

ABSOLUTE ROTARY ENCODER
MULTI-TURN BIT PARALLEL



Main Features

- Compact and heavy-duty industrial model
- Interface: Bit-parallel, push pull
Short circuit proof
- Input: Preset (optional) and latch
- Housing: 58 mm Ø
- Shaft: 6 or 10 mm Ø, hollow- 15 mm Ø
- Max. 65,536 steps per revolution (16 bit)
- Max. 16,384 revolution (14 bit)
- Code: Gray / Binary
- EMC: EN61000-6-2, EN61000-6-4, CE

Mechanical Structure

- Aluminum flange and housing
- Stainless steel shaft
- Precision ball bearings with sealing or cover rings
- Code disc made of unbreakable and durable plastic

Applications

- Sensing of
- Angles
 - Distances
 - Tracks
 - Inclinations
 - Differences between two or more axes

Electrical Features

- Temperature insensitive IR-opto-receiver-ASIC with integrated signal conditioning
- Only one IR-transmitter-diode per opto-ASIC
- Highly integrated circuit in SMD-technology
- Polarity inversion protection
- Over-voltage-peak protection

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Technical Data

Electrical Data

| | |
|----------------------|---|
| Outputs | Bit-parallel, push pull |
| Output level "high" | ~ supply voltage (load dependent) |
| Output current | Max. 20 mA each channel |
| Cycle time | < 10 µs (< 150 µs with preset version) |
| Step frequency | Version with Preset: 4,5 kHz Version without Preset: 50 kHz |
| Turn on time | < 1 s |
| Accuracy of division | ± ½ LSB (12 Bit), ± 2 LSB (16 Bit) |
| EMC | Emitted interference: EN 61000-6-4, Noise immunity: EN 61000-6-2 |
| Supply voltage | 10-30 V DC (absolute limits) * |
| Current consumption | Max. 400 mA (10 V DC), max. 180 mA (24 V DC) |
| Electrical lifetime | > 10 ⁵ h |
| Connection | Connector or cable exit 1 meter |

* Supply voltage according to EN 50 178 (safety extra-low voltage)

Mechanical Data

| | | | |
|--------------------------------------|---|--------------|---------------------|
| Housing | Aluminum, optional stainless steel | | |
| Lifetime | See next table | | |
| Shaft loading | Axial 40 N, radial 110 N | | |
| Inertia of rotor | ≈ 30 gcm ² | | |
| Friction torque | ≤ 3 Ncm (version without shaft sealing) | | |
| RPM (continuously) | Max. 6,000 | | |
| Shock (EN 60068-2-27) | ≤ 100 g (halfsine, 6 ms) | | |
| Permanent shock (EN 60028-2-29) | ≤ 10 g (halfsine, 16 ms) | | |
| Vibration (EN 60068-2-6) | ≤ 10 g (10 Hz ... 2,000 Hz) | | |
| Weight, multi-turn (stainless steel) | ≈ 400 g (≈ 800 g) | | |
| Flange | Synchro | Clamp | Hollow shaft |
| Shaft diameter | ø6 mm / ø10 mm | ø10 mm | ø15 mm |
| Shaft length or hollow shaft depth | 10 mm / 20mm | 20 mm | 15 – 30 mm |

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Minimal live cycle mechanical

| Flange group | Live cycle in 10 ⁸ turns on F _a / F _r | | |
|---|--|-------------|--------------|
| | 40 N / 60 N | 40 N / 80 N | 40 N / 110 N |
| C10 (Clamp flange ø10 x 20) | 247 | 104 | 40 |
| S10 (Synchro flange ø10 x 20) | 262 | 110 | 42 |
| S6 (Synchro flange ø6 x 10) without shaft sealing | 822 | 347 | 133 |

S6 (Synchro flange ø6 x 10) with shaft sealing: maximal 20 N axial, 80 N radial

Environmental Conditions

| | |
|-----------------------------|---|
| Operating temperature | - 40 ... + 85 °C * |
| Storage temperature | - 40 ... + 85 °C * |
| Humidity | 98 % (without liquid state) |
| Protection Class (EN 60529) | Casing side: IP 65 |
| | Shaft side: IP 64 (optional with shaft sealing: IP66) |

