



HEIDENHAIN



Product Information

ECA 4000 Absolute Modular Angle Encoder

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 2000 Hz	
Shock 6 ms	
Operating temperature	
Protection EN 60529	
Mass	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 (1σ)	
Protection EN 60529	
Mass	Scale drum

* Please select when ordering

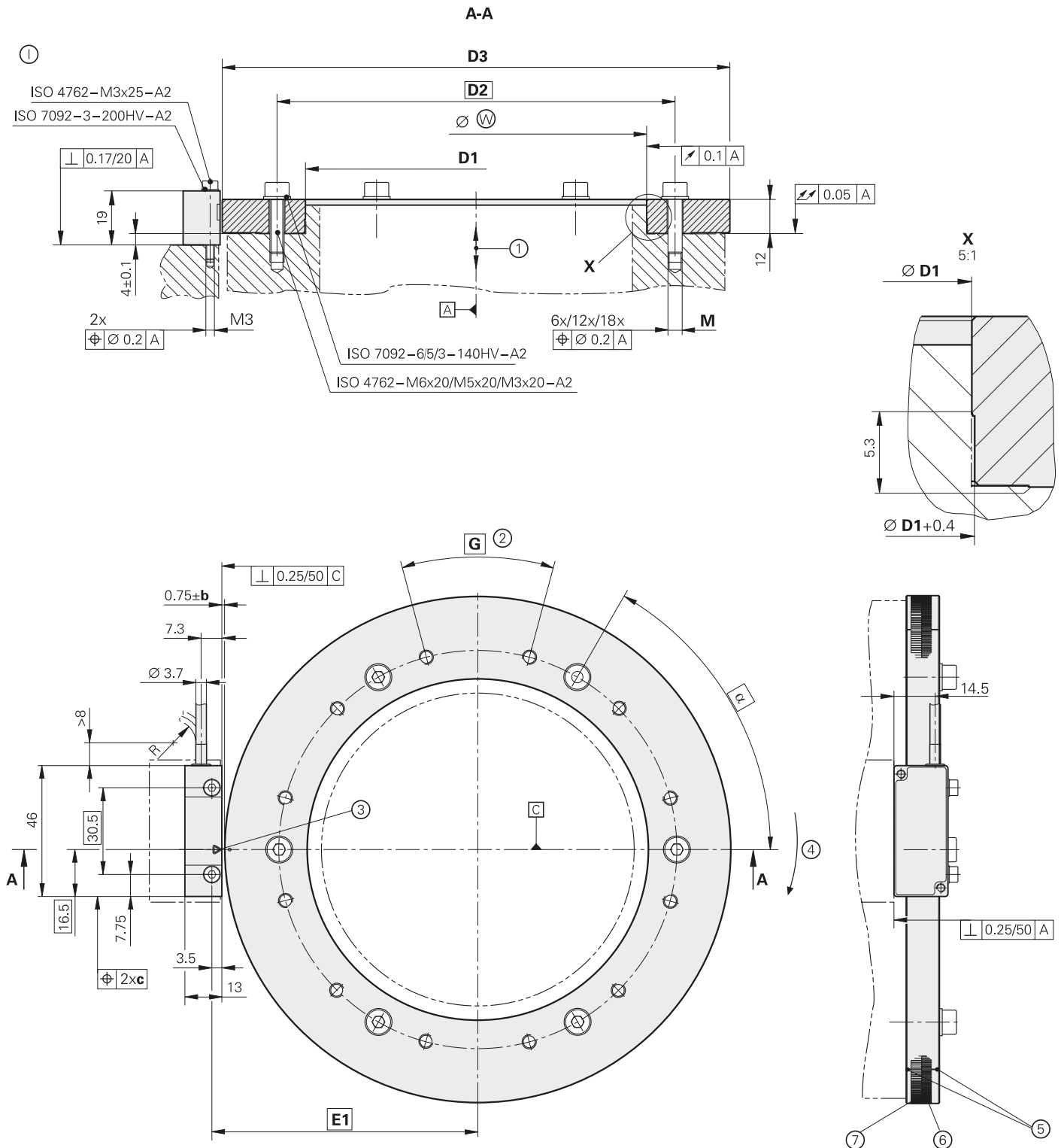
ECA 4410		ECA 4490F		ECA 4490M	
EnDat 2.2		Fanuc Serial Interface; α i Interface		Mitsubishi high speed interface	
EnDat22		Fanuc05		Mit03-4	
≤ 16 MHz		-			
≤ 5 μ s		-			
Cable 1 m or 3 m, with 8-pin M12 coupling (male)					
≤ 100 m		≤ 50 m		≤ 30 m	
DC 3.6V to 14 V					
At 3.6 V: 700 mW At 14 V: 800 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 cable) 20 g/m 15 g					

