



HEIDENHAIN



Product Information

RCN 2000

RCN 5000

RCN 8000

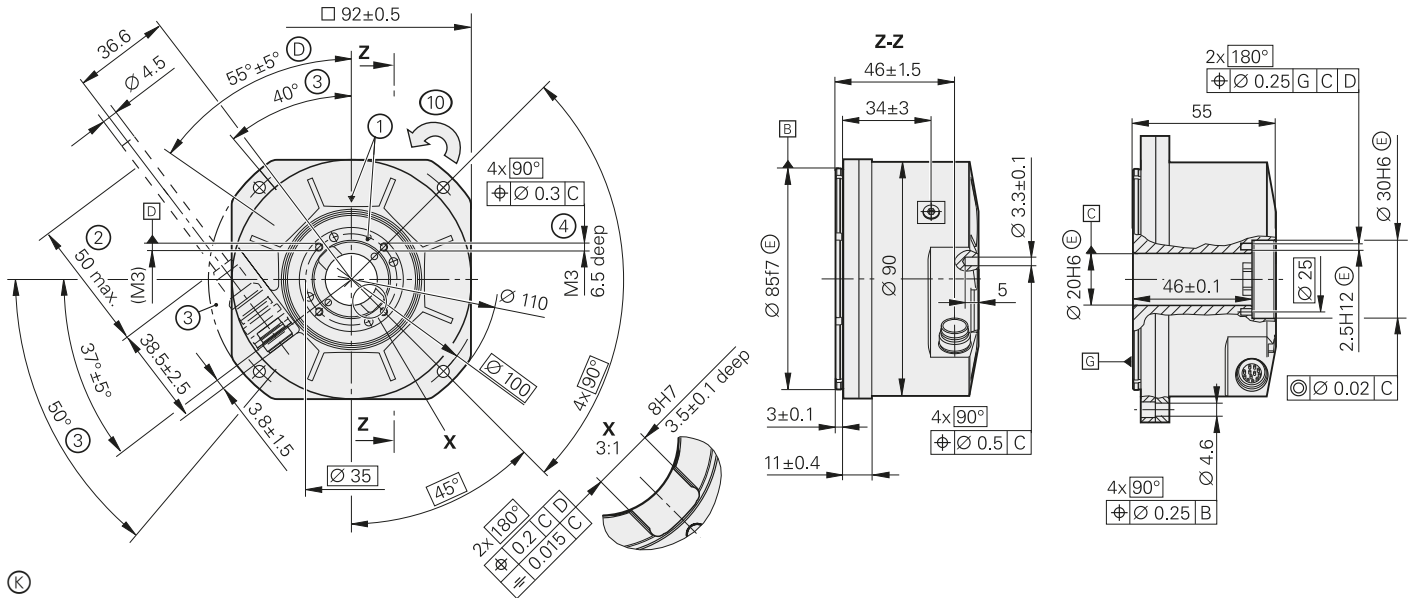
Absolute Angle Encoders for
Safety-Related Applications

November 2016

RCN 2000 series

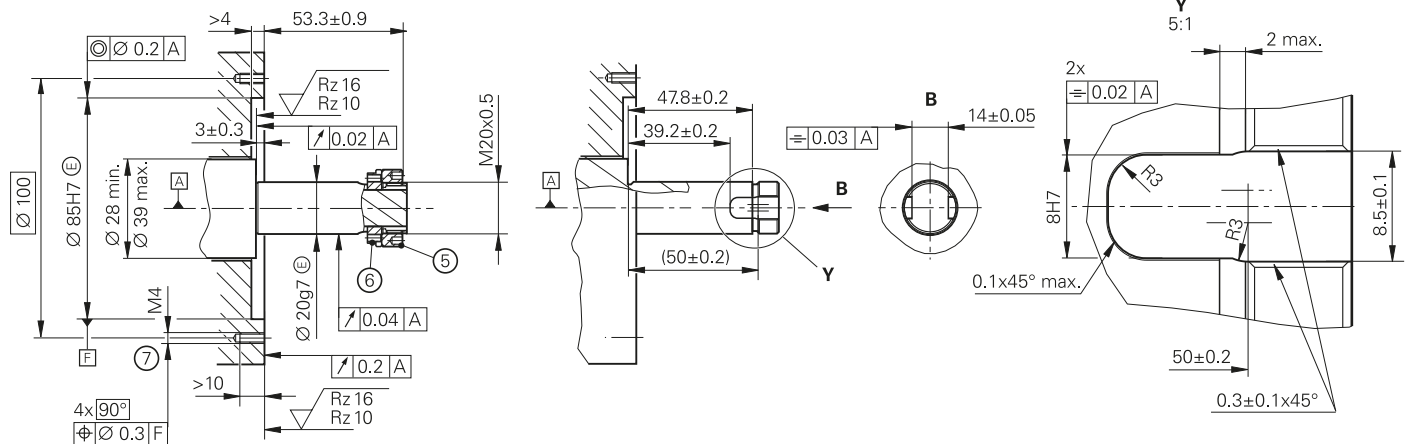
Absolute angle encoders for safety-related applications

- Safe absolute position
- Hollow through shaft $\varnothing 20$ mm
- System accuracy $\pm 2.5''$ and $\pm 5''$



Ⓚ Shaft coupling with ring nut and catch

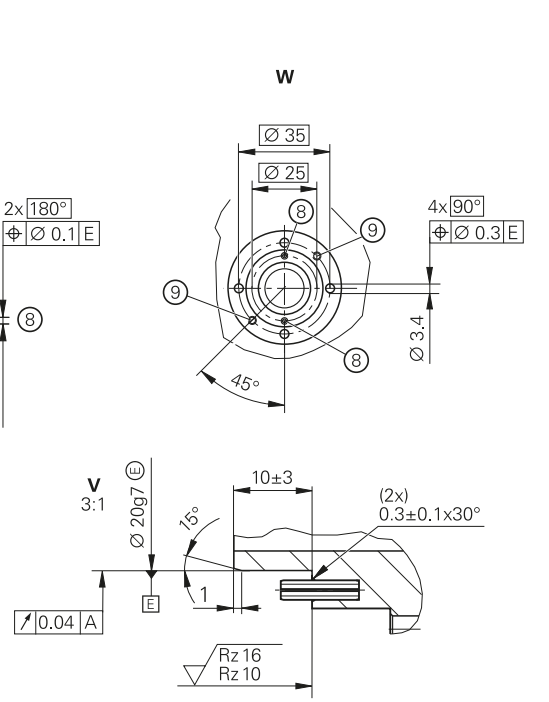
Shown without ring nut and catch



Ⓚ Alternative mounting option with front-end shaft coupling

mm
 Tolerancing ISO 8015
 ISO 2768 - m H
 < 6 mm: ± 0.2 mm

- Ⓜ = Bearing of mating shaft
- Ⓞ = Compressed air inlet
- Ⓟ = Required mating dimensions
- 1 = Mark for 0° position $\pm 5^\circ$
- 2 = Cable support
- 3 = Free space for customer
- 4 = Screw penetration 4.5 ± 0.5 mm
- 5 = Accessory: Ring nut ID 336669-03
- 6 = Accessory: Catch ID 817921-01
- 7 = Screw penetration > 7.5 mm
- 8 = $2 \times$ spring pins ISO 8752 - 2.5×10 - St
- 9 = When using spring pins, provide additional back-off threads (M3)
- 10 = Direction of shaft rotation for output signals as per the interface description



