AS
Absolute Magnetic Scales

RESISTANT TO COOLANTS AND OILS

UP TO 32 m LENGTH

TRACK SECTION SYSTEM (TRS)

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.

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.

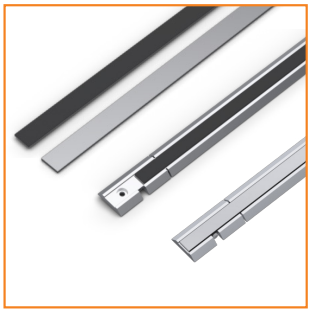
The DS19 absolute magnetic scale is compatible with Artos readhead and it supports linear and partial arc applications. The DS19 magnetic scale can be attached to shafts with larger diameters from 200 mm upwards. The use of the DS19 magnetic scale does not support a full 360° rotation of the shaft, but 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.**

SAS scales are available in predefined lengths up to 1.36 m (1.288 m measuring length for SAS10 and 1.281 m measuring length for SAS19). For longer scale options (>1.3 m) please **contact RLS.** The AS10 scale is available in lengths up to 16.3 m.

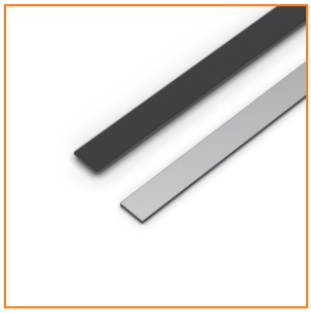
The SAS scale comes in two versions, one fully welded and another with the elasto-ferrite layer exposed. The welded version is designed for harsh environments where contamination with industrial compounds is possible, while the exposed version is intended for applications where higher accuracy is required.

Absolute scale variants

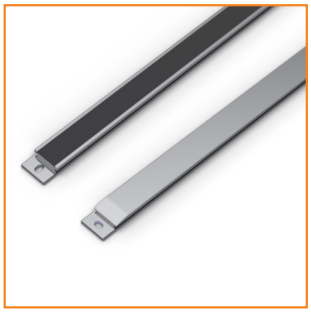
AS10 (optionally with cover foil or TRS system)



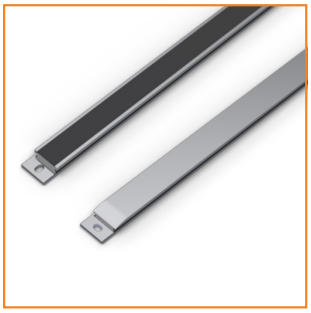
DS19 (optionally with cover foil)



SAS10 (exposed or fully welded)



SAS19 (exposed or fully welded)



Selection guide

		Compatibility with readheads			
Scale	**Accuracy at 0.2 mm ride height**	**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

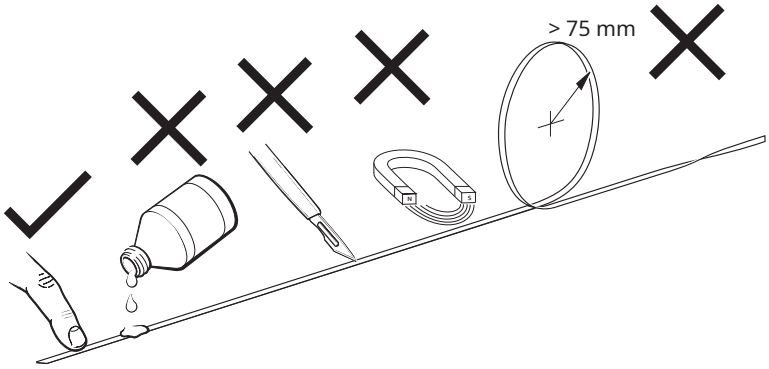
Operating temperature

–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

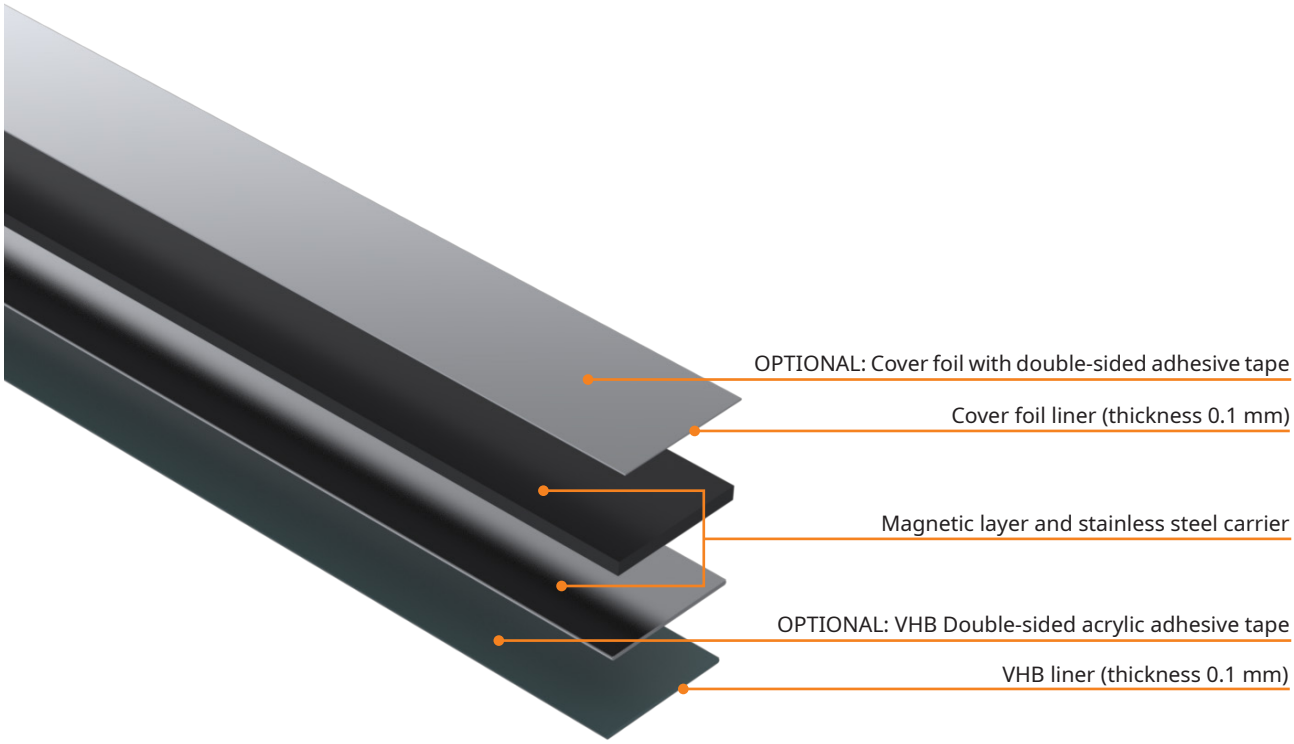
DS19 individual packaging

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

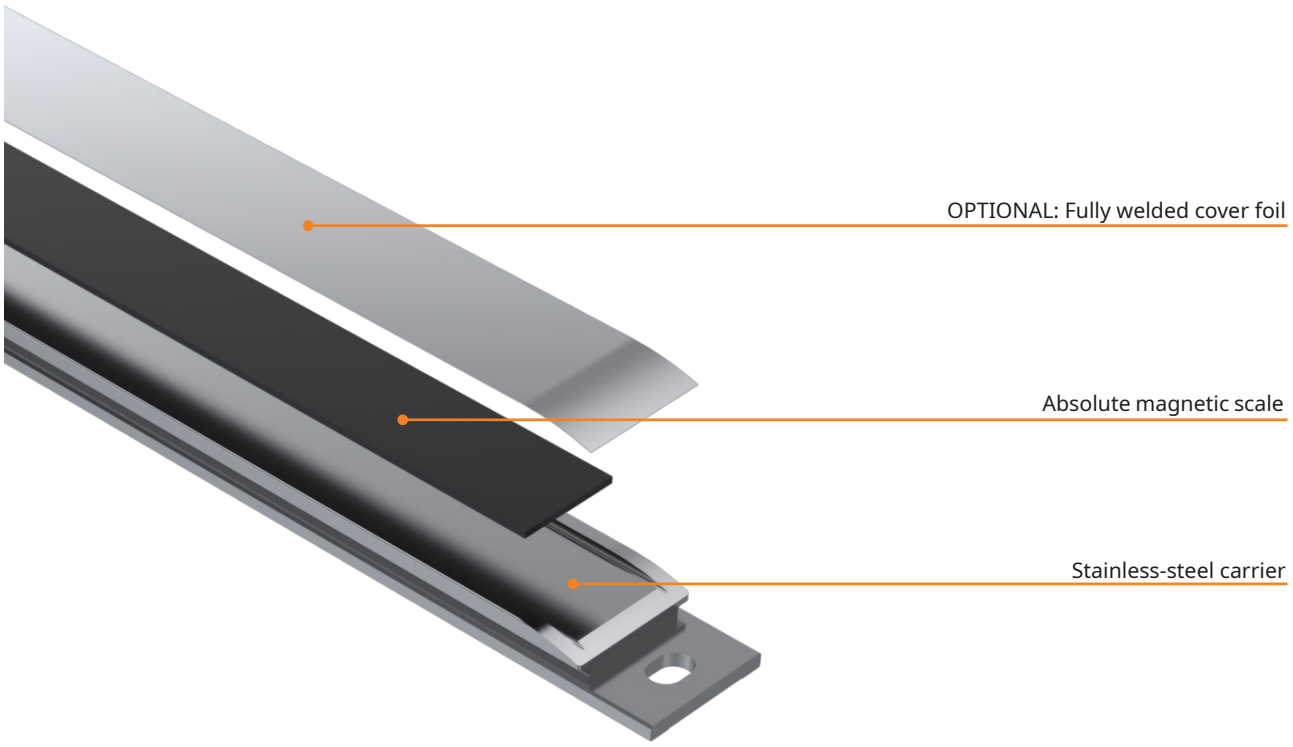
All magnetic scales have 12 months shelf life and should be installed within this period.

