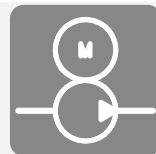
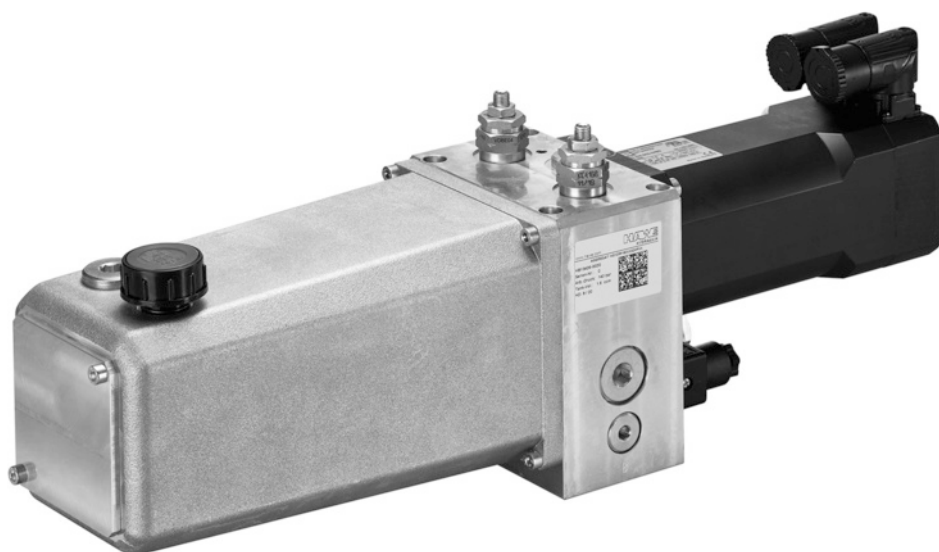


# Servo hydraulic power pack type HS 120

## Product documentation



Operating pressure $p_{\max}$ :	150 bar
Displacement volume $V_{\max}$ :	3.2 cm <sup>3</sup> /rev
Usable volume $V_{\text{use max}}$ :	0.3 l



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## Overview of servo hydraulic power pack type HS 120

Servo hydraulic power packs are a type of hydraulic power pack. They consist of a constant pump and a directly flange-mounted servomotor. This makes for a highly dynamic and energy-efficient drive unit.

The servo hydraulic power pack type HS 120 contains a very compact and powerful servo electric drive. Its 'power-on-demand' results in impressively high energy efficiency and allows it to be used without additional cooling. The servo hydraulic power pack type HS will let you set up reversible operation without any additional valve technology.

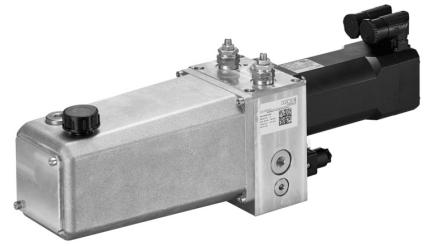
Depending on your application, a number of different motor/frequency converter combinations and pump delivery flow rates are available, as well as different variants of integrated check valve. The tank also features a level/temperature switch.

### Features and benefits

- Highly energy efficient
- Highly dynamic rate changes and direction changes are easy to set up
- Requires little space thanks to compact design
- Low noise
- Resource-saving due to small oil filling volume

### Intended applications

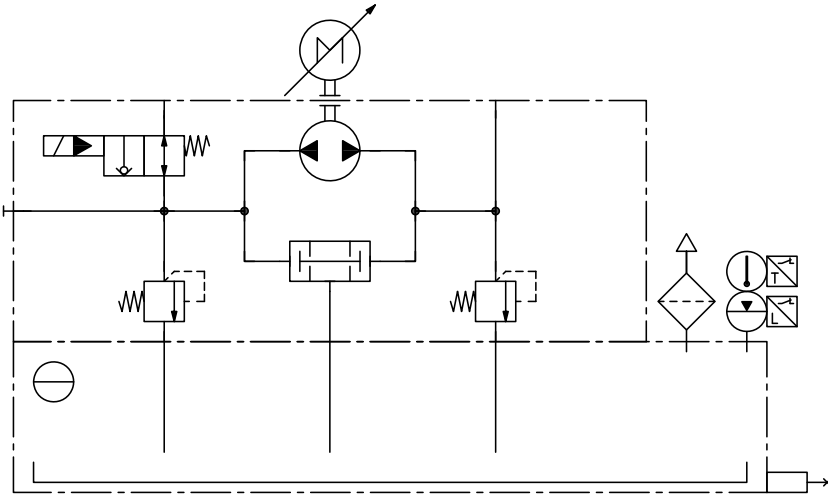
- Injection moulding machines
- Machine tools
- Punches and bending machines
- Leveller machines



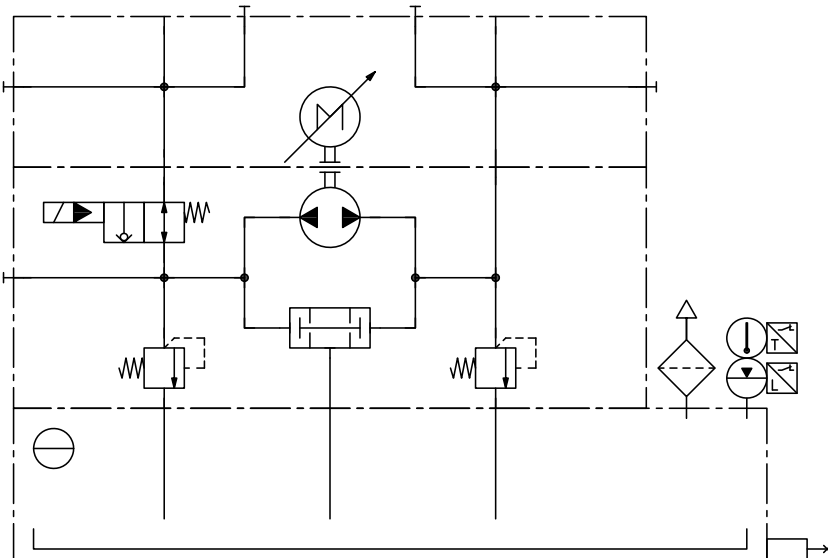
*Servo hydraulic power pack type HS 120*