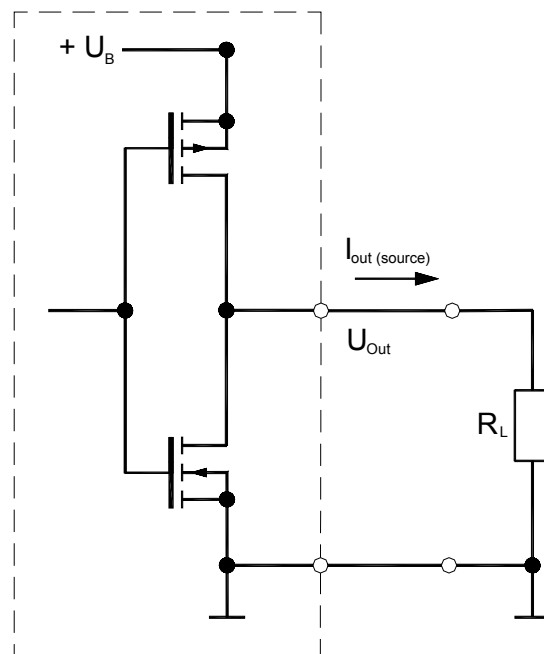
* Cable exit: -30 ... + 70 °C (stationary cable), -5 ... + 70 °C (moving cable)

Interface

Push pull

| | |
|----------------|--|
| Transmission | Data transmission via two transistors in push-pull circuit |
| Transfer | Transfer distance up to 50 m |
| Shielded lines | Shielded lines are essential to attain extremely high noise immunity |
| Connectable | Connectable to all usual PLC concepts with digital I/Os |
| Optional | Binary code transmission with integrated latch function |

Output Circuit



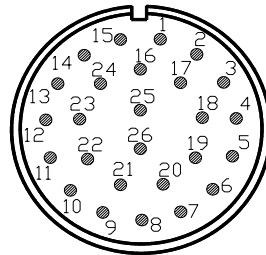
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Electrical Interface

| Signals | 26 Pin Connector | Cable color |
|---------|------------------|--------------|
| Bit 1 | Pin 1 | White |
| Bit 2 | 2 | Brown |
| Bit 3 | 3 | Green |
| Bit 4 | 4 | Yellow |
| Bit 5 | 5 | Grey |
| Bit 6 | 6 | Pink |
| Bit 7 | 7 | Blue |
| Bit 8 | 8 | Red |
| Bit 9 | 9 | Black |
| Bit 10 | 10 | Violet |
| Bit 11 | 11 | Grey-Pink |
| Bit 12 | 12 | Blue-Red |
| Bit 13 | 13 | White-Green |
| Bit 14 | 14 | Brown-Green |
| Bit 15 | Pin 15 | White-Yellow |

| Signals | 26 Pin Connector | Cable color |
|---------------------------|------------------|--------------|
| Bit 16 | Pin 16 | Yellow-Brown |
| Bit 17 | 17 | White-Grey |
| Bit 18 | 18 | Grey-Brown |
| Bit 19 | 19 | White-Pink |
| Bit 20 | 20 | Pink-Brown |
| Bit 21 | 21 | White-Blue |
| Bit 22 | - | Brown-Blue |
| Bit 23 | - | White-Red |
| Bit 24 | - | Brown-Red |
| Bit 25 | - | White-Black |
| Preset (opt.) | 22 | Brown-Black |
| Latch | 23 | Grey-Green |
| Complement | 24 | Yellow-Grey |
| +U _b = 10-30 V | 25 | Pink-Green |
| GND | Pin 26 | Yellow-Pink |

26 pin connector (male)



| COMPLEMENT-Input | | Encoder counting direction at clockwise rotation (as seen on shaft) |
|--|--|---|
| Function | Level | |
| Direction of rotation | 0 (Input = N.C.* or GND) | Up |
| Switch time < 3 μs | 1 (Input to + U _b or ≥ 4,5 V) | Down |
| Preset-Input (optional, should not used during shaft rotation) | | |
| Function | Level | |
| Preset | 0 (Input = N.C.* or GND) | Use the current value |
| | 1 (Input to + U _b or ≥ 4.5 V) | Set preset value to 0 (after 100ms) |
| Latch-Input | | |
| Function | Level | |
| Latch | 0 (Input = N.C.* or GND) | Use the current value |
| Latch time < 3 μs | 1 (Input to + U _b or ≥ 4.5 V) | Latch the value |

