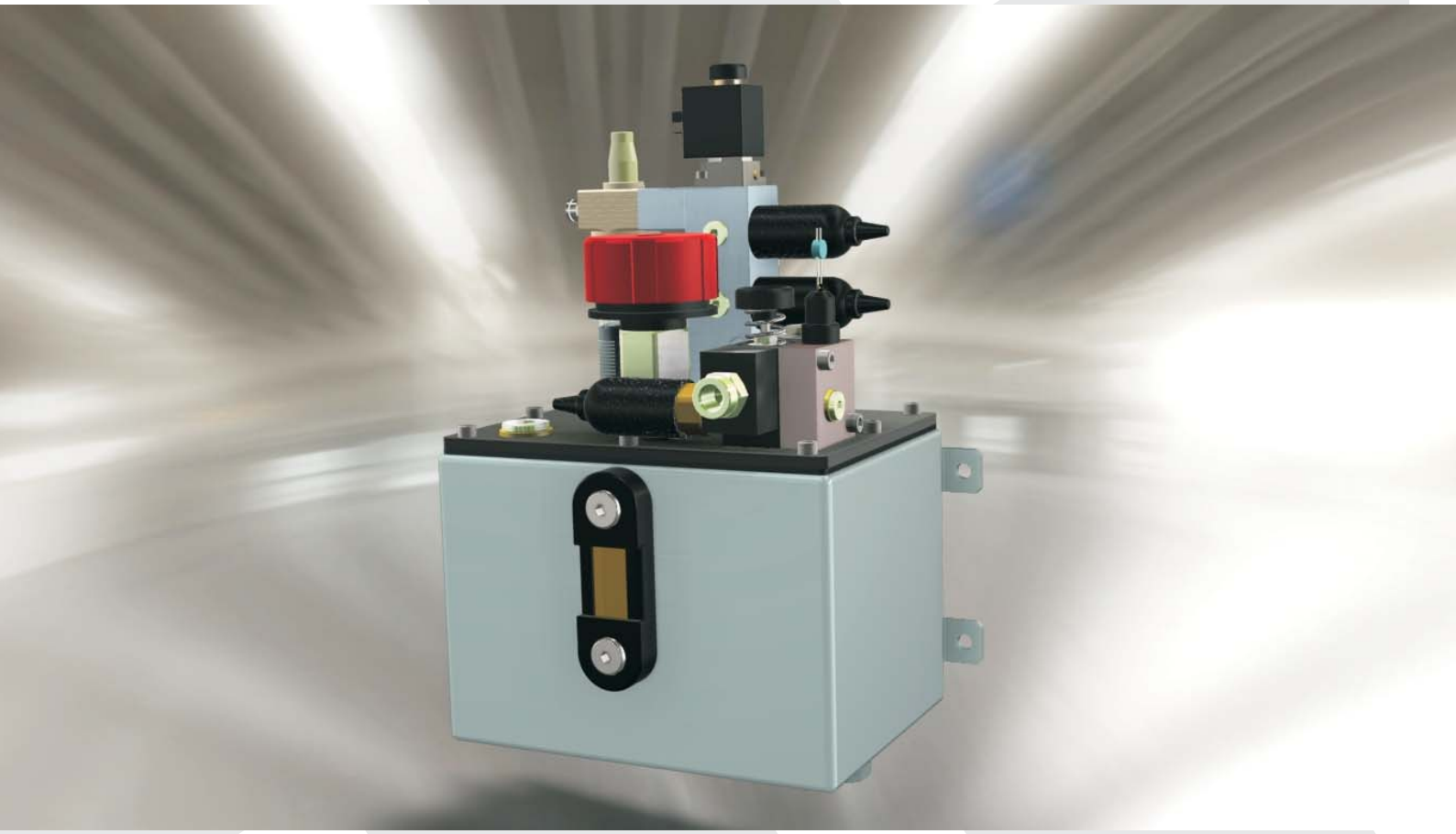
TECNOFLUID

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

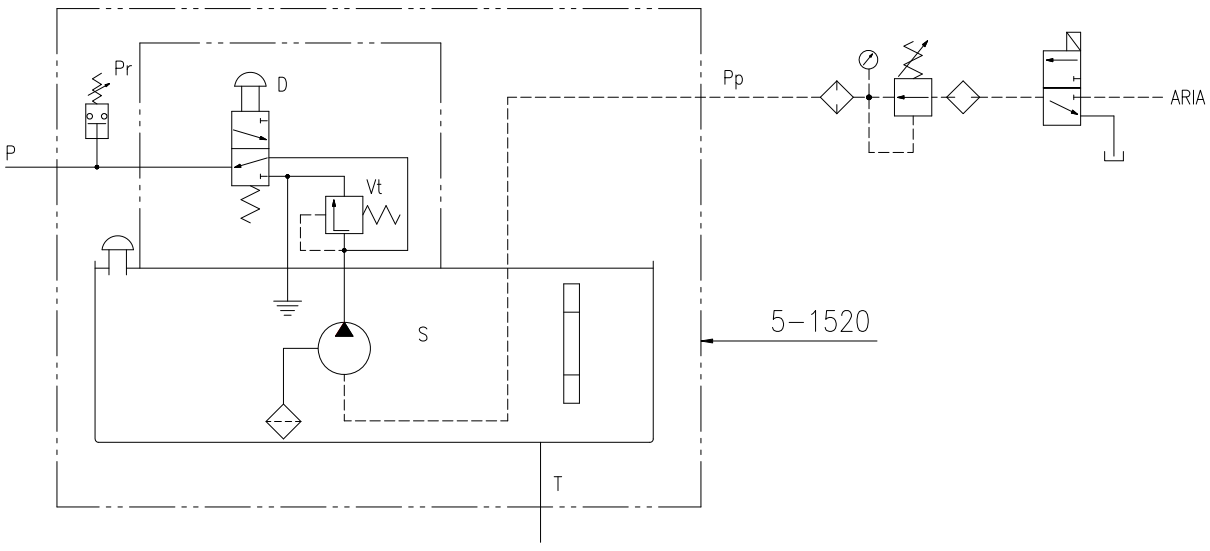


fig.1

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

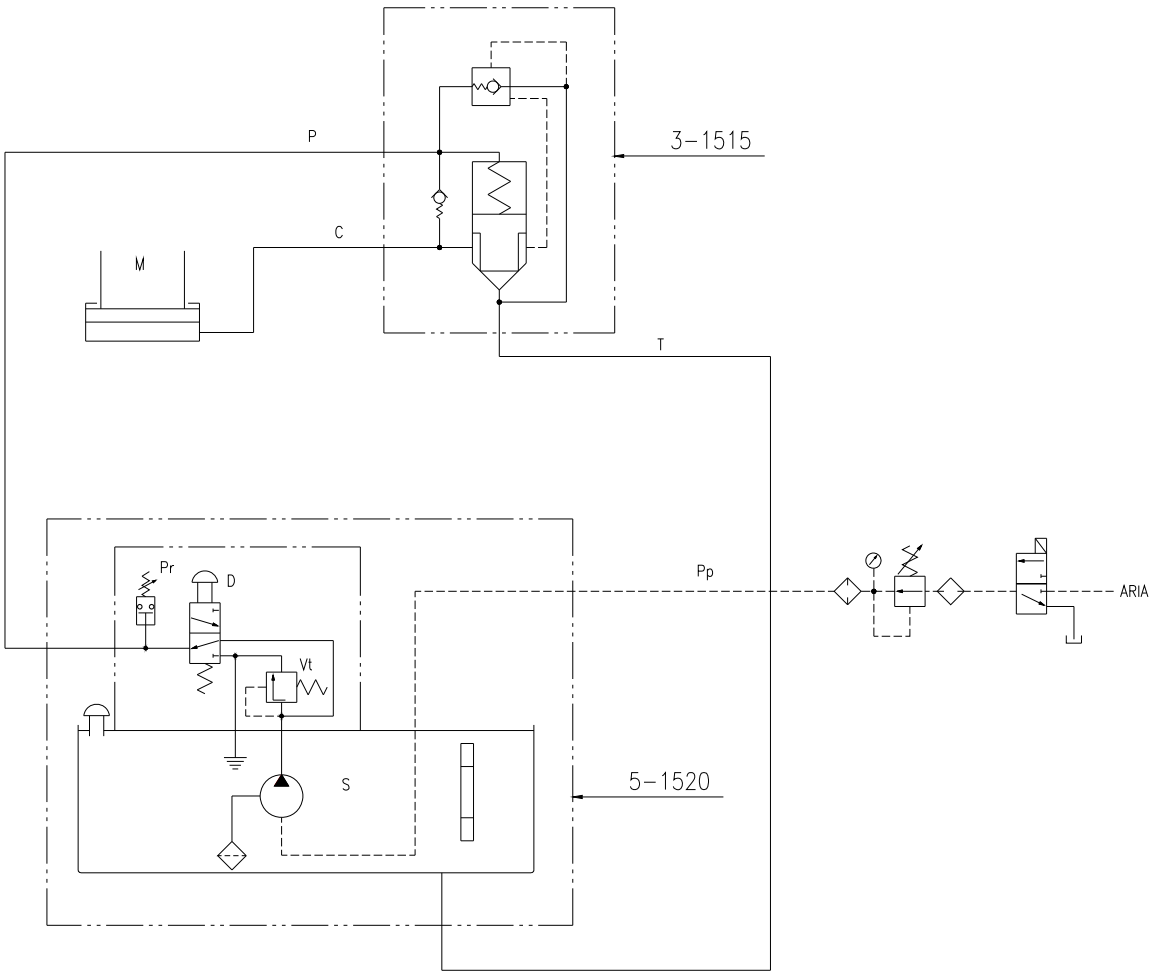


fig.2

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)

