



ROEMHELD
HILMA ■ STARK

CATALOGUE

Power Units and Clamping Pumps



Power Units

Clamping Pumps

Hydraulic Intensifier

ws.roemheld.com

wz.roemheld.com

mh.roemheld.com

POWER UNITS AND CLAMPING PUMPS

Clamping Power Units, Hydraulic Power Units, Hydro-Pneumatic Pump Units and Manually-Operated Pumps to Generate and Control Hydraulic Pressure

Power Units



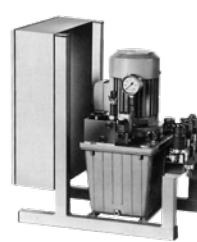
D 8.0115

max. flow rate 0.82/2.1/3.5 l/min
max. operating pressure 500 bar



D 8.013

max. operating pressure 500 bar



D 8.015

with manual or programmable -
proportional pressure adjustment



D 8.026

flow rate 0.9 to 12 l/min
reservoir sizes 11, 27, 40, 63 l
max. operating pressure 500 bar



D 8.031

reservoir sizes 27, 40, 63 l

Clamping Pumps



D 8.600

Hydro-pneumatic pumps
max. flow rate 1.5 l/min
max. operating pressure 500 bar



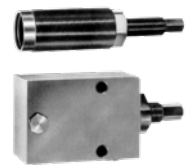
D 8.602

Hydro-pneumatic pump units
max. operating pressure 500 bar



D 8.800

Hydraulic pumps
manually operated
max. operating pressure 500 bar



D 8.819

Screw pumps
max. operating pressure 500 bar

Hydraulic Intensifier



D 8.753

Intensifier 21 cm³
max. operating pressure
125/500 bar



D 8.756

Intensifier 0.2 – 2.6 l/min
max. operating pressure 500 bar



D 8.757

Intensifier 1 – 2.6 l/min
max. operating pressure 500 bar



D 8.770

Intensifier air – oil
57 – 188 cm³
max. operating pressure 500 bar



Power Units

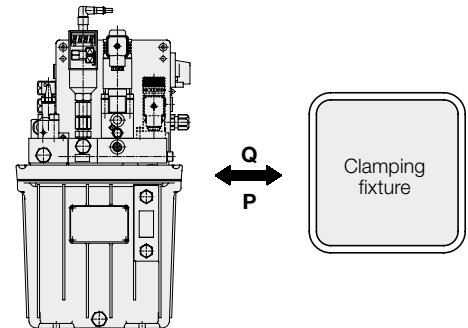
ready for connection*, energy-saving intermittent cycling

max. flow rate 0.82/2.1/3.5 l/min, max. operating pressure 500/250/160 bar



Advantages

- Very compact design
- Energy-saving intermittent cycling
- Many control variants
- Electronic pressure switch
- Digital pressure display
- Quick pressure adjustment by teach-in function
- Electric control optimally adapted
- High-quality leakage-free poppet valves
- Pressure generator also without valves available
- Useful accessory already mounted
- Alternatively manual switch or foot switch
- Ready for connection*



Application

These power units are especially suitable for the operation of small to medium-sized hydraulic clamping fixtures.

Maximally two clamping circuits for single or double-acting cylinders are available, that can be controlled independently of each other.

Thereby also "shuttle machining" is possible, i.e. that during machining of the workpiece in one fixture, workpiece change on the second fixture can be made.

Description

A special feature is the mounting of pump and electric motor in the reservoir. Thus hydraulic and electric control can be arranged in a space-saving way and easily accessible on the reservoir cover. The modular design enables a multitude of control variants.

The radial piston pump is available with three different flow rates and operating pressures.

To allow an energy-saving intermittent cycling only leakage-free poppet valves are used.

Important notes

These power units are exclusively designed for the industrial use of pressure generators for hydraulic clamping fixtures that allow intermittent cycling (see example).

All connected hydraulic components must be leakage-free and designed for the maximum operating pressure of the power unit.

The power unit supplies very high pressures. The connected clamping cylinders generate very high forces so that there is a permanent danger of crushing in the effective area of the piston rod. The manufacturer of the fixture or the machine is obliged to provide effective protection devices.

Installation, start up and maintenance have to be made according to the supplied operating instructions by authorised experts.

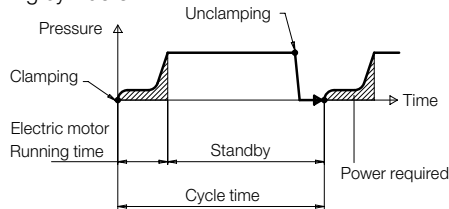
Energy-saving intermittent cycling

The electric motor is only running, as long as hydraulic oil is really required, that means to

- extend and retract the clamping cylinder
- build up the operating pressure

Example

Pressure-time diagram for single-acting clamping cylinders



In this example of a hydraulic clamping fixture the running time of the electric motor corresponds to the clamping time, which is only a few seconds.

In standby mode the power consumption is relatively low (see Electrical data).

Prerequisites are leakage-free clamping elements, valves and accessories.

The pressure control is made by an electronic pressure switch, that switches on the electric motor for a short time in case of a pressure drop.

Safety features

- Operating pressure infinitely adjustable, therefore precisely defined clamping force
- Electronic pressure switch with digital pressure display
- Repeatability ± 1 bar
- Pressure drop max. 10 %
- Hermetically sealed poppet valves
- Screen disks in the valve ports
- No pressure drop in case of power failure (see page 4)
- Control voltage 24 V DC
- Machine tool interlock (optional)
- Oil level and temperature control (optional)

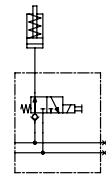
* Delivery

The power units are delivered ready for connection, i.e. after filling of hydraulic oil and connection of the hydraulic and electric lines they are ready for operation.

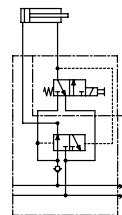
Control variants

1 clamping circuit

single acting

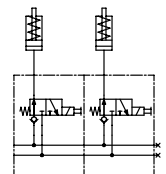


double acting

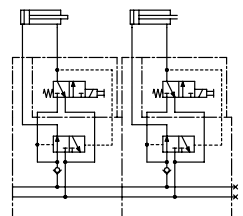


2 clamping circuits

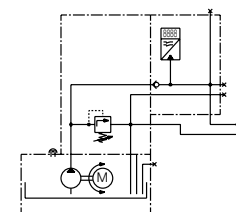
single acting



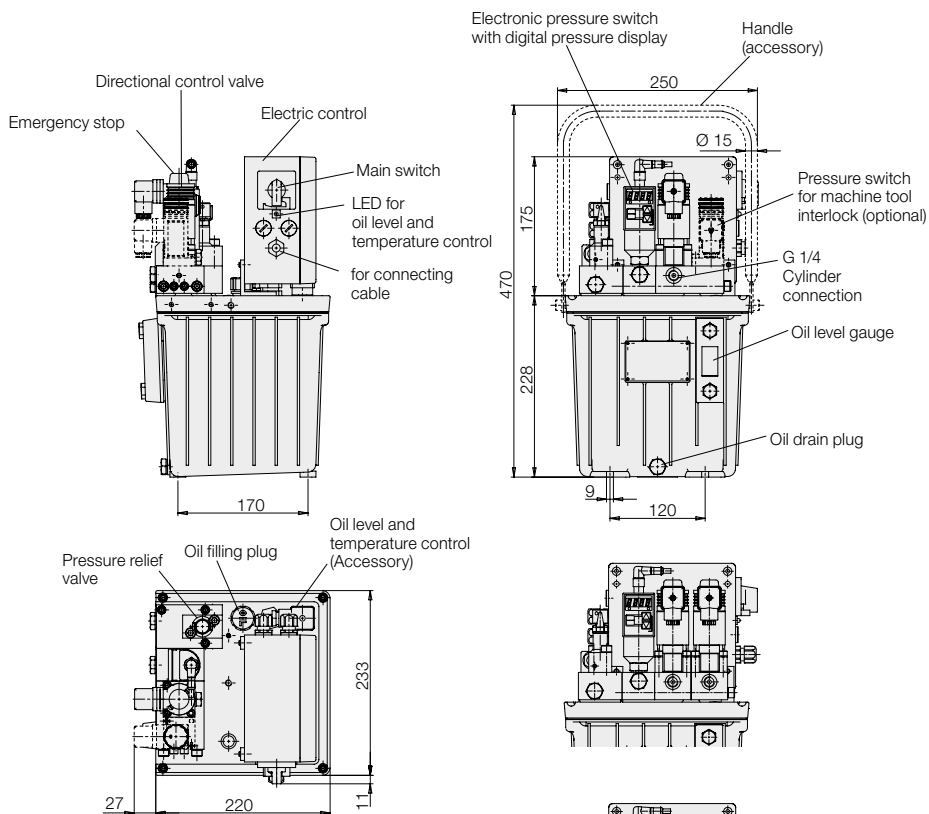
double acting



Without valve



Dimensions Technical data



Switch (Clamping-Unclamping)

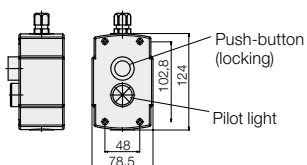
The power units are alternatively delivered with connected manual or foot switch (see chart). The pilot light in the switch signals:

1. Switch in clamping position
2. The adjusted clamping pressure is available

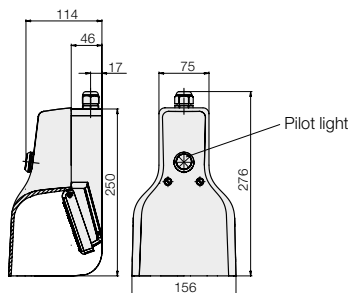
Important note!

This message signals that the clamping pressure is available at the electronic pressure switch of the power unit. The actual pressure of the clamping fixture can only be controlled by an installed pressure switch installed on the fixture (see machine tool interlock).

Manual switch



Foot switch



For start up it is imperative to pay attention to the supplied operating instructions!

Note

Power unit with manual switch for coupling systems see data sheet F 9.425

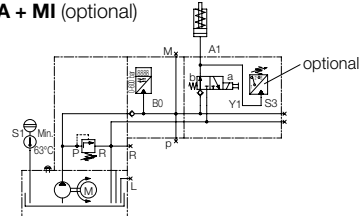
Hydraulic circuit diagrams

SA = Single-acting cylinders

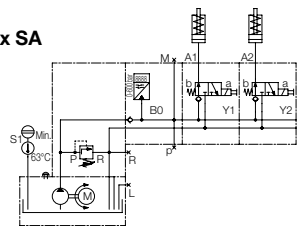
DA = Double-acting cylinders

MI = Machine tool interlock by additional pressure switch

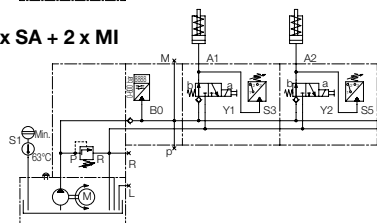
SA + MI (optional)



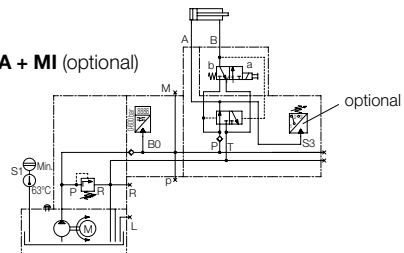
2 x SA



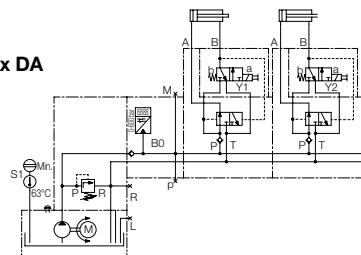
2 x SA + 2 x MI



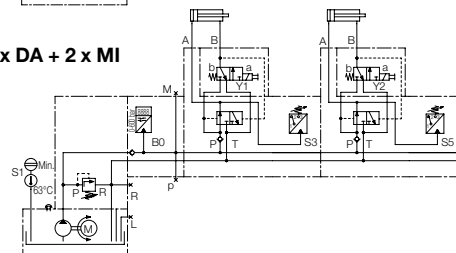
DA + MI (optional)



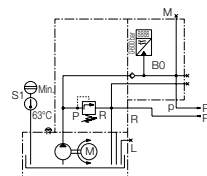
2 x DA



2 x DA + 2 x MI



Without valves



Versions Options • Accessories

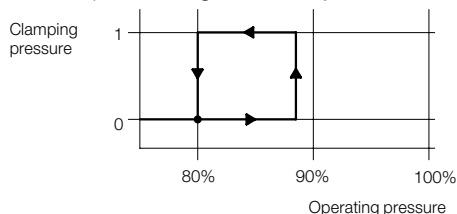
Cylinder type SA / DA without / with Pressure switch MI* (at power unit)	Directional control valve		Electric control	Terminal box	Manual switch	Foot switch	with- out	Flow rate / max. operating pressure			[cm³/s] [l/min] [bar] Weight [kg]
	3/2	4/2						13.67	35	58.5	
								0.82	2.1	3.51	
								500	250	160	
								Part no.	Part no.	Part no.	
	1		•		1			8405121	8405221	8405321	29.5
	1		•			1		8405122	8405222	8405322	30.5
	1		•				•	8405131	8405231	8405331	28.5
	1		•	•			•	8405141	8405241	8405341	28
	1		•		1			8405181	8405281	8405381	30.5
	1		•			1		8405182	8405282	8405382	31.5
	1		•				•	8405187	8405287	8405387	29.5
	1		•	•			•	8405143	8405243	8405343	29
	2		•		2			8405105	8405225	8405325	31.5
	2		•			2		8405106	8405226	8405326	33.5
	2		•				•	8405113	8405233	8405333	29.5
	2		•	•			•	8405142	8405242	8405342	29
	2		•		2			8405185	8405285	8405385	32.5
	2		•			2		8405186	8405286	8405386	33.5
	2		•				•	8405189	8405289	8405389	31.5
	2		•	•			•	8405145	8405245	8405345	29
		1	•		1			8405109	8405209	8405309	30
		1	•			1		8405111	8405211	8405311	31
		1	•				•	8405112	8405212	8405312	29
		1	•	•			•	8405147	8405247	8405347	28.5
		1	•		1			8405117	8405217	8405317	31
		1	•			1		8405118	8405218	8405318	32
		1	•				•	8405119	8405219	8405319	30
		1	•	•			•	8405148	8405248	8405348	29.5
		2	•		2			8405107	8405207	8405307	32.5
		2	•			2		8405108	8405208	8405308	33.5
		2	•				•	8405115	8405215	8405315	31.5
		2	•	•			•	8405146	8405246	8405346	31
		2	•		2			8405137	8405237	8405337	34
		2	•			2		8405138	8405238	8405338	35
		2	•				•	8405139	8405239	8405339	33
		2	•	•			•	8405140	8405240	8405340	33
-	-	-	•				•	8405110	8405210	8405310	27.5
-	-	-	•	•			•	8405149	8405249	8405349	27

* Machine tool interlock

As an option, every clamping circuit is checked by an additional pressure switch, which has to be electrically connected directly to the control of the processing machine.

Messages:

- Clamping pressure available
→ Workpiece can be machined
- Clamping pressure dropped below 80 %
→ Stop machining immediately



The switching point must be adjusted to 80% of the adjusted clamping pressure.

Note

If the pressure must be frequently changed, the electronic pressure switch is easier to adjust (identification letter "E").

Handle "B"

With the handle, the power unit can be easily transported by two persons to different places of installation.

Example of ordering

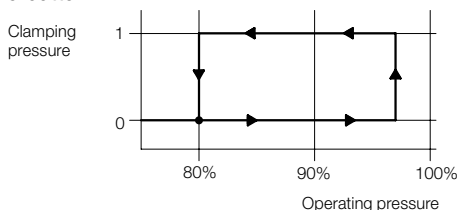
Power unit 8405221 with handle

Part no. 8405221B

Electronic pressure switch for machine tool interlock "E"

(instead of the mechanical pressure switch)

The lower switching point (80 % of the clamping pressure) of electronic pressure switches is firmly programmed and can be stored in teach mode for every desired clamping pressure by pressing a button.

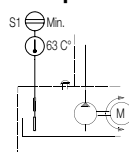


Example of ordering

Power units 8405-185 with two electronic pressure switches for machine tool interlock

Part no. 8405185E

Oil level and temperature control "T"



The oil level and temperature control is installed in the reservoir cover and electrically connected to the control box. In case of an error message, the control LED below the main switch is lit.

Possible errors:

- Oil filling quantity < 2.3 l
Shortage 0.7 l below the minimum oil level gauge.
Required refilling quantity min.1.5 l
- Oil temperature > 63 °C

Important note!

As long as the error message is available the electric motor does no longer start to avoid damages due to overheating. This means that in the case of a pressure drop the pump does not deliver!!!

Recommendation

Above all with automated operation the oil level and temperature control should only be used for machine tool interlock in combination with pressure switches. This is the only way to ensure that during the switch-off of the electric motor the workpiece machining will be interrupted in the case of a pressure drop of more than 20 %.

Example of ordering

Power unit 8405238 with machine tool interlock and oil level and temperature control

Part no. 8405238T

Different combinations

The three options described above are also available in combination. When placing the order please stick to the following sequence :

- | | |
|-----------------|-----------------------|
| "T" + "B" | 8 4 0 5 - X X X T B |
| "T" + "E" | 8 4 0 5 - X X X T E |
| "B" + "E" | 8 4 0 5 - X X X B E |
| "T" + "B" + "E" | 8 4 0 5 - X X X T B E |

Technical data Relative duty cycle

General data

Design	radial piston pump
Direction of rotation	any
Porting connection	fittings with G1/4 with screw-in plugs form B or E as per DIN 3852
Mounting	3 screws M 8
Mounting position	upright
Environment temperature	+5...+35 °C
Max. oil temperature	+60 °C
Noise level	max. 82 dB(A) (at a distance and height of 1 m above the ground standing on insulation felts)

Hydraulic data

Min. operating pressure	30 bar
Viscosity range	4...800 mm²/s
Recommended viscosity range	10...200 mm²/s
Recommended viscosity class	ISO VG 22 as per DIN 51524
Recommended hydraulic oil	HLP 22 as per DIN 51524-2 (not suitable for liquids of type HFA, HFB, HFC and HFD)

	Filling quantity	usable quantity
Content of the reservoir max.	5.0 l	3.2 l
Oil level gauge max.	3.8 l	2.0 l
min.	3.0 l	1.2 l
Electrical oil level control	2.3 l	0.5 l

Electrical data

Motor type	2-pole three-phase motor
Rating power	0.75 kW
Rated speed	2830 min⁻¹
Supply voltage	3 ~ 230/400 V ΔY 50 Hz ± 10 %
Nominal current at 400 V	2 A
Power factor cos φ	0.82
Standby	
Power consumption "Clamped"	5 W
"Unclamped"	28 - 50 W
Isolation class	B as per VDE 0530
Main switch	with thermal overload protection, can be padlocked
Control Electric motor	circuit breaker, control by pressure switch
Control voltage	24 V DC
3/2 directional control valve	controlled by manual switch or foot switch
Fuses	required 3 x 6 A slow primary 2 x 4 A slow (5x30mm) secondary 1 x 2 A slow (5x20mm)
Code class	IP 54
Supply line required	4 x 1 mm²
Manual switch	5 x 1 mm² approx. 3m long
Foot switch	4 x 1 mm² approx. 3m long
EMC	tested

Hydraulic control

The hydraulic control is designed for direct manifold mounting without pipes and consists of the following components:

The connecting block with pressure relief valve to adjust the desired operating pressure. The maximum operating pressure (chart page 3) is mechanically limited in the factory.

Series mounting plate with electronic pressure switch and digital pressure display to adjust the switch-off pressure for the electric motor. The adjustment is made in teach-in mode independent of the adjustment of the pressure relief valve. A pressure drop of approx. 10 % will cause the pump motor to start again.

Series mounting plate with directional control valve for control of single or double-acting cylinders.

Alternative:

Series mounting plate with directional control valve and pressure switch for machine tool interlock (see page 3)

Valves

Only leakage-free poppet valves are used to allow the energy-saving intermittent cycling (see page 1). The electric control is designed for maximally two solenoid valves.

Single-acting cylinders

One 3/2 directional control valve per clamping circuit is directly operated by a manual switch or a foot switch.

Double-acting cylinder

The 4/2 directional control valve is a combination of an electrically and a hydraulically operated 3/2 directional control valve. The control is made by a manual switch or a foot switch.

Operation of two clamping fixtures

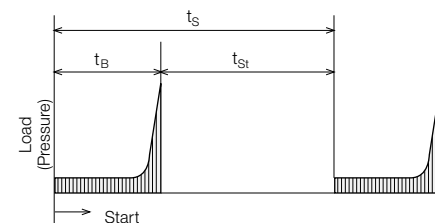
The control enables the operation of two clamping fixtures by means of two manual switches or two foot switches. Prerequisite is the same operating pressure of both fixtures.

Safety in case of power failure

The solenoid valves are de-energized in "clamping position". In the case of power failure this switching position is remained and thereby also the hydraulic pressure in the clamping line. A pressure drop is only to be feared with leaking clamping elements or valves.

Relative duty cycle

These power units are only suitable for intermittent cycling (intermittent cycling S3 as per VDE 0530).



t_B = Running time of the electric motor from start to switching off (clamping time)

t_{St} = Downtime (workpiece machining time)

t_S = Cycle time

The relative duty cycle is

$$\% ED = \frac{t_B}{t_B + t_{St}} \cdot 100 = \frac{t_B}{t_S} \cdot 100$$

Example

Clamping fixture with double-acting cylinders

Clamping time	$t_{B1} = 5s$
Unclamping time	$t_{B2} = 3s$
Workpiece machining time	$t_{St1} = 60s$
Workpiece changing time	$t_{St2} = 12s$
Cycle time	$t_S = 80s$

Relative duty cycle

$$ED = \frac{t_{B1} + t_{B2}}{t_S} \cdot 100 = \frac{5s + 3s}{80s} \cdot 100 = 10 \%$$

The maximum duty cycle is a function of the motor load. Apart from the load, the motor winding temperature of the submerged motor is in principle dependent on oil temperature and oil level.

With maximum oil level, the complete winding is submerged in oil and optimally cooled.

With decreasing oil surface a part of the winding is in the air. Since air is a poor heat conductor, the winding temperature increases considerably. Therefore the load of the motor must be reduced.

The following chart indicates the relative cycle time as a function of the oil level in the reservoir. The maximum oil temperature of 60 °C must not be exceeded (see "Oil level and temperature control").

Maximum relative cycle time [%ED]

(at room temperature 23 °C)

Oil level	8405 1XX	-2XX	-3XX
maximum	5.0 l 40	25	20
minimum	3.0 l 25	20	16

Maximum running time of the electric motor [s]

(with different oil levels)

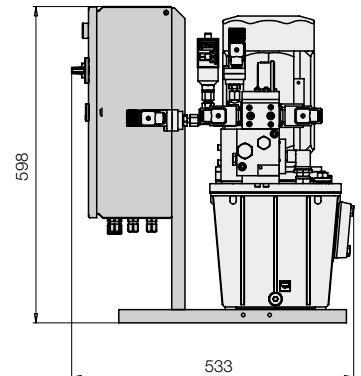
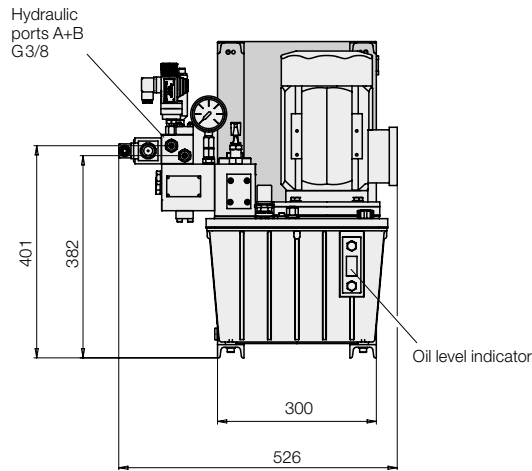
Reservoir			
maximum	5.0 l	120 s	91 s
usable	3.2 l		54 s
Anzeige			
maximum	3.8 l		
usable	2.0 l	120 s	57 s
Anzeige			
minimal	3.0 l	87 s	34 s
usable	1.2 l		20 s



Power Units

with two-hand operator console

max. operating pressure 500/250/160 bar



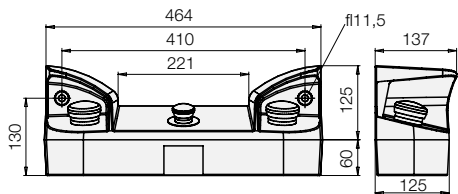
Two-hand operator console

The two-hand operator consoles are required for fixtures and installations with dangerous applications to keep hands from the effective area of the dangerous movement.

Both mushroom push-buttons have to be operated simultaneously within 0.5 seconds.

The basic housing of the two-hand operator console is made of plastics (Lexan 503R colour RAL 7035) and equipped with two mushroom push-buttons and one emergency palm button. The console is connected to the electric control with a 3 m long cable.

The two-hand operator consoles correspond to the demands as per EN ISO 13851.



Electric control

The electric control is installed in a control box 300x400x155 mm, which is connected by a mounting frame to the power unit.

The control box contains a safety control for evaluating and controlling all components.

Delivery

- Ready for operation after connection of the cable and filling in of the hydraulic oil
- High-pressure filter 10 µm
- Pressure gauge
- Pressure relief valve
- Control voltage lamp in the door of the control box
- Temperature and oil level control with an indication lamp in the door of the control box
- Luminous plugs on the valve solenoids
- Luminous plugs on the pressure switches
- Screw-in filters in the ports A + B for fixture type 2

Hydraulics

The hydraulic control of these power units is adapted to the function safety of the two-hand operator console and the electric control.

The control is designed for double-acting cylinders.

A cylinder motion by the 4/3 directional control valve is only possible if the valve solenoid is energized. In case of a voltage drop, the cylinder motion will be interrupted.

Technical data

Operating voltage	3/PE 400V 50Hz
Control voltage	24 V DC
Reservoir volume	11 l
Usable volume	6 l
Oil	HLP22 (piston pump) HLP32 (gear pump) DIN 51519 / 51524

Max. operating pressure	[bar]	500	250	160
Flow rate	[cm³/s]	15	41	75
	[l/min]	0.9	2.5	4.5
Rating	[kW]	0.75	1.1	1.1

Hydraulic ports

A+B	G 3/8
-----	-------

(in case of single-acting clamping cylinders, port B will be closed with the enclosed screw plug G 3/8)

Code for part numbers

8455	-	X	X	X
Basic type				
				Unclamping functions (see page 2)
				7 = variant a
				8 = variant b
				9 = only possible with fixture type 3
Max. operating pressure				Fixture type (see page 2)
4 = 500 bar				1 = clamping fixture
5 = 250 bar				2 = clamping fixture with couplings
6 = 160 bar				3 = bending, die-cutting and stamping fixture

Fixture type

Clamping fixture, type 1
8455-X1X

To trigger the clamping cycle, both mushroom push-buttons have to be pushed simultaneously. The mushroom push-buttons have to be depressed until the cylinder is extended and the green pilot light "Clamped" lights up. Then the clamping pressure is monitored by a pressure switch. If the mushroom push-buttons are released before the signal lamp lights up, the cylinder stops. Further extending or retracting of the cylinder is now possible by touch control of the two mushroom push-buttons or by the luminous push-button "Unclamping". When the system pressure has been reached, pressure switch B1 switches off the pump motor, and switches it on again, if pressure drops by more than 10%. For machine tool interlock, pressure switch B1 is set to 80 % of the clamping pressure. This signal is made available free of potential at the binders in the electric control and can be electrically controlled for linkages.

Unclamping functions

Variant a:
8455-XX7

For unclamping, the signal lamp "Unclamping" has to be operated and pushed as long as the cylinder is retracted and the blue luminous push-button "Unclamped" is lit.

Variant b:
8455-XX8

The luminous push-button "Unclamping" is only pushed for a short time. The blue luminous push-button "Unclamped" is blinking. Now the mushroom push-buttons have to be operated and pushed as long as the cylinder is retracted and the blue luminous push-button "Unclamped" is switched to permanent light.

