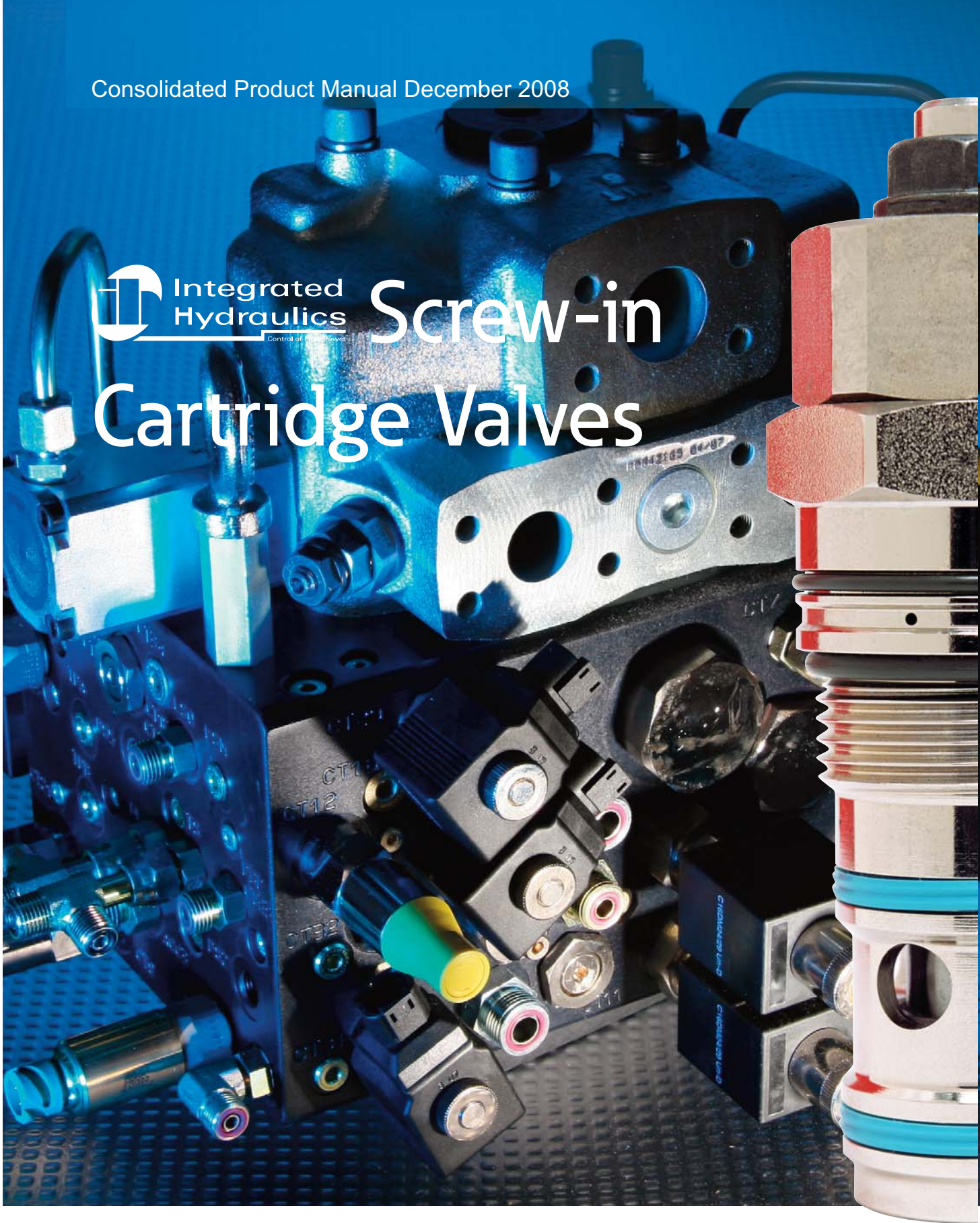


Consolidated Product Manual December 2008



Screw-in Cartridge Valves



EATON

Powering Business Worldwide





INTRODUCTION

QUICK SELECTION GUIDE	1
RELIEF VALVES	2
DUAL RELIEF VALVES	3
SEQUENCE VALVES	4
PRESSURE REDUCING VALVES	5
MOTION CONTROL VALVES including BoomLoc hose rupture valves	6
CHECK VALVES	7
NEEDLE / RESTRICTOR VALVES	8
FLOW REGULATORS	9
FLOW DIVIDER / COMBINER VALVES	10
DIRECTIONAL CONTROL VALVES	11
UNLOADING VALVES	12
SHUTTLE VALVES	13
CETOP MODULAR STACKING VALVES	14
MOTOR MOUNTED VALVES	15
HYDRAULIC INTEGRATED CIRCUITS	16
CAVITIES	17

INDEX

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INTRODUCTION

LIMITED WARRANTY

Integrated Hydraulics Ltd/Integrated Hydraulics Inc. (The Company) warrants that the items sold shall be free from defects in material and workmanship for a period of 12 months from date of shipment from the Company. Parts manufactured by a third party and supplied by The Company as part of a system or on their own shall be warranted to the extent of the original supplier's warranty and no more. The Company will undertake to remedy any defect resulting from faulty design, material or workmanship, provided that the Company shall not be required to expend money, services or material in any amounts exceeding the value of the original invoice for the said system or component. The Company will undertake to repair or replace the faulty system or component at the Company's discretion within a reasonable time scale agreed between the two parties. The Company shall not be liable for defects arising from materials provided by, or design stipulated or specified by the purchaser. The Company shall further not be liable for defects caused by faulty maintenance, incorrect erection or faulty repair by the purchaser. The Company will only be liable within the terms of warranty for defects which occur in connection with the proper use of the products within the specifications laid down for the products. The Company shall not be liable for any damage caused by any product after it has been delivered, nor shall the Company be liable for any damage to products manufactured by the purchaser, or

products of which the purchaser's product forms a part, or product from a third party which forms part of the purchaser's product. Goods may only be returned to the company upon prior written consent and at the Company's discretion shall be replaced, repaired or credited at the original invoiced price. The Company shall have no liability for any loss of profits, or any consequential loss, anticipated profits or any labour cost, whether incurred by the purchaser in replacing defective parts or otherwise. Any claim under this warranty must be made in writing within 30 days of the discovery of the problem or within 30 days of the end of the warranty period, whichever is sooner.

THE COMPANY HEREBY DISCLAIMS ANY AND ALL OTHER WARRANTIES, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Notwithstanding anything to the contrary in this warranty, or in any other agreement, purchase order, or other document, the Company shall not be responsible or liable for any consequential or incidental damages incurred or suffered by any purchaser, any customer of a purchaser or any other person in connection with the sale, marketing, distribution, use or any other action relating to the products.

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MATERIALS

Cartridge bodies are manufactured from high grade cold drawn steel bar, with the internal working parts hardened and ground for maximum performance and durability. Our line bodies, Hydraulic Integrated Circuit blocks and special bodies are manufactured from high strength, wrought aluminium bar and mild steel or stainless steel, dependant upon the exact requirements of individual applications. Various specialised coatings/finishes are obtainable for when environmentally unfriendly conditions are a consideration. For complete specifications and compatibilities, please consult our technical department.

It is recommended that for pressures above 210 bar (3000 psi) steel bodies are used. Whilst in most cases the aluminium bodies are strong enough, if transient peak pressures are encountered frequently, there is a possibility of fatigue.

PORTS

The ports on all our bodies are BSP (parallel) as standard and range in size from 1/4" to 1 1/4". SAE 'O' Ring and NPT ports are available on request.

SEALS

We use Nitrile as standard for temperatures of -20°C to +90°C (unless otherwise stated). Viton seals are available on request. Polyurethane seals are also available on some valves but care must be taken in their application with regard to fluid compatibility.

TEMPERATURE RANGES

Temperature ranges quoted throughout this catalogue relate to the seal material only. The viscosity index of the fluid should also be taken into account when selecting a valve, if in doubt please contact our technical department.

FLUIDS

Recommended fluid is mineral oil.

NOTE: All our test performances are carried out by using hydraulic oil with a viscosity of 40cSt at 40°C. For water based fluids, ie, 95/5 and 60/40 emulsion consult factory.

FILTRATION

Our valves utilise precision hydraulic components and we recommend a filtration level of between 15 and 25 microns, to produce a cleanliness level of BS5540/4 Class 18/13, dependant on the type of valve used. Replace filter elements regularly, try to avoid filter bypass condition - special attention should also be paid

to filtration when first commissioning the system or machine, when contamination levels are high.

TAMPERPROOF DEVICES

Various tamperproofing methods are available upon request for our range of cartridges and valves.

CARTRIDGE VALVE INSTALLATION

The correct machining of cavities to suit our range of cartridges is critical. Cavity tools are available for sale or hire and certified drawings are available upon request. All drawings and information contained within this catalogue are for guidance only. Where dimensions and actual valve usage is critical, please consult Integrated Hydraulics for full specifications and compatibilities. We reserve the right to alter specifications without notice or incurring obligation.

NOTE: It is important that each designer analyses all aspects of their application including consequences of any failure and review the information concerning the product or system in the current product catalogue. The responsibility for final selection rests with the customer.

TORQUE FIGURES

The torque values stated in this catalogue are for testing purposes only. Assembly tightening torque depends on many factors, including lubrication, coating and surface finish. Contact main office for further information.

ADJUSTMENT

The adjustment range and Max setting figures shown throughout this catalogue give the design range for each valve, higher or lower values may be attainable but should not be used without first contacting our Engineering department. Setting must ALWAYS be carried out using an appropriate gauge and it must NOT be assumed that screwing an adjuster to its maximum or minimum position will yield the maximum or minimum stated design setting for that valve.

PRESSURE EQUIPMENT DIRECTIVE

All pressure control valves manufactured by Integrated Hydraulics are designed to be "Pressure Accessories" in accordance with article 3 section 3 of the Pressure Equipment Directive and Sound Engineering Practice and sold in good faith as such. For "Safety Accessories" as defined in article 3 section 1.4 of the Pressure Equipment Directive please contact the UK Technical Sales Department.

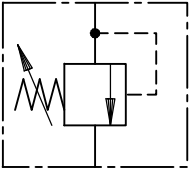
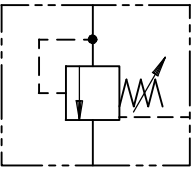




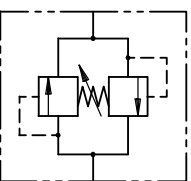
QUICK SELECTION GUIDE

1

SECTION 2 - RELIEF VALVES

RELIEF VALVE	DIRECT ACTING SLIDING SPOOL	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1GR30-P-*S	CARTRIDGE	30	140	2-171
	1GR35	3/8"			2-171
	1GR36	3/8" 1/2" 3/4"			2-171
	1GR60-P-*S	CARTRIDGE	60	40	2-161
	1GR65	3/8" 1/2"			2-161
	1GR66	1/2"			2-161
	1GR100-P-*S	CARTRIDGE	150	40	2-171
	1GR145	1/2" 3/4"			2-171
	1GR150	3/8" 1/2" 3/4"			2-171
	1GR155	1"			2-171
	DIFFERENTIAL AREA POPPET STYLE	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1LR300-F-*S	CARTRIDGE	380	350	2-191
	1LR350	1 1/4"			2-191
VENTABLE RELIEF VALVE	PILOT OPERATED SLIDING SPOOL	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1VR100-P-*S	CARTRIDGE	100	350	2-201
	1VR150	3/4"			2-201
	1VR200-P-*S	CARTRIDGE	200	350	2-211
	1VR250	1"			2-211

SECTION 3 - DUAL RELIEF VALVES

DUAL RELIEF VALVE SINGLE CARTRIDGE	DIFFERENTIAL AREA POPPET STYLE	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1CLLR50-F-*S	CARTRIDGE	50	350	3-115
	1CLLR55	3/8" 1/2"			3-115
	1CLLR100-F-*S	CARTRIDGE	150	350	3-121
	1CLLR150	3/4" 1"			3-121
	1CLLR155	3/4"			3-121

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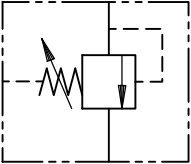
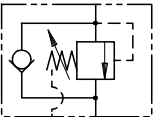
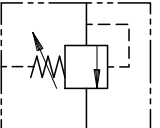
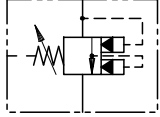
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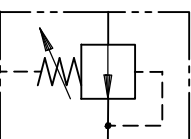
QUICK SELECTION GUIDE

SECTION 4 - SEQUENCE VALVES

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SEQUENCE VALVE	PILOT OPERATED SLIDING SPOOL	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
 <p>* CHECK VALVE IN BODY</p>	1PS60-P-*S	CARTRIDGE	60	350	4-131
	1PS65	3/8" 1/2"			4-131
	1PS66	1/2"			4-131
	1PS100-P-*S	CARTRIDGE	150	350	4-141
	1PS145	3/8" 1/2" 3/4"			4-141
	1PS200-P-*S	CARTRIDGE	250	350	4-151
	1PS250	1"			4-151
SEQUENCE VALVE WITH REVERSE FLOW	PILOT OPERATED/ DIRECTING ACTING SLIDING SPOOL	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1PSC30-F-*S	CARTRIDGE	30	200	4-161
	1PSC35	3/8" 1/2"			4-161
	1PSC100-P-*S	CARTRIDGE	150	350	4-171
	1PSC145	3/8" 1/2" 3/4"			4-171
SEQUENCE VALVE	DIRECTING ACTING SLIDING SPOOL	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
 <p>* CHECK VALVE IN BODY</p>	1DS30-P-*S	CARTRIDGE	30	140	4-121
	1DS35	3/8" 1/2"			4-121
	1DS60-P-*S	CARTRIDGE	60	350	4-111
	1DS65	3/8" 1/2"			4-111
	1DS66	1/2"			4-111
	1DS100-P-*S	CARTRIDGE	150	40	4-121
	1DS145	3/8" 1/2" 3/4"			4-121
	1DS155	3/4"			4-121
UNLOADING SEQUENCE VALVE	PILOT OPERATED SLIDING SPOOL	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
 <p>* CHECK VALVE IN BODY</p>	1UPS100-P-*S	CARTRIDGE	150	350	4-181
	1UPS145	3/8" 1/2" 3/4"			4-181
	1UPS155	3/4"			4-181

SECTION 5 - PRESSURE REDUCING VALVES

PRESSURE REDUCING VALVE	PILOT OPERATED SLIDING SPOOL	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1PA200-P-*S	CARTRIDGE	200	350	5-141
	1PA250	1"			5-141

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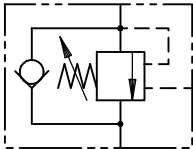
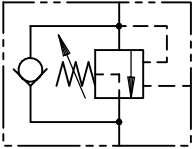
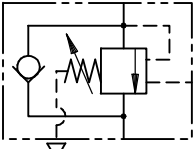
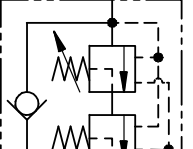
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QUICK SELECTION GUIDE

1

SECTION 6 - MOTION CONTROL VALVES

OVERCENTRE VALVE	PILOT ASSISTED RELIEF WITH CHECK	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1CE30	CARTRIDGE	30	350	6-111
	1CE35	3/8"			6-111
	1CE90	CARTRIDGE	90	350	6-151
	1CE95	1/2"			6-151
	1CE120	CARTRIDGE	120	350	6-181
	1CE150	3/4"			6-181
	1CE140	CARTRIDGE	140	420	6-205
	1CE145	3/4" 1"			6-205
	1CE300	CARTRIDGE	300	350	6-241
	1CE350	1 1/4"			6-241
OVERCENTRE VALVE BALANCED RELIEF	PILOT ASSISTED POPPET RELIEF	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1CER30	CARTRIDGE	30	350	6-121
	1CER35	3/8"			6-121
	1CER90	CARTRIDGE	90	350	6-161
	1CER95	1/2"			6-161
	1CER140	CARTRIDGE	140	420	6-211
	1CER145	3/4" 1"			6-211
OVERCENTRE VALVE FULLY BALANCED	PILOT ASSISTED POPPET RELIEF	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1CEB30	CARTRIDGE	30	350	6-131
	1CEB35	3/8"			6-131
	1CEB90	CARTRIDGE	90	350	6-171
	1CEB95	1/2"			6-171
	1CEBD90	CARTRIDGE	90	350	6-173
	1CEB120	CARTRIDGE	120	350	6-191
	1CEB150	3/4"			6-191
	1CEBD120	CARTRIDGE	120	350	6-193
	1CEB300	CARTRIDGE	300	350	6-251
	1CEB350	1 1/4"			6-251
	1CEBD300	CARTRIDGE	300	350	6-255
OVERCENTRE VALVE WITH COUNTERBALANCE	PILOT ASSISTED POPPET RELIEF	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1CEL30	CARTRIDGE	30	380	6-135
	1CEL35	3/8"			6-135
	1CEL90	CARTRIDGE	90	380	6-175
	1CEL95	1/2"			6-175
	1CEL140	CARTRIDGE	140	380	6-225
	1CEL145	3/4" 1"			6-225

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QUICK SELECTION GUIDE

SECTION 6 - MOTION CONTROL VALVES

1

OVERCENTRE VALVE ZERO DIFFERENTIAL	PILOT ASSISTED POPPET RELIEF	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1CPB30	CARTRIDGE	30	350	6-137
	1CPB35	3/8"			6-137
	1CPBD30	CARTRIDGE	30	350	6-139
	1CPBD90	CARTRIDGE	90	350	6-177
	1CPBD120	CARTRIDGE	180	400	6-197
	1CPBD300	CARTRIDGE	300	400	6-265
DUAL OVERCENTRE VALVE	PILOT ASSISTED POPPET RELIEF	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1CEE34	3/8"	30	350	6-111
	1CEE95	1/2"	90	350	6-151
	1CEE150	3/4"	120	350	6-181
	1CEE145	3/4" 1"	140	420	6-205
	1CEE350	1 1/4"	300	350	6-241
DUAL OVERCENTRE VALVE BALANCED RELIEF	PILOT ASSISTED POPPET RELIEF	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1CEER34	3/8"	30	350	6-121
	1CEER95	1/2"	90	350	6-161
	1CEER145	3/4" 1"	140	420	6-211
DUAL OVERCENTRE VALVE FULLY BALANCED	PILOT ASSISTED POPPET RELIEF	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1CEEB34	3/8"	30	350	6-131
	1CEEB95	1/2"	90	350	6-171
	1CEEB150	3/4"	120	350	6-191
	1CEEB350	1 1/4"	300	350	6-251
DUAL OVERCENTRE VALVE WITH COUNTERBALANCE	PILOT ASSISTED POPPET RELIEF	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1CEEL34	3/8"	30	380	6-135
	1CEEL95	1/2"	90	380	6-175
	1CEEL145	3/4" 1"	140	380	6-225
OVERCENTRE VALVES	BANJO MOUNTED	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1CBE*35	3/8"	30	350	6-141
	1CBE*150	3/4"	120	350	6-201

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QUICK SELECTION GUIDE

1

SECTION 6 - MOTION CONTROL VALVES

OVERCENTRE INTERNAL PILOT THROUGH PORTED	PILOT ASSISTED POPPET RELIEF	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1CE*36	3/8"	30	350	6-141
	1CE*156	3/4"	120	350	6-201
	1CE356	1 1/4"	300	350	6-269
OVERCENTRE VALVES GASKET MOUNTED	PILOT ASSISTED POPPET RELIEF	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1CE*G35	3/8"	30	350	6-141
	1CE*G150	3/4"	120	350	6-201
	1CEG350	1 1/4"	300	350	6-269
DUAL OVERCENTRE VALVE WITH BRAKE SHUTTLE	PILOT ASSISTED POPPET RELIEF	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1CEESH35	3/8"	30	350	6-271
	1CEESH95	3/4"	95	350	6-281
	1CEESH150	3/4"	120	350	6-291
	1CEESH350	1 1/4"	300	350	6-291
MOTION CONTROL AND LOCK VALVE	PILOT ASSISTED POPPET RELIEF	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1CEEC35	3/8"	30	350	6-301
	1CEEC95	3/4"	95	350	6-301
	1CEEC150	1"	150	350	6-311
	1CEEC350	1 1/4"	300	350	6-311
MOTION CONTROL VALVES WITH BRAKE SHUTTLE	PILOT ASSISTED POPPET RELIEF	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1CEECSH35	3/8"	30	350	6-321
	1CEECSH95	3/4"	95	350	6-331
	1CEECSH150	1"	150	350	6-341
	1CEECSH350	1 1/4"	300	350	6-341
HOSE BURST PROTECTION	BOOMLOCK	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1CEBL31	3/8"	30	350	6-441
	1CEBL31	1/2" SAE FLANGE	30	350	6-451
	1CEBL31	1/2"	30	350	6-461
	1CEBL91	1/2"	90	350	6-471
	1CEBL151	1/2"	150	350	6-481
	1CEBL256	3/4" SAE FLANGE	250	350	6-411
	1CEBL356	1" SAE FLANGE	350	350	6-421
	1CEBL556	1-1/4" SAE FLANGE	550	350	6-431

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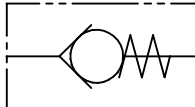
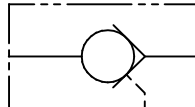
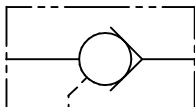
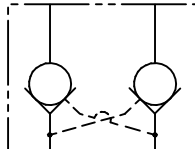
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QUICK SELECTION GUIDE

SECTION 7 - CHECK VALVES

1

CHECK VALVES	GUIDED POPPET LINE MOUNTED	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	FPR 1/4	1/4"	12	350	7-111
	FPR 3/8	3/8"	30	350	7-111
	FPR 1/2	1/2"	45	350	7-111
	FPR 3/4	3/4"	85	300	7-111
	FPR 1	1"	140	250	7-111
	FPR 1.1/4	1 1/4"	20	250	7-111
	FPR 1.1/2	1 1/2"	310	210	7-111
PILOT TO OPEN CHECK VALVES	HARDENED POPPET	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	4CK30	CARTRIDGE	30	350	7-151
	4CK35	3/8"			7-151
	4CK90	CARTRIDGE	90	350	7-161
	4CK95	1/2"			7-161
	4CKD90	CARTRIDGE	90	350	7-163
	4CKD95	1/2"			7-163
	4CK120	CARTRIDGE	120	350	7-171
	4CK125	3/4" 1"			7-171
	4CK300	CARTRIDGE	300	350	7-181
	4CK350	1 1/4"			7-181
	4KD25	1/4"	20	700	7-201
PILOT TO CLOSE CHECK VALVES	HARDENED POPPET	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	5CK30	CARTRIDGE	30	350	7-211
	5CK35	3/8"			7-211
	5CK120	CARTRIDGE	120	350	7-211
	5CK125	3/4" 1"			7-211
	5CK300	CARTRIDGE	250	350	7-211
	5CK350	1 1/4"			7-211
DUAL PILOT OPERATED CHECK VALVES	HARDENED POPPET	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	4CKK34	3/8"	30	350	7-151
	4CKK95	1/2"	90	350	7-161
	4CKKD95	1/2"	90	350	7-163
	4CKK125	3/4"	120	350	7-171
	4CKK350	1 1/4"	300	350	7-181

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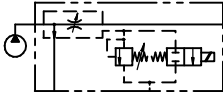
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SECTION 9 - FLOW REGULATORS

FLOW REGULATOR DIVERTER VALVES	SOLENOID SWITCH PRIORITY STYLE	PORT SIZE	Q RATED (L/min)	P MAX (Bar)	PAGE
	2FPH55	1/2"	55	350	9-181
	2FPH95	3/4"	95	350	9-181
	2FPH195	1"	195	350	9-181
	2FPH250	1"	200	350	9-191
	2FPH350	1 1/2"	350	350	9-191

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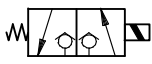
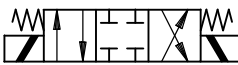

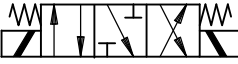
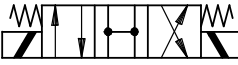

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
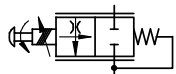
QUICK SELECTION GUIDE

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SECTION 11 - DIRECTIONAL CONTROL VALVES

SOLENOID VALVES	3-WAY, 2-POSITION SPOOL/POPPET	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	S229 Poppet	CARTRIDGE	12	210	11-2731
	S229 Poppet	3/8 1/2"			11-2731
SOLENOID VALVES	4-WAY, 3-POSITION SPOOL	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	S570	CARTRIDGE	35	210	11-3411
	S571	CARTRIDGE	34	210	11-3611
	S572	CARTRIDGE	34	210	11-3811
	S574	CARTRIDGE	34	210	11-4011
	S577R	CARTRIDGE	27	210	11-4211

SECTION 11 - PROPORTIONAL VALVES

PRESSURE RELIEF VALVES	SOLENOID OPERATED	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	PDR21A	CARTRIDGE	1.5	350	11/2-151
	PDR21A	1/4" 3/8"			11/2-151
FLOW CONTROL VALVES	SOLENOID OPERATED COMPENSATED	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	PFR2 4A	CARTRIDGE	18	210	11/9-121
	PFR2 4A	1/4" 3/8"			11/9-121

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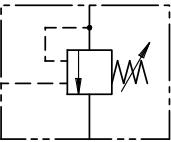
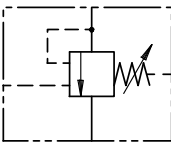
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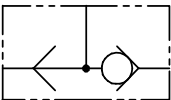
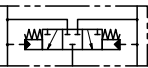
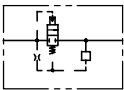
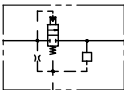
QUICK SELECTION GUIDE

SECTION 12 - UNLOADING VALVES

1

UNLOADING VALVES	PILOT OPERATED SLIDING SPOOL	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1UL60	CARTRIDGE	60	350	12-111
	1UL65	1/2"			12-111
PRIORITY UNLOADING VALVES	PILOT OPERATED SLIDING SPOOL	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1PUL60	CARTRIDGE	60	350	12-111
	1PUL65	1/2"			12-111
	1PUL200	CARTRIDGE	200	350	12-121
	1PUL250	1"			12-121

SECTION 13 - SHUTTLE VALVES

SHUTTLE VALVE	BALL TYPE	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1SH10	CARTRIDGE	20	350	13-105
HOT OIL SHUTTLE VALVE	SPOOL TYPE	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1HSH701	CARTRIDGE	80	420	13-185
	1HSH751	1/2" 3/4"			13-185
LOGIC ELEMENTS	SPOOL TYPE	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	LE402	CARTRIDGE	400	350	13-351
	LE452	1.1/4" 1.1/2"			13-351
	LEV402	CARTRIDGE	400	250	13-381
	LEV452	1.1/4" 1.1/2"			13-381

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SECTION 14 - CETOP 03/05 OVERCENTRE SANDWICH VALVES

1

OVERCENTRE VALVES	PILOT ASSISTED WITH RELIEF CHECK	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	03ACE*/03BCE*	Cetop 03	30	350	14-111
	05ACE*/05BCE*	Cetop 05	90	350	14-121
DUAL OVERCENTRE VALVES	PILOT ASSISTED WITH RELIEF CHECK	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	03ABCE*	Cetop 03	30	350	14-111
	05ABCE*	Cetop 05	90	350	14-121
CHECK VALVES	PILOT TO OPEN	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	03ACK/03BCK	Cetop 03	30	350	14-131
	05ACK/03BCK	Cetop 05	90	350	14-141
DUAL CHECK VALVES	PILOT TO OPEN	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	05ABCK	Cetop 03	30	350	14-131
	05ABCK	Cetop 05	90	350	14-141

SECTION 15 - MOTOR MOUNTED VALVES

Contact office for
further details

DANFOSS	DUAL RELIEF VALVES	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1CLLROMP150	1/2"	150	280	15-111
	1CLLROMS150	1/2"	150	280	15-121
DANFOSS	OVERCENTRE VALVES	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1CEEOMP35	1/2"	40	350	15-131
	1CEEOMS95	1/2"	90	350	15-141
	1CEOMP35	1/2"	40	350	15-131
	1CEOMS95	1/2"	90	350	15-141
	1CEESHOMP35	1/2"	40	350	15-151
	1CEESHOMS95	1/2"	90	350	15-161
	1CESHOMP35	1/2"	40	350	15-151
	1CESHOMS95	1/2"	90	350	15-161

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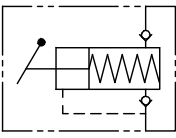
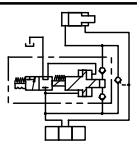


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SECTION 16 - HYDRAULIC INTEGRATED CIRCUITS & SPECIAL PRODUCTS

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further details

1

HAND PUMP	INTEGRATED CIRCUIT	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1HP7	CARTRIDGE		50	16-111
	1HP75	3/8" 1/2"		50	16-111
PRESSURE INTENSIFIER	INTEGRATED CIRCUIT	PORT SIZE	Q NOM (L/min)	P MAX (Bar)	PAGE
	1T16	1/4"	1.5	700	16-121

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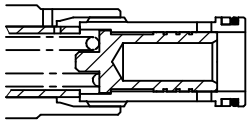
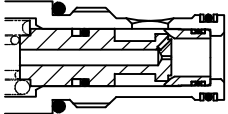
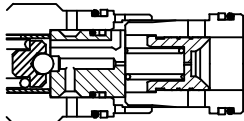
SECTION 2 - RELIEF VALVES

CONTENTS

This section contains a wide variety of relief valves suitable for most applications, with flows up to 380 litres/min (100 US GPM) and pressures up to 400 bar (5800 psi). Valves available include direct acting, poppet type reliefs suitable for safety and fast acting requirements and pilot operated valves giving good, accurate control over widely varying flows.

2

SELECTION

SECTION	SERIES	APPLICATION	RANGE	PAGE
	1GR Direct acting guided piston	Low pressure applications for radiator bypass or low pressure close control	140 bar max (2000 psi) 150 litres/min (40 US GPM)	2-161 to 1-171
	1LR Direct acting differential area, poppet type	Ideal for use as a relief where fast action is necessary to protect actuators	350 bar max (5000 psi) 380 litres/min (100 US GPM)	2-181 to 2-191
	1VR Pilot operated sliding spool, ventable	For use as a control valve giving accuracy of setting over a wide band of flow with dump or secondary pressure facility	350 bar max (5000 psi) 200 litres/min (52 US GPM)	2-201 to 2-211

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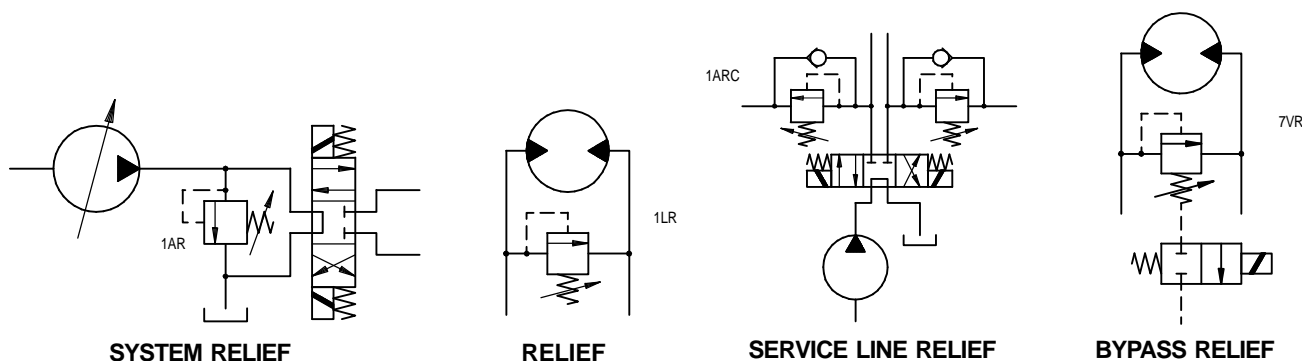
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TYPICAL CIRCUIT EXAMPLES



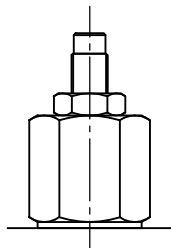
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PRESSURE EQUIPMENT DIRECTIVE

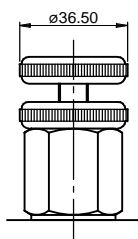
All pressure control valves manufactured by Integrated Hydraulics are designed to be “Pressure Accessories” in accordance with article 3 section 3 of the Pressure Equipment Directive and Sound Engineering Practice and sold in good faith as such. For “Safety Accessories” as defined in article 3 section 1.4 of the Pressure Equipment Directive please contact the UK Technical Sales Department.

ADJUSTMENTS

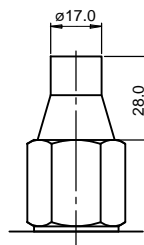
The adjustment range and Max setting figures shown throughout this catalogue give the design range for each valve, higher or lower values may be attainable but should not be used without first contacting our Engineering department. Setting must ALWAYS be carried out using an appropriate gauge and it must NOT be assumed that screwing an adjuster to its maximum or minimum position will yield the maximum or minimum stated design setting for that valve.



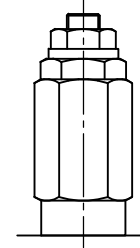
'P' - LEAKPROOF SCREW



'R' - HANDKNOB



'G' - TAMPERPROOF CAP



'F' - SCREW

Tightening torque of "F" adjuster locknut - 20 to 25 Nm

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RELIEF VALVES

Our brave new world of Hydraulics provides technology to industry that is ever improving and more complex. The demand for machines that think for themselves reducing human error have inspired the engineering fraternity to ever greater feats of hydraulic ingenuity.

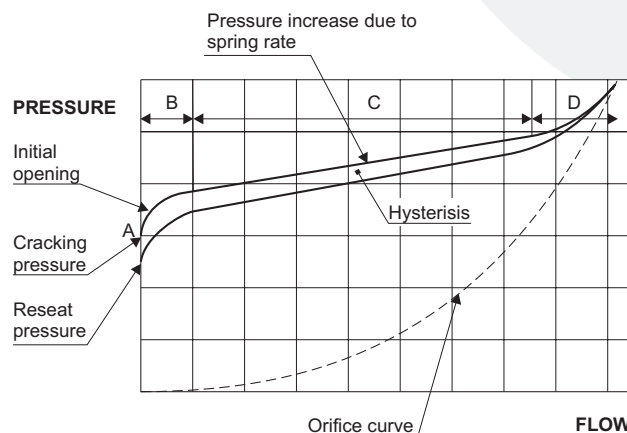
The simple directional valve has become an electronically controlled mechanism that provides fine control to the movement of machinery. The pump has become more efficient by adding feed back controls in the form of pressure compensation and load sensing, providing stable controlled flow to a pre-determined level to reduce energy losses. Even some actuators have built in transducers to provide position feed back completing the loop.

It is a shame that when using this modern technology the simpler and most important valve in a system can be as crude as a ball on a seat. The humble relief valve takes a back seat to the point where great effort is made not to allow this valve its rightful roll in providing the ultimate system protection. "Don't let it operate because it is noisy" or "we can not guarantee that the pressure control will be consistent". "The valve opens too soon and does not close quickly enough".

From the main system relief to the safety relief there are valves available that are equally advanced in their innovation and technology as the higher profile pumps, directional control valves and actuators. The problem is that many engineers do not understand the reasons for the different designs and their individual applications or how to assess the performance. This article will attempt to throw some light on what is available and where to apply the different designs.

It is true that the simplest relief valve is a ball sitting on a seat with a spring keeping it closed until the pressure over the area of the seat is high enough to allow the valve to open and allow flow to pass. The flow capacity is limited by the size of the seat and the pressure difference across the opening. To get more flow across the valve the ball has to move further back against the spring increasing the force and therefore the required pressure. A basic relief valve curve will look like Graph 1.

Graph 1. Basic relief curve



Graph 1 is based on a poppet style direct acting relief. The cracking pressure is the point "A" at which the pressure over the area of the seat is the same as the spring force. The initial opening characteristic "B" depends on the cone angle of the poppet, the second section of the curve "C" depends on the relationship between the design of the poppet and its movement which is effected by the rate of the spring, generally the higher the spring rate the steeper the gradient. As more flow passes through the valve the relief curve will meet the orifice curve "D".

The performance of a direct acting relief valve can be altered by innovative poppet design. By using the flow forces to help open the valve the effect of a high rate spring can be reduced and the gradient be kept relatively flat.

Figure 1. 1DR30 Direct acting poppet

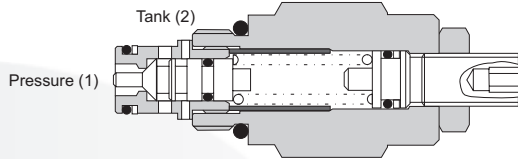
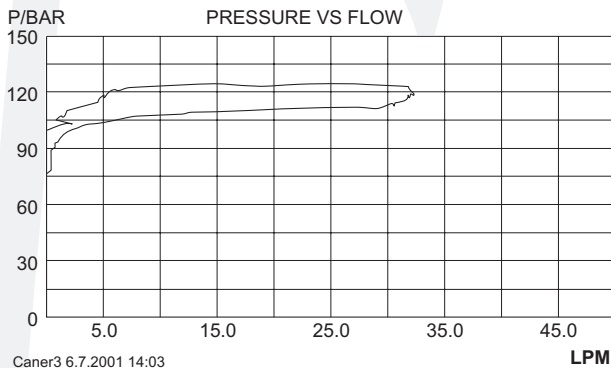


Figure 1 shows a section through a typical relief valve where the poppet design allows for a relatively low pressure rise due to increase in flow. A problem with this type of valve is that too much flow can cause the valve to have a negative pressure rise causing the valve to go unstable with fluctuating pressure.

The re-seat and repeatability of the valve depends upon the hysteresis. Internal seals cause friction against the bore as the valve tries to close. If a seal is under pressure then the hysteresis increases, graph 2.

Graph 2. Relief Curve showing the effect of hysteresis

1DR30-10S SET @ 100Bar CRACK PRESSURE
FLOW = 30L/MIN

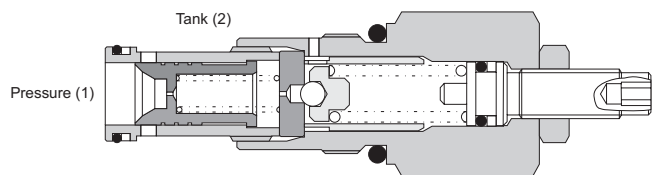


A poppet valve should not leak more than 1/3 cc/min up to the cracking pressure allowing it to be placed in a line where low leakage is important, and performing duties such as a service line relief.

A simple relief valve like this will give cost effective relief protection to small systems or where the valve is not the main pressure control but a pressure limiting device. They are not generally suitable for high flows because the spring would have to be of excessively high rate which would give an unacceptably steep relief curve.

Figure 2 shows a typical pilot operated, spool type relief valve that gives good control over varying flows. This valve, due to its design, allows a high flow to pass with very little rise in inlet pressure. The valve has a good re-seat and good repeatability due to there being no internal seals. A pilot operated relief valve is suitable as a main pressure control but due to the two stage design it is not suitable for safety applications where speed of operation is important. In the case of a rapid increase in inlet pressure the system will be subject to a longer pressure spike than if a direct acting valve were used.

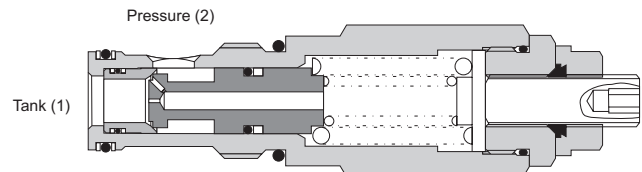
Figure 2. 1AR100 pilot operated spool



Increasing the flow capacity of a direct acting valve by reducing the area over which the pressure acts is possible, figure 3 shows a differential area poppet type relief valve that has the capability of very fast action and a high flow capacity for its size. The internal seal is subject to inlet pressure so the valve will display relatively poor re-seat characteristics.

The design of the poppet is such that as the valve begins to open the flow past the poppet draws oil from the spring chamber (by venturi effect over the small holes in the poppet annulus) causing initial over opening. This removes most of the pressure spike. The valve is therefore highly suitable as protection for actuators.

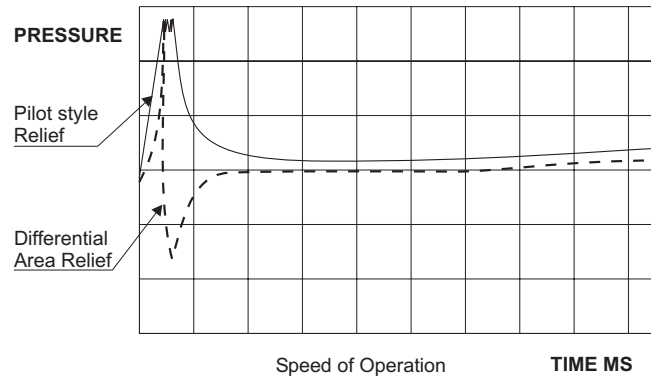
Figure 3. 1LR100 direct acting differential area



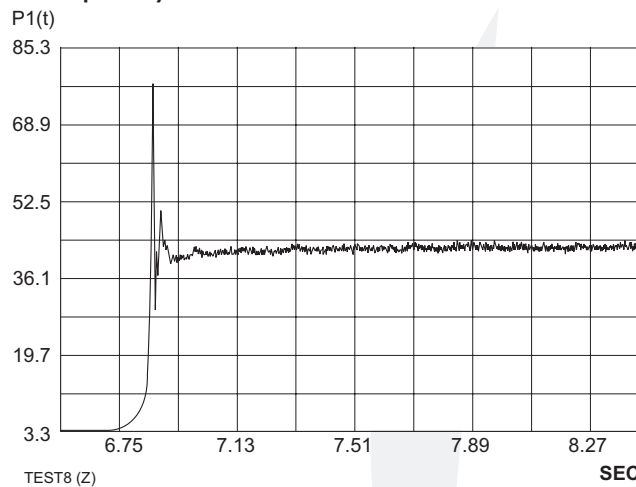


RELIEF VALVES

Graph 3. Comparison of Pilot and direct acting differential area type opening curves



Graph 4. Opening characteristics of pilot style relief



Graph 5. Opening characteristics of direct acting relief

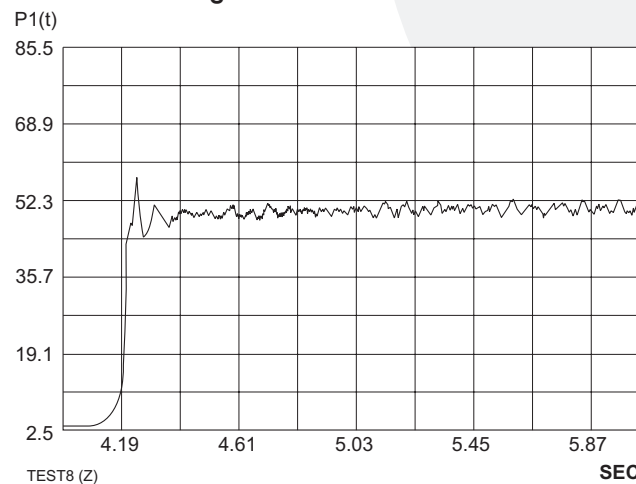
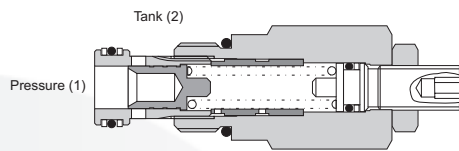


Figure 4. 1GR60 Direct acting spool



Graph 3 shows a comparison between the typical opening characteristics of a pilot style valve and a differential area direct acting valve with the special poppet described above. The difference between the opening characteristics of a pilot style relief valve and a direct acting spool type relief valve are shown in graph 4 & 5 respectively, graph 4 clearly illustrating the pressure spike permitted by the pilot style valve.

Figure 4 shows a spool type direct acting relief valve. These are suitable for low pressure systems where stable or constant operation is required. They provide quiet operation even with fluctuating pressures. The spool opens up a ring of holes in the sleeve that gives a more gradual increase in flow area than a poppet valve.

Spool valves will give between 50 and 100cc/min leakage before they open.

The four main types of relief valve as detailed above cover most applications but there are many variations on a theme that give flexibility to a systems design.

Ventable relief valves, figure 5, are used to provide an unloading function, presenting an ability to be remotely operated and the possibility of switching between more than one pressure.

Unloading relief valves or 'kick down' valves, figure 6, provide an off load of pressure when the setting is reached, the valve remains fully open until the pressure falls to zero. This removes any force created by an actuator that could cause mechanical damage within a system.

In order to simplify the design of a circuit and reduce its cost system designers frequently require a valve to perform additional functions, two such valves are shown below, figure 7 a relief valve in conjunction with bypass check and figure 8 a cross line relief valve.

When designing hydraulic systems it is important to consider the performance of the minor components such as relief valves. These may be minor in cost but they have a major impact in terms of value. A poor relief valve can effect the efficiency and life of a complete machine. From overall pressure control to actuator protection the relief has to be of the correct type to ensure sound performance and component integrity.

“From overall pressure control to actuator protection the relief has to be of the correct type to ensure sound performance and component integrity”

There are also electrically controlled proportional valves available that tie in with electronic systems. That is another subject but they should never be allowed to replace the humble mechanical relief valve, the correct application of which can permit a machine to operate to its optimum performance over a long period.

Figure 5. 1VR100 Ventable relief

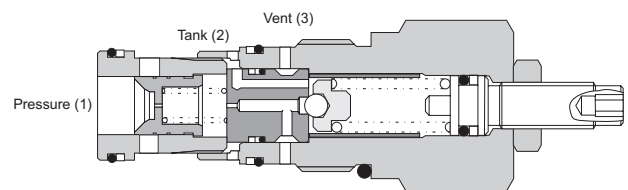


Figure 6. 1UAR100 Unloading relief

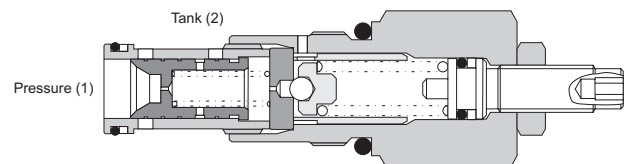


Figure 7. 1ACR100 Relief combined with by-pass check

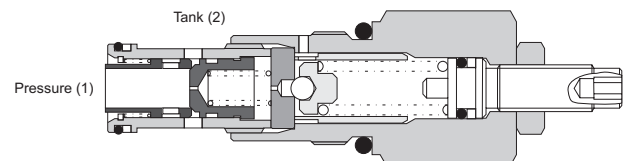
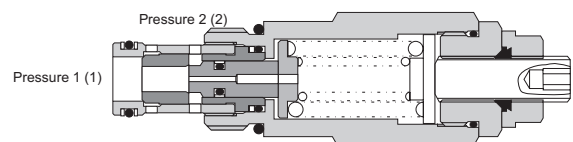


Figure 8. 1CLLR50 Dual relief





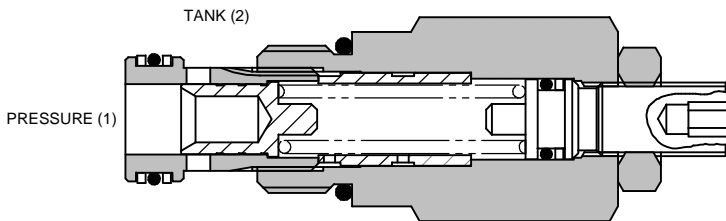
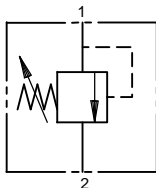
1GR SERIES RELIEF VALVE

DIRECT ACTING (ISO CAVITY NUMBER: 7789-20-1-0-90)

1GR60

SLIDING SPOOL TYPE

2



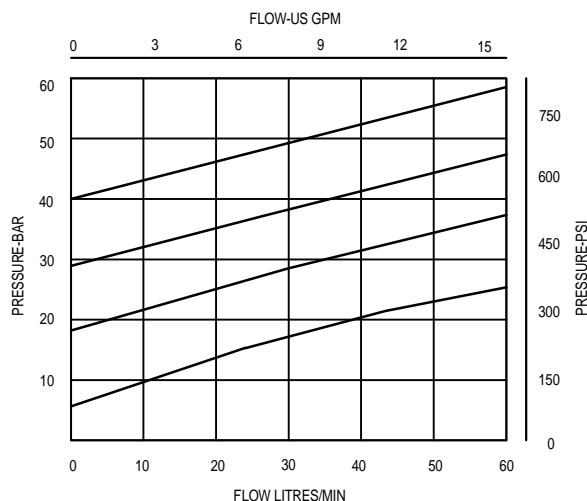
APPLICATION

To limit pressure in a system. Good for continuous duty and accurate pressure control with constant or varying flows.

OPERATION

The valve is held closed by the spring until pressure on the piston overcomes the valve setting, allowing relief flow to tank through a ring of radial holes.

PRESSURE DROP



FEATURES

High accuracy of pilot operated design. Hardened working parts give long, reliable, trouble-free life. Cartridge construction for installation into your own manifold.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	60 litres/min (16 US GPM)
Max Setting	40 bar (600 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add Suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	CVA20-01-0 (See Section 17)
Torque Cartridge into Cavity	45 Nm (33 lbs ft)
Weight	1GR60 0.18 kg (0.4 lbs) 1GR65 0.36 kg (0.8 lbs) 1GR66 0.48 kg (1.0 lbs)
Seal Kit Number	SK696 (Nitrile) SK696V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C (Standard seals)
Leakage	35 millilitres/min @ 210 bar
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

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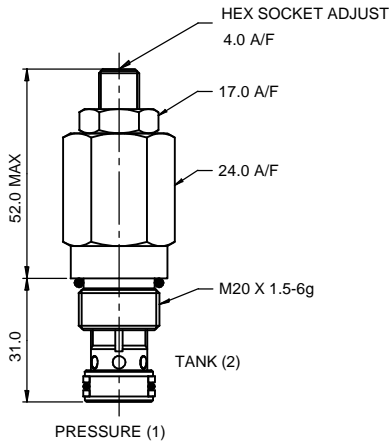
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CARTRIDGE ONLY

BASIC CODE: 1GR60



COMPLETE VALVE 3/8" 1/2" PORTS

BASIC CODE: 1GR65

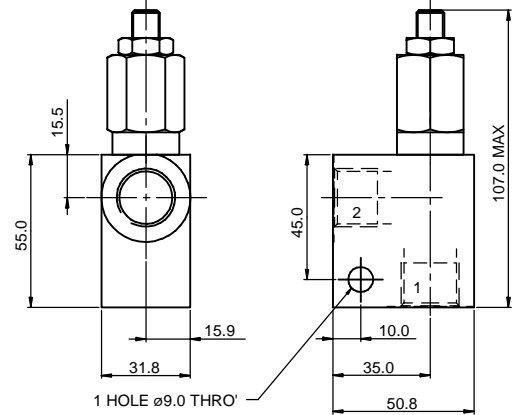
Body ONLY part numbers

BSP, aluminium
3/8" A13758
1/2" A8532

SAE, aluminium
3/8" A10780
1/2" A10781

BSP, steel
3/8" A13615

SAE, steel
1/2" A11798



2

COMPLETE VALVE 1/2" PORTS

BASIC CODE: 1GR66

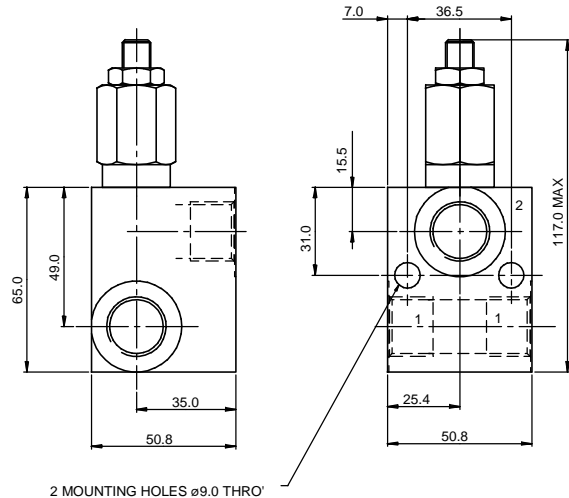
Body ONLY part numbers

BSP, aluminium
1/2" B13011

SAE, aluminium
1/2" B10783

BSP, steel
1/2" B13473

SAE, steel
1/2" B13477



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1GR**

P

3W

4

S

Basic Code

1GR60 = Cartridge Only

1GR65 = Cartridge and Body

1GR66 = Cartridge and Body through ported

Adjustment Means

P = Leakproof Screw Adjustment

R = Handknob Adjustment

G = Tamperproof Cap

(See page 2-102 for dimensions)

Port Sizes - Bodied Valves Only

3W = 3/8" BSP **6T** = 3/8" SAE

4W = 1/2" BSP **8T** = 1/2" SAE

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 4.8 l/min

2 = 5-20 bar. Std setting 20 bar

4 = 5-40 bar. Std setting 28 bar

Std setting made at 4.8 litres/min

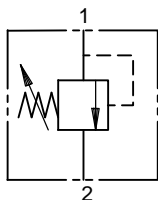
We reserve the right to change specifications without notice



1GR SERIES RELIEF VALVE

DIRECT ACTING

2

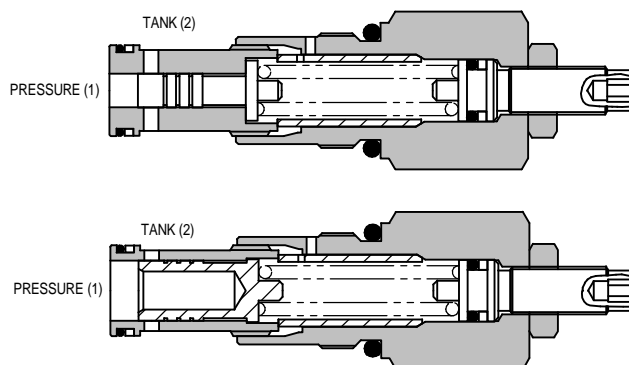


1GR30

SLIDING SPOOL TYPE

1GR100

SLIDING SPOOL TYPE



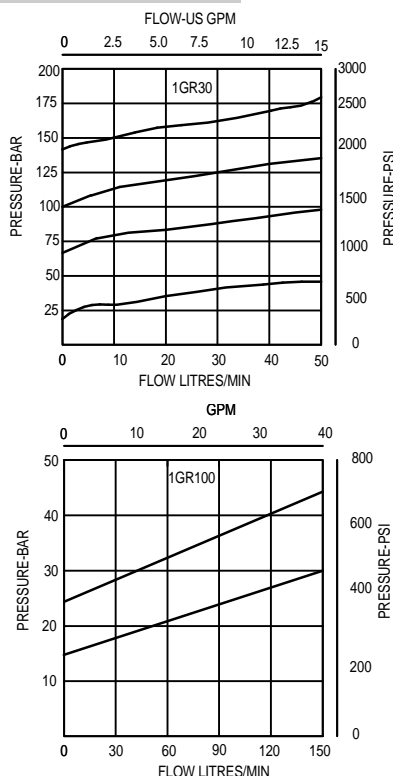
APPLICATION

Ideal for low pressure applications, giving good control with fairly constant flow. Also very quiet in operation when applied on low flow or unstable hydraulic systems.

OPERATION

The valve is held closed by the spring until pressure on the piston overcomes the valve setting, allowing relief flow to tank through a ring of radial holes.

PRESSURE DROP



FEATURES

Stable, quiet operation. Cartridge construction to give maximum flexibility in mounting. Offering good repeatability and reseal.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	1GR30 30 litres/min (8 US GPM) 1GR100 150 litres/min (40 US GPM)
Max Setting	1GR30 160 bar (2300 psi) 1GR100 40 bar (600 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add Suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A881 (See Section 17)
Torque Cartridge into Cavity	60 Nm (44 lbs ft)
Weight	1GR30/1GR100 0.31 kg (0.7 lbs) 1GR35/1GR145 0.54 kg (1.2 lbs) 1GR36/1GR150 0.91 kg (2.0 lbs) 1GR155 1.08 kg (2.4 lbs)
Seal Kit Number	SK190 (Nitrile) SK190V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operation Temp	-20°C to +90°C
Leakage	15 millilitres/min nominal
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

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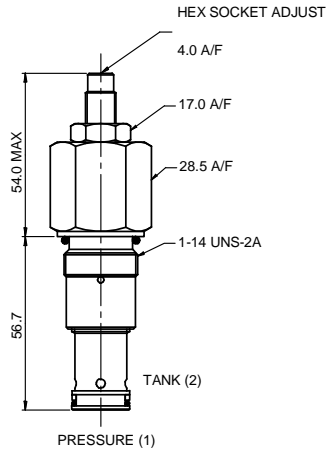
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Website: www.integratedhydraulics.com

CARTRIDGE ONLY

BASIC CODE: 1GR30 OR 1GR100

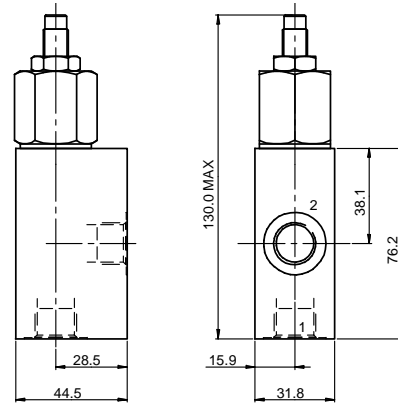


COMPLETE VALVE 1/2" 3/4" PORTS

BASIC CODE: 1GR35 OR 1GR145

Body ONLY part numbers

BSP, aluminium
1/2" B4851
3/4" B3954



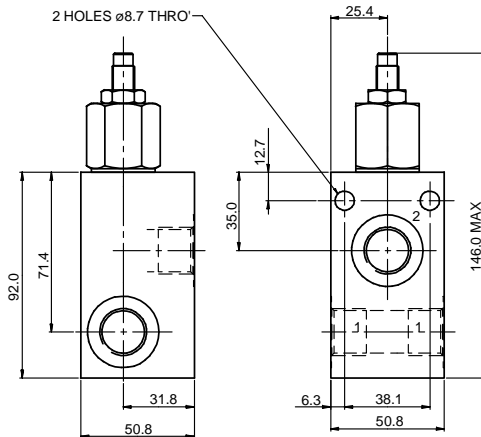
2

COMPLETE VALVE 3/8" 1/2" 3/4" PORTS

BASIC CODE: 1GR36 OR 1GR150

Body ONLY part numbers

BSP, aluminium	SAE, aluminium	BSP, steel	SAE, steel
3/8" C1084	3/8" B10784	1/2" C593	1/2" B10742
1/2" C1044	1/2" C7140	3/4" C4917	
3/4" C1086	3/4" B10506		

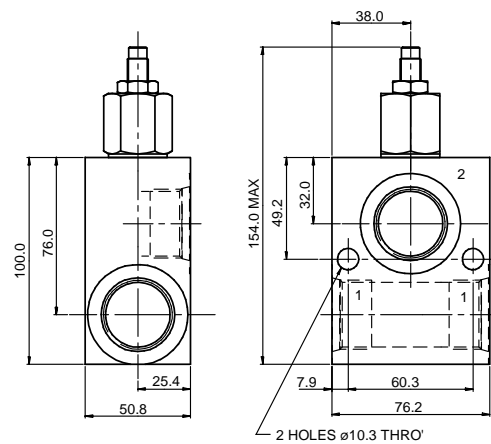


COMPLETE VALVE 1" PORTS

BASIC CODE: 1GR155

Body ONLY part numbers

BSP, aluminium	SAE, aluminium	BSP, steel	SAE, steel
1" B1617	1" B1037	1" B4596	1" B24040



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1GR P 3W 16 S**

Basic Code

1GR30 / 1GR100 = Cartridge Only
1GR35 / 1GR145 = Cartridge and Body
1GR36 / 1GR150 / 1GR155 = Cartridge and Body through ported

Adjustment Means

P = Leakproof Screw Adjustment
R = Handknob Adjustment
G = Tamperproof Cap
(See page 2-102 for dimensions)

Port Sizes - Bodied Valves Only

3W = 3/8" BSP 6T = 3/8" SAE
4W = 1/2" BSP 8T = 1/2" SAE
6W = 3/4" BSP 12T = 3/4" SAE
8W = 1" BSP 16T = 1" SAE

Seals

S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 4.8 l/min

1GR30:

7 = 7-70 bar. Std setting 35 bar
16 = 14-160 bar. Std setting 155 bar

1GR100:

0.6 = 0.3-6 bar. Std setting 6 bar
2 = 5-25 bar. Std setting 20 bar
4 = 5-40 bar. Std setting 28 bar
Std setting made at 4.8 litres/min

We reserve the right to change specifications without notice



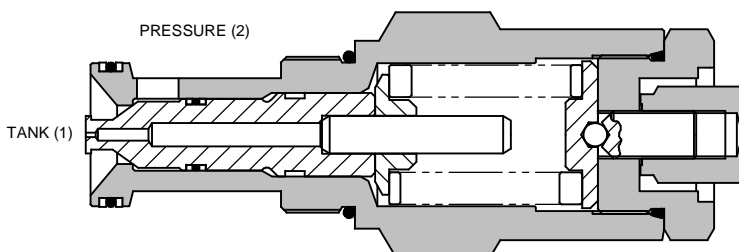
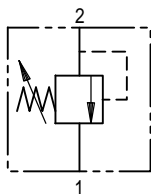
1LR SERIES RELIEF VALVE

DIRECT ACTING DIFFERENTIAL AREA

1LR300

POPPET TYPE

2



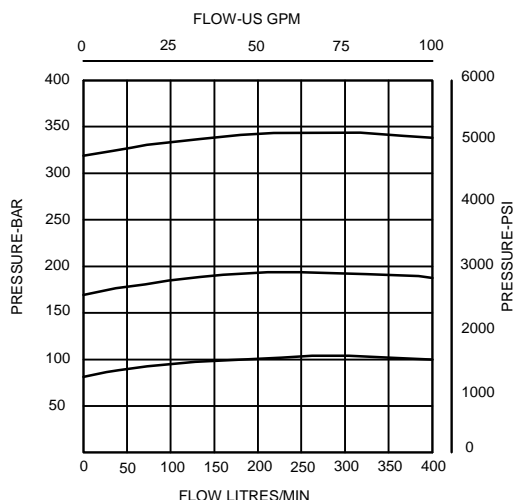
APPLICATION

Ideal for intermittent duty as protection against overload or surge conditions for all types of actuators. Very fast acting and extremely dirt tolerant.

OPERATION

Pressure acts over the differential area between the seat and seal on the poppet. When the pressure exceeds the setting, the valve opens, allowing relief flow to tank, washing contaminant away from the seat.

PRESSURE DROP



FEATURES

Dirt tolerant, robust and consistent with good pressure rise to increase in flow characteristics for a direct acting valve. Cartridge construction provides for maximum flexibility in mounting at the point where it is most needed.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	380 litres/min (100 US GPM)
Max Setting	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add Suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A1126 (See Section 17)
Torque Cartridge into Cavity	150 Nm (110 lbs ft)
Weight	1LR300 1.04 kg (2.3 lbs) 1LR350 2.08 kg (4.6 lbs)
Seal Kit Number	SK207 (Nitrile) SK207V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	1 millilitre/min nominal (15 dpm)
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

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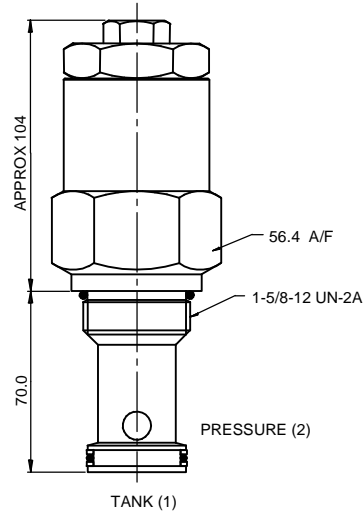
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CARTRIDGE ONLY

BASIC CODE: 1LR300



Tightening torque of "F" adjust
locknut - 20 to 25 Nm

COMPLETE VALVE

1 1/4" PORTS

BASIC CODE: 1LR350

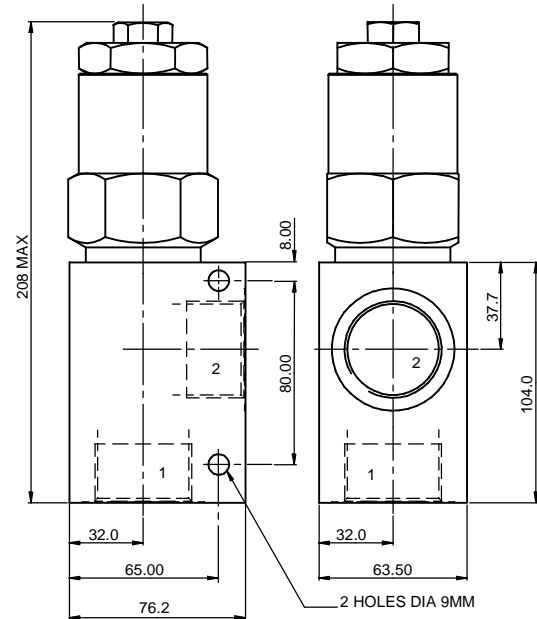
Body ONLY part numbers

BSP, aluminium
1 1/4" B5134

SAE, aluminium
1 1/4" B7783

BSP, steel
1 1/4" B882

SAE, steel
1 1/4" B11553



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1LR* F 10W 35 S**

Basic Code

1LR300 = Cartridge Only

1LR350 = Cartridge and Body

Adjustment Means

F = Screw Adjustment

Port Sizes - Bodied Valves Only

10W = 1 1/4" BSP 20T = 1 1/4" SAE

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 30 l/min

20 = 35-210 bar. Std setting 100 bar

35 = 70-350 bar. Std setting 280 bar

Std setting made at 30 litres/min



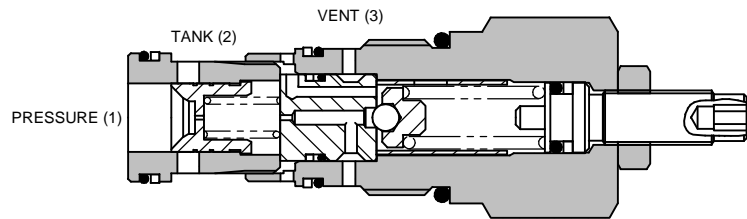
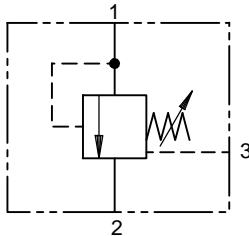
1VR SERIES VENTABLE RELIEF VALVE

PILOT OPERATED

1VR100

SLIDING SPOOL TYPE

2



APPLICATION

To limit pressure in a system. Good for continuous duty and accurate pressure control with constant or varying flows. The vent feature can be used with remote pilot section for a two-pressure system or to allow manual or remote 'unloading' of the pump.

OPERATION

When inlet pressure exceeds the setting of the valve, the pilot section opens. The pilot flow causes a pressure imbalance across the main section spool causing it to open, allowing relief flow to tank. When 'vented', pilot flow is referenced directly to tank, bypassing the pilot section. This flow through the vent causes a pressure imbalance, opening the main section and dumping the pump at minimum pressure drop.

FEATURES

High accuracy of pilot operated design. Hardened working parts give long, reliable, trouble-free life. Ventable for versatility of application. Cartridge construction for installation into your own manifold.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	100 litres/min (26 US GPM)
Max Setting	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add Suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A3146 (See Section 17)
Torque Cartridge into Cavity	75 Nm (55 lbs ft)
Weight	1VR100 0.46 kg (1.0 lbs) 1VR150 1.13 kg (2.5 lbs)
Seal Kit Number	SK275 (Nitrile) SK275V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	35 millilitres/min @ 280 bar
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

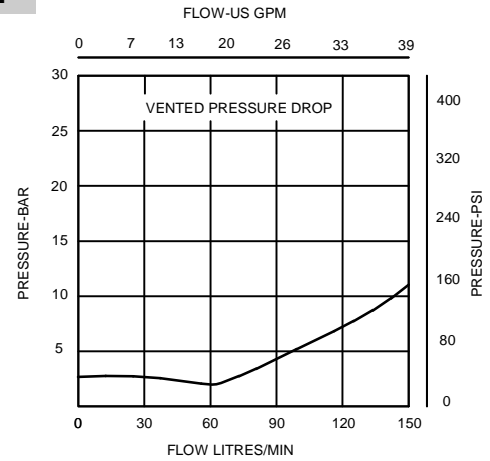
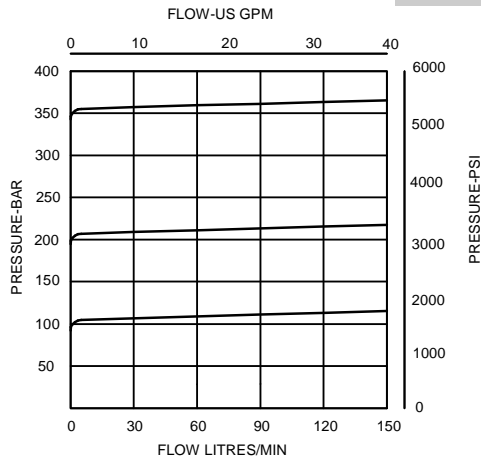
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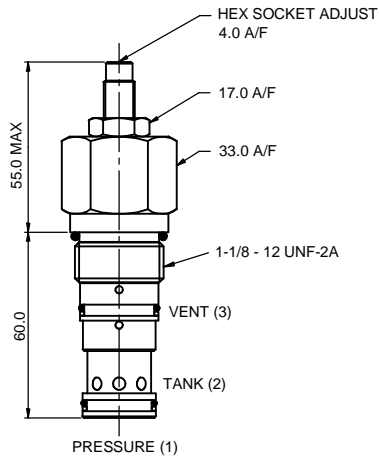
PRESSURE DROP



2

CARTRIDGE ONLY

BASIC CODE: 1VR100



COMPLETE VALVE

3/4" PORTS

BASIC CODE: 1VR150

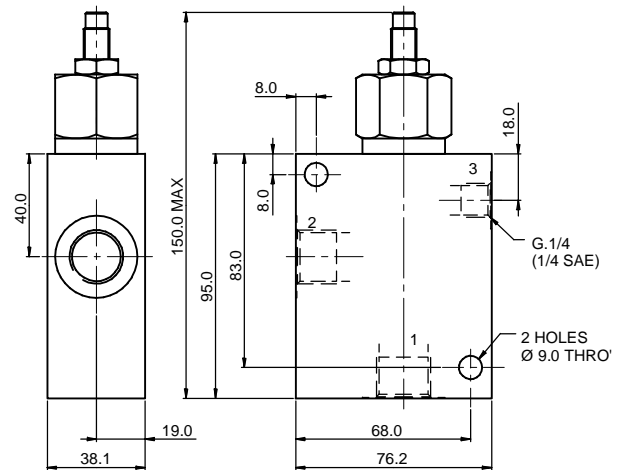
Body ONLY part numbers

BSP, aluminium
3/4" B4377

SAE, aluminium
3/4" B10785

BSP, steel
3/4" B4378

SAE, steel
3/4" B11554



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1VR***

P

4W

35

S

Basic Code

1VR100 = Cartridge Only

1VR150 = Cartridge and Body

Adjustment Means

P = Leakproof Screw Adjustment

G = Tamperproof Cap

(See page 2-102 for dimensions)

Port Sizes - Bodied Valves Only

6W = 3/4" BSP 12T = 3/4" SAE

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 14 l/min

20 = 10-210 bar. Std setting 100 bar

35 = 30-350 bar. Std setting 210 bar

Std setting made at 14 litres/min



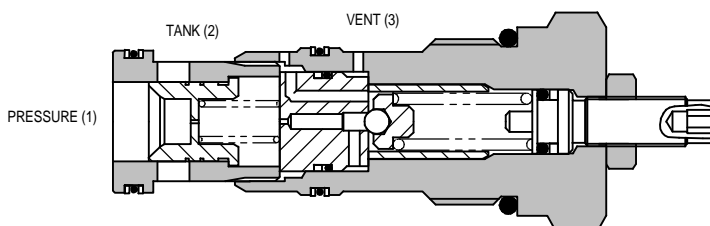
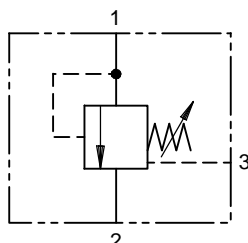
1VR SERIES VENTABLE RELIEF VALVE

PILOT OPERATED

1VR200

SLIDING SPOOL TYPE

2



APPLICATION

To limit pressure in a system. Good for continuous duty and accurate pressure control with constant or varying flows. The vent feature can be used with a remote pilot section for a two-pressure system or to allow manual or remote 'unloading' of the pump.

OPERATION

When inlet pressure exceeds the setting of the valve, the pilot section opens. The pilot flow causes a pressure imbalance across the main section spool causing it to open, allowing relief flow to tank. When 'vented', pilot flow is referenced directly to tank, bypassing the pilot section. This flow through the vent port causes a pressure imbalance, opening the main section and dumping the pump at minimum pressure drop.

FEATURES

High accuracy of pilot operated design. Hardened working parts give long, reliable, trouble-free life. Ventible for versatility of application. Cartridge construction for installation into your own manifold.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	200 litres/min (52 US GPM)
Max Setting	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add Suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A16102 (See Section 17)
Torque Cartridge into Cavity	100 Nm (73 lbs ft)
Weight	1VR200 0.74 kg (1.6 lbs) 1VR250 1.82 kg (4.0 lbs)
Seal Kit Number	SK173 (Nitrile) SK173V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	35 millilitres/min @ 280 bar
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

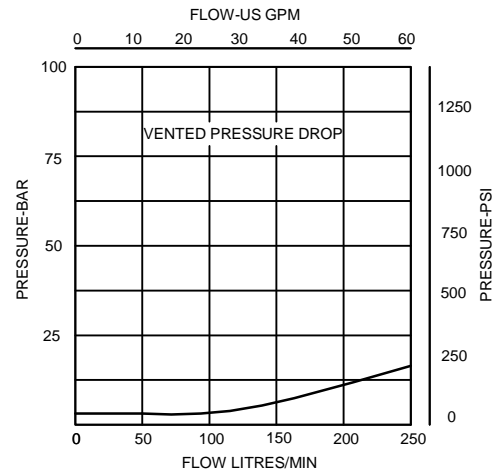
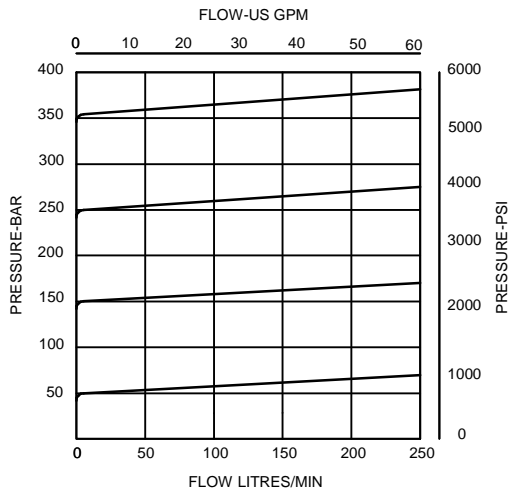
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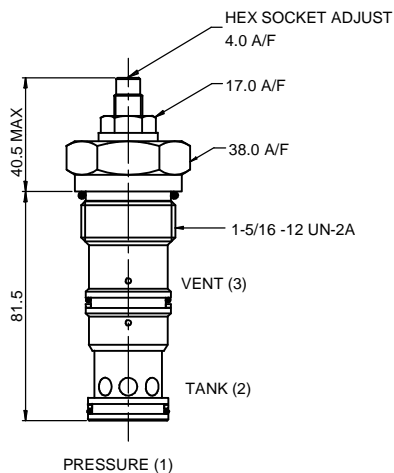
PRESSURE DROP



2

CARTRIDGE ONLY

BASIC CODE: 1VR200



COMPLETE VALVE 1" PORTS

BASIC CODE: 1VR250

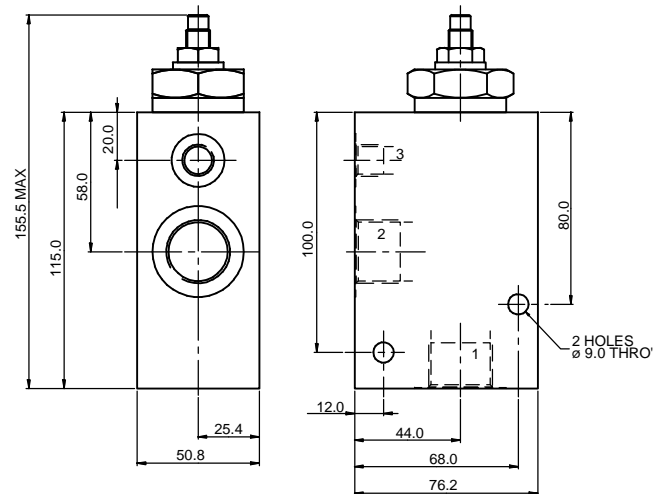
Body ONLY part numbers

BSP, aluminium 1" B3496

SAE, aluminium 1" B6807

BSP, steel 1" B3497

SAE, steel 1" B11555



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1VR P 8W 35 S**

Basic Code

1VR200 = Cartridge Only

1VR250 = Cartridge and Body

Adjustment Means

P = Leakproof Screw Adjustment

G = Tamperproof Cap

(See page 2-102 for dimensions)

Port Sizes - Bodied Valves Only

8W = 1" BSP

16T = 1" SAE

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 14 l/min

20 = 10-210 bar. Std setting 100 bar

35 = 30-350 bar. Std setting 210 bar

Std setting made at 14 litres/min

We reserve the right to change specifications without notice



SECTION 3 - DUAL RELIEF VALVES / CROSS LINE RELIEF VALVES

CONTENTS

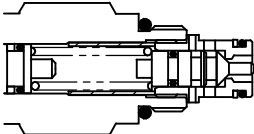
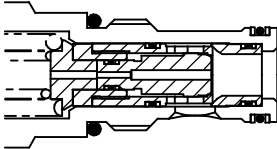
This section includes three main types of dual relief valve:

- 1) Differential area/direct acting poppet type including single or dual cartridge versions.
- 2) Direct acting with make up checks.
- 3) Pilot type with vent feature and make up checks.

3

Flows up to 150 litres/min (40 US GPM) and pressures up to 350 bar (5000 psi).

SELECTION

SECTION	SERIES	APPLICATION	RANGE	PAGE
	1DDR Direct acting, two-cartridge design	Maximum flexibility with separate relief settings and through ports for ease of mounting	400 bar (5000 psi) 30 litres/min (8 US GPM)	3-111
	1CLR Single cartridge, two way relief	With single adjustment giving compact solution to dual relief where line settings are the same	350 bar (5000 psi) 150 litres/min (40 US GPM)	3-115 to 3-121

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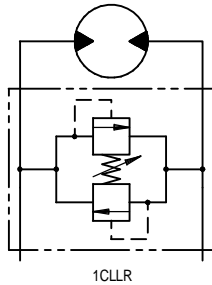
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TYPICAL CIRCUIT EXAMPLES



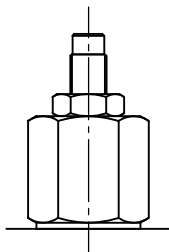
DUAL RELIEF SINGLE CARTRIDGE

PRESSURE EQUIPMENT DIRECTIVE

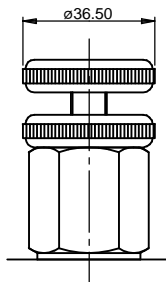
All pressure control valves manufactured by Integrated Hydraulics are designed to be "Pressure Accessories" in accordance with article 3 section 3 of the Pressure Equipment Directive and Sound Engineering Practice and sold in good faith as such. For "Safety Accessories" as defined in article 3 section 1.4 of the Pressure Equipment Directive please contact the UK Technical Sales Department.

ADJUSTMENTS

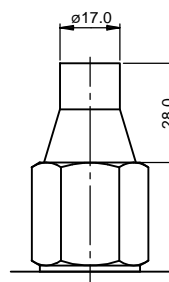
The adjustment range and Max setting figures shown throughout this catalogue give the design range for each valve, higher or lower values may be attainable but should not be used without first contacting our Engineering department. Setting must ALWAYS be carried out using an appropriate gauge and it must NOT be assumed that screwing an adjuster to its maximum or minimum position will yield the maximum or minimum stated design setting for that valve.



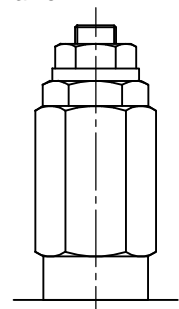
'P' - LEAKPROOF SCREW



'R' - HANDKNOB



'G' - TAMPERPROOF CAP



'F' - SCREW

Tightening torque of "F" adjuster
locknut - 20 to 25 Nm

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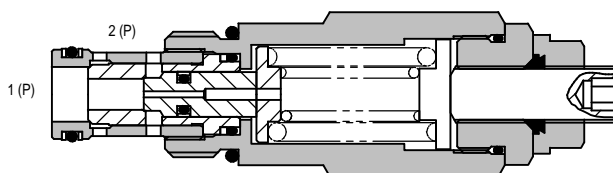
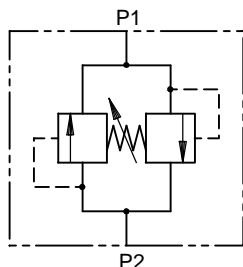
1CLLR SERIES DUAL RELIEF VALVE

DIRECT ACTING DIFFERENTIAL AREA

1CLLR50

POPPET TYPE

3



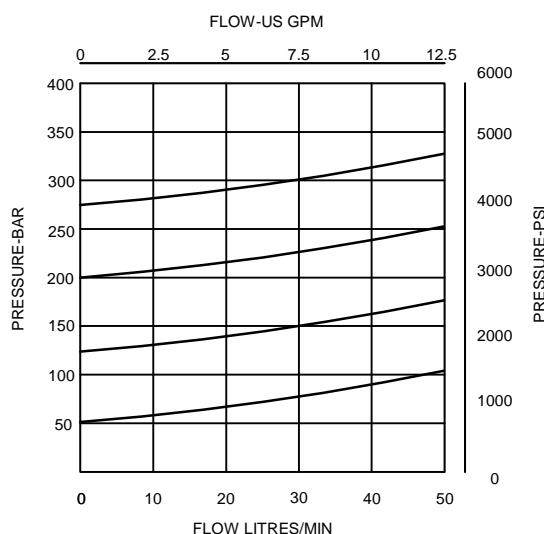
APPLICATION

To protect both lines in a circuit from over pressurisation by relieving oil to the other line. Ideal for use with motors or directional valves as a safety relief. Differential area, fast acting, poppet valve.

OPERATION

Pressure acts over one of two differential areas forcing the poppet back allowing relief flow to the other port. This being a single cartridge is ideal for mounting on to the motor in a special housing.

PRESSURE DROP



FEATURES

Single cartridge relieving in both directions cutting down space requirements, giving full adjustment through its range on both pressures at the same time.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	50 litres/min (12 US GPM)
Max Setting	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External steel surfaces zinc plate.
Body Material	Standard aluminium (up to 210 bar*) Add Suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A12370 (See Section 17)
Torque Cartridge into Cavity	30 Nm (22 lbs ft)
Weight	1CLLR50 0.23 kg (0.5 lbs) 1CLLR55 0.8 kg (1.8 lbs)
Seal Kit Number	SK1028 (Nitrile) SK1028V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	5 millilitres/min
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

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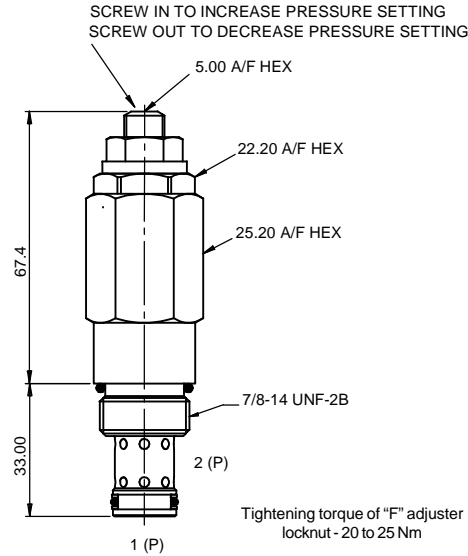
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CARTRIDGE ONLY

BASIC CODE: 1CLLR50



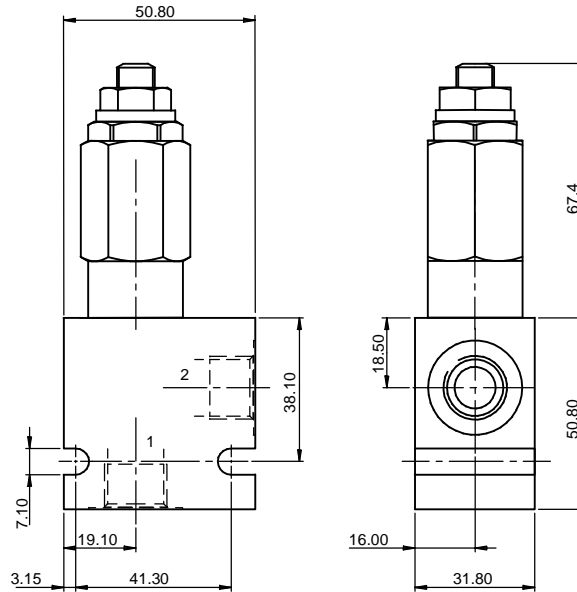
3

COMPLETE VALVE 3/8" 1/2" PORTS

BASIC CODE: 1CLLR55

Body ONLY part numbers

BSP, aluminium	SAE, aluminium	SAE, steel
3/8" B19053		
1/2" B19356	1/2" B19402	1/2" B20601



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CLLR* F 3W 35 S**

Basic Code

1CLLR50 = Cartridge Only
1CLLR55 = Cartridge and Body

Adjustment Means

F = Screw Adjustment

Port Sizes - Bodied Valves Only

3W = 3/8" BSP
4W = 1/2" BSP **8T** = 1/2" SAE

Seals

S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 4.5 l/min

17 = 35-175 bar. Std setting 105 bar
35 = 114-350 bar. Std setting 280 bar
Std setting made at 4.5 litres/min



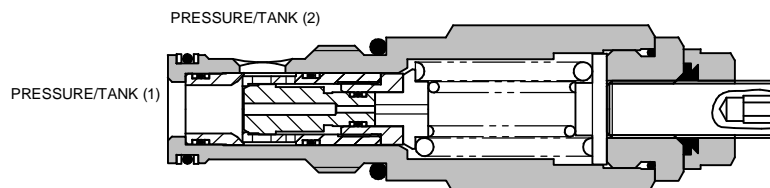
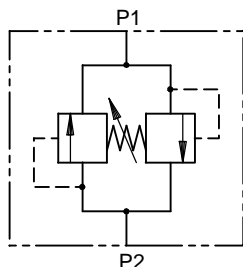
1CLLR SERIES DUAL RELIEF VALVE

DIRECT ACTING DIFFERENTIAL AREA

1CLLR100

POPPET TYPE

3



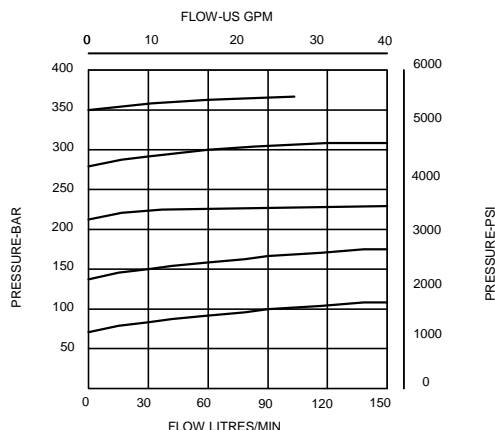
APPLICATION

To protect both lines in a circuit from over pressurisation by relieving oil to the other line. Ideal for use with motors or directional valves as a safety relief. Differential area, fast acting, poppet valve.

OPERATION

Pressure acts over one of two differential areas forcing the poppet back allowing relief flow to the other port. This being a single cartridge is ideal for mounting on to the motor in a special housing.

PRESSURE DROP



FEATURES

Single cartridge relieving in both directions cutting down space requirements, giving full adjustment through its range on both pressures at the same time.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	150 litres/min (40 US GPM)
Max Setting	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External steel surfaces black oxide
Body Material	Standard aluminium (up to 210 bar*) Add Suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A878 (See Section 17)
Torque Cartridge into Cavity	60 Nm (44 lbs ft)
Weight	1CLLR100 0.23 kg (0.5 lbs) 1CLLR150 0.8 kg (1.8 lbs) 1CLLR155 1.1 kg (2.4 lbs)
Seal Kit Number	SK614 (Nitrile) SK614V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	5 millilitres/min
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

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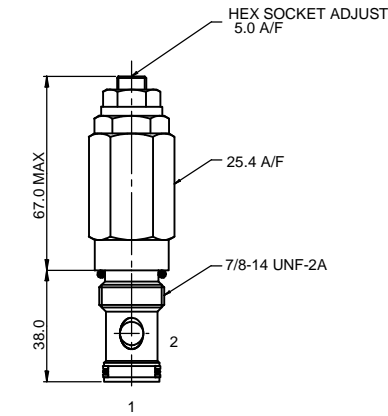
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CARTRIDGE ONLY

BASIC CODE: 1CLLR100



Tightening torque of "F" adjuster locknut - 20 to 25 Nm

COMPLETE VALVE 3/4" 1" PORTS

BASIC CODE: 1CLLR150

Body ONLY part numbers

BSP, aluminium

3/4" B1067

1" B1069

SAE, aluminium

3/4" B4409

1" B10827

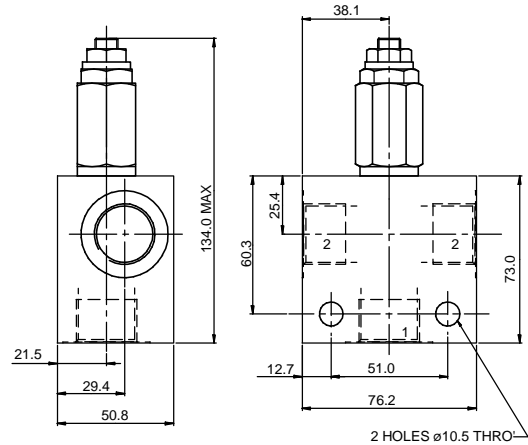
BSP, steel

3/4" B5614

1" B542

SAE, steel

1" B11801



3

COMPLETE VALVE 3/4" PORTS

BASIC CODE: 1CLLR155

Body ONLY part numbers

BSP, aluminium

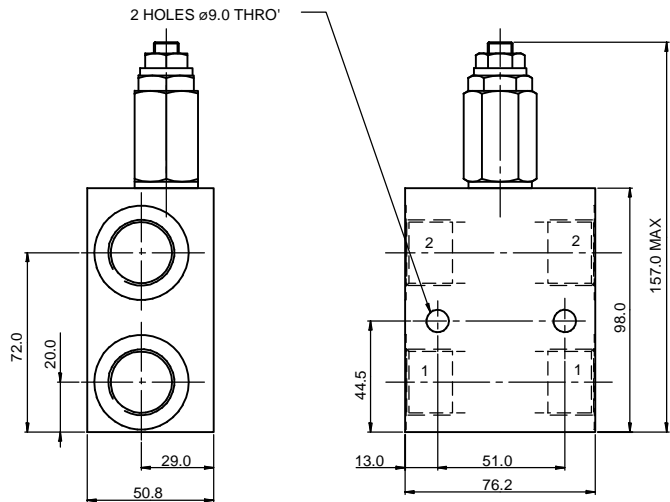
3/4" B2216

SAE, aluminium

3/4" B10623

BSP, steel

3/4" B7147



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CLLR***

F

6W

35

S

Basic Code

1CLLR100 = Cartridge Only

1CLLR150 = Cartridge and Body

1CLLR155 = Cartridge and Body through ported

Adjustment Means

F = Screw Adjustment

Port Sizes - Bodied Valves Only

6W = 3/4" BSP 12T = 3/4" SAE

8W = 1" BSP 16T = 1" SAE

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 14 l/min

35 = 114-350 bar. Std setting 280 bar
Std setting made at 14 litres/min



SEQUENCE VALVES

Figure 1. 1DS60 Direct Acting Sequence Valve

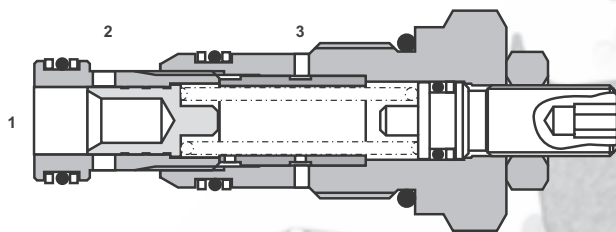


Figure 2. 1PS60 Pilot Operated Sequence Valve

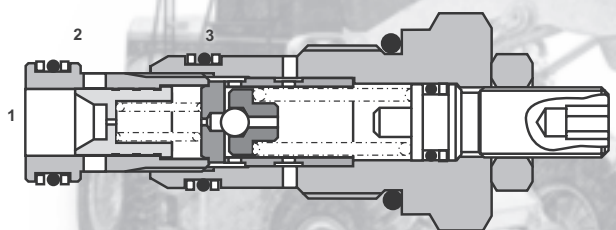


Figure 3. 1UPS100 Unloading, Pilot Operated Sequence Valve

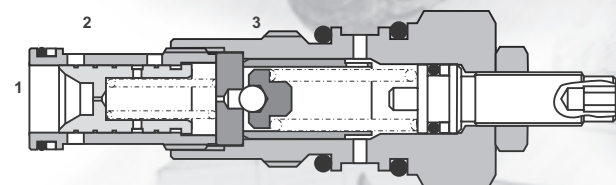


Figure 4. 1PSC100 Pilot Operated Sequence Valve with Reverse Flow Check

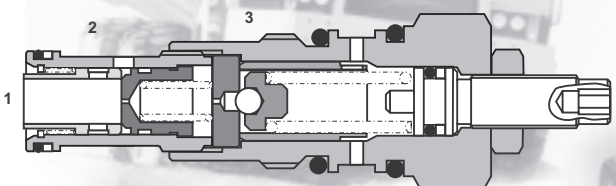
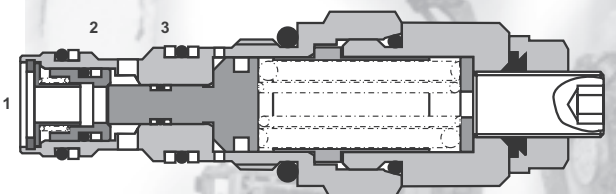


Figure 5. 1PSC30 Direct Acting Sequence Valve with Reverse Flow Check



It's entirely natural to succumb to labels and judge a book by its cover - even in the field of hydraulics. But some components refuse to be bound by the accepted norms...

In the modern era, correct identification is paramount. Many people carry ID cards describing them by name and photograph. For some of us this may be acceptable but when people try to 'pigeon hole' us we begin to react. We may like to think that we are multi-cultural and multi skilled, yet it is natural for us to assess things by the cover or the title. When we do this, we miss the diverse nature of people and things around us.

This extends to our understanding and subsequent application of hydraulic valves. The science of hydraulics is fairly simple - once the concepts of flow and pressure are understood together with their effect on mechanical components, the function of a valve or an actuator becomes clear. Unfortunately, we do not always stop to understand what the hydraulic function is outside of the description of a component and therefore the limitations placed on it by documentation. Few would advocate product being used outside of the parameters laid down in catalogue data sheets, but the innovative use of such product is to be applauded.

Taking Sequence valves as an example: These are used to sequence operations by preventing flow until a pre-determined pressure is reached. The only difference between this and a relief valve is that the former has a spring chamber drain to a separate port. This prevents down stream pressure increasing the setting of the valve. Provided the inlet pressure is higher than the setting, plus any back pressure on the drain line, the valve will remain open, allowing flow from inlet to outlet.

There are several types of sequence valve, each with its own performance envelope and special characteristics.

1) Direct acting spool type. (1DS60): The drawing shows a section through a cartridge version of a direct acting sequence valve. The pressure rises at the inlet (port 1) until the resultant force over the spool area overcomes the spring force. This causes the spool to move back against the spring, opening the inlet to the sequence port 2. Provided the inlet pressure is higher than that in the sequenced port, flow will take place from port 1 to port 2.

There is no connection between the sequence port and the spring chamber, so as the pressure rises in the sequenced port 2 the effective setting of the valve remains the same. Downstream pressure has no effect on the pressure required to keep the valve open.

With a direct acting sequence the greater the flow through the valve, the further the spool has to move back against the spring. This requires an increase in inlet pressure that corresponds to the extra compression of the spring.

- 2) Pilot Operated Sequence valve. (1PS60):** As with pilot operated relief valves, the pilot operated sequence valve does not require much increase in pressure differential to pass more flow. This makes the valve more suitable for varying flows and systems where the setting has to be close to the maximum working pressure.

In this case the inlet pressure acts on the pilot seat area and eventually causes the ball to move back against the spring. This creates a flow to tank via the drain port. The initial flow passes across the small orifice in the main spool, causing a pressure imbalance that moves the main spool back against a light spring. It does not take much pressure increase to move the spool fully back, so the valve will therefore go from fully closed to fully open over a very small pressure increase. One disadvantage with this over the direct acting valve is the constant flow to tank through the pilot section of the valve.

- 3) Unloading Sequence Valves (1UPS100):** Most sequence valves need to maintain a higher inlet pressure than the set pressure to keep the valve open. This, in some cases, can be inefficient especially if the second operation is working at a lower pressure than the setting.

The unloading sequence valve allows the valve to open fully as soon as the setting is reached. The valve functions to open in a similar way to the pilot operated valve except that when the setting is reached, the spool moves back and opens a separate hole, beyond the control orifice, in the spool to the outlet port. This means that the pressure behind the main spool will fall to the downstream pressure. The inlet pressure will then fall to the same pressure plus the pressure required to push the flow across the valve. This can be more efficient than the standard valve.

- 4) Sequence Valve with Reverse Flow Check (1PSC100):** It is usual in a double-acting system for the flow to have to pass past the sequence valve in reverse direction. It is possible to mount a free-flow check valve around the cartridge but it is also possible to include this extra valve in the design. This cartridge includes the free-flow check, making giving a more compact solution.

- 5) Direct Acting Sequence Valve with Reverse Flow Check (1PSC30):** For smaller flows, it is possible to have direct acting sequence valves with free-flow checks as standard in one cartridge. This valve is based on the overcentre valve components.

...a look at the make up of this device reveals that it is no more than a logic element with an adjustable spring force keeping it closed.

So much for boring descriptions! The fun part is making them do what you want: The standard circuit shown in all technical training manuals is the Guillotine circuit (figure 6). The modern version of this machine used for cutting metal relies on the sequence valve to make sure that the clamps remain on while the knife does it's job.

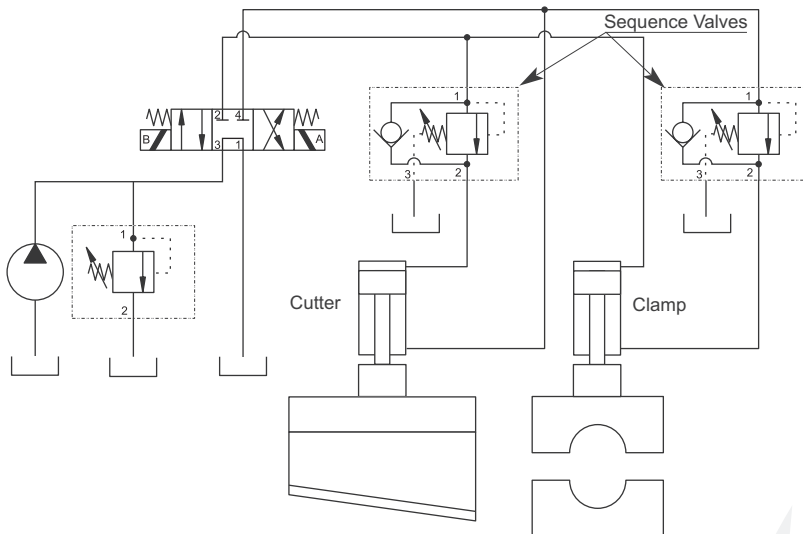
Variations: This is valve use according to the description in the manual. But a look at the make up of this device reveals that it is no more than a logic element with an adjustable spring force keeping it closed.





SEQUENCE VALVES

Figure 6. Clamp Circuit



Operation

When operated fluid will flow to the clamp cylinder closing it. At the end of its stroke, pressure will start to rise opening the sequence valve allowing flow to the knife. When the directional valve is switched to reverse the operation flow will pass first to the knife cylinder and only when it has reached the end of its stroke will the pressure rise sufficiently to open the sequence valve on the clamp line, allowing it to open. Return flow in both operations bypasses the sequence valve via the built in check elements.

Controlling the pressure in, or the flow from the drain line opens up a number of possibilities. When using a pilot operated version of the valve, closing the drain line will close the valve. In this way, high flows can be turned on and off by using a small solenoid valve situated on the drain line. This can be a normally open or closed valve with the added option of a controllable pressure drop across the valve.

By controlling the pressure in the drain line, you can use the valve in regenerative circuits, as below.

When extending the cylinders, oil from the 'rod' side is prevented from passing back to tank by a check valve and is directed towards the 'bore side' of the cylinder. The flow will then pass through the sequence valve from the outlet to inlet. The pressure in the outlet will be higher than the inlet, which is higher than the set pressure of the sequence valve. The drain

line is connected upstream of the check valve so that when retracting the cylinder, the working pressure increases the setting of the sequence valve and keeps it closed.

The main advantage of using the sequence valve over a pilot to close check, is that when centring the directional valve, the pressure can be set higher than any residual pressure, thereby preventing any un-solicited extension of the cylinder.

This kind of valve can also be used as a compensator in a pressure compensated flow regulator circuit (figure 8), whereby the drain line of the sequence valve is connected downstream of an adjustable orifice and the inlet of the sequence valve upstream, with the "sequenced" port connected to tank. The pressure drop across the orifice is sensed by the spool in the sequence valve. The pressure on the upstream side acts on the spool's nose and pressure on the downstream side acts on

Figure 7. Regenerative circuit

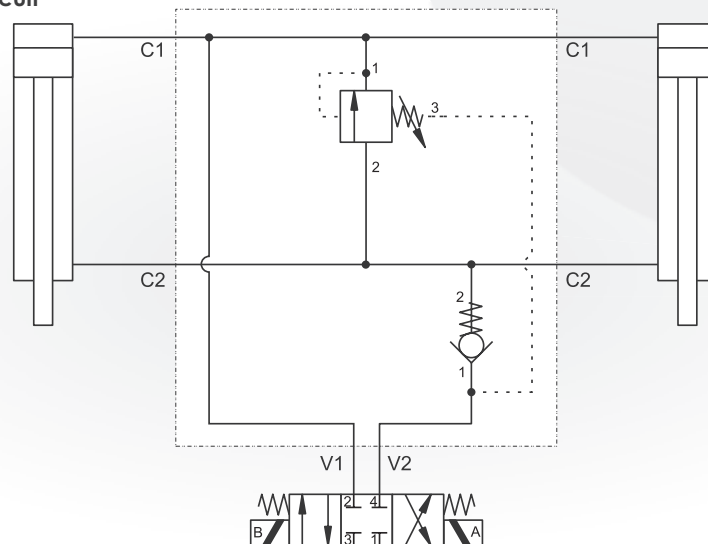
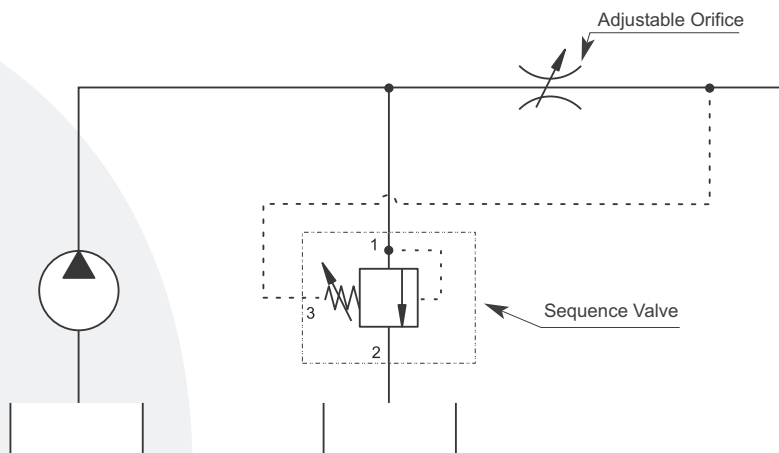


Figure 8. Pressure Compensated Flow Regulator



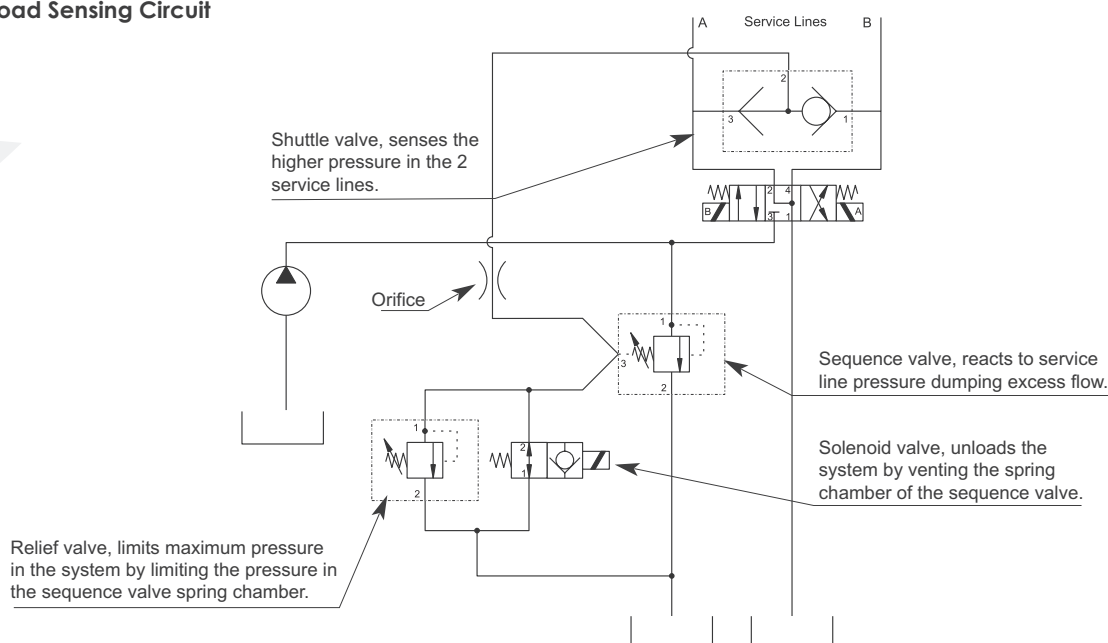
the other end of the spool in the spring chamber. If flow across the orifice increases due to a reduction in the downstream working pressure, then the pressure drop would increase and the sequence valve open further to by-pass excess flow to tank. The valve will therefore seek to maintain a constant flow irrespective of changes in working pressure.

A final example of an innovative use of a sequence valve is as a load sense compensator (figure 9). By feeding a load sense signal into the spring chamber, the setting of the valve can be raised. This ensures that the pump will only ever see a pressure equivalent to the working pressure, plus the setting of the valve. This pressure can be limited by using a pilot relief

valve on the drain line. The flow into the spring chamber has to be restricted for this to work, but a millimetre orifice normally works for me!

There are many other potential uses for this valve by using the drain port as a remote control port. Why limit the utilisation of problem solving tools at your disposal by sticking to a name? Hydraulic valves can be versatile. Think hydraulics before you think description and look to performance, not to catalogue claims. Use science and understanding first and the product second but always consult the valve manufacturer before going too far, as all valves will have their limitations - some of which are far from obvious.

Figure 9. Load Sensing Circuit



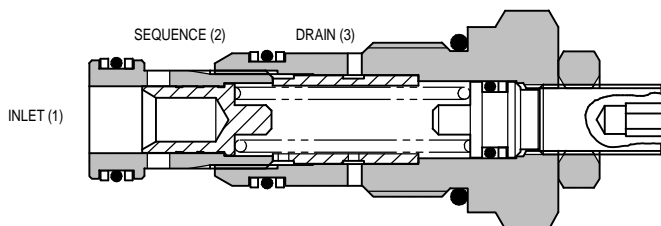
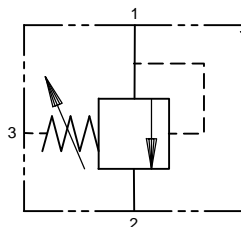


1DS SERIES SEQUENCE VALVE

DIRECT ACTING (ISO CAVITY NUMBER: 7789-22-6-0-90)

1DS60

SLIDING SPOOL TYPE



4

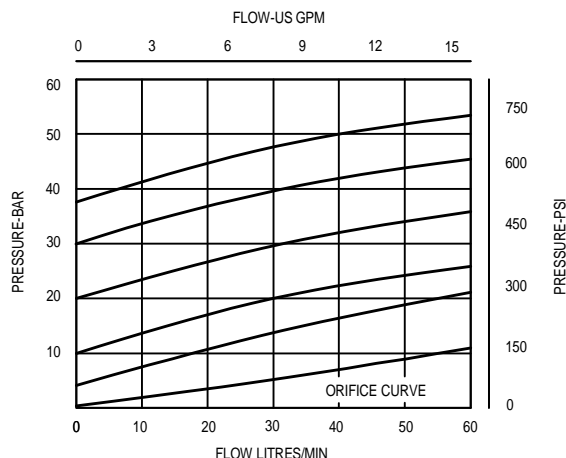
APPLICATION

Direct acting sequence valves are ideal for diverting oil to a second circuit at a predetermined pressure as in clamp and drill circuits, or as a relief where the back pressure varies. By taking the drain line directly to tank, back pressure effects are negated.

OPERATION

As with the direct acting relief valves, when the pressure exceeds the spring force, the spool moves back, opening the inlet to outlet.

