# Compact hydraulic power pack type INKA 1

## Product documentation

For short period operation S2 and periodic intermittent operation S3

| | |
|---|---|
| Operating pressure $p_{max}$: | 700 bar |
| Displacement volume $V_{max}$: | 1.5 $cm^3$/rev |
| Usable volume $V_{use\ max}$: | 1.5 l |


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# 1 Overview of compact hydraulic power pack type INKA 1

Compact hydraulic power packs are a type of hydraulic power pack. They are characterised by a highly compact design, since the motor shaft of the electric drive also acts as the pump shaft. Compact hydraulic power packs are designed to supply hydraulic circuits with hydraulic fluid.

The compact hydraulic power pack type INKA consists of the tank, the integrated motor and the radial piston pump or gear pump directly attached to the motor shaft. The directly mounted electronic communication box with integrated real-time operating system allows the operating state to be recorded and visualised. The measured values of the integrated multi-sensor (including the motor speed) can be passed on to the higher-level machine controls via standardised interfaces and processed there.

The consistently modular design of the type INKA means that different usage volumes and delivery flows can be realised quickly and easily from the modular system. Compatible, ready-for-connection, complete solutions can be assembled easily using a wide range of connection blocks and the valve banks that can be combined with them.

*Compact hydraulic power pack type INKA 1*

## Features and benefits

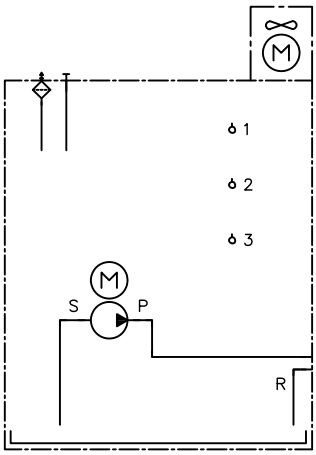
- Prepared for condition monitoring with integrated sensors and communication box
- Optimum efficiency through under-oil motor cooling, direct power transmission, and sophisticated heat dissipation
- Suitable for nominal operating modes S2 (short period operation) and S3 (periodic intermittent operation)
- Resource-saving due to small oil filling volume

## Intended applications

- Machine tools and material testing
- Hydraulic tools
- Handling systems
- Presses and processing machines

# 2 Available versions

## Circuit symbol




## Ordering examples

| INKA14 | 2 | V | 00 | -H0,64 | -E0 | X00X00X00 | -P0 | X | F000 | -G0 | -0 | -3 x 400 V 50 Hz-0,25kW | -... |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

- -...: 6.1.11 "Connection blocks and valves"
- -3 x 400 V 50 Hz-0,25kW: 3.6.1 "Motor data"
- -0: 2.1.10 "Stator"
- -G0: 2.1.9 "Drain hose for hydraulic fluid"
- F000: No external fan
- X: 2.1.8 "Additional option: electric"
- -P0: 2.1.7 "Electrical connection"
- X00X00X00: 2.1.6 "Switch output"
- -E0: 2.1.5 "Additional option: sensor system"
- -H0,64: 2.2 "Pump"
- 00: 2.1.4 "Rotation of the top housing cover"
- V: 2.1.3 "Installation position"
- 2: 2.1.2 "Tank size"
- INKA14: 2.1.1 "Basic type and motor power"

## 2.1 Motor and container

### 2.1.1 Basic type and motor power

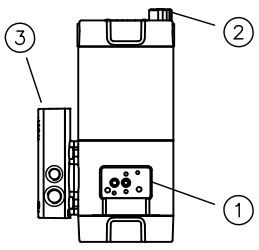
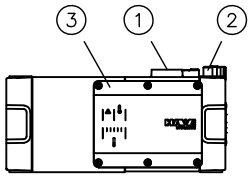
| Type | Motor voltages and motor data | | |
|---|---|---|---|
| | Nominal voltage | Nominal power (kW) | Rated speed (rpm) at 50 Hz/60 Hz |
| **3-phase motor, 4-pole** | | | |
| **INKA 14** | 3~400 V 50 Hz/460 V 60 Hz | 0.25 | 1400/1730 |
| | 3~230 V 50 Hz/265 V 60 Hz | 0.25 | 1400/1730 |
| | 3~400 V 50 Hz/460 V 60 Hz | 0.55 | 1380/1700 |
| | 3~230 V 50 Hz/265 V 60 Hz | 0.55 | 1380/1700 |
| **AC motor, 4-pole** | | | |
| **INKA 14** | 1~230 V 50 Hz | 0.37 | 1380 |

### 2.1.2 Tank size

| Coding | Vertical | | Horizontal | |
|---|---|---|---|---|
| | Fill volume (l) | Usable volume (l) | Fill volume (l) | Usable volume (l) |
| **1** | 1.60 | 0.55 | 1.60 | 0.65 |
| **2** | 2.10 | 1.05 | 2.05 | 0.85 |
| **3** | 2.75 | 1.65 | 2.60 | 1.10 |

**DAMAGE**
Tank size 1 only available with 3-phase motor 0.25 kW

### 2.1.3 Installation position

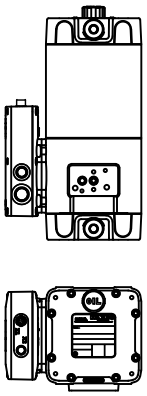
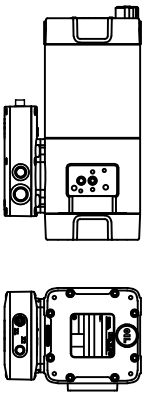
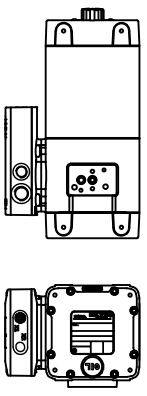
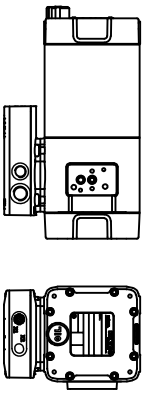
| Coding | Comment | Installation position |
|---|---|---|
| **V** | Vertical |  |
| **H** | Horizontal |  |

1 Connection base
2 Filler port and breather filter (hydraulic fluid)
3 Communication box

**DAMAGE**

- The horizontal version can also be incorporated vertically.
- The horizontal version with sensors can be inserted vertically, in which case no measurement of the fluid level is possible.
- The vertical version within radial piston pump (coding H) cannot be inserted horizontally.
- Re 1: Setup of connection block/directional valve bank:
  see Chapter 6.1.11, "Connection blocks and valves"

## 2.1.4 Rotation of the top housing cover

| Coding | 00 | 11 | 22 | 33 |
|---|---|---|---|---|
| |  |  |  |  |

**DAMAGE**

- Covers can only be mounted rotated with the vertical variant (coding V) (not with the horizontal variant, coding H).
- The top and bottom cover can each be mounted independently of the other, rotated in a 90° grid.
- Rotation 1 and 3 of the top cover only possible without additional electronic option (coding E0).

## 2.1.5 Additional option: sensor system

The optional sensor system can be used to measure the level, the temperature of the hydraulic fluid and the motor speed. The visualisation takes place at the communication box.

| Coding | Comment |
|---|---|
| **E0** | No additional electronic option |
| **E1** | Sensors with IO-Link (connection via M12 plug) |
| **E2** | Sensors with 3 switch outputs (connection via M12 plug) |

## 2.1.6 Switch output

Switch outputs can only be configured for sensors **E2**.

### Sensors E0 and E1

| Coding | Description |
|---|---|
| **X00** | Without switch outputs |

**Sensors E2**

Switch outputs 1, 2, and 3 can be configured independently of each other.

The same signals can also be selected for switch outputs 1, 2, and 3, e.g. D00D50D90.

| Coding | Description |
|---|---|
| D00 | Level ≦ 0% |
| D10 | Level ≦ 10% |
| D100 | Level ≦ 100% |
| T40 | Temperature ≧ 40°C |
| T50 | Temperature ≧ 50°C |
| N00 | Speed > 0 rpm |
| N01 | Speed > 100 rpm |
| E00 | Warning or error has occurred |
| E01 | Error has occurred |

**Selectable increments of oil temperature and fluid level:**

- **D:** D00 - D100 (every 10% selectable)
- **T:** T40 - T80 (every 10° C selectable)

**NOTE**
Once the configured switching threshold/switch output condition is met, supply voltage for the sensors is applied to the associated output.