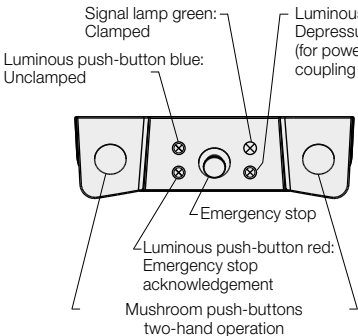
Clamping fixture with couplings, type 2
8455-X2X

The power unit has the additional function coupling or depressurise. By an additional white luminous push-button "Depressurised" both cylinder ports are depressurised. This function is required if the clamping fixture has to be separated from the power unit by a coupling unit (see data sheet F 9.425). In the ports A + B a filter element is screwed in.

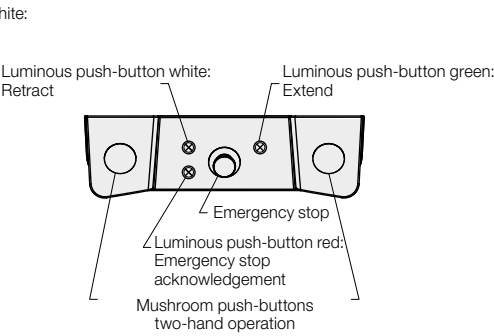
Bending, die-cutting and stamping fixture, type 3
8455-X39

Initial state:
Cylinder retracted, the green luminous push-button "Extend" is lit.
After operation of both mushroom push-buttons, the cylinder extends.
The mushroom push-buttons have to be pushed as long as the cylinder is extended (the green signal lamp of luminous push-button goes out, the white signal lamp of luminous push-button is lit), the pressure switch B1 reverses the valve (function effected) and the cylinder is retracted (luminous push-buttons change again).
If the mushroom push-buttons are released during the cylinder motion, the cylinder stops immediately. The luminous push-button is lit, which indicates the direction in which the cylinder will move after renewed operation of the mushroom push-buttons.
If the direction has to be reversed, the other luminous push-button has to be operated.
The direction changes again with every operation and is indicated by the green or white signal lamp.

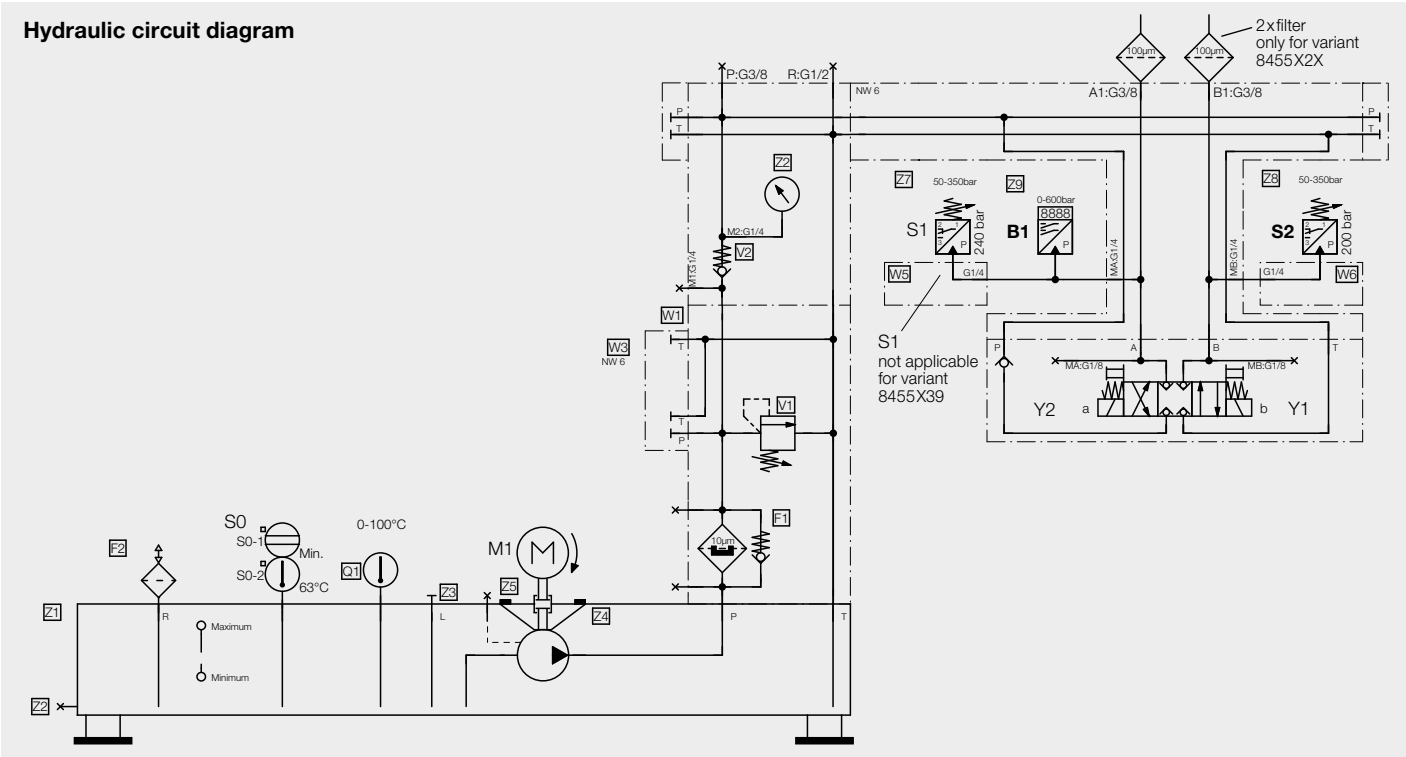
Two-hand operator console
Fixture type 1 and 2



Fixture type 3



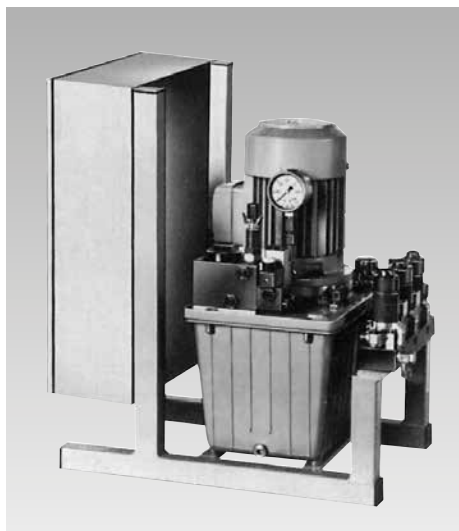
Hydraulic circuit diagram





Power Units

with manual or programmable proportional pressure adjustment
 400 V 50 Hz



Technical characteristics

- Proportional control
- Operating pressure: 50-500 bar, with 10 adjustable pressure stages
- Contact free of potential for machine tool interlock
- Valve and control voltage 24 V DC
- Oil level and oil temperature control
- Oil filler
- Hydraulic oil HLP 22
- Further data (see page 2)

Application

Hydraulic power units are used for clamping several fixtures with different clamping pressures. When using sensitive components, the clamping pressure or clamping force has to be optimised. For such applications a hydraulic power unit with proportional pressure adjustment is required, particularly if the pressures are frequently to be readjusted.

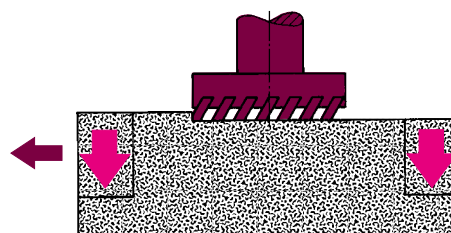
Positioning, supporting and clamping of workpieces on machine tools are part of the machining cycle. In most cases the sequence of the machining steps is determined by the N/C programme.

The programmable pressure adjustment allows to adjust the clamping pressure by means of the programme to the corresponding pressure of the machining step; therefore the M-functions of the machines are used.

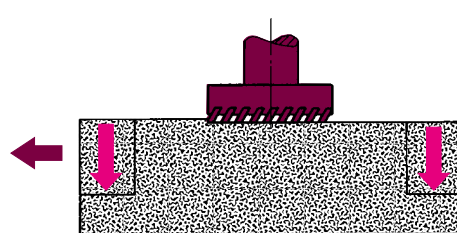
The power unit is particularly suited for applications where pressure adjustments are quite often adjusted manually.

Power units for double-acting cylinders and for shuttle machining are available.

Application example Rough machining



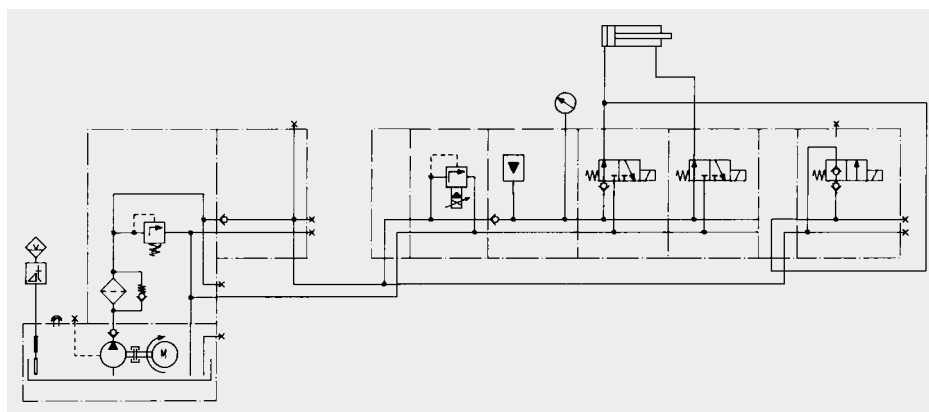
Finish machining



Clamping force

Machining force

Hydraulic circuit diagram of power unit with proportional pressure adjustment and pressure reduction, e.g. for finish machining

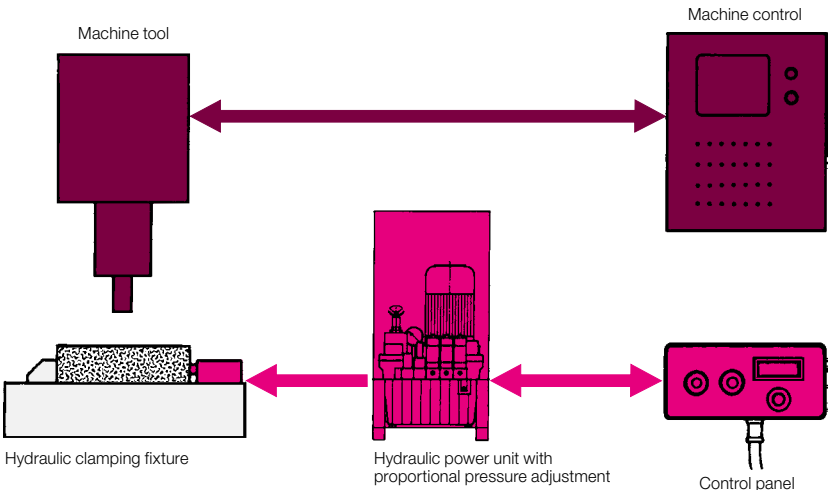


Manual pressure adjustment

The power unit is operated through the control panel which is installed directly besides the clamping point. There are 10 pressure stages adjusted. The operating pressure can be increased during the machining at any time. Pressure reduction can only be effected after unclamping was made.

Manual pressure adjustment with pressure reduction

To clamp workpieces according to the machining operation with minimum deformation, it is sometimes required to reduce the clamping pressure (e.g. for rough machining and following finish machining). A special hydraulic control is available for such applications.



Hydraulic power unit with proportional pressure adjustment

Cylinder double acting

Voltage	3 ~Y 400V ±5% 50Hz	
Flow rate	[l/min]	0.9
Oil volume	[l]	11
Rating	[kW]	0.75

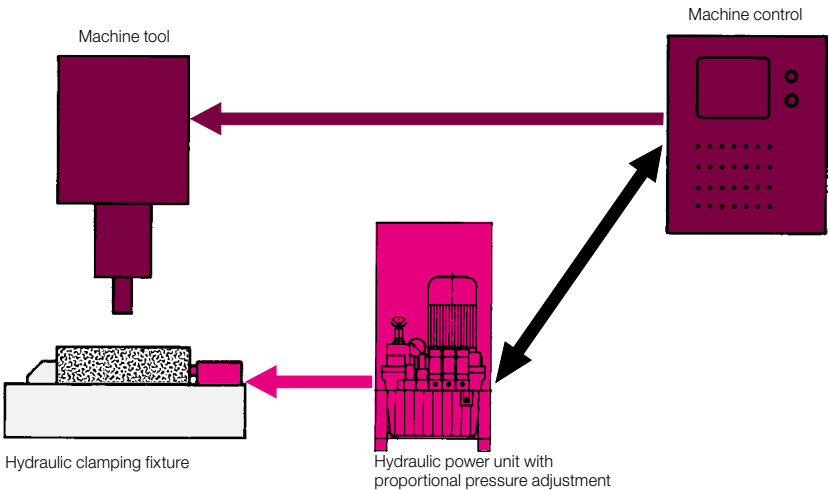
The hydraulic power unit can optionally be delivered for the operation of one fixture or for pendulum machining. Both versions can be equipped with or without pressure reduction.

Please contact us.

We are pleased to quote for the appropriate power unit for your application.

Programmable pressure adjustment

In modern automatic machining centres, that are required for flexible manufacturing, the clamping pressure must correspond to the cutting force. The manufacturing sequence and the corresponding clamping pressure including the pressure reduction are controlled by the programme of the N/C machine. The clamping pressure of the power unit with proportional pressure adjustment is adjusted via special commands of the N/C machine control and confirmed by return.



Hydraulic power unit with proportional pressure adjustment

Cylinder double acting

Voltage	3 ~Y 400V ±5% 50Hz	
Flow rate	[l/min]	0.9
Oil volume	[l]	11
Rating	[kW]	0.75

The standard hydraulic power unit with coupling to the N/C machine control is equipped with pressure reduction.

Please contact us.

We are pleased to quote for the appropriate power unit for your application.



Power Units in Modular Design

Operating pressure 30 to 500 bar, flow rate 0.9 to 12 l/min
 reservoir sizes 11 l, 27 l, 40 l, 63 l



Application

For the operation of hydraulic clamping fixtures and other handling and clamping systems on machine tools.

Description

The power units of this series consist of individual modules that are selected depending on the application and are assembled on the basis of a type code to a power unit ready for use.

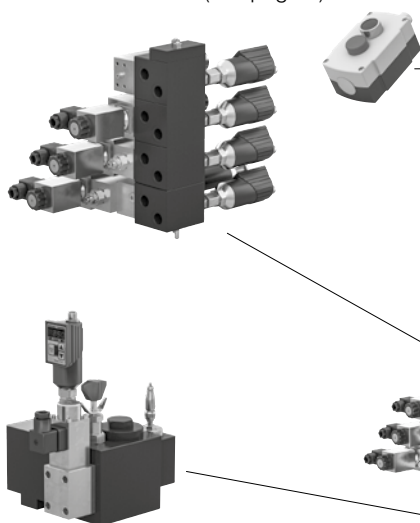
Modules

- Power unit (reservoir, pump, motor)
- Connecting block basic functions
- Valve block with up to 4 control circuits
- Electronics

Valve block

Control circuit **V1 XX X XXX SX_ ... V4**

Poppet/spool valves, function triggering, additional functions (see page 8)



Electronics **E X**

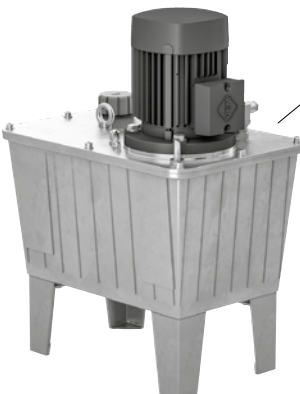
Electric control, terminal box, (see page 11)



Connecting block

Basic functions **A XXX_**

System pressure switch, unpressurised cycle, intermittent mode, filter control, oil control (see page 6)



Basic power unit **PM XX**

Motor rating 0.75 – 3.0 kW
 Reservoir sizes 11, 27, 40, 63 litres
 (see page 4)

Characteristics

- for single and double acting cylinders
- continuously adjustable operating pressure
- expandable to up to 8 pressure circuits
- constant flow rate
- wide range of valves
- wide range of hydraulic functions
- energy-saving mode S3 (intermittent mode) or S6 (unpressurised cycle)
- supplied ready for connection

Equipment - Standard

- connecting block with pressure relief valve
- pressure filter 10 µm
- oil level gauge
- oil temperature gauge
- design without piping

Equipment - Options

- electronic system pressure switch with simplified pressure adjustment by teach-in function
- pressure switch for machine tool interlock mechanically or electronically
- electrical oil level control
- electrical temperature control
- return filter
- electrical filter control
- electric control
- terminal box
- foot switch or manual switch
- key-operated switch

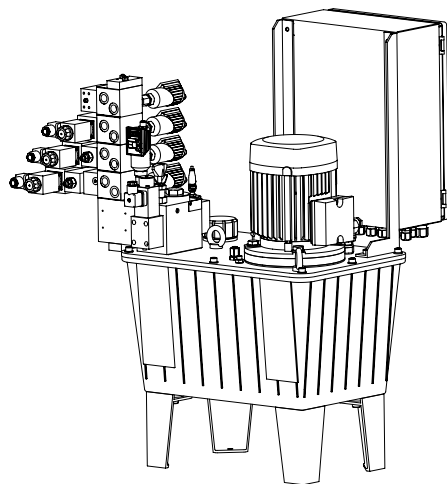
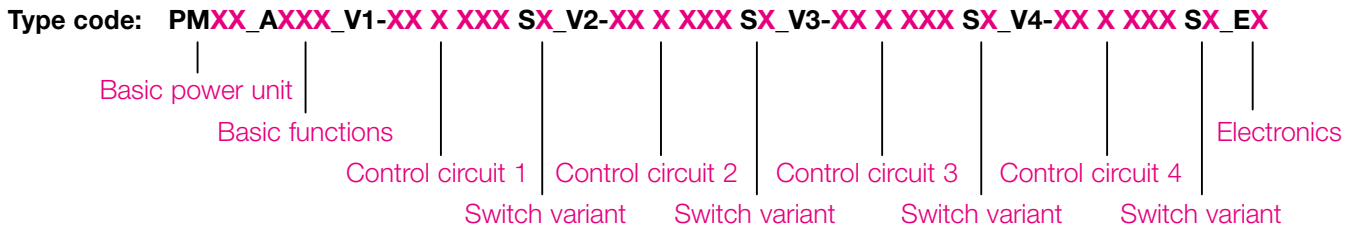
Performance data

p max. [bar]	Q [l/min]	Reservoir [l]
120	12	27 40 63
160	8.8	27 40 63
160	12	40 63
200	1.5	11 27 40 63
200	3.3	11 27 40 63
200	4.5	11 27 40 63
200	6.2	27 40 63
200	8.8	40 63
350	3.6	27 40 63
350	5.3	40 63
400	2.5	11 27 40 63
450	4.2	40 63
500	0.9	11 27 40 63
500	1.5	11 27 40 63
500	2.6	27 40 63
500	3.7	40 63
500	0.7/5.2	11 27 40 63
500	0.7/8.8	11

Further pump variants and equipments are available on request.

Power units in modular design

Type code "structure and determination"



Modular design

By the use of pre-assembled modules, module power units can be flexibly implemented in the short term and in a cost-effective way. The modular design and numerous design options allow a flexible adaptation to the respective application.

Module power units are particularly suitable as a base to build complex hydraulic controls. A linkable basic block offers the user the possibility to expand the power unit with different function and control elements for the specific application.

Determination of the type code

A type code that results from the used modules is available for the different module components and results in the final part number for the power unit.

To select the correct arrangement, size and performance of the individual components, you will find all parameters and their type code on the following pages.

Safety features

- Precisely defined clamping force by continuously adjustable operating pressure
- Electronic system pressure switch with digital pressure display (option)
- Repeatability ± 1 bar
- Renewed oil supply after a pressure drop of max. 10 %
- Machine tool interlock (option) at a pressure drop of max. 20 %, is automatically updated in case of pressure adjustment
- Oil level and temperature control (option)
- Precise oil temperature display by stick thermometer
- Pressure filter 10 μm in the connecting block
- Screen disks in the ports
- Control voltage 24 V DC
- Pressure maintenance in case of power failure due to hermetically sealed poppet valves
- Overpressure protection of the individual pressure circuits (option)

Important notes:

These power units are exclusively designed for the industrial use of pressure generators for hydraulic fixtures.

All connected hydraulic components must be leakage-free and designed for the maximum operating pressure of the power unit.

The power unit generates very high pressures. The connected cylinders generate very high forces so that there is a permanent danger of crushing in the effective area of the piston rod. The manufacturer of the fixture or the machine is obliged to provide effective protection devices. Installation, start up and maintenance have to be made according to the operating manual by authorised experts.

Technical data

Designs

- Gear pump max. 200 bar
- Piston pump max. 500 bar
- Pump combination max. 80 / 500 bar

Type of mounting foot mounting

Port size G 1/4, G 3/8 and G 1/2

Direction of rotation

(view from above onto the drive shaft)

- Gear pump clockwise rotation
- Piston pump any
- Pump combination counterclockwise rotation

Mounting position upright

Usable oil volume 50 % of reservoir volume

Vol. efficiency $\eta_{\text{vol}} = 85-95 \%$

Electrical characteristics - Motor

Nominal voltage*	400 V up to 2.2 kW star connection 400 V from 3 kW delta connection
Type	squirrel cage rotor, 4-pole
Voltage type*	three-phase AC voltage, 50 Hz
Code class	IP 55
Max. relative cycle time	depending on the operating pressure specifications for 100 % or 40 % ED see page 4

The calculation of the relative duty cycle is based on a cycle time of 10 min. With 40 % ED, e.g. the maximum load within the cycle should not exceed 4 min.

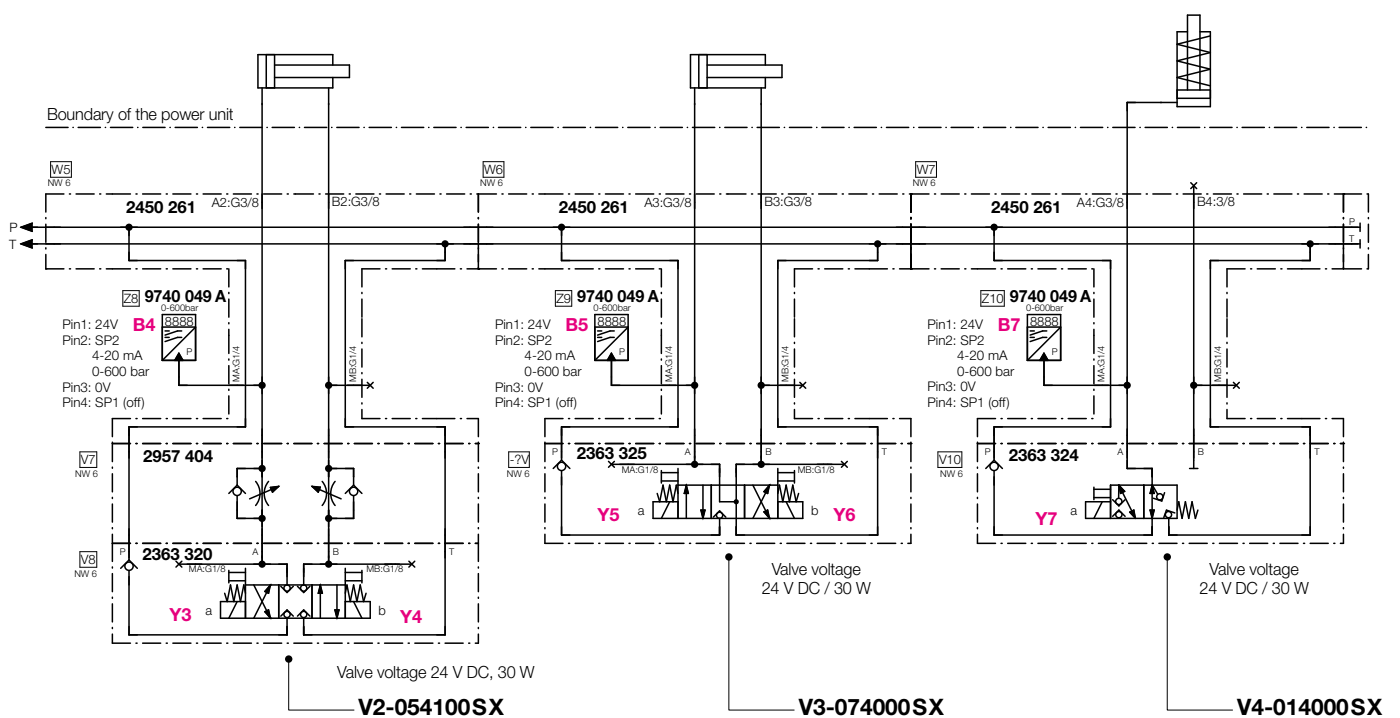
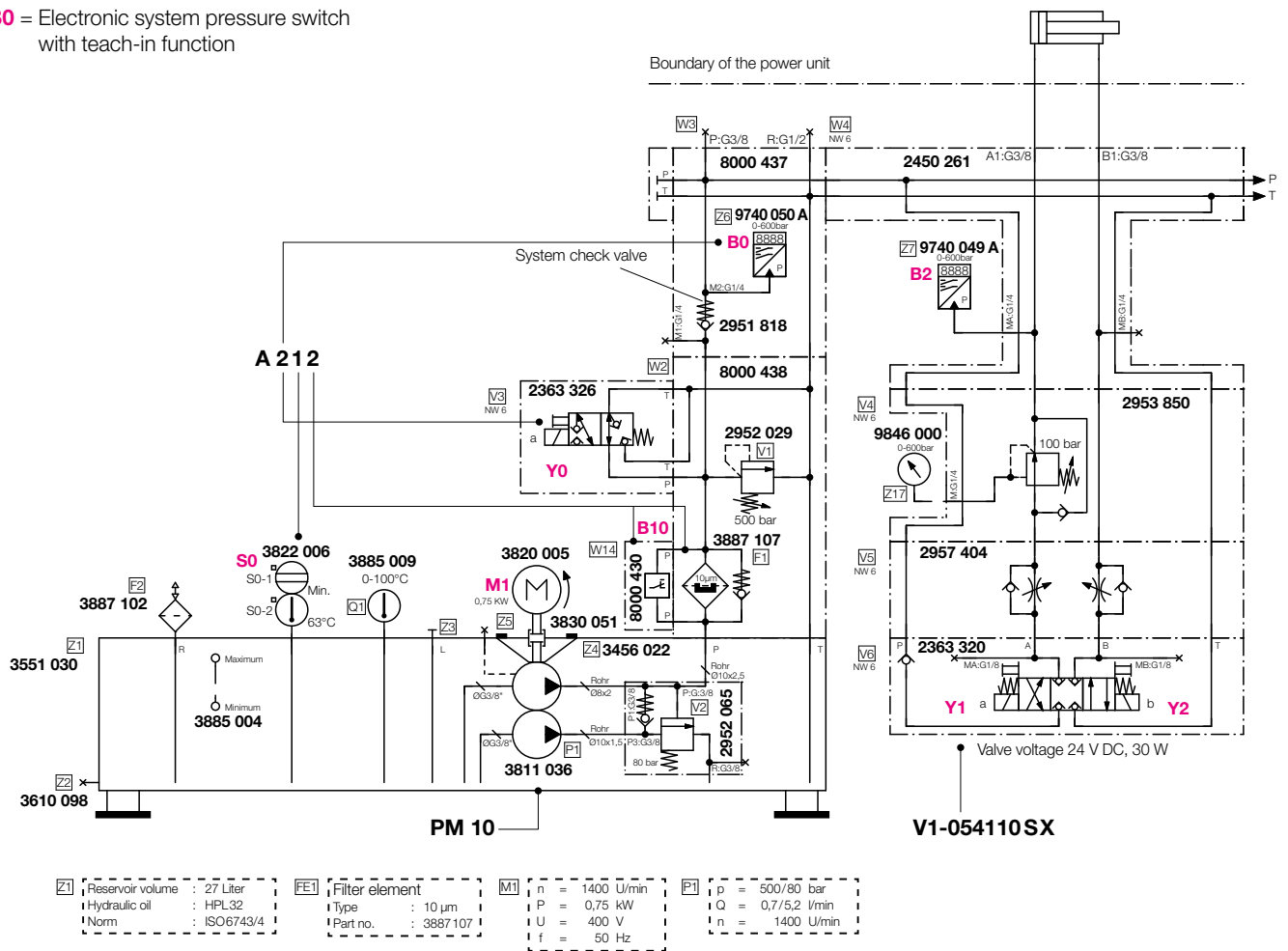
During the remaining time, the motor can carry a load of up to 50 % of the nominal output and should run continuously.

