

# Incremental encoders

**Heavy Duty  
hollow shaft, optical**

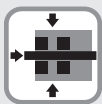
**Sendix Heavy Duty H120 (hollow shaft)**

**Push-pull / RS422 / optical fiber**



The Sendix Heavy Duty H120 were especially developed for large motors and generators. They are highly accurate and extremely robust thanks to HD-Safety-Lock™ – the Heavy Duty hollow shaft design of the latest generation with sturdy bearing construction and integrated bearing isolation. The dual protection of the shaft, the wide temperature range and the high protection level allow for use even under the harshest conditions.

The very large hollow shaft up to 28 mm plus the wide variety of mounting solutions and connection options offer the very highest degree of flexibility during installation.



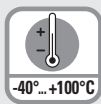
HD-Safety-Lock™



2.5 kV bearing isolation



Dual protection of the shaft



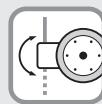
Temperature range  
-40°...+100°C



High protection level  
IP66/67



Shock/vibration resistant



Terminal box rotatable - 180°



Plug-in cage-clamp connectors



Hollow shaft up to ø 28 mm



Optical sensor



Seawater durable

## Robust

- Integrated bearing isolation up to 2.5 kV for reliable shaft connection. <sup>1)</sup>
- Extremely high resilience as a result of dual protection of the shaft (shielding cover disk and radial shaft seal), protection levels IP66 and IP67 as well as a seawater durable housing.
- High shock (200 g) and vibration (15 g) resistance.
- High level of resistance to interference as a result of optical fiber technology.

## Flexible

- 3 fixing solutions: conical central fastening, cylindrical central fastening or through hollow shaft.
- Connection via cable, M12 or M23 connector, terminal box or optical fiber.
- Torque stop on the flange or the cover – allows the device to be rotated as required during mounting.
- Through hollow shaft up to ø 28 mm.

## Order code Hollow shaft version

**8.H120.XXXX.XXXX**  
Type      a b c d e

### a Flange

- 1 = without mounting aid
- 2 = with fastening arm 70 mm [2.76"] <sup>2)</sup>
- 3 = with fastening arm 100 mm [3.93"] <sup>2)</sup>
- 4 = with fastening arm 150 mm [5.91"] <sup>2)</sup>
- 5 = with stator coupling, ø 119 mm [4.69"]

### b Through hollow shaft

- 2 = ø 16 mm [0.63"]
  - 3 = ø 20 mm [0.79"]
  - 5 = ø 25 mm [0.98"]
  - 7 = ø 28 mm [1.10"]
  - 6 = ø 1"
- Blind hollow shaft,  
with central fastening  
insertion depth max. 53 mm [2.09"]

A = ø 12 mm [0.47"]

B = ø 16 mm [0.63"]

- Blind hollow shaft, cone  
with central fastening  
insertion depth max. 22.5 mm [0.89"]
- K = ø 17 mm [0.67"], 1 : 10

### c Output circuit / power supply

- 4 = RS422 (with inverted signal) / 5 V DC
- 1 = RS422 (with inverted signal) / 10 ... 30 V DC
- 5 = push-pull (with inverted signal) / 10 ... 30 V DC
- 6 = push-pull (with inverted signal) / 10 ... 30 V DC, power version up to 350 m
- B = optical fiber + RS422 (with inverted signal) / 5 V DC <sup>3)</sup>
- A = optical fiber + RS422 (with inverted signal) / 10 ... 30 V DC <sup>3)</sup>
- C = optical fiber + push-pull (with inverted signal) / 10 ... 30 V DC <sup>3)</sup>

### d Type of connection

- 1 = radial cable, 1 m [3.28"] PVC
- A = radial cable, special length PVC \*)
- 2 = radial M12 connector, 8-pin, ccw
- 4 = radial M23 connector, 12-pin, ccw
- D = radial M23 connector, 12-pin, cw
- K = terminal box with plug-in spring terminal connectors, rotatable through 180°
- L = optical fiber connector + radial M23 connector, 12-pin, cw <sup>4)</sup>

\*) Available special lengths (connection type A):

2, 3, 5, 8, 10, 15 m [6.56, 9.84, 16.40, 26.25, 32.80, 49.21']

order code expansion .XXXX = length in dm

ex.: 8.H120.121A.2048.0030 (for cable length 3 m)

### e Pulse rate

- 50, 360, 512, 600, 1000, 1024, 1500, 2000, 2048, 2500, 4096, 5000
- (e.g. 360 pulses => 0360)

### Optional on request

- other pulse rates
- Ex 2/22 (not for type of connection L) <sup>5)</sup>

1) With a shaft diameter > 32 mm [1.26"] the insulation resistance of 2.5 kV cannot be guaranteed.  
2) Enclosed, not mounted.