PRESSURE DROP



FEATURES

Stable, quiet operation. Cartridge construction gives maximum flexibility in mounting. Offering good repeatability and reset.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	60 litres/min (16 US GPM)
Max Setting	40 bar (580 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add Suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	CVA-22-06-0 (See Section 17)
Torque Cartridge into Cavity	60 Nm (44 lbs ft)
Weight	1DS60 0.16 kg (0.35 lbs) 1DS65 0.50 kg (1.10 lbs) 1DS66 1.10 kg (2.42 lbs)
Seal Kit Number	SK618 (Nitrile) SK618V (Viton)
Filtration	BS5540/4 Class 18/12 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	25 millilitres/min nominal
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

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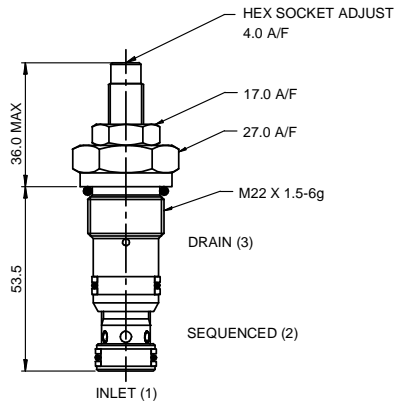
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CARTRIDGE ONLY

BASIC CODE: 1DS60

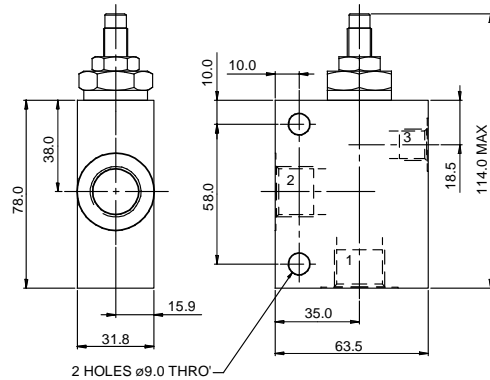


COMPLETE VALVE 3/8" 1/2" PORTS

BASIC CODE: 1DS65

Body ONLY part numbers

BSP, aluminium	SAE, aluminium	BSP, steel	SAE, steel
3/8" B12751	3/8" B10796	3/8" B17070	1/2" B11802
1/2" B8533	1/2" B10797		

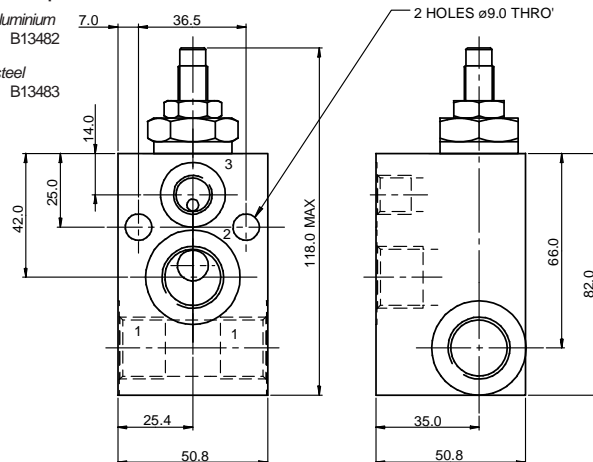


COMPLETE VALVE 1/2" PORTS

BASIC CODE: 1DS66

Body ONLY part numbers

BSP, aluminium	7.0	36.5
1/2" B13482		
BSP, steel	14.0	
1/2" B13483		



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1DS P 3W 4 S**

Basic Code

- 1DS60** = Cartridge Only
- 1DS65** = Cartridge and Body
- 1DS66** = Cartridge and Body Through ported

Adjustment Means

- P** = Leakproof Screw Adjustment
- R** = Handknob Adjustment
- G** = Tamperproof Cap
- (See page 4-102 for dimensions)

Port Sizes - Bodied Valves Only

- 3W** = 3/8" BSP
- 6T** = 3/8" SAE
- 4W** = 1/2" BSP
- 8T** = 1/2" SAE
- 1/4" BSP Drain Ports
- 1/4" SAE Drain Ports

Seals

- S** = Nitrile (For use with most industrial hydraulic oils)
- SV** = Viton (For high temperature and most special fluid applications)

Pressure Range @ 4.8 l/min

- 2** = 2-20 bar. Std setting 15 bar
- 4** = 8.5-40 bar. Std setting 25 bar
- Std setting made at 4.8 litres/min

We reserve the right to change specifications without notice

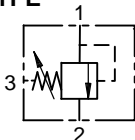


1DS SERIES SEQUENCE VALVE

DIRECT ACTING

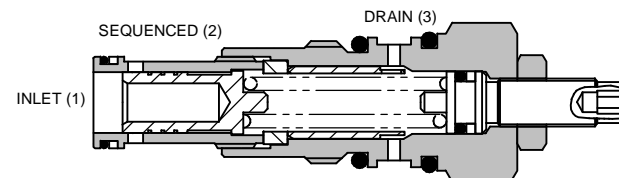
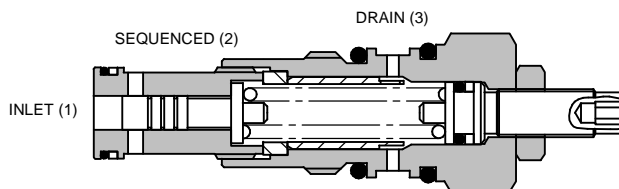
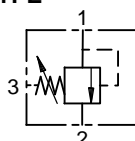
1DS30

SLIDING SPOOL TYPE



1DS100

SLIDING SPOOL TYPE



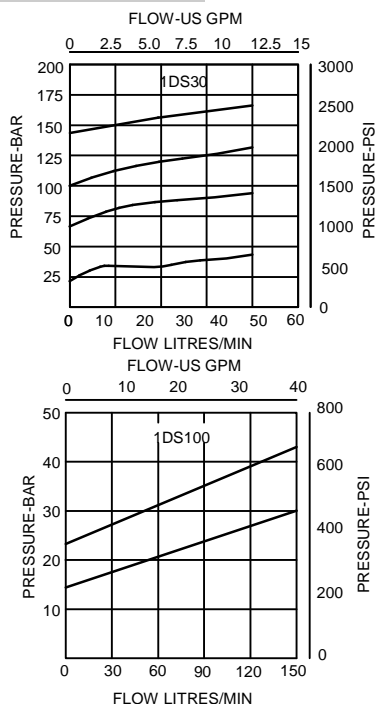
APPLICATION

Direct acting sequence valves are ideal for diverting oil to a second circuit at a predetermined pressure as in clamp and drill circuits, or as a relief where the back pressure varies. By taking the drain line directly to tank, back pressure effects are negated.

OPERATION

As with the direct acting relief valves, when the pressure exceeds the spring force, the spool moves back, opening the inlet to outlet.

PRESSURE DROP



FEATURES

Stable, quiet operation. Cartridge construction gives maximum flexibility in mounting. Offering good repeatability and reset.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	1DS30	30 litres/min (8 US GPM)
	1DS100	150 litres/min (40 US GPM)
Max Setting	1DS30	140 bar (2000 psi)
	1DS100	40 bar (600 psi)
Cartridge Material	Working parts hardened and ground steel. External steel surfaces zinc plated	
Body Material	Standard aluminium (up to 210 bar*) Add Suffix '377' for steel option	
Mounting Position	Unrestricted	
Cavity Number	A880 (See Section 17)	
Torque Cartridge into Cavity	60 Nm (44 lbs ft)	
Weight	1DS30/1DS100	0.28 kg (0.62 lbs)
	1DS35/1DS145	0.88 kg (1.94 lbs)
	1DS36/1DS150	0.71 kg (1.57 lbs)
	1DS155	1.17 kg (2.60 lbs)
Seal Kit Number	SK177 (Nitrile)	SK177V (Viton)
Filtration	BS5540/4 Class 18/13 (25 micron nominal)	
Operating Temp	-20°C to +90°C	
Leakage	25 millilitres/min nominal 15 millilitres/min nominal	
Nominal Viscosity Range	5 to 500 cSt	

*For applications above 210 bar please consult our technical department or use the steel body option.

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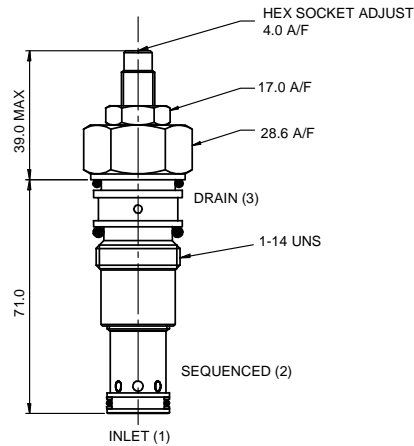
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CARTRIDGE ONLY

BASIC CODE: 1DS30
1DS100



4

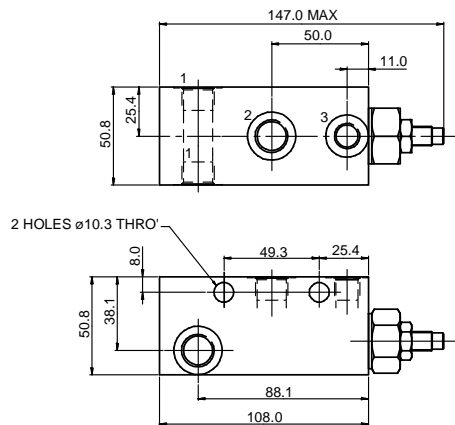
COMPLETE VALVE

BASIC CODE: 1DS35 3/8" 1/2" PORTS
1DS145 3/8" 1/2" 3/4" PORTS

Body ONLY part numbers

<i>BSP, aluminium</i>	<i>SAE, aluminium</i>
1/2" B4821	3/8" B10793
3/4" B5466	1/2" B6584
	3/4" B7883

<i>BSP, steel</i>	<i>SAE, steel</i>
1/2" B4527	
3/4" B4403	3/4" B11379



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1DS P 3W 14 S**

Basic Code

1DS30 / 1DS100 = Cartridge Only
1DS35 / 1DS145 = Cartridge and Body

Adjustment Means

P = Leakproof Screw Adjustment
R = Handknob Adjustment
G = Tamperproof Cap
(See page 4-102 for dimensions)

Port Sizes - Bodied Valves Only

4W = 1/2" BSP	6T = 3/8" SAE
6W = 3/4" BSP	8T = 1/2" SAE
1/4" BSP Drain Ports	12T = 3/4" SAE
	1/4" SAE Drain Ports

We reserve the right to change specifications without notice

Seals

S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 4.8 l/min

1DS30:
7 = 7- 70 bar. Std setting 35 bar
14 = 7-140 bar. Std setting 70 bar

1DS100:
2 = 2- 25 bar. Std setting 20 bar
4 = 5- 40 bar. Std setting 28 bar
Std setting made at 4.8 litres/min

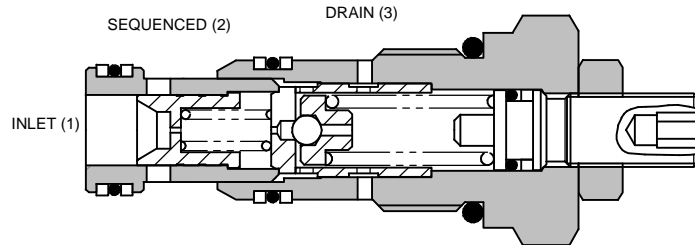
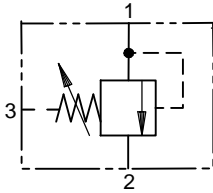


1PS SERIES SEQUENCE VALVE

PILOT OPERATED (ISO CAVITY NUMBER: 7789-22-6-0-90)

1PS60

SLIDING SPOOL TYPE



4

APPLICATION

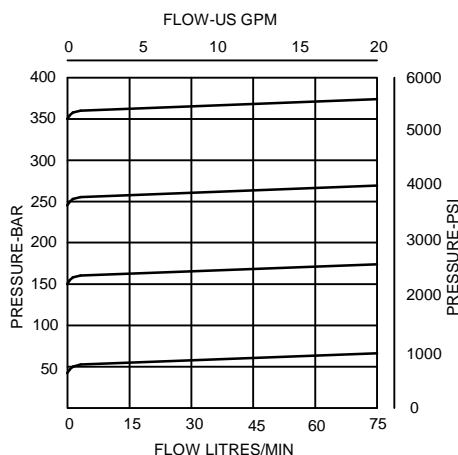
Pilot operated models are best suited for higher flows which may vary widely to:

1. Provide ordered or sequenced series of operations as in a clamp and drill circuit.
2. Serve as a relief valve where oil viscosity or restrictions in the downstream line would cause excessive back pressure. The separate spring chamber drain makes the sequence valve insensitive to this back pressure. Available with or without built-in reverse flow checks.

OPERATION

As in the pilot operated relief, when the setting of the valve is exceeded the pilot section opens. This pilot flow causes a pressure imbalance opening the main section and allowing flow to a secondary circuit (sequenced line).

PRESSURE DROP



FEATURES

Hardened steel working parts give long, trouble-free life. Selectively matched honed assemblies give accurate performance.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	60 litres/min (16 US GPM)
Max Setting	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add Suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	CVA-22-06-0 (See Section 17)
Torque Cartridge into Cavity	60 Nm (44 lbs ft)
Weight	1PS60 0.16 kg (0.35 lbs) 1PS65 0.50 kg (1.10 lbs) 1PS66 1.10 kg (2.42 lbs)
Seal Kit Number	SK618 (Nitrile) SK618V (Viton)
Filtration	BS5540/4 Class 18/12 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	35 millilitres/min @ 280 bar
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

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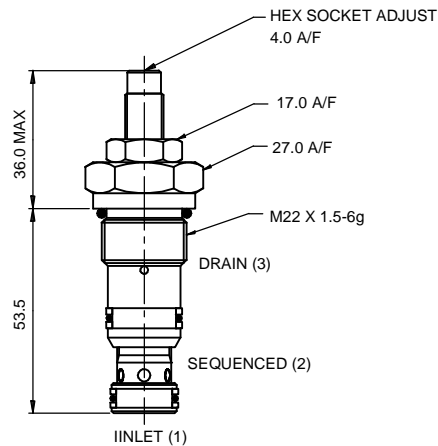
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CARTRIDGE ONLY

BASIC CODE: 1PS60



4

COMPLETE VALVE

3/8" 1/2" PORTS

BASIC CODE: 1PS65

Body ONLY part numbers

BSP, aluminium

3/8" B12751

1/2" B8533

SAE, aluminium

3/8" B10796

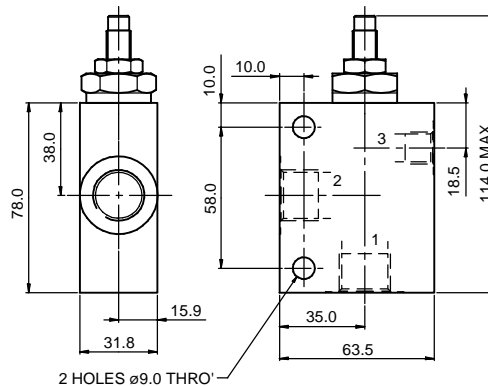
1/2" B10797

BSP steel

3/8" B17070

SAE, steel

1/2" B11802



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1PS**

P

3W

35

S

Basic Code

1PS60 = Cartridge Only

1PS65 = Cartridge and Body

Adjustment Means

P = Leakproof Screw Adjustment

R = Handknob Adjustment

G = Tamperproof Cap

(See page 4-102 for dimensions)

Port Sizes - Bodied Valves Only

3W = 3/8" BSP **6T** = 3/4" SAE

4W = 1/2" BSP **8T** = 1/2" SAE

1/4" BSP Drain Ports 1/4" SAE Drain Ports

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 4.8 l/min

10 = 7-100 bar. Std setting 35 bar

20 = 10-210 bar. Std setting 100 bar

35 = 20-350 bar. Std setting 280 bar

Std setting made at 4.8 litres/min

We reserve the right to change specifications without notice

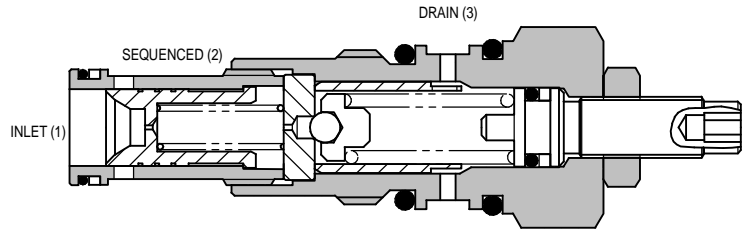
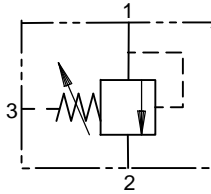


1PS SERIES SEQUENCE VALVE

PILOT OPERATED

1PS100

SLIDING SPOOL TYPE



4

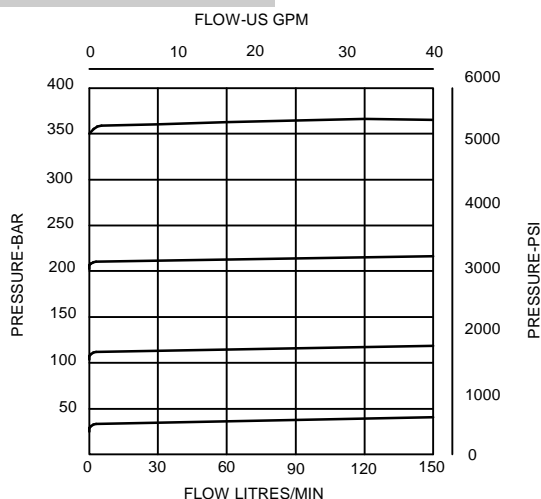
APPLICATION

Pilot operated sequence valves are ideal for systems where flows vary or the sequencing pressure is high. They provide ordered sequencing of two or more operations as with clamp and drill circuits. They can also be used as relief valves where the downstream pressure is high or changes during operation. By taking the drain line directly to tank, back pressure effects are negated.

OPERATION

As in the pilot operated relief valves, when the inlet pressure exceeds the valve setting, the pilot section opens causing a flow across the main spool orifice unbalancing it and subsequently moving it back against a light spring opening up the inlet to the outlet.

PRESSURE DROP



FEATURES

Match ground and honed hardened working parts give long, trouble-free life. Consistent stable operation providing low pressure rise due to increasing flow. Cartridge construction gives maximum flexibility in mounting. Available in bodies with or without free flow checks. Steel valve bodies available on request.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	150 litres/min (40 US GPM)
Max Setting	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add Suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A880 (See Section 17)
Torque Cartridge into Cavity	60 Nm (44 lbs ft)
Weight	1PS100 0.17 kg (0.37 lbs) 1PS145 0.56 kg (1.23 lbs) 1PS150 0.78 kg (1.72 lbs) 1PS155 1.05 kg (2.30 lbs)
Seal Kit Number	SK177 (Nitrile) SK177V (Viton)
Filtration	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	35 millilitres/min @ 280 bar
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

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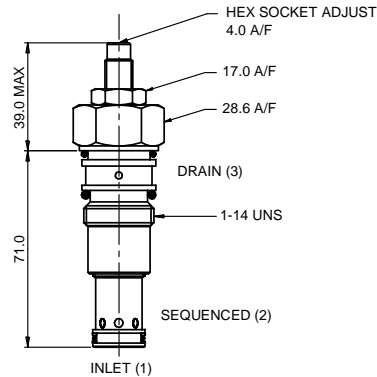
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CARTRIDGE ONLY

BASIC CODE: 1PS100



4

COMPLETE VALVE

3/8" 1/2" 3/4" PORTS

BASIC CODE: 1PS145

(WITHOUT BUILT-IN CHECK)

Body ONLY part numbers

BSP, aluminium

SAE, aluminium

BSP, steel

SAE, steel

1/2" B4821

3/8" B10793

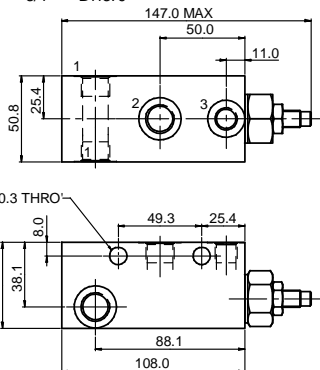
1/2" B4527

3/4" B11379

3/4" B5466

1/2" B6584

3/4" B4403



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1PS***

P

3W

35

S

Basic Code

1PS100

= Cartridge Only

1PS145

= Cartridge and Body

1PS155

= Cartridge, Body and Check

Adjustment Means

P = Leakproof Screw Adjustment

R = Handknob Adjustment

G = Tamperproof Cap

(See page 4-102 for dimensions)

Port Sizes - Bodied Valves Only

4W = 1/2" BSP

6T = 3/8" SAE

8T = 1/2" SAE

6W = 3/4" BSP

12T = 3/4" SAE

1/4" BSP Drain Ports

1/4" SAE Drain Ports

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 14 l/min

7 = 2-70 bar. Std setting 35 bar

20 = 10-210 bar. Std setting 100 bar

35 = 50-350 bar. Std setting 280 bar

Std setting made at 14 litres/min

We reserve the right to change specifications without notice

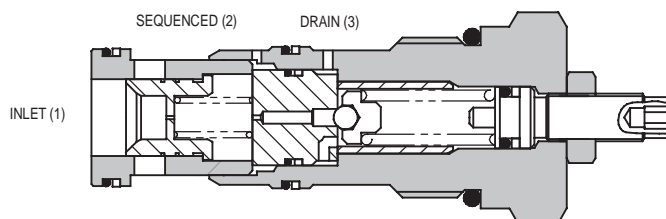
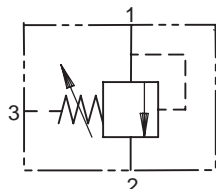


1PS SERIES SEQUENCE VALVE

PILOT OPERATED

1PS200

SLIDING SPOOL TYPE



4

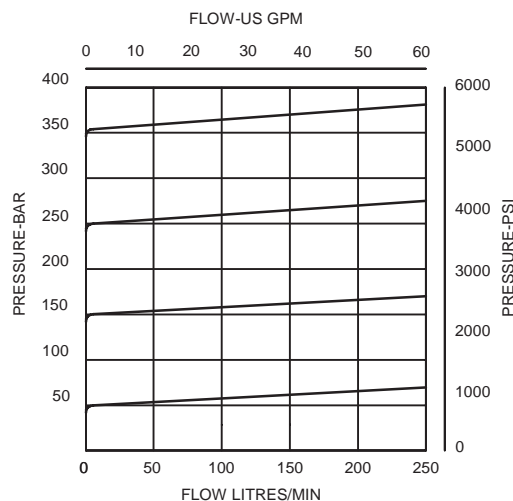
APPLICATION

Pilot operated sequence valves are ideal for systems where flows vary or the sequencing pressure is high. They provide ordered sequencing of two or more operations as with clamp and drill circuits. They can also be used as relief valves where the downstream pressure is high or changes during operation. By taking the drain line directly to tank, back pressure effects are negated.

OPERATION

As in the pilot operated relief valves, when the inlet pressure exceeds the valve setting, the pilot section opens causing a flow across the main spool orifice unbalancing it and subsequently moving it back against a light spring opening up the inlet to the outlet.

PRESSURE DROP



FEATURES

Match ground and honed hardened working parts give long, trouble-free life. Consistent stable operation providing low pressure rise due to increasing flow. Cartridge construction gives maximum flexibility in mounting. Available in bodies with or without free flow checks. Steel valve bodies available on request.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	250 litres/min (60 US GPM)	
Max Setting	350 bar (5000 psi)	
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated	
Body Material	Standard aluminium (up to 210 bar*) Add Suffix '377' for steel option	
Mounting Position	Unrestricted	
Cavity Number	A16102 (See Section 17)	
Torque Cartridge into Cavity	100 Nm (76 lbs ft)	
Weight	1PS200	0.72 kg (1.60 lbs)
	1PS250	1.62 kg (3.60 lbs)
Seal Kit Number	SK173 (Nitrile) SK173V (Viton)	
Filtration	BS5540/4 Class 18/13 (25 micron nominal)	
Operating Temp	-20°C to +90°C	
Leakage	35 millilitres/min @ 280 bar	
Nominal Viscosity Range	5 to 500 cSt	

*For applications above 210 bar please consult our technical department or use the steel body option.

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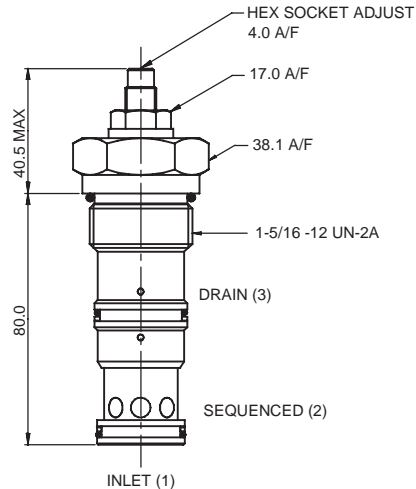
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CARTRIDGE ONLY

BASIC CODE: 1PS200



4

COMPLETE VALVE

1" PORTS

BASIC CODE: 1PS250

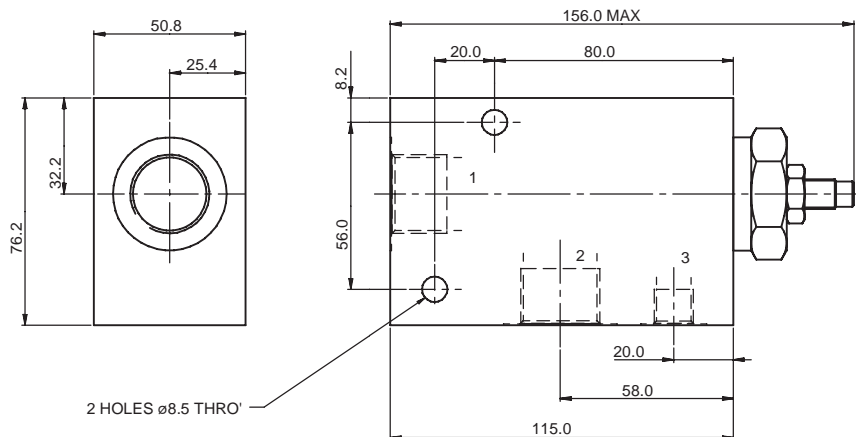
Body ONLY part numbers

BSP, aluminium
1" B3496

SAE, aluminium
1" B6807

BSP, steel
1" B3497

SAE, steel
1" B11555



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1PS***

P

6W

35

S

Basic Code

1PS200 = Cartridge Only

1PS250 = Cartridge and Body

Adjustment Means

P = Leakproof Screw Adjustment

R = Handknob Adjustment

G = Tamperproof Cap

(See page 4-102 for dimensions)

Port Sizes - Bodied Valves Only

8W = 1" BSP

16T = 1" SAE

1/4" BSP Drain Ports 1/4" SAE Drain Ports

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 14 l/min

20 = 10-210 bar. Std setting 100 bar

35 = 30-350 bar. Std setting 210 bar

Std setting made at 14 litres/min

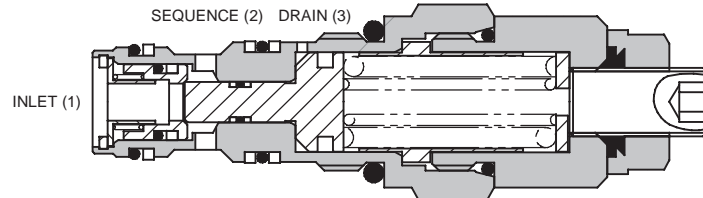
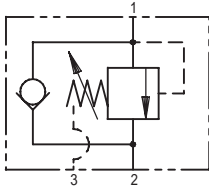
We reserve the right to change specifications without notice



1PSC30 SERIES SEQUENCE VALVE

DIRECT ACTING COMPLETE WITH CHECK VALVE

1PSC30



4

APPLICATION

Sequence valves provide ordered sequencing of two or more operations as with clamp and drill circuits. They can also be used as relief valves where the downstream pressure is high or changes during operation. By taking the drain line directly to tank, back pressure effects are negated.

OPERATION

As with the direct acting relief valves, when the pressure exceeds the spring force, the spool moves back, opening the inlet to outlet.

FEATURES

Match ground and honed hardened working parts give long, trouble-free life. Consistent stable operation providing low pressure rise due to increasing flow. Cartridge construction gives maximum flexibility in mounting. Steel valve bodies available on request.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	30 litres/min (8 US GPM)
Max Setting	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External steel surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add Suffix '377' for option
Mounting Position	Unrestricted
Cavity Number	A6610 (See Section 17)
Torque Cartridge into Cavity	45 Nm (33 lbs ft)
Weight	PSC30 0.15 kg (0.33 lbs) PSC35 0.41kg (0.90 lbs)
Seal Kit Number	SK395 (Nitrile) SK395V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

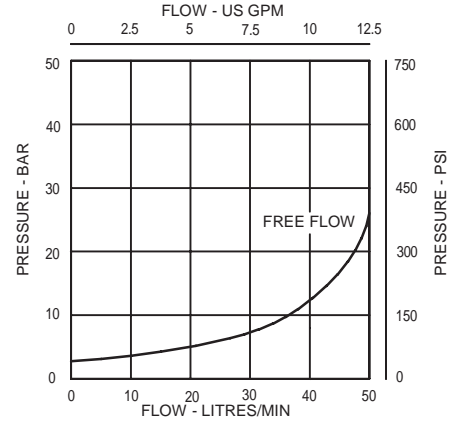
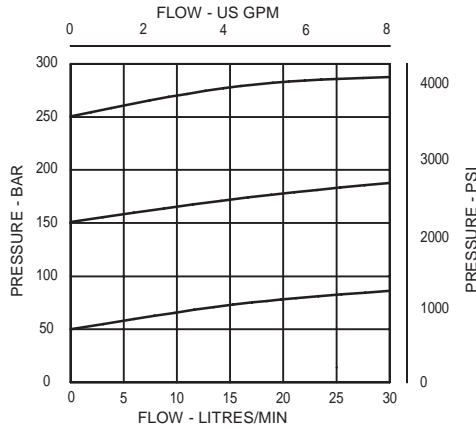
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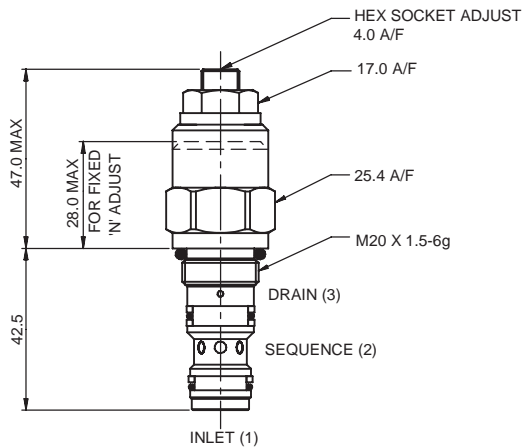
PRESSURE DROP



4

CARTRIDGE ONLY

BASIC CODE: 1PSC30



Tightening torque of "F" adjuster locknut - 20 to 25 Nm

COMPLETE VALVE

3/8" 1/2" PORTS

BASIC CODE: 1PSC35

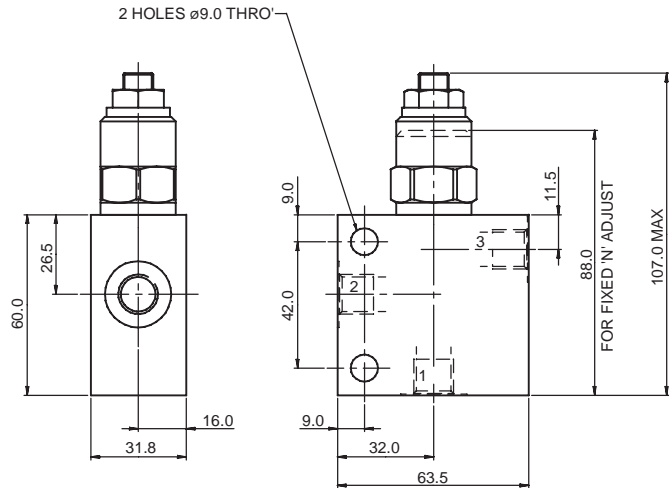
Body ONLY part numbers

BSP, aluminium
3/8" B6743

SAE, aluminium
3/8" B10536
1/2" B7884

BSP, steel
3/8" B12823

SAE, steel
1/2" B11811



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1PSC F 3W 20 S**

Basic Code

1PSC30 = Cartridge Only
1PSC35 = Cartridge and Body

Adjustment Means

F = Screw Adjustment
N = Fixed - State pressure setting required

Port Sizes - Bodied Valves Only

3W = 3/8" BSP Valve & Cyl Port. 1/4" BSP Pilot Port
6T = 3/8" SAE Valve & Cyl Port. 1/4" SAE Pilot Port
8T = 1/2" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

Seals

S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 4.8 l/min

10 = 10-100 bar. Std setting 70 bar
20 = 60-210 bar. Std setting 100 bar
35 = 70-350 bar. Std setting 210 bar
Std setting made at 4.8 litres/min

We reserve the right to change specifications without notice

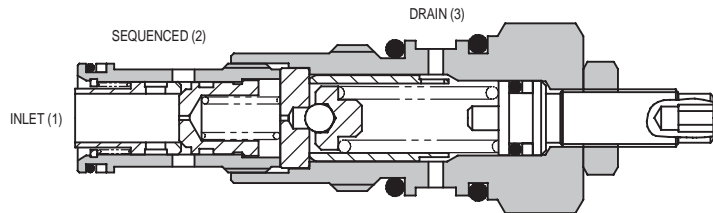
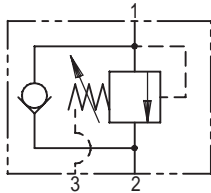


1PSC SERIES SEQUENCE VALVE

WITH REVERSE FLOW - PILOT OPERATED

1PSC100

SLIDING SPOOL TYPE



4

APPLICATION

Pilot operated sequence valves are ideal for systems where flows vary or the sequencing pressure is high. They provide ordered sequencing of two or more operations as with clamp and drill circuits. They can also be used as relief valves where the downstream pressure is high or changes during operation. By taking the drain line directly to tank, back pressure effects are negated.

OPERATION

As with the pilot operated relief valves, when the inlet pressure exceeds the valve setting, the pilot section opens causing flow across the main spool orifice unbalancing it and subsequently moving it back against a light spring opening up the inlet to the outlet. The 1PSC100 has a check portion which allows free reverse flow.

FEATURES

Match ground and honed hardened working parts give long, trouble-free life. Consistent stable operation providing low pressure rise due to increasing flow. Cartridge construction gives maximum flexibility in mounting. Steel valve bodies available on request.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	150 litres/min (40 US GPM)
Max Setting	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces electroless nickel plated
Body Material	Standard aluminium (up to 210 bar*) Add Suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A880 (See Section 17)
Torque Cartridge into Cavity	60 Nm (44 lbs ft)
Weight	1PSC100 0.17 kg (0.37 lbs) 1PSC145 0.78 kg (1.72 lbs)
Seal Kit Number	SK177 (Nitrile) SK177V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	35 millilitres/min @ 280 bar
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

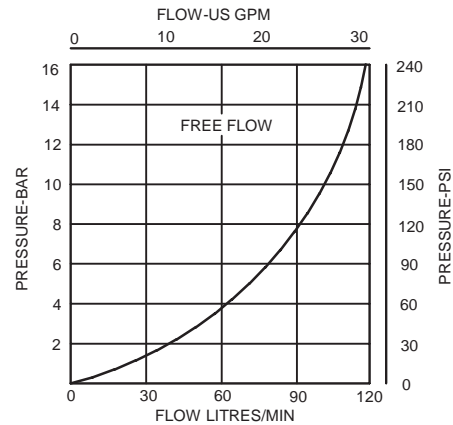
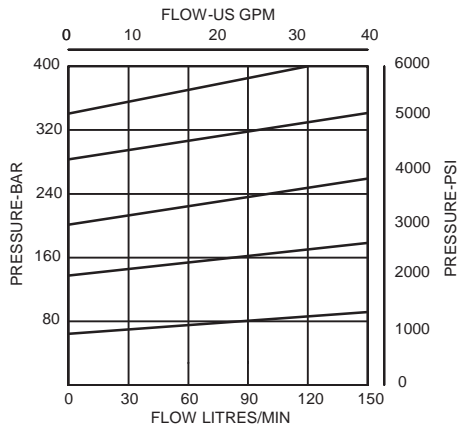
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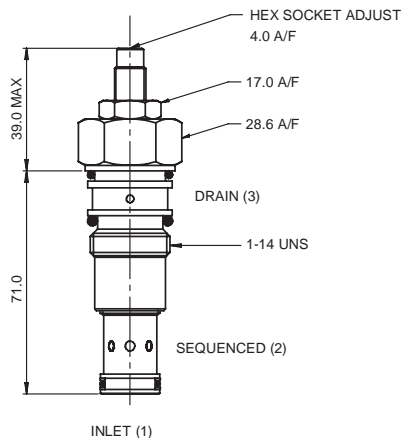
PRESSURE DROP



4

CARTRIDGE ONLY

BASIC CODE: 1PSC100



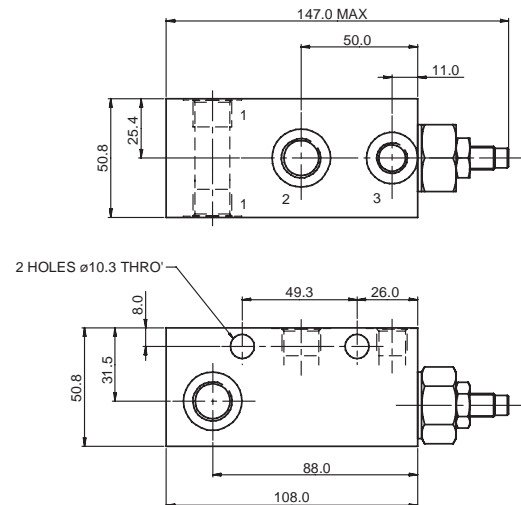
COMPLETE VALVE

3/8" 1/2" 3/4" PORTS

BASIC CODE: 1PSC145

Body ONLY part numbers

BSP, aluminium	SAE, aluminium	BSP, steel	SAE, steel
1/2" B4821	3/8" B10793	1/2" B4527	
3/4" B5466	1/2" B6584	3/4" B4403	3/4" B11379
	3/4" B7883		



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1PSC* P 3W 35 S**

Basic Code

1PSC100 = Cartridge Only
1PSC145 = Cartridge and Body

Adjustment Means

P = Leakproof Screw Adjustment
R = Handknob Adjustment
G = Tamperproof Cap
(See page 4-102 for dimensions)

Port Sizes - Bodied Valves Only

3W = 3/8" BSP **6T** = 3/8" SAE
4W = 1/2" BSP **8T** = 1/2" SAE
6W = 3/4" BSP **12T** = 3/4" SAE
1/4" BSP Drain Ports 1/4" SAE Drain Ports

Seals

S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 14 l/min

7 = 2- 70 bar. Std setting 35 bar
20 = 10-210 bar. Std setting 100 bar
35 = 50-350 bar. Std setting 280 bar
Std setting made at 14 litres/min

We reserve the right to change specifications without notice

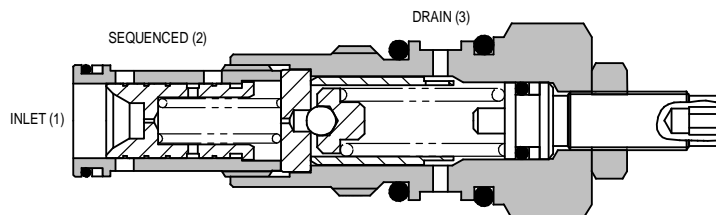
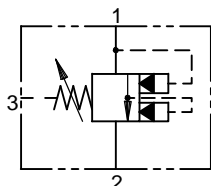


1UPS SERIES SEQUENCE VALVE

UNLOADING - PILOT OPERATED

1UPS100

SLIDING SPOOL TYPE



4

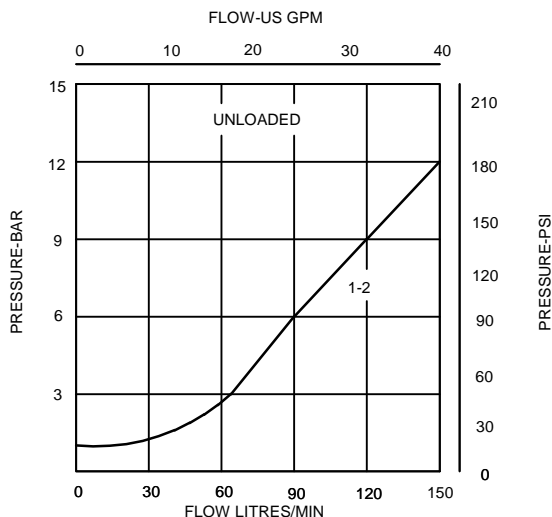
APPLICATION

An off-loading sequence valve opens fully to pass flow to a secondary circuit when the valve pressure setting is reached. This allows flow to the secondary circuit with a minimal pressure drop.

OPERATION

Inlet pressure acts on the pilot section of the valve. When the valve setting is reached, the pilot section opens and pilot flow causes the spool to move back uncovering the radial vent port. The main section then opens fully with pilot flow passing through the vent. The valve remains open until flow to the sequenced port ceases and inlet pressure drops to zero.

PRESSURE DROP



FEATURES

Hardened steel working parts give long, trouble-free life. Selectively matched honed assemblies give accurate performance.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	150 litres/min (40 US GPM)
Max Setting	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add Suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A880 (See Section 17)
Torque Cartridge into Cavity	60 Nm (44 lbs ft)
Weight	1PSC100 0.17 kg (0.37 lbs) 1PSC145 0.56 kg (1.23 lbs) 1PSC150 0.78 kg (1.72 lbs) 1PSC155 1.05 kg (2.30 lbs)
Seal Kit Number	SK177 (Nitrile) SK177V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	100 millilitres/min nominal
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

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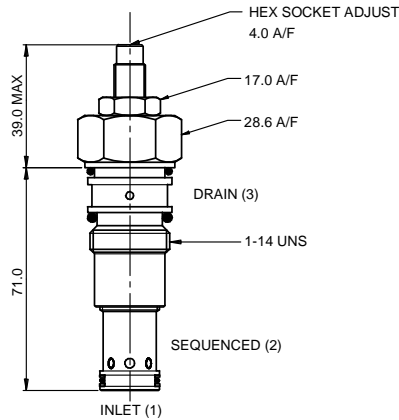
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CARTRIDGE ONLY

BASIC CODE: 1UPS100



4

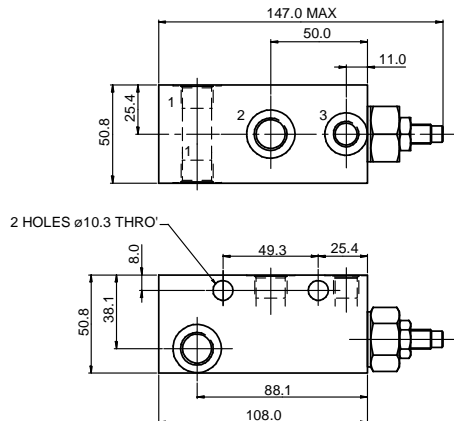
COMPLETE VALVE 3/8" 1/2" 3/4" PORTS

BASIC CODE: 1UPS145 (WITHOUT BUILT-IN CHECK)

Body ONLY part numbers

<i>BSP, aluminium</i>	<i>SAE, aluminium</i>
1/2" B4821	3/8" B10793
3/4" B5466	1/2" B6584
	3/4" B7883

<i>BSP, steel</i>	<i>SAE, steel</i>
1/2" B4527	
3/4" B4403	3/4" B11379



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1UPS* P 3W 35 S**

Basic Code

1UPS100 = Cartridge Only
1UPS145 = Cartridge and Body

Adjustment Means

P = Leakproof Screw Adjustment
R = Handknob Adjustment
G = Tamperproof Cap
(See page 4-102 for dimensions)

Port Sizes - Bodied Valves Only

4W = 1/2" BSP **6T** = 3/8" SAE
6W = 3/4" BSP **8T** = 1/2" SAE
1/4" BSP Drain Ports **12T** = 3/4" SAE
1/4" SAE Drain Ports

We reserve the right to change specifications without notice

Seals

S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 14 l/min

20 = 10-210 bar. Std setting 100 bar
35 = 50-350 bar. Std setting 210 bar
Std setting made at 14 litres/min



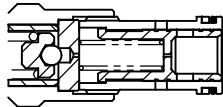
SECTION 5 - PRESSURE REDUCING VALVES

CONTENTS

This section contains pressure control valves which limit the downstream pressure to a set level. Direct acting and pilot operated versions with and without reverse reliefs are available. Flows up to 200 litres/min (52 US GPM) and pressures up to 350 bar (5000 psi).

SELECTION

5

SECTION	SERIES	APPLICATION	RANGE	PAGE
	1PA Pilot style sliding spool	Uses include two pressure systems where high flow coupled with very stable outlet pressure is required. These valves do not have reverse relief protection	350 bar (5000 psi) 200 litres/min (52 US GPM)	5-121 to 5-141

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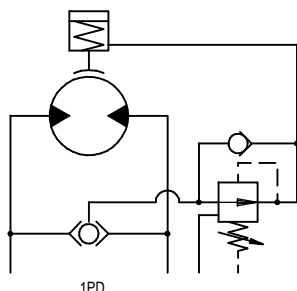
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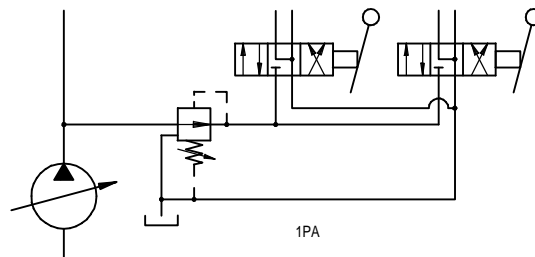
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TYPICAL CIRCUIT EXAMPLES



BRAKE PRESSURE LIMITATION



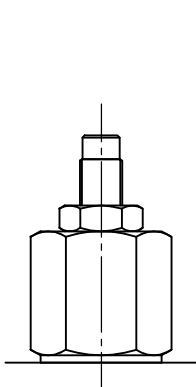
SECONDARY CIRCUIT

PRESSURE EQUIPMENT DIRECTIVE

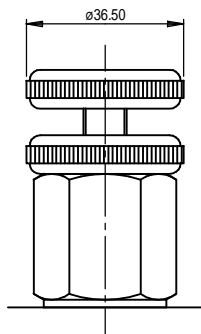
All pressure control valves manufactured by Integrated Hydraulics are designed to be "Pressure Accessories" in accordance with article 3 section 3 of the Pressure Equipment Directive and Sound Engineering Practice and sold in good faith as such. For "Safety Accessories" as defined in article 3 section 1.4 of the Pressure Equipment Directive please contact the UK Technical Sales Department.

ADJUSTMENTS

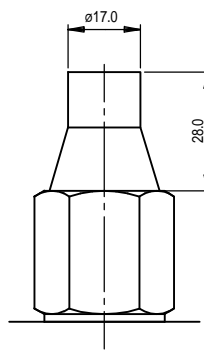
The adjustment range and Max setting figures shown throughout this catalogue give the design range for each valve, higher or lower values may be attainable but should not be used without first contacting our Engineering department. Setting must ALWAYS be carried out using an appropriate gauge and it must NOT be assumed that screwing an adjuster to its maximum or minimum position will yield the maximum or minimum stated design setting for that valve.



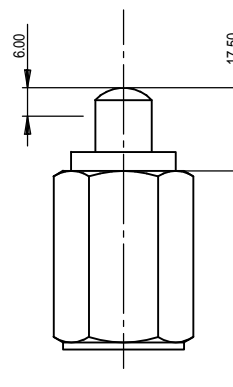
'P' - LEAKPROOF SCREW



'R' - HANDKNOB



'G' - TAMPERPROOF CAP



'C' - PLUNGER ACTUATED

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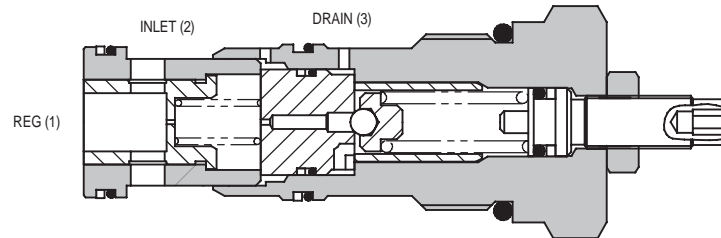
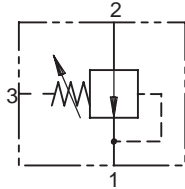


1PA SERIES PRESSURE REDUCING VALVE

PILOT OPERATED

1PA200

SLIDING SPOOL TYPE



5

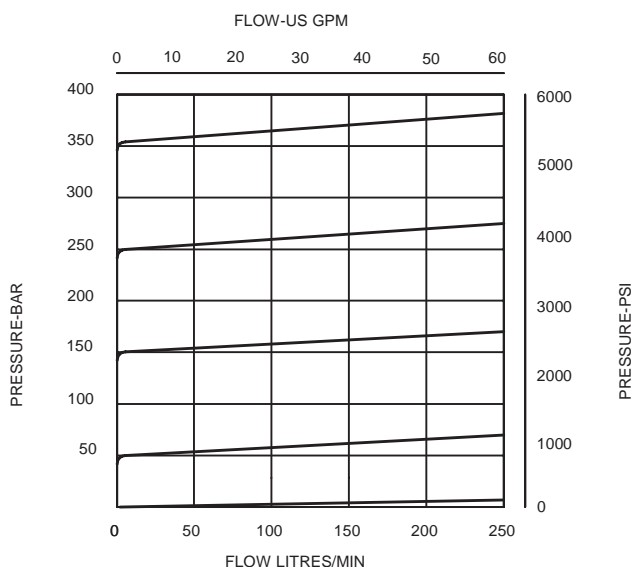
APPLICATION

To maintain a constant downstream pressure lower than the inlet pressure. Ideal for use in two pressure systems or to protect low pressure actuators such as brake cylinders. Note: where reverse flow is required, see 1PAA95, page number 5-161.

OPERATION

This valve is normally open, allowing oil from the inlet to pass through to the regulated port of the cartridge. When the regulated pressure reaches the valve setting, the pilot section opens causing a pressure imbalance across the main spool which moves, throttling the inlet flow, preventing any further pressure rise in the regulated line.

REGULATED PRESSURE



FEATURES

Internal parts hardened, match ground and honed to give long, trouble-free life. Pilot style design allows for high flows and accurate performance.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	200 litres/min (52 US GPM)
Max Setting	Inlet: 350 bar (5000 psi) Reg: 30-350 bar (435-5000 psi)
Max Differential	210 bar (3000 psi) between 1 and 2
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add Suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A16102 (See Section 17)
Torque Cartridge into Cavity	100 Nm (76 lbs ft)
Weight	1PA200 0.72 kg (1.59 lbs) 1PA250 1.06 kg (2.34 lbs)
Seal Kit Number	SK173 (Nitrile) SK173V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Pilot Flow	550 millilitres/min @ standard setting
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

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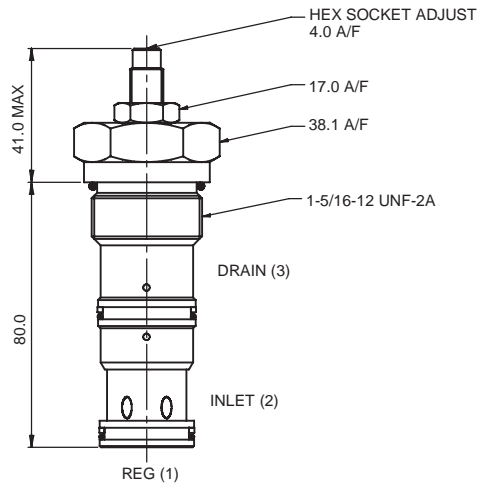
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CARTRIDGE ONLY

BASIC CODE: 1PA200



5

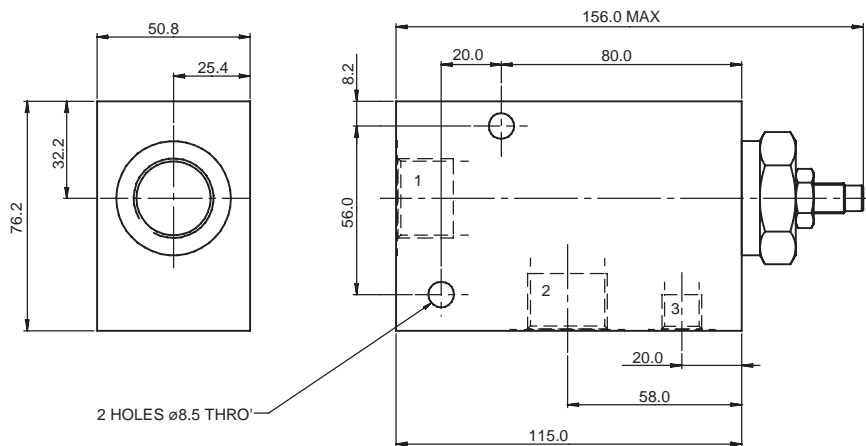
COMPLETE VALVE

3/4" 1" PORTS

BASIC CODE: 1PA250

Body ONLY part numbers

BSP, aluminium	SAE, aluminium	BSP, steel	SAE, steel
3/4" B3496	3/4" B10786	1" B3497	1" B11555
1" B3496	1" B6807		



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1PA***

P

8W

35

S

Basic Code

1PA200 = Cartridge Only

1PA250 = Cartridge and Body

Adjustment Means

P = Leakproof Screw Adjustment

R = Handknob Adjustment

G = Tamperproof Cap

(See page 5-102 for dimensions)

Port Sizes - Bodied Valves Only

12T = 3/4" SAE

8W = 1" BSP

16T = 1" SAE

1/4" BSP Drain Ports 1/4" SAE Drain Ports

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ zero flow

20 = 10-210 bar. Std setting 100 bar

35 = 30-350 bar. Std setting 280 bar

Std setting made at zero flow (dead head)

We reserve the right to change specifications without notice

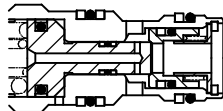
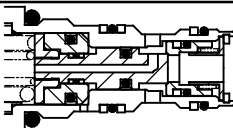
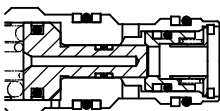
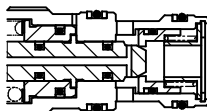
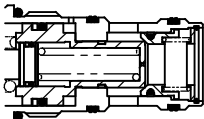
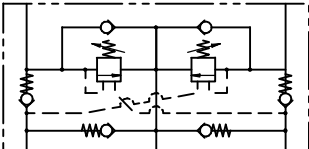
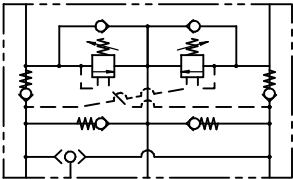


SECTION 6 - MOTION CONTROL VALVES

CONTENTS

This section contains a most extensive range of overcentre and motion control cartridges, including normal, part vented and fully vented versions. Suitable for load holding, load safety and to prevent load runaway, giving low pressure drops, various pilot ratios and excellent stability to all types of moving loads.

SELECTION

SECTION	SERIES	APPLICATION	RANGE	PAGE
	1CE/1CEE Overcentre cartridge pilot assisted relief with check	To control moving loads and prevent load runaway, giving load holding and hose failure safety	350 bar (5000 psi) 300 litres/min (80 US GPM)	6-111 6-151 6-181 6-205 6-241
	1CER Overcentre cartridge as 1CE series with relief balanced	As 1CE series but with relief balanced against back pressure allowing the valve to be used with closed centre DCV with service line reliefs	350 bar (5000 psi) 300 litres/min (80 US GPM)	6-121 6-161 6-211
	1CEB/1CEBD Overcentre cartridge as 1CE series with relief and pilot balanced	As 1CE series but balanced on relief and pilot areas. For use on proportional systems or applications with widely varying back pressures	350 bar (5000 psi) 300 litres/min (80 US GPM)	6-131 6-171 6-173 6-191 6-193 6-251 6-255
	1CEL Overcentre cartridge with constant counterbalance pressure	This valve is used in systems where the machine framework introduces instability, such as telescopic handlers, cranes and concrete pumps	380 bar (5510 psi) 140 litres/min (37 US GPM)	6-135 6-175 6-225
	1CPB/1CPBD Pilot controlled cartridges without relief function, unaffected by back pressure	For use on boom lock applications giving load-holding and hose failure safety. With or without internal relief	400 bar (5800 psi) 300 litres/min (80 US GPM)	6-137 6-139 6-177 6-197 6-265
	1CEEC Line mounted overcentre with make up checks. Piece parts in body style	Motion control valves with make up checks and cross line relief function for use on transmission systems or single rod cylinders when dual relief is required	350 bar (5000 psi) 300 litres/min (80 US GPM)	6-301 6-311
	1CEESH/1CEEC SH As 1CEEC series with brake shuttle. Piece parts in body style	As 1CEEC series but with added brake shuttle for removal of spring applied park brakes	350 bar (5000 psi) 300 litres/min (80 US GPM)	6-271 6-281 6-321 6-341

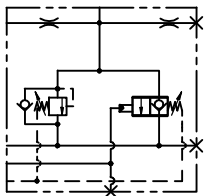
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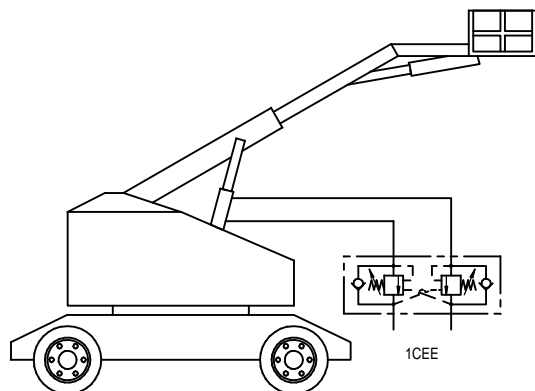
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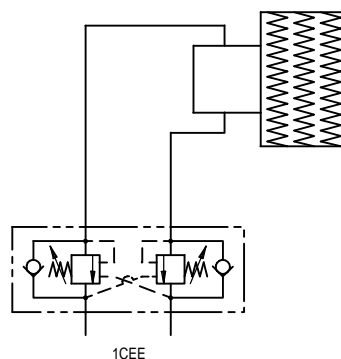
SECTION	SERIES	APPLICATION	RANGE	PAGE
	1CEBL In-line or cylinder mounted BoomLoc valves incorporating 1CPB(D) cartridge and additional relief cartridge element.	These overcentre valves are suitable for use on the boom and dipper cylinders of an excavator to help the manufacturer or user comply with standard ISO8643.	400 bar (5800 psi) 550 litres/min (145 US GPM)	6-400 to 6-491

TYPICAL CIRCUIT EXAMPLES



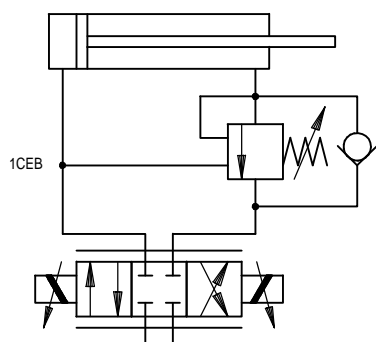
MANLIFT

Load holding and load safety provided by dual overcentre valves protecting the operator from hose failure and giving him a smooth ride.



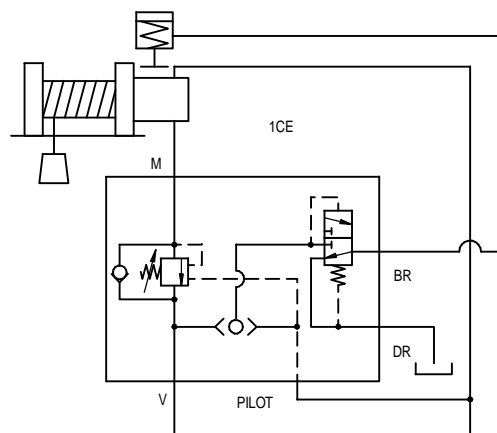
WHEEL MOTOR

Dual overcentres preventing load runaway in transmission systems forward and reverse.



PROPORTIONAL CONTROL

Balanced valves are required where back pressures vary as above in proportional valve circuits where flow is metered in and out of the directional control valve.



WINCH

Smooth lowering and soft stop for winches using overcentre combined with brake shuttles for spring applied brakes.

ADJUSTMENTS

The adjustment range and Max setting figures shown throughout this catalogue give the design range for each valve, higher or lower values may be attainable but should not be used without first contacting our Engineering department. Setting must ALWAYS be carried out using an appropriate gauge and it must NOT be assumed that screwing an adjuster to its maximum or minimum position will yield the maximum or minimum stated design setting for that valve.

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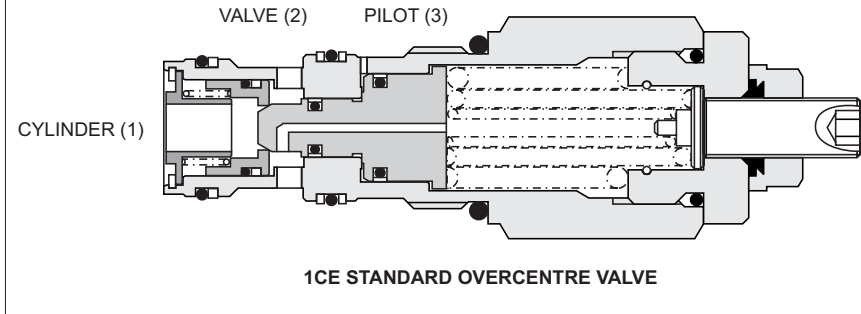
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OVERCENTRE VALVES

Fig 1



There are now many types of overcentre or motion control valves available to the designer of hydraulically operated machines, each one has its own place and specific benefits to the user. The function of these valves can be divided into three basic groups.

1. Load Holding; where the overcentre valve prevents the movement of a load when the directional valve is in the neutral position. Permitting the use of open centre directional valves and negating leakage past the spool of closed centre directional valves.
2. Load Control; where the overcentre valve prevents the actuator running ahead of the pump due to the load induced energy thereby eliminating cavitation in the actuator and loss of control.
3. Load Safety. In the case of hose failure an overcentre valve mounted onto or into an actuator will prevent uncontrolled movement of the load. When a boom is used as a crane then hose failure protection is vital as the loss of load control could cause damage to people or property.

Each of these functions is applicable to linear or rotary motion.

The standard overcentre valve (fig 1) can be described as a pilot assisted relief valve with an integral free flow check. The difference between this design of valve and a pilot check is that the check valve will open fully as soon as the pilot pressure is sufficient to open the valve because the only resistance to opening is the pressure locked in to the cylinder port. With an overcentre valve the pilot pressure has to overcome the force of the spring which is reduced by load pressure. This ensures a gradual opening and a metering of the flow as it passes the poppet. Integrated Hydraulics overcentre valves consist of a poppet that seals flow from an actuator, a check element, which permits free flow to the actuator and a pilot section that opens the poppet allowing flow from the actuator at a controlled rate. There are two basic designs, each with several variants. The direct acting design, whereby the pressure in the actuator acts on the full area of the nose of the poppet, is ideal for flows up to 200 L/min whereas the differential area

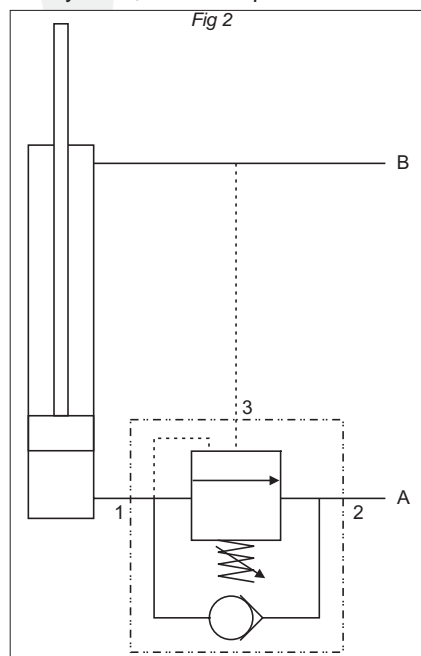
design, whereby the pressure acts on an annular area, is suitable for flows up to 300 L/min. Being of poppet type both designs exhibit excellent leakage characteristics with maximum leakage of up to 0.5 ml/min for valves up to 200 L/min capacity and up to 4ml/min for valves with 300 L/min capacity.

The cartridge has three ports, a cylinder port (1), a valve port (2) and a pilot port (3). If pressure, above the setting of the valve is applied to the cylinder port it will open as a relief. When applied to the valve port pressure will open a low pressure check allowing free flow into the cylinder port. Pressure applied to the pilot port acts over a larger area on the poppet than the area referenced to the cylinder port, so the valve will open at a low pressure.

For most applications the relief setting should be approximately 1.3 times higher than the maximum load induced pressure. This ensures that with the maximum load on the actuator the valve will remain closed until pilot pressure is applied. The pilot pressure required to open the valve will depend on the pilot ratio that is the ratio between the relief area and the pilot area. The pilot pressure can be calculated:

$$\text{Pilot pressure} = \frac{\text{Valve Setting} - \text{Load Pressure}}{\text{Pilot Ratio}}$$

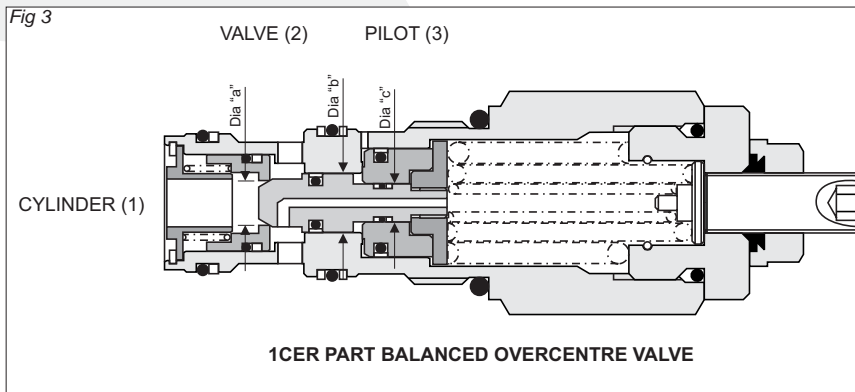
A typical application would entail mounting the overcentre valve in or on the end cap of a cylinder (fig 2). The cylinder port of the valve being connected to the full bore area of the cylinder, the valve port to the directional control line A



and the pilot connected to the annulus inlet, line B and so to the directional control line B. As soon as the pressure rises in the inlet port of the annulus (line B) to retract the rod to a point where it reaches the required pilot pressure the actuator will begin moving at the flow at which the pressure setting was made. If the load causes the

flow to increase then the inlet will be starved of oil and the pressure will begin to drop at this port. The reducing pressure will be sensed at the pilot allowing the spring to begin to close the valve preventing load run-away. In this way the valve will continually meter, controlling the load throughout its movement. When the pressure needed to move the load is higher than the pilot pressure needed to fully open the valve the only restriction produced is the pressure drop due to flow in the fully open condition.

With the standard overcentre the spring chamber is vented through the poppet to the valve port which creates a problem if there are varying or high back pressures.



Pressure in the valve port increases the effective setting of the valve by a factor equivalent to the pilot ratio plus one. This means that if there is a standing back pressure of 50 bar with a pilot ratio of 5:1 the effective relief setting would be increased by 300 bar. This creates problems if the application demands a closed centre directional valve and the utilisation of service line reliefs. The relief valves will operate to limit inlet pressure but will not act if there is an external load which needs to be limited. The overcentre will not allow oil past the seat due to the back pressure created by the service line relief valves. To overcome this problem the part balanced 1CER series was created (fig 3).

The 1CER series overcentre valve performs in the same way as the standard valve under most conditions. But the relief section of the valve is not affected by back pressure.

The poppet is designed to balance back pressure over two areas on the poppet. The first is a annular area between the seat (dia a) and the centre seal (dia b) on the poppet which acts to open the valve and the second at the spring end of the spool (dia c) acting to close the valve. These areas are the same, the poppet is therefore balanced and so pressure in the valve line will not affect the relief performance of the valve. It must be noted that the pilot pressure required to open the valve is still affected on a one to one ratio by any back pressure.

The advantage of this design is the ability to use the valve on closed centre directional valve systems allowing service line relief valves to operate as normal. Most other valves of this type on the market have an atmospheric vent which limits their use in corrosive atmospheres and are prone to leakage.

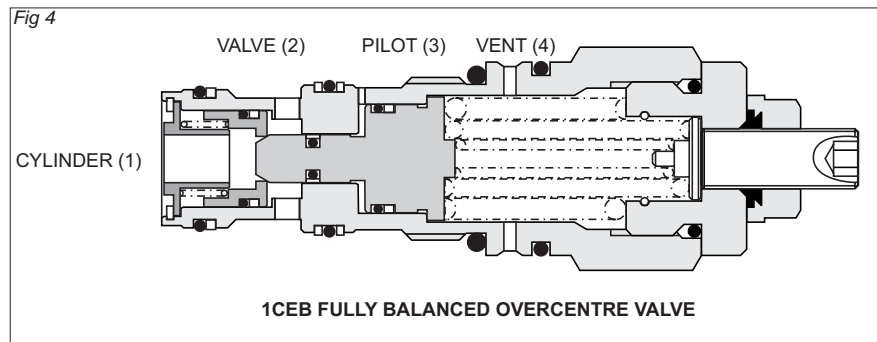
The 1CER valve does have some draw backs in certain applications. Because the pilot pressure is affected by back pressure the valve can not be used in regenerative circuits on the annular port of the cylinder. Also if used with a meter out proportional system the constantly varying back

pressures can cause both the part balanced and the standard valve to go unstable. For this is the reason the fully balanced version, 1CEB series (fig 4) is available. In this case the spring chamber is vented to atmosphere or to a separate drain port.

Any back pressure therefore does not affect the setting of the valve or the amount of pilot pressure needed.

For the standard, Part Balanced and Balanced valves there are various pilot ratios available to the system designer, which is best for his circuit? A general rule is that high pilot ratios are suitable for constant, stable loads and low pilot ratios for unstable and varying loads. The pilot ratio does not necessarily affect the working pressure by much given that the normal working pressure of a system is often much higher than the pilot pressure required to fully open the valve. If this is the case then the piloted open pressure drop will determine the systems efficiency.

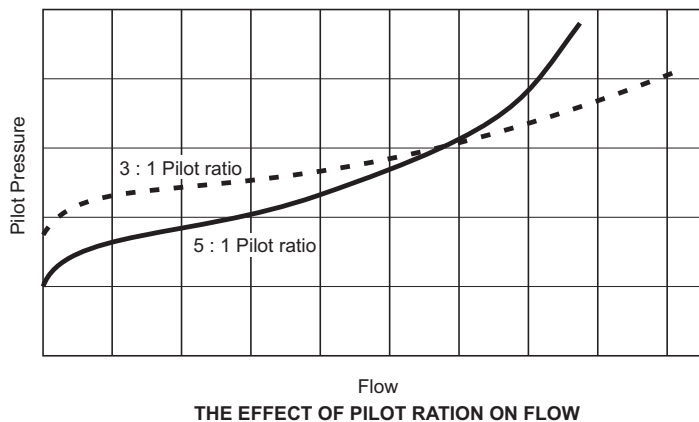
Graph 1 shows the pressure drop curves of two valves with different pilot ratios. The higher pilot ratio valve is more



restrictive than the low pilot ratio valve. This shows that above a certain pressure the lower pilot ratio valve is more efficient than the higher pilot ratio valve. It is important that the total performance is taken into account before specifying an overcentre valve.



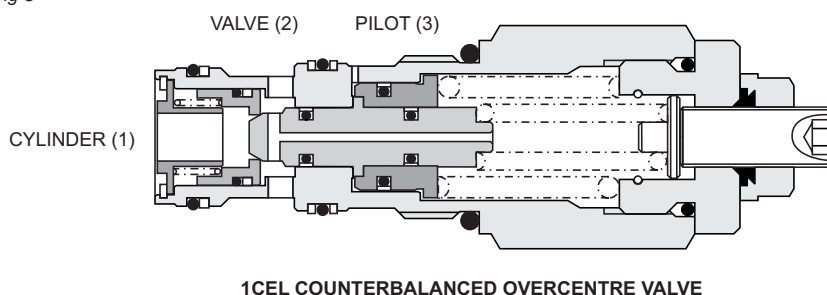
Graph 1



The two stage overcentre valve, 1CEL (Fig 5) has been developed to overcome a problem which has been a continual nuisance to designers of machines incorporating long unstable booms. Instability problems affect many machines, most noticeably those with high capacity cylinders particularly in conjunction with slender booms that are subject varying frictional forces. The best example is the Telescopic Handler that usually has a long cylinder to extend or retract its boom. At the end of its stroke the pressure of the oil within a cylinder rises to the setting of the main relief valve for that part of the system and by its nature, the motion control valve re-seat locks in that pressure (irrespective of any load induced pressure). When the operator lowers the load, this stored energy gives the valve the message that a heavy load is on the cylinder; therefore it takes less pilot pressure to open. As a result, the valve opens very quickly and allows the stored energy to dissipate causing a momentary runaway condition, this causes a rapid acceleration of the load that is then checked by the motion control valve and brought under control. The consequence of this is an initial instability as a boom is retracted; the number of jerks will depend on the stiffness of the system at the time of lowering. This instability can sometimes continue through the whole of the cylinder's stroke, its magnitude, in extreme cases, can cause severe operator insecurity or even the loss of a load.

The 1CEL valve uses two springs to control the poppet, only the outer spring being effected by the pilot piston,

Fig 5



leaving the inner to generate a counterbalance pressure. The two-stage valve has overcome many instability problems by preventing the total decay of the stored energy in the cylinder and stopping the valve over reacting. It allows the pressure to fall to the counterbalance setting, which can be adjusted dependant upon the severity of the application. This back pressure can also help to stiffen the boom during its movement further through its stroke, for example when wear pads on the box sections of a telescopic boom create changing frictional forces. This works well but with some systems, the backpressure created by this valve causes problems due to the reduction in available force. On certain machines, when for instance a crowd cylinder is bottomed,

the oil from a slave cylinder has to be forced across a relief valve; the boom cylinder creates an induced pressure by virtue of its downward force. It is possible that an unloaded boom will not lower due to the counterbalance pressure. Also in the fully piloted open position the valve still generates a backpressure heating the oil and creating inefficiency.

To overcome these problems another variant is available in which the counterbalance pressure is reduced as the pilot pressure increases. This design has a second pilot ratio, which acts to reduce the backpressure applied by the centre spring. Indeed the valve can be piloted fully open, eliminating the counterbalance pressure altogether so improving the efficiency of the system. With a primary pilot ratio of 4:1 and a secondary ratio of 0.5:1 the initial unloading of the stored pressure happens at a low pilot pressure followed by a more gentle reduction as the pilot pressure increases. The overall setting of the valve is a combination of the outer and the inner spring forces divided by the seat area.

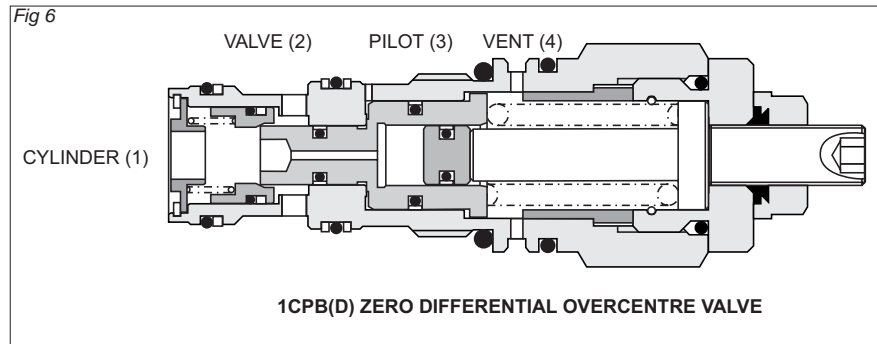
The practical application of either of these valves involves the establishing a range of acceptable settings. For example, the requirement is for the valve to be set at 200 bar (3000psi) with a counterbalance pressure between 35 and 70 bar (500-1000psi) - there are two springs within the valve, the outer one is fixed and the inner adjustable. For this application the outer spring would be set to give 165

bar (2400psi) and the inner adjustable between 35 and 70 bar (500-1000psi). This would give the valve an adjustable range of 165-235 bar (2400-3400psi). Given a pilot ratio of 6:1 or 4:1 depending on the type this extra pressure setting would have little effect on the pilot pressure needed to open the valve during normal operation.

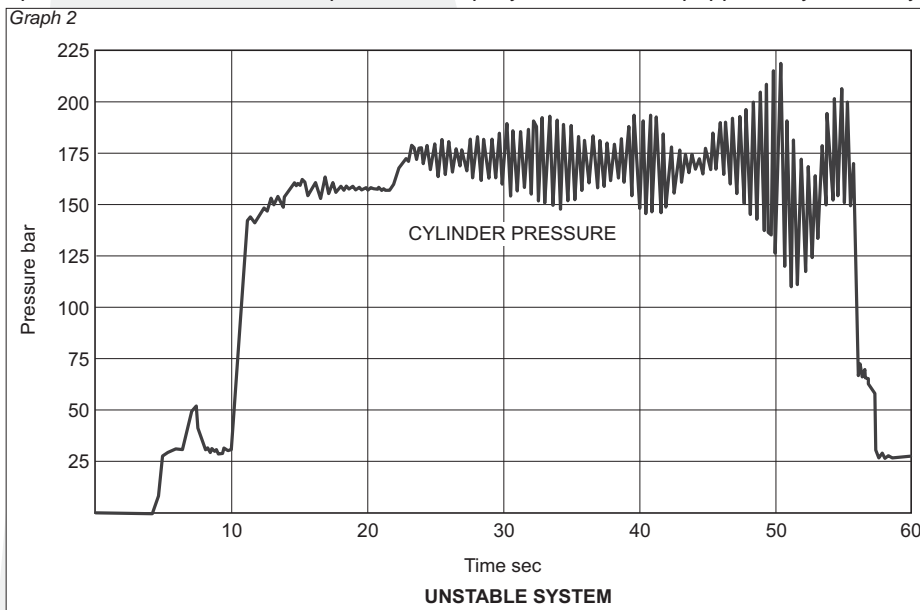
Graph 2 shows a typical recorded instability picking up machine frequencies and getting worse and Graph 3 shows the counterbalanced overcentre valves preventing the problem getting worse, dampening out the initial instability and the counterbalance pressure falling as the pilot pressure increases.

The zero differential range of load control valves 1CPB (fig 6) have been designed with 'BoomLoc' hose rupture valve applications in mind. Typically the valve is piloted open from the hydraulic remote control operating the main directional spool valve. By setting the overcentre to open just after the main valve it will control the flow rate at low speed but as the overcentre opens more rapidly than the

valve. The poppet seals against a tapered seat, as the pilot pressure increases the poppet will move off the seat. Flow is dependant upon the axial movement of the poppet which



in turn is dependant upon the force exerted by pilot pressure balanced by that exerted by the spring. The poppet is hydraulically balanced so this valve is unaffected

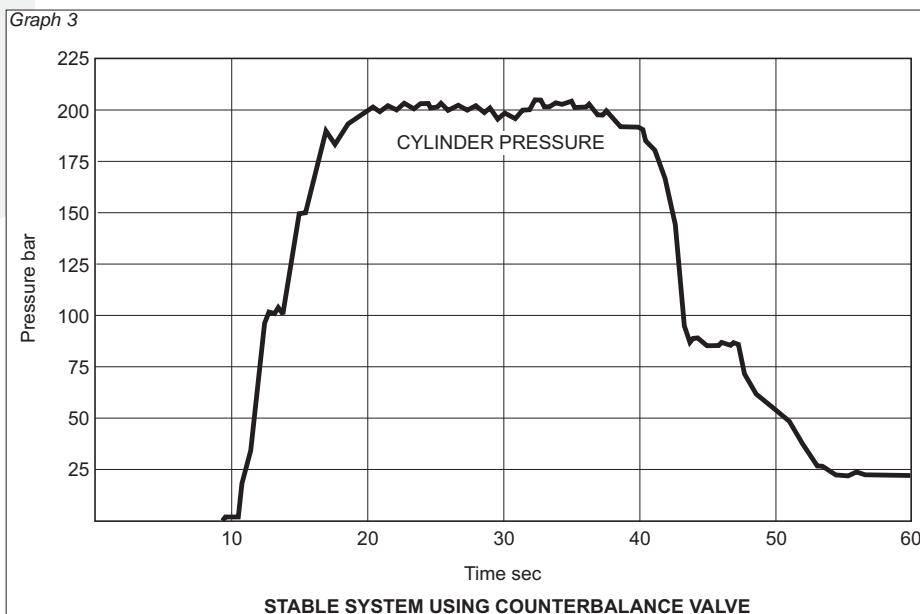


by valve line AND cylinder pressure but it will not provide any relief function. If over pressure, shock or thermal relief are required a second relief element is required.

The successful application of motion control valves, particularly in areas that are demanding involves the anticipation and resolution of numerous factors only some of which can be discussed in this article. Motion control valves are adjustable, are available in several pressure ranges with many pilot ratio options. Most of the valves fit in a common cavity (the exception being the fully balanced, 1CEB

directional valve the directional valve will control the flow rate at higher speeds. It is a pilot operated metered poppet

and zero differential, 1CPB versions when required with an external rather than an atmospheric vent) and are available



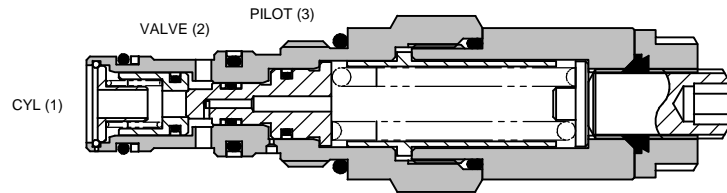
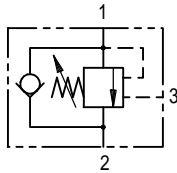
in sizes from 30 to 300 L/min. The flexibility of cartridge valve technology can therefore be easily applied to bring stability. The standard range of valves described here can be used to solve the vast majority of motion control problems and we are constantly developing new valves that will further improve stability and load control.



1CE SERIES OVERCENTRE VALVE

PILOT ASSISTED RELIEF WITH CHECK

1CE20



6

APPLICATION

Overcentre valves give static and dynamic control of loads by regulating the flow into and out of hydraulic actuators. When installed close to or within an actuator, the overcentre valve will stop runaway in the event of hose burst and if open centre directional control valves are used, will allow thermal expansion relief of the hydraulic fluid.

The overcentre cartridge is ideal for mounting directly into a cavity machined in the body of the cylinder, motor or rotary actuator. The cartridge can also be mounted directly to the ports via a specifically machined body as part of a Hydraulic Integrated Circuit or single unit, or contained within one of our standard line bodies.

Single overcentre valves are normally used when the load is unidirectional, for example an aerial platform or crane and dual overcentre valves are used for controlling loads in both directions for motor applications or for cylinders going over centre.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time.

PILOT RATIOS

- 3:1 Best suited for extremely unstable applications such as long booms or flexible frameworks.
- 4.5:1 Best suited for applications where load varies and machine structure can induce instability
- 8:1 Best suited for applications where the load remains relatively constant

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	20 litres/min (5 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A22903 (See Section 17)
Torque Cartridge into Cavity	40 Nm (30 lbs ft)
Weight	1CE20 0.16 kg (0.35 lbs) 1CE25 0.37 kg (0.82 lbs) 1CEE24 0.41 kg (0.89 lbs)
Seal Kit Number	SK1276 (Nitrile) SK1276V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

* For applications above 210 bar please consult our technical department or use the steel body option.

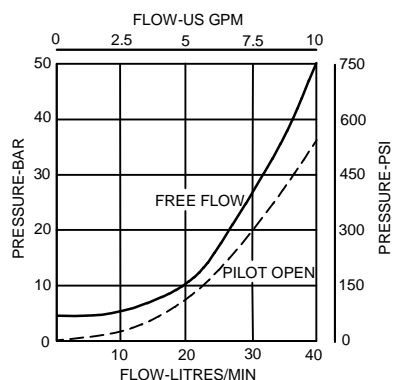
Integrated Hydraulics Ltd

Collins Road, Heathcote Ind. Est., Warwick, CV34 6TF, UK.
Tel: +44 (0) 1926 881171 Fax: +44 (0) 1926 315729
Website: www.integratedhydraulics.com

Integrated Hydraulics Inc

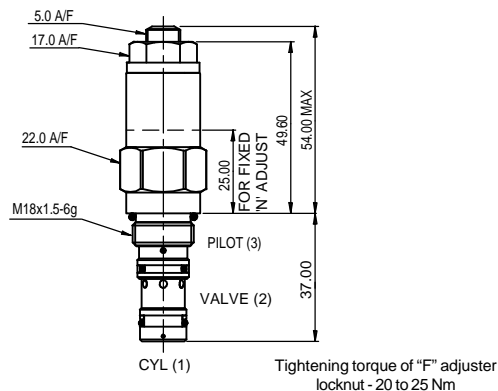
7047 Spinach Drive, Mentor, Ohio 44060, USA
Tel: (440) 974 3171 Fax: (440) 974 3170
Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 1CE20



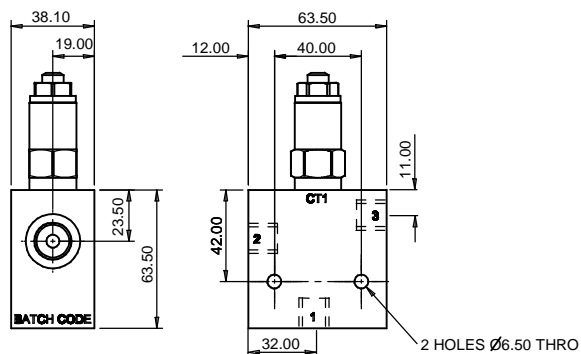
SINGLE VALVE

3/8" PORTS

BASIC CODE: 1CE25

Body ONLY part numbers

BSP, aluminium	SAE, aluminium	BSP, steel	SAE, steel
3/8" B24255	3/8" B24257	3/8" B24254	3/8" B24256



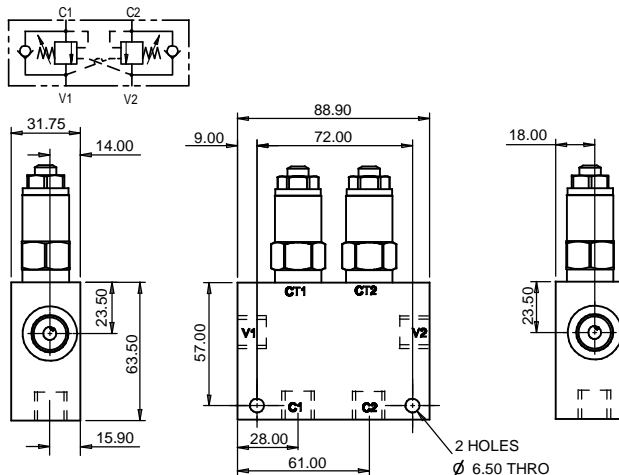
DUAL VALVE

3/8" PORTS

BASIC CODE: 1CEE24
(INTERNALLY CROSSED PILOTED)

Body ONLY part numbers

BSP, aluminium	SAE, aluminium	BSP, steel	SAE, steel
3/8" B24261	3/8" B24264	3/8" B24260	3/8" B24263



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CE***

F

3W

35

S

3

Basic Code

1CE20 = Cartridge Only

1CE25 = Cartridge and Body

1CEE24 = Cartridges and Dual Body

Adjustment Means

F = Screw Adjustment

N = Fixed - State pressure setting required

For fixed versions add setting in 10 bar increments to end of part number. Subject to a ±10% tolerance.

Port Sizes - Bodied Valves Only

3W = 3/8" BSP Valve & Cyl Port. 1/4" BSP Pilot Port

6T = 3/8" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

Pressure Range @ 4.8 l/min

20 = 100-230 bar. Std setting 140 bar

35 = 200-350 bar. Std setting 210 bar

Std setting made at 4.8 litres/min

Other pressure ranges available on request

Pilot Ratio

3 = 3:1

4 = 4.5:1

8 = 8:1

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

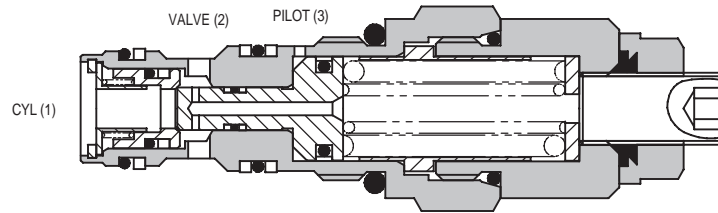
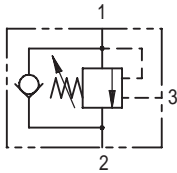
We reserve the right to change specifications without notice



1CE SERIES OVERCENTRE VALVE

PILOT ASSISTED RELIEF WITH CHECK

1CE30



6

APPLICATION

Overcentre valves give static and dynamic control of loads by regulating the flow into and out of hydraulic actuators. When installed close to or within an actuator, the overcentre valve will stop runaway in the event of hose burst and if open centre directional control valves are used, will allow thermal expansion relief of the hydraulic fluid.

The overcentre cartridge is ideal for mounting directly into a cavity machined in the body of the cylinder, motor or rotary actuator. The cartridge can also be mounted directly to the ports via a specifically machined body as part of a Hydraulic Integrated Circuit or single unit, or contained within one of our standard line bodies.

Single overcentre valves are normally used when the load is unidirectional, for example an aerial platform or crane and dual overcentre valves are used for controlling loads in both directions for motor applications or for cylinders going over centre.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time. Directly interchangeable with 30 litres/min pilot check valve. See catalogue page 7-151.

*** For applications above 210 bar please consult our technical department or use the steel body option.**

PILOT RATIOS

- 2.5:1 Best suited for extremely unstable applications such as long booms or flexible frameworks.
- 5:1 (Standard) Best suited for applications where load varies and machine structure can induce instability
- 10:1 Best suited for applications where the load remains relatively constant.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	30 litres/min (8 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A6610 (See Section 17)
Torque Cartridge into Cavity	45 Nm (33 lbs ft)
Weight	1CE30 0.15 kg (0.33 lbs) 1CE35 0.41 kg (0.90 lbs) 1CEE34 0.90 kg (1.98 lbs)
Seal Kit Number	SK395 (Nitrile) SK395V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

Integrated Hydraulics Ltd

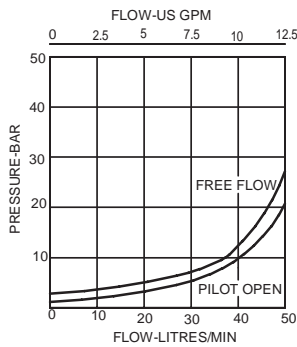
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Integrated Hydraulics Inc

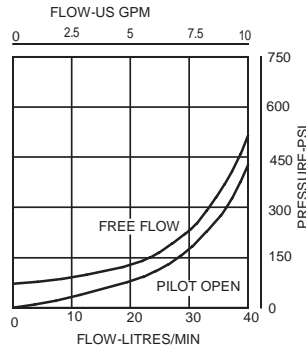
7047 Spinach Drive, Mentor, Ohio 44060, USA
Tel: (440) 974 3171 Fax: (440) 974 3170
Website: www.integratedhydraulics.com

PRESSURE DROP

2.5:1 & 5:1 version

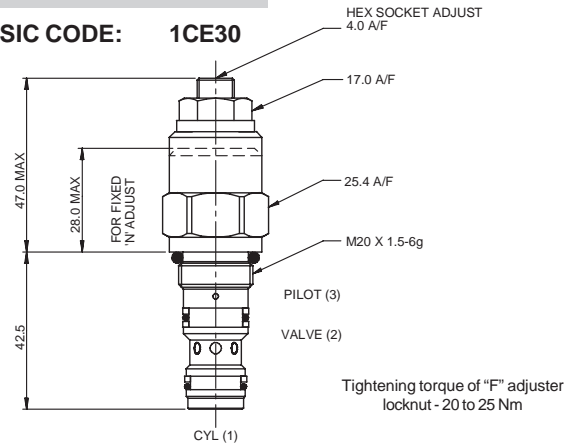


10:1 version



CARTRIDGE ONLY

BASIC CODE: 1CE30



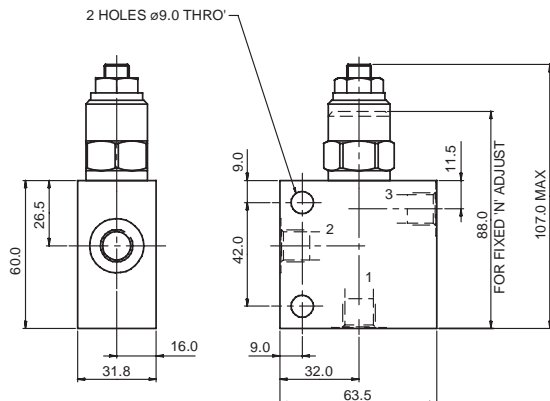
SINGLE VALVE

3/8" 1/2" PORTS

BASIC CODE: 1CE35

Body ONLY part numbers

BSP, aluminium	SAE, aluminium	BSP, steel	SAE, steel
3/8" B6743	3/8" B10536	3/8" B12823	1/2" B11811
	1/2" B7884		



Where measurements are critical request certified drawings

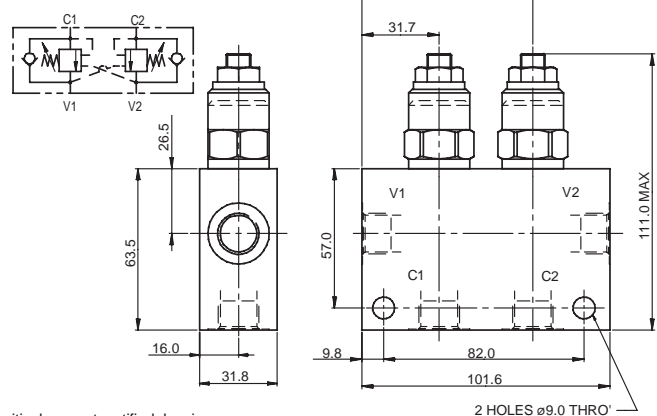
DUAL VALVE

3/8" 1/2" PORTS

BASIC CODE: 1CEE34 (INTERNALLY CROSSED PILOTED)

Body ONLY part numbers

BSP, aluminium	SAE, aluminium	BSP, steel	SAE, steel
3/8" B6836	3/8" B10805	3/8" B13803	1/2" B11812
	1/2" B30237		



ORDERING CODE EXAMPLE

1CE F 3W 35 S 5**

Basic Code

1CE30 = Cartridge Only
1CE35 = Cartridge and Body
1CEE34 = Cartridges and Dual Body

Adjustment Means

F = Screw Adjustment
N = Fixed - State pressure setting required
For fixed versions add setting in 10 bar increments to end of part number. Subject to a ±10% tolerance.

Port Sizes - Bodied Valves Only

3W = 3/8" BSP Valve & Cyl Port. 1/4" BSP Pilot Port
6T = 3/8" SAE Valve & Cyl Port. 1/4" SAE Pilot Port
8T = 1/2" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

Pressure Range @ 4.8 l/min

20 = (2.5:1 and 5:1): 70-210 bar. Std setting 100 bar
(10:1): 100-210 bar. Std setting 100 bar
35 = (2.5:1 and 5:1): 100-350 bar. Std setting 210 bar
(10:1): 120-350 bar. Std setting 210 bar

Std setting made at 4.8 litres/min

Other pressure ranges available on request

We reserve the right to change specifications without notice

Pilot Ratio

2 = 2.5:1
5 = 5:1 (Standard)
10 = 10:1

Seals

S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)

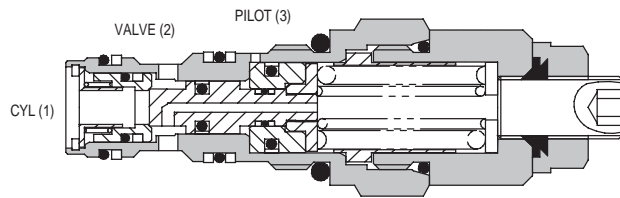
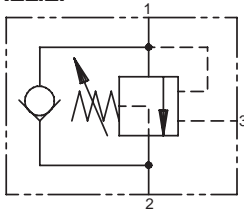


1CER SERIES OVERCENTRE VALVE

PART BALANCED - PILOT ASSISTED

1CER30

POPPET RELIEF



APPLICATION

The 1CER series overcentre valve performs all duties of a regular overcentre but is able to relieve and stay open irrespective of downstream pressure. This enables the valve to operate when used with a closed centre directional valve which has service line reliefs. The poppet is pressure balanced, preventing relief setting increase due to back pressure.

PILOT RATIOS

- 2.5:1 Best suited for extremely unstable applications such as long booms or flexible frameworks.
- 4:1 Best suited for applications where load varies and machine structure can induce instability.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	30 litres/min (8 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A6610 (See Section 17)
Torque Cartridge into Cavity	45 Nm (33 lbs ft)
Weight	1CER30 0.15 kg (0.33 lbs) 1CER35 0.41 kg (0.90 lbs) 1CEER34 0.90 kg (1.98 lbs)
Seal Kit Number	SK395 (Nitrile) SK395V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time. Directly interchangeable with 30 litres/min pilot check valve. See catalogue page 7-151.

*For applications above 210 bar please consult our technical department or use the steel body option.

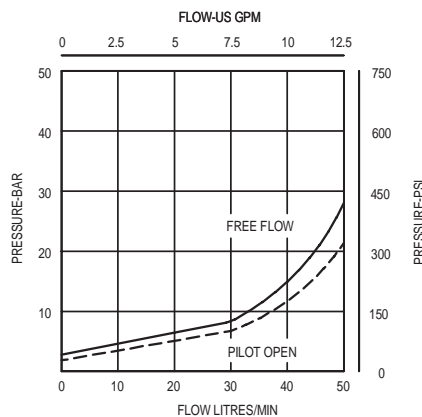
Integrated Hydraulics Ltd

Collins Road, Heathcote Ind. Est., Warwick, CV34 6TF, UK.
Tel: +44 (0) 1926 881171 Fax: +44 (0) 1926 315729
Website: www.integratedhydraulics.com

Integrated Hydraulics Inc

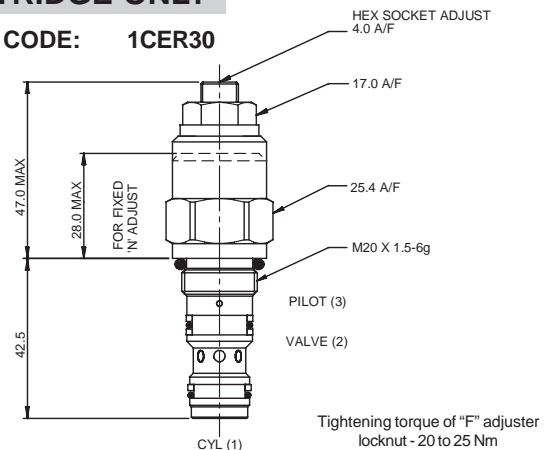
7047 Spinach Drive, Mentor, Ohio 44060, USA
Tel: (440) 974 3171 Fax: (440) 974 3170
Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 1CER30



SINGLE VALVE

3/8" 1/2" PORTS

BASIC CODE: 1CER35

Body ONLY part numbers

BSP, aluminium	SAE, aluminium	BSP, steel	SAE, steel
3/8" B6743	3/8" B10536	3/8" B12823	1/2" B11811
	1/2" B7884		

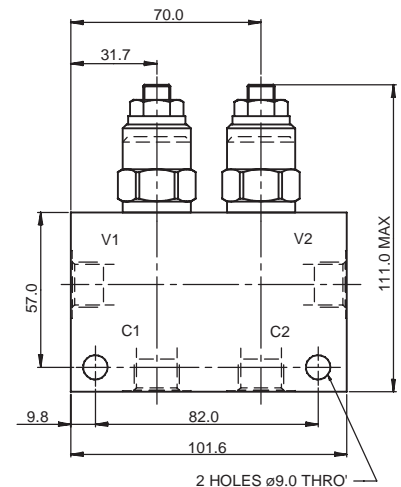
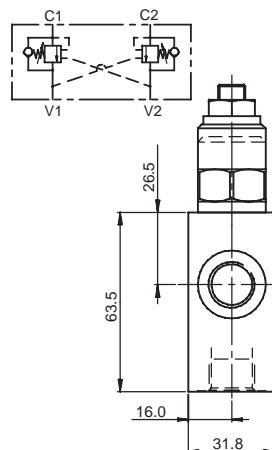
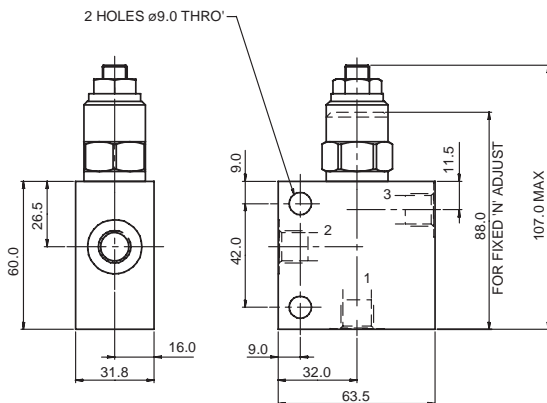
DUAL VALVE

3/8" 1/2" PORTS

**BASIC CODE: 1CEER34
(INTERNALLY CROSS PILOTED)**

Body ONLY part numbers

BSP, aluminium	SAE, aluminium	BSP, steel	SAE, steel
3/8" B6836	3/8" B10805	3/8" B13803	1/2" B11812
	1/2" B30237		



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CE****

F

3W

35

S

4

Basic Code

1CER30 = Cartridge Only

1CER35 = Cartridge and Body

1CEER34 = Cartridges and Dual Body

Adjustment Means

F = Screw Adjustment

N = Fixed - State pressure setting required

For fixed versions add setting in 10 bar increments to end of part number. Subject to a ±10% tolerance.

Port Sizes - Bodied Valves Only

3W = 3/8" BSP Valve & Cyl Port. 1/4" BSP Pilot Port

6T = 3/8" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

8T = 1/2" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

Pilot Ratio

2 = 2.5:1

4 = 4:1

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 4.8 l/min

35 = 100-350 bar. Std setting 210 bar
Std setting made at 4.8 litres/min

We reserve the right to change specifications without notice

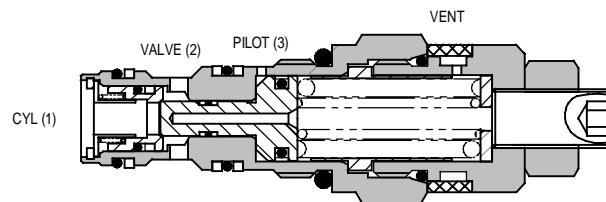
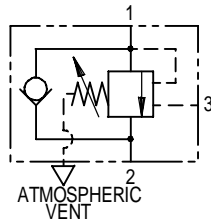


1CEB SERIES OVERCENTRE VALVE

FULLY BALANCED - PILOT ASSISTED

1CEB30

POPPET RELIEF



APPLICATION

Overcentre valves give static and dynamic control of loads by supplying a counterbalance pressure to the actuator. They prevent runaway in the event of hose burst and hold the load with minimal leakage.

The pressure balanced valve is unaffected by back pressure, allowing service line reliefs to operate and for the valve to be used in regenerative or proportional valve systems.

The overcentre valve should be mounted either into, onto or as close to the actuator as possible to give maximum protection.

Single overcentre valves control unidirectional loads such as in aerial platforms, cranes or winches and dual overcentres are suited to bi-directional motion such as wheel motor applications or cylinders going over centre.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple 'dual purpose' cavity. Allows quick, easy field service - reduces down time. Directly interchangeable with 30 litres/min pilot check valve. See page 7-151.

***For applications above 210 bar please consult our technical department or use the steel body option.**

PILOT RATIO

5:1

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	30 litres/min (8 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A6610 (See Section 17)
Torque Cartridge into Cavity	45 Nm (33 lbs ft)
Weight	1CEB30 0.14 kg (0.30 lbs) 1CEB35 0.40 kg (0.88 lbs) 1CEEB34 0.88 kg (1.94 lbs)
Seal Kit Number	SK395 (Nitrile) SK395V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

Note. This valve is not suitable for high frequency applications and aggressive environmental conditions.

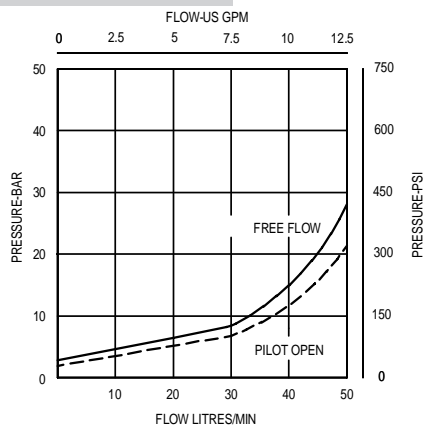
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Website: www.integratedhydraulics.com

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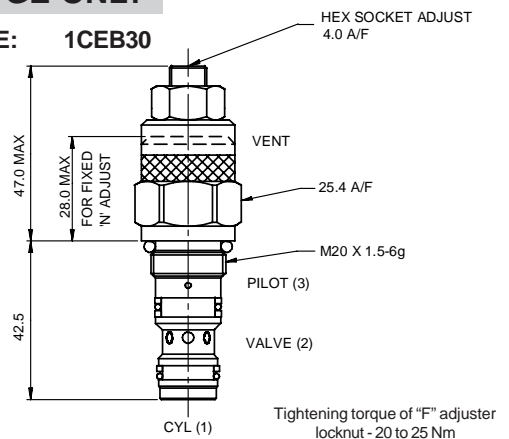
7047 Spinach Drive, Mentor, Ohio 44060, USA
Tel: (440) 974 3171 Fax: (440) 974 3170
Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 1CEB30



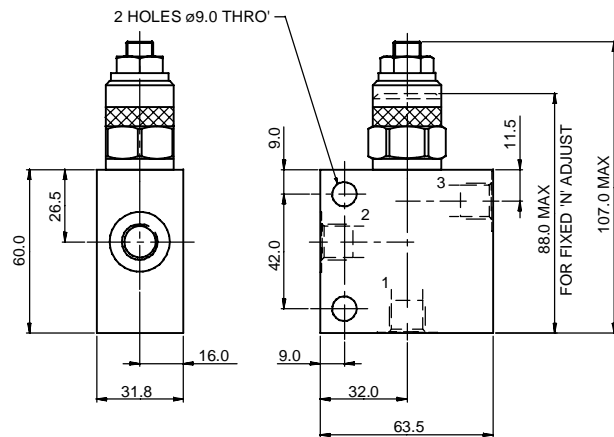
SINGLE VALVE

3/8" 1/2" PORTS

BASIC CODE: 1CEB35

Body ONLY part numbers

BSP, aluminium 3/8" B6743	SAE, aluminium 3/8" B10536 1/2" B7884	BSP, steel 3/8" B12823	SAE, steel 1/2" B11811
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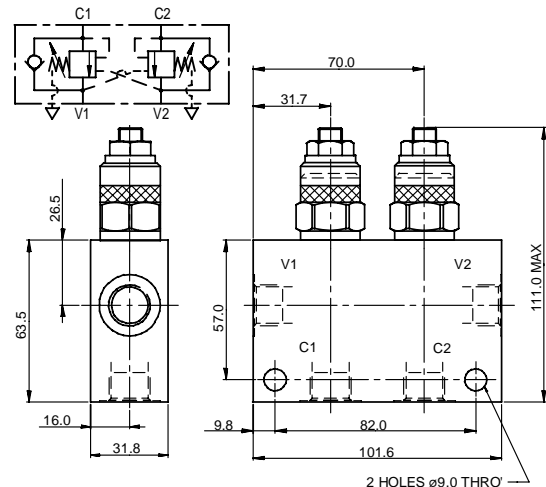
DUAL VALVE

3/8" 1/2" PORTS

BASIC CODE: 1CEEB34
(INTERNALLY CROSS PILOTED)

Body ONLY part numbers

BSP, aluminium 3/8" B6836	SAE, aluminium 3/8" B10805 1/2" B30237	BSP, steel 3/8" B13803	SAE, steel 1/2" B11812
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Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CE***

F

3W

35

S

5

Basic Code

1CEB30 = Cartridge Only

1CEB35 = Cartridge and Body

1CEEB34 = Cartridges and Dual Body

Adjustment Means

F = Screw Adjustment

N = Fixed - State pressure setting required

For fixed versions add setting in 10 bar increments to end of part number. Subject to a ±10% tolerance.

Port Sizes - Bodied Valves Only

3W = 3/8" BSP Valve & Cyl Port. 1/4" BSP Pilot Port

6T = 3/8" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

8T = 1/2" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

Pilot Ratio

5 = 5:1

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 4.8 l/min

35 = 100-350 bar. Std setting 210 bar
Std setting made at 4.8 litres/min

We reserve the right to change specifications without notice

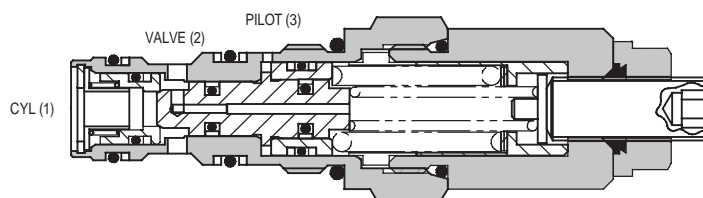
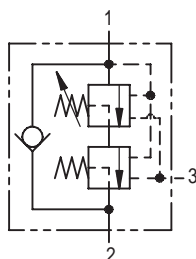


1CEL OVERCENTRE VALVE

PILOT ASSISTED RELIEF WITH CHECK AND COUNTERBALANCE

1CEL30

POPPET RELIEF



6

APPLICATION

The 1CEL30 overcentre valve performs all duties of a regular overcentre but maintains a counterbalance pressure to provide dampening of cylinders when there is a rapid loss in stored pressure. This counterbalance pressure reduces as the pilot pressure increases. Typical applications include extension cylinders on telescopic handlers where it is important to have a smooth operation when retracting from full extension.

OPERATION

The check section allows free flow and then locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied, maintaining a counterbalance pressure to prevent initial pressure loss and therefore instability. The total pressure setting will normally be set at 1.3 times the load induced pressure. The counterbalance pressure reduces as the pilot pressure increases.

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time.

PILOT RATIOS

Primary 4.3:1
Secondary 0.4:1

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	30 litres/min (8 US GPM)
Max Setting	380 bar (5510 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A6610
Torque Cartridge into Cavity	45 Nm (33 lbs ft)
Weight	0.15 kg (0.33 lbs)
Seal Kit Number	SK395 (Nitrile) SK395V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

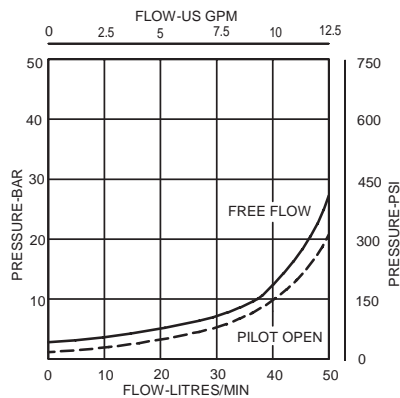
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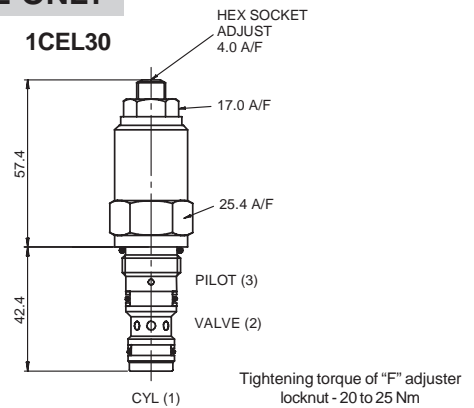
7047 Spinach Drive, Mentor, Ohio 44060, USA
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Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 1CEL30



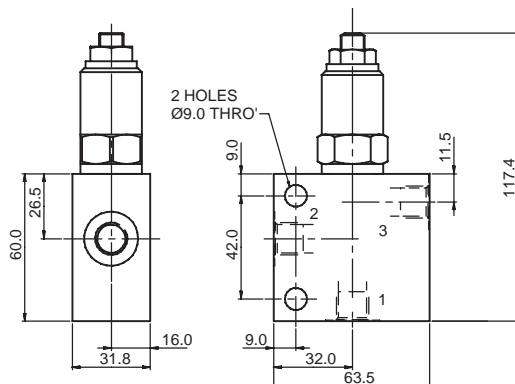
SINGLE VALVE

3/8" 1/2" PORTS

BASIC CODE: 1CEL35

Body ONLY part numbers

BSP, aluminium	SAE, aluminium	BSP, steel	SAE, steel
3/8" B6743	3/8" B10536	3/8" B12823	1/2" B11811
	1/2" B7884		



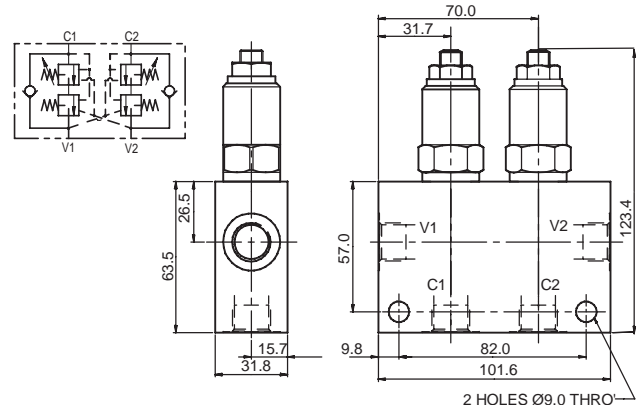
DUAL VALVE

3/8" 1/2" PORTS

BASIC CODE: 1CEEL34
(INTERNALLY CROSS PILOTED)

Body ONLY part numbers

BSP, aluminium	SAE, aluminium	BSP, steel	SAE, steel
3/8" B6836	3/8" B10805	3/8" B13803	1/2" B11812
	1/2" B30237		



This valve has been designed to eliminate instability from flexible boom applications or where the load induced pressure varies greatly. To get the best results, the settings should be adjusted for each application and then factory set for production quantities. Please contact Integrated Hydraulics for more information.

