

**High pressure intensifier
Hydraulic cylinders**



ICOP 
HYDRAULICS

Increase your fluid power

PRESSURE INTENSIFIERS

Our **pressure intensifiers** are designed to reliably achieve a **700 bar** working pressure on the bottom head of the hydraulic cylinder. In the case of an intensifier with a **1:4** ratio, a **175 bar** inlet pressure is enough to generate a **700 bar** pressure on the cylinder bottom head. Pressure intensifiers can be either fitted to the pipes or flanged directly on the cylinders. We can supply the hydraulic cylinders produced in our **ICOP Hydraulics** plants, suitably sized to work at high pressures. As an alternative, our pressure intensifiers can be fitted on ISO 6020-1 cylinders having a rated pressure of 160 bar. In this way, the hydraulic system will have a general pressure of 40 bar (1:4 ratio).

Benefits of **ICOP Hydraulics** intensifiers:

- Smaller size of the hydraulic cylinders which allows using more compact and lightweight machineries
- Use of standard gear pumps as an alternative to more expensive piston pumps
- Use of low pressure flexible hoses to reach the hydraulic cylinders
- Lower working pressures which ensure a longer system life

Differences between **ICOP Hydraulics** intensifiers and standard commercial intensifiers:

- A higher flow rate (up to 100 l/min compared to 10 l/min of standard simple-acting in-line intensifiers)
- Possibility of installing a regenerative plate to increase the flow rate to 300 l/min.
- Possibility of decompressing the chamber without any aid from extra valves
- No leakage between intensifier and pressure chamber
- Oil pressure is automatically maintained even in case the actuator is consuming oil (as opposed to the need of restoring operating conditions to resume pressure in standard intensifiers, i.e. by discharging the oil).



Demolition crusher cylinder



Press cylinder



Sheet shear cylinder



Mine driller cylinder



Picture 1 Marine crane arm lifting cylinder

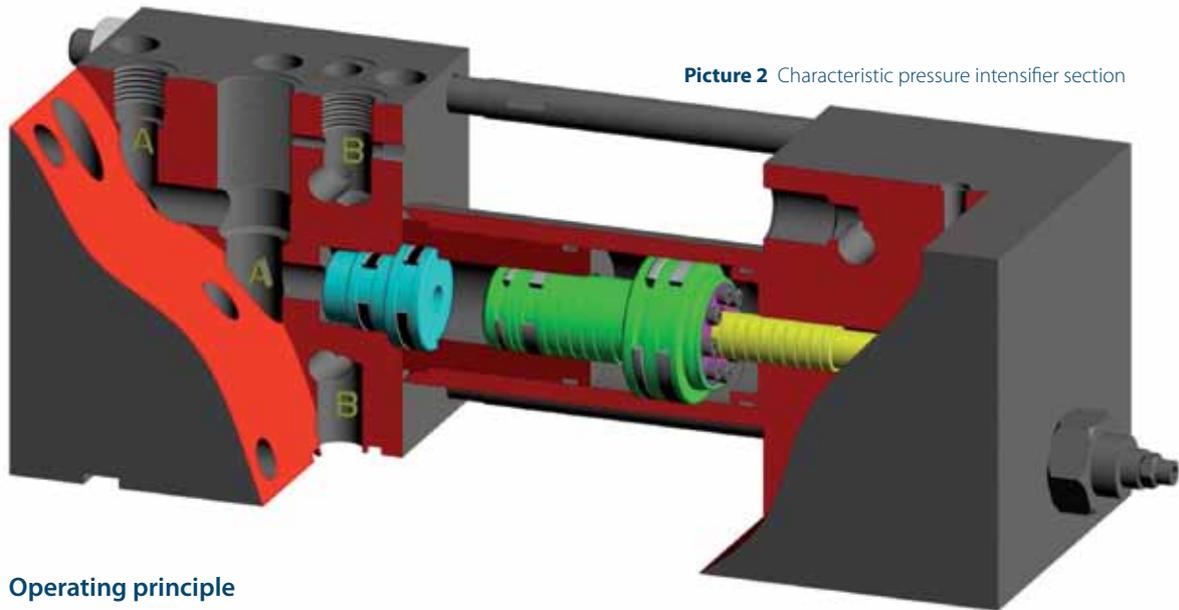
FIELDS OF APPLICATION

Fields of application of **ICOP Hydraulics** intensifiers:

- Demolition and pulverising
- Mining industry
- Drilling
- Cranes and lifting
- Earth moving machinery
- Plastic machines
- Presses
- Materials test



