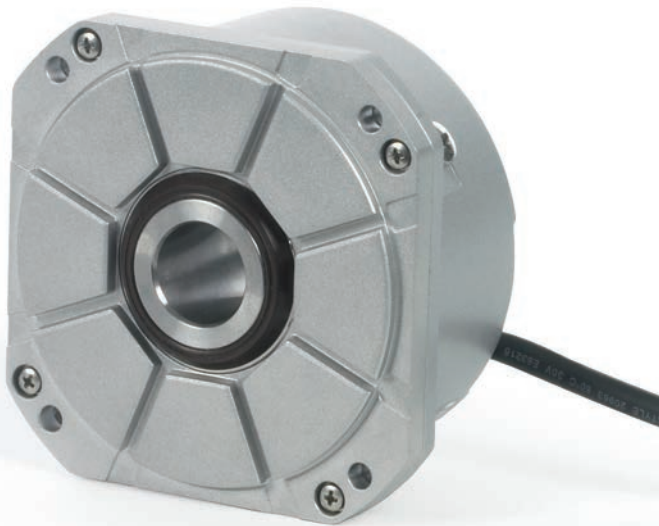




# HEIDENHAIN



Product Information

**RON 200**

**RON 700**

**RON 800**

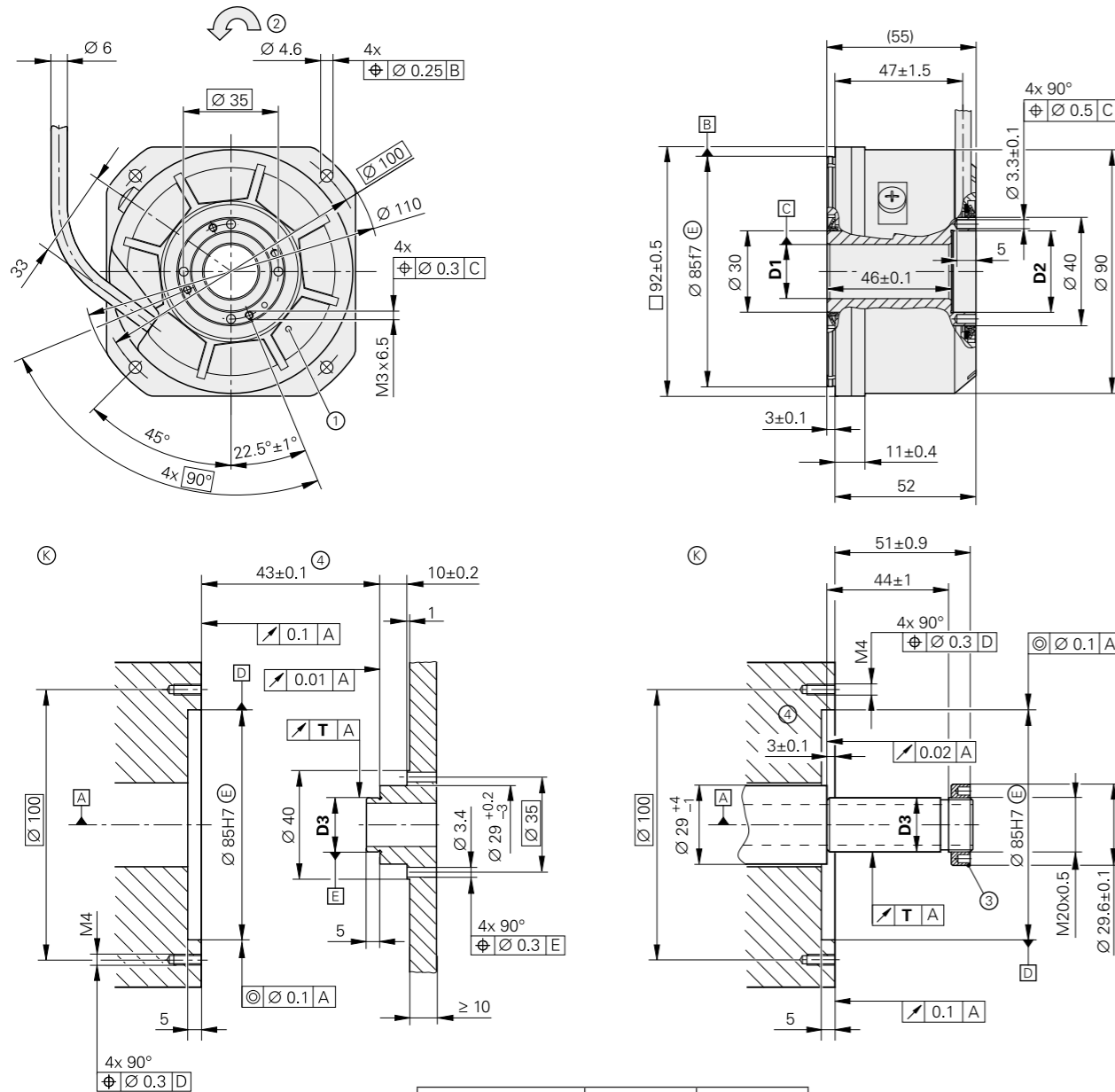
**RPN 800**

Incremental Angle Encoders  
with Integral Bearing,  
Hollow Shaft and  
Stator Coupling

02/2023

# RON 200 series

- Integrated stator coupling
- Hollow through shaft (Ø 20 mm)
- System accuracy: ±2.5" and ±5"



System accuracy	±2.5"	±5"
D1	Ø 20H6 ⊕	Ø 20H7 ⊕
D2	Ø 30H6 ⊕	Ø 30H7 ⊕
D3	Ø 20g6 ⊕	Ø 20g7 ⊕
T	0.01	0.02

mm  
  
 Tolerancing ISO 8015  
 ISO 2768:1989-mH  
 ≤ 6 mm: ±0.2 mm

Radial cable (can also be used axially)  
 ⊕ = Bearing of mating shaft  
 ⊕ = Required mating dimensions  
 1 = Position of the reference mark signal ±5°  
 2 = Direction of shaft rotation for ascending position values  
 3 = Accessory: ring nut (ID 336669-03)  
 4 = Stated tolerance contains mounting tolerances and thermal expansion;  
 no dynamic movement permitted

	Incremental RON 275	RON 275	RON 285	RON 287
<b>Measuring standard</b>	DIADUR circular scale with incremental track			
Line count	18000			
<b>System accuracy</b>	±5"			±2.5"
Position error per signal period	≤ ±0.7"			
