

MONORAIL and AMS

Profiled linear guideways
and integrated measuring systems

Mounting instructions 2017



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The MONORAIL and AMS installation instructions can be ordered free of charge from your Schneeberger partner or downloaded as a PDF file from www.schneeberger.com:

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1 Information on these assembly instructions

1.1 Function and validity

The MONORAIL and AMS assembly instructions describe how to assemble the profile railguide systems MONORAIL MR and MONORAIL BM and the integrated measuring system AMS.

1.2 Target group

These installation instruction are intended for assembly fitters, service technicians and all persons who install, commission, replace, handle or transport MONORAIL profile rail guides and AMS position measuring systems.

1.3 Symbols used

Action

→ This is a single step action.

1. This is the first step of a multi-step action.

Note

These are information and recommendations.

Warning information

Warning information precede the work step in which a hazard occurs. It has the following appearance:



Signal Word

Type and source of the hazard.

Consequences if the warning information is ignored.

Measure to prevent damage or injury.

Warning information is classified as follows by the signal word:

- **Warning**

This means that the risk of serious injury or significant material damage exists if the stipulated precautionary measures are not taken.

- **Caution**

This means that there is a risk of slight injury or material damage if the stipulated precautionary measures are not taken.

1.4 Other literature

- MONORAIL and AMS product catalog and application catalogue
- Operating Instruction Interpolation and digitizing electronics SMEa
- Instruction sheet/Start-up instructions AMSA-3L
- Installation Instructions Cover Strip MAC for MONORAIL MR
- Installation Instructions Cover Strip BAD for MONORAIL BM
- Installation Instructions Brass Plugs MRS / BRS for MONORAIL MR / BM
- Installation Instructions Steel Plugs MRZ for MONORAIL MR
- Installation Instructions Lubrication Plate SPL for MONORAIL
- Installation Advice Metal Wiper ASM
- Mounting notes MONORAIL-Carriages MR and BM
- Mounting notes MONORAIL-Carriages MR 100
- Mounting notes MONORAIL BM2G

Catalogs and installation instructions can be obtained from a SCHNEEBERGER representative or downloaded from www.schneeberger.com.

2 For your safety

2.1 Authorized persons

MONORAIL and AMS may only be installed by specialists who have the necessary training, e.g. assemblers who have read and understood these instructions.

2.2 Correct use

MONORAIL and AMS are used for precision linear movements and distance measurements mainly in machine tool and special machine designs.

MONORAIL and AMS may only be used within the defined temperature range, (MONORAIL -40 °C up to +80 °C, AMS 0 °C up to +70 °C).

Ensure that the bearings of the carriages are not damaged, e.g. by aggressive and corrosive substances.

2.3 General safety and protection measures

The installation instructions in this manual must be strictly observed for the installation of MONORAIL and AMS.

SCHNEEBERGER's application engineers are available for additional information.

SCHNEEBERGER is not liable for damages caused by:

- incorrect handling, installation and maintenance
- improper use of guides or the position measuring system
- unauthorized changes to MONORAIL and AMS.

In extreme cases, e.g. if rolling elements are lost, separation of guide carriage and rail can result. For each application check whether there are any health and safety hazards, and take appropriate design measures to exclude them.



Warning

Guide carriages can be separated from the guide rail in the event of overload or loss of rolling elements. Danger due to falling machine slide.

- Provide a safety barrier in the case of a suspended arrangement or overhead installation.
- Prevent access by people to the motion ranges of the axial slides by means of design measures.
- Store the MONORAIL and AMS in their original packing until it is installed, and protect it against moisture and damage.
- Protect MONORAIL AMS from magnetic fields. These can demagnetize the magnetic scale
- Interrupt the power supply before working on the electrical system.
- Use only SCHNEEBERGER original parts for repair work.
- Country-specific regulations, standards and directives on accident prevention must be observed.
- For safe functioning of the products also observe the information relating to form and position tolerances, dynamic limits, loading, lubrication and ambient conditions.

2.4 Environmental responsible behavior

Do not allow lubricants to escape into the environment and dispose of them due to country specific regulatory information.

3.1 Product variants

MONORAIL is a profile rail guide system. It consists of an individual rail with the associated carriage (MONORAIL guide) or several matching MONORAIL guides (MONORAIL system).

In the case of MONORAIL AMS with integrated position measuring system, the rail is equipped with a magnetic scale and a carriage on this rail has a housing with reading head. For a complete guide system with integrated distance measurement, a MONORAIL guide is always combined with a MONORAIL AMS guide.

The following product types are available, depending on roller element type and type of position measuring system:

MONORAIL MR

Profile guideway with rollers as rolling elements

MONORAIL BM

Profile guideway with balls as rolling elements

MONORAIL AMSA 3B

Profile guideway with distance measuring system with analog incremental interface

MONORAIL AMSD 3B

Roller profile guideway with distance measuring system with digital incremental Interface

MONORAIL AMSA 4B

Profile ball guideway with distance measuring system with analog incremental interface

MONORAIL AMSD 4B

Profile ball guideway with distance measuring system with digital incremental interface

MONORAIL AMSABS 3B

Roller profile guideway with distance measuring system with digital absolute Interface

MONORAIL AMSABS 4B

Ball profile guideway with distance measuring system with digital absolute Interface

MONORAIL AMSA 3L

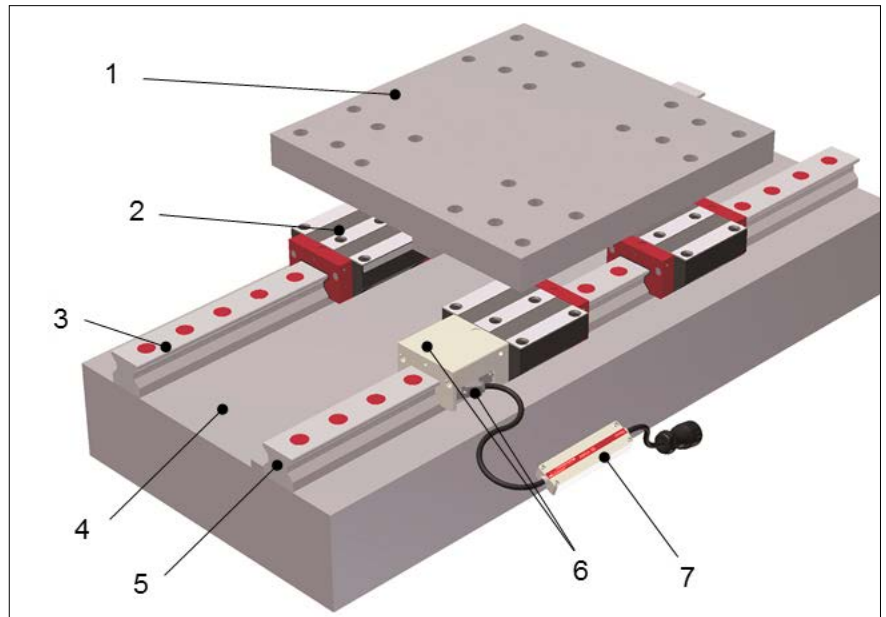
Roller profile guideway with distance measuring system for long axes with analog incremental interface

3 Product information

3.2 Components

The following illustrations show the components of a MONORAIL guide system with AMS based on the example of MONORAIL AMSA 3B.

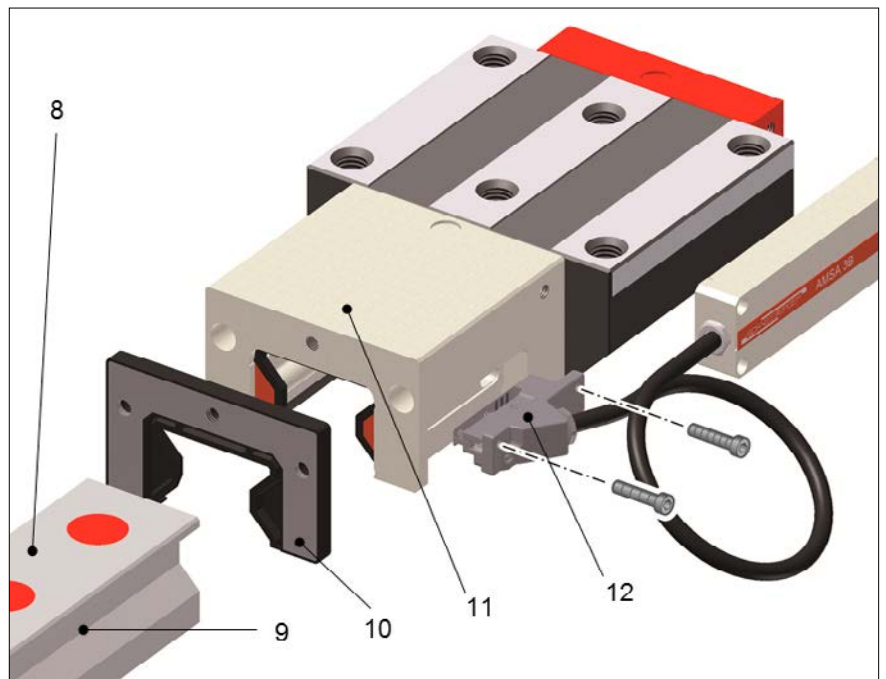
MONORAIL-System



- 1 Mounting Plate
- 2 Carriage
- 3 Rail without magnetic scale
- 4 Machine bed

- 5 Rail with magnetic scale
- 6 Reading head with housing
- 7 Electronic box

Measuring system

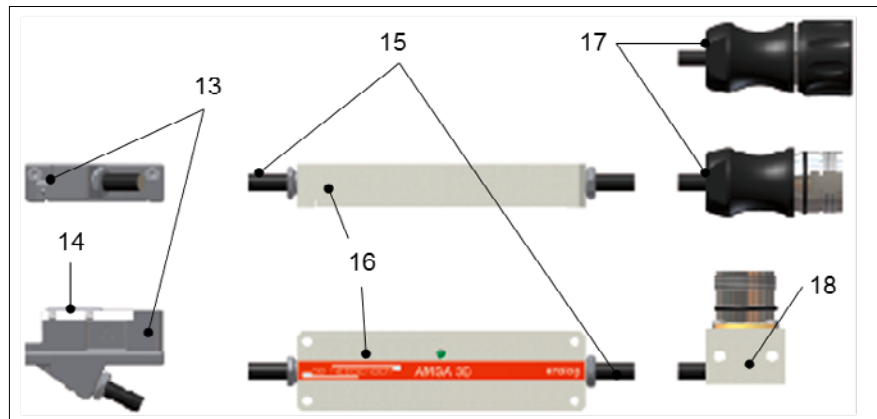


- 8 Rail with magnetic scale
- 9 Magnetic scale
- 10 Additional wiper (optional)

- 11 Housing
- 12 Read head with connecting cable

3 Product information

Reading head with connecting cable



- 13 Reading head
- 14 Sensor slider
- 15 Reading head connection cable
- 16 Electronic box
- 17 Connector (optional)
- 18 Mounting base (optional)

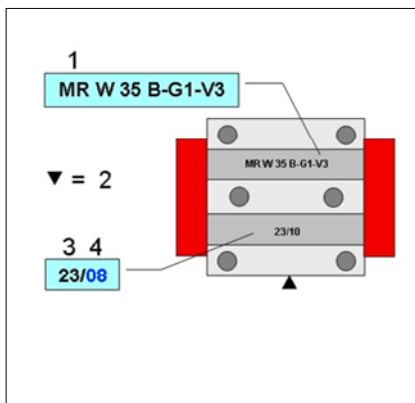
3 Product information

3.3 Labelling of rails and carriages

Rails and carriages are clearly marked by SCHNEEBERGER, so that product identification and tracing is possible for customers and manufacturers at any time. This includes a precise type designation, the production date and a serial number for rails, to which production logs of straightness or travel measurements can be assigned, for example.

For sectional rails and cover strips the individual segments and joints are also marked, so that the individual parts can be mounted in the correct order during installation.

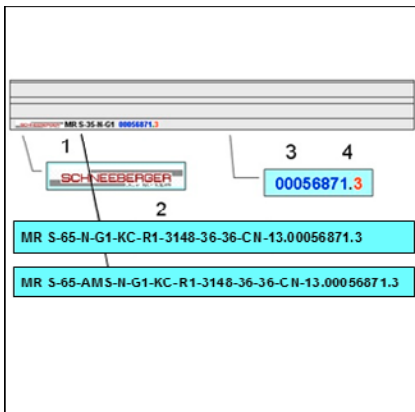
Carriages



Carriages are labelled on the top side, between the ground bolting surfaces. The marking comprises:

1. Type designation. For the meaning of the individual codes, please see the MONORAIL and AMS product catalog.
2. Locating side
3. Production date, comprising calendar week and
4. Year of production.

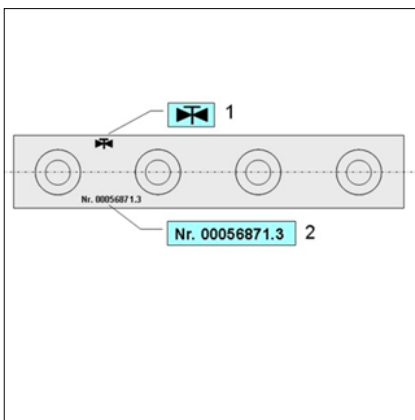
Standard labelling for rails



Rails are labelled on the lower side surface opposite the locating side. The marking comprises:


1. SCHNEEBERGER company logo
2. Typ designation. For the meaning of the individual codes, please see the MONORAIL and AMS product catalog.
3. Consecutive serial number
4. Area of separation from semi-manufactured product, specifies from which area of a production rail the customer rail was separated.