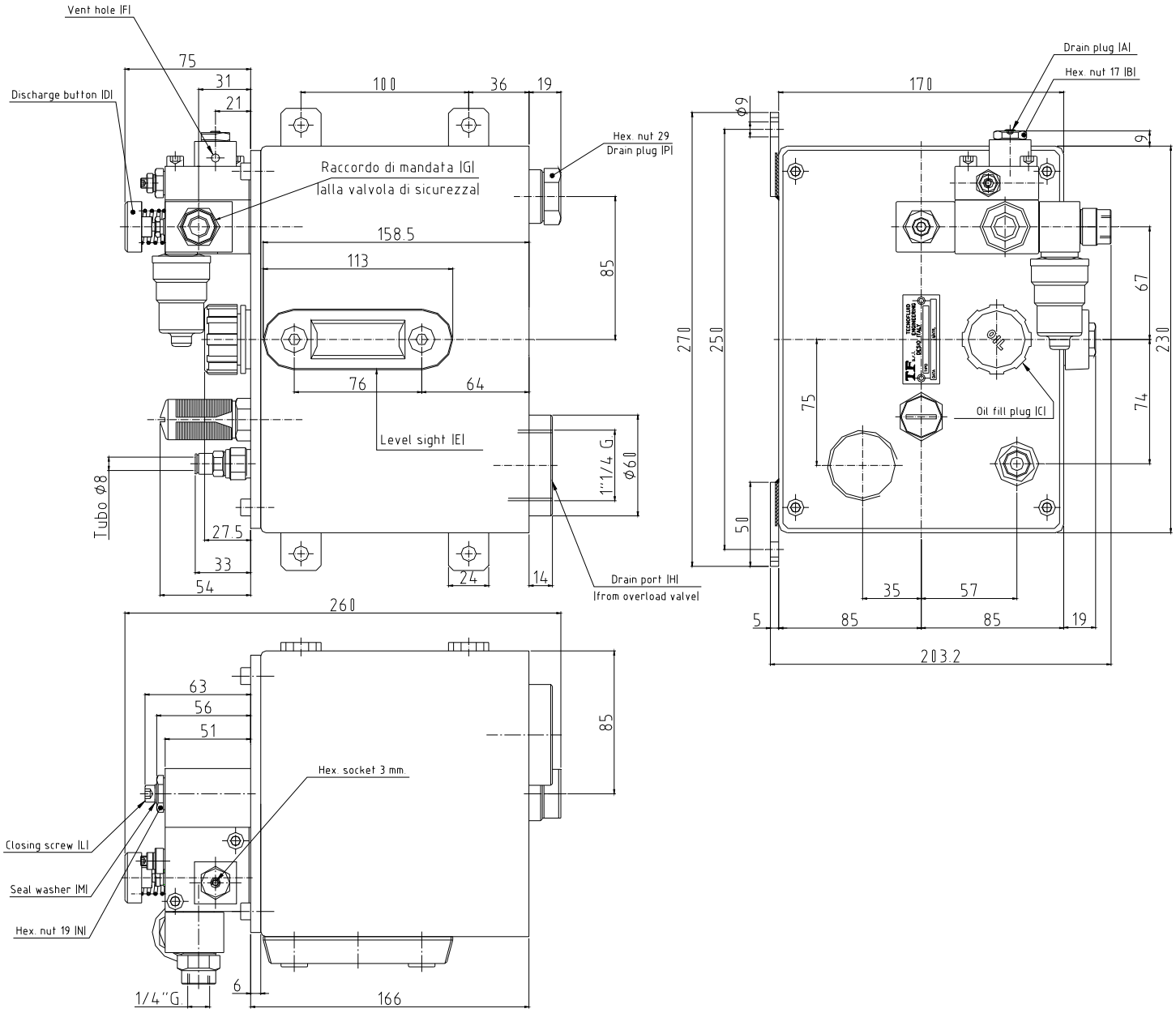


fig.3

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

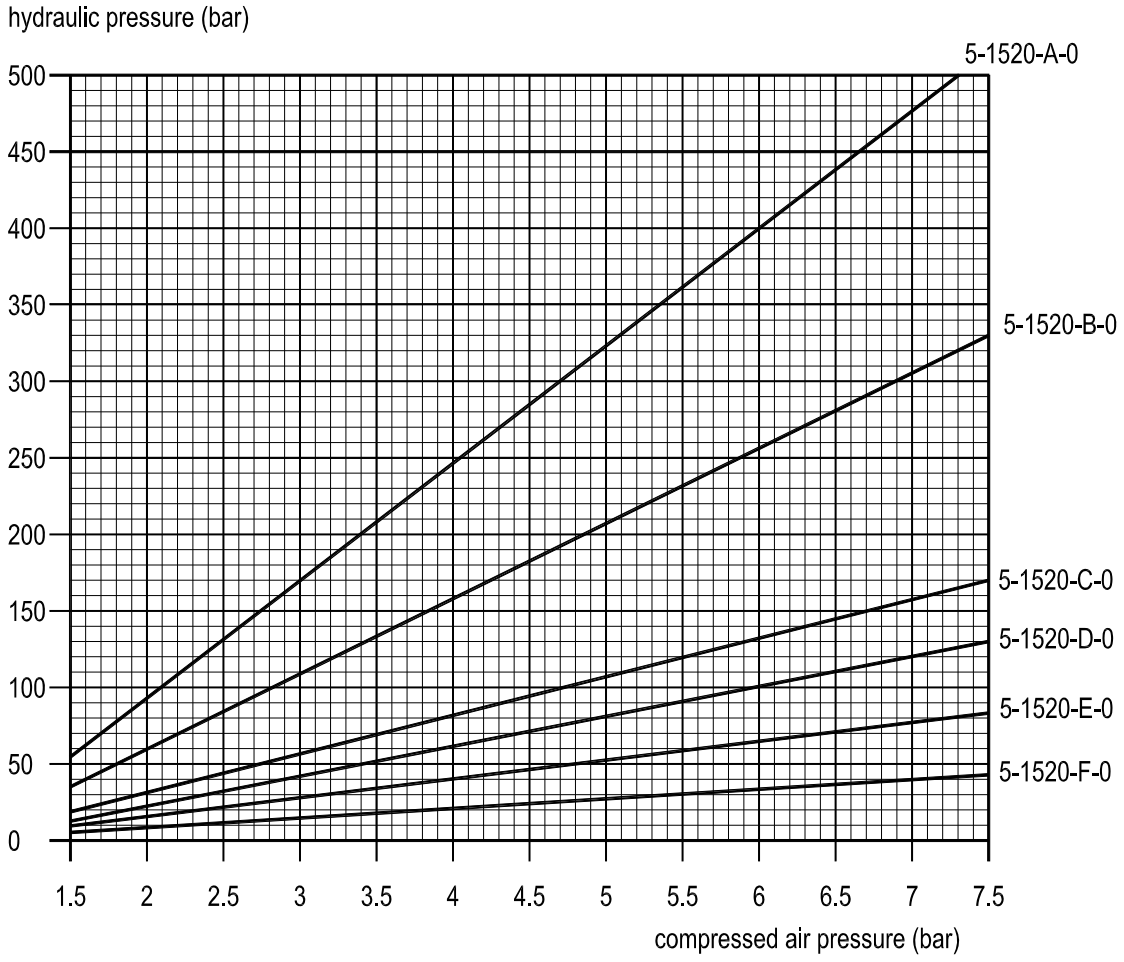


fig.4

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

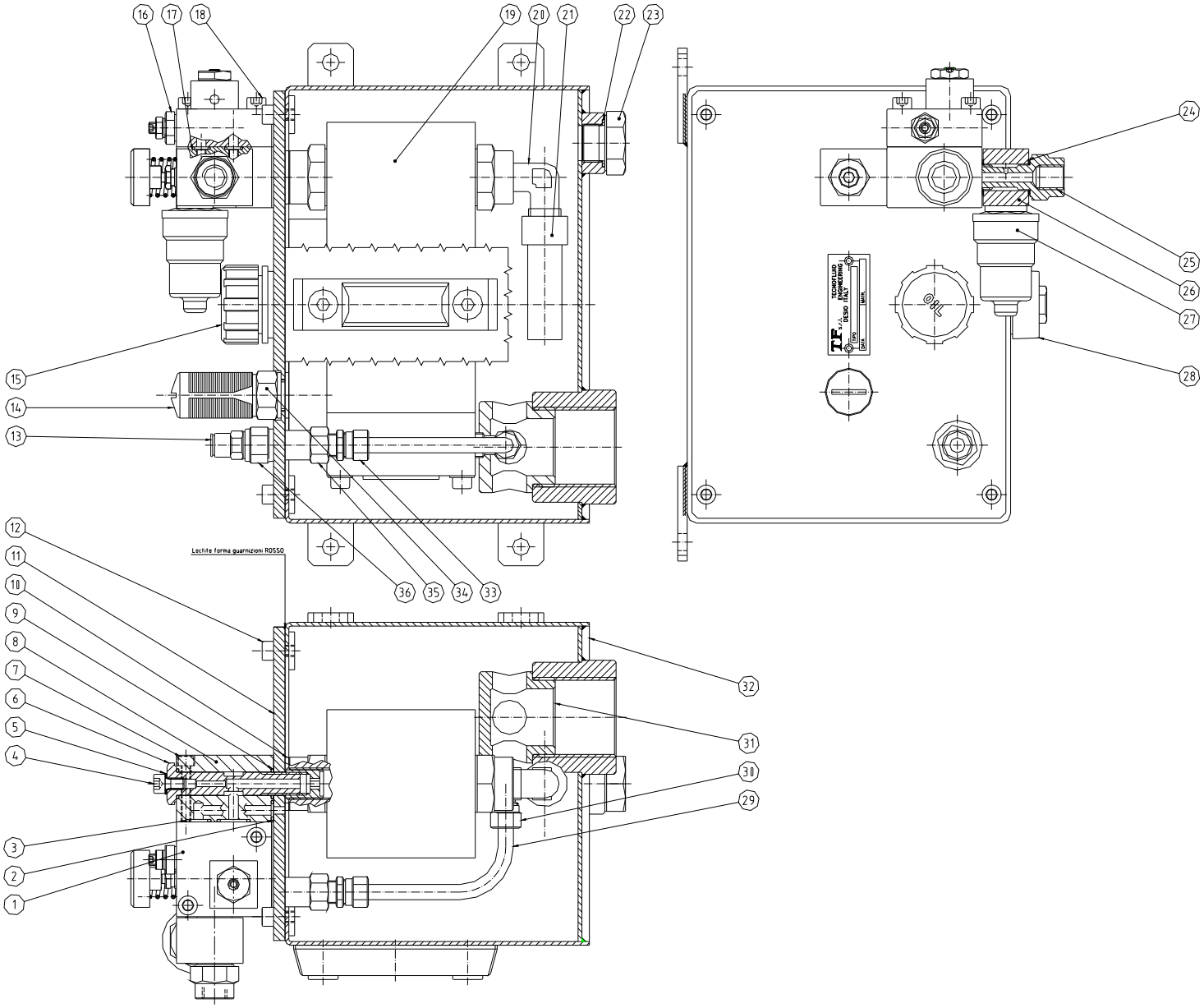


fig.5

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)