* Other voltages/frequencies as well as special approvals on request.

Power units in modular design

Hydraulic circuit diagram for example power unit

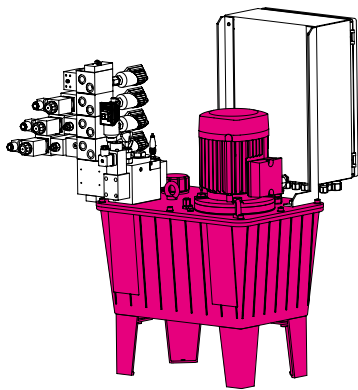
B0 = Electronic system pressure switch with teach-in function



Power units in modular design

Type code for power unit size "PMXX"

Type code: PMXX_AXXX_V1-XX X XXX SX_V2-XX X XXX SX_V3-XX X XXX SX_V4-XX X XXX SX_EX



Basic power unit

The basic selection takes place based on operating pressure p and flow rate Q . The size of the reservoir depends on the application conditions (e. g. environmental temperature, cycle time and function)

* Note

In case of the two-stage pump (RZ) the gear pump (large flow rate) is switched to unpressurised cycles by the integrated idling control valve as soon as a pressure of 80 bar is exceeded. Up to 80 bar, both flow rates will add up.

4 reservoir sizes: 11 l, 27 l, 40 l, 63 l

5 motor sizes: 0.75 kW, 1.1 kW, 1.5 kW, 2.2 kW, 3.0 kW

15 pump types: 0.9 to 12 l/min flow rate

(gear pump, piston pump and two-stage pump*)

Example:

Reservoir 11 l, max. 200 bar, gear pump 1.5 l/min, 0.75 kW = **PM 01**

Reservoir 27 l, max. 350 bar, piston pump 3.6 l/min, 2.2 kW = **PM 19**

Operating pressure [bar]		Flow rate Q [l/min]	Motor rating P [kW]	Reservoir volume V [l]	Pump type	PM XX
at 100% ED	at 40% ED**					
425	500	0.9	0.75	11	Piston pump	02
425	500	0.9	0.75	27	Piston pump	09
425	500	0.9	0.75	40	Piston pump	21
425	500	0.9	0.75	63	Piston pump	38
375	500	1.5	1.1	11	Piston pump	05
375	500	1.5	1.1	27	Piston pump	12
375	500	1.5	1.1	40	Piston pump	24
375	500	1.5	1.1	63	Piston pump	41
430	500	2.6	2.2	27	Piston pump	18
430	500	2.6	2.2	40	Piston pump	30
430	500	2.6	2.2	63	Piston pump	47
415	500	3.7	3.0	40	Piston pump	34
415	500	3.7	3.0	63	Piston pump	51
500	500	0.7/5.2*	0.75	11	Two-stage pump	03
500	500	0.7/8.8*	1.5	11	Two-stage pump	54
500	500	0.7/5.2*	0.75	27	Two-stage pump	10
500	500	0.7/5.2*	0.75	40	Two-stage pump	22
500	500	0.7/5.2*	0.75	63	Two-stage pump	39
365	450	4.2	3.0	40	Piston pump	35
365	450	4.2	3.0	63	Piston pump	52
310	400	2.5	1.5	11	Piston pump	07
310	400	2.5	1.5	27	Piston pump	14
310	400	2.5	1.5	40	Piston pump	26
310	400	2.5	1.5	63	Piston pump	43
310	350	3.6	2.2	27	Piston pump	19
310	350	3.6	2.2	40	Piston pump	31
310	350	3.6	2.2	63	Piston pump	48
290	350	5.3	3.0	40	Piston pump	36
290	350	5.3	3.0	63	Piston pump	53
200	200	1.5	0.75	11	Gear pump	01
200	200	1.5	0.75	27	Gear pump	08
200	200	1.5	0.75	40	Gear pump	20
200	200	1.5	0.75	63	Gear pump	37
170	200	3.3	1.1	11	Gear pump	04
170	200	3.3	1.1	27	Gear pump	11
170	200	3.3	1.1	40	Gear pump	23
170	200	3.3	1.1	63	Gear pump	40
170	200	4.5	1.5	11	Gear pump	06
170	200	4.5	1.5	27	Gear pump	13
170	200	4.5	1.5	40	Gear pump	25
170	200	4.5	1.5	63	Gear pump	42
180	200	6.2	2.2	27	Gear pump	15
180	200	6.2	2.2	40	Gear pump	27
180	200	6.2	2.2	63	Gear pump	44
175	200	8.8	3.0	40	Gear pump	32
175	200	8.8	3.0	63	Gear pump	49
130	160	8.8	2.2	27	Gear pump	16
130	160	8.8	2.2	40	Gear pump	28
130	160	8.8	2.2	63	Gear pump	45
130	160	12	3.0	40	Gear pump	33
130	160	12	3.0	63	Gear pump	50
99	120	12	2.2	40	Gear pump	29
95	120	12	2.2	27	Gear pump	17
95	120	12	2.2	63	Gear pump	46

** see page 2 "Electrical characteristics - Motor"

Pumps

Piston pumps

Type	radial piston pump
Nominal pressure max.	500 bar
Flow rates*	3.6 / 5.3 l/min to 350 bar
	2.5 l/min to 400 bar
	4.2 l/min to 450 bar
	0.9 / 1.5 / 2.6 / 3.7 l/min to 500 bar
Direction of rotation**	any
Speed range	continuous operation 100...2000 1/min, short-time operation up to 2850 1/min
Feature	high-pressure application, harsh operating conditions (e.g. punching / stamping)

Gear pumps

Type	2 opposite gears
Nominal pressure max.	200 bar
Flow rates*	1.5 / 3.3 / 4.5 / 6.2 / 8.8 l/min to 200 bar
	12 l/min to 160 bar
Direction of rotation**	clockwise rotation
Speed range	700...3000 1/min
Feature	intermediate-pressure application, high flow rate

Two-stage pump

Type	radial piston pump and gear pump screwed together continuous drive shaft
Nominal pressure max.	500 bar
Flow rate* up to approx. 80 bar	total flow rate active (gear plus piston pump)
from approx. 80 bar	only flow rate of piston pump active
Direction of rotation**	counterclockwise rotation
Speed range	700...2000 1/min, in short-time operation up to 2850 1/min
Feature	high flow rate up to approx. 80 bar, high pressure up to 500 bar
Typical application	quickly move large volume consumers and clamp them with high pressure

* at rated speed 1450 1/min

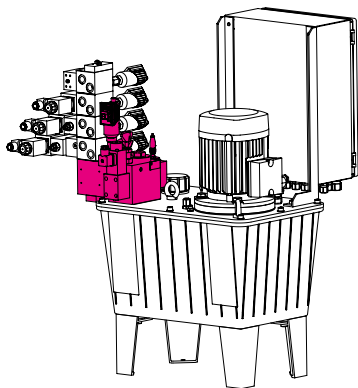
** direction of rotation (view from above onto the drive shaft)

Different flow rates and other pumps are available on request.

Power units in modular design

Type code for connecting block basic function "Axxx"

Type code: PMXX_Axxx_V1-XX X XXX SX_V2-XX X XXX SX_V3-XX X XXX SX_V4-XX X XXX SX_EX



Standard equipment

- Connecting block with pressure relief valve
- System check valve
- Pressure filter 10 µm
- Oil level gauge
- Oil temperature gauge (stick thermometer)
- Filler and reservoir ventilation
- Prepared for additional features

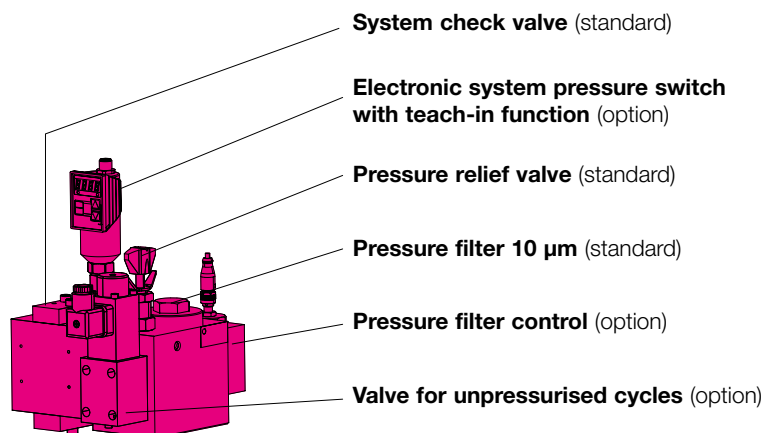
Connecting block basic functions

In addition to the standard equipment, additional features for the basic unit can be selected.

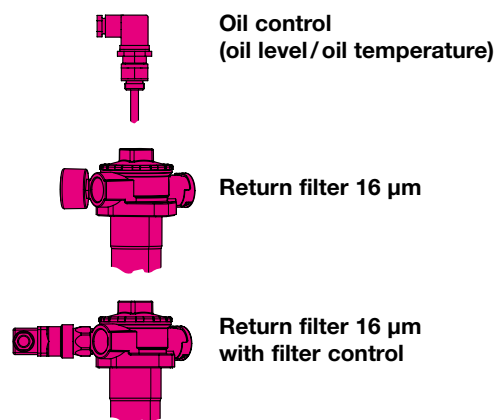
	Axxx
with pressure gauge, without system pressure switch, without valve for unpressurised cycle	0
with electronic system pressure switch for intermittent cycle	1
with electronic system pressure switch and valve for unpressurised cycle, $p_{max} = 500$ bar	2
with electronic system pressure switch and valve for unpressurised cycle, $p_{max} = 315$ bar	3
with pressure gauge, without system pressure switch, with valve for unpressurised cycle, $p_{max} = 500$ bar	4
with pressure gauge, without system pressure switch, with valve for unpressurised cycle, $p_{max} = 315$ bar	5
with visual temperature and oil level display (standard)	0
with temperature and oil level control switch and visual temperature and oil level display	1
with pressure filter (standard)	0
pressure and return filter	1
pressure filter with filter control	2
pressure filter and return filter with filter control	3

Connecting block including pressure filter and pressure relief valve, P port G3/8, R port G 1/2 and system check valve

(The retrofitting of individual features is possible at any time).



Additional options:



Note for teach-in function

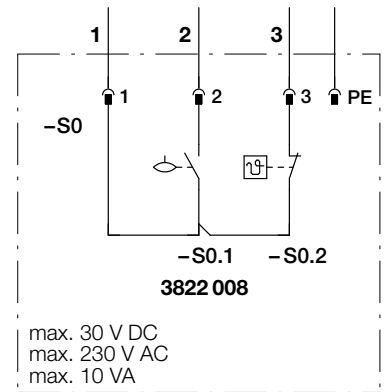
For teaching, the desired switching as well as reverse switching points are calculated and saved by pressing the Enter/Set key of the system pressure switch. The system is thus set and ready for operation, parameterisation of individual values is not required.

Detailed operating instructions are available on request.

Monitoring functions - Power unit

Oil control (oil temperature too high or oil level too low)

Contact oil temperature	break contact, opens at approx. 63 °C
Contact oil level	make contact, closes when oil above the float
Type of connection	connector, 3-pin as per DIN 43650 Pin 1: common root Pin 2: level Pin 3: temperature
Max. switching voltage	230 VAC
Max. switching current	1 A
Max. contact rating	10 VA
Medium temperature max.	85 °C
Code class	IP 65
For oil reservoir 11 litres	Part no. 3822008
For oil reservoir 27 litres	Part no. 3822006
For oil reservoir 40 litres	Part no. 3822048
For oil reservoir 63 litres	Part no. 3822005



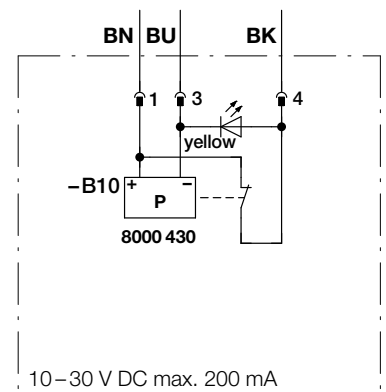
Note: The oil control can be retrofitted.
Several switching points for temperature and/or level on request.

Pressure filter control

Proximity switch with integrated function display

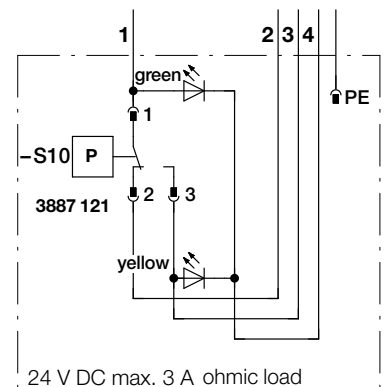
Operating voltage	10...30 VDC
Switching current	200 mA, 24 V DC
Output	break contact, opens in the event of contamination
Connection	connector, M12, 4-pin
Part no.	8000430

Note: The pressure filter control can be retrofitted.



Return filter control

Operating pressure	0...10 bar
Material	body polyamide, connecting parts steel galvanised, membrane NBR, seal copper
Code class	IP 67
Electrical connection	cable socket DIN 43650 - AF3 cable diameter 6...8 mm
Max. switching voltage	30 V DC
Max. switching current	0.25 A
Max. contact rating	3 W
Part no.	3887 121



Note: The return filter control can be retrofitted.

Power units in modular design

Type code for valve bloc for contro circuits “V1-XX X XXX SX” to “V4-XX X XXX SX”

Type code: PMXX_AXXX_V1-XX X XXX SX_V2-XX X XXX SX_V3-XX X XXX SX_V4-XX X XXX SX_EX

The determination of control circuit V2-XX X XXX SX, V3-XX X XXX SX and V4-XX X XXX SX is the same as of control circuit V1-XX X XXX SX.

Control valves

		Function*	V1-XX X XXX SX
	as reserve space	with blind plate	00
	3/2 directional poppet valve, 500 bar, without auxiliary energy P→A	1 x single acting	01
	3/2 directional poppet valve, 500 bar, without auxiliary energy A→R	1 x single acting	02
	3/2 directional poppet valve, 250 bar, without auxiliary energy P→A	1 x single acting	03
	3/2 directional poppet valve, 250 bar, without auxiliary energy A→R	1 x single acting	04
	4/3 directional poppet valve, 500 bar, without auxiliary energy all connections closed	1 x double acting	05
	4/3 directional poppet valve, 250 bar, without auxiliary energy all connections closed	1 x double acting	06
	4/3 directional poppet valve, 500 bar, without auxiliary energy A+B→R	1 x double acting	07
	4/3 directional poppet valve, 250 bar, without auxiliary energy A+B→R	1 x double acting	08
	2 x 3/2 directional poppet valve, 500 bar, without auxiliary energy P→A+B	2 x single acting	09
	2 x 3/2 directional poppet valve, 500 bar, without auxiliary energy A+B→R	2 x single acting	10
	2 x 3/2 directional poppet valve, 500 bar, without auxiliary energy P→A / B→R	2 x single acting	11
	2 x 3/2 directional poppet valve, 250 bar, without auxiliary energy P→A+B	2 x single acting	12
	2 x 3/2 directional poppet valve, 250 bar, without auxiliary energy A+B→R	2 x single acting	13
	2 x 3/2 directional poppet valve, 250 bar, without auxiliary energy P→A / B→R	2 x single acting	14
	2 x 4/2 directional spool valve, 315 bar, without auxiliary energy P→A / B→R	1x double-acting, not leakage-free	15
	4/3 directional spool valve, 315 bar, without auxiliary energy all connections closed	1x double-acting, not leakage-free	16
	4/3 directional spool valve, 315 bar, without auxiliary energy A+B→R	1x double-acting, not leakage-free	17
	4/3 directional spool valve, 315 bar, without auxiliary energy P→R, A+B closed	1x double-acting, not leakage-free	18
	4/3 directional spool valve, 315 bar, without auxiliary energy all connections connected	1x double-acting, not leakage-free	19
	without mounting plate, P and R closed	without	XX

Pressure switch

	without pressure switch for machine tool interlock	0
	piston pressure switch in A for machine tool interlock	1
	piston pressure switch in B for machine tool interlock	2
	one each piston pressure switch in A + B for machine tool interlock	3
	electronic pressure switch in A for machine tool interlock	4
	electronic pressure switch in B for machine tool interlock	5
	one each electronic pressure switch in A + B for machine tool interlock	6

Flow control valves

	without flow control valve	0
	with flow control valve in A+B, supply throttling, 500 bar	1
	with flow control valve in A+B, supply throttling, 315 bar	2

Pressure valves

	without pressure reducing valve	0
	pressure reducing valve in A with pressure display	1
	pressure reducing valve and pressure relief valve in A with pressure display	2
	pressure reducing valve in P with pressure display	3
	pressure reducing valve in P and pressure relief valve in A with pressure display	4
	pressure reducing valve in P and pressure relief valve in B with pressure display	5
	pressure reducing valve in P and pressure relief valve in A + B with pressure display	6
	pressure relief valve in A	7
	pressure relief valve in B	8
	pressure relief valve in A + B	9

Check valves

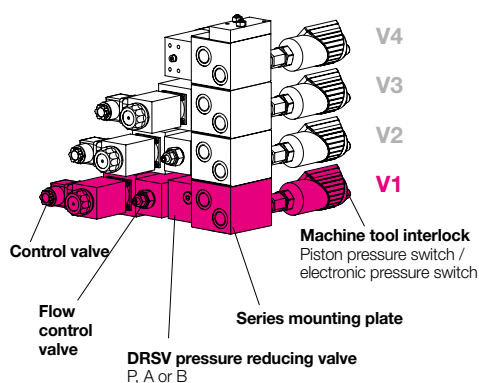
	without intermediate plate check valves	0
	intermediate plate twin check valves in A+B max. 315 bar	1
	intermediate plate check valve in A max. 315 bar	2
	intermediate plate check valve in B max. 315 bar	3

Switch

	without switch	0
	hand switch, latching with pilot light green	1
	foot switch, latching with pilot light green	2
	3-way selector switch, latching with pilot light green	3
	key switch, latching with pilot light green	4
	2 x hand switch, latching with pilot light green	5
	2 x foot switch, latching with pilot light green	6
	2 x key switch, latching with pilot light green	7

Power units in modular design

Switching symbols • Switch variants



Valve block (max. 4 control circuits V1–V4)

The equipment of the control circuits is based on the functional requirements of the application. The maximum pressures as well as the design-related differences in poppet and spool valves are to be considered.

Special versions

Switch combinations and special switches are possible on request. It is also always possible to deviate from the prescribed standard.

For example, more than 4 control circuits can be set up. It is possible to implement additional hydraulic functions.

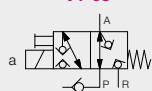
The electrical control can be designed even more individually up to the installation of programmable logic controllers and touch panels for human-machine communication.

Switching symbols

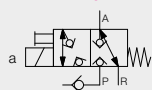
Control valves

3/2 directional poppet valve

V1-01
V1-03

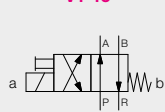


V1-02
V1-04



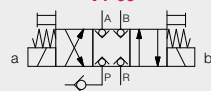
4/2 directional spool valve

V1-15

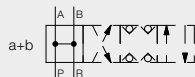


4/3 directional poppet valve

V1-05
V1-06



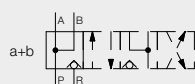
with 4th switching function
Solenoid "a" and "b" operated



V1-07
V1-08

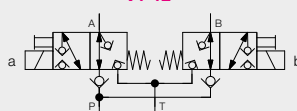


with 4th switching function
Solenoid "a" and "b" operated

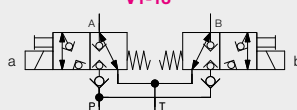


Double 3/2 directional poppet valve

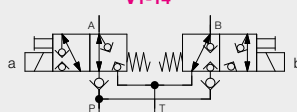
V1-09
V1-12



V1-10
V1-13

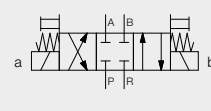


V1-11
V1-14

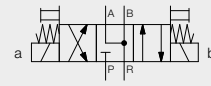


4/3 directional spool valve

V1-16



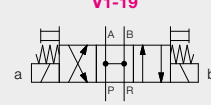
V1-17



V1-18



V1-19



Pressure switch

Piston pressure switch

V1-XX 1
V1-XX 2
V1-XX 3



Electronic pressure switch

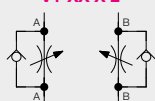
V1-XX 4
V1-XX 5
V1-XX 6



Flow control valves

Flow control valve

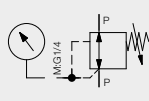
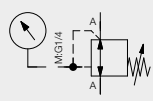
V1-XX X 1
V1-XX X 2



Pressure valves

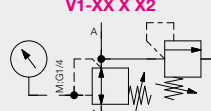
Pressure reducing valve

V1-XX X X1 V1-XX X X3

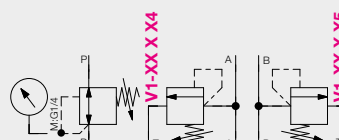


Pressure reducing valve with pressure relief valve

V1-XX X X2

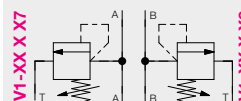


V1-XX X X6



Pressure relief valve

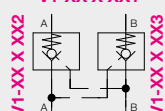
V1-XX X X9



Check valves

Intermediate plate twin check valve

V1-XX X XX1



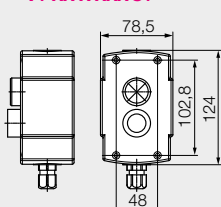
V1-XX X XX2 V1-XX X XX3

Switch

Connecting cable 3 m, other lengths on request

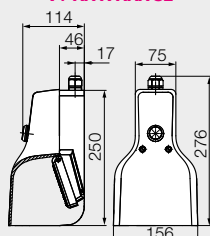
Hand switch

V1-XX XXX S1



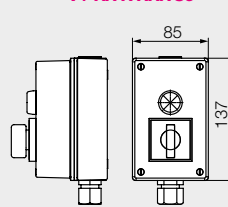
Foot switch

V1-XX XXX S2



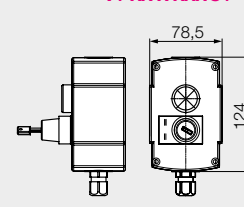
3-way selector switch

V1-XX XXX S3



Key switch

V1-XX XXX S4



Types of valves

Poppet valves, hermetically sealed

Adm. operating pressure	up to 500 bar
Adm. flow rate	up to 20 l/min
Flow direction	in the direction of the arrow as per symbol
Hydraulic oil	HLP 22 as per DIN 51524
Connection	flange for mounting plate assembly
Type of mounting	4 screws M5 (12.9) Tightening torque: 9.3 Nm
Nominal voltage	24 VDC, +5 % / -10 %
Pick-up and holding power	30 W
Make time	60 ms
Brake time	60 ms
Max. cycles	2000 /h
Duty cycle	100 % ED
Code class	IP 65 (IEC 60529)
Connection	cable socket as per DIN EN 175 301-803 and ISO 4400

Spool valves, leakage-afflicted

Leakage rate	up to 20 ccm/min at 100 bar
Adm. operating pressure	up to 315 bar
Adm. flow rate	up to 80 l/min
Flow direction	in the direction of the arrow as per symbol
Hydraulic oil	HLP 32 or 46 as per DIN 51524
Connection	flange, hole pattern as per DIN 24340, form A CETOP 4.2- 4.3, ISO 4401 for mounting plate assembly
Type of mounting	4 screws M 5 (10.9) Tightening torque: 8.1 Nm
Nominal voltage	24 VDC, + 10 % / -10 %
Pick-up and holding power	30 W
Make time	20 – 45 ms
Brake time	10 – 25 ms
Max. cycles	15000/h
Duty cycle	100 % ED
Code class	IP 65 as per DIN 40050
Connection	cable socket as per DIN EN 175 301-803 and ISO 4400

Other voltages and/or actuations available on request

Pressure reducing valves

Max. input pressure	[bar]	500
Adjustable output pressure	[bar]	30...380
(other pressure ranges on request)		

Pressure relief valves

Max. input pressure	[bar]	500
Adjustable reaction pressure	[bar]	50...500
(other pressure ranges on request)		

For the protection of pressure reducing valves, additional pressure relief valves are recommended.

Pressure switch variants

Electronic pressure switches

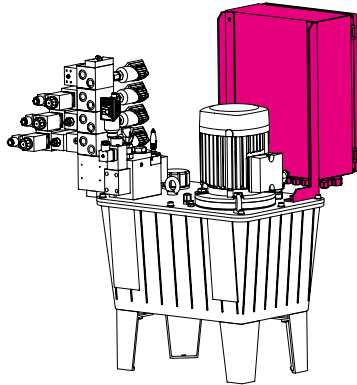
Recommended hydraulic oil	HLP 22, 32 and 46 as per DIN 51524
Pressure ranges	0...600 bar
Excess pressure [bar]	50 % of the nominal pressure (PN)
Pressure pick-up	Peak-value memory every 2 ms
Operating voltage	12 to 32 V DC (residual ripple < 10 %), protected against reverse polarity
Voltage drop	< 2 V
Current consumption	< 60 mA
Switching outputs	2 x pnp switching, no/nc 250 mA short circuit protection switching output 2 is omitted if current output is parameterised
Delay time	0 to 20 s, switch on and off delay separately adjustable
Range of adjustment switching point	6 to 600 bar
Reverse switching point	5 to 594 bar
Switching frequency	max. 125 Hz
Reproducibility	< ±0.1 % of the final value
Current output	if parameterised, switching output 2 is omitted 0/4 to 20 mA, 20 to 0/4 mA, starting point and final point selectable
Load	max. $RL [W] = (U_b - 8V) / 20 \text{ mA}$
Error detection	analogue output in case of line break
Rise time	5 ms (10 % to 90 % of PN)
Damping	0 to 20 s, adjustable
Linearity deviation	max. ± 0.25 % of PN
System pressure display	4 x 7 segment LED display
Display damping	0 to 20 s, adjustable
Switching function display	2x LED red
Operating temperature	-20 °C to +80 °C
Temperature drift	< ±0.2 % / 10 K (-10 °C to +70 °C)
Pressure port	G1/4A, SW 22
Sensor head material	stainless steel 1.4435
Housing material	PA 6.6, polyester
Code class	IP 65 as per EN 60529
Electric connection	M12 connector 4-pin
As system pressure switch	Part no. 9740050A* with teach-in function for easy system pressure adjustment
For machine tool interlock	Part no. 9740049A*

* Detailed operating instructions available on request

Mechanical pressure switch

Piston switch	Technical data as per data sheet F 9.732
---------------	--

Type code: PMXX_AXXX_V1-XX X XXX SX_V2-XX X XXX SX_V3-XX X XXX SX_V4-XX X XXX SX_EX



Electronics

The function triggering can be realised in various ways.

The following features are available for selection:

- **without electric control, without terminal box**
connection of the individual components and electric control provided by the customer
- **with terminal box, without electric control**
connections of the individual components are connected to the terminal strip of the terminal box, the connection will be made to the customer's electric control
- **with electric control**
function triggering by customer contacts or selected switches

_E X

without electric control, without terminal box.	0		_E X
with terminal box	1		
with electric control and function triggering provided by the customer	2		
with electric control and function triggering in a common housing	3		
with electric control and function triggering in individual housings	4		

U = 3/ N / PE 400 V 50 Hz

Other voltages and frequencies of 1 Ph. 110 V to 3 Ph. 500 V 50/60 Hz on request.

