HEIDENHAIN

РЕМСТАНМАШ
ТЕХНОЛОГИИ ДЛЯ ПРОИЗВОДСТВА



Product Information for
Customer-Specific Variants

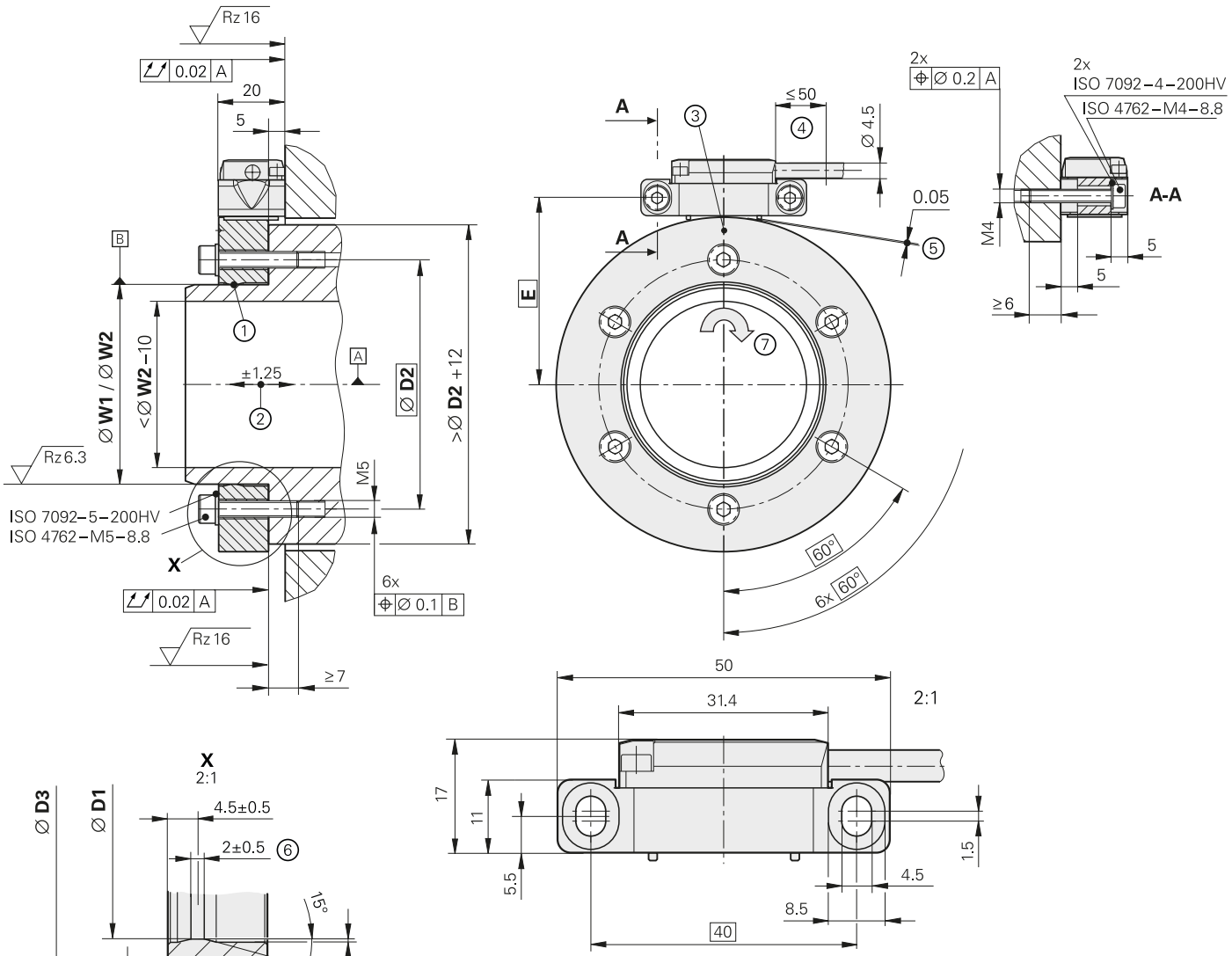
AK ERM 2xx0
TTR ERM 2x00

Modular Angle Encoders
with Magnetic Scanning and
Mechanical Fault Exclusion

February 2017

ERM 2200 series

- **Consisting of AK ERM 2280 and TTR ERM 2200C or TTR ERM 2200**
- **Modular encoders with magnetic scanning principle**
- **Signal period approx. 200 µm (at circumference)**
- **For rotary and tilting axes**
- **Suitable for fault exclusion for loosening of the mechanical connection**



D1	W1	W2	D2	D3	E
Ø 40 0/–0.007	Ø 40 +0.009/+0.002	Ø 40 +0.010/+0.003	Ø 50	Ø 64.37	37.9
Ø 40 0/–0.007	Ø 40 +0.009/+0.002	Ø 40 +0.010/+0.003	Ø 50	Ø 75.44	43.4
Ø 55 0/–0.008	Ø 55 +0.010/+0.002	Ø 55 +0.015/+0.007	Ø 70	Ø 90.53	51.0
Ø 60 0/–0.008	Ø 60 +0.010/+0.002	Ø 60 +0.016/+0.008	Ø 75	Ø 128.75	70.1
Ø 65 0/–0.008	Ø 65 +0.010/+0.002	Ø 65 +0.018/+0.010	Ø 80	Ø 128.75	70.1
Ø 70 0/–0.008	Ø 70 +0.010/+0.002	Ø 70 +0.019/+0.011	Ø 95	Ø 128.75	70.1
Ø 80 0/–0.008	Ø 80 +0.010/+0.002	Ø 80 +0.022/+0.014	Ø 95	Ø 150.88	81.2
Ø 90 0/–0.010	Ø 90 +0.013/+0.003	Ø 90 +0.027/+0.017	Ø 105	Ø 128.75	70.1
Ø 95 0/–0.010	Ø 95 +0.013/+0.003	Ø 95 +0.029/+0.019	Ø 110	Ø 128.75	70.1
Ø 95 0/–0.010	Ø 95 +0.013/+0.003	Ø 95 +0.029/+0.019	Ø 110	Ø 150.88	81.2
Ø 105 0/–0.010	Ø 105 +0.013/+0.003	Ø 105 +0.031/+0.021	Ø 120	Ø 150.88	81.2
Ø 110 0/–0.010	Ø 110 +0.013/+0.003	Ø 110 +0.033/+0.023	Ø 125	Ø 150.88	81.2
Ø 120 0/–0.010	Ø 120 +0.013/+0.003	Ø 120 +0.036/+0.026	Ø 135	Ø 150.88	81.2
Ø 120 0/–0.010	Ø 120 +0.013/+0.003	Ø 120 +0.036/+0.026	Ø 135	Ø 257.50	134.5
Ø 140 0/–0.012	Ø 140 +0.015/+0.003	Ø 140 +0.044/+0.032	Ø 155	Ø 176.03	93.7
Ø 140 0/–0.012	Ø 140 +0.015/+0.003	Ø 140 +0.044/+0.032	Ø 155	Ø 257.50	134.5
Ø 160 0/–0.012	Ø 160 +0.015/+0.003	Ø 160 +0.049/+0.037	Ø 170	Ø 257.50	134.5
Ø 160 0/–0.012	Ø 160 +0.015/+0.003	Ø 160 +0.049/+0.037	Ø 175	Ø 257.50	134.5
Ø 180 0/–0.012	Ø 180 +0.015/+0.003	Ø 180 +0.055/+0.043	Ø 190	Ø 221.29	116.4
Ø 200 0/–0.014	Ø 200 +0.018/+0.004	Ø 200 +0.063/+0.049	Ø 215	Ø 257.50	134.5
Ø 220 0/–0.014	Ø 220 +0.018/+0.004	Ø 220 +0.069/+0.055	Ø 235	Ø 257.50	134.5
Ø 295 0/–0.016	Ø 295 +0.020/+0.004	Ø 295 +0.093/+0.077	Ø 310	Ø 326.90	169.2

mm

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

W1 = Without mechanical fault exclusion
W2 = With mechanical fault exclusion

Ⓐ = Bearing of mating shaft
① = Shaft fit; ensure full-surface contact
② = Axial tolerance of mating shaft
③ = Reference mark position
④ = Cable support
⑤ = Mounting distance of 0.05 mm set with spacer shim
⑥ = Centering collar
⑦ = Direction of shaft rotation for output signals according to interface description