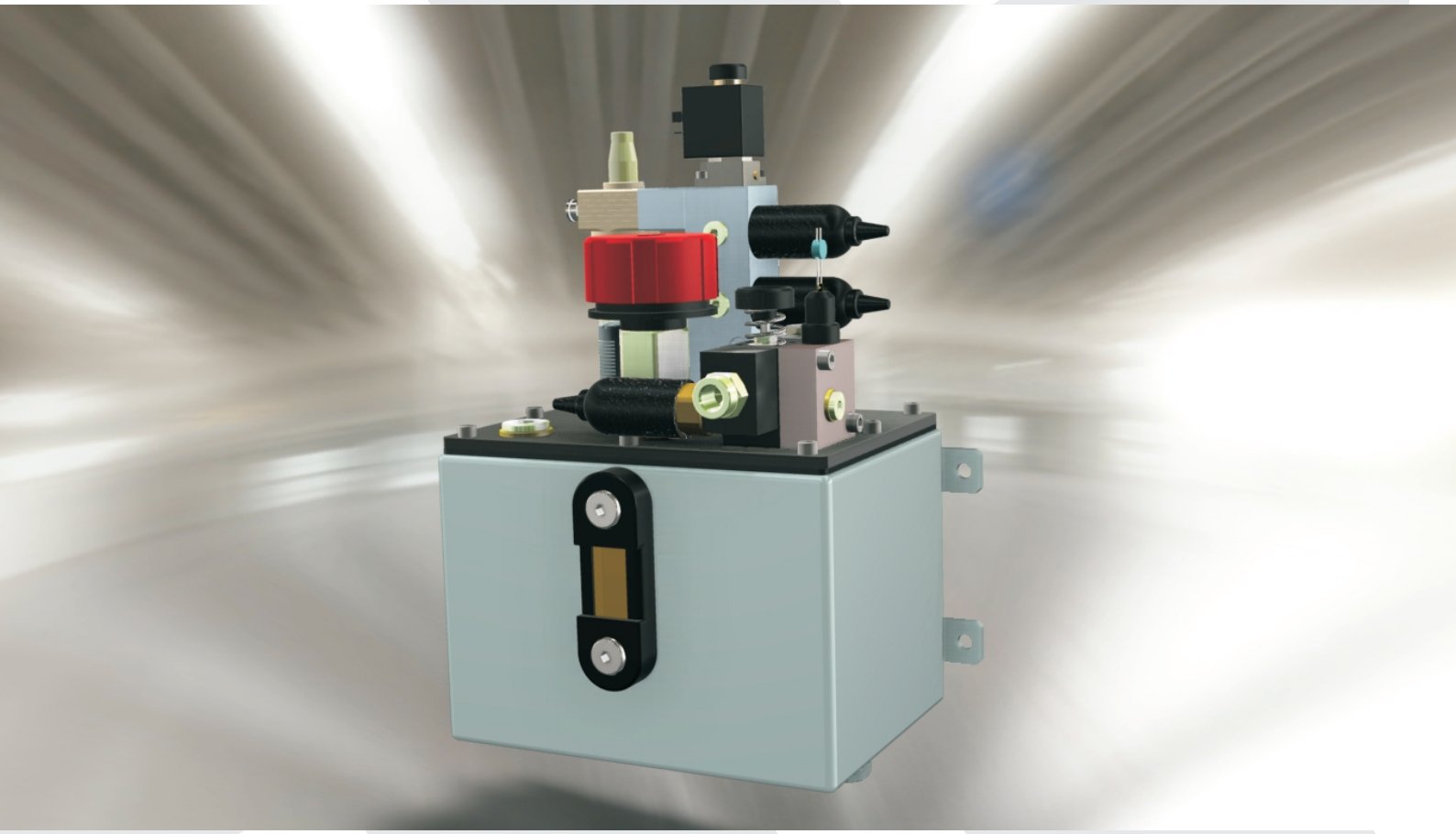
Item	DESCRIPTION	QUANT.	ORDERING CODE
1	MANIFOLD BLOCK, CLAMP CONTROL	1	R-2-1398
2	O-RING OR 106	1	PARK-5-052
3	O-RING OR 3037	1	PARK-2-012
4	HEX. SOCKET HEAD CAP SCREW M6 x 10	1	VTCE-6-10
5	METAL/RUBBER RING M6	3	GM-0505-M6
6	MANIFOLD SCREW	1	R-5-1520-3
7	HEX. SOCKET HEAD CAP SCREW M5 x 35	4	VTCE 5-35
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

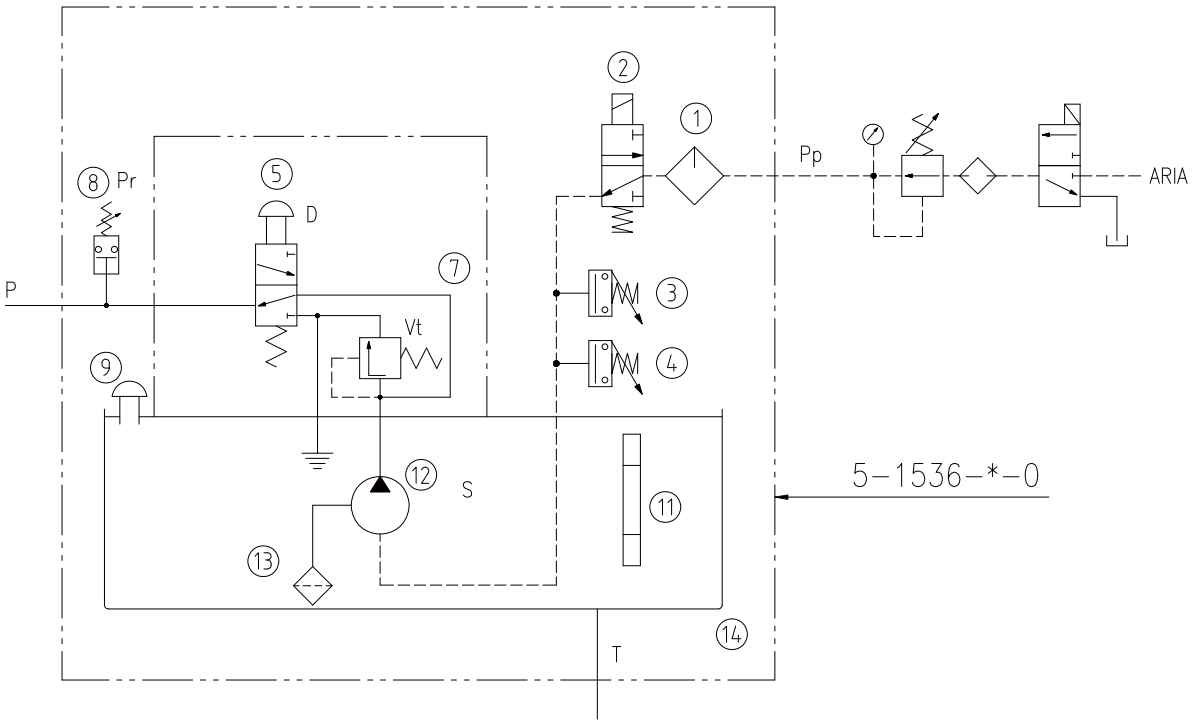


fig.1

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)

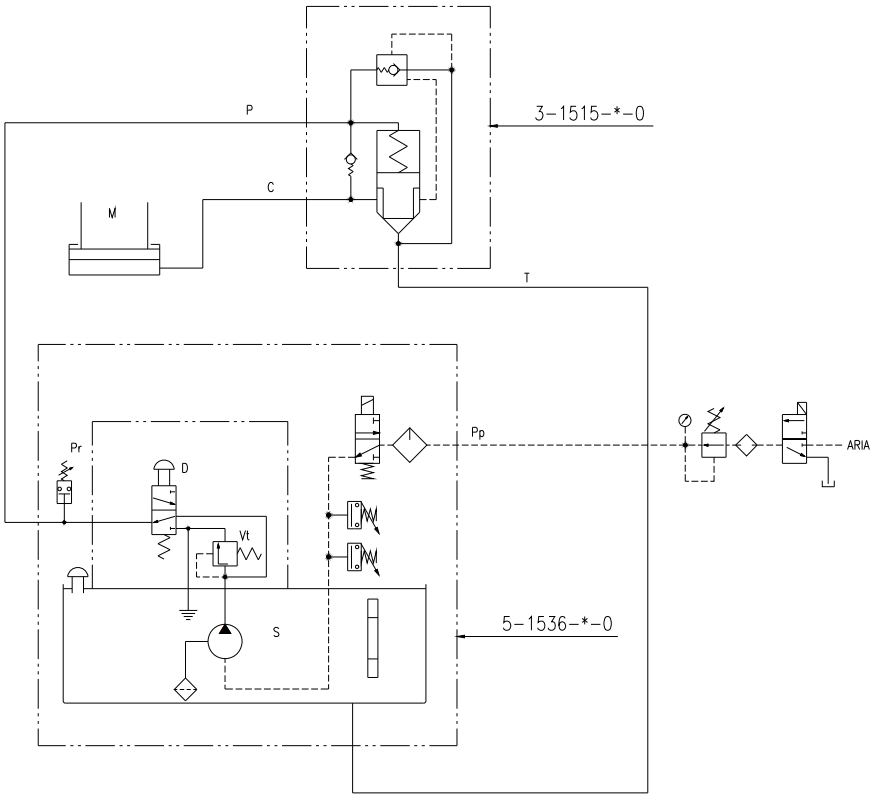


fig.2

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)