3) Can only be ordered with connection type L.  
4) Can only be ordered with output circuits A, B or C.  
5) For the cable connection type, cable material PUR.

# Incremental encoders

| Heavy Duty hollow shaft, optical      | Sendix Heavy Duty H120 (hollow shaft)                                                 | Push-pull / RS422 / optical fiber |
|---------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------|
| Connection technology                 |                                                                                       | Order no.                         |
| Cordset, pre-assembled                | M12 female connector with coupling nut, 8-pin<br>2 m [6.56'] PVC cable                | 05.00.6041.8211.002M              |
|                                       | M23 female connector with coupling nut, 12-pin<br>2 m [6.56'] PVC cable <sup>1)</sup> | 8.0000.6201.0002                  |
| Connector, self-assembly (straight)   | M12 female connector with coupling nut, 8-pin                                         | 05.CMB 8181-0                     |
|                                       | M23 female connector with coupling nut, 12-pin <sup>1)</sup>                          | 8.0000.5012.0000                  |
| Simplex patch cable, ST-ST-multimode  | optical fiber, length 5 m [16.40']                                                    | 05.B09-B09-821-0005               |
| Cable gland for optical fiber version | for achieving protection IP66 and IP67 at the optical fiber connector                 | 8.0000.5000.0007                  |
| Optical fiber receiver                | HTL / 10 ... 30 V DC, plug-in connector HD-Sub D15                                    | 6.LWLE.51                         |

Further accessories can be found in the Accessories section or in the Accessories area of our website at: [www.kuebler.com/accessories](http://www.kuebler.com/accessories).  
Additional connectors can be found in the Connection Technology section or in the Connection Technology area of our website at: [www.kuebler.com/connection\\_technology](http://www.kuebler.com/connection_technology).

| Technical data                              |                                                                                               |
|---------------------------------------------|-----------------------------------------------------------------------------------------------|
| Mechanical characteristics                  |                                                                                               |
| Maximum speed                               | 6000 min <sup>-1</sup><br>at 60°C [140°F] 3500 min <sup>-1</sup>                              |
| Starting torque – at 20°C [68°F]            | 0.05 Nm                                                                                       |
| Load capacity of shaft                      | radial 475 N<br>axial 375 N                                                                   |
| Weight                                      | 1.6 ... 2.0 kg [56.44 ... 70.55 oz]<br>(depending on version)                                 |
| Protection acc. to EN 60529                 | IP66 + IP67                                                                                   |
| Working temperature range                   | -40°C <sup>2)</sup> ... +100°C <sup>3)</sup><br>[-40°F <sup>3)</sup> ... +212°F <sup>3)</sup> |
| Materials                                   | shaft stainless steel,<br>bore tolerance H7<br>housing, flange seawater durable               |
| Shock resistance acc. to EN 60068-2-27      | 2000 m/s <sup>2</sup> , 6 ms                                                                  |
| Vibration resistance acc. to EN 60068-2-6   | 150 m/s <sup>2</sup> , 10 ... 2000 Hz                                                         |
| Technical data for optical fiber connection |                                                                                               |
| Power consumption per module                | < 2 W                                                                                         |
| Input level optical fiber transmitter       | 10 ... 30 V DC or RS422                                                                       |
| Optical wavelength                          | 850 nm                                                                                        |
| Optical transmission rate                   | 120 Mbit/s                                                                                    |
| Optical fiber synchronization display       | LED on the receiver                                                                           |
| Optical fiber connection                    | ST connector, ø 9 mm [0.35"]                                                                  |
| Glass fiber                                 | multimode fiber,<br>50/125 µm, 62.5/125 µm                                                    |
| Optical fiber transmission distance         | max. 2000 m [6561.68']                                                                        |

