RSF Elektronik

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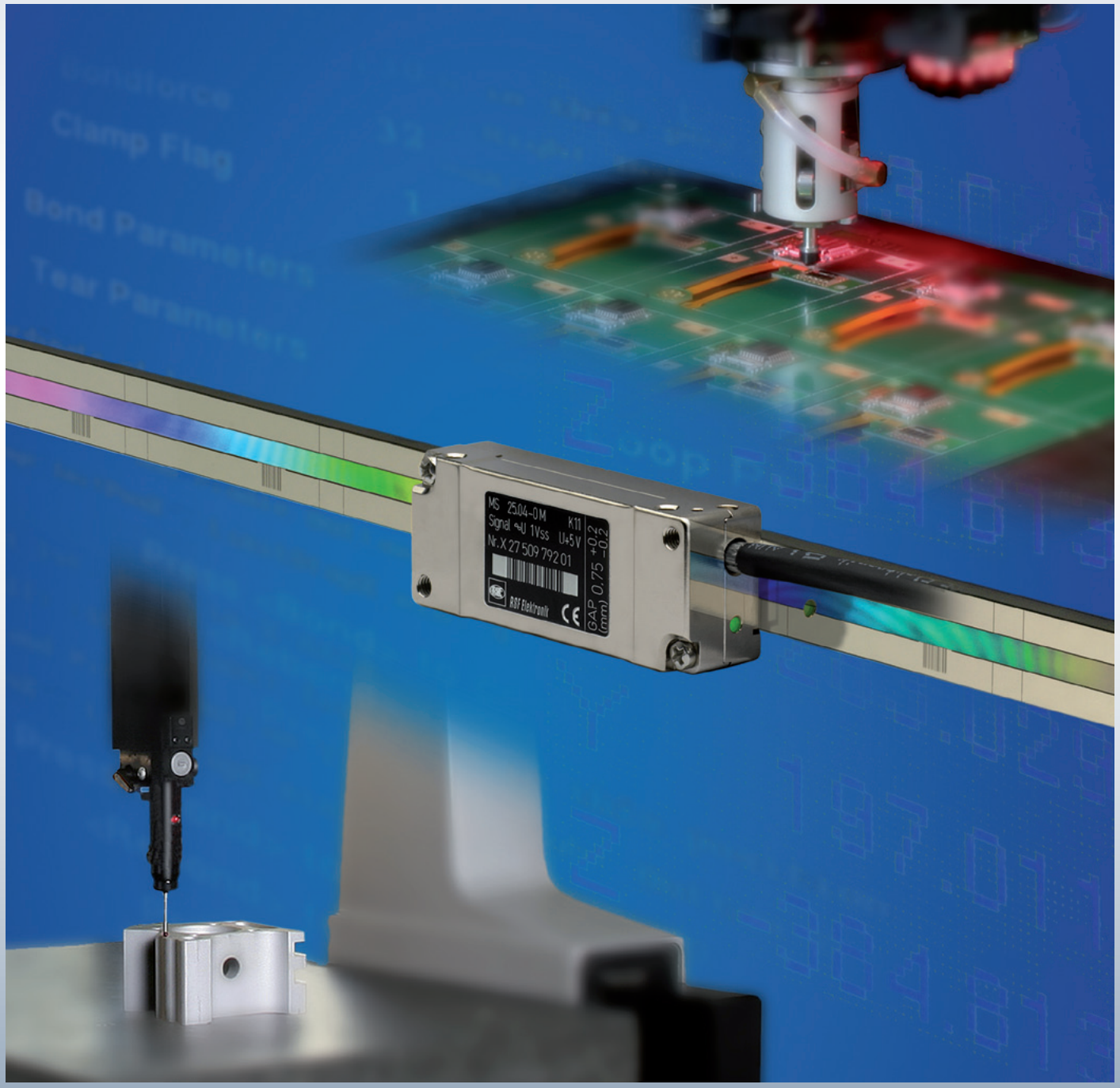
MS 2x Series

Exposed Linear Encoders with Singlefield Scanning



CONTENTS

TERM-EXPLANATIONS

Grating Pitch (Interval)
A grating is a continuous series of lines and spaces printed on the scale. The width of one line and one space is called the pitch (sometimes referred to as the interval) of the grating. The lines and spaces are accurately placed on the scale.

Signal Period
When scanning the grating, the encoder head produces sinusoidal signals with a period equal to the grating pitch.

Interpolation
The sinusoidal signal period can be electronically divided into equal parts. The interpolation circuitry generates a square wave edge for each division.

Measuring Step (Resolution)
The smallest digital counting step produced by an encoder.

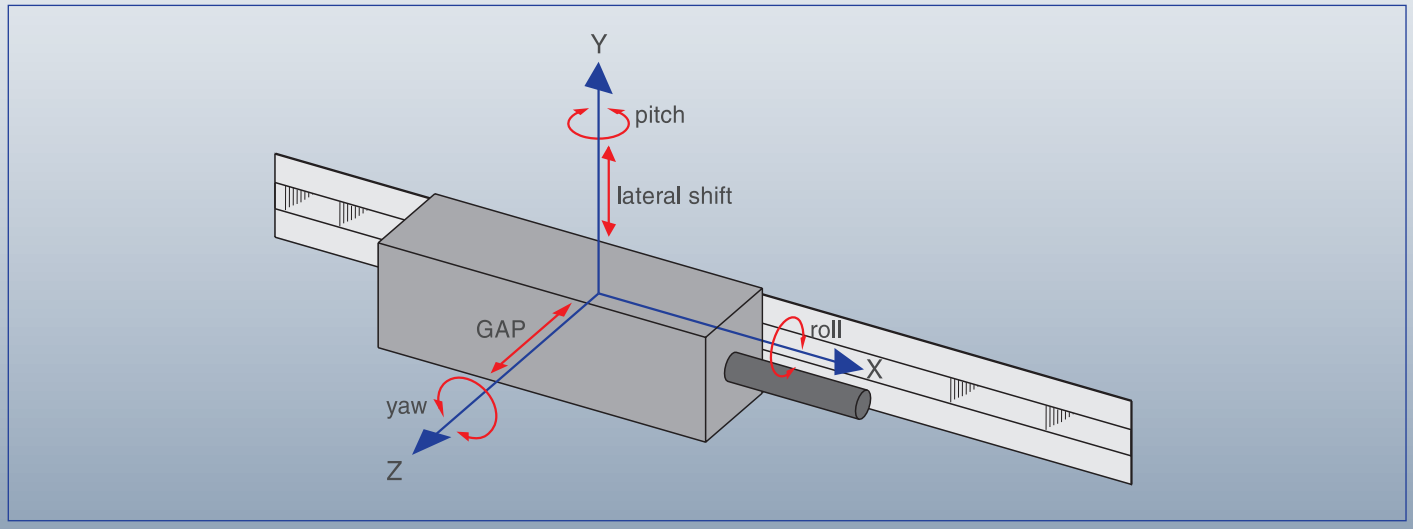
Reference Pulse (Reference Mark)
There is an additional track of marks printed next to the grating to allow a user to find an absolute position along the length of the scale. A one increment wide signal is generated when the encoder head passes the reference mark on the scale. This is called a “true” reference mark since it is repeatable in both directions. Subsequent electronics use this pulse to assign a preset value to the absolute reference mark position.

Error Signal
This signal appears when a malfunctioning encoder generates faulty scanning signals.

Accuracy
This is a fundamental characteristic, which is specified with an accuracy grade (e.g. ±5 µm/m).

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

Yaw Angle, Pitch Angle, Roll Angle, Lateral Shift, Airgap
Mounting tolerances of the encoder head relative to the scale.



REQUIREMENTS IN AN EXPOSED LINEAR ENCODER

- Contamination resistance
- Immunity against aging and temperature changes
- High resolution
- High traversing speed
- Large mounting tolerances
- Small dimensions

The MS 2x series meets all these requirements!

The trend today in motion control applications is for exposed Linear Encoder systems.
This is driven by steadily increasing demands for
- higher traversing speed
- higher operating cycles
- lower mechanical backlash
- zero frictional force induced by the encoder.

Only exposed, non-contact encoders fulfill all these requirements.

For special requirements like closed loop, speed control, highest accuracy and others it is important to minimize the interpolation errors.
Historically, the small grating periods used had the disadvantages of smaller mounting gaps and very tight overall mounting tolerances.
The MS 2x series encoders´ 40 µm grating period minimizes interpolation errors but can be mounted with a large gap and liberal mounting tolerances.

A drawback of many exposed Linear Encoders is their sensitivity to dirt and contamination on the scale.
The MS 2x series encoders´ unique optical design minimizes the effect of dirt and contamination normally associated with the exposed Linear Encoders.

The MS 2x series utilizes a unique scanning principle which allows high traversing speeds (up to 10 m/s), large mounting tolerances and contamination on the scale.

Reference marks, accurate and repeatable from both traversing directions, are standard.
Version MS 21, MS 26: The position of the reference mark can be selected by the customer.

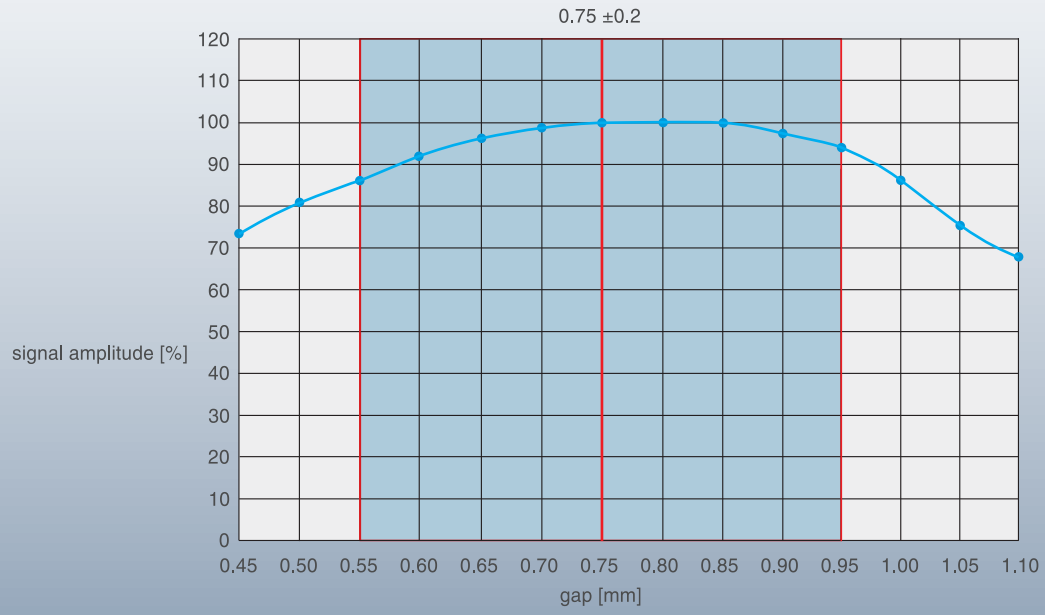
A wide range of interpolation electronics, integrated into the encoder head, enables resolutions from 10 µm to 100 nm. Square-wave signals, single ended, or via Line Driver RS 422, are provided at the output of the encoder head.

