

## Power Units

max. operating pressure 500/250/160 bar



Power unit for double-acting cylinders with cover and handle, and optionally with push-button or foot-actuated switch.

### Application

These power units are particularly suited for small and medium sized power workholding fixtures. The available configurations allow various selections of output flow, pressure, type of cylinder and operating switches.

### Construction

Main feature is the submerged pump and motor assembly. Hydraulic and electric control or terminal box are arranged easily accessible on the reservoir cover plate. In this way, all parts are mounted within the unit base outline, and are protected against damage during mobile use.

### Accessory see page 4

An optional cover (accessory) adds additional protection to the controls. Other available options are a handle and a mounting bracket for the push-button switch.

### Delivery

The power units are operational, after they are charged with hydraulic oil and the electrical power connection is made; optionally they are available without electric control, with terminal box, without switch.

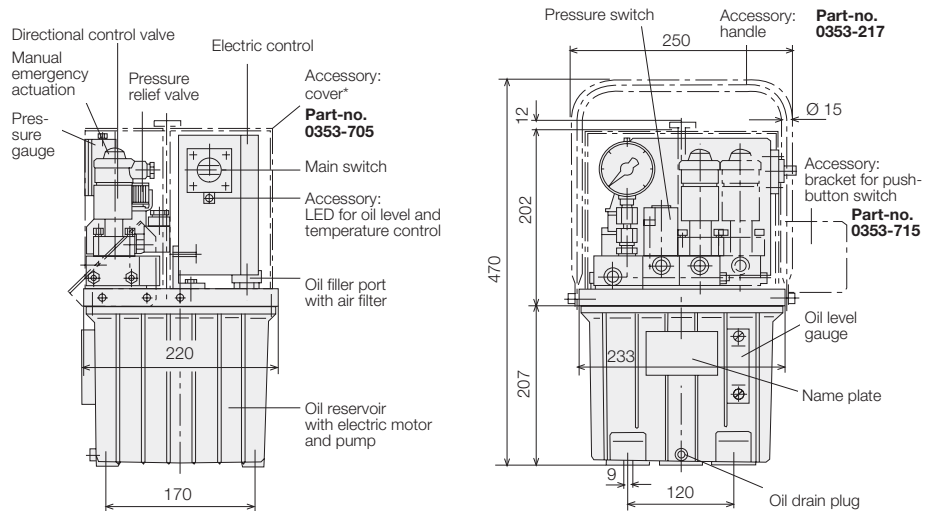
### Arrangement of power units at machine tools

Hydraulic power units should be arranged whenever possible outside the swarf area and handling area of operating personnel above the workholding fixture plane.

### Ordering

For version with mounted temperature and oil level control switch mark letter "T" behind the part-no.

**Example:** power unit, double acting with push-button and temperature and oil level control switch **part-no. 8400-183 T**.



\* Not possible in case of 2 double-acting circuits

|                         |         |       |      |      |
|-------------------------|---------|-------|------|------|
| Output flow             | [cm³/s] | 13.67 | 35.0 | 58.5 |
|                         | [l/min] | 0.82  | 2.1  | 3.51 |
| max. operating pressure | [bar]   | 500   | 250  | 160  |