	Absolute RCN 2510	RCN 2310
Measuring standard	DIADUR circular scale with absolute and incremental track (16384 lines)	
System accuracy	±2.5"	±5"
Position error per signal period	≤ ±0.3"	≤ ±0.4"
Functional safety For applications up to	<ul style="list-style-type: none"> • SIL 2 according to EN 61508 (further basis for testing: EN 61800-5-2) • Category 3, PL d according to EN ISO 13 849-1:2008 	
PFH	≤ 25 · 10 ⁻⁹	
Safe position ¹⁾	<i>Encoder:</i> ±0.22° (safety-related measuring step: SM = 0.088°) <i>Mechanical connection:</i> Fault exclusions for loosening of the housing/flange and hollow shaft (pages 10/11)	
Interface	EnDat 2.2	
Ordering designation	EnDat22	
Positions per revolution	268435456 (28 bits)	67108864 (26 bits)
Electrically permissible speed	≤ 3000 rpm for continuous position value	
Clock frequency Calculation time t _{cal}	≤ 16 MHz ≤ 5 μs	
Electrical connection	Separate adapter cable connectable to encoder via quick disconnect	
Cable length	≤ 100 m (with HEIDENHAIN cable; clock frequency ≤ 8 MHz)	
Voltage supply	DC 3.6 V to 14 V	
Power consumption ²⁾ (maximum)	3.6 V: ≤ 1.1 W 14 V: ≤ 1.3 W	
Current consumption (typical)	5 V: 140 mA (without load)	
Shaft	Hollow through shaft D = 20 mm	
Mechanically permissible speed	≤ 1500 rpm <i>Temporary:</i> ≤ 3000 rpm ³⁾ (speeds over 1500 rpm require consultation)	
Torque (friction)	≤ 3.3 Nm (typical starting torque: ≤ 0.08 Nm at 20 °C)	
Moment of inertia	<i>Rotor (hollow shaft):</i> 180 · 10 ⁻⁶ kgm ² <i>Stator (housing/flange):</i> 670 · 10 ⁻⁶ kgm ²	
Permissible axial motion of measured shaft	±0.3 mm	
Natural frequency	≥ 1000 Hz	
Vibration 55 to 2000 Hz Shock 6 ms	≤ 200 m/s ² (EN 60068-2-6) ≤ 200 m/s ² (EN 60068-2-27)	
Operating temperature	0 °C to 50 °C	0 °C to 60 °C -20 °C to 60 °C ³⁾
Protection EN 60 529	IP64	
Weight	≈ 1.0 kg	

¹⁾ Further tolerances may occur in subsequent electronics after position value comparison (contact manufacturer of subsequent electronics)

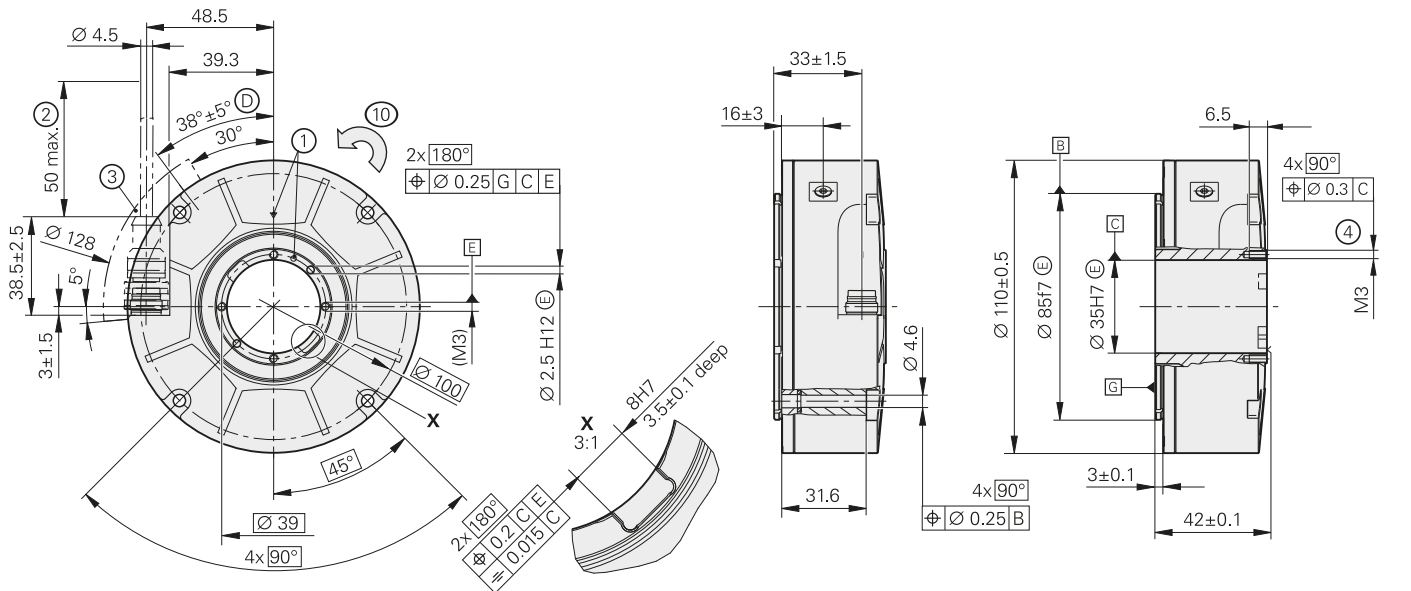
²⁾ See *General electrical information* in the *Interfaces for HEIDENHAIN Encoders* brochure

