



# RSF Elektronik

www.rsfs.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

## 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.

## 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

## 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

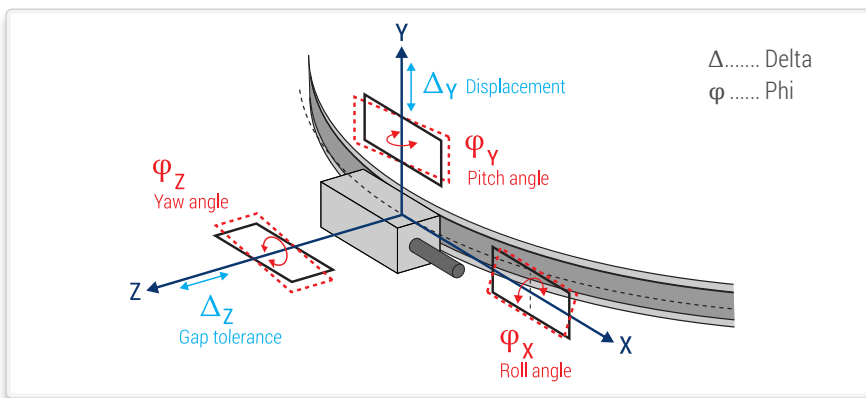
The smallest digital counting step produced by an encoder.

### 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.



### General information

Encoders from RSF Elektronik are usually integrated as components into complete systems. Applications of this type **require full-system, extensive testing, regardless of the encoder's specifications.**

The specifications provided in this brochure apply only to the encoder and not to the entire system.

Any operation of the encoder outside of the specified range or outside of its proper and intended use is at the user's own risk.

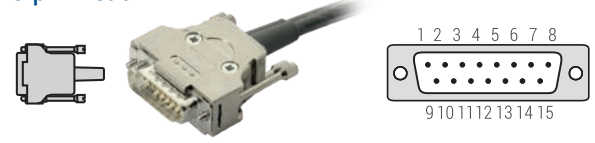
In safety-related systems, the encoder's position value must be tested by the higher-level system after switch-on.

# PIN ASSIGNMENTS

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



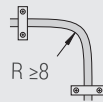

15-pin D-sub

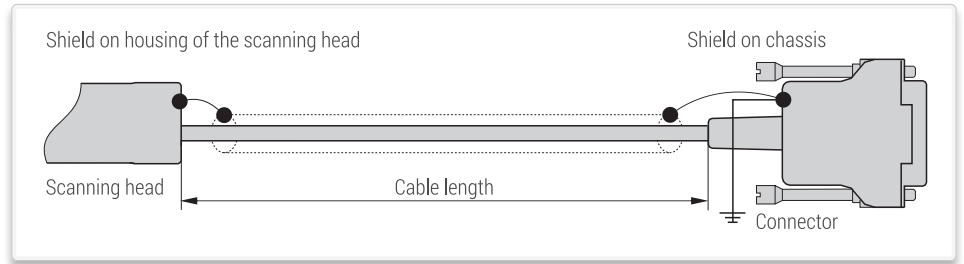


EnDat 2.2	Power supply				Serial data transmission			
	8	2	5	1	3	4	7	6
	4	12	2	10	5	13	8	15
EnDat 2.2	Up	Sensor Up	0 V	Sensor 0 V	DATA	DATA	CLOCK	CLOCK
	Brown/Green	Blue	White/Green	White	Grey	Pink	Violet	Yellow
EnDat 3	Power supply				Serial data transmission			
	8	2	5	1	3	4	7	6
	4	12	2	10	5	13	8	15
E30-RB	Up	Sensor Up	0 V	Sensor 0 V	SD+_NEXT	SD-_NEXT	SD+	SD-
	Brown/Green	Blue	White/Green	White	Grey	Pink	Violet	Yellow
BiSS C	Power supply				Serial data transmission			
	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	Power supply				Serial data transmission			
	8	2	5	1	3	4	7	6
	4	12	2	10	5	13	8	15
Fanuc05 ai Interface	Up	Sensor Up	0 V	Sensor 0 V	Serial Data	Serial Data	Request	Request
	Brown/Green	Blue	White/Green	White	Grey	Pink	Violet	Yellow
Mitsubishi	Power supply				Serial data transmission			
	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	Serial Data	Request Frame	Request Frame
Mit03-2					Belegt *	Belegt *	Request/ Data	Request/ Data
	Brown/Green	Blue	White/Green	White	Grey	Pink	Violet	Yellow
Panasonic	Power supply				Serial data transmission			
	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	Belegt *	Belegt *	Request/ Data	Request/ Data
	Brown/Green	Blue	White/Green	White	Grey	Pink	Violet	Yellow
Yaskawa	Power supply				Serial data transmission			
	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	Belegt *	Belegt *	DATA	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.

