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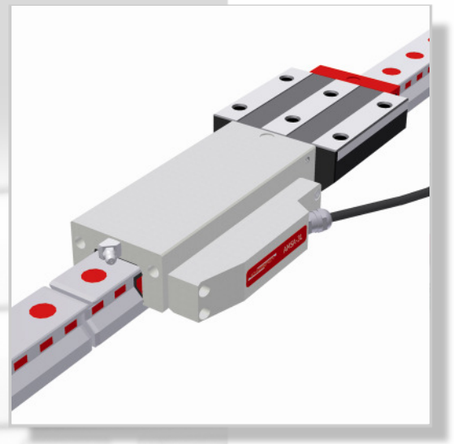
SCHNEEBERGER
LINEAR TECHNOLOGY

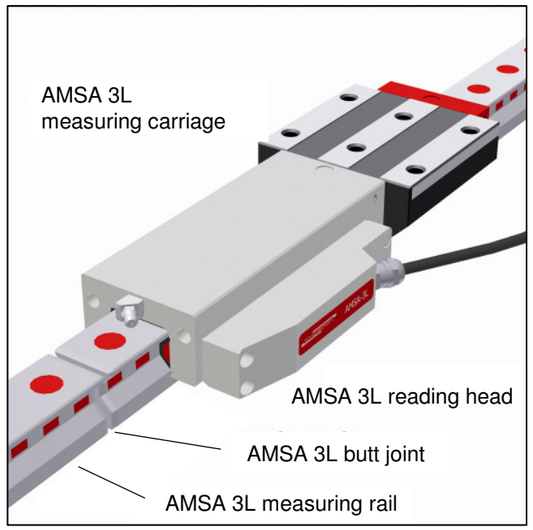


AMSA 3L

„AMS long“
Integrated and Modular Distance Measuring System for Long Axes

MONORAIL AMSA 3L

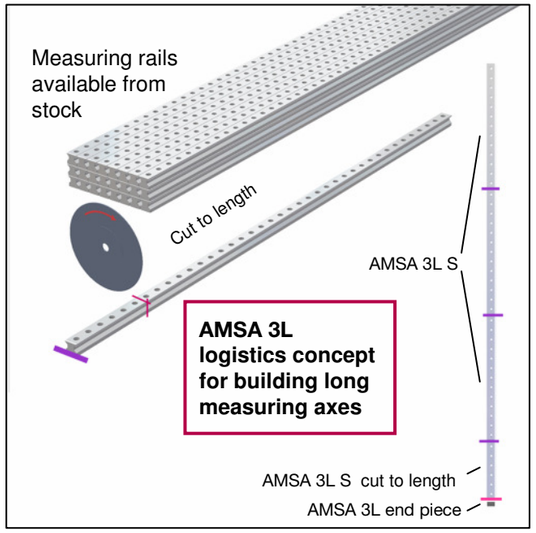
Since 1993, **SCHNEEBERGER** has been designing and manufacturing integrated magneto-resistive distance measuring systems. The latest development from SCHNEEBERGER, the AMSA 3L distance measuring system, has been conceived especially for extra long axes.
AMSA 3L "The product for all lengths" is now made possible by highly accurate machining and measurement of the rails. A special design of the rail ends for butt joints, when used in combination with the AMSA 3L reading head, allows the carriage to run over the butt joint, so that measuring axes of any desired length can be constructed.



The product AMSA 3L has the following **special features**:

- Long measuring lengths can be achieved by means of butt joints
- System dimensions correspond to those of our product **RSR**
- Precise overall length, L_3, of the rail
- The special design of AMSA 3L allows the carriage to pass over butt joints without loss of signal
- Complete interchangeability of rails, carriages and reading heads
- One reading head for all sizes
- Integral measuring-head electronics