## 2.1.7 Electrical connection

| Coding | Comment |
|---|---|
| P0 | Communication box, series |
| P1 | Connection via plug connector (right) |
| P2 | Connection via plug connector (bottom) |
| P3 | Connection via plug connector (left) |

## 2.1.8 Additional option: electric

| Coding | Comment |
|---|---|
| X | No additional option |

## 2.1.9 Drain hose for hydraulic fluid

| Coding | Comment |
|---|---|
| G0 | No hose |
| G3 | 300 mm drain hose with ball valve |
| G5 | 500 mm drain hose with ball valve |
| W3 | 300 mm drain hose with elbow and ball valve |
| W5 | 500 mm drain hose with elbow and ball valve |

## 2.1.10 Stator

| Coding | Comment |
|---|---|
| 0 | Standard |

## 2.2 Pump

- **H:** Pump elements (type MPE)
- **Z:** Gear pumps BG05

### 2.2.1 Single-circuit pump with a 3-phase motor

**NOTE**
See Pump element type MPE and PE for radial piston pumps: D 5600

**DAMAGE**

- The delivery flow $Q_{max}$ relates to the rated speed and varies depending on the load, see Chapter 3.6, "Electrical data"
- At a power frequency of 60 Hz, the delivery flow is approximately 1.2 times higher than that indicated here.
- The permitted pressures $p_{max}$ apply to a version with a 3~400 V 50 Hz / 460 V 60 Hz or 3~230 V 50 Hz/265 V 60 Hz motor
- Be aware of different motor power ratings and resulting permitted maximum pressures $pp_{max} = (pV_{g\ max})/V_g$ at other nominal voltages and power frequencies ($pV_{g\ max}$). see Chapter 3.6.1, "Motor data"

**Radial piston pump H**

| Coding | Piston diameter (mm) | Number of pump elements | Displacement volume $V_g$ (cm³/rev) | INKA 14 ...- 0.25 kW | | | INKA 14 ...- 0.55 kW | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Permissible pressure $p_{max}$ (bar) | Delivery flow $Q_{max}$ (lpm) | | Permissible pressure $p_{max}$ (bar) | Delivery flow $Q_{max}$ (lpm) | |
| | | | | | 50 Hz | 60 Hz | | 50 Hz | 60 Hz |
| H 0.27 | 4 | 3 | 0.19 | 700 | 0.26 | 0.32 | 700 | 0.25 | 0.31 |
| H 0.42 | 5 | 3 | 0.29 | 560 | 0.39 | 0.48 | 700 | 0.39 | 0.47 |
| H 0.64 | 6 | 3 | 0.42 | 390 | 0.57 | 0.70 | 700 | 0.56 | 0.69 |
| H 0.81 | 7 | 3 | 0.58 | 280 | 0.79 | 0.96 | 570 | 0.78 | 0.95 |
| H 1.10 | 8 | 3 | 0.75 | 220 | 1.02 | 1.25 | 440 | 1.01 | 1.22 |
| H 1.35 | 9 | 3 | 0.95 | 170 | 1.30 | 1.58 | 350 | 1.28 | 1.55 |

**Gear pump Z**

| Coding | Size | Displacement volume $V_g$ (cm³/rev) | INKA 14 ...- 0.25 kW | | | INKA 14 ...- 0.55 kW | | |
|---|---|---|---|---|---|---|---|---|
| | | | Permissible pressure $p_{max}$ (bar) | Delivery flow $Q_{max}$ (lpm) | | Permissible pressure $p_{max}$ (bar) | Delivery flow $Q_{max}$ (lpm) | |
| | | | | 50 Hz | 60 Hz | | 50 Hz | 60 Hz |
| Z 0.75 | 05 | 0.50 | 200 | 0.67 | 0.83 | 200 | 0.66 | 0.82 |
| Z 1.50 | 05 | 1.00 | 155 | 1.34 | 1.66 | 200 | 1.32 | 1.63 |
| Z 2.25 | 05 | 1.50 | 100 | 2.02 | 2.49 | 200 | 1.99 | 2.45 |

## 2.2.2 Single-circuit pump with a AC motor

**NOTE**

- The delivery flow $Q_{max}$ relates to the rated speed and varies depending on the load.
  see Chapter 3.6, "Electrical data"
- Notes on the pressures $p_{max}$: see Chapter 3.6, "Electrical data"
- The permitted pressures $p_{max}$ apply to a version with a 1x230 V 50 Hz motor.
- Be aware of different motor power ratings and resulting permitted maximum pressures $pp_{max} = (pV_{g\ max})/V_g$ at other nominal voltages and power frequencies ($pV_{g\ max}$).
  see Chapter 3.6, "Electrical data"
- The version with an AC motor requires an operating capacitor. It is not included in the scope of delivery. Recommendation and selection advice:
  see Chapter 3.6, "Electrical data"
  see Chapter 6.1.9, "Select operating capacitor for type INKA".
- It cannot be started up directly against the effects of pressure!

### Radial piston pump H

| Coding | Piston diameter (mm) | Number of pump elements | Displacement volume $V_g$ (cm³/rev) | INKA 14 ...- 0.37 kW | |
|---|---|---|---|---|---|
| | | | | Permissible pressure $p_{max}$ (bar) | Delivery flow $Q_{max}$ (lpm) |
| | | | | | 50 Hz |
| H 0.27 | 4 | 3 | 0.19 | 700 | 0.25 |
| H 0.42 | 5 | 3 | 0.29 | 460 | 0.39 |
| H 0.64 | 6 | 3 | 0.42 | 320 | 0.56 |
| H 0.81 | 7 | 3 | 0.58 | 230 | 0.78 |
| H 1.10 | 8 | 3 | 0.75 | 180 | 1.01 |
| H 1.35 | 9 | 3 | 0.95 | 140 | 1.28 |

### Gear pump Z

| Coding | Size | Displacement volume $V_g$ (cm³/rev) | INKA 14 ...- 0.37 kW | |
|---|---|---|---|---|
| | | | Permissible pressure $p_{max}$ (bar) | Delivery flow $Q_{max}$ (lpm) |
| | | | | 50 Hz |
| Z 0.75 | 05 | 0.50 | 200 | 0.66 |
| Z 1.50 | 05 | 1.00 | 125 | 1.32 |
| Z 2.25 | 05 | 1.50 | 85 | 1.99 |

# 3 Parameters

## 3.1 General data

| | |
|---|---|
| **Conformity** | ▪ Declaration of incorporation according to Machinery Directive 2006/42/EC<br>▪ Declaration of conformity according to Low-Voltage Directive 2014/35/EU |
| **Designation** | Compact hydraulic power pack |
| **Design** | Valve-controlled radial piston pump or gear pump |
| **Model** | Compact hydraulic power pack (closed unit with a pump, electric drive and tank) |
| **Material** | Housing: Aluminium<br>Communication box: Plastic |
| **Attachment** | Tightening torque: 8 Nm<br>see Chapter 4.1, "Mounting hole pattern" |
| **Installation position** | Vertical (INKA... V) or horizontal (INKA...H)<br>Please observe the notes on the installation position see Chapter 2.1.3, "Installation position" |
| **Operating elevation** | < 2000 m above sea level, permitted water content < 0.1% |
| **Rotation direction** | Radial piston pump (type H) – any<br>Gear pump (type Z) – anticlockwise<br>(Rotation direction only ascertainable from check of delivery flow; if there is no delivery flow in the 3-phase version, replace two of the three main conductors) |
| **Speed range (min ... max)** | Radial piston pump H: acc. to motor data, see Chapter 3.6.1, "Motor data"<br>Gear pump Z: acc. to motor data, see Chapter 3.6.1, "Motor data" |
| **Line connection** | Via bolted-on connection blocks, see Chapter 6.1.11, "Connection blocks and valves" |
| **Visualisation** | Visualisation via LEDs. No output of values. |

## 3.2 Weight

| | | |
|---|---|---|
| **Basic type** | **Type** | |
| | INKA 14 | 10 kg |
| **Tank** | **Tank size** | |
| | 1 | + 0 kg |
| | 2 | + 0.3 kg |
| | 3 | + 0.7 kg |

| | | |
|---|---|---|
| **Motor** | 3 ~ 0.25 kW | + 0 kg |
| | 3 ~ 0.55 kW | + 1.9 kg |
| | 1 ~ 0.37 kW | + 0.9 kg |
| **Pump version** | **Type** | |
| | H | + 0 kg |
| | Z | + 0.2 kg |

For weights of the required connection blocks and valve banks, see corresponding publications, see Chapter 6.1.11, "Connection blocks and valves".

