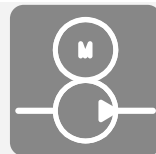
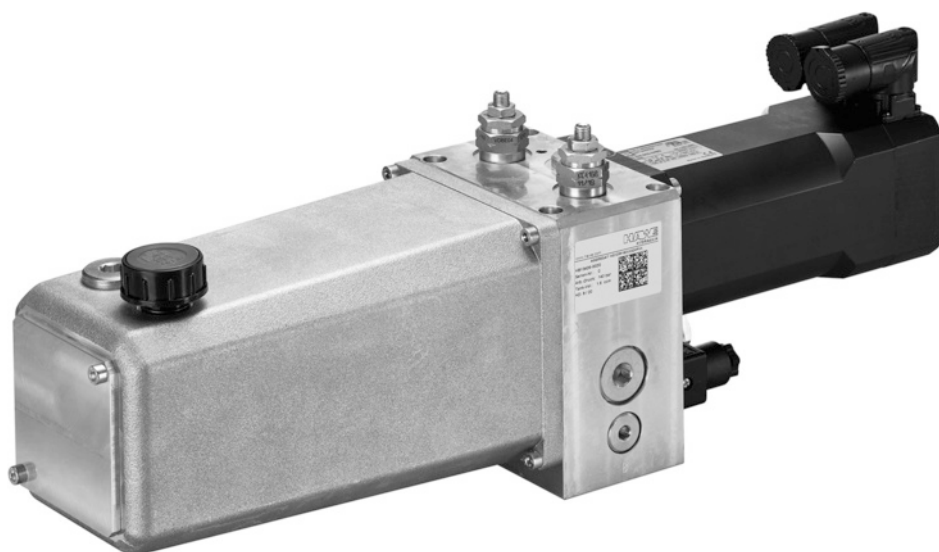


Servo hydraulic power pack type HS 120

Product documentation



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



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1**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.

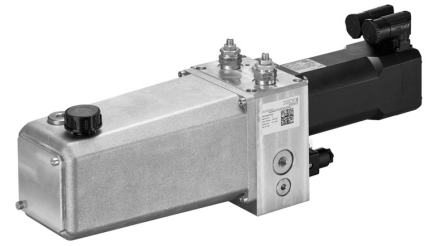
Depending on your application, a number of different motor/frequency converter combinations and pump delivery flow rates are available, as well as different variants of integrated check valve. The tank also features a level/temperature switch.

Features and advantages

- 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

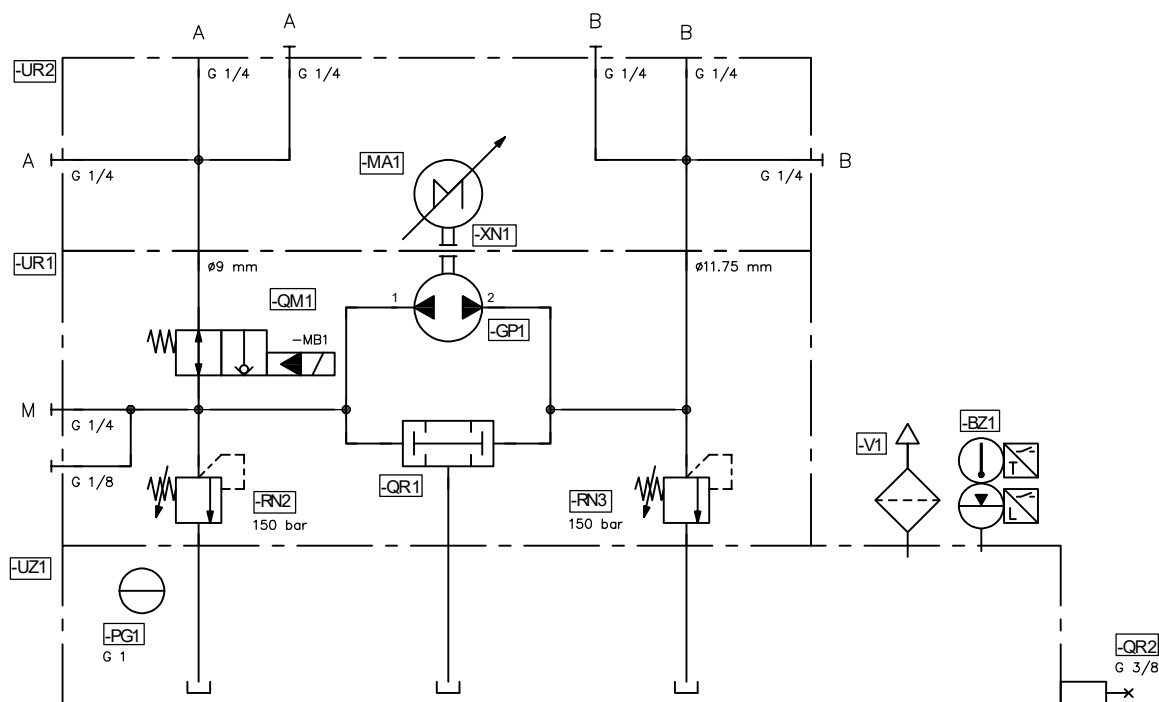
- Injection moulding machines
- Machine tools
- Punches and bending machines
- Leveller machines



Servo hydraulic power pack type HS 120

2 Available versions

Circuit symbol



-UR2, -MA1, -QM1 and -BZ1 optional.

