

ERA 4000 series

High-accuracy incremental angle encoder

- Steel scale drum with three-point centering or centering collar
- Optimized scanning performance for very high reliability
- Integrated three-color LED signal-quality indicator
- Consists of a scanning head and scale drum with optional sealing-air cover

Scanning head	AK ERA 4280 with 20 µm graduation period AK ERA 4480 with 40 µm graduation period AK ERA 4880 with 80 µm graduation period
Interface	~ 1 V _{PP} , HSP
Cutoff frequency –3 dB	1 MHz
Electrical connection	Cable (1 m or 3 m) 12-pin M12 coupling or 12-pin M23 coupling or 15-pin D-sub connector
Cable length	≤ 150 m (with HEIDENHAIN cable)
Supply voltage	DC 5 V ±0.5 V
Current consumption	< 130 mA (without load)
Vibration 55 Hz to 2000 Hz	With mechanical fault exclusion: ≤ 200 m/s ² (EN 60068-2-6) Without mechanical fault exclusion: ≤ 200 m/s ² (EN 60068-2-6)
Shock 11 ms 6 ms	With mechanical fault exclusion: ≤ 200 m/s ² (EN 60068-2-27) Without mechanical fault exclusion: ≤ 1000 m/s ² (EN 60068-2-27)
Operating temperature	–10 °C to 70 °C
Relative air humidity	≤ 93% (at 40 °C/4d as per EN 60068-2-78); condensation excluded
Protection	IP40
Mass	Scanning head ≈ 20 g (without cable) Connecting cable ≈ 20 g/m Coupling (M12) ≈ 15 g Coupling (M23) ≈ 50 g D-sub connector ≈ 32 g

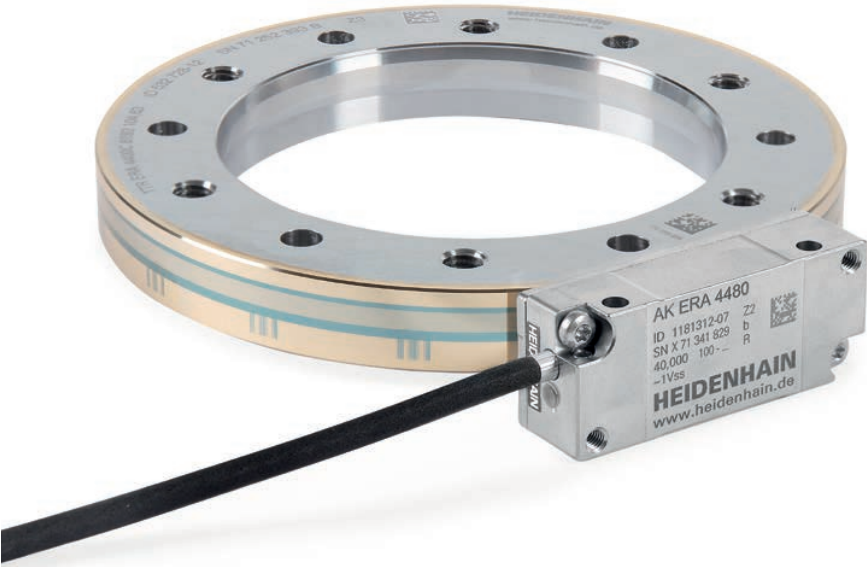
Scanning head	AK ERA 4480 with 40 µm graduation period and sealing-air cover
Interface	~ 1 V _{PP} , HSP
Cutoff frequency –3 dB	1 MHz
Electrical connection	Cable (1 m or 3 m) 12-pin M12 coupling or 12-pin M23 coupling
Cable length	≤ 150 m (with HEIDENHAIN cable)
Supply voltage	DC 5 V ±0.5 V
Current consumption	< 130 mA (without load)
Vibration 55 Hz to 2000 Hz	With mechanical fault exclusion: ≤ 200 m/s ² (EN 60068-2-6) Without mechanical fault exclusion: ≤ 200 m/s ² (EN 60068-2-6)
Shock: 11 ms 6 ms	With mechanical fault exclusion: ≤ 200 m/s ² (EN 60068-2-27) Without mechanical fault exclusion: ≤ 1000 m/s ² (EN 60068-2-27)
Operating temperature	–10 °C to 70 °C
Relative air humidity	≤ 93% (at 40 °C/4d as per EN 60068-2-78); condensation excluded
Protection	IP40
Mass	Scanning head ≈ 35 g (without cable) Cable ≈ 20 g/m Coupling (M12) ≈ 15 g Coupling (M23) ≈ 50 g

