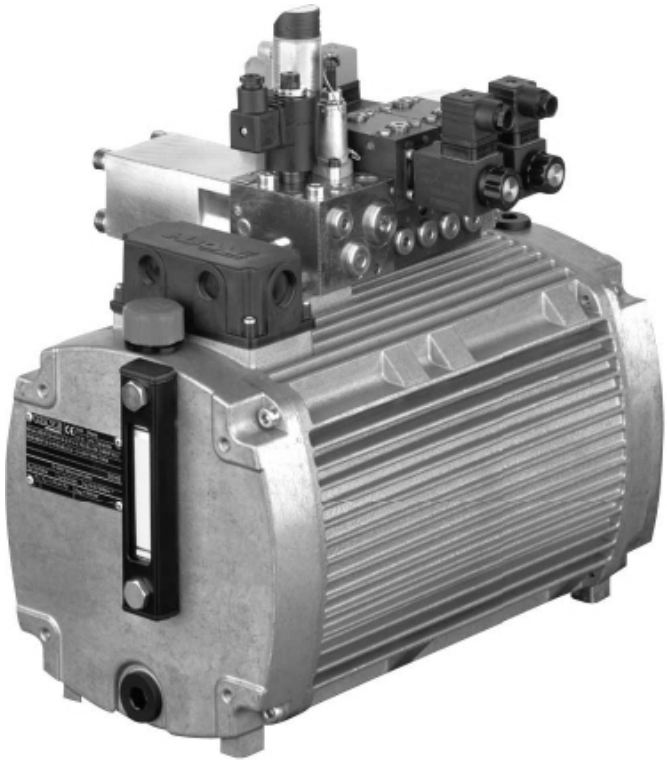
Type KA2 and KAW2 compact hydraulic power pack

Assembly instructions
with operating and maintenance information

Hydraulic power pack with radial piston or gear pump and integrated electric drive



B 8010
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HAWE HYDRAULIK

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Table of Contents

1 About these instructions

This manual is part of the product and describes the safe and proper use in all operating phases.

All photos and drawings in this manual show an available product variant. For precise details concerning the variant you have purchased, please refer to the type plate attached to the product.

- ► Read instructions before use.
- ► Make the manual accessible to operating and maintenance personnel at all times.
- ► Keep this manual for the lifetime of the product.
- ► Only pass on the product to third parties together with this manual.

1.1 Target audience

The target audience of this manual is trained and qualified personnel who are familiar with the installation, operation and maintenance of machines.

The manual provides relevant information for the machine manufacturer and machine operator as well as for training courses.

1.2 Applicable documents

Title/purpose	Document
Machine manufacturer's hydraulic and electrical connection schematic Document required to install hydraulic power pack correctly in entire machine	Manufacturer's operating instructions
Data sheet Characteristics and application ranges for this product	D 8010
Oil recommendations	D 5488/1
Optional add-ons to hydraulic power pack from other manufacturers e.g. hydraulic accumulator, filter etc.	Manufacturer's operating instructions
Explanations	"Declaration of incorporation acc. to Machinery Directive", page 58 "CE declaration acc. to Low Voltage Directive", page 59

1.3 Safety instructions and symbols

Safety indication

In these instructions, the following warning and safety notes are used:

Symbol	Meaning
DANGER	Draws your attention to a **hazardous** situation that can lead directly to **serious injury** or **death** if not avoided.
ATTENTION	Draws your attention to a **hazardous** situation that can indirectly lead to **serious injury** or **death** if not avoided.
CAUTION	Draws your attention to a hazardous situation that can indirectly lead to **light** to **moderate** injury if not avoided.
	**Notice** to prevent environmental and material damage.
	**Information** to ensure the correct use of the product.

Safety symbols

	**General safety symbol** Draws your attention to additional safety information.		
	Slipping hazard		Dragging hazard from moving parts
	Harmful substances		Tripping and falling hazard
	Fire accelerants		Falling loads
	Burn hazard		Crushing hazard
	Electrical voltage		Suspended loads
	No access to persons with pacemakers and defibrillators		

Mandatory signs

	Protective equipment
	**Safety boots** Wear appropriate safety boots to protect your feet against mechanical hazards
	**Work gloves** Wear suitable work gloves to protect your hands against chemical and mechanical hazards.
	**Safety goggles** Wear safety goggles to protect your eyes against chemical and mechanical hazards.

	Protective equipment
	**Protective clothing** ► Wear fitted clothing without protruding parts. ► Follow the safety data sheet of the hydraulic fluid.

2 For your safety

The product is built according to the state of the art and recognized safety regulations.

Nevertheless, there is a risk of personal injury and damage to property if this chapter and the safety instructions in this manual are not observed.

2.1 Intended use

The compact hydraulic power pack is designed as a hydraulic fluid supply in hydraulic systems.

The compact hydraulic power pack is designed for the following operating modes

- S2: Short period operation
- S3: Periodic intermittent operation

- The product is a technical work tool and intended for commercial and industrial use only.
- The product may only be operated in accordance with the technical data, operating conditions and performance limits specified in this manual.
- Only use original accessories and original spare parts approved by the manufacturer.

Partly completed machinery

The product is a partly completed machine according to the EC Machinery Directive 2006/42/EC and is intended exclusively for installation in a machine or system. The product is controlled via the manufacturer's machine / plant control.

► Follow the manufacturer's operating instructions.

2.2 Misuse

- use in other operating modes than specified in the intended use
- Using the product beyond the specified performance limits

- Use of hydraulic fluids other than those specified in these instructions
- Connecting consumers other than those specified
- Improperly installed, outdated, non-secured or damaged pipes and hose lines
- Use in atmospheres at risk of explosion
- Structural changes, especially if function and safety are compromised

2.3 Residual risks

⚠ DANGER

Danger from hydraulically operated parts when installing the compact hydraulic power pack in a complete system

Risk of serious or fatal injury

The compact hydraulic power pack produces, directs or regulates flow rates. These flows usually power hydraulic consumers in machines or systems.

- Observe the compact hydraulic power pack's project documentation when incorporating it into a machine or system.
- Note that new potential dangers may arise when the compact hydraulic power pack is incorporated into a complete system.
- Assess and document the new dangers in the complete system's manual.

⚠ WARNING

Fire hazard due to flammable and oxidising hydraulic fluid.

Risk of serious injury or death.

- Avoid fire and open light and do not smoke anywhere near the hydraulic power pack.
- Ensure that no hydraulic fluid can escape.
- Do not use any flammable or corrosive cleaning agents.
- Observe the safety data sheet from the hydraulic fluid manufacturer.
- Shield ignition sources with a surface temperature of > 200°C.

⚠ CAUTION

Danger of burning due to hot metal surfaces on the hydraulic power pack, particularly on the tank, motor, valve blocks and valves.

Risk of minor burns

- Do not touch the hydraulic power pack or directional valve solenoids during operation.
- Allow the hydraulic power pack and directional valve solenoids to cool down before any work.
- Wear protective gloves.
- If surface temperatures >60°C occur during operation, set up safety barriers.
- Ensure that fresh air can be drawn in and that warm air can escape.
- No changes of any kind (mechanical, welding or soldering work) may be made.

⚠ CAUTION

Exposure to hydraulic fluid.

Health risk.

- Wear protective gloves and goggles.
- Avoid prolonged skin contact with hydraulic fluids.
- Thoroughly wash any body parts exposed to hydraulic fluid.
- Observe safety instructions on the safety data sheet of the hydraulic fluid manufacturer.

⚠ CAUTION

Risk of falling from leaking hydraulic fluid

Spilled or leaked hydraulic fluid can form a slippery film on the floor.

- Use suitable aids when filling or bleeding.
- Check all connecting elements that convey oil for leaks before switching on the motor in the parent system.
- Wipe up leaked hydraulic fluid with suitable aids.

2.4 Duties of the operator

Observe and comply with regulations:

- Do not put the product into operation until the complete machine or system complies with the country-specific regulations, safety regulations and standards of the application.
- Observe and apply regulations for accident prevention and environmental protection.

Operate product safely:

- Despite safety devices, the product still poses residual risks. Observe the safety instructions in this manual to reduce health hazards and avoid dangerous situations.
- The operator must ensure that the operating conditions (see general, hydraulic and electrical data) are within the operating limits of the product.
- Keep all instructions / signs on the product in legible condition and observe them.

Instruct personnel:

- Regularly train the personnel in all points of these instructions and ensure that they are observed.
- Ensure the terms of the industrial safety and operating instructions are observed.
- Only use qualified personnel. Due to their training and experience, the qualified personnel must be able to recognize risks and avoid possible hazards.

2.5 Qualification of the personnel

The activities described in these instructions require basic knowledge of mechanics, hydraulics and electrics.

For the transport and handling of heavy loads, additional knowledge in handling hoists and slings is required.

- The activities may only be carried out by an appropriate specialist or an instructed person under the supervision of a specialist.
- Activities other than those described in these instructions may only be performed by HAWE or authorized specialist companies.
- The personnel must have read and understood these instructions.

Trained personnel

Personnel instructed comprehensively, by skilled staff on behalf of the owner, in how to perform its appointed tasks and in how to use the product safely.

Specialist personnel

Due to their technical training, knowledge and experience, specialists are able to assess and carry out the assigned work and can independently recognize possible dangers.

Qualified electrician

A person with appropriate professional training, knowledge and experience, so that he/she can recognize and avoid dangers that can be caused by electricity.

Auditor

Persons of a technical inspection body who are authorized to perform testing and monitoring tasks for pressure equipment and electrical systems.

2.6 Personal protective equipment

Personal protective equipment is designed to prevent and reduce hazards.

In the instructions, safety instructions with mandatory symbols indicate the wearing of special protective equipment for special activities.

Instruction and supply is carried out by the operator.

3 About this product

3.1 Identification

Order coding and type plate shown are only an example.

KA 24 KA 28	1 22	S L1	KS KTF	E/ P/	H 1.81 HZ 0.59/8.8	- A1/280 - ...	- FSR-24V	- 3x400 V 50 Hz - 3x400 V 50 Hz	/24 V DC	- G 1/2 x 300

- Oil drain hose
- Motor voltage
Fan
- Motor voltage
- Fan (on side)
- Valve combination acc. to commission number
- Pump version
- Electrical connection
- Additional options
- Mounting position
- Tank size
- Basic type and motor power

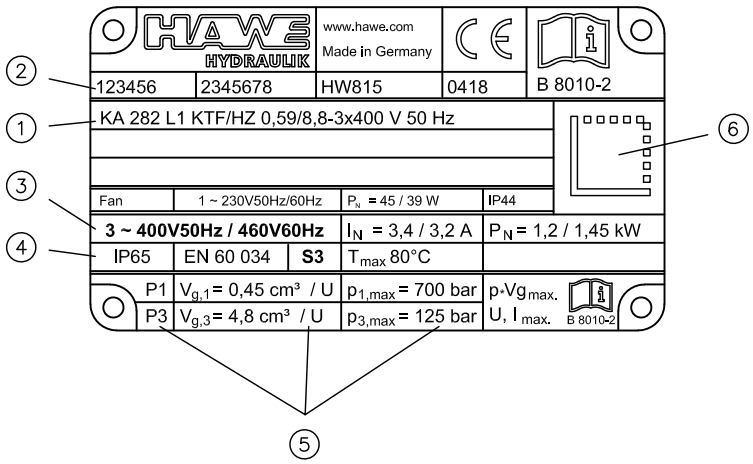
Motor type code

- Coding **KA** = 3-phase motor
- Coding **KAW** = AC motor

Type plate

The commission number on the type plate identifies the product uniquely and completely, including all fitted components.

The data are stored with the manufacturer and encoded in the DataMatrix on the type plate.



1 Order coding, type coding

2
- Customer order, commission number
- Production order
- Customer material number
- Date of manufacture (week XX in Year XX)

3
- Motor voltage/power frequency
- Nominal current I_N (50 Hz/60 Hz)
- Nominal power P_N (50 Hz/60 Hz)

The actual power consumption depends on the load and can be up to 1.8 x nominal power.

4
- Protection class
- EN standard
- Operating mode
- max. temperature
- Operating capacitor only with AC motor (not included)

5
- Pump port (P1 = single circuit, P3 = dual circuit)
- Geometric output volume V_G (cm^3/rev)
- Pump's max. permissible operating pressure

6 DataMatrix code

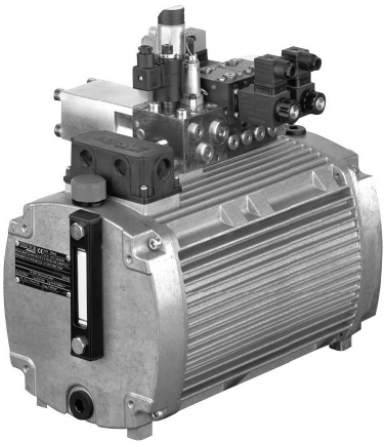
3.2 Product description

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 KA consists of the tank, the integrated motor and the radial piston or gear pump directly attached to the motor shaft. The compact design that this achieves is a crucial advantage compared to conventional hydraulic power packs.