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CEL***

F

3W

30

S

230

50

Basic Code

1CEL30 = Cartridge Only
1CEL35 = Cartridge and Body
1CEEL34 = Cartridges and Dual

Adjustment Means

F = Screw Adjustment

Port sizes - Bodied Valves Only

3W = 3/8" BSP Valve & Cyl Port. 1/4" BSP Pilot Port
6T = 3/8" SAE Valve & Cyl Port. 1/4" SAE Pilot Port
8T = 1/2" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

Counterbalance setting bar
(10 bar increments).

High pressure setting bar
(10 bar increments).

Seals

S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)

Pressure Range, bar @ 4.8 l/min
20 = 170-300. Std setting 220 (170/50)
30 = 240-370. Std setting 280 (230/50)
40 = 270-380. Std setting 350 (300/50)
Std setting made at 4.8 litres/min

We reserve the right to change specifications without notice

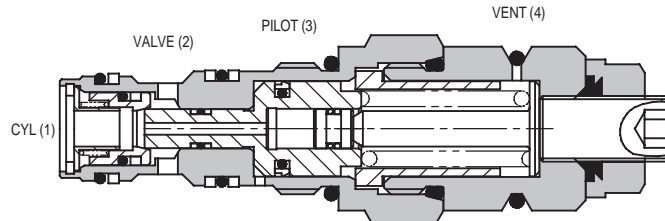
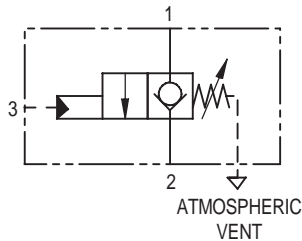


1CPB SERIES ZERO DIFFERENTIAL

OVERCENTRE VALVE

FULLY BALANCED - PILOT ASSISTED

1CPB30



6

APPLICATION

Zero differential overcentre valves give static and dynamic control of loads by supplying a restriction to flow related to the opening of the valve created by the pilot pressure. The valve is used in conjunction with a remote pilot source to provide hose failure protection, load control and load holding functions.

If over-pressure or shock pressure protection is required then a separate relief valve should be used.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. By the application of pilot pressure to the pilot port the poppet moves back against the main spring opening the cylinder port to the valve port. The metering characteristic of the valve is controlled by the rate of the spring, the seat angle and the pilot pressure applied.

Due to the balanced poppet design load induced pressure will not open the valve and once open valve port pressure will not increase the pilot pressure required to keep the valve open.

FEATURES

The cartridge fits a simple cavity allowing quick, easy field service reducing down time. Hardened poppet and seat provide for long leak free performance. Fits standard 30 litre overcentre cavity.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	30 litres/min (8 US GPM)
Max Working Pressure	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A6610 (See section 17)
Torque Cartridge into Cavity	45 Nm (33 lbs ft)
Weight	1CPB30 0.15 kg (0.33 lbs) 1CPB35 0.41 kg (0.90 lbs)
Seal Kit Number	SK1151 (Nitrile) SK1151V (Viton) SK1151P (Polyurethane/Nitrile)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min max (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

***For applications above 210 bar please consult our technical department or use the steel body option.**

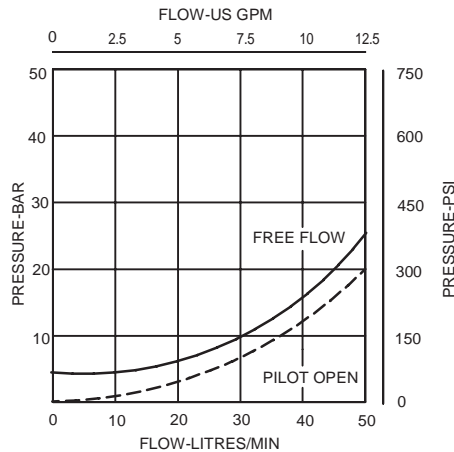
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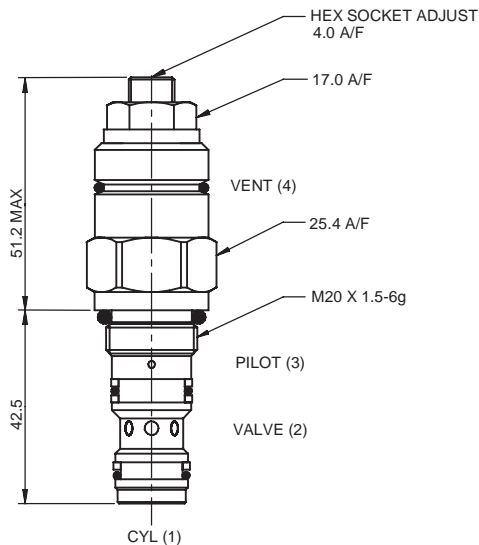
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Tel: (440) 974 3171 Fax: (440) 974 3170
Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 1CPB30



Tightening torque of "F" adjuster locknut - 20 to 25 Nm

SINGLE VALVE

3/8" 1/2" PORTS

BASIC CODE: 1CPB35

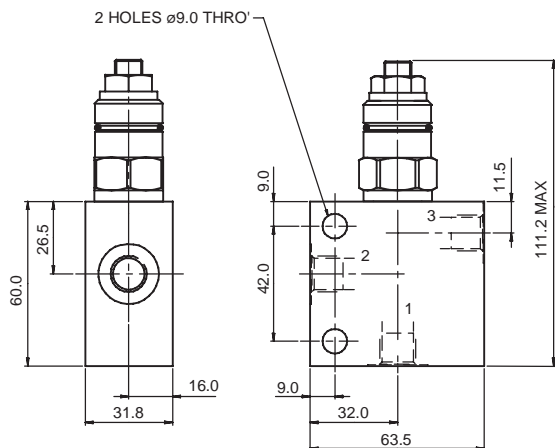
Body ONLY part numbers

BSP, aluminium
3/8" B6743

SAE, aluminium
3/8" B10536
1/2" B7884

BSP, steel
3/8" B12823

SAE, steel
1/2" B11811



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CPB***

F

3W

2

P

Basic Code

1CPB30 = Cartridge Only

1CPB35 = Cartridge and Body

Adjustment Means

F = Screw Adjustment

Port Sizes - Bodied Valves Only

3W = 3/8" BSP Valve & Cyl Port. 1/4" BSP Pilot Port

6T = 3/8" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

8T = 1/2" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

P = Polyurethane/Nitrile (For arduous applications)

Pilot Adjustment Range

2 = 5 - 20 bar. Std setting 10 bar

Std setting made at 4.8 litres/min

We reserve the right to change specifications without notice

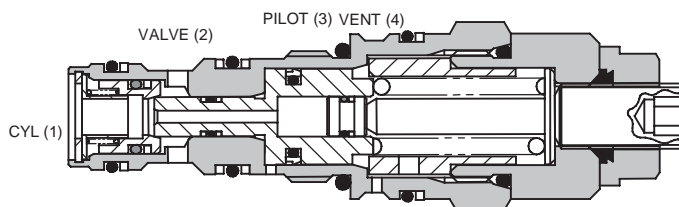
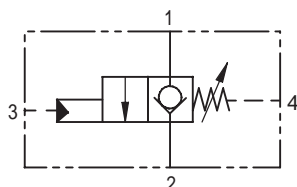


1CPBD SERIES ZERO DIFFERENTIAL

OVERCENTRE VALVE

FULLY BALANCED - PILOT ASSISTED

1CPBD30



6

APPLICATION

Zero differential overcentre valves give static and dynamic control of loads by supplying a restriction to flow related to the opening of the valve created by the pilot pressure.

The valve is used in conjunction with a remote pilot source to provide hose failure protection, load control and load holding functions.

If over-pressure or shock pressure protection is required then a separate relief valve should be used.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. By the application of pilot pressure to the pilot port the poppet moves back against the main spring opening the cylinder port to the valve port. The metering characteristic of the valve is controlled by the rate of the spring, the seat angle and the pilot pressure applied.

Due to the balanced poppet design load induced pressure will not open the valve and once open valve port pressure will not increase the pilot pressure required to keep the valve open.

FEATURES

The cartridge fits a simple cavity allowing quick, easy field service reducing down time.
Hardened poppet and seat provide for long leak free performance.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	30 litres/min (8 US GPM)
Max Working Pressure	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Mounting Position	Unrestricted
Cavity Number	AXP 20530
Torque Cartridge into Cavity	45 Nm (33 lbs ft)
Weight	1CPBD30 0.15 kg (0.33 lbs)
Seal Kit Number	SK1159 (Nitrile) SK1159V (Viton) SK1159P (Polyurethane)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min max (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

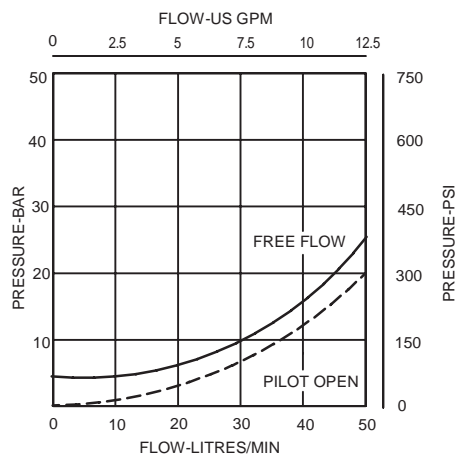
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Website: www.integratedhydraulics.com

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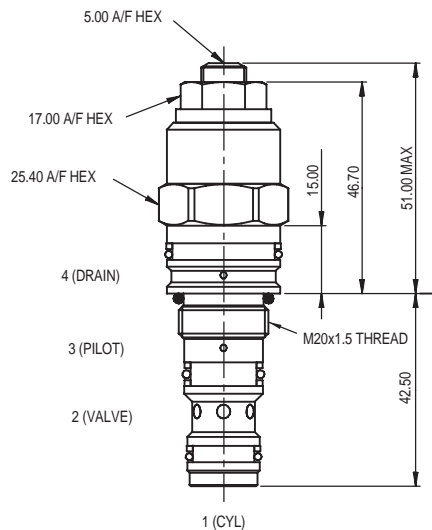
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Tel: (440) 974 3171 Fax: (440) 974 3170
Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 1CPBD30



Tightening torque of "F" adjuster
locknut - 20 to 25 Nm

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CPBD F 2 P**

Basic Code
1CPBD30 = Cartridge Only

Adjustment Means
F = Screw Adjustment

Seals

S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)
P = Polyurethane/Nitrile (For arduous applications)

Pilot Adjustment Range

2 = 5 - 20 bar. Std setting 10 bar
Std setting made at
4.8 litres/min

We reserve the right to change specifications without notice



1CE SERIES OVERCENTRE VALVE

ALTERNATIVE BODY ARRANGEMENTS for 30 Litres/min Valves

COMPLETE VALVE

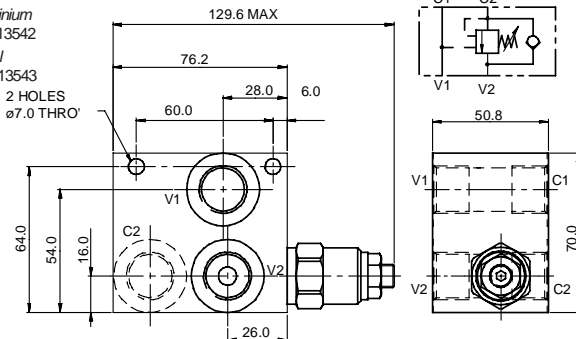
3/8" PORTS

BASIC CODE: 1CE36/1CEB36/1CER36/1CEL36
THROUGH PORTED

Body ONLY part numbers

BSP, aluminium
3/8" B13542

BSP, steel
3/8" B13543



COMPLETE VALVE

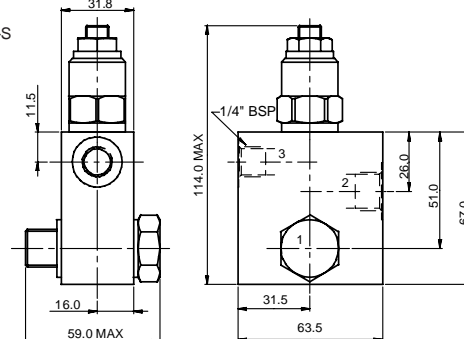
3/8" PORTS

BASIC CODE: 1CBE35/1CBEB35/1CBER35/1CBEL35
BANJO MOUNTED

Sub-assembly part numbers

BSP, aluminium
3/8" AXP13617-3W-S

Banjo Bolt torque - 47 Nm



6

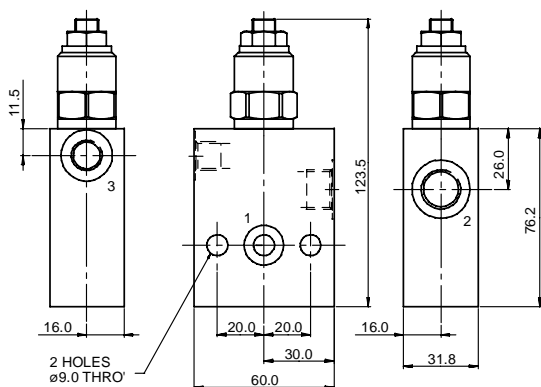
COMPLETE VALVE

3/8" PORTS

BASIC CODE: 1CEG35/1CEBG35/1CERG35/1CELG35
GASKET MOUNTED

Sub-assembly part numbers

BSP, aluminium
3/8" BXP13621-3W-S



Where measurements are critical request certified drawings

COMPLETE VALVE

3/8" PORTS

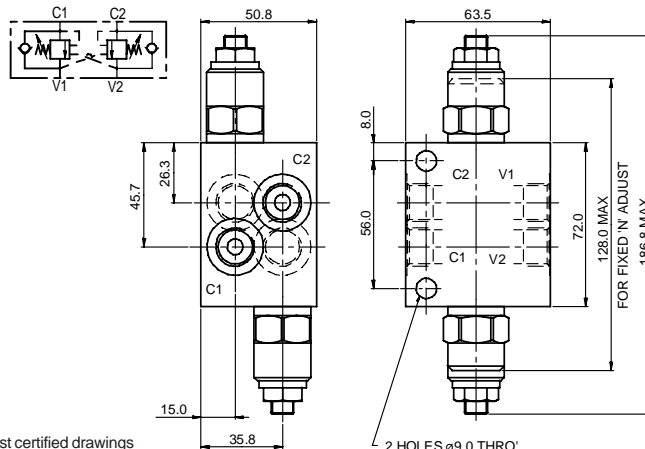
BASIC CODE: 1CEE35/1CEEB35/1CEER35/1CEEL35
DUAL OVERCENTRE (INTERNALLY CROSSED PILOTED)

Sub-assembly part numbers

BSP, aluminium
3/8" BXP24147-3W-S

SAE, aluminium
3/8" BXP24147-6T-S

BSP, steel
3/8" BXP24147-3W-S-377



ORDERING CODE EXAMPLE

1C****

F

3W

35

S

5

230

50

Basic Code

1CE36/1CEB36/1CER36/1CEL36 = Cartridge & Body Thro' Ported

1CBE35/1CBEB35/1CBER35/1CBEL35 = Cartridge & Body Banjo

1CEG35/1CEBG35/1CERG35/1CELG35 = Cartridge & Body Gasket

1CEE35/1CEEB35/1CEER35/1CEEL35 = Cartridges & Dual Body

Adjustment Means

F = Screw Adjustment

N = Fixed - State pressure setting required

For fixed versions add setting in 10 bar increments to end of

part number. Subject to a ±10% tolerance.

Port Sizes

3W = 3/8" BSP 6T = 3/8" SAE

Pressure Range

See cartridge data sheet

Counterbalance setting

(1CEL30 based options only)

bar in 10 bar increments.

High pressure setting

(1CEL30 based options only)

bar in 10 bar increments.

Pilot Ratio

(omit for 1CEL30 based

options)

2 = 2.5:1 4 = 4:1

5 = 5:1 10 = 10:1

(See cartridge details)

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

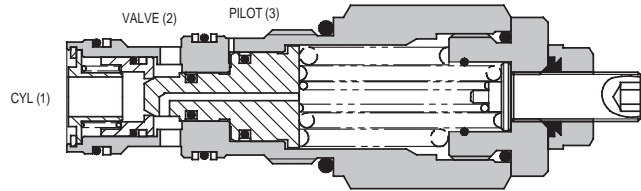
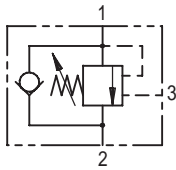
We reserve the right to change specifications without notice



1CE SERIES OVERCENTRE VALVE

PILOT ASSISTED RELIEF WITH CHECK

1CE90



6

APPLICATION

Overcentre valves give static and dynamic control of loads by regulating the flow into and out of hydraulic actuators. When installed close to or within an actuator, the overcentre valve will stop runaway in the event of hose burst and if open centre directional control valves are used, will allow thermal expansion relief of the hydraulic fluid.

The overcentre cartridge is ideal for mounting directly into a cavity machined in the body of the cylinder, motor or rotary actuator. The cartridge can also be mounted directly to the ports via a specifically machined body as part of a Hydraulic Integrated Circuit or single unit, or contained within one of our standard line bodies.

Single overcentre valves are normally used when the load is unidirectional, for example an aerial platform or crane and dual overcentre valves are used for controlling loads in both directions for motor applications or for cylinders going over centre.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time.

PILOT RATIOS

4:1 Best suited for applications where the load varies and machine structure can induce instability.

8:1 Best suited for applications where the load remains relatively constant.

Other ratios available upon request.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	90 litres/min (23 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A12336 (See Section 17)
Torque Cartridge into Cavity	60 Nm (44 lbs ft)
Weight	1CE90 0.29 kg (0.63 lbs) 1CE95 1.35 kg (2.97 lbs) 1CEE95 2.10 kg (4.62 lbs)
Seal Kit Number	SK633 (Nitrile) SK633V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

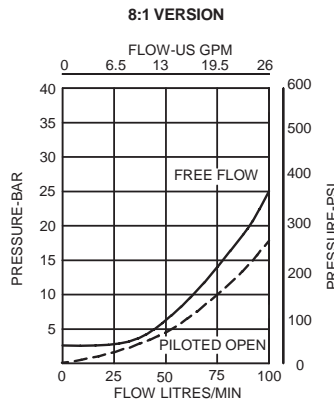
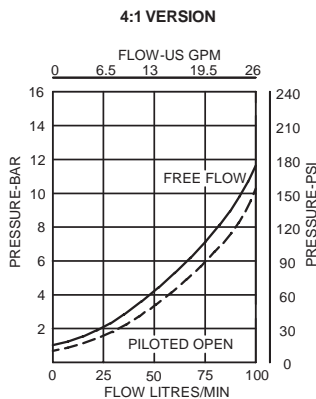
Integrated Hydraulics Ltd

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Website: www.integratedhydraulics.com

Integrated Hydraulics Inc

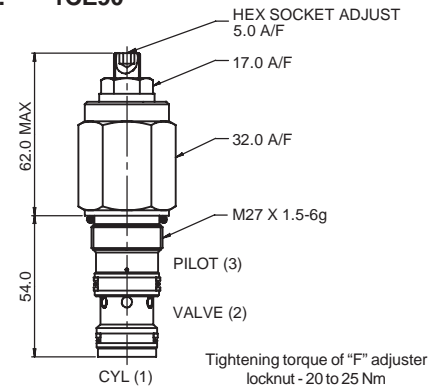
7047 Spinach Drive, Mentor, Ohio 44060, USA
Tel: (440) 974 3171 Fax: (440) 974 3170
Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 1CE90



SINGLE VALVE

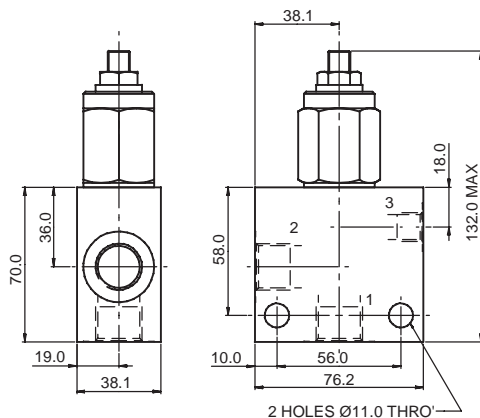
BASIC CODE: 1CE95

Body ONLY part numbers

BSP, aluminium 1/2" B13625 SAE, aluminium 1/2" B10806

1/2" PORTS

BSP, steel 1/2" B13626 SAE, steel 1/2" B10922



DUAL VALVE

BASIC CODE: 1CEE95

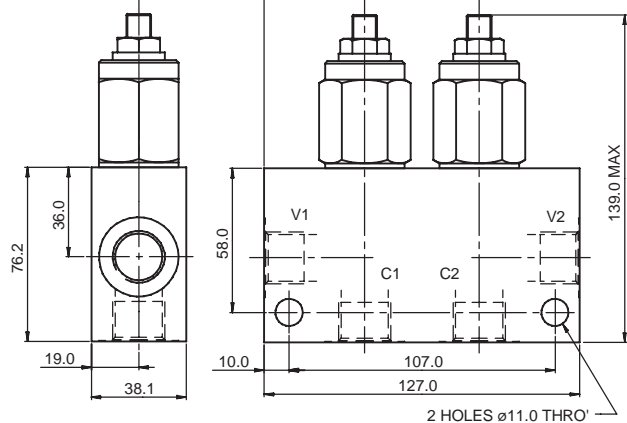
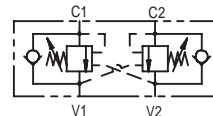
Body ONLY part numbers

BSP, aluminium 1/2" C13627 SAE, aluminium 1/2" C10807

1/2" PORTS

(INTERNALLY CROSS PILOTED)

BSP, steel 1/2" C13628 SAE, steel 1/2" C11561



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CE****

F

4W

35

S

4

Basic Code

1CE90 = Cartridge Only
1CE95 = Cartridge and Body
1CEE95 = Cartridges and Dual Body

Adjustment Means

F = Screw Adjustment
N = Fixed - State pressure setting required
For fixed versions add setting in 10 bar increments to end of part number. Subject to a ±10% tolerance.

Port Sizes - Bodied Valves Only

4W = 1/2" BSP Valve & Cyl Port. 1/4" BSP Pilot Port
8T = 1/2" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

Pilot Ratio

4 = 4:1
8 = 8:1
Other ratios available upon request

Seals

S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 4.8 l/min

20 = 70-225 bar. Std setting 100 bar
35 = 200-350 bar. Std setting 210 bar
Std setting made at 4.8 litres/min

We reserve the right to change specifications without notice

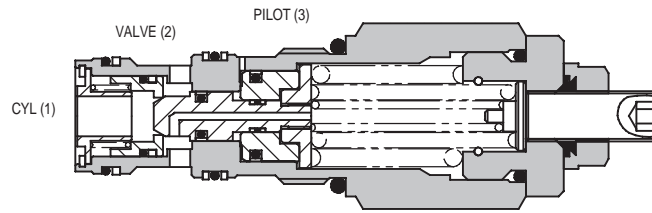
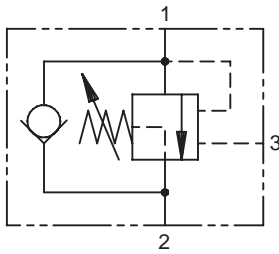


1CER SERIES OVERCENTRE VALVE

PART BALANCED - PILOT ASSISTED

1CER90

POPPET RELIEF



6

APPLICATION

The 1CER series overcentre valve performs all duties of a regular overcentre but is able to relieve and stay open irrespective of downstream pressure. This enables the valve to operate when used with a closed centre directional valve which has service line reliefs. The poppet is pressure balanced, preventing relief setting increase due to back pressure.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time.

PILOT RATIOS

4:1 Best suited for applications where the load varies and machine structure can induce instability.

Other ratios available upon request.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	90 litres/min (23 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A12336 (See Section 17)
Torque Cartridge into Cavity	60 Nm (44 lbs ft)
Weight	1CER90 0.29 kg (0.63 lbs) 1CER95 1.35 kg (2.97 lbs) 1CEER95 2.10 kg (4.62 lbs)
Seal Kit Number	SK633 (Nitrile) SK633V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

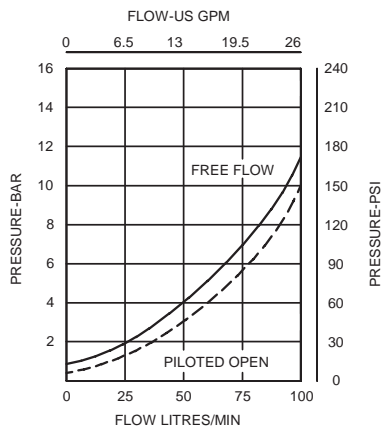
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Website: www.integratedhydraulics.com

Integrated Hydraulics Inc

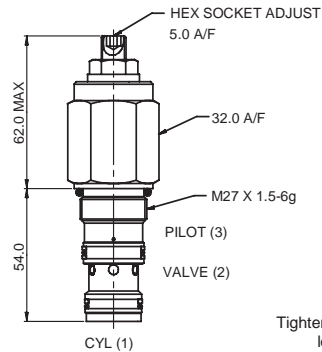
7047 Spinach Drive, Mentor, Ohio 44060, USA
Tel: (440) 974 3171 Fax: (440) 974 3170
Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 1CER90



Tightening torque of "F" adjuster locknut - 20 to 25 Nm

SINGLE VALVE

1/2" PORTS

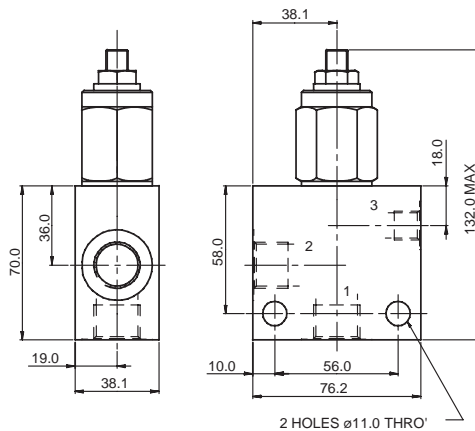
BASIC CODE: 1CER95

Body ONLY part numbers

BSP, aluminium 1/2" B13625
SAE, aluminium 1/2" B10806

BSP, steel 1/2" B13626

SAE, steel 1/2" B10922



DUAL VALVE

1/2" PORTS

BASIC CODE: 1CEER95

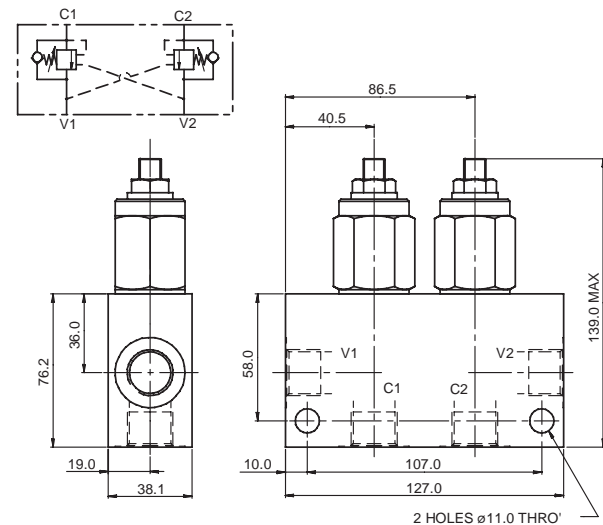
(INTERNALLY CROSS PILOTED)

Body ONLY part numbers

BSP, aluminium 1/2" C13627
SAE, aluminium 1/2" C10807

BSP, steel 1/2" C13628

SAE, steel 1/2" C11561



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CE****

F

4W

35

S

4

Basic Code

1CER90 = Cartridge Only

1CER95 = Cartridge and Body

1CEER95 = Cartridges and Body

Adjustment Means

F = Screw Adjustment

N = Fixed - State pressure setting required

For fixed versions add setting in 10 bar increments to end of part number. Subject to a ±10% tolerance.

Port Sizes - Bodied Valves Only

4W = 1/2" BSP Valve & Cyl Port. 1/4" BSP Pilot Port

8T = 1/2" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

Pilot Ratio

4 = 4:1

Other ratios available upon request

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 4.8 l/min

20 = 70-225 bar. Std setting 100 bar

35 = 200-350 bar. Std setting 210 bar

Std setting made at 4.8 litres/min

We reserve the right to change specifications without notice

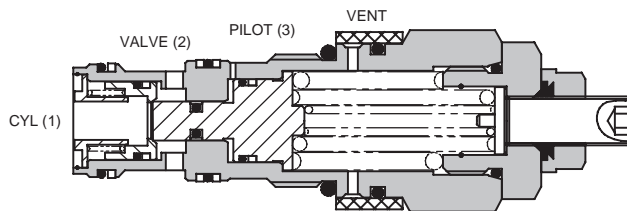
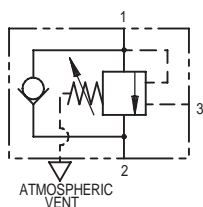


1CEB SERIES OVERCENTRE VALVE

FULLY BALANCED - PILOT ASSISTED

1CEB90

POPPET RELIEF



APPLICATION

Overcentre valves give static and dynamic control of loads by supplying a counterbalance pressure to the actuator. They will stop runaway in the event of hose burst and hold the load with minimal leakage.

The pressure balanced overcentre relief setting is unaffected by back pressure, enabling the valve to stay open when the valve port pressure rises. This will allow service line reliefs to work normally and will also allow the control of regenerative or proportional systems.

The overcentre valve should be mounted either into, onto or as close to the actuator as possible, using a machined cavity into the actuator or a suitable machined body, either gasket or line mounted.

Single overcentre valves are normally used when the load is unidirectional, for example an aerial platform or crane and dual overcentre valves are used for controlling loads in both directions for motor applications or for cylinders going over centre.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time.

***For applications above 210 bar please consult our technical department or use the steel body option.**

PILOT RATIOS

4:1 Best suited for applications where the load varies and machine structure can induce instability.

Other ratios available upon request.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	90 litres/min (23 US GPM)	
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)	
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated	
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option	
Mounting Position	Unrestricted	
Cavity Number	A12336 (See Section 17)	
Torque Cartridge into Cavity	60 Nm (44 lbs ft)	
Weight	1CEB90 0.29 kg (0.63 lbs) 1CEB95 1.35 kg (2.97 lbs) 1CEEB95 2.10 kg (4.62 lbs)	
Seal Kit Number	SK634 (Nitrile)	SK634V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)	
Operating Temp	-20°C to +90°C	
Leakage	0.3 millilitres/min (5 dpm)	
Nominal Viscosity Range	5 to 500 cSt	

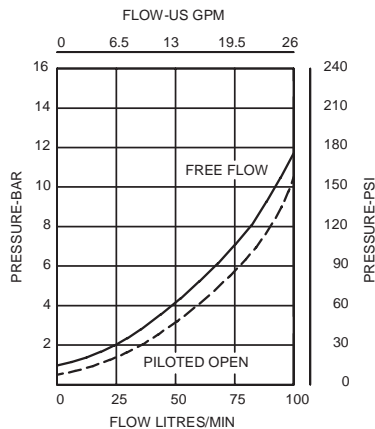
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Integrated Hydraulics Inc

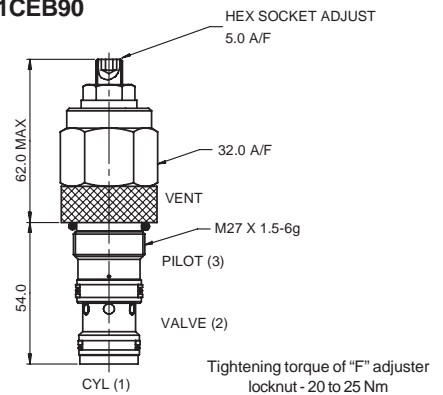
7047 Spinach Drive, Mentor, Ohio 44060, USA
Tel: (440) 974 3171 Fax: (440) 974 3170
Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 1CEB90



SINGLE VALVE

1/2" PORTS

BASIC CODE: 1CEB95

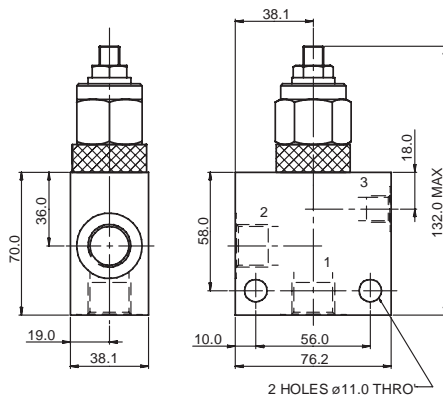
Body ONLY part numbers

BSP, aluminium
1/2" B13625

SAE, aluminium
1/2" B10806

BSP, steel
1/2" B13626

SAE, steel
1/2" B10922



DUAL VALVE

1/2" PORTS

BASIC CODE: 1CEE95

(INTERNALLY CROSS PILOTED)

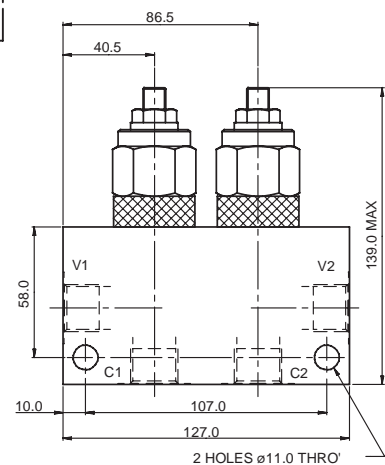
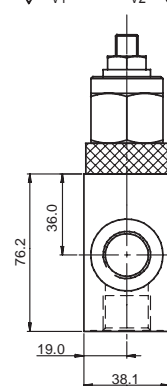
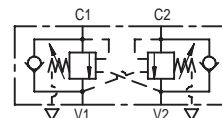
Body ONLY part numbers

BSP, aluminium
1/2" C13627

SAE, aluminium
1/2" C10807

BSP, steel
1/2" C13628

SAE, steel
1/2" C11561



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CE****

F

4W

35

S

4

Basic Code

1CEB90 = Cartridge Only

1CEB95 = Cartridge and Body

1CEE95 = Cartridges and Dual Body

Adjustment Means

F = Screw Adjustment

N = Fixed - State pressure setting required

For fixed versions add setting in 10 bar increments to end of part number. Subject to a ±10% tolerance.

Port Sizes - Bodied Valves Only

4W = 1/2" BSP Valve & Cyl Port. 1/4" BSP Pilot Port

8T = 1/2" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

Pilot Ratio

4 - 4:1

Other ratios available upon request

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 4.8 l/min

20 = 70-225 bar. Std setting 100 bar

35 = 200-350 bar. Std setting 210 bar

Std setting made at 4.8 litres/min

We reserve the right to change specifications without notice

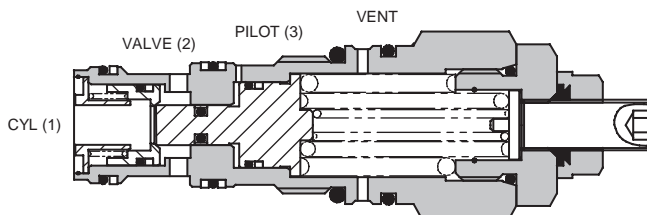
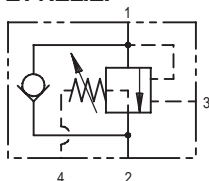


1CEBD SERIES OVERCENTRE VALVE

FULLY BALANCED - PILOT ASSISTED

1CEBD90

POPPET RELIEF



6

APPLICATION

Overcentre valves give static and dynamic control of loads by supplying a counterbalance pressure to the actuator. They will stop runaway in the event of hose burst and hold the load with minimal leakage.

The pressure balanced overcentre relief setting is unaffected by back pressure, enabling the valve to stay open when the valve port pressure rises. This will allow service line reliefs to work normally and will also allow the control of regenerative or proportional systems.

The overcentre valve should be mounted either into, onto or as close to the actuator as possible, using a machined cavity into the actuator or a suitable machined body, either gasket or line mounted.

Single overcentre valves are normally used when the load is unidirectional, for example an aerial platform or crane and dual overcentre valves are used for controlling loads in both directions for motor applications or for cylinders going over centre.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time.

PILOT RATIOS

4:1 Best suited for applications where the load varies and machine structure can induce instability.

Other ratios available upon request.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	90 litres/min (23 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A12196 (See Section 17)
Torque Cartridge into Cavity	60 Nm (44 lbs ft)
Weight	1CEBD90 0.29 kg (0.63 lbs)
Seal Kit Number	SK634 (Nitrile) SK634V (Viton) SK634P (Polyurethane/Nitrile)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

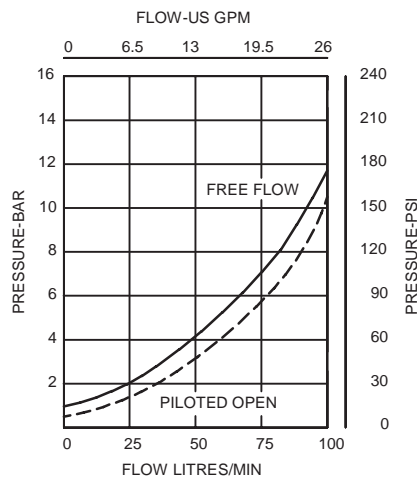
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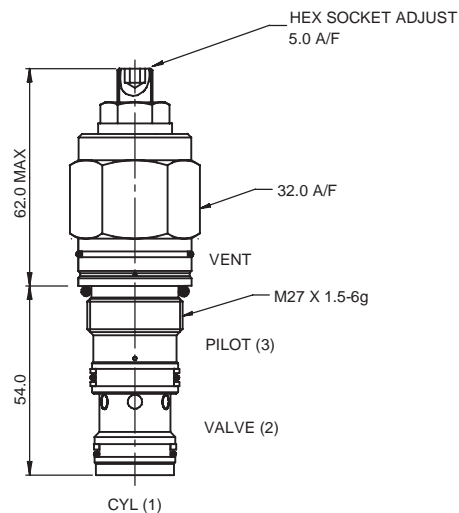
PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 1CEBD90

6



Tightening torque of "F" adjuster
locknut - 20 to 25 Nm

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CEBD90 F 35 P 4

Basic Code
1CEBD90

Adjustment Means
F = Screw Adjustment

Pressure Range @ 4.8 l/min
20 = 70-225 bar. Std setting 100 bar
35 = 200-350 bar. Std setting 210 bar
Std setting made at 4.8 litres/min

Pilot Ratio
4 - 4:1
Other ratios available upon request

Seals
S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)
P = Polyurethane/Nitrile (For arduous applications)

We reserve the right to change specifications without notice

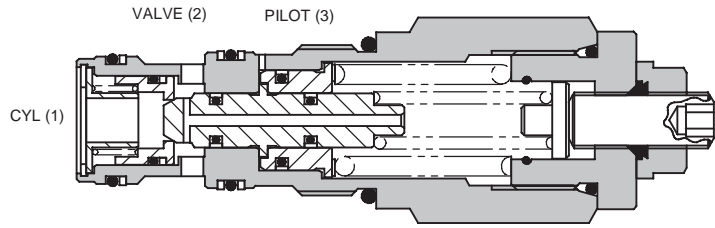
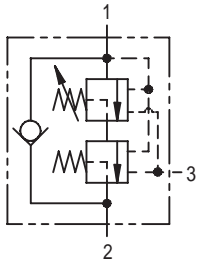


1CEL SERIES OVERCENTRE VALVE

PILOT ASSISTED RELIEF WITH CHECK AND COUNTERBALANCE

1CEL90

POPPET RELIEF



APPLICATION

The 1CEL series overcentre valve performs all duties of a regular overcentre but maintains a counterbalance pressure to provide dampening to cylinders when there is a rapid loss in stored pressure. Typical applications include extension cylinders on telescopic handlers where it is important to have a smooth operation when retracting from full extension.

PILOT RATIOS

Primary 5.6:1
Secondary 0.7:1

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	90 litres/min (23 US GPM)
Max Setting	380 bar (5510 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A12336 (See Section 17)
Torque Cartridge into Cavity	60 Nm (44 lbs ft)
Weight	1CEL90 0.29 kg (0.63 lbs) 1CEL95 1.35 kg (2.97 lbs) 1CEEL95 2.10 kg (4.62 lbs)
Seal Kit Number	SK633 (Nitrile) SK633V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

OPERATION

The check section allows free flow and then locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied, maintaining a counterbalance pressure to prevent initial pressure loss and therefore instability. The total pressure setting will normally be set 1.3 times the load induced pressure. The counterbalance pressure reduces as the pilot pressure increases.

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time.

*For applications above 210 bar please consult our technical department or use the steel body option.

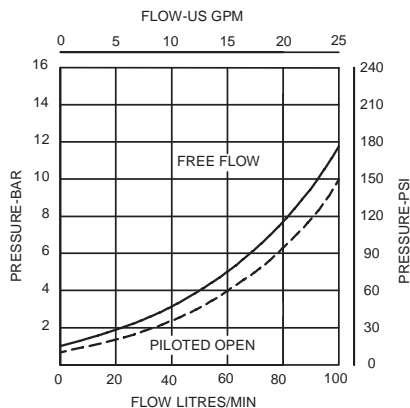
Integrated Hydraulics Ltd

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Website: www.integratedhydraulics.com

Integrated Hydraulics Inc

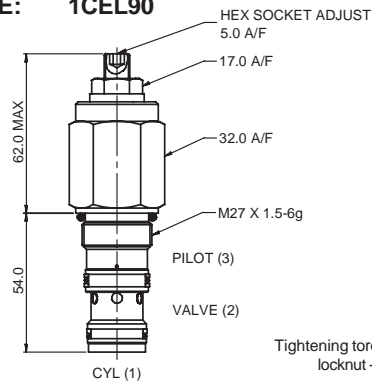
7047 Spinach Drive, Mentor, Ohio 44060, USA
Tel: (440) 974 3171 Fax: (440) 974 3170
Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 1CEL90



Tightening torque of "F" adjuster locknut - 20 to 25 Nm

SINGLE VALVE

1/2" PORTS

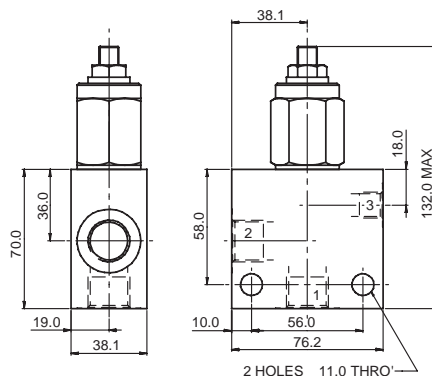
BASIC CODE: 1CEL95

Body ONLY part numbers

BSP, aluminium 1/2" B13625
SAE, aluminium 1/2" B10806

BSP, steel 1/2" B13626

SAE, steel 1/2" B10922



DUAL VALVE

1/2" PORTS

BASIC CODE: 1CEEL95

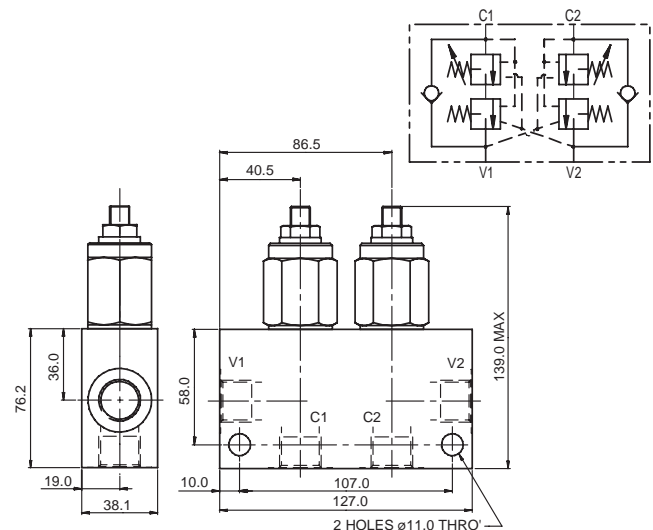
(INTERNALLY CROSS PILOTED)

Body ONLY part numbers

BSP, aluminium 1/2" C13627
SAE, aluminium 1/2" C10807

BSP, steel 1/2" C13628

SAE, steel 1/2" C11561



This valve has been designed to eliminate instability from flexible boom applications or where the load induced pressure varies greatly. To get the best results, the settings should be adjusted for each application and then factory set for production quantities. Please contact Integrated Hydraulics for more information.

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CE****

F

4W

30

S

220

60

Basic Code

1CEL90 = Cartridge Only

1CEL95 = Cartridge and Body

1CEEL95 = Cartridges and Dual Body

Adjustment Means

F = Screw Adjustment

N = Fixed - State pressure setting required

For fixed versions add setting in 10 bar increments to end of part number. Subject to a $\pm 10\%$ tolerance.

Port Sizes - Bodied Valves Only

4W = 1/2" BSP Valve & Cyl Port. 1/4" BSP Pilot Port

8T = 1/2" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

Counterbalance setting bar
(10 bar increments).

High pressure setting bar
(10 bar increments).

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

Pressure Range, bar @ 4.8 l/min

20 = 170-350. Std 220 (160/60)

30 = 210-380. Std 280 (220/60)

Std setting made at 4.8 litres/min



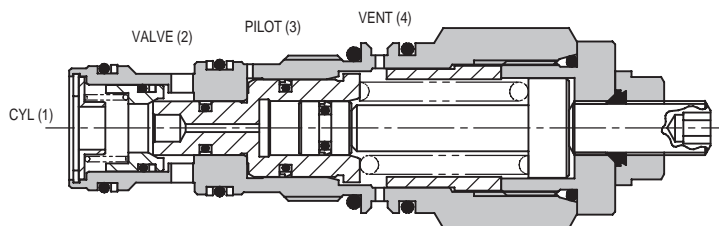
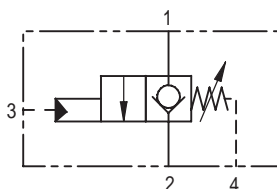
1CPBD SERIES ZERO DIFFERENTIAL

OVERCENTRE VALVE

FULLY BALANCED - PILOT ASSISTED

1CPBD90

POPPET RELIEF



APPLICATION

Zero differential overcentre valves give static and dynamic control of loads by supplying a restriction to flow related to the opening of the valve created by the pilot pressure.

The valve is used in conjunction with a remote pilot source to provide hose failure protection, load control and load holding functions.

If over-pressure or shock pressure protection is required then a separate relief valve should be used.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. By the application of pilot pressure to the pilot port the poppet moves back against the main spring opening the cylinder port to the valve port. The metering characteristic of the valve is controlled by the rate of the spring, the seat angle and the pilot pressure applied.

Due to the balanced poppet design load induced pressure will not open the valve and once open valve port pressure will not increase the pilot pressure required to keep the valve open.

FEATURES

The cartridge fits a simple cavity allowing quick, easy field service reducing down time.
Hardened poppet and seat provide for long leak free performance.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	90 litres/min (23 US GPM)
Max Working Pressure	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Mounting Position	Unrestricted
Cavity Number	A12196 (See Section 17)
Torque Cartridge into Cavity	60 Nm (44 lbs ft)
Weight	1CPBD90 0.29 kg (0.63 lbs)
Seal Kit Number	SK634 (Nitrile) SK634V (Viton) SK634P (Polyurethane/Nitrile)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

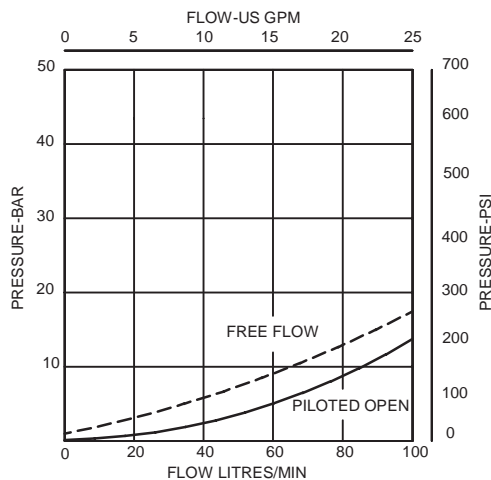
Integrated Hydraulics Ltd

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Website: www.integratedhydraulics.com

Integrated Hydraulics Inc

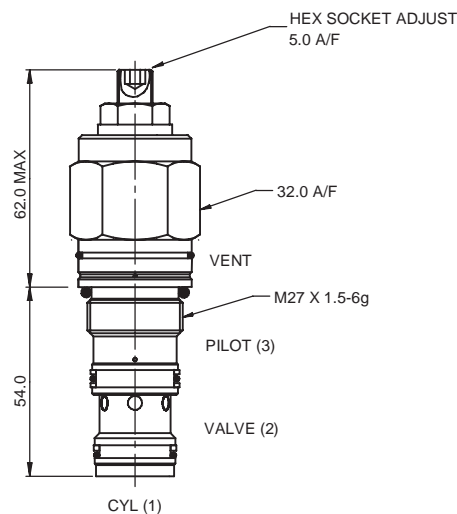
7047 Spinach Drive, Mentor, Ohio 44060, USA
Tel: (440) 974 3171 Fax: (440) 974 3170
Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 1CPBD90



Tightening torque of "F" adjuster
locknut - 20 to 25 Nm

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CPBD**

F

2

P

Basic Code

1CPBD90 = Cartridge Only

Adjustment Means

F = Screw Adjustment

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

P = Polyurethane/Nitrile (For arduous applications)

Pilot Adjustment Range

2 = 5 - 20 bar. Std setting 10 bar
Std setting made at
4.8 litres/min

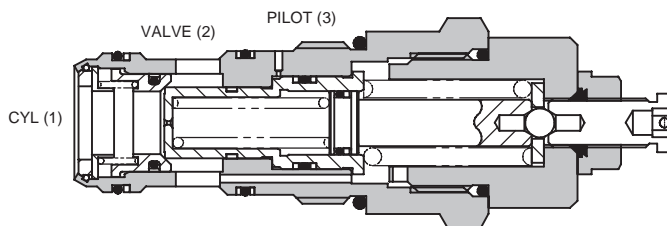
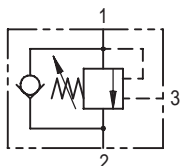
We reserve the right to change specifications without notice



1CE SERIES OVERCENTRE VALVE

PILOT ASSISTED RELIEF WITH CHECK

1CE120



6

APPLICATION

Overcentre valves give static and dynamic control of loads by regulating the flow into and out of hydraulic actuators. When installed close to or within an actuator, the overcentre valve will stop runaway in the event of hose burst and if open centre directional control valves are used, will allow thermal expansion relief of the hydraulic fluid.

The overcentre cartridge is ideal for mounting directly into a cavity machined in the body of the cylinder, motor or rotary actuator. The cartridge can also be mounted directly to the ports via a specifically machined body as part of a Hydraulic Integrated Circuit or single unit, or contained within one of our standard line bodies.

Single overcentre valves are normally used when the load is unidirectional, for example an aerial platform or crane and dual overcentre valves are used for controlling loads in both directions for motor applications or for cylinders going over centre.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Allows quick, easy field service - reduces down time.
Smooth, sure performance.

PILOT RATIOS

- 3.5:1 (Standard) Best suited for applications where load varies and machine structure can induce instability.
- 8:1 Best suited for applications where load remains relatively constant.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	120 litres/min (32 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A877 (See Section 17)
Torque Cartridge into Cavity	100 Nm (74 lbs ft)
Weight	1CE120 0.59 kg (1.30 lbs) 1CE150 1.46 kg (3.20 lbs) 1CEE150 2.58 kg (5.70 lbs)
Seal Kit Number	SK417 (Nitrile) SK417V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

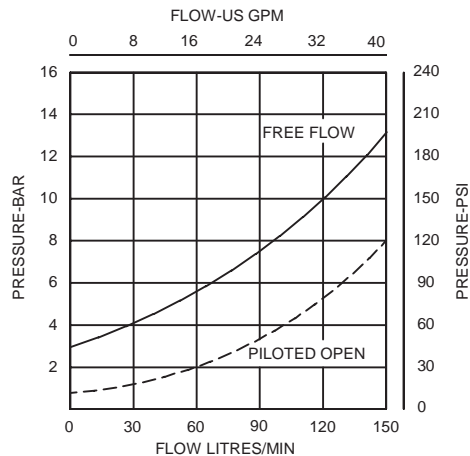
Integrated Hydraulics Ltd

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Website: www.integratedhydraulics.com

Integrated Hydraulics Inc

7047 Spinach Drive, Mentor, Ohio 44060, USA
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Website: www.integratedhydraulics.com

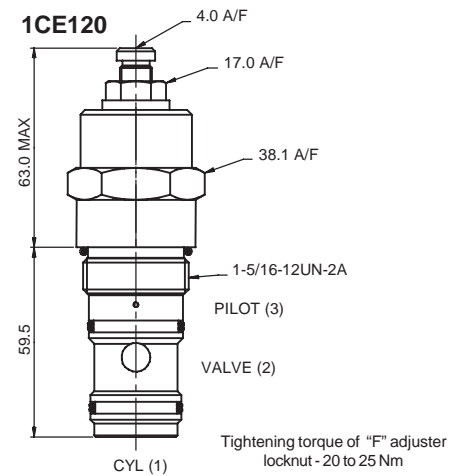
PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE:

1CE120



SINGLE VALVE

3/4" 1" PORTS

BASIC CODE: 1CE150

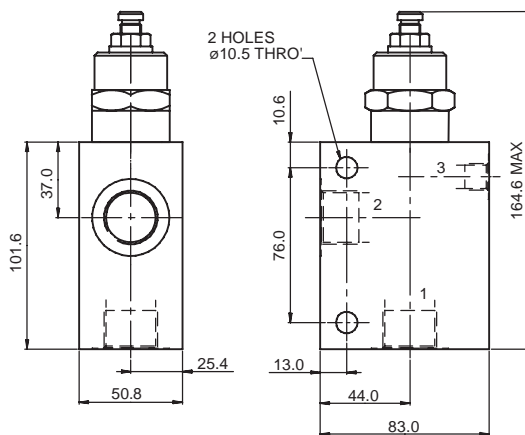
Body ONLY part numbers

BSP, aluminium
3/4" B6898

SAE, aluminium
3/4" B8200
1" B10708

BSP, steel
3/4" B5544

SAE, steel
1" B11814



DUAL VALVE

3/4" PORTS

BASIC CODE: 1CEE150

(INTERNALLY CROSS PILOTED)

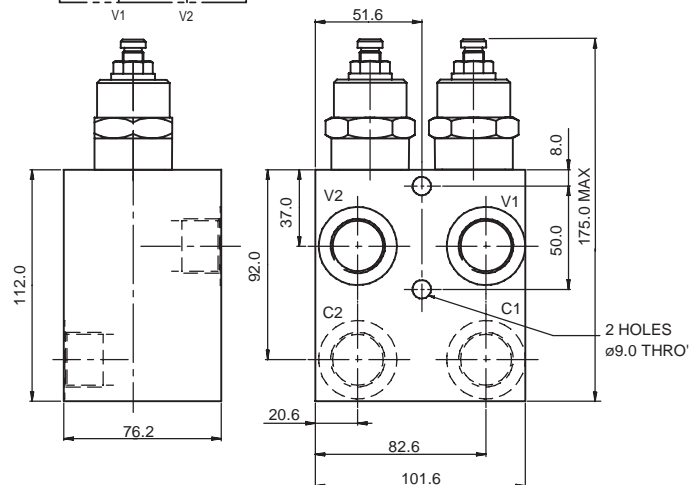
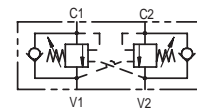
Body ONLY part numbers

BSP, aluminium
3/4" C2543

SAE, aluminium
3/4" C10629

BSP, steel
3/4" C1200

SAE, steel
3/4" C16434



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CE***

F

6W

35

S

3

Basic Code

1CE120 = Cartridge Only

1CE150 = Cartridge and Body

1CEE150 = Cartridges and Body

Adjustment Means

F = Screw Adjustment

Port Sizes - Bodied Valves Only

6W = 3/4" BSP Valve & Cyl Port. 1/4" BSP Pilot Port

12T = 3/4" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

16T = 1" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

Pressure Range @ 4.8 l/min

35 = 70-350 bar. Std setting 210 bar

Std setting made at 4.8 litres/min

Pilot Ratio

3 = 3.5:1

8 = 8:1

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

We reserve the right to change specifications without notice

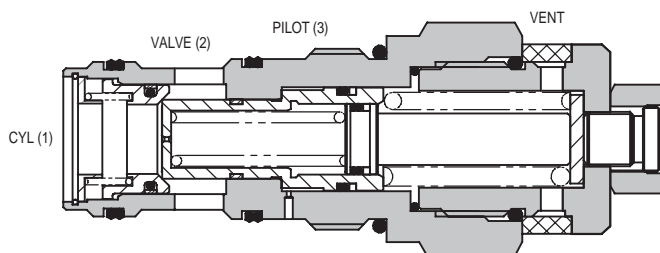
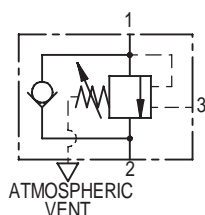


1CEB SERIES OVERCENTRE VALVE

FULLY BALANCED - PILOT ASSISTED

1CEB120

POPPET RELIEF



APPLICATION

Overcentre valves give static and dynamic control of loads by supplying a counterbalance pressure to the actuator. They prevent runaway in the event of hose burst and hold the load with minimal leakage.

The pressure balanced valve is unaffected by back pressure, allowing service line reliefs to operate and for the valve to be used in regenerative or proportional valve systems.

The overcentre valve should be mounted either into, onto or as close to the actuator as possible to give maximum protection.

Single overcentre valves control unidirectional loads such as in aerial platforms, cranes or winches and dual overcentres are suited to bi-directional motion such as wheel motor applications or cylinders going over centre.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple 'dual purpose' cavity. Allows quick, easy field service - reduces down time. Overcentre is interchangeable with 120 litres/min pilot check cartridge. See page 7-171.

PILOT RATIOS

3:1 (Standard)	Best suited for applications where load varies and machine structure can induce instability
8:1	Best suited for applications where load remains relatively constant.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	120 litres/min (32 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A877 (See Section 17)
Torque Cartridge into Cavity	100 Nm (74 lbs ft)
Weight	1CEB120 0.59 kg (1.30 lbs) 1CEB150 1.46 kg (3.20 lbs) 1CEEB150 2.58 kg (5.70 lbs)
Seal Kit Number	SK417 (Nitrile) SK417V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

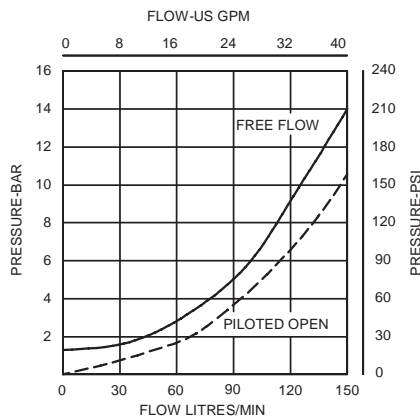
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Integrated Hydraulics Inc

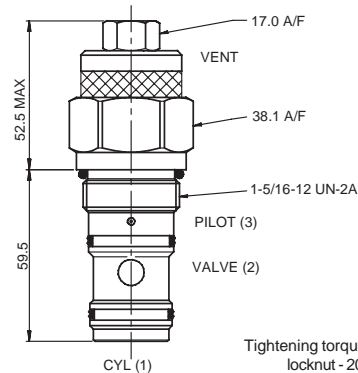
7047 Spinach Drive, Mentor, Ohio 44060, USA
Tel: (440) 974 3171 Fax: (440) 974 3170
Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 1CEB120



Tightening torque of "F" adjuster locknut - 20 to 25 Nm

SINGLE VALVE

3/4" 1" PORTS

BASIC CODE: 1CEB150

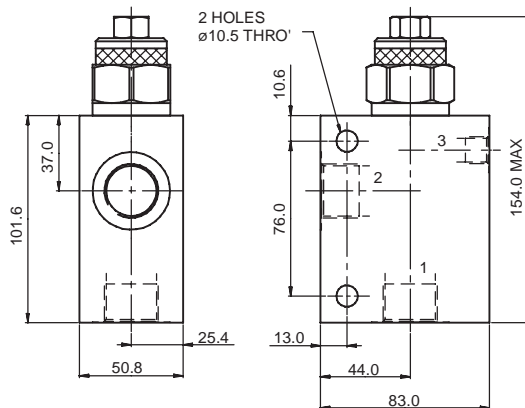
Body ONLY part numbers

BSP, aluminium
3/4" B6898

SAE, aluminium
3/4" B8200
1" B10708

BSP, steel
3/4" B5544

SAE, steel
1" B11814



DUAL VALVE

3/4" PORTS

BASIC CODE: 1CEEB150

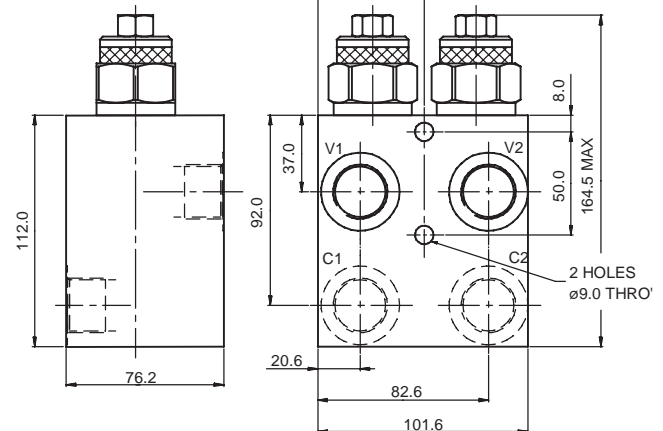
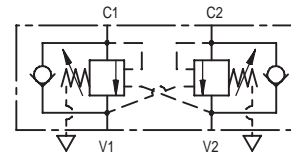
Body ONLY part numbers

BSP, aluminium
3/4" C2543

SAE, aluminium
3/4" C10629

BSP, steel
3/4" C1200

SAE, steel
3/4" C16434



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CE** P 6W 35 S 3**

Basic Code

1CEB120 = Cartridge Only

1CEB150 = Cartridge and Body

1CEEB150 = Cartridges and Dual Body

Adjustment Means

P = Leakproof Screw Adjustment

Port Sizes - Bodied Valves Only

6W = 3/4" BSP Valve & Cyl Port. 1/4" BSP Pilot Port

12T = 3/4" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

16T = 1" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

Pressure Range @ 4.8 l/min

35 = 70-350 bar. Std setting 210 bar

Std setting made at 4.8 litres/min

Pilot Ratio

3 = 3:1 (Standard)

8 = 8:1

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

P = Polyurethane/Nitrile (For arduous applications)

We reserve the right to change specifications without notice

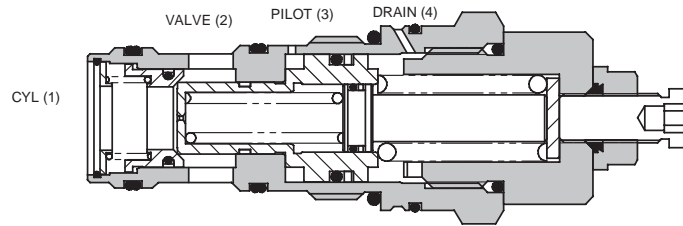
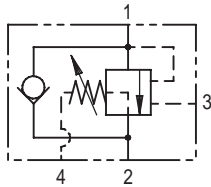


1CEBD SERIES OVERCENTRE VALVE

FULLY BALANCED - PILOT ASSISTED

1CEBD120

POPPET RELIEF



APPLICATION

Overcentre valves give static and dynamic control of loads by supplying a counterbalance pressure to the actuator. They prevent runaway in the event of hose burst and hold the load with minimal leakage.

The pressure balanced valve is unaffected by back pressure, allowing service line reliefs to operate and for the valve to be used in regenerative or proportional valve systems.

The overcentre valve should be mounted either into, onto or as close to the actuator as possible to give maximum protection.

Single overcentre valves control unidirectional loads such as in aerial platforms, cranes or winches and dual overcentres are suited to bi-directional motion such as wheel motor applications or cylinders going over centre.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple 'dual purpose' cavity. Allows quick, easy field service - reduces down time.

PILOT RATIOS

- 3:1 Best suited for applications where load varies and machine structure can induce instability
- 8:1 Best suited for applications where the load remains relatively constant.
- 12:1
- 22:1 Specifically designed for Boom Lock applications.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	180 litres/min (47 US GPM)
Max Setting	BMax Load Induced Pressure: 270 bar (4000 psi) Relief Setting 400 bar (5800 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces electroless nickel plated
Mounting Position	Unrestricted
Cavity Number	A6726
Torque Cartridge into Cavity	100 Nm (74 lbs ft)
Weight	0.59 kg (1.30 lbs)
Seal Kit Number	SK830 (Nitrile) SK830V (Viton) SK830P (Polyurethane/Nitrile)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min max (5 dpm)
Nominal Viscosity Range	5 to 500 cSt
Bar per turn	65 bar

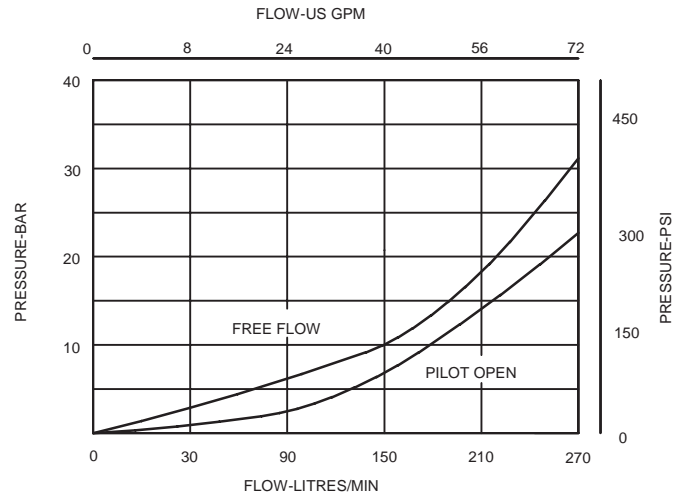
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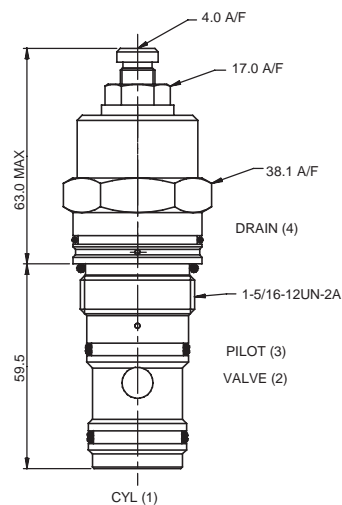
PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 1CEBD120

6



Tightening torque of "F" adjuster
locknut - 20 to 25 Nm

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CEBD120 F 35 P 8

Basic Code _____
1CEBD120 = Cartridge Only

Adjustment Means _____
F = Screw Adjustment

Pressure Range @ 4.8 l/min _____
35 = (8:1 and 22:1): 70-350 bar. Std setting 350 bar
40 = (12:1): 70-400 bar. Std setting 350 bar
Std setting made at 4.8 litres/min

Pilot Ratio

3 = 3:1
8 = 8:1
12 = 12:1
22 = 22:1

Seals

S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)
P = Polyurethane/Nitrile (For arduous applications)

We reserve the right to change specifications without notice

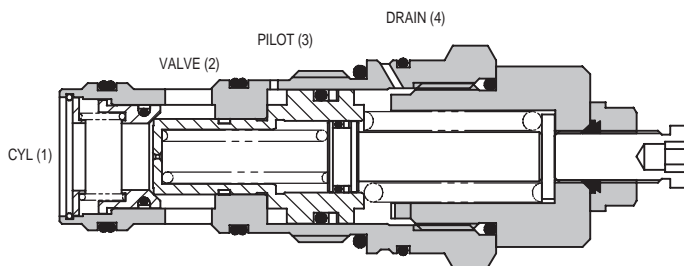
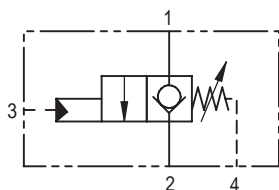


1CPBD SERIES ZERO DIFFERENTIAL

OVERCENTRE VALVE

FULLY BALANCED - PILOT ASSISTED

1CPBD120



6

APPLICATION

Zero differential overcentre valves give static and dynamic control of loads by supplying a restriction to flow related to the opening of the valve created by the pilot pressure.

The valve is used in conjunction with a remote pilot source to provide hose failure protection, load control and load holding functions.

If over-pressure or shock pressure protection is required then a separate relief valve should be used.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. By the application of pilot pressure to the pilot port the poppet moves back against the main spring opening the cylinder port to the valve port. The metering characteristic of the valve is controlled by the rate of the spring, the seat angle and the pilot pressure applied.

Due to the balanced poppet design load induced pressure will not open the valve and once open valve port pressure will not increase the pilot pressure required to keep the valve open.

FEATURES

The cartridge fits a simple cavity allowing quick, easy field service reducing down time. Hardened poppet and seat provide for long leak free performance.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	180 litres/min (47 US GPM)
Max Working Pressure	400 bar (5800 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Mounting Position	Unrestricted
Cavity Number	A6726 (See section 17)
Torque Cartridge into Cavity	100 Nm (74 lbs ft)
Weight	0.59 kg (1.30 lbs)
Seal Kit Number	SK830 (Nitrile) SK830V (Viton) SK830P (Polyurethane/Nitrile)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min max (5 dpm)
Nominal Viscosity Range	5 to 500 cSt
Bar per turn	5 bar

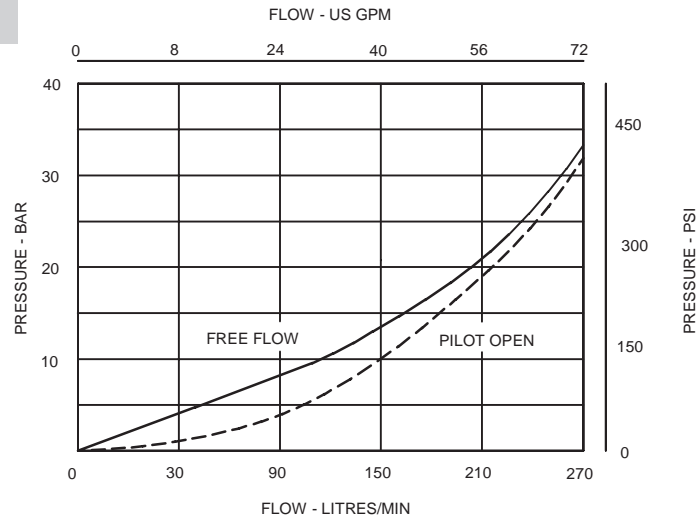
Integrated Hydraulics Ltd

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Tel: +44 (0) 1926 881171 Fax: +44 (0) 1926 315729
Website: www.integratedhydraulics.com

Integrated Hydraulics Inc

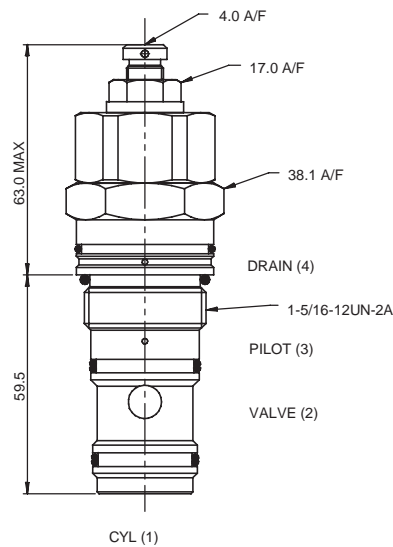
7047 Spinach Drive, Mentor, Ohio 44060, USA
Tel: (440) 974 3171 Fax: (440) 974 3170
Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 1CPBD120



Tightening torque of "F" adjuster
locknut - 20 to 25 Nm

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CPBD120

F

2

P

Basic Code

1CPBD120 = Cartridge Only

Adjustment Means

F = Screw Adjustment

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

P = Polyurethane/Nitrile (For arduous applications)

Pilot Adjust Range

2 = 5-20 bar. Std setting 10 bar
Std setting made at 4.8 litres/min

We reserve the right to change specifications without notice



1CE SERIES OVERCENTRE VALVE

ALTERNATIVE BODY ARRANGEMENTS for 100 Litres/min Valves

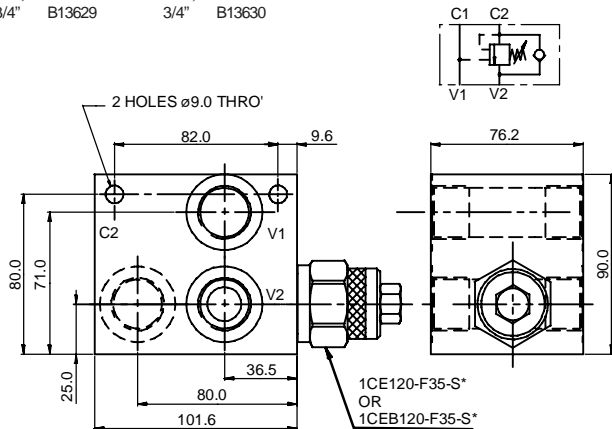
COMPLETE VALVE 3/4" PORTS

BASIC CODE: 1CE156/1CEB156

THROUGH PORTED

Body ONLY part numbers

BSP aluminium 3/4" B13629 BSP steel 3/4" B13630



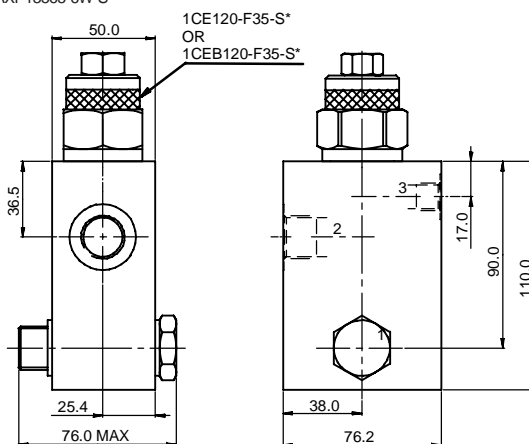
COMPLETE VALVE 3/4" PORTS

BASIC CODE: 1CBE150/1CBEB150

BANJO MOUNTED

Sub-assembly part numbers

BSP aluminium 3/4" AXP13565-6W-S



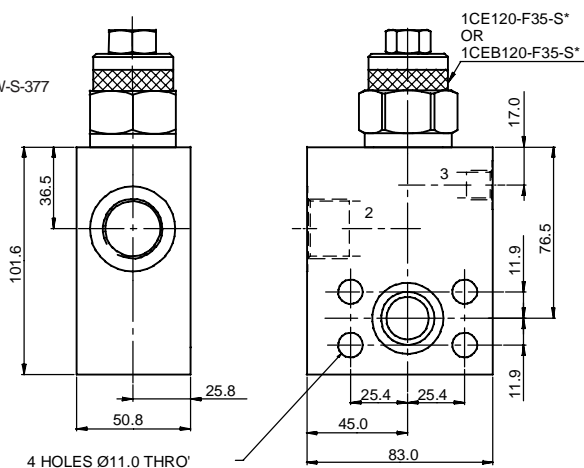
COMPLETE VALVE 3/4" SAE 6000 PSI FLANGE PORTS

BASIC CODE: 1CEG150/1CEBG150

GASKET MOUNTED

Sub-assembly part numbers

BSP aluminium 3/4" BXP13634-6W-S BSP steel 3/4" BXP13634-6W-S-377



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1C** F 6W 35 S 3**

Basic Code

1CE156/1CEB156 = Cartridge & Body Through Ported.
1CBE150/1CBEB150 = Cartridge & Body Banjo Mounted.
1CEG150/1CEBG150 = Cartridge & Body Gasket Mounted

Adjustment Means

P = Leakproof Screw Adjust (1CEB156/1CBEB150/1CEBG150)
F = Screw Adjust (1CE156/1CBE150/1CEG150)

Port Sizes - Bodied Valves Only

6W = 3/4" BSP Valve & Cyl Port. 1/4" BSP Pilot Port

Pressure Range @ 4.8 l/min

35 = 70-350 bar. Std setting 210 bar
Std setting made at 4.8 litres/min

Pilot Ratio

3 = 3.5:1 - 1CE156/1CEB150/
1CEG150
3 = 3:1 - 1CEB156/1CBEB150/
1CEBG150 (Standard)
8 = 8:1 - 1CEB156/1CBEB150/
1CEBG150

Seals

S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)
P = Polyurethane/Nitrile (For arduous applications)

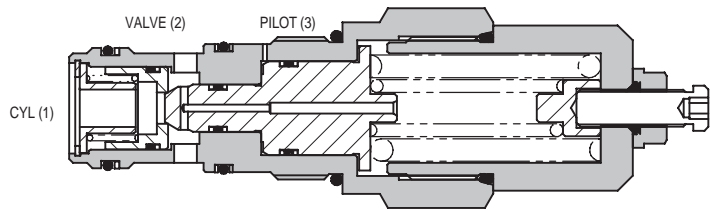
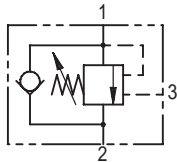
We reserve the right to change specifications without notice



1CE SERIES OVERCENTRE VALVE

PILOT ASSISTED RELIEF WITH CHECK

1CE140



6

APPLICATION

Overcentre valves give static and dynamic control of loads by regulating the flow into and out of hydraulic actuators. When installed close to or within an actuator, the overcentre valve will stop runaway in the event of hose burst and if open centre directional control valves are used, will allow thermal expansion relief of the hydraulic fluid.

The overcentre cartridge is ideal for mounting directly into a cavity machined in the body of the cylinder, motor or rotary actuator. The cartridge can also be mounted directly to the ports via a specifically machined body as part of a Hydraulic Integrated Circuit or single unit, or contained within one of our standard line bodies.

Single overcentre valves are normally used when the load is unidirectional, for example an aerial platform or crane and dual overcentre valves are used for controlling loads in both directions for motor applications or for cylinders going over centre.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time.

PILOT RATIOS

- 4:1 Best suited where the load varies and machine structure can induce instability.
- 6:1 Best suited for applications where the load remains relatively constant.
- Other ratios available upon request.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	140 litres/min (37 US GPM)										
Max Setting	Max Load Induced Pressure: 340 bar (4930 psi) Relief Setting: 420 bar (6090 psi)										
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated										
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option										
Mounting Position	Unrestricted										
Cavity Number	A20081										
Torque Cartridge into Cavity	150 Nm (110 lbs ft)										
Weight	<table> <tr> <td>1CE140</td><td>1.2 kg (2.5 lbs)</td></tr> <tr> <td>1CE145 (aluminium)</td><td>2.2 kg (4.5 lbs)</td></tr> <tr> <td>1CE145 (steel)</td><td>4.0 kg (8.8 lbs)</td></tr> <tr> <td>1CEE145 (aluminium)</td><td>2.9 kg (6.4 lbs)</td></tr> <tr> <td>1CEE145 (steel)</td><td>6.0 kg (13.2 lbs)</td></tr> </table>	1CE140	1.2 kg (2.5 lbs)	1CE145 (aluminium)	2.2 kg (4.5 lbs)	1CE145 (steel)	4.0 kg (8.8 lbs)	1CEE145 (aluminium)	2.9 kg (6.4 lbs)	1CEE145 (steel)	6.0 kg (13.2 lbs)
1CE140	1.2 kg (2.5 lbs)										
1CE145 (aluminium)	2.2 kg (4.5 lbs)										
1CE145 (steel)	4.0 kg (8.8 lbs)										
1CEE145 (aluminium)	2.9 kg (6.4 lbs)										
1CEE145 (steel)	6.0 kg (13.2 lbs)										
Seal Kit Number	SK1108 (Nitrile) SK1108V (Viton)										
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)										
Operating Temp	-20°C to +90°C										
Leakage	0.3 millilitres/min nominal (5 dpm)										
Nominal Viscosity Range	5 to 500 cSt										

*For applications above 210 bar please consult our technical department or use the steel body option.

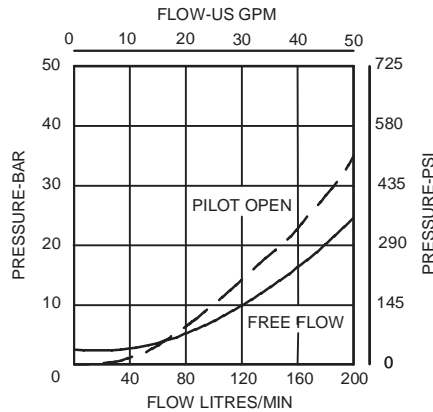
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Website: www.integratedhydraulics.com

Integrated Hydraulics Inc

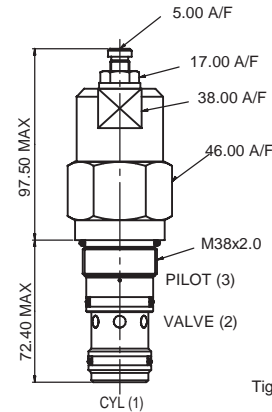
7047 Spinach Drive, Mentor, Ohio 44060, USA
Tel: (440) 974 3171 Fax: (440) 974 3170
Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 1CE140



Tightening torque of "F" adjuster locknut - 20 to 25 Nm

SINGLE VALVE

3/4" 1" PORTS

BASIC CODE: 1CE145

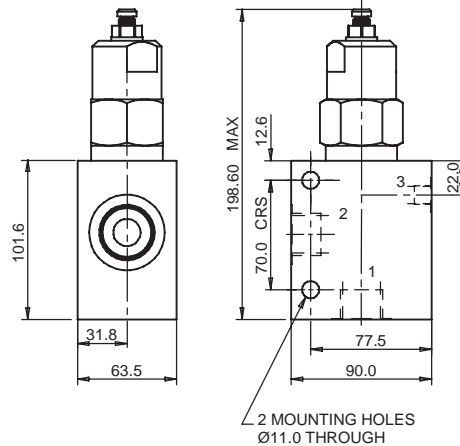
Body ONLY part numbers

BSP, aluminium
3/4" B20105
1" B20107

SAE, aluminium
1" B11946

BSP, steel
3/4" B20106
1" B20108

SAE, steel
1" B11947



DUAL VALVE

1" PORTS

BASIC CODE: 1CEE145

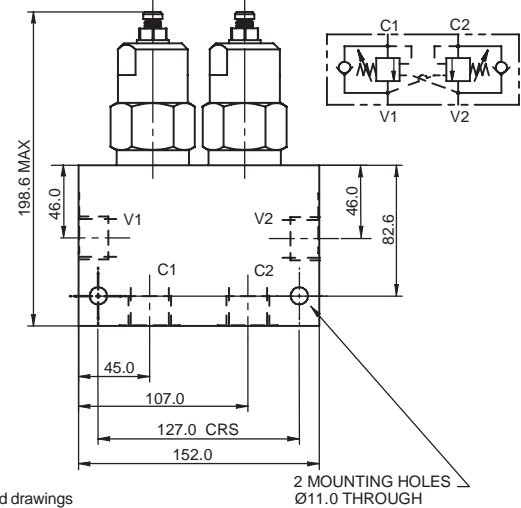
Body ONLY part numbers

BSP, aluminium
1" C20285

SAE, aluminium
1" C30105

BSP, steel
1" C20287

SAE, steel
1" C30106



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CE** F 6W 40 S 4**

Basic Code

1CE140 = Cartridge Only
1CE145 = Cartridge and Body
1CEE145 = Cartridges and Body

Adjustment Means

F = Screw Adjustment

Port Sizes - Bodied Valves Only

6W = 3/4" BSP Valve & Cyl Port. 1/4" BSP Pilot Port
8W = 1" BSP Valve & Cyl Port. 1/4" BSP Pilot Port
16T = 1" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

Pilot Ratio

4 = 4:1
6 = 6:1
Other ratios available upon request

Seals

S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 4.8 l/min

20 = 140-250 bar. Std setting 190 bar
30 = 220-330 bar. Std setting 270 bar
40 = 310-420 bar. Std setting 370 bar
Std setting made at 4.8 litres/min

We reserve the right to change specifications without notice

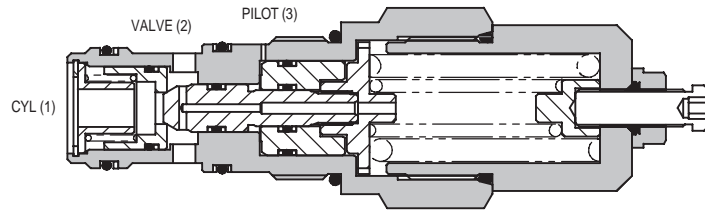
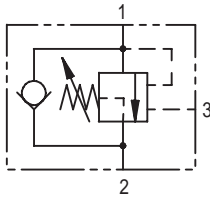


1CER SERIES OVERCENTRE VALVE

PART BALANCED - PILOT ASSISTED

1CER140

POPPET RELIEF



APPLICATION

The 1CER series overcentre valve performs all duties of a regular overcentre but is able to relieve and stay open irrespective of downstream pressure. This enables the valve to operate when used with a closed centre directional valve which has service line reliefs. The poppet is pressure balanced, preventing relief setting increase due to back pressure.

PILOT RATIOS

- 4:1 Best suited where the load varies and machine structure can induce instability.
 - 6:1 Best suited for applications where the load remains relatively constant.
- Other ratios available upon request.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	140 litres/min (37 US GPM)
Max Setting	Max Load Induced Pressure: 340 bar (4930 psi) Relief Setting: 420 bar (6090 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A20081
Torque Cartridge into Cavity	150 Nm (110 lbs ft)
Weight	1CER140 1.2 kg (2.6 lbs) 1CER145 (aluminium) 2.2 kg (4.8 lbs) 1CER145 (steel) 4.0 kg (8.8 lbs) 1CEER145 (aluminium) 2.9 kg (6.4 lbs) 1CEER145 (steel) 6.0 kg (13.2 lbs)
Seal Kit Number	SK1108 (nitrile) SK1108V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time.

*For applications above 210 bar please consult our technical department or use the steel body option.

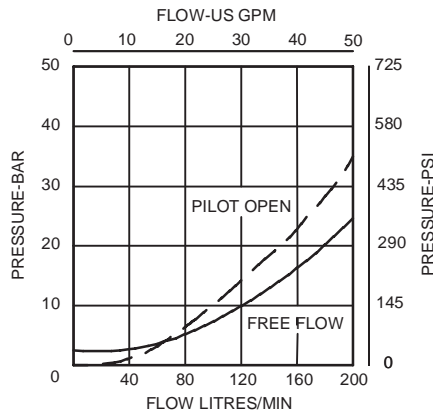
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Website: www.integratedhydraulics.com

Integrated Hydraulics Inc

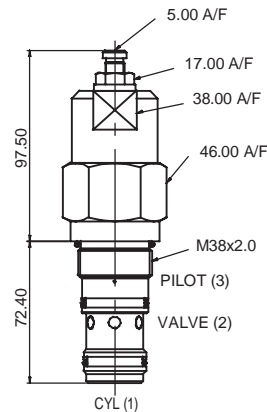
7047 Spinach Drive, Mentor, Ohio 44060, USA
Tel: (440) 974 3171 Fax: (440) 974 3170
Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 1CER140



Tightening torque of "F" adjuster locknut - 20 to 25 Nm

SINGLE VALVE

3/4" 1" PORTS

BASIC CODE: 1CER145

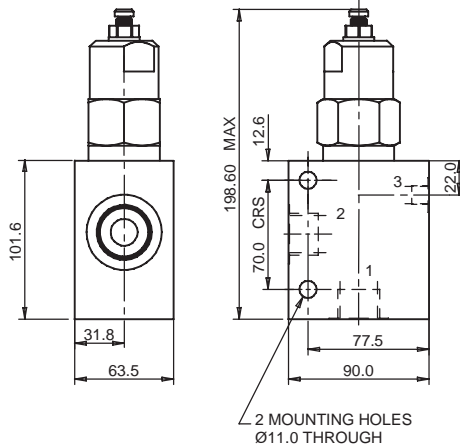
Body ONLY part numbers

BSP, aluminium
3/4" B20105
1" B20107

SAE, aluminium
3/4" B11952
1" B11946

BSP, steel
3/4" B20106
1" B20108

SAE, steel
3/4" B11953
1" B11947



DUAL VALVE

1" PORTS

BASIC CODE: 1CEER145

(INTERNALLY CROSS PILOTED)

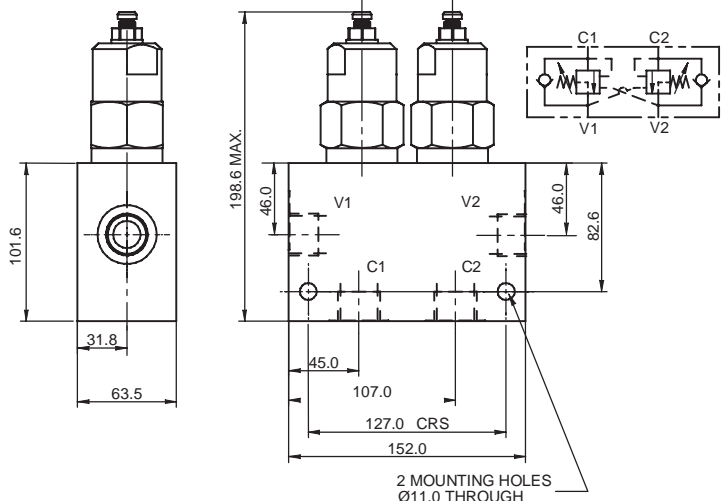
Body ONLY part numbers

BSP, aluminium
1" C20285

SAE, aluminium
1" C30105

BSP, steel
1" C20287

SAE, steel
1" C30106



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CER***

F

6W

40

S

4

Basic Code

1CER140 = Cartridge Only

1CER145 = Cartridge and Body

1CEER145 = Cartridges and Body

Adjustment Means

F = Screw Adjustment

Port Sizes - Bodied Valves Only

6W = 3/4" BSP Valve & Cyl Port. 1/4" BSP Pilot Port

8W = 1" BSP Valve & Cyl Port. 1/4" BSP Pilot Port

16T = 1" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

Pilot Ratio

4 = 4:1

6 = 6:1

Other ratios available upon request

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 4.8 l/min

20 = 140-250 bar. Std setting 190 bar

30 = 220-330 bar. Std setting 270 bar

40 = 310-420 bar. Std setting 370 bar
Std setting made at 4.8 litres/min

We reserve the right to change specifications without notice

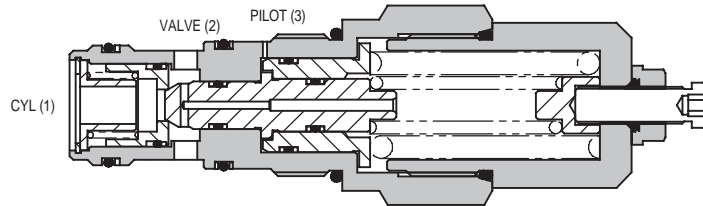
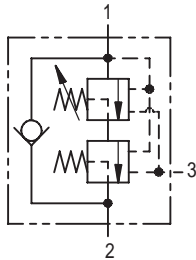


1CEL SERIES OVERCENTRE VALVE

PILOT ASSISTED RELIEF WITH CHECK AND COUNTERBALANCE

1CEL140

POPPET RELIEF



6

APPLICATION

The 1CEL overcentre valve performs all duties of a regular overcentre but maintains a counterbalance pressure to provide dampening to cylinders when there is a rapid loss in stored pressure. This counterbalance pressure reduces as the pilot pressure increases. Typical applications include extension cylinders on telescopic handlers where it is important to have a smooth operation when retracting from full extension.

OPERATION

The check section allows free flow and then locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied, maintaining a counterbalance pressure to prevent initial pressure loss and therefore instability. The total pressure setting will normally be set at 1.3 times the load induced pressure. The counterbalance pressure reduces as the pilot pressure increases.

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time.

PILOT RATIOS

Primary 6.1:1
Secondary 0.5:1

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	140 litres/min (37 US GPM)
Max Setting	380 bar (5510 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A20081
Torque Cartridge into Cavity	150 Nm (110 lbs ft)
Weight	1CEL140 1.2 kg (2.6 lbs) 1CEL145 (aluminium) 2.2 kg (4.8 lbs) 1CEL145 (steel) 4.0 kg (8.8 lbs) 1CEEL145 (aluminium) 2.9 kg (6.4 lbs) 1CEEL145 (steel) 6.0 kg (13.2 lbs)
Seal Kit Number	SK1108 (Nitrile) SK1108V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

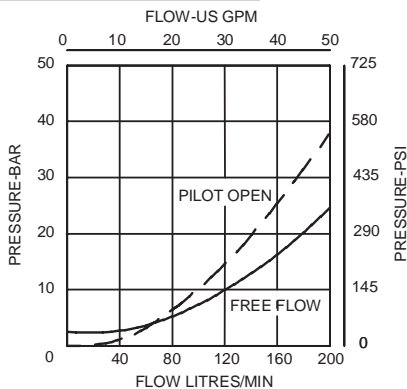
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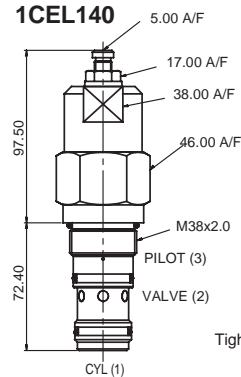
PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE:

1CEL140



SINGLE VALVE

3/4" 1" PORTS

BASIC CODE: 1CEL145

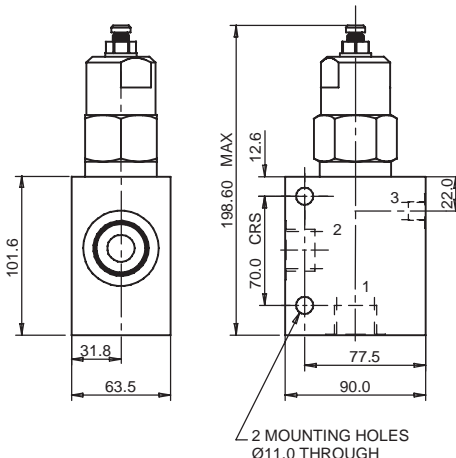
Body ONLY part numbers

BSP, aluminium
3/4" B20105
1" B20107

SAE, aluminium
1" B11946

BSP, steel
3/4" B20106
1" B20108

SAE, steel
1" B11947



DUAL VALVE

1" PORTS

BASIC CODE: 1CEEL145

(INTERNALLY CROSS PILOTED)

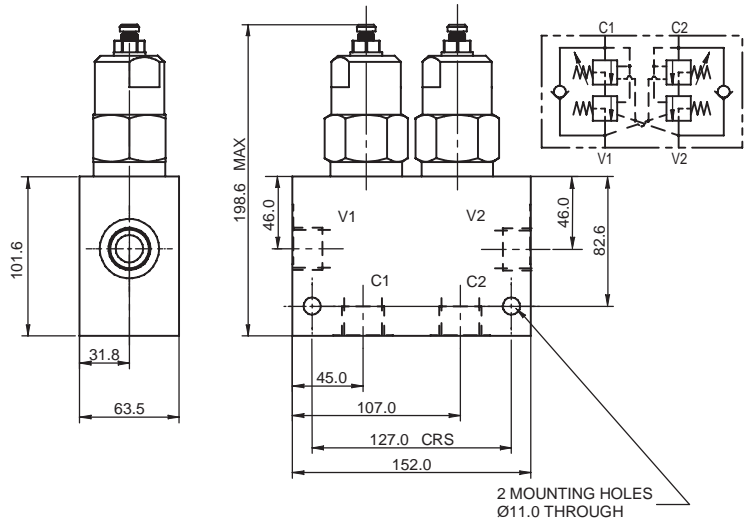
Body ONLY part numbers

BSP, aluminium
1" C20285

SAE, aluminium
1" C30105

BSP, steel
1" C20287

SAE, steel
1" C30106



This valve has been designed to eliminate instability from flexible boom applications or where the load induced pressure varies greatly. To get the best results, the settings should be adjusted for each application and then factory set for production quantities. Please contact Integrated Hydraulics for more information.

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CEL ***

F

6W

30

S

220

60

Basic Code

1CEL140 = Cartridge Only

1CEL145 = Cartridge and Body

1CEEL145 = Cartridges and Body

Adjustment Means

F = Screw Adjustment

Port Sizes - Bodied Valves Only

6W = 3/4" BSP Valve & Cyl Port. 1/4" BSP Pilot Port

8W = 1" BSP Valve & Cyl Port. 1/4" BSP Pilot Port

16T = 1" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

Counterbalance setting bar
(10 bar increments).

High pressure setting bar
(10 bar increments).

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

Pressure Range, bar @ 4.8 l/min

20 = 170-320. Std 220 (160/60)

30 = 230-380. Std 280 (220/60)

40 = 310-380. Std 350 (290/60)

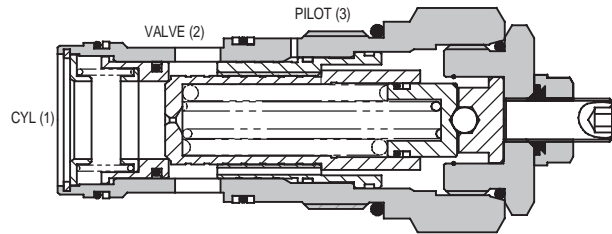
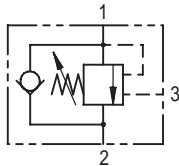
We reserve the right to change specifications without notice



1CE SERIES OVERCENTRE VALVE

PILOT ASSISTED RELIEF WITH CHECK

1CE300



6

APPLICATION

Overcentre valves give static and dynamic control of loads by regulating the flow into and out of hydraulic actuators. When installed close to or within an actuator, the overcentre valve will stop runaway in the event of hose burst and if open centre directional control valves are used, will allow thermal expansion relief of the hydraulic fluid.

The overcentre cartridge is ideal for mounting directly into a cavity machined in the body of the cylinder, motor or rotary actuator. The cartridge can also be mounted directly to the ports via a specifically machined body as part of a Hydraulic Integrated Circuit or single unit, or contained within one of our standard line bodies.

Single overcentre valves are normally used when the load is unidirectional, for example an aerial platform or crane and dual overcentre valves are used for controlling loads in both directions for motor applications or for cylinders going over centre.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Allows quick, easy field service - reduces down time.
Smooth, sure performance.

PILOT RATIOS

3:1 (Standard)

Best suited for applications where load varies and machine structure can induce instability.

8:1

Best suited for applications where load remains relatively constant.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	300 litres/min (80 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A6935 (See Section 17)
Torque Cartridge into Cavity	150 Nm (110 lbs ft)
Weight	1CE300 0.91 kg (2.00 lbs) 1CE350 2.71 kg (5.96 lbs) 1CEE350 5.42 kg (11.92 lbs)
Seal Kit Number	SK437 (Nitrile) SK437V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	4 millilitres/min nominal (60 dpm)
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

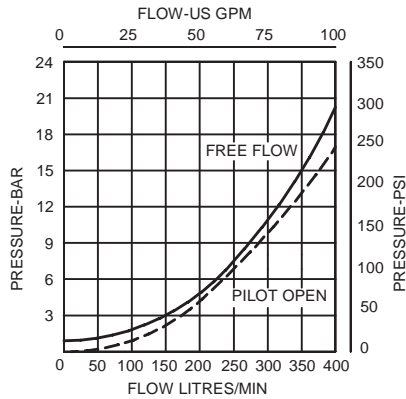
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Website: www.integratedhydraulics.com

Integrated Hydraulics Inc

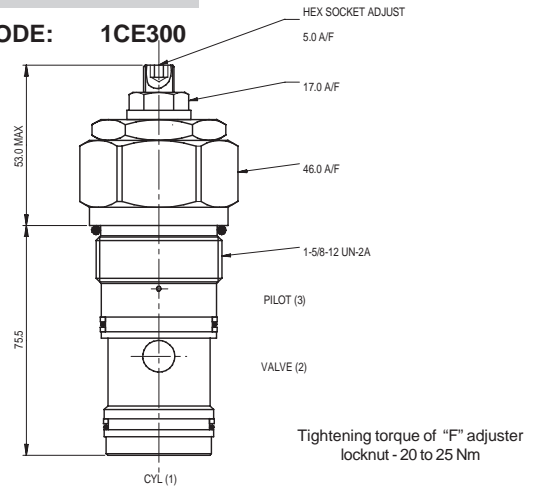
7047 Spinach Drive, Mentor, Ohio 44060, USA
Tel: (440) 974 3171 Fax: (440) 974 3170
Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 1CE300



SINGLE VALVE

1 1/4" PORTS

BASIC CODE: 1CE350

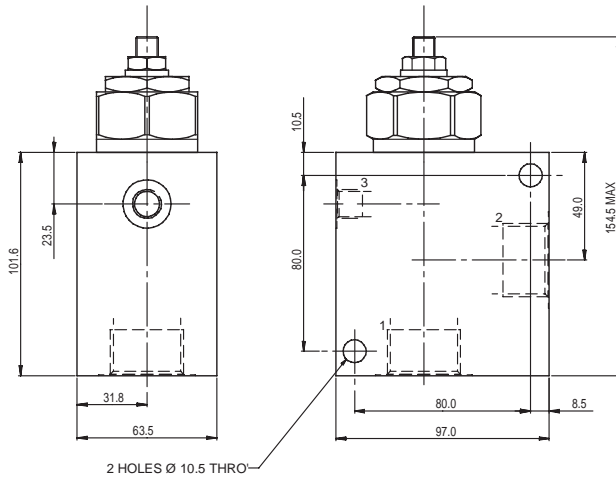
Body ONLY part numbers

BSP, aluminium
1 1/4" B6814

SAE, aluminium
1 1/4" B10630

BSP, steel
1 1/4" B8610

SAE, steel
1 1/4" B11474



DUAL VALVE

1 1/4" PORTS

BASIC CODE: 1CEE350

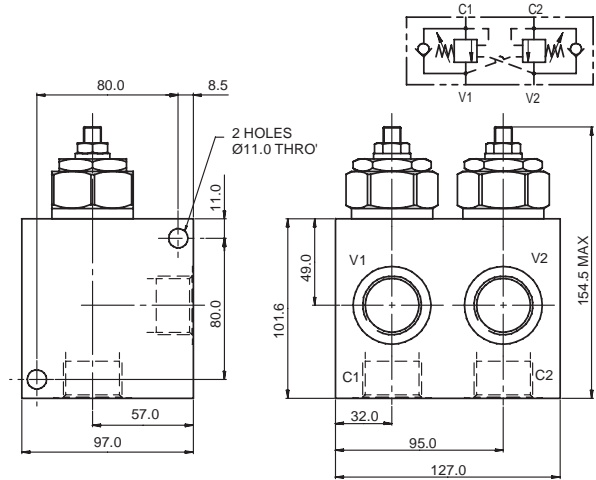
Body ONLY part numbers

BSP, aluminium
1 1/4" C8704

SAE, aluminium
1 1/4" C10811

BSP, steel
1 1/4" C8705

SAE, steel
1 1/4" C11564



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CE****

F

10W

35

S

3

Basic Code

1CE300 = Cartridge Only

1CE350 = Cartridge and Body

1CEE350 = Cartridges and Body

Adjustment Means

F = Screw Adjustment

Port Sizes - Bodied Valves Only

10W = 1 1/4" BSP Valve & Cyl Port. 1/4" BSP Pilot Port

20T = 1 1/4" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

Pressure Range @ 4.8 l/min

35 = 70-350 bar. Std setting 210 bar

Std setting made at 4.8 litres/min

Pilot Ratio

3 = 3:1 (Standard)

8 = 8:1

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

We reserve the right to change specifications without notice

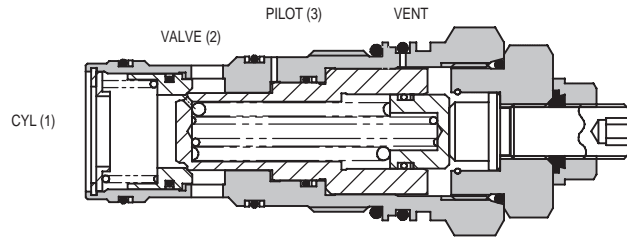
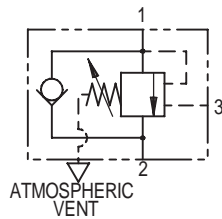


1CEB SERIES OVERCENTRE VALVE

FULLY BALANCED - PILOT ASSISTED

1CEB300

POPPET RELIEF



APPLICATION

Overcentre valves give static and dynamic control of loads by supplying a counterbalance pressure to the actuator. They prevent runaway in the event of hose burst and hold the load with minimal leakage.

The pressure balanced valve is unaffected by back pressure, allowing service line reliefs to operate and for the valve to be used in regenerative or proportional valve systems.

The overcentre valve should be mounted either into, onto or as close to the actuator as possible to give maximum protection.

Single overcentre valves control unidirectional loads such as in aerial platforms, cranes or winches and dual overcentres are suited to bi-directional motion such as wheel motor applications or cylinders going over centre.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Allows quick, easy field service - reduces down time.
Smooth, sure performance.

PILOT RATIOS

3:1 (Standard)

Best suited for applications where load varies and machine structure can induce instability.

8:1

Best suited for applications where load remains relatively constant.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	300 litres/min (80 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A6935 (See Section 17)
Torque Cartridge into Cavity	150 Nm (110 lbs ft)
Weight	1CEB300 0.91 kg (2.00 lbs) 1CEB350 2.71 kg (5.96 lbs) 1CEEB350 5.42 kg (11.92 lbs)
Seal Kit Number	SK686 (Nitrile) SK686V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	4 millilitres/min max (60 dpm)
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

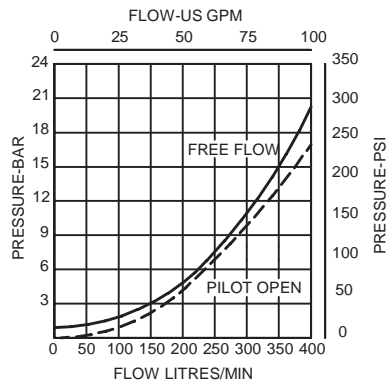
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Integrated Hydraulics Inc

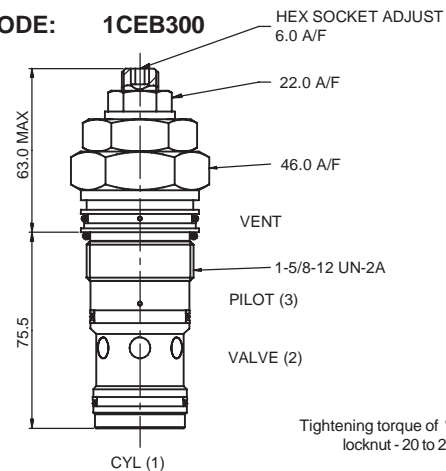
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Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 1CEB300



Tightening torque of "F" adjuster locknut - 20 to 25 Nm

6

SINGLE VALVE

1 1/4" PORTS

BASIC CODE: 1CEB350

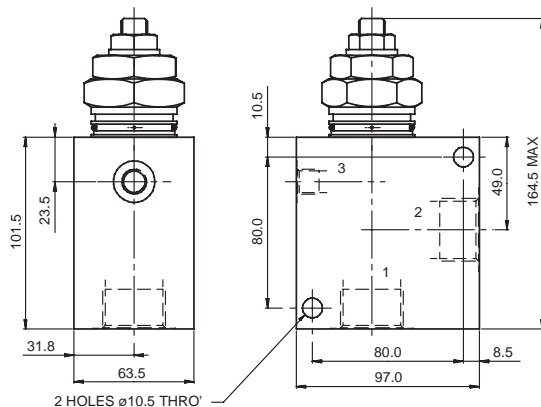
Body ONLY part numbers

BSP, aluminium
1 1/4" B6814

SAE, aluminium
1 1/4" B10630

BSP, steel
1 1/4" B8610

SAE, steel
1 1/4" B11474



DUAL VALVE

1 1/4" PORTS

BASIC CODE: 1CEEB350

(INTERNALLY CROSS PILOTED)

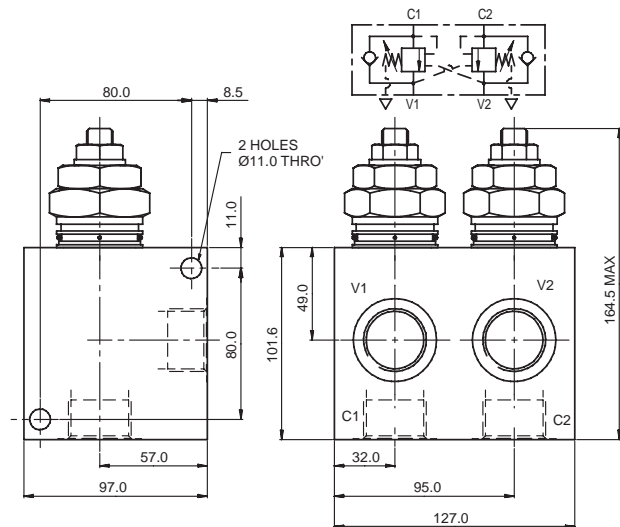
Body ONLY part numbers

BSP, aluminium
1 1/4" C8704

SAE, aluminium
1 1/4" C10811

BSP, steel
1 1/4" C8705

SAE, steel
1 1/4" C11564



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CE*****

F

10W

35

S

3

Basic Code

1CEB300 = Cartridge Only

1CEB350 = Cartridge and Body

1CEEB350 = Cartridges and Body

Adjustment Means

F = Screw Adjustment

Port Sizes - Bodied Valves Only

10W = 1 1/4" BSP Valve & Cyl Port. 1/4" BSP Pilot Port

20T = 1 1/4" SAE Valve & Cyl Port. 1/4" SAE Pilot Port

Pressure Range @ 4.8 l/min

35 = 70-350 bar. Std setting 210 bar

Std setting made at 4.8 litres/min

Pilot Ratio

3 = 3:1 (Standard)

8 = 8:1

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

We reserve the right to change specifications without notice

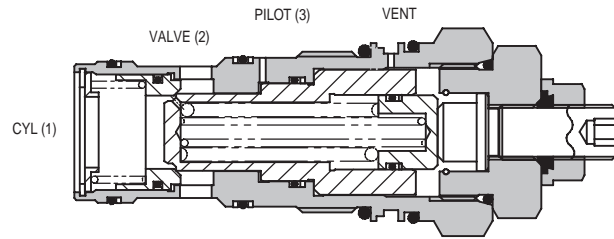
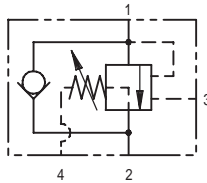


1CEBD SERIES OVERCENTRE VALVE

FULLY BALANCED - PILOT ASSISTED

1CEBD300

POPPET RELIEF



6

APPLICATION

Overcentre valves give static and dynamic control of loads by supplying a counterbalance pressure to the actuator. They prevent runaway in the event of hose burst and hold the load with minimal leakage.

The pressure balanced valve is unaffected by back pressure, allowing service line reliefs to operate and for the valve to be used in regenerative or proportional valve systems.

The overcentre valve should be mounted either into, onto or as close to the actuator as possible to give maximum protection.

Single overcentre valves control unidirectional loads such as in aerial platforms, cranes or winches and dual overcentres are suited to bi-directional motion such as wheel motor applications or cylinders going over centre.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Allows quick, easy field service - reduces down time.
Smooth, sure performance.

PILOT RATIOS

3:1 (Standard)

Best suited for applications where load varies and machine structure can induce instability.

