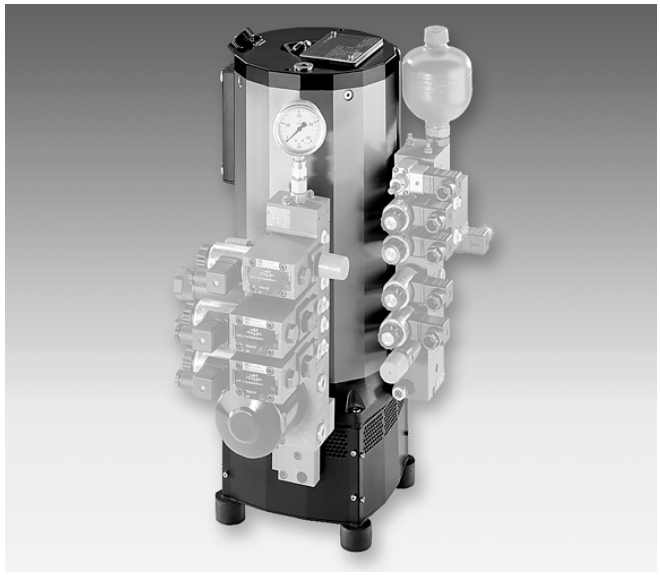
**RE 51 147/04.02**

# Clamping and drive module Type UPE 3

Drive power 3.0 kW / 4.0 kW

Series 1X

Maximum operating pressure 700 bar



H6842_01

Type UPE 3-1X/…

## Overview of contents



## Features

- Duty, continuous duty S1
- Compact design
- Low noise
- High cooling capacity
- Wide range of applications
- Wide range of variants
- A complete hydraulic control is possible (see RE 51 144)
- Ready for connection

## Application possibilities

- Clamping, releasing and indexing on machines
- Drives for hydraulic tools
- Drives for lifting and slewing mechanisms
- Drives for conveyors
- Use in general engineering
- Testing machines and test rigs

## Description, symbols

The type UPE 3 clamping and drive modules form a complete drive system that is supplied ready to install. It is used to provide pressure fluid for hydraulic circuits and can be used for continuous duty applications. The maximum oil temperature of 80 °C must however not be exceeded!

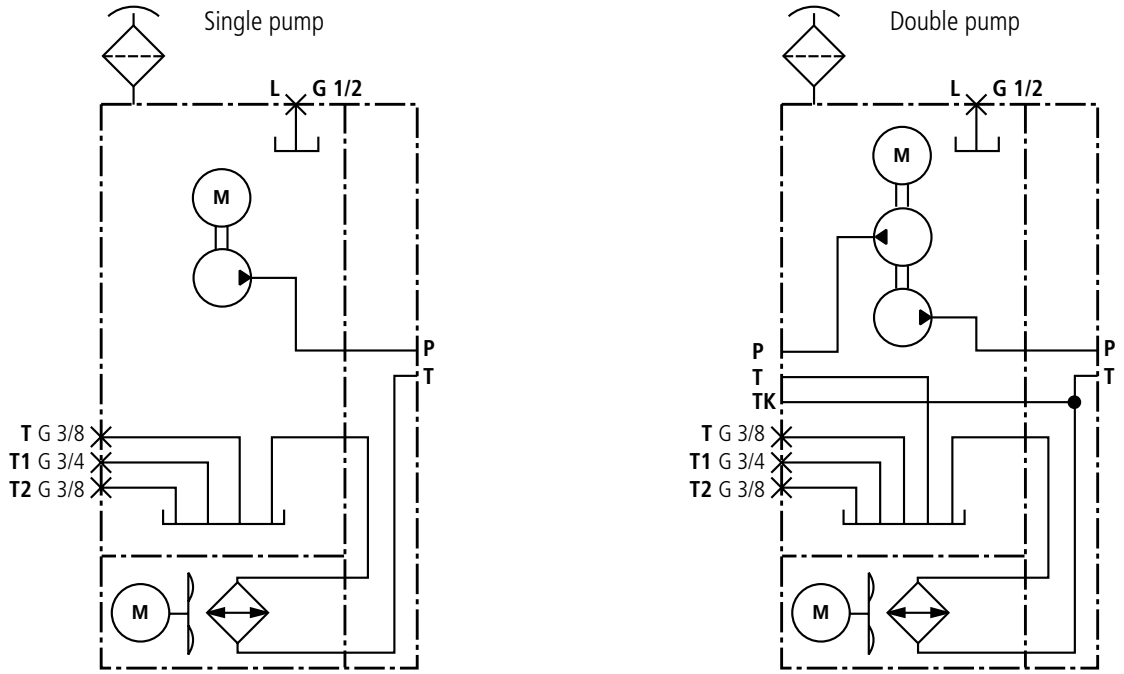
The clamping and drive module basically comprises of the aluminium housing, the pumps (radial piston, external gear pump), an oil immersed motor and the cooler. The stator of the oil immersed motor is pressed into the aluminium housing. It transfers the winding heat directly onto the exterior wall of the aluminium housing.