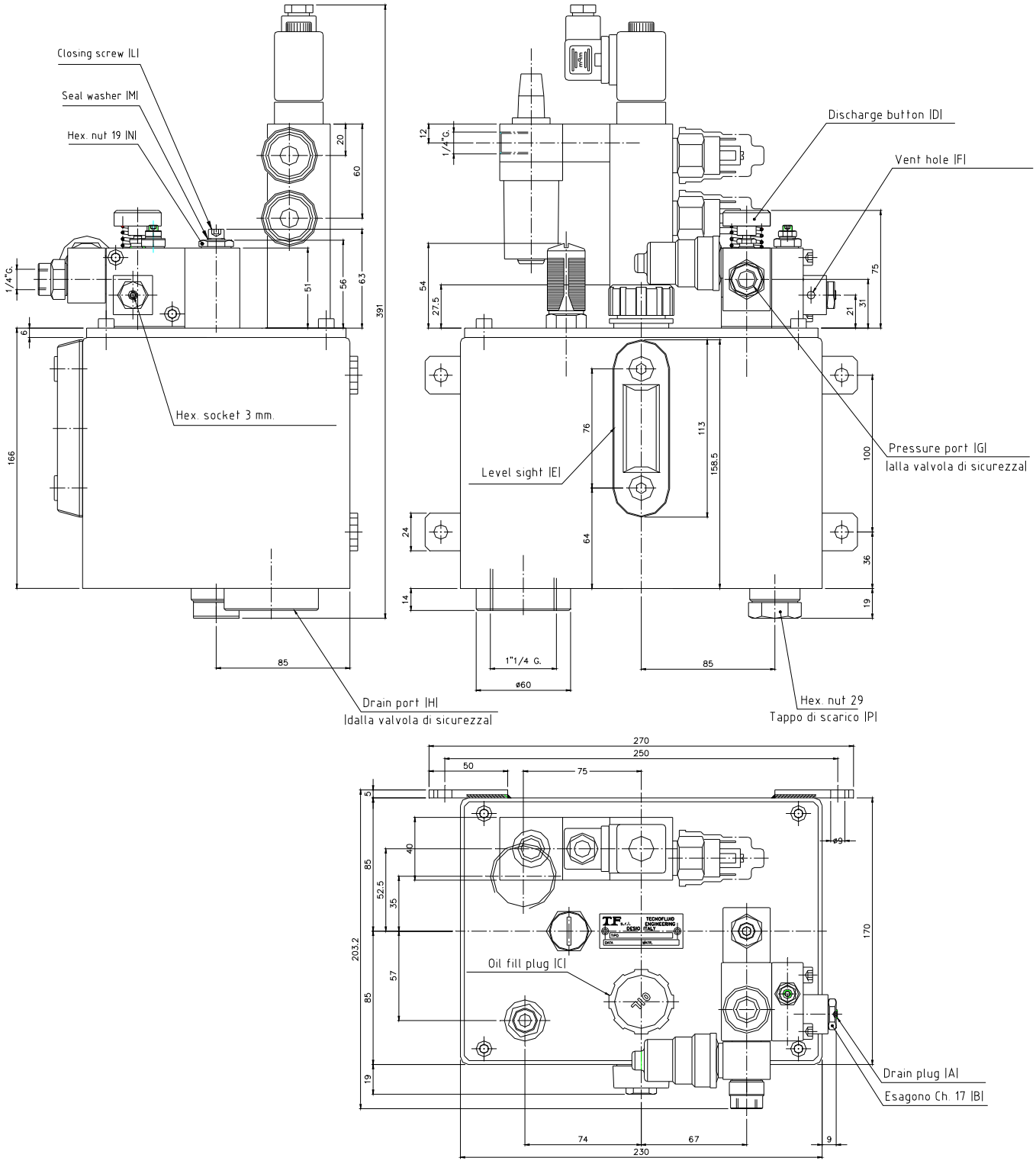


fig.3

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

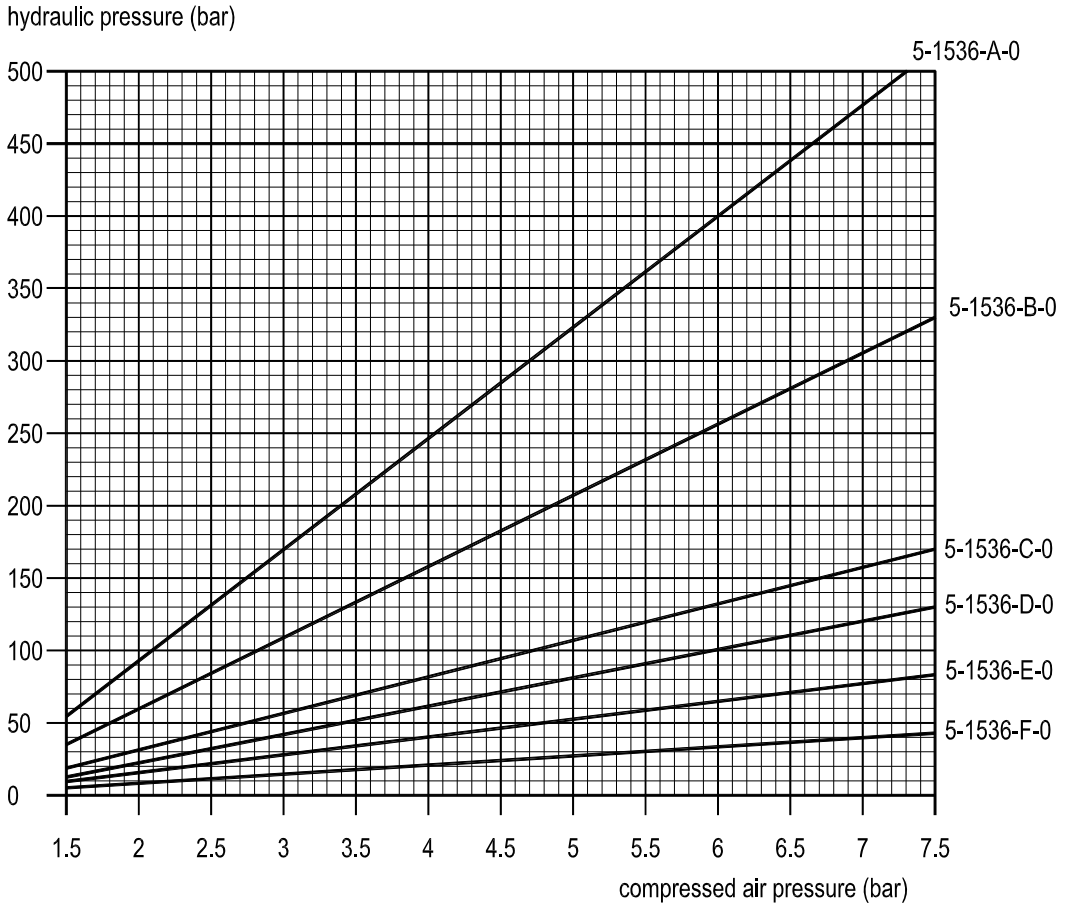


fig.4

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

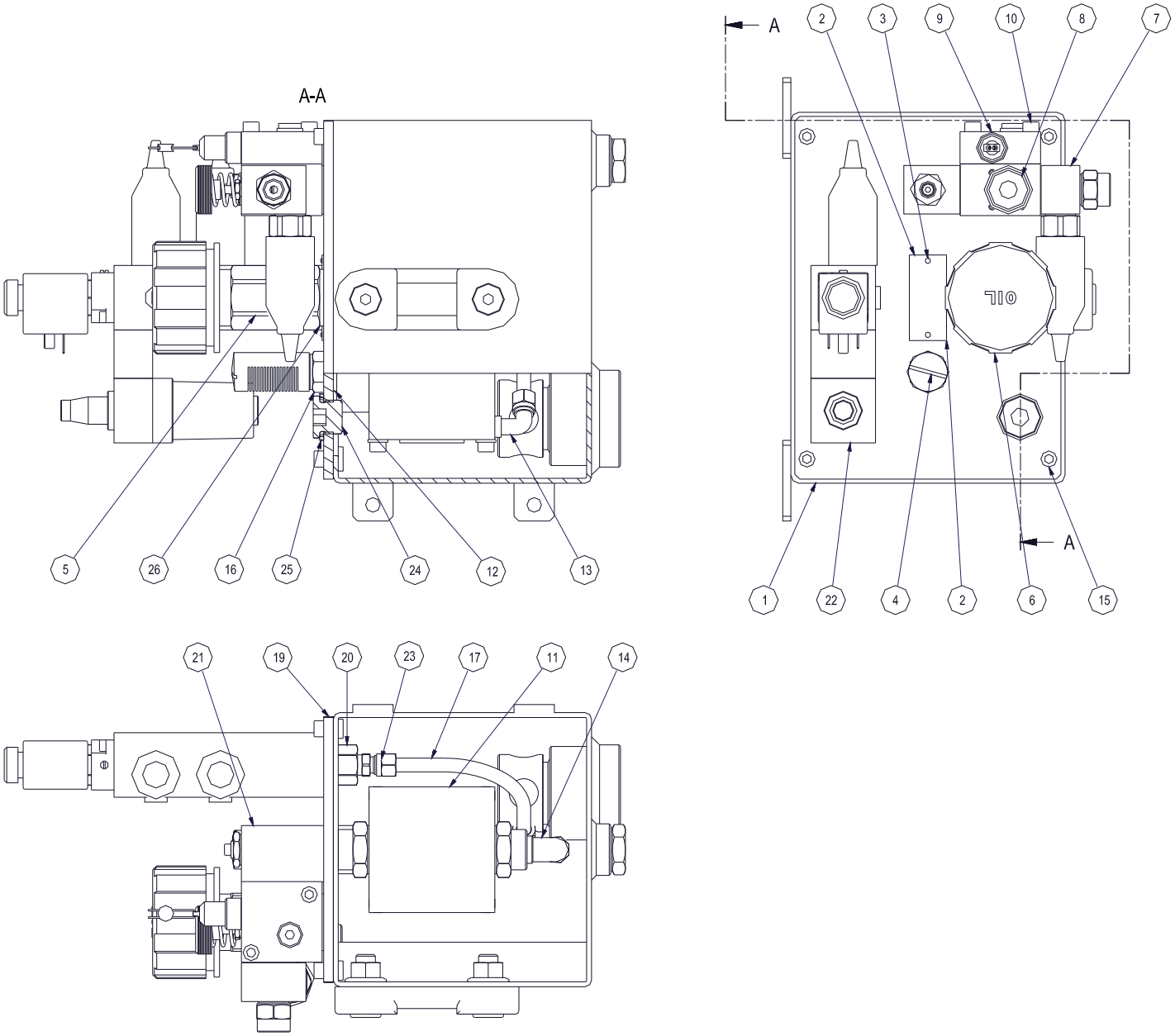


fig.5

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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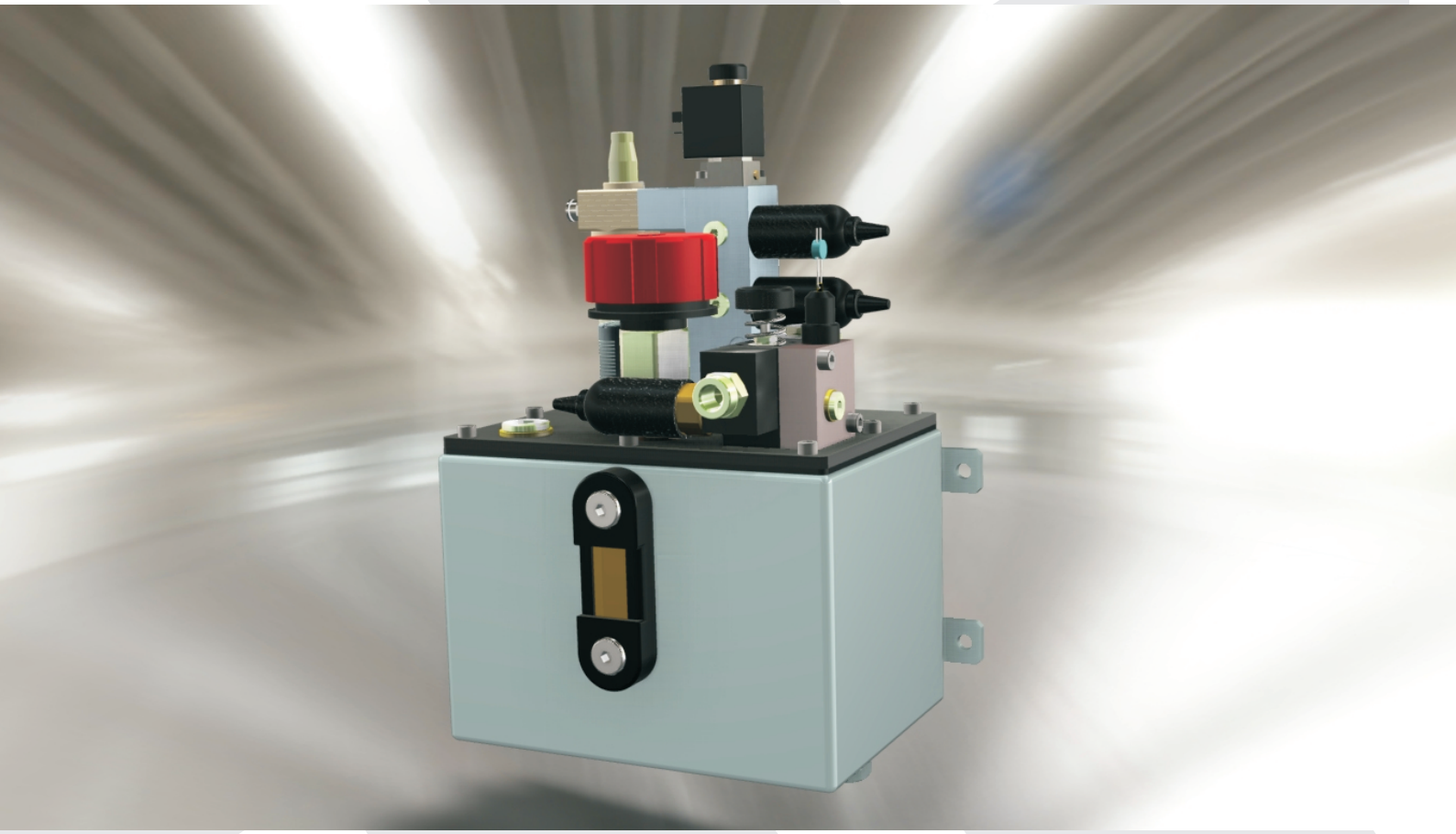