**Example:**

INKA 141 - H 0,27 ... - 3 x 0,55 kW

| Category | Basic pump | Tank | Motor | Pump version | Total weight |
|---|---|---|---|---|---|
| **Selection** | **INKA 14** | **1** | **3 ~ 0.55 kW** | **H 0.27** | |
| **Individual weights** | 10 kg | 0 kg | 2.2 kg | 0 kg | = 12.2 kg |

**Example:**

INKA 143 - Z 1,50 ... - 3 x 0,55 kW

| Category | Basic pump | Tank | Motor | Pump version | Total weight |
|---|---|---|---|---|---|
| **Selection** | **INKA 14** | **3** | **3 ~ 0.55 kW** | **Z 1.50** | |
| **Individual weights** | 10 kg | 0.7 kg | 2.2 kg | 0.2 kg | = 13.1 kg |

## 3.3 Hydraulic data

| | |
|---|---|
| **Hydraulic fluid** | Hydraulic fluid, according to DIN 51 524 Parts 2 to 3; ISO VG 10 to 68 according to DIN ISO 3448<br>Viscosity range: Type H: 4 - 800 mm²/s, type Z: 6 - 500 mm²/s<br>Optimal operating range: approx. 10 - 100 mm²/s<br>Also suitable for biologically degradable hydraulic fluids type HEPG (polyalkylene glycol) and HEES (synthetic ester) at operating temperatures up to approx. +70°C.<br>Also suitable for biologically degradable hydraulic fluids type HEES (synthetic ester) at operating temperatures up to approx. +70°C. |
| **Cleanliness level** | **ISO 4406**<br>21/18/15...19/17/13 |
| **Temperatures** | Environment: approx. -20 to +60°C, hydraulic fluid: -20 to +80°C, ensure the correct viscosity range.<br>Biologically degradable hydraulic fluids: note manufacturer specifications. With consideration for the seal compatibility, not above +70°C.<br>Start temperature: down to -20 °C is permissible (take account of the start viscosities!), as long as the steady-state temperature is at least 20 K higher during subsequent operation. |

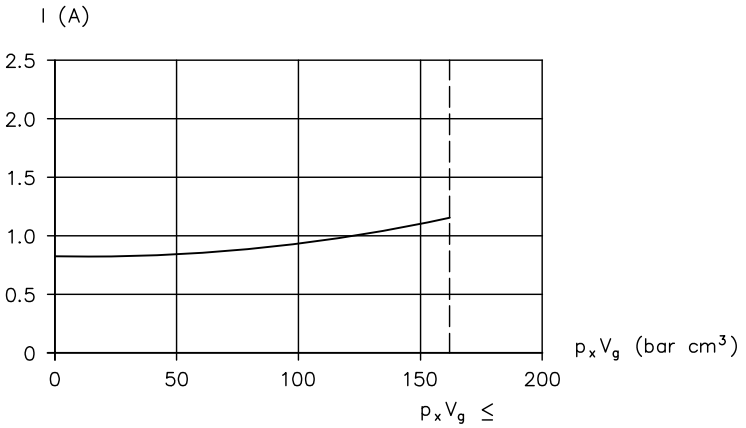
## 3.4 Pressure and volumetric flow

| | |
|---|---|
| **Pressure** | ▪ Pressure side (port P): depending on version and delivery flow, see see Chapter 2.2, "Pump"<br>▪ Suction side (container interior): ambient air pressure. Not suitable for charging. |
| **Start against pressure** | ▪ The version with 3-phase motor can start against the pressure $p_{max}$.<br>▪ The AC motor version can only act counter to a minor pressure (circulation pressure). |