Magnetic scale design

Structure of AS10 and DS19 absolute magnetic scale

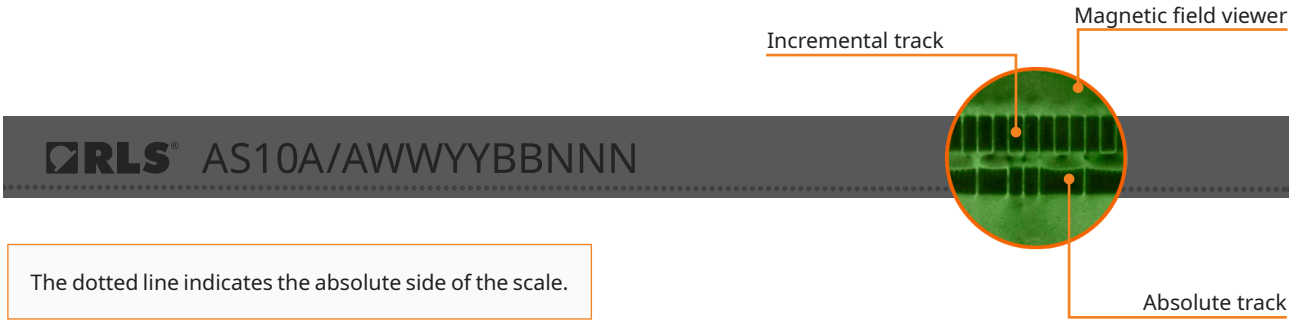


Structure of SAS absolute magnetic scale on a solid substrate



AS10 appearance and print

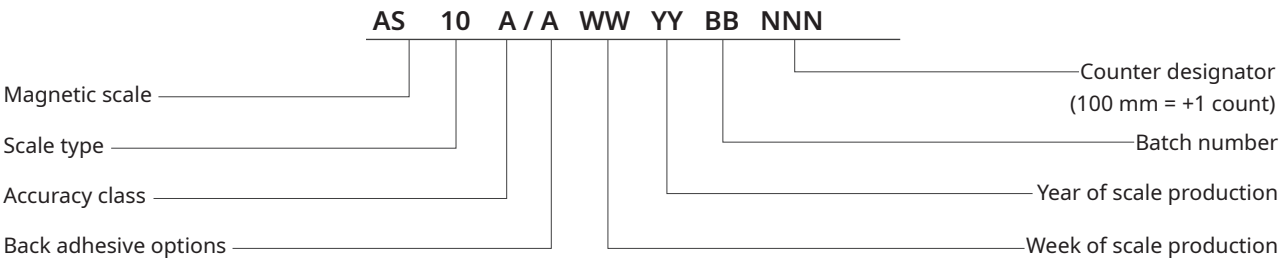
The orientation of the magnetised incremental track and absolute track is always the same, relative to the scale print as shown in the figure below.



The dotted line indicates the absolute side of the scale.

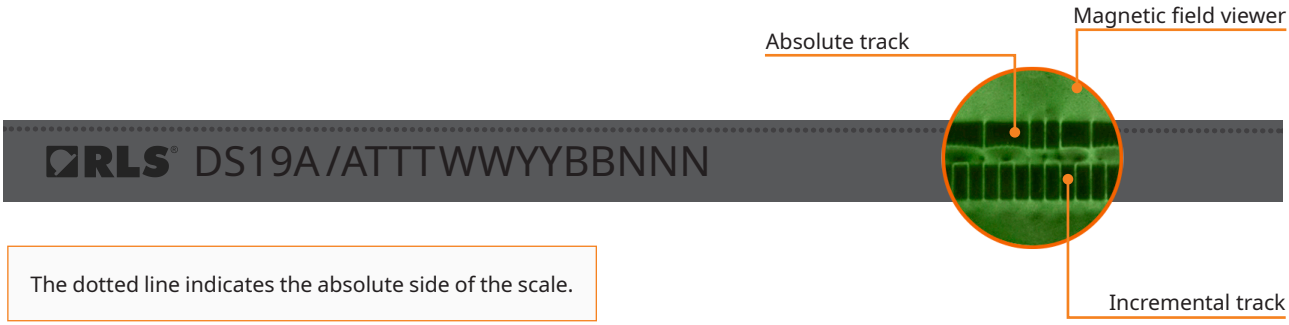
AS10 scale surface print description

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

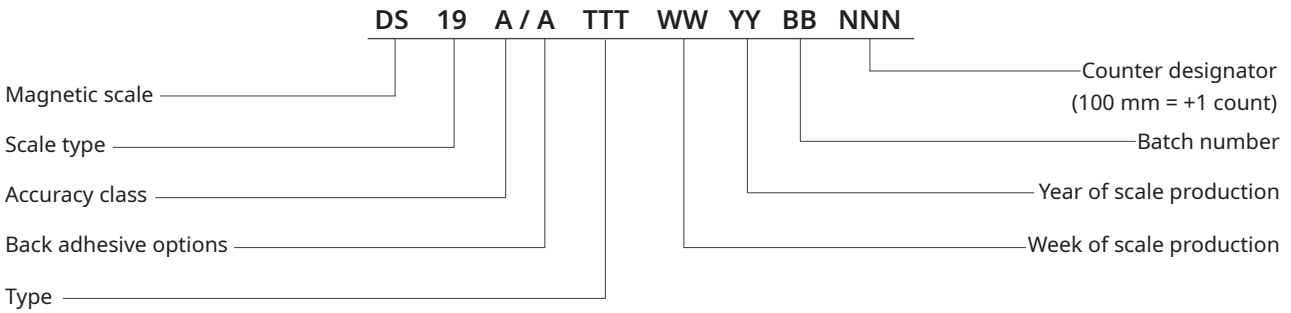
The orientation of the magnetised incremental track and absolute track is always the same, relative to the scale print as shown in the figure below. The dotted line indicates the absolute side of the scale.



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.



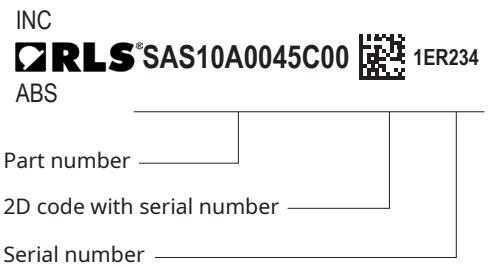
SAS10 appearance and print

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
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)	SAS10: ±20 µm/m SAS19: ±6 µm/m

*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).

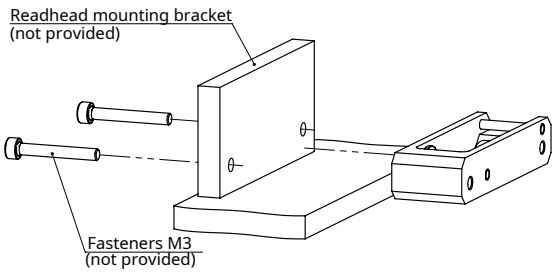
Further information can be found under **“Surface Preparation for 3M™ VHB™ Tape Applications”**.

Scale application

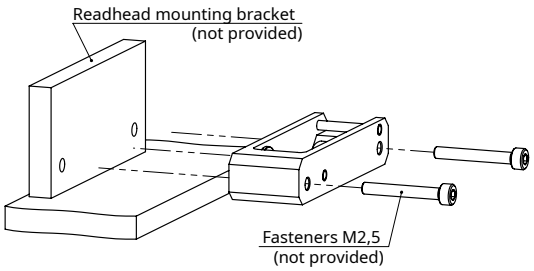
To simplify the scale installation use the scale applicator tool LMA10ASC00 or ACC088. Mount the applicator tool to the readhead mounting bracket. Use two fasteners as per readhead mounting configuration. The same principle of installing the scale can be applied to the magnetic scale DS19 with a different tool (ACC088). Further details can be found on pages 12 to 14.

Fastener mounting variants

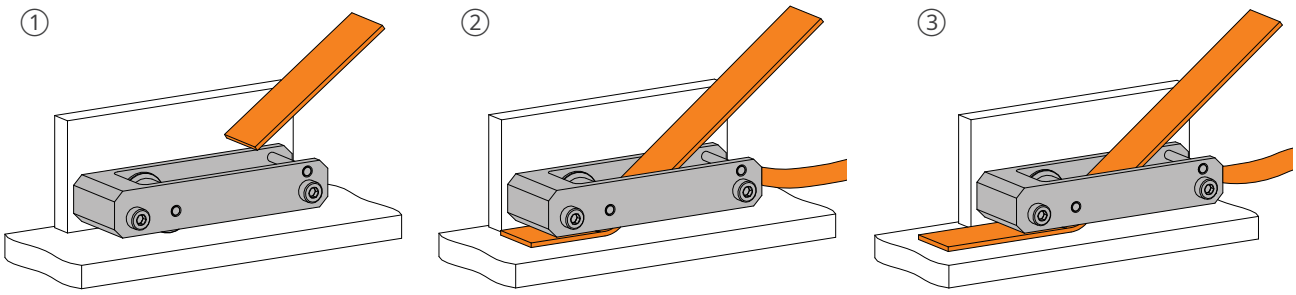
Variant A



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.

