

AS

Absolute Magnetic Scales

The robust absolute magnetic scales consist of a stainless steel carrier and an elastomer-bonded ferrite. Three options are available, the AS10, DS19 and SAS magnetic scales.

The flexible AS10 and DS19 scales are 10 and 15 mm wide. The SAS is a solid scale available in predefined lengths. It can be fully enclosed making it suitable for harsh environments where oils or coolants are present.

RESISTANT TO
COOLANTS AND
OILS

UP TO 32 m
LENGTH

TRACK
SECTION
SYSTEM
(TRS)



Features and benefits

- Excellent resistance to dirt, dust and humidity
- Totally enclosed SAS scale protected from contaminants
- Optional protective cover foil for AS10 and DS19 scales
- Easy installation with adhesive tape, end-clamps, or track system (TRS)
- Linear and partial arc application with DS19 scale



INDUSTRIAL AUTOMATION



LINEAR MOTOR



MEDICAL



ASSEMBLY LINES



MACHINE TOOL

General information

The AS10 and SAS10 absolute magnetic scales are compatible with the RLS LA11 and LA12 readheads. The LF11 readhead is compatible with the AS10 magnetic scale only. SAS19 is compatible with Artos readhead.

The DS19 absolute magnetic scale is compatible with Artos readhead and it supports linear and partial arc applications. The DS19 magnetic scale can be attached to shafts with larger diameters from 200 mm upwards. The use of the DS19 magnetic scale does not support a full 360° rotation of the shaft, but is intended for applications with large shafts where a full rotation is not required. The DS19 scale is available in lengths of up to 32 meters, while the partial arc application is limited to 8 meters. For more information about Artos readheads refer to [DRD01](#) and [DBD01](#).

SAS10 scales are available in lengths up to 1.36 m, providing a measuring length of 1.28 m. SAS19 scales are available up to 2.46 m, with a measuring length of 2.38 m. For longer applications, DS19 scales are available in lengths up to 32 m, while AS10 scales are offered in lengths up to 16.3 m.

The SAS scale comes in two versions, one fully welded and another with the elasto-ferrite layer exposed. The welded version is designed for harsh environments where contamination with industrial compounds is possible, while the exposed version is intended for applications where higher accuracy is required.

Absolute scale variants

AS10 (optionally with cover foil or TRS system)



DS19 (optionally with cover foil or TRS system)



SAS10 (exposed or fully welded)



SAS19 (exposed or fully welded)



Selection guide

Scale	Accuracy at 0.2 mm ride height	Compatibility with readheads			
		LA11	LA12	LF11	Artos
AS10	±30 µm/m	✓	✓	✓	-
SAS10	±20 µm/m	✓	✓	-	-
DS19	±10 µm/m	-	-	-	✓
SAS19	±6 µm/m	-	-	-	✓

Check the accuracy as a function of ride height and lateral offset in AST01 at [RLS Media center](#).

More about [LF11](#), [LA11](#), [LA12](#) and [Artos](#) readheads can be found at RLS Media center.

Storage and handling

Storage temperature



AS10 and DS19: -40 °C to +60 °C
SAS: -40 °C to +75 °C

Operating temperature



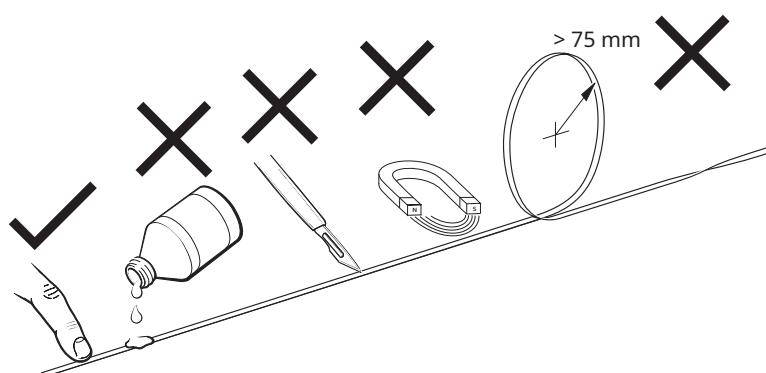
-40 °C to +100 °C

Humidity



85% non-condensing
IP67 (with cover foil)

The storage temperature of the AS10 and DS19 scale is lower than the operating temperature. This limit has been established because the AS10 and DS19 scales may be damaged within 2 months if exposed to higher temperatures. Once the scale is straightened and firmly attached, it can be exposed to the operating temperatures.



The minimum storage bending radius of the AS10 and DS19 scales is 75 mm.

It is strongly recommended that the scale is factory cut at RLS otherwise the product warranty does not apply.

The magnetic scale should not be exposed to magnetic field densities higher than 25 mT on its surface, as this may damage the scale.

Chemical resistance

The use of alcohol for cleaning is considered safe for AS10, DS19 and SAS exposed version, but it is not allowed to immerse the scales in alcohol. Furthermore, the scale surface print may disappear if the scale is not carefully cleaned.

SAS with a welded cover foil completely encapsulates the scale and protects it from aggressive industrial chemicals.

For more information on chemical resistance [contact RLS](#).

Packaging

The type of packaging depends on the length and quality of the magnetic scale. DS19 scales are always packed individually in tube or spiral packaging, depending on scale length. This prevents demagnetisation of the scale by maintaining the distance between the scale rolls.

When option B, H or N is selected for the AS10 scale, the protective cover foil is supplied with the scale (cover foil is up to 50 mm longer than specified with the part number). The cover foil for the DS19 scale must be ordered separately (cover foil is up to 50 mm longer than specified with the part number). The cover foil is not pre-installed on the scale.

The SAS scales are packed individually in wooden boxes.

AS10 individual packaging (up to and including 20 pieces)

Magnetic scale length	Type of packaging
≤ 300 mm	Plastic tube
> 300 mm	Rolled

AS10 multi-packaging (more than 20 pieces)

Magnetic scale length	Type of packaging
≤ 600 mm	Plastic tube
> 600 mm	Rolled

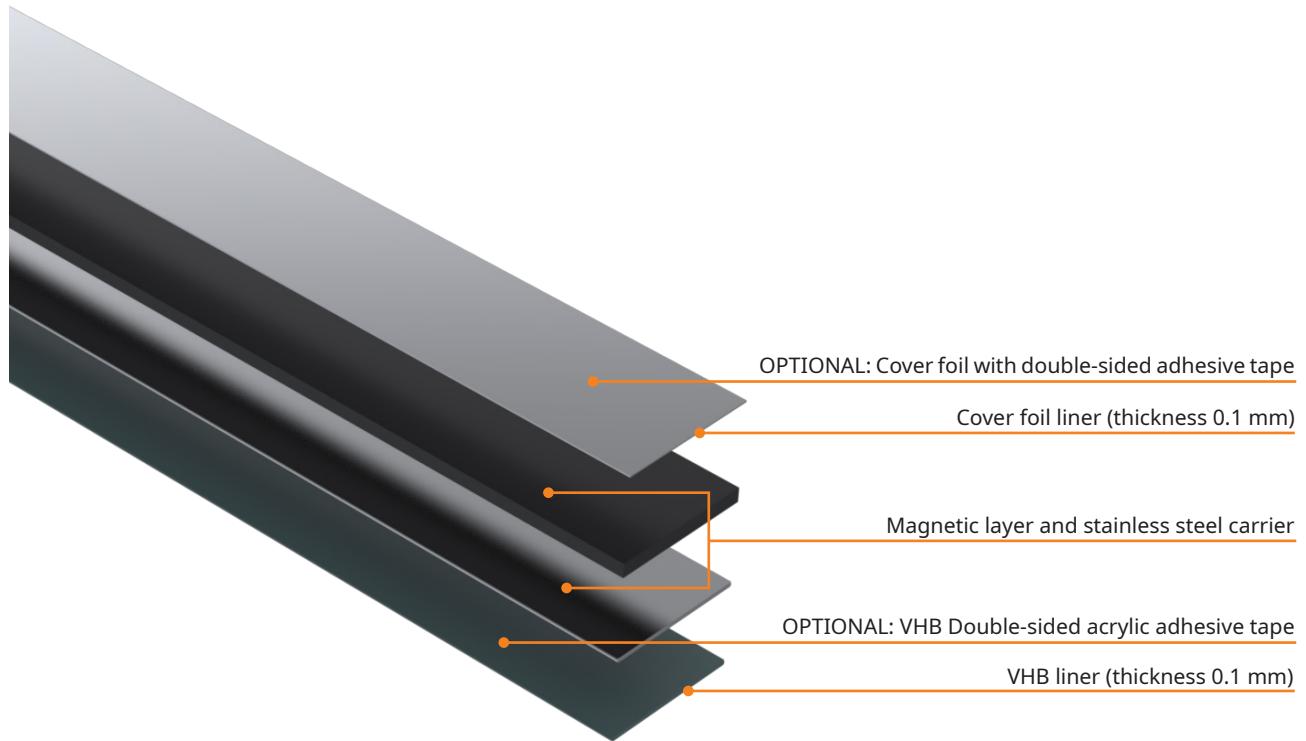
DS19 individual packaging

Magnetic scale length	Type of packaging
≤ 300 mm	Plastic tube
> 300 mm	Spiral

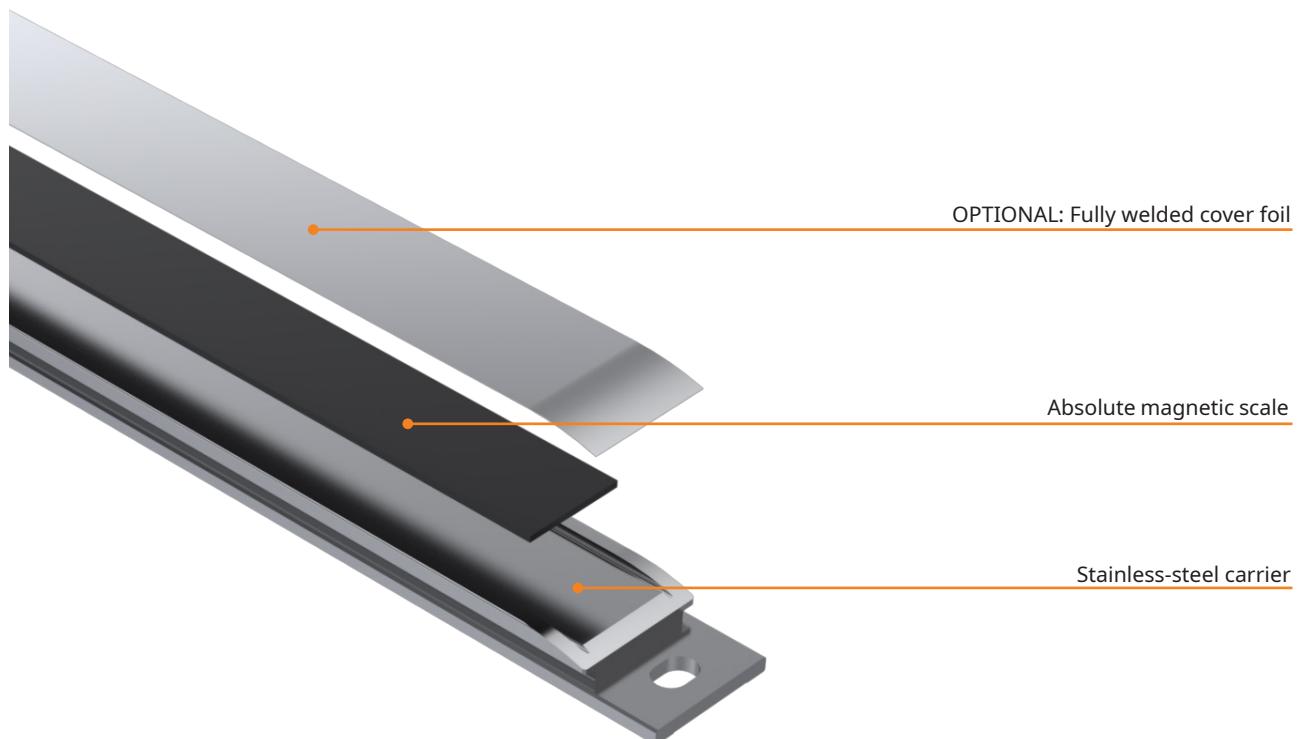
All magnetic scales have 12 months shelf life and should be installed within this period.

Magnetic scale design

Structure of AS10 and DS19 absolute magnetic scale

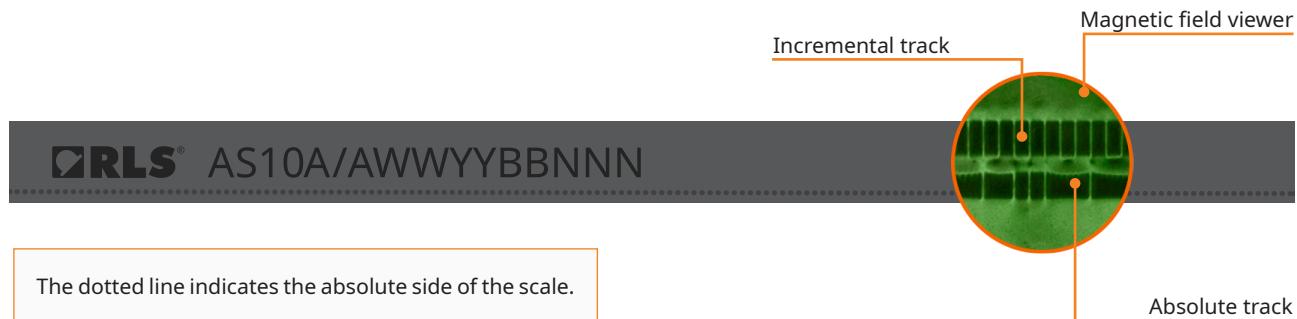


Structure of SAS absolute magnetic scale on a solid substrate



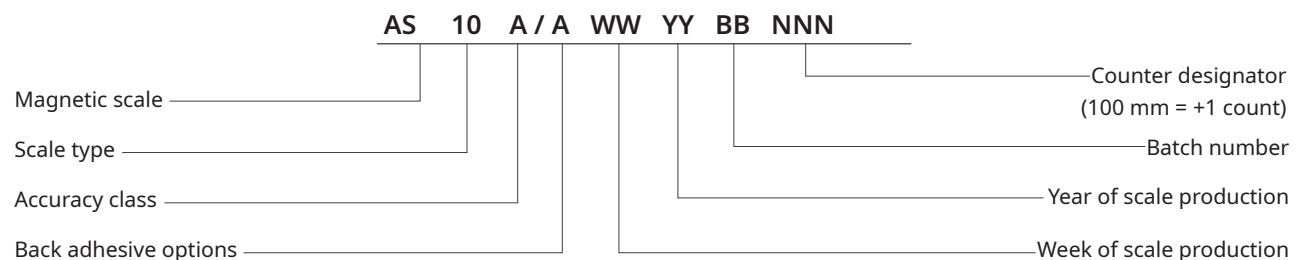
AS10 appearance and print

The orientation of the magnetised incremental track and absolute track is always the same, relative to the scale print as shown in the figure below.