## 3.5 Characteristic lines

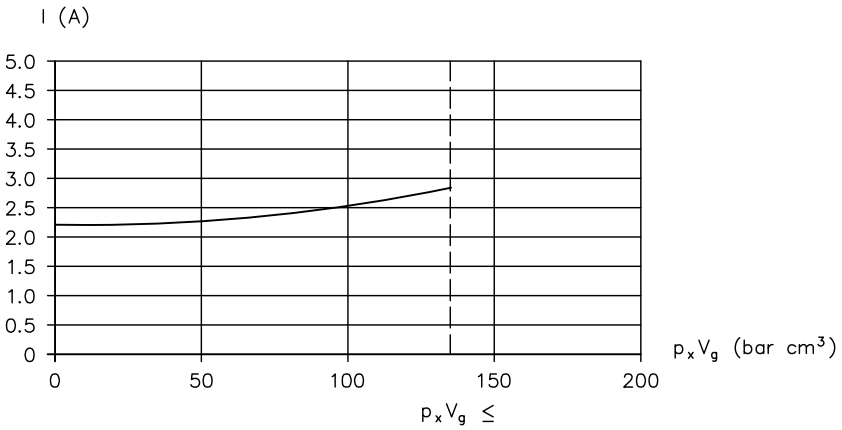
### Current consumption

**0.25 kW**



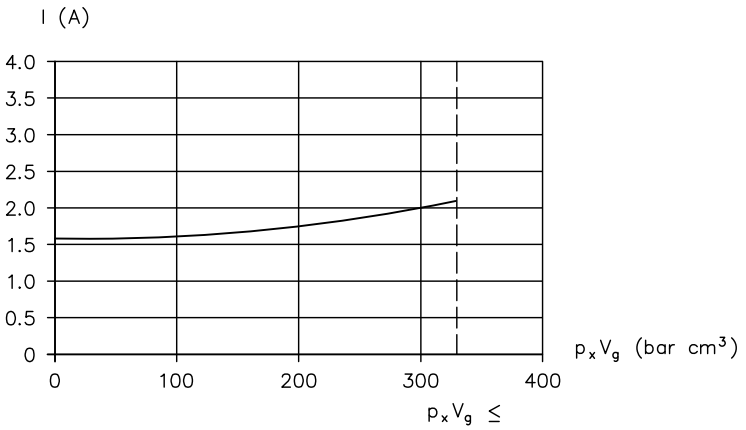

*$p_x$ $V_g$ hydraulic work value (bar cm³); I current consumption (A)*

**0.37 kW**




*$p_x$ $V_g$ hydraulic work value (bar cm³); I current consumption (A)*

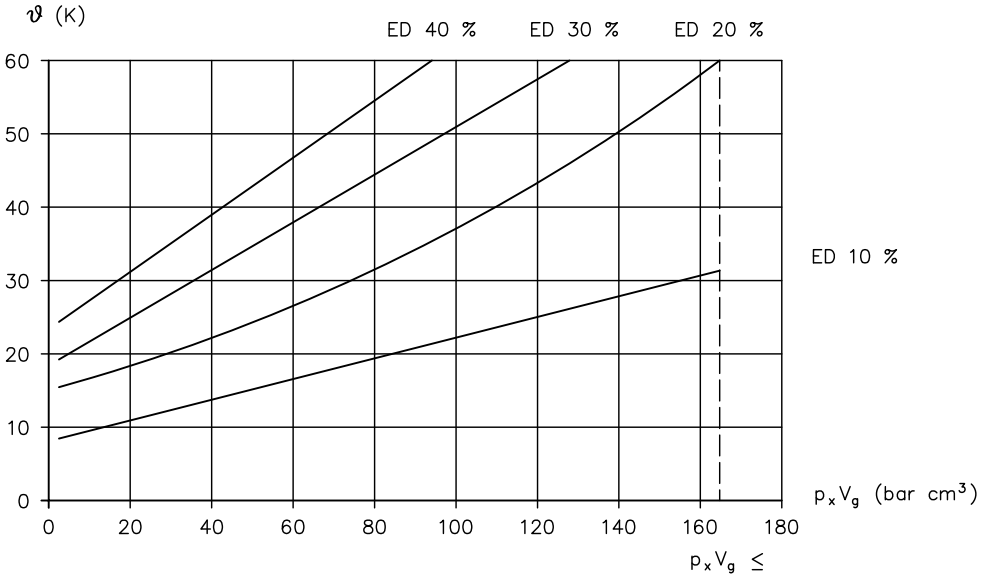
### 0.55 kW




*$p_x$ $V_g$ hydraulic work value (bar cm³); I current consumption (A)*

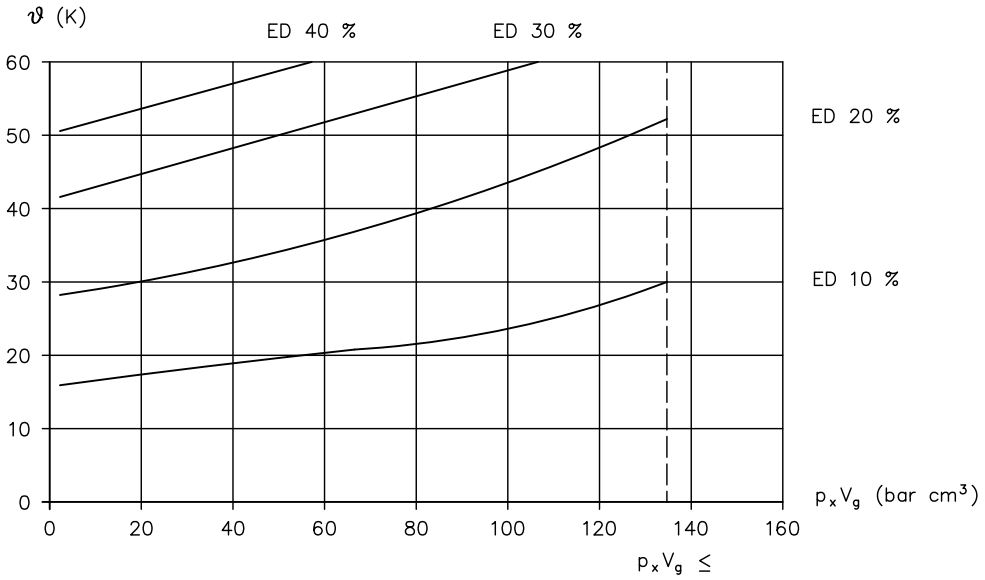
## Build-up of heat

### 0.25 kW



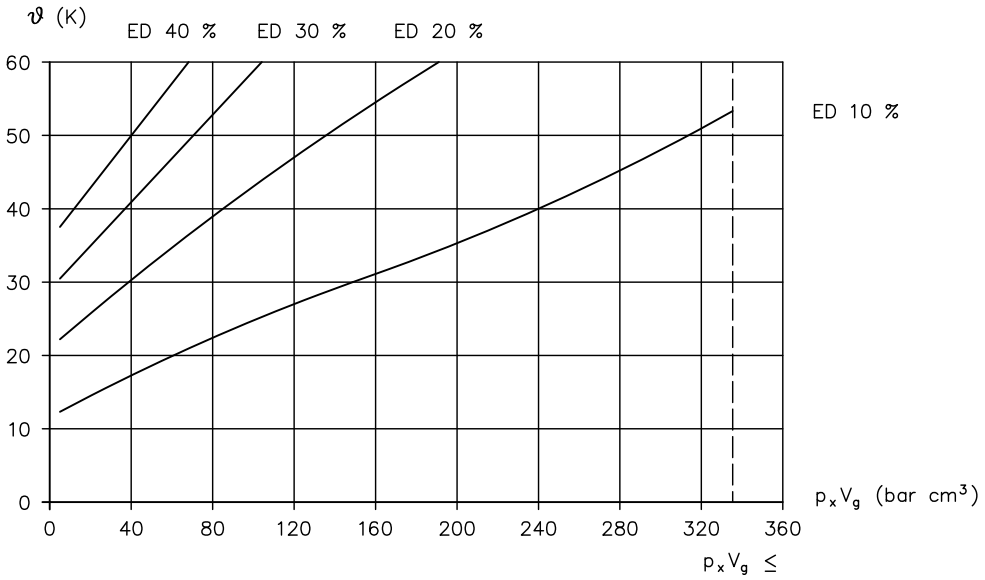

*$p_x$ $V_g$ hydraulic work value (bar cm³); $\Delta\vartheta$ steady-state temperature (K)*

### 0.37 kW




*$p_x$ $V_g$ hydraulic work value (bar cm³); $\Delta\vartheta$ steady-state temperature (K)*

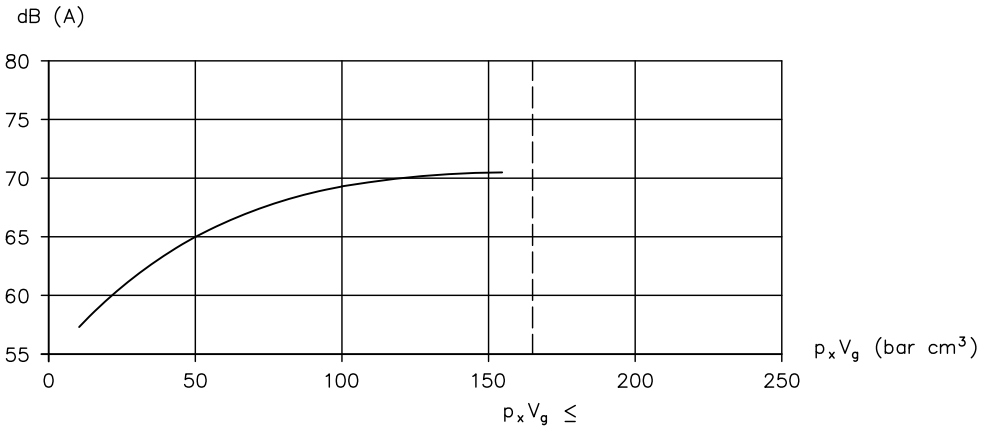
### 0.55 kW




*$p_x$ $V_g$ hydraulic work value (bar cm³); $\Delta\vartheta$ steady-state temperature (K)*

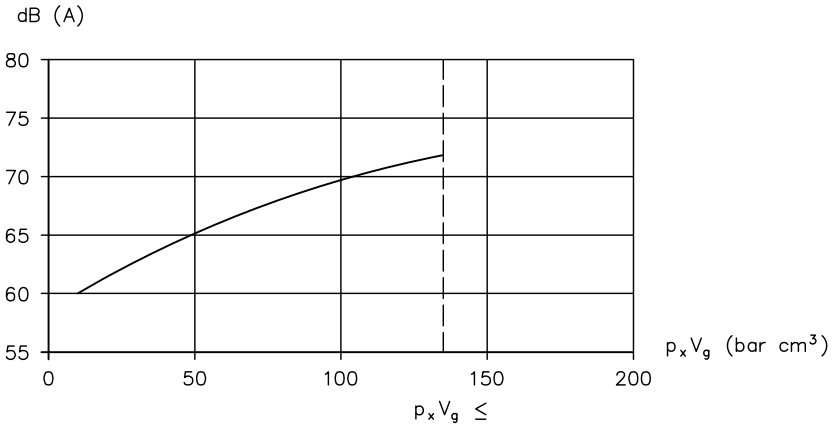
## Running noise

### 0.25 kW




*$p_x$ $V_g$ hydraulic work value(bar cm³); noise level dB(A)*

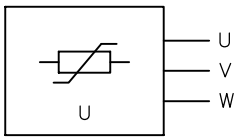
### 0.37 kW




*$p_x$ $V_g$ hydraulic work value(bar cm³); noise level dB(A)*

## 3.6 Electrical data

- The drive motor forms a closed, non-separable unit with the pump.

| | |
|---|---|
| **Connection** | **part of product**<br>▪ For version with HARTING connector: Screw-in housing HAN 3A-EG-M20, crimp connection, pin HAN Q 5/0-M-C<br>**not supplied**<br>▪ For version with HARTING connector: Mating connector, e.g. straight mating connector: Bushing HAN 3A-GG-M20, crimp connection, socket HAN Q 5/0-M<br>▪ For version with communication box: Ring cable lug M5, cable fitting M16x1.5 or M20x1.5<br>▪ For version with sensors (E1 or E2): M12 plug |
| **Protection class** | IP 65 according to IEC 60529<br>**NOTE**<br>Protect the breather filter from moisture penetration. |
| **Protection class** | VDE 0100 protection class 1 |
| **Insulation** | **Designed in accordance with EN 60 664-1**<br>▪ For 4-wire AC voltage systems L1-L2-L3-PE (3-phase systems) **with** an earthed neutral point up to 500 V AC nominal phase voltage phase-phase<br>▪ For 3-wire AC voltage systems L1-L2-L3 (3-phase systems) **without** an earthed neutral point up to a nominal phase voltage of 300 V AC phase-phase<br>▪ For a single-phase and earthed 2-wire alternating current system L-N (alternating current or mains) up to a nominal voltage of 300 V AC. |
| **Insulation material class** | F |
| **Suppressor** | Type RC 3 R |
| **Coding E** | ▪ Operating voltage: 3x 575 V AC<br>▪ Frequency: 10 to 400 Hz<br>▪ max. motor power: 7.5 kW<br>  |
| **Capacitor** | Capacitor is not included in the scope of delivery |

**PIN assignment for sensors E1**

| PIN | | Function |
|---|---|---|
| 1 | L+ | 24 V DC for sensor |
| 3 | L- | GND for sensor |
| 4 | C/Q | I/O link data line |

### PIN assignment for sensors E2

| PIN | | Function |
|---|---|---|
| 2 | | Switch output 1 |
| 4 | | Switch output 2 |
| 5 | | Switch output 3 |

## 3.6.1 Motor data

**NOTE**

- Re versions with 3-phase motors: The motor has to be ordered in star or delta circuit configuration and cannot be changed later.
- The current consumption of the motor is dependent on the load. The nominal values only apply for one operating point. In modes S2 and S3 the motor may be used at up to about 1.8 times its nominal power. The heat development which is increased here is cooled in the no-load phases or during downtimes.
- The current and pump delivery flow can be estimated on the basis of the medium and maximum hydraulic work values ($pV_{g\ m}$) and ($pV_{g\ max}$).
- Re versions with AC motors: The actual current consumption is also dependent on the size of the operating capacitor. The operating capacitor is not included in the scope of delivery. Operating capacitor design: "Selecting the operating capacitor".
- Re the specifications for the operating capacitor: 1x230V 50 Hz - ... µF / 400 V DB
- Voltage tolerances: ± 10% (IEC 38), at 3x460/265V 60 Hz ± 5%. It can be operated at undervoltage. Notes on the selection and composition of the product: see Chapter 6.1, "Planning information".

