



HEIDENHAIN



Product Information

ECA 4000

Absolute Modular
Angle Encoder

July 2016

ECA 4412, ECA 4492

Absolute angle encoder with high accuracy

- Steel scale drum with three-point centering
- Consists of scanning head and scale drum



ECA 4000

Scanning head	
Interface	
Ordering designation	
Clock frequency	
Calculation time t_{cal}	
Electrical connection	
Cable length ¹⁾	
Voltage supply	
Power consumption (max.)	
Current consumption (typical)	
Vibration 55 Hz to 2 000 Hz	
Shock 6 ms	
Operating temperature	
Protection EN 60529	
Weight	Scanning head Connecting cable Coupling (M12)

Scale drum	
Measuring standard	
Coefficient of expansion	
Drum inside diameter*	
Drum outside diameter*	
Mechanically permissible speed	
Electrically permissible speed	
Moment of inertia of rotor	
Permissible axial movement	
Positions per revolution	
Measuring step	
Signal periods	
Accuracy of graduation	
Position error per signal period	
RMS (1 σ)	
Protection EN 60 529	
Weight	Scale drum

* Please select when ordering
Product Information ECA 4000

12/2015

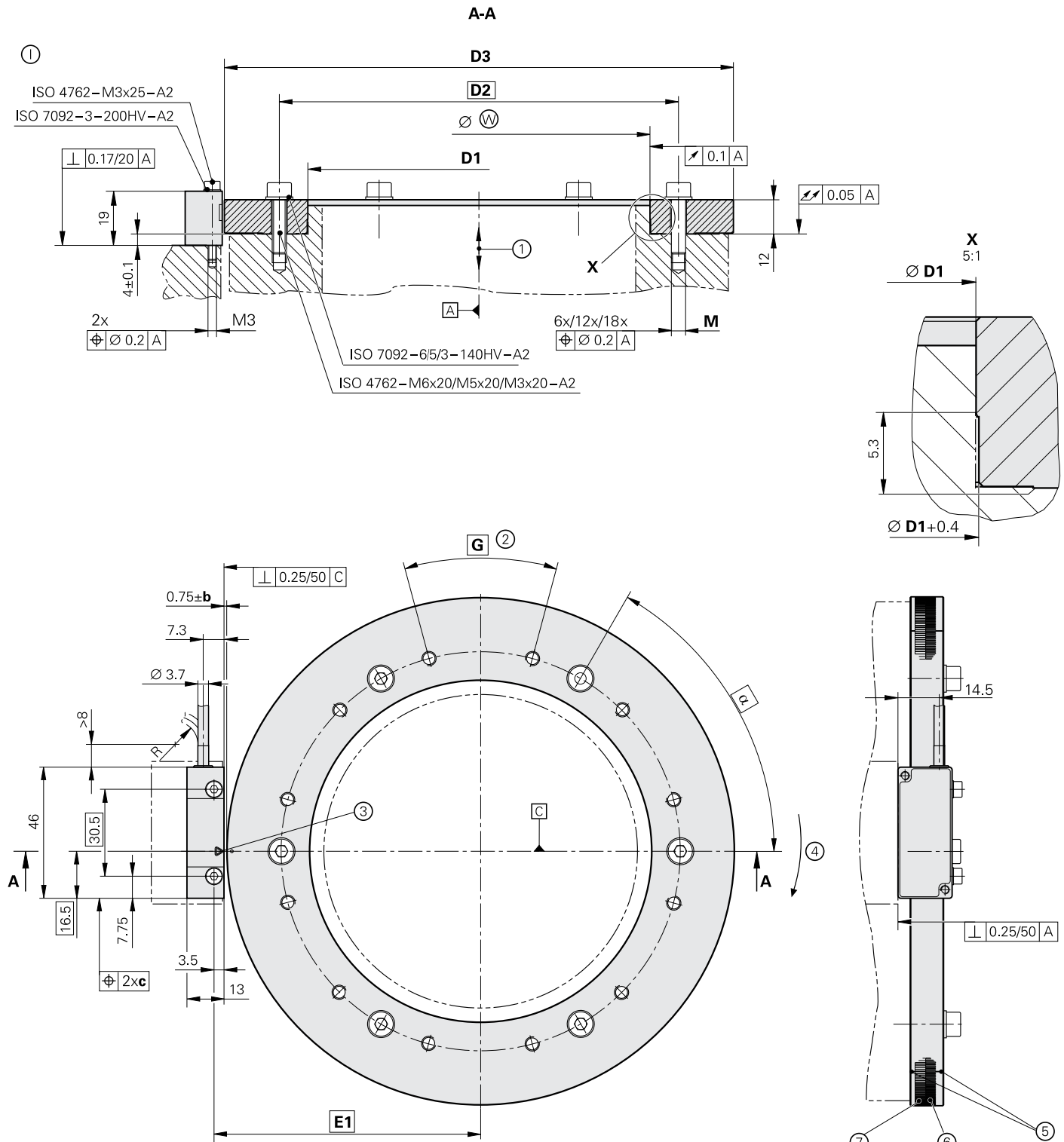
AK ECA 4410		AK ECA 4490F		AK ECA 4490M	
EnDat 2.2		Fanuc Serial Interface; α i Interface		Mitsubishi high speed interface	
EnDat22		Fanuc05		Mit03-4	
≤ 16 MHz		–			
≤ 5 μ s		–			
Cable 1 m or 3 m with 8-pin M12 connector (male)					
≤ 100 m		≤ 50 m		≤ 30 m	
DC 3.6 V to 14 V					
At 3.6 V: 700 mW At 14 V: 800 mW		At 3.6 V: 850 mW At 14 V: 950 mW			
At 5 V: 90 mA (without load)		At 5 V: 100 mA (without load)			
≤ 500 m/s ² (EN 60068-2-6) ≤ 1000 m/s ² (EN 60068-2-27)					
–10 °C to 70 °C					
IP67					
18 g (without connecting cable) 20 g/m 15 g					

