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HYDRAULIC ACTUATORS

HYDRAULIC - Power Pack

ELECTROMECHANICS

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HYDRAULIC LOCK CYLINDERS

The hydraulic lock cylinders of the CB series complete the wide range of special cylinders manufactured by our company for a variety of industrial sectors.
The CB hydraulic lock cylinders meet the demand for small-sized pressing devices delivering considerable pushing force. Due to their small overall dimensions (their main characteristic), according to the model, these cylinders can be used to lock small, medium or large-sized pieces. They can also be used for riveting, bending, marking or assembly works. They are manufactured in two versions (simple or double-acting), with a threaded external body and a smooth or tapped through hole, according to the model. Cylinders can be secured (according to their model) using the thread available on the body, through the tapped holes on the body (flanged connection) or the through holes on the body.
The CB hydraulic lock cylinders by Tecnofluid meet the strictest reliability requirements, also under heavy duty, whenever precise pushes and considerable work loads are required.

Technical characteristics:

Maximum pressure: 200 ÷ 320 bar (based on the model)

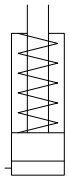
Fluid temperature: -20 ÷ +80°C

Recommended fluid: Mineral Hydraulic oil / phosphoric esters

Cylinders with threaded body – spring return (Series CB 01)

Max working pressure: 200 bar

Single-acting cylinders
Used with oil only
5-15-25 mm strokes

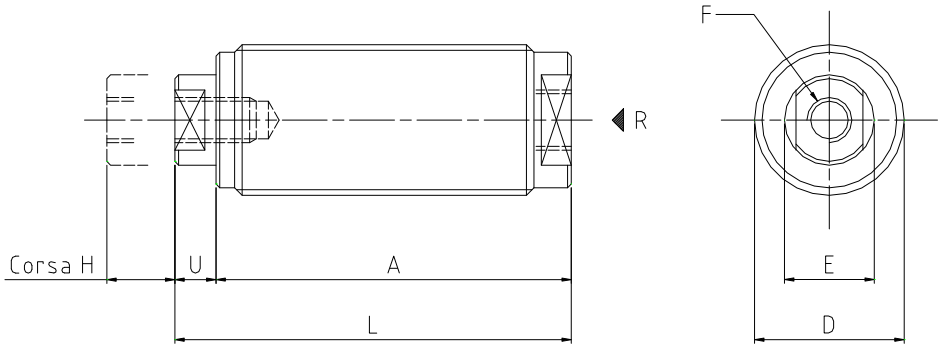


TECHNICAL DATA

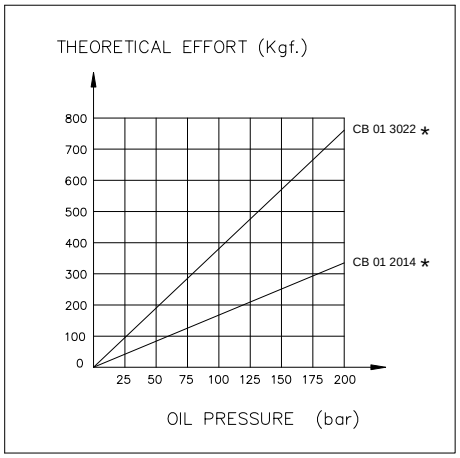
MODEL	Strength at 200 bar in Kgf.	Stroke in mm. H	Oil volume in cm³	Piston area in cm²	Oil infeed R
CB 01 201405 **CB 01 201415** **CB 01 201425**	307	5 15 25	0.76 2.30 3.80	1.53	R 1/8" G
CB 01 302205 **CB 01 302215** **CB 01 302225**	760	5 15 25	1.80 5.70 9.50	3.80	R 1/8" G

DESCRIPTION
Small-sized pushing piston, with threaded body, for easy connection to the equipment.

APPLICATIONS
Owing to their reduced overall dimensions and considerable pushing force, they are highly recommended to lock small and medium-sized items. They can be provided complete with supports, ring nuts and tips. As a rule they are driven by pressure multipliers or hydraulic power units.



DIAGRAM

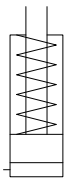


MODL	DIMENSIONS					
	A	D	E	F	L	U
CB 01 201405 **CB 01 201415** **CB 01 201425**	46 79 108	M 20 x 1.5	14	M 6 x 10	52 85 114	6
CB 01 302205 **CB 01 302215** **CB 01 302225**	57 77 110	M 30 x 1.5	22	M 8 x 10	64 84 117	7

Cylinders with threaded body – spring return (Series CB 02)

Max working pressure: 320 bar

Single-acting cylinders
Used with oil only
15-25-50 mm strokes

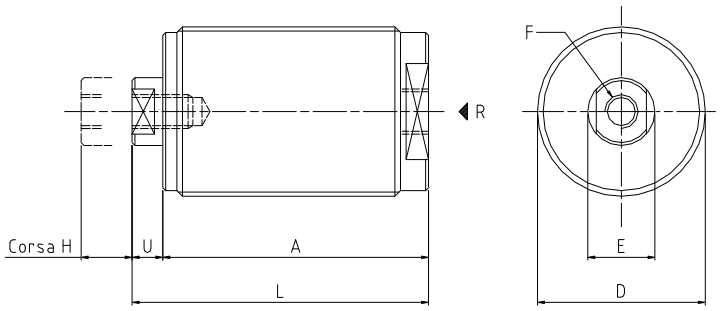


TECHNICAL DATA

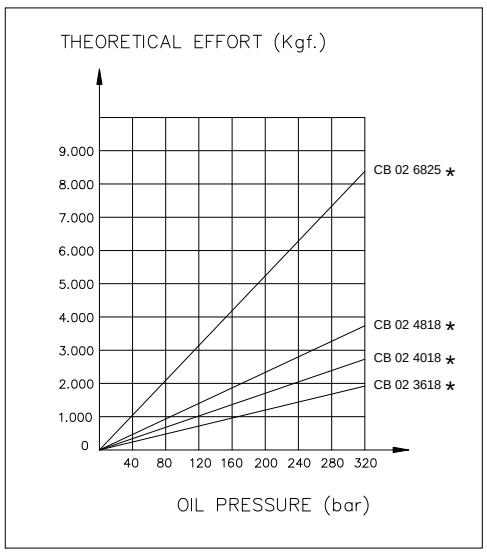
MODEL	Strength at 320 bar in Kgf.	Stroke in mm. H	Oil volume in cm³	Piston area in cm²	Oil infeed R
CB 02 361815 **CB 02 361825**	1968	15 25	9.20 15.40	6.15	R 1/8" G
CB 02 401815 **CB 02 401825**	2569	15 25	12.00 20.00	8.03	R 1/4" G
CB 02 481825 **CB 02 481850**	3436	25 50	26.80 53.60	10.74	R 1/4" G
CB 02 682525 **CB 02 682550**	8160	25 50	63.80 127.60	25.50	R 3/8" G

DESCRIPTION
Small-sized pushing piston, with threaded body, for easy connection to the equipment.

APPLICATIONS
Owing to their reduced overall dimensions and considerable pushing force, they are highly recommended to clamp medium and large-sized items. They are also used for riveting, bending, marking and assembly works. They can be provided complete with support bases, ring nuts and tips. As a rule they are driven by pressure multipliers or hydraulic power units.



DIAGRAM

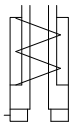


MODEL	DIMENSIONS					
	A	D	E	F	L	U
CB 02 361815 **CB 02 361825**	74 100	M 36 x 1.5	18	M 8 x 12	81 107	7
CB 02 401815 **CB 02 401825**	83 113	M 40 x 1.5	18	M 8 x 12	90 120	7
CB 02 481825 **CB 02 481850**	116 153	M 48 x 1.5	18	M 10 x 15	123 160	7
CB 02 682525 **CB 02 682550**	130 175	M 68 x 2.0	25	M 12 x 15	138 183	8

Cylinders with smooth through hole – smooth body – spring return (Series CB 03)

Max working pressure: 320 bar

Single-acting cylinders
Used with oil only
6-12mm stroke.

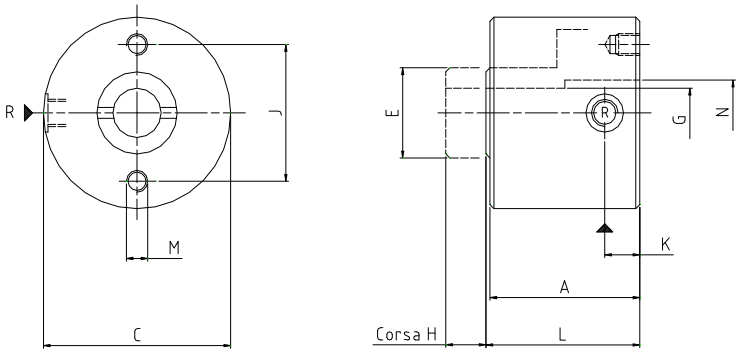


TECHNICAL DATA

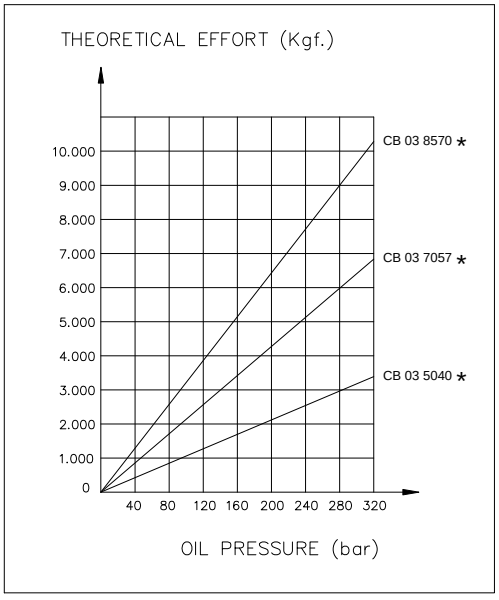
MODEL	Strength at 320 bar in Kgf.	Stroke in mm. H	Oil volume in cm³	Piston area in cm²	Oil infeed R
CB 03 504006 **CB 03 504012**	3206	6 12	6.01 12.02	10.02	R 1/8" G
CB 03 705706 **CB 03 705712**	6710	6 12	12.36 24.72	20.97	R 1/8" G R 1/4" G
CB 03 857006 **CB 03 857012**	10345	6 12	19.38 38.76	32.33	R 1/4" G

DESCRIPTION
Pushing or pulling lock piston, provided with a smooth through hole, to fit threaded easy-to-adjust pins or tie rods.

APPLICATIONS
Used for pushing or pulling. In the first case, fit properly shaped heads into the central hole. For rear clamping, use the holes on the lower base of the cylinder. It can be installed on multiple units, and in any position. As a rule they are driven by pressure multipliers or hydraulic power units.



DIAGRAM



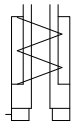
MODEL	DIMENSIONS								
	A	C	E	G	J	K	L	M	N
CB 03 504006 **CB 03 504012**	50 80	50	24	12	35	8	50.5 80.5	M 6 x 9	18
CB 03 705706 **CB 03 705712**	52 80	70	35	18	50	8.5 10.5	52.5 80.5	M 8 x 10	24
CB 03 857006 **CB 03 857012**	62 80	85	40	20	50	10.5	62.5 80.5	M 8 x 10	28

Cylinders with tapped through hole – threaded body – spring return (Series CB 04)

Max working pressure: 320 bar

TECHNICAL DATA

Single-acting cylinders
Used with oil only
6-12mm stroke.



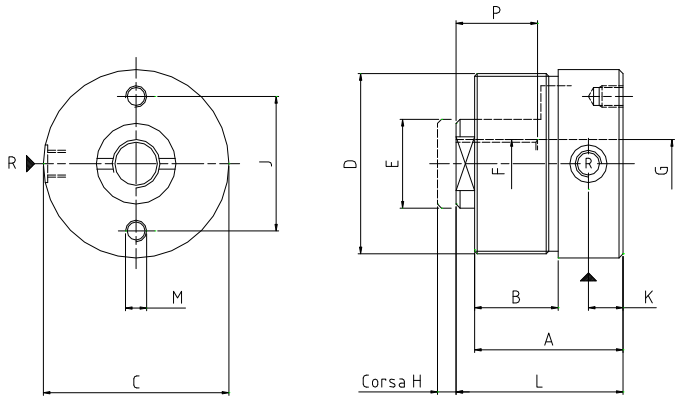
MODEL	Strength at 320 bar in Kgf.	Stroke in mm. H	Oil volume in cm³	Piston area in cm²	Oil infeed R
CB 04 484006 **CB 04 484012**	3206	6 12	6,01 12,02	10,02	R 1/8" G
CB 04 685706 **CB 04 685712**	6710	6 12	12,36 24,72	20,97	R 1/8" G R 1/4" G
CB 04 837006 **CB 04 837012**	10345	6 12	19,38 38,76	32,33	R 1/4" G

DESCRIPTION

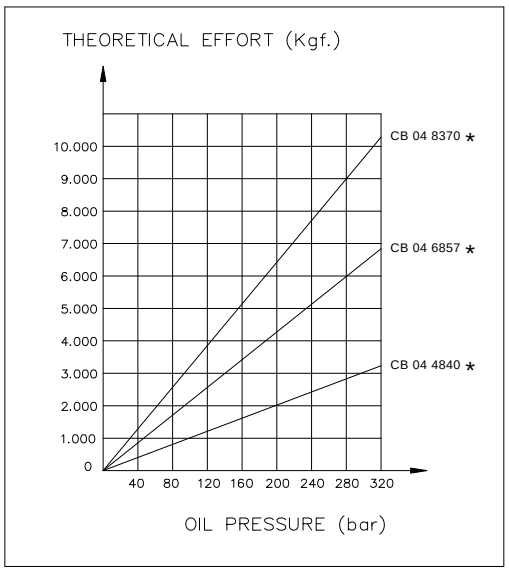
Pushing or pulling lock piston, provided with a tapped through hole, to fit threaded easy-to-adjust tie rods. Threaded body.

APPLICATIONS

Used for pushing or pulling. In the first case, fit properly shaped heads into the central hole. For rear clamping, use the holes on the lower base of the cylinder. It can be installed on multiple units, and in any position. As a rule they are driven by pressure multipliers or hydraulic power units.



DIAGRAM



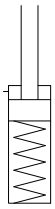
MODEL	DIMENSIONS					
	A	B	C	D	E	F
CB 04 484006 **CB 04 484012**	50 80	30 45	50	M 48 x 1.5	24	M 12
CB 04 685706 **CB 04 685712**	52 80	30 45	70	M 68 x 2	35	M 18
CB 04 837006 **CB 04 837012**	62 80	35 45	85	M 83 x 2	40	M 20

MODEL	DIMENSIONS					
	G	J	K	L	M	P
CB 04 484006 **CB 04 484012**	12	35	8	56 86	M 6 x 9	22 40
CB 04 685706 **CB 04 685712**	18	50	8.5 10.5	58 86	M 8 x 10	22 40
CB 04 837006 **CB 04 837012**	20	50	10.5	68 86	M 8 x 10	27 40

Pull cylinders - threaded body – spring return (Series CB 06)

Max working pressure: 320 bar

Single-acting cylinders
Used with oil only
10-25 mm stroke

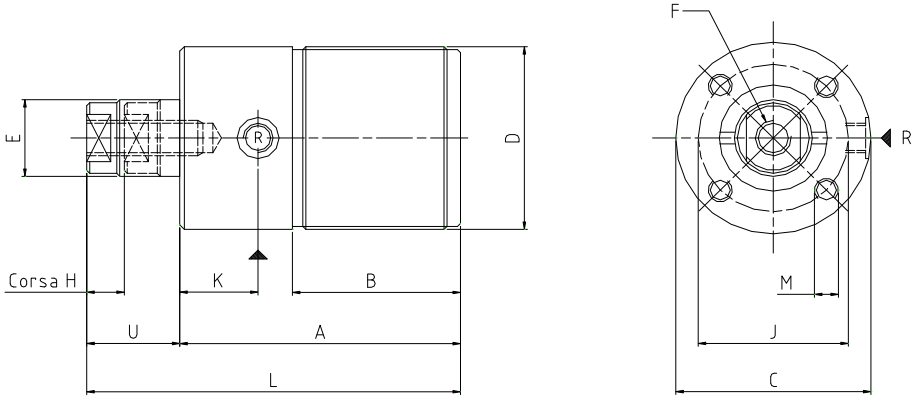


TECHNICAL DATA

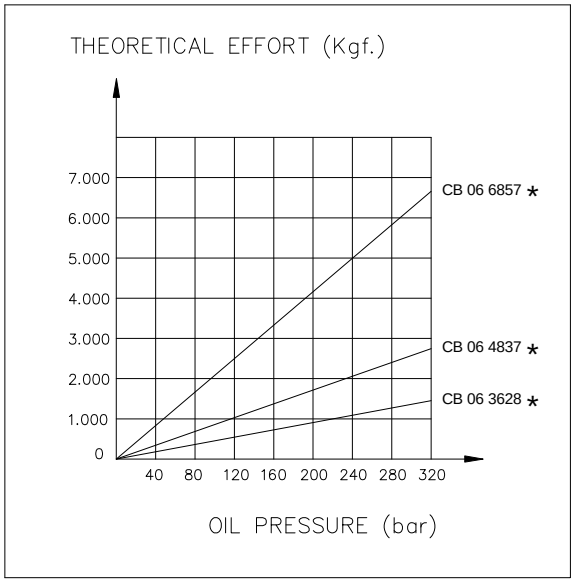
MODEL	Strength at 320 bar in Kgf.	Stroke in mm. H	Oil volume in cm³	Piston area in cm²	Oil infeed R
CB 06 362810 **CB 06 362825**	1478	10 25	4.62 11.55	4.62	R 1/8" G
CB 06 483710 **CB 06 483725**	2624	10 25	8.20 20.50	8.2	R 1/8" G
CB 06 685710 **CB 06 685725**	6595	10 25	20.61 51.52	20.61	R 1/4" G

DESCRIPTION
The piston of these cylinders moves inwards, and generates a pulling force. The body its threaded for easy assembly, and is provided with 4 tapped holes for flange connection.

APPLICATIONS
These cylinders are used for traditional numeric control or transfer machinery/equipment, and can be assembled in any position, either alone or in batteries, and are driven by pressure multipliers or hydropneumatic power units.



DIAGRAM



MODEL	DIMENSIONS				
	A	B	C	D	E
CB 06 362810 **CB 06 362825**	85 100	47 63	36	M 36 x 1.5	14
CB 06 483710 **CB 06 483725**	85 100	53 68	48	M 48 x 1.5	18
CB 06 685710 **CB 06 685725**	100 115	58 74	68	M 68 x 2	25

MODEL	DIMENSIONS					
	F	K	J	L	M	U
CB 06 362810 **CB 06 362825**	M 8 x 15	28	28	103 135	M 6 x 10	20 35
CB 06 483710 **CB 06 483725**	M 10 x 20	25	37	105 135	M 6 x 12	20 35
CB 06 685710 **CB 06 685725**	M 14 x 20	32	50	120 150	M 8 x 15	20 35

Double-acting cylinders – threaded body (Series CB 08)

Max working pressure: 250 bar

Double-acting cylinders
Used with oil only
25-50-80-100 mm strokes

TECHNICAL DATA

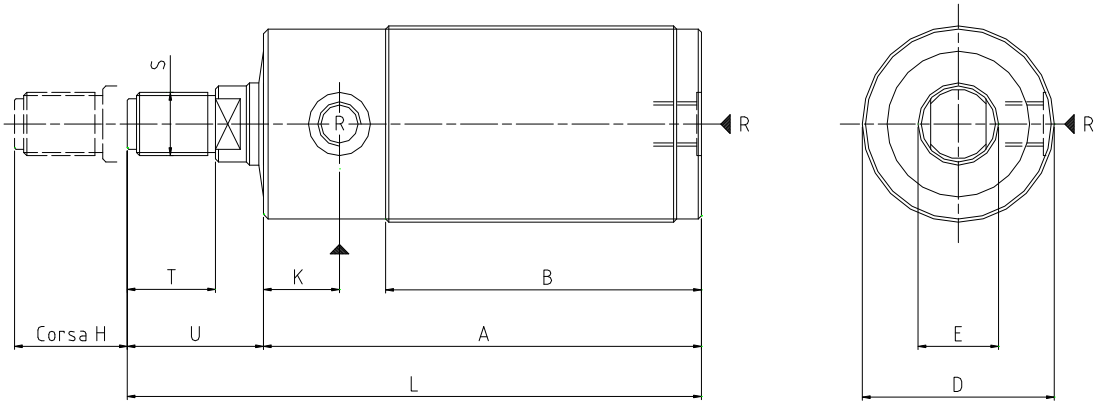
MODEL	Strength at 250 bar in Kgf.		Stroke in mm. H	Oil volume in cm³		Piston area in cm²		Oil infeed R
	Push	Pull		Push	Pull	Push	Pull	
CB 08 362525 **CB 08 362550** **CB 08 362580** **CB 08 3625100**	1225	840	25 50 80 100	12.25 24.50 39.20 49.00	8.42 16.85 26.96 33.80	4.9	3.37	R 1/8" G
CB 08 483525 **CB 08 483550** **CB 08 483580** **CB 08 4835100**	2405	1770	25 50 80 100	24.05 48.10 76.96 96.20	17.70 35.40 56.65 70.80	9.62	7.08	R 1/4" G
CB 08 685550 **CB 08 685580** **CB 08 6855100**	5937	4712	50 80 100	118.75 190.99 237.50	94.25 150.80 188.50	23.75	18.85	R 3/8" G

DESCRIPTION

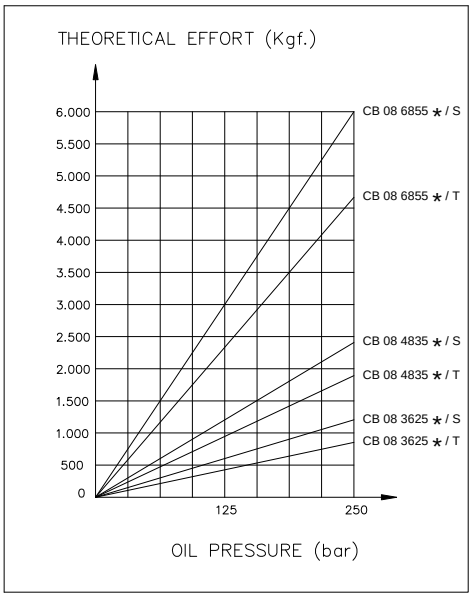
Double-acting short-stroke cylinders, with threaded body, for easy installation and positioning on specific equipment.

APPLICATIONS

These cylinders are used to manufacture shearing, pressing and piercing tools, for thin sheets or pipes. As a rule they are driven by hydropneumatic or hydraulic power units.



DIAGRAM



/ T = Pull effort

/ S = Push effort

MODEL	DIMENSIONS								
	A	B	D	E	K	L	S	T	U
CB 08 362525 **CB 08 362550** **CB 08 362580** **CB 08 3625100**	121 146 176 196	93 118 148 168	M 36 x 1.5	14	18	145 170 200 220	M 10 x 1.25	14	24
CB 08 483525 **CB 08 483550** **CB 08 483580** **CB 08 4835100**	130 155 185 205	95 120 150 170	M 48 x 1.5	18	22	160 185 215 235	M 14 x 1.5	18	30
CB 08 685550 **CB 08 685580** **CB 08 6855100**	175 205 225	132 162 182	M 68 x 2	25	28	213 243 263	M 20 x 1.5	25	38

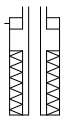
Spring lock cylinder – hydraulic release (Series CB 09)

Max working pressure: 200 bar

TECHNICAL DATA

Single-acting cylinders
Used with oil only
Threaded body

MODEL	Strength at 200 bar in Kgf.	Stroke in mm. H	Oil volume in cm^3	Piston area in cm^2	Oil infeed R
CB 09 48 CB 09 68	1100 2500	2,7 3,7	2,3 5,3	8,20 14,20	R 1/8" G

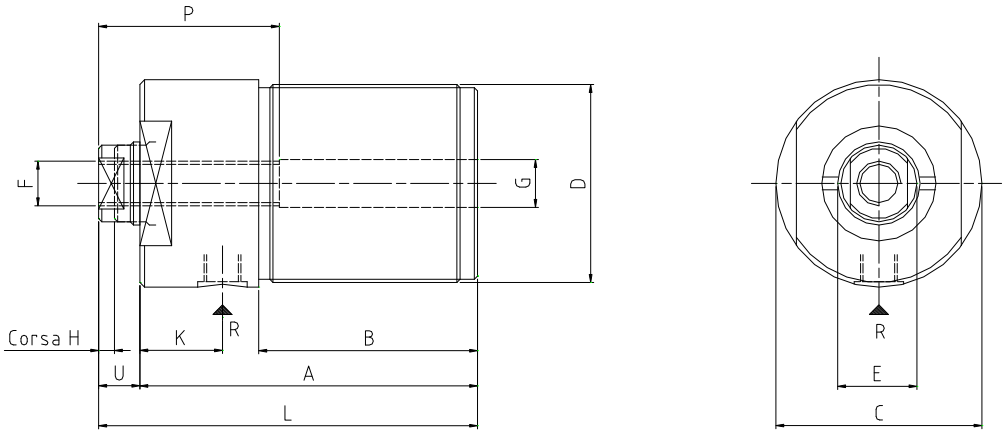


DESCRIPTION

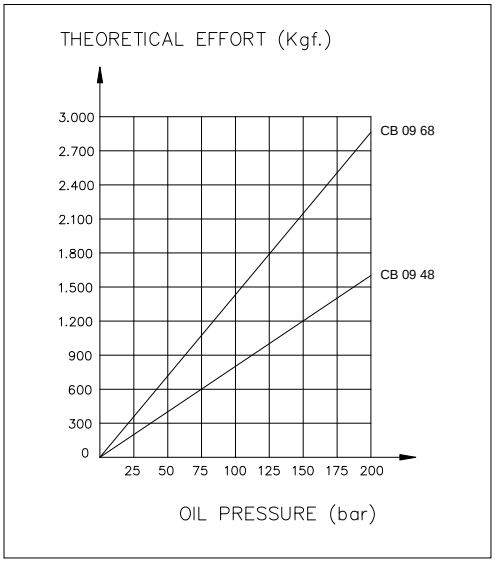
Piston with partially tapped through hole. Threaded body for pre-loading a series of Belleville springs, built-into the cylinder, for a considerable locking force. To release it, inject oil under pressure into the cylinder.

APPLICATIONS

These cylinders are highly recommended to permanently lock guides, tailstocks, heads of machine tools. They are used also to lock moulds and matrixes or pieces on pallets, and whenever a constant locking force is required indefinitely, without holding the connection pressed continuously, by means of multipliers or power units. The central tapped hole makes it possible to install easily adjustable threaded tie rods. It can be mounted in any position.



DIAGRAM

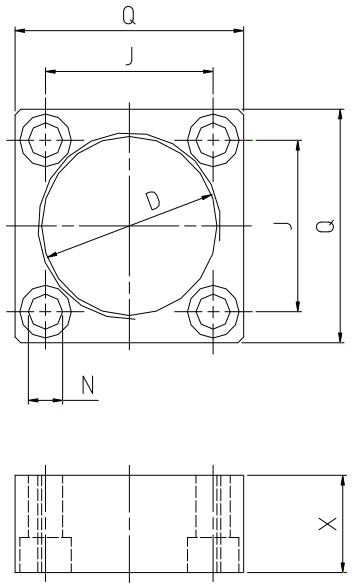


MODEL	DIMENSIONS				
	A	B	C	D	E
CB 09 48 CB 09 68	86 120	58 85	50 60	M 48 x 1,5 M 60 x 2	18 22

MODEL	DIMENSIONS					
	F	G	K	L	P	U
CB 09 48 CB 09 68	M 10 x 1,5 M 16 x 2	10.1 16.1	19 19	94 129	40 40	8 9

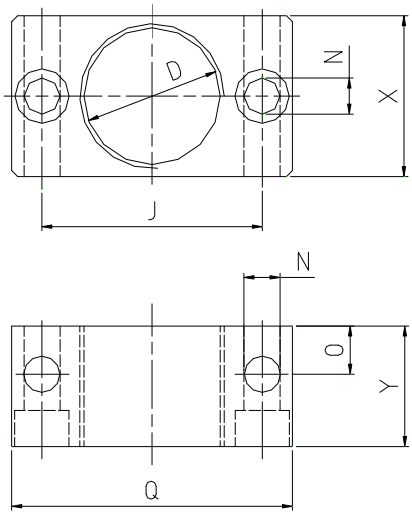
Support bases

SQUARE SUPPORT BASES



MODEL	DIMENSIONS				
	D	J	N	Q	X
BQ 36	M 36 x 1,5	38	9	50	20
BQ 48	M 48 x 1,5	44	9	60	25
BQ 68	M 68 x 2	64	11	80	30

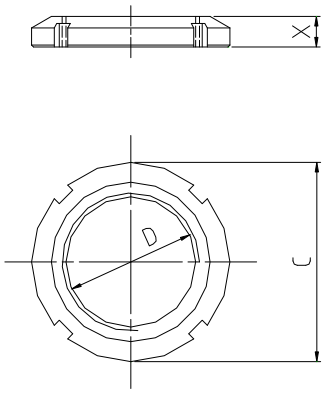
RECTANGULAR SUPPORT BASES



MODEL	DIMENSIONS						
	D	J	N	O	Q	X	Y
BS 20	M 20 x 1.5	35	7	10	50	25	30
BS 30	M 30 x 1.5	50	9	12	70	40	
BS 36	M 36 x 1.5	55					
BS 40	M 40 x 1.5	60			80	50	40
BS 48	M 48 x 1.5	70			90	60	
BS 68	M 68 x 2	90	11	15	110	80	50

Ring nuts - Tips

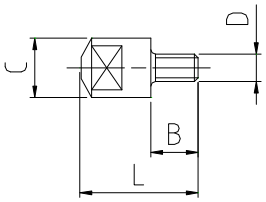
RING NUTS



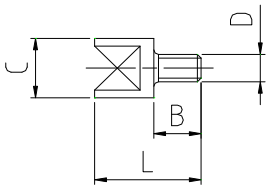
MODEL	DIMENSIONS		
	C	D	X
GF 20	28	M 20 x 1.5	5
GF 30	45	M 30 x 1.5	7
GF 36	52	M 36 x 1.5	8
GF 40	58	M 40 x 1.5	9
GF 48	68	M 48 x 1.5	10
GF 68	85	M 68 x 2	12

TIPS

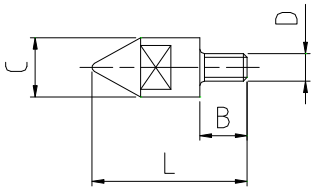
PR



PV



PC



MODEL	DIMENSIONS			
	B	C	D	L
PR 1306 PC 1306 PV 1306	10	13	M 6	20 25 20
PR 1708 PC 1708 PV 1708	12	17	M 8	27 32 27

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TECNOFLUID
ENGINEERING

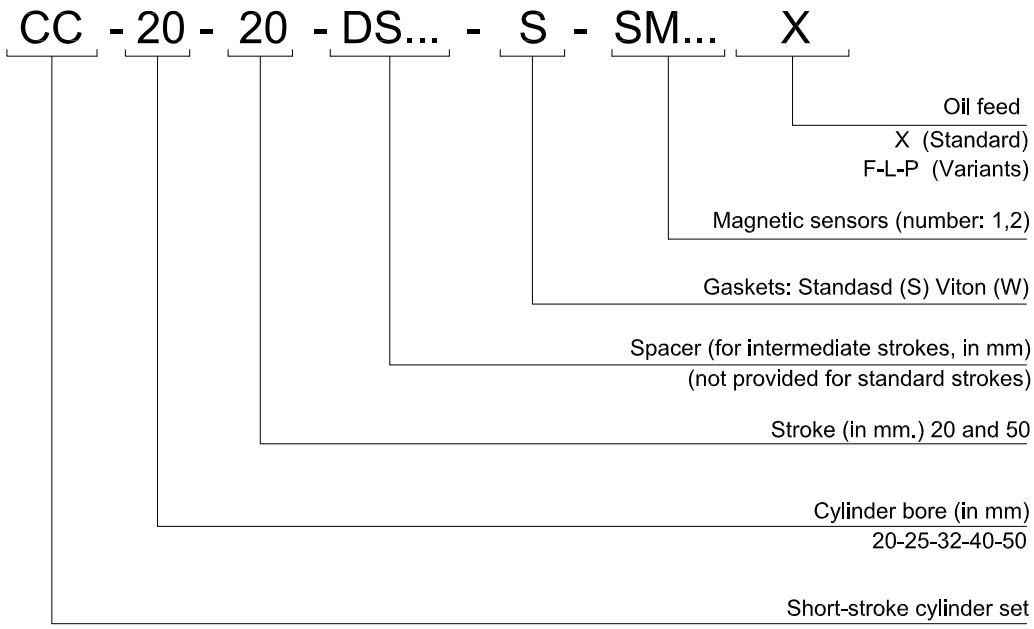
SHORT-STROKE CYLINDERS

The short-stroke cylinders of the CC series complete the wide range of special cylinders manufactured by our company for a variety of industrial sectors.
The CC short-stroke hydraulic cylinders can meet the need for small-sized presses.
The main feature of these cylinders is their reduced overall dimensions, compared with ISO cylinders, and therefore can be used to lock or move in very small spaces.
They are manufactured in the double-acting version, with magnetic sensors. Their body is provided with holes for sensors.
All CC short-stroke cylinders are equipped with a magnetic piston with two PTFE anti-friction shoes for a precise guide and reduced friction.
Cylinders can be clamped by means of the holes available on their body.
The CC short-stroke hydraulic cylinders by Tecnofluid meet the strictest reliability requirements, also under heavy duty, whenever precise pushes and considerable work loads are required.

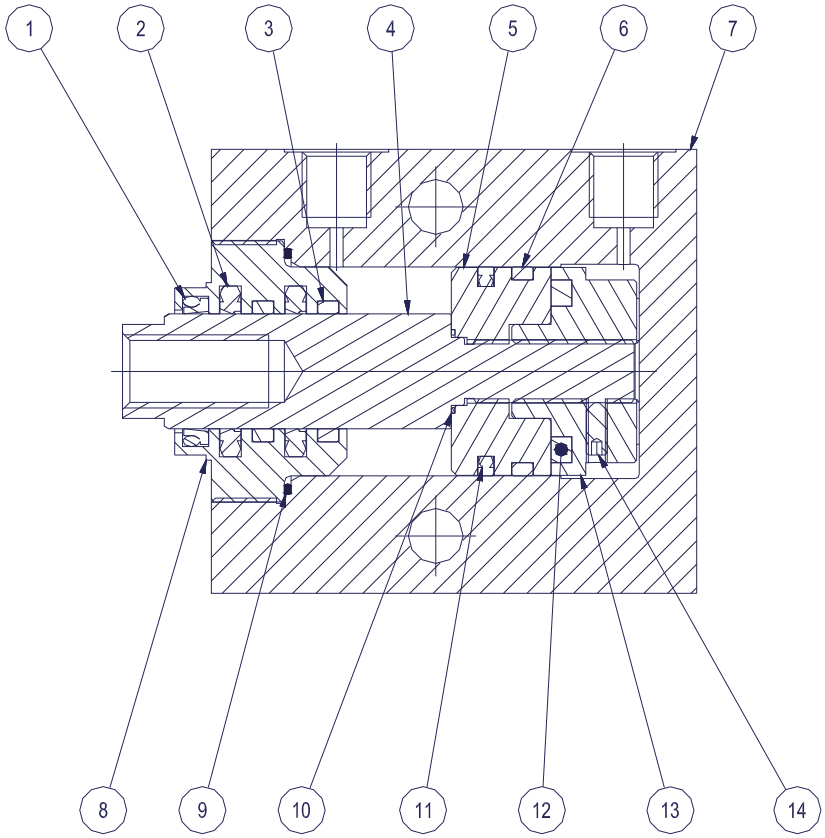
Technical characteristics:

Bore: 20÷50mm
Standard stroke: 20 and 50 mm
Rated pressure: 160 bar
Maximum pressure: 250 bar
Fluid temperature: **-20 ÷ +**80°C (standard gaskets)
Fluid temperature: **-20 ÷ +**150°C (Viton gaskets)
Recommended fluid: Mineral Hydraulic oil / phosphoric esters

Coding key:

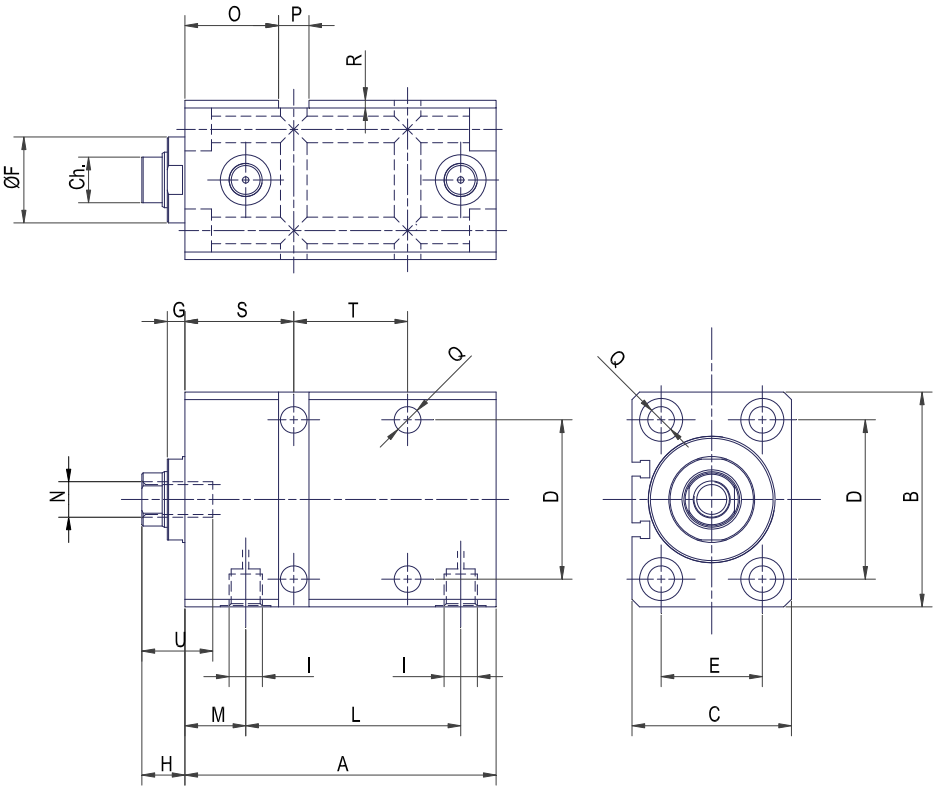


STRUCTURAL CHARACTERISTICS



Rif.	Componenti	Materiale	Rif.	Componenti	Materiale
1	Dust scraper	Nitrile rubber + PTFE	8	Guide bushing	Bronze
2	Stem gasket	NBR/fiber	9	O-ring	Nitrile rubber
3	Guiding sliding block	PTFE	10	O-ring	Nitrile rubber
4	Stem	Chromium-plated steel	11	Piston gasket	Nitrile rubber + PTFE
5	Piston	Steel	12	Magnet	Neodymium
6	Guiding sliding block	PTFE	13	semipistone posteriore	Steel
7	Body	Special light alloy	14	Grano antisvitamento	Acciaio brunito

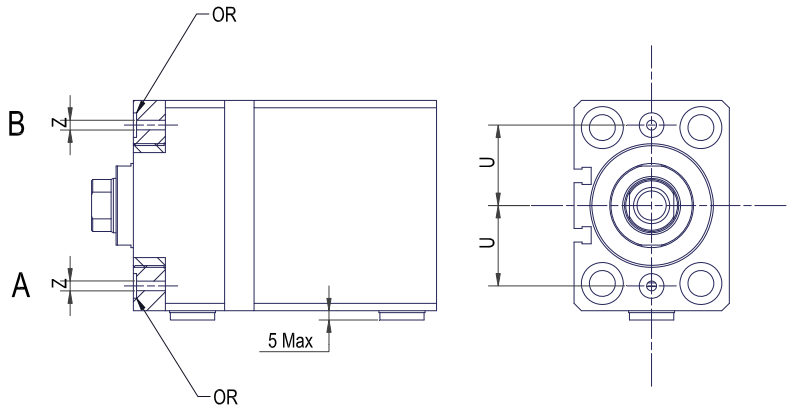
STANDARD VERSION



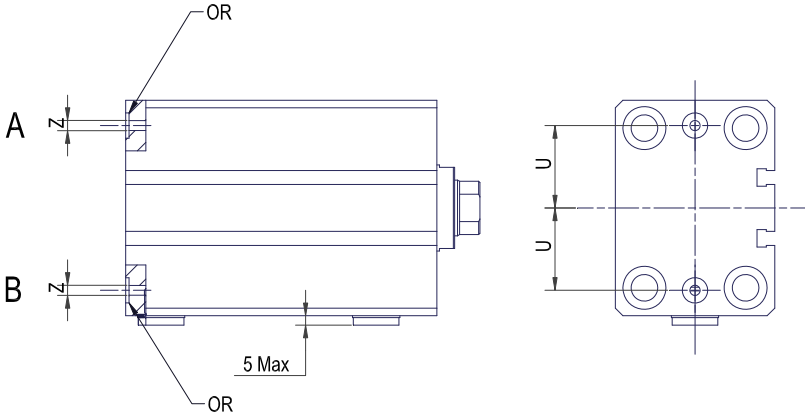
Piston	20		25		32		40		50		63		80		100	
Stem	14		18		22		22		28		28		36		45	
Stroke	20	50	20	50	20	50	20	50	20	50	20	50	20	50	20	50
A	74	104	77	107	80	110	93	123	95	125	105	135	120	150	130	160
B	60		65		75		85		100		115		140		170	
C	40		45		55		63		75		90		110		140	
CH	11		14		18		18		24		24		32		41	
D	45		50		55		63		76		90		110		135	
E	25		30		35		40		45		55		75		95	
F	27		30		34		34		42		50		60		72	
G	5		6,5		8		7		8		7		7		8	
H	12		14		15		17		20		20		20		25	
I	1/4" G.		1/4" G.		1/4" G.		1/4" G.		1/4" G.		3/8" G.		1/2" G.		1/2" G.	
L	42	72	43	73	46	76	55	85	55,5	85,5	55	85	60	90	65	95
M	20		22		22		24		25		29		35		37	
N	M8		M10		M12		M14		M20		M20		M27		M33	
O	28		32		34		37		37,5		47,5		50		60	
P	10		10		12		12		15		15		20		20	
Q	6,5		8,5		10,5		10,5		13		13		17		17	
R	2		2		3		3		5		5		5		5	
S	33		37		40		43		45		55		60		70	
T		40		40		40		45		45		40		40		30
U	16		21		21		28		33		34		38		45	

OIL FEED VARIANTS (WITHOUT FITTING)

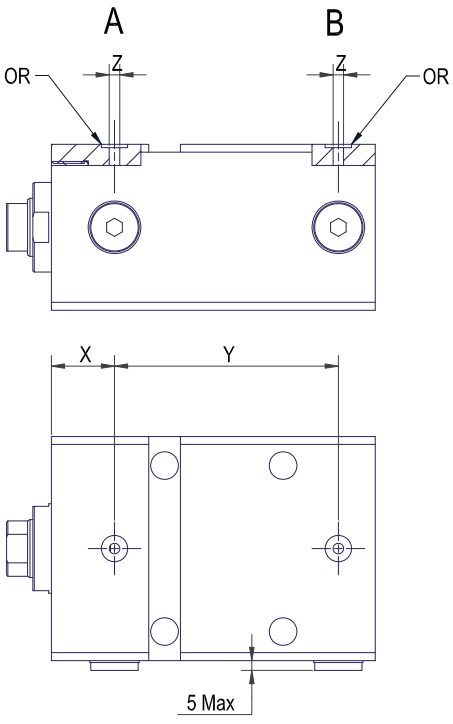
FRONT FEED (NO FIXING HOLES FORESEEN ON THE SHAFT AXIS)



BACK FEED (NO FIXING HOLES FORESEEN ON THE SHAFT AXIS)



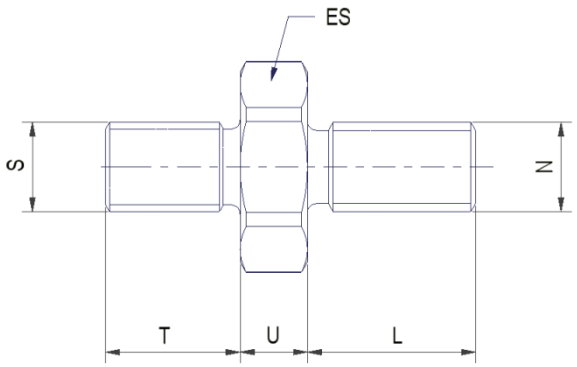
LOWER SUPPORT FEED



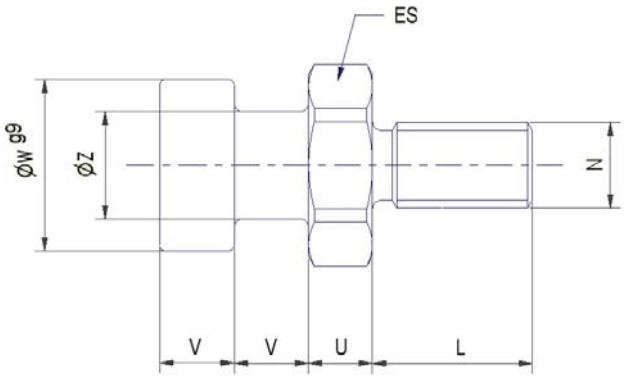
Piston	20		25		32		40		50		63		80		100	
Stroke	**20**	**50**	**20**	**50**	**20**	**50**	**20**	**50**	**20**	**50**	**20**	**50**	**20**	**50**	**20**	**50**
U	21		25,5		30		32,5		40		48		59		70	
X	20		22		22		24		25		29		35		37	
Y	42	72	43	73	46	76	55	85	55,5	85,5	55	85	60	90	65	95
Z	4		4		4		4		7		7		7		7	
OR	OR 106		OR 106		OR 106		OR 106		OR 108		OR 108		OR 108		OR 108	

STEM ACCESSORIES

Male terminal EM

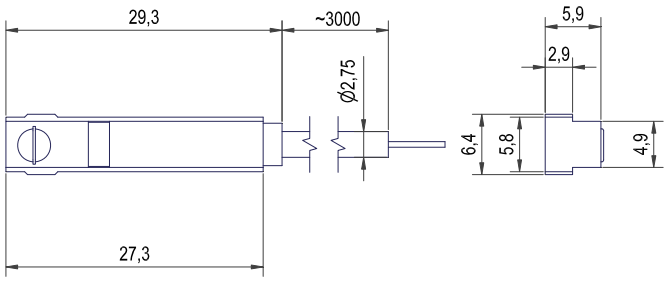


Hammer head ET

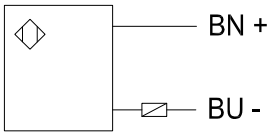


Type		ES	L	N	S	T	U	V	W g9	Z
EM-20	**ET-20**	17	15	M8	M8 x 1	12	6	7	16	10
EM-25	**ET-25**	17	20	M10	M10 x 1,25	14	6	7	16	10
EM-32	**ET-32**	19	20	M12	M12 x 1,25	16	7	8	18	11
EM-40	**ET-40**	22	25	M14	M14 x 1,5	18	8	8	18	11
EM-50	**ET-50**	30	30	M20	M20 x 1,5	28	9	10	22	14
EM-63	**ET-63**	30	30	M20	M20 x 1,5	28	9	10	22	14
EM-80	**ET-80**	36	40	M27	M27 x 2	36	12	12,5	28	18
EM-100	**ET-100**	46	50	M33	M33 x 2	45	14	16	35	22

MAGNETIC SENSORS



Circuit type



TECHNICAL CHARACTERISTICS	
Voltage	1..130 V AC/DC
Max. current	500 mA
Protection degree	IP 67 (DIN 40050)
Cable	2 x 0.25 mm²
Length	2000 mm
Contact	N.O.

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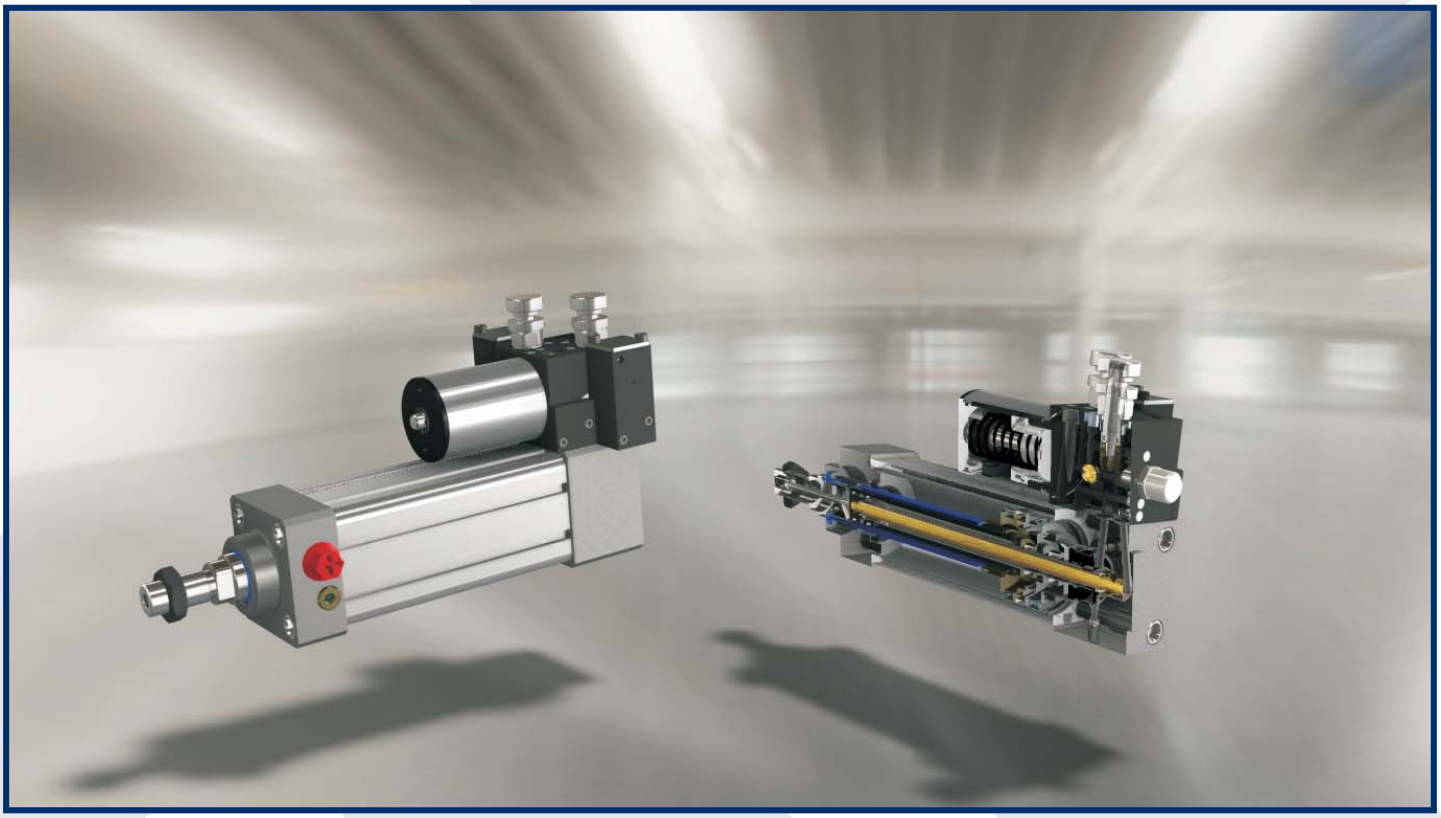


HYDROPNEUMATIC CYLINDERS

Requirements

The coaxial hydropneumatic governor consists of a pneumatic power section and a hydraulic control section.
This device is used to adjust and standardise speed; if installed, it makes it possible to solve any space problems in the machines.
The hydraulic circuit is closed, without any air-oil contact; the versions listed below are available:

- adjustment with rod out
- adjustment with rod in
- double adjustment

All versions can be provided with a speed control device:

- quick approach (SKIP N.A.)
- stop (STOP N.A.)

Operating principle

This system exploits oil incompressibility: flowing through a flow regulator, it absorbs and neutralizes any speed variation of the relevant pneumatic cylinder.
The hydropneumatic governor can split, by means of suitable procedures, the different processing stages, and makes it possible to approach the pieces more quickly, to speed-up or slow-down the processing steps, to accelerate, for example, the approach to the next piece (using by-pass valves known as skip valves); furthermore, it can be equipped with stop valves to clamp and hold all moving pieces.
The skip and stop valves are 2-way pneumatic glove valves; as a rule both of them are open, and therefore pneumatic pressure must be provided in order to shut-off the skip valve and turn-on the stop valve.
The hydropneumatic governor is provided with an auxiliary tank, to offset the volume difference between the two chambers and to refill the unit after the leaks (even minimum) between the stem and its gasket.
A piston inside the tank is pressed by a spring which ensure a slight overpressure within the system.
Furthermore, a dip stick protrudes from the tank, to indicate minimum oil level.

General characteristics:

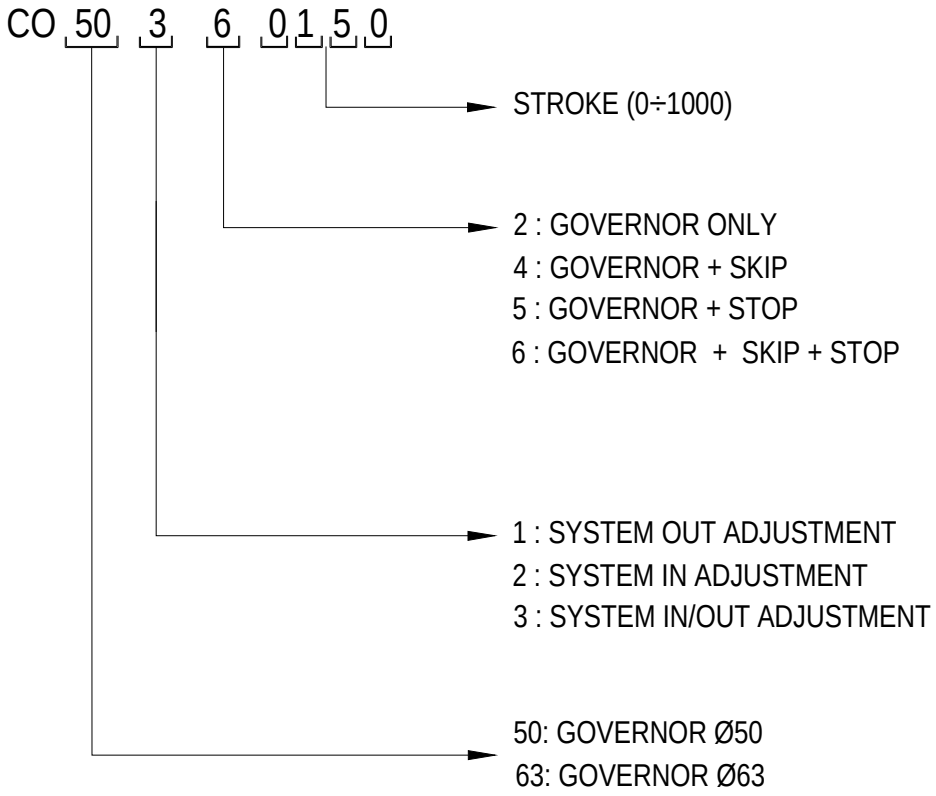
Type	Coaxial hydropneumatic unit
Bore	Ø50 – Ø63
Clamps	Hole center distance according to ISO standards, on front and rear flanges
Stroke	Optional (0÷1000)
Working pressure	1-10 bar
External chamber fluid	Filtered and lubed or dry air
Internal chamber fluid	Hydraulic oil
Working temperature	-10°C +80°C
Circuit oil	Hydraulic oil, viscosity: 2.9E – 50°C
Min. and max. speed	70 – 6000 mm/min
Min. actuating pressure of skip and stop valves	4 bar

Materials of main components:

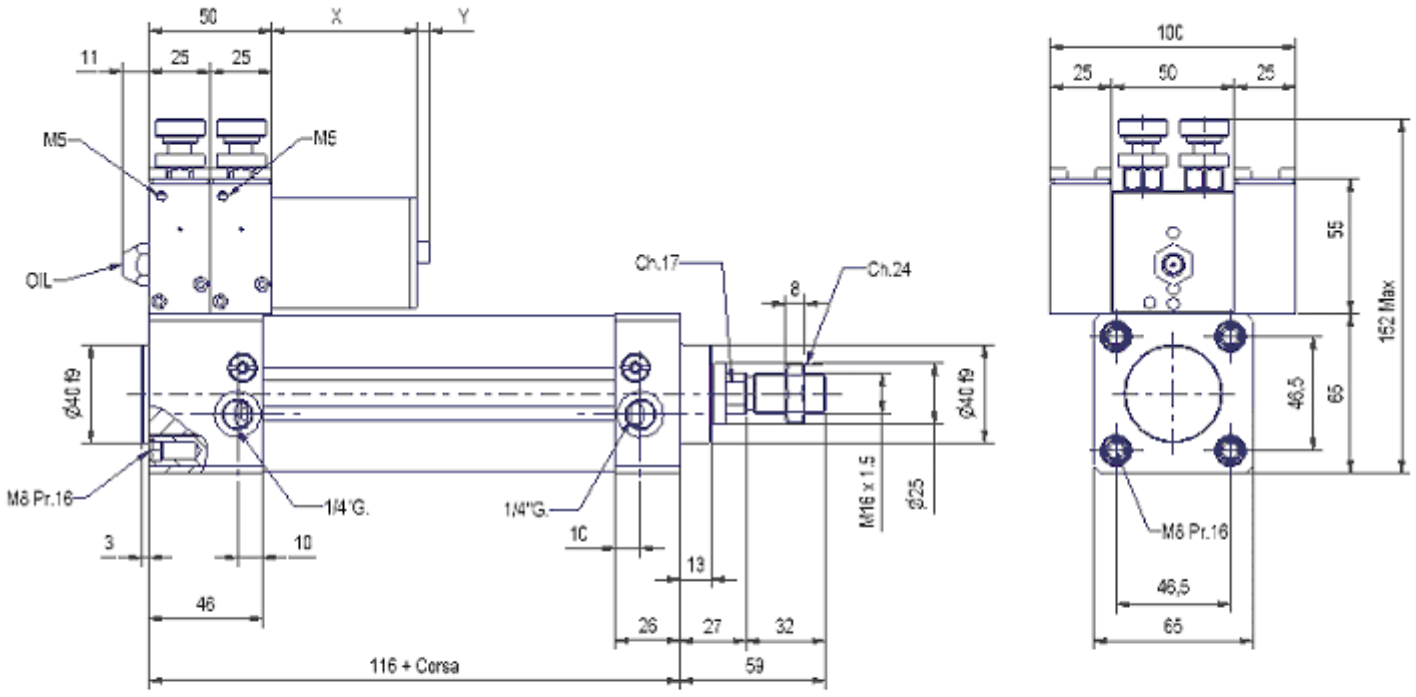
Heads	Aluminium
Liner	Calibrated and anodized extruded light alloy
Stem	Chromium-plated steel C43
Piston gasket	NBR or Viton
Stem gasket	Polyurethane
Adjusting units	Nickel-plated brass
Skip and stop valves	Aluminium

Coding key:

The example above shows the coding of a double-acting CO hydropneumatic cylinder (stem out + in control), provided with speed governors, skip + stop valves, Ø50 bore and 150mm stroke.

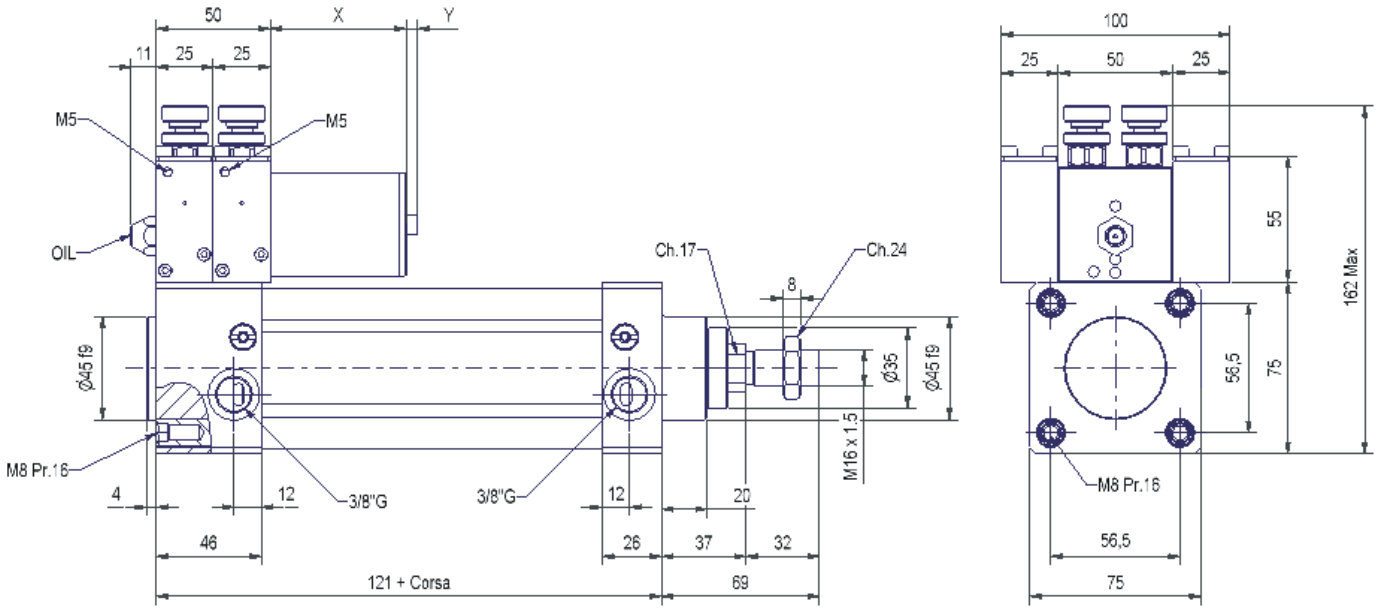


Overall dimensions of the Ø50 governor:



STROKE	X	Y max
0÷199	84	39
200÷399	156	84

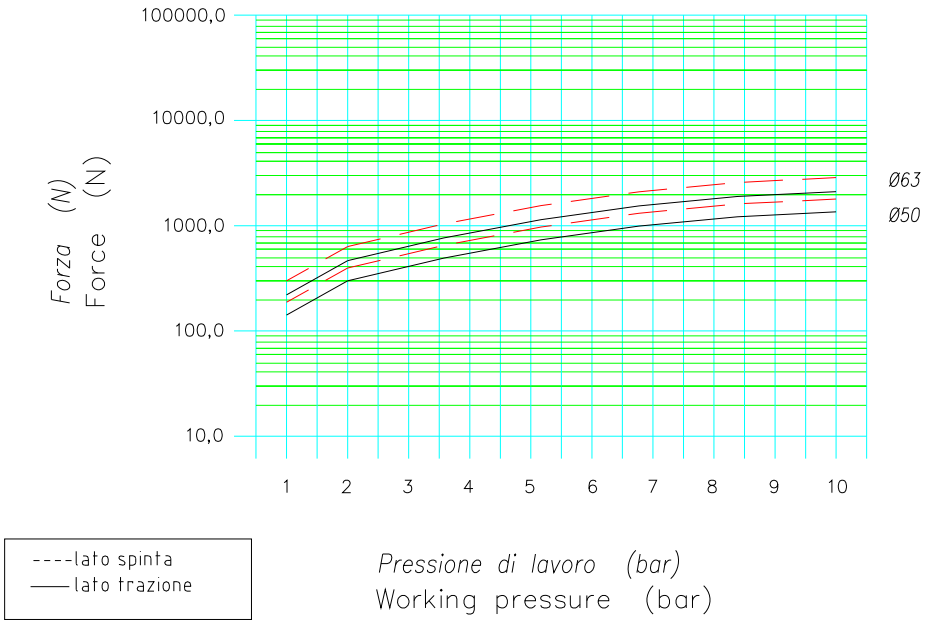
Overall dimensions of the Ø63 governor:



STROKE	X	Y max
0÷199	84	39
200÷399	156	84

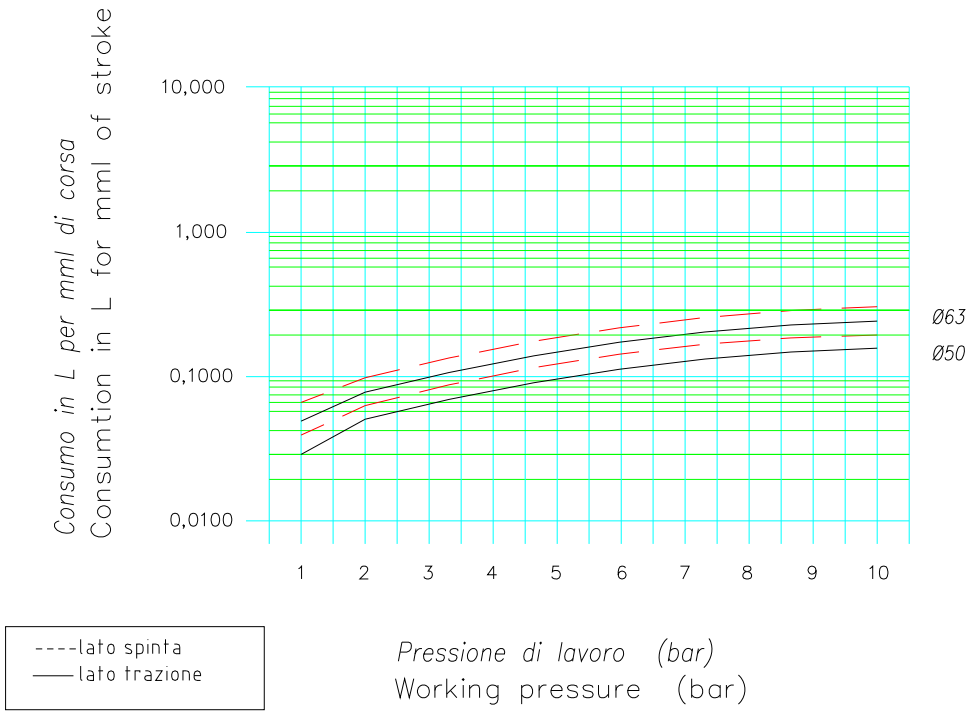
Force table (N):

Force table in N



Cylinder consumption table in NL (1 cm of stroke):

Cylinder consumption table in NL (1 cm. of stroke)



Maintenance

The coaxial hydropneumatic governor is a closed circuit system, and therefore no factors can negatively affect its operation. Be careful with the hydraulic oil level, for it must never drop below the minimum level indicated by the drip stick of the auxiliary tank. Otherwise, cavitation or air bubbles inside the circuit would hinder system regulation. Top-up the oil, if necessary, only through the dedicated unidirectional valve mounted on the rear head, by means of an oil syringe. Excess oil will be ejected through a small drain hole on the tank.

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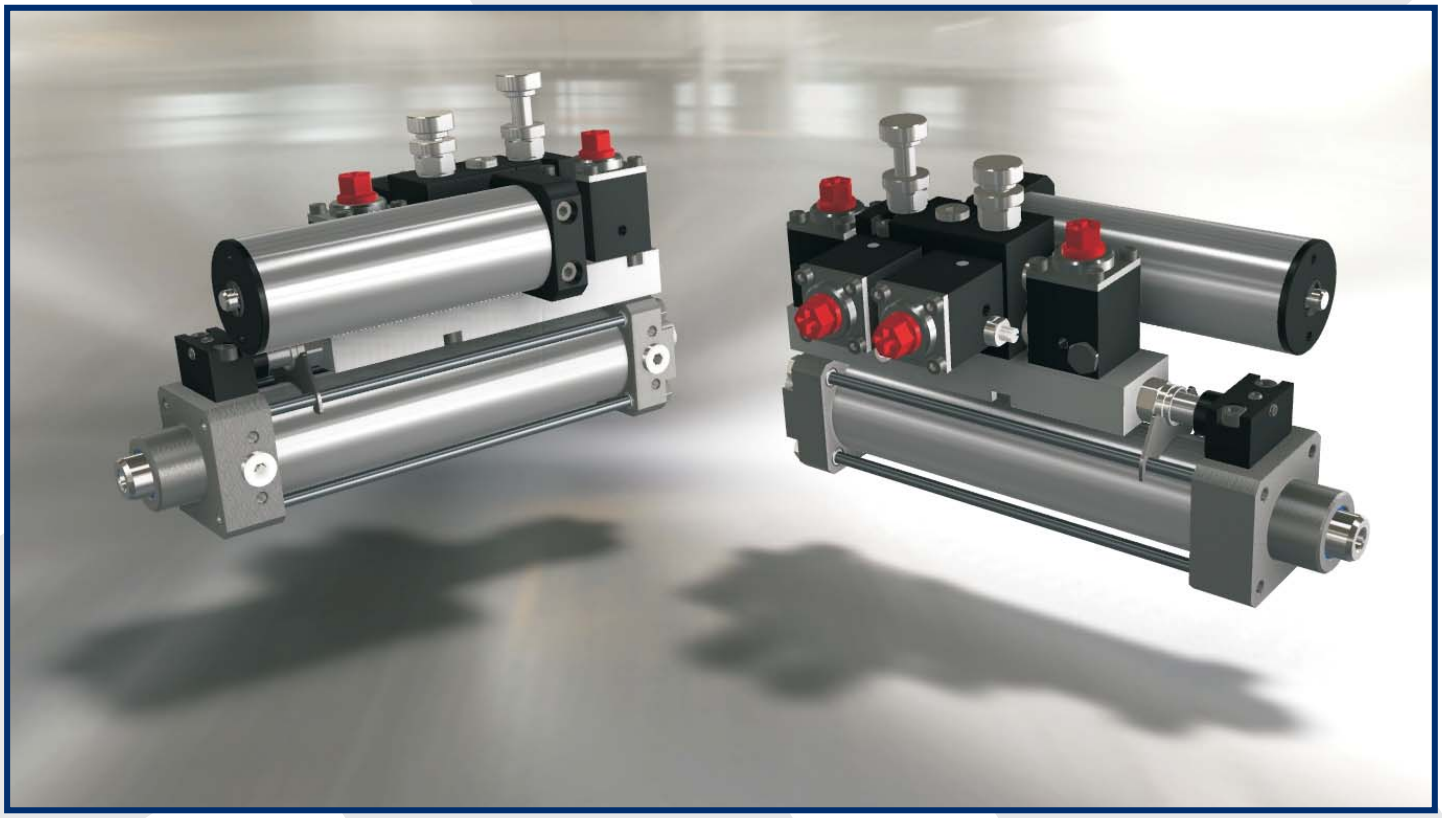


HYDRAULIC SPEED GOVERNORS

Requirements

The hydraulic speed governor is a closed-circuit system, coupled – as a rule – with a pneumatic cylinder. This device is used to adjust and standardise the speed of a linear actuator, and can be installed also on systems other than cylinders.