**3-phase motor**

| Type | Nominal voltage and power frequency $U_N$ (V), f (Hz) | Nominal power $P_N$ (kW) | Rated speed $n_N$ (rpm) | Nominal current $I_N$ (A) | Starting current ratio $I_A$ / $I_N$ | Power factor cos φ | Hydraulic work value $(pV_g)_{max}$ (bar cm³) |
|---|---|---|---|---|---|---|---|
| INKA 14 ...-0.25 kW | 3~400 V 50 Hz / 460 V 60 Hz | 0.25 | 1400 / 1730 | 0.70 / 0.67 | 4.2 / 5.1 | 0.75 / 0.65 | 165 |
| | 3~230 V 50 Hz/265 V 60 Hz | 0.25 | 1400/1730 | 1.21/1.16 | 4.2/5.1 | 0.75/0.65 | 165 |
| INKA 14 ...-0.55 kW | 3~400 V 50 Hz/460 V 60 Hz | 0.55 | 1380/1700 | 1.41/1.37 | 4.4/5.4 | 0.78/0.69 | 332.5 |
| | 3~230 V 50 Hz/265 V 60 Hz | 0.55 | 1380/1700 | 2.40/2.37 | 4.4/5.4 | 0.78/0.69 | 332.5 |

**AC motor**

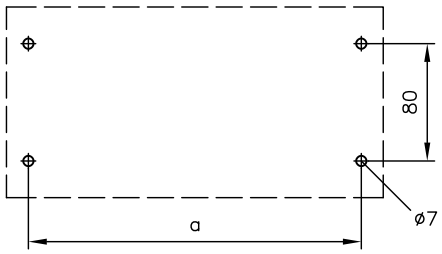
| Type | Nominal voltage and power frequency $U_N$ (V), f (Hz) | Nominal power $P_N$ (kW) | Rated speed $n_N$ (rpm) | Nominal current $I_N$ (A) | Starting current ratio $I_A$ / $I_N$ | Power factor cos φ | Hydraulic work value $(pV_g)_{max}$ (bar cm³) | Recommended operating capacitor $C_B$ (µF) |
|---|---|---|---|---|---|---|---|---|
| INKA 14 ...-0.37 kW | 1~230 V 50 Hz | 0.37 | 1380 | 2.69 | 2.5 | 0.95 | 135 | 12 |

# 4 Dimensions

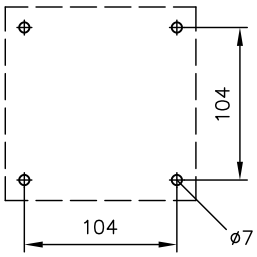
All dimensions in mm, subject to change.

## 4.1 Mounting hole pattern

Horizontal version coding **H**




Vertical version coding **V**

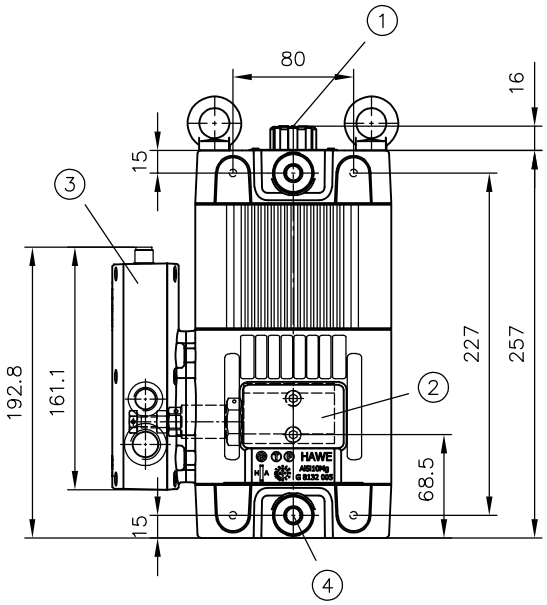


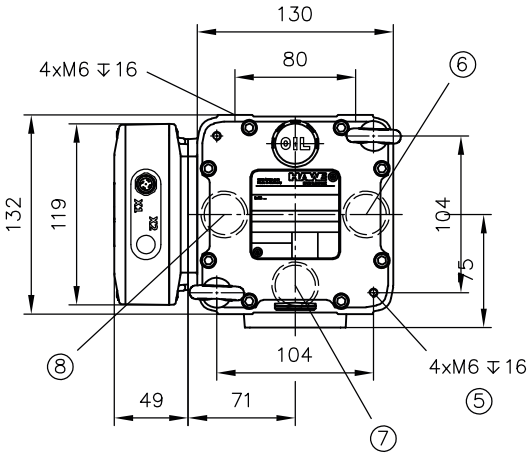

| Coding tank size | a |
|---|---|
| 1 | 227 |
| 2 | 272 |
| 3 | 322 |

## 4.2 Pump

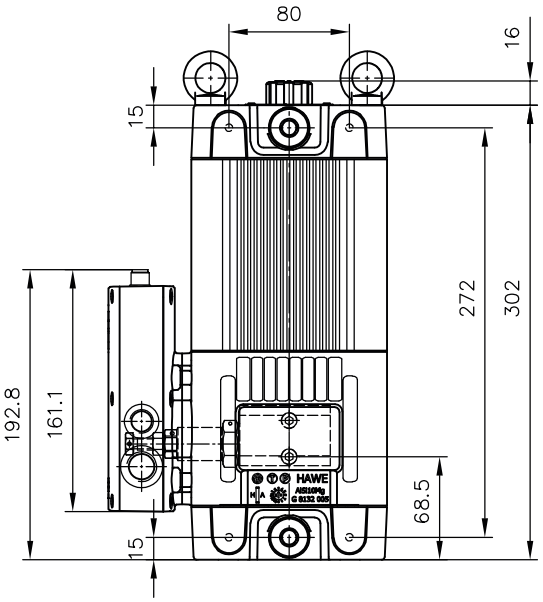
### 4.2.1 Vertical version

Tank size **1**

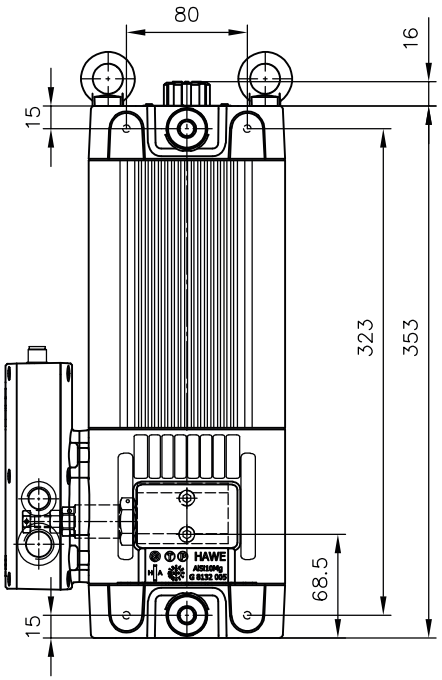



Tank size **2**



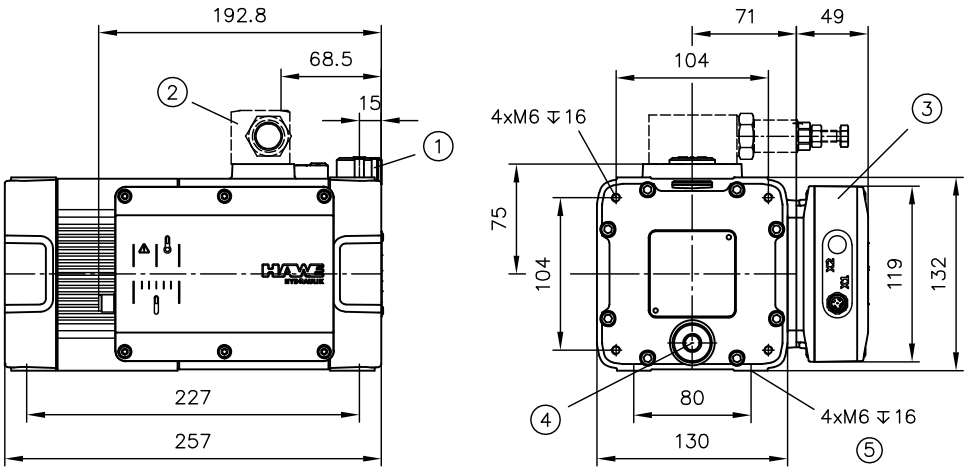

Tank size **3**




1 Filler port and breather filter (hydraulic fluid)
Filling G 1/2
Breather filter (10 µm)
2 Connection base with connection block; example: Type AB 1 K
3 Communication box
4 Hydraulic fluid drain G 1/2
5 Mounting thread (4x on both ends)
6 Rotation of covers coding 11
7 Rotation of covers coding 22
8 Rotation of covers coding 33

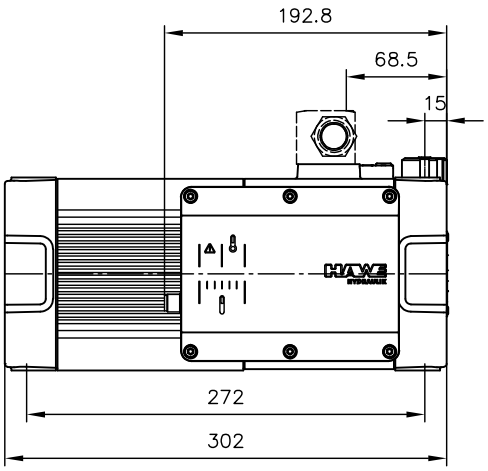
## 4.2.2 Horizontal version

Tank size **1**

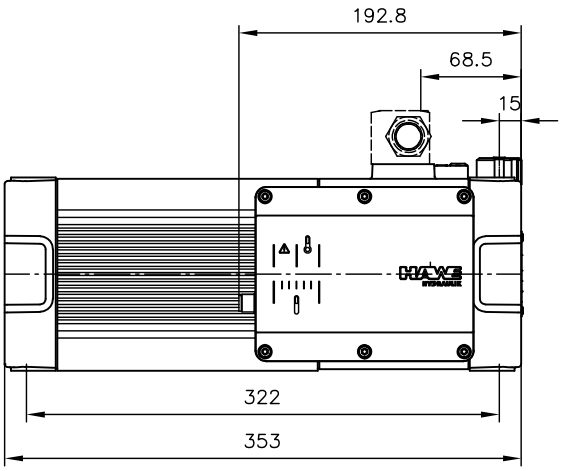



1 Filler port and breather filter (hydraulic fluid)
Filling G 1/2
Breather filter (10 µm)
2 Connection base with connection block; example: Type AB 1 K
3 Communication box
4 Hydraulic fluid drain G 1/2
Drain hose
5 Mounting thread (2x on both lids)