AMSA 3L Concept

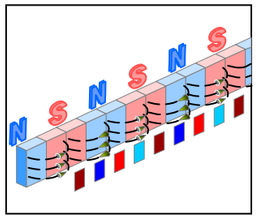


To achieve a high level of availability of AMSA 3L components worldwide, each size is manufactured in 3 m segments, and both ends of a segment are prepared for the AMSA 3L butt joint.
The rails can be joined together to build axes of any desired length. Special lengths at the start and end of a measuring axis are cut to length using a simple cutting-off machine. The butt joints along the measuring axis are adjusted on assembly to achieve correct phasing using a special installation tool.
Because single rails are 100% interchangeable, they can be replaced in the field at any time. The proven concept from our standard program, "One reading head for all sizes", has been adopted here too, so that, for AMSA 3L, a minimum of spare parts ensures a high degree of availability in service.

Differences to the standard program

- There are no special versions available.
- The rail lengths are fixed. For the start and end of a set of rails, the segments must be designed so that they can be produced by cutting an AMSA 3L rail to length.
- The rails cannot be butt-joined to standard rails.
- Only analog output signals are available.
- Standard reading heads are not suitable for use with butt-joined AMSA 3L rails .

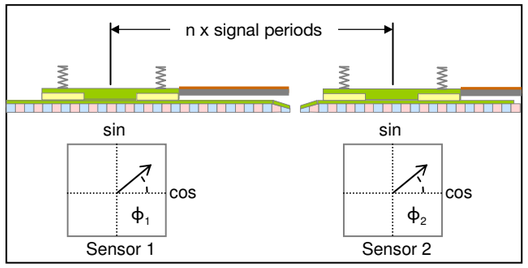
Magneto-resistive sensing



AMS sensors from SCHNEEBERGER are machine elements that reliably convert movement over a magnetic grid into analog output signals .

The arrangement of magneto-resistive strips results in stable and accurate output signals. Because the sine and cosine strips are uniformly distributed on the active sensor surface, both magnetic interference fields and unintentional changes in sensor position during operation are suppressed .

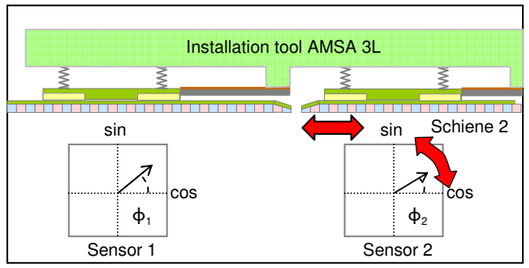
Sensing at rail joints



The AMSA 3L sensing system employs 2 sensors whose geometric spacing is precisely reflected in the geometry of the reading head. The sensors are cast into a special titanium slider housing.
The distance between sensors S1 and S2 has been chosen so that, at the end of a rail, one sensor is always over the useable magnetised area. Because the full bridges of AMSA 3L sensors are directly connected to each other at the outputs, there is a reduction in signal amplitude at the sensor outputs. The subsequent evaluation electronics measure the current signal amplitude and regulate the bridge voltage of the sensor elements so that, at the reading head, standardised 1 Vss signals are available.
Because the momentary amplitude is sensed at 4 kHz, this regulation is invisible to the user .

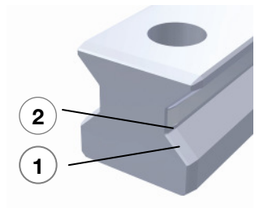
To minimise measurement deviations at the butt joint, neighbouring rail segments must be precisely aligned with each other in the measuring direction .

This is carried out at initial assembly. To simplify this task, an installation tool, incorporating sensors, data logger and measuring software, is available .



In conjunction with the installation software, the installation tool measures and displays the phase difference (ϕ2 - ϕ1) so that the rail joint can be adjusted by moving the rails axially relative to each other. In the above example, the butt joint is adjusted by moving rail 2 in the direction of measurement until the phase difference is small enough; the mounting screws of the rail are then tightened in this position .