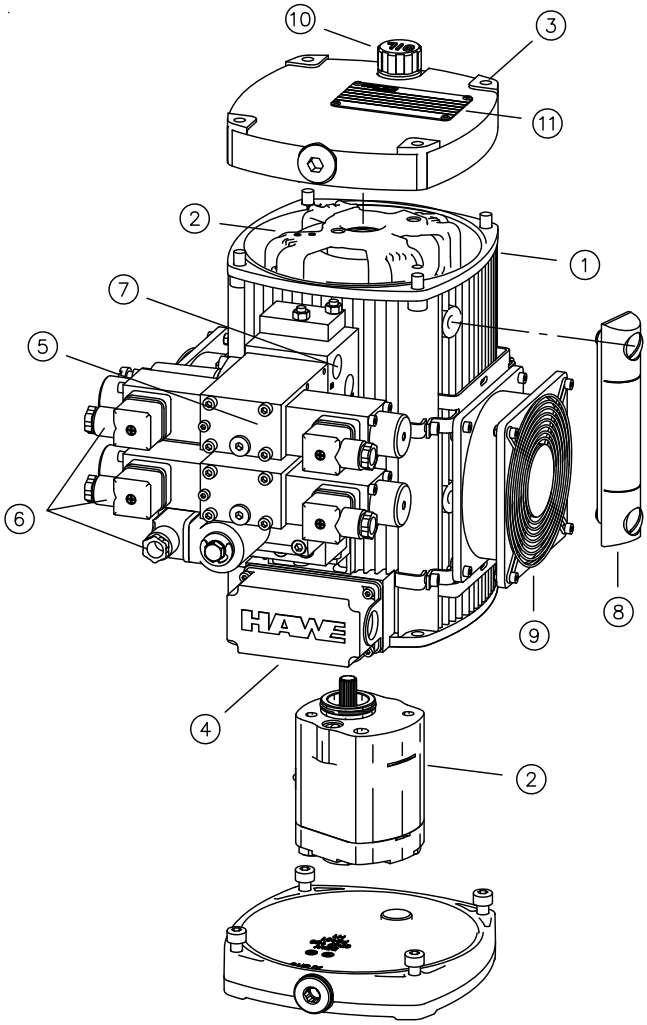
The compact hydraulic power pack's uncompromisingly module design will enable you to quickly and easily set up a variety of usage volumes and sizes. Compatible, ready-for-connection, complete solutions can be assembled easily using a wide range of connection blocks and the valve banks that can be combined with them.

For systems with high loads, a fan that enables additional heat dissipation can be optionally mounted on the housing. The fan is powered by a separate motor independently of the pump motor.



KA2 and KAW2-type compact hydraulic power pack

3.3 Assembly



1 Hydraulic fluid tank with motor
2 Pump
3 Fastening, e.g. for transport eyelets
Here: 2 x eye-bolts
4 Terminal box for electrically connecting motor and monitoring components, e.g. temperature and level switches
5 Connection block and valve bank
6 Electrical connection of valves and monitoring components, e.g. pressure switches
7 Hydraulic connection to consumers
8 Level gauge
9 External fan (optional)
10 Hydraulic fluid filler neck and breather filter
11 Type plate

4 Transport and storage

4.1 Safety instructions

⚠ WARNING

Falling, tipping and toppling heavy loads
Risk of serious injury

- Make sure that the danger zone, the area beneath suspended loads and the transport path is clear of people.
- Wear safety shoes and protective gloves.

DAMAGE

Risk of damage from improper transport

- Only use the intended eyelets for transport.
- Make sure that belts or chains do not tear or knock components off the hydraulic power pack during transport.

DAMAGE

Damage to the silica gel filter

- The tapped journal of the silica gel filter can shear off due to lateral forces. For transport and assembly the silica gel filter is therefore replaced by a tapped plug in the opening.
- Transport and assemble the hydraulic power pack only with the tapped plug screwed in.

DAMAGE

Pollution from transport while filled with hydraulic fluid
Hydraulic fluid must be prevented from escaping into the environment.

- When transporting after prior use, drain the hydraulic fluid from the tank.
- Collect cleaning, operating and lubrication fluids and consumable materials in suitable containers and dispose of them according to local regulations.

4.2 Transport

Transporting the product

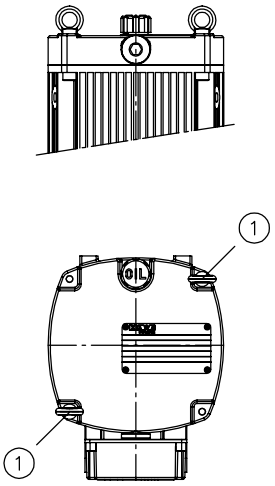
☑ Make sure that the eye-bolts are firmly attached, that there are enough of them and that they are in the correct positions on the hydraulic power pack.

- Use the specified eye-bolts when moving the unit using belts, chains or carry handles.
- Transport methods depend on the hydraulic power pack's weight, see "Technical data", page 56.
- Use suitable lifting gear and industrial trucks or have two people lift and carry the unit by its carry handles.

Attachment points for transport eye-bolts

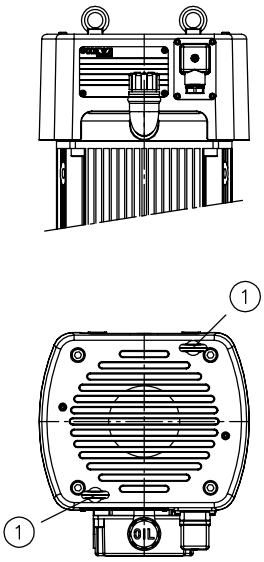
The eye-bolts are included with the product.

Vertical version



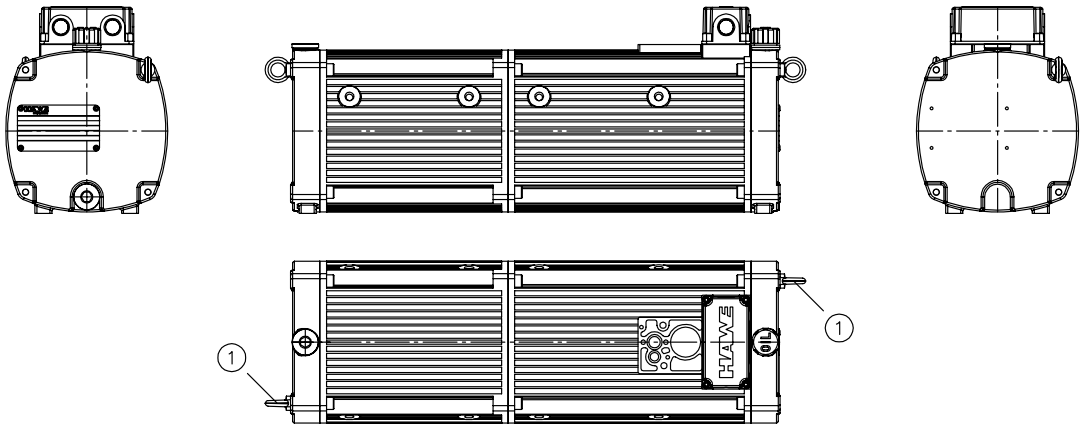
1 Eye-bolt screw-in points

Pump with fan



1 Eye-bolt screw-in points

Horizontal version



1 Eye-bolt screw-in points

4.3 Scope of delivery

Included in scope of delivery

- Hydraulic power pack (motor and pump in tank) with power connection (terminal box or Harting plug) and, if applicable, suppressor
- 2 transport eye-bolts on container
- Temperature switch coding **T** on type KAW (hydraulic power pack with alternating current)
- Breather filter, with oil dipstick on some versions
- Oil drain screw or oil drain hose
- Cap for oil filler or filler reduction with screen

Additional accessories

depending on the variant chosen.

Type-specific parameters are listed on the product's type plate, e.g.: Data on motor and pump power.

For further technical data, refer to HAWE publication **D 8010**.

"Applicable documents", page 5

Not included in scope of delivery

Electrical connection

- Line connector M12x1, 4-pin for option **PM**.
- Line connector M12x1, 5-pin for option **KD, KS** (vertical version):
  (Coding **KD, KS** is level gauge with N/C or N/O contact switch)

Motor

- Operating capacitor for AC variant type KAW
- Motor protection circuit

Accessories for commissioning

- Damping elements for fastening
- Hydraulic fluid
- Electronic controller elements for the hydraulic system

4.4 Checking the delivery

Unpacking and inspecting

1. Take out the product. Use the eye-bolts to help when doing so.
2. Check that the product is complete and check for transport damage.
   - If there is any damage, refuse shipment or sign for damage when accepting it.
   - Note all transport damage on the transport documents or the carrier's delivery note.
   - Take photos of any product damage and submit a claim to the manufacturer immediately.
3. Dispose of the packaging in accordance with local regulations.

Submit claims to:

HAWE Hydraulik SE
Einsteinring 17
85605 Aschheim
Germany

Email: info@hawe.de
www.hawe.com

Phone: +49 (0) 89 / 37 91 00 - 1000

Claims for damage can only be accepted if submitted within the applicable claim periods. HAWE cannot accept liability for later claims.

4.5 Storage

DAMAGE

Damage from incorrect storage

Protect the product from soiling and damage.

- Keep the product wrapped in a plastic bag when storing it to protect it from dust and constant air circulation.
- Seal all hydraulic fluid ports with caps or dummy plugs.
- Store the product in a position matching its intended mounting position, with the hydraulic fluid filler port at the top and the fluid drain at the bottom.

Storage conditions

Storage space	▪ dark ▪ keep away from direct sunlight and other light sources with heavy UV share ▪ constant temperature and humidity ▪ do not store close to facilities that product ozone (electric drives, high-voltage equipment or similar)
Storage temperature	+15°C to +20°C
Relative humidity	65% +/- 10%

5 Assembly and installation

5.1 Mechanical connection

Assembly

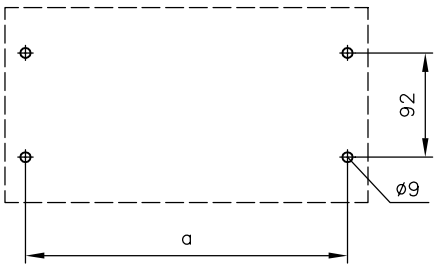
Setting up and attaching

1. Check the order coding to identify the intended mounting position.
   - Vertical (type: **KA...S...**) or
   - Horizontal (type: **KA...L...)**
2. Check that the support/frame possesses sufficient load capacity. This depends on the hydraulic power pack's weight.
3. Drill fastening holes as instructed by the mounting hole pattern.
4. Bolt into the M8 threaded holes using the recommended damping elements.

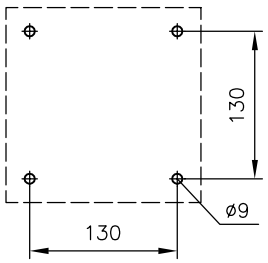
- The horizontal version can also be incorporated vertically.
- If you are installing a horizontal version vertically:
  - Position with bleeder at top.
  - Position the integrated pump at the bottom.
  - Turn only the top housing covers, keep the extensions in their original positions.