Characteristics

This system exploits oil incompressibility: flowing through a flow regulator, it absorbs and neutralizes any speed variation in the connected system, which can be either a pneumatic cylinder or another device.
Hydraulic speed governors can split, by means of suitable procedures, the different processing stages, and make it possible to approach the pieces more quickly, to speed-up or slow-down the processing steps, to accelerate the approach to the next piece, to complete other slow working stages etc.

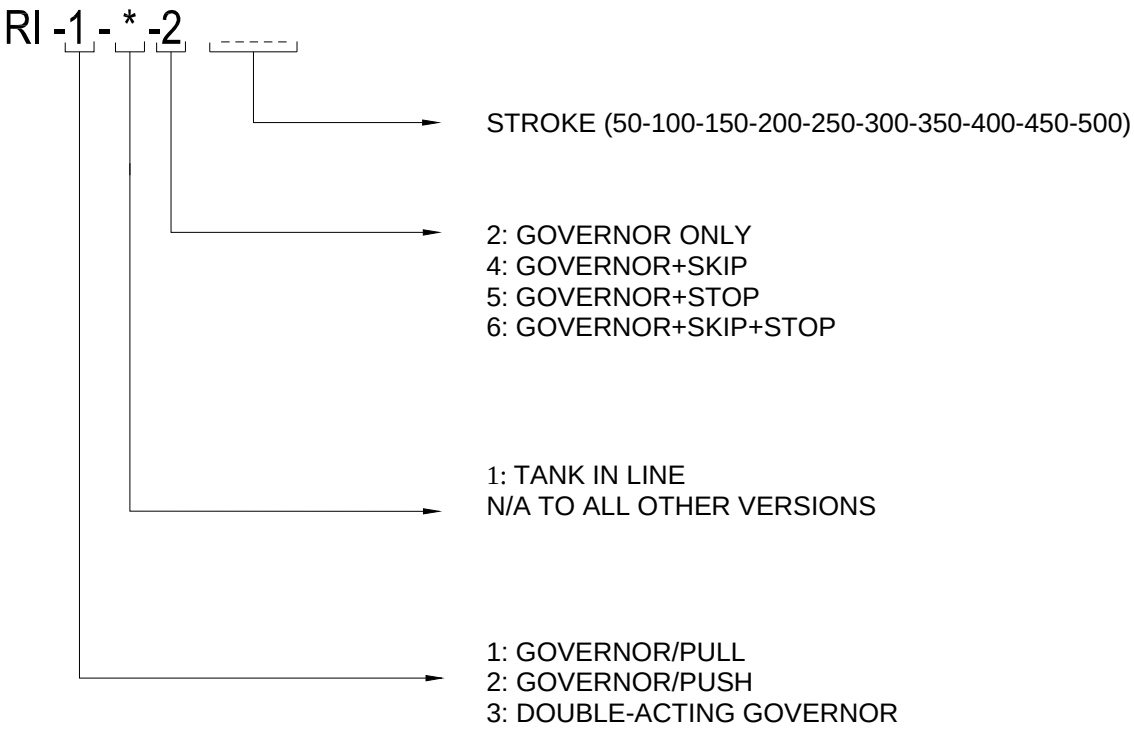
Operating principle

The operating principle of hydraulic speed governors is based on oil incompressibility: flowing from the front to the rear chamber (or vice-versa), through a flow regulator, it absorbs and neutralizes any speed variation in the linear actuator connected to it.
Hydraulic speed governors can split, by means of suitable procedures, the different processing stages, and make it possible to approach the pieces more quickly, to speed-up or slow-down the processing steps, to accelerate, for example, the approach to the next piece (using by-pass valves known as skip valves); furthermore, they can be equipped with stop valves to clamp and hold all the moving pieces connected to them. The skip and stop valves are 2-way pneumatic glove valves; as a rule both of them are open, and therefore pneumatic pressure must be provided in order to shut-off the skip valve and turn-on the stop valve. The skip valve is provided with an auxiliary maximum speed governor. The governors' stems are provided with a threaded hole (M10x1.5) for clamping, while in order to secure speed governors to the machine or cylinder, you can use the threaded holes available on front heads (M6), coupled with optional connecting plates.
All speed governors are provided with an auxiliary tank, to offset the volume difference between the two chambers (due to the presence of the stem in the front chamber) and to refill the unit after the leaks (even minimum) between the stem and its gasket.
A piston inside the tank is pressed by a spring which ensure a slight overpressure within the system. Furthermore, a dip stick protrudes from the tank, to indicate minimum oil level.

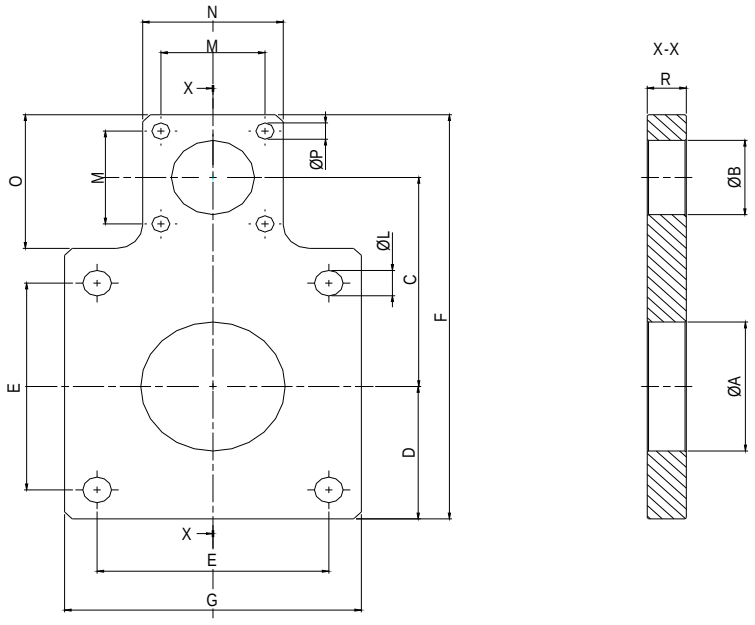
General characteristics:

Heads	**Aluminium**
Liner	**Drawn steel**
Tie rods	**Galvanised steel**
Stem	**Chromium-plated steel C43**
Piston	**Aluminium**
Piston gasket	**NBR or Viton**
Stem gasket	**Polyurethane**
Adjusting units	**Stainless steel**
Skip and stop valves	**Aluminium**
Circuit oil	**Hydraulic oil, viscosity: 2.9E – 50°C**
Max. load	**600 kg**
Min. and max. speed	**60 – 10000 mm/min**
Working temperature	**-10°C +70°C**
Min. actuating pressure of skip and stop valves	**4 bar**

Coding key:


RI -1 - * -2 -----
STROKE (50-100-150-200-250-300-350-400-450-500)
2: GOVERNOR ONLY
4: GOVERNOR+SKIP
5: GOVERNOR+STOP
6: GOVERNOR+SKIP+STOP
1: TANK IN LINE
N/A TO ALL OTHER VERSIONS
1: GOVERNOR/PULL
2: GOVERNOR/PUSH
3: DOUBLE-ACTING GOVERNOR

Cylinder adapter plate (ISO)



Code	ØA F11	ØB F11	C	D	E	F	Minimum stroke: 50mm				O	ØP	R
4-1585-49-40	35.5	32	60	27	38	114	54	7	40	-	-	7	10
4-1585-49-50	40.5	32	65	32	46.5	124	64	9	40	54	56	7	10
4-1585-49-63	45.5	32	71.5	38.5	56.5	137	77	9	40	54	57.5	7	15
4-1585-49-80	45.5	32	80	47	72	154	94	11	40	54	57.5	7	15
4-1585-49-100	55.5	32	90	57	89	174	114	11	40	54	57.5	7	20

Maintenance

The hydraulic speed governor is a closed circuit system, and therefore no factors can negatively affect its operation. Be careful with the hydraulic oil level, for it must never drop below the minimum level indicated by the drip stick of the auxiliary tank. Otherwise, cavitation or air bubbles inside the circuit would hinder system regulation. Top-up the oil, if necessary, only through the dedicated unidirectional valve mounted on the rear head, by means of an oil syringe. Excess oil will be ejected through a small drain hole on the tank.

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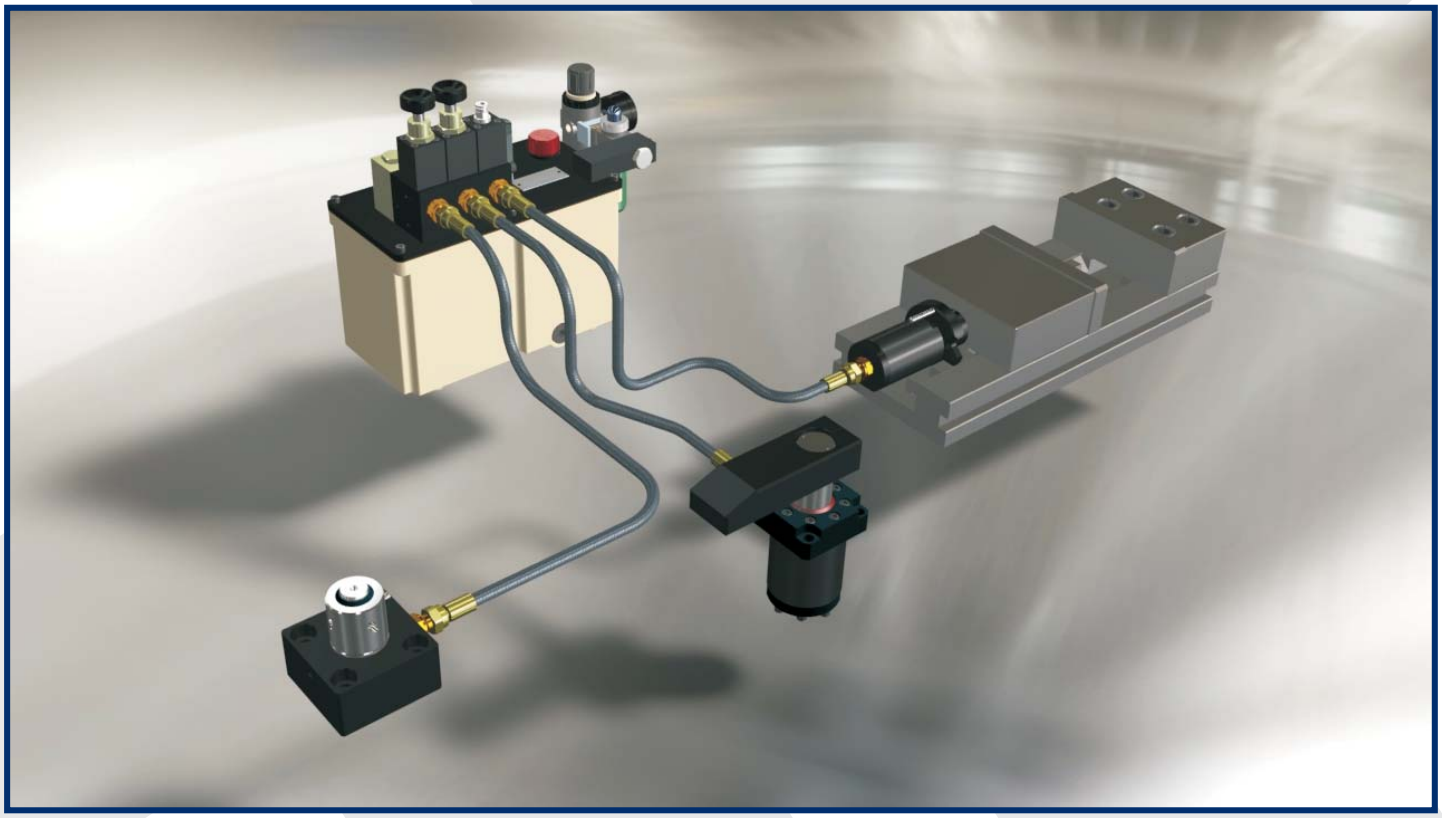


HYDRAULIC POWER LOCKING UNIT

HYDRAULIC POWER LOCKING UNIT 5-1563

Requirements

The system consists of hydropneumatic power unit **5-1563-*-***, that shall be provided with distribution blocks (see the relevant specific documents).
This device can be used for all hydraulic applications requiring constant flow-rate, because – owing to its peculiar nature, it can produce a pulsing hydraulic flow.
Figure 1 shows a typical application of the hydraulic locking power unit **5-1563-*-***, complete with 3 hydraulic control blocks: The first one is a basic pneumatic control (**2-1403-0)**, the second one is an additional pneumatic control (**2-1405-0**) while the third is an additional manual control (**2-1406-0**).

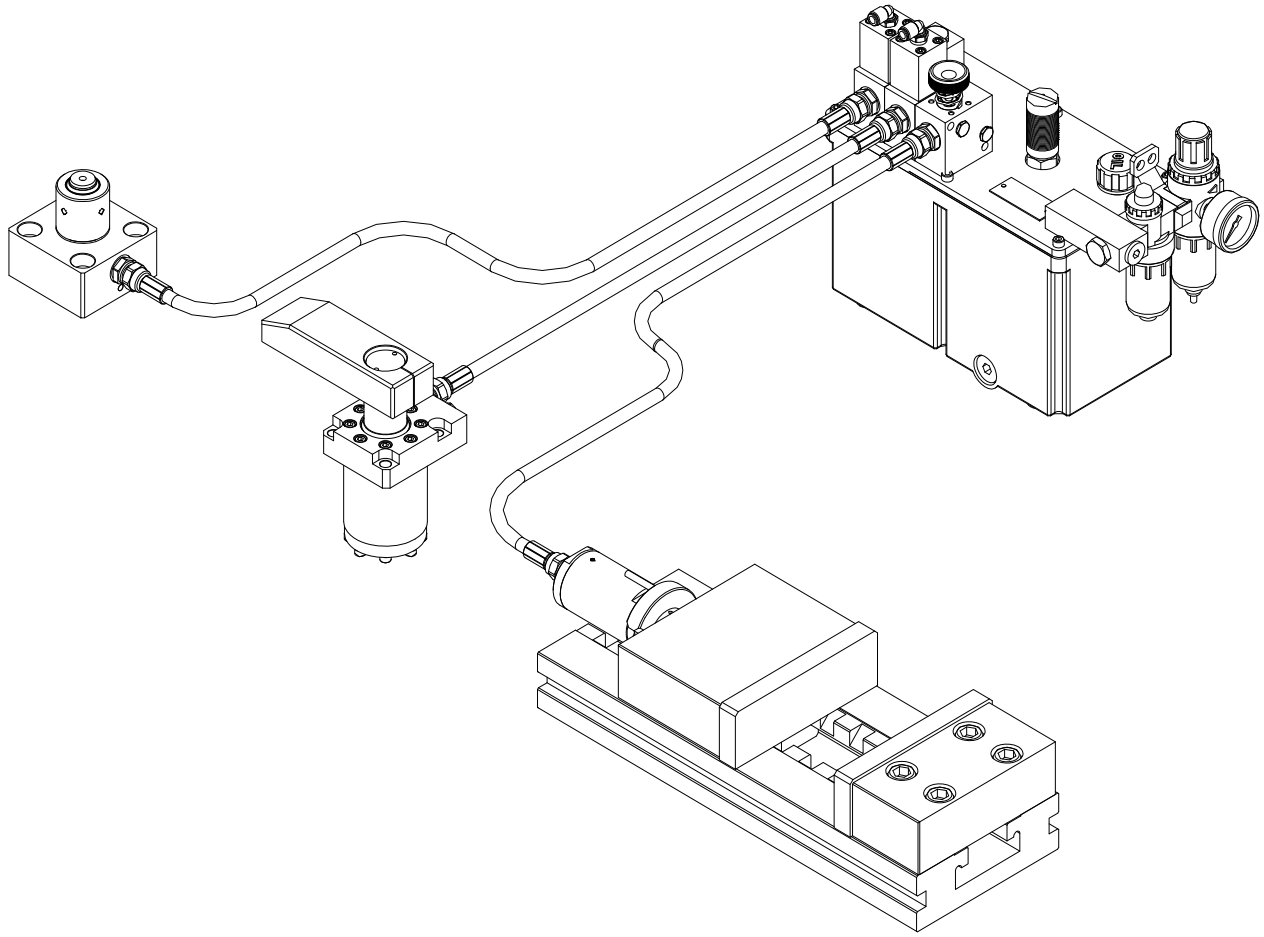


fig.1

Characteristics

In addition to its extremely reduced overall dimensions, this system can maintain the internal pressure of the connected hydraulic devices without using electric motors, because the power unit is equipped with a pneumatic engine.
The modular design of this device makes it possible to increase the number of the independently-controlled device, up to a maximum of six.
The hydraulic distributors available on these power units are fit for controlling single-acting hydraulic systems; if you wish to control a double-acting system, use also two distributor blocks for every single device or 4-way control blocks.
These power units are available in five versions, that differ by the maximum pressure which can be reached.
Furthermore, they are available with a Nylon or painted aluminium tank.
Owing to their peculiar structural characteristics, these power units can be used also under heavy environmental conditions, in the presence of dust, vapours, chips etc.

Hydraulic diagrams

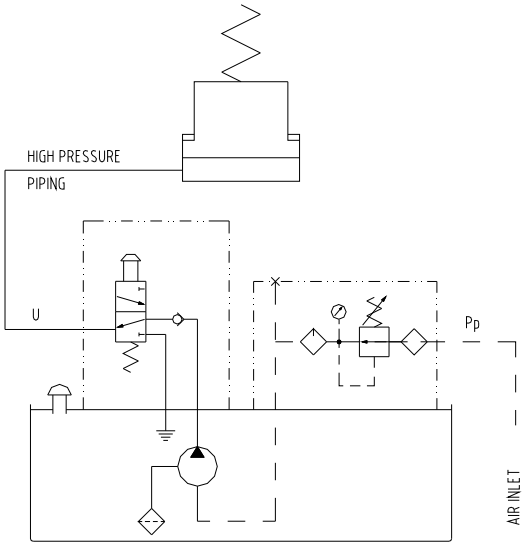


fig.2

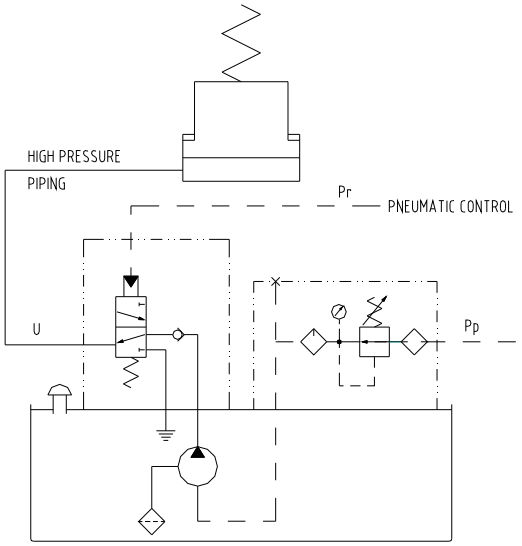


fig.3

Figure 2 shows the hydraulic diagram of power unit **5-1563-*-***, with manual control distributor **2-1398-0**, while figure 3 shows power unit **5-1563-*-***, with pneumatic control distributor **2-1403-0**.
The connection to the device is very simple: directly connect the power unit to the hydraulic device by a flexible HP hose, to be connected to the compressed air line.
The symbols used in figures 2 and 3 indicate:
Pp = pneumatic feed, **Pr** = remote pneumatic control inlet, **U** = connection to the hydraulic device.

Operating principle

The hydropneumatic power units' operating principle is based on the difference in section between the hydraulic part and the pneumatic part of the pump mounted inside them: the greater the difference, the more the pressure actually delivered; on the contrary, the greater the hydraulic pressure, the lower the flow-rate provided by the system within the time unit.

Diagram of connections with optional elements

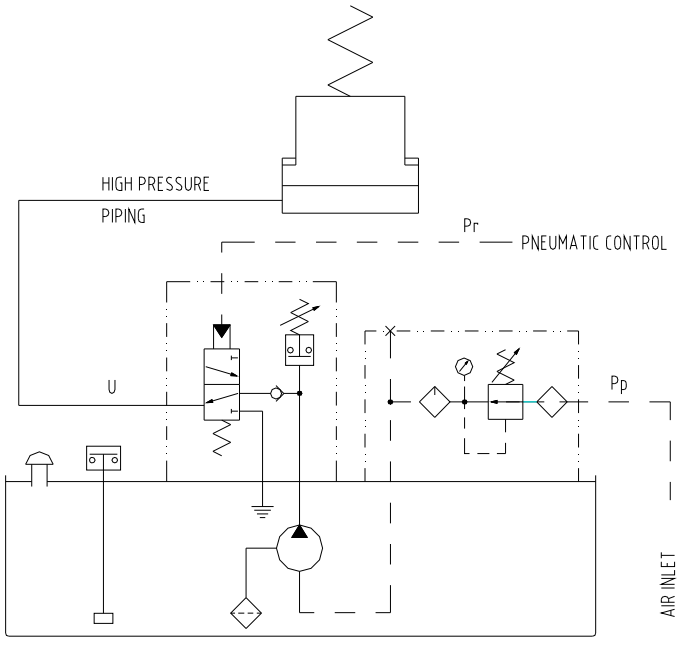


fig. 4

Operation with manual control power unit 5-1563-*-* (diagram in figure 2)

The system shown in the figure must be fed by a compressed airline.
This line feds the hydropneumatic pump mounted on the power unit's tank; the pump, once actuated, conveys oil under pressure to the hydraulic device by a HP pipe.
The pressure delivered by the pump is based on the pneumatic feed pressure.
This value is adjusted by a pressure reducer mounted on the power unit.
The pneumatic pressure provided to the power unit generates a constant pressure; in order to discharge the connected devices, press the push-button located on the hydraulic control block mounted on the power unit cover.
Press this push-button to switch the distributor box located inside the block. The distributor box switching stops the hydraulic flow from the hydropneumatic pump, connects the hydraulic device to the power unit's discharge and allows the oil under pressure to freely flow into its tank.
To put the hydraulic device connected to the power unit under pressure again, simply pull the control block's push-button upwards. The box inside it moves and locks the discharge line, and connects the hydropneumatic pump's delivery line to the device connected to the power unit.
In a plant consists of several devices (up to six per power unit), the pressure drop in the common delivery line to the different blocks does not affect the locking pressure of the devices under pressure,
owing to the non-return valves positioned between every single block and the common delivery line to the hydropneumatic pump.

Operation of pneumatic control power unit 5-1563-*-* (diagram in figure 3)

The operating principle is substantially the same, except for the installation of one or more remote pneumatic control distributors, instead of those controlled by means of a push-button.
The pneumatic control of the power unit's distributor box makes it possible to actuate the distributor directly from a switchboard, by means of a 3-way pneumatic electrovalve; otherwise the box can be controlled by a pneumatic pedal or a manual-control pneumatic valve.
The use of the pneumatic control is highly recommended whenever the power unit is located in a difficult access site (e.g. work areas of machine tools).

Optionals (diagram in figure 4)

All types of power unit can be provided (on demand) with an electric level switch and a MP pressure switch.
The level switch – that can be provided with either a normally open or a normally closed contact – must send an emergency signal to the machine where the system is installed, whenever the oil level in the power unit drops below the minimum, to prevent any sudden lack of pressure in the hydraulic devices.
This function is performed also by the MP pressure switch, that will allow operation providing that hydraulic pressure is available on the common delivery line to the distributor blocks.
Regarding the pneumatic-control power unit, the pressure switch indicates that pressure is available also when the power unit is switched to the discharge mode, because the pressure switch is mounted upstream of the distributor unit; in this case it is advisable to install an electric control circuit to prevent operation of the systems coupled to the power unit when the latter is in discharge mode.

Power unit 5-1563-*-* + 2-1398-0 (figure 5)

Figure 5 shows the external view of manual-control power unit **5-1563-*-***.
The device consists of a semi-transparent nylon or painted aluminium tank (capacity: approx. 2.5 liters) and an anodized aluminium cover, on which the filer-reducer-lubricator unit, the hydropneumatic pump's exhaust silencer, the fill cap, the electrical connector of the level switch (if any) and the hydraulic distributor unit are secured.

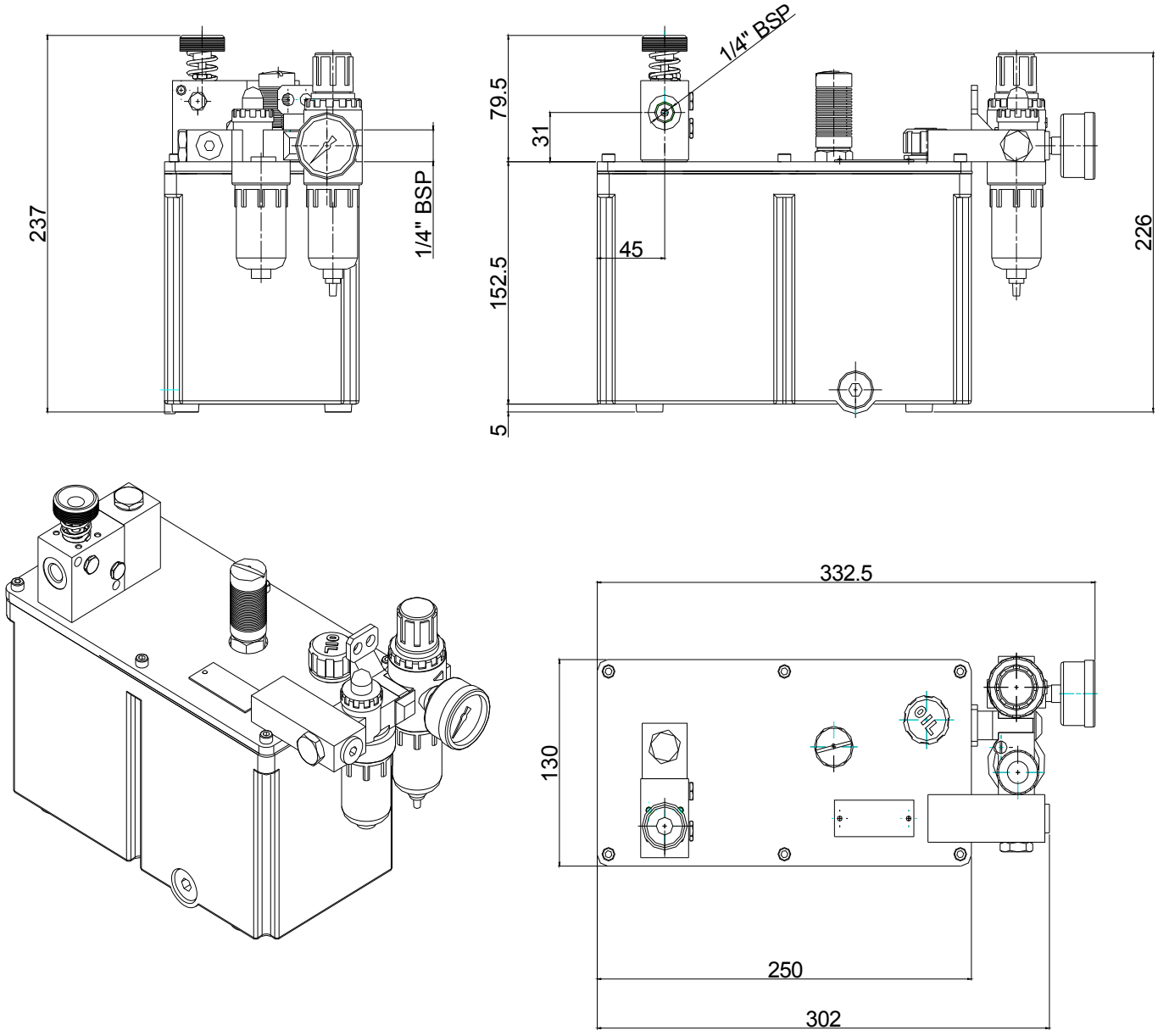


fig.5

Power unit 5-1563-*-* + 2-1403-0 (figure 6)

Figure 6 shows the external view of pneumatic-control power unit **5-1563-*-***.
The elements of this power unit are the ones used for the manual-control power unit, except for the hydraulic discharge unit, which is provided with a small pneumatic control cylinder, instead of a manual push-button.

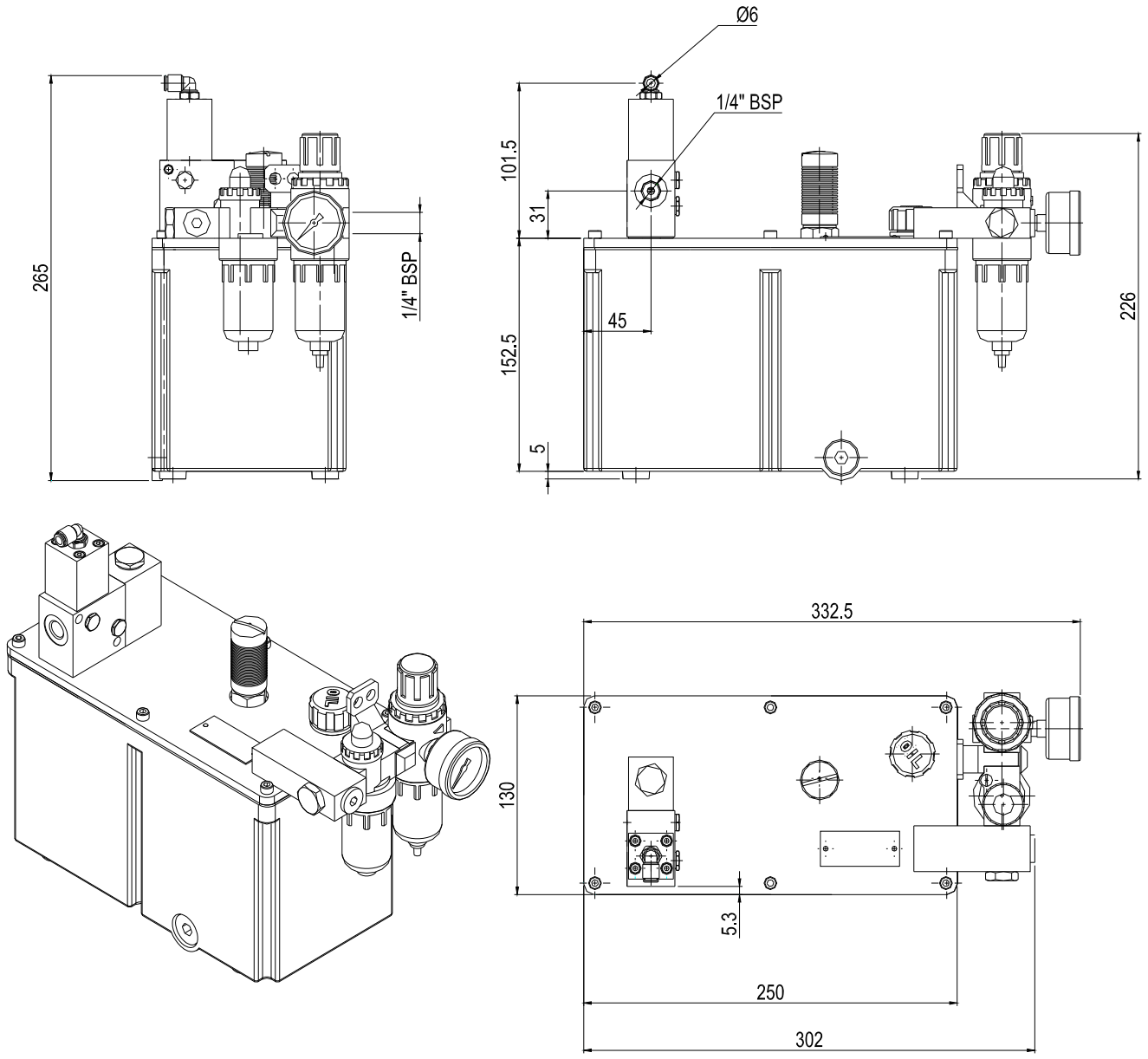


fig.6

Technical data

MAXIMUM OIL VISCOSITY	**10° Engler**
MAXIMUM OIL TEMPERATURE	**90°C**
AMBIENT TEMPERATURE	**-10 +50°C**
MINIMUM ENSURED CAPACITY OF THE POWER UNIT	**0,06 l/1'**
MIN. PNEUMATIC FEED PRESSURE	**1.5 bar**
MAX. PNEUMATIC FEED PRESSURE	**7 bar**
DIAMETER OF PNEUMATIC FEED INLET	**1/4" G.**
DIAMETER OF HYDRAULIC DUCT CONNECTION	**1/4" G.**
MINIMUM PRESSURE/RETURN ON THE BLOCK	**500 bar**
MAXIMUM PERMISSIBLE VOLTAGE ON LEVEL SWITCH	**50 W**
MAXIMUM PERMISSIBLE PRESSURE ON PRESSURE SWITCH	**42V. 4A. AC 42V. 2A. DC**

Useful installation tips

If you decide to install a hydraulic locking system with hydropneumatic power units, do not forget a few general considerations:
- The piping which connects the power unit to the hydraulic devices must be of the HP type.
- The hydraulic devices must consist of components fit for the pressure delivered by the power unit.
- Use oil **CASTROL HISPYN AWS 68** to prevent unexpected wear.
- The power unit must be mounted in horizontal position, as near as possible to the devices.
- The piping that, starting from the power unit, transmits pressure to the devices can be either rigid or flexible, providing that the duct is of the HP type.
- The compressed air which feeds the pump must be dry and properly lubricated (a drop of oil every about twenty pump strokes of the power unit).
- It is advisable to position the power unit in a position easy to reach, so as to facilitate maintenance operations (oil topping up, condensate drainage etc.).
- The oil used in the power unit must be perfectly filtered, since the suspended metal particles would cause irreparable damage to the system; in any case, the oil viscosity must not exceed the maximum expected viscosity.
- During the first start-up of the system, it could be imperative to fire the pump; to do this, simply reset the pneumatic feed pressure by the reducer connected to the power unit; then unscrew the hexagonal drain cap (using a 11mm wrench) mounted on the side of the hydraulic block; then put the power unit under pressure gradually, up until the oil overflows from the seat of the removed cap. Then reset the pneumatic pressure and mount the hexagonal cap; make sure that the cap seal is positioned properly.
- We recommend that you do not use liquid Teflon for the assembly of connecting joints between the device and the power unit; where you cannot use metal-rubber washers, we recommend that you adopt conical thread fittings and use a Teflon tape for sealing.

Air-oil compression ratios

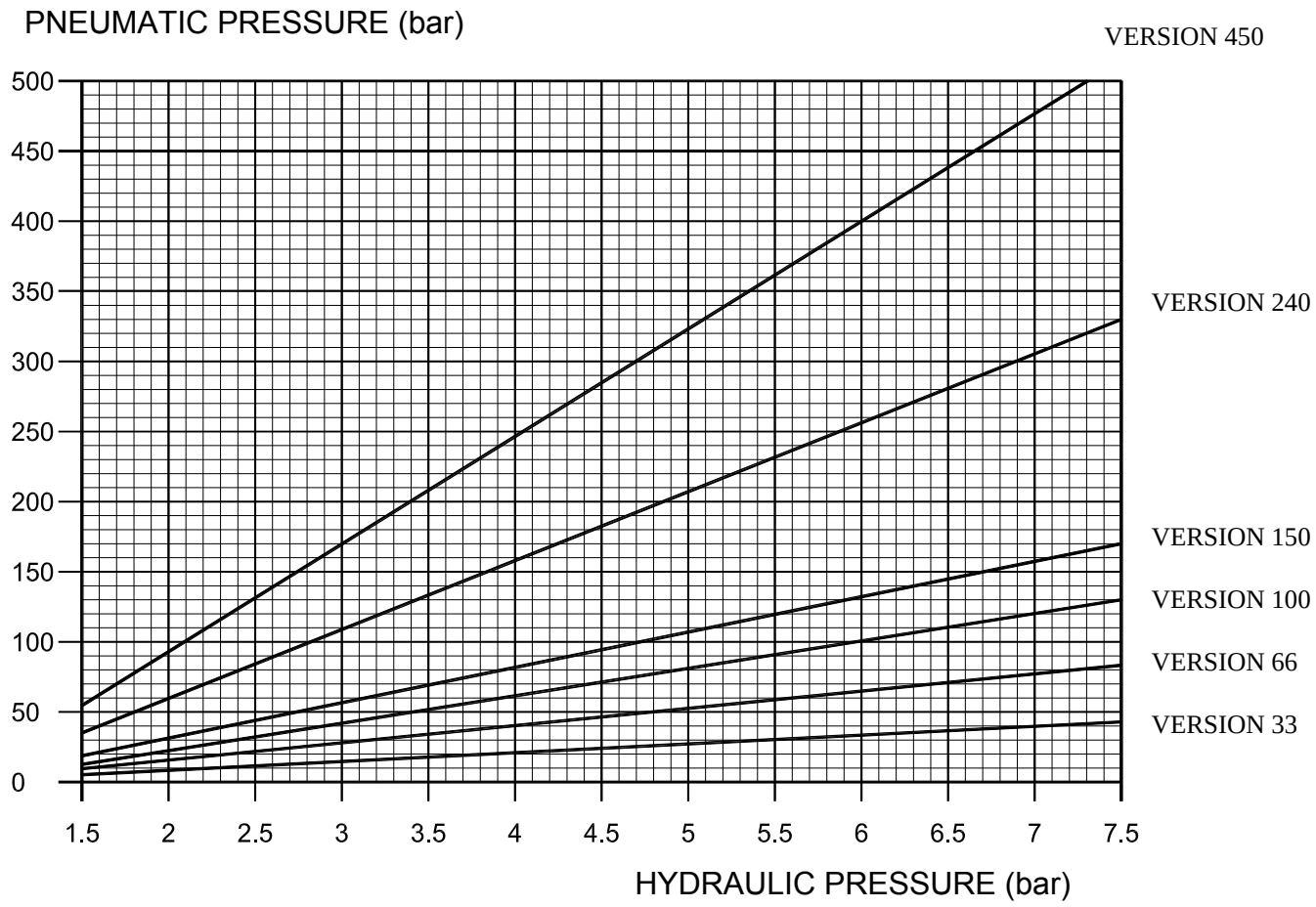


fig.7

Figure 7 shows the graph of air-oil compression ratios for the six versions of hydropneumatic pumps designed for hydropneumatic power units **5-1563-*-***.

Order codes

The table below indicates the order code for a manual-control hydropneumatic power unit (maximum operating pressure: 450 bar), provided with semi-transparent nylon tank (standard version)

A	B	C
5-1563-	**450**	**P**

Field **"A"** specifies the type of device: **5-1563 = HYDROPNEUMATIC POWER UNIT**

Field **"B"** indicates the type of pump: **33 = ACHIEVABLE PRESSURE 33 bar (PUMP 1-1396-F)**
66 = ACHIEVABLE PRESSURE 60 bar (PUMP 1-1396-E)
100 = ACHIEVABLE PRESSURE 100 bar (PUMP 1-1396-D)
150 = ACHIEVABLE PRESSURE 150 bar (PUMP 1-1396-C)
210 = ACHIEVABLE PRESSURE 210 bar (PUMP 1-1396-B)
450 = ACHIEVABLE PRESSURE 450 bar (PUMP 1-1396-A)

Field **"C"** indicates the type of tank: **P = NYLON TANK (STANDARD)**
A = ALUMINIUM TANK (SPECIAL)

The code resulting from the example specified above is: **5-1563-450-P**.

Please specify in the order also the number and code of the modular blocks mounted on the power unit (max. 6). For the codes and characteristics of the above mentioned blocks see the relevant documents.

Possible failures during start-up

EFFECT		The power unit does not start
CAUSE	1	The power unit's pressure reducer is set to 0 bar
	2	The compressed air line is closed or clogged
REMEDY	1	Screw the pressure reducer’s knob clockwise
	2	Check the compressed air line upstream of the power unit

EFFECT		The power unit functions slowly
CAUSE	1	The pressure reducer connected to the power unit is calibrated at less than 1.5 bar
	2	A pressure reducer calibrated at less than 2 bar is positioned upstream of the power unit
	3	There's a choke on the line upstream of the power unit (e.g. bent or crushed pipe)
	4	The control unit has reached the balance pressure between incoming pneumatic pressure and delivered hydraulic pressure
REMEDY	1	Bring the reducer to a pressure above 2 bar
	2	Bring the reducer to a pressure above 2 bar
	3	Check the power unit's pneumatic duct
	4	Normal phenomenon

EFFECT		The power unit functions normally but there is no hydraulic flowrate
CAUSE	1	The oil level in the tank is insufficient
	2	The pump is off
	3	The suction filter is clogged
REMEDY	1	Pour some oil into the tank, and then start-up
	2	Start-up as indicated above
	3	Disassemble the power unit cover from the tank, unscrew filter from the suction union and clean thoroughly; re-assemble the unit and carry out the drainage procedure, if necessary

EFFECT		The pressure in the circuit is insufficient/the power unit is pumping continuously
CAUSE	1	Leak in the hydraulic circuit
REMEDY	1	Carefully inspect the hydraulic circuit and, if necessary, tighten again or replace the unions or the pieces with leaks of hydraulic fluid

Spare parts of power unit 5-1563-*-*

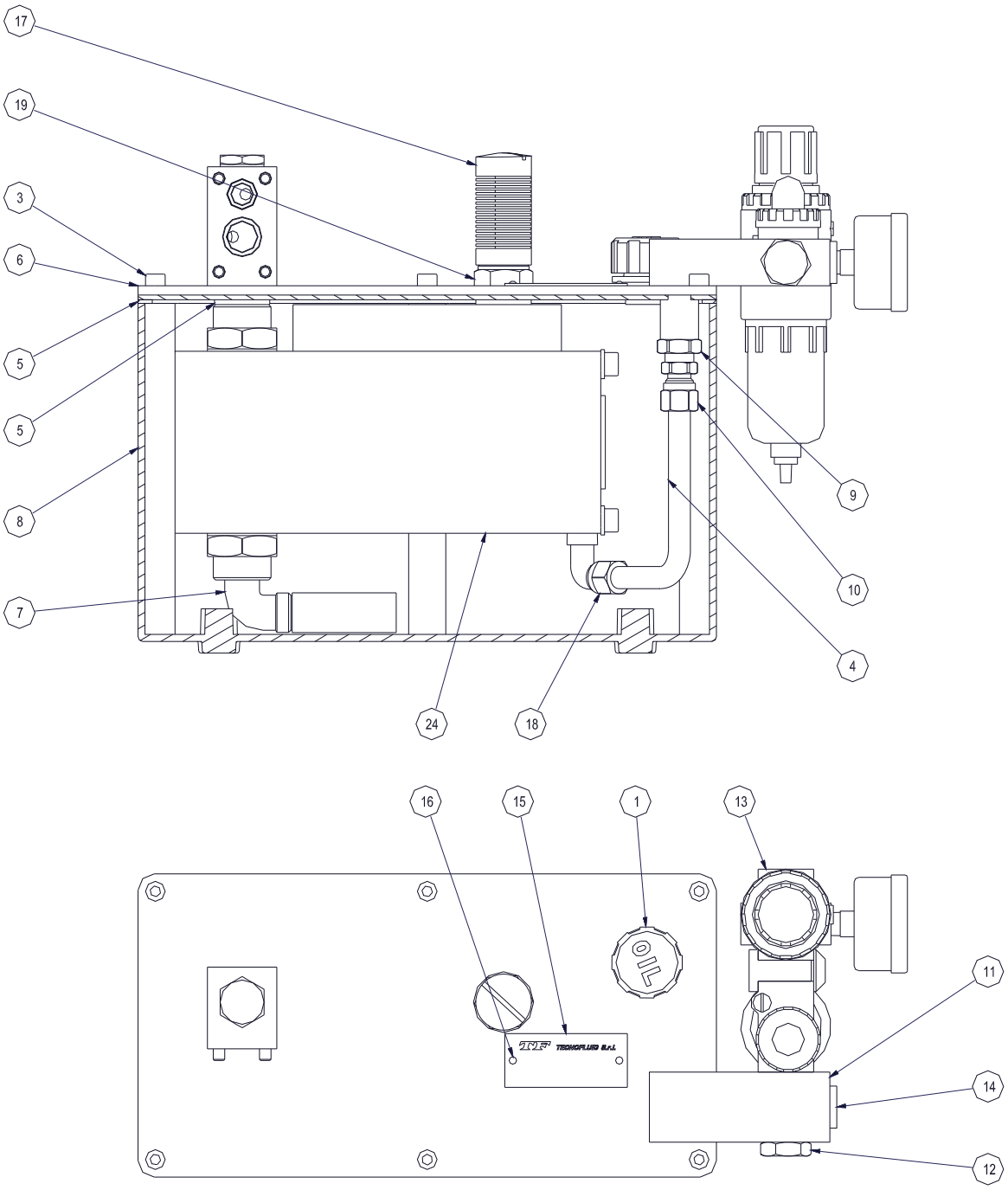


fig.8

Figure 8 shows an exploded view of power unit **5-1563-*-***, where all its components are numbered.
The spare parts' list also includes the quantities of the items required for completing a single unit.
For the list, see page 11.

Spare parts' list for power unit 5-1563-*-* (see the exploded view in figure 8)

POS	NAME	Q.TY	ORDER CODE
1	FILL CAP 1/2"G. SPLASH GUARD	1	TCAR 12 30 P
2	PLASTIC CAP WITH STOP 3/8"	1	TCBP 38 G
3	HEX. SOCKET HEAD SCREW M5x16 UNI 5931	6	VTCE 5 16
4	NATURAL SMOOTH RILSAN PIPE 6-8	1	TU PN 8 6 LN
5	PAPER SEAL FOR TANK 3 P	1	GCA 1
6	COVER	1	5-1399-1
7	SUCTION FILTER 3/8" G.	1	5-1522-0
8	NYLON/ALUMINIUM TANK (3 LITRES)	1	SERB 3 P / 3 A
9	PNEUM EXTENSION 1/4"G. Lg 35	1	PROL 14 35
10	PNEUMATIC FITTING WITH DIR 1/4 T8 OGIVA	1	RAPD 14 08 2
11	PNAUMATIC BLOCK	1	5-1399-4
12	LOCKING SCREW	1	5-1399-5
13	FILTER (REG+LUBR+MAN) 1/4"	1	FRL 14 P
14	PNEUM CAP 1/4+SEAL	1	TC 14 P
15	PUMP PLATE 1 1194	1	TARGH 1194
16	STEEL NAIL Ø1.9x5	2	CH A 1.9 5
17	DYNAMIC SILENCER 3/8" G.	1	SIL 38 D
18	PNEUMATIC FITTING WITH RUB 1/4 T8 OGIVA	1	RAPG 14 08 2
19	PNEUM EXTENSION 3/8" Lg 23.5	1	PROL 38 23.5
20	ROND BONDED 3/8 Sp. 2.1	2	RTMG 38 1
21	ADAPTER	1	2-1398-7
22	OR 3062 15.54x2.62 NBR 70	1	PARK 2-114
23	OR 3050 12.37x2.62 NBR 70	2	PARK 2-112
24	HYDROPNEUMATIC PUMP	1	1-1396-*-0
25	MANIFOLD/COLUMN UNIT	1	5-1563-1

NOTES

THE HYDROPNEUMATIC POWER UNITS DESCRIBED IN THIS FILE HAVE BEEN DESIGNED AND MANUFACTURED ACCORDING TO CRITERIA AIMED AT PREVENTING ANY DAMAGE TO PEOPLE AND PROPERTY; ANYWAY, SINCE THESE HYDROPNEUMATIC POWER UNITS ARE PRESSURE GENERATORS, ANY IMPROPER USE OF THIS DEVICE MAY BE POTENTIALLY DANGEROUS.

THREE-WAY MANUAL CONTROL HYDRAULIC BLOCK

Requirements

This system consists of a three-way hydraulic distribution block (**2-1398-0**).
This device has been designed to control the hydraulic pressure delivered by hydraulic power units (**5-1563-*-0**). Therefore, a **5-1563** power unit is required to use the three-way distribution block (**2-1398-0**). For their technical characteristics, see the relevant technical documentation.
This device has been designed to control a single pressure line, and therefore is fit for single-acting cylinders.

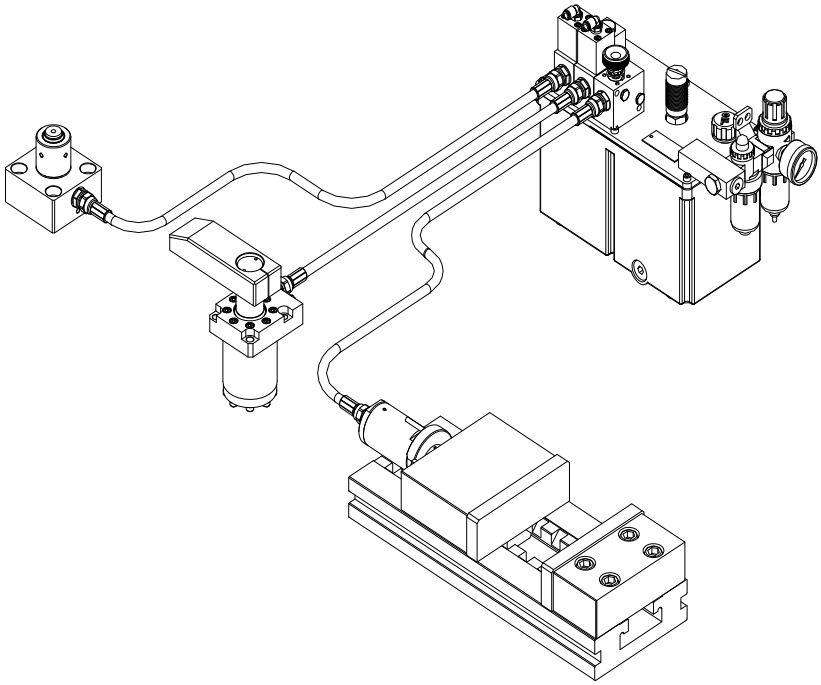


fig.1

Characteristics

Owing to its structural characteristics this system ensures the control of a hydraulic line and makes it possible to hold pressure even when the pressure in the rest of the system is lower, because oil is needed by another application. The system modularity also makes it possible to handle more pressure lines (up to a maximum of 6 elements).

Hydraulic system

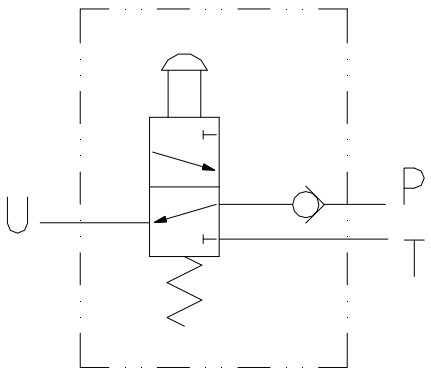


fig.2

Figure 2 shows the block's hydraulic diagram (**2-1398-0**) in the spring return version.
The basic version is under examination: the block is mounted directly on the pressure intake flange of the hydraulic power unit. An additional modular version can be mounted on this basic block. The additional block's code is **2-1406-0**.
The symbols used in figure 2 shall be interpreted as follows:
P = Pressure line (from the power unit), **T** = Discharge line (to the power unit), **U** = connection to the hydraulic device.

Operating principle

This distributor exploits the motion of a distribution box that slides along its guide sleeve and covers/uncovers the openings which connect the delivery, use and discharge lines. A unidirectional vale is positioned upstream of this distribution box, to prevent pressure on the operating line from reaching the delivery line, if the pressure in this line is lower than the one in the pressure line, when hydraulic pressure is need by another hydraulic block mounted on the plant.

Hydraulic diagrams

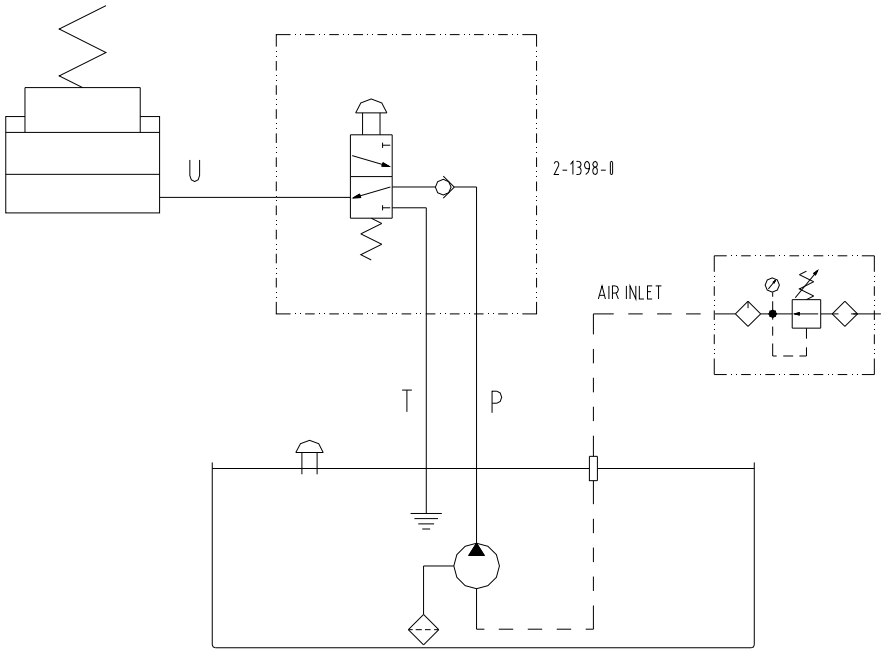


fig.3

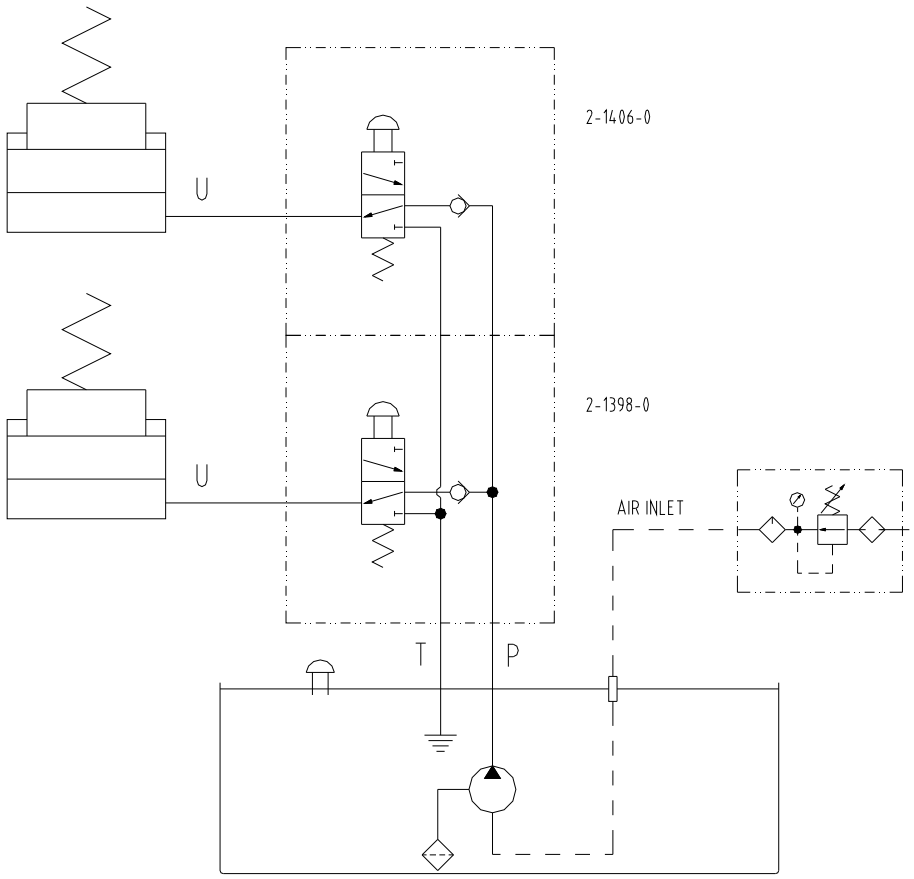


fig.4

Operation of single-use plant **(diagram in figure 3)**

The system shown in the figure is an example of connection of a single collector block (**2-1398-0**) to a hydropneumatic power unit.
In this case the block is connected to a single-acting spring-return cylinder.
In this position the power unit's delivery line is in communication with the cylinder, that is extended and under pressure. When pressing the manual control of block **2-1398-0**,the delivery line is shut-off and the operating line connected to the cylinder is connected to the discharge.
When the button is released, block **2-1398-0** is switched again and the operating line is put under pressure.

Operation of single-use plant **(diagram in figure 4)**

The system shown in the figure is an example of connection of a collector block (**2-1398-0**) to an additional block (**2-1406-0**).
As in the above example, the cylinders connected to delivery lines are usually under pressure.
If the line of the cylinder connected to block **2-1406-0** is switched to the discharge mode, the pressure on the plant's delivery **P** will not change and the other block (**2-1398-0**) will remain under pressure. When the button of the block (**2-1406-0**) is released, the connected cylinder will need some fluid, and a pressure drop will occur on the whole pressure line **P** of the plant. The pressure in the cylinder connected to collector block **2-1398-0** will not drop suddenly, owing to the activation of the internal check valve.

Manual collector block 2-1398-0

This direct-actuation spring-return directional valve is operated when a stem slides vertically inside the seat available in the single-block distributor body. The stem motion is controlled by a push-button integral with the stem.
The valve body is made of steel coated with anti-friction material and passivized to withstand corrosion over the time.
Gaskets are usually made of nitrile rubber, but different compounds can be mounted when necessary.
The cursor and the internal unidirectional valve are made of treated and ground chrome-nickel steel.

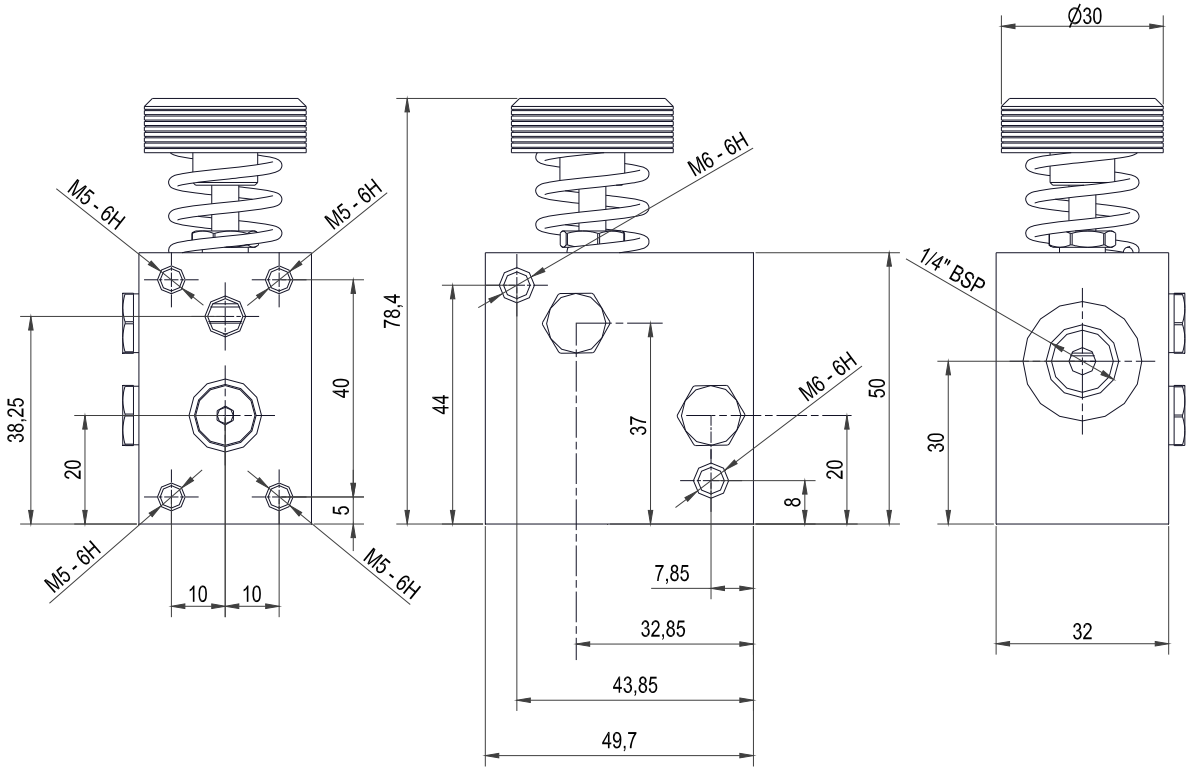


fig.5

Figure 5 shows the external view of collector block **2-1398-0**, with its overall dimensions. The device is secured to the power unit by means of 4 tapped holes (M5). The additional version **2-1406-0** is different from the basic version, but only because the two M6 holes are replaced by 2 through holes (Ø 6.5) for 2 M6 screws, that will clamp the additional distributor unit **2-1406-0** (max. 5 blocks) to collector block **2-1398-0**.

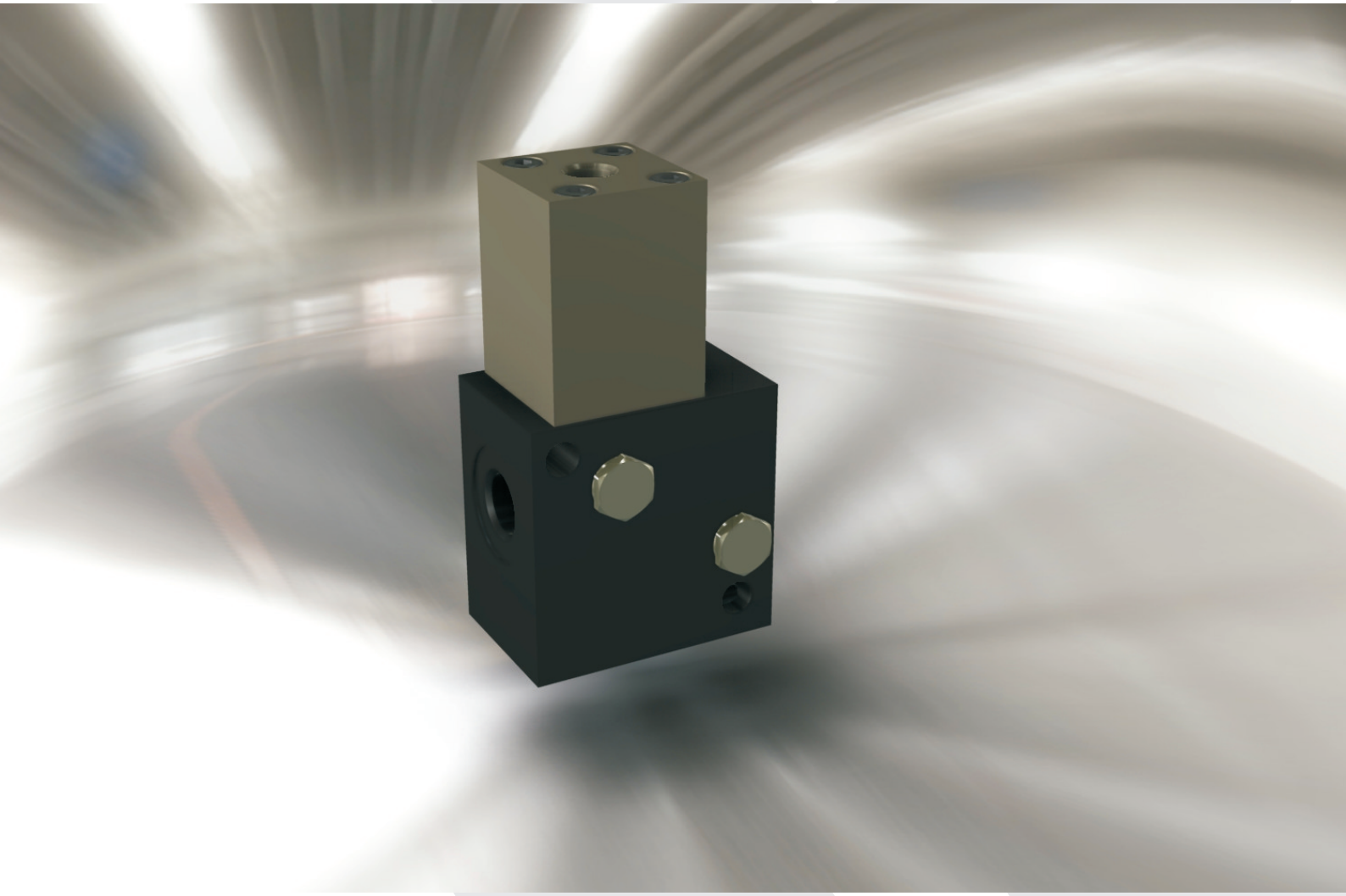
Technical data

MAXIMUM WORKING PRESSURE	**500 bar**
MAXIMUM OIL VISCOSITY	**10° Engler**
MAXIMUM OIL TEMPERATURE	**90°C**
AMBIENT TEMPERATURE	**-10 / +50°C**
CONNECTION DIAMETER	**1/4” G**

NOTES

As specified above, distributor blocks **2-1398-0** and **2-1406-0** have been designed and manufactured for Tecnofluid hydropneumatic power units.
Any other application shall be carefully assessed in cooperation with our technical department.

THREE-WAY PNEUMATIC CONTROL HYDRAULIC BLOCK



Requirements

This system consists of a three-way hydraulic distribution block (**2-1403-0**).
This device has been designed to control the hydraulic pressure delivered by hydraulic power units (**5-1563-*-0**). Therefore, a **5-1563** power unit is required to use the three-way distribution block (**2-1403-0**). For their technical characteristics, see the relevant technical documentation.
This device has been designed to control a single pressure line, and therefore is fit for single-acting cylinders. For cylinders or other devices to be actuated which require a double-acting control, use 2 distributor blocks: one for each line of the item to be actuated.

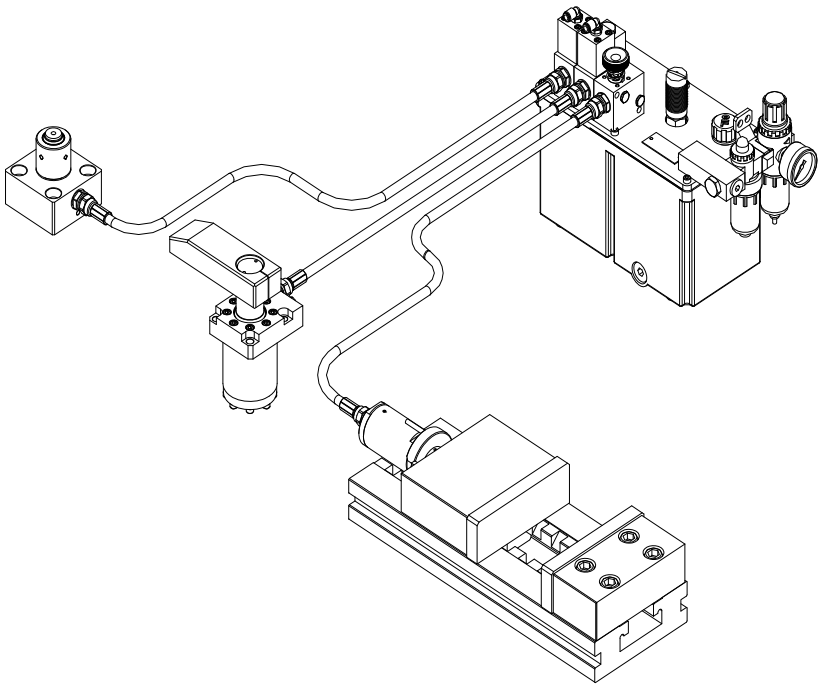


fig.1

Characteristics

Owing to its structural characteristics this system ensures the control of a hydraulic line and makes it possible to hold pressure even when the pressure in the rest of the system is lower, because oil is needed by another application. The system modularity also makes it possible to handle more pressure lines (up to a maximum of 6 elements).

Hydraulic diagram

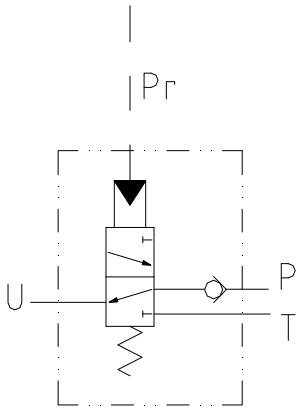


fig.2

Figure 2 shows the hydraulic diagram of block **2-1403-0**.
The basic version is under examination: the block is mounted directly on the pressure intake flange of the hydraulic power unit. An additional modular version can be mounted on this basic block. The additional block's code is **2-1405-0**.
The symbols used in figure 2 shall be interpreted as follows:
P = Pressure line (from the power unit), **T** = Discharge line (to the power unit), **U** = connection to the hydraulic device, **Pr** = Pneumatic driving line (from a 3-way pneumatic directional valve)

Operating principle

This distributor exploits the motion of a distribution box that slides along its guide sleeve and covers/uncovers the openings which connect the delivery, use and discharge lines. A unidirectional vale is positioned upstream of this distribution box, to prevent pressure on the operating line from reaching the delivery line, if the pressure in this line is lower than the one in the pressure line, when hydraulic pressure is need by another hydraulic block mounted on the plant.