<b>Interface</b>	□ TTL		~ 1 V <sub>pp</sub>	
Integrated interpolation* Output signals per rev.	5-fold 90000	10-fold 180000	-	
Reference mark*	One		RON 2xx: One RON 2xx C: Distance-coded	
Cutoff frequency -3 dB	-	-	≥ 180 kHz	
Output frequency	≤ 250 kHz	≤ 1 MHz	-	
Edge separation a	≥ 0.96 μs	≥ 0.22 μs	-	
Elec. permissible speed	≤ 166 rpm	≤ 333 rpm	-	
<b>Electrical connection*</b>	Cable (1 m), with or without 12-pin M23 coupling (male)			
Cable length <sup>1)</sup>	≤ 50 m		≤ 150 m	
Supply voltage	DC 5 V ±0.5 V/≤ 150 mA (without load)			
<b>Shaft</b>	Hollow through shaft D = 20 mm			
Mech. permissible speed	≤ 3000 rpm			
Starting torque	≤ 0.08 Nm at 20 °C			
Moment of inertia of rotor	73.0 · 10 <sup>-6</sup> kgm <sup>2</sup>			
Permissible axial motion of measured shaft	±0.1 mm			
<b>Natural frequency</b>	≥ 1200 Hz			
<b>Vibration</b> 55 Hz to 2000 Hz	≤ 100 m/s <sup>2</sup> (EN 60068-2-6)			
<b>Shock</b> 6 ms	≤ 200 m/s <sup>2</sup> (EN 60068-2-27)			
<b>Operating temperature</b>	Frequent flexing: -10 °C to 70 °C Stationary cable: -20 °C to 70 °C			0 °C to 50 °C
<b>Protection</b> EN 60529	IP64			
<b>Mass</b>	≈ 0.8 kg			