Units with sinusoidal output, 1Vpp, are also available.

Two end of travel optical switch signals are available directly out of the reader head. The end of travel signal locations can be easily set by the user.

Due to recent advancements in technology, all of these benefits are now available in a small package design.

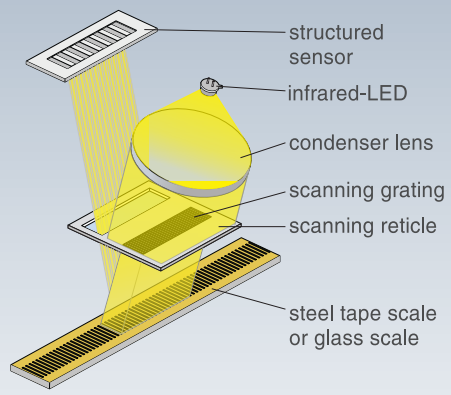
Signal amplitude vs. reading head gap



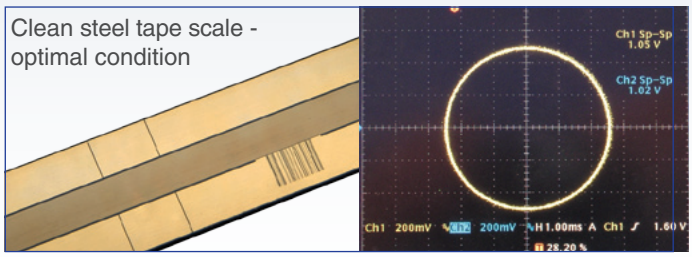
SCANNING PRINCIPLE

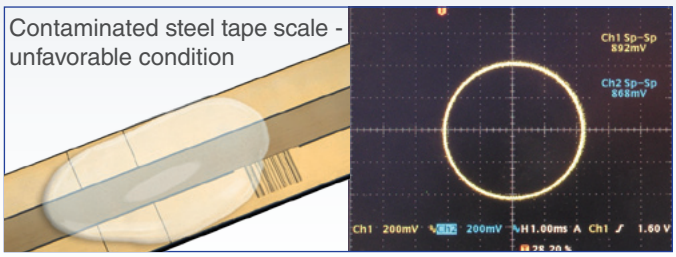
The MS 2x series incremental Linear Encoders work with the imaging, photoelectric measuring principle and a **singlefield reflective scanning** method. A scale graduation pattern on a steel tape (with gold grating) or a glass scale (with chrome grating) with 40 µm grating pitch is used. The light from an infrared LED with a small light emitting surface is collimated parallel by a condenser lens and directed through the scanning reticle to the scale. When the scale is moved relative to the encoder head, the light is modulated by the scale gratings and produces a periodic intensity signal that is converted into electrical signals by photo elements back in the encoder head.
The scanning reticle is designed to allow for a large mounting gap and liberal mounting tolerances. This system is insensitive to waviness of the steel tape due to poor mounting conditions. Any minor differences in the grating period of the scale or the scanning reticle will not cause a measuring problem due to the large continuous pattern reflected onto the structured sensor. This sensor consists of multiple photo elements connected in a pattern to generate four sinusoidal signals, each shifted by 90°. All four signals are generated from one scanning field and all four signals are equally influenced by any contamination simultaneously. When all four signals are influenced at the same time by the same amount, interpolation error is eliminated.

Scanning priciple



Effect of contamination on the quality and size of the measuring signal

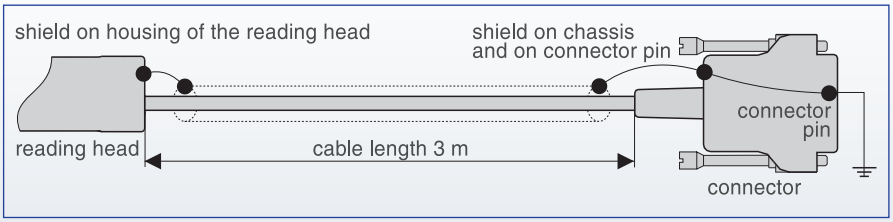




High insensitivity to contamination by use of a new scanning principle

SHIELDING, PIN ASSIGNMENTS

Single-shielded PUR-cable, Ø: 4.3 mm
Bending radius fixed mounting: > 10 mm,
continuous flexing: > 50 mm
Torsion: > 300.000 cycles,
Dragchain: > 5.000.000 cycles
Applicable cables for use in vacuum-applications are also available on request.

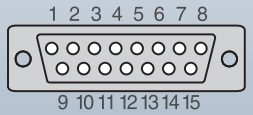


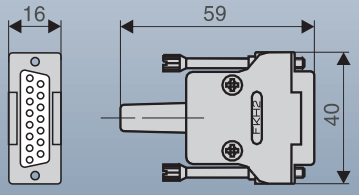
Connector LD15 15-pin

Pin	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Sinusoidal voltage signals 1 Vpp	nc	0 V sensor	nc	$\overline{RI}$	$\overline{A2}$	$\overline{A1}$	+5 V sensor	+5 V	0 V	S1**	S2**	RI	A2	A1	shield
Square-wave signals via Line Driver	test*	0 V sensor	$\overline{US}$	$\overline{RI}$	$\overline{T2}$	$\overline{T1}$	+5 V sensor	+5 V	0 V	S1**	S2**	RI	T2	T1	shield

- Test: **Analog signal switch-over for setup**
  By applying +5 V to the test pin, the test signals (analog) are switched to the output connector.
- * MS 25, MS 26 = nc
- ** Version without switch signals (version 0) = nc
- Sensor: The sensor-pins are bridged in the chassis with the particular power supply.
- **MS 20, MS 25**: S1, S2 = switch signals
  MS 21, MS 26: S1 = conditionally useable as switch signal
  S2 = switch signal
- The shield is additional connected with the chassis.

Pin Assignment
(view on pins)





OUTPUT SIGNALS

Sinusoidal voltage signals 1Vpp

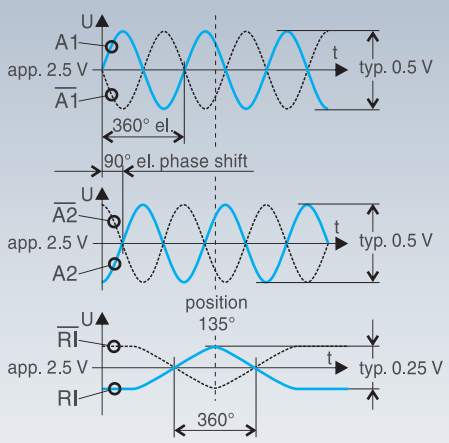
(drawing shows “positive counting direction”)
Two sinusoidal voltage signals A1 and A2 and one reference mark signal (all with inverted signals).

Power supply: +5 V ±5 %, max. 130 mA (unloaded)
Track signals (differential voltage A1 to $\overline{A1}$ resp. A2 to $\overline{A2}$):
Signal amplitude 0.6 Vpp to 1.2 Vpp; typ. 1 Vpp
(with terminating impendance Zo = 120 Ω between A1 to $\overline{A1}$ resp. A2 to $\overline{A2}$)

Reference mark
(differential voltage RI to $\overline{RI}$):
Useable component 0.2 up to 0.85 V; typical 0.5 V
(with terminating impedance Zo = 120 Ω between RI to $\overline{RI}$)

Advantage:
- High traversing speed with long cable lengths possible

Voltage signals (1 Vpp)



Square-wave signals

(drawing shows “positive counting direction”)
With a Schmitt-Trigger (for times 1) or interpolation electronics (for times -5, -10, -20, -25, -50 or -100) the photoelement output signals are converted into two square-wave signals that have a phase shift of 90°.
Output signals either can be "single ended" or Line Driver "differential" (RS 422).
One measuring step reflects the measuring distance between two edges of the square-wave signals.

The controls/DRO´s must be able to detect each edge of the square-wave signals. The minimum edge separation a_{min} is listed in the technical data and refers to a measurement at the output of the interpolator (inside the scanning head). Propagation-time differences in the Line Driver, the cable and the Line Receiver reduce the edge separation.

Propagation-time differences:
Line Driver: max. 10 ns
Cable: 0.2 ns per meter
Line receiver: max. 10 ns refered to the recommended Line Receiver circuit

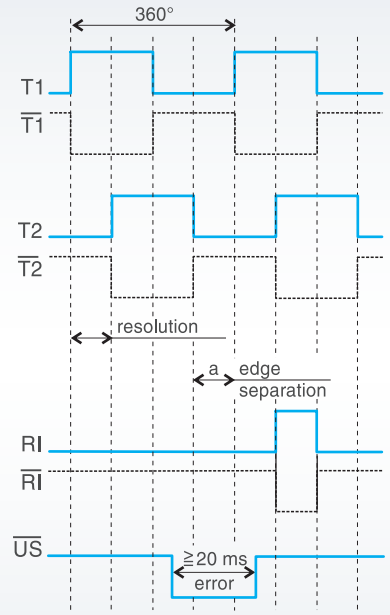
To prevent counting errors, the controls/DRO´s must be able to process the resulting edge separation.

Example:
a_{min} = 100 ns, 10 m cable
100 ns - 10 ns - 10 x 0.2 ns - 10 ns = 78 ns

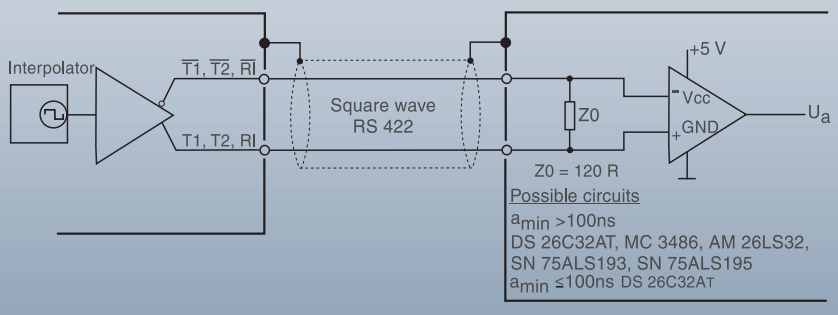
Power supply: +5 V ±5%, max. 165 mA (unloaded)

Advantage:
- Noise immune signals
- No further subdividing electronics necessary

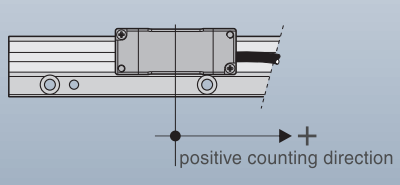
Square wave signals „differential“



Recommended Line Receiver circuit



Counting direction

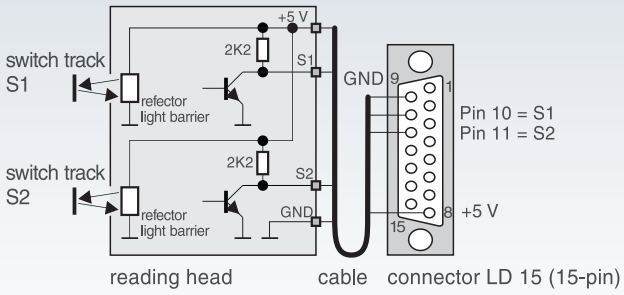


SWITCH SIGNAL OUTPUT

For individual special functions there are two additional switch tracks on the glass scale/ metal tape .
The switching point position can be chosen by the user by placing self-adhesive covering tapes.