Tank size **2**



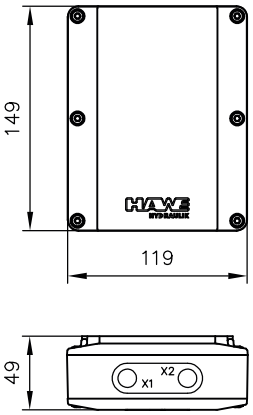

Tank size **3**



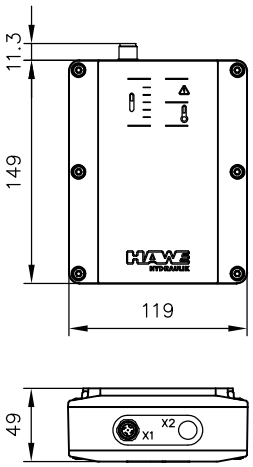
## 4.2.3 Additional options

### Sensors

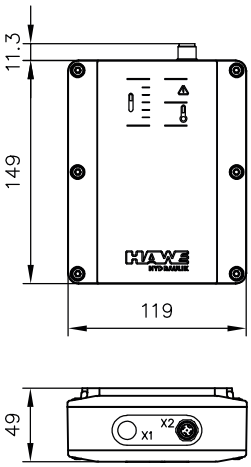
Coding **E0**




Coding **E1**

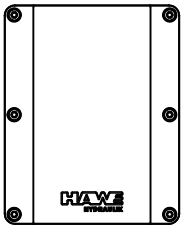



Coding **E2**

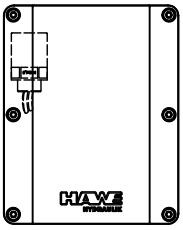


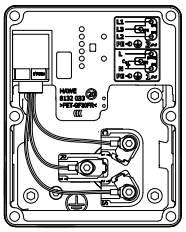

### Electrical additional options

Coding **X**



Coding **E**

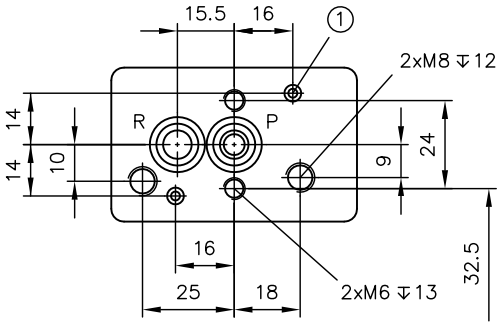




## 4.3 Connections

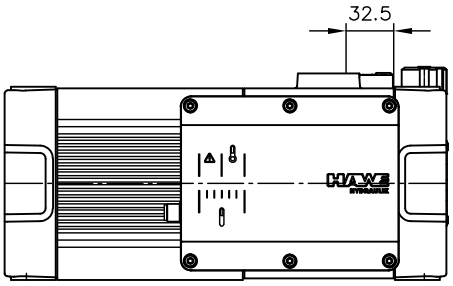
### 4.3.1 Hydraulic connections

**Single-circuit pump**

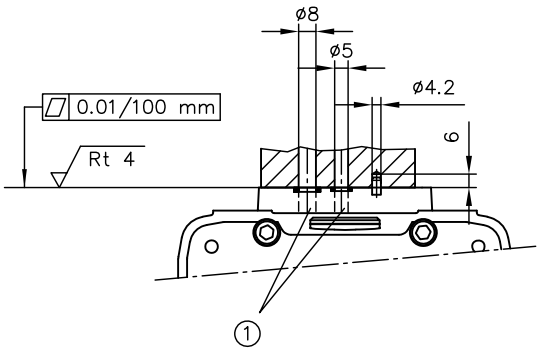



1 Centring pin ∅4 mm

**Pump**



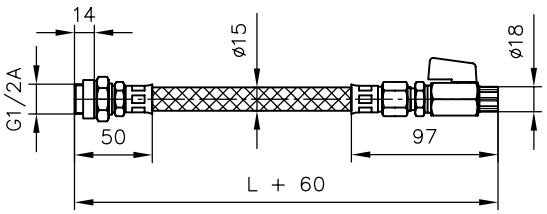

**Hole for self-made connection block**




1 Sealing of connections:
P, R = 8x2 NBR 90 Sh

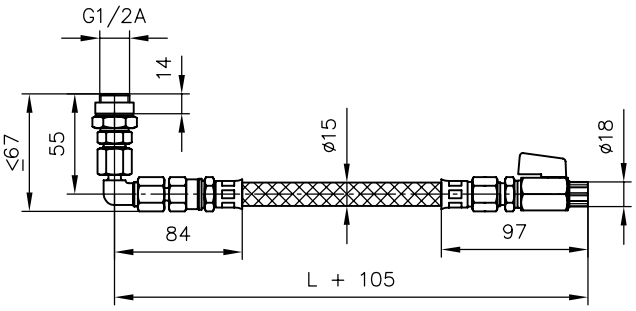
### Drain hose for hydraulic fluid

Coding **G3 and G5**




| Coding | L |
|---|---|
| G3 | 300 |
| G5 | 500 |

Coding **W3 and W5**

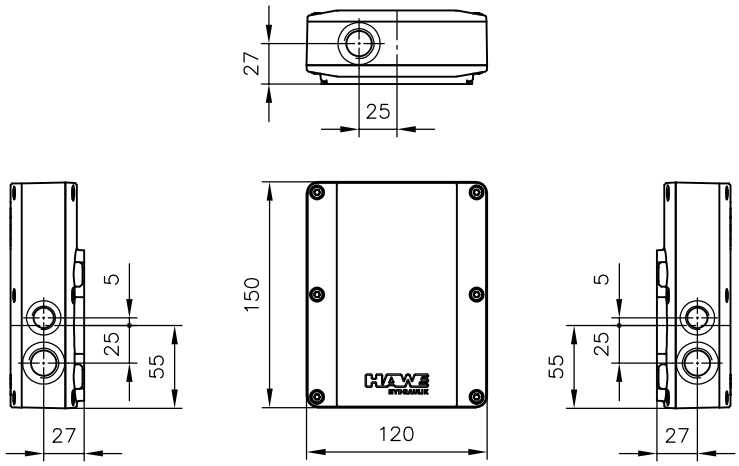



| Coding | L |
|---|---|
| W3 | 300 |
| W5 | 500 |

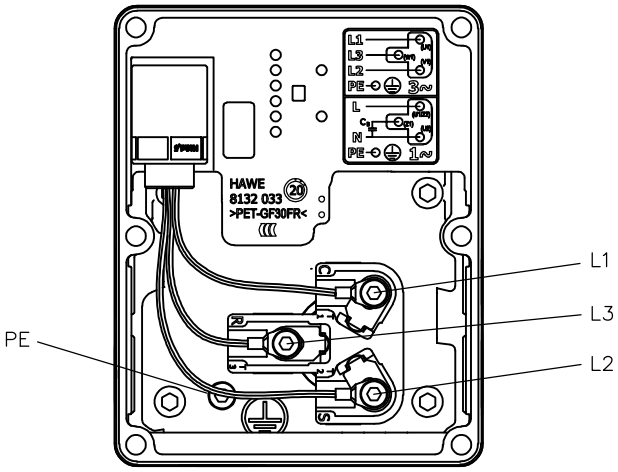
## 4.3.2 Electrical connections

### Connected via communication box

Coding **P0**



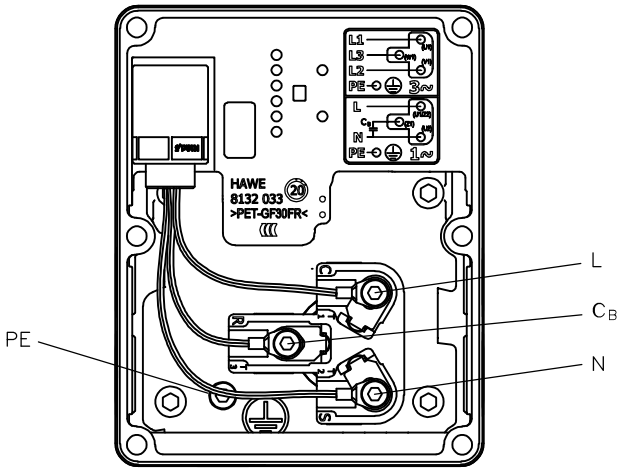
Connection for 3-phase motor




| | Y | Δ |
|---|---|---|
| L1 | U1 | U1/W2 |
| L2 | V1 | V1/U2 |
| L3 | W1 | W1/V2 |
| PE | ⏚ | ⏚ |

U2, V2, W2 connected at factory

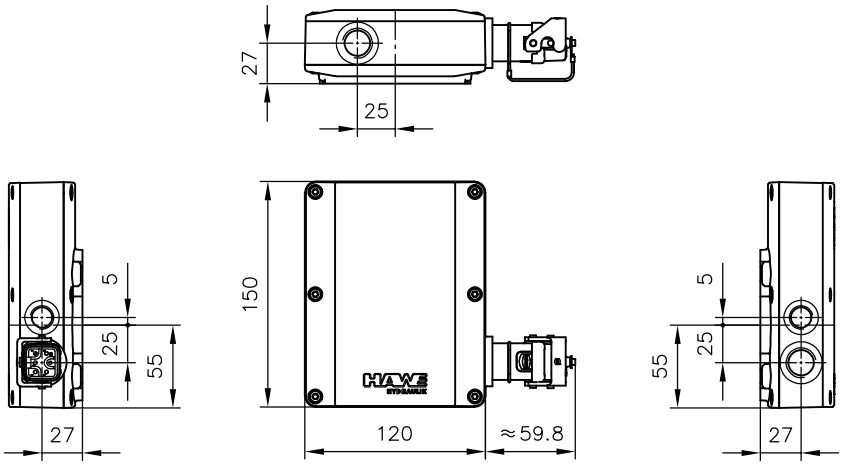
Connection for AC motor



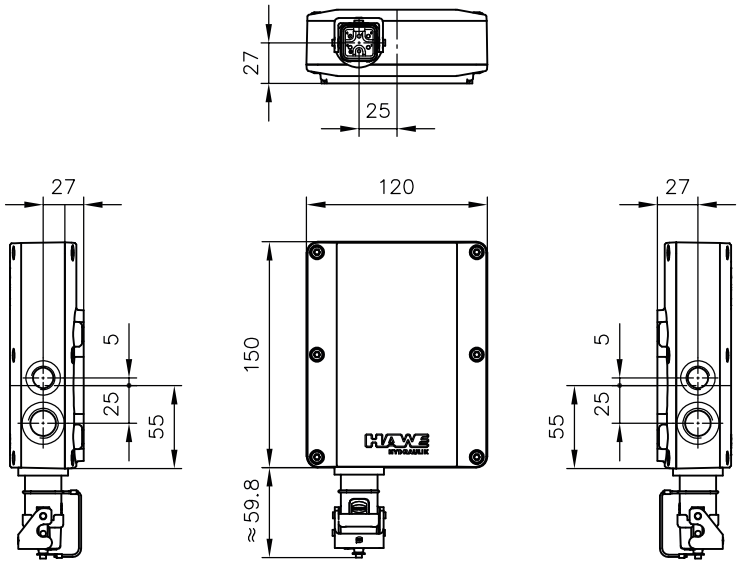

| | |
|---|---|
| L | U1/Z2 |
| N | U2 |
| $C_B$ | Z2 |
| PE | ⏚ |

## Connected via connectors

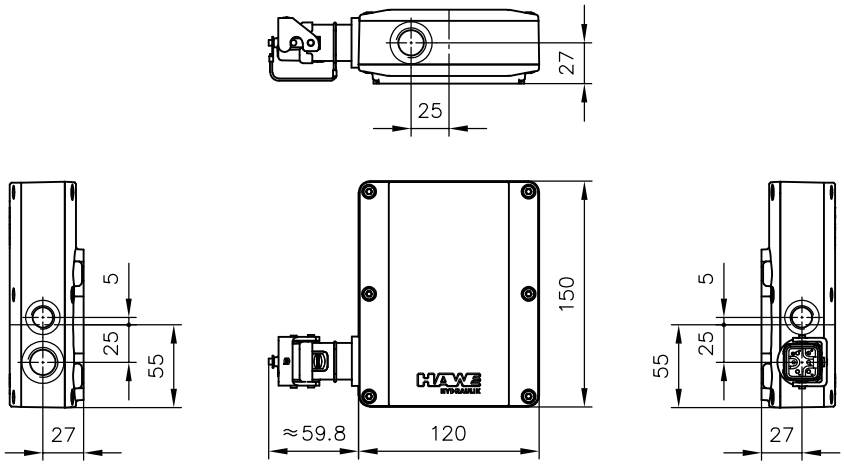
Coding **P1**



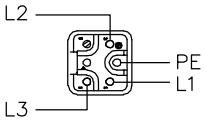
Coding **P2**



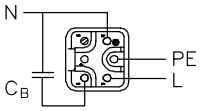

Coding **P3**




Connection for 3-phase motor




Connection for AC motor



# 5 Installation, operation and maintenance information

**DAMAGE**

**Reference to other document**

Assembly instructions for compact hydraulic power pack type INKA 1: B 8132-1

Available for this product: assembly instructions with notes on

- intended use,
- operating and maintenance,
- Assembly information

# 6 Other information

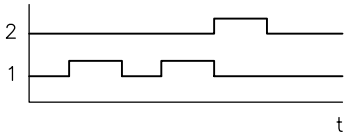