Scanning head	AK ERM 2280
Interface	⁓ 1 V_{PP}
Cutoff frequency –3 dB	≥ 300 kHz
Signal period	≈ 200 µm
Line count*	See *Scale drum*
Electrical connection*	Cable 1 m, with or without coupling
Cable length	≤ 150 m (with HEIDENHAIN cable)
Voltage supply	DC 5 V ±0.5 V
Current consumption	≤ 150 mA (without load)
Vibration 55 Hz to 2000 Hz **Shock** 6 ms	≤ 400 m/s^2 (EN 60068-2-6) ≤ 1000 m/s^2 (EN 60068-2-27); *with fault exclusion for loosening of the mech. connection:* 400 m/s^2
Operating temperature	–10 °C to +60 °C
Protection EN 60529	IP67
Mass	≈ 0.15 kg (without cable)

* Please select when ordering

РЕМСТАНМАШ
ТЕХНОЛОГИИ ДЛЯ ПРОИЗВОДСТВА

Scale drum	TTR ERM 2200C and TTR ERM 2200		
Measuring standard	MAGNADUR graduation; signal period of approx. 200 µm		
Line count*	1024	1200	1440
Position error per SP[1)]	±9″	±8″	±6.5″
Accuracy of graduation	±12″	±10″	±8.5″
Reference mark*	Distance-coded or one		
Angle for absolute reference (with distance-coded RM)	≤ 45°	≤ 30°	≤ 24°
Permissible axial motion	±1.25 mm		
Outside diameter	64.37 mm	75.44 mm	90.53 mm
Drum shape	A56	A01	A26
Inside diameter	40 mm	40 mm	55 mm
Bolt hole circles	Ø 50 mm; 6 x M6	Ø 50 mm; 6 x M6	Ø 70 mm; 6 x M6
Mechanically permissible speed	22000 rpm	19000 rpm	18500 rpm
Moment of inertia of rotor	$0.15 \cdot 10^{-3}$ kgm^2	$0.32 \cdot 10^{-3}$ kgm^2	$0.63 \cdot 10^{-3}$ kgm^2
Max. angular acceleration	50000 rad/s^2	27000 rad/s^2	20000 rad/s^2
Mass	0.21 kg	0.35 kg	0.44 kg

***** Please select when ordering

1) Position error within one signal period and the accuracy of the graduation together result in the encoder-specific error; for additional error from mounting and bearing of the measured shaft, see *Measuring accuracy* in the catalog *Modular Angle Encoders with Magnetic Scanning*.

Scale drum	TTR ERM 2200 C and TTR ERM 2200								
Measuring standard	MAGNADUR graduation; signal period of approx. 200 µm								
Line count*	2048					2400			
Position error per SP[1)]	±4.5″					±4″			
Accuracy of graduation	±6″					±5.5″			
Reference mark*	Distance-coded or one								
Angle for absolute reference (with distance-coded RM)	≤ 22.5°					≤ 18°			
Permissible axial motion	±1.25 mm								
Outside diameter	128.75 mm					150.88 mm			
Drum shape*	A11	A15	A21	A16	A14	A06	A20	A07	A18
Inside diameter	60 mm	65 mm	70 mm	90 mm	95 mm	80 mm	95 mm	105 mm	110 mm
Bolt hole circles	Ø 75 mm; 6 x M6	Ø 80 mm; 6 x M6	Ø 95 mm; 6 x M6	Ø 105 mm; 6 x M6	Ø 110 mm; 6 x M6	Ø 95 mm; 6 x M6	Ø 110 mm; 6 x M6	Ø 120 mm; 6 x M6	Ø 125 mm; 6 x M6
Mechanically permissible speed	13000 rpm	13000 rpm	14000 rpm	12500 rpm	12500 rpm	11000 rpm	11000 rpm	10500 rpm	10500 rpm
Moment of inertia of rotor	$2.9 \cdot 10^{-3}$ kgm^2	$2.9 \cdot 10^{-3}$ kgm^2	$2.8 \cdot 10^{-3}$ kgm^2	$2.3 \cdot 10^{-3}$ kgm^2	$2.1 \cdot 10^{-3}$ kgm^2	$5.3 \cdot 10^{-3}$ kgm^2	$4.8 \cdot 10^{-3}$ kgm^2	$4.4 \cdot 10^{-3}$ kgm^2	$4.1 \cdot 10^{-3}$ kgm^2
Max. angular acceleration	4400 rad/s^2	4800 rad/s^2	6000 rad/s^2	8000 rad/s^2	9000 rad/s^2	3100 rad/s^2	3900 rad/s^2	4900 rad/s^2	5000 rad/s^2
Mass	1.2 kg	1.1 kg	1.0 kg	0.74 kg	0.65 kg	1.5 kg	1.2 kg	1.0 kg	0.93 kg

***** Please select when ordering

[1)] Position error within one signal period and the accuracy of the graduation together result in the encoder-specific error; for additional error from mounting and bearing of the measured shaft, see *Measuring accuracy* in the catalog *Modular Angle Encoders with Magnetic Scanning*.

РЕМСТАНМАШ
ТЕХНОЛОГИИ ДЛЯ ПРОИЗВОДСТВА

Scale drum	TTR ERM 2200C and TTR ERM 2200		
Measuring standard	MAGNADUR graduation; signal period of approx. 200 µm		
Line count*	2400	2800	3520
Position error per SP[1)]	±4″	±3.5″	±3″
Accuracy of graduation	±7″	±6″	±5″
Reference mark*	Distance-coded or one		
Angle for absolute reference (with distance-coded RM)	≤ 18.0°	≤ 14.4°	≤ 16.36°
Permissible axial motion	±1.25 mm		
Outside diameter	150.88 mm	176.03 mm	221.29 mm
Drum shape	A03	A36	A55
Inside diameter	120 mm	140 mm	180 mm
Bolt hole circles	Ø 135 mm; 6 x M6	Ø 155 mm; 6 x M6	Ø 190 mm; 6 x M6
Mechanically permissible speed	10500 rpm	8500 rpm	5500 rpm
Moment of inertia of rotor	$3.4 \cdot 10^{-3}$ kgm^2	$6.3 \cdot 10^{-3}$ kgm^2	$15 \cdot 10^{-3}$ kgm^2
Max. angular acceleration	7000 rad/s^2	4400 rad/s^2	2200 rad/s^2
Mass	0.72 kg	0.99 kg	1.5 kg

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РЕМСТАНМАШ
ТЕХНОЛОГИИ ДЛЯ ПРОИЗВОДСТВА