\* Please select when ordering

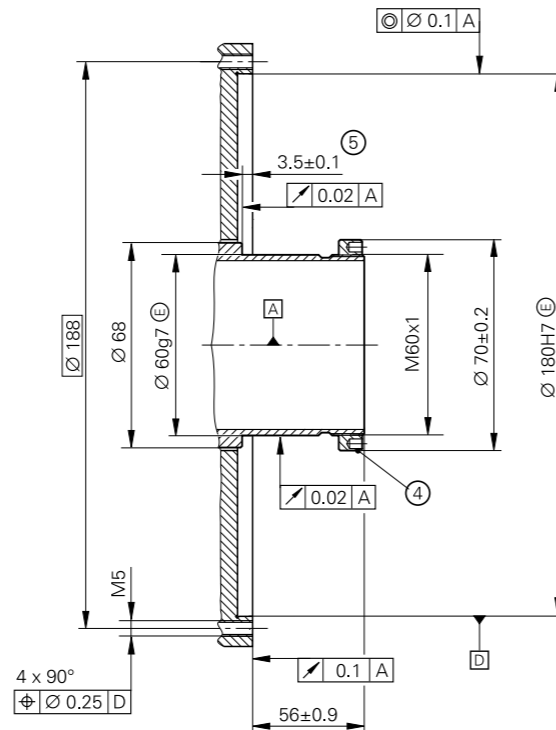
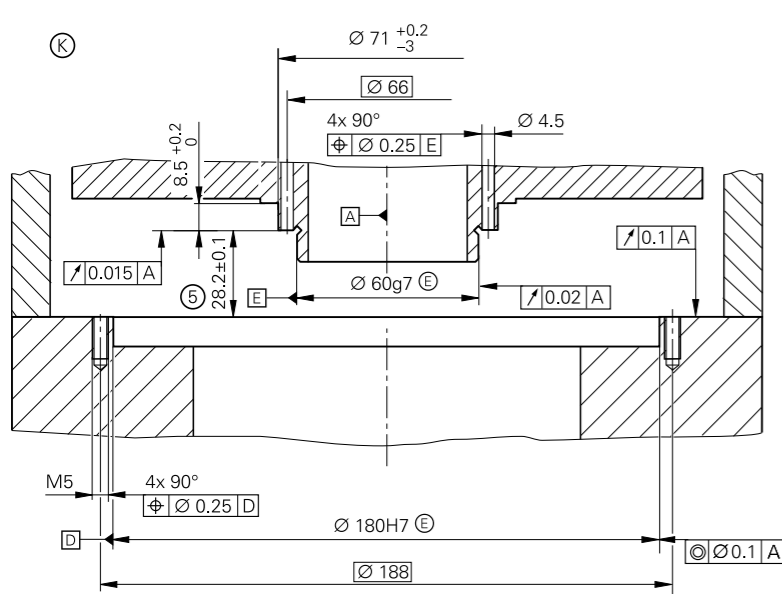
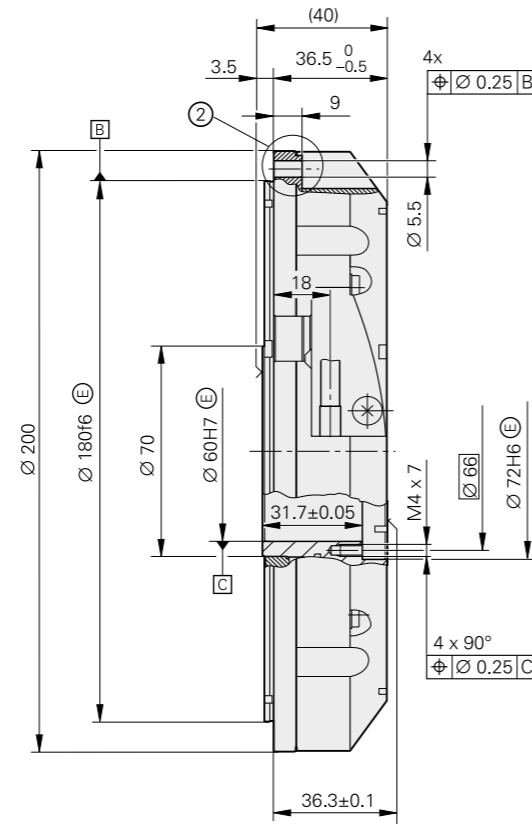
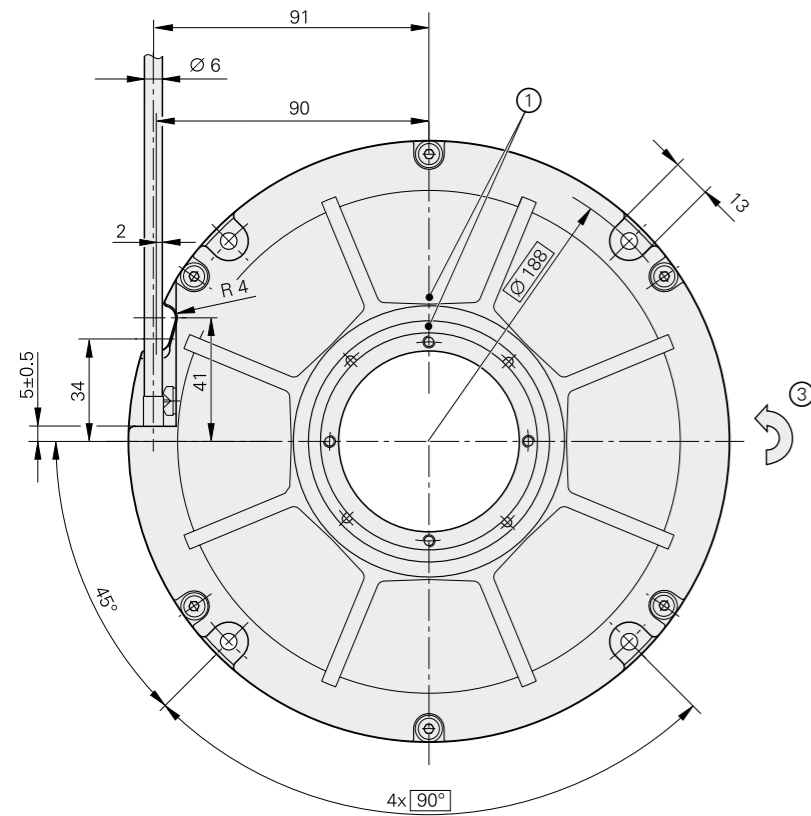
<sup>1)</sup> With HEIDENHAIN cable