³⁾ No fault exclusion for loosening of the mechanical connection

RCN 5000 series

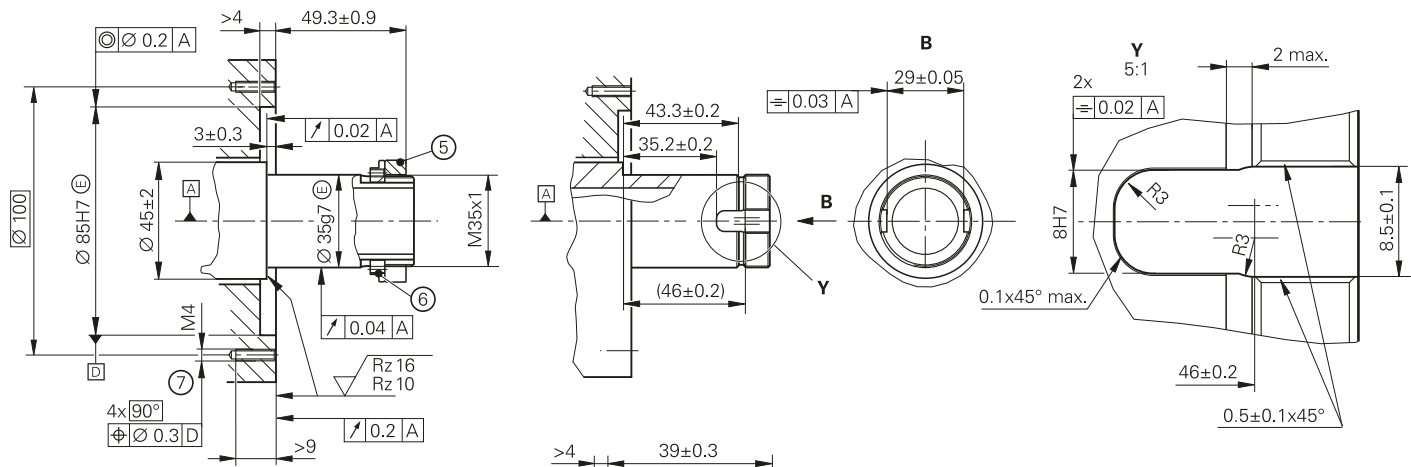
Absolute angle encoders for safety-related applications

- Safe absolute position
- Hollow through shaft $\varnothing 35$ mm
- System accuracy $\pm 2.5''$ and $\pm 5''$



Ⓚ Shaft coupling with ring nut and catch

Shown without ring nut and catch



Ⓚ Alternative mounting option with front-end shaft coupling

mm
 Tolerancing ISO 8015
 ISO 2768 - m H
 < 6 mm: ± 0.2 mm

- Ⓜ = Bearing of mating shaft
- Ⓞ = Compressed air inlet
- Ⓢ = Required mating dimensions
- 1 = Mark for 0° position $\pm 5^\circ$
- 2 = Cable support
- 3 = Free space for customer
- 4 = Screw penetration 4.5 ± 0.5 mm
- 5 = Accessory: Ring nut ID 336669-17
- 6 = Accessory: Catch ID 817921-02
- 7 = Screw penetration > 7 mm
- 8 = $2 \times$ spring pins ISO 8752 - 2.5×10 - St
- 9 = When using spring pins, provide additional back-off threads (M3)
- 10 = Direction of shaft rotation for output signals as per the interface description

	Absolute RCN 5510		RCN 5310
Measuring standard	DIADUR circular scale with absolute and incremental track (16384 lines)		
System accuracy	±2.5"	±5"	
Position error per signal period	≤ ±0.3"	≤ ±0.4"	
Functional safety For applications up to	<ul style="list-style-type: none"> • SIL 2 according to EN 61508 (further basis for testing: EN 61800-5-2) • Category 3, PL d according to EN ISO 13 849-1:2008 		
PFH	≤ 25 · 10 ⁻⁹		
Safe position ¹⁾	<i>Encoder:</i> ±0.22° (safety-related measuring step: SM = 0.088°) <i>Mechanical connection:</i> Fault exclusions for loosening of the housing/flange and hollow shaft (pages 10/11)		
Interface	EnDat 2.2		
Ordering designation	EnDat22		
Positions per revolution	268435456 (28 bits)	67108864 (26 bits)	
Electrically permissible speed	≤ 3000 rpm for continuous position value		
Clock frequency Calculation time t _{cal}	≤ 16 MHz ≤ 5 μs		
Electrical connection	Separate adapter cable connectable to encoder via quick disconnect		
Cable length	≤ 100 m (with HEIDENHAIN cable; clock frequency ≤ 8 MHz)		
Voltage supply	DC 3.6 V to 14 V		
Power consumption ²⁾ (maximum)	3.6 V: ≤ 1.1 W 14 V: ≤ 1.3 W		
Current consumption (typical)	5 V: 140 mA (without load)		
Shaft	Hollow through shaft D = 35 mm		
Mechanically permissible speed	≤ 1500 rpm <i>Temporary:</i> ≤ 3000 rpm ³⁾ (speeds over 1500 rpm require consultation)		
Torque (friction)	≤ 3.38 Nm (typical starting torque: ≤ 0.2 Nm at 20 °C)		
Moment of inertia	<i>Rotor (hollow shaft):</i> 130 · 10 ⁻⁶ kgm ² <i>Stator (housing/flange):</i> 1010 · 10 ⁻⁶ kgm ²		
Permissible axial motion of measured shaft	±0.3 mm		
Natural frequency	≥ 1000 Hz		
Vibration 55 to 2000 Hz Shock 6 ms	≤ 200 m/s ² (EN 60068-2-6) ≤ 200 m/s ² (EN 60068-2-27)		
Operating temperature	0 °C to 50 °C	0 °C to 60 °C -20 °C to 60 °C ³⁾	
Protection EN 60 529	IP64		
Weight	≈ 0.9 kg		

¹⁾ Further tolerances may occur in subsequent electronics after position value comparison (contact manufacturer of subsequent electronics).