AMS rails with magnetic scale



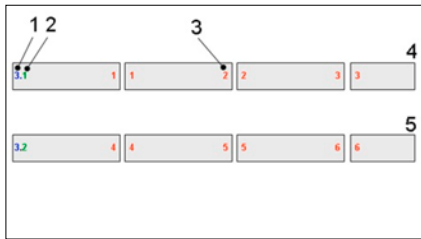
In addition to the standard labelling, measuring system rails are also provided with the serial number and an identification for the type of reference marks on the top side of the rail

The symbol identifies the position of the magnetic scale as well as the type of reference marks. The following types are available:

-  single or constant pattern of reference marks
- DC** for distance coded reference
- ABS** for absolute system; customized labeling

1. Symbol for reference mark pattern (for codes see product catalog MONORAIL and AMS catalog)
2. Serial number

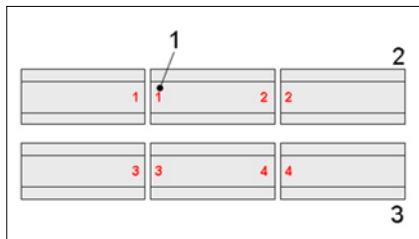
3 Product information



Multi part rails – standard / paired

Are assigned a joint number and, for paired design, a sequence number on the upper side of the rail. This comprises:

1. Sequence number, order-related (for paired design)
2. Rail line number, consecutive depending on rail sequence (for paired design)
3. Joint code, consecutive depending on rail sequence
4. Rail line 1
5. Rail line 2



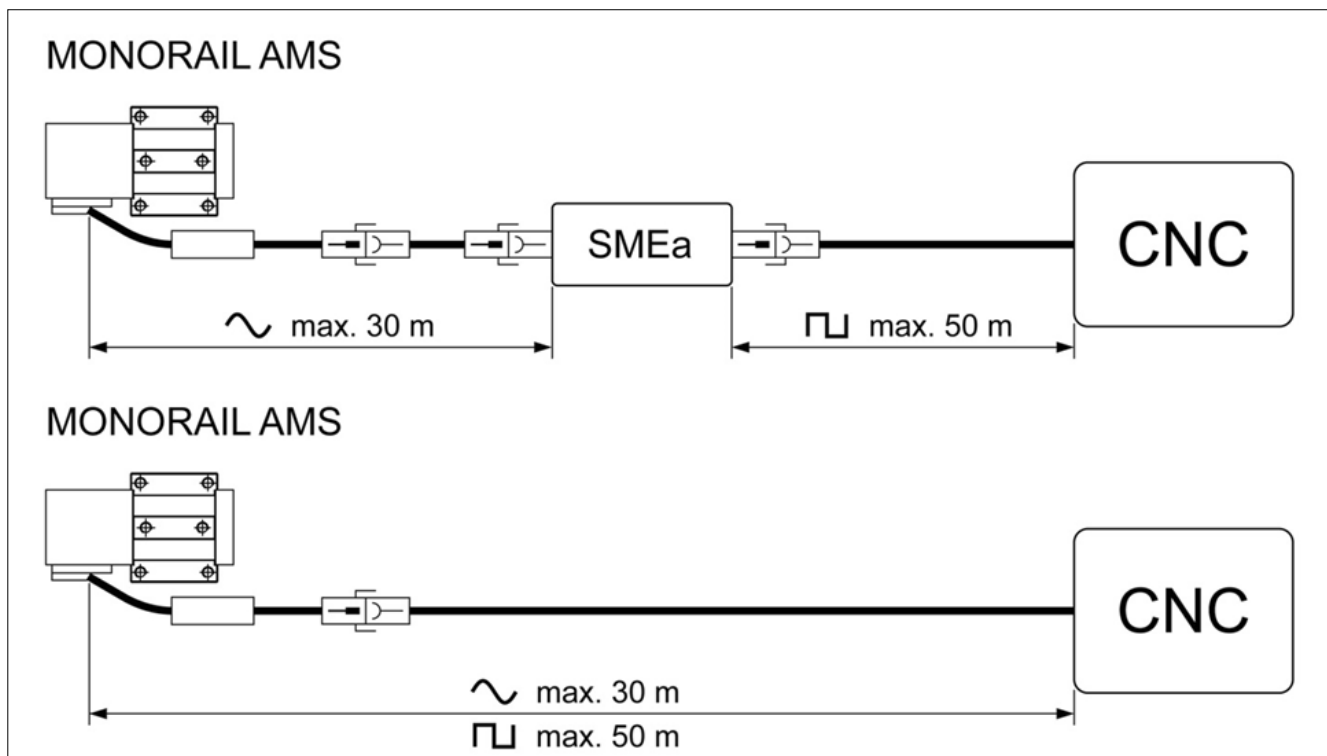
Multi part cover strips

Sectional cover strips MAC/&BAC are labeled with a joint code, like sectional rails. This is located on the lower side of the strip ends:

1. Joint code, consecutive depending on rail sequence
2. Rail line 1
3. Rail line 2

3.4 Connection of the measuring system

MONORAIL AMS is connected to the axis drive control either directly or via the SMEa interpolation and digitization electronics.



3 Product information

3.5 Electrical interfaces of the measuring systems

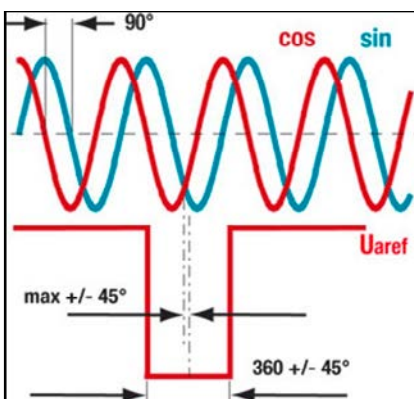
Three types of interface are used to connect MONORAIL AMS linear position measuring systems to CNC controls, depending on the product type.

For cable interfaces and pin configuration, see chap. 11.1.

3.5.1 Incremental position measuring systems with analog interfaces: AMSA 3B, AMSA 4A, AMSA 3L

Analog voltage interface 1 Vpp

- Supply voltage $5 \pm 0,25$ V
- Power consumption 90mA / 5V per reading head

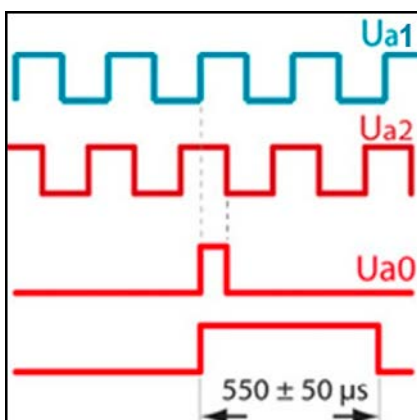


The signals are shown inverted after differential amplification. The phase position of the incremental signals is shifted by exactly 90° . The levels after differential amplification of the incremental signals and the reference signal are 1 ± 0.1 Vpp. The incremental signals provide valid values between 0.6 Vpp and 1.4 Vpp. The reference pulse is adjusted to production reference standards, symmetrically to the intersection of sine and cosine (at 45°). The width and phase position of the reference pulse are limited as specified in the diagram. As a result, the accuracy of the reference point can be increased on the receiver side through the additional use of incremental information. This interface functions with all established controls, which support a 1 Vpp voltage interface.

3.5.2 Incremental position measuring systems with digital interfaces : AMSD 3A, AMSD 4A

RS 422 digital quadrature signals with reference and error signal

- Reference pulse width 90° or $500 \mu\text{s}$ (for FANUC).
- Supply voltage $5\text{V} \pm 10\%$
- Power consumption 40 mA per reading head



The incremental signals $R+$, $R-$, $Ua0+$, $Ua0-$ and the reference signals $R+$, $R-$ complementarily transmit the information to RS 422. The positive signals are shown in the diagram. The levels of the individual signals are:

High $> 2,5$ V

Low $< 0,5$ V

The rise and fall times are less than 20 ns. The minimal edge distances are calculated from the maximum output frequency. The follow-up electronics must be able to reliably process the maximum output frequency.

3.5.3 Absolute position measuring system with digital interfaces: AMSABS

Interface SSI

- Measuring cycle 18µs
- Signal coding: Binary or optional gray code max. 28 bit (configurable)
- Max. clock frequency 1 MHz
- Electrical interface RS 422

The absolute information is transmitted via a serial, clock-synchronized interface. Each bit of information contains the complete absolute information, which is represented in binary form or in Gray code. In the maximum configured resolution, the system can transmit 0.05 µm steps. Every transferred position value is accompanied by a configurable error bit or warning bit. In this way, errors can be detected and the system safely operated. This product can be connected to standard controls with SSI interface.

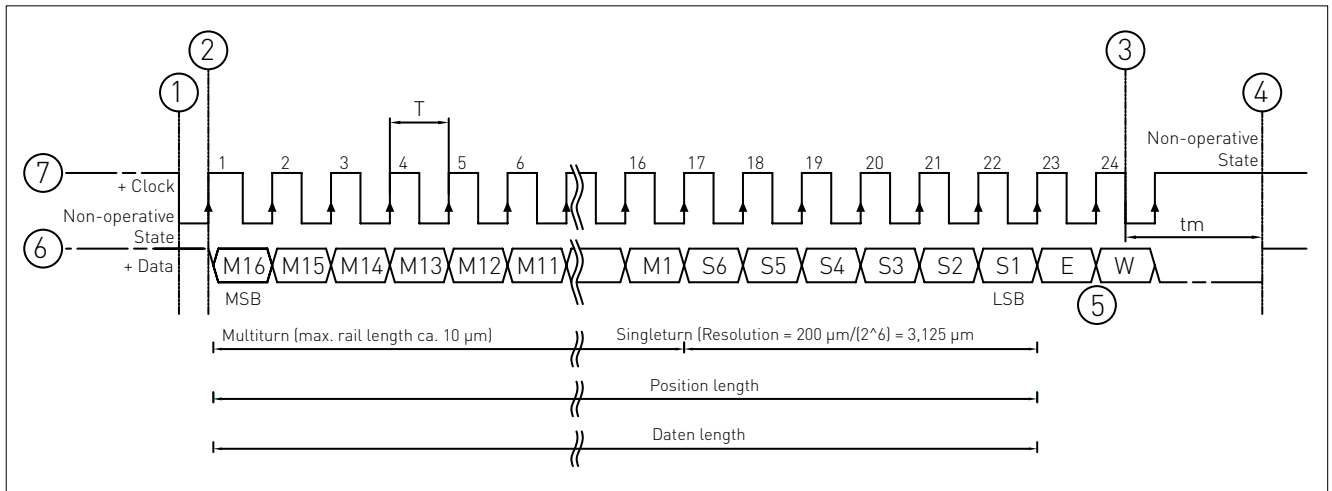
The measuring system can be operated with 5V or optional 24V. Only one voltage may be connected.

3 Product information

3.5.4 Absolute position measuring system with digital interfaces : FANUC-/Mitsubishi

Example of a position transmission with 22 position bits, 2 special bits and with a resolution of 3,125µm:

max. rail length = $2^{22} * 3,125\mu\text{m} = \sim 13\text{m}$



- 1: first falling edge in the clock signal
- 2: Start of the data transmission
- 3: last falling edge in the clock signal
- 4: Encoder ready for new data transmission
- 5: Special bit (error or warning) is configurable depending on the controller
- 6: Data from the sensor
- 7: Controller clock
- T: Period duration of the clock signal
- tm: Monoflop time (configurable)
- LSB - LSB - Resolution: (Least Significant Bit) configurable (in the graphic: 3.125 µm)

Fanuc Serial Interface

The Fanuc Serial Interface uses the same hardware as the SSI interface, but does not send a clock pulse to the motor controllers, only a request signal (REQ), from which the measuring system calculates the clock rate (1 MHz or 2 MHz) and, with this clock pulse and a preset timing, sends both position data and additional information such as sensor identification and alarm information to the receiver.

Mitsubishi interface

The Mitsubishi serial interface uses the same hardware as the SSI interface; however, it does not send any rate to the motor controllers, rather only a request signal (REQ); depending of the request signal, there will be position data, serial number or resolution information transmitted to the controller. The resolution, status information and transmission half-duplex (2-line system) or full-duplex (4-line system) can be configured.

4 Storage and transport

MONORAIL guides and the AMS linear measuring system are high-precision components, which must be handled with appropriate care. In order to protect them from damage during storage and transport, the following instructions must be followed:

- Internal transport may only be carried out by trained and authorized persons.
- Store and transport guides and accessories in the original packaging if possible, in order to protect from corrosion.
- Do not store products in the open air, and protect from impacts and moisture.
- Observe storage temperature
 - -40°C to +80°C for MONORAIL guides and accessories
 - -20°C to +70°C for AMS measuring system
- Only remove the products from the original packaging at the place of installation and immediately before installation.

Rails



Caution

Rails can fall during transport and injure people.

- Suspend long rails at several points during transport with a crane.
- Pay attention to the swivel range of the long rails.
- Carriages can slip off the rail. Risk of injury.
- Never hold rails with carriages at an angle during transport and handling.

Guide rails must be supported over their entire length during storage. Rails longer than 1.5 m must be supported at least three points.

Cover strips

- If possible, store and transport cover strips rolled up in their original packaging, support straight strips over their entire length and do not bend.
- Observe minimum bending radius ($R_{min} = 0.4 \text{ m}$) of strips.

Carriages

Protect guide carriages from sudden loads, to avoid loss of rolling elements.

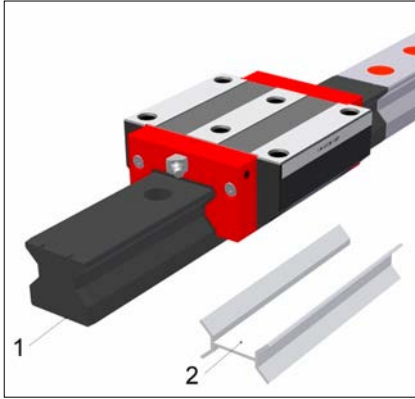
- Always store and transport carriages on the guide rail or on a transport rail or mounting rail, in order to protect the rolling elements.
- Do not remove the frontplate at MONORAIL BM

4 Storage and transport



Caution

- Transport rails are not suitable for mounting guide carriages.
- Use an MRM or MBM mounting rail for mounting up onto the guide rail, see also 9.2



1. Mounting rail
2. Transport rail

Measuring system



Caution

- Magnetic fields can destroy the magnetic scale of AMS rails.
- Protect rails with integrated scale from magnetic fields
 - Do not use lifting magnets for transport

- Protect AMS reading heads from strong vibrations or impacts (max. impact loading 30 g).
- Always transport reading heads together with the carriage if possible. Only remove reading heads from the mounting enclosure to mount the carriage up onto the guide rail.
- Always remove reading head, when mounting up carriage onto the rail
- In the case of the AMS absolute measuring system, do not remove the activation strip on the electronics box for the power supply. Only activate the battery upon installation.

Transport packaging

MONORAIL products are either dispatched in individual cartons, in wooden crates or on pallets with several packages. The packages can be up to approx. 6 m long. From a gross weight of 30 kg, carton packages are placed on disposable or returnable pallets, so that they can be stacked. For packages from 1.50 m in length, boards are also fitted under cartons for reinforcement, in order to prevent excessive deflection.

- In the case of wooden crates and pallets, note the pick-up points for the forklift truck, in order to avoid damage.
- Pick up long packages in their center of gravity.
- Wooden crates can be stacked on top of each other up to a maximum weight of 1000 kg.
- Cartons can be stacked up to a weight of 100 kg / m².

Transport aids

Hoisting devices, cranes or forklifts, can be used as aids for moving individual carriages and rails or packages, to avoid any buckling of the rails.

- The hoisting device must not damage the products or their packaging.
- The hoisting device must minimize any deflection.

5 Preparations for assembly

5.1 Tools and auxiliary equipment required

- Oilstone and polishing pad
- Lubricating oil or lubricating grease
- MoS₂-containing grease for the mounting screws, to attain uniform tightening forces and therefore improved run accuracies
- Plastic hammer and spacer for mounting plastic plugs
- MWH hydraulic mounting tool, including hydraulic unit for mounting MRZ steel plugs or MRS brass plugs for MONORAIL MR
- Scalpel and brass brush for mounting MRS brass plugs
- MWC or BWC mounting tool for mounting cover strips
- Torque wrench
- Mounting screws for rails
- MRM mounting rails for MONORAIL MR and MBM mounting rails for MONORAIL BM
- Open-end wrench, screwdriver and socket head wrench for mounting lubrication connection pieces and additional wipers

5.2 Delivery status

Single unit

All guide components are delivered individually, i.e. unmounted, in correct packaging as standard. Accessories are provided in separate packaging.

Unless specified otherwise by the customer, the lubrication connections are prepared at the front in the center of the front plate (S10, S20) and covered with plastic plugs. Lubrication connections that are not required are sealed. Single carriages are supplied on a transport rail, in order to protect the rolling elements.

AMS measuring systems are mounted ready to plug in, electrical accessories and cables are packed with the mechanics. In delivery status the reading head can either be mounted in the mounting enclosure, or be provided as an individual part in separate packaging.

System delivery

If required, rails and carriage can also be delivered as a system. A system delivery means that the guide carriage is mounted with all accessories and pushed onto the rail. Lubrication connections on the carriage are prepared in accordance with customer specifications. Lubrication accessories are mounted according to specification or provided in separate packaging.

Corrosion protection

The outer surfaces of the guide carriage and the rails are treated with a hardening anti-corrosive agent. The rolling elements are provided with mineral oil-based corrosion protection. Preservation with grease can also be provided if required. Carriages and rails are wrapped with a corrosion protection film. Additional precautions are taken for special requirements such as overseas transport.