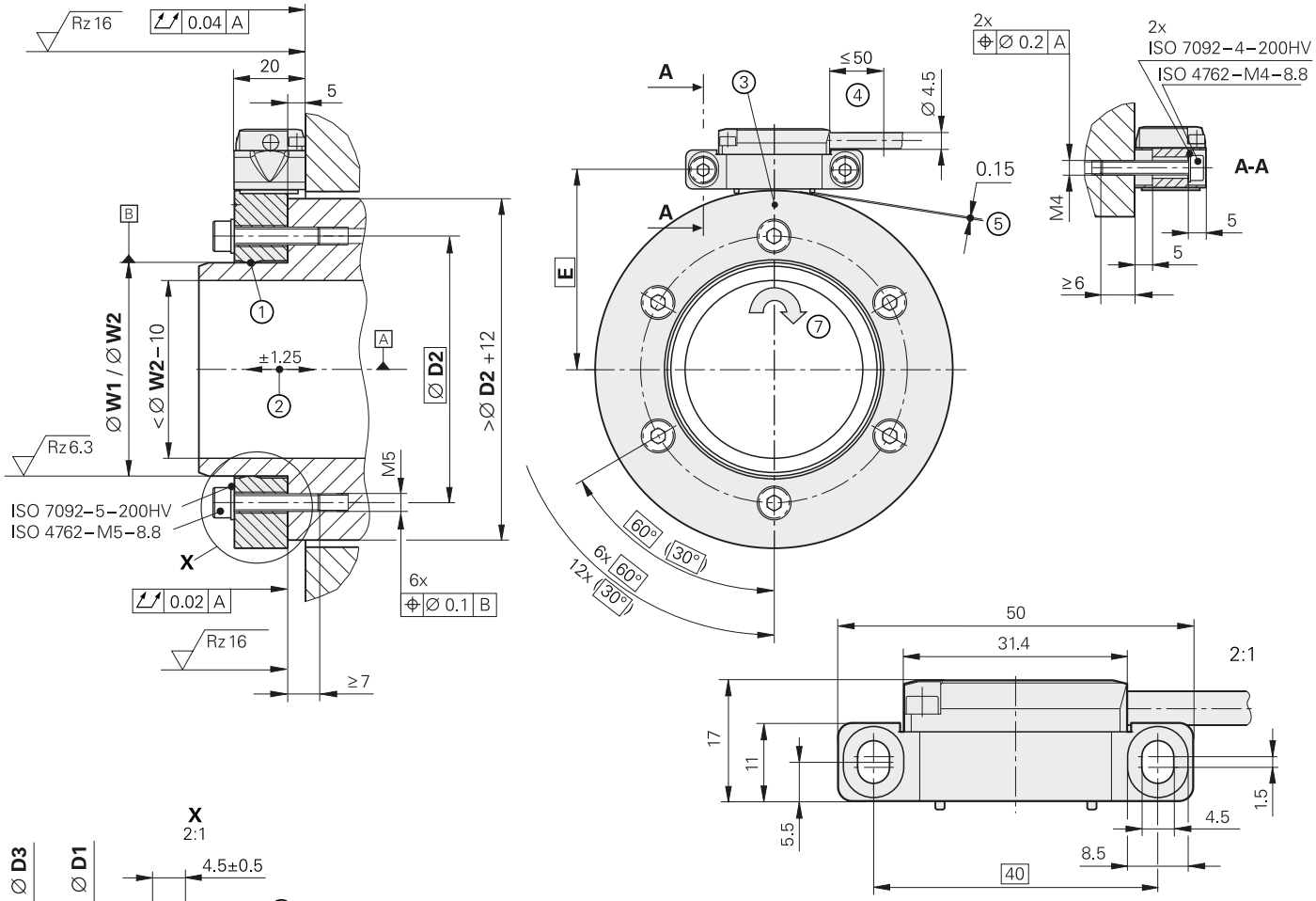
Scale drum	TTR ERM 2200 C and TTR ERM 2200						
Measuring standard	MAGNADUR graduation; signal period of approx. 200 µm						
Line count*	4096						5200
Position error per SP[1)]	±2.5″						±2″
Accuracy of graduation	±3.5″					±4.5″	±4″
Reference mark*	Distance-coded or one						
Angle for absolute reference (with distance-coded RM)	≤ 11.25°						≤ 13.85°
Permissible axial motion	±1.25 mm						
Outside diameter	257.5 mm						326.9 mm
Drum shape*	A23	A19	A34	A48	A28	A08	A17
Inside diameter	120 mm	140 mm	160 mm	160 mm	200 mm	220 mm	295 mm
Bolt hole circles	Ø 135 mm; 6 x M6	Ø 155 mm; 6 x M6	Ø 175 mm; 6 x M6	Ø 170 mm; 6 x M6	Ø 215 mm; 6 x M6	Ø 235 mm; 6 x M6	Ø 310 mm; 6 x M6
Mechanically permissible speed	6500 rpm	6500 rpm	6000 rpm	5000 rpm	6000 rpm	6000 rpm	4500 rpm
Moment of inertia of rotor	$47 \cdot 10^{-3}$ kgm^2	$45 \cdot 10^{-3}$ kgm^2	$42 \cdot 10^{-3}$ kgm^2	$42 \cdot 10^{-3}$ kgm^2	$31 \cdot 10^{-3}$ kgm^2	$23 \cdot 10^{-3}$ kgm^2	$42 \cdot 10^{-3}$ kgm^2
Max. angular acceleration	450 rad/s^2	540 rad/s^2	650 rad/s^2	630 rad/s^2	1200 rad/s^2	1800 rad/s^2	1300 rad/s^2
Mass	4.7 kg	4.2 kg	3.6 kg	3.6 kg	2.3 kg	1.6 kg	1.7 kg

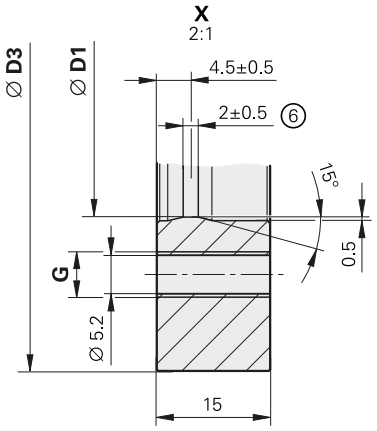
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[1)] Position error within one signal period and the accuracy of the graduation together result in the encoder-specific error; for additional error from mounting and bearing of the measured shaft, see *Measuring accuracy* in the catalog *Modular Angle Encoders with Magnetic Scanning*.

ERM 2400 series

- **Consisting of AK ERM 2420 or AK ERM 2480 and TTR ERM 2400 or TTR ERM 2400C**
- **Modular encoders with magnetic scanning principle**
- **Signal period approx. 400 µm (at circumference)**
- **For C axis on lathes**
- **Suitable for fault exclusion for loosening of the mechanical connection**





mm

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

W1 = Without mechanical fault exclusion
W2 = With mechanical fault exclusion

Ⓐ = Bearing of mating shaft
① = Shaft fit; ensure full-surface contact
② = Axial tolerance of mating shaft
③ = Reference mark position
④ = Cable support
⑤ = Mounting distance of 0.15 mm set with spacer shim
⑥ = Centering collar
⑦ = Direction of shaft rotation for output signals according to interface description

