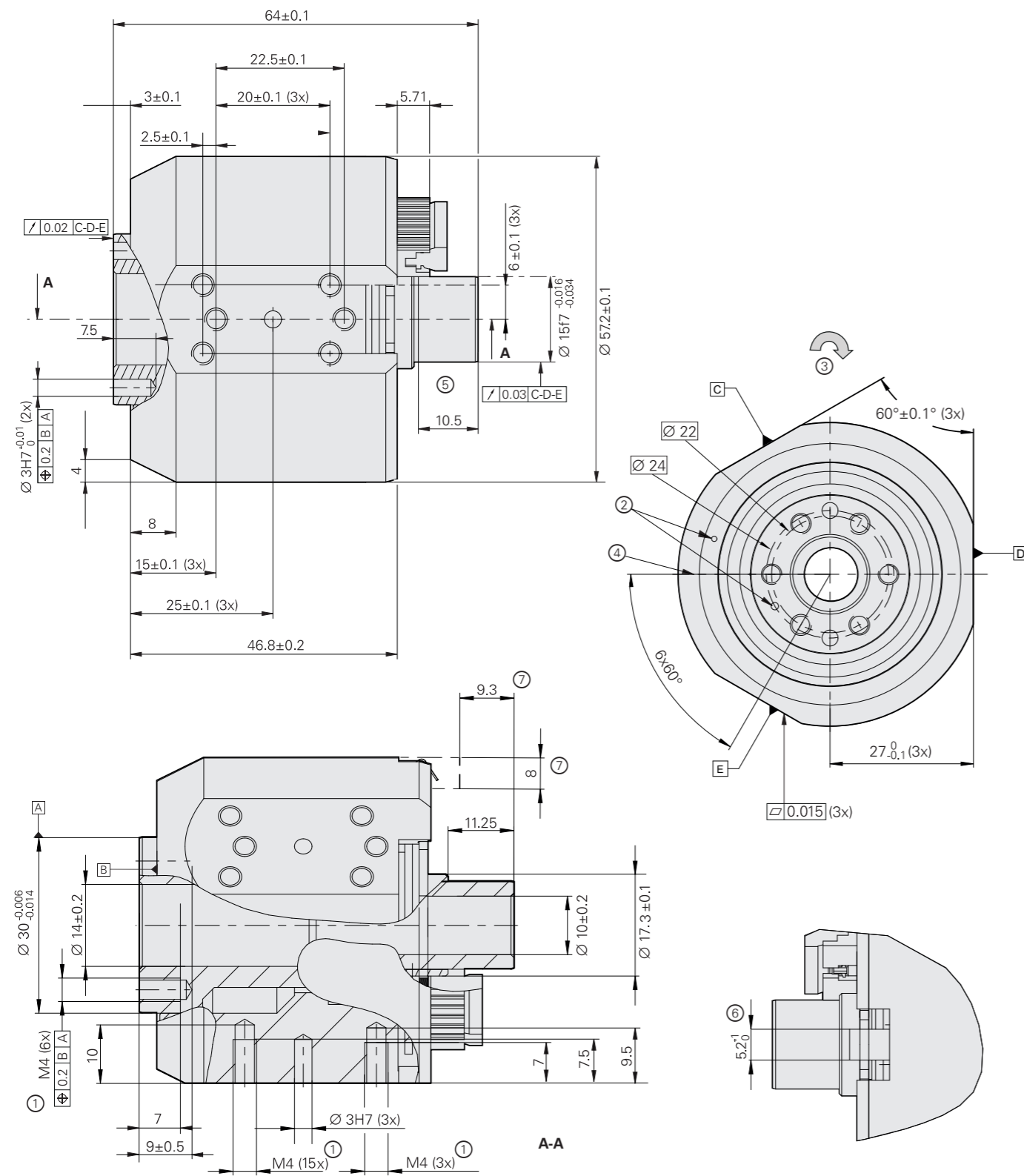# HEIDENHAIN

Product Information

MRS 2200 Series
Angle Encoder Modules

MRS 2280

Angle encoder module with integrated encoder and bearing