5 Preparations for assembly

Packaging material

Cardboard packaging is used for individual rail deliveries and for system delivery. Wooden crates are available for specific countries or special requirements, for an additional price. Cardboard boxes are used for individual carriage packaging. The lubrication accessories are enclosed.

Product-accompanying documents

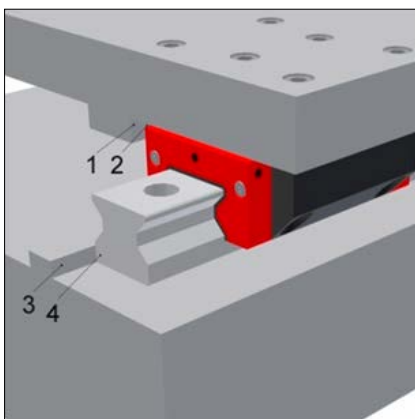
Product-specific mounting instructions and commissioning instructions as well as customer-specific reports are supplied with the products.

Mounting instructions are available from SCHNEEBERGER on request, see chapter 1.4.

5.3 Unpacking and checking the delivery

- Unpack profile rail guides at the place of installation, immediately before mounting. Carefully cut open the corrosion protection film with a knife, without scratching any parts of the guide.
- Always support long rails at several support points during handling.
- Always leave carriages on the rail if possible. Always leave individually packaged carriages on the transport rail.
- Use an MRM or MBM mounting rail to mount and demount carriages onto/off the guide rail. Leave demounted carriages on the mounting rail.
- Check completeness and condition of parts shipment. Pay special attention to bent cover strips, lubrication connection pieces, sealing rings, plugs etc.
- Read supplied mounting instructions and product accompanying documents carefully before mounting.
- Before assembling stock for temperature adjustment.

5.4 Preparing locating sides



- 1 Locating side, mounting plate
- 2 Locating side, carriage
- 3 Locating side, machine bed
- 4 Locating side, rail

1. Check the locating sides of the machine bed and mounting plate for dimensional and position accuracy. If these do not meet the requirements, have the locating sides reworked.
2. Clean all locating sides thoroughly. Remove burrs and unevenness with an oilstone.
3. Make sure that guides and mounting base are at the same room temperature before and during mounting
4. Remove corrosion protection from rails and carriage with suitable solvent, e.g. mineral spirits. Do not use solvents that can attack plastics!
5. Lightly oil the locating sides on the rails and carriages.

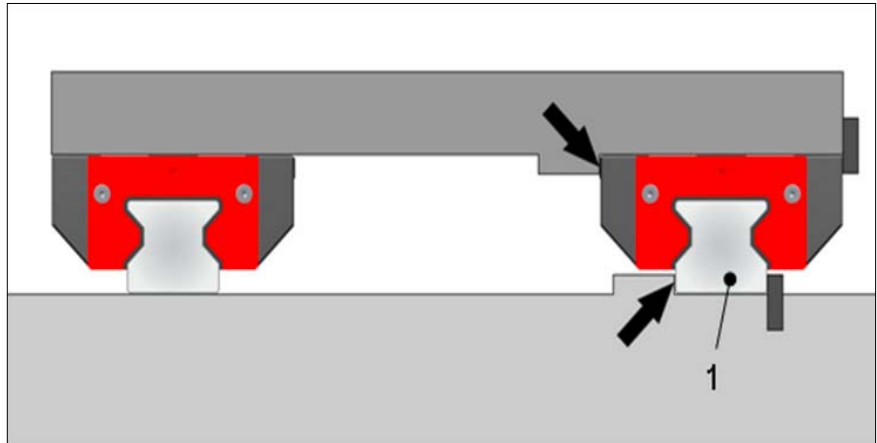
5 Preparations for assembly

5.5 Determining installation variants

Different installation variants are recommended, depending on the requirements for the accuracy and the rigidity of the profile guideways. These differ in the type of carriage mounting as well as the position of the machine-side locating faces and thus the lateral guide.

Four typical installation variants are described in more detail below:

Installation variant 1

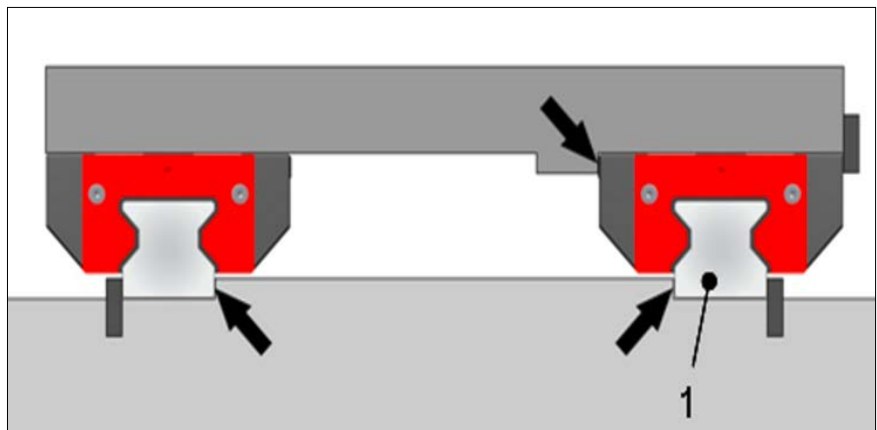


On the side of the reference rail locating sides between

- Machine bed and rails, mounting plate and carriages.
- Mounting plate screwed onto the carriage from above.

1 Reference rail

Installation variant 2

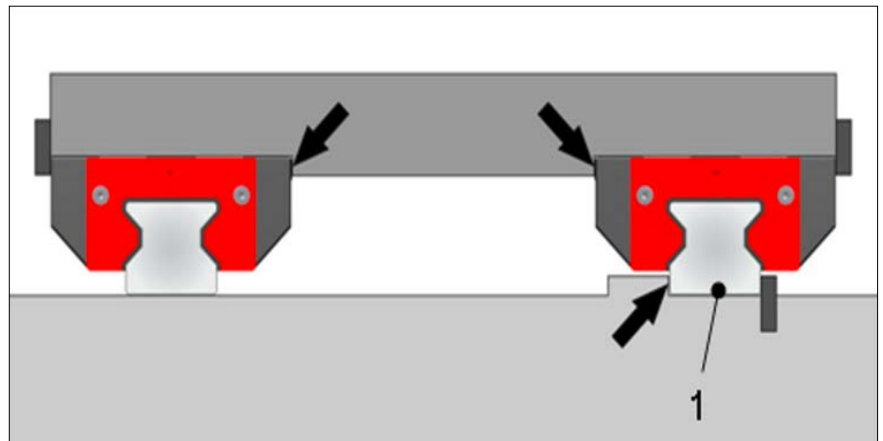


- On both rail sides locating sides between the machine bed and rail.
- On the reference rail side locating sides between the mounting plate and carriage.
- Mounting plate screwed onto the carriage from above.

1 Reference rail

5 Preparations for assembly

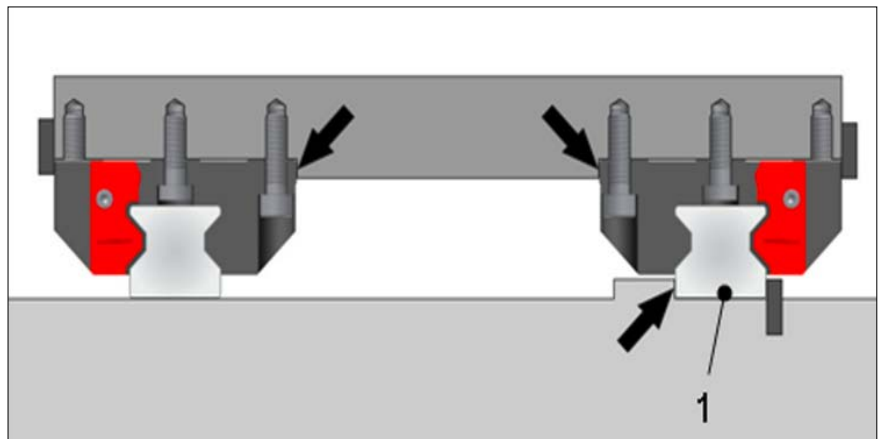
Installation variant 3



- On the side of the reference rail locating side between machine bed and rail
- On both rail sides locating sides between the mounting plate and carriage
- Mounting plate screwed onto the carriage from above

1 Reference rail

Installation variant 4



- On the side of the reference rail locating side between machine bed and rail
- On both rail sides locating sides between the mounting plate and carriage
- Mounting plate screwed onto the carriage from below. At first, screw the carriages on the mounting rail, than slide it on the rail, see chapter 6.5.

1 Reference rail

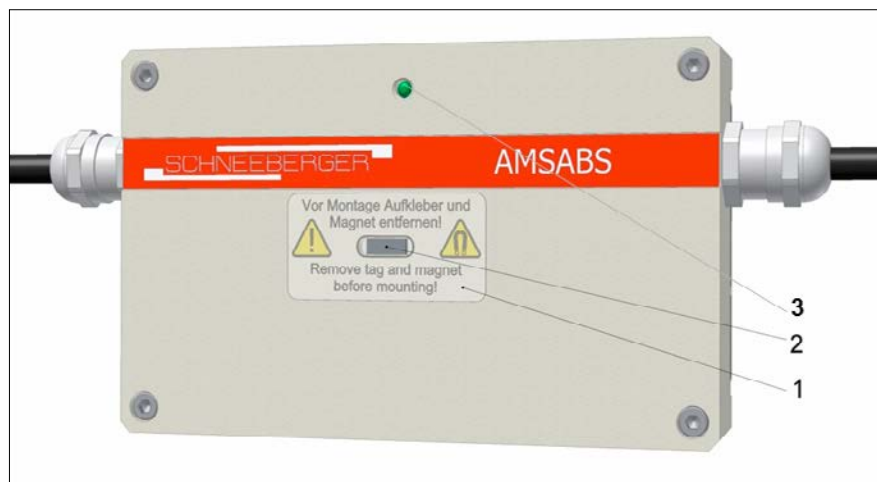
The **reference rail** (rail 1) is the rail which is placed against a locating side in the machine bed, or the rail with the magnetic scale and the carriage with reading head.

5 Preparations for assembly

5.6 Measuring system preparation

AMSABS

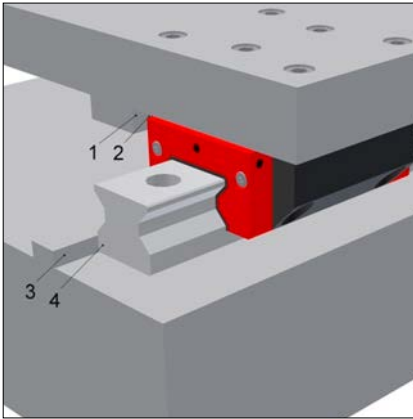
The absolute position measuring system has an integrated battery-buffered power supply, which ensures that the position information is retained even when the control is switched off. This power supply must be activated before mounting the reading head, by removing the tag, see picture below, with the magnet underneath on the electronics housing.



- 1 tag
- 2 magnet
- 3 LED

6 Installation

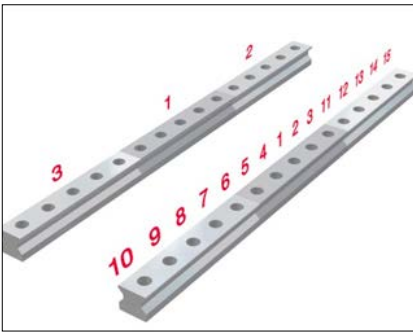
6.1 Important information on installation



Handling rails

The rails, machine bed, mounting plate and fixing screws must have the same temperature at the start of installation. Always clamp the rails with their locating side against the locating side of the machine bed. The locating side of the rails is on the side facing away from the Name SCHNEEBERGER and the type number.

- 1 Locating side, mounting plate
- 2 Locating side, carriage
- 3 Locating side, machine bed
- 4 Locating side, rail



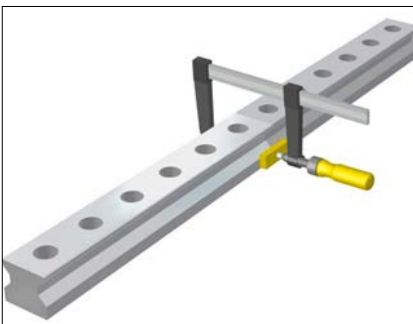
For high running accuracy and a good screw head position, grease the contact surface and the thread of the fastening screws with grease containing MoS₂. Always tighten the fixing screws with a torque wrench.

See section 11.2 for the tightening torques.

Tighten mounting screws consecutively, either from the start of the rail or from the center of the rail. In the case of sectional rails, mount the individual rail segments alternately from the line center or consecutively outwards.



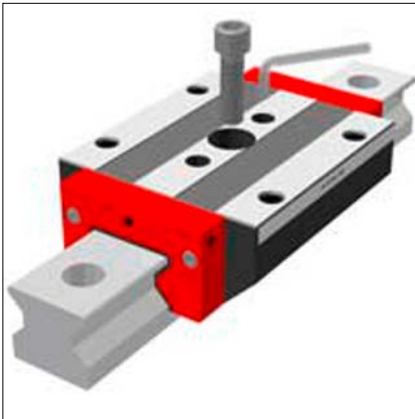
Multi part rails are marked with a number at the joints and, in the case of paired design, are also provided with a sequence number at the start of the rail. Mount the rails so that the joint numbers match. The rail with sequence number Index 1 or joint number 1 is referred to as the reference rail.



When mounting multi part rail lines without a locating side in the machine bed, align the rail joints using a fixing bridge or assembly carriage MWM. When mounting with machine-side locating side, always place the rails with their locating side to the stop face. In both cases make sure that the rails are lined up without gaps (except AMS-L and RSR/BSR).

Take the MONORAIL AMS rail with magnetic rail as reference rail. The MONORAIL AMS rail is marked as AMS at the side and the AMS carriage is equipped with the reading head housing

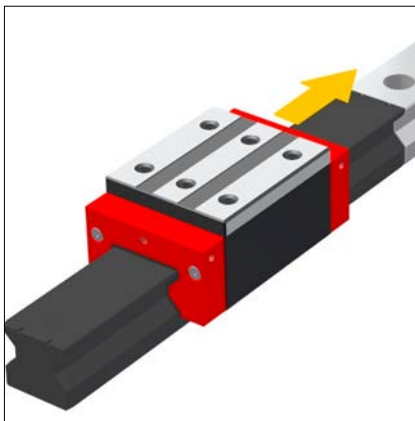
6 Installation



Assembly carriage MWM

The carriage is used for sectional rails, to align the joints between two pieces of rail. For this purpose the carriage is positioned centrally above the joint and the rail mounting screws are tightened through the two outer holes in the rear of the carriage. It is also used to align guide rails without a locating side. For this purpose the assembly carriage is gradually moved over the guide rail and the lateral position is recorded by means of laser or dial gauge. When the carriage is centrally located over a rail hole, the rail can be pushed into the desired position by force, and at the same time the mounting screws can be inserted into the rail from above through the central hole and tightened.

The MWM assembly carriage is available as an accessory from SCHNEEBERGER.



Handling carriages

Use a mounting rail to mount and demount carriages, transport rails are not suitable for this purpose, see section 4. If possible, always leave the carriages on the rail. In the case of paired design, do **not** interchange carriages belonging to different rails.

Protect individual carriages from contamination and the loss of rolling elements. Always leave carriages on a transport rail or mounting rail during transport and storage. In the case of carriages with a reading head, always remove the reading head before pushing the carriage onto a mounting rail.

Always clamp carriage locating faces against the locating faces of the mounting plate. The locating side of a carriage is its ground side. Always tighten the fastening screws with a torque wrench.

Befestigungsschrauben immer mit einem Drehmomentschlüssel anziehen, Anzieh-See section 11.2 for the tightening torques.

Modifications on the front plates to change the lubrication connection should be carried out by SCHNEEBERGER.