TTR ECA 4402									
Steel drum $\alpha_{\text{therm}} \approx 10.5 \cdot 10^{-6} \text{ K}^{-1}$									
70 mm	80 mm	120 mm	130 mm	150/185 mm	180/210 mm	270 mm	425 mm	512 mm	
104.63 mm	127.64 mm	178.55 mm	148.20 mm	208.89 mm	254.93 mm	331.31 mm	484.07 mm	560.46 mm	
≤ 8500 rpm	≤ 6250 rpm	≤ 4500 rpm	≤ 5250 rpm	≤ 4250 rpm	≤ 3250 rpm	≤ 2500 rpm	≤ 1800 rpm	≤ 1500 rpm	
≤ 7000 rpm	≤ 5750 rpm	≤ 3000 rpm	≤ 4400 rpm	≤ 2550 rpm	≤ 2100 rpm	≤ 900 rpm	≤ 600 rpm	≤ 550 rpm	
$0.83 \cdot 10^{-3} \text{ kgm}^2$	$2.0 \cdot 10^{-3} \text{ kgm}^2$	$7.1 \cdot 10^{-3} \text{ kgm}^2$	$1.7 \cdot 10^{-3} \text{ kgm}^2$	$12/6.5 \cdot 10^{-3} \text{ kgm}^2$	$28/20 \cdot 10^{-3} \text{ kgm}^2$	$59 \cdot 10^{-3} \text{ kgm}^2$	$199 \cdot 10^{-3} \text{ kgm}^2$	$263 \cdot 10^{-3} \text{ kgm}^2$	
$\leq \pm 0.4$ mm (scale drum relative to the scanning head)									
134217728 (27 bits)					268435456 (28 bits)		536870912 (29 bits)		
0.0097"					0.0048"		0.0024"		
8195	10010	14003	11616	16379	19998	25993	37994	44000	
± 3 "	± 2.5 "	± 2 "	± 2.3 "	± 1.9 "	± 1.8 "	± 1.7 "	± 1.5 "	± 1.5 "	
± 0.20 " 0.040"	± 0.16 " 0.032"	± 0.12 " 0.023"	± 0.14 " 0.028"	± 0.10 " 0.020"	± 0.08 " 0.016"	± 0.06 " 0.012"	± 0.04 " 0.009"	± 0.04 " 0.007"	
IP00									
≈ 0.42 kg	≈ 0.69 kg	≈ 1.20 kg	≈ 0.35 kg	$\approx 1.5/0.66$ kg	$\approx 2.3/1.5$ kg	≈ 2.6 kg	≈ 3.8 kg	≈ 3.7 kg	