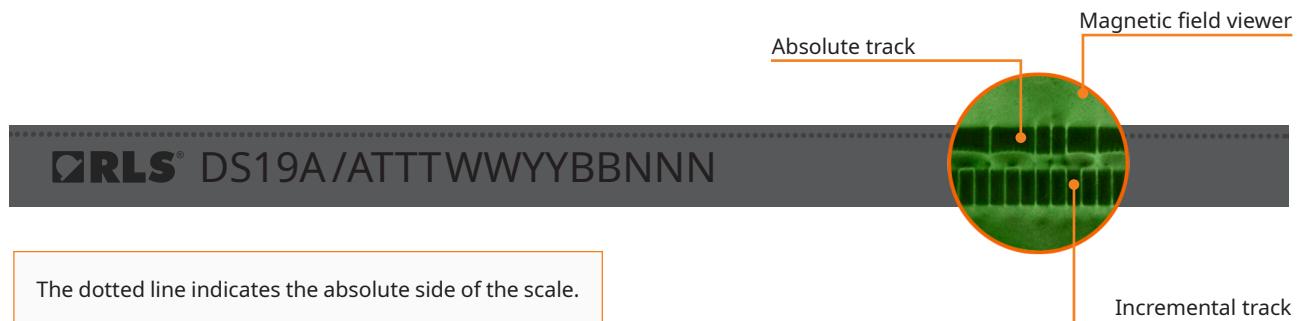
AS10 scale surface print description

Scale surface print appears every 100 mm and contains the RLS logo and the designator described below. If the scale is shorter than 100 mm it does not contain the print but just the dotted line with which the absolute side of the scale can be determined.



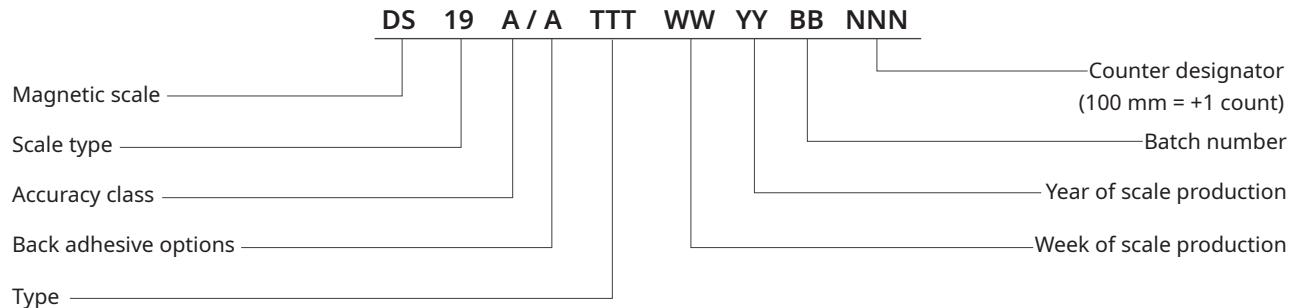
DS19 appearance and print

The orientation of the magnetised incremental track and absolute track is always the same, relative to the scale print as shown in the figure below. The dotted line indicates the absolute side of the scale.



DS19 scale surface print description

Scale surface print appears every 100 mm and contains the RLS logo and the designator described below. If the scale is shorter than 100 mm it does not contain the print but just the dotted line with which the absolute side of the scale can be determined.



SAS10 appearance and print

The orientation of the magnetised incremental track and absolute track is always the same, relative to the scale print as shown in the figure below.

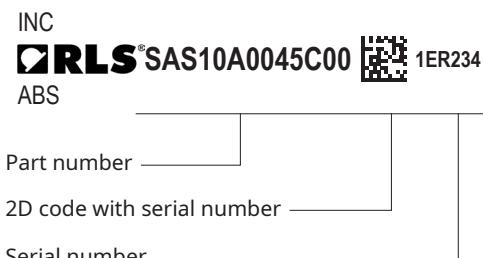


SAS19 appearance and print

The orientation of the magnetised incremental track and absolute track is always the same, relative to the scale print as shown in the figure below.



SAS scale surface print description



The print/engraving of the scale surface appears once per entire exposed/fully welded length of the scale. It includes the RLS logo, part number, serial number, marking of the incremental (INC) and absolute (ABS) track and QR code that contains serial number information.

Technical specifications

System data	AS10	DS19	SAS
Incremental pole length	2 mm	2 mm	2 mm
Maximum scale length	16.3 m	32 m	1.36 m (SAS10) 2.46 m (SAS19)
Type of reading	Linear	Linear and partial arc (for OD > 200 mm)	Linear
Scale accuracy at 0.2 mm ride height*	±30 µm/m	±10 µm/m ±15 µm/m (option 003)	±20 µm/m (SAS10) ±6 µm/m (SAS19)

* For more information about the accuracy please see the AST01 technical article at [RLS Media center](#).

Mechanical data

Material	Carrier	1.4310 stainless steel	1.4310 stainless steel	1.4016 stainless steel
	Magnetic medium	NBR elasto-ferrite	NBR elasto-ferrite	NBR elasto-ferrite
Thickness	Carrier	0.3 ±0.05 mm	0.3 ±0.05 mm	-
	Double-sided acrylic adhesive tape VHB 3M9469	0.13 mm	0.13 mm	-
	VHB liner thickness	0.1 mm	0.1 mm	-
	Cover foil	0.076 ±0.006 mm	0.076 ±0.006 mm	-
	Double sided tape	0.05 mm	0.05 mm	-
	Scale	1.43 ±0.1 mm (with back adhesive) 1.3 ±0.1 mm (without back adhesive)	1.43 ±0.1 mm (with back adhesive) 1.3 ±0.1 mm (without back adhesive)	6.08 ±0.03 mm
Mass	62 g/m	93 g/m	700 g/m	
Width	10 ^{-0.05} _{+0.15} mm	15 ^{-0.05} _{+0.15} mm	18 ±0.05 mm	
Cover foil width	CF10	9.5 ±0.1 mm (for regular scale)	-	-
	CF08	7.6 ±0.35 mm (for track system)	-	-
	CF15	-	14.5 ±0.35 mm	-
Length tolerance	±0.5 mm ±40 [µm/m] × 10 ⁻³ × scale length [m]	±0.5 mm ±15 [µm/m] × 10 ⁻³ × scale length [m]	-	
Expansion coefficient (carrier)	~17 × 10 ⁻⁶ [m/mK]	~17 × 10 ⁻⁶ [m/mK]	10.4 × 10 ⁻⁶ [m/mK]	

Environmental data

Temperature	Operating	-40 °C to +100 °C	-40 °C to +100 °C	-40 °C to +100 °C
	Storage	-40 °C to +60 °C	-40 °C to +60 °C	-40 °C to +75 °C

Installation instructions

Dimensions and tolerances are in mm. Dimensions without tolerance values are in accordance with ISO 2768-m.



Installation of AS10 and DS19 magnetic scale with adhesive tape

Installation surface preparation

Magnetic scales are equipped with VHB backside adhesive tape. Most substrates are best prepared by cleaning with a 50:50 mixture of isopropyl alcohol and water before applying the magnetic scale. Exceptions to the general procedure that may require additional surface preparation include:

- Heavy oil/grease: To remove heavy oil or grease from a surface, a degreaser or solvent-based cleaning agent may be required, followed by cleaning with IPA/water.
- Abrasion: Sanding a surface and then cleaning with IPA/water can remove heavy dirt or oxidation and improve adhesion.
- Adhesion promoters: Priming a surface can significantly improve initial and ultimate adhesion to many materials such as plastics and paints.
- Porous surfaces: Most porous and fibrous materials such as wood, chipboard, concrete, etc. must be sealed to provide a unified surface.
- Unique materials: Special surface preparation may be required for glass and glass-like materials, copper and copper-containing metals, plastics or rubber containing migrating components (e.g. plasticisers).

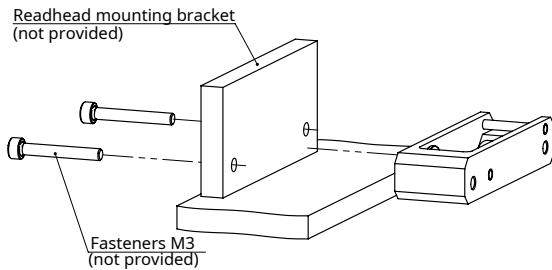
Further information can be found under ["Surface Preparation for 3M™ VHB™ Tape Applications"](#).

Scale application

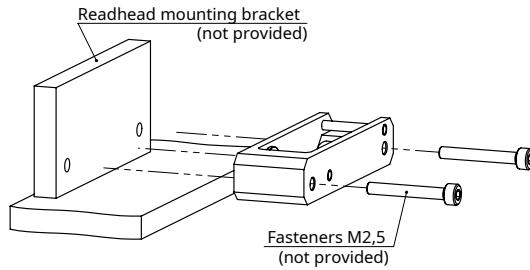
To simplify the scale installation use the scale applicator tool LMA10ASC00 for the AS10 scale or ACC088 for the DS19 scale. Mount the applicator tool to the readhead mounting bracket. Use two fasteners as per readhead mounting configuration. The same principle of installing the scale can be applied to the magnetic scale DS19 with a different tool (ACC088). Further details can be found on [pages 9 to 17](#).

Fastener mounting variants

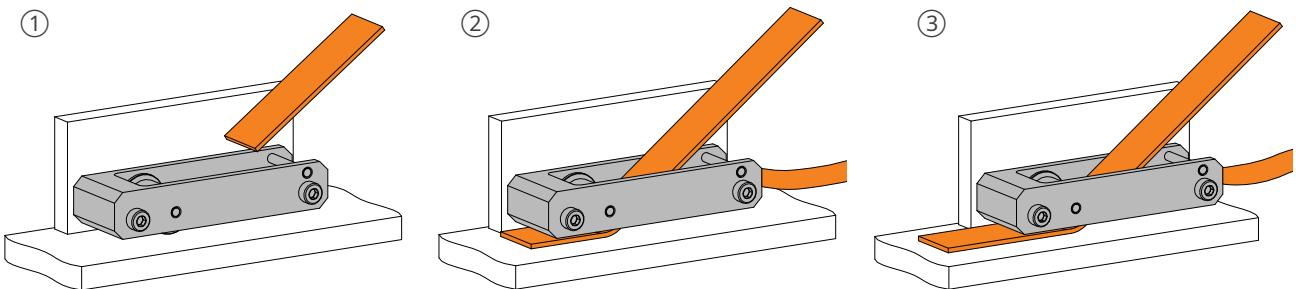
Variant A



Variant B



Good surface contact can be achieved by applying a pressure of about 100 kPa. At room temperature, approximately 50 % of the final bond strength is achieved after 20 minutes, 90 % after 24 hours and 100 % after 72 hours. Dynamic overlap shear (peak force to separate is measured after 72 hours dwell time): 830 kPa.



Load the scale into the applicator tool.

Separate the backing paper from the first 40 mm of scale and feed the scale into the applicator tool.

Apply the scale.

Push the scale carefully through to the end of scale mark, ensuring that it does not stick to the mounting surface until it is in position. Attach the end of the scale to the mounting surface with light finger pressure.

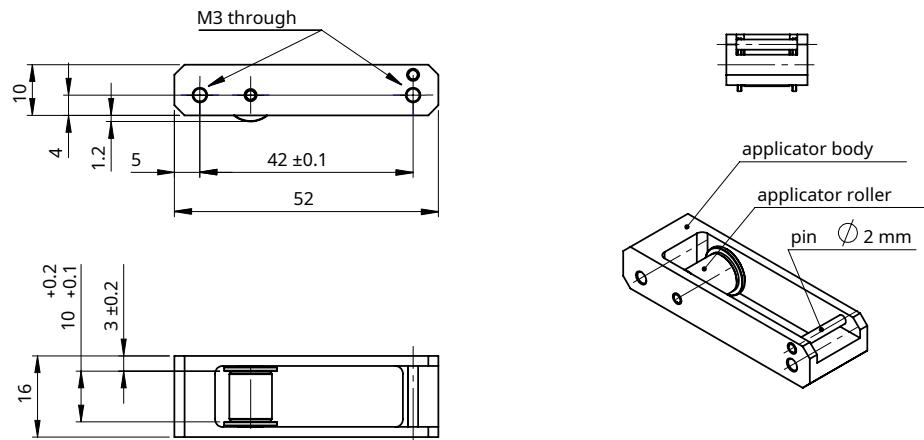
Ensure complete adhesion.

Apply firm finger pressure along the full length of the scale from the centre outwards to each end.

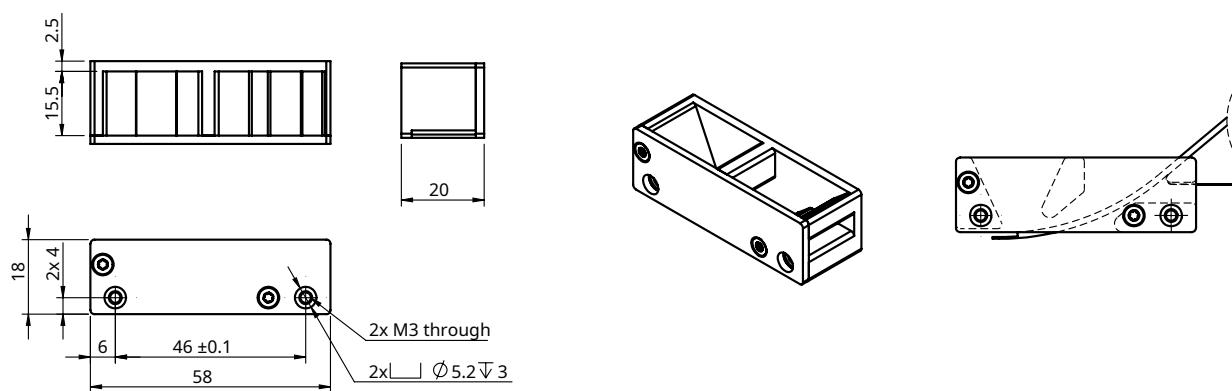
To prevent the scale from sticking to the mounting surface during this process, you may need to reapply about 20 mm of backing paper to the end of the scale before inserting it into the applicator tool.