# SHIELDING

<b>Cable</b>	3.7 mm
<b>Material</b>	Shielded PUR-cable; Drag chain qualified
<b>Bending radius</b>	Fixed mounting  $R \geq 8$
	Continuous flexing  $R \geq 40$



## ACCURACY DEFINITION

With modular angle encoders, an eccentric mounting of the graduation carrier additionally results in a measurement error.

In addition, dimensional and form errors of the customer's shaft can result in added eccentricity, especially for scale tape rings and segments.

The measuring error, caused by eccentric mounting respectively a form deviation, results from the following formula:

$$\Delta\varphi = \pm \frac{412 \times e}{D}$$

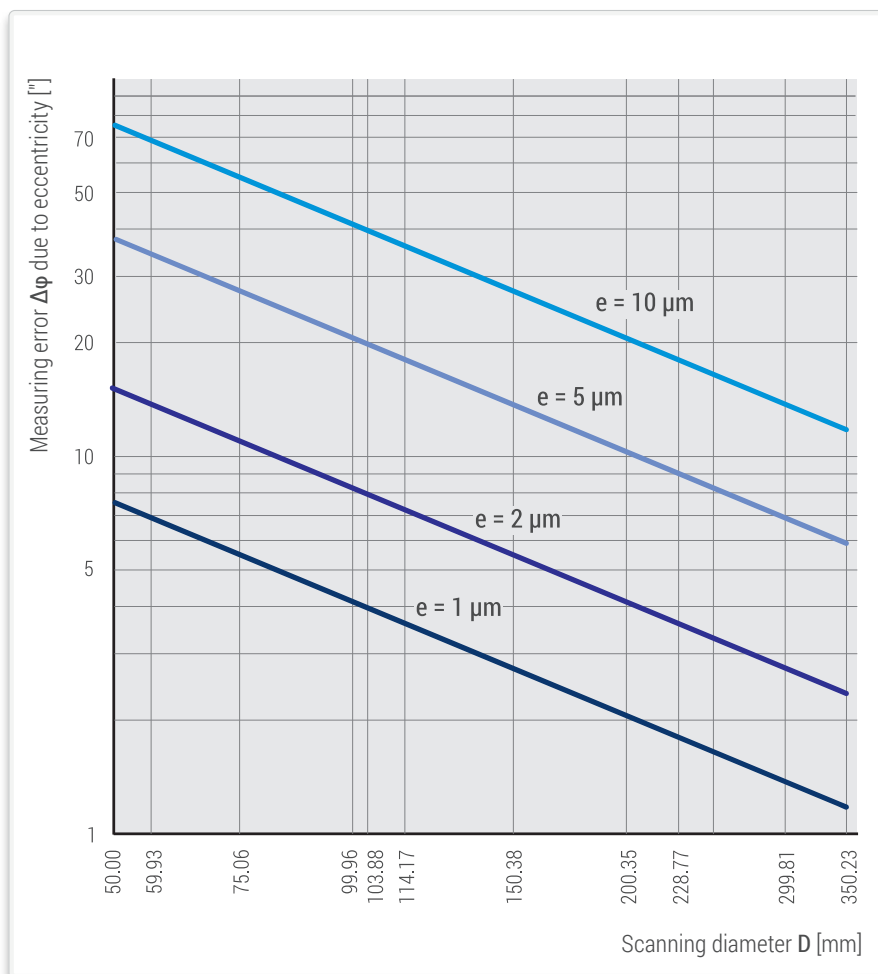
$\Delta\varphi$  = Measuring error due to eccentricity ["]

D = Scanning diameter [mm]

e = Resulting eccentricity of the graduation carrier in [ $\mu\text{m}$ ]

- $0.67 \times \Delta_{\text{max}}$  for drum (TTR) with three-point centering
- $0.5 \times \Delta_{\text{max}} = 1/2$  concentricity for scale tape ring (MBR)

$\Delta_{\text{max}}$  = Maximum difference of the measured values using a probe



## 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.

### 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
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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.

### 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).

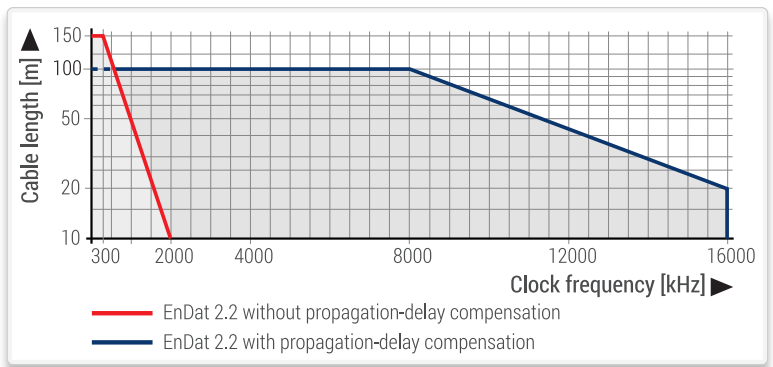
**Parameters** are saved in various memory areas, e.g.:

- 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.