GENERAL CHARACTERISTICS

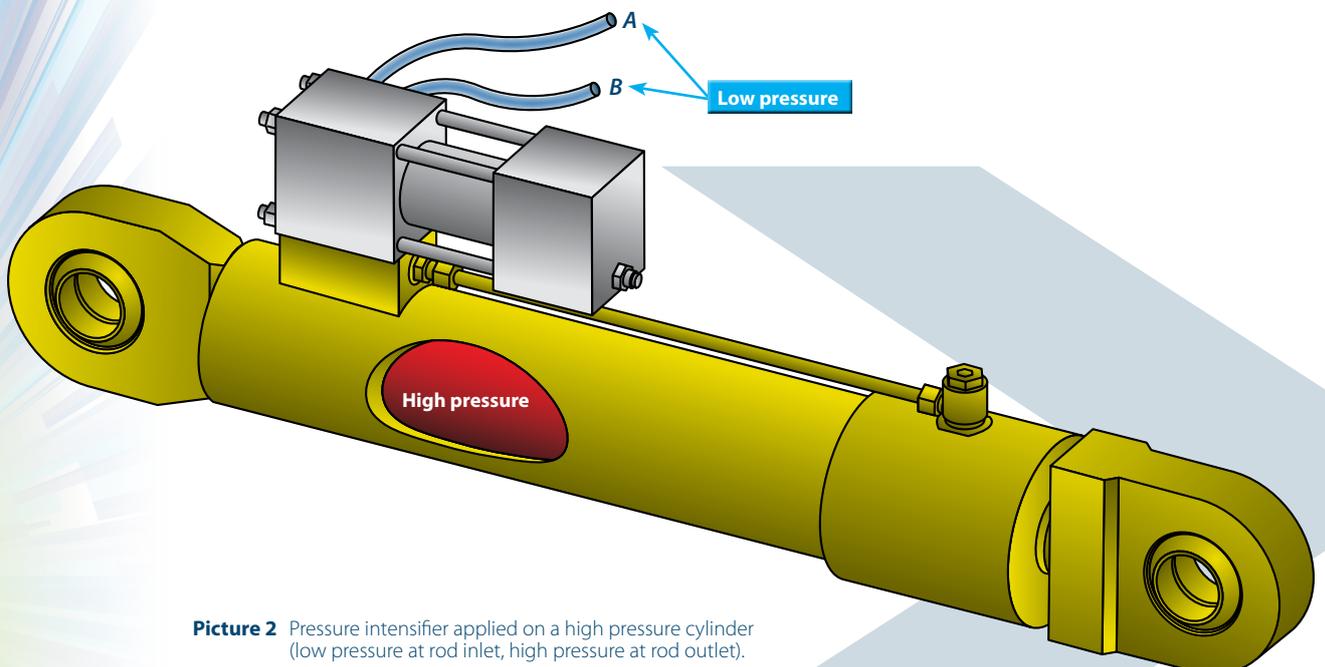


Picture 2 Characteristic pressure intensifier section

Operating principle

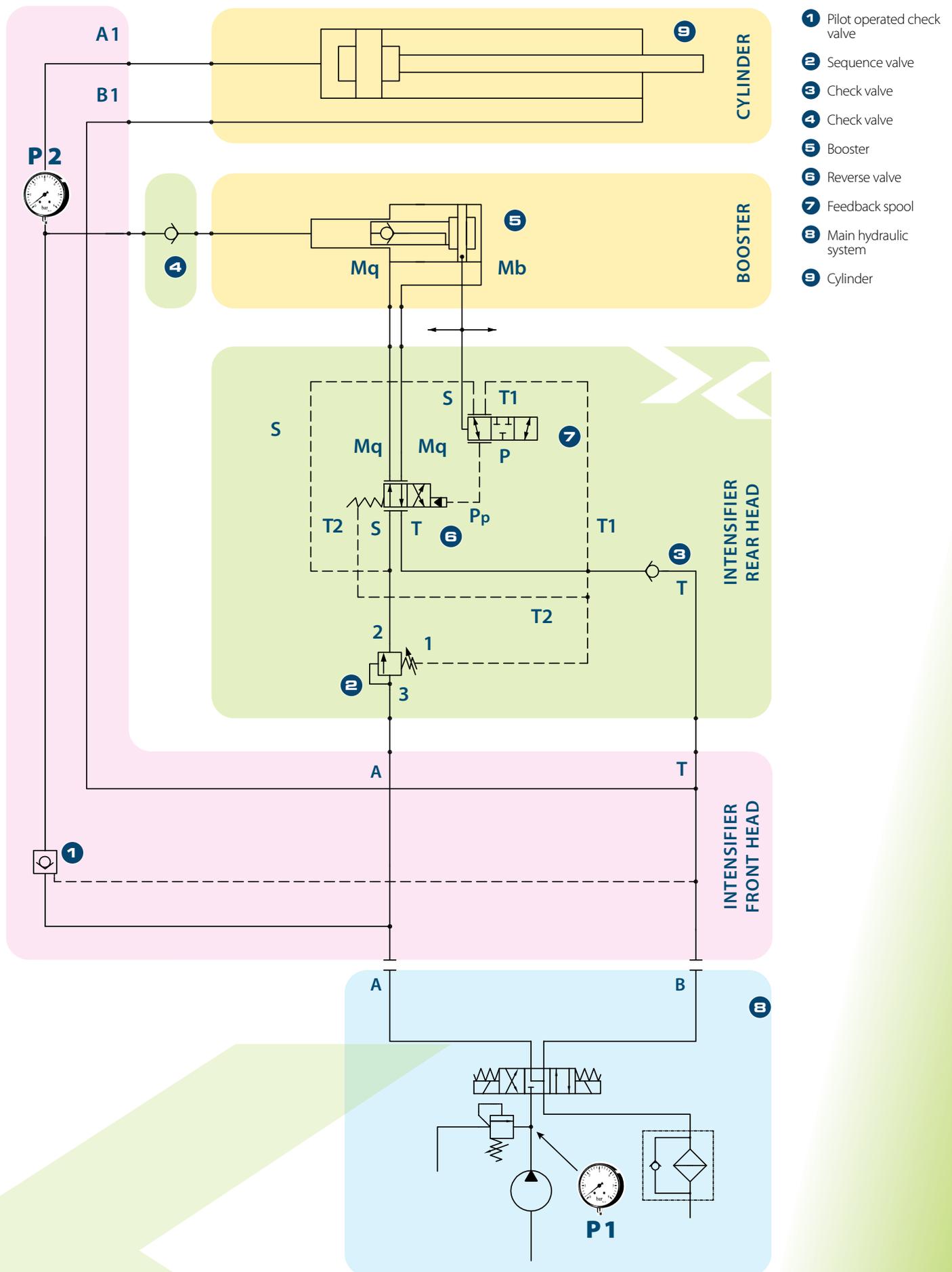
- 1 Loadless rod extension. The hydraulic oil enters through inlet *A* and is sent to valve 1 (valve 2 is calibrated, therefore it is closed). The oil enters into the cylinder bottom head, causing the cylinder to extend.
- 2 The cylinder rod extends until it comes across a resisting load; valve 2 opens, the oil goes through valve 7 and goes on into the Pp line of valve 6 which takes up the crossover position. The oil is then driven into Booster 5, where it is intensified according to the designed multiplication ratio (for example 1:4), and then to the cylinder bottom head (meanwhile, valve 1 closes due to the pressure difference).
- 3 Once Booster 5 has reached its stroke limit, the feedback spool 7, which is mechanically linked to it, connects outlet Pp of valve 6 with T1, bringing it to the parallel position. This causes Booster 5 to retract and hence to be filled with oil. At this point, it is ready to resume its pressure intensifying stroke on the cylinder bottom head.
- 4 Booster 5 stops intensifying the pressure until the cylinder has reached the stroke limit or the pressure value required by the load.
- 5 The pressure remains stable at the reached value, provided that there is no leakage on the cylinder and that there are no load changes.
- 6 To reduce pressure in the cylinder bottom head and to get the cylinder to retract, switch the inlet pressure delivered by the hydraulic system to inlet *B*. Valve 1, which features a pressure reducing device, depressurizes the cylinder bottom head and then opens, ensuring that the hydraulic cylinder resumes the standard pressure set in the main hydraulic system.