## 2 Available versions

### Circuit symbol



### Version with connection block



## Ordering example

HS 120	R	S	16	H	02	K	224	W	.../	...	-M	-1/4	-07S6K12
													2.1 "Basic type and size"
													2.2 "Nominal motor voltage and power"
													2.3 "Pump"
													2.4 "Tank size"
													2.5 "Check valve in line A"
													2.6 "Check valve solenoid voltage"
													2.7 "Additional options"
													2.8 "Connection block"
													2.9 "Converter"
													Operating pressure, B-side 20 to 150 bar
													Operating pressure, A-side 20 to 150 bar
													Monitoring X Without
													K Level and temperature monitor, N/C contact 60° C
													Installation position Horizontal
													Version R Reversible

## 2.1 Basic type and size

Type	Version	Flow rate Q <sub>max</sub> (lpm)	Pressure p <sub>max</sub> (bar)
HS 120	Reversible	8.9	150

## 2.2 Nominal motor voltage and power

Motor	Description	Nominal voltage (V)	Rated speed (rpm)	Nominal power (kW)	Flows (A)	Torques (Nm)
X	Without motor					
S	TA3S	400	3000	0.8	I <sub>0</sub> 1.81	M <sub>0</sub> 2.9
					I <sub>N</sub> 1.62	M <sub>N</sub> 2.6
					I <sub>max</sub> 5.4	M <sub>max</sub> 8.7
L	TA3L			1.8	I <sub>0</sub> 4.0	M <sub>0</sub> 6.8
					I <sub>N</sub> 3.35	M <sub>N</sub> 5.7
					I <sub>max</sub> 12.0	M <sub>max</sub> 20.4

## 2.3 Pump

### External gear pump

Coding	Output volume $V_g$ (cm <sup>3</sup> /rev)	No-load flow $Q_0$ (lpm) without load, at 3000 rpm	Operating pressure $p_{max}$ (bar)
11	1.1	3.1	150
13	1.3	3.6	150
16	1.6	4.5	150
21	2.1	5.9	115
27	2.7	7.5	90
32	3.2	8.9	75

## 2.4 Tank size

Coding	Fill volume (l)	Usable volume (l)
02	1.05	0.3*

### DAMAGE

\* If the maximum amount of hydraulic fluid is poured in, the level of hydraulic fluid is above the visible range of the fluid level display (sight glass).

## 2.5 Check valve in line A

Coding	Description
X	Tapped plug, open
223	2/2 directional valve, N/C contact, bi-directional flow, see <a href="#">D 6414</a>
224	2/2 directional valve, N/O contact, bi-directional flow, see <a href="#">D 6414</a>

## 2.6 Check valve solenoid voltage

Coding	Electrical connection	Nominal voltage
N	DIN line connector	12 V DC
P		24 V DC
V		115 V AC 50-60 Hz Rectifier integrated in connector socket
W		230 V AC 50-60 Hz Rectifier integrated in connector socket

see also [D 6414](#)

## 2.7 Additional options

Coding	Description	Document		
H	without options			
M	with options (for details see the table pressure switches / pressure gauges / measurement fittings)			
<b>Pressure switches</b>				
51 EA1	DG 51 E-A 100	D 5440 E/2		
51 EA2	DG 51 E-A 250			
6 E1	DG 61, pressure: 0 to 100 bar	D 5440 F		
6 ER1	DG 61 R, pressure: 0 to 100 bar			
6 E2	DG 62, pressure: 0 to 250 bar			
6 ER2	DG 62 R, pressure: 0 to 250 bar			
7 E1	DG 71, pressure: 0 to 100 bar	D 5440 G		
7 E2	DG 71, pressure: 0 to 250 bar			
<b>Pressure gauge</b>				
	<b>Diameter</b>	<b>Scale range</b>	<b>Connection pin</b>	
9/100	∅ 63	0 to 100 bar	radially downwards	D 7077
9/160	∅ 63	0 to 160 bar	radially downwards	
9/250	∅ 63	0 to 250 bar	radially downwards	
95/100	∅ 50	0 to 100 bar	radially downwards	
95/160	∅ 50	0 to 160 bar	radially downwards	
95/250	∅ 50	0 to 250 bar	radially downwards	
<b>Measurement fitting</b>				
MA 8	Minimes fitting type SMK 20-08 S-PK			D 7077

**i NOTE**  
Pressure switches are used to monitor or control the pressure generator. They can be mounted directly on the pump support.

## 2.8 Connection block

Coding	Description
Without coding	Without
-1/4	G 1/4"



## 2.9 Converter

Coding	Nominal power (kW)	Nominal current (A)
Without coding	Without converter	
07S6K12-1100	0.8	2.6
10S6K12-1100	2.2	5.8

### **i** NOTE

- Connection voltage: 3 x 184 V AC - 550 V AC
- Power frequency: 50/60 Hz  $\pm 2$  %
- Safety function: STO
- Field bus interface: EtherCAT

The converter has an RS485 interface for programming and parameterisation. The converter is parameterised with the COMBIVIS studio 6 from KEB. The PC interface cable can be ordered as an optional extra see Chapter 6.2, "Accessories and spare parts". For detailed information on parameterisation, see [www.keb.de](http://www.keb.de)

### 3.1 General data

<b>Designation</b>	hydraulic power pack
<b>Design</b>	speed-controlled external gear pump
<b>Model</b>	Servo hydraulic power pack
<b>Installation position</b>	Horizontal
<b>Material</b>	Pump support, tank: aluminium Motor: lacquered, RAL 9005 (deep black)
<b>Conformity</b>	<ul style="list-style-type: none"> <li>▪ Declaration of incorporation as per Machinery Directive 2006/42/EC</li> <li>▪ For declarations of conformity for converters and motors see <a href="http://www.keb.de">www.keb.de</a></li> </ul>
<b>Attachment</b>	without connection block: Threaded hole 3 x M6 or 4 x through hole $\varnothing$ 6.6 mm for fastening screw M6 with connection block: Threaded hole 4 x M8
<b>Rotation direction</b>	reversing external gear pump (rotation direction can only be determined by monitoring flow rate)
<b>Speed range (min ... max)</b>	External gear pump: 400 - 3000 rpm
<b>Line connection</b>	Via screwed on connection block, see Chapter 4, "Dimensions"

