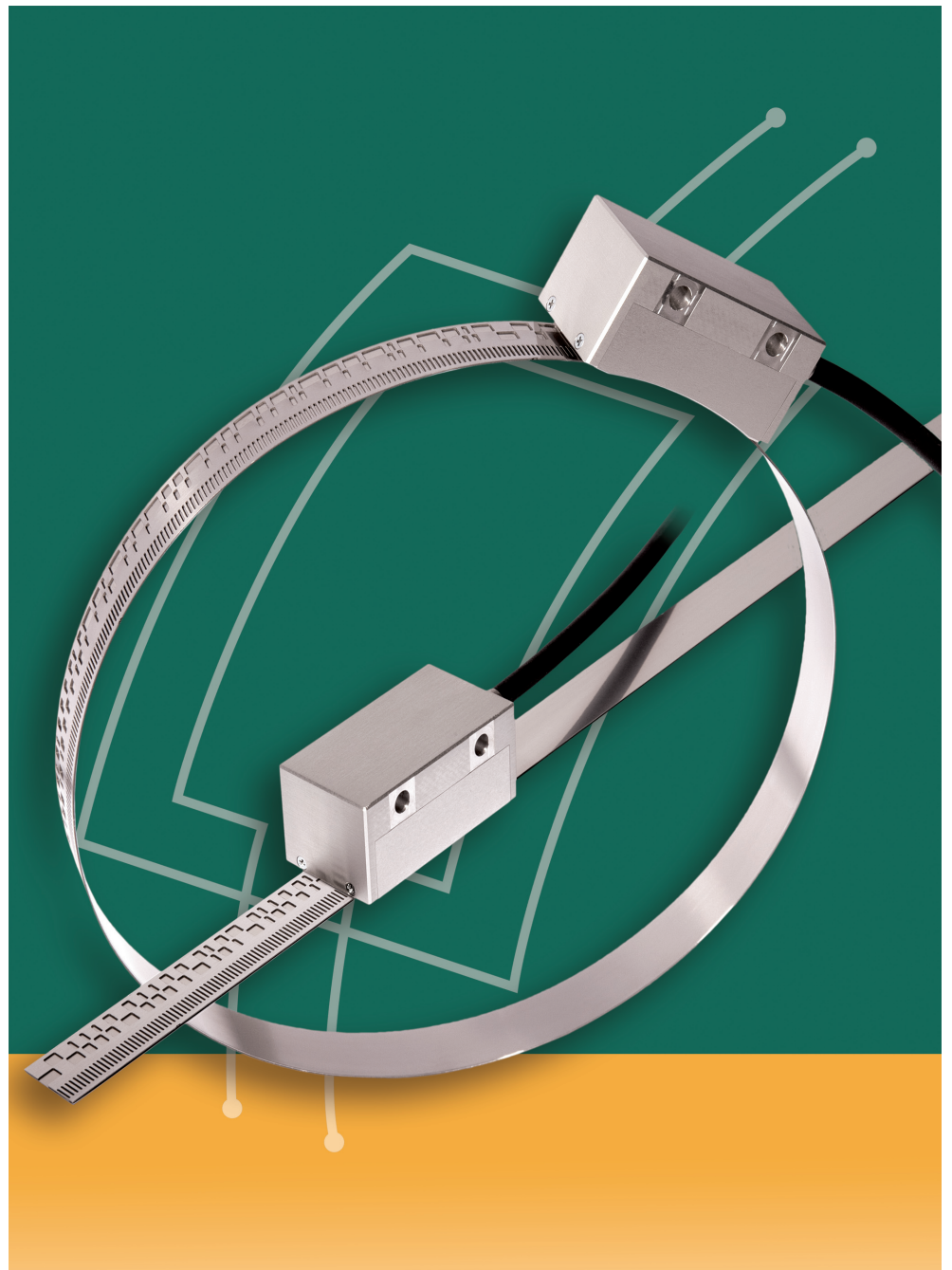


amo

AMO GmbH

***Absolute encoder based on the AMOSIN® –
Inductive Measuring Principle***



This document was created very carefully. If there are any technical changes, they will promptly updated in the documents on our website www.amo-gmbh.com

With the publication of this brochure all previous editions become invalid.

The currently valid brochure is available on our website www.amo-gmbh.com

SN: ABSOLUTE-P 20131004

Table of contents

General informations

<i>General information</i>	4
----------------------------------	---

Absolute angle measuring systems

<i>Standard measuring flanges for outside scanning</i>	6
<i>Customer specific measuring flanges for outside scanning</i>	8
<i>Measuring rings for outside scanning</i>	10
<i>Measuring rings for inside scanning</i>	12
<i>Scanning head for absolute angle measuring systems</i>	14

Non guided Absolute length measuring systems

<i>Scales for non-guided measuring systems, mounted with adhesive tape</i>	18
<i>Scales for non-guided measuring systems with steel carrier</i>	19
<i>Scanning heads for non-guided measuring systems</i>	22

Guided Absolute length measuring systems

<i>Measuring rail for guided systems</i>	25
<i>Scanning head for guided systems</i>	28

General technical data

<i>Maximum speeds</i>	31
<i>Cable</i>	32
<i>Plug and connection assignments</i>	33

General

Absolut Angle Measuring System

AMO announces new absolute linear and angular encoders with IP 67 rating.

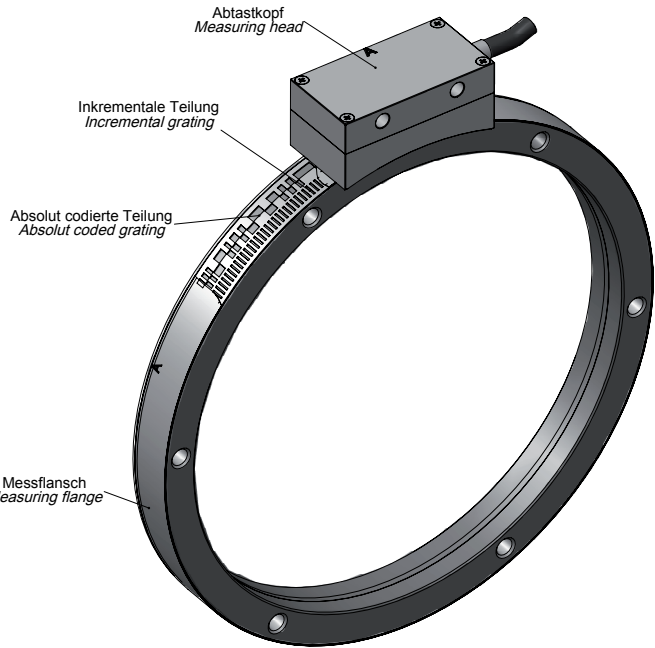
We have recently introduced ABSYS, a broad range of absolute measuring system products covered by several AMO patents, based on our proven and successful AMOSIN® pure inductive measuring principle.

Our linear and rotary scales are produced incorporating two highly accurate grating tracks - one incremental and the other a coded absolute pattern, using a precision etched photo-lithographic process. The encoder head incorporates a micro coil array sensor along with analog and digital evaluation electronics.

For both the linear and rotary systems, the absolute position value is acquired in real time. Several types of serial interfaces are available, including SSI, BiSS/C, and CNC control protocols. As an option, the system electronics can also deliver 1 Vpp SINE / COSINE signals at 40µm pitch.

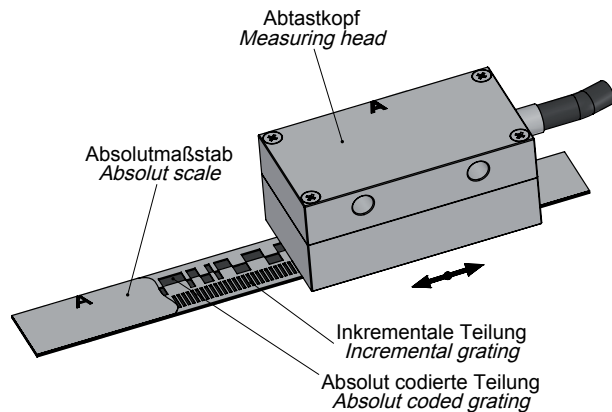
The basic pitch period of the incremental graduation is 1000µm.

The new ABSYS absolute encoders include all of the unique inductive encoder features that our incremental encoders have for harsh environments, such as very wide operating temperature envelope, ability to operate in high shock, vibration, and electromagnetic environments, but yet offer high accuracy, high resolution, and high speed. Additional data for our encoders can be found in the AMOSIN® brochures (see www.amo-gmbh.com).



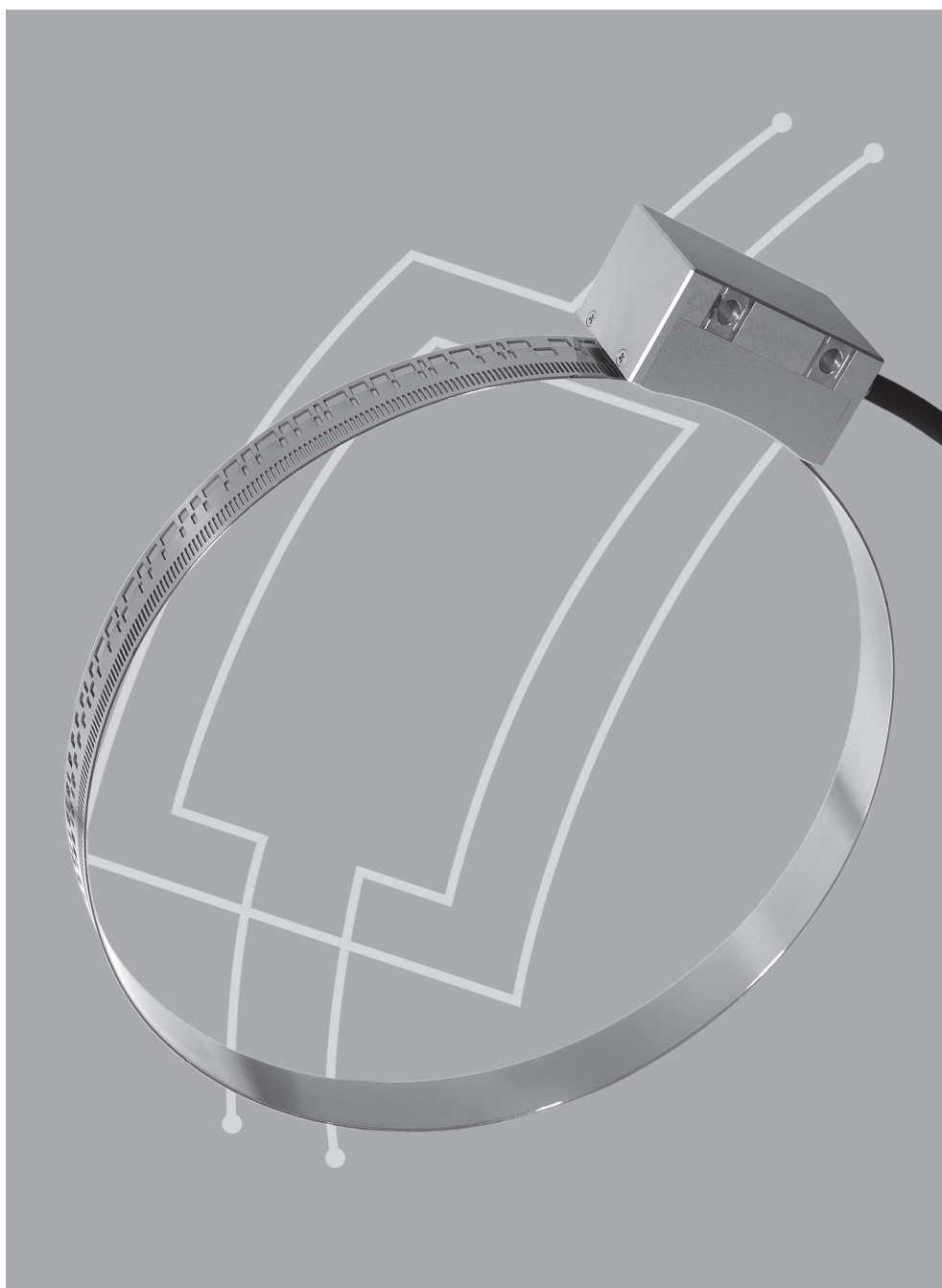
Linear measuring lengths up to **32 meters**, and standard ring scale size from 80 mm up to 652 mm diameter are available. Measuring rings with other diameters up to 10m on request.