Scanning head		AK ERA 4470					
Interface		□□TTL					
Integrated interpolation*		1-fold ¹⁾	10-fold	50-fold	100-fold	500-fold	1000-fold
Scanning frequency ²⁾		≤ 450 kHz	≤ 312.5 kHz	≤ 125 kHz	≤ 62.5 kHz	≤ 12.5 kHz	≤ 6.25 kHz
Edge separation <i>a</i>		≥ 0.220 μs	≥ 0.07 μs	≥ 0.03 μs			
Electrical connection*		Cable (1 m or 3 m) 15-pin D-sub connector (male), with interface electronics in the connector					
Cable length		With HEIDENHAIN cable: ≤ 20 m; during signal adjustment with the PWM 21: ≤ 3 m					
Supply voltage		DC 5 V ±0.5 V					
Current consumption		≤ 250 mA (without load)					
Vibration 55 Hz to 2000 Hz		With mechanical fault exclusion: ≤ 200 m/s ² (EN 60068-2-6) Without mechanical fault exclusion: ≤ 200 m/s ² (EN 60068-2-6)					
Shock 11 ms 6 ms		With mechanical fault exclusion: ≤ 200 m/s ² (EN 60068-2-27) Without mechanical fault exclusion: ≤ 1000 m/s ² (EN 60068-2-27)					
Operating temperature		−10 °C to 70 °C					
Relative air humidity		≤ 93% (at 40 °C/4d as per EN 60068-2-78); condensation excluded					
Protection		IP40					
Mass	Scanning head	≈ 20 g (without cable)					
	Cable	≈ 20 g/m					
	D-sub connector	≈ 74 g					

* Please select when ordering

1) Suitable for applications that measure the time between individual TTL output signal clock edges; non-clocked output signals enable low edge jitter

2) Maximum scanning frequency during referencing: 70 kHz



Scale drum with centering collar	
Measuring standard	
Coefficient of expansion	
Signal periods/ interpolation error per signal period ¹⁾	TTR ERA 4200
	TTR ERA 4400
	TTR ERA 4800
Accuracy of graduation	
Reference marks	
Drum inside diameter*	
Drum outside diameter*	
Mech. permissible speed	
With mechanical fault exclusion	
Without mechanical fault exclusion	
Moment of inertia	
Maximum angular acceleration with mechanical fault exclusion	
Permissible axial movement	
Protection EN 60529	
Mass	