Ordering example

HS 120 R S 16 H 02 K R2U G 24 -1/4 -MA: 51 EA -07S6K12-1100

2.8 "Additional options"

- Pressure switch
- Converter

2.7 "Connection block (UR2)"

2.6 "Solenoid voltage and connector Check valve (MB1)"

2.5 "Check valve in line A (QM1)"

Monitoring

- X = without
- K = level and temperature monitor, N/C contact 60 °C

2.4 "Tank (UZ1)"

Installation position ▪ horizontal

2.3 "Pump (GP1)"

2.2 "Nominal motor voltage and power"

Version ▪ R = Reversible

2.1 "Basic type and size"

2.1 Basic type and size

Type	Version	Flow rate Q_{max} (l/min)	Pressure p_{max} (bar)
HS 120	Reversible	8.9	150

2.2 Nominal motor voltage and power

Motor	Description	Nominal voltage (V)	Rated speed (min ⁻¹)	Nominal power (kW)	Flows (A)	Torques (Nm)
X	Without motor					
S	TA3S	400	3000	0.8	I_0 1.81	M_0 2.9
					I_N 1.62	M_N 2.6
					I_{max} 5.4	M_{max} 8.7
L	TA3L			1.8	I_0 4.0	M_0 6.8
					I_N 3.35	M_N 5.7
					I_{max} 12.0	M_{max} 20.4

2.3 Pump (GP1)

External gear pump

Coding	Flow volume V_g (cm ³ /rev)	No-load flow rate Q_0 (l/min) without load, at 3000 min ⁻¹	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	150
27	2.7	7.5	150
32	3.2	8.9	150

2.4 Tank (UZ1)

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

! NOTICE

* 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 (QM1)

Coding	Description
X	Tapped plug, open
R2	2/2 directional valve type SVNE 8 R2, N/C contact, bi-directional flow, see D 6354/1
S2	2/2 directional valve type SVNE 8 S2, N/O contact, bi-directional flow, see D 6354/1
R2U	2/2 directional valve type SVNE 8 R2U, N/C contact, bi-directional flow, with inductive switch position monitoring, see D 6354/1
S2U	2/2 directional valve type SVNE 8 S2U, N/O contact, bi-directional flow, with inductive switch position monitoring, see D 6354/1

2.6 Solenoid voltage and connector Check valve (MB1)

Coding	Electrical connection	Nominal voltage
G 12	<ul style="list-style-type: none"> ▪ X: without line connector ▪ G: with line connector 	12 V DC
G 24		24 V DC
X 12		12 V DC
X 24		24 V DC

see also [D 6354/1](#)

2.7 Connection block (UR2)

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

2.8 Additional options

Coding	Description		Document
G8 MA	Measurement connection G 1/4-M16 NBR		
Pressure switches type DG			
		Pressure range (bar)	
MA: 51 EA	DG 51 E-A 250	0 to 250	D 5440 E/2
MA: 6 E2	DG 62	0 to 250	D 5440 F
MA: 6 ER2	DG 62 R	0 to 250	
MA: 7 E2	DG 72	0 to 250	D 5440 G
Electronic pressure transducer type DT			
MA: DT 11-250	DT 11-250	0 to 250	D 5440 T/2
MA: DT 11V-250	DT 11V-250	0 to 250	
MA: DT 2-2	DT 2-2	0 to 250	D 5440 T/1
MA: DT 2V-2	DT 2V-2	0 to 250	
Fittings type X			
MA: X MA: X 84	Fitting for pressure gauge and other hydraulic accessories with tapped journal G 1/4 A		D 7077
MA: 9/160	Pressure gauge with damping	0 to 160	

i INFORMATION

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

Converter

Coding	Nominal power (kW)	Nominal current (A)	Accessories
without coding	Without converter		
07S6K12-1100	0.8	2.6	Motor cable: 00S4519-0002, length 2 m Resolver cable: 00S6L50-1002, length 2 m Brake resistor: 10G6A90-4300 Line choke: 07Z1B04-1000 Connector/shielding set: 00S6ZC0-0000
10S6K12-1100	2.2	5.8	Motor cable: 00S4519-0002, length 2 m Resolver cable: 00S6L50-1002, length 2 m Brake resistor: 10G6A90-4300 Line choke: 10Z1B04-1000 Connector/shielding set: 00S6ZC0-0000

i INFORMATION

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

The converter has an RS485 interface for programming and parametrisation. The converter is parametrised with the COMBIVIS studio 6 from KEB. The PC interface cable can be ordered as an optional extra see Chapter 6.2, "Accessories, spare and individual parts". For detailed information on parametrisation, see www.keb.de