APPLICATION



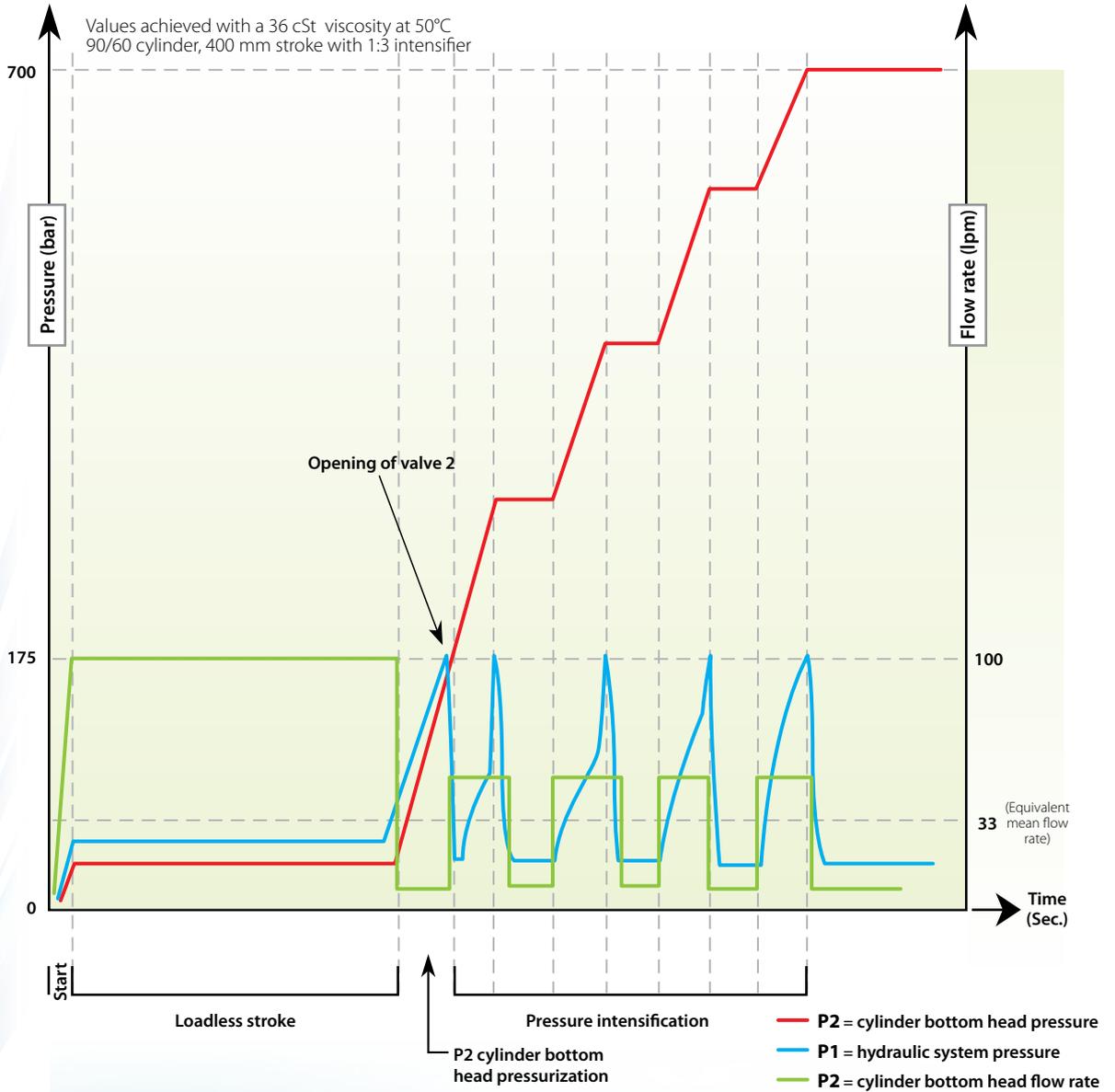
Picture 2 Pressure intensifier applied on a high pressure cylinder (low pressure at rod inlet, high pressure at rod outlet).