Move the axis slowly and steadily through its full range of motion. As it moves, lightly press the scale behind the applicator tool with your finger to help it adhere to the mounting surface. At the same time, gently pull the backing paper away from the applicator tool as it separates.

LA11 applicator assembly



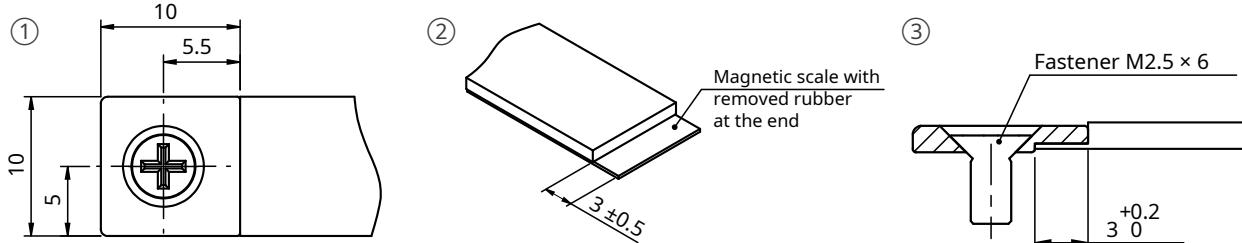
Artos applicator assembly



Installation of AS10 magnetic scale with end clamps

End clamp kit has been designed to anchor the ends of the AS10 magnetic scale. Make sure the installation surface is clean and free of debris. Included in the kit are 2 end clamps and 2 fasteners M2.5 × 6 DIN 965.

Installation process



Prepare the mounting surface.

Drill the holes to the mounting surface as shown above.

Prepare the magnetic scale.

If the scale was not ordered pre-prepared for installation with end clamps, please make sure that:

- the hole to hole distance is correct (scale length + 6 mm),
- the rubber surface at the ends of the scale was cut and removed as shown in the figure above.

Install the scale to the surface.

Make sure that the scale has been cut to the correct length and the mounting surface has been cleaned. Install the self-adhesive scale using the scale applicator tool.

Install the end clamp.

Use the supplied fasteners and attach the end clamps so that the magnetic scale is held under the clamp.

Magnetic scales can be mounted using only end clamps, without the need for VHB adhesive tape. However, in this case, the mounting surface must be properly prepared. To prevent lateral movement of the magnetic scale, mill a groove in the mounting surface that is 10 mm wide and at least 0.3 mm deep.

If using only end clamps without VHB tape, the recommended maximum scale length is 100 mm. End clamps help secure the scale ends more effectively. However, for optimal stability, we strongly recommend using both end clamps and VHB adhesive together.

Installation of AS10 and DS19 magnetic scale with TRS

TRS system is designed for applications that require an easily removable scale. The track system consists of aluminium guide rails, available in 1 m and 2 m sections, and a scale clamp element. It holds the magnetic scale securely while allowing it to expand and contract freely. The scale clamp provides a fixed point from which the magnetic scale can expand.

If damaged, the scale can be pulled out of the guide rails and replaced even if access is limited, reducing machine downtime. This feature also makes the system ideal for large machines that need to be disassembled for transport.

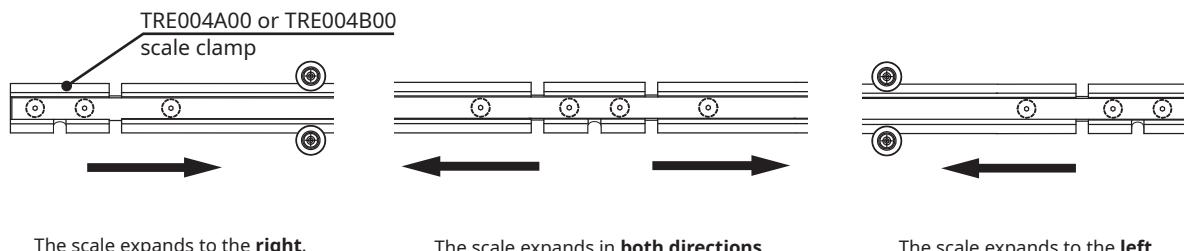
The design of the track section allows installation next to most standard guide rails or freely on any surface. This makes it suitable for many applications, such as automated assembly lines, packaging equipment, printing and other machines where the scale must be installed/removed for transport, or simply for all applications where the thermal expansion of the scale must be independent of the machine structure.

Technical specifications	TRS for AS10	TRS for DS19
Part numbers	TRS100A00, TRS200A00 TRE004A00	TRS100B00, TRS200B00 TRE004B00
Material	Aluminium, EN AW-6060	Aluminium, EN AW-6060
Mass	157 g/m	200 g/m
Thermal expansion	~25 µm/m/°C	~25 µm/m/°C
Dimensions - cross section	20 mm × 4 mm	25 mm × 4.5 mm
Available section lengths	1 m, 2 m	1 m, 2 m

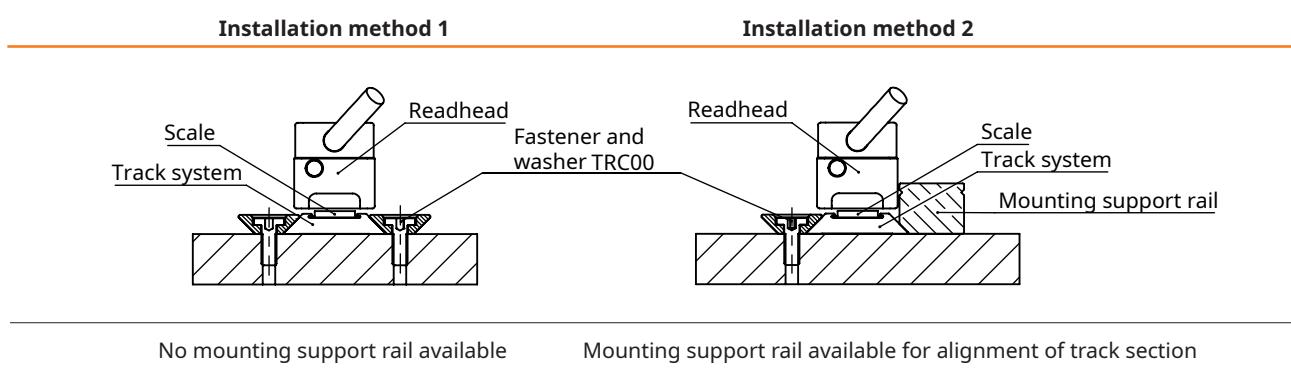
Installation tips

Thermal expansion control

The scale can be fixed either at the left/right end or at the center depending on the thermal expansion scheme.

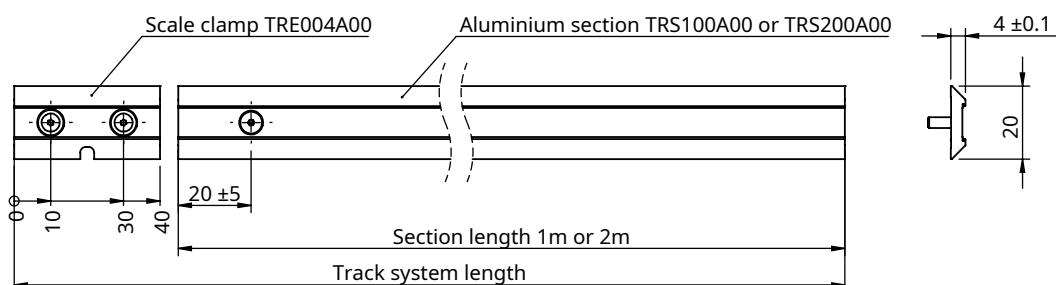


Installation methods



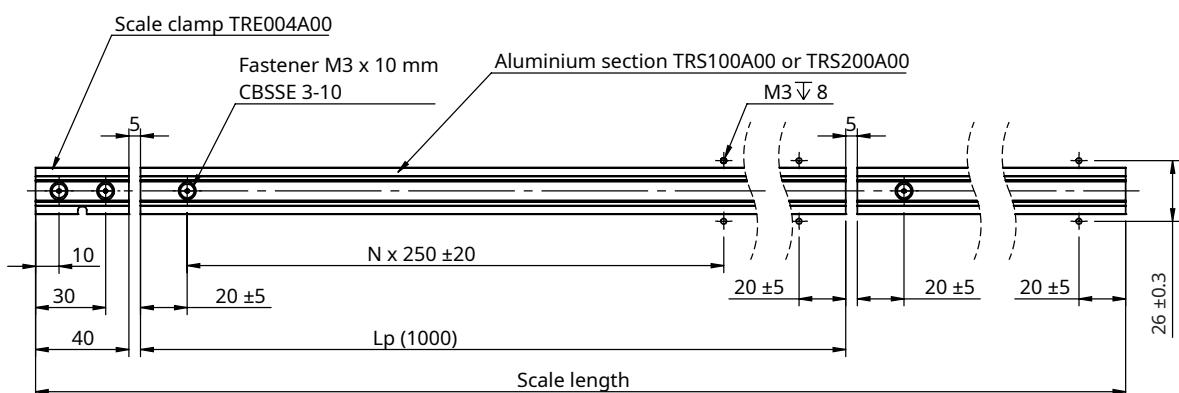
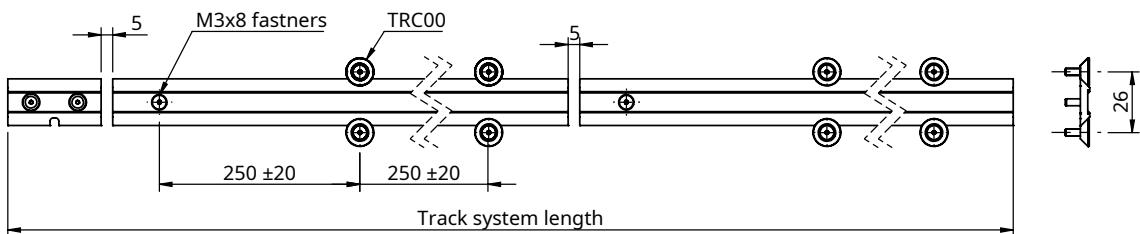
Number of TRC00 (fasteners and washers) required		
Track section	Installation method 1	Installation method 2
TRS100A00 or TRS100B00	8	4
TRS200A00 or TRS200B00	16	8

TRS100A00 or TRS200A00



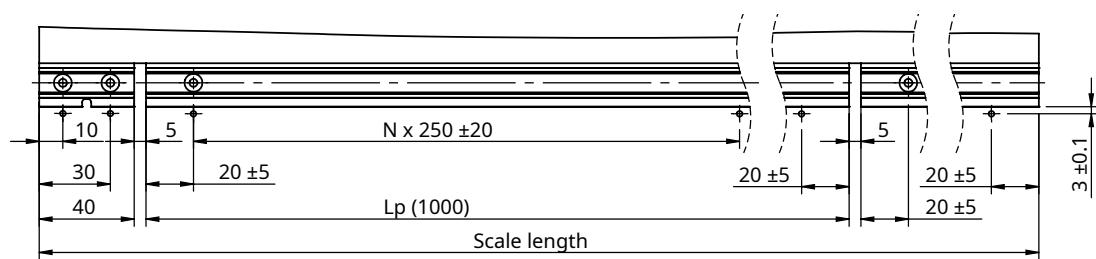
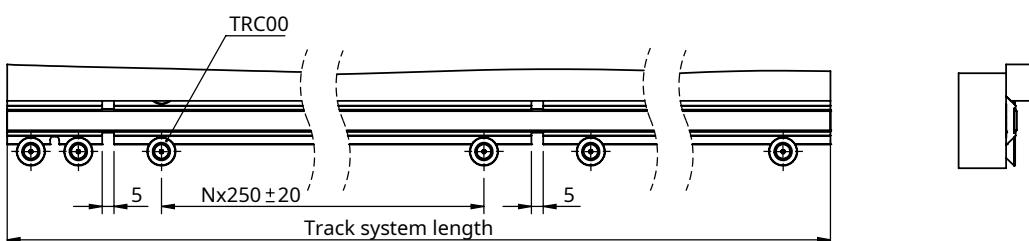
General tolerances: ISO 2768 m K

Installation method 1

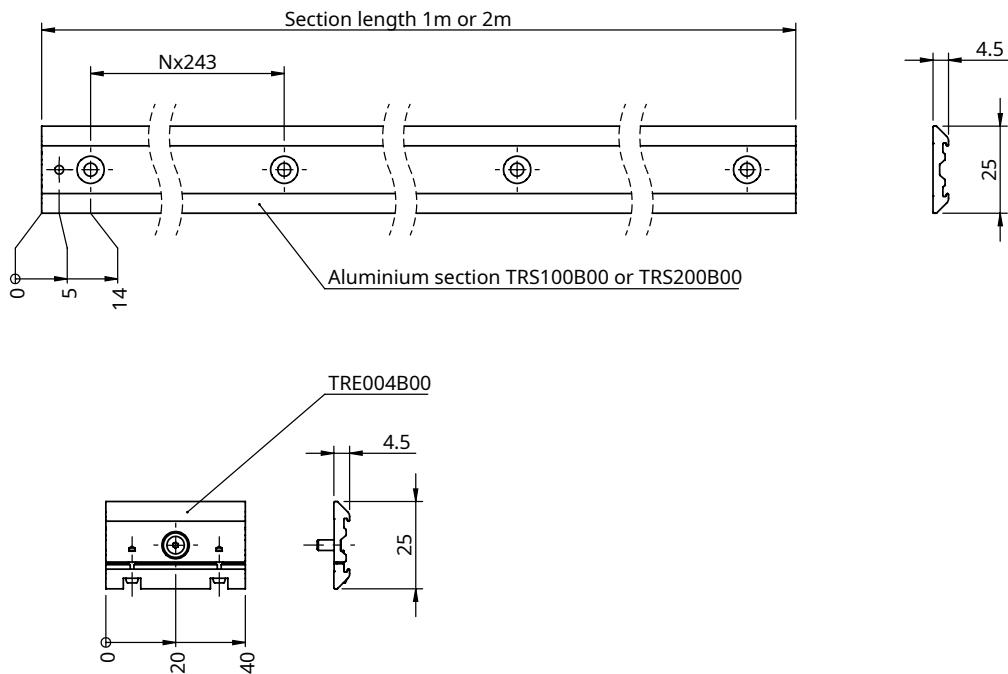


Valid for TRS supporting AS10 scale. Recommended use of M3x 8 (CBSM3-8 Misumi). For more information see Table of recommended fastener tightening torques at [RLS Media center](#).