Hydraulic connection diagrams

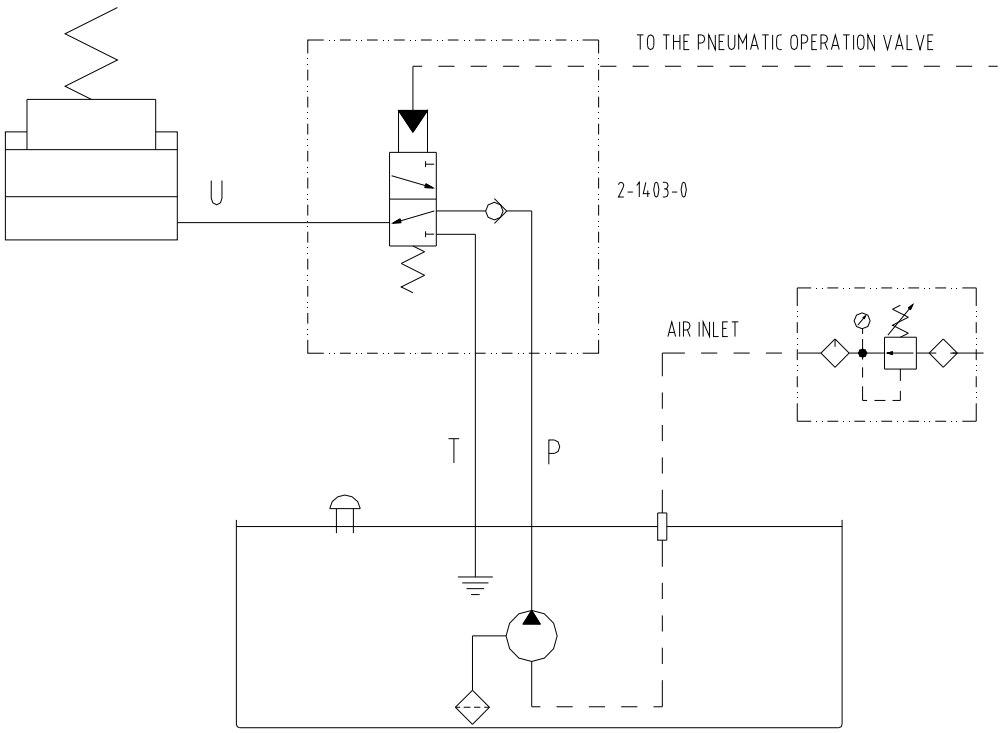


fig.3

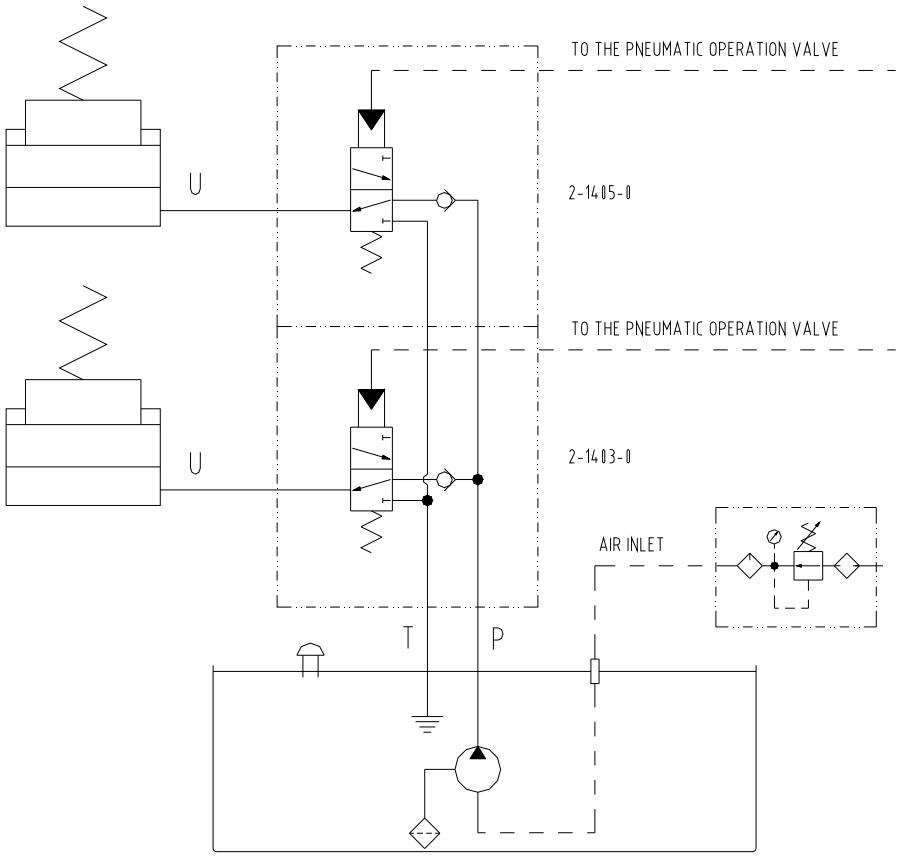


fig.4

Operation of a single-use plant **(diagram in figure 3)**

The system shown in the figure is an example of connection of a single collector block (**2-1403-0**) to a hydropneumatic power unit.
In this case the block is connected to a single-acting spring-return cylinder.
In this position the power unit's delivery line is in communication with the cylinder, that is extended and under pressure. By providing pressure to the pneumatic driving line of block **2-1403-0**, the delivery line is shut-off and the line connected to the cylinder is connected to the discharge.
By letting the pressure on the pneumatic driving line out, block **2-1403-0** is switched again and puts the operating line under pressure again.

Operation of a double-use plant **(diagram in figure 4)**

The system shown in the figure is an example of connection of a collector block (**2-1403-0**) to an additional block (**2-1405-0**).
As in the above example, the cylinders connected to delivery lines are usually under pressure.
If the line of the cylinder connected to block **2-1405-0** is switched to the discharge mode, the pressure on the plant's delivery **P** will not change and the other block (**2-1403-0**) will remain under pressure. By letting out the pressure on the pneumatic driving line of block **2-1405-0**, the connected cylinder will need some fluid, and a pressure drop will occur on the whole pressure line **P** of the plant. The pressure in the cylinder connected to collector block **2-1403-0** will not drop suddenly, owing to the activation of the internal check valve.

Pneumatic collector block 2-1403-0

This pneumatic spring-return directional valve is operated when a stem slides vertically inside the seat available in the single-block distributor body. The stem is moved by a pneumatic piston integral with the stem.
The valve body is made of steel coated with anti-friction material and passivized to withstand corrosion over the time.
Gaskets are usually made of nitrile rubber, but different compounds can be mounted when necessary.
The cursor and the internal unidirectional valve are made of treated and ground chrome-nickel steel.
The liner of the pneumatic drive unit is made of hard oxidized aluminium, like the piston moving inside it, which is anodized only.

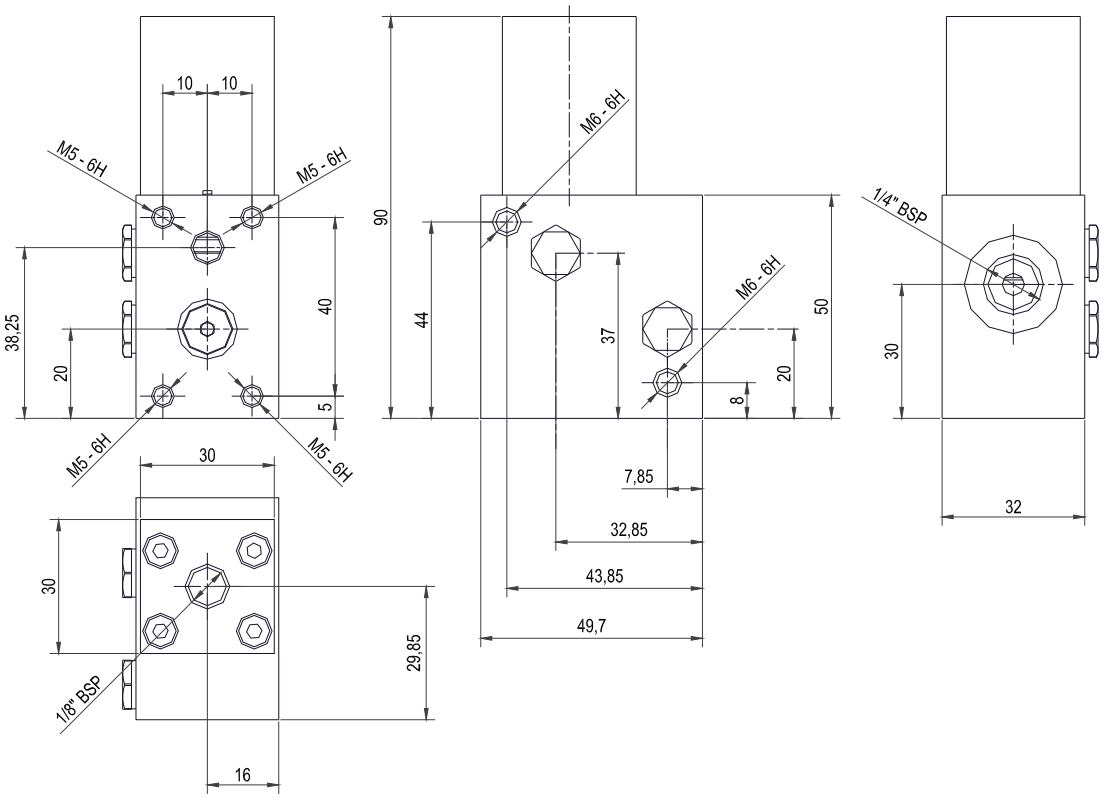


fig.5

Figure 5 shows the external view of collector block **2-1405-0**, with its overall dimensions. The device is secured to the power unit by means of 4 tapped holes (M5). The additional version **2-1405-0** is different from the basic version, but only because the two M6 holes are replaced by 2 through holes (Ø 6.5) for 2 M6 screws, that will clamp the additional distributor unit **2-1405-0** (max. 5 blocks) to collector block **2-1403-0**.

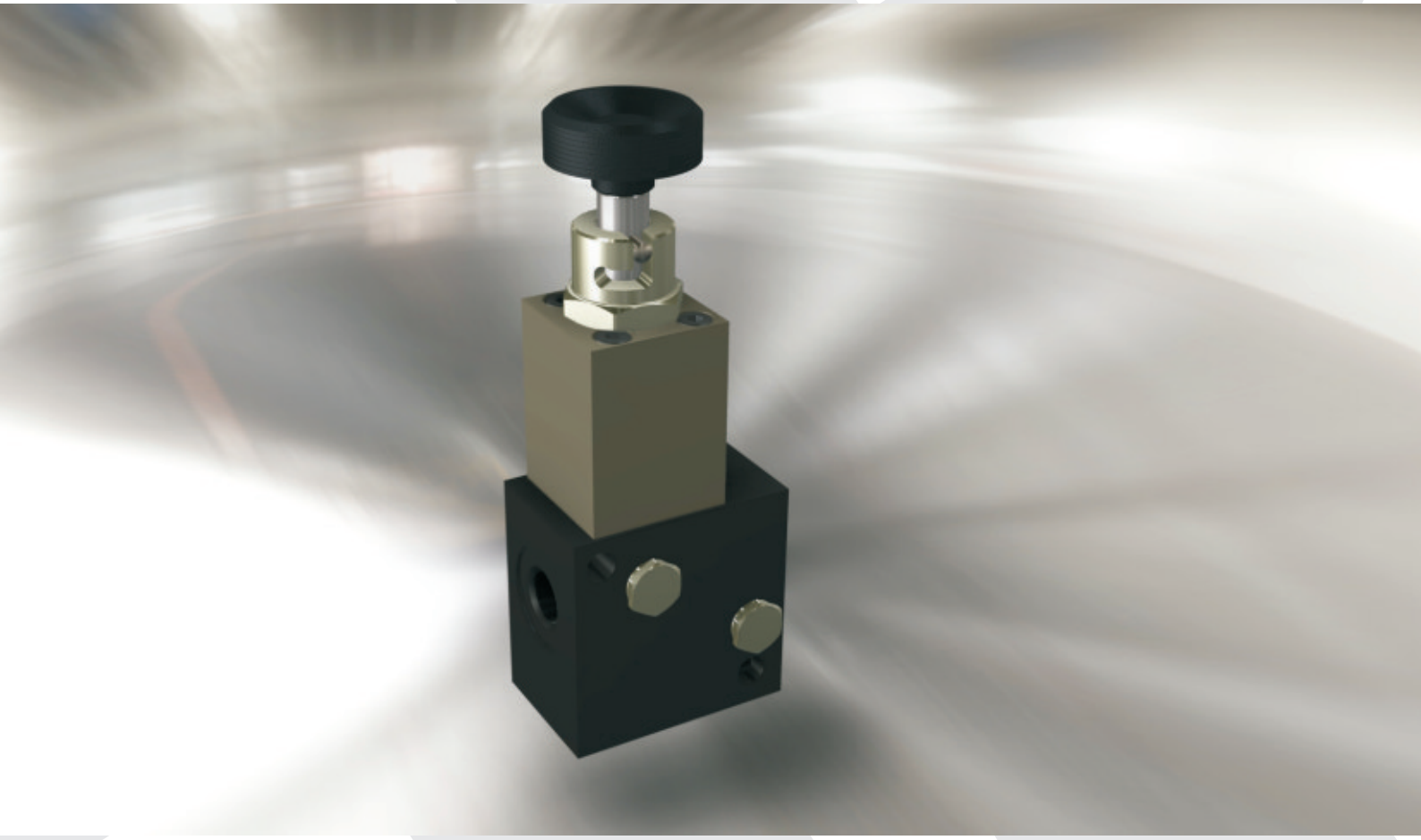
Technical data

MAXIMUM WORKING PRESSURE	**500 bar**
MAXIMUM PNEUMATIC DRIVE PRESSURE	**7 bar**
MAXIMUM OIL VISCOSITY	**10° Engler**
MAXIMUM OIL TEMPERATURE	**90°C**
AMBIENT TEMPERATURE	**-10 +50°C**
CONNECTION DIAMETER	**1/4” G.**
DRIVE CONNECTION DIAMETER	**1/8” G.**

NOTES

As specified above, distributor blocks **2-1403-0** and **2-1405-0** have been designed and manufactured for Tecnofluid hydropneumatic power units.
Any other application shall be carefully assessed in cooperation with our technical department.

THREE-WAY HYDRAULIC BLOCK MANUAL CONTROL AND DETENTOR



Requirements

This system consists of a three-way hydraulic distribution block (**2-1634-0**).
This device has been designed to control the hydraulic pressure delivered by hydraulic power units (**5-1563-*-0**). Therefore, a **5-1563** power unit is required to use the three-way distribution block (**2-1634-0**). For their technical characteristics, see the relevant technical documentation.
This device has been designed to control a single pressure line, and therefore is fit for single-acting cylinders.

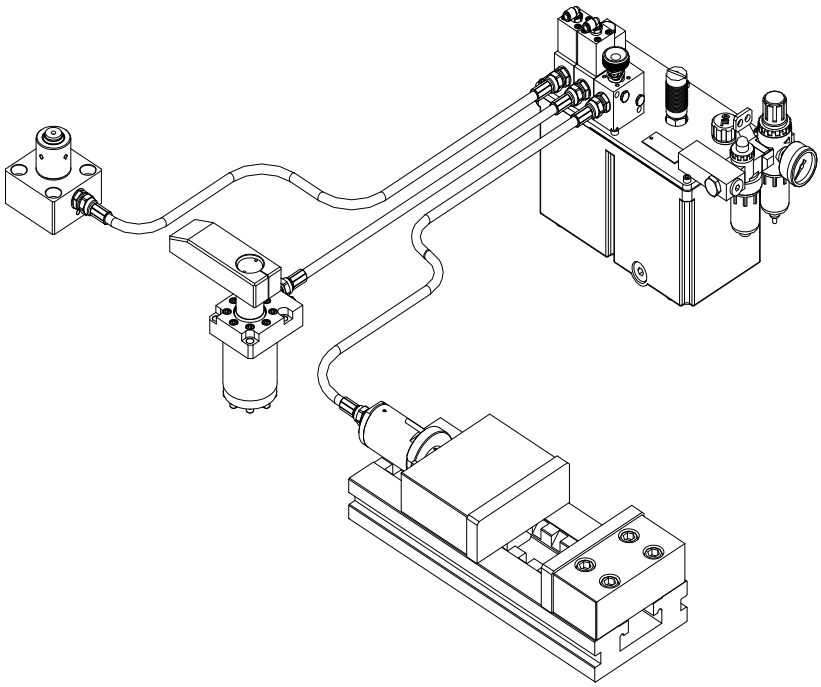


fig.1

Characteristics

Owing to its structural characteristics this system ensures the control of a hydraulic line and makes it possible to hold pressure even when the pressure in the rest of the system is lower, because oil is needed by another application. The system modularity also makes it possible to handle more pressure lines (up to a maximum of 6 elements).

Hydraulic diagram

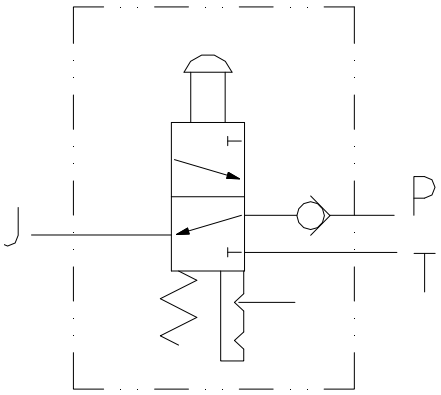


fig.2

Figure 2 shows the hydraulic diagram of block **2-1634-0**.
The basic version is under examination: the block is mounted directly on the pressure intake flange of the hydraulic power unit. An additional modular version can be mounted on this basic block. The additional block's code is **2-1635-0**.
The symbols used in figure 2 shall be interpreted as follows:
P = Pressure line (from the power unit), **T** = Discharge line (to the power unit), **U** = connection to the hydraulic device.

Operating principle

This distributor exploits the motion of a distribution box that slides along its guide sleeve and covers/uncovers the openings which connect the delivery, use and discharge lines. A unidirectional vale is positioned upstream of this distribution box, to prevent pressure on the operating line from reaching the delivery line, if the pressure in this line is lower than the one in the pressure line, when hydraulic pressure is need by another hydraulic block mounted on the plant.

Hydraulic connection diagrams

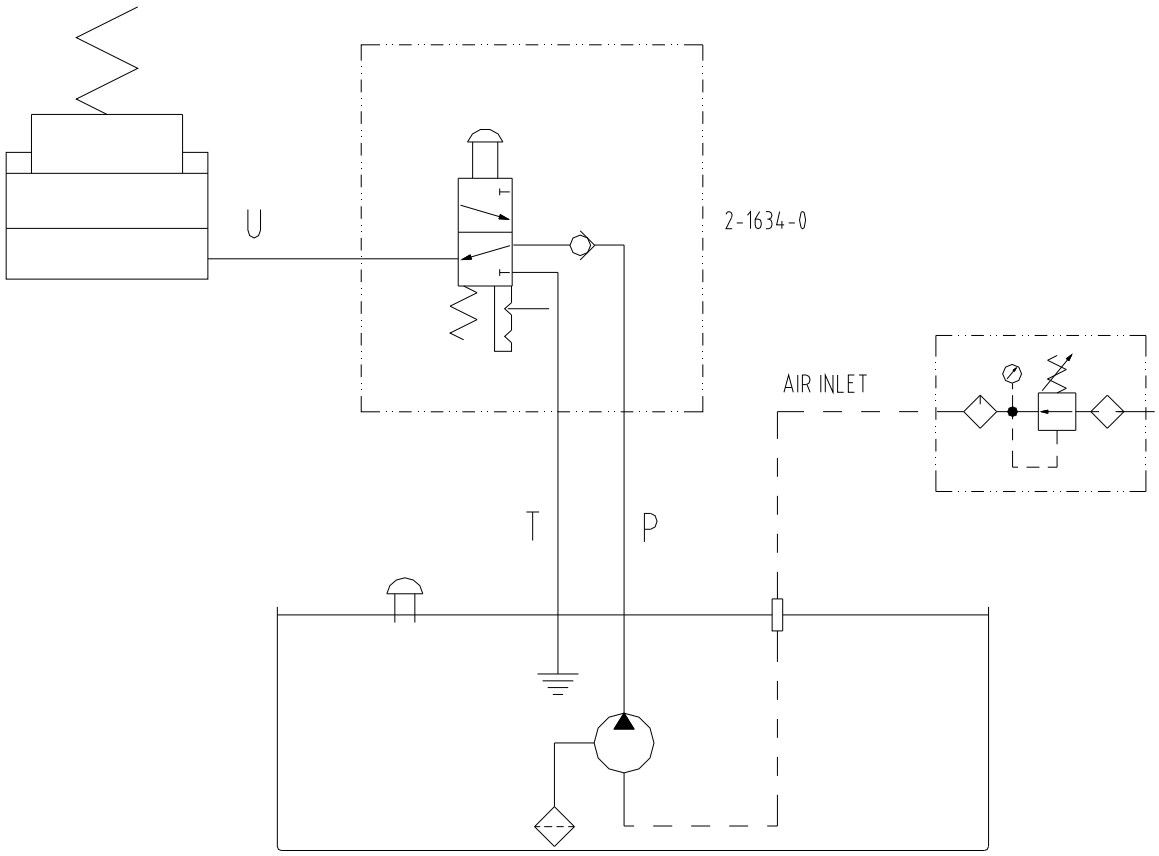


fig.3

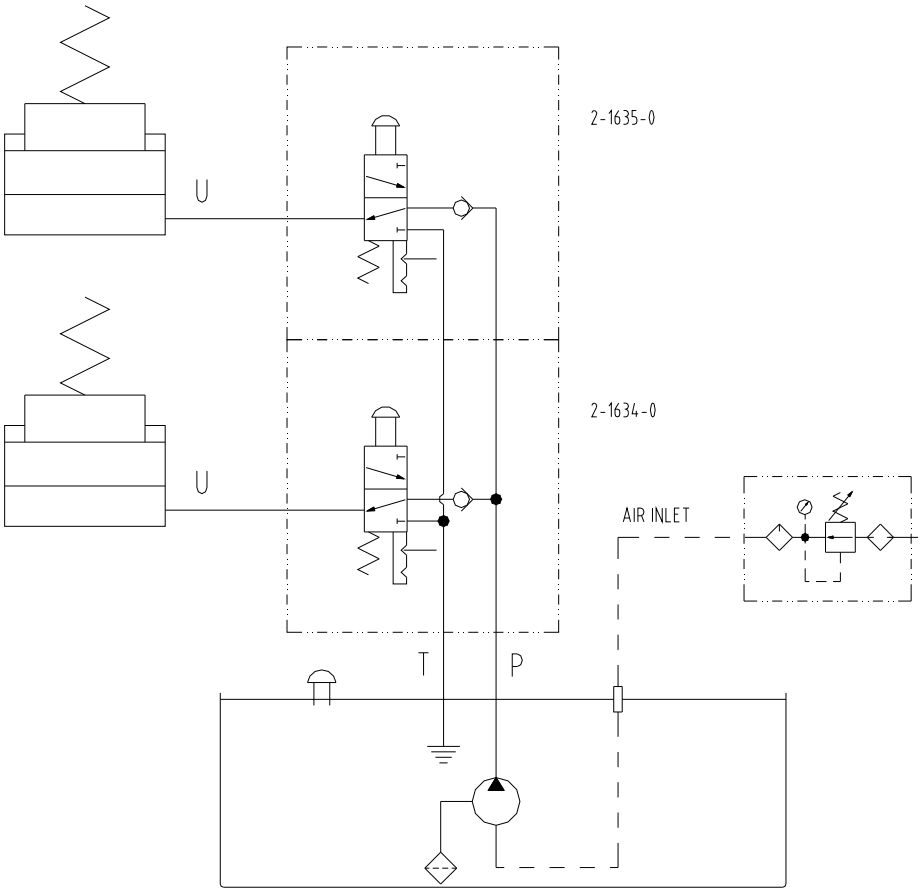


fig.4

Operation of a single-use plant **(diagram in figure 3)**

The system shown in the figure is an example of connection of a single collector block (**2-1634-0**) to a hydropneumatic power unit.
In this case the block is connected to a single-acting spring-return cylinder.
In this position the power unit's delivery line is in communication with the cylinder, that is extended and under pressure. By pressing and turning (to keep it pressed) the manual control of block **2-1634-0**, the delivery line is shut-off and the line connected to the cylinder is connected to the discharge.
When the manual control is turned in the opposite direction and the button is released, block **2-1634-0** is switched again and the operating line is put under pressure.

Operation of a single-use plant **(diagram in figure 4)**

The system shown in the figure is an example of connection of a collector block (**2-1634-0**) to an additional block (**2-1635-0**).
As in the above example, the cylinders connected to delivery lines are usually under pressure.
If the line of the cylinder connected to block **2-1635-0** is switched to the discharge mode, the pressure on the plant's delivery **P** will not change and the other block (**2-1634-0**) will remain under pressure. When the button of block **2-1635-0** is turned and released, the connected cylinder will need some hydraulic fluid, and a pressure drop will occur on the whole pressure line **P** of the plant. The pressure in the cylinder connected to collector block **2-1634-0** will not drop suddenly, owing to the activation of the internal check valve.

Manual collector block 2-1634-0

This direct-actuation spring-return directional valve is operated when a stem slides vertically inside the seat available in the single-block distributor body. The stem motion is controlled by a push-button integral with the stem. The push-button is retained by means of a hollow grub screw inside which a pin integral with the piston stem slides.
The valve body is made of steel coated with anti-friction material and passivized to withstand corrosion over the time.
Gaskets are usually made of nitrile rubber, but different compounds can be mounted when necessary.
The cursor and the internal unidirectional valve are made of treated and ground chrome-nickel steel.

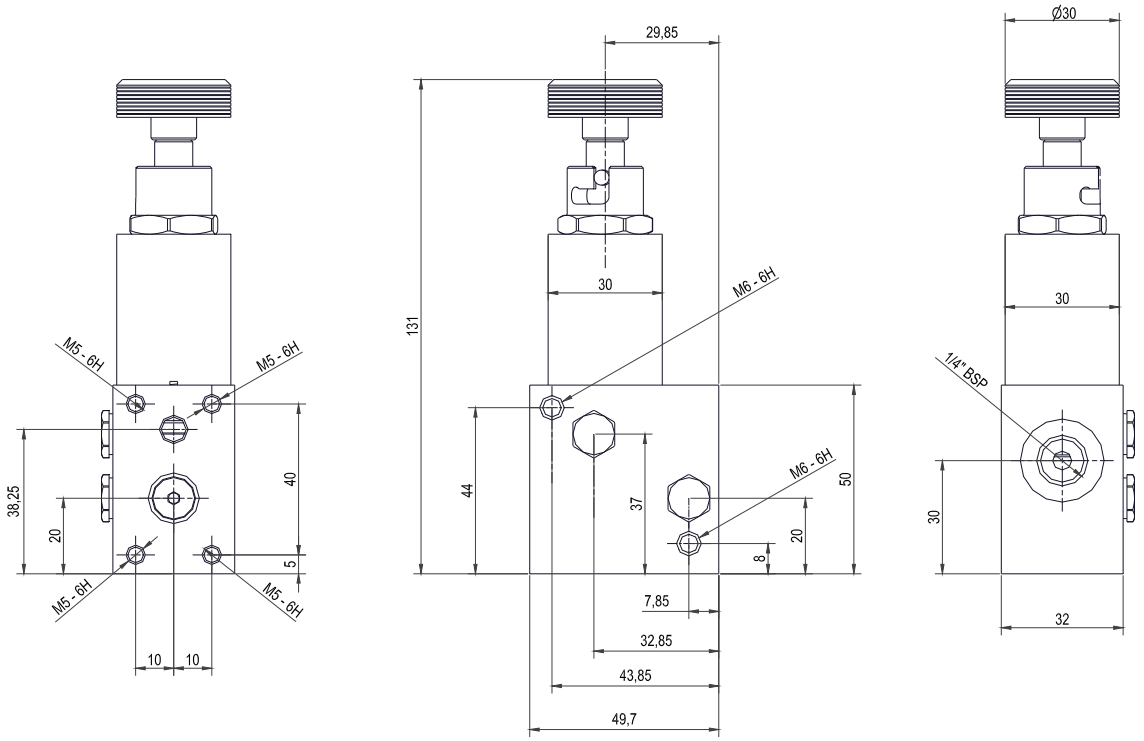


fig.5

Figure 5 shows the external view of collector block **2-1634-0**, with its overall dimensions. The device is secured to the power unit by means of 4 tapped holes (M5). The additional version **2-1635-0** is different from the basic version, but only because the two M6 holes are replaced by 2 through holes (Ø 6.5) for 2 M6 screws, that will clamp the additional distributor unit **2-1635-0** (max. 5 blocks) to collector block **2-1634-0**.

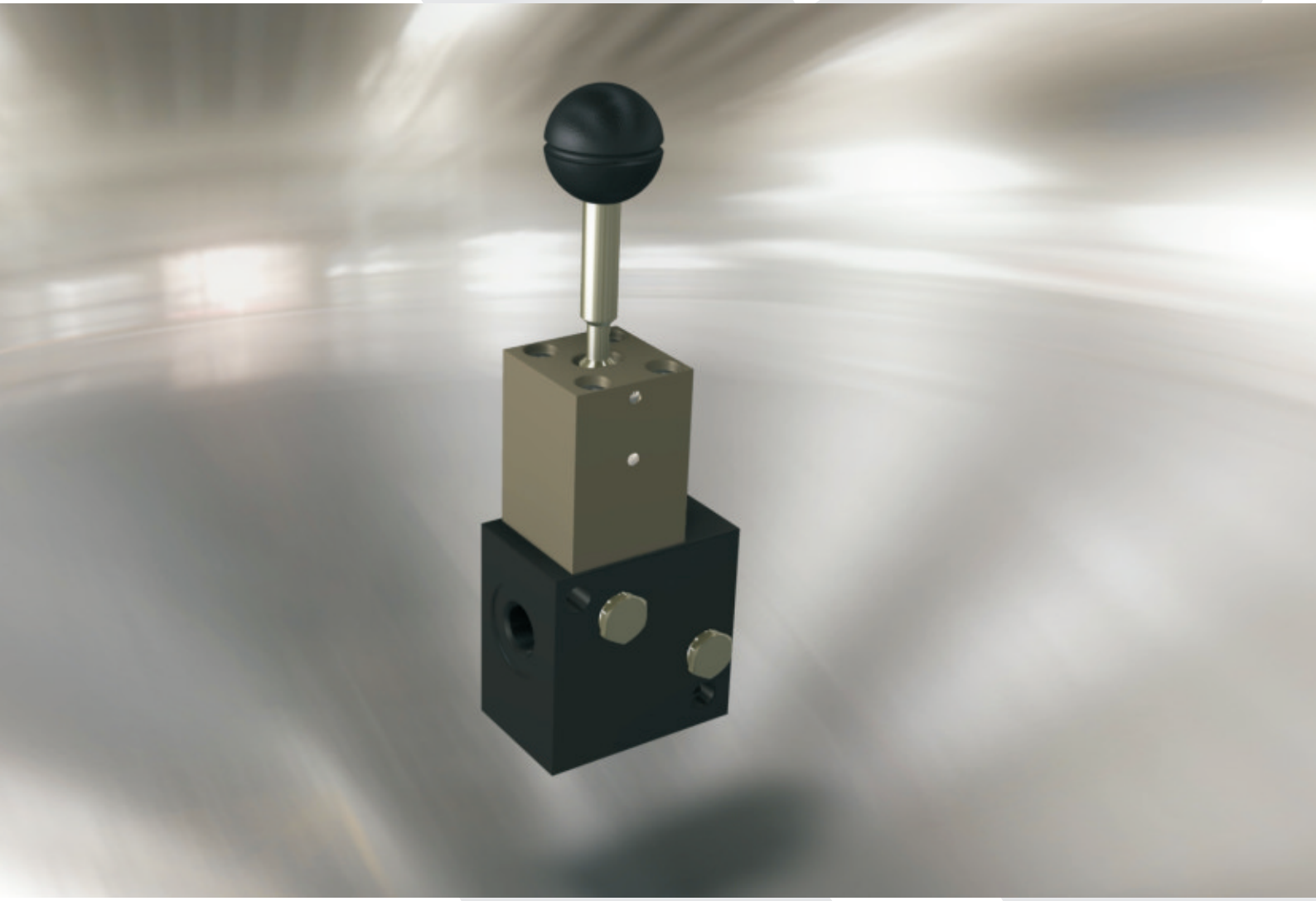
Technical data

MAXIMUM WORKING PRESSURE	**500 bar**
MAXIMUM OIL VISCOSITY	**10° Engler**
MAXIMUM OIL TEMPERATURE	**90°C**
AMBIENT TEMPERATURE	**-10 +50°C**
CONNECTION DIAMETER	**1/4" G.**

NOTES

As specified above, distributor blocks **2-1634-0** and **2-1635-0** have been designed and manufactured for Tecnofluid hydropneumatic power units.
Any other application shall be carefully assessed in cooperation with our technical department.

THREE-WAY LEVER CONTROL HYDRAULIC BLOCK



Requirements

This system consists of a three-way hydraulic distribution block (**2-1514-0**).
This device has been designed to control the hydraulic pressure delivered by hydraulic power units (**5-1563-*-0**). Therefore, a **5-1563** power unit is required to use the three-way distribution block (**2-1514-0**). For their technical characteristics, see the relevant technical documentation.
This device has been designed to control a single pressure line, and therefore is fit for single-acting cylinders. For cylinders or other devices to be actuated which require a double-acting control, use 2 distributor blocks: one for each line of the item to be actuated.

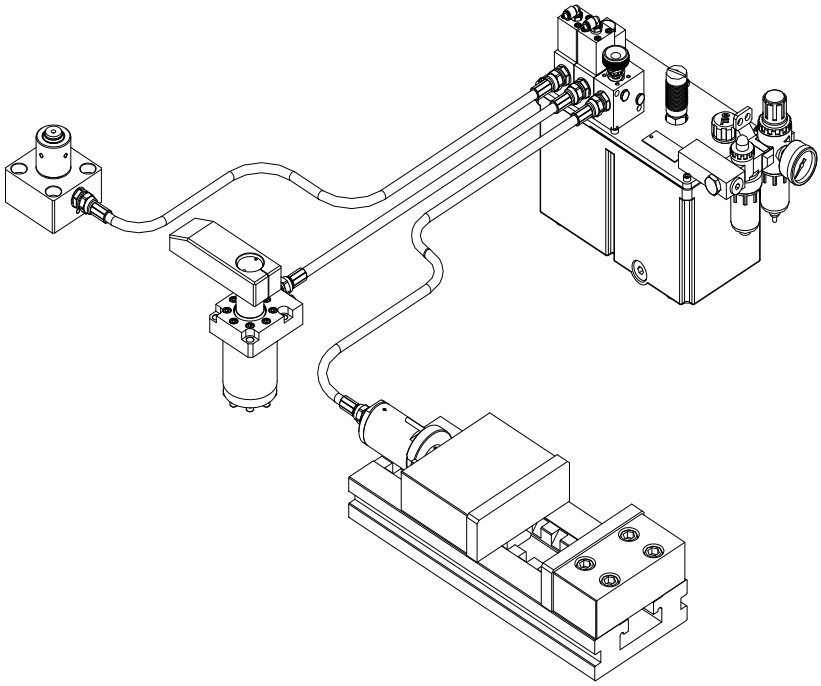


fig.1

Characteristics

Owing to its structural characteristics this system ensures the control of a hydraulic line and makes it possible to hold pressure even when the pressure in the rest of the system is lower, because oil is needed by another application. The system modularity also makes it possible to handle more pressure lines (up to a maximum of 6 elements).

Hydraulic diagram

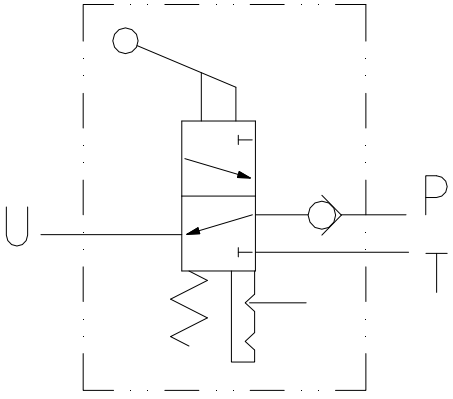


fig.2

Figure 2 shows the hydraulic diagram of block **2-1514-0**.
The basic version is under examination: the block is mounted directly on the pressure intake flange of the hydraulic power unit. An additional modular version can be mounted on this basic block. The additional block's code is **2-1514-A-0**.
The symbols used in figure 2 shall be interpreted as follows:
P = Pressure line (from the power unit), **T** = Discharge line (to the power unit), **U** = connection to the hydraulic device, **Pr** = Pneumatic driving line (from a 3-way pneumatic directional valve)

Operating principle

This distributor exploits the motion of a distribution box that slides along its guide sleeve and covers/uncovers the openings which connect the delivery, use and discharge lines. A unidirectional vale is positioned upstream of this distribution box, to prevent pressure on the operating line from reaching the delivery line, if the pressure in this line is lower than the one in the pressure line, when hydraulic pressure is need by another hydraulic block mounted on the plant.

Hydraulic connection diagrams

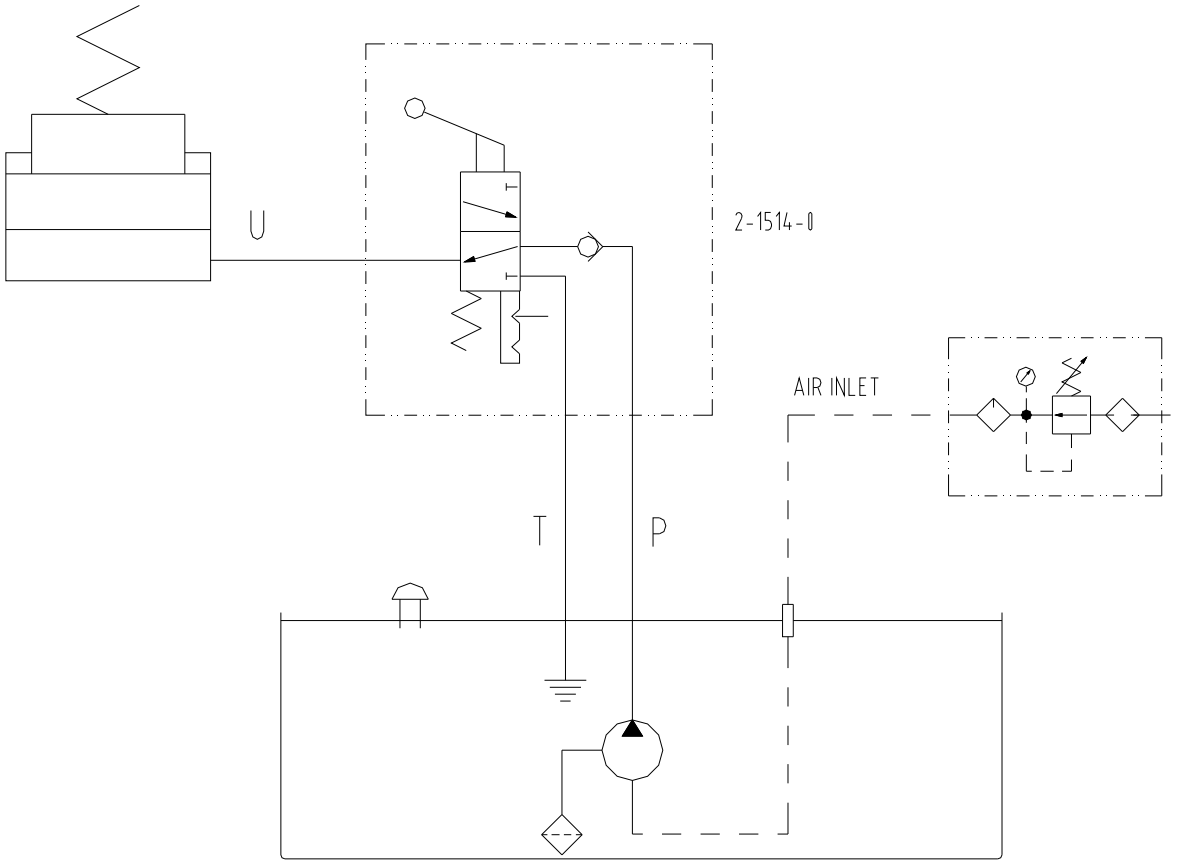


fig.3

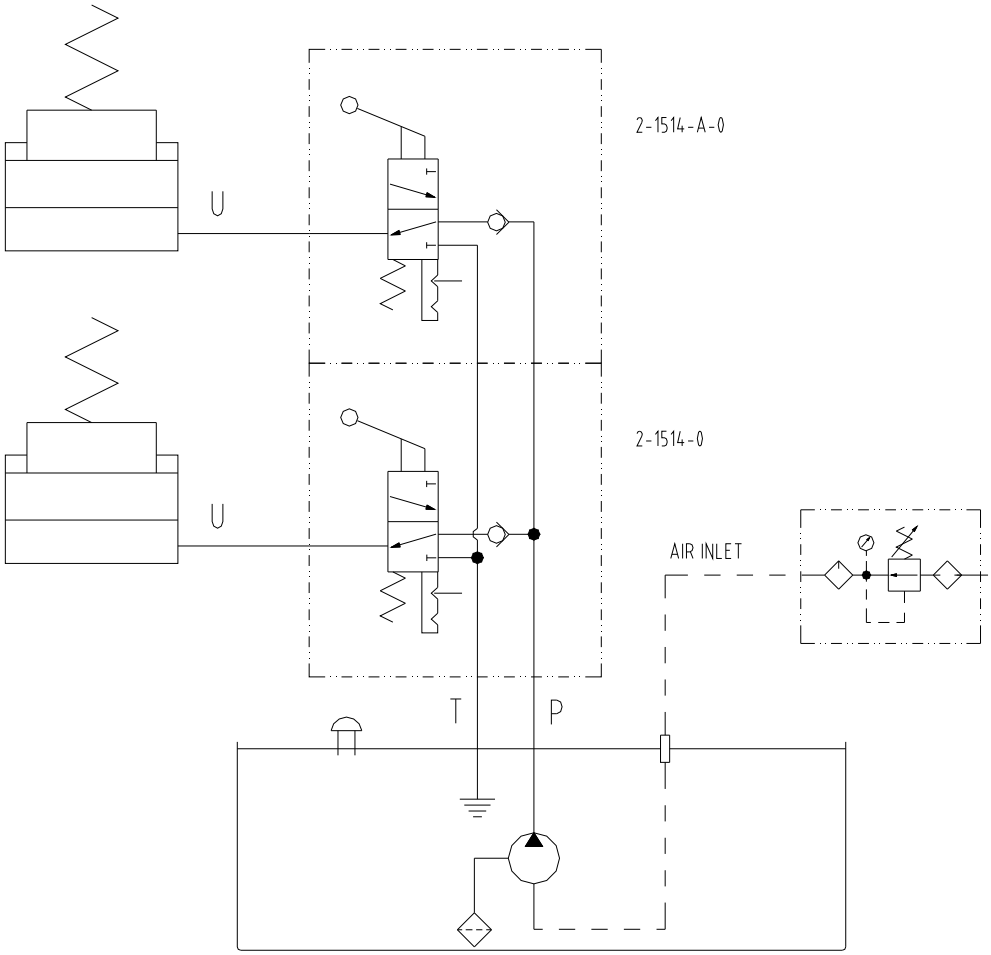


fig.4

Operation of a single-use plant **(diagram in figure 3)**

The system shown in the figure is an example of connection of a single collector block (**2-1514-0**) to a hydropneumatic power unit.
In this case the block is connected to a single-acting spring-return cylinder.
In this position the power unit's delivery line is in communication with the cylinder, that is extended and under pressure. By activating the lever control available on block **2-1514-0**, the delivery line is shut-off and the line connected to the cylinder is connected to the discharge.
When the control lever is moved to the previous position, block **2-1514-0** is switched again and the operating line is put under pressure.

Operation of a double-use plant **(diagram in figure 4)**

The system shown in the figure is an example of connection of a collector block (**2-1514-0**) to an additional block (**2-1514-A-0**).
As in the above example, the cylinders connected to delivery lines are usually under pressure.
If the line of the cylinder connected to block **2-1514-0** is switched to the discharge mode, the pressure on the plant's delivery **P** will not change and the other block (**2-1514-A-0**) will remain under pressure. When the lever on block **2-1514-A-0** is moved, the connected cylinder will need some hydraulic fluid, and a pressure drop will occur on the whole pressure line **P** of the plant. The pressure in the cylinder connected to collector block **2-1514-0** will not drop suddenly, owing to the activation of the internal check valve.

Lever control collector block (code 2-1514-0)

This manual control (bistable lever) directional valve is operated when a stem slides vertically inside the seat available in the single-block distributor body. The stem motion is controlled by a cam which slides coaxially to the piston, actuated by the control lever.
The valve body is made of steel coated with anti-friction material and passivized to withstand corrosion over the time.
Gaskets are usually made of nitrile rubber, but different compounds can be mounted when necessary.
The cursor and the internal unidirectional valve are made of treated and ground chrome-nickel steel.

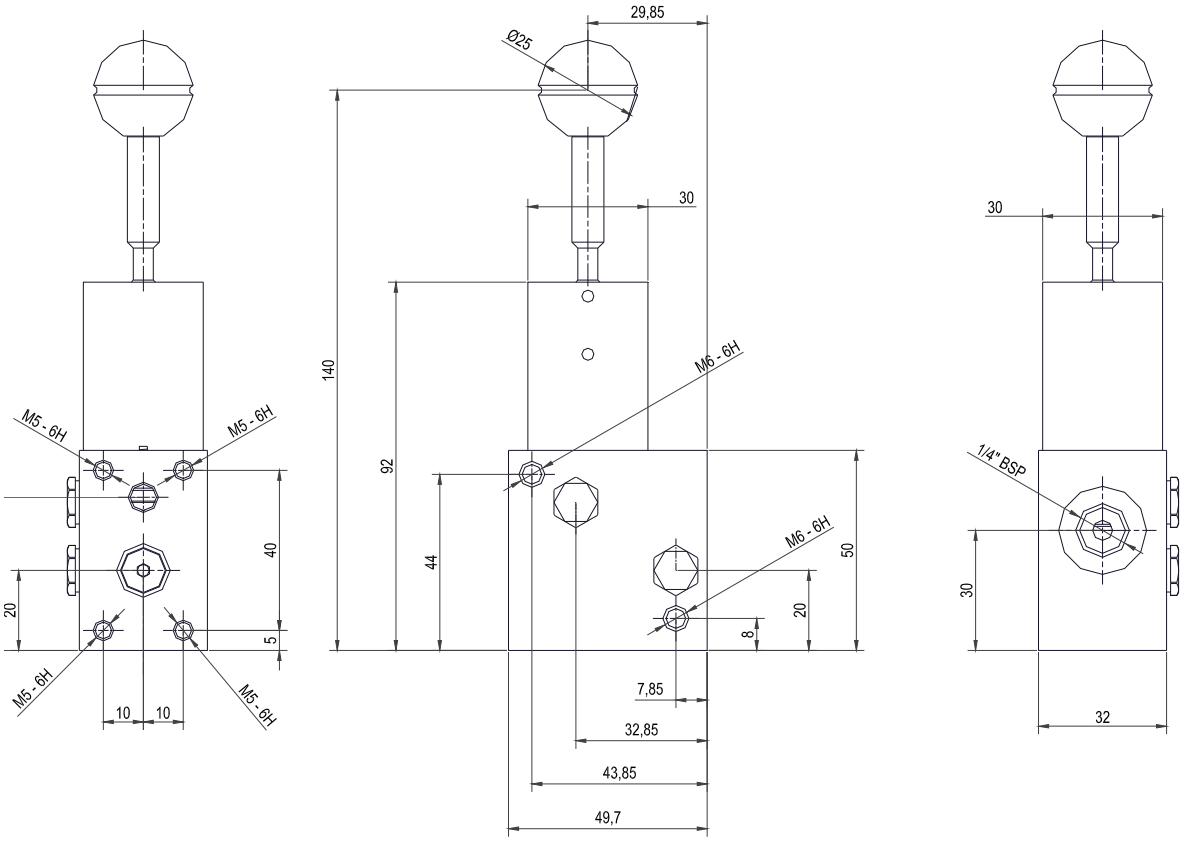


fig.5

Figure 5 shows the external view of collector block **2-1415-0**, with its overall dimensions. The device is secured to the power unit by means of 4 tapped holes (M5). The additional version **2-1415-A-0** is different from the basic version, but only because the two M6 holes are replaced by 2 through holes (Ø 6.5) for 2 M6 screws, that will clamp the additional distributor unit **2-1514-0** (max. 5 blocks) to collector block **2-1514-A-0**.

Technical data

MAXIMUM WORKING PRESSURE	**500 bar**
MAXIMUM OIL VISCOSITY	**10° Engler**
MAXIMUM OIL TEMPERATURE	**90°C**
AMBIENT TEMPERATURE	**-10 +50°C**
CONNECTION DIAMETER	**1/4" G.**

NOTES

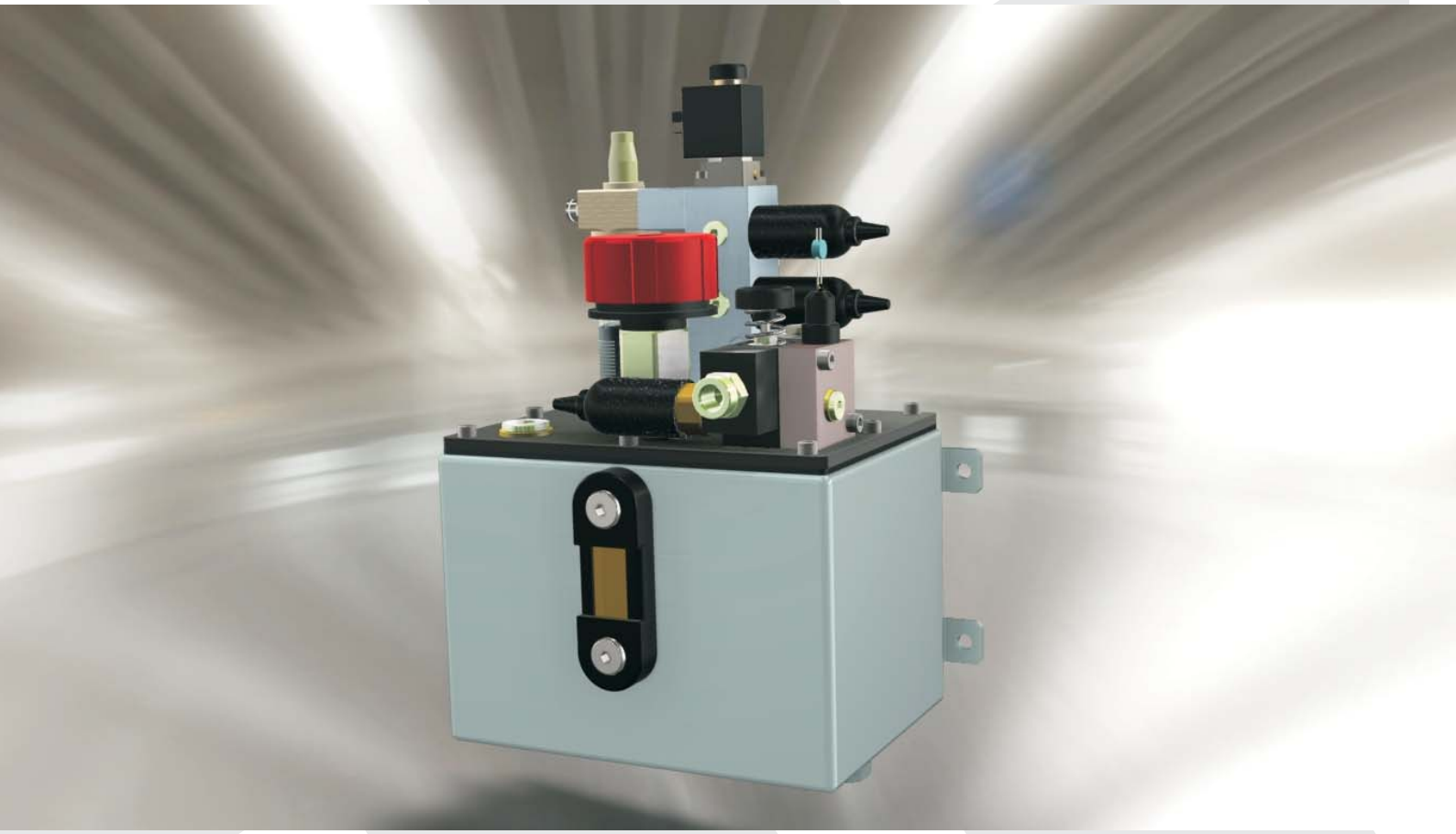
As specified above, distributor blocks **2-1514-0** and **2-1514-A-0** have been designed and manufactured for Tecnofluid hydropneumatic power units.
Any other application shall be carefully assessed in cooperation with our technical department.

TECNOFLUID

ENGINEERING

POWER UNIT FOR HYDRAULIC OVERLOAD

POWER UNIT FOR HYDRAULIC OVERLOAD MODEL 5-1520-0



Requirements

The system consists of a hydropneumatic power unit code **5-1520-*-0.**
Such device has been designed for supplying the hydraulic preloading pressure to the hydraulic overload valve for one-point suspension eccentric presses code **3-1517-*-0** and **3-1548-*-0.**
Hence the use of power unit code **5-1520-*-0** is dependent on the adoption of valve code **3-1517-*-0** or **3-1548-*-0** for whose characteristics, see relative technical documentation.
The compressed air supply line connecting the press to power unit code **5-1520-*-0** should be equipped with a normally closed, 2-position, 3-way solenoid valve, a pressure regulator, ¼" , complete with pressure gauge and (whenever not provided on the press) lubricator guaranteeing supply of lubricated compressed air to the power unit.
Furthermore the compressed air sent to power unit code **5-1520-*-0** should be free from condensed water; when the press is not provided with any condensate drain system, the above pressure regulator should be complete with a separator filter.

Characteristics

The system in question, besides being very compact in size, allows making full use of the performance characteristics of the safety valve connected to it. Although it is a compact power unit and very straightforward in design, it meets all the operative requirements associated with highly complex systems of large overall size; thanks to these advantages, the device finds highly interesting applications also on presses of reduced tonnage.

Hydraulic circuit diagram

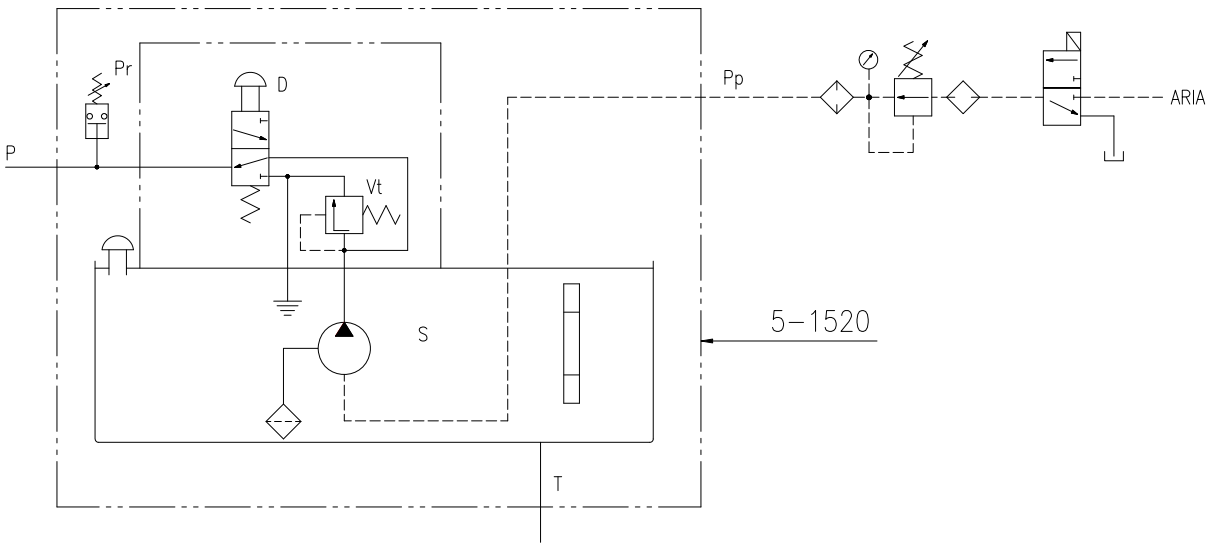


fig.1

Figure 1 shows the hydraulic circuit diagram of power unit code **5-1520-*-0**.
Note the great simplicity of connection to the press. In fact, it is merely necessary to connect the power unit to the hydraulic overload valve through high pressure flexible piping and to connect the 1”1/4 discharge port of the hydraulic overload valve to relative port on the power unit through flexible piping of appropriate size.
Interpretation of the symbols used in figure 1 is as follows:
Pp = compressed air supply, **Pr** = minimum pressure switch, **P** = port, delivery line to hydraulic overload valve, **Vt** = relief valve, preloading pressure, **D=** manual control, hydraulic overload valve discharge, **T=** connection to discharge port from the hydraulic overload valve, **S=** power unit tank.

Principle of operation

Power unit code **5-1520-*-0** incorporates a hydropneumatic pump which, upon being actuated by the pneumatic pressure taken from the press on which it is installed, sends the oil drawn in from tank **S** into delivery line **P**. After the hydraulic die cushion of the press has been filled, the pressure in delivery line **P** is increased until it becomes stabilized at the value corresponding to the air/oil booster ratio associated with the above pump.
Such pressure is then held constant by the pump even in the presence of slight hydraulic displacements.

Diagram for connection to a valve of the hydraulic overload code 3-1515-*-0 or 3-1548-*-0

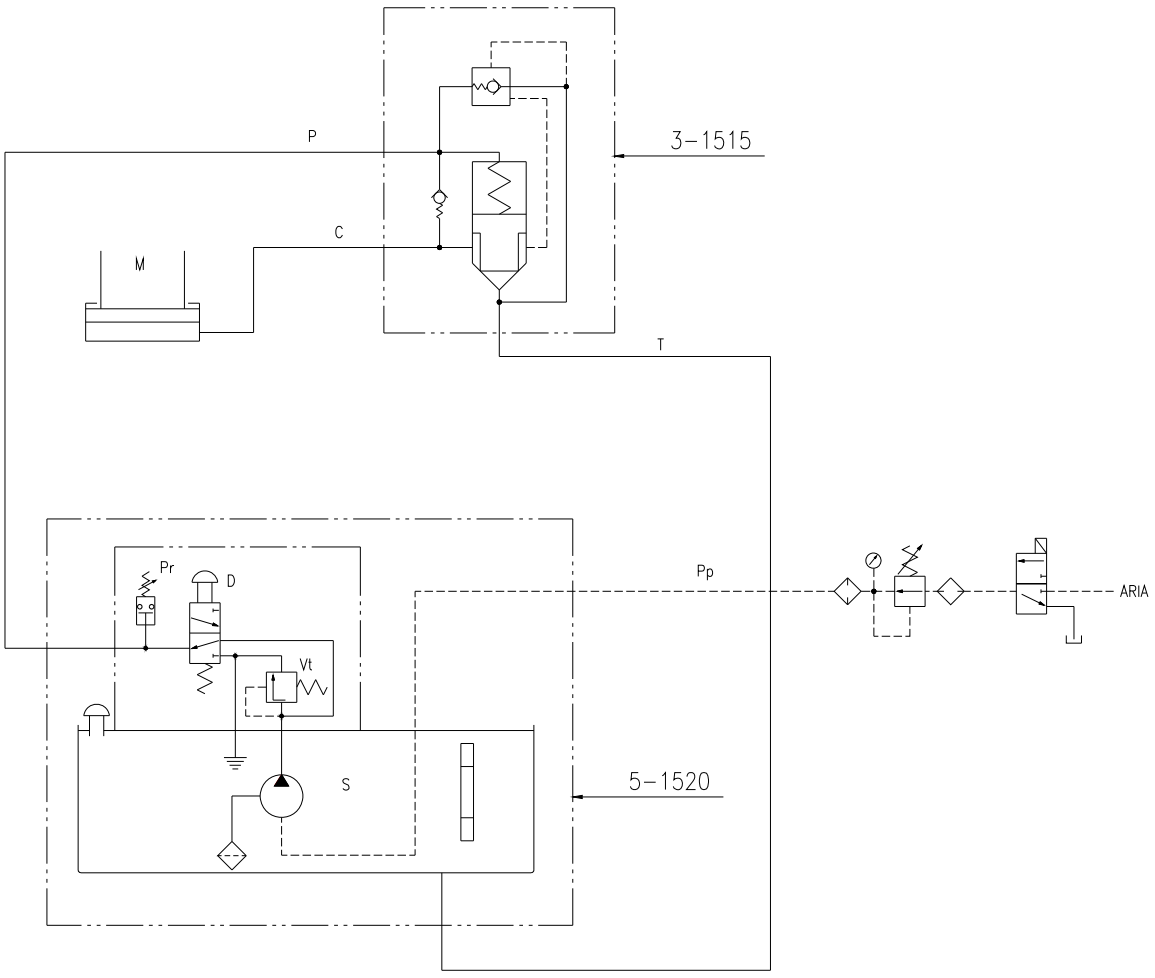


fig.2

Operation of power unit code 5-1520-*-0 (diagram in figure 1)

The system shown in the figure requires to be supplied by a compressed air line coming from the press.
Such line supplies the hydropneumatic pump installed in the power unit tank. Upon being actuated, the pump sends oil under pressure to the hydraulic die cushion through a high pressure pipe.
The preloading pressure supplied by the pump depends on compressed air supply pressure and the size of the pump installed in the power unit (**5-1520-A-0, 5-1520-B-0**, **5-1520-C-0**, **5-1520-D-0**, **5-1520-E-0** and **5-1520-F-0**), see page 6 for the pressure values supplied for each type of power unit.
Such value is adjusted by means of a pressure reducer which is indicated in the circuit diagram in question but is not supplied with the device.
When the equilibrium pressure is reached, the pump stops maintaining the preset hydraulic pressure in delivery line **P.**
During the rise in pressure of delivery line **P**, minimum pressure switch **Pr** (set at 20 bar) is tripped thus giving the machine ready signal to the press and so allowing it to be started.
During in the manual discharge phase or in an emergency (caused by the hydraulic overload valve) this pressure switch (**Pr)** is opened thus sending the emergency signal to the press (machine not ready /overload tripped).
Discharge push button **D** has the dual purpose of discharging the hydraulic overload in the case of the press stalling when trying out the die as well as resetting the preloading pressure of the power unit. In fact, when the preloading pressure is decreased, the hydraulic pressure remains entrapped in the hydraulic die cushion. Therefore the system should be discharged manually in order to set a preloading pressure of the hydraulic overload less than the one preset previously. On the other hand, when there is an increase in preloading pressure, it is merely necessary to adjust the pneumatic pressure reducer connected to the power unit in order to obtain the required value (see graphs on page 6 for the resultant air/oil pressure values).
Valve **Vt** serves for limiting the maximum pressure which can be supplied by the power unit. When the threshold preset on the valve is exceeded, the hydropneumatic pump incorporated in the power unit discharges its flow by not stopping upon reaching the equilibrium pressure.
The set pressure of valve **Vt** is calculated according to the max. permissible tonnage for the press in relation to the diameter of the hydraulic die cushion.
Lastly valve **Vt** has a side-mounted bleeder screw to be used in case of accidental unpriming of the pump
(e.g. Start-up of power unit with oil level lower than minimum).

Power unit code 5-1520-*-0 (figure 3)

The power unit consists of a fabricated sheet steel tank, an aluminium cover screwed on to the tank and a distribution block for the hydraulic control; the minimum pressure switch is mounted on this block.
The block also includes the port for connection of the delivery line to valve code **3-1517-*-0** or **3-1548-*-0**.
The tank contains approx. 4 litres of oil; the tank bottom incorporates the discharge port (1”1/4) for connection of the overload valve code **3-1517-*-0** or **3-1548-*-0**.
The tank also mounts the oil fill plug, the quick connect fitting for the compressed air supply (8 mm dia. plastic tube) as well as the hydraulic control block incorporating the pressure limit valve and venting device of the power unit.

Power unit code 5-1520-*-0 (figure 3)

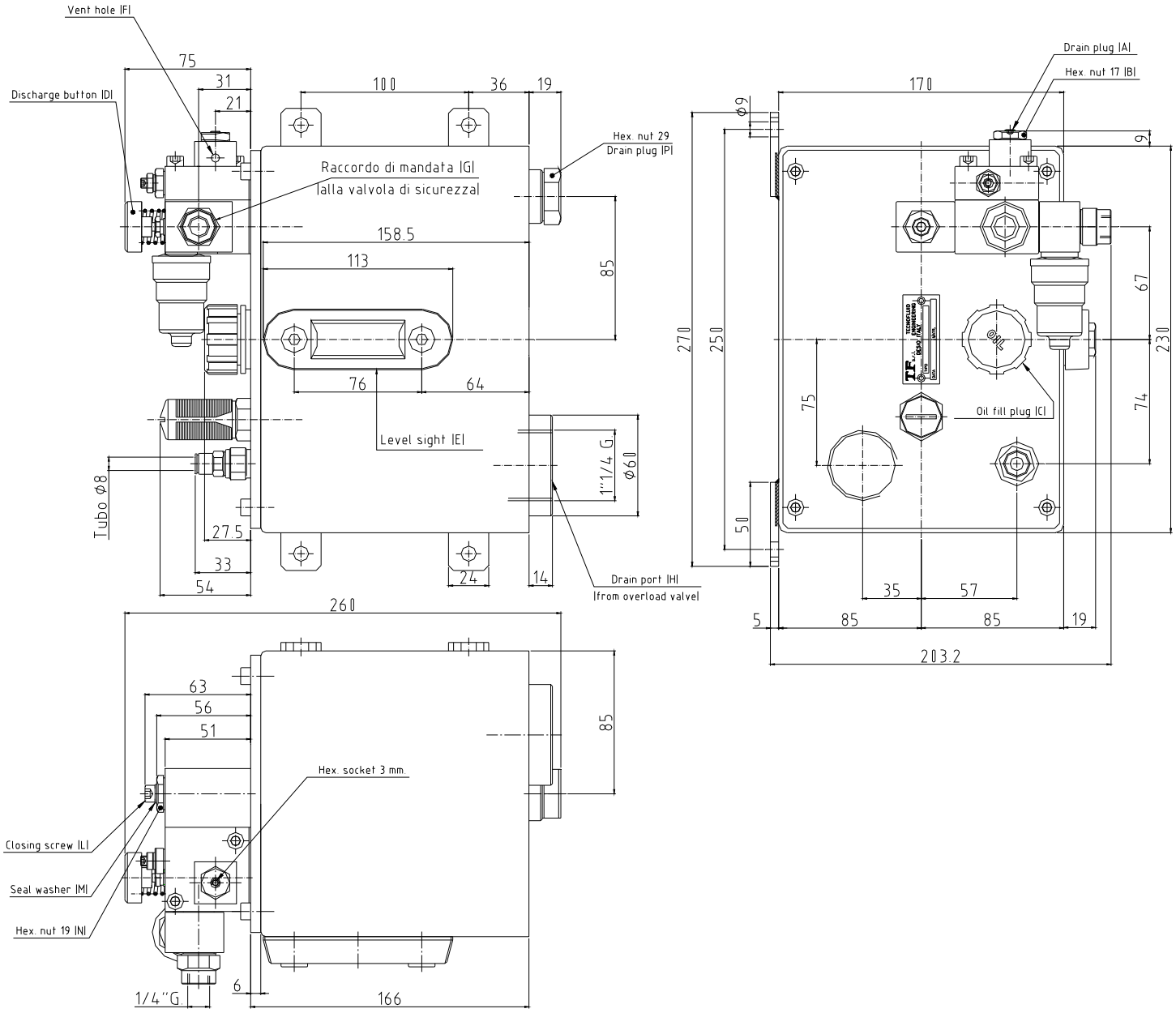


fig.3

Specification

AIR - OIL COMPRESSION RATIO	**See page 5**
MAX. PRELOADING PRESSURE	**380 bar**
MAX. OIL VISCOSITY	**10° Engler**
MAX. OIL TEMPERATURE	**90° C.**
AMBIENT TEMPERATURE	**-10 +50 ° C.**
GUARANTEED MIN. FLOW RATE, POWER UNIT	**1.5 L/minute**
MIN. COMPRESSED AIR SUPPLY PRESSURE	**1.5 bar**
MAX. COMPRESSED AIR SUPPLY PRESSURE	**7 bar**
PORT DIAMETER, COMPRESSED AIR INLET	**PIPE DIA. 8**
PORT DIAMETER, HYDRAULIC DELIVERY LINE	**1/4"**
PORT DIAMETER, HYDRAULIC DISCHARGE LINE	**1"1/4**
MAX. RETURN PRESSURE ON BLOCK	**500 bar**
MAX. PERMISSIBLE VOLTAGE ON PRESSURE SWITCH	**42 V. 4 A. AC 42 V. 2 A. DC**

Practical installation recommendations

When deciding to install a hydraulic overload system on an eccentric press the following overall considerations should be taken into account:

- The overload valve should be mounted in the immediate vicinity of the die cushion and should be connected to the latter with rigid high pressure piping.
- The hydraulic die cushion of the slide should always have provision for an air venting system located in the immediate vicinity its top part in order to be able to collect and expel all air bubbles present.
- The hydraulic die cushion seals should be of the high pressure type, preferably of polyurethane.
- The material of construction of die cushion cylinder should be as homogeneous as possible (free from blow-holes or cracks) in order to ensure perfect oil tightness and to protect the seals from abnormal wear.
- The piping conveying the preloading pressure from the power unit to the valves can be either rigid or flexible but the line must always be of the high pressure type and the piping must always be proportional to the pipe fittings.
- The compressed air supplying the hydraulic power unit should be dry and well lubricated (one drop of oil for about every 20 pump strokes of the power unit).
- It is essential to install a three-way solenoid valve upstream to the compressed air preparation unit; such solenoid valve serves to shut off the compressed air supply of the power unit in the event of an overload.
- It is advisable to place the compressed air lubricator fitted on the power unit in an easily accessible position so as to facilitate the oil topping up operations.
- The oil used for the power unit can be of the same type used for lubrication of the press guides but this oil must never be allowed to come into contact with the lubrication oil because the suspended metal particles would cause irreparable damage to the system; viscosity of the oil should never exceed max. permissible value.
- During the first start-up of the system it is essential to prime the pump. To do so, merely follow the operational procedure **"HYDRAULIC OVERLOAD SYSTEM COMMISSIONING"** concerning power unit code **5-1520** attached to this technical documentation.
- The discharge piping should have an inner diameter of no less than 30 mm and should be able to withstand pressures in the order of 70 bar.
- It is highly inadvisable to use liquid Teflon when mounting the fittings connecting the valves to the power unit; where it is not possible to use metal-rubber seal washers, it is recommended to adopt fittings with taper thread and use Teflon tape for sealing.
- The type of power unit to be used (max. pressure available) can be deduced from the graph on page. 6; the type of power unit used is always given on the nameplate affixed to its cover.

Rating of power units code 5-1520-*-0: The power units in question can be equipped with hydropneumatic pumps of different power ratings; the table below lists the max. pressures which can be obtained and the codes of relative power units.