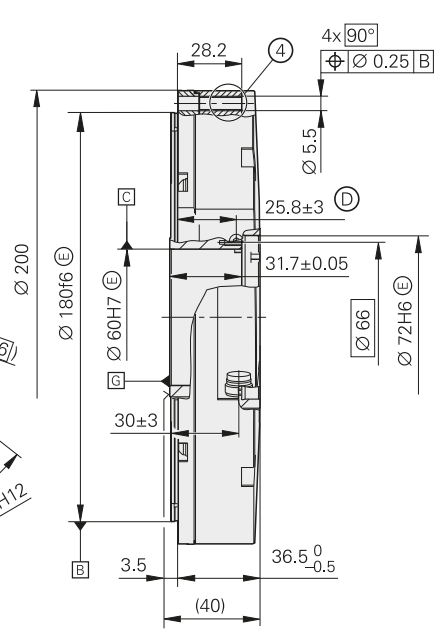
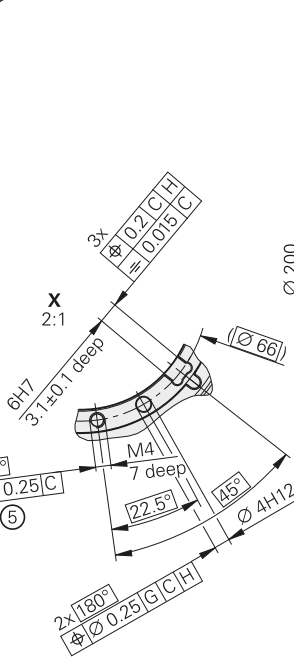
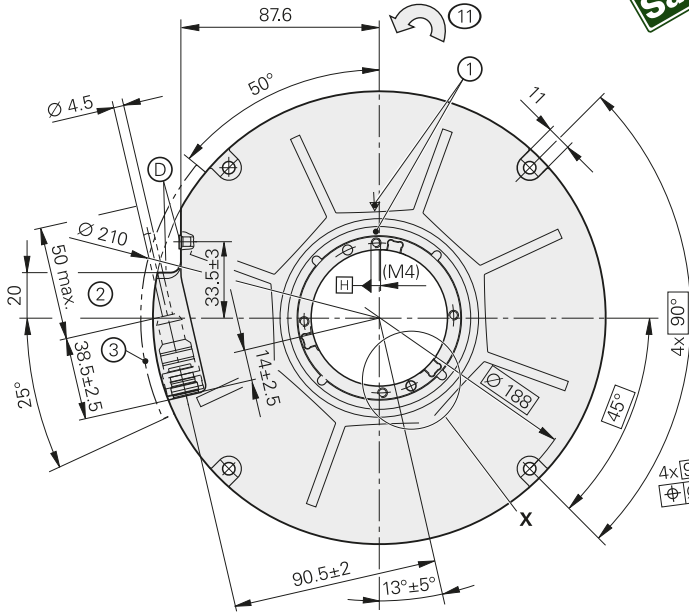
²⁾ See *General electrical information* in the *Interfaces for HEIDENHAIN Encoders* brochure

³⁾ No fault exclusion for loosening of the mechanical connection

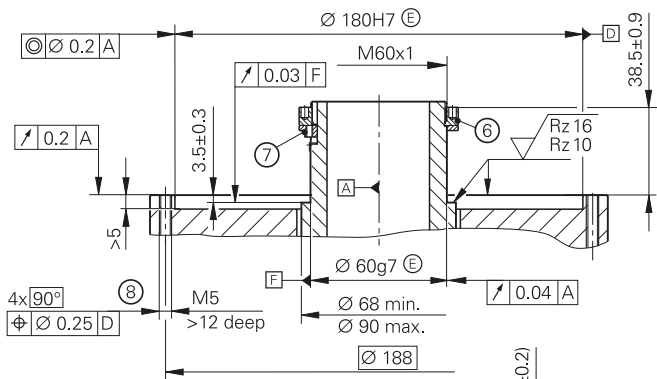
RCN 8000 series

Absolute angle encoders for safety-related applications

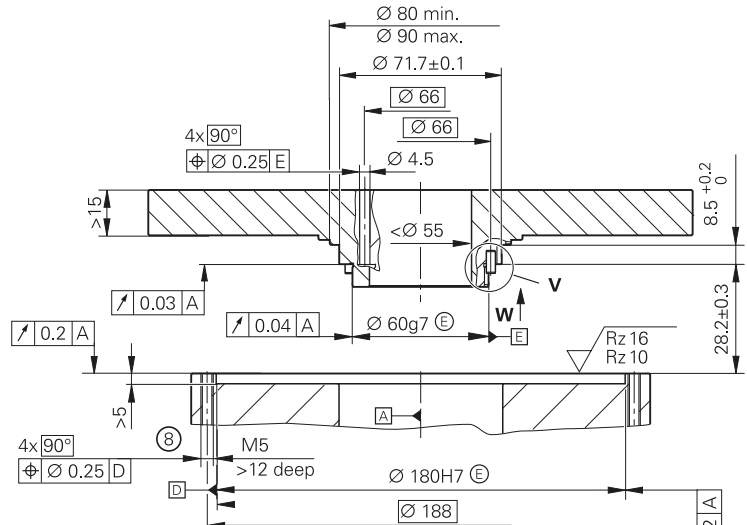
- Safe absolute position
- Hollow through shaft $\varnothing 60$ mm
- System accuracy $\pm 1''$ and $\pm 2''$



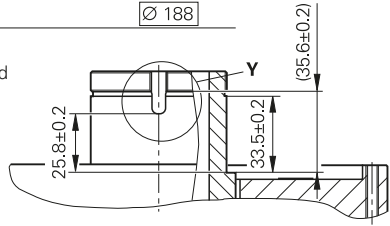
(K) Shaft coupling with ring nut and catch



(K) Alternative mounting option with front-end shaft coupling

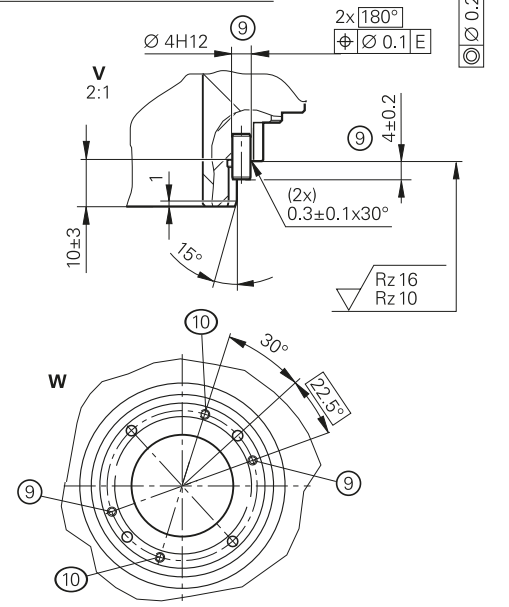


Shown without ring nut and catch



mm
 Tolerancing ISO 8015
 ISO 2768 - m H
 < 6 mm: ± 0.2 mm

- ▣ = Bearing of mating shaft
- ⊙ = Compressed air inlet
- ⊙ = Required mating dimensions
- 1 = Mark for 0° position $\pm 5^\circ$
- 2 = Cable support
- 3 = Free space for customer
- 4 = Shown rotated by 45°
- 5 = Screw penetration 5.5 \pm 0.5 mm
- 6 = Accessory: Ring nut ID 336669-11
- 7 = Accessory: Catch ID 817921-03
- 8 = Screw penetration > 10 mm
- 9 = 2x spring pins ISO 8752 - 4x10 - St
- 10 = When using spring pins, provide additional back-off threads (M4)
- 11 = Direction of shaft rotation for output signals as per the interface description