The pressure fluid returning from the controls is passed through the oil-air cooler. The cooled pressure fluid is then returned to the reservoir.

There are threads located in the anti-vibration mounts for assembling the type UPE 3 clamping and drive module.

Optionally the type UPE 3 clamping and drive module can be fitted with electrical monitoring of the oil level and the oil temperature, a breather filter and two complete controls (see RE 51 144).

☞ ⚠ **Attention!**
The clamping and drive module can heat up during operation ⇒ **Danger of injury!**




## Ordering details

**UPE 3 –1X / / / – V ***

Series 10 to 19 (10 to 19: unchanged installation and connection dimensions) **= 1X**

**Drive power**
3.0 kW **= 3,0**
4.0 kW **= 4,0**

Pump for control 1 (see tables on pages 4 and 5)
without pump **= 0**

Pump for control 2 (see tables on pages 4 and 5)
without pump **= 0**

**Reservoir nominal size**
Oil capacity 8.5 L **= 7**
Oil capacity 11.0 L **= 9** [1)]

[1)] Not possible with a „R4" radial piston pump.

Further details in clear text

**Seals**
**V =** FKM seals

**Built-on hydraulic control** (see RE 51 144)
**0 =** **Without** control
**1 =** **With** control

**Filling plug**
**No code =** Filler with dip stick
**B =** Breather filter

**Oil monitoring**
**A =** Sight glass
**AN =** Sight glass with float switch
**AT =** Sight glass with temperature switch
**ANT =** Sight glass with float and temperature switches

## Overview of accessory modules

H6843_01

Basic module "G"

**Basic module "G"**

- Basic module with integrated pressure relief valve for simple lifting/lowering or pressure maintaining functions
- When using the basic module „G“ it is not possible to fit any further stacking units
- For further details see catalogue sheet „Control blocks for clamping and drive modules type UPE 2“ RE 51 144

H6844_01

Directional valve module "W"

**Directional valve module "W" [1)]**

- Makes it possible to design controls using valves with a porting pattern to DIN 24 340 form A
- The number of directional valve modules is dependent on the draw-off volume and the pump flow
- For further details see catalogue sheet „Control blocks for clamping and drive modules type UPE 2“ RE 51 144

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Poppet valve module "S"

**Poppet valve module "S" [1)]**

- Poppet valve modules basically comprise of:
  - A pressure relief block,
  - One or more control blocks
  - An end block
- The design of the control is dependent on the application
- The number of poppet valve modules is dependent on the draw-off volume and pump flow
- For further details see catalogue sheet „Control blocks for clamping and drive modules type UPE 2“ RE 51 144

[1)] The directional and poppet valve modules can be combined!

## **Technical data** (for applications outside these parameters, please consult us!)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Pressure fluid | | Mineral oil (HLP) to DIN 51 524, part 2<br>**Please take into account our specifications stated within catalogue sheet RE 07 075!** | | | | | | | |
| Pressure fluid temperature range | °C | – 20 to + 80 | | | | | | | |
| Degree of contamination | | Maximum permissible degree of contamination of the pressure fluid is to NAS 1638 class 9. We therefore recommend a filter with a minimum retention rate of $\beta_{10} \geq 100$. | | | | | | | |
| Optimum viscosity range | $mm^2/s$ | 10 to 200 | | | | | | | |
| Drive module direction of rotation | | Optional (type R); closckwise (types G, G/G, G/R, R/G) | | | | | | | |
| Fan direction of rotation | | Clockwise | | | | | | | |
| Installation | | Vertical | | | | | | | |
| Operating mode | | All modes of operation where the oil steady state temperature remains under 80 °C | | | | | | | |
| **Drive power 3.0 kW** | | | | | | | | | |
| Radial piston pump type **R** | | | | | | | | | |
| Flow [3] | L/min | 0.82 | 1.36 | 1.66 | 2.08 | 2.83 [1] | 3.25 | 4.25 [1] | |
| Nom. pressure [2; 3] | bar | 700 | 700 | 700 | 450 | 600 | 350 | 390 | |
| RPM | $min^{-1}$ | 1415 | 1415 | 2880 | 1415 | 2880 | 1415 | 2880 | |
| Gear pump type **G** | | | | | | | | | |
| Flow [3] | L/min | 1.40 | 2.80 | 4.40 | 5.60 | 7.00 | 8.80 | 11.2 | 14.0 |
| Nom. pressure [2; 3] | bar | 260 | 260 | 260 | 250 | 220 | 170 | 130 | 110 |
| RPM | $min^{-1}$ | 1415 | 1415<br>2880 [4] | 1415 | 1415<br>2880 [4] | 1415 | 1415<br>2880 [4] | 1415<br>2880 [4] | 1415<br>2880 [4] |
| **Drive power 4.0 kW** | | | | | | | | | |
| Radial piston pump type **R** | | | | | | | | | |
| Flow [3] | L/min | 0.82 | 1.36 | 1.66 | 2.08 | 2.83 [1] | 3.25 | 4.25 [1] | |
| Nom. pressure [2; 3] | bar | 700 | 700 | 700 | 450 | 700 | 350 | 450 | |
| RPM | $min^{-1}$ | 1390 | 1390 | 2850 | 1390 | 2850 | 1390 | 2850 | |
| Gear pump type **G** | | | | | | | | | |
| Flow [3] | L/min | 1.40 | 2.80 | 4.40 | 5.60 | 7.00 | 8.80 | 11.2 | 14.0 |
| Nom. pressure [2; 3] | bar | 260 | 260 | 260 | 250 | 250 | 230 | 170 | 140 |
| RPM | $min^{-1}$ | 1390 | 1390<br>2850 [4] | 1390 | 1390<br>2850 [4] | 1390 | 1390<br>2850 [4] | 1390<br>2850 [4] | 1390<br>2850 [4] |
| Protection to VDE 0530 / EN 60034 | | IP 54 for the completely assembled unit,with exception of the fan (IP 54) | | | | | | | |
| Nominal reservoir size / type | | 7/R | 7/G | 9/G | 9/R/G | 9/G/R | 9/G/G | | |
| Weight (without pressure fluid) | kg | 47.0 | 46.1 | 46.5 | 58.6 | 58.6 | 51.6 | | |