| Cylinder type                                                                  | Switch type              | Weight [kg] | Part-no.        | Part-no.        | Part-no.        |
|--------------------------------------------------------------------------------|--------------------------|-------------|-----------------|-----------------|-----------------|
| <b>With electric control</b>                                                   |                          |             |                 |                 |                 |
| single acting<br>(1 valve)                                                     | push-button              | 29.5        | <b>8400-121</b> | <b>8400-221</b> | <b>8400-321</b> |
|                                                                                | foot-actuated switch     | 30.5        | <b>8400-122</b> | <b>8400-222</b> | <b>8400-322</b> |
|                                                                                | without switch           | 28.5        | <b>8400-131</b> | <b>8400-231</b> | <b>8400-331</b> |
| double acting<br>(2 valves)                                                    | push-button              | 30.5        | <b>8400-103</b> | <b>8400-223</b> | <b>8400-323</b> |
|                                                                                | foot-actuated switch     | 31.5        | <b>8400-104</b> | <b>8400-224</b> | <b>8400-324</b> |
|                                                                                | without switch           | 29.5        | <b>8400-113</b> | <b>8400-233</b> | <b>8400-333</b> |
| two double acting<br>(two 4/2 directional control valves)                      | 2 push-buttons           | 32.5        | <b>8400-107</b> | <b>8400-207</b> | <b>8400-307</b> |
|                                                                                | 2 foot-actuated switches | 33.5        | <b>8400-108</b> | <b>8400-208</b> | <b>8400-308</b> |
|                                                                                | without switch           | 31.5        | <b>8400-115</b> | <b>8400-215</b> | <b>8400-315</b> |
| two single acting<br>(shuttle machining)<br>(2 valves)                         | 2 push-buttons           | 31.5        | <b>8400-105</b> | <b>8400-225</b> | <b>8400-325</b> |
|                                                                                | 2 foot-actuated switches | 33.5        | <b>8400-106</b> | <b>8400-226</b> | <b>8400-326</b> |
|                                                                                | without switch           | 29.5        | <b>8400-113</b> | <b>8400-233</b> | <b>8400-333</b> |
| single acting<br>with machine tool interlock<br>(1 valve)                      | push-button              | 30.5        | <b>8400-181</b> | <b>8400-281</b> | <b>8400-381</b> |
|                                                                                | foot-actuated switch     | 31.5        | <b>8400-182</b> | <b>8400-282</b> | <b>8400-382</b> |
|                                                                                | without switch           | 29.5        | <b>8400-187</b> | <b>8400-287</b> | <b>8400-387</b> |
| double acting<br>with machine tool interlock<br>(2 valves)                     | push-button              | 31.5        | <b>8400-183</b> | <b>8400-283</b> | <b>8400-383</b> |
|                                                                                | foot-actuated switch     | 32.5        | <b>8400-184</b> | <b>8400-284</b> | <b>8400-384</b> |
|                                                                                | without switch           | 30.5        | <b>8400-188</b> | <b>8400-288</b> | <b>8400-388</b> |
| two single acting<br>(shuttle machining)<br>with mach. tool interl. (2 valves) | 2 push-buttons           | 32.5        | <b>8400-185</b> | <b>8400-285</b> | <b>8400-385</b> |
|                                                                                | 2 foot-actuated switches | 33.5        | <b>8400-186</b> | <b>8400-286</b> | <b>8400-386</b> |
|                                                                                | without switch           | 31.5        | <b>8400-189</b> | <b>8400-289</b> | <b>8400-389</b> |
| without valves                                                                 | without switch           | 27.5        | <b>8400-110</b> | <b>8400-210</b> | <b>8400-310</b> |
| <b>With terminal box</b>                                                       |                          |             |                 |                 |                 |
| single acting<br>(1 valve)                                                     | without switch           | 28.0        | <b>8400-141</b> | <b>8400-241</b> | <b>8400-341</b> |
| double acting or<br>shuttle machining (2 valves)                               | without switch           | 29.0        | <b>8400-142</b> | <b>8400-242</b> | <b>8400-342</b> |
| two double acting<br>(two 4/2 directional control valves)                      | without switch           | 31.5        | <b>8400-146</b> | <b>8400-246</b> | <b>8400-346</b> |
| single acting<br>with mach. tool interl. (1 valve)                             | without switch           | 29.0        | <b>8400-143</b> | <b>8400-243</b> | <b>8400-343</b> |
| double acting<br>with mach. tool interl. (2 valves)                            | without switch           | 30.0        | <b>8400-144</b> | <b>8400-244</b> | <b>8400-344</b> |
| two single acting<br>(shuttle machining)<br>with mach. tool interl. (2 valves) | without switch           | 29.0        | <b>8400-145</b> | <b>8400-245</b> | <b>8400-345</b> |



## Control variants

Single-acting cylinders  
Connecting several single-acting cylinders to one pressure port is possible.  
Sequence control, e.g. positioning before clamping can be easily attained with sequence valves as per data sheet C 2.954. The unit for shuttle machining allows the operation of two independent circuits with two switches.