Before moving the carriage on the rail, the corrosion protection film has been removed.

If the carriage get moved on the rail several times, the wipers has been protected against sharp-edged rail holes.

6 Installation



Attention:

Only non-magnetic materials may be used in the immediate vicinity of the scale strip and the reading head (Fig. A)

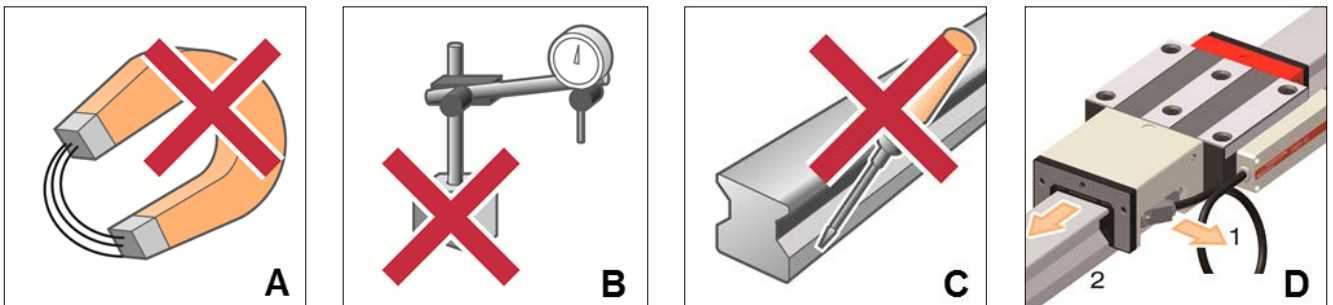
Only use non-magnetic aids to transport and align the AMS rails (Fig. B)

Avoid direct contact between tools and the magnetic measuring tape (Fig. C)

Use mineral spirits or ethyl alcohol to clean the rails and carriage.

Remove the AMS reading head (1), before moving the MONORAIL carriage (2) off the rail (Fig. D).

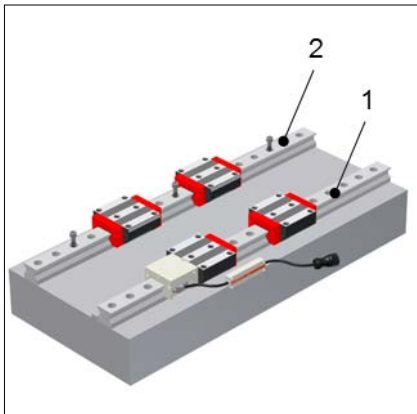
Measuring system



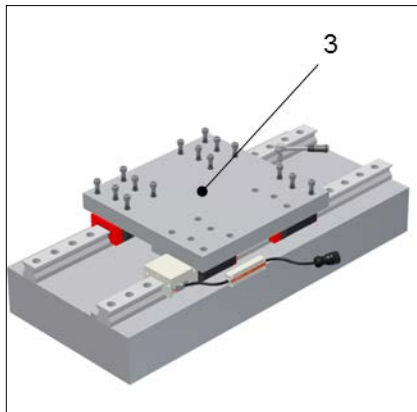
- Adequate free space must be provided for disassembly of the sensing head
- Note the following diameters: Cable plug: $\varnothing = 28 \text{ mm}$
 Reading head connection cable: $\varnothing = 6 \text{ mm}$
 Extension cable: $\varnothing = 8 \text{ mm}$ or $\varnothing = 14 \text{ mm}$

6 Installation

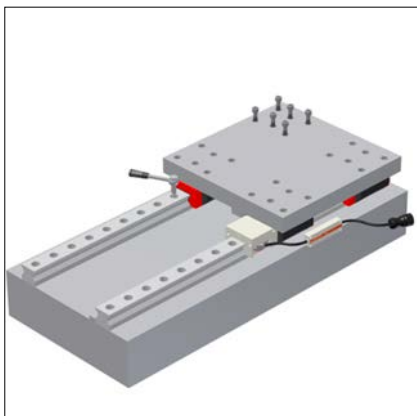
6.2 Installation variant 1 – One locating side for one rail



1. Clamp the reference rail (1) against the locating side of the machine bed and screw it securely into place, see section 6.1.
2. Align the opposite rail (2) parallel and lightly tighten the screws.



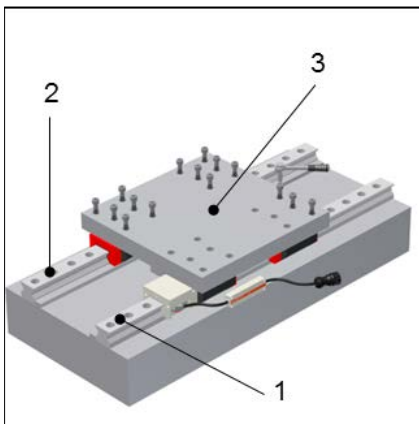
3. Place the mounting plate (3) on the carriages and lightly tighten the fastening screws.
4. Clamp the mounting plate (3) against the locating sides of the carriages on the secured reference rail and screw securely into place.



5. Securely screw a carriage on the not yet fastened rail on the mounting plate (3).
6. If carriages with additional wipers are protected by a mounting rail MRM/MRB film, secure the mounting rail film to prevent it slipping, see section 7.3.
7. Slide the mounting plate (3) with the carriage backwards and forwards and tighten the fastening screws of the unsecured rail securely next to the carriage, see section 6.1.
8. Securely screw on the mounting plate (3).

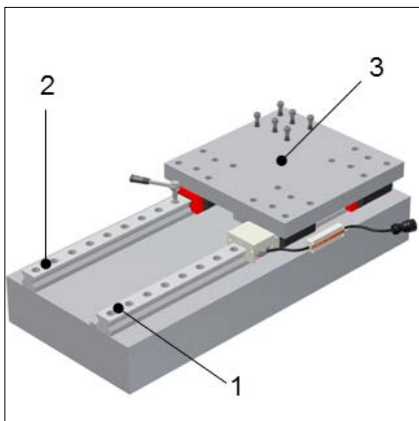
6 Installation

6.3 Installation variant 2 – one locating side per rail

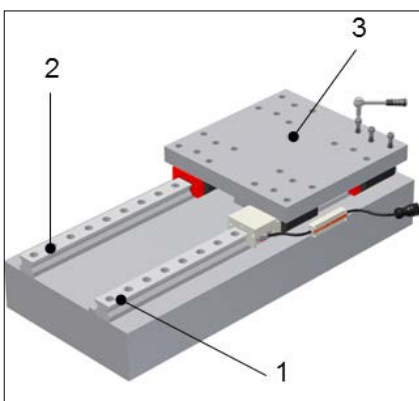


1. Clamp both rails against the locating sides and securely screw them into place, see section 6.1.
2. If necessary, fit clamping screws, clamping bars or conical bars.
3. Place the mounting plate (3) on the carriages and lightly tighten all fastening screws.
4. Clamp the mounting plate (3) against the locating sides of the carriage on the reference rail and securely screw it to these two carriages.
5. If carriages with additional wipers are protected by a assembly protective film, secure the mounting rail film to prevent it slipping, see section 7.3.
6. Slide the mounting plate (3) with carriage once over the entire rail length.
7. Securely screw the mounting plate (3) into place.

6.4 Installation variant 3 – One locating side for one rail

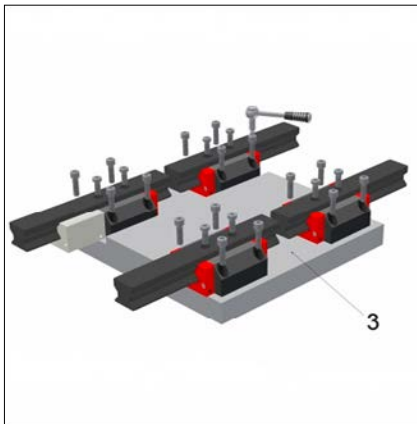


1. Clamp the reference rail against the locating side and screw it securely into place, see section 6.1.
2. Align the opposite rail parallel and provisionally secure it.
3. Place the mounting plate (3) onto the carriages and lightly tighten all fastening screws.
4. Clamp the mounting plate (3) on every rail side against the locating sides of the carriages and securely screw into place.
5. If carriages with additional wipers are protected by a mounting rail film, secure the mounting rail film to prevent it slipping, see section 7.3.
6. If necessary, fit clamping screws, clamping bars or conical bars.
7. Slide the mounting plate (3) with the carriage backwards and forwards and tighten the fastening screws of the unsecured rail securely next to the carriage, see section 6.1.

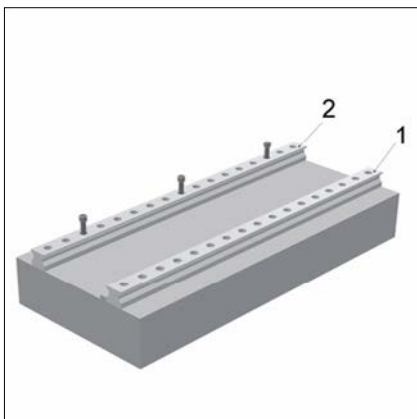


6 Installation

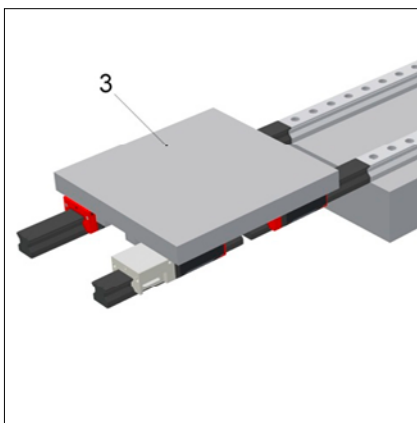
6.5 Installation variant 4 – One locating side for one rail



1. Remove reading head, see section 9.3.
2. Run off the carriages, see section 9.2, with one mounting rail MRM/MBM in each case. When doing so, note that carriage and rail belong together.
3. Clamp the locating side of the carriage (ground side) against the locating sides of the mounting plate (3) and screw securely into place.
4. If carriages with additional wipers ZCV/ZCN are protected by a mounting rail film, secure the mounting rail film to prevent it slipping, see section 7.3.



5. Clamp the reference rail (1) against the locating sides on the machine bed and screw securely into place, see section 6.1.
6. If necessary, fit clamping screws, clamping bars or conical bars.
7. Align the opposite rail (2) parallel and provisionally secure it.

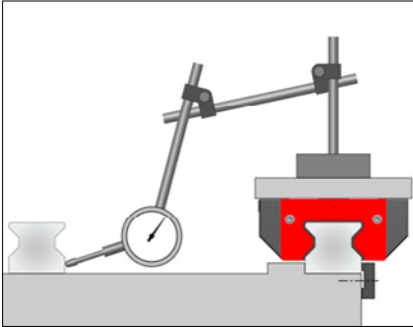


8. Place the mounting plate (3) with the carriage onto the rail, by pushing the face side of the mounting rail MRM/MBM to the face side of the rail and slide it on the rails.
9. Slide the mounting plate (3) with carriages backwards and forwards and tighten the fastening screws of the unsecured rail, securely next to the carriage, see section 6.1.
10. Install reading head, see section 9.3.

7 Completing assembly

7.1 Checking the parallelism and travel accuracy

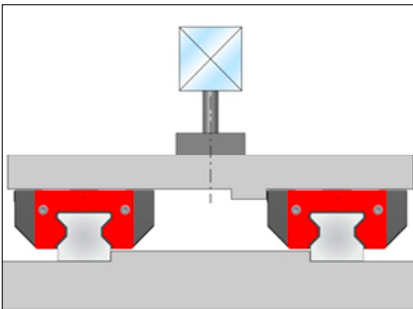
Checking the parallelism and travel accuracy



Parallelism

Check observance of parallelism tolerances for the rails with measuring gauge and two carriages coupled together.

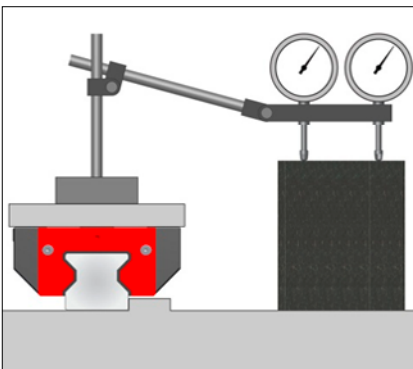
Use the vertical lateral side face as reference face on the opposite rail. For checking the AMS-rails, there are special intermediate plates available



Travel accuracy

Check the travel accuracy with laser, autocollimator or measuring gauge and ruler. The measurement should always be carried out on the machine slide and not on individual carriages, in order to achieve correct results.

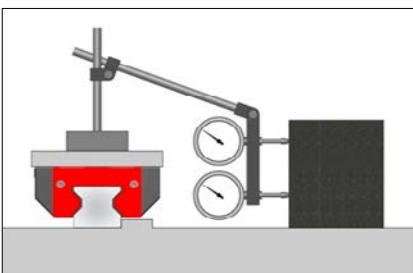
Optical travel measurement on an axial slide by means of laser / autocollimator



Vertical travel measurement with two measuring gauges

Two measuring gauges are recommended, in order to measure angular deviations by the guide carriage about the longitudinal rail axis by means of a differential measurement.

If using one measuring gauge, ensure that its lateral positioning is as close as possible to the guide rail.



Horizontal travel measurement with two measuring gauges

Two measuring gauges are recommended, in order to measure angular deviations by the guide carriage about the longitudinal rail axis by means of a differential measurement.

If using one measuring gauge, ensure that its depth positioning is as close as possible to the guide rail center.

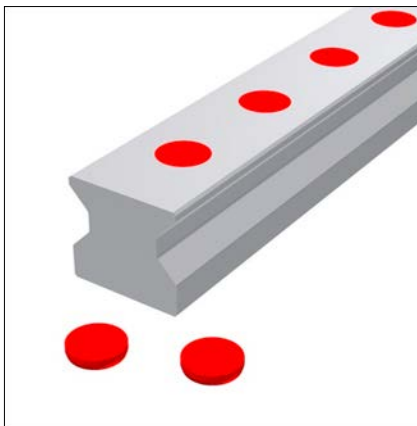
7 Completing assembly

7.2 Fitting the screw cover



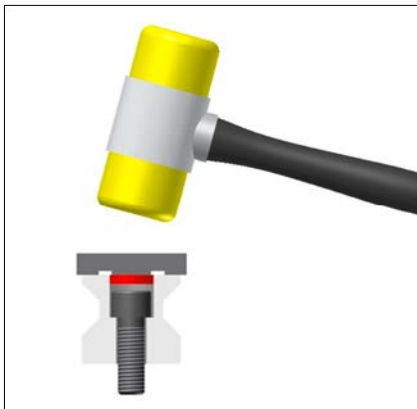
Caution:

- Rail holes and cover strips MAC/BAC can have sharp edges. Risk of injury.
- Wear gloves
- Protect wipers on carriage when traveling over unsealed rail holes, using mounting protection strip



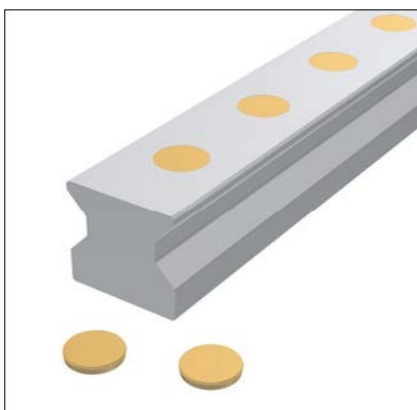
Plastic plugs MRK / BRK

Use plastic hammer and spacer, e.g. acrylic glass block or mounting rail, for assembly.



