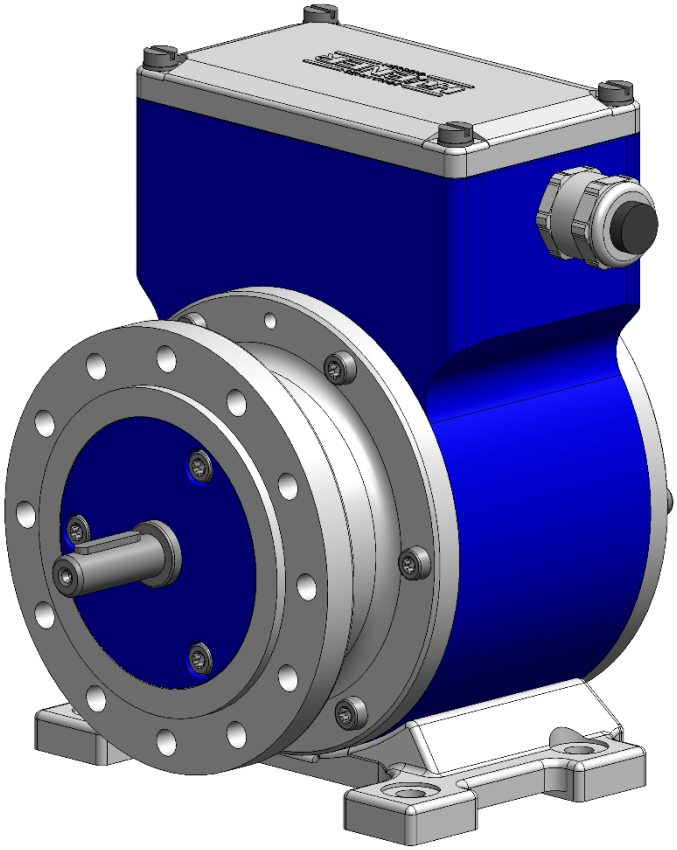
English

JOHANNES HÜBNER GIESSEN

ideas and solutions



Operating and Assembly Instructions

Incremental Encoder FG 40

Read the Operating and Assembly Instructions prior to assembly, starting installation and handling!
Keep for future reference!

Translation of the original Operating and Assembly Instructions
ID-78511-R16

FG40_MANUAL-en_R16(2024-12-16)ID78511.docx

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UL certificates can be requested from us.
An overview of our UL devices can be found at the following link:
https://iq.ulprospector.com/info

UL File Number: E351535

Type	**UL model No.**
FG 40 (solid shaft)	FG 40 K-XXXX
	FG 40 K-XXXX-S
	FG 40 KK-XXXX
	FG 40 L-XXXX
	FG 40 L-XXXX-S
	FG 40 LL-XXXX
FGH 40 (hollowshaft)	FGH 40 K-XXXX
	FGHJ 40 K-XXXX
	FGH 40 K-XXXX-S
	FGH 40 KK-XXXX
	FGHJ 40 KK-XXXX
	FGH 40 L-XXXX
	FGHJ 40 L-XXXX
	FGH 40 LL-XXXX
	FGHJ 40 LL-XXXX

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Subject to errors and changes due to technical improvements.

Directory

1 General

1.1 Information about the Operating and Assembly instructions

These Operating and Assembly Instructions provide important instructions for working with the device. They must be carefully read prior to starting all tasks, and the instructions contained herein must be followed.

In addition, applicable local regulations for the prevention of industrial accidents and general safety regulations must be complied with.

1.2 Scope of delivery

Incremental Encoder FG 40, Operating and Assembly Instructions.

1.3 Explanation of symbols

Warnings are indicated by symbols in these Operating and Assembly Instructions. The warnings are introduced by signal words that express the scope of the hazard.
The warnings must be strictly heeded; you must act prudently to prevent accidents, personal injury, and property damage.

WARNING!
Indicates a possibly dangerous situation that can result in death or serious injury if it is not avoided.

CAUTION!
Indicates a possibly dangerous situation that can result in minor injury if it is not avoided.

CAUTION!
Indicates a possibly dangerous situation that can result in material damage if it is not avoided.

NOTES!
Indicates useful tips and recommendations as well as information for efficient and trouble-free operation.

NOTES!
Do not use a hammer or similar tool when installing the device due to the risk of damage occurring to the bearings or coupling!

DANGER!
Life-threatening danger due to electric shock!
Indicates a life-threatening situation due to electric shock. If the safety instructions are not complied with there is danger of serious injury or death. The work that must be executed should only be performed by a qualified electrician.

1.4 Disclaimer

All information and instructions in these Operating and Assembly Instructions have been provided under due consideration of applicable guidelines, as well as our many years of experience.
The manufacturer assumes no liability for damages due to:

- Failure to follow the instructions in the Operating and Assembly Instructions
- Non-intended use
- Deployment of untrained personnel
- Opening of the device or conversions of the device

In all other aspects the obligations agreed in the delivery contract as well as the delivery conditions of the manufacturer apply.

1.5 Copyright

NOTES!
Content information, text, drawings, graphics, and other representations are protected by copyright and are subject to commercial property rights.
It is strictly forbidden to make copies of any kind or by any means for any purpose other than in conjunction with using the device without the prior written agreement of the manufacturer. Any copyright infringements will be prosecuted.

1.6 Guarantee terms

The guarantee terms are provided in the manufacturer's terms and conditions.

1.7 Customer service

For technical information personnel is available that can be contacted by telephone, fax or email. See manufacturer's address on page 2.

2 Safety

DANGER!
This section provides an overview of all the important safety aspects that ensure protection of personnel, as well as safe and trouble-free device operation.
If these safety instructions are not complied with significant hazard can occur.

2.1 Responsibility of the owner

The device is used in commercial applications. Consequently the owner of the device is subject to the legal occupational safety obligations and subject to the safety, accident prevention and environmental protection regulations that are applicable for the device's area of implementation.

2.2 Intended use

The device has been designed and constructed exclusively for the intended use described here.

Series FG 40 Incremental Encoders are used for measurement of rotations, for instance of electrical and mechanical drives and shafts.

Claims of any type due to damage arising from non-intended use are excluded; the owner bears sole responsibility for non-intended use.

For UL and CSA:

For the use in NFPA 79 applications only.

2.3 Improper use

	**Warning:** This device is not intended for use in residential areas and cannot ensure adequate protection of radio reception in such environments.

Do not use the device in potentially explosive areas.
The device must not be subjected to mechanical loads in addition to its own weight and unavoidable vibration and shock loads that arise during normal operations.

Examples for non-permitted mechanical loads (incomplete list):

- Fastening transport or lifting tackle to the device, for example a crane hook to lift a motor.
- Fastening packaging components to the device, for example ratchet straps, tarpaulins etc.
- Using the device as a step, for example by people to climb onto a motor.

2.4 Personnel

Installation and commissioning as well as disassembly routines must be carried out by skilled technical staff only.

2.5 Personal protective equipment

Wear personal protective equipment such as safety shoes and safety clothing to minimise risks to health and safety when carrying out work such as installation, disassembly or commissioning. Adhere to all applicable statutory regulations as well as the rules and standards determined by the owner.

2.6 Special dangers

Residual risks that have been determined based on a risk assessment are cited below.

2.6.1 Electrical current

DANGER!

Life-threatening danger due to electrical shock!
There is an imminent life-threatening hazard if live parts are touched. Damage to insulation or to specific components can pose a life-threatening hazard.
Therefore:
Immediately switch off the device and have it repaired if there is damage to the insulation of the power supply.
De-energize the electrical equipment and ensure that all components are connected for all tasks on the electrical equipment.
Keep moisture away from live parts. Moisture can cause short circuits.

2.6.2 Rotating shafts / Hot surfaces

WARNING!

Danger of injury due to rotating shafts and hot surfaces!
Touching rotating shafts can cause serious injuries.
Therefore:
Do not reach into moving parts/shafts or handle moving parts/shafts during operation.
Close to protect from injury all access openings in flanges with the corresponding plug screw, and provided you exposed rotating components with protective covers.
Do not open covers during operation. Prior to opening the covers ensure that all parts have come to a standstill.
The encoder can become hot during prolonged use.
In case of contact risk of burns is existing.

2.6.3 Safeguarding against restart

DANGER!

Life-threatening danger if restarted without authorization!
When correcting faults there is danger of the power supply being switched on without authorization.
This poses a life-threatening hazard for persons in the danger zone.
Therefore:
Prior to starting work, switch off the system and safeguard it from being switched on again.

3 Technical Data

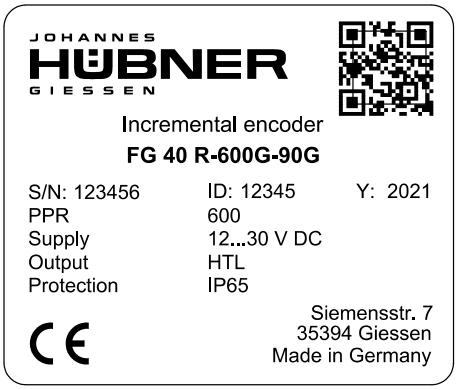
3.1 Type plates

Nameplates for different device variations are shown below

Encoder with one terminal box

Encoder with 2 terminal boxes (redundant version)

Encoder with 2 sinusoidal signals



Encoder with round plug (not UL-listed)

The nameplate and UKCA label are located on the side of the housing.
Nameplate information:

Englisch	Deutsch
Manufacturer, address	Hersteller, Anschrift
Type:Incremental Encoder, Year of manufacture	Typ: Inkrementaler Drehgeber, Baujahr
CE mark	CE-Kennzeichnung
Serial number (S/N)	Seriennummer (S/N)
Pulse rate	Impulszahl
Degree of protection	Schutzart
Supply voltage	Versorgungsspannung
Outputs	Ausgänge
Certification references	Zertifizierungshinweise
QR-Code	QR-Code

3.2 Electrical and mechanical data

3.2.1 For pulse rates (square wave pulses)

Pulse rates	Value
Standard pulse rates	500, 600, 1000, 1024, 1200, 2000, 2048, 2400, 2500
Special pulse rates	4000, 4096, 4800, 5000, 8192, 10000, 12000, 16000, 16384, 20000, 25000, 40000, 50000 (further pulse rates according to customers specification)
Connection data	
Supply voltage	12 V … 30 V DC For UL and CSA Class 2 supplied
No load-current	approx. 50 mA at 24 V
Outputs	Current limited, short-circuit proof push-pull line driver with integrated impedance adaptation for 30 to 140 Ω lines.
Pulse height (HTL)	approx. as supply voltage, output saturation voltage < 0.4 V at I_L 30 mA
Output current	max. 150 mA at 24 V (observe derating)
Internal resistance	75 Ω bei 24 V
Slew rate	200 V / µs with C_L 100 pF
Duty cycle	1 : 1 ± 3 % for standard pulse rates 1 : 1 ± 5 % for special pulse rates up to 25000 pulses
Square wave displacement 0°, 90°	90° ± 3 % for standard pulse rates 90° ± 5 % or special pulse rates up to 25000 pulses
Max. frequency	200 kHz, Higher max. frequency on request
Special output voltage 5V (TTL)	
Pulse height	5V, RS422-compatible (TIA/EIA-Standard)
Supply voltage	12 … 30 V DC (optional: 5 V DC) For UL and CSA Class 2 supplied

3.2.2 Output signals Sine / Cosine

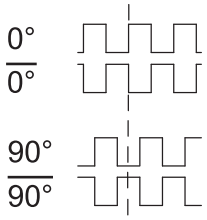
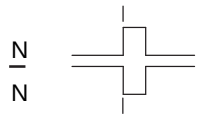
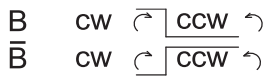
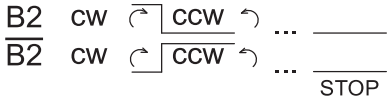
Pulse rates	Value
Standard pulse rates	500, 600, 1000, 1024, 1200, 2000, 2048, 2400, 2500
Connection data	
Supply voltage	5 V … 30 V DC For UL and CSA Class 2 supplied
No load-current	Approx. 120 mA at 5 V, approx. 50 mA at 24 V
Max. frequency	200 kHz, higher max. frequency on request
Output signals	2 sinusoidal signals A and B each with inverted signals Reference pulse with inverted signal Signal amplitude 1 V pp / R_L = 120 Ω Error signal and inverted signal Signal amplitude 5V
Resolution	1024 signal periodes

Duty cycle	1 ± 0,1
Phase shift A, B	90° ± 1°

Protection class acc. to DIN EN 60529	Sealing	Permissible speed	Rotor moment of inertia	Breakaway torque
IP65	Standard	≤ 6000 min $^{-1}$	510 gcm²	6 Ncm
IP66	with labyrinth seal	≤ 6000 min $^{-1}$	580 gcm²	6 Ncm
IP66/IP67	with axial shaft seal	≤ 4000 min $^{-1}$	510 gcm²	8 Ncm
IP66/IP67	with radial shaft seal (for special applications, e.g. wet areas in rolling mills)	≤ 3000 min $^{-1}$	510 gcm²	9 Ncm
(UL and CSA Type 1)				

Encoder temperature ranges		
Standard	0°C… + 70°C	
Special temperature ranges	-25°C… + 85°C -40°C… + 85°C -5°C… + 100°C	For UL/CSA max. +70°C
Vibration resistance	DIN EN 60068-2-6 / IEC 68-2-6 (10 … 2000 Hz)	20 g (=200 m/s²)
Shock resistance	DIN EN 60068-2-27 / IEC 68-2-27 (6 ms)	150 g (=1500 m/s²)
Max. encoder shaft load	$F_{a,\ max.}$ (axial) = 100 N $F_{r,\ max.}$ (radial) = 120 N	
Shaft dimensions	11j6 x 30 mm (standard) 14j6 x 30 mm (optional)	
Weight	Type AK Type K Type KK	approx. 2,8 kg approx. 3,1 kg approx. 3,6 kg

The FG 40 is categorised in Group 1 and Class A in accordance with EN 55011 and is only intended for use in an industrial environment.

Signal outputs	
Basic version Basic channel 0° (A) and pulse channel 90° (B) Internal system diagnostics with error output (ERROR) Each with inverted signals	
Option N Reference pulse (N) mechanically defined; one square-wave pulse per revolution; with inverted signal	
Option 2F Twice as many pulses as basic channel by combining the 0° and 90°channels	
Option B Rapid direction of rotation detection at each edge of the 0° and 90°channels Can be combined with Option F	
Option B2 Rapid direction of rotation detection at each edge of the 0° and 90° channels; additional standstill recognition	
Option B3 Rotation-dependent output signals. This option supports counter cards with separate UP/DOWN pulse inputs. Basic channel signals are issued at option output 1 when rotation is clockwise and at option output 2 when rotation is counterclockwise.	
Option S Electronic overspeed switch with two independently programmable switching points	See separate Operating and Assembly Instructions EGS® 40
Fiber optic option As an alternative to conventional signal transmissions via copper cables encoder signals can also be transmitted via fiberoptic cables.	Max. frequency 100 kHz

The signal sequence 0°, 90° applies for clockwise rotation seen from the drive shaft direction.
To obtain the same signal sequence for counter clockwise rotation the clamp 0°, $\overline{90}$° has to be connected see connection diagram.

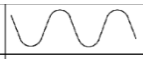
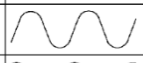
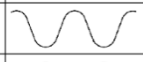
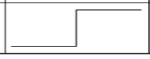
Signal outputs for output signals sine / cosine

Basic channel 0° (A) and pulse channel 90° (B).