### Double-acting cylinders

Several double-acting cylinders can be connected to the two pressure ports of the unit. Single-acting cylinders can be connected additionally, however, they retract slower than the double-acting cylinders. Pressure dependent sequence controls can be applied, too.

**These power units can be equipped with max. 4 valves, which are vertically mounted. If necessary, please contact us!**

### Power unit without valve

This unit is used in conjunction with external hydraulic controls only. The power unit serves as an independent pressure source with its own electrical control, maintaining a set pressure by a pressure control switch.

## Safety provisions

An increased safety in power workholding is achieved through the following characteristics: Operating pressure stepless adjustable from 25 bar (8400-2XX and 8400-3XX), 50 bar (8400-1XX) respectively, therefore precisely defined clamping force with accurate repeatability. Visual control of operating pressure through built-in pressure gauge. If required the gauge could be disconnected and installed elsewhere at the fixture in a protected location. For shuttle machining an additional gauge is necessary. Automatic control of operating pressure through built-in pressure switch. A pressure drop of approx. 10% will cause the pump motor to start again.

No immediate pressure loss on power failure. The solenoid valves are deenergized in the "clamped position" and the poppet types provide tight sealing.

## Oil level and temperature control: 'T'

Each power unit can be equipped with this accessory. This combined level and temperature transducer will be screwed into a thread of the reservoir cover, the cable must be connected in the electric control box according to the electric circuit diagram (see page 3). The electrical bridge between terminal 5 and 6 must be removed. Function: If the oil level drops below a predetermined level or the oil temperature exceeds 60°C (continuous run of the pump) the electric motor will be cut off. A LED placed below the main switch is lit. The motor starts running after replenishing the oil level or an oil temperature drop respectively.

## Machine tool interlock

All power units can be equipped with one, or two pressure switches for shuttle machining, to control machine tool interlock. The pressure switches are adjusted to 80% of the operating pressure and are electrically connected to the control of the machine tool. Therefore the machine tool can only start operation if the fixture has been clamped. On the other side the machine tool will be cut off if pressure drops down for more than 20%.

## General characteristics

|                           |                                                                |
|---------------------------|----------------------------------------------------------------|
| Design                    | Radial piston pump                                             |
| Direction of rotation any |                                                                |
| Porting                   | G 1/4 for male connectors<br>form B, DIN 3852                  |
| Mountings                 | 3 bolts M8<br>(not required for mobile use)                    |
| Mounting position         | upright                                                        |
| Environmental temperature | -10 ... +35° C                                                 |
| Noise level               | max. 80 dB (A)<br>(in 1 m distance and height above the floor) |

## Hydraulic characteristics

|                        |                                                                                    |
|------------------------|------------------------------------------------------------------------------------|
| Viscosity range        | (4 ... 300) 10 <sup>-6</sup> m <sup>2</sup> /s                                     |
| Recom. viscosity class | ISO VG 22 as per DIN 51519                                                         |
| Recom. hydraulic oil   | HLP 22 as per DIN 51524<br>(not suited for fluids of the type HS-A, HS-C and HS-D) |

|                       |         |        |
|-----------------------|---------|--------|
|                       | normal* | max.** |
| Oil charge [l]        | 3.8     | 5.0    |
| Usable oil volume [l] | 1.75    | 2.95   |

The difference on the oil level gauge is max. - min. 0.97 l

\* black mark on the oil level gauge

\*\*up to the reservoir cover

## Electrical characteristics

### Electric motor

|                 |                                                                            |
|-----------------|----------------------------------------------------------------------------|
| Type            | 2-pole three-phase motor                                                   |
| Rating          | 0.75 kW                                                                    |
| Speed           | 2830 1/min                                                                 |
| Voltage         | 3/PE ~ 50 Hz, 400 V<br>Other voltages and frequencies on request available |
| Current         | 1.95 A                                                                     |
| cos φ           | 0.82                                                                       |
| Isolation class | B as per VDE 0530                                                          |
| Duty cycle      | see section 9                                                              |
| Main switch     | Main switch with excess current                                            |