HYDRAULIC DIAGRAM



CHARACTERISTIC CURVES

Laboratory tests have evidenced the following operating characteristic curves in cylinders fitted with an intensifier:

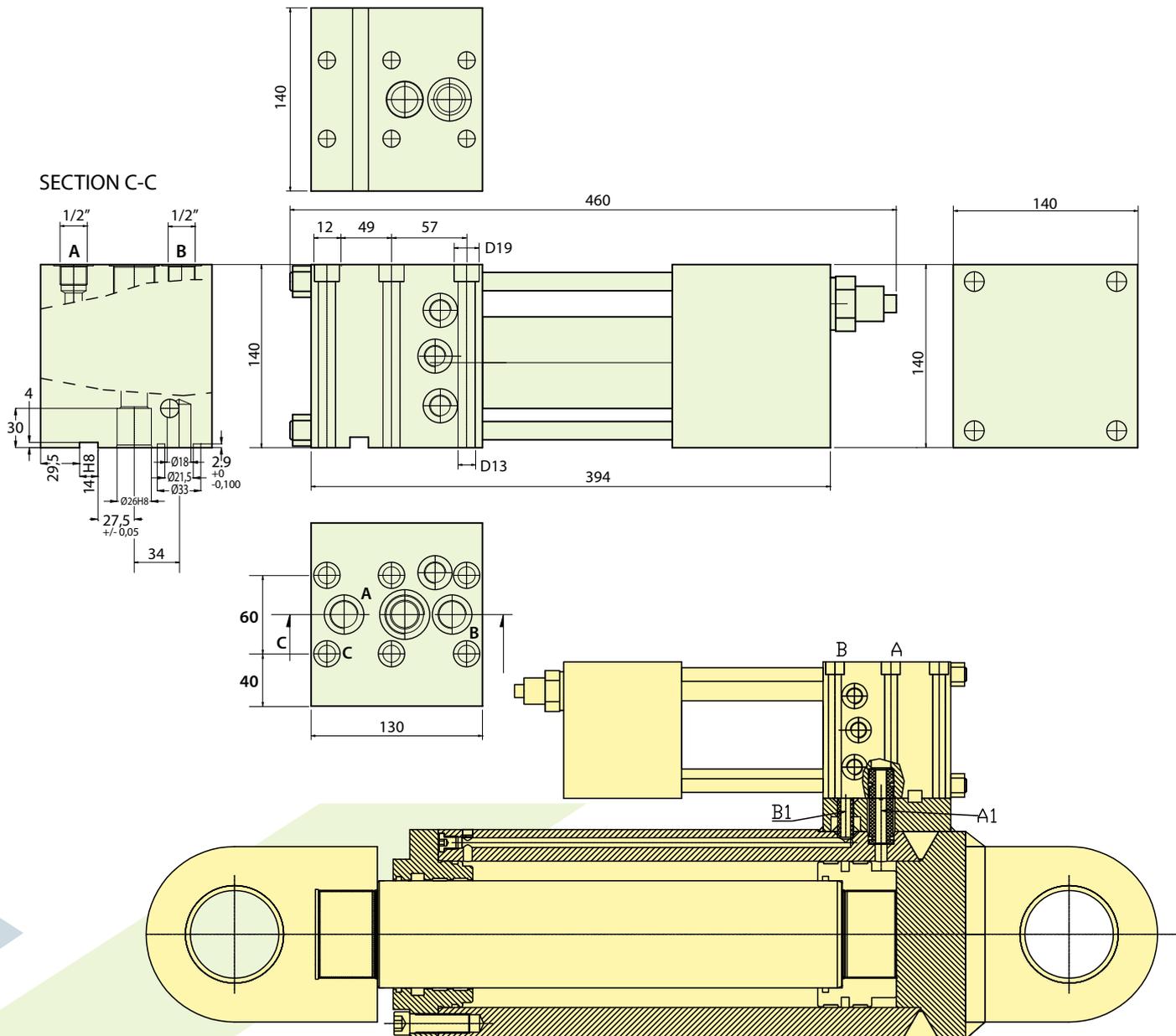


Picture 3 Cylinders with intensifier for mining works

PERFORMANCE DATA

Maximum operating pressure	bar	700
Maximum flow rate	l/min	100
Ambient temperature range	°C	-20 / +70
Fluid temperature range	°C	-20 / +80
Fluid viscosity range	cSt	10 ÷ 400
Degree of fluid contamination	ISO 4406:1999 Standard	class 20/18/15
Recommended viscosity	cSt	25
Masse	kg	35

INSTALLATION DIMENSIONS



Picture 4 Cylinder with intensifier for shears (demolition)