[1] 60 Hz is not possible!

[2] Is only valid for single pumps, with double pumps the maximum nominal pressure is dependent on the pump combination and the valve controls (see calculation example on page 5)

[3] Relates to the RPM at 50 Hz

[4] Only in conjunction with radial piston pumps that require a speed of 2880 $min^{-1}$ or 2850 $min^{-1}$!

## Pump combinations

| Pump for control 1 \ Pump for control 2 | Without pump | R 0,82 | R 1,36 | R 1,66 | R 2,08 | R 2,83 | R 3,25 | R 4,25 | G 1,40 | G 2,80 | G 4,40 | G 5,60 | G 7,00 | G 8,80 | G 11,2 | G 14,0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Without pump | – | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| R 0,82 | • | – | – | – | – | – | – | – | • | • | • | • | • | • | • | • |
| R 1,36 | • | – | – | – | – | – | – | – | • | • | • | • | • | • | • | • |
| R 1,66 | • | – | – | – | – | – | – | – | – | • | – | • | – | • | • | • |
| R 2,08 | • | – | – | – | – | – | – | – | • | • | • | • | • | • | • | • |
| R 2,83 | • | – | – | – | – | – | – | – | – | • | – | • | – | • | • | • |
| R 3,25 | • | – | – | – | – | – | – | – | • | • | • | • | • | • | • | • |
| R 4,25 | • | – | – | – | – | – | – | – | – | • | – | • | – | • | • | • |
| G 1,40 | • | • | • | – | • | – | • | – | • | • | • | • | • | • | • | • |
| G 2,80 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| G 4,40 | • | • | • | – | • | – | • | – | • | • | • | • | • | • | • | • |
| G 5,60 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| G 7,00 | • | • | • | – | • | – | • | – | • | • | • | • | • | • | • | • |
| G 8,80 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| G 11,2 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| G 14,0 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |

**Pump combination:** • possible, – not possible

**Calculation example for determining the maximum nominal pressure in relation to the drive power:**

With double pumps it has to be taken into account that both pumps are providing a flow of oil. The valve controls have to be so selected that the individual controls, during the time that no flow is required, can be switched to zero pressure circulation. The pressure fluid temperature increase in the reservoir is thereby reduced.

Examples:

1. The pumps are pressurised one after the other, each of the pumps can be operated up to the nominal pressure. (For nominal pressures see page 4).
2. The pumps are pressurised at the same time:

$$P \geq (p_1 \bullet q_{V1} + p_2 \bullet q_{V2}) \bullet \frac{1}{\eta \bullet 600}\ [\text{kW}]$$

$P$ = Electric motor dive power in kW
$p_1$ = Pump 1 pressure in bar
$q_{V1}$ = Pump 1 flow in L/min
$p_2$ = Pump 2 pressure in bar
$q_{V2}$ = Pump 2 flow in L/min
$\eta$ = Efficiency approx. 85 % $\Rightarrow \eta = 0.85$

E.g.:

$p_1 = 480$ bar; $q_{V1} = 1.66$ L/min; $p_2 = 100$ bar; $q_{V2} = 5.60$ L/min; $\eta = 0.85$

$$P \geq (480\ \text{bar} \bullet 1.66\ \text{L/min} + 100\ \text{bar} \bullet 5.60\ \text{L/min}) \frac{1}{0.85 \bullet 600}$$