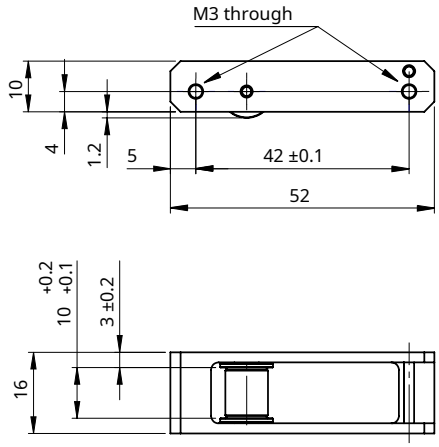
Apply the scale.
Push the scale carefully through to the end of scale mark, ensuring that it does not stick to the mounting surface until it is in position. Attach the end of the scale to the mounting surface with light finger pressure.

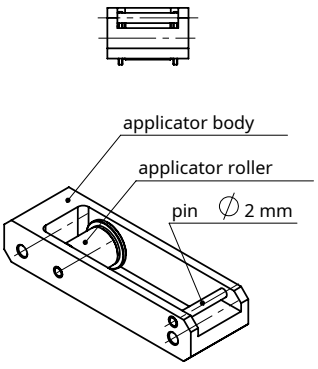
Ensure complete adhesion.
Apply firm finger pressure along the full length of the scale from the centre outwards to each end.

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

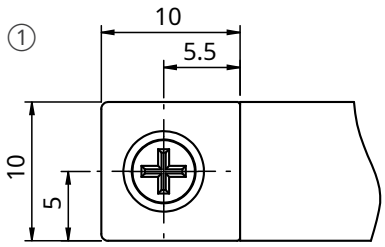




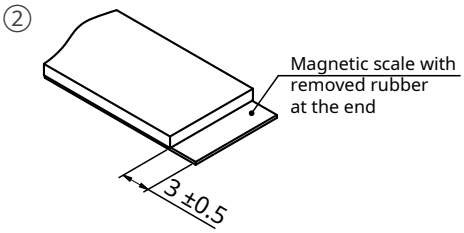
Installation of AS10 magnetic scale with end clamps

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

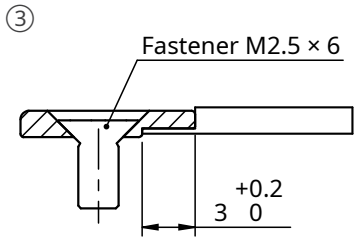


Prepare the mounting surface.
Drill the holes to the mounting surface as shown above.



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 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.

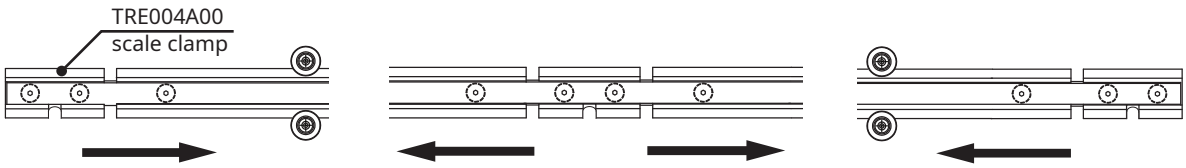
TRS technical specifications

Material	Aluminium, EN AW-6060
Mass	157 g/m
Thermal expansion	~25 µm/m/°C
Dimensions - cross section	20 mm × 4 mm
Available section lengths	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.



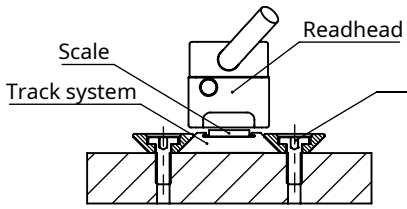
The scale expands to the **right**.

The scale expands in **both directions**.

The scale expands to the **left**.

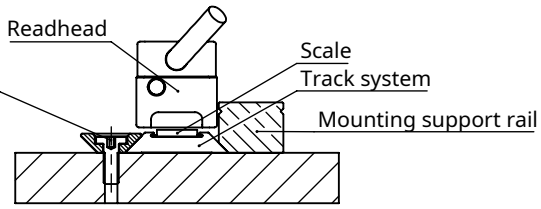
Installation methods

Installation method 1



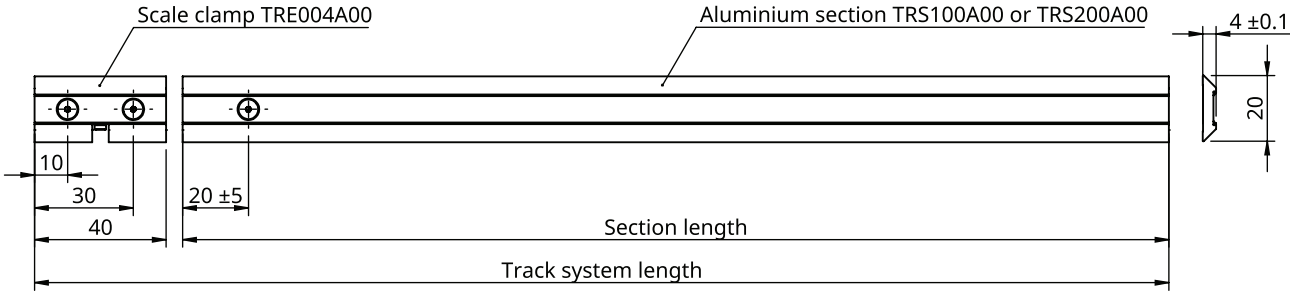
No mounting support rail available

Installation method 2



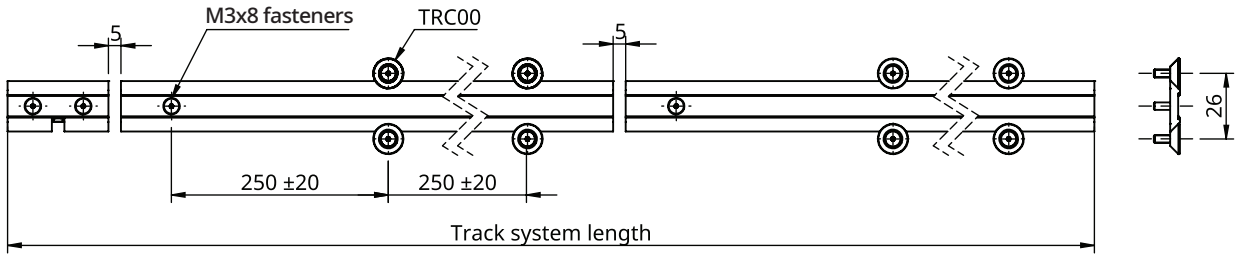
Mounting support rail available for alignment of track section

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

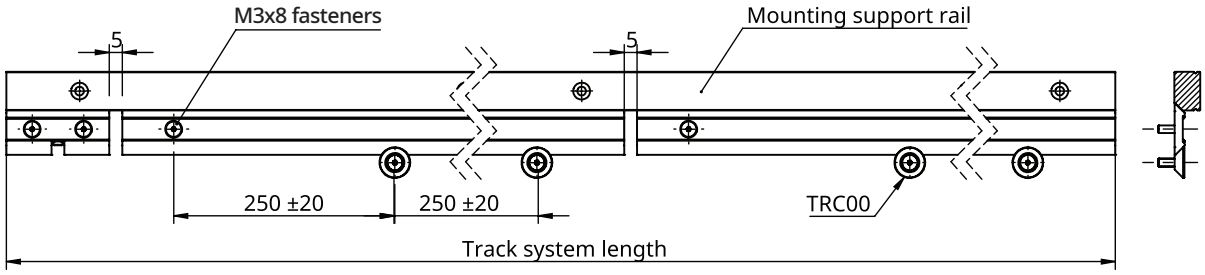


General tolerances: ISO 2768 m K

Installation method 1



Installation method 2



Recommended use of M3x 8 (CBSM3-8 Misumi). For more information see **Table of recommended fastener tightening torques** at **RLS Media center.**

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

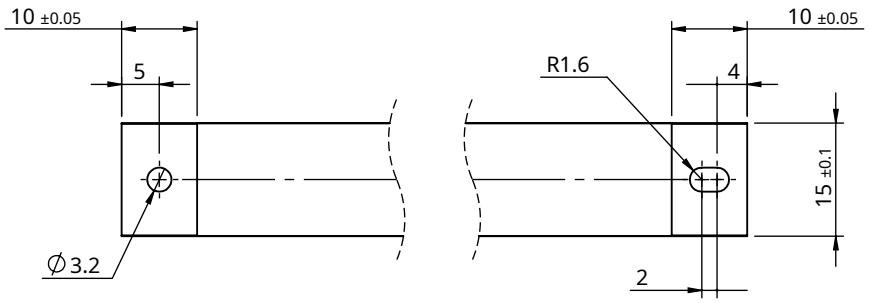
The DS19 scale can be installed in 2 different ways:

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

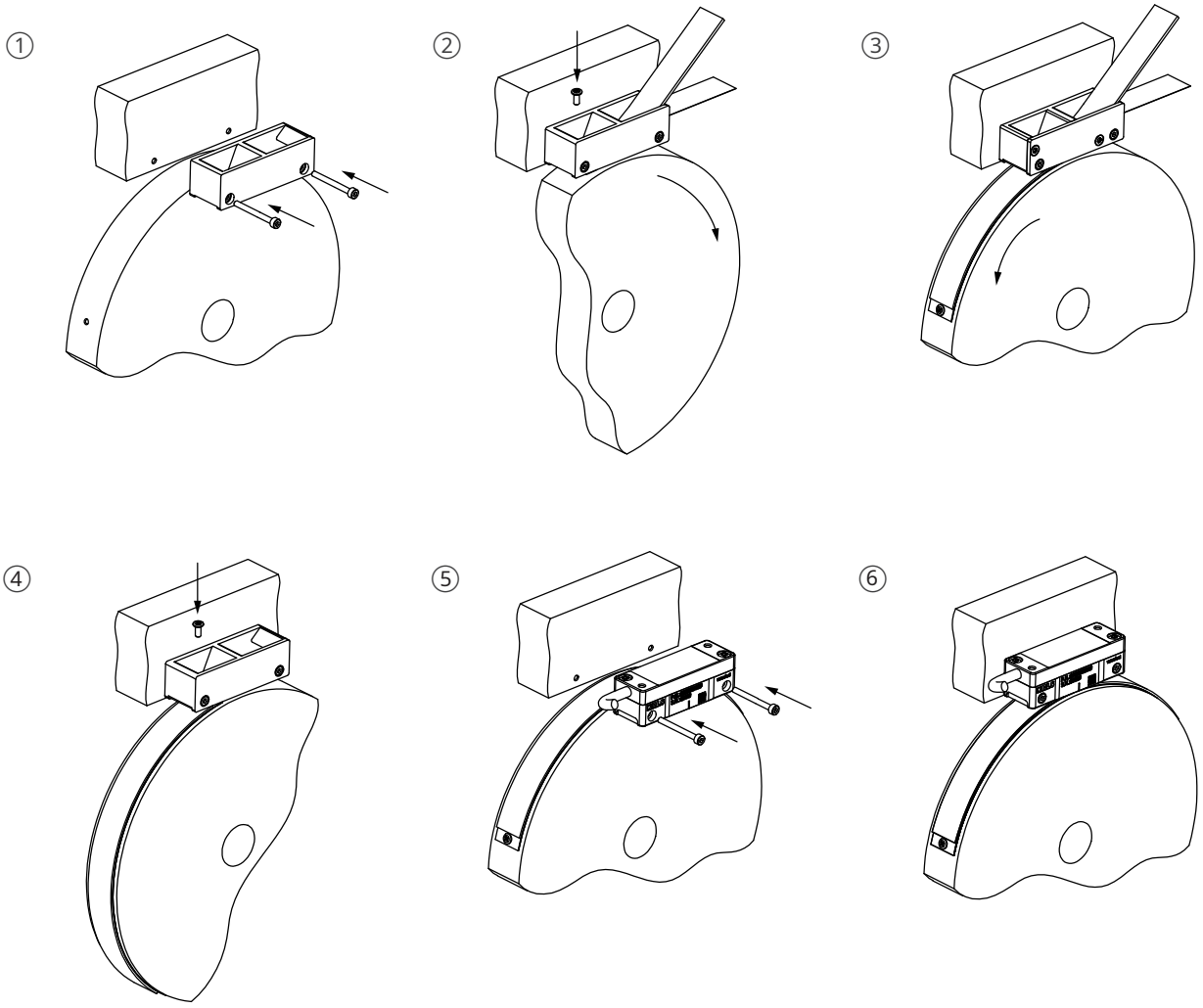
The fasteners (M3x6 CBSTSE3-6 T6 A2) at both ends prevent the magnetic scale from peeling off the edges when installed on a curved surface (e.g. a rotating shaft). It is not recommended to install the scale just with the fasteners at both ends (without adhesive tape). Using just fasteners to attach the 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 ∅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.

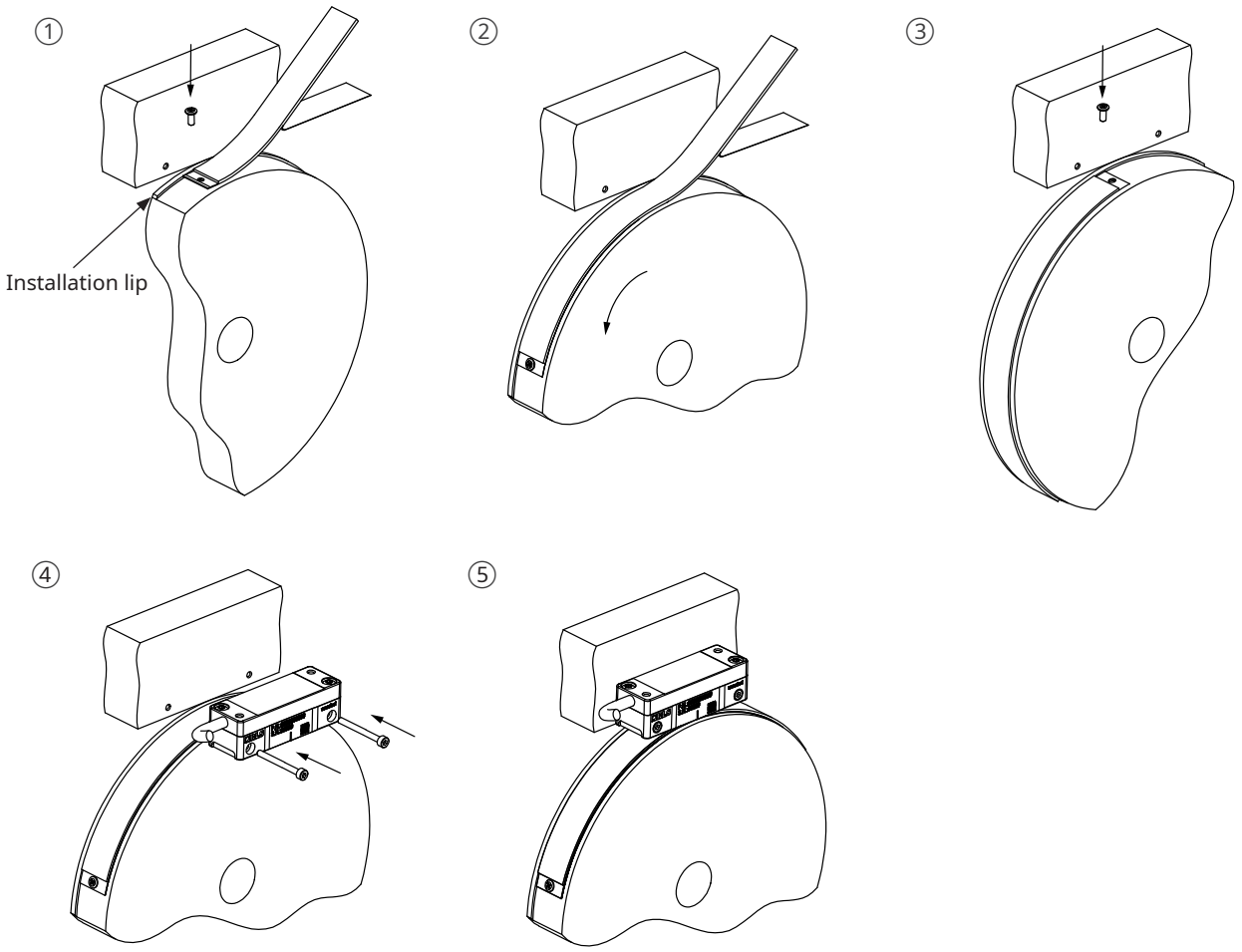
④ Insert the supplied fastener (ARC00) through the top hole of the installation tool and attach the right end of the scale. Use the recommended torque from the **Table of recommended fastener tightening torques.** If the shaft's range of motion is limited and the scale cannot be fully installed, the 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 of 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.