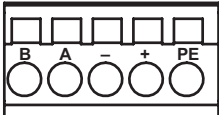
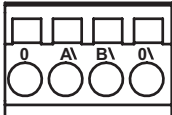
| Electrical characteristics                      |                                                       |                                  |                                    |
|-------------------------------------------------|-------------------------------------------------------|----------------------------------|------------------------------------|
| Output circuit                                  | RS422 (TTL-compatible))                               | Push-pull                        | Push-pull (power version)          |
| Power supply                                    | 5 V DC (±5 %)<br>or 10 ... 30 V DC                    | 10 ... 30 V DC                   | 10 ... 30 V DC                     |
| Power consumption (no load)                     | max. 90 mA                                            | max. 80 mA                       | max. 90 mA                         |
| Permissible load per channel                    | DC max. +/- 20 mA<br>peak max. +/- 30 mA              | max. +/- 30 mA<br>max. +/- 70 mA | max. +/- 150 mA<br>max. +/- 200 mA |
| Pulse frequency                                 | max. 300 kHz                                          | max. 300 kHz                     | max. 300 kHz                       |
| Max. cable length                               | 550 m at 100 kHz                                      | 150 m at 80 kHz                  | 350 m at 100 kHz                   |
| Signal level                                    | HIGH min. 2.5 V<br>LOW max. 0.5 V                     | min. +V - 3.0 V<br>max. 2.5 V    | min. +V - 4.0 V<br>max. 3.0 V      |
| Rising edge time t <sub>r</sub>                 | max. 200 ns                                           | max. 1 µs                        | max. 1 µs                          |
| Falling edge time t <sub>f</sub>                | max. 200 ns                                           | max. 1 µs                        | max. 1 µs                          |
| Short circuit proof outputs <sup>4)</sup>       | yes                                                   | yes                              | yes                                |
| Reverse polarity protection of the power supply | yes                                                   | yes                              | yes                                |
| CE compliant acc. to                            | EMC guideline 2014/30/EU<br>RoHS guideline 2011/65/EU |                                  |                                    |

- 1) Suitable for connection type 4.  
2) With connector: -40°C [-40°F], with securely installed cable: -30°C [-22°F],  
with flexibly installed cable: -20°C [-4°F].  
3) Measured at the flange.  
4) If power supply correctly applied.

# Incremental encoders

|                                             |                                              |                                          |
|---------------------------------------------|----------------------------------------------|------------------------------------------|
| <b>Heavy Duty<br/>hollow shaft, optical</b> | <b>Sendix Heavy Duty H120 (hollow shaft)</b> | <b>Push-pull / RS422 / optical fiber</b> |
|---------------------------------------------|----------------------------------------------|------------------------------------------|

## Terminal assignment

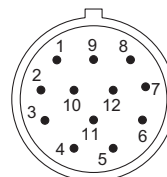
| Output circuit      | Type of connection | Cable (isolate unused cores individually before initial start-up) |                                                                                   |    |         |        |         |                                                                                     |           |           |           |           |                  |
|---------------------|--------------------|-------------------------------------------------------------------|-----------------------------------------------------------------------------------|----|---------|--------|---------|-------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|------------------|
| 1, 4, 5, 6          | 1, A               | Signal:                                                           | 0 V                                                                               | +V | 0 Vsens | +Vsens | A       | $\bar{A}$                                                                           | B         | $\bar{B}$ | 0         | $\bar{0}$ | $\perp$          |
|                     |                    | Core color:                                                       | WH                                                                                | BN | GY PK   | RD BU  | GN      | YE                                                                                  | GY        | PK        | BU        | RD        | Shield           |
| Output circuit      | Type of connection | M12 connector, 8-pin                                              |                                                                                   |    |         |        |         |                                                                                     |           |           |           |           |                  |
| 1, 4, 5, 6          | 2                  | Signal:                                                           | 0 V                                                                               | +V | 0 Vsens | +Vsens | A       | $\bar{A}$                                                                           | B         | $\bar{B}$ | 0         | $\bar{0}$ | $\perp$          |
|                     |                    | Pin:                                                              | 1                                                                                 | 2  | —       | —      | 3       | 4                                                                                   | 5         | 6         | 7         | 8         | PH <sup>1)</sup> |
| Output circuit      | Type of connection | M23 connector, 12-pin                                             |                                                                                   |    |         |        |         |                                                                                     |           |           |           |           |                  |
| 1, 4, 5, 6, A, B, C | 4, D, L            | Signal:                                                           | 0 V                                                                               | +V | 0 Vsens | +Vsens | A       | $\bar{A}$                                                                           | B         | $\bar{B}$ | 0         | $\bar{0}$ | $\perp$          |
|                     |                    | Pin:                                                              | 10                                                                                | 12 | 11      | 2      | 5       | 6                                                                                   | 8         | 1         | 3         | 4         | PH <sup>1)</sup> |
| Output circuit      | Type of connection | Terminal connections                                              |                                                                                   |    |         |        |         |                                                                                     |           |           |           |           |                  |
| 1, 4, 5, 6          | K                  | Signal:                                                           | B                                                                                 | A  | 0 V     | +V     | $\perp$ | 0                                                                                   | $\bar{A}$ | $\bar{B}$ | $\bar{0}$ |           |                  |
|                     |                    | Pin:                                                              | B                                                                                 | A  | —       | +      | PE      | 0                                                                                   | $\bar{A}$ | $\bar{B}$ | $\bar{0}$ |           |                  |
|                     |                    |                                                                   |  |    |         |        |         |  |           |           |           |           |                  |