Power unit code	5-1520-A-0	5-1520-B-0	5-1520-C-0	5-1520-D-0	5-1520-E-0
Max. pressure (bar)	450	240	150	100	66

Air / oil compression ratios

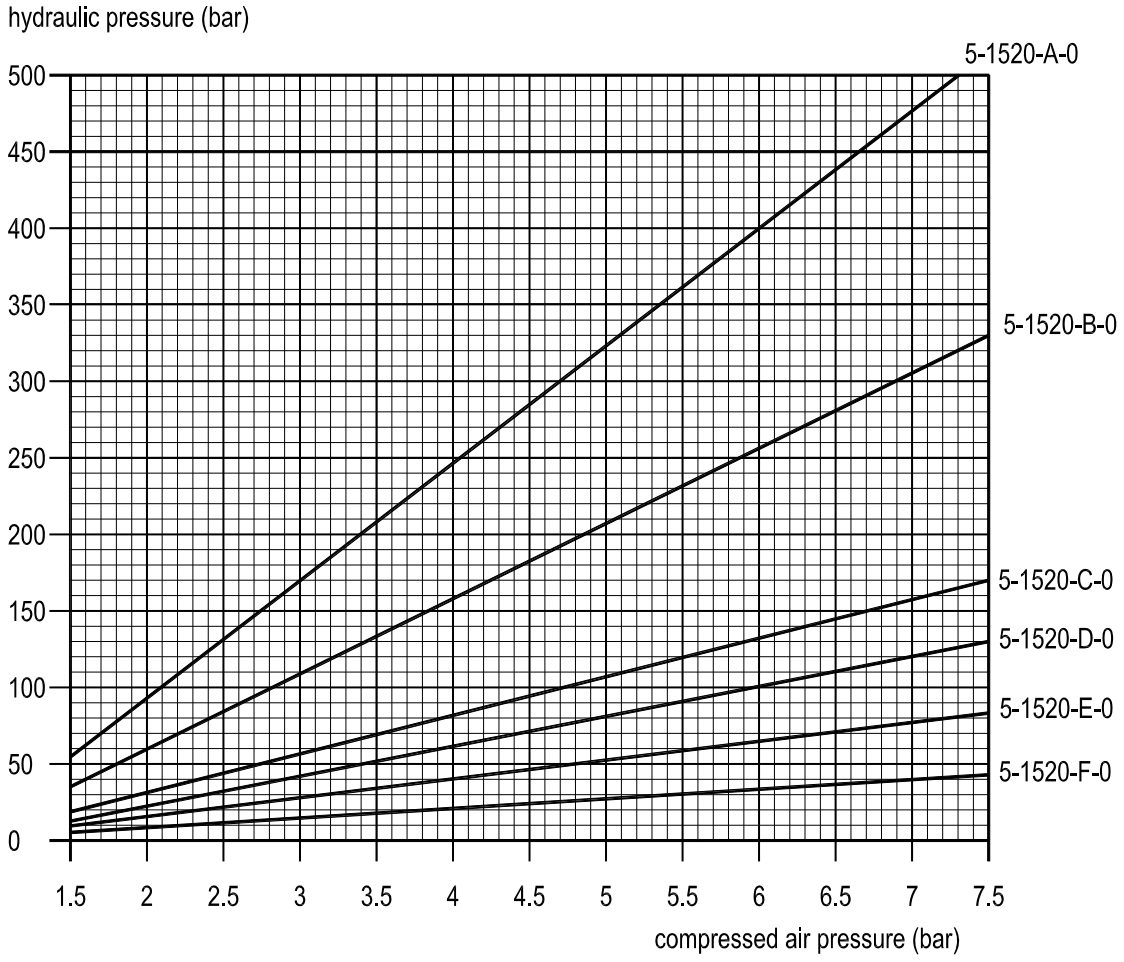


fig.4

Figure 4 shows the graph regarding the air / oil compression ratios for the five versions of pneumatic power units designed for supplying the valves of the hydraulic overload system code **3-1517-*-0** or **3-1548-*-0.**

Possible failures during start-up

EFFECT		The power unit does not start
CAUSE	1	The power unit's pressure reducer is set to 0 bar
	2	The compressed air line is closed or clogged
REMEDY	1	Screw the pressure reducer's knob clockwise
	2	Check the compressed air line upstream of the power unit

EFFECT		The power unit functions slowly
CAUSE	1	The pressure reducer connected to the power unit is calibrated at less than 1.5 bar
	2	A pressure reducer calibrated at less than 2 bar is positioned upstream of the power unit
	3	There's a choke on the line upstream of the power unit (e.g. bent or crushed pipe)
	4	The control unit has reached the balance pressure between incoming pneumatic pressure and delivered hydraulic pressure
REMEDY	1	Bring the reducer to a pressure above 2 bar
	2	Bring the reducer to a pressure above 2 bar
	3	Check the power unit's pneumatic duct
	4	Normal phenomenon

EFFECT		The power unit functions normally but there is no hydraulic flowrate
CAUSE	1	The oil level in the tank is insufficient
	2	The pump is not primed
	3	The suction filter is clogged
REMEDY	1	Pour some oil into the tank, and then start-up
	2	Start-up as indicated above
	3	Disassemble the power unit cover from the tank, unscrew filter from the suction union and clean thoroughly; re-assemble the unit and carry out the drainage procedure, if necessary

EFFECT		The pressure in the circuit is insufficient/the power unit is pumping continuously
CAUSE	1	Leak in the hydraulic circuit
REMEDY	1	Carefully inspect the hydraulic circuit and, if necessary, tighten again or replace the unions or the pieces with leaks of hydraulic fluid

Spare parts, power unit code 5-1520-*-0

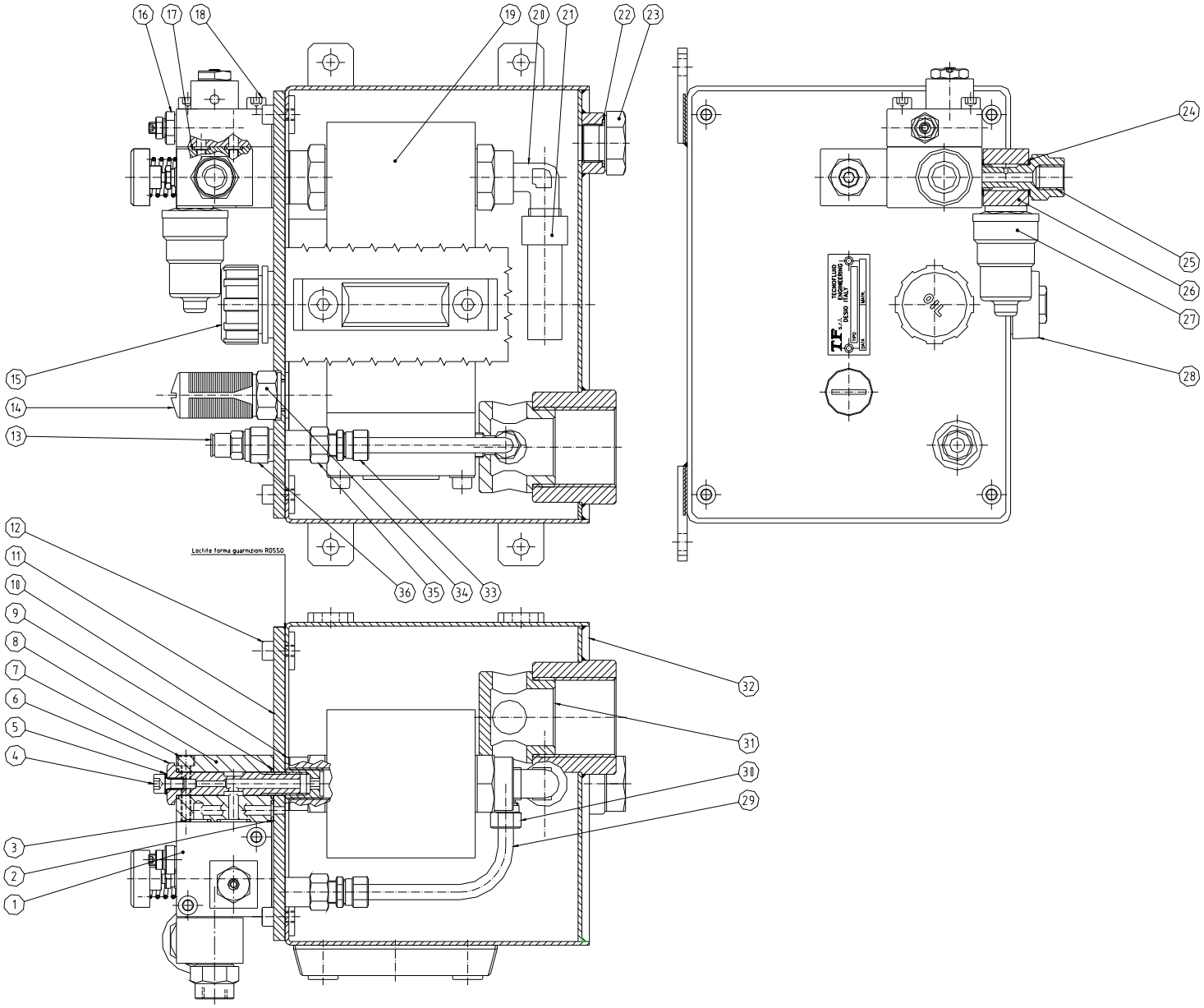


fig.5

Figure 5 shows a section of power unit **5-1520-*-0**, in which all the power unit components are numbered.
The spare parts list also gives the quantities for each single item necessary for completing a single device.
See next page for the list in question.

Spare parts list for power unit code 5-1520-*-0 (see section in figure 5)

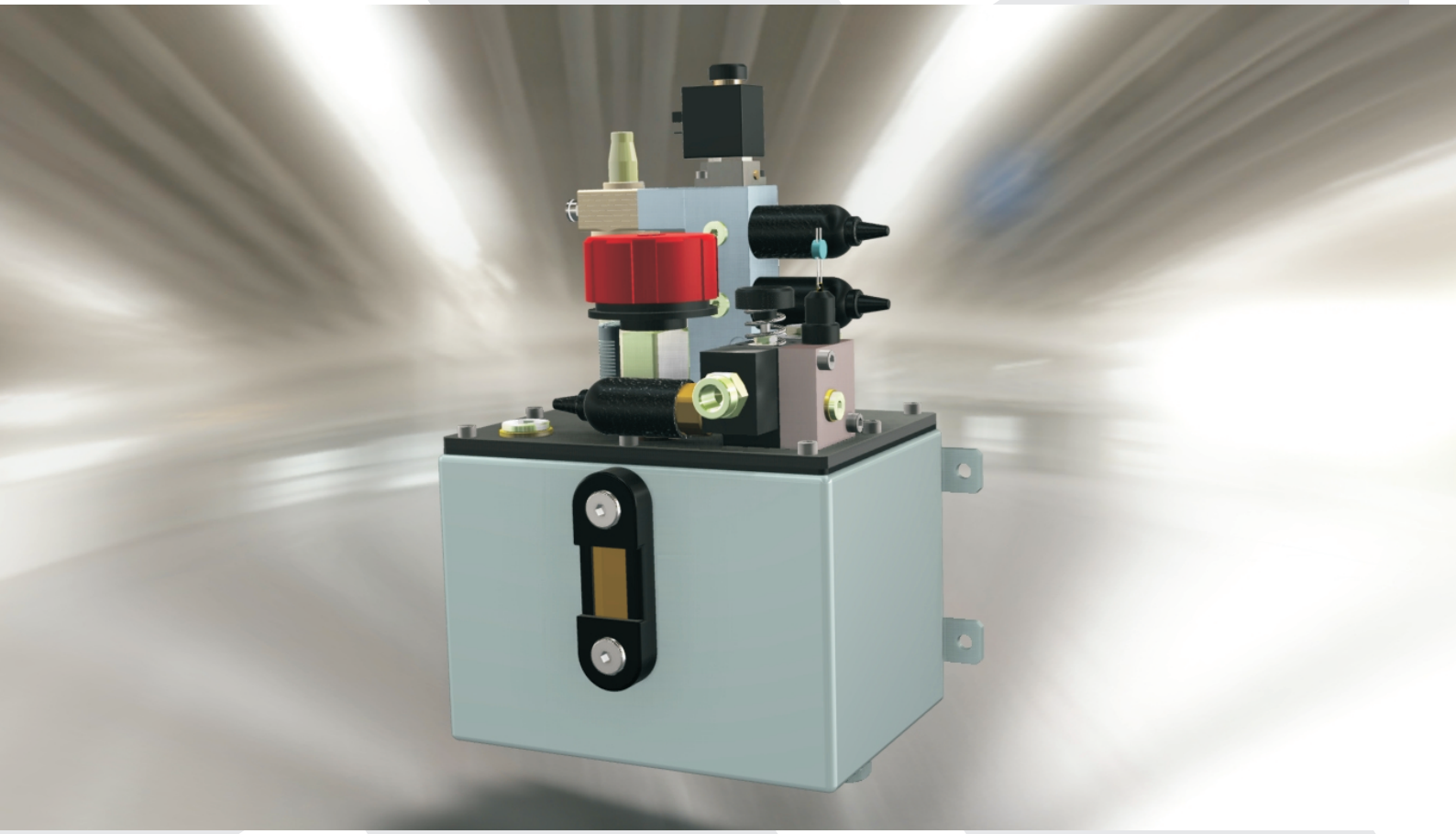
Item	DESCRIPTION	QUANT.	ORDERING CODE
1	MANIFOLD BLOCK, CLAMP CONTROL	1	R-2-1398
2	O-RING OR 106	1	PARK-5-052
3	O-RING OR 3037	1	PARK-2-012
4	HEX. SOCKET HEAD CAP SCREW M6 x 10	1	VTCE-6-10
5	METAL/RUBBER RING M6	3	GM-0505-M6
6	MANIFOLD SCREW	1	R-5-1520-3
7	HEX. SOCKET HEAD CAP SCREW M5 x 35	4	VTCE 5-35
8	MANIFOLD	1	R-2-1398-1
9	O-RING OR 2056	5	PARK-2-015
10	METAL/RUBBER RING 3/8".	3	GM-0502-3/8
11	POWER UNIT COVER	1	R-5-1520-1
12	HEX. SOCKET HEAD CAP SCREW M6 x 12	4	VTCE-6-12
13	COMPRESSED AIR FITTING ¼" HOSE 8	1	3-CMR-120814
14	DYNAMIC SILENCER 3/8"G.	1	4A3SPL
15	BREATHER / FILLER CAP ¾"	1	TC-SFN-3/4
16	MODULAR RELIEF VALVE	1	(R-3-1521)
17	O-RING OR 2025	2	PARK-2-010
18	HEX. SOCKET HEAD CAP SCREW M6 x 30	2	VTCE-6-30
19	HYDROPNEUMATIC PUMP	1	(R-1-1396)
20	ELBOW FITTING 3/8".	1	F90-110-210
21	SUCTION FILTER 90 µ	1	R-5-1522
22	O-RING OR 2087	1	PARK-2-020
23	DRAIN PLUG	1	R-5-732-11
24	METAL/RUBBER RING 1/4".	3	GM-0503-1/4
25	MANIFOLD SCREW	1	R-5-1472-1
26	BLOCK	1	R-5-1472-2
27	PRESSURE SWITCH, ¼" PORT	1	R-1518
28	LEVEL SIGHT 72 mm	1	SPIA-LVA-1SA
29	HOSE 6-8, COMPRESSED AIR LINE	1	4-MBTR-86
30	ELBOW FITTING ¼ ", COMPRESSED AIR LINE.	1	CMO-160814
31	DRILLED PLUG	1	R-5-1318-5
32	TANK, SIZE 1	1	R-5-1318-1-1
33	STRAIGHT CONNECTOR ¼ ", COMPRESSED AIR LINE	1	CMO-110814
34	EXTENSION 3/8", COMPRESSED AIR LINE	1	856-105Z-38-38
35	EXTENSION 1/4", COMPRESSED AIR LINE	1	3-CRA-0391435
36	SLEEVE 1/4", COMPRESSED AIR LINE	1	3-CRA-130014

N.B.

WHEN ORDERING SPARE PARTS, ALWAYS STATE THE SERIAL NUMBER STAMPED ON THE NAMEPLATE AFFIXED TO THE POWER UNIT COVER FOR ALL THOSE PARTS WHOSE CODE IS GIVEN BETWEEN BRACKETS IN THE LIST APPEARING ON PAGE 9.

THE HYDROPNEUMATIC UNITS DESCRIBED IN THIS MANUAL HAVE BEEN DESIGNED AND MANUFACTURED ACCORDING TO CRITERIA AIMED AT PREVENTING INJURY TO PERSONS OR DAMAGE TO OBJECTS; HOWEVER IT SHOULD BE POINTED OUT THAT, AS THE HYDROPNEUMATIC POWER UNITS ARE PRESSURE GENERATORS, THE IMPROPER USE OF SUCH DEVICE COULD BE POTENTIALLY HAZARDOUS.

POWER UNIT FOR HYDRAULIC OVERLOAD
MODEL 5-1536



Requirements

The system consists of an oleo-pneumatic control unit (code **5-1536-*-0**).
This device has been designed in order to provide the pre-loading hydraulic pressure to hydraulic safety valves for eccentric presses with a pushing point (codes **3-1517-*-0** and **3-1548-*-0**).
Accordingly the use of the control unit (code **5-1536-*-0**) is subject to the adoption of one of the valves mentioned above – for their technical characteristics, refer to the relevant technical documentation
The pneumatic supply line which connects the press to the control unit (code **5-1536-*-0**) shall be equipped with a ¼" G. pressure regulator, complete with pressure gauge.
The compressed air conveyed to the control unit (code **5-1536-*-0**) must be free of condensate; if the machine is not provided with a condensate removal system, the said regulator shall be complete with separator filter.

Characteristics

Apart from its reduced overall dimensions, the system under examination makes it possible to use the safety valve connected to it at best. In spite of its reduced dimensions, this control unit can meet all the operating requirements typical of more complex and bulky systems, and therefore is a very interesting apparatus also for small-tonnage machines.

Hydraulic diagram

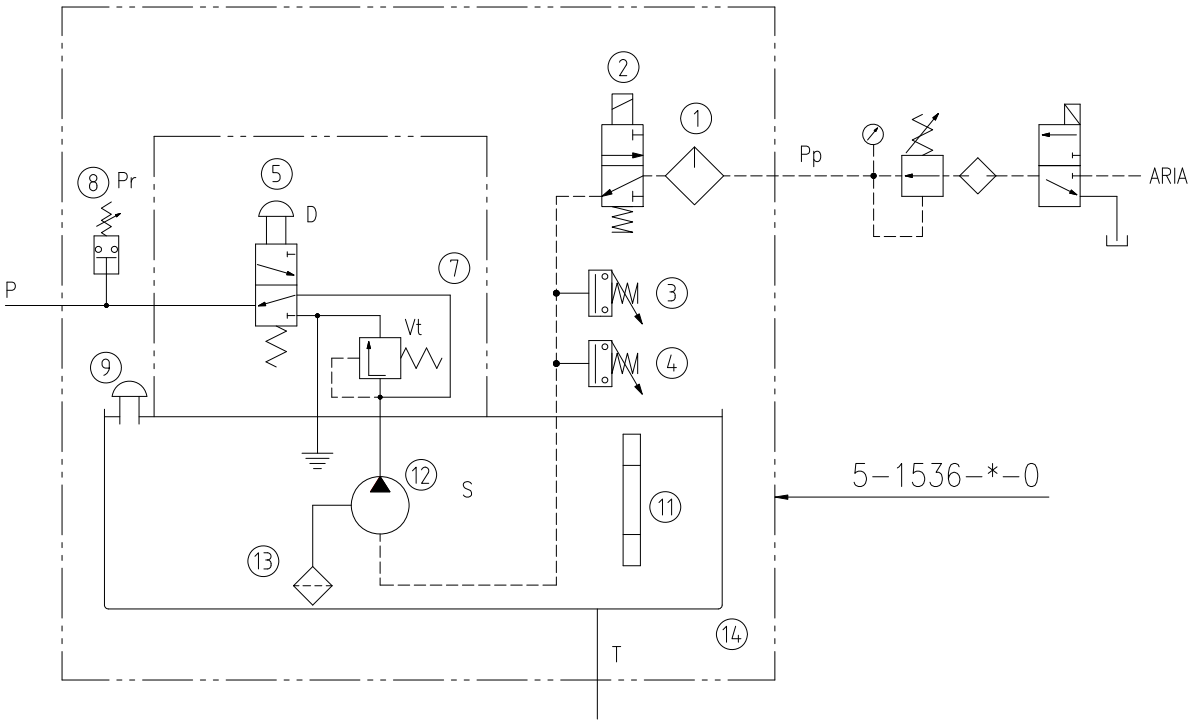


fig.1

Figure 1 shows the hydraulic diagram of the control unit (code **5-1536-*-0**).
Please note that connection to the machine is extremely simple: just connect the control unit to the hydraulic safety valve directly, through a HP flexible hose, and connect its outlet opening to the dedicated connection of the control unit, by a flexible hose of suitable size.
The symbols used in figure 1 can be interpreted as follows:
A = pneumatic feed **P** = control unit's delivery coupling **T=** outlet connection (from the hydraulic safety valve) **1=** compressed air lubricator **2=** compressed ait cut-off electrovalve **3=** pressure switch (max. permissible pneumatic pressure) **4=** pressure switch (min. permissible pneumatic pressure) **5=** manual control valve for hydraulic safety valve discharge **7=** calibrated valve for maximum pre-loading hydraulic pressure **8=** pressure switch (min. pre-loading hydraulic pressure) **9=** tank's filler cap **11=** tank's sight glass **12=** oleo-pneumatic pump **13=** suction filter **14=** tank.

Working principle

The hydraulic safety unit (code **3-1536-*-0**) includes an oleo-pneumatic pump which, once actuated by pneumatic pressure from the press on which it is mounted, pumps the oil sucked from tank **14** into oil gallery **P**. Once the hydraulic cushion of the press has been filled, the pressure in oil gallery **P** rises until it stabilizes at a value which corresponds to the air/oil multiplication ratio of the said pump.
The reached pressure is then kept constant by the pump, also in the presence of a slight hydraulic blow-by.

Diagram of connection to the hydraulic safety valve (code 3-1515-*-0 or 3-1548-*-0)

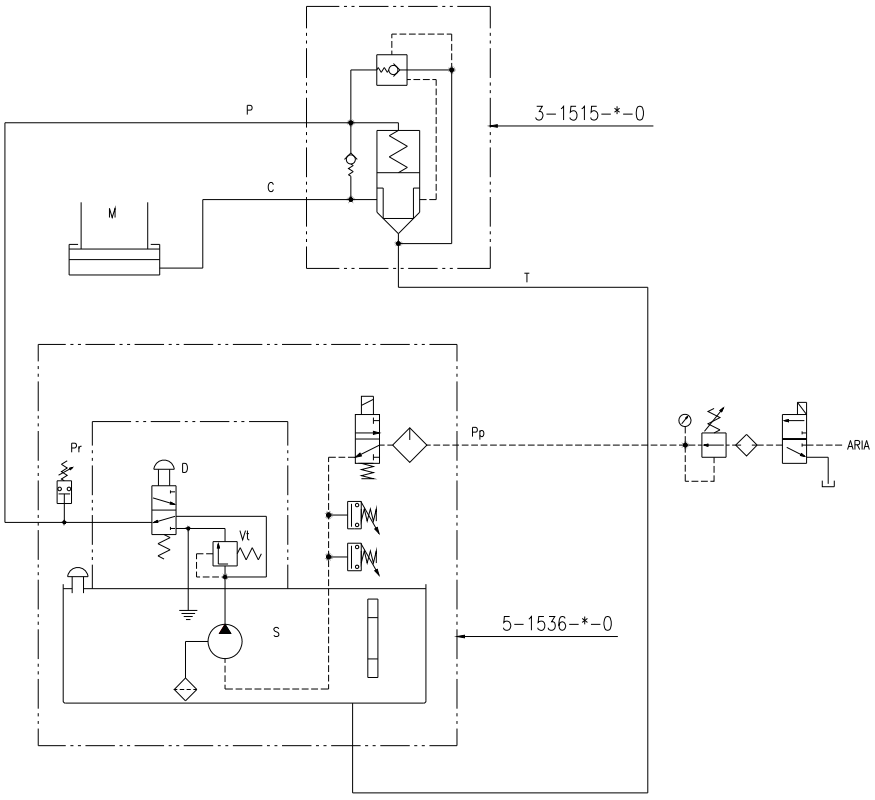


fig.2

Operation of the control unit, code 5-1536-*-0 (diagram in figure 1)

The system illustrated in the figure must be supplied by a compressed air line from the machine.
This line feeds the oleo-pneumatic pump mounted in the control unit's tank; once actuated, the pump feeds oil under pressure to the hydraulic cushion, through a HP piping.
The preloading pressure delivered by the pump is a function of the pneumatic feed pressure and the size of the pump mounted on the control unit (**1-1396-A-0**, **1-1396-B-0**, **1-1396-C-0**, **1-1396-D-0, 1-1396-E-0** and **1-1396-F-0**); for the pressure values delivered by each type of control unit see page 6.
This value is regulated by a pressure reducer non included in the supply of the apparatus.
Once the balance pressure has been reached, the pump stops, keeping in the oil gallery **P** the preset hydraulic pressure; during the rise in pressure of delivery line **P**, the minimum pressure switch **8** (calibrated at 50 bar) switches, so as to give the "machine ready" signal to the press, and to enable its start-up.
The same pressure switch **8**, during the manual discharge or emergency phase (induced by the hydraulic safety valve) switches to the open position, by sending the emergency signal to the machine (machine not ready/activation of the safety device).
The drain valve **5** performs the double function of discharging the hydraulic safety device in case of jamming of the press during the die testing stage and the resetting of the control unit's preloading pressure.
As soon as the preloading pressure drops, the hydraulic pressure remains trapped in the hydraulic cushion, and accordingly the system is to be discharged in manual mode, in order to set a safety device's preloading pressure lower than the value set before. If the preloading pressure rises, simply use the pneumatic pressure reducer connected to the control unit to obtain the desired value (for the air/oil pressure values, refer to the graphs on page **6**).
The function of valve **7** is to limit the maximum pressure that can be delivered by the control unit; when the threshold set on the valve is exceeded, the oleo-pneumatic pump inside the control unit enables the discharge of its capacity, and does not stop when the balance pressure is reached.
The calibration value of valve **Vt** is calculated according to the maximum permissible tonnage of the press, with respect to the diameter of its hydraulic cushion and the pre-loading discharge ratio selected for safety valves.
The max. pressure switch **3** signals that the maximum pre-loading set for the system has been exceeded, while the min. pressure switch **4** signals the minimum pre-loading level; both calibration values are determined based on the parameters set by the press manufacturer.
Pneumatic electrovalve **2** shall stop pump **12** during the activation of the hydraulic safety device, in order to prevent no-load pumping during the stages that immediately follows the emergency activation.
Oiler **1** is shop-tested for a correct lubrication of pump **12**, and shall be filled from time to time in order to prevent the system working without lubrication.
The oil level in the control unit, during the first start-up of the system, shall be approximately half of sight glass **11**, with the hydraulic cushion of the press **empty**.

Control unit, code 5-1536-*-0 (figure 3)

The control unit consists of a steel frame tank, an aluminium cover fastened to the tank by screws and a distribution block for the hydraulic control. The minimum pressure switch is located on this block, as well as the connection for delivery to the hydraulic safety valve.
The tank contains some 4 liters of oil and its bottom includes the return opening (1"1/4 G) from the drain connection of the safety valve.
The tank is provided with an oil-filler cap, the control column for the pneumatic supply (¼" G connection), the hydraulic control block the pressure relief valve is fastened to and the control unit's drainage device.

Control unit, code 5-1536-*-0 (figure 3)

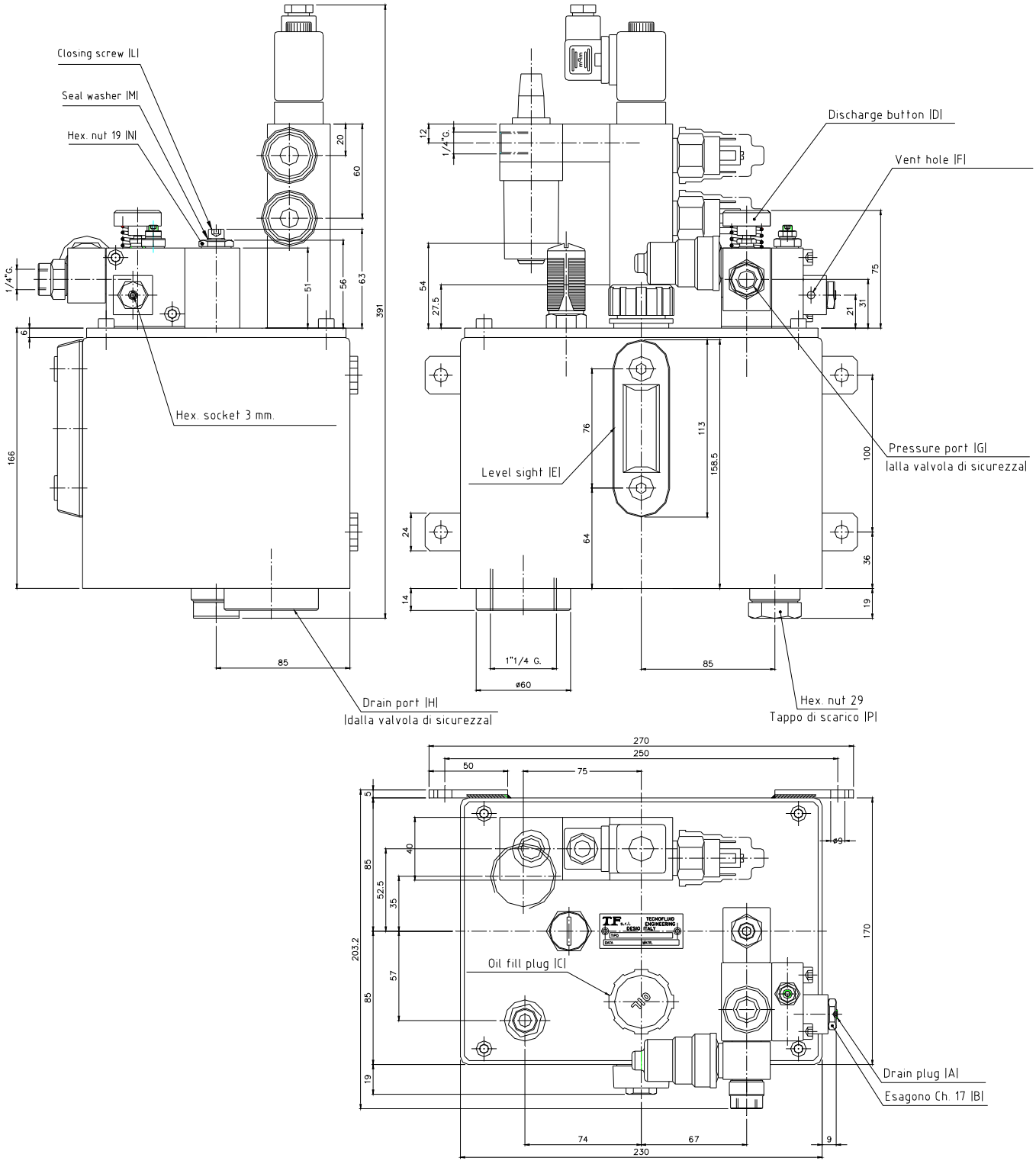


fig.3

Data sheet

AIR-OIL COMPRESSION RATIO	**See page 5**
MAXIMUM PRE-LOADING PRESSURE	**380 bar**
MAXIMUM VISCOSITY OF THE OIL	**10° Engler**
MAXIMUM OIL TEMPERATURE	**90° C**
ROOM TEMPERATURE	**-10 +50 °C**
MINIMUM ENSURED CAPACITY OF THE CONTROL UNIT	**0.8 L/1'**
MIN. PNEUMATIC FEED PRESSURE	**1.5 bar**
MAX. PNEUMATIC FEED PRESSURE	**7 bar**
PNEUMATIC FEED INLET DIAMETER	**1/4" G**
DIAMETER OF THE HYDRAULIC DELIVERY DUCT'S CONNECTION	**1/4" G**
DIAMETER OF THE HYDRAULIC DRAINING DUCT'S CONNECTION	**1"1/4 G**
MAXIMUM VOLTAGE ON THE HYDRAULIC PRESSURE SWITCH	**250 V 6 A AC**
MAXIMUM VOLTAGE ON PNEUMATIC PRESSURE SWITCHES	**42 V 4 A AC 42 V 2 A DC**

Useful installation tips

If you decide to install a hydraulic safety system on an eccentric press, do not forget a few general considerations:

- The safety valve must be mounted near the cushion and must be connected to them using rigid HP pipes.
- The ram's hydraulic cushion must always be provided with a bleeding system positioned next to its top, so as to collect and eject any air bubbles.
- The hydraulic cushion's seals must be of high pressure type (if possible made of polyurethane).
- The cushion's cylinder must be made of homogeneous material, as far as possible (without any blowholes or cracks) in order to ensure a perfect hydraulic sealing and to protect the sealing elements from normal wear and tear
- The piping that, starting from the control unit, transmits the pre-loading pressure to the valve, can be either rigid or flexible, providing that the duct is of the HP type and the piping is proportional to the relevant fittings.
- The compressed air which feeds the hydraulic control unit must be dry and properly lubricated (a drop of oil every about twenty pump strokes of the control unit).
- It is advisable to position the compressed air oiler mounted on the control unit in a position easy to reach, so as to facilitate the oil topping up.
- The oil used in the control unit can be the one used for lubricating the guides of the machine; anyway, the oil must never come into contact with the lubrication oil, since the suspended metal particles would cause irreparable damage to the system; in any case, the oil viscosity must not exceed the maximum expected viscosity.
- During the first start-up of the system, it is imperative to fire the pump; to do this, simply follow the operational procedure **"STARTING-UP THE HYDRAULIC SAFETY SYSTEM"** relating to the control unit (code **5-1536-*-0**), enclosed to this technical documentation.
- The drain piping shall have an internal diameter of at least 30 mm, and shall withstand a pressure of 70 bar.
- We recommend that you do not use liquid Teflon for the assembly of connecting joints between valves and control unit; where you cannot use metal-rubber washers, we recommend that you adopt conical thread fittings and use a Teflon tape for sealing.
- The type of control unit to be adopted (maximum pressure that can be delivered) can be inferred from the graph on page 6; the type of adopted control unit is always specified on the plate fastened onto its cover.

Coding of hydraulic safety units, code 5-1536-*-0: These control units can be supplied equipped with different oleo-pneumatic pumps; the table below lists the maximum pressures which can be obtained and the control units' codes.

Control unit code	5-1536-A-0	5-1536-B-0	5-1536-C-0	5-1536-D-0	5-1536-E-0
Max. pressure (bar)	**450**	**240**	**150**	**100**	**66**

Air/oil compression ratios

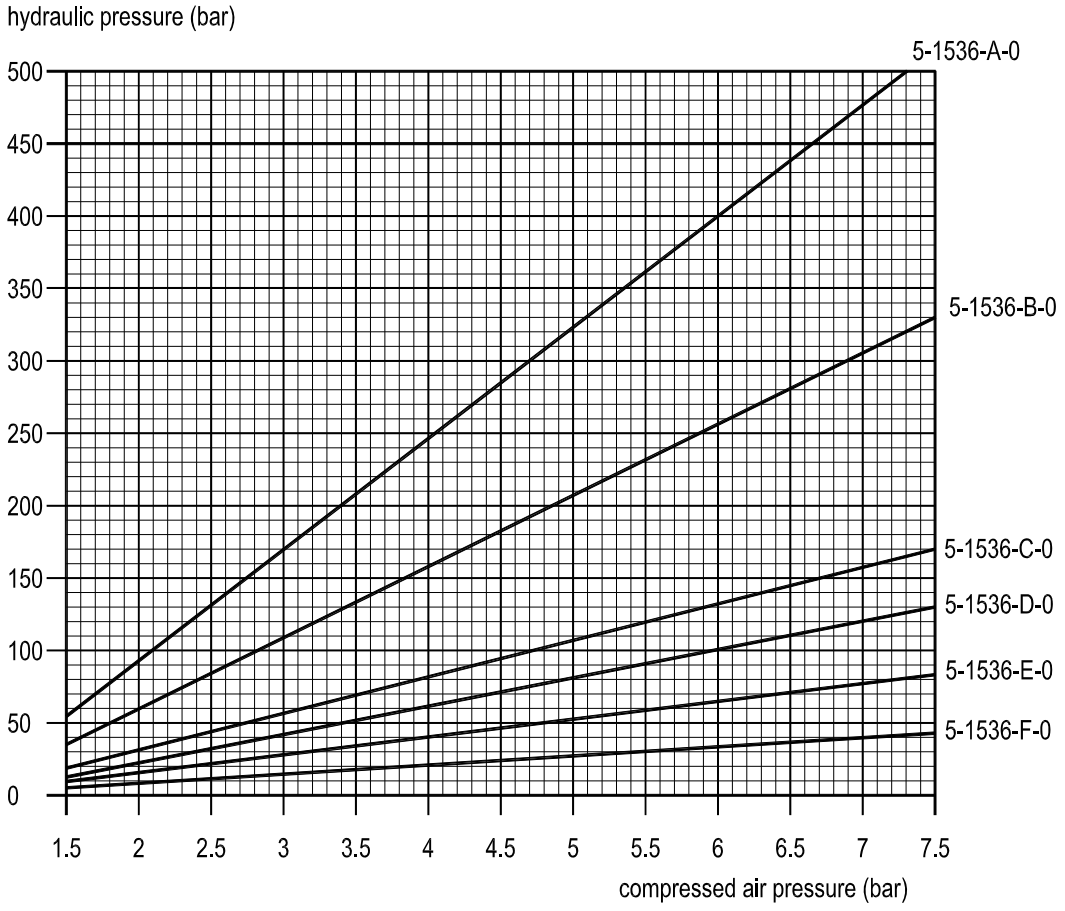


fig.4

Figure 4 shows the graph of the air/oil compression ratios for the pneumatic control unit models required to feed the hydraulic safety valves.

Possible failures during start-up

EFFECT		The power unit does not start
CAUSE	1	The power unit's pressure reducer is set to 0 bar
	2	The compressed air line is closed or clogged
REMEDY	1	Screw the pressure reducer’s knob clockwise
	2	Check the compressed air line upstream of the power unit

EFFECT		The power unit functions slowly
CAUSE	1	The pressure reducer connected to the power unit is calibrated at less than 1.5 bar
	2	A pressure reducer calibrated at less than 2 bar is positioned upstream of the power unit
	3	There's a choke on the line upstream of the power unit (e.g. bent or crushed pipe)
	4	The control unit has reached the balance pressure between incoming pneumatic pressure and delivered hydraulic pressure
REMEDY	1	Bring the reducer to a pressure above 2 bar
	2	Bring the reducer to a pressure above 2 bar
	3	Check the power unit's pneumatic duct
	4	Normal phenomenon

EFFECT		The power unit functions normally but there is no hydraulic flowrate
CAUSE	1	The oil level in the tank is insufficient
	2	The pump is not primed
	3	The suction filter is clogged
REMEDY	1	Pour some oil into the tank, and then start-up
	2	Start-up as indicated above
	3	Disassemble the power unit cover from the tank, unscrew filter from the suction union and clean thoroughly; re-assemble the unit and carry out the drainage procedure, if necessary

EFFECT		The pressure in the circuit is insufficient/the power unit is pumping continuously
CAUSE	1	Leak in the hydraulic circuit
REMEDY	1	Carefully inspect the hydraulic circuit and, if necessary, tighten again or replace the unions or the pieces with leaks of hydraulic fluid

Spare parts for the control unit , code 5-1536*-0

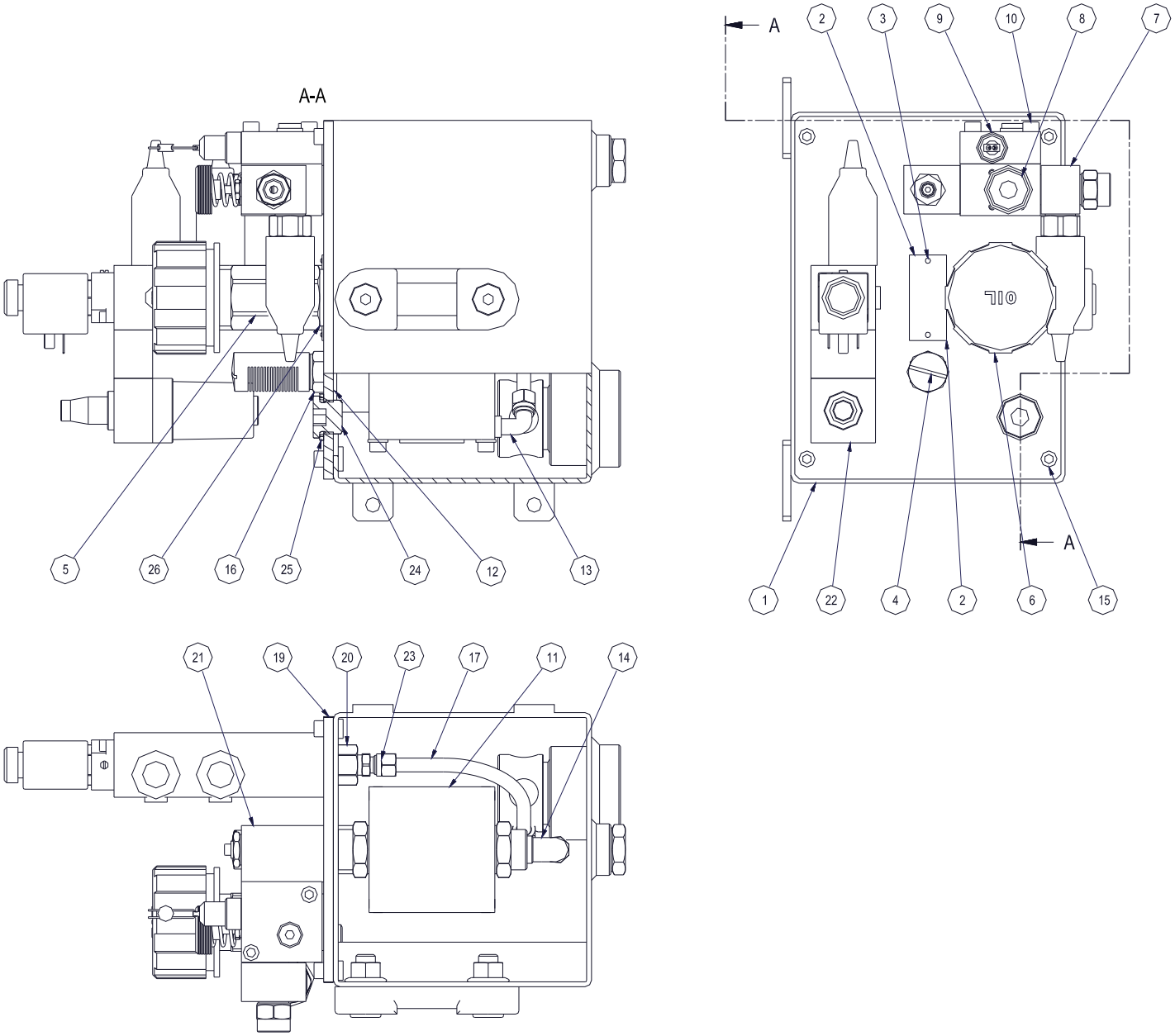


fig.5

Figure 5 shows a section plane of the control unit (code **5-1536-*0)**, where all the components of the control unit have been numbered .
The spare parts list includes also the quantity of every single item, as may be necessary for completing a single unit.
This list is available on the next page.

Spare parts for the control unit, code 5-1536*-0 (see the section plane in figure 5)

POS	NAME	Q.TY	ORDER CODE
1	HYDR. SAFETY TANK (SIZE 1)	1	5-1318-GR1
2	PUMP PLATE 1 1194	1	TARGH 1194
3	STEEL NAIL Ø1.9x5	2	CH A 1.9 5
4	DYNAMIC SILENCER 3/8"G.	1	SIL 38 D
5	M-F ¾ EXTENSION H=55	1	PROL 34 55
6	FILLER PLUG WITH ¾ SCREW	1	TCAR 34 70 V
7	PRESSURE SWITCH BLOCK	1	5-1474-0
8	MANUAL CONTROL MANIFOLD BLOCK	1	2-1398-0
9	MAX. MODULAR VALVE, 30÷150 or 240÷450 bar	1	(3-1521-B,A-0)
10	SOCKET SCREW M6X30 UNI 5931	2	VTCE 6 30
11	OLEO-PNEUMATIC PUMP 450,240,150,100 or 66 bar	1	(1-1396-A,B,C,D,E-0)
12	BONDED WASHER 3/8, thickness 2.1	2	RTMG 38 1
13	PNEUM FITTING WITH RUB 1/4 T8 OGIVA	1	RAPG 14 08 2
14	SUCTION FILTER 3/8" G	1	5-1522-0
15	SOCKET SCREW M6x12 UNI 5931	4	VTCE 6 12
16	PNEUM EXTENSION 3/8" Lg 23.5	1	PROL 38 23.5
17	RILSAN PIPE 6-8 SMOOTH NATURAL	1	TUPN 8 6 LN
18	PIPE STIFFENER	1	5-1520-4
19	CONTROL UNIT COVER	1	5-1536-1
20	M-F UNION 3/8-1/4	1	RA-201
21	MANIFOLD/COLUMN UNIT FOR HYDRAULIC SAFETY	1	5-1520-50
22	PRESSURE CONTROL BLOCK - NA LINE	1	3-1535-0-B
23	PNEUM FITTING WITH RUB 1/4 T8 OGIVA	1	RAPD 14 08 2
24	PLASTIC CAP WITH STOP 1/2 “ GAS DIN 908	1	TC 12 908
25	BONDED WASHER 1/2, thickness 2.5	1	RTMG 12 1
26	BONDED WASHER 3/4, thickness 2.5	1	RTMG 34 1

NOTES:

WHEN ORDERING ANY SPARE PARTS, IT IS IMPERATIVE TO QUOTE THE SERIAL NUMBER ON THE PLATE FASTENED ONTO THE COVER OF THE CONTROL UNIT FOR ALL ITEMS WHOSE CODE IS INDICATED IN BRACKETS IN THE LIST ON PAGE 9.

THE OLEO-PNEUMATIC CONTROL UNITS DESCRIBED IN THIS FILE HAVE BEEN DESIGNED AND MANUFACTURED ACCORDING TO CRITERIA AIMED AT PREVENTING ANY DAMAGE TO PEOPLE AND PROPERTY; ANYWAY, SINCE THESE OLEO-PNEUMATIC CONTROL UNITS ARE PRESSURE GENERATORS, ANY IMPROPER USE OF THIS DEVICE MAY BE POTENTIALLY DANGEROUS.

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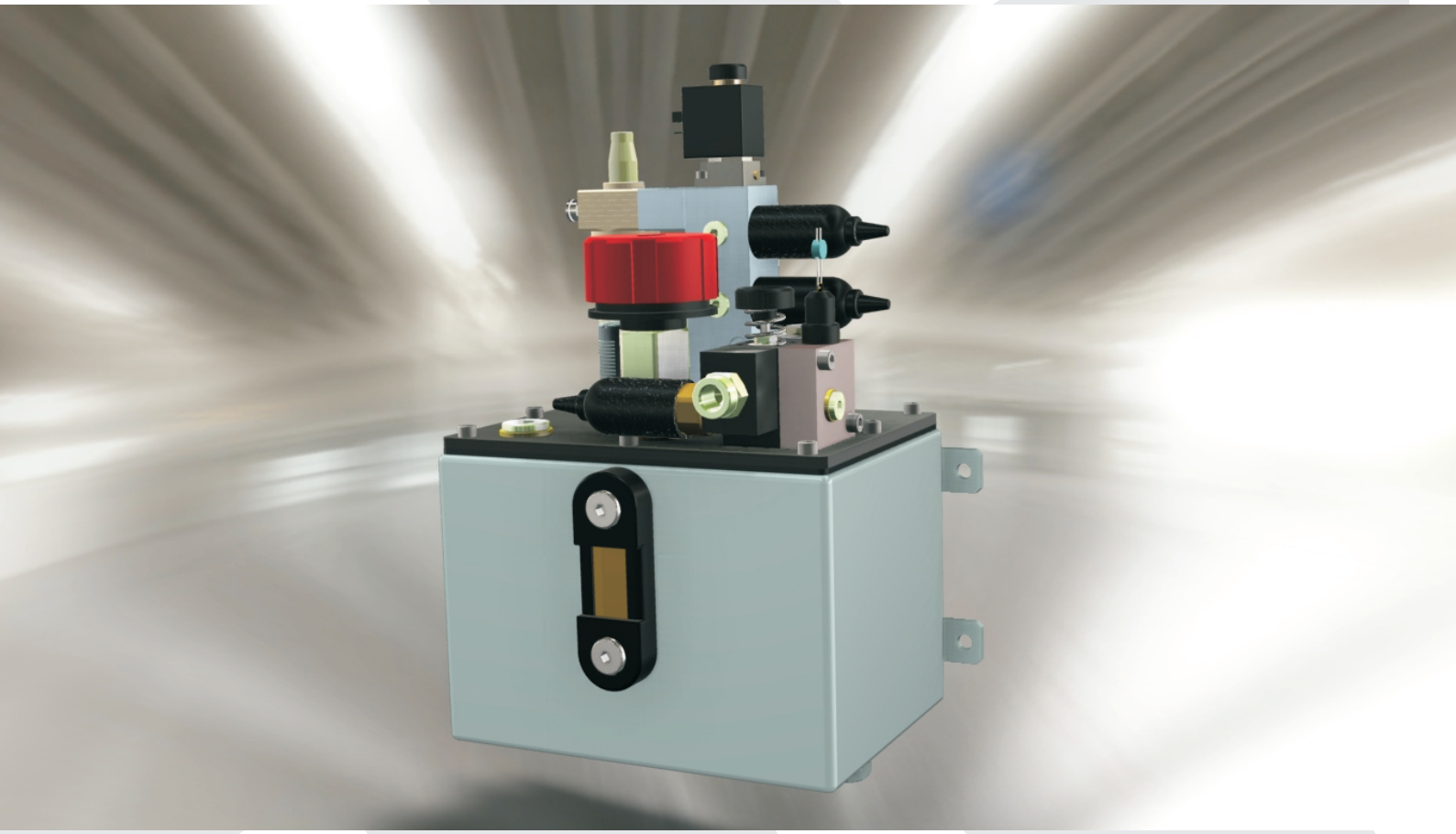
POWER UNIT FOR HYDRAULIC OVERLOAD
MODEL 5-1698



Requirements

The system consists of an oleopneumatic control unit with code **5-1698-*-0.**
This device was developed to deliver hydraulic pre-charge pressure to code **3-1517-*-0**, **3-1548-*-0, 3-1757-*-0** etc… hydraulic safety valves for eccentric-shaft presses with twin connecting rods.
Therefore, the use of code **5-11698-*-0** control unit is conditioned by the use of one of the above listed valves, for whose characteristics please refer to the relevant technical documentation.
The pneumatic supply lines connecting the press to code **5-1698-*-0** control unit must be equipped with two ¼" G filter-lubricator assemblies complete with pressure gauges.
In addition, the compressed air delivered to code **5-1698-*-0** control unit must be free from condensation water; should the machine not be equipped with any condensation reduction system, the above mentioned reducer must be complete with a separator filter. In addition, the hydraulic safety valve drain lines must be conveyed into an expansion tank with appropriate capacity (about three times the total volume of the hydraulic cushions). This expansion tank must also be provided with a properly sized vent to prevent dangerous overpressures inside it.

Characteristics

The system in question has small overall dimensions and allows optimum use of the safety valves connected to it
In fact, although it is a small size control unit, it meets all technical requirements of a hydraulic safety system applied even on high tonnage machines which are equipped with control an monitoring devices for the functions of the same system.
The two combined pumps inside the control unit enable reaching the set pre-charge pressure even when this is much lower than the maximum one which can be delivered. In fact the low pressure pump can be always fed at the maximum pneumatic pressure, whereas the high pressure pump
can also be fed with very low pneumatic pressures.
The control unit design enables its installation externally to the ram, thus saving a lot of space.

Hydraulic diagram

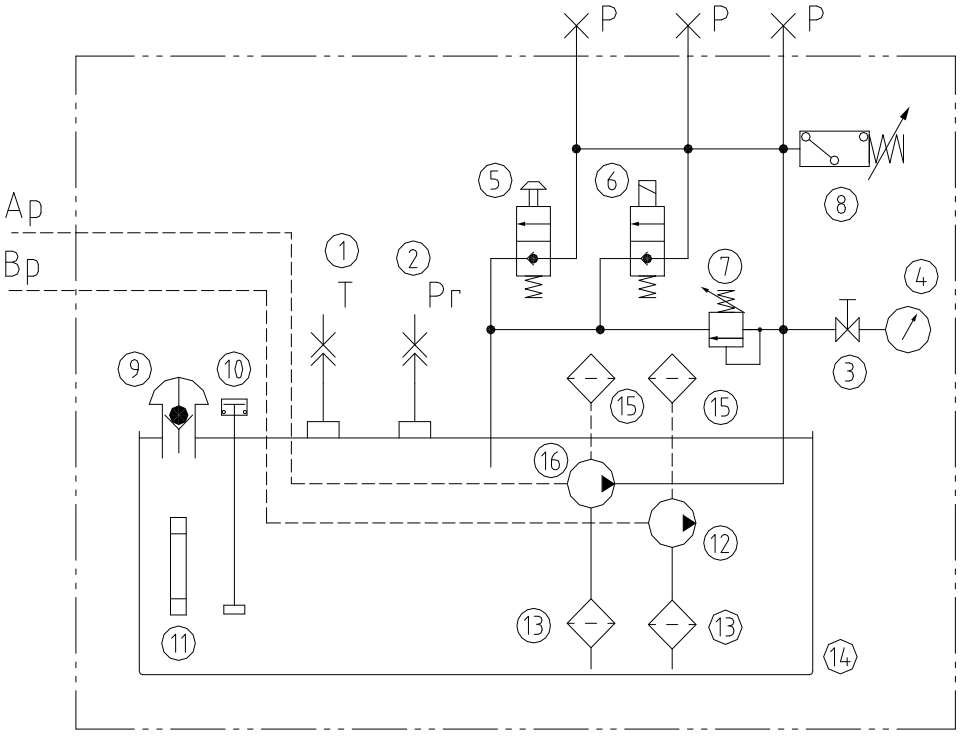


fig.1

Figure 1 shows the hydraulic diagram of code **5-1698-*-0** control unit
Note the extremely simple connection to the machine: the control unit is directly connected to the hydraulic safety valve through a high-pressure flexible pipe and connect the latter' drain pipes to an expansion tank which, in its turn, must be connected to the control unit drain connection.
The symbols used in Figure 1 have the following meanings:
Ap = high pressure pump pneumatic supply **Bp** = low pressure pump pneumatic supply
P = control unit delivery connections **Pr** = reservoir pressurization (pump priming) connection **T** = expansion tank drain connection (safety valve drain) **1** = drain **2** = pressurization **3** = pressure gauge cut-out cock
4 = hydraulic pre-charge pressure gauge **5** = hydraulic safety manual drain control valve **6** = hydraulic safety drain control solenoid valve **7** = maximum hydraulic pre-charge pressure calibrated valve **8** = minimum hydraulic pre-charge pressure switch **9**= reservoir fill plug with vent valve **10**= reservoir level switch
11= reservoir oil sight glass **12**= oleopneumatic low-pressure pump **13**= suction filter **14**= reservoir **15**= pump muffler.
16 = oleopneumatic high-pressure pump

Operating principle

Code **5-1698-*-0** control unit contains two parallel oleopneumatic pumps operated by pneumatic pressure from the press on which
it is installed, which pump oil sucked from reservoir **14** into delivery pipe **P**.
Once the press hydraulic cushions are full, pressure in delivery pipe **P** rises until reaching the value which corresponds to the above mentioned high-pressure pump's typical air/oil pressure ratio.
The reached pressure value is then kept constant by the same pump even if slight hydraulic leaks occur.
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Connection diagram to hydraulic safety valves

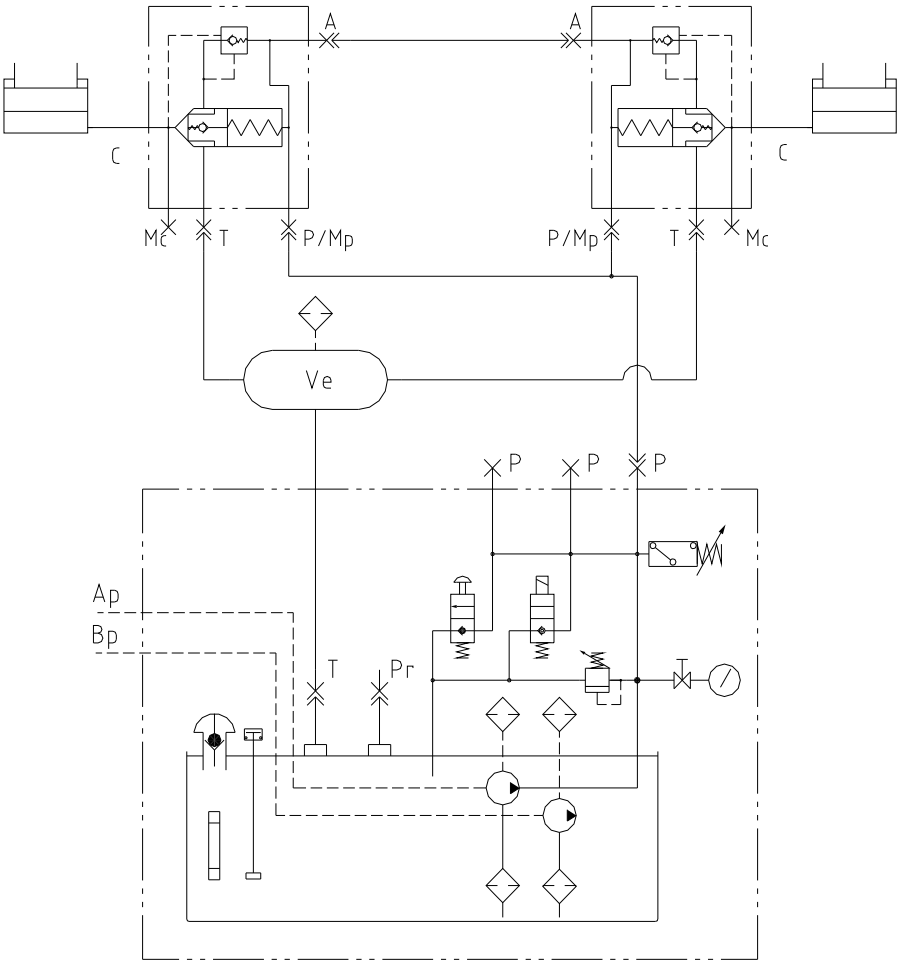

fig.2

Operation of code 5-1698-*-0 control unit (diagram in figure 1)

The system shown in the figure must be fed by two compressed air lines from the machine.
These lines feed the oleopneumatic pumps installed in the control unit reservoir; when started, the pumps deliver pressurized oil to the hydraulic cushion through a high-pressure piping.
The maximum pre-load pressure provided by the high-pressure pump depends on line **Ap** pneumatic supply pressure and the pump size installed in the control unit (**1-1396-A-0**, **1-1396-B-0**, **1-1396-C-0**, **1-1396-D-0, 1-1396-E-0**), please refer to page 6 for pressure values supplied for each type of control unit. Line **Bp** pneumatic pressure can be maintained around 6 bar, at which value the low-pressure pump delivers about 30 bar. This value is delivered through a pressure reducer not included in the device supply.
Upon reaching balance pressure, the pumps stop, maintaining the set hydraulic pressure in delivery pipe **P**;
during the pressure increase in delivery line **P**, the minimum pressure switch **8** (normally calibrated at 50 bar) is switched,
sending the ready machine signal to the press, which is thus started.
Under manual drain or emergency conditions (induced by the hydraulic safety valve), pressure switch **8** also switches to to opening, sending an emergency signal to the machine (machine not ready/safety device trip).
Drain valve **5** and solenoid valve **6** have the double function of draining the hydraulic safety system, should the press get blocked during mould test, and resetting the control unit pre-charge pressure.
In fact, as the pre-charge pressure decreases, the hydraulic pressure remains trapped inside the hydraulic cushions, it is therefore required to drain the system, either manually or through electric control, in order to adjust the safety pre-charge pressure at a lower value than previously set. On the contrary, should pre-charge pressure increase, just operate the pneumatic pressure reducer connected to the control unit so as to obtain the desired value (please refer to charts on page **6** for the resulting air/oil pressure values).
Valve **7** has the function of limiting the maximum pressure which can be delivered by the control unit; when the threshold set in the valve is reached, the oleopneumatic pump inside the same control unit conveys its flow-rate to drain, without stopping when balance pressure is reached.
Valve **Vt** calibration value is calculated according to the maximum tonnage allowed for the press with respect to the diameter of its hydraulic cushions and the pre-charge/drain ratio selected for the safety valves.
Pressure gauge **4** indicates the level at which the system is adjusted and cut-out cock **3** enables cutting off the same gauge when not used, in order to increase its service life and reading accuracy.
Level switch **10** prevents the press operation, should oil level inside reservoir **14** fall below the minimum set value.
At the system's first startup, oil level in the control unit must be about half of visual level **11**, with **empty** hydraulic cushions of the press.

Code 5-1698-*0 control unit (figure 3)

The control unit consists of a metal structure reservoir, an aluminum cover fixed to the reservoir with screws and a hydraulic control single-piece on which the minimum pressure switch is installed; the single-piece also is also fitted with a connection for delivery of pressure to the hydraulic safety valves.
The reservoir contains about 20 liters of oil.
The reservoir also houses the oil fill plug, a port for the return of drain from the expansion tank (3/4" G connection) and the hydraulic control single-piece, in which the pressure relief valve and the control unit drain device are installed along with the pressure displaying device.

Code 5-1698-*-0 control unit (figure 3)

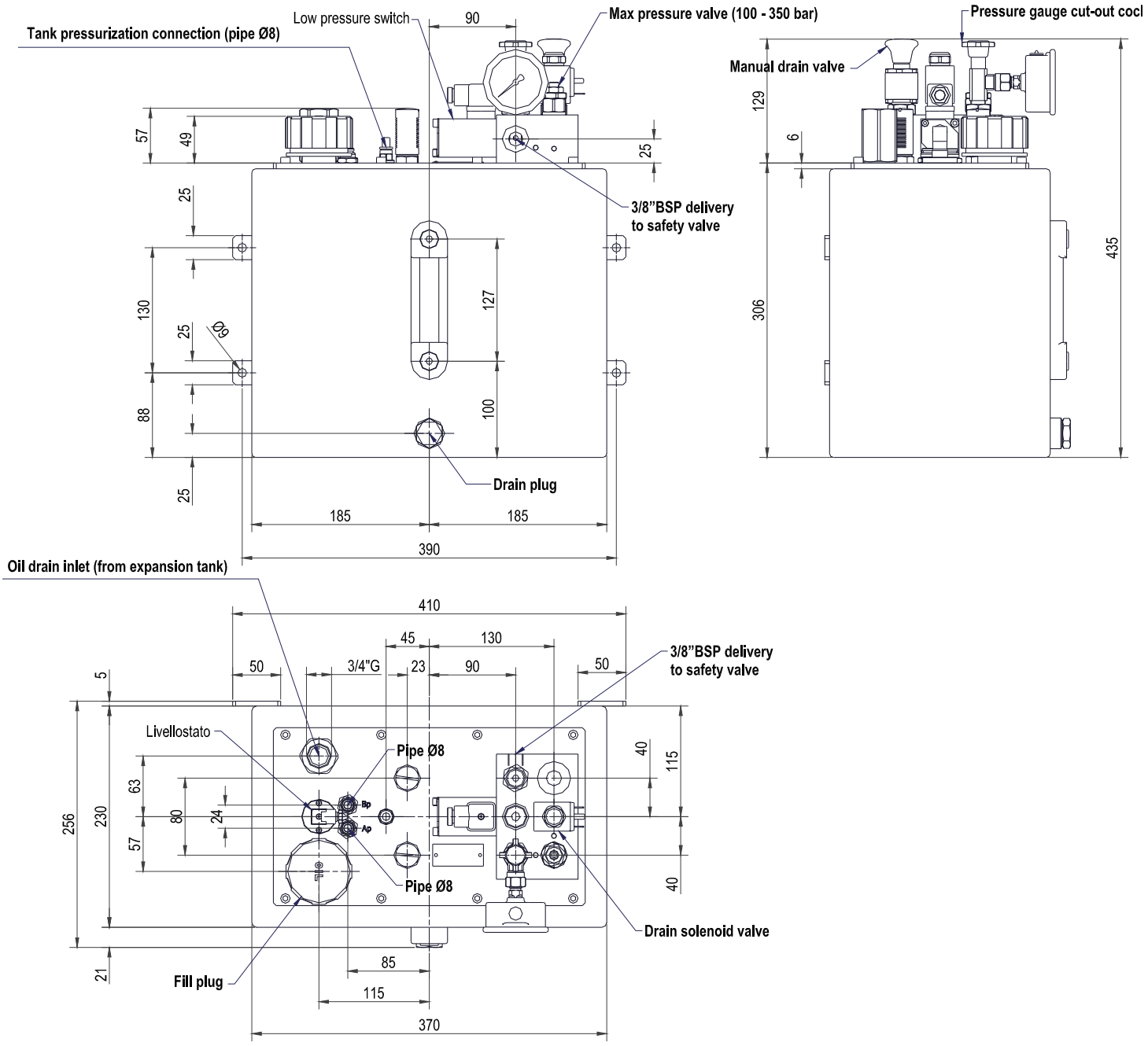

fig.3

Technical data

AIR – OIL COMPRESSION RATIO	**See page 6**
MAXIMUM PRE-CHARGE PRESSURE	**320 bar**
MAXIMUM OIL VISCOSITY	**10° Engler**
MAXIMUM OIL TEMPERATURE	**90° C.**
ROOM TEMPERATURE	**-10 +50 ° C.**
MINIMUM GUARANTEED UNIT FLOW-RATE	**3.5 L/1'**
MIN. PNEUMATIC SUPPLY PRESSURE	**2.5 bar**
MIN. PNEUMATIC SUPPLY PRESSURE	**7 bar**
PNEUMATIC SUPPLY INLET DIAMETER	**PIPE: Ø 8**
DELIVERY HYDRAULIC PIPE CONNECTION DIAMETER	**1/4" G.**
DRAIN HYDRAULIC PIPE CONNECTION DIAMETER	**3/4" G.**
MAX. LEVEL SWITCH POWER INPUT	**50 W**
MAXIMUM HYDRAULIC PRESSURE SWITCH VOLTAGE	**250 V. 6 A. AC**

Installation tips

If the hydraulic safety system is to be installed on an eccentric-shaft press, these general aspects must be taken into account.

- Safety valves must be installed next to cushions and connected to them through high-pressure stiff pipes.
- The ram hydraulic cushions must always be provided with an air purge system located next to their top, in order to collect and vent any air bubbles inside them.
- The hydraulic cushion seals must be adequate for high-pressure, preferably made of polyurethane.
- The cushion cylinder must be made of the most possible homogeneous material (free from blowholes or cracks) so as to ensure a perfect hydraulic seal and preserve the seal elements from abnormal wear.
- The pipe bringing pre-charge pressure from the control unit to the valves can indifferently be stiff or flexible, provided it is suitable for high pressure and properly sized for fittings.
- The compressed air feeding the hydraulic unit must be dried and well lubricated (an oil drop every twenty pump strokes of the unit, approximately).
- It is recommended that the compressed air lubricator, installed on the control unit, be located in easily accessible position,
  for easier topping up of the oil contained in it.
- The oil used in the control unit can be the same which is used for lubricating the machine guides, but under no circumstances must this oil come into contact with the lubricating one, since the suspended metal parts would cause irreparable damages to the system; in any case, the oil viscosity must not exceed the maximum one prescribed.
- Upon the system's first startup, it is mandatory to prime the pump: to do that, please follow the procedure "**HYDRAULIC SAFETY SYSTEM COMMISSIONING OPERATIONS**" relating to code **5-1698-*-0** control unit attached to this documentation.
- It is recommended not to use liquid teflon when installing the connections between valves and control unit; where metal-rubber seal washers cannot be used, it is advisable to resort to tapered thread fittings and apply teflon tape for sealing.
- The type of control unit to be selected (maximum deliverable pressure) can be deduced from the chart on page 6, the used type of control unit is always indicated in the plate on the cover of the same.

Coding of code 5-1698-*-0 control units: these units can be supplied equipped with different power oleopneumatic pumps; the table below shows the maximum obtainable pressures and the codes of the relevant control units.

Control unit code	5-1698-A-0	5-1698-B-0	5-1698-C-0	5-1698-D-0	5-1698-E-0
Max. pressure (bar)	450	240	150	100	66

Air – oil compression ratios

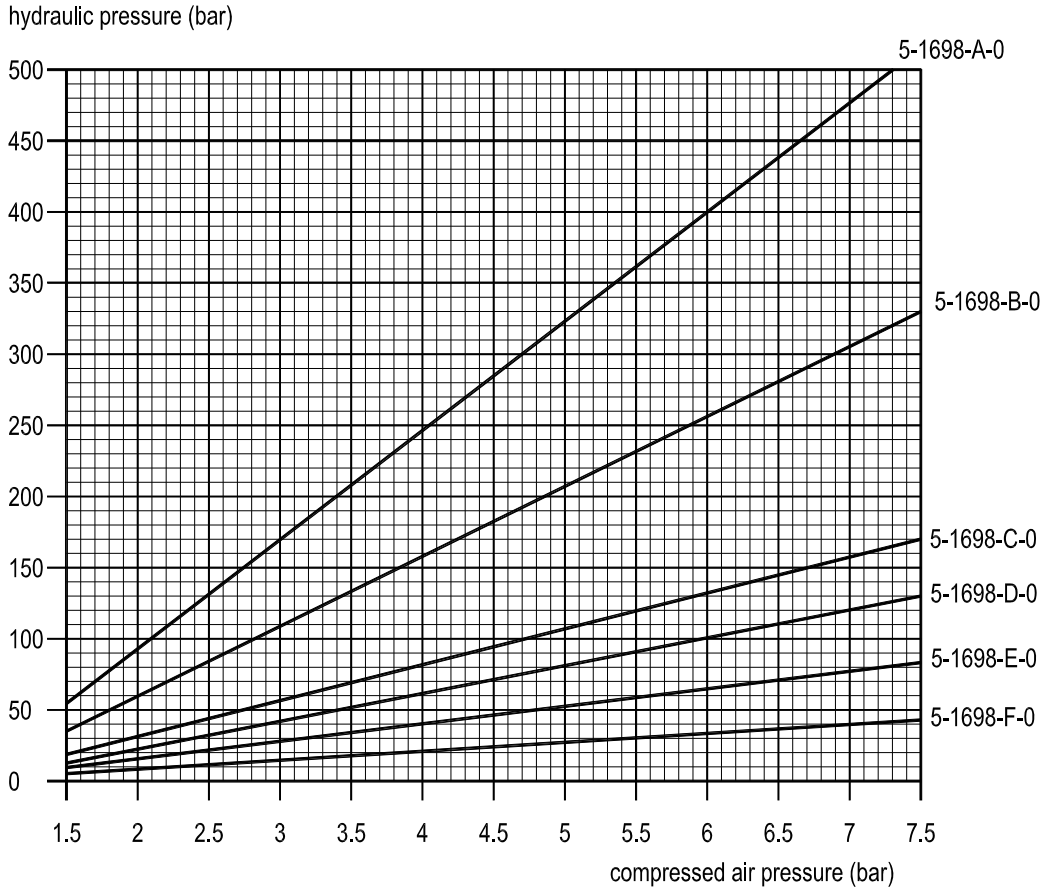

fig.4

Figure 4 shows the chart relating to air/oil compression ratios for control unit versions used to feed the hydraulic safety valves.