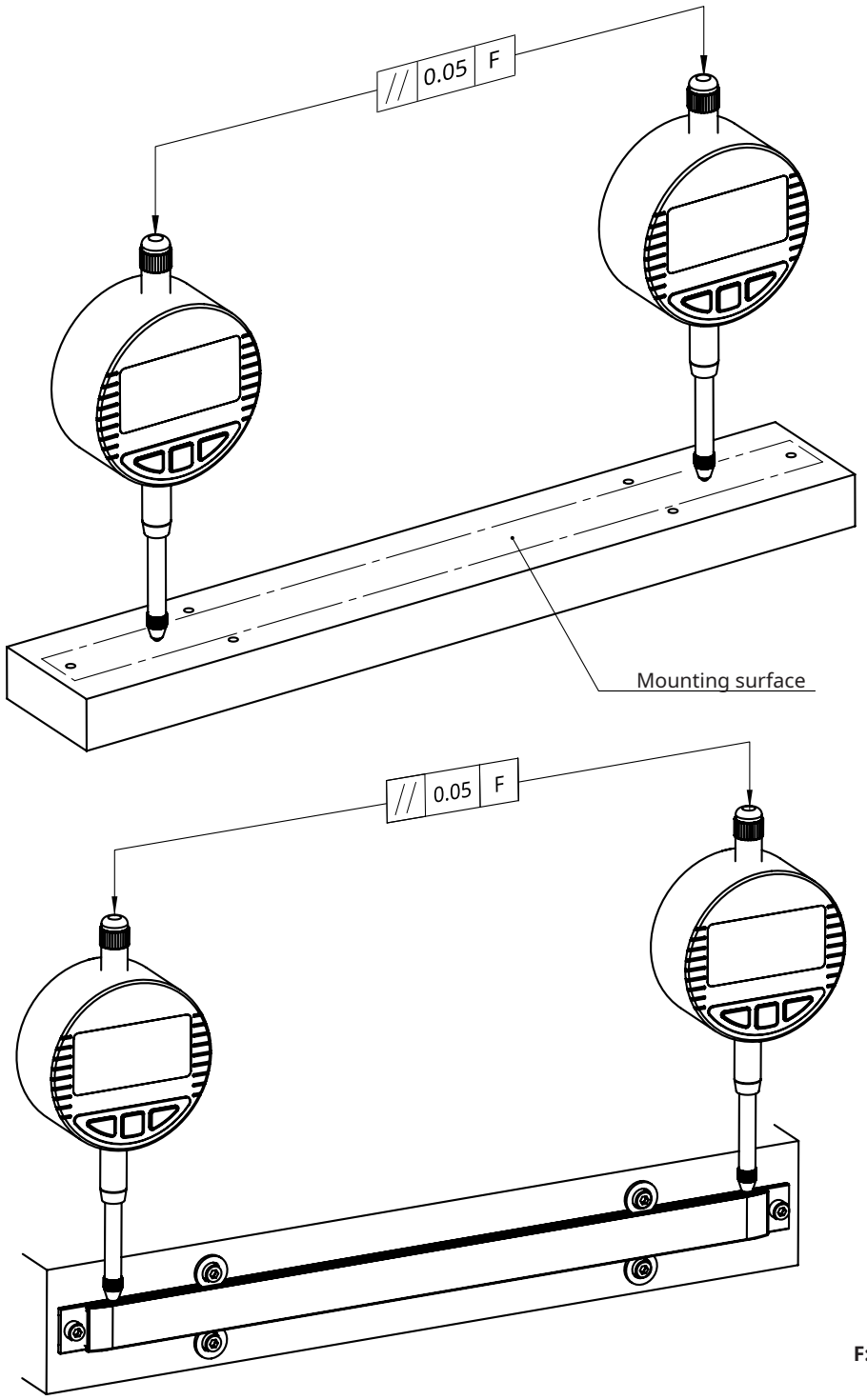
③ Use the included fastener (ARC00) and fasten down the right side of the scale. Use the recommended torque from the **Table of recommended fastener tightening torques.**

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.

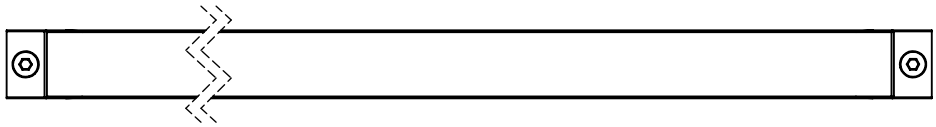


F: Machine guideway

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

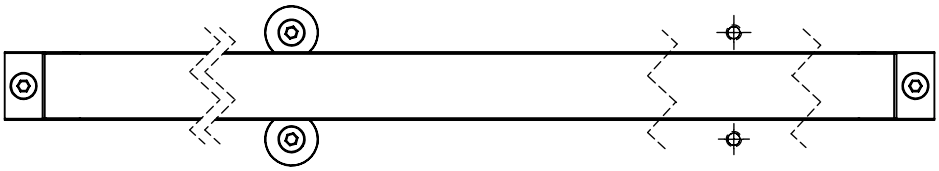
For scales up to 150 mm long:

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



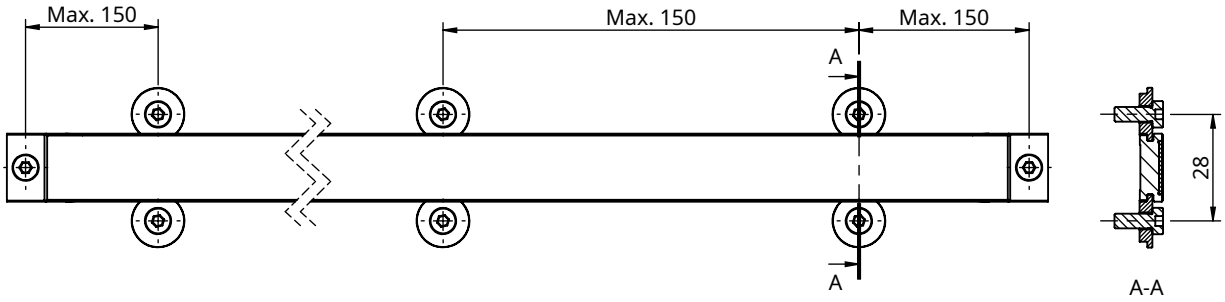
For scales longer than 150 mm:

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

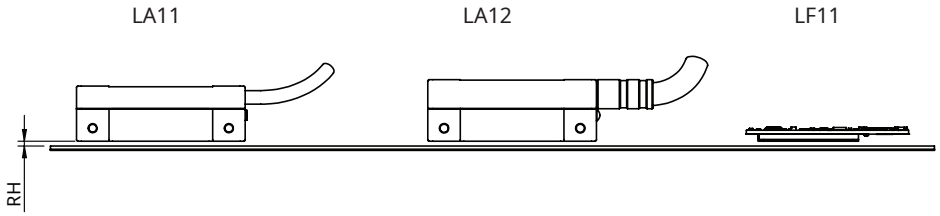
Values in the table apply when the scale is installed on the flat surface (the scale is not curved).

		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	/	/

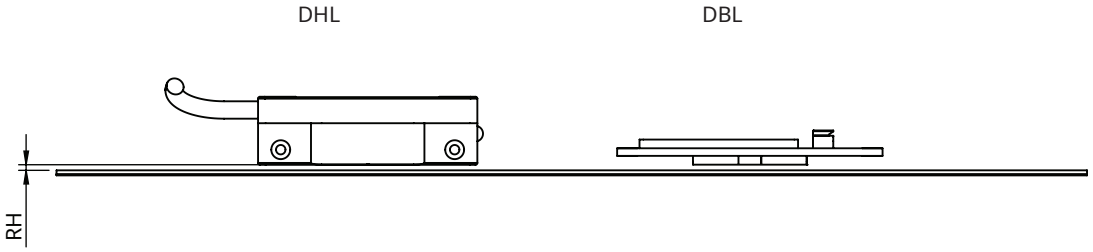
Values in mm.

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

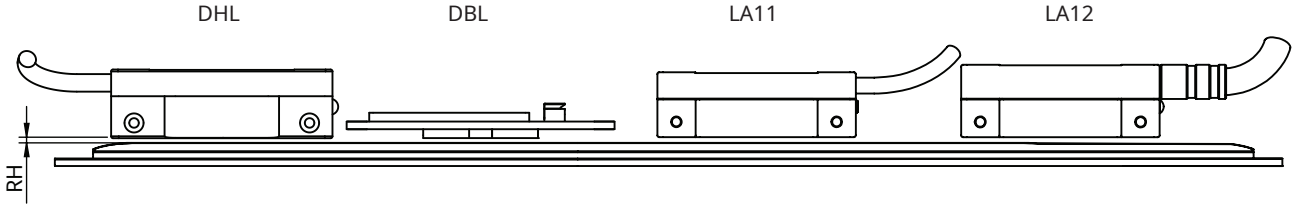
AS10 with LA11/LA12/LF11



DS19 with Artos



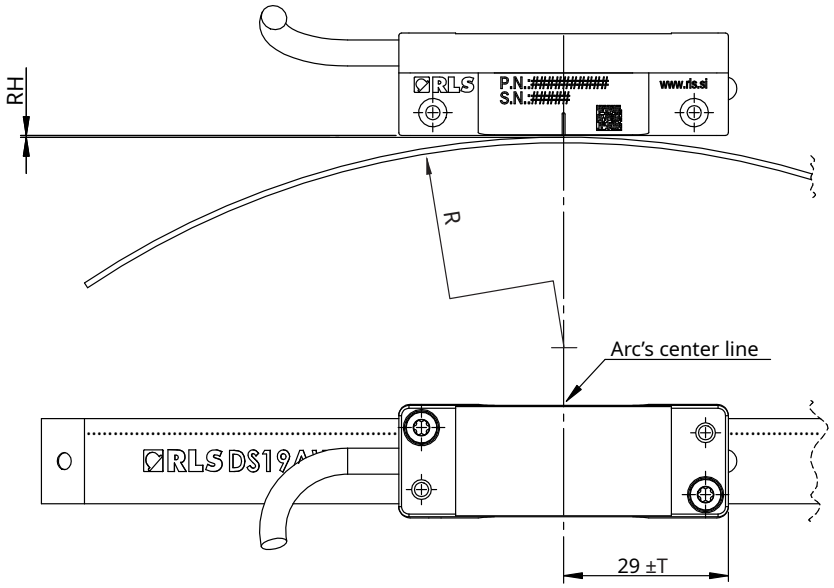
SAS with Artos and LA11/LA12



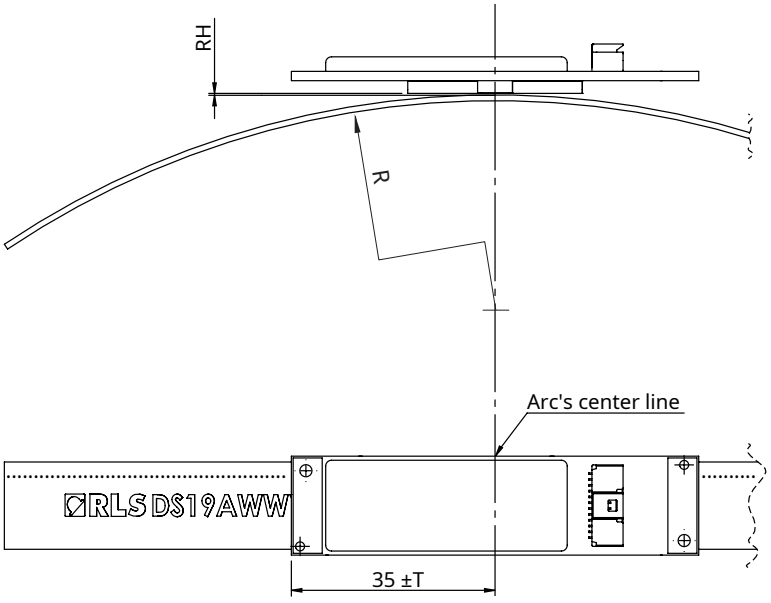
Ride height (RH) and center line offset for partial arc application of the DS19 scales

Values in the table below apply when the scale is installed on a curved surface (only applicable for DS19 scale). Minimum bending radius 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 differes based on the shaft diameter and scale type (001 and 002).

