RSF Elektronik

RELIABLE. SOPHISTICATED. FLEXIBLE.

Incremental Linear Encoders

Enclosed Models

RSF Elektronik Ges.m.b.H.

RSF Elektronik was founded 1973 in St. Georgen near Salzburg, Austria.

From the beginning, the objective was to develop and produce Linear and Rotary Encoders and Digital Readouts. Our products were well accepted in the market, and after some years, the company employed more than 100 people.

Due to growth, it was then necessary for RSF Elektronik to move into larger facilities. The company moved in 1978 to our current location. Today, the largest percentage of our shipments are Incremental Linear Encoders.

To guarantee the best possible support, we have regional offices in the USA, China, Southkorea, Switzerland and in Slovenia. We also have distributors in nearly every industrialized country in the world.

One of the main internal elements of opto-electronic measuring systems are high precision divisions on glass and/or steel carriers. Under the trade name “SENTOP”, RSF Elektronik manufactures Precision Graduations in thin layer technology. 2002 a new production plant has been equipped to the latest international standards what the todays technique in clean room conditions fulfiles.

Our quality, performance and environment management comply with DIN EN ISO 9001 and DIN EN ISO 14001 standards.

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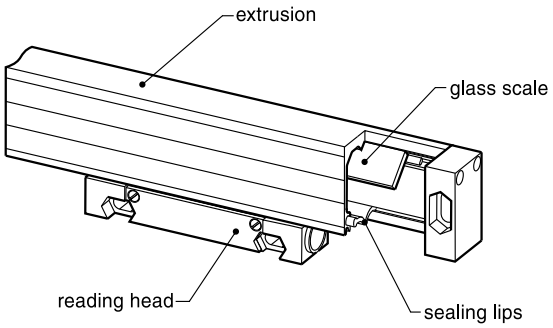
Design and operation

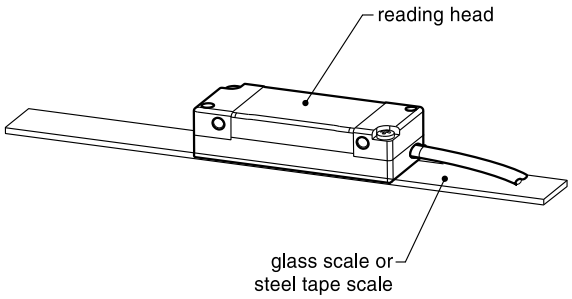
RSF manufactures Linear Encoders in enclosed and open versions.
The enclosed models are easy to install with large mounting tolerances.
They are also best suited for harsh environments. The sealing lips on the extrusion keep out coolants and contamination.

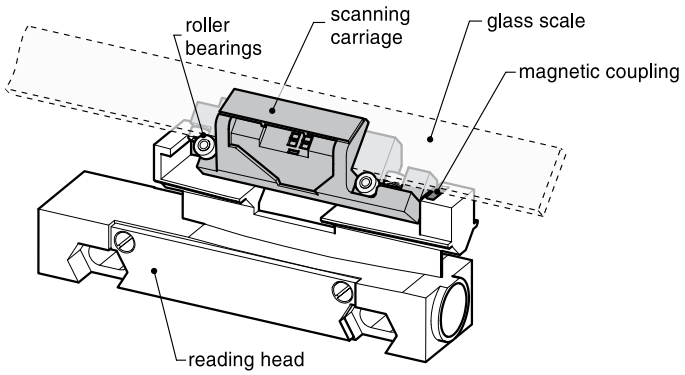
The non-contact open measuring systems are for high displacement velocities and high accuracies, commonly used in clean environments.