Possible failures during commissioning

EFFECT		The power unit does not start
CAUSE	1	The power unit's pressure reducer is set to 0 bar
	2	The compressed air line is closed or clogged
REMEDY	1	Screw the pressure reducer’s knob clockwise
	2	Check the compressed air line upstream of the power unit

EFFECT		The power unit functions slowly
CAUSE	1	The pressure reducer connected to the power unit is calibrated at less than 1.5 bar
	2	A pressure reducer calibrated at less than 2 bar is positioned upstream of the power unit
	3	There's a choke on the line upstream of the power unit (e.g. bent or crushed pipe)
	4	The control unit has reached the balance pressure between incoming pneumatic pressure and delivered hydraulic pressure
REMEDY	1	Bring the reducer to a pressure above 2 bar
	2	Bring the reducer to a pressure above 2 bar
	3	Check the power unit's pneumatic duct
	4	Normal phenomenon

EFFECT		The power unit functions normally but there is no hydraulic flowrate
CAUSE	1	The oil level in the tank is insufficient
	2	The pump is not primed
	3	The suction filter is clogged
REMEDY	1	Pour some oil into the tank, and then start-up
	2	Start-up as indicated above
	3	Disassemble the power unit cover from the tank, unscrew filter from the suction union and clean thoroughly; re-assemble the unit and carry out the drainage procedure, if necessary

EFFECT		The pressure in the circuit is insufficient/the power unit is pumping continuously
CAUSE	1	Leak in the hydraulic circuit
REMEDY	1	Carefully inspect the hydraulic circuit and, if necessary, tighten again or replace the unions or the pieces with leaks of hydraulic fluid

Code 5-1698-*-0 unit spare parts

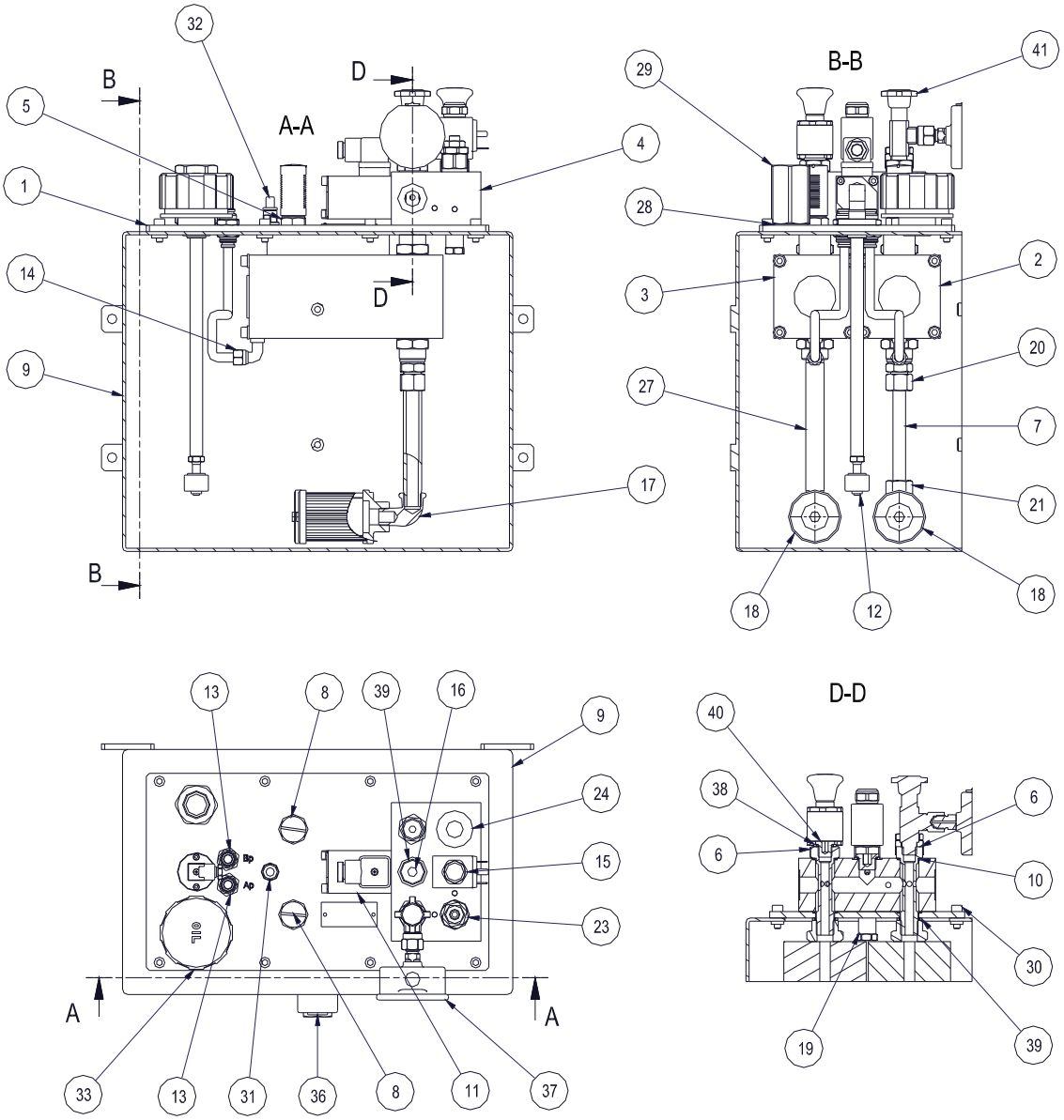

fig.5

Figure 5 shows a section plane of code **5-1698-*-0** control unit, in which all components of the same are numbered. The spare part list also indicates the quantities for each item which are required to complete a given device. Please refer to the following page for the list in question.

Spare part list for code 5-1698-*-0 control unit (see section plane in figure 5)

POS	NAME	Q.TY	ORDER CODE
1	CONTROL UNIT COVER	1	5-1698-1
2	OLEO-PNEUMATIC PUMP 66÷450 bar	1	(1-1396-*-0)
3	OLEO-PNEUMATIC PUMP 33 bar	1	1-1396-F-0
4	VALVES MANIFOLD	1	5-1698-2
5	PNEUM EXTENSION 3/8" Lg 23.5	2	PROL 38 23.5
6	SPECIAL SCREW	2	5-1698-3
7	SUCTION PIPE	1	5-1698-5
8	DYNAMIC SILENCER 3/8"G.	2	SIL 38 D
9	OIL TANK	1	5-1698-90-A
10	OR 2081 20.35x1.78 NBR 70	4	PARK 2 019
11	MIN. PRESSURE PRESSURE SWITCH	1	5-1393-B-0
12	OIL LEVEL SWITCH L=250	1	5-1623-0-250
13	PNEUMATIC FITTING M16 Ø8	2	RAPP 16 08
14	PNEUM FITTING WITH RUB 1/4 Ø8	2	RAPG 14 08 2
15	TWO WAY SOLENOID VALVE 3/4 UNF	1	EVIC 34 05 2
16	PLUG WITH STOP 3/8" GAS DIN 908	1	TC 38 908
17	MALE-FEMALE ELBOW 3/8”-3/8"	1	RA G MF 38
18	SUCTION FILTER 3/8" Lg 95 90 MICRON	2	FI 38 M90
19	PNEUM EXTENSION 1/4"G. Lg 35	1	PROL 14 35
20	HYDRAULIC FITTING 3/8 Ø12	1	RAID 38 12 1
21	HYDRAULIC ELBOW FITTING 3/8 Ø12	1	RAIG 38 12 1
23	MAX PRESS CHECK VALVE 100-350 bar	1	(VATC 10 35)
24	TWO WAY KNOB VALVE 3/4 UNF	1	VAMC 34 05
27	MALE-MALE PIPE 3/8"G. x 150 Lg.	1	TRON 38G 150
28	METAL-RUBBER SEALING WASHER 3/4	1	RTMG 34 2
29	PNEUM EXTENSION M-F 3/4 H=55	1	PROL 34 55
30	SOCKET SCREW M6x16 12K UNI 5931	8	VTCE 6 16 K
31	PNEUMATIC FITTING 1/4 Ø8	1	RAPD 14 08 1
32	PNEUMATIC PLUG Ø8	1	TC T8
33	FILL PLUG 3/4"	1	TCAR 34 70 V
36	OIL LEVEL SIGHT	1	SLVA 127 1
37	PRESSURE GAUGE Ø63	1	MAN 14 A 315I
38	METAL-RUBBER SEALING WASHER 1/4"	1	RTMG 14 1
39	METAL-RUBBER SEALING WASHER 3/8"	6	RTMG 38 1
40	PLUG WITH STOP 1/4"G. DIN 908	1	TC 14 908
41	GAUGE ISOLATOR VALVE	1	RUEM 14 FT

NOTES:

WHEN ORDERING SPARES, ALWAYS STATE THE SERIAL NUMBER PRINTED ON THE PLATE ON THE CONTROL UNIT COVER FOR ALL ITEMS WHOSE CODE IS INCLUDED IN THE LIST BRACKETS IN THE LIST OF PAGE 9.

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Requirements

The system consists of an oleopneumatic control unit with code **5-1719-*-0.**
This device was developed to deliver hydraulic pre-charge pressure to code **3-1517-*-0**, **3-1548-*-0, 3-1757-*-0** etc… hydraulic safety valves for eccentric-shaft presses with twin connecting rods.
Therefore, the use of code **5-1719-*-0** control unit is conditioned by the use of one of the above listed valves, for whose characteristics please refer to the relevant technical documentation.
The pneumatic supply lines connecting the press to code **5-1719-*-0** control unit must be equipped with two ¼" BSP filter-lubricator assemblies complete with pressure gauges.
In addition, the compressed air delivered to code **5-1719-*-0** control unit must be free from condensation water; should the machine not be equipped with any condensation reduction system, the above mentioned reducer must be complete with a separator filter. The hydraulic safety valve drain line must be made with pipes of properly sized diameter for connection threads (1"1/4) and these pipes must be able to resist backpressures of at least 50 bar.

Characteristics

The system in question has small overall dimensions and allows optimum use of the safety valves connected to it
In fact, despite its small size, this control unit meets all technical requirements typical of a hydraulic safety system applied even on high tonnage machines which are equipped with control and monitoring devices for the functions of the same system.
The two combined pumps inside the control unit enable reaching the set pre-charge pressure even when this is much lower than the maximum one which can be delivered. In fact the low pressure pump can be always fed at the maximum pneumatic pressure, whereas the high pressure pump can also be fed with very low pneumatic pressures.
The control unit design enables its installation inside the ram, so that it is possible to directly connect the safety valve drain pipes to the control unit tank.

Hydraulic diagram

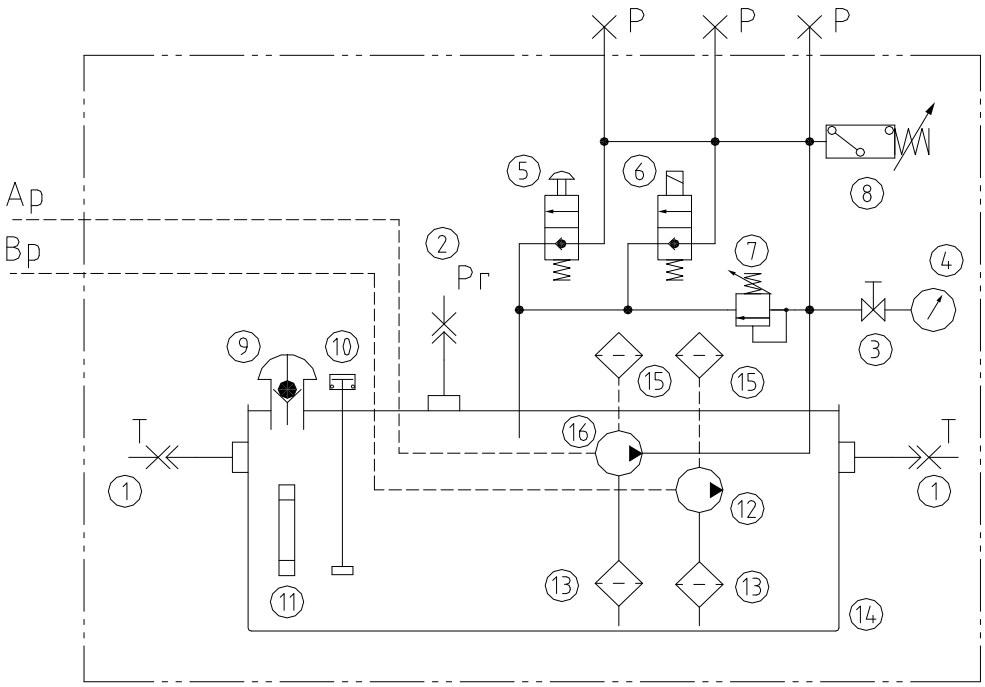

fig.1

Figure 1 shows the hydraulic diagram of code **5-1719-*-0** control unit
Note the extremely simple connection to the machine: the control unit is directly connected to the hydraulic safety valve through a high-pressure flexible pipe and connect the latter drain pipes to the 1”1/4 threaded connections on the control unit tank.
The symbols used in Figure 1 have the following meanings:
Ap = high pressure pump pneumatic supply **Bp** = low pressure pump pneumatic supply
P = control unit delivery connections **Pr** = reservoir pressurization (pump priming) connection **T** = drain connection (safety valve drain) **1** = drain (T) **2** = pressurization (Pr) **3** = pressure gauge cut-out cock
4 = hydraulic pre-charge pressure gauge **5** = hydraulic safety manual drain control valve **6** = hydraulic safety drain control solenoid valve **7** = maximum hydraulic pre-charge pressure calibrated valve **8** = minimum hydraulic pre-charge pressure switch **9=** reservoir fill plug with vent valve **10=** reservoir level switch
11= reservoir oil sight glass **12=** oleopneumatic low-pressure pump **13=** suction filter **14=** reservoir **15=** pump muffler.
16 = oleopneumatic high-pressure pump

Operating principle

Code **5-1719-*-0** control unit contains two parallel oleopneumatic pumps operated by pneumatic pressure from the press on which it is installed, which pump oil sucked from reservoir 14 into delivery pipe **P**.
Once the press hydraulic cushions are full, pressure in delivery pipe **P** rises until reaching the value which corresponds to the above mentioned high-pressure pump’s typical air/oil pressure ratio.
The reached pressure value is then kept constant by the same pump even if slight hydraulic leaks occur.

Connection diagram to hydraulic safety valves

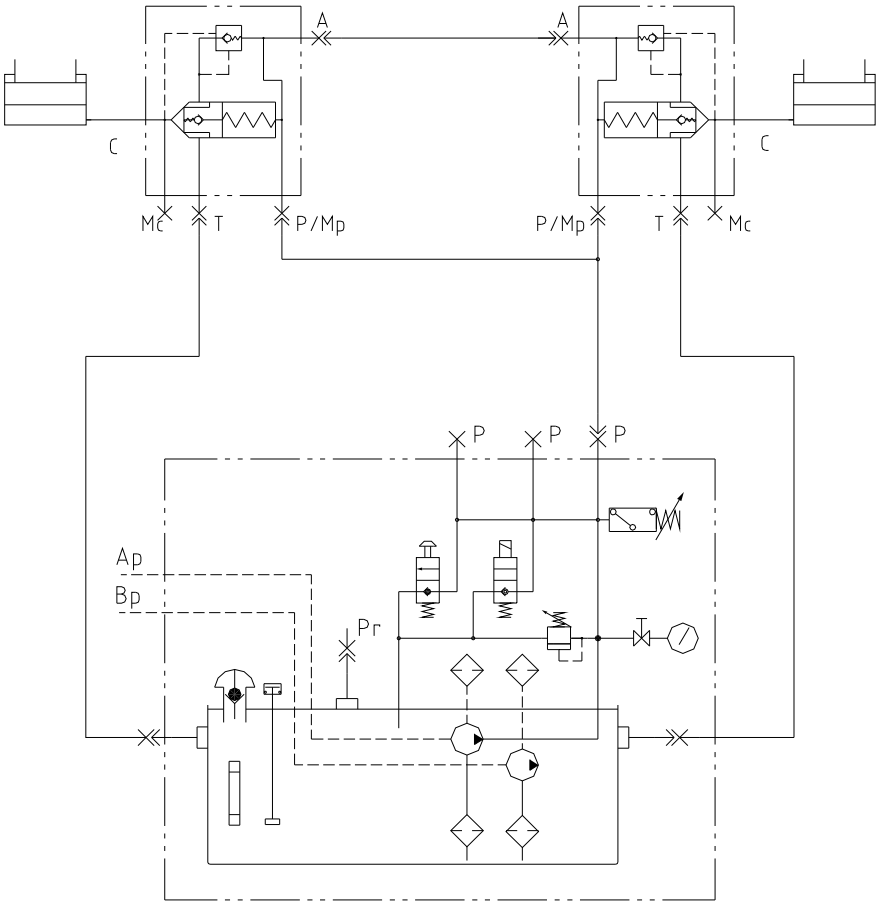

fig.2

Operation of code 5-11719-*-0 control unit (diagram in figure 1)

The system shown in the figure must be fed by two compressed air lines from the machine.
These lines feed the oleopneumatic pumps installed in the control unit reservoir; when started, the pumps deliver pressurized oil to the hydraulic cushion through a high-pressure piping.
The maximum pre-load pressure provided by the high-pressure pump depends on line **Ap** pneumatic supply pressure and the pump size installed in the control unit (**5-1719-A-0**, **5-1719-B-0**, **5-1719-C-0**, **5-1547-D-0, 5-1547-E-0**), please refer to page 6 for pressure values supplied for each type of control unit. Line **Bp** pneumatic pressure can be maintained around 6 bar, at which value the low-pressure pump delivers about 30 bar. This value is delivered through a pressure reducer not included in the device supply.
Upon reaching balance pressure, the pumps stop, maintaining the set hydraulic pressure in delivery pipe **P**; during the pressure increase in delivery line **P**, the minimum pressure switch **8** (normally calibrated at 50 bar) is switched, sending the ready machine signal to the press, which is thus started.
Under manual drain or emergency conditions (induced by the hydraulic safety valve), pressure switch **8** also switches to to opening, sending an emergency signal to the machine (machine not ready/safety device trip).
Drain valve **5** and solenoid valve **6** have the double function of draining the hydraulic safety system, should the press get blocked during mould test, and resetting the control unit pre-charge pressure.
In fact, as the pre-charge pressure decreases, the hydraulic pressure remains trapped inside the hydraulic cushions, it is therefore required to drain the system, either manually or through electric control, in order to adjust the safety pre-charge pressure at a lower value than previously set. On the contrary, should pre-charge pressure increase, just operate the pneumatic pressure reducer connected to the control unit so as to obtain the desired value (please refer to charts on page **6** for the resulting air/oil pressure values).
Valve **7** has the function of limiting the maximum pressure which can be delivered by the control unit; when the threshold set in the valve is reached, the oleopneumatic pump inside the same control unit conveys its flow-rate to drain, without stopping when balance pressure is reached.
Valve **Vt** calibration value is calculated according to the maximum tonnage allowed for the press with respect to the diameter of its hydraulic cushions and the pre-charge/drain ratio selected for the safety valves.
Pressure gauge **4** indicates the level at which the system is adjusted and cut-out cock **3** enables cutting off the same gauge when not used, in order to increase its service life and reading accuracy.
Level switch **10** prevents the press operation, should oil level inside reservoir **14** fall below the minimum set value.
At the system's first startup, oil level in the control unit must be about half of visual level **11**, with **empty** hydraulic cushions of the press.

Code 5-1719-*0 control unit (figure 3)

The control unit consists of a metal structure reservoir, on which the safety valve drain fittings are fixed an aluminum cover fixed to the reservoir with screws and
a hydraulic control single-piece on which the minimum pressure switch is installed; the minimum pressure switch is installed in the single-piece.
The single-piece is also fitted with the connection for delivery of pressure to the hydraulic safety valves.
The reservoir contains about 20 liters of oil.
The reservoir houses the oil fill plug, the hydraulic control single-piece, in which the pressure relief valve is installed, and the control unit drain device along with the pressure displaying device.

Code 5-1719-*-0 control unit (figure 3)

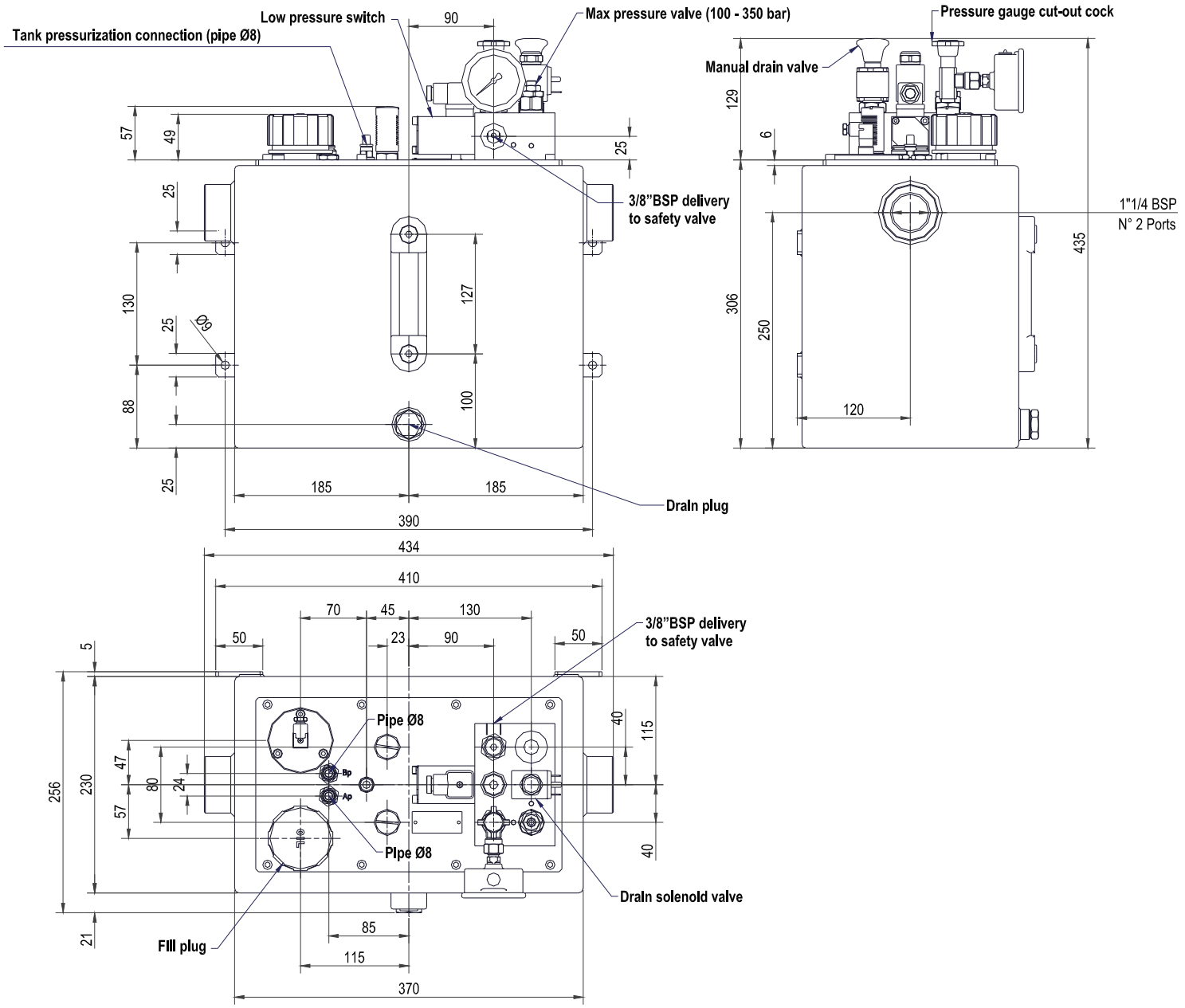

fig.3

Technical data

AIR – OIL COMPRESSION RATIO	**See page 6**
MAXIMUM PRE-CHARGE PRESSURE	**320 bar**
MAXIMUM OIL VISCOSITY	**10° Engler**
MAXIMUM OIL TEMPERATURE	**90° C.**
ROOM TEMPERATURE	**-10 +50 ° C.**
MINIMUM GUARANTEED UNIT FLOW-RATE	**3.5 L/1'**
MIN. PNEUMATIC SUPPLY PRESSURE	**2.5 bar**
MIN. PNEUMATIC SUPPLY PRESSURE	**7 bar**
PNEUMATIC SUPPLY INLET DIAMETER	**PIPE: Ø 8**
DELIVERY HYDRAULIC PIPE CONNECTION DIAMETER	**1/4" G.**
DRAIN HYDRAULIC PIPE CONNECTION DIAMETER	**1"1/4 G.**
MAX. LEVEL SWITCH POWER INPUT	**50 W**
MAXIMUM HYDRAULIC PRESSURE SWITCH VOLTAGE	**250 V. 6 A. AC**

Installation tips

If the hydraulic safety system is to be installed on an eccentric-shaft press, these general aspects must be taken into account.

- Safety valves must be installed next to cushions and connected to them through high-pressure stiff pipes.
- The ram hydraulic cushions must always be provided with an air purge system located next to their top, in order to collect and vent any air bubbles inside them.
- The hydraulic cushion seals must be adequate for high-pressure, preferably made of polyurethane.
- The cushion cylinder must be made of the most possible homogeneous material (free from blowholes or cracks) so as to ensure a perfect hydraulic seal and preserve the seal elements from abnormal wear.
- The pipe bringing pre-charge pressure from the control unit to the valves can indifferently be stiff or flexible, provided it is suitable for high pressure and properly sized for fittings.
- The compressed air feeding the hydraulic unit must be dried and well lubricated (an oil drop every twenty pump strokes of the unit, approximately).
- It is recommended that the compressed air lubricator, installed on the control unit, be located in easily accessible position, for easier topping up of the oil contained in it.
- The oil used in the control unit can be the same which is used for lubricating the machine guides, but under no circumstances must this oil come into contact with the lubricating one, since the suspended metal parts would cause irreparable damages to the system; in any case, the oil viscosity must not exceed the maximum one prescribed.
- Upon the system's first startup, it is mandatory to prime the pump: to do that, please follow the procedure "**HYDRAULIC SAFETY SYSTEM COMMISSIONING OPERATIONS**" relating to code **5-1719-*-0** control unit attached to this documentation.
- It is recommended not to use liquid teflon when installing the connections between valves and control unit; where metal-rubber seal washers cannot be used, it is advisable to resort to tapered thread fittings and apply teflon tape for sealing.
- The type of control unit to be selected (maximum deliverable pressure) can be deduced from the chart on page 6, the used type of control unit is always indicated in the plate on the cover of the same.

Coding of code 5-1698-*-0 control units: these units can be supplied equipped with different power oleopneumatic pumps; the table below shows the maximum obtainable pressures and the codes of the relevant control units.

Control unit code	5-1719-A-0	5-1719-B-0	5-1719-C-0	5-1719-D-0	5-1719-E-0
Max. pressure (bar)	**450**	**240**	**150**	**100**	**66**

Air – oil compression ratios

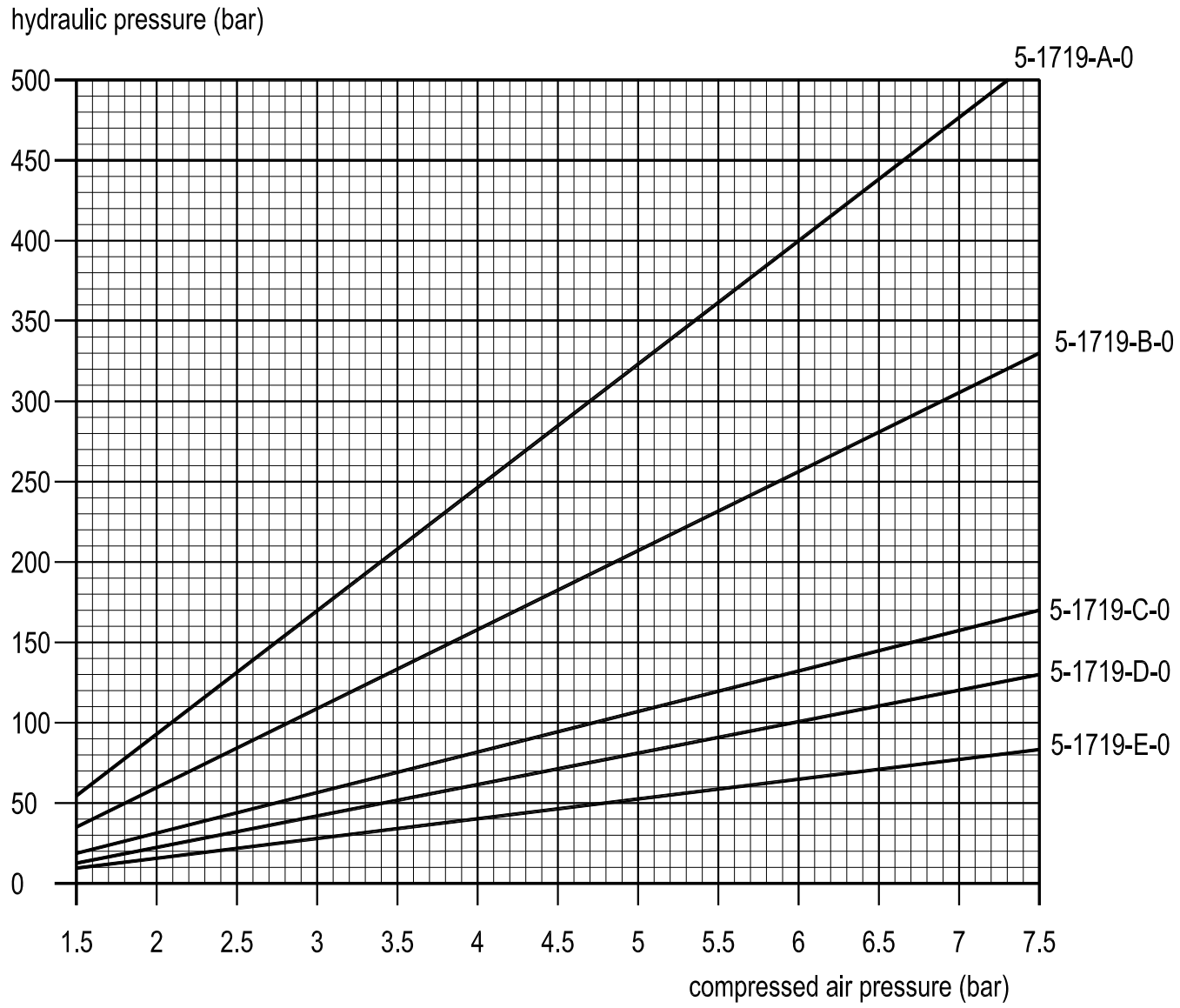

fig.4

Figure 4 shows the chart relating to air/oil compression ratios for control unit versions used to feed the hydraulic safety valves.

Possible failures during commissioning

EFFECT		The power unit does not start
CAUSE	1	The power unit's pressure reducer is set to 0 bar
	2	The compressed air line is closed or clogged
REMEDY	1	Screw the pressure reducer’s knob clockwise
	2	Check the compressed air line upstream of the power unit

EFFECT		The power unit functions slowly
CAUSE	1	The pressure reducer connected to the power unit is calibrated at less than 1.5 bar
	2	A pressure reducer calibrated at less than 2 bar is positioned upstream of the power unit
	3	There's a choke on the line upstream of the power unit (e.g. bent or crushed pipe)
	4	The control unit has reached the balance pressure between incoming pneumatic pressure and delivered hydraulic pressure
REMEDY	1	Bring the reducer to a pressure above 2 bar
	2	Bring the reducer to a pressure above 2 bar
	3	Check the power unit's pneumatic duct
	4	Normal phenomenon

EFFECT		The power unit functions normally but there is no hydraulic flowrate
CAUSE	1	The oil level in the tank is insufficient
	2	The pump is not primed
	3	The suction filter is clogged
REMEDY	1	Pour some oil into the tank, and then start-up
	2	Start-up as indicated above
	3	Disassemble the power unit cover from the tank, unscrew filter from the suction union and clean thoroughly; re-assemble the unit and carry out the drainage procedure, if necessary

EFFECT		The pressure in the circuit is insufficient/the power unit is pumping continuously
CAUSE	1	Leak in the hydraulic circuit
REMEDY	1	Carefully inspect the hydraulic circuit and, if necessary, tighten again or replace the unions or the pieces with leaks of hydraulic fluid

Code 5-1719-*-0 unit spare parts

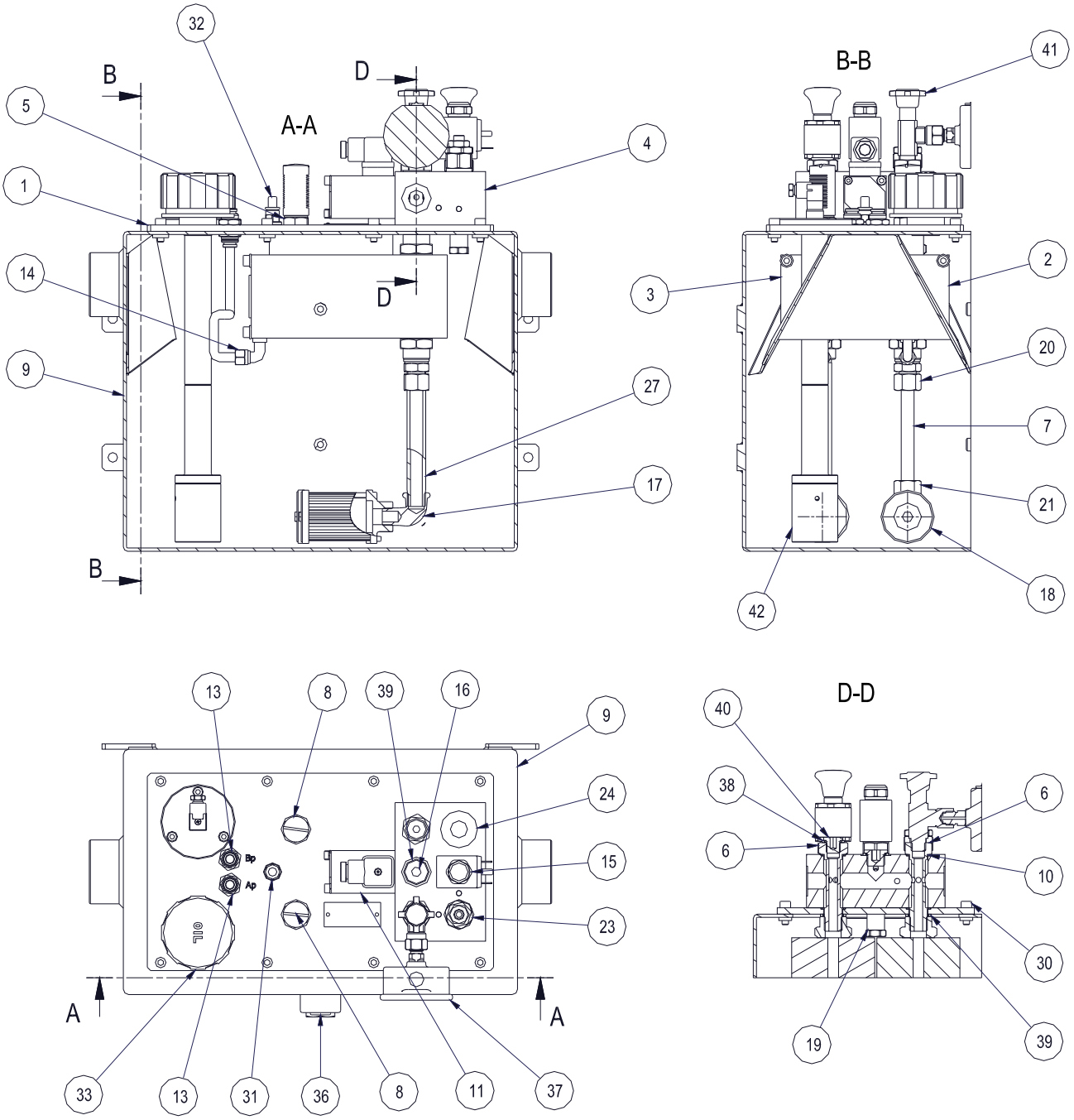

fig.5

Figure 5 shows a section plane of code **5-1719-*-0** control unit, in which all components of the same are numbered. The spare part list also indicates the quantities for each item which are required to complete a given device. Please refer to the following page for the list in question.

Spare part list for code 5-1719-*-0 control unit (see section plane in figure 5)

POS	DENOMINAZIONE	QUANT.	CODICE ORDINAZIONE
1	CONTROL UNIT COVER	1	5-1698-1
2	OLEO-PNEUMATIC PUMP 66÷450 bar	1	(1-1396-*-0)
3	OLEO-PNEUMATIC PUMP 33 bar	1	1-1396-F-0
4	VALVES MANIFOLD	1	5-1698-2
5	PNEUM EXTENSION 3/8" Lg 23.5	2	PROL 38 23.5
6	SPECIAL SCREW	2	5-1698-3
7	SUCTION PIPE	1	5-1698-5
8	DYNAMIC SILENCER 3/8"G.	2	SIL 38 D
9	OIL TANK	1	5-1698-90-A
10	OR 2081 20.35x1.78 NBR 70	4	PARK 2 019
11	MIN. PRESSURE PRESSURE SWITCH	1	5-1393-B-0
12	OIL LEVEL SWITCH L=250	1	5-1623-0-250
13	PNEUMATIC FITTING M16 Ø8	2	RAPP 16 08
14	PNEUM FITTING WITH RUB 1/4 Ø8	2	RAPG 14 08 2
15	TWO WAY SOLENOID VALVE 3/4 UNF	1	EVIC 34 05 2
16	PLUG WITH STOP 3/8" GAS DIN 908	1	TC 38 908
17	MALE-FEMALE ELBOW 3/8”-3/8"	1	RA G MF 38
18	SUCTION FILTER 3/8" Lg 95 90 MICRON	2	FI 38 M90
19	PNEUM EXTENSION 1/4"G. Lg 35	1	PROL 14 35
20	HYDRAULIC FITTING 3/8 Ø12	1	RAID 38 12 1
21	HYDRAULIC ELBOW FITTING 3/8 Ø12	1	RAIG 38 12 1
23	MAX PRESS CHECK VALVE 100-350 bar	1	(VATC 10 35)
24	TWO WAY KNOB VALVE 3/4 UNF	1	VAMC 34 05
27	MALE-MALE PIPE 3/8"G. x 150 Lg.	1	TRON 38G 150
30	SOCKET SCREW M6x16 12K UNI 5931	8	VTCE 6 16 K
31	PNEUMATIC FITTING 1/4 Ø8	1	RAPD 14 08 1
32	PNEUMATIC PLUG Ø8	1	TC T8
33	FILL PLUG 3/4"	1	TCAR 34 70 V
36	OIL LEVEL SIGHT	1	SLVA 127 1
37	PRESSURE GAUGE Ø63	1	MAN 14 A 315I
38	METAL-RUBBER SEALING WASHER 1/4"	1	RTMG 14 1
39	METAL-RUBBER SEALING WASHER 3/8"	6	RTMG 38 1
40	PLUG WITH STOP 1/4"G. DIN 908	1	TC 14 908
41	GAUGE ISOLATOR VALVE	1	RUEM 14 FT
42	OIL LEVEL SWITCH L=280	1	5-1610-0-280

NOTES:

WHEN ORDERING SPARES, ALWAYS STATE THE SERIAL NUMBER PRINTED ON THE PLATE ON THE CONTROL UNIT COVER FOR ALL ITEMS WHOSE CODE IS INCLUDED IN THE LIST BRACKETS IN THE LIST OF PAGE 9.

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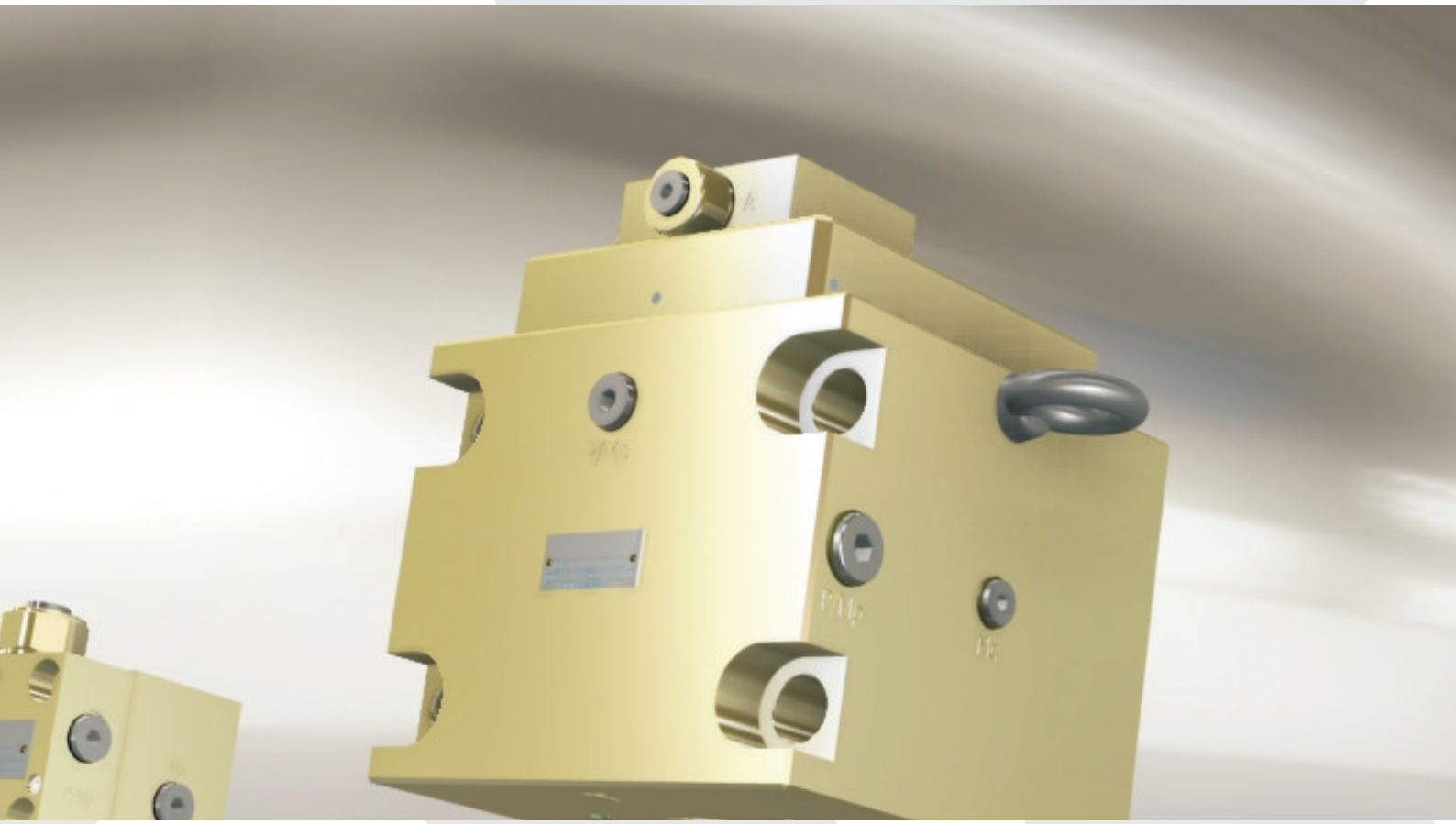
TECNOFLUID

ENGINEERING

HYDRAULIC SAFETY VALVES

HYDRAULIC SAFETY VALVES
MODEL 3-1757



Requirements

The system consists of one or more **3-1757-*0** valves.
This device has been designed to control the hydraulic pressure delivered by oleopneumatic control units (codes **5-1698** and **5-1719**). Accordingly the use of the **3-1757-*0** valves is subject to the adoption of one of the control units mentioned above – for their technical characteristics, refer to the relevant technical documentation.
To allow the use of this system, the machine must be provided with hydraulic cushions, according to the diagram in figure 1; furthermore, the maximum pressure for the activation of the safety device must not exceed 500 bar. To this end, the hydraulic cushions must be suitably dimensioned, in order to ensure the required tonnage to the machine .

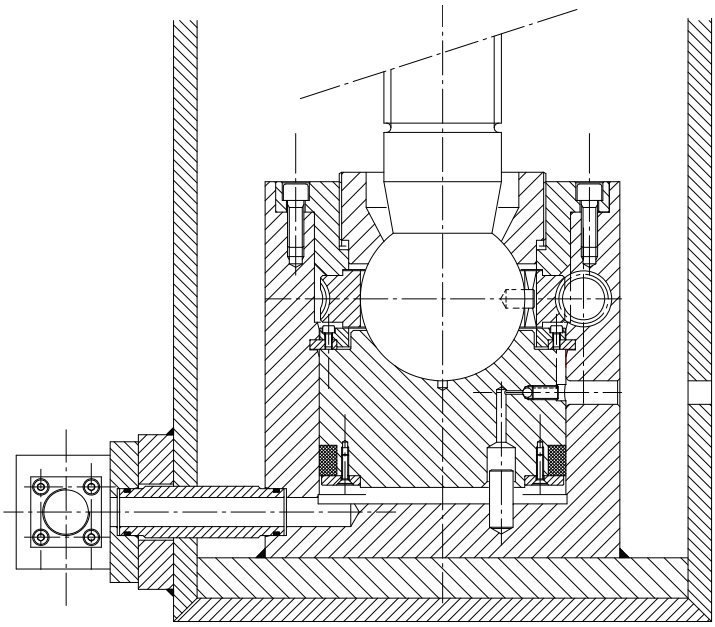


fig.1

Characteristics

Apart from a satisfactory repeatability, the system under examination ensures low response times,
so that the occurrence of pressure peaks is dramatically reduced. The extremely high ratio of preloading pressure to safety device activation pressure (up to 1:5), allows the adoption of reduced preloading pressures for the hydraulic cushions, thus decreasing the stress the cushions are subjected to.
The design of the system makes it possible to continuously modify the activation pressure of the safety device, working on the preloading pressure delivered by the control unit.

Hydraulic diagram

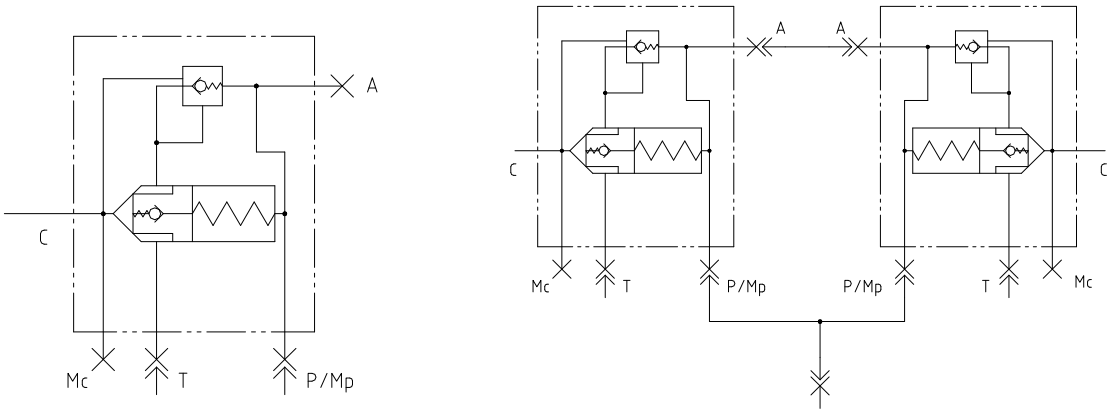


fig.2

Figure 2 shows the hydraulic diagram of the **3-1757-*0** valve. The symbols used in figure 2 can be interpreted as follows:

P = preloading (from the control unit), **T** = discharge line, **A** = drive, **C** = connection to the hydraulic cushion, **Mc** = connection of the hydraulic cushion pressure gauge, **Mp** = connection of the preloading line pressure gauge.

Working principle

The hydraulic cushions (figure 1) are obtained between the connecting rods and the ram of the press, which are pre-loaded with a hydraulic pressure **P** in order to confer more stiffness to the system.
After every single work cycle of the press, the pressure inside the cushions rises to a variable value **Pl**, which substantially depends on the type of work which is being carried out.
If, for accidental reasons (e.g. wear of the die) the pressure in the hydraulic cushions exceeds the maximum preset value **Ps**, the safety valve cod. **3-1757-*-0** involved in the overload will switch automatically to the discharge mode, while causing the other valves connected to it to discharge by means of drive **A**, so as to drain the oil from the hydraulic cushion, and to allow the ram to go beyond the bottom dead center (**BDC**).

Hydraulic connection diagrams

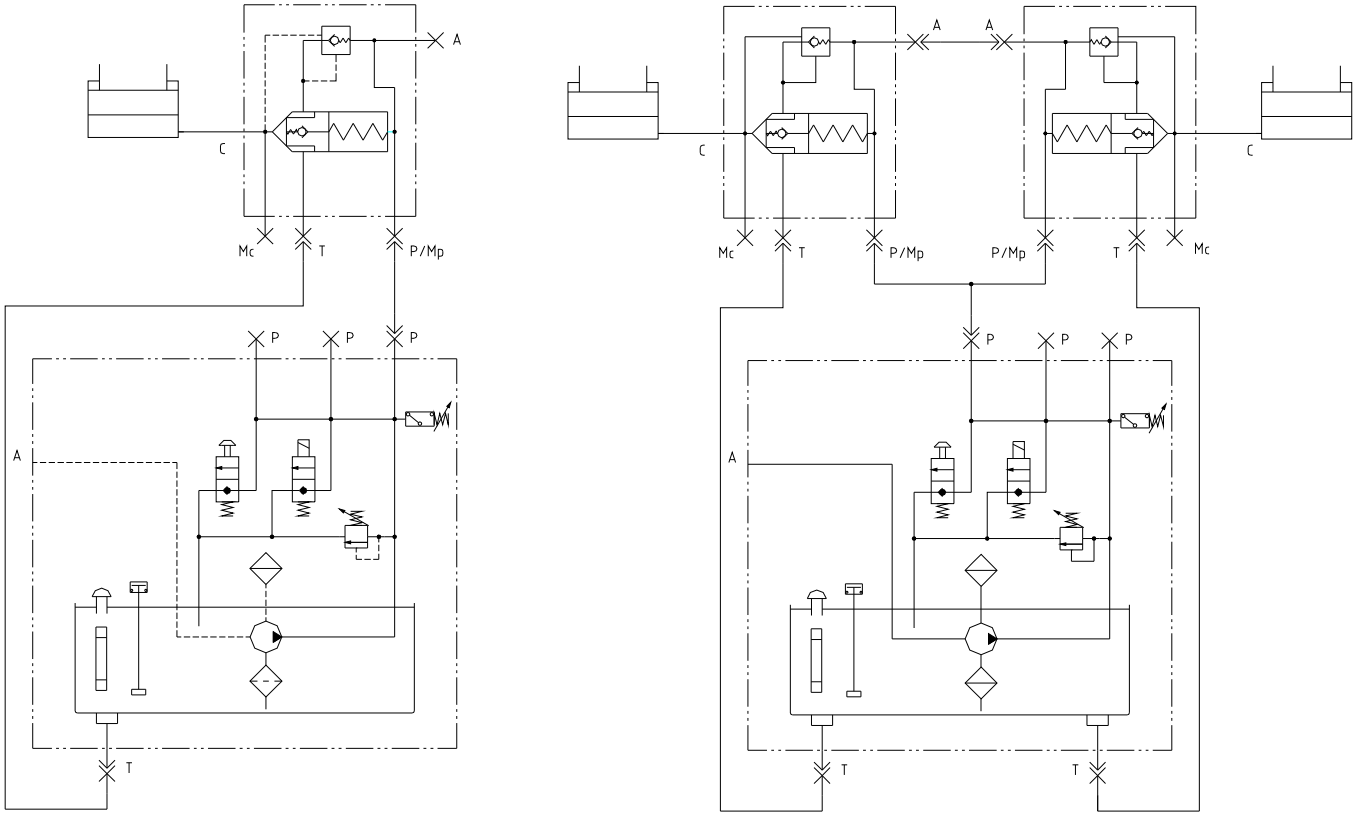


fig.3

Plant operation (diagram in figure 3)

The system illustrated in the figure must be supplied by a compressed air line **(A)** from the machine.
This line feeds the oleo-pneumatic pump mounted in the unit tank; once actuated, the pump sends oil under pressure to hydraulic cushions **(C)**, through **3-1757-*-0** valves and ducts **P** and **C**.
The preloading pressure ensured by the pump is a function of the pneumatic supply pressure supplied to the control unit, this value is regulated by a pressure reducer mounted on the press in a position accessible to the operator; the reducer can be of conventional type (manual control) or provided with electrical control (with a step-by-step reducer) or electromagnetic control (proportional electrovalve).
During the functioning of the press, the preloading pressure delivered by the hydraulic safety unit and the cyclical pressure generated by hydraulic cushions **(C)** through the operation of the press, interact and based on the ratio of the driving areas of the **3-1757-*-0** valves, they ensure that the necessary pressure does not exceed the preset value.
If the pressure of the press exceeds the maximum preset value, the pressure generated in hydraulic cushions **(C)** overcomes the one generated by the control unit and the valves are switched to the discharge mode, so as to allow the oil in the hydraulic cushions to freely flow into the unit's tank through ducts **(T)**.
The switching of **3-1757-*-0** valves results in the resetting of the preloading pressure, and accordingly in the switching of the minimum pressure pressure switch mounted on the unit.
The signal of the pressure switch, apart from sending an emergency signal to the machine, shall stop the air flow which feeds the oleo-pneumatic pump.
The overload signal, sent by the pressure switch, shall stop the machine, by working on the brake/clutch assembly.

3-1757-*-0 Valve

This is an hydrodriven valve; its operation is based on the principle of differential sections.
Its body is wholly made spheroidal cast iron and is chromogalvanized to withstand corrosion over time.
The sealing elements are usually made of nitrile rubber, though different compounds can be mounted, as the case may be. The sliders and the internal liners are made of treated and ground chrome-nickel steel.
The valve is supplied with all openings plugged with high-pressure sealing elements, so as to allow the plant designer to use only the necessary openings; the outlet opening is not plugged.

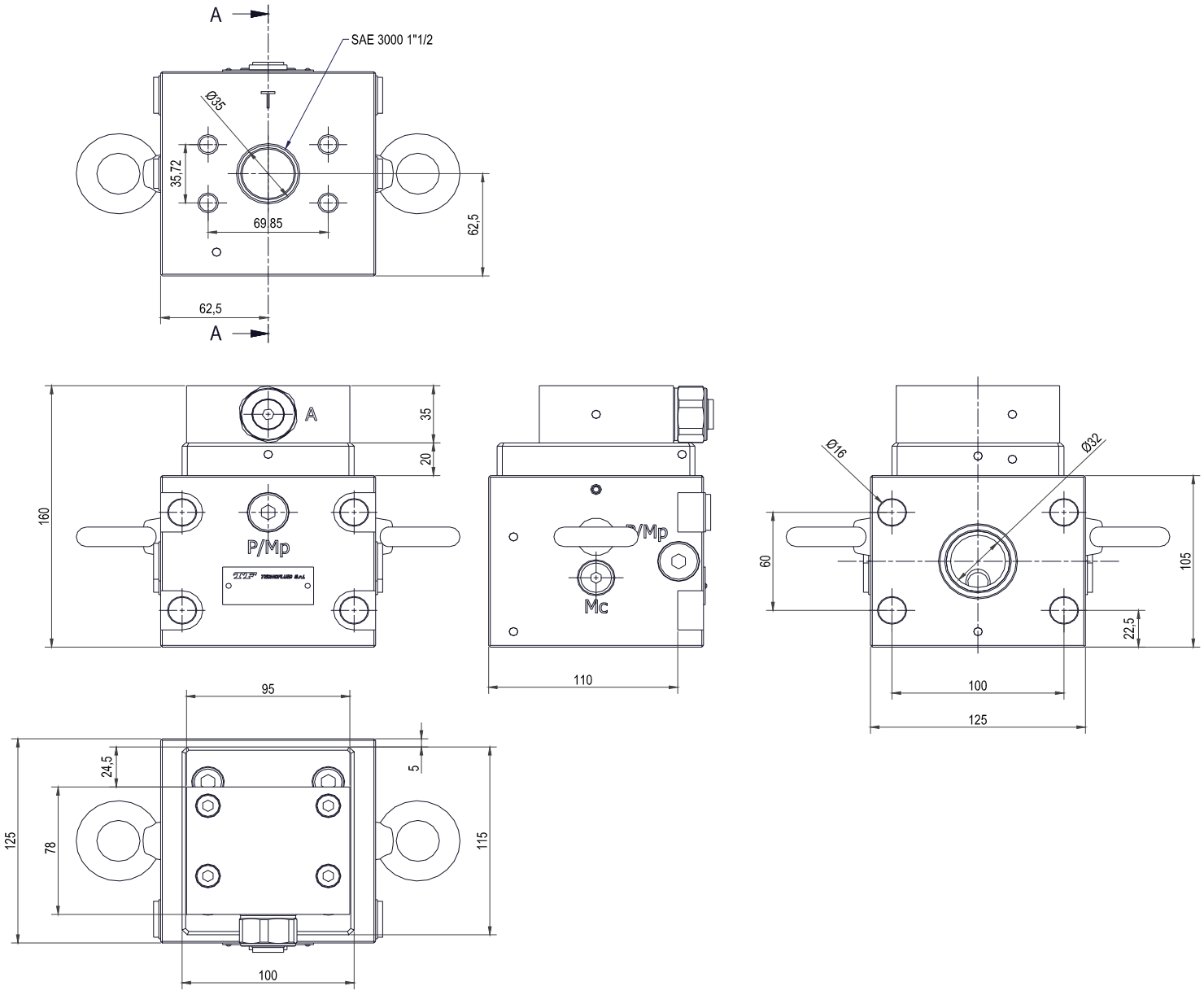


fig.4

Figure 4 shows the external view with the overall dimensions of the **3-1757-*-0** valve; the valve is fastened to the ram by 4 high-resistance hollow hexagonal screws M14x140 mm.
The diameter of the hole for communication with the hydraulic cushion must not exceed 32 mm and the supporting plane of the valve must have a maximum roughness of 1.6 Ra and a minimum planarity of 0.02/100 mm.
It can be mounted in any position.

5-1719 Control unit (figure 5)

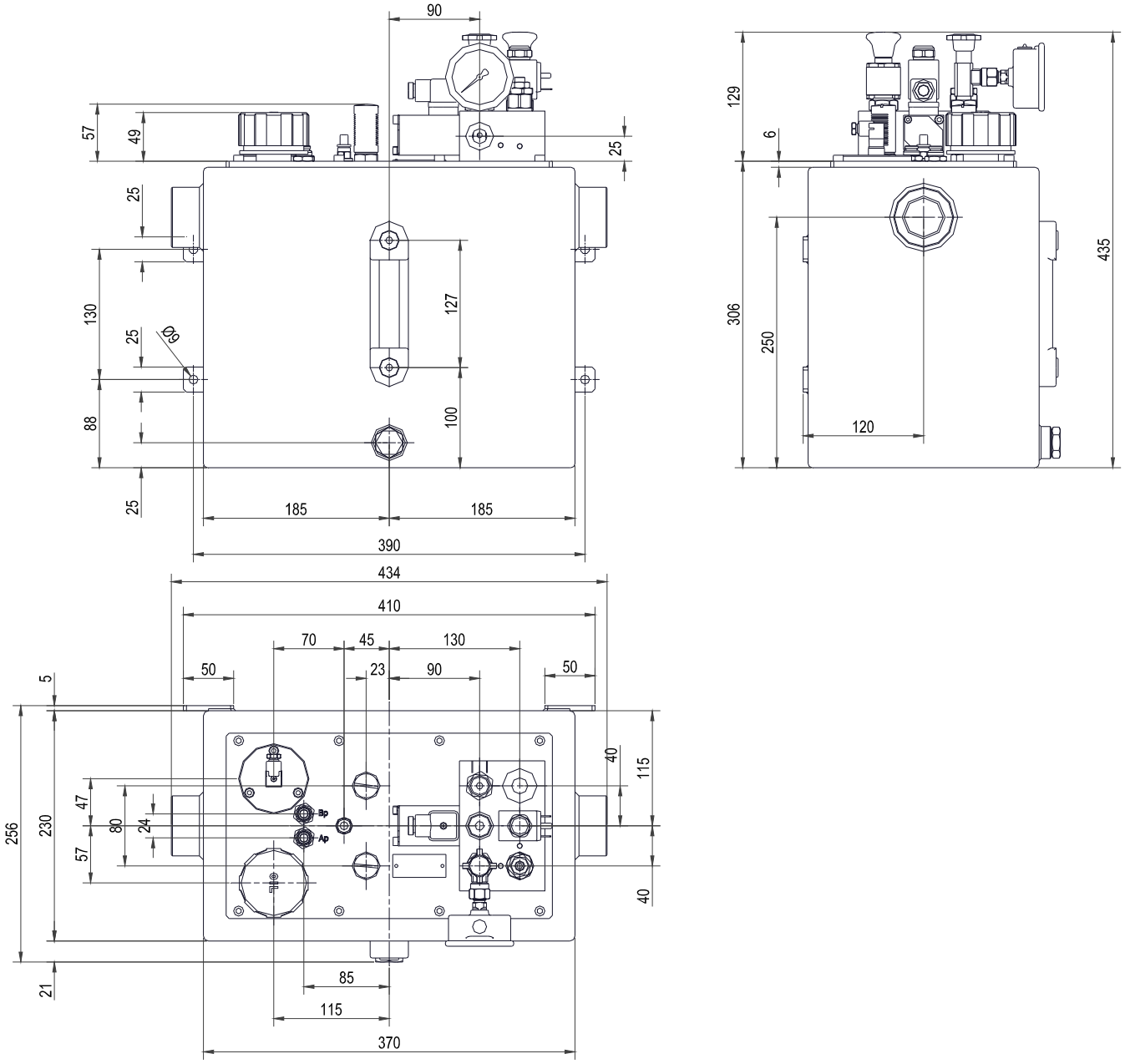


fig.5

Figure 5 shows the external view, with the overall dimensions and the connection openings of the **5-1719** control unit.
The control unit consists of a steel frame tank, an aluminum cover fastened to the tank by screws and a distribution block for the hydraulic control. The minimum pressure pressure switch is located on this block, as well as the connection for the delivery to the **3-1757-*-0** valves.
The tank contains some 18 liters of oil and its bottom includes the return openings (1”1/4 G) from the drain connection of **3-1757-*-0** safety valves.
The tank is provided with an oil-filler cap, the quick connection for the pneumatic supply (plastic pipe, Ø 8 mm.), and the hydraulic control block.
For any further information on the control unit, refer to the dedicated technical documentation.

Data sheet

PRELOADING RATIO : DISCHARGE	**1:1.3 TO 1:5**
MAXIMUM PRELOADING PRESSURE	**380 bar**
SAFETY ACTIVATION TIME	**0.01 sec.**
MAXIMUM VISCOSITY OF THE OIL	**10° Engler**
MAXIMUM OIL TEMPERATURE	**90° C.**
ROOM TEMPERATURE	**-10 +50 ° C.**
DIAMETER OF THE VALVE'S PRESSURE INTAKES	**1/4" + 3/8" G.**
NOMINAL DIAMETER OF THE VALVE	**ND 32**
VALVE'S DISCHARGE DUCT	**SAE 300 1"1/2**

Useful suggestions for installation

If you decide to install a hydraulic safety system on a cam press, do not forget a few general considerations:

- The safety valves must be mounted near the cushions, and must be connected to them using rigid HP pipes.
- The ram's hydraulic cushions must always be provided with a bleeding system positioned next to their top, so as to collect and eject any air bubbles.
- The hydraulic cushions' seals must be of high pressure type (if possible made of polyurethane).
- The cushions' cylinders must be made of homogeneous material, as far as possible (without any blowholes or cracks) in order to ensure a perfect hydraulic sealing and to protect the sealing elements from anomalous wear and tear.
- The piping that, starting from the control unit, transmits the preloading pressure to the valves can be either rigid or flexible, providing that the duct is designed for high pressure.
- It is advisable to position the control unit in a position easy to reach, so as to facilitate the oil topping up.
- The oil used in the control unit can be the one used for lubricating the guides of the machine; anyway, the oil must never come into contact with the lubrication oil, since the suspended metal particles would cause irreparable damage to the system; in any case, the oil viscosity must not exceed the maximum expected viscosity.
- We recommend that you do not use liquid Teflon for the assembly of connecting joints between valves and control unit; where you cannot use metal-rubber washers, we recommend that you adopt conical thread fittings and use a Teflon tape for sealing.

Spare parts of the 3-1757-*0 valve

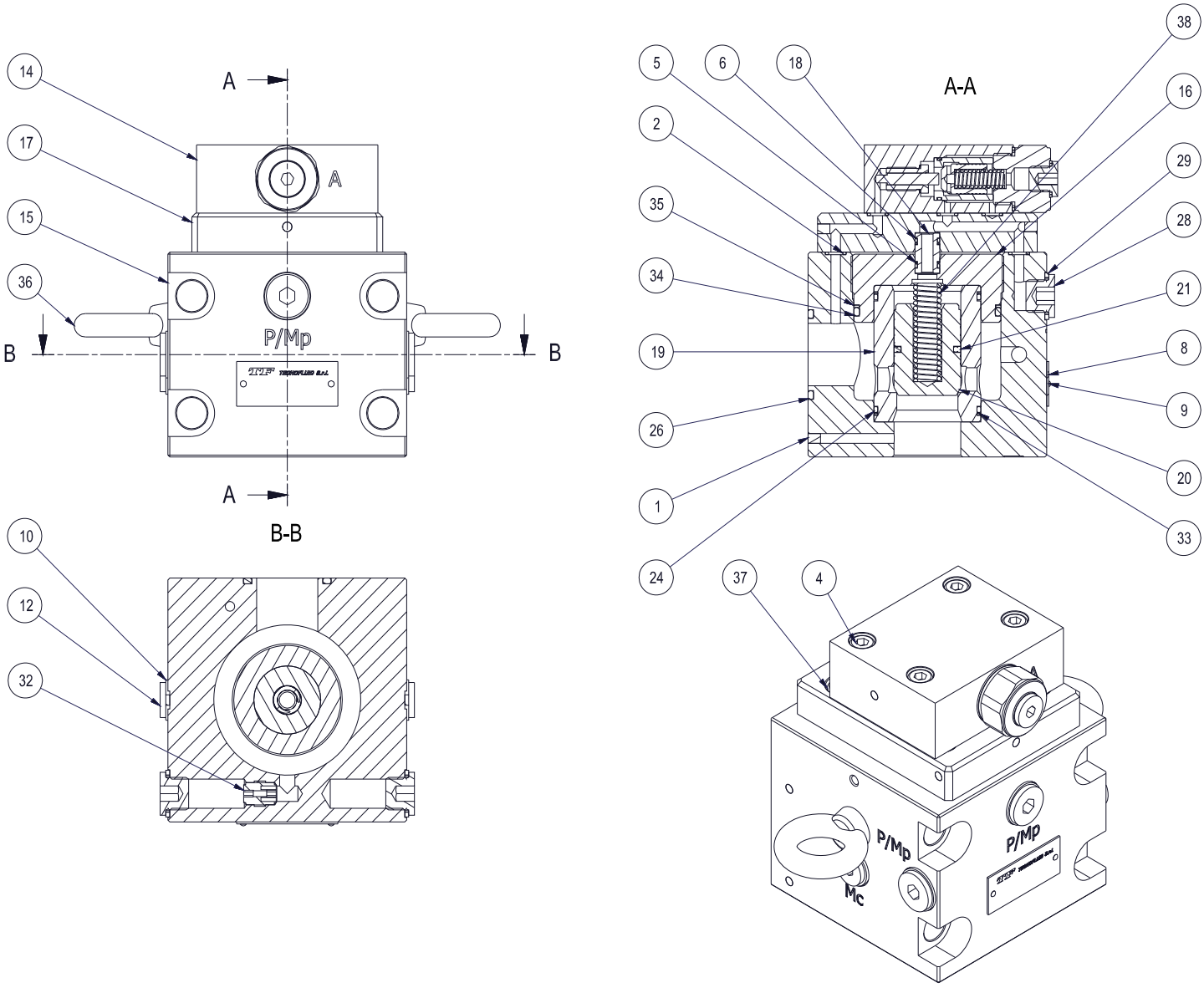


fig.6

Figure 6 shows a section plane of the hydraulic safety valve code **3-1757-*-0**, where all the components of the unit have been numbered.
The spare parts list includes also the quantity of every single item, as may be necessary to complete a unit.
This list is available on the next page.

Spare parts list of the 3-1757-*-0 hydraulic safety unit (see the section plane in figure 6)

POS	NAME	Q.TY	ORDER CODE
1	EXPANDING PLUG Ø5	9	AVDEL 5
2	OR 2031 7.66x1.78 NBR 70	9	PARK 2 011
4	SOCKET SCREW M8x40	4	VTCE 8 40
5	ANTI-EXTRUSION RING FOR OR 2062	2	PARBAK 8-016
6	OR 2037 9.25x1.78 NBR 70	2	PARK 2-012
8	ALUMINIUM TAG	1	TARGH 1194
9	THREAD NAIL Ø1.9x5	2	CH A 1.9 5
10	METAL-RUBBER SEALING WASHER 1/4"	2	RTMG 14 1
12	PLUG WITH STOP 1/4"G. DIN 908	2	TC 14 908
14	PRESSURE SETTING HEAD 1:1,3÷1:5	1	3-1548-102-A,B,C,D,E,F
15	BODY ND 32	1	3-1757-1
16	MAIN PLUG DN 32	1	3-1757-3
17	SUB PLATE DN 32	1	3-1757-5
18	CONNECTION	1	3-1757-6
19	LINER DN 32	1	3-1757-2
20	PRIMARY SHUTTER DN 32	1	3-1757-4
21	SPECIAL SLIDING SEAL	1	GTE 035 2
24	OR 3200 50.47x2.62 NBR 70	2	PARK 2-136
33	ANTI-EXTRUSION RING FOR OR 3200	2	PARBAK 8-136
26	OR 39.69x3.53 NBR 70	1	OR 144
28	PLUG WITH STOP 3/8" GAS DIN 908	3	TC 38 908
29	METAL-RUBBER SEALING WASHER 3/8	3	RTMG 38 1
32	NONRETURN VALVE 1/4"	1	VNRC 14 01
34	OR 4275 69.44x3.53 NBR 70	1	PARK 2-232
35	ANTI-EXTRUSION RING FOR OR 4275	1	PARBAK 8-232
36	GOLFARO MASCHIO M10	2	GOLM 10
37	SOCKET SCREW M10x30 UNI 5931	4	VTCE 8 30
38	SPRING 2.2-14.2-62.5-16+2	1	MOLLA 376
39	SCREW WITHOUT HEAD M6x8 UNI 5923	1	VCE 6 8 A

Valve coding (code 3-1757-*-0):

Le valvole i oggetto sono fornibili con diversi rapporti fra pressione di precarica e pressione di intervento la lettera che segue il codice identifica il rapporto in oggetto:

Valve code	3-1757-A-0	3-1757-B-0	3-1757-C-0	3-1757-D-0	3-1757-E-0	3-1757-F-0
Preloading/discharge ratio	1:1.3	1:1.6	1:2	1:3	1:4	1:5

NOTES

The **3-1757-*-0** valve can function also with other types of control units; for more information, please contact our technical department.