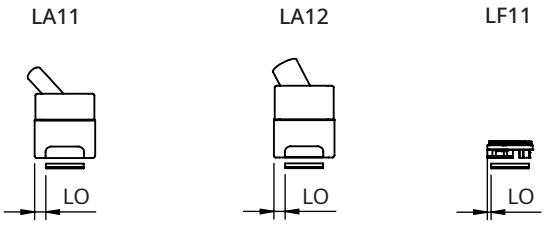
	Shaft OD	Ride height (RH) (up to 2 m long scale) option 001	Ride height (RH) (2 to 8 m long scale) option 002	Tangential (T) / center line offset
No cover foil	200 - 249 mm	0.1 to 0.7 mm	-	1 mm
	250 - 299 mm	0.1 to 0.85 mm	-	
	300 mm and up	0.1 to 1.0 mm	-	
With cover foil	200 - 249 mm	0.1 to 0.6 mm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

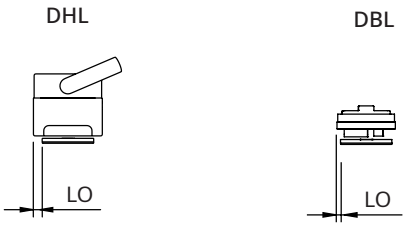
		LA11/LA12		LF11	Artos DHL		Artos DBL	
		AS10	SAS10	AS10	DS19	SAS19	DS19	SAS19
No cover foil	With or without adhesion tape	3 ±0.3	±0.2	1 ±0.3	2.5 ±1	1 ±1	1 ±1	0.5 ±1
	Scale prepared for track system	3 ±0.2		1 ±0.2	/	/	/	/
With cover foil	With or without adhesion tape	3 ±0.3		1 ±0.3	2.5 ±1	1 ±1	1 ±1	0.5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

Values in mm.

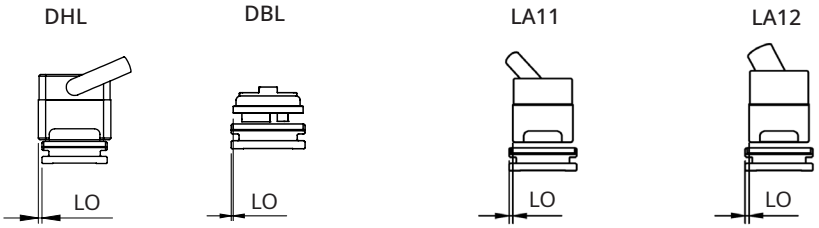
AS10 with LA11/LA12/LF11



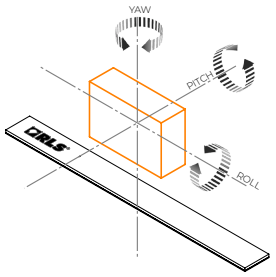
DS19 with Artos



SAS with Artos and LA11/LA12



Roll, pitch and yaw



	LA11/LA12		LF11	Artos	
	AS10	SAS10	AS10	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)								
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

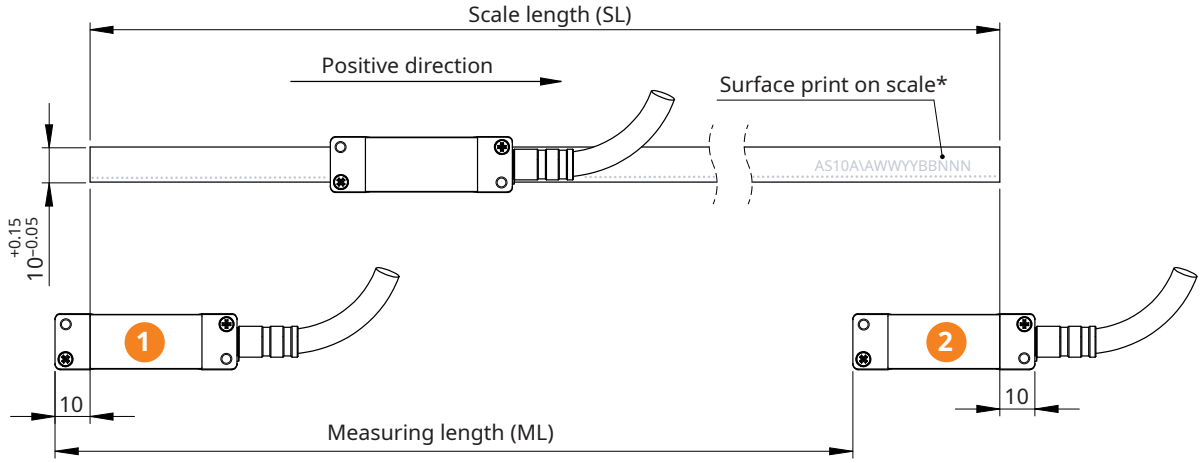
AS10 installation with LA11 and LA12 readhead

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)

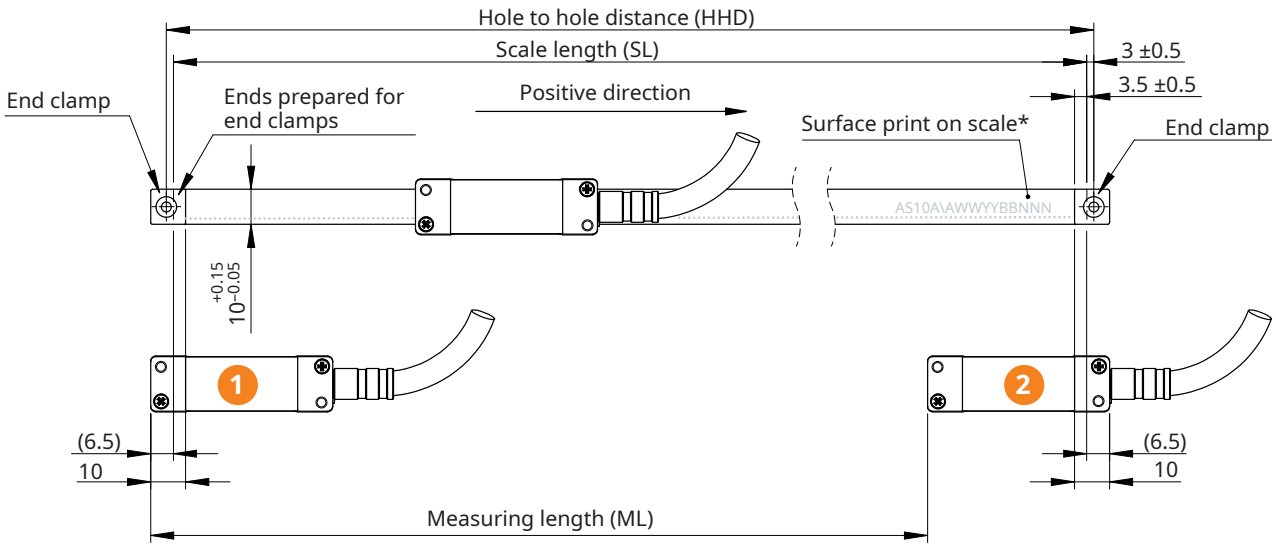
Installation of AS10 magnetic scale with adhesive tape