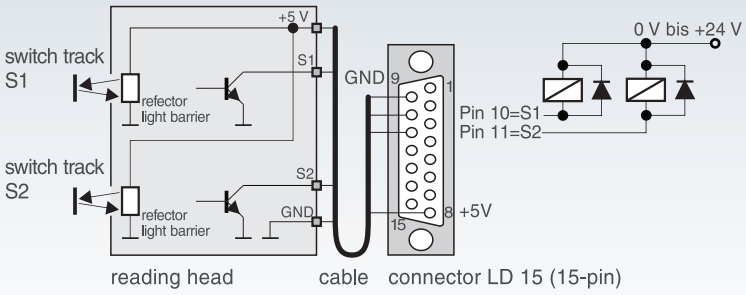
With the MS 21.xx, MS 26.xx version there is just one switch signal available.
The second track of this version is used to select the reference mark.
This feature makes the selection of the reference mark position, by the user, very easy.

VERSION 1
TTL output (active high)

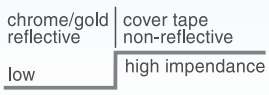


S1, S2 = TTL output
I_{SOURCE} = 1 mA (high level > 2 V)
I_{SINK} = 20 mA (low level < 0.8 V)

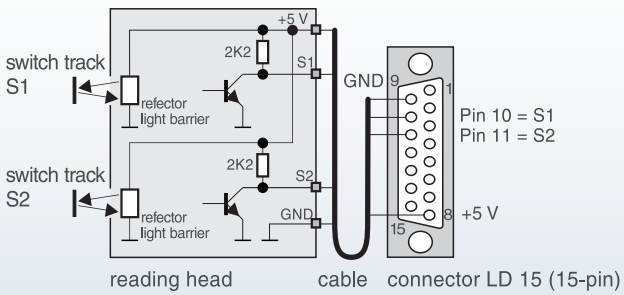
VERSION 2 (STANDARD)
open collector output (active high impedance)



S1, S2 = open collector output
I_{SINK} = 20 mA (low level < 0.8 V)

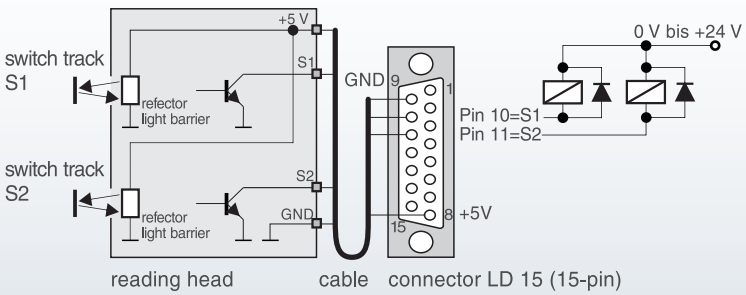


VERSION 3
TTL output (active low)

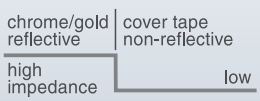


S1, S2 = TTL output
I_{SOURCE} = 1 mA (high level > 2 V)
I_{SINK} = 20 mA (low level < 0.8 V)

VERSION 4 (STANDARD)
open collector output (active low)



S1, S2 = open collector output
I_{SINK} = 20 mA (low level < 0.8 V)



MS 25, MS 26 WITH INTEGRATED MOUNTING CONTROL

Features:

- Easy mounting; no test box or oscilloscope needed
- The quality of the scanning signal is visible via a tricolored LED - directly at the reading head
- Permanent-control of the scanning signals over the whole measuring length
- Function-control of the reference impulse
- **MS 25**: Two independent switch signals for individual functions
- **MS 26**: Position of reference mark can be selected by the customer
  one switch signal for special functions

LED-display to evaluate the „counting signals“

Amplitude-range sin cos	LED flashes	LED colour	Mounting is …
1.35 V - 1.45 V	5x	●	insufficient
1.25 V - 1.35 V	4x	●	insufficient
1.15 V - 1.25 V	3x	●	acceptable
1.05 V - 1.15 V	2x	●	good
0.95 V - 1.05 V	1x	●	**best**
0.85 V - 0.95 V	2x	●	good
0.75 V - 0.85 V	3x	●	acceptable
0.65 V - 0.75 V	4x	●	insufficient
0.55 V - 0.65 V	5x	●	insufficient
0.45 V - 0.55 V	6x	●	insufficient
0.35 V - 0.45 V	7x	●	insufficient
<0.35 V	8x	●	insufficient

Function-control reference impulse (RI)

While passing the reference mark,
the LED switches shortly into blue resp. red

- ● RI out of tolerance
- ● RI within tolerance

Note! The status display of the reference mark signal is switched off at higher velocities, in order to avoid permanent blinking.
The information of the incremental signals would otherwise no longer be displayed.

Attention:

- At MS 25, MS 26 version with square-wave signals, no analogue-signal switch-over for additional external mounting control is provided
- The remaining features and technical data are the same as for versions MS 20 and MS 21

MS 20, MS 21, MS 25, MS 26 TECHNICAL DATA

Features:

- **MS 25, MS 26** with integrated mounting control
- Small dimensions
- Easy mounting as a result of large mounting tolerances
- High insensitivity to contamination by use of an extensive Quasi-singlefield scanning principle
- High traversing speed
- Integrated subdividing electronics in the encoder head for up to times 100 interpolation (before quadrature)
- Reference mark (accurate and repeatable from both traversing directions)
- **MS 20**, **MS 25**: Two independent switch signals (optical) for individual functions
- **MS 21**, **MS 26**: Position of reference mark can be selected by the customer
- **MS 21**, **MS 26**: One switch signal for special functions

Reading head: 40 µm grating pitch

Scale model	Output signals	System resolution [µm]	Integrated interpolation	Max. velocity [m/s]	Max. output frequency [kHz]
MS 2x.04	∿ 1 Vpp	depending on external interpolation	--	10.0	250
					Edge separation amin
MS 2x.24	⎍	10	times 1	10.0	500 ns
MS 2x.34	⎍	5	times 2	10.0	250 ns
MS 2x.64	⎍	2	times 5	6.4	300 ns
MS 2x.74	⎍	1	times 10	3.2	300 ns
MS 2x.44	⎍	0.5	times 20	2.4	200 ns
MS 2x.54	⎍	0.4	times 25	1.92	200 ns
MS 2x.84	⎍	0.2	times 50	1.92	100 ns
MS 2x.94	⎍	0.1	times 100	0.96	100 ns

Mounting-adjustment/Test: With electronic signal test/set-up box to optimize or check the mounting (Page 18)

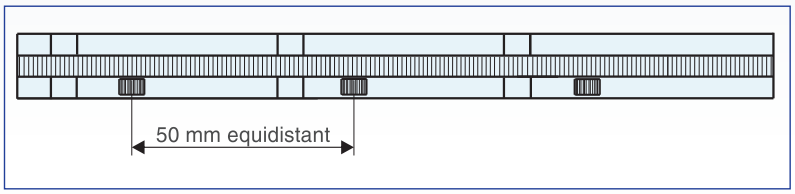
Permissible vibration: 150 m/s² (40 bis 2000 Hz)
Permissible shock: 750 m/s² (8 ms)

Permissible temperature:
–20 °C bis +70 °C (storage), 0 °C bis +50 °C (operation)

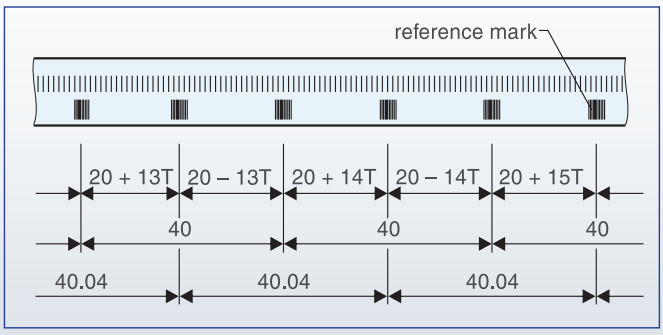
Scale unit: Grating carrier: Glass, glass ceramic (ROBAX, ZERODUR) or steel

Mechanical features of the scale unit	MS 20, MS 25		MS 21, MS 26	
Grating carrier	glass	steel	glass	steel
Grating pitch (T)	40 µm	40 µm	40 µm	40 µm
Accuracy grades	±3, ±5 µm/m	±5, ±15 µm/m	±3, ±5 µm/m	±5, ±15 µm/m
Non-linearity	≦ ±1 µm/70 mm ≦ ±3 µm/1000 mm		≦ ±1 µm/70 mm ≦ ±3 µm/1000 mm	
Maximum measuring length (ML)	3140 mm	20 000 mm	3140 mm	20 000 mm
Reference marks (RI)				
Standard: 50 mm (equidistant)	■	■	■	■
At any location, on request		■	■	■
Distance-coded	■	■ up to ML 6240 mm		
Position selectable by customer		■	■	■
Switch tracks	2	2	1	1