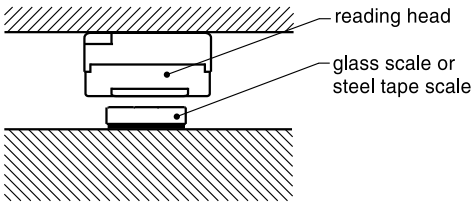
Enclosed systems
with guided scanning carriage



Open systems
with non-contact scanning carriage





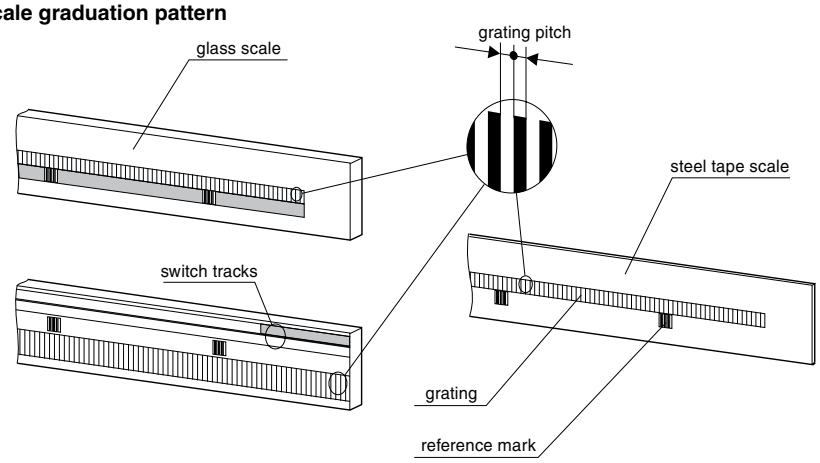


Enclosed Linear Encoders have a roller bearing, self-guided scanning carriage.
The scanning carriage is spring loaded to track properly within the encoder head mounting tolerance range.
A set of rare earth magnets couple the scanning carriage to the mounting base of the encoder head.

This magnetic coupling compensates allowable mounting tolerances and machine guide non-parallelism.
Non-contact open encoders rely on the air gap between the encoder head and scale to be uniform over the measuring range. The flatness of the mounting surface and the parallelism of the machine guideway is important.

The scale graduation pattern has a high accuracy grating.
Scales can be produced on metal tape or spars, or glass substrates.
One cycle (period) of grating pitch, is defined as one chrome line and one corresponding line space, each with the same width.
The total width of one chrome line and one line space is called grating pitch.
A second track adjacent to the graduation pattern, contains the Reference Mark(s).
There are standard Reference Mark locations, or they can be specified upon request.
Multiple Reference Marks must be separated by n x 50 mm distances.

Scale graduation pattern

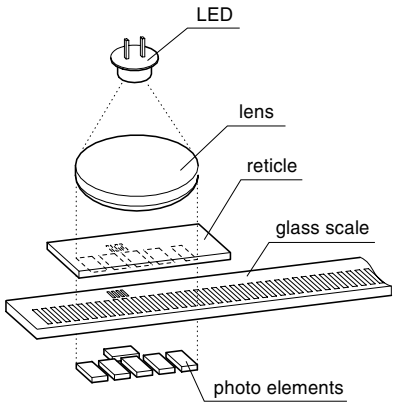


Linear Encoders with the suffix "**K**" in the model type have distance coded Reference Marks. The absolute position is available after a measured move of a maximum of 20 mm .

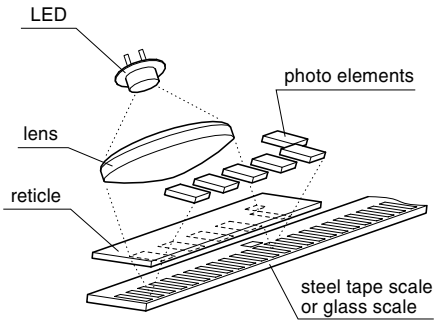
Cause of the optical scanning version a accurate Reference Mark is warranted.

When there is relative movement between the encoder head and the linear scale, LED light is modulated by the scale grating pitch and converted into electrical signals by the photo-elements. Solid state LEDs and silicon photo-elements are used for high reliability and durability.