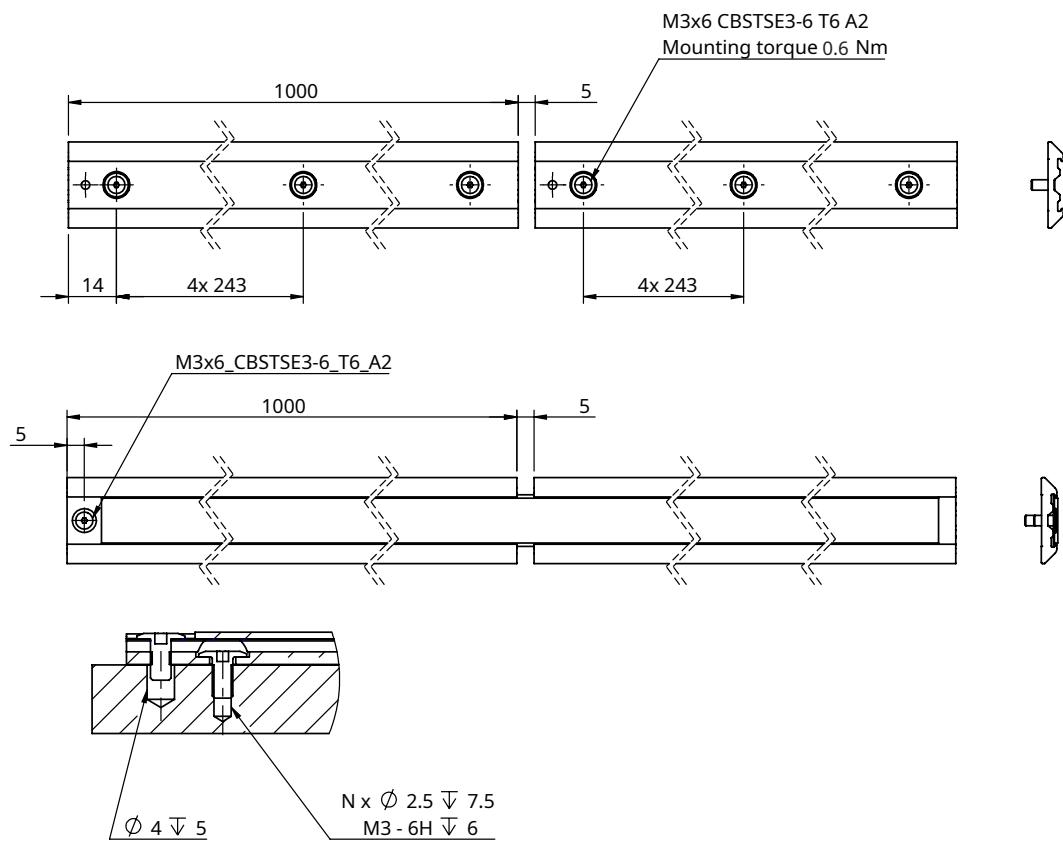
Installation method 2



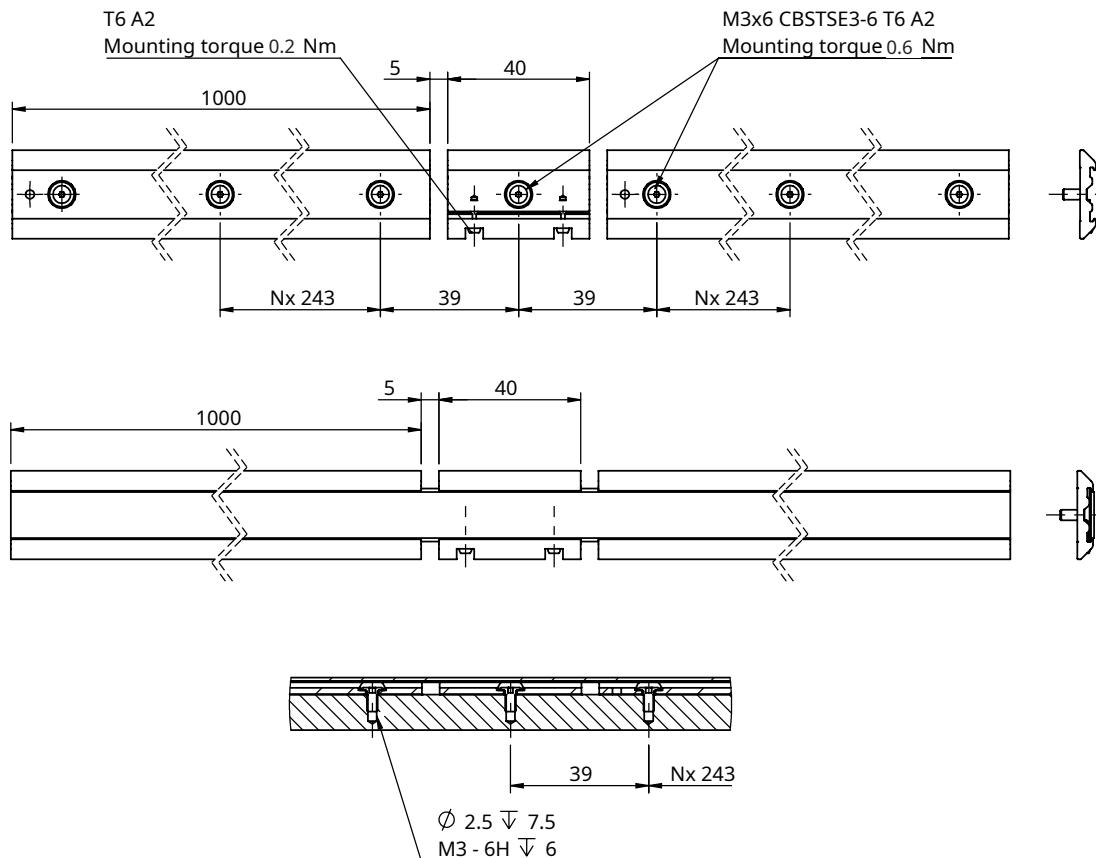
TRS100B00 or TRS200B00



Installation method 1



Installation method 2



Other installation options are also available. Please refer to the previous pages, where the installation of TRS for the AS10 scale is described.

Installation of DS19 magnetic scale with adhesive and fasteners at both ends

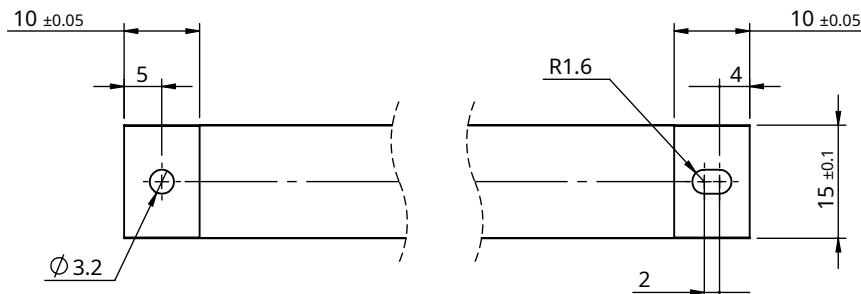
The DS19 scale can be installed in 2 different ways:

- With adhesive tape only.
- With adhesive tape + fasteners at both ends.

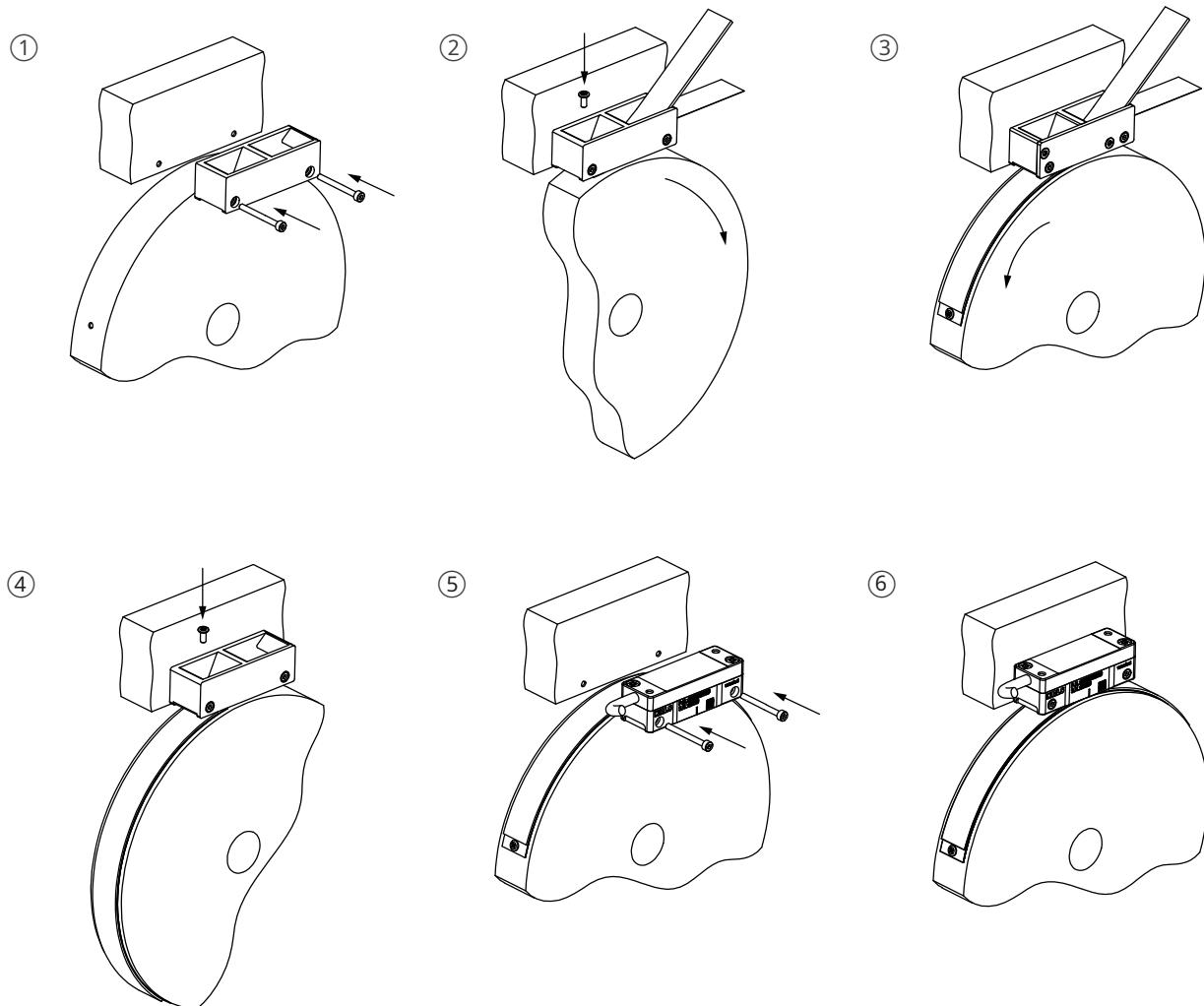
The fasteners (M3x6 CBSTSE3-6 T6 A2) at both ends prevent the magnetic scale from peeling off the edges when installed on a curved surface (e.g. a rotating shaft). It is not recommended to install the scale just with the fasteners at both ends (without adhesive tape). Using just fasteners to attach the scale may not be sufficient and the scale may bend in the middle and come into contact with the readhead. This can lead to a malfunction.

The left side of the DS19 scale has a $\varnothing 3.2$ mm hole and a slot hole on the right side. The slot hole is used to compensate for the length tolerance of the scale and possibly also the tolerance between the holes on the shaft.

Before the final installation of the scale it is recommended to lay the scale over the shaft to see if the distance between the holes at both ends matches with the holes on the shaft.



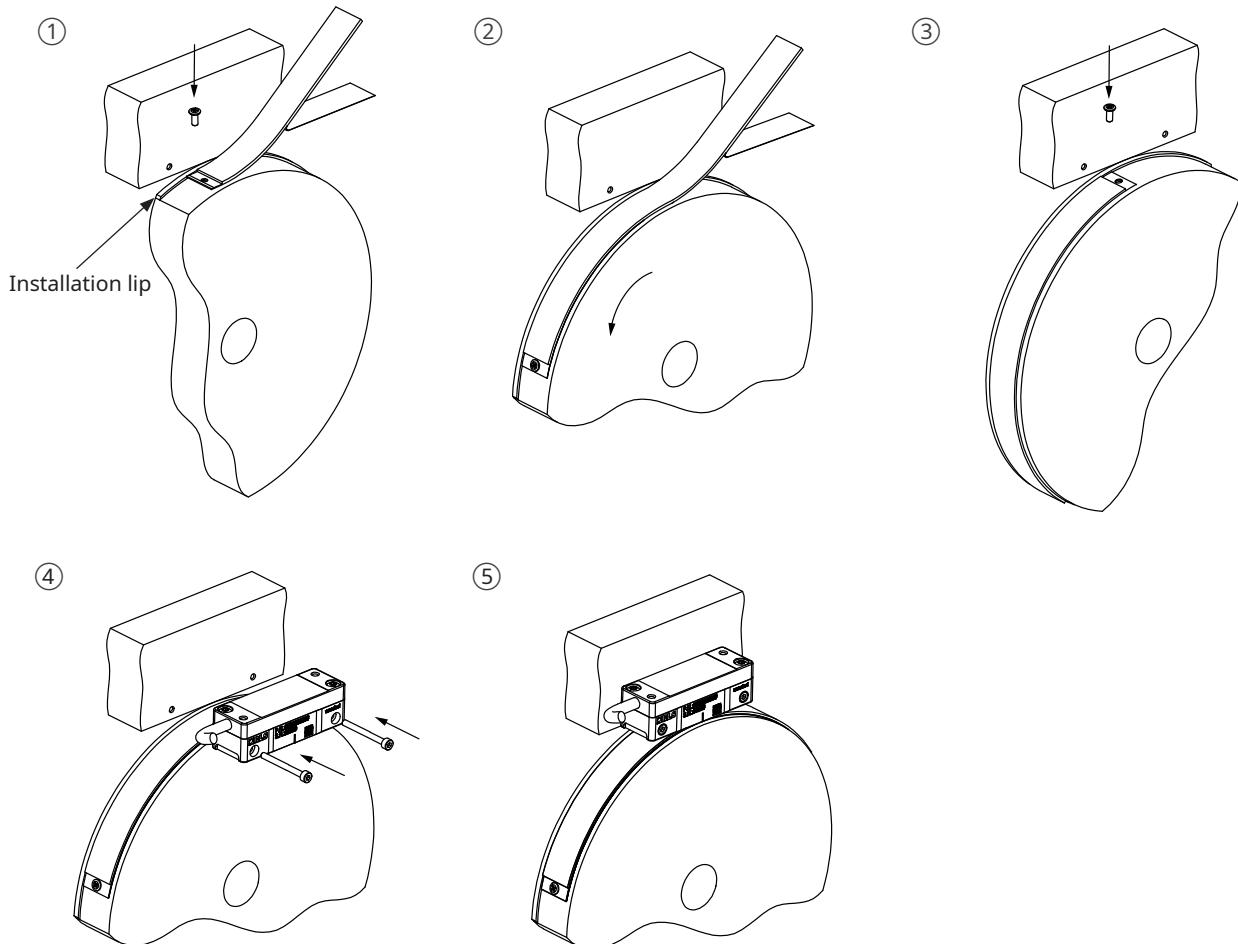
Installation of DS19 magnetic scale with installation tool (ACC088)