- **Compact dimensions**
- **High measuring and bearing accuracy**
- **Hollow shaft Ø 10 mm**
- **High resistance to tilt**
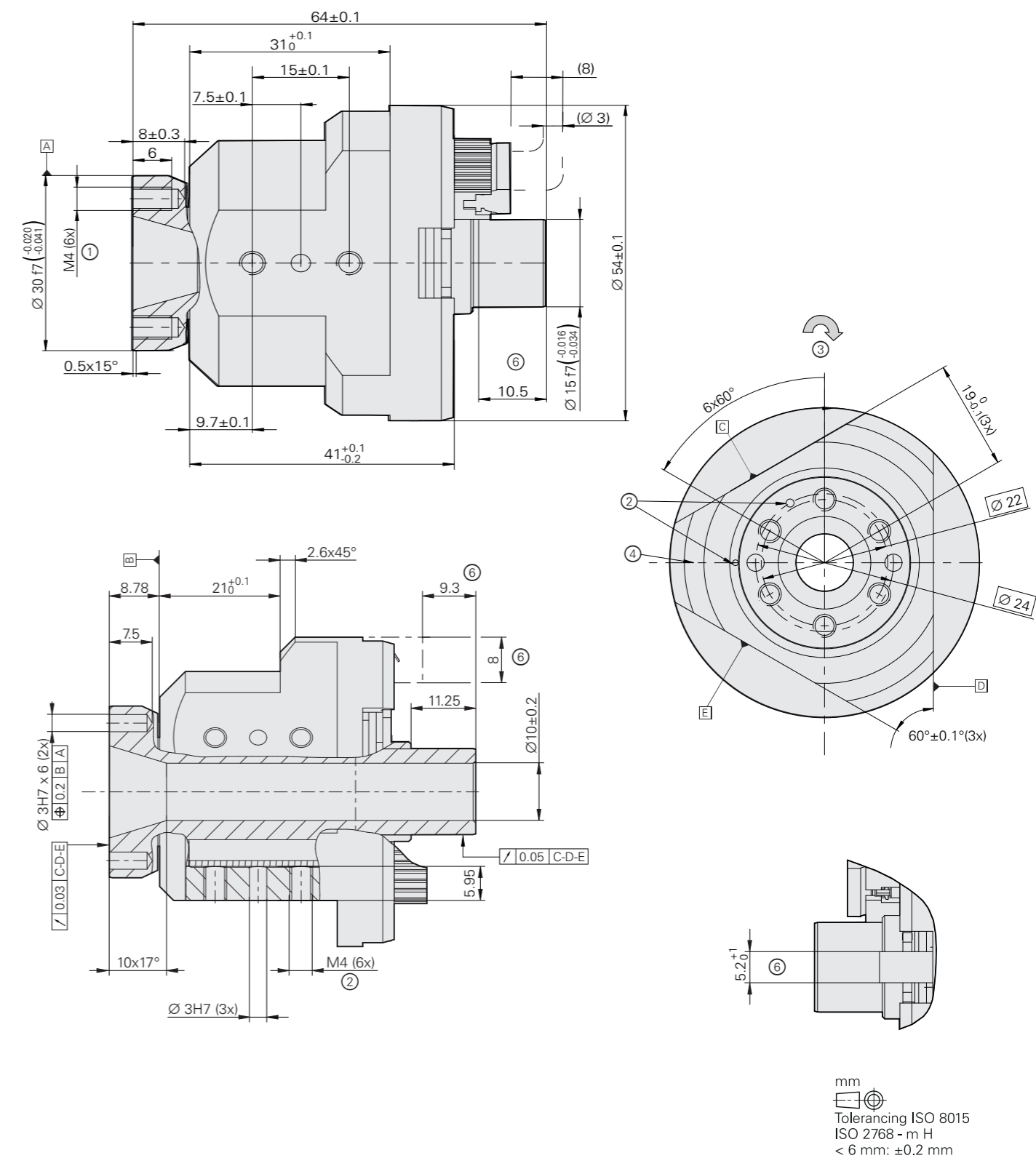

