

Absolute encoders - singleturn

| | | |
|---------------------------------------|--|--------------------------|
| Standard SIL3/PLe, optical | Sendix 5853FS3 / 5873FS3 (shaft / hollow shaft) | SSI/BiSS + SinCos |
|---------------------------------------|--|--------------------------|

| | | |
|---|---|------------------------------------|
| Order code Hollow shaft | 8.5873FS3 Type | .XXXX.XX2X a b c d e f g |
| a Flange 9 = with torque stop FS, flexible, IP65 J = with torque stop FS, flexible, IP67 A = with torque stop FS, rigid, IP65 (incl. torque pin FS) K = with torque stop FS, rigid, IP67 (incl. torque pin FS) B = with stator coupling FS, ø 63 mm [2.48"], IP65 L = with stator coupling FS, ø 63 mm [2.48"], IP67 | e Code B = SSI, binary C = BiSS, binary G = SSI, gray | |
| b Through hollow shaft 3 = ø 10 mm [0.39"] 4 = ø 12 mm [0.47"] 5 = ø 14 mm [0.55"] <i>Tapered shaft</i> K = ø 10 mm [0.39"] | f Resolution ¹⁾ A = 10 bit 1 = 11 bit 2 = 12 bit 3 = 13 bit 4 = 14 bit 7 = 17 bit | |
| c Interface / supply voltage 3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC 4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC | g Options (service) 1 = no option 2 = status LED 3 = SET button and status LED | |
| d Type of connection 2 = radial cable, 1 m [3.28'] PVC B = radial cable, special length PVC *) E = tangential cable, 1 m [3.28'] PVC F = tangential cable, special length PVC *) 4 = radial M23 connector, 12-pin *) Available special lengths (connection types B, F): 2, 3, 5, 8, 10, 15 m [5.56, 9.84, 16.40, 26.25, 32.80, 49.21'] order code expansion .XXXX = length in dm ex.: 8.5873FS2.B44B.G322.0030 (for cable length 3 m) | Optional on request - Ex 2/22 (not for type of connection E, F) ²⁾³⁾ - other resolutions - surface protection salt spray ³⁾ | |

| Accessories | | Order no. |
|--|---|-------------------------|
| EMC shield terminal | for top-hat rail mounting | 8.0000.4G06.0312 |
| Screw retention | Loctite 243, 5 ml | 8.0000.4G05.0000 |
| Bellows coupling, safety-oriented | You will find an overview of our couplings for Sendix shaft encoders under kuebler.com/accessories . | |
| Safety modules Safety-M compact | You will find an overview of our systems and components for Functional Safety and the corresponding software under kuebler.com/safety . | |
| LED SSI display 570 / 575 | Electronic position display up to 32 bit. You will find an overview or under kuebler.com/position_display | |

| Connection technology | | Order no. |
|---------------------------------|---|------------------------------|
| Cordset, pre-assembled | M23 female connector with coupling nut, 12-pin, cw single ended 2 m [6.56'] PVC cable ⁴⁾ | 8.0000.6901.0002.0031 |
| | M23 female connector with coupling nut, 12-pin, cw M23 male connector with external thread, 12-pin, ccw 2 m [6.56'] PVC cable ⁴⁾ | 8.0000.6905.0002.0032 |
| Connector, self-assembly | M23 female connector with coupling nut, 12-pin, cw | 8.0000.5012.0000 |

Further Kübler accessories can be found at: kuebler.com/accessories
 Further Kübler cables and connectors can be found at: kuebler.com/connection-technology

1) Resolution, preset value and count direction are factory-programmable.
 2) For the cable connection type, cable material PUR.
 3) Not possible for flange type A and K.
 4) Other lengths available.

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Technical data

Notes regarding "Functional Safety"

These encoders are suitable for use in safety-related systems up to SIL3 acc. to EN 61800-5-2 and PLe to EN ISO 13849-1 in conjunction with controllers or evaluation units, which possess the necessary functionality.