SL = ML + 32 mm

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

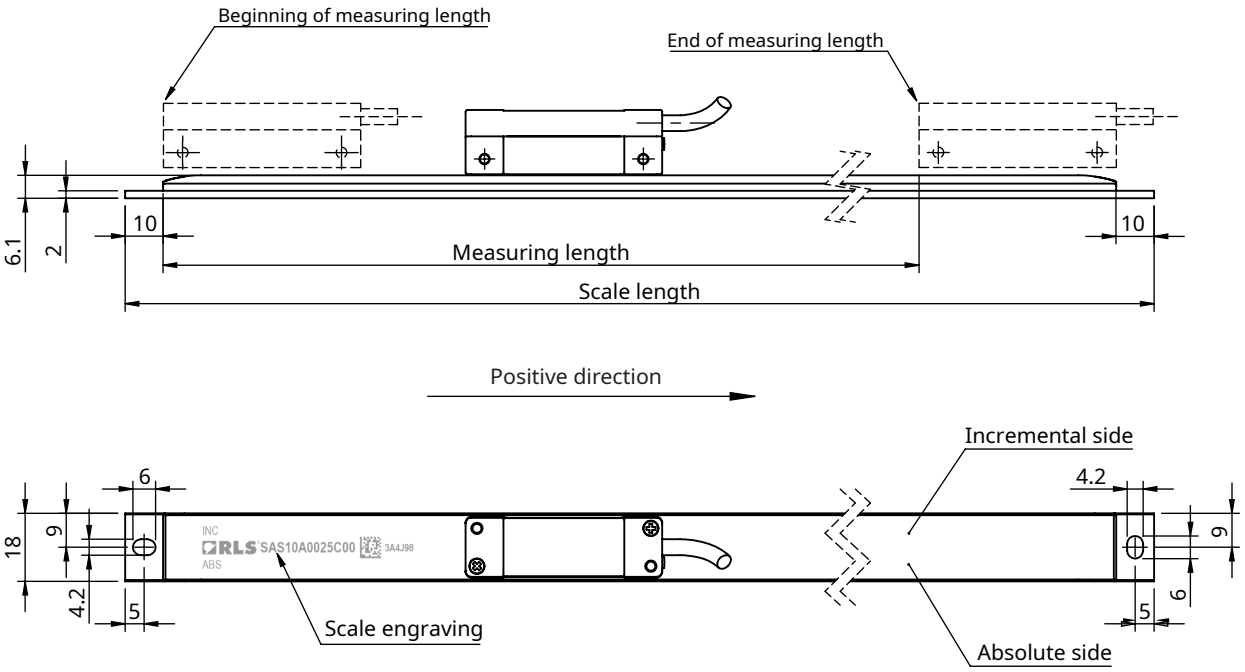
Installation of AS10 magnetic scale with end clamps



SL = ML + 39 mm
HHD = SL + (6 mm ±1 mm)

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

SAS10 installation with LA11 and LA12 readhead



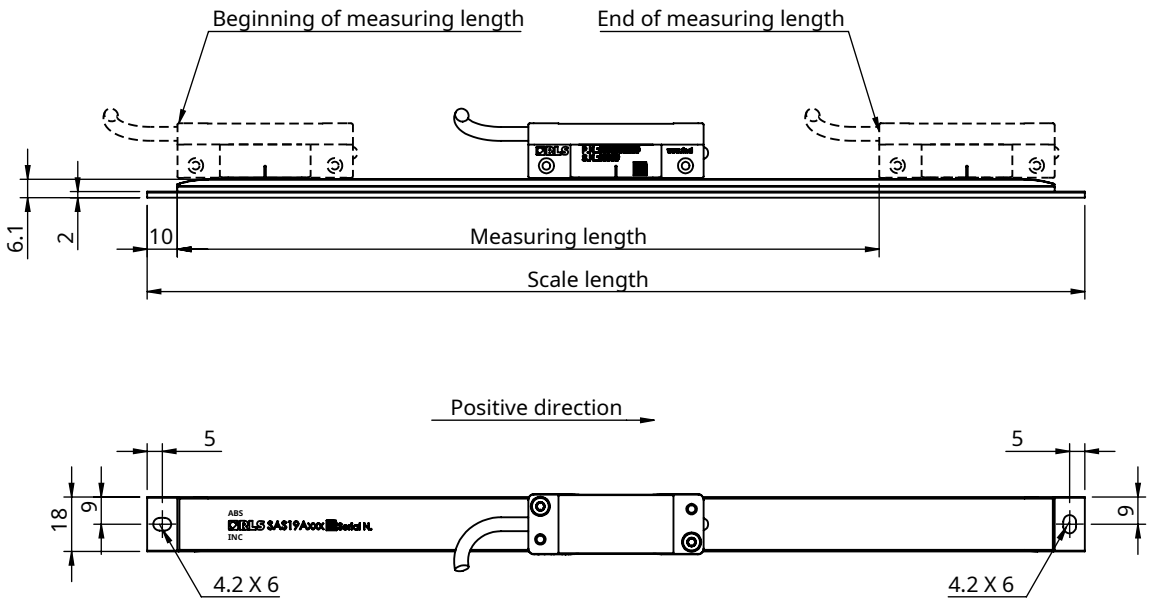
SL = ML + 72 mm

SAS10 scales always start with the absolute position 0 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 mm

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

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

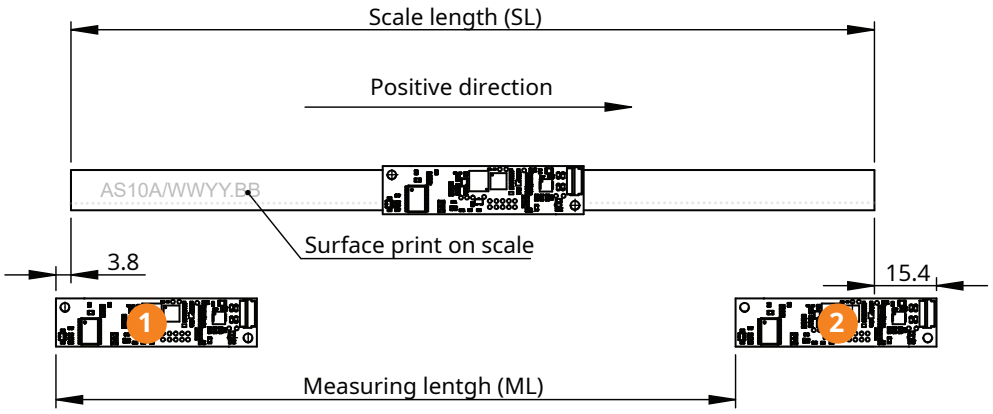
AS10 installation with LF11 readhead

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)

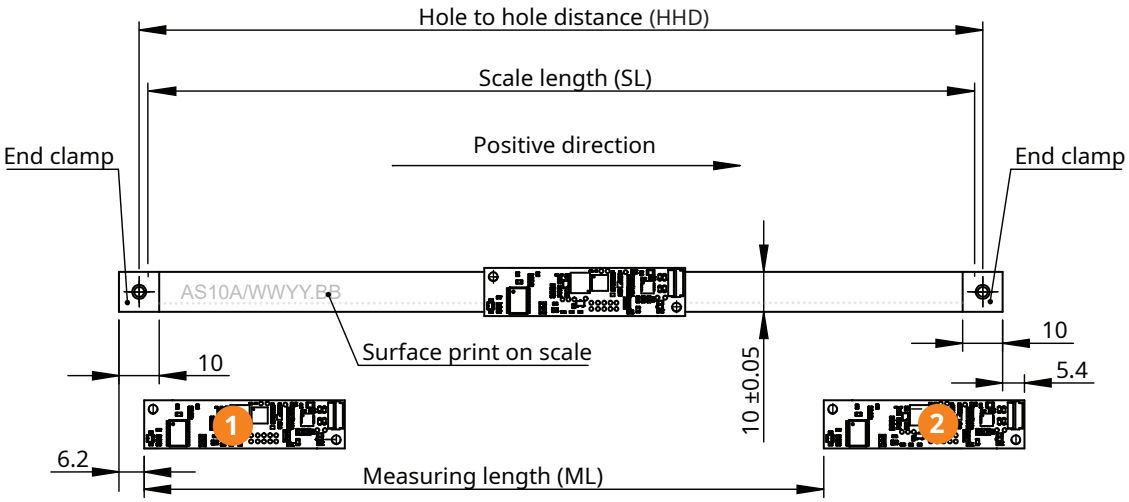
Installation of AS10 magnetic scale with adhesive tape



SL = ML + 31 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 mm
HHD = SL + (6 mm ±1 mm)
SL tolerance = ±(0.5 mm +0.04 mm/m)

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

DS19 installation with Artos DHL readhead

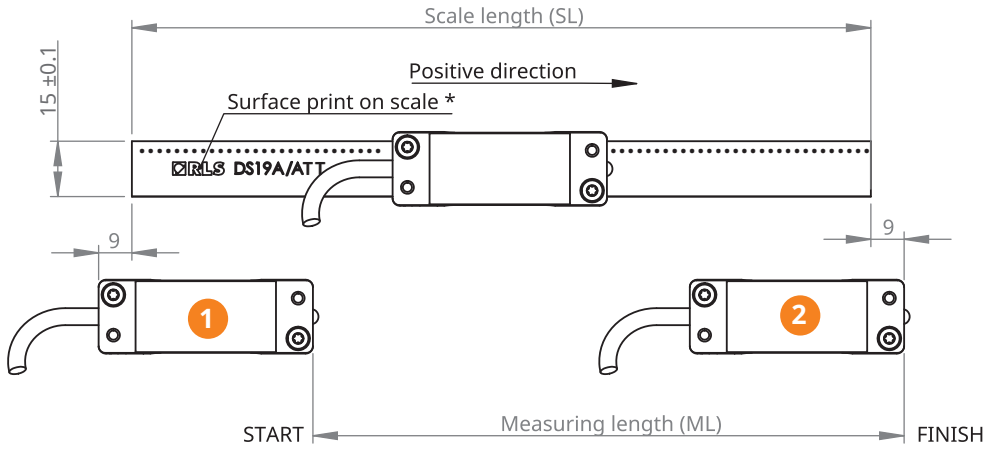
1 and 2 are encoder position limits

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.