Special approvals on request.

E2 - Function triggering provided by the customer:

Potential free contacts from a customer control.

E3 - Function triggering in a common housing:

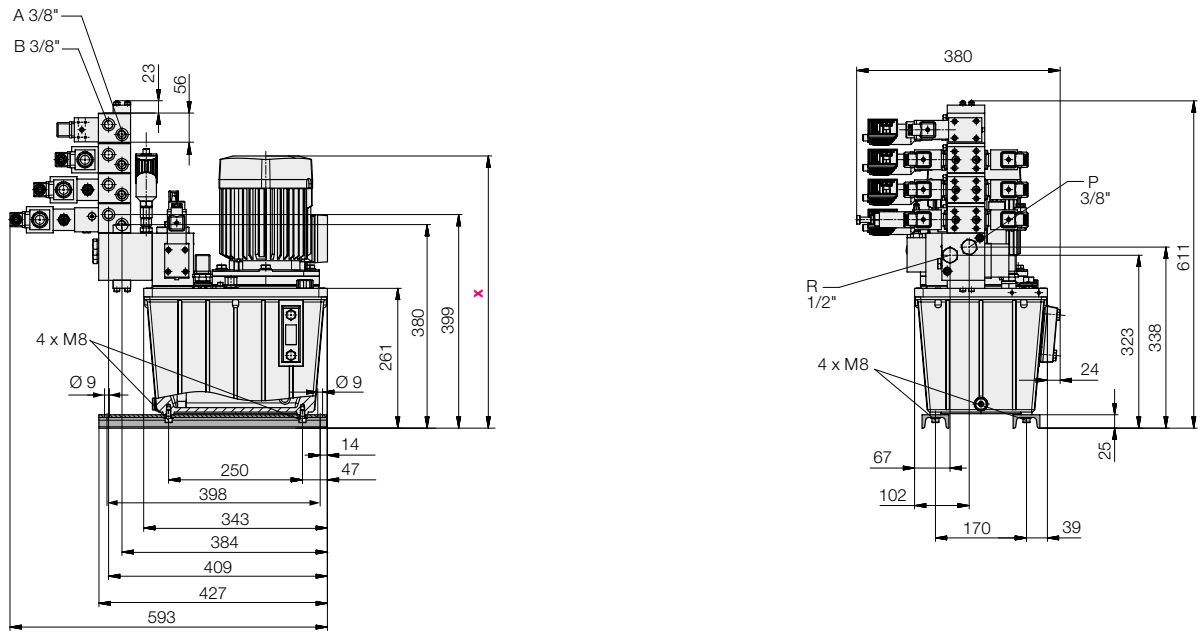
The selected switches in control circuits are installed in one operating housing and connected to the electrical control.

E4 - Function triggering in individual housings:

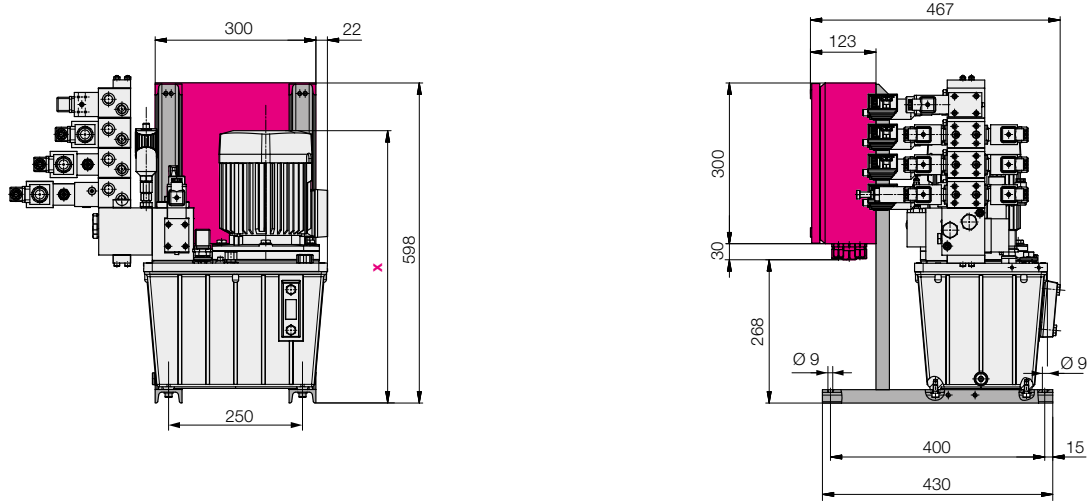
The selected switches in the control circuits are designed as shown on page 9 and individually connected to the electric control.

Example power unit 11 litres

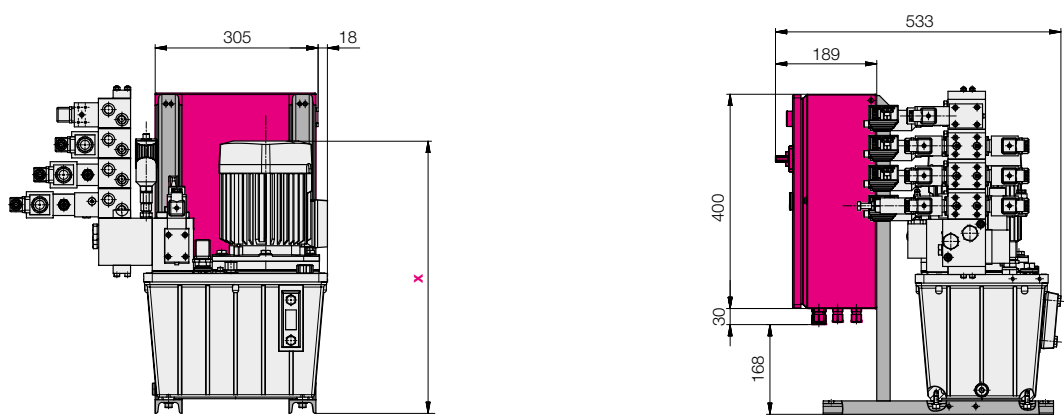
without electronics _E0



with terminal box _E1



with electric control _E2, _E3, _E4



Dimensions in mm

Example power unit 11 litres

(Dimensions in mm)

Power unit 11 litres

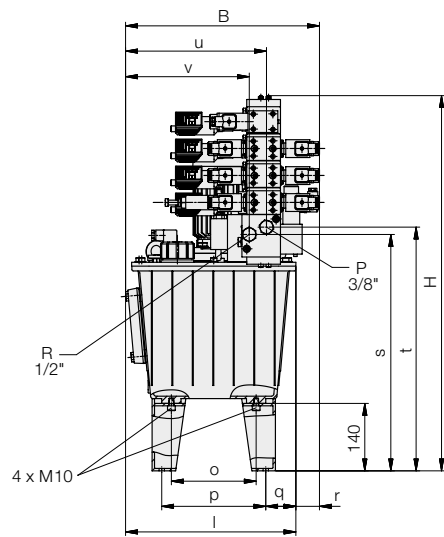
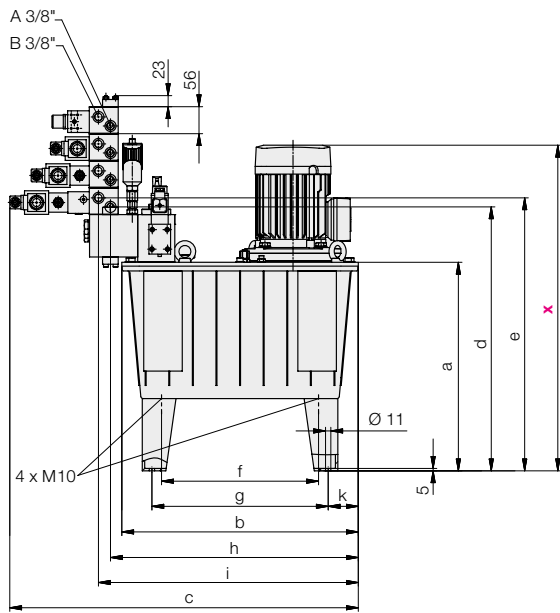
Motor 0.75 kW	x	509
Motor 1.1 kW	x	575
Motor 1.5 kW	x	575

Reservoir volume	Type code for example power unit	Part no.*
11	PM 03_A212_V1-054110S0_V2-054100S0_V3-074000S0_V4-014000S0_E0	8456004
11	PM 03_A212_V1-054110S0_V2-054100S0_V3-074000S0_V4-014000S0_E1	8456003
11	PM 03_A212_V1-054110S1_V2-054100S1_V3-074000S1_V4-014000S1_E4	8456002

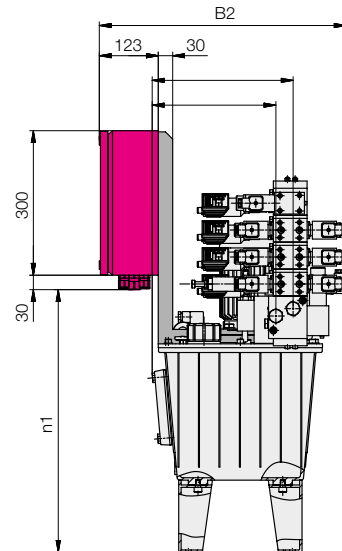
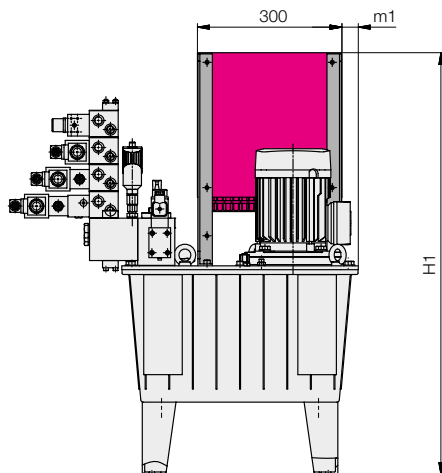
* Orders can be placed with the type code or – if available – with the part number.

Example power unit 27 / 40 / 63 litres

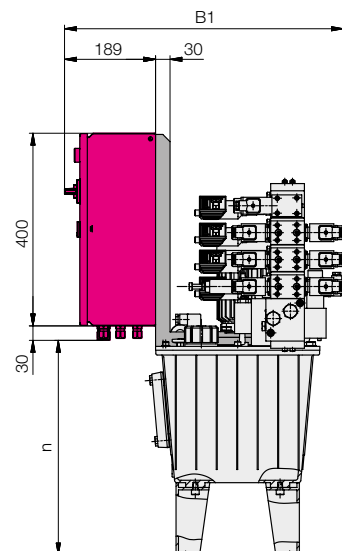
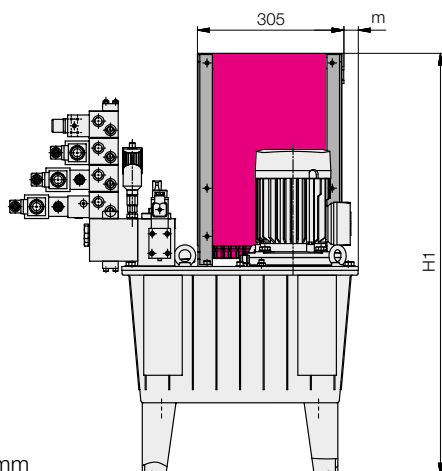
without electronics _E0



with terminal box _E1



with electric control _E2, _E3, _E4



Dimensions in mm

Example power unit 27 / 40 / 63 litres

(Dimensions in mm)

Dimension table power unit	27 litres	40 litres	63 litres
Motor 0.75 kW x	677	707	757
Motor 1.1 kW x	743	773	823
Motor 1.5 kW x	743	773	823
Motor 2.2 kW x	794	824	874
Motor 3.0 kW x		824	874
a	433	463	513
b	491	525	615
c	724	758	848
B	403	485	539
B1	579	662	712
B2	513	596	646
d	548	578	628
e	567	597	647
f	326	341	423
g	366	381	463
h	515	549	639
H	779	809	859
H1	876	906	956
i	540	574	664
j	233	233	233
k	63	72	77
l	354	436	490
m	30	41	66
m1	34	45	70
n	446	476	526
n1	546	576	626
o	176	241	283
p	216	281	323
q	63	72	76
r	49	49	49
s	491	521	571
t	506	536	586
u	293	375	429
v	257	339	393

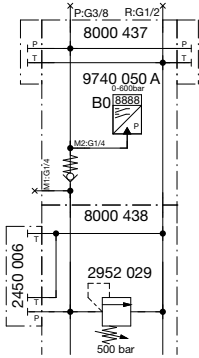
Reservoir volume	Type code for example power unit	Part no.*
27	PM10_A212_V1-054110S0_V2-054100S0_V3-074000S0_V4-014000S0_E0	8457003
27	PM10_A212_V1-054110S0_V2-054100S0_V3-074000S0_V4-014000S0_E1	8457002
27	PM10_A212_V1-054110S1_V2-054100S1_V3-074000S1_V4-014000S1_E4	8457001
40	PM22_A212_V1-054110S0_V2-054100S0_V3-074000S0_V4-014000S0_E0	8458003
40	PM22_A212_V1-054110S0_V2-054100S0_V3-074000S0_V4-014000S0_E1	8458002
40	PM22_A212_V1-054110S1_V2-054100S1_V3-074000S1_V4-014000S1_E4	8458001
63	PM39_A212_V1-054110S0_V2-054100S0_V3-074000S0_V4-014000S0_E0	8459003
63	PM39_A212_V1-054110S0_V2-054100S0_V3-074000S0_V4-014000S0_E1	8459002
63	PM39_A212_V1-054110S1_V2-054100S1_V3-074000S1_V4-014000S1_E4	8459001

* Orders can be placed with the type code or – if available – with the part number.

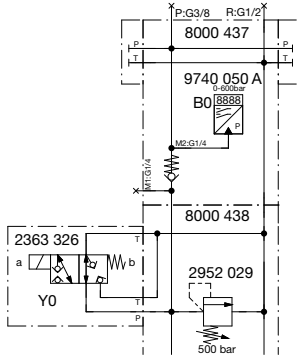
Power units in modular design

Example configurations

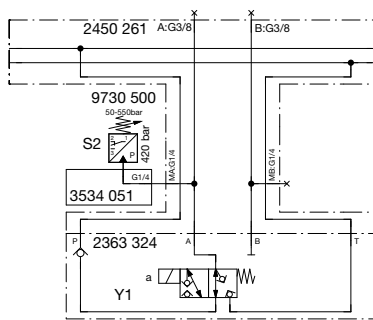
PMXX_A1
intermittent cycle



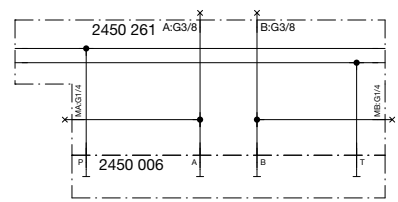
PMXX_A2...
unpressurised cycle, 500 bar



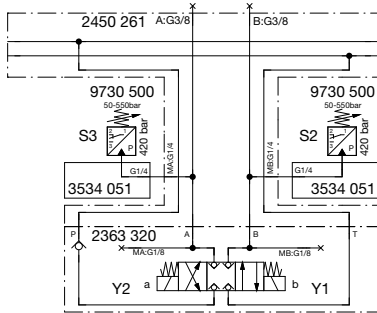
PMXX_XXXX_V1-011000...
1x single acting, 500 bar with MI in A



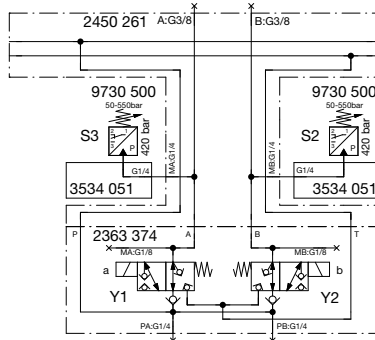
PMXX_XXXX_V1-XXXXXX_V2-000000...
2nd valve combination as reserve space, closed with a blind plate for later retrofitting



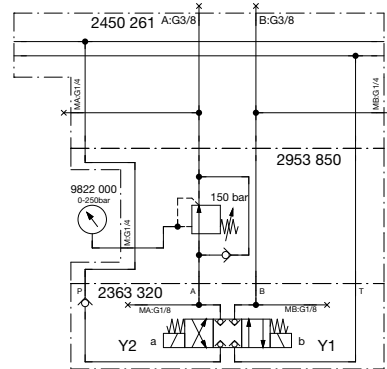
PMXX_XXXX_V1-053000...
1x double acting, 500 bar with MI in A+B



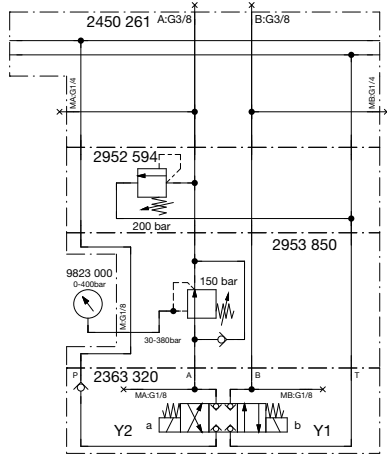
PMXX_XXXX_V1-093000...
2x single acting, 500 bar with MI in A+B



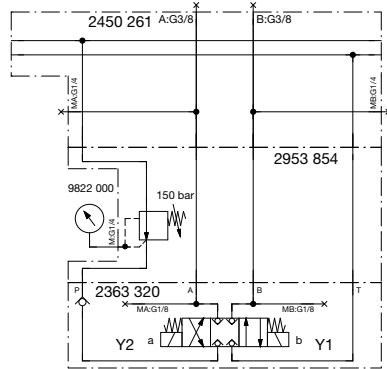
PMXX_XXXX_V1-050010...
1x double acting, valve 500 bar pressure reduction in A, 150 bar



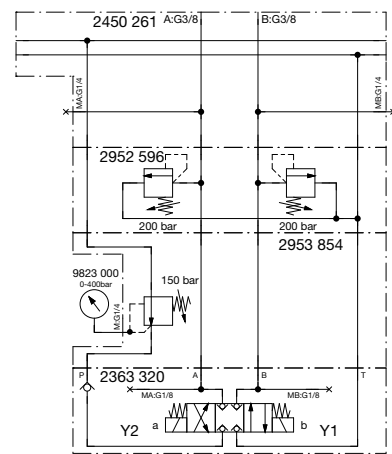
PMXX_XXXX_V1-050020...
1x double acting, valve 500 bar pressure reduction in A, 150 bar



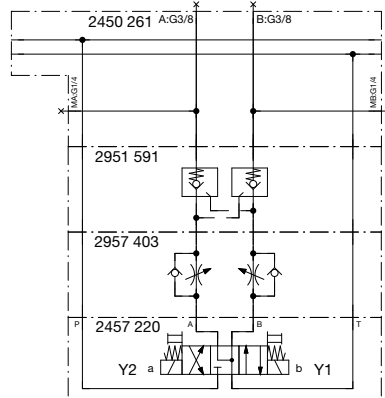
PMXX_XXXX_V1-050030...
1x double acting, valve 500 bar pressure reduction in P, 150 bar



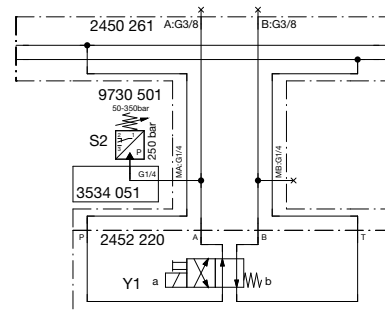
PMXX_XXXX_V1-050060...
1x double acting, valve 500 bar pressure reduction in P, 150 bar



PMXX_XXXX_V1-170201...
1x double acting, 350 bar with twin flow control check valve and twin check valve



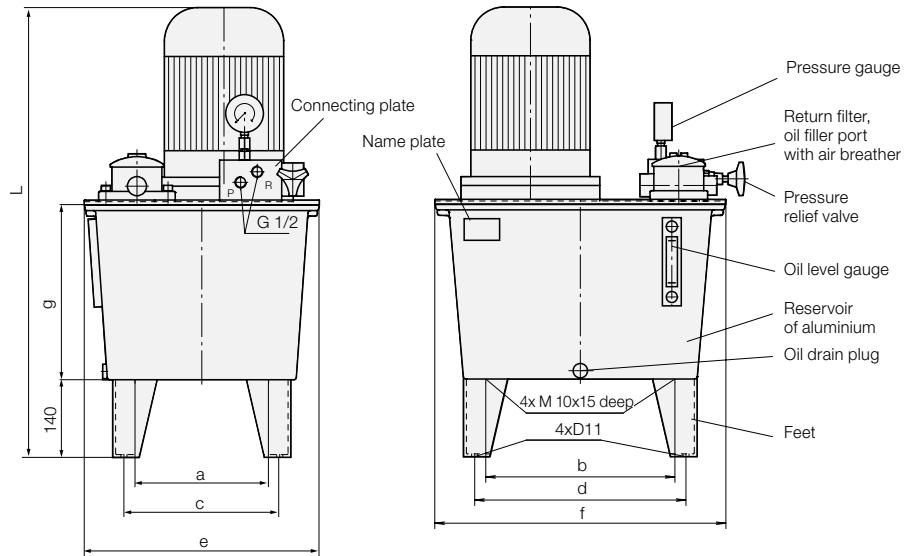
PMXX_XXXX_V1-151000...
1x double acting, 315 bar with MI in A one of the two pressure lines is always under pressure





Power Units

Oil reservoir V = 27 l, 40 l, and 63 l



Technical data

Design	
– Gear pump	max. 200 bar
– Piston pump	max. 500 bar
– Pump combination	max. 80/500 bar
Mounting	Foot mounting
Porting	G 1/4 and G 1/2
Direction of rotation	(viewed from above onto drive shaft)
– Gear pump	clockwise
– Piston pump	any
– Pump combination	counterclockwise
Mounting position	upright
Usable oil volume	half of the reservoir volume
Vol. efficiency	$\eta_{vol} = 85\text{--}95\%$

Electrical data

Nominal voltage	230/400V up to 2.2 kW 400 V from 3 kW
Power system	3-phase AC, 50 Hz
Code class	IP 54
Relative duty cycle ED	Depends on operating pressure. Details for 100% and 40% ED (see page 2)

Dimensions

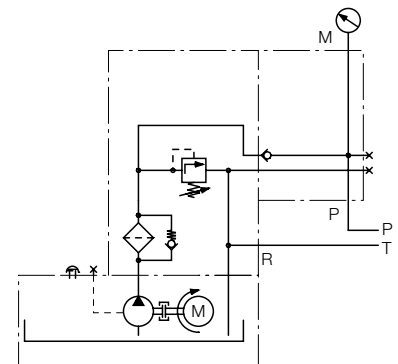
	V = 27 l	V = 40 l	V = 63 l
a	176	241	282,5
b	326	341	422,5
c	216	281	322,5
d	366	381	462,5
e	341	424	474
f	491	525	615
g	285	315	365
L	see page 2		

Other data
see table and data sheet A 0.100.

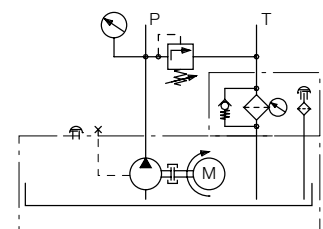
Optional oil level and temperature control.

Part no.	for V = 27 l	3822006
	for V = 40 l	3822048
	for V = 63 l	3822005

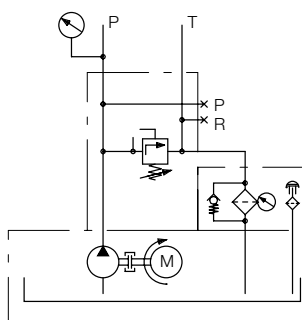
Piston pump with pressure filter



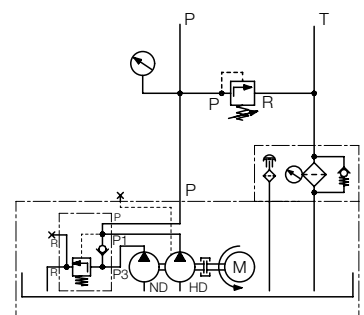
Piston pump with return filter



Gear pump



Pump combination



The calculation of the relative duty cycle is based on a cycle of 10 min. At 40% ED e.g. the maximum load within the cycle should not exceed 4 min. During the remaining time the motor can be loaded up to 50% of the nominal output rating and should run continuously.

Flow rate		Operating pressure		Nominal rating [kW]	RF ²⁾ DF ²⁾ LV ²⁾	L ³⁾ V=27 l [mm]	L ³⁾ V=40 l [mm]	L ³⁾ V=63 l [mm]	Weight [kg]			Part no. Reservoir volume		
[ccm/s]	[l/min]	100% ED ¹⁾	40% ED						V=27 l	V=40 l	V=63 l	V=27 l	V=40 l	V=63 l
Power unit with gear pump – direction of rotation: clockwise														
75	4.5	60	85	0.75	RF	683	–	–	34	–	–	8142 120	–	–
		200	200	2.2	RF	759	792	842	44	55	59	8145 120	8145 140	8145 160
102	6.2	45	60	0.75	RF	683	–	–	34	–	–	8152 120	–	–
		100	125	1.5	RF	725	758	–	37	48	–	8154 120	8154 140	–
146	8.8	45	60	0.75	RF	683	716	–	35	46	–	8156 120	8156 140	–
		90	110	1.5	RF	725	758	808	38	49	55	8157 120	8157 140	8157 160
		175	200	3.0	RF	–	793	843	–	60	64	–	8159 140	8159 160
200	12	50	70	1.5	RF	725	758	808	38	49	55	8164 120	8164 140	8164 160
		115	140	3.0	RF	–	793	843	–	60	64	–	8166 140	8166 160
		160	190	4.0	RF	–	809	859	–	68	72	–	8167 140	8167 160
		200	200	5.5	RF	–	858	908	–	77	82	–	8168 140	8168 160
267	16	40	50	1.5	RF	725	758	808	39	50	56	8174 120	8174 140	8174 160
		60	75	2.2	RF	760	793	843	46	57	61	8175 120	8175 140	8175 160
		85	105	3.0	RF	–	793	843	–	61	65	–	8176 140	8176 160
		115	140	4.0	RF	–	809	859	–	69	73	–	8177 140	8177 160
		165	195	5.5	RF	–	858	908	–	78	83	–	8178 140	8178 160
400	24	40	50	2.2	RF	760	793	843	46	57	61	8185 120	8185 140	8185 160
		55	70	3.0	RF	–	793	843	–	61	65	–	8186 140	8186 160
		80	95	4.0	RF	–	809	859	–	69	73	–	8187 140	8187 160
		100	120	5.5	RF	–	858	908	–	78	83	–	8188 140	8188 160
		150	180	7.5	RF	–	–	946	–	–	105	–	–	8189 160
Power unit with piston pump – direction of rotation: any														
100	6.0	315	–	4.0	RF	–	805	855	–	71	75	–	8267 140	8267 160
140	8.4	315	–	5.5	RF	–	861	911	–	79	83	–	8268 140	8268 160
200	12.0	315	–	7.5	RF	–	899	949	–	104	108	–	8269 140	8269 160
100	6.0	–	350	4.0	RF	–	805	855	–	71	75	–	8277 140	8277 160
140	8.4	–	350	5.5	RF	–	861	911	–	79	83	–	8278 140	8278 160
200	12.0	–	350	7.5	RF	–	899	949	–	104	108	–	8279 140	8279 160
61	3.7	–	500	3.0	DF	756	789	839	53	64	68	8256 120	8256 140	8256 160
88	5.3	–	350	3.0	RF	756	789	839	62	67	71	8252 120	8252 140	8252 160
88	5.3	–	500	4.0	RF	–	805	855	–	75	79	–	8257 140	8257 160
123	7.4	–	330	4.0	RF	–	805	855	–	77	81	–	8253 140	8253 160
123	7.4	–	500	5.5	RF	–	861	911	–	84	88	–	8258 140	8258 160
Power unit with combination of gear pump and piston pump – direction of rotation: counterclockwise														
150/25	9.0/1.5	90/500	–	1.5	LV/RF	731	764	–	42	53	–	8280 125	8280 145	–
205/25	12.3/1.5	90/500	–	1.5	LV/RF	731	764	–	42	53	–	8281 125	8281 145	–
150/43	9.0/2.6	80/500	–	2.2	LV/RF	756	789	–	52	63	–	–	8283 145	–
205/43	12.3/2.6	80/500	–	2.2	LV/RF	756	789	–	52	63	–	–	8284 145	–
266/43	16.0/2.6	80/500	–	2.2	LV/RF	756	789	–	53	64	–	–	8285 145	–
150/61	9.0/3.7	80/500	–	3.0	LV/RF	756	789	839	60	70	74	–	8286 145	8286 165
205/61	12.3/3.7	80/500	–	3.0	LV/RF	756	789	839	60	70	74	–	8287 145	8287 165
150/88	9.0/5.3	80/500	–	4.0	LV/RF	–	805	855	–	78	84	–	–	8288 165
205/88	12.3/5.3	80/500	–	4.0	LV/RF	–	805	855	–	78	84	–	–	8289 165
150/123	9.0/7.4	80/500	–	5.5	LV/RF	–	861	911	–	85	89	–	–	8290 165

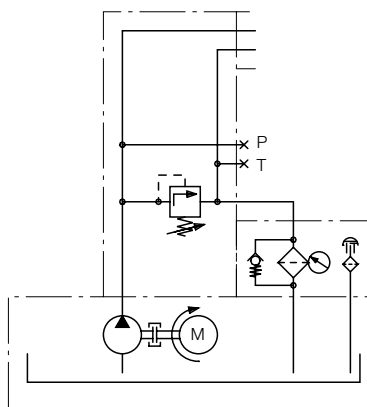
1) Refers to electric motor only. Running time of pump at max. pressure depends on unit power losses. It should be noted that oil temperature must not exceed 70°C.