D1	W1	W2	D2	D3	E	G
Ø 40 0/–0.007	Ø 40 +0.009/+0.002	Ø 40 +0.010/+0.003	Ø 50	Ø 64.37	37.9	6x M6
Ø 40 0/–0.007	Ø 40 +0.009/+0.002	Ø 40 +0.010/+0.003	Ø 50	Ø 75.44	43.4	12x Ø 5.2
Ø 55 0/–0.008	Ø 55 +0.010/+0.002	Ø 55 +0.015/+0.007	Ø 65	Ø 75.44	43.4	6x M6
Ø 55 0/–0.008	Ø 55 +0.010/+0.002	Ø 55 +0.015/+0.007	Ø 70	Ø 90.53	51.0	6x M6
Ø 60 0/–0.008	Ø 60 +0.010/+0.002	Ø 60 +0.016/+0.008	Ø 75	Ø 128.75	70.1	6x M6
Ø 65 0/–0.008	Ø 65 +0.010/+0.002	Ø 65 +0.018/+0.010	Ø 80	Ø 128.75	70.1	6x M6
Ø 70 0/–0.008	Ø 70 +0.010/+0.002	Ø 70 +0.019/+0.011	Ø 95	Ø 128.75	70.1	6x M6
Ø 70 0/–0.008	Ø 70 +0.010/+0.002	Ø 70 +0.019/+0.011	Ø 85	Ø 150.88	81.2	6x M6
Ø 80 0/–0.008	Ø 80 +0.010/+0.002	Ø 80 +0.022/+0.014	Ø 95	Ø 150.88	81.2	6x M6
Ø 90 0/–0.010	Ø 90 +0.013/+0.003	Ø 90 +0.027/+0.017	Ø 105	Ø 128.75	70.1	6x M6
Ø 95 0/–0.010	Ø 95 +0.013/+0.003	Ø 95 +0.029/+0.019	Ø 110	Ø 128.75	70.1	6x M6
Ø 95 0/–0.010	Ø 95 +0.013/+0.003	Ø 95 +0.029/+0.019	Ø 110	Ø 150.88	81.2	6x M6
Ø 105 0/–0.010	Ø 105 +0.013/+0.003	Ø 105 +0.031/+0.021	Ø 120	Ø 150.88	81.2	6x M6
Ø 110 0/–0.010	Ø 110 +0.013/+0.003	Ø 110 +0.033/+0.023	Ø 125	Ø 150.88	81.2	6x M6
Ø 120 0/–0.010	Ø 120 +0.013/+0.003	Ø 120 +0.036/+0.026	Ø 135	Ø 257.50	134.5	6x M6
Ø 130 0/–0.012	Ø 130 +0.015/+0.003	Ø 130 +0.041/+0.029	Ø 145	Ø 257.50	134.5	6x M6
Ø 140 0/–0.012	Ø 140 +0.015/+0.003	Ø 140 +0.044/+0.032	Ø 155	Ø 176.03	93.7	6x M6
Ø 140 0/–0.012	Ø 140 +0.015/+0.003	Ø 140 +0.044/+0.032	Ø 155	Ø 257.50	134.5	6x M6
Ø 160 0/–0.012	Ø 160 +0.015/+0.003	Ø 160 +0.049/+0.037	Ø 175	Ø 213.24	112.3	6x M6
Ø 160 0/–0.012	Ø 160 +0.015/+0.003	Ø 160 +0.049/+0.037	Ø 170	Ø 257.50	134.5	6x M6
Ø 160 0/–0.012	Ø 160 +0.015/+0.003	Ø 160 +0.049/+0.037	Ø 175	Ø 257.50	134.5	6x M6
Ø 200 0/–0.014	Ø 200 +0.018/+0.004	Ø 200 +0.063/+0.049	Ø 215	Ø 257.50	134.5	6x M6
Ø 260 0/–0.016	Ø 260 +0.020/+0.004	Ø 260 +0.082/+0.066	Ø 275	Ø 326.9	169.2	6x M6
Ø 330 0/–0.018	Ø 330 +0.022/+0.004	Ø 330 +0.105/+0.087	Ø 345	Ø 362.11	186.8	12x M6
Ø 380 0/–0.018	Ø 380 +0.022/+0.005	Ø 380 +0.119/+0.101	Ø 395	Ø 452.64	232.0	12x M6
Ø 425 0/–0.020	Ø 425 +0.025/+0.005	Ø 425 +0.134/+0.114	Ø 445	Ø 484.07	247.7	12x M6
Ø 450 0/–0.020	Ø 450 +0.025/+0.005	Ø 450 +0.142/+0.122	Ø 465	Ø 484.07	247.7	6x M6
Ø 450 0/–0.020	Ø 450 +0.025/+0.005	Ø 450 +0.142/+0.122	Ø 465	Ø 484.07	247.7	12x M6
Ø 512 0/–0.022	Ø 512 +0.027/+0.005	Ø 512 +0.161/+0.139	Ø 528	Ø 603.52	307.5	12x M6

Scanning head	AK ERM 2420	AK ERM 2480
Interface	⊓⊔TTL	∿ 1 V_{PP}
Cutoff frequency –3 dB Scanning frequency	– ≤ 350 kHz	≥ 300 kHz –
Signal period	≈ 400 µm	
Line count*	See *Scale drum*	
Electrical connection*	Cable 1 m, with or without coupling	
Cable length	≤ 100 m (with HEIDENHAIN cable)	≤ 150 m (with HEIDENHAIN cable)
Voltage supply	5 V DC ± 0.5 V	
Current consumption	≤ 150 mA (without load)	
Vibration 55 Hz to 2000 Hz **Shock** 6 ms	≤ 400 m/s^2 (EN 60068-2-6) ≤ 1000 m/s^2 (EN 60068-2-27); *with fault exclusion for loosening of the mech. connection:* 400 m/s^2	
Operating temperature	–10 °C to +100 °C	
Protection EN 60529	IP67	
Mass	≈ 0.15 kg (without cable)	

***** Please select when ordering

РЕМСТАНМАШ
ТЕХНОЛОГИИ ДЛЯ ПРОИЗВОДСТВА

Scale drum	TTR ERM 2400 C and TTR ERM 2400								
Measuring standard	MAGNADUR graduation; signal period of approx. 400 µm								
Line count*	512	600		720	1024				
Position error per SP[1)]	±18″	±15.5″		±13″	±9″				
Accuracy of graduation	±13″	±11″		±10″	±7″				
Reference mark*	*TTR ERM 2400:* one; *TTR ERM 2400 C:* distance-coded								
Angle for absolute reference (with distance-coded RM)	≤ 45°	≤ 36°		≤ 30°	≤ 22.5°				
Permissible axial motion	±1.25 mm								
Outside diameter	64.37 mm	75.44 mm		90.53 mm	128.75 mm				
Drum shape*	A56	A22	A59	A26	A11	A15	A21	A16	A14
Inside diameter	40 mm	40 mm	55 mm	55 mm	60 mm	65 mm	70 mm	90 mm	95 mm
Bolt hole circles	Ø 50 mm; 6 x M6	Ø 50 mm; 12 x Ø 5.2 mm	Ø 65 mm; 6 x M6	Ø 70 mm; 6 x M6	Ø 75 mm; 6 x M6	Ø 80 mm; 6 x M6	Ø 95 mm; 6 x M6	Ø 105 mm; 6 x M6	Ø 110 mm; 6 x M6
Mechanically permissible speed	22000 rpm	19000 rpm	18000 rpm	18500 rpm	13000 rpm	13000 rpm	14000 rpm	12500 rpm	12500 rpm
Moment of inertia of rotor	$0.15 \cdot 10^{-3}$ kgm^2	$0.32 \cdot 10^{-3}$ kgm^2	$0.24 \cdot 10^{-3}$ kgm^2	$0.63 \cdot 10^{-3}$ kgm^2	$2.9 \cdot 10^{-3}$ kgm^2	$2.9 \cdot 10^{-3}$ kgm^2	$2.8 \cdot 10^{-3}$ kgm^2	$2.3 \cdot 10^{-3}$ kgm^2	$2.1 \cdot 10^{-3}$ kgm^2
Max. angular acceleration	50000 rad/s^2	50000 rad/s^2	48000 rad/s^2	20000 rad/s^2	4400 rad/s^2	4800 rad/s^2	6000 rad/s^2	8000 rad/s^2	9000 rad/s^2
Mass	0.21 kg	0.34 kg	0.22 kg	0.44 kg	1.2 kg	1.1 kg	1.0 kg	0.74 kg	0.65 kg

***** Please select when ordering

[1)] Position error within one signal period and the accuracy of the graduation together result in the encoder-specific error; for additional error from mounting and bearing of the measured shaft, see *Measuring accuracy* in the catalog *Modular Angle Encoders with Magnetic Scanning*.

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ТЕХНОЛОГИИ ДЛЯ ПРОИЗВОДСТВА

Scale drum	TTR ERM 2400 C and TTR ERM 2400						
Measuring standard	MAGNADUR graduation; signal period of approx. 400 µm						
Line count*	1200					1400	1696
Position error per SP[1)]	±8″					±6.5″	±5.5″
Accuracy of graduation	±6″					±7″	±4.5″
Reference mark*	*TTR ERM 2400:* one; *TTR ERM 2400 C:* distance-coded						
Angle for absolute reference (with distance-coded RM)	≤ 24°					≤ 18°	≤ 22.5°
Permissible axial motion	±1.25 mm						
Outside diameter	150.88 mm					176.03 mm	213.24 mm
Drum shape*	A29	A06	A20	A07	A18	A36	A54
Inside diameter	70 mm	80 mm	95 mm	105 mm	110 mm	140 mm	160 mm
Bolt hole circles	Ø 85 mm; 6 x M6	Ø 95 mm; 6 x M6	Ø 110 mm; 6 x M6	Ø 120 mm; 6 x M6	Ø 125 mm; 6 x M6	Ø 155 mm; 6 x M6	Ø 175 mm; 6 x M6
Mech. permissible speed	11 000 rpm	11 000 rpm	11 000 rpm	10 500 rpm	10 500 rpm	8500 rpm	7000 rpm
Moment of inertia of rotor	$5.5 \cdot 10^{-3}$ kgm^2	$5.3 \cdot 10^{-3}$ kgm^2	$4.8 \cdot 10^{-3}$ kgm^2	$4.4 \cdot 10^{-3}$ kgm^2	$4.1 \cdot 10^{-3}$ kgm^2	$6.3 \cdot 10^{-3}$ kgm^2	$16 \cdot 10^{-3}$ kgm^2
Max. angular acceleration	2600 rad/s^2	3100 rad/s^2	3900 rad/s^2	4900 rad/s^2	5000 rad/s^2	4400 rad/s^2	1900 rad/s^2
Mass	1.6 kg	1.5 kg	1.2 kg	1.0 kg	0.93 kg	0.99 kg	1.8 kg