With reference to the spare parts list on the previous page, please note the following:

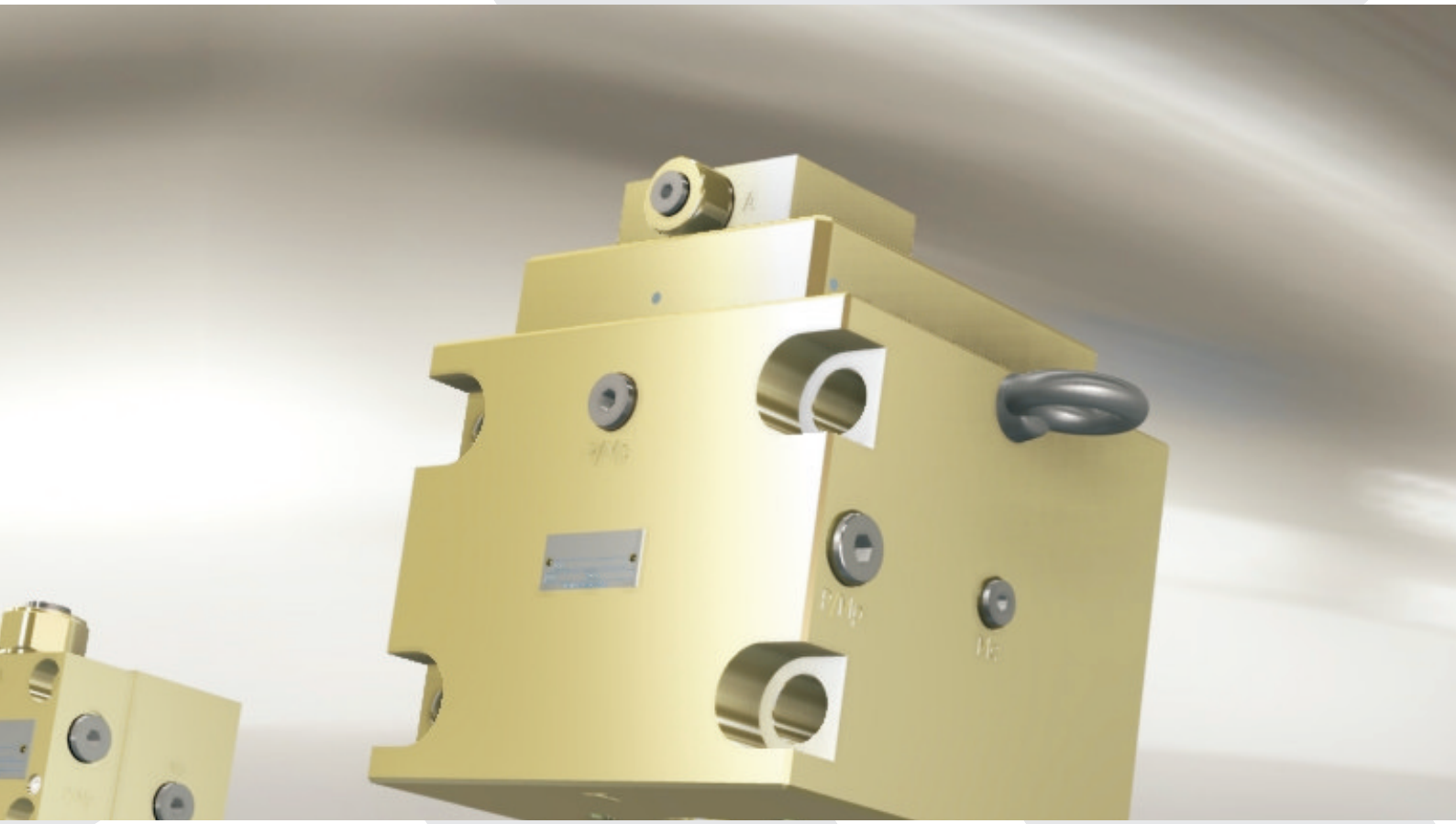
WHEN YOU REQUEST ANY SPARE PARTS, ALWAYS SPECIFY THE COMPLETE CODE OF THE RELATED VALVE.

NOT ALL THE LISTED DEVICES CAN BE SUPPLIED ALONE: DUE TO REDUCED COUPLING TOLERANCES, RECIPROCALLY SLIDING ITEMS MUST BE SUPPLIED TOGETHER.

Please find below a list of items to be supplied together; the numbering of the various items refer to the section plane in figure 6:

- LINER-SHUTTER UNIT = 19+20+21

HYDRAULIC SAFETY VALVES
MODEL 3-1517



Requirements

The system consists of a valve (code **3-1517**) and a oleo-pneumatic control unit (code **5-1520**).
To use this system, the machine must be provided with a hydraulic cushion, as shown in figure 1; furthermore, the maximum activation pressure of the safety device shall not exceed 500 bar. To this end, the hydraulic cushion must be of suitable size, in order to ensure the tonnage required for the machine.

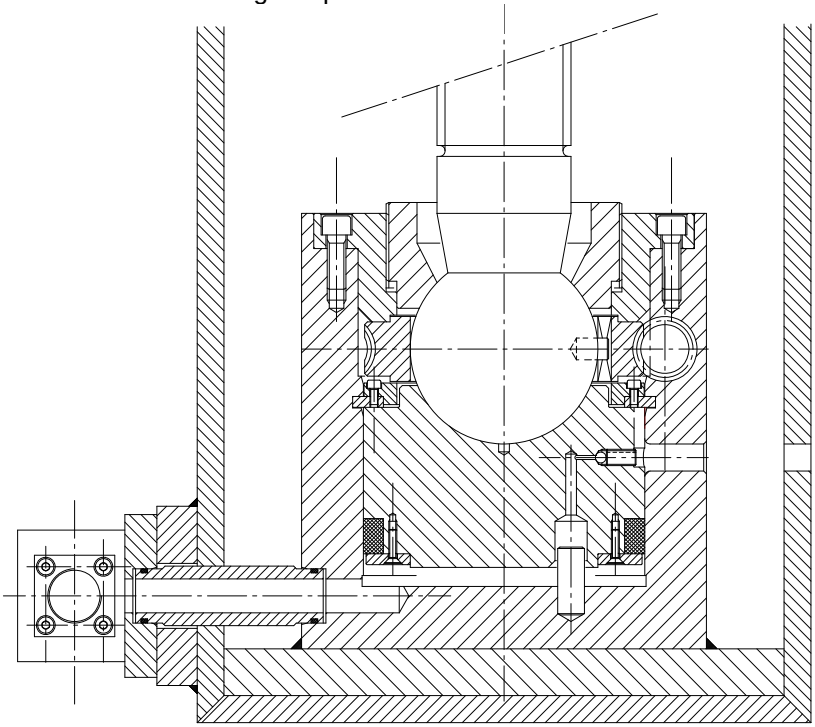


fig.1

Characteristics

Apart from a satisfactory operating repeatability, this system ensures very short response times, so that the occurrence of pressure peaks is reduced dramatically. The safety device's pre-loading pressure to activation pressure ratio can be very high (up to 1:5), so that the hydraulic cushion's pre-loading pressures are very low and the stress placed on the cushion is decreased. The arrangement of the system makes it possible to continuously change the safety device's activation pressure, by modifying the pre-loading pressure delivered by the control unit.

Hydraulic diagram

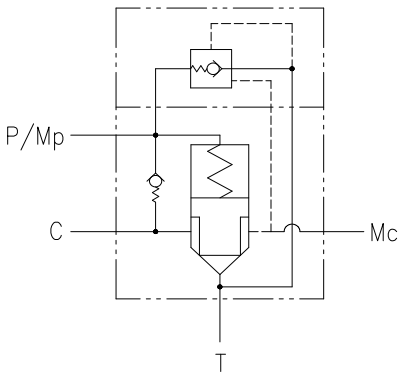


fig.2

Figure 2 shows the hydraulic diagram of the valve (code **3-517**).
The symbols used in figure 2 can be interpreted as follows:
P/Mp= pre-loading (from the control unit/pressure gauge connection (pre-loading line), **T** = exhaust piping, **C** = connection to the hydraulic cushion **Mc** = pressure gauge connection (hydraulic cushion line).

Working principle

A hydraulic cushion (figure 1) between the rod and the press ram is pre-loaded with a hydraulic pressure (**P**), so that the system becomes stiff.
After every single work cycle of the press, the pressure inside the cushion rises up to a variable value **Pl**, which substantially depends on the type of work which is being carried out.
If, for accidental reasons (e.g. wear of the die) the pressure in the hydraulic cushions exceeds the maximum preset value **Ps**, the safety valve (code **3-1517**) switches automatically to the discharge mode and drains the oil from the hydraulic cushion, in order to allow the ram to go beyond the bottom dead center (**BDC**).

Hydraulic connection diagrams

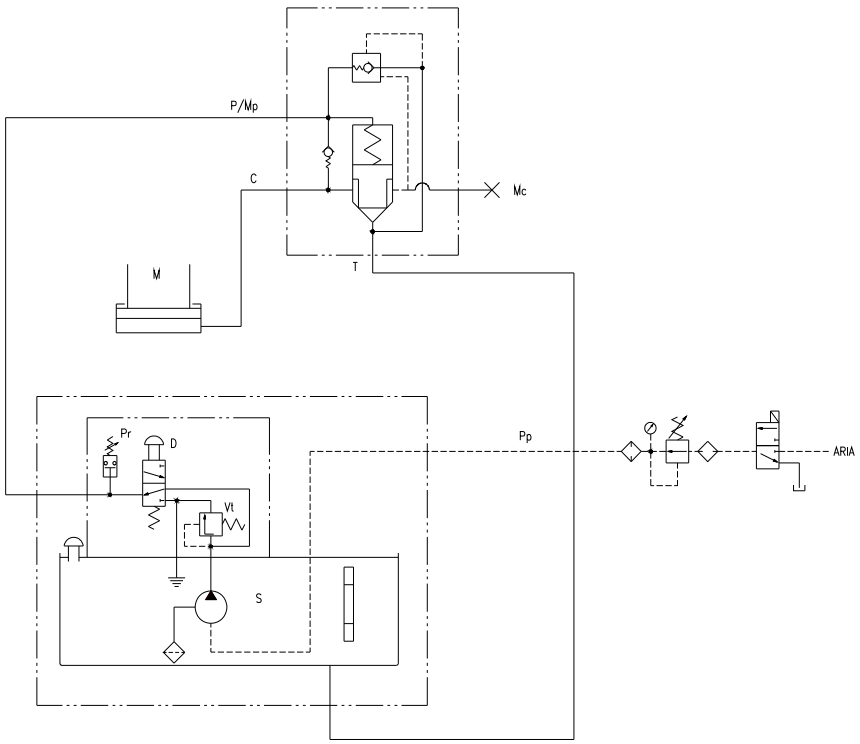


fig.3

Plant operation for a single-connecting rod press (see the diagram in figure 3)

The system illustrated in the figure must be supplied by a compressed air line **(Pp)** from the machine.
This line feeds the oleo-pneumatic pump mounted in the unit tank **(S)** of the control unit (code **5-1520**); once actuated, the pump sends oil under pressure to the hydraulic cushion **(M)**, through the valve (code **3-1517**) and ducts **P/Mp** and **C**.
The preloading pressure delivered by the pump is a function of the pneumatic supply pressure supplied to the control unit; this value is regulated by a pressure reducer mounted on the press in a position accessible to the operator; the reducer can be of conventional type (manual control) or provided with electrical control,

(with a step-by-step reducer) or electromagnetic control (proportional electrovalve).
During the functioning of the press, the pre-loading pressure delivered by the control unit and the cyclical pressure generated by hydraulic cushion **(M)** through the operation of the press, interact and based on the ratio of the driving areas of the valve (code **3-1517**), they ensure that the necessary pressure does not exceed the preset value.
If the pressure of the press exceeds the maximum preset value, the pressure generated in hydraulic cushion **(M)** overcomes the one generated by the control unit and the valve is switched to the discharge mode, so as to allow the oil in the hydraulic cushion to freely flow into the control unit's tank **(S)**.
The switching of the valve (code **3-1517**) results in the resetting of the preloading pressure, and accordingly in the switching of the min. pr. pressure switch **(Pr)** mounted on the control unit.
The signal of the pressure switch, apart from sending an emergency signal to the machine, shall stop the air flow which feeds the oleo-pneumatic pump.
The cutting out of the oleo-pneumatic feed can be obtained by a 3-way electrovalve, to be mounted close to the pneumatic pressure reducer.
The overload signal, sent by the pressure switch, shall stop the machine, by working on the brake/clutch assembly.
In order to reduce the pre-loading pressure, and accordingly the press tonnage, switch the system to the discharge mode, like in the presence of an overload, by pressing the relevant push-button of the distributor **(D)** mounted on the control unit.
In order to prevent any arbitrary rise in the pre-loading pressure delivered by the control unit, above the maximum value pre-determined according to the rated tonnage of the machine, the calibration valve **(Vt)** mounted on the **5-1520** control unit shall release the overpressure, if any.

Valve, code 3-1517

This is an hydrodriven valve; its operation is based on the principle of differential sections.
Its body is wholly made of spheroidal cast iron and is chromogalvanized to withstand corrosion over time.
The sealing elements are usually made of nitrile rubber, though different compounds can be mounted, as the case may be.
Sliders and internal liners are made of treated and ground chrome-nickel steel.
The valve is supplied with all openings plugged with high-pressure sealing elements, so as to allow the plant designer to use only the necessary openings; the outlet opening is not plugged.

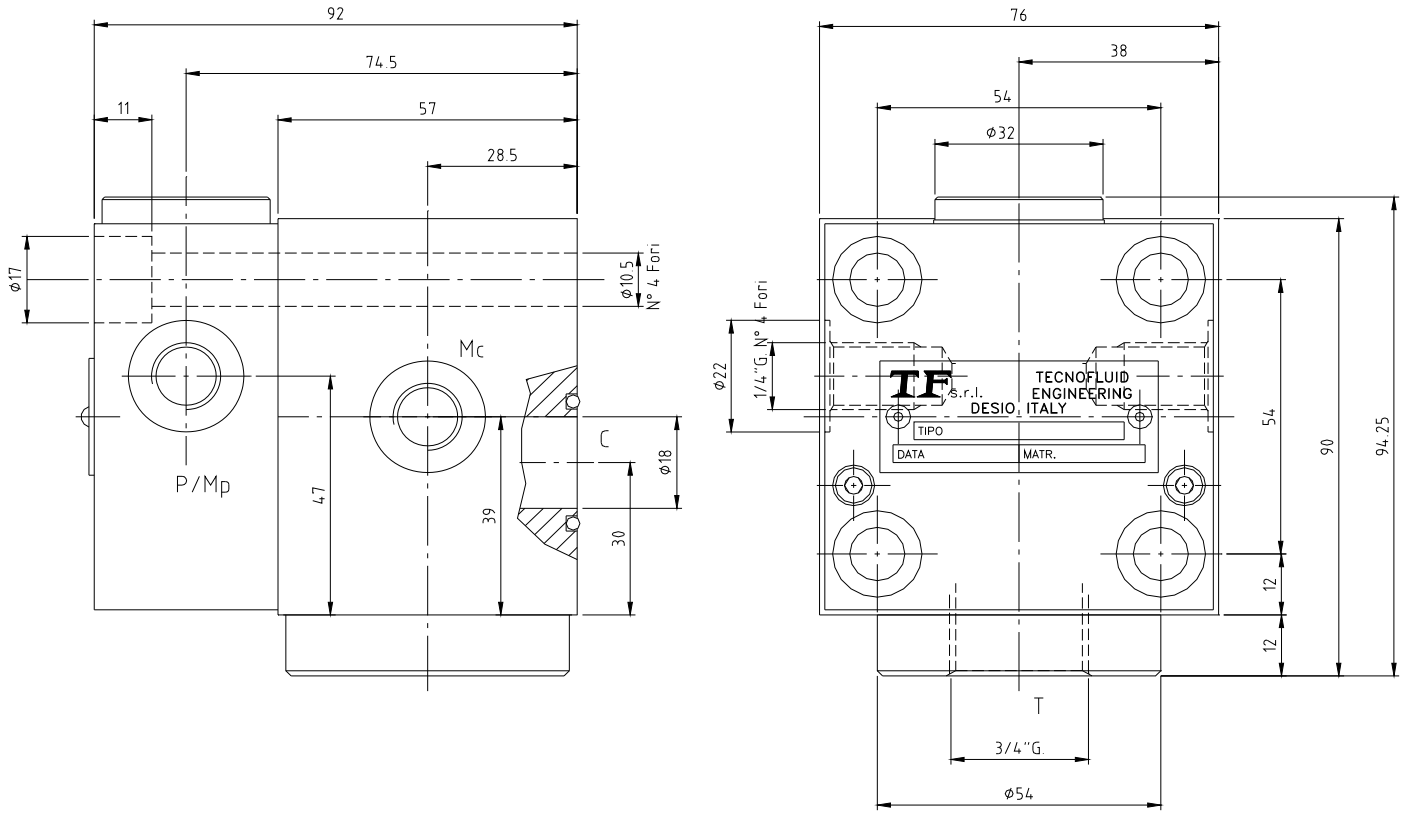


fig.4

Figure 4 shows an external view, with the overall dimensions of the valve (code **3-1517**); the valve is fastened to the ram by 4 high-resistance hollow hexagonal screws M10x100 mm.
The diameter of the hole for communication with the hydraulic cushion must not exceed 18 mm and the supporting plane of the valve must have a maximum roughness of 1.6 Ra and a minimum planarity of 0.02/100 mm.
It can be mounted in any position

Control unit, code 5-1520 (figure 5)

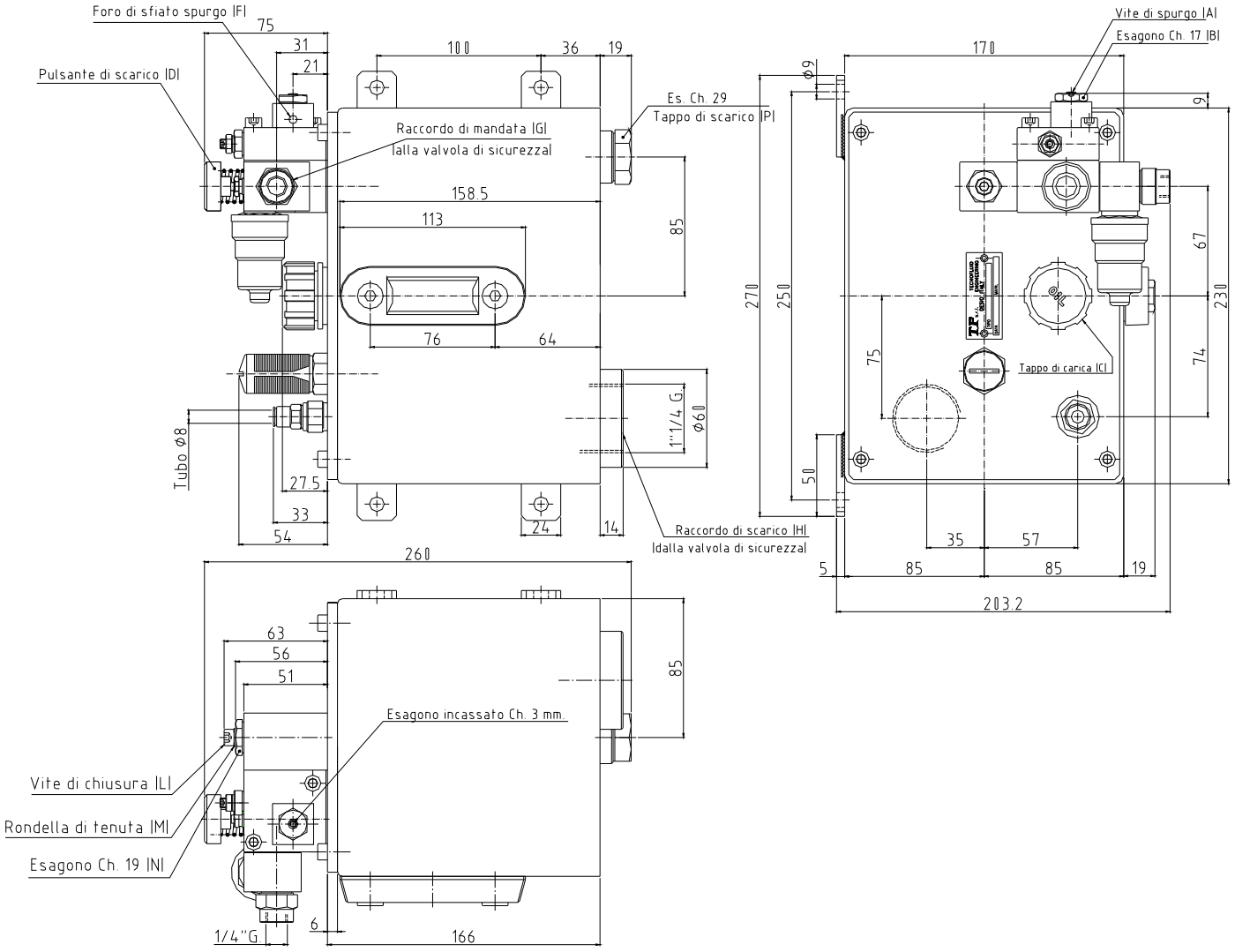


fig.5

Figure 5 shows an external view, with the overall dimensions and the connection openings of the **5-1520** control unit
The control unit consists of a steel frame tank, an aluminium cover fastened to the tank by screws and a distribution block for the hydraulic control. The minimum pressure switch is located on this block, as well as the connection for delivery to the valve (code **3-1517**).
The tank contains some 4 liters of oil and its bottom includes the return opening (1"1/4 G) from the drain connection of the safety valve (code **3-1517**).
The tank is provided with an oil-filler cap, the quick connection for pneumatic supply (plastic pipe, Ø 8 mm.), and the hydraulic control block.
For any further information on this control unit, please refer to the dedicated technical documentation.

Data sheet

PRELOADING RATIO : DISCHARGE	**1:1.3 TO 1:5**
MAXIMUM PRELOADING PRESSURE	**380 bar**
SAFETY DEVICE/ACTIVATION TIME	**0.008 sec.**
MAXIMUM VISCOSITY OF THE OIL	**10° Engler**
MAXIMUM OIL TEMPERATURE	**90° C**
ROOM TEMPERATURE	**-10 +50 °C**
MINIMUM ENSURED CAPACITY OF THE CONTROL UNIT	**0.1 l/1'**
MIN. PNEUMATIC FEED PRESSURE	**1 bar**
MAX. PNEUMATIC FEED PRESSURE	**7 bar**
DIAMETER OF THE VALVE'S PRESSURE INTAKES	**1/4" G.**
NOMINAL DIAMETER OF THE VALVE	**ND 18**
DIAMETER OF THE VALVE'S DISCHARGE DUCT	**3/4" G.**

Useful installation tips

If you decide to install a hydraulic safety system on an eccentric press, do not forget a few general considerations:

- The safety valve must be mounted near the cushion and must be connected to them using rigid HP pipes.
- The ram's hydraulic cushion must always be provided with a bleeding system positioned next to its top, so as to collect and eject any air bubbles.
- The hydraulic cushion's seals must be of high pressure type (if possible made of polyurethane).
- The cushion's cylinder must be made of homogeneous material, as far as possible (without any blowholes or cracks) in order to ensure a perfect hydraulic sealing and to protect the sealing elements from normal wear and tear
- The piping that, starting from the control unit, transmits the pre-loading pressure to the cushion, can be either rigid or flexible, providing that the duct is of the HP type.
- The compressed air which feeds the hydraulic control unit must be dry and properly lubricated (a drop of oil every about twenty pump strokes of the control unit).
- It is essential to mount a 3-way electrovalve upstream of the filter-reducer-oiler unit; the function of this electrovalve is to cut out the control unit's pneumatic feed in case of overload.
- It is advisable to position the compressed air oiler for the control unit supply in a position easy to reach, so as to facilitate the oil topping up.
- The oil used in the control unit can be the one used for lubricating the guides of the machine; anyway, the oil must never come into contact with the lubrication oil, since the suspended metal particles would cause irreparable damage to the system; in any case, the oil viscosity must not exceed the maximum expected viscosity.
- We recommend that you do not use liquid Teflon for the assembly of connecting joints between valves and control unit; where you cannot use metal-rubber washers, we recommend that you adopt conical thread fittings and use a Teflon tape for sealing.

Spare parts for the valve , code 3-1517

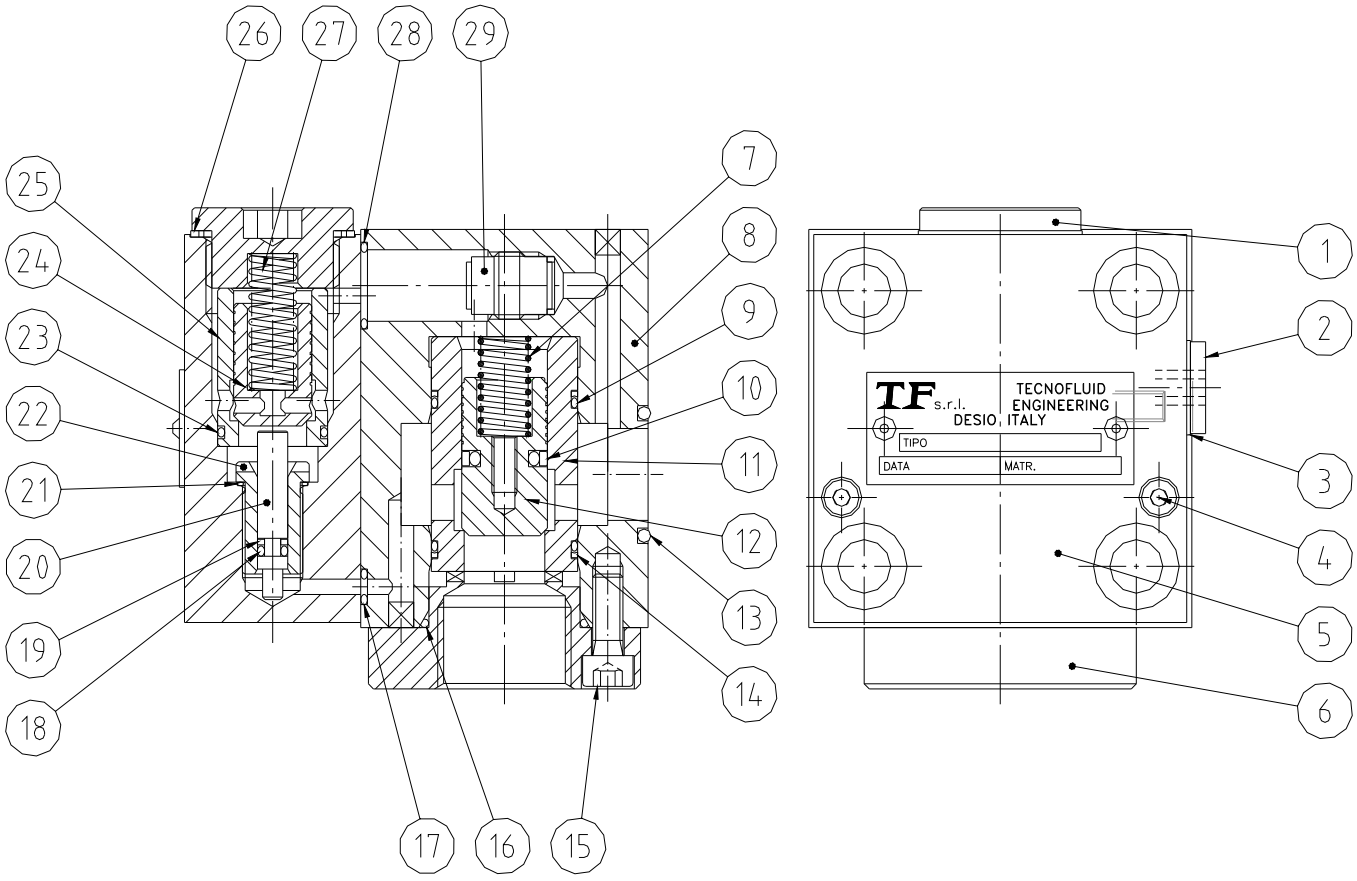


fig.6

Figure 6 shows a section plane of the **3-1517** hydraulic safety valve, where all the components of the valve have been numbered .
The spare parts list includes also the quantity of every single item, as may be necessary for completing a single unit.
This list is available on the next page.

Spare parts for the 3-1517 valve (see the section plane in figure 6)

POS	NAME	QUANTITY	ORDER CODE
1	CAP	1	R-3-1513-8
2	PLASTIC CAP WITH STOP 1/4 " G. DIN 908	3	TC 1/4 908
3	METAL-RUBBER WASHERS	3	GM 0503 1/4
4	HOLLOW HEXAGONAL SCREW M4 X 50	2	VTCE-4-50
5	CALIBRATION HEAD	1	R-3-1517-2
6	SMALL FLANGE	1	R-3-1517-3
7	COMPRESSION COIL SPRING	1	SPRING 493
8	VALVE BODY	1	R-3-1517-1
9	O-RING OR 2100	2	PARK 2-022
10	SLIDING SEAL	1	ETS-17-B40-BN
11	PRIMARY LINER	1	R-3-1517-4
12	PRIMARY SHUTTER	1	R-3-1517-5
13	O-RING OR 3087	1	PARK 2-118
14	ANTI-EXTRUSION RING x OR 2100	1	PARBAK 8-022
15	HOLLOW HEXAGONAL SCREW M6 X 16	3	VTCE-6-16
16	O-RING OR 2118	1	PARK 2-025
17	O-RING OR 2015	2	PARK 2-007
18	O-RING OR 2012	1	PARK 2-006
19	ANTI-EXTRUSION RING x OR 2012	1	PARBAK 8-006
20	PUSHER PISTON	1	R-3-1513-6
21	METRIC O-RING	1	KSA 0013
22	PUSHER BUSH	1	R-3-1513-7
23	O-RING OR 2075	1	PARK 2-018
24	SECONDARY SHUTTER	1	R-3-1513-5
25	SECONDARY LINER	1	R-3-1513-9
26	METAL-RUBBER WASHER	1	GM 0503 3/4
27	COMPRESSION COIL SPRING	1	MOLLA 489
28	O-RING OR 2056	1	PARK 2-015
29	NON-RETURN VALVE	2	R-3-1517-VNR

NOTES

In this technical documentation reference is made to the **5-1520** hydraulic safety unit; for any further information, please consult the relevant documentation

The **3-1517** valve can operate also with other types of control units; for more information, please contact our technical department.

With reference to the spare parts list on the previous page, please note the following:

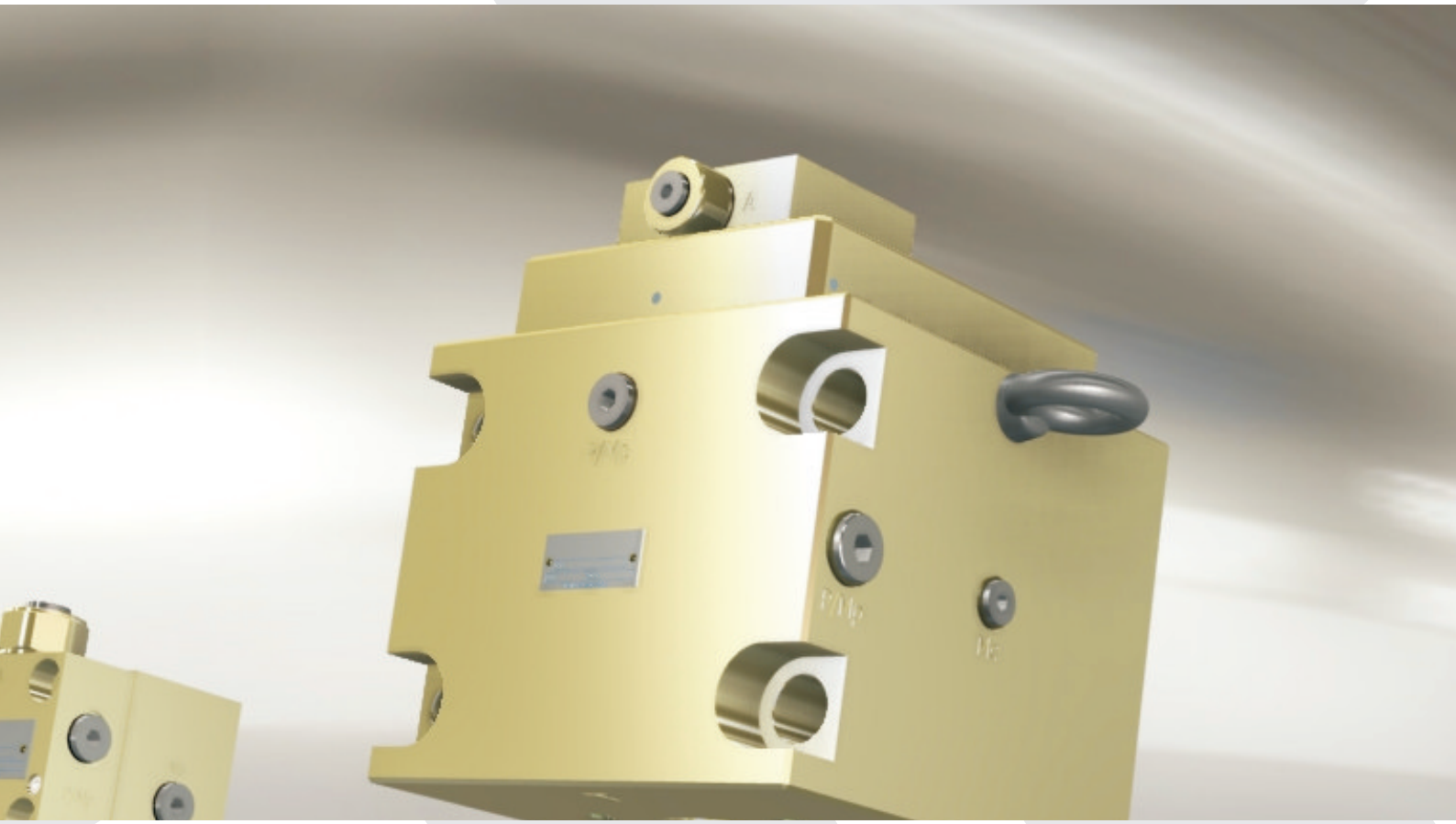
NOT ALL THE LISTED DEVICES CAN BE SUPPLIED ALONE: DUE TO REDUCED COUPLING TOLERANCES, RECIPROCALLY SLIDING ITEMS MUST BE SUPPLIED TOGETHER.
WHEN ORDERING SPARE PARTS, ALWAYS SPECIFY THE PRE-LOADING-DISCHARGE RATIO OF THE RELATED VALVE.

Please find below a list of items to be supplied together; the numbering of the various items refers to the section plane in figure 6:

- DRIVING UNIT = 24+25

- LINER-SHUTTER UNIT = 11+12

HYDRAULIC SAFETY VALVES
MODEL 3-1548



Requirements

The system consists of one or more **3-1548-*0** valves.
This device has been designed to control the hydraulic pressure delivered by oleopneumatic control units (codes **5-1520, 5-1536, 5-1528**, **5-1547**, **5-1698** and **5-1719**). Accordingly the use of the **3-1548-*0** valves is subject to the adoption of one of the control units mentioned above – for their technical characteristics, refer to the relevant technical documentation.
To allow the use of this system, the machine must be provided with hydraulic cushions, according to the diagram in figure 1; furthermore, the maximum pressure for the activation of the safety device must not exceed 500 bar. To this end, the hydraulic cushions must be suitably dimensioned, in order to ensure the required tonnage to the machine .

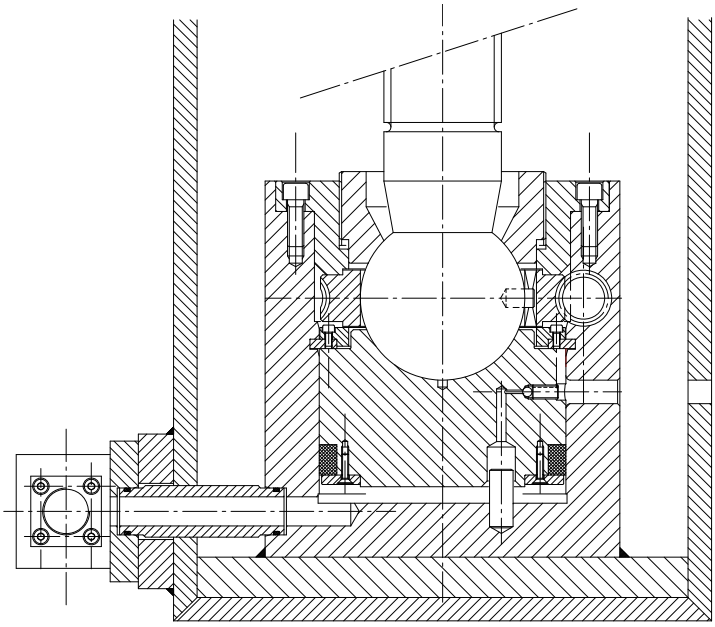


fig.1

Characteristics

Apart from a satisfactory repeatability, the system under examination ensures low response times,
so that the occurrence of pressure peaks is dramatically reduced. The extremely high ratio of preloading pressure to safety device activation pressure (up to 1:5), allows the adoption of reduced preloading pressures for the hydraulic cushions, thus decreasing the stress the cushions are subjected to.
The design of the system makes it possible to continuously modify the activation pressure of the safety device, working on the preloading pressure delivered by the control unit.

Hydraulic diagram

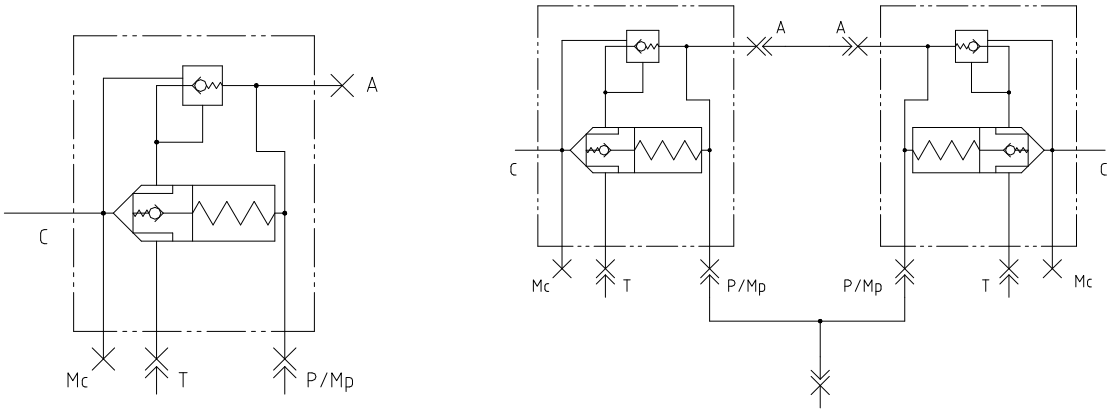


fig.2

Figure 2 shows the hydraulic diagram of the **3-1548-*0** valve. The symbols used in figure 2 can be interpreted as follows:

P = preloading (from the control unit), **T** = discharge line, **A** = drive, **C** = connection to the hydraulic cushion, **Mc** = connection of the hydraulic cushion pressure gauge, **Mp** = connection of the preloading line pressure gauge.

Working principle

The hydraulic cushions (figure 1) are obtained between the connecting rods and the ram of the press, which are pre-loaded with a hydraulic pressure **P** in order to confer more stiffness to the system.
After every single work cycle of the press, the pressure inside the cushions rises to a variable value **Pl**, which substantially depends on the type of work which is being carried out.
If, for accidental reasons (e.g. wear of the die) the pressure in the hydraulic cushions exceeds the maximum preset value **Ps**, the safety valve cod. **3-1548-*0** involved in the overload will switch automatically to the discharge mode, while causing the other valves connected to it to discharge by means of drive **A**, so as to drain the oil from the hydraulic cushion, and to allow the ram to go beyond the bottom dead center (**BDC**).

Hydraulic connection diagrams

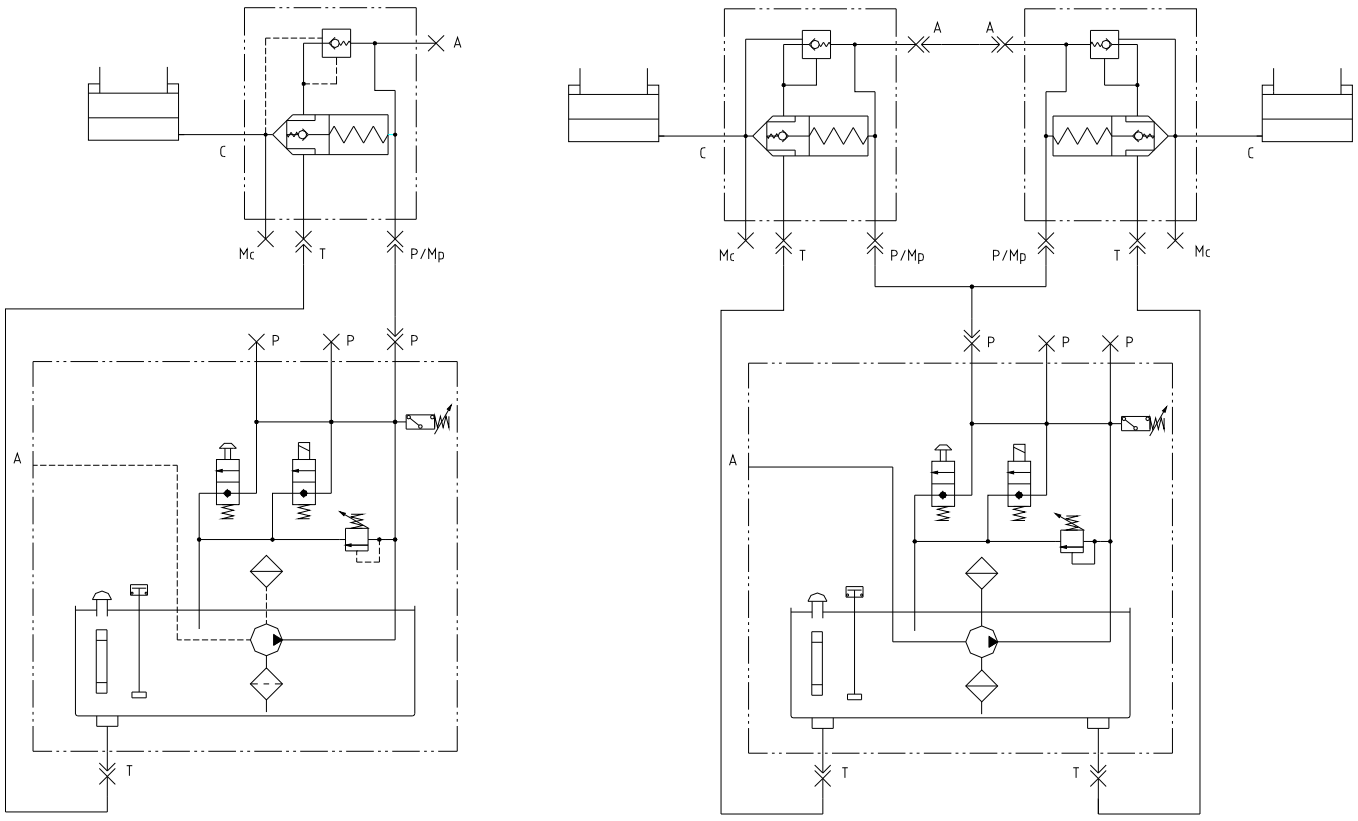


fig.3

Plant operation (diagram in figure 3)

The system illustrated in the figure must be supplied by a compressed air line **(A)** from the machine.
This line feeds the oleo-pneumatic pump mounted in the unit tank; once actuated, the pump sends oil under pressure to hydraulic cushions **(C)**, through **3-1548-*0** valves and ducts **P** and **C**.
The preloading pressure ensured by the pump is a function of the pneumatic supply pressure supplied to the control unit, this value is regulated by a pressure reducer mounted on the press in a position accessible to the operator; the reducer can be of conventional type (manual control) or provided with electrical control (with a step-by-step reducer) or electromagnetic control (proportional electrovalve).
During the functioning of the press, the preloading pressure delivered by the hydraulic safety unit and the cyclical pressure generated by hydraulic cushions **(C)** through the operation of the press, interact and based on the ratio of the driving areas of the **3-1548-*0** valves, they ensure that the necessary pressure does not exceed the preset value.
If the pressure of the press exceeds the maximum preset value, the pressure generated in hydraulic cushions **(C)** overcomes the one generated by the control unit and the valves are switched to the discharge mode, so as to allow the oil in the hydraulic cushions to freely flow into the unit's tank through ducts **(T)**.
The switching of **3-1548-*0** valves results in the resetting of the preloading pressure, and accordingly in the switching of the minimum pressure pressure switch mounted on the unit.
The signal of the pressure switch, apart from sending an emergency signal to the machine, shall stop the air flow which feeds the oleo-pneumatic pump.
The overload signal, sent by the pressure switch, shall stop the machine, by working on the brake/clutch assembly.

3-1548-*-0 Valve

This is an hydrodriven valve; its operation is based on the principle of differential sections.
Its body is wholly made spheroidal cast iron and is chromogalvanized to withstand corrosion over time.
The sealing elements are usually made of nitrile rubber, though different compounds can be mounted, as the case may be. The sliders and the internal liners are made of treated and ground chrome-nickel steel.
The valve is supplied with all openings plugged with high-pressure sealing elements, so as to allow the plant designer to use only the necessary openings; the outlet opening is not plugged.

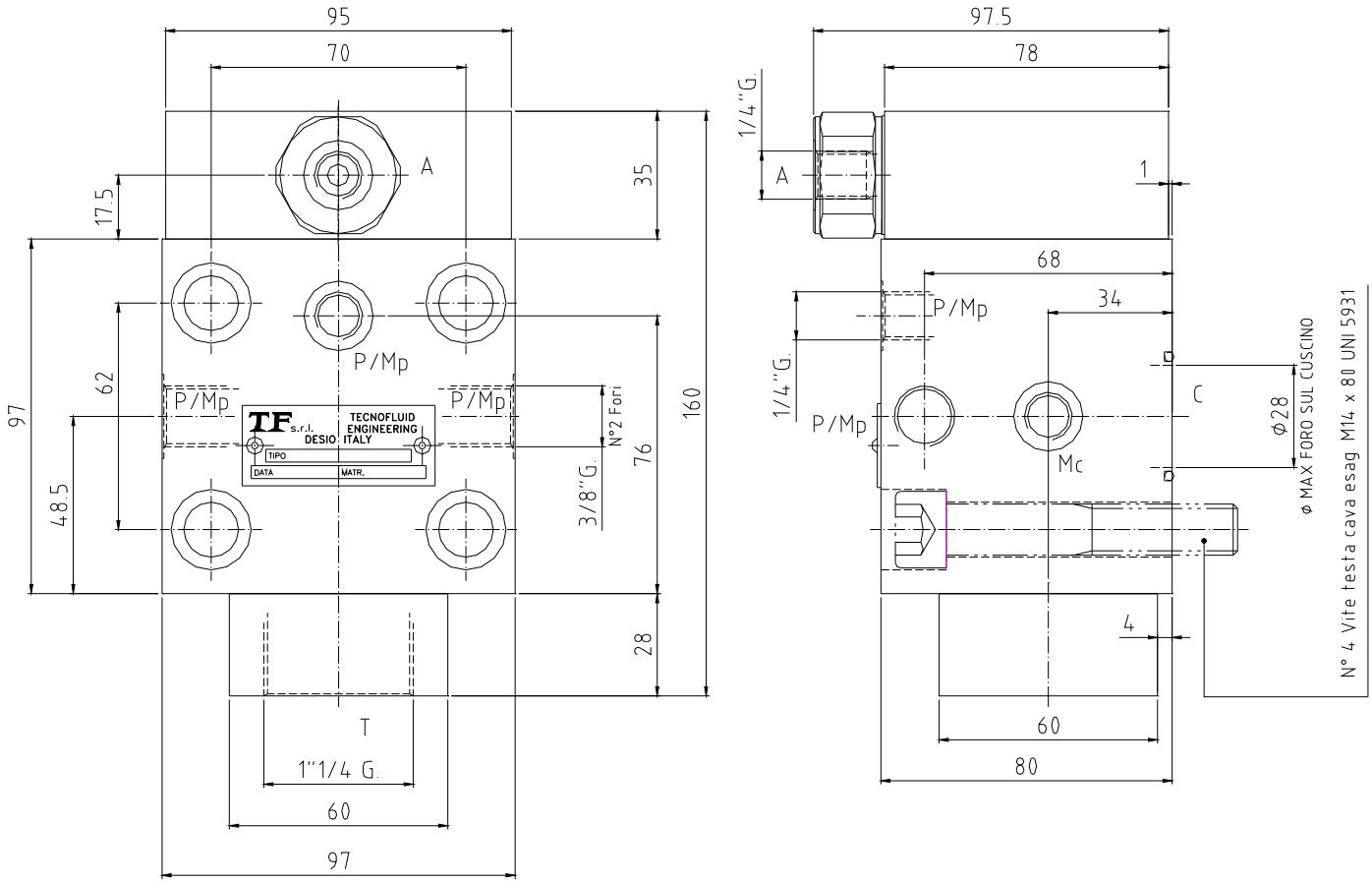


fig.4

Figure 4 shows the external view with the overall dimensions of the **3-1548-*-0** valve; the valve is fastened to the ram by 4 high-resistance hollow hexagonal screws M14x80 mm.
The diameter of the hole for communication with the hydraulic cushion must not exceed 28 mm and the supporting plane of the valve must have a maximum roughness of 1.6 Ra and a minimum planarity of 0.02/100 mm.
It can be mounted in any position.

5-1528 Control unit (figure 5)

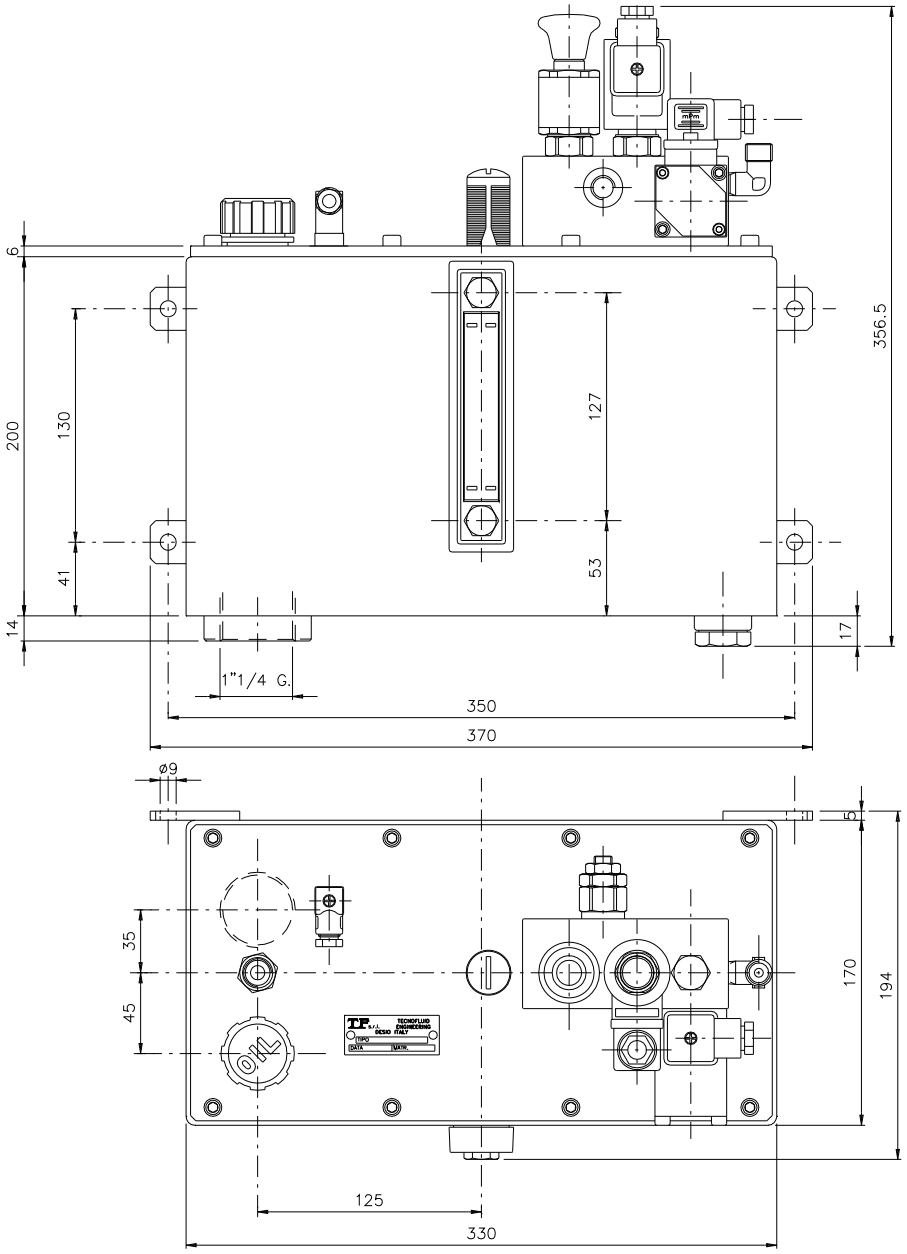


fig.5

Figure 5 shows the external view, with the overall dimensions and the connection openings of the **5-1528** control unit.
The control unit consists of a steel frame tank, an aluminum cover fastened to the tank by screws and a distribution block for the hydraulic control. The minimum pressure pressure switch is located on this block, as well as the connection for the delivery to the **3-1548-*0**valves.
The tank contains some 10 liters of oil and its bottom includes the return openings (1”1/4 G) from the drain connection of **3-1548-*0** safety valves.
The tank is provided with an oil-filler cap, the quick connection for the pneumatic supply (plastic pipe, Ø 8 mm.), and the hydraulic control block.
For any further information on the control unit, refer to the dedicated technical documentation.

Data sheet

PRELOADING RATIO : DISCHARGE	**1:1.3 TO 1:5**
MAXIMUM PRELOADING PRESSURE	**380 bar**
SAFETY ACTIVATION TIME	**0.01 sec.**
MAXIMUM VISCOSITY OF THE OIL	**10° Engler**
MAXIMUM OIL TEMPERATURE	**90° C.**
ROOM TEMPERATURE	**-10 +50 ° C.**
DIAMETER OF THE VALVE'S PRESSURE INTAKES	**1/4" + 3/8" G.**
NOMINAL DIAMETER OF THE VALVE	**ND 25**
DIAMETER OF THE VALVE'S DISCHARGE DUCT	**1"1/4 G.**

Useful suggestions for installation

If you decide to install a hydraulic safety system on a cam press, do not forget a few general considerations:

- The safety valves must be mounted near the cushions, and must be connected to them using rigid HP pipes.
- The ram's hydraulic cushions must always be provided with a bleeding system positioned next to their top, so as to collect and eject any air bubbles.
- The hydraulic cushions' seals must be of high pressure type (if possible made of polyurethane).
- The cushions' cylinders must be made of homogeneous material, as far as possible (without any blowholes or cracks) in order to ensure a perfect hydraulic sealing and to protect the sealing elements from anomalous wear and tear.
- The piping that, starting from the control unit, transmits the preloading pressure to the valves can be either rigid or flexible, providing that the duct is designed for high pressure.
- It is advisable to position the control unit in a position easy to reach, so as to facilitate the oil topping up.
- The oil used in the control unit can be the one used for lubricating the guides of the machine; anyway, the oil must never come into contact with the lubrication oil, since the suspended metal particles would cause irreparable damage to the system; in any case, the oil viscosity must not exceed the maximum expected viscosity.
- We recommend that you do not use liquid Teflon for the assembly of connecting joints between valves and control unit; where you cannot use metal-rubber washers, we recommend that you adopt conical thread fittings and use a Teflon tape for sealing.

Spare parts of the 3-1548-*0 valve

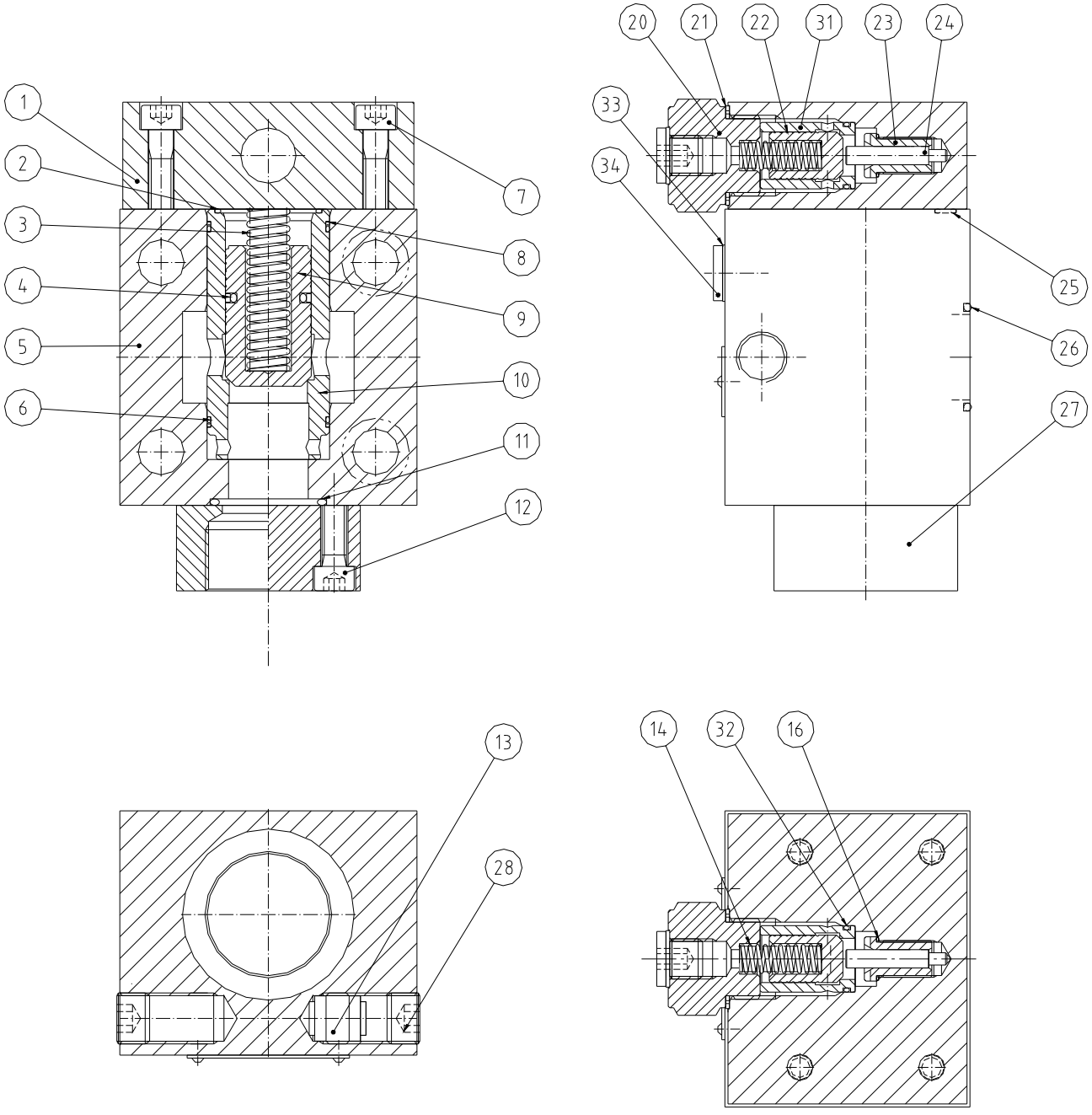


fig.6

Figure 6 shows a section plane of the hydraulic safety valve code **3-1548-*0**, where all the components of the unit have been numbered.
The spare parts list includes also the quantity of every single item, as may be necessary to complete a unit.
This list is available on the next page.

Spare parts list of the 3-1548-*-0 hydraulic safety unit (see the section plane in figure 6)

POS	NAME	QTY	ORDER CODE
1	CALIBRATION HEAD	1	R-3-1513-2
2	O-RING OR 2125	1	PARK 2-026
3	COMPRESSION COIL SPRING	1	MOLLA 376
4	SPECIAL SLIDING SEAL	1	ETS 28 B40 BN
5	VALVE BODY	1	R-3-1513-1
6	O-RING OR 2137	2	PARK 2-028
7	SOCKET SCREW M8x30	4	VTCE 8 35
8	ANTI-EXTRUSION RING x OR 2137	2	PARBAK 8-028
9	PRIMARY SHUTTER	1	R-3-15134
10	LINER	1	R-3-1513-3
11	O-RING OR 3131	1	PARK 2-125
12	SOCKET SCREW M8x30	4	VTCE 8-30
13	NONRETURN VALVE	2	R-3-1513-VNR
14	COMPRESSION COIL SPRING	1	MOLLA 489
16	METRIC O-RING	1	KSA 0013
17	ANTI-EXTRUSION RING x OR 2012	1	PARBAK 8-006
18	O-RING OR 2012	1	PARK 2-006
20	DRIVING PLUG	1	R-3-1548-1
21	METAL-RUBBER SEALING WASHER	1	GM 0503 3/4
22	SECONDARY SHUTTER	1	R-3-1513-5-A÷F
23	PUSHER BUSH	1	R-3-1513-7
24	PUSHER PISTON	1	R-3-1513-6
25	O-RING OR 2015	1	PARK 2-007
26	O-RING OR 3118	1	PARK 2-123
27	FLANGE	1	R-3-1154-2
28	TAPERED PLUG (3/8”) DIN 906	2	TC 3/8
31	SECONDARY LINER	1	R-3-1513-9-A÷F
32	O-RING OR 2075	1	PARK 2-018
33	METAL-RUBBER SEALING WASHER	3	GM 0503 1/4
34	PLUG WITH STOP (1/4 “) DIN 908	3	TC 1/4 908

Valve coding (code 3-1548-*-0):

These valves can be supplied with different ratios of preloading pressure to intervention pressure; the letter after the code identifies this ratio:

Valve code	3-1548-A-0	3-1548-B-0	3-1548-C-0	3-1548-D-0	3-1548-E-0	3-1548-F-0
Preloading/discharge ratio	1:1.3	1:1.6	1:2	1:3	1:4	1:5

NOTES

The **3-1548-*-0** valve can function also with other types of control units; for more information, please contact our technical department.

With reference to the spare parts list on the previous page, please note the following:

WHEN YOU REQUEST ANY SPARE PARTS, ALWAYS SPECIFY THE COMPLETE CODE OF THE RELATED VALVE.

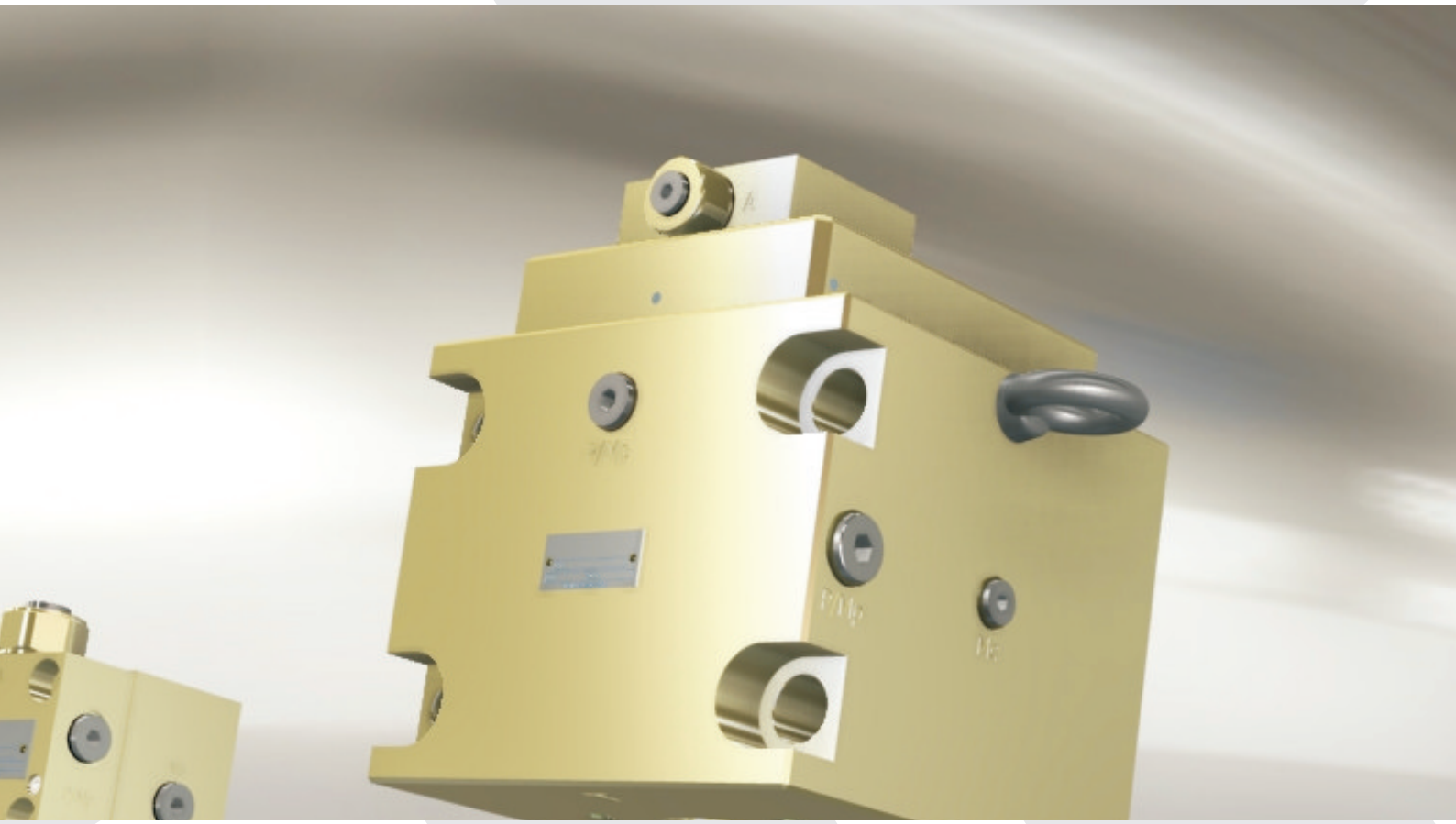
NOT ALL THE LISTED DEVICES CAN BE SUPPLIED ALONE: DUE TO REDUCED COUPLING TOLERANCES, RECIPROCALLY SLIDING ITEMS MUST BE SUPPLIED TOGETHER.

Please find below a list of items to be supplied together; the numbering of the various items refer to the section plane in figure 6:

- DRIVING UNIT = 22+31

- LINER-SHUTTER UNIT = 10+9+4

HYDRAULIC SAFETY VALVES
MODEL 3-1758



Requirements

The system consists of one or more **3-1758-*-0** valves.
This device has been designed to control the hydraulic pressure delivered by oleopneumatic control units (codes **5-1698**, **5-1719** and **5-1752**). Accordingly the use of the **3-1758-*-0** valves is subject to the adoption of one of the control units mentioned above – for their technical characteristics, refer to the relevant technical documentation.
To allow the use of this system, the machine must be provided with hydraulic cushions, according to the diagram in figure 1; furthermore, the maximum pressure for the activation of the safety device must not exceed 500 bar. To this end, the hydraulic cushions must be suitably dimensioned, in order to ensure the required tonnage to the machine .

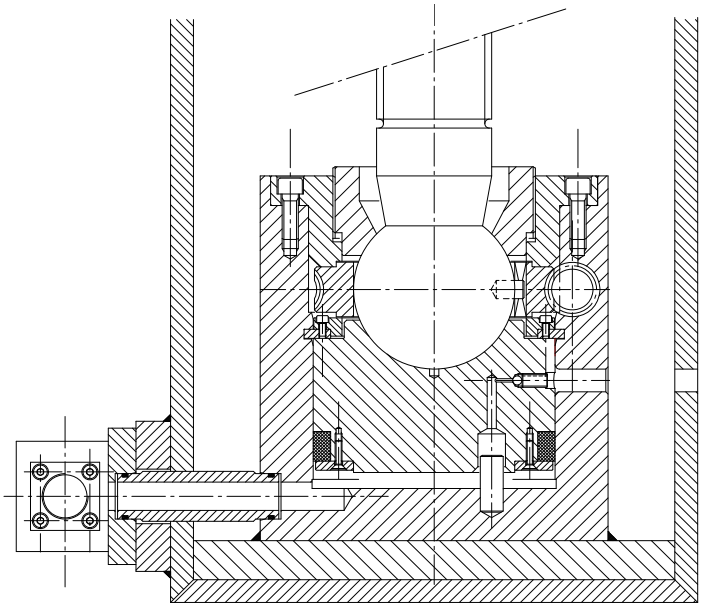


fig.1

Characteristics

Apart from a satisfactory repeatability, the system under examination ensures low response times,
so that the occurrence of pressure peaks is dramatically reduced. The extremely high ratio of preloading pressure to safety device activation pressure (up to 1:5), allows the adoption of reduced preloading pressures for the hydraulic cushions, thus decreasing the stress the cushions are subjected to.
The design of the system makes it possible to continuously modify the activation pressure of the safety device, working on the preloading pressure delivered by the control unit.

Hydraulic diagram

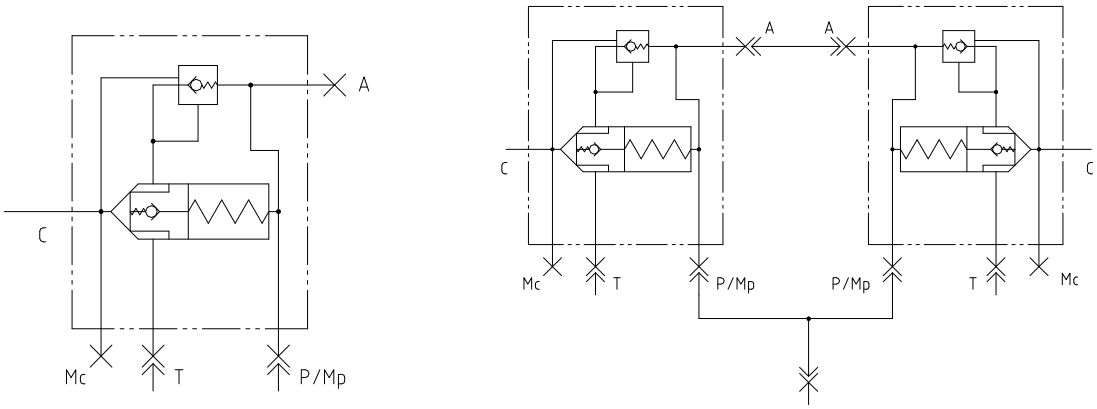


fig.2

Figure 2 shows the hydraulic diagram of the **3-1758-*-0** valve. The symbols used in figure 2 can be interpreted as follows:

P = preloading (from the control unit), **T** = discharge line, **A** = drive, **C** = connection to the hydraulic cushion, **Mc** = connection of the hydraulic cushion pressure gauge, **Mp** = connection of the preloading line pressure gauge.