Principle of the standard reference marks



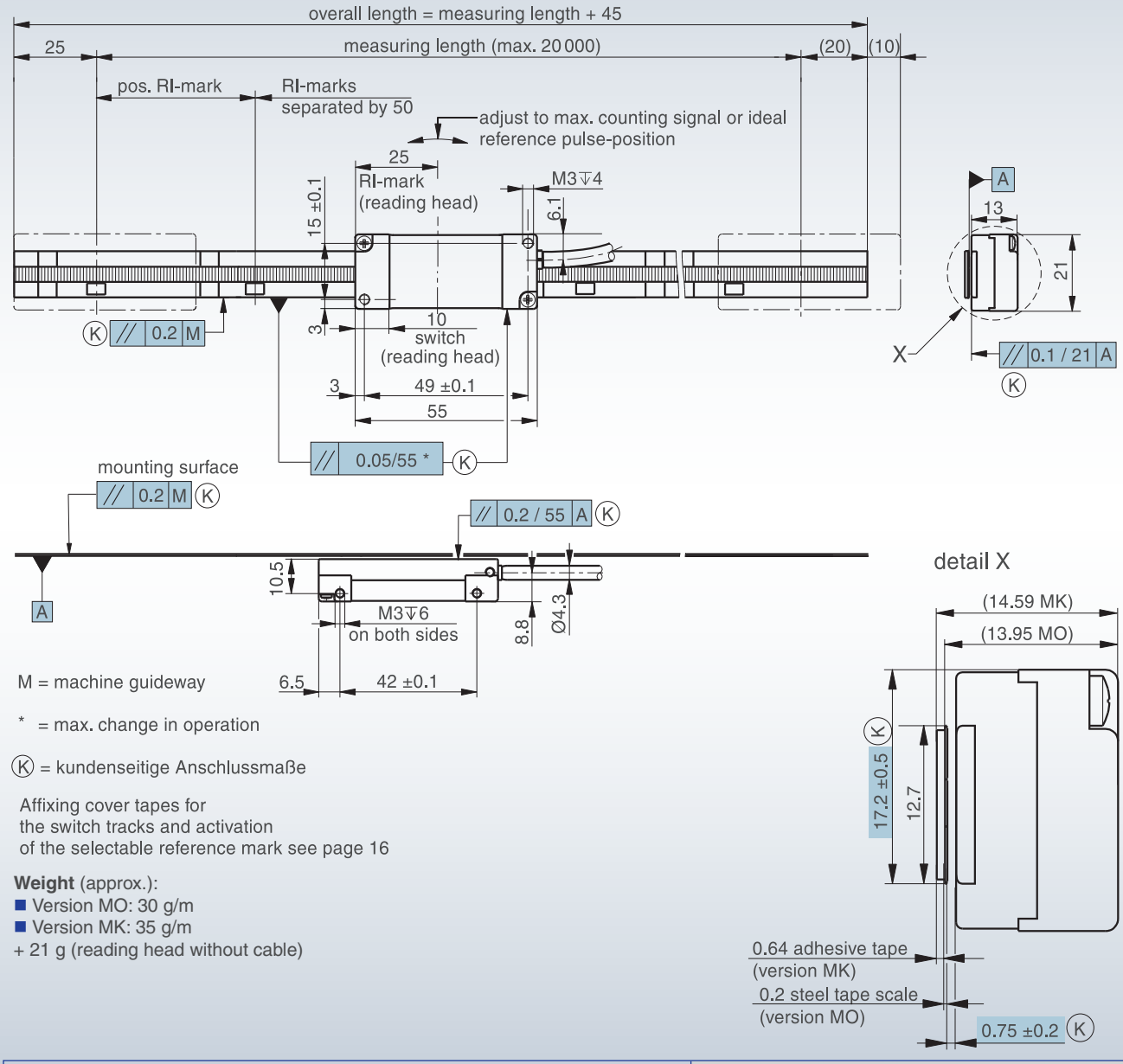
Principle of the distance-coded reference marks



MS 20, MS 21, MS 25, MS 26 MO/MK

- Version MO: Steel tape scale only
- Version MK: Steel tape scale with adhesive tape

Dimensions, mounting tolerances:



M = machine guideway

* = max. change in operation

Ⓚ = kundenseitige Anschlussmaße

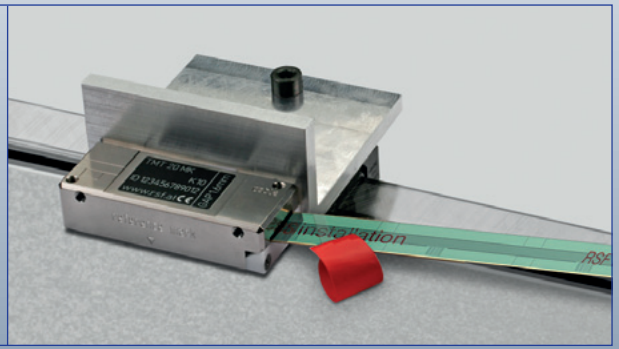
Affixing cover tapes for the switch tracks and activation of the selectable reference mark see page 16

Weight (approx.):
- Version MO: 30 g/m
- Version MK: 35 g/m

+ 21 g (reading head without cable)

Bandanbauhilfe **TMT 20 MK** (optional)
For safe and precise mounting of the steel tape scale.

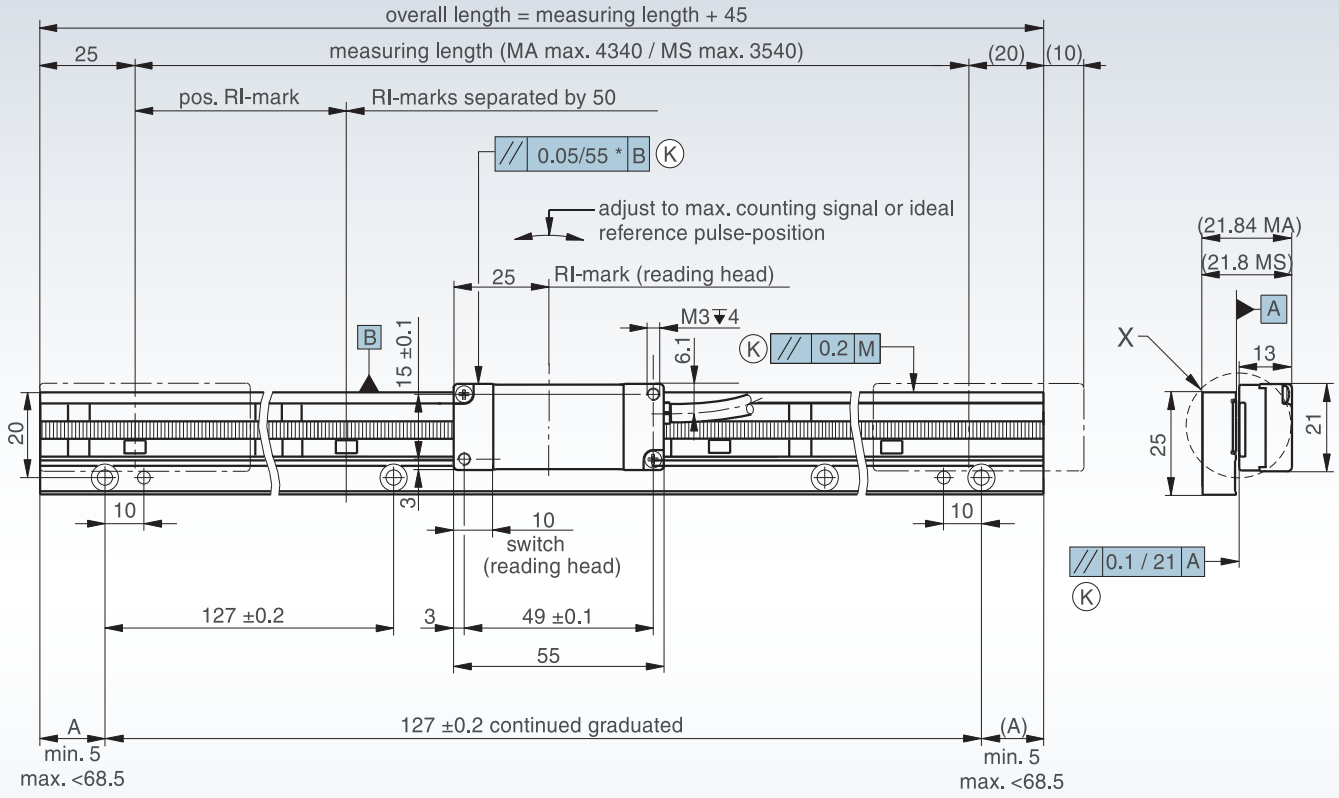
- Mount TMT 20 MK instead of the reading head MS 2x
- Thread steel tape scale (version MK) and move along the scale length
- Remove TMT 20 MK, mount reading head MS 2x

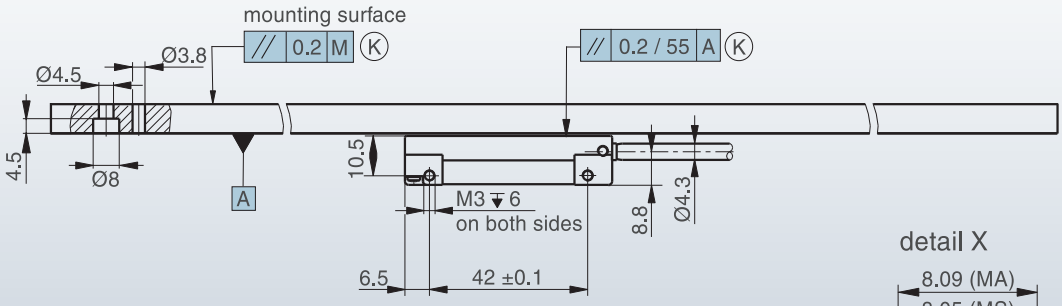


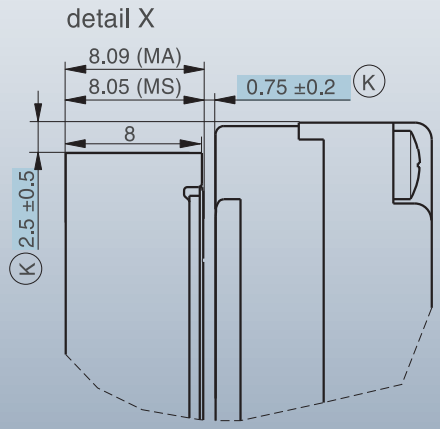
MS 20, MS 21, MS 25, MS 26 MA/MS

- Version MA: Steel tape scale on aluminum carrier
- Version MS: Steel tape scale on steel carrier
- Version MA, MS: Carrier bolted

Dimensions, mounting tolerances:







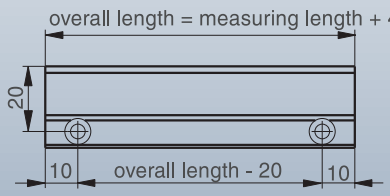
M = machine guideway

* = max. change in operation

(K) = required mating dimensions

Affixing cover tapes for the switch tracks and activation of the selectable reference mark see page 16

scale carrier for measuring length <92

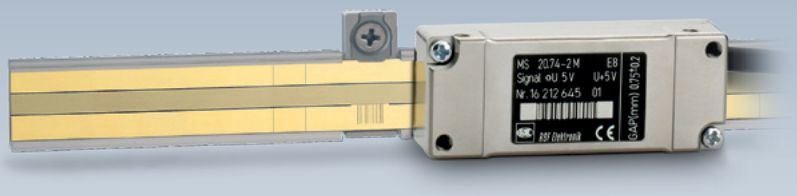


Weight (approx.):
- Version MA: 550 g/m
- Version MS: 1500 g/m

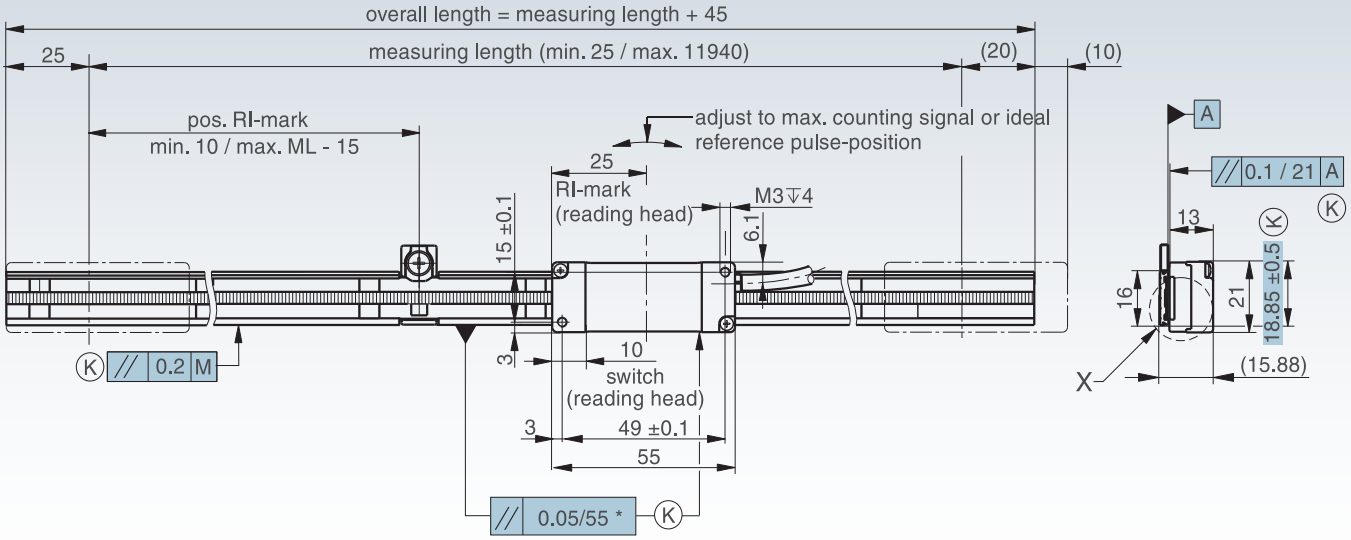
+ 21 g (reading head without cable)

