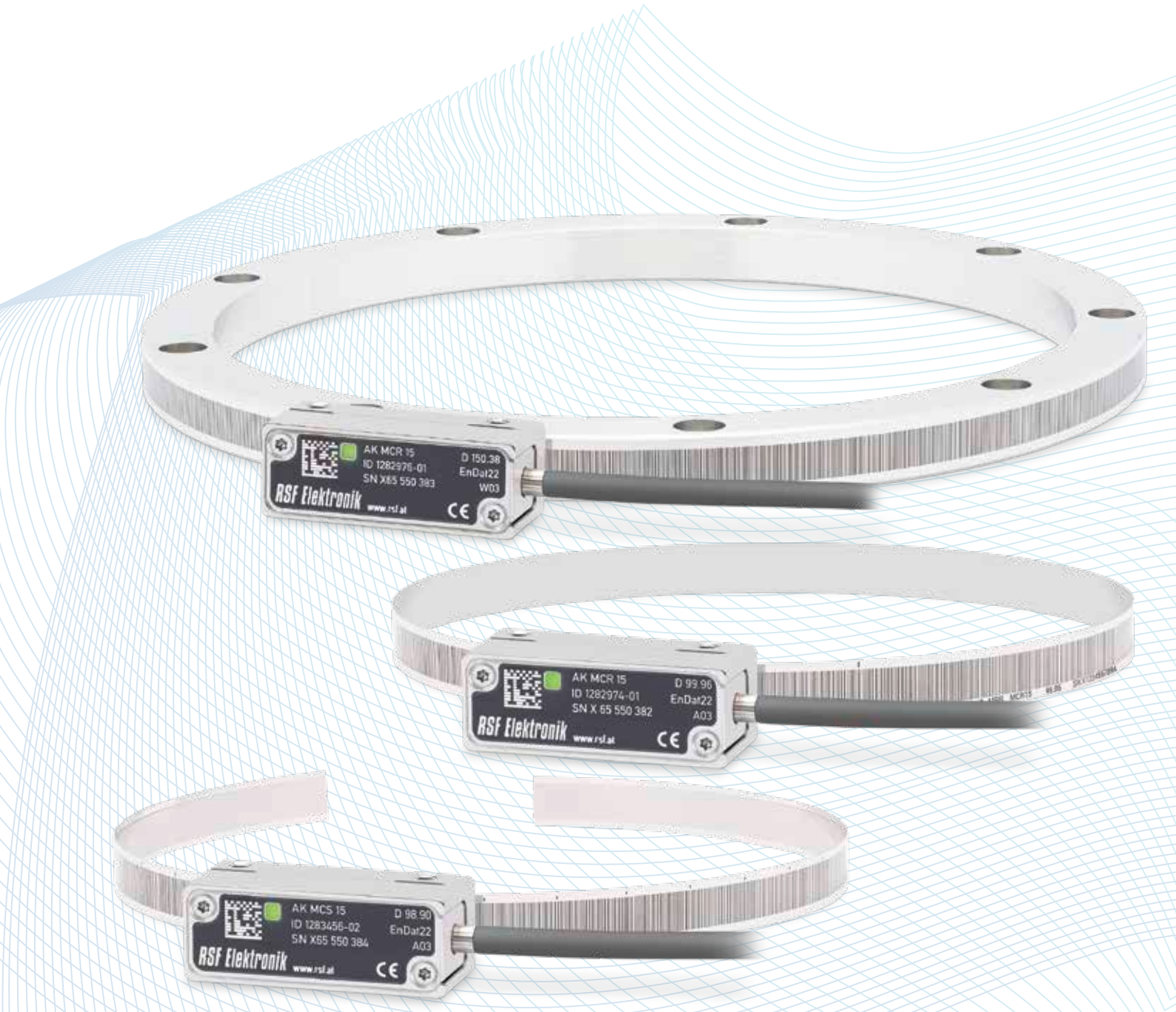
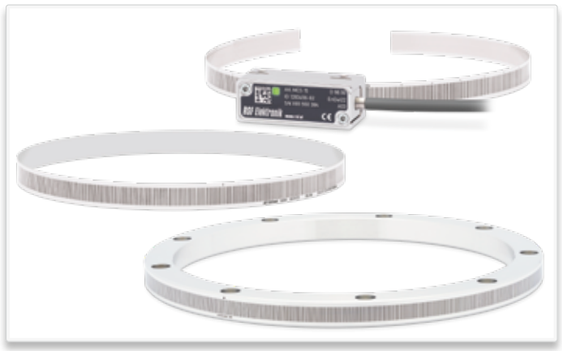
RSF Elektronik

www.rsf.at

MCR 15 | MCS 15
ABSOLUTE MODULAR ANGLE ENCODERS





- Absolute position valuation
- Large mounting tolerances
- Serial interfaces
- Status display directly at the scanning head via LED function

REQUIREMENTS ON AN ABSOLUTE MODULAR ANGLE ENCODER

- AVOIDING REFERENCING
- ADVANCED OPERATIONAL PERFORMANCE
- HIGH PERMISSIBLE ROTATIONAL SPEED (MCR 15)
- SMALL DIMENSIONS
- NO MECHANICAL BACKLASH
- ZERO FRICTIONAL FORCE
- WEAR-FREE OPERATION

MCR 15 AND MCS 15 MEET ALL THESE REQUIREMENTS!