¹⁾With HEIDENHAIN cable

ECA 4412, ECA 4492

Dimensions

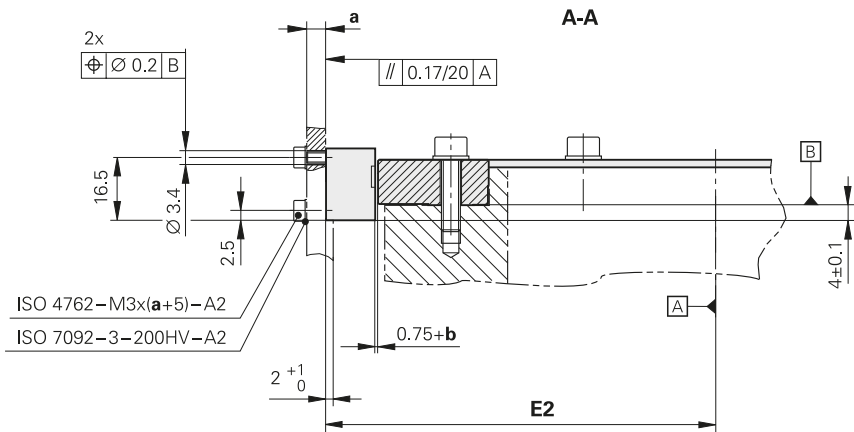


mm

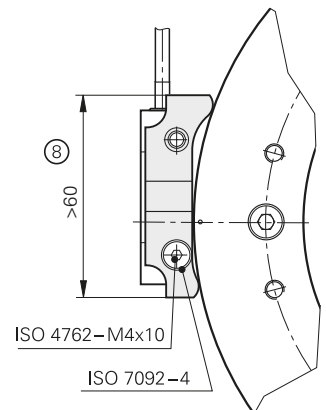
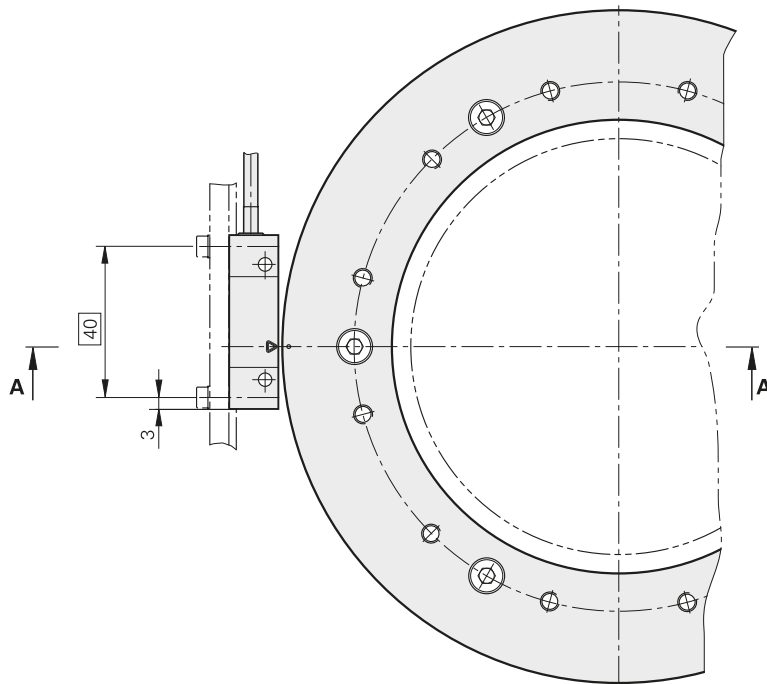
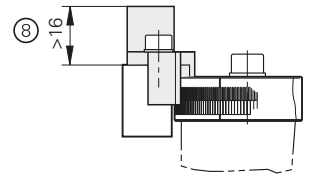
 Tolerancing ISO 8015
 ISO 2768 - m H
 ≤ 6 mm: ±0.2 mm

- ⊙, ⊕ = Mounting options
- ⊠ = Bearing
- ⊗ = 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 = Marks for drum centering (3x120°)
- 6 = Incremental track
- 7 = Code track
- 8 = Space for mounting aid

II



Accessory: Mounting aid


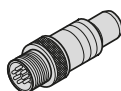
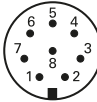