Installation procedure

1. Position plug on previously cleaned rail hole. Ensure parallel seating of plugs with the rail surface.
2. Beat plugs in lightly first of all,
3. Check seating again and remove any chips.
4. DaThen beat in plugs flush.



Brass plugs MRS / BRS

Hydraulic mounting tool MWH is recommended for correct installation of brass plugs.

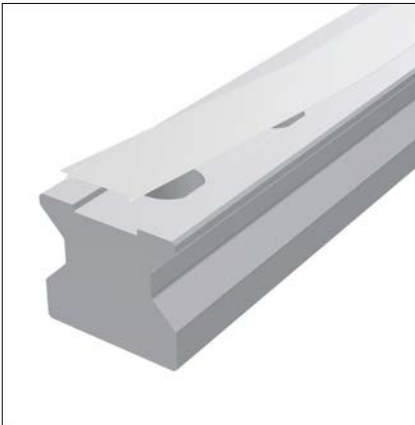
For a detailed description of the installation procedure, see Installation Instructions Brass Plugs MRS for MONORAIL MR.

7 Completing assembly



Steel plugs MRZ

Hydraulic mounting tool MWH is recommended for correct installation of steel plugs.
For a detailed description of the installation procedure, see Installation Instructions Steel Plugs MRZ for MONORAIL MR.



Cover strip MAC / BAC



Caution

Cover strips can bend during storage and transport, and can damage the wipers on the carriage.

- Always support the cover strips over the entire length.
- Do not use bended cover strips.

Mounting tool MWC or BWC is recommended for correct installation of cover strips

The installation is described in detail in the Installation Instructions MAC Cover Strip for MONORAIL MR and Installation Instructions BAC Cover Strip for MONORAIL BM.

7.3 Removing assembly protective film for additional wipers (optional)



Carriages with additional wipers ZCN/ZCV are delivered with a mounting protection film, if the rails are screwed down from above and the mounting holes are covered with plugs. The assembly protective film protects the sealing lips during assembly and must not be removed until the fastening holes of the rails are closed.

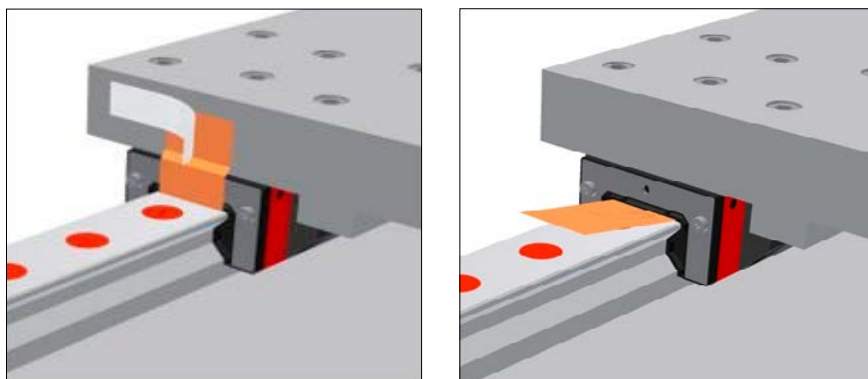


Caution

Additional wipers can be damaged by the edges of the open fastening holes of the rails when the carriage is moved

- Do not remove the assembly protective film until after the retaining holes are closed.

7 Completing assembly



→ Pull the assembly protective film out of the carriage in the rail direction.

7.4 Lubrication



Lubrication

Screw the lubrication connection pieces into the carriages.

When doing so, observe the following:

- Before mounting lubrication connection pieces, check that the lubrication connection in the front plate is open.
- The lubrication connections have a plastic thread. Take due care when inserting lubrication connection pieces.
- Maximum tightening torque 1.5 Nm.
- Minimum screw-in depth 4 mm (thread depth in the front plate: 6 mm).
- Connection pieces with conical thread: max. screw-in depth according to thread length.
- When lubricating from above, place the supplied sealing ring into the countersink of the front plate and, if necessary, improve the hold with some lubricating oil.

If central lubrication is present, connect the carriages to the central lubrication.

Note

Modifications to the carriage front plates for the purpose of changing the lubrication connection should be carried out exclusively by SCHNEEBERGER.

First lubrication

Carry out first lubrication of the carriages, see section 11.3. When doing so, move the carriages several times by more than three times their length. Wet rails slightly with the guide lubricant. A thin lubrication film on the rails reduces lubricant consumption at the start of operation, as the surface roughness of the rail are already filled with lubricant.

7 Completing assembly

Lubrication plate SPL

The lubrication plates SPL are delivered ready for installation, i.e. oil-filled.

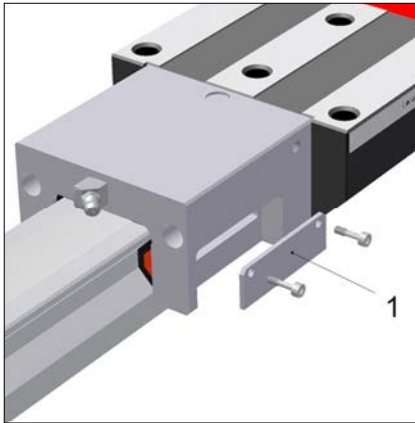
Note:

- The oil-emitting contact elements are lightly pretensioned and can be destroyed by incorrect handling.
- Carefully push lubrication plates over the end of the rail.
- Only mount lubrication plates when carriage is on rail.
- For detailed installation description, see Installation Instructions Lubrication Plate SPL for MONORAIL.

7.5 Install interpolation and digitizing electronics SMEa (optional)

- Adjustment and installation of interpolation and digitization electronics SMEa, see Operating Instructions for Interpolation and Digitization Electronics SME.

7.6 Mounting and connecting the reading head



Reading head installation

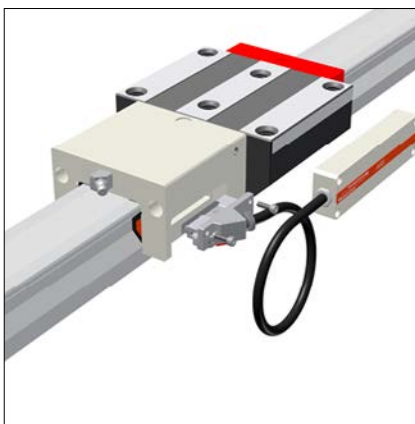
In the case of MONORAIL AMS systems that are supplied without a reading head, the mounting enclosure is sealed with a cover plate (1). This must be removed for installation of the reading head.



Attention:

When handling and inserting the reading head, make sure that the sliders are not damaged. Don't touch the sliders. Be sure of clean contact between slider and magnetic strip

7.6.1 AMS 3B, AMS 4B, AMSA 3L

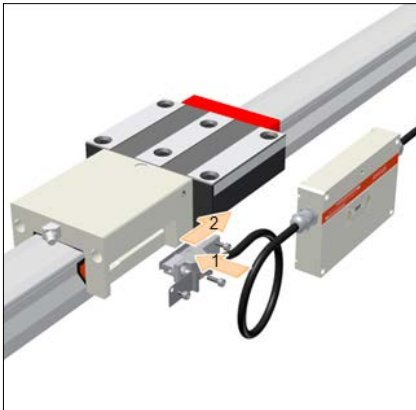


1. Remove cover plate from housing if necessary.
2. Carefully insert reading head into the opening on the side of the housing.
3. Insert and tighten the mounting screws. No additional adjustments are necessary.

| Type: | AMS 3B | AMS 4B | AMSABS |
|-------------------|--------------------------|-----------------------------|-------------------------|
| Screws: | 2x ISO4762 M3x10 - A2 | 2x ISO 4762 M2, 5x8 - A2 | 2x ISO4762 M3x5 - A2 |
| | | | 1x ISO4762 M3x5 - A2 |
| Tightening torque | 1,1 Nm | 1,1 Nm | 1,1 Nm |

7 Completing assembly

7.6.2 AMSABS



1. Remove cover plate from mounting enclosure if necessary.
2. Activate the battery.
3. Carefully insert reading head orthogonally into the opening on the housing.
4. Move reading head parallel to the rail until it has reached its screw-on position, see figure beside. This procedure guarantees that the measuring system automatically detects its absolute position during mounting, and is ready for operation immediately after mounting. The LED lights up green when the control is switched on.

Reading head connection



Caution

Risk of destruction for the electronics in the reading head due to short-circuit currents. Before connecting the cable, interrupt the power supply and ensure that it is not restored without authorization.

Connecting directly to drive control

Connect reading head connector to the drive control and tighten connection nut hand-tight.

Connecting via SMEa:

1. Connect 12-pole connector of reading head to the SMEa interpolation and digitization electronics and tighten connection nut hand-tight.
2. Connect connecting cable between SMEa and drive control.

Operating status display










The measuring system variants AMSD 3B, AMSD 4B, AMSA 3B, AMSA 4B, and AMSABS have a service LED in the electronics housing of the reading head, which indicates the various operating states of the measuring system.

AMSD

| LED-status | Cause |
|--------------------|---|
| Red permanent | Hardware error, no function, fault signal -Uas active |
| Red flicker | Operating voltage error (< 4.5 V or > 5.5 V), Fault signal -Uas active |
| Red-Green flicker | Signal strength zero, no function, fault signal -Uas active |
| Red-Green blinking | Signal strength too low, function still provided with reduced accuracy, fault signal -Uas active |
| Green blinking | Signal strength too high, function still provided with reduced accuracy, fault signal -Uas active |
| Red blinking | Travel speed too high, fault signal -Uas active |
| Green permanent | Fault-free operation |

7 Completing assembly

AMSA 3B uns 4B / AMSABS 3B und 4B

| LED-Status | | AMSA | AMSABS | Meaning | Cause |
|--------------------|---|------|--------|-------------------------------|---|
| Red permanent |  | x | x | internal error | Hardware error, memory, CRC |
| Red flicker |  | x | x | external error | Supply voltage out of tolerance |
| Red-Green flicker |  | x | x | Amplitude < 60% | Allowed amplitude fallen below |
| Red-Green blinking |  | x | x | Amplitude > 140% | Allowed amplitude exceed |
| Green flicker |  | x | x | Bridge circuit voltage > 8V | Bridge circuit voltage in critical range, Danger of pollution |
| Green blinking |  | x | x | Bridge circuit voltage < 0,6V | Bridge circuit voltage in critical range, Danger of wear sensor |
| Red blinking |  | | x | no absolute position | Speed in battery mode to high or none refence impulse (Battery mode > 1,5m/s) |
| Green + Red flash |  | | x | Battery voltage < 3V | Battery empty |
| Green |  | x | x | Fault-free operation | |

7.7 Electronics box and cable installation

Electronics box

The reading heads of the measuring system (not AMSA 3L) have a separate electronics box, which is integrated into the reading head cable. With all AMS types, except AMSA 3L this box has a LED on the front, which displays various operating states. Mount electronics box near the reading head, noting the following:

- Mount electronics box so that the front of the box and the diagnostic LED (for AMSD 3B/4B, AMSABS 3B) are easily accesible during servicing.
- Do not lay the cables to and from the box in energized state.
- Observe minimum bending radii of the cables, see chapter 11.4.
- Screw hole pattern, see chapter 11.1.

Cables

- When laying cables for the measuring system, note the following points:
- 12-pole shielded cables with a minimum cross-section of $[4 \times (2 \times 0.14) + (4 \times 0.5)]$ mm² are used as extension and connecting cables between measuring system and control.
- The maximum cable lengths are:

| Signal type | Cable length max. |
|-------------|-------------------|
| analog | 30 m |
| digital | 50 m |

- When using AMS with analog signal and an SMEa interpolation and digitization electronics the specified cable lengths also apply, i.e. max. 30 m between measuring system and SMEa and 50 m between SMEa and control.
- For cable feedthroughs, note the dimensions of the mounting base according to catalog and connector diameter ($\varnothing = 28$ mm).
- Do not lay cables next to sources of interference, e.g. magnetic fields of voltage supplies, mains leads, motors, valves, relays and their connection leads.

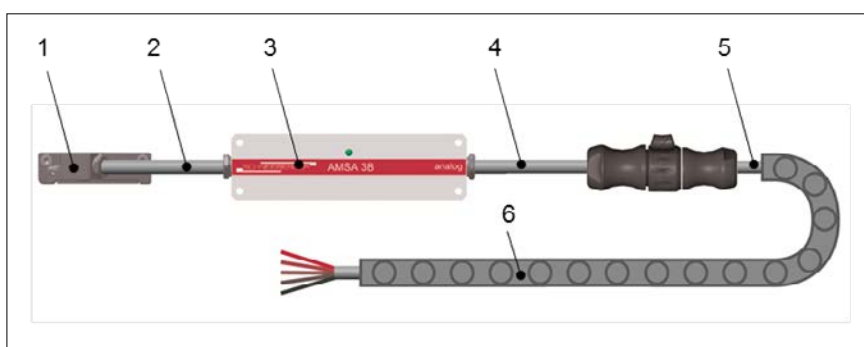
7 Completing assembly

An adequate distance from interference signal conducting cables is obtained with:

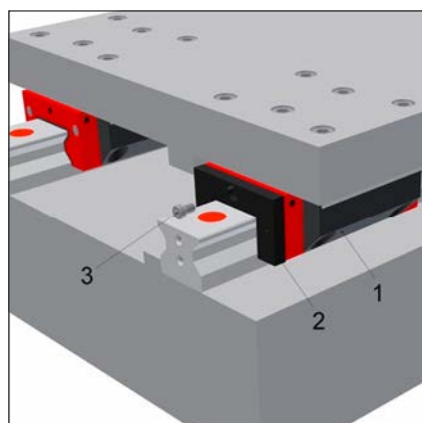
- a distance of 0.1m.
- an earthed screen, if metal cable ducts are used.
- a minimum distance of 0.2 m from storage throttles in switching power supplies
- separate hydraulic hoses and electric cables.
- Lay reading head cables statically if possible, i.e. not in cable trailing devices/ducts. Use extension cables for cable trailing devices.

1 Reading head; 2 Sensor cable; 3 Electronics box; 4 Reading head cable; 5 extension cable; 6 trailing cable

- Do not use sharp-edged ducts.
- Lay cables without tensile strain.
- Observe bending radii of cables, see chapter 11.4.



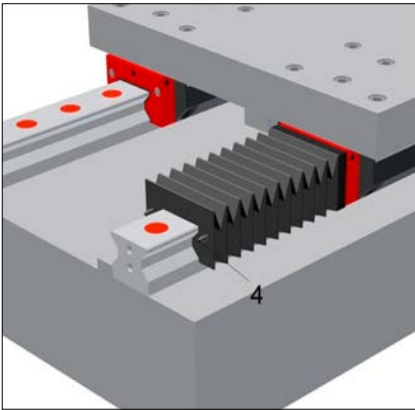
7.8 Installing the bellows FBM / FBB - optional



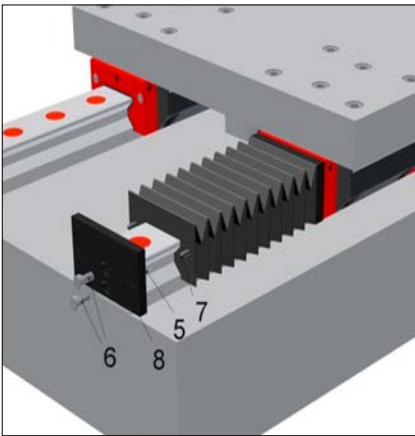
The FBM / FBB bellows are primarily used to additionally protect the guide rails from dust and splash water.

1. Before installing the bellows, seal the rail holes with plugs or cover strip.
2. Move machine slide roughly into the center of the stroke.
3. Insert the adapter plate (2) in front of the first carriage (1), so that the counterbore in the mounting hole is located on the side that is turned away from the carriage.
4. Fix adapter plate to the central lubrication connection thread on the front plate using the central screw (3), max. tightening torque 1.5 Nm.