Absolut Linear Measuring System



Absolute angle measuring systems

- Outside or Inside Scanning
- Resolution up to 25 bit
- Available interfaces:
SSI, BiSS/C, Fanuc
- Diameters up to 10 m
- Protection class IP 67



Standard measuring flanges and rings for outside scanning

Measuring flanges **WMFA-1010** with 1000µm grating pitch offered as standard sizes as shown in the table below.

Customer specific designs for the measuring flange can be supplied by AMO or the measuring flange will be supplied by the customer for mounting the measuring ring at AMO (see page 8 for details).

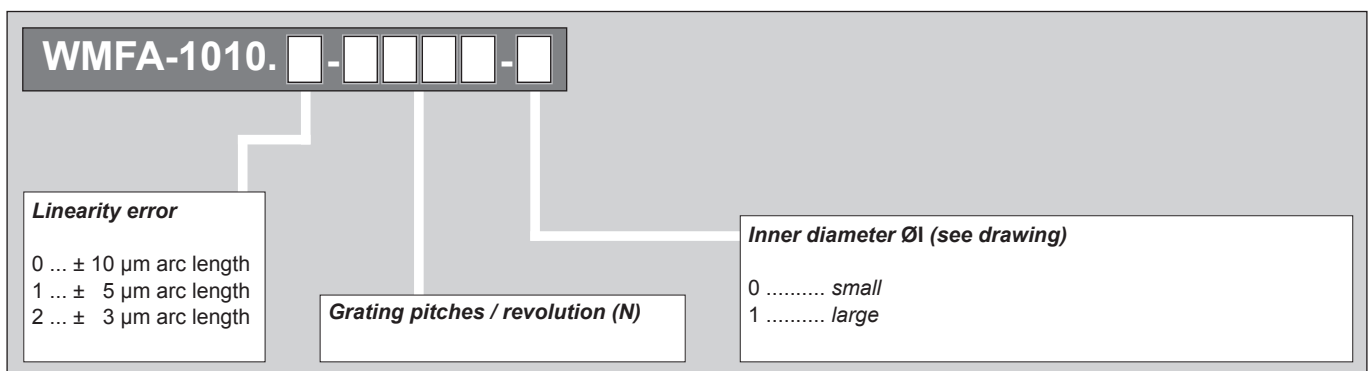
The measurement scale of the absolute angle measuring systems with external scan can be realized in the following models:

- standard measuring flange
- customer specific flange
- measuring rings

Technical data

	WMFA-1010					
	Standard sizes N					
	0256	0360	0512	0720	0900	1024
Grating pitch [arc length]:	1000 µm					
Grating accuracy [arc length]:	± 10 µm, ± 5 µm oder (or) ± 3 µm					
Mechanical execution:	Stainless steel measuring flange in 2 versions: massive: WMFA-1010.x-xxxx- 0 thin: WMFA-1010.x-xxxx- 1					
Outer diameter ØA [mm]:	81,95	115,12	163,54	229,78	287,08	326,55
Incremental grating pitches / rev:	256	360	512	720	900	1024
Absolute resolution / rev [increments] 1µm:	2 ¹⁸	360 x 2 ¹⁰	2 ¹⁹	720 x 2 ¹⁰	900 x 2 ¹⁰	2 ²⁰
Absolute resolution / rev [increments] 0,25µm:	2 ²⁰	360 x 2 ¹²	2 ²¹	720 x 2 ¹²	900 x 2 ¹²	2 ²²

Ordering code: **WMFA-1010**

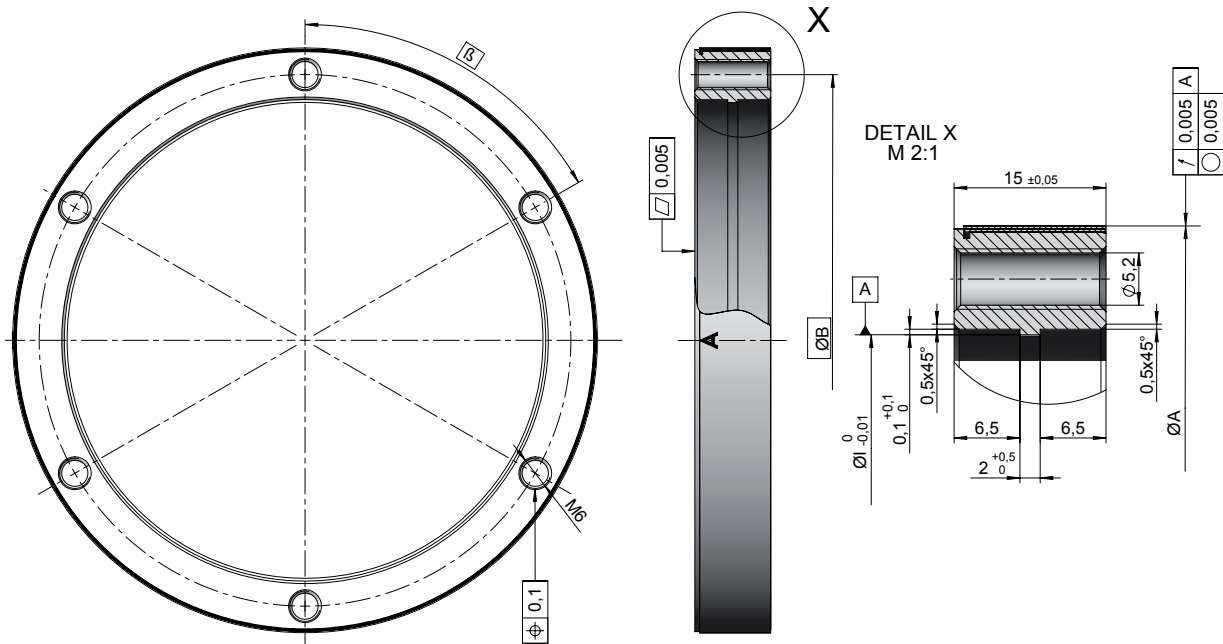


Dimensions standard measuring flanges

Type WMFA-1010	Ø A [mm]	Ø I [mm]		Ø B [mm]	β	Scale accuracy		
						WMFA-1010.0	WMFA-1010.1	WMFA-1010.2
0256-1	81,95	60	$^{+0}_{-0,01}$	70	6 x 60°	±50"	±25"	±15"
0360-0	115,12	60	$^{+0}_{-0,01}$	75	6 x 60°	±36"	±18"	±10"
0360-1	115,12	95	$^{+0}_{-0,01}$	105				
0512-0	163,54	105	$^{+0}_{-0,01}$	120	6 x 60°	±24"	±12"	±7,5"
0512-1 ¹⁾	163,54	143	$^{+0}_{-0,01}$	153				
0720-0	229,78	180	$^{+0}_{-0,01}$	195	6 x 60°	±18"	±9"	±5,4"
0720-1 ¹⁾	229,78	209	$^{+0}_{-0,01}$	219				
0900-0	287,08	180	$^{+0}_{-0,01}$	195	12 x 30°	±14"	±7"	±4,3"
0900-1 ¹⁾	287,08	266	$^{+0}_{-0,01}$	276				
1024-0	326,55	220	$^{+0}_{-0,01}$	235	12 x 30°	±12"	±6"	±3,8"
1024-1 ¹⁾	326,55	296	$^{+0}_{-0,01}$	311				

¹⁾ Only for press-fitt assembly on the customers shaft (recommended shaft tolerance +0,02 / +0,01)

Dimensions WMFA-1010



Customer specific measuring flanges for outside scanning

Customer specific designs for the measuring flange can be supplied by AMO (Type **WMFA**) or the measuring flange will be supplied by the customer for mounting the measuring ring at AMO (Type **WMBA**). In this case the diameter for mounting the measuring ring can be calculated as shown in the table on the next page.

Special sizes with any number of pitches per revolution on request

Technical data

	WMFA-1010 / WMBA-1010					
	Standard sizes N					
	0256	0360	0512	0720	0900	1024
Grating pitch [arc length]:	1000 µm					
Grating accuracy [arc length]:	± 10 µm, ± 5 µm oder (or) ± 3 µm					
Mechanical execution:	Customer specific, recommended material 1.4104 (Aisi 430F) or 1.7225 (Aisi 4140)					
Outer diameter ØA [mm]:	81,95	115,12	163,54	229,78	287,08	326,55
Incremental grating pitches / rev:	256	360	512	720	900	1024
Absolute resolution / rev [increments] 1µm:	2 ¹⁸	360 x 2 ¹⁰	2 ¹⁹	720 x 2 ¹⁰	900 x 2 ¹⁰	2 ²⁰
Absolute resolution / rev [increments] 0,25µm:	2 ²⁰	360 x 2 ¹²	2 ²¹	720 x 2 ¹²	900 x 2 ¹²	2 ²²

The production drawing for the carrier flange can be released by AMO.

For applications with large diameters or significant variations in temperature during operation the system must be designed accordingly.

Mechanical design for WMFA-1010 / WMBA-1010

WMFA-1010 / WMBA-1010																	
<p><i>Recommended material: 1.4104 (Aisi 430F) or 1.7225 (Aisi 4140) Please contact AMO if using other soft magnetic material.</i></p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: center;">Grating pitch [arc length]: 1000 µm</th> </tr> <tr> <th style="text-align: center;">N</th> <th style="text-align: center;">ØF [mm]</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">256</td> <td style="text-align: center;">81,25 ±0,01</td> </tr> <tr> <td style="text-align: center;">360</td> <td style="text-align: center;">114,42 ±0,01</td> </tr> <tr> <td style="text-align: center;">512</td> <td style="text-align: center;">162,84 ±0,02</td> </tr> <tr> <td style="text-align: center;">720</td> <td style="text-align: center;">229,08 ±0,02</td> </tr> <tr> <td style="text-align: center;">900</td> <td style="text-align: center;">286,38 ±0,02</td> </tr> <tr> <td style="text-align: center;">1024</td> <td style="text-align: center;">325,85 ±0,02</td> </tr> </tbody> </table> <p style="text-align: center; margin-top: 20px;"><i>N: Integer number of grating pitches per revolution</i></p>	Grating pitch [arc length]: 1000 µm		N	ØF [mm]	256	81,25 ±0,01	360	114,42 ±0,01	512	162,84 ±0,02	720	229,08 ±0,02	900	286,38 ±0,02	1024	325,85 ±0,02
Grating pitch [arc length]: 1000 µm																	
N	ØF [mm]																
256	81,25 ±0,01																
360	114,42 ±0,01																
512	162,84 ±0,02																
720	229,08 ±0,02																
900	286,38 ±0,02																
1024	325,85 ±0,02																
<p><small>*) Recommended eccentricity: Greater eccentricities up to ~0,05mm do not affect the function of the device, but cause a proportional loss in positioning accuracy.</small></p>																	