Reference pulse (N) mechanically defined; one square-wave pulse per revolution; with inverted signal

Each with inverted signal.

Internal system diagnostics with error output (ERROR).

A+		Ausgang A+	*Output A+*
A-		Ausgang A- Invers	*Output A-* *Inverse*
B+		Ausgang B+	*Output B+*
B-		Ausgang B- Invers	*Output B-* *Inverse*
N+		Ausgang Nullimpuls	*Output Reference*
N-		Ausgang Nullimpuls Invers	*Output Reference* *Inverse*
ERR		Fehlerausgang (Low aktiv)	*Error Output* *(Low activ)*
$\overline{\text{ERR}}$		Fehlerausgang (High aktiv)	*Error Output* *(High activ)*

3.3 Type code

3.3.1 For pulse rates (square wave pulses)

FG	40	K	1024	G	90G	NG	2F	S

Incremental encoder

Series

connections, radial design
K: Terminal box
R: Burndy®-plug
C: Connection cable
L: Fiber optic connection
S: 15-pole EMC industrial plug

KK: 2 terminal boxes, i.e. redundant version or with option S
further combined connections available

connections, axial design
AK: Terminal box
AR: Burndy®-plug
AC: Connection cable

Pulses per revolution

Basic signal output
Basic channel 0° (A)
Pulse channel 90° (B)
Each with inverted signals

NG: Option reference pulse with inverted signal
N2: Reference pulse, mechanically fixed with LED check (red) for display of reference pulse

2F: Option 2F
B: Option B
B2: Option B2
B3: Option B3

S: Option S
Options see pages before

3.3.2 For output signals Sine / Cosine

FG	40	K	1024	S	N

Incremental encoder

Series

connections, radial design
K: Terminal box
R: Burndy®-plug
C: Connection cable
L: Fiber optic connection
S: 15-pole EMC industrial plug

KK: 2 terminal boxes, i.e. redundant version

Resolution
1024 signal periods per revolution

Output signals
2 sinusoidal signals A and B each with inverted signals

NG: Option reference pulse with inverted signal

4 Transport, packaging and storage

4.1 Safety instructions for transport

CAUTION!
Material damage caused by improper transport!
Observe the symbols and information on the packaging:

- Do not throw - risk of breakage
- Keep dry
- Do not expose to heat above 40 °C or direct sunlight.

4.2 Incoming goods inspection

Check delivery immediately upon receipt for completeness and possible transport damage.

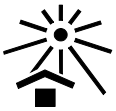
Inform the forwarder directly on receipt of the goods about existing transport damages (prepare pictures for evidence).

4.3 Packaging / disposal

The packaging is not taken back and must be disposed of in accordance with the respective statutory regulations and local guidelines.

4.4 Storage of packages (devices)

Keep dry
Keep packages dry and free from dust; protect from moisture.



Protect against heat
Protect packages from heat above 40 °C and direct sunlight.

If you intend to store the device for a longer period of time (> 6 months) we recommend you use protective packaging (with desiccant).

NOTES!
Turn the shaft of the device every 6 month to prevent the bearing grease solidifying!

5 Mounting and commissioning

5.1 Safety instructions

Personnel

Installation and commissioning must be carried out by skilled technical staff only.

NOTES!

Observe the safety instructions contained in **Chapter 2** when installing or working on the device!

5.2 Technical information

NOTES!

Do not use a hammer or similar tool when installing the device due to the risk of damage occurring to the bearings or coupling!

Ambient temperature

The max. permissible ambient temperature depends on the speed and degree of protection of the device, the signal frequency, the length of the signal cable and the place of installation (please refer to Chapter 3.2).

Degree of protection

To fulfil degree of protection requirements the diameter of the connection cable must correspond to that of the cable gland (please refer to Chapter 11 dimension drawings)!

Deep groove ball bearings

FG incremental encoders are fitted with maintenance-free, greased "for-life" deep groove bearings. Bearings must be changed by the manufacturer only. Opening the encoder renders the guarantee null and void.

Screw retention

We recommend using Loctite® 243 threadlocker (medium strength) on all fastening screws to prevent loosening.

5.3 Required tools

- Spanners: 10 mm, 22 mm, 24 mm
- Allen keys: 2 mm, 3 mm
- Flat-blade screwdrivers:
- Assembly grease
- Loctite® 243 (medium strength threadlocker)

5.4 Mounting preparations

1. Ensure all accessories are available (please refer to Chapter 11 Dimension drawings).

NOTES!
Fastening screws and earth cable are not included in the range of supply.

2. Preparing the place of attachment: Clean the (motor) shaft, centering, bolting surfaces and fastening threads; check for damage. Repair any damage!

5.5 Mounting B5 type (flange) incremental encoders

NOTES!
For a mounting example please refer to dimension drawing HM 09 M 57 263b (Chapter 11.1).

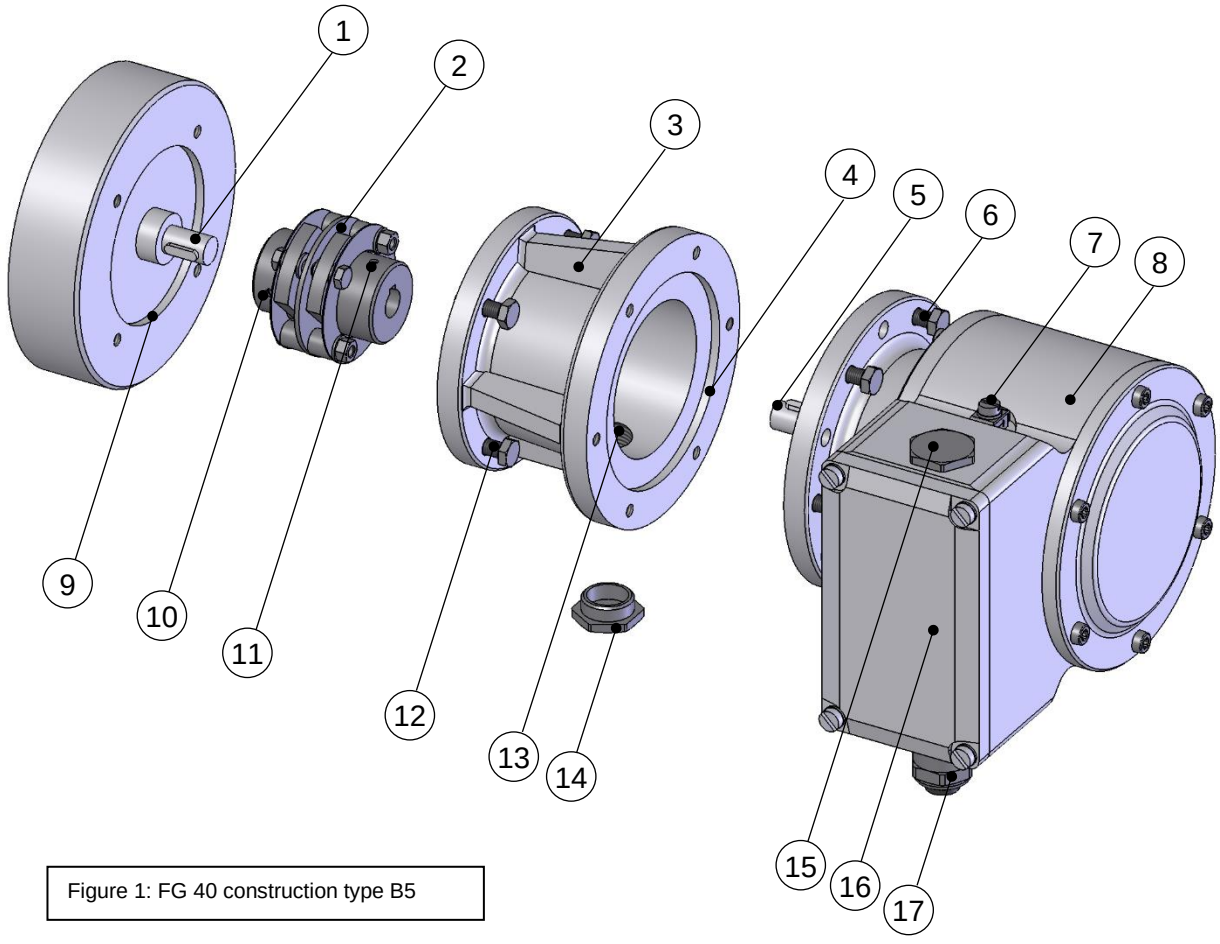


Figure 1: FG 40 construction type B5

1. Lightly grease the (motor) shaft (1) and centering (9).
2. Fit coupling (2) onto (motor) shaft.

NOTES!
You must be able to mount the coupling without force. Ream out the bores of used couplings, if necessary!

3. Secure the coupling hub on the (motor) shat with a grub screw or cheese head screw (10) (depending on the coupling type).
4. Fasten the intermediate flange (3) to the motor using the fastening screws (12).

NOTES!
If possible, fit the intermediate flange in a manner that ensures the screwed sealing plug (14) points downwards!

5. Lightly grease the encoder shaft (5) and centering (4).
6. Fit the encoder (8) into both the centering (4) and coupling hub at the same time.

NOTES!
You must be able to mount the coupling without force. Ream out the bores of used couplings, if necessary!

NOTES!
If possible, fit the device in a manner that ensures the cable gland points downwards Exchange the position of the cable gland (17) and the blanking plug (15), if necessary.

7. Secure the encoder with 4-6 screws (6) evenly distributed around the circumference of the flange.
8. Remove the sealing plug (14) from the access bore (13) to the coupling.
9. Secure the coupling hub on the encoder shaft with a grub screw or cheese head screw (11) (depending on the coupling type).

NOTES!
To carry out this task, it may be necessary to turn the (motor) shaft to the correct position.

10. Replace the sealing plug (14) to seal the access bore to the coupling.

5.6 Mounting B35 type (flange and foot) incremental encoders

NOTES!
B35 type encoders can be attached by means of a flange (B5, please refer to Chapter 5.5) **or** foot (B3):
For a mounting example please refer to dimension drawing HM 09 M 102 240b (Chapter 11.2).

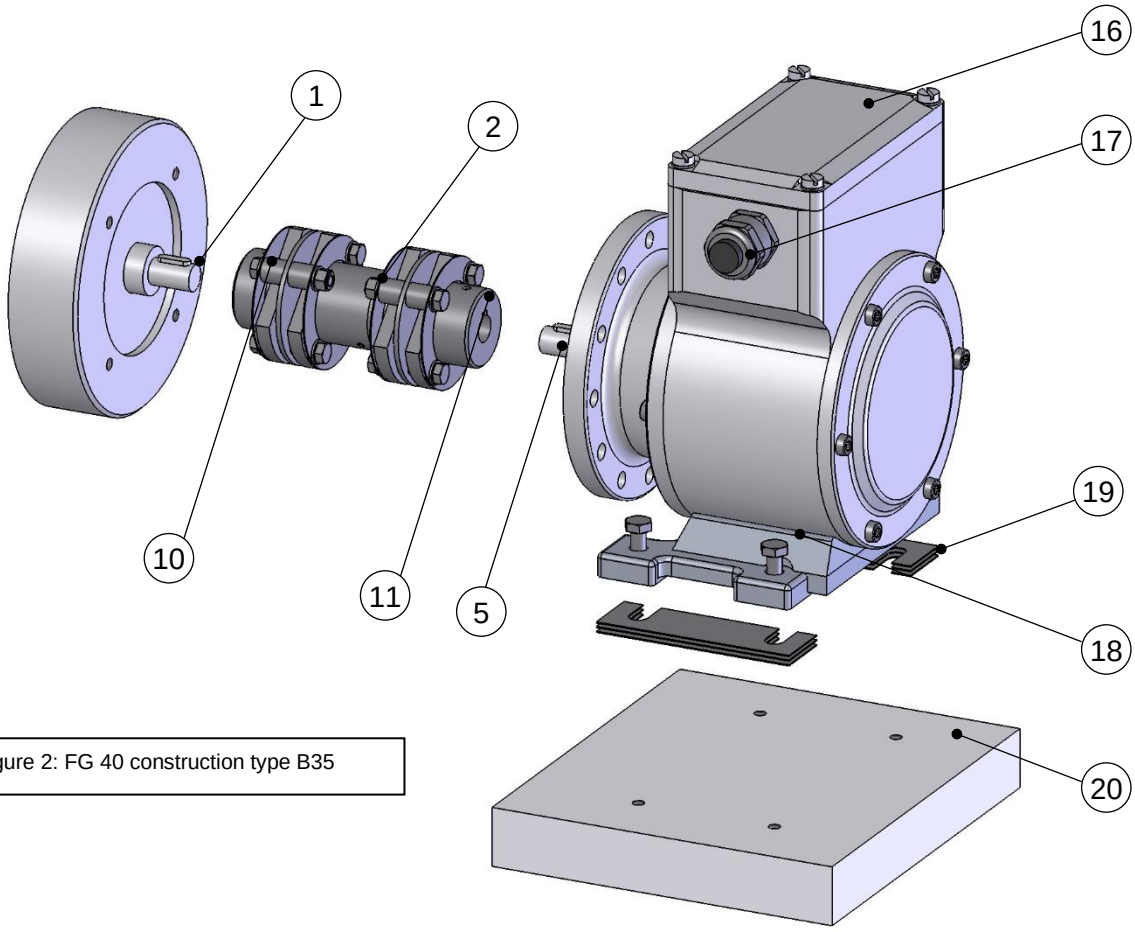


Figure 2: FG 40 construction type B35

1. Lightly grease the (motor) shaft (1).
2. Fit coupling (2) onto (motor) shaft.

NOTES!
You must be able to mount the coupling without force. Ream out the bores of used couplings, if necessary!

NOTES!
We recommend our zero-backlash, torsion-resistant **double-joint coupling HKD5** to attach B35 type encoders. Please refer to the catalogue *Torsion Resistant Couplings for Encoders.*

3. Secure the coupling hub on the (motor) shaft with a grub screw or cheese head screw (10) (depending on the coupling type).

4. Align the encoder shaft (5) to the (motor) shaft and insert into the coupling hub.

NOTES!
Use shims (19) to achieve the correct vertical alignment to the base plate (20).
Observe information in Chapter 5.7about mounting errors and max. permissible mounting tolerances!

5. Fasten encoder foot with 4 M6 hexagon head screws (18).
6. Secure the coupling hub on the encoder shaft with the grub screw or cheese head screw (11) (depending on the coupling type).