Mounting hole pattern

Horizontal version coding **L**

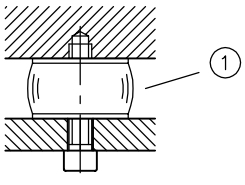


Vertical version coding **S**



Coding tank size	a
--	284
01, 1	336
02, 2	484
22, 3	684

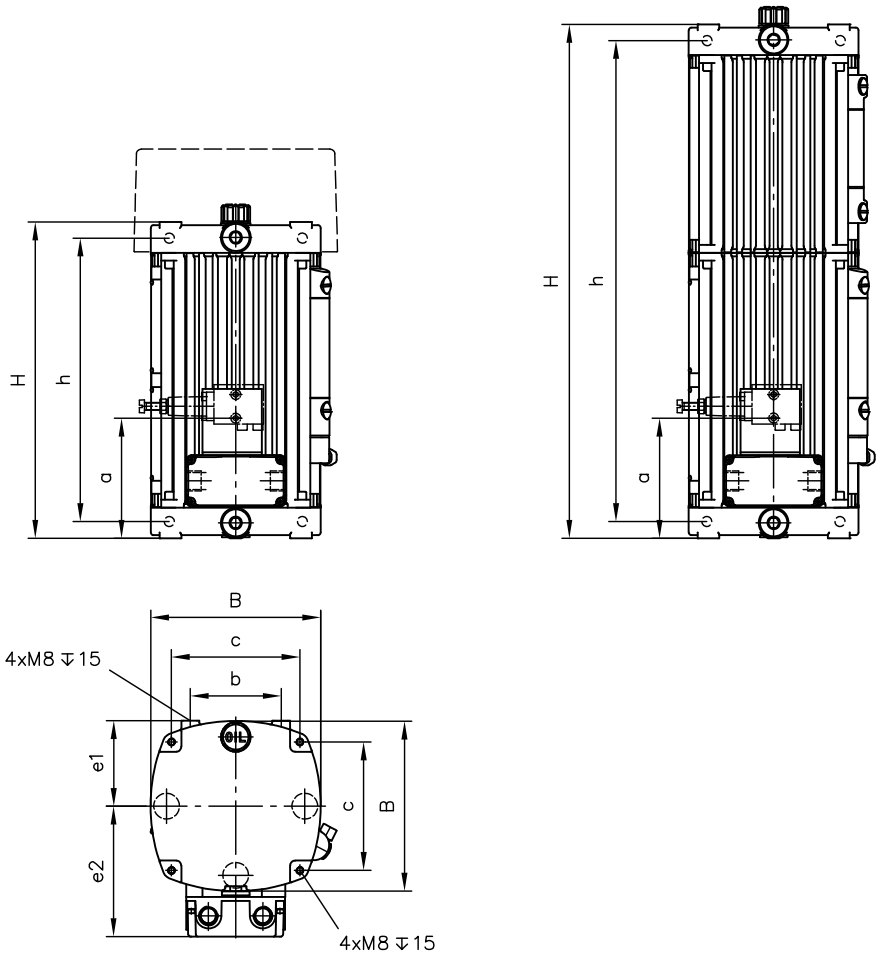
Recommended fastening with damping element



1 Damping element ∅40x30/M8 (65 Shore)

5.1.1 Pump dimensions

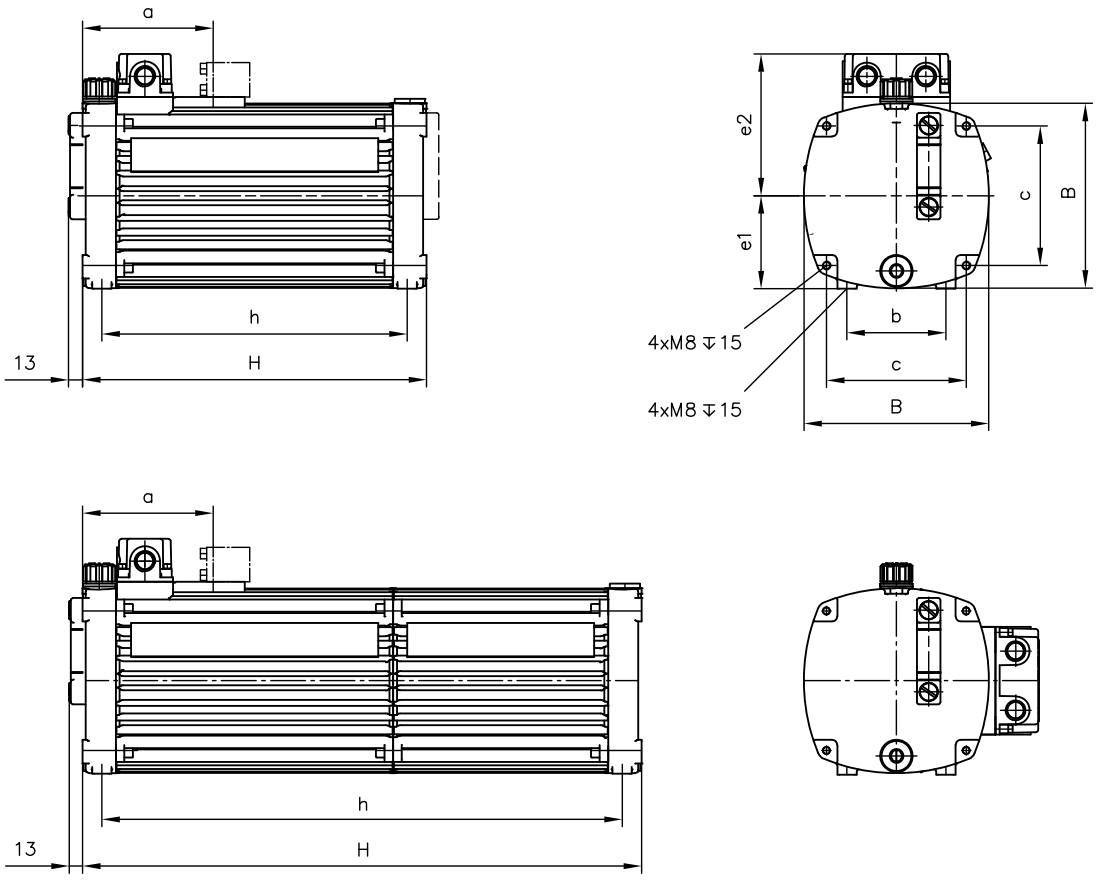
Vertical version



Basic type	B	e1	e2	c	b	a
KA2/KAW2	172	87.5	132	130	92	121.5

Coding tank size	H	h
No designation	320	284
1, 01	372	336
11	424	388
2, 02	520	484
21	572	536
22	778	742
3	720	684

Horizontal version



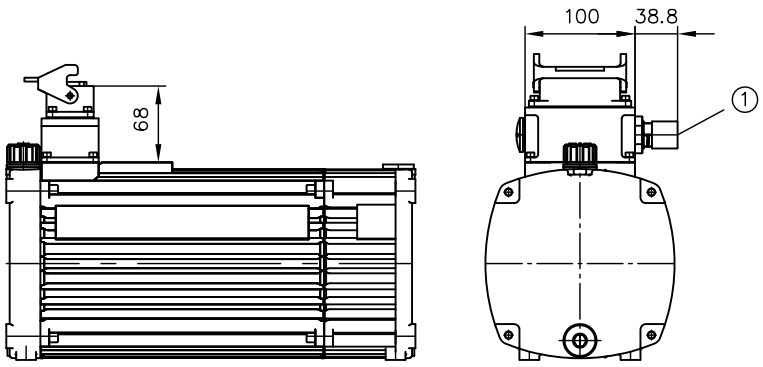
Basic type	B	e1	e2	c	b	a
KA2/KAW2	172	87.5	132	130	92	121.5

Coding tank size	H	h
No designation	320	284
1, 01	372	336
11	424	388
2, 02	520	484
21	572	536
22	778	742
3	720	684

5.1.2 Additional components' dimensions

Terminal box

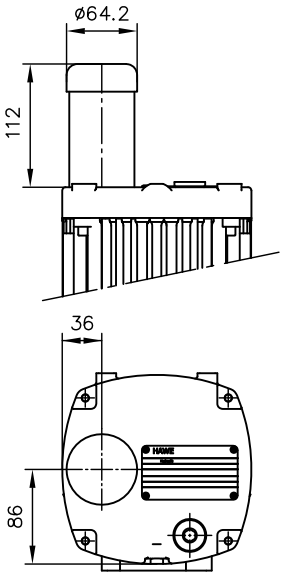
Coding **P**



1 Suppressor coding **PE**

Silica gel filter

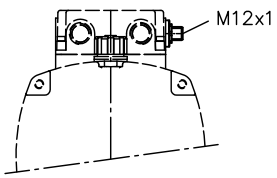
Coding **G**



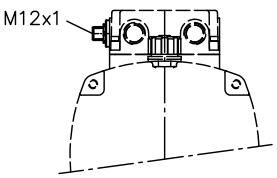
Temperature and/or level switch

Terminal box: M12 connections for temperature and/or level switch

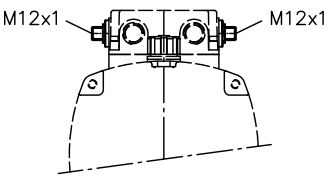
Coding **M, P**



Coding **M1 and PM1**



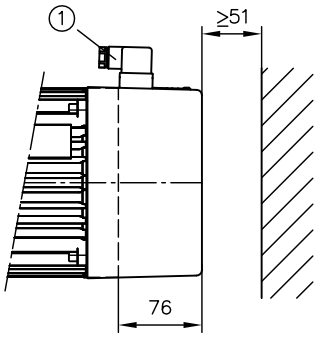
Coding **M2 and PM2**



Fan

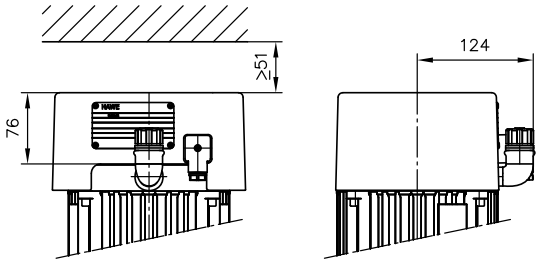
Minimum gap see drawing.

Horizontal version
Coding **F**



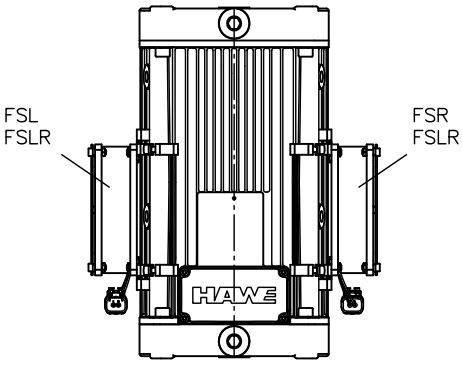
1 Electrical connection to fan

Vertical version
Coding **F, F1**

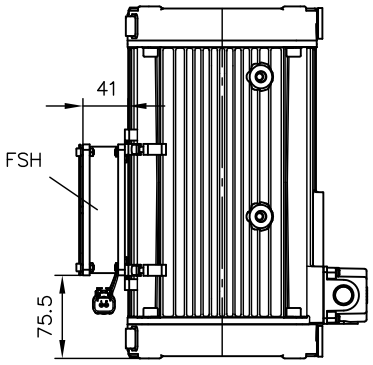


Fan (on side)

Coding **FSL, FSR, FSLR, FSH**

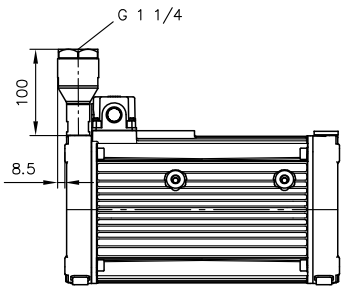


*Coding **FSL, FSR, FSLR, FSH***

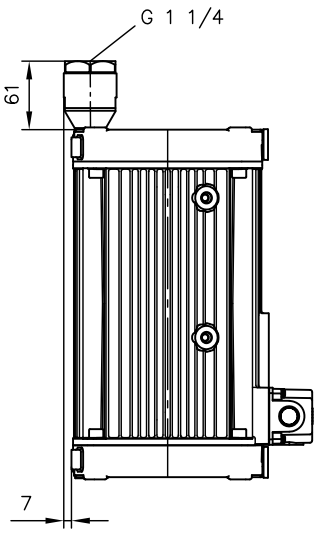


Filler reduction

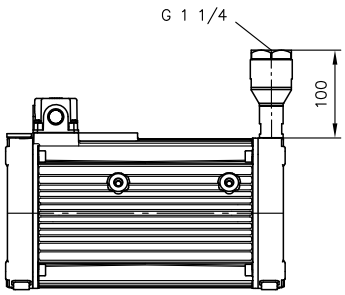
Coding **B**
Horizontal version



Coding **B**
Vertical version



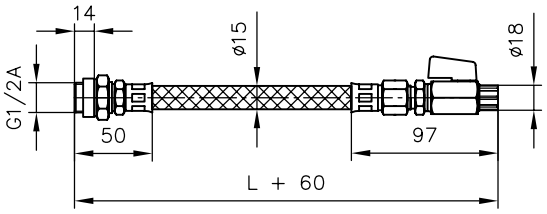
Coding **B1**
Horizontal version



Oil drain hose

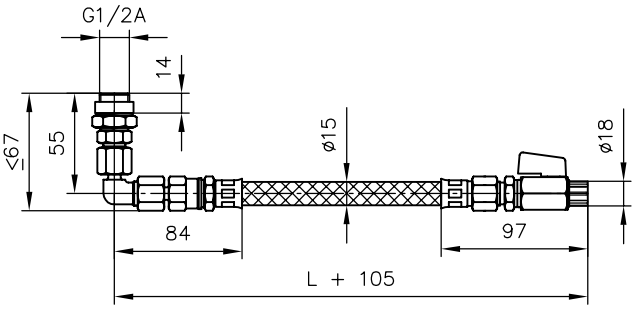
Coding **G 1/2 x L**

L = 300 mm/500 mm
with ball valve



Coding **G 1/2 W x L**

L = 300 mm/500 mm
with ball valve and elbow



5.2 Hydraulic connection

DAMAGE

Prerequisites for assembling hydraulic connections

- The dimensions of all access and connecting lines must correspond to the specifications of the system. Pipes, hose lines, fittings and connectors must be designed for the maximum pressure of the system.
- Pipes, hose lines, fittings and connectors that have an insufficient inner diameter or that are too long will lead to pressure losses. This impairs the performance of the hydraulic system.
- Keep lines as short as possible and avoid kinks. Do not go below the smallest bend radius specified by the manufacturer.
- Keep the number of employed fittings to a minimum to avoid potential leakage spots.
- All hydraulic lines are to be mounted tension-free to prevent noise generation and damage due to resonances.
- No contamination from the cylinders, screw fittings, connectors and hose lines may enter the hydraulic system. Flush before use.