- ① Install the applicator for DS19 scale.
- ② Place the magnetic scale into the right opening and peel off 40 mm of the liner that protects the adhesive. Lead the liner through the bottom right opening. Align mounting holes of the hub and the scale. Insert the supplied fastener (ARC00) through the top hole of the installation tool and attach the left end of the scale. Use the recommended torque from the [Table of recommended fastener tightening torques](#).
- ③ While rotating the shaft, install the remaining part of the scale.
- ④ Insert the supplied fastener (ARC00) through the top hole of the installation tool and attach the right end of the scale. Use the recommended torque from the [Table of recommended fastener tightening torques](#). If the shaft's range of motion is limited and the scale cannot be fully installed, the installation tool must be removed from the base bracket and carefully taken off the scale. Apply firm finger pressure over the entire length of the scale.
- ⑤ Install the readhead.
- ⑥ Align the readhead according to the tolerance specification (radial, axial, tangential offsets). A simple 0.3 mm thick plastic shim can be used to set up the air gap between the scale and the readhead.

Installation of DS19 magnetic scale on the shaft with the installation lip

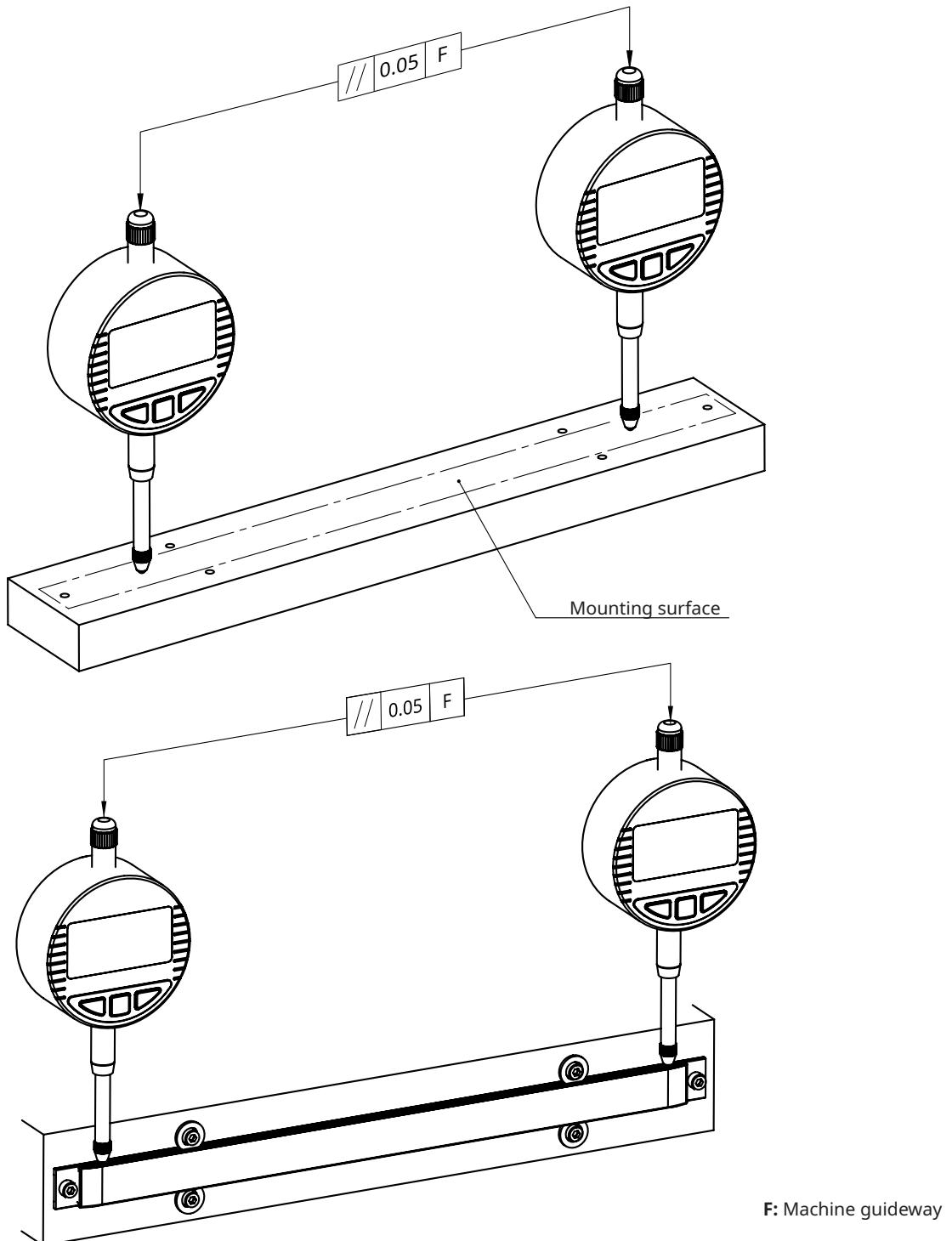
Design the shaft with the installation lip >0.3 mm high. The installation lip must be laterally (axially) correctly positioned to align the scale based on the tolerance specification of the readhead. The installation lip will lead the magnetic scale in a straight line during installation.



- ① Peel off the first 20 mm of liner that protects the adhesive from magnetic scale. Align mounting holes of the hub and the scale. Fasten down the left end of the scale with included fastener (ARC00). Use the recommended torque from the [Table of recommended fastener tightening torques](#).
- ② Apply the scale alongside the installation lip while slowly rotating the shaft and peeling off the liner.
- ③ Use the included fastener (ARC00) and fasten down the right side of the scale. Use the recommended torque from the [Table of recommended fastener tightening torques](#).
- ④ Install the readhead.
- ⑤ Align the readhead according to the tolerance specification (radial, axial, tangential offsets). A simple 0.3 mm thick plastic shim can be used to set up the air gap between the scale and the readhead.

Installation of solid absolute scale (SAS)

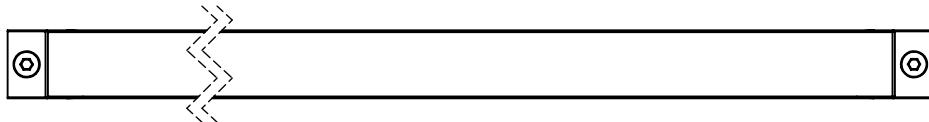
Mounting on steel substrate with similar coefficient of thermal expansion (CTE) – recommended. Make sure that the mounting surface of the magnetic scale has been cleaned and degreased before you proceed.



To achieve specified performance, maintain the mounting surface and the readhead guideway inside 0.05 mm parallelism according to the machine guideway.

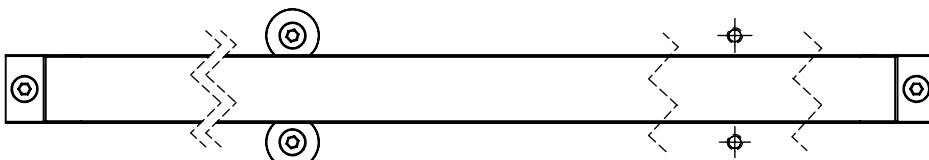
For scales up to 150 mm long:

Mount the left-most and right-most fasteners with a force of 1.2 Nm (no washers required).



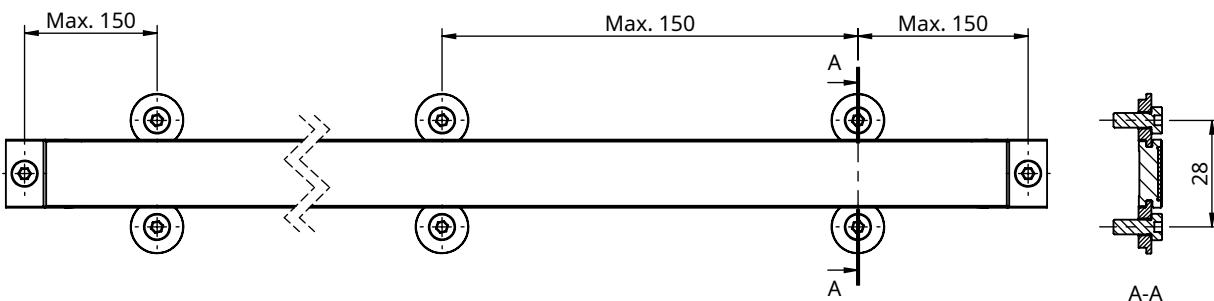
For scales longer than 150 mm:

Use washers every 150 mm along the scale to prevent bending. Mount the left-most and rightmost fasteners with force of 1.2 Nm. A required number of fasteners and washers is supplied with the scale.



Example of SAS scale mounting (top view):

Dimensions and tolerances are in mm.



Installation tolerances

Ride height (RH) for linear application of the scales

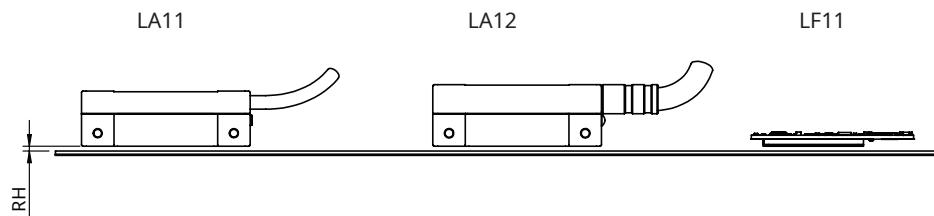
Values in the table apply when the scale is installed on the flat surface (the scale is not curved).

		LA11/LA12		LF11	Artos	
		AS10	SAS10	AS10	SAS19 / DS19 (options 001/002)	DS19 (option 003)
No cover foil	With or without adhesion tape	0.1 to 0.6	0.1 to 0.5	0.1 to 0.7	0.1 to 1.0	0.1 to 0.6
	Scale prepared for track system	0.1 to 0.5	/	0.1 to 0.6	/	/
With cover foil	With or without adhesion tape	0.1 to 0.5	0.1 to 0.5	0.1 to 0.6	0.1 to 0.9	0.1 to 0.5
	Scale prepared for track system	0.1 to 0.4	/	0.1 to 0.5	/	/

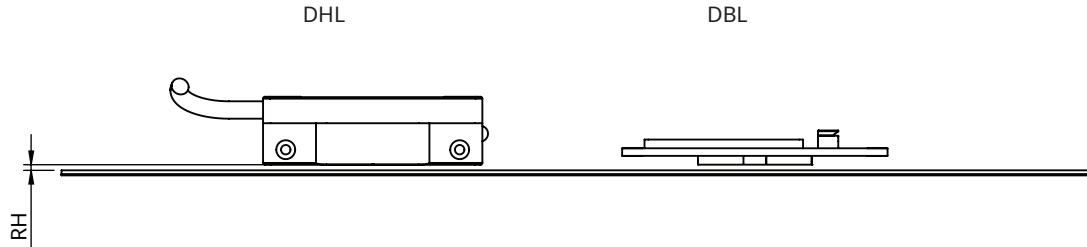
Values in mm.

The optimal installation is at 0.2 mm ride height. For easier and more reliable installation please use a 0.2 mm thick shim.

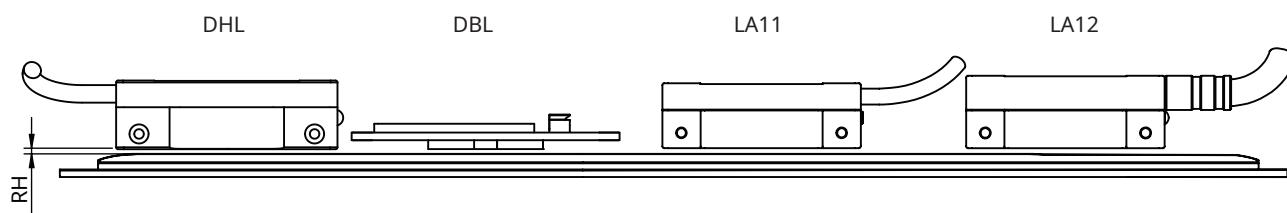
AS10 with LA11/LA12/LF11



DS19 with Artos



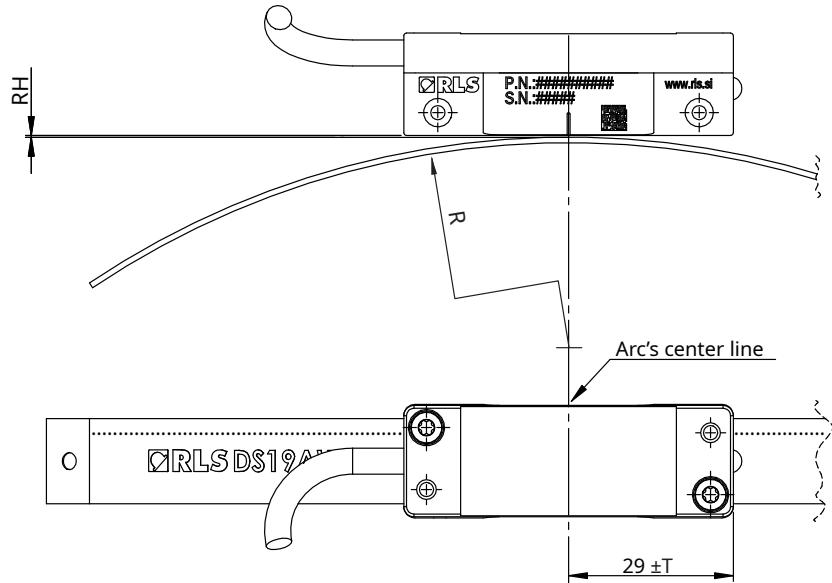
SAS with Artos and LA11/LA12



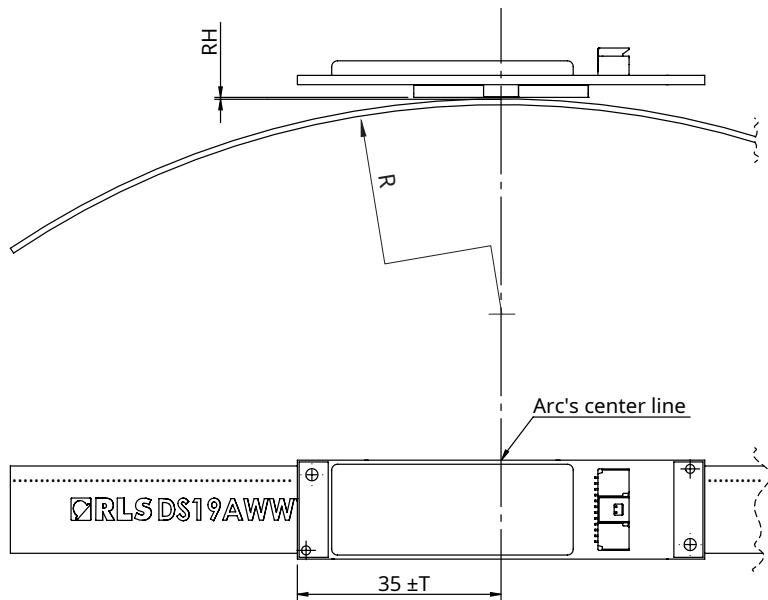
Ride height (RH) and center line offset for partial arc application of the DS19 scales

Values in the table below apply when the scale is installed on a curved surface (only applicable for DS19 scale). Minimum bending diameter for partial arc application is 200 mm.