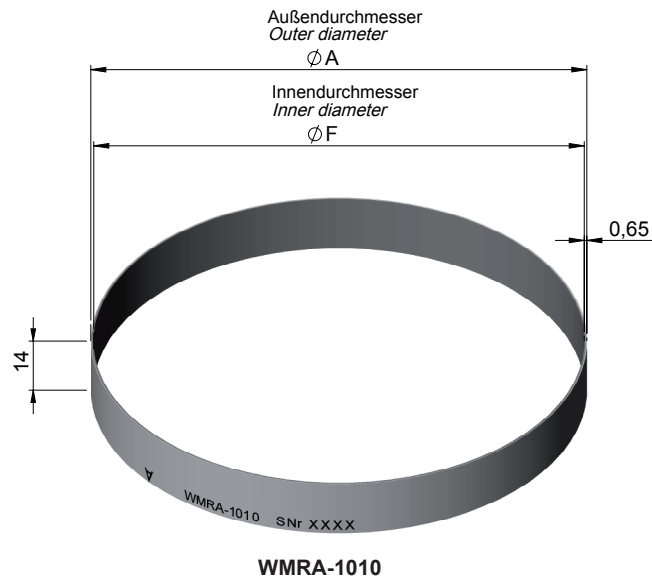
Ordering code: customer specific designs for WMFA-1010 / WMBA-1010

<p>WMFA-1010. <input type="text"/> - <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> - S <input type="text"/> <input type="text"/></p> <p>WMBA-1010. <input type="text"/> - <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> - S <input type="text"/> <input type="text"/></p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; padding: 5px;"> <p>Linearity error</p> <p>0 ... ± 10 µm arc length 1 ... ± 5 µm arc length 2 ... ± 3 µm arc length</p> </td> <td style="width: 40%; padding: 5px;"> <p style="text-align: center;">Grating pitches / revolution (N)</p> </td> <td style="width: 30%; padding: 5px;"> <p>Customer specific design</p> <p>xx number defined by AMO</p> </td> </tr> </table>	<p>Linearity error</p> <p>0 ... ± 10 µm arc length 1 ... ± 5 µm arc length 2 ... ± 3 µm arc length</p>	<p style="text-align: center;">Grating pitches / revolution (N)</p>	<p>Customer specific design</p> <p>xx number defined by AMO</p>
<p>Linearity error</p> <p>0 ... ± 10 µm arc length 1 ... ± 5 µm arc length 2 ... ± 3 µm arc length</p>	<p style="text-align: center;">Grating pitches / revolution (N)</p>	<p>Customer specific design</p> <p>xx number defined by AMO</p>		

Measuring rings for outside scanning

Thin, stainless steel measuring ring, consisting of a steel carrier ring, a graduation ring and a protection ring. Easily pressfitted mounting to the corresponding flange by the customer. (see mounting instruction at www.amo-gmbh.com)

For special applications the measuring ring (circular segment also possible) can be mounted on a flange at the factory.



Technical data

WMRA-1010									
Standard sizes N									
	0256	0360	0512	0720	0900	1024	1440	1800	2048
Grating pitch [arc length]:	1000 µm								
Grating accuracy [arc length]:	± 10 µm, ± 5 µm oder (or) ± 3 µm								
Mechanical execution:	Stainless steel measuring ring								
Flange material:	No special material required								
Outer diameter ØA [mm]:	81,95	115,12	163,54	229,78	287,08	326,55	458,99	573,61	652,58
Incremental grating pitches / rev:	256	360	512	720	900	1024	1440	1800	2048
Absolute resolution / rev [increments] 1µm:	2 ¹⁸	360 x 2 ¹⁰	2 ¹⁹	720 x 2 ¹⁰	900 x 2 ¹⁰	2 ²⁰	1440 x 2 ¹⁰	1800 x 2 ¹⁰	2 ²¹
Absolute resolution / rev [increments] 0,25µm:	2 ²⁰	360 x 2 ¹²	2 ²¹	720 x 2 ¹²	900 x 2 ¹²	2 ²²	1440 x 2 ¹²	1800 x 2 ¹²	2 ²³

Special sizes with any number of pitches per revolution on request

Mechanical design for WMRA-1010

WMRA-1010																																		
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #cccccc;"> <th colspan="2" style="text-align: center;">Grating pitch [arc length]:</th> <th style="text-align: center;">1000 µm</th> </tr> <tr style="background-color: #cccccc;"> <th style="text-align: center;">N</th> <th colspan="2" style="text-align: center;">ØF [mm]</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">256</td><td colspan="2" style="text-align: center;">80,65 ±0,01</td></tr> <tr><td style="text-align: center;">360</td><td colspan="2" style="text-align: center;">113,82 ±0,01</td></tr> <tr><td style="text-align: center;">512</td><td colspan="2" style="text-align: center;">162,24 ±0,02</td></tr> <tr><td style="text-align: center;">720</td><td colspan="2" style="text-align: center;">228,48 ±0,02</td></tr> <tr><td style="text-align: center;">900</td><td colspan="2" style="text-align: center;">285,78 ±0,02</td></tr> <tr><td style="text-align: center;">1024</td><td colspan="2" style="text-align: center;">325,25 ±0,02</td></tr> <tr><td style="text-align: center;">1440</td><td colspan="2" style="text-align: center;">457,69 ±0,03</td></tr> <tr><td style="text-align: center;">1800</td><td colspan="2" style="text-align: center;">572,31 ±0,06</td></tr> <tr><td style="text-align: center;">2048</td><td colspan="2" style="text-align: center;">651,28 ±0,07</td></tr> </tbody> </table> <p style="text-align: center; margin-top: 10px;"><i>N: Integer number of grating pitches per revolution</i></p>	Grating pitch [arc length]:		1000 µm	N	ØF [mm]		256	80,65 ±0,01		360	113,82 ±0,01		512	162,24 ±0,02		720	228,48 ±0,02		900	285,78 ±0,02		1024	325,25 ±0,02		1440	457,69 ±0,03		1800	572,31 ±0,06		2048	651,28 ±0,07	
Grating pitch [arc length]:		1000 µm																																
N	ØF [mm]																																	
256	80,65 ±0,01																																	
360	113,82 ±0,01																																	
512	162,24 ±0,02																																	
720	228,48 ±0,02																																	
900	285,78 ±0,02																																	
1024	325,25 ±0,02																																	
1440	457,69 ±0,03																																	
1800	572,31 ±0,06																																	
2048	651,28 ±0,07																																	
<p><small>*) Recommended eccentricity: Greater eccentricities up to ~0,05mm do not affect the function of the device, but cause a proportional loss in positioning accuracy.</small></p>																																		

Ordering code: WMRA-1010

WMRA-1010. -

Linearity error

- 0 ... ± 10 µm arc length
- 1 ... ± 5 µm arc length
- 2 ... ± 3 µm arc length

Grating pitches / revolution (N)

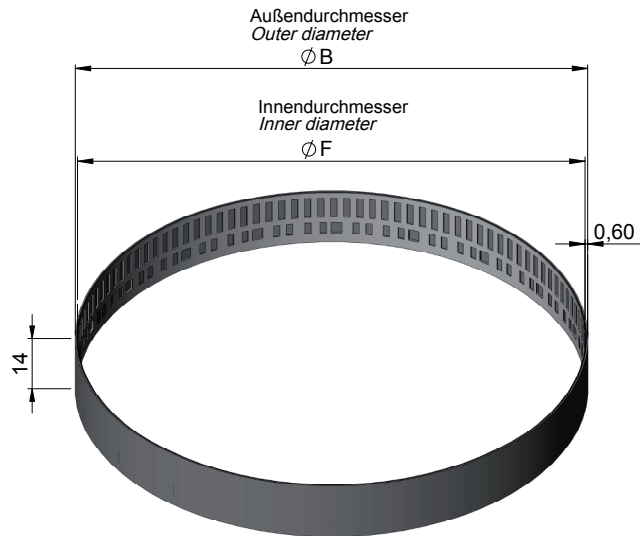
The production drawing for the carrier flange can be released by AMO.

For applications with large diameters or significant variations in temperature during operation and when the carrier flanges are not made of steel, the system must be designed accordingly.

Measuring rings for inside scanning

Thin, stainless steel measuring ring **WMRA-1110** consisting of a steel carrier ring and a graduation ring.

The ring can be mounted over a „snap-effect“ by the customer into a corresponding groove or against a stop collar.



WMRA-1110

Technical data

	WMRA-1110			
	Standard sizes N			
	1024	1440	1800	2048
Grating pitch [arc length]:	1000 μm			
Grating accuracy [arc length]:	$\pm 10 \mu\text{m}$, $\pm 5 \mu\text{m}$ oder (or) $\pm 3 \mu\text{m}$			
Mechanical execution:	Stainless steel measuring ring			
Flange material:	No special material required			
Incremental grating pitches / rev:	1024	1440	1800	2048
Absolute resolution / rev [increments] $1 \mu\text{m}$:	2^{20}	1440×2^{10}	1800×2^{10}	2^{21}
Absolute resolution / rev [increments] $0,25 \mu\text{m}$:	2^{22}	1440×2^{12}	1800×2^{12}	2^{23}

Special sizes with any number of pitches per revolution on request

Mechanical design for WMRA-1110

WMRA-1110																			
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #cccccc;"> <th colspan="2" style="text-align: center;">Grating pitch [arc length]:</th> <th style="text-align: center;">1000 µm</th> </tr> <tr style="background-color: #cccccc;"> <th style="text-align: center;">N</th> <th colspan="2" style="text-align: center;">ØB [mm]</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1024</td> <td colspan="2" style="text-align: center;">326,62 ±0,02</td> </tr> <tr> <td style="text-align: center;">1440</td> <td colspan="2" style="text-align: center;">459,01 ±0,03</td> </tr> <tr> <td style="text-align: center;">1800</td> <td colspan="2" style="text-align: center;">573,56 ±0,06</td> </tr> <tr> <td style="text-align: center;">2048</td> <td colspan="2" style="text-align: center;">652,47 ±0,07</td> </tr> </tbody> </table> <p style="text-align: center; margin-top: 20px;"><i>N: Integer number of grating pitches per revolution</i></p>	Grating pitch [arc length]:		1000 µm	N	ØB [mm]		1024	326,62 ±0,02		1440	459,01 ±0,03		1800	573,56 ±0,06		2048	652,47 ±0,07	
Grating pitch [arc length]:		1000 µm																	
N	ØB [mm]																		
1024	326,62 ±0,02																		
1440	459,01 ±0,03																		
1800	573,56 ±0,06																		
2048	652,47 ±0,07																		
<p><small>*) Recommended eccentricity: Greater eccentricities up to ~0,05mm do not affect the function of the device, but cause a proportional loss in positioning accuracy.</small></p>																			

Ordering code: WMRA-1110

WMRA-1110. -

Linearity error

0 ... ± 10 µm arc length
1 ... ± 5 µm arc length
2 ... ± 3 µm arc length

Grating pitches / revolution (N)

The production drawing for the carrier flange can be released by AMO.

For applications with large diameters or significant variations in temperature during operation and when the carrier flanges are not made of steel, the system must be designed accordingly.

Scanning head for absolute angle measuring systems

The scanning heads **WMKA-2010x** with integrated electronics can be combined with measuring flanges **WMFA-1010**, **WMBA-1010** or measuring rings **WMRA-1010** (see page 6).

The systems are insensitive against environmental pollution like (like oil, coolant, dust ...).