Working principle

The hydraulic cushions (figure 1) are obtained between the connecting rods and the ram of the press, which are pre-loaded with a hydraulic pressure **P** in order to confer more stiffness to the system.
After every single work cycle of the press, the pressure inside the cushions rises to a variable value **Pl**, which substantially depends on the type of work which is being carried out.
If, for accidental reasons (e.g. wear of the die) the pressure in the hydraulic cushions exceeds the maximum preset value **Ps**, the safety valve cod. **3-1758-*-0** involved in the overload will switch automatically to the discharge mode, while causing the other valves connected to it to discharge by means of drive **A**, so as to drain the oil from the hydraulic cushion, and to allow the ram to go beyond the bottom dead center (**BDC**).

Hydraulic connection diagrams

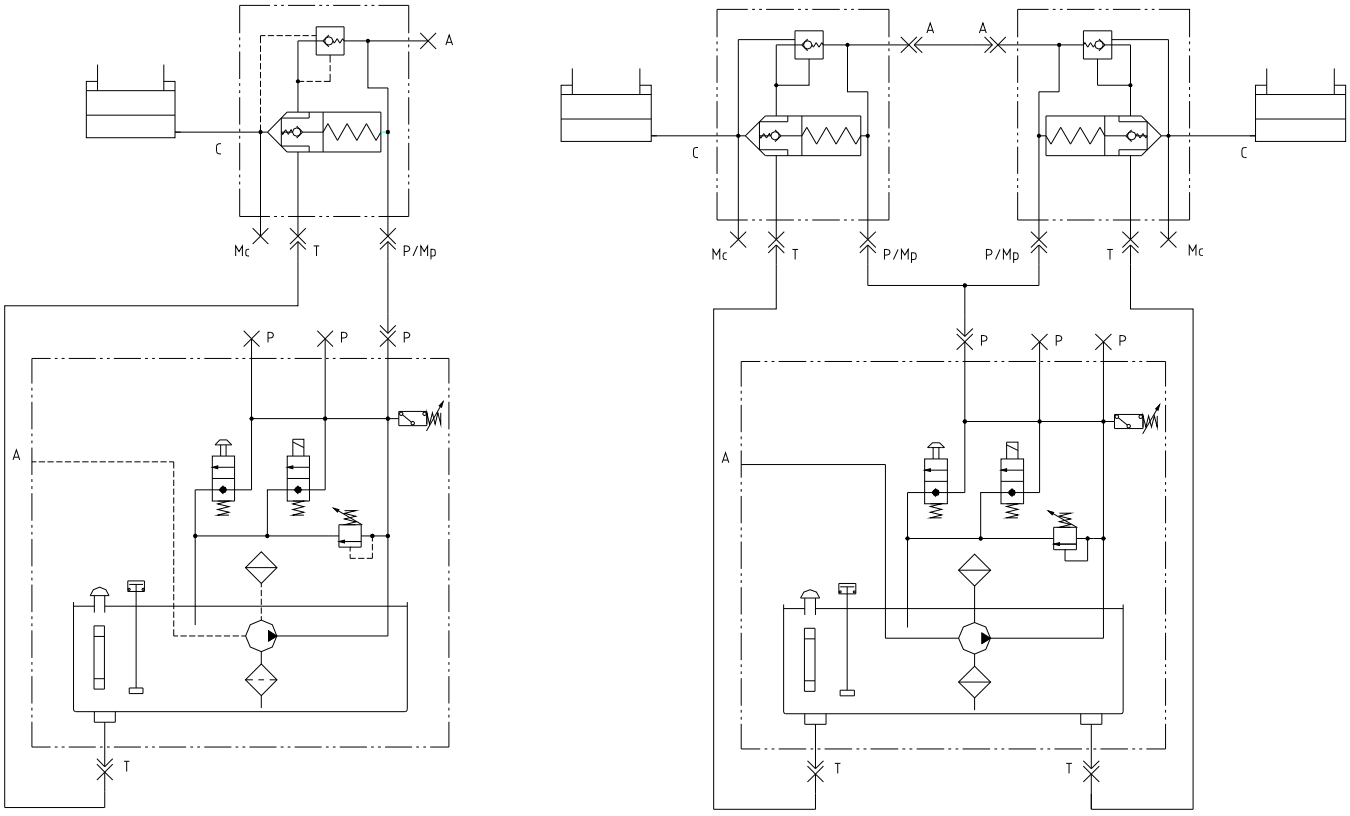


fig.3

Plant operation (diagram in figure 3)

The system illustrated in the figure must be supplied by a compressed air line **(A)** from the machine.
This line feeds the oleo-pneumatic pump mounted in the unit tank; once actuated, the pump sends oil under pressure to hydraulic cushions **(C)**, through **3-1758-*-0** valves and ducts **P** and **C**.
The preloading pressure ensured by the pump is a function of the pneumatic supply pressure supplied to the control unit, this value is regulated by a pressure reducer mounted on the press in a position accessible to the operator; the reducer can be of conventional type (manual control) or provided with electrical control (with a step-by-step reducer) or electromagnetic control (proportional electrovalve).
During the functioning of the press, the preloading pressure delivered by the hydraulic safety unit and the cyclical pressure generated by hydraulic cushions **(C)** through the operation of the press, interact and based on the ratio of the driving areas of the **3-1758-*-0** valves, they ensure that the necessary pressure does not exceed the preset value.
If the pressure of the press exceeds the maximum preset value, the pressure generated in hydraulic cushions **(C)** overcomes the one generated by the control unit and the valves are switched to the discharge mode, so as to allow the oil in the hydraulic cushions to freely flow into the unit's tank through ducts **(T)**.
The switching of **3-1758-*-0** valves results in the resetting of the preloading pressure, and accordingly in the switching of the minimum pressure pressure switch mounted on the unit.
The signal of the pressure switch, apart from sending an emergency signal to the machine, shall stop the air flow which feeds the oleo-pneumatic pump.
The overload signal, sent by the pressure switch, shall stop the machine, by working on the brake/clutch assembly.

3-1758-*-0 Valve

This is an hydrodriven valve; its operation is based on the principle of differential sections.
Its body is wholly made spheroidal cast iron and is chromogalvanized to withstand corrosion over time.
The sealing elements are usually made of nitrile rubber, though different compounds can be mounted, as the case may be. The sliders and the internal liners are made of treated and ground chrome-nickel steel.
The valve is supplied with all openings plugged with high-pressure sealing elements, so as to allow the plant designer to use only the necessary openings; the outlet opening is not plugged.

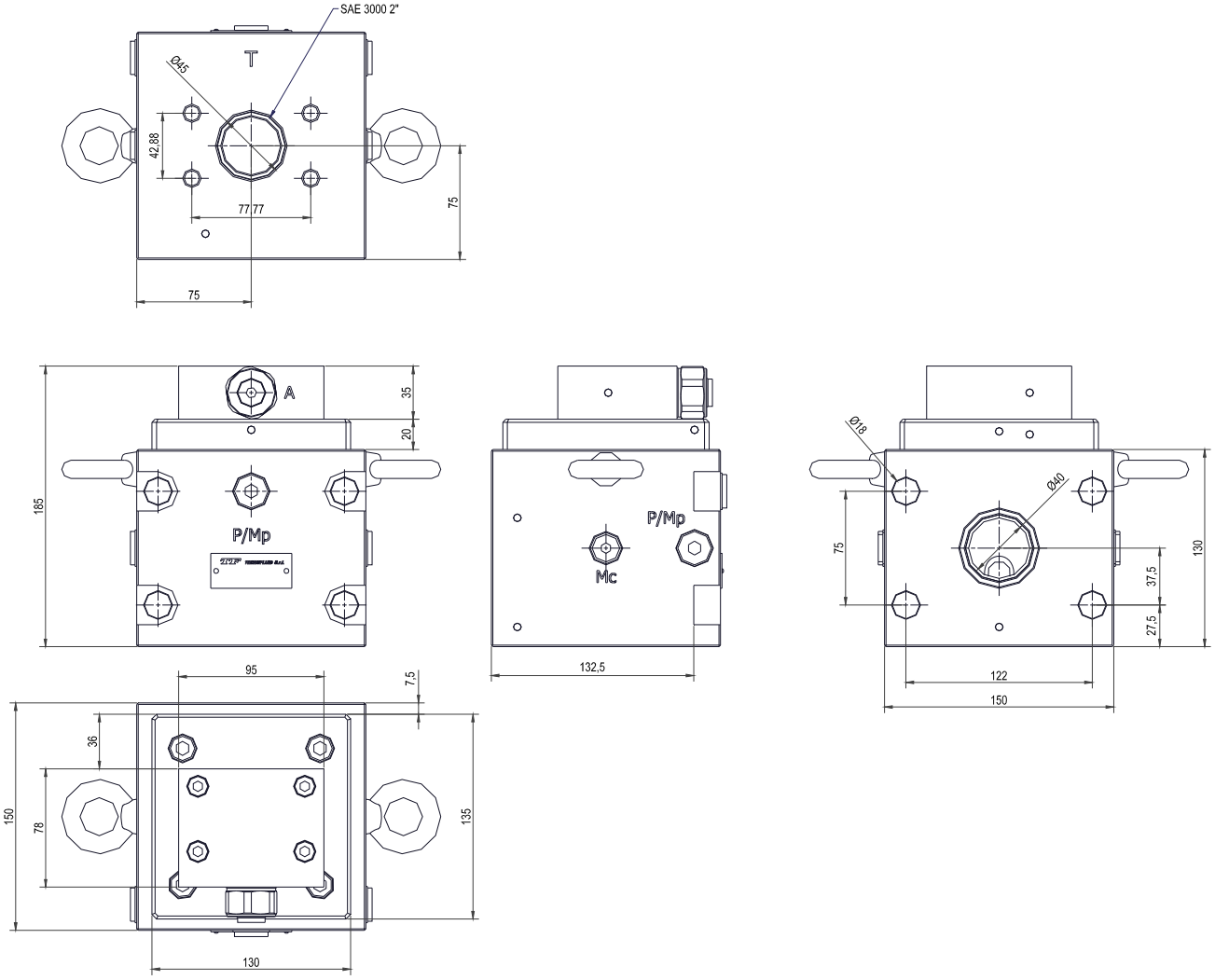


fig.4

Figure 4 shows the external view with the overall dimensions of the **3-1758-*-0** valve; the valve is fastened to the ram by 4 high-resistance hollow hexagonal screws M16x160 mm.
The diameter of the hole for communication with the hydraulic cushion must not exceed 40 mm and the supporting plane of the valve must have a maximum roughness of 1.6 Ra and a minimum planarity of 0.02/100 mm.
It can be mounted in any position.

5-1719 Control unit (figure 5)

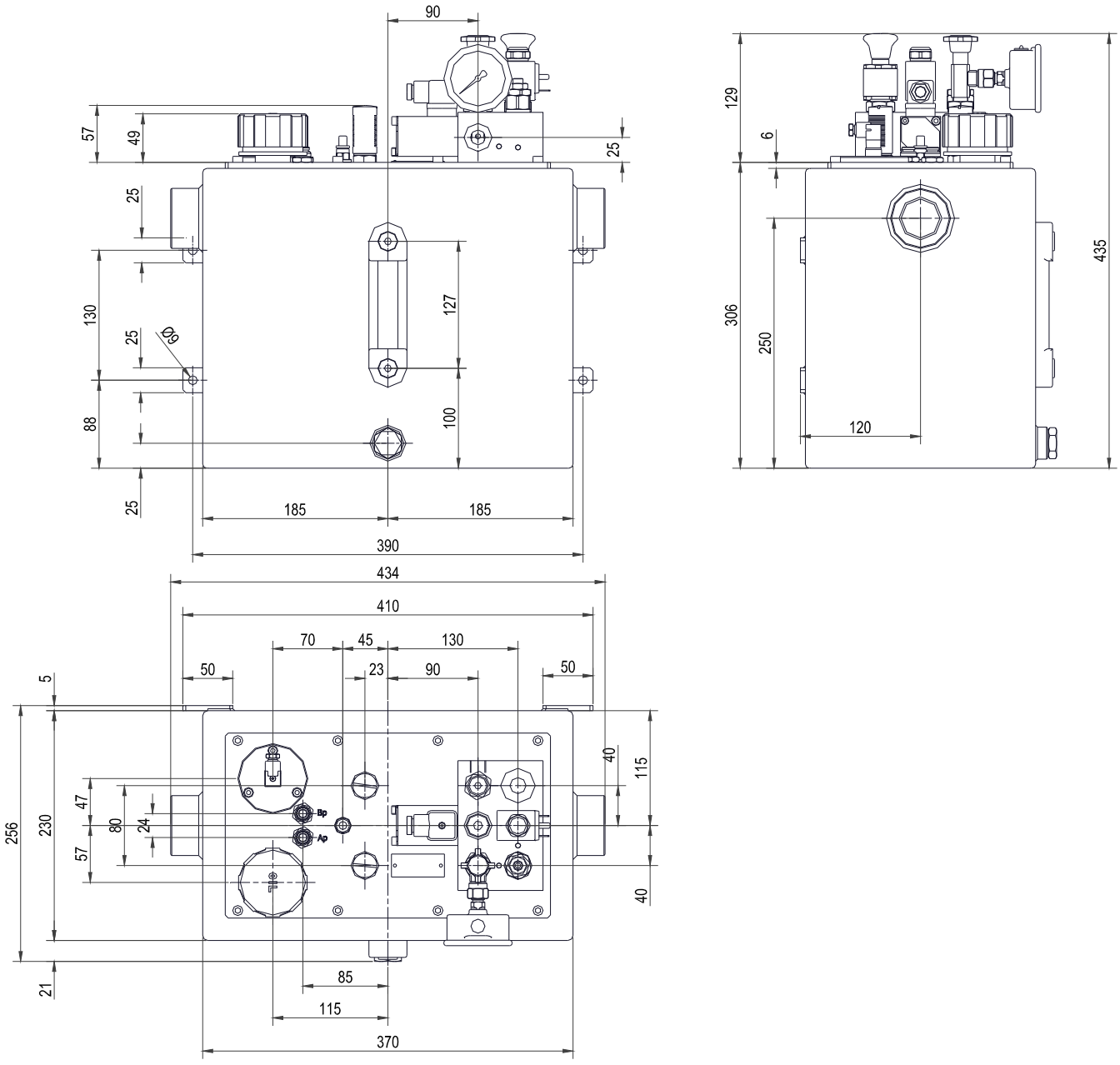


fig.5

Figure 5 shows the external view, with the overall dimensions and the connection openings of the **5-1719** control unit.
The control unit consists of a steel frame tank, an aluminum cover fastened to the tank by screws and a distribution block for the hydraulic control. The minimum pressure pressure switch is located on this block, as well as the connection for the delivery to the **3-1758-*-0** valves.
The tank contains some 18 liters of oil and its bottom includes the return openings (1”1/4 G) from the drain connection of **3-1758-*-0** safety valves.
The tank is provided with an oil-filler cap, the quick connection for the pneumatic supply (plastic pipe, Ø 8 mm.), and the hydraulic control block.
For any further information on the control unit, refer to the dedicated technical documentation.

Data sheet

PRELOADING RATIO : DISCHARGE	**1:1.3 TO 1:5**
MAXIMUM PRELOADING PRESSURE	**380 bar**
SAFETY ACTIVATION TIME	**0.01 sec.**
MAXIMUM VISCOSITY OF THE OIL	**10° Engler**
MAXIMUM OIL TEMPERATURE	**90° C.**
ROOM TEMPERATURE	**-10 +50 ° C.**
DIAMETER OF THE VALVE'S PRESSURE INTAKES	**1/4" + 3/8" G.**
NOMINAL DIAMETER OF THE VALVE	**ND 40**
VALVE'S DISCHARGE DUCT	**SAE 300 2"**

Useful suggestions for installation

If you decide to install a hydraulic safety system on a cam press, do not forget a few general considerations:

- The safety valves must be mounted near the cushions, and must be connected to them using rigid HP pipes.
- The ram's hydraulic cushions must always be provided with a bleeding system positioned next to their top, so as to collect and eject any air bubbles.
- The hydraulic cushions' seals must be of high pressure type (if possible made of polyurethane).
- The cushions' cylinders must be made of homogeneous material, as far as possible (without any blowholes or cracks) in order to ensure a perfect hydraulic sealing and to protect the sealing elements from anomalous wear and tear.
- The piping that, starting from the control unit, transmits the preloading pressure to the valves can be either rigid or flexible, providing that the duct is designed for high pressure.
- It is advisable to position the control unit in a position easy to reach, so as to facilitate the oil topping up.
- The oil used in the control unit can be the one used for lubricating the guides of the machine; anyway, the oil must never come into contact with the lubrication oil, since the suspended metal particles would cause irreparable damage to the system; in any case, the oil viscosity must not exceed the maximum expected viscosity.
- We recommend that you do not use liquid Teflon for the assembly of connecting joints between valves and control unit; where you cannot use metal-rubber washers, we recommend that you adopt conical thread fittings and use a Teflon tape for sealing.

Spare parts of the 3-1758-*-0 valve

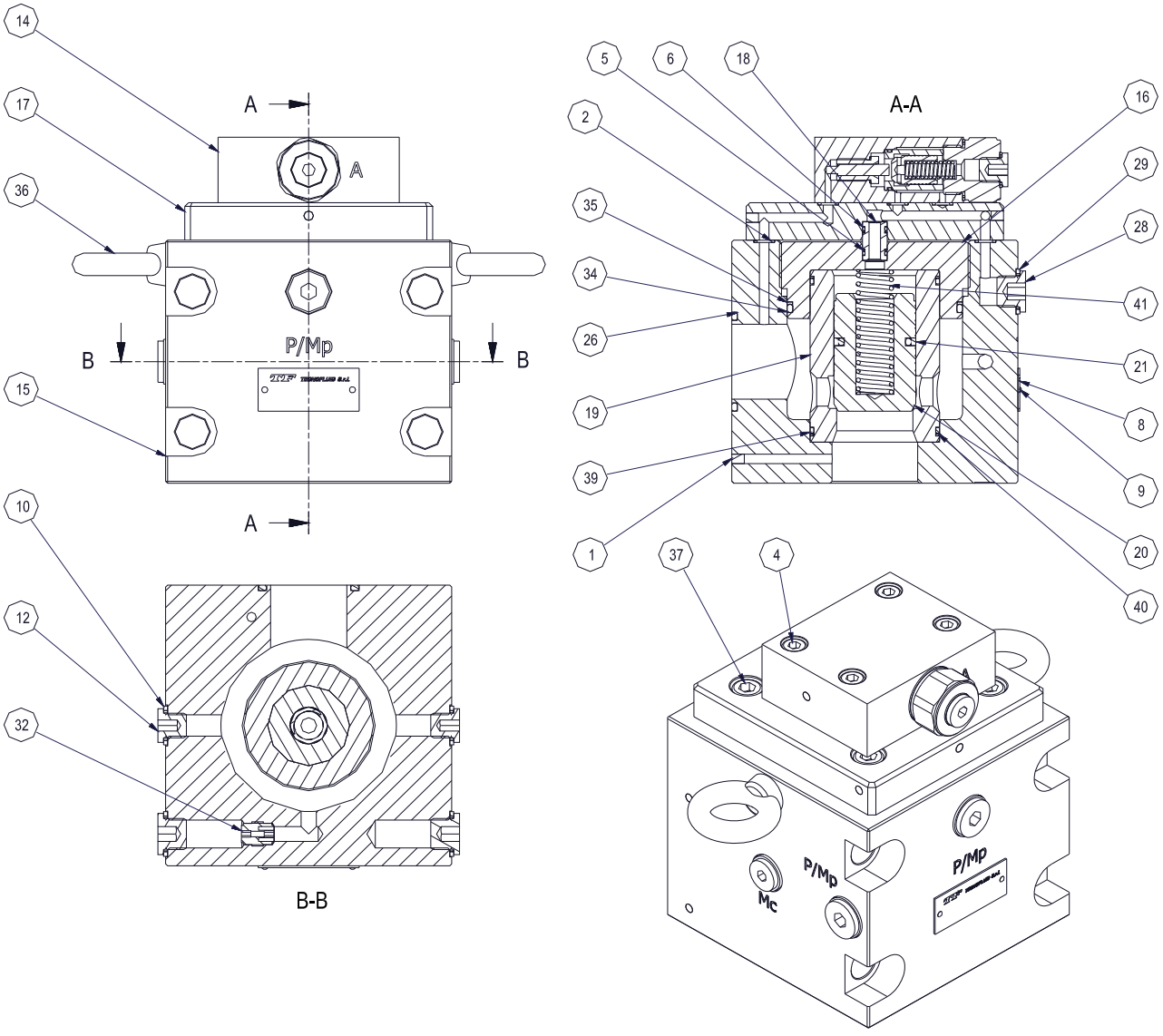


fig.6

Figure 6 shows a section plane of the hydraulic safety valve code **3-1758-*-0**, where all the components of the unit have been numbered.
The spare parts list includes also the quantity of every single item, as may be necessary to complete a unit.
This list is available on the next page.

Spare parts list of the 3-1758-*-0 hydraulic safety unit (see the section plane in figure 6)

POS	NAME	Q.TY	ORDER CODE
1	EXPANDING PLUG Ø5	9	AVDEL 5
2	OR 2031 7.66x1.78 NBR 70	9	PARK 2 011
4	SOCKET SCREW M8x40	4	VTCE 8 40
5	ANTI-EXTRUSION RING FOR OR 2062	2	PARBAK 8-016
6	OR 2037 9.25x1.78 NBR 70	2	PARK 2-012
8	ALUMINIUM TAG	1	TARGH 1194
9	THREAD NAIL Ø1.9x5	2	CH A 1.9 5
10	METAL-RUBBER SEALING WASHER 1/4"	2	RTMG 14 1
12	PLUG WITH STOP 1/4"G. DIN 908	2	TC 14 908
14	PRESSURE SETTING HEAD 1:1,3÷1:5	1	3-1548-102-A,B,C,D,E,F
15	BODY ND 40	1	3-1758-1
16	MAIN PLUG DN 40	1	3-1758-3
17	SUB PLATE DN 40	1	3-1758-5
18	CONNECTION	1	3-1757-6
19	LINER DN 40	1	3-1758-2
20	PRIMARY SHUTTER DN 40	1	3-1758-4
21	SPECIAL SLIDING SEAL	1	GTE 043 2
26	OR 46.04x3.53 NBR 70	1	OR 150
28	PLUG WITH STOP 3/8" GAS DIN 908	3	TC 38 908
29	METAL-RUBBER SEALING WASHER 3/8	3	RTMG 38 1
32	NONRETURN VALVE 1/4"	1	VNRC 14 01
34	OR 4337 85.32x3.53 NBR 70	1	PARK 2-237
35	ANTI-EXTRUSION RING FOR OR 4337	1	PARBAK 8-237
36	GOLFARO MASCHIO M10	2	GOLM 10
37	SOCKET SCREW M10x30 UNI 5931	4	VTCE 8 30
39	OR 3250 63.17x2.62 NBR 70	2	PARK 2-144
40	ANTI-EXTRUSION RING FOR OR 3250	2	PARBAK 8-144
41	SPRING 2.2-19.5-111-13.5+2	1	MOLLA 843
42	SCREW WITHOUT HEAD UNI 5923	1	VCE 6 8 A

Valve coding (code 3-1758-*-0):

Le valvole i oggetto sono fornibili con diversi rapporti fra pressione di precarica e pressione di intervento la lettera che segue il codice identifica il rapporto in oggetto:

Valve code	3-1758-A-0	3-1758-B-0	3-1758-C-0	3-1758-D-0	3-1758-E-0	3-1758-F-0
Preloading/discharge ratio	1:1.3	1:1.6	1:2	1:3	1:4	1:5

NOTES

The **3-1758-*-0** valve can function also with other types of control units; for more information, please contact our technical department.

With reference to the spare parts list on the previous page, please note the following:

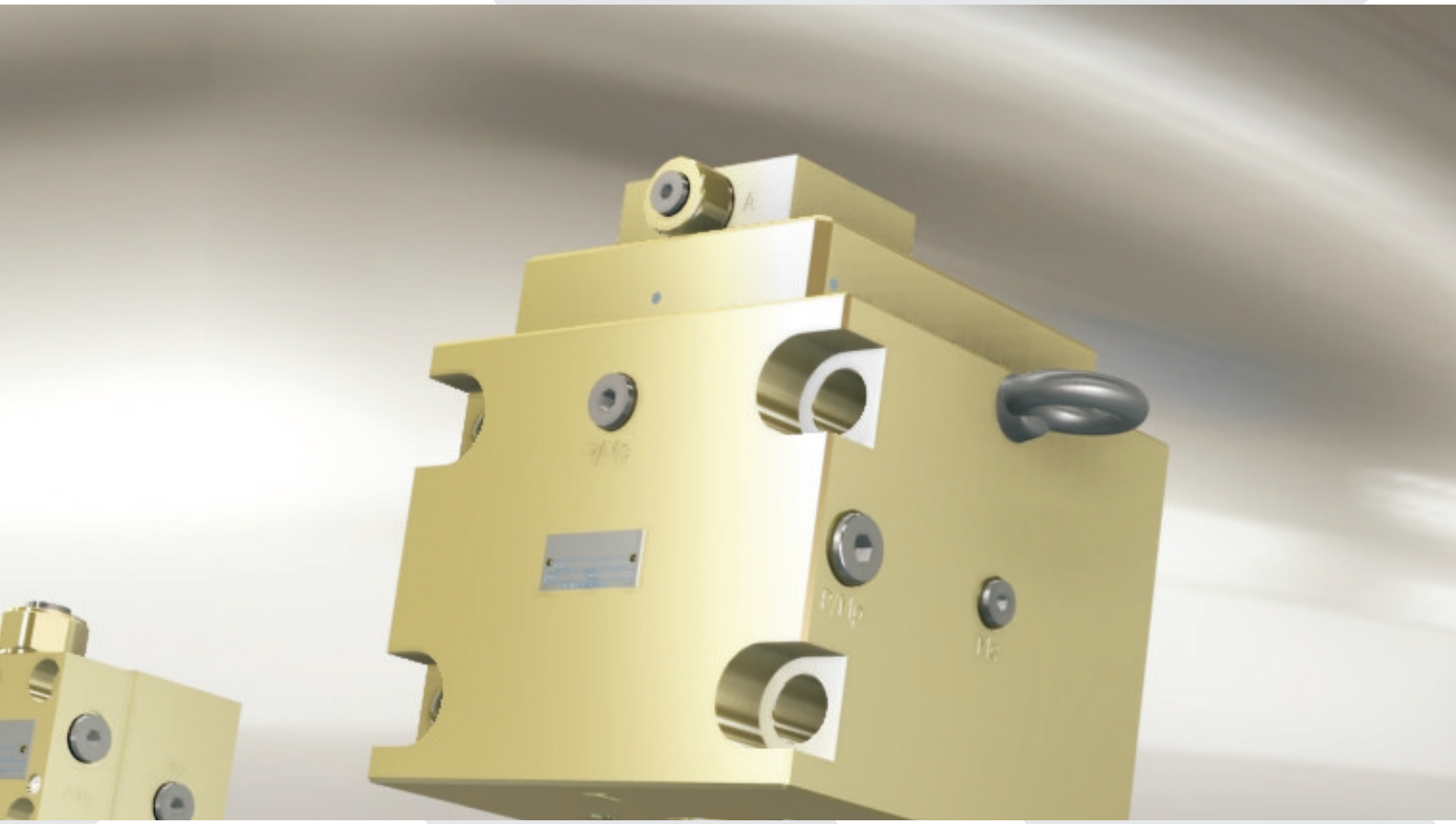
WHEN YOU REQUEST ANY SPARE PARTS, ALWAYS SPECIFY THE COMPLETE CODE OF THE RELATED VALVE.

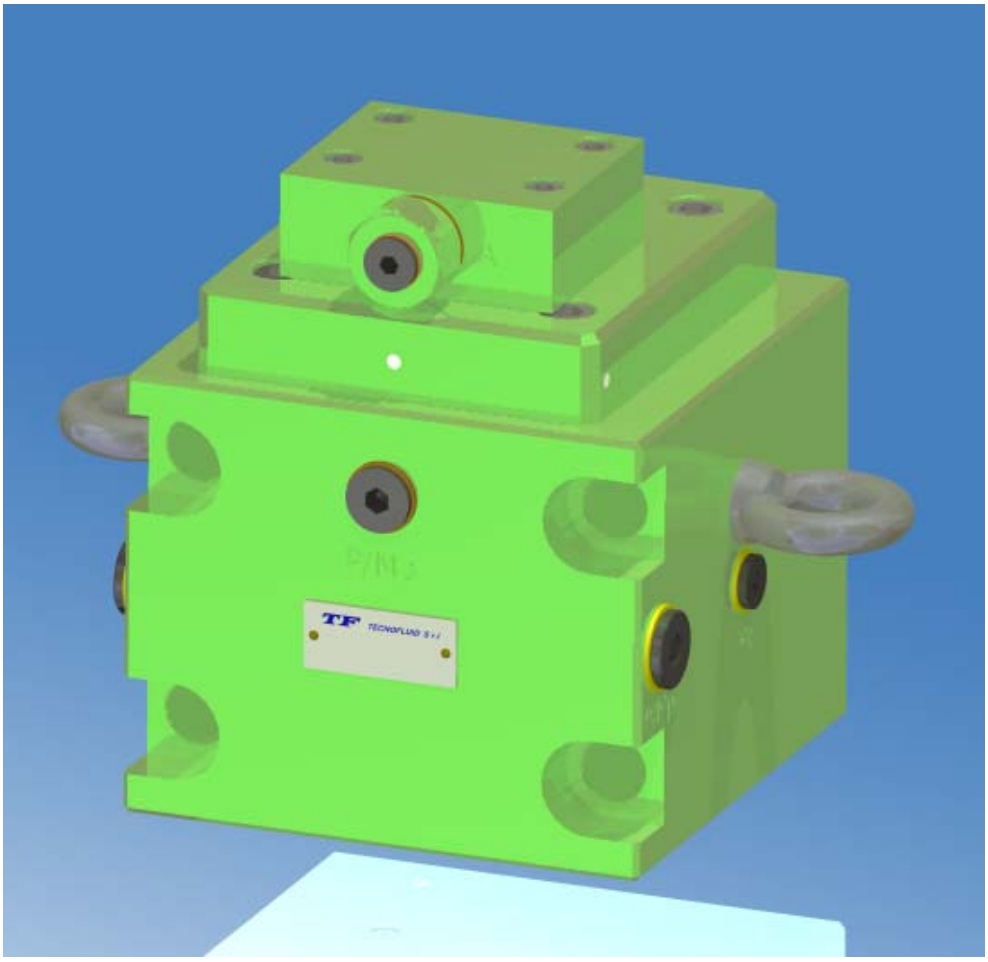
NOT ALL THE LISTED DEVICES CAN BE SUPPLIED ALONE: DUE TO REDUCED COUPLING TOLERANCES, RECIPROCALLY SLIDING ITEMS MUST BE SUPPLIED TOGETHER.

Please find below a list of items to be supplied together; the numbering of the various items refer to the section plane in figure 6:

- LINER-SHUTTER UNIT = 19+20+21

HYDRAULIC SAFETY VALVES
MODEL 3-1759





HYDRAULIC SAFETY VALVE ND 50
FOR HIGH PRELOAD/DISCHARGE RATIO
CAM PRESSES
TYPE 3-1759-*-0

Requirements

The system consists of one or more **3-1759-*-0** valves.
This device has been designed to control the hydraulic pressure delivered by oleopneumatic control units (codes **5-1698**, **5-1719** and **5-1752**). Accordingly the use of the **3-1759-*-0** valves is subject to the adoption of one of the control units mentioned above – for their technical characteristics, refer to the relevant technical documentation.

To allow the use of this system, the machine must be provided with hydraulic cushions, according to the diagram in figure 1; furthermore, the maximum pressure for the activation of the safety device must not exceed 500 bar. To this end, the hydraulic cushions must be suitably dimensioned, in order to ensure the required tonnage to the machine .

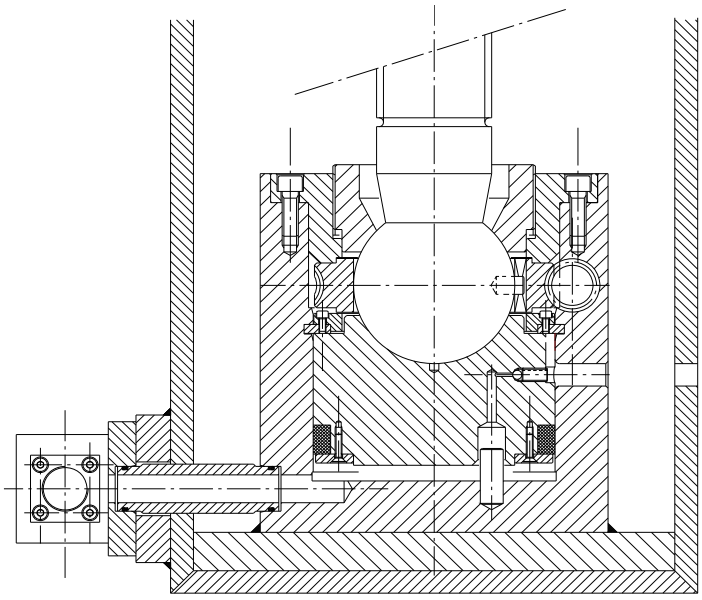


fig.1

Characteristics

Apart from a satisfactory repeatability, the system under examination ensures low response times,
so that the occurrence of pressure peaks is dramatically reduced. The extremely high ratio of preloading pressure to safety device activation pressure (up to 1:5), allows the adoption of reduced preloading pressures for the hydraulic cushions, thus decreasing the stress the cushions are subjected to.
The design of the system makes it possible to continuously modify the activation pressure of the safety device, working on the preloading pressure delivered by the control unit.

Hydraulic diagram

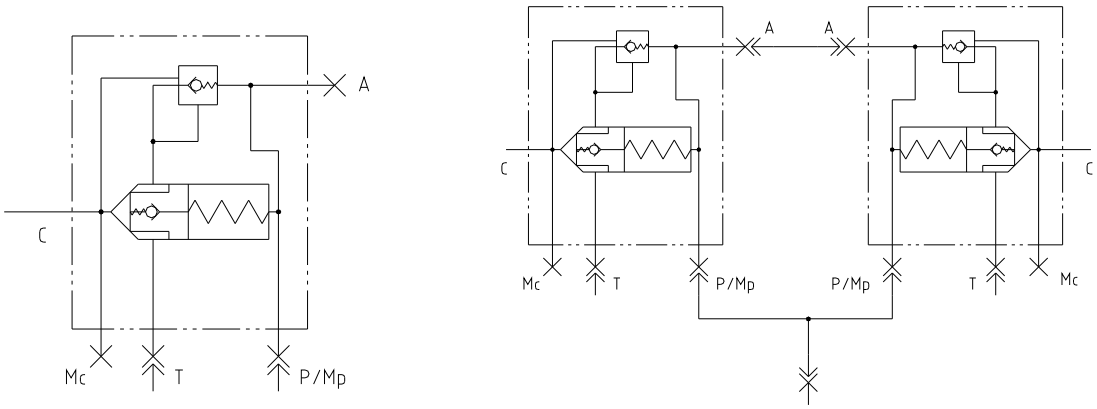


fig.2

Figure 2 shows the hydraulic diagram of the **3-1759-*-0** valve. The symbols used in figure 2 can be interpreted as follows:

P = preloading (from the control unit), **T** = discharge line, **A** = drive, **C** = connection to the hydraulic cushion, **Mc** = connection of the hydraulic cushion pressure gauge, **Mp** = connection of the preloading line pressure gauge.

Working principle

The hydraulic cushions (figure 1) are obtained between the connecting rods and the ram of the press, which are pre-loaded with a hydraulic pressure **P** in order to confer more stiffness to the system.
After every single work cycle of the press, the pressure inside the cushions rises to a variable value **Pl**, which substantially depends on the type of work which is being carried out.
If, for accidental reasons (e.g. wear of the die) the pressure in the hydraulic cushions exceeds the maximum preset value **Ps**, the safety valve cod. **3-1759-*-0** involved in the overload will switch automatically to the discharge mode, while causing the other valves connected to it to discharge by means of drive **A**, so as to drain the oil from the hydraulic cushion, and to allow the ram to go beyond the bottom dead center (**BDC**).

Hydraulic connection diagrams

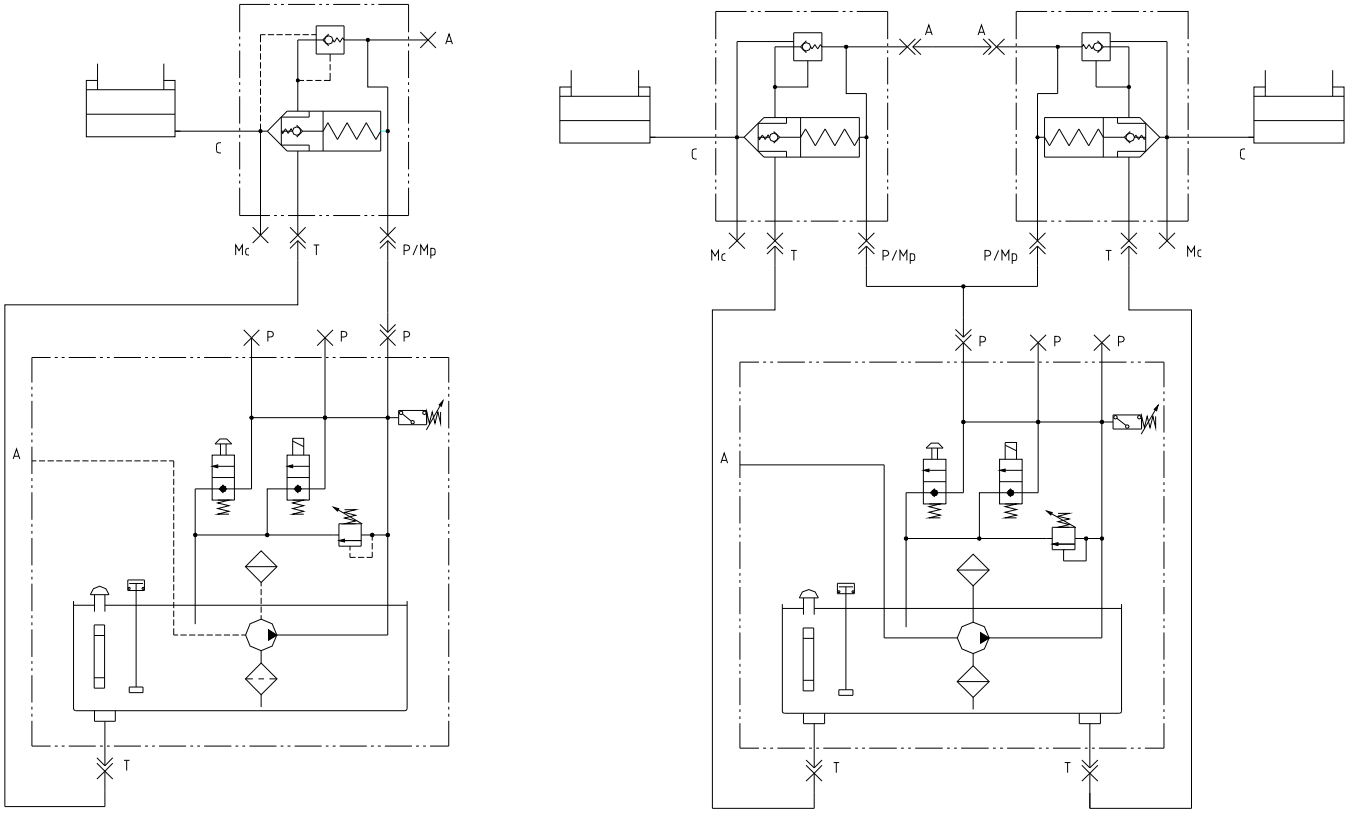


fig.3

Plant operation (diagram in figure 3)

The system illustrated in the figure must be supplied by a compressed air line **(A)** from the machine.
This line feeds the oleo-pneumatic pump mounted in the unit tank; once actuated, the pump sends oil under pressure to hydraulic cushions **(C)**, through **3-1759-*-0** valves and ducts **P** and **C**.
The preloading pressure ensured by the pump is a function of the pneumatic supply pressure supplied to the control unit, this value is regulated by a pressure reducer mounted on the press in a position accessible to the operator; the reducer

can be of conventional type (manual control) or provided with electrical control (with a step-by-step reducer) or electromagnetic control (proportional electrovalve).
During the functioning of the press, the preloading pressure delivered by the hydraulic safety unit and the cyclical pressure generated by hydraulic cushions **(C)** through the operation of the press, interact and based on the ratio of the driving areas of the **3-1759-*-0** valves, they ensure that the necessary pressure does not exceed the preset value.
If the pressure of the press exceeds the maximum preset value, the pressure generated in hydraulic cushions **(C)** overcomes the one generated by the control unit and the valves are switched to the discharge mode, so as to allow the oil in the hydraulic cushions to freely flow into the unit's tank through ducts **(T)**.
The switching of **3-1759-*-0** valves results in the resetting of the preloading pressure, and accordingly in the switching of the minimum pressure pressure switch mounted on the unit.
The signal of the pressure switch, apart from sending an emergency signal to the machine, shall stop the air flow which feeds the oleo-pneumatic pump.
The overload signal, sent by the pressure switch, shall stop the machine, by working on the brake/clutch assembly.

3-1759-*-0 Valve

This is an hydrodriven valve; its operation is based on the principle of differential sections.
Its body is wholly made spheroidal cast iron and is chromogalvanized to withstand corrosion over time.
The sealing elements are usually made of nitrile rubber, though different compounds can be mounted, as the case may be. The sliders and the internal liners are made of treated and ground chrome-nickel steel.
The valve is supplied with all openings plugged with high-pressure sealing elements, so as to allow the plant designer to use only the necessary openings; the outlet opening is not plugged.

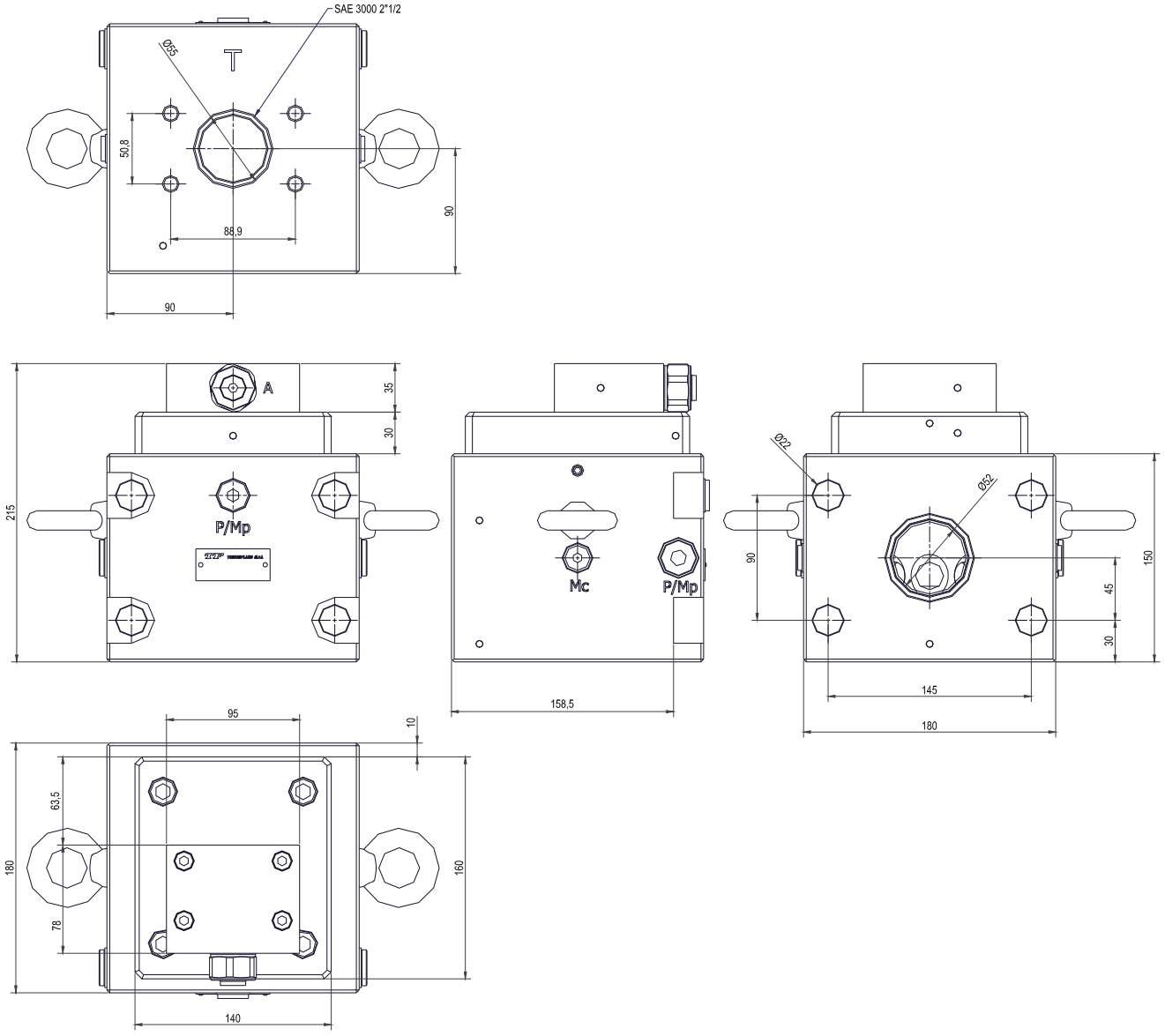


fig.4

Figure 4 shows the external view with the overall dimensions of the **3-1759-*-0** valve; the valve is fastened to the ram by 4 high-resistance hollow hexagonal screws M20x200 mm.
The diameter of the hole for communication with the hydraulic cushion must not exceed 50 mm and the supporting plane of the valve must have a maximum roughness of 1.6 Ra and a minimum planarity of 0.02/100 mm.
It can be mounted in any position.

5-1719 Control unit (figure 5)

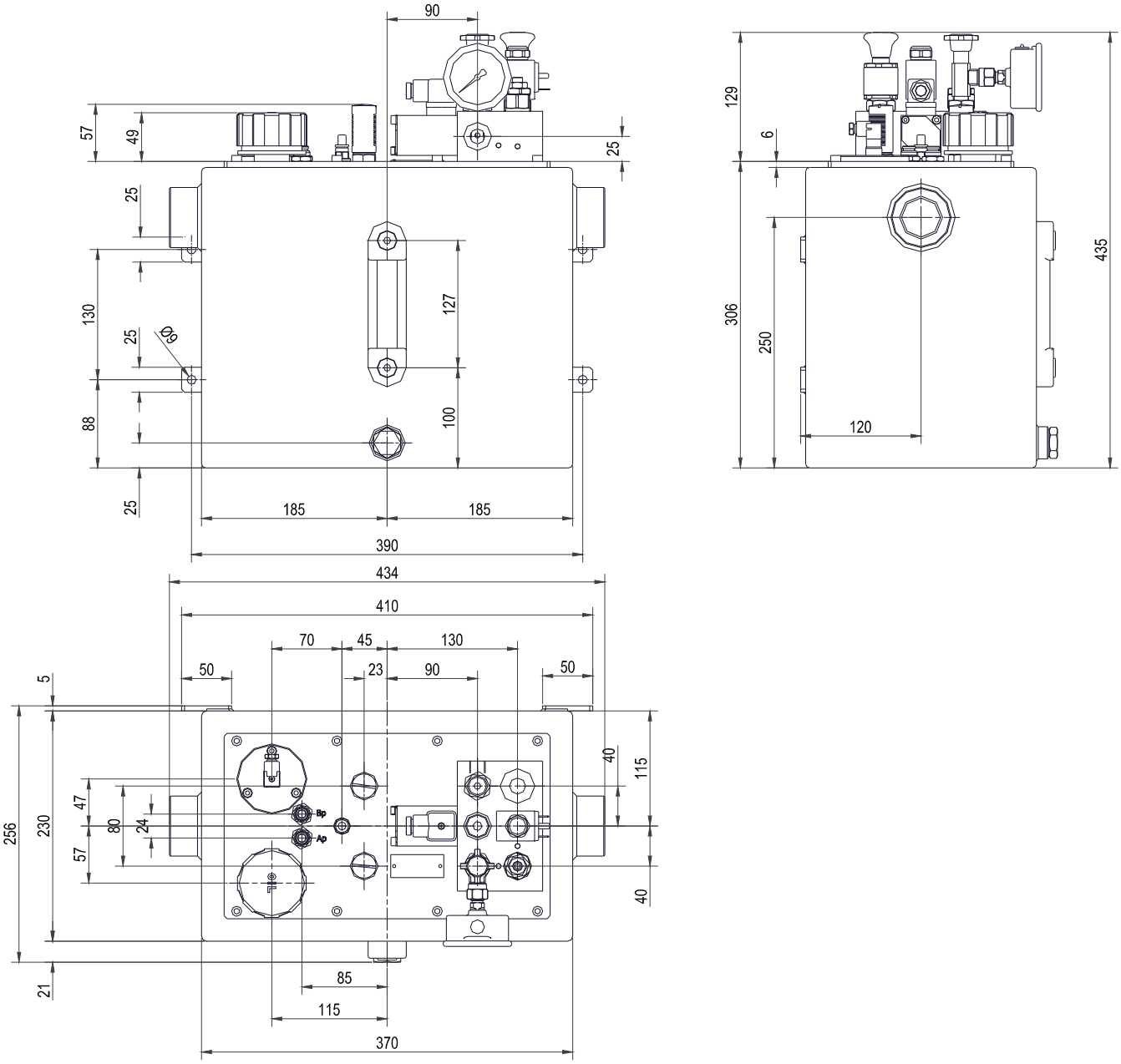


fig.5

Figure 5 shows the external view, with the overall dimensions and the connection openings of the **5-1719** control unit.
The control unit consists of a steel frame tank, an aluminum cover fastened to the tank by screws and a distribution block for the hydraulic control. The minimum pressure pressure switch is located on this block, as well as the connection for the delivery to the **3-1759-*-0** valves.
The tank contains some 18 liters of oil and its bottom includes the return openings (1”1/4 G) from the drain connection of **3-1759-*-0** safety valves.
The tank is provided with an oil-filler cap, the quick connection for the pneumatic supply (plastic pipe, Ø 8 mm.), and the hydraulic control block.
For any further information on the control unit, refer to the dedicated technical documentation.

Data sheet

PRELOADING RATIO : DISCHARGE	**1:1.3 TO 1:5**
MAXIMUM PRELOADING PRESSURE	**380 bar**
SAFETY ACTIVATION TIME	**0.01 sec.**
MAXIMUM VISCOSITY OF THE OIL	**10° Engler**
MAXIMUM OIL TEMPERATURE	**90° C.**
ROOM TEMPERATURE	**-10 +50 ° C.**
DIAMETER OF THE VALVE'S PRESSURE INTAKES	**1/4" + 3/8" + 1/2" G.**
NOMINAL DIAMETER OF THE VALVE	**ND 50**
VALVE'S DISCHARGE DUCT	**SAE 300 2"1/2**

Useful suggestions for installation

If you decide to install a hydraulic safety system on a cam press, do not forget a few general considerations:

- The safety valves must be mounted near the cushions, and must be connected to them using rigid HP pipes.
- The ram's hydraulic cushions must always be provided with a bleeding system positioned next to their top, so as to collect and eject any air bubbles.
- The hydraulic cushions' seals must be of high pressure type (if possible made of polyurethane).
- The cushions' cylinders must be made of homogeneous material, as far as possible (without any blowholes or cracks) in order to ensure a perfect hydraulic sealing and to protect the sealing elements from anomalous wear and tear.
- The piping that, starting from the control unit, transmits the preloading pressure to the valves can be either rigid or flexible, providing that the duct is designed for high pressure.
- It is advisable to position the control unit in a position easy to reach, so as to facilitate the oil topping up.
- The oil used in the control unit can be the one used for lubricating the guides of the machine; anyway, the oil must never come into contact with the lubrication oil, since the suspended metal particles would cause irreparable damage to the system; in any case, the oil viscosity must not exceed the maximum expected viscosity.
- We recommend that you do not use liquid Teflon for the assembly of connecting joints between valves and control unit; where you cannot use metal-rubber washers, we recommend that you adopt conical thread fittings and use a Teflon tape for sealing.

Spare parts of the 3-1759-*-0 valve

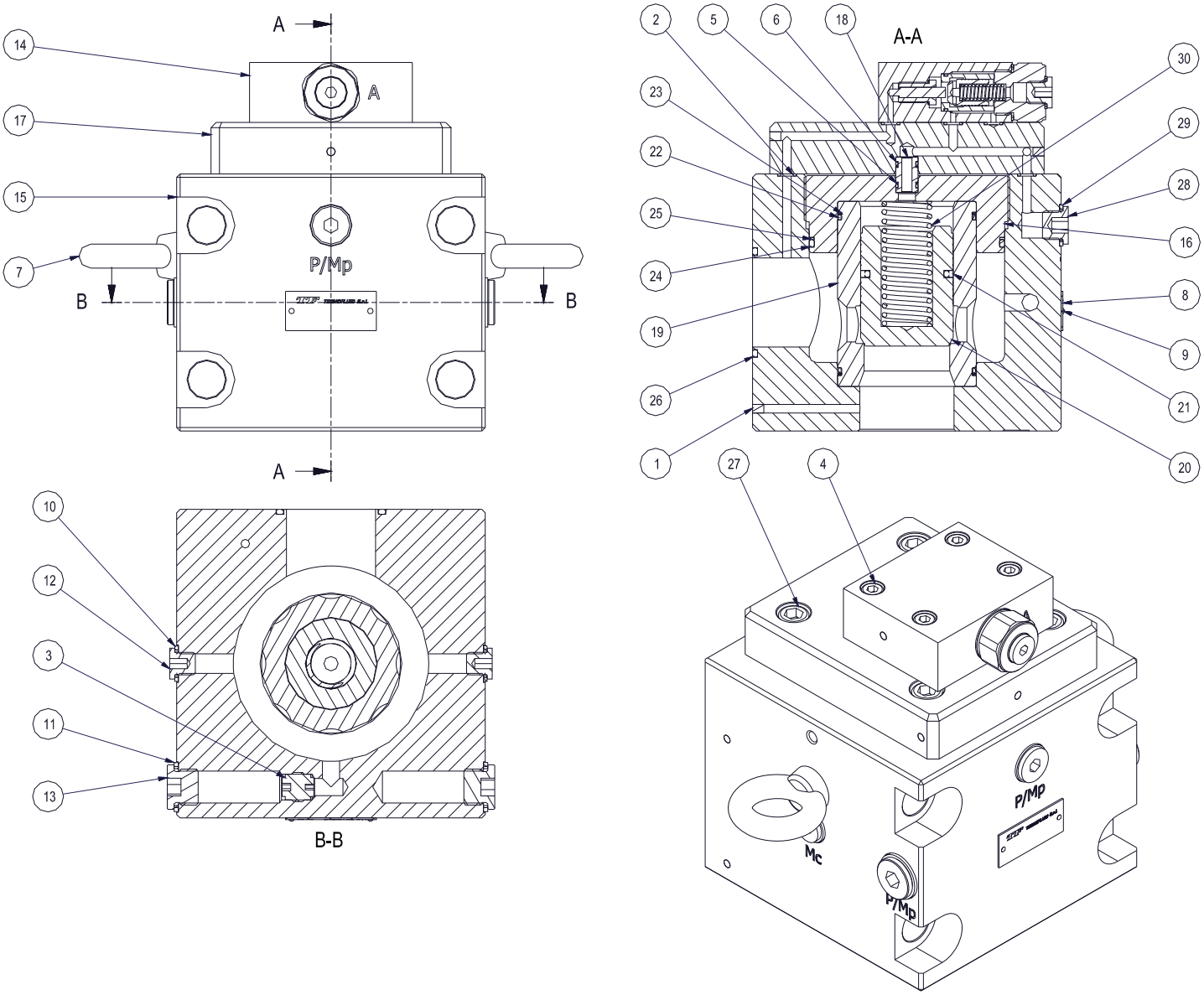


fig.6

Figure 6 shows a section plane of the hydraulic safety valve code **3-1759-*-0**, where all the components of the unit have been numbered.
The spare parts list includes also the quantity of every single item, as may be necessary to complete a unit.
This list is available on the next page.

Spare parts list of the 3-1759-*-0 hydraulic safety unit (see the section plane in figure 6)

POS	NAME	Q.TY	ORDER CODE
1	EXPANDING PLUG Ø5	9	AVDEL 5
2	OR 2031 7.66x1.78 NBR 70	9	PARK 2 011
3	NONRETURN VALVE 3/8"	1	VNRC 38 01
4	SOCKET SCREW M8x40	4	VTCE 8 40
5	ANTI-EXTRUSION RING FOR OR 2062	2	PARBAK 8-016
6	OR 2037 9.25x1.78 NBR 70	2	PARK 2-012
7	GOLFARO MASCHIO M12	2	GOLM 12
8	ALUMINIUM TAG	1	TARGH 1194
9	THREAD NAIL Ø1.9x5	2	CH A 1.9 5
10	METAL-RUBBER SEALING WASHER 1/4"	2	RTMG 14 1
11	METAL-RUBBER SEALING WASHER 1/2"	2	RTMG 12 1
12	PLUG WITH STOP 1/4"G. DIN 908	2	TC 14 908
13	PLUG WITH STOP 1/2"GAS DIN 908	2	TC 12 908
14	PRESSURE SETTING HEAD 1:1,3÷1:5	1	3-1548-102-A,B,C,D,E,F
15	BODY ND 50	1	3-1759-1
16	MAIN PLUG DN 50	1	3-1759-3
17	SUB PLATE DN 50	1	3-1759-5
18	CONNECTION	1	3-1757-6
19	LINER DN 50	1	3-1759-2
20	PRIMARY SHUTTER DN 50	1	3-1759-4
21	SPECIAL SLIDING SEAL	1	GTE 054 2
22	OR 3300 75.87x2.62 NBR 70	2	PARK 2-151
23	ANTI-EXTRUSION RING FOR OR 3300	2	PARBAK 8-151
24	OR 4425 107.5x3.53 NBR 70	1	PARK 2-244
25	ANTI-EXTRUSION RING FOR OR 4425	1	PARBAK 8-244
26	OR 4225 56.74x3.53 NBR 70	1	PARK 2 228
27	SOCKET SCREW M12x45 UNI 5931	4	VTCE 12 45
28	PLUG WITH STOP 3/8" GAS DIN 908	1	TC 38 908
29	METAL-RUBBER SEALING WASHER 3/8	1	RTMG 38 1
30	SPRING 2.8-29-127-12.5+2	1	MOLLA 842
31	SCREW WITHOUT HEAD UNI 5923	1	VCE 8 14 A

Valve coding (code 3-1759-*-0):

Le valvole i oggetto sono fornibili con diversi rapporti fra pressione di precarica e pressione di intervento la lettera che segue il codice identifica il rapporto in oggetto:

Valve code	3-1759-A-0	3-1759-B-0	3-1759-C-0	3-1759-D-0	3-1759-E-0	3-1759-F-0
Preloading/discharge ratio	1:1.3	1:1.6	1:2	1:3	1:4	1:5

NOTES

The **3-1759-*-0** valve can function also with other types of control units; for more information, please contact our technical department.

With reference to the spare parts list on the previous page, please note the following:

WHEN YOU REQUEST ANY SPARE PARTS, ALWAYS SPECIFY THE COMPLETE CODE OF THE RELATED VALVE.

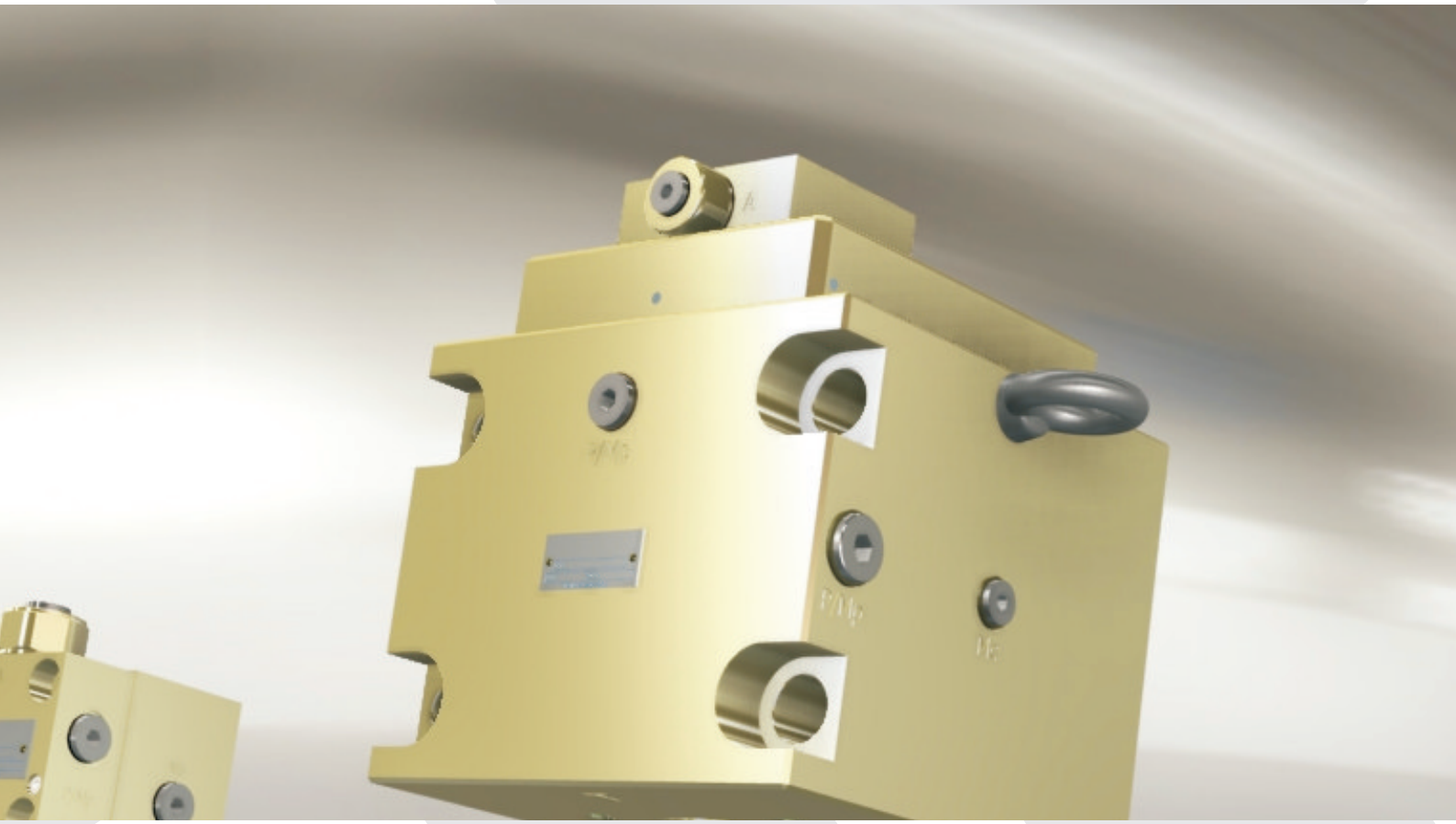
NOT ALL THE LISTED DEVICES CAN BE SUPPLIED ALONE: DUE TO REDUCED COUPLING TOLERANCES, RECIPROCALLY SLIDING ITEMS MUST BE SUPPLIED TOGETHER.

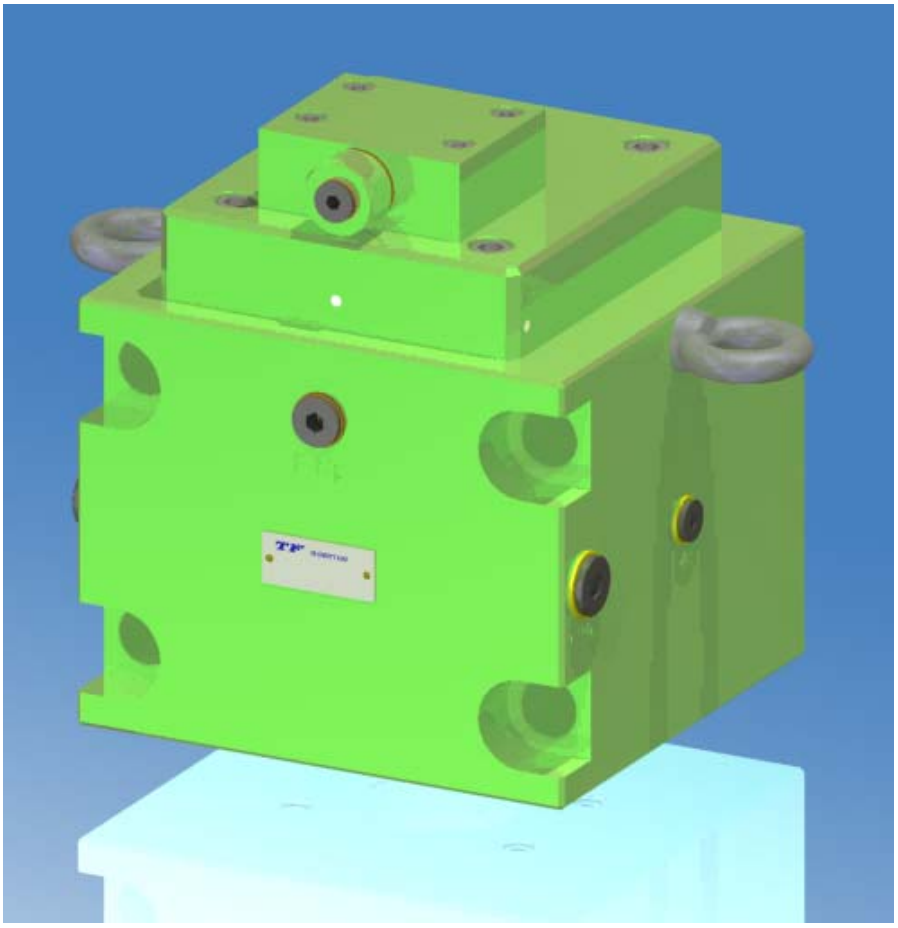
Please find below a list of items to be supplied together; the numbering of the various items refer to the section plane in figure 6:

- LINER-SHUTTER UNIT = 19+20+21

TECNOFLUID ENGINEERING srl
Via Dei Mille, 1 20031 CESANO MADERNO (MB)
TEL. 0362.645981 FAX 0362.645999
e-mail info@tecnofluid.info www.tecnofluid.info

HYDRAULIC SAFETY VALVES
MODEL 3-1760





HYDRAULIC SAFETY VALVE ND 63
FOR HIGH PRELOAD/DISCHARGE RATIO
CAM PRESSES
TYPE 3-1760-*-0

Requirements

The system consists of one or more **3-1760-*-0** valves.
This device has been designed to control the hydraulic pressure delivered by oleopneumatic control units (codes **5-1698**, **5-1719** and **5-1752**). Accordingly the use of the **3-1760-*-0** valves is subject to the adoption of one of the control units mentioned above – for their technical characteristics, refer to the relevant technical documentation.
To allow the use of this system, the machine must be provided with hydraulic cushions, according to the diagram in figure 1; furthermore, the maximum pressure for the activation of the safety device must not exceed 500 bar. To this end, the hydraulic cushions must be suitably dimensioned, in order to ensure the required tonnage to the machine .

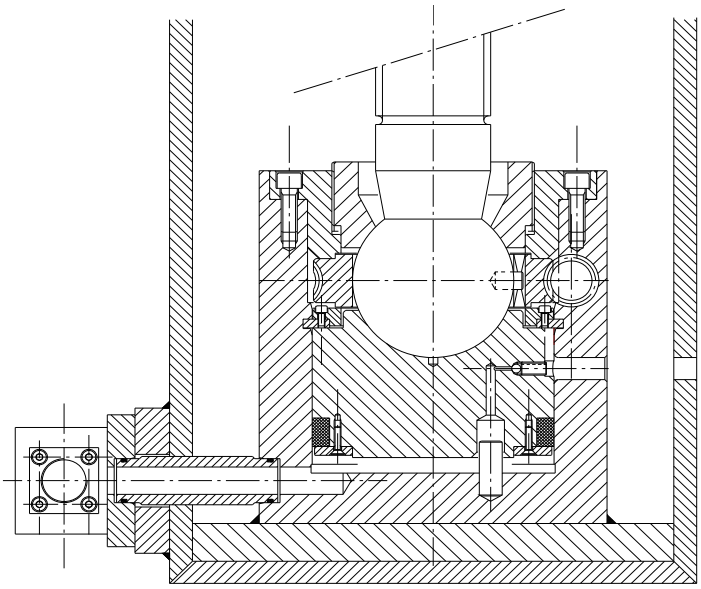


fig.1

Characteristics

Apart from a satisfactory repeatability, the system under examination ensures low response times, so that the occurrence of pressure peaks is dramatically reduced. The extremely high ratio of preloading pressure to safety device activation pressure (up to 1:5), allows the adoption of reduced preloading pressures for the hydraulic cushions, thus decreasing the stress the cushions are subjected to.
The design of the system makes it possible to continuously modify the activation pressure of the safety device, working on the preloading pressure delivered by the control unit.

Hydraulic diagram

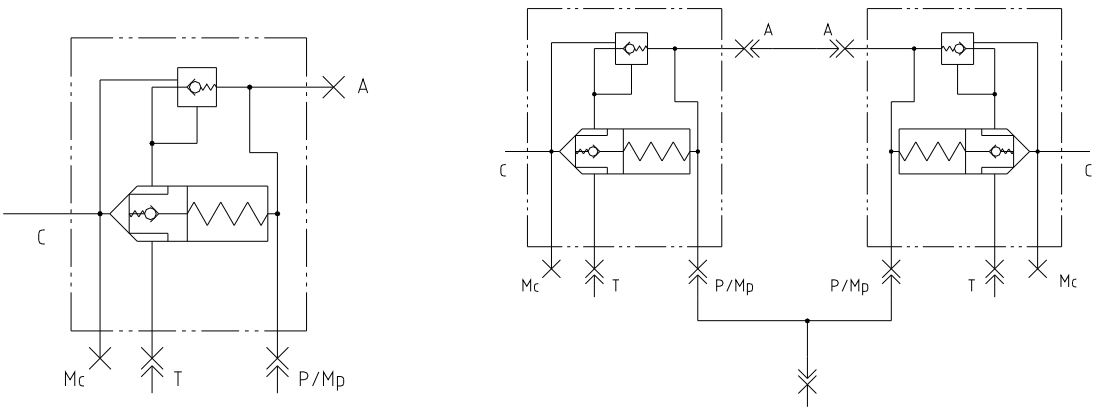


fig.2

Figure 2 shows the hydraulic diagram of the **3-1760-*-0** valve. The symbols used in figure 2 can be interpreted as follows:

P = preloading (from the control unit), **T** = discharge line, **A** = drive, **C** = connection to the hydraulic cushion, **Mc** = connection of the hydraulic cushion pressure gauge, **Mp** = connection of the preloading line pressure gauge.