3 Parameters

3.1 General data

Designation	hydraulic power pack
Design	speed-controlled external gear pump (GP1)
Model	Servo hydraulic power pack
Installation position	Horizontal
Material	<ul style="list-style-type: none"> ▪ pump housing (UR1), connection block (UR2), tank (UZ1): Aluminium ▪ Motor (MA1): lacquered, RAL 9005 (deep black)
Conformity	<ul style="list-style-type: none"> ▪ Declaration of incorporation as per Machinery Directive 2006/42/EC ▪ For declarations of conformity for converters and motors see www.keb.de
Attachment	<ul style="list-style-type: none"> ▪ without connection block (UR2): Threaded hole 3x M6 or 4x through hole \varnothing 6.6 mm for fastening screw M6 ▪ with connection block (UR2): Threaded hole 4x M8
Rotation direction	External gear pump (GP1), reversing (direction of rotation can be determined by flow control; when looking at the pump shaft journal, a clockwise direction of rotation results in a delivery flow at connection A).
Speed range (min ... max)	<ul style="list-style-type: none"> ▪ External gear pump (GP1): 400 - 3000 min⁻¹
Line connection	via screwed-on connection block (UR2), see Chapter 4, "Dimensions"

3.2 Hydraulic data

Pressure	Coding Pump (GP1)	Pressure p_{max} (bar)
	11	150
	13	150
	16	150
	21	150
	27	150
	32	150

Start against pressure	The version with servomotor (MA1) can start against the pressure p_{max} .
Hydraulic fluid	Hydraulic fluid, according to DIN 51524 Parts 1 to 3; ISO VG 10 to 68 according to DIN ISO 3448 Viscosity range: 10 - 500 mm ² /s Optimal operating range: approx. 10 - 100 mm ² /s Other media on request
Cleanliness level	ISO 4406 21/18/15...19/17/13 D 5488/1
Temperatures	Ambient conditions: 0 to +40°C, hydraulic fluid: 0 to +60°C, ensure the correct viscosity range.
Fill volume and usable volume	<ul style="list-style-type: none"> ▪ Tank fill volume: 1.05 l ▪ Usable volume: 0.3 l

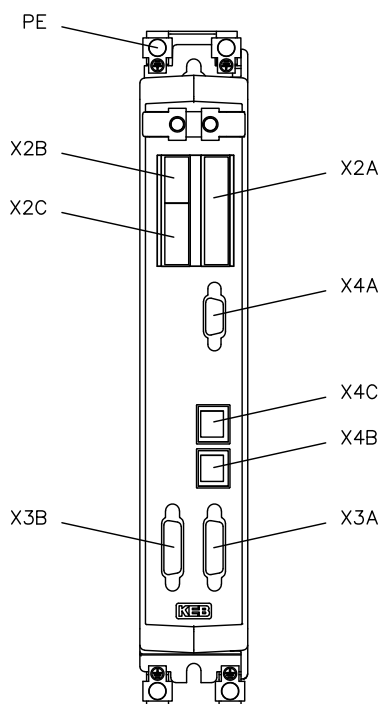
3.3 Weight

with servomotor (MA1), type TA3S, without hydraulic fluid:	≈ 11.3 kg
with servomotor (MA1), type TA3L, without hydraulic fluid:	≈ 13.9 kg
without servomotor (MA1), without hydraulic fluid:	≈ 6.3 kg
Converter:	≈ 1.9 kg
Connection block (UR2):	≈ 1.0 kg

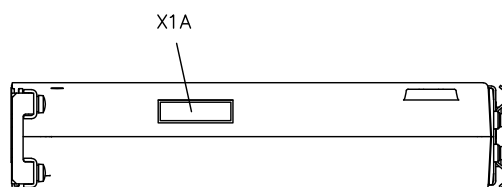
3.4 Electrical data

Connection

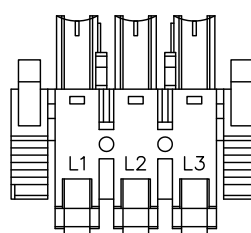
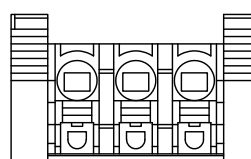
The electrical connection is made in the converter. Connections via optionally available cables including connectors see Chapter 6.2, "Accessories, spare and individual parts". For detailed information on terminal connections, see www.keb.de



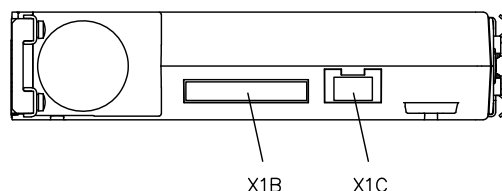
- X2A Control terminal strip
- X2B Safety functions / DC 24 V supply
- X2C CAN bus/analogue inputs and outputs
- X3A Encoder interface, channel A
- X3B Encoder interface, channel B
- X4A Diagnostic interface
- X4B Field bus interface (in)
- X4C Field bus interface (out)
- PE Protective earth/functional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



X1A Power input



3-phase power supply (400 V devices)
Cross-section: 0.5 - 2.5 mm² AWG 20-14



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

Protection class

IEC 60529

Motor (MA1):	IP 54
Converter:	IP 20

Protection class

IEC 61140

Motor (MA1):	I
--------------	---

Insulation

EN 60 664-1

Converter:	Overvoltage category III
------------	--------------------------

Insulation material class

Motor (MA1): 155 (F)

Suppressor

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, spare and individual parts"

Brake resistor

i INFORMATION

If returning flow rates have to be throttled by the servo hydraulic power pack, an external brake resistor must be used.