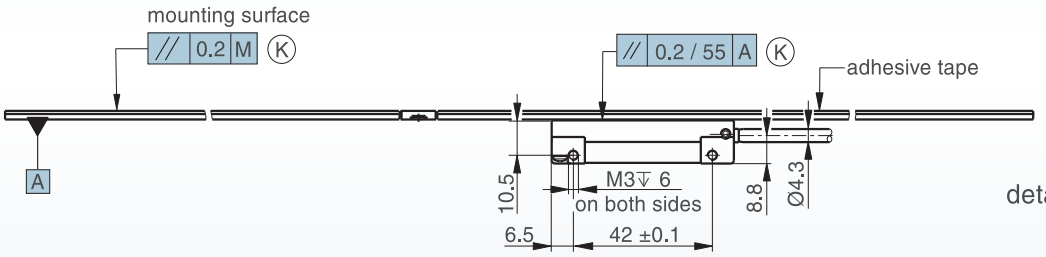
MS 20, MS 21, MS 25, MS 26 MP

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

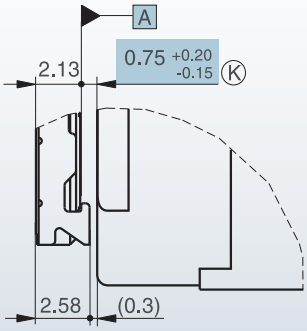


Dimensions, mounting tolerances:





detail X



M = machine guideway

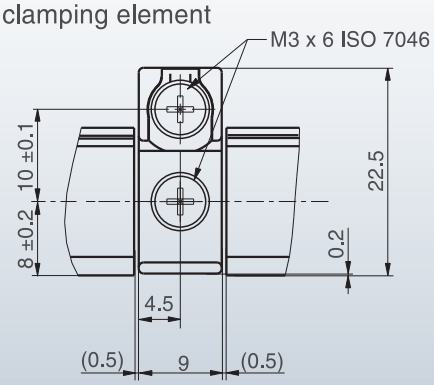
* = max. change in operation

Ⓚ = required mating dimensions

Affixing cover tapes
for the switch tracks
see page 16

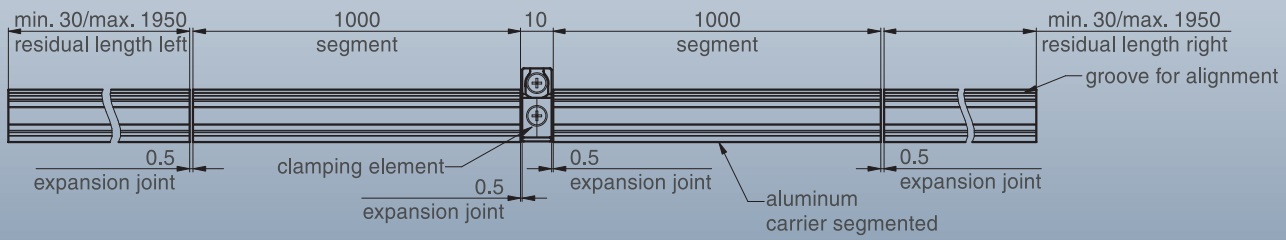
Weight (approx.):
- 115 g/m + 20 g clamping element + 21 g (reading head without cable)

clamping element



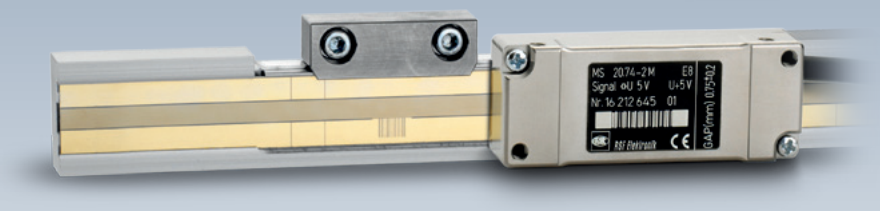
thread hole M3↧5 - supplied by customer

arrangements of the segments at large measuring lengths

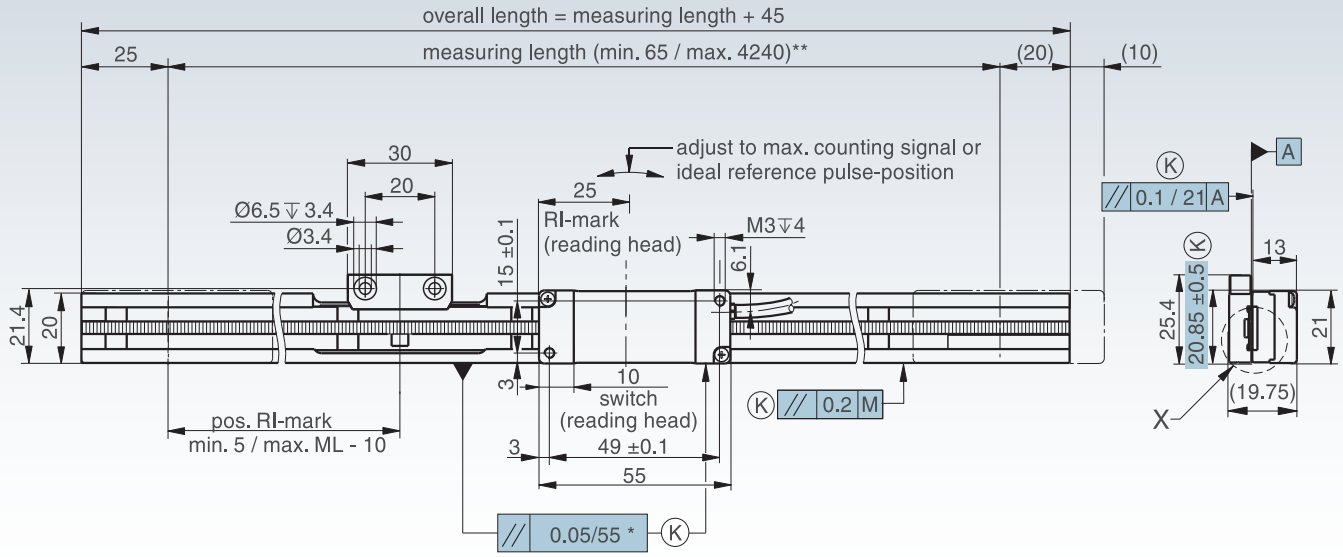


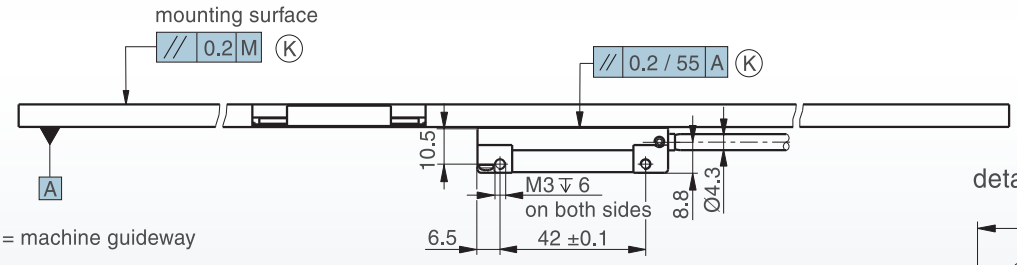
MS 20, MS 21, MS 25, MS 26 MT

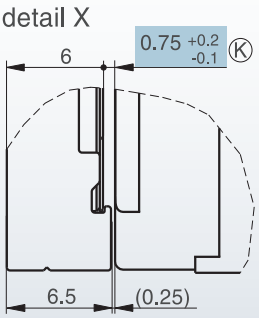
- Steel tape scale in aluminum carrier with clamping element
- Carrier bolted



Dimensions, mounting tolerances:







M = machine guideway

* = max. change in operation

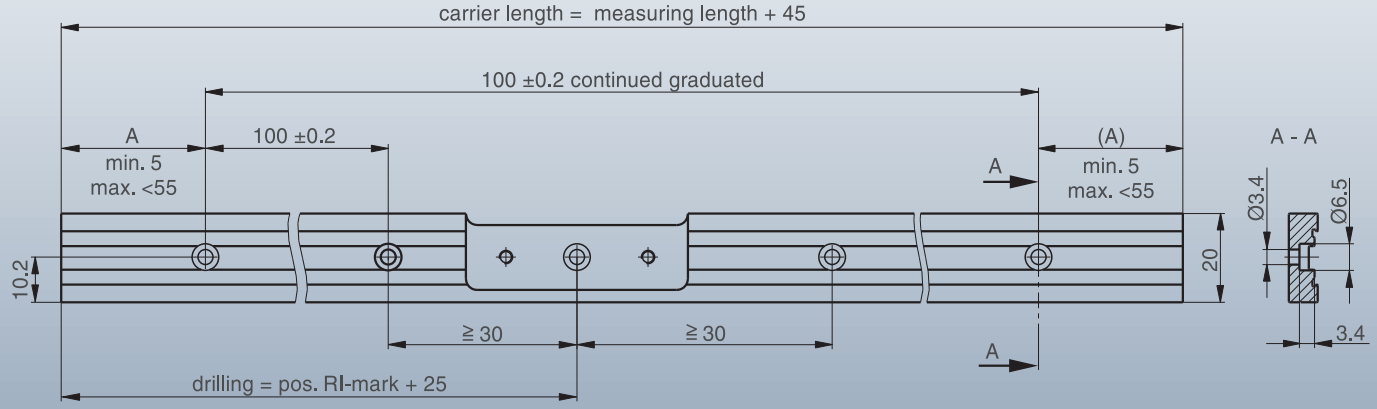
** = ML bis 11 940 mm on request; possible with a segmented carrier

Ⓚ = required mating dimensions

Affixing cover tapes for for switch tracks see page 16

Weight (approx.):
- 335 g/m + 20 g clamping element
+ 21 g (reading head without cable)