Control electric motor

### Valves

### Fuses

|                      |                                                                                                                                 |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Main switch          | Control voltage 24 V DC                                                                                                         |
| Code class           | Motor to be externally fused with 3x6 A slow. Internal electric control circuit 24 V DC                                         |
| Electric connections | Fuses<br>Primary: 2x4 A slow, 5x30 mm<br>Secondary: 1x2 A slow, 5x20 mm can be pad-locked                                       |
| Push-button switch   | IP 54                                                                                                                           |
| Foot-actuated switch | Wire 4 x 1 mm <sup>2</sup>                                                                                                      |
| EMC                  | Push-button switch 5 x 1 mm <sup>2</sup> approx. 3 m long<br>Foot-actuated switch 6 x 1 mm <sup>2</sup> approx. 3 m long tested |

### Oil level

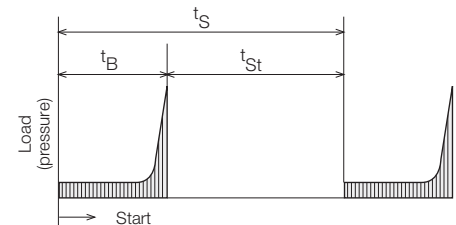
|      |        | 8400-1XX | 8400-2XX | 8400-3XX |
|------|--------|----------|----------|----------|
| max. | [% ED] | 40       | 25       | 20       |
| min. | [% ED] | 25       | 20       | 16       |

## Max. uninterrupted running time (t<sub>B</sub> max.) of pumps for the following oil levels in the reservoir<sup>1)</sup>

|                                   |  |       |      |      |
|-----------------------------------|--|-------|------|------|
| Maximum:                          |  |       |      |      |
| Up to reservoir cover             |  | 120 s | 84 s | 50 s |
| Useable oil volume approx. 2.95 l |  |       |      |      |
| Normal:                           |  |       |      |      |
| Black mark at oil level gauge     |  | 120 s | 50 s | 29 s |
| Useable oil volume approx. 1.75 l |  |       |      |      |
| Minimum:                          |  |       |      |      |
| Red mark at oil level gauge       |  | 57 s  | 22 s | 13 s |
| Useable oil volume approx. 0.78 l |  |       |      |      |

## Relative duty cycle

This power unit can only be used intermittently similar to section S 3 of VDE 0530. The motor will be cut off by the pressure switch as soon as a preset pressure is reached. Relative duty cycle will be determined using the following diagram.



t<sub>B</sub> = time elapsed from motor start to motor cut off (running time)

t<sub>St</sub> = idle time

t<sub>S</sub> = cycle time

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

Different motor running and idle times are simply added.

Example: Power workholding fixture with double-acting cylinders

|                  |                         |
|------------------|-------------------------|
| Clamping time    | t <sub>B1</sub> = 5 s   |
| Machining time   | t <sub>St1</sub> = 60 s |
| Unclamping time  | t <sub>B2</sub> = 3 s   |
| Load-unload time | t <sub>St2</sub> = 12 s |
| Cycle time       | t <sub>S</sub> = 80 s   |

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

$$ED = 10\%$$

The max. relative duty cycle is a function of the motor load. Motor winding temperature of the submerged motor is dependent upon oil temperature and oil level. Winding is totally oil cooled at max. oil level (up to reservoir cover), however air cooled when usable oil volume (2.95 l) is used up. This reduces the relative duty cycle with decreasing oil level.

Data of max. relative duty cycle given below were determined for an environmental temperature of 23°C.

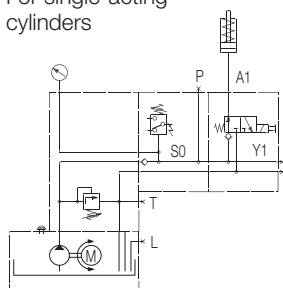
The max. oil temperature is 60°C.

<sup>1)</sup> refers to the lowest admissible oil level (at the same time switching point of oil level control. See accessory).