<sup>2)</sup> Range includes mounting tolerances and thermal expansion; no dynamic movement permitted



# RON 786/RON 886/RPN 886

- Integrated stator coupling
- Hollow through shaft (Ø 60 mm)
- System accuracy: ±1" or ±2"



- Radial cable (can also be used axially)  
 □ = Bearing of mating shaft  
 ⊙ = Required mating dimensions  
 1 = Position of the reference mark signal ±5°  
 2 = Shown rotated by 45°  
 3 = Direction of shaft rotation for ascending position values  
 4 = Accessory: ring nut ID 336669-15  
 5 = Stated tolerance includes mounting tolerances and thermal expansion; no dynamic movement permitted

mm  
 Tolerancing ISO 8015  
 ISO 2768:1989-mH  
 ≤ 6 mm: ±0.2 mm

	Incremental RON 786	RON 886	RPN 886
<b>Measuring standard</b>	DIADUR circular scale with incremental track		
Line count*	18000 36000	36000	90000 (≥ 180000 signal periods)
<b>System accuracy</b>	±2"		±1"
Position error per signal period	18000 lines: ≤ ±0.7" 36000 lines: ≤ ±0.35"	≤ ±0.35"	
<b>Interface</b>	~ 1 V <sub>PP</sub>		
Reference mark*	RON x86: One RON x86C: Distance-coded		One
Cutoff frequency	-3 dB -6 dB	≥ 180 kHz ≥ 800 kHz ≥ 1300 kHz	
<b>Electrical connection*</b>	Cable (1 m), with or without 12-pin M23 coupling (male)		
Cable length <sup>1)</sup>	≤ 150 m		
Supply voltage	DC 5 V ±0.5 V/≤ 150 mA (without load)		DC 5 V ±0.5 V/≤ 250 mA (without load)
<b>Shaft</b>	Hollow through shaft D = 60 mm		
Mech. permissible speed	≤ 1000 rpm		
Starting torque	≤ 0.5 Nm at 20 °C		
Moment of inertia of rotor	1.20 · 10 <sup>-3</sup> kgm <sup>2</sup>		
Permissible axial motion of measured shaft	≤ ±0.1 mm		
<b>Natural frequency</b>	≥ 1000 Hz		≥ 500 Hz
<b>Vibration</b> 55 Hz to 2000 Hz	≤ 100 m/s <sup>2</sup> (EN 60068-2-6)		≤ 50 m/s <sup>2</sup> (EN 60068-2-6)
<b>Shock</b> 6 ms	≤ 200 m/s <sup>2</sup> (EN 60068-2-27)		≤ 200 m/s <sup>2</sup> (EN 60068-2-27)
<b>Operating temperature</b>	0 °C to 50 °C		
<b>Protection</b> EN 60529	IP64		
<b>Mass</b>	≈ 2.5 kg		

\* Please select when ordering  
 1) With HEIDENHAIN cable  
 2) Range includes mounting tolerances and thermal expansion; no dynamic movement permitted

# Mechanical design types and mounting

## RON, RPN

The **RON** and **RPN** angle encoders have an integral bearing, a hollow shaft and a stator-side coupling. The measured shaft is directly connected to the shaft of the angle encoder.

### Setup

The circular scale is rigidly affixed to the hollow shaft. The scanning unit rides on the shaft on ball bearings and is connected to the housing with a coupling on the stator side. The stator coupling and the sealing design compensate for axial and radial mounting error to a high degree without restricting accuracy or functionality. This thereby simplifies mounting. During angular acceleration of the shaft, the stator coupling must absorb only the torque resulting from friction within the bearing. Angle encoders with stator coupling therefore provide excellent dynamic performance.

### Mounting

The housing of the RON and RPN is firmly connected to the mounting surface of the machine part by means of a mounting flange and a centering collar.