$P \geq 2.66$ kW

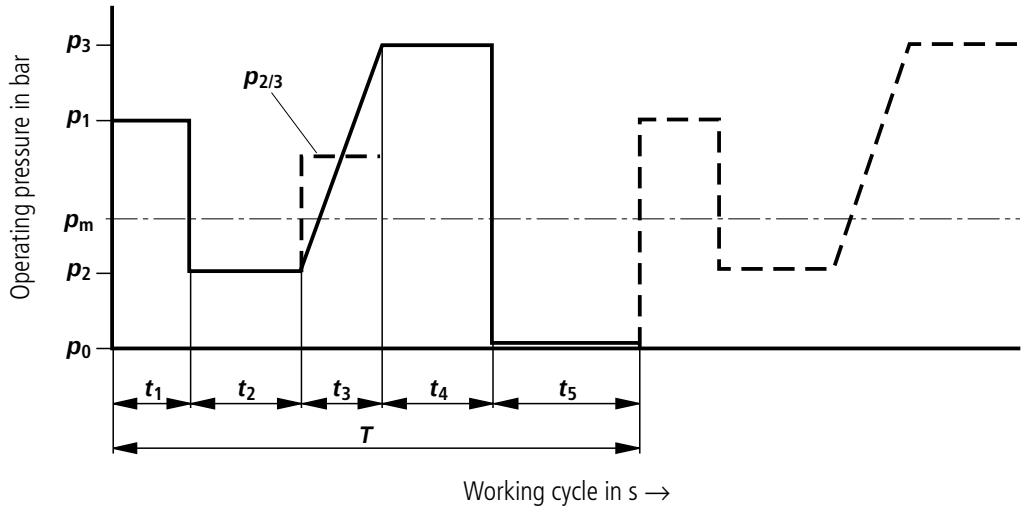
$\Rightarrow$ Selected electric motor with $P = 3$ kW

## Calculating the pressure fluid steady state temperature

The determination of the steady state temperture is used to estimate the expected pressure fluid temperature when in continuous operation. This is in relation to the operating pressure, the flow, the built-on controls as well as the machine which the drive module is fitted onto.

The steady state temperature is reached after approx. one hour of operation.

**Average operating pressure**




$p_0$ = Zero pressure operation in bar
$p_1$, $p_2$, $p_3$ = Operating pressure in bar
$p_m$ = Average operating temperature in bar
$t_1$, $t_2$, $t_3$, $t_4$, $t_5$ = Time interval in s
$T$ = Working cycle in s

$$p_m = \frac{1}{T} (p_1 \bullet t_1 + p_2 \bullet t_2 + p_{2/3} \bullet t_3 + p_3 \bullet t_4 + p_0 \bullet t_5)$$

$$p_{2/3} = \frac{p_2 + p_3}{2}$$

$$T = t_1 + t_2 + t_3 + t_4 + t_5$$

Example:

$t_1$ = 15 s; $t_2$ = 20 s; $t_3$ = 15 s; $t_4$ = 20 s; $t_5$ = 30 s;

$p_1$ = 180 bar; $p_2$ = 70 bar; $p_3$ = 250 bar; $p_0$ = 0 bar

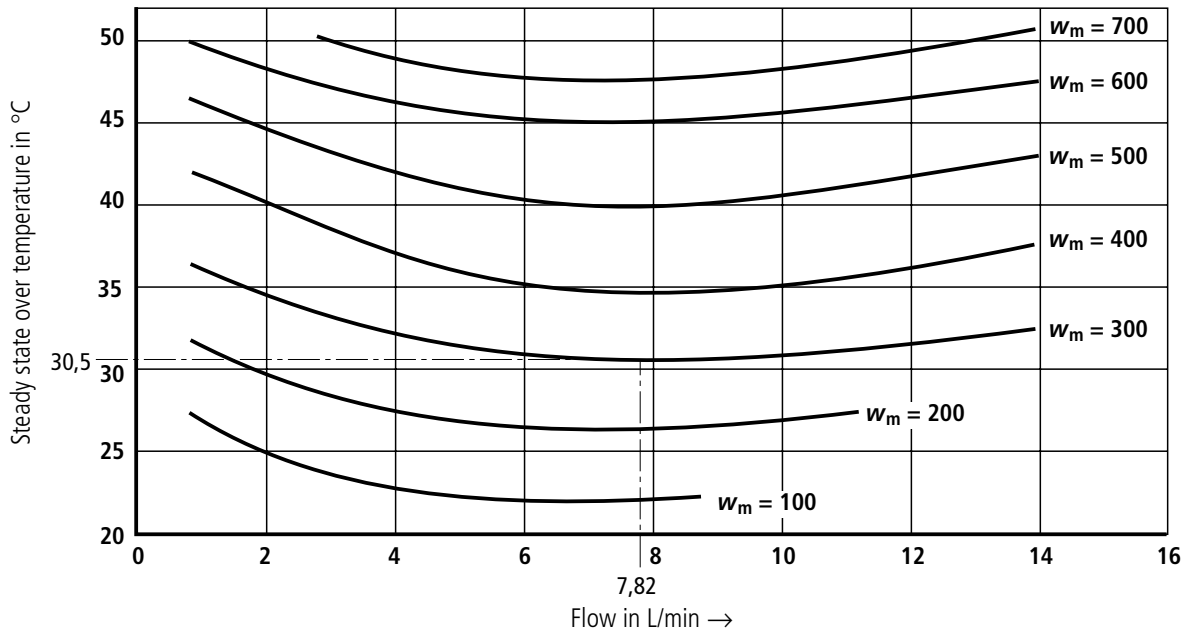
$$p_{2/3} = \frac{70 \text{ bar} + 250 \text{ bar}}{2} = 320 \text{ bar}$$