### 3.2 Hydraulic data

<b>Pressure <math>p_{max}</math></b>	Coding for pump	Pressure
	<b>11</b>	150 bar
	<b>13</b>	150 bar
	<b>16</b>	150 bar
	<b>21</b>	115 bar
	<b>27</b>	90 bar
	<b>32</b>	75 bar
<b>Starting against pressure</b>	The version with a servomotor can start against a pressure of $p_{max}$ .	
<b>Hydraulic fluid</b>	Hydraulic fluid, according to DIN 51 524 Parts 1 to 3; ISO VG 10 to 68 according to DIN ISO 3448 Viscosity range: 10 - 500 mm <sup>2</sup> /s, continuous operation: 10 - 100 mm <sup>2</sup> /s Other media on request	
<b>Cleanliness level</b>	<b>ISO 4406</b> <u>18/15/12</u>	
<b>Temperatures</b>	Surrounding area: 0 to +40 °C, hydraulic fluid: 0 to +60 °C, ensure the correct viscosity range.	

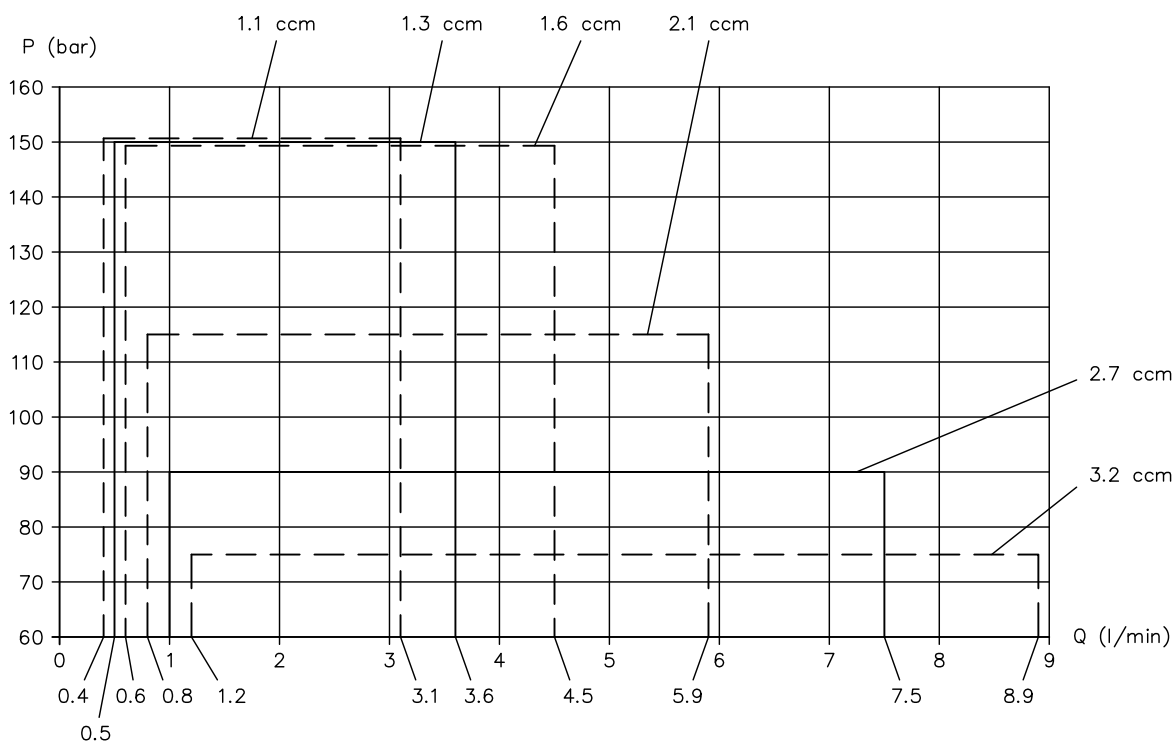
Fill and usable volume	tank fill volume:	1.05 l
	usable volume:	0.3 l

### 3.3 Weight

With TA3S servomotor, without hydraulic fluid:	≈ 11.3 kg
With TA3L servomotor, without hydraulic fluid:	≈ 13.9 kg
Without servomotor, without hydraulic fluid:	≈ 6.3 kg
Converter:	≈ 1.9 kg
Connection block:	≈ 1.0 kg

### 3.4 Characteristic lines

#### Area of application of pump

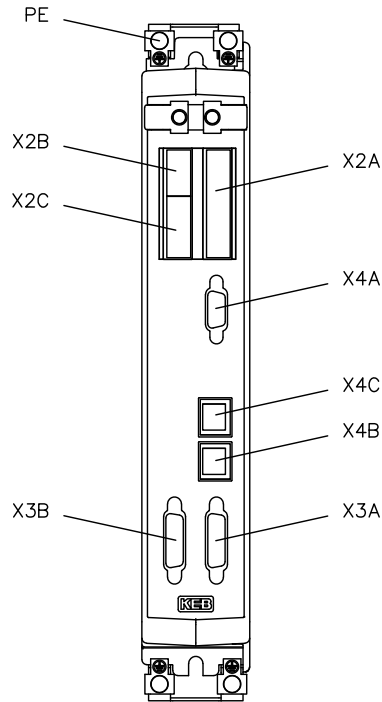


$Q$  flow rate (lpm);  $p$  pressure (bar)