Technical data

	WMKA-2110x inside scanning	WMKA-2010x outside scanning
Operating temperature:	-10°C ... 85°C	
Storage temperature:	-20°C ... 85°C	
Protection class:	IP67	
Vibration:	< 200 m/s ² für (for) 55 – 2000 Hz	
Shock:	< 2000 m/s ² für (for) 6 ms	
Power supply:	5V ±5%	
Power consumption:	max. 350 mA	
Incremental grating pitch:	1000 µm	
Max. input frequency:	39 kHz für alle absoluten Schnittstellen (2,4kHz bei 0,25µm) /for all absolute interfaces 60 kHz für 1Vss Ausgang / for 1Vpp output	
System resolution:	Absolutes interface: bis zu 25 bit pro Umdrehung <i>Absolute interface: up to 25 bit per revolution</i> Analogausgang 1Vss: bis zu 31,25 µm <i>Analog output 1Vpp: down to 31,25 µm</i>	
Absolute interfaces:	SSI (200kHz ... 1MHz and Sine/Cosine) BiSS/C (max. clock frequency: 2,5 MHz) FANUC, DRIVE-CLiQ Mitsubishi in preparation <i>Other interfaces on request</i>	
Suitable measuring scale:	WMRA-1110	WMFA-1010 WMBA-1010 WMRA-1010
	see page 12	see page 6

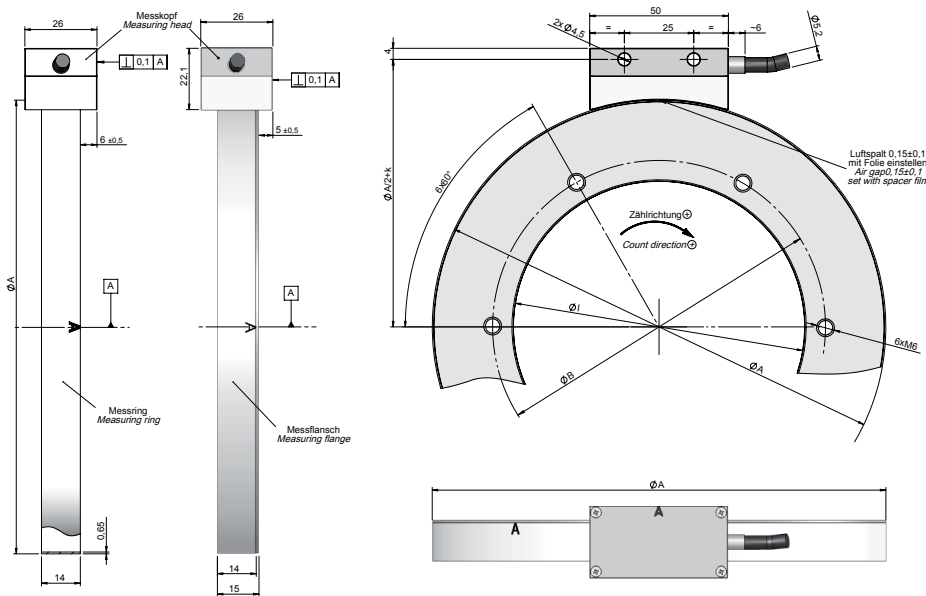
Possible resolutions for 1Vpp output (only for SSI-interface)

Output signal				
Sine 1Vpp				
Type WMKA	Signal periods		Max. input frequency ⁽¹⁾ f[kHz]	Power consumption [mA] at 5V
	Teilungsfaktor Dividing factor	Perioden [Bogenlänge] Periods [arc length] [μm]		
2x100.x00 ⁽¹⁾	1	1000	9 (1μm) 2,4 (0,25μm)	max. 350
2x100.x10	1	1000	9 (1μm) 2,4 (0,25μm)	max. 350
2x100.x11	8	125		
2x100.x12	10	100		
2x100.x13	25	40		
2x100.x14	32	31,25		
2x100.x15	4	250		
2x100.x16	16	62,5	60 (1μm)	max. 350
2x100.x30	1	1000		

Output frequency f_a (input frequency for subsequent electronics) is limited to 300 kHz for 1Vpp-systems.

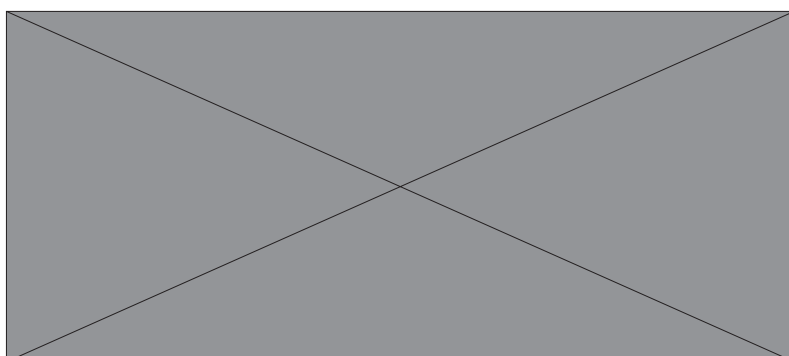
⁽¹⁾ Encoder for safety related applications

Assembly drawing WMKA-2010x



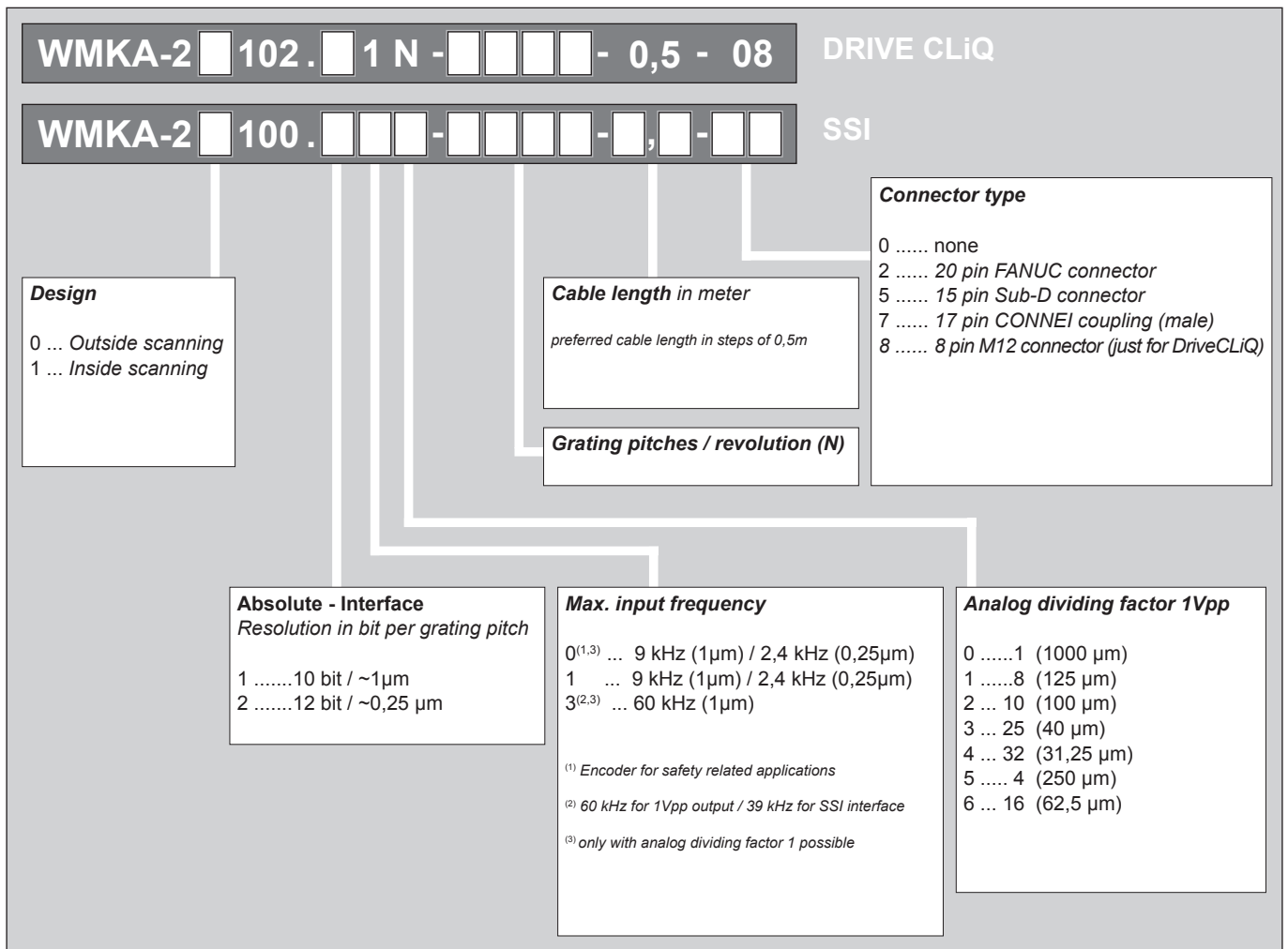
N Pitches / rev	ØA/2 + k [mm]
256	56,74
360	73,29
512	97,82
720	131,64
900	160,39
1024	180,33
1440	246,74
1800	304,25
2048	343,84