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ТЕХНОЛОГИИ ДЛЯ ПРОИЗВОДСТВА

Scale drum	**TTR ERM 2400 C and TTR ERM 2400**					
Measuring standard	MAGNADUR graduation; signal period of approx. 400 µm					
Line count	2048					
Position error per SP[1)]	±4.5″					
Accuracy of graduation	±4″					
Reference mark*	*TTR ERM 2400:* one; *TTR ERM 2400 C:* distance-coded					
Angle for absolute reference (with distance-coded RM)	≤ 22.5°					
Permissible axial motion	±1.25 mm					
Outside diameter	257.5 mm					
Drum shape*	A23	A32	A19	A34	A48	A28
Inside diameter	120 mm	130 mm	140 mm	160 mm	160 mm	200 mm
Bolt hole circles	Ø 135 mm; 6 x M6	Ø 145 mm; 6 x M6	Ø 155 mm; 6 x M6	Ø 175 mm; 6 x M6	Ø 170 mm; 6 x M6	Ø 215 mm; 6 x M6
Mech. permissible speed	6500 rpm	6500 rpm	6500 rpm	6000 rpm	5000 rpm	6000 rpm
Moment of inertia of rotor	$47 \cdot 10^{-3}$ kgm^2	$46 \cdot 10^{-3}$ kgm^2	$45 \cdot 10^{-3}$ kgm^2	$42 \cdot 10^{-3}$ kgm^2	$42 \cdot 10^{-3}$ kgm^2	$31 \cdot 10^{-3}$ kgm^2
Max. angular acceleration	450 rad/s^2	490 rad/s^2	540 rad/s^2	650 rad/s^2	630 rad/s^2	1200 rad/s^2
Mass	4.7 kg	4.4 kg	4.2 kg	3.6 kg	3.6 kg	2.3 kg

***** Please select when ordering
1) Position error within one signal period and the accuracy of the graduation together result in the encoder-specific error; for additional error from mounting and bearing of the measured shaft, see *Measuring accuracy* in the catalog *Modular Angle Encoders with Magnetic Scanning*.

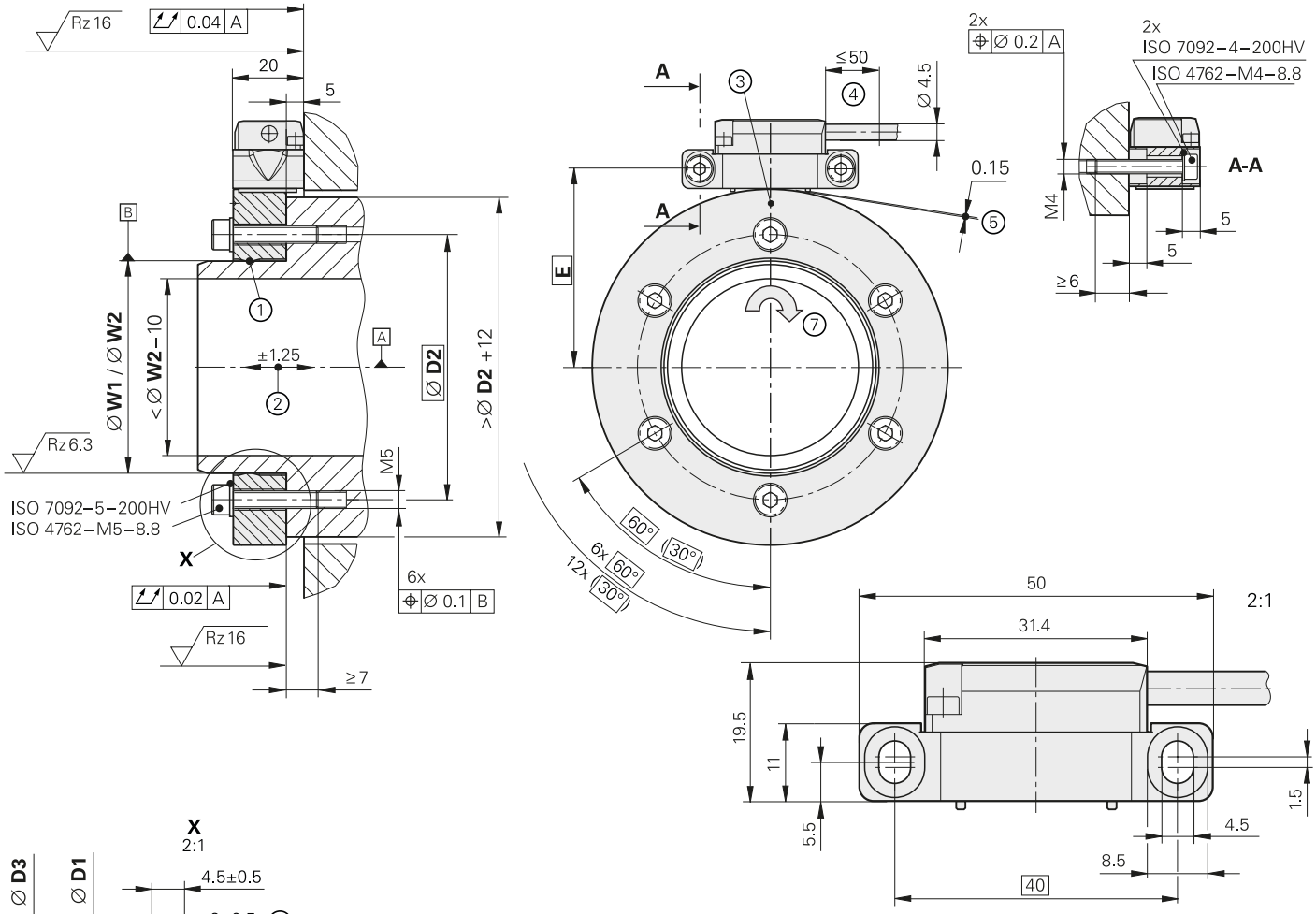
Scale drum	TTR ERM 2400 C and TTR ERM 2400						
Measuring standard	MAGNADUR graduation; signal period of approx. 400 µm						
Line count*	2600	2880	3600	3850			4800
Position error per SP[1)]	±3.5″		±3″	±2.5″			±2″
Accuracy of graduation	±3.5″	±4″	±3″	±3.5″			±3″
Reference mark*	*TTR ERM 2400:* one; *TTR ERM 2400 C:* distance-coded						
Angle for absolute reference (with distance-coded RM)	≤ 13.85	≤ 12.0°		≤ 10.29°			≤ 9.0°
Permissible axial motion	±1.25 mm						
Outside diameter	326.9 mm	362.11 mm	452.64 mm	484.07 mm			603.52 mm
Drum shape*	A52	A30	A53	A33	A25	A57	A49
Inside diameter	260 mm	330 mm	380 mm	425 mm	450 mm	450 mm	512 mm
Bolt hole circles	Ø 275 mm; 6 x M6	Ø 345 mm; 12 x M6	Ø 395 mm; 12 x M6	Ø 445 mm; 12 x M6	Ø 465 mm; 6 x M6	Ø 465 mm; 12 x M6	Ø 528 mm; 12 x M6
Mech. permissible speed	4500 rpm	4000 rpm	3000 rpm	3000 rpm	3000 rpm	3000 rpm	1600 rpm
Moment of inertia of rotor	$76 \cdot 10^{-3}$ kgm^2	$58 \cdot 10^{-3}$ kgm^2	$240 \cdot 10^{-3}$ kgm^2	$250 \cdot 10^{-3}$ kgm^2	$150 \cdot 10^{-3}$ kgm^2	$150 \cdot 10^{-3}$ kgm^2	$710 \cdot 10^{-3}$ kgm^2
Max. angular acceleration	560 rad/s^2	2100 rad/s^2	570 rad/s^2	620 rad/s^2	470 rad/s^2	1000 rad/s^2	230 rad/s^2
Mass	3.5 kg	1.9 kg	5.4 kg	4.8 kg	2.8 kg	2.8 kg	9.1 kg

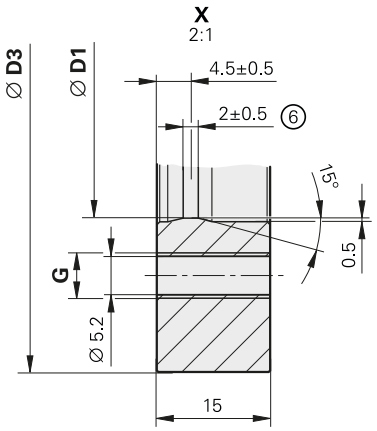
***** Please select when ordering

1) Position error within one signal period and the accuracy of the graduation together result in the encoder-specific error; for additional error from mounting and bearing of the measured shaft, see *Measuring accuracy* in the catalog *Modular Angle Encoders with Magnetic Scanning*.