Additional functions can be found in the operating manual.

| Safety characteristics | |
|---|---|
| Classification | PLe / SIL3 |
| System structure | 2 channel (Cat. 4) |
| PFH_d value¹⁾ | 1.09 x 10 ⁻⁸ h ⁻¹ |
| Mission time / Proof test interval | 20 years |
| Relevant standards | EN ISO 13849-1:2015; EN ISO 13849-2:2012; EN 61800-5-2:2007 |

| Electrical characteristics | |
|--|---|
| Supply voltage | 5 V DC (±5 %) or 10 ... 30 V DC |
| Current consumption (no load) | 5 V DC max. 70 mA 10 ... 30 V DC max. 45 mA |
| Reverse polarity protection of the supply voltage | yes |
| Short circuit proof outputs | yes ²⁾ |
| UL approval | file no. E224618 |
| CE compliant acc. to | EMC guideline 2014/30/EU Machinery directive 2006/42/EC RoHS guideline 2011/65/EU |

| Mechanical characteristics | |
|--|--|
| Maximum speed shaft version | up to 70 °C [158 °F] 12000 min ⁻¹ , 10000 min ⁻¹ (continuous) up to T _{max} 8000 min ⁻¹ , 5000 min ⁻¹ (continuous) |
| Maximum speed hollow shaft version | up to 70 °C [158 °F] 9000 min ⁻¹ , 6000 min ⁻¹ (continuous) up to T _{max} 6000 min ⁻¹ , 3000 min ⁻¹ (continuous) |
| Starting torque - at 20 °C [68 °F] | shaft version < 0.01 Nm hollow shaft version < 0.03 Nm |
| Mass moment of inertia | shaft version 4.0 x 10 ⁻⁶ kgm ² hollow shaft version 7.0 x 10 ⁻⁶ kgm ² |
| Insertion depth for shaft | hollow shaft version min. 34 mm [1.34"] |
| Load capacity of shaft | radial 80 N axial 40 N |
| Weight | approx. 0.45 kg [15.87 oz] |
| Protection acc. to EN 60529 | IP65, IP67 |
| Working temperature range | -40 °C ... +90 °C [-40 °F ... +194 °F] ³⁾ |
| Material | shaft / hollow shaft stainless steel flange aluminum housing zinc die-cast cable PVC (PUR for Ex 2/22) |
| Shock resistance acc. to EN 60068-2-27 | 500 m/s ² , 11 ms |
| Vibration resistance acc. to EN 60068-2-6 | 200 m/s ² , 5 ... 2000 Hz |

1) The specified value is based on a diagnostic coverage of 99 %, that must be achieved with an encoder evaluation unit.
The encoder evaluation unit must meet at least the requirements for SIL3.

| EMC | |
|---------------------------|--|
| Relevant standards | EN 55011 class B :2009 / A1:2010 EN 61326-1:2013 EN 61326-3-1:2008 |

| SSI interface | |
|---|--|
| Output driver | RS485 transceiver type |
| Permissible load / channel | max. +/- 20 mA |
| Signal level | HIGH typ. 3.8 V LOW at I _{Load} = 20 mA typ. 1.3 V |
| Resolution | 10 ... 14 bit and 17 bit |
| Code | binary or gray |
| SSI clock rate | 50 kHz ... 2 MHz |
| Data refresh rate | ST resolution ≤ 14 bit ≤ 1 μs ST resolution ≥ 15 bit 4 μs |
| Monoflop time | ≤ 15 μs |
| Note: If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts with the new values. The update rate is dependent on the clock speed, data length and monoflop-time. | |

| BiSS interface | |
|--|--|
| Output driver | RS485 transceiver type |
| Permissible load / channel | max. +/- 20 mA |
| Signal level | HIGH typ. 3.8 V LOW at I _{Load} = 20 mA typ. 1.3 V |
| Resolution | 10 ... 14 bit and 17 bit |
| Code | binary |
| Clock rate | up to 10 MHz |
| Max. update rate | < 10 μs, depends on the clock rate and the data length |
| Data refresh rate | ST resolution ≤ 14 bit ≤ 1 μs ST resolution 17 bit 2.4 μs |
| Note: <ul style="list-style-type: none"> – bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings – CRC data verification | |

