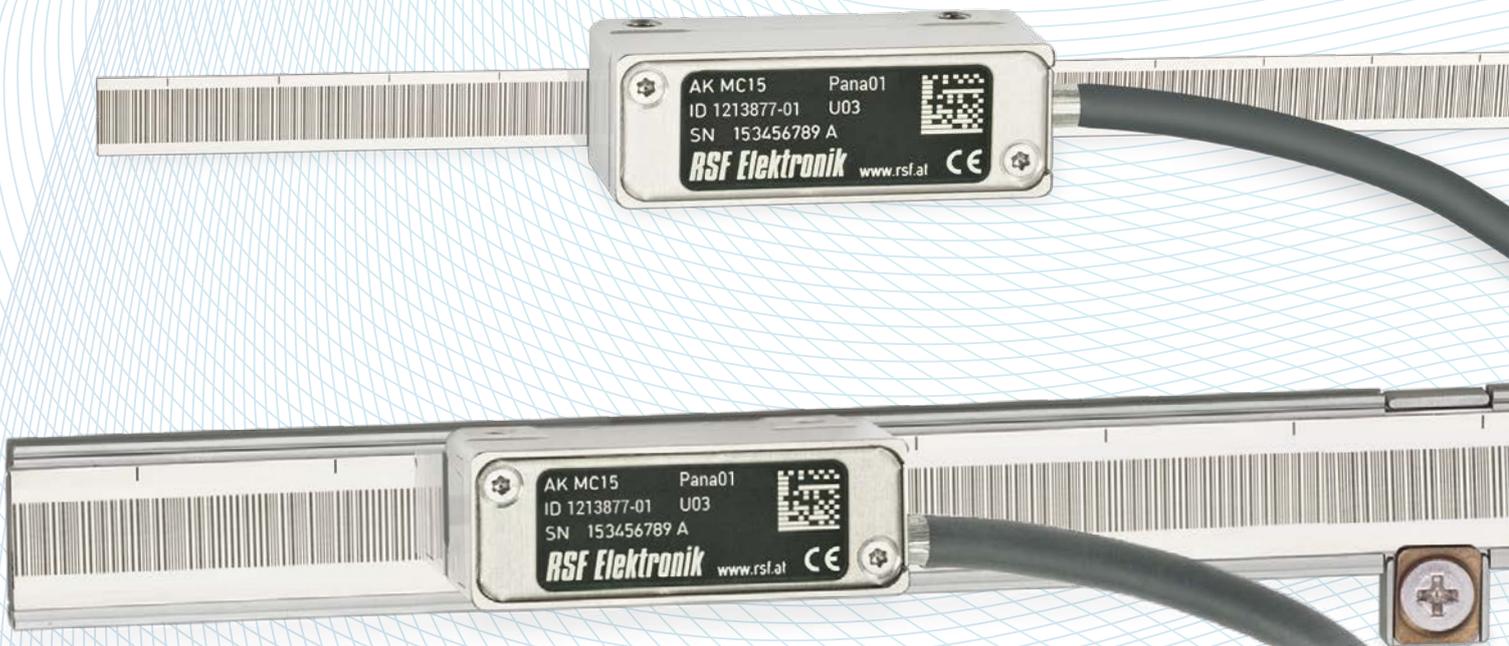




RSF Elektronik

www.rsf.at

MC 15 ABSOLUTE EXPOSED LINEAR ENCODERS





SPECIAL FEATURES

Due to increasing demand for absolute position valuation RSF Elektronik offers the MC 15, an absolute exposed linear encoder.

- ABSOLUTE POSITION VALUATION
- LARGE MOUNTING TOLERANCES
- SERIAL INTERFACES

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.

Yaw angle, pitch angle, roll angle, lateral shift, airgap

Mounting tolerances of the encoder head relative to the scale.