TERM EXPLANATIONS

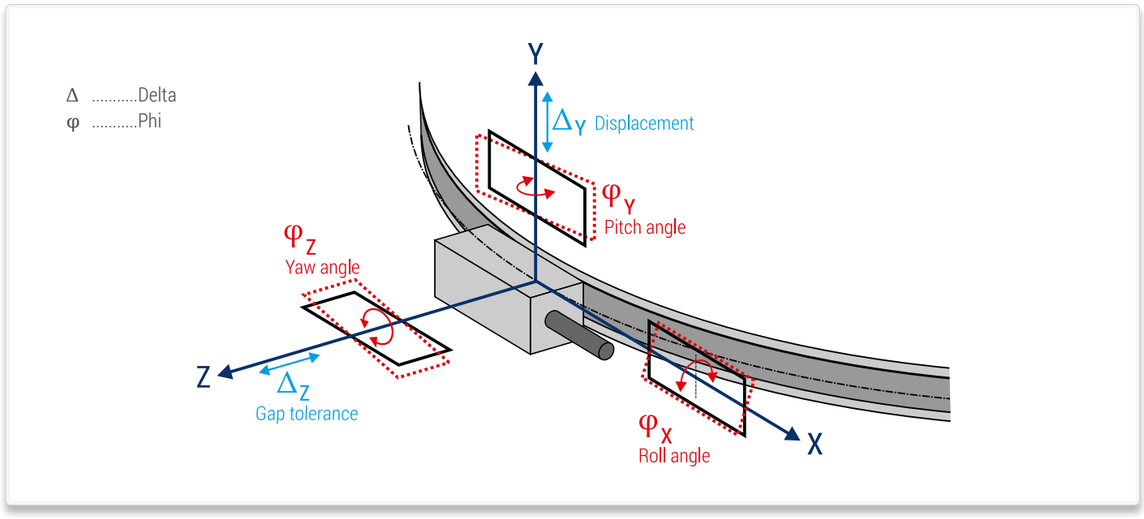
Absolute position indexing
Serial encoding of a line sequence as a highly precise graduation.

Scanning head
Opto-electronic scanning device of a graduation.

Measuring step
The smallest digital counting step produced by an encoder.

Accuracy
This is a fundamental characteristic, which is specified with an accuracy grade.

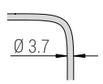
Yaw angle, pitch angle, roll angle, displacement, gap tolerance
Mounting tolerances of the scanning head relative to the scale.



ABSOLUTE MEASUREMENT PRINCIPLE

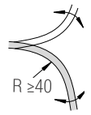
This means the position valuation from evaluating one unique code information at any point over the entire measuring range. For this the scanning head needs not to be moved relative to the graduation carrier, so that the position value is available immediately after power-on. Reference points and reference drives are thus not required. The subsequent electronics may access this position value at any time.

SHIELDING

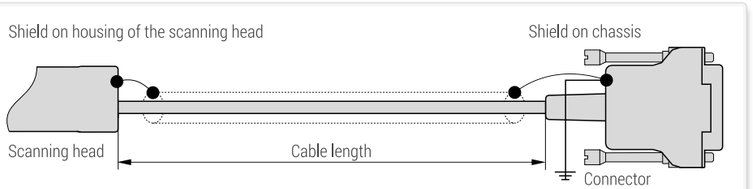


Shielded PUR-cable.
Drag chain qualified.

Bending radius fixed mounting

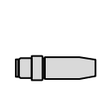


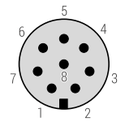
Bending radius continuous flexing



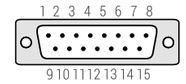
PIN ASSIGNMENTS

8-pin M12-connector according to IEC 61076-2-101 LM008–Gxx-A





15-pin D-sub



EnDat 2.2

	Voltage supply				Absolute position values			
	8	2	5	1	3	4	7	6
	4	12	2	10	5	13	8	15
EnDat 2.2	Up	Sensor Up	0 V	Sensor 0 V	DATA	$\overline{\text{DATA}}$	CLOCK	$\overline{\text{CLOCK}}$
	Brown/Green	Blue	White/Green	White	Grey	Pink	Violet	Yellow

BiSS C

	8	2	5	1	3	4	7	6
	4	12	2	10	5	13	8	15
BiSS/Cu	Up	Sensor Up	0 V	Sensor 0 V	SLO+	SLO–	MA+	MA–
	Brown/Green	Blue	White/Green	White	Grey	Pink	Violet	Yellow

Fanuc

	8	2	5	1	3	4	7	6
	4	12	2	10	5	13	8	15
Fanuc05 αi Interface	Up	Sensor Up	0 V	Sensor 0 V	Serial Data	$\overline{\text{Serial Data}}$	Request	~~Request~~
	Brown/Green	Blue	White/Green	White	Grey	Pink	Violet	Yellow

Mitsubishi

	8	2	5	1	3	4	7	6
	4	12	2	10	5	13	8	15
Mit03-4	Up	Sensor Up	0 V	Sensor 0 V	Serial Data	$\overline{\text{Serial Data}}$	Request Frame	$\overline{\text{Request}}$ Frame
Mit03-2					Occupied *	Occupied *	Request/ Data	$\overline{\text{Request}}$/ $\overline{\text{Data}}$
	Brown/Green	Blue	White/Green	White	Grey	Pink	Violet	Yellow

Panasonic

	8	2	5	1	3	4	7	6
	4	12	2	10	5	13	8	15
Pana02	Up	Sensor Up	0 V	Sensor 0 V	Occupied *	Occupied *	Request/ Data	$\overline{\text{Request}}$/ $\overline{\text{Data}}$
	Brown/Green	Blue	White/Green	White	Grey	Pink	Violet	Yellow

Yaskawa

	8	2	5	1	3	4	7	6
	4	12	2	10	5	13	8	15
YEC07	Up	Sensor Up	0 V	Sensor 0 V	Occupied *	Occupied *	DATA	$\overline{\text{DATA}}$
	Brown/Green	Blue	White/Green	White	Grey	Pink	Violet	Yellow

- Up = Power supply voltage
- Sensor: The sensor line is connected in the scanning head with the corresponding power line.
- The shield is connected with the chassis.
- Not connected pins or wires must not be used.
- * Required for adjustment/inspection by PWT 101.