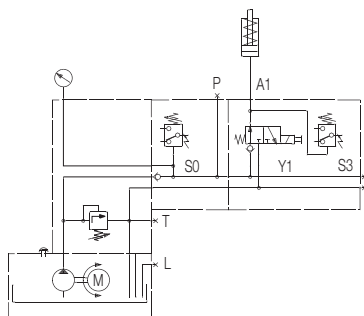


## Hydraulic circuit diagrams

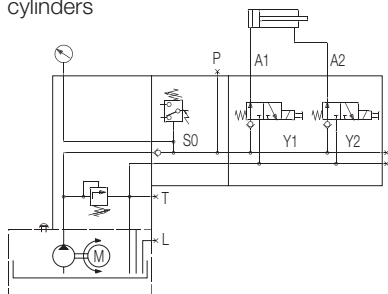
For single-acting cylinders



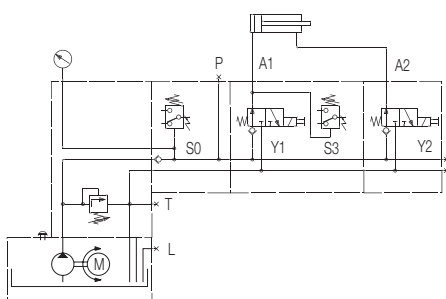
For single-acting cylinders with pressure switch for machine tool interlock