DEMOLITION, PULVERISING

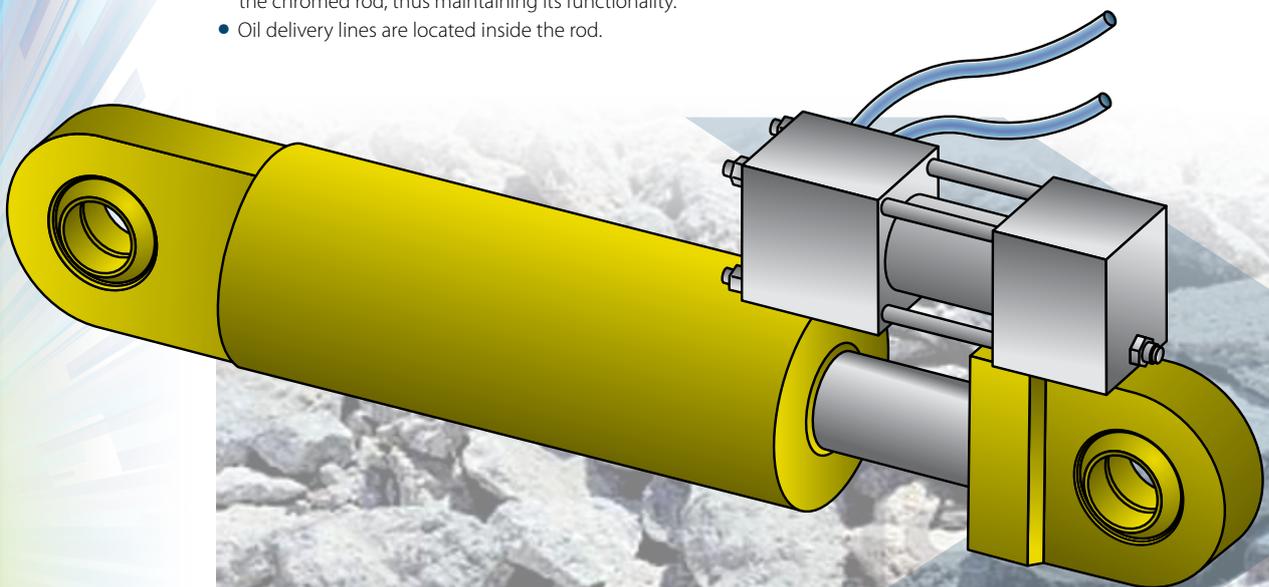


The field of **demolition** represents one of the main applications of pressure intensifiers. In this field, the weight of the cylinders linked to the demolition crusher, permits more extension of the operating machine arm they are connected to. The use of an intensifier allows reducing the cylinder diameter or employing crushers with a higher closing force.

Icop Hydraulics intensifiers for the demolition field feature yet an additional exclusive function in that they generate a strong impact when the crusher hits the concrete structure. This causes the structure to collapse easily, thus increasing productivity.

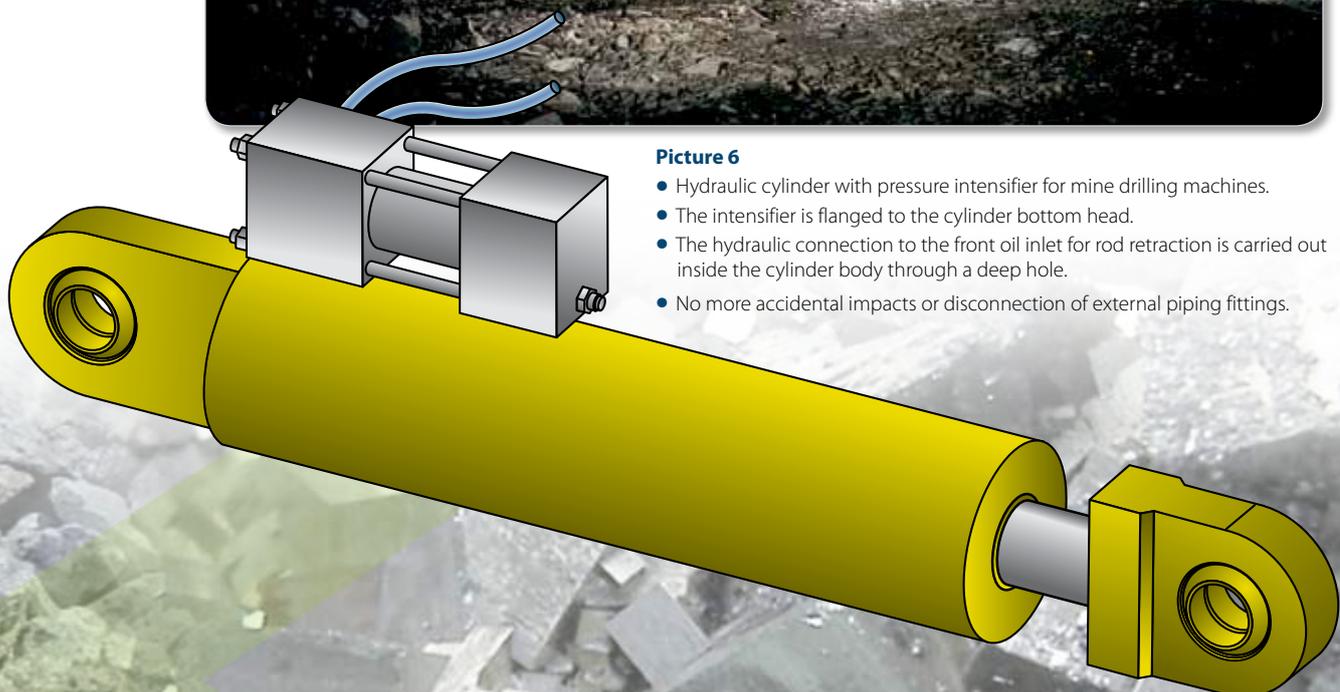
Picture 5

- Hydraulic cylinder with pressure intensifier for demolition-pulverising machines.
- The pressure intensifier is flanged to the rod.
- During the work phase, the cylinder body comes out, the demolition debris do not hit the chromed rod, thus maintaining its functionality.
- Oil delivery lines are located inside the rod.