	Absolute RCN 8510	RCN 8310
Measuring standard	DIADUR circular scale with absolute and incremental track (32 768 lines)	
System accuracy	±1"	±2"
Position error per signal period	≤ ±0.15"	≤ ±0.2"
Functional safety For applications up to	<ul style="list-style-type: none"> • SIL 2 as per EN 61508 (further basis for testing: EN 61800-5-2) • Category 3, PL d as per EN ISO 13849-1:2008 for standstill and velocity monitoring Category 2, PL d as per EN ISO 13849-1:2008 for safe absolute positions (Category 3, PL d as per EN ISO 13849-1:2008 for safe absolute positions in connection with controls from HEIDENHAIN or Siemens Sinamics S120) 	
PFH	≤ 25 · 10 ⁻⁹	
Safe position ¹⁾	<i>Encoder:</i> ±0.11° (safety-related measuring step: SM = 0.044°) <i>Mechanical connection:</i> Fault exclusions for loosening of the housing/flange and hollow shaft (pages 10/11)	
Interface	EnDat 2.2	
Ordering designation	EnDat22	
Positions per revolution	536870912 (29 bits)	
Electrically permissible speed	≤ 1 500 rpm for continuous position value	
Clock frequency Calculation time t _{cal}	≤ 16 MHz ≤ 5 μs	
Electrical connection	Separate adapter cable connectable to encoder via quick disconnect	
Cable length	≤ 100 m (with HEIDENHAIN cable; clock frequency ≤ 8 MHz)	
Voltage supply	DC 3.6 V to 14 V	
Power consumption ²⁾ (maximum)	3.6 V: ≤ 1.1 W 14 V: ≤ 1.3 W	
Current consumption (typical)	5 V: 140 mA (without load)	
Shaft	Hollow through shaft D = 60 mm	
Mechanically permissible speed	≤ 500 rpm <i>Temporary:</i> ≤ 1 500 rpm ³⁾ (speeds over 500 rpm require consultation)	
Torque (friction)	≤ 4.05 Nm (typical starting torque: ≤ 0.7 Nm at 20 °C)	
Moment of inertia	<i>Rotor (hollow shaft):</i> 1.22 · 10 ⁻³ kgm ² <i>Stator (housing/flange):</i> 11.0 · 10 ⁻³ kgm ²	
Permissible axial motion of measured shaft	±0.3 mm	
Natural frequency	≥ 900 Hz	
Vibration 55 to 2 000 Hz Shock 6 ms	≤ 200 m/s ² (EN 60068-2-6) ≤ 200 m/s ² (EN 60068-2-27)	
Operating temperature	0 °C to +50 °C	
Protection EN 60529	IP64	
Weight	≈ 2.8 kg	

¹⁾ Further tolerances may occur in subsequent electronics after position value comparison (contact manufacturer of subsequent electronics).

²⁾ See *General electrical information* in the *Interfaces for HEIDENHAIN Encoders* brochure

³⁾ No fault exclusion for loosening of the mechanical connection

Sinamics is a registered trademark of SIEMENS AG.

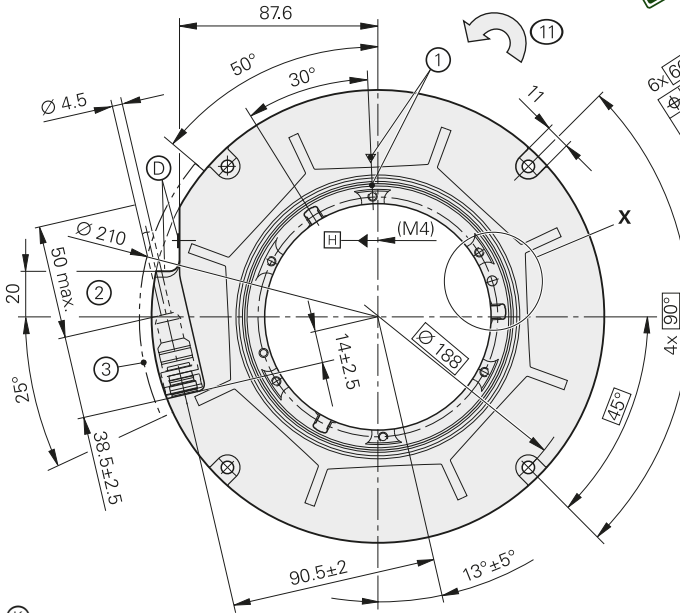
RCN 8000 series

Absolute angle encoders for safety-related applications

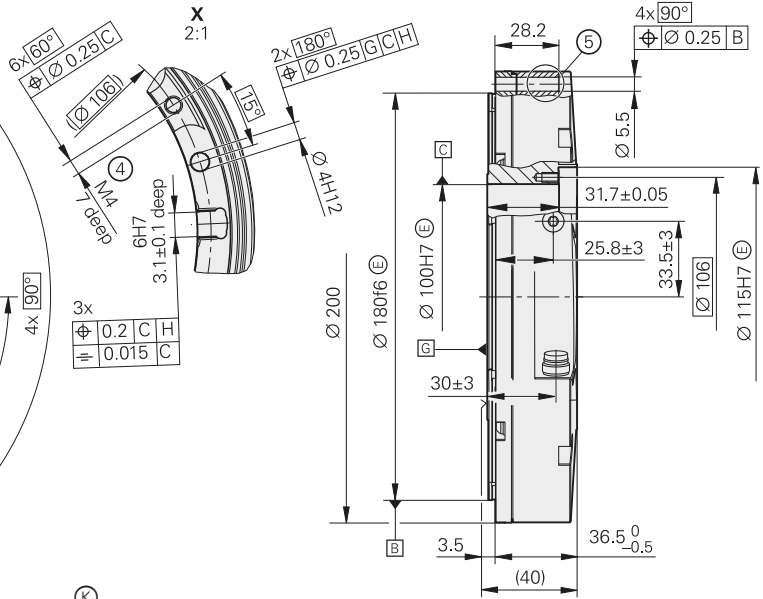
- Safe absolute position
- Hollow through shaft $\varnothing 100$ mm
- System accuracy $\pm 1''$ and $\pm 2''$