Transmissive scanning principle



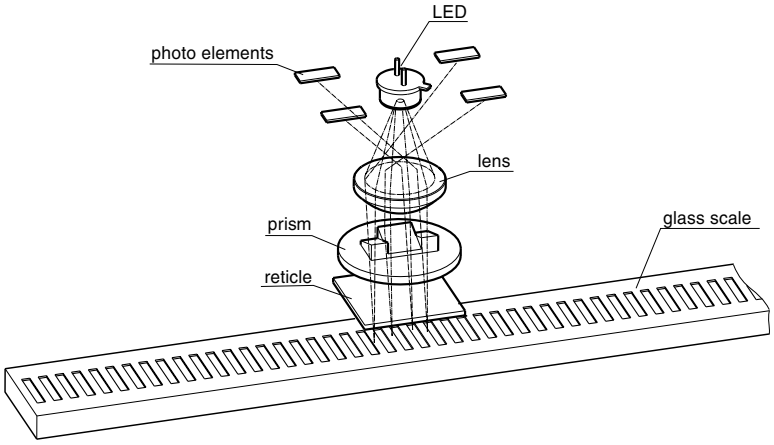
Reflective scanning principle



The scale consists of a glass carrier and reflection-type phase grating.
The scanning reticle acts as transmission phase grating.

The light beam, produced by an LED and collimated by a lens, is deflected by prisms and the phase grating of the reticle in different directions.
After reflection and diffraction at the scale grating, the different beams, depending on the change of position phase shifted, interfere after passing the reticle again, thus producing 2 by 90° shifted, sinusoidal measuring signals.
Using this interferential measuring principle, one signal period equals half of the scale grating pitch.

Reflection-type phase grating



Output signals

Sinusoidal voltage signals
There are two sinusoidal voltage signals (A1 and A2) and one Reference Index (with inverted signals).

Reference voltage of the output signals:
V+/2 (approx. 2.5 V)
Track signals (differential voltage A1 to $\overline{A1}$ resp. A2 to $\overline{A2}$):
Phaseshift 90° ±10° el.
electrical offset ±10% of the signal amplitude
Signal amplitude 0.6 Vpp to 1.2 Vpp
typ. 1 Vpp with terminating impedance Zo = 120 Ω

Reference Mark
(differential voltage RI to $\overline{RI}$):
El. position typically 135°
(referenced to A1)
El. width typically 270°
Useable component 0.2 up to 0.85 V, typical 0.5 V with terminating impedance Zo = 120 Ω

Advantage: High traversing speed with long cable lengths possible.
These signals are suitable for the connection to appropriate CNC and/or Feedback Systems.

Sinusoidal micro-current signals
There are two sinusoidal micro-current signals (0° and 90°) and one Reference Index (with inverted signals).

Output signals 0° and 90°:
Phaseshift 90° ±10° el.
electrical offset ±10% of the signal amplitude
Signal amplitude with a load of 1 kΩ:
7 to 16 µApp (11.5 µApp typical)

Output signal Reference Mark (RI):
El. Position typical 135° (referenced to 0°)
El. width typical 270°
2 to 8 µA, (typical 5 µA)

These signals can be input to External Subdividing Electronics or NC Controls with built-in Subdividing Electronics.

Square wave signals
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).

For measuring systems with single ended output signals the max. cable length is 10 m, including extension cable.
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.

