

ERM 2200/2400/2900 series

- Incremental angle encoder with magnetic scanning
- Consists of a scanning head and scale drum
 - Multiple graduation periods in accordance with accuracy and speed requirements
 - Various drum shapes for rotary axes and main spindles
 - High variety of drum diameters



ERM 2200



ERM 2900

Scanning head	
Interface	
Cutoff frequency (−3dB) Scanning frequency	
Integrated interpolation	
Clock frequency	
Calculation time t _{cal}	
Electrical connection	
Cable outlet	
Supply voltage	
Current consumption (typical)	
Power consumption (max.)	
Cable length ¹⁾	
Vibration 55 Hz to 2000 Hz	
Shock 6 ms	
Shock: 6 ms, With fault exclusion for the loosening of the mechanical connection	
Operating temperature	
Protection EN 60529	
Mass	Scanning head Cable M23 coupling M12 coupling

	Graduation period ≈ 200 μm			Graduation period ≈ 400 μm			Graduation period ≈ 1000 μm
	AK ERM 2280	AK ERM 2283	AK ERM 2293 M	AK ERM 2480	AK ERM 2420	AK ERM 2410	AK ERM 2980
	⋈ 1 V _{PP}		Mitsubishi high speed Interface (Mit 02-4) ²⁾	⋈ 1 V _{PP}	TTL x 1, TTL x 2	EnDat 2.2 ^{2) 3)}	⋈ 1 V _{PP}
	≥ 300 kHz –		– –	≥ 300 kHz –	– ≥ 350 kHz	– –	≥ 300 kHz –
	–		16384 (14 bits)	–		16384 (14 bits)	–
	–					≤ 8 MHz	–
	–					≤ 5 μs	–
	Cable (1 m) with or without 12-pin M23 coupling	Cable (1 m) with 12-pin M23 coupling or 12-pin M12 coupling	Cable (1 m) with 8-pin M12 coupling	Cable (1 m) with or without 12-pin M23 coupling		Cable (1 m) with 8-pin M12 coupling	Cable (1 m) with or without 12-pin M23 coupling
	Tangential, to the left or right			Tangential, to the left or right, axial		Tangential, to the right	Tangential, to the left or right, axial
	DC 5 V ±0.5 V		DC 3.6 V to 14 V	DC 5 V ±0.5 V		DC 3.6 V to 14 V	DC 5 V ±0.5 V
	≤ 150 mA (without load)	≤ 35 mA (without load)	≤ 90 mA (without load)	≤ 150 mA (without load)		At 5 V: ≤ 90 mA (without load)	≤ 150 mA (without load)
			At 3.6 V: 1080 mW At 14 V: 1300 mW			At 3.6 V: 1080 mW At 14 V: 1300 mW	
	≤ 150 m		≤ 30 m	≤ 150 m	≤ 100 m	≤ 150 m	
	≤ 400 m/s ² (EN 60068-2-6) ≤ 1000 m/s ² (EN 60068-2-27) ≤ 400 m/s ² (EN 60068-2-27)		≤ 300 m/s ² (EN 60068-2-6) ≤ 1000 m/s ² (EN 60068-2-27) ≤ 400 m/s ² (EN 60068-2-27)	≤ 400 m/s ² (EN 60068-2-6) ≤ 1000 m/s ² (EN 60068-2-27) ≤ 400 m/s ² (EN 60068-2-27)		≤ 300 m/s ² (EN 60068-2-6) ≤ 1000 m/s ² (EN 60068-2-27) ≤ 400 m/s ² (EN 60068-2-27)	≤ 400 m/s ² (EN 60068-2-6) ≤ 1000 m/s ² (EN 60068-2-27) ≤ 400 m/s ² (EN 60068-2-27)
	–10 °C to 60 °C			–10 °C to 100 °C			
	IP67						
	≈ 30 g (without cable) ≈ 37 g/m ≈ 50 g ≈ 15 g						

1) With HEIDENHAIN cable
2) Absolute position value after crossing two reference marks
3) EnDat 2.2 for incremental encoders can be used only after consultation with the controller manufacturer