TTR ECA 4402 (ECA 4402 scale drum)								
Steel drum $\alpha_{\text{therm}} \approx 10.5 \cdot 10^{-6} \text{ K}^{-1}$								
70 mm	80 mm	120 mm	150/185 mm	180/210 mm	270 mm	425 mm	512 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	
$\leq 8500 \text{ rpm}$	$\leq 6250 \text{ rpm}$	$\leq 4500 \text{ rpm}$	$\leq 4250 \text{ rpm}$	$\leq 3250 \text{ rpm}$	$\leq 2500 \text{ rpm}$	$\leq 1800 \text{ rpm}$	$\leq 1500 \text{ rpm}$	
$\leq 7000 \text{ rpm}$	$\leq 5750 \text{ rpm}$	$\leq 3000 \text{ rpm}$	$\leq 2550 \text{ rpm}$	$\leq 2100 \text{ rpm}$	$\leq 900 \text{ rpm}$	$\leq 600 \text{ rpm}$	$\leq 550 \text{ rpm}$	
$0.83 \cdot 10^{-3} \text{ kgm}^2$	$2.0 \cdot 10^{-3} \text{ kgm}^2$	$7.1 \cdot 10^{-3} \text{ kgm}^2$	$12/6.5 \cdot 10^{-3} \text{ kgm}^2$	$28/20 \cdot 10^{-3} \text{ kgm}^2$	$59 \cdot 10^{-3} \text{ kgm}^2$	$199 \cdot 10^{-3} \text{ kgm}^2$	$263 \cdot 10^{-3} \text{ kgm}^2$	
$\leq \pm 0.4 \text{ mm}$ (scale drum relative to scanning head)								
134217728 (27 bits)				268435456 (28 bits)		536870912 (29 bits)		
0.0097"				0.0048"		0.0024"		
8195	10010	14003	16379	19998	25993	37994	44000	
$\pm 3''$	$\pm 2.5''$	$\pm 2''$	$\pm 1.9''$	$\pm 1.8''$	$\pm 1.7''$	$\pm 1.5''$	$\pm 1.5''$	
$\pm 0.20''$ 0.040"	$\pm 0.16''$ 0.032"	$\pm 0.12''$ 0.023"	$\pm 0.10''$ 0.020"	$\pm 0.08''$ 0.016"	$\pm 0.06''$ 0.012"	$\pm 0.04''$ 0.009"	$\pm 0.04''$ 0.007"	
IP00								
$\approx 0.42 \text{ kg}$	$\approx 0.69 \text{ kg}$	$\approx 1.20 \text{ kg}$	$\approx 1.5/0.66 \text{ kg}$	$\approx 2.3/1.5 \text{ kg}$	$\approx 2.6 \text{ kg}$	$\approx 3.8 \text{ kg}$	$\approx 3.7 \text{ kg}$	