Mechanical execution of rail ends

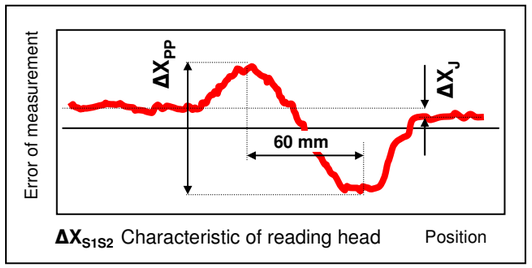


1
Because rails must be phase-aligned at assembly, direct butt joints are not possible, and AMSA 3L rails therefore have an enlarged lead-in .

2
At the ends, the cover strip over the measuring scale slopes into an additional groove to enable the reading head to pass over the joint repeatedly without damage.
In addition, the cover strip is welded to the measuring scale at the ends.
To improve the run-in and run-out behaviour at the ends, extra-long ceramic shoes are used .

Accuracy at the butt joint

The errors of measurement which are determined for the AMSA 3L system at the butt joint, are shown in the picture below:



The deviation ΔX_J represents the accuracy of the rail alignment.
The maximum deviation ΔX_{PP} results from the sum of reading head deviation ΔX_{S1S2} and ΔX_J.

Order code AMSA 3L rails

1x	AMSA 3L S 35-N-G1-KC	-R11	-3000	-CN
Quantity				
Execution				
Reference sides				
Rail length L3 *				
Coating				

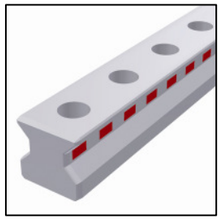
* The rail length has to be indicated for start and end pieces only

Order code AMSA 3L measuring carriages

1 x	AMSA 3L W	35	-B	-P3	-G1	-V2	-R1	-CN	-S21	-LN	-TSU
Quantity											
Measuring carriage											
Size											
Type											
Reading head position											
Accuracy											
Preload											
Reference side											
Coating											
Lube connection											
Lubrication as delivered condition											
Interface											

Rail lengths differing from the indicated system length are manufactured from the basic product.
Please refer to the MONORAIL main catalog for details of options for rails and carriages.

Product overview of rails



Size	System length [mm]	Magneti-zation	Execution
25	3000	TR30	AMSA 3L S 25 N-G1-KC-
35	3000	TR40	AMSA 3L S 35 N-G1-KC-
45	2992,5	TR105	AMSA 3L S 45 N-G1-KC-
55	3000	TR60	AMSA 3L S 55 N-G1-KC-
65	3000	TR75	AMSA 3L S 65 N-G1-KC-

Available options for rails

Accuracy

- G1 very accurate

Straightness

- KC standard

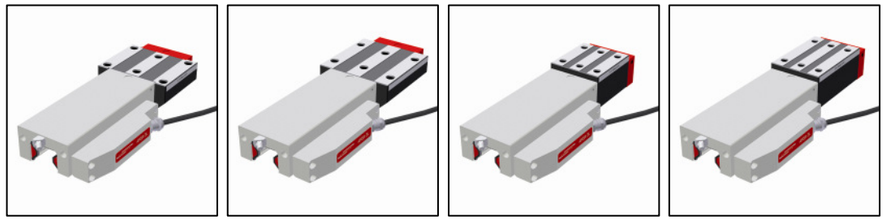
Locating sides

- R11 Reference bottom, scale bottom
- R22 Reference top, scale top

Coating

- CN none
- CH hard chrorme

Product overview of carriages



Carriage sizes / Carriages types	A standard	B standard., long	C compact, high	D compact, high, long
25	AMSA 3L W 25-A	AMSA 3L W 25-B	AMSA 3L W 25-C	AMSA 3L W 25-D
35	AMSA 3L W 35-A	AMSA 3L W 35-B	AMSA 3L W 35-C	AMSA 3L W 35-D
45	AMSA 3L W 45-A	AMSA 3L W 45-B	AMSA 3L W 45-C	AMSA 3L W 45-D
55	AMSA 3L W 55-A	AMSA 3L W 55-B	AMSA 3L W 55-C	AMSA 3L W 55-D
65		AMSA 3L W 65-B		AMSA 3L W 65-D
Features				
fixing from above	●	●	●	●
fixing from below	●	●		
for medium loads	●		●	
for high loads		●		●