Function reserve

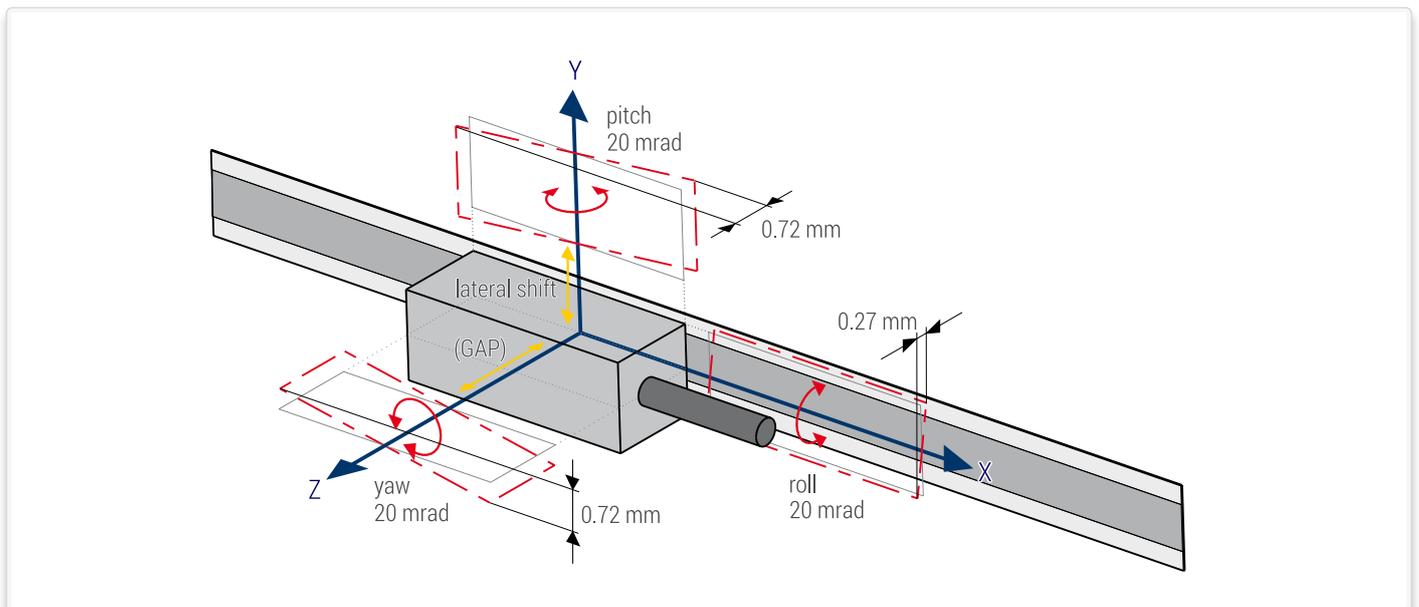
Monitoring of the scanning signals.

Accuracy

This is a fundamental characteristic, which is specified with an accuracy grade (e.g. $\pm 5 \mu\text{m/m}$).

Abbe error

Measuring error due to lateral distance between the measuring system and the machining level.



FEATURES

To meet the increasing demand in the market for absolute position value determination, RSF Elektronik's product portfolio also includes an absolute open linear encoder with the MC 15. This is driven by steadily increasing demands for

- AVOIDING REFERENCING
- ADVANCED OPERATIONAL SAFETY
- HIGH TRAVERSING SPEED
- SMALL DIMENSIONS
- NO MECHANICAL BACKLASH
- ZERO FRICTIONAL FORCE
- WEAR-FREE OPERATION



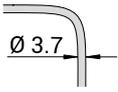
ABSOLUTE MEASUREMENT PRINCIPLE

This means the position valuation from evaluating one unique code information at any point over the entire measuring length.

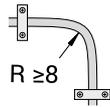
For this the scanning head needs not to be moved relative to the scale, so that the position value is available immediately after power-on. Reference points and reference drives are thus not required.

The subsequent electronics may access this position value at any time.