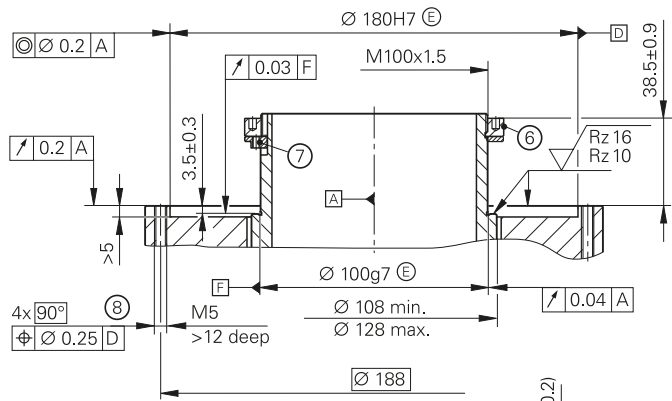
Functional Safety



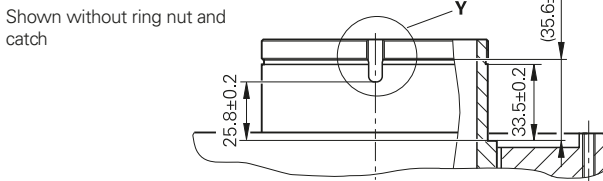
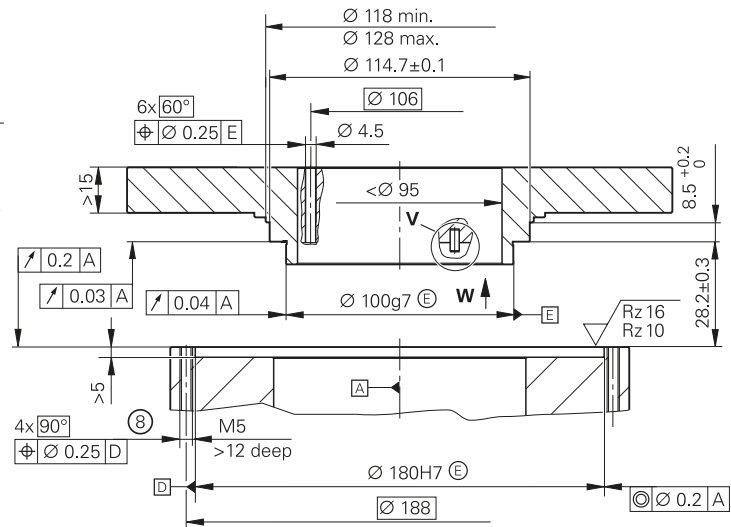
Ⓚ Shaft coupling with ring nut and catch



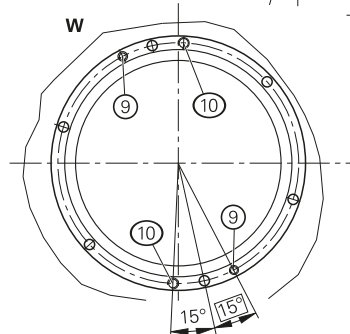
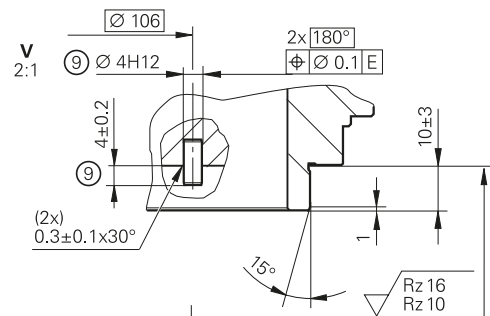
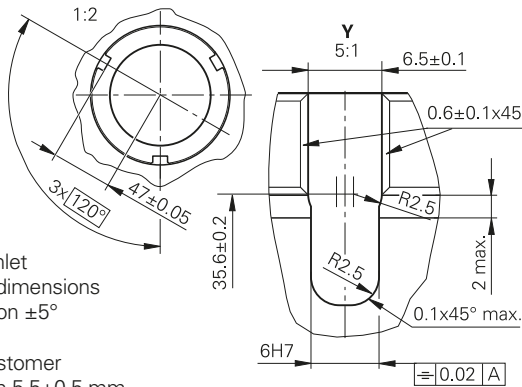
Ⓚ Alternative mounting option with front-end shaft coupling



Shown without ring nut and catch



mm
Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ± 0.2 mm



- ▣ = Bearing
- ⊙ = Compressed air inlet
- ⊕ = Required mating dimensions
- 1 = Mark for 0° position $\pm 5^\circ$
- 2 = Cable support
- 3 = Free space for customer
- 4 = Screw penetration 5.5 ± 0.5 mm
- 5 = Shown rotated by 45°
- 6 = Accessory: Ring nut ID 336669-16
- 7 = Accessory: Catch ID 817921-04
- 8 = Screw penetration > 10 mm
- 9 = 2x spring pins ISO 8752 – 4x10 – St
- 10 = When using spring pins, provide additional back-off threads (M4)
- 11 = Direction of shaft rotation for output signals as per the interface description

	Absolute RCN 8510	RCN 8310
Measuring standard	DIADUR circular scale with absolute and incremental track (32 768 lines)	
System accuracy	±1"	±2"
Position error per signal period	≤ ±0.15"	≤ ±0.2"
Functional safety For applications up to	<ul style="list-style-type: none"> • SIL 2 as per EN 61508 (further basis for testing: EN 61800-5-2) • Category 3, PL d as per EN ISO 13849-1:2008 for standstill and velocity monitoring Category 2, PL d as per EN ISO 13849-1:2008 for safe absolute positions (Category 3, PL d as per EN ISO 13849-1:2008 for safe absolute positions in connection with controls from HEIDENHAIN or Siemens Sinamics S120) 	
PFH	≤ 25 · 10 ⁻⁹	
Safe position ¹⁾	<i>Encoder:</i> ±0.11° (safety-related measuring step: SM = 0.044°) <i>Mechanical connection:</i> Fault exclusions for loosening of the housing/flange and hollow shaft (pages 10/11)	
Interface	EnDat 2.2	
Ordering designation	EnDat22	
Positions per revolution	536870912 (29 bits)	
Electrically permissible speed	≤ 1 500 rpm for continuous position value	
Clock frequency Calculation time t _{cal}	≤ 16 MHz ≤ 5 μs	
Electrical connection	Separate adapter cable connectable to encoder via quick disconnect	
Cable length	≤ 100 m (with HEIDENHAIN cable; clock frequency ≤ 8 MHz)	
Voltage supply	DC 3.6 V to 14 V	
Power consumption ²⁾ (maximum)	3.6 V: ≤ 1.1 W 14 V: ≤ 1.3 W	
Current consumption (typical)	5 V: 140 mA (without load)	
Shaft	Hollow through shaft D = 100 mm	
Mechanically permissible speed	≤ 500 rpm <i>Temporary:</i> ≤ 1 500 rpm ³⁾ (speeds over 500 rpm require consultation)	
Torque (friction)	≤ 4.5 Nm (typical starting torque: ≤ 1.0 Nm at 20 °C)	
Moment of inertia	<i>Rotor (hollow shaft):</i> 3.20 · 10 ⁻³ kgm ² <i>Stator (housing/flange):</i> 10.0 · 10 ⁻³ kgm ²	
Permissible axial motion of measured shaft	±0.3 mm	
Natural frequency	≥ 900 Hz	
Vibration 55 to 2 000 Hz Shock 6 ms	≤ 200 m/s ² (EN 60068-2-6) ≤ 200 m/s ² (EN 60068-2-27)	
Operating temperature	0 °C to +50 °C	
Protection EN 60 529	IP64	
Weight	≈ 2.6 kg	

¹⁾ Further tolerances may occur in subsequent electronics after position value comparison (contact manufacturer of subsequent electronics).

²⁾ See *General electrical information* in the *Interfaces for HEIDENHAIN Encoders* brochure

³⁾ No fault exclusion for loosening of the mechanical connection

Sinamics is a registered trademark of SIEMENS AG.