POWER UNIT FOR HYDRAULIC OVERLOAD MODEL 5-1698



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

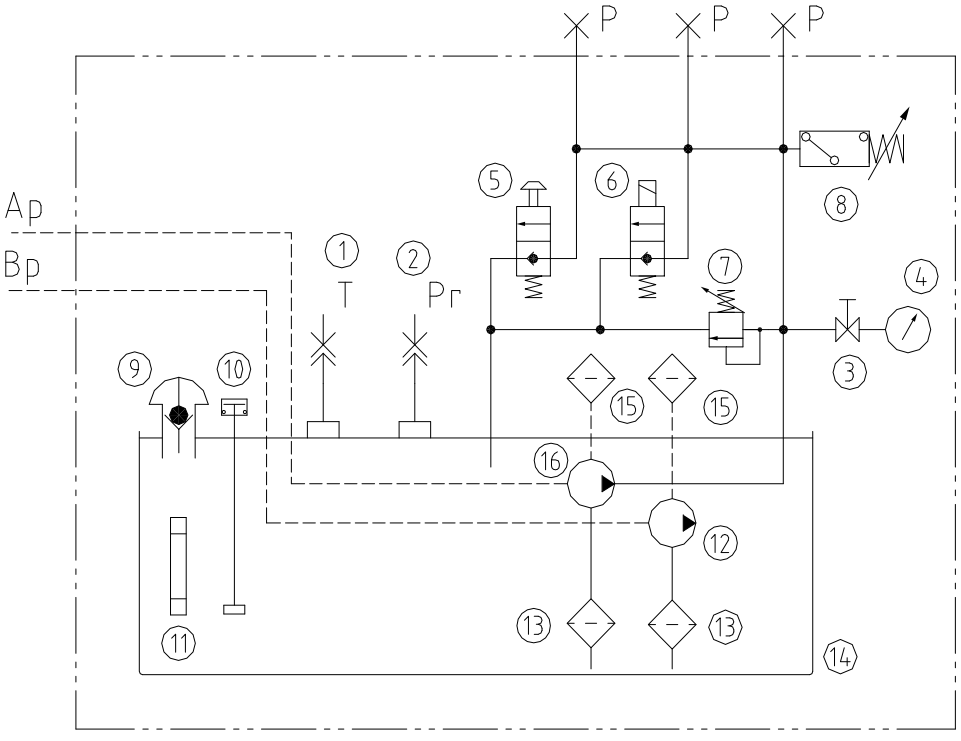


fig.1

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

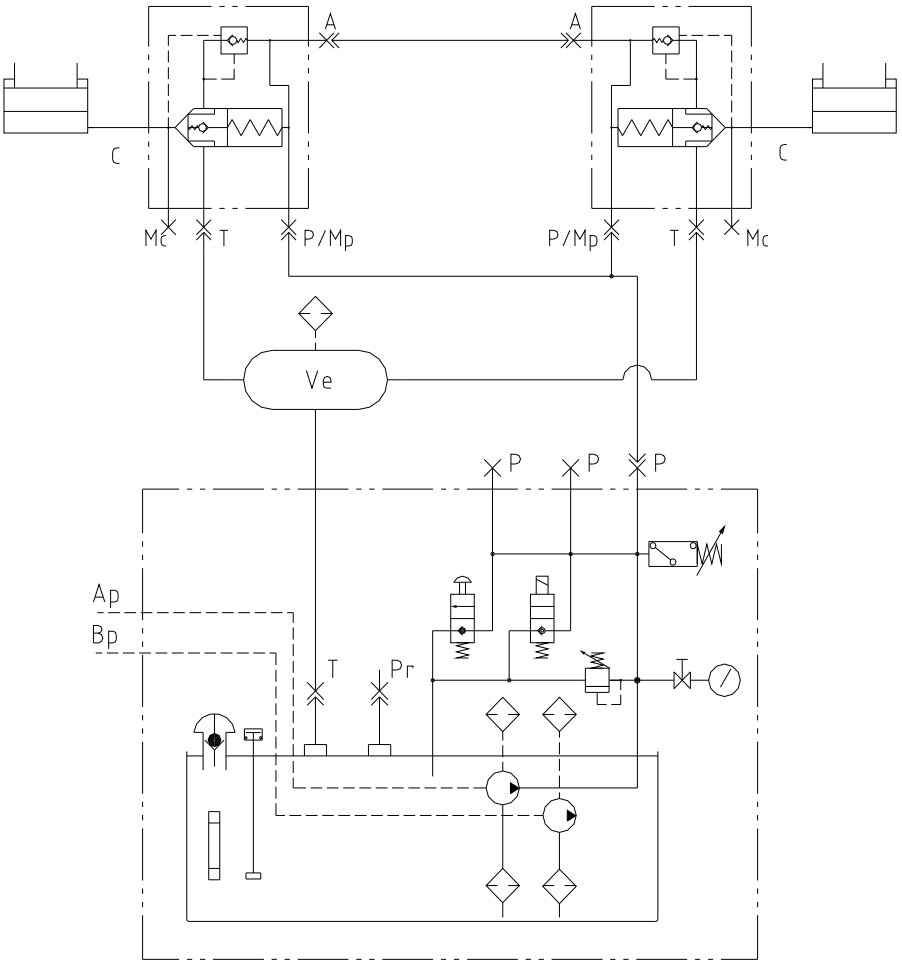

fig.2

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)