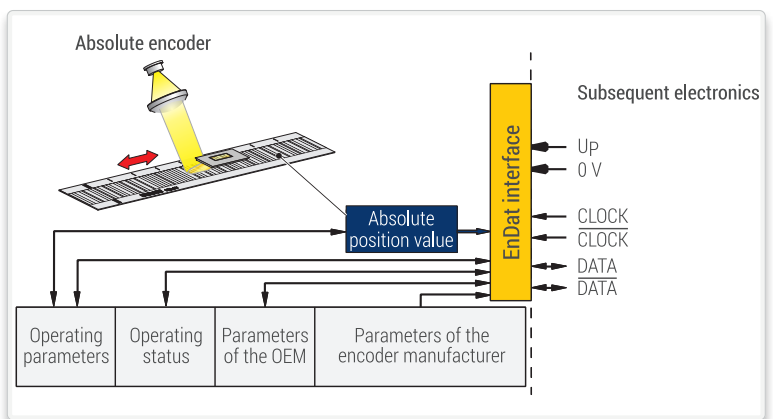
- Error messages
- Warnings
- Online diagnostics based on valuation numbers

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



### 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.

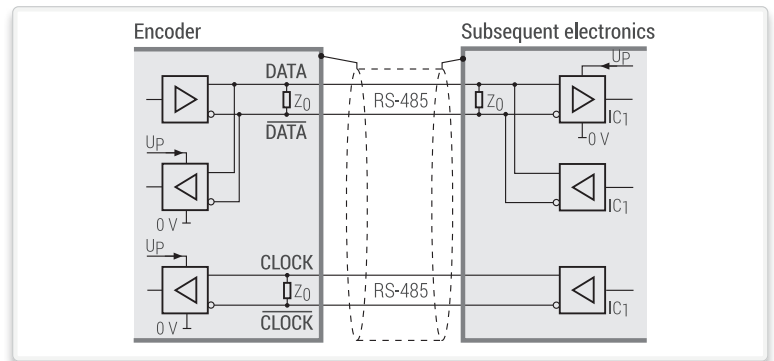


## INPUT CIRCUITRY OF SUBSEQUENT ELECTRONICS

### Dimensioning

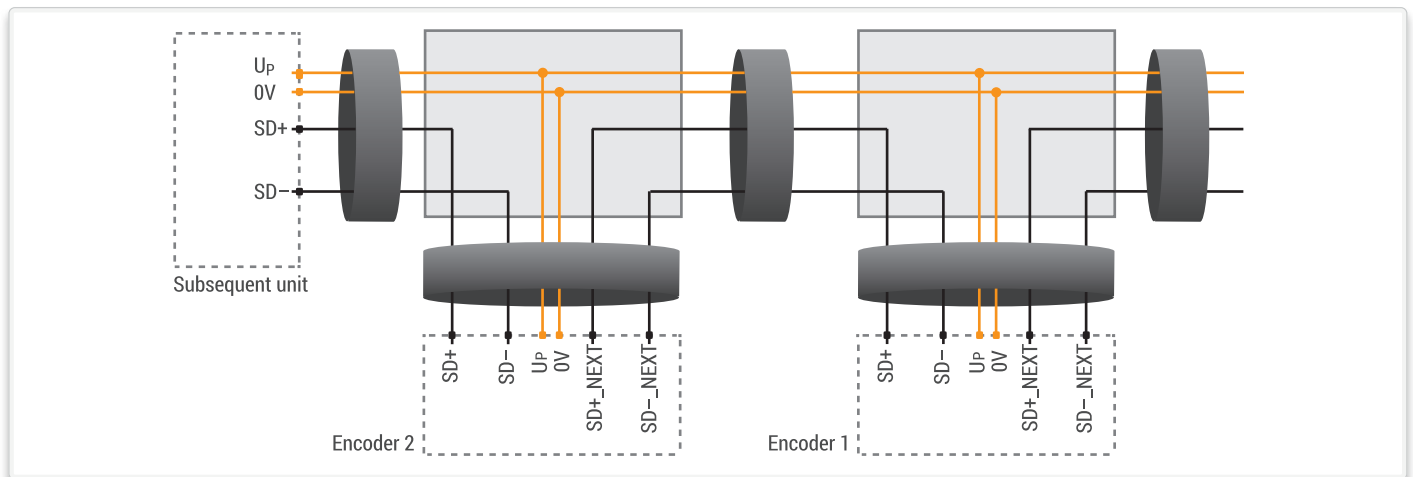
IC1 = RS 485 differential line receiver

$Z_0 = 120 \Omega$



## EnDat 3

The ordering designation E30-RB defines the bus operation with up to six encoders, but also works with just one encoder.