Assembly drawing WMKA-2110x

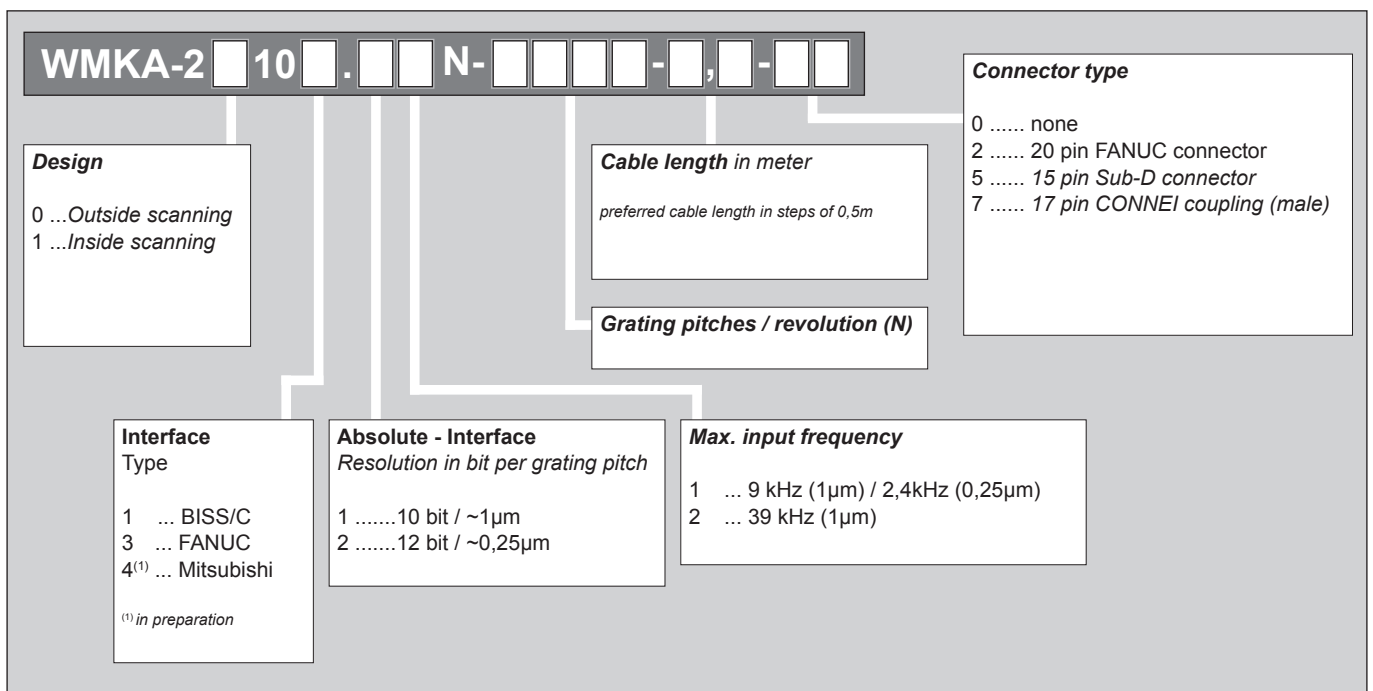


N Pitches / rev	k [mm]
1024	1,93
1440	1,37
1800	1,09
2048	0,96

Ordering code: WMKA-2010x/2110x with SSI - Interface and DRIVE CLiQ

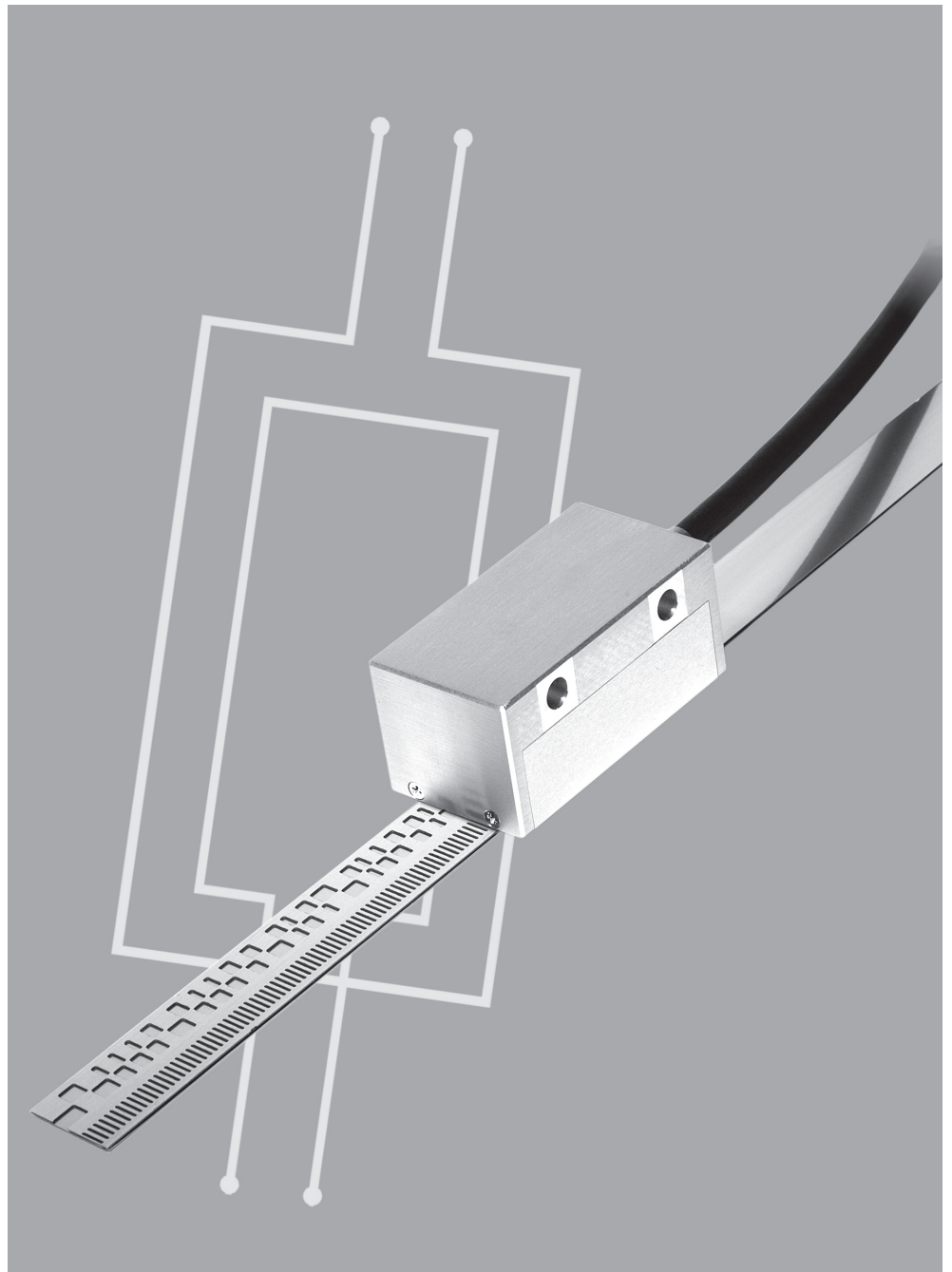


Ordering code: WMKA-2010x/2110x for interfaces other than SSI and DRIVE CLiQ



Absolute length measuring systems

- *Resolution up to 25 bit*
- *Available interfaces:
SSI, BiSS/C, Fanuc*
- *Measuring lengths up to 32m*
- *Protection class IP 67*



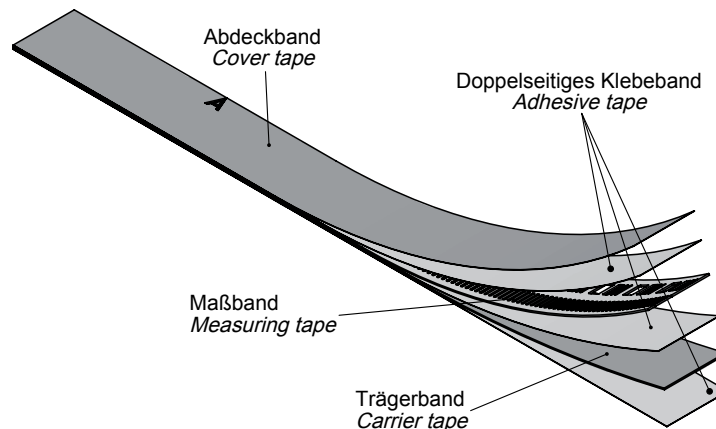
LMBA-1110/2110

Scale for non-guided measuring systems, mounted with adhesive tape

At the open, non-guided systems a double sided adhesive foil is applied on the measuring scale for direct sticking on the machine bed. At all of these versions the scanning still takes place without contact and is therefore not subject to wear.

There are 2 different types of scales. Scale type **LMBA-1110** for scale length up to 9200 mm and scale type **LMBA-2110** for scales with more than 9200mm length.

Configuration



Technical data

	LMBA-1110	LMBA-2110
Incremental grating pitch:	1000 µm	
Accuracy after linear compensation:	± 10 µm/m, ± 5 µm/m oder (or) ± 3 µm/m	
Coefficient of expansion:	~ 11 ppm/K	
Overall length GL:	≤ 9200 mm	> 9200 mm, bis (up to) 32000 mm
Measuring length ML:	ML = GL - 50 mm	
Mechanical execution:	Stainless steel measuring tape with adhesive layer for mounting	

Ordering code

LMBA- 110. -

Overall length

1 ... ≤ 9200 mm
2 ... > 9200 mm

Linearity error

1 ... ± 10 µm/m
2 ... ± 5 µm/m
3 ... ± 3 µm/m

Overall length in mm

LMBA-1410/2410

Scale on stainless steel carrier, for non-guided measuring systems

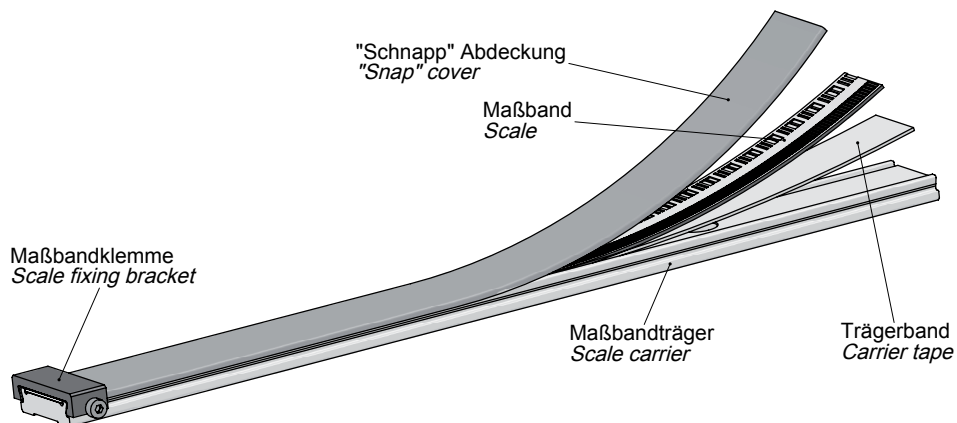
The scale type **LMBA-1410/2410** is designed for harsh applications where adhesive backed scale tape is not appropriate. A slim stainless steel carrier is attached to the machine with screws, with an interlocking "snap cover" securing the scale tape in position.

There are 2 different types of scales. Scale type **LMBA-1410** for scale length up to 9200 mm and scale type **LMBA-2410** for scales with more than 9200mm length.

Main features of the LMBA - 1410/2410 carrier

- Mounting on the machine without any adhesive (ideal for harsh environments, replacement or repairable mounting is possible)
- Stainless steel scale carrier
- Measuring lengths up to 32 m
- Standard one meter carrier length, can be butted together for ease of installation, optional single carriers up to three meters are available

Configuration



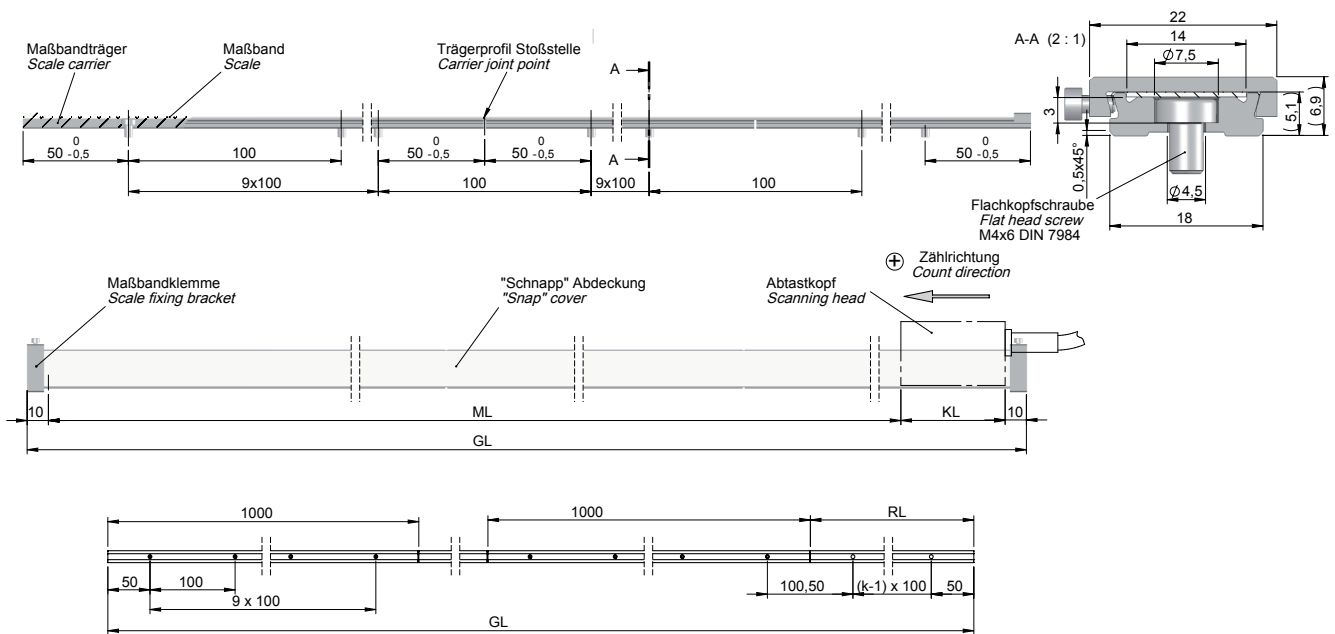
Technical data

	LMBA-1410	LMBA-2410
Incremental grating pitch:	1000 µm	
Accuracy after linear compensation:	± 10 µm/m, ± 5 µm/m oder (or) ± 3 µm/m	
Coefficient of expansion:	~ 11 ppm/K	
Overall length:	≤ 9200 mm	9200 mm bis (up to) 32000 mm
Mechanical execution:	Stainless steel measuring tape mounted on stainless steel carrier Single carrier up to 3 m, lengths up to 32 m with multiple carriers	