SERIAL INTERFACES

EnDat 2.2

The EnDat interface is a digital, **bidirectional** interface for encoders. It is capable both of transmitting **position values** as well as transmitting or updating information stored in the encoder, or of saving new information. Thanks to the **serial transmission method**, only **four signal lines** are required. The data is transmitted in **synchronism** with the clock signal from the subsequent electronics. The type of transmission (position values, parameters, diagnostics, etc.) is selected through mode commands that the subsequent electronics send to the encoder.

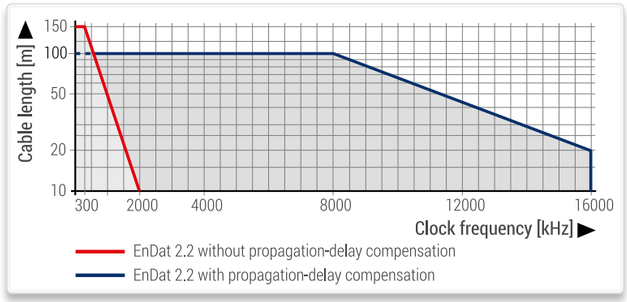
Interface	**EnDat 2.2** serial bidirectional
Data transfer	Position values, parameters and additional data
Data input	Differential line receiver according to EIA standard RS 485 for the signals CLOCK, CLOCK, DATA and DATA
Data output	Differential line driver according to EIA standard RS 485 for DATA and DATA signals
Position values	Ascending during traverse in direction of cable outlet
Power supply	3.6 V to 14 V

CLOCK FREQUENCY

The clock frequency is variable—depending on the cable length (max. 150 m)—between 100 kHz and 2 MHz. With propagation-delay compensation in the subsequent electronics, either clock frequencies up to 16 MHz are possible or cable lengths up to 100 m. The maximum clock frequency is stored in the encoder memory.

EnDat 2.2	≤ 8 MHz or 16 MHz

Transmission frequencies up to 16 MHz in combination with large cable lengths place high technological demands on the cable. Due to the data transfer technology, the cable connected directly to the encoder must not be longer than 20 m. Greater cable lengths can be realized with a cable no longer than 6 m and an extension cable. As a rule, the entire transmission path must be designed for the respective clock frequency.



POSITION VALUES

The position value can be transmitted with or without additional data. At the earliest, the position value is transmitted to the subsequent electronics after the calculation time t_{cal} has elapsed. The calculation time is ascertained at the highest clock frequency permissible for the encoder, but limited at 8 MHz.

Only the required number of bits is transferred for the position value. The bit number can be read out from the encoder for automatic parameterization.

ADDITIONAL DATA

One or two items of additional data can be appended to the position value, depending on the type of transmission (selection via MRS code). The additional data supported by the respective encoder is saved in the encoder parameters.

MEMORY AREAS

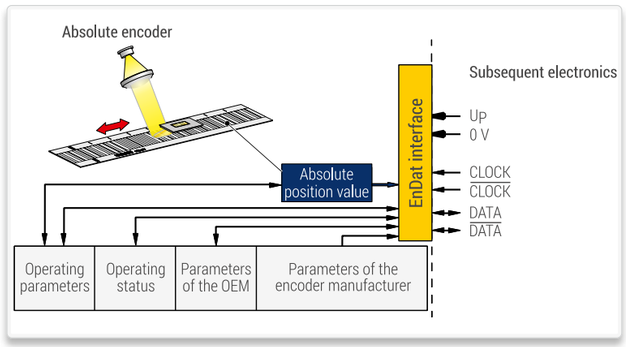
The encoder provides several memory areas for parameters. These can be read from by the subsequent electronics, and some can be written to by the encoder manufacturer, the OEM, or even the end user. The parameter data are stored in a permanent memory. This memory permits only a limited number of write access events and is not designed for cyclic data storage. Certain memory areas can be write-protected (this can only be reset by the encoder manufacturer).

Parameters are saved in various memory areas, e.g.:

- Encoder-specific information
- Information of the OEM (e. g. „electronic ID-label" of the motor)
- Operating parameters (datum shift, instruction, etc.)
- Operating status (alarm or warning messages)

Monitoring and diagnostic functions of the EnDat interface enable a detailed inspection of the encoder.

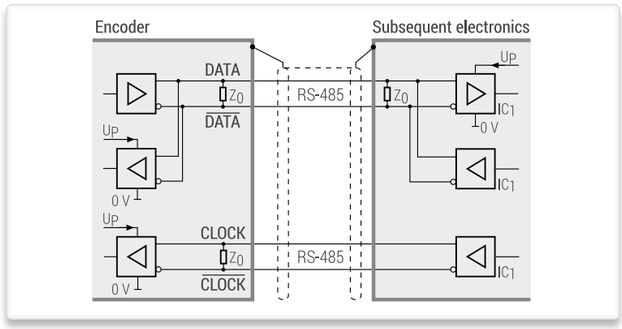
- Error messages
- Warnings
- Online diagnostics based on valuation numbers



INPUT CIRCUITRY OF SUBSEQUENT ELECTRONICS

Dimensioning
IC1 = RS 485 differential line receiver
Z0 = 120 Ω

EnDat2.2 is a bidirectional interface of HEIDENHAIN.
Detailed information you will find on: www.endat.de



CUSTOMER-SPECIFIC SERIAL INTERFACES

BiSS C
RSF Elektronik encoders with the **Code B** after the model designation are suited for connection to Biss C controls with **BiSS C unidirectional interface**

