DESIGN AND OPERATION

Linear encoders from RSF Eletronik are all-purpose. They are suited for manual applications; yet they are also particularly suitable for closed loop drive devices.

Owing to their sealed design, the linear encoders of the **MSA 7** and **MSA 8** series are predestined for applications in **automation** and **production technology**. They are ideally suited for **metrology**, **printing** and **robotics**, especially in applications where protection for the scale and reading head is required.

MSA 7 and **MSA 8** represent a systematic advancement of tried-and-tested devices and feature improved design details. During development, RSF Elektronik paid particular attention to the optimization of the accuracy of these devices. We achieved this goal thanks to the perfect combination of several individual components. Furthermore, the components that are subject to more stress have been optimized to increase system accuracy over the longer term.

Measuring devices are made up of two components: the **extrusion** and **reading head**. Preferably, the extrusion is to be mounted on the moveable part of the linear axis, and the reading head to the fixed part (cable duct) of the linear axis.

The **extrusion** consists of a stable aluminum profile, fastening elements, a scale and sealing lips.

Drip caps at the profile and specially formed sealing lips prevent the intrusion of dust and liquids into the extrusion. The fiber-reinforced sealing lips are highly abrasion-resistant. High velocities are feasible due to the high degree of rigidity of the unit, coupled with the ideally formed blade area of the reading head.

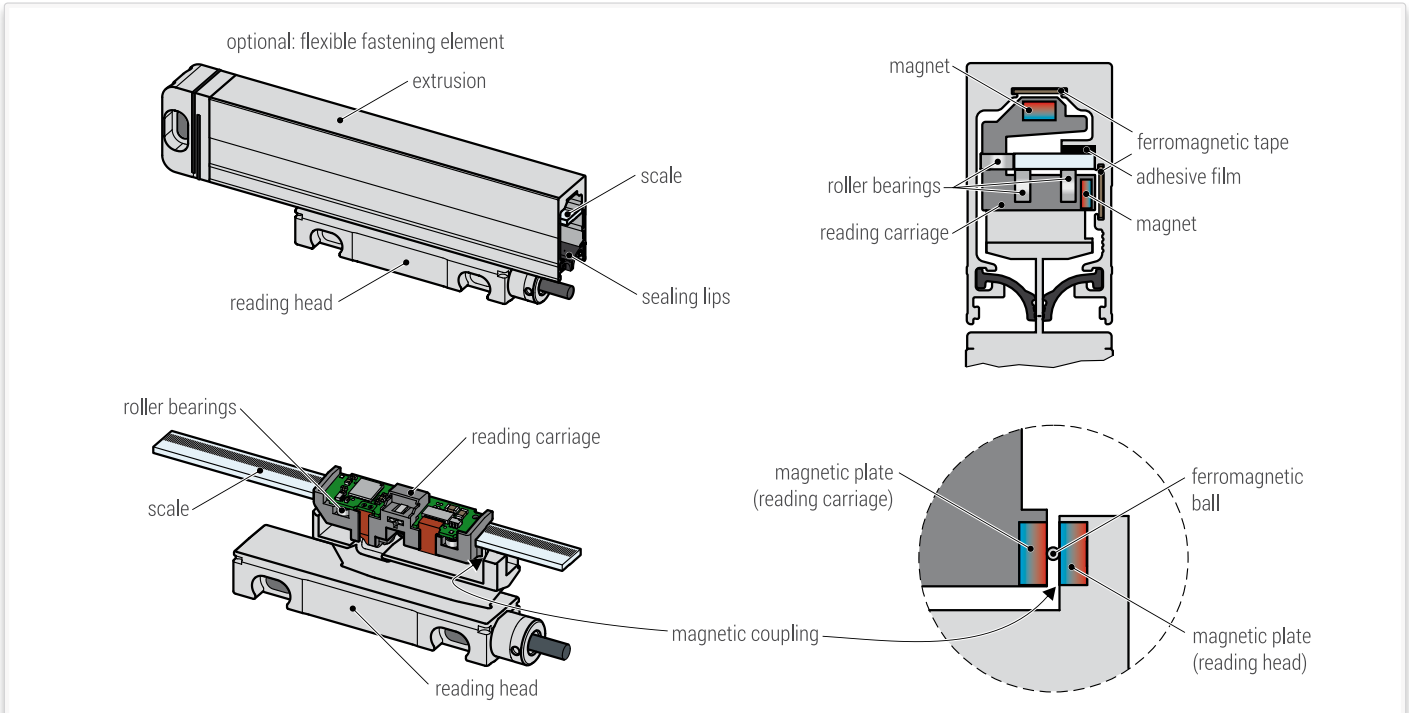
The **scale** is fastened by dint of a flexible adhesive film in the profile, which compensates for the differing linear expansion between the glass or glass ceramics and the aluminum. Thus a **reproducible thermal behavior** is ensured (expansion or shortening of the scale to the profile in case of temperature changes). The scale can additionally be fixed in the profile in order to adjust the thermal zero point to each measuring requirement. Expansion differences between aluminum profile and machine slide are evened out by flexible fastening elements. The **high accuracy of the measuring scale** is the result of a sophisticated lithographic process. A consistently accurate reproduction of the original measuring scale forms the basis for the manufacture of the highly accurate scales in RSF electronic measuring devices.