For detailed hydraulic data, see the type plate.

Hydraulic data

Pressure	Pressure side (port P): depends on version and delivery flow. Suction side (vessel interior): ambient air pressure. Not suitable for charging. p_{min} = 30 bar (due to dynamic pressure)
Start against pressure	The version with 3-phase motor can start against the pressure p_{Max}. The AC motor version can only act counter to a minor pressure.
Hydraulic fluid	Hydraulic fluid: according to DIN 51 524 Part 1 to 3; ISO VG 10 to 68 according to DIN ISO 3448 Viscosity range: min. approx. 4; max. approx. 800 mm^2/s Optimal operating range: approx. 10 to 500 mm^2/s Also suitable for biologically degradable hydraulic fluids type HEPG (polyalkylene glycol) and HEES (synthetic ester) at operating temperatures up to approx. 70°C.
Cleanliness class	**ISO 4406** 21/18/15...19/17/13
Temperature	Environment: approx. -40 to +80°C, oil: -25 to +80°C, pay attention to the viscosity range. Start temperature: down to -40°C is permissible (observe start viscosities!), as long as the steady-state temperature is at least 20K higher during subsequent operation. Biologically degradable hydraulic fluids: note manufacturer specifications. With consideration for the seal compatibility, not above +70°C.

Hydraulic assembly

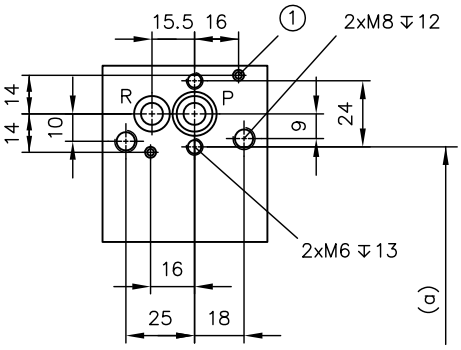
Fastening hydraulic ports

☑ Note the prerequisites for assembling hydraulic connections

1. **Port P:** Connect the hydraulic hoses properly.
2. **Hydraulic fluid drain:** Screw in the drain screw.
3. **Directional valves:** Connect any solenoid valves to the controller in accordance with the hydraulic schematic and function diagram.

Dimensions

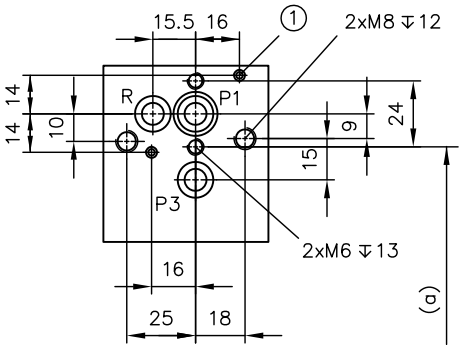
Single-circuit pump



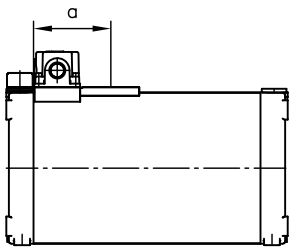
1 Centring pin ∅4 mm

a = 121.5

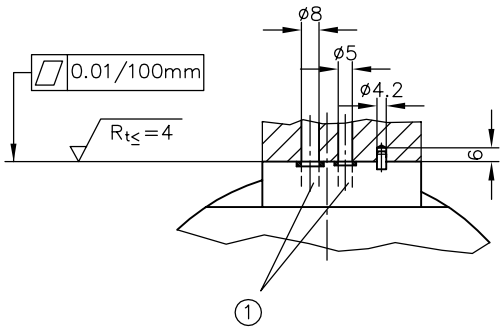
Dual-circuit pump with shared pedestal



1 Centring pin ∅4 mm



Hole for self-made connection block



1 Sealing of the connections:
P, P1, P3 = 8x2 NBR 90 Sh
R = 10.5x1.4x1.9 NBR (Kantseal)

Installing the silica gel filter

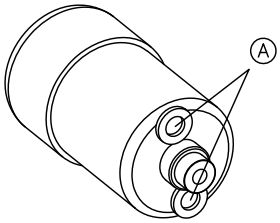
☑ Red caps are screwed onto the silica gel filter for protection during transport and storage.

1. Remove the caps.
2. Screw in the silica gel filter by hand. Caution: risk of breakage!

DAMAGE

Remove the silica gel filter's caps before commissioning

There is a risk of damaging the hydraulic power pack during operation.



A Sealing caps

5.3 Electrical connection

In this chapter

5.3.1 Safety instructions

⚠ WARNING

Risk of injury due to electric shock caused by incorrect assembly of electric cabling.
Risk of serious injury or death.

- ► Only have work performed on the electrical system by an electrically skilled person or by trained personnel working under the supervision of an electrically skilled person.
- ► Please note that incorrect assembly of electric cabling may result in material damage.

DAMAGE

Notes on electrical connection and earthing
are included in the terminal box and in this manual.
Earthing see "Connecting the electric drive", page 30.

DAMAGE

Disconnecting electrical power sources

- ► Plug connection on compact hydraulic power pack (various types of plug optionally available) or
- ► Power supply unit in overall machinery (see owner's operating instructions)

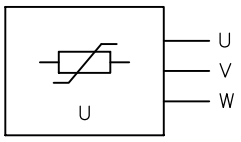
DAMAGE

Ensuring electromagnetic compatibility (EMC)
If the product (1) is connected to a system (2), it will not produce any impermissible interference (3).

Tests validating immunity to interference for demonstrating compliance with the standard EN 60034-1 para. 12.1.2.1 or VDE 0530-1 are not required.

Any transient electromagnetic fields generated when switching the motor on or off that may cause interference can be attenuated using a suppressor(4).

Suppressor coding **E, PE**



Legend:

1 Induction motor acc. to EN 60034-1 para. 12.1.2.1
2 e.g. power supply acc. to EN 60034-1 para. 6
3 EN 60034-1 para. 19
4 Type 23140, 3x400 V AC 4 kW 50-60 Hz by Murr-Elektronik, D-71570 Oppenweiler or from HAWE.

5.3.2 Electrical connection markings

KA 24 **KA 28**	1 22	S L1	KS KTF	**E/** **P/**	H 1.81 HZ 0.59/8.8	- A1/280 - ...	- FSR-24V	**- 3x400 V 50 Hz** **- 3x400 V 50 Hz**	/24 V DC	- G 1/2 x 300

Motor voltage

Electrical connection

Basic type and motor power

Motor type code

- Coding **KA** = 3-phase motor
- Coding **KAW** = AC motor

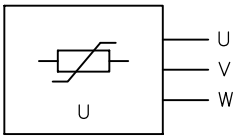
Coding	Comment
No designation	Series (terminal box)
P	HARTING plug
PM, PM1, PM2	HARTING plug with an additional connection M12x1 right, left or on both sides for temperature and/or level switch (horizontal version), in a vertical version and level switch (coding KD, KS) M12 connection to the level gauge Coding PM2 not in combination with suppressor coding PE
M, M1, M2	Terminal box with an additional connection M12x1 right, left or on both sides for temperature and/or level switch (horizontal version), in a vertical version and level switch (coding KD, KS) M12 connection to the level gauge Coding M2 not in combination with suppressor coding E or filler reduction coding B
E, PE	Additional suppressor on terminal box or HARTING plug

5.3.3 Connecting the electric drive

Electrical data

- Data applies to radial piston pumps and gear pumps
- The drive motor forms a closed, non-separable unit with the pump.

Connection	**part of product** • For version with HARTING plug, housing with female insert HARTING HAN 1 CE or equivalent, cable cross section 1.5 mm² • For version with integrated terminal box, flat plug sleeve 6.3 AMP **not supplied** • For terminal box version: cable fittings M20x1.5 • for option M.., PM.. : Line connector M12x1, 4-pin • for option KD, KS (vertical version): M12x1, 5-pole
Protection class	IP 65 according to IEC 60529 The breather filter must be safeguarded against moisture penetration.
Protection class	VDE 0100 Protection class 1

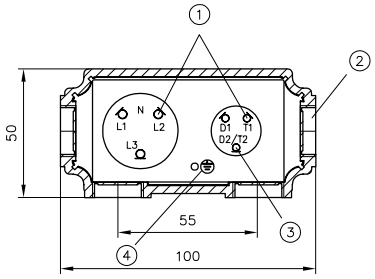
Insulation	**designed in accordance with EN 60 664-1** • For 4-wire AC voltage systems L1-L2-L3-PE (3-phase systems) **with** an earthed neutral point up to 500 V AC nominal phase voltage phase-phase • For 3-wire AC voltage systems L1-L2-L3 (3-phase systems) **without** an earthed neutral point up to a nominal phase voltage of 300 V AC phase-phase • 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 **Coding E, PE**	Type RC 3 R ▪ Operating voltage: 3x 575 V AC ▪ Frequency: 10 to 400 Hz ▪ max. motor power: 4.0 kW 

5.3.3.1 Connections on terminal box

Terminal box

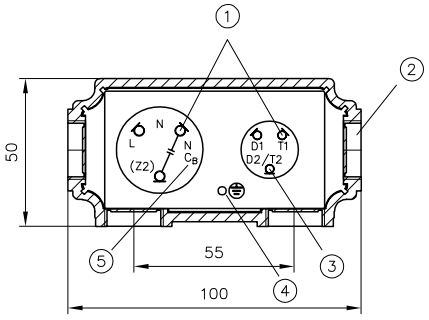
Coding **M**, **M1**, **M2**

3-phase motor



1 Flat plug
2 4x cable fittings M20x1.5
3 For vertical version (only D2/T2-T1)
4 Earth

AC motor



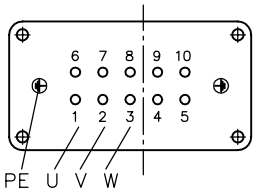
1 Flat plug
2 4x cable fittings M20x1.5
3 For vertical version (only D2/T2-T1)
4 Earth
5 C_B – operating capacitor is not included in the scope of delivery

5.3.3.2 Connections with Harting plug

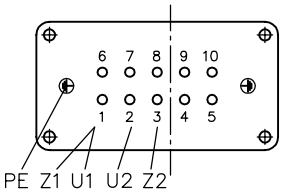
Harting plug HAN 10 E

Coding **P**

3-phase motor

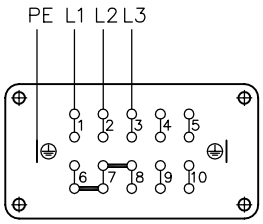


AC motor

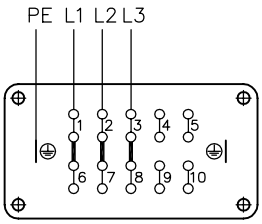


Harting male connector (on-site connection)

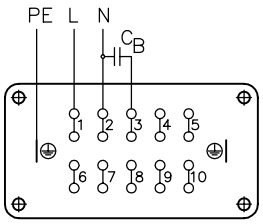
3-phase motor ⋎



3-phase motor △



AC motor



C_B – operating capacitor is not included in the scope of delivery

5.3.3.3 Motor data

3-phase motor

The actual power consumption depends on the load and can be up to 1.8 x nominal power.