$T$ = 15 s + 20 s + 15 s + 20 s + 30 s = 100 s

$$p_m = \frac{1}{100 \text{ s}} (180 \text{ bar} \bullet 15 \text{ s} + 70 \text{ bar} \bullet 20 \text{ s} + 320 \text{ bar} \bullet 15 \text{ s} + 250 \text{ bar} \bullet 15 \text{ s} + 0 \text{ bar} \bullet 30 \text{ s}) = \mathbf{102.5 \text{ bar}}$$

## Pressure fluid steady state temperature

**Steady state over temperature**




$w_m$ = Average flow
$p_m$ = Average operating pressure in bar
$p_{m1}$ = Average operating pressure of pump 1 in bar
$p_{m2}$ = Average operating pressure of pump 2 in bar

$q_V$ = Flow in L/min
$q_{V1}$ = Flow of pump 1 in L/min
$q_{V2}$ = Flow of pump 2 in L/min
$\vartheta_U$ = Ambient temperature in °C
$\Delta\vartheta$ = Steady state over temperature in °C
$\vartheta_B$ = Steady state temperature in °C

### Single pump:

$$w_m = p_m \bullet q_V$$

### Double pump:

For the double pump version of the clamping and drive module the average operating pressure for both pumps has to be determined. The average flow can be calculated by using the individual flows. The steady state temperature can be read from the diagram in relationship to the total flow.

$$w_m = p_{m1} \bullet q_{V1} + p_{m2} \bullet q_{V2}$$

$$q_V = q_{V1} + q_{V2}$$

$$\vartheta_B = \vartheta_U + \Delta\vartheta$$

Example:
$p_{m1}$ = 100 bar; $p_{m2}$ = 30 bar
$q_{V1}$ = 0.82 L/min; $q_{V2}$ = 7.0 L/min
$\vartheta_U$ = 20 °C; $\Delta\vartheta$ = 31 °C from diagram

$w_m$ = 100 bar•0.82 L/min + 30 bar•7.0 L/min = **292**

$q_V$ = 0.82 L/min + 7.0 L/min = **7.82 L/min**

$\vartheta_B$ = 20 °C + 30.5 °C = **50.5 °C**

## Electric motor

Within the nominal power range the clamping and drive module is designed for use to VDE 0530 (EN 60 034), for continuous operation S1. The electric motor complies with protection class F and the complete clamping and drive module is protected to class IP 54.

The electric motor direction of rotation is dependent on the pump fitted (see technical data on page 4). The fan direction of rotation is clockwise.

**Clamping and drive module technical data** (for applications outside these parameters, please consult us!)

| | | | |
|---|---|---|---|
| Voltage [1] | *U* | V | 230 / 400 ±6% Δ/Y |
| Frequency | *f* | Hz | 50 / 60 |
| Operating mode | | | S1 continuous |
| Isolation class | | | F (winding) |
| Protection | | | IP 54 |
| No. of poles | | | 2 / 4 |

**Frequency 50 Hz**

| Power kW | Speed $min^{-1}$ | Power factor cos φ | Nom. current at Δ 230 V | Nom. current at Y 400 V |
|---|---|---|---|---|
| 3.0 [2] | 1415 | 0.76 | 12.2 A | 7.0 A |
| 3.0 [3] | 2880 | 0.86 | 11.1 A | 6.4 A |
| 4.0 [2] | 1390 | 0.73 | 17.0 A | 9.8 A |
| 4.0 [3] | 2850 | 0.85 | 15.0 A | 8.6 A |

**Frequency 60 Hz**

| Power kW | Speed $min^{-1}$ | Power factor cos φ | Nom. current at Δ 230 V | Nom. current at Y 400 V |
|---|---|---|---|---|
| 3.0 [2] | 1700 | 0.83 | 11.1 A | 6.4 A |
| 3.0 [3] | 3450 | 0.92 | 9.4 A | 5.4 A |
| 4.0 [2] | 1680 | 0,77 | 16.2 A | 9.3 A |
| 4.0 [3] | 3420 | 0.90 | 12.5 A | 7.2 A |

[1] Other voltages on request

[2] 4 poles

[3] 2 poles

**Fan technical data** (for applications outside these parameters, please consult us!)

| | | | |
|---|---|---|---|
| Voltage [1] | *U* | V | 230 |
| Frequency | *f* | Hz | 50 / 60 |
| Operating mode | | | S1 continuous |
| Isolation class | | | B (winding) |
| Protection | | | IP 54 |

**Frequency 50 Hz**

| Power W | Speed $min^{-1}$ | Nom. current at 230 V |
|---|---|---|
| 45 | 2800 | 0.3 A |

**Frequency 60 Hz**

| Power W | Speed $min^{-1}$ | Nom. current at 230 V |
|---|---|---|
| 39 | 3250 | 0.3 A |

[1] Other voltages on request

## Electro-magnetic compatibility EMC

The clamping and drive module is, in accordance with the „Regulations regarding electro-magnetic compatibility of components (§2, section 4)" EWG regulations, not a ready for use component. To avoid any possible electro-magnetic interference from occurring, the use of anti-interference components from Murr-Elektronik in 71570 Oppenweiler is recommended.