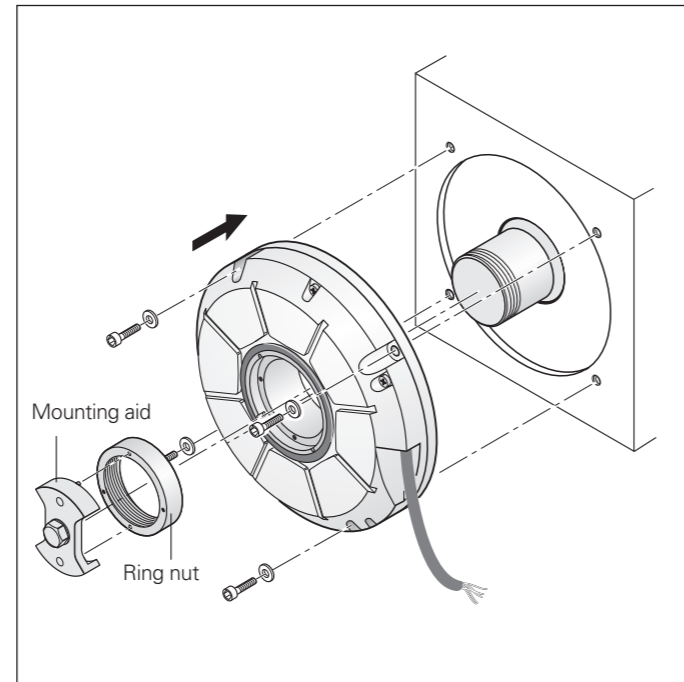
### • RON and RPN shaft coupling

#### Shaft coupling with ring nut

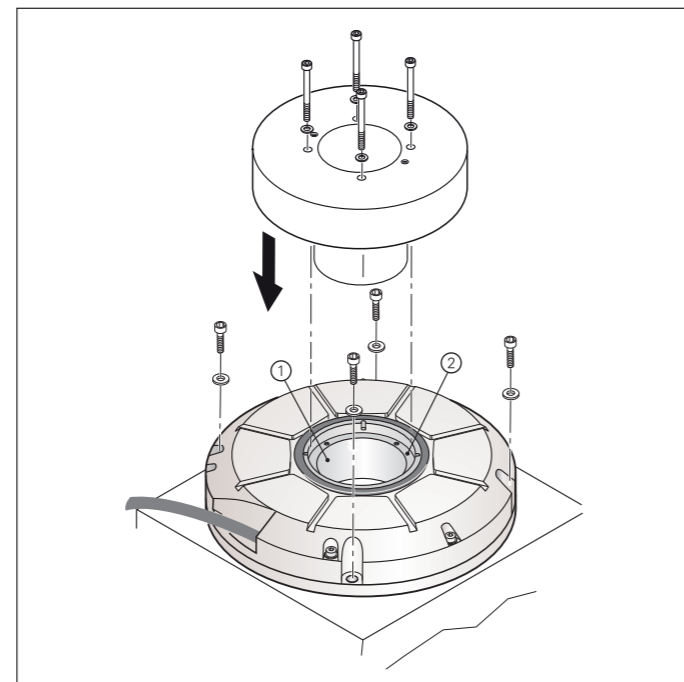
The shaft is designed as a hollow through shaft. For installation, the hollow through shaft of the angle encoder is seated onto the machine shaft and fastened from the encoder's front face with a ring nut. The ring nut can be easily tightened with the mounting aid.

#### Front-face shaft coupling

Especially for rotary tables, it is often helpful to integrate the angle encoder into the table such that the encoder is accessible when the rotor is lifted. The hollow shaft is connected through the front-face threaded holes by means of special mounting elements made for the given design (not