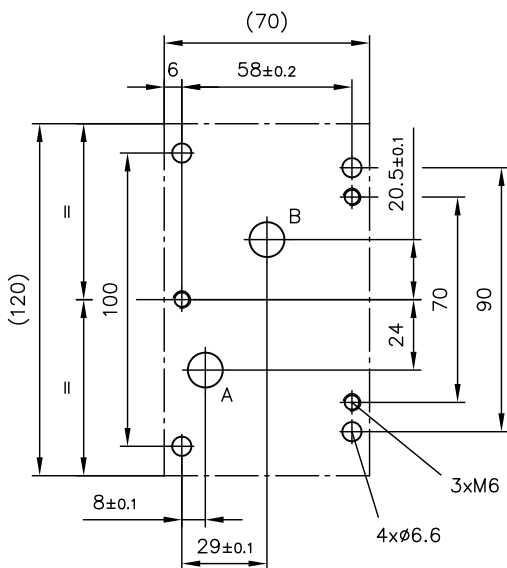
- see Chapter 6.2, "Accessories, spare and individual parts"
- For wiring instructions see www.keb.de

4 Dimensions

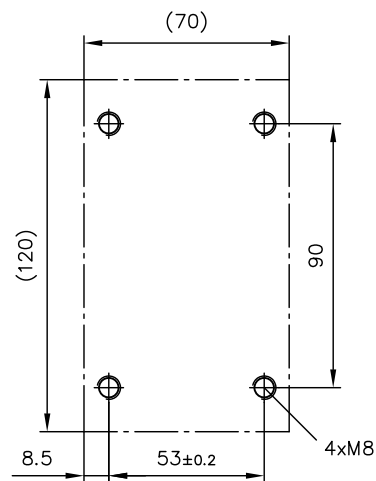
All dimensions in mm, subject to change.

4.1 Mounting hole pattern

Version without connection block (UR2)

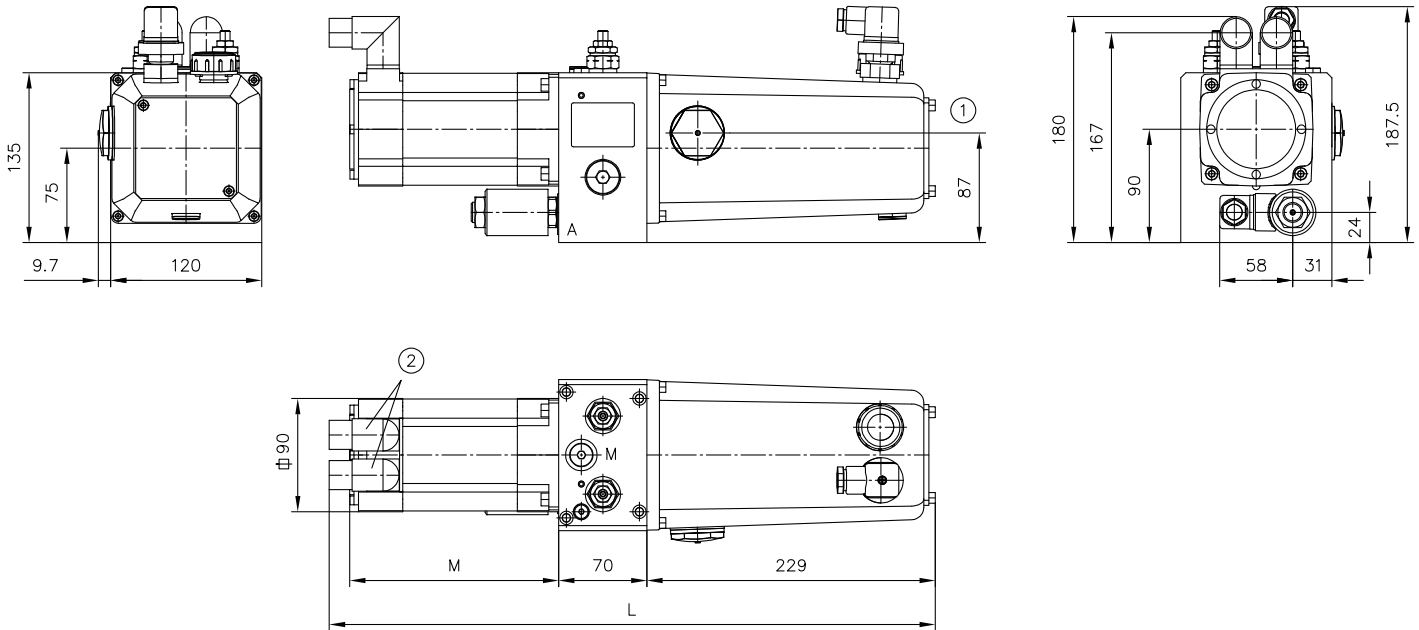


Version with connection block (UR2)