ERM 2400 series

- **Consisting of AK ERM 2410 or AK ERM 2490 M and TTR ERM 2400 C**
- **Modular encoders with magnetic scanning principle**
- **For C axis on lathes**
- **Integrated counting function for position-value output**
- **Absolute position value after traverse of two reference marks**
- **Suitable for fault exclusion for loosening of the mechanical connection**





D1	W1	W2	D2	D3	E	G
Ø 40 0/–0.007	Ø 40 +0.009/+0.002	Ø 40 +0.010/+0.003	Ø 50	Ø 64.37	37.9	6x M6
Ø 40 0/–0.007	Ø 40 +0.009/+0.002	Ø 40 +0.010/+0.003	Ø 50	Ø 75.44	43.4	12x Ø 5.2
Ø 55 0/–0.008	Ø 55 +0.010/+0.002	Ø 55 +0.015/+0.007	Ø 65	Ø 75.44	43.4	6x M6
Ø 55 0/–0.008	Ø 55 +0.010/+0.002	Ø 55 +0.015/+0.007	Ø 70	Ø 90.53	51.0	6x M6
Ø 60 0/–0.008	Ø 60 +0.010/+0.002	Ø 60 +0.016/+0.008	Ø 75	Ø 128.75	70.1	6x M6
Ø 65 0/–0.008	Ø 65 +0.010/+0.002	Ø 65 +0.018/+0.010	Ø 80	Ø 128.75	70.1	6x M6
Ø 70 0/–0.008	Ø 70 +0.010/+0.002	Ø 70 +0.019/+0.011	Ø 95	Ø 128.75	70.1	6x M6
Ø 70 0/–0.008	Ø 70 +0.010/+0.002	Ø 70 +0.019/+0.011	Ø 85	Ø 150.88	81.2	6x M6
Ø 80 0/–0.008	Ø 80 +0.010/+0.002	Ø 80 +0.022/+0.014	Ø 95	Ø 150.88	81.2	6x M6
Ø 90 0/–0.010	Ø 90 +0.013/+0.003	Ø 90 +0.027/+0.017	Ø 105	Ø 128.75	70.1	6x M6
Ø 95 0/–0.010	Ø 95 +0.013/+0.003	Ø 95 +0.029/+0.019	Ø 110	Ø 128.75	70.1	6x M6
Ø 95 0/–0.010	Ø 95 +0.013/+0.003	Ø 95 +0.029/+0.019	Ø 110	Ø 150.88	81.2	6x M6
Ø 105 0/–0.010	Ø 105 +0.013/+0.003	Ø 105 +0.031/+0.021	Ø 120	Ø 150.88	81.2	6x M6
Ø 110 0/–0.010	Ø 110 +0.013/+0.003	Ø 110 +0.033/+0.023	Ø 125	Ø 150.88	81.2	6x M6
Ø 120 0/–0.010	Ø 120 +0.013/+0.003	Ø 120 +0.036/+0.026	Ø 135	Ø 257.50	134.5	6x M6
Ø 130 0/–0.012	Ø 130 +0.015/+0.003	Ø 130 +0.041/+0.029	Ø 145	Ø 257.50	134.5	6x M6
Ø 140 0/–0.012	Ø 140 +0.015/+0.003	Ø 140 +0.044/+0.032	Ø 155	Ø 176.03	93.7	6x M6
Ø 140 0/–0.012	Ø 140 +0.015/+0.003	Ø 140 +0.044/+0.032	Ø 155	Ø 257.50	134.5	6x M6
Ø 160 0/–0.012	Ø 160 +0.015/+0.003	Ø 160 +0.049/+0.037	Ø 175	Ø 213.24	112.3	6x M6
Ø 160 0/–0.012	Ø 160 +0.015/+0.003	Ø 160 +0.049/+0.037	Ø 170	Ø 257.50	134.5	6x M6
Ø 160 0/–0.012	Ø 160 +0.015/+0.003	Ø 160 +0.049/+0.037	Ø 175	Ø 257.50	134.5	6x M6
Ø 200 0/–0.014	Ø 200 +0.018/+0.004	Ø 200 +0.063/+0.049	Ø 215	Ø 257.50	134.5	6x M6
Ø 260 0/–0.016	Ø 260 +0.020/+0.004	Ø 260 +0.082/+0.066	Ø 275	Ø 326.9	169.2	6x M6
Ø 330 0/–0.018	Ø 330 +0.022/+0.004	Ø 330 +0.105/+0.087	Ø 345	Ø 362.11	186.8	12x M6
Ø 380 0/–0.018	Ø 380 +0.022/+0.005	Ø 380 +0.119/+0.101	Ø 395	Ø 452.64	232.0	12x M6
Ø 425 0/–0.020	Ø 425 +0.025/+0.005	Ø 425 +0.134/+0.114	Ø 445	Ø 484.07	247.7	12x M6
Ø 450 0/–0.020	Ø 450 +0.025/+0.005	Ø 450 +0.142/+0.122	Ø 465	Ø 484.07	247.7	6x M6
Ø 450 0/–0.020	Ø 450 +0.025/+0.005	Ø 450 +0.142/+0.122	Ø 465	Ø 484.07	247.7	12x M6
Ø 512 0/–0.022	Ø 512 +0.027/+0.005	Ø 512 +0.161/+0.139	Ø 528	Ø 603.52	307.5	12x M6

mm

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

W1 = Without mechanical fault exclusion
W2 = With mechanical fault exclusion

A = Bearing of mating shaft
① = Shaft fit; ensure full-surface contact
② = Axial tolerance of mating shaft
③ = Reference mark position
④ = Cable support
⑤ = Mounting distance of 0.15 mm set with spacer shim
⑥ = Centering collar
⑦ = Direction of shaft rotation for output signals according to interface description

РЕМСТАНМАШ
ТЕХНОЛОГИИ ДЛЯ ПРОИЗВОДСТВА

Scanning head	**AK ERM 2410**	**AK ERM 2490 M**
Interface	EnDat 2.2 (absolute position value after traverse of two reference marks in "Position value 2"	Mitsubishi high speed interface (absolute position value after traverse of two reference marks in "Position value 2"
Ordering designation	EnDat22	Mit02-4
Integrated interpolation	16384-fold (14 bits)	
Clock frequency	≤ 8 MHz	–
Calculation time t_{cal}	≤ 5 µs	–
Signal period	≈ 400 µm	
Line count*	See *Scale drum*	
Electrical connection	Cable, 1 m, with M12 coupling, 8-pin	
Cable length	≤ 150 m (with HEIDENHAIN cable)	≤ 50 m
Voltage supply	DC 3.6 to 14 V	
Power consumption	*At 14 V:* 110 mA; *at 3.6 V:* 300 mA (maximum)	
Current consumption (typical)	*At 5 V:* 90 mA (without load)	
Vibration 55 Hz to 2000 Hz **Shock** 6 ms	≤ 300 m/s^2 (EN 60068-2-6) ≤ 1000 m/s^2 (EN 60068-2-27); *with fault exclusion for loosening of the mech. connection:* 400 m/s^2	
Operating temperature	–10 °C to +100 °C	
Protection EN 60529	IP67	
Mass	≈ 0.15 kg (without cable)	