EnDat2.2 and EnDat 3 are bidirectional interfaces of HEIDENHAIN. Detailed information you will find on: [www.endat.de](http://www.endat.de)

## CUSTOMER-SPECIFIC SERIAL INTERFACES

**Fanuc** (Ordering designation: Fanuc05 ai Interface)

**Code F** (AK MC 15 F)

Connection to Fanuc controls with **Fanuc Serial Interface**

**Mitsubishi**

- Ordering designation: Mit03-2 (One-pair transmission)

- Ordering designation: Mit03-4 (Two-pair transmission)

**Code M** (AK MC 15 M)

Connection to Mitsubishi controls with **Mitsubishi high speed interface**

**Panasonic** (Ordering designation: Pana02)

**Code P** (AK MC 15 P)

Connection to Panasonic controls with **Panasonic Serial Interface**

**Yaskawa** (Ordering designation: YEC07)

**Code Y** (AK MC 15 Y)

Connection to Yaskawa controls with **Yaskawa Serial Interface**

**BiSS C** (Ordering designation: BiSS/Cu)

**Code B** (AK MC 15 B)

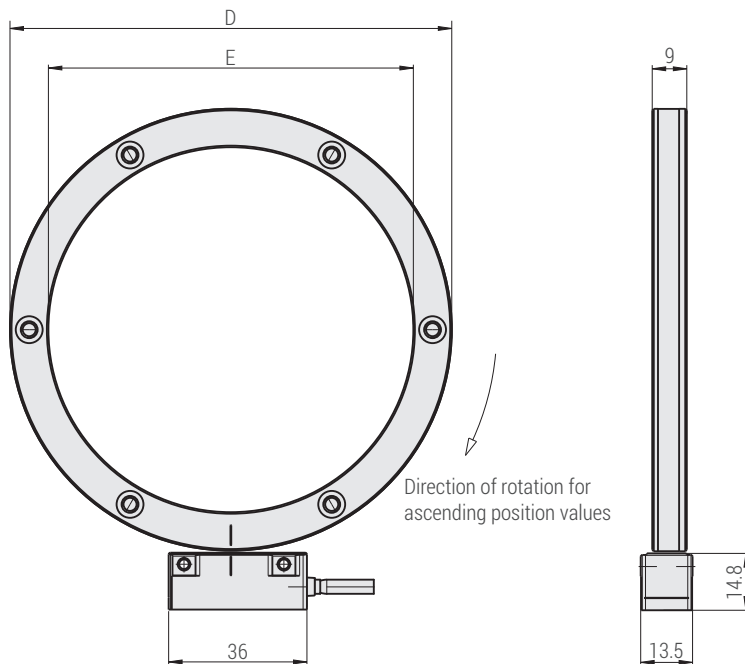
Connection to BiSS C controls with **BiSS C unidirectional interface** (permissible clock frequencies  $\leq 5$  MHz or 10 MHz)

## MCR 15 Scanning head with graduation drum

- Steel- or Aluminum graduation drum
- Mounting: screwable with three-point centering
- Status display directly at the scanning head via LED



### Main dimensions without tolerance specifications



Technical drawings and further documents at [www.heidenhain.com/documentation](http://www.heidenhain.com/documentation)



Mating dimensions  
ID 1258860

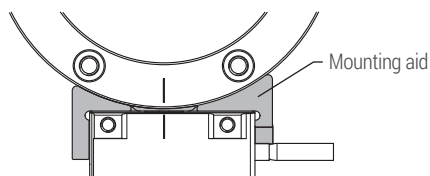
Scanning head	AK MCR 15		AK MCR 15 F		AK MCR 15 M		AK MCR 15 P	AK MCR 15 Y	AK MCR 15 B	
Interface	EnDat 2.2	EnDat 3	Fanuc serial interface ai Interface		Mitsubishi high speed interface		Panasonic serial interface	Yaskawa serial interface	BiSS C unidirectional	
Version	EnDat 22	E30-RB*	Fanuc05*		Mit03-2	Mit03-4	Pana02	YEC07*	BiSS/Cu	
Calculation time $t_{cal}$	$\leq 5 \mu s$	--	--		--		--	--	--	
Clock frequency	$\leq 15 \text{ MHz}$	--	--		--		--	--	--	
Electrical connection	Cable, 1 m, 1.5 m or 3 m with M12-connector 8-pin or D-sub connector 15-pin									
Supply voltage	DC 3.6 V to 14 V (3.6 V at least required in the scanning head)									
Power consumption max.	At 3.6 V: $\leq 950 \text{ mW}$ At 14 V: $\leq 1050 \text{ mW}$									
Current consumption typ.	At 5 V: 100 mA (without load)									
Vibration 55 Hz to 2000 Hz Shock 6 ms	$\leq 500 \text{ m/s}^2$ (EN 60 068-2-6) $\leq 1000 \text{ m/s}^2$ (EN 60 068-2-27)									
Temperature	Operating temperature: $-10 \text{ }^\circ\text{C}$ to $70 \text{ }^\circ\text{C}$ Storage temperature: $-20 \text{ }^\circ\text{C}$ to $70 \text{ }^\circ\text{C}$									
Mass	Scanning head: 12 g (without cable), connecting cable: 20 g/m, connector: M12-connector: 15 g; D-sub connector: 28 g									