1 = Tightening torque of the M3 – 8.8 cylinder head screw: 1.1 Nm ±0.05 Nm
2 = Tightening torque of the M4 – 8.8 cylinder head screw: 2.5 Nm ±0.13 Nm
3 = Mark for 0° position ±5°
4 = Direction of shaft rotation for ascending position values
5 = LED position
6 = Permitted for shaft clamping
7 = Area available for flex PCB

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

MRS 2281

Angle encoder module with integrated encoder and bearing
- **Compact dimensions**
- **High measuring and bearing accuracy**
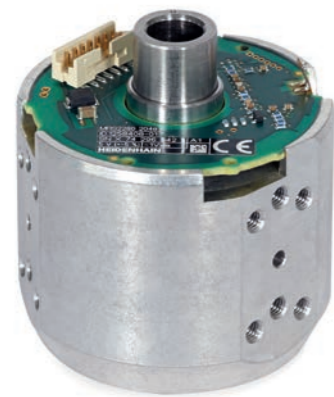- **Hollow shaft Ø 10 mm**
- **High resistance to tilt**

1 = Tightening torque of the M3 – 8.8 cylinder head screw: 1.1 Nm ±0.05 Nm
2 = Tightening torque of the M4 – 8.8 cylinder head screw: 2.5 Nm ±0.13 Nm
3 = Mark for 0° position ±5°
4 = Direction of shaft rotation for ascending position values
5 = LED position
6 = Permitted for shaft clamping
7 = Area available for flex PCB

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

Specifications

Encoder characteristics	Incremental	
	MRS 2280	**MRS 2281**
Measuring standard	DIADUR circular scale	
Signal periods	2048	
System accuracy	±10″	
Position error per signal period	±1.5″	
Repeatability	*From both directions:* 3″	
RMS position noise	Typically 0.07″	
Interface	$\sim$ 1 V$_{PP}$	
Reference marks	One	
Cutoff frequency –3 dB	≥ 210 kHz	
Electrical connection	14-pin header; adapter cable with quick connector as accessory	
Cable length	≤ 30 m (with HEIDENHAIN cable)	
Supply voltage	DC 5 V ±0.25 V	
Power consumption (max.)	*5.25 V:* ≤ 700 mW	
Current consumption (typical)	*Without load:* I$_P$ = 60 mA; max. 120 mA *With load:* max. 130 mA	

MRS 2280

MRS 2281

Specifications

Bearing properties	Incremental	
	MRS 2280	**MRS 2281**
Shaft	Hollow through shaft D = 10 mm	
Max. permissible axial load[1]	100 N (centered load)	50 N (centered load)
Max. permissible radial load[1]	45 N	
Max. permissible tilting torque[1]	5 Nm	2.5 Nm
Contact stiffness	*Axial:* 54 N/µm *Radial:* 153 N/µm (calculated values)	*Axial:* 27 N/µm *Radial:* 77 N/µm (calculated values)
Resistance to tilt	52 Nm/mrad (calculated value)	24 Nm/mrad (calculated value)
Mech. permissible speed	1000 rpm	
Moment of friction	≤ 20 mNm	≤ 15 mNm
Starting torque	≤ 30 mNm	≤ 20 mNm
Max. transferable shaft torque[1]	1 Nm	
Moment of inertia of rotor	$1.5 \cdot 10^{-5}$ kgm^2	$0.9 \cdot 10^{-5}$ kgm^2
Radial guideway accuracy	≤ 0.8 µm[2]	≤ 2.4 µm[2]
Non-reproducible radial guideway accuracy	≤ 0.5 µm[2]	≤ 1.6 µm[2]
Axial runout of the surface	≤ 20 µm	≤ 30 µm
Radial runout	≤ 30 µm	≤ 50 µm
Vibration 55 Hz to 2000 Hz **Shock** 6 ms	≤ 200 m/s^2 (EN 60068-2-6) ≤ 100 m/s^2 (EN 60068-2-27) (without load)	
Protection EN 60529	IP00[3]	
Operating temperature **Storage temperature**	0 °C to 50 °C 0 °C to 50 °C	
Relative air humidity	≤ 75 % without condensation	
Mass	0.34 kg (without cable or connector)	0.23 kg (without cable or connector)