* Please select when ordering

РЕМСТАНМАШ
ТЕХНОЛОГИИ ДЛЯ ПРОИЗВОДСТВА

Scale drum	TTR ERM 2400C								
Measuring standard	MAGNADUR graduation; signal period of approx. 400 µm								
Line count*	512	600		720	1024				
Position error per SP[1)]	±18″	±15.5″		±13″	±9″				
Accuracy of graduation	±13″	±11″		±10″	±7″				
Reference mark	Distance-coded								
Angle for absolute reference (with distance-coded RM)	≤ 45°	≤ 36°		≤ 30°	≤ 22.5°				
Permissible axial motion	±1.25 mm								
Outside diameter	64.37 mm	75.44 mm		90.53 mm	128.75 mm				
Drum shape*	A56	A22	A59	A26	A11	A15	A21	A16	A14
Inside diameter	40 mm	40 mm	55 mm	55 mm	60 mm	65 mm	70 mm	90 mm	95 mm
Bolt hole circles	Ø 50 mm; 6 x M6	Ø 50 mm; 12 x Ø 5.2 mm	Ø 65 mm; 6 x M6	Ø 70 mm; 6 x M6	Ø 75 mm; 6 x M6	Ø 80 mm; 6 x M6	Ø 95 mm; 6 x M6	Ø 105 mm; 6 x M6	Ø 110 mm; 6 x M6
Mech. permissible speed	22000 rpm	19000 rpm	18000 rpm	18500 rpm	13000 rpm	13000 rpm	14000 rpm	12500 rpm	12500 rpm
Moment of inertia of rotor	$0.15 \cdot 10^{-3}$ kgm^2	$0.32 \cdot 10^{-3}$ kgm^2	$0.24 \cdot 10^{-3}$ kgm^2	$0.63 \cdot 10^{-3}$ kgm^2	$2.9 \cdot 10^{-3}$ kgm^2	$2.9 \cdot 10^{-3}$ kgm^2	$2.8 \cdot 10^{-3}$ kgm^2	$2.3 \cdot 10^{-3}$ kgm^2	$2.1 \cdot 10^{-3}$ kgm^2
Max. angular acceleration	50000 rad/s^2	50000 rad/s^2	48000 rad/s^2	20000 rad/s^2	4400 rad/s^2	4800 rad/s^2	6000 rad/s^2	8000 rad/s^2	9000 rad/s^2
Mass	0.21 kg	0.34 kg	0.22 kg	0.44 kg	1.2 kg	1.1 kg	1.0 kg	0.74 kg	0.65 kg

***** Please select when ordering

[1)] Position error within one signal period and the accuracy of the graduation together result in the encoder-specific error; for additional error from mounting and bearing of the measured shaft, see *Measuring accuracy* in the catalog *Modular Angle Encoders with Magnetic Scanning*.

РЕМСТАНМАШ
ТЕХНОЛОГИИ ДЛЯ ПРОИЗВОДСТВА

Scale drum	TTR ERM 2400C						
Measuring standard	MAGNADUR graduation; signal period of approx. 400 µm						
Line count*	1200					1400	1696
Position error per SP[1)]	±8″					±6.5″	±5.5″
Accuracy of graduation	±6″					±7″	±4.5″
Reference mark	Distance-coded						
Angle for absolute reference (with distance-coded RM)	≤ 24°					≤ 18°	≤ 22.5°
Permissible axial motion	±1.25 mm						
Outside diameter	150.88 mm					176.03 mm	213.24 mm
Drum shape*	A29	A06	A20	A07	A18	A36	A54
Inside diameter	70 mm	80 mm	95 mm	105 mm	110 mm	140 mm	160 mm
Bolt hole circles	Ø 85 mm; 6 x M6	Ø 95 mm; 6 x M6	Ø 110 mm; 6 x M6	Ø 120 mm; 6 x M6	Ø 125 mm; 6 x M6	Ø 155 mm; 6 x M6	Ø 175 mm; 6 x M6
Mech. permissible speed	11 000 rpm	11 000 rpm	11 000 rpm	10 500 rpm	10 500 rpm	8500 rpm	7000 rpm
Moment of inertia of rotor	$5.5 \cdot 10^{-3}$ kgm^2	$5.3 \cdot 10^{-3}$ kgm^2	$4.8 \cdot 10^{-3}$ kgm^2	$4.4 \cdot 10^{-3}$ kgm^2	$4.1 \cdot 10^{-3}$ kgm^2	$6.3 \cdot 10^{-3}$ kgm^2	$16 \cdot 10^{-3}$ kgm^2
Max. angular acceleration	2600 rad/s^2	3100 rad/s^2	3900 rad/s^2	4900 rad/s^2	5000 rad/s^2	4400 rad/s^2	1900 rad/s^2
Mass	1.6 kg	1.5 kg	1.2 kg	1.0 kg	0.93 kg	0.99 kg	1.8 kg

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РЕМСТАНМАШ
ТЕХНОЛОГИИ ДЛЯ ПРОИЗВОДСТВА

Scale drum	TTR ERM 2400C					
Measuring standard	MAGNADUR graduation; signal period of approx. 400 µm					
Line count	2048					
Position error per SP[1)]	±4.5″					
Accuracy of graduation	±4″					
Reference mark	Distance-coded					
Angle for absolute reference (with distance-coded RM)	≤ 22.5°					
Permissible axial motion	±1.25 mm					
Outside diameter	257.5 mm					
Drum shape*	A23	A32	A19	A34	A48	A28
Inside diameter	120 mm	130 mm	140 mm	160 mm	160 mm	200 mm
Bolt hole circles	Ø 135 mm; 6 x M6	Ø 145 mm; 6 x M6	Ø 155 mm; 6 x M6	Ø 175 mm; 6 x M6	Ø 170 mm; 6 x M6	Ø 215 mm; 6 x M6
Mech. permissible speed	6500 rpm	6500 rpm	6500 rpm	6000 rpm	5000 rpm	6000 rpm
Moment of inertia of rotor	$47 \cdot 10^{-3}$ kgm^2	$46 \cdot 10^{-3}$ kgm^2	$45 \cdot 10^{-3}$ kgm^2	$42 \cdot 10^{-3}$ kgm^2	$42 \cdot 10^{-3}$ kgm^2	$31 \cdot 10^{-3}$ kgm^2
Max. angular acceleration	450 rad/s^2	490 rad/s^2	540 rad/s^2	650 rad/s^2	630 rad/s^2	1200 rad/s^2
Mass	4.7 kg	4.4 kg	4.2 kg	3.6 kg	3.6 kg	2.3 kg

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Scale drum	TTR ERM 2400C						
Measuring standard	MAGNADUR graduation; signal period of approx. 400 µm						
Line count*	2600	2880	3600	3850			4800
Position error per SP[1)]	±3.5″		±3″	±2.5″			±2″
Accuracy of graduation	±3.5″	±4″	±3″	±3.5″			±3″
Reference mark	Distance-coded						
Angle for absolute reference (with distance-coded RM)	≤ 13.85	≤ 12.0°		≤ 10.29°			≤ 9.0°
Permissible axial motion	±1.25 mm						
Outside diameter	326.9 mm	362.11 mm	452.64 mm	484.07 mm			603.52 mm
Drum shape*	A52	A30	A53	A33	A25	A57	A49
Inside diameter	260 mm	330 mm	380 mm	425 mm	450 mm	450 mm	512 mm
Bolt hole circles	Ø 275 mm; 6 x M6	Ø 345 mm; 12 x M6	Ø 395 mm; 12 x M6	Ø 445 mm; 12 x M6	Ø 465 mm; 6 x M6	Ø 465 mm; 12 x M6	Ø 528 mm; 12 x M6
Mech. permissible speed	4500 rpm	4000 rpm	3000 rpm	3000 rpm	3000 rpm	3000 rpm	1600 rpm
Moment of inertia of rotor	$76 \cdot 10^{-3}$ kgm^2	$58 \cdot 10^{-3}$ kgm^2	$240 \cdot 10^{-3}$ kgm^2	$250 \cdot 10^{-3}$ kgm^2	$150 \cdot 10^{-3}$ kgm^2	$150 \cdot 10^{-3}$ kgm^2	$710 \cdot 10^{-3}$ kgm^2
Max. angular acceleration	560 rad/s^2	2100 rad/s^2	570 rad/s^2	620 rad/s^2	470 rad/s^2	1000 rad/s^2	230 rad/s^2
Mass	3.5 kg	1.9 kg	5.4 kg	4.8 kg	2.8 kg	2.8 kg	9.1 kg

***** Please select when ordering

1) Position error within one signal period and the accuracy of the graduation together result in the encoder-specific error; for additional error from mounting and bearing of the measured shaft, see *Measuring accuracy* in the catalog *Modular Angle Encoders with Magnetic Scanning*.