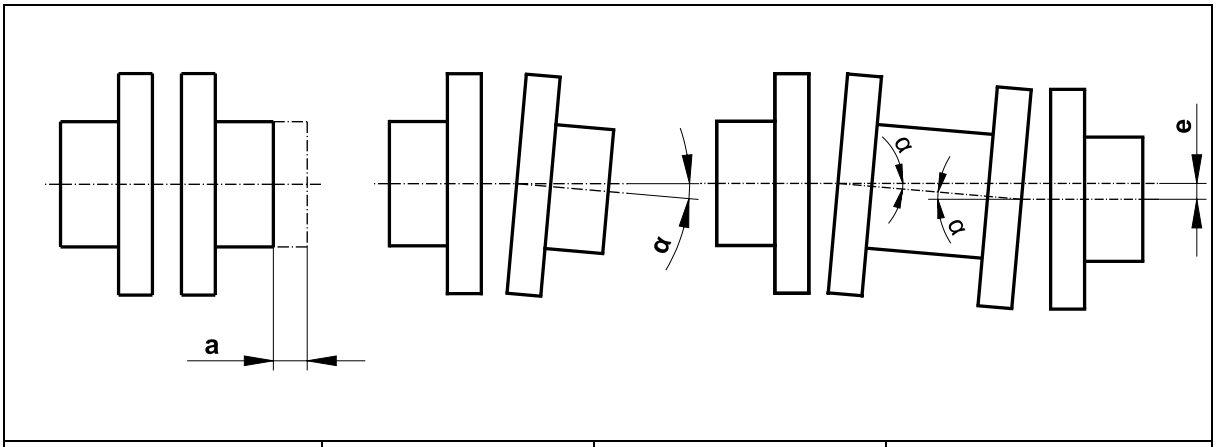
5.7 Mounting tolerances for construction type B5 and B35

NOTES!
Angle misalignment and parallel displacement between the (motor) shaft and the encoder shaft are mounting errors and should be kept as small as possible.

Mounting errors

- Cause radial forces to act on the encoder shaft.
- Reduce the service life of the bearings and the coupling.
- Degrade the quality of the signals (harmonic content).

Mounting tolerances for our zero-backlash, torsion-resistant couplings HK5 and HKD5:



Coupling	Axial offset	Angular error	Parallel offset
HK 5	± 1 mm	0.5°	-
HKD 5	± 1.5 mm	0.5°	0.5 mm

5.8 Attaching additional devices

NOTES!
Encoders in construction type B5/B14 have a second shaft end with integrated coupling half (1) and a B 14 flange (2) on the non-drive end onto which it is possible to fit an additional device with a B5 flange, for example an incremental encoder, absolute shaft encoder or an overspeed switch. A second coupling half with elastomer ring (5, Figure 4), which is available as an accessory, is required to fit an additional device.
Installation example see dimension drawing HM 09 M 102 245 (Chapter 11.5).
This design option makes it possible to combine up to four devices.

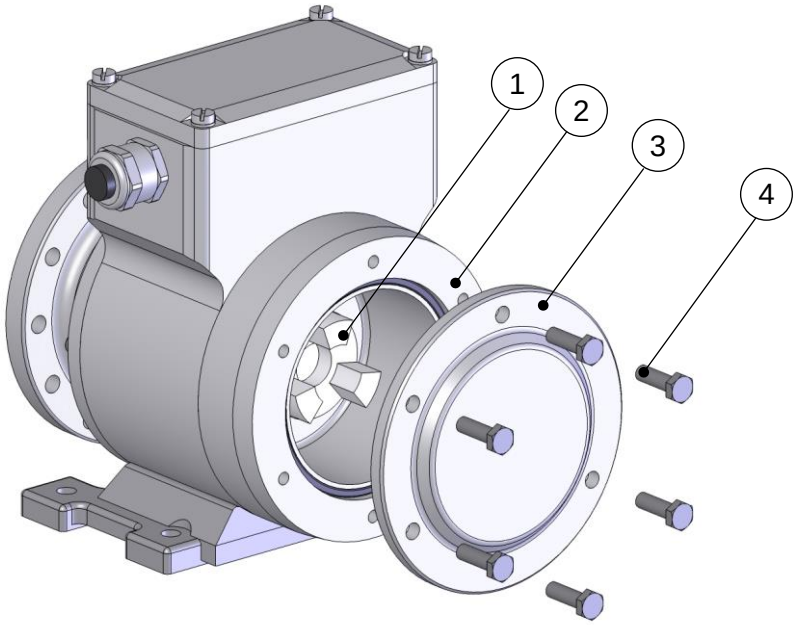


Figure 3:

When supplied ex works the second shaft end is protected by a cover plate (3) secured with 6x M6x20 hexagon head screws (4).

CAUTION!
Do not remove the housing cover secured with Torx screws! These devices are not equipped with a second shaft end.

1. Loosen the hexagon head screws (4).

NOTES!
The fastening screws (4) can be used later to secure the additional device (7).

2. Remove the cover plate (3).

NOTES!
Ensure no liquids or dirt are allowed ingress into the device when the cover plate is removed.
Mount the cover again, if you experience installation delays.

WARNING!
If no second device is added ensure the cover plate is fitted to protect and cover the second shaft end.

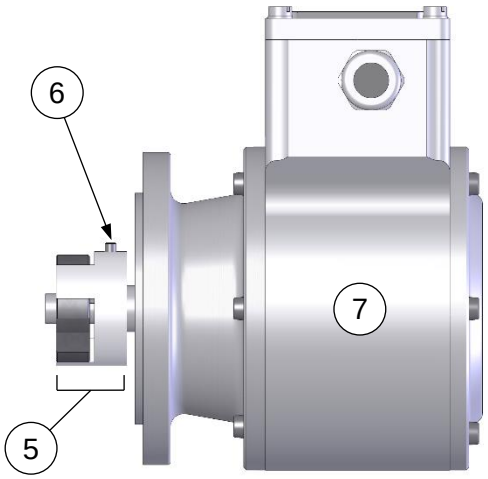


Figure 4:

3. Slide on the coupling half (5) with elastomer ring up to the collar of the shaft of the additional device (7), and secure by tightening the grub screw (6).

NOTES!
The correct distance between both coupling halves has now been set.

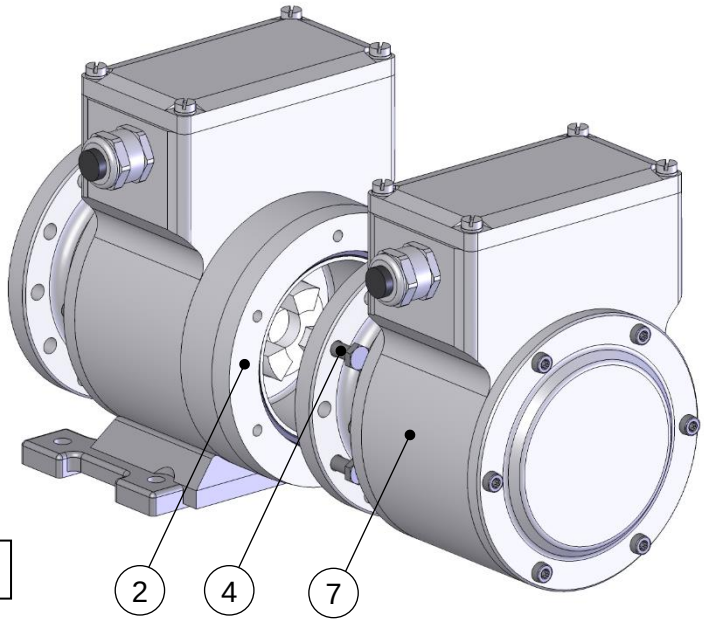


Figure 5:

4. Mount the attachment (7) to the B 14 flange (2) of the rotary encoder.

5. Fix the attachment (7) with 6 x hex bolts M6 x 20 – 8.8. For this step the mounting screws (4) of the cover can be used.

5.9 Installation

5.9.1 General rules

NOTES!

In environments with high drive power, external systems can generate high electromagnetic emissions. Adverse effects on FG 40 operation can be avoided by observing the following guidelines:

- Uninterrupted, low-resistance machine grounding must be ensured across all parts of a plant. Ensure that the connections have good electrical contact. Poor conductivity can be caused, for example, by paint, lubricants, corrosion or similar. In practice, large cable cross-sections are required for low-resistance machine grounding.
- Generous mounting distances must be maintained from actuators with a high energy density, such as contactors, inverters, motors, solenoid valves and brakes.
- Shielding of cables must be carried out professionally, for example between the inverter and motor. Please observe the manufacturer's specifications.
- Inductances of relays, contactors, solenoid valves or brakes should be wired with suppressors. To prevent conducted interference coupling, this is necessary for relays or contactors that are connected directly to the inputs or outputs (IO). To prevent interference coupling via the air path, this also applies to all inductances in the near field of the installation. Suppressors must be connected directly to the coil: RC elements or varistors for operation with alternating current (AC) and freewheeling diodes or varistors for operation with direct current (DC), whereby freewheeling diodes are preferable.
- The FG 40 is operated with low voltage of up to 30 V. To avoid interference coupling via the air path, it is important to plan cable routes with sufficient distance to power lines in accordance with the following diagram. This generally applicable diagram is to be used for all connections **inside** and **outside** control cabinets.

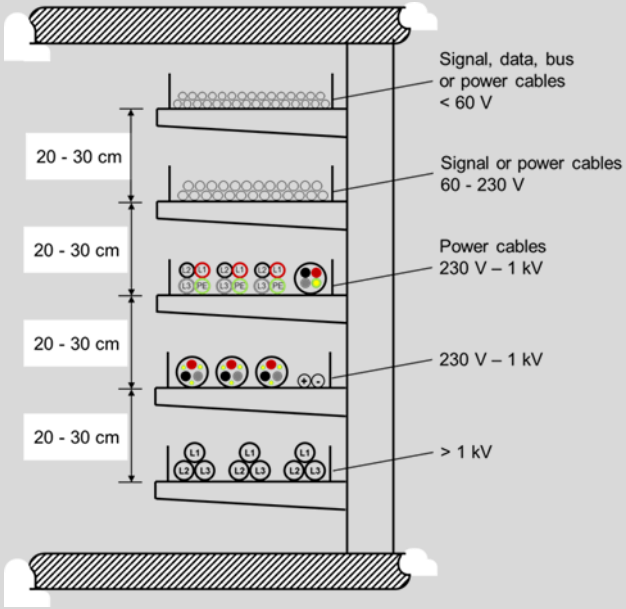


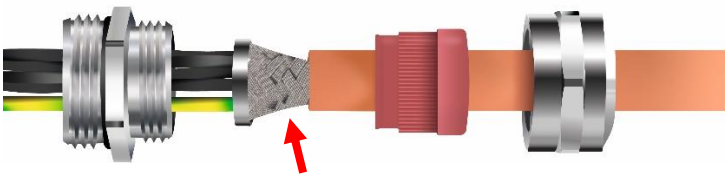
Figure : Scheme for planning cable routes

5.9.2 Connecting

- Sufficient dimensioning of the power supply.
- The conductor cross-section of the power supply cable must be designed so that the maximum voltage drop is less than 3 V. A wire cross-section of 0.75 mm² is recommended. Permissible cable diameter: 6,5…9,5 mm.

  (Cable diameter for UL-listed devices 8…9,5 mm).
- A DC distribution network can comprise considerable cable lengths, which may be subject to interference. It is recommended that the FG 40 is not operated on a heavily disturbed DC distribution network. If necessary, a separate power supply should be provided. To minimize interference, the DC distribution should be connected to the power supply unit in a star configuration and with symmetrical routing of the forward and return conductors (as a “twisted pair” or as a cable).
- A shielded supply cable must be used for the electrical connection. The cable shield must be connected to the machine grounding on both sides. Shield connection terminals must be used to connect the cable shielding to a large surface area in the switch cabinet. The same applies to the shielding of signal cables.
- A cable for connecting to ground potential must be connected to the ground terminal of the FG 40, if not already pre-assembled (max. tightening torque 2.0 Nm).
- A flat grounding strap consisting of fine stranded wire with a minimum cross-section of 6 mm² must be used for grounding.
- The grounding strap must be permanently and permanently connected to a low-impedance, nearby grounding point on the system side. The grounding point must be bare metal, free of paint, non-conductive surface finishes, grease, oil and corrosion. The length of the grounding strap should not exceed 2 m.

5.9.3 Shield contacting for EMC cable gland with cone



Example –Figure: Cable gland with cone

The shield is placed on the cone. The insulation must be removed at this point. The shielding must remain intact in this area and must not be damaged.

5.9.4 Connecting the fiber optic cable

The fiber optic cable is inserted into the terminal box of the FG 40 via the second cable gland and is connected to a ST plug at the fiber optic output. Several sealing inserts for different cable diameters are included with the basic unit for the FO cable gland. The outer sheath of the fiber optic cable must be firmly seated in the sealing insert of the cable gland.
In the terminal box, the fiber optic cable without an outer sheath must be laid in a loop without kinks.

Figure: Fiber optic cable and supply cable in the terminal box of the FG 40

For fixed cable installations, either a non-slotted or a slotted sealing insert in the sizes 2 x 3 mm, 1 x 5...8 mm, 1 x 7...10.5 mm can be used in the cable gland of the fiber optic cable. The non-slotted sealing insert requires a tool to fit the ST plug due to the narrow internal diameter. Slotted sealing inserts enable device installation with pre-assembled fiber optic cables.

ATTENTION!

UL-/CSA-conformity is only given for the non-slotted sealing insert (pre-assembled). When using a slotted sealing insert (enclosed), the UL-/CSA test mark must therefore be covered with the enclosed sticker.

5.10 Electrical connection and start up

NOTES!
You must observe applicable EMC guidelines when routing cables!

NOTES for UL and CSA!
Do only use copper cables!

5.10.1 Preparing cables

1. Strip cable insulation.

2. Crimp wire-end ferrules.

5.10.2 Electrical connection

1. Open the terminal box cover (16, Fig.1).

CAUTION!
Do not allow moisture to enter the terminal box when the cover is open!

2. Remove the cap of the cable gland (17, Fig. 1).

3. Feed the cable into the terminal box trough the cable gland.

NOTES!
The signal cable shielding can be connected directly to the housing via the EMC cable gland. A coil spring integrated in the cable gland ensures all-round contact is made with the bare cable shielding to ensure a good shield connection. This type of shield connection should be preferred.

Alternatively, if equipotential boning currents are anticipated it is possible to connect the cable shielding to a shield terminal in the terminal box. A capacitor between the shield terminal and the encoder housing prevents the flow of equalizing current.

To achieve an effective shielding the cable shield must also be connected in the electrical cabinet.

4. Tighten the cable gland and blanking plugs using a spanner.

NOTES!
Prior to delivery cable glands and blanking plugs are tightened finger tight only. To ensure that the terminal box is reliably sealed tighten all cable glands and blanking plugs before starting up for the first time.

5. Use a spanner to tighten the cable gland until the cable is securely clamped and properly sealed.

NOTES!
Prevent lateral pulling forces acting on the cable and plugs so as not to impair the degree of protection of the cable gland.

6. Connect the supply voltage and signal cable (please refer to the connection diagrams, Chapter 11).

CAUTION!
Do not apply supply voltage to the signal outputs, as this will destroy the device!

7. Applicable to alternative shield connection only: fit cable lug to cable shield and connect to the shield terminal (please refer to the connection diagrams, Chapter 12).

NOTES!
To achieve a good shielding effect the cable shield be kept as short as possible.

8. Close the terminal box cover.

NOTES!
Before closing the terminal box cover check and if necessary clean both seal surfaces and the gasket.

CAUTION!
Ensure when closing the terminal box cover that no cable becomes jammed.

9. Secure earth cable to earth terminal (7).

6 Dismantling

6.1 Safety instructions

Personnel

Dismantling must be carried out by skilled technical staff only.

WARNING!

Observe the safety instructions contained in **Chapter 2** when inspecting or working on the device!

NOTES!

Do not use a hammer or similar tool when installing the device due to the risk of damage occurring to the bearings or coupling!

6.2 Dismantling the encoder

Remove all electrical cables from the device before dismantling. To dismantling the encoder follow the instructions given in Chapters 5.5 and 5.6 or 5.8 in the reverse order.