included in delivery). In order to meet the radial and axial runout requirements, the interior hole ① and the shoulder surface ② must be used as the mounting surfaces for the front-face shaft coupling.



Mounting an angle encoder with a ring nut



Example of connecting an encoder to the shaft face

### Ring nuts for the RON and RPN

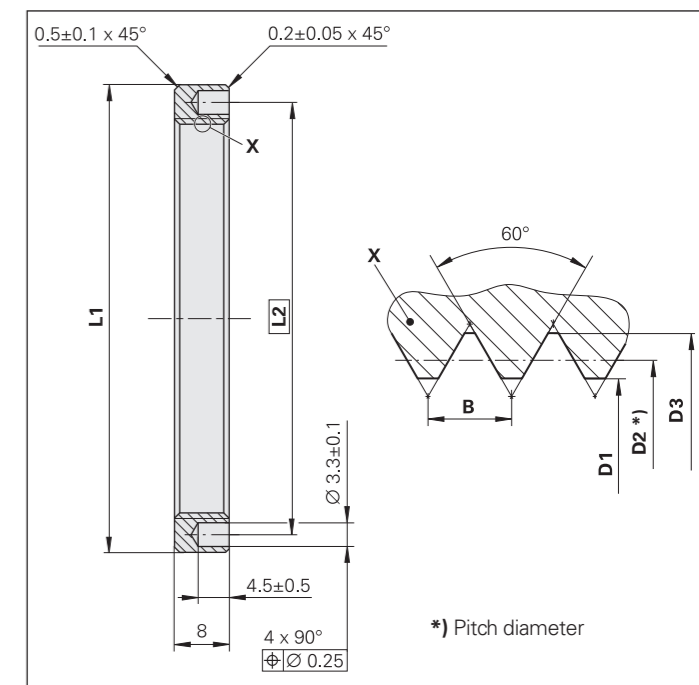
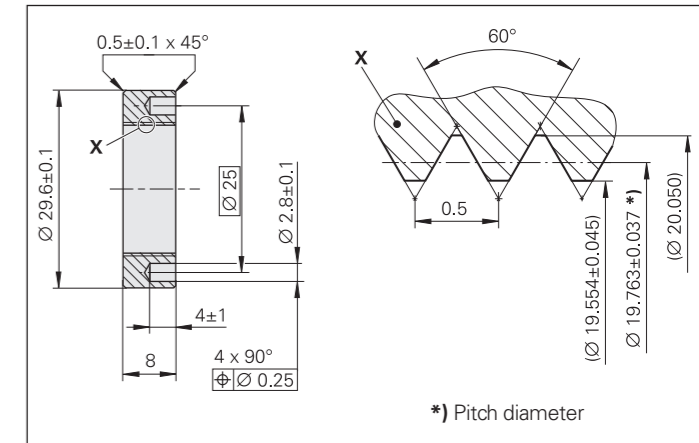
HEIDENHAIN offers special ring nuts for RON and RPN angle encoders. Choose the tolerance of the shaft thread such that the ring nut can be tightened easily, with a small amount of axial play. This guarantees that the load is evenly distributed on the shaft connection and prevents undesirable forces on the encoder's hollow shaft.