LMBA - 1410/2410

Multiple section carrier, type M2

- Multiple carriers in 1000 mm modules
- Overall length in steps of 200 mm
 $GL = (n \times 1000) + RL$ [mm]
i.e.: 1200 mm, 1400 mm, 1600mm, ...
- Scale loose mounted on the carrier and fixed with the cover tape
- Any measuring lengths up to 32 m
- Can be combined with scanning head LMKA-1110x for overall length ≤ 9200 mm
 or scanning head LMKA-2110x for overall length >9200 mm



$GL = (n \times 1000) + RL$ [mm]

$RL = (k \times 100)$ [mm]

$ML = GL - 70$ mm

$n = 1, 2, 3, \dots$

$k = 2, 4, 6, 8$

GL ... overall length

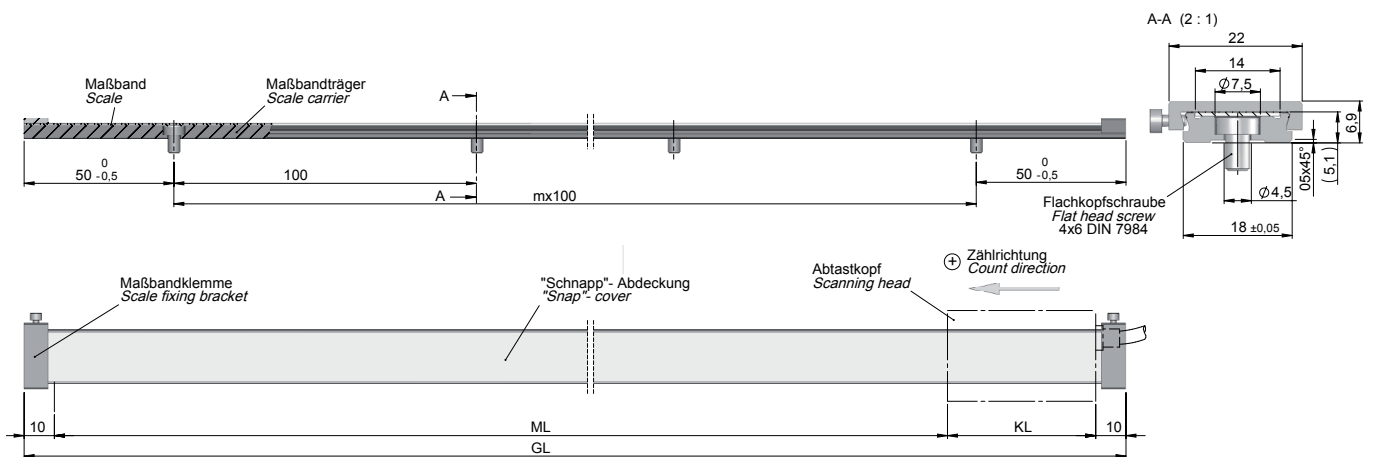
RL ... remaining length

ML ... measuring length

LMBA - 1410

Single section carrier, type E2

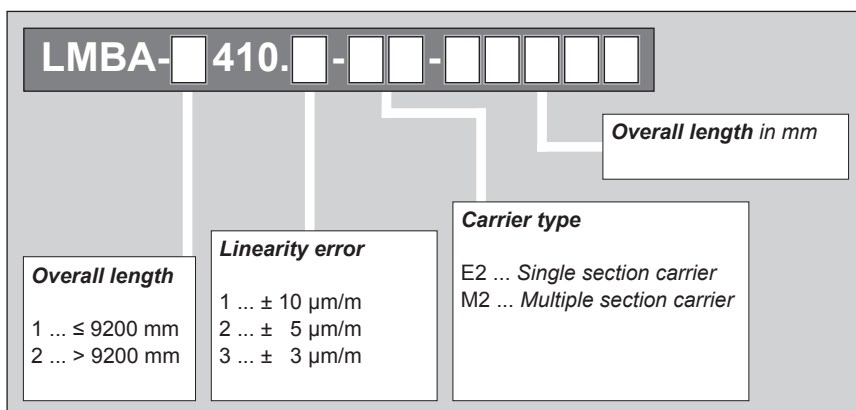
- Single carrier up to 3000 mm in length
- Overall length in steps of 100 mm
 $GL = (m + 1) \times 100$ [mm]
i.e.: 200 mm, 300 mm, ... , 3000 mm
- Scale loose mounted on the carrier and fixed with the cover tape
- Can be combined with scanning head LMKA-1110x



$GL = (m + 1) \times 100$ [mm] $m = 1, 2, 3, \dots, 29$
 $ML = GL - 70$ mm

GL ... Gesamtlänge / overall length
 ML ... Messlänge / measuring length

Ordering code



LMKA-1110x/2110x

Scanning head for non-guided absolute length measuring systems

The open, non-guided scanning heads with integrated electronics can be combined with measuring scale types **LMBA-1110/2110** or **LMBA-1410/2410** (see page 18).

Scanning head **LMKA-1110x** can be used only with scale type **LMBA-1110** or **LMBA-1410**, scanning head **LMKA-2110x** can be used only with scale type **LMBA-2110** or **LMBA-2410**.

The systems are insensitive against environmental pollution like (like oil, coolant, dust ...).

Technical data

	LMKA-1110x	LMKA-2110x
Operating temperature:	-10°C ... 85°C	
Storage temperature:	-20°C ... 85°C	
Protection class:	IP67	
Vibration:	< 200 m/s ² für (for) 55 – 2000 Hz	
Shock:	< 2000 m/s ² für (for) 6 ms	
Power supply:	5V ±5%	
Power consumption:	max. 350 mA	
Incremental grating pitch:	1000 µm	
Max. scale length:	≤ 9200 mm	> 9200 mm
Max. speed:	10 m/s for 1µm 2,5 m/s for 0,25µm	
System resolution:	<i>Absolute interface:</i> 1 µm / 0,25 µm <i>Analog output 1Vpp:</i> 1000 µm or 40 µm	
Absolute interfaces:	SSI (200kHz ... 1MHz and Sine/Cosine) BiSS/C (max. clock frequency: 2,5 MHz) FANUC, DRIVE-CLiQ Mitsubishi & Yaskawa in preparation) Other interfaces on request	
Suitable measuring scale:	LMBA-1110 LMBA-1410 see page 18	LMBA-2110 LMBA-2410 see page 18

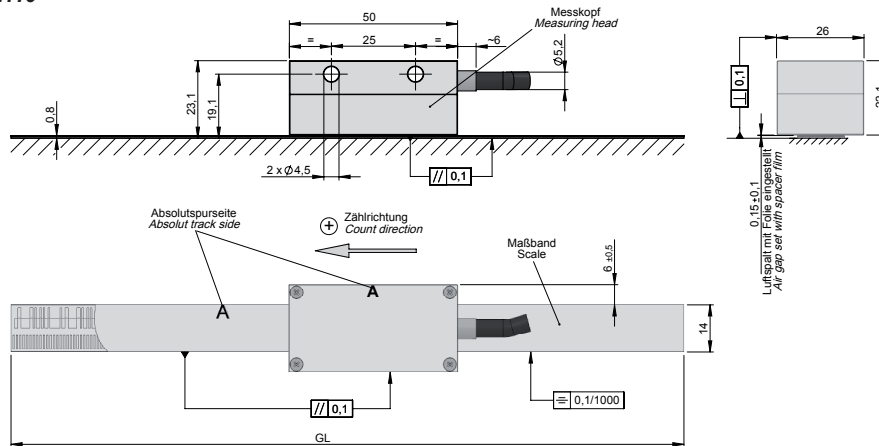
Possible resolutions for 1Vpp output (only for SSI-interface)

Output signal				
Sine 1Vpp				
Type LMKA	Signal periods		Maximum speed [m/s]	Power consumption [mA] at 5V
	Dividing factor	Periods [arc length] [μm]		
x1100.100 ⁽¹⁾	1	1000	10	max. 350
x1100.110	1	1000	10	max. 350
x1100.113	25	40		
x1100.200 ⁽¹⁾	1	1000	2,5	max. 350
x1100.210	1	1000	2,5	max. 350
x1100.213	25	40		

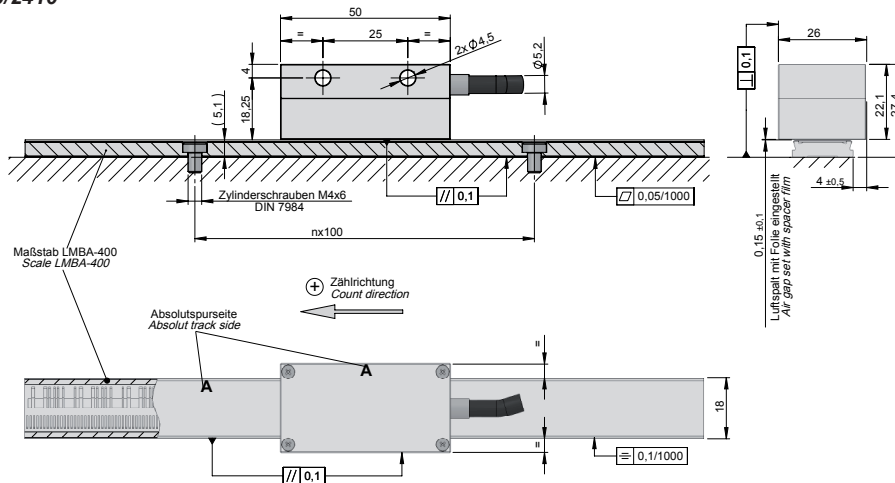
⁽¹⁾ Encoder for safety related applications