7 Faults

7.1 Faults table

Faults	Possible cause	Remedy
Moisture in the terminal box	Soiled terminal box gasket or seal surfaces	Clean terminal box gasket and seal surfaces
	Damaged terminal box gasket	Replace terminal box gasket
	Cable gland/blanking plug not tightened	Tighten cable gland/blanking plug
	Unsuitable cable for cable gland	Use suitable cable and cable glands
No output signals	Supply voltage not connected	Connect supply voltage
	Connection cable reversed	Wire correctly
Output signals subject to interference	Unsuitable cable	Use data cable with conductors arranged as twisted pairs and common shield
	Cable shield not connected	Connect cable shield at both ends
	Cable routing not EMC compliant	Observe applicable EMC guidelines when routing cables
Signal interruptions	Signal end stage overloaded	Check pin assignment; observe connection diagram
		Do not assign unused outputs
	Outputs short-circuited	Do not connect outputs with supply voltage or GND
Contact Hübner-Service (page 2) if none of the remedies listed above provides a solution)!		

8 Inspections

8.1 Safety instructions

WARNING!

Skilled technical staff only are permitted to inspect the device and its installation.

Observe the safety instructions contained in **Chapter 2** when inspecting or working on the device!

8.2 Maintenance information

The device is maintenance-free. However, to guarantee optimum fault-free operations we recommend that you carry out the following inspections.

8.3 Inspection schedule

Interval	Inspections
Yearly	Inspect the coupling for damage and ensure it is free of play
	Ensure the fastening screws are properly tightened
	Ensure cable connections and connection terminals are securely seated
Following approx 16 000 … 20 000 hours of operation / higher levels of continuous load	Check deep groove ball bearings are running smoothly and listen for running noises

9 Disposal

9.1 Disposal procedure

The manufacturer is not obliged to take back the device.

The device is classed as electronic equipment and subject to the WEEE Directive; observe local, country-specific laws when disposing of the device.

For information on environmentally sound disposal please contact your local authority or a specialist disposal company.

10 Replacement parts

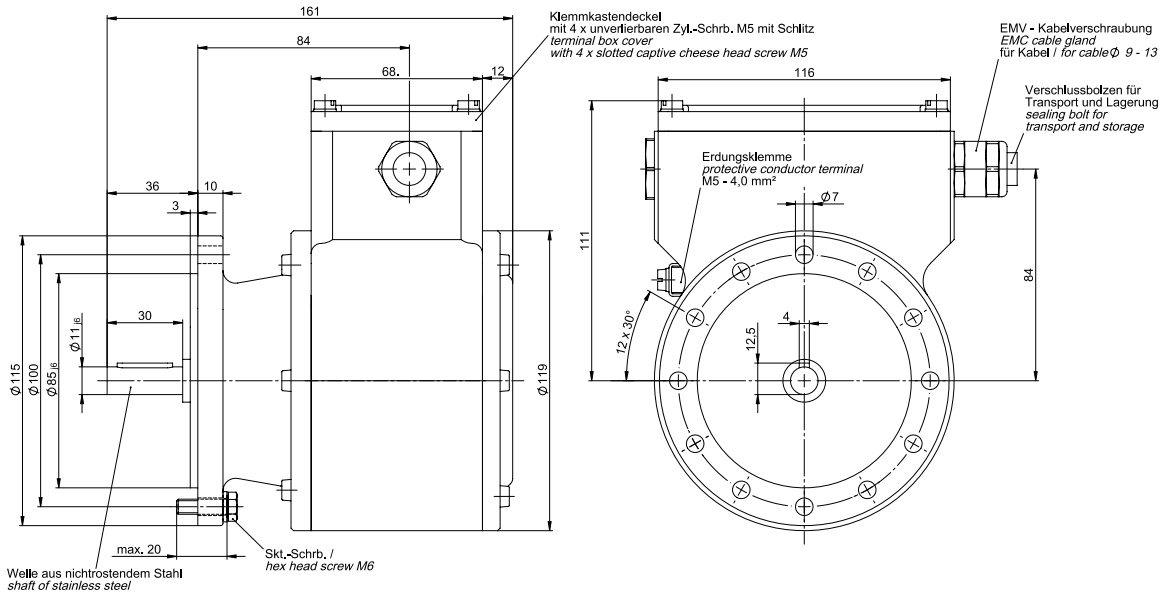
The replacement parts listed below can be obtained via the service address on page 2.

Replacement parts	Comment
Cover	Cover for the 2nd shaft end or for the hollow shaft bore (gAS)
Cable gland	M 20 x 1.5
Terminal box cover	Including flat seal and screws
Feather key	Specify shaft dimensions or feather key dimension
Programming cable and software	
Screw plug	For closing the access to the coupling

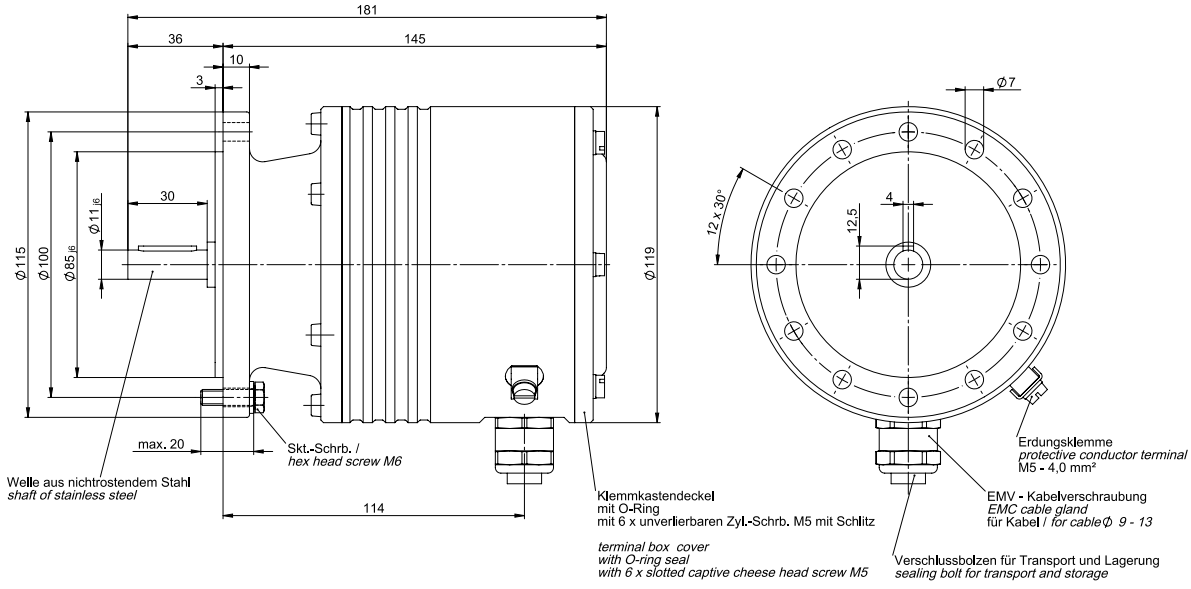
11 Dimension drawings

Further dimension drawings on our website or on request.

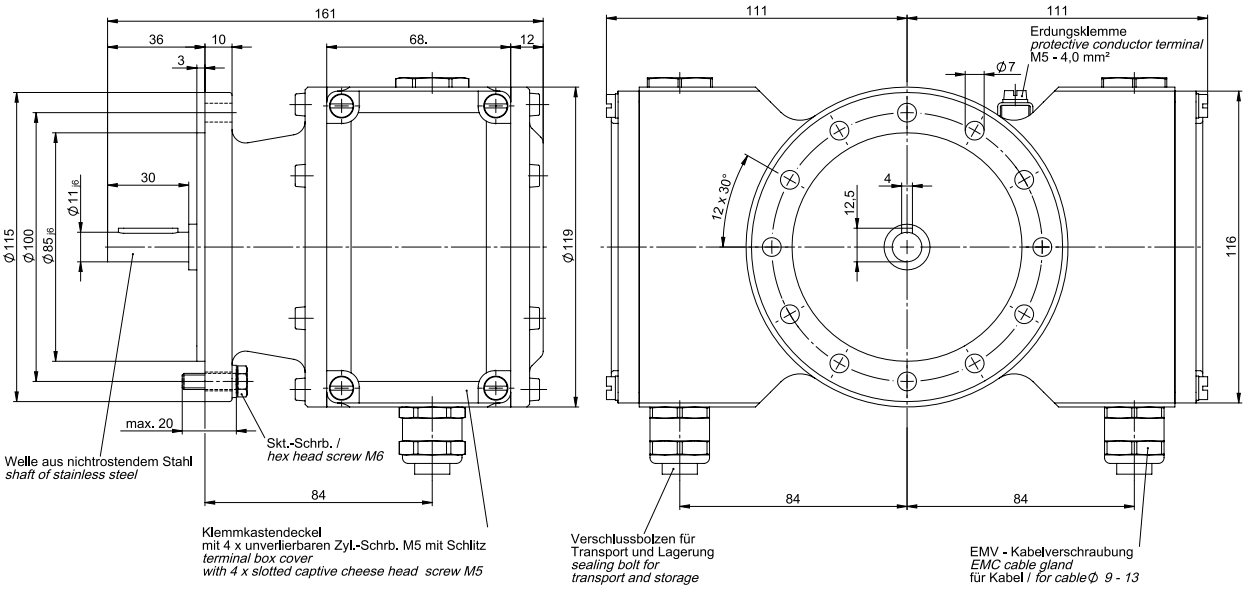
11.1 Construction type B5 (flange)



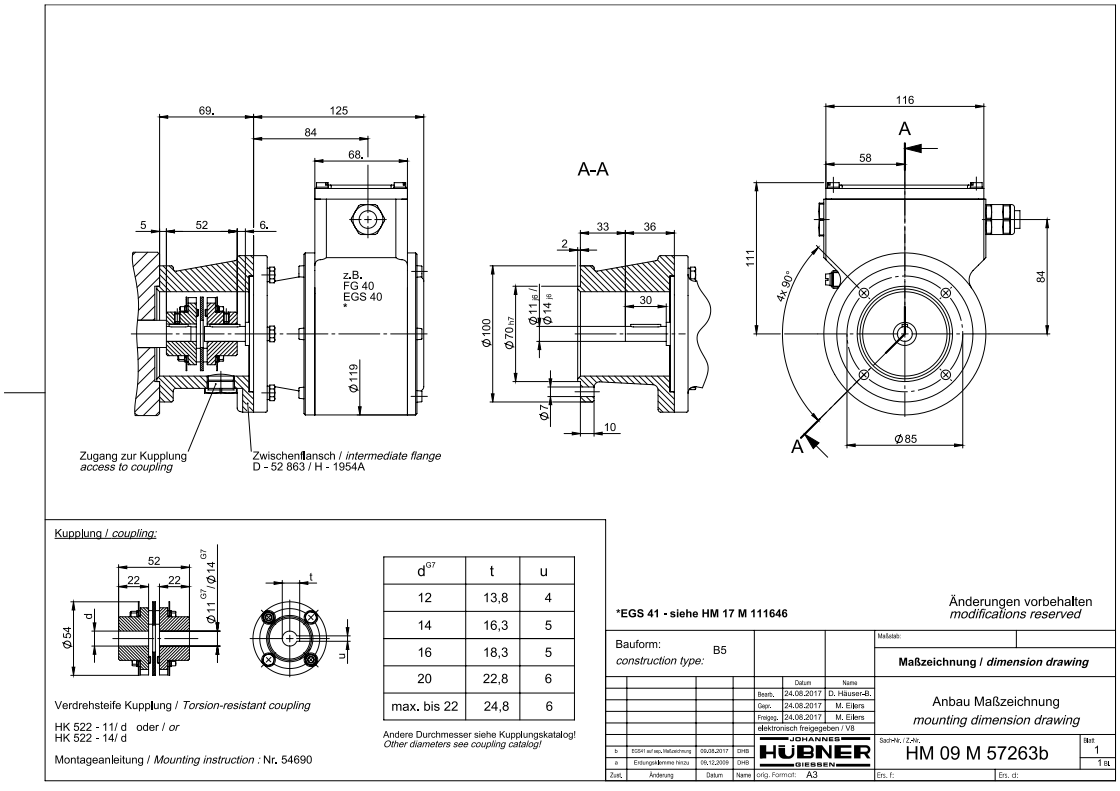
FG 40 K	With radial terminal box	HM 08 M 57 221a



FG 40 AK	With axial terminal box	HM 08 M 57 024a



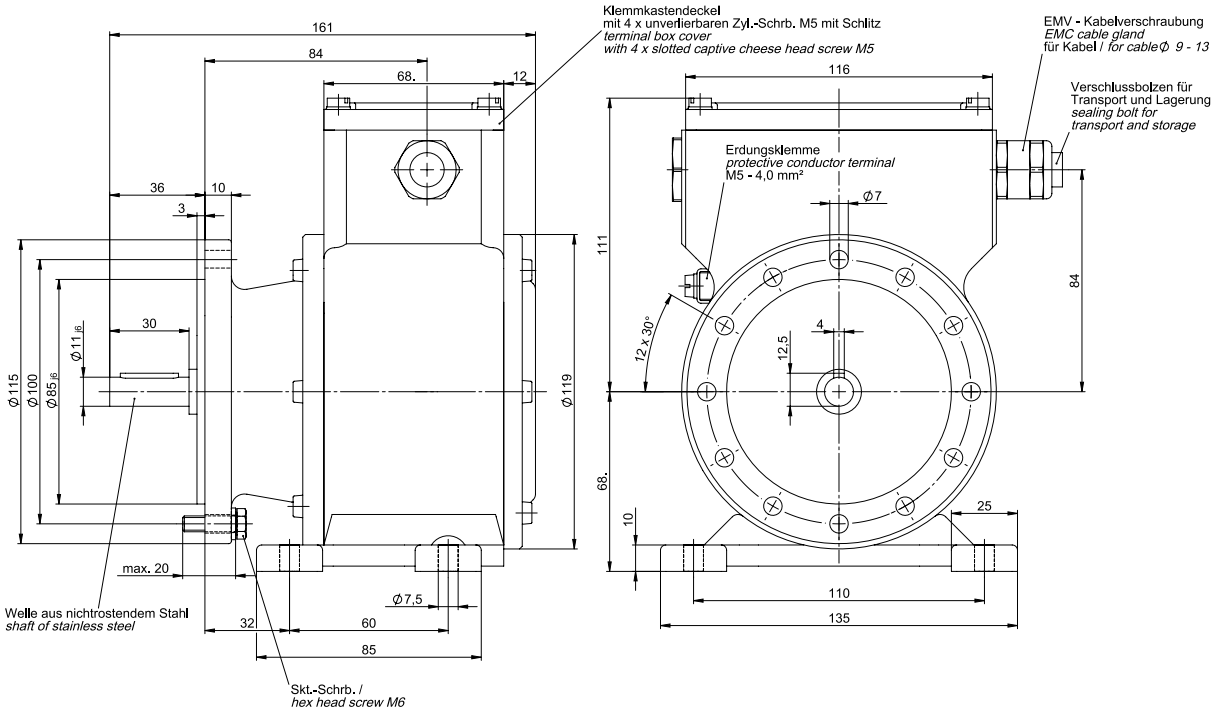
FG 40 KK	Redundant version	HM 08 M 57 223a