* no ledge on connector disposed

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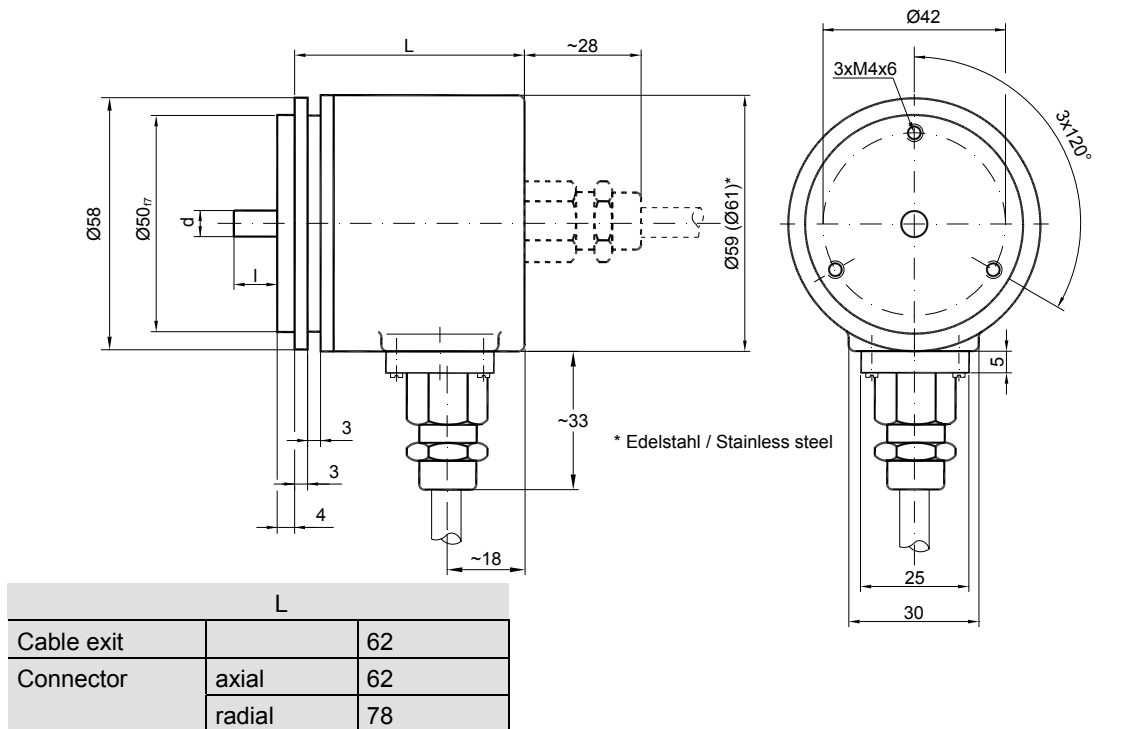
Mechanical Drawings