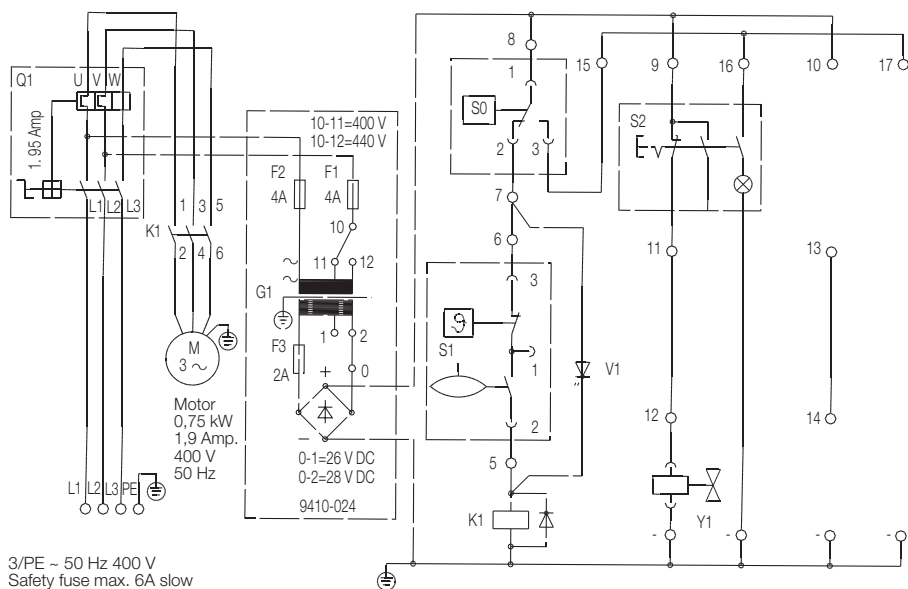
For double-acting cylinders



For double-acting cylinders with pressure switch for machine tool interlock



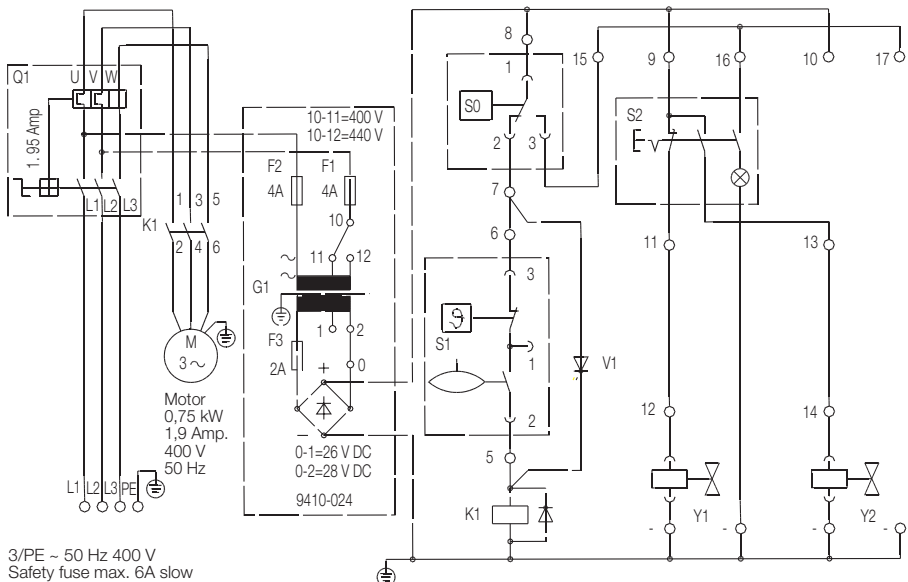
## Electric circuit diagrams



3/PE ~ 50 Hz 400 V  
Safety fuse max. 6A slow

S0 = Pressure switch  
(S1/V1 = oil control accessory only on request)

S2 = Switch  
Y1 = 3/2 Solenoid valve



3/PE ~ 50 Hz 400 V  
Safety fuse max. 6A slow

S0 = Pressure switch  
(S1/V1 = oil control accessory only on request)

S2 = Switch  
Y1 and Y2 = 3/2 Solenoid valve

**Note:** Pressure switches for machine tool interlock are directly connected.

For connection of oil level and temperature control remove electrical bridge from 5 to 6.

The luminous diode in switch S2 or S4 is lit, if 'clamping' has been triggered, the pressure in the system has been built up, and the pressure switch S0 has reacted. In the case of renewed cycling of the pump it goes out for a short time.

Also if in the case of pendulum fixtures clamping of the corresponding unclamped fixture has been triggered.

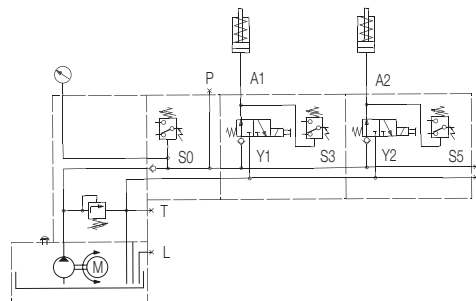
**Note:** an effective monitoring of the clamping pressure should be made by a pressure gauge at the fixture.



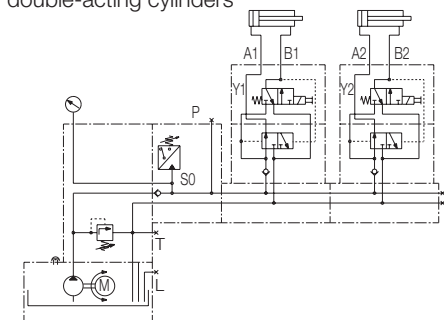
# ROEMHELD

## Hydraulic circuit diagrams

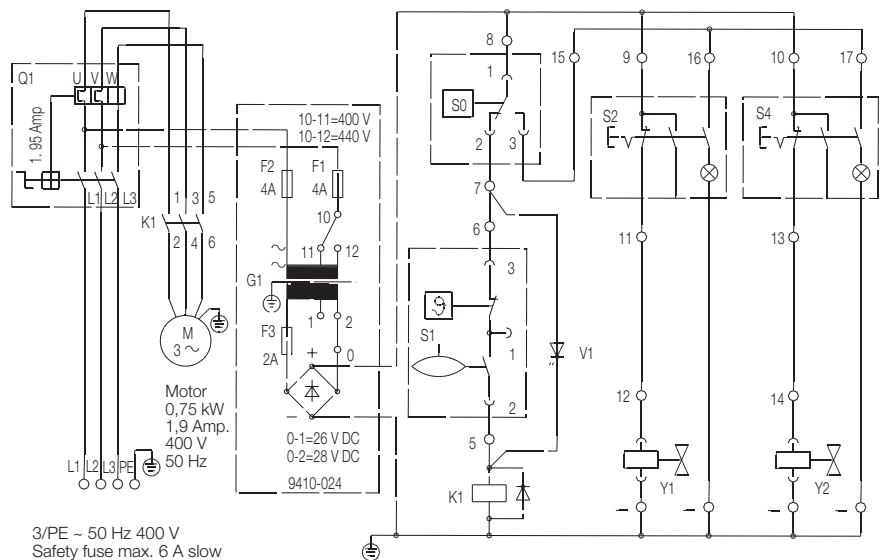
For two circuits with single acting cylinders (e.g. view with pressure switch for machine tool interlock).