2) RF = for return filter
DF = for pressure filter
LV = for idle pressure valve

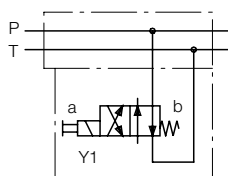
3) Dimension L = minimum height, depending on the motor type and the use of damper rings to reduce the noise level.

When using damper rings dimension L is changed as follows:

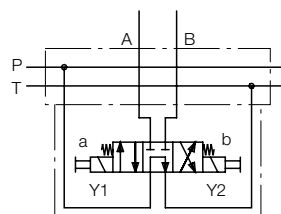
Motor 0.75 up to 1,5 kW: plus 40 mm
Motor 2.2 up to 4,0 kW: plus 45 mm
Motor 5.5 up to 7,5 kW: plus 50 mm



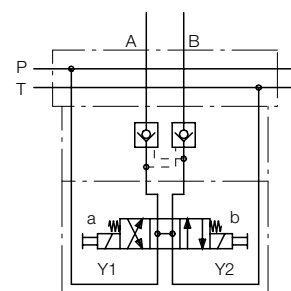
Basic power unit



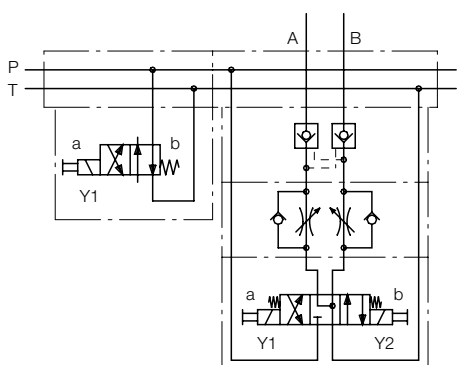
4/2 directional control valve with mounting plate for unpressurised cycles



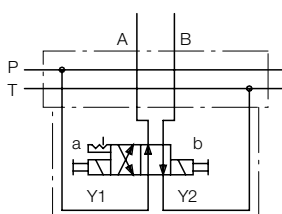
4/3 directional control valve with mounting plate for unpressurised cycles in central position. Ports A and B closed, not leakage-free



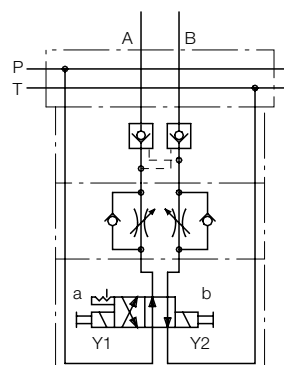
4/3 directional control valve with mounting plate for unpressurised cycles in central position. Ports A and B closed by a twin check valve, and leakage-free



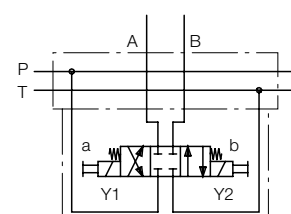
4/2 directional control valve with mounting plate for unpressurised cycles



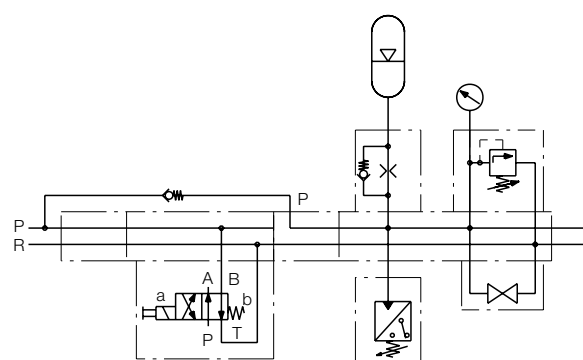
4/2 directional control valve with catch



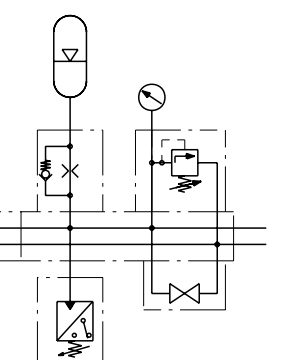
4/2 directional control valve with catch, twin flow control valve and twin check valve. Ports A and B closed and leakage-free



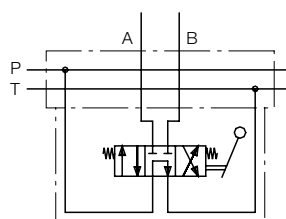
4/3 directional control valve. Ports A and B closed, not leakage-free



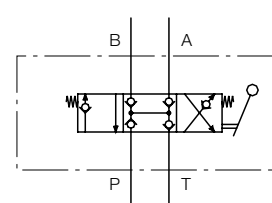
4/2 directional control valve with mounting plate for unpressurised cycles



Accumulator connecting block with accumulator, check valve with throttling, pressure switch, drain plug, pressure reducing valve and pressure gauge



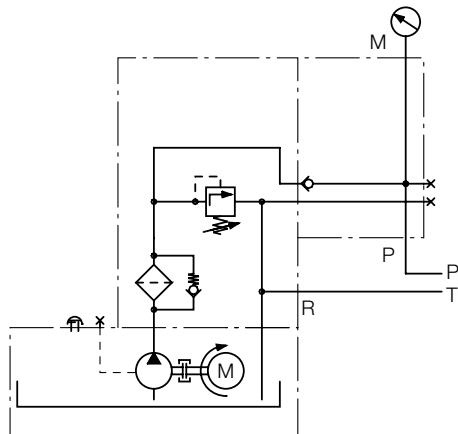
4/3 directional control valve with unpressurised cycle in central position, manually operated by lever, spring return. Ports A and B closed, not leakage-free



4/3 directional control valve with closed and leakage-free central position. Manual operation by lever with spring return up to an operating pressure of 300 bar. In the case of higher operating pressures there is no automatic lever return. When using this valve the power unit must function intermittently or with a valve for unpressurised cycles.

Power units with piston pumps, flow rate up to 6.0 l/min

Piston pump with pressure filter



The same valves ND 4, valve blocks and control variants as used for the power units as per data sheet D 8.021 can be mounted to all power units with pressure filter, e.g. Part no. 8275 120.

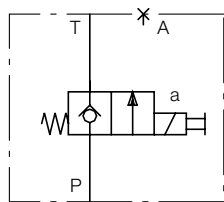
Power units with piston pump, flow rate more than 6.0 l/min

For power units with piston pump e.g. 8.4 l/min, Part no. 8278 140, or with pump combination e.g. 9.0/1.5 l/min, Part no. 8280 145, with return filter valves ND 10 and mounting plates with ports G 1/2 have to be used.

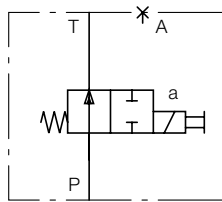
When designing a power unit the surface ratios of the cylinders (e.g. in the case of Römheld cylinders 1.6:1 or in the case of swing clamps 2.75:1 up to 4:1) have to be considered, since the flow rate will increase correspondingly in the return line.

Smaller pumps have to be used accordingly. The max. admissible flow rate of valves ND 10 is 25 l/min. These valves are mounted separately on the top of the reservoir cover.

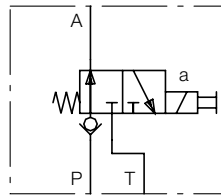
Variants of valves ND 10 in initial position on single mounting plate, Part no. 3534299



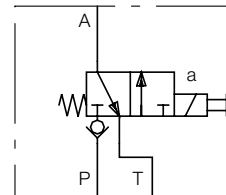
0-position: closed



0-position: passage



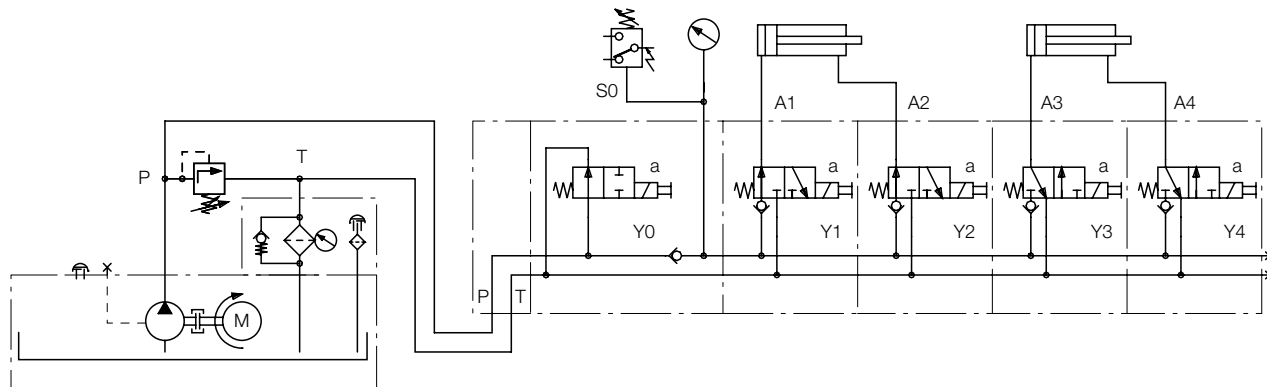
0-position: passage to the cylinder



0-position: return from the cylinder

In addition, there is the possibility to install valves in block design onto series mounting plates if several functions are required.

Example: 2 x double acting with different valves, unpressurised cycle and pressure switch



Further versions on request!

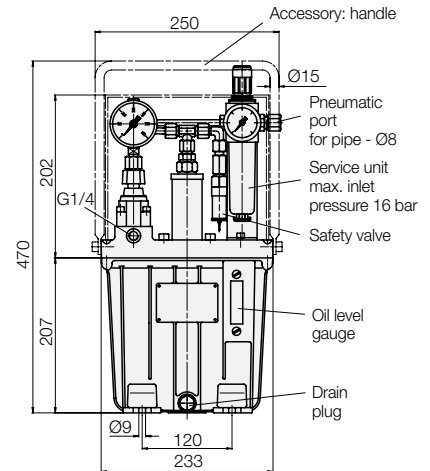
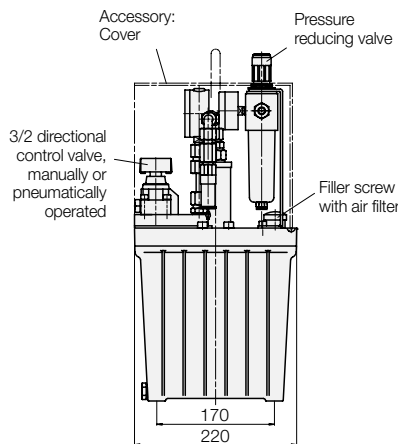
Power units with hydraulic and electric control can be designed and delivered according to your task.

– Please do not hesitate to contact us! –



Hydro-Pneumatic Pumps

max. flow rate 1.5 l/min, max. operating pressure 500 bar



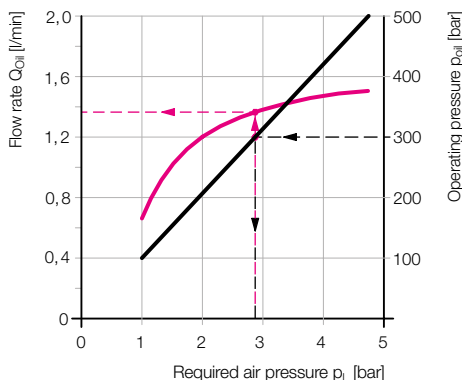
Application

The hydro-pneumatic pump is particularly suitable for small to medium-sized clamping and assembly fixtures with single or double-acting cylinders, which mainly operate in intermittent mode (pressure build up and pressure holding).

Description

The tandem plunger pump is built into the oil reservoir in a space-saving manner. It operates with oscillating movements and automatic stroke reversing control by a pilot-operated 4/2 directional control valve. The stroke frequency and thereby the flow rate depend on air pressure and hydraulic counter pressure.

Flow rate without counter pressure (idle running)



Example

For an operating pressure of $p_{oil} = 300$ bar an air pressure of $p_L = 2.8$ bar is adjusted at the pressure reducing valve. The flow rate Q_{oil} without counter pressure is approx. 1.35 l/min.

Control variants

Manually-operated 3/2 directional control valve

This valve is equipped with a turning handle for direct operation at the power unit.

Pneumatically-operated 3/2 directional control valve

This valve is mounted on the power unit allowing for pneumatic remote control, which, however, requires an additional hand lever valve (accessory). According to the length of the pneumatic piping between both valves, there is a longer or shorter time delay for the clamping and unclamping operation.

Without valve as pressure generator

For external valve controls (P and R ports only) The pump unit maintains constant the adjusted pressure.

With attached valve control

For single and double-acting cylinders Examples see page 3 and 4

Technical data

Max. flow rate	[cm ³ /s]	25
	[l/min]	1.5
Max. operating pressure	[bar]	500
Min. operating pressure	[bar]	100
Max. air pressure	[bar]	4.7
Min. air pressure	[bar]	1.0
Intensification ratio		1:108
Max. air consumption	[l/min]	1200
Min. control pressure	[bar]	3
for pneumatic valve		
Max. oil charge	[l]	4.0
Usable oil volume	[l]	1.8
Viscosity range	[10 ⁻⁶ m ² /s]	10...500
Recom. viscosity class		ISO VG 22
as per DIN 51519		
Recom. hydraulic oil		HLP 22
as per DIN 51524		
Noise level	[dBA]	78
Weight, approx.	[kg]	20

Hydro-pneumatic pumps with deviating pressure or flow rate on request.

Delivery

The power units are delivered complete and ready for connection. On the pneumatic side there is a service unit with pressure reducer and filter. An additional pressure relief valve prevents increase of pressure over 4.8 bar, and thus operating pressures over 500 bar on the hydraulic side. With valve control fitted, the customer must ensure that the valves are controlled.

Part no.

Pump with manual valve	8600110
Pump with pneumatic valve	8600111
Pump without valve as pure pressure generator	8600112
Pump as basic power unit for attachable valve control	8600113

When selecting this pump, the valves for single or double-acting cylinders must be determined additionally.

Examples see page 3 and 4

Accessories for 8600110, -111 and -112

Handle	0353217
Cover	0353714

Accessories for pneumatic remote control of 8600111

Hand lever valve with catch	3812005
Sound absorber for hand lever valve	3887015
Foot valve with catch including cover	0381206
Air hose ND 6	3890059
Screwed socket G1/4	3890071
Tube clamp	3890076

Example of ordering

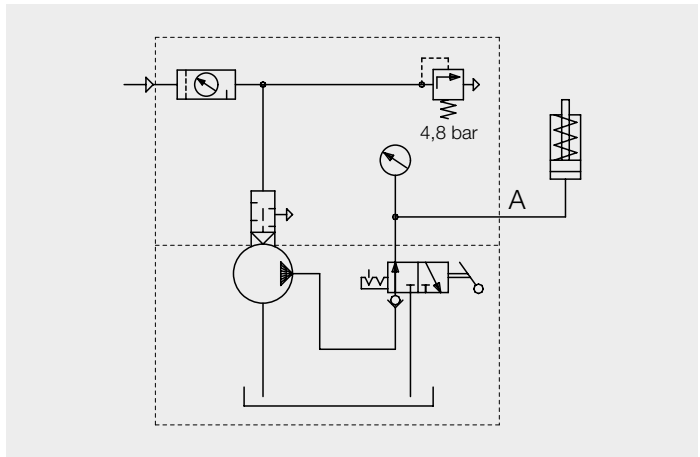


Pump with manual valve	8600110
Handle	0353217
Cover	0353714

Hydro-pneumatic pump with manual valve

Part no. 8600 110

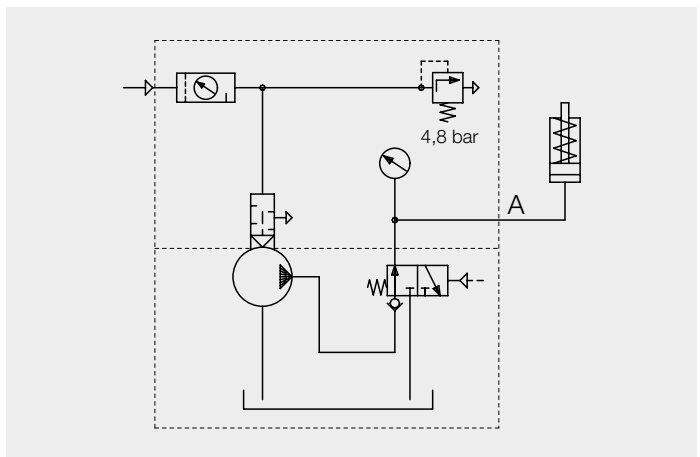
Control:
manually-operated 3/2 directional control poppet valve for single-acting elements



Hydro-pneumatic pump with pneumatic valve

Part no. 8600 111

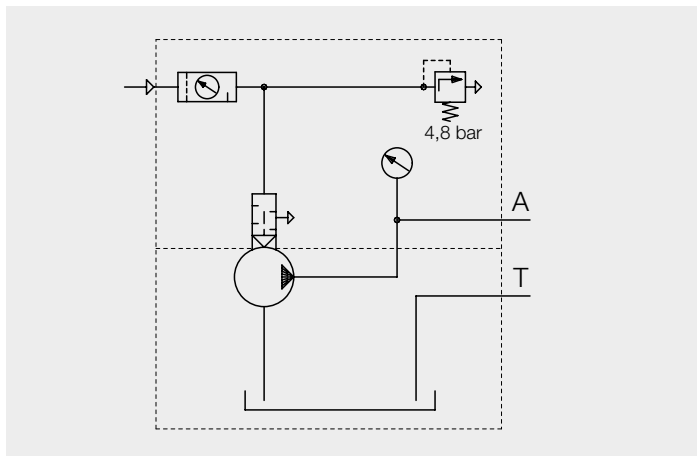
Control:
Pneumatically-operated 3/2 directional control poppet valve for single-acting elements
Accessories for pneumatic remote control see page 1.



Hydro-pneumatic pump as pressure generator

Part no. 8600 112

Without valve for external valve control



Hydro-pneumatic pump as basic power unit

Part no. 8600 113

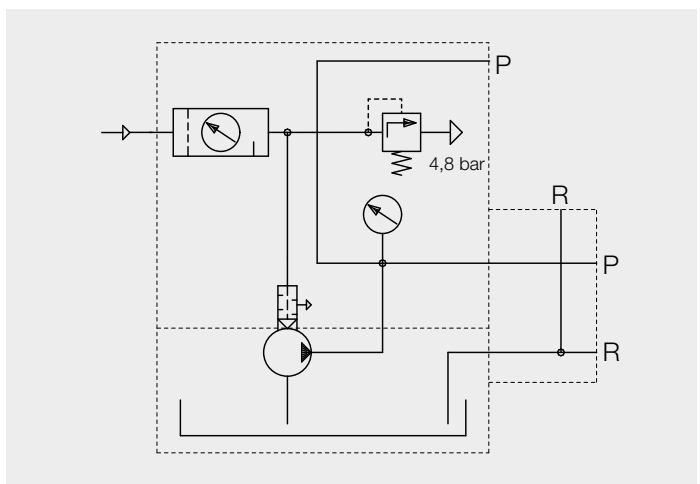
for attachable valve control
for single or double-acting elements

For this basic power unit, the valves for single or double-acting cylinders must be determined additionally.
For clamping pressure monitoring, electrically evaluable piston pressure switches can be selected.

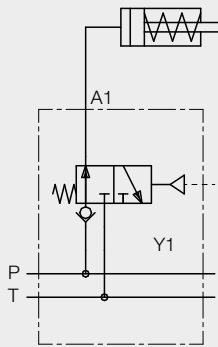
The valves and pressure switches are manifold-mounted on series mounting plates.

The series mounting plates are firmly mounted to the basic power unit via tie rods.

Examples see page 3 and 4.

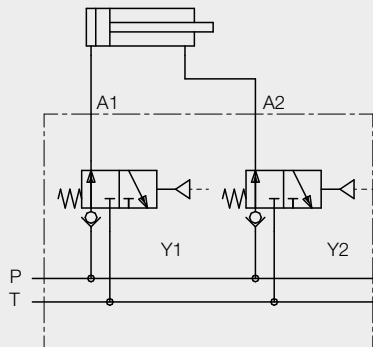


Single acting



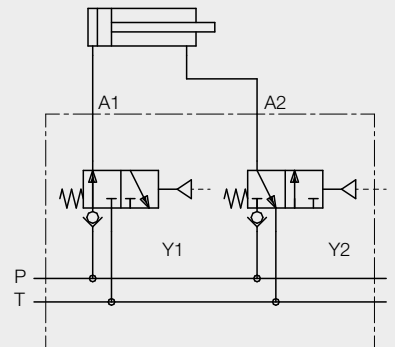
1 x 3/2 directional control poppet valve,
clamped without control air

Double acting with 2 identical valve positions



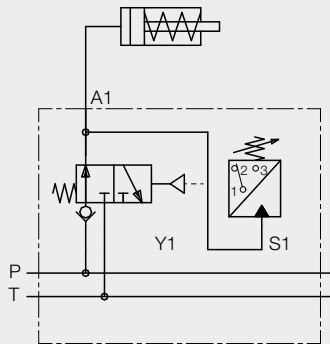
2 x identical 3/2 directional control
poppet valves,
alternating control air supply

Double acting with 2 different valve positions



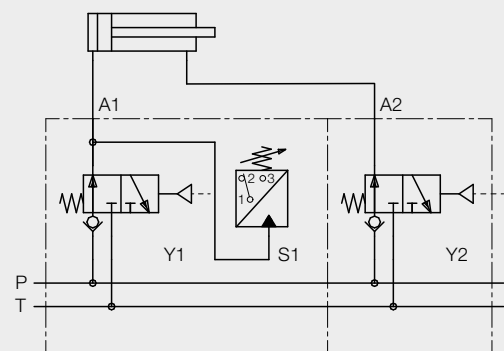
2 x inverse 3/2 directional control
poppet valves,
simultaneous control air supply

Single acting with machine tool interlock



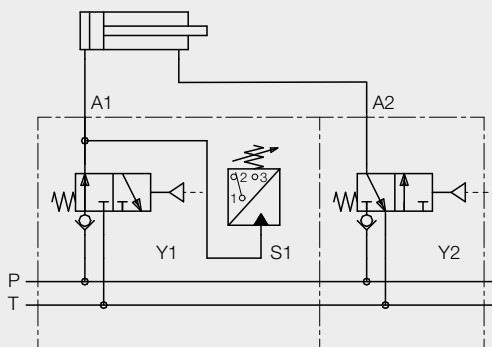
1 x 3/2 directional control poppet valve,
clamped without control air,
with 1 x piston pressure switch in the clamping outlet

Double acting with 2 identical valve positions with machine tool interlock



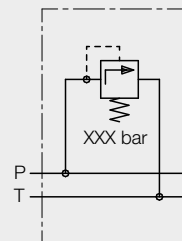
2 x identical 3/2 directional control poppet valves,
alternating control air supply,
with 1 x piston pressure switch in the clamping outlet

Double acting with 2 different valve positions with machine tool interlock



2 x inverse 3/2 directional control poppet valves,
simultaneous control air supply,
clamped without control air,
with 1 x piston pressure switch in the clamping outlet

Pressure limitation in the hydraulic circuit

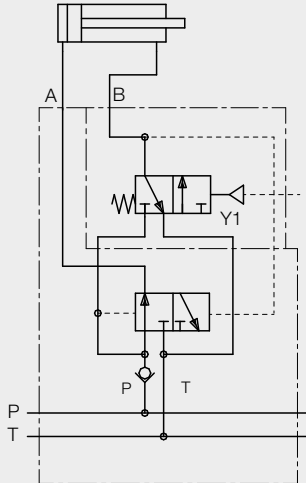


1 x adjustable pressure relief valve
as additional safety valve

Note

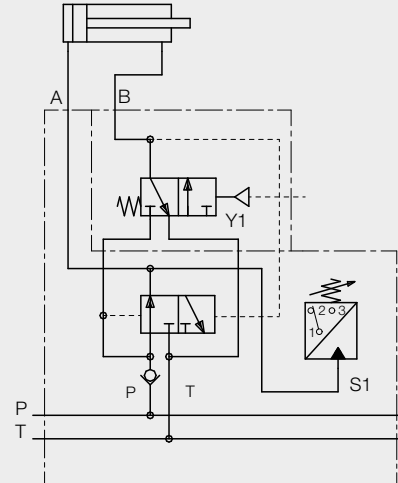
The pressure relief valve must be set to the operating pressure + 15 % as a minimum. This prevents the hydro-pneumatic pump from being permanently switched on. Adjustment of the operating pressure see example on page 1.

Double acting via 4/2 directional function *1)



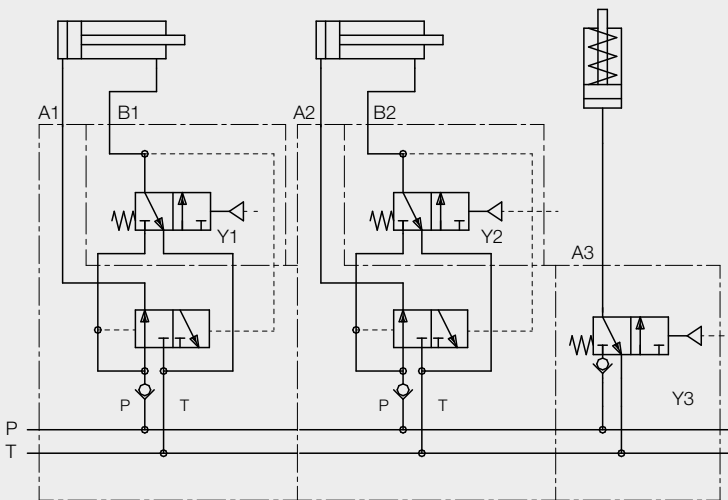
2x 3/2 directional control poppet valve,
clamped without control air,
with hydraulically controlled intermediate plate

Double acting via 4/2 directional function *1) with machine tool interlock

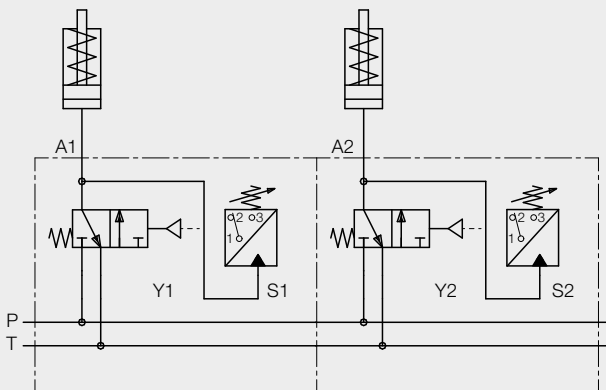


2x 3/2 directional control poppet valve,
clamped without control air,
with hydraulically controlled intermediate plate
with 1x piston pressure switch in the clamping outlet

2 x double acting via 4/2 directional function *1) and 1 x single acting



2 x single acting with machine tool interlock



*1) Note on the 4/2 directional function:

Due to the design, one of the two pressure outlets A or B
is always under pressure, therefore not suitable for
coupling purposes.