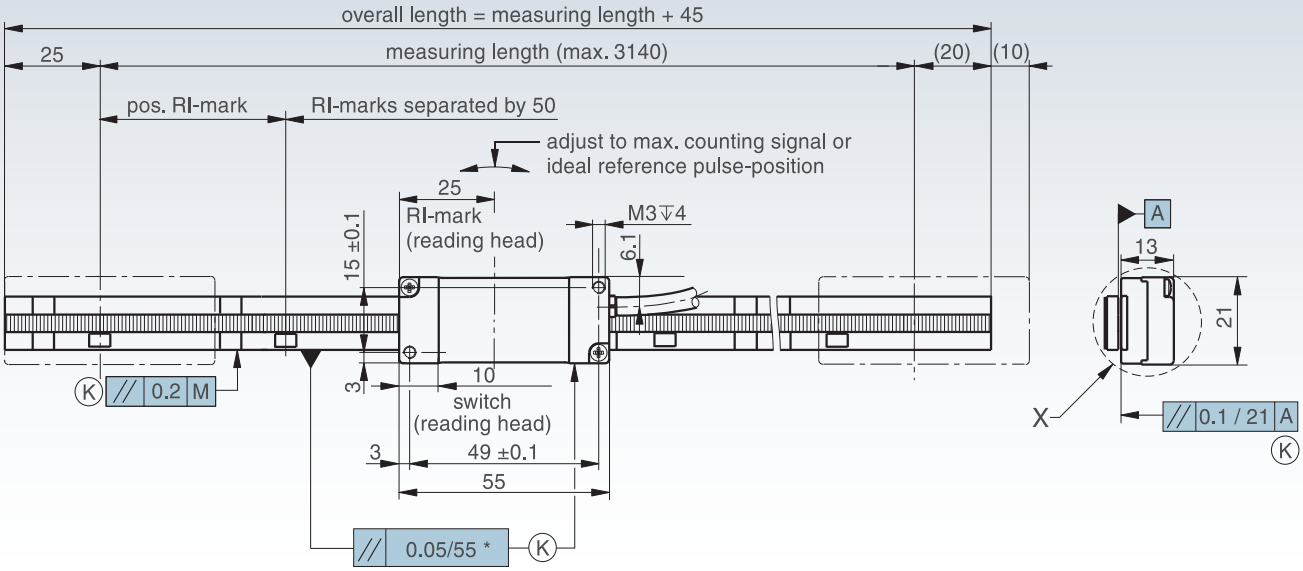
aluminum carrier

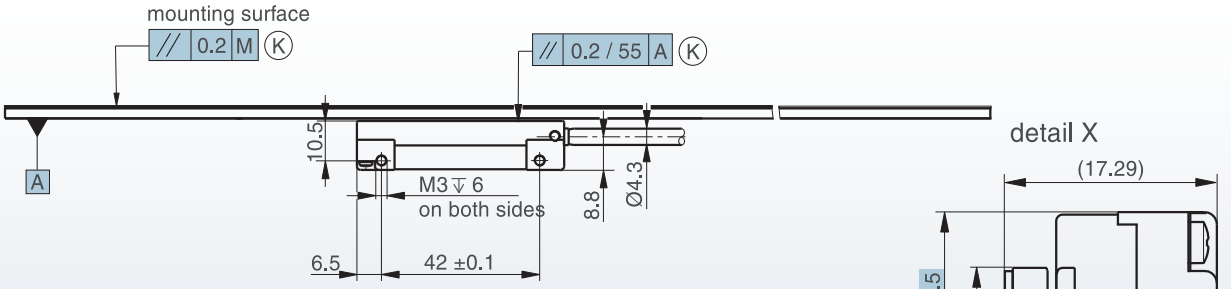


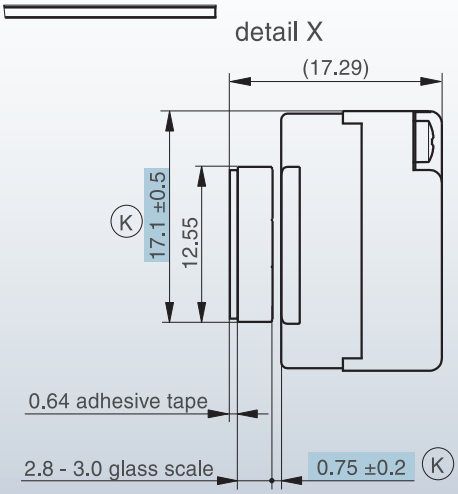
MS 20, MS 21, MS 25, MS 26 GK

■ Glass scale with adhesive tape

Dimensions, mounting tolerances:







M = machine guideway

* = max. change in operation

Ⓚ = required mating dimensions

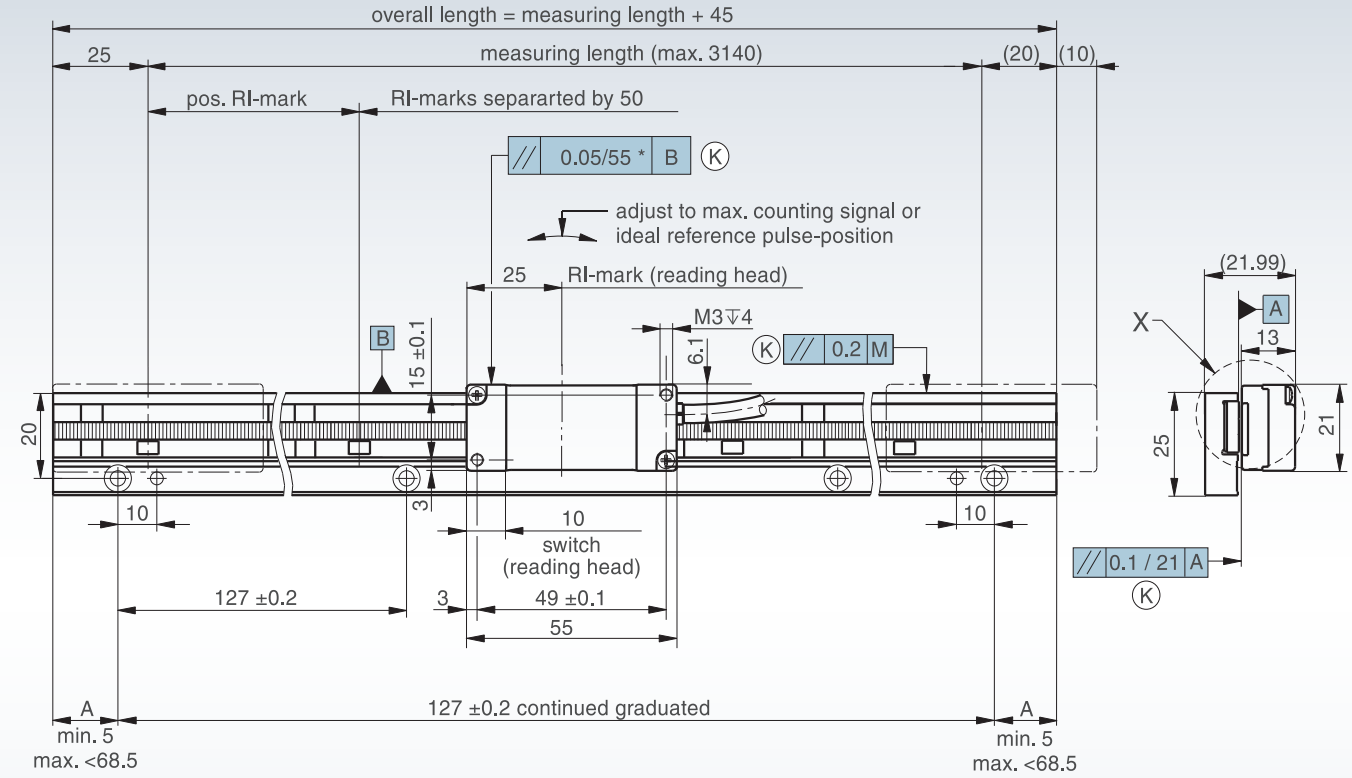
Affixing cover tapes for
the switch tracks and activation
of the selectable reference mark see page 16

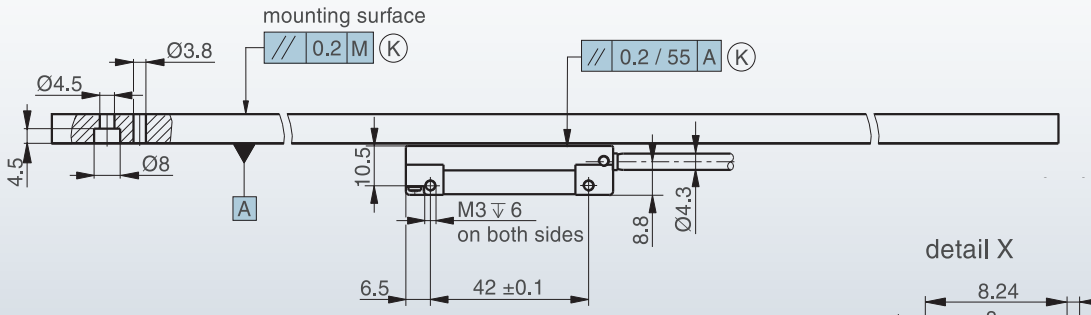
Weight (approx.):
■ 100 g/m
+ 21 g (reading head without cable)

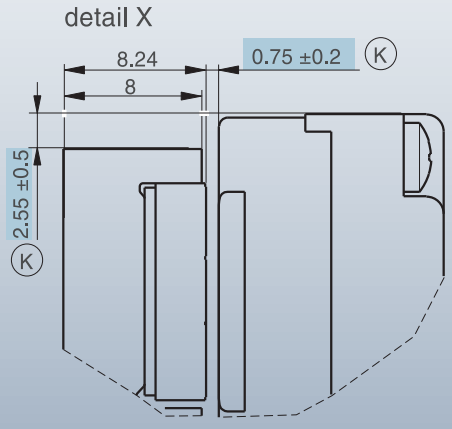
MS 20, MS 21, MS 25, MS 26 GA

- Glass scale in aluminum carrier
- Carrier bolted

Dimensions, mounting tolerances:







M = machine guideway

* = max. change in operation

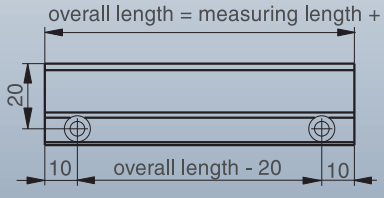
(K) = required mating dimensions

Affixing cover tapes for
the switch tracks and activation
of the selectable reference mark
see page 16