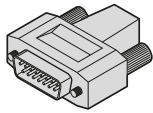
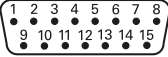





D1	⊙	D2	D3	E1	E2	α	M	G	b [mm]	c [mm]
$\varnothing 70 +0.05/+0.07$	$\varnothing \leq 70$	$\varnothing 85$	$\varnothing 104.63$	56.57	66.07	$6 \times 60^\circ = 360^\circ$	6x M5	/	± 0.07	0.3
$\varnothing 80 +0.05/+0.07$	$\varnothing \leq 80$	$\varnothing 95$	$\varnothing 127.64$	68.07	77.57	$6 \times 60^\circ = 360^\circ$	6x M5	/	± 0.07	0.3
$\varnothing 120 +0.05/+0.07$	$\varnothing \leq 120$	$\varnothing 140$	$\varnothing 178.55$	93.52	103.02	$6 \times 60^\circ = 360^\circ$	6x M5	/	± 0.10	0.3
$\varnothing 130 +0.05/+0.07$	$\varnothing \leq 130$	$\varnothing 139$	$\varnothing 148.20$	78.35	87.85	$12 \times 30^\circ = 360^\circ$	12x M3	/	± 0.07	0.3
$\varnothing 150 +0.05/+0.07$	$\varnothing \leq 150$	$\varnothing 163$	$\varnothing 178.55$	93.52	103.02	$12 \times 30^\circ = 360^\circ$	12x M3	/	± 0.10	0.3
$\varnothing 150 +0.05/+0.07$	$\varnothing \leq 150$	$\varnothing 165$	$\varnothing 208.89$	108.69	118.19	$6 \times 60^\circ = 360^\circ$	6x M5	/	± 0.12	0.5
$\varnothing 180 +0.05/+0.07$	$\varnothing \leq 180$	$\varnothing 200$	$\varnothing 254.93$	131.71	141.21	$6 \times 60^\circ = 360^\circ$	6x M5	/	± 0.12	0.5
$\varnothing 185 +0.05/+0.07$	$\varnothing \leq 185$	$\varnothing 197$	$\varnothing 208.89$	108.69	118.19	$12 \times 30^\circ = 360^\circ$	12x M3	/	± 0.12	0.5
$\varnothing 210 +0.05/+0.07$	$\varnothing \leq 210$	$\varnothing 230$	$\varnothing 254.93$	131.71	141.21	$12 \times 30^\circ = 360^\circ$	12x M3	/	± 0.12	0.5
$\varnothing 270 +0.05/+0.07$	$\varnothing \leq 270$	$\varnothing 290$	$\varnothing 331.31$	169.90	179.40	$12 \times 30^\circ = 360^\circ$	12x M5	/	± 0.15	1.0
$\varnothing 425 +0.05/+0.07$	$\varnothing \leq 425$	$\varnothing 445$	$\varnothing 484.07$	246.29	255.79	$12 \times 30^\circ = 360^\circ$	12x M6	12x M6	± 0.15	1.0
$\varnothing 512 +0.05/+0.07$	$\varnothing \leq 512$	$\varnothing 528$	$\varnothing 560.46$	284.48	293.98	$18 \times 20^\circ = 360^\circ$	18x M6	12x M8	± 0.15	1.0


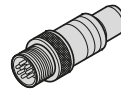
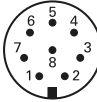

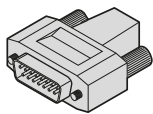
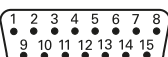



For CAD data go to cad.heidenhain.de

Electrical connection


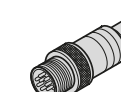


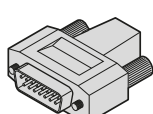




EnDat pin layout

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

Fanuc pin layout

8-pin M12 coupling					15-pin D-sub connector				
									
	Power supply				Serial data transmission				
	8	2	5	1	3	4	7	6	
	4	12	2	10	5	13	8	15	
	U _P	Sensor U _P	0V	Sensor 0V	Serial Data	Serial Data	Request	Request	
	Brown/Green	Blue	White/Green	White	Gray	Pink	Violet	Yellow	