\* multiturn capable

Scale drum	TTR MCR 15 S / TTR MCR 15 A											
Graduation carrier	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: $\alpha_{therm} \approx 16 \times 10^{-6} \text{ K}^{-1}$ Aluminum: $\alpha_{therm} \approx 23.4 \times 10^{-6} \text{ K}^{-1}$											
Scanning diameter (D) [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 (E) [mm]	30	40	55	80	95	130	180	209	230	280	330	
Permissible speed [rpm]	$\leq 14\,000$	$\leq 12\,200$	$\leq 9\,750$	$\leq 7\,300$	$\leq 6\,400$	$\leq 4\,300$	$\leq 2\,650$	$\leq 2\,300$	$\leq 2\,100$	$\leq 1\,000$	$\leq 850$	
Permissible axial movement	$\leq \pm 1 \text{ mm}$ (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	$\pm 25''$	$\pm 20''$	$\pm 15''$	$\pm 10''$	$\pm 10''$	$\pm 10''$	$\pm 10''$	$\pm 10''$	$\pm 10''$	$\pm 10''$	$\pm 10''$	
Moment of inertia [ $10^{-3} \text{ kgm}^2$ ]	S A	$\approx 0.03$ $\approx 0.01$	$\approx 0.07$ $\approx 0.02$	$\approx 0.15$ $\approx 0.05$	$\approx 0.39$ $\approx 0.13$	$\approx 0.58$ $\approx 0.20$	$\approx 1.49$ $\approx 0.51$	$\approx 3.70$ $\approx 1.27$	$\approx 5.24$ $\approx 1.79$	$\approx 7.30$ $\approx 2.49$	$\approx 12.80$ $\approx 4.37$	$\approx 21.25$ $\approx 7.26$
Mass [g]	S A	$\approx 79$ $\approx 27$	$\approx 101$ $\approx 34$	$\approx 135$ $\approx 46$	$\approx 189$ $\approx 65$	$\approx 234$ $\approx 80$	$\approx 302$ $\approx 103$	$\approx 409$ $\approx 140$	$\approx 459$ $\approx 157$	$\approx 507$ $\approx 173$	$\approx 609$ $\approx 208$	$\approx 734$ $\approx 251$

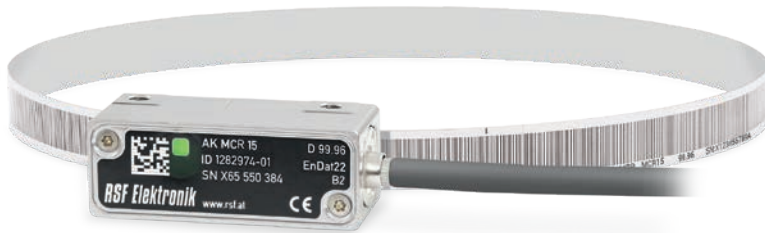
## OPTIONAL ACCESSORIES

Mounting aid:

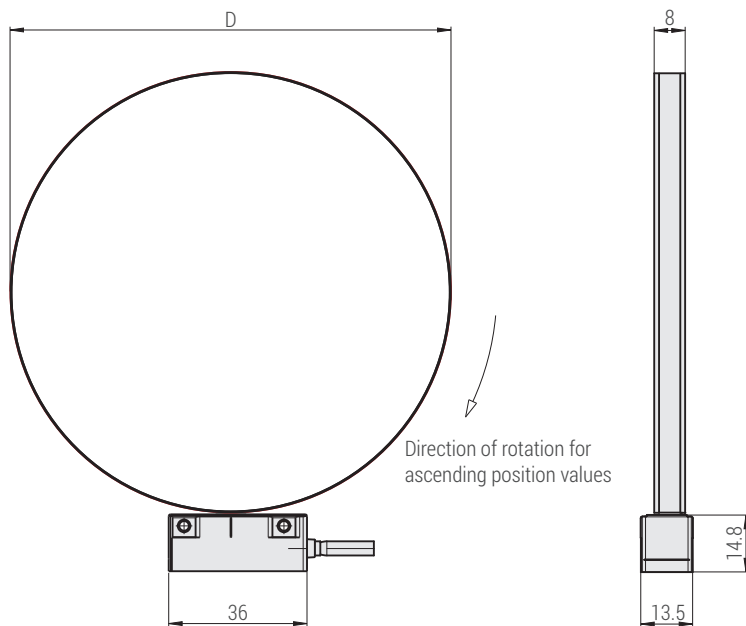


## MCR 15 Scanning head with scale tape ring

- Steel scale tape ring
- Mounting: cylindrical interference fit
- Status display directly at the scanning head via LED



### Main dimensions without tolerance specifications



Technical drawings and further documents at [www.heidenhain.com/documentation](http://www.heidenhain.com/documentation)



Mating dimensions  
ID 1344425

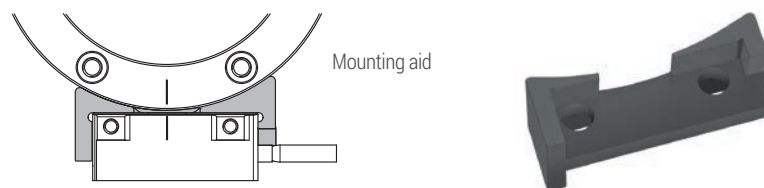
Scanning head	AK MCR 15		AK MCR 15 F	AK MCR 15 M		AK MCR 15 P	AK MCR 15 Y	AK MCR 15 B
Interface	EnDat 2.2	EnDat 3	Fanuc serial interface ai Interface	Mitsubishi high speed interface		Panasonic serial interface	Yaskawa serial interface	BiSS C unidirectional
Version	EnDat 22	E30-RB*	Fanuc05*	Mit03-2	Mit03-4	Pana02	YEC07*	BiSS/Cu
Calculation time $t_{cal}$ Clock frequency	$\leq 5 \mu s$ $\leq 15 \text{ MHz}$	--	--	--	--	--	--	--
Electrical connection	Cable, 1 m, 1.5 m or 3 m with M12-connector 8-pin or D-sub connector 15-pin							
Supply voltage	DC 3.6 V to 14 V (3.6 V at least required in the scanning head)							
Power consumption max.	At 3.6 V: $\leq 950 \text{ mW}$ At 14 V: $\leq 1050 \text{ mW}$							
Current consumption typ.	At 5 V: 100 mA (without load)							
Vibration 55 Hz to 2000 Hz Shock 6 ms	$\leq 500 \text{ m/s}^2$ (EN 60 068-2-6) $\leq 1000 \text{ m/s}^2$ (EN 60 068-2-27)							
Temperature	Operating temperature: $-10 \text{ }^\circ\text{C}$ to $70 \text{ }^\circ\text{C}$ Storage temperature: $-20 \text{ }^\circ\text{C}$ to $70 \text{ }^\circ\text{C}$							
Mass	Scanning head: 12 g (without cable), connecting cable: 20 g/m, connector: M12-connector: 15 g; D-sub connector: 28 g							

\* multiturn capable

Scale tape ring	MBR MCR 15									
Graduation carrier	Steel scale tape ring with absolute track									
Coefficient of expansion	$\alpha_{therm} \approx 10 \times 10^{-6} \text{ K}^{-1}$									
Scanning diameter (D) [mm]	59.93	75.06	99.96	114.17	150.38	200.35	228.77	249.85	299.81	350.23
Permissible speed [rpm]	$\leq 3120$	$\leq 2540$	$\leq 1900$	$\leq 1670$	$\leq 1260$	$\leq 950$	$\leq 830$	$\leq 760$	$\leq 630$	$\leq 540$
Permissible axial movement	$\leq \pm 1 \text{ mm}$ (scale tape 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	$\pm 20''$	$\pm 15''$	$\pm 10''$	$\pm 10''$	$\pm 10''$	$\pm 10''$	$\pm 10''$	$\pm 10''$	$\pm 10''$	$\pm 10''$
Moment of inertia [ $10^{-3} \text{ kgm}^2$ ]	$\approx 0.003$	$\approx 0.005$	$\approx 0.012$	$\approx 0.018$	$\approx 0.041$	$\approx 0.097$	$\approx 0.144$	$\approx 0.188$	$\approx 0.325$	$\approx 0.518$
Mass [g]	$\approx 2.9$	$\approx 3.6$	$\approx 4.8$	$\approx 5.5$	$\approx 7.3$	$\approx 9.7$	$\approx 11.0$	$\approx 12.1$	$\approx 14.5$	$\approx 16.9$