Weight (approx.):
- 650 g/m

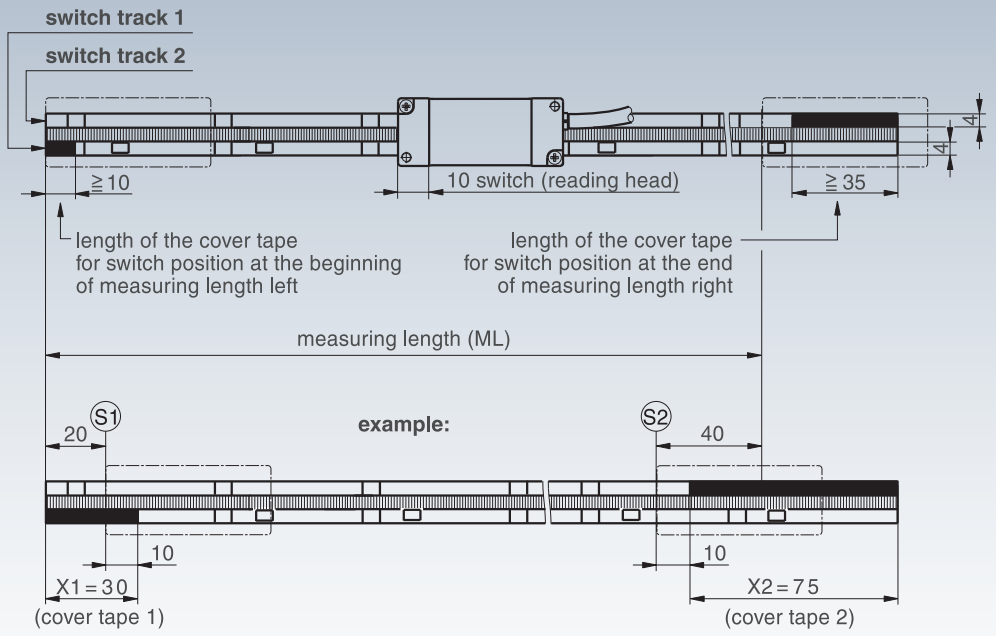
+ 21 g (reading head without cable)

scale carrier for measuring length <92



SWITCH TRACKS

MS 20, MS 25: Positioning of the switch points



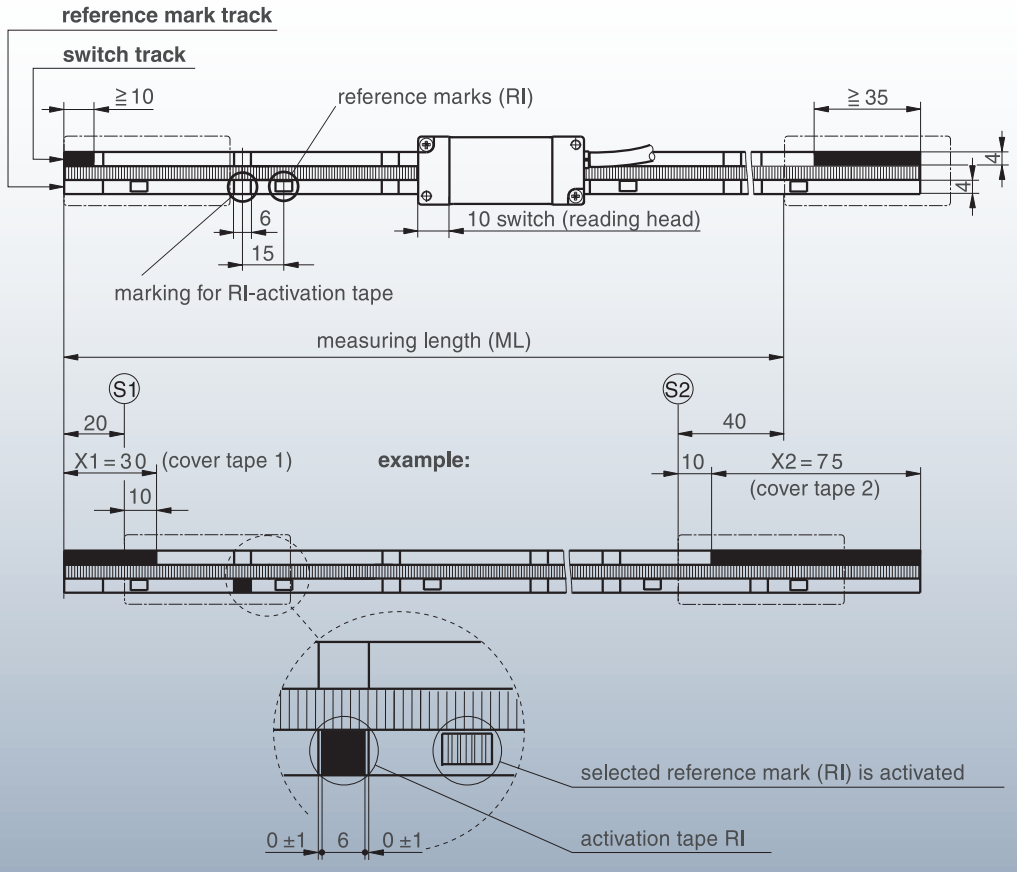
S1 = switch point 1
X1 = S1 + 10 (from left)

S2 = switch point 2
X2 = S2 + 35 (from right)

E. g.: S1: 20 mm from the beginning of ML (left)
Lenght X1 = 20 mm + 10 mm = 30 mm

S2: 40 mm from the end of ML (right)
Lenght X2 = 40 mm + 35 mm = 75 mm

MS 21, MS 26: Reference mark (RI)-select, positioning of the switch points



S1 = switch point left
X1 = S1 + 10 (from left)

S2 = switch point right
X2 = S2 + 35 (from right)

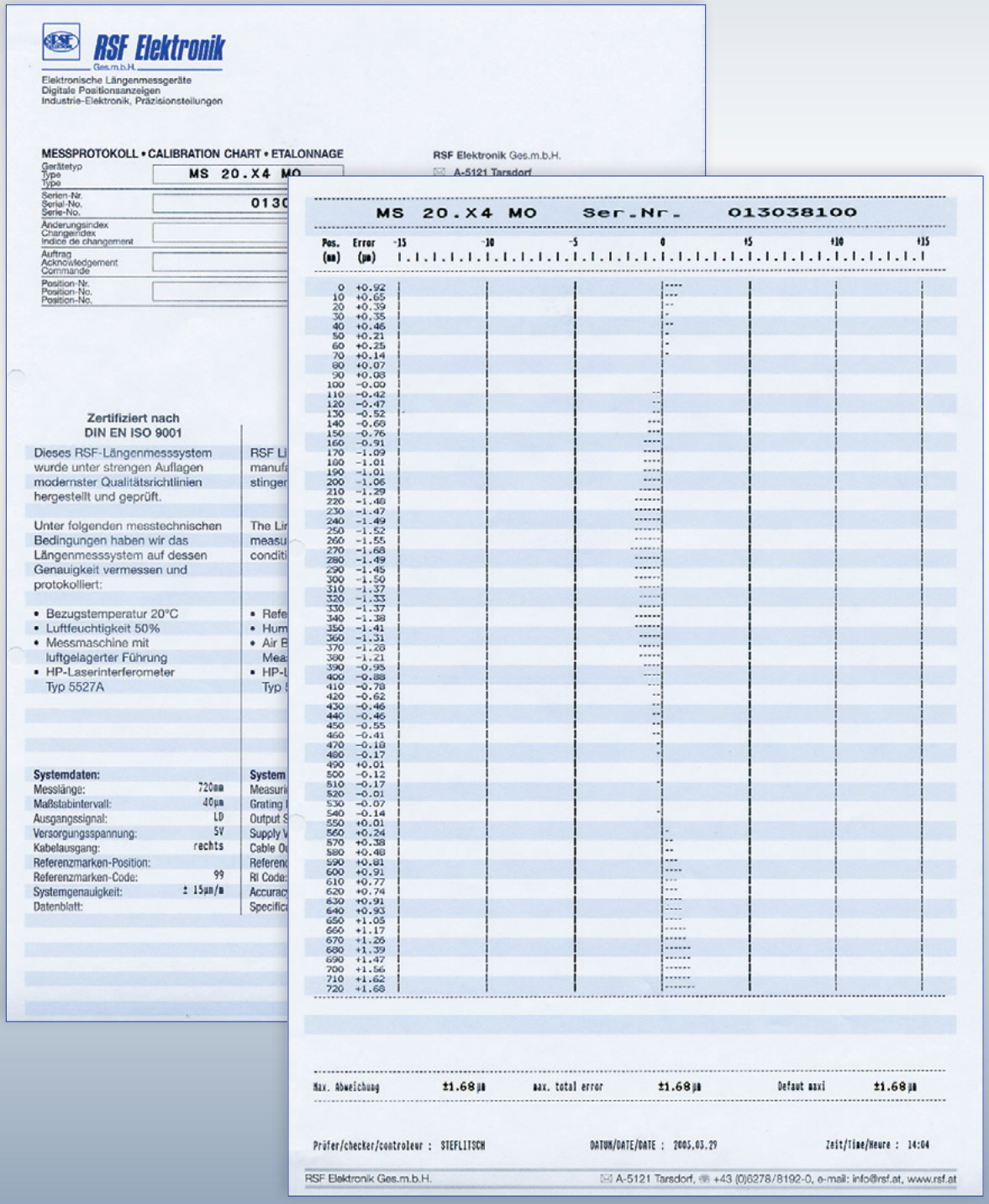
ACCURACY

The accuracy of the Linear Encoder is classified with a "± tolerance" in µm/m (e.g. ± 5 µm/m).

The accuracy and tolerance apply to any meter within the measuring length.
For measuring lengths less than 1000 mm, the accuracy specification applies to the whole measuring length.

For best system accuracy, the encoder should be mounted near the machining level and as parallel as possible to the motion direction.

Example of a typical calibration chart for a MS 2x scale tape:



RSF Elektronik
Ges.m.b.H.
Elektronische Längenmessgeräte
Digitale Positionsanzeigen
Industrie-Elektronik, Präzisionsteilungen

MESSPROTOKOLL • CALIBRATION CHART • ETALONNAGE

RSF Elektronik Ges.m.b.H.
A-5121 Tarsdorf

Gerätetyp / Type / Type: MS 20.X4 MO
Serien-Nr. / Serial-No. / Serie-No.: 0130
Änderungsindex / Change-Index / Indice de changement:
Auftrag / Acknowledgement / Commande:
Position-Nr. / Position-No. / Position-No.:

Zertifiziert nach
DIN EN ISO 9001

Dieses RSF-Längenmesssystem wurde unter strengen Auflagen modernster Qualitätsrichtlinien hergestellt und geprüft.