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)
KA 21	3x400 V 50 Hz / 3x460 V 60 Hz	0.55/0.66	2790/3350	1.25/1.3	4.8/5.4	0.84/0.88	165/165
	3x230 V 50 Hz	0.55	2790	2.2	4.8	0.84	165
	3x690 V 50 Hz Y	0.55	2790	0.73	4.8	0.84	165
KA 22	3x400 V 50 Hz / 3x460 V 60 Hz	1.1/1.32	2790/3400	2.7/2.6	5.4/7.1	0.83/0.80	520/520
	3x230 V 50 Hz	1.32	2790	4.7	5.4	0.83	520
	3x690 V 50 Hz Y	1.1	2790	1.55	6.3	0.83	490
	3x200 V 50 Hz / 3x220 V 60 Hz *	1.1/1.1	2820/3380	5.5/4.9	5.4/6.2	0.74/0.88	490/350
KA 23	3x400 V 50 Hz / 3x460 V 60 Hz	0.37/0.44	1360/1650	1.0/1.0	4.3/4.4	0.80/0.81	220/220
	3x230 V 50 Hz	0.37	1360	1.75	4.3	0.80	220
	3x690 V 50 Hz Y S3	0.75	1330	1.3	3.0	0.75	385
	3x575 V 60 Hz Y S3	0.75	1670	1.4	3.8	0.75	360
	3x200 V 50 Hz / 3x220 V 60 Hz *	0.37/0.37	1410/1690	2.3/2.0	4.8/4.8	0.67/0.67	290/210
KA 24	3x400 V 50 Hz / 3x460 V 60 Hz	0.75/0.9	1360/1650	2.2/2.1	4.3/5.4	0.74/0.74	590
	3x230 V 50 Hz	0.75	1360	3.8	4.3	0.74	590
	3x500 V 50 Hz / 3x575 V 60 Hz	0.75/0.9	1400/1700	1.8/1.6	4.3/4.8	0.71/0.68	590/590
	3x200 V 50 Hz / 3x220 V 60 Hz *	0.75/0.75	1390/1680	4.5/3.9	4.8/4.8	0.67/0.67	610/460
KA 26	3x400 V 50 Hz / 3x460 V 60 Hz	1.4/1.68	2810/3340	3.3/3.0	5.1/5.0	0.82/0.90	585
	3x230 V 50 Hz	1.4	2810	5.7	5.1	0.82	585
	3x500 V 50 Hz / 3x575 V 60 Hz	1.4/1.4	2820/3450	2.35/2.0	6.0/7.1	0.85/0.86	590/590
	3x380 V 60 Hz Y	1.4	3450	3.05	7.1	0.86	630
	3x200 V 50 Hz / 3x220 V 60 Hz *	1.4/1.4	2840/3450	6.4/5.3	6.2/7.1	0.79/0.86	630/630
KA 28	3x400 V 50 Hz / 3x460 V 60 Hz	1.2/1.45	1380/1680	3.4/3.2	4.8/5.0	0.76/0.78	870/870
	3x230 V 50 Hz	1.2	1380	5.9	4.8	0.76	870
	3x200 V 50 Hz / 3x220 V 60 Hz *	1.1/1.1	1390/1690	6.3/5.5	5.1/5.1	0.67/0.76	785/665
KA 29	3x400 V 50 Hz	1.6/1.92	1390/1690	6.7/6.2	3.8/3.8	0.54/0.54	1250/1250
	3x230 V 50 Hz	1.6	1390	11.6	3.8	0.54	1250
	3x200 V 50 Hz / 3x220 V 60 Hz *	1.6/1.92	1400/1680	12.5/10.8	3.9/3.9	0.55/0.55	1225/1060

* Motors for 200 V 50 Hz or 220 V 60 Hz networks (Japan)

AC motor

The actual power consumption depends on the load and can be up to 1.8 x nominal power.

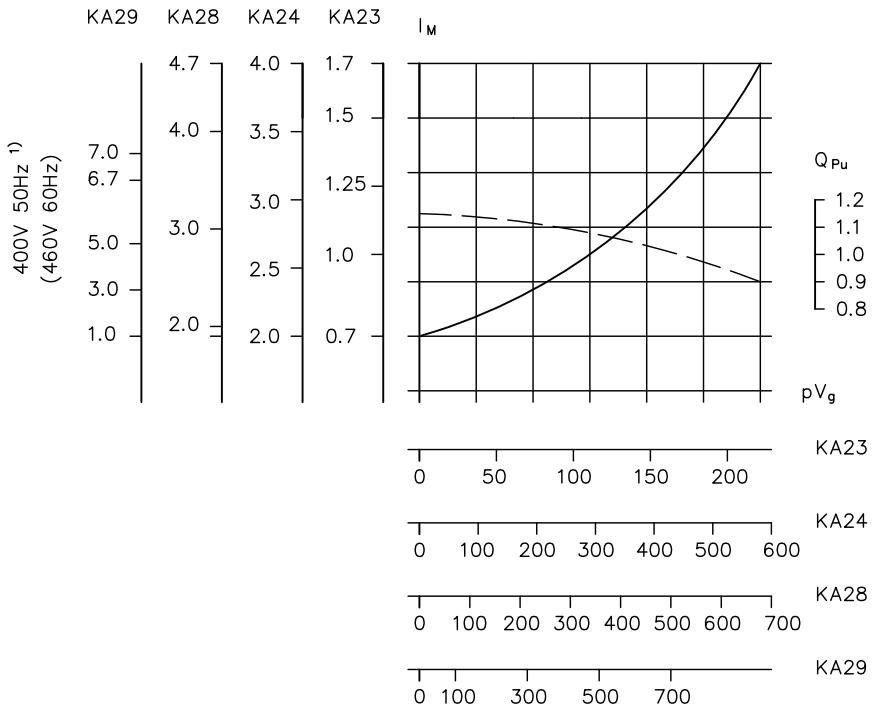
AC motor

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	Recommend-ed operating capacitor C_B (µF)	Hydraulic work value $(pV_g)_{max}$ (bar cm³)
KAW 21	1x230 V 50 Hz ⊥	0.37	2770	2.5	3.7	0.97	24	100
	1x110 V 60 Hz ⊥	0.37	3340	5.5	3.0	0.96	50	70
KAW 22	1x230 V 50 Hz ⊥	0.75	2810	4.75	4.4	0.94	32	230
	1x110 V 60 Hz ⊥	0.75	3400	12.0	3.5	0.90	120	175
	1x220 V 60 Hz ⊥	0.75	3400	6.0	3.5	0.90	30	200
KAW 23	1x230 V 50 Hz ⊥	0.25	1380	1.9	3.0	0.91	18	145
	1x110 V 60 Hz ⊥	0.25	1650	4.4	3.2	0.96	50	100
KAW 24	1x230 V 50 Hz ⊥	0.5	1390	4.1	2.9	0.95	32	350
	1x110 V 60 Hz ⊥	0.5	1680	9.0	3.3	0.98	65	210
	1x220 V 60 Hz ⊥	0.5	1680	3.9	2.9	0.98	25	275
KAW 26	1x230 V 50 Hz ⊥	1.1	2770	7.2	4.8	0.98	32	275
	1x110 V 60 Hz ⊥	1.1	3340	15.0	4.0	0.99	100	235
	1x220 V 60 Hz ⊥	1.1	3340	7.2	4.0	0.99	25	275
	1x115 V 50 Hz ⊥	1.1	2750	15.0	4.0	0.96	120	260
KAW 28	1x230 V 50 Hz ⊥	0.7	1370	5.1	3.0	0.94	36	400
	1x110 V 60 Hz ⊥	0.7	1650	10.5	3.0	0.98	100	315

5.3.3.4 Current consumption characteristic lines

Current consumption characteristic lines KA 23, KA 24, KA 28, KA 29

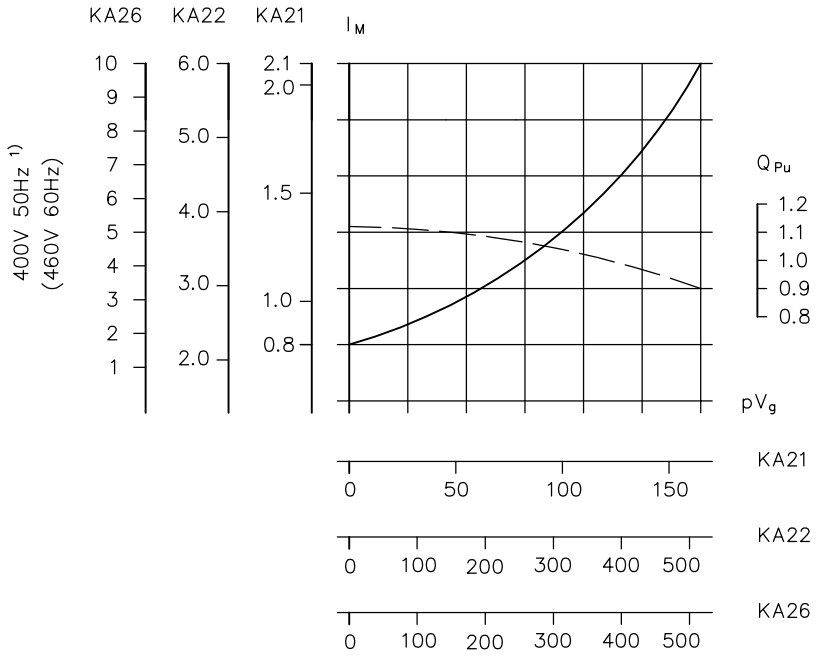
Operating voltage **3x400/230 V 50 Hz ⅄△, 3x460/265 V 60 Hz ⅄△**



pV_g hydraulic work value (bar cm³); I_M motor current (A); Q_{Pu} delivery flow characteristic (trend) 1.0

Current consumption characteristic lines KA 21, KA 22, KA 26

Operating voltage **3x400/230 V 50 Hz ⅄△, 3x460/265 V 60 Hz ⅄△**

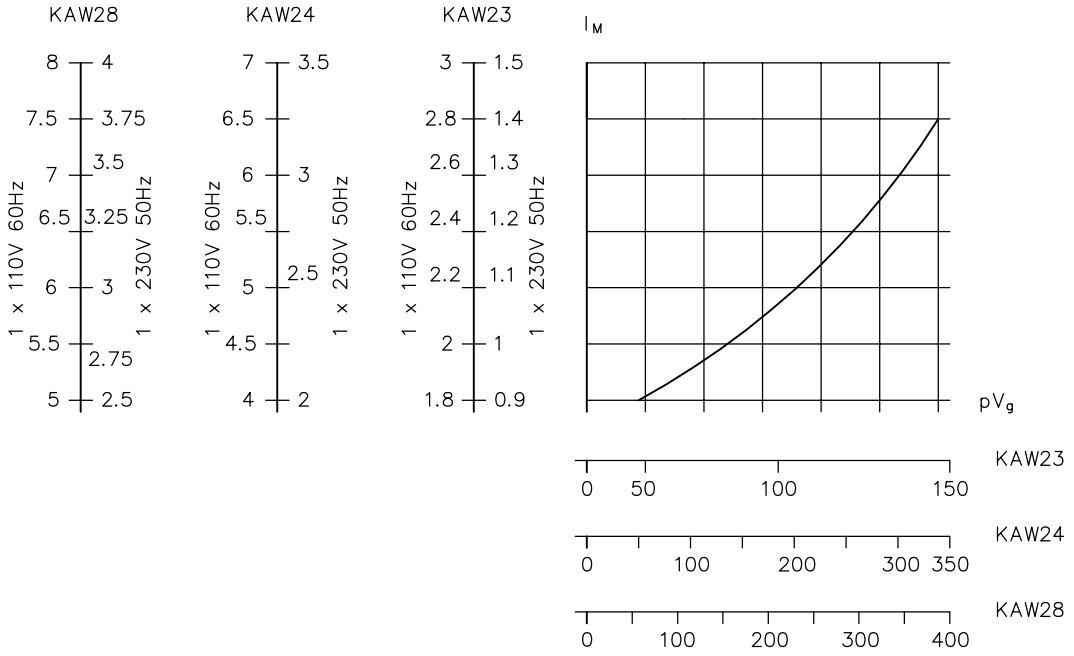


pV_g hydraulic work value (bar cm³); I_M motor current (A); Q_{Pu} delivery flow characteristic (trend) 1.0