## 6.1 Planning information

**NOTE**

The procedure for the selection and design of compact hydraulic power packs with a valve attachment is described below. In order to find the ideal solution, several iterative steps generally have to be carried out.

### 6.1.1 Drawing up function diagram

The required or desired (hydraulically activated) functions form the basis for the function diagram.




### 6.1.2 Determining pressures and flow rates

1. Dimension and select actuators based on the reaction forces that occur
2. Calculate flow rates based on the desired velocity profiles

**DAMAGE**

**Observe the reset times of spring-loaded clamping cylinders when dimensioning pipelines or hose lines as well as the valves**

In the case of time-linked clamping devices, the release of spring-loaded clamping cylinders may have a greater influence over the time interval than clamping. The return stroke times are determined exclusively by the forces of the reset springs. They drive the cylinder pistons ahead, against the flow resistance from directional valves and pipelines.

3. Calculate necessary operating pressures
4. Determine maximum necessary pump delivery flow Q (lpm)
5. Determine system operating pressure $p_{max}$ (bar)

Q - flow rate

p - pressure

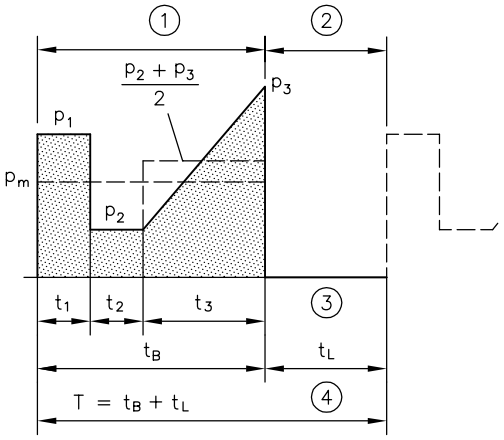
A - Area

v - Velocity

F - Force

$$Q\left(l/\min\right) = 0,06 \cdot A\left(mm^2\right) \cdot v\left(\frac{m}{s}\right)$$

$$p\left(bar\right) = \frac{10 \cdot F(N)}{A(mm^2)}$$




1 Load time
2 No-load time
3 No load
4 One working cycle

## 6.1.3 Creating a hydraulic circuit diagram

**Selection criteria**

- Single circuit system
- Accumulator charging mode
- Use of an accumulator for the short-term support of the pump delivery flow

## 6.1.4 Drawing up a time/load diagram on the basis of a function diagram

**Deriving the mode for the compact hydraulic power pack**

► Calculation of the relative duty cycle %ED
► S2 – short period operation
► S3 – Periodic intermittent operation

## 6.1.5 Selecting the compact hydraulic power pack

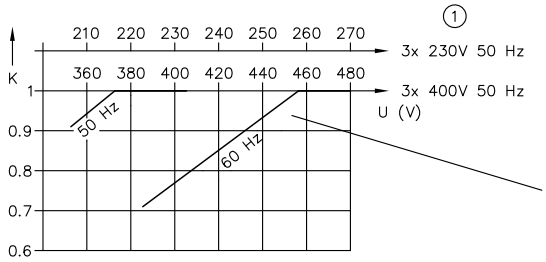
1. Select basic type based on power supply
   - Three-phase current
   - Alternating current
2. Select motor
   - Voltage tolerances: ± 10% (IEC 38), at 3x460/265 V 60 Hz ± 5%
   - It can be operated at undervoltage. Bear in mind that this will involve performance restrictions.