4.2 Hydraulic power pack with fitted servomotor (MA1)

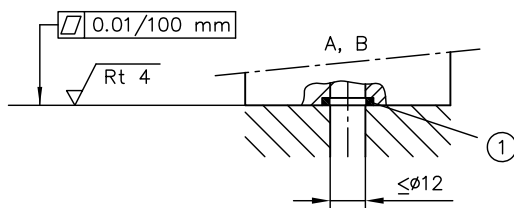
HS 120



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

Coding Motor (MA1)	M	L
S	161	482
L	261	582

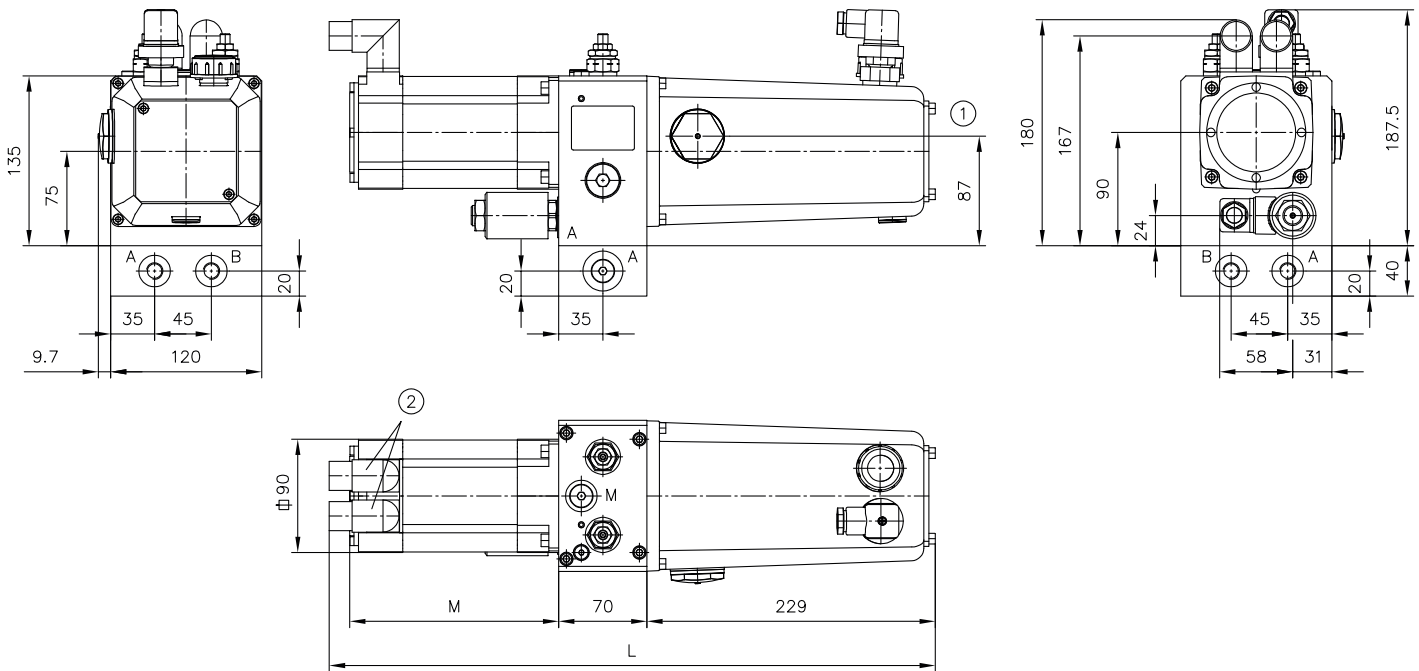
Hole pattern of the base plate



- 1 O-ring

with connection block (UR2)