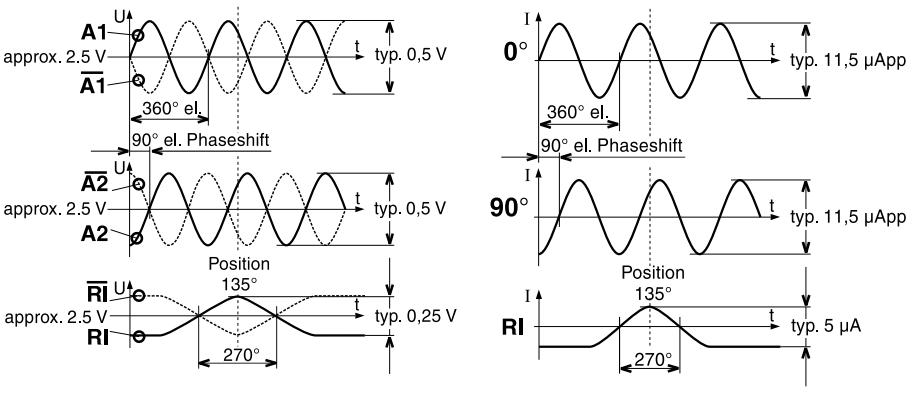
Propagation-time differences:
Line Driver: max. 10 ns
Cable: 0.2 ns per meter
Line Receiver: max. 10 ns refered to the recommended Line Receiver circuit

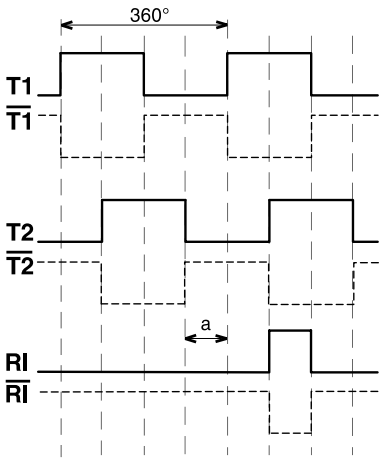
To prevent counting errors, the controls/DRO´s must be able to process the resulting edge separation.

Example:
a_{min} = 100 ns, 10 m cable
The control/DRO must be able to detect
100ns - 10ns - 10 x 0.2ns - 10ns = 78ns

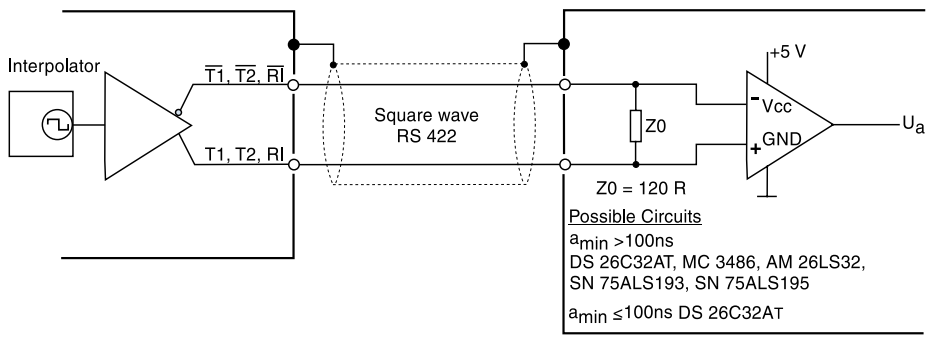
Advantage:
- Noise immune signals
- No further subdividing electronics necessary

Drawing in "positive counting direction"