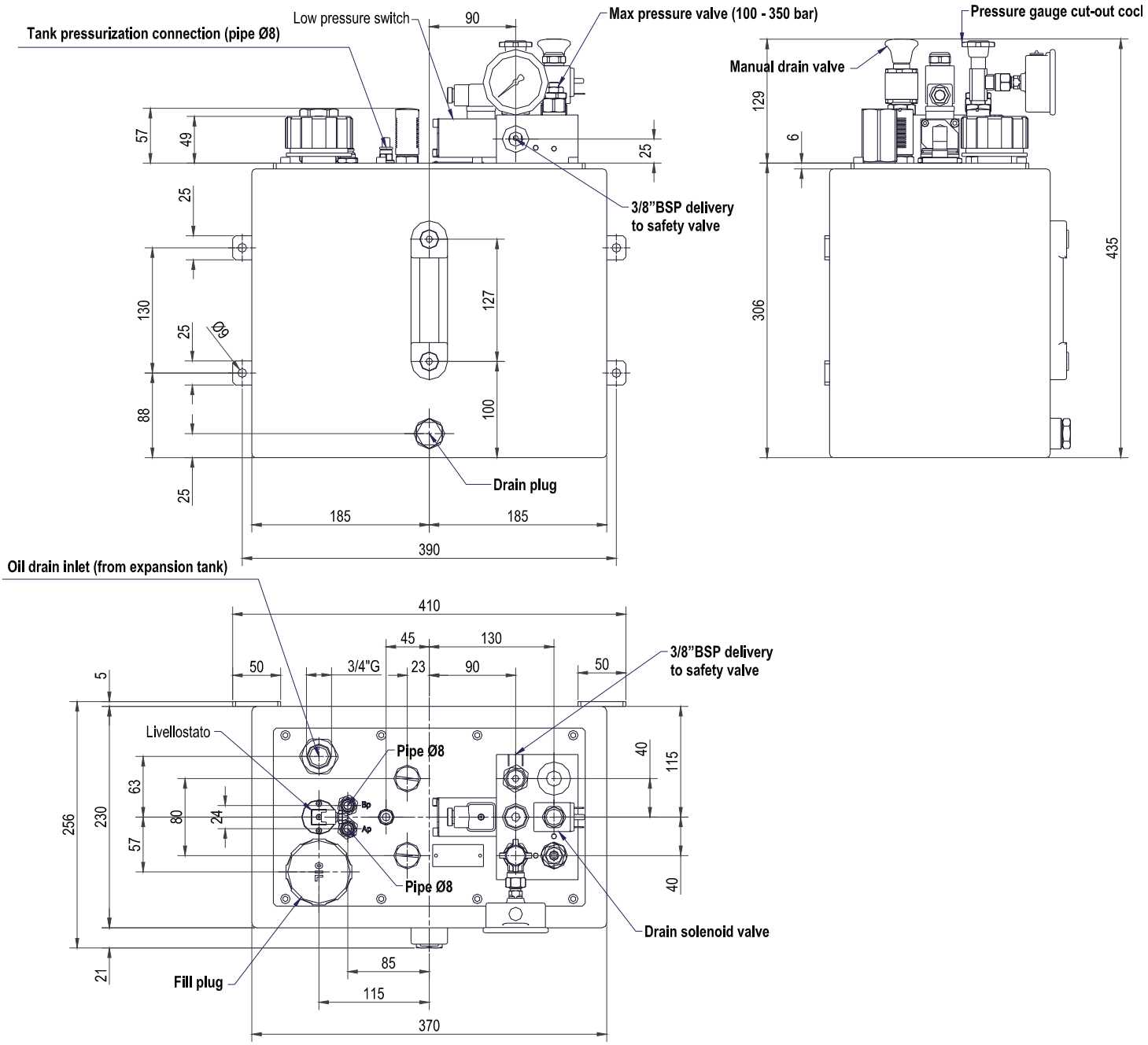

fig.3

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

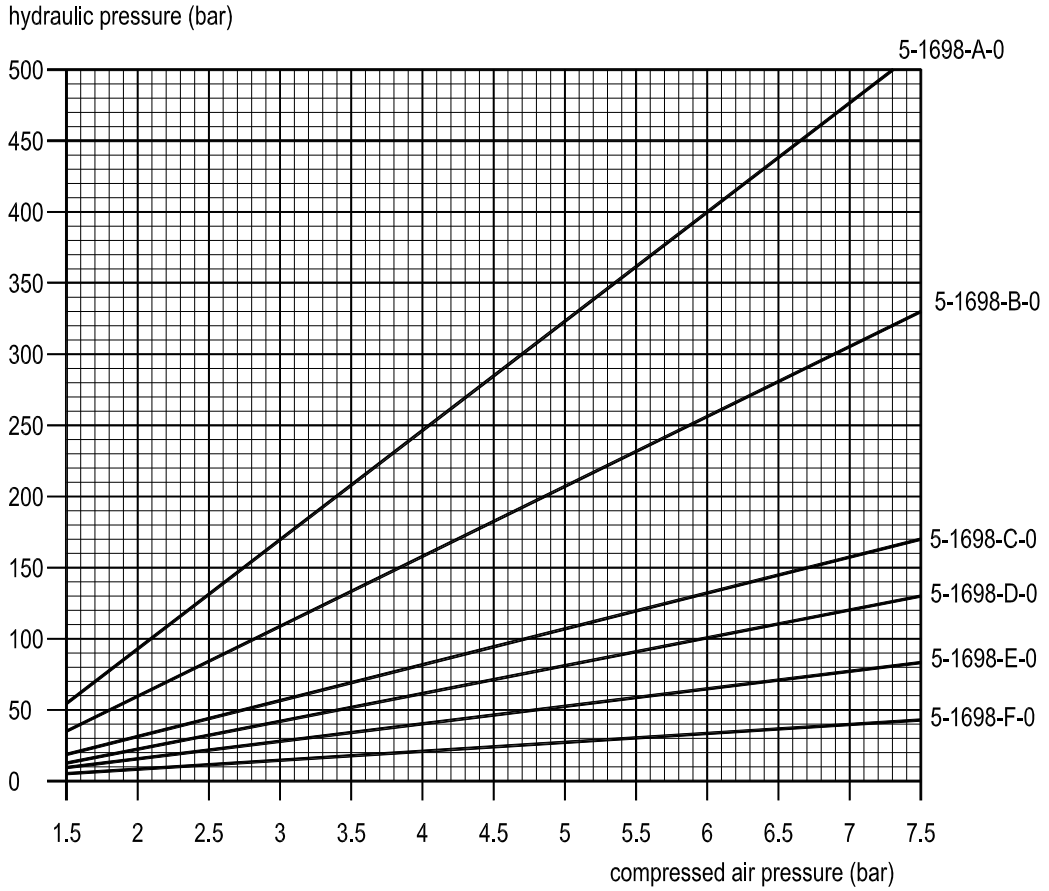

fig.4

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

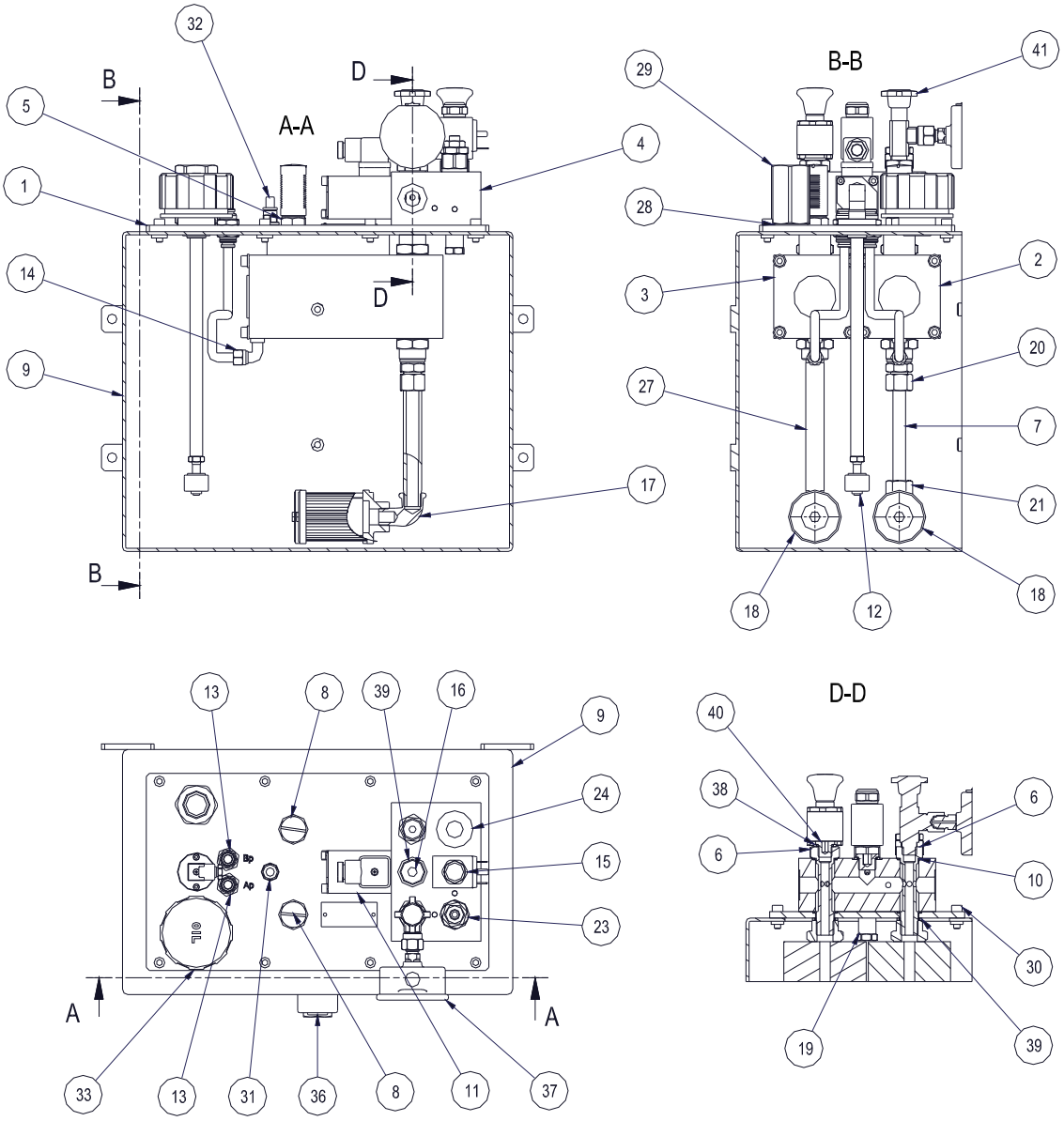

fig.5

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.

THE OLEOPNEUMATIC CONTROL UNITS DESCIBED IN THIS BOOKLET WERE DESIGNED AND MANUFACTURED ON PRINCIPLES AIMED AT AVOIDING DAMAGES