HS 120

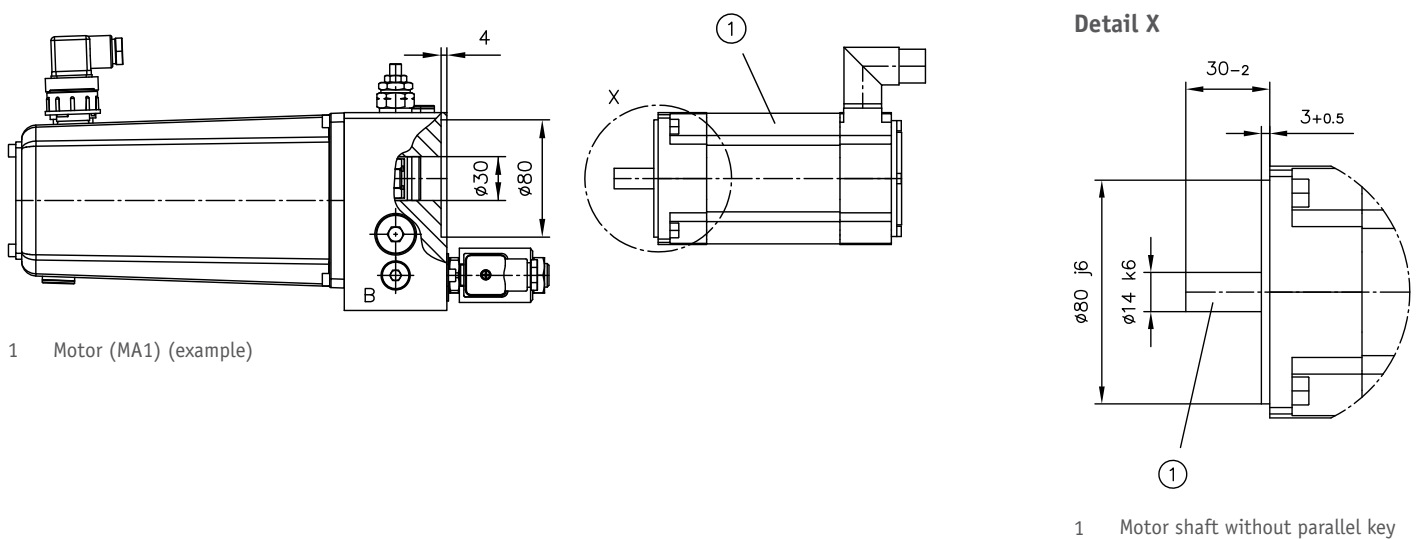


- 1 min. oil level
- 2 rotatable by 270°

Coding Motor (MA1)	M	L
S	161	482
L	261	582

Ports (ISO 228-1)	
A, B	G 1/4

Motor connection

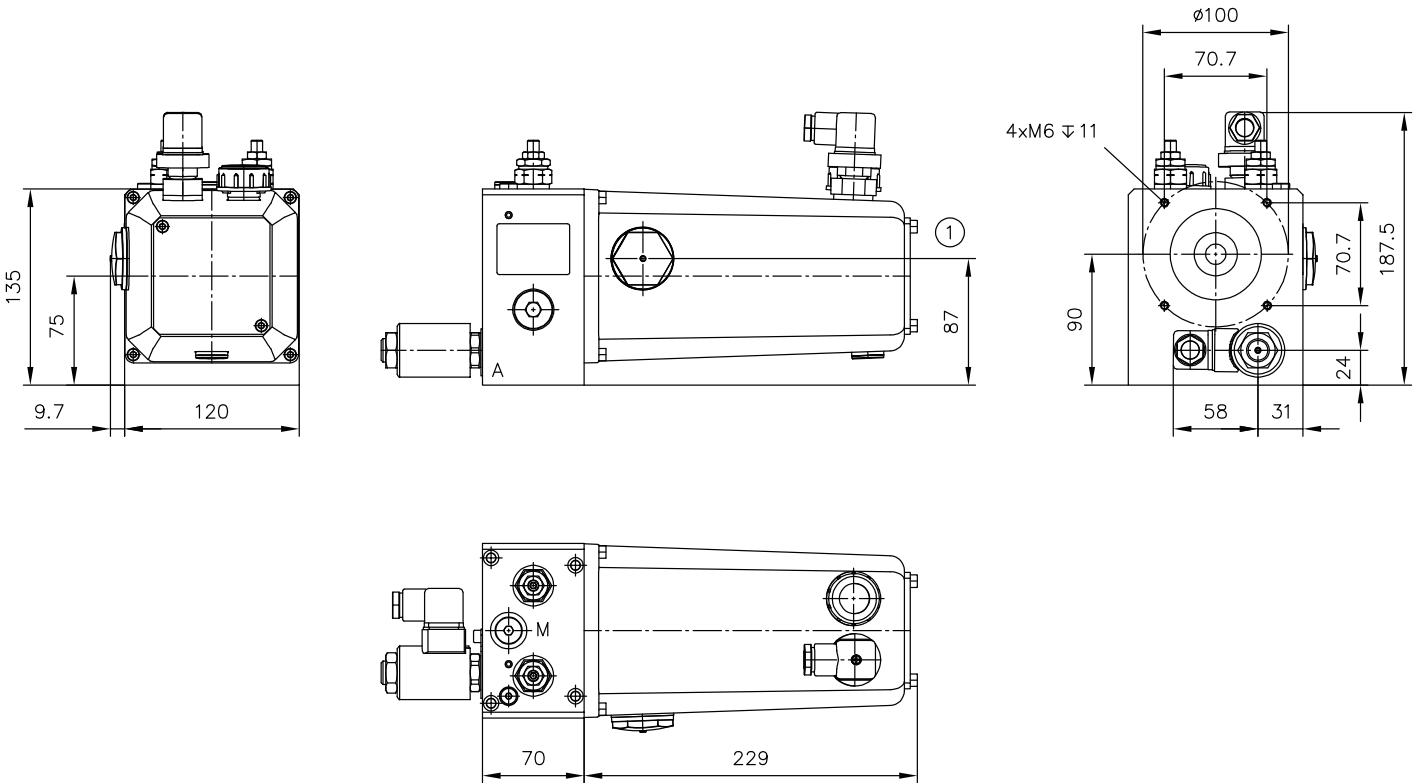


- 1 Motor (MA1) (example)

- 1 Motor shaft without parallel key

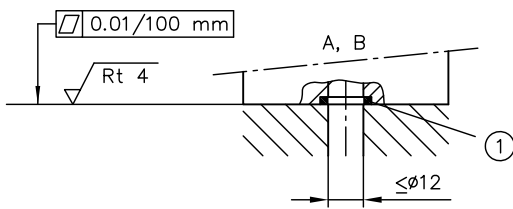
4.3 Hydraulic power pack without servomotor (MA1)