Scale drum	TTR ERM 2200 TTR ERM 2203 Grating period $\approx 200\ \mu\text{m}$				
Measuring standard Coefficient of expansion	Steel drum $\alpha_{\text{therm}} \approx 10 \cdot 10^{-6}\ \text{K}^{-1}$				
Signal periods	1024	1200	1440	1800	2048
Drum inside diameter*	40 mm	40 mm/55 mm	55 mm	70 mm	80 mm/95 mm
Drum outside diameter*	64.37 mm	75.44 mm	90.53 mm	113.16 mm	128.75 mm
Accuracy of graduation TTR ERM 2200 TTR ERM 2203	$\pm 12''$ $\pm 8''$	$\pm 10''$ $\pm 6.5''$	$\pm 8.5''$ $\pm 5.5''$	$\pm 7''$ $\pm 4.5''$	$\pm 6''$ $\pm 4''$
Interpolation error per signal period TTR ERM 2200 TTR ERM 2203	$\pm 9''$ $\pm 4.5''$	$\pm 8''$ $\pm 4''$	$\pm 6.5''$ $\pm 3.5''$	$\pm 5.5''$ $\pm 3''$	$\pm 4.5''$ $\pm 2.5''$
Reference mark	One or distance-coded				
Mech. permissible speed	$\leq 22\,000\ \text{rpm}$	$\leq 19\,000\ \text{rpm}/$ $\leq 18\,000\ \text{rpm}$	$\leq 18\,500\ \text{rpm}$	$\leq 14\,500\ \text{rpm}$	$\leq 13\,000\ \text{rpm}/$ $\leq 12\,500\ \text{rpm}$
Maximum angular acceleration ¹⁾	$50\,000\ \text{rad/s}^2$	$27\,000\ \text{rad/s}^2/$ $48\,000\ \text{rad/s}^2$	$20\,000\ \text{rad/s}^2$	$9\,000\ \text{rad/s}^2$	$6\,000\ \text{rad/s}^2/$ $9\,000\ \text{rad/s}^2$
Moment of inertia	$0.15 \cdot 10^{-3}\ \text{kgm}^2$	$0.32 \cdot 10^{-3}\ \text{kgm}^2/$ $0.24 \cdot 10^{-3}\ \text{kgm}^2$	$0.63 \cdot 10^{-3}\ \text{kgm}^2$	$1.5 \cdot 10^{-3}\ \text{kgm}^2$	$2.6 \cdot 10^{-3}\ \text{kgm}^2/$ $2.1 \cdot 10^{-3}\ \text{kgm}^2$
Permissible axial movement	$\leq \pm 1.25\ \text{mm}$				
Mass	$\approx 0.21\ \text{kg}$	$\approx 0.35\ \text{kg}/$ $\approx 0.22\ \text{kg}$	$\approx 0.44\ \text{kg}$	$\approx 0.69\ \text{kg}$	$\approx 0.89\ \text{kg}/$ $\approx 0.65\ \text{kg}$

* Please select when ordering
¹⁾ With fault exclusion for the loosening of the mechanical connection

	2400	2800	3392	4096	5200	7200
	105 mm/120 mm	130 mm/140 mm	160 mm	180 mm/220 mm	260 mm/295 mm	380 mm/410 mm
	150.88 mm	176.03 mm	213.24 mm	257.50 mm	326.90 mm	452.64 mm
	±5.5"/7" ±3.5"/5.5"	±5"/6" ±3.5"/5"	±4" ±2.5"	±3.5"/4.5" ±2"/3.5"	±3"/4" ±1.5"/3"	±2.5"/3.5" -/-
	±4" ±2"	±4" ±2"	±3" ±1.5"	±2.5" ±1.5"	±2" ±1"	±1.5" -/-
	≤ 10500 rpm	≤ 9000 rpm/ ≤ 8500 rpm	≤ 7000 rpm	≤ 6000 rpm	≤ 4500 rpm	≤ 3000 rpm
	4900 rad/s ² / 7000 rad/s ²	3300 rad/s ² / 4400 rad/s ²	1900 rad/s ²	820 rad/s ² / 1800 rad/s ²	560 rad/s ² / 1300 rad/s ²	570 rad/s ² / 960 rad/s ²
	4.4 · 10 ⁻³ kgm ² / 3.4 · 10 ⁻³ kgm ²	7.4 · 10 ⁻³ kgm ² / 6.3 · 10 ⁻³ kgm ²	16 · 10 ⁻³ kgm ²	37 · 10 ⁻³ kgm ² / 23 · 10 ⁻³ kgm ²	76 · 10 ⁻³ kgm ² / 42 · 10 ⁻³ kgm ²	240 · 10 ⁻³ kgm ² / 150 · 10 ⁻³ kgm ²
	≈ 1.0 kg/ ≈ 0.72 kg	≈ 1.2 kg/ ≈ 0.99 kg	≈ 1.8 kg	≈ 3.0 kg/ ≈ 1.6 kg	≈ 3.5 kg/ ≈ 1.7 kg	≈ 5.4 kg/ ≈ 3.2 kg