8:1

Best suited for applications where load remains relatively constant.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	300 litres/min (80 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A13098 (See Section 17)
Torque Cartridge into Cavity	150 Nm (110 lbs ft)
Weight	1CEBD300 0.91 kg (2.00 lbs)
Seal Kit Number	SK686 (Nitrile) SK686V (Viton) SK686P (Polyurethane/Nitrile)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	4 millilitres/min max (60 dpm)
Nominal Viscosity Range	5 to 500 cSt

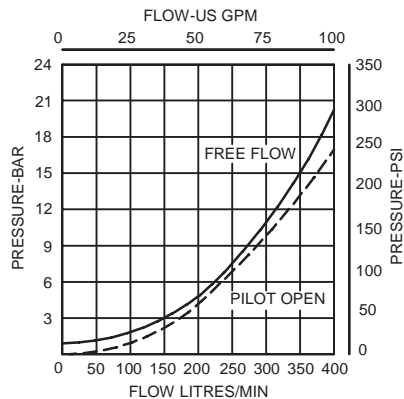
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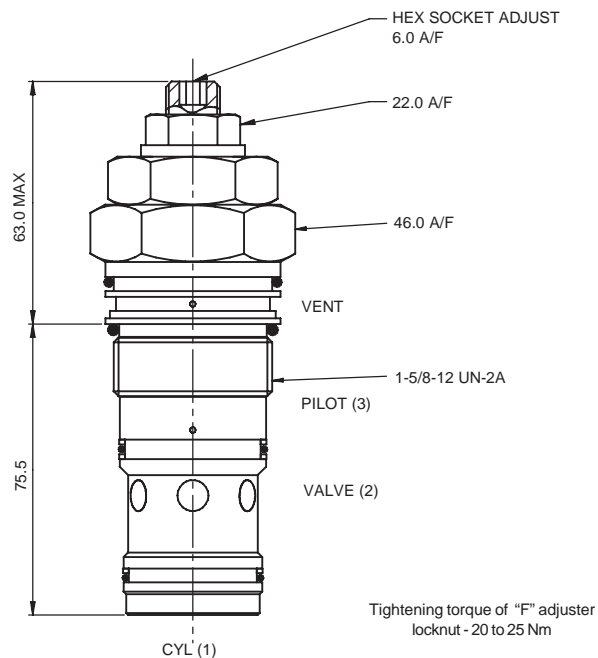
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Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 1CEBD300



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CEBD300 F 35 P 8

Basic Code
1CEBD300 = Cartridge Only

Adjustment Means
F = Screw Adjustment

Pressure Range @ 4.8 l/min
35 = 70-350 bar. Std setting 210 bar
Std setting made at 4.8 litres/min

Pilot Ratio
3 = 3:1 (Standard)
8 = 8:1

Seals
S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)
P = Polyurethane/Nitrile (For arduous applications)

We reserve the right to change specifications without notice

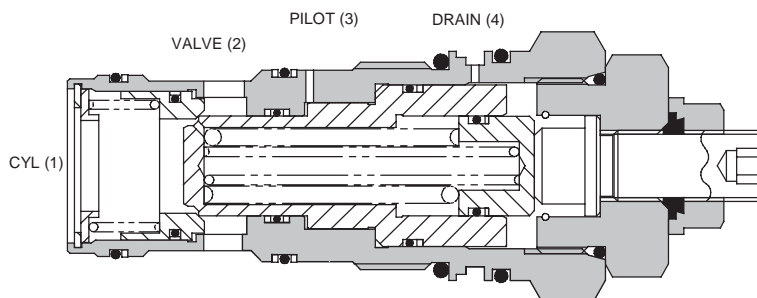
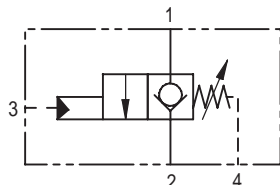


1CPBD SERIES ZERO DIFFERENTIAL

OVERCENTRE VALVE

FULLY BALANCED - PILOT ASSISTED

1CPBD300



6

APPLICATION

Zero differential overcentre valves give static and dynamic control of loads by supplying a restriction to flow related to the opening of the valve created by the pilot pressure.

The valve is used in conjunction with a remote pilot source to provide hose failure protection, load control and load holding functions.

If over-pressure or shock pressure protection is required then a separate relief valve should be used.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. By the application of pilot pressure to the pilot port the poppet moves back against the main spring opening the cylinder port to the valve port. The metering characteristic of the valve is controlled by the rate of the spring, the seat angle and the pilot pressure applied.

Due to the balanced poppet design load induced pressure will not open the valve and once open valve port pressure will not increase the pilot pressure required to keep the valve open.

FEATURES

The cartridge fits a simple cavity allowing quick, easy field service reducing down time. Hardened poppet and seat provide for long leak free performance.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	300 litres/min (80 US GPM)
Max Working Pressure	400 bar (5800 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Mounting Position	Unrestricted
Cavity Number	A13098 (See section 17)
Torque Cartridge into Cavity	150 Nm (110 lbs ft)
Weight	0.91 kg (2.0 lbs)
Seal Kit Number	SK971 (Nitrile) SK971V (Viton) SK971P (Polyurethane/Nitrile)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	4.0 millilitres/min max (60 dpm)
Nominal Viscosity Range	5 to 500 cSt
Bar per turn	5 bar

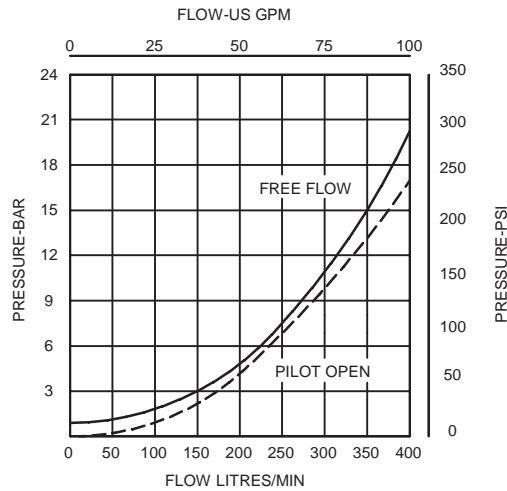
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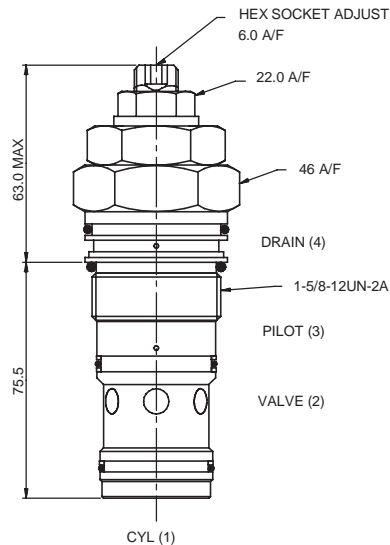
PRESSURE DROP



6

CARTRIDGE ONLY

BASIC CODE: 1CPBD300



Tightening torque of "F" adjuster
locknut - 20 to 25 Nm

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CPBD300

F

2

P

Basic Code

1CPBD300 = Cartridge Only

Adjustment Means

F = Screw Adjustment

Seals

S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)
P = Polyurethane/Nitrile (For arduous applications)

Pilot Adjust Range

2 = 5-20 bar. Std setting 10 bar
Std setting made at 4.8 litres/min

We reserve the right to change specifications without notice



1CE SERIES OVERCENTRE VALVE

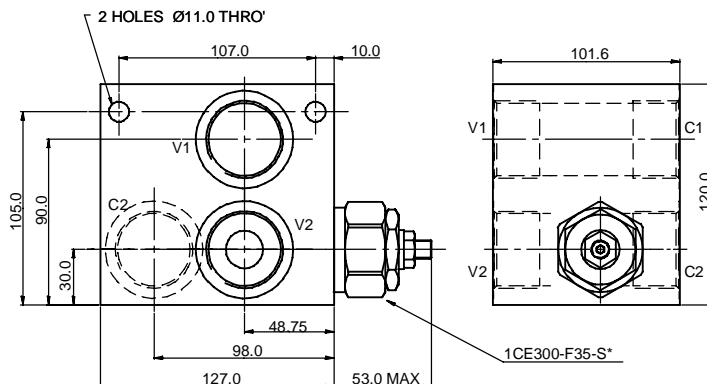
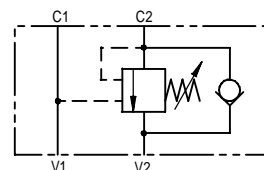
ALTERNATIVE BODY ARRANGEMENTS for 300 Litres/min Valves

COMPLETE VALVE

BASIC CODE: 1CE356
THROUGH PORTED

1 1/4" PORTS

Body ONLY part numbers
BSP, aluminium 1 1/4" C13637
BSP, steel 1 1/4" C13638



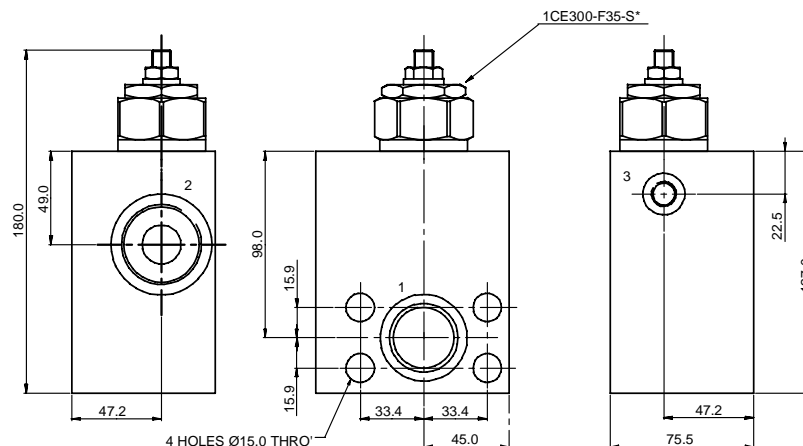
6

COMPLETE VALVE

BASIC CODE: 1CEG350
GASKET MOUNTED

1 1/4" PORTS

Sub-assembly part numbers
BSP, aluminium 1 1/4" CXP20647-10W-S
BSP, steel 1 1/4" CXP20647-10W-S-377



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CE*** F 10W 35 S 3

Basic Code

1CE356 = Cartridge and Body Through Ported
1CEG350 = Cartridge and Body Gasket Mounted

Adjustment Means

F = Screw Adjustment

Port Sizes - Bodied Valves Only

10W = 1 1/4" BSP Valve & Cyl Port. 1/4" BSP Pilot Port

Pressure Range @ 4.8 l/min

35 = 70-350 bar. Std setting 210 bar
Std setting made at 4.8 litres/min

Pilot Ratio

3 = 3:1
8 = 8:1

Seals

S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)

We reserve the right to change specifications without notice

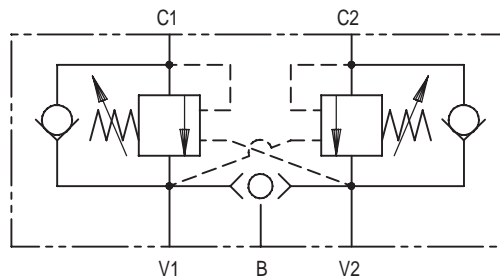




1CEESH SERIES DUAL OVERCENTRE VALVE

WITH BRAKE SHUTTLE - PILOT ASSISTED

1CEESH35



APPLICATION

Overcentre Valves give static and dynamic control of loads by regulating the flow into and out of hydraulic actuators. When installed close to or within an actuator, the overcentre valve will stop runaway in the event of hose burst and if open centre directional control valves are used, will allow thermal expansion relief of the hydraulic fluid.

These dual overcentre valves also contain a brake release shuttle valve which ensures that pressure is applied to a brake release circuit regardless of whether pressure is applied to ports V1 or V2. These multifunction valves are normally used for the static and dynamic control of systems using motors or semi-rotary actuators.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

PILOT RATIOS

- 2.5:1 Best suited for extremely unstable applications such as long booms or flexible frameworks.
- 5:1 Best suited for applications where load (Standard) varies and machine structure can induce instability.
- 10:1 Best suited for applications where load remains relatively constant.

FEATURES

These valves have the excellent load control and safety features of the dual overcentre valve with the addition of a port for a brake release line. Smooth, safe performance.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	30 litres/min (8 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces electroless nickel plated
Body Material	Steel
Mounting Position	Line mounted
Weight	2.20 kg (4.84 lbs)
Seal Kit Number	SK816 (Nitrile) SK816V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

Integrated Hydraulics Ltd

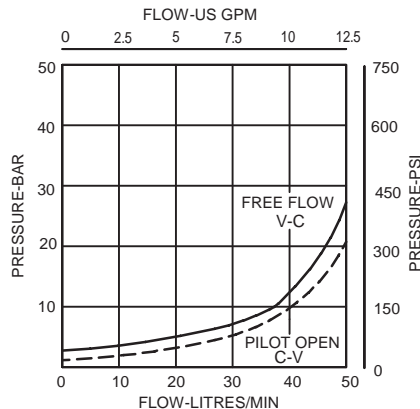
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Website: www.integratedhydraulics.com

Integrated Hydraulics Inc

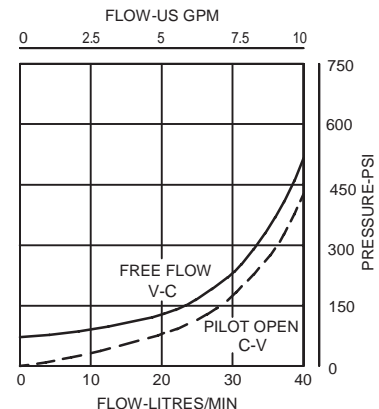
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Website: www.integratedhydraulics.com

PRESSURE DROP

2.5:1 & 5:1 version



10:1 version

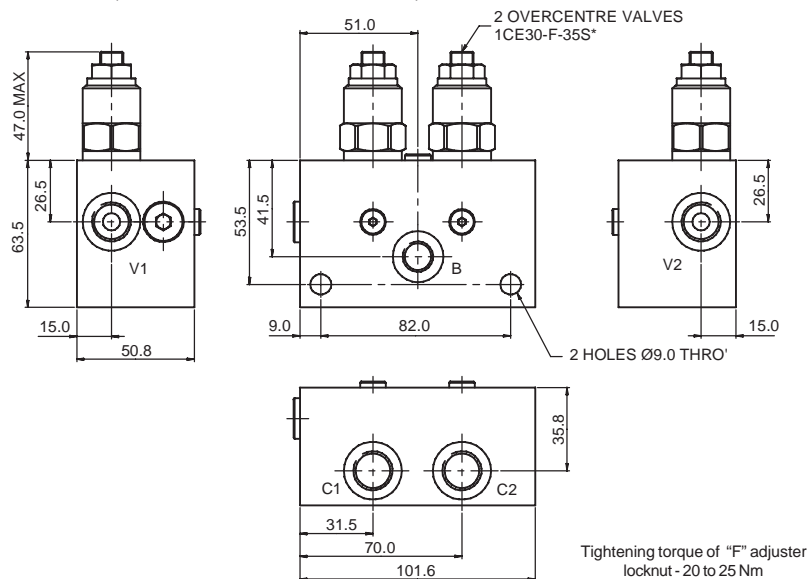


COMPLETE VALVE 3/8" PORTS

BASIC CODE: 1CEESH35 (INTERNALLY CROSS PILOTED)

Sub-assembly part numbers

BSP, steel
3/8" BXP15939-3W-S-377



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CEESH35 F 3W 35 S 5 377

Basic Code

1CEESH35 = Cartridges and Body Only

Adjustment Means

F = Screw Adjustment

N = Fixed - State pressure setting required

For fixed versions add setting in 10 bar increments to end of part number. Subject to a ±10% tolerance.

Port Sizes - Bodied Valves Only

3W = 3/8" BSP Valve & Cyl Port. 1/4" BSP Brake Port

Pressure Range @ 4.8 l/min

35 = (2.5:1 and 5:1): 100-350 bar. Std setting 210 bar
(10:1): 120-350 bar. Std setting 210 bar

Std setting made at 4.8 litres/min

Body Material

377 = Steel

Pilot Ratio

2 = 2.5:1

5 = 5:1 (Standard)

10 = 10:1

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

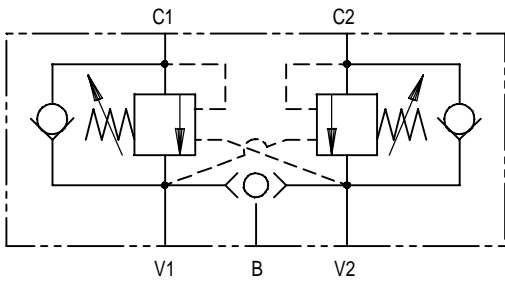
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1CEESH SERIES DUAL OVERCENTRE VALVE

WITH BRAKE SHUTTLE - PILOT ASSISTED

1CEESH95



APPLICATION

Overcentre Valves give static and dynamic control of loads by regulating the flow into and out of hydraulic actuators. When installed close to or within an actuator, the overcentre valve will stop runaway in the event of hose burst and if open centre directional control valves are used, will allow thermal expansion relief of the hydraulic fluid.

These dual overcentre valves also contain a brake release shuttle valve which ensures that pressure is applied to a brake release circuit regardless of whether pressure is applied to ports V1 or V2. These multifunction valves are normally used for the static and dynamic control of systems using motors or semi-rotary actuators.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

PILOT RATIO

- 4:1 Best suited for applications where the load varies and machine structure can induce instability.
- 8:1 Best suited for applications where the load remains relatively constant.
- Other ratios available upon request.

FEATURES

These valves have the excellent load control and safety features of the dual overcentre valve with the addition of a port for a brake release line. Smooth, safe performance.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	90 litres/min (23 US GPM)
Max Setting	Max Load Induced Pressure: 160 bar (2300 psi) (20) 270 bar (4000 psi) (35) Relief Setting: 350 bar (5000 psi) (35) 225 bar (3260 psi) (20)
Cartridge Material	Working parts hardened and ground steel. External surfaces electroless nickel plated
Body Material	Steel
Mounting Position	Line mounted
Weight	3.50 kg (7.70 lbs)
Seal Kit Number	SK817 (Nitrile) SK817V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

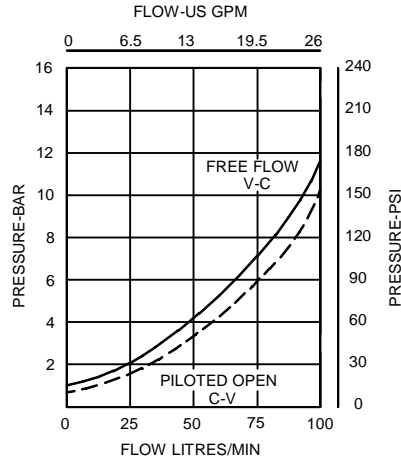
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PRESSURE DROP

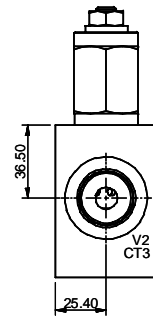
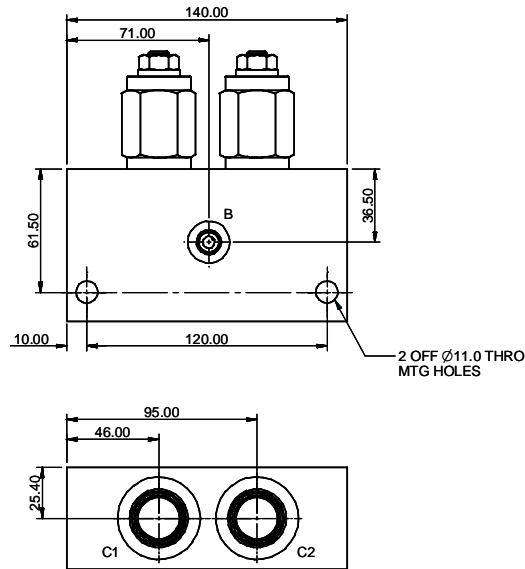
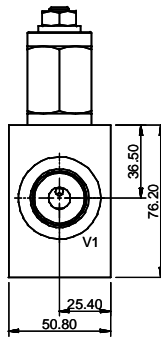


COMPLETE VALVE 3/4" PORTS

BASIC CODE: 1CEESH95 (INTERNALLY CROSS PILOTED)

Sub-assembly part numbers
BSP, steel

3/4" BXP17429-6W-377



Tightening torque of "F" adjuster locknut - 20 to 25 Nm

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CEESH95 F 6W 35 S 4 377

Basic Code

1CEESH95 = Cartridges and Body

Adjustment Means

F = Screw Adjustment

N = Fixed - State pressure setting required

For fixed versions add setting in 10 bar increments to end of part number. Subject to a $\pm 10\%$ tolerance.

Port Sizes - Bodied Valves Only

6W = 3/4" BSP Valve & Cyl Port. 1/4" BSP Brake Port

Pressure Range @ 4.8 l/min

20 = 70-225 bar. Std setting 100 bar

35 = 200-350 bar. Std setting 210 bar

Std setting made at 4.8 litres/min

Body Material

377 = Steel

Pilot Ratio

4 = 4:1

8 = 8:1

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

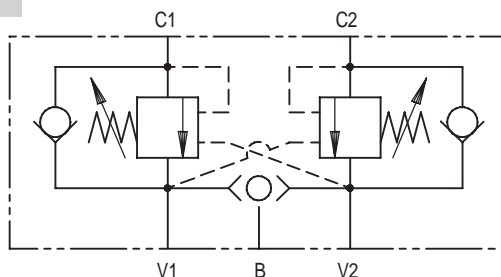
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1CEESH SERIES DUAL OVERCENTRE VALVE

WITH BRAKE SHUTTLE - PILOT ASSISTED

1CEESH150/1CEESH350



6

APPLICATION

Overcentre valves give static and dynamic control of loads by regulating the flow into and out of hydraulic actuators. When installed close to or within an actuator, the overcentre valve will stop runaway in the event of hose burst and if open centre directional control valves are used, will allow thermal expansion relief of the hydraulic fluid.

These dual overcentre valves also contain a brake release shuttle valve which ensures that pressure is applied to a brake release circuit regardless of whether pressure is applied to ports V1 or V2. These multifunction valves are normally used for the static and dynamic control of systems using motors or semi-rotary actuators.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

PILOT RATIOS

- 3:1 Best suited for applications where load varies
3.5:1 and machine structure can induce instability.
- 8:1 Best suited for applications where the load remains relatively constant.

FEATURES

These valves have the excellent load control and safety features of the dual overcentre valve with the addition of a port for a brake release line. Smooth, safe performance.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	1CEESH150: 150 l/min (40 US GPM) 1CEESH350: 300 l/min (80 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) relief Setting: 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces electroless nickel plated
Body Material	Steel
Mounting Position	Line mounted
Weight	1CEESH150: 3.50 kg (7.70 lbs) 1CEESH350: 5.42 kg (11.94 lbs)
Seal Kit Number	1CEESH150: SK818 (Nitrile) SK818V (Viton) 1CEESH350: SK688 (Nitrile) SK688V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	1CEESH150: 0.3 millilitres/min nominal (5 dpm) 1CEESH350: 4 millilitres/min nominal (60 dpm)
Nominal Viscosity Range	5 to 500 cSt

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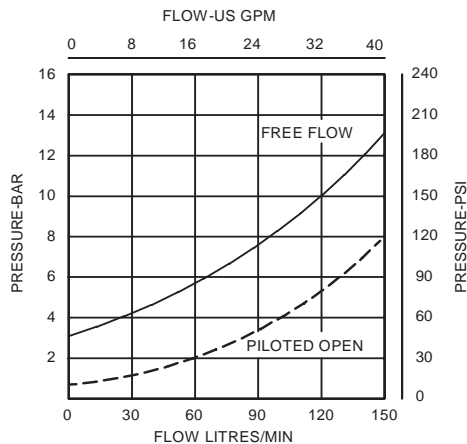
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PRESSURE DROP

1CEESH150



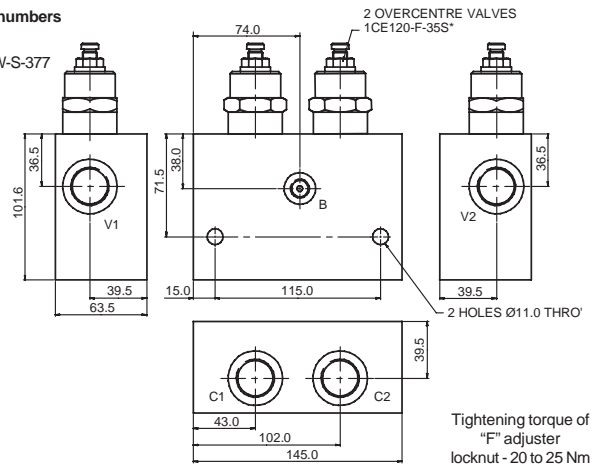
COMPLETE VALVE

1" PORTS

BASIC CODE: 1CEESH150 (INTERNALLY CROSS PILOTED)

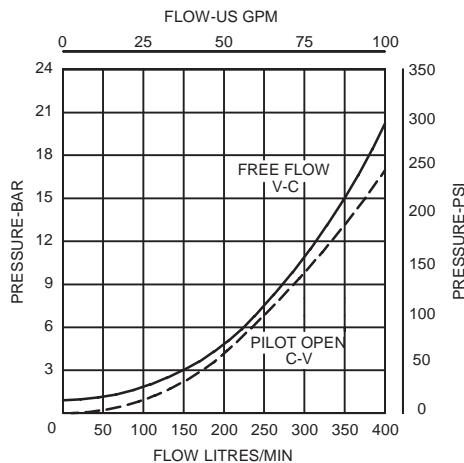
Sub-assembly part numbers

BSP, steel
1" CXP15933-8W-S-377



PRESSURE DROP

1CEESH350



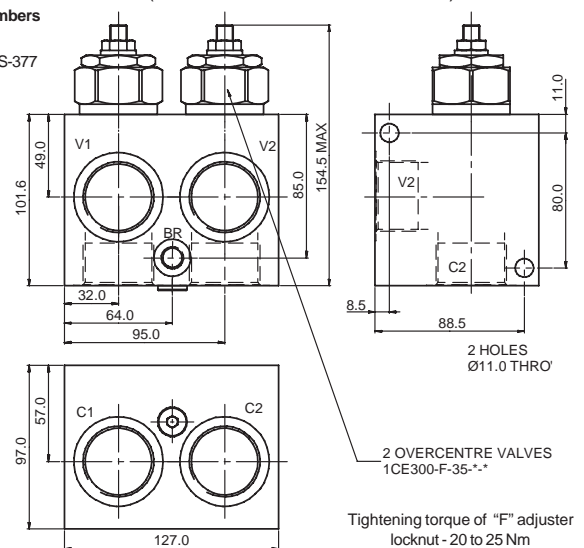
COMPLETE VALVE

1 1/4" PORTS

BASIC CODE: 1CEESH350 (INTERNALLY CROSS PILOTED)

Sub-assembly part numbers

BSP, steel
1.1/4" CXP22297-10W-S-377



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CEESH* F 10W 35 S 3 377**

Basic Code

1CEESH150 = Cartridges and Body
1CEESH350 = Cartridges and Body

Adjustment Means

F = Screw Adjustment

Port Sizes - Bodied Valves Only

8W = 1" BSP Valve & Cyl Port. 1/4" BSP Brake Port
10W = 1 1/4" BSP Valve & Cyl Port. 1/4" BSP Brake Port

Body Material

377 = Steel

Pilot Ratio

3 = 3:1 - 1CEESH350 (Standard)
3 = 3.5:1 - 1CEESH150
8 = 8:1 - 1CEESH350

Seals

S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 4.8 l/min

35 = 70-350 bar. Std setting 210 bar
Std setting made at 4.8 litres/min

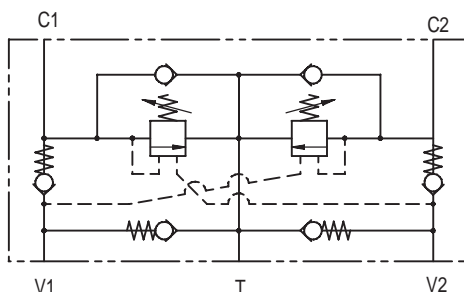
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1CEEC SERIES MOTION CONTROL & LOCK VALVE

PILOT ASSISTED

1CEEC35/1CEEC95



APPLICATION

Motion control and lock valves give static and dynamic control by regulating the flow into and out of hydraulic actuators. When installed close to an actuator, the valve can stop runaway in the event of hose burst. The valves also give dual thermal and overload relief protection.

A low pressure tank or charge line may be connected to the T port to provide a make-up flow to either actuator port.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

A system of check valves allows crossline relief for dynamic applications with the optional make up facility to compensate for any change in system volume.

PILOT RATIOS

- 2.5:1 (1CEEC35) Best suited for extremely unstable applications such as long booms or flexible framework.
- 5:1 (1CEEC35) Best suited for applications where load varies and machine structure can induce instability.
- 4:1 (1CEEC95) Best suited for applications where the load remains relatively constant.
- 10:1 (1CEEC35)
- 8:1 (1CEEC95)

FEATURES

These valves provide complete circuit control and protection in a single valve body, reducing installation time and cost. Smooth, safe performance of dual direction actuators.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	1CEEC35: 30 litres/min (8 US GPM) 1CEEC95: 95 litres/min (25 US GPM)
Max Setting	Max Load Induced Pressure: 160 bar (2300 psi) (20) 270 bar (4000 psi) (35) Relief Setting: 350 bar (5000 psi) (35) 225 bar (3260 psi) (20)
Cartridge Material	Working parts hardened and ground steel. External surfaces electroless nickel plated
Body Material	Steel
Mounting Position	Line mounted
Weight	1CEEC35: 2.03 kg (4.50 lbs) 1CEEC95: 3.70 kg (8.20 lbs)
Seal Kit Number	1CEEC35: SK815 (Nitrile) SK815V (Viton) 1CEEC95: SK814 (Nitrile) SK814V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

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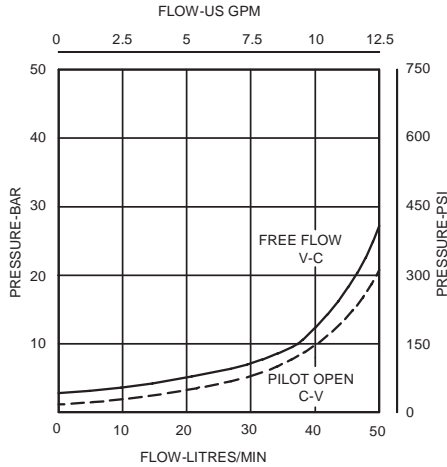
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Website: www.integratedhydraulics.com

PRESSURE DROP

1CEEC35 2: 5:1 & 5: 1

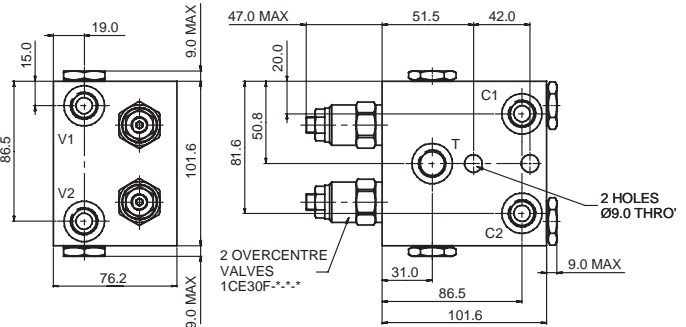


COMPLETE VALVE 3/8" PORTS

BASIC CODE: 1CEEC35 (INTERNALLY CROSS PILOTED)

Sub-assembly part numbers

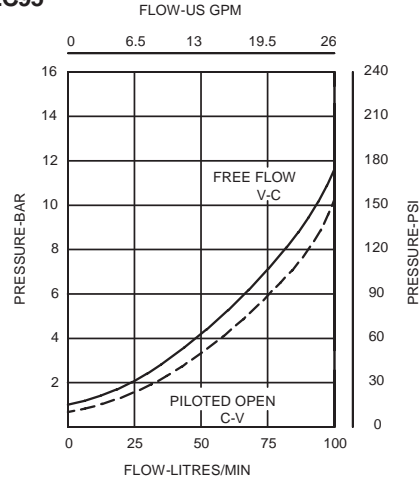
BSP, steel
3/8" BXP16247-3W-S-377



Tightening torque of "F" adjuster locknut - 20 to 25 Nm

PRESSURE DROP

1CEEC95

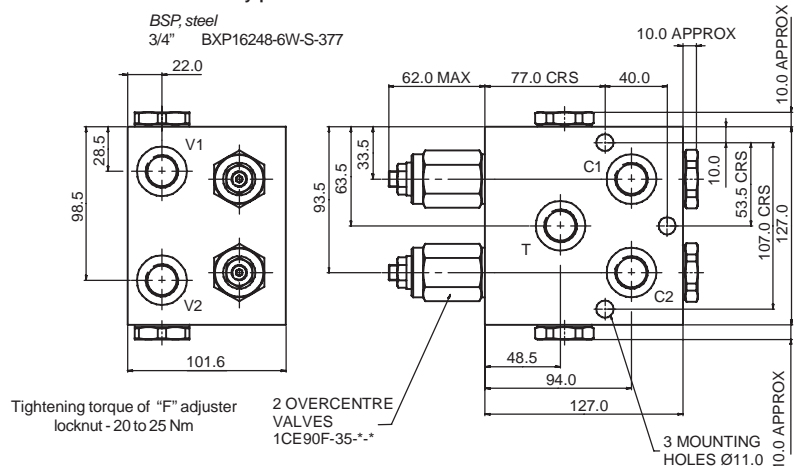


COMPLETE VALVE 3/4" PORTS

BASIC CODE: 1CEEC95 (INTERNALLY CROSS PILOTED)

Sub-assembly part numbers

BSP, steel
3/4" BXP16248-6W-S-377



Tightening torque of "F" adjuster locknut - 20 to 25 Nm

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CEEC F 3W 35 S 5 377**

Basic Code

1CEEC35 = Cartridge and Body

1CEEC95 = Cartridge and Body

Adjustment Means

F = Screw Adjustment

N = Fixed - State pressure setting required
For fixed versions add setting in 10 bar increments to end of part number. Subject to a ±10% tolerance.

Port Sizes - Bodied Valves Only

3W = 3/8" BSP

6W = 3/4" BSP

Pressure Range @ 4.8 l/min

20 = (2.5:1 and 5:1): 70-210 bar. Std setting 100 bar. (1CEEC35)

(10:1): 100-210 bar. Std setting 100 bar. (1CEEC35)

35 = (2.5:1 and 5:1): 100-350 bar. Std setting 210 bar. (1CEEC35)

(10:1): 120-350 bar. Std setting 210 bar. (1CEEC35)

35 = (4:1 and 8:1): 200-350 bar. Std setting 210 bar. (1CEEC95)

Std setting made at 4.8 litres/min

Body Material

377 = Steel

Pilot Ratio

2 = 2.5:1 (1CEEC35)

4 = 4:1 (1CEEC95)

5 = 5:1 (1CEEC35 standard)

8 = 8:1 (1CEEC95)

10 = 10:1 (1CEEC35)

Other ratios available upon request

Seals

S = Nitrile (For use with most industrial hydraulic oils)

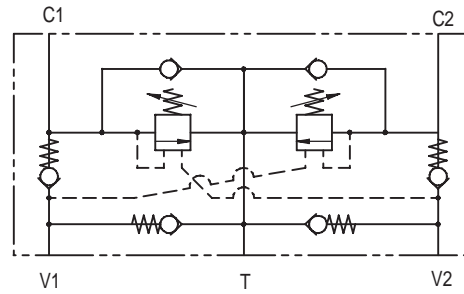
SV = Viton (For high temperature and most special fluid applications)



1CEEC SERIES MOTION CONTROL VALVE

MOTOR APPLICATIONS - PILOT ASSISTED POPPET

1CEEC150/1CEEC350



6

APPLICATION

Motion control and lock valves give static and dynamic control by regulating the flow into and out of hydraulic actuators. When installed close to an actuator, the valve can stop runaway in the event of hose burst. The valves also give dual thermal and overload relief protection.

A low pressure tank or charge line may be connected to the T port to provide a make-up flow to either actuator port.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

A system of check valves allows crossline relief for dynamic applications with the optional make up facility to compensate for any change in system volume.

PILOT RATIOS

- 3:1 Best suited applications where load varies and machine structure can induce instability
- 8:1 Best suited for applications where the load remains relatively constant.

FEATURES

These valves provide complete circuit control and protection in a single valve body, reducing installation time and cost. Smooth, safe performance of dual direction actuators.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	1CEEC150: 150 litres/min (40 US GPM) 1CEEC350: 300 litres/min (80 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Steel
Mounting Position	Line mounted
Weight	1CEEC150: 3.7 kg (8.20 lbs) 1CEEC350: 8.2 kg (18.0 lbs)
Seal Kit Number	1CEEC150: SK813 (Nitrile) SK813V (Viton) 1CEEC350: SK635 (Nitrile) SK635V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	1CEEC150: 0.3 millilitres/min nominal (5 dpm) 1CEEC350: 4 millilitres/min nominal (60 dpm)
Nominal Viscosity Range	5 to 500 cSt

Integrated Hydraulics Ltd

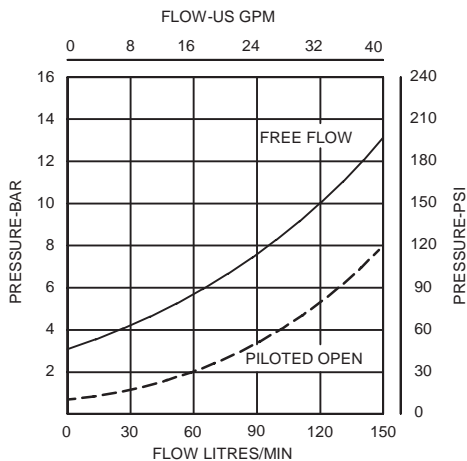
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PRESSURE DROP

1CEEC150



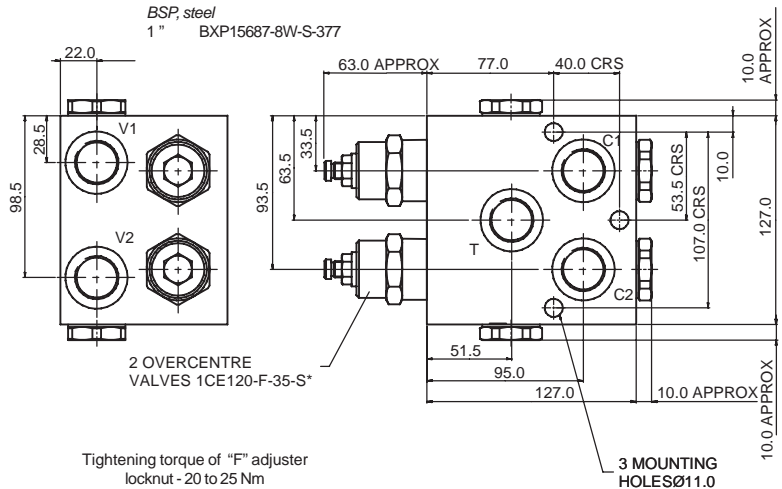
COMPLETE VALVE **1" PORTS**

BASIC CODE: 1CEEC150 (INTERNALLY CROSS PILOTED)

Sub-assembly part numbers

BSP, steel

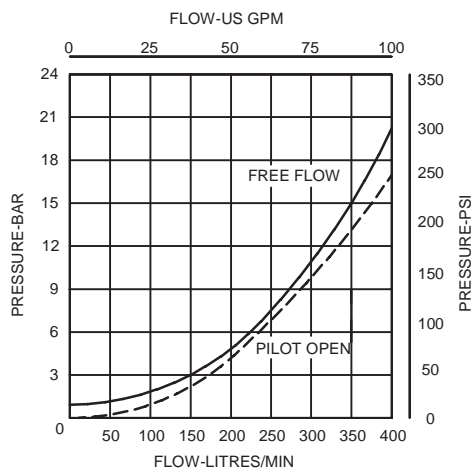
1 " BXP15687-8W-S-377



Tightening torque of "F" adjuster
locknut - 20 to 25 Nm

PRESSURE DROP

1CEEC350



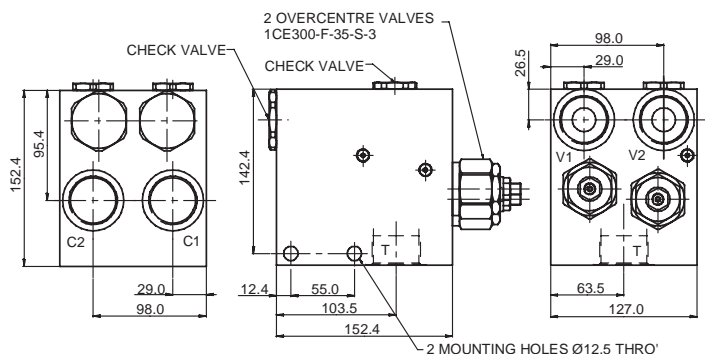
COMPLETE VALVE **1 1/4" PORTS**

BASIC CODE: 1CEEC350 (INTERNALLY CROSS PILOTED)

Sub-assembly part numbers

BSP, steel

1 1/4" DXP16844-10W-S-377



Tightening torque of "F" adjuster
locknut - 20 to 25 Nm

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CEEC***	F	10W	35	S	3	377
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Basic Code

1CEEC150 = Cartridges and Body

1CEEC350 = Cartridges and Body

Adjustment Means

F = Screw Adjustment

Port Sizes - Bodied Valves Only

8W = 1" BSP Valve & Cyl Port. 1/4" BSP Brake Port

10W = 1 1/4" BSP Valve & Cyl Port. 1/4" BSP Brake Port

Pressure Range @ 4.8 l/min

35 = 70-350 bar. Std setting 210 bar

Std setting made at 4.8 litres/min

Body Material

377 = Steel

– Pilot Ratio

3 = 3:1 - 1CEEC350 (Standard)

3 = 3.5:1 - 1CEEC150

8 = 8:1 - 1CEEC350

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

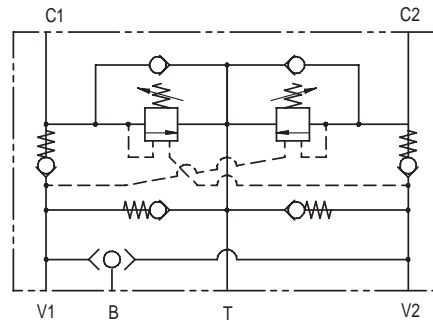
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1CEECSH SERIES MOTION CONTROL VALVE

WITH BRAKE SHUTTLE - PILOT ASSISTED

1CEECSH35



APPLICATION

Motion control and lock valves give static and dynamic control by regulating the flow into and out of hydraulic actuators. When installed close to an actuator, the valve can stop runaway in the event of hose burst. The valves also give dual thermal and overload relief protection.

A low pressure tank or charge line may be connected to the T port to provide a make-up flow to either actuator port.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

A system of check valves allows crossline relief for dynamic applications with the optional make up facility to compensate for any change in system volume.

PILOT RATIOS

2.5:1	Best suited for extremely unstable applications such as long booms or flexible frameworks.
5:1 (Standard)	Best suited for applications where the load and machine structure can induce instability.
10:1	Best suited for applications where the load remains relatively constant.

FEATURES

This valve provides complete circuit control and protection as with the standard motion control valve but has the addition of a brake release shuttle and brake port contained in a single body.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	30 litres/min (8 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. Extnal sufaces electroless nickel plated
Body Material	Steel
Mounting Position	Line mounted
Weight	2.03 kg (4.50 lbs)
Seal Kit Number	SK815 (Nitrile) SK815V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

Integrated Hydraulics Ltd

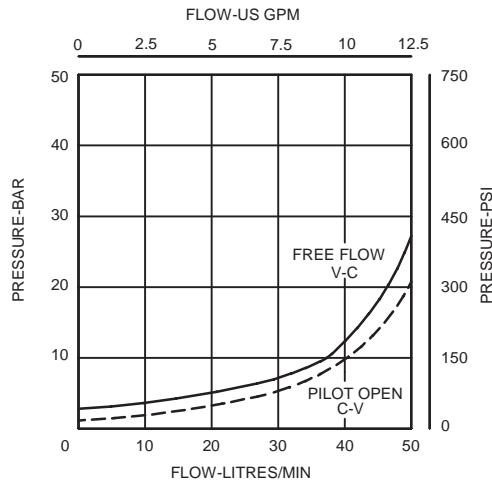
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PRESSURE DROP

2.5:1 & 5:1 versions



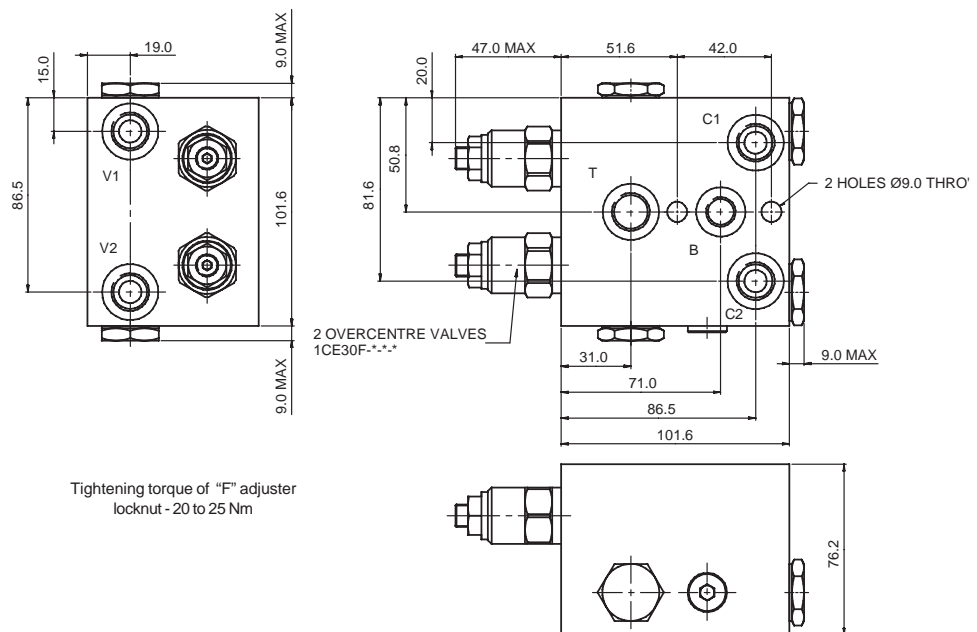
COMPLETE VALVE 3/8" PORTS

BASIC CODE: 1CEECSH35 (INTERNALLY CROSS PILOTED)

Sub-assembly part numbers

BSP, steel

3/8" CXP15947-3W-S-377



Tightening torque of "F" adjuster locknut - 20 to 25 Nm

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CEECSH35	F	3W	35	S	5	377	
Basic Code							Body Material
Adjustment Means							377 = Steel
F = Screw Adjustment							Pilot Ratio
N = Fixed - State pressure setting required							2 = 2.5:1
For fixed versions add setting in 10 bar increments to end of part number. Subject to a ±10% tolerance.							5 = 5:1 (standard)
Port Sizes - Bodied Valves Only							10 = 10:1
3W = 3/8" BSP Valve & Cyl Port. 1/4" BSP Brake Port							Seals
Pressure Range @ 4.8 l/min							S = Nitrile (For use with most industrial hydraulic oils)
35 = (2.5:1 and 5:1): 100-350 bar. Std setting 210 bar							SV = Viton (For high temperature and most special fluid applications)
(10:1): 120-350 bar. Std setting 210 bar							
Std setting made at 4.8 litres/min							

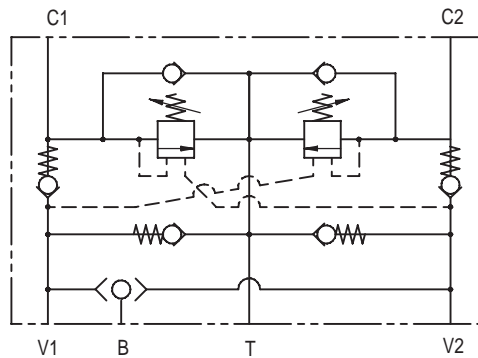
We reserve the right to change specifications without notice



1CEECSH SERIES MOTION CONTROL VALVE

WITH BRAKE SHUTTLE - PILOT ASSISTED

1CEECSH95



APPLICATION

Motion control and lock valves give static and dynamic control by regulating the flow into and out of hydraulic actuators. When installed close to an actuator, the valve can stop runaway in the event of hose burst. The valves also give dual thermal and overload relief protection.

A low pressure tank or charge line may be connected to the T port to provide a make-up flow to either actuator port.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

A system of check valves allows crossline relief for dynamic applications with the optional make up facility to compensate for any change in system volume.

PILOT RATIO

- 4:1 Best suited for applications where the load varies and machine structure can induce instability.
- 8:1 Best suited for applications where the load remains relatively constant.
- Other ratios available upon request.

FEATURES

This valve provides complete circuit control and protection as with the standard motion control valve but has the addition of a brake release shuttle and brake port contained in a single body.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	95 litres/min (25 US GPM)
Max Setting	Max Load Induced Pressure: 160 bar (2300 psi) (20) 270 bar (4000 psi) (35) Relief Setting: 350 bar (5000 psi) (35) 225 bar (3260 psi) (20)
Cartridge Material	Working parts hardened and ground steel. External surfaces electroless nickel plated
Body Material	Steel
Mounting Position	Line mounted
Weight	3.70 kg (8.20 lbs)
Seal Kit Number	SK814 (Nitrile) SK814V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

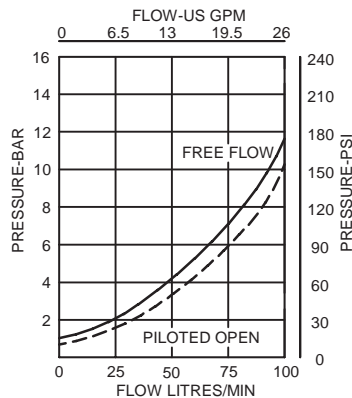
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PRESSURE DROP

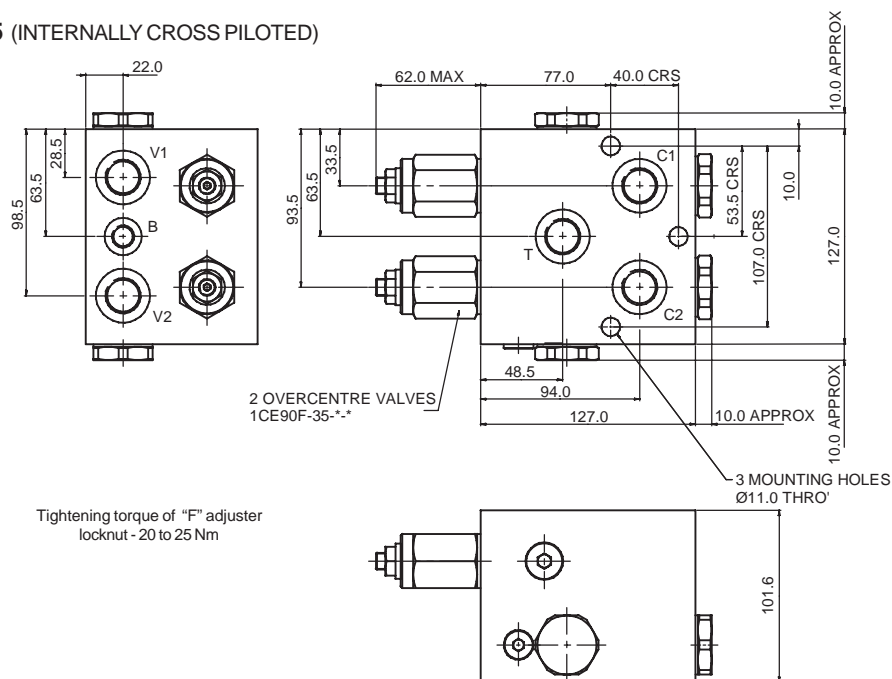


COMPLETE VALVE 3/4" PORTS

BASIC CODE: 1CEECSH95 (INTERNALLY CROSS PILOTED)

Sub-assembly part numbers

BSP, steel
3/4" BXP15936-6W-S-377



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CEECSH95 F 6W 35 S 4 377

Basic Code
1CEECSH95

Adjustment Means

F = Screw Adjustment

N = Fixed - State pressure setting required

For fixed versions add setting in 10 bar increments to end of part number. Subject to a ±10% tolerance.

Port Sizes - Bodied Valves Only

6W = 3/4" BSP Valve & Cyl Port. 1/4" BSP Brake Port

Pressure Range @ 4.8 l/min

20 = 70-225 bar. Std setting 100 bar

35 = 200-350 bar. Std setting 210 bar

Std setting made at 4.8 litres/min

Body Material

377 = Steel

Pilot Ratio

4 = 4:1 (Standard)

8 = 8:1

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

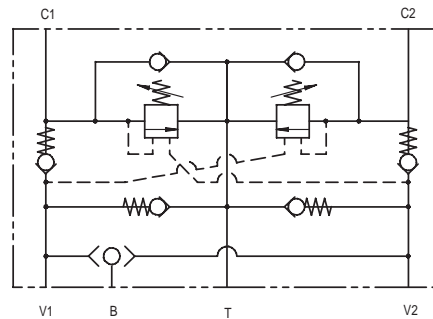
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1CEECSH SERIES MOTION CONTROL VALVE

WITH BRAKE SHUTTLE - PILOT ASSISTED

1CEECSH150 / 1CEECSH350



APPLICATION

Motion control and lock valves give static and dynamic control by regulating the flow into and out of hydraulic actuators. When installed close to an actuator, the valve can stop runaway in the event of hose burst. The valves also give dual thermal and overload relief protection.

A low pressure tank or charge line may be connected to the T port to provide a make-up flow to either actuator port.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows.

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

A system of check valves allows crossline relief for dynamic applications with the optional make up facility to compensate for any change in system volume.

PILOT RATIOS

- 3:1 Best suited for applications where load varies and machine structure can induce instability.
- 8:1 Best suited for applications where the load remains relatively constant.

FEATURES

This valve provides complete circuit control and protection as with the standard motion control valve, but has the addition of a brake release shuttle and brake port contained in a single body.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	1CEECSH150 150 l/min (40 US GPM) 1CEECSH350: 350 l/min (80 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces electroless nickel plated
Body Material	Steel
Mounting Position	Line mounted
Weight	1CEECSH150: 3.7 kg (8.2 lbs) 1CEECSH350: 8.2 kg (18.0 lbs)
Seal Kit Number	1CEECSH150: SK813 (Nitrile) SK813V (Viton) 1CEECSH350: SK635 (Nitrile) SK635V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	1CEECSH150: 0.3 millilitres/min nominal (5 dpm) 1CEECSH350: 4 millilitres/min nominal (60 dpm)
Nominal Viscosity Range	5 to 500 cSt

Integrated Hydraulics Ltd

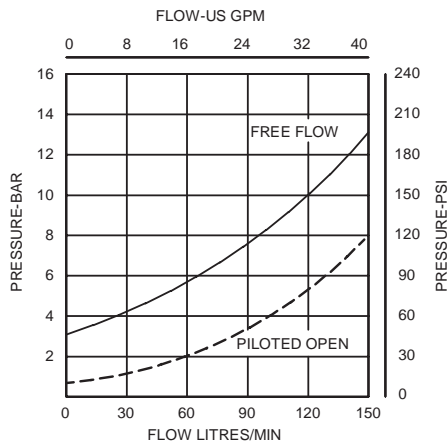
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PRESSURE DROP

1CEECSH150

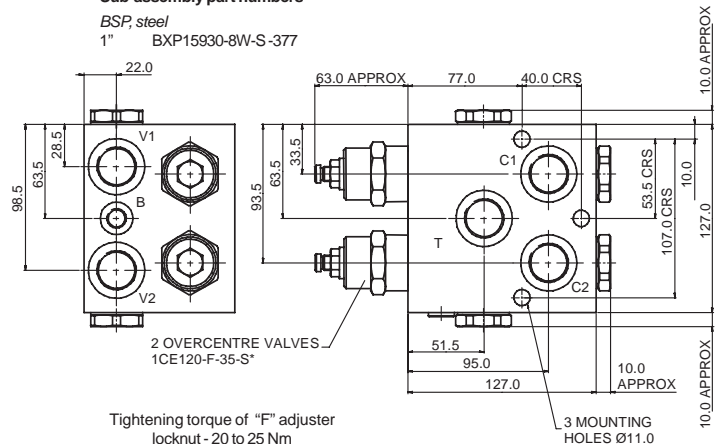


COMPLETE VALVE 1" PORTS

BASIC CODE: 1CEECSH150 (INTERNALLY CROSS PILOTED)

Sub-assembly part numbers

BSP, steel
1" BXP15930-8W-S-377

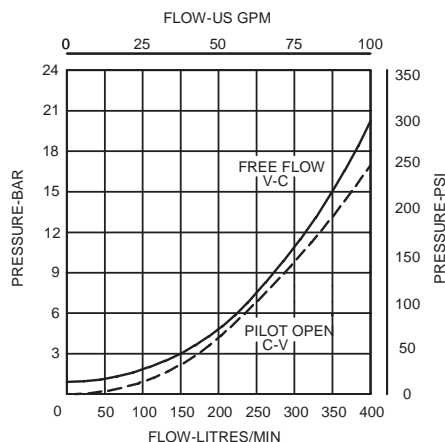


Tightening torque of "F" adjuster locknut - 20 to 25 Nm

PRESSURE DROP

Sub-assembly part numbers

BSP, steel
1 1/4" DXP22047-10W-S-377

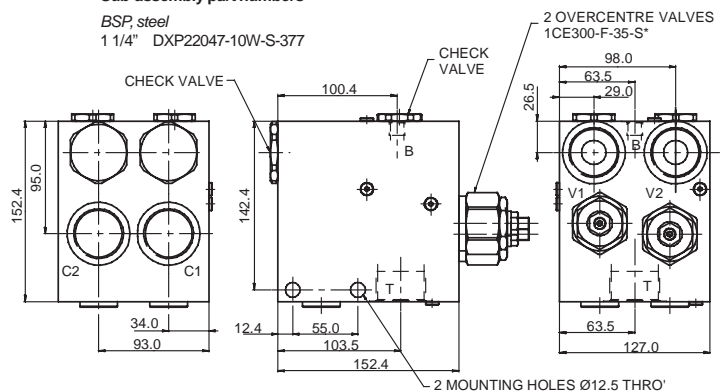


COMPLETE VALVE 1 1/4" PORTS

BASIC CODE: 1CEECSH350 (INTERNALLY CROSS PILOTED)

Sub-assembly part numbers

BSP, steel
1 1/4" DXP22047-10W-S-377



Tightening torque of "F" adjuster locknut - 20 to 25 Nm

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CEECSH* F 10W 35 S 3 377**

Basic Code

1CEECSH150 = Cartridges and Body*

1CEECSH350 = Cartridges and Body

Adjustment Means

F = Screw Adjustment

Port Sizes - Bodied Valves Only

8W = 1" BSP Valve & Cyl Port. 1/4" BSP Brake Port

10W = 1 1/4" BSP Valve & Cyl Port. 1/4" BSP Brake Port

Pressure Range @ 4.8 l/min

35 = 70-350 bar. Std setting 210 bar

Std setting made at 4.8 litres/min

Body Material

377 = Steel

Pilot Ratio

3 = 3:1 - 1CEECSH350 (Standard)

3 = 3.5:1 - 1CEECSH150

8 = 8:1 - 1CEECSH350

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)





1CEBL SERIES

These valves comply with International Standard ISO8643 for hydraulic excavators and backhoe loaders incorporating servo pilot systems. The valves' function is to prevent uncontrolled lowering of the boom in the event of hose rupture. Closure of the valve is activated by bringing the main control valve lever to the neutral position.

By separating the relief and pilot function into two individual cartridges, the pilot cartridge has no relieving function, hence any load on the valve does not affect its opening characteristics. Consequently, the valve will always open at the same pilot pressure/joystick position, regardless of load. This feature enables the valve to be tuned to open in harmony with the machine's own main control valve, giving better control.

The pilot cartridge is generally set to dwell 1 to 2 bar behind the main control valve, therefore the Integrated Hydraulics valve takes control in the event of hose failure.

When fitted to the arm/dipper cylinder, this dwell behind the main control valve prevents acceleration when 'arm down' is selected.

Fig. 1 and 2 show typical circuits utilising these components.

Line mountings or SAE flange mountings are available for direct fitment to the actuator. Where line mounted models are used it is essential that steel pipes are used between the valve and the actuator.

All components are manufactured in steel and are electroplated for corrosion protection.

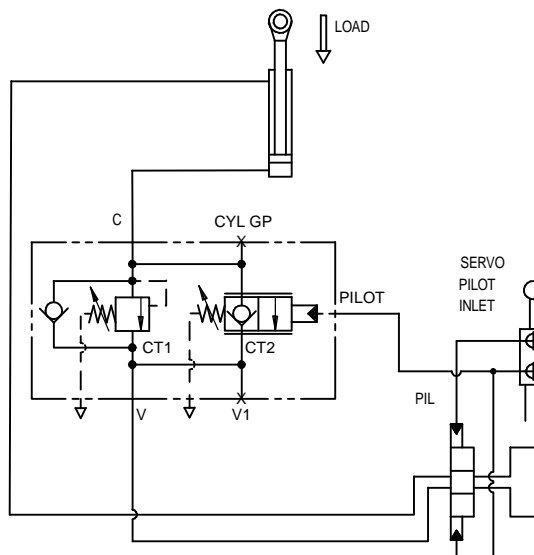
TYPICAL CIRCUIT

COMPACT MACHINERY

(see page 6-441 to 6-461)

For flows up to 30 and 40 litres/minute

FIG. 1

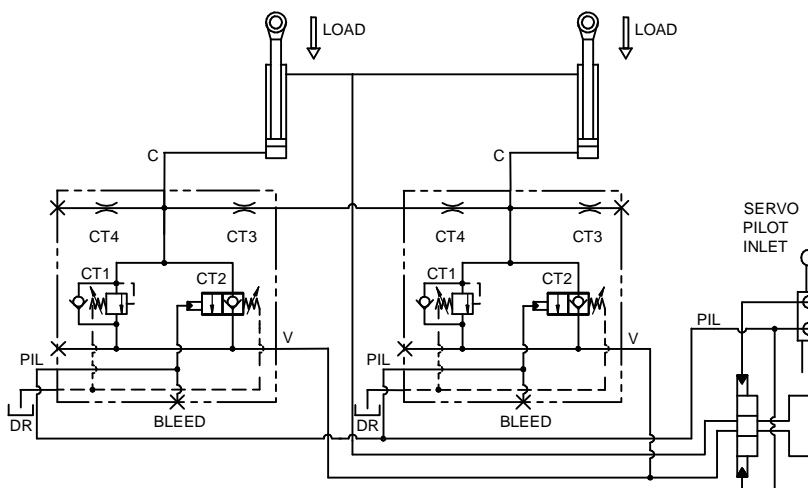


HEAVY MACHINERY

(see page 6-411 to 6-431 & 6-481)

For flows up to 250, 350 and 550 litres/minute

FIG. 2





BOOMLOC VALVES (DESIGNED & TESTED TO ISO8643)

The requirement for hose rupture protection on mobile plant is enshrined in law in many territories and likely to become so in many others. ISO8643 requires that, in the event of a hose failure while lowering a boom it should not accelerate to more than twice its original speed with the control lever held in the same position. Additionally the valves introduced to achieve this should not unduly effect the operation of the machine to which they are fitted. (The current 100% maximum increase may be reduced to 75% in the future). If a hose were to fail while a boom is lifting or static the load should be held in position. We have developed a range of hose rupture valves, designated "BoomLoc", that are designed to meet the stipulations of ISO8643 and can be applied to numerous different machines.

BoomLoc valves are reliable because they make use of standard off the shelf components that have been field proven, in most cases for many years. All our cartridge valves are manufactured to a high standard with moving parts hardened and precision finished to give a long trouble free service life. Their performance is predictable so set up and development times can be dramatically reduced even when applied to a new system. In service the valves perform as intended with cartridges having been tested to over 1,000,000 cycles in our development department and having been used for many years in the field. When operating under normal circumstances, i.e. with hoses intact, BoomLoc valves offer high efficiency, as the hydraulic fluid is free to pass through the valve to the cylinder with negligible pressure loss. And by selecting the most appropriate package to match the performance of any given directional valve pressure losses in the return direction can be kept to an absolute minimum.

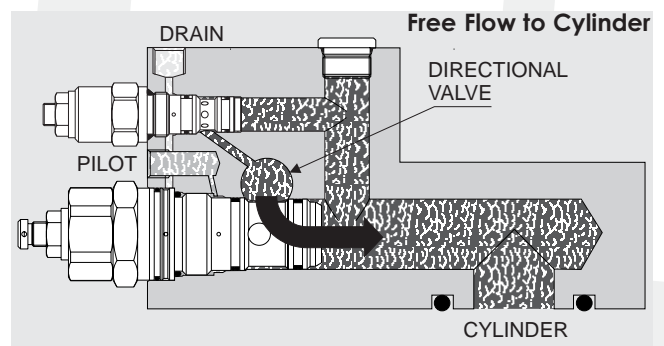
BoomLoc valves can provide a very compact solution. The valve should be mounted on the cylinder, either directly onto its port or connected to the port by rigid tube, so space can be quite restricted. Using Integrated Hydraulics Boomloc valves unique design potential to the full, transfer plates, commonly employed to permit the fitting of more bulky valves can often be eliminated. The block can be designed to suit the customer's installation and can even be done away with if the cartridge valves are incorporated into cylinder end caps thus dramatically reducing the space requirement and the cost of the overall package. Furthermore additional features can be incorporated in the block making the machine more versatile.

To achieve the desired protection without adversely effecting the operation of the machine it requires the accurate balancing of the hose rupture valve and the main directional valve. In order to work effectively the opening of the hose rupture valve should, ideally, lag behind that of the directional valve and the difference in pressure drop should remain constant throughout the operating flow range. To achieve this the hose rupture valve should be matched to the system in which it is employed, a set up that works on one type of

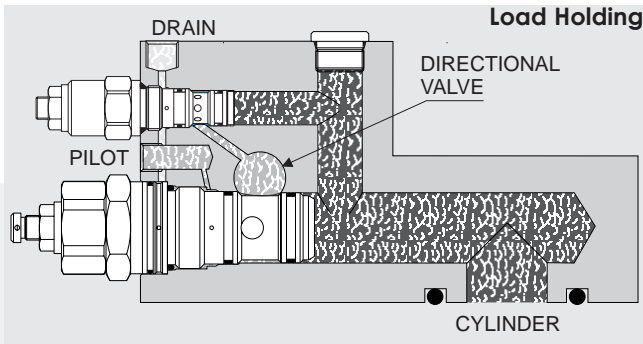
machine would not necessarily work on another. Due to the unique seat and poppet arrangement in the 1CPB series cartridges used in their "BoomLoc" range and the flexibility of the cartridge valve design "BoomLoc" valves can be tailored to suit most directional valves and so provide exceptionally fine control. A level of control that is particularly desired for levelling and grading, which can reduce (if not eliminate) the "washer board" effect frequently found when other valves are used. This fine control also has the benefits of enabling the operator to accurately position loads during craning operations.

Reduced installation costs can be realised using these "BoomLoc" valves as they use a simple direct SAE mounting to cylinder. In order to minimise stock requirements we have, where possible designed the cylinder port face to be suitable for both SAE3000 and 6000 flanges. A pilot bleed port is available on most valves simplifying installation further. Service costs are also minimal, in the unlikely event of a BoomLoc valve being damaged, repair usually just involves the replacement of one or two self-contained cartridges. What is more there is rarely any need to remove the block from the cylinder when changing the cartridges - reducing the risk of the ingress of contaminants and the down time of the machine. Spares inventory is frequently reduced as the same two, standard, off-the shelf cartridges (albeit set differently) are often used on a wide range of machines.

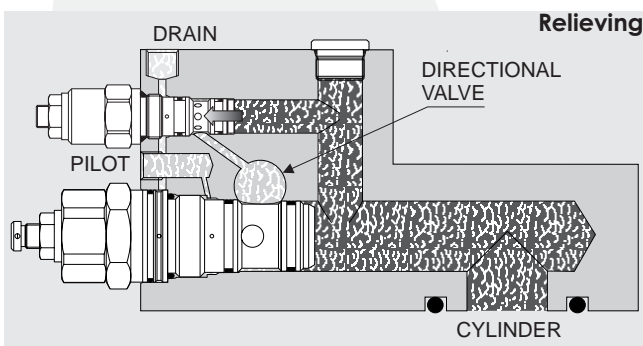
OPERATION



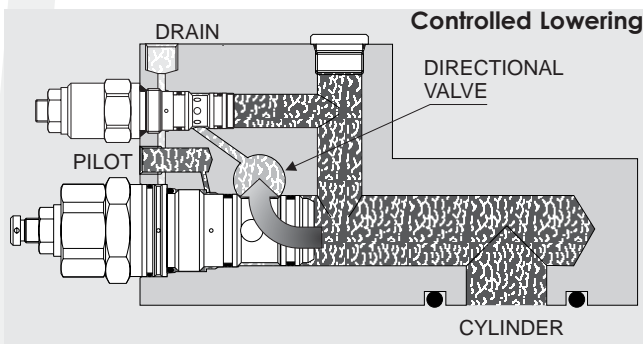
Upon operating the control to raise a boom, pilot pressure from the hydraulic remote control unit operates the appropriate spool in the main directional valve, permitting flow to the cylinder. At the cylinder the flow passes through our Hose Rupture Valve (HRV) check sections with minimal pressure loss and enters the cylinder. (The fluid from the other end of the cylinder flows directly to tank via the main control valve).



When the control lever is returned to neutral, the check valves in the HRV close and any return flow is blocked, the load is now locked in position.



Cavitation and excessive pressure in the boom cylinder, (bottom end circuit), is prevented by an overload relief and make up check, located in the HRV. Flow being returned to tank via the main control valve port relief.



When the control lever is pushed forward to the boom lower position, pilot pressure from the hydraulic remote control unit operates the appropriate section of the main directional valve, opening flow from the cylinder return line to tank. At the same time the pilot pressure opens the main poppet of the HRV, thus allowing oil to flow from the bottom end of the cylinder to the return line. The rate at which the boom descends is dependent on the position of the poppet in the HRV and the spool in the main directional valve. So in the event of a total hose failure the HRV will prevent the boom accelerating above twice its original speed. As the flow rate is now dictated by the pressure drop across only the BoomLoc valve. Releasing the control lever will permit the poppet in the BoomLoc HRV to close stopping the boom from further descent.

BOOMLOC VALVES SET-UP PROCEDURES

For reasons of safety it is recommended that ALL adjustments to the Hose Rupture Valve be carried out with the bucket rested on the floor.

Unless otherwise requested the cartridges are preset to 350 bar (relief cartridge) and 10 bar (pilot cartridge, part number 1CPB** or 1CPBD**). The pilot valve will normally require adjustment, but the relief setting of 350 bar is generally suitable for most applications and ensures the maximum protection of the cylinders. Check the maximum pressure of the system and adjust the relief valve if required. Prior to all adjustment ensure pilot line has been fully bled. This can be achieved by operating the joystick to either roll in or lower the respective cylinder and opening the bleed port on the Hose Rupture Valve. In cases where no "BLEED" port is provided, disconnect the pilot hose from the Hose Rupture Valve and running it to a suitable container should suffice.

Relief Valve setting: The relief setting of 350 bar has been calculated to meet most systems but can be adjusted to individual requirements. It is advised that the setting be between 10 and 20% higher than the main control valve. To increase setting, screw the adjuster clockwise to increase pressure at a rate of approximately 65 bar per full turn. To decrease setting, screw the adjuster anti-clockwise to decrease pressure at the same rate.

Pilot Cartridge setting: To successfully set the pilot cartridge pressure, two 400 bar and one 50 bar gauges need to be used. On the Hose Rupture Valve, connect one 400 bar gauge to the "E" port where provided (or the cylinder port if no "E" port) and the other 400 bar gauge in the valve inlet line "V", and connect the 50 bar gauge in the pilot line "P".

The procedure can be related to both the Arm cylinder and the Boom cylinders but for the ease of explanation, the following procedure is for Boom cylinders only.

- 1 Fully swing out Arm cylinder. Raise Boom to full extension and at the end of its stroke record the pressure in the valve and cylinder gauges.
- 2 To check setting, slowly move joystick to lower Boom. When the gauge in the valve line starts to fall, it is a signal that the main control valve has started to open, at this point note the setting in the pilot line, typically 8 bar.
- 3 Continue to slowly operate the joystick and note the reading in the pilot line when the gauge in the cylinder line starts to fall. This indicates the setting of the pilot cartridge (1CPB(D), typically 10 bar.

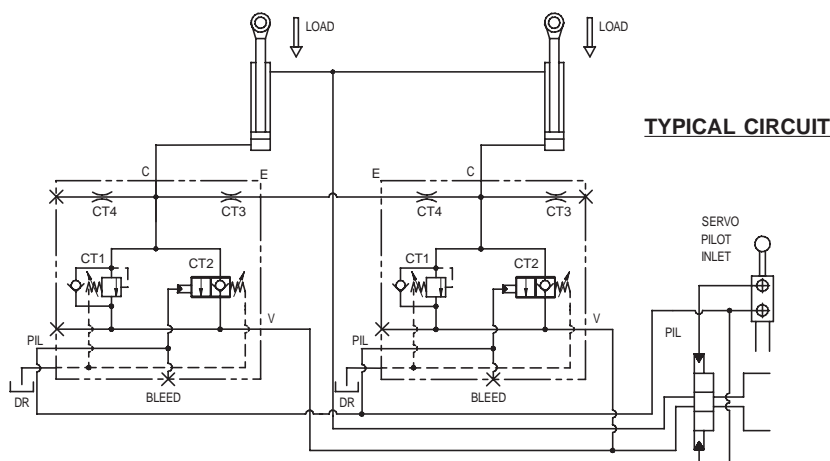
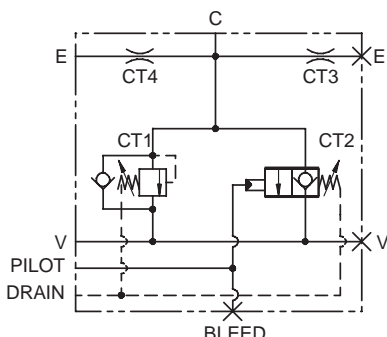
It is recommended that the Pilot Cartridge should dwell between 1.5 and 2 bar behind the Main Control Valve. If the pilot valve is set too low, pressure at "E" falls before "V" - adjust pilot valve clockwise.

If the difference between 2 and 3 above is greater than 2 bar - adjust the pilot valve anti-clockwise.



1CEBL SERIES LOAD CONTROL / HOLDING VALVE c/w Independent Pilot Control HOSE BURST PROTECTION - FLANGE MOUNTED (REF: ISO 8643)

1CEBL256



6

APPLICATION

These overcentre valves are suitable for use on the boom and dipper cylinders of an excavator to help the manufacturer or user comply with standard ISO8643.

They were designed to give relief, load holding and hose failure protection to systems where a pilot system controls the directional valves.

OPERATION

By connecting the hose rupture valve pilot in parallel with the directional spool valve pilot, and adjusting the opening characteristics of the hose rupture valve to suit that of the spool valve "BoomLoc" may be set so as not to interfere with the normal operation of the machine. Fine adjustment of the pilot pressure permits the optimum setting to be made in differing operating systems.

Both the pilot and the relief sections are unaffected by backpressure, enabling the service line relief's to operate normally. In the event of hose failure, the control will be passed from the main spool to the "BoomLoc" valve, maintaining control of the cylinder.

Regardless of the load the pilot pressure requirement remains constant as the valve is unaffected by load induced pressure, the poppet being fully balanced with zero differential area.

FEATURES

This is a compact design with good dirt tolerance. Hardened poppets and seats provide excellent load holding characteristics with all the advantages of the cartridge insert.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	250 litres/min (66 US GPM)
Max Setting	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces electroless nickel plated and passivated
Body Material	Bright drawn mild steel bar. Zinc plated and passivated
Mounting Position	Flange mounted
Weight	7.5 kg (16.5lbs)
Seal Kit Number	SK1162P (Polyurethane/Nitrile)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.6 millilitres/min max (10 dpm)
Nominal Viscosity Range	5 to 500 cSt

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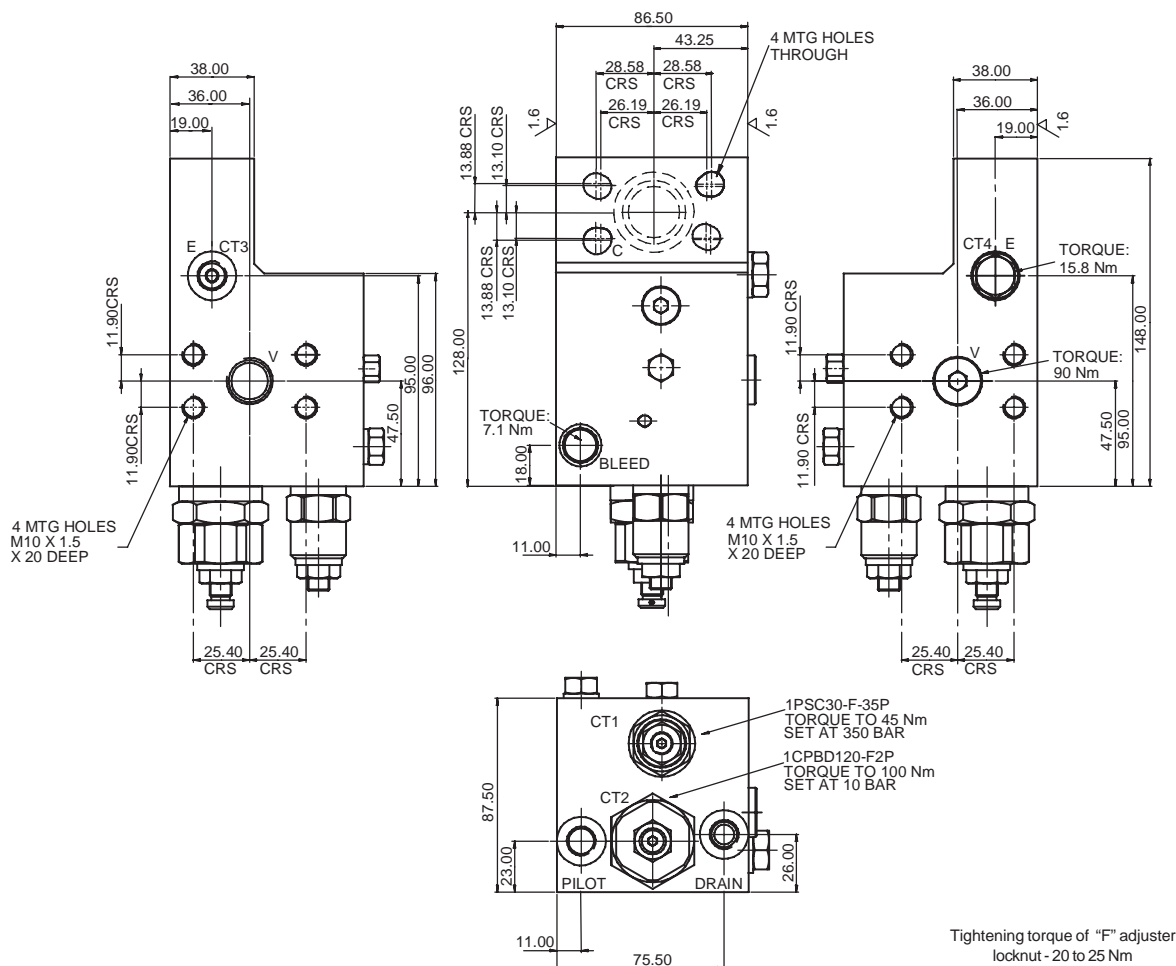
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Website: www.integratedhydraulics.com

COMPLETE VALVE FLANGE MOUNTED

BASIC CODE: 1CEBL256

Note: Cylinder port bolt holes are slotted for fitment to both SAE 3000 & SAE 6000 mounting faces.



Tightening torque of "F" adjuster
locknut - 20 to 25 Nm

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CEBL256	F	3/4	6	35	P
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Basic Code_____

1CEBL256 = Cartridges and Body

Adjustment Means_
F = Screw Adjustment

Port Size

3/4" = 3/4" SAE Flange Cylinder Port
(Slotted for 3000 and 6000)
3/4" SAE Flange Valve Port (Thread G1/2)
1/8" BSP Bleed Port
1/4" BSP All Other Ports

Seals

P = Contains polyurethane and standard seal.

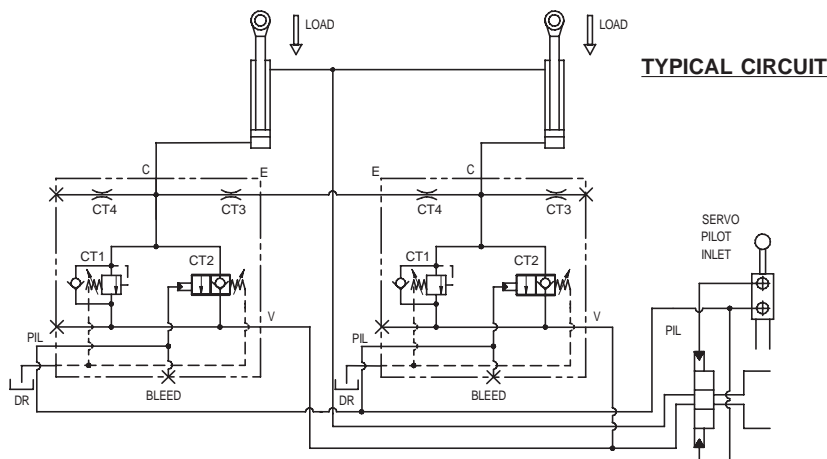
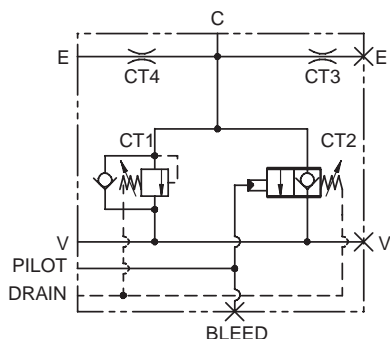
Pressure Range @ 4.8 l/min
35 = 70-350 bar. Std setting 350 bar
 Std Setting made at 4.8 litres/min

SAE Port Type
6 = SAE 6000
 (Valve Port)



1CEBL SERIES LOAD CONTROL / HOLDING VALVE c/w Independent Pilot Control HOSE BURST PROTECTION - FLANGE MOUNTED (REF: ISO 8643)

1CEBL356



6

APPLICATION

These overcentre valves are suitable for use on the boom and dipper cylinders of an excavator to help the manufacturer or user comply with standard ISO8643.

They were designed to give relief, load holding and hose failure protection to systems where a pilot system controls the directional valves.

OPERATION

By connecting the hose rupture valve pilot in parallel with the directional spool valve pilot, and adjusting the opening characteristics of the hose rupture valve to suit that of the spool valve "BoomLoc" may be set so as not to interfere with the normal operation of the machine. Fine adjustment of the pilot pressure permits the optimum setting to be made in differing operating systems.

Both the pilot and the relief sections are unaffected by backpressure, enabling the service line relief's to operate normally. In the event of hose failure, the control will be passed from the main spool to the "BoomLoc" valve, maintaining control of the cylinder.

Regardless of the load the pilot pressure requirement remains constant as the valve is unaffected by load induced pressure, the poppet being fully balanced with zero differential area.

FEATURES

This is a compact design with good dirt tolerance. Hardened poppets and seats provide excellent load holding characteristics with all the advantages of the cartridge insert.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	350 litres/min (92 US GPM)
Max Setting	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces electroless nickel plated and passivated
Body Material	Bright drawn mild steel bar. Zinc plated and passivated
Mounting Position	Flange mounted
Weight	7.5 kg (16.5 lbs)
Seal Kit Number	SK1161P (Polyurethane/Nitrile)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.6 millilitres/min max (10 dpm)
Nominal Viscosity Range	5 to 500 cSt

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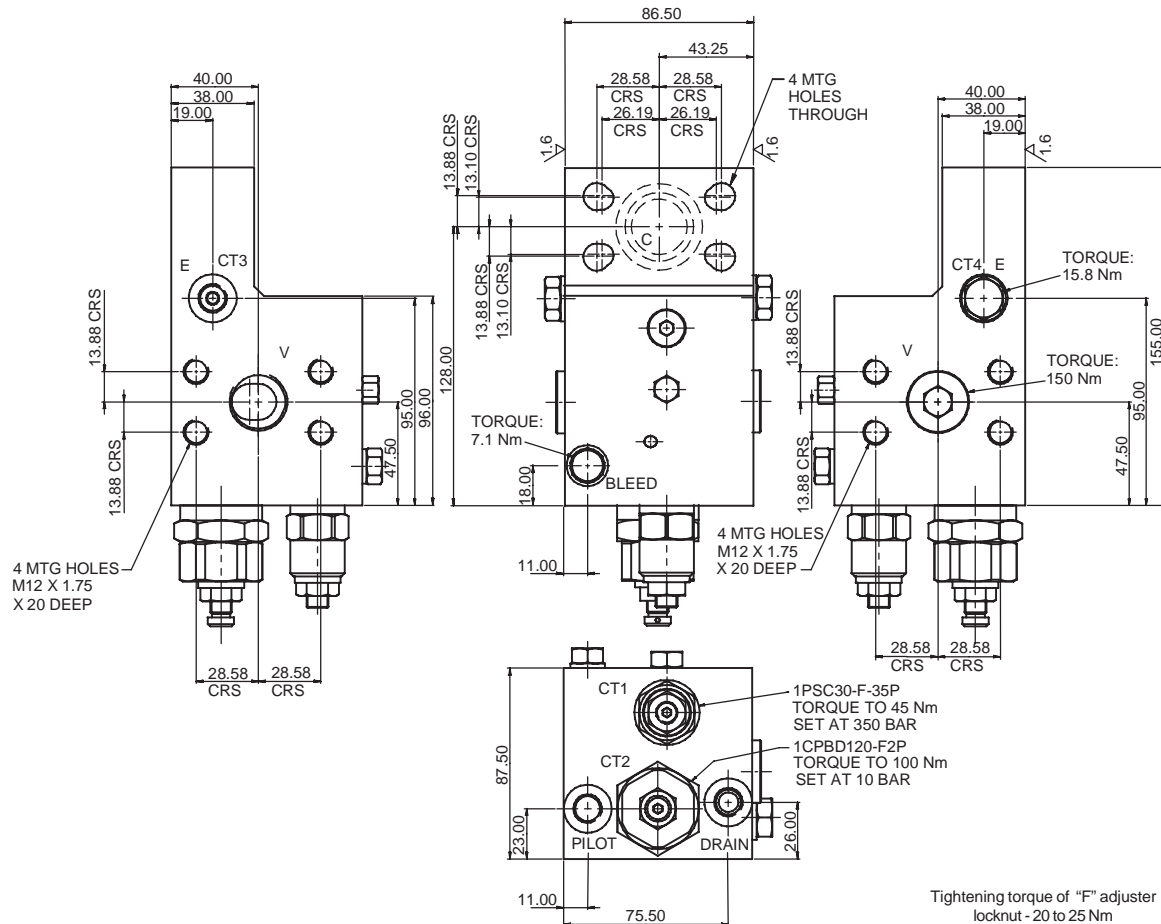
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Website: www.integratedhydraulics.com

COMPLETE VALVE FLANGE MOUNTED

BASIC CODE: 1CEBL356

Note: Cylinder port bolt holes are slotted for fitment to both SAE 3000 & SAE 6000 mounting faces.



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CEBL356 F 1 6 35 P

Basic Code
1CEBL356 = Cartridges and Body

Adjustment Means
F = Screw Adjustment

Port Size
1 = 1" SAE Flange Cylinder Port
(Slotted for 3000 and 6000)
1" SAE Flange Valve Port (Thread G 3/4)
1/8" BSP Bleed Port
1/4" BSP All Other Ports

Seals
P = Contains polyurethane and standard seal.

Pressure Range @ 4.8 l/min
35 = 70-350 bar. Std setting 350 bar
Std Setting made at 4.8 litres/min

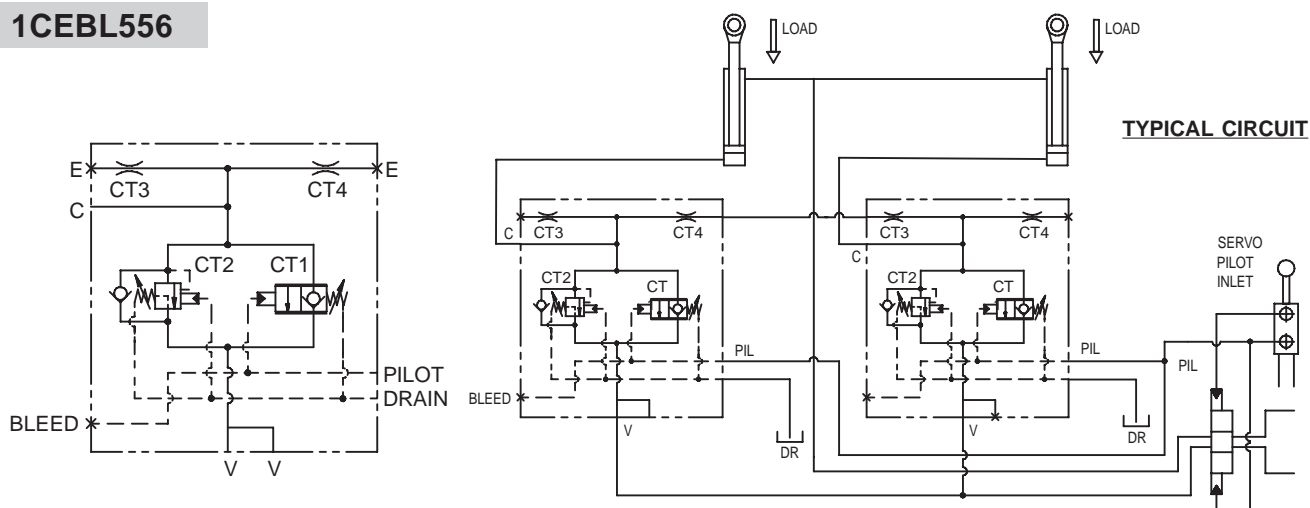
SAE Port Type
6 = SAE 6000 (Valve Port)

We reserve the right to change specifications without notice



1CEBL SERIES LOAD CONTROL / HOLDING VALVE c/w Independent Pilot Control HOSE BURST PROTECTION - SAE FLANGE MOUNTED (REF: ISO 8643)

1CEBL556



6

APPLICATION

These overcentre valves are suitable for use on the boom and dipper cylinders of an excavator to help the manufacturer or user comply with standard ISO8643.

They were designed to give relief, load holding and hose failure protection to systems where a pilot system controls the directional valves.

OPERATION

By connecting the hose rupture valve pilot in parallel with the directional spool valve pilot, and adjusting the opening characteristics of the hose rupture valve to suit that of the spool valve "BoomLoc" may be set so as not to interfere with the normal operation of the machine. Fine adjustment of the pilot pressure permits the optimum setting to be made in differing operating systems.

Both the pilot and the relief sections are unaffected by backpressure, enabling the service line relief's to operate normally. In the event of hose failure, the control will be passed from the main spool to the "BoomLoc" valve, maintaining control of the cylinder.

Regardless of the load the pilot pressure requirement remains constant as the valve is unaffected by load induced pressure, the poppet being fully balanced with zero differential area.

FEATURES

This is a compact design with good dirt tolerance. Hardened poppets and seats provide excellent load holding characteristics with all the advantages of the cartridge insert.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	550 litres/min (145 US GPM)
Max Setting	400 bar (5800 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces electroless nickel plated and passivated
Body Material	Bright drawn mild steel bar. Zinc plated and passivated
Mounting Position	Flange mounted
Weight	21 kg (46.2 lbs)
Seal Kit Number	SK1163P (Polyurethane/Nitrile)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	4.3 millilitres/min max (70 dpm)
Nominal Viscosity Range	5 to 500 cSt

Integrated Hydraulics Ltd

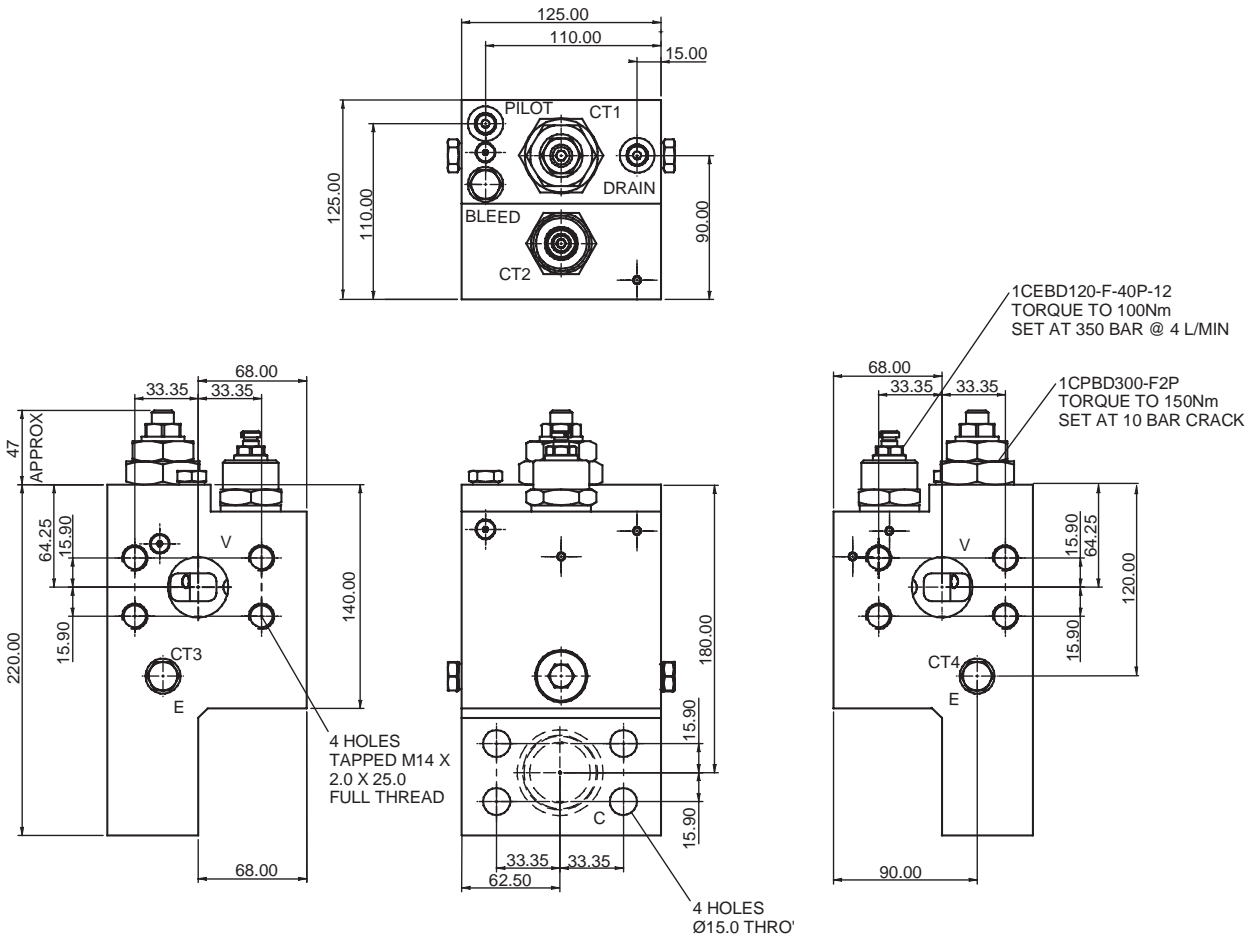
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7047 Spinach Drive, Mentor, Ohio 44060, USA
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COMPLETE VALVE FLANGE MOUNTED

BASIC CODE: 1CEBL556



Tightening torque of "F" adjuster locknut - 20 to 25 Nm

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CEBL556 F 5/4 6 40 P

Basic Code
1CEBL556 = Cartridges and Body

Adjustment Means
F = Screw Adjustment

Port Size
5/4 = 1 1/4" SAE Flange Cylinder Port
1 1/4" SAE Flange Valve Port
1/4" BSP All Other Ports

SAE Port Type
6 = SAE 6000

Seals
P = Contains polyurethane and standard seal.

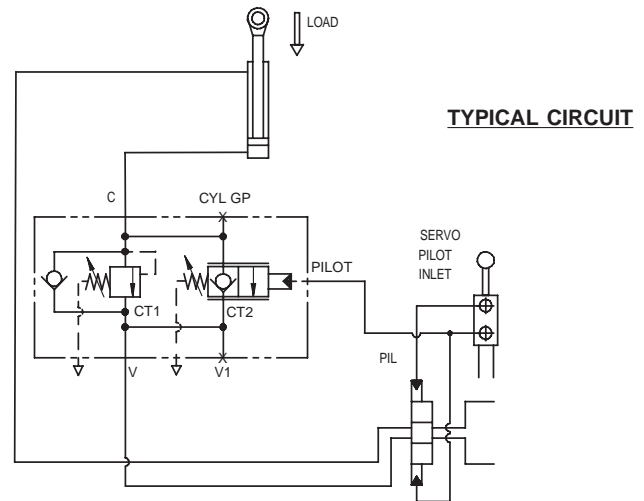
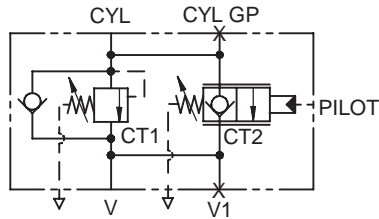
Pressure Range @ 4.8 l/min
40 = 70-400 bar. Std setting 350 bar
Std Setting made at 4.8 litres/min

We reserve the right to change specifications without notice



1CEBL SERIES LOAD CONTROL / HOLDING VALVE c/w Independent Pilot Control HOSE BURST PROTECTION - LINE MOUNTED (REF: ISO 8643)

1CEBL31



6

APPLICATION

These overcentre valves are suitable for use on the boom and dipper cylinders of an excavator to help the manufacturer or user comply with standard ISO8643.

They were designed to give relief, load holding and hose failure protection to systems where a pilot system controls the directional valves.

OPERATION

By connecting the hose rupture valve pilot in parallel with the directional spool valve pilot, and adjusting the opening characteristics of the hose rupture valve to suit that of the spool valve "BoomLoc" may be set so as not to interfere with the normal operation of the machine. Fine adjustment of the pilot pressure permits the optimum setting to be made in differing operating systems.

Both the pilot and the relief sections are unaffected by backpressure, enabling the service line relief's to operate normally. In the event of hose failure, the control will be passed from the main spool to the "BoomLoc" valve, maintaining control of the cylinder.

Regardless of the load the pilot pressure requirement remains constant as the valve is unaffected by load induced pressure, the poppet being fully balanced with zero differential area.

FEATURES

This is a compact design with good dirt tolerance. Hardened poppets and seats provide excellent load holding characteristics with all the advantages of the cartridge insert.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	30 litres/min (8 US GPM)
Max Setting	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces electroless nickel plated and passivated
Body Material	Bright drawn mild steel bar. Zinc plated and passivated
Mounting Position	Line mounted
Weight	2 kg (4.4 lbs)
Seal Kit Number	SK1164P (Polyurethane/Nitrile)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.6 millilitres/min max (10 dpm)
Nominal Viscosity Range	5 to 500 cSt

Integrated Hydraulics Ltd

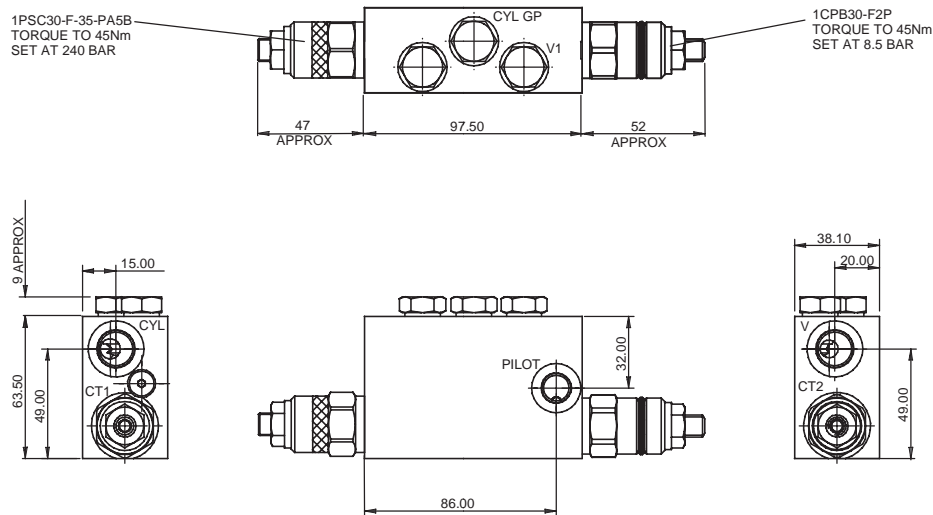
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COMPLETE VALVE LINE MOUNTED

BASIC CODE: 1CEBL31



Tightening torque of "F" adjuster
locknut - 20 to 25 Nm

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CEBL31 F 3W 35 P

Basic Code
1CEBL31 = Cartridges and Body

Adjustment Means
F = Screw Adjustment

Port Size
3W = 3/8" BSP Cylinder Port
3/8" BSP Valve Port
1/4" BSP All Other Ports

Seals
P = Contains polyurethane and
standard seal.

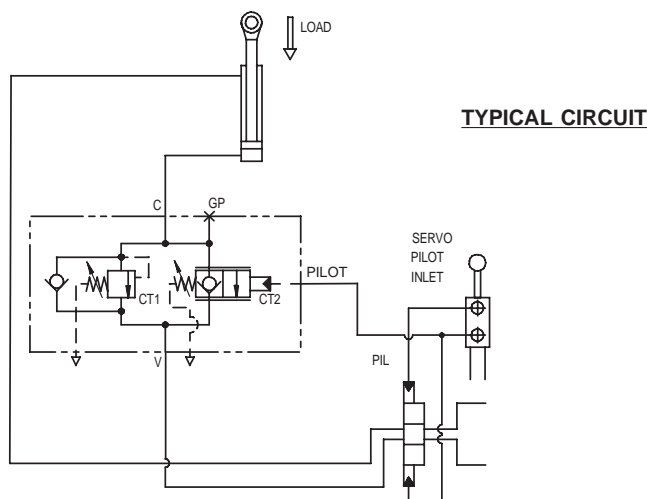
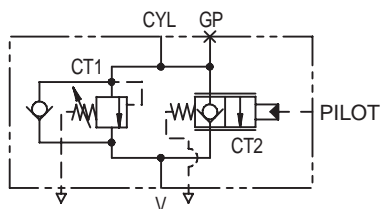
Pressure Range @ 4.8 l/min
35 = 70-350 bar. Std setting 240 bar
Std Setting made at 4.8 litres/min

We reserve the right to change specifications without notice



1CEBL SERIES LOAD CONTROL / HOLDING VALVE c/w Independent Pilot Control HOSE BURST PROTECTION - SAE FLANGE MOUNTED (REF: ISO 8643)

1CEBL31



6

APPLICATION

These overcentre valves are suitable for use on the boom and dipper cylinders of an excavator to help the manufacturer or user comply with standard ISO8643.

They were designed to give relief, load holding and hose failure protection to systems where a pilot system controls the directional valves.

OPERATION

By connecting the hose rupture valve pilot in parallel with the directional spool valve pilot, and adjusting the opening characteristics of the hose rupture valve to suit that of the spool valve "BoomLoc" may be set so as not to interfere with the normal operation of the machine. Fine adjustment of the pilot pressure permits the optimum setting to be made in differing operating systems.

Both the pilot and the relief sections are unaffected by backpressure, enabling the service line relief's to operate normally. In the event of hose failure, the control will be passed from the main spool to the "BoomLoc" valve, maintaining control of the cylinder.

Regardless of the load the pilot pressure requirement remains constant as the valve is unaffected by load induced pressure, the poppet being fully balanced with zero differential area.

FEATURES

This is a compact design with good dirt tolerance. Hardened poppets and seats provide excellent load holding characteristics with all the advantages of the cartridge insert.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	30 litres/min (8 US GPM)
Max Setting	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces electroless nickel plated and passivated
Body Material	Bright drawn mild steel bar. Zinc plated and passivated
Mounting Position	Flange mounted
Weight	2 Kg (4.4 lbs)
Seal Kit Number	SK1165P (Polyurethane/Nitrile)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.6 millilitres/min max (10 dpm)
Nominal Viscosity Range	5 to 500 cSt

Integrated Hydraulics Ltd

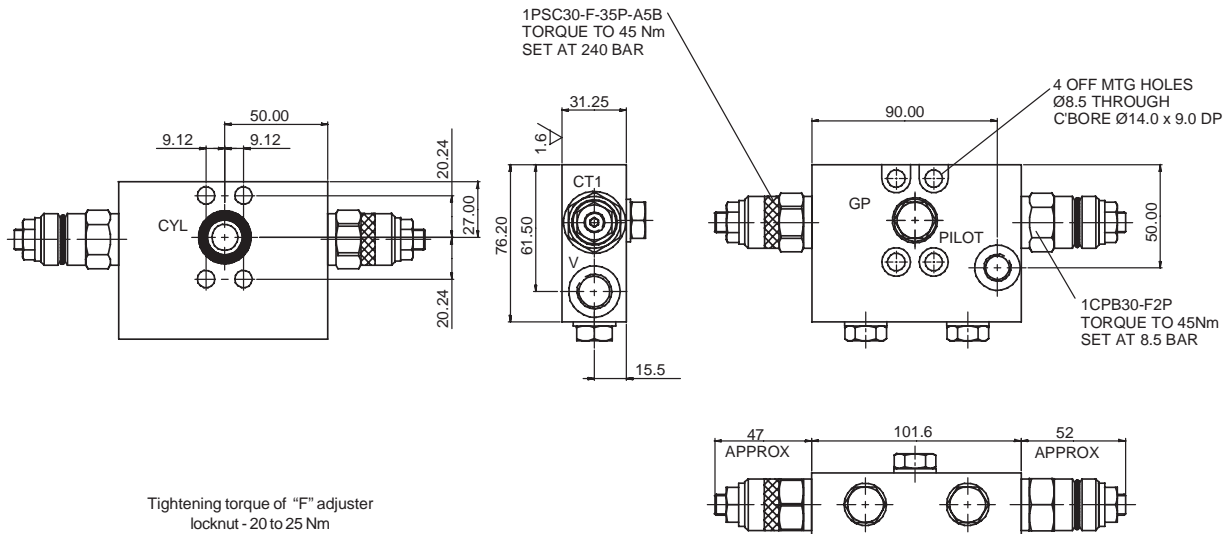
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COMPLETE VALVE FLANGE MOUNTED

BASIC CODE: 1CEBL31



6

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CEBL31 F 1/2 6 35 P

Basic Code

1CEBL31 = Cartridges and Body

Adjustment Means

F = Screw Adjustment

Port Size

1/2 = 1/2" SAE Flange Cylinder Port
3/8" BSP Valve Port
1/4" BSP All Other Ports

SAE Port Type

6 = SAE 6000

Seals

P = Contains polyurethane and standard seal.

Pressure Range @ 4.8 l/min

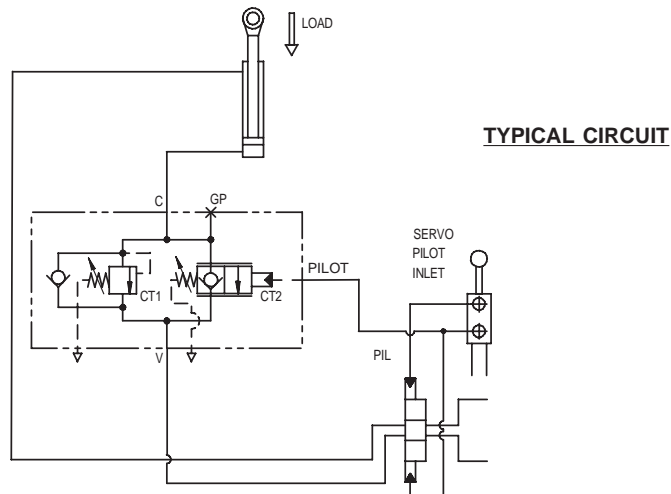
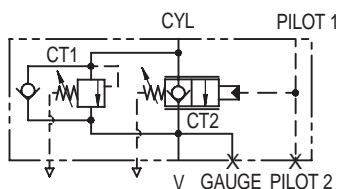
35 = 70-350 bar. Std setting 240 bar
Std Setting made at 4.8 litres/min

We reserve the right to change specifications without notice



1CEBL SERIES LOAD CONTROL / HOLDING VALVE c/w Independent Pilot Control HOSE BURST PROTECTION - LINE MOUNTED (REF: ISO 8643)

1CEBL31



6

APPLICATION

These overcentre valves are suitable for use on the boom and dipper cylinders of an excavator to help the manufacturer or user comply with standard ISO8643.

They were designed to give relief, load holding and hose failure protection to systems where a pilot system controls the directional valves.

OPERATION

By connecting the hose rupture valve pilot in parallel with the directional spool valve pilot, and adjusting the opening characteristics of the hose rupture valve to suit that of the spool valve "BoomLoc" may be set so as not to interfere with the normal operation of the machine. Fine adjustment of the pilot pressure permits the optimum setting to be made in differing operating systems.

Both the pilot and the relief sections are unaffected by backpressure, enabling the service line relief's to operate normally. In the event of hose failure, the control will be passed from the main spool to the "BoomLoc" valve, maintaining control of the cylinder.

Regardless of the load the pilot pressure requirement remains constant as the valve is unaffected by load induced pressure, the poppet being fully balanced with zero differential area.

FEATURES

This is a compact design with good dirt tolerance. Hardened poppets and seats provide excellent load holding characteristics with all the advantages of the cartridge insert.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	30 litres/min (8 US GPM)
Max Setting	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces electroless nickel plated and passivated
Body Material	Bright drawn mild steel bar. Zinc plated and passivated
Mounting Position	Line mounted
Weight	2 Kg (4.4 lbs)
Seal Kit Number	SK1164P (Polyurethane/Nitrile)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.6 millilitres/min max (10 dpm)
Nominal Viscosity Range	5 to 500 cSt

Integrated Hydraulics Ltd

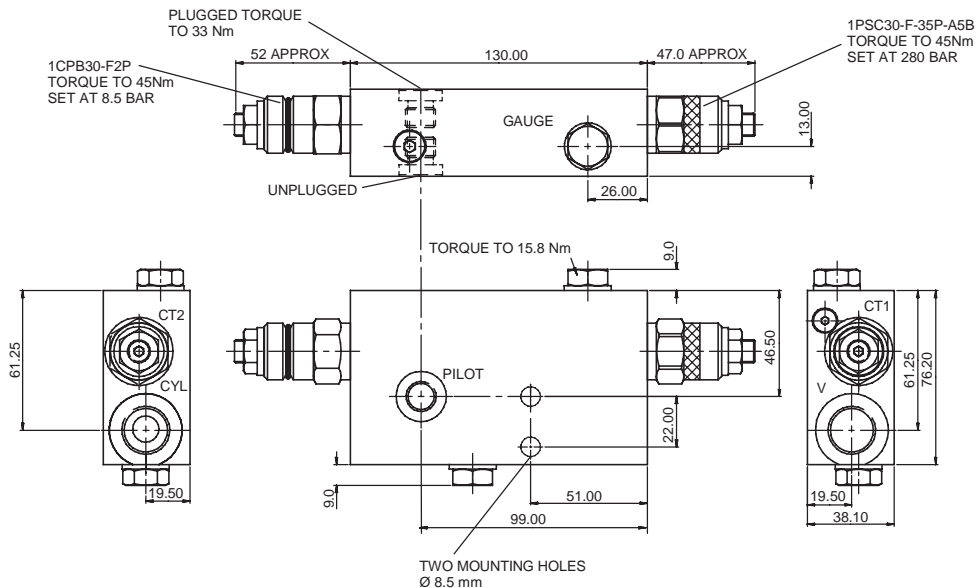
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COMPLETE VALVE LINE MOUNTED

BASIC CODE: 1CEBL31



Tightening torque of "F" adjuster
locknut - 20 to 25 Nm

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CEBL31 F 4W 35 P

Basic Code
1CEBL31 = Cartridges and Body

Adjustment Means
F = Screw Adjustment

Port Size
4W = 1/2" BSP Cylinder Port
1/2" BSP Valve Port
1/4" BSP All Other Ports

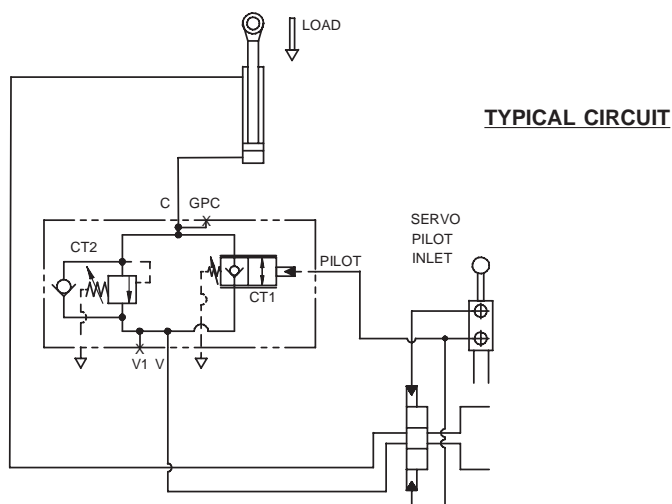
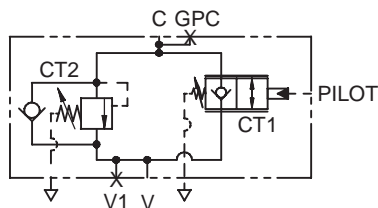
Seals
P = Contains polyurethane and
standard seal.