Synchro Flange

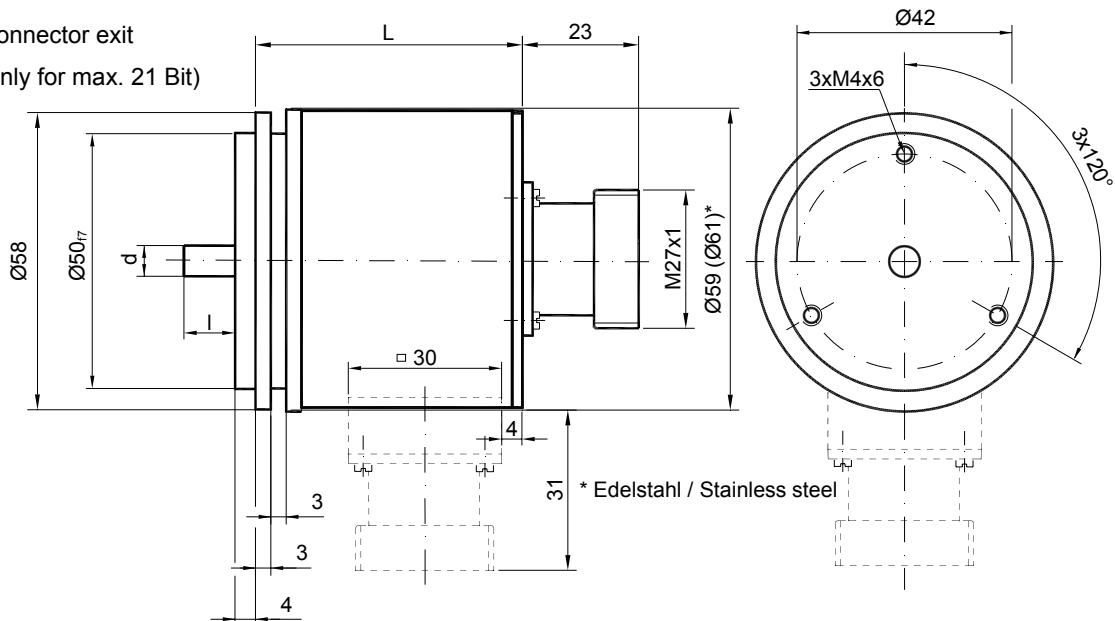
Two versions available

| Synchro flange | d [mm] | l [mm] |
|----------------|-----------------------|--------|
| Version S06 | $\varnothing 6_{f6}$ | 10 |
| Version S10 | $\varnothing 10_{h8}$ | 20 |

Cable exit (~ $\varnothing 10$ mm)



Connector exit
(only for max. 21 Bit)