Mitsubishi pin layout







8-pin M12 coupling					15-pin D-sub connector				
									
	Power supply				Serial data transmission				
	8	2	5	1	3	4	7	6	
	4	12	2	10	5	13	8	15	
	U _P	Sensor U _P	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; U_P = 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



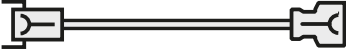


PUR adapter cables and connecting cables [[4 x (2 x 0.09 mm ²)]; A _P = 0.09 mm ²			
PUR adapter cables and connecting cables [[4 x 0.14 mm ²) + (4 x 0.34 mm ²)]; A _P = 0.34 mm ²		Ø 6 mm	Ø 3.7 mm ¹⁾
Connecting cable with 8-pin M12 connector (female) and 8-pin M12 coupling (male)		368330-xx	801142-xx
Connecting cable with 8-pin M12 right-angle connector (female) and 8-pin M12 coupling (male)		373289-xx	801149-xx
Adapter cable with 8-pin M12 connector (female) and 15-pin D-sub connector (male), for PWM 20, EIB 74x, etc.		524599-xx	801129-xx
Adapter cable with 8-pin M12 right-angle connector (female) and 15-pin D-sub connector (male), for PWM 20, EIB 74x, etc.		722025-xx	801140-xx
Connecting cable with 8-pin M12 connector (female) and free cable end (cut off)		634265-xx	–
Connecting cable with 8-pin M12 right-angle connector (female) and free cable end (cut off)		606317-xx	–

¹⁾ Max. total cable length 6 m

A_P: Cross section of power supply lines





Connecting cables Fanuc Mitsubishi

Fanuc

PUR adapter cables and connecting cables $[4 \times (2 \times 0.09 \text{ mm}^2)]; A_P = 0.09 \text{ mm}^2$			
PUR adapter cables and connecting cables $[(4 \times 0.14 \text{ mm}^2) + (4 \times 0.34 \text{ mm}^2)]; A_P = 0.34 \text{ mm}^2$ Ø 6 mm			Ø 3.7 mm ¹⁾
Connecting cable with 8-pin M12 connector (female) and 8-pin M12 coupling (male)		368330-xx	801142-xx
Connecting cable with 8-pin M12 right-angle connector (female) and 8-pin M12 coupling (male)		373289-xx	801149-xx
Adapter cable with 8-pin M12 connector (female) and 15-pin Fanuc connector (female)		646807-xx	–
Connecting cable with 8-pin M12 connector (female) and free cable end		634265-xx	–
Connecting cable with 8-pin M12 right-angle connector (female) and free cable end (cut off)		606317-xx	–

¹⁾ Max. total cable length 6 m; A_P: Cross section of supply lines

Mitsubishi

PUR adapter cables and connecting cables $[(4 \times 0.14 \text{ mm}^2) + (4 \times 0.34 \text{ mm}^2)]; A_P = 0.34 \text{ mm}^2$		Ø 6 mm
Adapter cable with 8-pin M12 connector (female) and 20-pin Mitsubishi connector	 Mitsubishi, 20-pin	646806-xx
Adapter cable with 8-pin M12 connector (female) and 10-pin Mitsubishi connector	 Mitsubishi, 10-pin	647314-xx
Connecting cable with 8-pin M12 connector (female) and free cable end		634265-xx
Connecting cable with 8-pin M12 right-angle connector (female) and free cable end (cut off)		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 document edition valid when the order is made.



More information:

Comply with the requirements described in the following documents to ensure the correct operation of the encoder:

- Brochure *Modular Angle Encoders With Optical Scanning* 1222041-xx
- Brochure *Interfaces of HEIDENHAIN Encoders* 1078628-xx