Fault exclusion for the loosening of the mechanical connection

Specifications
This customer-specific Product Information document contains technical characteristics of modular magnetic encoders that are not included in the brochure "Modular Angle Encoders with Magnetic Scanning". Unless otherwise specified in this Product Information document, the specifications and installation instructions given in the brochure apply.

Additionally, the requirements and limitations for installation with mechanical fault exclusion are described in this Product Information document.

Mechanical fault exclusion
Mounting with mechanical fault exclusion is to be seen as an option. If no mechanical fault exclusion is required for the safety solution, the drum can be fitted with a smaller interference fit (dimensioning of the drive shaft according to W1).

A mechanical fault exclusion is possible for the following products:
- AK ERM 2280 (ID 1144028-xx) together with the scale drum TTR ERM 2200 (ID 733349-xx) or TTR ERM 2200 C (ID 671712-xx)
- AK ERM 2420 with ID 1144042-xx or AK ERM 2480 with ID 1144048-xx or AK ERM 2410 with ID 1144041-xx or AK ERM 2490 M with ID 1144043-xx together with the TTR ERM 2400 scale drum with ID 1144140-xx or TTR ERM 2400 C with ID 1144150-xx

In addition to the data interface, the mechanical connection of the encoder to the motor is relevant to safety. The standard for electrical drives, EN 61800-5-2, defines the 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 a fault exclusion for the loosening of the mechanical connection is required.

The machine manufacturer is responsible for the dimensioning of mechanical connections in a drive system. The OEM should ideally consider the application conditions for the mechanical design. Providing objective evidence of a safe connection is time-consuming, however. For this reason, HEIDENHAIN has developed a mechanical fault exclusion for the ERM 2xx0 series.

The qualification of the mechanical fault exclusion was performed for a broad application range of the encoders. This means that fault exclusion is ensured under the operating conditions listed below. The great range of temperatures in combination with the multitude of material characteristics, as well as the maximum permissible shaft speeds and accelerations require an interference fit of the drum. Because of the dimensioning of the interference fit, and taking into account all safety factors, HEIDENHAIN recommends heating the scale drum.

РЕМСТАНМАШ
ТЕХНОЛОГИИ ДЛЯ ПРОИЗВОДСТВА

The scanning head and scale drum are mounted by screws, with special attention paid to the following with regard to installation with mechanical fault exclusion:

Mechanical connection	Fastening	Safe position for the mechanical coupling[1]	Restricted characteristic values[2]
Scanning head	Screw connection:[3] M4 ISO 4762 8.8	±0.025°	• Maximum acceleration of the scanning head including vibration 55 Hz to 2000 Hz (as per EN 60068-2-6) and shock 6 ms (as per EN 60068-2-27) ≤ 400 m/s^2 See *Specifications:* • Maximum angular acceleration of the scale drum See *Dimensions:* • Inside diameter and mounting tolerance of the measured shaft • Surface roughness of the mating surfaces • Screw depth See *Material:* • Usable materials
Scale drum	Screw connection:[3] M5 ISO 4762 8.8		

[1] Fault exclusions are possible only for the explicitly named mounting option
[2] Unlike ERM 2xx0, without mechanical fault exclusion
[3] Friction coefficient class B as per VDI 2230

Material
For the material of the mating shaft and stator, the data given in the table is to be observed.

Mounting temperature
All information on screw connections is given with respect to a mounting temperature of 15 °C to 35 °C.

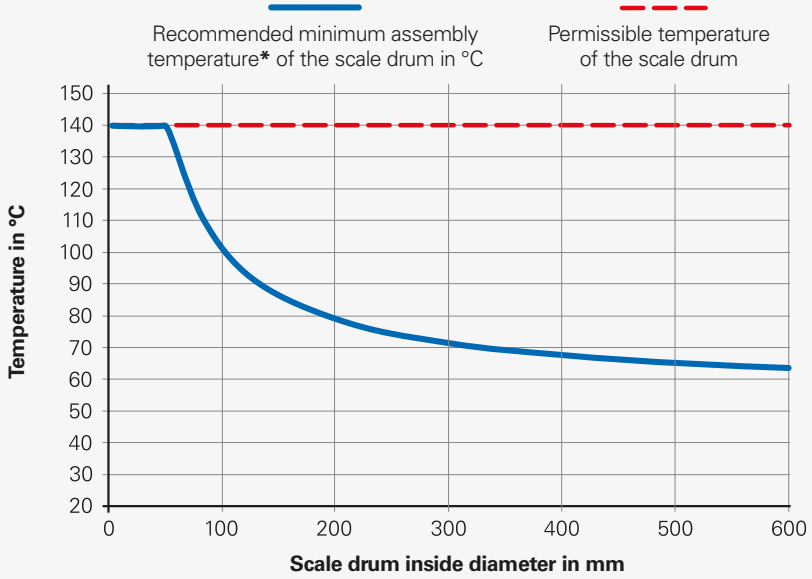
Mounting the scale drum
An oversize of the shaft is required for fault exclusion. The scale drum should preferably be shrunk thermally onto the mating shaft and additionally be fastened with screws. For this purpose, the scale drum must be heated slowly before mounting. Use a heat chamber or a heat plate (but no induction heating sources). The diagram shows the recommended minimum temperatures for the different drum diameters. The maximum temperature should not exceed 140 °C.

During shrink-fitting, make sure that the hole patterns of the scale drum and mating shaft are properly aligned. Appropriate positioning aids (setscrews) can facilitate mounting. When the scale drum has cooled down, all mounting screws have to be tightened again with the correct torque. The mounting screws used for the assembly of the scanning head and scale drum must be used only to secure the scanning head and the scale drum. Do not additionally fasten any other components with these screws.

Removing the scale drum
The scale drum is removed using the corresponding back-off threads in the drum. To do so, fasten greased screws and tighten them in a row until the scale drum comes off the shaft. It is also helpful here to use setscrews inserted into the mating shaft, on which the screws in the back-off threads apply pressure.

Mounting the scanning head
Care must be taken to ensure that the correct scale drum and scanning head are used (correct size and number of signal periods). In order to mount the scanning head, the provided spacer shim is applied to the surface of the circumferential scale drum. The scanning head is pressed against the shim, fastened, and the shim is removed.

	Mating shaft (drum connection)	Mating stator (scanning head connection)
Material	Steel	Steel/cast iron
Tensile strength R_m	≥ 600 N/mm^2	≥ 250 N/mm^2
Shear strength τ_m	≥ 390 N/mm^2	≥ 290 N/mm^2
Elastic modulus E	200 000 N/mm^2 to 215 000 N/mm^2	110 000 N/mm^2 to 215 000 N/mm^2
Coefficient of thermal expansion α_{therm}	(10 to 13) · 10^{-6} K^{-1}	



* The temperature is given with respect to an ambient temperature of 20 °C. If the ambient temperature differs, adapt the assembly temperature accordingly.

РЕМСТАНМАШ
ТЕХНОЛОГИИ ДЛЯ ПРОИЗВОДСТВА

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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 document edition valid when the order is made.

Related documents: Comply with the information in the following documents to ensure the correct and intended operation of the encoder:

• Catalog:	*Modular Angle Encoders with Magnetic Scanning*	745168-xx
• Mounting Instructions	*AK ERM 2280*	1156253-xx
	AK ERM 2420/2480	1156255-xx
	AK ERM 2410/2490 M	1156254-xx
	TTR ERM 2200	1165087-xx
	TTR ERM 2400	1165088-xx

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

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