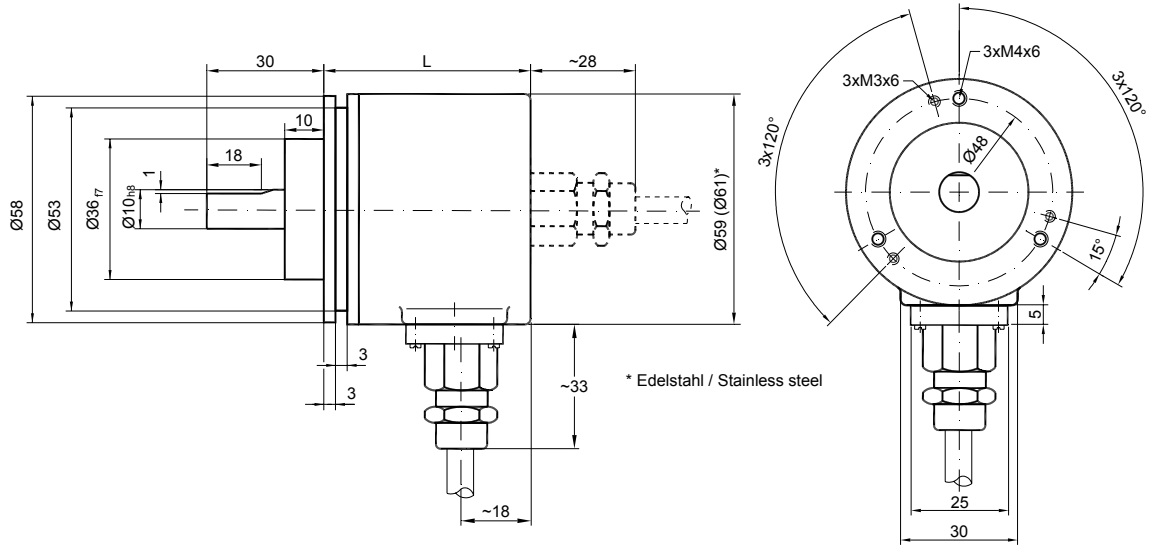


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Mechanical Drawings

Clamp flange

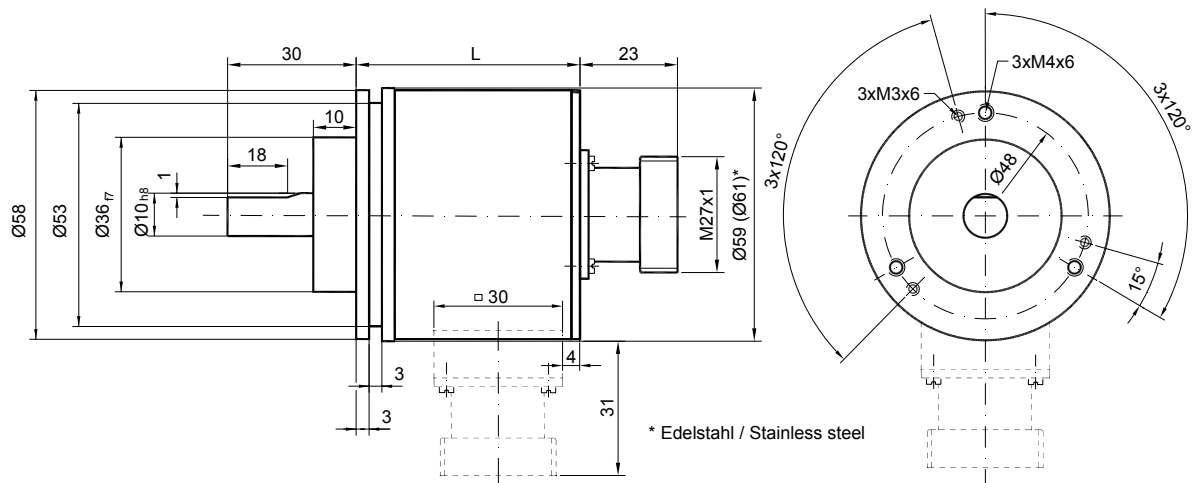
Cable exit (~ \varnothing 10 mm)



| L | | |
|------------|--------|----|
| Cable exit | | 62 |
| Connector | axial | 62 |
| | radial | 78 |

Connector exit

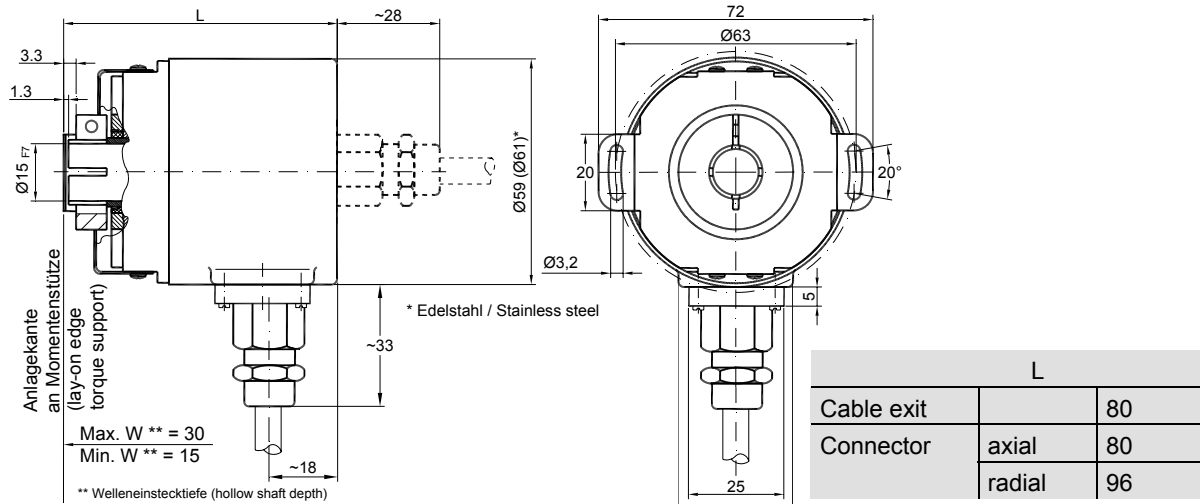
(only for max. 21 Bit)



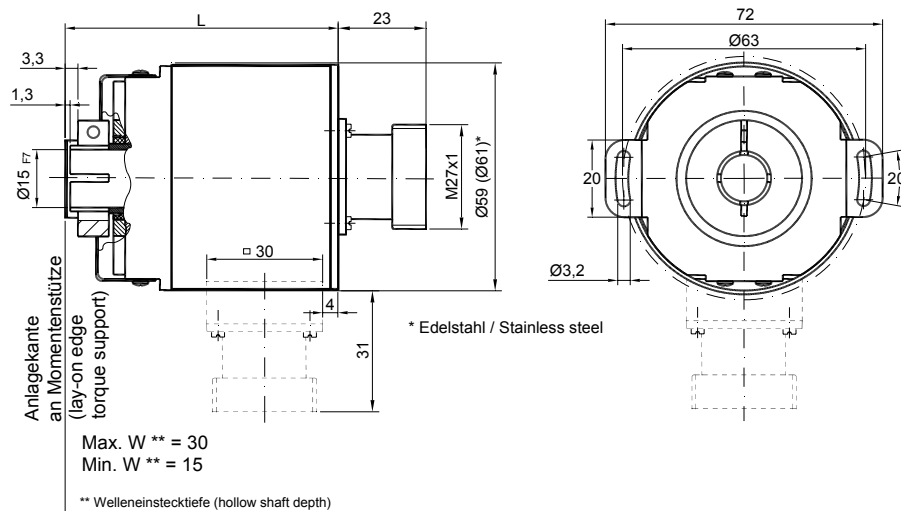
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Hollow Shaft (H)