     $p_{max\ red} = p_{max} * k$

     $p_{max}$ (bar) – max. operating pressure in accordance with the selection tables

     $p_{max\ red}$ (bar) – reduced max. available operating pressure

     * k – correction factor from the diagram




*U supply voltage (V); K correction factor*

1 Motor design

**NOTE**
Pump delivery flow 1.2 x greater than with 50 Hz operation.

3. Select pump type (radial piston pump, gear pump)
4. Select the key figure for the pump delivery flow, taking into account the maximum permissible pressure.
5. Determine basic type based on motor size
6. Estimate noise level on the basis of parameters

## 6.1.6 Calculating the hydraulic work value

1. Calculate mean pressure
2. Calculate mean hydraulic work value (average pressure x output volume)
3. Calculate maximum hydraulic work value (max. operating pressure x output volume)

### Calculation

$p_m$ (bar) = calculated average pressure per cycle during the load time

$t_B = t_1 + t_2 + t_3 + \ldots$

$$p_m = \frac{1}{t_B}\left(p_1 \cdot t_1 + p_2 \cdot t_2 + \frac{p_2 + p_3}{2} \cdot t_3 + \ldots\right)$$

$p_m V_g$ = average hydraulic work value

$V_g$ = Geometric displacement volume

$pV_{g\,max}$ (bar $cm^3$) = $p_{max} * V_g$

## 6.1.7 Determining the steady-state temperature

**NOTE**
Observe the maximum permissible temperature of the hydraulic fluid of 80 °C!
Further restrictions regarding other hydraulic fluids see Chapter 3.3, "Hydraulic data"

### Calculation

$\vartheta_{Oil\ B} = \Delta\vartheta_B + \vartheta_U$

| | |
|---|---|
| $\vartheta_{Oil\ B}$ (°C) | Steady-state temperature of the hydraulic fluid |
| $\Delta\vartheta_B$ (K) | Steady-state temperature (estimation from the characteristic lines to determine the excess temperature) |
| $\vartheta_U$ (K) | Ambient temperature at the place of installation |

For an approximate check of the steady-state temperature of the hydraulic fluid, the two most important data are generally sufficient:

- average hydraulic work of the pump ($p_m V_g$) and
- relative load duration per working cycle (% duty cycle).

Other influencing factors are

- Pressure run during the load phase (average pressure)
- Time share of the no-load phase
- Additional throttle losses over and above normal flow resistances (approx. 30%) from valves and lines are only to be taken into account if they take effect over a longer share of time within a working cycle (load phase). For instance, this includes work against the pressure-limiting valve (loss = 100%)

see also Chapter 3.5, "Characteristic lines"

$$\text{Relative duty cycle } \%ED = \frac{t_B}{t_B + t_L} \cdot 100$$

| | |
|---|---|
| $t_B$ | Load time |
| $t_L$ | No-load time |

**DAMAGE**
Lower steady-state temperatures are possible with a fan (coding F) and/or larger tank.

## 6.1.8 Determining the maximum current consumption

**Determine current consumption from the electrical data**
► see Chapter 3.6, "Electrical data"

**Set motor protection circuit**
► Set motor protection circuit to 0.85 to 0.9 times the motor current ($I_M$) see operating instructions B 8132-1

## 6.1.9 Selecting the operating capacitor

**DAMAGE**

- An operating capacitor is required in order to operate an AC motor.
- The operating capacitor is not included in the scope of delivery.

► The values listed in the table (see Chapter 3.6.1, "Motor data") ensure that the specified pressures are achieved.
► Where the utilisation is < 75% of the maximum possible hydraulic work value ($pV_g$): use an approx. 30% smaller capacitor to reduce the power losses.
► Select capacitor according to motor voltage:

| Motor voltage | Rated voltage |
|---|---|
| 1x230 V 50 Hz | 400 V DB |

## 6.1.10 Setting the pump after-run

If the compact hydraulic power pack is wired directly to the hydraulic cylinder, e.g. in the circuit for clamping devices (B-type connection blocks), and if a pressure switch causes it to cut out once the set pressure has been reached, a certain increase in pressure still takes place as a result of the after-run action of the pump motor.

The level of this additional rise in pressure is dependent on the pressure setting, on the consumer volume and on the pump delivery flow.

If you wish to prevent these pressure rises, the setting for the pressure-limiting valve has to be adjusted in line with the switch-off point on the pressure switch. As a result, the subsequent delivery from the pump is discharged via the pressure-limiting valve.

**The adjustment of the after-run should be carried out as follows:**

1. Open the pressure-limiting valve fully.
2. Set the pressure switch to the highest value (by turning the adjusting screw clockwise as far as it will go).
3. Switch on the pump (with a consumer and pressure gauge connected) and turn up the pressure-limiting valve until the pressure gauge shows the required end operating pressure.
4. Turn the pressure switch in the opposite direction until the pump is switched off at the pressure value set.
   see Chapter 3, "Parameters"
5. Lock the pressure-limiting valve and the pressure switches.

The rise in pressure due to the after-run can also be avoided by using an accumulator or additional volume in the load line.

If the hydraulic power pack is used to full capacity, i.e. the pressure setting is close to the maximum permissible pressure, then practically no after-run occurs because the pump comes to a standstill almost immediately after being switched off.
see Chapter 2, "Available versions"

## 6.1.11 Connection blocks and valves

A connection block is necessary to make a compact hydraulic power pack ready for a hydraulic connection.

**NOTE**
When selecting one, take note of the specifications of the mounted directional valves.

**NOTE**
When setting the pressure-limiting valve on the connection block, take note of the pump's and valve mounting's maximum permitted pressure.

| Type | Description | Publication |
|---|---|---|
| **AB, AL** | For single-circuit pumps<br>with a pressure-limiting valve and the possibility of direct mounting of directional valve banks<br>**Optional:**<br>▪ Pressure filter or return line filter<br>▪ Idle circulation valve<br>▪ Accumulator charging valve<br>▪ Proportional pressure-limiting valve | D 6905 AB |
| **AB ... X** | For single-circuit pumps<br>with a component-approved pressure-limiting valve and the possibility of direct mounting of directional valve banks (for use in accumulator systems)<br>**Optional:**<br>▪ Pressure filter or return line filter<br>▪ Idle circulation valve | D 6905 AB |
| **B** | For single-circuit pumps<br>for the activation of single-acting cylinders with a pressure-limiting valve and drain valve<br>**Optional:**<br>▪ Throttle valve | D 6905 B |
| **C** | For single-circuit pumps<br>with connections P and R for direct piping | D 6905 C |

**NOTE**
The direct mounting of valve banks with directional valves on **AB**-type connection blocks enables a compact hydraulic unit to be assembled without the need for additional piping.

| Type | Description | $p_{max}$ (bar) | Publication |
|---|---|---|---|
| **VB** | Valve bank (directional seated valve) | 700 | D 7302 |
| **BWN, BWH** | Valve bank (directional seated valve) | 450 | D 7470 B/1 |
| **SWR, SWS** | Valve bank (directional spool valve) | 315 | D 7951 |
| **BA** | Valve bank for the combination of different directional valves with connection pattern NG 6 in accordance with DIN 24 340-A6 | 400 | D 7788 |
| **BVH** | Valve bank (directional seated valve) | 400 | D 7788 BV |
| **NBVP** | Directional seated valve | 400 | D 7765 N |
| **NSWP** | Directional spool valve | 315 | D 7451 N |
| **NSMD** | Clamping module<br>(Directional spool valve with a pressure reducing valve and acknowledge function) | 120 | D 7787 |
| **NZP** | Intermediate plates<br>with connection pattern NG 6 in accordance with DIN 24 340-A6 | 400 | D 7788 Z |

## References

### Compact hydraulic power packs

- Compact hydraulic power pack type KA and KAW size 2: D 8010
- Compact hydraulic power packs type KA and KAW size 4: D 8010-4
- Compact hydraulic power pack type MPN and MPNW: D 7207
- Compact hydraulic power pack type HK 2: D 7600-2
- Compact hydraulic power pack type HK 3: D 7600-3
- Compact hydraulic power pack type HKL and HKLW: D 7600-3L
- Compact hydraulic power pack type HK 4: D 7600-4
- Compact hydraulic power pack type NPC: D 7940
- Mini hydraulic power pack type H 300, 350: D 6344
- Mini hydraulic power pack type H 400, 410, 440: D 6345
- Mini hydraulic power pack type HR 050: D 6014
- Micro hydraulic power pack type HR 080: D 6342
- Mini hydraulic power pack type HR 120: D 6343
- Compact hydraulic power pack type HS: D 6347
- Mini hydraulic power pack type A: D 6025

### Connection blocks

- Connection blocks for single-circuit pump types AB, AL: D 6905 AB
- Connection blocks type B for hydraulic power packs: D 6905 B
- Connection block type C 5 and C 6: D 6905 C
- Connection blocks for dual-circuit pump types AN, AL, NA: D 6905 A/2

### Valves and valve banks

- Valve bank (directional seated valve) type VB: D 7302
- Valve bank (directional seated valve) type BWN and BWH: D 7470 B/1
- Directional spool valve type SWPN: D 7451 AT
- Directional spool valve bank type SWS: D 7951
- Valve bank (nominal size 6) type BA: D 7788
- Valve bank (directional seated valve) type BVH: D 7788 BV
- Directional seated valve type NBVP 16: D 7765 N
- Directional seated valve type ROLV: D 8144
- Directional spool valve type NSWP 2: D 7451 N
- Clamping module type NSMD: D 7787
- Intermediate plate type NZP: D 7788 Z

### Attached components

- Fitting type X 84: D 7077
- Diaphragm accumulator type AC: D 7969
- Miniature accumulator type AC: D 7571

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