| SinCos interface | |
|----------------------------|---------------------------|
| Max. frequency -3dB | 400 kHz |
| Signal level | 1 V _{pp} (±10 %) |
| Short circuit proof | yes ²⁾ |
| Pulse rate | 2048 ppr |

| LED | |
|---|--|
| The optional LED (red) serves to display various alarm or error messages. In normal operation the LED is OFF. | |
| If the LED is ON (status output LOW) this indicates: <ul style="list-style-type: none"> - sensor error, singleturn or multiturn (soiling, glass breakage etc.) - LED error, failure or ageing - Over- or under-temperature | |
| In the SSI mode, the fault indication can only be reset by switching off the supply voltage to the device. | |

2) Short circuit to 0 V or to output, one channel at a time, supply voltage correctly applied.
3) Cable version: -30 °C ... +90 °C [-22 °F ... +194 °F].

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| SET input or SET button | |
|----------------------------------|---|
| Input | HIGH active |
| Input type | comparator |
| Signal level | HIGH min: 60 % of +V, max: +V LOW max: 25 % of +V (supply voltage) |
| Input current | < 0.5 mA |
| Min. pulse duration (SET) | 10 ms |
| Timeout after SET signal | 14 ms |

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET button (with a pencil, ball-point pen or similar). Other preset values can be factory-programmed. The SET input has a signal delay time of approx. 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approx. 15 ms before the new position data can be read. During this time the LED is ON.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

| DIR input | |
|--|------|
| Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This function can also be factory-programmed to be inverted. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The LED will come ON and the status output will switch to LOW. | |
| If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences. | |
| Response time (DIR input) | 1 ms |

| Power-ON | |
|--|--|
| After Power-ON the device requires a time of approx. 150 ms before valid data can be read. | |
| Hot plugging of the encoder should be avoided. | |

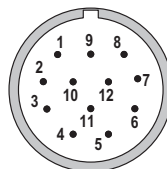
Terminal assignment

| Interface | Type of connection | Cable (isolate unused cores individually before initial start-up) | | | | | | | | | | | | | |
|-----------|--------------------|---|-----|----|----|----|----|----|-----|-----|----|-----------|-------|-----------|---------|
| | | Signal: | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | A | \bar{A} | B | \bar{B} | \perp |
| 3, 4 | 1, 2, A, B, E, F | Core color: | WH | BN | GN | YE | GY | PK | BU | RD | BK | VT | GY-PK | RD-BU | shield |

| Interface | Type of connection | M23 connector, 12-pin | | | | | | | | | | | | | |
|-----------|--------------------|-----------------------|-----|----|----|----|----|----|-----|-----|---|-----------|----|-----------|---------|
| | | Signal: | 0 V | +V | C+ | C- | D+ | D- | SET | DIR | A | \bar{A} | B | \bar{B} | \perp |
| 3, 4 | 3, 4 | Pin: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | PH |

- +V: Supply voltage encoder +V DC
- 0 V: Supply voltage encoder ground GND (0 V)
- C+, C-: Clock signal
- D+, D-: Data signal
- SET: Set input
- DIR: Direction input
- A, \bar{A} : Cosine signal
- B, \bar{B} : Sine signal
- PH \perp : Plug connector housing (shield)

Top view of mating side, male contact base



M23 connector, 12-pin

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Dimensions shaft version

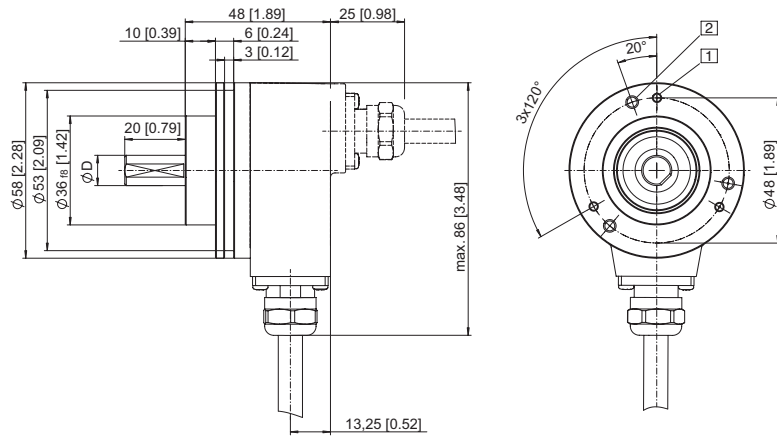
Dimensions in mm [inch]