Cable Exit (~ \varnothing 10 mm)



Connector exit (only for max. 21 Bit)



Mounting instructions

Do not tighten the clamp ring unless the machine shaft is properly inserted into the bore of the hollow shaft.

The diameter of the hollow shaft can be reduced to 12 mm, 10 mm or 8 mm by using an adapter (this reducing adapter can be pushed into the hollow shaft).

Allowed shaft movements of the drive element are listed in the table.

| | axial | radial |
|---------|--------------|--------------|
| static | ± 0.3 mm | ± 0.5 mm |
| dynamic | ± 0.1 mm | ± 0.2 mm |

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Models / Ordering Description

| Description | Type Key | | | | | | | |
|------------------------------------|--|-----|----|-----------|-----------|----------|-----------|----------|
| Optocode | SAG | - - | 00 | - - | - - | - - | - - | - - |
| Interface push pull with Preset | PP | | | | | | | |
| | P1 | | | | | | | |
| Version | | | 00 | | | | | |
| Code | Gray | | | G | | | | |
| | Binary | | | B | | | | |
| Bits for revolutions *1 | 16 | | | 04 | | | | |
| | 256 | | | 08 | | | | |
| | 4096 | | | 12 | | | | |
| | 16384 | | | 14 | | | | |
| Steps per revolution *1 | 4096 (0.09°) | | | | 12 | | | |
| | 8192 (0.04°) | | | | 13 | | | |
| | 65536 (0.005°) | | | | 16 | | | |
| Flange | Clamp flange | | | | | C | | |
| | Synchro flange | | | | | S | | |
| | Blind hollow shaft | | | | | B | | |
| Shaft | ø10 mm | | | | | | 10 | |
| | ø06 mm | | | | | | 06 | |
| | ø15 mm (only for hollow shaft) | | | | | | 15 | |
| Mechanical options | Without | | | | | | | 0 |
| | Shaft sealing | | | | | | | S |
| | Stainless steel (only axial exit possible) | | | | | | | V |
| | Customized | | | | | | | C |
| Connection | Connector axial, max. 21 bit | | | | | | | PAT |
| | Connector radial, max. 21 bit ** | | | | | | | PRT |
| | 1m cable exit, axial, max. 25 bit | | | | | | | CAW |
| | 1m cable exit, radial, max. 25 bit ** | | | | | | | CRW |
| Options | number for special options | | | | | | | |

Standard = bold, Further models on request

* total Resolution on connector exit max. 21 bit, on cable exit max. 25 bit

** not in stainless version



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Accessories

| Description | | Type |
|------------------------|---|--------|
| Connector, counterpart | Circular connector, 26 pins | PAT |
| Cable for PAT | 28 x 0,14 mm ² + 2 x 1,5 mm ² | STK-30 |
| Shaft coupling * | Drilling: 10 mm | GS 10 |
| | Drilling: 6 mm | GS 06 |
| Clamp disc * | 4 pcs. / AWC | SP 15 |
| Clamp ring * | 2 pcs. / AWC | SP H |
| Reducing adapter ** | 15 mm to 14 mm | RR14 |
| Reducing adapter ** | 15 mm to 12 mm | RR12 |
| Reducing adapter ** | 15 mm to 10 mm | RR10 |
| Reducing adapter ** | 15 mm to 8 mm | RR8 |

* not for hollow shaft

** only for hollow shaft

We do not assume responsibility for technical inaccuracies or omissions. Specifications are subject to change without notice.