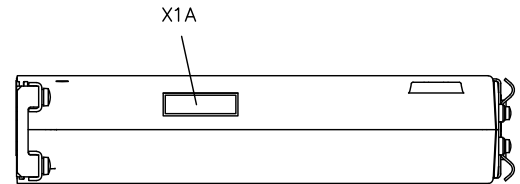
### 3.5 Electrical data

#### Connection

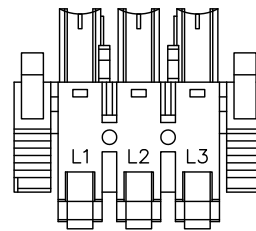
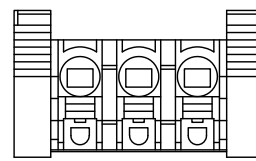
The electrical connection is made in the converter. Connections via optionally available cables including connectors see Chapter 6.2, "Accessories and spare parts". For detailed information on terminal connections, see [www.keb.de](http://www.keb.de)



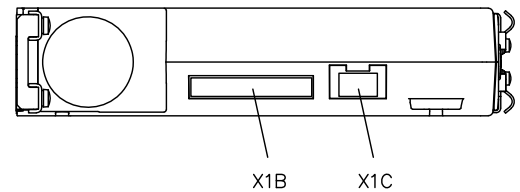
- X2A Control terminal strip
- X2B Safety functions / DC 24 V supply
- X2C CAN bus/analogue inputs and outputs
- X3A Encoder interface, channel A
- X3B Encoder interface, channel B
- X4A Diagnostic interface
- X4B Field bus interface (in)
- X4C Field bus interface (out)
- PE Protective earth/functional earth



X1A Power input



3-phase power supply (400 V devices)  
Cross-section: 0.5 - 2.5 mm<sup>2</sup> AWG 20-14



X1B Motor output/connection for brake resistor  
X1C Temperature monitoring, brake control

#### Protection class

**IEC 60529**

Motor: IP 54

Converter: IP 20

#### Protection class

**IEC 61140**

Motor: I

#### Insulation

**EN 60 664-1**

Converter: Overvoltage category III

#### Insulation material class

Motor: 155 (F)

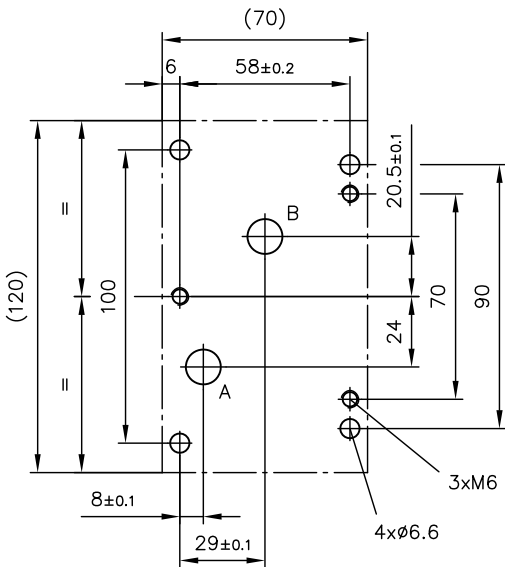
<b>Suppressor</b>	Integrated HF filter in the power section of the converter. As an option, a line choke can be connected upstream see Chapter 6.2, "Accessories and spare parts"
<b>Brake resistor</b>	<p><b>i NOTE</b></p> <p><b>If returning flow rates have to be throttled by the servo hydraulic power pack, an external brake resistor must be used.</b></p> <ul style="list-style-type: none"><li>▪ see Chapter 6.2, "Accessories and spare parts"</li><li>▪ For wiring instructions see <a href="http://www.keb.de">www.keb.de</a></li></ul>

## 4 Dimensions

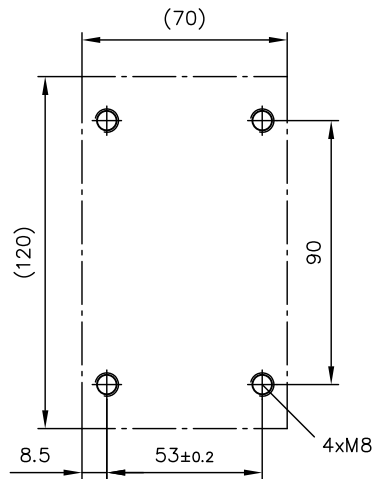
All dimensions in mm, subject to change.