- Ordering designation: BiSS/Cu

Fanuc
RSF Elektronik encoders with the **Code F** after the model designation are suited for connection to Fanuc controls with **Fanuc Serial Interface**

- Ordering designation: Fanuc05 αi Interface

Mitsubishi
RSF Elektronik encoders with the **Code M** after the model designation are suited for connection to Mitsubishi controls with **Mitsubishi high speed interface**

- Ordering designation: Mit03-2
  One-pair transmission
- Ordering designation: Mit03-4
  Two-pair transmission

Panasonic
RSF Elektronik encoders with the **Code P** after the model designation are suited for connection to Panasonic controls with **Panasonic Serial Interface**

- Ordering designation: Pana02

Yaskawa
RSF Elektronik encoders with the **Code Y** after the model designation are suited for connection to Yaskawa controls with **Yaskawa Serial Interface**

- Ordering designation: YEC07

MCR 15 Scanning head with graduation drum - TECHNICAL DATA

SCANNING HEAD

Model	AK MCR 15	AK MCR 15 F	AK MCR 15 M		AK MCR 15 P	AK MCR 15 Y*	AK MCR 15 B
Interface	EnDat 2.2	Fanuc serial interface αi Interface	Mitsubishi high speed interface		Panasonic serial interface	Yaskawa serial interface	BiSS C unidirectional
Version	EnDat 2.2	Fanuc05	Mit03-2	Mit03-4	Pana02	YEC07	BiSS/Cu
Calculation time t_{cal} Clock frequency	≤ 5 µs ≤ 16 MHz	-- --	-- --		-- --	-- --	-- --
Electrical connection	Cable, 1 m, 1.5 m or 3 m with M12-connector 8-pin or D-sub connector 15-pin						
Voltage supply	DC 3.6 V to 14 V (3.6 V at least required in the scanning head)						
Power consumption max.	At 3.6 V: ≤ 950 mW At 14 V: ≤ 1050 mW						
Current consumption typ.	At 5 V: 100 mA (without load)						
Vibration 55 Hz to 2000 Hz Shock 6 ms	≤ 500 m/s² (EN 60 068-2-6) ≤ 1000 m/s² (EN 60 068-2-27)						
Temperature	Operating temperature: -10 °C to 70 °C, storage temperature: -20 °C to 70 °C						
Mass	Scanning head: 12 g (without cable), connecting cable: 20 g/m, connector: M12-connector: 15 g; D-sub connector: 28 g						

* On request

GRADUATION CARRIER

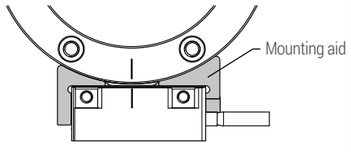
Model	**TTR MCR 15 S:** Steel drum with absolute track for mounting with three-point centering **TTR MCR 15 A:** Aluminum drum with absolute track for mounting with three-point centering										
Coefficient of expansion	Steel: α ≈ 16 x 10^{-6} K^{-1} Aluminum: α ≈ 23.4 x 10^{-6} K^{-1}										
Scanning diameter [mm]	50.00	59.93	75.06	99.96	114.17	150.38	200.35	228.77	249.85	299.81	350.23
Inside diameter [mm]	30	40	55	80	95	130	180	209	230	280	330
Permissible speed [rpm]	≤ 14 000	≤ 12 200	≤ 9750	≤ 7300	≤ 6400	≤ 4300	≤ 2650	≤ 2300	≤ 2100	≤ 1000	≤ 850
Permissible axial movement	≤ ±1 mm (drum relative to the scanning head)										
Positions per revolution [bit]	22	22	23	23	23	24	24	24	24	25	25
Measuring step	0.309"	0.309"	0.154"	0.154"	0.154"	0.077"	0.077"	0.077"	0.077"	0.038"	0.038"
System accuracy	±25"	±20"	±15"	±10"	±10"	±10"	±10"	±10"	±10"	±10"	±10"
Moment of inertia [10^{-3} kgm^2]	≈ 0.03 ≈ 0.01	0.07 0.02	0.15 0.05	0.39 .013	0.58 0.20	1.49 0.51	3.70 1.27	5.24 1.79	7.30 2.49	12.80 4.37	21.25 7.26
Mass [g]	≈ 79 ≈ 27	≈ 101 ≈ 34	≈ 135 ≈ 46	≈ 189 ≈ 65	≈ 234 ≈ 80	≈ 302 ≈ 103	≈ 409 ≈ 140	≈ 459 ≈ 157	≈ 507 ≈ 173	≈ 609 ≈ 208	≈ 734 ≈ 251