Scale drum	TTR ERM 2400 Grating period $\approx 400\ \mu\text{m}$					
Measuring standard Coefficient of expansion	Steel drum $\alpha_{\text{therm}} \approx 10 \cdot 10^{-6}\ \text{K}^{-1}$					
Signal periods	512	600	720	900	1024	1200
Drum inside diameter*	40 mm	40 mm/55 mm	55 mm	70 mm	80 mm/95 mm	105 mm/120 mm
Drum outside diameter*	64.37 mm	75.44 mm	90.53 mm	113.16 mm	128.75 mm	150.88 mm
Accuracy of graduation	$\pm 13''$	$\pm 11''$	$\pm 10''$	$\pm 8''$	$\pm 7''$	$\pm 6''/8''$
Interpolation error per signal period	$\pm 18''$	$\pm 15.5''$	$\pm 13''$	$\pm 10.5''$	$\pm 9''$	$\pm 8''$
Reference mark	One or distance-coded					
Mech. permissible speed	$\leq 22\,000\ \text{rpm}$	$\leq 19\,000\ \text{rpm}/$ $\leq 18\,000\ \text{rpm}$	$\leq 18\,500\ \text{rpm}$	$\leq 14\,500\ \text{rpm}$	$\leq 13\,000\ \text{rpm}/$ $\leq 12\,500\ \text{rpm}$	$\leq 10\,500\ \text{rpm}$
Maximum angular acceleration ¹⁾	$50\,000\ \text{rad/s}^2$	$27\,000\ \text{rad/s}^2/$ $48\,000\ \text{rad/s}^2$	$20\,000\ \text{rad/s}^2$	$9\,000\ \text{rad/s}^2$	$6\,000\ \text{rad/s}^2/$ $9\,000\ \text{rad/s}^2$	$4\,900\ \text{rad/s}^2/$ $7\,000\ \text{rad/s}^2$
Moment of inertia	$0.15 \cdot 10^{-3}\ \text{kgm}^2$	$0.32 \cdot 10^{-3}\ \text{kgm}^2/$ $0.24 \cdot 10^{-3}\ \text{kgm}^2$	$0.63 \cdot 10^{-3}\ \text{kgm}^2$	$1.5 \cdot 10^{-3}\ \text{kgm}^2$	$2.6 \cdot 10^{-3}\ \text{kgm}^2/$ $2.1 \cdot 10^{-3}\ \text{kgm}^2$	$4.4 \cdot 10^{-3}\ \text{kgm}^2/$ $3.4 \cdot 10^{-3}\ \text{kgm}^2$
Permissible axial movement	$\leq \pm 1.25\ \text{mm}$					
Mass	$\approx 0.21\ \text{kg}$	$\approx 0.35\ \text{kg}/$ $\approx 0.22\ \text{kg}$	$\approx 0.44\ \text{kg}$	$\approx 0.69\ \text{kg}$	$\approx 0.89\ \text{kg}/$ $\approx 0.65\ \text{kg}$	$\approx 1.0\ \text{kg}/0.72\ \text{kg}$

* Please select when ordering
¹⁾ With fault exclusion for the loosening of the mechanical connection