- +V: Encoder power supply +V DC  
 0 V: Encoder power supply ground GND (0 V)  
 0 Vsens / +Vsens: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.  
 A,  $\bar{A}$ : Incremental output channel A  
 B,  $\bar{B}$ : Incremental output channel B  
 0,  $\bar{0}$ : Reference signal  
 PH  $\perp$ : Plug connector housing (shield)

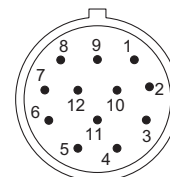
## Top view of mating side, male contact base



M12 connector,  
8-pin, ccw



M23 connector,  
12-pin, ccw



M23 connector,  
12-pin, cw

<sup>1)</sup> PH = shield is attached to connector housing.

# Incremental encoders

## Heavy Duty hollow shaft, optical

## Sendix Heavy Duty H120 (hollow shaft)

## Push-pull / RS422 / optical fiber

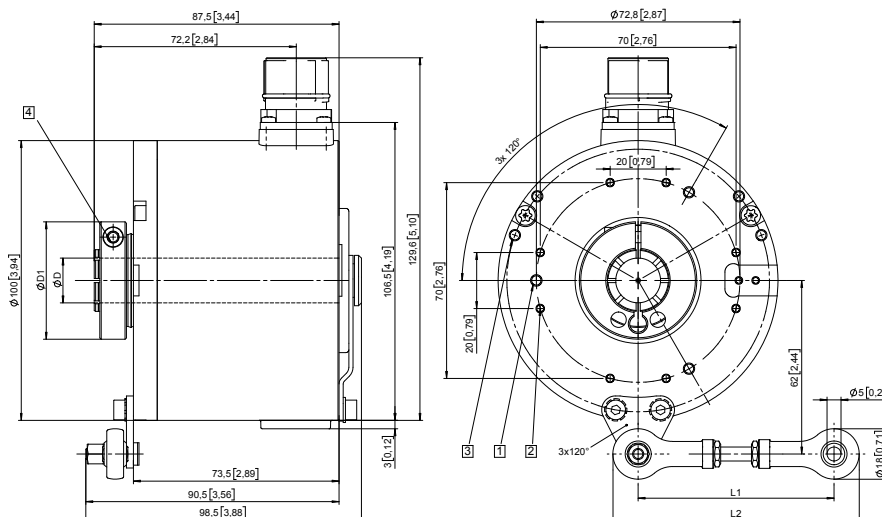
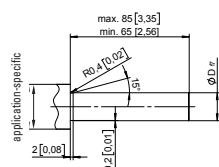
### Dimensions

Dimensions in mm [inch]

#### Flange with fastening arm Through hollow shaft

- 1 3 x M4, 7 [0.28] deep
- 2 8 x M3, 8 [0.31] deep
- 3 6 x M4
- 4 Recommended torque for the clamping ring 2 Nm (SW3)