CONFORMITIES AND CERTIFICATIONS

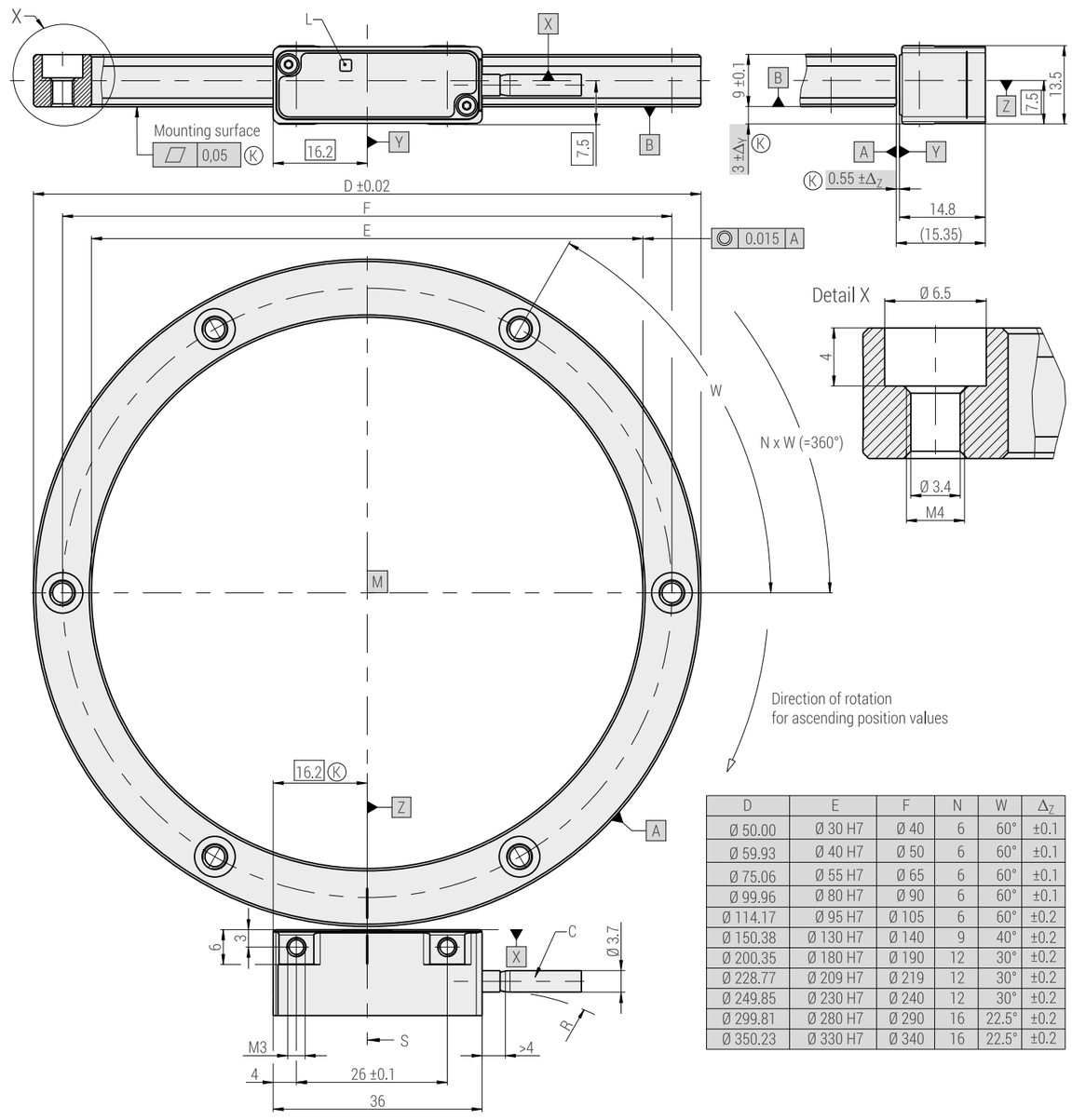
RoHS	2011/65/EU, 2015/863/EU
EMV	2014/30/EU
UL-Product-Certifications	B 022705 0009, U8V 022705 0005, CB 022705 0006

OPTIONAL ACCESSORIES

Mounting aid:



MCR 15 Scanning head with graduation drum - DIMENSIONS, MOUNTING TOLERANCES



D	E	F	N	W	Δ_Z
Ø 50.00	Ø 30 H7	Ø 40	6	60°	±0.1
Ø 59.93	Ø 40 H7	Ø 50	6	60°	±0.1
Ø 75.06	Ø 55 H7	Ø 65	6	60°	±0.1
Ø 99.96	Ø 80 H7	Ø 90	6	60°	±0.1
Ø 114.17	Ø 95 H7	Ø 105	6	60°	±0.2
Ø 150.38	Ø 130 H7	Ø 140	9	40°	±0.2
Ø 200.35	Ø 180 H7	Ø 190	12	30°	±0.2
Ø 228.77	Ø 209 H7	Ø 219	12	30°	±0.2
Ø 249.85	Ø 230 H7	Ø 240	12	30°	±0.2
Ø 299.81	Ø 280 H7	Ø 290	16	22.5°	±0.2
Ø 350.23	Ø 330 H7	Ø 340	16	22.5°	±0.2

mm

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

M = Rotary axis
S = Optical centerline and mark for 0° position
(K) = Required mating dimensions

C = Cable
L = LED function display
R = Bending radius: stat. R ≥8 mm, dyn. R ≥40 mm

Permissible position deviation of the scanning head – drum A B
Δ_Y = Displacement, ±1.0
Δ_Z = Gap tolerance, see table above

φ_Z = ±20 mrad or ±1.15° (yaw angle)
φ_Y = ±5 mrad or ±0.29° (pitch angle)
φ_X = ±7 mrad or ±0.40° (roll angle)

MCR 15 Scanning head with tape scale ring - TECHNICAL DATA

SCANNING HEAD

Model	AK MCR 15	AK MCR 15 F	AK MCR 15 M		AK MCR 15 P	AK MCR 15 Y*	AK MCR 15 B
Interface	EnDat 2.2	Fanuc serial interface αi Interface	Mitsubishi high speed interface		Panasonic serial interface	Yaskawa serial interface	BiSS C unidirectional
Version	EnDat 2.2	Fanuc05	Mit03-2	Mit03-4	Pana02	YEC07	BiSS/Cu
Calculation time t_{cal} Clock frequency	≤ 5 µs ≤ 16 MHz	-- --	-- --		-- --	-- --	-- --
Electrical connection	Cable, 1 m, 1.5 m or 3 m with M12-connector 8-pin or D-sub connector 15-pin						
Voltage supply	DC 3.6 V to 14 V (3.6 V at least required in the scanning head)						
Power consumption max.	At 3.6 V: ≤ 950 mW At 14 V: ≤ 1050 mW						
Current consumption typ.	At 5 V: 100 mA (without load)						
Vibration 55 Hz to 2000 Hz Shock 6 ms	≤ 500 m/s² (EN 60 068-2-6) ≤ 1000 m/s² (EN 60 068-2-27)						
Temperature	Operating temperature: -10 °C to 70 °C, storage temperature: -20 °C to 70 °C						
Mass	Scanning head: 12 g (without cable), connecting cable: 20 g/m, connector: M12-connector: 15 g; D-sub connector: 28 g						