7 Completing assembly



5. Push preassembled bellows (with support frame and rivet plugs) onto the rail.
6. Engage the rivet plugs (4,7) on the end of the bellows into the corresponding holes of the adapter plate.



7. Insert the end plate (5) onto the rail end so that the side with the counterbores in the fastening holes is averted the carriage.
8. Attach the end plate with the screws provided (6).
9. Engage the rivet plugs (4,7) on the end of the bellows in the corresponding holes (8) on the end plate.
10. Check that the bellows slide smoothly on the rail and the corrugations are not excessively compressed or expanded in the slide end positions.

7.9 Checking the installation result

After installation, the guide and accessories must be checked for correct installation and functioning

Moving force:

- Move the machine slide manually across the entire stroke and ensure even moving force and smooth movement

Lubrication:

- Ensure that the lubrication lines are correctly connected and vented, and the carriages are adequately supplied with lubricant. The lubricant delivery can be checked by activating the lubrication supply and simultaneously moving the carriages on the rail. A thin film of lubricant must be visible on the rail, and no lubricant must escape from the lubricant lines, the lubrication connection pieces or between front plate and carriage body.

Accessories

Details of installation procedure and inspection are described in the installation instructions for the individual accessories, see chapter 1.4.

7 Completing assembly

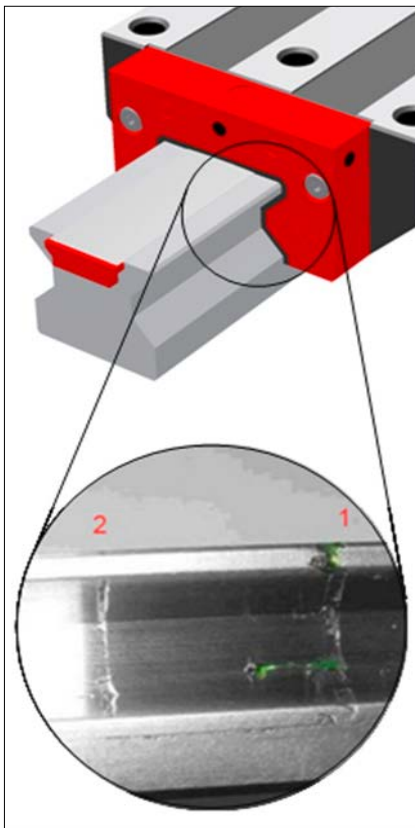
Cover strip and plugs

The wiper lips on the carriages must not be damaged during operation by burrs or projecting parts of the cover elements.

- Check that cover strips and plugs are fitted flush and evenly.
- Cover strips must be located neatly and without gaps on the rail surface and must not be bent. The ends must be secured with steel cover strip retainers or end pieces.
- Plugs must be installed flush and parallel to the rail surface, i.e. they must not protrude or be positioned too low. In the case of plastic and brass plugs, make sure that no residual chips or burrs are present.

Front plates and additional wipers

The wipers on the carriage front plates and on accessories, as well as the additional wipers, must be checked for correct fitting and functioning. Lubricant applied to the rail must be wiped clean and must not form smears on the traversed rail surface.



Wiper inspecting:

1. Clean lubricant and particles of dirt from rail and sealing lips of wipers.
2. Apply lubricating grease or oil (ideally colored) to rail tracks and distribute evenly with a cloth.
3. Move carriage with wiper a few centimeters over the wetted rail, then back to the starting position and then forward again, but not quite so far as for the first stroke. The inspection is clarified by the following figure:

The wiper effect must be clearly identifiable at the end of the first stroke (1), as the surplus lubricant is pushed on here. When the carriage is moved back, the lubricant located on the sealing lip is withdrawn. At the end of the second movement, if the wiper is functioning correctly, a thin continuous line of lubricant must be visible on the rail track. (2). If this is not present or is interrupted, this indicates inadequate pre-tensioning or incorrect positioning of the wiper.

Metal wiper ASM / ABM

The wipers must form an even gap around the rail profile and must not touch the rail at any point. For AMS systems you have to use special metal wipers.

- Check correct seating of wipers with feeler gauge and by moving the machine slide.

Bellows

You must check that the bellows are correctly mounted on the intermediate and end plate, and ensure that they run smoothly.

- To do this, move the machine axis, checking that the bellows slide smoothly on the rail and that the corrugations are not excessively compressed or expanded in the slide end positions.

8 Commissioning

8.1 Guide checklist

Before commissioning the guide, the following points must be checked in order to ensure the functionality of the guide:

- Guide correctly mounted, see chapter 6
- System accuracy and moving force checked, see chapter 7.1, 7.9
- Lubricant supply ensured, see chapter 7.9
- Corrosion protection removed and rail lubricated, see chapter 5.3, 6.1
- Initial lubrication performed, see chapter 7.4, 7.9
- Rail covers mounted and seating checked, see chapter 7.2, 7.9
- Wiper function checked, see chapter 7.9
- Function and seating of bellows checked, see chapter 7.8, 7.9

8.2 Measuring system checklist

The following points must be checked in order to ensure the functionality of the measuring system:

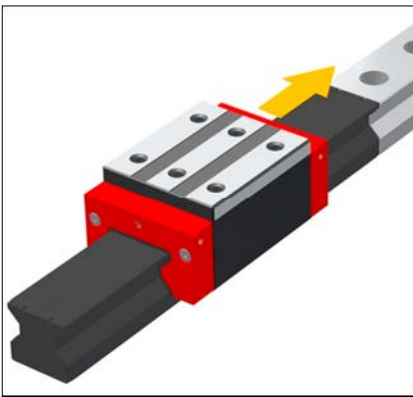
- Carriage with mounting enclosure mounted on the rail, so that the reading head is located on the scale side of the rail. The scale side is indicated by the reference mark symbol.
- Battery for AMSABS activated by removing the magnet on the electronics box, see chapter 5.6
- Reading head correctly mounted in the mounting enclosure, see chapter 7.6
- Cable and electronics box correctly installed, see chapter 7.7
- Connection to control established, see chapter 7.6
- LED of operating status display (optional) lights up green when the control is switched on.

9.1 Cleaning

**Caution**

- Clean all parts with ethyl alcohol or mineral spirits only. Do not use cleaning agents or solvents that can attack plastic parts.
- Clean dirty rails with a soft, lint free cloth or fabric cloth. Do not use compressed air!
- Avoid direct contact between tools and the magnetic scale of the rail.

9.2 Running the carriages on- and off the rail



- The carriages and rails form an unit. In the case of paired design, do **not** interchange carriages belonging to different rails.
- Use a mounting rail MRM/MBM to mount and demount the carriage, so that the rolling elements cannot fall out of the carriage. By standard scope of supply not included

**Caution**

When the carriage, connected to the housing of the scanning head, is run on or off the rail, the slider springs of the reading head can bend.

- Remove the reading head before running the carriage on or off the rail.

1. Run the carriage onto an MRM / BRM mounting rail.
2. Leave carriages on the mounting rail during transport or storage. Make sure that carriages and the matching rails are not mixed up.

**Caution**

Chips which are under the metal wipers can scratch the magnetic scale.

- Only use metal wipers that are marked for the AMS measuring system on rails with magnetic scale

3. Run carriages individually from the mounting rail onto the associated rail again. Please note the following for carriages with metal wipers:
 - Slightly loosen mounting screws of plate wiper on the front plate.
 - run carriages onto the rails.
 - Ensure an even radial air gap between metal wiper and rail, and fastening mounting screws again

9.3 Reading head replacement

SCHNEEBERGER AMS position measuring systems are maintenance-free in principle. In the event of a reading head defect, the reading head can be simply replaced, without the need to disassemble the carriage



Warning

Risk of crushing by moving axial slides.

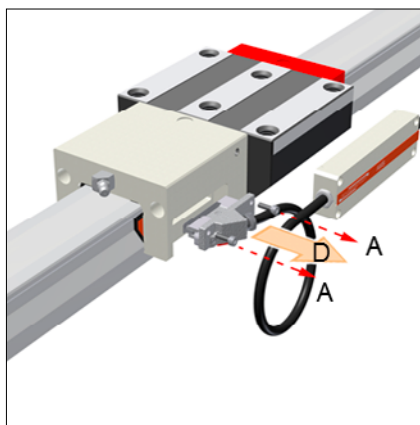
→ Before replacing the reading head, switch off the main switch and secure against restarting. Secure axis if necessary.



Caution

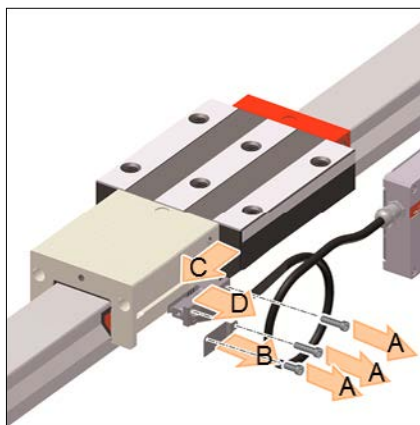
Risk of destruction for the electronics in the reading head due to short-circuit currents

→ Before replacing the reading head, interrupt the power supply and ensure that it is not restored without authorization.



Disassembly of the reading head

1. Switch off the main switch and secure against restarting.
2. Remove protective covers if necessary.
3. Secure position of non functional axis.
4. Disconnect reading head connection cable.
5. Loosen fixing screws of separate electronics housing.
6. Loosen fixing screws of reading head.
- 6.1 Remove cover plate (just for AMSABS)
- 6.2 Slide the reading head longitudinally in its location groove, until it is free to move radially (just for AMSABS)
7. Carefully remove the reading head from the housing, perpendicularly to the bearing surface
8. Note fault and serial number and pack reading head.



Order of disassembly AMSABS reading head

- A Remove screws
- B Remove cover plate (just for AMSABS)
- C Push reading head along the guideway (just for AMSABS)
- D Extract the reading head

Reading head installation

1. Check support surface of reading head on the housing for contamination, e.g. deburring or paint residues.
2. Clean magnetic scale
3. Carefully unpack new reading head
4. Clean reading head sensor slider if necessary
5. Activate battery on AMSABS, see chapter 5.6.
6. Carefully insert the reading head into the opening on the housing, ensuring that it is flat.
7. On AMSABS slide reading head parallel to the rail, until it has reached its screw-on position. This procedure guarantees that the measuring system automatically detects its absolute position during mounting, and is ready for operation immediately after mounting. The LED lights up green when the control is switched on.
8. Tighten fixing screws on housing. Tightening torque 0.3 Nm
9. Lay cable and fix separate electronics housing. Observe notes in chapter 7.7
10. Connect connection cable with connector and tighten connection nut hand-tight.
11. Restore power supply.
12. On the AMS with operating status display, ensure that the LED lights up green.
13. Adjust zero point (not AMSABS): Perform reference travel on the drive control. Make sure that the reading head only detects the reference marks with a tolerance of ± 0.5 mm.

**Caution**

The machine is not operationally safe unless the zero point is adjusted.

- Adjust the zero point after every reading head installation (not AMSABS).

9.4 AMSABS Battery**Battery status display**

On the AMSABS with SSI interface, a weak battery status is indicated by the operating status LED, see chapter 7.6.

- Set maintenance interval for reading head.

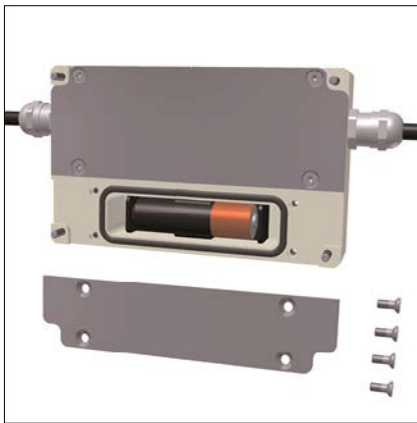
On the AMSABS with Fanuc interface, an inadequate battery status is indicated by an error message in the control. Fanuc error log, see chapter 10.2.

- Set maintenance interval for reading head.

In case of low battery, you can replace it easily

In case of the message "battery change necessary", the measuring system is internally supplied with voltage during the battery change, so that the system is ready for operation again immediately after the battery change. Without loss of the axis position.

9 Maintenance



1. Unscrew cover of battery compartment on the back of the electronics box.
2. Remove used battery.
3. Insert new battery, ensuring correct polarity.
4. Ensure that the o-ring fits into the corresponding groove, as well as that the groove and the surface of the cover plate are clean of contamination.
5. Place cover on battery compartment and screw down, tightening torque 0.3 Nm.
6. Dispose the worn out batteries in a professional way, take care to the certain country-specific particularities

Used battery type: Lithium Type AA- LS 14500- 3,6V-2400mAh- SAFT

9.5 Inspection and replacement of accessories and wearing parts

Front plates and additional wipers

Perfect functioning of the carriage seals is essential for a long service life of the guide. In general the wipers are maintenance-free, provided they have adequate lubrication and are in a clean environment. However, certain operational conditions, such as dust and chips, which can enter the guide, or inadequate lubrication, inevitably result in wear of the sealing lips.

→ Inspect the wipers of the front plates and additional wipers for wear at regular intervals (max. 6 months) and replace if necessary.

Inspection

- Inspect cross wipers of front plate and additional wipers, by applying lubricant to the rail.
- The lubricant must be cleanly wiped off during movement, and must not form smears on the rail surface when moving back.
- Replace front plate or additional wiper if damaged.

Replacement

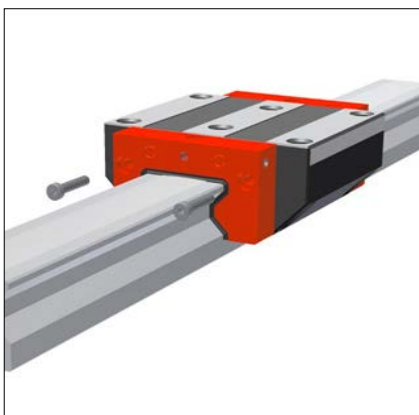
General information

In order to replace front plates and additional wipers, the mounting screws of the front plates must be removed. Please note that, on MONORAIL BM, the front plates must never be removed from the carriage body. In the case of MONORAIL MR, front plates should only be removed from the carriage when being replaced, and the carriage must not be moved after removing the front plate. Always use a mounting rail to mount and demount the carriage on and off the rail. In the case of carriages with measuring system, remove the reading head from the housing before mounting and demounting the carriage on and off the rail.



Caution:

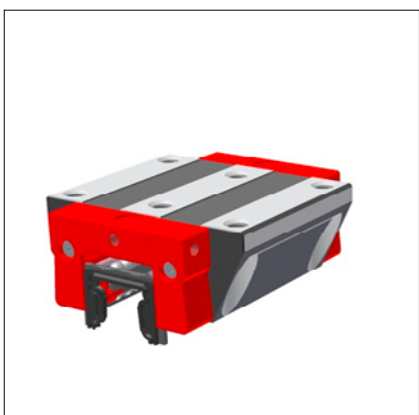
In the case of MONORAIL BM, the front plate is part of the rolling element deflection. Removing the front plate will result in loss of balls. Only the cross wipers are replaced here, not the front plate.



Front plates with integrated cross wiper on MONORAILMR

In the case of MONORAIL MR, the complete front plate is replaced.

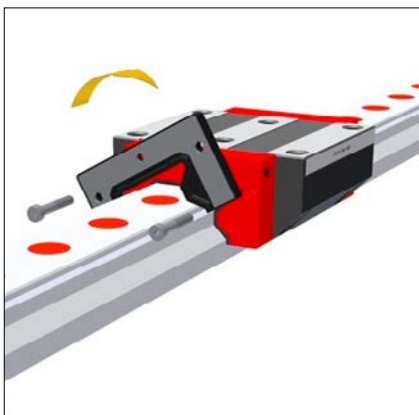
1. Loosen screws and remove front plate axially from the rail. Do not move the carriage during this process.
2. Install new front plate in the reverse order. Observe max. tightening torque of fixing screws in accordance with chap. 11.2.