Artos (DHL)



Artos (DBL)



The table below shows the ride heights between the Artos DBL/DHL readhead and the DS19 scale installed on a curved surface. The ride height differs based on the shaft diameter and scale type (001 and 002).

	Shaft OD	Ride height (RH) (up to 2 m long scale) option 001	Ride height (RH) (2 to 8 m long scale) option 002	Tangential (T) / center line offset
No cover foil	200 - 249 mm	0.1 to 0.7 mm	-	1 mm
	250 - 299 mm	0.1 to 0.85 mm	-	
	300 mm and up	0.1 to 1.0 mm	-	
With cover foil	200 - 249 mm	0.1 to 0.6 mm	-	1 mm
	250 - 299 mm	0.1 to 0.75 mm	-	
	300 mm and up	0.1 to 0.9 mm	-	
No cover foil	630 mm and up	-	0.1 to 0.9 mm	
With cover foil	630 mm and up	-	0.1 to 0.8 mm	

Lateral offset (LO)

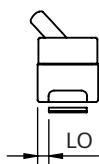


		LA11/LA12		LF11	Artos DHL		Artos DBL	
		AS10	SAS10	AS10	DS19	SAS19	DS19	SAS19
No cover foil	With or without adhesion tape	3 ±0.3	1 ±0.2	1 ±0.3	2.5 ±1	1 ±1	1 ±1	0.5 ±1
	Scale prepared for track system	3 ±0.2		1 ±0.2	/	/	/	/
With cover foil	With or without adhesion tape	3 ±0.3		1 ±0.3	2.5 ±1	1 ±1	1 ±1	0.5 ±1
	Scale prepared for track system	3 ±0.2		1 ±0.2	/	/	/	/

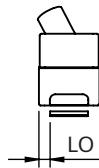
Values in mm.

AS10 with LA11/LA12/LF11

LA11



LA12

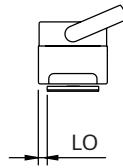


LF11

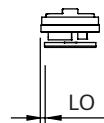


DS19 with Artos

DHL

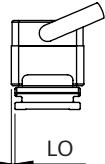


DBL

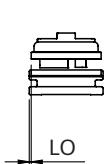


SAS with Artos and LA11/LA12

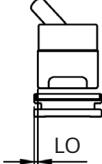
DHL



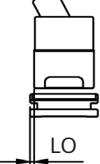
DBL



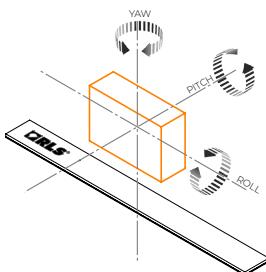
LA11



LA12



Roll, pitch and yaw



LA11/LA12

AS10

SAS10

LF11

AS10

Artos

DS19

SAS19

Non-parallel mounting (roll)	±1°	±1°	±1°	± 1°	± 1°
Non-parallel mounting (yaw)	±0.5°	±0.5°	±0.5°	± 1°	± 1°
Non-parallel mounting (pitch)	±0.5°	±0.5°	±0.5°	± 1°	± 1°

Maximum speed tables

LA11 (parallel incremental signals) □□

AS10, SAS10

Ordering code	Resolution (µm)	Interpolation factor	Maximum speed (m/s)								
			1.82	0.91	0.23	0.11	0.06	0.03	0.02	0.01	0.01
13B	~0.244	8,192	1.82	0.91	0.23	0.11	0.06	0.03	0.02	0.01	0.01
12B	~0.488	4,096	3.65	1.82	0.46	0.23	0.12	0.06	0.05	0.02	0.01
11B	~0.976	2,048	7	3.65	0.91	0.46	0.24	0.12	0.10	0.05	0.02
2D0	1	2,000	7	3.73	0.93	0.47	0.24	0.12	0.10	0.05	0.02
10B	~1.953	1,024	7	7	1.82	0.91	0.48	0.24	0.19	0.10	0.05
09B	~3.906	512	7	7	3.65	1.82	0.95	0.49	0.38	0.19	0.10
08B	~7.812	256	7	7	7	3.65	1.90	0.97	0.77	0.39	0.19
07B	15.625	128	7	7	7	7	3.81	1.94	1.53	0.77	0.39
06B	31.25	64	7	7	7	7	7	3.89	3.07	1.55	0.78
05B	62.5	32	7	7	7	7	7	7	6.14	3.10	1.56
04B	125	16	7	7	7	7	7	7	7	6.19	3.11
Minimum edge separation (µs)			0.07	0.12	0.50	1	2	4	5	10	20
Maximum count frequency (MHz)			15	8	2	1	0.50	0.25	0.20	0.10	0.05
Part numbering			K	A	B	C	D	E	F	G	H

LA12

AS10, SAS10

Ordering code	Resolution (µm)	Interpolation factor	Maximum speed (m/s)
13B	~0.244	8,192	2
12B	~0.488	4,096	4
11B	~0.976	2,048	7
8D0	0.250	8,000	2
2D0	1	2,000	7
1D0	2	1,000	7

LF11

AS10

Ordering code	Resolution (µm)	Interpolation factor	Maximum speed (m/s)
13B	~0.244	8,192	1.85
12B	~0.488	4,096	3.65
11B	~0.976	2,048	7

Artos

DS19 and SAS19

The maximum linear speed is 20 m/s regardless of the chosen resolution on DHL and DBL readheads. Refer to [Maximum speed calculator for scales](#).

How to define scale length

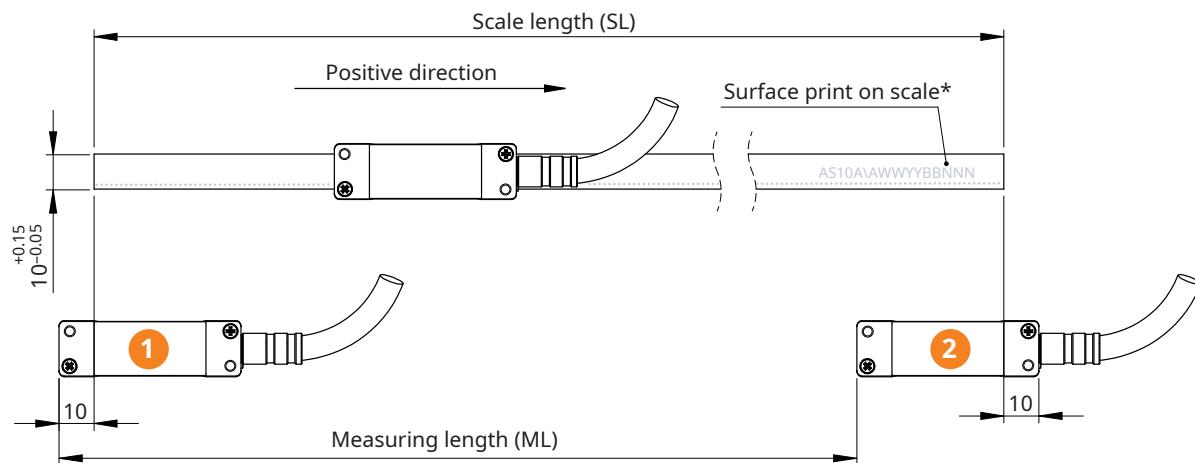
AS10 installation with LA11 and LA12 readhead

① and ② are encoder position limits

If special requirement AS10_03 (03 - absolute code begins with zero) is selected and the readhead is at location ① as shown on the drawing below, the readhead reports the absolute position 5 ± 1 mm or 8 ± 1 for a scale with the end-clamps.. The absolute position reported by the encoder at location ② can be calculated with the following equation:

Absolute position value ② = $x - 27$ mm (within tolerance ± 1 mm)
 x = Total length of the effective part of the magnetic scale (elasto-ferrite rubber)

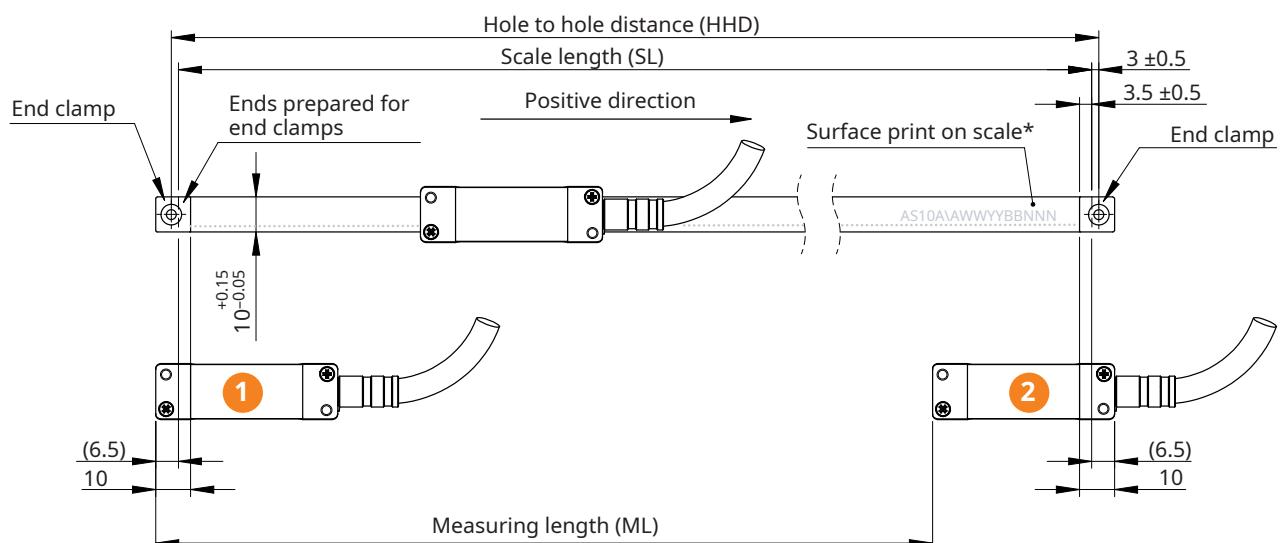
Installation of AS10 magnetic scale with adhesive tape



$$SL = ML + 32 \text{ mm}$$

* Scale surface print does not represent the actual ordering code.
For orientation purpose only.

Installation of AS10 magnetic scale with end clamps

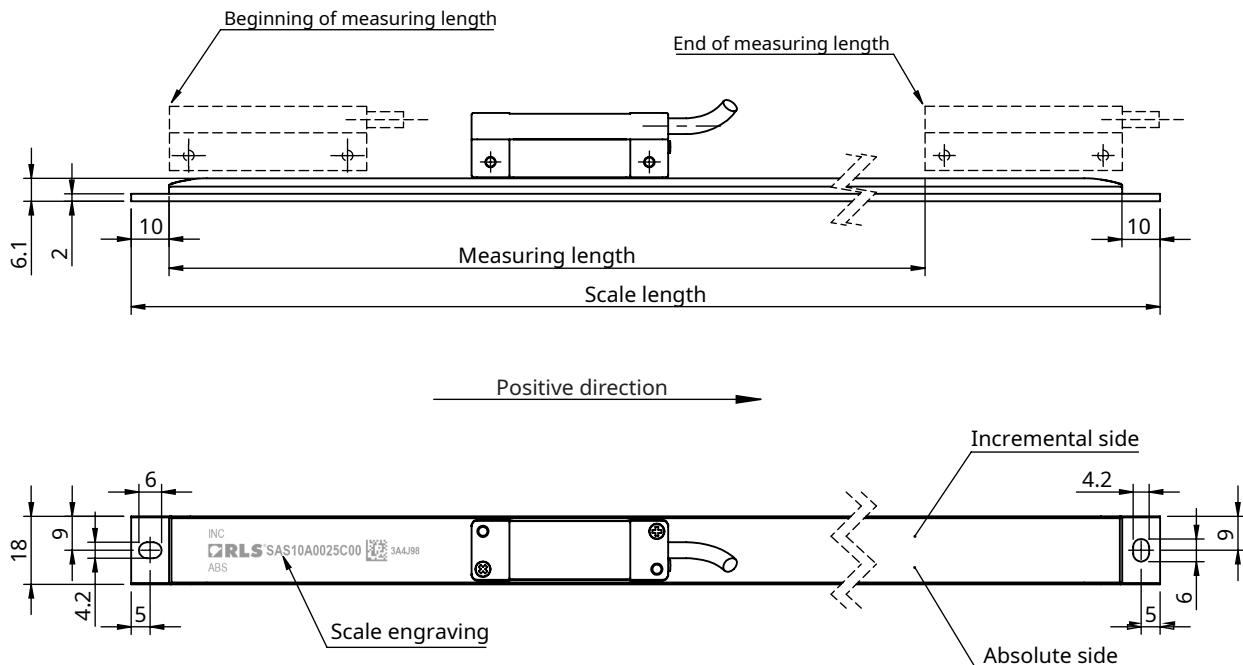


$$SL = ML + 39 \text{ mm}$$

$$HHD = SL + (6 \text{ mm} \pm 1 \text{ mm})$$

* Scale surface print does not represent the actual ordering code.
For orientation purpose only.