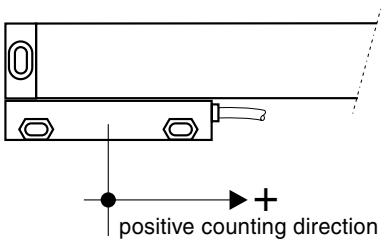




Recommended Line Receiver circuit

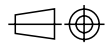


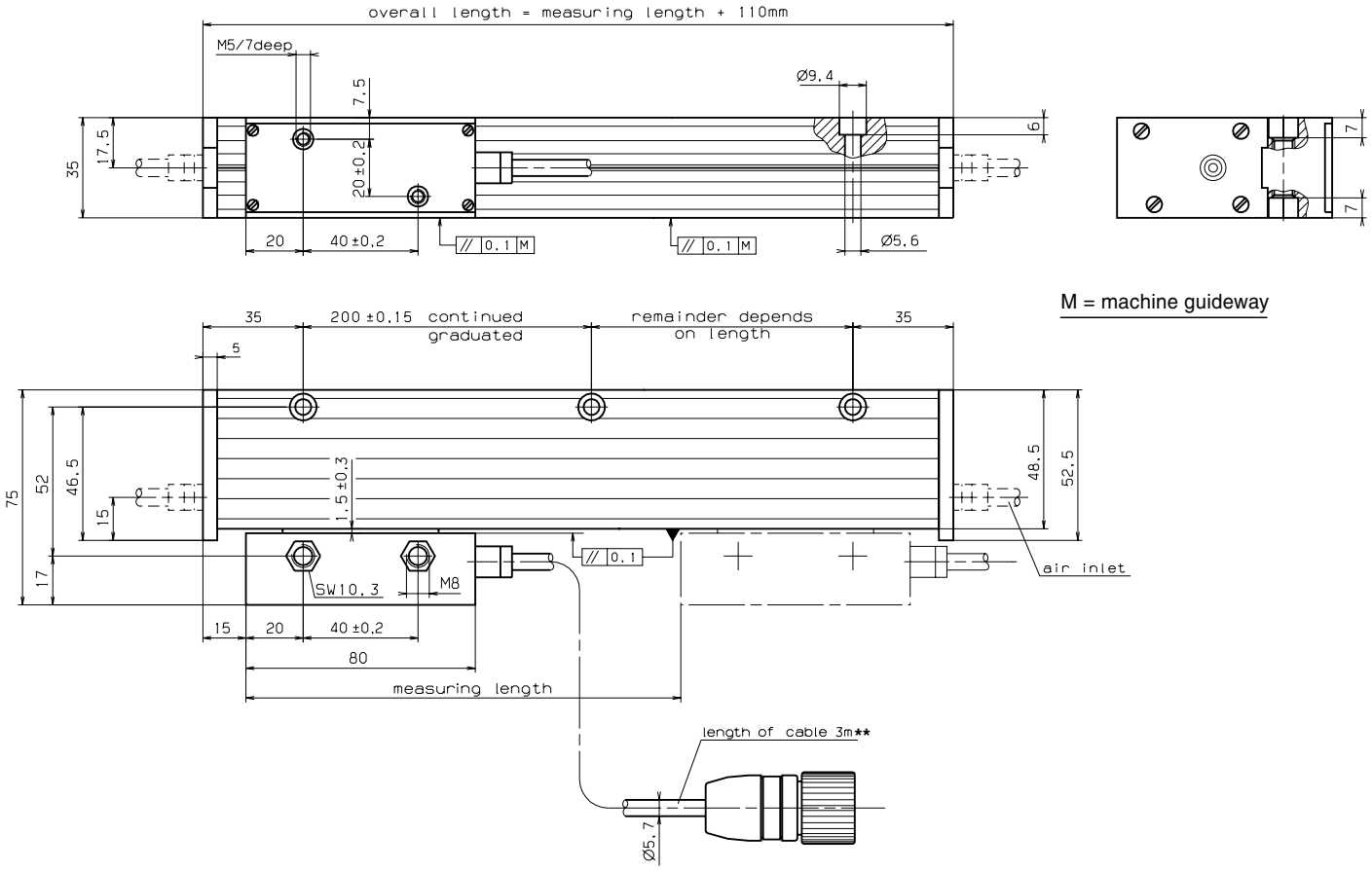
Positive counting direction orientation

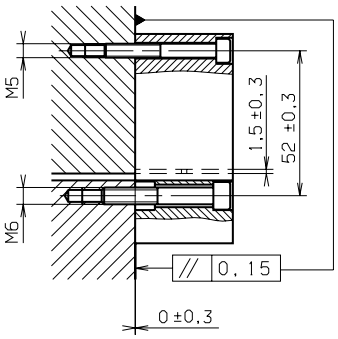


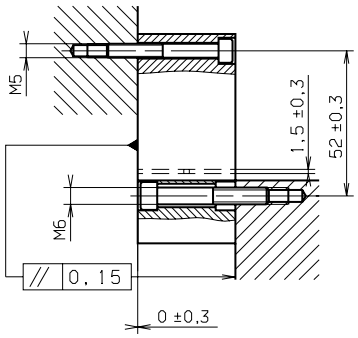
TOP

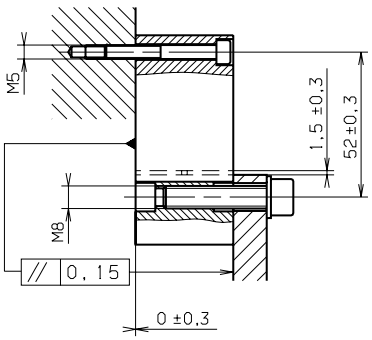
MSA 371, MSA 391 Dimensions - Mounting tolerances - Mounting possibilities:

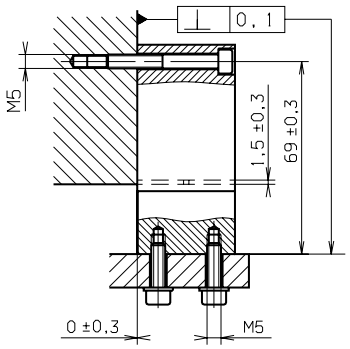






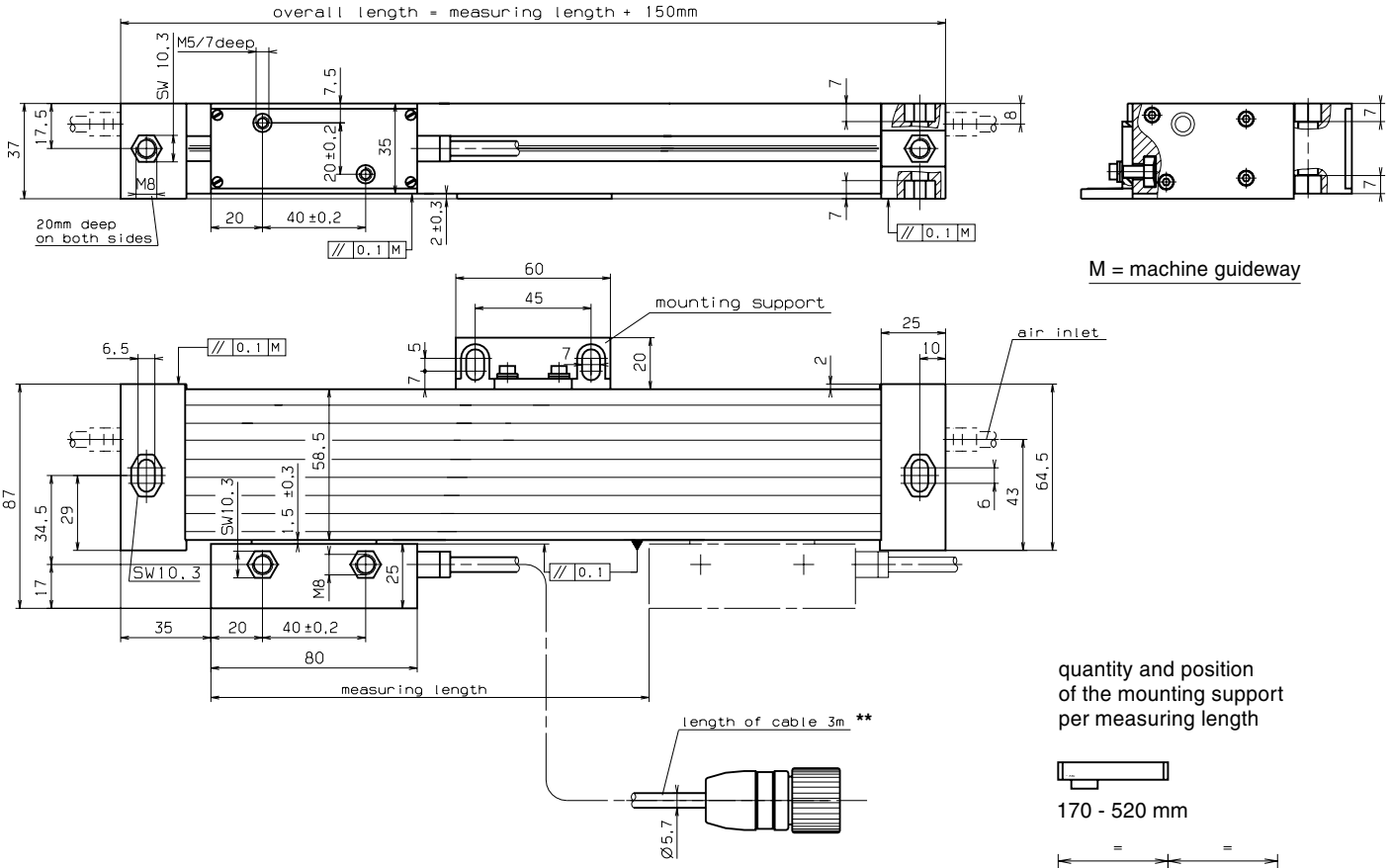






** armoured cable optional

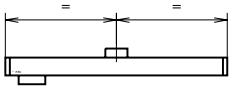
MSA 372 Dimensions - Mounting tolerances - Mounting possibilities:



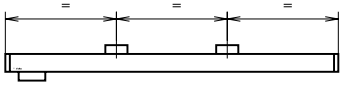
M = machine guideway

quantity and position
of the mounting support
per measuring length