TO PEOPLE OR THINGS; HOWEVER, PLEASE KEEP IN MIND THAT, SINCE OLEOPNEUMATIC CONTROL UNITS ARE PRESSURE GENERATORS, THE IMPROPRER USE OF THE DEVICE MAY BE POTENTIALLY DANGEROUS.

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

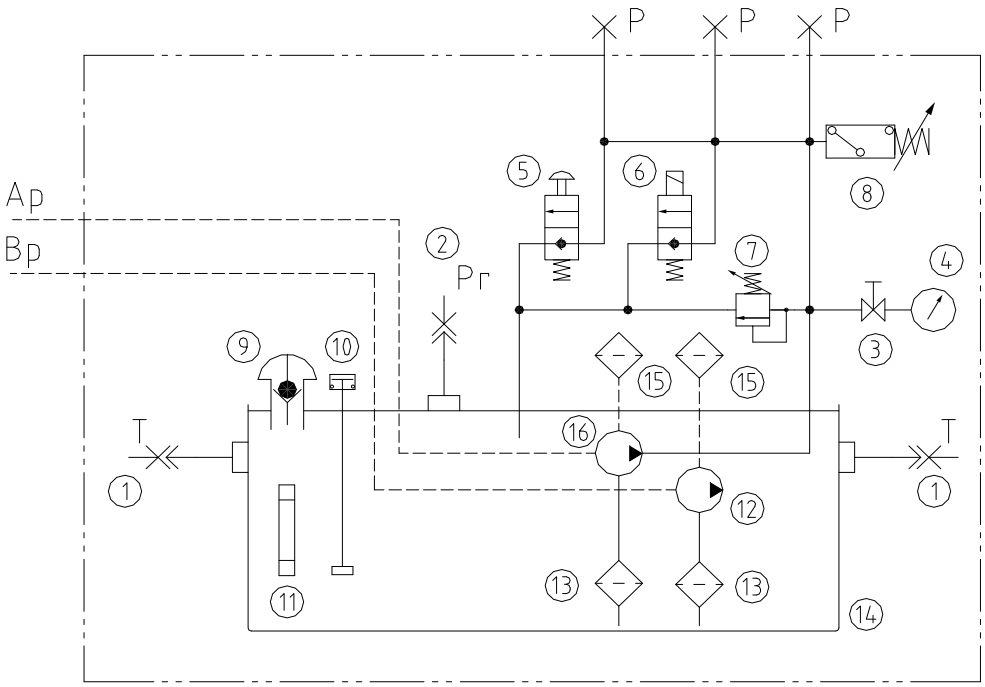

fig.1

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

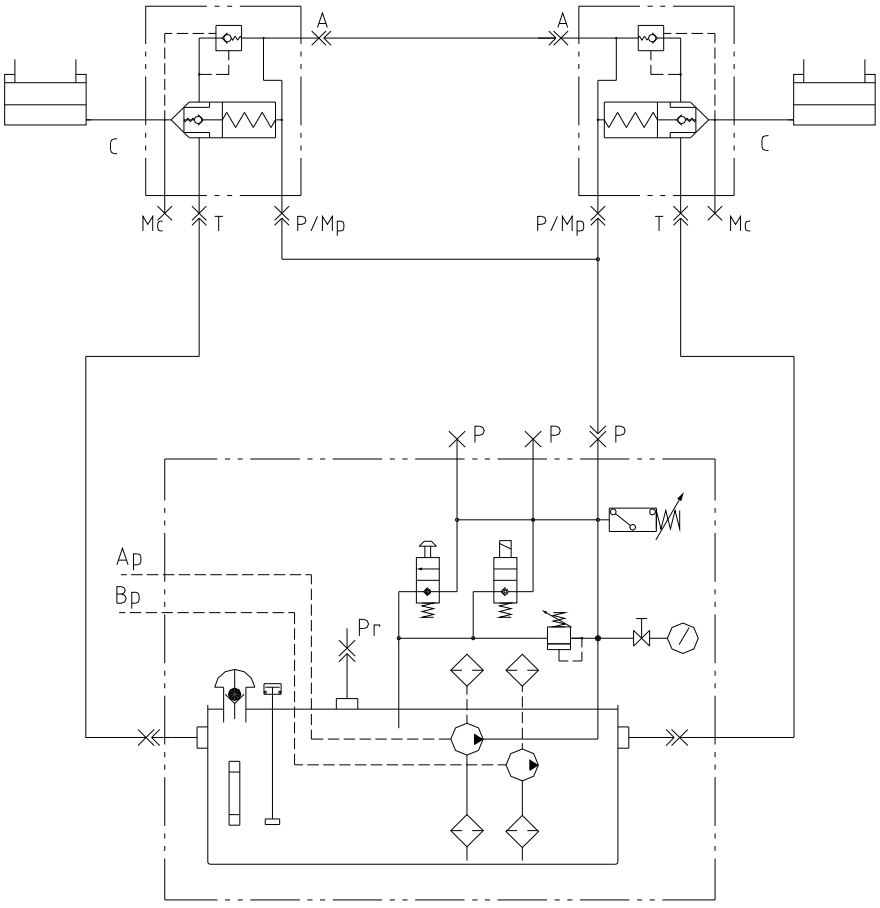

fig.2

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)