[1] Purely static load, without additional vibrations or shock load. The overlapping of individual loads is not taken into account.
[2] Measured at distance h = 20 mm from the mating surface of the rotor; see *Measuring and bearing accuracy* in the *Angle Encoder Modules* brochure
[3] The electromagnetic compatibility of the complete system must be ensured by taking the correct measures during installation.
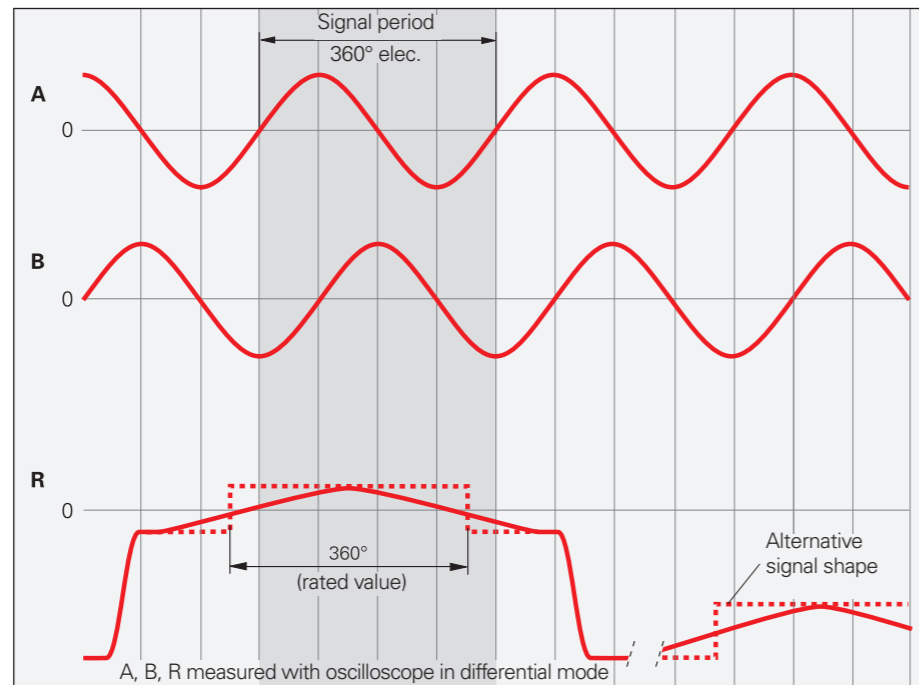
Interfaces

〰 1 V$_{PP}$ incremental signals

HEIDENHAIN encoders with 〰 1 V$_{PP}$ interface provide voltage signals that can be highly interpolated.

The sinusoidal **incremental signals** A and B are phase-shifted by 90° elec. and have amplitudes of typically 1 V$_{PP}$. The illustrated sequence of output signals—with B lagging A—applies to the direction of motion shown in the dimension drawing.

The **reference mark signal** R has a unique assignment to the incremental signals. The output signal may be lower next to the reference mark.

A

B

R

Signal period
360° elec.

360°
(rated value)

Alternative
signal shape

A, B, R measured with oscilloscope in differential mode

📖 **Further information:**

For detailed descriptions of all available interfaces, as well as general electrical information, please refer to the *Interfaces of HEIDENHAIN Encoders* brochure.

Electrical connection

Pin layout

14-pin PCB connector

		Power supply				Incremental signals						Other signals		
		1b	7a	5b	3a	6b	2a	3b	5a	4b	4a	/	/	/
		U$_P$	Sensor U$_P$	0 V	Sensor 0 V	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$_P$** = 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!

1 V$_{PP}$ cable

PUR output cable ⌀ 3.7 mm 6 × (2 × 0.05 mm^2)		
With 14-pin PCB connector and 15-pin D-sub connector (male)		1160480-xx

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.

📖 **Further information:**

To ensure proper and intended use, comply with the specifications in the following documents:
- *Angle Encoder Modules* brochure   1102713-xx
- *Interfaces of HEIDENHAIN Encoders* brochure   1078628-xx