¹⁾ With HEIDENHAIN cable

ECA 4412, ECA 4492

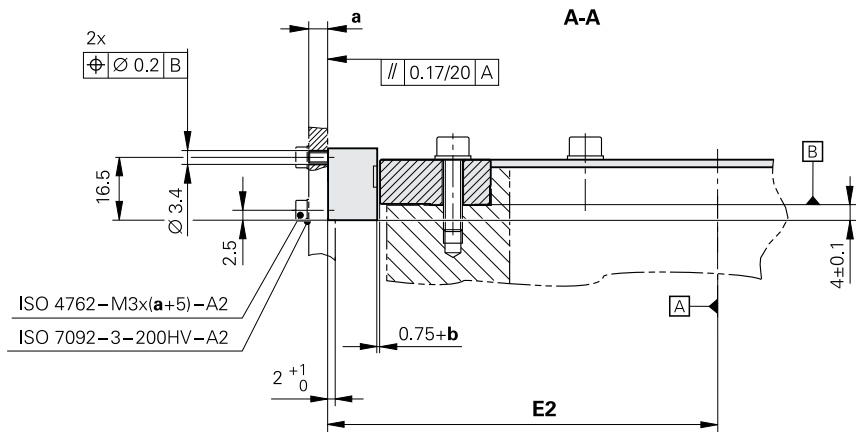
Dimensions



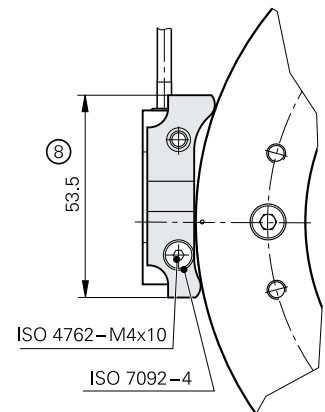
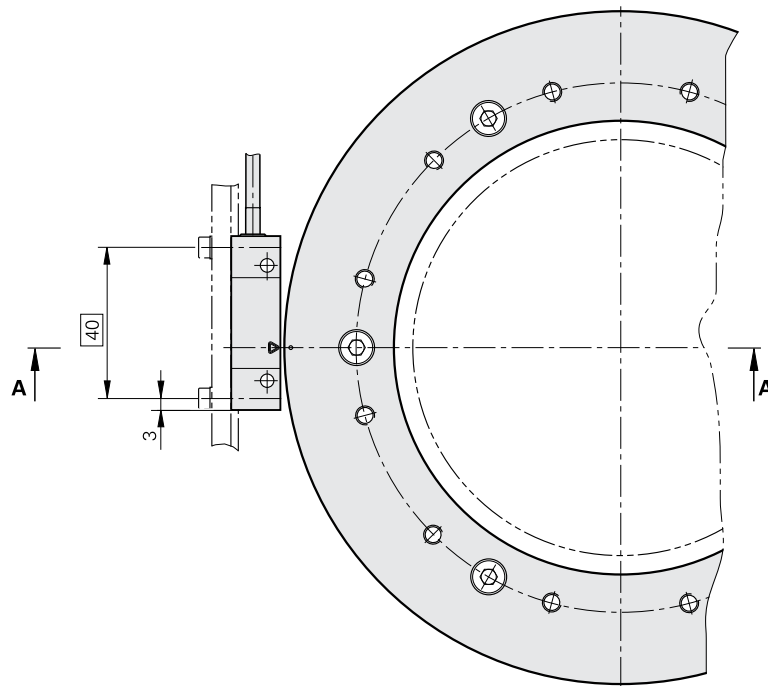
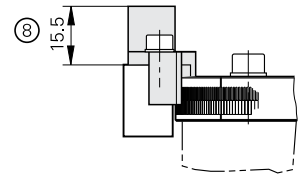
mm
Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm

- ①, ② = Mounting options
- Ⓜ = Bearing
- Ⓦ = Internal mating diameter (shaft)
- 1 = Permissible axial motion of measured shaft: ≤ ±0.4 mm
- 2 = Not permitted for drum fastening
- 3 = Optical centerline and mark for 0° position
- 4 = Positive direction of rotation
- 5 = Mark for drum centering (3x120°)
- 6 = Incremental track
- 7 = Code track
- 8 = Space for mounting aid

II



Accessory: Mounting aid

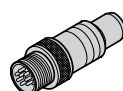
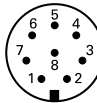
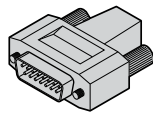
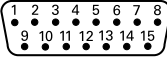


D1	Ⓜ	D2	D3	E1	E2	α	M	G	b [mm]	c [mm]
Ø 70 +0.05/+0.07	Ø ≤ 70	Ø 85	Ø 104.63	56.57	66.07	6x60° = 360°	6x M5	/	±0.07	0.3
Ø 80 +0.05/+0.07	Ø ≤ 80	Ø 95	Ø 127.64	68.07	77.57	6x60° = 360°	6x M5	/	±0.07	0.3
Ø 120 +0.05/+0.07	Ø ≤ 120	Ø 140	Ø 178.55	93.52	103.02	6x60° = 360°	6x M5	/	±0.10	0.3
Ø 150 +0.05/+0.07	Ø ≤ 150	Ø 165	Ø 208.89	108.69	118.19	6x60° = 360°	6x M5	/	±0.12	0.5
Ø 180 +0.05/+0.07	Ø ≤ 180	Ø 200	Ø 254.93	131.71	141.21	6x60° = 360°	6x M5	/	±0.12	0.5
Ø 185 +0.05/+0.07	Ø ≤ 185	Ø 197	Ø 208.89	108.69	118.19	12x30° = 360°	12x M3	/	±0.12	0.5
Ø 210 +0.05/+0.07	Ø ≤ 210	Ø 230	Ø 254.93	131.71	141.21	12x30° = 360°	12x M3	/	±0.12	0.5
Ø 270 +0.05/+0.07	Ø ≤ 270	Ø 290	Ø 331.31	169.90	179.40	12x30° = 360°	12x M5	/	±0.15	1.0
Ø 425 +0.05/+0.07	Ø ≤ 425	Ø 445	Ø 484.07	246.29	255.79	12x30° = 360°	12x M6	12x M6	±0.15	1.0
Ø 512 +0.05/+0.07	Ø ≤ 512	Ø 528	Ø 560.46	284.48	293.98	18x20° = 360°	18x M6	12x M8	±0.15	1.0

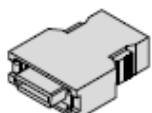
For CAD data go to cad.heidenhain.de

Electrical connection

EnDat pin layout

8-pin coupling, M12					15-pin D-sub connector			
								
	Voltage supply				Absolute position values			
	8	2	5	1	3	4	7	6
	4	12	2	10	5	13	8	15
	U _P	Sensor U _P	0 V	Sensor 0 V	DATA	DATA	CLOCK	CLOCK
								
	Brown/Green	Blue	White/Green	White	Gray	Pink	Violet	Yellow

Fanuc pin layout

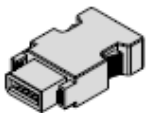
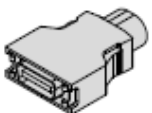
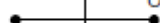
20-pin Fanuc connector					8-pin M12 coupling				
									
	Voltage supply					Absolute position values			
	9	18/20	12	14	16	1	2	5	6
	8	2	5	1	–	3	4	7	6
	Up	Sensor Up	0V	Sensor 0V	Shield	Serial Data	Serial Data	Request	Request
	Brown/ Green	Blue	White/ Green	White	–	Gray	Pink	Violet	Yellow

Cable shield connected to housing; **Up** = 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!