MINING INDUSTRY

In **mining industry** applications, **Icop Hydraulics** pressure intensifiers help optimise the digging and drilling works. When the tool hits a highly resistant rock, the pressure intensifier **automatically** generates a pressure head, which allows the tool to break through. Pressure and force on the cylinders remain the same until the rock layer bearing more resistance has been broken through. After that, the load on the cylinders decreases and the pressure intensifying effect stops, leaving on the cylinders the pressure set in the hydraulic system.



Picture 6

- Hydraulic cylinder with pressure intensifier for mine drilling machines.
- The intensifier is flanged to the cylinder bottom head.
- The hydraulic connection to the front oil inlet for rod retraction is carried out inside the cylinder body through a deep hole.
- No more accidental impacts or disconnection of external piping fittings.

CRANES AND LIFTING

In the past twenty years, the field of **cranes** has undergone an impressive transformation thanks to the introduction of electronic controls. Now, machines feature higher safety standards and operating precision, due to the tests carried on the hydraulic systems using gear or piston pumps with max. pressure limits of **350 bars**. In specific situations, the use of pressure intensifiers ensures a considerable increase in power. For this field, **Icop Hydraulics** has developed a special intensifier with low pressure pulsations to prevent the arm from swinging. Limited weights and increased lifting power offer a major competitive advantage to the most innovative crane manufacturers.