### 4.1 Mounting hole pattern

Version without connection block

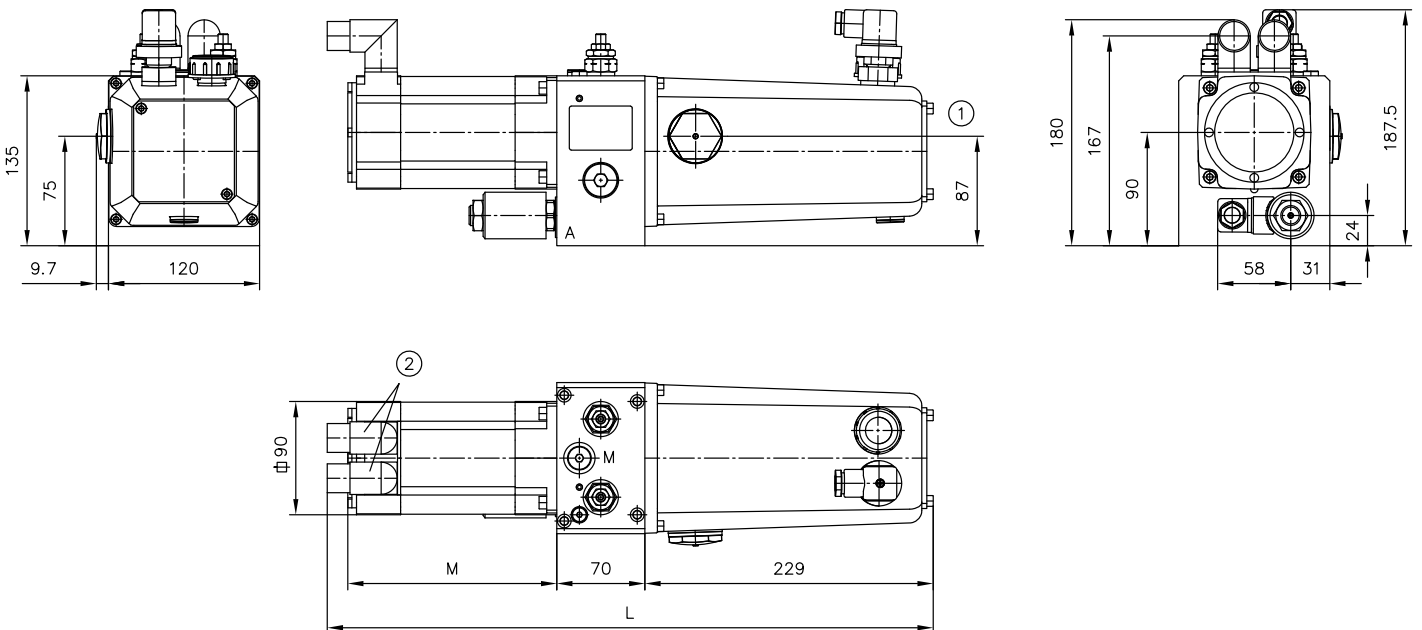


Version with connection block



### 4.2 Hydraulic power pack with mounted servomotor

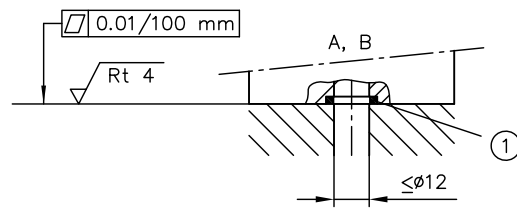
HS 120



- 1 min. oil level
- 2 rotatable by 270°

Coding for motor	M	L
S	161	482
L	261	582

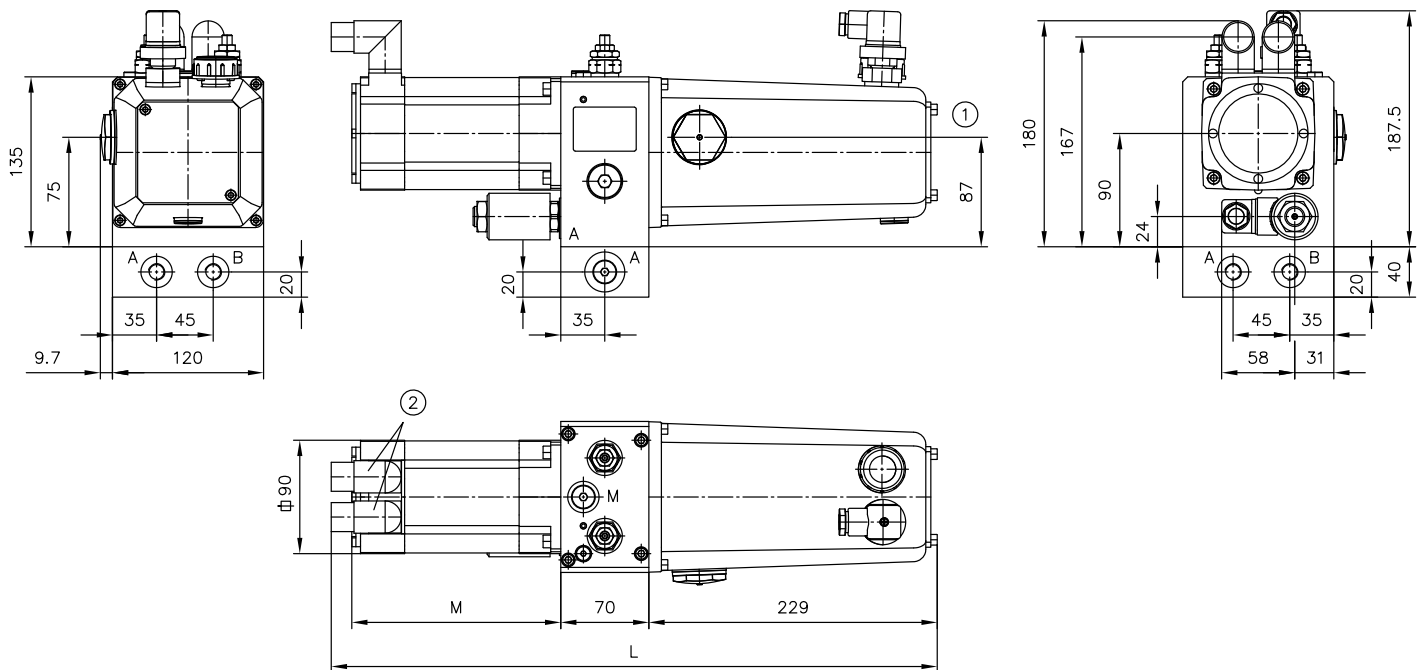
Hole pattern of the base plate



1 O-ring

with connection block

HS 120



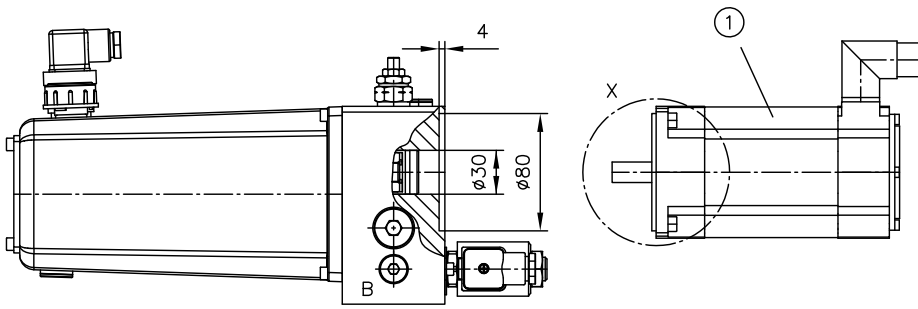
- 1 min. oil level
- 2 rotatable by 270°