Mitsubishi pin layout

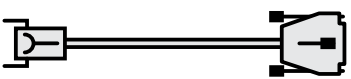
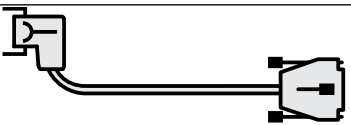
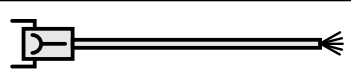
10-pin Mitsubishi connector		20-pin Mitsubishi connector		8-pin M12 coupling					
									
	Voltage supply				Absolute position values				
	10-pin	1	–	2	–	7	8	3	4
	20-pin	20	19	1	11	6	16	7	17
		8	2	5	1	3	4	7	6
	Up	Sensor Up	0V	Sensor 0V	Serial Data	Serial Data	Request Frame	Request Frame	
	Brown/Green	Blue	White/Green	White	Gray	Pink	Violet	Yellow	

Cable shield connected to housing; **Up** = 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!

EnDat connecting cables

PUR connecting cable $[4(2 \times 0.09 \text{ mm}^2)]; A_P = 0.09 \text{ mm}^2$			
PUR connecting cable $[(4 \times 0.14 \text{ mm}^2) + (4 \times 0.34 \text{ mm}^2)]; A_P = 0.34 \text{ mm}^2$		$\varnothing 6 \text{ mm}$	$\varnothing 3.7 \text{ mm}^{1)}$
Complete with connector (female) and coupling (male), 8-pin		368330-xx	801142-xx
Complete with right-angle connector (female) and coupling (male), 8-pin		373289-xx	801149-xx
Complete with connector (female), 8-pin, and D-sub connector (male), 15-pin, for PWM 20, EIB 74x etc.		524599-xx	801129-xx
Complete with right-angle connector (female), 8-pin and D-sub connector (male), 15-pin, for PWM 20, EIB 74x etc.		722025-xx	801140-xx
With one connector (female), 8-pin		634265-xx	–
With one right-angle connector (female), 8-pin		606317-xx	–

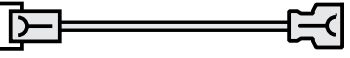
¹⁾ Maximum total cable length 6 m
 A_P : Cross section of power supply lines

Connecting cables

Fanuc

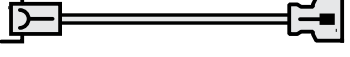
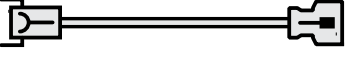
Mitsubishi

Fanuc

PUR connecting cable $[4 \times (2 \times 0.09 \text{ mm}^2)]; A_P = 0.09 \text{ mm}^2$			
PUR connecting cable $[(4 \times 0.14 \text{ mm}^2) + (4 \times 0.34 \text{ mm}^2)]; A_P = 0.34 \text{ mm}^2$		Ø 6 mm	Ø 3.7 mm ¹⁾
Complete With M12 connector (female) and M12 coupling (male), 8 pins each		368330-xx	801142-xx
Complete With M12 right-angle connector (female) and M12 coupling (male), 8 pins each		373289-xx	801149-xx
Complete With 8-pin M12 connector (female) and Fanuc connector (female)		646807-xx	–
With one connector With 8-pin M12 connector (female)		634265-xx	–
With one connector With 8-pin M12 right-angle connector (female)		606317-xx	–

¹⁾ Maximum total cable length 6 m; A_P : Cross section of power supply lines

Mitsubishi

PUR connecting cable $[(1 \times 4 \times 0.14 \text{ mm}^2) + (4 \times 0.34 \text{ mm}^2)]; A_P = 0.34 \text{ mm}^2$		Ø 6 mm	
Complete With M12 connector (female), 8-pin, and Mitsubishi connector, 20-pin	 Mitsubishi 20-pin	646806-xx	
Complete With M12 connector (female), 8-pin, and Mitsubishi connector, 10-pin	 Mitsubishi 10-pin	647314-xx	
With one connector With 8-pin M12 connector (female)		634265-xx	
With one connector With 8-pin M12 right-angle connector (female)		606317-xx	

A_P : Cross section of power supply lines

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.

Further Information

- Catalog: *Angle Encoders Without Integral Bearing*
- Catalog: *Interfaces of HEIDENHAIN Encoders*