* On request

GRADUATION CARRIER

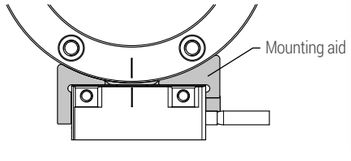
Model	**MBR MCR 15**: Steel tape scale ring with absolute track									
Coefficient of expansion	Steel: α ≈ 10 x 10^{-6} K^{-1}									
Scanning diameter [mm]	59.93	75.06	99.96	114.17	150.38	200.35	228.77	249.85	299.81	350.23
Permissible speed [rpm]	≤ 3120	≤ 2540	≤ 1900	≤ 1670	≤ 1260	≤ 950	≤ 830	≤ 760	≤ 630	≤ 540
Permissible axial movement	≤ ±1 mm (tape scale ring relative to the scanning head)									
Positions per revolution [bit]	22	23	23	23	24	24	24	24	25	25
Measuring step	0.309"	0.154"	0.154"	0.154"	0.077"	0.077"	0.077"	0.077"	0.038"	0.038"
System accuracy	±20"	±15"	±10"	±10"	±10"	±10"	±10"	±10"	±10"	±10"
Moment of inertia [10^{-3} kgm²]	≈ 0.003	≈ 0.005	≈ 0.012	≈ 0.018	≈ 0.041	≈ 0.097	≈ 0.144	≈ 0.188	≈ 0.325	≈ 0.518
Mass [g]	≈ 2.9	≈ 3.6	≈ 4.8	≈ 5.5	≈ 7.3	≈ 9.7	≈ 11.0	≈ 12.1	≈ 14.5	≈ 16.9

CONFORMITIES AND CERTIFICATIONS

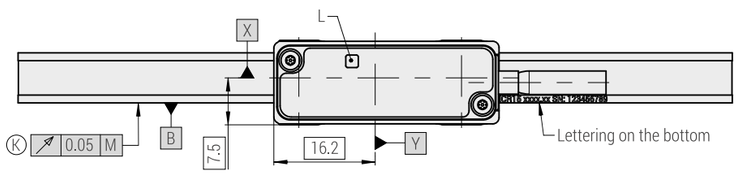
RoHS	2011/65/EU, 2015/863/EU
EMV	2014/30/EU
UL-Product-Certifications	B 022705 0009, U8V 022705 0005, CB 022705 0006

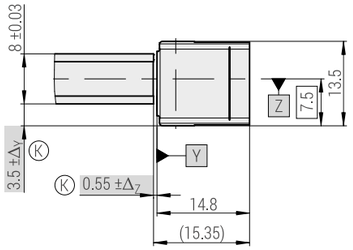
OPTIONAL ACCESSORIES

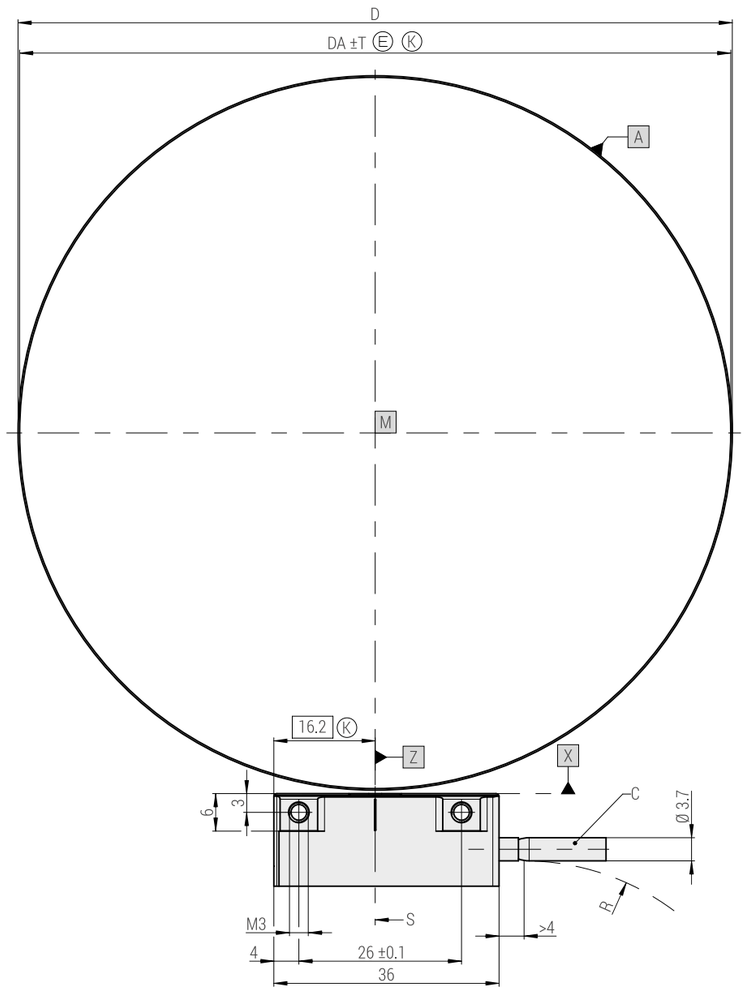
Mounting aid:



MCR 15 Scanning head with tape scale ring - DIMENSIONS, MOUNTING TOLERANCES







D	±T
Ø 59.93	0.005
> Ø 60.00 ... ≤ Ø 70.00	0.006
> Ø 70.00 ... ≤ Ø 80.00	0.008
> Ø 80.00 ... ≤ Ø 120.00	0.010
> Ø 120.00 ... ≤ Ø 180.00	0.015
> Ø 180.00 ... ≤ Ø 250.00	0.020
> Ø 250.00 ... ≤ Ø 350.23	0.030

D	Δ_Z
Ø 59.93 ... ≤ Ø 110.00	0.1
> Ø 110.00 ... ≤ Ø 350.23	0.2

mm

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

M = Rotary axis
D = Scanning diameter
DA = Mating diameter
T = Tolerance mating diameter
S = Optical centerline and mark for 0° position
K = Required mating dimensions

C = Cable
L = LED function display
R = Bending radius: stat. R ≥8 mm, dyn. R ≥40 mm

Calculation:
DA = D – 0.5

Permissible position deviation scanning head – shaft A B
Δ_Y = Displacement, ±1.0
Δ_Z = Gap tolerance, see table above

φ_Z = ±20 mrad or ±1.15° (yaw angle)
φ_Y = ±5 mrad or ±0.29° (pitch angle)
φ_X = ±7 mrad or ±0.40° (roll angle)

MCS 15 Scanning head with tape scale segment - TECHNICAL DATA

SCANNING HEAD

Model	AK MCS 15	AK MCS 15 F	AK MCS 15 M		AK MCS 15 P	AK MCS 15 Y	AK MCS 15 B
Interface	EnDat 2.2	Fanuc serial interface αi Interface	Mitsubishi high speed interface		Panasonic serial interface	Yaskawa serial interface	BiSS C unidirectional
Version	EnDat 2.2	Fanuc05	Mit03-2	Mit03-4	Pana02	YEC07	BiSS/Cu
Measuring step (based on neutral axis)	0.1 µm (100 nm) 0.05 µm (50 nm)						
Calculation time t_{cal} Clock frequency	≤ 5 µs ≤ 16 MHz	-- --	-- --		-- --	-- --	-- --
Traversing speed	≤ 600 m/min						
Interpolation error	Approx. ±1 µm						
Electrical connection	Cable, 1 m, 1.5 m or 3 m with M12-connector 8-pin or D-sub connector 15-pin						
Voltage supply	DC 3.6 V to 14 V (3.6 V at least required in the scanning head)						
Power consumption max.	At 3.6 V: ≤ 950 mW At 14 V: ≤ 1050 mW						
Current consumption typ.	At 5 V: 100 mA (without load)						
Vibration 55 Hz to 2000 Hz Shock 6 ms	≤ 500 m/s² (EN 60 068-2-6) ≤ 1000 m/s² (EN 60 068-2-27)						
Temperature	Operating temperature: -10 °C to 70 °C, storage temperature: -20 °C to 70 °C						
Mass	Scanning head: 12 g (without cable), connecting cable: 20 g/m, connector: M12-connector: 15 g; D-sub connector: 28 g						

GRADUATION CARRIER

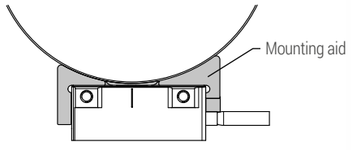
Model	**MB MCS 15**: Steel tape scale with adhesive tape and absolute track (SK)
Coefficient of expansion	$\alpha \approx 10 \times 10^{-6}\ K^{-1}$
Possible scanning diameter	> 75 mm to ≤ 1500 mm (at larger diameters MC 15 applicable) ≤ 75 mm on request
Accuracy of the grating (based on neutral axis)	±15 µm/m
Mass	20 g/m

CONFORMITIES AND CERTIFICATIONS

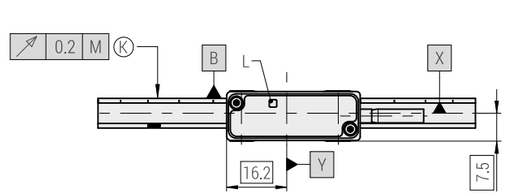
RoHS	2011/65/EU, 2015/863/EU
EMV	2014/30/EU
UL-Product-Certifications	B 022705 0009, U8V 022705 0005, CB 022705 0006

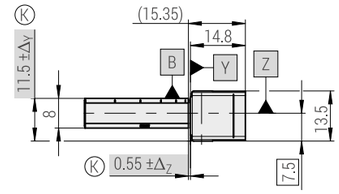
OPTIONAL ACCESSORIES

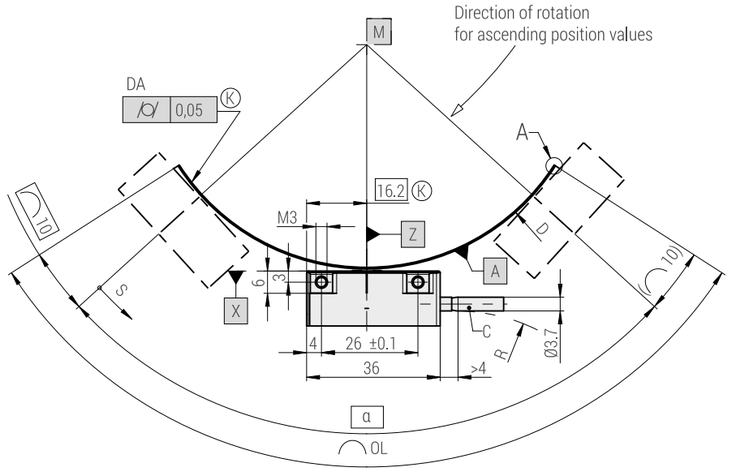
Mounting aid:

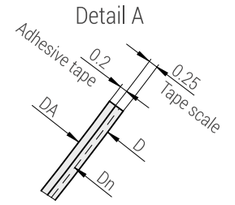


MCS 15 DIMENSIONS, MOUNTING TOLERANCES









Calculations:
D = DA + 0.9

Overall length
OL = 20 + (D – 0.25) × π × α / 360°
(round up result to integer)

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

M = Rotary axis
OL = Length of tape
α = Measuring range [°]
D = Scanning diameter
DA = Mating diameter
Dn = Neutral axis
(K) = Required mating dimensions

S = Code start value not defined
C = Cable
L = LED function display
R = Bending radius: stat. R ≥8 mm, dyn. R ≥40 mm

Permissible position deviation scanning head – scale tape A B
Δ_Y = Displacement, ±1.0
Δ_Z = Gap tolerance
= ±0.1 ... D ≤ 100
= ±0.2 ... D > 100
φ_Z = ±20 mrad or ±1.15° (yaw angle)
φ_Y = ±5 mrad or ±0.29° (pitch angle)
φ_X = ±7 mrad or ±0.40° (roll angle)

Tape scale:
Arbitrary position of absolute coding
Zero point set by customer

ACCESSORY: EXTERNAL TESTING DEVICE PWT 101

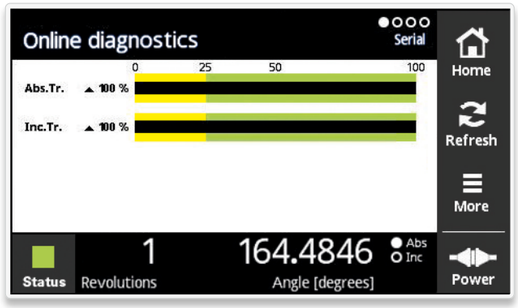
The PWT 101 is a testing device for checking the function of absolute RSF Elektronik encoders. Thanks to its compact dimensions and robust design, the PWT 101 is ideal for mobile use. A 4.3-inch touchscreen provides for display and operation.

For example, for encoders with EnDat interface you can not only display the position value but also export the online diagnosis, shift datums, and perform further inspection functions.

AVAILABLE FUNCTIONS

The performance range of the PWT 101 can be expanded by firmware update. Appropriate firmware files that can be imported to the PWT 101 through a memory card (not included in delivery) will be made available at www.heidenhain.de.

Feature content of the PWT 101	EnDat 2.2	BiSS/Cu	Fanuc05	Mitsubishi03-2, 03-4	Panasonic02	YEC07
Position display						
Display of the absolute position	✓	✓	✓	✓	✓	✓
Display and resetting of error messages	✓	✓	✓	✓	✓	✓
Display and resetting of warnings	✓	✓	✓	✓	✓	✓
Display of transmission status	✓	✓	✓	✓	✓	✓
Diagnostics						
Display of online diagnostics	✓	✓	✓	✓	✓	✓
Display of supply voltage and supply current	✓	✓	✓	✓	✓	✓
Additional functions (if supported by the encoder)						
Datum shift („electrical zeroing of position")	✓	--	--	--	--	✓
Memory contents						
Display of encoder information	✓	✓	✓	✓	✓	✓



Display at MCR 15

STATUS DISPLAY VIA LED FUNCTION

LED function at the scanning head	EnDat 2.2	BiSS/Cu	Fanuc05	Mitsubishi 03-4, 03-2	Panasonic02	YEC 07	Note
GREEN Very good	✓	✓	✓	✓	✓	✓	
YELLOW Warning	✓	✓	--	--	✓	--	Check mounting, clean encoder
RED Alarm	✓	✓	✓	✓	✓	✓	Check mounting, clean encoder

FURTHER PRODUCTS

MSR 15 | MSS 15

Incremental modular angle encoders with small dimensions

- Quality of the scanning signals is directly visible at the scanning head via a tricolored LED function
- Easy mounting as a result of large mounting tolerances
- High insensitivity against contaminations
- Possible drum diameter (TTR): 50.00 mm to 350.23 mm (outside)
- Possible scanning diameter (MBR): 59.93 mm to 350.23 mm (outside)
- Steel tape scale (MSS) from Ø 75 mm

MSR 45

Modular angle encoders with steel tape scale - various versions

- Full-circle or segment version
- Grating period: 200 µm
- Accuracy of the grating (stretched): ±30 µm/m
- High permissible rotational speed resp. circumferential speed
- Integrated subdividing: up to times 100
- Possible diameter: Full-circle from 146.99 mm Segment from 150 mm

MC 15

Absolute linear encoders with status display

- Divers serial interfaces
- Status display directly at the scanning head via LED function
- Easy mounting as a result of large mounting tolerances
- High insensitivity against contaminations
- Max. measuring length Steel tape scale: 10 000 mm

MS 15

Exposed scanning linear encoders with integrated mounting control

- Easy mounting; no test box or oscilloscope needed
- Quality of the scanning signals is directly visible at the scanning head via a tricolored LED function
- Two independent switch tracks for individual special functions
- Position of reference mark selectable by customer
- High insensitivity against contamination
- High permissible traversing speed
- Integrated subdividing: up to times 200
- Max. measuring length: Glass scale: 3140 mm Steel tape scale: 20 000 mm

MS 45

Exposed scanning linear encoders with integrated mounting control

- Easy mounting; no test box or oscilloscope needed
- Quality of the scanning signals is directly visible at the scanning head via a tricolored LED function
- Flat dimensions
- Easy mounting due to large mounting tolerances
- High insensitivity against contamination
- High permissible traversing speed
- Integrated subdividing: up to times 100
- Max. measuring length: Steel tape scale: 30 000 mm

DISTRIBUTION CONTACTS

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