1) Values at 230 V △ are the values times √3

Current consumption characteristic lines KAW 23, KAW 24, KAW 28

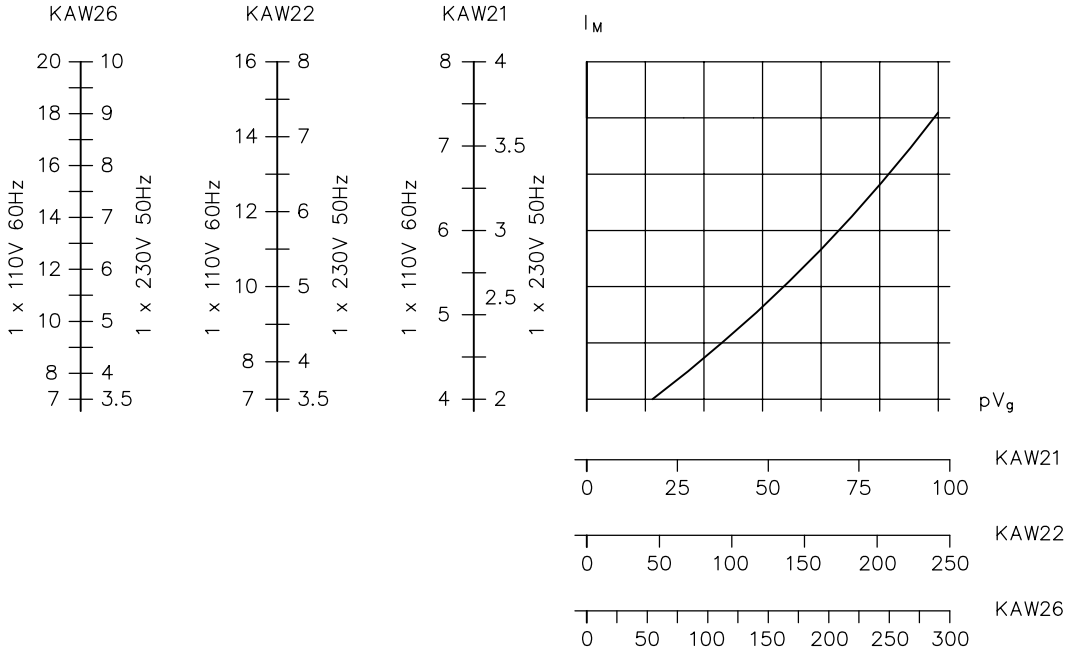
Operating voltage **1x230 V 50 Hz/1x110 V 60 Hz**



pV_g hydraulic work (bar cm³); I_M motor current (A);

Current consumption characteristic lines KAW 21, KAW 22, KAW 26

Operating voltage **1x230 V 50 Hz/1x110 V 60 Hz**

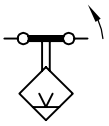
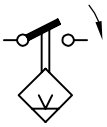


pV_g hydraulic work (bar cm³); I_M motor current (A);

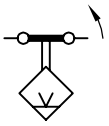
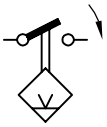
5.3.4 Connecting level switch and temperature switch

Level switch duty cycle
Dropping hydraulic fluid level:
If the amount of hydraulic fluid removed during each duty cycle causes the oil level to fall below the level switch's monitoring level, take suitable electrical measures to mute the signal until the fluid level rises above the monitoring level once again when the hydraulic fluid flows back in at the end of the duty cycle.

Level switch for type KA...L (horizontal)

Max. DC/AC switching capacity	30 VA	
Max. DC/AC current	0.5 A (cos φ = 1)	
Max. voltage	230 V AC/DC	
Electrical connection	on terminal box/HARTING plug	
Circuit symbol	Coding **D** (N/C contact) 	Coding **S** (N/O contact) 

Level switch for type KA...S (vertical)

DC/AC switching capacity	10 W	
Max. DC/AC current	1 A	
Max. voltage	150 V 50/60 Hz 200 V DC	
Electrical connection	Line connector industry standard contact gap 9.4 mm M12x1, 5-pin (coding **M**, **M1**, **M2**, **PM**, **PM1**, **PM2**)	
Circuit symbol	Coding **KD** (N/C contact) 	Coding **KS** (N/O contact) 

Temperature switch

Response temperature acc. to installed temperature switch.

Bimetallic-element switch

- design: thermal-magnetic circuit breaker (type **KAW**)
- design: separate temperature switch (type **KA**)

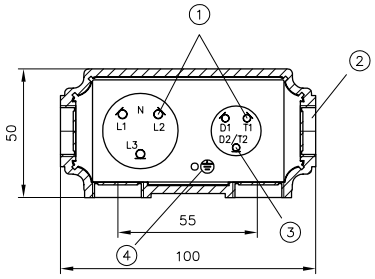
Signal indication	80°C ± 5K (coding **T, TT60**) 60°C ± 5K (coding **T60**) 55°C ± 5K (coding **TT50**) 50°C ± 5K (coding **T50**)
Max. voltage	600 V 50/60 Hz
Nominal current (cos φ ~ 0.95 / 0.6)	2.5 A/1.6 A
Max. current at 24 V (cos φ = 1)	1.5 A
Electrical connection	on terminal box/HARTING plug
Circuit symbol	

5.3.4.1 Connections on terminal box

Terminal box

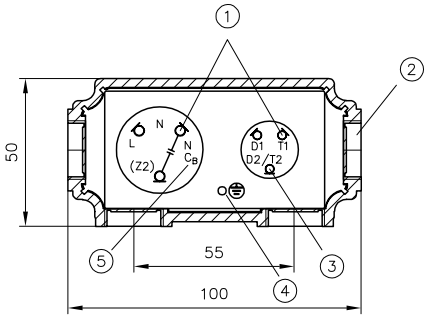
Coding **M**, **M1**, **M2**

3-phase motor



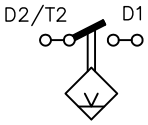
1 Flat plug
2 4x cable fittings M20x1.5
3 For vertical version (only D2/T2-T1)
4 Earth

AC motor

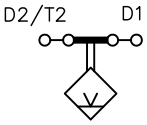


1 Flat plug
2 4x cable fittings M20x1.5
3 For vertical version (only D2/T2-T1)
4 Earth
5 C_B – operating capacitor is not included in the scope of delivery

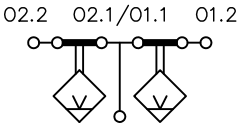
Level switch
Coding **S**



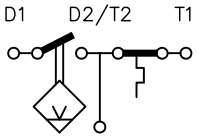
Level switch
Coding **D**



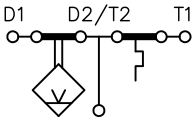
Level switch
Coding **DD**



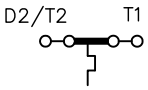
Level switch
Coding **ST**



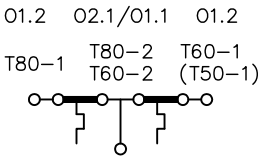
Level switch
Coding **DT**



Temperature switch
Coding **T**



Temperature switch
Coding **TT50, TT60**

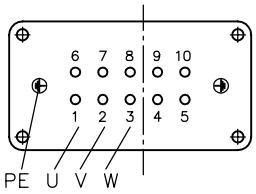


5.3.4.2 Connections with Harting plug

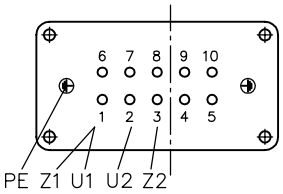
Harting plug HAN 10 E

Coding **P**

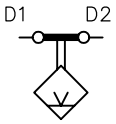
3-phase motor



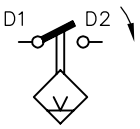
AC motor



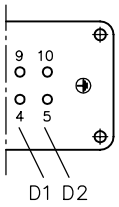
Coding **D**
(N/C contact)



Coding **S**
(N/O contact)

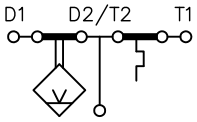


Coding **D, S**
(Harting plug)



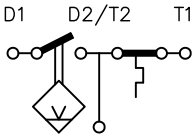
Level switch

Coding **DT**



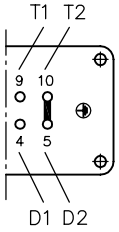
Level switch

Coding **ST**



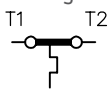
Harting plug

Coding **DT, ST**



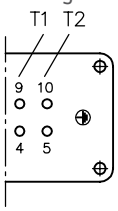
Temperature switch

Coding **T**



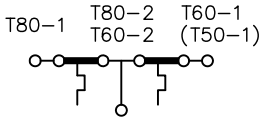
Harting plug

Coding **T**



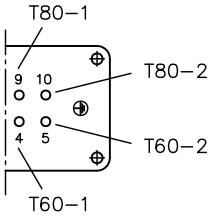
Temperature switch

Coding **TT50, TT60**



Harting plug

Coding **TT50, TT60**

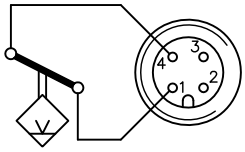


5.3.4.3 Terminal box with additional connection

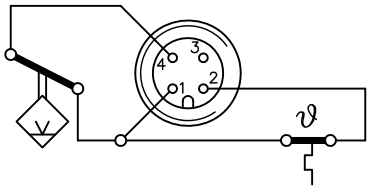
Additional connection M12x1, 4-pin

Coding **M, M1, PM, PM1**

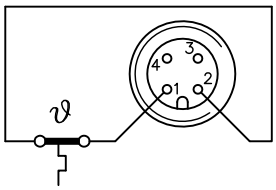
Pin assignment for level switch
Coding **D, S**



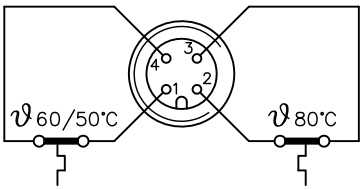
Pin assignment for temperature switch and level switch (horizontal version only)
Coding **ST, DT**



Pin assignment for temperature switch
Coding **T**



Pin assignment for two temperature switches
Coding **TT50, TT60**

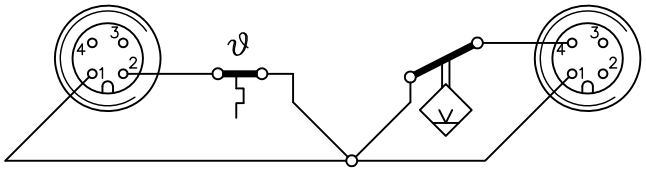


5.3.4.4 Harting plug with additional connection

Additional connection 2x M12x1, 4-pin

Coding **M2 and PM2**

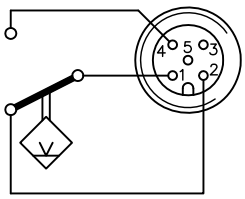
Coding **DT, ST**
One temperature switch and one level switch (horizontal version):



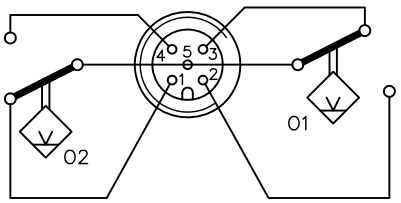
Additional connection M12x1, 5-pin

Coding **PM**

Coding **KD, KS**



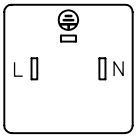
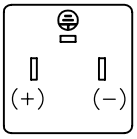
Coding **KDD**



5.3.5 Connecting the fan

Fan connection and motor data

Coding **F, F1**

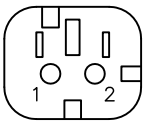
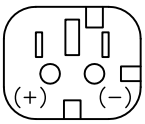
Temperature range	-30°C ... +50°C
Electrical connection	Line connector acc. to DIN EN 175 301-803 A Coding **F** 1x230 V 50/60 Hz ⊥ 1x110 V 60 Hz ⊥  Coding **F1** 24V DC 

Motor data

U_N	P_N(W)	Rotation speed (rpm)	Protection class
1x230 V 50/60 Hz ⊥	45	2800/3250	IP 44
1x110 V 60 Hz ⊥	38	3250	IP 44
24 V DC	12	3050	IP 20

Fan (on side) connection and motor data

Coding **FSL, FSR, FSH, FSLR**

Electrical connection	Tyco line connector TE 776427-1 1x230 V 50/60 Hz ⊥ 1x115 V 50 Hz ⊥ 1x110 V 60 Hz ⊥  Tyco line connector TE 776427-2 24V DC 

Motor data

U_N	P_N(W)	Rotation speed (rpm)	Protection class
1x230 V 50/60 Hz ⊥	19	2650/3100	IP 68
1x110 V 50/60 Hz ⊥	19	2650/3100	IP 68
24 V DC	5	2800	IP 68

6 Start-up

6.1 Safety instructions

DAMAGE

Prerequisites for commissioning

The product may only be put into commission once it has been installed in the machine or system it is intended for and this machine or system complies fully with the European Machinery Directive.