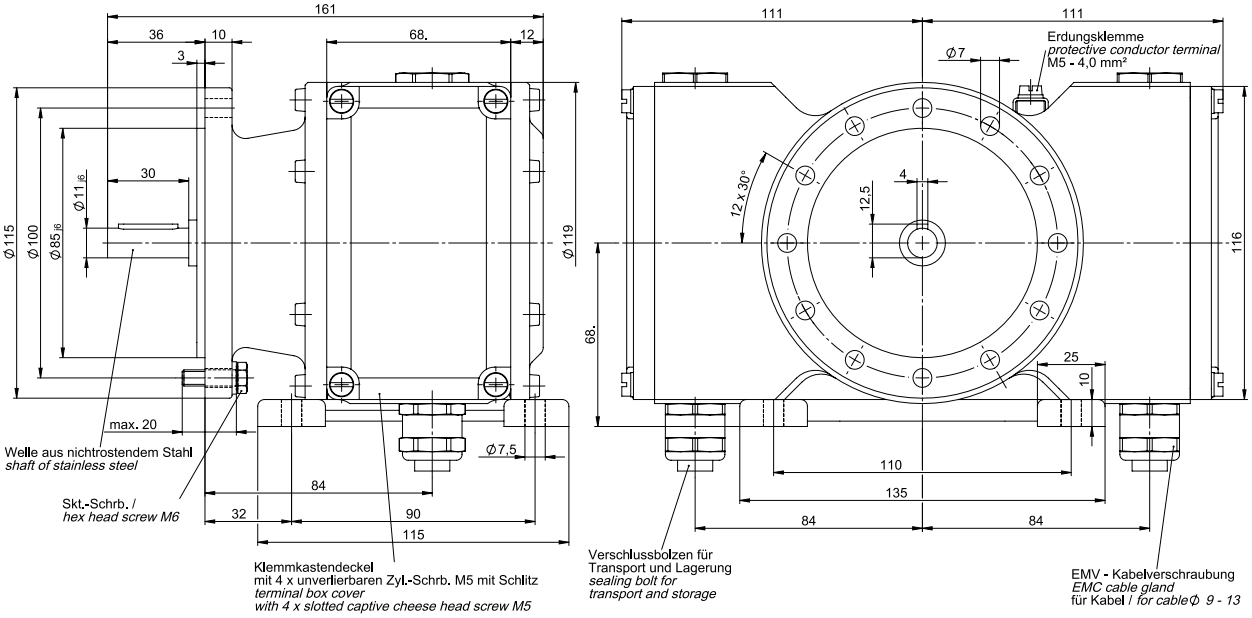
d G7	t	u
12	13,8	4
14	16,3	5
16	18,3	5
20	22,8	6
max. bis 22	24,8	6

FG 40 K	Mounting example for construction type B5 with flange and coupling HK 522	HM 09 M 57 263b

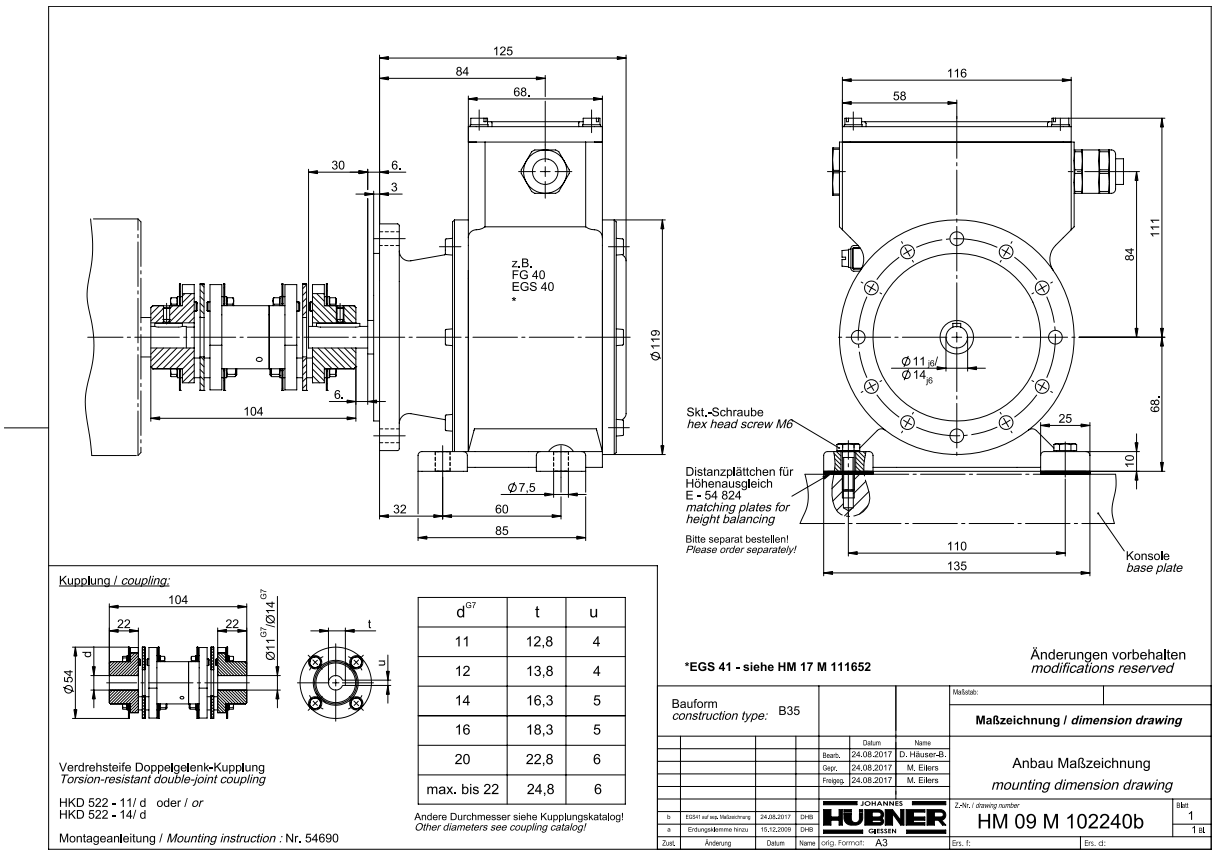
11.2 Construction type B35 (flange and foot)



FG 40 K | **With radial terminal box** | **HM 08 M 57 222a**



FG 40 KK | **Redundant version** | **HM 08 M 57 224a**

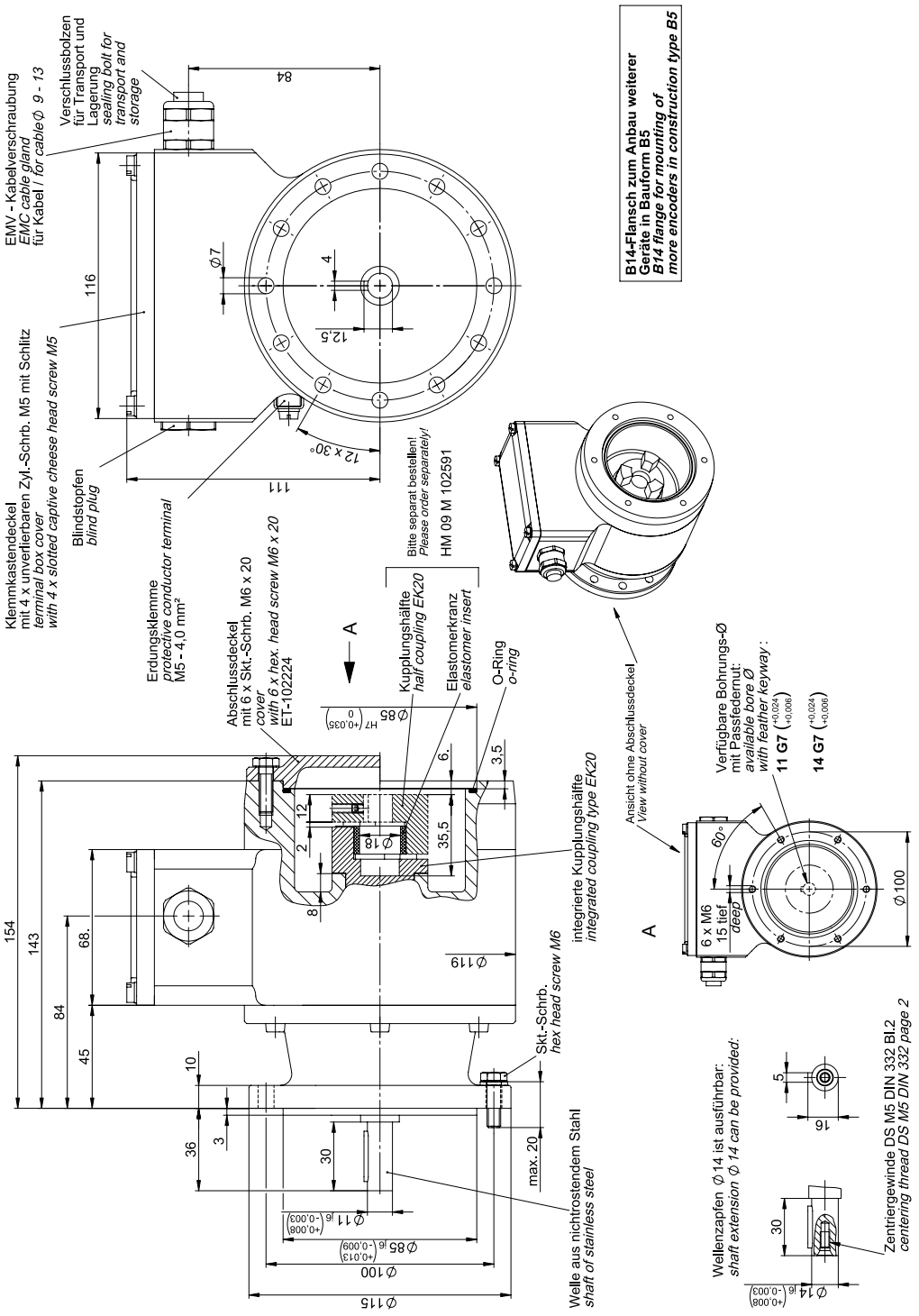


d^{G7}	t	u
11	12,8	4
12	13,8	4
14	16,3	5
16	18,3	5
20	22,8	6
max. bis 22	24,8	6

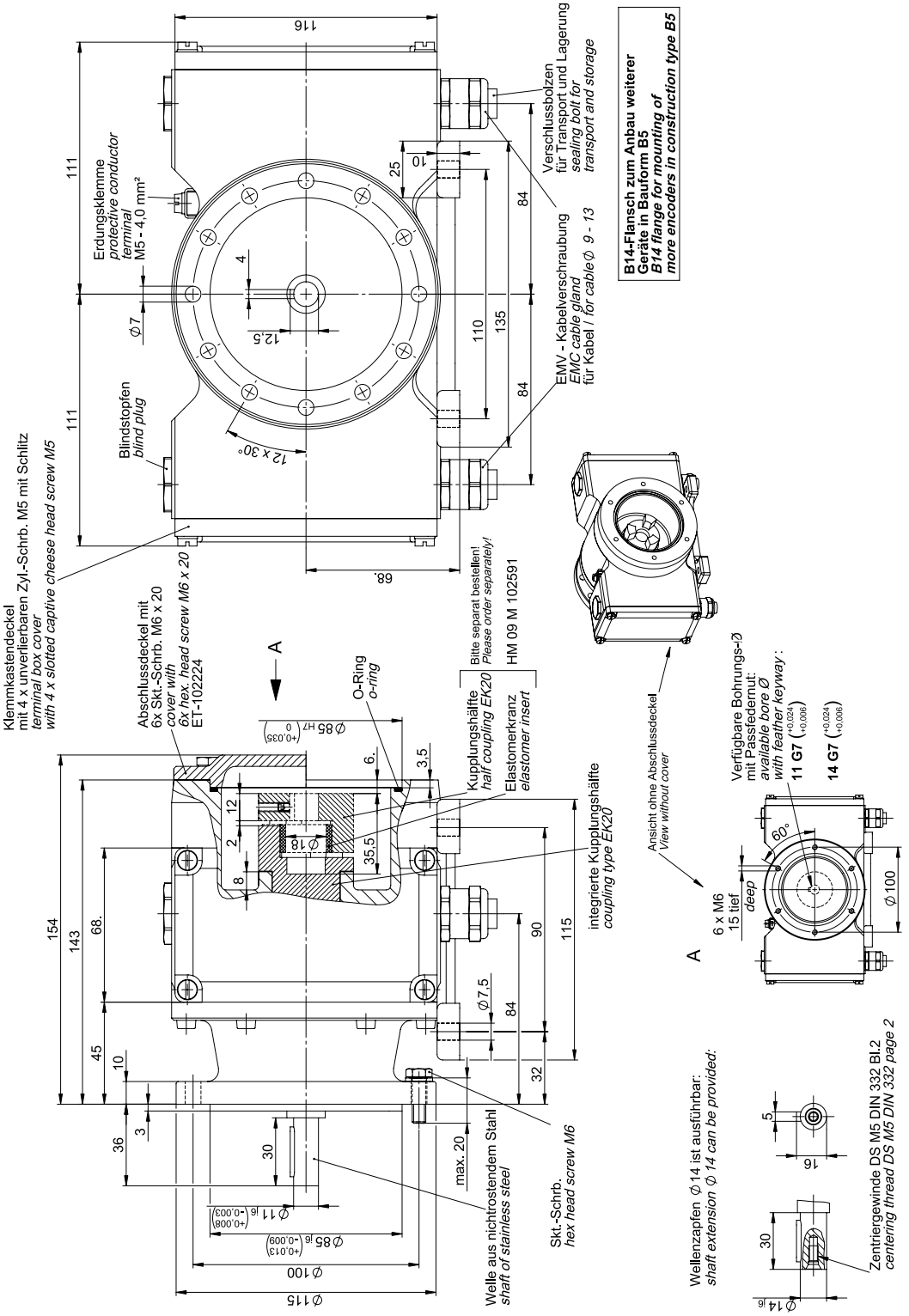
				Datum	Name
				Bearb.	24.08.2017 D. Häuser-B.
				Gepr.	24.08.2017 M. Eilers
				Freigeg.	24.08.2017 M. Eilers
b	EG41 auf eig. Maßzeichnung		24.08.2017	DHB	
a	Erdungsklemme hinzu		15.12.2009	DHB	
Zust.	Änderung		Datum	Name	

FG 40 K	**Mounting example for construction type B35 With coupling HKD 522**
	HM 09 M 102 240b