	TTR ERA 4200C with 20 µm graduation period TTR ERA 4400C with 40 µm graduation period TTR ERA 4800C with 80 µm graduation period								
	Steel drum $\alpha_{\text{therm}} \approx 10.4 \cdot 10^{-6} \text{ K}^{-1}$								
	12 000/ ±0.32"	16 384/ ±0.24"	20 000/ ±0.19"	28 000/ ±0.14"	32 768/ ±0.12"	40 000/ ±0.10"	52 000/ ±0.07"	–	–
	6000/ ±1.08"	8192/ ±0.79"	10000/ ±0.65"	14000/ ±0.46"	16384/ ±0.40"	20000/ ±0.32"	26000/ ±0.25"	38000/ ±0.17"	44000/ ±0.15"
	3000/ ±2.16"	4096/ ±1.58"	5000/ ±1.30"	7000/ ±0.93"	8192/ ±0.79"	10000/ ±0.65"	13000/ ±0.50"	–	–
	±5"	±3.7"	±3"	±2.5"				±2"	
	Distance-coded or one								
	40 mm	70 mm	80 mm	120 mm	150 mm	180 mm	270 mm	425 mm	512 mm
	76.75 mm	104.63 mm	127.64 mm	178.55 mm	208.89 mm	254.93 mm	331.31 mm	484.07 mm	560.46 mm
	10000 rpm	8500 rpm	6250 rpm	4500 rpm	4250 rpm	3250 rpm	2500 rpm	1800 rpm	1500 rpm
	20000 rpm	15000 rpm	12250 rpm	8750 rpm	7500 rpm	6250 rpm	4750 rpm	3250 rpm	2750 rpm
	$0.27 \cdot 10^{-3}$ kgm ²	$0.81 \cdot 10^{-3}$ kgm ²	$1.9 \cdot 10^{-3}$ kgm ²	$7.1 \cdot 10^{-3}$ kgm ²	$12 \cdot 10^{-3}$ kgm ²	$28 \cdot 10^{-3}$ kgm ²	$59 \cdot 10^{-3}$ kgm ²	$195 \cdot 10^{-3}$ kgm ²	$258 \cdot 10^{-3}$ kgm ²
	20000 rad/s ²	14000 rad/s ²	6600 rad/s ²	2700 rad/s ²	1800 rad/s ²	1000 rad/s ²	1300 rad/s ²	900 rad/s ²	1200 rad/s ²
	≤ ±0.5 mm (scale drum relative to the scanning head)								
	Complete encoder after mounting: IP00; with sealing-air cover: IP40								
	≈ 0.28 kg	≈ 0.41 kg	≈ 0.68 kg	≈ 1.2 kg	≈ 1.5 kg	≈ 2.3 kg	≈ 2.6 kg	≈ 3.8 kg	≈ 3.6 kg

* Please select when ordering

1) The interpolation error within one signal period and the accuracy of the graduation together yield the encoder-specific error; for additional errors arising from installation and the bearing of the measured shaft, see *Measurement accuracy*

Scale drum with three-point centering	TTR ERA 4202 C with 20 µm graduation period						
Measuring standard Coefficient of expansion	Steel drum $\alpha_{\text{therm}} \approx 10.4 \cdot 10^{-6} \text{ K}^{-1}$						
Signal periods	12 000	16 384	20 000	28 000	32 768	40 000	52 000
Accuracy of graduation	±4"	±3"	±2.5"	±2"	±1.9"	±1.8"	±1.7"
Interpolation error per signal period¹⁾	±0.36"	±0.24"	±0.19"	±0.14"	±0.12"	±0.10"	±0.07"
Reference marks	Distance-coded or one						
Drum inside diameter*	40 mm	70 mm	80 mm	120 mm/ 150 mm	150 mm/ 185 mm	180 mm/ 210 mm	270 mm
Drum outside diameter*	76.75 mm	104.63 mm	127.64 mm	178.55 mm	208.89 mm	254.93 mm	331.31 mm
Mech. permissible speed	20 000 rpm	15 000 rpm	12 250 rpm	8 750 rpm	7 500 rpm	6 250 rpm	4 750 rpm
Moment of inertia	$0.28 \cdot 10^{-3} \text{ kgm}^2$	$0.83 \cdot 10^{-3} \text{ kgm}^2$	$2.0 \cdot 10^{-3} \text{ kgm}^2$	$7.1 \cdot 10^{-3} \text{ kgm}^2 /$ $4.5 \cdot 10^{-3} \text{ kgm}^2$	$12 \cdot 10^{-3} \text{ kgm}^2 /$ $6.4 \cdot 10^{-3} \text{ kgm}^2$	$28 \cdot 10^{-3} \text{ kgm}^2 /$ $20 \cdot 10^{-3} \text{ kgm}^2$	$59 \cdot 10^{-3} \text{ kgm}^2$
Permissible axial movement	≤ ±0.5 mm (scale drum relative to the scanning head)						
Protection EN 60529	Complete encoder after mounting: IP00, with sealing-air cover: IP40						
Mass	≈ 0.30 kg	≈ 0.42 kg	≈ 0.69 kg	≈ 1.2 kg/ ≈ 0.66 kg	≈ 1.5 kg/ ≈ 0.66 kg	≈ 2.3 kg/ ≈ 1.5 kg	≈ 2.6 kg

* Please select when ordering

¹⁾ The interpolation error within one signal period and the accuracy of the graduation together yield the encoder-specific error; for additional errors arising from installation and the bearing of the measured shaft, see *Measurement accuracy*