All valves shown with pneumatic control 4...15 bar.
Valves with 24 VDC solenoids as per data sheet C 2.360.
Valves manually operated as per data sheet C 2.320.
Valves with hydraulic control 16...50 bar on request.



Hydro-Pneumatic Pump Units

for single and double-acting cylinders
max. operating pressure 500 bar



Application

The hydro-pneumatic pump unit is **particularly suitable for smaller hydraulic clamping and assembly fixtures** with single or double-acting hydraulic elements.

Description

Single-acting version

The single-acting hydro-pneumatic pump unit is manually operated. Only by operating the pedal will the fixture be clamped or unclamped. The pump delivers oil as long as the desired operating pressure is obtained. Air pressure is adjusted by a pneumatic service unit. Oil pressure is maintained by an integrated check valve. The pump does not automatically supply oil in case of leaks!

Double-acting version

By pushing the pedal, the connected double-acting hydraulic cylinders are extended or retracted according to the position of the manual 4/3 directional control valve. The pedal has to be pushed as long as the cylinders are in its final position and the desired oil pressure is obtained. After release of the pedal, the pump does not re-deliver in case of pressure drop on the oil side! The pedal can be locked by the laterally-arranged pin with the description "PUSH INTO LOCK", thereby the pump is continuously supplied with air. In this case the cylinders are exclusively activated by the manual 4/3 directional control valve. Small leaks are compensated by the pump and the oil pressure is maintained constantly.

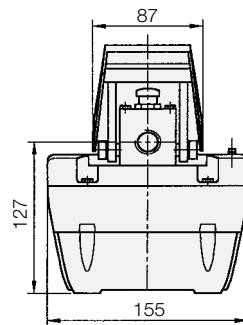
Important note

For permanent industrial use we recommend the hydro-pneumatic pump as per data sheet D 8.600.

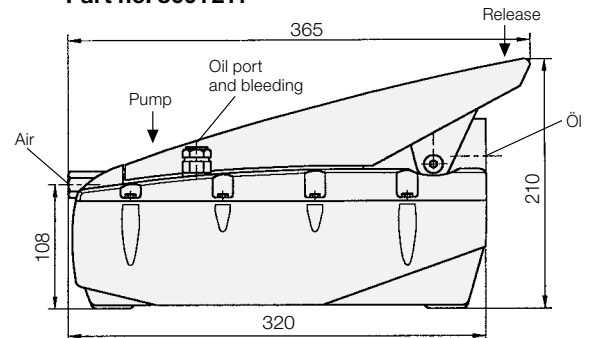
Delivery

The hydro-pneumatic pump unit is delivered with oil filling ready for connection. Preparation of the compressed air is made by an external service unit. Use of a lubricator is not required!

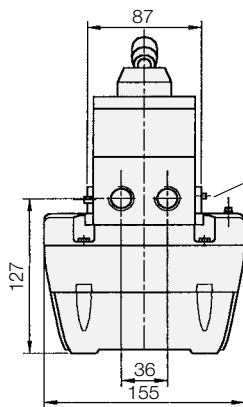
For single-acting cylinders



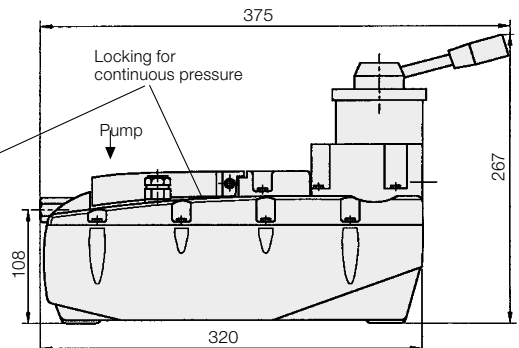
Part no. 8601211



For double-acting cylinders

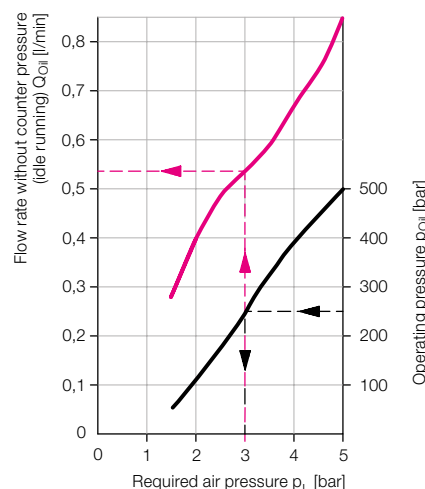


Part no. 8601221



Advantages

- Suitable for mobile use
- Integrated safety valve avoids pressure increase over 500 bar independently of the air pressure
- No health hazard oil mist when operating with non-lubricated air



Example: For an operating pressure of $p_{Oil} = 250$ bar an air pressure of $p_L = 3$ bar is adjusted at the preceding service unit. The flow rate Q_{Oil} (without counterpressure) is approx. 0.54 l/min.

Technical data

Max. flow rate	[cm³/s]	14.16
	[l/min]	0.85
Max. operating pressure*)	[bar]	500
Min. operating pressure	[bar]	50
Max. air pressure	[bar]	5
Min. starting pressure	[bar]	1.5
Max. air consumption	[Nl/min]	400
Transmission ratio		1:100
Max. oil volume	[l]	2.5
Usable oil volume	[l]	2.1
Connecting thread	[oil + air]	G1/4
Viscosity range	[10 – 6 m²/s]	10 – 500
Recom. viscosity grade as per DIN 51519		ISO VG 22
Recom. hydraulic oil as per DIN 51524		HLP 22
Noise level		75 db (A) / 1m

Single-acting version

Weight	6.3 kg
Part no.	8601211

Double-acting version

Weight	6.8 kg
Part no.	8601221

Accessories

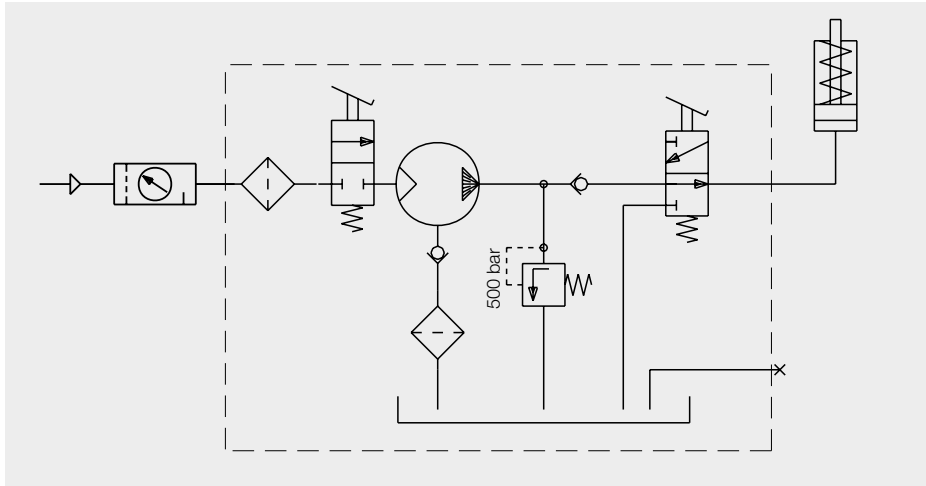
Service unit	9511005
Pressure gauge (600 bar)	9846000
Pressure gauge union	9208040

*) On request, the max. operating pressure can be limited.

Circuit examples

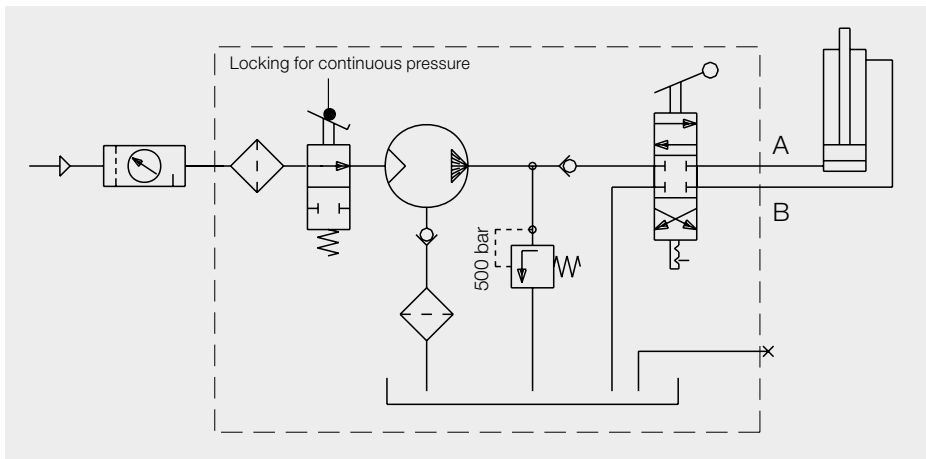
Circuit example: single-acting version

Part no. 8601211



Circuit example: double-acting version

Part no. 8601221



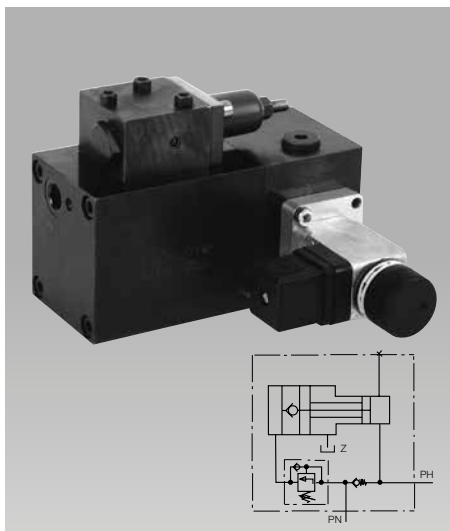


Intensifier 21 cm³

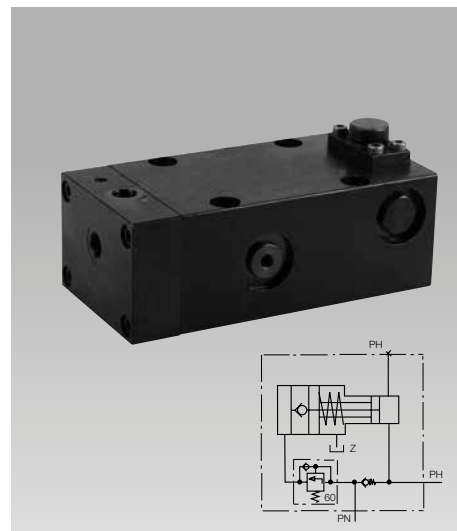
Intensification ratio 1 : 4, max. operating pressure 500 / 125 bar
 single and double acting



Double-acting intensifier
 for single-acting cylinders



Double-acting intensifier with sequence valve
 for double-acting cylinders



Single-acting intensifier with integrated
 sequence valve for single-acting cylinders

Application

Hydraulic intensifiers convert a hydraulic pressure on the primary side (input) into a higher pressure on the secondary side (output).

This enables the use of the comparatively low pressure of machine tool hydraulics to pressurise a hydraulic cylinder with quadruple pressure.

The oil quantity to be transmitted is not important for the intensifiers of this data sheet. Only after oil supply of the hydraulic cylinder in the low-pressure range is affected, the piston of intensification will be activated according to its specification by an external valve control or by an integrated switching function.

Important notes!

The intensification volume of the intensifiers is 21 cm³. This is the reason why no hydraulic element, which functions only with high pressure, e.g. hydraulic accumulators with a gas-preload pressure of more than 100 bar and an oil absorption exceeding 10 cm³, must be used in the high-pressure range.

The intensification volume of 21 cm³ is only used to generate the high-pressure, i.e. the compressibility of the hydraulic oil (1 % at a pressure increase of 150 bar) and the increase of volume of the high-pressure hoses (1 cm³ per m at a pressure increase of 100 bar) has to be considered.

Complete air bleeding of the hydraulic system is very important.

The high-pressure part should be controlled by a pressure gauge.

The elements 8753200, -201 and -203 can be equipped with a manifold-mounted pressure switch for machine tool interlock, when using 8753202 the pressure switch will be integrated in the piping. The switching pressure should be adjusted to 80 % of the secondary pressure.

When using pressure intensifiers 8753201 and 8753202 pay attention that no liquids penetrate through venting port "Z".

The vent screw with sintered metal air filter can be removed and a vent hose can be connected, if required.

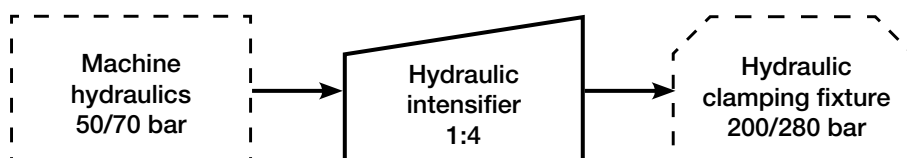
Operating conditions, tolerances and other data see data sheet A 0.100.

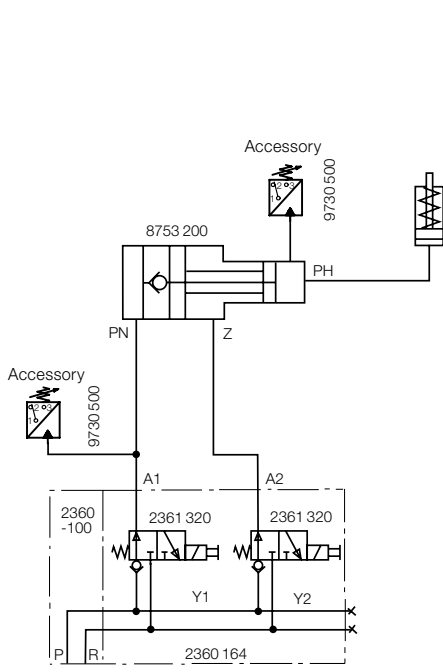
Accessory

Pressure switch as per data sheet F 9.732.

Pressure gauge as per data sheet F 9.300.

Application example





Hydraulic circuit diagram for 8753200

Intensifier 8753200 is mainly used for single-acting hydraulic elements.

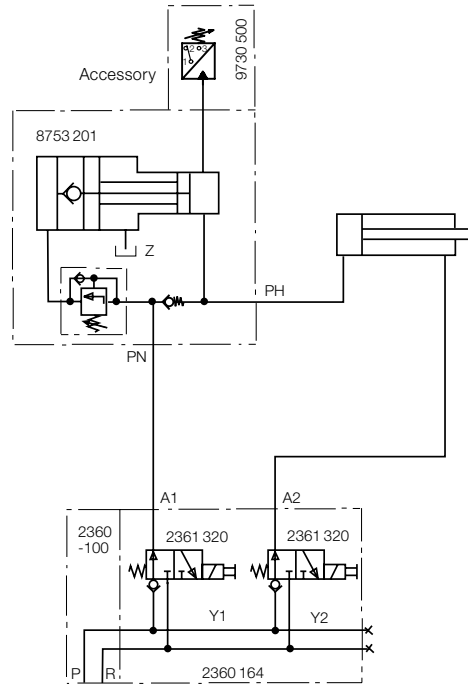
To fill the hydraulic cylinder, the piston of intensification must be kept in its off-position via control port "Z". For this purpose a second 3/2 directional control valve Y2 is required. In order to intensify the pressure after filling with the ratio 1:4, this valve has to be discharged in the low-pressure area to the reservoir after pressure built-up.

This timing will be determined by a pressure switch mounted in the low-pressure area between the valve and the intensifier.

To unclamp the hydraulic cylinder, the low-pressure port is discharged to the reservoir and the control port "Z" is connected to pressure. The piston of intensification moves to its off-position and the check valve opens.

Option: the pressure switch can be mounted in the high-pressure range to effect an active pressure monitoring for machine tool interlock.

See application example on page 4.



Hydraulic circuit diagram for 8753201

Intensifier 8753201 is used for double-acting hydraulic elements.

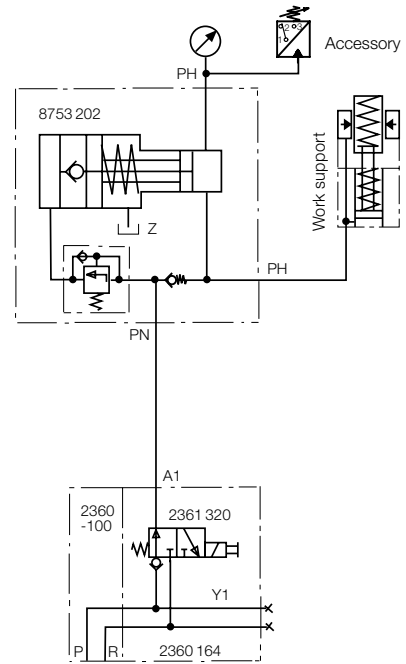
For filling in the low-pressure range, oil flows through the incorporated check valve to the cylinder.

The intensifier will be only activated, if the adjusted opening pressure at the integrated sequence valve is exceeded. The opening pressure should be approx. 80–90% of the max. low-pressure.

The returning oil during unclamping of the cylinder presses the piston of intensification in its off-position and opens the check valve in the piston. Via this valve the oil returns to the reservoir.

The function group intensifier/hydraulic cylinder is switched like a double-acting cylinder, i.e. without further control elements by two assigned 3/2 directional control valves.

The pressure switch which can be retro-fitted in the high-pressure range is used for pressure monitoring for machine tool interlock.



Hydraulic circuit diagram for 8753202 / -203

The single-acting intensifiers 8753202 and 8753203 are used for operation of single-acting hydraulic elements e.g. work supports.

For filling in the low-pressure range, oil flows through the incorporated check valve to the cylinder. The intensifier will be only activated, if the adjusted pressure at the integrated sequence valve is exceeded.

This opening pressure is not adjustable and is approx. 60 bar for 8753202 and approx.

40 bar for 8753203. The operating pressure on the low-pressure side should be at least 0 bar above this opening pressure. Both versions generate on the high-pressure side a pressure that is 3.85 times higher than the pressure on the low-pressure side.

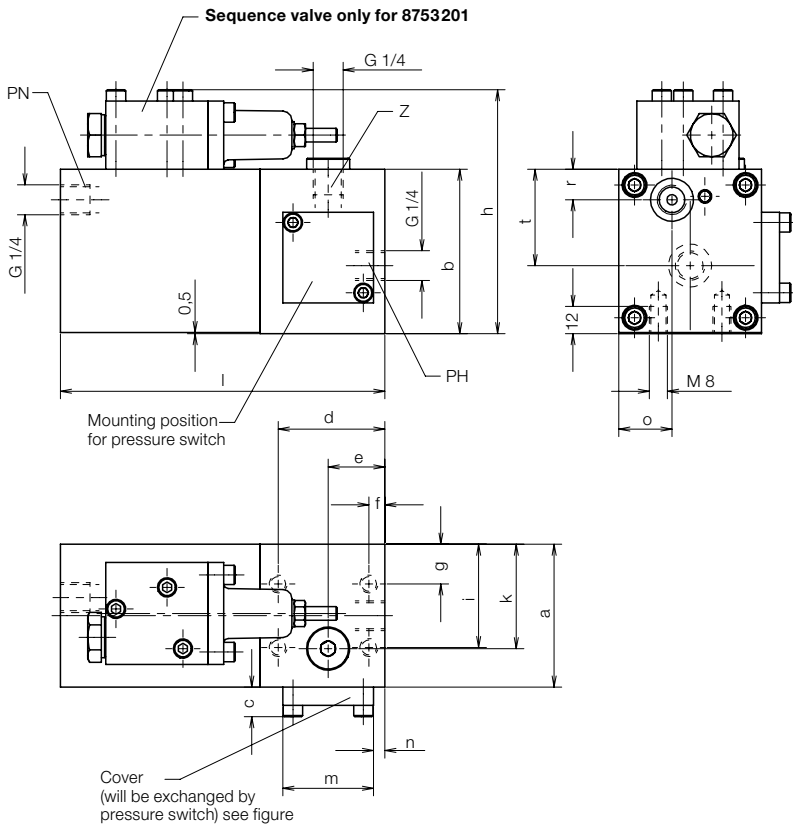
During unclamping the piston will be returned by an installed spring. The check valve will be opened in the off-position and the connected cylinders return also to their off-position.

By means of an additional pressure gauge the high-pressure part can be controlled.

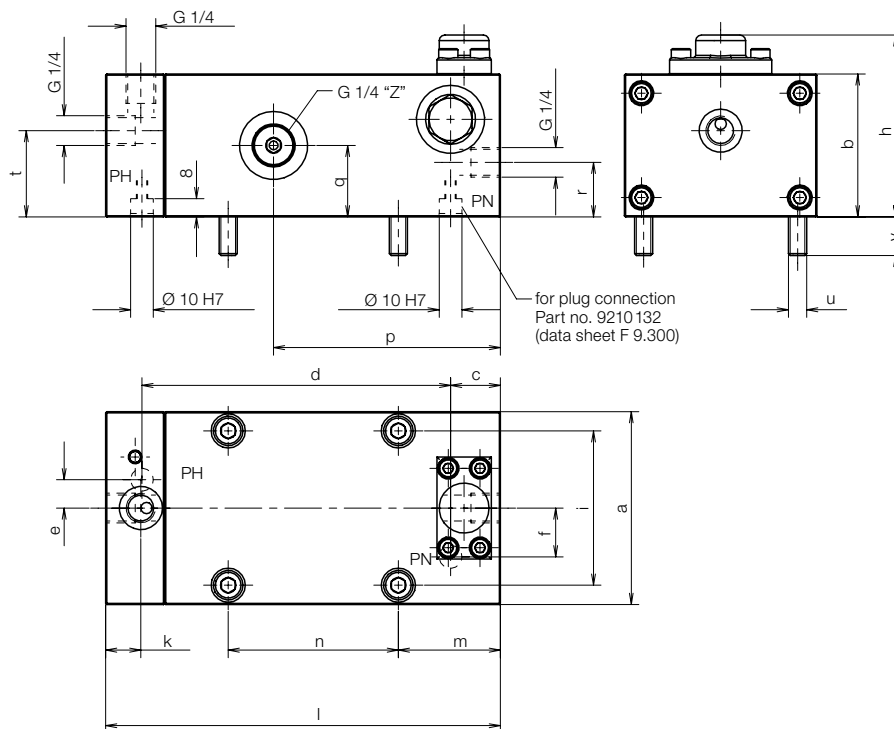
An additional pressure switch monitors the pressure for machine tool interlock.

See application example on page 4.

Dimensions



Versions	①	②
Sequence valve	without	with
Intensification ratio	1:4	1:4
High-pressure side		
Max. operating press. [bar]	500	500
Low-pressure side		
Max. operating press. [bar]	125	125
Max. flow rate [l/min]	8	8
Intensification volume [cm ³]	21	21
a [mm]	60	63
b [mm]	60	72.5
c [mm]	13	13
d [mm]	47	47
e [mm]	25	25
f [mm]	7	7
g [mm]	16	17.5
h [mm]	–	107.5
i [mm]	44	45.5
k [mm]	14	46
l [mm]	135	143
m [mm]	40x40	40x40
n [mm]	5	5
o [mm]	30	23.5
t [mm]	30	42.5
r [mm]	15	13.5
Part no.	8753200	8753201



Intensification ratio	1:3.85	1:3.85
Low-pressure side:		
Sequence pressure [bar]	approx. 60	approx. 40
Min. operating press.* [bar]	70	50
Max. operating press. [bar]	130	130
High-pressure side:		
Min. operating press. [bar]	270	190
Max. operating press. [bar]	500	500
Max. flow rate [l/min]	8	8
Usable oil volume [cm ³]	21	21
a [mm]	85	85
b [mm]	63	63
c [mm]	22	22
d ±0.1 [mm]	136	136
e ±0.1 [mm]	12.5	12.5
f ±0.1 [mm]	21.5	21.5
h +2 [mm]	80	80
i [mm]	68	68
k [mm]	15.5	15.5
l [mm]	174	174
m [mm]	45	45
n [mm]	75	75
p [mm]	100	100
q [mm]	31.5	31.5
r [mm]	24	24
t [mm]	38	38
u [mm]	M 8	M 8
v [mm]	17	17
Part no.	8753202	8753203

* Minimum pressure of machine hydraulics

Use of intensifiers for work supports

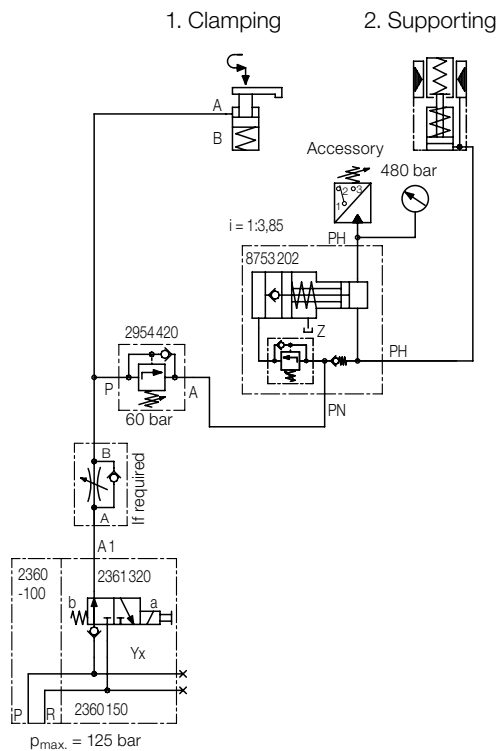
Starting situation

A workpiece shall be clamped with swing clamps onto fixed points and then additionally supported. The machine hydraulics has an operating pressure of 125 bar, but this is too little for a sufficient retention force of the work supports.

Solutions

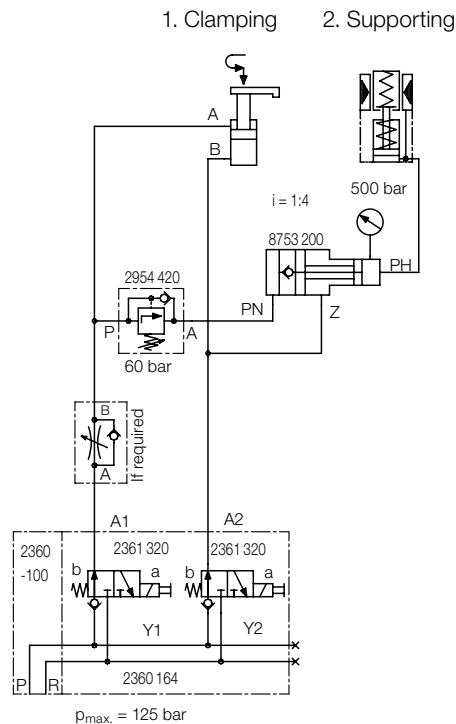
Hydraulic control - single acting

For single-acting connection only intensifier 8753 202 can be used. With intensification ration 1:3.85 a pressure of approx. 480 bar will be obtained at the work support.



Hydraulic control - double acting

For double-acting connection the pressure intensifier 8753 200 with an intensification ratio of 1:4 supplies a pressure of 500 bar.



Important note

Bleed carefully during start-up, since these intensifiers deliver in the high-pressure part only an oil volume of 21 cm³.



Intensifier 0.2 - 2.6 l/min

Intensification ratio 1.5 to 7.5, max. operating pressure up to 500 bar
double acting



Advantages

- Very compact design
- Continuous flow rate
- Leakage compensation
- Pressure regulation low-pressure side
- Expensive high-pressure pump not required
- High-pressure only where needed
- Cost-saving piping

Application

The hydraulic intensifiers convert a low input pressure into a higher output pressure according to the intensification ratio. In principle, smaller clamping elements can be used with higher pressure and thus more workpieces can be machined on one fixture.