Ring nut for  
Hollow shaft  $\varnothing$  20 mm: ID 336669-03  
Hollow shaft  $\varnothing$  50 mm: ID 336669-15  
Hollow shaft  $\varnothing$  60 mm: ID 336669-11

Ring nut for	L1	L2	D1	D2	D3	B
Hollow shaft $\varnothing$ 50	$62 \pm 0.2$	$\varnothing 55$	$(\varnothing 49.052 \pm 0.075)$	$\varnothing 49.469 \pm 0.059$	$(\varnothing 50.06)$	1
Hollow shaft $\varnothing$ 60	$70 \pm 0.2$	$\varnothing 65$	$(\varnothing 59.052 \pm 0.075)$	$\varnothing 59.469 \pm 0.059$	$(\varnothing 60.06)$	1

Ring nut for hollow shaft  $\varnothing$  20 mm



### PWV inspection tool for RON/RPN angle encoders

The PWV makes it fast and easy to inspect the most significant mating dimensions. Its built-in measuring equipment measures position and radial runout, for example. It is best suited for the shaft coupling with a ring nut.

PWV for  
Hollow shaft  $\varnothing$  20 mm: ID 516211-01  
Hollow shaft  $\varnothing$  50 mm: ID 516211-02  
Hollow shaft  $\varnothing$  60 mm: ID 516211-03



### Mounting tool for HEIDENHAIN ring nuts

The mounting aid is used to tighten the ring nut. Its pins lock into the holes in the ring nut. A torque wrench provides the necessary tightening torque.

Mounting aid for ring nuts with  
Hollow shaft  $\varnothing$  20 mm: ID 530334-03  
Hollow shaft  $\varnothing$  50 mm: ID 530334-15  
Hollow shaft  $\varnothing$  60 mm: ID 530334-11

### Materials required for mounting the RON and RPN

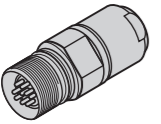

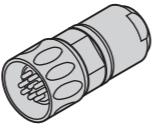
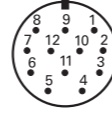
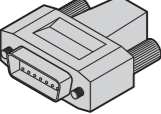
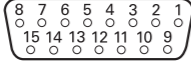
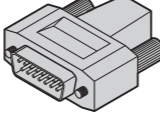
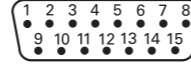




The machine shaft and the fastening components must be made of steel. The material must exhibit a thermal coefficient of expansion  $\alpha_{\text{therm}} = 10 \cdot 10^{-6} \text{ K}^{-1}$  to  $\alpha_{\text{therm}} = 16 \cdot 10^{-6} \text{ K}^{-1}$ . Additionally, the material must meet the following specifications:

- For hollow-shaft connection  
 $R_m \geq 650 \text{ N/mm}^2$   
 $R_{p0.2} \geq 370 \text{ N/mm}^2$
- For housing connection  
 $R_{p0.2} \geq 370 \text{ N/mm}^2$