Functional safety

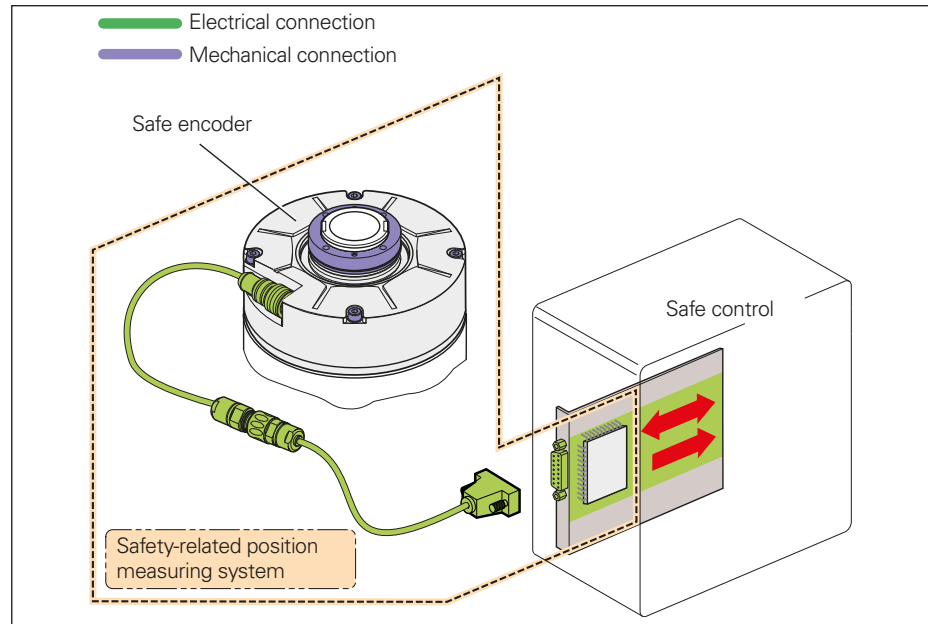
With its RCN 2000/5000/8000 series of absolute angle encoders, HEIDENHAIN offers the ideal solution for position acquisition for rotational axes in safety-related applications. The encoders can be operated as single-encoder systems in conjunction with a safe control in applications with control category SIL-2 (according to EN 61508) or performance level d (of EN ISO 13849).

Reliable transmission of the position is based on two independently generated absolute position values and on error bits, which are then provided to the safe control. The functions of the encoder can be used for numerous safety tasks in the complete system according to EN 61800-5-2 (see table).

The RCN 2000/5000/8000 angle encoders provide a safe absolute position value at all times—including immediately after switch-on or restart. Purely serial data transfer takes place via the bidirectional EnDat 2.2 interface.

In addition to the data interface, the mechanical connection of the encoder to the motor is also relevant to safety. Table D16 of the standard for electrical drives, EN 61800-5-2, defines the loss or loosening of the mechanical connection

between the encoder and drive as a fault that requires consideration. Since it cannot be guaranteed that the control will detect such errors, in many cases the possibility of the mechanical connection becoming loose or lost must be eliminated.



Safety-related position measuring system with mechanical connection and electrical interface

Fault exclusion for the loosening of the mechanical connection

There are possibilities for attaching the RCN 2000, RCN 5000 and RCN 8000 series that rule out the possibility of such faults.

Normally mounting screws are used to attach the housing or flange, but some special cases must be considered for hollow-shaft connections.

Mechanical connection	Fastening ¹⁾	Safe position for the mechanical coupling ²⁾	Restricted specifications ³⁾
Housing/flange	RCN 2000/5000: Screws: M4 ISO 4762 8.8 RCN 8000: Screws: M5 ISO 4762 8.8	±0°	See <i>Specifications</i> : • Mechanically permissible speed • Operating temperature (only for RCN 2000/5000)
Hollow shaft Shaft coupling with ring nut	Ring nut and catch (see <i>Mounting</i>)	RCN 2000: ±0.55° RCN 5000: ±0.35° RCN 8000: Ø 60 mm: ±0.15° Ø 100 mm: ±0.10°	See <i>Mounting</i> : • Usable materials • Permissible angular acceleration
Hollow shaft Front-end shaft coupling	RCN 2000/5000: Screws: M3 ISO 4762 8.8 Spring pins: ISO 8752 – 2.5x10 – St RCN 8000: Screws: M4 ISO 4762 8.8 Spring pins: ISO 8752 – 4x10 – St	RCN 2000: ±0.07° RCN 5000: ±0.06° RCN 8000: ±0.02°	

¹⁾ A suitable anti-rotation lock is to be used for the screw connections (for mounting or service)

²⁾ Fault exclusions are given only for the mounting options explicitly stated

³⁾ Compared to standard encoders (see the catalog *Angle Encoders with Integral Bearing*)

Mounting

Mounting

With the RCN angle encoders the shaft is connected with a ring nut and catch.

- Catch for RCN 2000: ID 817921-01
 Catch for RCN 5000: ID 817921-02
 Catch for RCN 8000:
 – Hollow shaft \varnothing 60 mm: ID 817921-03
 – Hollow shaft \varnothing 100 mm: ID 817921-04

Front-end shaft coupling with mounting screws and spring pins is possible as an alternative.

Materials to be used

The machine shaft and the fastening components must be made of steel. The material must have a coefficient of expansion of $\alpha = (10 \text{ to } 16) \cdot 10^{-6} \text{ K}^{-1}$.

Additionally, the material must meet the following specifications:

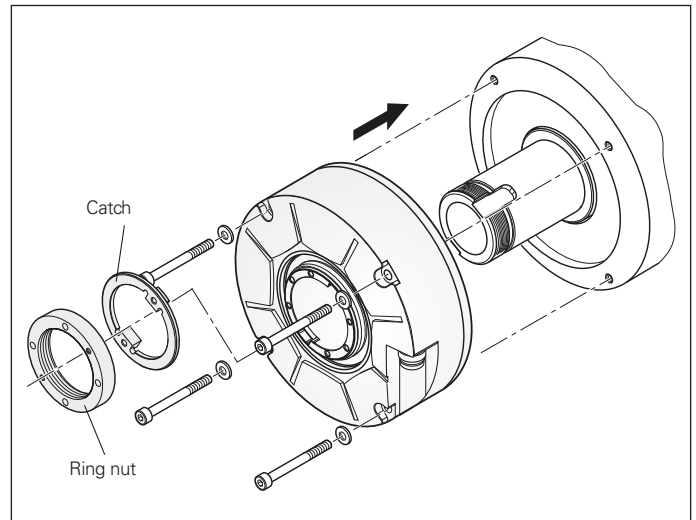
- Hollow-shaft connection
 $R_m \geq 650 \text{ N/mm}^2$
 $R_{p0.2} \geq 500 \text{ N/mm}^2$
- Housing connection
 $R_{p0.2} \geq 370 \text{ N/mm}^2$