A single hydraulic cylinder, a complete group of cylinders or a complete hydraulic clamping fixture can be connected to the hydraulic intensifier.

In case of a leakage in the high-pressure area the constant pressure is maintained, as long as low pressure is available.

Description

An oscillating pump piston, that will be automatically reversed in the end positions by a hydraulically-operated valve, is installed in the intensifier. The ratio of the piston areas corresponds to the intensification ratio.

For unhindered flow in the low-pressure range, the pump piston will be bypassed by means of a bypass-line. A pilot-controlled check valve shuts off the high pressure.

Important notes

The intensifier can produce extremely high hydraulic pressures. The manufacturer of the system must provide effective safety valves for protection against excessive pressures.

The connection of the intensifier must always be double acting. For oil supply, port R must be depressurised.

Pump piston and valve slide are fit with minimum clearance. In order to permanently secure the function, it is imperative to install a high-pressure filter at the input IN of the intensifier (see hydraulic circuit diagram).

As long as pressure is available at IN, the intensifier has an internal leakage between the ports IN and R.

If no pressure is available at IN, the pressure can drop in the high-pressure area in case of a leakage. By the installation of a pilot-controlled check valve at port H a pressure drop is avoided (see hydraulic circuit diagram). This applies in particular to uncoupled systems (clamping pallets).

Pressure / flow rate diagram



Function

The flow rate is supplied without pressure through input IN via the check valves RV1, RV2 and DV to the output H and thereby to the hydraulic cylinders.

With increasing counter pressure the oscillating pump OP starts working. The flow rate at output H is getting smaller and smaller and is nearly zero when reaching the maximum operating pressure.

The pump holds constant the pressure at H as long as low-pressure is available at IN. Between the ports IN and R there will be leakage of approx. 50 cm³/min, since due to functional reasons the pump elements cannot be sealed without leakage.

To retract the cylinders, port IN will be depressurised and port R pressurised. At the same time, the check valve DV will be opened and enables free return flow.

Single-acting cylinders

If only single-acting cylinders are connected, a double-acting valve function is required to control the pilot-operated check valves for unclamping (see hydraulic circuit diagram).

Technical data

Low pressure min.	20 bar
max.	see part numbers
High pressure max.	see part numbers
Temperature range	-30 ... +100 °C
Filtration nominal value	10 µm
Contamination max.	class 19 / 16 as per ISO 4406
Other data	see data sheet A 0.100

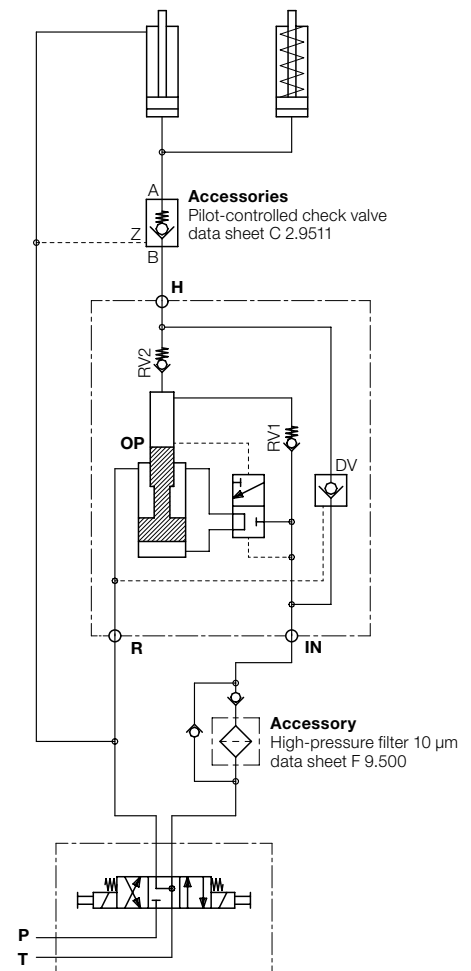
High pressure



Low pressure

Hydraulic circuit diagram

In the hydraulic circuit diagram, the required accessories are represented (see "Important notes").



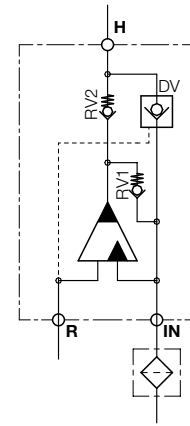
Pipe thread version Intensification ratio 1.5 to 7.5



Application

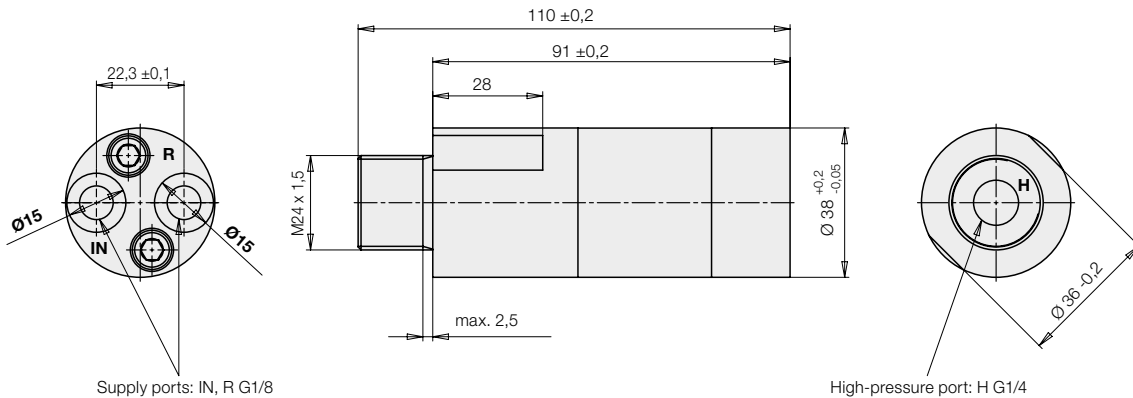
Intensifiers with pipe thread are very compact. They are integrated into the piping of a clamping fixture, specifically where high-pressure is required. Thus the costs for piping can be considerably reduced.

For the use on clamping pallets, pay attention to "Important notes" on page 1.



Accessory
High-pressure filter 10 µm
data sheet F 9.500

Size 1

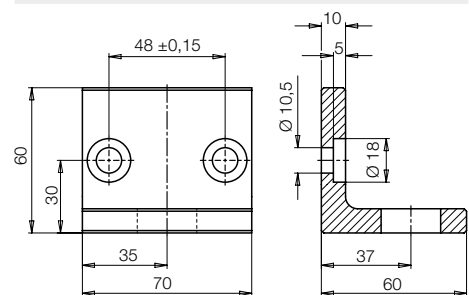


Intensification ratio	2	2.8	3.3	4	4.8	6.2	7.5
Max. operating pressure							
Low pressure IN [bar]	207	178	151	125	104	80	67
High pressure H [bar]	414	500	500	500	500	500	500
Max. flow rate							
Low pressure IN [l/min]	8	8	8	8	8	8	8
High pressure H*) approx. [l/min]	1.5	1.5	0.8	0.6	0.5	0.4	0.2
Weight approx. [kg]	0.75	0.75	0.75	0.75	0.75	0.75	0.75

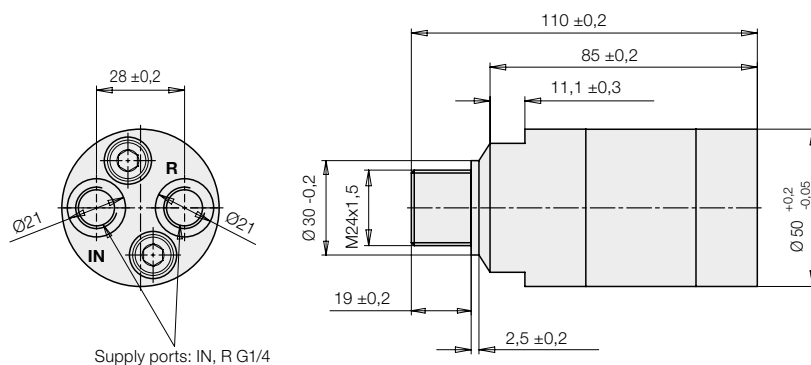
Part no. 8755120 8755128 8755132 8755140 8755148 8755162 8755175

Mounting bracket usable for both sizes

Part no. 35381035

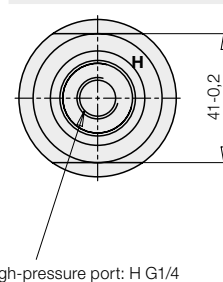


Size 2



Hexagon nut M24x1.5 -DIN 936

Part no. 3302104



Intensification ratio	1.5	2	2.8	3.2	4	5	6.6
Max. operating pressure							
Low pressure IN [bar]	207	207	178	156	125	100	75
High pressure H [bar]	311	414	500	500	500	500	500
Max. flow rate							
Low pressure IN [l/min]	8	8	8	15	14	14	13
High pressure H*) approx. [l/min]	2.6	2.4	1.4	1.6	1.3	1	0.4
Weight approx. [kg]	1.2	1.2	1.2	1.2	1.2	1.2	1.2

Part no. 8755015 8755020 8755028 8755032 8755040 8755050 8755066

Example

Intensifier 8755040

Low pressure max. 125 bar

Flow rate max. 14 l/min

High pressure max. 500 bar

Flow rate approx. 1.3 l/min

(at 0.6 x 500 bar = 300 bar counter pressure)

*) Flow rate at output H with a counter pressure of 60 % of the max. operating pressure.
With increasing counter pressure the flow rate tends to zero (see page 1).

Manifold-mounting version Intensification ratio 1.5 to 6.6

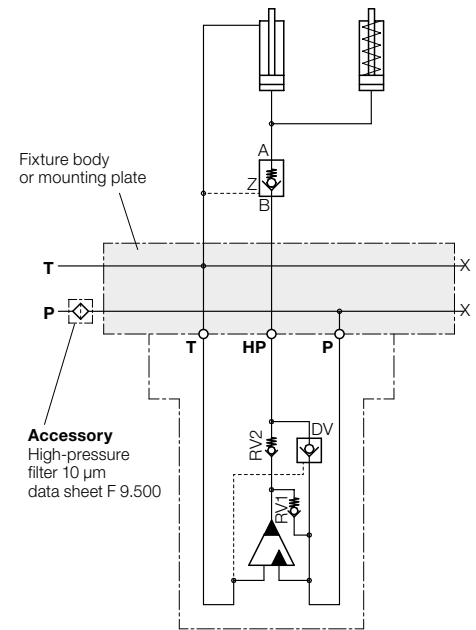


Application

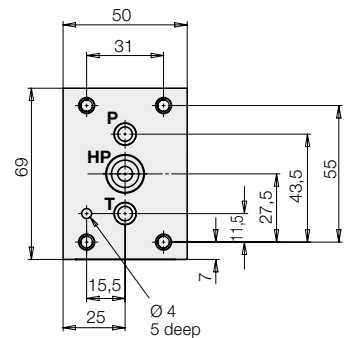
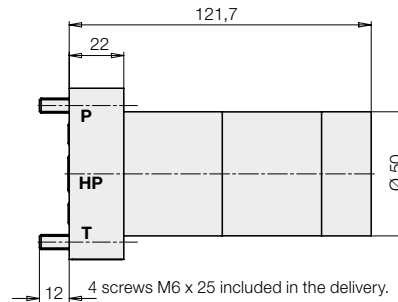
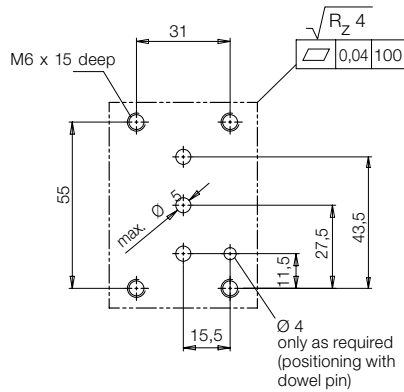
Intensifiers for manifold mounting allow mounting without pipes on special mounting plates or directly on the fixture body provided with drilled channels and a ground manifold-mounting surface.

Important notes

A pressure filter has to be provided in the P line to the intensifier (see hydraulic circuit diagram page 1).
The high-pressure area must be well ventilated to avoid unnecessary prolongation of the clamping time.



Connecting scheme

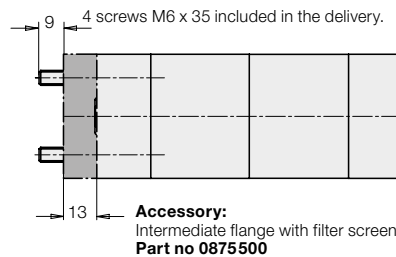


Accessory

Intermediate flange with filter screen

The installed screen disks have a hole Ø of 0.63 m. They are designed to protect the pressure intensifier from larger swarf that has entered the system during pipe assembly or coupling and uncoupling.

The specified pressure filter with filter fineness of 10 µm should be used on the power unit.



Intensification ratio		1.5	2	2.8	3.2	4	5	6.6
Max. operating pressure								
Low pressure IN	[bar]	207	207	178	156	125	100	75
High pressure H	[bar]	311	414	500	500	500	500	500
Max. flow rate								
Low pressure IN	[l/min]	8	12	13	15	14	14	13
High pressure H*) approx.	[l/min]	2.6	2.4	1.4	1.6	1.3	1	0.4
Weight approx.	[kg]	1.85	1.85	1.85	1.85	1.85	1.85	1.85
Part no.		8755615	8755620	8755628	8755632	8755640	8755650	8755666

*) Flow rate at output HP with a counter pressure of 60 % of the max. operating pressure.
With increasing counter pressure the flow rate tends to zero (see page 1).

Example

Intensifier 8755640

Low pressure max. 125 bar
Flow rate max. 14 l/min
High pressure max. 500 bar
Flow rate approx. 1.3 l/min
(at 0.6 x 500 bar = 300 bar counter pressure)

Double-acting function Intensification ratio 1.5 to 5

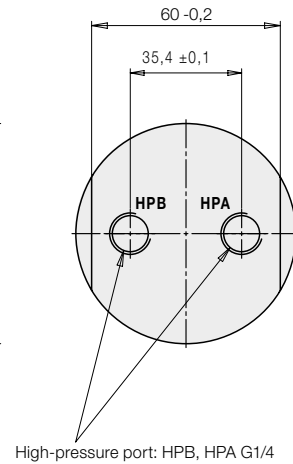
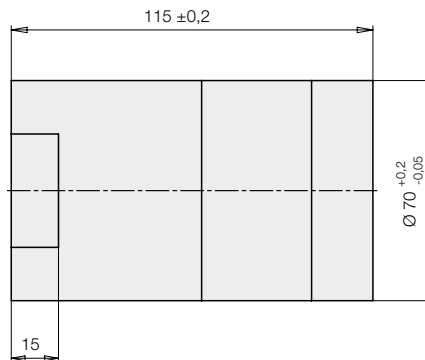
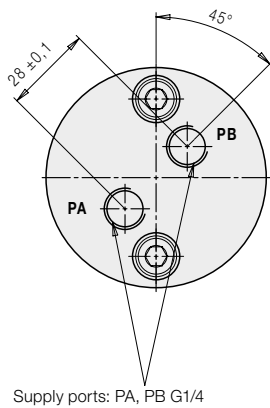
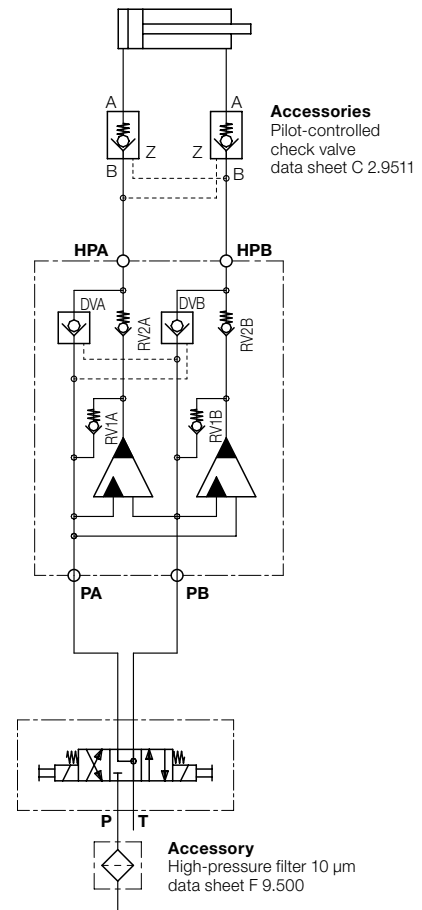


Application

With these intensifiers, double-acting hydraulic cylinders can be supplied with high pressure for extension as well as retraction. The separate operation of two single-acting cylinders is only possible, if they extend and retract alternately (see hydraulic circuit diagram).

Important notes

The simultaneous pressurisation of both ports is not admissible. While one side is pressurised, the other side must be depressurised. If constant pressure has to be maintained at the high-pressure ports, independently of the input pressure, one or two additional pilot-operated check valves have to be installed (see hydraulic circuit diagram).



Intensification ratio

		1.5	2	3.2	4	5
Max. operating pressure						
Low pressure PA,PB	[bar]	207	207	155	125	100
High pressure HPA,HPB	[bar]	311	414	500	500	500
Max. flow rate						
Low pressure PA,PB	[l/min]	8	12	15	14	14
High pressure HPA,HPB*) approx.	[l/min]	2.6	2.4	1.6	1.3	1
Weight approx.	[kg]	3.2	3.2	3.2	3.2	3.2

Part no. 8755515 8755520 8755532 8755540 8755550

Example

Intensifier 8755540

Low pressure max. 125 bar
Flow rate max. 14 l/min
High pressure max. 500 bar
Flow rate approx. 1.3 l/min
(at 0.6 x 500 bar = 300 bar counter pressure)

*) Flow rate at output HPA or HPB with a counter pressure of 60% of the max. operating pressure. With increasing counter pressure the flow rate tends to zero (see page 1).



Intensifier 1 - 2.6 l/min

Intensification ratio 1.5 to 5, max. operating pressure 500 bar
 double acting, with pilot-operated check valve



Advantages

- Compact design
- Pipe thread and manifold mounting connection possible
- Continuous flow rate
- Pressure regulation low-pressure side
- Expensive high-pressure pump not required
- High-pressure only where needed
- Cost-saving piping
- Pilot-controlled check valve integrated
- Sequence valve can be adapted

Application

Hydraulic intensifiers convert a low input pressure into a higher output pressure according to the intensification ratio.

In principle, smaller clamping elements can be used with higher pressure and thus more workpieces can be machined on one fixture. A single hydraulic cylinder, a complete group of cylinders or a complete hydraulic clamping fixture can be connected to the hydraulic intensifier.

The integrated pilot-controlled check valve prevents a pressure drop in the high-pressure range on uncoupled pallets.

Prerequisite is the use of leakage-free clamping elements.

Description

An oscillating pump piston, that will be automatically reversed in the end positions by a hydraulically-operated valve, is installed in the intensifier. The ratio of the piston areas corresponds to the intensification ratio.

For unhindered flow in the low-pressure range, the pump piston will be bypassed by means of a bypass-line. A pilot-controlled check valve shuts off the high pressure.

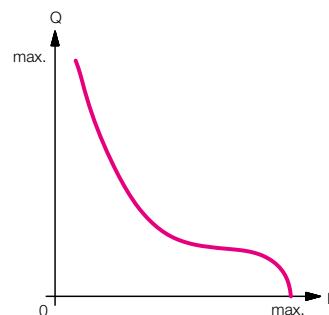
Important notes!

The intensifier can produce extremely high hydraulic pressures. The manufacturer of the system must provide effective safety valves for protection against excessive pressures.

The intensifier must always be connected for double acting use, also if only a single acting cylinder will be operated. For oil supply, port R must be depressurised, so that the pump and the pilot-operated check valves can work without failure.

As long as pressure is available at IN, the pump piston has an internal leakage by design that drains at return port R.

Pressure - flow rate diagram



Functional principle

The flow rate is supplied without pressure through input IN via the check valves RV3 and DV2 to the output H and thereby to the hydraulic cylinders.

At the same time, the oscillating pump OP starts working. The flow rate at output H is getting smaller and smaller and is nearly zero when reaching the maximum operating pressure.

The pump holds constant the pressure at H as long as low-pressure is available at IN.

Between the ports IN and R there will be leakage of approx. 50 cm³/min, since due to functional reasons the pump elements cannot be sealed without leakage.

If the input IN is depressurised, the check valve DV2 prevents a pressure drop at port H. To retract the cylinders, port IN will be depressurised and port R pressurised. The check valves DV1 and DV2 will be unlocked and allow a free return.

Single-acting cylinders

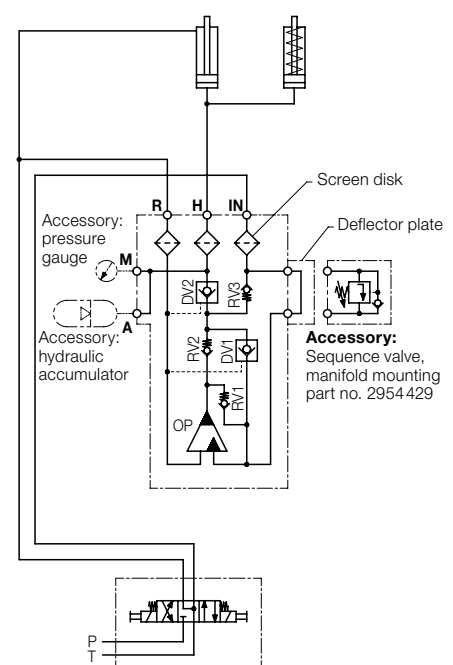
If only single-acting cylinders are connected, a double-acting valve function is required to control the pilot-operated check valves for unclamping (see hydraulic circuit diagram).

High pressure



Low pressure

Hydraulic circuit diagram



Power unit with a pressure filter 10 µm is required.

Accessory: Sequence valve

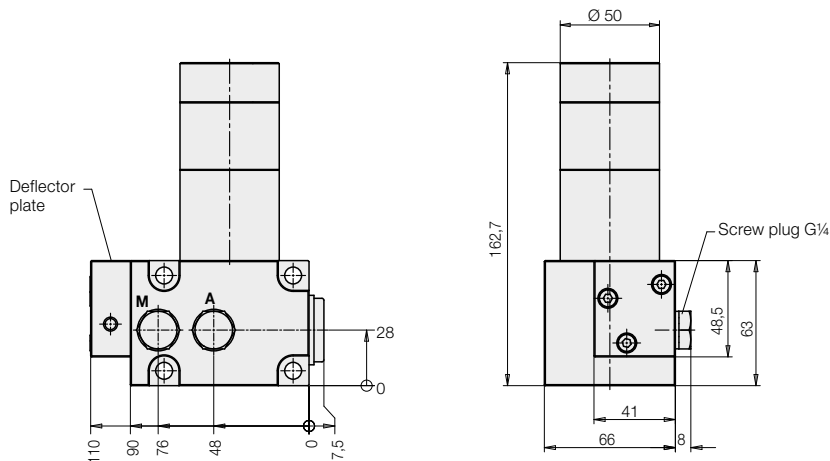
As soon as pressure is available at port IN the oscillating pump starts working and thereby consumes already a part of the available flow rate. Thus, the clamping time is extended.

By means of the manifold mounting sequence valve, the pump is only switched on when really required. This allows a significant reduction of the clamping time, particularly

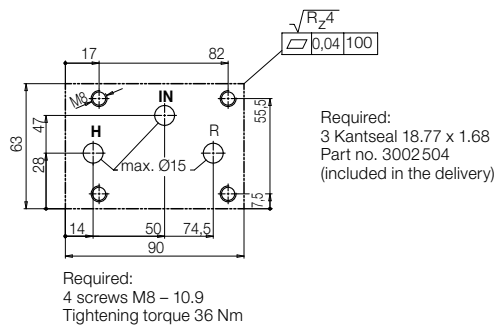
- in systems with a relatively small low pressure pump and/or
- if a relatively large volume is to be filled at the high-pressure side.

It is also possible to activate the high pressure only when a certain pressure is reached in the system.

Dimensions Technical data



Connecting scheme for manifold-mounting



Inputs

IN = Low pressure

R = Unlock check valves DV1 and DV2

Outputs

H = High pressure for hydraulic cylinders

A, M = High pressure for accessories (hydraulic accumulator, pressure gauge...) (Do not use as a cylinder port!)

Connecting thread 5 x G 1/4

Intensification ratio		1.5	2	3.2	4	5
Max. operating pressure						
Low pressure IN	[bar]	200	200	156	125	100
High pressure H	[bar]	300	400	500	500	500
Min. operating pressure	[bar]	20	20	20	20	20
Max. flow rate						
Low pressure IN	[l/min]	8	12	15	14	14
High pressure H*	[l/min]	2.6	2.4	1.6	1.3	1
Seals		NBR	NBR	NBR	NBR	NBR
Temperature range	[°C]	-30...+100	-30...+100	-30...+100	-30...+100	-30...+100
Max. degree of pollution	[ISO 4406]	Class 19/16	Class 19/16	Class 19/16	Class 19/16	Class 19/16
Required filter mesh size	[mm]	0.01	0.01	0.01	0.01	0.01
Screen filter (installed)	[mm]	0.63	0.63	0.63	0.63	0.63
Weight	[kg]	2.8	2.8	2.8	2.8	2.8
Part no.		8755715	8755720	8755732	8755740	8755750

*) in case of a counter pressure of 300 bar.

With increasing counter pressure the flow rate tends to zero (see page 1).

Accessory

Sequence valve as per data sheet C 2.954

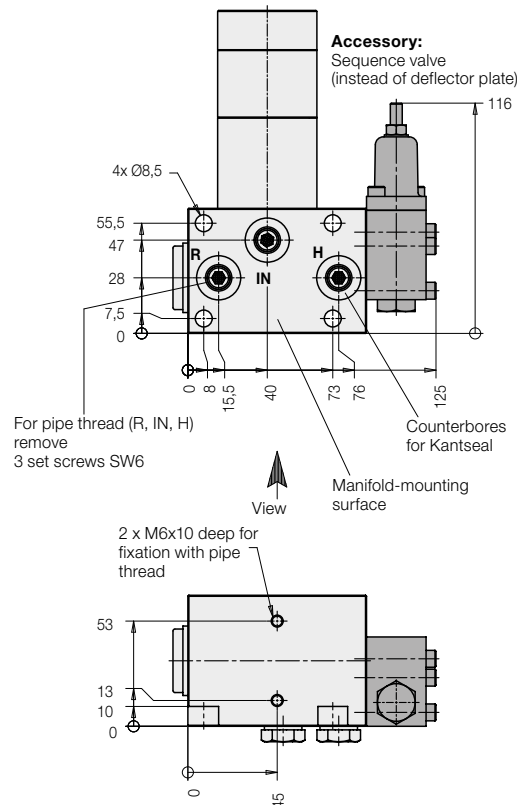
Adjusting range 10 - 150 bar

Part no. 2954429

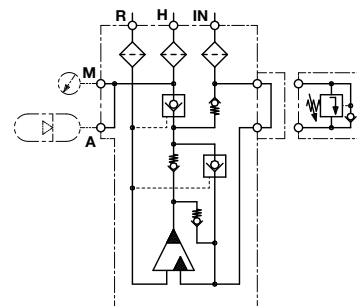
Required for mounting:

3 screws M5x35 - 8.8

Part no. 3300215



Hydraulic symbol





Intensifiers air - oil, 57 - 188 cm³

**Intensification ratio 25 to 82.64, max. operating pressure up to 500 bar
single acting, with oil reservoir**



Description

This pneumatic-hydraulic intensifier can be used as a pressure generator where live cables are not possible or suitable.

Only single-acting cylinders can be connected. The cylinder volume should utilise the working only up to 60-70% so as to have some reserve left.