Assembly drawings LMKA-1110x/2110x

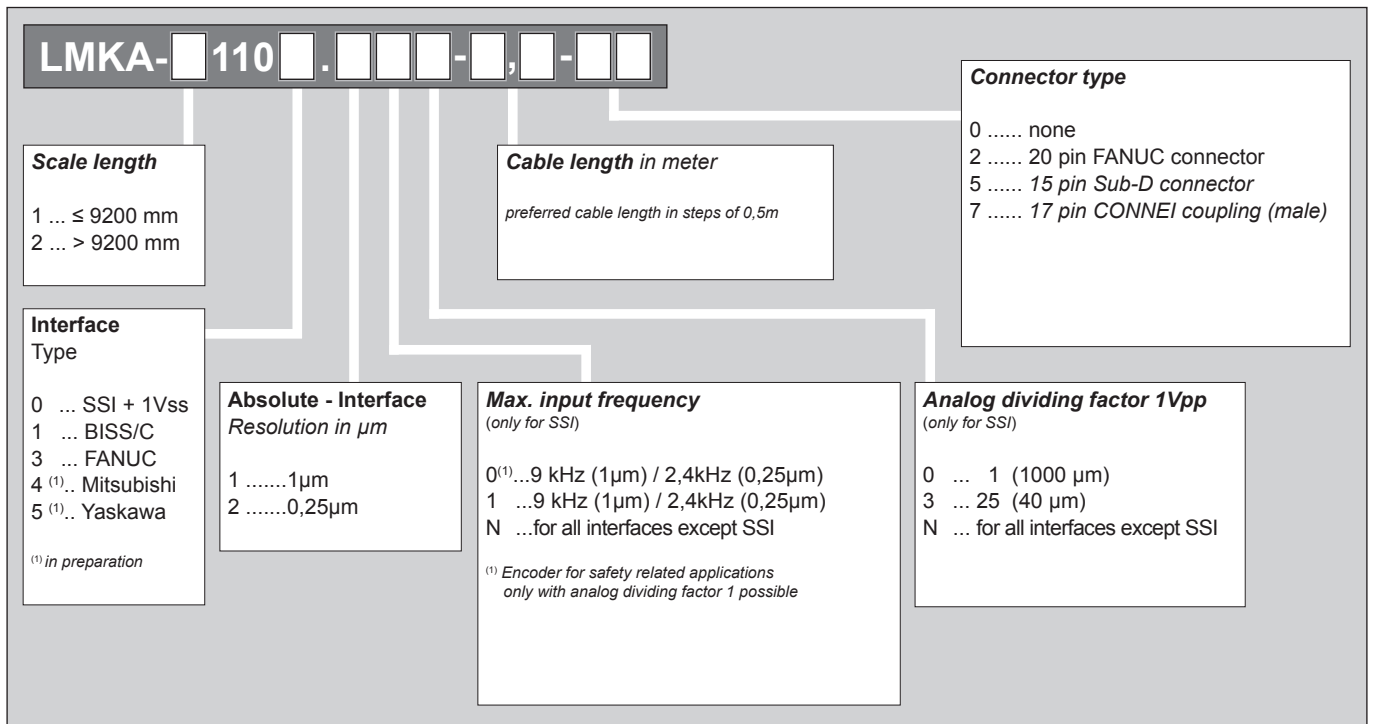
Scale type LMBA-1110/2110



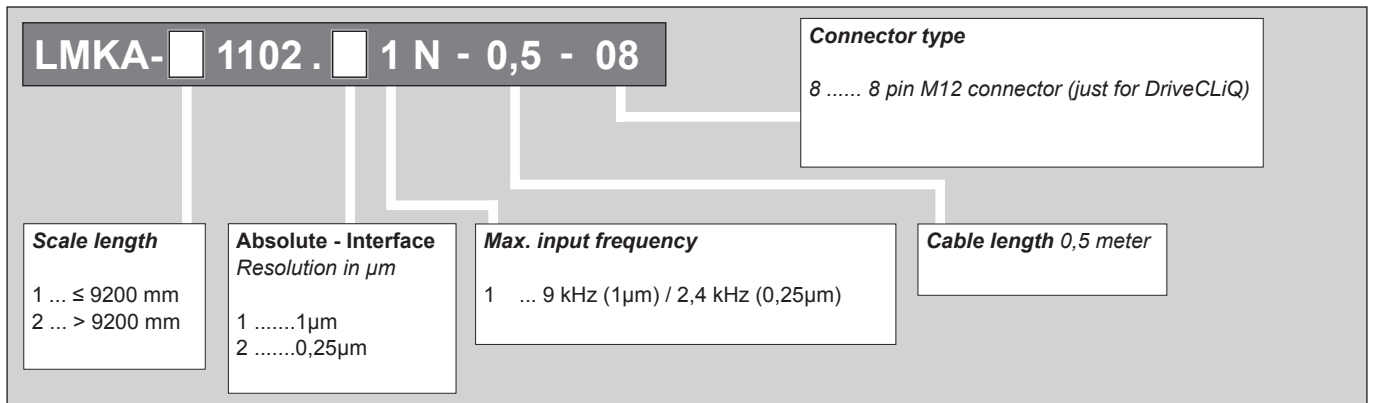
Scale type LMBA-1410/2410



Ordering code: LMKA-1110x/2110x



Ordering code: LMKA-1110x/2110x with DRIVE CLiQ - Interface



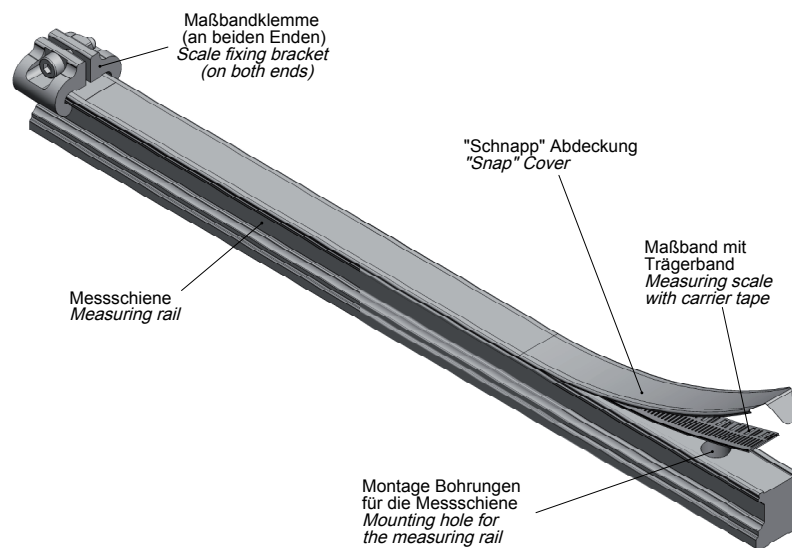
LMFA-1310/2310

Measuring rail for guided AMOSIN® measuring systems

At the guided measuring systems the scale is integrated in a guiderail.
The measuring rail **LMFA-1310/2310** is available in single or multiple sections.

There are 2 different types of scales. Scale type **LMFA-1310** for scale length up to 9200 mm and scale type **LMFA-2310** for scales with more than 9200mm length.

Configuration



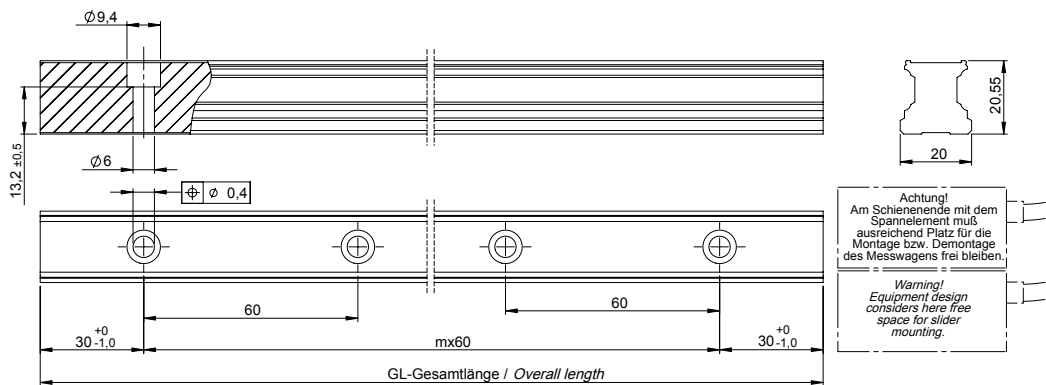
Technical data

	LMFA-1310	LMFA-2310
Grating pitch:	1000 µm	
Accuracy after linear compensation:	± 10 µm/m, ± 5 µm/m or ± 3 µm/m	
Coefficient of expansion:	~ 11 ppm/K	
Overall length:	≤ 9200 mm	> 9200mm (bis zu / up to 32 000 mm)
Mechanical execution:	Standard guide rail with integrated measuring scale	

LMFA - 1310

Single section measuring rail

- Single section measuring rail for measuring lengths up to 3860 mm
- Measuring length in steps of 60 mm
 $ML = (m \times 60) - 40$ [mm]; $m \geq 2$
 i.e.: 80 mm, 140 mm, ... , 3860 mm
- Can be combined with scanning heads LMKA-1310x



$GL = ((m + 1) \times 60)$ [mm] $m = 2, 3, 4, \dots, 65$
 $ML = GL - 100$ [mm]

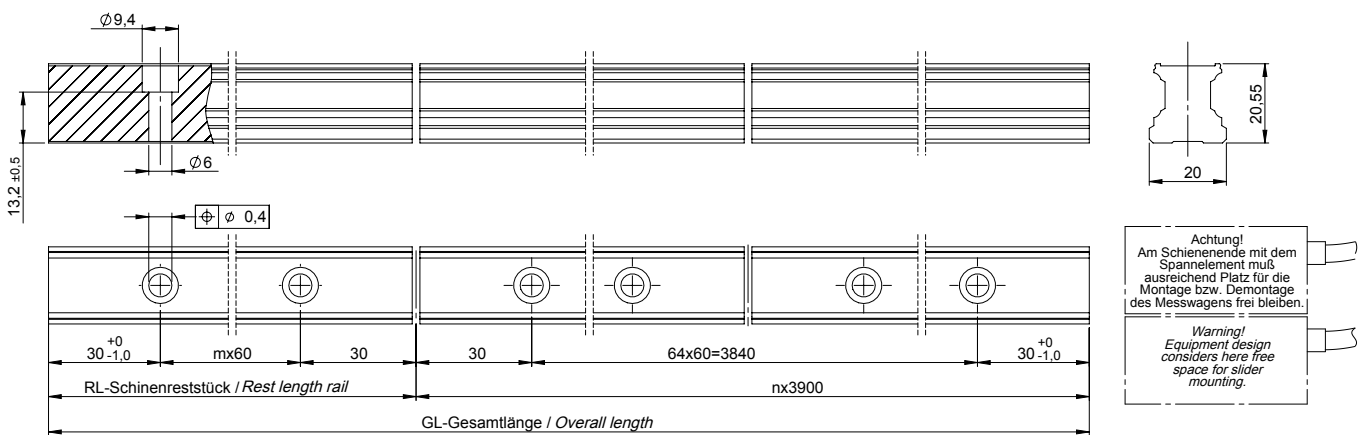
GL ... overall length
 ML ... measuring length

Max. total length: 3960 mm
 Max. measuring length: 3860 mm

LMFA - 1310/2310

Multiple section measuring rail

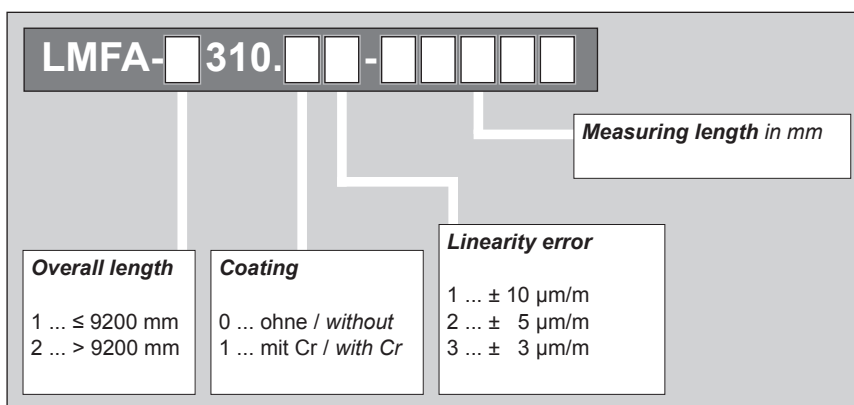
- Multiple section measuring rail for measuring lengths greater than 3860 mm
- Measuring length in steps of 60 mm
 $ML = (n \times 3900) + (m \times 60) - 40$ [mm]
- Can be combined with scanning heads LMK-1310x/2310x



$GL = (n \times 3900) + RL$ [mm] $n = 1, 2, 3, \dots$
 $RL = ((m + 1) \times 60)$ [mm] $m = 1, 2, 3, \dots 64$
 $ML = GL - 100$ [mm]

GL ... overall length
 RL ... Remaining length
 ML ... measuring length

Ordering code



LMKA-1310x/2310x

Scanning head for guided absolute length measuring systems

The guided scanning heads **LMKA-1310x/2310x** with integrated evaluation electronics can be combined with the measuring rails **LMFA-1310/2310** (see page 25).