DANGER

Improper commissioning may cause the hydraulic drives to move unexpectedly.

Risk of serious injury or death.

- Before beginning disassembly, relieve the system of hydraulic pressure.
- A corresponding warning sign (HAWE order number 7788 022 (4708 4258-00)) must be attached in an easily visible place on or near the hydraulic accumulator.
- No modifications of any kind (mechanical, welding or soldering work) may be made to the accumulator.

CAUTION

Overloading components due to incorrect pressure settings.

Risk of minor injury.

- Always monitor the pressure gauge when setting and changing the pressure.
- Take note of the maximum pressure of the pump.

CAUTION

Danger of burning due to hot metal surfaces on the hydraulic power pack, particularly on the tank, motor, valve blocks and valves.

Risk of minor burns

- Do not touch the hydraulic power pack or directional valve solenoids during operation.
- Allow the hydraulic power pack and directional valve solenoids to cool down before any work.
- Wear protective gloves.
- If surface temperatures >60°C occur during operation, set up safety barriers.
- Ensure that fresh air can be drawn in and that warm air can escape.
- No changes of any kind (mechanical, welding or soldering work) may be made.

6.2 Checks before commissioning

Check for correct connection

1. Mechanical:
   - fastening to machine, frame and base
2. Electrical:
   - Power supply
   - Control
   - Motor protection circuit
3. Hydraulic:
   - piping and hoses
   - Cylinder
   - Motors

6.3 Set motor protection circuit

Set motor protection circuit

1. Set motor protection circuit to approximately 0.85 to 0.9 times the motor current (I_M).
   - ✓ When operating normally, the motor protection circuit will not trip prematurely.
   - ✓ When the pressure-limiting valve triggers, the period until shutdown does not become long enough for the hydraulic fluid's temperature to exceed its permissible maximum.
2. Run a test run to check the motor protection circuit's settings.

Additional safety precautions against malfunctions are the temperature switches, level switches and pressure switches. These are optionally available for the hydraulic power pack.

6.4 Filling hydraulic fluid

DAMAGE

Dirt must not enter the product

Otherwise, the product may suffer damage

- Always fill hydraulic fluid via the system filter or a mobile filter station.
- Observe the recommended cleanliness class for the hydraulic fluid.
- Keep all pipes, hose lines, fittings and couplings clean.
- Carry out all work in a clean environment.
- Clean hands and clothing before working.

DAMAGE

Accumulator systems

- Fill accumulators using designated equipment in accordance with the pressure specifications of the hydraulic schematic.
- Observe the manufacturer's corresponding operating instructions and hydraulic schematics.

Filling hydraulic fluid

☑ Only use the hydraulic fluid specified for the system.

1. Refer to the table for filling quantity.
2. Fill hydraulic fluid via the system filter or a mobile filter station.
3. Fill up to the top marking on the fill level monitor.

Coding	Fill volume V_{fill} (l)	Usable volume vertical V_{usable} (l)	Usable volume horizontal V_{usable} (l)
--	3.9	1.85	1.5
1	5.0	2.7	2.0
01	5.0	1.85	2.0
11	6.1	2.7	2.5
2	7.5	5.45	3.15
02	7.5	--	3.15
21	8.6	5.45	3.65
22	11.1	--	4.8
3	11.1	9.05	4.8

The fill volume and usable volume may deviate slightly from the indicated values, depending on the motor and pump.

6.5 Setting pump's rotation direction

1. Briefly run the drive motor
   ✓ The pump is pumping hydraulic fluid

☑ The pump is not pumping hydraulic fluid

2. Check that the motor's rotation direction matches the pump's rotation direction
   - Radial piston pump = any
   - Gear pump = anticlockwise
3. For 3-phase version
   ► If there is no delivery flow, swap over two of the three main conductors.

6.6 Starting and bleeding

⚠ WARNING

Risk of injury from pressurised components

Risk of serious injury or death.

► Check all components for correct installation before charging the hydraulic system to operating pressure.

⚠ WARNING

Risk of injury from pressurised bleeder screw

Risk of serious injury or death

- ► Depressurise the hydraulic power pack before bleeding.

DAMAGE

The hydraulic system is bled using bleeder screws.

Bleed the system through a consumer that has a high point within the hydraulic system.

Starting and bleeding

On the hydraulic power pack

☑ The directional valve is in the switching position in which the pump can idle (see manufacturer's hydraulics schematic).

1. Slightly unscrew the bleeder screw.
2. Switch the pump on and off several times so that the pump cylinders bleed automatically.

Optional procedure if the controller lacks the requisite capability

☑

3. Connect a pipe screw connection with a short pipe bracket and a transparent plastic hose to port P.
4. Insert the other end into the hydraulic fluid filler opening.
   ✓ The bleeding process is complete when hydraulic fluid flows out without bubbles.
5. Then move the consumer(s) back and forth several times until the air is largely removed and the movement is smooth.
6. Tighten the bleeder screw again.

On a consumer in a high position

1. Slightly unscrew the bleeder screw.
   ✓ The bleeding process is complete when hydraulic fluid flows out without bubbles.
2. Tighten the bleeder screw again.

7 Maintenance

7.1 Safety instructions

Maintenance measures consist of inspection, service and repair. Maintenance measures are described here.

- Maintenance work must only be carried out by qualified personnel.
- Tasks not described in this chapter may only be carried out by HAWE Service.
- If faults or damage occur, switch off the hydraulic system immediately.
- Observe the information in the supplier documentation.
- Document all activities in a maintenance log.

⚠ WARNING

Danger of accident and fatal injury due to lack of maintenance or careless maintenance
Omitted or negligently performed maintenance can cause the hydraulic system to malfunction. Improperly performed maintenance or improperly conducted troubleshooting can pose a danger to personnel.

- Read and abide by all instructions provided in this section.

⚠ WARNING

Risk of injury from electrical, mechanical or hydraulic hazards when working on the hydraulic power pack
Risk of serious injury or death

- Prior to all work on the hydraulic power pack, disconnect the power supply from the drive motor.
- Prior to all work on the hydraulic power pack, relieve the pressure in the hydraulic system.

⚠ CAUTION

The hydraulic power pack and valves' solenoids may become hot during operation.
Risk of injury from minor burns

- If surface temperatures >60°C occur during operation, set up safety barriers.
- Allow the hydraulic power pack and the solenoids to cool sufficiently before touching them.
- Ensure that the device can aspirate sufficient volumes of fresh air and that hot air can escape.
- Modifications of any kind, especially mechanical, welding or soldering, are prohibited.

DAMAGE

Disconnecting electrical power sources

- Plug connection on compact hydraulic power pack (various types of plug optionally available) or
- Power supply unit in overall machinery (see owner's operating instructions)

7.2 Cleaning

DAMAGE

Damage from improper cleaning

- Only clean with the hydraulic connections sealed to prevent cleaner from entering.
- Do not use aggressive cleaning agents.
- Treat the product only with suitable cleaning agents.
- Do not use a high-pressure cleaner.

7.3 Maintenance plan

	as required	Every 3 months	Every 6 months	Once a year	Every 2 years	Every 6 years, after 10 years at the latest
Check safety markings				✓		
Hydraulic fluid: "Checking the fluid level", page 51		✓				
"Changing hydraulic fluid", page 50	✓			✓		
"Checking and replacing the silica gel filter", page 51			✓			
Change pressure and return line filter (if present)	✓			✓		
"Visual check: Hydraulic lines (pipes and hoses)", page 49 and replace if necessary	✓			✓		
"Visual check: Electrics (cables, connections, plugs)", page 49 and replace if necessary	✓			✓		
Electric drive: "Checking electrical equipment", page 49					✓	
"Checking and replacing hydraulic hoses", page 49						✓

7.4 Service

7.4.1 Visual check: Hydraulic lines (pipes and hoses)

Immediately repair any damage of this kind to hydraulic lines:

- External leakages
- Visible signs of external damage cracks, kinks, detaching, cuts, abrasion, material fatigue etc.
- Hose deformation when unpressurised and when pressurised

7.4.2 Visual check: Electrics (cables, connections, plugs)

Immediately repair any damage of this kind to electrical systems:

- Visible signs of external damage, like brittle insulation, abrasion, kinks, material ageing etc.
- Corroded electrical plugs and sockets

7.4.3 Checking electrical equipment

DAMAGE

Testing electrical equipment

- The testing must only be performed by an electrically skilled person or by electrically instructed personnel.
- Only use suitable measurement and test devices.
- The high-voltage test values or results of the insulation test may be impaired due to old or contaminated hydraulic fluid.

DAMAGE

Operating electrical systems safely

You can only properly and reliably operate electrical systems or equipment in a safe manner if their condition is guaranteed to be perfect at all times. The German DGUV Vorschrift 3 accident prevention regulations specifies inspection intervals and test methods. The associated instructions (DA) detail how the safety goals can be achieved.

Recurring inspections acc. to DGUV Vorschrift 3

- Visual check
- Check PE and equipotential bonding
- Check insulation
- Check shutdown conditions
- Check circuit breakers
- Measure earth
- Test certificate

7.4.4 Checking and replacing hydraulic hoses

DAMAGE

When handling hydraulic hoses, observe the applicable standards, regulations and rules:

- ISO 17165-2: Recommended practices for hydraulic hose lines.
- DGUV Rule 113-015 (BGR 237 – German regulations for occupational insurance schemes) hydraulic hose lines – “Rules for safe use”.
- DGUV information sheet no. 015 “Testing and replacing hydraulic hose lines”.

7.4.5 Changing hydraulic fluid

Draining hydraulic fluid

⚠ WARNING

Danger of scalding from hot hydraulic fluid.
Danger of scalding.

- Please note that hydraulic fluid remains very hot even a long time after switching off.
- Allow the complete system to cool down before carrying out any work.
- Avoid skin contact with hot hydraulic fluid.

DAMAGE

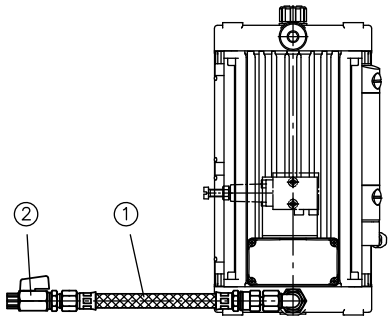
- Do not release hydraulic fluid into the environment.
- Collect cleaning, operating and lubrication fluids and consumable materials in suitable containers and dispose of them according to local regulations.

Draining

Draining hydraulic fluid

☑ Keep a vessel handy to catch the expended hydraulic fluid. The vessel needs to be big enough to catch all the fluid.

1. Depressurise the hydraulic system.
2. Unscrew and remove the filler and breather filter.
3. Optional: Remove and check the silica gel filter, replace it if necessary.
4. Drain the used hydraulic fluid.



through hydraulic fluid drain screw

1. Undo the drain screw on the product.
2. Drain the expended hydraulic fluid into a separate vessel.
3. Screw the drain screw back in again (tightening torque: 9 Nm).

through hydraulic fluid drain hose (1)

1. Open the drain valve (2) on the drain hose (1).
2. Drain the expended hydraulic fluid into a separate vessel.
3. Close the drain valve (2) again

Filling hydraulic fluid

DAMAGE

Dirt must not enter the product
Otherwise, the product may suffer damage

- Always fill hydraulic fluid via the system filter or a mobile filter station.
- Observe the recommended cleanliness class for the hydraulic fluid.
- Keep all pipes, hose lines, fittings and couplings clean.
- Carry out all work in a clean environment.
- Clean hands and clothing before working.

DAMAGE

Replace the oil filter when changing the hydraulic fluid.

► Otherwise, the fresh hydraulic fluid will be contaminated again.

Filling hydraulic fluid

1. Fill hydraulic fluid into the hydraulic power pack through the system filter or a mobile filter station.
2. While changing the hydraulic fluid, keep an eye on the level switch and monitor its signals.
3. Screw the breather filter or silica gel filter back in again.
4. Switch on the hydraulic power pack.
   ✓ The hydraulic accumulator fills automatically.
5. Bleed the hydraulic system.
   ✓ The hydraulic power pack is ready for operation.

7.4.6 Checking the fluid level

Dropping hydraulic fluid levels may indicate leaks in the system.