Clamping flange, \varnothing 58 [2.28]

Flange type 1 + 3 with shaft type 2

(drawing with cable)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep



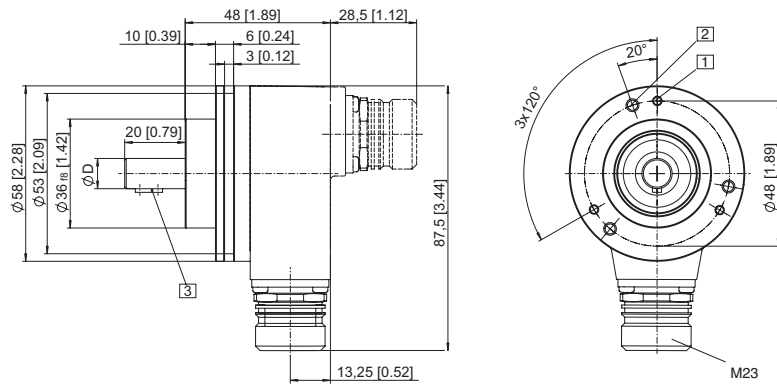
| D | Fit | L |
|-----------|-----|-----------|
| 10 [0.39] | f7 | 20 [0.79] |

Clamping flange, \varnothing 58 [2.28]

Flange type 1 + 3 with shaft type A

(drawing with M23 connector)

- 1 3 x M3, 6 [0.24] deep
- 2 3 x M4, 8 [0.32] deep
- 3 Feather key DIN 6885 - A - 3x3x6



| D | Fit | L |
|-----------|-----|-----------|
| 10 [0.39] | f7 | 20 [0.79] |

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Standard
SIL3/PLe, optical

Sendix 5853FS3 / 5873FS3 (shaft / hollow shaft)

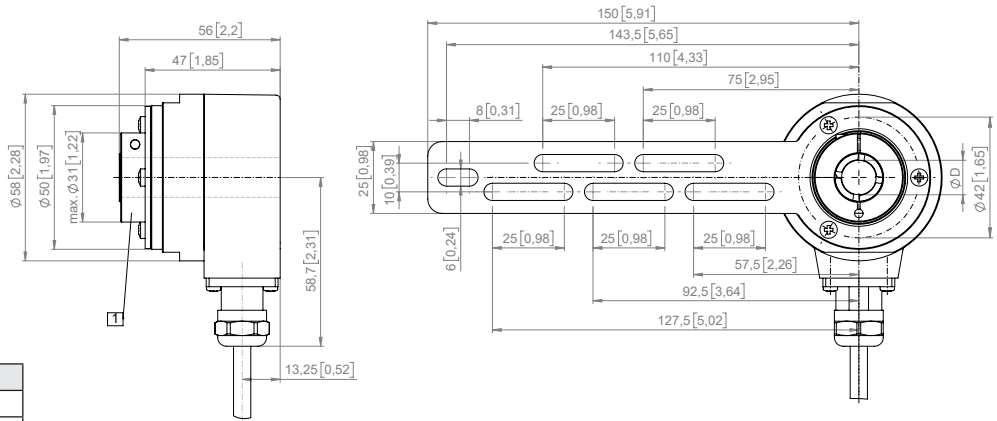
SSI/BiSS + SinCos

Dimensions hollow shaft version

Dimensions in mm [inch]

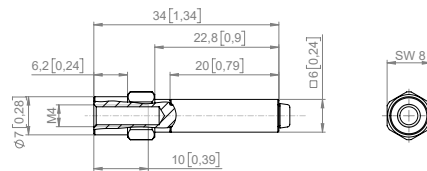
Flange with torque stop FS, rigid
Flange type A + K
Through hollow shaft
(drawing with cable)