#### Shaft connection to the application



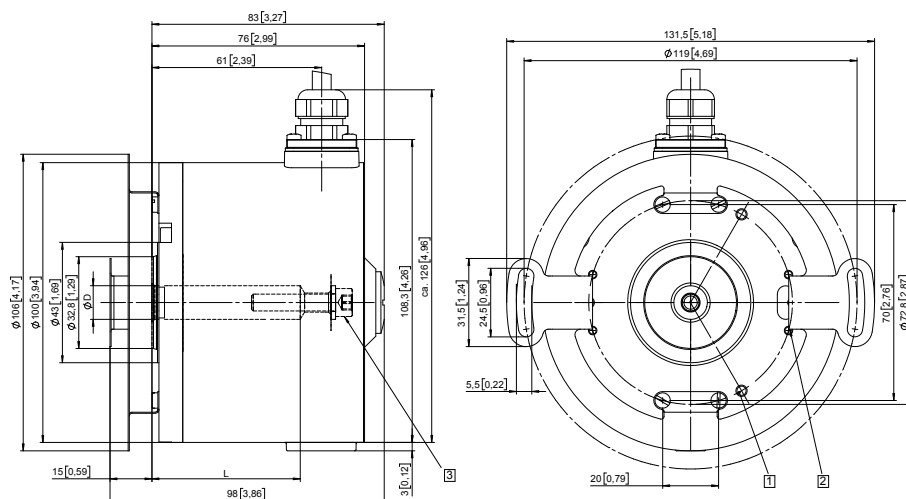
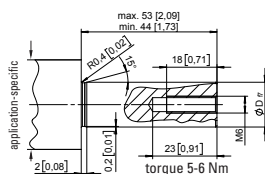
| D         | Fit | D1          |
|-----------|-----|-------------|
| 16 [0.63] | H7  | 42.0 [1.65] |
| 20 [0.79] | H7  | 42.0 [1.65] |
| 25 [0.98] | H7  | 47.5 [1.87] |
| 28 [1.10] | H7  | 52.0 [2.05] |
| 1"        | H7  | 47.5 [1.87] |

| Fastening arm | L1                          | L2                          |
|---------------|-----------------------------|-----------------------------|
| 70 mm [2.76]  | 64 ... 74 [2.51 ... 2.91]   | 82 ... 92 [3.23 ... 3.62]   |
| 100 mm [3.93] | 94 ... 104 [3.70 ... 4.09]  | 112 ... 122 [4.41 ... 4.80] |
| 150 mm [5.91] | 144 ... 154 [5.67 ... 6.06] | 162 ... 172 [6.38 ... 6.77] |

#### Flange with stator coupling, Ø 119 [4.69] Blind hollow shaft with central fastening

- 1 3 x M4, 7 [0.28] deep
- 2 8 x M3, 8 [0.31] deep
- 3 Recommended torque for M6 (SW5) 5 - 6 Nm

#### Shaft connection to the application



| D         | Fit | L         |
|-----------|-----|-----------|
| 12 [0.47] | H7  | 53 [2.09] |
| 16 [0.63] | H7  | 53 [2.09] |

L = insertion depth blind hollow shaft

# Incremental encoders

## Heavy Duty hollow shaft, optical

## Sendix Heavy Duty H120 (hollow shaft)

## Push-pull / RS422 / optical fiber

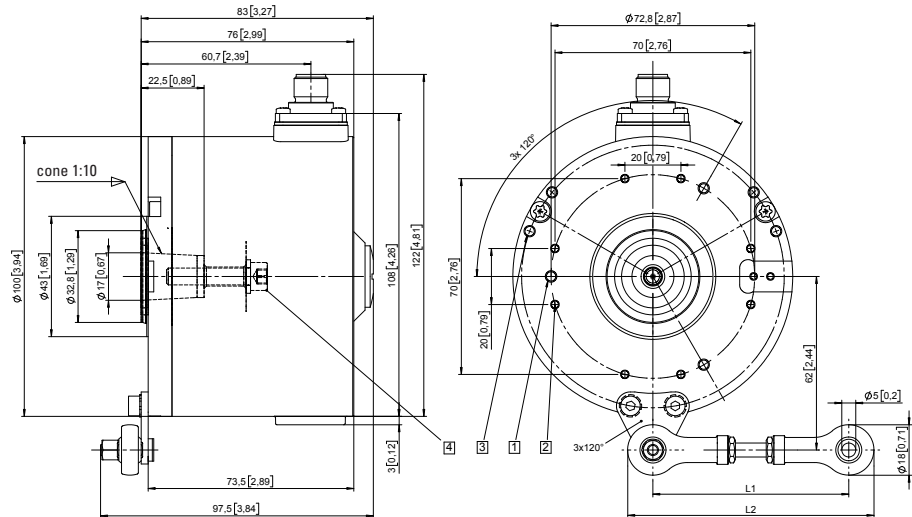
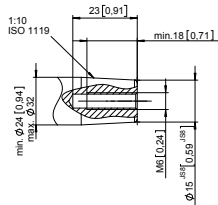
### Dimensions