HS 120



1 min. oil level

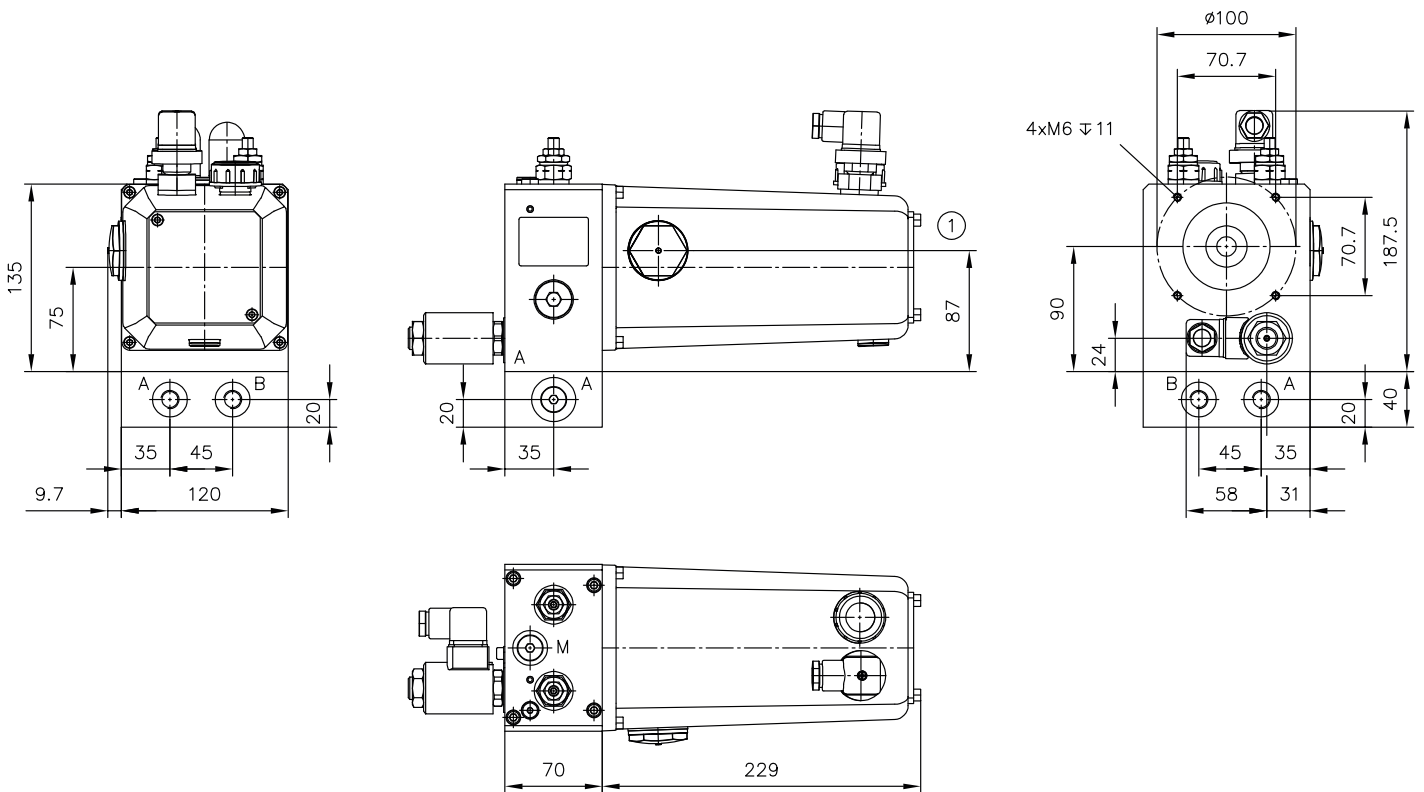
Hole pattern of the base plate



1 O-ring

with connection block (UR2)