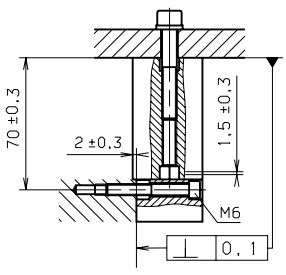
170 - 520 mm

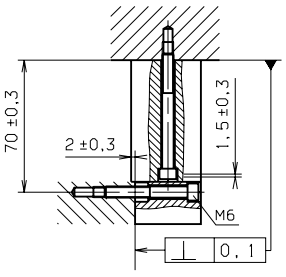


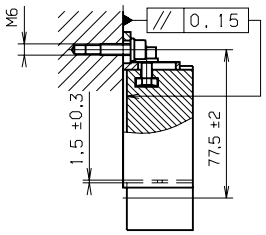
620 - 1020 mm 1x

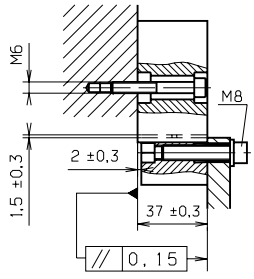


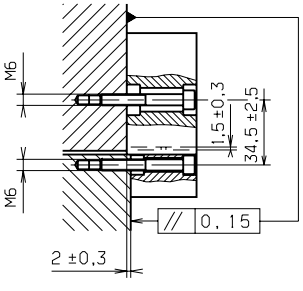
1140 - 2040 mm 2x
2240 - 3040 mm 3x

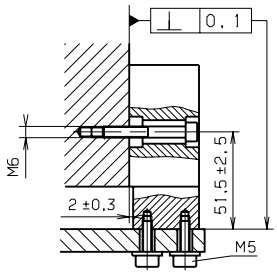


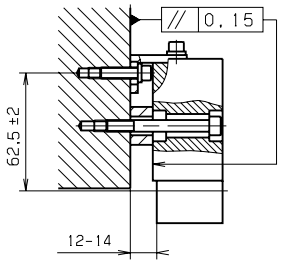












** armoured cable optional