Dimensions in mm [inch]

**Flange with fastening arm**  
**Blind hollow shaft with central fastening,**  
**cone,  $\phi$  17 [0.67], 1 : 10**  
**(blind hollow shaft, cone type K)**

- 1 3 x M4, 7 [0.28] deep
- 2 8 x M3, 8 [0.31] deep
- 3 6 x M4
- 4 Recommended torque for M6 (SW5) 5 - 6 Nm

Shaft connection to the application

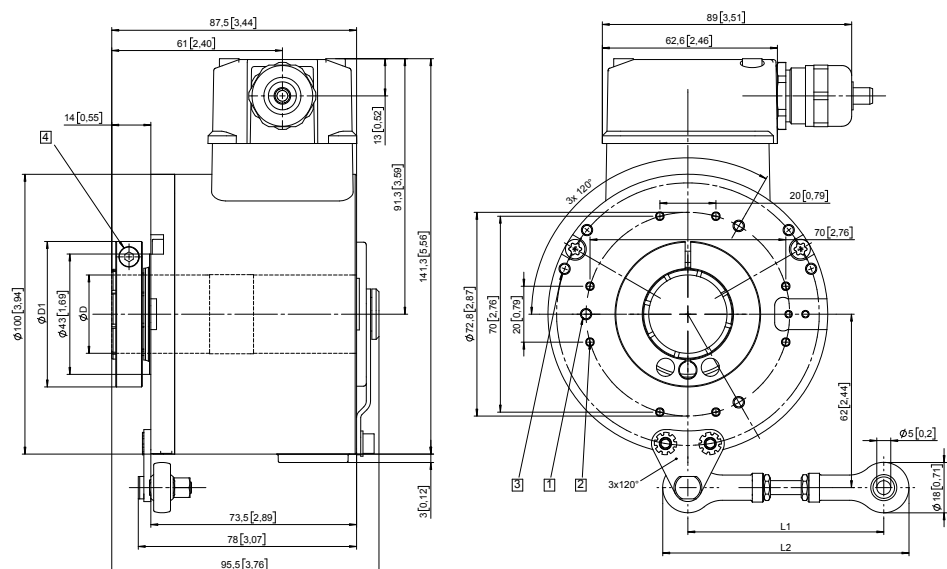
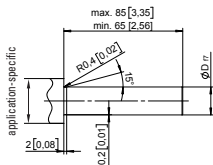


| Fastening arm | L1                          | L2                          |
|---------------|-----------------------------|-----------------------------|
| 70 mm [2.76]  | 64 ... 74 [2.51 ... 2.91]   | 82 ... 92 [3.23 ... 3.62]   |
| 100 mm [3.93] | 94 ... 104 [3.70 ... 4.09]  | 112 ... 122 [4.41 ... 4.80] |
| 150 mm [5.91] | 144 ... 154 [5.67 ... 6.06] | 162 ... 172 [6.38 ... 6.77] |

**Flange with fastening arm**  
**Through hollow shaft and**  
**terminal box**

- 1 3 x M4, 7 [0.28] deep
- 2 8 x M3, 8 [0.31] deep
- 3 6 x M4
- 4 Recommended torque for the clamping ring 2 Nm (SW3)

Shaft connection to the application



| D         | Fit | D1          |
|-----------|-----|-------------|
| 16 [0.63] | H7  | 42.0 [1.65] |
| 20 [0.79] | H7  | 42.0 [1.65] |
| 25 [0.98] | H7  | 47.5 [1.87] |
| 28 [1.10] | H7  | 52.0 [2.05] |
| 1"        | H7  | 47.5 [1.87] |

| Fastening arm | L1                          | L2                          |
|---------------|-----------------------------|-----------------------------|
| 70 mm [2.76]  | 64 ... 74 [2.51 ... 2.91]   | 82 ... 92 [3.23 ... 3.62]   |
| 100 mm [3.93] | 94 ... 104 [3.70 ... 4.09]  | 112 ... 122 [4.41 ... 4.80] |
| 150 mm [5.91] | 144 ... 154 [5.67 ... 6.06] | 162 ... 172 [6.38 ... 6.77] |