Cross wipers for front plates on MONORAIL BM

In the case of MONORAIL BM, only the cross wipers are replaced in the front plate.

1. Demount the carriage from the rail with the aid of a mounting rail.
2. Remove defective cross wiper downwards from the front plate housing.
3. Push new cross wiper completely into the front plate groove, until the wiper clicks into place.
4. Run carriage on the rail.



Additional wipers ZCN / ZCV / ZBN / ZBV

can be replaced directly on the rail. This means that they can also be subsequently installed, e.g. for carriages on which the cross wipers of the front plate are worn, and the carriages cannot be removed from the rail for replacement.

1. Loosen screws on carriage front plate.
2. Pull additional wiper out from the front plate a few millimeters, holding the front plate steady.
3. Remove wiper directly from the rail and replace. (Keep the metal surface outwards).
4. Put new additional wiper over the rail cross-section or thread over the end of the rail.
5. Press additional wiper onto the front plate, using the centering taper on the back to align it.
6. Ensure even seating of the wiper and tighten screws, for max. tightening torque see chap. 11.2

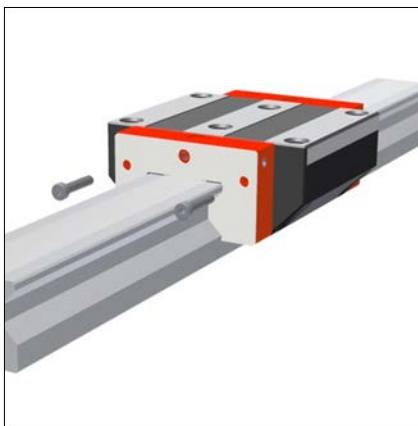
Longitudinal wipers

Inspection

- Damages on longitudinal wipers can usually only be detected after complete disassembly of the carriage or mounting enclosure

Replacement

- In the event of damage to the longitudinal wipers which are permanently connected to the carriage or mounting enclosure, replace the complete component.



Metal wipers ASM / ABM

Inspection

- Inspect metal wiper for mechanical damage and ensure even gap in relation to the rail profile.
- Replace or readjust metal wiper, depending on finding.

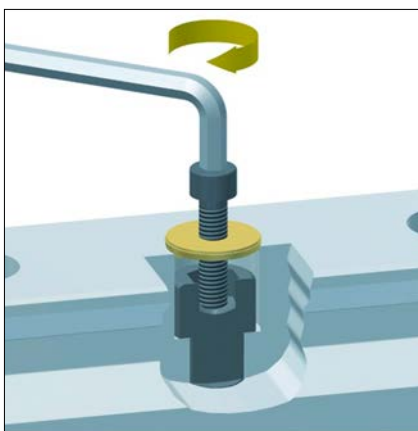
Replacement

1. Loosen screws on front plate and remove wiper over the end of the rail.
2. Mount new metal wiper over the end of the rail.
3. Screw in mounting screws, so that wiper can still be moved manually. Set even gap between rail and wiper contour with feeler gauge.
4. Hold metal wiper and tighten mounting screws, for maximum torque see chap. 11.2.
5. Check gap again after tightening the screws.

Rail covers

Intact rail covers, including plugs, cover strips and bellows, are essential for reliable functioning of the sealing systems on the carriage, and are thus also responsible for ensuring a long service life of the guide.

Check rail covers for damage and wear at regular intervals (maximum 6 months) and replace if necessary.



Plugs

must be fitted flush and parallel to the rail surface. Projecting or scratched plugs can damage the carriage wipers or, if located too low, there is a risk that dirt will accumulate in the rail holes or the carriage wipers will be damaged by the sharp edges of the rail holes..

Replacement

☑ Plastic, brass or steel plugs can be quickly and easily removed by screwing in a screw, see example of brass plug in figure beside. In the case of plastic plugs, self-tapping screws can be used for this purpose.

Inspection

Dirt and chips in the holes or on the rail surface, which are not wiped off during operation, are a sure sign of non-functional plugs.

In this case, replace the plugs and also inspect the carriage wipers.

For detailed information on inspection, installation and disassembly, please see:

- Installation Instructions MRS Brass Plugs for MONORAIL MR
- Installation Instructions MRZ Steel Plugs for MONORAIL MR

Cover strips MAC / BAC

must be neatly positioned over the entire length of the rail without gaps, with a slight upwards curvature on the rail surface. The ends must be secured with steel cover strip retainers or end pieces. Sectional strips must not have any gaps at the joint.

Inspection

Cover strips must be replaced in the following cases:

- Bent or scratched strips
- If strips are displaced longitudinally, are turned up at the end or are bent.

Replacement

The replacement of cover strips is described in detail in the following instructions:

- Installation Instructions MAC Cover Strip for MONORAIL MR and
- Installation Instructions BAC Cover Strip for MONORAIL BM

Bellows

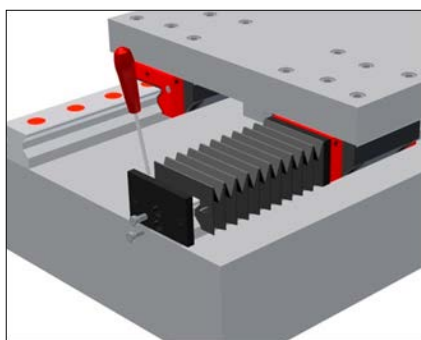
must slide cleanly over the rail and must not present any damage.

Inspection

Check bellows for damage such as cracks or holes. If damaged, replace the bellows and also check the MONORAIL guide for damage or contamination, clean if necessary.

Replacement

Bellows are connected to the intermediate plate on the carriage and the end plate at the end of the rail by plastic rivets.

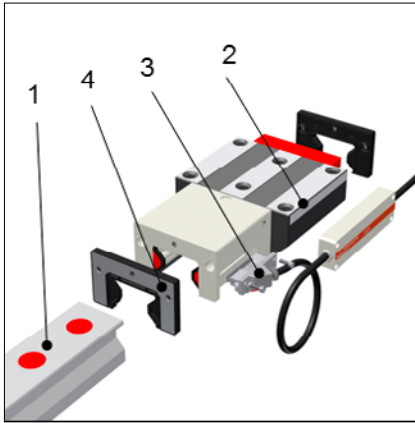


1. Loosen bellows from the mounting plates using a flat screwdriver, for example.
2. Loosen mounting screws of end plate and remove bellows over the end of the rail.
3. Clean guide rail, check rail and plugs or cover strip for damage.
4. Push new pre-assembled bellows (with rivet plugs) onto the rail.
5. Lock rivet plugs at end of bellows into the relevant holes of the intermediate plate.
6. Screw on end plate, and once again lock rivet plugs at end of bellows into the relevant holes of the end plate.
7. Check bellows for correct seating and smooth running.

9 Maintenance

9.6 Spare parts - availability

All guideways in the MONORAIL MR, BM and AMS product groups consist of up to four logic assemblies.



- 1) Rail
- 2) Carriage with housing for reading head if applicable
- 3) AMS-reading head
- 4) Accessories

The assemblies are subject to technical modifications, which result in new, improved design versions. I.e. the internal structure of the assemblies can change in respect of technology, materials used, number and interaction of parts used.

After the delivery of MONORAIL systems SCHNEEBERGER undertakes to make available compatible assemblies and consequently also compatible complete systems, which can be replaced as assemblies. This allows the full serviceability of all products in the field to be maintained, while still making improvements. Parts from these assemblies are only maintained and offered until introduction of the new assembly, and supplied for a maximum of 1 year afterwards. Vice-versa, this means that discontinuation of assemblies that will be replaced by newer versions is announced 1 year before their discontinuation.

For assemblies as a whole, SCHNEEBERGER offers compatible assemblies which have an identical design in respect of the mechanical connection geometry of the rail, the collision cross-sections and connection dimensions, for a period of 10 years after announcing discontinuation of the product on the market. Exceptions will be notified separately.

10 Troubleshooting for the AMS measuring system

10.1 Notes on trouble shooting

| Fault | Possible cause | Correction |
|--|--|---|
| Error message on drive control | Particles of dirt under the slider in the reading head | Clean slider, mounting enclosure and magnetic scale |
| | Cable breakage in reading head connection cable | Try swapping cable with other axis. Test cable for short-circuit and interruption |
| | Connector of reading head connection cable loose | Tighten connection nut hand-tight |
| | Reading head defective | Replace reading head |
| | Reading head or mounting enclosure loose | Tighten mounting screws |
| Axis always drops out in the same position | Magnetic scale mechanically or magnetically damaged | Replace rail if necessary |
| Axis inaccurately positioned | Reading head or SMEa interpolation and digitization electronics offset | Replace reading head or SMEa interpolation and digitization electronics |

11 Appendix

11.1 Technical data

General field of application

| Environment | MR | BM | AMS |
|----------------------|-----------------|-----------------|---------------|
| Working temperature | -40 °C – +80 °C | -40 °C – +80 °C | 0 °C – +70 °C |
| Storage temperature | -40 °C – +80 °C | -40 °C – +80 °C | -20°C – +70°C |
| Vibration / Impactas | 30 g | 30 g | 30 g (10 g)* |

*

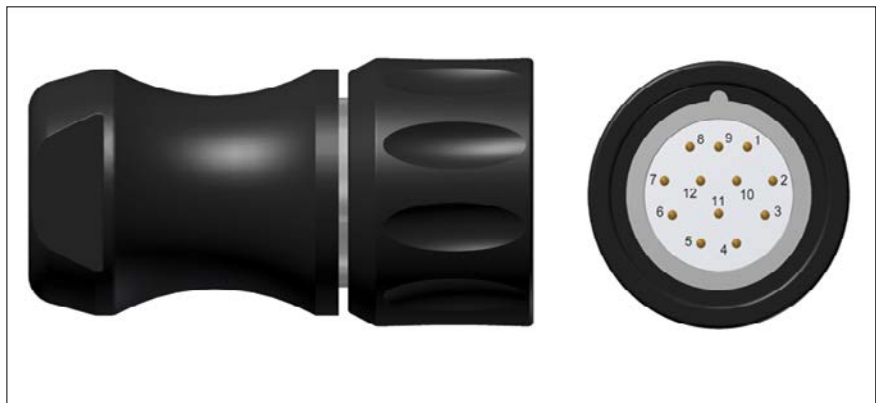
Attention: 10 g for AMSA 3L

Reading head interfaces

Analog voltage interfaces TSU / TRU / TMU

Digital interfaces TSD / TRD / TMD

Absolute digital interfaces TRH-SSI / TMH-SSI / TRH-Fanuc / TRH-Mitsubishi

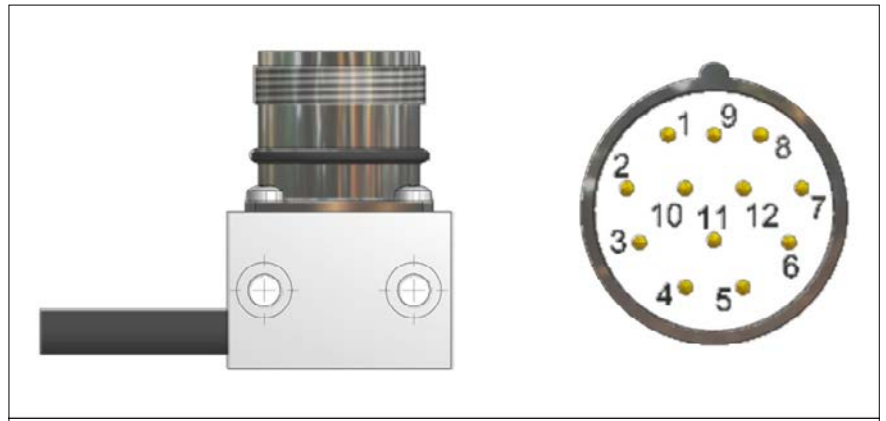


Interface TSU / TSD

12-pole circular connector with contact pins and connection nut with internal thread.
Cable length: 3 m

**Interface TRU / TRD**

12-pole circular connector with contact pins and external thread.
Cable length: 3 m

**Interface TMU / TMD / TMH-SSI**

12-pole circular connector with contact pins, fitted in a mounting base.
Cable length: 0,3 m

11 Appendix

Pin assignment TMU / TMD / TMH-SSI

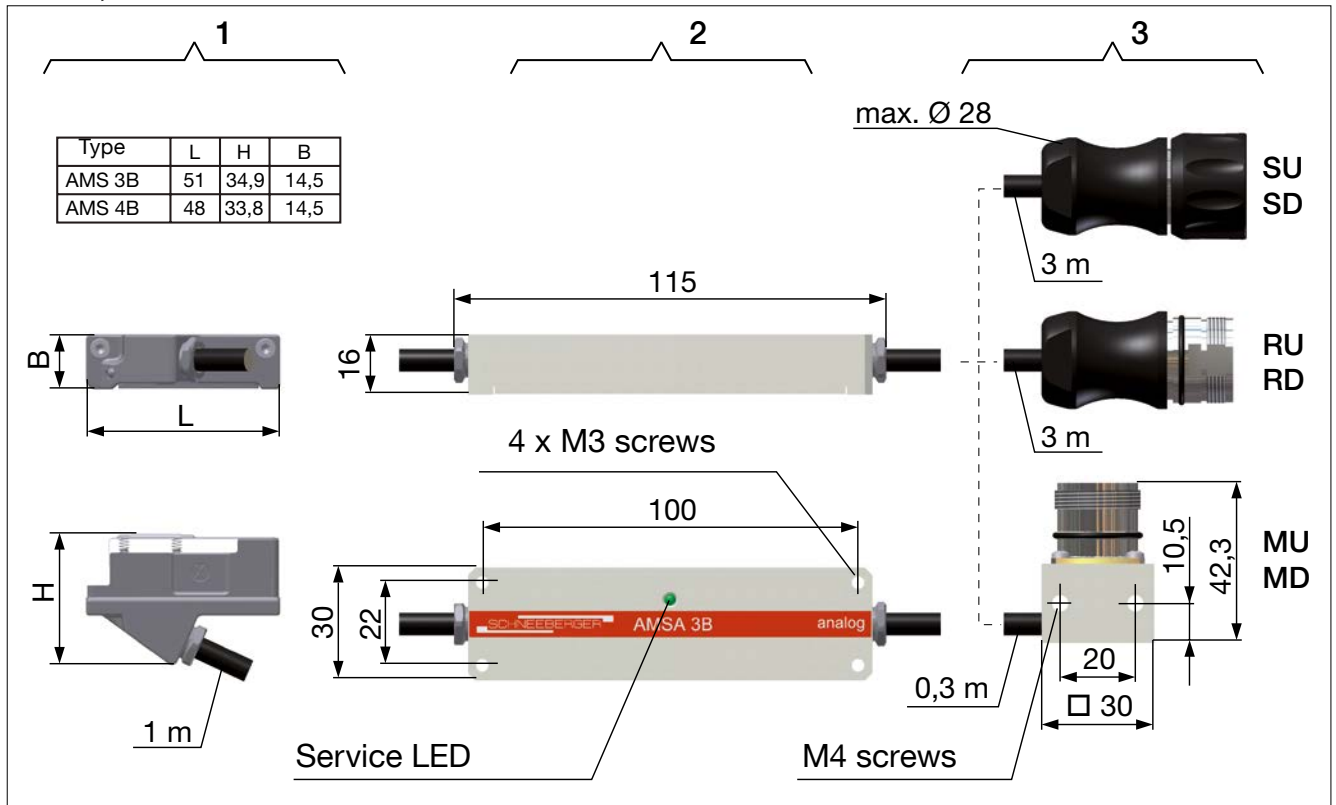
| Interfaces | | | | |
|-----------------|-------------|------------------------|-----------------|---|
| TSU / TRU / TMU | | | TSD / TRD / TMD | |
| Contact | Signal | Signaltype | Signal | Signaltype |
| 1 | - Ua2 | - Cosinue | - Ua2 | Quadrature signal |
| 2 | +5 V sensor | Feedback | +5 V Sensor | Feedback |
| 3 | + Ua0 | Reference signal | + Ua0 | Reference signal synchronized |
| 4 | - Ua0 | Reference signal | - Ua0 | Reference signal synchronized |
| 5 | + Ua1 | + sine | + Ua1 | Quadrature signal |
| 6 | - Ua1 | - sine | - Ua1 | Quadrature signal |
| 7 | - Uas | NC | - Uas | Fault signal active low, minimum duration 20 ms |
| 8 | + Ua2 | + cosine | + Ua2 | Quadrature signal |
| 9 | - | NC | - | NC |
| 10 | 0 V GND | Input terminal voltage | 0 V GND | Input terminal voltage |
| 11 | 0 V sensor | Feedback | 0 V Sensor | Feedback |
| 12 | +5 V | Input terminal voltage | + 5 V | Input terminal voltage |