Pressure Range @ 4.8 l/min
35 = 70-350 bar. Std setting 280 bar
Std Setting made at 4.8 litres/min



1CEBL SERIES LOAD CONTROL / HOLDING VALVE c/w Independent Pilot Control HOSE BURST PROTECTION - LINE MOUNTED (REF: ISO 8643)

1CEBL91



6

APPLICATION

These overcentre valves are suitable for use on the boom and dipper cylinders of an excavator to help the manufacturer or user comply with standard ISO8643.

They were designed to give relief, load holding and hose failure protection to systems where a pilot system controls the directional valves.

OPERATION

By connecting the hose rupture valve pilot in parallel with the directional spool valve pilot, and adjusting the opening characteristics of the hose rupture valve to suit that of the spool valve "BoomLoc" may be set so as not to interfere with the normal operation of the machine. Fine adjustment of the pilot pressure permits the optimum setting to be made in differing operating systems.

Both the pilot and the relief sections are unaffected by backpressure, enabling the service line relief's to operate normally. In the event of hose failure, the control will be passed from the main spool to the "BoomLoc" valve, maintaining control of the cylinder.

Regardless of the load the pilot pressure requirement remains constant as the valve is unaffected by load induced pressure, the poppet being fully balanced with zero differential area.

FEATURES

This is a compact design with good dirt tolerance. Hardened poppets and seats provide excellent load holding characteristics with all the advantages of the cartridge insert.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	90 litres/min (24 US GPM)
Max Setting	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces electroless nickel plated and passivated
Body Material	Bright drawn mild steel bar. Zinc plated and passivated
Mounting Position	Line mounted
Weight	3.5 kg (7.7 lbs)
Seal Kit Number	SK1166P (Polyurethane/Nitrile)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.6 millilitres/min max (10 dpm)
Nominal Viscosity Range	5 to 500 cSt

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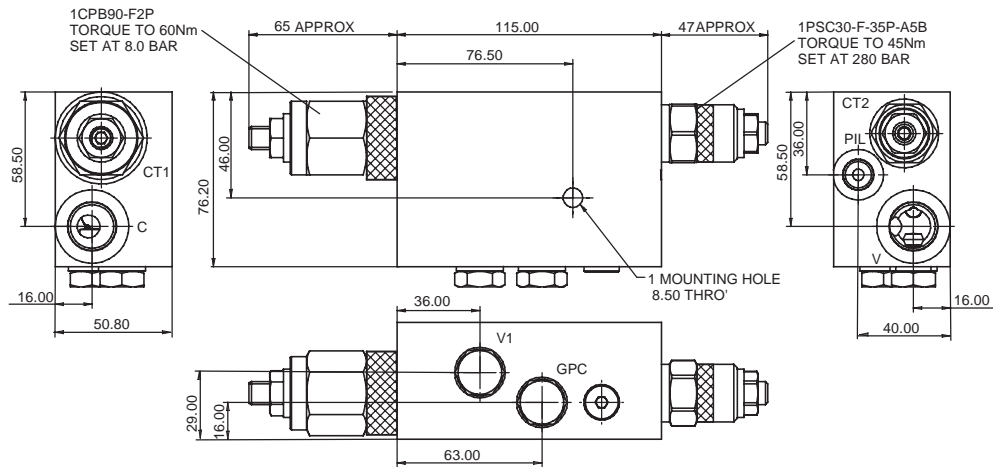
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COMPLETE VALVE LINE MOUNTED

BASIC CODE: 1CEBL91



Tightening torque of "F" adjuster
locknut - 20 to 25 Nm

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CEBL91 F 4W 35 P

Basic Code
1CEBL91 = Cartridges and Body

Adjustment Means
F = Screw Adjustment

Port Size
4W = 1/2" BSP Cylinder Port
1/2" BSP Valve Port "V"
1/4" BSP "V1" & All Other Ports

Seals
P = Contains polyurethane and
standard seal.

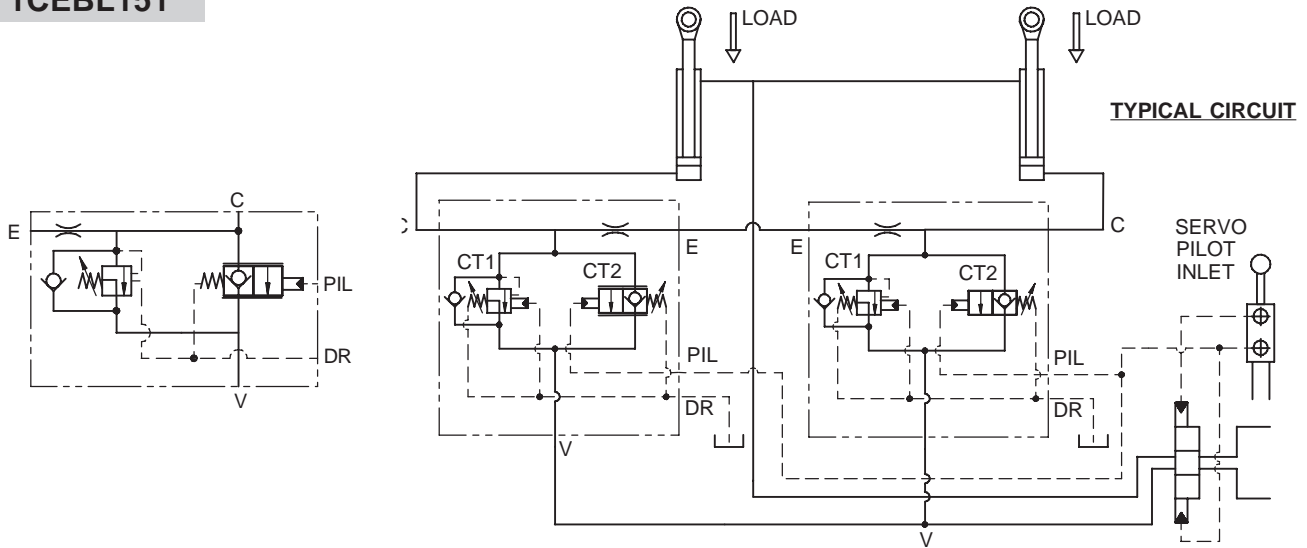
Pressure Range @ 4.8 l/min
35 = 70-350 bar. Std setting 280 bar
Std Setting made at 4.8 litres/min

We reserve the right to change specifications without notice



1CEBL SERIES LOAD CONTROL / HOLDING VALVE c/w Independent Pilot Control HOSE BURST PROTECTION - LINE MOUNTED (REF: ISO 8643)

1CEBL151



6

APPLICATION

These overcentre valves are suitable for use on the boom and dipper cylinders of an excavator to help the manufacturer or user comply with standard ISO8643.

They were designed to give relief, load holding and hose failure protection to systems where a pilot system controls the directional valves.

OPERATION

By connecting the pilot line in parallel with the spool valve pilot, the low pilot pressure allows the valve to open just prior to the spool valve, ensuring that the valve does not interfere with the normal operation of the machine. Fine adjustment of pilot valve allows for differing operating systems.

Both the pilot and the relief sections are unaffected by back pressure, enabling the service line reliefs to operate normally, without interfering with the spool valve control as it meters the return flow. In the event of hose failure, the control will be passed from the main spool to the overcentre valve, maintaining control of the cylinder.

As the pilot valve is operated on a zero differential, induced load pressure does not alter the preset pilot pressure.

FEATURES

This is a compact design with good dirt tolerance. Hardened poppets and seats provide excellent load holding characteristics with all the advantages of the cartridge insert.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	150 litres/min (40 US GPM)
Max Setting	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces electroless nickel plated and passivated
Body Material	Bright drawn mild steel bar. Zinc plated and passivated
Mounting Position	Line mounted
Weight	3 kg (6.6 lbs)
Seal Kit Number	SK947P (Polyurethane/Nitrile)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.6 millilitres/min max (10 dpm)
Nominal Viscosity Range	5 to 500 cSt

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Integrated Hydraulics Inc

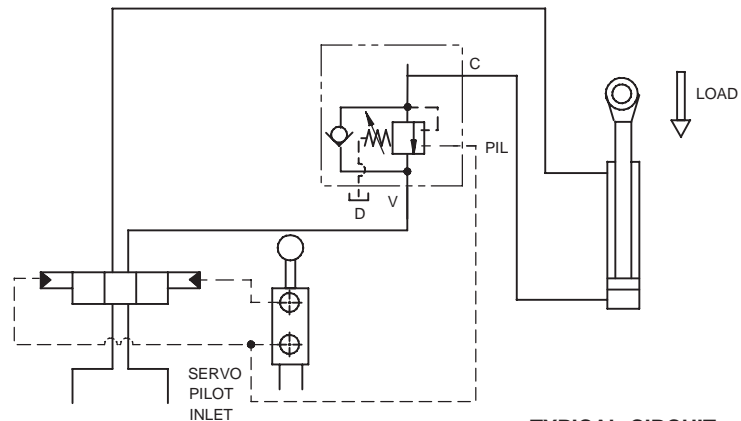
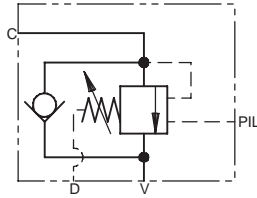
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1CEBL SERIES LOAD CONTROL / HOLDING VALVE

HOSE BURST PROTECTION - LINE MOUNTED (REF: ISO 8643)

1CEBL153



TYPICAL CIRCUIT

6

APPLICATION

These overcentre valves are suitable for use on the boom and dipper cylinders of an excavator to help the manufacturer or user comply with standard ISO8643.

They were designed to give relief, load holding and hose failure protection to systems where a pilot system controls the directional valves.

OPERATION

By connecting the pilot line in parallel with the spool valve pilot, the high pilot ratio allows the valve to open just prior to the spool valve, ensuring that the valve does not interfere with the normal operation of the machine.

Both the pilot and the relief sections are unaffected by back pressure, enabling the service line reliefs to operate normally, without interfering with the spool valve control as it meters the return flow. In the event of hose failure, the control will be passed from the main spool to the overcentre valve, maintaining control of the cylinder.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

This is a compact design with good dirt tolerance. Hardened poppets and seats provide excellent load holding characteristics with all the advantages of the cartridge insert.

PILOT RATIO

22:1

To allow use with normal pilot systems which can be found on most excavators

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	150 litres/min (40 US GPM)
Max Setting	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces electroless nickel plated
Body Material	Bright drawn mild steel bar. Zinc plated and passivated
Mounting Position	Mount directly to the cylinder using steel pipe.
Weight	1.5 kg (3.3 lbs)
Seal Kit Number	SK924
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	1.5 millilitres/min max
Nominal Viscosity Range	5 to 500 cSt

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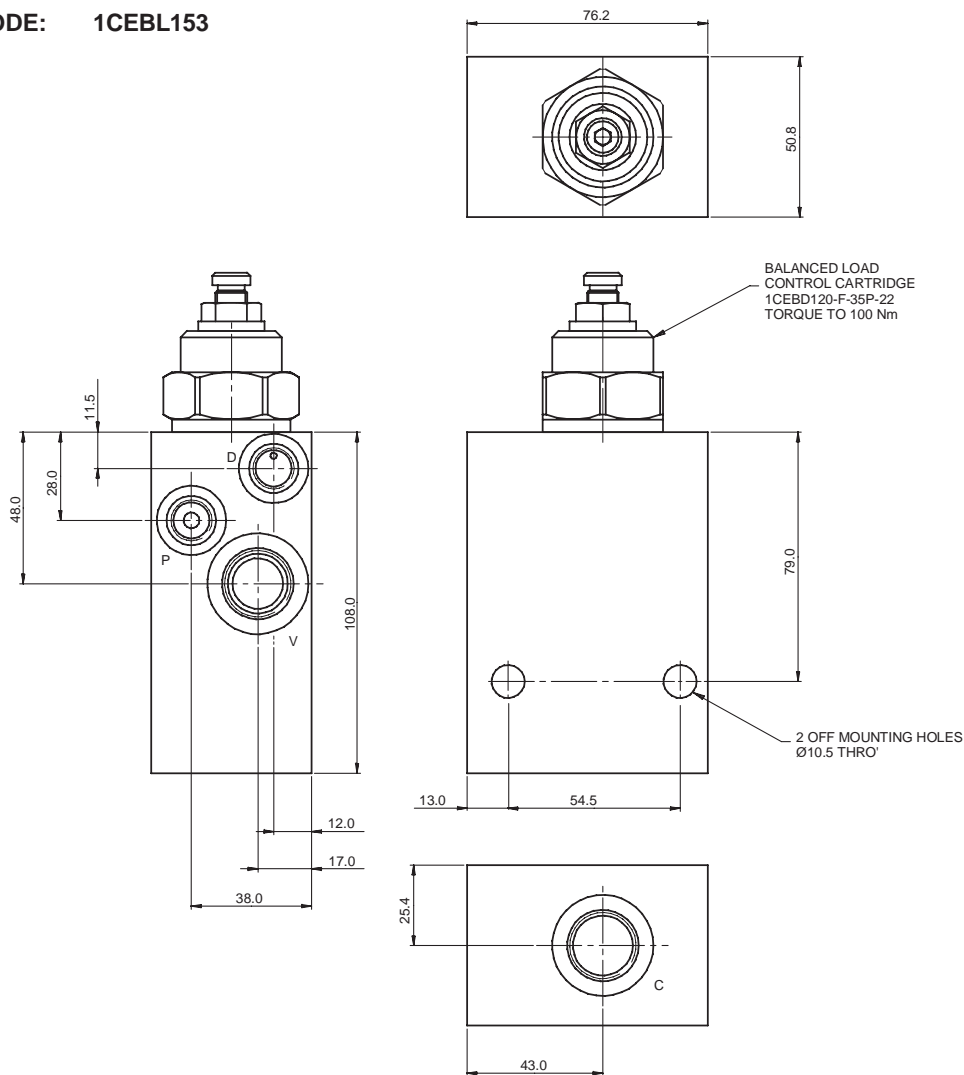
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Fax: +44 (0) 1926 315729

Website: www.integratedhydraulics.com

COMPLETE VALVE

BASIC CODE: 1CEBL153



Tightening torque of "F" adjuster
locknut - 20 to 25 Nm

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CEBL153 F 4W 35 P

Basic Code

Adjustment Means

F = Screw Adjustment

Port Size

4W = 1/2" BSP Cylinder Port
1/2" BSP Valve Port
1/4" BSP Pilot Port/Drain Port

Seals

P = Contains polyurethane and standard seal.

Pressure Range @ 4.8 l/min

35 = 70-350 bar. Std setting 350 bar
Std Setting made at 4.8 litres/min

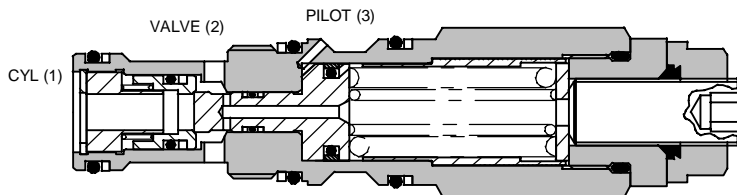
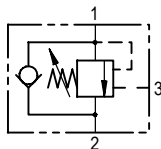
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1SE SERIES OVERCENTRE VALVE

PILOT ASSISTED RELIEF WITH CHECK

1SE30



APPLICATION

Overcentre valves give static and dynamic control of loads by regulating the flow into and out of hydraulic actuators. When installed close to or within an actuator, the overcentre valve will stop runaway in the event of hose burst and if open centre directional control valves are used, will allow thermal expansion relief of the hydraulic fluid.

The overcentre cartridge is ideal for mounting directly into a cavity machined in the body of the cylinder, motor or rotary actuator. The cartridge can also be mounted directly to the ports via a specifically machined body as part of a Hydraulic Integrated Circuit or single unit, or contained within one of our standard line bodies.

Single overcentre valves are normally used when the load is unidirectional, for example an aerial platform or crane and dual overcentre valves are used for controlling loads in both directions for motor applications or for cylinders going over centre.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time. Directly interchangeable with 30 litres/min pilot check valve.

PILOT RATIOS

- | | |
|-------------------|---|
| 2.5:1 | Best suited for extremely unstable applications such as long booms or flexible frameworks. |
| 5:1
(Standard) | Best suited for applications where load varies and machine structure can induce instability |
| 10:1 | Best suited for applications where the load remains relatively constant. |

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	30 litres/min (8 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Mounting Position	Unrestricted
Cavity Number	A20090-T11A
Torque Cartridge into Cavity	45 Nm (33 lbs ft)
Weight	0.15 kg (0.33 lbs)
Seal Kit Number	SK1079 (Nitrile) SK1079V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

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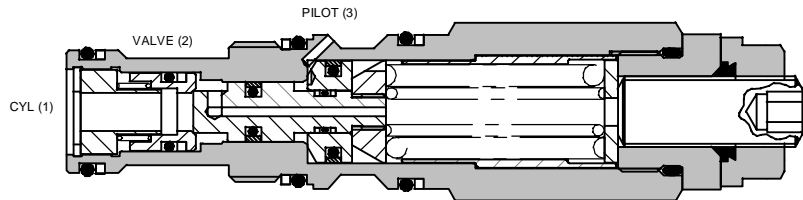
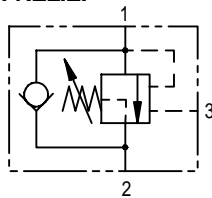


1SER SERIES OVERCENTRE VALVE

PART BALANCED - PILOT ASSISTED

1SER30

POPPET RELIEF



APPLICATION

The 1SER series overcentre valve performs all duties of a regular overcentre but is able to relieve and stay open irrespective of downstream pressure. This enables the valve to operate when used with a closed centre directional valve which has service line reliefs. The poppet is pressure balanced, preventing relief setting increase due to back pressure.

PILOT RATIOS

4:1 Best suited for applications where load varies and machine structure can induce instability.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time. Directly interchangeable with 30 litres/min pilot check valve.

Rated Flow	30 litres/min (8 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Mounting Position	Unrestricted
Cavity Number	A20090-T11A
Torque Cartridge into Cavity	45 Nm (33 lbs ft)
Weight	0.15 kg (0.33 lbs)
Seal Kit Number	SK1079 (Nitrile) SK1079V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

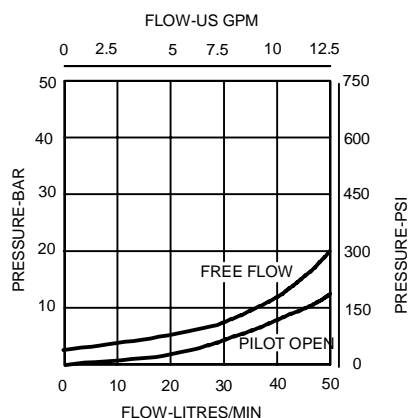
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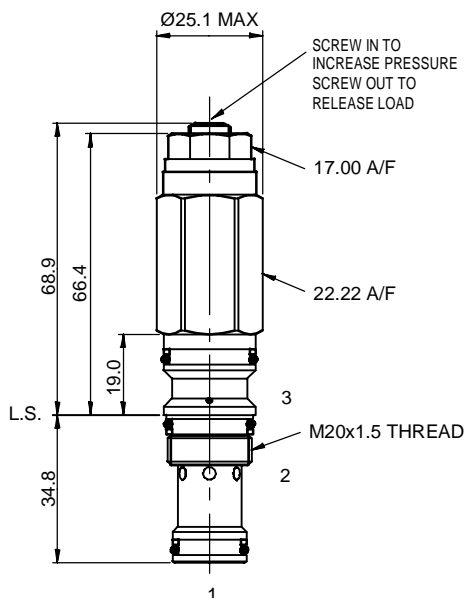
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PRESSURE DROP



CARTRIDGE ONLY

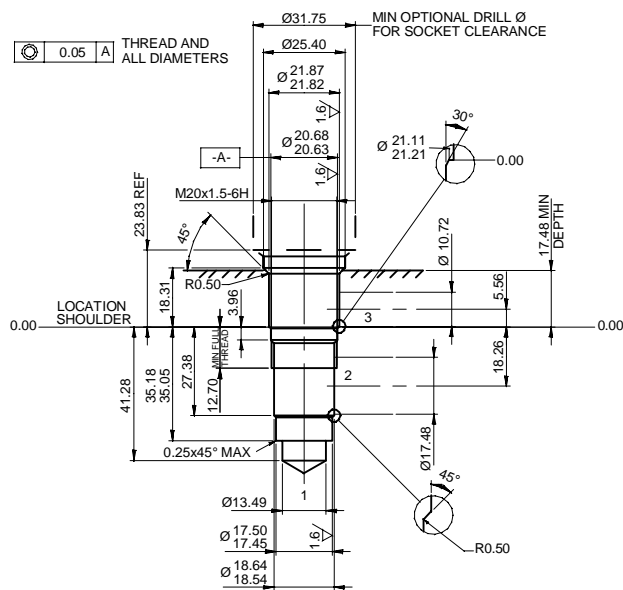
BASIC CODE: 1SER30



CAVITY

A20090-T11A

FORM DRILL: TD-11A
FORM REAMER: TR-11A



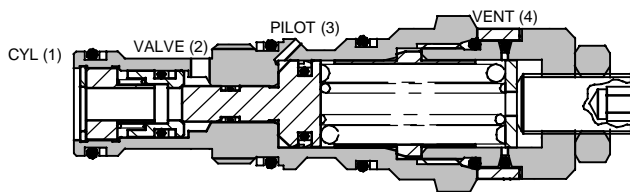
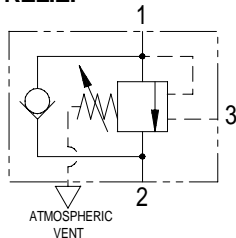


1SEB SERIES OVERCENTRE VALVE

FULLY BALANCED - PILOT ASSISTED

1SEB30

POPPET RELIEF



APPLICATION

Overcentre valves give static and dynamic control of loads by supplying a counterbalance pressure to the actuator. They prevent runaway in the event of hose burst and hold the load with minimal leakage.

The pressure balanced valve is unaffected by back pressure, allowing service line reliefs to operate and for the valve to be used in regenerative or proportional valve systems.

The overcentre valve should be mounted either into, onto or as close to the actuator as possible to give maximum protection.

Single overcentre valves control unidirectional loads such as in aerial platforms, cranes or winches and dual overcentres are suited to bi-directional motion such as wheel motor applications or cylinders going over centre.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple 'dual purpose' cavity. Allows quick, easy field service - reduces down time. Directly interchangeable with 30 litres/min pilot check valve.

PILOT RATIO

5:1

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	30 litres/min (8 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A20090-T11A
Torque Cartridge into Cavity	45 Nm (33 lbs ft)
Weight	0.14 kg (0.30 lbs)
Seal Kit Number	SK1079 (Nitrile) SK1079V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

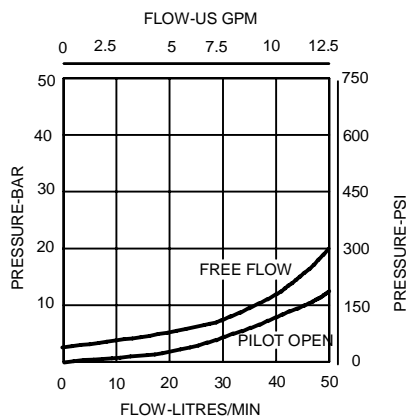
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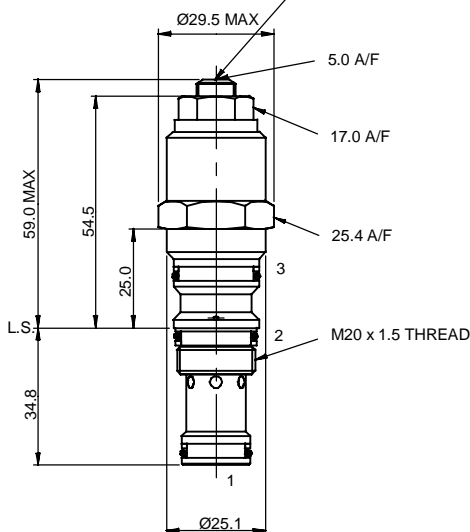
PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 1SEB30

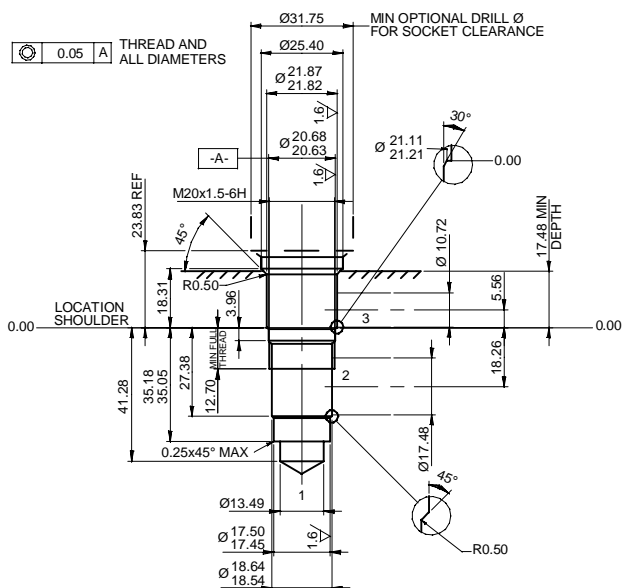
SCREW IN TO INCREASE
PRESSURE. SCREW OUT
TO RELEASE LOAD.



CAVITY

A20090-T11A

FORM DRILL: TD-11A
FORM REAMER: TR-11A



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1SEB30 F 35 S 5

Basic Code

Adjustment Means

F = Screw Adjustment

N = Fixed - State pressure setting required

For fixed versions add setting in 10 bar increments to end of part number. Subject to a ±10% tolerance.

Pressure Range @ 4.8 l/min

35 = 75-350 bar. Std setting 210 bar

Std setting made at 4.8 litres/min

Pilot Ratio
5 = 5:1

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

We reserve the right to change specifications without notice

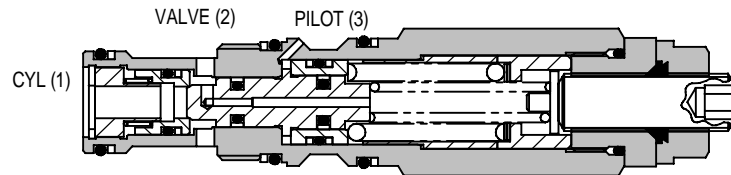
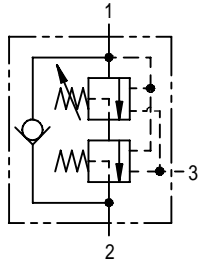


1SEL OVERCENTRE VALVE

PILOT ASSISTED RELIEF WITH CHECK AND COUNTERBALANCE

1SEL30

POPPET RELIEF



APPLICATION

The 1SEL30 overcentre valve performs all duties of a regular overcentre but maintains a counterbalance pressure to provide dampening of cylinders when there is a rapid loss in stored pressure. This counterbalance pressure reduces as the pilot pressure increases. Typical applications include extension cylinders on telescopic handlers where it is important to have a smooth operation when retracting from full extension.

OPERATION

The check section allows free flow and then locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied, maintaining a counterbalance pressure to prevent initial pressure loss and therefore instability. The total pressure setting will normally be set at 1.3 times the load induced pressure. The counterbalance pressure reduces as the pilot pressure increases.

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	30 litres/min (8 US GPM)
Max Setting	380 bar (5510 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Mounting Position	Unrestricted
Cavity Number	A20090-T11A
Torque Cartridge into Cavity	45 Nm (33 lbs ft)
Weight	0.15 kg (0.33 lbs)
Seal Kit Number	SK1079 (Nitrile) SK1079V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

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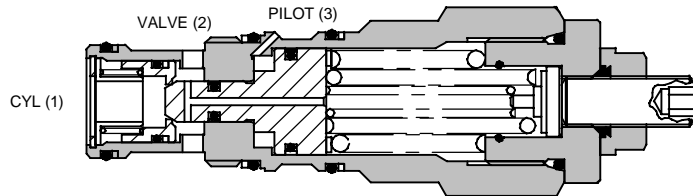
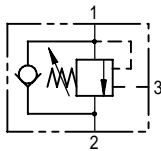
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1SE SERIES OVERCENTRE VALVE

PILOT ASSISTED RELIEF WITH CHECK

1SE90



APPLICATION

Overcentre valves give static and dynamic control of loads by regulating the flow into and out of hydraulic actuators. When installed close to or within an actuator, the overcentre valve will stop runaway in the event of hose burst and if open centre directional control valves are used, will allow thermal expansion relief of the hydraulic fluid.

The overcentre cartridge is ideal for mounting directly into a cavity machined in the body of the cylinder, motor or rotary actuator. The cartridge can also be mounted directly to the ports via a specifically machined body as part of a Hydraulic Integrated Circuit or single unit, or contained within one of our standard line bodies.

Single overcentre valves are normally used when the load is unidirectional, for example an aerial platform or crane and dual overcentre valves are used for controlling loads in both directions for motor applications or for cylinders going over centre.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time.

PILOT RATIOS

4:1 Best suited for applications where the load remains relatively constant.

Other ratios available upon request.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	90 litres/min (23 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Mounting Position	Unrestricted
Cavity Number	A20092-T2A
Torque Cartridge into Cavity	60 Nm (44 lbs ft)
Weight	0.42 kg (0.92 lbs)
Seal Kit Number	SK1093 (Nitrile) SK1093V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

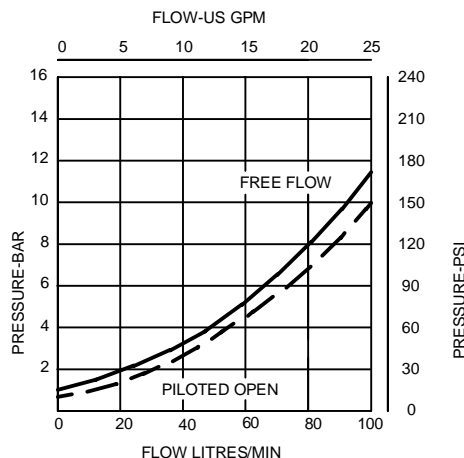
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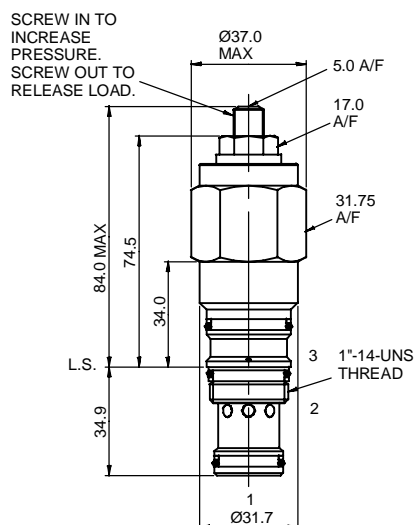
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PRESSURE DROP



CARTRIDGE ONLY

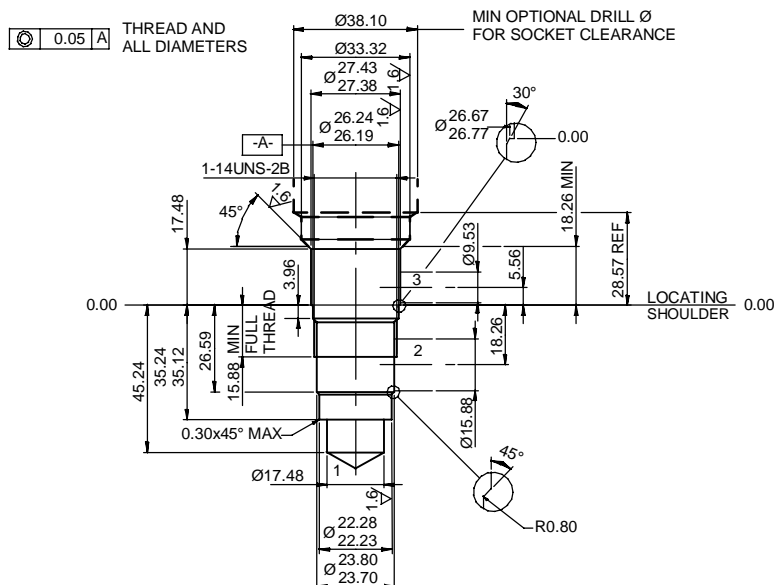
BASIC CODE: 1SE90



CAVITY

A20092-T2A

FORM DRILL: TD-2A
FORM REAMER: TR-2A



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1SE90 F 35 S 4

Basic Code

Adjustment Means

F = Screw Adjustment

N = Fixed - State pressure setting required

For fixed versions add setting in 10 bar increments to end of part number. Subject to a ±10% tolerance.

Pressure Range @ 4.8 l/min

20 = 70-225 bar. Std setting 100 bar

35 = 175-350 bar. Std setting 210 bar

Std setting made at 4.8 litres/min

Pilot Ratio

4 = 4:1

Other ratios available upon request

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

We reserve the right to change specifications without notice

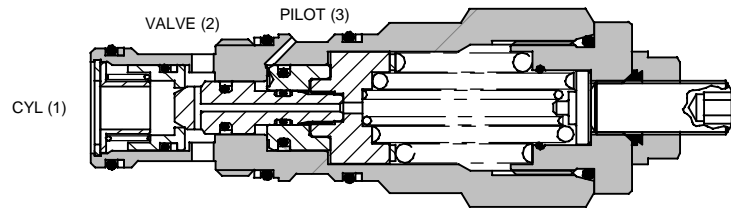
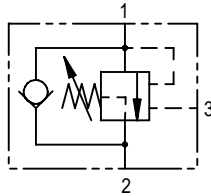


1SER SERIES OVERCENTRE VALVE

PART BALANCED - PILOT ASSISTED

1SER90

POPPET RELIEF



APPLICATION

The 1SER series overcentre valve performs all duties of a regular overcentre but is able to relieve and stay open irrespective of downstream pressure. This enables the valve to operate when used with a closed centre directional valve which has service line reliefs. The poppet is pressure balanced, preventing relief setting increase due to back pressure.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time.

PILOT RATIOS

4:1 Best suited for applications where the load remains relatively constant.

Other ratios available upon request.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	90 litres/min (23 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Mounting Position	Unrestricted
Cavity Number	A20092-T2A
Torque Cartridge into Cavity	60 Nm (44 lbs ft)
Weight	0.42 kg (0.92 lbs)
Seal Kit Number	SK1093 (Nitrile) SK1093V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

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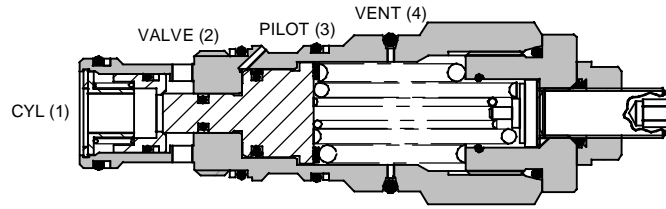
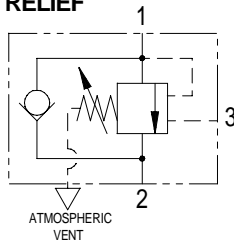


1SEB SERIES OVERCENTRE VALVE

FULLY BALANCED - PILOT ASSISTED

1SEB90

POPPET RELIEF



APPLICATION

Overcentre valves give static and dynamic control of loads by supplying a counterbalance pressure to the actuator. They will stop runaway in the event of hose burst and hold the load with minimal leakage.

The pressure balanced overcentre relief setting is unaffected by back pressure, enabling the valve to stay open when the valve port pressure rises. This will allow service line reliefs to work normally and will also allow the control of regenerative or proportional systems.

The overcentre valve should be mounted either into, onto or as close to the actuator as possible, using a machined cavity into the actuator or a suitable machined body, either gasket or line mounted.

Single overcentre valves are normally used when the load is unidirectional, for example an aerial platform or crane and dual overcentre valves are used for controlling loads in both directions for motor applications or for cylinders going over centre.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time.

PILOT RATIOS

- 4:1 Best suited for applications where the load remains relatively constant.
Other ratios available upon request.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	90 litres/min (23 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Mounting Position	Unrestricted
Cavity Number	A20092-T2A
Torque Cartridge into Cavity	60 Nm (44 lbs ft)
Weight	0.42 kg (0.92 lbs)
Seal Kit Number	SK1096 (Nitrile) SK1096V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

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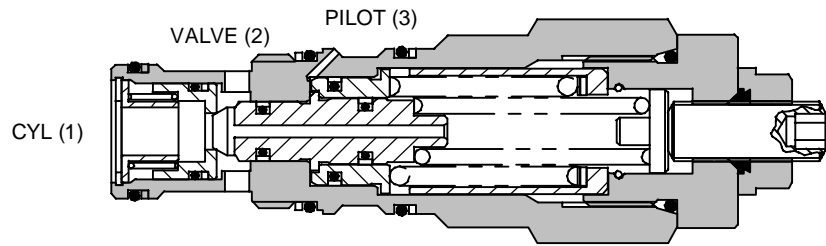
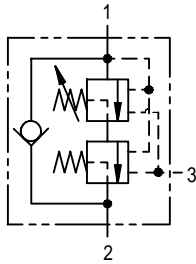


1SEL OVERCENTRE VALVE

PILOT ASSISTED RELIEF WITH CHECK AND COUNTERBALANCE

1SEL90

POPPET RELIEF



APPLICATION

The 1SEL90 overcentre valve performs all duties of a regular overcentre but maintains a counterbalance pressure to provide dampening to cylinders when there is a rapid loss in stored pressure. This counterbalance pressure reduces as the pilot pressure increases. Typical applications include extension cylinders on telescopic handlers where it is important to have a smooth operation when retracting from full extension.

OPERATION

The check section allows free flow and then locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied, maintaining a counterbalance pressure to prevent initial pressure loss and therefore instability. The total pressure setting will normally be set at 1.3 times the load induced pressure. The counterbalance pressure reduces as the pilot pressure increases.

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	90 litres/min (23 US GPM)
Max Setting	380 bar (5510 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Mounting Position	Unrestricted
Cavity Number	A20092-T2A
Torque Cartridge into Cavity	60 Nm (44 lbs ft)
Weight	0.42 kg (0.92 lbs)
Seal Kit Number	SK1093 (Nitrile) SK1093V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

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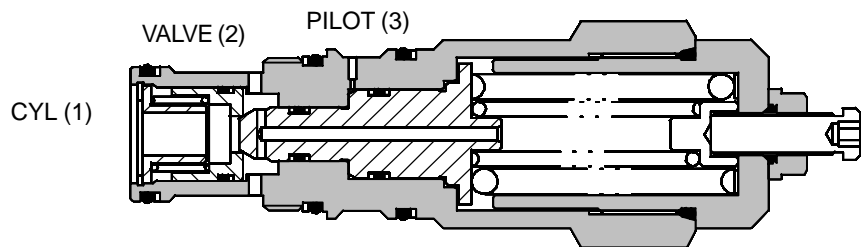
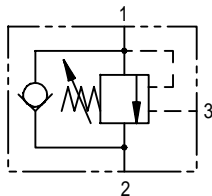
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Website: www.integratedhydraulics.com



1SE SERIES OVERCENTRE VALVE

PILOT ASSISTED RELIEF WITH CHECK

1SE140



APPLICATION

Overcentre valves give static and dynamic control of loads by regulating the flow into and out of hydraulic actuators. When installed close to or within an actuator, the overcentre valve will stop runaway in the event of hose burst and if open centre directional control valves are used, will allow thermal expansion relief of the hydraulic fluid.

The overcentre cartridge is ideal for mounting directly into a cavity machined in the body of the cylinder, motor or rotary actuator. The cartridge can also be mounted directly to the ports via a specifically machined body as part of a Hydraulic Integrated Circuit or single unit, or contained within one of our standard line bodies.

Single overcentre valves are normally used when the load is unidirectional, for example an aerial platform or crane and dual overcentre valves are used for controlling loads in both directions for motor applications or for cylinders going over centre.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time.

PILOT RATIOS

- 4:1 Best suited where the load varies and machine structure can induce instability.
- 6:1 Best suited for applications where the load remains relatively constant.
- Other ratios available upon request.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	140 litres/min (37 US GPM)
Max Setting	Max Load Induced Pressure: 340 bar (4930 psi) Relief Setting: 420 bar (6090 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Mounting Position	Unrestricted
Cavity Number	A20094-T17A
Torque Cartridge into Cavity	150 Nm (110 lbs ft)
Weight	1.2 kg (2.5 lbs)
Seal Kit Number	SK1116 (Nitrile) SK1116V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

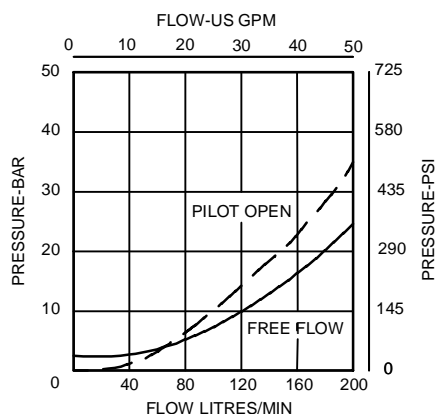
Integrated Hydraulics Ltd

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Website: www.integratedhydraulics.com

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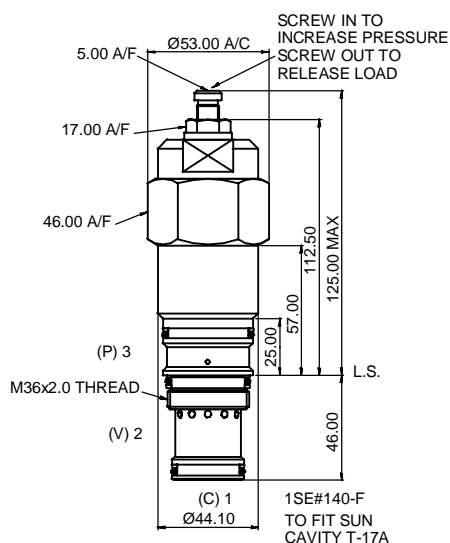
7047 Spinach Drive, Mentor, Ohio 44060, USA
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Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

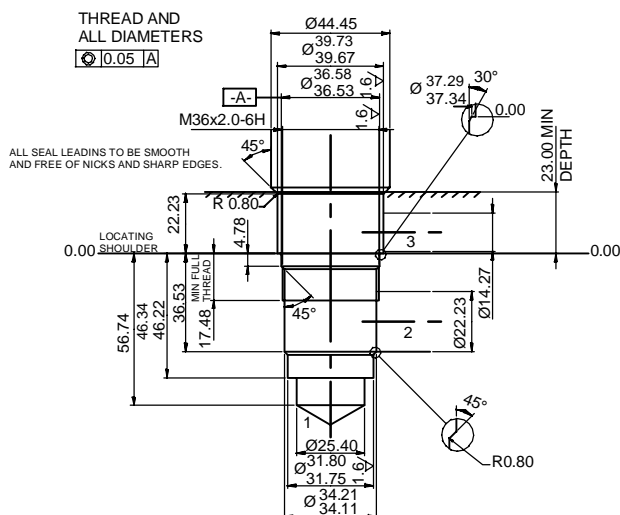
BASIC CODE: 1SE140



CAVITY

A20094-T17A

**FORM DRILL - TD-17A
FORM REAMER - TR-17A**



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1SE****

F

40

S

4

Basic Code

Adjustment Means

F = Screw Adjustment

N = Fixed - State pressure setting required

For fixed versions add setting in 10 bar increments to end of part number. Subject to a ±10% tolerance.

Pressure Range @ 4.8 l/min

20 = 140-250 bar. Std setting 190 bar

30 = 220-330 bar. Std setting 270 bar

40 = 310-420 bar. Std setting 370 bar

Std setting made at 4.8 litres/min

Pilot Ratio

4 = 4:1

6 = 6:1

Other ratios available upon request

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

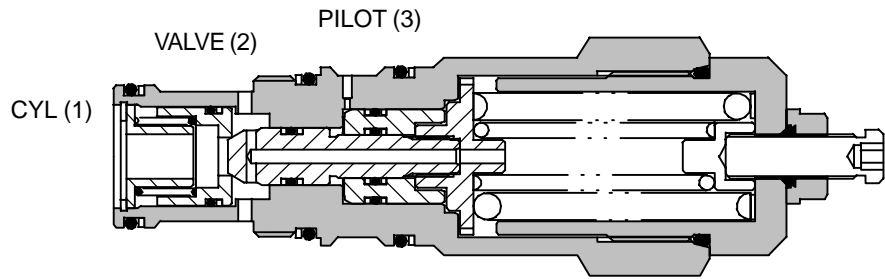
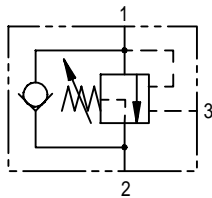
We reserve the right to change specifications without notice



1SER SERIES OVERCENTRE VALVE

PART BALANCED - PILOT ASSISTED

1SER140



APPLICATION

The 1SER series overcentre valve performs all duties of a regular overcentre but the relief section is able to stay open irrespective of downstream pressure. This enables the valve to operate when used with a closed centre directional valve which has service line reliefs. The poppet is pressure balanced, preventing relief setting increase due to back pressure.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time.

PILOT RATIOS

- 4:1 Best suited where the load varies and machine structure can induce instability.
- 6:1 Best suited for applications where the load remains relatively constant.
- Other ratios available upon request.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	140 litres/min (37 US GPM)
Max Setting	Max Load Induced Pressure: 340 bar (4930 psi) Relief Setting: 420 bar (6090 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Mounting Position	Unrestricted
Cavity Number	A20094-T17A
Torque Cartridge into Cavity	150 Nm (110 lbs ft)
Weight	1.2 kg (2.5 lbs)
Seal Kit Number	SK1116 (Nitrile) SK1116V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

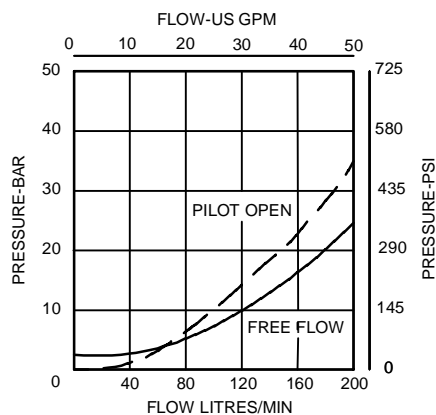
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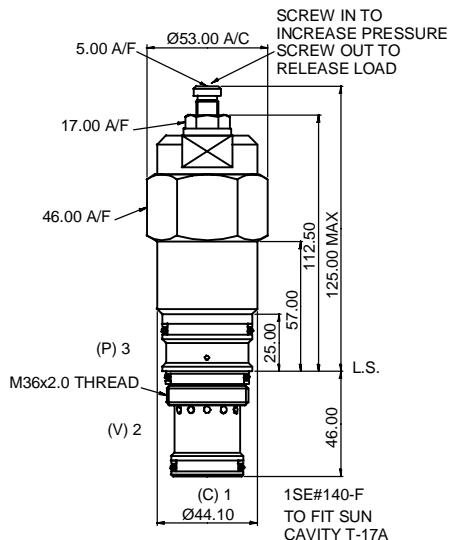
7047 Spinach Drive, Mentor, Ohio 44060, USA
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Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

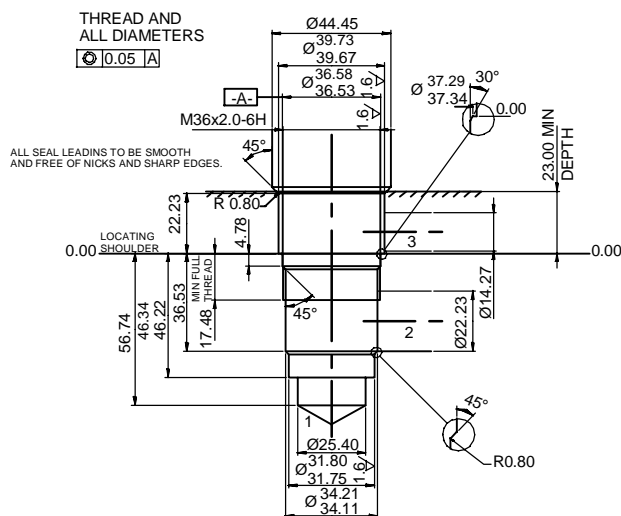
BASIC CODE: 1SER140



CAVITY

A20094-T17A

**FORM DRILL - TD-17A
FORM REAMER - TR-17A**



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1SER***

F

40

S

4

Basic Code

Adjustment Means

F = Screw Adjustment

N = Fixed - State pressure setting required

For fixed versions add setting in 10 bar increments to end of part number. Subject to a ±10% tolerance.

Pressure Range @ 4.8 l/min

20 = 140-250 bar. Std setting 190 bar

30 = 220-330 bar. Std setting 270 bar

40 = 310-420 bar. Std setting 370 bar

Std setting made at 4.8 litres/min

Pilot Ratio

4 = 4:1

6 = 6:1

Other ratios available upon request

Seals

S = Nitrile (For use with most industrial hydraulic oils)

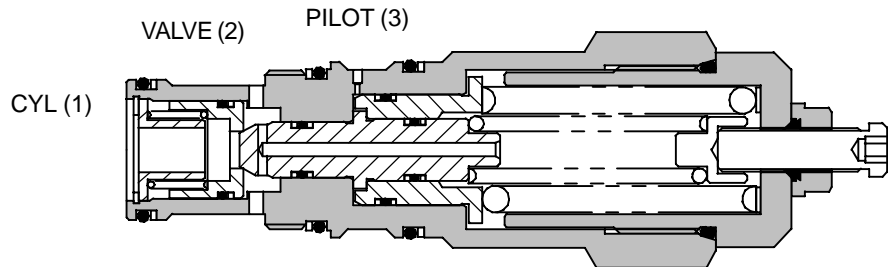
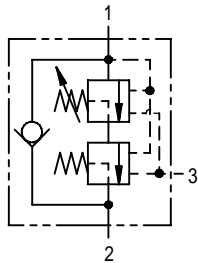
SV = Viton (For high temperature and most special fluid applications)



1SEL SERIES OVERCENTRE VALVE

PILOT ASSISTED RELIEF WITH CHECK AND COUNTERBALANCE

1SEL140



APPLICATION

The 1SEL overcentre valve performs all duties of a regular overcentre but maintains a counterbalance pressure to provide dampening to cylinders when there is a rapid loss in stored pressure. This counterbalance pressure reduces as the pilot pressure increases. Typical applications include extension cylinders on telescopic handlers where it is important to have a smooth operation when retracting from full extension.

OPERATION

The check section allows free flow and then locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied, maintaining a counterbalance pressure to prevent initial pressure loss and therefore instability. The total pressure setting will normally be set at 1.3 times the load induced pressure. The counterbalance pressure reduces as the pilot pressure increases.

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	140 litres/min (37 US GPM)
Max Setting	380 bar (5310 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Mounting Position	Unrestricted
Cavity Number	A20094-T17A
Torque Cartridge into Cavity	150 Nm (110 lbs ft)
Weight	1.2 kg (2.5 lbs)
Seal Kit Number	SK1116 (Nitrile) SK1116V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

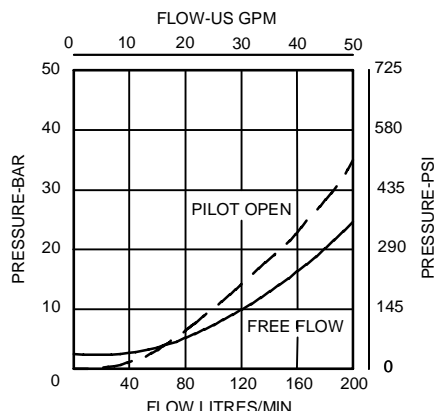
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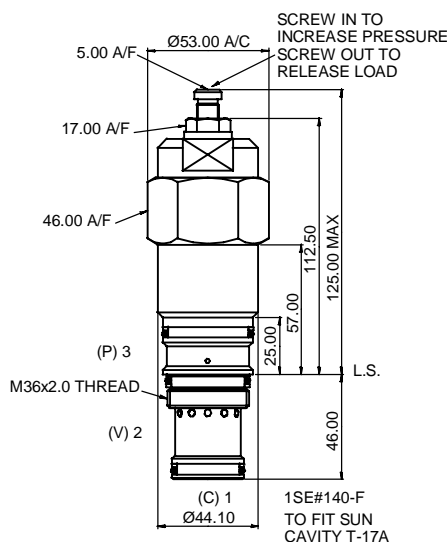
7047 Spinach Drive, Mentor, Ohio 44060, USA
Tel: +1 440 974 3171 Fax: +1 440 974 3170
Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

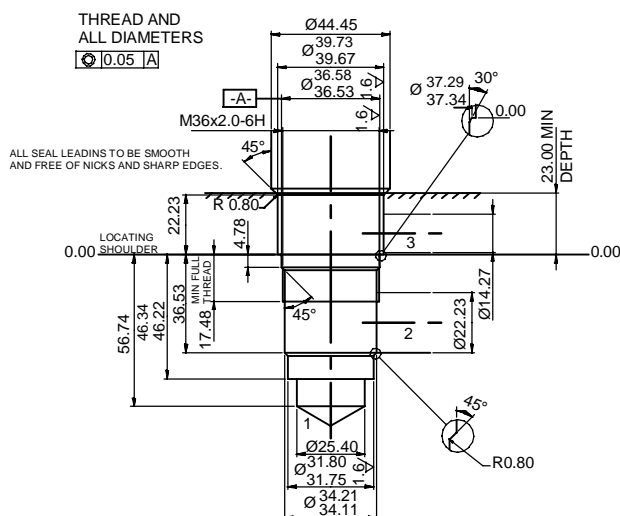
BASIC CODE: 1SEL140



CAVITY

A20094-T17A

**FORM DRILL - TD-17A
FORM REAMER - TR-17A**



This valve has been designed to eliminate instability from flexible boom applications or where the load induced pressure varies greatly. To get the best results, the settings should be adjusted for each application and then factory set for production quantities. Please contact Integrated Hydraulics for more information.

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1SEL140

F

30

S

220

60

Basic Code

Adjustment Means

F = Screw Adjustment

N = Fixed - State pressure setting required

For fixed versions add setting in 10 bar increments to end of part number. Subject to a ±10% tolerance.

Pressure Range, bar @ 4.8 l/min

20 = 170-320. Std 220 (160/60)

30 = 230-380. Std 280 (220/60)

40 = 310-380. Std 350 (290/60)

Counterbalance setting bar
(10 bar increments).

High pressure setting bar
(10 bar increments).

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

We reserve the right to change specifications without notice

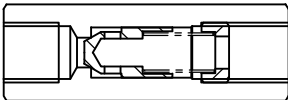
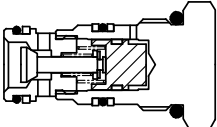
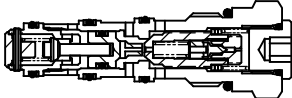
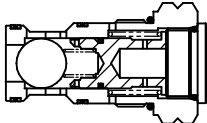


SECTION 7 - CHECK VALVES

CONTENTS

This section contains check valves of sizes up to 1 1/4" BSP and cracking pressure from 0.5 to 7.0 bar. Also included in this section are hose rupture valves of sizes up to 3/4" BSP and pilot check valves with flow ranges up to 300 litres/min (80 US GPM). These are available in cartridge, insert or body form.

SELECTION

SECTION	SERIES	APPLICATION	RANGE	PAGE
	FPR Poppet line mounted check valve	Non return valves or bypass low pressure reliefs	Up to 350 bar (5000 psi) Up to 250 l/min (60 US GPM)	7-111
	4CK(D) Cartridge pilot to open check valve	Pilot operated check valves for load holding applications such as stabiliser legs or cylinder locking. Available with decompression feature	Up to 350 bar (5000 psi) Up to 300 l/min (80 US GPM)	7-151 to 7-181
	4CKKT Dual pilot operated check with thermal relief.	Dual pilot operated check cartridge for load holding applications such as stabiliser legs or cylinder locking. Includes thermal relief element.	Up to 300 bar (4350 psi) Up to 25l/min (6.6 US GPM)	7-197
	5CK Cartridge pilot to close check valve	Pilot to close check valves can be used for regenerative systems or in hydraulic logic circuits	Up to 350 bar (10000 psi) Up to 250 l/min (65 US GPM)	7-211

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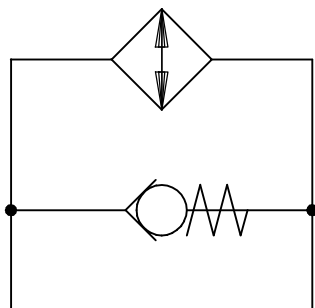
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Tel: +44 (0) 1926 881171 Fax: +44 (0) 1926 315729
Website: www.integratedhydraulics.com

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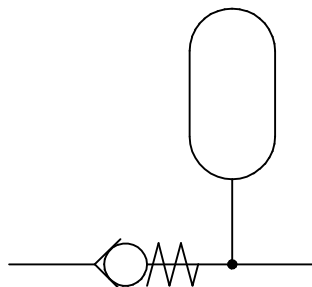
7047 Spinach Drive, Mentor, Ohio 44060, USA
Tel: (440) 974 3171 Fax: (440) 974 3170
Website: www.integratedhydraulics.com



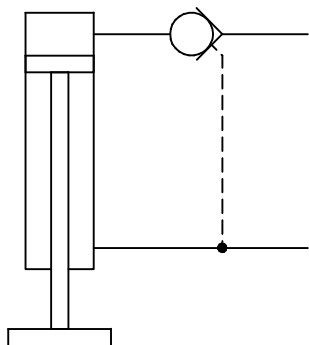
TYPICAL CIRCUIT EXAMPLES



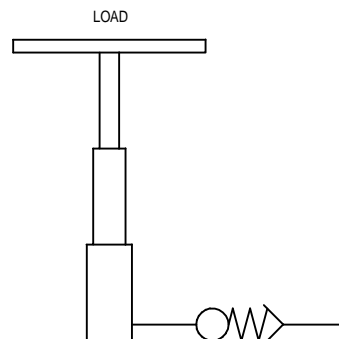
COOLER BYPASS



ACCUMULATOR HOLDING



STABILISER CYLINDER



HOSE FAILURE

7

OPTIONS

Other options are available, such as mechanically operated checks or checks with manual overrides.

Some ventable valves are also manufactured.

Special valves with restrictions in one direction and free flow in the other are also easily produced.

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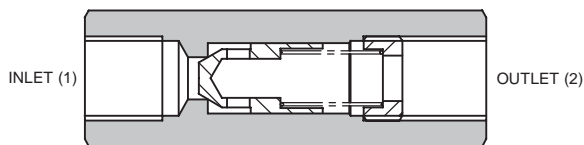
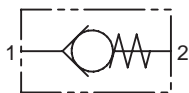
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Website: www.integratedhydraulics.com



FPR SERIES CHECK VALVE

GUIDED POPPET LINE MOUNTED



APPLICATION

A range of line mounted valves for convenient installation into hydraulic circuits. Valves allow flow at a low pressure drop (from 0.5 bar, 7 psi) in the free flow direction and prevent flow in the reverse direction. The range extends from 1/4" BSP to 1 1/2" BSP (12 litres/min 3 US GPM to 310 litres/min, 82 US GPM) nominal flow with cracking pressures from 0.5 to 5 bar (7 to 72.5 psi).

FEATURES

All steel construction with hardened and precision ground poppet gives excellent flow capability and shut-off characteristics with good tolerance to particle (dirt) contaminated fluid.

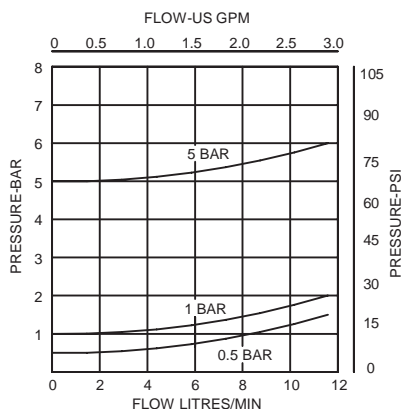
SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

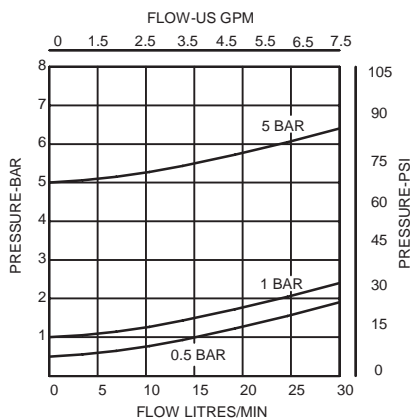
Rated Flow	310 litres/min (82 US GPM)														
Valve Material	Working parts hardened and ground steel. External surfaces zinc plated														
Mounting Position	Line mounted														
Weight	<table><tr><td>FPR 1/4"</td><td>0.11 kg (0.24 lbs)</td></tr><tr><td>FPR 3/8"</td><td>0.19 kg (0.42 lbs)</td></tr><tr><td>FPR 1/2"</td><td>0.25 kg (0.55 lbs)</td></tr><tr><td>FPR 3/4"</td><td>0.50 kg (1.10 lbs)</td></tr><tr><td>FPR 1"</td><td>0.89 kg (1.95 lbs)</td></tr><tr><td>FPR 1 1/4"</td><td>1.75 kg (3.85 lbs)</td></tr><tr><td>FPR 1 1/2"</td><td>2.10 kg (4.63 lbs)</td></tr></table>	FPR 1/4"	0.11 kg (0.24 lbs)	FPR 3/8"	0.19 kg (0.42 lbs)	FPR 1/2"	0.25 kg (0.55 lbs)	FPR 3/4"	0.50 kg (1.10 lbs)	FPR 1"	0.89 kg (1.95 lbs)	FPR 1 1/4"	1.75 kg (3.85 lbs)	FPR 1 1/2"	2.10 kg (4.63 lbs)
FPR 1/4"	0.11 kg (0.24 lbs)														
FPR 3/8"	0.19 kg (0.42 lbs)														
FPR 1/2"	0.25 kg (0.55 lbs)														
FPR 3/4"	0.50 kg (1.10 lbs)														
FPR 1"	0.89 kg (1.95 lbs)														
FPR 1 1/4"	1.75 kg (3.85 lbs)														
FPR 1 1/2"	2.10 kg (4.63 lbs)														
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)														
Operating Temp	-20°C to +90°C														
Nominal Viscosity Range	5 to 500 cSt														

PRESSURE DROP

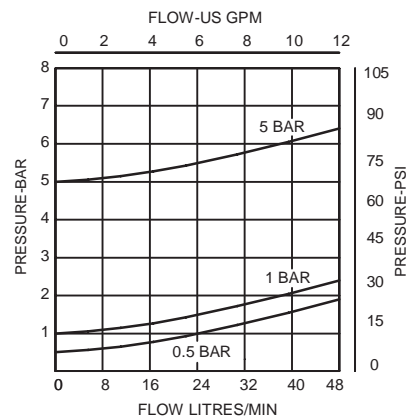
FPR 1/4"



FPR 3/8"



FPR 1/2"



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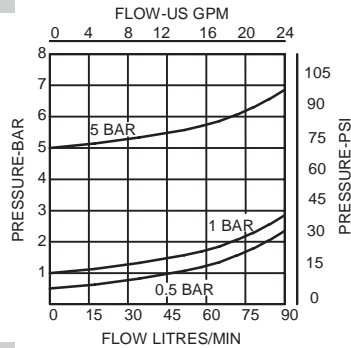
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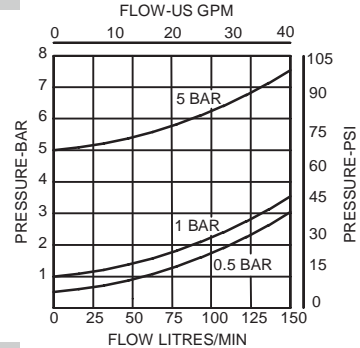
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Website: www.integratedhydraulics.com

PRESSURE DROP

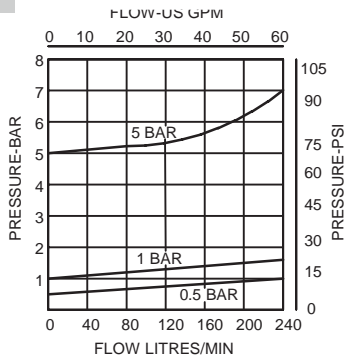
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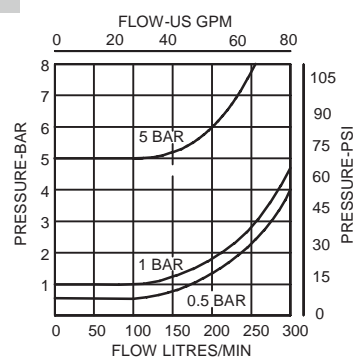
FPR 1"



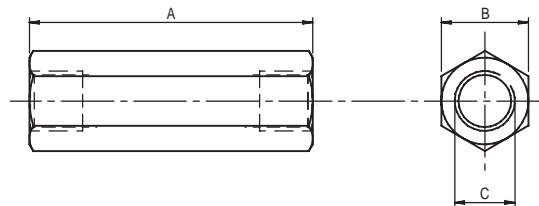
FPR 1 1/4"



FPR 1 1/2"



7



Basic Code	Flow Rate	Pressure	A	B	C
FPR 1/4	12 litres/min (3 US GPM)	350 bar (5000 psi)	62	19	1/4" BSP
FPR 3/8	30 litres/min (8 US GPM)	350 bar (5000 psi)	68	24	3/8" BSP
FPR 1/2	45 litres/min (12 US GPM)	350 bar (5000 psi)	78	27	1/2" BSP
FPR 3/4	85 litres/min (22 US GPM)	300 bar (4300 psi)	88	36	3/4" BSP
FPR 1	140 litres/min (37 US GPM)	250 bar (3600 psi)	112	46	1" BSP
FPR 1 1/4	220 litres/min (58 US GPM)	250 bar (3600 psi)	142	55	1 1/4" BSP
FPR 1 1/2	310 litres/min (82 US GPM)	210 bar (3000 psi)	155	60	1 1/2" BSP

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

FPR **

0.5

Basic Code

FPR1/4 = Inline valve
FPR3/8 = Inline valve
FPR1/2 = Inline valve
FPR3/4 = Inline valve
FPR1 = Inline valve
FPR1 1/4 = Inline valve
FPR1 1/2 = Inline valve

Cracking Pressure

0.5 = 0.5 bar (standard)
1.0 = 1.0 bar (FPR1/4, 3/8, 1/2, 3/4 Only)
2.5 = 2.5 bar
5.0 = 5.0 bar
10.0 = 10.0 bar

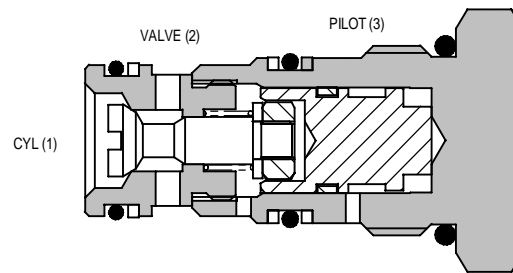
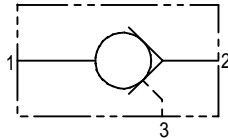
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4CK SERIES CHECK VALVE

PILOT TO OPEN

4CK30



APPLICATION

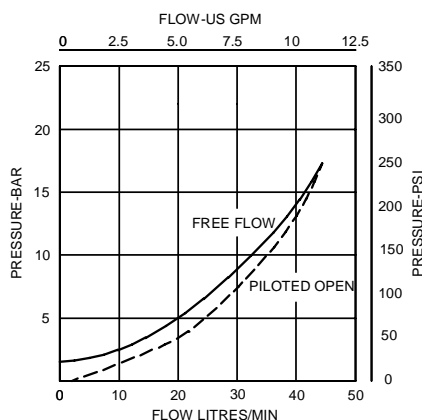
Pilot check valves allow flow to pass in one direction, with a low pressure drop, then prevent reverse flow until pilot pressure is applied. There are many applications for this valve type, the most common being to lock and hold a cylinder, or another hydraulic actuator, in position.

The 4CK30 is a small cartridge valve and is ideally suited for fitting directly into a cylinder, giving economy of installation, direct control of cylinder movement and ease of servicing.

OPERATION

Pressure on the valve port causes the poppet to lift against the spring force, allowing the flow to the cylinder port. Reverse flow is prevented by the poppet reseating. Pressure applied to the pilot port will overcome the cylinder port pressure and lift the poppet from its seat, allowing flow from the cylinder to valve port.

PRESSURE DROP



FEATURES

Hardened and ground poppet gives excellent flow capability for valve size, positive sealing and long working life. Cartridge construction allows installation in actuators, manifold blocks and Hydraulic Integrated Circuits. Fits the same cavity as the 1CE30 overcentre valve. See page 6-111.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	30 litres/min (8 US GPM)
Max Pressure	350 bar (5000 psi)
Pilot Ratio	3:1
Cartridge Material	Working parts hardened and ground steel. Electroless zinc plated body
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option.
Mounting Position	Unrestricted
Cavity Number	A6610 (See Section 17)
Torque Cartridge into Cavity	45 Nm (33 lbs ft)
Weight	4CK30 0.08 kg (0.18 lbs) 4CK35 0.34 kg (0.75 lbs) 4CKK35 0.76 kg (1.67 lbs)
Seal Kit Number	SK430 (Nitrile) SK430V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

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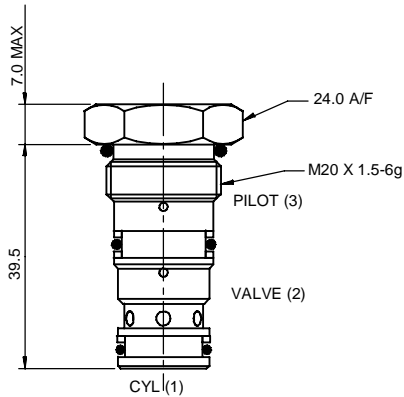
Collins Road, Heathcote Ind. Est., Warwick, CV34 6TF, UK.
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Website: www.integratedhydraulics.com

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Website: www.integratedhydraulics.com

CARTRIDGE ONLY

BASIC CODE: 4CK30



SINGLE VALVE

3/8" 1/2" PORTS

BASIC CODE: 4CK35

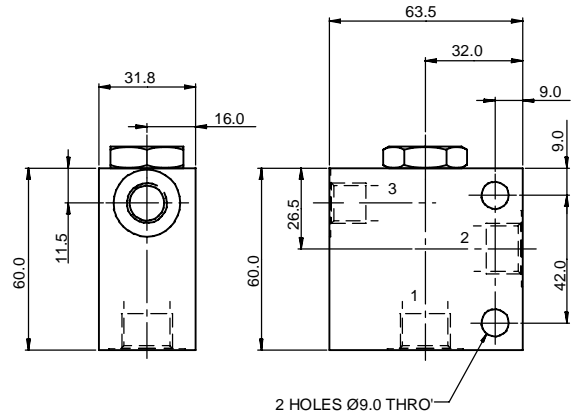
Body ONLY part numbers

BSP, aluminium
3/8" B6743

SAE, aluminium
3/8" B10536
1/2" B7884

BSP, steel
3/8" B12823

SAE, steel
1/2" B11811



DUAL VALVE

3/8" 1/2" PORTS

BASIC CODE: 4CKK34

DUAL CHECK VALVE (INTERNALLY CROSSED PILOTED)

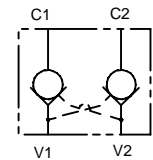
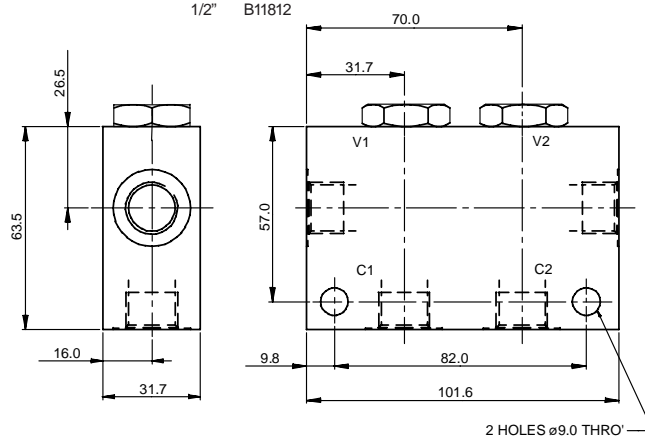
Body ONLY part numbers

BSP, aluminium
3/8" B6836

SAE, aluminium
3/8" B10805
1/2" B30237

BSP, steel
3/8" B13803

SAE, steel
1/2" B11812



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

4CK***

1

3W

S

3

Basic Code

4CK30 = Cartridge Only

4CK35 = Cartridge and Body

4CKK34 = Cartridges and Dual Body

Pilot Port Sizes

1 = Internal

Port Sizes - Bodied Valves Only

3W = 3/8" BSP. 1/4" BSP Pilot Port

6T = 3/8" SAE. 1/4" SAE Pilot Port

8T = 1/2" SAE. 1/4" SAE Pilot Port

Optional Pilot Seal

Omit if not required

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

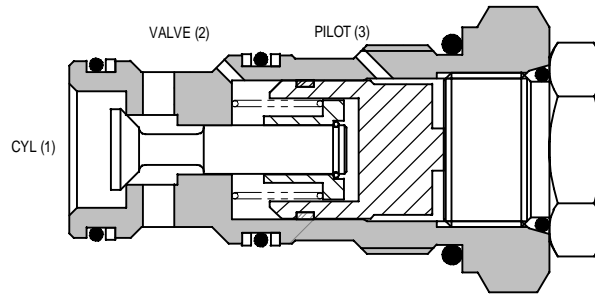
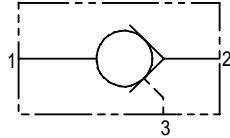
We reserve the right to change specifications without notice



4CK SERIES CHECK VALVES

PILOT OPERATED POPPET

4CK90



APPLICATION

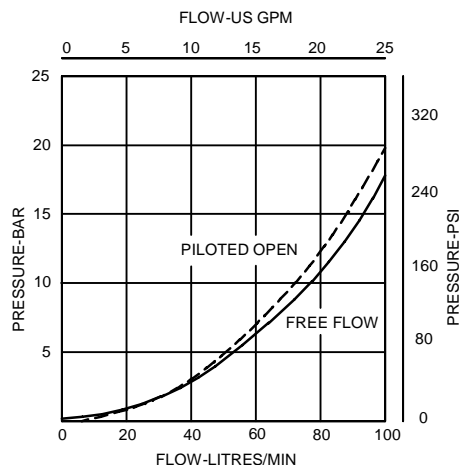
Pilot check valves allow flow to pass in one direction, with a low pressure drop, then prevent reverse flow until pilot pressure is applied. There are many applications for this valve type, the most common being to lock and hold a cylinder, or another hydraulic actuator, in position.

The 4CK90 is a small cartridge valve is ideally suited for fitting directly into a cylinder, giving economy of installation, direct control of cylinder movement and ease of servicing.

OPERATION

Pressure on the valve port causes the poppet to lift against the spring force, allowing the flow to the cylinder port. Reverse flow is prevented by the poppet reseating. Pressure applied to the pilot port will overcome the cylinder port pressure and lift the poppet from its seat, allowing return flow.

PRESSURE DROP



FEATURES

Hardened and ground poppet gives excellent flow capability, positive sealing and long working life. The larger seat diameter restricts the pilot ratio to 4:1. Cartridge construction allows installation in actuators, manifold blocks and Hydraulic Integrated Circuits. Versions with sealed pilot pistons are available. Fits the same cavity as the 1CE90 overcentre valve. See page 6-151.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	90 litres/min (24 US GPM)	
Max Pressure	350 bar (5000 psi)	
Pilot Ratio	4:1	
Cartridge Material	Working parts hardened and ground steel. Electroless zinc plated body	
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option.	
Mounting Position	Unrestricted	
Cavity Number	A12336 (See Section 17)	
Torque Cartridge into Cavity	60 Nm (44 lbs ft)	
Weight	4CK90	0.27 kg (0.61 lbs)
	4CK95	1.33 kg (2.90 lbs)
	4CKK95	2.03 kg (4.51 lbs)
Seal Kit Number	SK832 (Nitrile)	SK832V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)	
Operating Temp	-20°C to +90°C	
Leakage	0.3 millilitres/min nominal (5 dpm)	
Nominal Viscosity Range	5 to 500 cSt	

*For applications above 210 bar please consult our technical department or use the steel body option.

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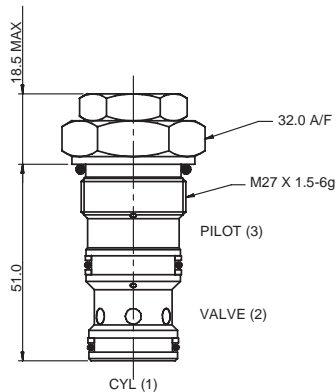
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CARTRIDGE ONLY

BASIC CODE: 4CK90



SINGLE VALVE

BASIC CODE: 4CK95

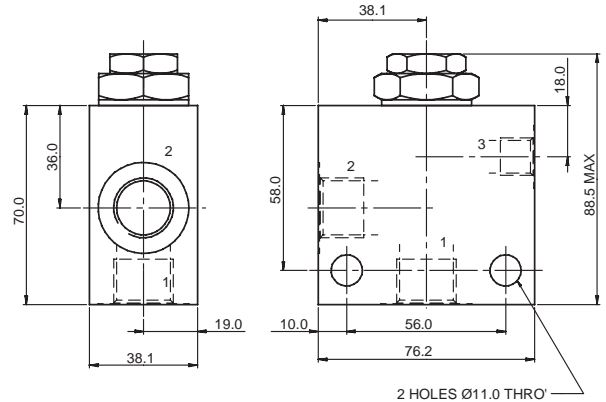
Body ONLY part numbers

BSP, aluminium
1/2" B13625

SAE, aluminium
1/2" B10806

BSP, steel
1/2" B13626

SAE, steel
1/2" B10922



DUAL VALVE

1/2" PORTS

BASIC CODE: 4CKK95 (INTERNALLY CROSS PILOTED)

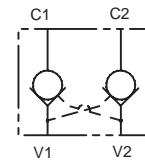
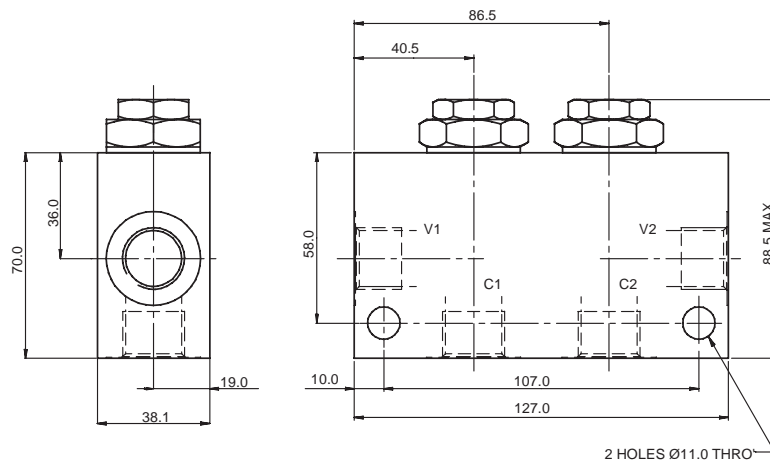
Body ONLY part numbers

BSP, aluminium
1/2" C13627

SAE, aluminium
1/2" C10807

BSP, steel
1/2" C13628

SAE, steel
1/2" C11561



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

4CK***

1

4W

S

3

Basic Code

4CK90 = Cartridge Only

4CK95 = Cartridge and Body

4CKK95 = Cartridges and Dual Body

Pilot Port Sizes

1 = Internal

Port Sizes - Bodied Valves Only

4W = 1/2" BSP. 1/4" BSP. Pilot Port

8T = 1/2" SAE 1/4" SAE Pilot Port

Optional Pilot Seal

Omit if not required

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

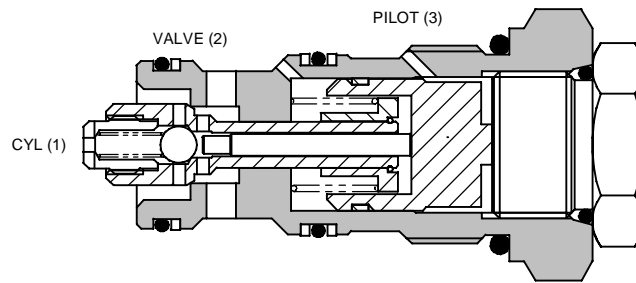
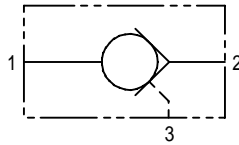
We reserve the right to change specifications without notice



4CKD SERIES CHECK VALVES

PILOT OPERATED WITH DECOMPRESSION STAGE

4CKD90



APPLICATION

A decompression pilot check can be used in most applications that use a standard pilot operated check. Free flow in one direction and load holding in the other. The decompression feature allows locked-in pressure to decay in a controlled fashion, reducing hydraulic noise and instability caused by the rapid loss of energy from the actuator. The valve is effective in clamping circuits and when used with intensifiers or when there are high load induced pressures.

FEATURES

Decompression stage reduces hydraulic noise on rapid loss of pressure. Precision ground ball and hardened & ground poppet ensure positive sealing and long, trouble-free working life.

This valve is directly interchangeable with the 4CK90 check valve and 1CE*90 series overcentre valve.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	90 litres/min (24 US GPM)
Max Pressure	Cylinder Port 1: 420 bar (6000 psi) Ports 2 & 3: 350 bar (5000 psi)
Pilot Ratio	25:1 - decompression stage 3:1 - main stage
Cartridge Material	Working parts hardened and ground steel. Electroless nickel plated body
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option.
Mounting Position	Unrestricted
Cavity Number	A12336
Torque Cartridge into Cavity	60 Nm (44 lbs ft)
Weight	0.243 kg (0.54 lbs)
Seal Kit Number	SK986 (Nitrile) SK986V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

OPERATION

The ball and poppet are held onto their respective seats by spring force, ensuring positive sealing as long as the pressure on port 1 is equal to or greater than the pressure on port 2. As soon as the pressure on port 2 exceeds the pressure on port 1 plus the spring force, the valve opens from 2 to 1. In order to pass flow in the reverse direction, pilot pressure must be applied to port 3. Once this reaches the required level, the pilot piston acting on the pin in the centre of the poppet lifts the ball off its seat, enabling the fluid to decompress and thus reducing the load pressure acting on port 1. As the load pressure decreases, the pilot pressure required to open the main stage also decreases and when the correct pilot pressure is reached, the main stage poppet is lifted off its seat by the advancing pilot piston, allowing full flow from 1 to 2.

When calculating the pilot pressure, it must be remembered that any back pressure on port 2 will cause this to increase on a 1:1 ratio.

*For applications above 210 bar please consult our technical department or use the steel body option.

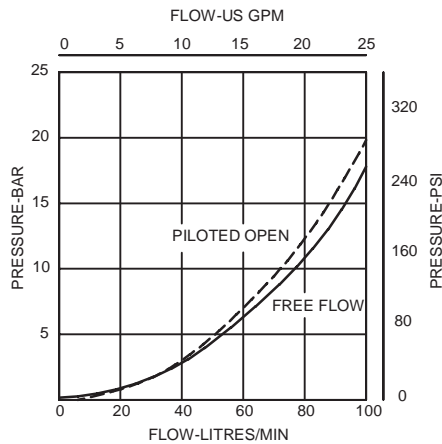
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Website: www.integratedhydraulics.com

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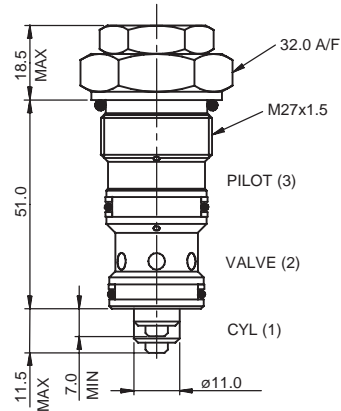
7047 Spinach Drive, Mentor, Ohio 44060, USA
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Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 4CKD90



Note. Ensure cavity clears nose end of cartridge

SINGLE VALVE

1/2" PORTS

BASIC CODE: 4CKD95

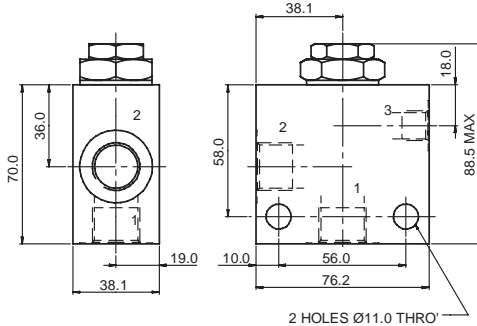
Body ONLY part numbers

BSP, aluminium
1/2" B13625

SAE, aluminium
1/2" B10806

BSP, steel
1/2" B13626

SAE, steel
1/2" B10922



DUAL VALVE

1/2" PORTS

BASIC CODE: 4CKKD95 (INTERNALLY CROSS PILOTED)

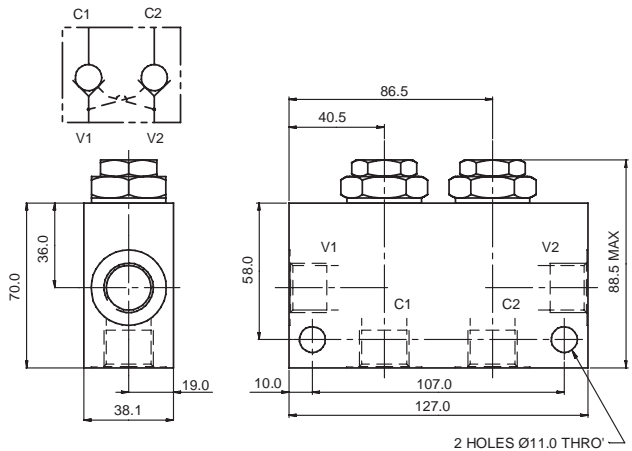
Body ONLY part numbers

BSP, aluminium
1/2" C13627

SAE, aluminium
1/2" C10807

BSP, steel
1/2" C13628

SAE, steel
1/2" C11561



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

4CK****

1

4W

S

3

Basic Code

4CKD90 = Cartridge Only

4CKD95 = Cartridge and Body

4CKKD95 = Cartridges and Dual Body

Pilot Port Sizes

1 = Internal

Port Sizes - Bodied Valves Only

4W = 1/2" BSP. 1/4" BSP. Pilot Port

8T = 1/2" SAE 1/4" SAE Pilot Port

Optional Pilot Seal

Omit if not required

Seals

S = Nitrile (For use with most industrial hydraulic oils)

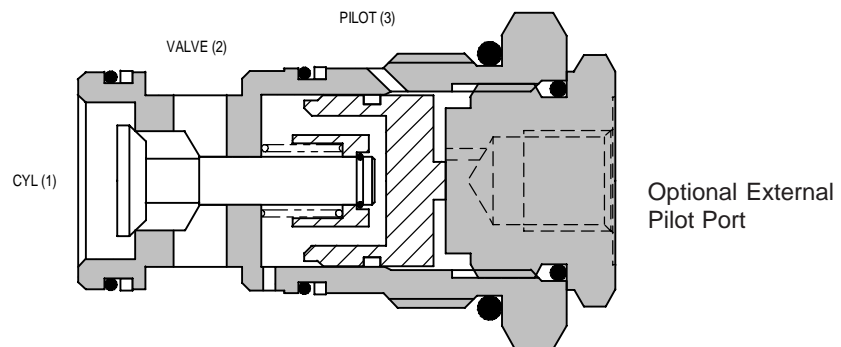
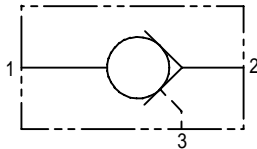
SV = Viton (For high temperature and most special fluid applications)



4CK SERIES CHECK VALVES

PILOT OPERATED POPPET

4CK120



APPLICATION

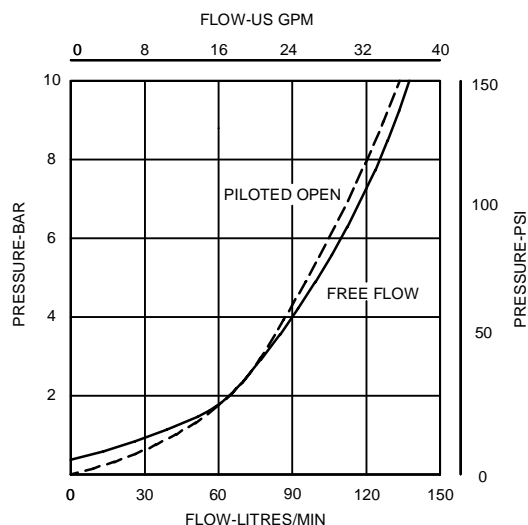
Pilot check valves allow flow to pass in one direction, with a low pressure drop, then prevent reverse flow until pilot pressure is applied. There are many applications for this valve type, the most common being to lock and hold a cylinder, or another hydraulic actuator, in position.

The 4CK120 cartridge valve is ideally suited for fitting directly into a cylinder, giving economy of installation, direct control of cylinder movement and ease of servicing.

OPERATION

Pressure on the valve port causes the poppet to lift against the spring force, allowing flow to the cylinder port. Reverse flow is prevented by the check reseating. Pressure applied to the pilot port will overcome the cylinder port pressure and lift the poppet from its seat, allowing return flow.

PRESSURE DROP



*For applications above 210 bar please consult our technical department or use the steel body option.

FEATURES

Hardened and ground poppet gives excellent flow capability, positive sealing and long working life. The larger seat diameter restricts the pilot ratio to 3:1. Cartridge construction allows installation in actuators, manifold blocks and Hydraulic Integrated Circuits. Versions with sealed pilot pistons are available. Fits the same cavity as the 1CE100 overcentre valve. See page 6-181.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	120 litres/min (32 US GPM)	
Max Pressure	350 bar (5000 psi)	
Pilot Ratio	3:1	
Cartridge Material	Working parts hardened and ground steel. Zinc plated body	
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option.	
Mounting Position	Unrestricted	
Cavity Number	A877 (See Section 17)	
Torque Cartridge into Cavity	100 Nm (74 lbs ft)	
Weight	4CK120	0.28 kg (0.62 lbs)
	4CK125	1.15 kg (2.54 lbs)
	4CKK125	1.96 kg (4.32 lbs)
Seal Kit Number	SK381 (Nitrile)	SK381V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)	
Operating Temp	-20°C to +90°C	
Leakage	0.3 millilitres/min nominal (5 dpm)	
Nominal Viscosity Range	5 to 500 cSt	

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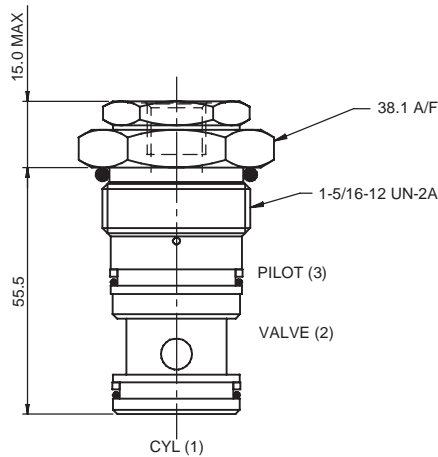
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CARTRIDGE ONLY

BASIC CODE: 4CK120



SINGLE VALVE

BASIC CODE: 4CK125

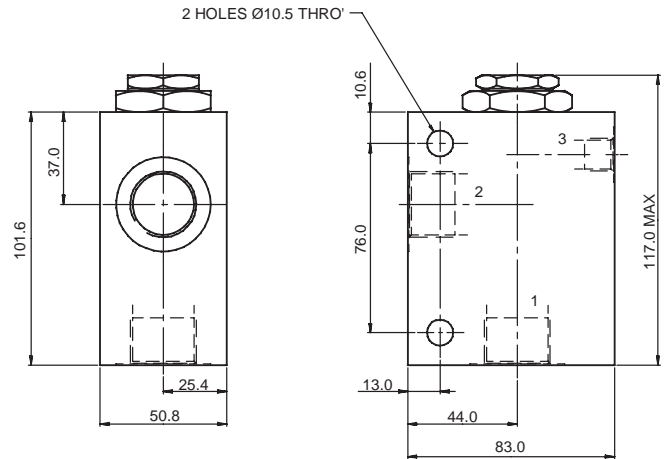
Body ONLY part numbers

BSP, aluminium
3/4" B6898

SAE, aluminium
3/4" B8200
1" B10708

BSP, steel
3/4" B5544

SAE, steel
1" B11814



7

DUAL VALVE

3/4" PORTS

BASIC CODE: 4CKK125

(INTERNALLY CROSS PILOTED)

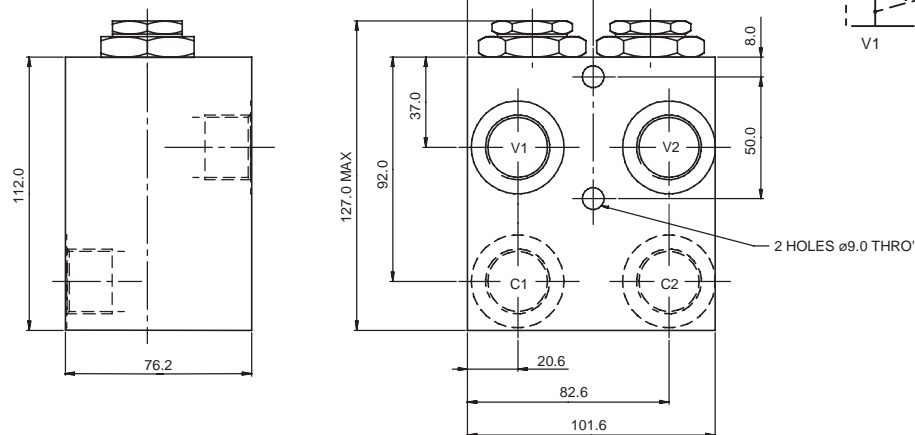
Body ONLY part numbers

BSP, aluminium
3/4" C2543

SAE, aluminium
3/4" C10629

BSP, steel
3/4" C1200

SAE, steel
3/4" C16434



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

4CK****

1

6W

S

3

Basic Code

4CK120 = Cartridge Only

4CK125 = Cartridge and Body

4CKK125 = Cartridges and Dual Body

Pilot Port Sizes

1 = Internal

2W = 1/4" BSP (External Pilot). Omit for bodied valves

4T = 1/4" SAE (External Pilot). Omit for bodied valves

Port Sizes - Bodied Valves Only

6W = 3/4" BSP. 1/4" BSP Pilot Port

12T = 3/4" SAE. 1/4" SAE Pilot Port

16T = 1" SAE. 1/4" SAE Pilot Port

Optional Pilot Seal

Omit if not required

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

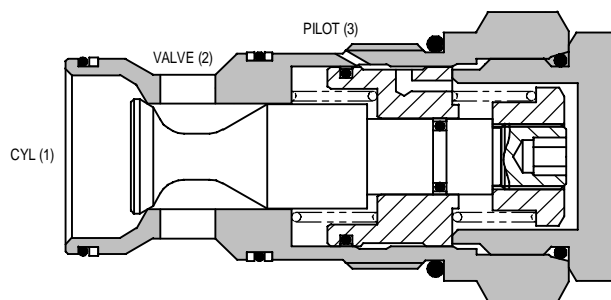
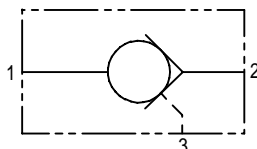
We reserve the right to change specifications without notice



4CK SERIES CHECK VALVE

PILOT OPERATED POPPET

4CK300



7

APPLICATION

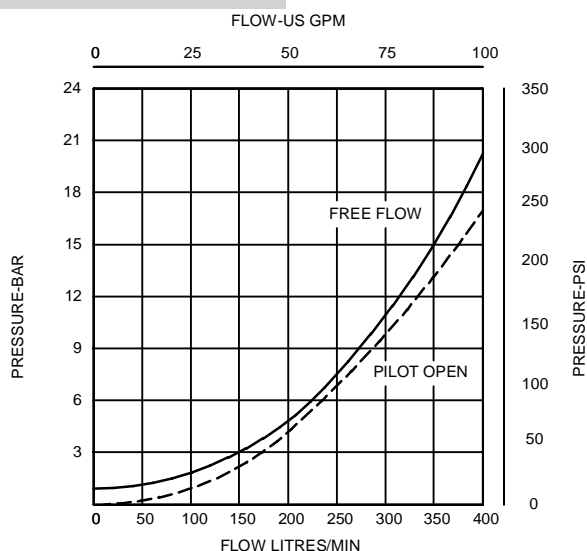
Pilot check valves allow flow to pass in one direction, with a low pressure drop, then prevent reverse flow until pilot pressure is applied. There are many applications for this valve type, the most common being to lock and hold a cylinder, or another hydraulic actuator, in position.

The 4CK300 cartridge valve is ideally suited for fitting directly into a cylinder, giving economy of installation, direct control of cylinder movement and ease of servicing.

OPERATION

Pressure on the valve port causes the poppet to lift against the spring force, allowing flow to the cylinder port. Reverse flow is prevented by the check reseating. Pressure applied to the pilot port will overcome the cylinder port pressure and lift the poppet from its seat, allowing return flow.

PRESSURE DROP



FEATURES

Hardened and ground poppet gives excellent flow capability, positive sealing and long working life. The larger seat diameter restricts the pilot ratio to 3:1. Cartridge construction allows installation in actuators, manifold blocks and Hydraulic Integrated Circuits. Versions with sealed pilot pistons are available. Fits the same cavity as the 1CE300 overcentre valve. See page 6-211.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	300 litres/min (80 US GPM)	
Max Pressure	350 bar (5000 psi)	
Pilot Ratio	3:1	
Cartridge Material	Working parts hardened and ground steel. zinc nickel plated body	
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option.	
Mounting Position	Unrestricted	
Cavity Number	A6935 (See Section 17)	
Torque Cartridge into Cavity	150 Nm (110 lbs ft)	
Weight	4CK300	0.28 kg (0.62 lbs)
	4CK350	1.15 kg (2.54 lbs)
	4CKK350	1.96 kg (4.32 lbs)
Seal Kit Number	SK683 (Nitrile)	SK683V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)	
Operating Temp	-20°C to +90°C	
Leakage	0.5 millilitres/min nominal (5 dpm)	
Nominal Viscosity Range	5 to 500 cSt	

*For applications above 210 bar please consult our technical department or use the steel body option.

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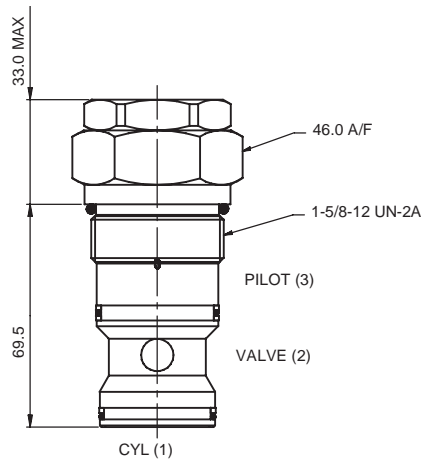
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CARTRIDGE ONLY

BASIC CODE: 4CK300



SINGLE VALVE

1 1/4" PORTS

BASIC CODE: 4CK350

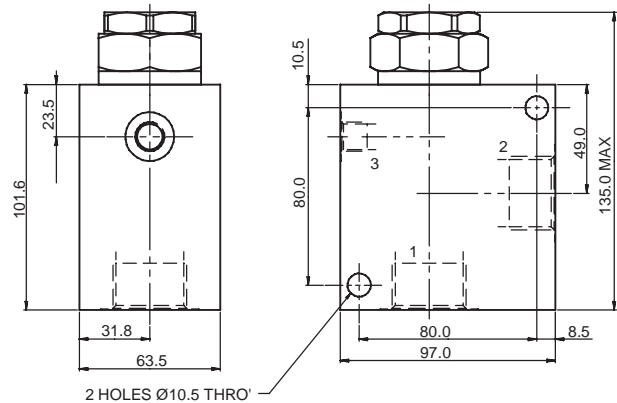
Body ONLY part numbers

BSP, aluminium
1 1/4" B6814

SAE, aluminium
1 1/4" B10630

BSP, steel
1 1/4" B8610

SAE, steel
1 1/4" B11474



DUAL VALVE

1 1/4" PORTS

BASIC CODE: 4CKK350

(INTERNALLY CROSS PILOTED)

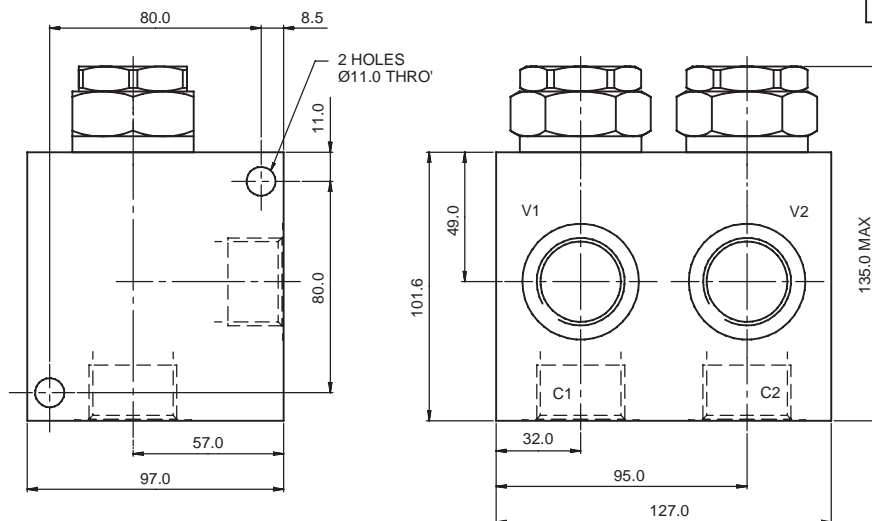
Body ONLY part numbers

BSP, aluminium
1 1/4" C8704

SAE, aluminium
1 1/4" C10811

BSP, steel
1 1/4" C8705

SAE, steel
1 1/4" C11564



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

4CK***

1

10W

S

3

Basic Code

4CK300 = Cartridge Only

4CK350 = Cartridge and Body

4CKK350 = Cartridges and Dual Body

Pilot Port Size

1 = Internal

Port Sizes - Bodied Valves Only

10W = 1 1/4" BSP, 1/4" BSP Pilot Port

20T = 1 1/4" SAE, 1/4" SAE Pilot Port

Pilot Seal

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

We reserve the right to change specifications without notice



4CK SERIES CHECKVALVE

ALTERNATIVE BODY ARRANGEMENTS for 30 to 300 Litres/min Valves

COMPLETE VALVE

3/8" PORTS - 4CK30* CARTRIDGE

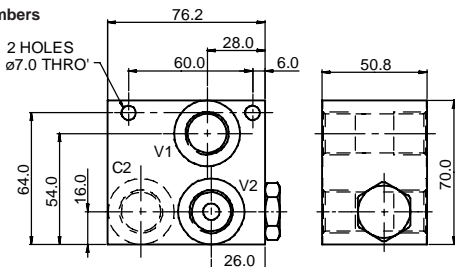
BASIC CODE: 4CK36

THROUGH PORTED

Body ONLY part numbers

BSP, aluminium
3/8" B13542

BSP, steel
3/8" B13543



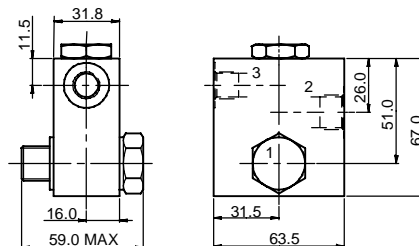
BASIC CODE: 4CBK35

BANJO MOUNTED

Sub-assembly part numbers

BSP, aluminium
3/8" AXP13617-3W-S

Banjo bolt torque - 47 Nm

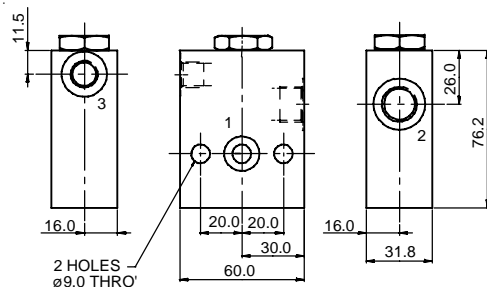


BASIC CODE: 4CKG35

GASKET MOUNTED

Sub-assembly part numbers

BSP, aluminium
3/8" BXP13621-3W-S



BASIC CODE: 4CKK35

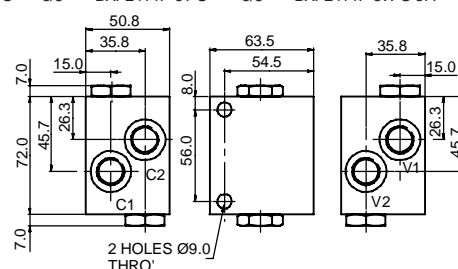
(INTERNALLY CROSS PILOTED)

Sub-assembly part numbers

BSP, aluminium
3/8" BXP24147-3W-S

SAE, aluminium
3/8" BXP24147-6T-S

BSP, steel
3/8" BXP24147-3W-S-377



7

COMPLETE VALVE

3/4" PORTS - 4CK120* CARTRIDGE

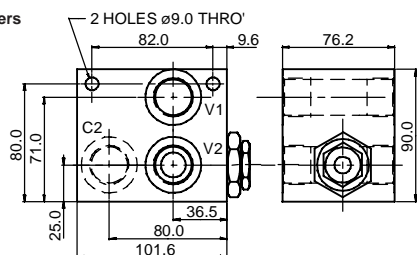
BASIC CODE: 4CK156

THROUGH PORTED

Body ONLY part numbers

BSP, aluminium
3/4" B13629

BSP, steel
3/4" B13630

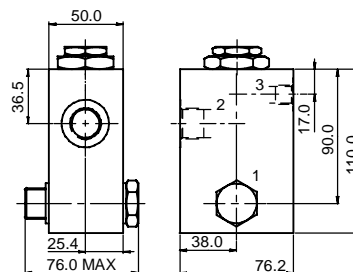


BASIC CODE: 4CBK150

BANJO MOUNTED

Sub-assembly part numbers

BSP, aluminium
3/4" AXP13565-6W-S



3/4" SAE 6000 PSI FLANGE PORTS - 4CK120* CARTRIDGE

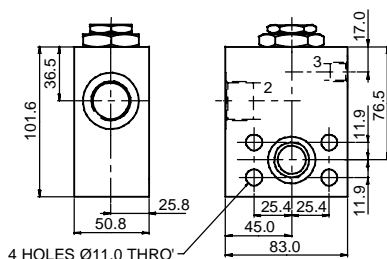
BASIC CODE: 4CKG150

GASKET MOUNTED

Sub-assembly part numbers

BSP, aluminium
3/4" BXP13634-6W-S

BSP, steel
3/4" BXP13634-6W-S-377



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Integrated Hydraulics Inc

7047 Spinach Drive, Mentor, Ohio 44060, USA
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Website: www.integratedhydraulics.com

COMPLETE VALVE

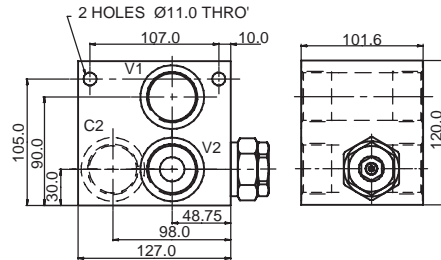
1 1/4" PORTS - 4CK300* CARTRIDGE

BASIC CODE: 4CK356
THROUGH PORTED

Body ONLY part numbers

BSP, aluminium
1 1/4" C13637

BSP, steel
1 1/4" C13638



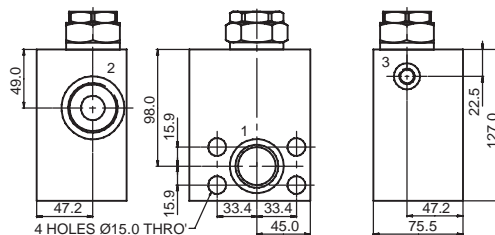
1 1/4" SAE 6000 PSI FLANGE PORTS - 4CK300* CARTRIDGE

BASIC CODE: 4CKG350
GASKET MOUNTED

Sub assembly part numbers

BSP, aluminium
1 1/4" BXP20647-10W-S

BSP, steel
1 1/4" BXP20647-10W-S



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

4CK*****

3W

S

3

Basic Code

- 4CK36** = Cartridge & Body Thro' Ported
- 4CBK35** = Cartridge & Body Banjo Mounted
- 4CKG35** = Cartridge & Body Gasket Mounted
- 4CKK35** = Cartridge & Dual Body
- 4CK156** = Cartridge & Body Thro' Ported
- 4CBK150** = Cartridge & Body Banjo Mounted
- 4CKG150** = Cartridge & Body Gasket Mounted
- 4CK356** = Cartridge & Body Thro' Ported
- 4CKG350** = Cartridge & Body Gasket Mounted

Optional Pilot Seal

3 = Required
Omit if not required

Seals

S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)

Port Sizes

3W = 3/8" BSP **6T** = 3/8" SAE
6W = 3/4" BSP
10W = 1 1/4" BSP

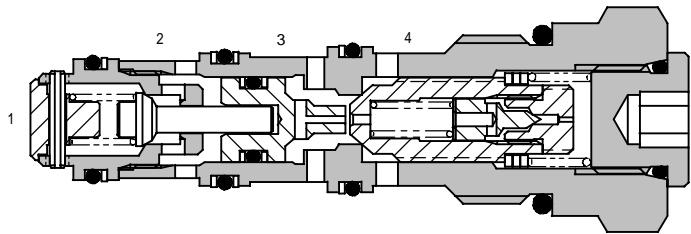
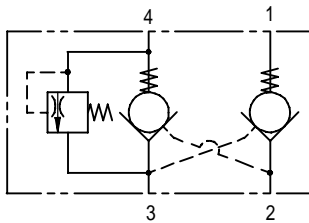
We reserve the right to change specifications without notice



4CKKT SERIES DUAL CHECK VALVE

PILOT TO OPEN WITH THERMAL RELIEF

4CKKT50



APPLICATION

Pilot check valves allow flow to pass in one direction, with a low pressure drop, then prevent reverse flow until pilot pressure is applied. There are many applications for this valve type, the most common being to lock and hold a cylinder, or another hydraulic actuator, in position.

A pilot relief valve will protect the cylinder and hoses from thermal expansion of the hydraulic fluid.

OPERATION

Pressure on the valve port causes the poppet to lift against the spring force, allowing the flow to the cylinder port. Reverse flow is prevented by the poppet reseating. Pressure applied to the pilot port will overcome the cylinder port pressure and lift the poppet from its seat, allowing flow from the cylinder to valve port.

In dual pilot check valves, each pilot section is cross connected to the opposite line giving automatic pilot operation in both directions. When the pressure in C1 rises above the setting of the relief valve, the relief valve will open, allowing flow to the V1 port, relieving pressure on the cylinder.