11.3 Construction type B5/B14 (flange with 2 shaft ends)

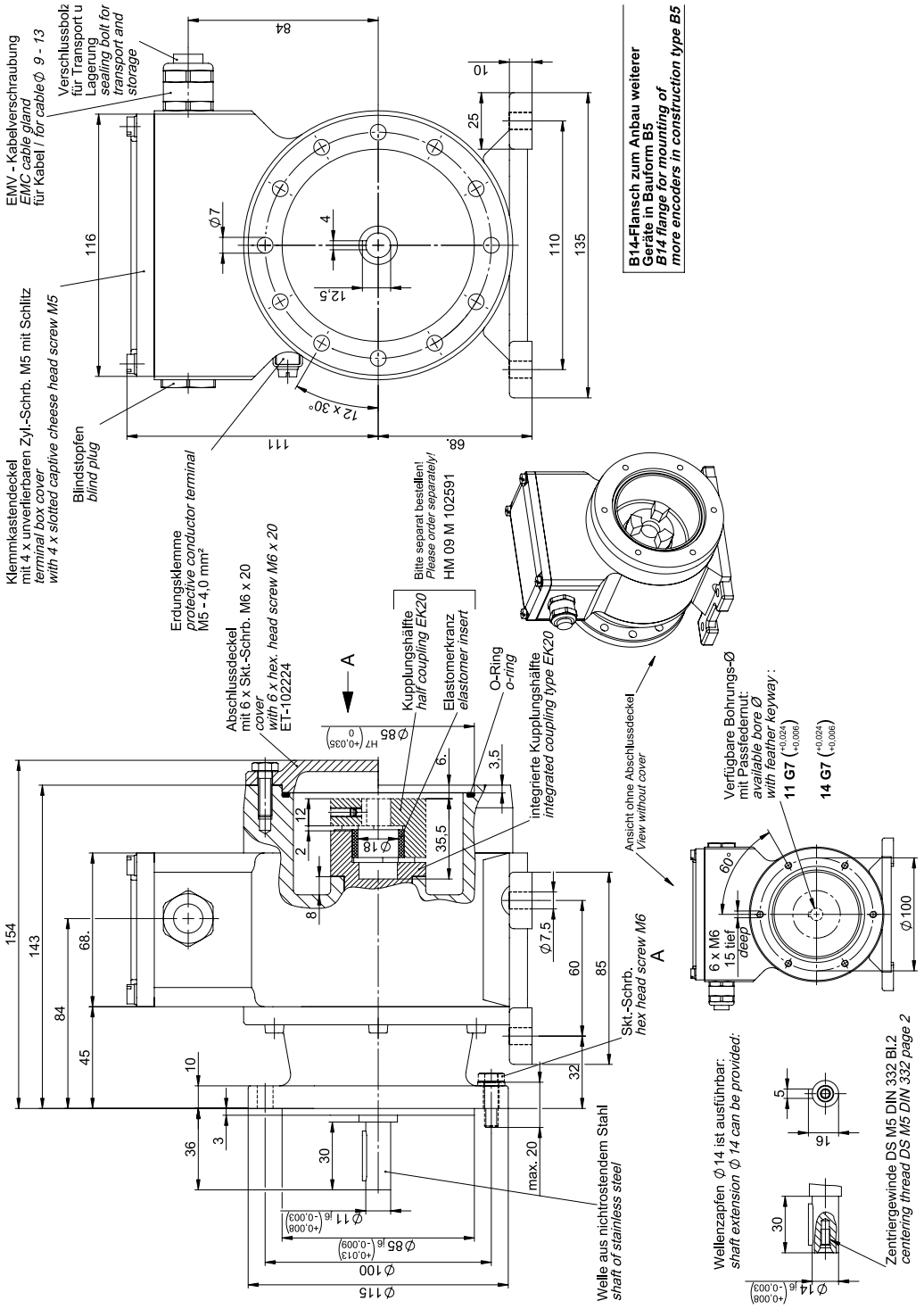


FG 40 K	Construction type B5/B14 (flange with 2 shaft ends)	HM 09 M 102 541

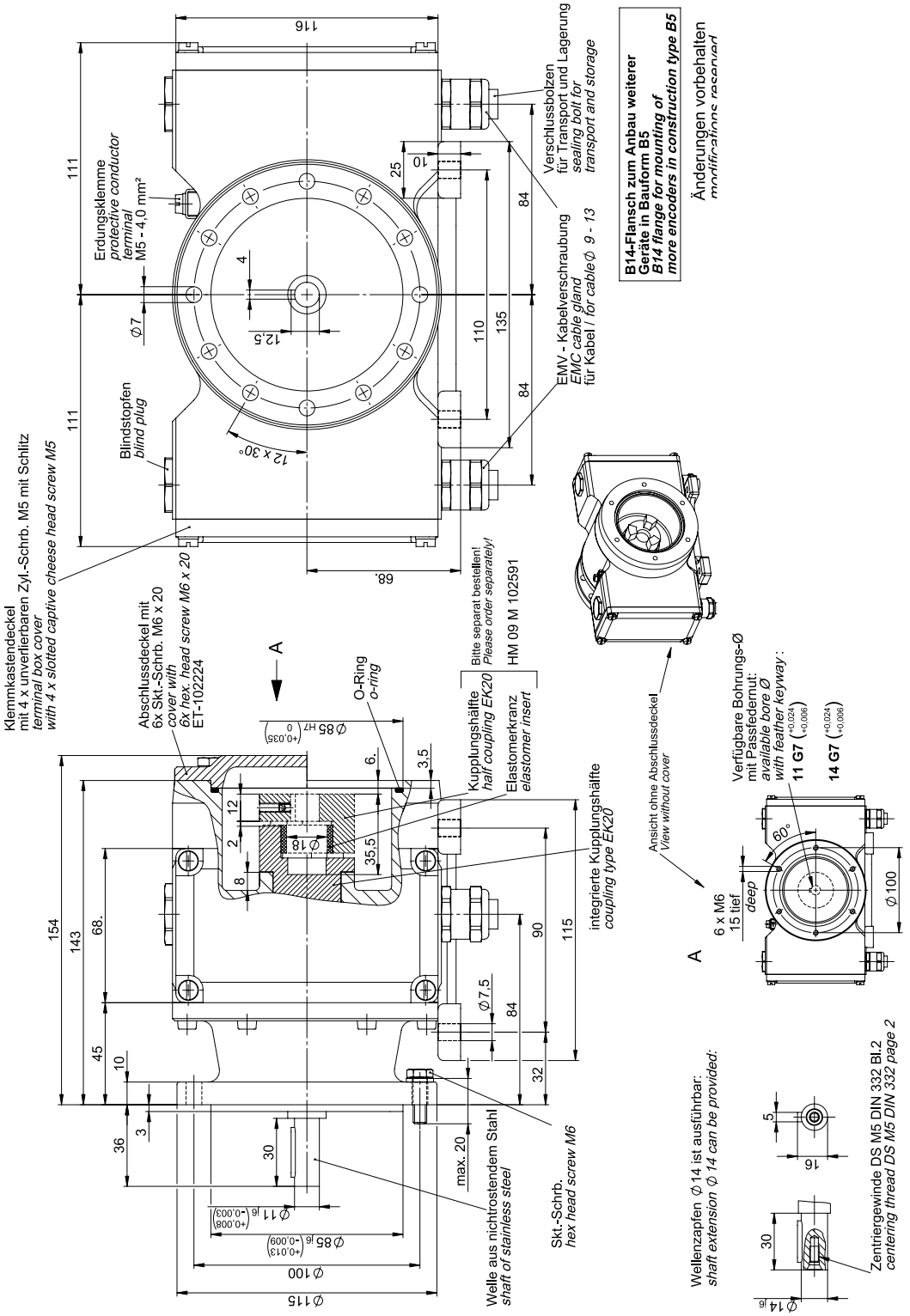


FG 40 KK **redundant version** **HM 09 M 102 549**

11.4 construction type B35/B14 (flange and foot with 2 shaft ends)

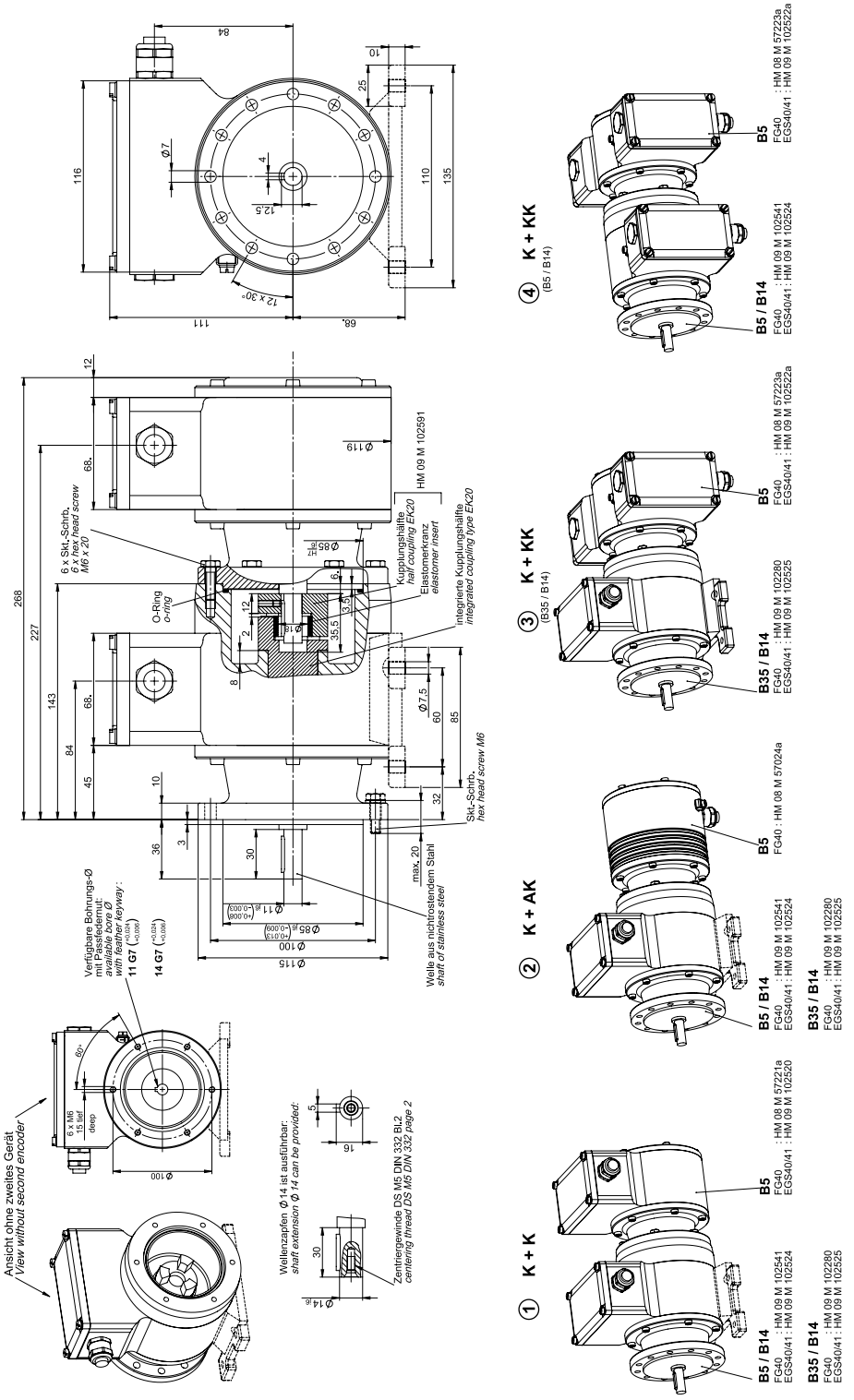


FG 40 K	construction type B35/B14 (flange and foot with 2 shaft ends)	HM 09 M 102 280