Available options for carriages

Accuracy

- G0 highly accurate
- G1 very accurate
- G2 accurate
- G3 standard

Preload

- V1 low
- V2 medium
- V3 high

Reference side

- R1 Ref. at bottom
- R2 Ref. on top

Coating

- CN none
- CH hard chrome

Lube connections

- S10 left center
- S20 right center
- S11 top left
- S21 top right
- S12 lower left side
- S22 lower right side
- S13 upper left side
- S23 upper right side
- S32 left side
- S42 right side

Lubrication as delivered

- LN Oil protect
- LG Grease protect
- LV Full greasing

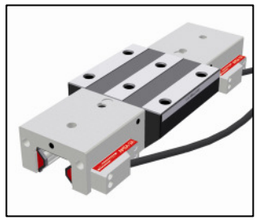
Interface

- TMU analog 0,3 m
- TSU analog 3 m

Reading head position

- P1 right top
- P3 left bottom

Installation tool MWM

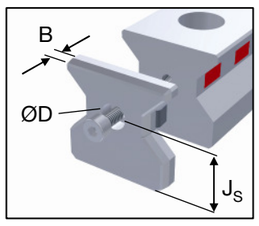


For the phase adjustment of AMSA 3L rails, a special installation tool is required.
The installation tool is available for all sizes of rail and comprises:

- The basic mechanical device
- Two reading heads for sensing the phase angles
- Display software for calibration and measurement
- Instructions for assembly and commissioning.

Size	Order code	Size	Order code
25	MWM 3L 25	**55**	MWM 3L 55
35	MWM 3L 35	**65**	MWM 3L 65
45	MWM 3L 45		

End piece EST 3L



The AMSA 3L concept includes the possibility, where necessary, of using shortened rails for the first and last segments of a set.

The end pieces secure the cover strip of the measuring scale, after a rail has been cut to length, to prevent it from coming off.
End pieces can be fitted at both ends and are secured with a central screw.

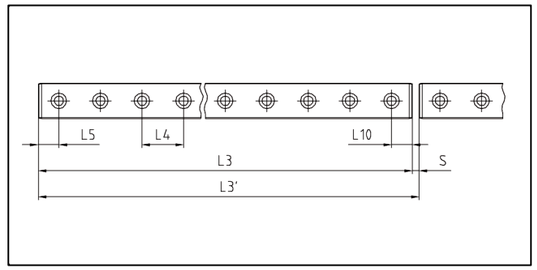
Size	Order code	B	J_S	ØD
25	EST 3L 25	10	14,5	4,5
35	EST 3L 35	10	22	4,5
45	EST 3L 45	10	20	7
55	EST 3L 55	10	28	7
65	EST 3L 65	10	38	7

Accessories from the standard program

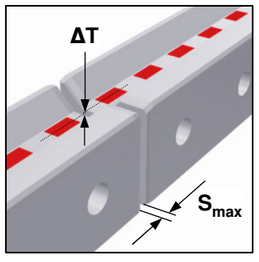
Useful accessories from the standard program :

- Additional wipers ZCN, ZCV
- Metal wipers ASM
- Steel plugs, brass plugs, plastic plugs.

Technical data of rails



Type	$L_{3'}$	L_3	S	L_4	L_5/L_{10}
AMSA 3L S 25	3000	2999,5	0,5	30	14,75
AMSA 3L S 35	3000	2999,5	0,5	40	19,75
AMSA 3L S 45	2992,5	2992	0,5	52,5	25
AMSA 3L S 55	3000	2999,5	0,5	60	29,75
AMSA 3L S 65	3000	2999,5	0,5	75	37,25