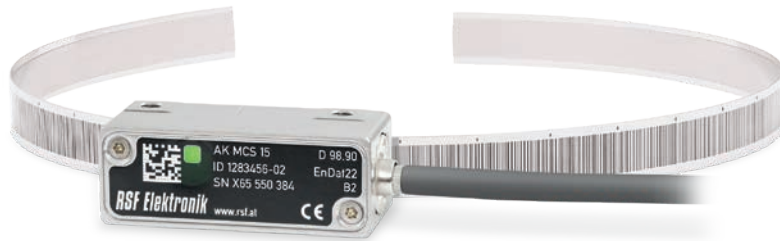
## OPTIONAL ACCESSORIES

Mounting aid:

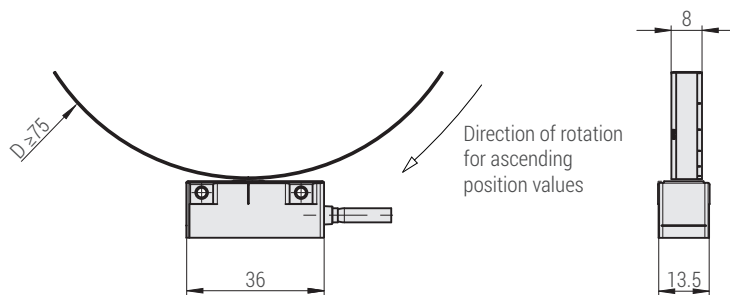


## MCS 15 Scanning head with scale tape segment

- Scale tape segment
- Mounting: adhesive tape
- Status display directly at the scanning head via LED



### Main dimensions without tolerance specifications



Technical drawings and further documents at [www.heidenhain.com/documentation](http://www.heidenhain.com/documentation)



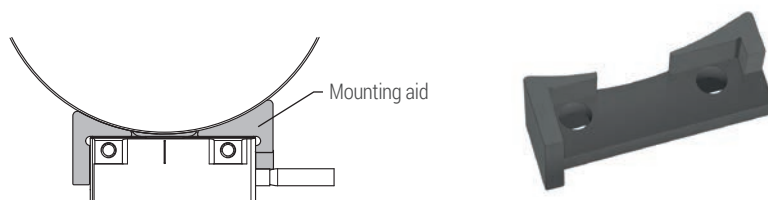
Mating dimensions  
ID 1255079

Scanning head	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	EnDat 3	Fanuc serial interface ai Interface	Mitsubishi high speed interface		Panasonic serial interface	Yaskawa serial interface	BiSS C unidirectional
Version	EnDat 22	E30-RB	Fanuc05	Mit03-2	Mit03-4	Pana02	YEC07	BiSS/Cu
Measuring step (based on neutral axis)	0.1 $\mu\text{m}$ (100 nm) 0.05 $\mu\text{m}$ (50 nm)							
Calculation time $t_{\text{cal}}$	$\leq 5 \mu\text{s}$	--	--	--	--	--	--	--
Clock frequency	$\leq 15 \text{ MHz}$	--	--	--	--	--	--	--
Electrical connection	Cable, 1 m, 1.5 m or 3 m with M12-connector 8-pin or D-sub connector 15-pin							
Supply voltage	DC 3.6 V to 14 V (3.6 V at least required in the scanning head)							
Power consumption max.	At 3.6 V: $\leq 950 \text{ mW}$ At 14 V: $\leq 1050 \text{ mW}$							
Current consumption typ.	At 5 V: 100 mA (without load)							
Vibration 55 Hz to 2000 Hz Shock 6 ms	$\leq 500 \text{ m/s}^2$ (EN 60 068-2-6) $\leq 1000 \text{ m/s}^2$ (EN 60 068-2-27)							
Temperature	Operating temperature: $-10 \text{ }^\circ\text{C}$ to $70 \text{ }^\circ\text{C}$ Storage temperature: $-20 \text{ }^\circ\text{C}$ to $70 \text{ }^\circ\text{C}$							
Mass	Scanning head: 12 g (without cable), connecting cable: 20 g/m, connector: M12-connector: 15 g; D-sub connector: 28 g							

Scale tape segment	MB MCS 15 SK
Graduation carrier	Steel scale tape with adhesive tape and absolute track
Coefficient of expansion	$\alpha_{\text{therm}} \approx 10 \times 10^{-6} \text{ K}^{-1}$
Possible scanning diameter (D)	$> 75 \text{ mm}$ to $\leq 1500 \text{ mm}$ (at larger diameters MC 15 applicable) $\leq 75 \text{ mm}$ on request
Accuracy of the grating (based on neutral axis)	$\pm 15 \mu\text{m/m}$
Mass	20 g/m