Electric fill level monitor

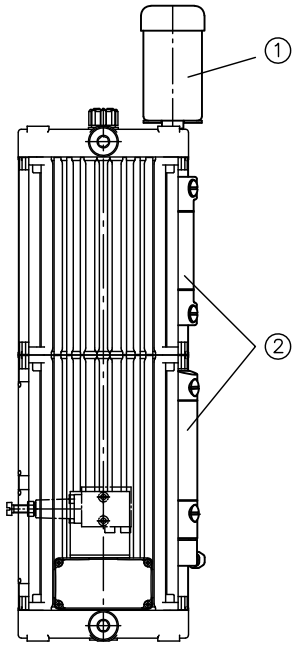
☑ Level gauge with level switch

- ► The level switch triggers a signal when the minimum fluid level is reached.
- ► Top up the hydraulic fluid at the latest when the fluid level has reached its minimum.

Visual fill level monitor

☑ Visual level gauge

- ► Use the visual level gauge to check the hydraulic fluid level when the system is unpressurised.
- ► Top up the hydraulic fluid at the latest when the fluid level has reached its minimum.



1 Silica gel filter
2 Visual level gauge

7.4.7 Checking and replacing the silica gel filter

Replacing the silica gel filter if it is clogged

☑ Contamination indicator: The filter material on the silica gel filter has turned pink

1. Depressurise the system
2. Remove the used silica gel filter
3. Screw in a new silica gel filter
4. Before commissioning, take the red sealing plug off the underside of the new silica gel filter
   ✓ The silica gel filter is ready for use

7.5 Repairs

Spare and wearing parts

- Trained specialist personnel can perform repairs themselves.
- Order spare and wearing parts from the manufacturer by providing the commission number (see type plate).

The motor cannot be replaced as it is an integral part of the tank.

DAMAGE

For safety reasons, only genuine spare parts and accessories may be used.

HAWE Hydraulik SE disclaims any liability or warranty for damage caused by the use of non-genuine spare parts and accessories.

8 Troubleshooting

Fault	Possible cause	Remedy
Excessive noise production	Hydraulic fluid level too low (foaming hydraulic fluid)	► "Filling hydraulic fluid", page 50
	Pump/motor faulty	**Hydraulic power pack** ► Shut down ► Repair or replace
Insufficient or no pressurisation	Faulty connections	► Check connections ► "Visual check: Hydraulic lines (pipes and hoses)", page 49
	Pump/motor faulty	**Hydraulic power pack** ► Shut down ► Repair or replace
	Delivery flow direction wrong	► "Setting pump's rotation direction", page 45
	Deviations of the pressure specifications	► "Get in touch with manufacturer", page 60

9 Disassembly and disposal

9.1 Safety instructions

⚠ DANGER

Sudden movement of the hydraulic drives when disassembled incorrectly
Risk of serious injury or death

- Depressurise the hydraulic system.
- Perform safety measures in preparation for maintenance.

⚠ CAUTION

Danger of burning due to hot metal surfaces on the hydraulic power pack, particularly on the tank, motor, valve blocks and valves.
Risk of minor burns

- Do not touch the hydraulic power pack or directional valve solenoids during operation.
- Allow the hydraulic power pack and directional valve solenoids to cool down before any work.
- Wear protective gloves.
- If surface temperatures >60°C occur during operation, set up safety barriers.
- Ensure that fresh air can be drawn in and that warm air can escape.
- No changes of any kind (mechanical, welding or soldering work) may be made.

DAMAGE

- Do not release hydraulic fluid into the environment.
- Collect cleaning, operating and lubrication fluids and consumable materials in suitable containers and dispose of them according to local regulations.

9.2 Disassembly and disposal

Disassembly

1. Shut down the hydraulic system in the machine controls.
2. Secure it against unintentional restarting.
   ✓ System shut down securely.
3. Drain hydraulic fluid.
   ✓ The hydraulic system has been depressurized and can be disassembled.
4. Disconnect electrical cables.
5. Disconnect hydraulic lines.
6. Disassemble electrical and hydraulic components.
7. Properly dispose of all disassembled parts.

Disposal information

DAMAGE

Recommended disposal by waste types:

- Mixed scrap: Valve bank, valve control, manifold
- Electronic waste: Switch box, pump housing with motor
- Scrap iron: Metal frame, accumulator (unpressurised), pump
- Waste oil: Hydraulic fluid

10 Appendix

10.1 Technical data

Type-specific parameters are listed on the product's type plate, e.g.: Data on motor and pump power.

For further technical data, refer to HAWE publication **D 8010**.

"Applicable documents", page 5

General information

Conformity	▪ "Declaration of incorporation (Machinery Directive)", page 58 ▪ "Declaration of conformity (Low Voltage Directive)", page 59 ▪ UL conformity of the stators - UL reference E216350 ▪ UL conformity of the fans F, F1 - UL reference E216350
Designation	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)
Operating mode	▪ Short period operation (S2) and ▪ Periodic intermittent operation (S3)
Material	Housing: Aluminium
Attachment	M8 threaded holes, see dimensioned drawings
Mounting position	Vertical (KA...S) or horizontal (KA...L)
Line connection	only via bolted-on connection blocks Basic pump: see mounting hole pattern
Rotation direction	Radial piston pump – any Gear pump – anticlockwise (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	Radial piston pump H: 100 to 3500 rpm Gear pump Z 1.1 ... Z 2.7: 800 to 4000 rpm Z 3.5 ... Z 8.4: 500 to 3800 rpm Z 8.8 ... Z 11.3 500 to 3500 rpm

Silica gel filter	Filter area	26.6 cm^2
	Desiccant quantity	125 g
	Absorption capacity	150 ml
	Filter efficiency	3 µm absolute; (β≥200)
	Operating temperature range	-30°C ... +90°C
Filler screen	Coding	B, B1
	Screen mesh size	0.63 mm
	Connection	G 1 1/4

Weight

w/o hydraulic fluid
w/o connection blocks

Type	H (3 cylinders)	H (6 cylinders)	Z	HZ
KA 21, 23	10.9 kg	11.5 kg	12.7 kg	13.2 kg
KA 22, 24	13.2 kg	13.6 kg	15.0 kg	15.5 kg
KA 26, 28, 29	14.7 kg	15.1 kg	16.5 kg	17.0 kg

Tank size 01, 1	+ 0.7 kg
Tank size 02, 2	+ 2.2 kg
Tank size 11	+ 1.4 kg
Tank size 21	+ 2.9 kg
Tank size 22, 3	+ 4.4 kg
External fans F, F1	+ 1.8 kg
External side fans FSL, FSR, FSH	+ 0.54 kg (1x110 V, 1x230 V) + 0.22 kg (24 V DC)
External side fan FSLR	+ 1.1 kg (1x110 V, 1x230 V) + 0.45 kg (24 V DC)

The number of cylinders depends on the delivery flow coding.
Type-specific parameters are listed on the product's type plate.
For further technical data, refer to HAWE publication **D 8010**.
"Applicable documents", page 5

10.2 Declaration of incorporation (Machinery Directive)

HAWE HYDRAULIK

Solutions for a World under Pressure

HAWE Hydraulik SE, Postfach 11 55, 85605 Aschheim/München

Declaration of Incorporation within the meaning of the Machinery Directive 2006/42/EC, appendix II, No.1 B

Compact hydraulic power pack type KA…, KAW…, KA2…/ZM… and KAW2…/ZM…
acc. to our **documentation D 8010, D 8010-4, SK 8010 L1, SK 8010 S1 and SK 8010 W**
(latest release)

is an incomplete machine (acc. to article 2g), which is exclusively intended for installation or assembly of another machinery or equipment.
The specific technical documents, necessary acc. to appendix VII B, can be prepared any time and transmitted in electronic form to the responsible national authority on request.
Risk assessment and analysis are implemented according to appendix I of the Machinery Directive.
The dept. Product, Application & Service is authorized to compile the specific technical documents necessary acc. to appendix VII B.

HAWE Hydraulik SE, Dept. Product Management, Einsteinring 17, D-85609 Aschheim/Munich

The following basic safety and health protection requests acc. to appendix I of this guideline do apply and are complying with:
Chapter 1.1.2, 1.1.3, 1.1.5, 1.2 (complete chapter), 1.3.1, 1.3.2, 1.3.4, 1.3.6, 1.3.7, 1.5.1, 1.5.2, 1.5.3, 1.5.4, 1.5.5, 1.5.6, 1.5.8, 1.5.9, 1.5.16, 1.6.3, 1.7.1, 1.7.3, 1.7.4 and 1.7.4.3.

The incomplete machine also fulfills below shown EU-Directives:
2014/35/EU:2014-02-26 Directive of electrical equipment designed for use within certain voltage limits
2014/68/EU:2014-05-15 Pressure equipment Directive (applicable if an accumulator is used)

Following harmonized guidelines have been used:

EN 12100-1:2011-03	*Safety of machinery - General principles for design*
EN ISO 4413:2011-04	*Hydraulic fluid power - General rules and safety requirements for systems and their components*
EN 60204-1:2014-10	*Safety of machinery - Electrical equipment of machines - Part 1: General requirements*

We assume that the delivered equipment is intended for the installation into a machine.
Putting in operation is forbidden until it has been verified that the machine, where our products shall be installed, is complying with the Machinery Directive 2006/42/EC.
This Declaration of Incorporation is void, when our product has been modified without our written approval.

HAWE Hydraulik SE

Axel Schwerdtfeger (Chief Technical Officer)

10.3 Declaration of conformity (Low Voltage Directive)

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HAWE HYDRAULIK

Streitfeldstraße 25
D-81673 München
Tel. +49 89 379100-0
Fax +49 89 379100-1269

Datum
2016-06-06

Declaration of Conformity acc. to EC-Regulation 2014/35/EU, electrical devices intended for use within certain voltage limits

We, HAWE-Hydraulik SE
with head office: D-81673 München, Streitfeldstraße 25
declare under our sole responsability that the product

compact power pack type KA, KAW, KA2…/ZM… and KAW2…/ZM…
acc. to our documentation D 8010, D 8010-4, SK 8010 L1, SK 8010 S1 and SK 8010 W (actual release)

to which this declaration relates is in conformity with the following standard(s) or other normative document(s):

DIN EN 60034 (DIN VDE 0530)
DIN VDE 0110

Any product modifications without prior written approval from the manufacturer will make this statement invalid.

HAWE Hydraulik SE

i.A. Dipl.-Ing. A. Nocker (Produktmanagement)

Europäische Aktiengesellschaft (SE) , Sitz der Gesellschaft: München , USt ID Nr: DE180016108 , Registergericht München HRB 174760
Vorstand: Karl Haeusgen, Martin Heusser, Wolfgang Sochor, Markus Unterstein
Vorsitzender des Aufsichtsrats: Hans-Jürgen Thaus , Ehrenvorsitzender des Aufsichtsrats: Joachim Gommlich
Hypo-Vereinsbank München, 1780008454 (BLZ 700 202 70), IBAN DE53 7002 0270 1780 0084 54, BIC HYVEDEMMXXX
Commerzbank München, 150623700 (BLZ 700 400 41), IBAN DE56 7004 0041 0150 6237 00, BIC COBADEFFXXX
Baden-Württembergische Bank, 2368049 (BLZ 600 501 01), IBAN DE90 6005 0101 0002 3680 49, BIC SOLADEST
Bayerische Landesbank, 203693428 (BLZ 700 500 00), IBAN DE86 7005 0000 0203 6934 28, BIC BYLADEMMXXX

Zertifiziert nach
ISO 9001
ISO 14001
ISO 50001

9998 5909 00

11 Contact details

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Further information

HAWE Hydraulik SE is a responsible development partner with application expertise and experience in more than 70 areas of mechanical and plant engineering. The product range includes hydraulic power packs, constant and variable pumps, valves, sensors and accessories. Modular systems are complemented by electronic components, are perfectly coordinated with the hydraulic components and simplifying control, signal evaluation and fault detection. The intelligent system solutions reduce energy consumption and operating costs. Compact drives save space and permit innovative machine design.

Approximately 2000 employees in 16 countries and sales partners in more than 40 countries around the globe provide customers with local, professional and personal support. The company is certified in accordance with ISO 9001, ISO 4413, ISO 50001, OHSAS 18001.

■ **HAWE subsidiaries and service repair shops** • **HAWE sales partners**

- Germany
- Finland
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- Italy
- Austria
- Switzerland
- Slovenia
- Spain
- Sweden
- USA
- Canada
- Russia
- China
- India
- Japan
- Korea
- Singapore
- Australia

You can find further information on HAWE Hydraulik, your local contact and the range of hydraulics training sessions offered at: www.hawe.com.

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