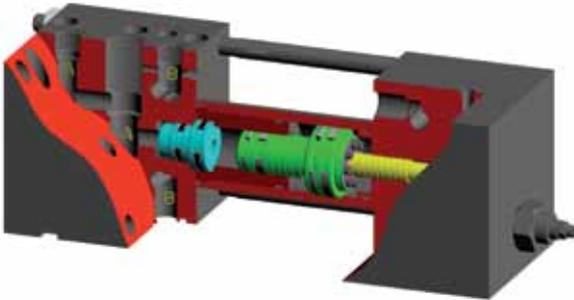


Picture 7 Lifting arm cylinder

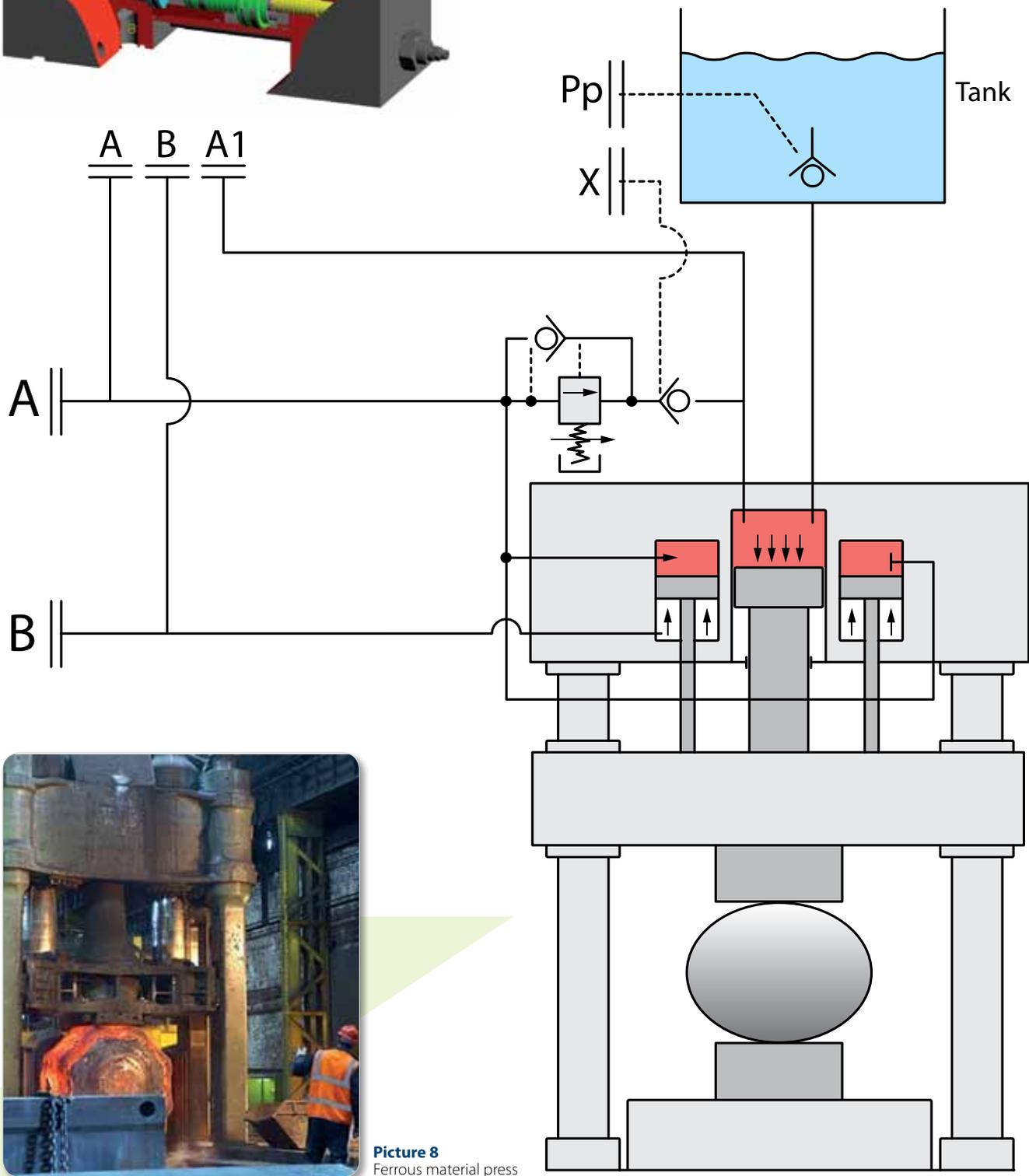
PRESSES

ICOP Hydraulics pressure intensifiers can be fitted in hydraulic press control circuits. Two possible configurations, depending on the size of the press:

- Double acting with direct pump crossing
- In a shunt with pressurization occurring after the downward stroke of the press and the closing of pre-filling valve.



Hydraulic diagram of an intensifier applied in a shunt to a vertical gravity press with auxiliary cylinders.