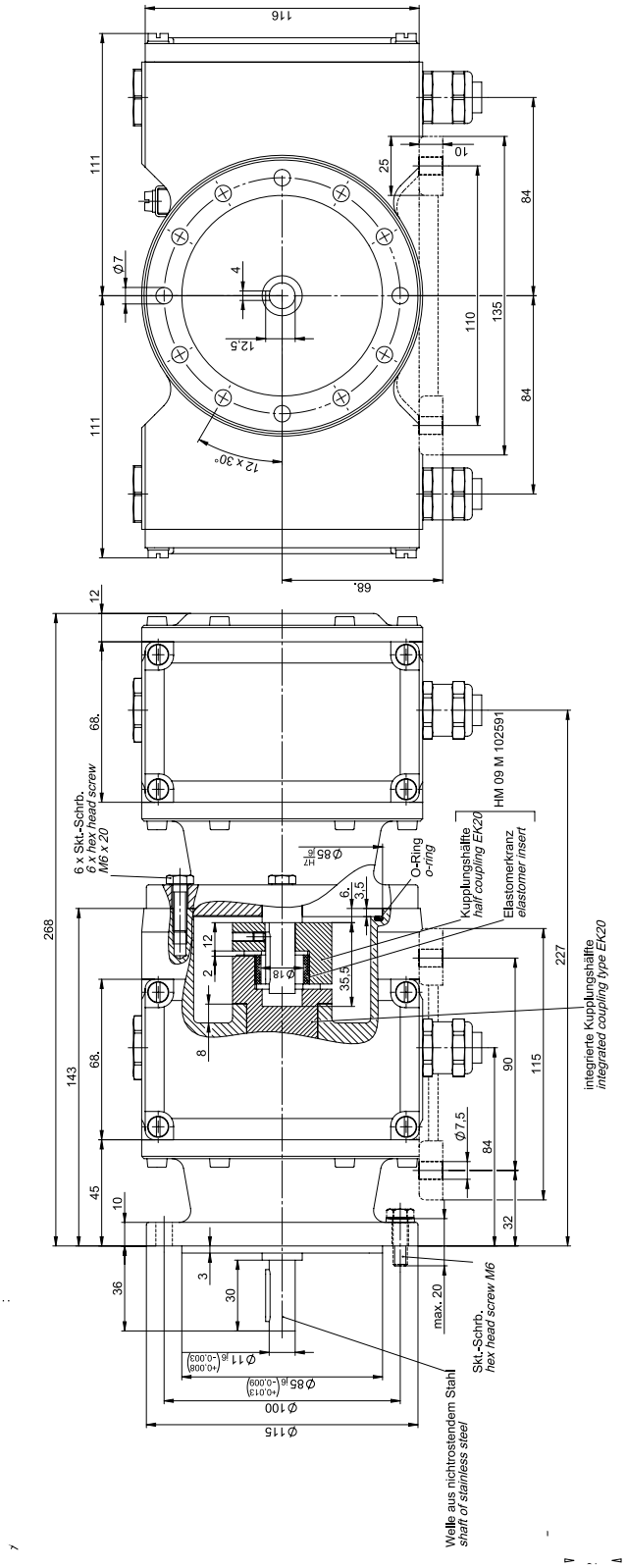


FG 40 KK	redundant version	HM 09 M 101 548

11.5 Mounting options

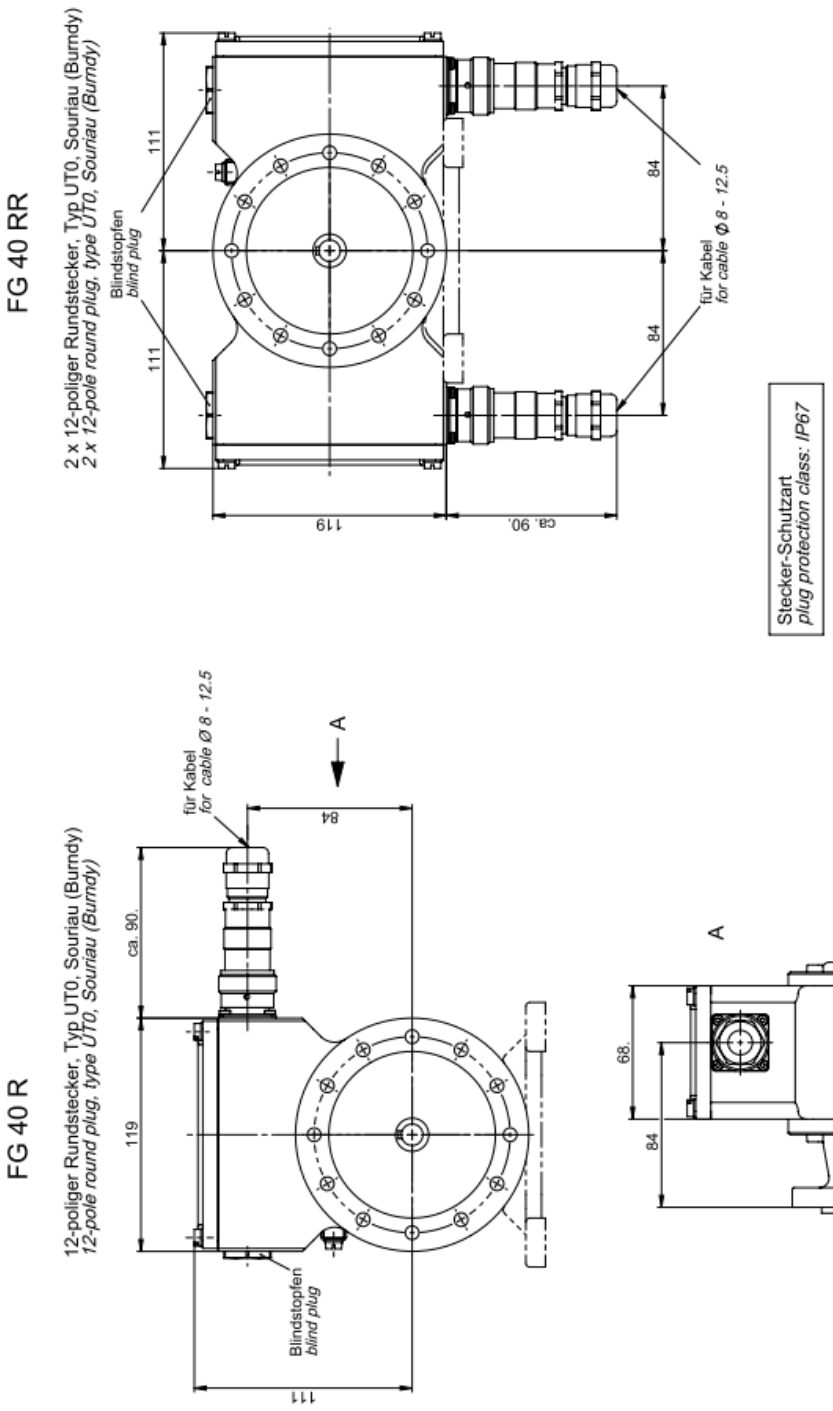


FG 40 K	FG 40 K with coupled unit	HM 09 M 102 245

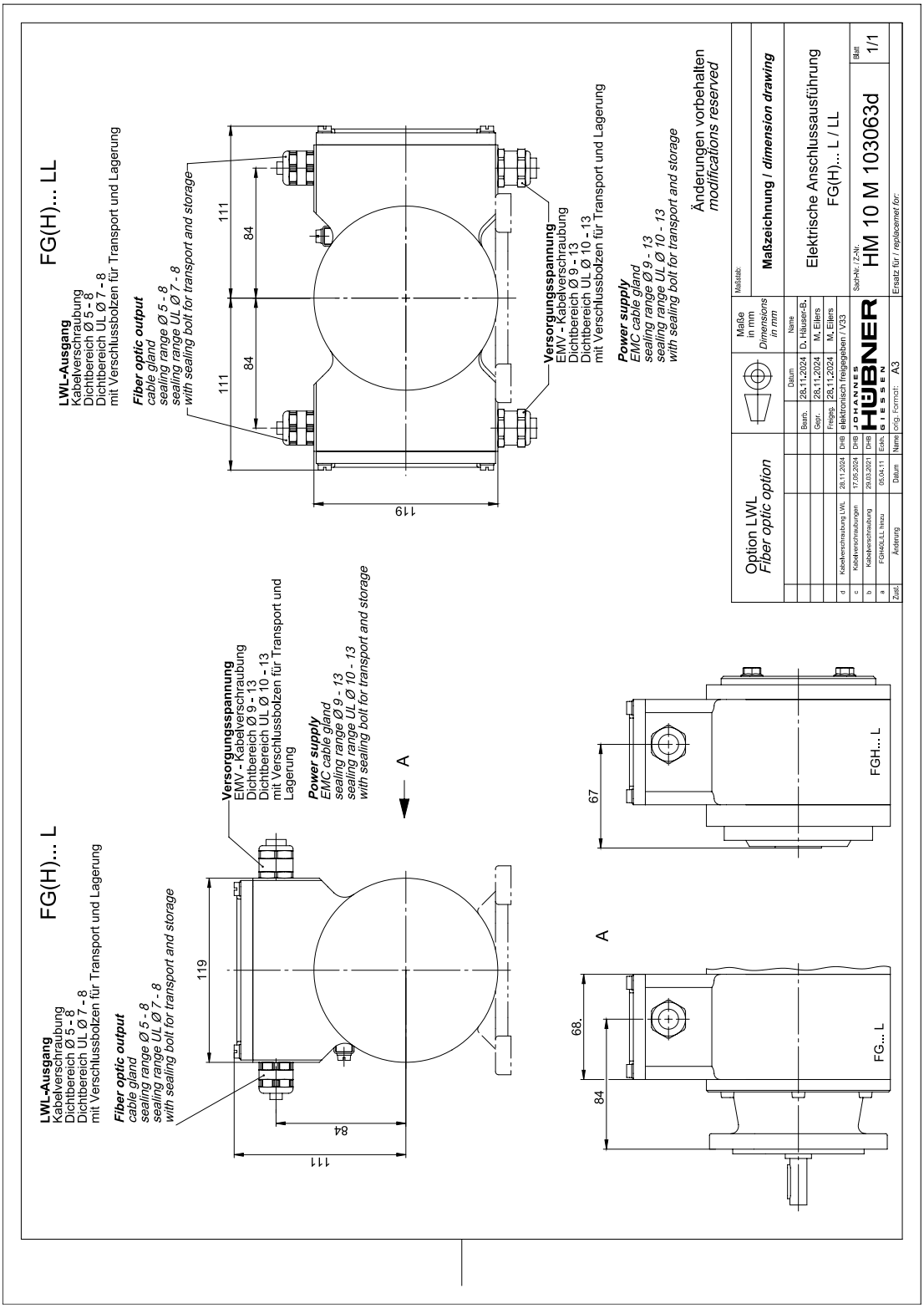


FG 40 KK	FG 40 KK with coupled unit	HM 09 M 102 627

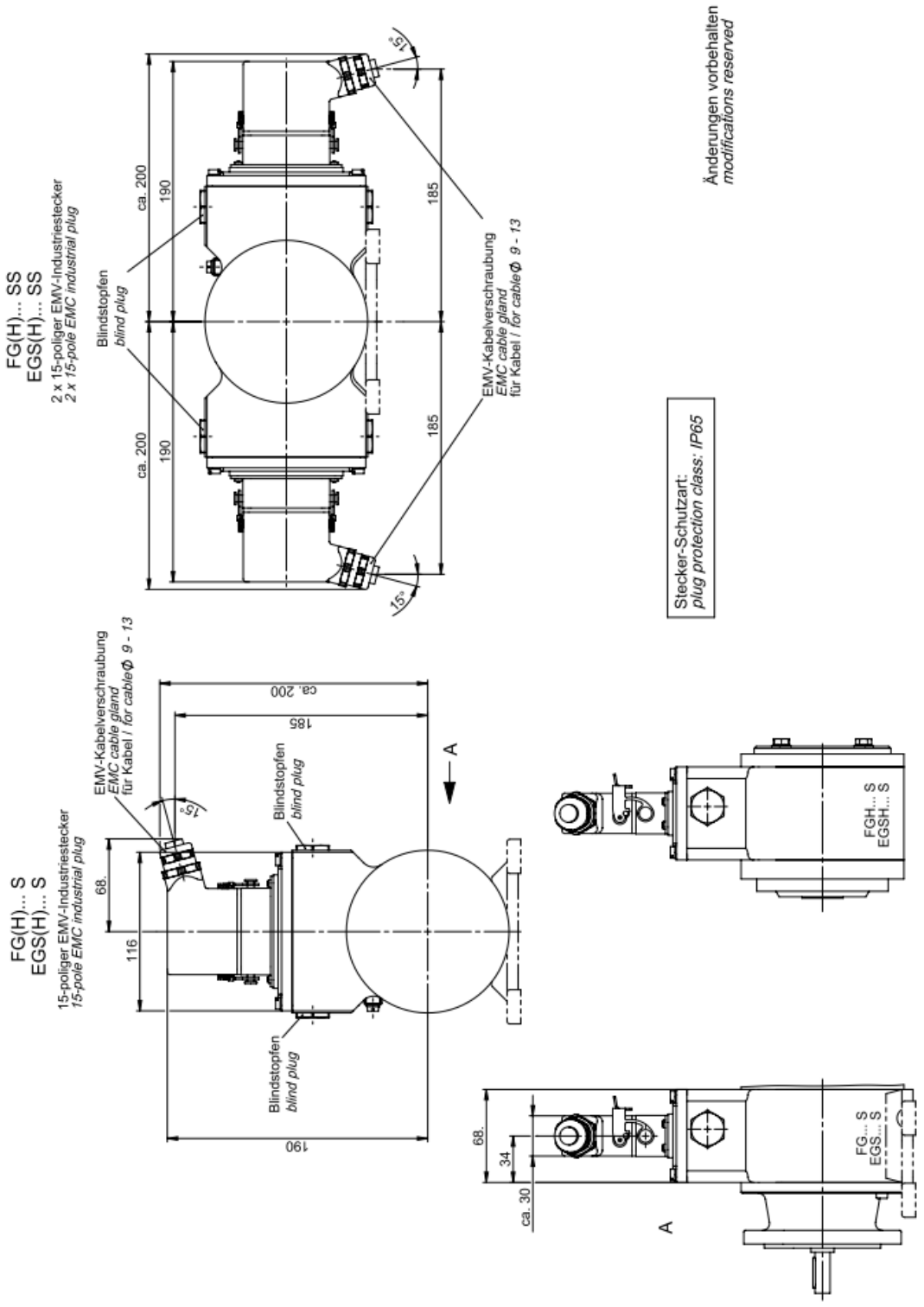
11.6 Additional dimension drawings – electrical socket design



FG 40 R/RR	**additional dimension drawing electrical socket design FG 40 R/RR**	**HM 09 M 102 270**



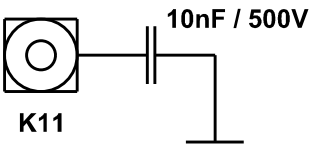
FG 40 L/LL	additional dimension drawing electrical socket design FG 40 L/LL	HM 09 M 103063d



	additional dimension drawing	
FG 40 S/SS	**electric connection implementation FG 40 S/SS 15 pole EMC**	**HM 12 M 105755**

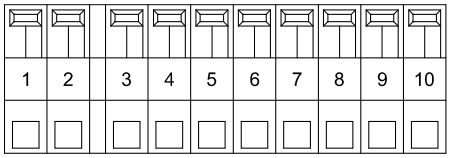
12 Connection diagrams

Shielding:
The shield of the signal cable can be connected
directly to the housing of the encoder by the cable gland. Alternatively the shield of the signal cable can be connected to K11 via a capacitor(10nF / 500V) to the housing of the encoder.



Klemmkasten *Terminal box*		Anschlussplan *Connection diagram*	PN109-400 *PN109-400*	
1	0V		GND	*GND*
2	12...30V		Versorgungsspannung	*Power Supply*
3	0°		Inkr. Ausgang 0°	*Incr. Output 0°*
4	$\overline{0°}$		Inkr. Ausgang 0° Invers	*Incr. Output 0° Inverse*
5	90°		Inkr. Ausgang 90°	*Incr. Output 90°*
6	$\overline{90°}$		Inkr. Ausgang 90° Invers	*Incr. Output 90° Inverse*
7	N		Nullimpuls	*Reference*
8	$\overline{N}$		Nullimpuls Invers	*Reference Inverse*
9	ERR		Fehlerausgang (Low aktiv)	*Error Output (Low active)*
10	$\overline{ERR}$		Fehlerausgang (High aktiv)	*Error Output (High active)*

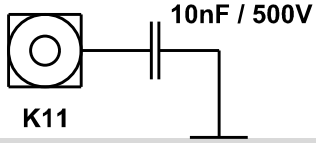
FG 40 **Standard** **Terminal box**



10 pole printed circuit spring terminal block type Phoenix ZFKDS

Connection data:
wire section
0,2-1,5 [mm²]

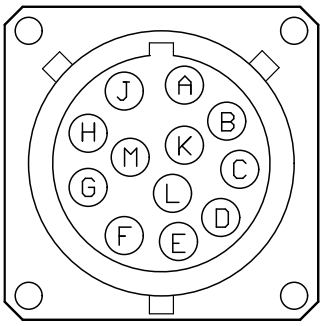
Alternative Shielding



Klemmkasten *Terminal box*		Anschlussplan *Connection diagram*	PN109-401 *PN109-401*	
1	0V		GND	*GND*
2	12...30V		Versorgungsspannung	*Power Supply*
3	0°		Inkr. Ausgang 0°	*Incr. Output 0°*
4	$\overline{0°}$		Inkr. Ausgang 0° Invers	*Incr. Output 0° Inverse*
5	90°		Inkr. Ausgang 90°	*Incr. Output 90°*
6	$\overline{90°}$		Inkr. Ausgang 90° Invers	*Incr. Output 90° Inverse*
7	-		nicht belegt	*not connected*
8	-		nicht belegt	*not connected*
9	ERR		Fehlerausgang (Low aktiv)	*Error Output (Low active)*
10	$\overline{ERR}$		Fehlerausgang (High aktiv)	*Error Output (High active)*

FG 40 **Standard without reference pulse** **Terminal box**

Socket insert view



Crimp contacts for cross-sectional data of wire from 0,52 up to 1,5 mm²

Shield:

The shield of the signal cable is directly to be connected with the socket housing.