Unter folgenden messtechnischen Bedingungen haben wir das Längenmesssystem auf dessen Genauigkeit vermessen und protokolliert:

- Bezugstemperatur 20°C
- Luftfeuchtigkeit 50%
- Messmaschine mit luftgelagerter Führung
- HP-Laserinterferometer Typ 5527A

Systemdaten:

Messlänge:	720mm
Maßstabintervall:	40µm
Ausgangssignal:	LD
Versorgungsspannung:	5V
Kabelausgang:	rechts
Referenzmarken-Position:	
Referenzmarken-Code:	99
Systemgenauigkeit:	± 15µm/m
Datenblatt:	

MS 20.X4 MO Ser.Nr. 013038100

Pos. (mm)	Error (µm)
0	+0.92
10	+0.65
20	+0.39
30	+0.35
40	+0.46
50	+0.21
60	+0.25
70	+0.14
80	+0.07
90	+0.08
100	-0.09
110	-0.42
120	-0.47
130	-0.52
140	-0.69
150	-0.76
160	-0.91
170	-1.09
180	-1.01
190	-1.01
200	-1.06
210	-1.29
220	-1.48
230	-1.47
240	-1.49
250	-1.52
260	-1.55
270	-1.68
280	-1.49
290	-1.45
300	-1.50
310	-1.37
320	-1.33
330	-1.37
340	-1.38
350	-1.41
360	-1.31
370	-1.28
380	-1.21
390	-0.95
400	-0.88
410	-0.78
420	-0.62
430	-0.46
440	-0.46
450	-0.55
460	-0.41
470	-0.18
480	-0.17
490	+0.01
500	-0.12
510	-0.17
520	-0.01
530	-0.07
540	-0.14
550	+0.01
560	+0.24
570	+0.38
580	+0.48
590	+0.81
600	+0.91
610	+0.77
620	+0.74
630	+0.91
640	+0.93
650	+1.05
660	+1.17
670	+1.26
680	+1.39
690	+1.47
700	+1.56
710	+1.62
720	+1.68

Max. Abweichung ±1.68µm max. total error ±1.68µm Defaut maxi ±1.68µm

Prüfer/checker/controleur : STEFLITSCH DATUM/DATE/DATE : 2005.03.29 Zeit/Time/Heure : 14:04

RSF Elektronik Ges.m.b.H. A-5121 Tarsdorf, +43 (0)6278/8192-0, e-mail: info@rsf.at, www.rsf.at

PG ELECTRONIC SIGNAL TEST/SET-UP BOXES

Exposed Linear Encoders are adjusted at the factory to provide optimal signals at the specified mounting conditions.

Even though the Linear Encoders of the MS 2x series allow for large mechanical mounting tolerances, it is recommended to inspect the mounting by checking the quality of the output signals.

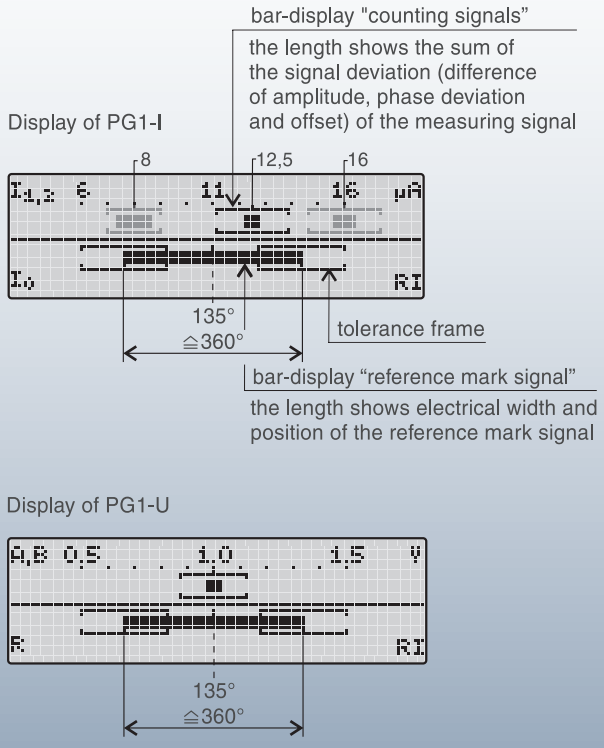
There are various methods of checking the quality of the output signals. The signals can be connected to an oscilloscope and checked for conformity with signal specifications. This method requires effort, training and expensive test equipment (oscilloscope). Often one or all of these items are unavailable to the installing technician.
As an alternative to this method, RSF offers different signal test boxes. With these test boxes all encoder signals can be quickly and easily checked.

The **PG1-I** / **PG1-U** is an all-purpose signal test box where all the relevant signals are displayed on LCD Bars.
The **PG1-I** / **PG1-U** allows the quantitative as well as the qualitative evaluation of the encoder signals.

The **PG2-I** / **PG-U** test box checks all relevant signals; amplitude, phase and offset, and displays the results in a qualitative format on a polychromatic LED display.

PG1-I / PG1-U

PG2-I / PG-U

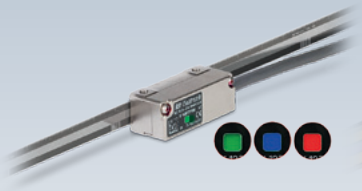


Intended PG-use	Output signals Square-wave	Output signals Sinus (1 Vpp)
PG1-I 	■	--
PG1-U 	--	■
PG2-I 	■	--
PG-U 	--	■

■ intended

-- not intended

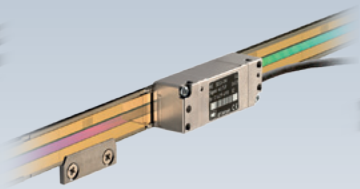
PRODUCT DIRECTORY



MS 14 Series

Reflective scanning Linear Encoder with integrated mounting

- Easy mounting; no test box or oscilloscope needed
- Quality of the scanning signals is directly visible at the reading head via a 3-coloured LED
- Extremely small dimensions
- Easy mounting as a result of large mounting tolerances
- High insensitivity against contamination
- High traversing speed
- Integrated subdividing: up to times 100 interpolation
- Max. measuring length Steel tape scale: 20 000 mm



MS 30, MS 31 Series

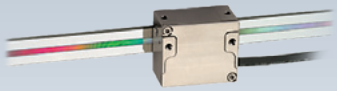
Reflective scanning Linear Encoder

- Two independent switch signals for individual special functions
- Position of reference mark selectable
- Small dimensions
- Easy mounting as a result of large mounting tolerances
- High traversing speed
- High insensitivity against contamination
- Integrated subdividing: up to times 100 interpolation
- Max. measuring length Glass scale: 3140 mm Steel tape scale: 11 940 mm

MS 45 Series

Reflective scanning Linear Encoder with integrated mounting control (only MS 45)

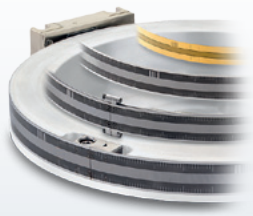
- Easy mounting; no test box or oscilloscope needed
- Quality of the scanning signals is directly visible at the reading head via a 3-coloured LED
- Small dimensions
- Easy mounting as a result of large mounting tolerances
- High insensitivity against contamination
- High traversing speed
- Integrated subdividing: up to times 100 interpolation
- Max. measuring length Steel tape scale: 30 000 mm



MS 82 Series

Interferential Linear Encoder

- Two switch tracks for individual special functions
- Non-contact reflective scanning
- High traversing speed
- Small dimensions
- Scale unit: glass scale or ROBAX® glass cramic scale with phasse grating
- Max. measuring length Glass scale: 3140 mm Glass ceramic: 1540 mm



MSR 40

Modular Rotary Encoder with steel tape scale

Different versions

- Full-circle or segment version
- Grating pitch: 200 µm
- Accuracy of the grating (stretched): ±30 µm/m
- High rotational speed resp. circumferential speed
- Integrated subdividing: up to times 100 interpolation

MSR 20

- Segment version
- Grating pitch: 40 µm
- Accuracy of the grating (stretched): ±15 µm/m
- High circumferential speed
- Integrated subdividing: up to times 100 interpolation

MSA 170 Series

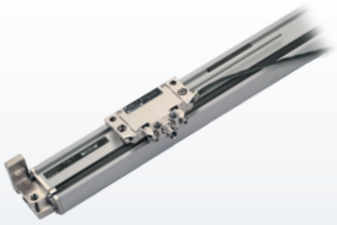
- Sealed version
- Guided by ball bearings
- Distance-coded reference marks
- Mounting holes on the extrusion ends
- Max. measuring length: 520 mm

E. g.: MSA 470

E. .g.: MSA 730

MSA 7xx, MSA 8xx Series (small dimensions)
MSA 4xx, MSA 5xx Series (large dimensions)

- Optimized thermal behavior
- Connection cable pluggable (optional)
- Sealed version
- Distance-coded reference marks
- Mounting holes at the ends or along the scale unit for improved vibration stability
- Max. measuring length: 3040 mm



MSA 374 Series

- With integrated guide rail system
- For application on presses bending machines and hydraulic cylinders
- Sealed version
- Roller bearing dual guided scanning carriage
- Free positionable switching magnets for special functions
- Distance-coded reference marks
- Mounting holes on the extrusion ends
- Max. measuring length: 720 mm

DISTRIBUTION CONTACTS

Austria
Corporate
Head Quarters

RSF Elektronik Ges.m.b.H.
A-5121 Tarsdorf
☏ +43 (0) 62 78 81 92-0
FAX +43 (0) 62 78 81 92-79
e-mail: info@rsf.at
internet: www.rsf.at

France

HEIDENHAIN FRANCE sarl
2 Avenue de la Christallerie
92310 Sèvres
☏ +33 1 41 14 30 00
FAX +33 1 41 14 30 30
e-mail: info@heidenhain.fr

United Kingdom

HEIDENHAIN (GB) Ltd.
200 London Road
Burgess Hill
West Sussex RH15 9RD
☏ +44 (0)1444 238550
FAX +44 (0)1444 870024
e-mail: sales@heidenhain.co.uk

Italy

HEIDENHAIN ITALIANA S.r.l.
Via Asiago, 14
20128 Milano (MI)
☏ +39 02 27075-1
FAX +39 02 27075-210
e-mail: info@heidenhain.it

Switzerland

RSF Elektronik (Schweiz) AG
Vieristrasse 14
CH-8603 Schwerzenbach
☏ +41 44 955 10 50
FAX +41 44 955 10 51
e-mail: info@rsf.ch
internet: www.rsf.ch

Slovenia

RSF Elektronik prodaja, d.o.o.
Jozeta Jame 14
SI-1210 Ljubljana
☏ +386 (0) 1 519 88 80
FAX +386 (0) 1 519 88 80
e-mail: mail@rsf-elektronik.si

China

RSF Elektronik GmbH
Tian Wei San Jie,
Area A, Beijing Tianzhu Airport Industrial Zone
Shunyi District
101312 Beijing
P.R. China
☏ +86 (0) 10 80 42 02 88
FAX +86 (0) 10 80 42 02 90
e-mail: cao.shizhi@rsf.cn
internet: www.rsf.cn

Korea

HEIDENHAIN LTD.
201 Namsung Plaza, 9th Ace Techno Tower,
345-30, Gasan-Dong, Geumcheon-Gu,
Seoul, Korea 153-782
☏ +82 (0) 2 20 28 74 30
e-mail: info@heidenhain.co.kr
internet: www.rsf.co.kr

USA

HEIDENHAIN CORPORATION
333 East State Parkway
Schaumburg, IL 60173-5337
☏ +1 847 490 11 91
e-mail: info@heidenhain.com
internet: www.rsf.net

Date 04/2010 ■ Art.Nr. 574898-24 ■ Doc.Nr. D574898-00-A-24 ■ Technical adjustments in reserve!