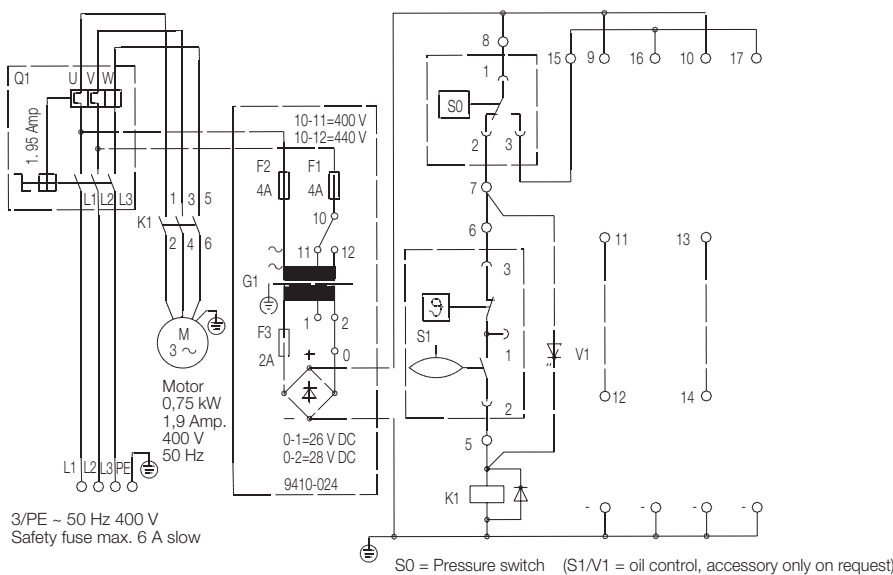
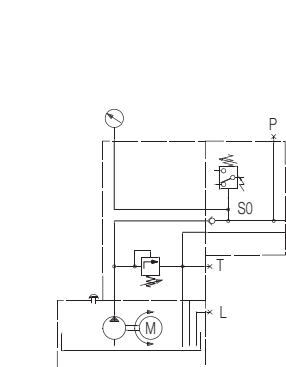
For two circuits with double-acting cylinders



## Electric circuit diagrams

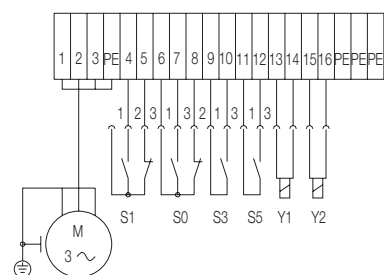


Without valves and without switches



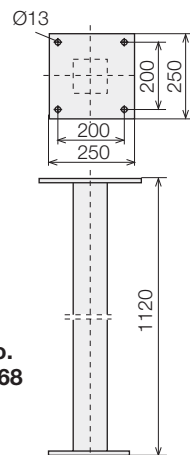
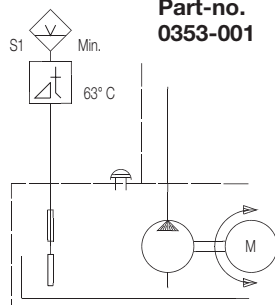
## Plan of maximum terminal connections

Part-no. 8400-X4X

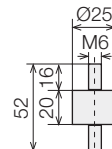


## Accessory

Oil level and oil temperature control  
**Part-no. 0353-001**



Anti-vibration mount (single)  
**Part-no. 3141-308**



Three off are required per power unit