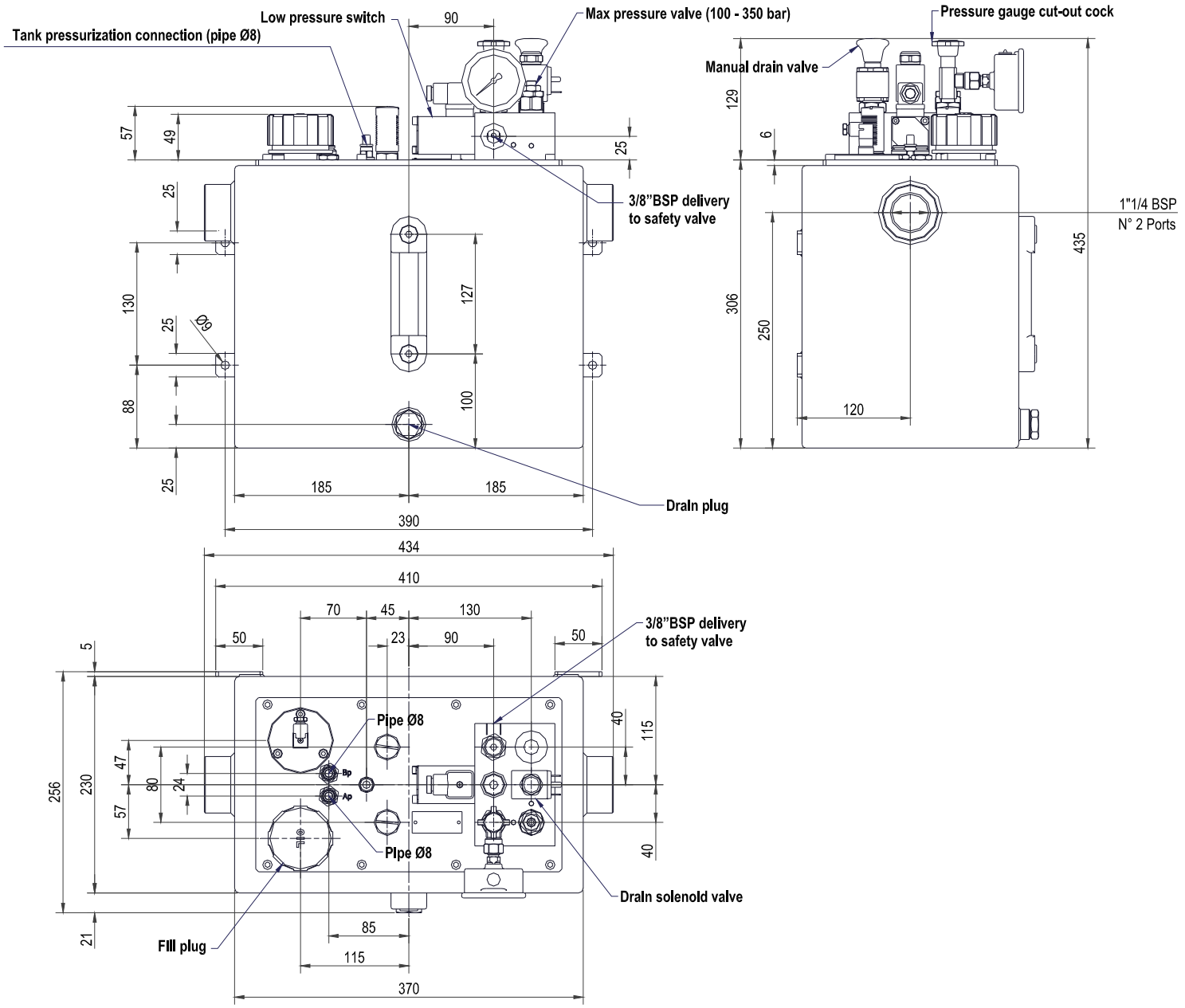

fig.3

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

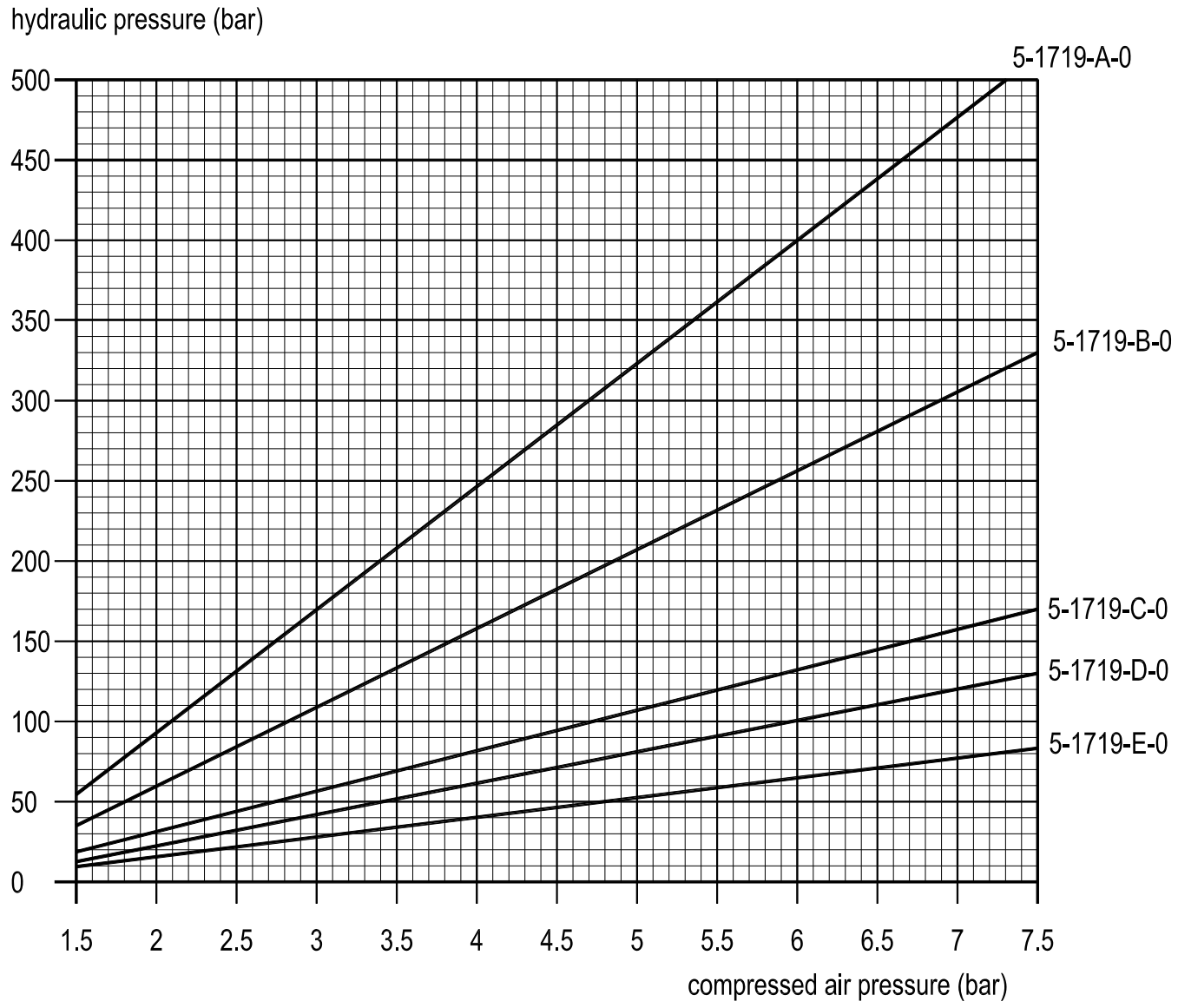

fig.4

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

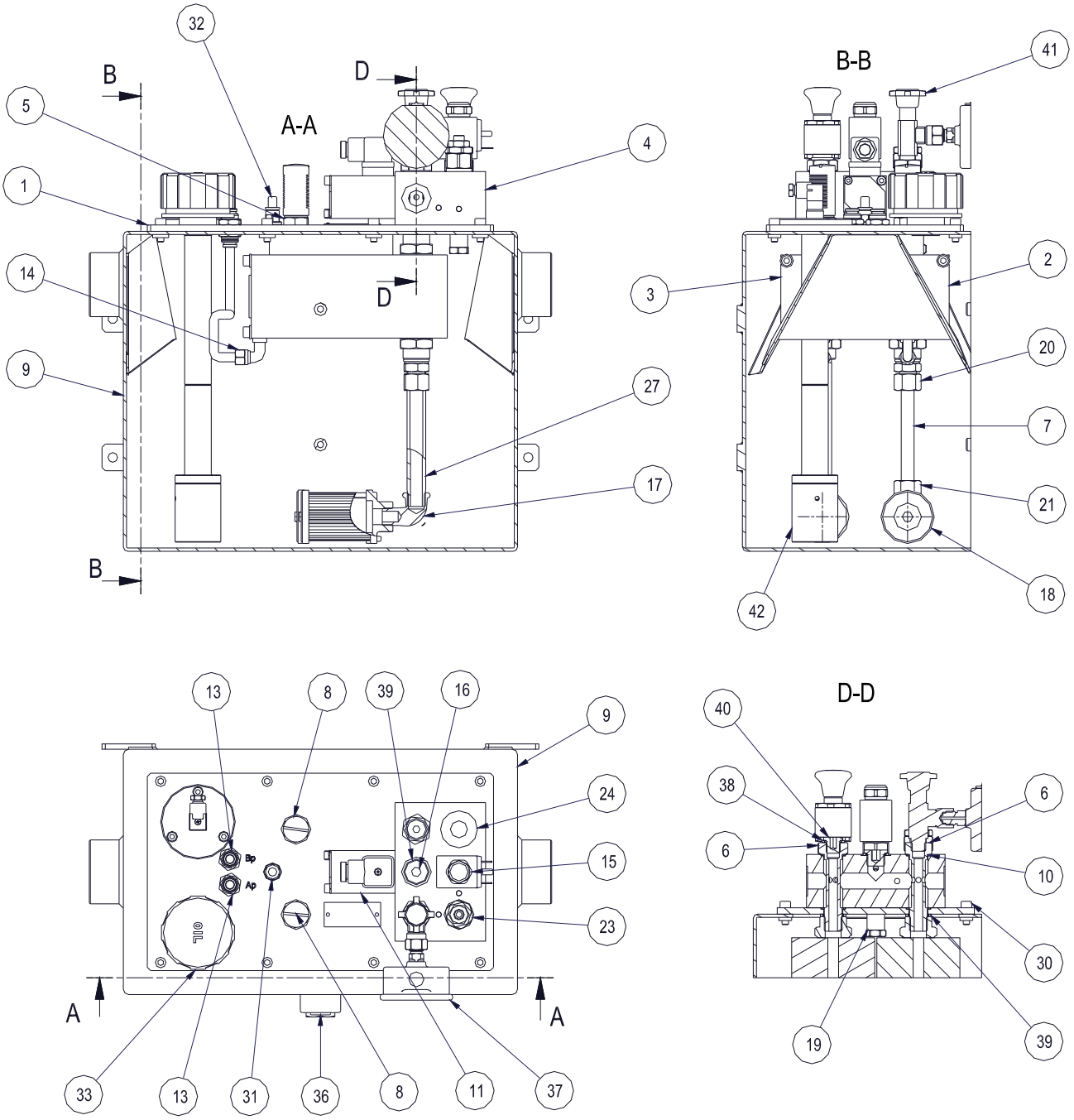

fig.5

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.

THE OLEOPNEUMATIC CONTROL UNITS DESCIBED IN THIS BOOKLET WERE DESIGNED AND MANUFACTURED ON PRINCIPLES AIMED AT AVOIDING DAMAGES TO PEOPLE OR THINGS; HOWEVER, PLEASE KEEP IN MIND THAT, SINCE OLEOPNEUMATIC CONTROL UNITS ARE PRESSURE GENERATORS, THE IMPROPRER USE OF THE DEVICE MAY BE POTENTIALLY DANGEROUS.

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