FEATURES

Hardened and ground poppet gives excellent flow capability for valve size, positive sealing and long working life. Cartridge construction allows installation in actuators, manifold blocks and Hydraulic Integrated Circuits.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	25 litres/min (6.6 US GPM)
Max Pressure	300 bar (4350 psi)
Pilot Ratio	3:1
Cartridge Material	Working parts hardened and ground steel. Electroless zinc plated body
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option.
Mounting Position	Unrestricted
Cavity Number	A12744 (See Section 17)
Torque Cartridge into Cavity	30 Nm (22 lbs ft)
Weight	4CKKT50 0.08 kg (0.18 lbs) 4CKKT55 0.34 kg (0.75 lbs)
Seal Kit Number	SK1120 (Nitrile) SK1120V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage C1-V1 C2-V2	1.0 millilitres/min nominal (15 d.p.m) 0.3 millilitres/min nominal (5 d.p.m)
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

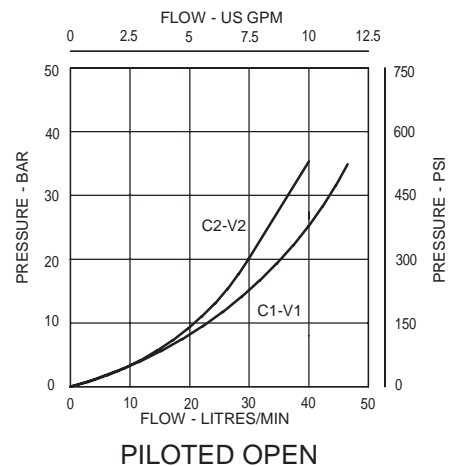
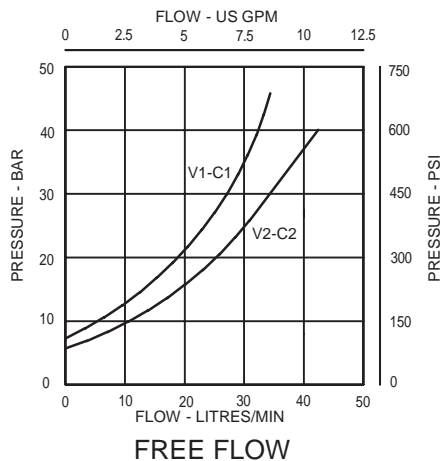
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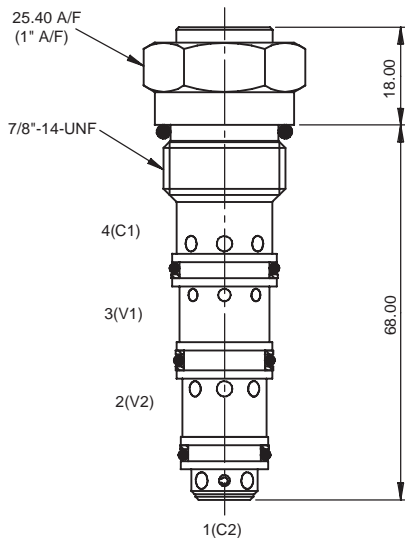
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Website: www.integratedhydraulics.com

PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 4CKKT50



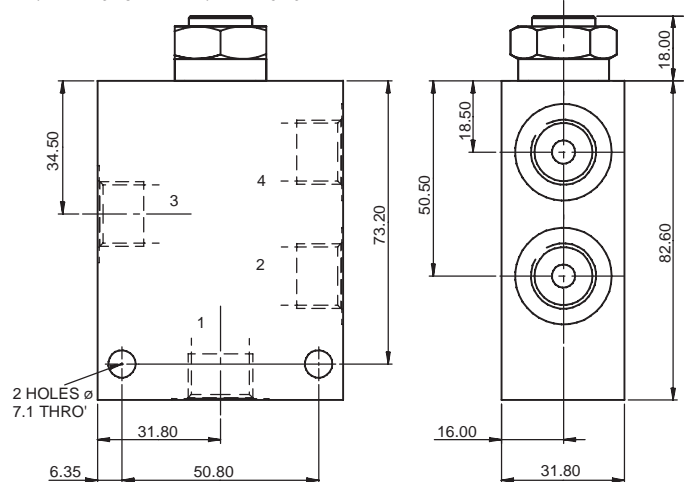
DUAL VALVE

3/8" PORTS

BASIC CODE: 4CKKT55 (INTERNALLY CROSS PILOTED)

Body ONLY part numbers

BSP, aluminium	SAE, aluminium
3/8" B19240	3/8" B19241
1/2" B19228	1/2" B19229



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

4CKKT 3W 3 S 3 28

Basic Code

4CKKT50 = Cartridge Only

4CKKT55 = Cartridge and Body

Port Sizes - Bodied Valves Only

3W = 3/8" BSP.

6T = 3/8" SAE.

4W = 1/2" BSP

8T = 1/2" SAE

Pilot Ratio

3 = 3:1

Pressure Setting

24 = 240 bar (3500 psi)

28 = 280 bar (4000 psi)

35 = 350 bar (5000 psi)

Optional Pilot Seal

3 = Standard

Omit if not required

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

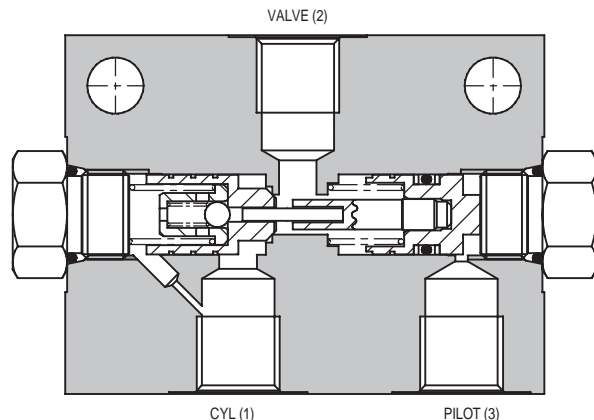
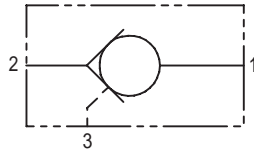
We reserve the right to change specifications without notice



4KD SERIES CHECK VALVE

PILOT OPERATED WITH DECOMPRESSION STAGE

4KD25



APPLICATION

Used to lock a cylinder or part of a circuit and prevent reverse flow until pilot pressure is applied. For use in high pressure, low flow circuits and circuits requiring decompression. Can be used in conjunction with the 1T16 pressure intensifier. See page 16-121.

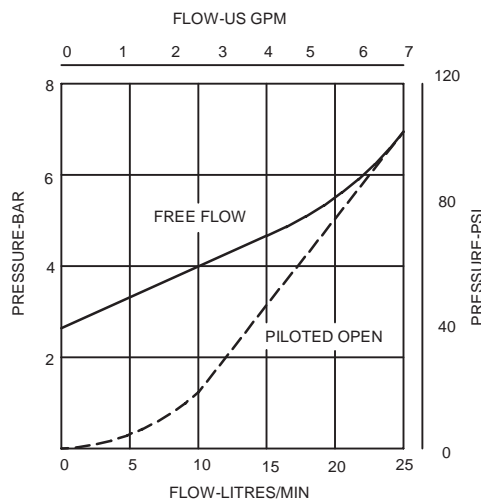
FEATURES

Decompression feature for low pilot pressure requirements and to reduce hydraulic noise on rapid loss of pressure.

OPERATION

In free flow direction, flow through inlet unseats the poppet and flows out of the cylinder port. When the control valve is centred the load is locked. When pilot pressure is applied the piston unseats the small poppet in the centre of the main poppet. Flow through this small seat area lowers the load or locked pressure (decompression stage). With load pressure reduced the main poppet is then piloted fully open allowing reverse flow.

PRESSURE DROP



SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	25 litres/min (6 US GPM)
Max Pressure	700 bar (10000 psi) Cylinder Port 140 bar (2000 psi) Pilot Port
Pilot Ratio	25:1 Decompression 4:1 Full flow
Body Material	Steel
Mounting Position	Line mounted
Weight	0.8 kg (1.8 lbs)
Seal Kit Number	SK1060 (Nitrile) SK1060V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Nominal Viscosity Range	5 to 500 cSt

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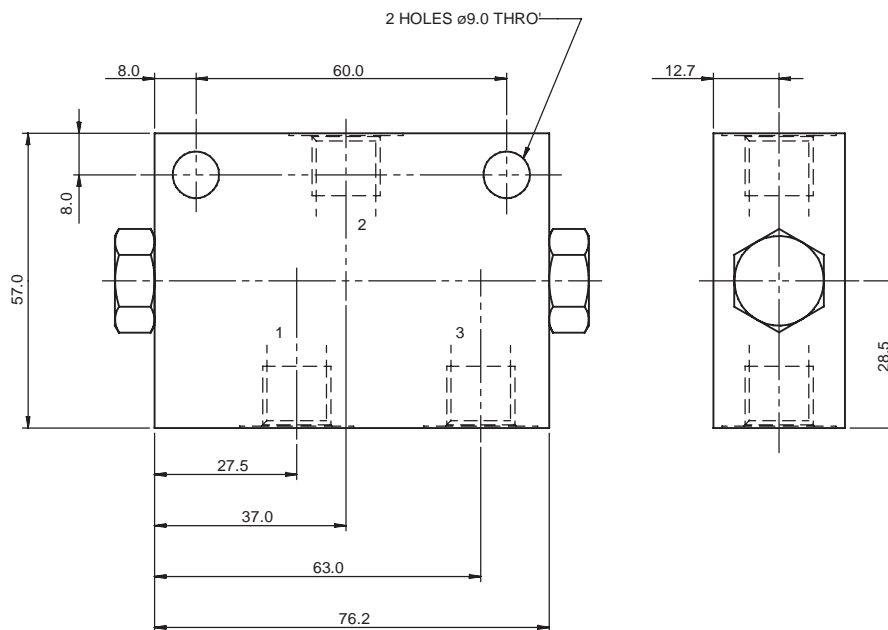
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COMPLETE VALVE 1/4" PORTS

BASIC CODE: 4KD25



7

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

4KD25

N

2W

S

3

Basic Code

4KD25 = Complete Valve

Adjustment Means

N = Fixed

Port Sizes - Bodied Valves Only

2W = 1/4" BSP

'O Ring on Pilot Piston
(Standard)

Seals

S = Nitrile (For use with most industrial hydraulic oils)

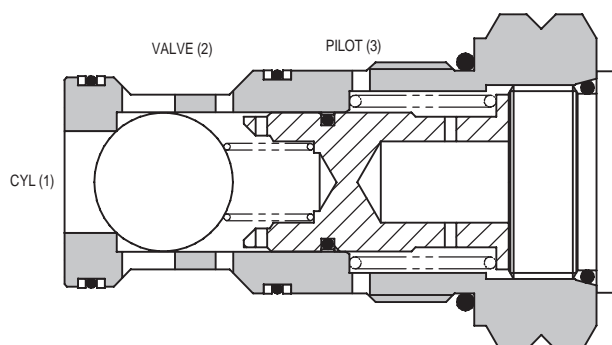
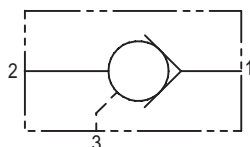
SV = Viton (for high temperature and most special fluid applications)



5CK SERIES CHECK VALVES

PILOT TO CLOSE

5CK30; 5CK120; 5CK300



APPLICATION

Pilot to close check valves allow flow to pass in one direction, with a low pressure drop to prevent reverse flow. When the pilot pressure is applied, flow is prevented in either direction. The pilot ratio of 2:1 allows a lower pressure in the pilot line to hold the valve closed.

The 5CK30 series are check cartridges ideally suited for fitting directly onto a cylinder. They are ideal for use in regenerative circuits, accumulator dump circuits and in control of cylinders or motors.

OPERATION

Pressure on the cylinder port causes the ball to lift against the spring force, allowing flow through to the valve port. Reverse flow is prevented by the ball reseating. Pressure applied to the pilot port will hold the ball against its seat, preventing flow from cylinder to valve.

FEATURES

Easy flow path gives good pressure to flow characteristics and hardened components ensure a long working life. Cartridge construction allows installation in actuators, manifold blocks and Hydraulic Integrated Circuits. They fit the same cavities as the 4CK pilot to open check valves, so care should be taken when selecting the valve.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

	5CK30	5CK120	5CK300
Rated Flow	30 litres/min (8 US GPM)	120 litres/min (32 US GPM)	250 litres/min (65 US GPM)
Max Pressure	350 bar (5000 psi)		
Pilot Ratio	2:1		
Cartridge Material	Working parts hardened and ground steel. Zinc nickel plated body		
Line Body Material	Standard aluminium (up to 210 bar*). Add suffix '377' for steel option		
Mounting Position	Unrestricted		
Cavity Number	A6610	A877	A6935
Torque Cartridge into Cavity	45 Nm (33 lbs ft)	100 Nm (74 lbs ft)	150 Nm (110 lbs ft)
Weight	0.08 kg (0.18 lbs)	0.28 kg (0.62 lbs)	0.28 kg (0.62 lbs)
Recommended Filtration	SK829 / SK829V	SK833 / SK833V	SK834 / SK834V
Seal Kit Number	BS5540/4 Class 18/13 (25 micron nominal)		
Operating Temp	-20°C to +90°C		
Leakage	0.3 millilitres/min (5 dpm)		
Nominal Viscosity Range	5 to 500 cSt		

*For applications above 210 bar please consult our technical department or use the steel body option.

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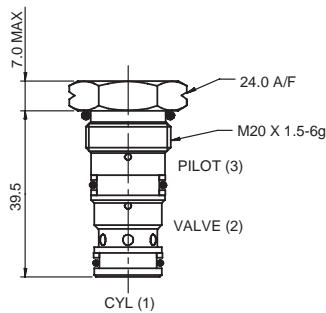
Collins Road, Heathcote Ind. Est., Warwick, CV34 6TF, UK.
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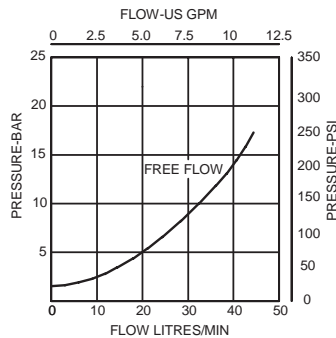
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Website: www.integratedhydraulics.com

CARTRIDGE ONLY

BASIC CODE: 5CK30



PRESSURE DROP



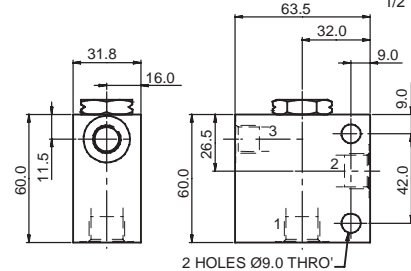
SINGLE VALVE

3/8" 1/2" PORTS

BASIC CODE: 5CK35

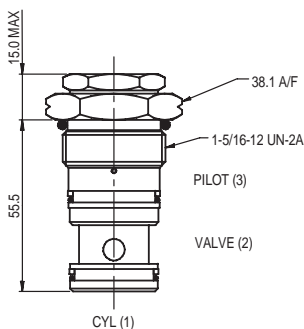
Body ONLY part numbers

BSP, aluminium 3/8" B6743	SAE, aluminium 3/8" B10536	BSP, steel 3/8" B12823	SAE, steel 1/2" B11811
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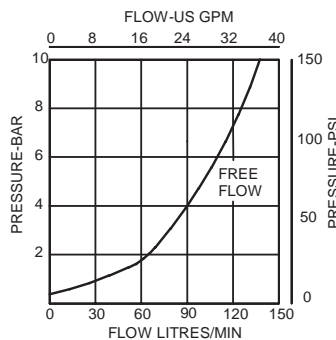


CARTRIDGE ONLY

BASIC CODE: 5CK120



PRESSURE DROP



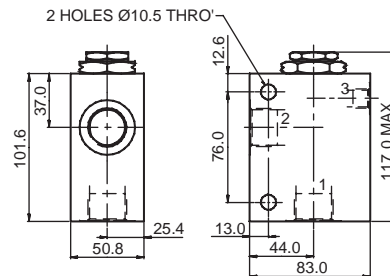
SINGLE VALVE

3/4" 1" PORTS

BASIC CODE: 5CK125

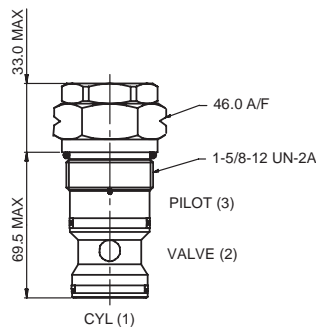
Body ONLY part numbers

BSP, aluminium 3/4" B6898	SAE, aluminium 3/4" B8200	BSP, steel 3/4" B5544	SAE, steel 1" B11814
	1" B10708		

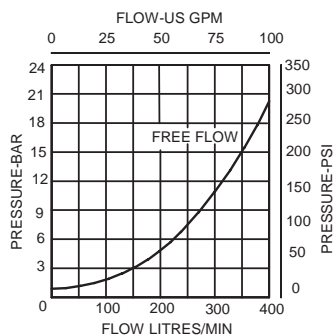


CARTRIDGE ONLY

BASIC CODE: 5CK300



PRESSURE DROP



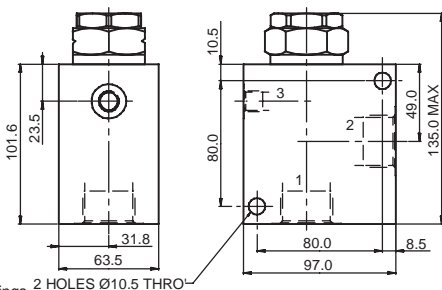
SINGLE VALVE

1 1/4" PORTS

BASIC CODE: 5CK350

Body ONLY part numbers

BSP, aluminium 1 1/4" B6814	SAE, aluminium 1 1/4" B10630	BSP, steel 1 1/4" B8610	SAE, steel 1 1/4" B11474
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Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

5CK***

1

3W

S

2

Basic Code

5CK30/5CK120/5CK300 = Cartridge Only
5CK35/5CK125/5CK350 = Cartridge and Body

Pilot Port Size (Omit for line valves)

1 = Internal

Port Sizes - Bodied Valves Only

3W = 3/8" BSP.	6T = 3/8" SAE.	1/4" BSP/SAE Pilot Port
6W = 3/4" BSP.	12T = 3/4" SAE.	1/4" BSP/SAE Pilot Port
10W = 1 1/4" BSP.	20T = 1 1/4" SAE.	1/4" BSP/SAE Pilot Port

Pilot Ratio

2 = 2:1

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

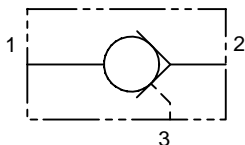
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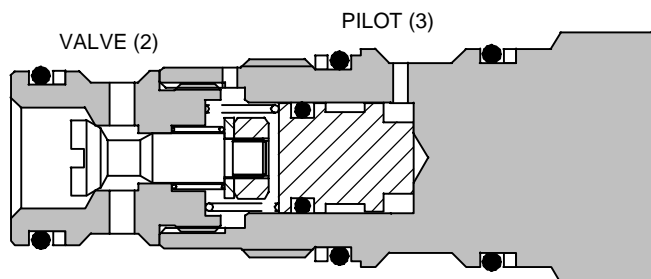
4SK SERIES CHECK VALVE

PILOT TO OPEN

4SK30



CYL (1)



APPLICATION

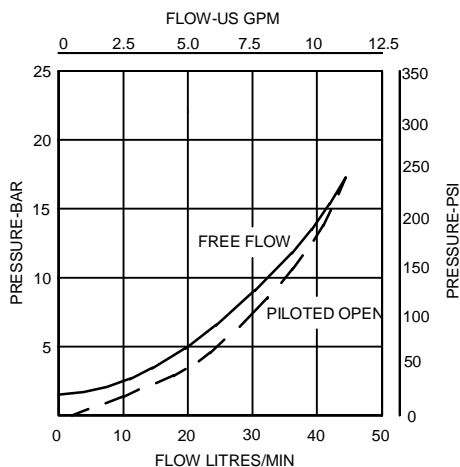
Pilot check valves allow flow to pass in one direction, with a low pressure drop, then prevent reverse flow until pilot pressure is applied. There are many applications for this valve type, the most common being to lock and hold a cylinder, or another hydraulic actuator, in position.

The 4SK30 is a small cartridge valve and is ideally suited for fitting directly into a cylinder, giving economy of installation, direct control of cylinder movement and ease of servicing.

OPERATION

Pressure on the valve port causes the poppet to lift against the spring force, allowing the flow to the cylinder port. Reverse flow is prevented by the poppet reseating. Pressure applied to the pilot port will overcome the cylinder port pressure and lift the poppet from its seat, allowing flow from the cylinder to valve port.

PRESSURE DROP



FEATURES

Hardened and ground poppet gives excellent flow capability for valve size, positive sealing and long working life. Cartridge construction allows installation in actuators, manifold blocks and Hydraulic Integrated Circuits. Fits the same cavity as the 1SE30 overcentre valve.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	30 litres/min (8 US GPM)
Max Pressure	350 bar (5000 psi)
Pilot Ratio	3:1 & 5:1
Cartridge Material	Working parts hardened and ground steel. Zinc plated body
Mounting Position	Unrestricted
Cavity Number	A20090-T11A
Torque Cavity into Cartridge	45 Nm (33 lbs ft)
Weight	0.18 kg (0.39 lbs)
Seal Kit Number	SK1079 (Nitrile) SK1079V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal
Nominal Viscosity Range	5 to 500 cSt

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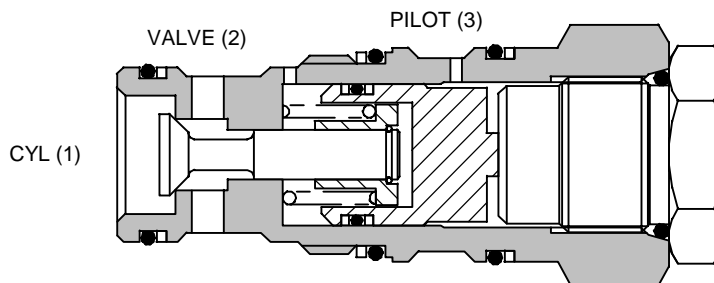
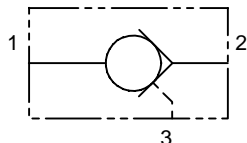
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4SK SERIES CHECK VALVES

PILOT OPERATED POPPET

4SK90



APPLICATION

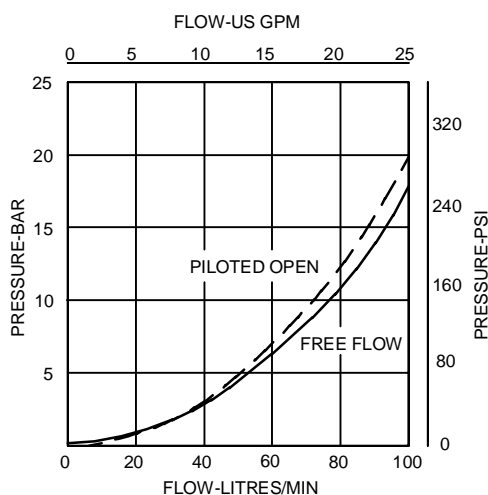
Pilot check valves allow flow to pass in one direction, with a low pressure drop, then prevent reverse flow until pilot pressure is applied. There are many applications for this valve type, the most common being to lock and hold a cylinder, or another hydraulic actuator, in position.

The 4SK90 is a small cartridge valve ideally suited for fitting directly into a cylinder, giving economy of installation, direct control of cylinder movement and ease of servicing.

OPERATION

Pressure on the valve port causes the poppet to lift against the spring force, allowing the flow to the cylinder port. Reverse flow is prevented by the poppet reseating. Pressure applied to the pilot port will overcome the cylinder port pressure and lift the poppet from its seat, allowing return flow.

PRESSURE DROP



FEATURES

Hardened and ground poppet gives excellent flow capability, positive sealing and long working life. The larger seat diameter restricts the pilot ratio to 4:1. Cartridge construction allows installation in actuators, manifold blocks and Hydraulic Integrated Circuits. Versions with sealed pilot pistons are available. Fits the same cavity as the 1SE90 overcentre valve.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	90 litres/min (24 US GPM)
Max Pressure	350 bar (5000 psi)
Pilot Ratio	4:1
Cartridge Material	Working parts hardened and ground steel. Zinc plated body
Mounting Position	Unrestricted
Cavity Number	A20092-T2A
Torque Cavity into Cartridge	60 Nm (44 lbs ft)
Weight	0.39 kg (0.86 lbs)
Seal Kit Number	SK1093 (Nitrile) SK1093V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

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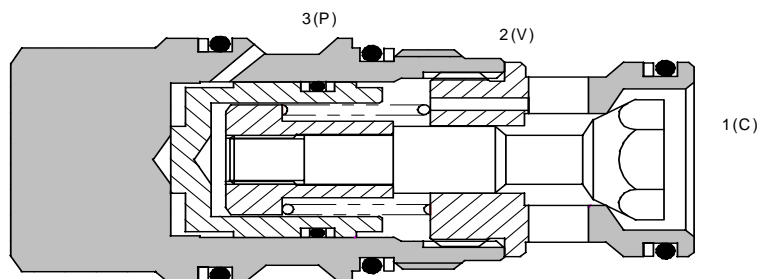
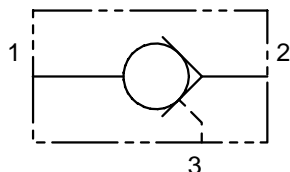
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4SK SERIES CHECK VALVES

PILOT OPERATED POPPET

4SK140



APPLICATION

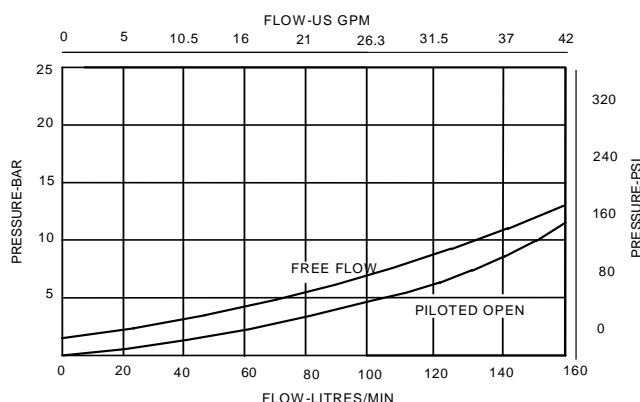
Pilot check valves allow flow to pass in one direction, with a low pressure drop, then prevent reverse flow until pilot pressure is applied. There are many applications for this valve type, the most common being to lock and hold a cylinder, or another hydraulic actuator, in position.

The 4SK140 is a small cartridge valve ideally suited for fitting directly into a cylinder, giving economy of installation, direct control of cylinder movement and ease of servicing.

OPERATION

Pressure on the valve port causes the poppet to lift against the spring force, allowing the flow to the cylinder port. Reverse flow is prevented by the poppet reseating. Pressure applied to the pilot port will overcome the cylinder port pressure and lift the poppet from its seat, allowing return flow.

PRESSURE DROP



FEATURES

Hardened and ground poppet gives excellent flow capability, positive sealing and long working life. The larger seat diameter restricts the pilot ratio to 3:1. Cartridge construction allows installation in actuators, manifold blocks and Hydraulic Integrated Circuits. Versions with sealed pilot pistons are available. Fits the same cavity as the 1SE140 overcentre valve.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	140 litres/min (37 US GPM)
Max Pressure	350 bar (5000 psi)
Pilot Ratio	3:1
Cartridge Material	Working parts hardened and ground steel. Zinc plated body
Mounting Position	Unrestricted
Cavity Number	A20094-T17A
Torque Cavity into Cartridge	200 Nm (150lbs ft)
Weight	0.44 kg (0.96lbs)
Seal Kit Number	SK1116 (Nitrile) SK1116V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

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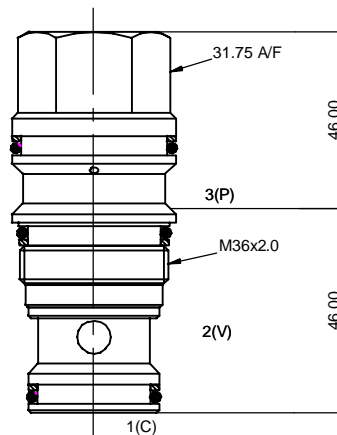
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CARTRIDGE ONLY

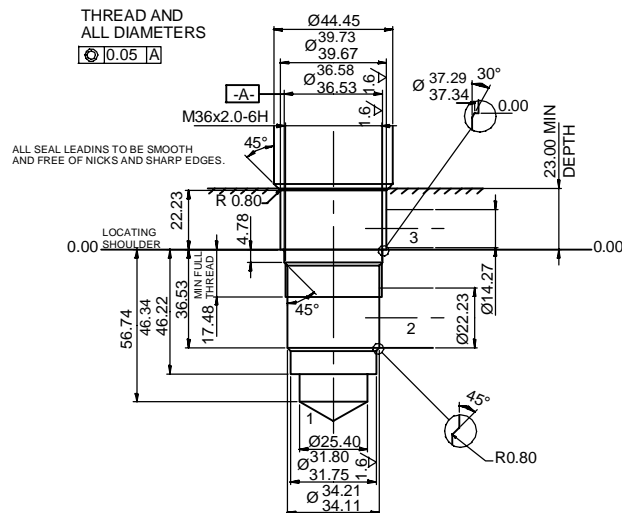
BASIC CODE: 4SK140



CAVITY

FORM DRILL: TD-17A
FORM REAMER: TR-17A

A20094-T17A



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

4SK140

3

S

3

Basic Code

Pilot Ratio

3 = 3:1

Optional Pilot Seal

Omit if not required

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

We reserve the right to change specifications without notice



Section 9 - PRESSURE COMPENSATED FLOW REGULATOR VALVES

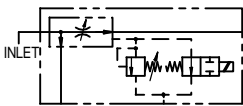
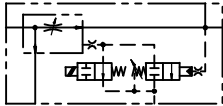
CONTENTS

This section contains a selection of pressure compensated flow regulators, both line mounted and cartridge style. There are three main types:

- 1) Restrictive style 2) Bypass style 3) Priority style

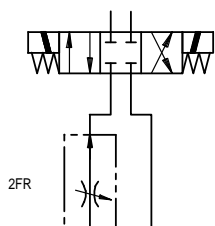
Regulated flows up to 350 litres/min (92 US GPM) and pressures up to 350 bar (5000 psi)

SELECTION

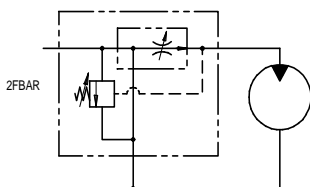
CIRCUIT	SERIES	APPLICATION	RANGE	PAGE
	2FPH Priority flow regulator with relief and electrical switch.	Priority style with relief to bypass and solenoid override. Ideal for excavator attachments such as hammers.	350 bar (5000 psi) Reg:0-195 l/min (0 - 50 US GPM)	9-181
	2FPH Priority flow regulator with pressure limit on regulated port and electrical switch.	Priority style flow regulator with pressure limit on regulated line allowing bypass pressure to rise above setting, with electrical override.	350 bar (5000 psi) Reg:0-350 l/min (0 -92 US GPM)	9-191



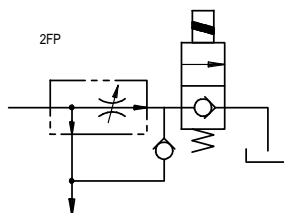
TYPICAL CIRCUIT EXAMPLES



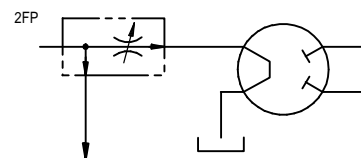
SPEED CONTROL



MOTOR CONTROL



TWO-SPEED CIRCUIT

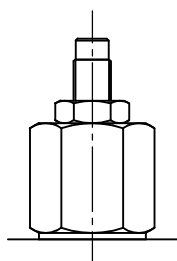


STEERING MOTOR

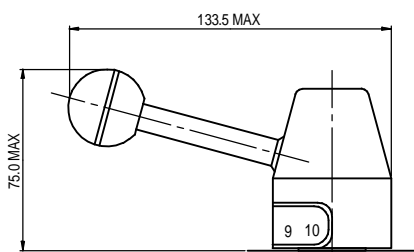
ADJUSTMENTS

The adjustment range and Max setting figures shown throughout this catalogue give the design range for each valve, higher or lower values may be attainable but should not be used without first contacting our Engineering department. Setting must ALWAYS be carried out using an appropriate gauge and it must NOT be assumed that screwing an adjuster to its maximum or minimum position will yield the maximum or minimum stated design setting for that valve.

9

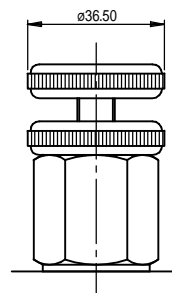


'P' - LEAKPROOF SCREW

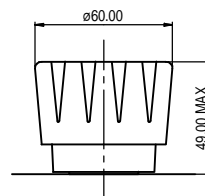


'L' - LEVER

LINEAR ADJUSTMENT THROUGH 180°. VARIABLE TO GIVE 1 TO 95 LITRES/MIN WITH THE ABILITY TO SET A MAXIMUM BETWEEN THESE FLOWS



'R' - HANDKNOB



'D' - DETENT

11 POSITIVE POSITIONS 320° ROTATION

Available only on:

2FP95
2FB95
2FR95
2FRC95
2FBAR95

Available only on:

2FP95
2FB95
2FR95
2FRC95
2FBAR95

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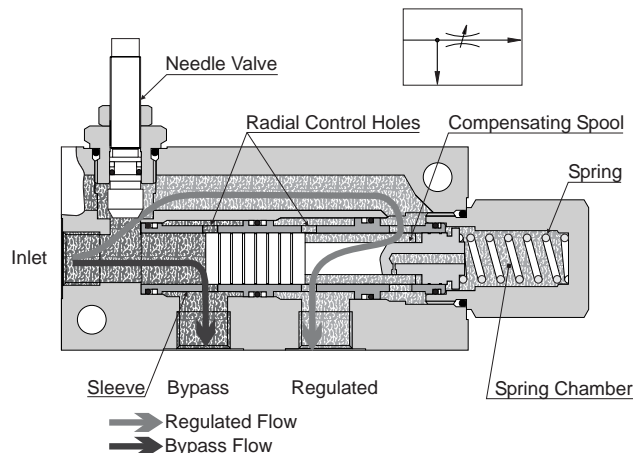
ATTACHMENT VALVES

In order for users of mobile plant to operate auxiliary equipment from the hydraulic system of the carrier so avoiding the need for an auxiliary power source accurate control of the flow and pressure is vital. The requirements of various attachments will differ both by type and manufacturer and the carriers operating system will also vary.

The following article charts the progress of several variants that solve the problem of differential pressure requirements whilst at the same time offering additional benefits. The standard Priority Flow Regulator (2FP) is the basis for a range of valves designed to provide priority flow and a bypass flow which can be used at different pressures. The setting is controlled by a simple needle valve with a compensating spool restricting the flow to the port working at the higher pressure thus maintaining the controlled flow from the regulated port. Before describing the variations in design and application it is necessary to understand the workings and performance of the standard priority style flow regulator as the normal operation of the variants (2FPH series) are the same.

2FP SERIES PRIORITY FLOW REGULATOR

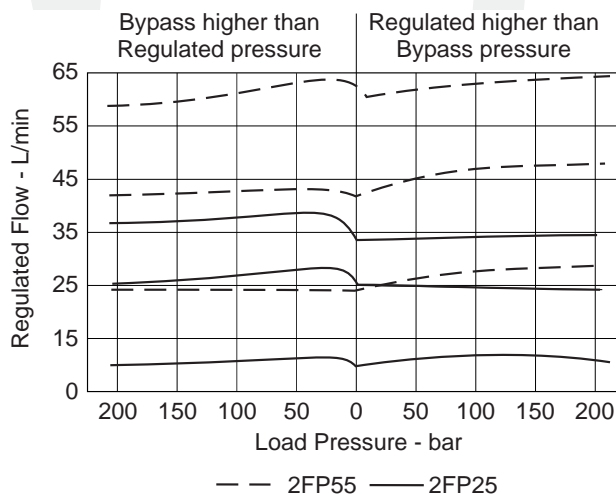
The flow from the pump enters the inlet port and passes across the needle valve, then on through the sleeve, past the compensating spool and out through the regulated port. The passage of oil across the needle valve creates a pressure difference which is sensed across the compensating spool. When the flow is sufficient to create a 7 bar pressure difference across the needle valve the compensating spool will begin to move uncovering the radial holes in the sleeve and opening up a path to the bypass port. Oil will therefore begin to pass to the bypass line. If the flow tries to increase across the needle valve, and so to the regulated port, there will be an increase in pressure difference sensed by the compensating spool causing it to move further against the spring, open further the line to the bypass port and limiting the flow to the regulated line. If the inlet flow falls below the setting of the valve the pressure difference across the needle valve will drop below the 7 bar needed to keep the bypass line open therefore the priority line is always satisfied before the bypass line opens. Changes in operating pressure on either of the two outlets will alter the inlet pressure to the higher of the two pressures (plus the control pressure which is 7 bar). If the working pressure in the regulated line is higher than that in the bypass line then the tendency would be for the flow to try to take the easy way out and flow down the bypass line. This would detract from the flow passing across the needle valve lowering the pressure difference causing the compensating spool to shift, increasing the restriction to the flow to the by-pass and reducing the restriction of the flow to the regulated line. In



this way the compensating spool will maintain the regulated or priority flow at a constant level.

If the working pressure in the bypass line is higher than that in the regulated line then there would be a tendency for the flow to increase through the regulated line, increasing the flow would increase the pressure difference across the needle valve and cause the compensating spool to metre the regulated line.

During the normal operation of any system utilising this type of valve both the regulated and the bypass pressures will be constantly altering causing the compensating spool to metre. The valve will maintain the priority flow within +/- 10% of its setting throughout its range. The largest movement in flow will occur when pressure differential is transitional, the higher pressure varying between the bypass and regulated ports, this causes the compensating spool to move from metering one ring of holes in the sleeve to the other. (See graph)



2FPH55, 95 & 195

The 2FPH series of flow regulators are based around the standard priority flow controls but with the addition of a pressure control and a solenoid vent both causing all of the

flow to pass to the bypass port.

This type of flow regulator lends its self to attachment circuits where a piece of ancillary equipment needs a controlled flow with a pressure limitation which is lower than the maximum working pressure of the carrier.

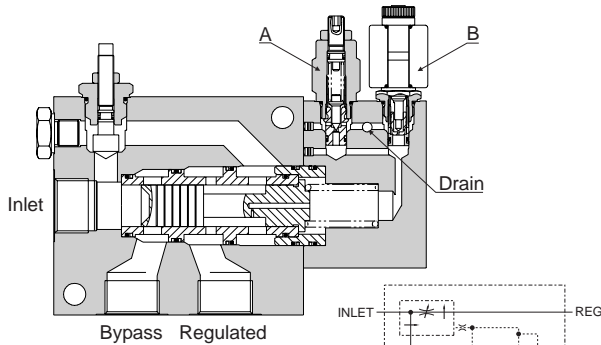


Fig 2. Priority type pressure compensated flow regulator with pressure control and override- 2FPH55/95/195

They were originally developed for Hammer circuits where the hydraulic hammer requires a constant flow for efficient operation. There was also a pressure limit for safe operation which was well below the normal working pressure of Excavators. It was also necessary to maintain the other functions on the carrier to enable movement of the arm and the pecking action needed to fire the hammer into life. This was achieved by control of the spring chamber pressure in the standard priority flow regulators. The dampening orifice in the spool on these valves enabled the use of pilot valves which were mounted directly into the spring housing giving a very neat, compact solution. In normal operation these valves behave just as the 2FP range but if the pressure in the bypass circuit exceeds the setting of the relief valve ("A" in Fig 2) the compensator spool reacts by cutting ALL flow to the Regulated port, only when the pressure in the by-pass port drops below the setting of the relief will normal flow be resumed. When using this type of valve with a hammer it is an advantage to have the hammer turn off if the operator decides to put too much pressure on down stroke in an attempt to increase the speed of operation. In this way potential damage to the hammer is avoided. Energizing the Solenoid valve ("B" in Fig 2) has the same effect, venting one side of the compensator spool and causing it to block flow to the regulated port.

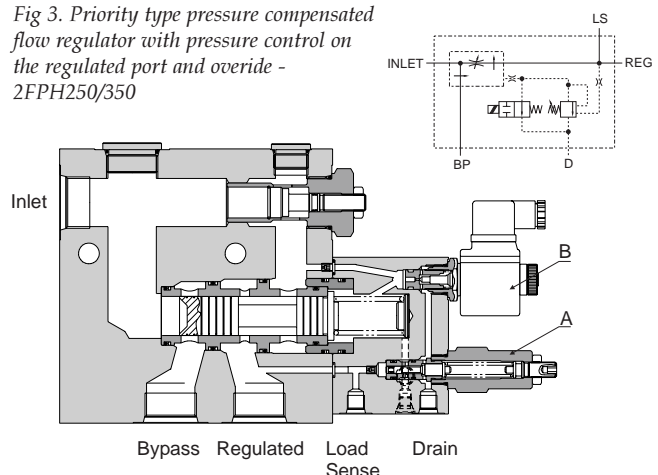
The range included three sizes which corresponded to the three larger sizes of priority flow regulator with rated regulated flows of 55, 95 and 195 L/min. At the time this covered the majority of the applications.

2FPH250/350

It was not long before the operators of Excavators realised that a power take off provided by this sort of valve enabled the use of more varied attachments without the extra power source and the associated pipe work. The disadvantage with the original valves was that the pressure sense for limiting the regulated pressure was referenced to the inlet. This meant that if the inlet pressure rose higher than the setting of the attachment then the valve would switch all of the flow to the bypass starving the attachment of oil. The valve therefore became limited to hammers and other high pressure attachments. The other alternative was to set the pressure control valve in the flow regulator high and fit an external relief valve on the regulated line.

Developments in Excavator control systems and also in the attachments demanded that a new design of valve was necessary. The two new additions to the range have been designed to accommodate the attachments which may require the bypass pressure to work higher than the regulated pressure while maintaining the function of the attachment. The pressure limit to the regulated line is achieved by using a pilot unloading valve ("A" in Fig 3) which senses pressure from the regulated line only. This allows the bypass pressure to rise above the regulated setting without affecting the operation of the attachment. Again in normal operation these valves behave just as the 2FP range but if the pressure in the regulated line rises above the setting of the unloading valve it will vent the spring chamber causing the compensator spool to shift cutting the flow to the regulated port. The resultant lack of flow will cause the pressure to drop, the unloading valve to close and the compensator to open the regulated port again. In practice this all happens smoothly and balance is maintained. By operating the pilot solenoid valve ("B" in Fig 3) and venting the spring chamber to tank, all of the flow will pass to the bypass port. While the valves will work perfectly adequately with hammers it will also work with generators, compactors, crushers and flail mowers. With this design it was also felt that increases in regulated flow were desirable hence the 250 and 350 L/min regulated flow rating.

Fig 3. Priority type pressure compensated flow regulator with pressure control on the regulated port and override - 2FPH250/350



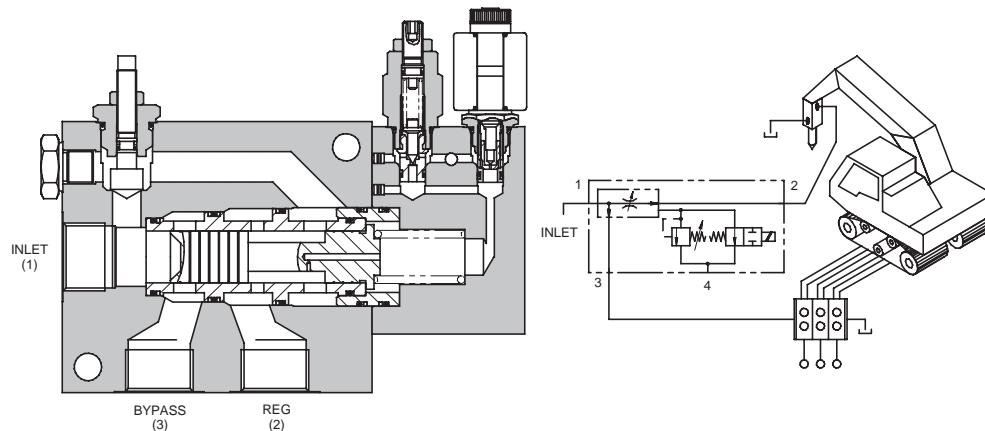


2FPH SERIES PRESSURE COMPENSATED FLOW

REGULATOR/DIVERTER - PRIORITY STYLE

2FPH SERIES

SOLENOID SWITCH



APPLICATION

The 2FPH series of priority flow regulator valves gives full control of regulated flow (see the 2FP series) plus remote selection of priority flow and adjustable pressure limitation of the regulated line.

9

OPERATION

Inlet flow passes through the adjustable orifice and the radial holes in the spool/sleeve assembly then out of the regulated port. The pressure drop across the orifice is sensed at each end of the spool, producing a force which, at the required flow rate, overcomes the spring force. The resultant movement of the spool regulates the flow by opening the radial valve ports to the bypass port and closing the regulated flow ports. The solenoid valve vents the spring chamber to a drain line and in its NORMAL (de-energised) mode all inlet flow is diverted to the bypass port. The pre-set regulated flow is selected by energising the solenoid. The adjustable relief valve vents the spring chamber at the pre-set pressure and diverts the flow to the bypass port. It may be necessary to fit a 10 bar check valve in the bypass or regulated line to ensure the valve switches fully.

FEATURES

Line body construction with three ports allows direct connection into hydraulic systems. Leakproof adjust screw gives easy, accurate adjustment to required flow setting. Remote functional selection with solenoid operation. Adjustable relief valve gives system protection. Hardened and ground working parts give accurate flow control and long working life.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	INLET:	
	2FPH55	95 litres/min (25 US GPM)
	2FPH95	150 litres/min (40 US GPM)
	2FPH195	380 litres/min (100 US GPM)
	REGULATED:	
	2FPH55	55 litres/min (14 US GPM)
	2FPH95	95 litres/min (25 US GPM)
	2FPH195	160 litres/min (42 US GPM)
Max Pressure	2FPH55	280 bar (4000 psi)
	2FPH95/2FPH195	350 bar (5000 psi)
Material	All working parts hardened and ground steel	
Body Material	2FPH55 Aluminium (up to 210 bar*) 2FPH95/2FPH195 Steel	
Mounting Position	Line mounted	
Weight	2FPH55	3.00 kg (6.60 lbs)
	2FPH95	3.50 kg (7.70 lbs)
	2FPH195	12.26 kg (27.00 lbs)
Seal Kit Number	2FPH55	SK267 (Nitrile) SK267V (Viton)
	2FPH95	SK547 (Nitrile) SK547V (Viton)
	2FPH195	SK258 (Nitrile) SK258V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)	
Operating Temp	-20°C to +90°C	
Nominal Viscosity Range	5 to 500 cSt	

*For applications above 210 bar please consult our technical department or use the steel body option.

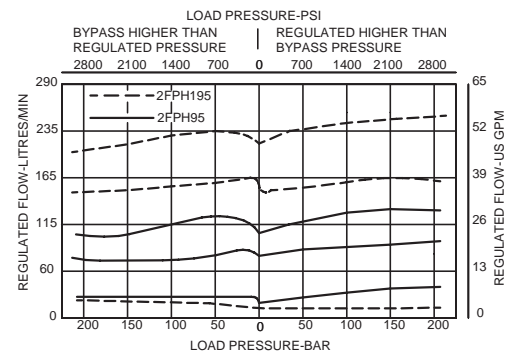
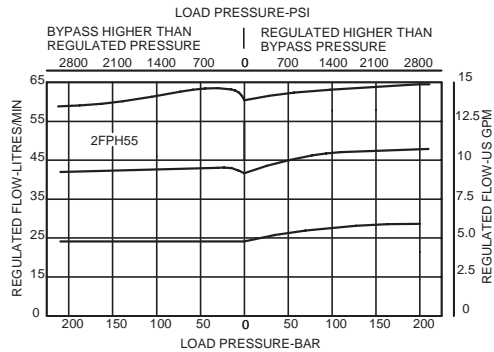
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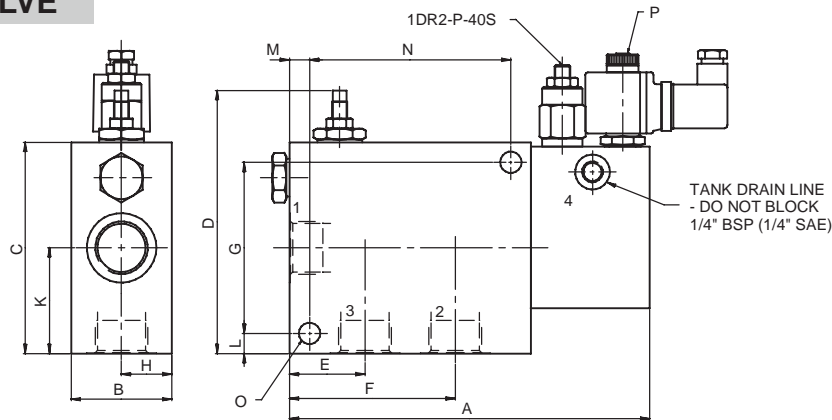
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PERFORMANCE



COMPLETE VALVE



Basic Code	Port Size	A	B	C	D	E	F	G	H	K	L	M	N	O	P	Std R/V Setting
2FPH55	1/2"	168	51	76	127	44.5	82.5	-	32	28.5	8.5	10	95	Ø8.5	SX203	280 bar
2FPH95	3/4"	232	63.5	76	127	58	102	58	39.5	32	10	10	136	Ø10.5	S207	200 bar
2FPH195	1"	227.5	63.5	133	168	47	104	108	32	67	13	13	127	Ø13.5	S207	280 bar

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

2FPH P 6W 95 S H 24**

Basic Code
2FPH = Complete Valve

Adjustment Means
P = Leakproof Screw Adjustment
R = Handknob Adjustment
(See page 9-102 for dimensions)

Port Sizes - Bodied Valves Only
4W = 1/2" BSP 8T = 1/2" SAE
6W = 3/4" BSP 12T = 3/4" SAE
8W = 1" BSP 16T = 1" SAE

Adjustable Flow Range
55 = 0- 55 litres/min - 2FPH55
95 = 0- 95 litres/min - 2FPH95
195 = 0-195 litres/min - 2FPH195

Voltage
12 = 12VDC
24 = 24VDC
Other options available on request

Coil Termination
H = ISO4400 (plug included)
F = Flying Leads DC only
DM = Deutsch Moulded
Other terminations available on request

Seals
S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)

We reserve the right to change specifications without notice

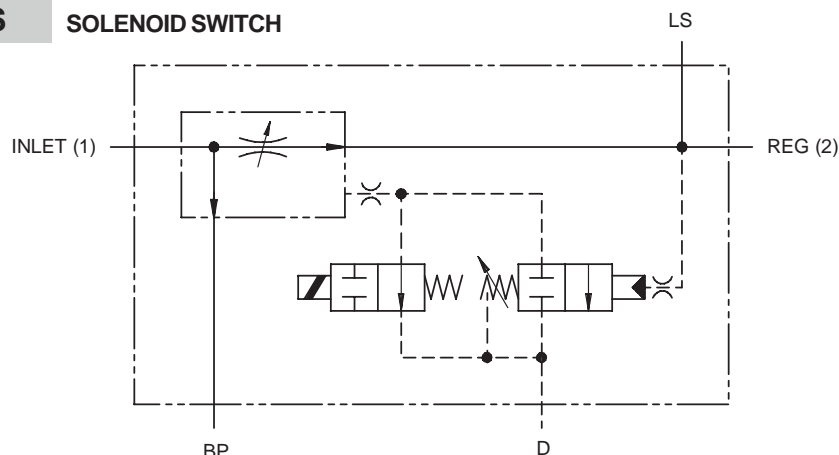


2FPH SERIES PRESSURE COMPENSATED FLOW

REGULATOR/DIVERTER - PRIORITY STYLE

2FPH SERIES

SOLENOID SWITCH



APPLICATION

The 2FPH series of priority flow regulator valves gives full control of regulated flow (see the 2FP series) plus remote selection of priority flow and adjustable pressure limitation of the regulated line.

OPERATION

Inlet flow passes through the adjustable orifice and the radial holes in the spool/sleeve assembly then out of the regulated port. The pressure drop across the orifice is sensed at each end of the spool, producing a force which, at the required flow rate, overcomes the spring force. The resultant movement of the spool regulates the flow by opening more radial holes to the bypass port. The solenoid valve vents the spring chamber to a drain line and in its de-energised mode all inlet flow is diverted to the bypass port. The pre-set regulated flow is selected by energising the solenoid. The adjustable pilot valve vents the spring chamber when the regulated line reaches the preset pressure, diverting the flow to the bypass port where the pressure can continue to rise if necessary. It may be necessary to fit a 10 bar check valve in the bypass or regulated line to ensure the valve switches fully.

FEATURES

Line body construction with three ports allows direct connection into hydraulic systems. Leakproof adjust screw gives easy, accurate adjustment to required flow setting. Remote functional selection with solenoid operation. Adjustable relief valve gives system protection whilst allowing bypass pressure to rise above setting if required. Hardened and ground working parts give accurate flow control and long working life.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	INLET: 2FPH250 350 litres/min (92 US GPM) 2FPH350 450 litres/min (120 US GPM)	
	REGULATED: 2FPH250 200 litres/min (52 US GPM) 2FPH350 350 litres/min (92 US GPM)	
Max Pressure	350 bar (5000 psi)	
Material	All working parts hardened and ground steel	
Body Material	Steel, zinc plated and passivated	
Mounting Position	Line mounted	
Weight	2FPH250	17 kg (37.4 lbs)
	2FPH350	28 kg (61.0 lbs)
Seal Kit Number	2FPH250	SK819 (Nitrile) SK819V (Viton)
	2FPH350	SK820 (Nitrile) SK820V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)	
Operating Temp	5 to 500 cSt	
Nominal Viscosity Range	-20°C to +90°C	

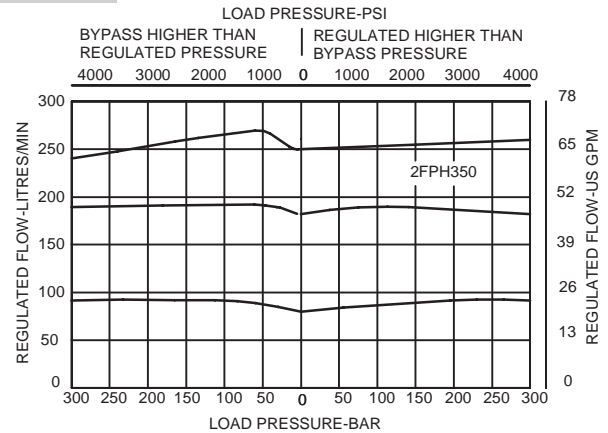
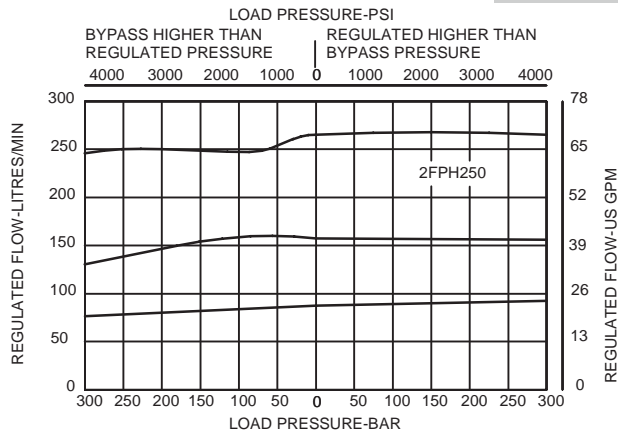
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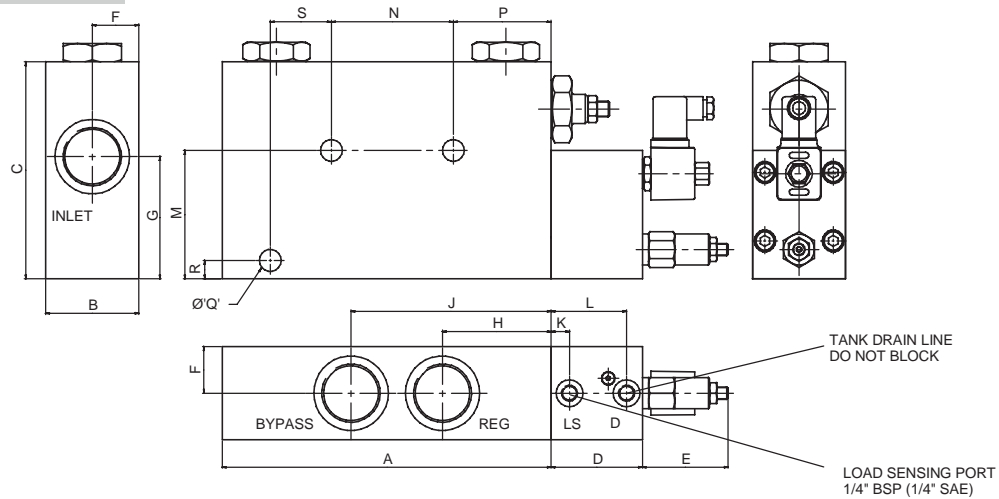
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PERFORMANCE



COMPLETE VALVE



Basic Code	Port Size	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	Std R/V Setting
2FPH250	1"	177	63.5	177.8	75	70	31.75	143	47.5	105	15	62	110	95	63	13.5	-	-	280 bar
2FPH350	1 1/2"	269	76.2	177.8	75	70	38.1	100	89	164	15	62	15	100	39	18.0	90	50	200 bar

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

2FPH* P 8W 250 S H 24**

Basic Code
2FPH = Complete Valve

Adjustment Means
P = Leakproof Screw Adjustment
R = Handknob Adjustment
(See page 9-102 for dimensions)

Port Sizes - Bodied Valves Only
8W = 1" BSP 16T = 1" SAE
12W = 1 1/2" BSP 24T = 1 1/2" SAE

Adjustable Flow Range
250 = 0-250 litres/min - 2FPH250
350 = 0-350 litres/min - 2FPH350

Voltage
12 = 12VDC
24 = 24VDC
Other options available on request

Coil Termination
H = ISO4400 (plug included)
F = Flying Leads DC only
DM = Deutsch Moulded
Other terminations available on request

Seals
S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)

We reserve the right to change specifications without notice

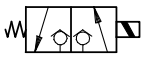


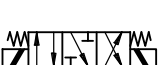



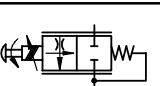


DIRECTIONAL CONTROL VALVES

CONTENTS

A range of cartridge solenoid valves with flows up to 100 litres/min (26 US GPM) and pressures up to 350 bar (5000 psi), including a variety of poppet and spool solutions.

SELECTION

CIRCUIT	SERIES	APPLICATION	RANGE	PAGE
	S229	3-way, 2-position poppet	210 bar (3000 psi); 12 litres/min (3 US GPM)	11-2731
	S570	4-way, 3-position spool	210 bar (3000 psi); 35 litres/min (9 US GPM)	11-3411
	S571	4-way, 3-position spool	210 bar (3000 psi); 34 litres/min (8.7 US GPM)	11-3611
	S572	4-way, 3-position spool	210 bar (3000 psi); 34 litres/min (8.7 US GPM)	11-3811
	S574	4-way, 3-position spool	210 bar (3000 psi); 34 litres/min (8.7 US GPM)	11-4011
	S577R	4-way, 3-position spool	210 bar (3000 psi); 27 litres/min (7 US GPM)	11-4211
	PDR21A	Proportional Pressure relief	350 bar (5000 psi) 1.5 litres/min (0.3 US GPM)	11/2-151
	PFR24A	Proportional Flow Control	210 bar (3000 psi); 18 litres/min (4.7 US GPM)	11/9-121

Note. When using these valves in conjunction with a PLC and there is a possibility of a residual voltage please contact the factory with application information to ensure safe operation of the product.

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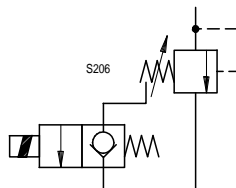
Collins Road, Heathcote Ind. Est., Warwick, CV34 6TF, UK.
Tel: +44 (0) 1926 881171 Fax: +44 (0) 1926 315729
Website: www.integratedhydraulics.com

Integrated Hydraulics Inc

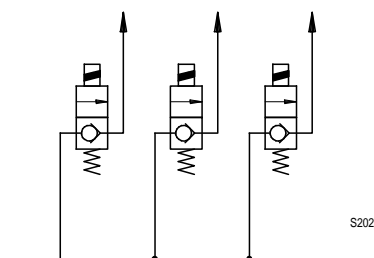
7047 Spinach Drive, Mentor, Ohio 44060, USA
Tel: (440) 974 3171 Fax: (440) 974 3170
Website: www.integratedhydraulics.com



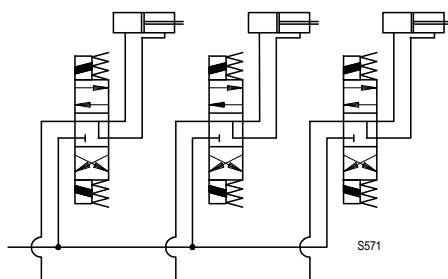
TYPICAL CIRCUIT EXAMPLES



RELIEF VENTED



SYSTEM SELECTION

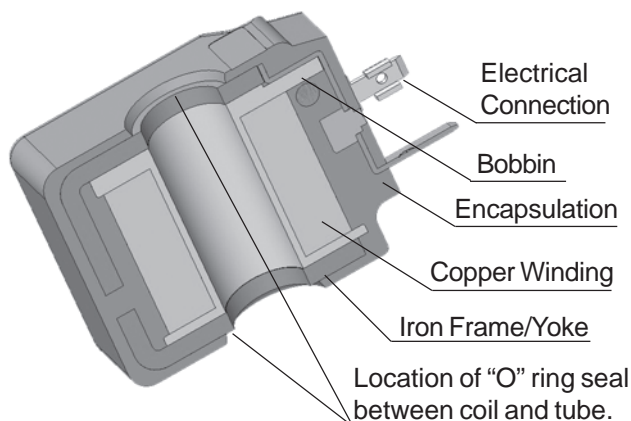


MULTIPLE ACTUATOR SELECTION



COIL INFORMATION

C13 and C16 Series



WATTAGE

C13 (for 13 mm tubes)	= 14, 22 & 27 Watts
C16 (for 16 mm tubes)	= 19 & 29 Watts

VOLTAGES

Standard

12 VDC	110 VRAC
24 VDC	220 VRAC

Special/Optional

Other Voltages are available on request

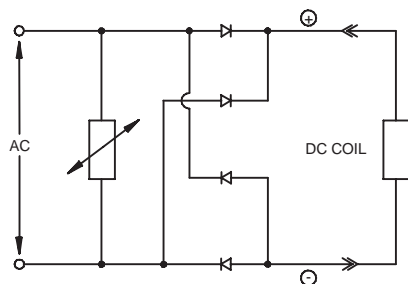
ALTERNATING CURRENT

For AC voltage an ISO4400 rectified connector must be used, as the coils are wound for DC.

The correct connector is available from the factory:

110 VAC	=	AXP9997-115
220 VAC	=	AXP9997-230

VDR is fitted for over-voltage protection.
Diodes are rated at 1.5 amp.



AC Voltage Connector Circuit Diagram

DUTY RATING

The coil is rated for continuous operation at nominal voltage $\pm 10\%$ and a ambient range of -20 to $+40$.

Note. Coil performance, force produced and power consumed, is effected by the heat of the coil, performance figures given in this catalogue are measured under simulated continuous duty conditions at the coil stabilised temperature. It is important to verify the actual conditions the valve will experience for any given application it should be tested in situ to confirm valve selection.

WIRE INSULATION

The coil winding is copper magnet wire insulation equivalent to class N (200°C).

ENCAPSULATION MATERIAL

C13, 14 Watt coils and C16, 19 Watt coils are black in colour and made from PBT (Black Polybutylene Reinforced) equivalent to Class F (155°C)

C13, 22 & 27 Watt coils and C16, 29 Watt coils are black in colour and made from IXEF (Black Polyarylamide Reinforced) equivalent to Class H (180°C)

INGRESS PROTECTION (IP) BS EN 60529

The coil/tube joint is sealed by "O" rings preventing fluid ingress and the possibility of tube corrosion.

Different electrical connectors offer different levels of protection the minimum being the DIN 43650 connector with a gasket at IP65. Integrated Hydraulics offer a wide range of connector types - details of which are available on request.

CONNECTORS

- H = ISO4400 Standard DIN43650
2 pin and earth
- F = Black Flying Leads 1.5mm^2 wire
600 mm long, 15 AWG, 2.2 mm diameter,
Teflon FEP covered (DC voltage only)
- DM = Deutsch Moulded 2 way DT04-2P series.
(DC voltage only).

Caution – When handling coils after or during use they maybe hot which can cause burning to the skin. Handle with care and use the appropriate equipment.

We reserve the right to change specifications without notice

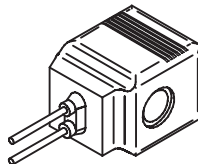
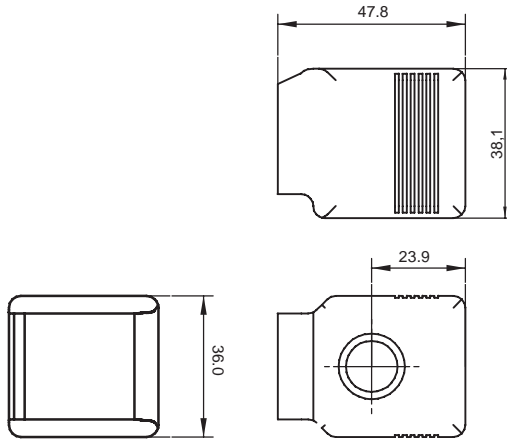
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Website: www.integratedhydraulics.com

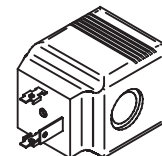
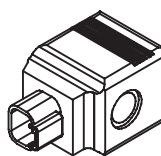
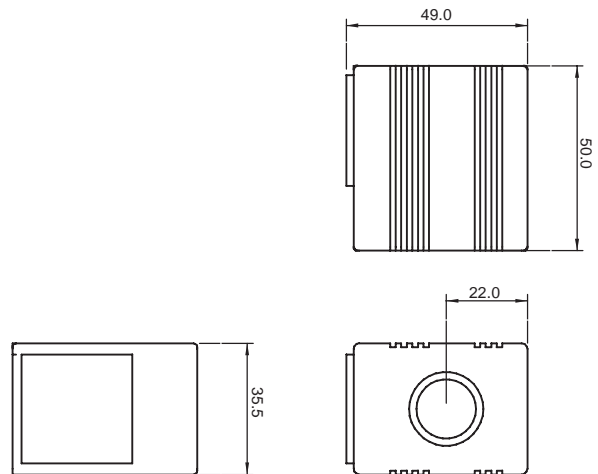
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C13 Coils



C16 Coils



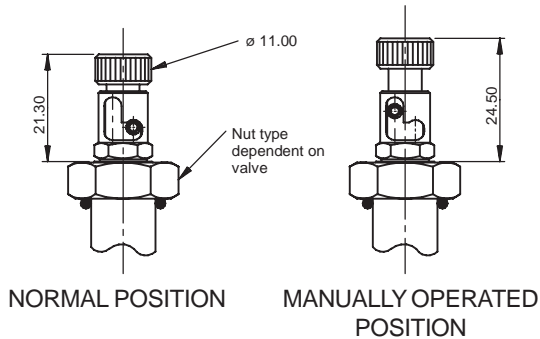
ORDERING CODE EXAMPLE

	C16	H	24	19	
Coil Series					Wattage
13 = 13 mm tube					C13
16 = 16 mm tube					14 = 14 Watt
					22 = 22 Watt
					27 = 27 Watt
Connection					C16
H = DIN43650 ISO Standard					19 = 19 Watt
F = Flying Leads (12 and 24 VDC only)					29 = 29 Watt
DM = Deutsch Moulded (12 and 24 VDC only)					
(Consult factory for other options)					Voltage
					12 = 12 VDC
					24 = 24 VDC
					110 = 110 VRAC
					220 = 220 VRAC*
					*220 to 240 VAC

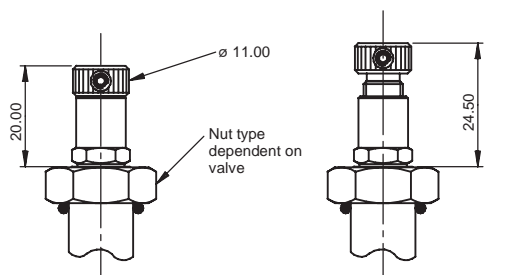
All AC coils must be used with a rectifying connector:-
(AXP9997-115 or AXP9997-230)
(Other voltages available on request)



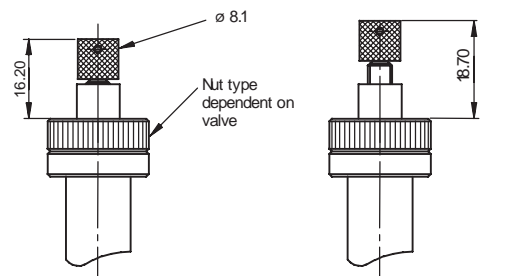
PUSH AND TWIST MANUAL OVERRIDE TYPE 1



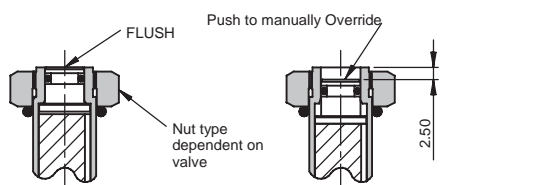
SCREW, NORMALLY OPEN MANUAL OVERRIDE TYPE 2



SCREW, NORMALLY CLOSED MANUAL OVERRIDE TYPE 2

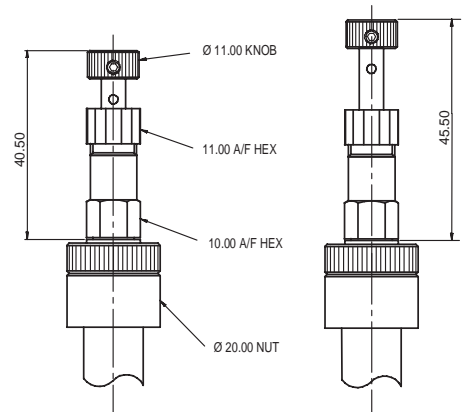


PUSH MANUAL OVERRIDE TYPE 3



PUSH TO MANUALLY OVERRIDE

PUSH/PULL MANUAL OVERRIDE TYPE 4



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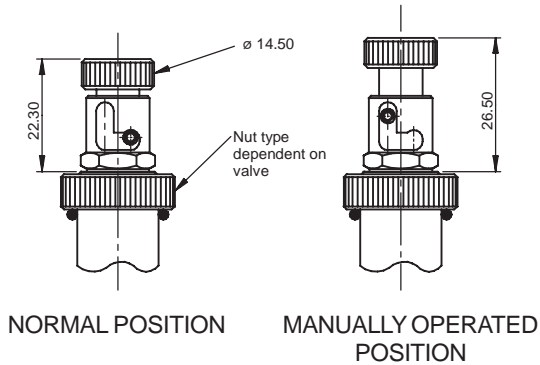
Tel: (440) 974 3171 Fax: (440) 974 3170

Website: www.integratedhydraulics.com

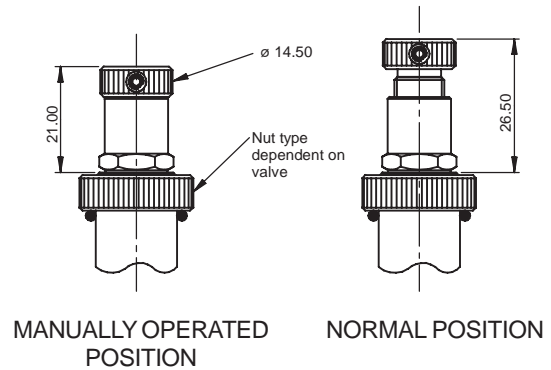
S5 Series

- consult factory for availability

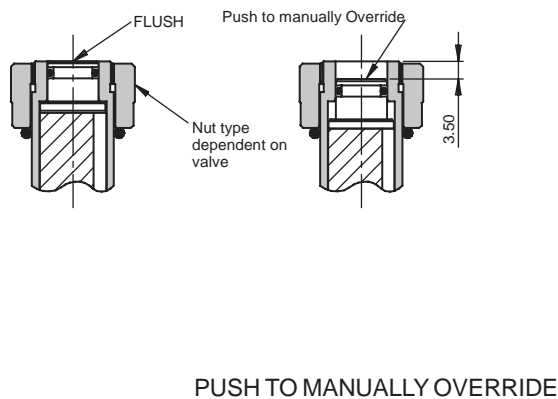
PUSH AND TWIST MANUAL OVERRIDE TYPE 1



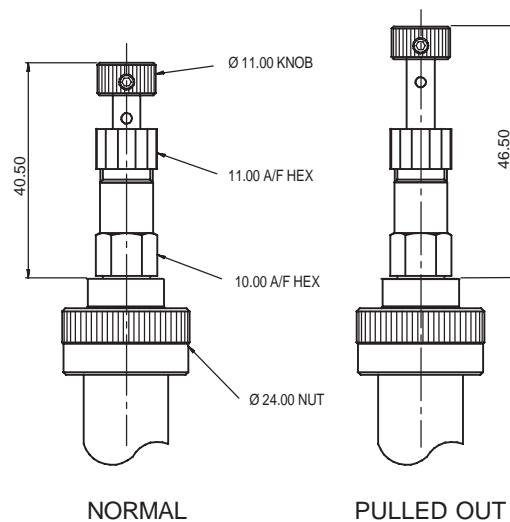
SCREW MANUAL OVERRIDE TYPE 2



PUSH MANUAL OVERRIDE TYPE 3



PUSH/PULL MANUAL OVERRIDE TYPE 4

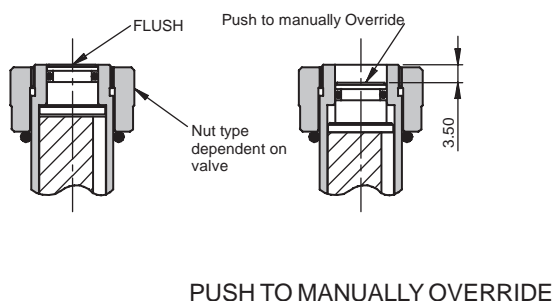


11

S6Series

- consult factory for availability

PUSH MANUAL OVERRIDE TYPE 3

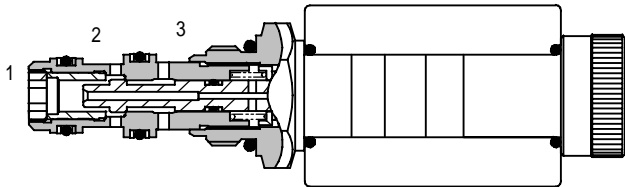




S229 Directional Control Valve - 3-Way, 2-Position Poppet

Up to 12 litres/min (3 US GPM) • Up to 210 bar (3000 PSI)

S229



FEATURES

- High flow capacity with reduced space requirements.
- No dynamic seals.
- Standard valve bodies and common cavities.
- One-piece encapsulated coil with minimal amperage draw.
- Oil immersed armature solenoid.
- Various coil terminals and voltages.
- Coil interchangeability with all Series S5 valves.
- Manual override, seal variations and other options available.
- Sealed coil arrangement to protect stem from corrosion.

COIL INFORMATION

(See Page 11-1021)

Part Number: C16-*/29

Voltage available: 12, 24 VDC
110, 220 VAC*

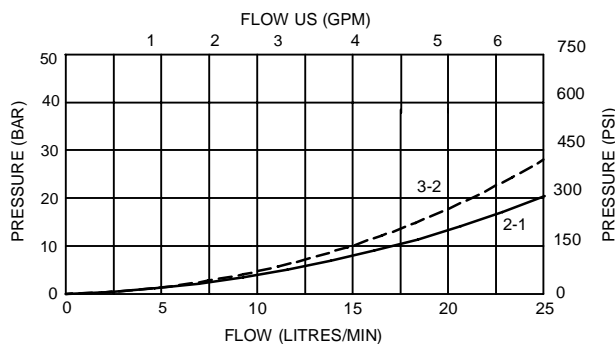
* AC coils must be used with a rectifying connector.

SPECIFICATIONS

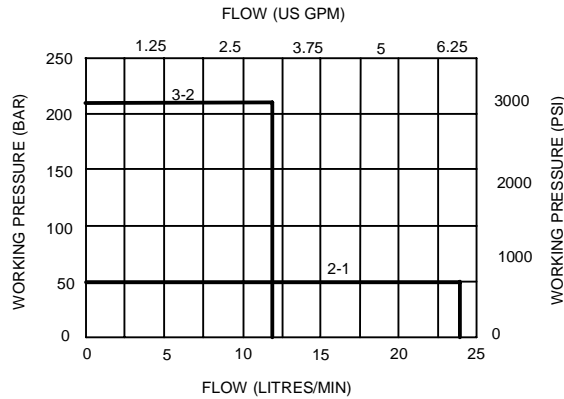
Basic Model Code	S229
Symbol	
Actuator Port Location	Port 2
Max. Working Pressure	210 bar (3000 psi)
Flow Rating	See performance graphs
Nominal Flow (at Delta P = 5 bar (70 psi))	10 litres/min (2.6 US GPM)
Internal Leakage	Less than 0.6 ml/min (10 dpm) 210 bar differential at 32 centistokes
Temperature Range	-20 to +120°C (-4 to +248°F)
Nominal Viscosity Range	15 to 250 centistokes
Recommended Filtration	BS5540/4 18/13 (25 micron or better)
Fluid	Compatible with most general purpose hydraulic fluids
Seal Material	Standard nitrile with PTFE back up rings
Seal Kit Number	SK1119 (Nitrile) SK1119V (Viton)
Mounting Position	Unrestricted
Cartridge Weight	0.13 kg (0.3 lbs)
Coil Weight	0.3 kg (0.6 lbs)
Cavity Number	A3531 (See section 17)
Torque into Cavity	30 Nm (22 lbs ft)
Electrical Data	See coil data sheet
Line Body Material	Aluminium Alloy

PRESSURE DROP v's FLOW

Viscosity = 32 cSt (150 SSU)

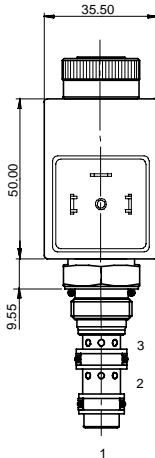
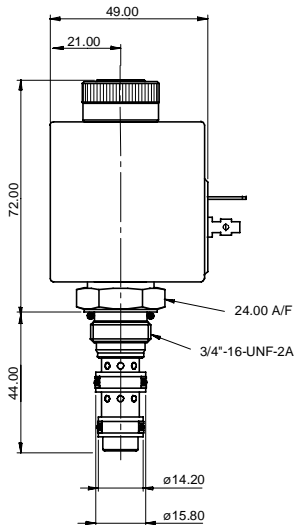


PERFORMANCE



CARTRIDGE ONLY

BASIC CODE: S229



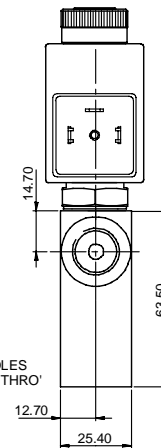
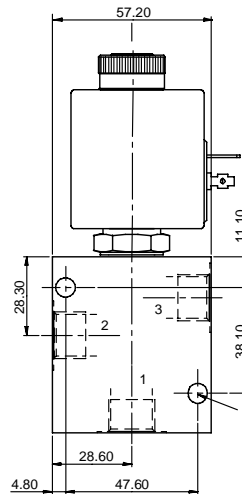
COMPLETE VALVE

1/4" 3/8" PORTS

BASIC CODE: S229

Body ONLY part numbers

<i>BSP, aluminium</i>	<i>SAE, aluminium</i>
1/4" B7724	
3/8" B6684	3/8" B6516



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

S229

N

H

24

3W

Basic Code
S229

Seals
N = Nitrile
V = Viton

Manual Override (consult factory for availability)
2 = Screw
3 = Push

Port Sizes

2W = 1/4" BSP
3W = 3/8" BSP

6T = 3/8" SAE

Voltage

12 = 12 VDC
24 = 24 VDC

110 = 110 VAC
220 = 220 VAC

Coil Termination

H = DIN43650

F = Flying Leads

DM = Deutsch Moulded

Other terminations available on request

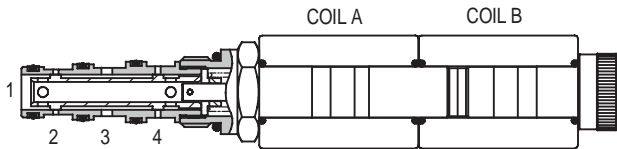
We reserve the right to change specifications without notice



S570 Directional Control Valve - 4-Way, 3-Position Spool

Up to 35 litres/min (9 US GPM) • Up to 210 bar (3000 PSI)

S570



COIL INFORMATION

(See Page 11-1021)

Part Number: C16-*/19 (two per valve)

Voltage available: 12, 24 VDC
110, 220 VAC*

* AC coils must be used with a rectifying connector.

FEATURES

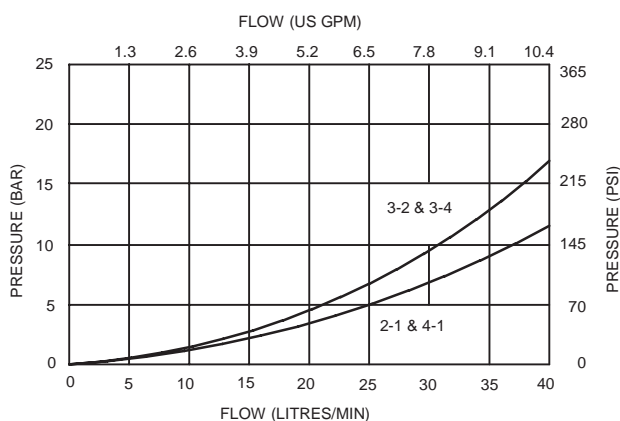
- High flow capacity with reduced space requirements.
- No dynamic seals.
- Standard valve bodies and common cavities.
- One-piece encapsulated coil with minimal amperage draw.
- Oil immersed armature solenoid.
- Various coil terminals and voltages.
- Coil interchangeability with all Series S5 valves.
- Manual override, seal variations and other options available.
- Sealed coil arrangement to protect stem from corrosion.

SPECIFICATIONS

Basic Model Code	S570
Symbol	
Max. Working Pressure	210 bar (3000 psi)
Flow Rating	See performance graphs
Nominal flow (at Delta P = 5 bar (70 psi))	22 litres/min (5.8 US GPM)
Internal Leakage	Less than 120 ml/min 210 bar differential at 32 centistokes
Temperature Range	-20 to +120°C (-4 to +248°F)
Nominal Viscosity Range	15 to 250 centistokes
Recommended Filtration	BS5540/4 18/13 (25 micron or better)
Fluid	Compatible with most general purpose hydraulic fluids
Seal Material	Viton with PTFE back up rings
Seal Kit Number	SK1034 (Nitrile) SK1034V (Viton)
Mounting Position	Unrestricted
Cartridge Weight	0.25 kg (0.55 lbs)
Coil Weight	0.3 kg (0.6 lbs) - two per valve
Cavity Number	A12744 (See Section 17)
Torque into Cavity	30 Nm (22 lbs ft)
Electrical Data	See coil data sheet
Line Body Material	Aluminium Alloy

PRESSURE DROP v's FLOW

Viscosity = 32 cSt (150 SSU)



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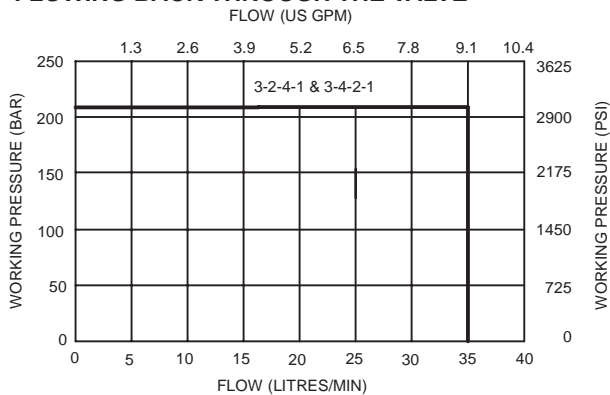
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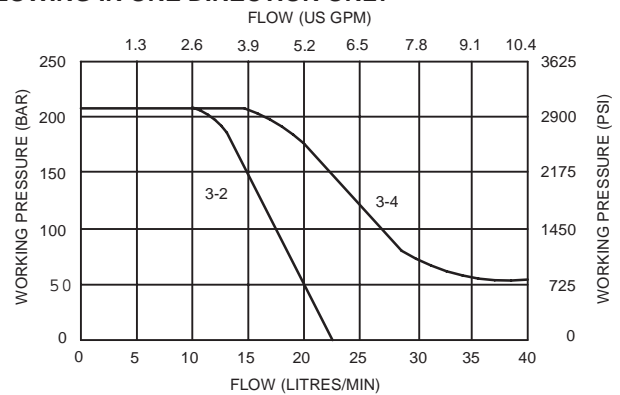
PERFORMANCE

FLOWING BACK THROUGH THE VALVE



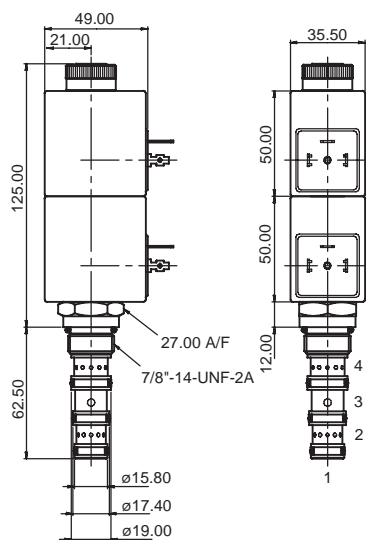
PERFORMANCE

FLOWING IN ONE DIRECTION ONLY



CARTRIDGE ONLY

BASIC CODE: S570



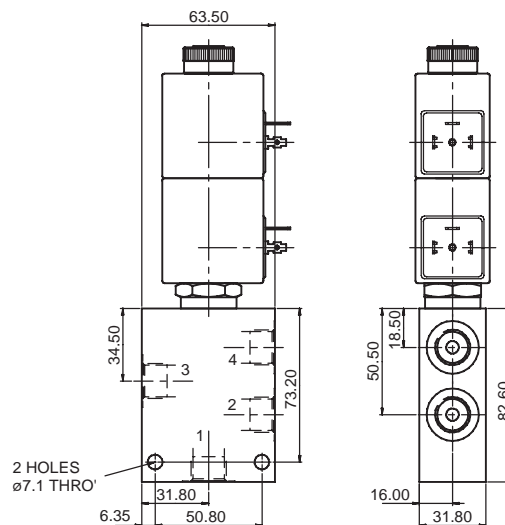
COMPLETE VALVE

3/8" 1/2" PORTS

BASIC CODE: S570

Body ONLY part numbers

BSP, aluminium SAE, aluminium
3/8" B19240 1/2" B19229
1/2" B19228



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

S570

N

H

24

3W

Basic Code
S570

Seals

N = Nitrile
V = Viton

Manual Override (consult factory for availability)

4 = Push/Pull

Port Sizes

3W = 3/8" BSP

4W = 1/2" BSP

8T = 1/2" SAE

Voltage

12 = 12 VDC

24 = 24 VDC

110 = 110 VAC

220 = 220 VAC

Coil Termination

H = DIN43650

F = Flying Leads

DM = Deutsch Moulded

Other terminations available on request

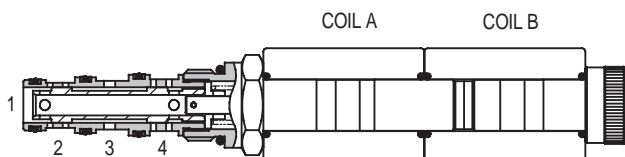
We reserve the right to change specifications without notice



S571 Directional Control Valve - 4-Way, 3-Position Spool

Up to 34 litres/min (8.7 US GPM) • Up to 210 bar (3000 PSI)

S571



FEATURES

- High flow capacity with reduced space requirements.
- No dynamic seals.
- Standard valve bodies and common cavities.
- One-piece encapsulated coil with minimal amperage draw.
- Oil immersed armature solenoid.
- Various coil terminals and voltages.
- Coil interchangeability with all Series S5 valves.
- Manual override, seal variations and other options available.
- Sealed coil arrangement to protect stem from corrosion.

COIL INFORMATION

(See Page 11-1021)

Part Number: C16-*/19 (two per valve)

Voltage available: 12, 24 VDC
110, 220 VAC*

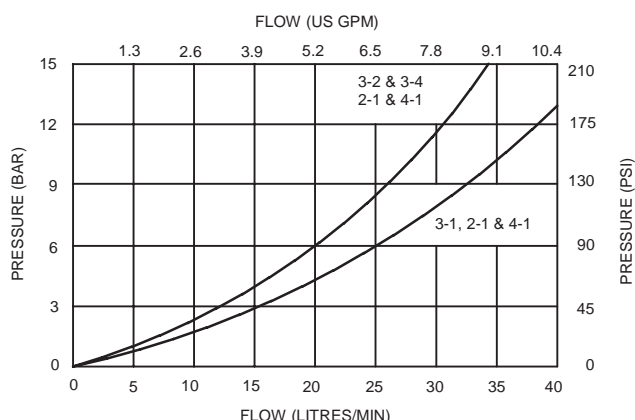
* AC coils must be used with a rectifying connector.

SPECIFICATIONS

Basic Model Code	S571
Symbol	
Max. Working Pressure	210 bar (3000 psi)
Flow Rating	See performance graphs
Nominal Flow (at Delta P = 5 bar (70 psi))	18 litres/min (4.7 US GPM)
Internal Leakage	Less than 120 ml/min past each land 210 bar differential at 32 centistokes
Temperature Range	-20 to +120°C (-4 to +248°F)
Nominal Viscosity Range	15 to 250 centistokes
Recommended Filtration	BS5540/4 18/13 (25 micron or better)
Fluid	Compatible with most general purpose hydraulic fluids
Seal Material	Standard nitrile with PTFE back up rings
Seal Kit Number	SK1034 (Nitrile) SK1034V (Viton)
Mounting Position	Unrestricted
Cartridge Weight	0.25 kg (0.5 lbs)
Coil Weight	0.3 kg (0.6 lbs) - two per valve
Cavity Number	A12744 (See Section 17)
Torque into Cavity	30 Nm (22 lbs ft)
Electrical Data	See coil data sheet
Line Body Material	Aluminium Alloy

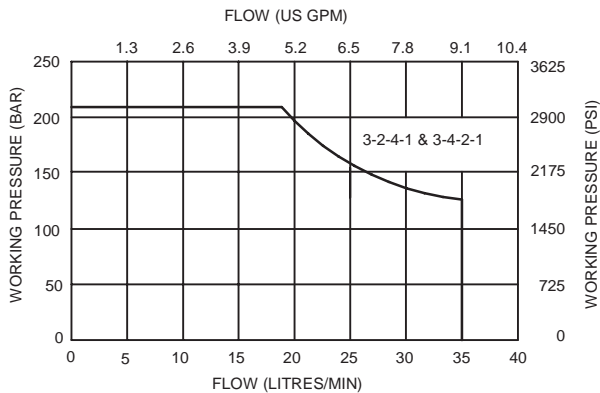
PRESSURE DROP v's FLOW

Viscosity = 32 cSt (150 SSU)



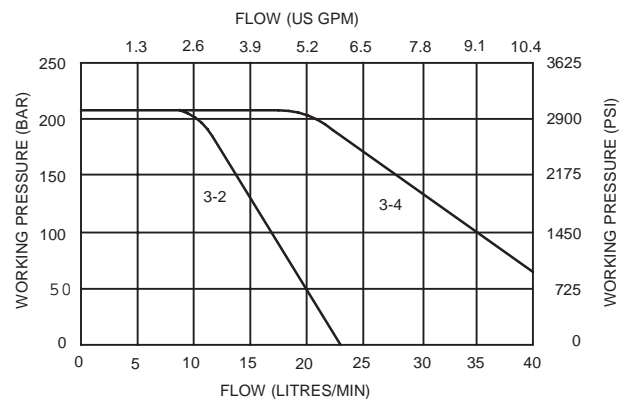
PERFORMANCE

FLOWING BACK THROUGH THE VALVE



PERFORMANCE

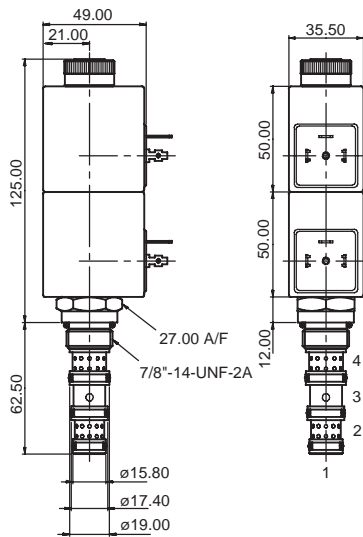
FLOWING IN ONE DIRECTION ONLY



NOTE: Higher flows available on request

CARTRIDGE ONLY

BASIC CODE: S571



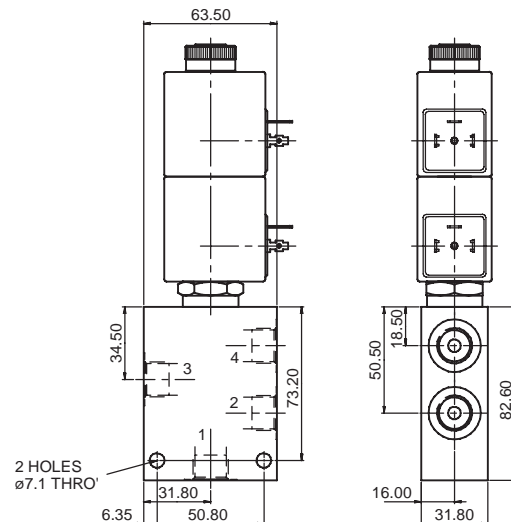
COMPLETE VALVE

3/8" 1/2" PORTS

BASIC CODE: S571

Body ONLY part numbers

BSP, aluminium 3/8" B19240
1/2" B19228
SAE, aluminium 1/2" B19229



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

S571

N

H

24

3W

Basic Code
S571

Seals

N = Nitrile
V = Viton

Manual Override (consult factory for availability)

4 = Push/Pull

Port Sizes

3W = 3/8" BSP

4W = 1/2" BSP

8T = 1/2" SAE

Voltage

12 = 12 VDC

24 = 24 VDC

110 = 110 VAC

220 = 220 VAC

Coil Termination

H = DIN43650

F = Flying Leads

DM = Deutsch Moulded

Other terminations available on request

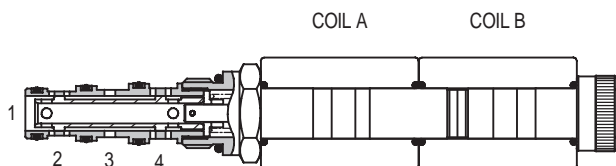
We reserve the right to change specifications without notice



S574 Directional Control Valve - 4-Way, 3-Position Spool

Up to 34 litres/min (8.7 US GPM) • Up to 210 bar (3000 PSI)

S574



COIL INFORMATION

(See Page 11-1021)

Part Number: C16-*-/19 (two per valve)

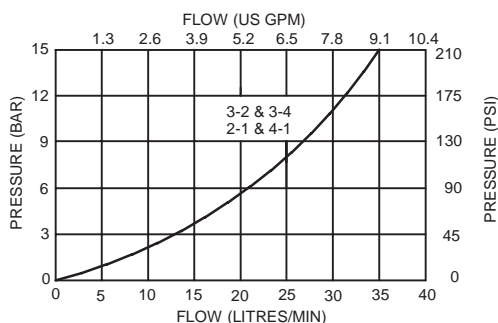
Voltage available: 12, 24 VDC
110, 220 VAC*

* AC coils must be used with a rectifying connector.

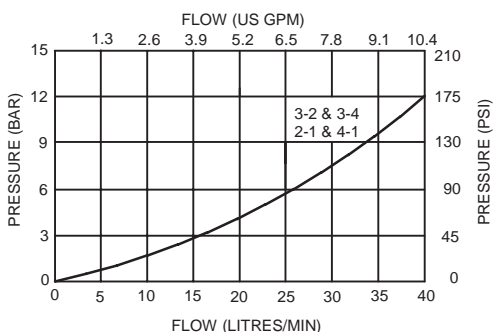
PRESSURE DROP v's FLOW

Viscosity = 32 cSt (150 SSU)

SPOOL SHIFTED



SPOOL CENTRED



FEATURES

- High flow capacity with reduced space requirements.
- No dynamic seals.
- Standard valve bodies and common cavities.
- One-piece encapsulated coil with minimal amperage draw.
- Oil immersed armature solenoid.
- Various coil terminals and voltages.
- Coil interchangeability with all Series S5 valves.
- Manual override, seal variations and other options available.
- Sealed coil arrangement to protect stem from corrosion.

SPECIFICATIONS

Basic Model Code	S574
Symbol	
Max. Working Pressure	210 bar (3000 psi)
Flow Rating	34 litres/min (8.7 US GPM)
Nominal flow (at Delta P = 5 bar (70 psi))	20 litres/min (5 US GPM)
Internal Leakage	Less than 120 ml/min past each land 210 bar differential at 32 centistokes
Temperature Range	-20 to +120°C (-4 to +248°F)
Nominal Viscosity Range	15 to 250 centistokes
Recommended Filtration	BS5540/4 18/13 (25 micron or better)
Fluid	Compatible with most general purpose hydraulic fluids
Seal Material	Standard nitrile with PTFE back up rings
Seal Kit Number	SK1034 (Nitrile) SK1034V (Viton)
Mounting Position	Unrestricted
Cartridge Weight	0.25 kg (0.5 lbs)
Coil Weight	0.3 kg (0.6 lbs) - two per valve
Cavity Number	A12744 (See Section 17)
Torque into Cavity	30 Nm (22 lbs ft)
Electrical Data	See coil data sheet
Line Body Material	Aluminium Alloy

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Website: www.integratedhydraulics.com

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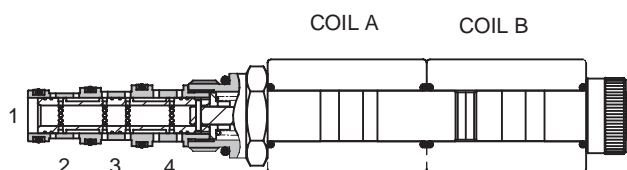
7047 Spinach Drive, Mentor, Ohio 44060, USA
Tel: (440) 974 3171 Fax: (440) 974 3170
Website: www.integratedhydraulics.com



S577R Directional Control Valve - 4-Way, 3-Position Spool

23 litres/min (7 US GPM) • Up to 210 bar (3000 PSI)

S577R



FEATURES

- High flow capacity with reduced space requirements.
- No dynamic seals.
- Standard valve bodies and common cavities.
- One-piece encapsulated coil with minimal amperage draw.
- Oil immersed armature solenoid.
- Various coil terminals and voltages.
- Coil interchangeability with all Series S5 valves.
- Manual override, seal variations and other options available.
- Sealed coil arrangement to protect stem from corrosion.

COIL INFORMATION

(See Page 11-1021)

Part Number: C16-*/19 (two per valve)

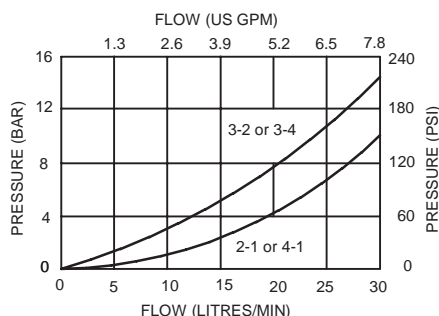
Voltage available: 12, 24 VDC
110, 220 VAC*

* AC coils must be used with a rectifying connector.

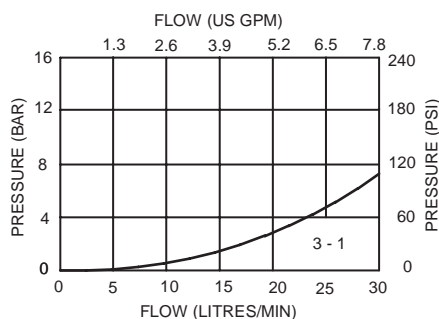
PRESSURE DROP v's FLOW

Viscosity = 32 cSt (150 SSU)

SPOOL SHIFTED



SPOOL CENTRED



SPECIFICATIONS

Basic Model Code	S577R
Symbol	
Max. Working Pressure	210 bar (3000 psi)
Flow Rating	23 litres/min (7 US GPM)
Nominal flow (at Delta P = 5 bar (70 psi))	20 litres/min (5 US GPM)
Internal Leakage	Less than 100 ml/min 210 bar differential at 32 centistokes
Temperature Range	-20 to +120°C (-4 to +248°F)
Nominal Viscosity Range	15 to 250 centistokes
Recommended Filtration	BS5540/4 18/13 (25 micron or better)
Fluid	Compatible with most general purpose hydraulic fluids
Seal Material	Standard nitrile with PTFE back up rings
Seal Kit Number	SK1034 (Nitrile) SK1034V (Viton)
Mounting Position	Unrestricted
Cartridge Weight	0.25 kg (0.5 lbs)
Coil Weight	0.3 kg (0.6 lbs) - two per valve
Cavity Number	A12744 (See page 11-441)
Torque into Cavity	30 Nm (22 lbs ft)
Electrical Data	See coil data sheet
Line Body Material	Aluminium Alloy

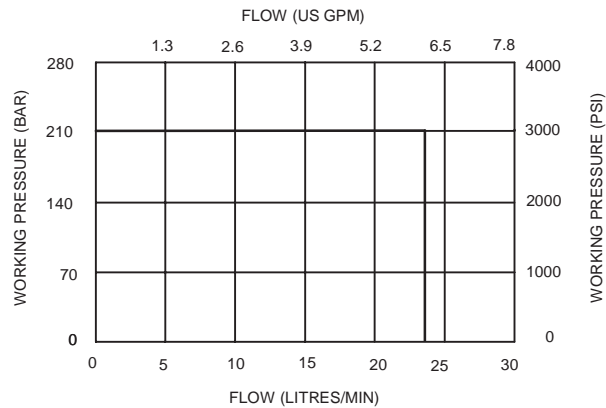
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Tel: +44 (0) 1926 881171 Fax: +44 (0) 1926 315729
Website: www.integratedhydraulics.com

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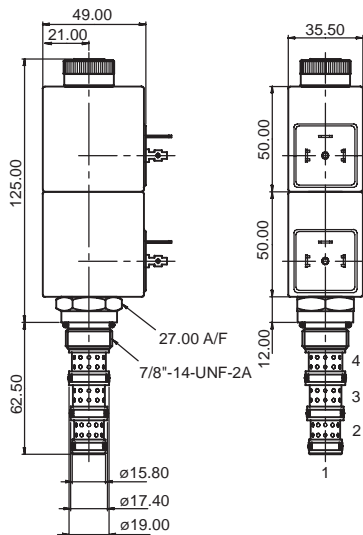
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Website: www.integratedhydraulics.com

PERFORMANCE



CARTRIDGE ONLY

BASIC CODE: S577R



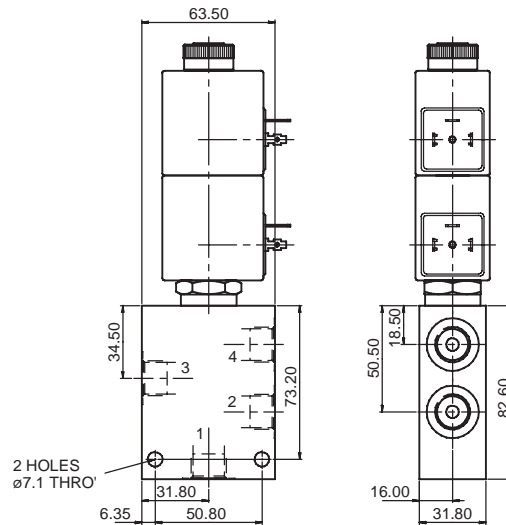
COMPLETE VALVE

3/8" 1/2" PORTS

BASIC CODE: S577R

Body ONLY part numbers

BSP, aluminium 3/8" B19240 1/2" B19228 SAE, aluminium 1/2" B19229



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

S577R N H 24 3W

Basic Code
S577R

Seals
N = Nitrile
V = Viton

Manual Override (consult factory for availability)
4 = Push/Pull

Port Sizes

3W = 3/8" BSP
4W = 1/2" BSP 8T = 1/2" SAE

Voltage

12 = 12 VDC 110 = 110 VAC
24 = 24 VDC 220 = 220 VAC

Coil Termination

H = DIN43650
F = Flying Leads
DM = Deutsch Moulded
Other terminations available on request

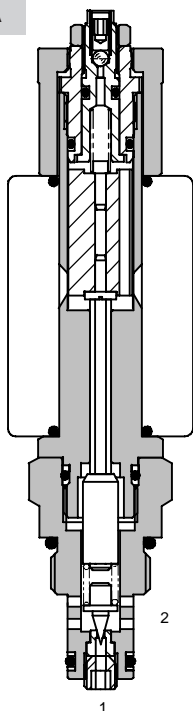
We reserve the right to change specifications without notice



PDR21A Pressure Relief Valve

1.5 litres/min (0.3 US GPM) • 350 bar (5000 PSI)

PDR21A



DESCRIPTION

This valve can be infinitely adjusted within a prescribed range by a varying electrical control signal. Pressure output is directly proportional to changes in DC current input.

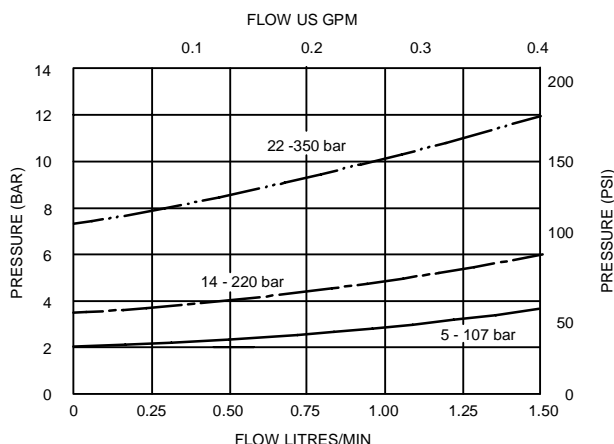
COIL INFORMATION

(See Page 11-1021)

Part Number: C16-*/19

Voltage available: 12, 24 VDC

PRESSURE DROP



FEATURES

- High flow capacity with reduced space requirements.
- No dynamic seals.
- Standard valve bodies and common cavities.
- One-piece encapsulated coil with minimal amperage draw.
- Oil immersed armature solenoid.
- Various coil terminals and voltages.
- Coil interchangeability with all Series S5 valves.
- Manual override, seal variations and other options available.
- Sealed coil arrangement to protect stem from corrosion.

SPECIFICATIONS

Basic Model Code	PDR21A
Symbol	
Max. Inlet Pressure	350 bar (5000 psi)
Pressure Ranges up to 75% of Max Current	10 = 5 - 107 bar (72 - 1550 psi) 20 = 14 - 220 bar (200 - 3200 psi) 35 = 22 - 350 bar (320 - 5000 psi)
Max Press Port 2	100 bar (1450 psi)
Max. Flow	1.5 litres/min (0.3 US GPM)
Typ. Hydraulic Hysteresis	<12.5% without PWM
Response times	10 = 2 - 193 ms 20 = 3 - 395 ms 35 = 2 - 358 ms
Dead Band	10% approx
Internal Leakage	< 5 ml/min
Temp' Range (oil)	-20 to +120°C (-4 to +248°F)
Nominal Viscosity Range	15 to 250 centistokes
Recommended Filtration	BS5540/4 18/13 (25 micron or better)
Fluid	Compatible with most general purpose hydraulic fluids
Seal Material	Standard nitrile with PTFE back up rings
Seal Kit Number	SK1119 (Nitrile) SK1119V (Viton)
Mounting Position	For best results mount below reservoir oil level. If this is not feasible mount horizontally.
Cartridge Weight	0.25 kg (0.55 lbs)
Coil Weight	0.3 kg (0.6 lbs)
Cavity Number	A879 (See Section 17)
Torque into Cavity	40 Nm (29.5 lbs ft)
Electrical Data	See coil data sheet
Line Body Material	Standard Aluminium (up to 210 bar) Add suffix "377" for steel option

*For applications above 210 bar please consult our technical department or use the steel body option.