## OPTIONAL ACCESSORIES

Mounting aid:



## 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.

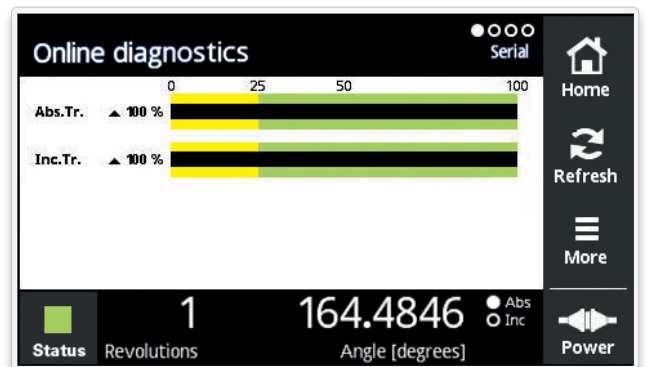
### AVAILABLE FUNCTIONS

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](http://www.heidenhain.de).



Feature content of the PWT 101	EnDat 22	E30-RB *	BiSS/Cu	Fanuc05	Mit03-2, Mit03-4	Pana02	YEC07
<b>Position display</b>	✓	✓	✓	✓	✓	✓	✓
Display of the absolute position	✓	✓	✓	✓	✓	✓	✓
Display and resetting of error messages	✓	✓	✓	✓	✓	✓	✓
Display and resetting of warnings	✓	✓	✓	✓	✓	✓	✓
Display of transmission status	✓	✓	✓	✓	✓	✓	✓
<b>Diagnostics</b>	✓	✓	✓	✓	✓	✓	✓
Display of online diagnostics	✓	✓	✓	✓	✓	✓	✓
Display of supply voltage and supply current	✓	✓	✓	✓	✓	✓	✓
<b>Additional functions (if supported by the encoder)</b>							
Datum shift („electrical zeroing of position“)	✓	✓	--	--	--	--	✓
<b>Memory contents</b>	✓	✓	✓	✓	✓	✓	✓
Display of encoder information	✓	✓	✓	✓	✓	✓	✓

\* Only in single operation



Display at MCR 15

## STATUS DISPLAY VIA LED FUNCTION

LED function at the scanning head	EnDat 22	E30-RB	BiSS/Cu	Fanuc05	Mit03-4, Mit03-2	Pana02	YEC 07	Note
GREEN Very good	✓	✓	✓	✓	✓	✓	✓	
YELLOW Warning	✓	✓	✓	--	--	✓	--	Check mounting, clean encoder
RED Alarm	✓	✓	✓	✓	✓	✓	✓	Check mounting, clean encoder

## FURTHER PRODUCTS



### MCR 16 | MCS 16

#### *Absolute modular angle encoders*

- Diverse serial interfaces
- Status display directly at the scanning head via LED
- Optimized interpolation error
- Easy mounting as a result of large mounting tolerances
- High insensitivity against contaminations
- Possible drum diameter (TTR): 75.06 mm to 350.23 mm (outside)
- Possible scanning diameter (MBR): 75.06 mm to 700.89 mm (outside)
- Possible scanning diameter (MCS): from 75.06 mm

### MSR 15 | MSS 15

#### *Incremental modular angle encoders*

- Display of signal quality directly at the scanning head via tricolored LED
- 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 700.89 mm (outside)
- Possible scanning diameter (MSS): from 75 mm

### MSR 45

#### *Incremental modular angle encoders*

- Full-circle or segment version
- Grating period: 200  $\mu\text{m}$
- Accuracy of the grating (stretched):  $\pm 30 \mu\text{m/m}$
- 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*

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

### MS 14

#### *Exposed linear encoders*

- Easy mounting; no test box or oscilloscope needed
- Display of signal quality directly at the scanning head via tricolored LED
- Position of reference mark selectable by customer
- High insensitivity against contamination
- High permissible traversing speed
- Integrated subdividing: up to times 200
- Max. measuring length  
Steel scale tape: 10 000 mm

### MS 15

#### *Exposed scanning linear encoders*

- Easy mounting; no test box or oscilloscope needed
- Display of signal quality directly at the scanning head via tricolored LED
- 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 scale tape: 20 000 mm

### MS 45

#### *Exposed scanning linear encoders*

- Easy mounting; no test box or oscilloscope needed
- Display of signal quality directly at the scanning head via tricolored LED
- 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 scale tape: 30 000 mm

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Date 03/2026 ■ Art.No. 1277002-02 ■ Doc.No. D1277002-06-A-01 ■ Technical adjustments in reserve!



## RSF Elektronik

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Linear and Angle Encoders  
Precision Graduations

Certified acc. to  
ISO 9001  
ISO 14001