Crimping tool: Burndy® No. MR 8 GE 5

Burndy-Stecker *Burndy plug*		Anschlussplan *Connection diagram*	PN109-410 *PN109-410*		
1	A	0V		GND	*GND*
2	B	12..30V		Versorgungsspannung	*Power Supply*
3	C	0°		Inkr. Ausgang 0°	*Incr. Output 0°*
4	D	$\overline{0°}$		Inkr. Ausgang 0° Invers	*Incr. Output 0° Inverse*
5	E	90°		Inkr. Ausgang 90°	*Incr. Output 90°*
6	F	$\overline{90°}$		Inkr. Ausgang 90° Invers	*Incr. Output 90° Inverse*
7	G	N		Nullimpuls	*Reference*
8	H	$\overline{N}$		Nullimpuls Invers	*Reference Inverse*
9	J	ERR		Fehlerausgang (Low aktiv)	*Error Output (Low activ)*
10	K	$\overline{ERR}$		Fehlerausgang (High aktiv)	*Error Output (High activ)*
11	L	-		nicht belegt	*not connected*
12	M	-		nicht belegt	*not connected*

FG 40 Standard (not for UL/CSA) Burndy® plug

Connection cable

6x2x0,56 twin-standard, shielded

Type: HE-2LVCC-CY AWG 20b acc. to VDE 0881

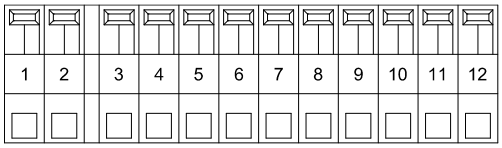
Cross-section: 0,56 mm²
Temperature: -20 °C to + 105 °C
Outside dia: 10,1 mm

shield is connected to casing

other cables- / temperature ranges on request

Anschlusskabel *Connection cable*			Anschlussplan *Connection diagram*	PN109-420 *PN109-420*				
1	A	schwarz	*black*	0V		GND	*GND*
2	B	rot	*red*	12..30V		Versorgungsspannung	*Power Supply*
3	C	orange	*orange*	0°		Inkr. Ausgang 0°	*Incr. Output 0°*
4	D	schwarz	*black*	$\overline{0°}$		Inkr. Ausgang 0° Invers	*Incr. Output 0° Inverse*
5	E	blau	*blue*	90°		Inkr. Ausgang 90°	*Incr. Output 90°*
6	F	schwarz	*black*	$\overline{90°}$		Inkr. Ausgang 90° Invers	*Incr. Output 90° Inverse*
7	G	gelb	*yellow*	N		Nullimpuls	*Reference*
8	H	schwarz	*black*	$\overline{N}$		Nullimpuls Invers	*Reference Inverse*
9	J	grün	*green*	ERR		Fehlerausgang (Low aktiv)	*Error Output (Low activ)*
10	K	schwarz	*black*	$\overline{ERR}$		Fehlerausgang (High aktiv)	*Error Output (High activ)*
11	L	-	-	-		nicht belegt	*not connected*
12	M	-	-	-		nicht belegt	*not connected*

FG 40 Standard (not for UL/CSA) Connection cable

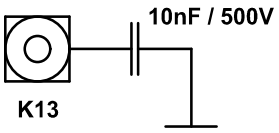


12 pole printed circuit spring terminal block type Phoenix ZFKDS

Connection data:
Wire section
0,2-1,5 [mm²]

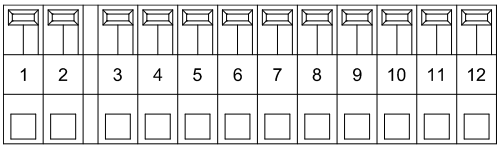
Shielding:
The shield of the signal cable can be connected directly to the housing of the encoder by the cable gland. Alternatively the shield of the cable can be connected to K13 via a capacitor (10nF / 500V) to the housing of the encoder.

Alternative Shielding



Klemmkasten *Terminal box*		Anschlussplan *Connection diagram*	PN109-430 *PN109-430*
1	0V	GND	*GND*
2	12...30V	Versorgungsspannung	*Power Supply*
3	0°	Inkr. Ausgang 0°	*Incr. Output 0°*
4	$\overline{0°}$	Inkr. Ausgang 0° Invers	*Incr. Output 0° Inverse*
5	90°	Inkr. Ausgang 90°	*Incr. Output 90°*
6	$\overline{90°}$	Inkr. Ausgang 90° Invers	*Incr. Output 90° Inverse*
7	N	Nullimpuls	*Reference*
8	$\overline{N}$	Nullimpuls Invers	*Reference Inverse*
9	ERR	Fehlerausgang (Low aktiv)	*Error Output (Low active)*
10	$\overline{ERR}$	Fehlerausgang (High aktiv)	*Error Output (High active)*
11	2F	Option 2F	*Option 2F*
12	$\overline{2F}$	Option 2F invers	*Option 2F inverse*

FG 40 Option 2F Terminal box

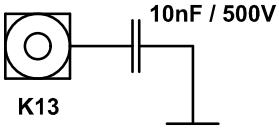


10 pole printed circuit spring terminal block type Phoenix ZFKDS

Connection data:
Wire section
0,2-1,5 [mm²]

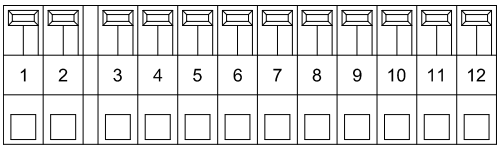
Shielding:
The shield of the signal cable can be connected directly to the housing of the encoder by the cable gland. Alternatively the shield of the cable can be connected to K13 via a capacitor (10nF / 500V) to the housing of the encoder.

Alternative Shielding



Klemmkasten *Terminal box*		Anschlussplan *Connection diagram*	PN109-440 *PN109-440*
1	0V	GND	*GND*
2	12...30V	Versorgungsspannung	*Power Supply*
3	0°	Inkr. Ausgang 0°	*Incr. Output 0°*
4	$\overline{0°}$	Inkr. Ausgang 0° Invers	*Incr. Output 0° Inverse*
5	90°	Inkr. Ausgang 90°	*Incr. Output 90°*
6	$\overline{90°}$	Inkr. Ausgang 90° Invers	*Incr. Output 90° Inverse*
7	N	Nullimpuls	*Reference*
8	$\overline{N}$	Nullimpuls Invers	*Reference Inverse*
9	ERR	Fehlerausgang (Low aktiv)	*Error Output (Low active)*
10	$\overline{ERR}$	Fehlerausgang (High aktiv)	*Error Output (High active)*
11	B	CW CCW	Option B	*Option B*
12	$\overline{B}$	CW CCW	Option B invers	*Option B inverse*

FG 40 Option B Terminal box

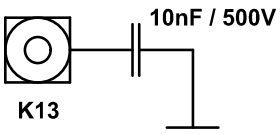


12 pole printed circuit spring terminal block type Phoenix ZFKDS

Connection data:
Wire section
0,2-1,5 [mm²]

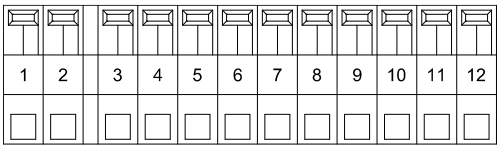
Shielding:
The shield of the signal cable can be connected directly to the housing of the encoder by the cable gland. Alternatively the shield of the cable can be connected to K13 via a capacitor (10nF / 500V) to the housing of the encoder.

Alternative Shielding



Klemmkasten *Terminal box*		Anschlussplan *Connection diagram*	PN109-450 *PN109-450*
1	0V	GND	*GND*
2	12...30V	Versorgungsspannung	*Power Supply*
3	0°	Inkr. Ausgang 0°	*Incr. Output 0°*
4	$\overline{0°}$	Inkr. Ausgang 0° Invers	*Incr. Output 0° Inverse*
5	90°	Inkr. Ausgang 90°	*Incr. Output 90°*
6	$\overline{90°}$	Inkr. Ausgang 90° Invers	*Incr. Output 90° Inverse*
7	N	Nullimpuls	*Reference*
8	$\overline{N}$	Nullimpuls Invers	*Reference Inverse*
9	ERR	Fehlerausgang (Low aktiv)	*Error Output (Low active)*
10	$\overline{ERR}$	Fehlerausgang (High aktiv)	*Error Output (High active)*
11	B2	Option B2	*Option B2*
12	$\overline{B2}$	Option B2 invers	*Option B2 inverse*

FG 40 Option B2 Terminal box

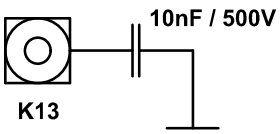


10 pole printed circuit spring terminal block type Phoenix ZFKDS

Connection data:
Wire section
0,2-1,5 [mm²]

Shielding:
The shield of the signal cable can be connected directly to the housing of the encoder by the cable gland. Alternatively the shield of the cable can be connected to K13 via a capacitor (10nF / 500V) to the housing of the encoder.

Alternative Shielding



Klemmkasten *Terminal box*		Anschlussplan *Connection diagram*	PN109-460 *PN109-460*
1	0V	GND	*GND*
2	12...30V	Versorgungsspannung	*Power Supply*
3	0°	Inkr. Ausgang 0°	*Incr. Output 0°*
4	$\overline{0°}$	Inkr. Ausgang 0° Invers	*Incr. Output 0° Inverse*
5	90°	Inkr. Ausgang 90°	*Incr. Output 90°*
6	$\overline{90°}$	Inkr. Ausgang 90° Invers	*Incr. Output 90° Inverse*
7	N	Nullimpuls	*Reference*
8	$\overline{N}$	Nullimpuls Invers	*Reference Inverse*
9	ERR	Fehlerausgang (Low aktiv)	*Error Output (Low active)*
10	$\overline{ERR}$	Fehlerausgang (High aktiv)	*Error Output (High active)*
11	B3	Option B3	*Option B3*
12	$\overline{B3}$	Option B3 invers	*Option B3 inverse*

FG 40 Option B3 Terminal box

Klemmkasten Anschlussplan PN109-470 *Terminal box Connection diagram PN109-470*			
1	12...30V DC	Versorgungsspannung	*Power Supply*
2	0V	GND	*GND*
3	LWL	Lichtwellenleiter	*Fibre Optic Cable*

2 pol. Print-Zugfederklemme Typ Phoenix ZFKDS
2 pole printed circuit spring terminal block type Phoenix ZFKDS

Anschlussdaten:
Aderquerschnitt
0,2-1,5 [mm^2]

Connection data:
wire section
0.2-1.5 [mm^2]

Anschlussdaten:
ST-Steckverbinder
1 Glasfaser 50/125µm
oder
1 Glasfaser 62,5/125µm

Connection data:
ST connector
1 Fibre optic cable 50/125µm
or
1 Fibre optic cable 62.5/125µm

Schirmung:
Der Schirm der Signalleitung kann über die Kabelverschraubung direkt mit dem Gehäuse verbunden werden.
Alternativ kann der Kabelschirm an K11 über einen Kondensator (4,7nF / 250V AC) mit dem Gebergehäuse verbunden werden.

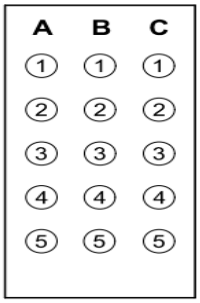
Shielding:
The shield of the signal cable can be connected directly to the housing of the encoder by the cable gland.
Alternatively the shield of the signal cable can be connected to K11 via a capacitor (4.7nF / 250V AC) to the housing of the encoder.

Alternativer Schirmanschluss
Alternative Shielding

FG 40 connection sheme PN 109-470 terminal box

Ansicht auf Steckdoseneinsatz

Socket insert view



Anschlussdaten:
Crimpkontakte für Drahtquerschnitte 0,75-1,0 [mm^2]

Connection data:
Crimp contacts for cross-Sectional data of wire 0.75-1.0 [mm^2]

Schirmung:
Der Schirm der Signalleitung muss über die Kabelverschraubung direkt mit dem Gehäuse verbunden werden.

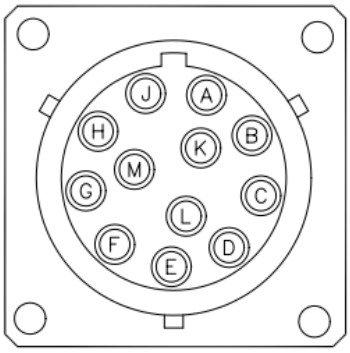
Shielding:
The shield of the signal cable has to be connected directly to the housing of the encoder by the cable gland.

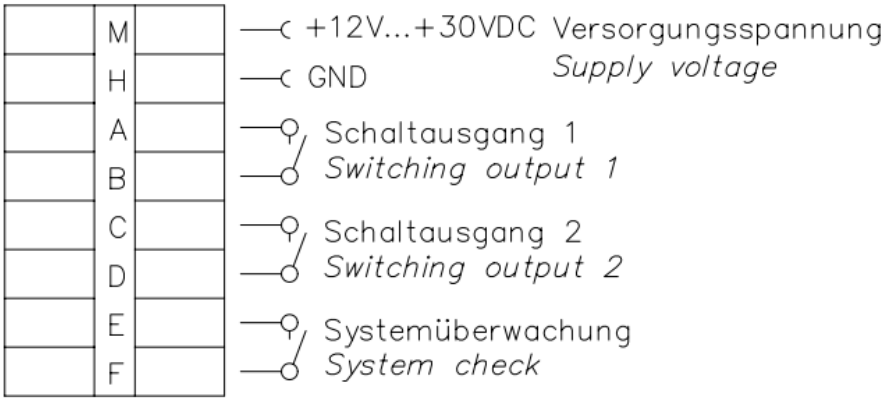
EMV-Industriestecker *EMC industrial plug*		Anschlussplan *Connection diagram*	PN109-415 *PN109-415*	
C5	0V		GND	*GND*
A5	12...30V		Versorgungsspannung	*Power Supply*
A1	0°		Inkr. Ausgang 0°	*Incr. Output 0°*
A2	$\overline{0°}$		Inkr. Ausgang 0° Invers	*Incr. Output 0° Inverse*
A3	90°		Inkr. Ausgang 90°	*Incr. Output 90°*
A4	$\overline{90°}$		Inkr. Ausgang 90° Invers	*Incr. Output 90° Inverse*
B3*	N		Nullimpuls	*Reference*
B4*	$\overline{N}$		Nullimpuls Invers	*Reference Inverse*
B5	ERR		Fehlerausgang (Low aktiv)	*Error Output (Low active)*
C3	$\overline{ERR}$		Fehlerausgang (High aktiv)	*Error Output (High active)*
C1*	2F		Option 2F	*Option 2F*
C2*	$\overline{2F}$		Option 2F invers	*Option 2F inverse*
C1*	B	CW CCW	Option B	*Option B*
C2*	$\overline{B}$	CW CCW	Option B invers	*Option B inverse*
C1*	B2	CW CCW ... Stop	Rechtslauf	*clock wise*
C2*	$\overline{B2}$	CW CCW ... Stop	Linkslauf	*counter clock wise*

* optional je nach Ausführung
depending on options

FG 40 connection sheme PN 109-415 (nicht für UL/CSA) EMC industrial plug

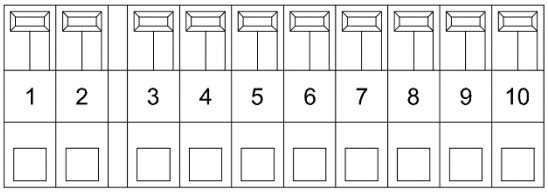
Ansicht auf Steckdoseneinsatz
View on device connector





Crimpkontakte für Drahtquerschnitte 0,52 bis 1,5 mm
Crimping tool: Burndy No. MR 8 GE 5

FG 40 connection sheme 649 Option S(nicht für UL/CSA) Burndy plug



10 pol. Print-Zugfederklemme Typ Phoenix ZFKDS
10 pole printed circuit spring terminal block type Phoenix ZFKDS

Anschlussdaten:
Aderquerschnitt
0,2-1,5 [mm^2]

Connection data:
wire section
0.2-1.5 [mm^2]

Klemmkasten *Terminal box*		Anschlussplan *Connection diagram*	PN148-400b *PN148-400b*	
1	0V		GND	*GND*
2	5...30V DC		Versorgungsspannung	*Power Supply*
3	A+		Ausgang A+	*Output A+*
4	A-		Ausgang A- Invers	*Output A-* *Inverse*
5	B+		Ausgang B+	*Output B+*
6	B-		Ausgang B- Invers	*Output B-* *Inverse*
7	N		Nullimpuls	*Reference*
8	$\overline{N}$		Nullimpuls Invers	*Reference* *Inverse*
9	ERR		Fehlerausgang (Low aktiv)	*Error Output* *(Low active)*
10	$\overline{ERR}$		Fehlerausgang (High aktiv)	*Error Output* *(High active)*

FG 40 **connection sheme 148 400b** **Sine /cosine output**