| Interfaces | | | | |
|------------|--------------------------------|--------------------|--------------------|--------------------------|
| | | TMH-SSI / TRH-SSI | TMH / TRH-Fanuc | TMH / TRH -Mitsubishi |
| Contact | Signal type | Signal | Signal | Signal |
| 1 | Supply voltage feedback | +5V Sensor | - | +5V Sensor |
| 2 | NC | - | - | - |
| 3 | NC | - | - | - |
| 4 | Supply voltage feedback | 0V Sensor | - | 0V Sensor |
| 5 | RxD internal parameter setting | - | - | - |
| 6 | TxD internal parameter setting | - | - | - |
| 7 | Supply voltage | +5V (optional 24V) | +5V (optional 24V) | +5V to +24V |
| 8 | + clock | CLK+ | +REQ | +REQ (Half-,Full-duplex) |
| 9 | - clock | CLK- | -REQ | -REQ (Half-,Full-duplex) |
| 10 | Supply voltage | 0V | 0V | 0V |
| 11 | Internal shielding | - | - | - |
| 12 | + cosine | B+ | - | - |
| 13 | - cosine | B- | - | - |
| 14 | + data | DATA+ | +SD | +SD (Full-duplex) |
| 15 | + sine | A+ | - | - |
| 16 | - sine | A- | - | - |
| 17 | - data | DATA- | -SD | -SD (Full-duplex) |

11 Appendix

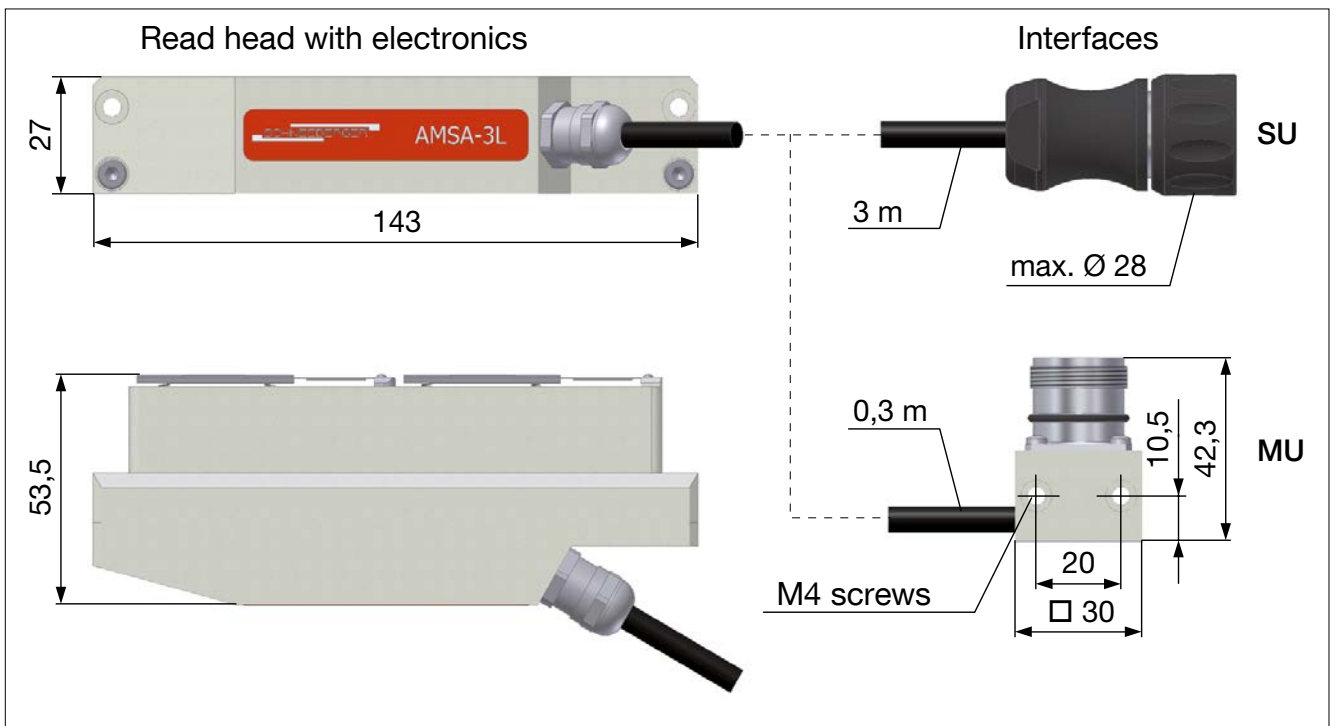
Reading head dimensions

AMS 3B, AMS 4B



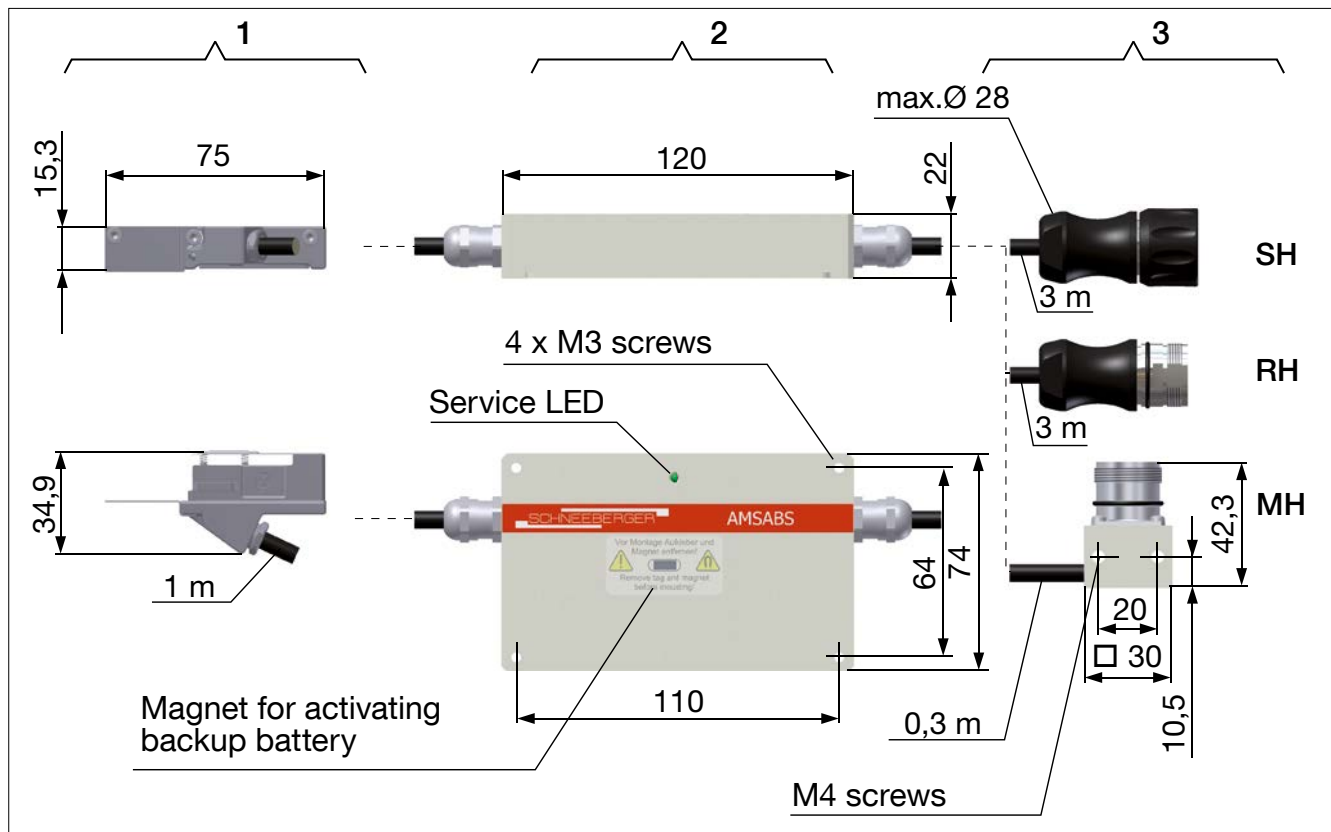
1 Reading head; 2 Electronics box; 3 Interfaces

AMSA 3L



11 Appendix

AMSABS



1 Reading head; 2 Electronics box; 3 Interfaces

11.2 Screw tightening torques

Tightening torques for rails and carriages



Caution

Under high loads, the screw connections are unable to prevent lateral slipping of rails or carriages.

- For fastening of MONORAIL profiled linear guideways all through fixing holes and/or tapped fixing holes has to be used.
- In the case of high loads, implement structural measures to prevent slipping of rails or carriages (for example: lateral location).
- The screw manufacturer's information must be observed and is always mandatory.
- Ensure adequate material strength of the connecting structure.
- Tighten low-head screws as per DIN 6912 according to class 8.8.

Tightening torques for mounting screws DIN 912/ISO 4762 ($\mu = 0.125$)

If the mounting screws are lubricated with a MoS₂-containing grease and tightened using a torque wrench, a more even pretensioning force will be obtained, considerably improving the travel accuracy.

| Max. tightening torques (Nm) | | | | | | | | | | | |
|------------------------------|------|----|-------|-------|-------|-------|-------|-------|--------|-----|------|
| Screw | | M4 | M5 | M6 | M8 | M10 | M12 | M14 | M16 | M20 | M24 |
| Sizes | | 15 | 15,20 | 20,25 | 25-35 | 30-45 | 45,55 | 55,65 | 65,100 | 100 | 100 |
| Strength-Class | 8,8 | 3 | 6 | 10 | 25 | 49 | 83 | 130 | 200 | 410 | 700 |
| | 12.9 | 5 | 10 | 16 | 40 | 81 | 95 | 166 | 265 | 680 | 1100 |



Caution

If greases are used, particularly those containing MoS₂, the friction coefficient μ can be reduced by half.

- Reduce torques accordingly.
- Lock screws with adhesive if prestress losses are expected.

Tightening torques for front plates and additional wipers

The maximum tightening torques for the mounting screws of front plates and additional wipers are shown in the following table.



Caution

The screws are provided with a chemical screw adhesive. Its adhesive force is reduced by repeated screwing in and unscrewing, which can result in undesirable loosening of screws during operation.

- Do not use mounting screws repeatedly.

| Max. tightening torques for front plate (Nm) | | | |
|--|------------------|----------------|------------------|
| MONORAIL BM | | MONORAIL MR | |
| Sizes | M _{Anz} | Sizes | M _{Anz} |
| BM 15 | 0,5 | MR 25 – MR 35 | 1,3 |
| BM 20 – BM 35 | 0,9 | MR 45 | 1,5 |
| BM 45 | 1,2 | MR 55 – MR 100 | 2,2 |

11.3 Lubrication quantities for initial lubrication

Range of application

- The lubrication quantities for MONORAIL MR are also applied for AMSA 3B, AMSD 3B, AMSA 3L, AMSABS 3A
- The lubrication quantities for MNORAIL BM also apply for AMSA 4A, AMSD 4A and BZ.

Lubrication with grease:

| Initial lubrication, quantity per carriage (cm ³) | | | | | | |
|---|-------|-------|-------|-------|-------|--------|
| Carriage type MR | MR 25 | MR 35 | MR 45 | MR 55 | MR 65 | MR 100 |
| A,C,E | 1,9 | 2,9 | 5,3 | 8,4 | - | - |
| B,D | 2,2 | 3,7 | 6,6 | 10,6 | 18,9 | 40 |
| Carriage type BM | BM 15 | BM 20 | BM 25 | BM 30 | BM 35 | BM 45 |
| A,C,E,F | 0,9 | 1,7 | 2,8 | 4,7 | 6,6 | 12,6 |
| B,D,G | - | 2,1 | 3,5 | 5,8 | 8,1 | 15,6 |
| K | 0,7 | 1,4 | - | - | - | - |

Notes

- SCHNEEBERGER recommends lubricating grease KP2K in accordance with DIN 51825 or low-viscosity grease GP00N/ GP000N to DIN 51826
- The specified lubrication quantities apply for both grease and for fluid grease
- When greasing the carriage, move it by three times its length
- If there are two lubrication connections per carriage, divide the specified quantity accordingly
- In case of lubricating with GP000N consider the mounting position of the axis.

11 Appendix

Lubrication with oil:

| Initial lubrication, Quantity of oil per carriage for all types of carriages (cm ³) | | | | | | |
|--|-------|-------|-------|-------|-------|--------|
| MR | MR 25 | MR 35 | MR 45 | MR 55 | MR 65 | MR 100 |
| Any mounting orientation | 0,95 | 0,55 | 0,7 | 0,9 | 1,2 | 2,25 |
| BM | BM 15 | BM 20 | BM 25 | BM 30 | BM 35 | BM 45 |
| Any mounting orientation | 0,2 | 0,5 | 0,6 | 0,9 | 1,1 | 1,2 |

Notes

- SCHNEEBERGER recommends mineral oil type CLP (DIN 51517) or HLP (DIN 51524) in the viscosity range ISO VG32 ... ISO VG100 (DIN 51519).
- Bed track oils CGLP can be used up to ISO VG220.

General information for lubrication

- Insert total oil quantity in a single pulse or in several pulses in quick succession, moving the carriage at the same time
- In the case of vertical installation of the carriage, the lubrication connection must be in the upper front plate
- Divide the mentioned quantity accordingly when there are 2 lubrication connections per carriage.
- When grease the carriage, move it by three times its length.
- Consider the mounting position of the axis (separate lubrication)
- If necessary run strokes to lubrication and/or cleaning
- Lube before downtime / recommissioning

11.4 Cable bending radii

| Cable diameter | Permissible bending radius R | |
|------------------------------------|------------------------------|-------------------|
| | Alternate bending | Once-only bending |
| 6 mm without metal protection tube | ≥ 75 mm | ≥ 20 mm |
| 8 mm without metal protection tube | ≥ 100 mm | ≥ 40 mm |
| 14 mm with metal protection tube | ≥ 100 mm | ≥ 50 mm |

PROSPECTUSES

- COMPANY BROCHURE
- CUSTOMIZED BEARINGS
- GEAR RACKS
- LINEAR BEARINGS and RECIRCULATING UNITS
- MINERAL CASTING SCHNEEBERGER
- MINISLIDE MSQscale
- MINI-X MINIRAIL / MINISCALE PLUS / MINISLIDE
- MONORAIL and AMS profiled linear guideways with integrated measuring system
- MONORAIL and AMS application catalog
- POSITIONING SYSTEMS
- SLIDES



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