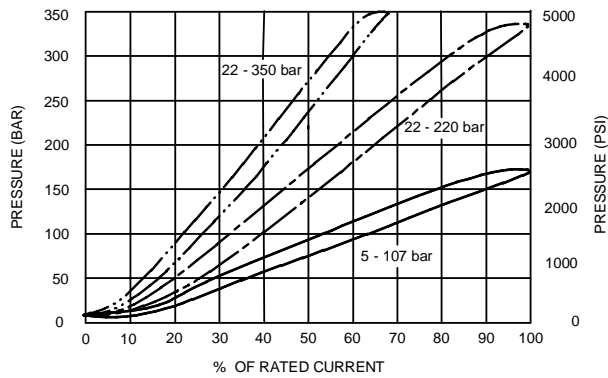
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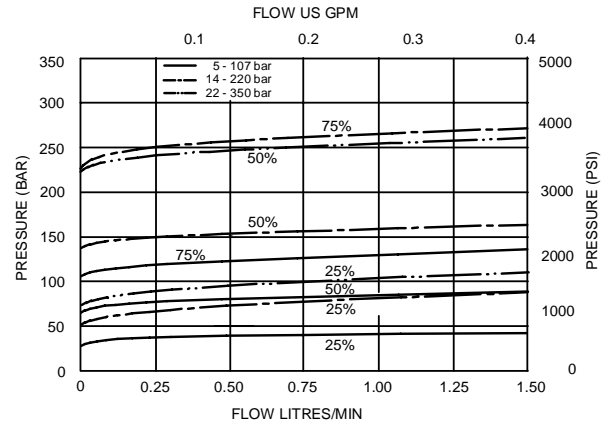
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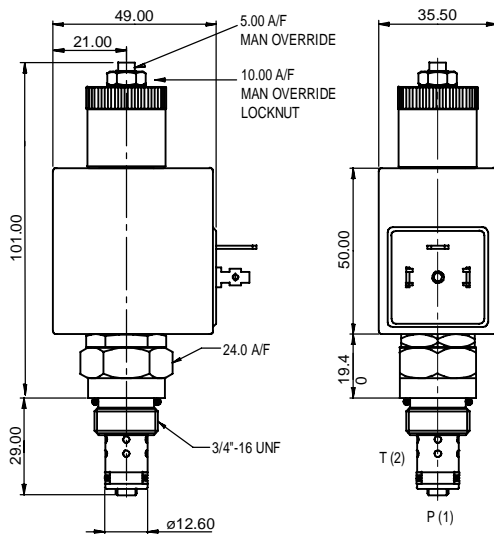


Relief Pressure vs Input Current (24 Vdc)



CARTRIDGE ONLY

BASIC CODE: PDR21A



COMPLETE VALVE

1/4" 3/8" PORTS

BASIC CODE: PDR21A

Body ONLY part numbers

BSP, aluminium

1/4" A1485

3/8" A1043

SAE, aluminium

1/4" A14842

3/8" A15676

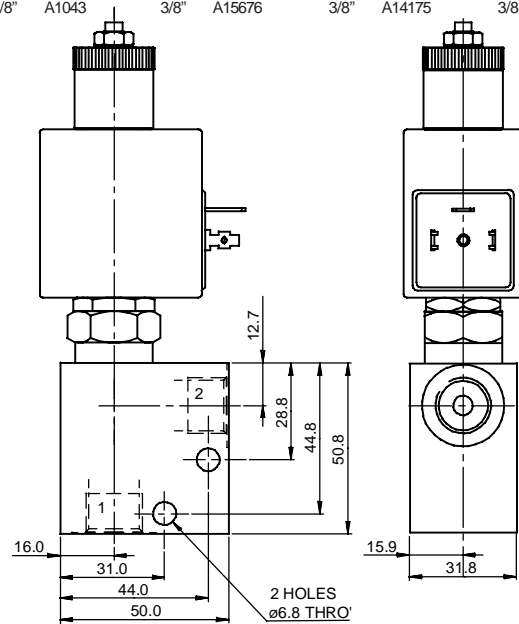
BSP, steel

1/4" A14128

3/8" A14175

SAE, steel

3/8" A14843



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

PDR21A N 20 6 H 24 3W

Basic Code

PDR21A = Normally Open

Seals

N = Nitrile

V = Viton

Pressure Range

10 = 5 to 120 bar

20 = 10 to 240 bar

Manual Override (omit if not required)

6 = Screw

Port Sizes

2W = 1/4" BSP

3W = 3/8" BSP

4T = 1/4" SAE

6T = 3/8" SAE

Voltage

12 = 12 VDC

24 = 24 VDC

Coil Termination

H = DIN43650

F = Flying Leads

A = Junior Amp

DM = Deutsch Moulded

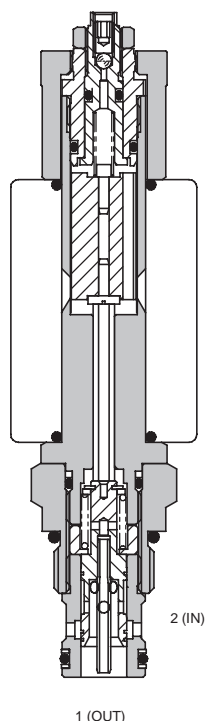
Other terminations available on request

We reserve the right to change specifications without notice



PFR2 4A Flow Control Valve 2 Port Restrictive Pressure Compensated 18 litres/min (4.7 US GPM) • 210 bar (3000 PSI)

PFR2 4A



COIL INFORMATION

(See Page 11-1021)

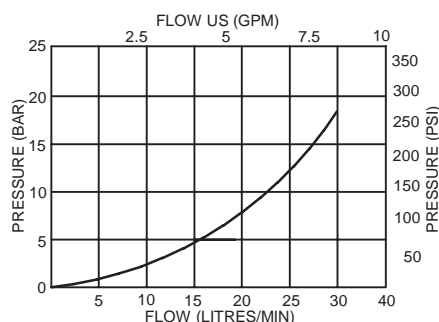
Part Number: C16-*/19

Voltage available: 12, 24 VDC

PRESSURE DROP v's FLOW

Viscosity = 32 cSt (150 SSU)

PFR2 4A @ 100%



FEATURES

- High flow capacity with reduced space requirements.
- No dynamic seals.
- Standard valve bodies and common cavities.
- One-piece encapsulated coil with minimal amperage draw.
- Oil immersed armature solenoid.
- Various coil terminals and voltages.
- Coil interchangeability with all Series S5 valves.
- Manual override, seal variations and other options available.
- Sealed coil arrangement to protect stem from corrosion.

SPECIFICATIONS

Basic Model Code	PFR2 4A
Symbol	
Max. Inlet Pressure	210 bar (3000 psi)
*Max Regulated Flow at rated current @ 30 bar	28 litres/min @ 100%, 23 litres/min @ 85%, 18 litres @ 75%
Hysteresis	8% Maximum without PWM 4% Maximum with PWM
Frequency	200 Hz to 400 Hz - 200 recommended
Dead Band	25-35% of rated current
Response Time	300 ms
Internal Leakage	Up to 200 ml/min 210 bar differential at 32 centistokes
Temp' Range (oil)	-20 to +120°C (-4 to +248°F)
Nominal Viscosity Range	15 to 250 centistokes
Recommended Filtration	BS5540/4 16/13 (25 micron or better)
Fluid	Compatible with most general purpose hydraulic fluids
Seal Material	Standard nitrile with PTFE back up rings
Seal Kit Number	SK1138 (Nitrile) SK1138V (Viton)
Mounting Position	Unrestricted
Cartridge Weight	0.2 kg (0.44 lbs)
Coil Weight	0.3 kg (0.6 lbs)
Cavity Number	A6701 (See Section 17)
Torque into Cavity	30 Nm (22 lbs ft)
Electrical Data	See coil data sheet
Line Body Material	Aluminium Alloy

* Based on a saturated inlet with an increasing signal.

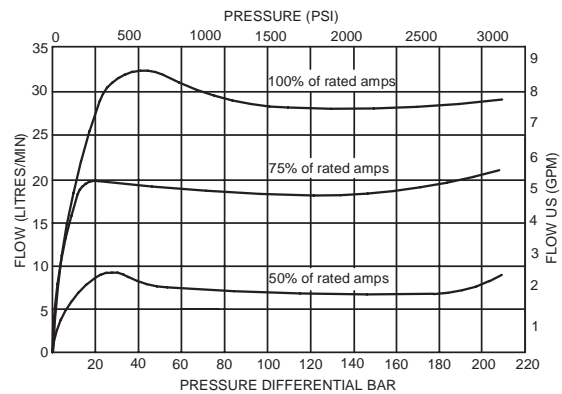
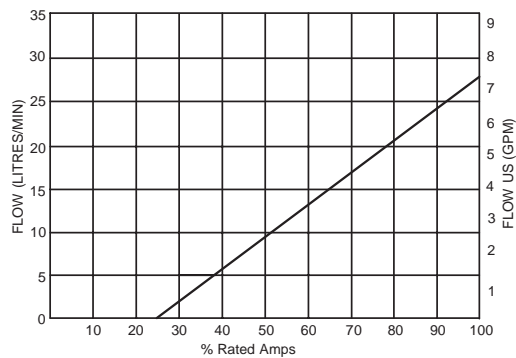
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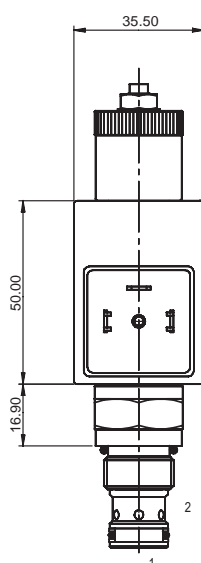
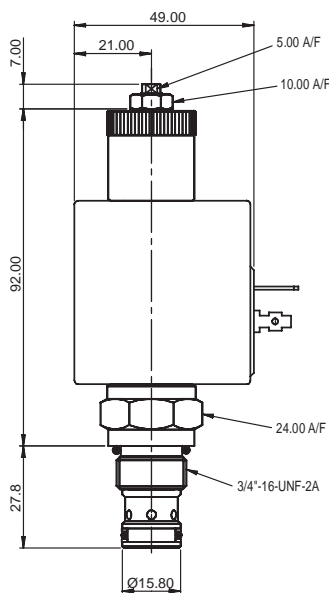
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PERFORMANCE



CARTRIDGE ONLY

BASIC CODE: PFR2 4A



COMPLETE VALVE

1/4" 3/8" PORTS

BASIC CODE: PFR2 4A

Body ONLY part numbers

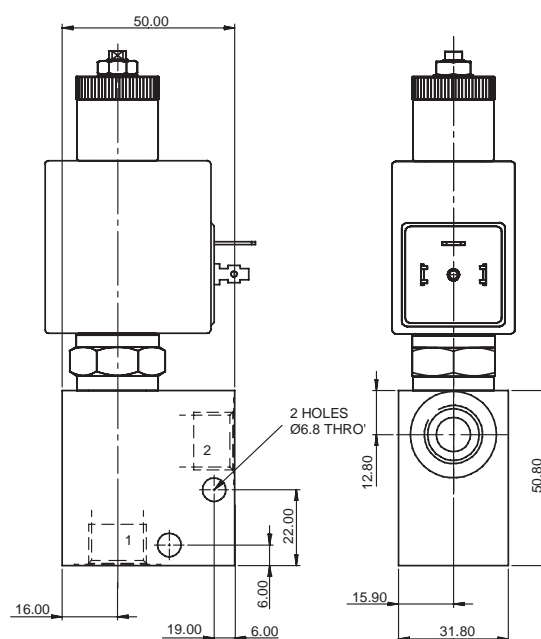
BSP, aluminium

1/4" A12592

3/8" A7450

SAE, aluminium

3/8" A19355



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

PFR2 4A N 6 H 24 3W

Basic Code

PFR2 4A

Seals

N = Nitrile

V = Viton

Manual Override

6 = Screw

Port Sizes

2W = 1/4" BSP

3W = 3/8" BSP

6T = 3/8" SAE

Voltage

12 = 12 VDC

24 = 24 VDC

Coil Termination

H = DIN43650

F = Flying Leads

DM = Deutsch Moulded

Other terminations available on request

We reserve the right to change specifications without notice

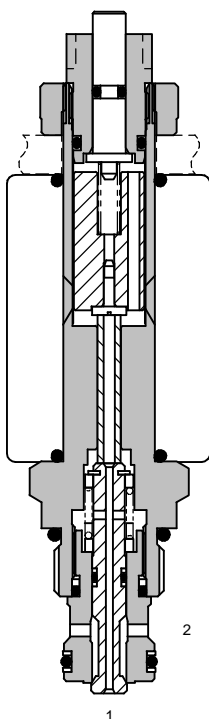


PNX21159-03 Flow Control Valve

2 Port Restrictive, Poppet, Pressure Compensated.

18 litres/min (4.7 US GPM) • 210 bar (3000 PSI)

PNX21159-03



COIL INFORMATION

(See Page 11-431)

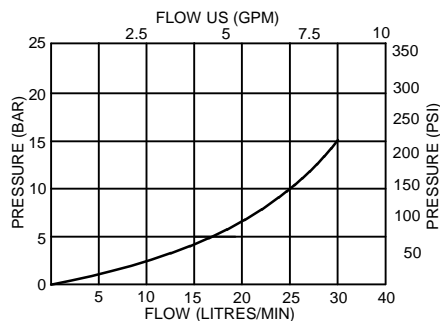
Part Number: C16-*/29

Voltage available: 12, 24 VDC

PRESSURE DROP v's FLOW

Viscosity = 32 cSt (150 SSU)

PNX21159-03 @ 100%



FEATURES

- High flow capacity with reduced space requirements.
- No dynamic seals.
- Standard valve bodies and common cavities.
- One-piece encapsulated coil with minimal amperage draw.
- Oil immersed armature solenoid.
- Various coil terminals and voltages.
- Coil interchangeability with all Series S5 valves.
- Manual override, seal variations and other options available.
- Sealed coil arrangement to protect stem from corrosion.

SPECIFICATIONS

Basic Model Code	PNX21159-03
Symbol	
Max. Inlet Pressure	210 bar (3000 psi)
*Max Regulated Flow at rated current @ 50 bar	20 litres/min @ 100%, 15 litres/min @ 85%, 11 litres @ 75%
Frequency	200 Hz to 400 Hz - 200 recommended
Dead Band	38%-60% of rated current
Response Time	80 ms
Internal Leakage	Up to 0.67 ml/min (10dpi) 210 bar differential at 32 centistokes
Temp' Range (oil)	-20 to +120°C (-4 to +248°F)
Nominal Viscosity Range	15 to 250 centistokes
Recommended Filtration	BS5540/4 16/13 (25 micron or better)
Fluid	Compatible with most general purpose hydraulic fluids
Seal Material	Standard nitrile with PTFE back up rings
Seal Kit Number	SK1138 (Nitrile) SK1138V (Viton)
Mounting Position	Unrestricted
Cartridge Weight	0.2 kg (0.44 lbs)
Coil Weight	0.3 kg (0.6 lbs)
Cavity Number	A6701 (See Section 17)
Torque into Cavity	30 Nm (22 lbs ft)
Electrical Data	See coil data sheet

* Based on a saturated inlet with an increasing signal.

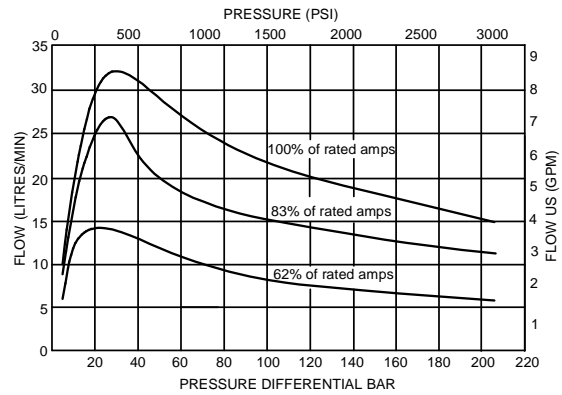
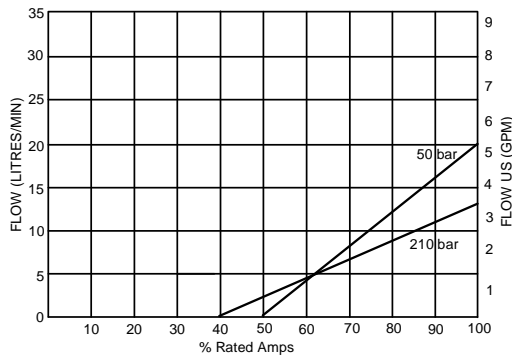
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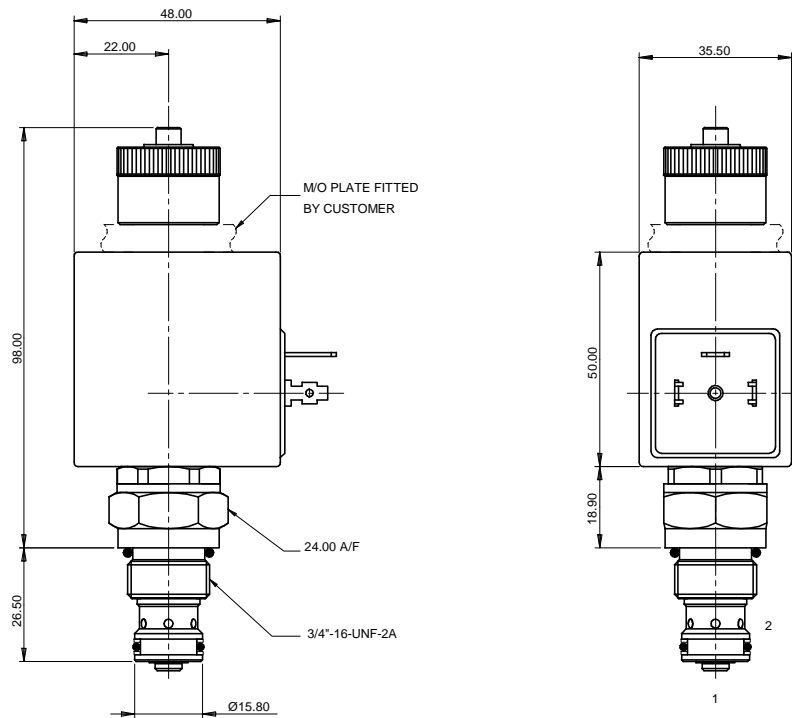
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PERFORMANCE



CARTRIDGE ONLY

BASIC CODE: PNX21159-03



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

PNX21159-03

H

24

Basic Code
PNX21159-03

Seals
Nitrile
Viton also available

Manual Override
Push

Voltage

24 = 24 VDC

Coil Termination

H = DIN43650

F = Flying Leads

A = Junior Amp

DM = Deutsch Moulded

Other terminations available on request

We reserve the right to change specifications without notice

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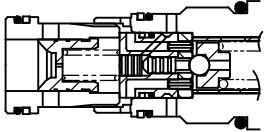
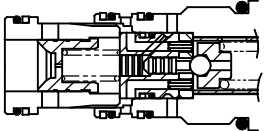
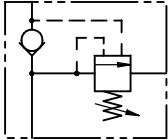
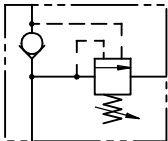
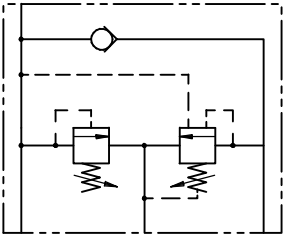


SECTION 12 - UNLOADING VALVES

CONTENTS

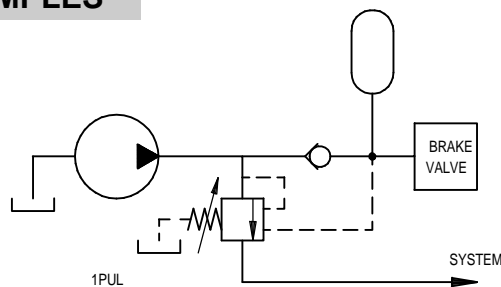
This section contains a range of pump unloading valves both cartridge and bodied versions. Flows up to 200 litres/min (52 US GPM) and pressures up to 350 bar (5000 psi). The bodied valves contain check valves and an internal pilot. Ideal for accumulator systems.

SELECTION

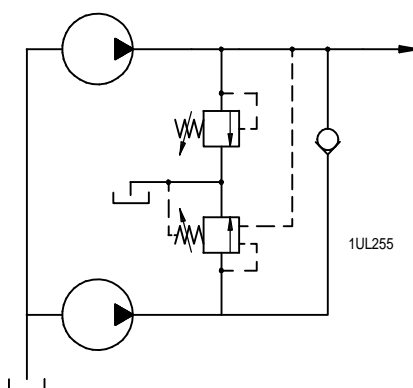
SECTION	SERIES	APPLICATION	RANGE	PAGE
	1UL60	This valve will unload a pump to tank when a pilot pressure reaches the setting. The valve also gives relief protection	350 bar (5000 psi) 60 litres/min (16 US GPM)	12-111
	1PUL60 1PUL200	This valve will unload a pump to another system when a pilot pressure is reached. The valve also gives relief protection	350 bar (5000 psi) 200 litres/min (52 US GPM)	12-111 12-121
	1UL65	This valve contains a check and an internal pilot line ideal for accumulator circuits when the outlet flow is dumped to tank	350 bar (5000 psi) 60 litres/min (16 US GPM)	12-112
	1PUL65 1PUL250	This valve contains a check and an internal pilot line ideal for accumulator circuits unloading the pump when the outlet flow is diverted to a secondary circuit	350 bar (5000 psi) 200 litres/min (52 US GPM)	12-112 12-122
	1UL255	Designed to be used in two pump, hi/lo circuits to unload the high flow pump at a low pressure and provide high pressure relief	P1 = 50 litres @ 350 bar (5000 psi) P2 = 100 litres @ 350 bar (5000 psi)	12-131



TYPICAL CIRCUIT EXAMPLES



PUMP UNLOADING CIRCUIT

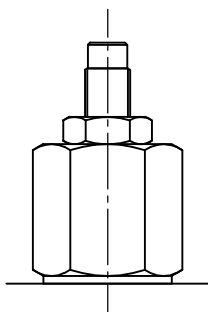


TWO PUMP HI/ LO UNLOADING CIRCUIT

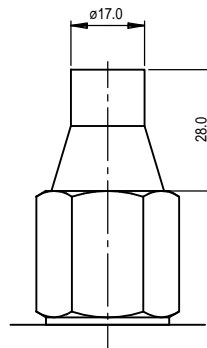
ADJUSTMENTS

The adjustment range and Max setting figures shown throughout this catalogue give the design range for each valve, higher or lower values may be attainable but should not be used without first contacting our Engineering department. Setting must ALWAYS be carried out using an appropriate gauge and it must NOT be assumed that screwing an adjuster to its maximum or minimum position will yield the maximum or minimum stated design setting for that valve.

12



'P' - LEAKPROOF SCREW



'G' - TAMPERPROOF CAP

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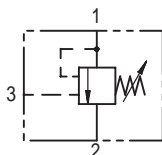


1UL60 / 1PUL60 UNLOADING VALVE

PILOT OPERATED - SLIDING SPOOL TYPE

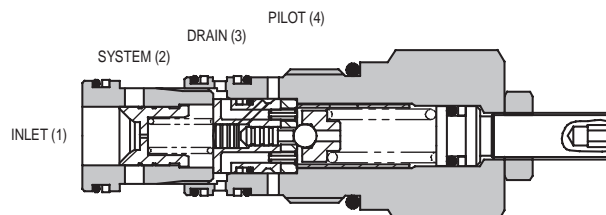
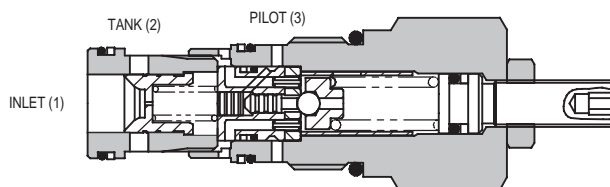
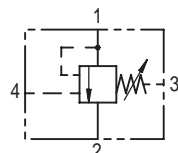
1UL60

UNLOADS TO TANK



1PUL60

UNLOADS TO A SECONDARY SYSTEM



APPLICATION

These unloader valves are used to unload a pump, or pumps, to tank when pressure in a separate part of the circuit reaches a pre-set level. The valves will close, causing the circuit to reload, when the pressure drops to approximately 85% of the unload pressure. The most common application is to maintain a pressure in an accumulator which may be used in an emergency to operate an essential hydraulic function. (Eg, a brake circuit). The 1PUL60 valve has a drain port to ensure correct valve function while allowing the bypassed oil to be used for a secondary circuit requirement.

OPERATION

Inlet pressure is seen on the nose of the valve and system pressure (downstream of the system check valve) operates on the system pilot port. When pressure rises to the valve setting, the relief section opens and the system pressure acts on the pilot piston to hold the valve in the open position. The ratio between the pilot piston diameter and the seat diameter to the relief valve pilot section ensures that the valve will be maintained in the fully open position until the system pressure drops to approximately 85% of the unload pressure.

FEATURES

Valves are available as cartridges for installation into special line bodies or into custom designed Hydraulic Integrated Circuits. (NOTE: Provision must be made for a system check valve and a pilot line to signal the system pressure). Valve assemblies can be supplied complete in a line body for use in accumulator circuits. Bodied valves include a check valve and the required connection from the system to the valve pilot port.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	60 litres/min (16 US GPM)	
Max Setting	350 bar (5000 psi)	
Differential Unload/Reload	10-15%	
Cartridge Material	All working parts hardened and ground steel. External surfaces zinc plated	
Body Material	Standard Steel	
Mounting Position	Unrestricted	
Cavity Number	1UL60 A3146 1PUL60 A12088	(See Section 17)
Torque Cartridge into Cavity	75 Nm (55 lbs ft)	
Weight	1UL60/1PUL60 0.46 kg (1.01 lbs) 1UL65/1PUL65 0.8 kg (1.76 lbs)	
Seal Kit Number	1UL60 SK451 (Nitrile) SK451V (Viton) 1PUL60 SK750 (Nitrile) SK750V (Viton)	
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)	
Operating Temp	-20°C to +90°C	
Leakage	35 millilitres/min nominal	
Nominal Viscosity Range	5 to 500 cSt	

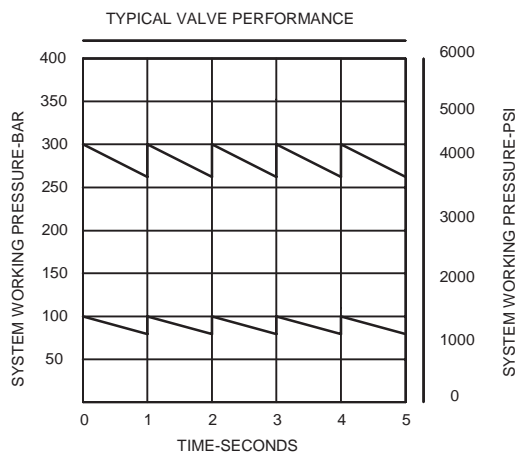
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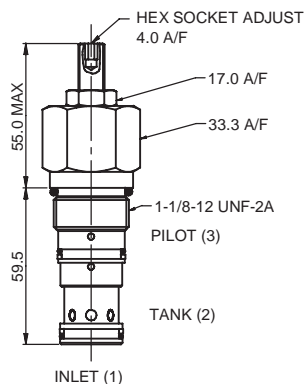
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PERFORMANCE CURVE

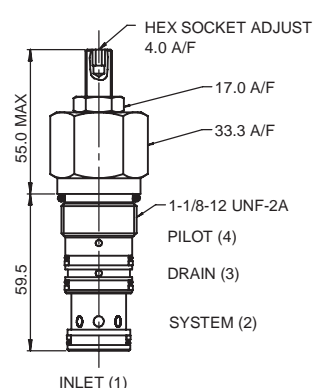


CARTRIDGE ONLY

BASIC CODE: 1UL60



BASIC CODE: 1PUL60

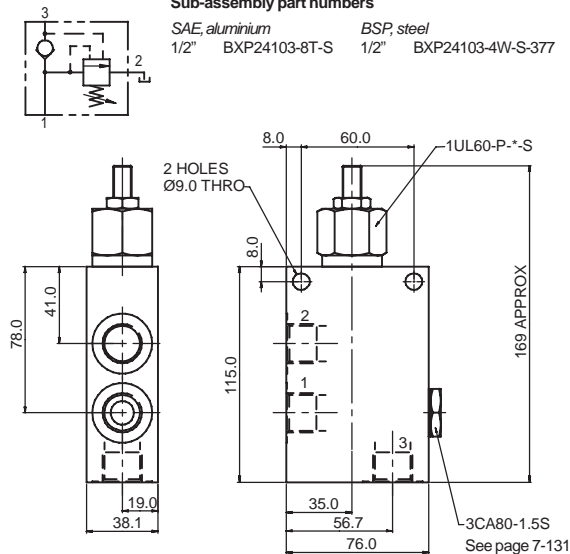


COMPLETE VALVE 1/2" PORTS

BASIC CODE: 1UL65 (WITH SYSTEM CHECK)

Sub-assembly part numbers

SAE, aluminium BSP, steel
1/2" BXP24103-8T-S 1/2" BXP24103-4W-S-377



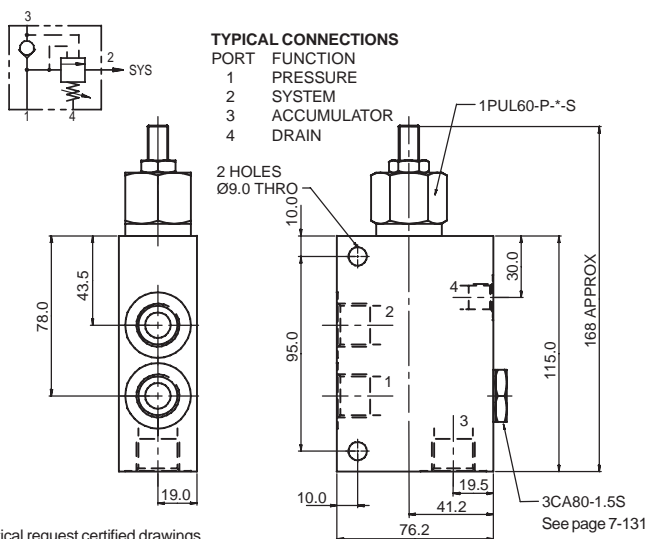
Where measurements are critical request certified drawings

COMPLETE VALVE 1/2" PORTS

BASIC CODE: 1PUL65 (WITH SYSTEM CHECK)

Sub-assembly part numbers

SAE, aluminium BSP, steel
1/2" BXP24046-8T-S 1/2" BXP24046-4W-S-377



TYPICAL CONNECTIONS

PORT	FUNCTION
1	PRESSURE
2	SYSTEM
3	ACCUMULATOR
4	DRAIN

12

ORDERING CODE EXAMPLE

1*UL P 4W 35 S 377**

Basic Code

1UL60 = Cartridge Only

1PUL60 = Cartridge Only

1UL65 = Cartridge and body

1PUL65 = Cartridge and body

Adjustment Means

P = Leakproof Screw Adjustment

G = Tamperproof Cap

(See page 12-102 for dimensions)

Port Sizes - Bodied Valves Only

4W = 1/2" BSP

8T = 1/2" SAE

Body Material

377 = Steel

Omit for Aluminium (up to 210 bar)

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

Pressure Range @ 4.8 l/min

10 = 40-100 bar. Std setting 75 bar

35 = 150-350 bar. Std setting 200 bar

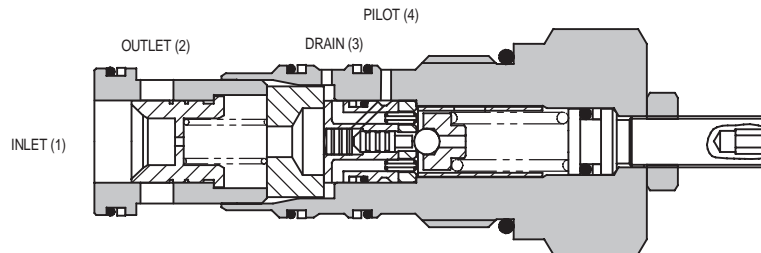
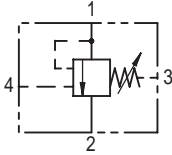
20 = 70-210 bar. Std setting 100 bar



1PUL200 PRIORITY UNLOADING VALVE

PILOT OPERATED - SLIDING SPOOL TYPE

1PUL200



APPLICATION

These unloader valves are used to divert pump flow to a secondary circuit when pressure in the priority line reaches a pre-set level. The valves will close, causing the circuit to reload, when the pressure drops to approximately 85% of the unload pressure. The most common application is to maintain a pressure in an accumulator which may be used in an emergency to operate an essential hydraulic function (eg, a brake circuit). This valve has a drain port to ensure correct valve function while allowing the bypassed oil to be used for a secondary circuit requirement.

OPERATION

Inlet pressure is seen on the nose of the valve and system pressure (downstream of the system check valve) operates on the system pilot port. When pressure rises to the valve setting, the relief section opens and the system pressure acts on the pilot piston to hold the valve in the open position. The ratio between the pilot piston diameter and the seat diameter of the relief valve pilot section ensures that the valve will be maintained in the fully open position until the system pressure drops to approximately 85% of the unload pressure.

FEATURES

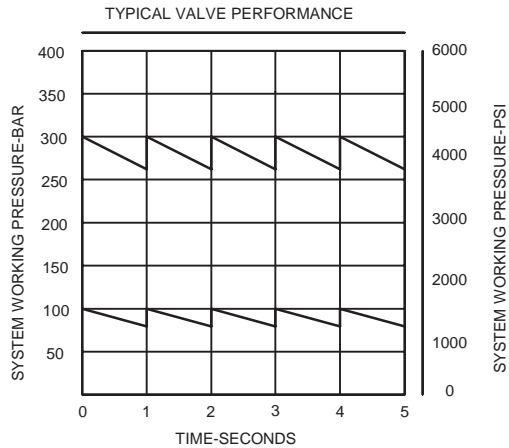
Valves are available as cartridges for installation into line bodies or into custom designed Hydraulic Integrated Circuits. (NOTE: Provision must be made for a system check valve and a pilot line to signal the system pressure). Valve assemblies can be supplied complete in a line body for ready installation into a hydraulic system. Bodied valves include a check valve and the required connection from the system to the valve pilot port.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

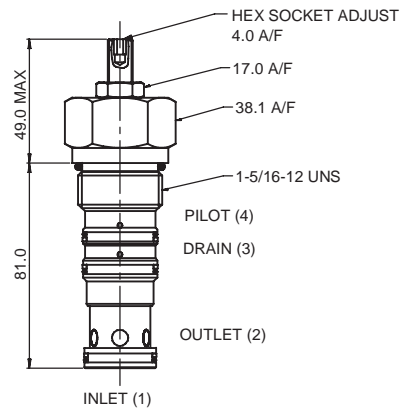
Rated Flow	200 litres/min (52 US GPM)	
Max Setting	350 bar (5000 psi)	
Differential Unload/Reload	10-15%	
Cartridge Material	All working parts hardened and ground steel. External surfaces zinc plated	
Body Material	Standard steel	
Mounting Position	Unrestricted	
Cavity Number	A3145 (See Section 17)	
Torque Cartridge into Cavity	100 Nm (73 lbs ft)	
Weight	1PUL200	0.74 kg (1.63 lbs)
	1PUL250	6.8 kg (14.96 lbs)
Seal Kit Number	1PUL200	SK670 (Nitrile) SK670V (Viton)
	1PUL250	SK452 (Nitrile) SK452V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)	
Operating Temp	-20°C to +90°C	
Leakage	35 millilitres/min @ 210 bar	
Nominal Viscosity Range	5 to 500 cSt	

PERFORMANCE CURVE



CARTRIDGE ONLY

BASIC CODE: 1PUL200

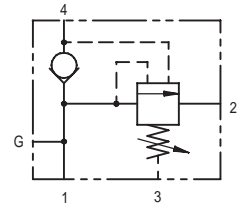
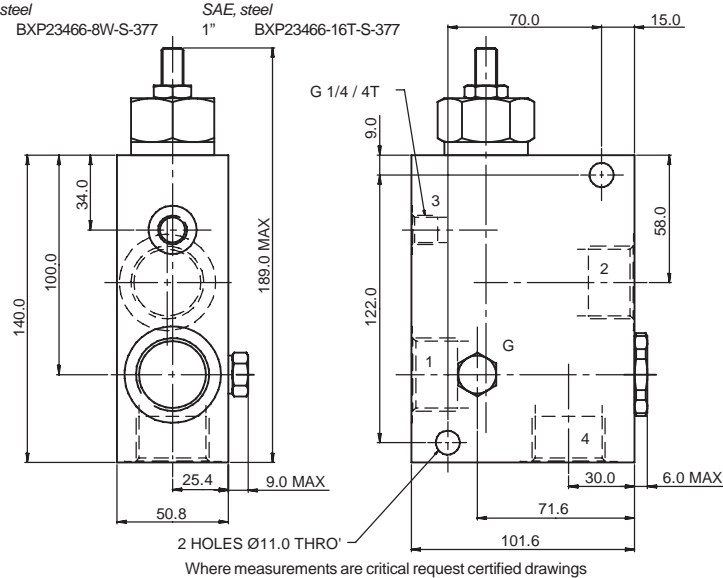


COMPLETE VALVE 1" PORTS

BASIC CODE: 1PUL250 (WITH SYSTEM CHECK)

Sub-assembly part numbers

SAE, aluminium 1" BXP23466-16T-S BSP, steel 1" BXP23466-8W-S-377 SAE, steel 1" BXP23466-16T-S-377



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1PUL * P 8W 35 S 377**

Basic Code

1PUL200 = Cartridge Only
1PUL250 = Cartridge and Body

Adjustment Means

P = Leakproof Screw Adjustment
G = Tamperproof Cap
(See page 12-102 for dimensions)

Port Sizes - Bodied Valves Only

8W = 1" BSP. 1/4" BSP Drain Port
16T = 1" SAE. 1/4" SAE Drain Port

Body Material

377 - Steel
Omit for Aluminium (up to 210 bar)

Seals

S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)

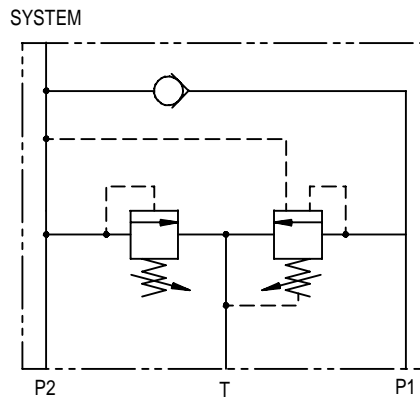
Adjustable Pressure Range

20 = 30-210 bar. Std setting 100 bar
35 = 150-350 bar. Std setting 200 bar



1UL255 TWO PUMP UNLOADING VALVE

1UL255



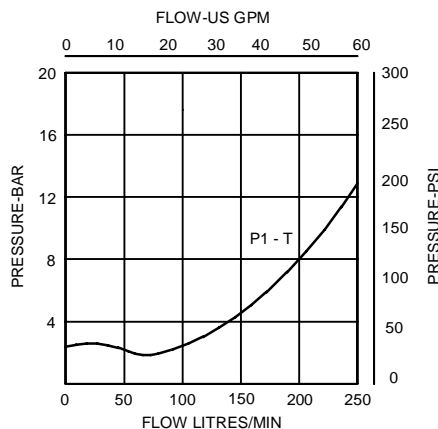
APPLICATION

Two-pump unloader valves are used in systems with combinations of two (or more) pumps to give high flow at low pressure and high pressure at low flow. The valves bypass the flow from the low pressure pump(s) to tank at a pre-set pressure. This allows pump selection to give, for example, rapid advance and high power compaction with the most economic usage of system components and energy requirements.

OPERATION

Pump inlet to P1 and P2 is combined to give maximum flow at low pressure. When the load pressure increases to the valve setting the high flow (low pressure) pump is bypassed from P1 to tank allowing nearly all system power to be used for the high pressure pump. (See graph for the pressure drop of the dumped flow). The system relief valve provides protection by limiting the maximum pressure in the system line.

PRESSURE DROP



FEATURES

This is a self contained system including two replaceable cartridges with full adjustment through their respective ranges. Hardened working components give long, trouble-free life and single body reduces plumbing to a minimum.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	150 litres/min (40 US GPM) low flow/high pressure (P2) 200 litres/min (52 US GPM) high flow/low pressure (P1)
Max Setting	350 bar (5000 psi)
Cartridge Material	All working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard - steel
Mounting Position	Unrestricted
Weight	3.15 kg (6.93 lbs)
Seal Kit Number	SK671 (Nitrile) SK671V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Nominal Viscosity Range	5 to 500 cSt

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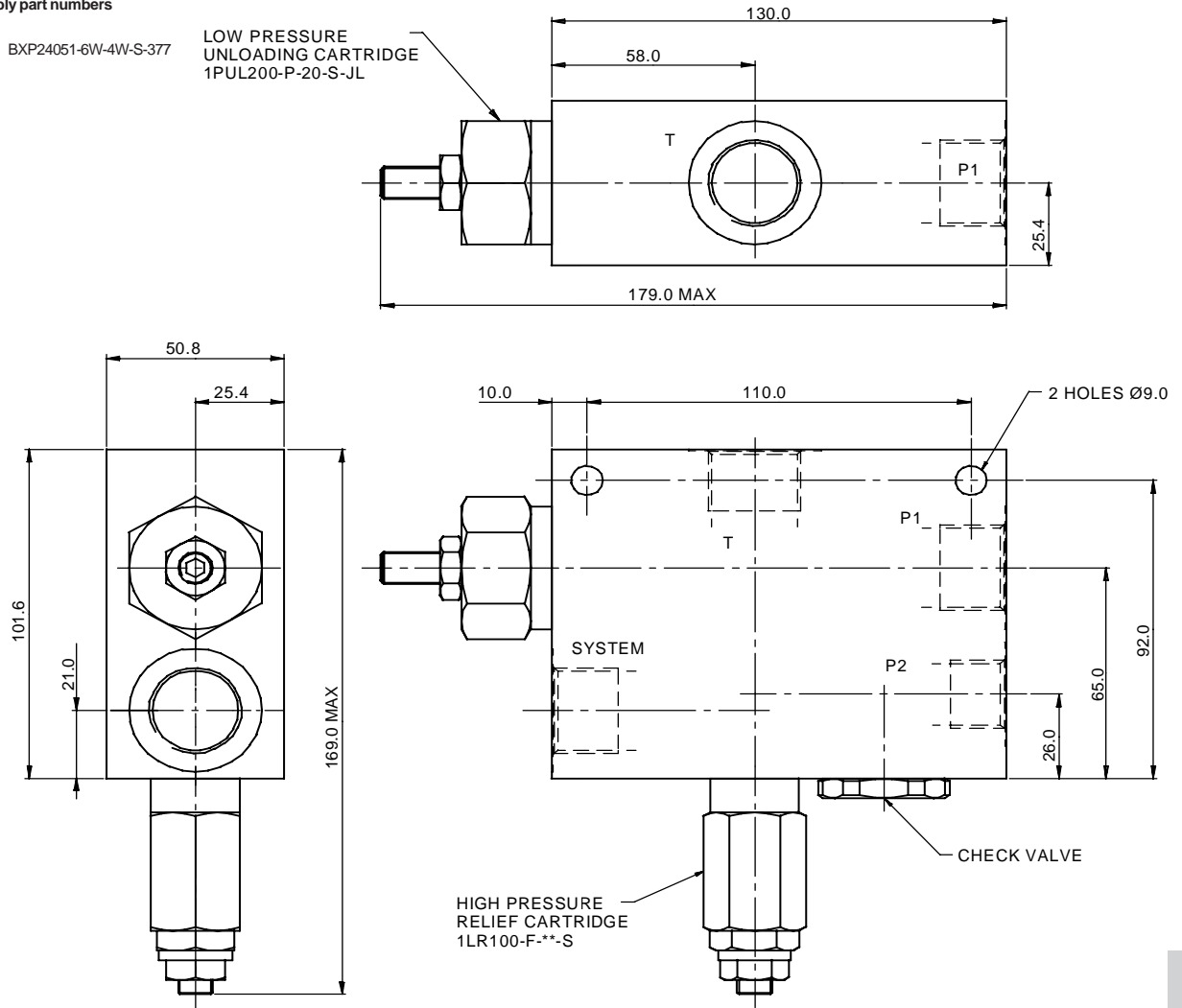
COMPLETE VALVE

BASIC CODE: 1UL255

Sub-assembly part numbers

BSP, steel
3/4" - 1/2" BXP24051-6W-4W-S-377

LOW PRESSURE
UNLOADING CARTRIDGE
1PUL200-P-20-S-JL



12

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

Basic Code	1UL255	P	6W-4W	20	35	S	Seals
1UL255 = Complete Valve							S = Nitrile (For use with most industrial hydraulic oils)
Adjustment Means							SV = Viton (For high temperature and most special fluid applications)
P = Leakproof Screw Adjustment							
Port Sizes - Bodied Valves Only							
6W - 4W = 3/4" BSP System, P1 and T. 1/2" BSP P2							
Adjustable Low Pressure Range							Adjustable High Pressure Range
20 = 30-210 bar. Std setting 100 bar							17 = 35-175 bar. Std setting 105 bar
35 = 150-350 bar. Std setting 200 bar							28 = 75-285 bar. Std setting 175 bar
							35 = 114-350 bar. Std setting 280 bar

We reserve the right to change specifications without notice



SECTION 13 - SHUTTLE VALVES

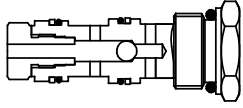

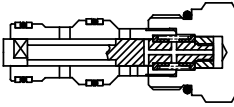
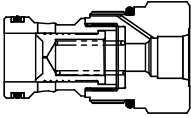
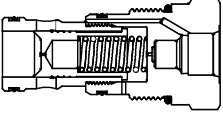
CONTENTS

This section contains a wide range of shuttle valves which are ideal for brake circuits and pilot logic circuits. Also included are remote sequence cartridges which can be used for unloading or sequencing small flows.

Pressures up to 350 bar (5000 psi) and flows up to 30 litres/min (8 US GPM).

Hot oil shuttle integrated circuits are also included, with pressures up to 350 bar (5000 psi) and flows up to 120 litres/min (32 US GPM).

SELECTION

SECTION	SERIES	APPLICATION	RANGE	PAGE
	1SH Ball type shuttle cartridge	This valve senses the higher pressure in two lines and allows a signal to a third port whilst blocking the lower pressure line.	350 bar (5000 psi) 20 litres/min (5 US GPM)	13-105
	1RDS Pilot operated spool valves, cartridge type	These valves provide a variety of 2 and 3 way pilot operated directional control valves with a wide range of applications	420 bar (6090 psi) 80 litres/min (20 US GPM)	13-165
	1HSH Hot oil shuttle cartridge	These valves provide a hot oil shuttle facility for mounting into manifolds	420 bar (6090 psi) 80 litres/min (20 US GPM)	13-185
	LE	Logic element with 'piggy back' pilot control	350 bar (5000 psi) 400 litres/min (100 US GPM)	13-351
	LEV	Logic element with 'piggy back' pilot control and vent	250 bar (3625 psi) 400 litres/min (100 US GPM)	13-381

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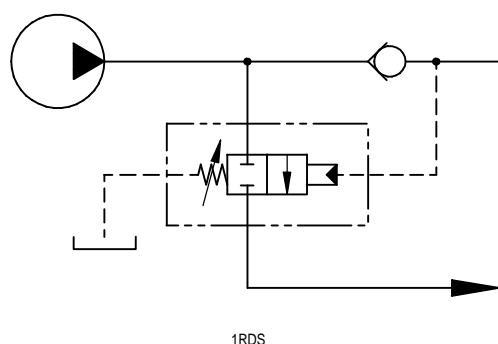
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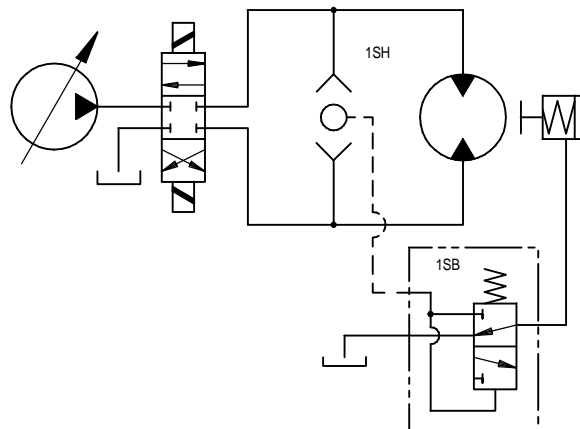
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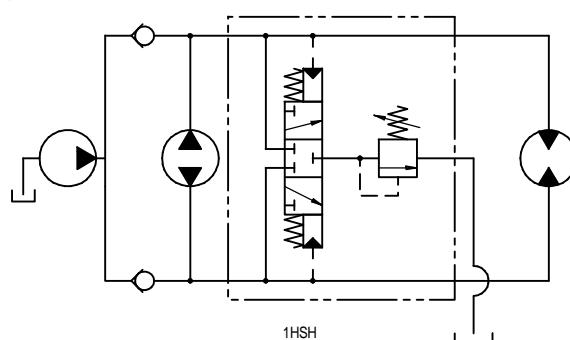
TYPICAL CIRCUIT EXAMPLES



REMOTE SEQUENCE



BRAKE CIRCUIT

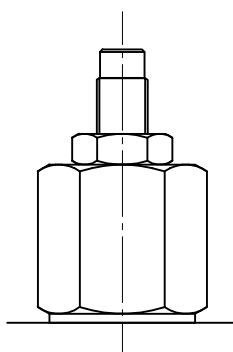


HOT OIL SHUTTLE & PURGE RELIEF

ADJUSTMENTS

The adjustment range and Max setting figures shown throughout this catalogue give the design range for each valve, higher or lower values may be attainable but should not be used without first contacting our Engineering department. Setting must ALWAYS be carried out using an appropriate gauge and it must NOT be assumed that screwing an adjuster to its maximum or minimum position will yield the maximum or minimum stated design setting for that valve.

13



'P' - LEAKPROOF SCREW

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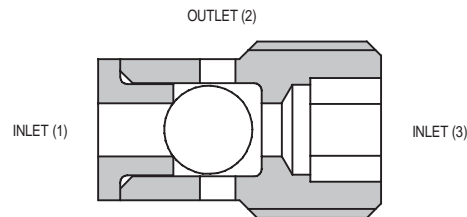
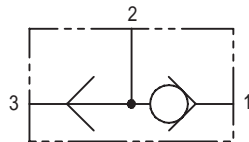


1SH10 SHUTTLE VALVE

BALL TYPE

FOR SERVICE
INSTRUCTIONS, PLEASE
CONTACT MAIN OFFICE.

1SH10



THIS COMPONENT IS NOT TESTED IF
SUPPLIED AS CARTRIDGE INSERT ONLY

APPLICATION

This valve provides a means of sensing the higher pressures between two lines on a hydraulic circuit allowing this line to be used for an auxiliary function such as the removal of a mechanically applied brake, the operation of a gauge or to give a remote pressure sensing line for the control of a separate valve.

OPERATION

When a higher pressure is sensed at inlet (1) than at inlet (3) the ball within the cartridge is forced against a seat opening the higher pressure to outlet (2). When the higher pressure appears at inlet (3) the ball is forced against another seat which blocks inlet (1) and opens up inlet (3) to outlet (2).

FEATURES

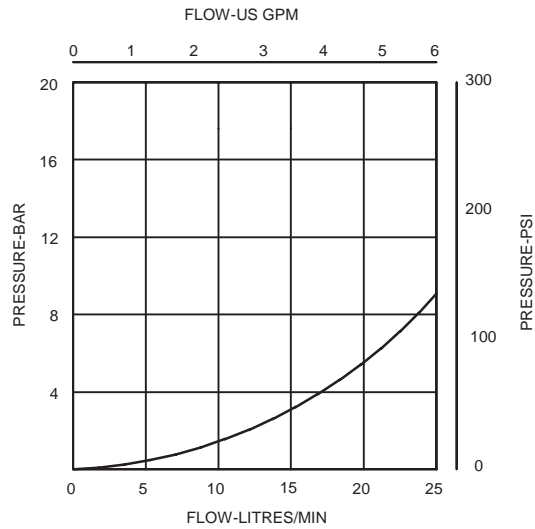
Cartridge design enabling speedy servicing when mounted in a body or in a composite manifold.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

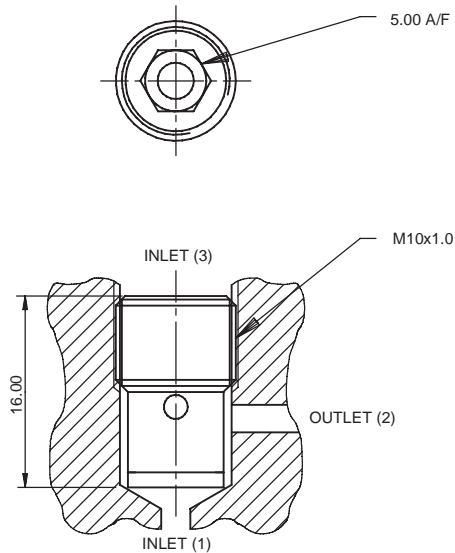
Rated Flow	20 litres/min (5 US GPM)
Max Working Pressure	350 bar (5000 psi)
Cartridge Material	All working parts hardened and ground steel. External surfaces zinc plated
Mounting Position	Unrestricted
Cavity Number	A16927
Torque Cartridge into Cavity	8-10 Nm (Use Loc-Tite 542)
Weight	0.05 kg (0.11 lbs)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.6 millilitres/min max
Nominal Viscosity Range	5 to 500 cSt

PRESSURE DROP



CARTRIDGE ONLY

USING LOC-TITE 542,
TORQUE CARTRIDGE TO
8-10 NM AGAINST THE
BOTTOM OF THE CAVITY.



13

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1SH10

Basic Code _____
1SH10 = Cartridge Only

We reserve the right to change specifications without notice

13-106.C

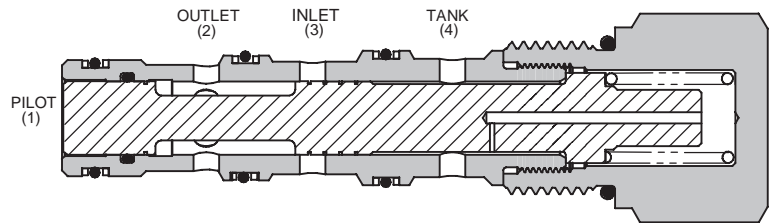
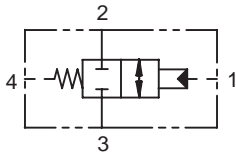


1RDS702 REMOTE SEQUENCE VALVE

PILOT OPERATED SPOOL

1RDS702

NORMALLY CLOSED



APPLICATION

This valve provides a means of interrupting a pressure line when a predetermined pilot pressure is reached in a normally open or normally closed form.

The valve can be used in any pilot or small flow system as a remotely operated sequence valve.

OPERATION

When a pre-set pilot pressure is reached the spool moves back against the spring either opening or closing the line between inlet and outlet. When the pilot pressure falls the valve will return to its normal position.

FEATURES

Cartridge design enabling speedy servicing when mounted in a body or in a composite manifold. Sealed pilot as standard.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	80 litres/min (20 US GPM)
Max Working Pressure	420 bar (6090 psi)
Pilot Pressure	7 or 10 bar (101.5 or 145 psi)
Cartridge Material	All working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A21145 (See Section 17)
Torque Cartridge into Cavity	67 Nm (50 lbs ft)
Weight	1RDS702 0.37 kg (0.8 lbs) 1RDS752 1.97 kg (4.3 lbs)
Seal Kit Number	SK1227 (Nitrile) SK1227V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	90 millilitres/min nominal per land
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

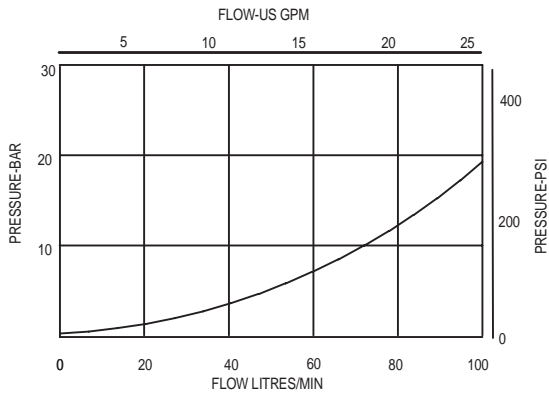
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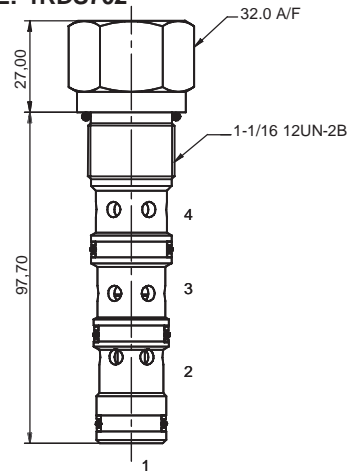
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PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: 1RDS702



COMPLETE VALVE

3/4" PORTS

BASIC CODE: 1RDS752

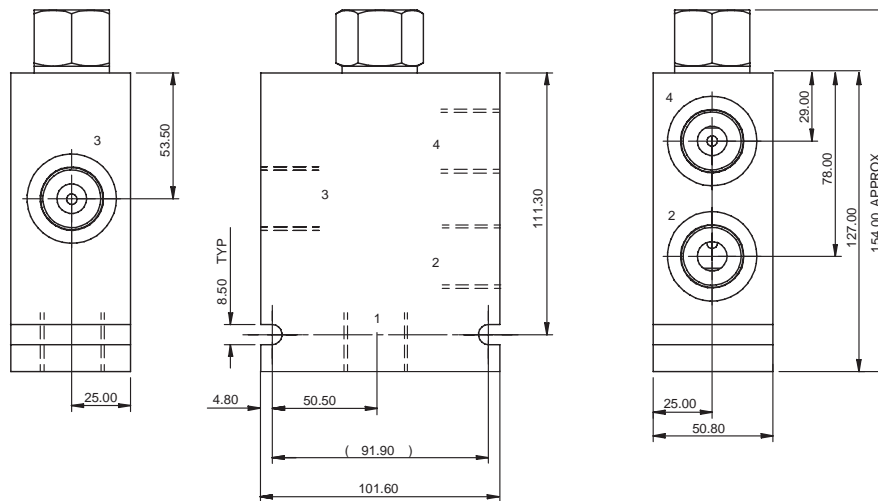
Body ONLY part numbers

BSP, aluminium
3/4" B21818

BSP, steel
3/4" B21819

SAE, aluminium
3/4" B21822

SAE, steel
3/4" B21823



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1RDS* 2 N 3W 1.0 S**

Basic Code

1RDS702 = Cartridge Only

1RDS752 = Cartridge and Body

Options

2 = Normally Closed

Adjustment Means

N = Fixed

Port Sizes - Bodied Valves Only

6W = 3/4" BSP

12T = 3/4" SAE

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

Pilot Pressure

0.7 = 7 bar

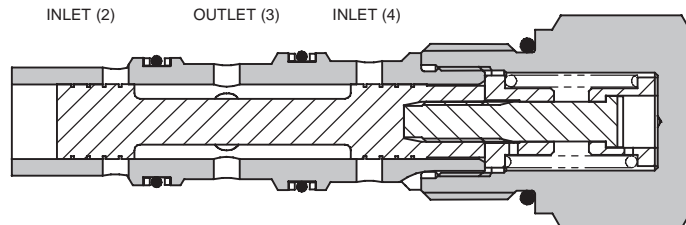
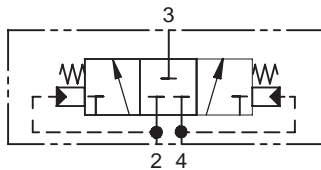
1.0 = 10 bar

We reserve the right to change specifications without notice



1HSH701 HOT OIL SHUTTLE VALVE

1HSH701



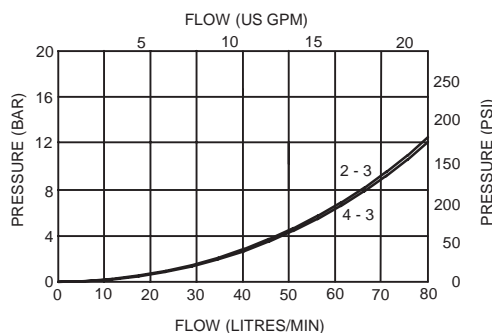
APPLICATION

This valve provides hot oil exhaust in a closed loop hydrostatic system. The high pressure line causes the valve to open the low pressure line to tank through a back pressure relief valve, thus purging the system of extra oil supplied by the charge pump.

OPERATION

Inlet (2) and inlet (4) are fed by the pressure lines of a close loop hydraulic system. As soon as pressure rises in either line, the spool which is internally piloted opens the lower pressure side to tank through a relief valve. This allows the charge pump flow to be exhausted to tank after the oil has done its work, hence the title 'hot oil shuttle'. If the system is reversed, the spool switches in the opposite direction, maintaining hot oil exhaust.

PRESSURE DROP



FEATURES

Compact design with high pressure rating and low pressure drop characteristics. Hardened and match ground working parts keep cross port leakage to a minimum.

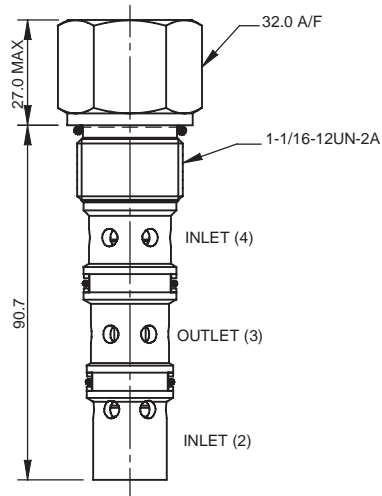
SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Max Working Pressure	420bar (6000 psi)
Rated Purge Oil Flow	80 litres/min (21 US GPM)
Body Material	Standard steel
Mounting Position	Line mounted
Cavity Number	A21145 (See Section 17)
Torque Cartridge into Cavity	67 Nm (50 lbs ft)
Weight	1HSH701 0.37 kg (0.8 lbs) 1HSH751 1.60 kg (3.5 lbs)
Seal Kit Number	SK1211 (Nitrile) SK1211V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	90 millilitres/min nominal per land
Nominal Viscosity Range	5 to 500 cSt

CARTRIDGE ONLY

BASIC CODE: 1HSH701



COMPLETE VALVE 3/4" PORTS

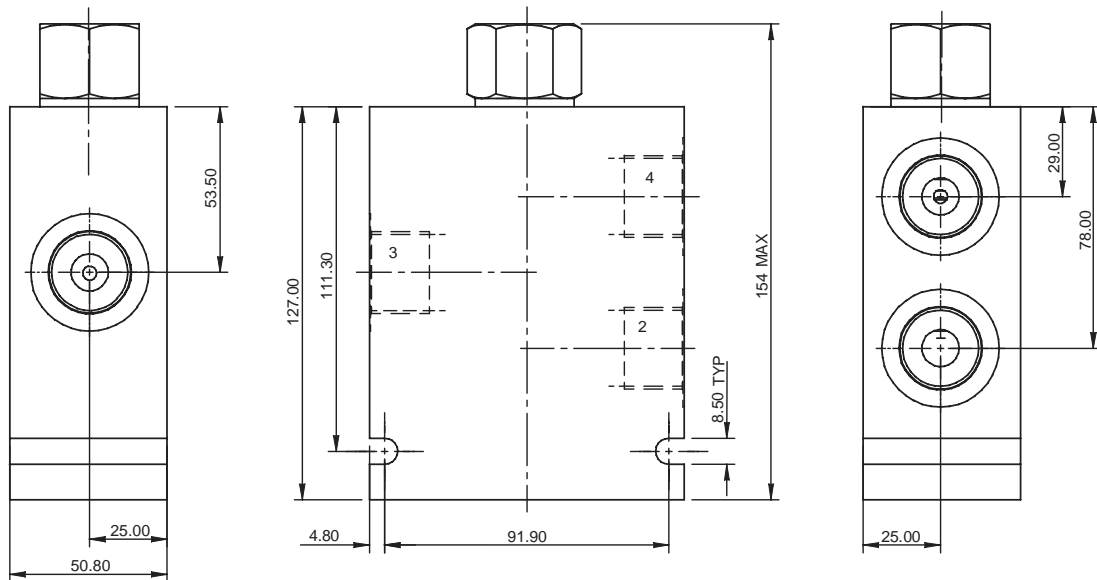
BASIC CODE: 1HSH751

Body ONLY part numbers

SAE, aluminium
3/4" B21668

BSP, steel
3/4" B21667

SAE, steel
3/4" B21669



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1HSH 6W 1.0 S 377**

Basic Code

1HSH701 = Cartridge Only
1HSH751 = Cartridge and Body

Port Sizes - Bodied Valves Only

6W = 3/4" BSP 12T = 3/4" SAE

Body Material

377 = Steel
Omit for aluminium (up to 210 bar)

Seals

S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)

Pilot Pressure

0.4 = 4 bar
1.0 = 10 bar

We reserve the right to change specifications without notice

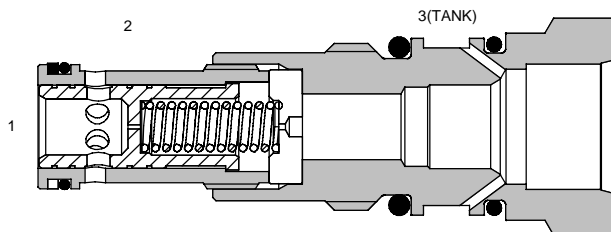
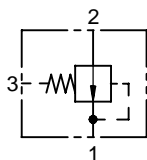


1LE100 SERIES 2/2 SPOOL NORMALLY OPEN LOGIC ELEMENT

Optional Pilot Control

Up to 80 litres/min (20 US GPM) • 350 bar (5000 PSI)

1LEV100



APPLICATION

For use in conjunction with pilot valves to allow control of larger flows. When used with a 2/2 solenoid valve the combination allows control of flows to 80 lts/min (20 US gpm). With a pilot relief valve or a proportional relief valve the element becomes a high flow pilot style pressure reducing valve. With a needle valve an on/off function is achieved.

The outlet flow becomes the controlled pressure line.

OPERATION

With a pilot valve fitted the valve will only close when flow is allowed across the orifice in the middle of the spool. Flow passing across this orifice will cause there to be a pressure difference that acts over the full area of the spool to move it back against the spring that biases it open. By controlling the pressure in the spring chamber you can control the pressure at which the valve closes.

FEATURES

Very versatile in its application using hardened and ground spool and sleeve giving minimal internal leakage and long life.

High flow and pressure rating increases the variety of applications into which it can fit.

With small modifications to the spool the valve can be used as a compensator for restrictive pressure compensated flow controls.

CONTROL OPTIONS

1DR2-P-**S	Page 2.151
S207N	Page 11-171
S215N	Page 11-2015
2CN20-S	Page 8-111
PDR2	TBA

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	80 litres/min (20 US GPM)
Max Pressure	Working 350 bar (5000 psi) Differential 2-1 210 bar (3000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A880 (See Section 17)
Torque Cartridge into Cavity	60 Nm (44 lbs ft)
Weight	0.21 kg (0.5 lbs)
Seal Kit Material	PTFE Backups, Nitrile or Viton Seals
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +120°C
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

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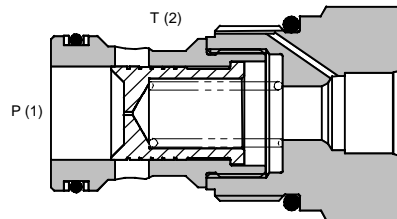
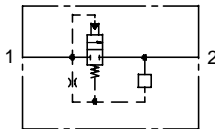




LE402 SERIES OVERCENTRE VALVE

PILOT ASSISTED RELIEF WITH CHECK

LE402



APPLICATION

For use in conjunction with pilot valves to allow control of larger flows. When used with a 2/2 solenoid valve the combination allows control of flows to 350 lts/min (95 US gpm). With a pilot relief valve or a proportional relief valve the element becomes a high flow pilot style relief. With a needle valve an on/off function is achieved. The outlet flow would normally go to tank because back pressure will act on the pilot cartridge to increase the switching pressure.

OPERATION

With a pilot valve fitted the valve will only open when flow is allowed across the orifice in the middle of the spool. Flow passing across this orifice will cause there to be a pressure difference that acts over the full area of the spool to move it back against the spring that biases it closed. By controlling the pressure in the spring chamber you can control the pressure at which the valve opens.

FEATURES

Very versatile in its application using hardened and ground spool and sleeve giving minimal internal leakage and long life. High flow and pressure rating increases the variety of applications into which it can fit.

CONTROL OPTIONS

1DR2-P-**S	Page 2.151
PDR2	Page 11/2-151
S207N	Page 11-1711
S215	Page 11-2051
2CN20-S	Page 8-111

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	350 litres/min (95 US GPM)	
Max Setting	Max Load Induced P1: 350 bar (5000 psi) P2: 210 bar (3000 psi)	
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated	
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option	
Mounting Position	Unrestricted	
Cavity Number	A13245 (See Section 17)	
Torque Cartridge into Cavity	60 Nm (44 lbs ft)	
Weight	LE402	0.29 kg (0.63 lbs)
	LE452	1.35 kg (2.97 lbs)
Seal Kit Number	SK633 (Nitrile)	SK633V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)	
Operating Temp	-20°C to +90°C	
Leakage	Up to 350 millilitres/min	
Nominal Viscosity Range	5 to 500 cSt	

*For applications above 210 bar please consult our technical department or use the steel body option.

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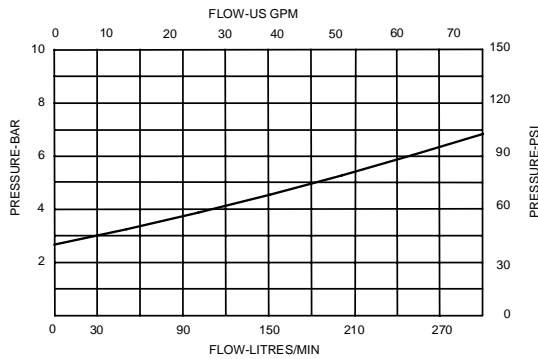
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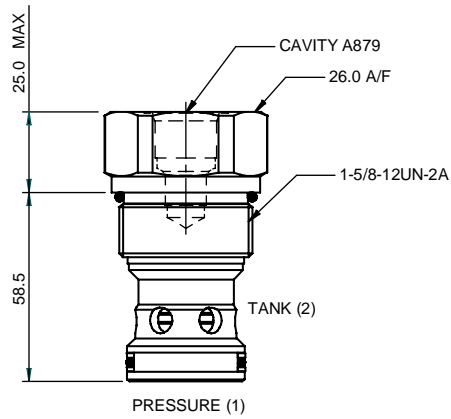
PRESSURE DROP

FREE FLOW 1-2



CARTRIDGE ONLY

BASIC CODE: LE402



COMPLETE VALVE

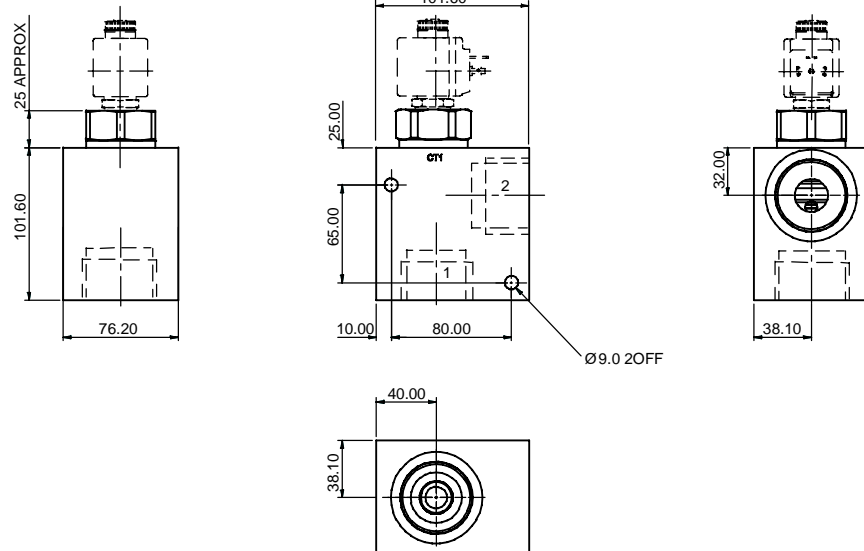
1 1/4" 1 1/2" PORTS

BASIC CODE: LE452

Body ONLY part numbers

BSP, aluminium SAE, aluminium
1 1/4" C24005 1 1/4" C24011
1 1/2" C24007 1 1/2" C24013

BSP, steel SAE, steel
1 1/4" C24006 1 1/4" C24012
1 1/2" C24008 1 1/2" C24014



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

LE4**

N

0.2

1DR2-P-40S

10W

Basic Code

1LE402 = Cartridge (Logic Element)

1LE452 = Cartridge (Logic Element) and Body

Seals

N = Nitron

V = Viton

Port Sizes

10W = 1/1/4 BSP

20T = 1/1/4 SAE

Pilot Cartridge Part Number

Blank = None

1DR2-P-40S

PDR21AN*6**

S207N

S215

2CN20

- See Page No: 2-151

- See Page No: 11/2-151

- See Page No: 11-1711

- See Page No: 11-2051

- See Page No: 8-111

Spring

0.2 = 1.75 bar

We reserve the right to change specifications without notice

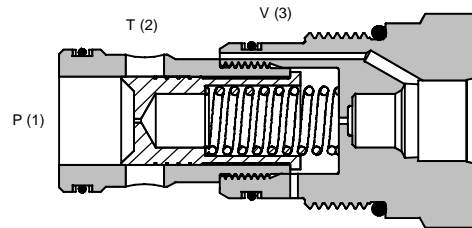
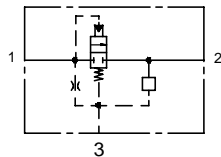


LEV SERIES 2/2 SPOOL VENTABLE LOGIC ELEMENT

Optional Pilot Control

400 Litres/min (100 US GPM) • 250 bar (3625 PSI)

LEV402



APPLICATION

For use in conjunction with pilot valves to allow control of larger flows. When used with a 2/2 solenoid valve the combination allows control of flows to 400 lts/min (100 US gpm). With a pilot relief valve or a proportional relief valve the element becomes a high flow pilot style ventable relief. With a needle valve an on/off function is achieved.

The outlet flow would normally go to tank because back pressure will act on the pilot cartridge to increase the switching pressure.

OPERATION

With a pilot valve fitted the valve will only open when flow is allowed across the orifice in the middle of the spool. Flow passing across this orifice will cause there to be a pressure difference that acts over the full area of the spool to move it back against the spring that biases it closed. By controlling the pressure in the spring chamber you can control the pressure at which the valve opens.

The vent port can be used as a remote control port to provide two pressure operation or a dump facility.

FEATURES

13

Very versatile in its application using hardened and ground spool and sleeve giving minimal internal leakage and long life.

High flow and pressure rating increases the variety of applications into which it can fit.

With small modifications to the spool the valve can be used in load sensing circuits or as a compensator for by-pass pressure compensated flow controls.

CONTROL OPTIONS

1DR2-P-**S	Page 2.151
PDR2	Page 11/2-151
S207N	Page 11-171
S215N	Page 11-2051
2CN20-S	Page 8-111

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	400 litres/min (100 US GPM)
Max Working Pressure	250 bar Port 1 and 2 210 bar Port 3
Switch Pressure	3 bar
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A21773 (See Section 17)
Torque Cartridge into Cavity	150 Nm (110 lbs ft)
Weight	LEV402 0.70 kg (1.54 lbs) LEV452 2.54 kg (5.6 lbs)
Seal Kit	SK1232 (Nitrile) SK1232V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to + 90°C
Leakage	Up to 350 ml/min
Nominal Viscosity Range	32 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

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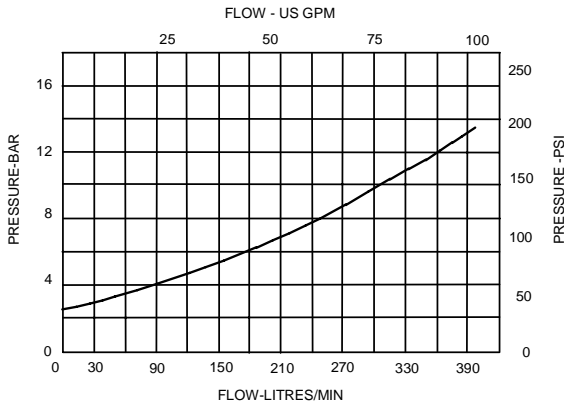
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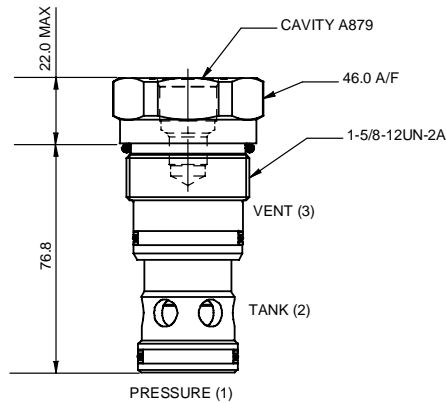
PRESSURE DROP

VENTED PRESSURE DROP



CARTRIDGE ONLY

BASIC CODE: LEV402



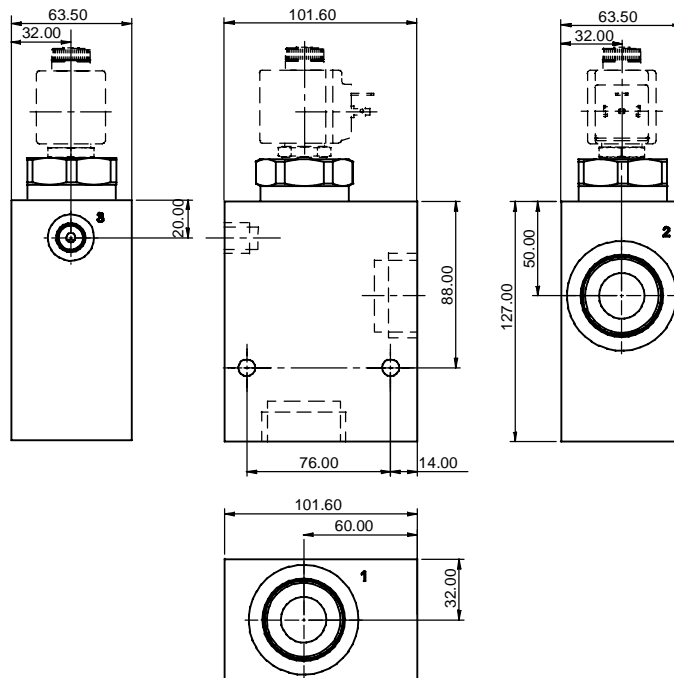
COMPLETE VALVE 1 1/4" 1 1/2" PORTS

BASIC CODE: LEV452

Body ONLY part numbers

<i>BSP, aluminium</i>	<i>SAE, aluminium</i>
1 1/4" C23285	1 1/4" C23279
1 1/2" C23278	1 1/2" C23287

<i>BSP, steel</i>	<i>SAE, steel</i>
1 1/4" C23286	1 1/4" C23284
1 1/2" C23283	1 1/2" C23288



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

LEV4**	N	0.2	1DR2-P-40S	10W
<p>Basic Code _____</p> <p>1LEV402 = Cartridge Only (Logic Element)</p> <p>1LEV452 = Cartridge (Logic Element) and Body</p> <p>Seals _____</p> <p>N = Nitrile</p> <p>V = Viton</p> <p>Spring _____</p> <p>0.2 = 2 Bar</p>				
<p>Port Sizes</p> <p>10W = 1/1/4" BSP</p> <p>1/4" BSP Vent Port</p> <p>20T = 1/1/4" SAE</p> <p>1/4" SAE Vent Port</p> <p>Pilot Cartridge Part Number</p> <p>Blank = None</p> <p>1DR2-P-40S - See Page No: 2-151</p> <p>PDR21AN*6** - See Page No: 11/2-151</p> <p>S207N - See Page No: 11-171</p> <p>S215 - See Page No: 11-2051</p> <p>2CN20 - See Page No: 8-111</p>				

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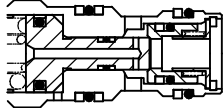
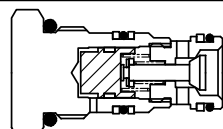


SECTION 14 - INDUSTRIAL VALVES

CONTENTS

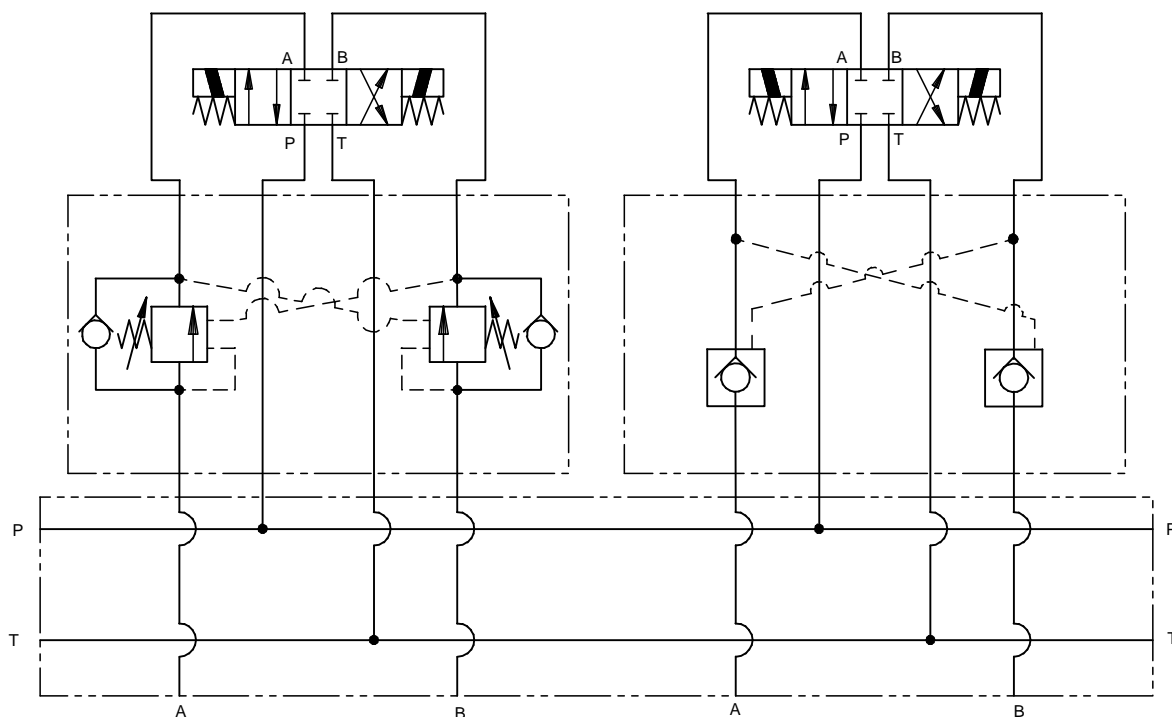
This section contains 90 L/min, 350 bar (24 US GPM, 5000psi) CETOP 03 & 05 Stacking Overcentre and Pilot Operated Check stacking valve modules using cartridge technology to improve serviceability. Also Directional, Flow and Pressure controls available on request.

SELECTION

SECTION	SERIES	APPLICATION	RANGE	PAGE
	Overcentre Valves Cetop 03 (NG06) and 05 (NG10). Single and Dual.	Cetop 03 - Using 1CE*30 cartridges, see page 6-111, 6-121 & 6-131. Cetop 05 - Using 1CE*90 cartridge, see page 6-151, 6-161 & 6-171.	Up to 350 bar (5000 psi) Up to 90 l/min (23US GPM)	14-111 to 14-121
	PO Check Valves Cetop 03 (NG06) and 05 (NG10). Single and Dual.	Cetop 03 - Using 4CK30 cartridge, see page 7-151. Cetop 05 - Using 4CK90 cartridge, see page 7-161.	Up to 350 bar (5000 psi) Up to 90 l/min (23US GPM)	14-131 to 14-141



TYPICAL CIRCUIT EXAMPLES



PRESSURE EQUIPMENT DIRECTIVE

All pressure control valves manufactured by Integrated Hydraulics are designed to be “Pressure Accessories” in accordance with article 3 section 3 of the Pressure Equipment Directive and Sound Engineering Practice and sold in good faith as such. For “Safety Accessories” as defined in article 3 section 1.4 of the Pressure Equipment Directive please contact the UK Technical Sales Department.

ADJUSTMENTS

The adjustment range and Max setting figures shown throughout this catalogue give the design range for each valve, higher or lower values may be attainable but should not be used without first contacting our Engineering department. Setting must ALWAYS be carried out using an appropriate gauge and it must NOT be assumed that screwing an adjuster to its maximum or minimum position will yield the maximum or minimum stated design setting for that valve.

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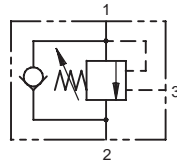
Website: www.integratedhydraulics.com



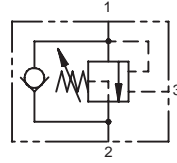
CETOP 03 OVERCENTRE STACKING SLICES

PILOT ASSISTED RELIEF WITH CHECK

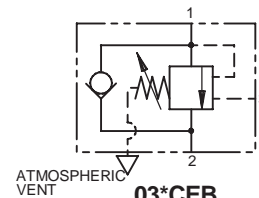
03*CE/ 03*CER/ 03*CEB



03*CE



03*CER



03*CEB

APPLICATION

Overcentre valves give static and dynamic control of loads by regulating the flow into and out of hydraulic actuators. When installed close to or within an actuator, the overcentre valve will stop runaway in the event of hose burst and if open centre directional control valves are used, will allow thermal expansion relief of the hydraulic fluid.

Single overcentre valves are normally used when the load is unidirectional, for example an aerial platform or crane and dual overcentre valves are used for controlling loads in both directions for motor applications or for cylinders going over centre.

The 1CER series overcentre valve performs all duties of a regular overcentre but is able to relieve and stay open irrespective of downstream pressure. This enables the valve to operate when used with a closed centre directional valve which has service line reliefs. The poppet is pressure balanced, preventing relief setting increase due to back pressure.--

In the 1CEB series pressure balanced overcentre relief setting is unaffected by back pressure, enabling the valve to stay open when the valve port pressure rises. This will allow the control of regenerative or meter out proportional systems.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time.

PILOT RATIOS

1CE30

2.5:1

Best suited for extremely unstable applications such as long booms or flexible frameworks.

5:1 (Std)

Best suited for applications where load varies and machine structure can induce instability

10:1

Best suited for applications where the load remains relatively constant.

1CER30

4:1

Best suited for applications where the load remains relatively constant.

Other ratios available upon request.

1CEB30

5:1

Best suited for systems where back pressure varies frequently and for re-regenerative systems.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	30 litres/min (8 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A6610 (See Section 17)
Torque Cartridge into Cavity	45 Nm (33 lbs ft)
Weight (inc Cartridges)	Single 0.62 kg (1.36 lbs) Dual 0.8 kg (1.76 lbs)
Seal Kit Number	SK395 (Nitrile) SK395V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

For pressure drop curves please see section 6 (cartridge only).

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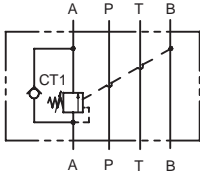
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COMPLETE VALVE

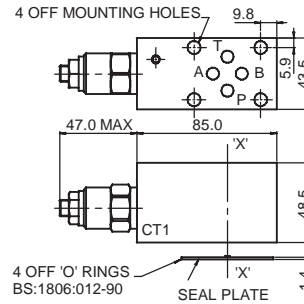
BASIC CODE: 03ACE* Overcentre in A, piloted from B

Sub-assembly part numbers

Aluminium
BXP9150-S



Tightening torque of "F" adjuster
locknut - 20 to 25 Nm

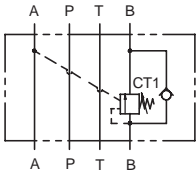


COMPLETE VALVE

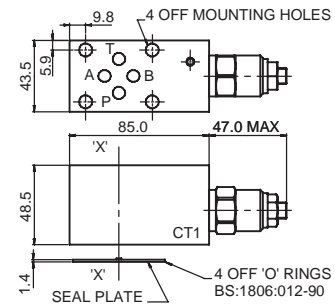
BASIC CODE: 03BCE* Overcentre in B, piloted from A

Sub-assembly part numbers

Aluminium
BXP9150-S



Tightening torque of "F" adjuster
locknut - 20 to 25 Nm

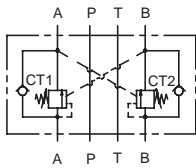


COMPLETE VALVE

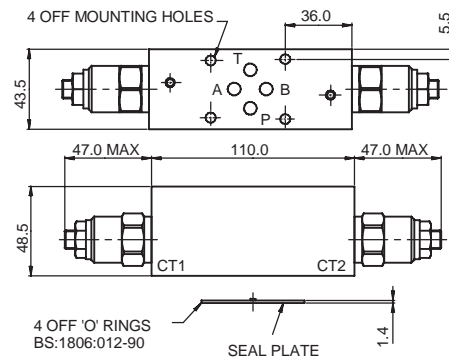
BASIC CODE: 03ABCE* Overcentre in A & B, cross piloted

Sub-assembly part numbers

Aluminium Steel
BXP9151-S BXP9151-S-377



Tightening torque of "F" adjuster
locknut - 20 to 25 Nm



FOR SEAL PLATE INFORMATION SEE PAGE 14-151

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

Basic Code

03A = Overcentre in A
03B = Overcentre in B
03AB = Overcentre in A&B

Overcentre Valve

CE = 1CE30
CER = 1CER30
CEB = 1CEB30
(See Section 6)

Adjustment Means

F = Screw Adjustment
N = Fixed - State pressure setting required
For fixed versions add setting in 10 bar increments to end of part number. Subject to a ±10% tolerance.

Pressure Range @ 4.8 l/min

20 = (All pilot ratios) 70 - 225 bar. Std setting 100 bar (CE)
35 = (2.5:1, 4:1, 5:1) 70 - 350 bar. Std setting 210 bar (CE, CER)
35 = (10:1) 90 - 350 bar. Std setting 210 bar (CE)
35 = (5:1) 75 - 350 bar. Std setting 210 bar (CEB)
Other pressure ranges available on request

Body Material

Omit = Aluminium. (Up to 210 bar*)
377 = Steel.

Pilot Ratio

2.5:1 (03*CE)
4:1 (03*CER)
5:1 (03*CE/03*CEB)
10:1 (03*CE)

Seals

S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)

*** For applications above 210 bar please consult our technical department or use the steel body option.**

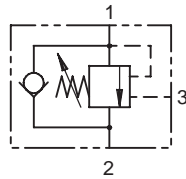
We reserve the right to change specifications without notice



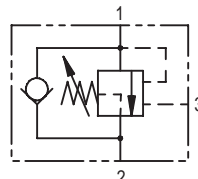
CETOP 05 OVERCENTRE STACKING SLICES

PILOT ASSISTED RELIEF WITH CHECK

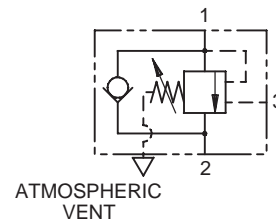
05*CE/ 05*CER/ 05*CEB



05*CE



05*CER



05*CEB

APPLICATION

Overcentre valves give static and dynamic control of loads by regulating the flow into and out of hydraulic actuators. When installed close to or within an actuator, the overcentre valve will stop runaway in the event of hose burst and if open centre directional control valves are used, will allow thermal expansion relief of the hydraulic fluid.

Single overcentre valves are normally used when the load is unidirectional, for example an aerial platform or crane and dual overcentre valves are used for controlling loads in both directions for motor applications or for cylinders going over centre.

The 1CER series overcentre valve performs all duties of a regular overcentre but is able to relieve and stay open irrespective of downstream pressure. This enables the valve to operate when used with a closed centre directional valve which has service line reliefs. The poppet is pressure balanced, preventing relief setting increase due to back pressure.--

In the 1CEB series pressure balanced overcentre relief setting is unaffected by back pressure, enabling the valve to stay open when the valve port pressure rises. This will allow the control of regenerative or meter out proportional systems.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time.

PILOT RATIOS

4:1 Best suited for applications where the load remains relatively constant.

Other ratios available upon request.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	90 litres/min (23 US GPM)	
Max Setting	Max Load Induced	
	Pressure:	270 bar (4000 psi)
	Relief Setting:	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated	
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option	
Mounting Position	Unrestricted	
Cavity Number	A12336 (See Section 17)	
Torque Cartridge into Cavity	60 Nm (44 lbs ft)	
Weight (inc cartridges)	Single	2.18 kg (4.8 lbs)
	Dual	3.02 kg (6.64 lbs)
Seal Kit Number	SK633 (Nitrile)	SK633V (Viton)
1CEB Seal Kit Number	SK634 (Nitrile)	SK634V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)	
Operating Temp	-20°C to +90°C	
Leakage	0.3 millilitres/min nominal (5 dpm)	
Nominal Viscosity Range	5 to 500 cSt	

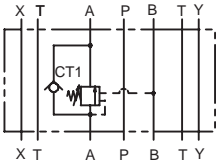
For pressure drop curves please see section 6 (cartridge only).

COMPLETE VALVE

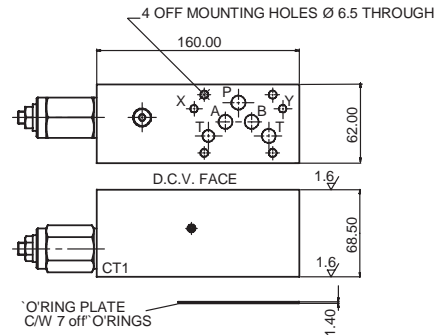
BASIC CODE: 05ACE* Overcentre in A, piloted from B

Sub-assembly part numbers

Aluminium
BXP9206-S



Tightening torque of "F" adjuster
locknut - 20 to 25 Nm

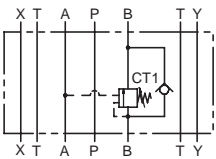


COMPLETE VALVE

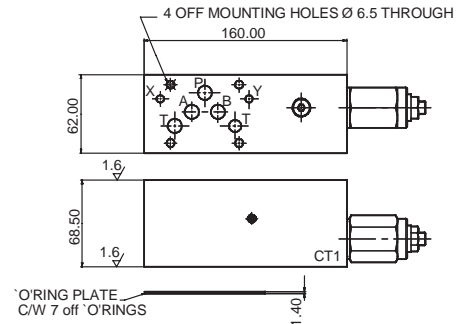
BASIC CODE: 05BCE* Overcentre in B, piloted from A

Sub-assembly part numbers

Aluminium
BXP9207-S



Tightening torque of "F" adjuster
locknut - 20 to 25 Nm

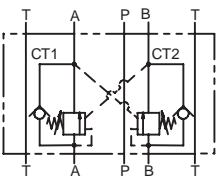


COMPLETE VALVE

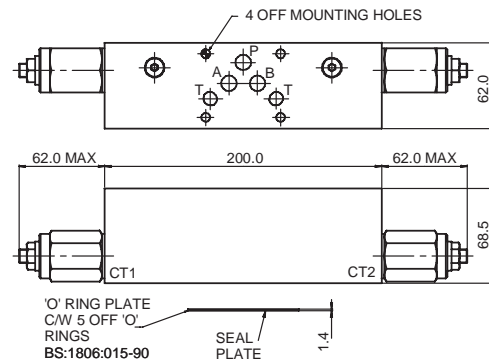
BASIC CODE: 05ABCE* Overcentre in A & B, cross Piloted

Sub-assembly part numbers

Aluminium
BXP9209-S



Tightening torque of "F" adjuster
locknut - 20 to 25 Nm



FOR SEAL PLATE INFORMATION SEE PAGE 14-151

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

05 ** CE* F 35 S 4

Basic Code

05A = Overcentre in A
05B = Overcentre in B
05AB = Overcentre in A&B

Overcentre Valve

CE = 1CE90
CER = 1CER90
CEB = 1CEB90
(See Section 6)

Adjustment Means

F = Screw Adjustment
N = Fixed - State pressure setting required
For fixed versions add setting in 10 bar increments to end of part number. Subject to a ±10% tolerance.

Pressure Range @ 4.8 l/min

20 = 70 - 225 bar. Std setting 100 bar
35 = 200 - 350 bar. Std setting 210 bar
Std setting made at 4.8 litres/min
Other pressure ranges available on request

Body Material

Omit = Aluminium. (Up to 210 bar*)
377 = Steel.

Pilot Ratio

4 = 4:1

Seals

S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)

*** For applications above 210 bar please consult our technical department or use the steel body option.**

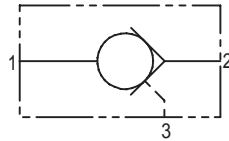
We reserve the right to change specifications without notice



CETOP 03 CHECK STACKING SLICE

PILOT TO OPEN

03*CK



APPLICATION

Pilot check valves allow flow to pass in one direction, with a low pressure drop, then prevent reverse flow until pilot pressure is applied. There are many applications for this valve type, the most common being to lock and hold a cylinder, or another hydraulic actuator, in position.

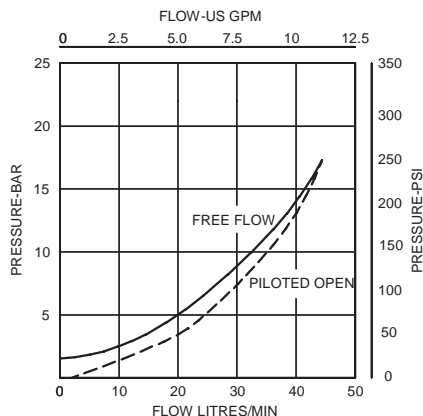
The 4CK30 is a small cartridge valve and is ideally suited for fitting directly into a cylinder, giving economy of installation, direct control of cylinder movement and ease of servicing.

OPERATION

Pressure on the valve port causes the poppet to lift against the spring force, allowing the flow to the cylinder port. Reverse flow is prevented by the poppet reseating. Pressure applied to the pilot port will overcome the cylinder port pressure and lift the poppet from its seat, allowing flow from the cylinder to valve port.

PRESSURE DROP

Cartridge only



FEATURES

Hardened and ground poppet gives excellent flow capability for valve size, positive sealing and long working life.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	30 litres/min (8 US GPM)	
Max Pressure	350 bar (5000 psi)	
Pilot Ratio	3:1	
Cartridge Material	Working parts hardened and ground steel. Electroless zinc plated body	
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option.	
Mounting Position	Unrestricted	
Cavity Number	A6610 (See Section 17)	
Torque Cavity into Cartridge	45 Nm (33 lbs ft)	
Weight (inc cartridge)	Single	0.52 kg (1.14 lbs)
	Dual	0.74 kg (1.63 lbs)
Seal Kit Number	SK430 (Nitrile)	SK430V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)	
Operating Temp	-20°C to +90°C	
Leakage	0.3 millilitres/min nominal	
Nominal Viscosity Range	5 to 500 cSt	

14

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Website: www.integratedhydraulics.com

Integrated Hydraulics Inc

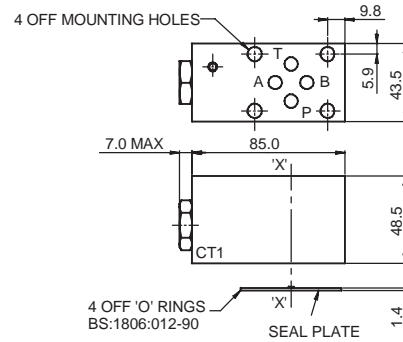
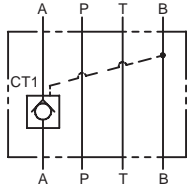
7047 Spinach Drive, Mentor, Ohio 44060, USA
Tel: (440) 974 3171 Fax: (440) 974 3170
Website: www.integratedhydraulics.com

COMPLETE VALVE

BASIC CODE: 03ACK Check in A, piloted from B

Sub-assembly part numbers

Aluminium
BXP9150-S

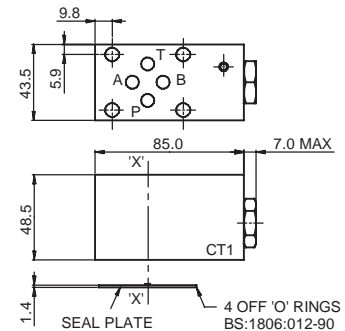
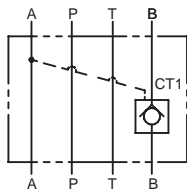


COMPLETE VALVE

BASIC CODE: 03BCK Check in B, piloted from A

Sub-assembly part numbers

Aluminium
BXP9150-S

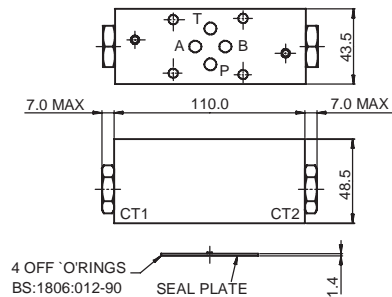
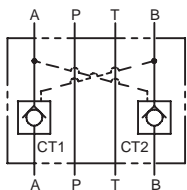


COMPLETE VALVE

BASIC CODE: 03ABCK Check in A & B, cross piloted

Sub-assembly part numbers

Aluminium Steel
BXP9151-S BXP9151-S-377



FOR SEAL PLATE INFORMATION SEE PAGE 14-151

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

03 **

CK

S

3

Basic Code

03A = Check in A

03B = Check in B

03AB = Check in A & B

Pilot Operated Check Valve

CK = 4CK30 (See Section 7)

Body Material

Omit = Aluminium. (Up to 210 bar*)

377 = Steel.

Optional Pilot Seal

Omit if not required

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

*** For applications above 210 bar please consult our technical department or use the steel body option.**

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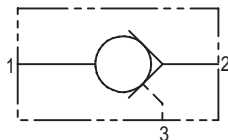
Website: www.integratedhydraulics.com



CETOP 05 CHECK STACKING SLICE

PILOT TO OPEN

05*CK



APPLICATION

Pilot check valves allow flow to pass in one direction, with a low pressure drop, then prevent reverse flow until pilot pressure is applied. There are many applications for this valve type, the most common being to lock and hold a cylinder, or another hydraulic actuator, in position.

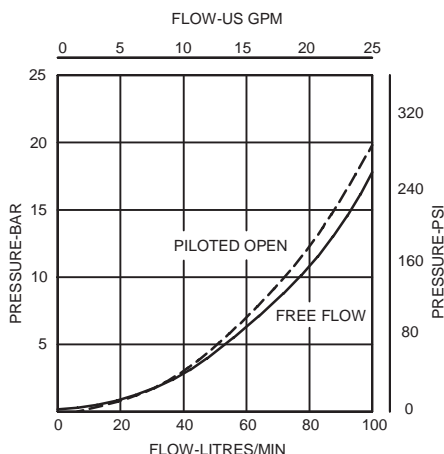
The 4CK90 is a small cartridge valve and is ideally suited for fitting directly into a cylinder, giving economy of installation, direct control of cylinder movement and ease of servicing.

OPERATION

Pressure on the valve port causes the poppet to lift against the spring force, allowing the flow to the cylinder port. Reverse flow is prevented by the poppet reseating. Pressure applied to the pilot port will overcome the cylinder port pressure and lift the poppet from its seat, allowing flow from the cylinder to valve port.

PRESSURE DROP

Cartridge only



FEATURES

Hardened and ground poppet gives excellent flow capability for valve size, positive sealing and long working life.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	90 litres/min (24 US GPM)	
Max Pressure	350 bar (5000 psi)	
Pilot Ratio	4:1	
Cartridge Material	Working parts hardened and ground steel. Electroless zinc plated body	
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option.	
Mounting Position	Unrestricted	
Cavity Number	A12336 (See Section 17)	
Torque Cavity into Cartridge	60 Nm (44 lbs ft)	
Weight (inc cartridge)	Single	1.96 kg (4.31 lbs)
	Dual	2.58 kg (5.68 lbs)
Seal Kit Number	SK832 (Nitrile)	SK832V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)	
Operating Temp	-20°C to +90°C	
Leakage	0.3 millilitres/min nominal	
Nominal Viscosity Range	5 to 500 cSt	

14

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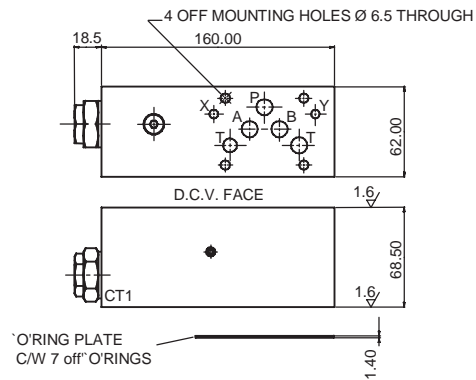
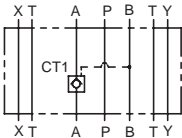
7047 Spinach Drive, Mentor, Ohio 44060, USA
Tel: (440) 974 3171 Fax: (440) 974 3170
Website: www.integratedhydraulics.com

COMPLETE VALVE

BASIC CODE: 05ACK Check in A, piloted from B

Sub-assembly part numbers

Aluminium
BXP9206-S

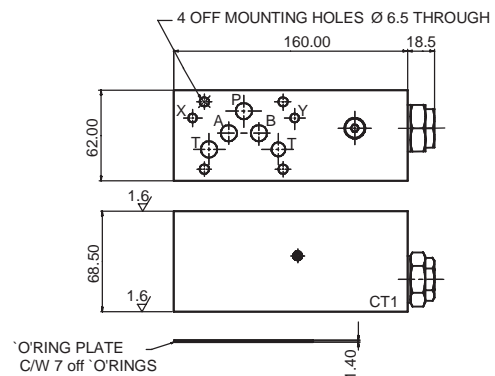
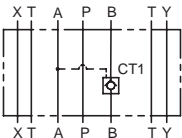


COMPLETE VALVE

BASIC CODE: 05BCK Check in B, piloted from A

Sub-assembly part numbers

Aluminium
BXP9207-S

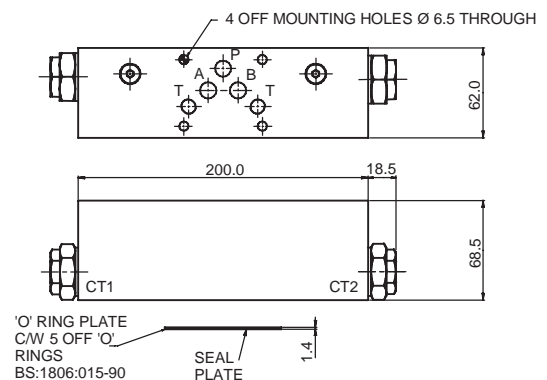
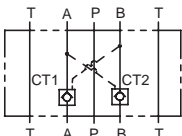


COMPLETE VALVE

BASIC CODE: 05ABCK Check in A & B, cross piloted

Sub-assembly part numbers

Aluminium
BXP9209-S



FOR SEAL PLATE INFORMATION SEE PAGE 14-151

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

05 **

CK

S

3

Basic Code

05A = Check in A

05B = Check in B

05AB = Check in A & B

Pilot Operated Check Valve

CK = 4CK90 (See Section 7)

Body Material

Omit = Aluminium. (Up to 210 bar*)

377 = Steel.

Optional Pilot Seal

Omit if not required

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

*** For applications above 210 bar please consult our technical department or use the steel body option.**

We reserve the right to change specifications without notice

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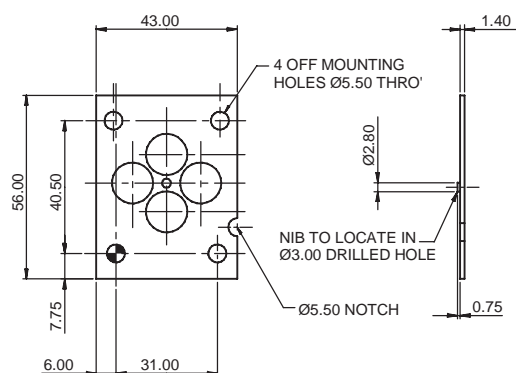
Website: www.integratedhydraulics.com

SEALING PLATES

Integrated Hydraulics have designed their range of CETOP Modular Stacking Valves to be used in conjunction with sealing plates which give maximum flexibility and versatility to the user. Each plate has a notch cut out which is used for correct mounting of each valve to give the required function on the correct port or in the right direction. The CETOP 03 plate has a central dimple for locating the plate in the centre of the valve.

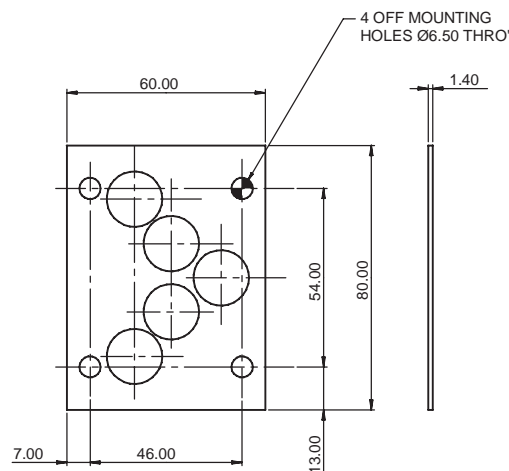
CETOP 03

PK550



CETOP 05

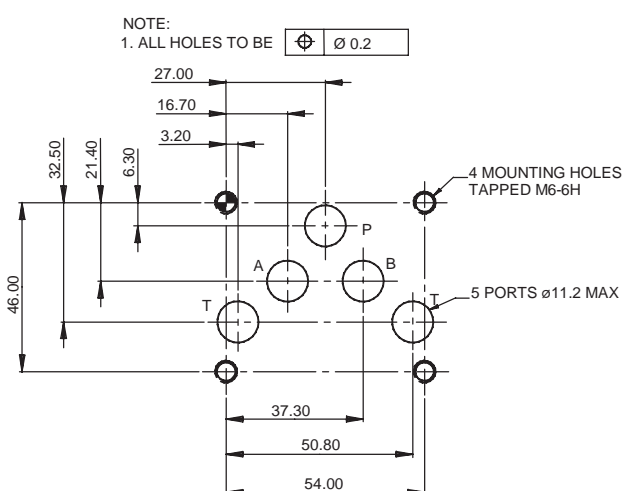
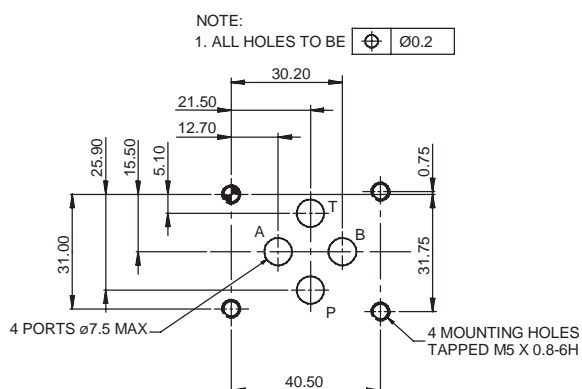
PK555



NOTE: Central locating dimple should always point towards the solenoid valve, ie, always away from the subplate.

MOUNTING PATTERN CETOP 03 AXP 7648

MOUNTING PATTERN CETOP 05 AXP 7647







SECTION 15 - DIRECT MOUNTED VALVES

CONTENTS

This section shows a list of valves which mount directly to motors using the OMP and OMS mounting pattern. They include dual relief valves and overcentre valves.

There are many other variations available - please contact the factory for further information.

SELECTION

CIRCUIT	SERIES	APPLICATION	RANGE	PAGE
	1CLLROMP Danfoss OMP Motor Dual relief	Direct mounting, dual relief valve to provide shock relief protection at the optimum point within the circuit	280 bar (4000 psi) 150 litres/min (40 US GPM)	15-111
	1CLLROMS Danfoss OMS Motor Dual Relief	Direct mounting, dual relief valve to provide shock relief protection at the optimum point within the circuit	280 bar (4000 psi) 150 litres/min (40 US GPM)	15-121
	1CEEOMP Danfoss OMP Motor Dual overcentre	Direct mounting, dual overcentre valve to prevent load runaway, limiting static leakage and providing hose failure safety	350 bar (5000 psi) 40 litres/min (10 US GPM)	15-131
	1CEEOMS Danfoss OMS Motor Dual overcentre	Direct mounting, dual overcentre valve to prevent load runaway, limiting static leakage and providing hose failure safety	350 bar (5000 psi) 90 litres/min (23 US GPM)	15-141
	1CEOMP Danfoss OMP Single overcentre	Direct mounting, single overcentre valve to prevent load runaway, limiting static leakage and providing hose failure safety	350 bar (5000 psi) 40 litres/min (10US GPM)	15-131
	1CEOMS Danfoss OMS Single overcentre	Direct mounting, single overcentre valve to prevent load runaway, limiting static leakage and providing hose failure safety	350 bar (5000 psi) 90 litres/min (23US GPM)	15-141
	1CEESHOMP Danfoss OMP Dual overcentre with shuttle	Direct mounting, dual overcentre valve to prevent load runaway, limiting static leakage and providing hose failure safety with brake release shuttle	350 bar (5000 psi) 40 litres/min (10 US GPM)	15-151
	1CEESHOMS Danfoss OMS Dual overcentre with shuttle	Direct mounting, dual overcentre valve to prevent load runaway, limiting static leakage and providing hose failure safety with brake release shuttle	350 bar (5000 psi) 90 litres/min (23US GPM)	15-141
	1CESHOMP Danfoss OMP Single overcentre with shuttle	Direct mounting, single overcentre valve to prevent load runaway, limiting static leakage and providing hose failure safety with brake release shuttle	350 bar (5000 psi) 40 litres/min (10 US GPM)	15-151
	1CESHOMS Danfoss OMS Single overcentre with shuttle	Direct mounting, single overcentre valve to prevent load runaway, limiting static leakage and providing hose failure safety with brake release shuttle	350 bar (5000 psi) 90 litres/min (23 US GPM)	15-161

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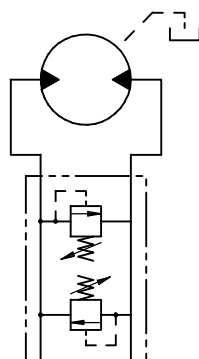
Collins Road, Heathcote Ind. Est., Warwick, CV34 6TF, UK.
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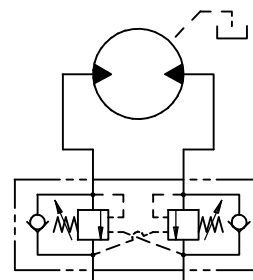
7047 Spinach Drive, Mentor, Ohio 44060, USA
Tel: (440) 974 3171 Fax: (440) 974 3170
Website: www.integratedhydraulics.com



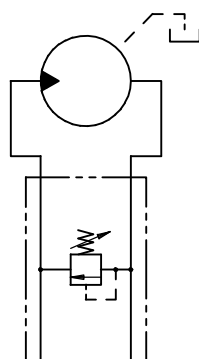
TYPICAL CIRCUIT EXAMPLES



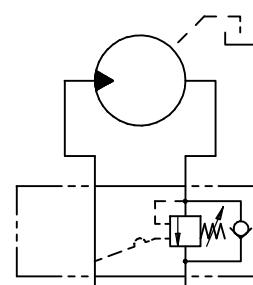
DUAL RELIEF



DUAL OVERCENTRE



SINGLE RELIEF



SINGLE OVERCENTRE

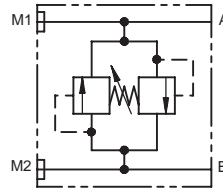
NOTES

These valves are some examples of valves in current production. The versatility of cartridge valves and experienced design makes it possible to mount most circuits to the motor giving space saving, reduced leakage points and, most of all, optimum efficiency.