Scale drum	TTR ERM 2404 Grating period $\approx 400\ \mu\text{m}$					
Measuring standard Coefficient of expansion	Steel drum $\alpha_{\text{therm}} \approx 10 \cdot 10^{-6}\ \text{K}^{-1}$					
Signal periods	360	400	512	600	900	1024
Drum inside diameter*	30 mm	30 mm	40 mm/55 mm	55 mm/60 mm	80 mm	100 mm
Drum outside diameter*	45.26 mm	50.29 mm	64.37 mm	75.44 mm	113.16 mm	128.75 mm
Accuracy of graduation	$\pm 24''$	$\pm 21''$	$\pm 17''$	$\pm 14''$	$\pm 10''$	$\pm 9''$
Interpolation error per signal period	$\pm 25.5''$	$\pm 23''$	$\pm 18''$	$\pm 15.5''$	$\pm 10.5''$	$\pm 9''$
Reference mark	One					
Mech. permissible speed	$\leq 60\,000\ \text{rpm}$	$\leq 54\,000\ \text{rpm}$	$\leq 42\,000\ \text{rpm}$ $\leq 38\,000\ \text{rpm}$	$\leq 36\,000\ \text{rpm}$ $\leq 30\,000\ \text{rpm}$	$\leq 22\,000\ \text{rpm}$	$\leq 20\,000\ \text{rpm}$
Moment of inertia	$0.027 \cdot 10^{-3}\ \text{kgm}^2$	$0.045 \cdot 10^{-3}\ \text{kgm}^2$	$0.12 \cdot 10^{-3}\ \text{kgm}^2$ $0.06 \cdot 10^{-3}\ \text{kgm}^2$	$0.19 \cdot 10^{-3}\ \text{kgm}^2$ $0.16 \cdot 10^{-3}\ \text{kgm}^2$	$1.0 \cdot 10^{-3}\ \text{kgm}^2$	$1.4 \cdot 10^{-3}\ \text{kgm}^2$
Permissible axial movement	$\leq \pm 0.5\ \text{mm}$					
Mass	$\approx 0.07\ \text{kg}$	$\approx 0.10\ \text{kg}$	$\approx 0.16\ \text{kg/}$ $\approx 0.07\ \text{kg}$	$\approx 0.17\ \text{kg/}$ $\approx 0.13\ \text{kg}$	$\approx 0.42\ \text{kg}$	$\approx 0.42\ \text{kg}$

Scale drum	TTR ERM 2904 Grating period $\approx 1000\ \mu\text{m}$				
Measuring standard Coefficient of expansion	Steel drum $\alpha_{\text{therm}} \approx 10 \cdot 10^{-6}\ \text{K}^{-1}$				
Signal periods	180	192	256	300	400
Drum inside diameter*	35 mm	40 mm	55 mm	60 mm	100 mm
Drum outside diameter*	54.43 mm	58.06 mm	77.41 mm	90.72 mm	120.96 mm
Accuracy of graduation	$\pm 72''$	$\pm 68''$	$\pm 51''$	$\pm 44''$	$\pm 33''$
Interpolation error per signal period	$\pm 72''$	$\pm 68''$	$\pm 51''$	$\pm 44''$	$\pm 33''$
Reference mark	One				
Mech. permissible speed	$\leq 50\,000\ \text{rpm}$	$\leq 47\,000\ \text{rpm}$	$\leq 35\,000\ \text{rpm}$	$\leq 29\,000\ \text{rpm}$	$\leq 16\,000\ \text{rpm}$
Moment of inertia	$0.06 \cdot 10^{-3}\ \text{kgm}^2$	$0.07 \cdot 10^{-3}\ \text{kgm}^2$	$0.22 \cdot 10^{-3}\ \text{kgm}^2$	$0.45 \cdot 10^{-3}\ \text{kgm}^2$	$0.93 \cdot 10^{-3}\ \text{kgm}^2$
Permissible axial movement	$\leq \pm 0.5\ \text{mm}$				
Mass	$\approx 0.11\ \text{kg}$	$\approx 0.11\ \text{kg}$	$\approx 0.19\ \text{kg}$	$\approx 0.30\ \text{kg}$	$\approx 0.30\ \text{kg}$

* Please select when ordering

Scale drum	TTR ERM 2405 Grating period $\approx 400\text{ }\mu\text{m}$	
Measuring standard Coefficient of expansion	Steel drum $\alpha_{\text{therm}} \approx 10 \cdot 10^{-6}\text{ K}^{-1}$	
Signal periods	512	600
Drum inside diameter*	40 mm	55 mm
Drum outside diameter*	64.37 mm	75.44 mm
Accuracy of graduation	$\pm 17''$	$\pm 14''$
Interpolation error per signal period	$\pm 18''$	$\pm 15.5''$
Reference mark	One	
Mech. permissible speed	$\leq 33\,000\text{ rpm}$	$\leq 27\,000\text{ rpm}$
Moment of inertia	$0.11 \cdot 10^{-3}\text{ kgm}^2$	$0.16 \cdot 10^{-3}\text{ kgm}^2$
Permissible axial movement	$\leq \pm 0.5\text{ mm}$	
Mass	$\approx 0.15\text{ kg}$	$\approx 0.14\text{ kg}$

* Please select when ordering