When designing fixtures, some features of the air intensifier should be taken into account:

1. Extend cylinder

Air intensifiers are liable to release the effective oil volume very quickly within 1 second. The oil speed depends only on the volume flow of the compressed air. This may cause malfunctions in clamping elements where the maximum volume flow is limited (swing clamps, work supports). In those cases a flow control valve must be provided on the oil side.

2. Pressure build-up

After extending the cylinders, pressure build-up is relatively slow, according to the nominal bore of the pneumatic piping and air pressure. At 6 bar the sextuple working volume must be fed, which takes approx. 3 seconds.

3. Pressure release

For this purpose, the air volume accumulated must first be reduced to a residual pressure below 0.2 bar, before the connected hydraulic cylinders retract. The high-speed vent valve available as an accessory allows for a pressure release time of approx. 2 sec. at an initial pressure of 6 bar.

4. Pressure adjustment

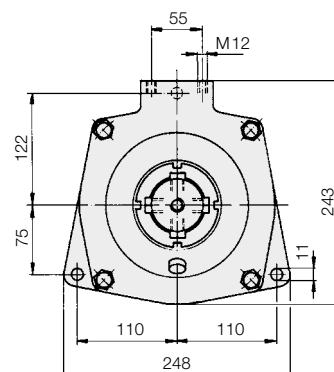
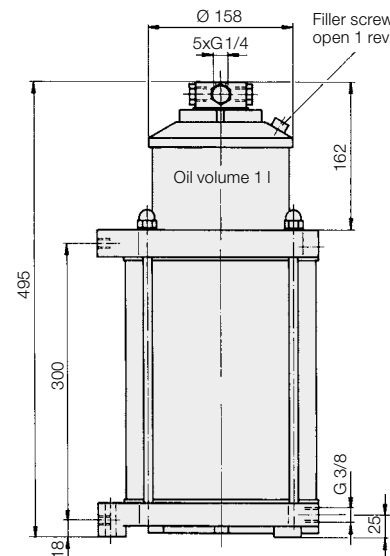
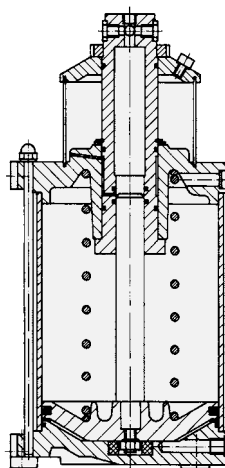
The hydraulic operating pressure can only be adjusted by means of a pressure reducing valve on the pneumatic side. We recommend our service unit **Part no. 9511 005**.

Important note: The maximum operating pressure on the hydraulic side is determined by the component having the smallest admissible operating pressure.

The pneumatic adjustment must be checked by a pressure gauge located on the hydraulic side.

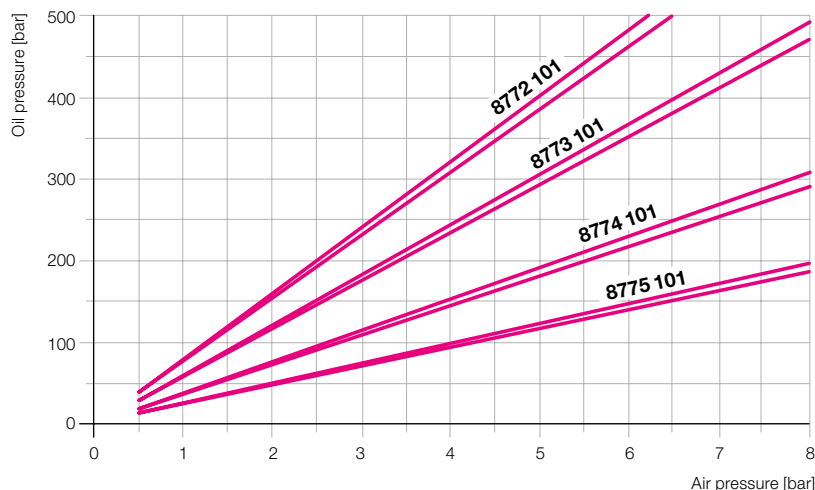
5. Replenishment

Any minor leak losses are compensated by replenishing out of the oil tank. This requires a well vented system and an oil filler screw slightly opened.



Max. air consumption per stroke at 6 bar	approx. 28,3 l
Viscosity range	(4...1000) 10 ⁻⁶ m ² /s
Recommended viscosity class	ISO VG 22 as per DIN 51519
Recommended hydraulic oil	HLP 22 as per 51524
Weight	22 kg
Mounting position	vertical or horizontal on mounting surface

Intensification ratio	Oil pressure [bar]		Max. air pressure [bar]	Max. oil pressure [bar]	Work volume [cm ³]	Part no.
	at 6 bar air pressure min.	max.				
82.64 : 1	462	480	6.3	505	57	8772 101
64 : 1	358	372	8	500	73	8773 101
39.06 : 1	218	227	8	305	120	8774 101
25 : 1	140	145	8	195	188	8775 101



Start up

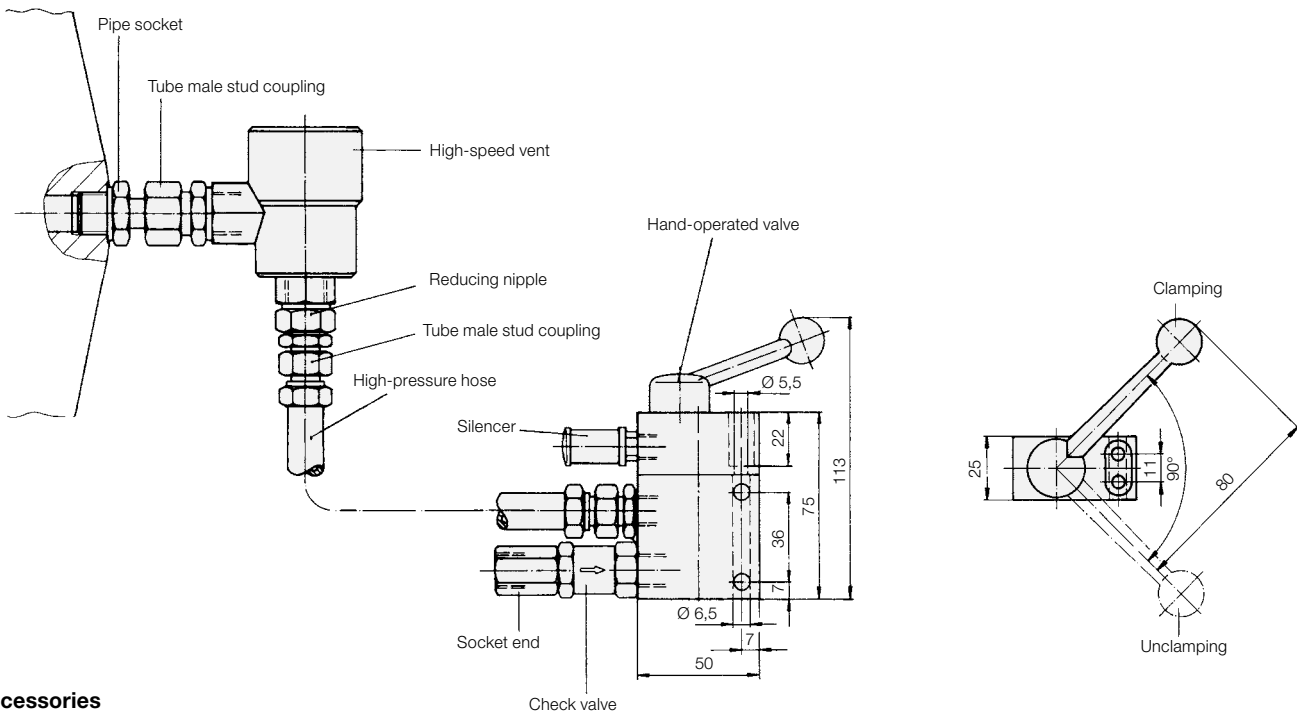
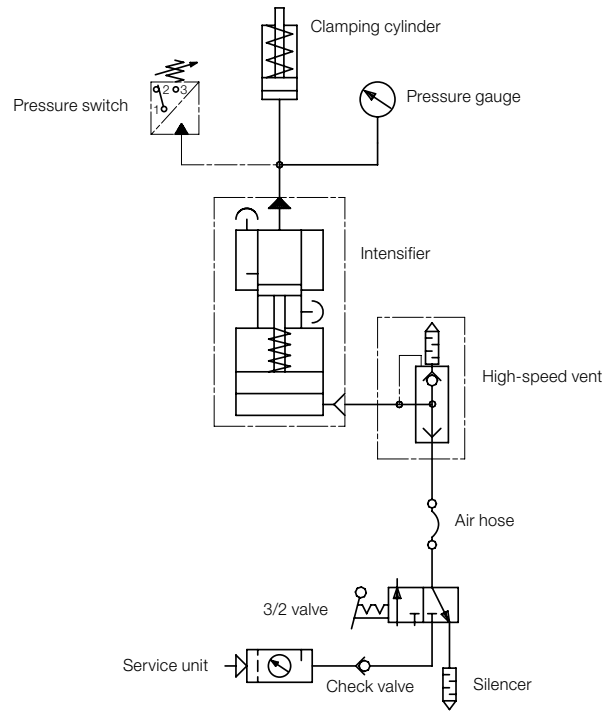
The air intensifiers are delivered without oil. After connecting the cylinders, the oil reservoir can be filled.

Air Bleeding

Complete bleeding is particularly important because of the limited working volume of the air intensifier. Bleeding is facilitated by first arranging the air intensifier somewhat below the cylinder level, i.e. the pipes rise slightly towards the cylinders. Loosen the most distant union nut of the fitting at the cylinder. Then blow cautiously compressed air into the filling port of the oil reservoir. The overpressure (max. 2 bar!) generated in the reservoir displaces the hydraulic oil in the pump body and into the piping system, thus expelling the air through the unfastened swivel nut.

When only bubble-free oil comes out, first fasten swivel nut and then shut off compressed air. If necessary repeat this at the other cylinder connections. Finally, the oil reservoir has to be filled up again.

During operation, the hydraulic connection of the air intensifier should lie above the cylinder level. This is to avoid that, during prolonged standstill periods in depressurised condition, a partial vacuum is produced in the system that causes the intake of air through the cylinder seals.



Accessories

Hand lever valve G 1/4 with notch	3812005
Sound absorber for hand lever valve	3887015
Foot-actuated valve G 1/4 with notch incl. safety cover	0381206
High-speed vent valve G 3/8	3812008
High-pressure hose (see data sheet F 9.361)	93206XXXXX
Tube male stud coupling D 8 L	9208131
Reducing nipple G 1/4 inside, G 3/8 outside	3613073
Tube male stud coupling D 12 L	9212030
Pipe socket DC 12 L	9212032
Check valve	3812009
Socket end G 1/4 – G 1/4	3890077
Service unit see figure	9511005
Pressure gauge 600 bar	9846000
Pressure gauge union	9208040

Service unit
Part no. 9511 005





Hydraulic Pumps

manually operated
max. operating pressure 100, 200 and 500 bar



Type with foot lever, base and pressure gauge

In connection with our clamping elements, workpieces can be clamped economically with this clamping pump.

Furthermore, this pump can be used for lifting loads, adjusting and clamping tables, as well as for other operating processes.

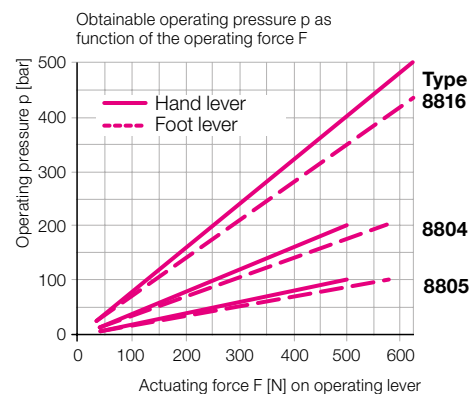
The particular advantages of this pump are:

- Choice of hand or foot operation
- Pumping and releasing with the same lever
- Continuously adjustable pressure relief valve
- Metallic seal on pump piston, thereby nearly wear-free
- Compact, self-contained design.

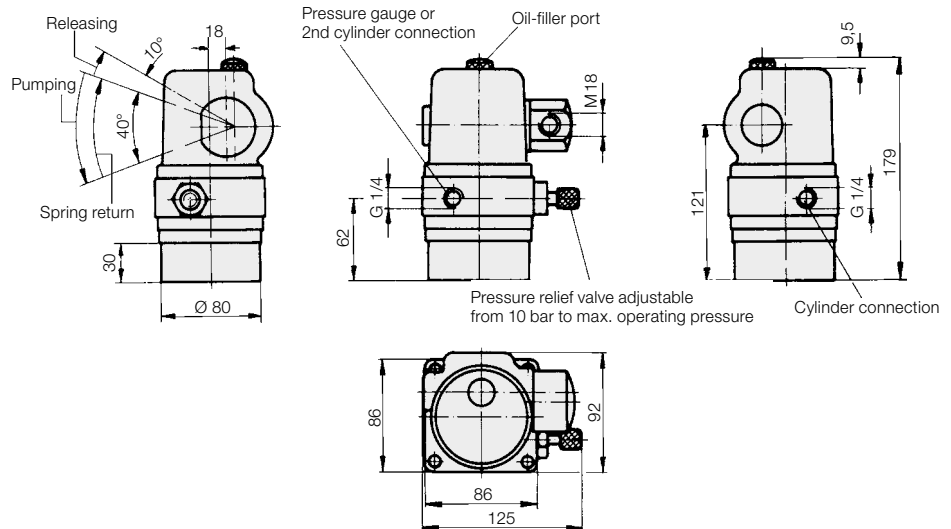
Delivery without accessories.

Hydraulic lifting pumps with safety hand or foot lever are assembled and ready for operation.

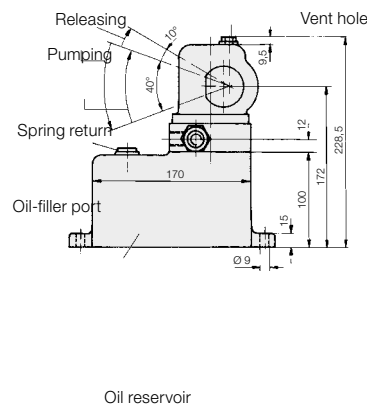
Accessory see page 2.



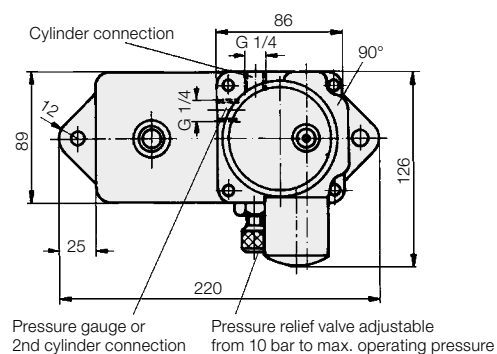
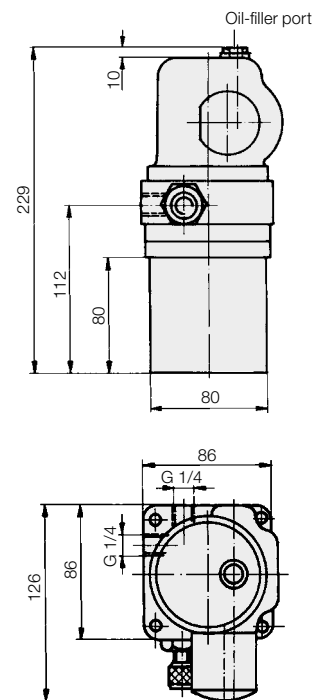
Types 8804006, 8805006, 8816006



Types 8806006 and 8807006



Type 8808006



Included in the delivery of all hydraulic pumps:

1 tube male stud coupling D8L or D8S with sieve for swarf protection.

1 swivel banjo coupling DSVK8L or SVH8SR with sieve for swarf protection.

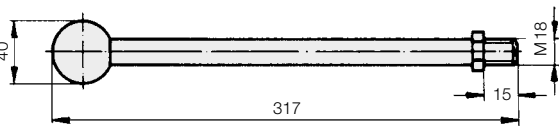
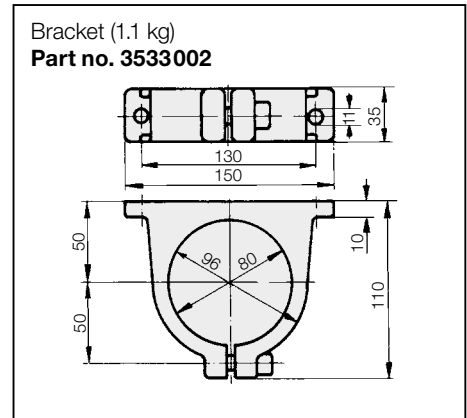
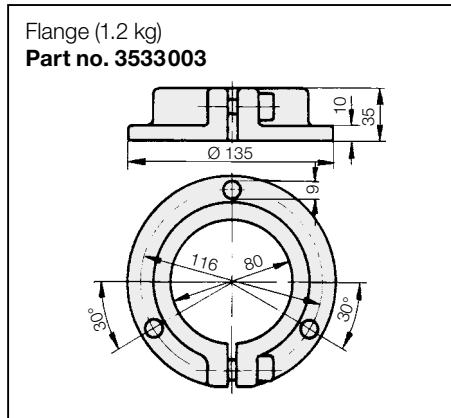
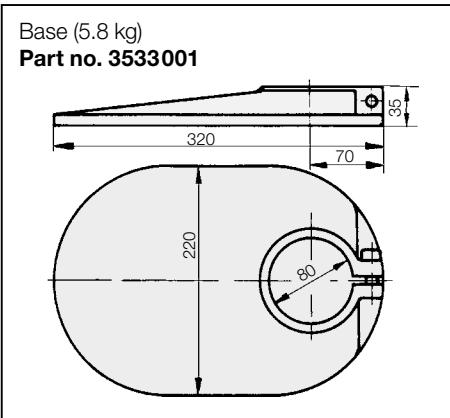
Max. operating pressure	[bar]	200	100	500	100	200	200
Oil volume	[cm ³]	300	300	300	970	970	400
Available oil volume	[cm ³]	150	150	150	750	750	250
Displacement per stroke	[cm ³]	4	8	2	8	4	4
Weight	[kg]	6.1	6.1	6.1	9.5	9.5	6.4
Part no. (without accessory)		8804006	8805006	8816006	8806006	8807006	8808006

Accessories

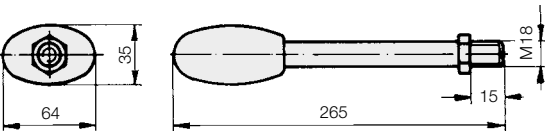
The following accessories with connecting fittings for the hydraulic pump must be ordered separately:

For pump type		8804006	8805006	8816006	8806006	8807006	8808006
Base plate	Part no.	3533001	3533001	3533001	–	–	3533001
Bracket	Part no.	3533002	3533002	3533002	–	–	3533002
Flange	Part no.	3533003	3533003	3533003	–	–	3533003
Foot lever	Part no.	0990102	0990102	0990102	0990102	0990102	0990102
Hand lever	Part no.	0990103	0990103	0990103	0990103	0990103	0990103
Pump unit with safety hand lever	Part no.	8804026	8805026	8816026	8806026	8807026	8808026
Pump unit with safety foot lever	Part no.	8804016	8805016	8816016	8806016	8807016	8808016
Pressure gauge with 90° elbow 0-250 bar	Part no.	9811015	9811015	–	9811015	9811015	9811015
Pressure gauge with 90° elbow 0-600 bar	Part no.	–	–	9811017	–	–	–
Hydraulic oil HLP 32, 1l container	Part no.	9895001	9895001	9895001	9895001	9895001	9895001

High-pressure hose see data sheet F 9.361



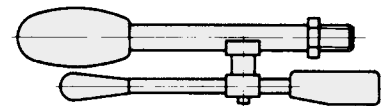
Hand lever
Part no. 0990103



Foot lever
Part no. 0990102



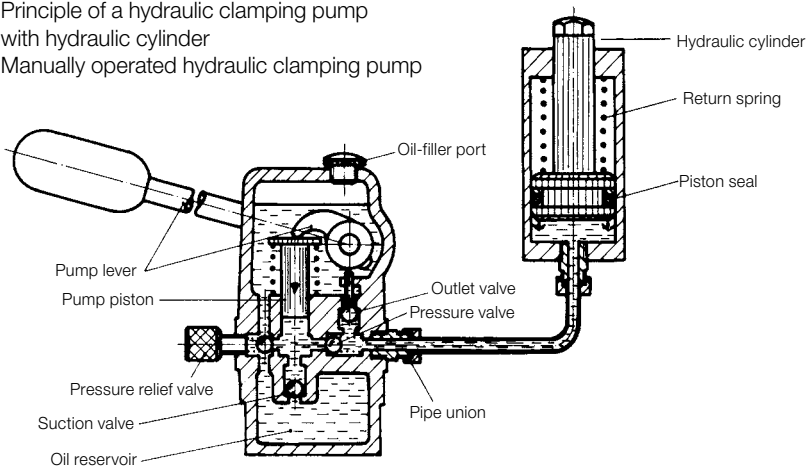
Safety hand lever *



Safety foot leverl *

* Delivery only together with hydraulic pump (see table)

Principle of a hydraulic clamping pump with hydraulic cylinder
Manually operated hydraulic clamping pump



Example for ordering

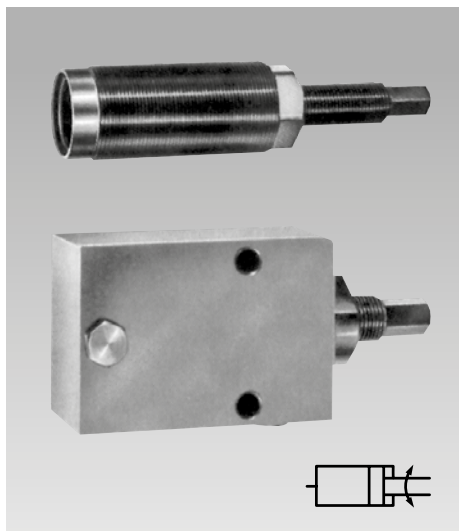
Hydraulic clamping pump with accessories,
8 cm³ displacement,
100 bar operating pressure

Hydraulic clamping pump	8805006
Foot lever	0990102
Base	3533001
High-pressure hose 1.6 m	9320601600
Gauge with 90° elbow	9811015
Hydraulic oil	9895001
The pump supplied filled with oil.	



Screw Pumps

max. operating pressure 500 bar



Application

The screw pump is especially suited as a pressure source for very small clamping fixtures, which must be independent of an external pressure source.

Importante notes

In connection with a clamping cylinder a closed system can be built-up, for which the following has to be considered:

The clamping cylinder used must be leak tight under static pressure, which is the case for all Römheld clamping cylinders.

Because of leakage during piston stroking and because of oil compressibility (1 % at 140 bar pressure rise) only 60 – 70% of pump displacement should be utilized.

Air in oil increases compressibility considerably. The system must be absolutely purged from air. An air bleed screw at the highest point of the system, is essential.

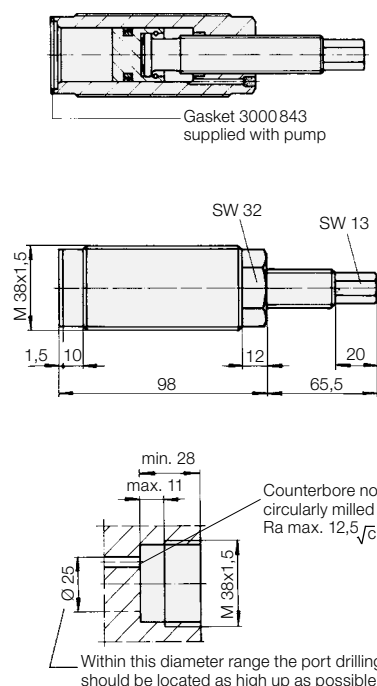
There oil can be added to the system, too, after the pump piston is returned. Piping and drilled passages are to be arranged such, that forming of air pockets is prevented.

Precise control of the clamping force is possible with a monitoring gauge only, since closed systems cannot contain a relief valve within the system.

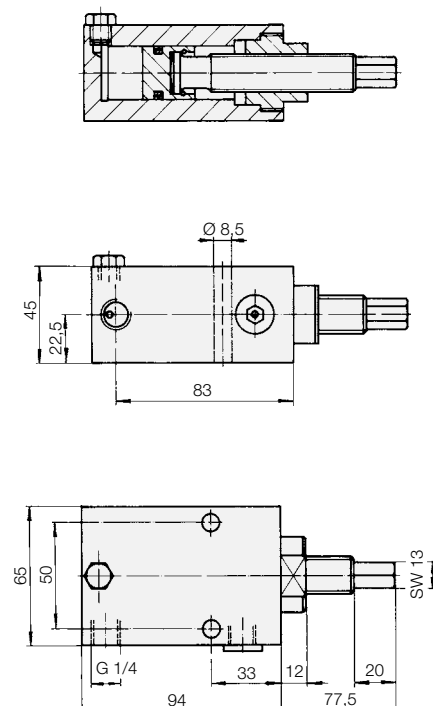
The use of a pneumatic torquing wrench can provide torque limitation for the pump screw. Nevertheless, a gauge will be required for calibration and monitoring.

A pressure transducer can also be used, or a spring preloaded pin, the position of which can be monitored by limit switches e.g. at various stations in a production process, when used with workholding pallets.

Threaded-body type



Block-body type



Part no.

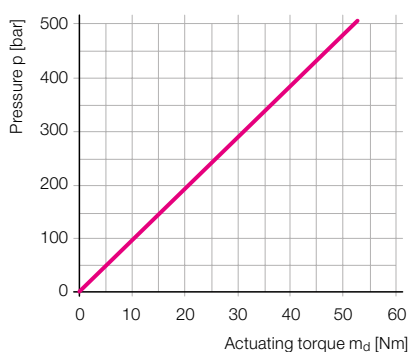
8819101

Part no.

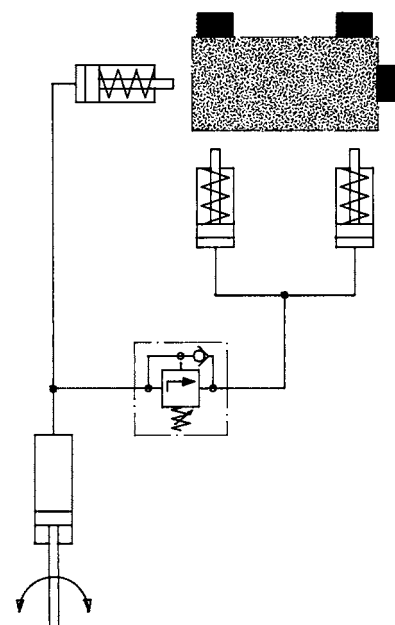
8819001

Technical data

Piston Ø	25 mm
Stroke	43 mm
Displacement	21 cm ³
Displacement/revolution	0,98 cm ³
Mounting torque for threaded-body type	80 Nm
Mounting position	horizontal as shown above



Hydraulic circuit diagramm





ROEMHELD
HILMA ■ STARK

INNOVATIVE SOLUTIONS AND PIONEERING TRENDS

Innovative and smart clamping technology solutions for workpieces as well as for tools in forming technology and plastics processing form the core of the continuously growing portfolio. It is supplemented by components and systems for assembly and handling technology, drive technology and automation, as well as locking systems for wind turbine rotors.



WORKHOLDING

Elements and systems for workpiece clamping, hydraulic components and hydraulic cylinders

ws.roemheld.com



QUICK DIE CHANGE

Elements and systems for clamping and changing tools and moulds on presses, punches and injection moulding machines

wz.roemheld.com



ASSEMBLY & HANDLING

Devices and equipment for turning, lifting, tilting and moving heavy workpieces as well as press-fit devices, linear drives and assembly devices for bicycles

mh.roemheld.com

Römheld GmbH

Friedrichshütte
Römheldstraße 1–5
35321 Laubach
Germany

Phone +49 6405/89-0
info@roemheld.de
www.roemheld.com

FOLLOW US!    