E.G.

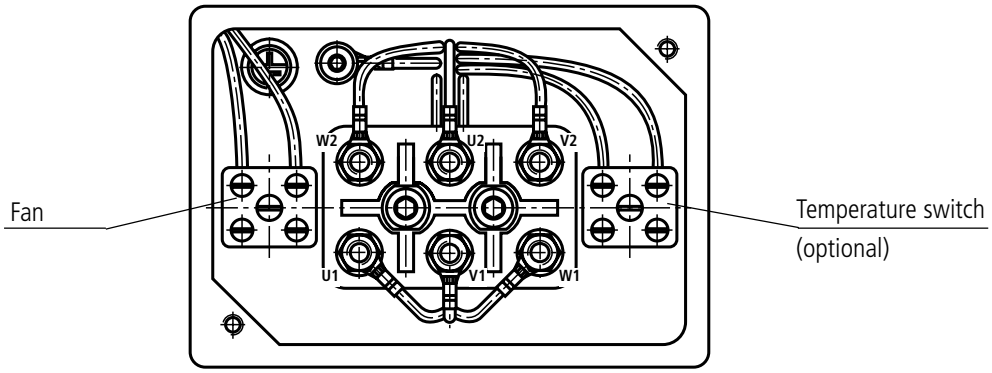
Type 23050, 3 x400 VAC, 50-60 Hz (motor)

Type 20002, 230 VAC (fan)

## Terminal allocation

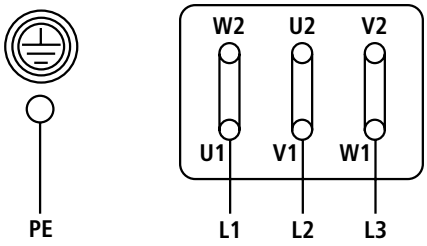
**Terminal allocation within the clamping and drive module terminal box**