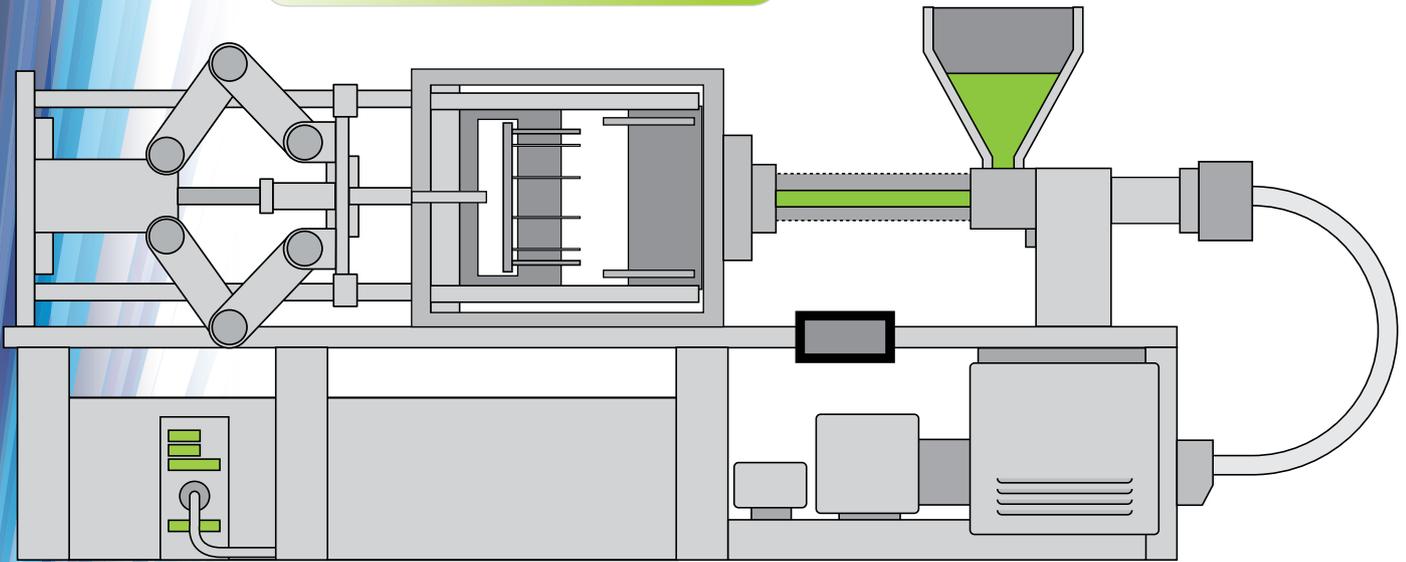
Picture 8 Ferrous material press

INJECTION AND BLOWING

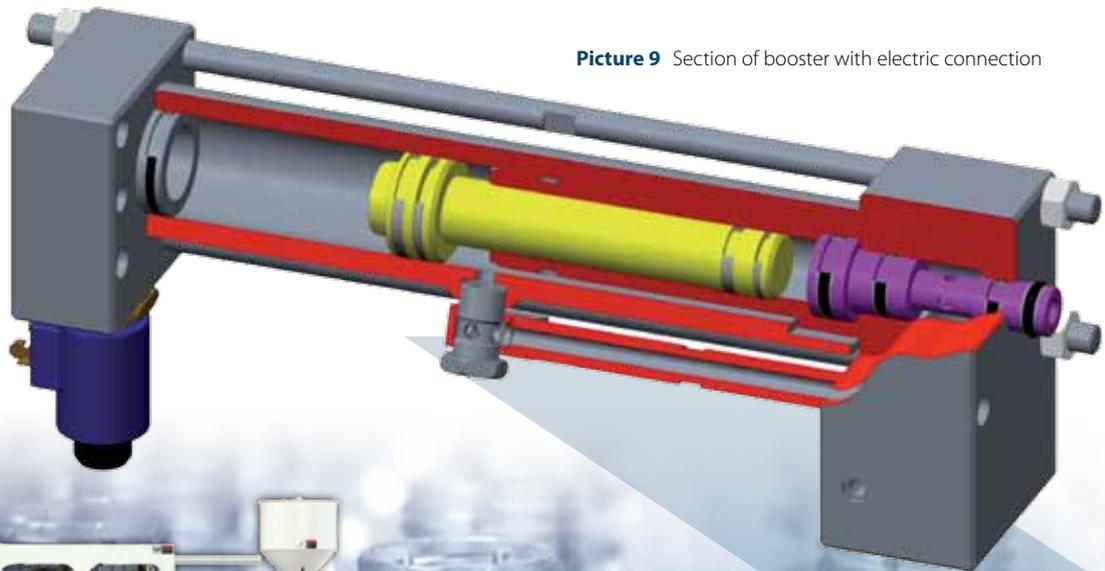
plastics

The great innovations in the field of **plastics injection and blowing** machines have determined a massive introduction of electromechanical actuators in place of the conventional hydraulic drives. The use of **Icop Hydraulics** pressure intensifiers represents an efficient alternative, particularly in the mould closing function.

Characteristic diagram of a mould closing device for plastics injection machines (simplification: no need for toggle joint thanks to an increased thrust force):



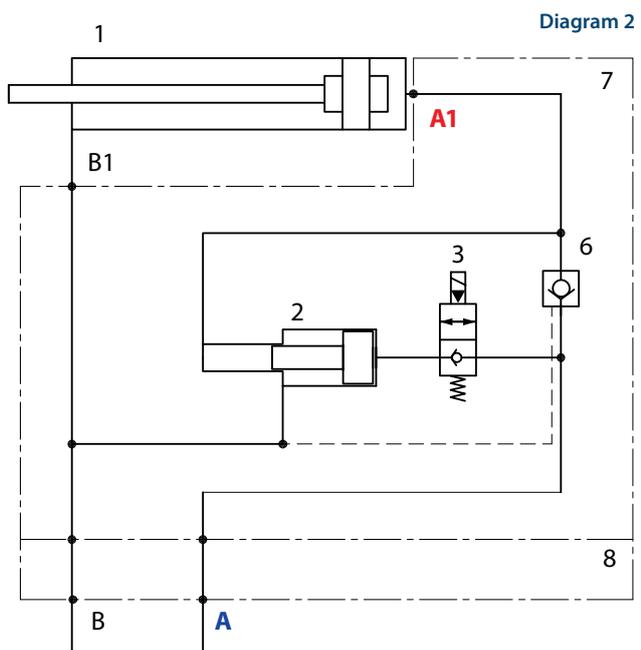
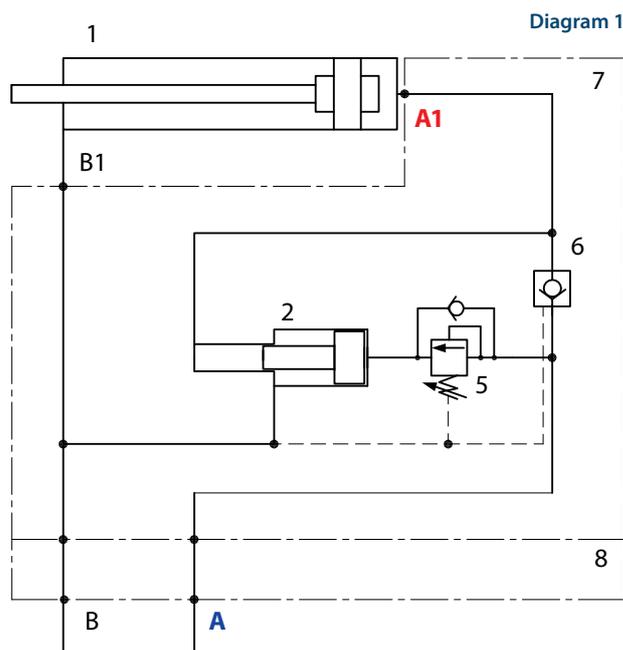
Picture 9 Section of booster with electric connection



The innovation brought about since the introduction of **Icop Hydraulics** intensifiers on the plastics injection machines has had two main effects:

- 1) simplification: no need for toggle joint thanks to an increased thrust force.
- 2) a reduction of the electric power of the hydraulic system, which allows reducing the diameter of the closing cylinder as well as the inlet flow rate

Diagram 2 has a higher performance as it allows determining when to insert the **booster** in an extremely accurate and fast way. By installing the booster on the cylinder by means of a suitable sizing, the maximum pressure can be reached very fast by energizing valve 3 only once. This is because only the oil inside cylinder 1, side **A1**, is to be pressurized.



Operating principle - diagram 1

- Cylinder 1 rod is extended, the mould closes.
- Pressure on **A** increases up to valve 5 setting value.
- Valve 5 opens, booster 2 starts operating by intensifying pressure on **A1**.
- The maximum value of **A1** depends on the booster multiplication ratio and on the inlet pressure of the hydraulic system (for example, 800 bar on **A1** with 200 bar system pressure on **A** and a 1:4 multiplication ratio).

Operating principle - diagram 2

- Cylinder 1 rod is extended, the mould closes.
- Pressure on **A** increases up to maximum value of the hydraulic system.
- The booster starts working when solenoid valve 3 is energized; pressure on **A1** is intensified.
- **A1** maximum value depends on the booster multiplication ratio and on the inlet pressure of the hydraulic system (for example, 800 bar on **A1** with 200 bar system pressure on **A** and a 1:4 multiplication ratio).