# Electrical connection

~ 1 V<sub>PP</sub> incremental signals

## Pin layout

<b>12-pin M23 coupling</b>  				<b>12-pin M23 connector</b>  									
<b>15-pin D-sub connector</b> For HEIDENHAIN controls and IK 220  				<b>15-pin D-sub connector</b> For encoder or PWM 20  									
	Power supply				Incremental signals						Other signals		
	12	2	10	11	5	6	8	1	3	4	9	7	/
	1	9	2	11	3	4	6	7	10	12	5/8/13/15	14	/
	4	12	2	10	1	9	3	11	14	7	5/6/8/15	13	/
	U <sub>P</sub>	Sensor <sup>1)</sup> U <sub>P</sub>	0V	Sensor <sup>1)</sup> 0V	A+	A-	B+	B-	R+	R-	Vacant	Vacant	Vacant
	Brown/ Green	Blue	White/ Green	White	Brown	Green	Gray	Pink	Red	Black	/	Violet	Yellow

**Cable shield** connected to housing; **U<sub>P</sub>** = Power supply voltage

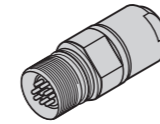
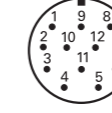
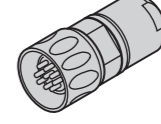
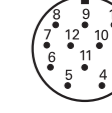
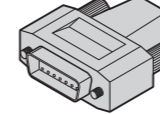
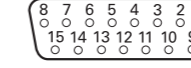
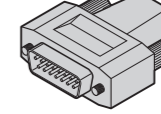
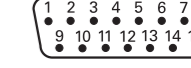




**Sensor:** The sense line is connected in the encoder with the corresponding power line.

Vacant pins or wires must not be used!

<sup>1)</sup> LIDA 2xx: vacant

# TTL incremental signals

## Pin layout

<b>12-pin M23 coupling</b>  				<b>12-pin M23 connector</b>  									
<b>15-pin D-sub connector</b> For HEIDENHAIN controls and IK 220  				<b>15-pin D-sub connector</b> For encoder or PWM 20  									
	Power supply				Incremental signals						Other signals		
	12	2	10	11	5	6	8	1	3	4	7	/	9 <sup>3)</sup>
	1	9	2	11	3	4	6	7	10	12	14	8/13/15	5
	4	12	2	10	1	9	3	11	14	7	13	5/6/8	15 <sup>3)</sup>
	U <sub>P</sub>	Sensor <sup>1)</sup> U <sub>P</sub>	0V	Sensor <sup>1)</sup> 0V	U <sub>a1</sub>	U <sub>a1</sub>	U <sub>a2</sub>	U <sub>a2</sub>	U <sub>a0</sub>	U <sub>a0</sub>	U <sub>aS</sub> <sup>2)</sup>	Vacant	Vacant
	Brown/ Green	Blue	White/ Green	White	Brown	Green	Gray	Pink	Red	Black	Violet	/	Yellow

**Cable shield** connected to housing; **U<sub>P</sub>** = Power supply voltage

**Sensor:** The sense line is connected in the encoder with the corresponding power line.

Vacant pins or wires must not be used!

<sup>1)</sup> LIDA 2xx: vacant / <sup>2)</sup> ERO 14xx: vacant

<sup>3)</sup> **Exposed linear encoders:** conversion from TTL to 11 μA<sub>PP</sub> for the PWT, otherwise not assigned

# HEIDENHAIN

**DR. JOHANNES HEIDENHAIN GmbH**

Dr.-Johannes-Heidenhain-Straße 5

83301 Traunreut, Germany

☎ +49 8669 31-0

📠 +49 8669 32-5061

info@heidenhain.de

www.heidenhain.com

This Product Information document supersedes all previous editions, which thereby become invalid. The basis for ordering from HEIDENHAIN is always the Product Information document edition valid when the order is placed.

## More information:

Comply with the requirements described in the following documents to ensure correct and intended operation:

- Brochure: *Angle Encoders with Integral Bearing* 591109-xx
- Brochure: *Interfaces of HEIDENHAIN Encoders* 1078628-xx
- Brochure: *Cables and Connectors* 1206103-xx

For brochures and Product Information documents, visit [www.heidenhain.com](http://www.heidenhain.com).