Permissible angular acceleration

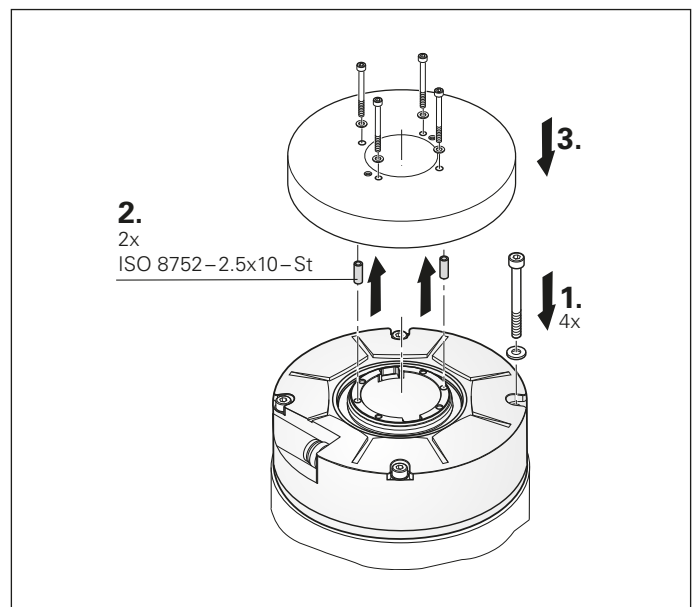
The following values apply for angular acceleration, depending on its application and mounting configuration:

- Permissible angular acceleration of the rotor for application through hollow shaft and shaft coupling with catch and ring nut:
 RCN 2000 series: $20\,000 \text{ rad/s}^2$
 RCN 5000 series: $25\,000 \text{ rad/s}^2$
 RCN 8000 series:
 – \varnothing 60 mm: $4\,500 \text{ rad/s}^2$
 – \varnothing 100 mm: $3\,500 \text{ rad/s}^2$
- Permissible angular acceleration of the rotor for application through hollow shaft and front-end shaft coupling with fastening screws and spring pins:
 RCN 2000 series: $5\,500 \text{ rad/s}^2$
 RCN 5000 series: $10\,000 \text{ rad/s}^2$
 RCN 8000 series:
 – \varnothing 60 mm: $3\,000 \text{ rad/s}^2$
 – \varnothing 100 mm: $3\,000 \text{ rad/s}^2$
- Permissible angular acceleration of the stator for application through flange/housing:
 RCN 2000 series: $4\,000 \text{ rad/s}^2$
 RCN 5000 series: $2\,500 \text{ rad/s}^2$
 RCN 8000 series:
 – \varnothing 60 mm: $1\,000 \text{ rad/s}^2$
 – \varnothing 100 mm: $1\,000 \text{ rad/s}^2$

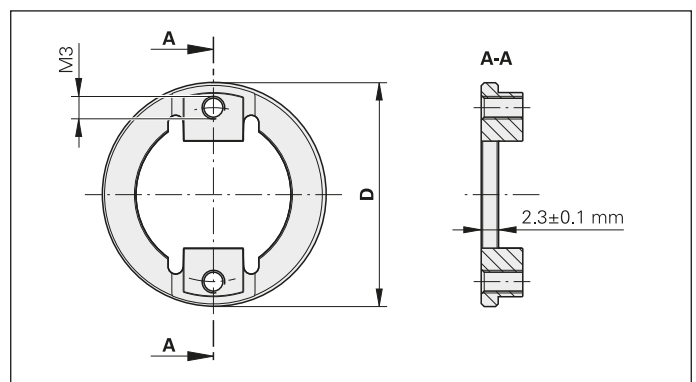
Shaft coupling with ring nut and catch



Front-end shaft coupling with mounting screws and spring pins



Catch



	D (mm)	Moment of inertia of ring nut and catch
RCN 2000	29.6	$4.8 \cdot 10^{-6} \text{ kgm}^2$
RCN 5000	45.8	$24 \cdot 10^{-6} \text{ kgm}^2$
RCN 8000 (\varnothing 60 mm)	70	$87 \cdot 10^{-6} \text{ kgm}^2$
RCN 8000 (\varnothing 100 mm)	114	$550 \cdot 10^{-6} \text{ kgm}^2$

Electrical connection

Connecting cables

PUR adapter cable		$\varnothing 4.5 \text{ mm}; [4 \times 2 \times 0.14 \text{ mm}^2]; A_P = 0.14 \text{ mm}^2$
Complete with 8-pin M12 coupling (male)		679671-xx
Complete with 15-pin D-sub connector (female)		735987-xx
PUR connecting cables		$\varnothing 6 \text{ mm}; [4 \times 0.14 \text{ mm}^2 + 4 \times 0.34 \text{ mm}^2]; A_P = 0.34 \text{ mm}^2$
Complete with 8-pin M12 connector (female) and 8-pin M12 coupling (male)		368330-xx
Complete with 8-pin M12 connector (female) and 15-pin D-sub connector (female)		533627-xx
Complete with 15-pin connector (female) and 15-pin coupling (male)		524599-xx

A_P : Cross section of power supply lines

\varnothing : Cable diameter (for bend radii, see catalog *Interfaces of HEIDENHAIN Encoders*)

Note for safety-related applications: Only completely assembled HEIDENHAIN cables are qualified.

Be sure to exchange connectors or modify cables only after consultation with HEIDENHAIN Traunreut.

For more cables, see the *Angle Encoders with Integral Bearing* catalog

Pin layout

8-pin coupling, M12				15-pin D-sub connector				
Voltage supply				Absolute position values				
	8	2	5	1	3	4	7	6
	1	9	2	11	5	8	14	15
	U_P	Sensor U_P	0V	Sensor 0V	DATA	$\overline{\text{DATA}}$	CLOCK	$\overline{\text{CLOCK}}$
	Brown/Green	Blue	White/Green	White	Gray	Pink	Violet	Yellow

Cable shield connected to housing; U_P = power supply voltage

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

Vacant pins or wires must not be used!

HEIDENHAIN

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

Please note the following documents:

Adhere to the information in the following documents to ensure the correct and intended operation of the encoder:

- Catalog: Angle Encoders with Integral Bearing 591109
- Mounting Instructions RCN 2310/2510 765742
- RCN 5310/5510 765743
- RCN 8310/8510 ($\varnothing 60 \text{ mm}$) 765744
- RCN 8310/8510 ($\varnothing 100 \text{ mm}$) 765745

- Technical Information: Safety-Related Position Measuring Systems 596632

For implementation in a control:

- Specification for Safe Control 533095

For catalogs, brochures and Product Information Sheets, visit www.heidenhain.de.