Depending on the model, the **reading head** is available with a **fixed** or **detachable cable**. The **reading carriage** includes a reticle and optoelectronics for signal generation. Hall-sensors are integrated in the reading head, which generate switch signals for an additional position detection or enable a selection of reference marks. They are activated by magnets that can be optionally positioned in any way on the extrusion by the customer. The evaluation electronics are positioned in the **reading carriage**, generating the evaluation signals (e.g. 1 Vpp or TTL).

Thanks to the design of the reading carriage alignment deviations between extrusion and machine guide are evened out. It rolls by dint of high-precision roller bearings on the scale and is pressed down by magnets that affect the ferromagnetic tapes on the extrusion (**magnet guide**). By mounting within the tolerance there are no forces between reading head and extrusion that could stress guide parts of the linear axis. Moreover, the extrusion is not subjected to any bending strain.

In the measuring direction, the reading carriage is connected by a wear-free and maintenance-free **magnetic coupling**. A ferromagnetic ball rolling freely between two magnetic plates makes for a connection that is very stiff in the measuring direction, yet flexible in all other degrees of freedom, minimizing the reversal error. Thus any deviation (within the tolerance) will be evened out by the ideal mounting of the measurement device.

The combination of magnetic guide and magnetic coupling allows for generous mounting tolerances without any negative influence on accuracy. Hence substantial benefits are achieved in comparison to traditional technologies.



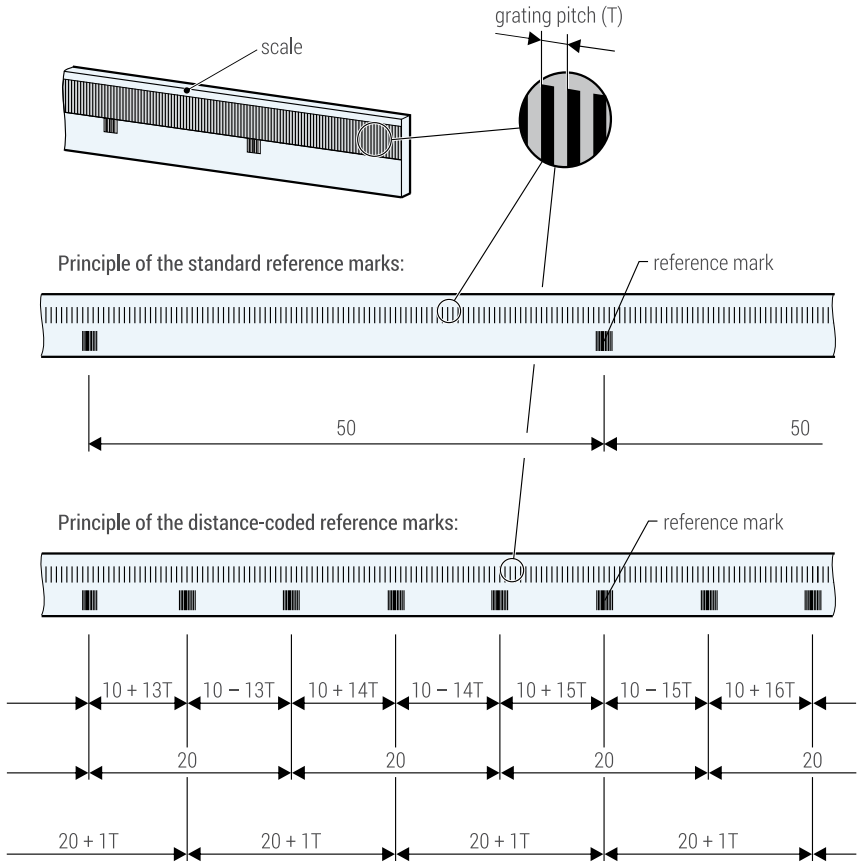
A high accuracy grating is deployed as scale graduation. Depending on the model, glass ($\alpha \approx 8{,}5 \times 10^{-6}$/K) or glass ceramics ($\alpha \approx 0 \times 10^{-6}$/K) is employed as base.

The grating is the consistent series of lines and spaces. The width of one line and one space is called a grating pitch (T).

Parallel to the grating, there are one or more reference marks on a second track. Within the measuring length, any position is possible and additional reference marks can be chosen at will in a distance of 50 mm.

Linear encoders with a suffix „**K**" in the model designation are equipped with distance-coded reference marks. After traveling a distance of 20 mm at maximum, the absolute tool position is available with these models.By dint of the optical scanning, a position-accurate evaluation of the reference marks is ensured.

Scale unit



These incremental linear encoders work according to an imaging photoelectric measuring principle with a transmissive **singlefield scanning**.

The regulated light of an infrared LED is collimated by a condenser lens, passes through the grid of the reticle and the scale and generates a periodic intensity distribution on the structured sensor.

The sensor generates sinusoidal signals of the highest quality that prove to be widely insensitive to possible contaminations, which can never be entirely ruled out despite all technical precautions.

The regulation of the LED ensures a constant light output, guaranteeing stability in the case of temperature fluctuations as well as with long-run operation.

Transmissive singlefield scanning