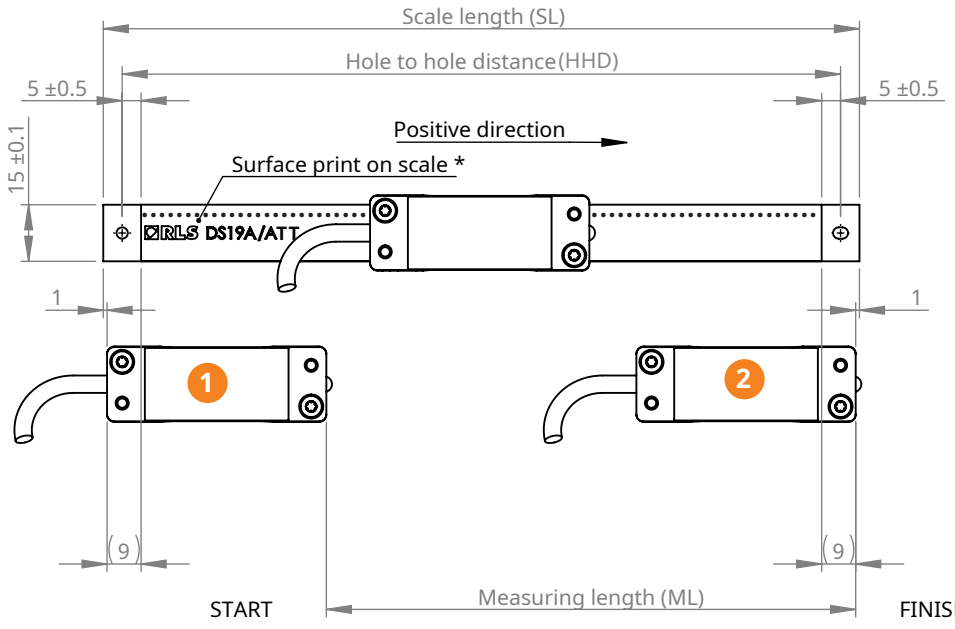
Installation of DS19 magnetic scale



SL = ML + 40 mm
HHD = SL – 10 mm
SL tolerance = ±(0.5 mm +0.02 mm/m)

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

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



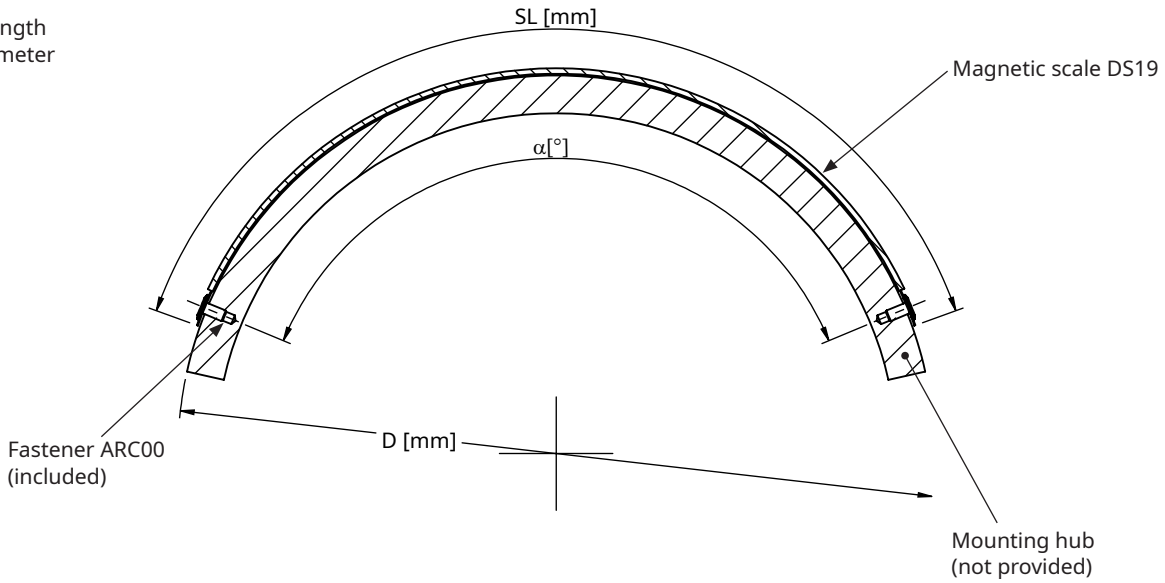
SL = ML + 60 mm
HHD = SL – 10 mm
SL tolerance = ±(0.5 mm +0.02 mm/m)

* 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.**

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

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

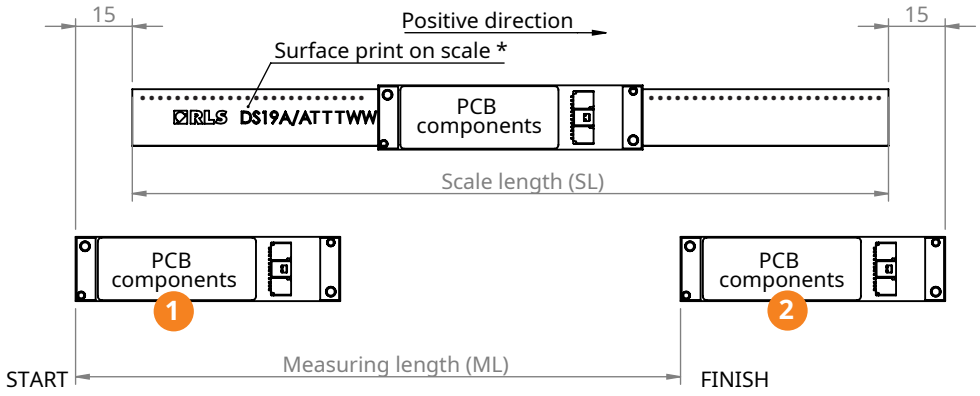
1 and 2 are encoder position limits

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 mm
- option 002 = 9 ±1 mm
- option 003 = 7 ±1 mm

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.

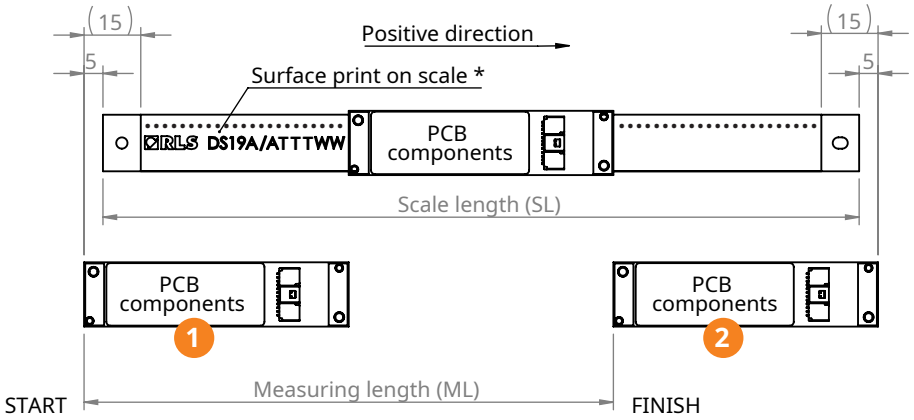
Installation of DS19 magnetic scale



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

SL = ML + 40 mm
HHD = SL – 10 mm

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



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

SL = ML + 60 mm
HHD = SL – 10 mm

Part numbering

AS10

AS 10 A 01000 A 00

Accuracy class

A - N/A

Scale length

xxxxx - Where xxxxx 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 and must be ordered separately (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.

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	
0113 - 113 mm	**0481** - 481 mm	**0981** - 981 mm	
0193 - 193 mm	**0581** - 581 mm	**1081** - 1081 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	A	25 / 45 / 90 / 120 / 200 / 250 / 300 / 400 / 488 / 588 / 688 / 788 / 888 / 988 / 1088 / 1188 / 1288	A / C	00
SAS19		18 / 38 / 83 / 113 / 193 / 243 / 293 / 393 / 481 / 581 / 681 / 781 / 881 / 981 / 1081 / 1181 / 1281		

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 radius 200 mm, ±10 µm accuracy)

002 - DS19 (2 ≤ 8 m, minimum bending radius 630 mm, ±10 µm accuracy)

Linear scale

003 - DS19 (8 ≤ 32 m, no bending allowed, ±15 µm accuracy)

Scale length

xxxxx - Where xxxxx equals length in mm

Please note that if you select a scale length of 40 mm (with mechanical option A) or 60 mm (with mechanical option L), the measuring length is 0.

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

L - With 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	00040 - 02000	R / Z	A	A / B	S	A / C	00
			00060 - 02000		L				
	002		02001 - 08000		A / L			A	
	003		08001 - 32000						

Please note that if you select a scale length of 40 mm (with mechanical option A) or 60 mm (with mechanical option L), the measuring length is 0.

Cover foil part numbering

CF 10 1000

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.

Accessories

Magnet viewer
MM0001

End clamp kit
LM10ECL00

(2 clamps + 2 fasteners)

Track section, 1.00 m
TRS100A00

(1x fastener M3x10 included)

Applicator tool for magnetic scale and cover foil
LMA10ASC00

Fastener and washer for TRS profile
TRC00

Track section, 2.00 m
TRS200A00

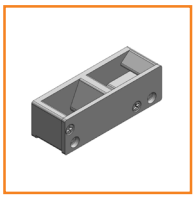
(1x fastener M3x10 included)

Scale clamp with fasteners, 0.04 m
TRE004A00

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

Washer for SAS10
MN01509

(included when ordering the SAS10 scale)



Installation tool for DS19
ACC088

Fastener for DS19 partial arc
ARC00

(M3x6 CBSTSE3-6 T6 A2)

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Document issues

Issue	Date	Page	Description
7	20. 8. 2024	22	Number of washer and fastener added
		23	Installation of AS10 with end clamps drawing amended
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