SAS10 installation with LA11 and LA12 readhead



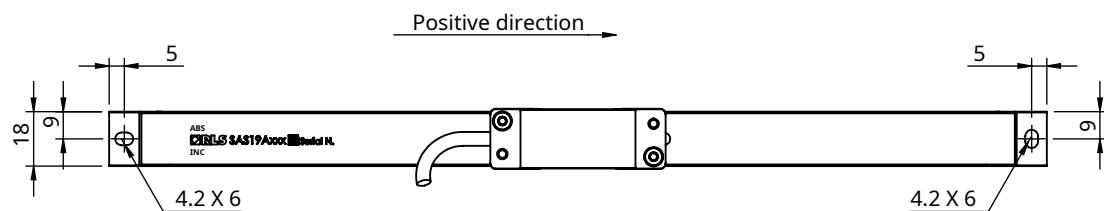
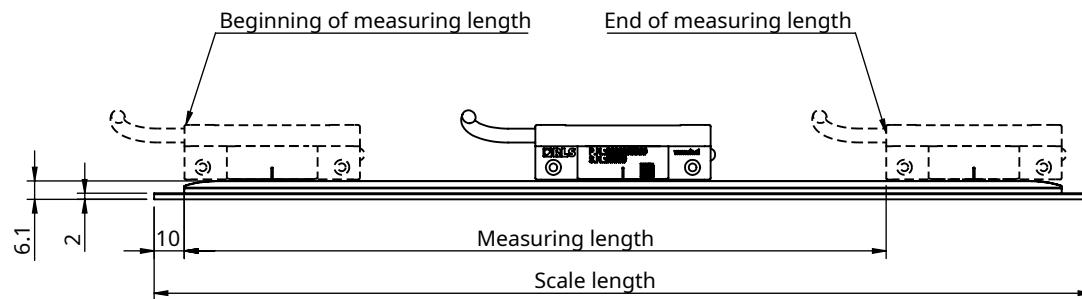
$$SL = ML + 72 \text{ mm}$$

SAS10 scales always start with the absolute zero position regardless of scale length.

Scale length [mm]	Measuring length (LA11/ LA12) [mm]	Nr. of washers (MN01509)	Nr. of fasteners (M4 x 10 IMBUS ISO 7380)*
97	25	2	4
117	45	2	4
162	90	2	4
192	120	2	4
272	200	2	4
322	250	4	6
372	300	4	6
472	400	6	8
560	488	6	8
660	588	8	10
760	688	10	12
860	788	10	12
960	888	12	14
1060	988	14	16
1160	1088	14	16
1260	1188	16	18
1360	1288	18	20

* 2 additional screws to attach the scale at both ends. 2 standard washers M4 DIN 125 stainless-steel included.

SAS19 installation with Artos readhead



$$SL = ML + 79 \text{ mm}$$

SAS19 scales always start with the absolute zero position regardless of scale length.

Scale length [mm]	Measuring length (Artos) [mm]	Nr. of washers (MN01509)	Nr. of fasteners (M4 x 10 IMBUS ISO 7380)*
97	18	2	4
117	38	2	4
162	83	2	4
192	113	2	4
272	193	2	4
322	243	4	6
372	293	4	6
472	393	6	8
560	481	6	8
660	581	8	10
760	681	10	12
860	781	10	12
960	881	12	14
1060	981	14	16
1160	1081	14	16
1260	1181	16	18
1360	1281	18	20
1560	1481	20	22
2060	1981	26	28
2460	2381	32	34

* 2 additional screws to attach the scale at both ends. 2 standard washers M4 DIN 125 stainless-steel included.

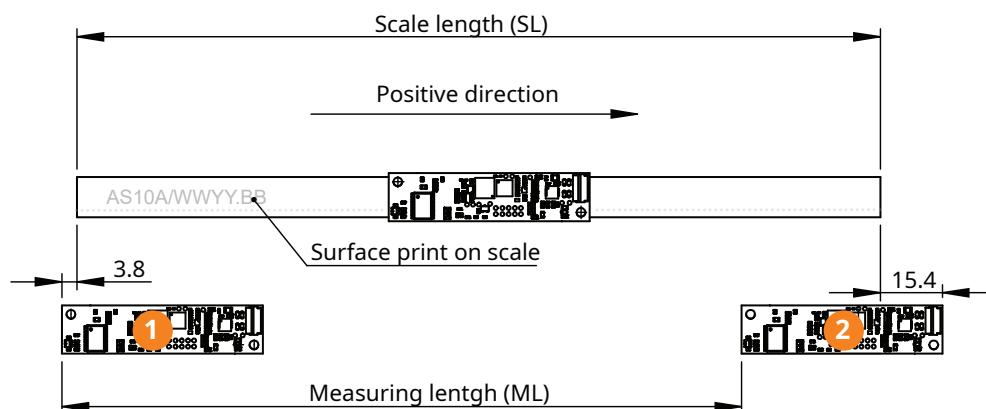
AS10 installation with LF11 readhead

① and ② are encoder position limits

If special requirement 03 (absolute code begins with zero) is selected and the readhead is at location ① as shown on the drawing below, the readhead reports the absolute position 3 ± 1 mm or 6 ± 1 for a scale with the end-clamps. The absolute position reported by the encoder at location ② can be calculated with the following equation:

Absolute position value ② = $x - 30$ mm (within tolerance ± 1 mm)
 x = Total length of the effective part of the magnetic scale (elasto-ferrite rubber)

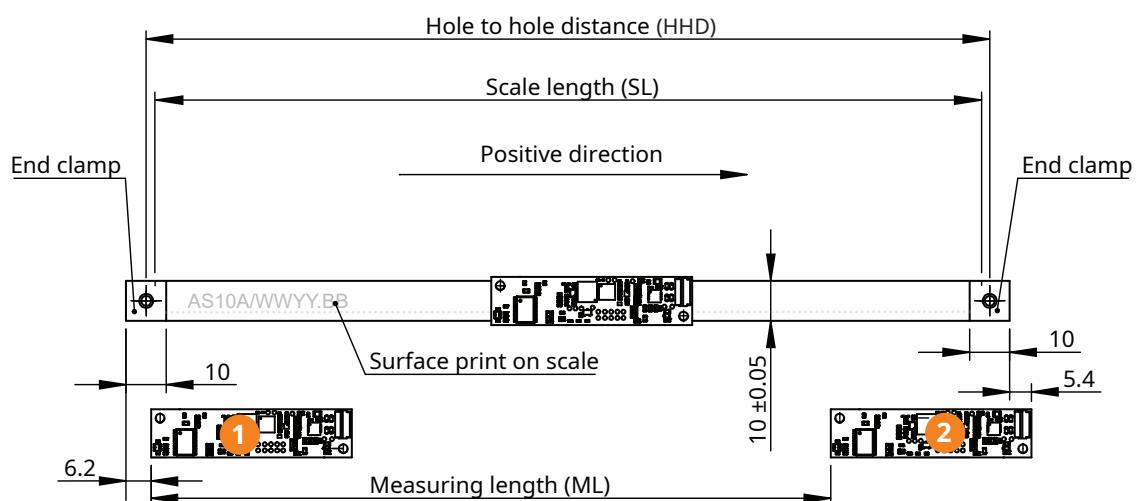
Installation of AS10 magnetic scale with adhesive tape



$$SL = ML + 31 \text{ mm}$$

* Scale surface print does not represent the actual ordering code.
 For orientation purpose only.

Installation of AS10 magnetic scale with end clamps



$$SL = ML + 38 \text{ mm}$$

$$HHD = SL + (6 \text{ mm} \pm 1 \text{ mm})$$

$$SL \text{ tolerance} = \pm(0.5 \text{ mm} + 0.04 \text{ mm/m})$$

* Scale surface print does not represent the actual ordering code.
 For orientation purpose only.

DS19 installation with Artos DHL readhead

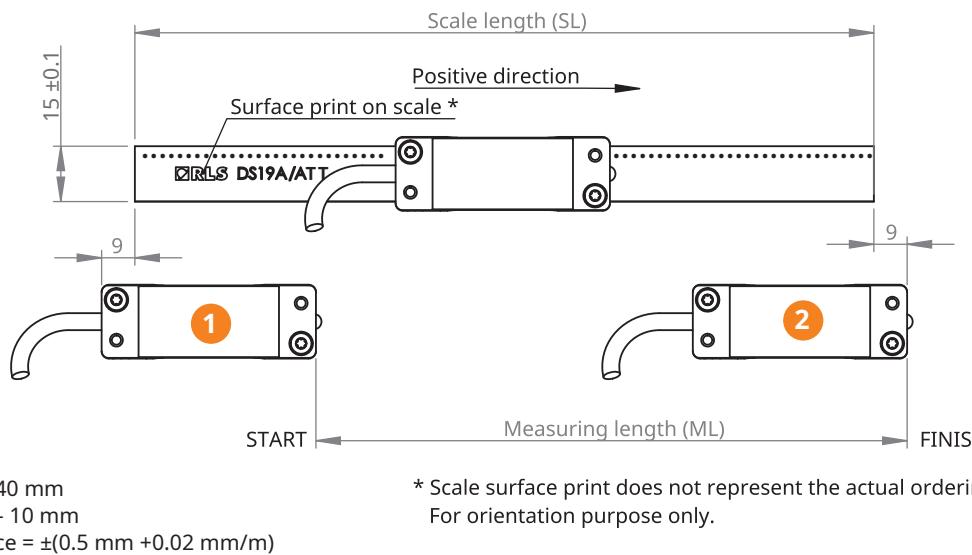
① and ② are encoder position limits

If the **absolute code type "Z"** (absolute code begins with zero) is selected and the readhead is at location ① as shown on the drawing below, the reported position of the readhead is different according to the selected option:

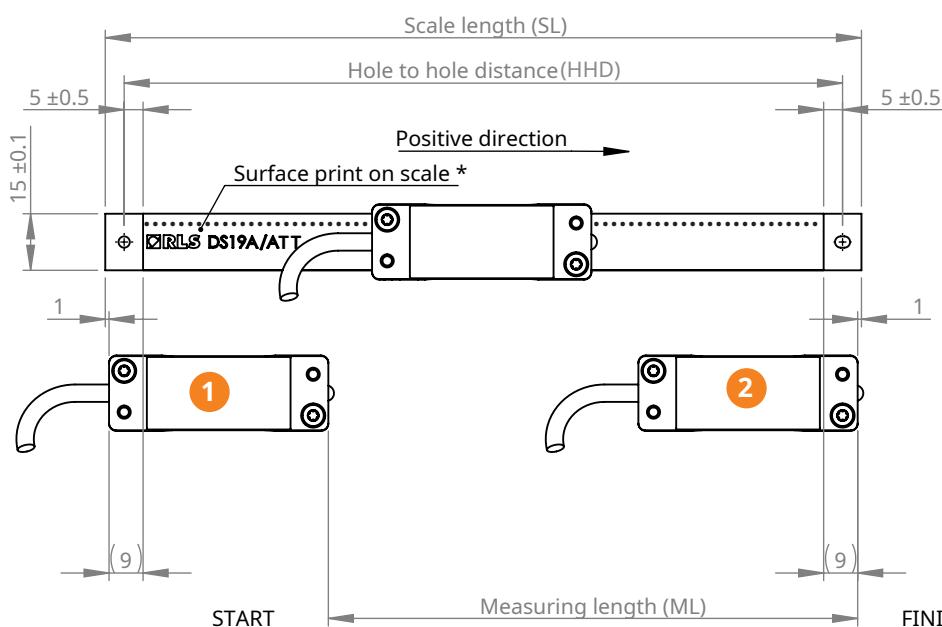
- option 001 = 11 ± 1 or 21 ± 1 mm for a scale with the end-clamps
- option 002 = 9 ± 1 or 19 ± 1 mm for a scale with the end-clamps
- option 003 = 7 ± 1 or 17 ± 1 mm for a scale with the end-clamps

The absolute position reported by the encoder at location ② can be calculated with the following equation:
 $ML = SL - n$, stated under corresponding DS19 scale type.

Installation of DS19 magnetic scale



Installation of DS19 magnetic scale with fasteners at both ends of the scale



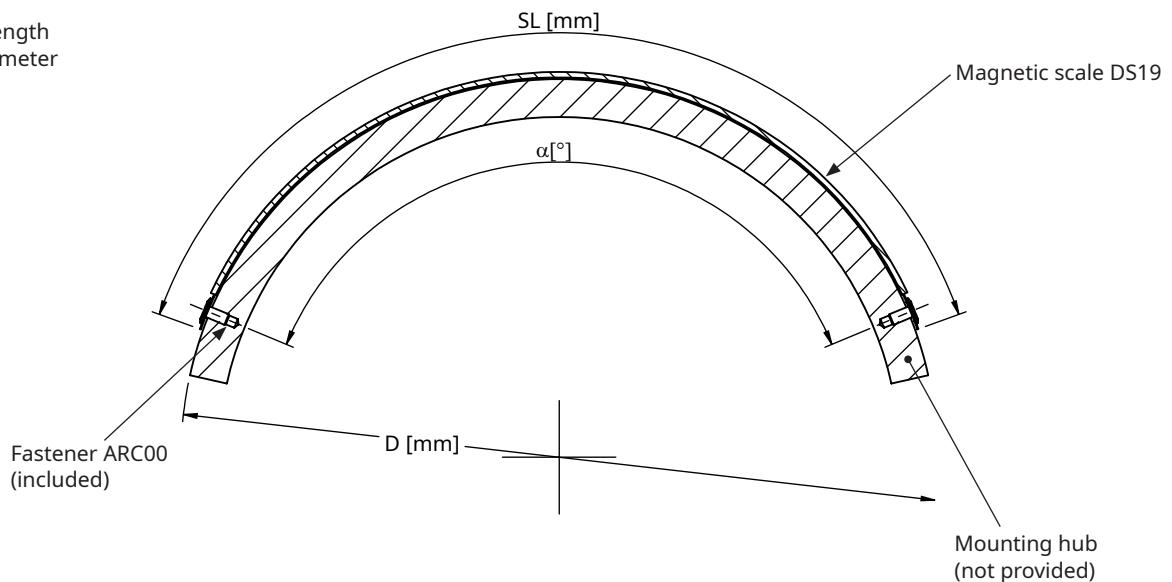
SL = ML + 60 mm
HHD = SL - 10 mm
SL tolerance = $\pm(0.5 \text{ mm} + 0.02 \text{ mm/m})$

* Scale surface print does not represent the actual ordering code.
For orientation purpose only.