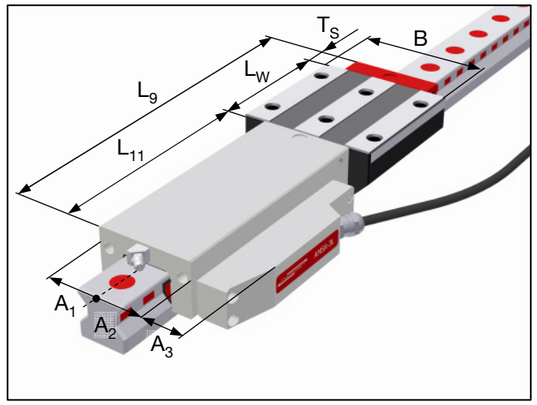
ΔT = Maximum height difference at the scale butt

S_{max} = Maximum gap between the rails

X_{RM} = Distance between reference marks

Type	ΔT	S_{max}	X_{RM}		
AMSA 3L S 25	0,03	2,3	30		
AMSA 3L S 35	0,03	2,3	40		
AMSA 3L S 45	0,03	3,5	105		
AMSA 3L S 55	0,03	3,5	60		
AMSA 3L S 65	0,03	3,5	75		

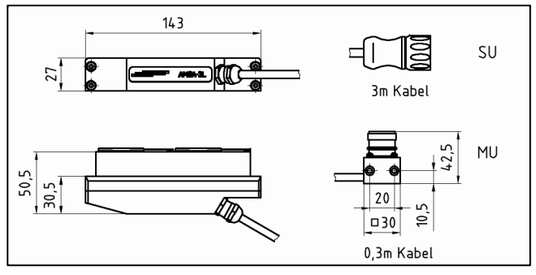
Technical data of carriages



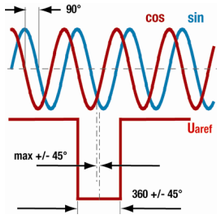
	B				L_W			
	AMSA 3L W				AMSA 3L W			
BG	-A	-B	-C	-D	-A	-B	-C	-D
25	70	70	48	48	57	79,4	57	79,4
35	100	100	70	70	76	103	76	103
45	120	120	86	86	100	135	100	135
55	140	140	100	100	120	162	120	162
65	-	170	-	126	-	201	-	201

	L_9				T_S	L_{11}	A_1	A_2	A_3
	AMSA 3L W				AMSA 3L W				
BG	-A	-B	-C	-D	-A,-B,-C,-D				
25	232	255	232	255	12	163	31	31	30
35	260	287	260	287	16,5	168	34	34	30
45	289	324	289	324	18,8	170	42	42	26
55	315	357	315	357	21,8	173	49	49	22
65	-	402	-	402	25	176	62,5	61,5	13,5

Dimensions of reading head



Technical data of interface



Pin	Signal	Signal type
1	$-U_{a2}$	-Cosine
2	+5V sense	Feedback
3	$+U_{a0}$	Reference
4	$-U_{a0}$	Reference
5	$+U_{a1}$	+ Sine
6	$-U_{a1}$	- Sine
7	$-Au_s$	NC
8	$+U_{a2}$	+Cosine
9	-	NC
10	0V GND	Supply
11	0V sense	Feedback
12	+ 5V	Supply

After differential amplification, the signals are displayed inverted. The incremental signals are exactly 90° out of phase. The level after differential amplification of the incremental signals and the reference signal is 1 +/- 0.1 Vss. The incremental signals provide valid data between 0.6 Vss and 1.4 Vss. In production, the reference impulse is set to be symmetrical to the sine/cosine crossover point (at 45°). The width and phase of the reference impulse is limited as shown in the figure. This enables an increase in the accuracy of the reference point by making additional use of the incremental information. This interface operates with all normal control systems that support a 1 Vss voltage interface .

Technical data

Magnetic scale	Hard magnetic graduation
Signal period	200 µm
Reference marks	Synchronized to hole pitch
Length	Standard ≈ 3 m
Maximum speed	1 m/s
Accuracy class	±5 µm / 1000 mm
Accuracy at butt joint	ΔX_{pp} = ±7 µm, ΔX_{S1S2} = ±5 µm
Environment	
Protection category	IP 67
Working temperature	0° - +70° C
Storage temperature	-20° - +70° C
Vibration / impacts	10 g