Coding for motor	M	L
S	161	482
L	261	582

Connections per  
ISO 228-1

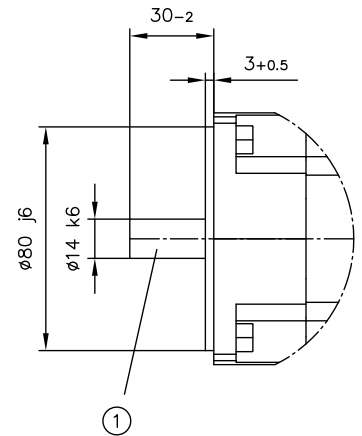
A, B	G 1/4
------	-------

**Motor connection**



1 Motor (as an example)

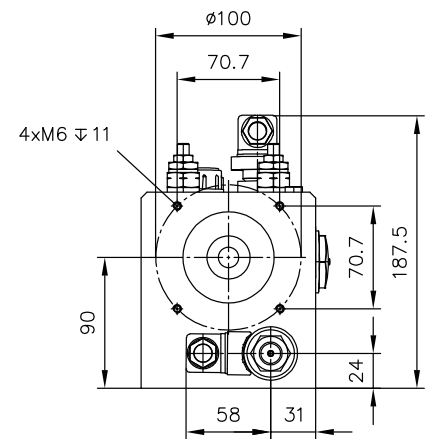
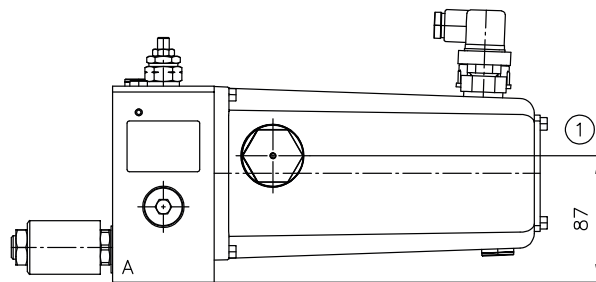
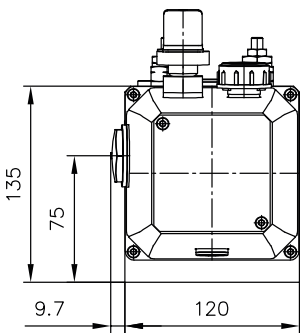
**Detail X**