## Incremental encoders

## Heavy Duty hollow shaft, optical

## Sendix Heavy Duty H120 (hollow shaft)

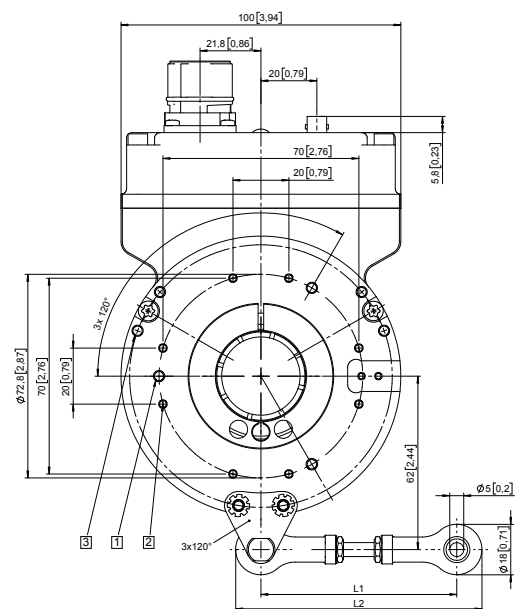
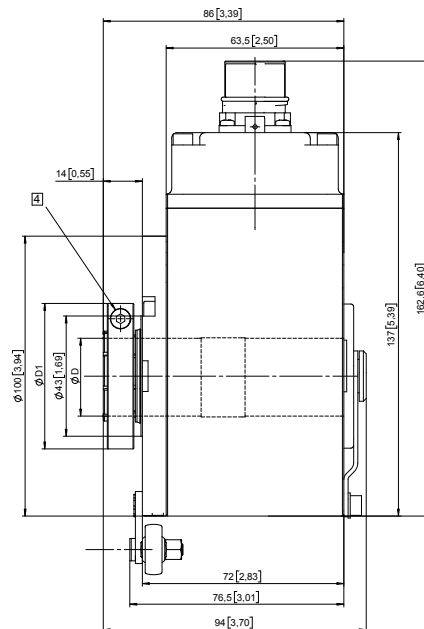
### Push-pull / RS422 / optical fiber

## Dimensions

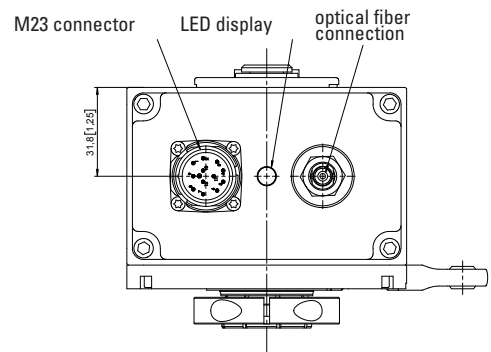
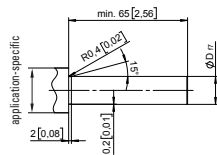
Dimensions in mm [inch]

**Flange with fastening arm through hollow shaft and optical fiber connection (type of connection L)**

- 1 3 x M4, 7 [0.28] deep
- 2 8 x M3, 8 [0.31] deep
- 3 6 x M4
- 4 Recommended torque for the clamping ring 2 Nm (SW3)



### Shaft connection to the application



| D         | Fit | D1          |
|-----------|-----|-------------|
| 16 [0.63] | H7  | 42.0 [1.65] |
| 20 [0.79] | H7  | 42.0 [1.65] |
| 25 [0.98] | H7  | 47.5 [1.87] |
| 28 [1.10] | H7  | 52.0 [2.05] |
| 1"        | H7  | 47.5 [1.87] |

| Fastening arm | L1                          | L2                          |
|---------------|-----------------------------|-----------------------------|
| 70 mm [2.76]  | 64 ... 74 [2.51 ... 2.91]   | 82 ... 92 [3.23 ... 3.62]   |
| 100 mm [3.93] | 94 ... 104 [3.70 ... 4.09]  | 112 ... 122 [4.41 ... 4.80] |
| 150 mm [5.91] | 144 ... 154 [5.67 ... 6.06] | 162 ... 172 [6.38 ... 6.77] |