SHIELDING, PIN ASSIGNMENTS



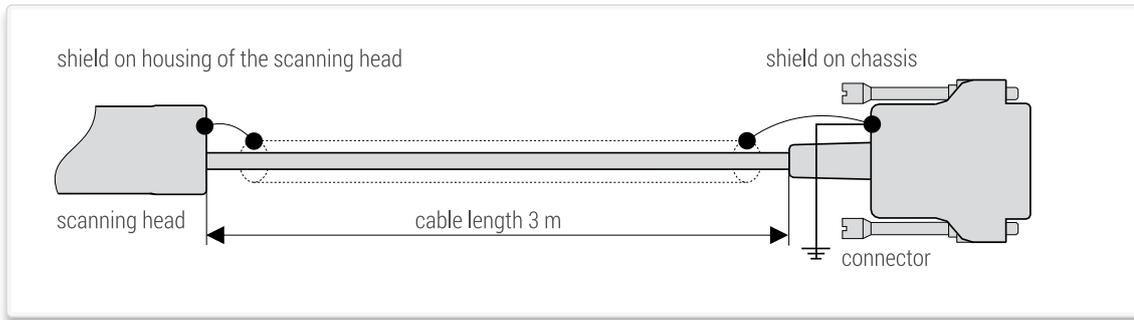
shielded PUR-cable, \varnothing 3.7 mm
Drag chain qualified.



bending radius fixed mounting



bending radius continuous flexing



Pin assignment EnDat 2.2

8-pin M12-connector according to IEC 61076-2-101 LM008-Gxx-A					15-pin D-sub				
Voltage supply					absolute position values				
	8	2	5	1	3	4	7	6	
	4	12	2	10	5	13	8	15	
	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	

- Up = power supply voltage
- Sensor: The sensor pins are bridged in the scanning head with the particular power supply.
- The shield is connected with the chassis.
- Not connected pins or wires must not be used.

Pin assignment Mitsubishi

8-pin M12-connector according to IEC 61076-2-101 LM008-Gxx-A					15-pin D-sub			
Voltage supply					absolute position values			
	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
Mit02-2					occupied *	occupied *	Request/ Data	Request/ Data
	brown/green	blue	white/green	white	grey	pink	violet	yellow

- Up = power supply voltage
- Sensor: The sensor pins are bridged in the scanning head with the particular power supply.
- The shield is connected with the chassis.
- Not connected pins or wires must not be used.
- * Required for adjustment/inspection by PWT 100.

Pin assignment Panasonic

8-pin M12-connector according to IEC 61076-2-101 LM008-Gxx-A					15-pin D-sub			
Voltage supply					absolute position values			
	8	2	5	1	3	4	7	6
	4	12	2	10	5	13	8	15
	Up	Sensor Up	0 V	Sensor 0 V	occupied *	occupied *	Request Data	Request Data
	brown/green	blue	white/green	white	grey	pink	violet	yellow

- Up = power supply voltage
- Sensor: The sensor pins are bridged in the scanning head with the particular power supply.
- The shield is connected with the chassis.
- Not connected pins or wires must not be used.
- * Required for adjustment/inspection by PWT 100.

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.

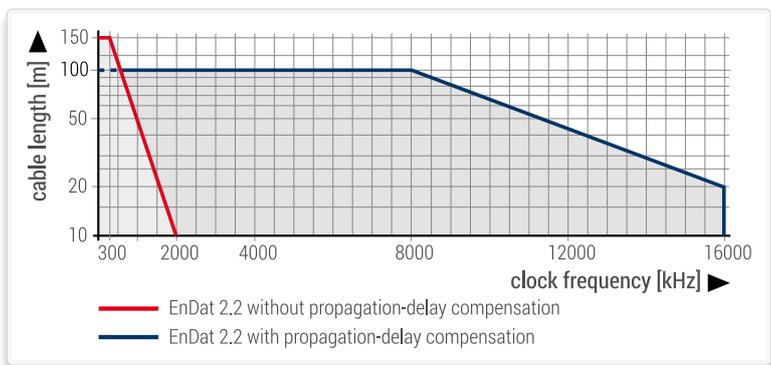
Interface	EnDat 2.2 serial bidirectional
Data transfer	Position values, parameters and additional data
Data input	Differential line receiver according to EIA standard RS 485 for the signals CLOCK, $\overline{\text{CLOCK}}$, DATA and $\overline{\text{DATA}}$
Data output	Differential line driver according to EIA standard RS 485 for DATA and $\overline{\text{DATA}}$ 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
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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. It is not transmitted to the subsequent electronics until after the calculation time total has passed. The calculation time is ascertained at the highest clock frequency permissible for the encoder, but at no greater than 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.:

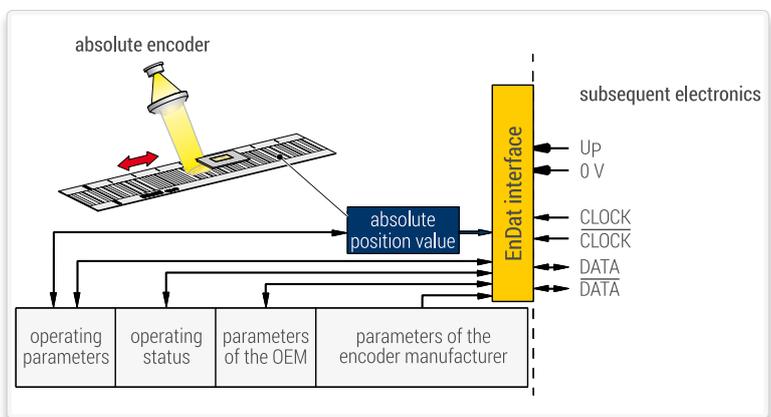
- Encoder-specific information
- Information of the OEM (e. g. „electronic ID-label“ of the motor)
- Operating parameters (datum shift, instruction, etc.)
- Operating status (alarm or warning messages)

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

- Error messages
- Warnings
- Online diagnostics based on valuation numbers (EnDat 2.2)

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

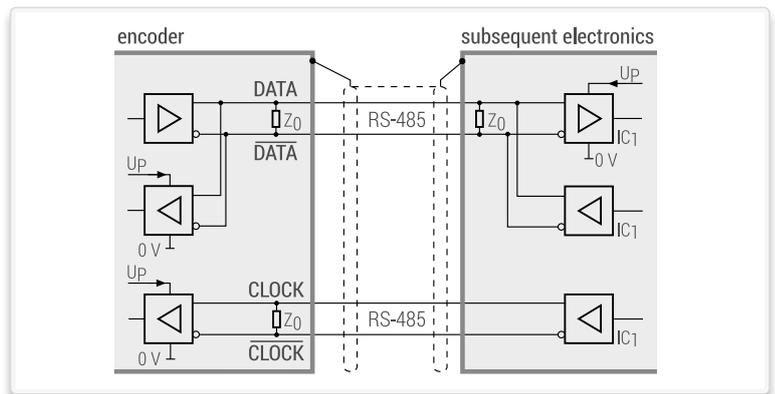
Dimensioning

IC1 = RS 485 differential line receiver

$Z_0 = 120 \Omega$

EnDat2.2 is a bidirectional interface of HEIDENHAIN.

Detailed information you will find on: www.endat.de



CUSTOMER-SPECIFIC SERIAL INTERFACES

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: Mit02-2
Generation 1, one-pair transmission
- Ordering designation: Mit03-4
Generation 2, 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: Pana01

TECHNICAL DATA

SCANNING HEAD

Interface	EnDat 2.2	Mitsubishi high speed interface	Panasonic serial interface
Version	EnDat 2.2	Mit03-4	Mit02-2 Pana01
Model	MC 15	MC 15 M	MC 15 P
Measuring step	0.1 μm (100 nm) 0.05 μm (50 nm)		
Calculation time t_{cal} Clock frequency	$\leq 5 \mu\text{s}$ $\leq 16 \text{ MHz}$	-- --	-- --
Traversing speed	$\leq 600 \text{ m/min}$		
Interpolation error	$< \pm 2 \mu\text{m}$		
Electrical connection	Cable, 1 m or 3 m with M12-connector 8-pin or D-sub connector 15-pin		
Cable length	$\leq 100 \text{ m}$	$\leq 30 \text{ m}$	$\leq 50 \text{ m}$
Voltage supply	DC 3.6 V to 14 V		
Power consumption max.	at 3.6 V: $\leq 800 \text{ mW}$ at 14 V: $\leq 900 \text{ mW}$	at 3.6 V: $\leq 950 \text{ mW}$ at 14 V: $\leq 1050 \text{ mW}$	
Current consumption typ.	at 5 V: 80 mA (without load)	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)		
Operating temperature	-10 °C to 50 °C		
Weight Scanning head Connecting cable Connector	$\leq 18 \text{ g}$ (without cable) 20 g/m M12-connector: 15 g; D-sub connector: 28 g		