1 Motor shaft without parallel key

**4.3 Hydraulic power pack without servomotor**

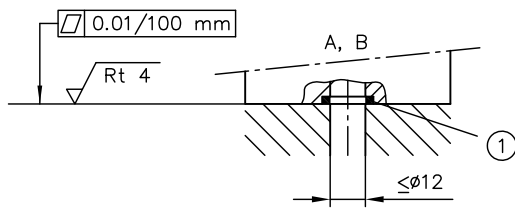
**HS 120**



1 min. oil level



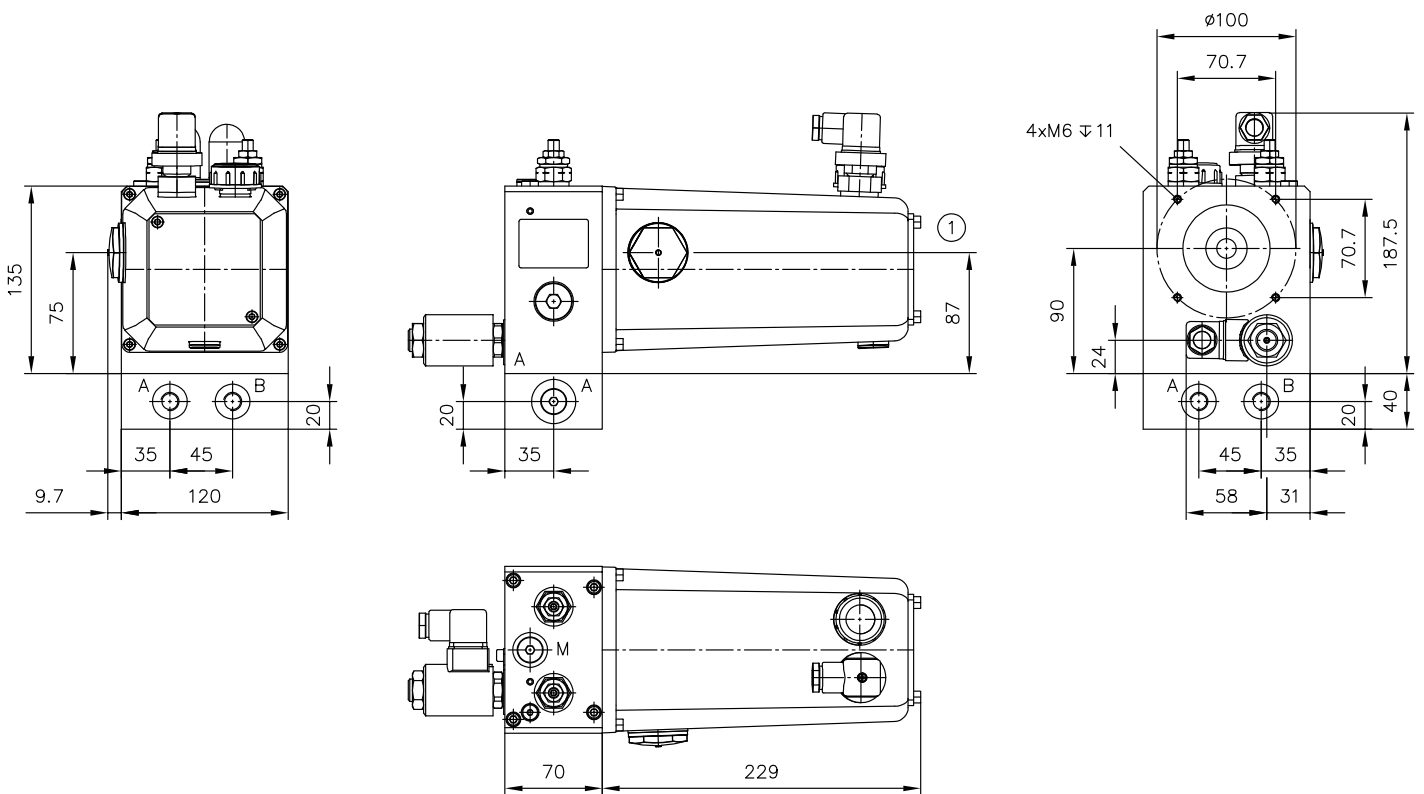
**Hole pattern of the base plate**



1 O-ring

**with connection block**

**HS 120**

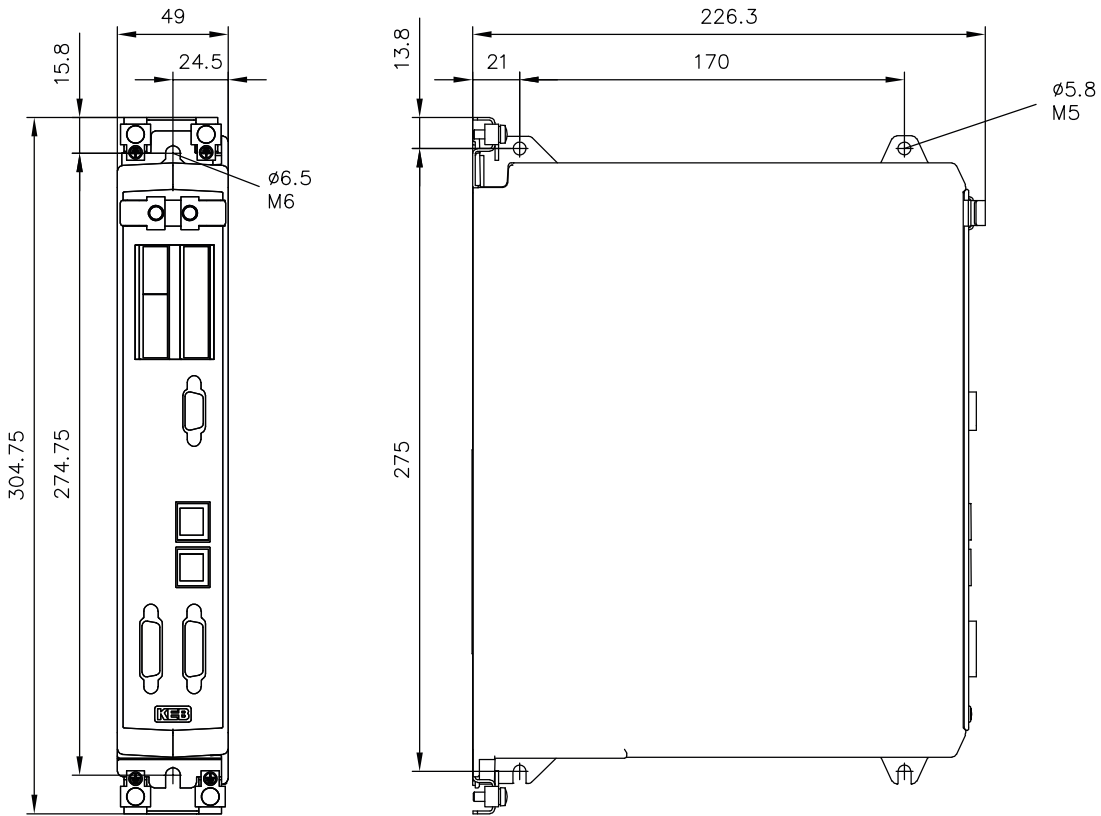


1 min. oil level

**Connections per  
ISO 228-1**

A, B	G 1/4
------	-------

## 4.4 Converter



**5****Installation, operation and maintenance information****! DAMAGE****Reference to other document****Assembly instructions for compact hydraulic power pack type HS: B 6347**

Available for this product: assembly instructions with notes on

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

## 6 Other information

### 6.1 Selection of drive unit

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

When selecting a different drive unit than is suggested in the type code, the following data must be sent to the motor supplier for the design:

- maximum rotation speed  $n_{\max}$  at torque  $M$
- maximum torque  $M_{\max}$  at rotation speed  $n$
- effective torque  $M_{\text{eff}}$  or the cycle data with level and duration of the required pressures including idle times

#### 6.1.1 Actuator

- ▶ Dimensioning and selection of the actuators based on the reaction forces occurring (force and speed)

##### **i** NOTE

##### **Observe reset times of spring-loaded clamping cylinders.**

For clamping fixtures whose operating principle is based on specific periods of time, releasing the spring-loaded clamping cylinder is often more important than the clamping with regard to the time period. Only the forces of the return springs determine the return stroke times here. They move the cylinder pistons, against the flow resistance of directional control valves and pipe lines. This must be observed when dimensioning pipe lines or hose lines and the valves.

#### 6.1.2 Pump

1. Calculation of the flow rates

$$Q_n \left[ \frac{l}{min} \right] = 0,06 \times A_n [mm^2] \times v_n \left[ \frac{m}{s} \right] \quad \text{with } Q_n \text{ (lpm), } A_n \text{ (mm}^2\text{), } v_n \text{ (m/s) - } n \text{ Index of the system volume flow rate, } A \text{ piston face}$$

$$Q_{\max} \left[ \frac{l}{min} \right] = 0,06 \div A_{\max} [mm^2] \times v_{\max} \left[ \frac{m}{s} \right] \quad \text{with } Q_{\max} \text{ (lpm), } A_{\max} \text{ (mm}^2\text{), } v_{\max} \text{ (m/s)}$$

2. Calculation of the operating pressures

$$p_n [bar] = \frac{10 \times F_n [N]}{A [mm^2]} \quad \text{with } p_n \text{ (bar), } F_n \text{ (N), } A \text{ (mm}^2\text{) - } n \text{ Index of the system operating pressure}$$

3. Calculation of the maximum (system) operating pressure

$$p_{\max} [bar] = \frac{10 \times F_n [N]}{A [mm^2]} \quad \text{with } p_{\max} \text{ (bar), } F_{\max} \text{ (N), } A \text{ (mm}^2\text{)}$$