Working principle

The hydraulic cushions (figure 1) are obtained between the connecting rods and the ram of the press, which are pre-loaded with a hydraulic pressure **P** in order to confer more stiffness to the system.
After every single work cycle of the press, the pressure inside the cushions rises to a variable value **Pl**, which substantially depends on the type of work which is being carried out.
If, for accidental reasons (e.g. wear of the die) the pressure in the hydraulic cushions exceeds the maximum preset value **Ps**, the safety valve cod. **3-1760-*-0** involved in the overload will switch automatically to the discharge mode, while causing the other valves connected to it to discharge by means of drive **A**, so as to drain the oil from the hydraulic cushion, and to allow the ram to go beyond the bottom dead center (**BDC**).

Hydraulic connection diagrams

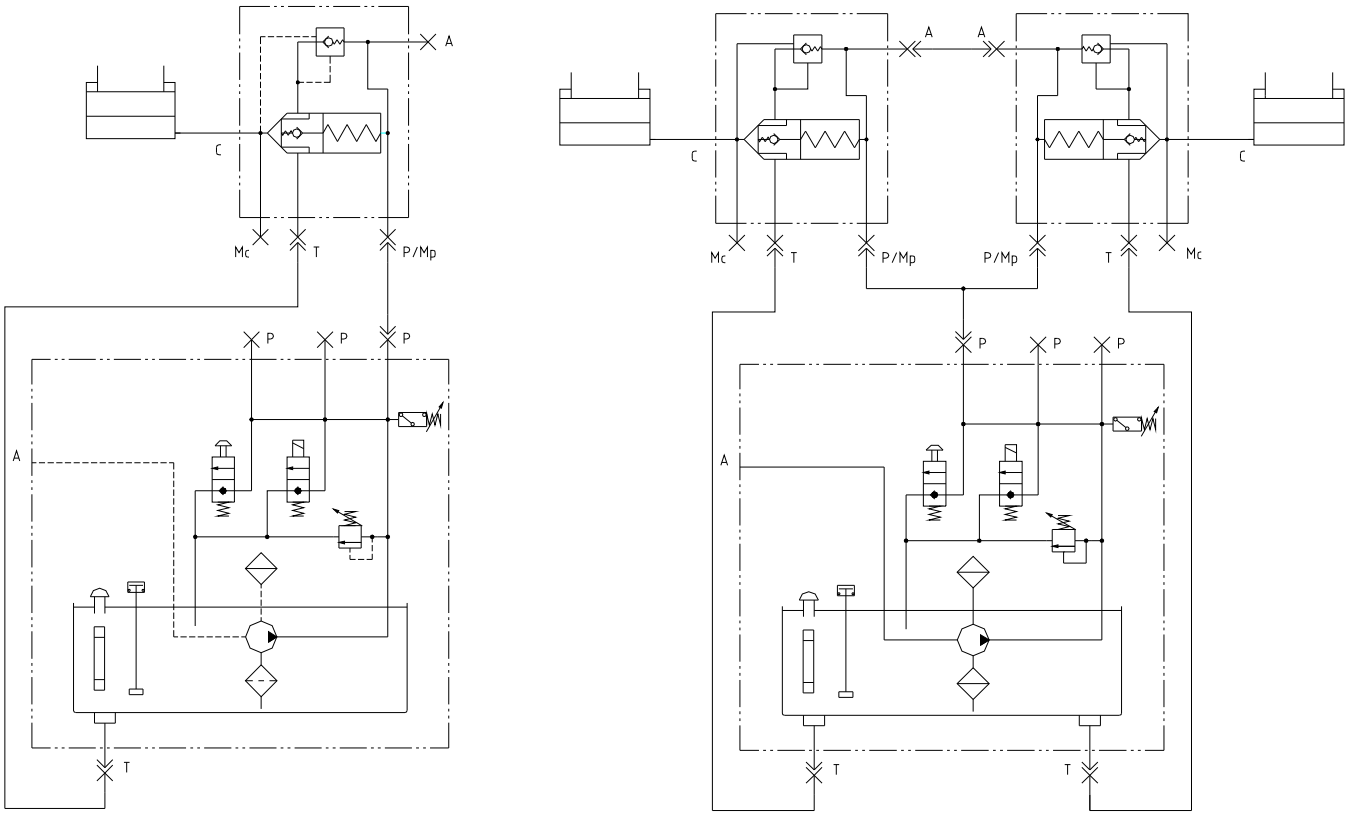


fig.3

Plant operation (diagram in figure 3)

The system illustrated in the figure must be supplied by a compressed air line **(A)** from the machine.
This line feeds the oleo-pneumatic pump mounted in the unit tank; once actuated, the pump sends oil under pressure to hydraulic cushions **(C)**, through **3-1760-*-0** valves and ducts **P** and **C**.
The preloading pressure ensured by the pump is a function of the pneumatic supply pressure supplied to the control unit, this value is regulated by a pressure reducer mounted on the press in a position accessible to the operator; the reducer

can be of conventional type (manual control) or provided with electrical control (with a step-by-step reducer) or electromagnetic control (proportional electrovalve).
During the functioning of the press, the preloading pressure delivered by the hydraulic safety unit and the cyclical pressure generated by hydraulic cushions **(C)** through the operation of the press, interact and based on the ratio of the driving areas of the **3-1760-*-0** valves, they ensure that the necessary pressure does not exceed the preset value.
If the pressure of the press exceeds the maximum preset value, the pressure generated in hydraulic cushions **(C)** overcomes the one generated by the control unit and the valves are switched to the discharge mode, so as to allow the oil in the hydraulic cushions to freely flow into the unit's tank through ducts **(T)**.
The switching of **3-1760-*-0** valves results in the resetting of the preloading pressure, and accordingly in the switching of the minimum pressure pressure switch mounted on the unit.
The signal of the pressure switch, apart from sending an emergency signal to the machine, shall stop the air flow which feeds the oleo-pneumatic pump.
The overload signal, sent by the pressure switch, shall stop the machine, by working on the brake/clutch assembly.

3-1760-*-0 Valve

This is an hydrodriven valve; its operation is based on the principle of differential sections.
Its body is wholly made spheroidal cast iron and is chromogalvanized to withstand corrosion over time.
The sealing elements are usually made of nitrile rubber, though different compounds can be mounted, as the case may be. The sliders and the internal liners are made of treated and ground chrome-nickel steel.
The valve is supplied with all openings plugged with high-pressure sealing elements, so as to allow the plant designer to use only the necessary openings; the outlet opening is not plugged.

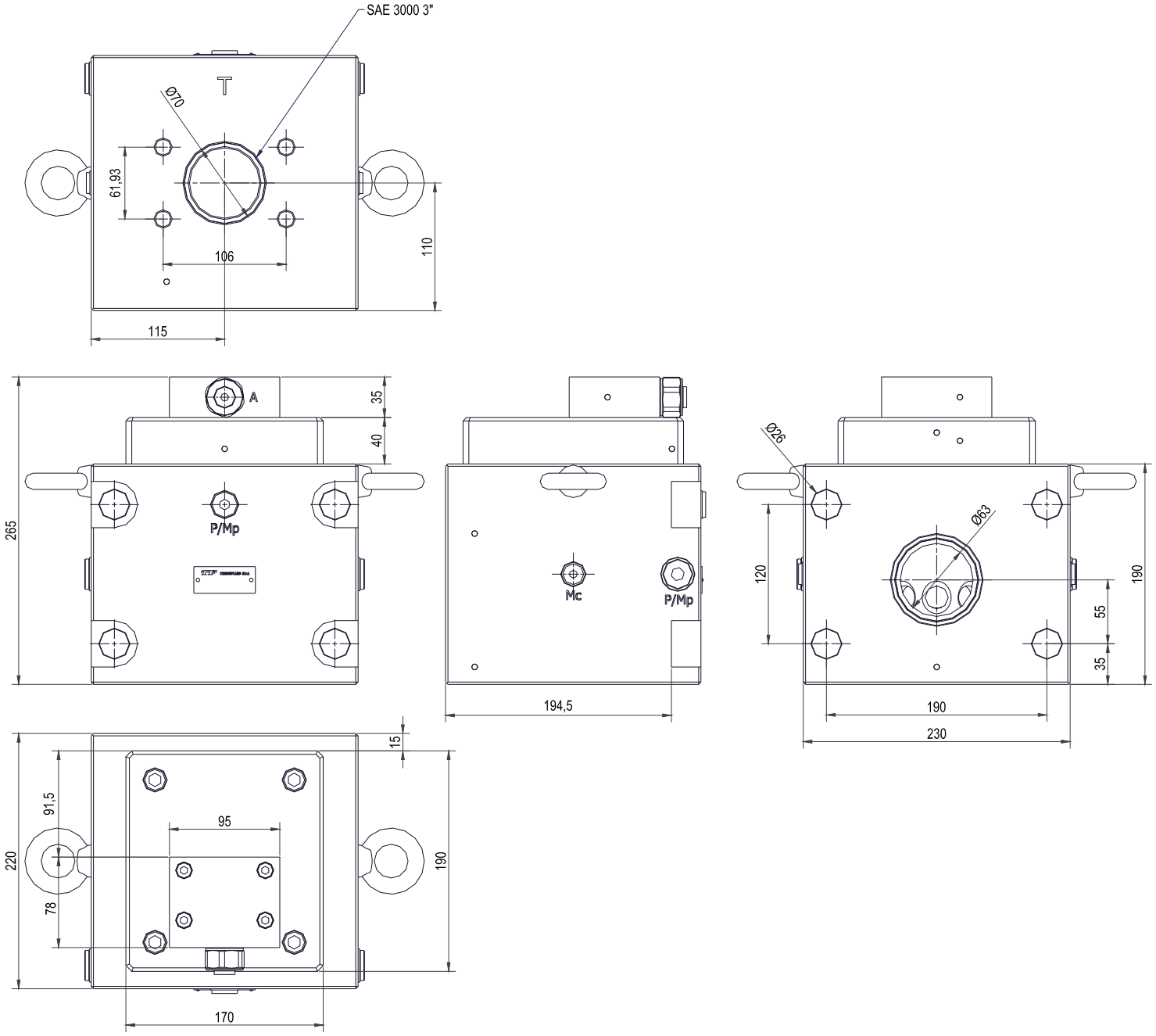


fig.4

Figure 4 shows the external view with the overall dimensions of the **3-1760-*-0** valve; the valve is fastened to the ram by 4 high-resistance hollow hexagonal screws M24x240 mm.
The diameter of the hole for communication with the hydraulic cushion must not exceed 63 mm and the supporting plane of the valve must have a maximum roughness of 1.6 Ra and a minimum planarity of 0.02/100 mm.
It can be mounted in any position.

5-1719 Control unit (figure 5)

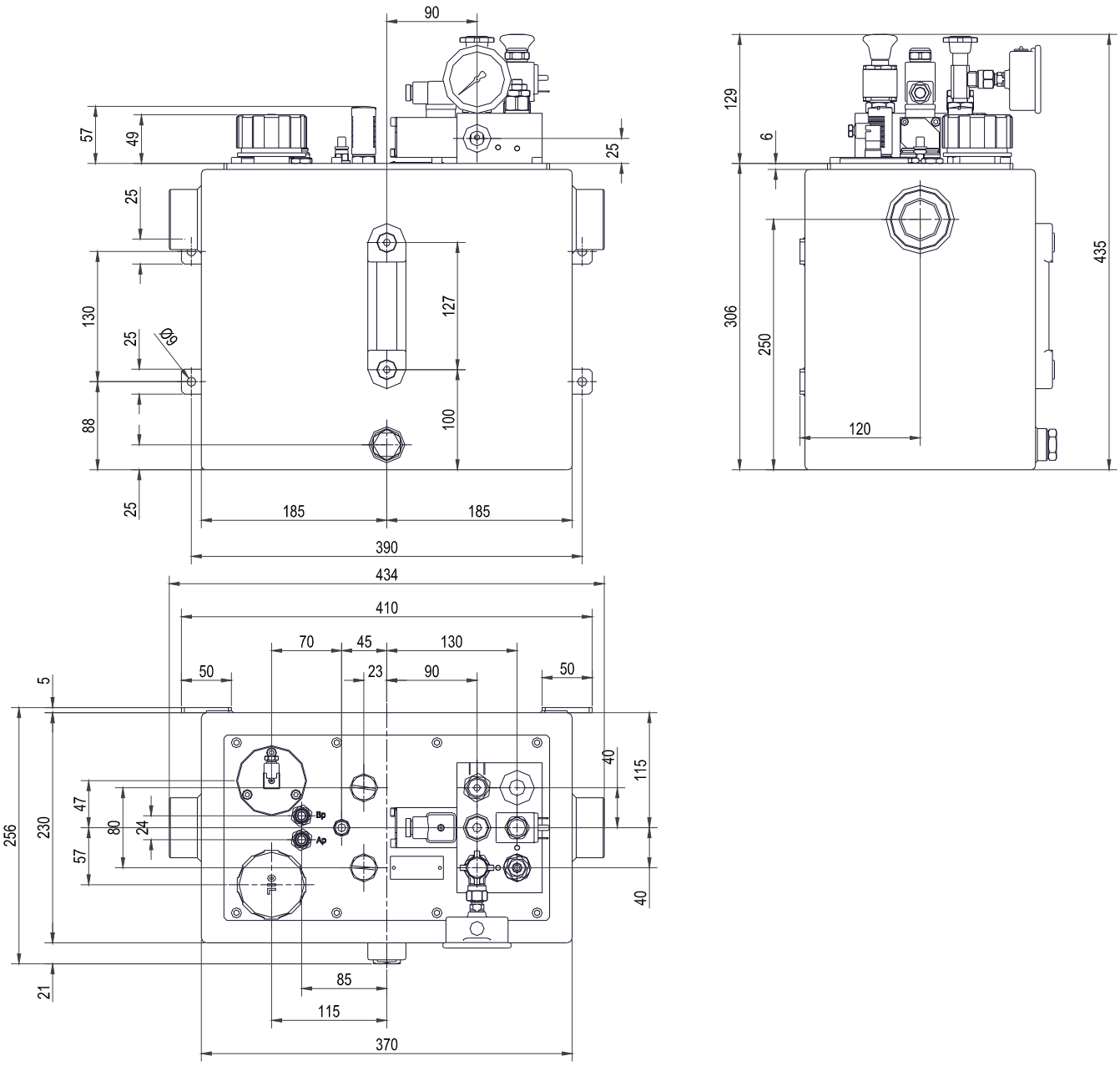


fig.5

Figure 5 shows the external view, with the overall dimensions and the connection openings of the **5-1719** control unit.
The control unit consists of a steel frame tank, an aluminum cover fastened to the tank by screws and a distribution block for the hydraulic control. The minimum pressure pressure switch is located on this block, as well as the connection for the delivery to the **3-1760-*-0** valves.
The tank contains some 18 liters of oil and its bottom includes the return openings (1”1/4 G) from the drain connection of **3-1760-*-0** safety valves.
The tank is provided with an oil-filler cap, the quick connection for the pneumatic supply (plastic pipe, Ø 8 mm.), and the hydraulic control block.
For any further information on the control unit, refer to the dedicated technical documentation.

Data sheet

PRELOADING RATIO : DISCHARGE	**1:1.3 TO 1:5**
MAXIMUM PRELOADING PRESSURE	**380 bar**
SAFETY ACTIVATION TIME	**0.01 sec.**
MAXIMUM VISCOSITY OF THE OIL	**10° Engler**
MAXIMUM OIL TEMPERATURE	**90° C.**
ROOM TEMPERATURE	**-10 +50 ° C.**
DIAMETER OF THE VALVE'S PRESSURE INTAKES	**1/4" + 3/8" + 1/2" G.**
NOMINAL DIAMETER OF THE VALVE	**ND 63**
VALVE'S DISCHARGE DUCT	**SAE 300 3"**

Useful suggestions for installation

If you decide to install a hydraulic safety system on a cam press, do not forget a few general considerations:

- The safety valves must be mounted near the cushions, and must be connected to them using rigid HP pipes.
- The ram's hydraulic cushions must always be provided with a bleeding system positioned next to their top, so as to collect and eject any air bubbles.
- The hydraulic cushions' seals must be of high pressure type (if possible made of polyurethane).
- The cushions' cylinders must be made of homogeneous material, as far as possible (without any blowholes or cracks) in order to ensure a perfect hydraulic sealing and to protect the sealing elements from anomalous wear and tear.
- The piping that, starting from the control unit, transmits the preloading pressure to the valves can be either rigid or flexible, providing that the duct is designed for high pressure.
- It is advisable to position the control unit in a position easy to reach, so as to facilitate the oil topping up.
- The oil used in the control unit can be the one used for lubricating the guides of the machine; anyway, the oil must never come into contact with the lubrication oil, since the suspended metal particles would cause irreparable damage to the system; in any case, the oil viscosity must not exceed the maximum expected viscosity.
- We recommend that you do not use liquid Teflon for the assembly of connecting joints between valves and control unit; where you cannot use metal-rubber washers, we recommend that you adopt conical thread fittings and use a Teflon tape for sealing.

Spare parts of the 3-1760-*-0 valve

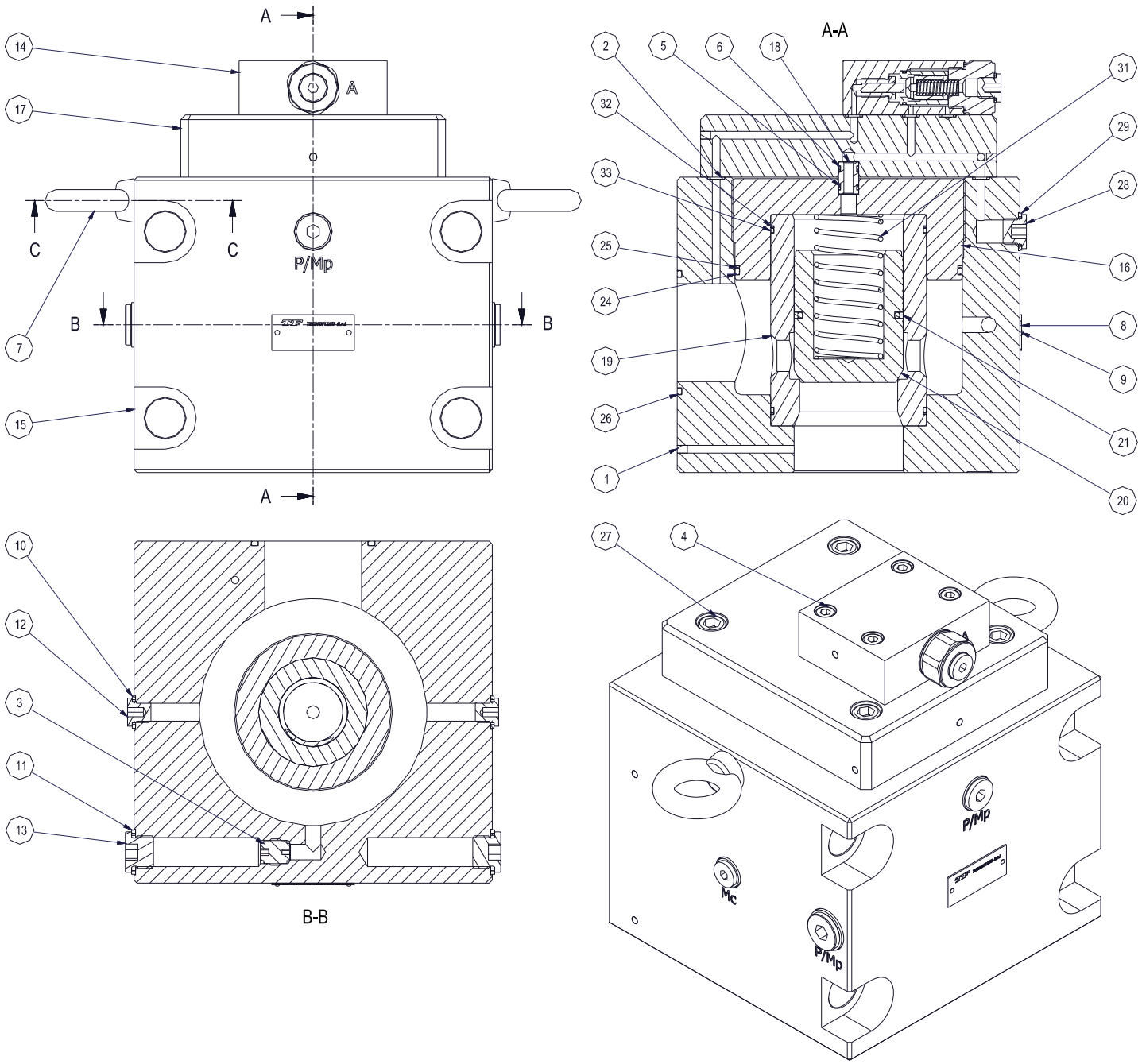


fig.6

Figure 6 shows a section plane of the hydraulic safety valve code **3-1760-*-0**, where all the components of the unit have been numbered.
The spare parts list includes also the quantity of every single item, as may be necessary to complete a unit.
This list is available on the next page.

Spare parts list of the 3-1760-*-0 hydraulic safety unit (see the section plane in figure 6)

POS	NAME	Q.TY	ORDER CODE
1	EXPANDING PLUG Ø5	9	AVDEL 5
2	OR 2031 7.66x1.78 NBR 70	9	PARK 2 011
3	NONRETURN VALVE 3/8"	1	VNRC 38 01
4	SOCKET SCREW M8x40	4	VTCE 8 40
5	ANTI-EXTRUSION RING FOR OR 2062	2	PARBAK 8-016
6	OR 2037 9.25x1.78 NBR 70	2	PARK 2-012
7	GOLFARO MASCHIO M12	2	GOLM 12
8	ALUMINIUM TAG	1	TARGH 1194
9	THREAD NAIL Ø1.9x5	2	CH A 1.9 5
10	METAL-RUBBER SEALING WASHER 1/4"	2	RTMG 14 1
11	METAL-RUBBER SEALING WASHER 1/2"	2	RTMG 12 1
12	PLUG WITH STOP 1/4"G. DIN 908	2	TC 14 908
13	PLUG WITH STOP 1/2"GAS DIN 908	2	TC 12 908
14	PRESSURE SETTING HEAD 1:1,3÷1:5	1	3-1548-102-A,B,C,D,E,F
15	BODY ND 63	1	3-1760-1
16	MAIN PLUG DN 63	1	3-1760-3
17	SUB PLATE DN 50	1	3-1760-5
18	CONNECTION	1	3-1757-6
19	LINER DN 63	1	3-1760-2
20	PRIMARY SHUTTER DN 63	1	3-1760-4
21	SPECIAL SLIDING SEAL	1	GTE 070 2
24	OR 4550 139.3x3.53 NBR 70	1	PARK 2-254
25	ANTI-EXTRUSION RING FOR OR 4550	1	PARBAK 8-254
26	OR 4287 72.62x3.53 NBR 70	1	PARK 2 233
27	SOCKET SCREW M12x45 UNI 5931	4	VTCE 12 45
28	PLUG WITH STOP 3/8" GAS DIN 908	1	TC 38 908
29	METAL-RUBBER SEALING WASHER 3/8	1	RTMG 38 1
31	SPRING 3-44-159-8+2	1	MOLLA 840
32	ANTI-EXTRUSION RING FOR OR 3375	2	PARBAK 8-154
33	OR 3375 94.92x2.62 NBR 70	2	PARK 2-154
34	SCREW WITHOUT HEAD UNI 5923	1	VCE 8 14 A

Valve coding (code 3-1760-*-0):

Le valvole i oggetto sono fornibili con diversi rapporti fra pressione di precarica e pressione di intervento la lettera che segue il codice identifica il rapporto in oggetto:

Valve code	3-1760-A-0	3-1760-B-0	3-1760-C-0	3-1760-D-0	3-1760-E-0	3-1760-F-0
Preloading/discharge ratio	1:1.3	1:1.6	1:2	1:3	1:4	1:5

NOTES

The **3-1760-*-0** valve can function also with other types of control units; for more information, please contact our technical department.

With reference to the spare parts list on the previous page, please note the following:

WHEN YOU REQUEST ANY SPARE PARTS, ALWAYS SPECIFY THE COMPLETE CODE OF THE RELATED VALVE.

NOT ALL THE LISTED DEVICES CAN BE SUPPLIED ALONE: DUE TO REDUCED COUPLING TOLERANCES, RECIPROCALLY SLIDING ITEMS MUST BE SUPPLIED TOGETHER.

Please find below a list of items to be supplied together; the numbering of the various items refer to the section plane in figure 6:

- LINER-SHUTTER UNIT = 19+20+21

TECNOFLUID ENGINEERING srl
Via Dei Mille,1 20031 CESANO MADERNO (MB)
TEL. 0362.645981 FAX 0362.645999
e-mail info@tecnofluid.info www.tecnofluid.info

TECNOFLUID
ENGINEERING

Shock absorber stroke 15mm

Series 4-1621--0*

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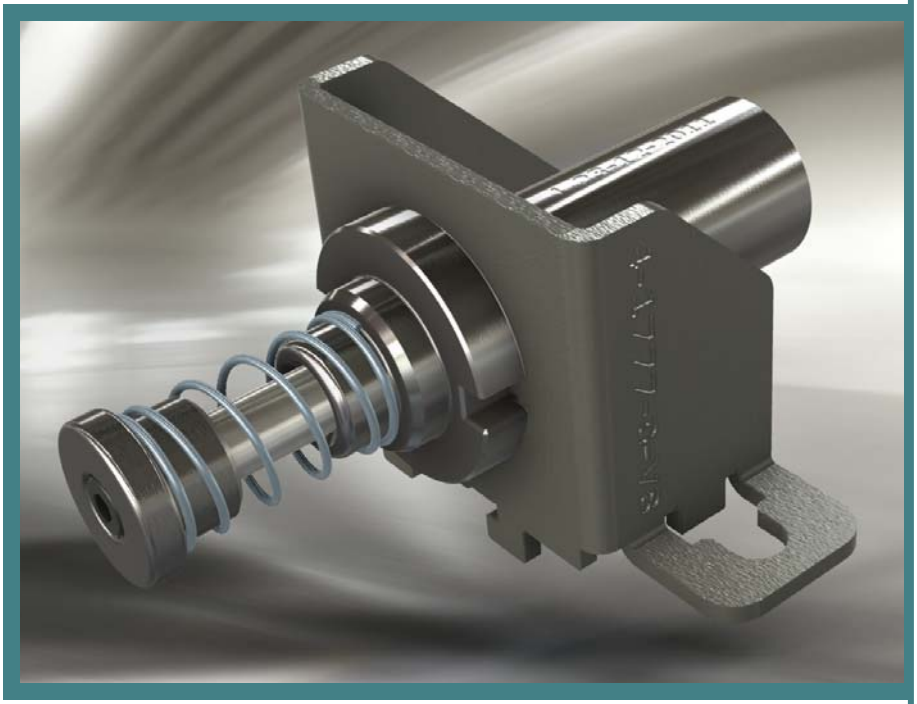
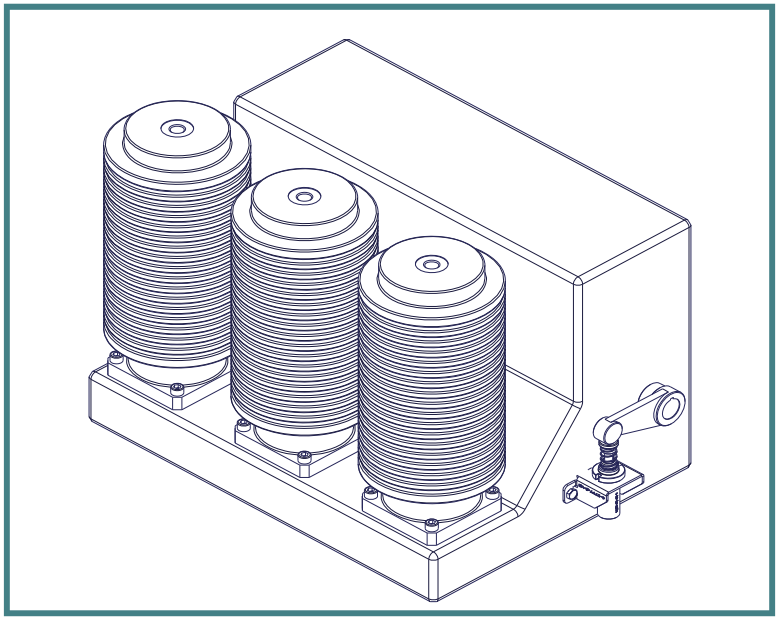


Shock absorber stroke 15

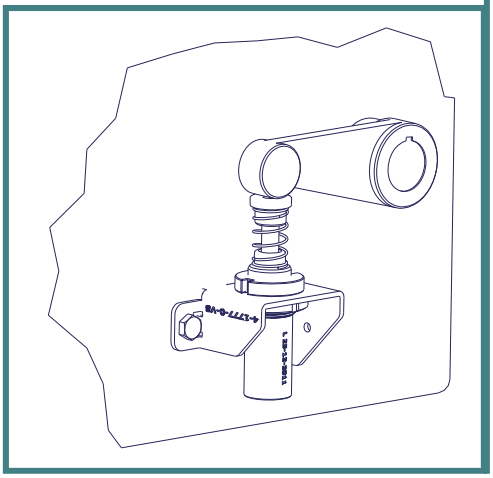
Series 4-1777-

Requirements

The shock absorbers of series **4-1777-*-0** are studied in order to convert into thermal energy the kinetic energy generated from mechanical devices in motion. Those absorbers are axial sliding type, the direction of motion proper of the device to be cushioned will have to be coaxial to the shock absorber and as coincident as possible to the axis of the shock absorber.



Should the motion be rotatory, as shown below, it will be necessary to convert it into linear motion by means of levers studied so to minimize the radial components during the impact; this to prevent radial charges on the shock absorber's rod during the impact.

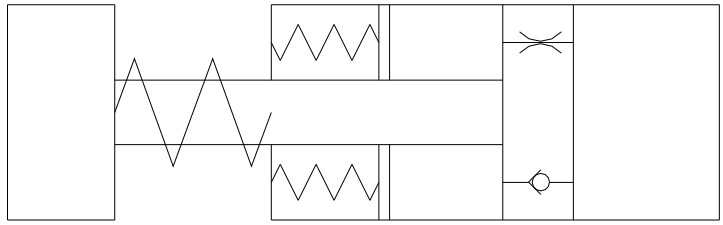


Features

Thanks to its structural features, this system grants the correct functioning of the device also in particularly unfavourable environment conditions, ensuring effectiveness for a high number of manoeuvres and long lasting operating life.

Functioning scheme

The image represents the functioning diagram of the shock absorber code **4-1777-0**. The left part of the hydraulic chamber represents the area of the volumetric compensator, while the right part represents the throttling piston and its one-way valve for quick return.



Principle of functioning

This system is based on the physical principle of dissipation of energy caused from the temperature increase. In this specific case the increase of temperature is obtained by means of the hydraulic fluid contained in the shock absorber which is pushed to flow through a gauged opening; this generates a mechanical resistance which is transformed into increase of the fluid temperature. It is then worthy of note that, although during a single cycle the dispersible energy may result extremely high, the total dispersible energy in the time unit (h) is strictly connected to the heat dissipation capacity of the shock absorber. An excessive frequency of use in time causes in fact the overheating of the device.

Functioning of the damper

The system shown in the picture explains the functioning of the shock absorber:

On the left part of the picture it is represented a pressure disc integrated to the shaft that connects to the hydraulic piston. During functioning, a mechanical device that hits the pressure disc with a given kinetic energy will cause its translation towards the damping body. The hydraulic piston, connected to the shaft, will then be moved towards the bottom of the hydraulic chamber of the damper.

This displacement causes the closing, by dynamic effect, of the one-way valve of the piston.

The hydraulic fluid present inside the chamber will then be forced to pass through the narrowing in the hydraulic piston; this will generate as a reaction the braking force that will raise the pressure inside the hydraulic chamber of the damper.

The fluid transferred from one section to the other of the damper will furthermore compress an accumulator formed by a panel of elastomer with closed cells; this will contract under effect of the hydraulic fluid and will allow to compensate the reduction of the available hydraulic volume that is caused by the penetration of the shaft inside the shock absorber.

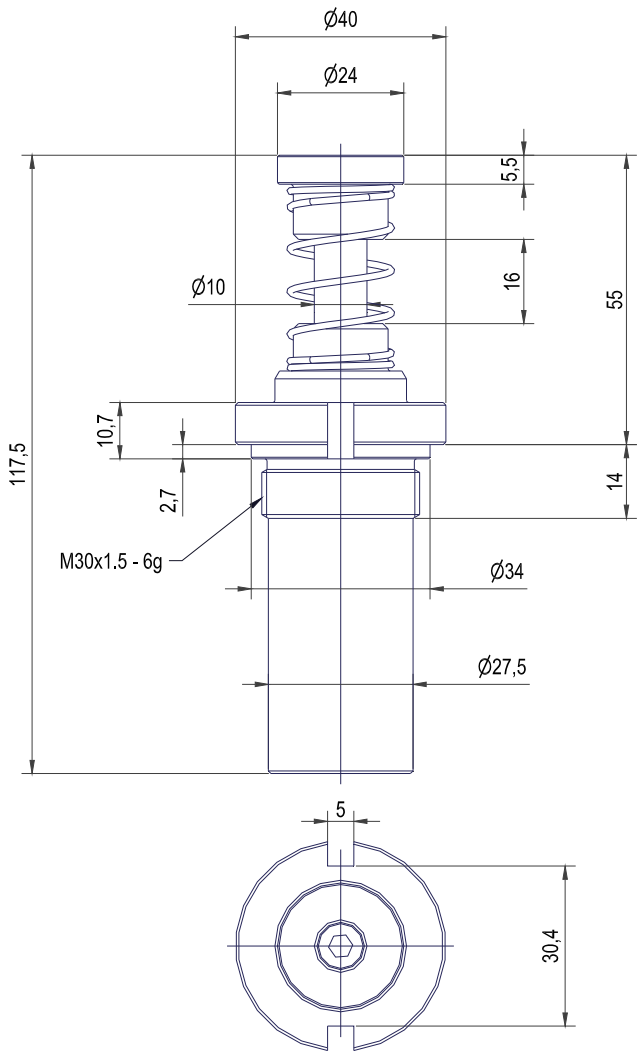
During the release, once the mechanical action on the pressure disc stops, the combined action between return spring and one-way valve inside the piston allows the quick flowing back of the hydraulic fluid in the back chamber and then the quick return of the shock absorber in the rest position.

Overall dimensions

The figure represents the outer view with the overall dimensions of the shock absorber code **4-1777-0.** The device is fixed to the host structure by means of a thread M30x1.5 obtained on the outer of the damper body.

Differently from the version **4-1621-*-0**, this device can not be used as limit switch for the hosting structure.

Upon request threaded nuts and fixing clamps are available.



Technical Data's

MAXIMUM EFFECTIVE MASS	120 Kg
TOTAL ENERGY PER CYCLE (W3)	375 Nm
TOTAL ENERGY PER HOUR (W4)	135.000 Nm/hr
MAXIMUM IMPACT SPEED (Vd)	2,5 m/s
ENVIRONMENT MINIMUM TEMPERATURE	-20° C.
ENVIRONMENT MAXIMUM TEMPERATURE	+70° C.

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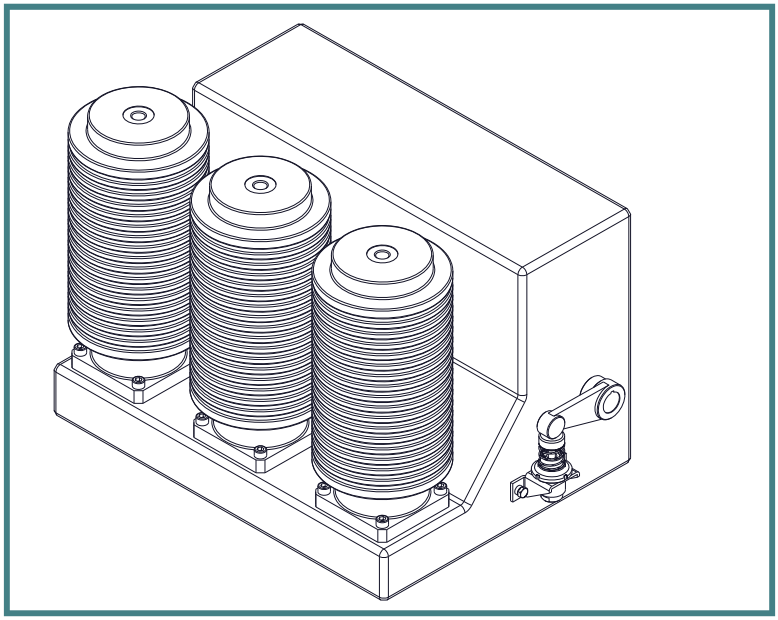
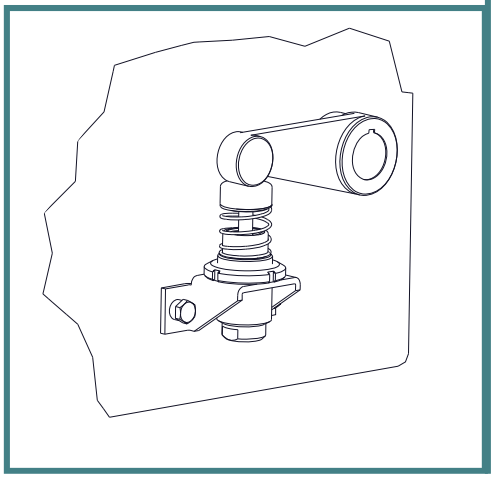
Requirements

The shock absorbers of series **4-1621-*-0** are studied in order to convert into thermal energy the kinetic energy generated from mechanical devices in motion. Those absorbers are axial sliding type, the direction of motion proper of the device to be cushioned will have to be coaxial to the shock absorber and as coincident as possible to the axis of the shock absorber.



Should the motion be rotatory, as shown below, it will be necessary to convert it into linear motion by means of levers studied so to minimize the radial components during the impact; this to prevent radial charges on the shock absorber's rod during the impact.

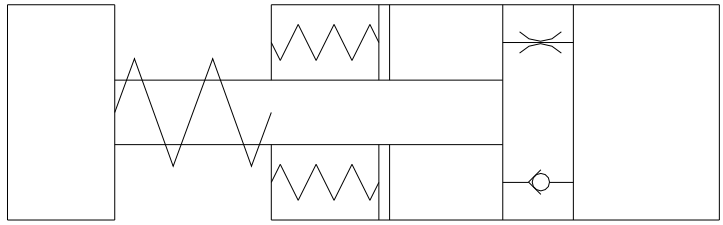


Features

Thanks to its structural features, this system grants the correct functioning of the device also in particularly unfavourable environment conditions, ensuring effectiveness for a high number of manoeuvres and long lasting operating life.

Functioning scheme

The image represents the functioning diagram of the shock absorber code **4-1621-*-0**. The left part of the hydraulic chamber represents the area of the volumetric compensator, while the right part represents the throttling piston and its one-way valve for quick return.



Principle of functioning

This system is based on the physical principle of dissipation of energy caused from the temperature increase. In this specific case the increase of temperature is obtained by means of the hydraulic fluid contained in the shock absorber which is pushed to flow through a gauged opening; this generates a mechanical resistance which is transformed into increase of the fluid temperature. It is then worthy of note that, although during a single cycle the dispersible energy may result extremely high, the total dispersible energy in the time unit (h) is strictly connected to the heat dissipation capacity of the shock absorber. An excessive frequency of use in time causes in fact the overheating of the device.

Functioning of the damper

The system shown in the picture explains the functioning of the shock absorber:

On the left part of the picture it is represented a pressure disc integrated to the shaft that connects to the hydraulic piston. During functioning, a mechanical device that hits the pressure disc with a given kinetic energy will cause its translation towards the damping body. The hydraulic piston, connected to the shaft, will then be moved towards the bottom of the hydraulic chamber of the damper.

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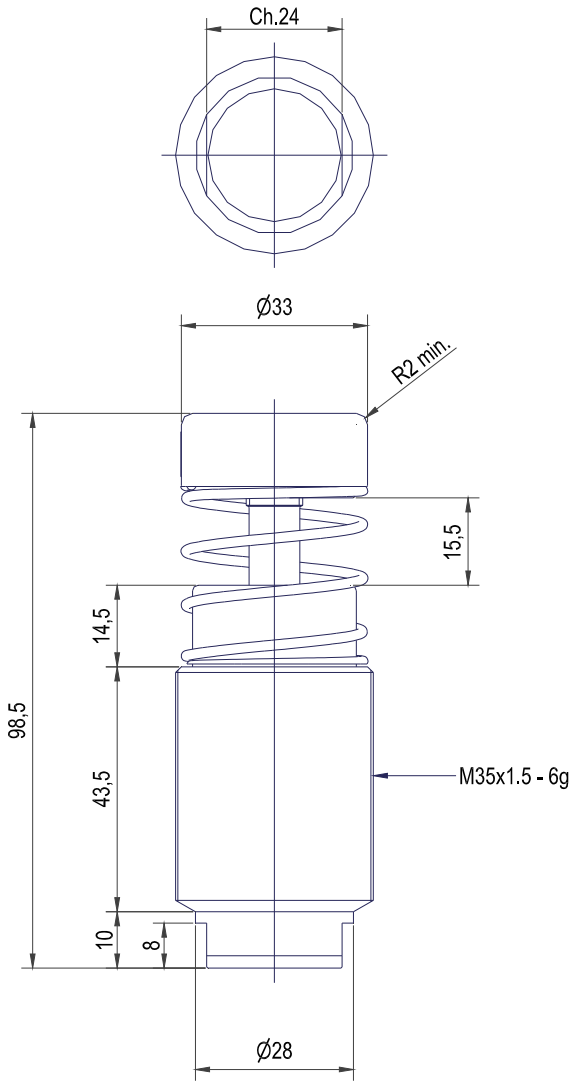
The hydraulic fluid present inside the chamber will then be forced to pass through the narrowing in the hydraulic piston; this will generate as a reaction the braking force that will raise the pressure inside the hydraulic chamber of the damper.

The fluid transferred from one section to the other of the damper will furthermore compress an accumulator formed by a panel of elastomer with closed cells; this will contract under effect of the hydraulic fluid and will allow to compensate the reduction of the available hydraulic volume that is caused by the penetration of the shaft inside the shock absorber.

During the release, once the mechanical action on the pressure disc stops, the combined action between return spring and one-way valve inside the piston allows the quick flowing back of the hydraulic fluid in the back chamber and then the quick return of the shock absorber in the rest position.

Overall dimensions

The figure represents the outer view with the overall dimensions of the shock absorber code **4-1621-*-0.** The device is fixed to the host structure by means of a thread M35x1.5 obtained on the outer of the damper body. Upon request threaded nuts and fixing clamps are available.



Technical Data's

MAXIMUM EFFECTIVE MASS	120 Kg
TOTAL ENERGY PER CYCLE (W3)	375 Nm
TOTAL ENERGY PER HOUR (W4)	135.000 Nm/hr
MAXIMUM IMPACT SPEED (Vd)	2,5 m/s
ENVIRONMENT MINIMUM TEMPERATURE	-20° C.
ENVIRONMENT MAXIMUM TEMPERATURE	+70° C.

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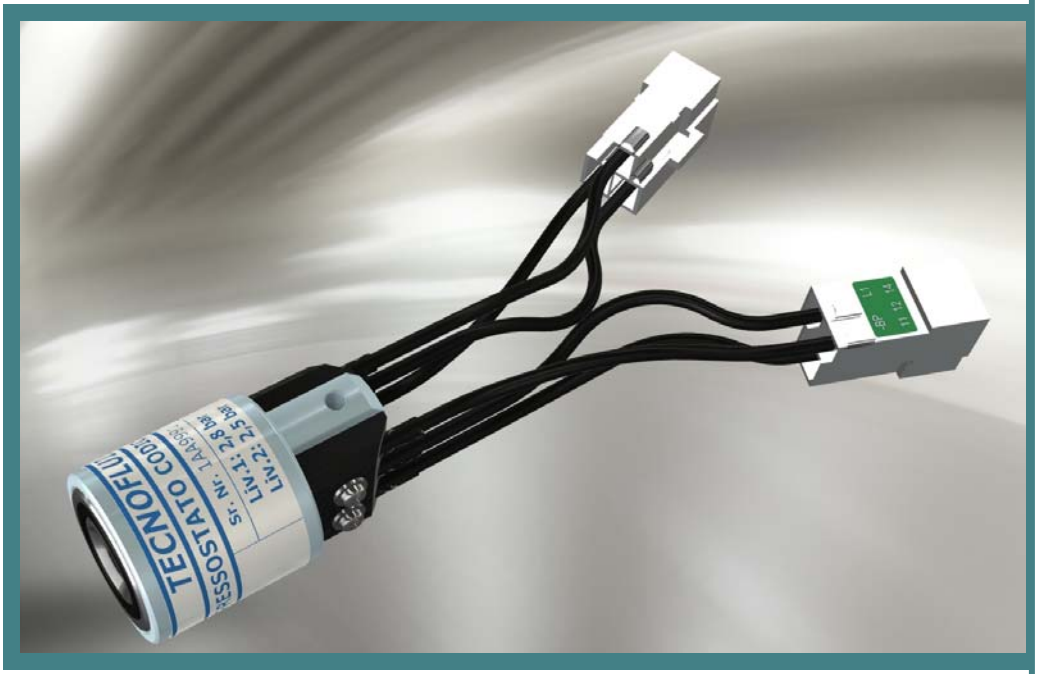
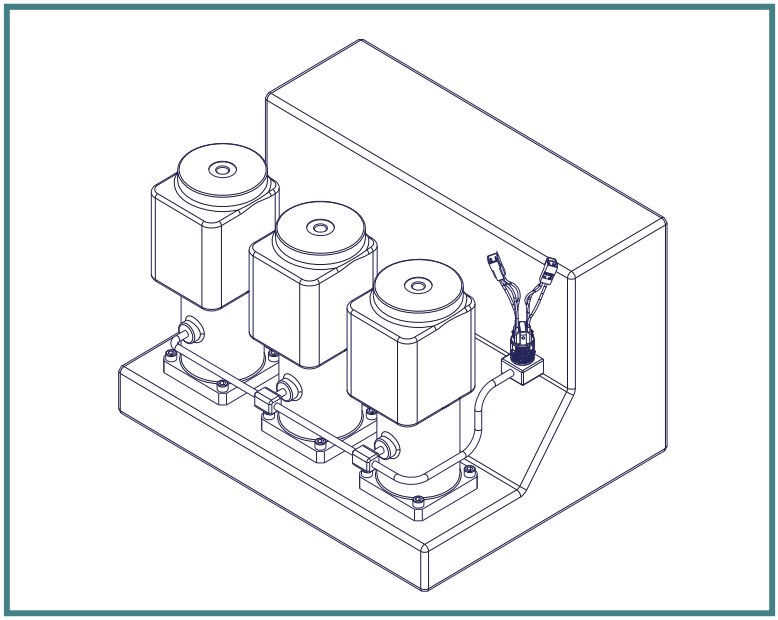


Double level pressure switch for gas

*Series 5-1648-0-**

Requirements

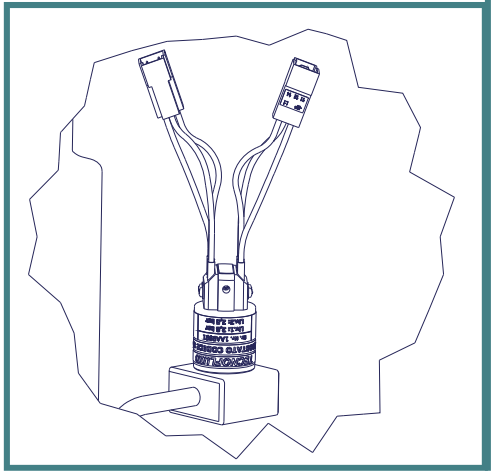
The pressure switches of series **5-1648-0-*** are engineered to keep under control the pressure of SF6 gas inside middle voltage switchgears. These pressure switches are double switching level type and are therefore suitable for the monitoring of two different levels of pressure.



This feature allows to manage a first alert level under which to foresee a gas filling up inside the switchgear, and a second intervention level over which the switchgear is put in emergency protection.

The switchgear must also be provided of a pressure connection with male thread 1/4" BSP suitable to hold the pressure switch.

The detail shows a typical application of the pressure switch with adoption of a manifold basis that receives gas from the three poles of the switchgear. This solution is particularly convenient as it allows to use just one pressure switch to keep under control the pressure level of all poles of the switchgear.

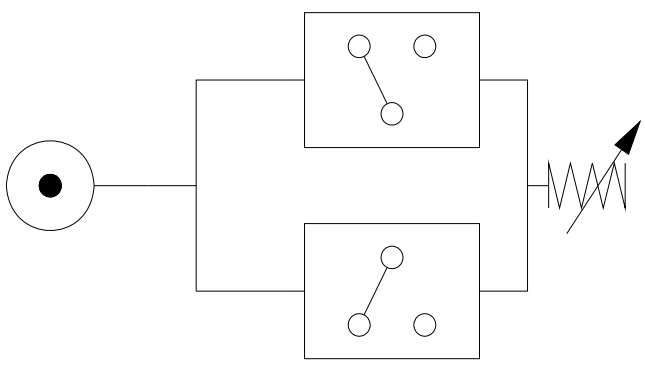


Features

Contrarily to the normal pneumatic pressure switches, this system is equipped with a sophisticated expansion system through metallic bellow which grants a nearly unlimited life avoiding the performance deterioration typical of other systems like, for instance, devices with nitril membrane.

Functioning scheme

The image represents the functioning diagram of the pressure switches of series **5-1648-0-***. The left part represents the area in contact with gas, the central part represents the microswitches while the right part represents the calibration spring which sets out the intervention levels of the device.



Principle of functioning

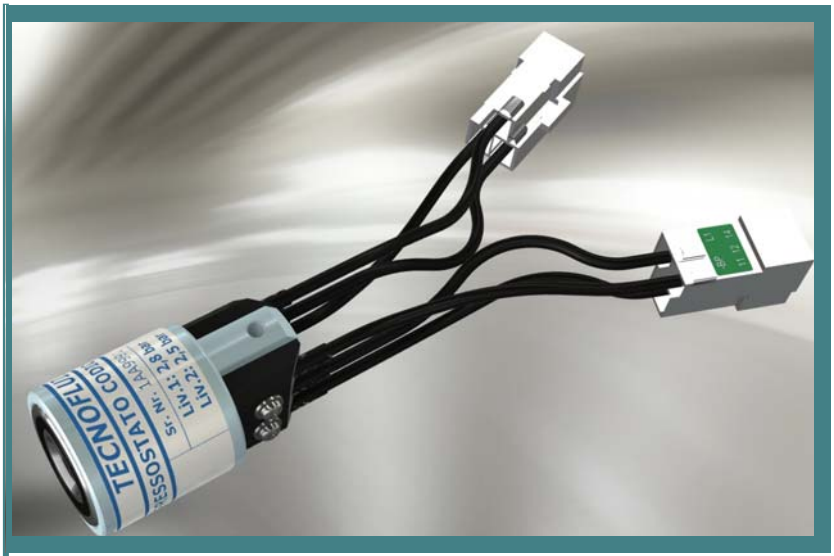
The principle of functioning of a pressure switch is that a gas under pressure develops a thrust of given entity if applied to a mobile element of known section. This thrust is proportional to the pressure applied on the section in question. If such thrust is opposed to a spring which has its force calibrated on the pressure willing to be monitored, the result will be that at reaching of the determined calibrated pressure, the switching of the electrical contact installed on the pressure switch will occur.

Functioning of the pressure switch

The system shown in the picture works as described below:

The left part of the picture represents the connecting port through which the pressure switch is assembled on the circuit to be monitored.

The aluminium central body lodges a high sensitivity bellow which, under effect of the gas pressure, tends to expand longitudinally.



Two microswitches are assembled above the bellow, with the aim to set out the electrical switching of the two levels, alert and alarm, of the pressure switch.

During its longitudinal stroke the bellow gets in contact, one after the other, with the two microswitches and sets out their switching of state.

As the microswitches are three contacts type, it is possible to obtain a switching from NO to NC or vice-versa.

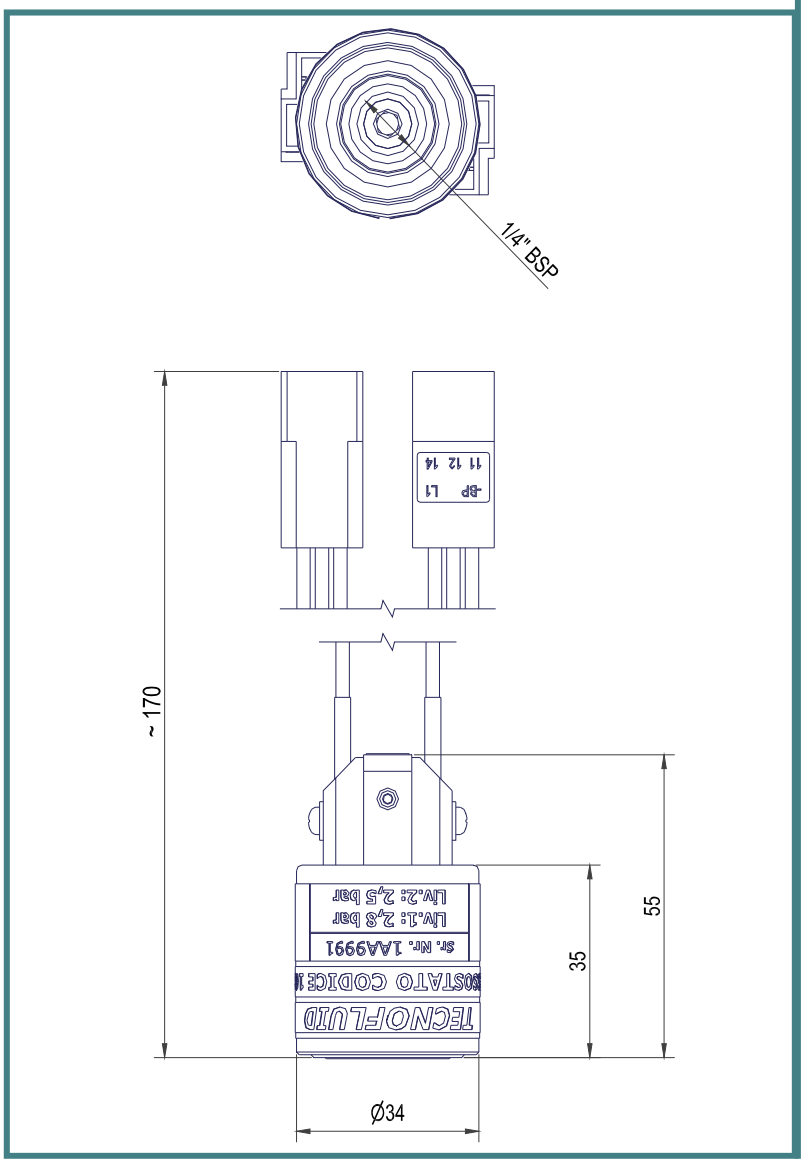
The calibration spring that determines the switching pressure of the microswitches is positioned in the central part above the microswitches.

Overall dimensions

The figure represents the outer view with the overall dimensions of the pressure switch code **5-1648-0-*.** The device is fixed to the host structure by means of a thread 1/4" BSP female, obtained on the lower side of the device.

On the same side an OR gasket in nitrile rubber is assembled for front holding.

The lower part of the pressure switch, as well as the bellow, are made of stainless steel while the housing is made of anodized aluminium. The outer protection class of the pressure switch body is IP 42.



Technical Data's

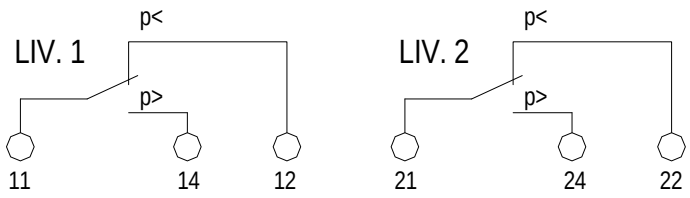
MECHANICAL FEATURES

Body	Anodized aluminium
Threaded connection	Stainless steel
Limit of mechanical resistance	30 bar
Max working pressure	5 bar
Max hysteresis	30% of calibration value
Operating temperature	-40/+85 °C
Clamping torque	25 Nm Max

ELECTRICAL FEATURES

Max commutable tension	250 V ac
Max commutable current	5 A
Protection class	IP 42
Electrical connection	Male faston (AMP 926097-1)

Electrical scheme



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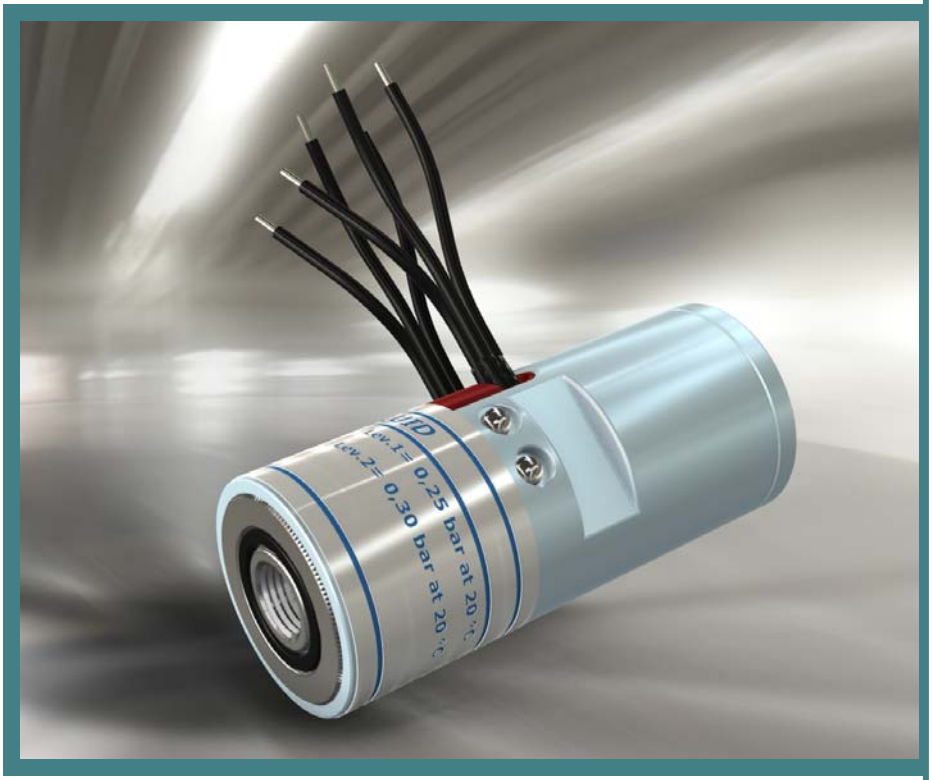
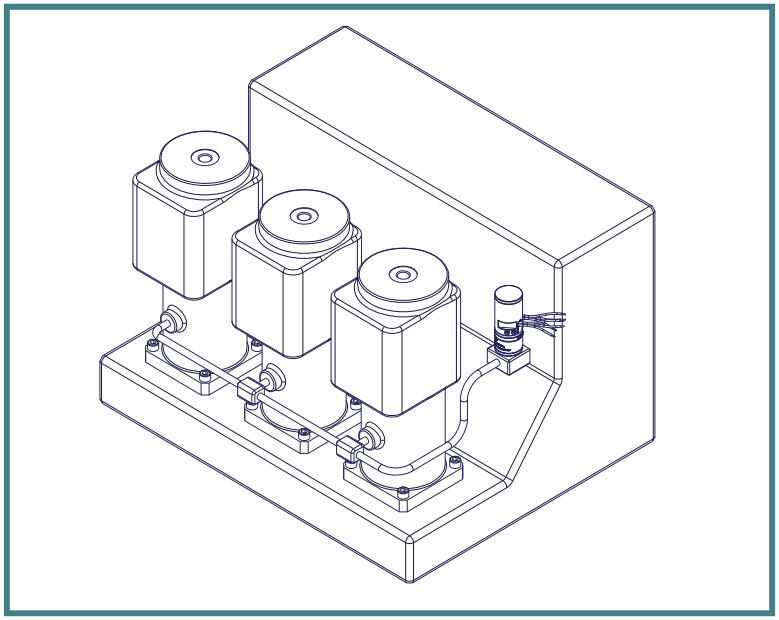


Double level density switch for gas

Series 5-1780-0-

Requirements

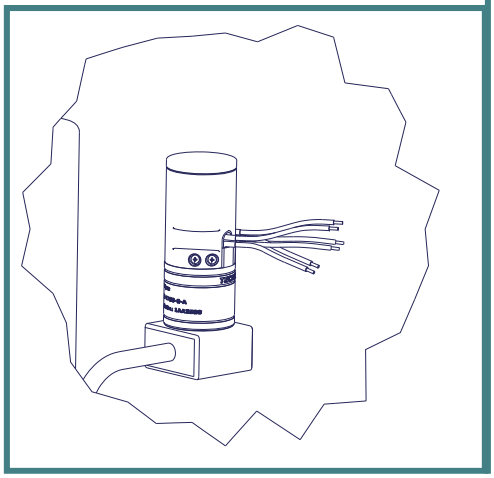
The density switches of series **5-1780-0-*** are substantially pressure switches with double level temperature compensated, engineered to keep under control the pressure of SF6 gas inside middle voltage switchgears. These density switches are double switching level type and are therefore suitable for the monitoring of two different levels of pressure.



This feature allows to manage a first alert level under which to foresee a gas filling up inside the switchgear, and a second intervention level over which the switchgear is put in emergency protection.

The switchgear must also be provided of a pressure connection with male thread 1/4” BSP suitable to hold the density switch.

The detail shows a typical application of the density switch with adoption of a manifold basis that receives gas from the three poles of the switchgear. This solution is particularly convenient as it allows to use just one pressure switch to keep under control the pressure level of all poles of the switchgear.



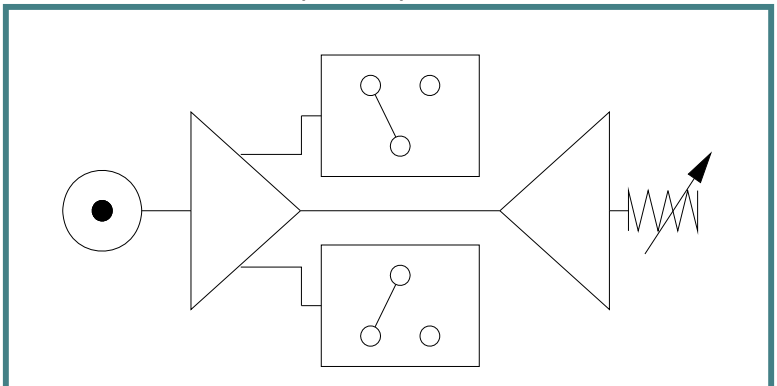
Features

Thanks to its structural features, this density switch grants the correct functioning of the device even in particularly unfavourable environment conditions, keeping the setting parameters practically unchanged independently from the temperature and pressure variations.

This device is therefore suitable for use in environments with extremely different temperature ranges and/or high altimetry.

Functioning scheme

The image represents the functioning diagram of the pressure switches of series **5-1780-0-***. The left part represents the area in contact with gas, the central part represents the microswitches while the right part represents the calibration spring which sets out the intervention levels of the device.



Principle of functioning

This density switch is characterized by an element sensible to pressure which is placed in contact to the gas section of the circuit to be monitored, it is composed of one bellow rigidly connected to a second bellow exposed to atmosphere pressure. The two microswitches of the device are positioned between the two elements sensible to pressure.

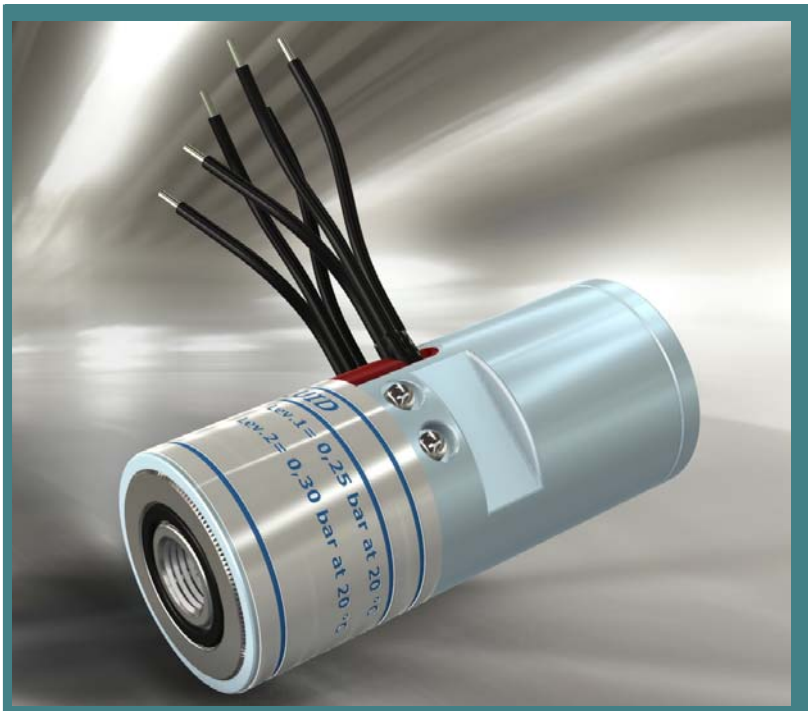
Placing the sensible element in contact to atmospheric pressure renders the device insensitive to variations of both temperature and environment pressure, allowing the reading of the switching pressures at absolute level.

Functioning of the density switch

The system shown in the picture works as described below:

The left part of the picture represents the connecting port through which the pressure switch is assembled on the circuit to be monitored.

The aluminium central body lodges a high sensitivity bellow which, under effect of the gas pressure, tends to expand longitudinally.



Two microswitches are assembled above the bellow, with the aim to set out the electrical switching of the two levels, alert and alarm, of the pressure switch.

During its motion upward the bellow is in contrast with a second bellow pre loaded and exposed to atmospheric pressure. During its longitudinal stroke the lower bellow gets in contact, one after the other, with the two microswitches and sets out their switching of state.

As the microswitches are three contacts type, it is possible to obtain a switching from NO to NC or vice-versa.

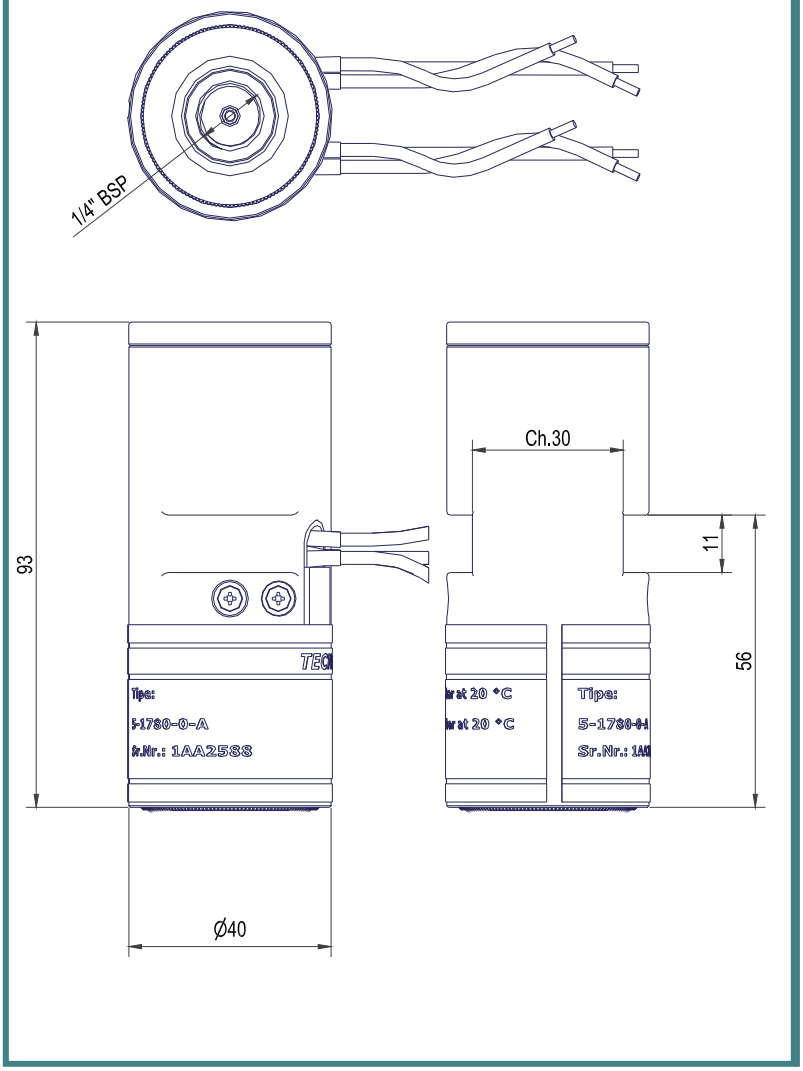
The bellow in contact with the atmospheric pressure is pre loaded in order to set out the device setting.

Overall dimensions

The figure represents the outer view with the overall dimensions of the pressure switch code **5-1780-0-*.** The device is fixed to the host structure by means of a thread 1/4" BSP female, obtained on the lower side of the device.

On the same side an OR gasket in nitrile rubber is assembled for front holding.

The lower part of the pressure switch, as well as the bellows, are made of stainless steel while the housing is made of anodized aluminium. The outer protection class of the pressure switch body is IP 54.



Technical Data's

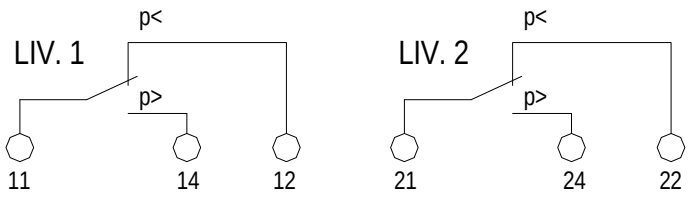
MECHANICAL FEATURES

Body	Anodized aluminium
Threaded connection	Stainless steel
Limit of mechanical resistance	30 bar
Max working pressure	5 bar
Tolerance on calibration	+/- 0.05 bar
Operating temperature	-25/+85 °C
Clamping torque	5÷10 Nm

ELECTRICAL FEATURES

Max commutable tension	250 V ac
Max commutable current	5 A
Protection class	IP 54
Electrical connection	Upon request

Electrical scheme



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