MOTOR MOUNTED VALVE OMP MOUNTING PATTERN CROSS LINE RELIEF VALVE

1CLLROMP150



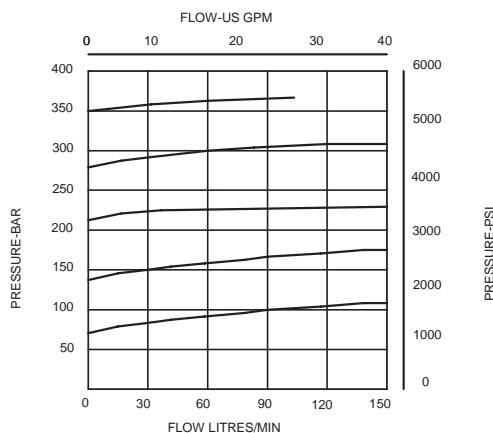
APPLICATION

To protect both lines in a circuit from over pressurisation by relieving oil to the other line. Ideal for use with motors or directional valves as a safety relief. Differential area, fast acting, poppet valve.

OPERATION

Pressure acts over one of two differential areas forcing the poppet back allowing relief flow to the other port. This being a single cartridge is ideal for mounting on to the motor in a special housing.

PRESSURE DROP



FEATURES

Single cartridge relieving in both directions cutting down space requirements, giving full adjustment through its range on both pressures at the same time.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	150 litres/min (40 US GPM)
Max Setting	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External steel surfaces black oxide
Body Material	Standard aluminium (up to 210 bar*) Add Suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A878 (See Section 17)
Torque Cartridge into Cavity	60 Nm (44 lbs ft)
Weight	1.46 kg (3.21 lbs)
Seal Kit Number	SK1280 (Nitrile) SK1280V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	5 millilitres/min
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

Integrated Hydraulics Ltd

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Integrated Hydraulics Inc

7047 Spinach Drive, Mentor, Ohio 44060, USA
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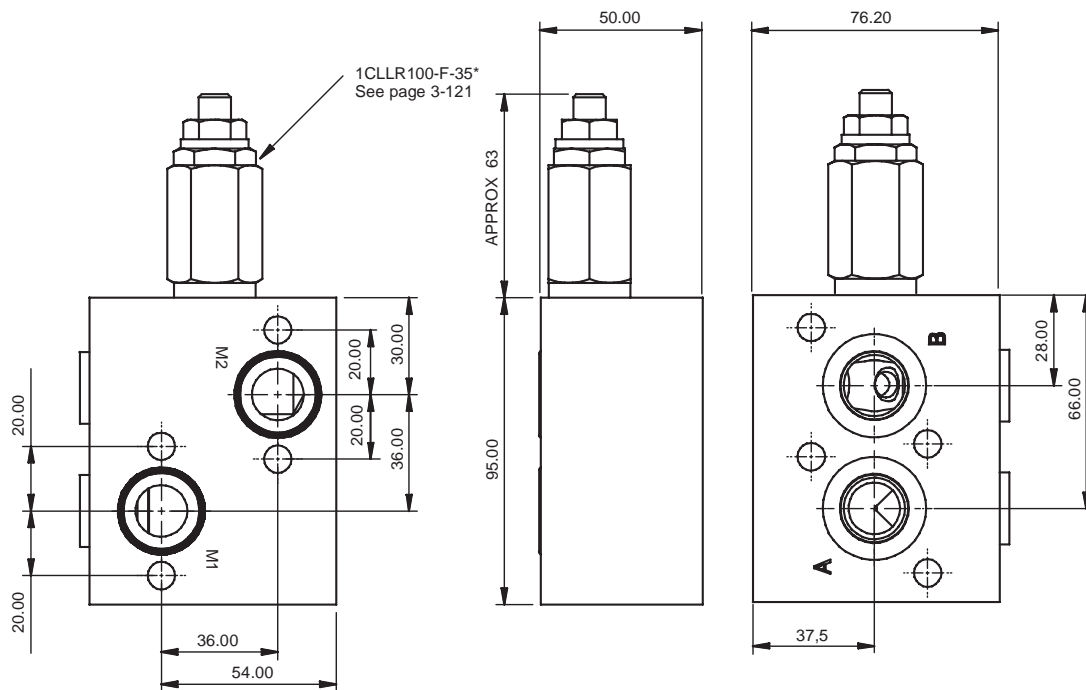
COMPLETE VALVE 1/2" PORTS

BASIC CODE: 1CLLROMP150

Sub-assembly part numbers

BSP, aluminium

1/2" AXP24058-4W-S



Tightening torque of "F" adjuster
locknut - 20 to 25 Nm

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CLLROMP150 F 4W 35 S BK

Basic Code
1CLLROMP150 = Cartridge and Body

Adjustment Means
F = Screw Adjustment

Port Sizes - Bodied Valves Only
4W = 1/2" BSP 8T = 1/2" SAE

Adjustable Pressure Range
35 = 114-350 bar. Std setting 280 bar*
Std setting made at 14 litres/min
* Cartridges must not be adjusted above the safe working pressure of the motor

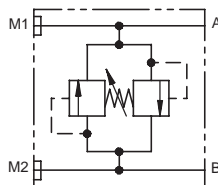
Mounting
BK = Bolt Kit

Seals
S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)



MOTOR MOUNTED VALVE OMS MOUNTING PATTERN CROSS LINE RELIEF VALVE

1CLLROMS150



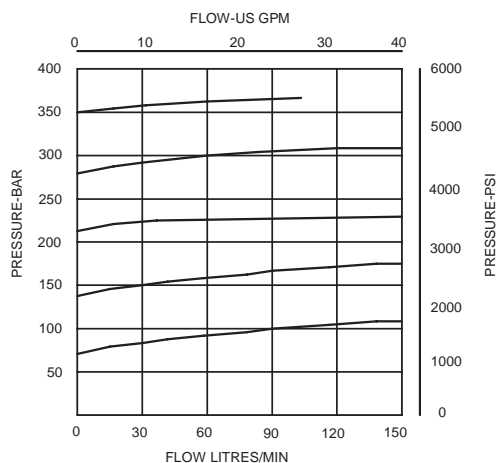
APPLICATION

To protect both lines in a circuit from over pressurisation by relieving oil to the other line. Ideal for use with motors or directional valves as a safety relief. Differential area, fast acting, poppet valve.

OPERATION

Pressure acts over one of two differential areas forcing the poppet back allowing relief flow to the other port. This being a single cartridge is ideal for mounting on to the motor in a special housing.

PRESSURE DROP



FEATURES

Single cartridge relieving in both directions cutting down space requirements, giving full adjustment through its range on both pressures at the same time.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	150 litres/min (40 US GPM)
Max Setting	350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External steel surfaces black oxide
Body Material	Standard aluminium (up to 210 bar*) Add Suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A878 (See Section 17)
Torque Cartridge into Cavity	60 Nm (44 lbs ft)
Weight	0.99 kg (2.18 lbs)
Seal Kit Number	SK1280 (Nitrile) SK1280V (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	5 millilitres/min
Nominal Viscosity Range	5 to 500 cSt

*For applications above 210 bar please consult our technical department or use the steel body option.

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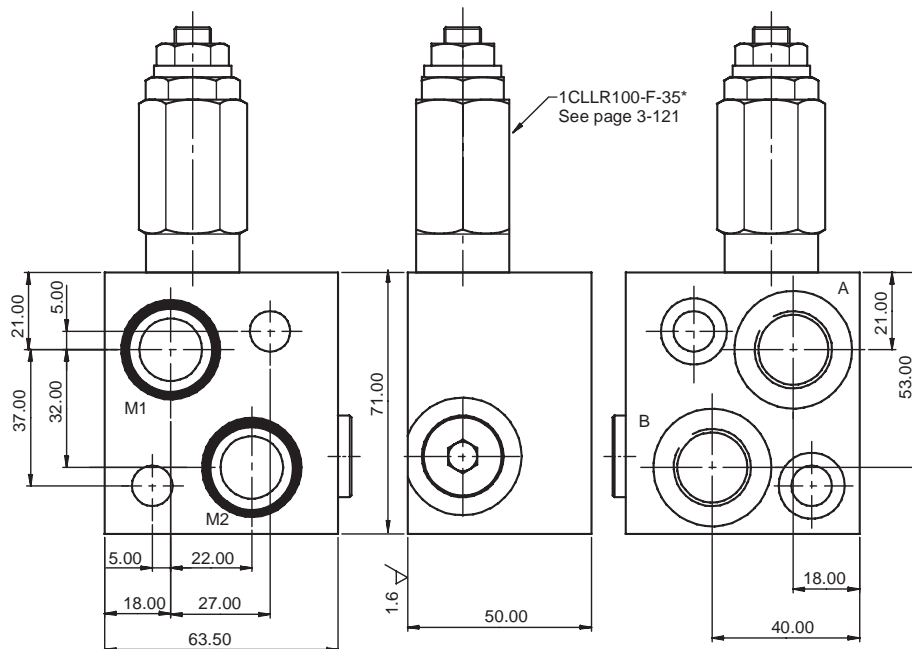
COMPLETE VALVE 1/2" PORTS

BASIC CODE: 1CLLR0MS150

Sub-assembly part numbers

BSP, aluminium

1/2" AXP24059-4W-S



Tightening torque of "F" adjuster
locknut - 20 to 25 Nm

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CLLR0MS150 F 4W 35 S BK

Basic Code
1CLLR0MS150 = Cartridge and Body

Adjustment Means
F = Screw Adjustment

Port Sizes - Bodied Valves Only
4W = 1/2" BSP 8T = 1/2" SAE

Adjustable Pressure Range
35 = 114-350 bar. Std setting 280 bar*
Std setting made at 14 litres/min
* Cartridges must not be adjusted above the safe working pressure of the motor

Mounting
BK = Bolt Kit

Seals
S = Nitrile (For use with most industrial hydraulic oils)
SV = Viton (For high temperature and most special fluid applications)

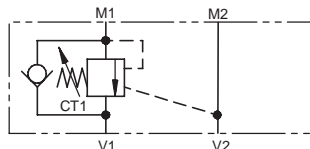


MOTOR MOUNTED VALVES

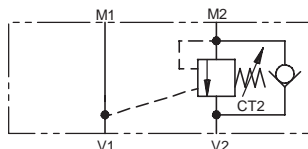
OMP MOUNTING PATTERN

SINGLE AND DUAL OVERCENTRE VALVE

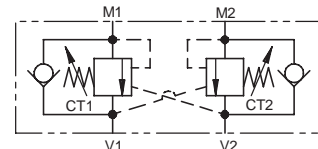
1CEOMP35/1CEEOMP35



1CEOMP35-1



1CEOMP35-2



1CEEOMP35

APPLICATION

Overcentre valves give static and dynamic control of loads by regulating the flow into and out of hydraulic actuators. When installed close to or within an actuator, the overcentre valve will stop runaway in the event of hose burst and if open centre directional control valves are used, will allow thermal expansion relief of the hydraulic fluid.

The overcentre cartridge is ideal for mounting directly into a cavity machined in the body of the cylinder, motor or rotary actuator. The cartridge can also be mounted directly to the ports via a specifically machined body as part of a Hydraulic Integrated Circuit or single unit, or contained within one of our standard line bodies.

Single overcentre valves are normally used when the load is unidirectional, for example an aerial platform or crane and dual overcentre valves are used for controlling loads in both directional for motor applications or for cylinders going over centre.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time. Directly interchangeable with 30 litres/min pilot check valve. See catalogue page 7-151.

PILOT RATIOS

- 2.5:1 Best suited for extremely unstable applications such as long booms or flexible frameworks.
- 5:1 (Standard) Best suited for applications where load varies and machine structure can induce instability
- 10:1 Best suited for applications where the load remains relatively constant.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	30 litres/min (8 US GPM)
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option
Mounting Position	Unrestricted
Cavity Number	A6610 (See Section 17)
Torque Cartridge into Cavity	45 Nm (33 lbs ft)
Weight	1CEOMP35 1.6 kg (3.52 lbs) 1CEEOMP35 1.66 kg (3.65 lbs)
Seal Kit Number	1CEOMP35 SK1285 SK1285V 1CEEOMP35 SK1284 SK1284V
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

* For applications above 210 bar please consult our technical department or use the steel body option.

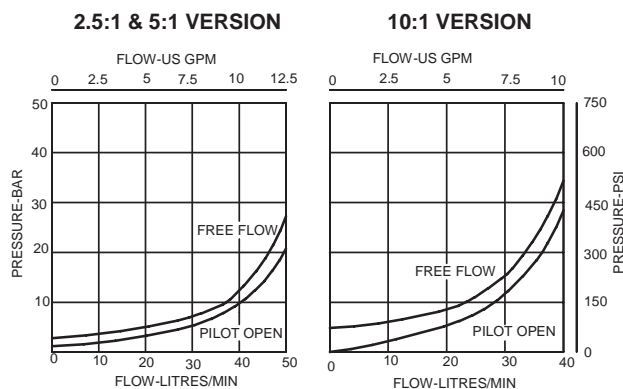
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PRESSURE DROP



COMPLETE VALVE 1/2" PORTS

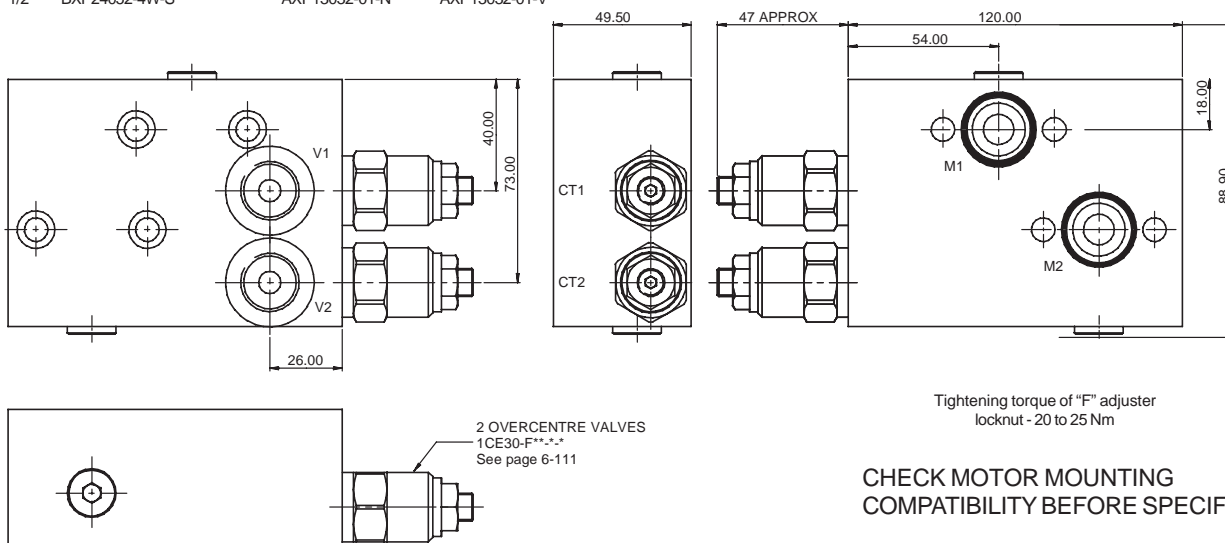
BASIC CODE: 1CEEOMP35

Sub-assembly part numbers

BSP, aluminium
1/2" BXP24052-4W-S

Cavity plug part number

Nitrile AXP13032-01-N
Viton AXP13032-01-V



CHECK MOTOR MOUNTING
COMPATIBILITY BEFORE SPECIFYING

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CE*OMP35* F 4W 35 S 5 BK

Basic Code

1CEEOMP35 = Cartridge and Body

1CEOMP35-1 = Single overcentre in line V1-M1

1CEOMP35-2 = Single overcentre in line V2-M2

Adjustment Means

F = Screw Adjustment

Port Sizes - Bodied Valves Only

4W = 1/2" BSP

Pressure Range

20 = (2.5:1 and 5:1): 70-210 bar. Std setting 100 bar
(10:1): 100-210 bar. Std setting 100 bar

35 = (2.5:1 and 5:1): 100-350 bar. Std setting 210 bar
(10:1): 120-350 bar. Std setting 210 bar

Std setting made at 4.8 litres/min

* Cartridges must not be adjusted above the safe working pressure of the motor

We reserve the right to change specifications without notice

Mounting

BK = Bolt Kit

Pilot Ratio

2 = 2.5:1

5 = 5:1

10 = 10:1

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

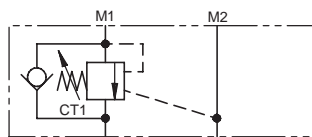


MOTOR MOUNTED VALVES

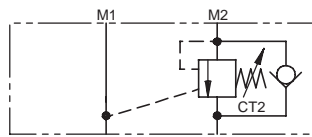
OMS MOUNTING PATTERN

SINGLE & DUAL OVERCENTRE VALVES

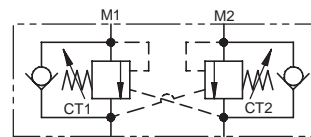
1CEOMS95/1CEEOMS95



1CEOMS95-1



1CEOMS95-2



1CEEOMS95

APPLICATION

Overcentre valves give static and dynamic control of loads by regulating the flow into and out of hydraulic actuators. When installed close to or within an actuator, the overcentre valve will stop runaway in the event of hose burst and if open centre directional control valves are used, will allow thermal expansion relief of the hydraulic fluid.

The overcentre cartridge is ideal for mounting directly into a cavity machined in the body of the cylinder, motor or rotary actuator. The cartridge can also be mounted directly to the ports via a specifically machined body as part of a Hydraulic Integrated Circuit or single unit, or contained within one of our standard line bodies.

Single overcentre valves are normally used when the load is unidirectional, for example an aerial platform or crane and dual overcentre valves are used for controlling loads in both directions for motor applications or for cylinders going over centre.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time.

PILOT RATIOS

- 4:1 Best suited for applications where the load varies and machine structure can induce instability.
- 8:1 Best suited for applications where the load remains relatively constant.
- Other ratios available upon request.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	90 litres/min (23 US GPM)		
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)		
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated		
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option		
Mounting Position	Unrestricted		
Cavity Number	A12336 (See Section 17)		
Torque Cartridge into Cavity	60 Nm (44 lbs ft)		
Weight	1CEOMS95	2.16 kg (4.75 lbs)	
	1CEEOMS95	2.26 kg (4.97 lbs)	
Seal Kit Number	1CEOMS95	SK1282	SK1282V
	1CEEOMS95	SK795	SK795V
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)		
Operating Temp	-20°C to +90°C		
Leakage	0.3 millilitres/min nominal (5 dpm)		
Nominal Viscosity Range	5 to 500 cSt		

*For applications above 210 bar please consult our technical department or use the steel body option.

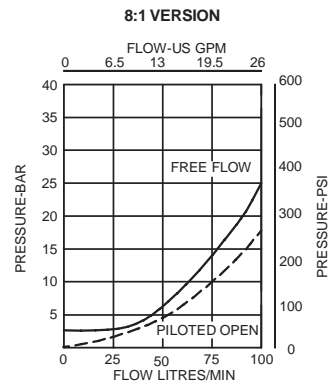
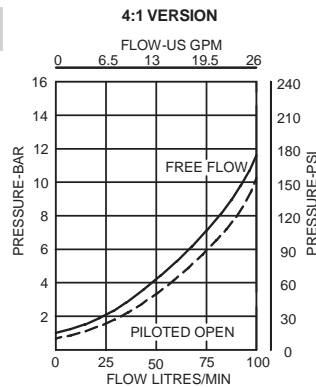
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PRESSURE DROP



COMPLETE VALVE

1/2" PORTS

BASIC CODE: 1CEEOMS95

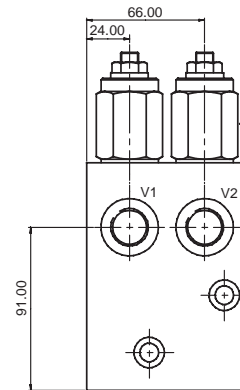
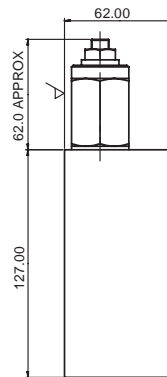
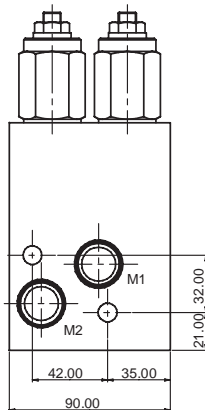
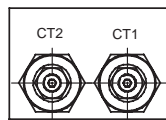
Sub-assembly part numbers

BSP, aluminium
1/2" BXP24055-4W-S

Cavity plug part numbers

Nitrile
AXP14434-02-N

Viton
AXP14434-02-V



2 OVERCENTRE
VALVES
1CE90-F***-**
See page 6-151

Tightening torque of "F" adjuster
locknut - 20 to 25 Nm

CHECK MOTOR MOUNTING COMPATIBILITY BEFORE SPECIFYING

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CE*OMS95-* F 4W 35 S 4 BK

Basic Code

1CEEOMS95 = Cartridge and Body
1CEEOMS95-1 = Single overcentre in line V1 - M1
1CEEOMS95-2 = Single overcentre in line V2 - M2

Adjustment Means

F = Screw Adjustment

Port Sizes - Bodied Valves Only

4W = 1/2" BSP

Adjustable Pressure Range

20 = 70-225 bar. Std setting 100 bar

35 = 200-350 bar. Std setting 210 bar

Std setting made at 4.8 litres/min

* Cartridges must not be adjusted above the safe working pressure of the motor

Mounting

BK = Bolt Kit

Pilot Ratio

4 = 4:1

8 = 8:1

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

We reserve the right to change specifications without notice

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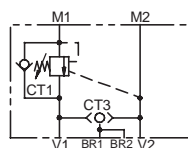


MOTOR MOUNTED VALVES

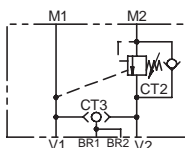
OMP MOUNTING PATTERN

SINGLE AND DUAL OVERCENTRE VALVE WITH BRAKE RELEASE SHUTTLE

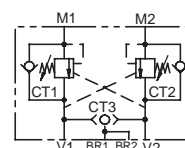
1CEESHOMP35



1CESHOMP35-1



1CESHOMP35-2



1CEESHOMP35

APPLICATION

Overcentre valves give static and dynamic control of loads by regulating the flow into and out of hydraulic actuators. When installed close to or within an actuator, the overcentre valve will stop runaway in the event of hose burst and if open centre directional control valves are used, will allow thermal expansion relief of the hydraulic fluid.

The overcentre cartridge is ideal for mounting directly into a cavity machined in the body of the cylinder, motor or rotary actuator. The cartridge can also be mounted directly to the ports via a specifically machined body as part of a Hydraulic Integrated Circuit or single unit, or contained within one of our standard line bodies.

Single overcentre valves are normally used when the load is unidirectional, for example an aerial platform or crane and dual overcentre valves are used for controlling loads in both directional for motor applications or for cylinders going over centre.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time. Directly interchangeable with 30 litres/min pilot check valve. See catalogue page 7-151.

PILOT RATIOS

- 2.5:1 Best suited for extremely unstable applications such as long booms or flexible frameworks.
- 5:1 (Standard) Best suited for applications where load varies and machine structure can induce instability
- 10:1 Best suited for applications where the load remains relatively constant.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

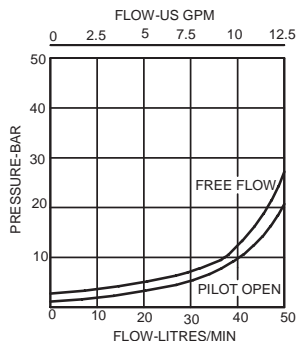
Rated Flow	30 litres/min (8 US GPM)	
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)	
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated	
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option	
Mounting Position	Unrestricted	
Cavity Number	A6610 (See Section 17)	
Torque Cartridge into Cavity	45 Nm (33 lbs ft)	
Weight	1CESHOMP35	2.29 kg (5.04lbs)
	1CEESHOMP35	2.34 kg (5.15 lbs)
Seal Kit Number	1CESHOMP35	SK1285 SK1285V
	1CEESHOMP35	SK1284 SK1284V
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)	
Operating Temp	-20°C to +90°C	
Leakage	0.3 millilitres/min nominal (5 dpm)	
Nominal Viscosity Range	5 to 500 cSt	

* For applications above 210 bar please consult our technical department or use the steel body option.

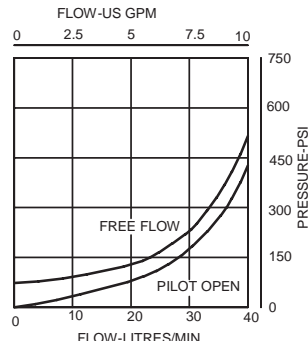
PRESSURE DROP

1ce30

2.5:1 & 5:1 VERSION



10:1 VERSION



COMPLETE VALVE 1/2" PORTS

BASIC CODE: 1CEESHOMP35

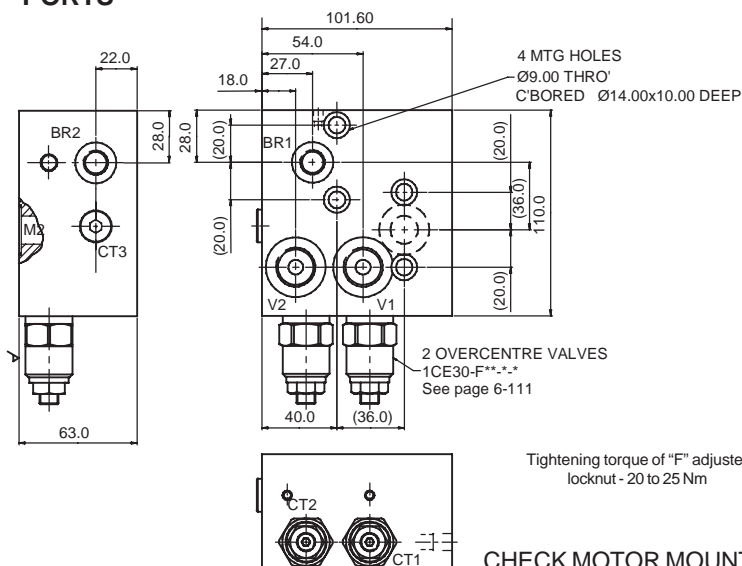
Sub-assembly part numbers

BSP, aluminium
1/2" BXP24053-4W-S

Cavity plug part numbers

Nitrile
AXP13032-01-N

Viton
AXP13032-01-V



CHECK MOTOR MOUNTING
COMPATIBILITY BEFORE SPECIFYING

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CE*SHOMP35-* F 4W 35 S 5 BK

Basic Code

1CEEOMP35 = Cartridge and Body
1CESHOMP35-1 = Single overcentre in line V1 - M1
1CESHOMP35-2 = Single overcentre in line V2 - M2

Adjustment Means

F = Screw Adjustment

Port Sizes - Bodied Valves Only

4W = 1/2" BSP 1/4" BSP brake port

Adjustable Pressure Range

20 = (2.5:1 and 5:1): 70-210 bar. Std setting 100 bar
(10:1): 100-210 bar. Std setting 100 bar
35 = (2.5:1 and 5:1): 100-350 bar. Std setting 210 bar
(10:1): 120-350 bar. Std setting 210 bar

Std setting made at 4.8 litres/min

Other pressure ranges available on request

* Cartridges must not be adjusted above the safe working pressure of the motor

Mounting

BK = Bolt Kit

Pilot Ratio

2 = 2.5:1

5 = 5:1

10 = 10:1

Seals

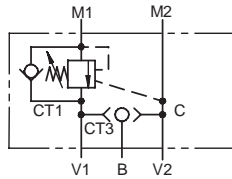
S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

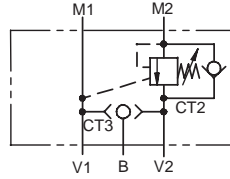


MOTOR MOUNTED VALVES OMS MOUNTING PATTERN SINGLE AND DUAL OVERCENTRE VALVE WITH BRAKE RELEASE SHUTTLE

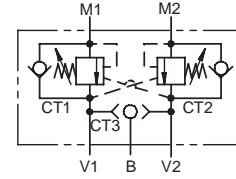
1CESHOMS/1CEESHOMS



1CESHOMS95-1



1CESHOMS95-2



1CEESHOMS95

APPLICATION

Overcentre valves give static and dynamic control of loads by regulating the flow into and out of hydraulic actuators. When installed close to or within an actuator, the overcentre valve will stop runaway in the event of hose burst and if open centre directional control valves are used, will allow thermal expansion relief of the hydraulic fluid.

The overcentre cartridge is ideal for mounting directly into a cavity machined in the body of the cylinder, motor or rotary actuator. The cartridge can also be mounted directly to the ports via a specifically machined body as part of a Hydraulic Integrated Circuit or single unit, or contained within one of our standard line bodies.

Single overcentre valves are normally used when the load is unidirectional, for example an aerial platform or crane and dual overcentre valves are used for controlling loads in both directions for motor applications or for cylinders going over centre.

OPERATION

The check section allows free flow into the actuator then holds and locks the load against movement. The pilot assisted relief valve section will give controlled movement when pilot pressure is applied. The relief section is normally set to open at a pressure at least 1.3 times the maximum load induced pressure but the pressure required to open the valve and allow movement depends on the pilot ratio of the valve. For optimisation of load control and energy usage, a choice of pilot ratios is available.

The pressure required to open the valve and start actuator movement can be calculated as follows:

$$\text{Pilot Pressure} = \frac{(\text{Relief Setting}) - (\text{Load Pressure})}{\text{Pilot Ratio}}$$

FEATURES

Cartridge is economical and fits simple cavity. Allows quick, easy field service - reduces down time.

PILOT RATIOS

4:1 Best suited for applications where the load varies and machine structure can induce instability.

8:1 Best suited for applications where the load remains relatively constant.

Other ratios available upon request.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Rated Flow	90 litres/min (23 US GPM)		
Max Setting	Max Load Induced Pressure: 270 bar (4000 psi) Relief Setting: 350 bar (5000 psi)		
Cartridge Material	Working parts hardened and ground steel. External surfaces zinc plated		
Body Material	Standard aluminium (up to 210 bar*) Add suffix '377' for steel option		
Mounting Position	Unrestricted		
Cavity Number	A12336 (See Section 17)		
Torque Cartridge into Cavity	60 Nm (44 lbs ft)		
Weight	1CESHOMS95	2.32kg (5.10 lbs)	
	1CEESHOMS95	2.42 kg (5.32lbs)	
Seal Kit Number	1CESHOMS95	SK1282	SK1282V
	1CEESHOMS95	SK795	SK795V
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)		
Operating Temp	-20°C to +90°C		
Leakage	0.3 millilitres/min nominal (5 dpm)		
Nominal Viscosity Range	5 to 500 cSt		

*For applications above 210 bar please consult our technical department or use the steel body option.

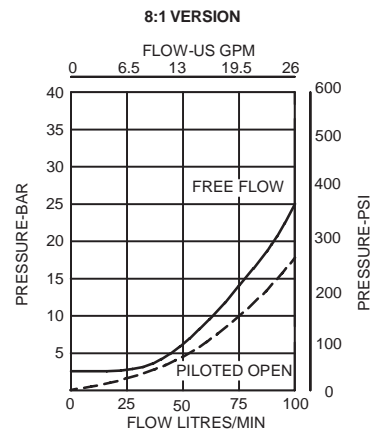
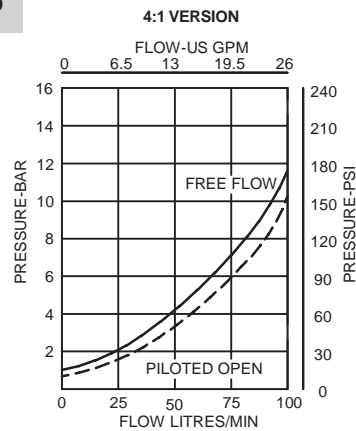
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PRESSURE DROP



COMPLETE VALVE 1/2" PORTS

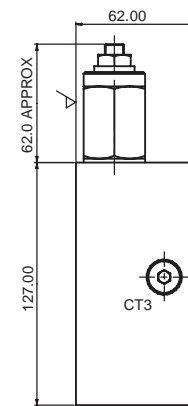
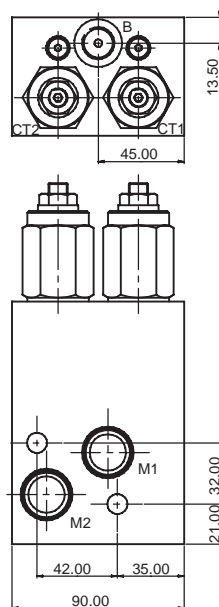
BASIC CODE: 1CEESHOMS95

Sub-assembly part numbers

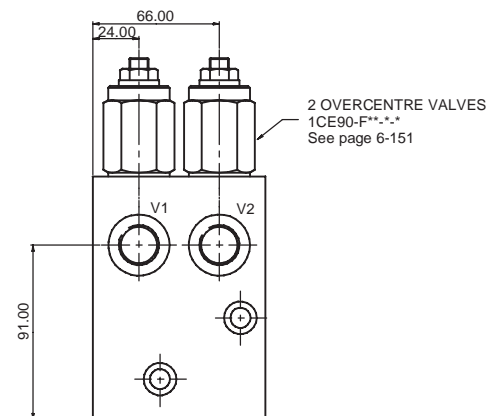
BSP, aluminium
1/2" BXP24056-4W-S

Cavity plug part numbers

Nitrile
AXP14434-02-N
Viton
AXP14434-02-V



Tightening torque of "F" adjuster
locknut - 20 to 25 Nm



2 OVERCENTRE VALVES
1CE90-F***-***
See page 6-151

**CHECK MOTOR MOUNTING
COMPATIBILITY BEFORE SPECIFYING**

Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

1CE*SHOMS95-* F 4W 35 S 4 BK

Basic Code

1CEESHOMS95 = Cartridge and Body

1CESHOMS95-1 = Single overcentre in line V1 - M1

1CESHOMS95-2 = Single overcentre in line V2 - M2

Adjustment Means

F = Screw Adjustment

Port Sizes - Bodied Valves Only

4W = 1/2" BSP 3/8" BSP brake port

Pressure Range @ 4.8 l/min

20 = 70-225 bar. Std setting 100 bar

35 = 200-350 bar. Std setting 210 bar

Std setting made at 4.8 litres/min

Mounting

BK = Bolt Kit

Pilot Ratio

4 = 4:1

8 = 8:1

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

We reserve the right to change specifications without notice

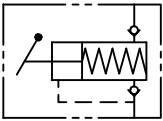
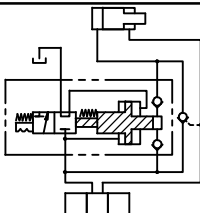
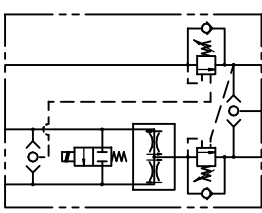
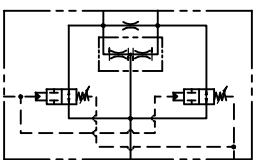
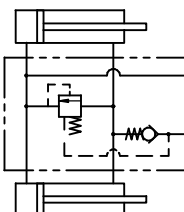
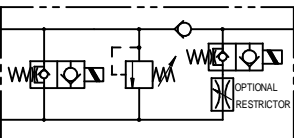


SECTION 16 - HYDRAULIC INTEGRATED CIRCUITS & SPECIAL PRODUCTS

CONTENTS

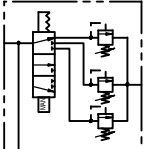
This section contains a range of application ideas. Port sizes up to 1" BSP are available, with flows up to 300 litres/min (80 US GPM).

SELECTION

CIRCUIT	SERIES	APPLICATION	RANGE	PAGE
	1HP7 Hand pump	This hand pump has been designed for use on machines which require emergency lowering, or for pilot supply on access platforms and lubrication circuits	50 bar (725 psi) generated pressure 1.3 cc (1.3 ml) per stroke displacement	16-111
	1T16 Pressure intensifier	This valve converts low input pressure from a small low pressure pump or sub-circuit to high pressure up to 700 bar. This valve eliminates the need for a high pressure pump or high-low type circuit.	700 bar (10,000 psi)	16-121
	1TR Transmission valve	This valve is designed to keep traction on wheels even when one is free to spin. This valve also gives runaway protection and brake release	350 bar (5000 psi) 100 litres/min (26 US GPM)	*
 TYPICAL CIRCUIT	2DF Difflock valve	For use in transmission circuits with low pressure pilot to bypass, keeping running pressure drop down to a minimum.	350 bar (5000 psi) 220 litres/min (57 US GPM)	*
	1RG Regenerative valve	This valve uses the exhaust flow from the annular side of the cylinder to increase the speed of the actuator by feeding the oil into the full bore	250 bar (3600 psi) 250 litres/min (65 US GPM)	*
	1SL Raise lower package	For simple single acting lifts such as hydraulic platforms or tail gate lifts on trucks	210 bar (3000 psi) 20 litres/min (5 US GPM)	*

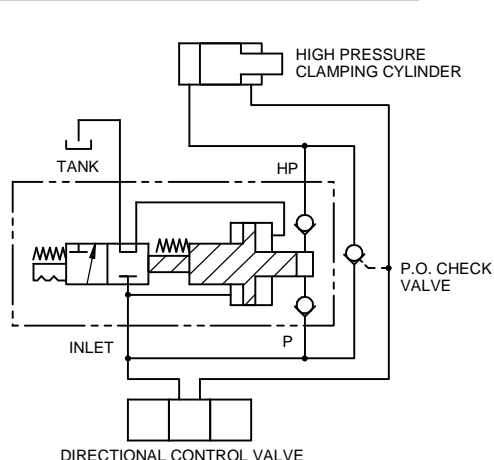
* Contact office for further details



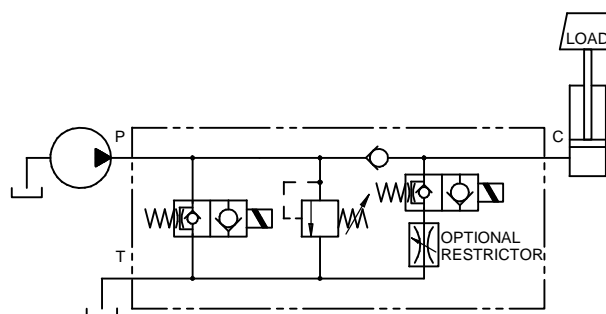
CIRCUIT	SERIES	APPLICATION	RANGE	PAGE
	1MAR Triple relief with diverter	For use in a system which requires three different relief valve settings. Commonly used in forklift truck clamp applications.	400 bar (5800 psi) 150 litres/min (40 US GPM)	*

* Contact office for further details

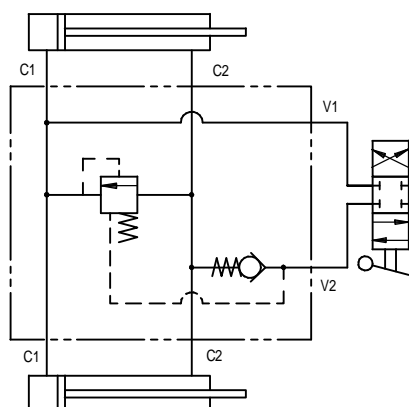
TYPICAL CIRCUIT EXAMPLES



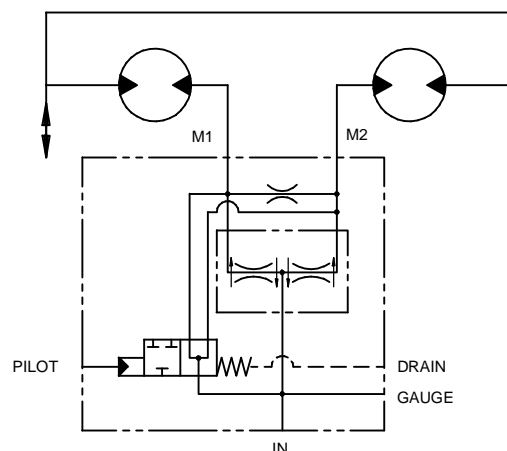
INTENSIFIER



LOAD LOWERING VALVE



REGENERATIVE CIRCUIT



DIFFLOCK CIRCUIT

NOTES

These valves are typical of Hydraulic Integrated Circuits, giving full control in one manifold. This saves space, improves performance and cuts costs. Many other semi-standard packages are available on request.

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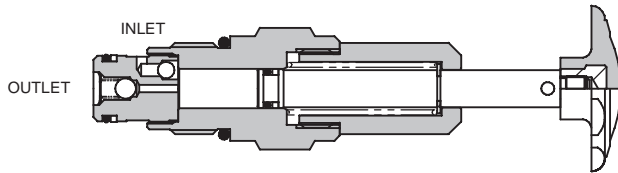
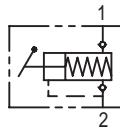
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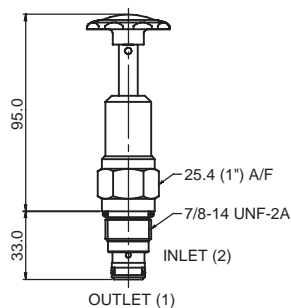
1HP SERIES HAND PUMP

1HP7



CARTRIDGE ONLY

BASIC CODE: 1HP7



COMPLETE VALVE 3/8" PORTS

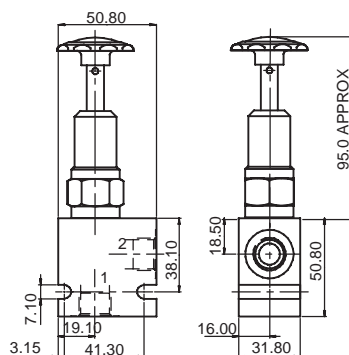
BASIC CODE: 1HP75

Body ONLY part numbers

BSP, aluminium
3/8" B19053

SAE, aluminium

1/2" B19402



APPLICATION

The 1HP7 hand pump has been designed to be used on machines which require emergency release of brakes or for pilot supply for emergency lowering of access platforms. It can also be utilised in the lubrication circuits.

OPERATION

Depressing the plunger will force oil out through a check valve and into the system. The plunger will then retract drawing oil into the chamber through a second check valve.

FEATURES

- Built in pressure and suction checks.
- Self contained cartridge element.
- Low leakage ball and seat design.
- Minimal effort required for plunger movement.

SPECIFICATIONS

Figures based on: Oil Temp = 40°C Viscosity = 40 cSt

Bore Diameter	9.5 mm (0.375")
Stroke	19 mm (0.75")
Displacement	1.3 cc (1.3 ml)
Generated Pressure	50 bar (725 psi)
Cartridge Material	Working parts hardened & ground steel
Body Material	Zinc plated steel & anodised aluminium
Cavity Number	A12370 (See Section 17)
Torque Cartridge into Cavity	40 Nm (30 lbs ft)
Weight	0.16 kg (0.35 lbs)
Seal Kit Number	SK1224 (Nitrile) SK1224 (Viton)
Recommended Filtration Level	BS5540/4 Class 18/13 (25 micron nominal)
Operating Temp	-20°C to +90°C
Leakage	0.3 millilitres/min nominal (5 dpm)
Nominal Viscosity Range	5 to 500 cSt

ORDERING CODE EXAMPLE

16

Basic Code

1HP7 = Cartridge Only
1HP75 = Cartridge and Body

Port Sizes - Bodied Valves Only

3W = 3/8" BSP 8T = 1/2" SAE

1HP7

3W

S

Seals

S = Nitrile (For use with most industrial hydraulic oils)

SV = Viton (For high temperature and most special fluid applications)

We reserve the right to change specifications without notice

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1T16 PRESSURE INTENSIFIER

APPLICATION

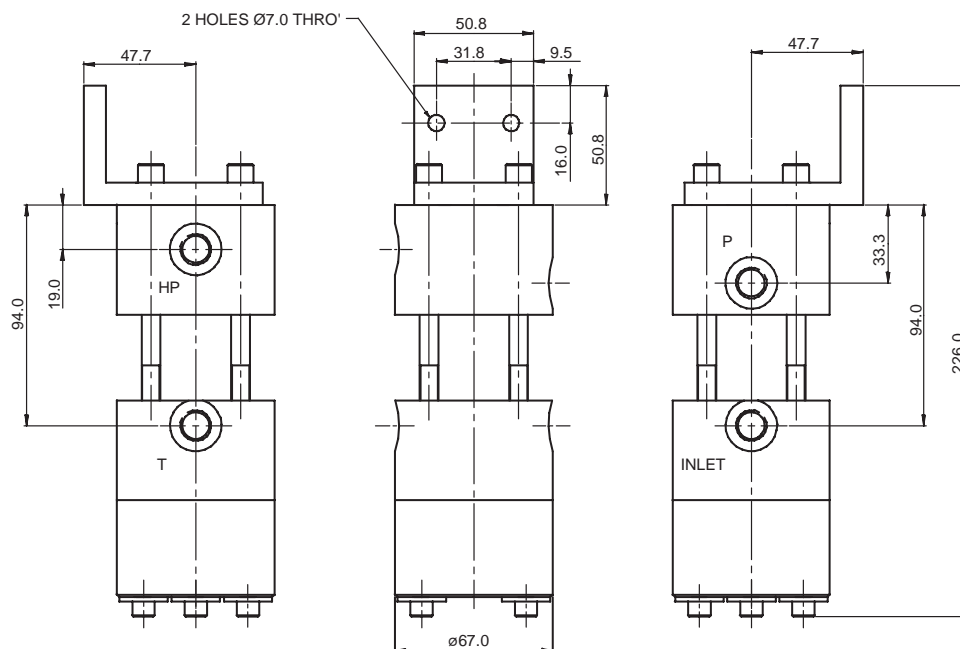
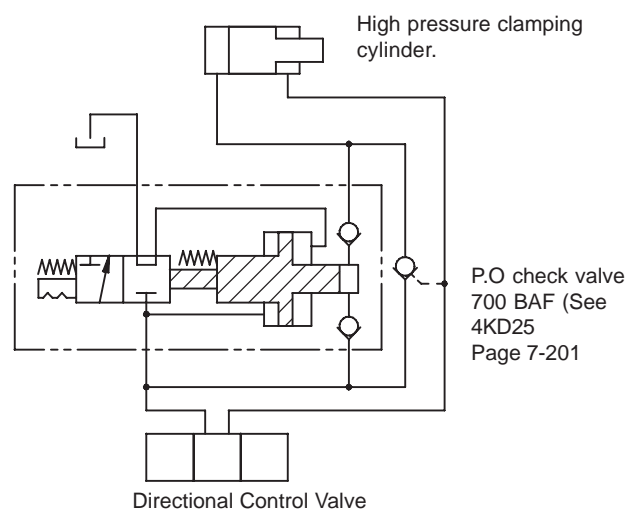
This valve is used to convert low input pressure from a small low pressure pump or sub-circuit to high pressure up to 700 bar (10000 psi) and can eliminate the need for high pressure pump, or high-low type circuit. It is best suited for use with low horsepower, variable volume pumps. Contact main office for full specifications.

MAXIMUM PRESSURE

Inlet: 110 bar (1600 psi)
Output: 700 bar (10000 psi)

RATED FLOW

Inlet: 1.5 litres/min (0.4 US GPM) max
Output: 165 millilitres/min (10 in³/min)



Where measurements are critical request certified drawings

ORDERING CODE EXAMPLE

Basic Code	1T16	2W	6	S	Seals
1T16 = Intensifier					S = Nitrile (For use with most industrial hydraulic oils)
Port Sizes - Bodied Valves Only					SV = Viton (For high temperature and most special fluid applications)
2W = 1/4" BSP					Pressure Intensification Ratio
					6 = 6.5:1

We reserve the right to change specifications without notice

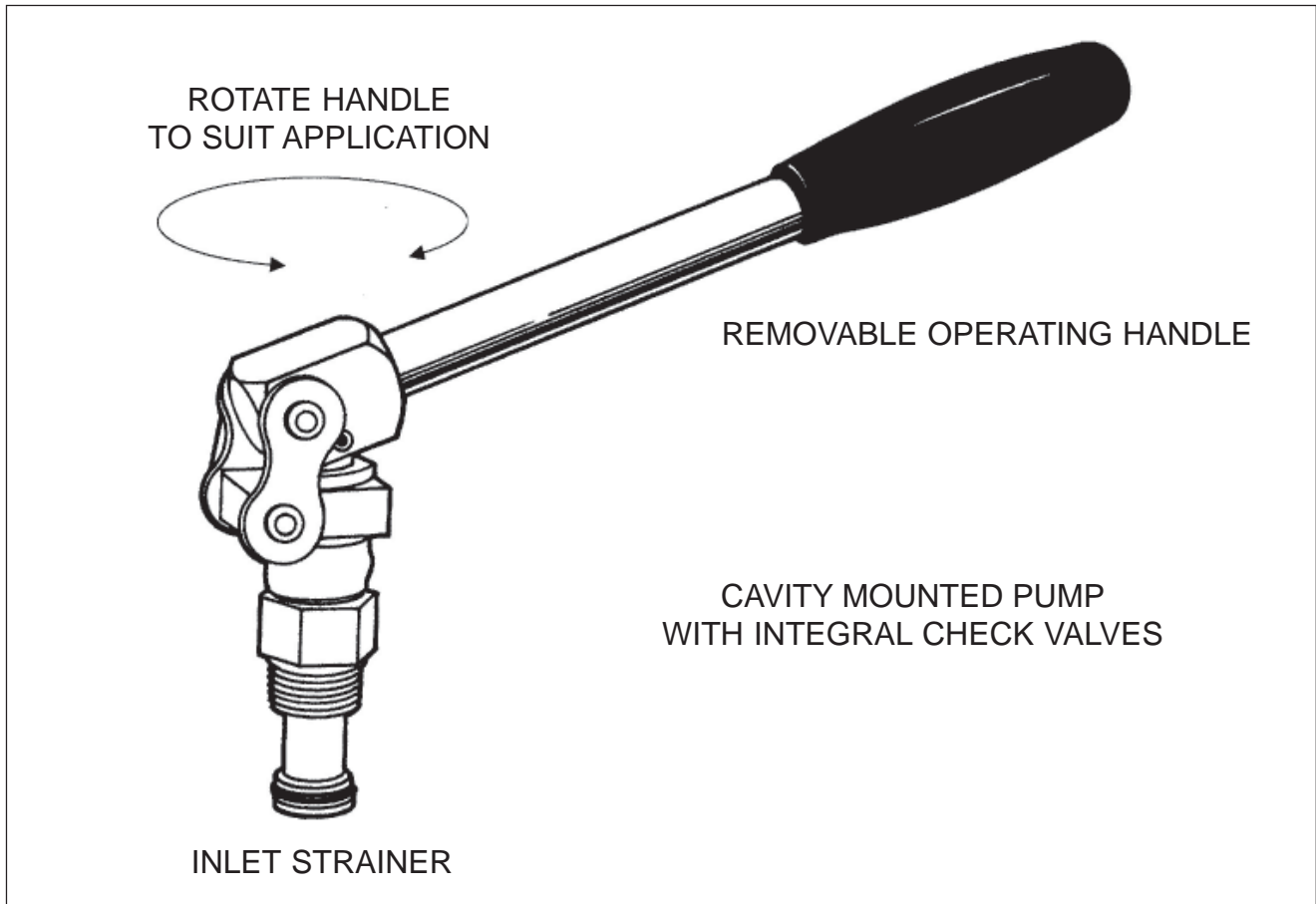
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CARTRIDGE TYPE CAVITY MOUNTED HYDRAULIC HAND OPERATED PUMP



FEATURES

- ◆ novel cartridge hand operated hydraulic pump
- ◆ single acting operation on down stroke
- ◆ eliminates the need for connecting pipe work
- ◆ built in strainer on pump inlet
- ◆ manifold mounted in industry standard cavity
- ◆ steel construction with hard chrome piston
- ◆ handle rotates on body to suit user
- ◆ operating handle is easily removed for storage
- ◆ suitable for use with hydraulic mineral oil
- ◆ nitrile rubber seals; other options available
- ◆ fluid displacement 1.9 cc per stroke
- ◆ temperature (fluid and ambient) -20 to 80°C
- ◆ maximum working pressure 250 bar
- ◆ light weight - weighs 0.8 kg including handle

INSTALLATION & MAINTENANCE

APPLICATION

Suitable for any application requiring manual generation of hydraulic power, eg, emergency back up, operating hydraulic cylinders or actuators, hydrostatic testing, etc.

MOUNTING

Suitable for manifold mounting into Integrated Hydraulics' cavity type AXP878 (2 port, 7/8"-14 UNF thread). The pump body is screwed into the cavity; the handle mechanism rotates on the body to allow alignment as required for application.

Mounting orientation is universal.

Sealing is by nitrile rubber 'O' rings (standard material; other materials such as fluorocarbon or ethylene propylene are available to order).

Recommended tightening torque when fitting pump body into manifold: 45-50 Nm.

CONNECTIONS

Inlet in base; outlet in side, to suit specified cavity dimensions. As with any hand pump, the inlet line back to tank should be kept as short and unconstricted as possible for optimum performance.

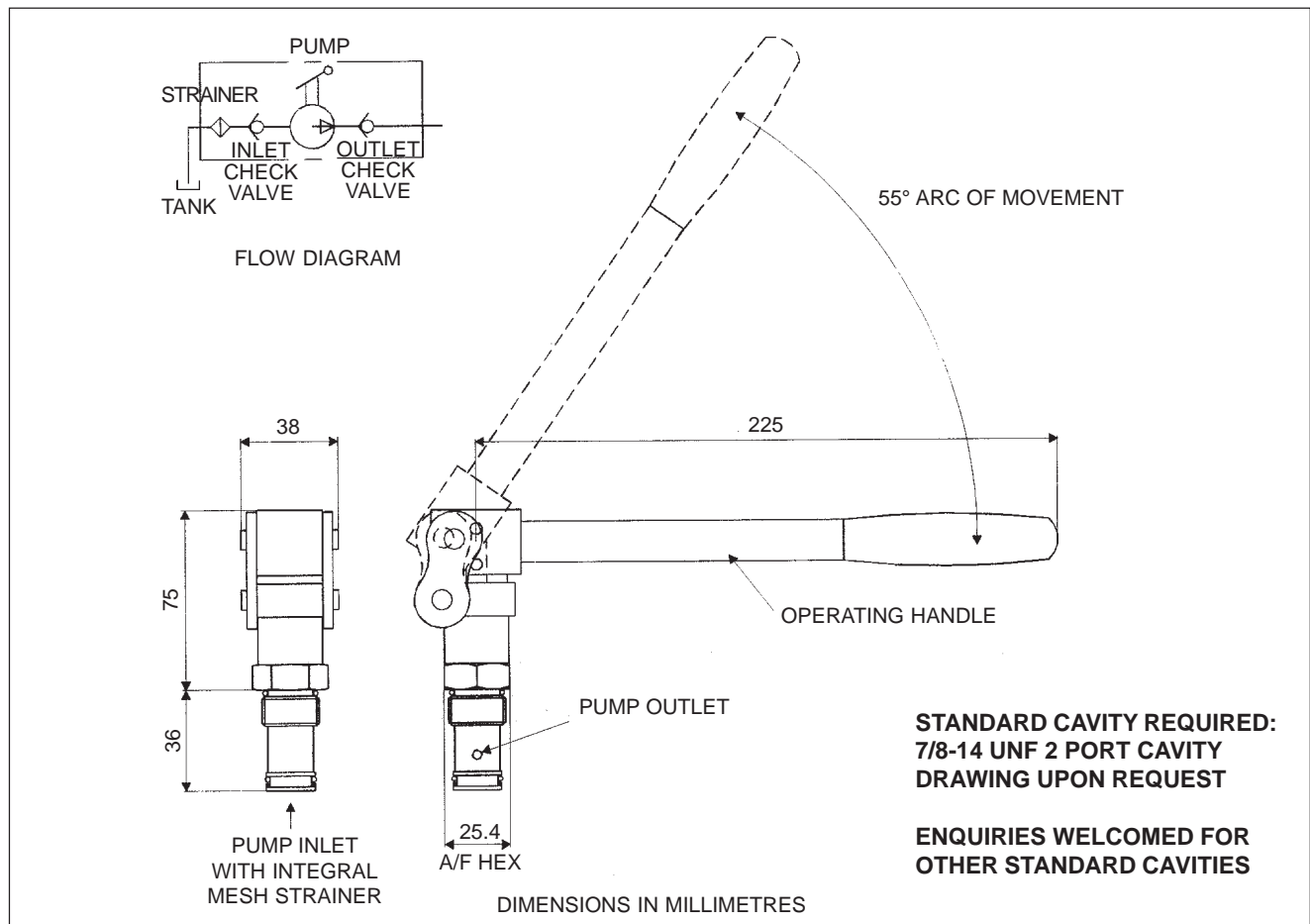
COMMISSIONING

The pump should be operated during installation to leak test and bleed the hydraulic circuit. Failure to do so will result in reduced pump displacement and a spongy action.

MAINTENANCE

The inlet strainer is easily accessible for cleaning on the base of the pump. Should it be necessary, inlet and outlet non return valves are also accessible for cleaning. Rubber seal components are easily replaceable using standard tools; service kits are available.

DIMENSIONS





CARTRIDGE CAVITIES

INDEX

VALVE	CAVITY	PAGE NUMBER
1CE120, 1CEB120, 4CK120, 5CK120	A877	17-111
1LR100, 1CLLR100	A878	17-111
1DR2, 1DR30, 3CA20, 3CA30, PDR21A	A879	17-111
1DS30, 1DS100, 1PS100, 1PSC100, 1UPS100, 1PA100	A880	17-111
1AR100, 1ARC100, 1UAR100, 1GR30, 1GR100	A881	17-131
1LR300	A1126	17-131
1PUL200	A3145	17-141
1VR100, 1UL60	A3146	17-141
S229	A3531	17-141
1RDS302, 1RDS303, 1SB304	A5302	17-161
1CE30, 1CER30, 1CEB30, 1CEL30, 1CPB30, 4CK30, 5CK30, 1PSC30	A6610	17-161
PFR2 4A	A6701	17-161
1CEBD120, 1CPBD120	A6726	17-161
1CE300, 1CEB300, 4CK300, 5CK300	A6935	17-171
	A6951	17-171
1PUL60	A12088	17-181
1CEBD90, 1CPBD90	A12196	17-181
1CE90, 1CEB90, 1CER90, 1CEL90, 1CPB90, 4CK(D)90	A12336	17-181
1HP7, 3CA50, 1CLLR50, 1DR50	A12370	17-181
1PD50	A12743	17-191
S570, S571, S572, S574, S577, 4CKKT50	A12744	17-191
1CEBD300, 1CPBD300	A13098	17-191
LE402	A13245	17-195
1VR200, 1PA200, 1PS200	A16102	17-195
1SH10	A16927	17-201
	A19787	17-201
1CE140, 1CER140, 1CEL140	A20081	17-201
1CPBD30	A20530	17-205
1HSH701, 1RDS702	A21145	17-205
	A21473	17-205
3CA200	A21616	17-205
LEV402	A21773	17-207
	A22232	17-207
1AR60, 1GR60, 2CR30, 2CFR30	CVA-20-01-0	17-211
1DS60, 1PS60, 1PA60	CVA-22-06-0	17-211

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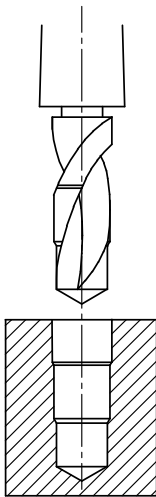
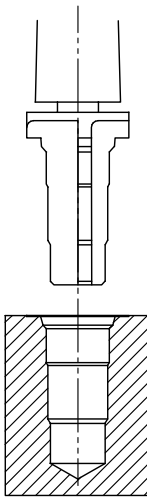
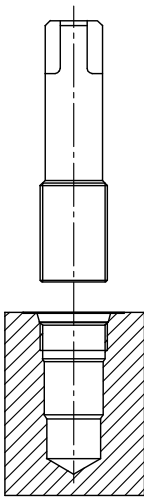
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Our cavities have been designed to achieve standardisation based on each thread size to reduce the amount of tooling required to cover the valve range. All new designs of cartridge are made to fit the ISO recommendations for standard cavities. The diagram below shows the sequence of tooling using tools specified in the following pages. Note: a pilot drill may be required before the form drill.

Great care must be taken to ensure that the tools are inserted along the same machining axis to maintain correct concentricities, hence bodies should not be moved between operations.

OPERATION 1	OPERATION 2	OPERATION 3
FORM DRILL	FORM REAMER	PLUG TAP
		

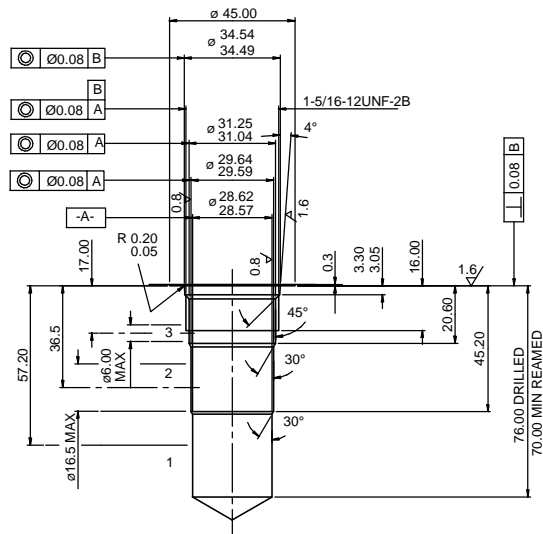


CARTRIDGE CAVITIES

CAVITY A877

CAVITY TOOLS

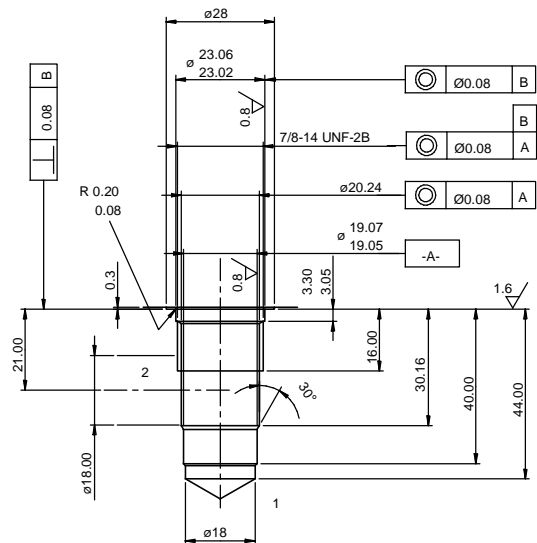
FORM DRILL A1161
FORM REAMER A1162
PLUG TAP 1 5/16-12 UNF



CAVITY A878

CAVITY TOOLS

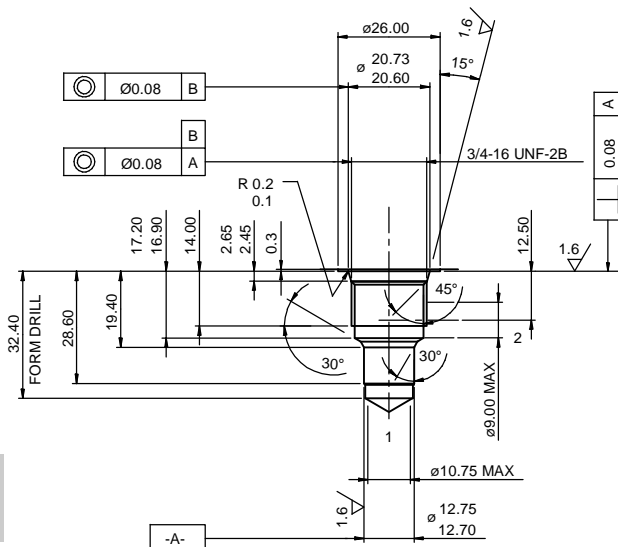
FORM DRILL A885
FORM REAMER A1173
PLUG TAP 7/8-14 UNF



CAVITY A879

CAVITY TOOLS

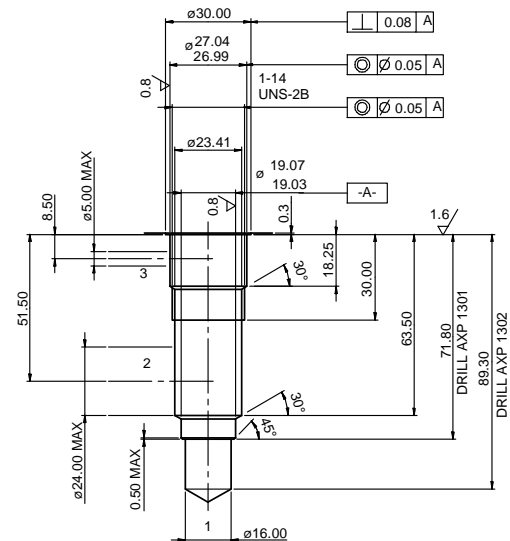
FORM DRILL A1040
FORM REAMER A1041
PLUG TAP 3/4-16 UNF



CAVITY A880

CAVITY TOOLS

FORM DRILL A1302
FORM REAMER A1303
PLUG TAP 1-14 UNS



NOTE: These cavity dimensions are for installation purposes only. Certified drawings available upon request.

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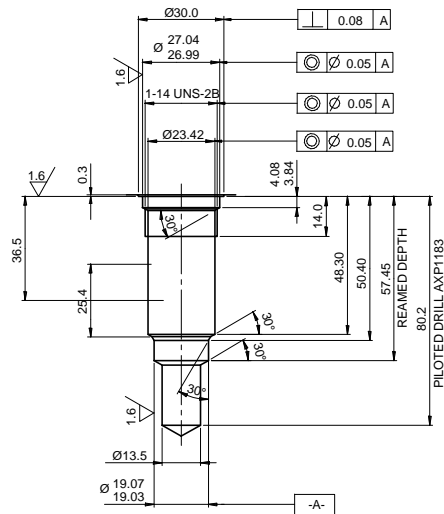


CARTRIDGE CAVITIES

CAVITY A881

CAVITY TOOLS

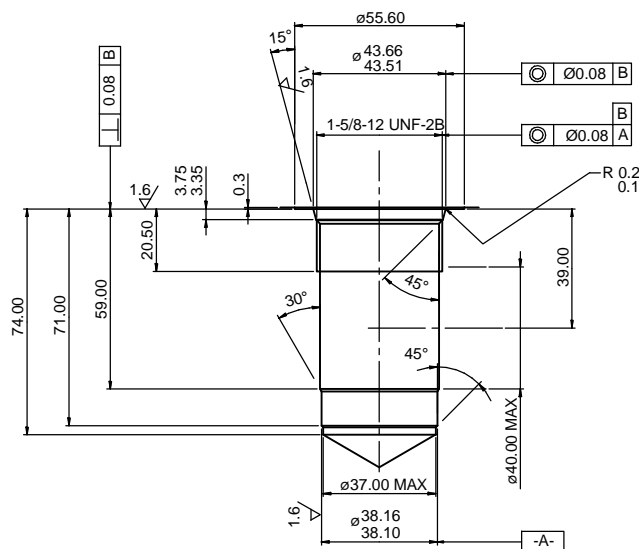
FORM DRILL A1183
FORM REAMER A1036
PLUG TAP 1-14 UNS



CAVITY A1126

CAVITY TOOLS

FORM DRILL AT422
FORM REAMER AT488
PLUG TAP 1 5/8-12 UNF



NOTE: These cavity dimensions are for installation purposes only. Certified drawings available upon request.

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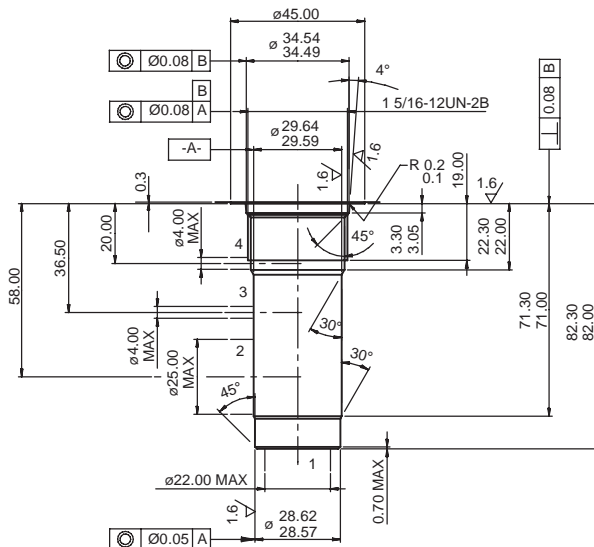
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CAVITY A3145

CAVITY TOOLS

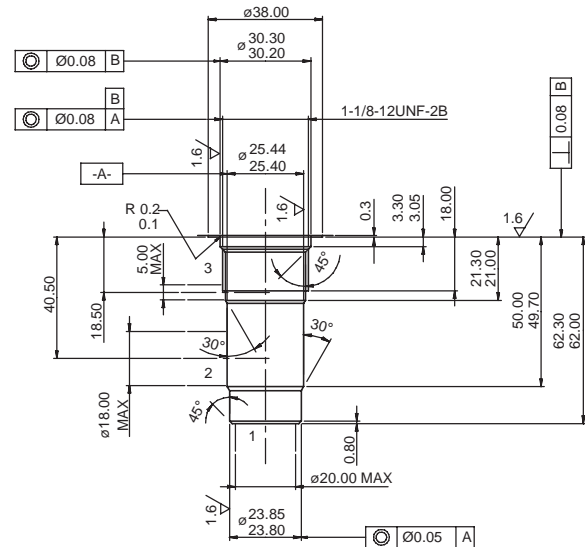
FORMDRILL A3226
FORMREAMER A3227
PLUG TAP 1 5/16-12 UN



CAVITY A3146

CAVITY TOOLS

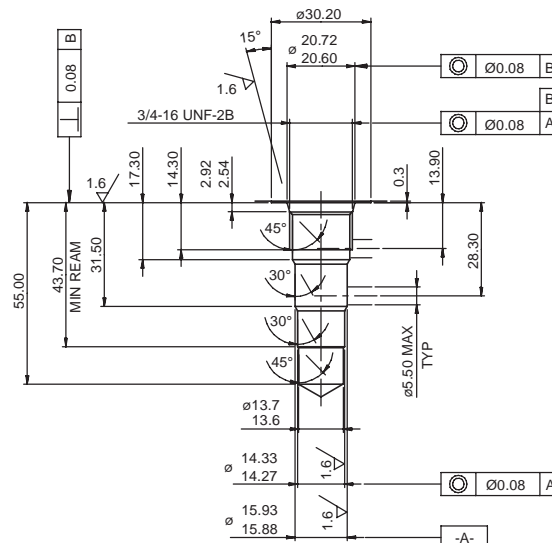
FORMDRILL A3315
FORMREAMER A3316
PLUG TAP 1 1/8-12 UNF



CAVITY A3531

CAVITY TOOLS

FORMDRILL A3538
FORMREAMER A3539
PLUG TAP 3/4-16 UNF



NOTE: These cavity dimensions are for installation purposes only. Certified drawings available upon request.

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Integrated Hydraulics Inc

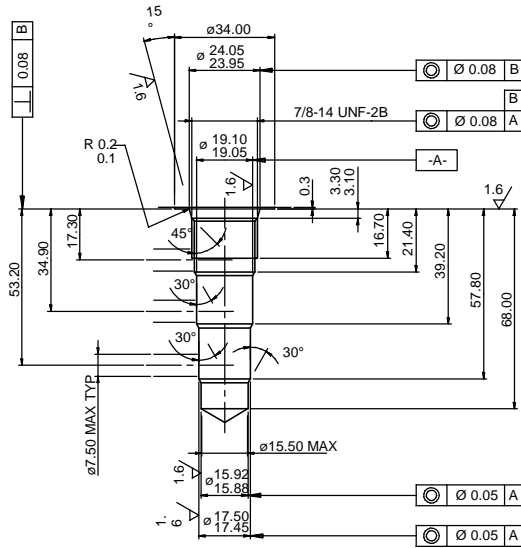
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CAVITY A5302

CAVITY TOOLS

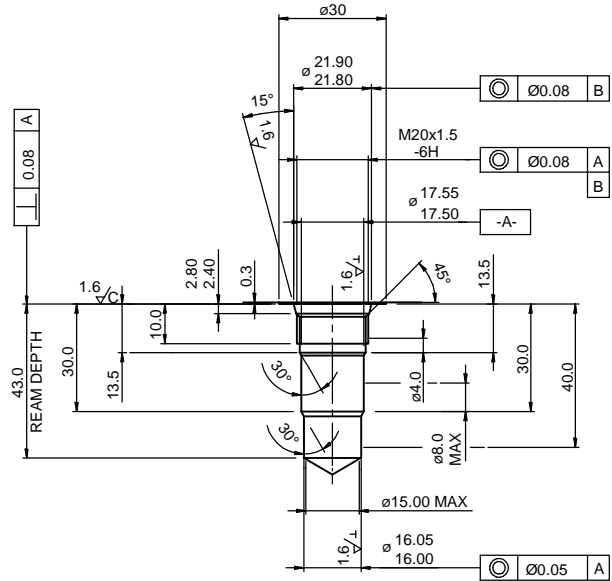
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FORM REAMER A5669
PLUG TAP 7/8-14 UNF



CAVITY A6610

CAVITY TOOLS

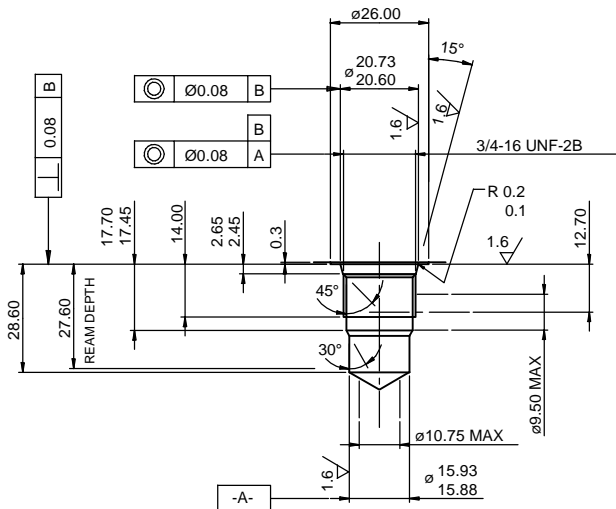
FORM DRILL AT447
FORM REAMER AT448
PLUG TAP M20 X 1.5



CAVITY A6701

CAVITY TOOLS

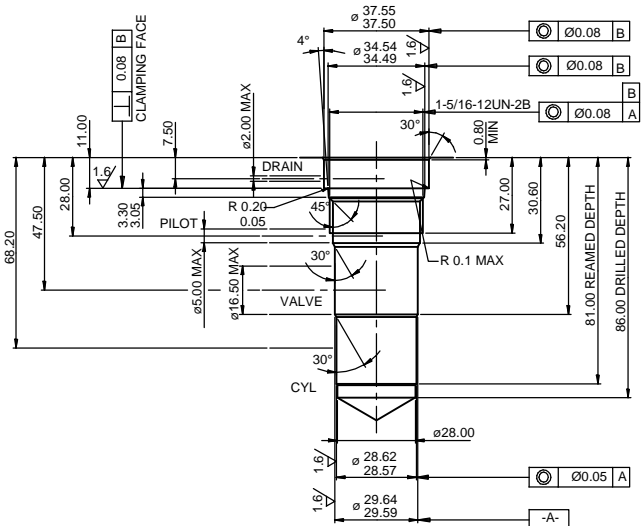
FORM DRILL AT482
FORM REAMER AT483
PLUG TAP 3/4-16 UNF



CAVITY A6726

CAVITY TOOLS

FORM DRILL A6933
FORM REAMER A6934
PLUG TAP 1 5/16-12 UNF



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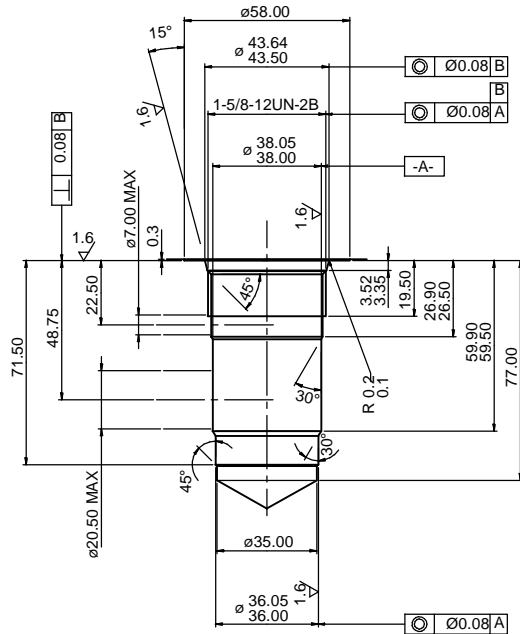
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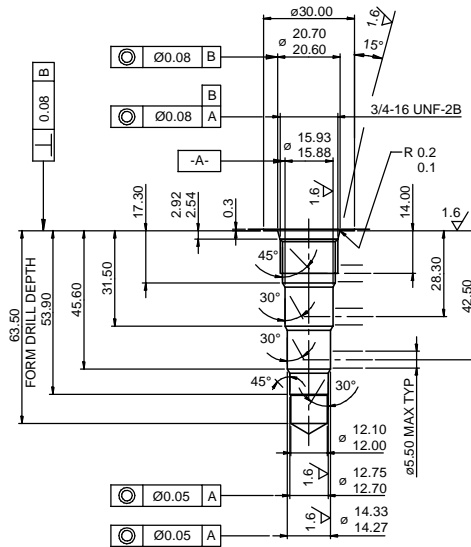
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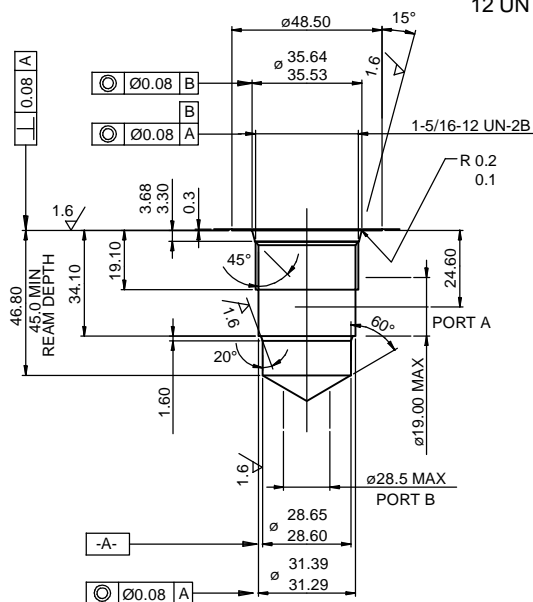
FORM DRILL	AT501
FORM REAMER	AT502
PLUG TAP	1 5/8-12 UN



FORM DRILL A7645
FORM REAMER A7646
PLUG TAP 3/4-16 UNF



FORM DRILL A8590
FORM REAMER A8591
PLUG TAP 1 5/16" -
15° 12 UN -2B



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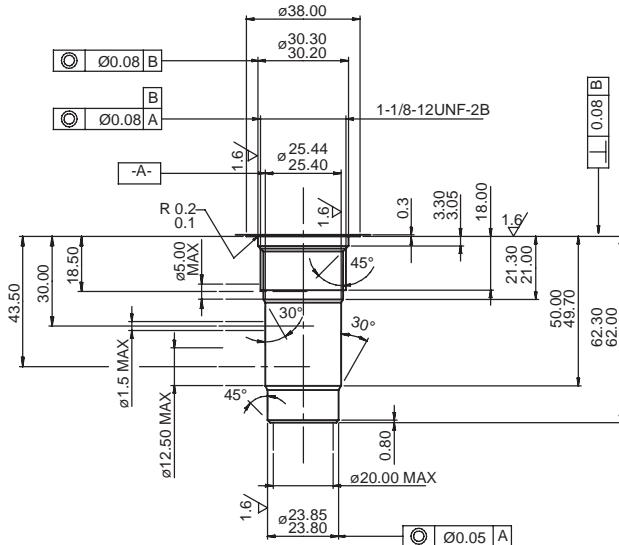
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CAVITY A12088

CAVITY TOOLS

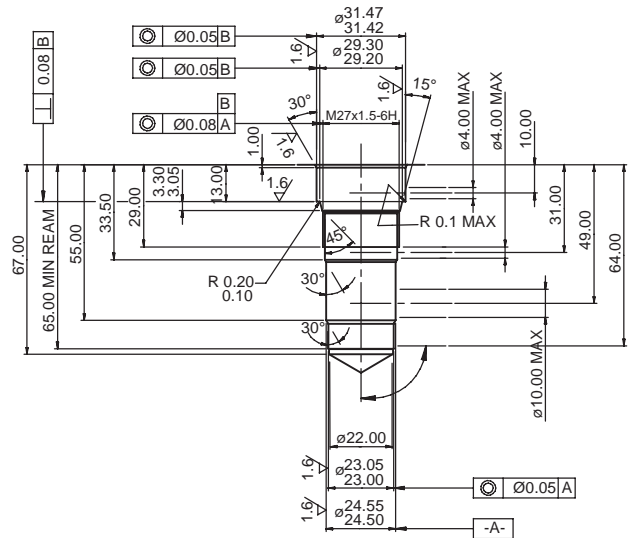
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FORM REAMER A3316
PLUG TAP 1 1/8-12 UNF



CAVITY A12196

CAVITY TOOLS

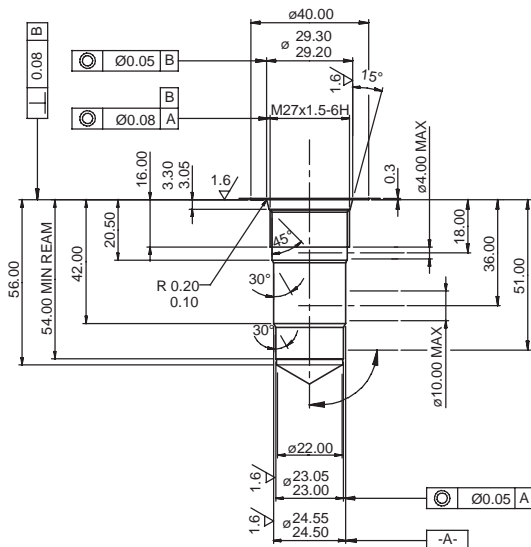
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FORM REAMER A12198
PLUG TAP M27 X 1.5



CAVITY A12336

CAVITY TOOLS

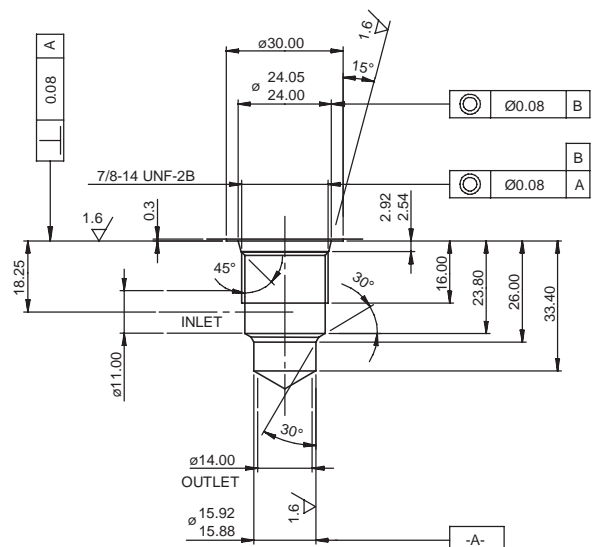
FORM DRILL A12337
FORM REAMER A12338
PLUG TAP M27 X 1.5



CAVITY A12370

CAVITY TOOLS

FORM DRILL A12439
FORM REAMER A12440
PLUG TAP 7/8-14 UNF



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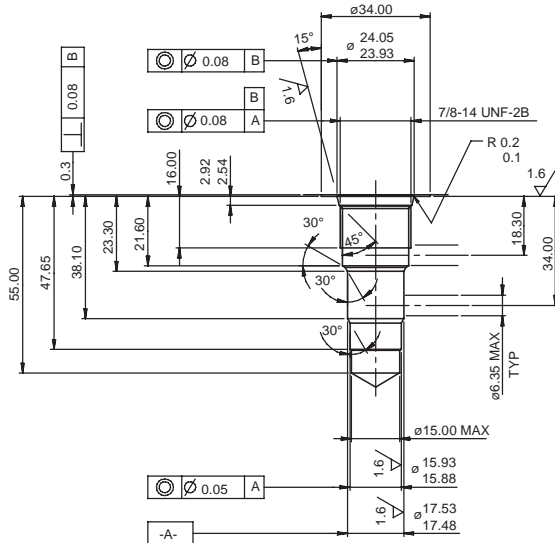


CARTRIDGE CAVITIES

CAVITY A12743

CAVITY TOOLS

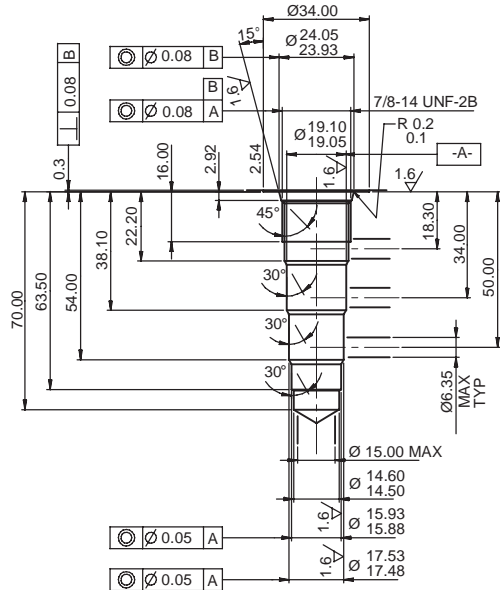
FORM DRILL A12802
FORM REAMER A12803
PLUG TAP 7/8-14 UNF



CAVITY A12744

CAVITY TOOLS

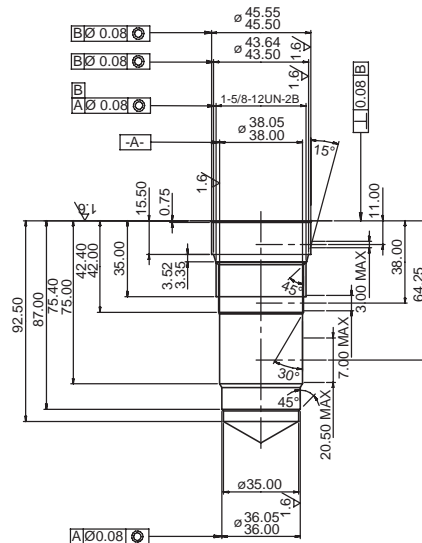
FORM DRILL A12804
FORM REAMER A12805
PLUG TAP 7/8"-14 UNF



CAVITY A13098

CAVITY TOOLS

FORM DRILL A13099
FORM REAMER A13100
PLUG TAP 1 5/8"-12 UN



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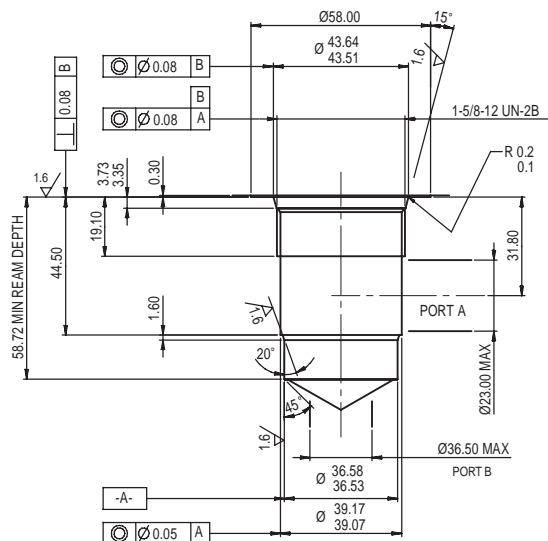
Website: www.integratedhydraulics.com



CAVITY A13245

CAVITY TOOLS

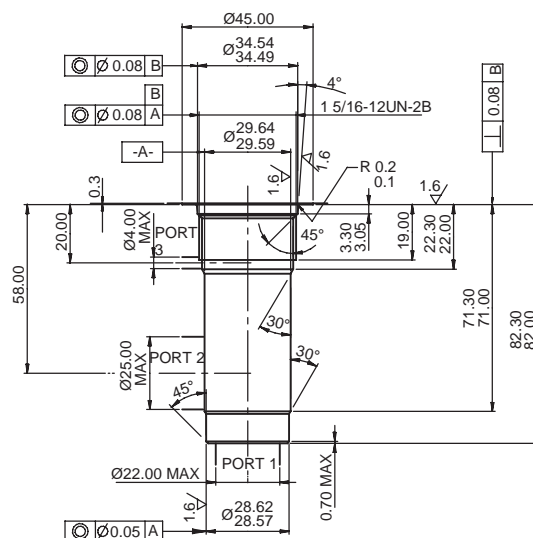
FORM DRILL A13246
FORM REAMER A13247
PLUG TAP 1.5/8"-12UNF-2B



CAVITY A16102

CAVITY TOOLS

FORM DRILL A3226
FORM REAMER A3227
PLUG TAP 1.5/16-12UNF-2B



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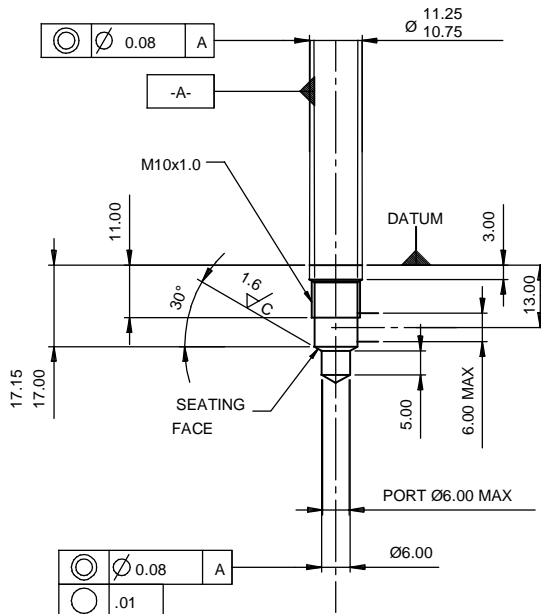


CARTRIDGE CAVITIES

CAVITY A16927

CAVITY TOOLS

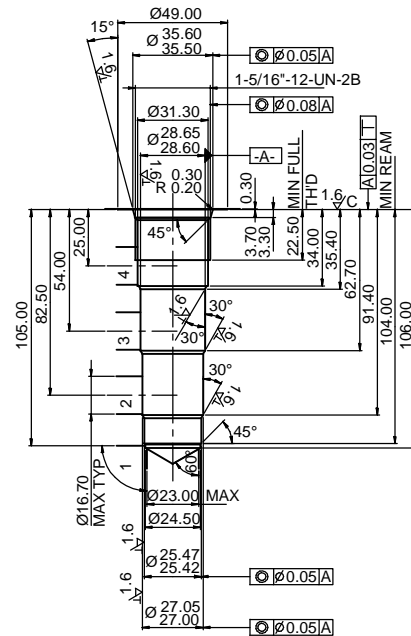
FORM REAMER AT1097
PLUG TAP M10 x 1.0



CAVITY A19787

CAVITY TOOLS

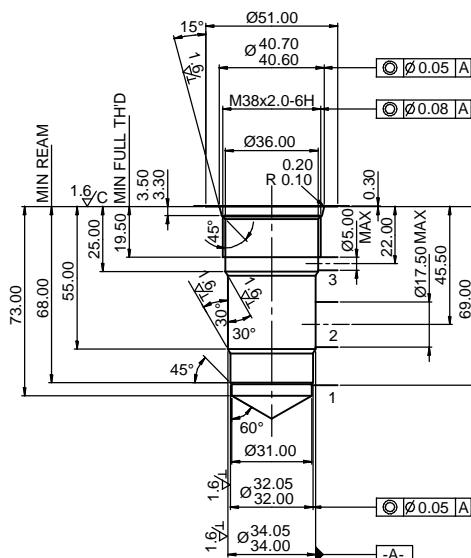
FORM DRILL AT2215
FORM REAMER AT2216
PLUG TAP 1 5/16" - 12 UN - 2B



CAVITY A20081

CAVITY TOOLS

FORM DRILL AT2369/1
FORM REAMER AT2369/2
PLUG TAP M38 x 2-6H



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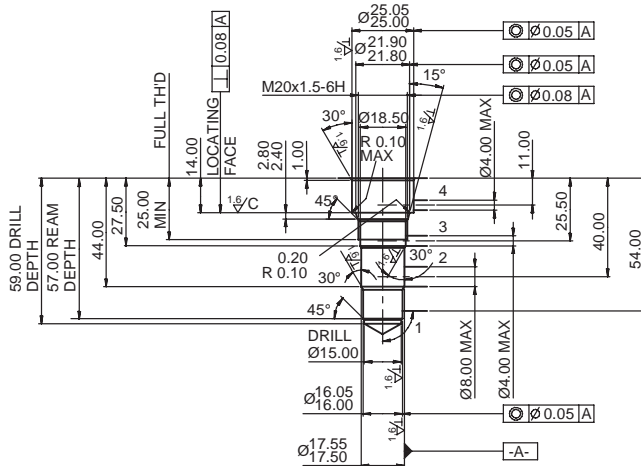
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CAVITY A20530

CAVITY TOOLS

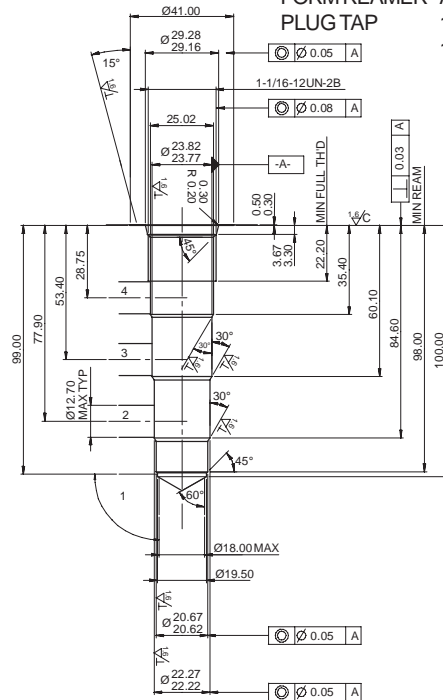
FORM DRILL AT2573
FORM REAMER AT2574
PLUG TAP M20 x 1.5 6H



CAVITY A21145

CAVITY TOOLS

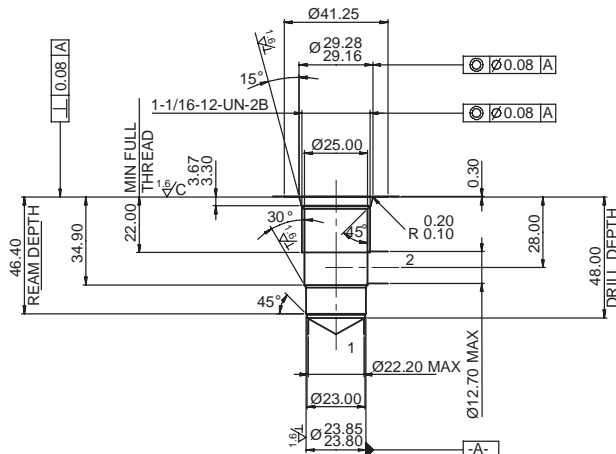
FORM DRILL AT2962
FORM REAMER AT2963
PLUG TAP 1 1/16
12 UN - 2B



CAVITY A21473

CAVITY TOOLS

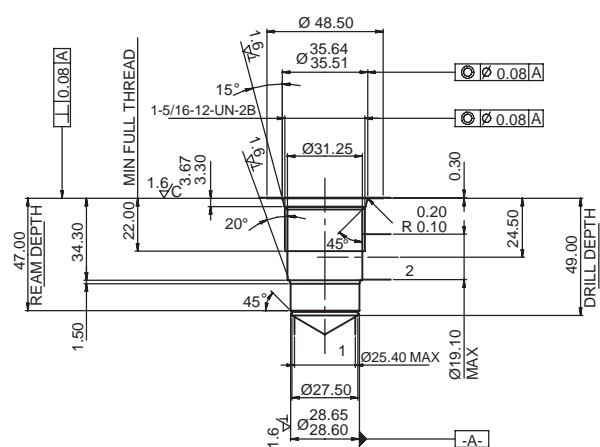
FORM DRILL A3058
FORM REAMER A3059
PLUG TAP 1 1/16
 12UN-2B



CAVITY A21616

CAVITY TOOLS

FORM DRILL AT3081
FORM REAMER AT3082
PLUG TAP 1 5/16"
12UN-2B



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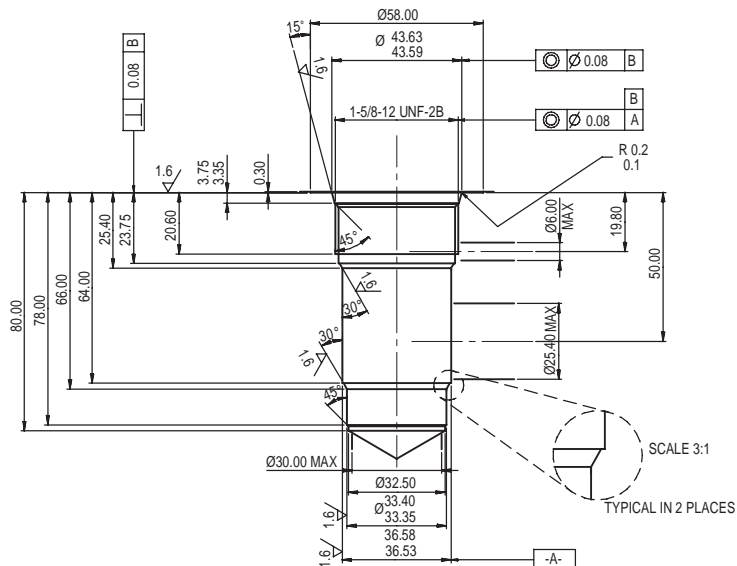
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CAVITY A21773

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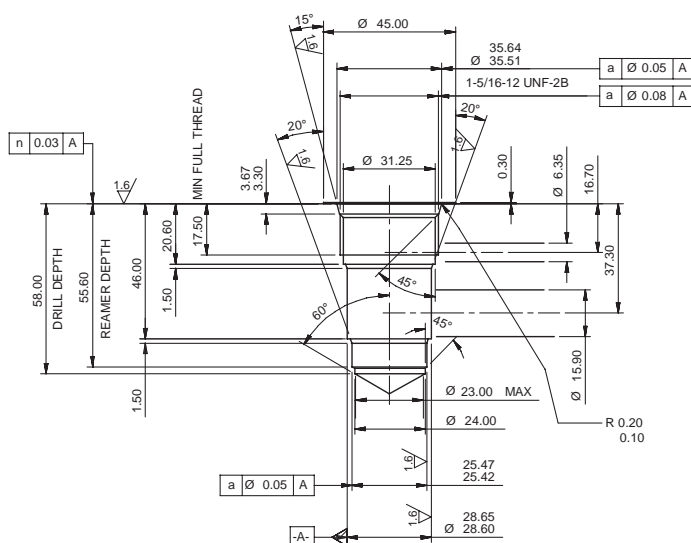
FORM DRILL AT3308
FORM REAMER AT3309
PLUG TAP 1.5/8"-12UNF-2B



CAVITY A22232

CAVITY TOOLS

FORM DRILL A3703
FORM REAMER A3704
PLUG TAP 1.5/16-12UNF-2B



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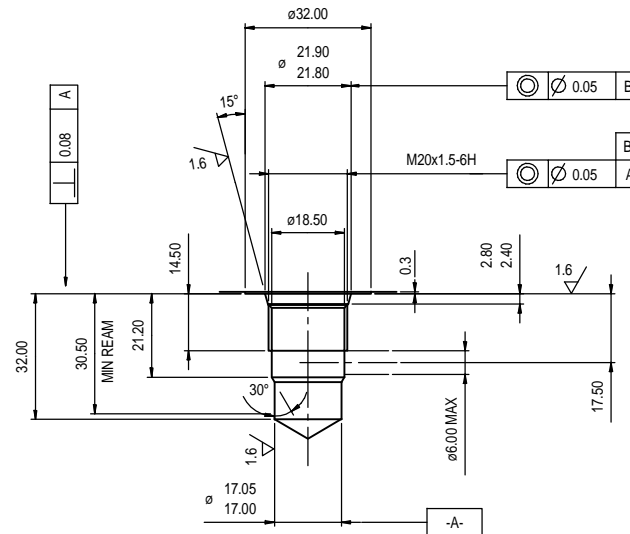
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CAVITY CVA- 20- 01- 0

CAVITY TOOLS

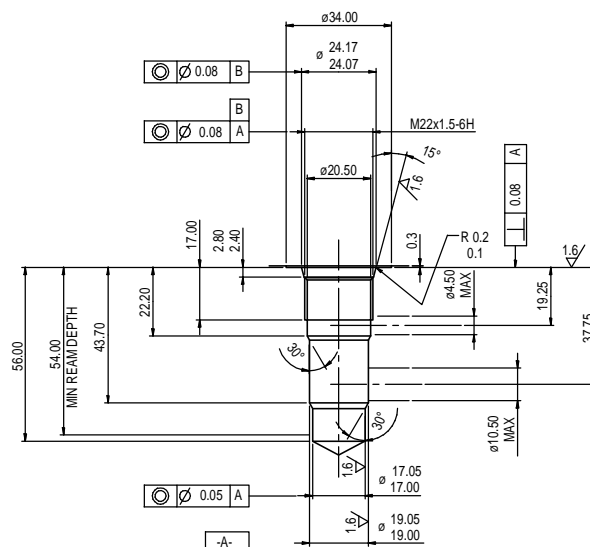
FORM DRILL A8961
FORM REAMER A8962
PLUG TAP M20 X 1.5



CAVITY CVA- 22- 06- 0

CAVITY TOOLS

FORM DRILL A8966
FORM REAMER A8967
PLUG TAP M22 X 1.5



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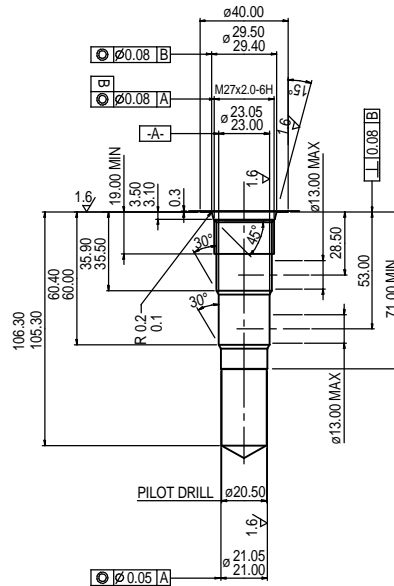
CARTRIDGE CAVITIES

ISO STANDARD

CAVITY CVB- 27- 04- 0

CAVITY TOOLS

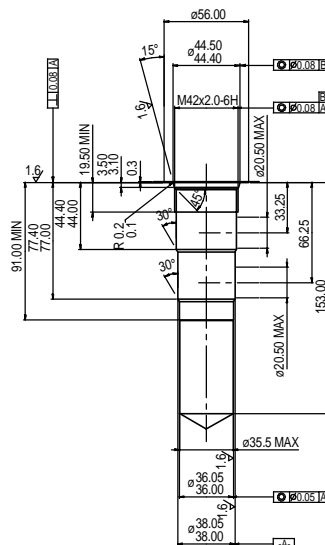
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FORM REAMER AT496
PLUG TAP M27 X 2



CAVITY CVB- 42- 04- 0

CAVITY TOOLS

FORM DRILL BT499
FORM REAMER AT498
PLUG TAP M42 X 2



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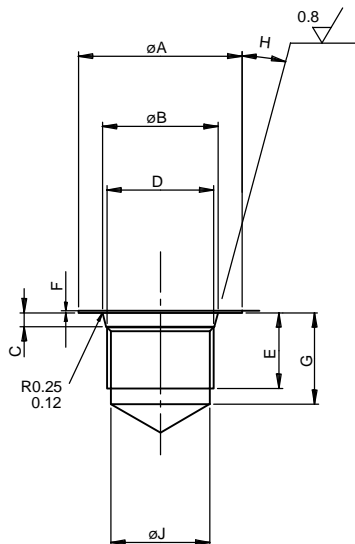


BSP, SAE, BSP WITH 'O'-RING GROOVE

SAE PORT CAVITY

A3066

TOOLING AVAILABLE UPON REQUEST

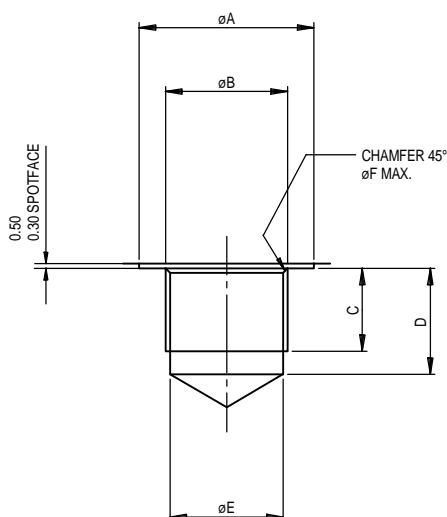


	ØA	ØB	C	D	E	F	G	H	ØJ
1/8 (2T)	17.06	9.23 9.10	2.26 1.88	5/16-24 UNF	9.90	0.3	11.89	12°	6.86
1/4 (4T)	21.03	12.48 12.36	2.74 2.36	7/16-20 UNF	11.53	0.3	13.90	12°	9.91
3/8 (6T)	24.61	15.77 15.65	2.84 2.46	9/16-18 UNF	12.70	0.3	15.50	12°	12.95
1/2 (8T)	30.17	20.72 20.60	2.92 2.54	3/4-16 UNF	14.27	0.3	17.50	15°	17.50
5/8 (10T)	34.20	24.02 23.90	2.92 2.54	7/8-14 UNF	16.60	0.3	19.80	15°	20.30
3/4 (12T)	41.25	29.28 29.16	3.67 3.30	1-1/16-12 UNF	19.05	0.3	23.01	15°	25.02
1 (16T)	48.50	35.64 35.51	3.67 3.30	1-5/16-12 UNF	19.00	0.3	23.00	15°	31.25
1-1/4 (20T)	58.00	43.64 43.50	3.52 3.35	1-5/8-12 UNF	19.00	0.3	23.00	15°	39.00

BSP PORT CAVITY

A7693

TOOLING AVAILABLE UPON REQUEST



BSP	ØA	ØB	C	D	ØE	ØF
1/8 (1W)	19.00	G1/8	10.00	14.00	8.70	10.20
1/4 (2W)	22.00	G1/4	12.00	16.00	11.50	13.60
3/8 (3W)	25.00	G3/8	12.00	16.00	15.00	17.10
1/2 (4W)	32.00	G1/2	16.00	21.00	19.00	21.40
3/4 (6W)	38.00	G3/4	19.00	24.00	24.60	26.90
1 (8W)	44.00	G1	21.00	26.00	30.50	33.70
1-1/4 (10W)	53.00	G1-1/4	21.00	26.00	39.50	42.50
1-1/2 (12W)	61.00	G1-1/2	25.00	31.00	45.00	48.30

NOTE: These port dimensions are for installation purposes only. Certified drawings available upon request.

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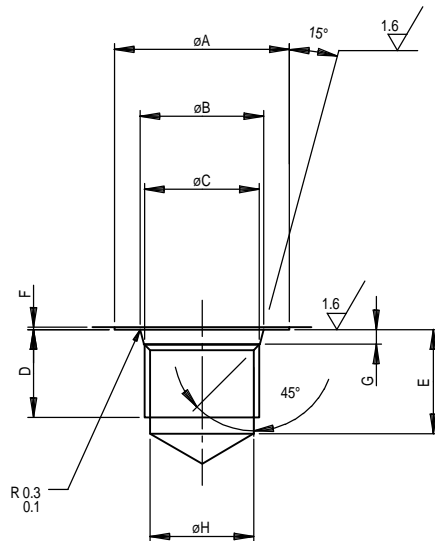
Website: www.integratedhydraulics.com



BSP WITH 'O'-RING GROOVE

A7290

TOOLING AVAILABLE UPON REQUEST



	ØA	ØB	ØC	D	E	F	G	ØH
1/4	22.0	15.7 15.6	G 1/4	12.0	15.0	0.3	2.7 2.5	11.5
3/8	25.0	18.7 18.6	G 3/8	12.0	15.0	0.3	2.7 2.5	15.0
1/2	32.0	22.7 22.6	G 1/2	16.0	19.0	0.3	2.7 2.5	19.0
3/4	38.0	29.9 29.8	G 3/4	19.0	24.0	0.3	3.7 3.5	24.6
1	44.0	35.9 35.8	G 1	21.0	26.0	0.3	3.7 3.5	30.5
1-1/4	53.0	44.9 44.8	G 1-1/4	21.0	26.0	0.3	3.7 3.5	39.5

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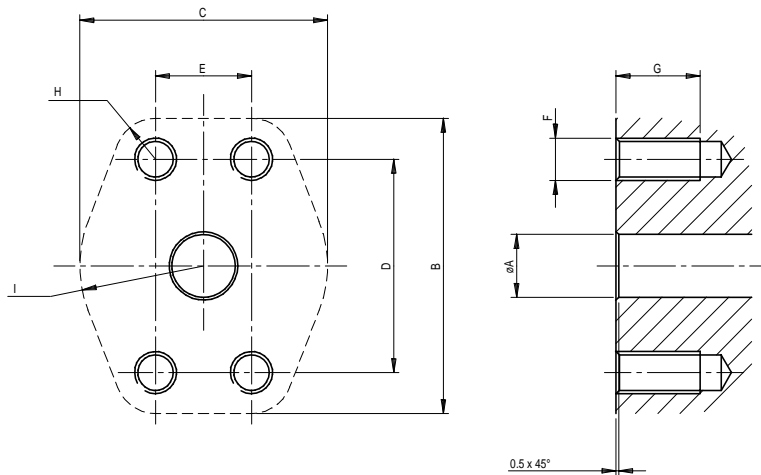
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SAE MOUNTING PATTERN



3000 psi (210 bar) 6000 psi (420 bar)



All dimensions in millimetres

FLANGE SIZE		A	B	C	D	E	F (UNC-2B)	G	H	I
3000 PSI	1/2"	13	54	46	38.1	17.5	5/16-18	16	7.9	23
	3/4"	19	65	52	47.6	22.2	3/8-16	16	8.7	26.2
	1"	25	70	59	52.4	26.2	3/8-16	17	8.7	29.4
	1-1/4"	32	79.4	73	58.7	30.2	7/16-14	20	10.3	36.5
	1-1/2"	38	94	83	69.9	35.7	1/2-13	20	11.9	41.3
6000 PSI	1/2"	13	56	47	40.5	18.2	5/16-18	16	7.75	23.5
	3/4"	19	71	60	50.8	23.8	3/8-16	17	10.1	30
	1"	25	81	70	57.2	27.8	7/16-14	20	11.9	35
	1-1/4"	32	95	77	66.7	31.8	1/2-13	22	14.2	38.5
	1-1/2"	38	113	95	79.4	36.6	5/8-11	22	16.8	47.5

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