Alpha is an angle between both holes at the ends of the scale and can be calculated with the following formula. For holes dimensions please refer to the chapter **Installation of DS19 magnetic scale with installation tool**.

$$\alpha [^\circ] = \frac{360^\circ \times (SL - 10 \text{ mm})}{\pi \times (D + 0.6)}$$

SL = scale length
D = hub diameter



Before peeling off the liner to expose the adhesive on the scale, simulate placing the scale on the flange to see if the holes at both ends of the scale overlap with the holes on the mounting flange. You might not see a perfect overlap with the liner present on the scale, but it gives a general indication that the holes on the flange are correctly aligned with the scale length.

DS19 installation with Artos DBL readhead

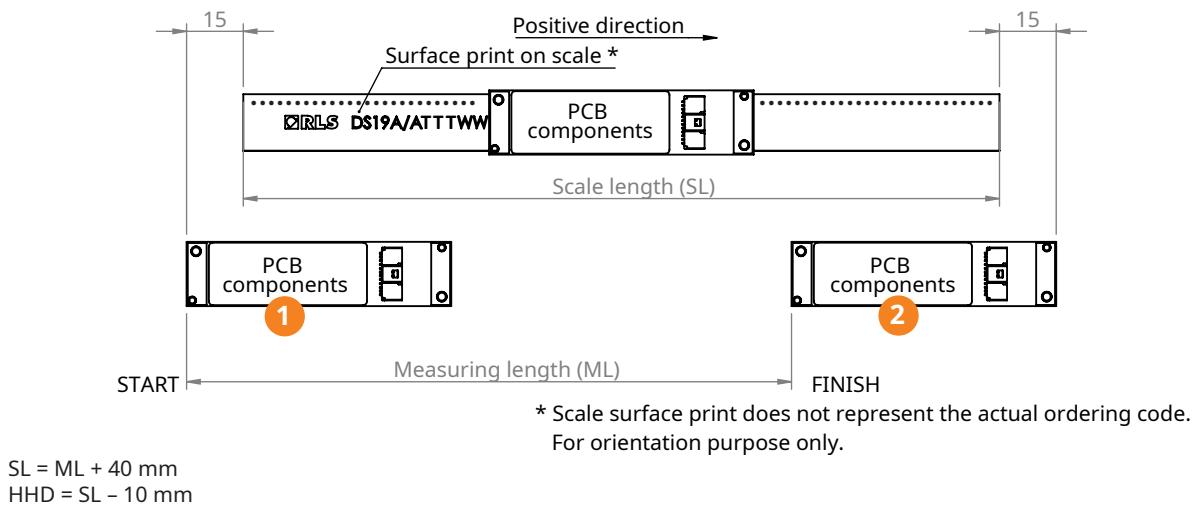
① and ② are encoder position limits

If the **absolute code type "Z"** (absolute code begins with zero) is selected and the readhead is at location ① as shown on the drawing below, the reported position of the readhead is different according to the selected option:

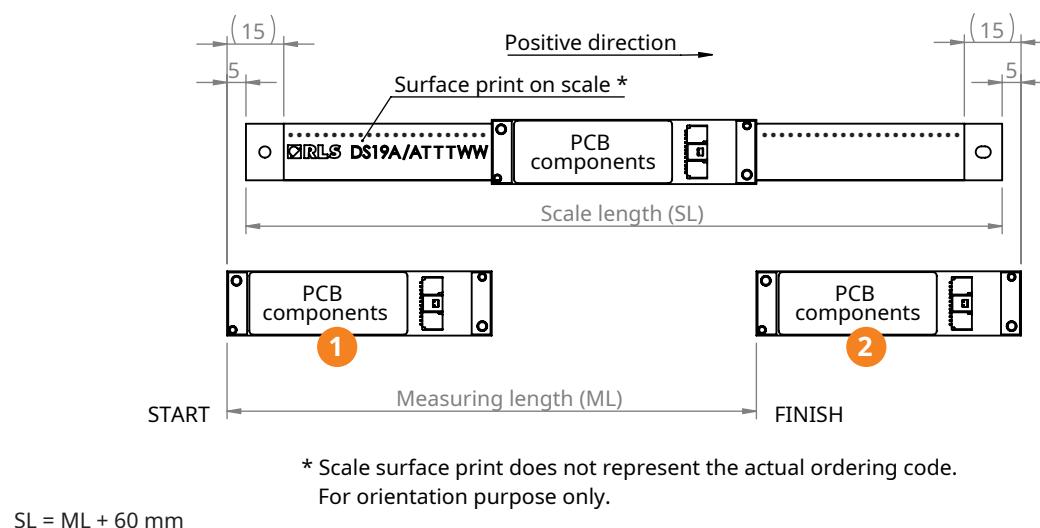
- option 001 = 11 ± 1 or 21 ± 1 mm for a scale with the end-clamps
- option 002 = 9 ± 1 or 19 ± 1 mm for a scale with the end-clamps
- option 003 = 7 ± 1 or 17 ± 1 mm for a scale with the end-clamps

The absolute position reported by the encoder at location ② can be calculated with the following equation:
 $ML = SL - n$, stated under corresponding DS19 scale type.

Installation of DS19 magnetic scale



Installation of DS19 magnetic scale with fasteners at both ends of the scale



Part numbering

AS10

AS 10 A 01000 A 00

Accuracy class

A - N/A

Scale length

xxxx - Where xxxx equals scale length in mm

Options

A - VHB back adhesive tape (standard)

B - VHB back adhesive tape; with cover foil*

C - VHB back adhesive tape; ends prepared for end clamping

G - No VHB back adhesive tape; sides prepared for insertion into track section

H - No VHB back adhesive tape, sides prepared for insertion into track section; with cover foil*

I - No back adhesive tape

N - No back adhesive tape; with cover foil*

P - No back adhesive tape; ends prepared for end clamping**

* Cover foil is not factory mounted on the scale (cover foil is up to 50 mm longer than specified with the part number).

** It can only be used when the magnetic scale is installed in the groove to prevent lateral sliding.

The groove dimension must correspond to the scale width.

Special requirements

00 - No special requirements (standard)

03 - Absolute code begins with 0. Available up to 16.3 m

The AS10 magnetic scale without the special option (»00«) is randomly cut from a reel with the corresponding absolute position of the 16.3 m long scale. The absolute position value reported by the LA11/LA12 readhead varies depending on which stock scale the section was cut from.

Table of available combinations

Series	Accuracy class	Scale length	Options	Reference mark
AS10	A	xxxx	A / B / C / G / H / I / N / P	00 / 03

SAS solid scale part numbering

	SAS10	A	1100	A	00
Solid scale family					
10 - SAS scale compatible with LA11/LA12					
19 - SAS scale compatible with Artos					
Effective measuring length					
SAS10 and LA11/LA12 readhead					
0025 - 25 mm	0250 - 250 mm	0688 - 688 mm	1188 - 1188 mm		
0045 - 45 mm	0300 - 300 mm	0788 - 788 mm	1288 - 1288 mm		
0090 - 90 mm	0400 - 400 mm	0888 - 888 mm			
0120 - 120 mm	0488 - 488 mm	0988 - 988 mm			
0200 - 200 mm	0588 - 588 mm	1088 - 1088 mm			
For longer scale options (>1.3m) please contact RLS .					
SAS19 and Artos readhead					
0018 - 18 mm	0243 - 243 mm	0681 - 681 mm	1181 - 1181 mm		
0038 - 38 mm	0293 - 293 mm	0781 - 781 mm	1281 - 1281 mm		
0083 - 83 mm	0393 - 393 mm	0881 - 881 mm	1481 - 1481 mm		
0113 - 113 mm	0481 - 481 mm	0981 - 981 mm	1981 - 1981 mm		
0193 - 193 mm	0581 - 581 mm	1081 - 1081 mm	2381 - 2381 mm		
Options					
A - No cover foil					
C - Welded cover foil					
Special requirement					
00 - No special requirements					

Table of available combinations

Series	N/A	Measuring scale length	Options	Special requirement
SAS10		25 / 45 / 90 / 120 / 200 / 250 / 300 / 400 / 488 / 588 / 688 / 788 / 888 / 988 / 1088 / 1188 / 1288		
SAS19	A	18 / 38 / 83 / 113 / 193 / 243 / 293 / 393 / 481 / 581 / 681 / 781 / 881 / 981 / 1081 / 1181 / 1281 / 1481 / 1981 / 2381	A / C	00

DS19 scale part numbering

DS 19 001 A 01000 Z L A S A 00

Absolute scale family

DS - Absolute scale Artos (linear and partial arc)

Scale width

19 - Width 15 mm, 2 mm pole pitch

Scale type option

Linear and partial arc scale

001 - DS19 (≤ 2 m, minimum bending diameter 200 mm, ± 10 μ m accuracy)

002 - DS19 ($2 \leq 8$ m, minimum bending diameter 630 mm, ± 10 μ m accuracy)

Linear scale

003 - DS19 ($8 \leq 32$ m, no bending allowed, ± 15 μ m accuracy)

Scale length

xxxxx - Where **xxxxx** equals length in mm

Minimum scale length is 60 mm with mechanical option A and 80 mm with mechanical option L. In this case the measuring length is 20 mm.

Absolute code type

R - Random cut of the scale with a random start of the absolute code

Z - Start with absolute zero

Mechanical option

A - Without holes

G - No cover foil, prepared for track section

H - No cover foil, prepared for track section, with slot holes at both ends of the scale (fasteners included)

L - With slot holes at both ends of the scale (fasteners included)

Adhesive option

A - With VHB 3M adhesive tape

B - Without VHB 3M adhesive tape

Packaging type

A - Box (individual packaging > 300 mm length)

C - Tube (individual packaging ≤ 300 mm length)

Special requirements

00 - No special requirements

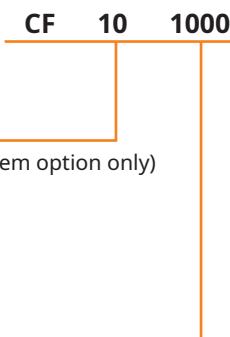
The DS19 magnetic scale with the absolute code type "R" is cut at random from a reel, with absolute positions assigned based on the original scale lengths of 2 m, 8 m, or 32 m. If the ordered scale is up to 2 m long, the section is cut from a 2 m long scale in stock. For scales between 2.1 m and 8 m, sections are cut from an 8 m stock scale. For scales between 8.1 m and 32 m, sections are cut from a 32 m stock scale. The absolute position value reported by the Artos readhead varies depending on which stock scale the section was cut from.

Table of available combinations DS19

Scale family	Scale type option	N/A	Scale length	Absolute code	Mechanical option	Adhesive option	N/A	Packaging type	Special requirements	
DS19	001	A	00060 - 02000	R / Z	A / L / G / H	A / B	S	A / C	00	
	002		02001 - 08000					A		
	003		08001 - 32000							

Minimum scale length is 60 mm with mechanical option A and 80 mm with mechanical option L. In this case the measuring length is 20 mm.

Cover foil part numbering



Cover foil width

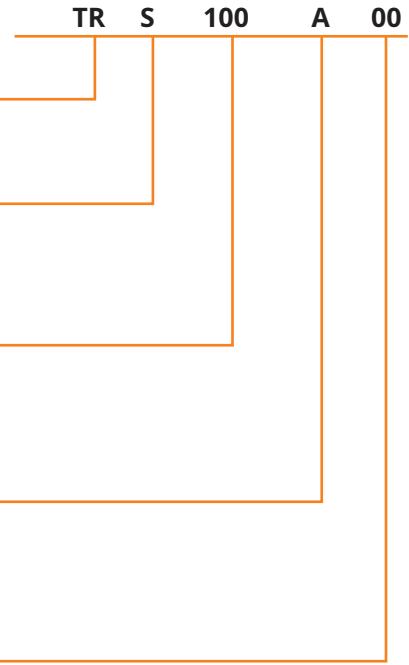
- 08** - 08 mm width (for AS10 track system option only)
- 10** - 10 mm width (for AS10 scale)
- 15** - 15 mm width (for DS19 scale)

Cover foil length

xxxx - Where xxxx equals foil length in cm*

* Cover foil is up to 50 mm longer than specified with the part number.

Track section system part numbering



Track section system

TR - Track section system

Integral part

S - Aluminium profile for scale insertion

E - Link for fixing the scale

Length of the TRS

100 - 1.0 m long TRS profile

200 - 2.0 m long TRS profile

Compatibility with scales

A - Compatible with AS10

B - Compatible with DS19

Special requirements

00 - No special requirements

Accessories



Magnet viewer
MM0001

SAS10/SAS19



Washer
MN01509

(included when ordering the SAS10/19 scale)

AS10



Applicator tool for magnetic scale and cover foil
LMA10ASC00



Scale clamp with fasteners,
0.04 m
TRE004A00

(2x fastener M3x10 and 1x fastener M2x4 included)



End clamp kit
LM10ECL00

(2 clamps + 2 fasteners)



Track section, 2.00 m
TRS200A00

(1x fastener M3x10 included)



Track section, 1.00 m
TRS100A00

(1x fastener M3x10 included)



Fastener and washer for TRS profile
TRC00

DS19

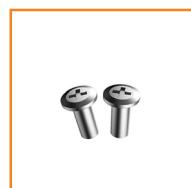


Installation tool
ACC088



Scale clamp with fasteners,
0.04 m
TRE004B00

(2x fastener M2x8 and 1x fastener M3x6 included)



Fastener for partial arc
ARC00

(2x fastener M3x6)



Track section, 2.00 m
TRS200B00

(9x fastener M3x6 included)



Track section, 1.00 m
TRS100B00

(5x fastener M3x6 included)



Fastener and washer for TRS profile
TRC00

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Document issues

Issue	Date	Page	Description
8	5. 11. 2024	29	Part numbering amended
9	19. 3. 2025	3	Packaging options amended
		9, 12, 27	Installation and dimension drawings added
		30 - 32	Part numbering amended
		-	SAS19 option added
10	4. 4. 2025	3, 22, 25, 26	End-clamps tolerances added
11	24. 11. 2025	2, 7, 27, 33	New scale lengths added
		9 - 14, 36 - 37	TRS system and new accessories added

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