**Factory side:**



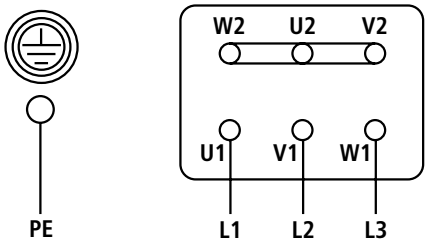

**Customer side:**

Δ Delta *U* = 230 V



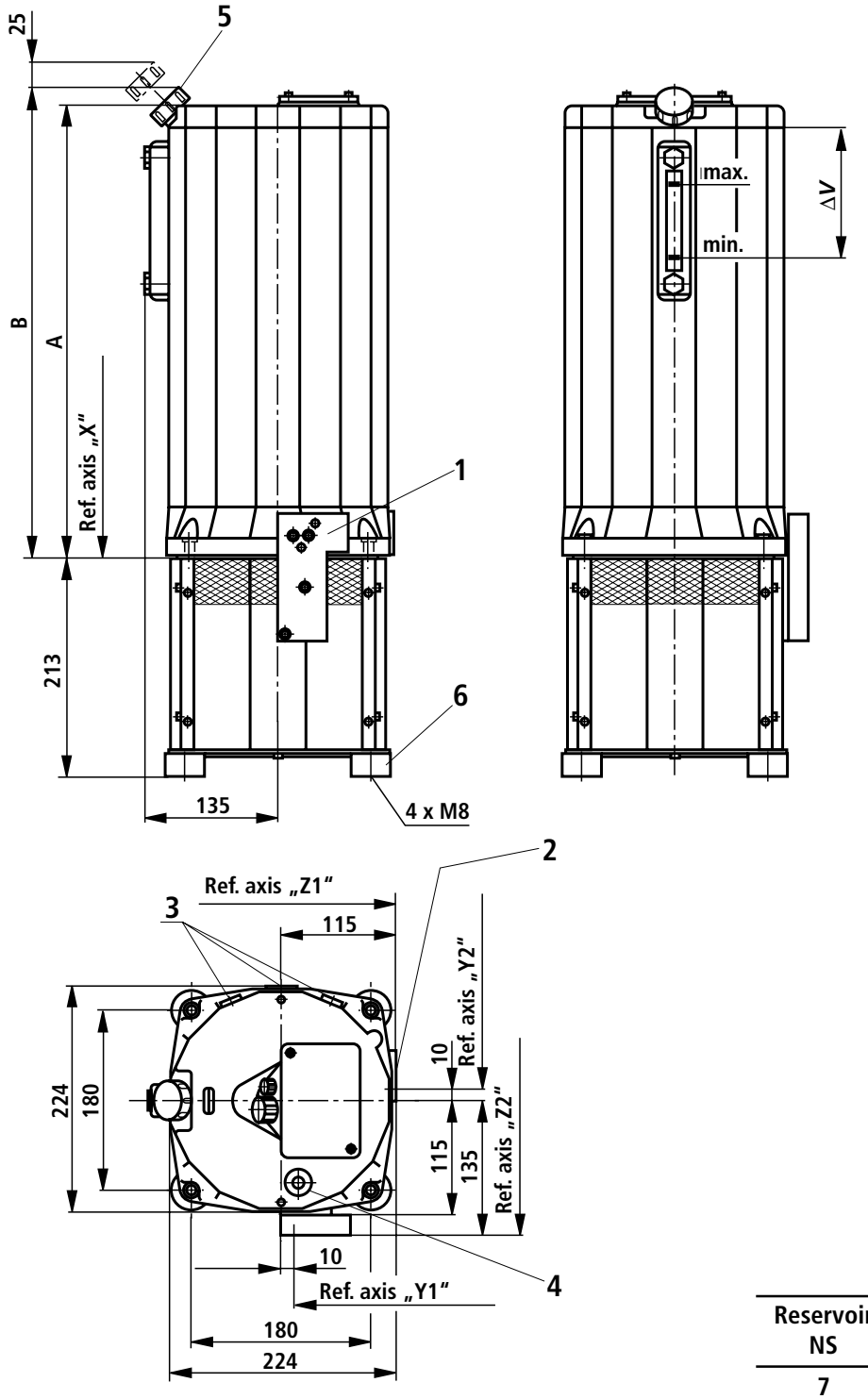

**Customer side:**

Y Star *U* = 400 V



## Unit dimensions

(Dimensions in mm)




| Reservoir NS | A | B |
|---|---|---|
| **7** | 455 | 470 |
| **9** | 575 | 590 |

**X, Y** and **Z** are **ref. axes.** These are used to determine the installation dimensions of the control block which is to be fitted.

**1** Control 1 mounting surface
**2** Control 2 mounting surface
**3** Oil drain plug (2 x G 3/8; 1 x G 3/4)
**4** Drain oil connection G 1/2
**5** Breather filter
**6** Anti-vibration mount

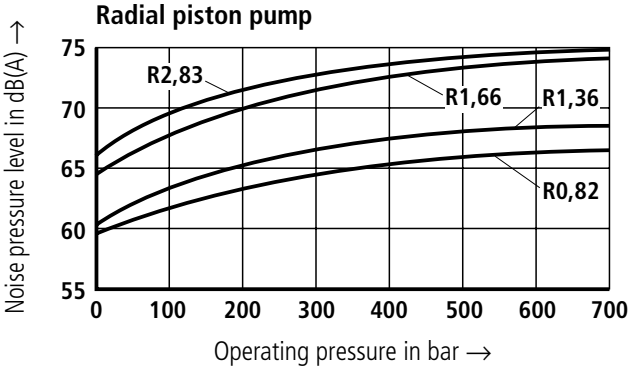
### Filling and draw-off quantities

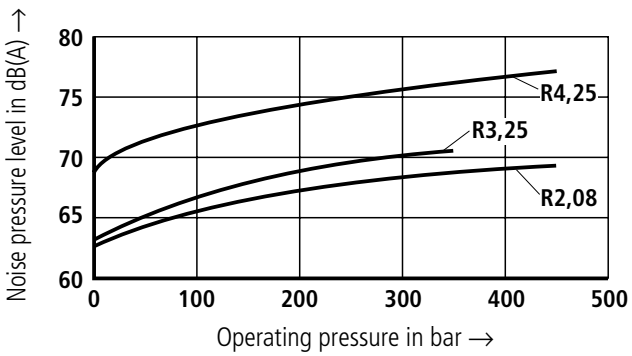
| | Reservoir NS | Qty. in litres |
|---|---|---|
| Filling quantity | **7** | 8.5 |
| | **9** | 11.0 |
| Draw-off quantity | **7** | 3.5 |
| | **9** | 3.5 |
| Draw-off quantity up to the float switch switching point | **7** | 2.3 |
| | **9** | 2.3 |

## **Noise pressure level** (measured at $\nu$ = 41 mm²/s and $\vartheta$ = 50 °C)

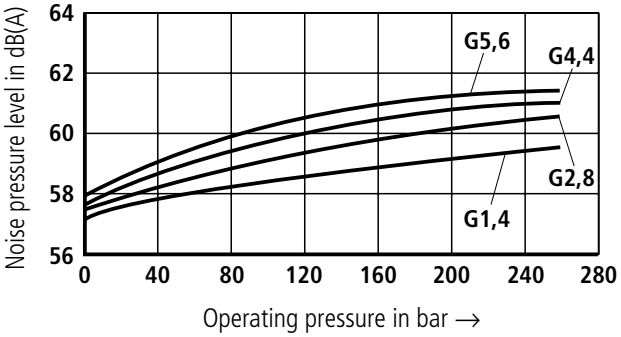
### Single pump:

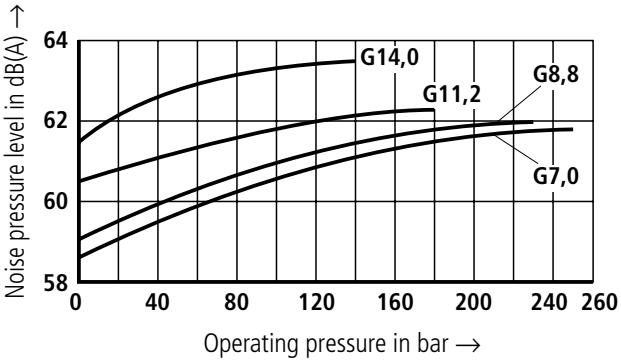
**Radial piston pump**




**External gear pump**




### Double pump:

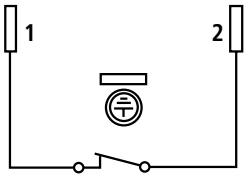
The noise pressue level of the double pump version of the clamping and drive module increases by approx. 2 dB(A) when compared to the value of the single pump.

## **Float switch** (optional)

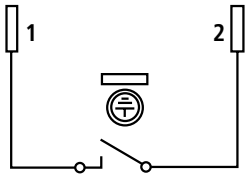
### Description

The float switch is used to electrically monitor the level of the pressure fluid. When the minimum oil level is reached the contact opens and a signal is given to the control system.

### Electrical function



Maximum level



Minimum level

### Technical data

| | | |
|---|---|---|
| Maximum voltage | V | 50 AC/DC |
| Maximum current consumption | A | 0.25 |
| Maximum power consumption | W | 3.0 |
| Protection | | IP 65 |
| Contact type | | NC |

## **Temperature switch** (optional)

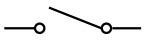
### Description

With the aid of the temperature switch the clamping and drive module is protected against unpermissibly high pressure fluid temperatures. The temperature switch has a fixed switching pint, this switches at a pressure fluid temperature of 80 °C.

The reset switching hysteresis is approx. 10 K.

### Electrical function


Temperature < 80 °C


Temperature ≥ 80 °C

### Technical data

| | | | | | |
|---|---|---|---|---|---|
| Switching temperature | | ° C | 80 ± 3K | | |
| AC voltages | – Nominal voltage | V | 250 | 110 | 60 |
| | – Max. loading | A | 6.3 | 8.0 | 1.0 |
| Frequency | | Hz | 50 / 60 | | |
| Power factor | | cos φ | 1.0 | | |
| DC voltages | | V | 42 = 1.2 A | | |
| | | V | 6; 12; 24 = 1.5 A | | |

## **Breather filter** (optional)

When using the clamping and dirve module in a highly contaminated environment we recommend the use of a breather filter.

The breather filter has a filtration rating of 10 µm.

## Commissioning guidelines

- Check to see whether the clamping and drive module is correctly fitted to the machine which is to be driven (hydraulically and electrically).
- For the motor electrical connections, the washers and connection bridges provided must be used.
- Take the fan (clockwise) direction of rotation into account, as the air will be blown out of the bottom of the clamping and drive module. (Practical check: Hold a sheet of paper to the perforated steel fan cover, the paper must be sucked onto the cover.)
- The electric motor must be protected by a system with overload relays.
  This must be set to the nominal current, this stated on the type/ performace label.
- When installing the clamping and drive module fitted with an external gear pump particular care must be taken with the motors direction of rotation, see the direction of rotation arrow. (Practical check: Briefly switch the motor on and check to see if the pump provides a flow of oil.)
- Only fill the pressure fluid via a filter with the required minimum retention rate.
- The clamping and drive module has to be filled with pressure fluid until the correct level on the dip stick has been reached.
- Under no circumstances allow the clamping and drive module to run without pressure fluid.
- Start-up the clamping and dirve module without load and allow it to supply oil without pressure for a few seconds so that adequate lubrication is ensured.
- The fluid level in the clamping and drive module has to be checked, after bleeding the hydraulic control as well as the actuators by moving them in and out repeatedly or via the bleed points provided, and filled to the required level if required.
- The clamping and drive module must only be used within the permissbile data limits. It must also only be used in good condition.
- Before any work is carried out on the clamping and drive module, the system must be depressurised and the power supply switched off.
- Any unauthorised changes and conversions which effect the safety and function are not permitted.
- Protective measures provided must not be removed.
- Keep the oil-air cooler clean and do not cover as, otherwise the pressrue fluid and electric motor will over heat.
- The general current safety and accident prevention regualtions are to be taken into account and complied with.

**Note: With reference to the EC machinery guidelines 89/392 EWG, annex II, section B:**

The assemblies have been manufactured in accordance with the harmonised standards prEN 982, prEN 983, DIN EN 292 and DIN EN 60 204-1.

Commissioning may not take place until it has been confirmed that the machine, into which the assembly is to be installed, conforms with the regualtions stated with the EC guidelines.

☞ ⚠ **Attention!**

The clamping and drive module can heat up during operation ⇒ **Danger of injury!**

Adjustments, maintenance and service of the clamping and drive module may only be carried out by authorised, trained and supervised personnel.

**For repairs only use original Bosch Rexroth spare parts!**

## Notes

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