- 1 SW 3, recommended torque for the clamping ring 2.5 Nm



| D | Fit |
|-----------|-----|
| 10 [0.39] | H7 |
| 12 [0.47] | H7 |
| 14 [0.55] | H7 |

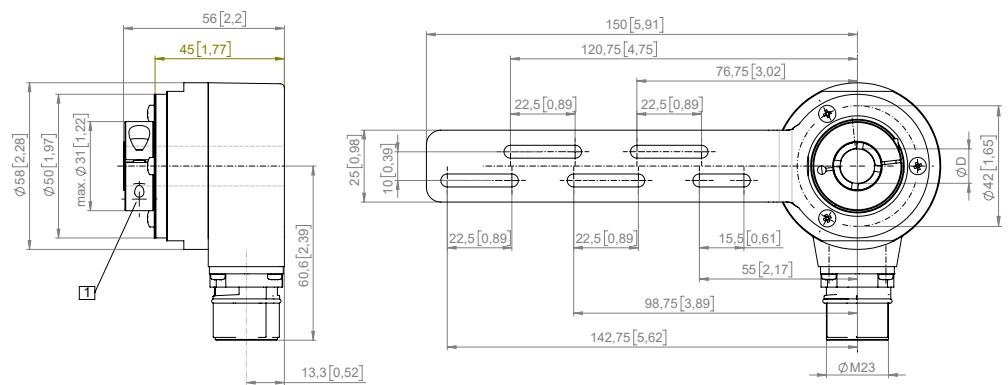
Torque pin with rectangular sleeve with M4 thread



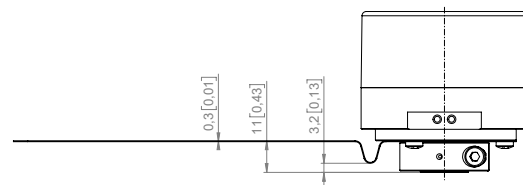
Flange with torque stop FS, flexible

Flange type 9 + J
Through hollow shaft
(drawing with M23 connector)

- 1 Recommended torque for the clamping ring 2.5 Nm



| D | Fit |
|-----------|-----|
| 10 [0.39] | H7 |
| 12 [0.47] | H7 |
| 14 [0.55] | H7 |



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Dimensions hollow shaft version

Dimensions in mm [inch]

Flange with stator coupling FS, ø 63 [2.48]

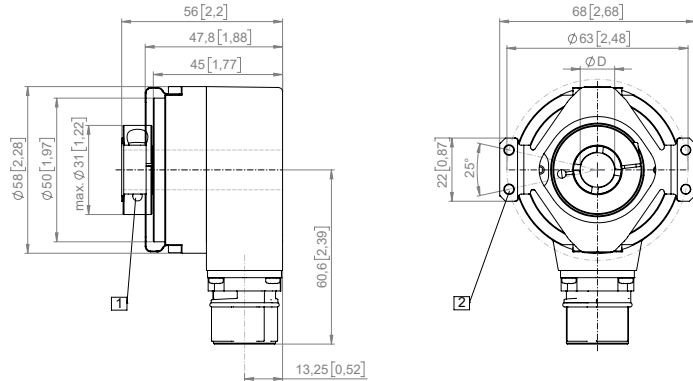
Flange type B + L

Through hollow shaft

(drawing with M23 connector)

- 1 SW 3, recommended torque for the clamping ring 2.5 Nm

- 2 For (4x) M3 screw



| D | Fit |
|-----------|-----|
| 10 [0.39] | H7 |
| 12 [0.47] | H7 |
| 14 [0.55] | H7 |

Flange with stator coupling FS, ø 63 [2.48]

Flange type B + L

Tapered shaft

(drawing with tangential cable outlet)

- 1 For (4x) M3 screw

- 2 Status-LED

- 3 SET button

- 4 Recommended torque for central screw M5 (SW 4) 3.0 ^{+0.5} Nm (tapered shaft)