GRADUATION CARRIER

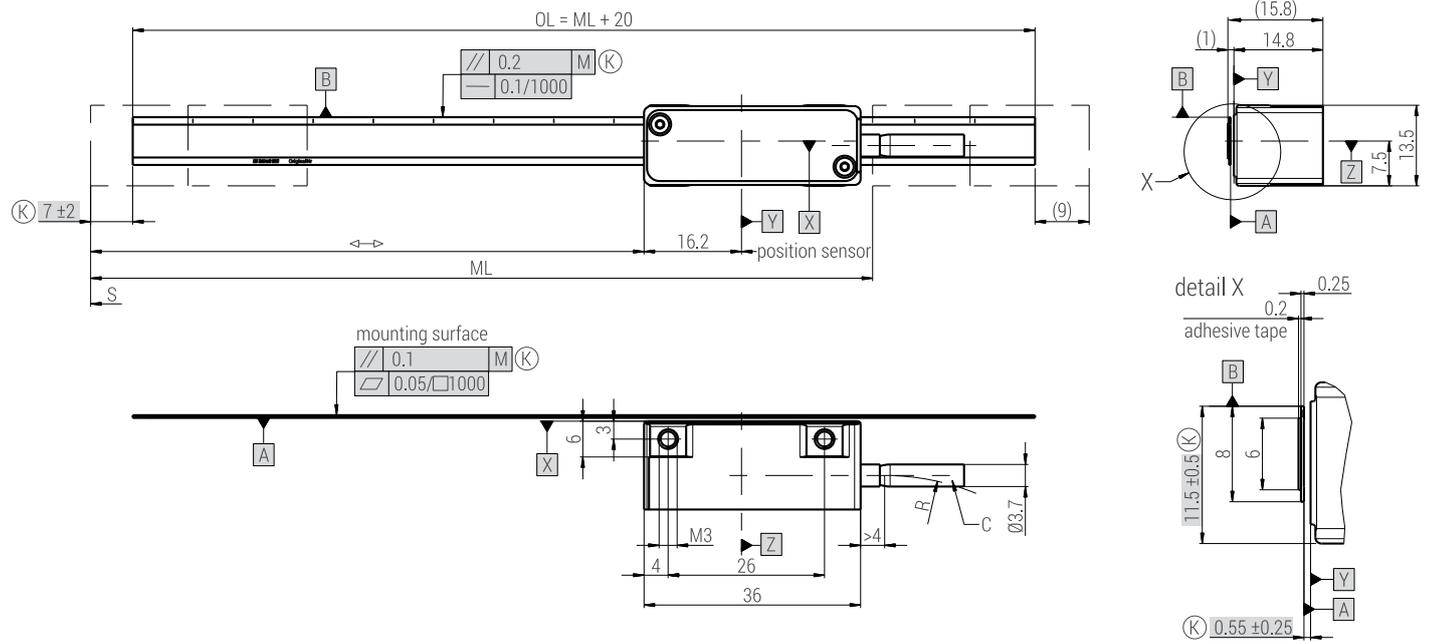
Graduation carrier	<ul style="list-style-type: none"> ▪ MK: steel tape scale with absolute track and adhesive tape ▪ MP: steel tape scale with absolute track in aluminum carrier with clamping element
Coefficient of linear expansion	$\alpha \approx 10 \times 10^{-6}/\text{K}$
Accuracy grade	$\pm 15 \mu\text{m/m}$
Measuring length ML	up to 3020 mm; longer lengths on request
Weight Scale tape Aluminum carrier + Clamping element	20 g/m 12 g/m + 15 g

MC 15 MK

- Steel tape scale with absolute track and adhesive tape



Dimensions, mounting tolerances:



- M = machine guideway
- ML = measuring length
- OL = overall length
- $\leftarrow S \dots S + ML$
- C = cable
- (K) = required mating dimensions
- R = bending radius: stat. $R \geq 8$ mm, dyn. $R \geq 40$ mm
- S = code start value not defined