HS 120

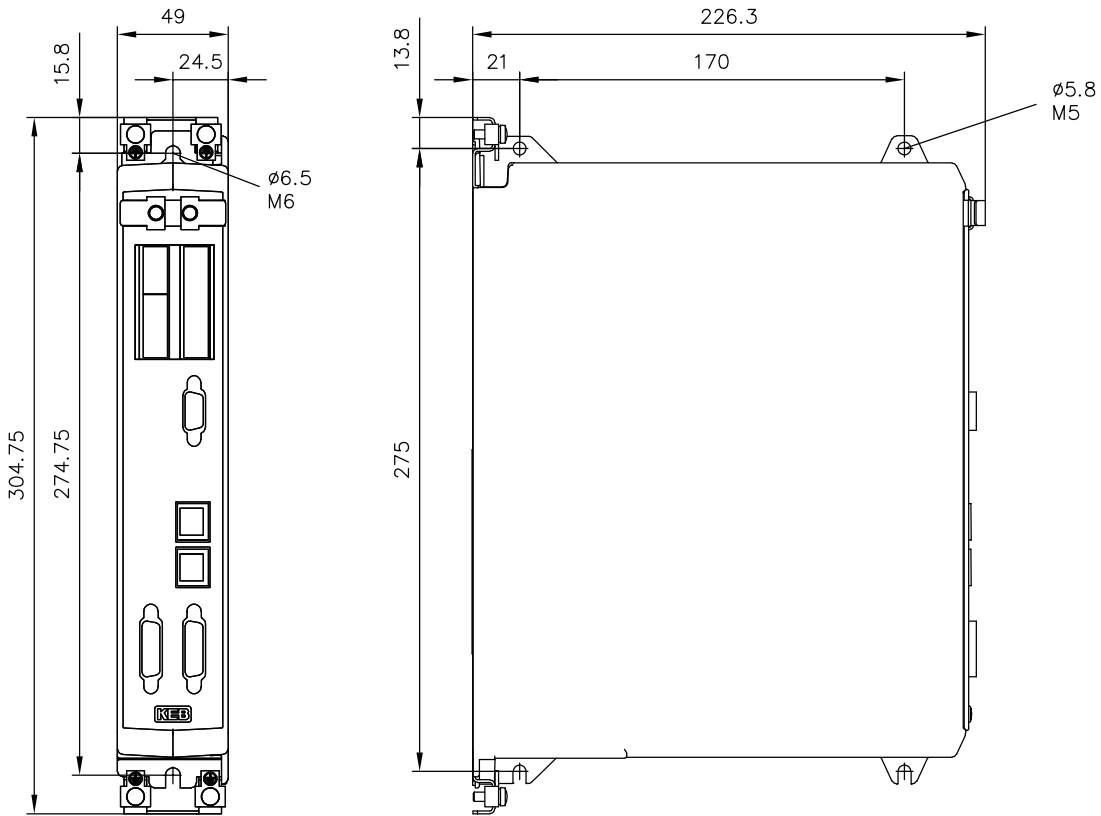


1 min. oil level

Ports (ISO 228-1)

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

4.4 Converter



5**Installation, operation and maintenance information****!** NOTICE**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_{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 INFORMATION

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 (GP1)

1. Calculation of the flow rates

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

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

2. Calculation of the operating pressures

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

3. Calculation of the maximum (system) operating pressure

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

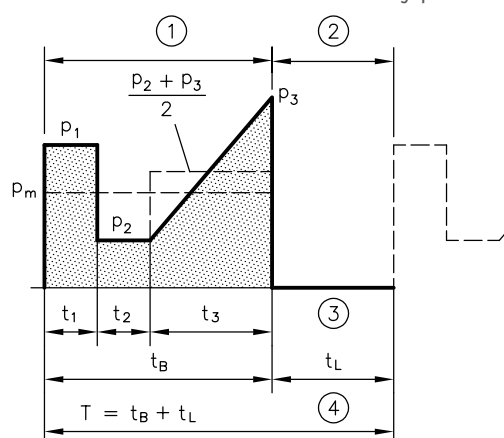
4. Selection of the pump using the n/Q diagram, see Chapter 6.1.4, "Motor selection"

- Observe the permissible pump rotation speed: $n = 400$ to 3000 min^{-1}

6.1.3 Determination of the cycle data and calculation of the torques

1. Determine the cycle data and create a function 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)

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

M_{eff} effective torque (Nm)

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

i INFORMATION

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 **INFORMATION**

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 **INFORMATION**

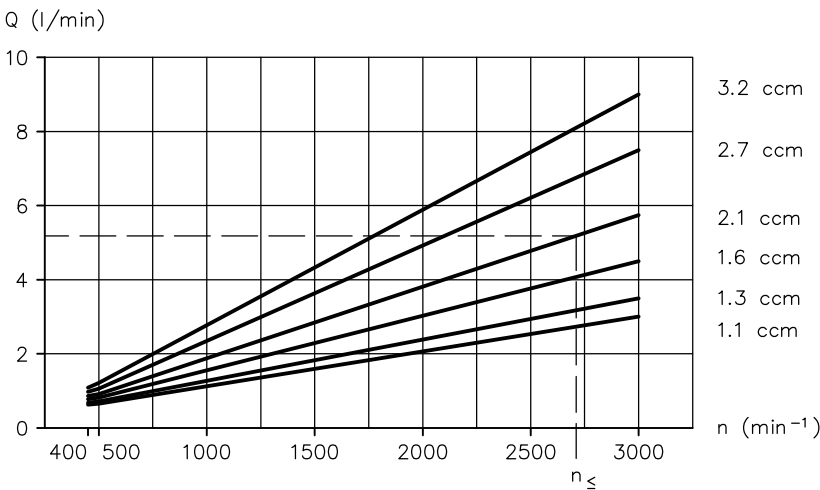
If no information on the load cycle is available, a motor in line with TA3L must be selected.

i **INFORMATION**

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_{max}) from the following diagram
- 2 Compare n_{max} with motor rotation speed range



n rotation speed (min⁻¹); Q flow rate (l/min)

6.2 Accessories, spare and individual parts

Motor (MA1)	Designation	Material number
TA3S	Motor: TA3S V30 ER TW	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 V30 ER TW	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
Sprocket	for coupling	Material number
SPROCKET \ ZKR GS 98 sh-A RED	KC1064B	6285 4013-00
SPROCKET 64 SH-D-H-GS GREEN	3019 5137-00	6285 4014-00

! NOTICE

For ordering, please use the material number.