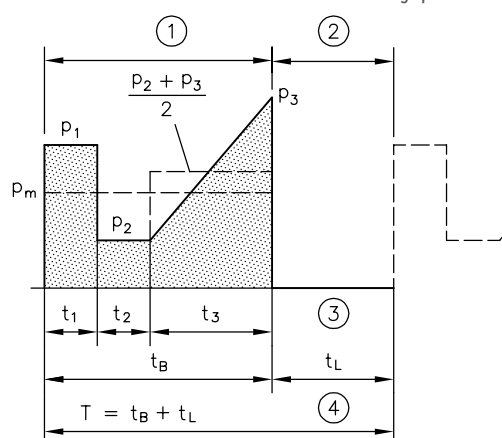
4. Selection of the pump using the p/V diagram, see Chapter 3.4, "Characteristic lines"

- Adhere to the pump limit line
- Observe the permissible pump rotation speed:  $n = 400$  to  $3000$  rpm

### 6.1.3 Determination of the cycle data and calculation of the torques

#### 1. Determine cycle data and prepare functional diagram

- Value and duration of the necessary pressures  $p$  including no-load periods (pauses)



- Loaded period  $t_B$
- No-load period  $t_L$
- No load
- One working cycle

#### 2. Calculation of the torque $M$ of the motor

$p_{eff}$  Effective pressure (bar)

$$p_{eff} \left[ \text{bar} \right] = \sqrt{\frac{p_1^2 \times t_1 + p_2^2 \times t_2 + p_3^2 \times t_3}{T}}$$

$M_{max}$  maximum torque (Nm)

$$M_{max} \left[ \text{Nm} \right] = \frac{V \left[ \frac{\text{cm}^3}{\text{rev}} \right] \times p_{max} \left[ \text{bar} \right]}{62,8 \times 0,8}$$

with  $V$  ( $\text{cm}^3/\text{U}$ ),  $p_{max}$  (bar)

$M_{eff}$  effective torque (Nm)

$$M_{eff} \left[ \text{Nm} \right] = \frac{V \left[ \frac{\text{cm}^3}{\text{rev}} \right] \times p_{max} \left[ \text{bar} \right]}{62,8 \times 0,8}$$

with  $V$  ( $\text{cm}^3/\text{U}$ ),  $p_{eff}$  (bar)

#### **i** NOTE

The moment of inertia of the coupling and pump can be ignored for the motor design.

### 6.1.4 Motor selection

$M_{\text{eff}} < M_{\text{nom}} = 2.6 \text{ Nm}$  TA3S motor (with 07S6K12-1100 inverter)

$M_{\text{eff}} > M_{\text{nom}} = 2.6 \text{ Nm}$  TA3L motor (with 10S6K12-1100 inverter)

**i NOTE**

If no information on the load cycle is available the TA3L motor with the associated converter must be selected. Assignment of the converter as per order coding.

### Use of other drive units

**i NOTE**

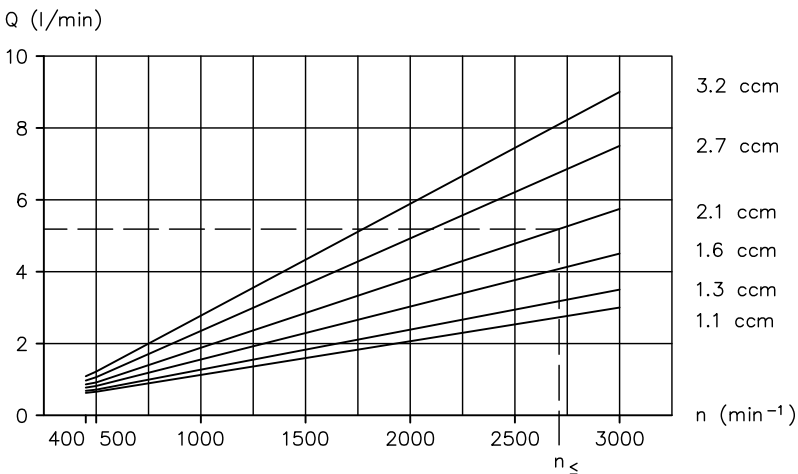
If no information on the load cycle is available, a motor in line with TA3L must be selected.

**i NOTE**

**The maximum rotation speed of the pump must be in the rotation speed range of the motor to be used.**

When using other servomotors, the rotation speed of the selected pump size must be compared with the motor speed in addition to calculating the torques.

- 1 Read maximum achievable rotation speed ( $n_{\text{max}}$ ) from the following diagram
- 2 Compare  $n_{\text{max}}$  with motor rotation speed range



$n$  rotation speed (rpm);  $Q$  flow rate (lpm)

## 6.2 Accessories and spare parts

Motor	Designation	Material number
TA3S	Motor: TA3S	4714 4680-00
	Converter: 07S6K12-1100	6217 0880-00
	Motor cable: 00S4519-0002, length: 2 m	6217 0884-00
	Resolver cable: 00S6L50-1002, length: 2 m	6217 0885-00
	Brake resistor: 10G6A90-4300	6217 0887-00
	Line choke: 07Z1B04-1000	6217 0882-00
	Connector/shielding set: 00S6ZC0-0000	6217 0886-00
	PC interface cable (USB serial converter): 0058060-0040	6217 0888-00
TA3L	Motor: TA3L	4714 4681-00
	Converter: 10S6K12-1100	6217 0881-00
	Motor cable: 00S4519-0002, length: 2 m	6217 0884-00
	Resolver cable: 00S6L50-1002, length: 2 m	6217 0885-00
	Brake resistor: 10G6A90-4300	6217 0887-00
	Line choke: 10Z1B04-1000	6217 0883-00
	Connector/shielding set: 00S6ZC0-0000	6217 0886-00
	PC interface cable (USB serial converter): 0058060-0040	6217 0888-00

**! DAMAGE**

For ordering, please use the material number.

**HAWE Hydraulik SE**

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