- permissible position deviation of the scanning unit - scale tape reference plane **A B**
- Z = ± 0.25 mm (airgap)
- Y = ± 0.5 mm (lateral)
- $\angle Z = \pm 20$ mrad or $\pm 1.15^\circ$ (yaw angle)
- $\angle Y = \pm 20$ mrad or $\pm 1.15^\circ$ (pitch angle)
- $\angle X = \pm 20$ mrad or $\pm 1.15^\circ$ (roll angle)

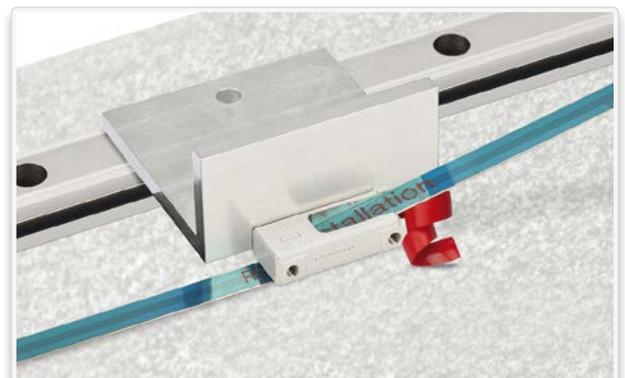
scale
arbitrary position of absolute coding
zero position set by customer

mm

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

Tape mounting tool **TMT 14 MK** (optional)
For safe and precise mounting of the steel tape scale.

- Mount TMT 14 MK instead of the MS 15 scanning head.
- Thread steel tape scale (version MK) and move along the scale length.
- Remove TMT 14 MK, mount MS 15 scanning head.

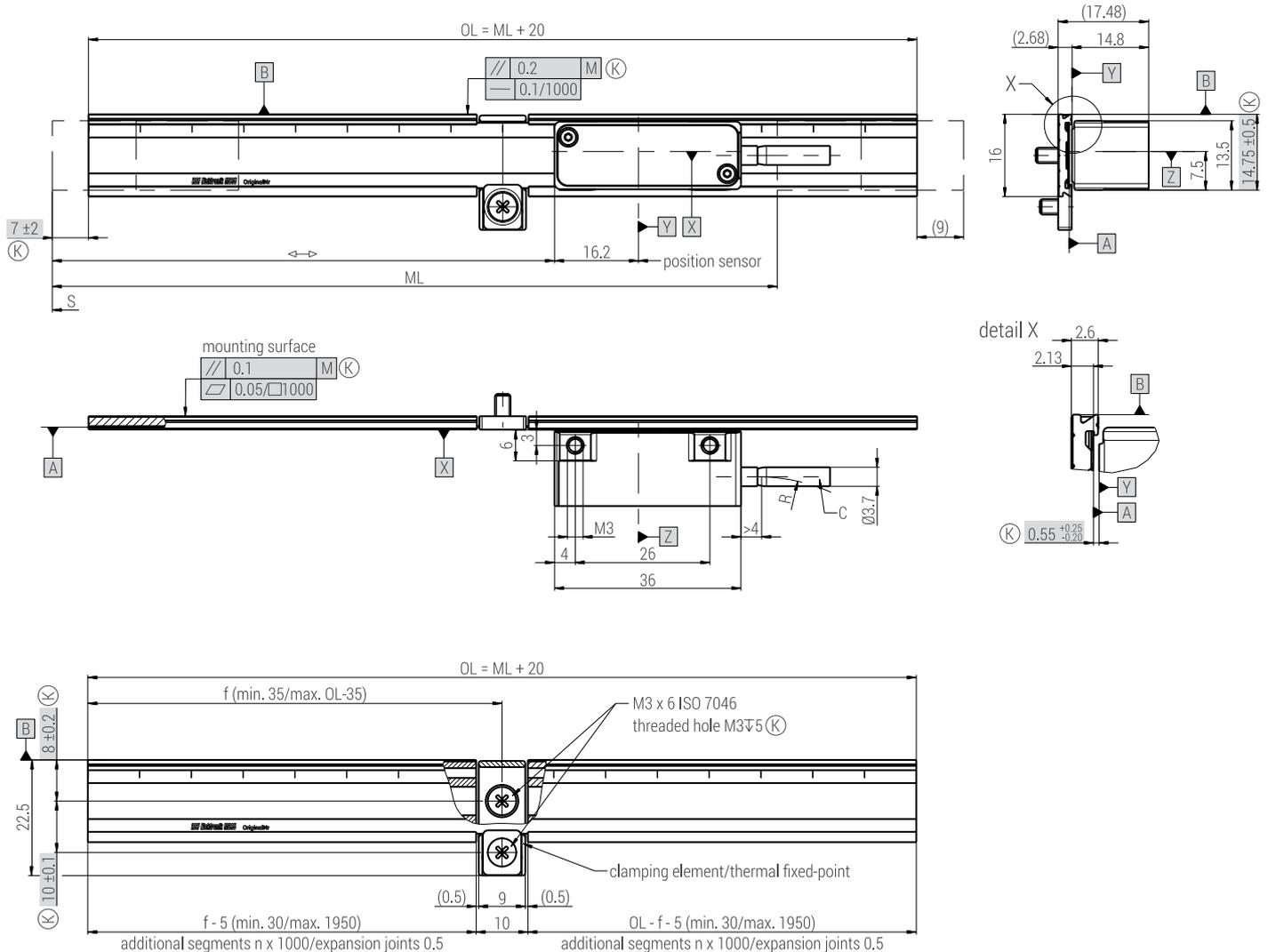


MC 15 MP

- Steel tape scale in aluminum carrier with clamping element
- Clamping element bolted
- Carrier with adhesive tape



Dimensions, mounting tolerances:



- M = machine guideway
- ML = measuring length
- OL = overall length
- ↔ = S...S + ML
- f = OL/2 (standard) any position of the clamping element (optional)
- C = cable
- (K) = required mating dimensions
- R = bending radius: stat. R ≥ 8 mm, dyn. R ≥ 40 mm
- S = code start value not defined

- permissible position deviation of the scanning unit - scale tape reference plane [A|B]
- Z = +0.25 mm - 0.2 (airgap)
- Y = ±0.5 mm (lateral shift)
- Z = ±20 mrad or ±1.15° (yaw angle)
- Y = ±20 mrad or ±1.15° (pitch angle)
- X = ±20 mrad or ±1.15° (roll angle)
- scale
- arbitrary position of absolute coding
- zero position set by customer

mm

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

ACCESSORY EXTERNAL TESTING DEVICE PWT 100

The PWT 100 is a testing device for checking the function and adjustment of absolute RSF Elektronik encoders. Thanks to its compact dimensions and robust design, the PWT 100 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

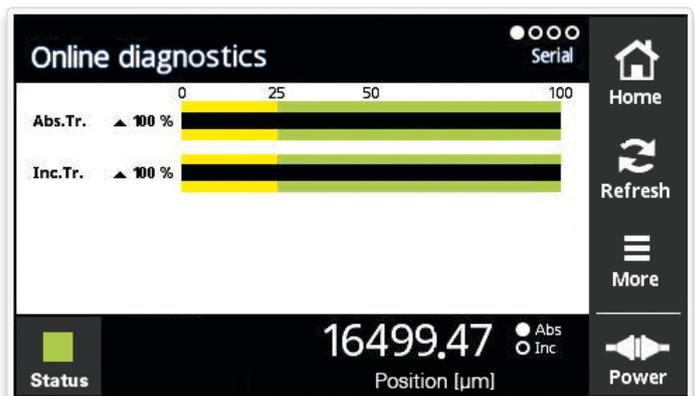
The performance range of the PWT 100 can be expanded by firmware update. Appropriate firmware files that can be imported to the PWT 100 through a memory card (not included in delivery) will be made available at www.heidenhain.de.

MOUNTING WIZARD

As far as the adjustment of encoders is concerned, the PWT 100 can only be used for online diagnostics.



Feature content of the PWT 100	EnDat 2.2	Mitsubishi	Panasonic
Position display			
Display of the absolute position	✓	✓	✓
Display and resetting of error messages	✓	✓	✓
Display and resetting of warnings	✓	✓	✓
Display of transmission status	✓	✓	✓
Diagnose			
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	✓	✓	✓



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RSF Elektronik

Ges.m.b.H.

Linear Encoders
Cable Systems
Precision Graduations
Digital Readouts

Zertifiziert nach
DIN EN ISO 9001
DIN EN ISO 14001