Scanning head **LMKA-1310x** can be used only with rail type **LMFA-1310** and scanning head **LMKA-2310x** can be used only with rail type **LMFA-2310**.

The systems are insensitive against environmental pollution (i.e. oil, coolant, ...). Because of the option to mount the scanning head using the mounting spring high mounting tolerances, especially for longer measuring length, can be realized.

Technical data

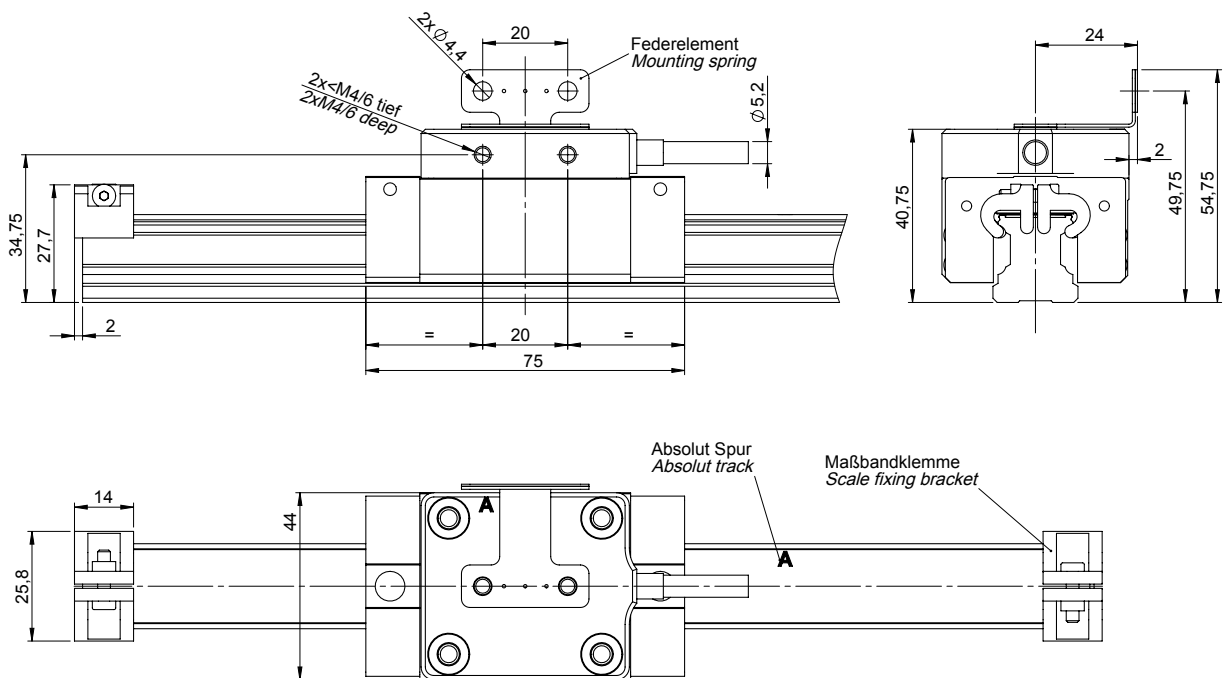
	LMKA-1310x	LMKA-2310x
Operating temperature:	0°C ... 80°C	
Storage temperature:	-20°C ... 85°C	
Protection class:	IP67	
Vibration:	< 200 m/s ² für (for) 55 – 2000 Hz	
Shock:	< 2000 m/s ² für (for) 6 ms	
Power supply:	5V ±5%	
Power consumption:	max. 350 mA	
Incremental grating pitch:	1000 µm	
Max. scale length:	≤ 9200 mm	> 9200 mm
Max. speed:	5 m/s für 1µm; 2,5 m/s für 0,25µm, limited by the mechanics	
System resolution:	Absolute interface: 1 µm / 0,25µm Analog output 1Vpp: 1000 µm or 40 µm	
Absolute interfaces:	SSI (200kHz ... 1MHz and Sine/Cosine) BiSS/C (max. clock frequency: 2,5 MHz) FANUC, DRIVE-CLiQ Mitsubishi & Yaskawa in preparation Other interfaces on request	
Suitable measuring scale:	LMFA-1310 see page 25	LMFA-2310 see page 25

Possible resolutions for 1Vpp output (only for SSI-interface)

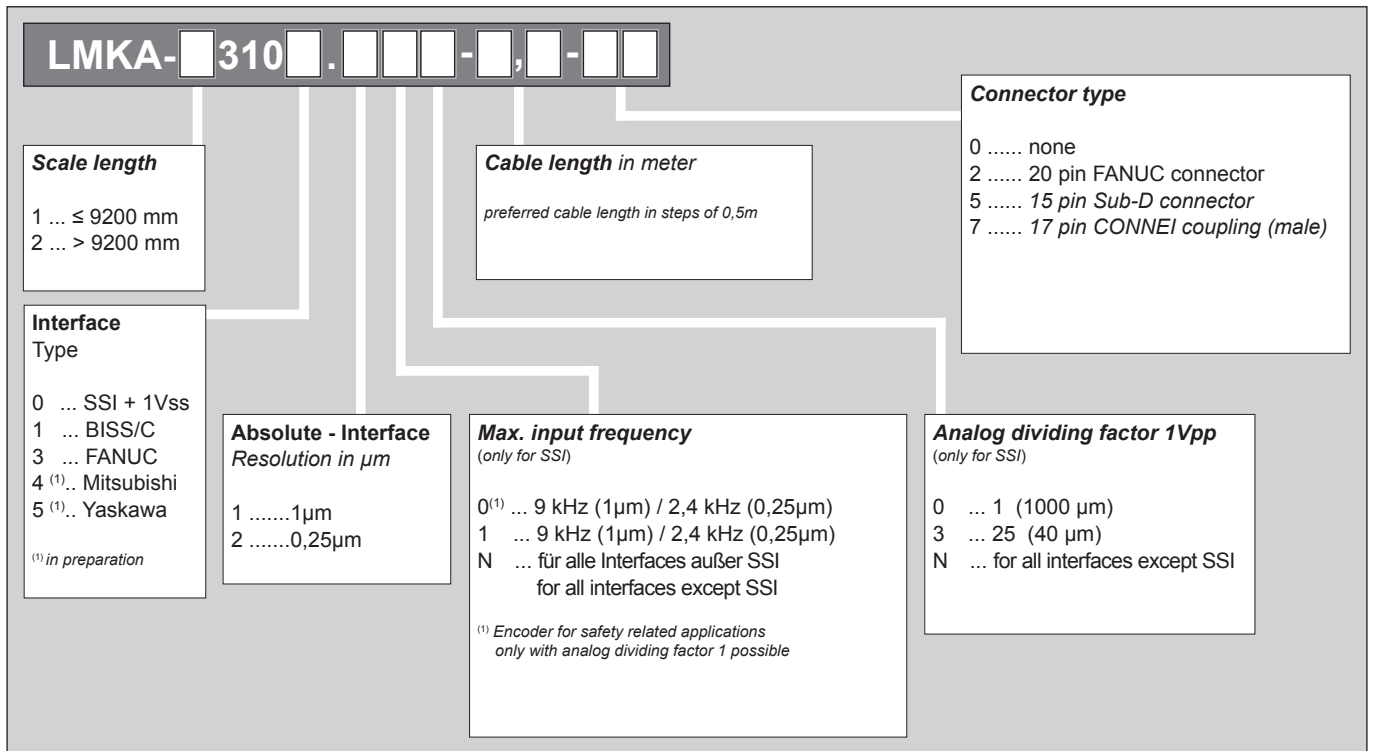
Output signal				
Sine 1Vpp				
Type	Signal periods		Maximum speed	Power consumption
	Dividing factor	Periods [arc length] [μm]		
x3100.100 ⁽¹⁾	1	1000	5	max. 350
x3100.110	1	1000	5	max. 350
x3100.113	25	40		
x3100.200 ⁽¹⁾	1	1000	2,5	max. 350
x3100.210	1	1000	2,5	max. 350
x3100.213	25	40		

⁽¹⁾ Encoder for safety related applications

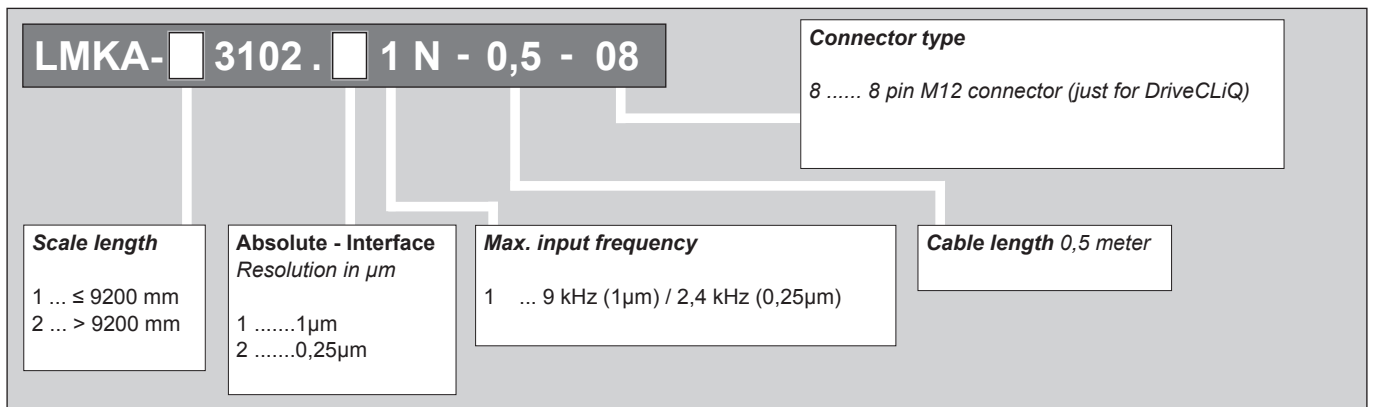
Assembly drawings LMKA-1310x/2310x



Ordering code: **LMKA-1310x/2310x**



Ordering code: **LMKA-1310x/2310x with DRIVE CLiQ - Interface**



Maximum speed

a) Max. speed

The maximum speed n_{max} of a measuring system can be calculated considering the max. input frequency f of the scanning head and the number of pitches per revolution N of the measuring flange as follows:

$$n_{max} \text{ [U/min]} = f[\text{Hz}] \times 60 / N$$

$$n_{max} \text{ [rpm]} = f[\text{Hz}] \times 60 / N$$

b) Output frequency

The max. output signal frequency f_a of the scanning head depends on the max. speed n used in the application, the number of grating pitches per revolution N and the dividing factor D of a scanning head.
It's important to not exceed the max. input frequency of the subsequent electronics.

$$f_a \text{ [Hz]} = (n[\text{rpm}] / 60) \times N \times D \text{ for scanning head with 1Vpp output}$$

Maximum rotary speeds for standard measuring flanges respectively measuring rings are shown below.

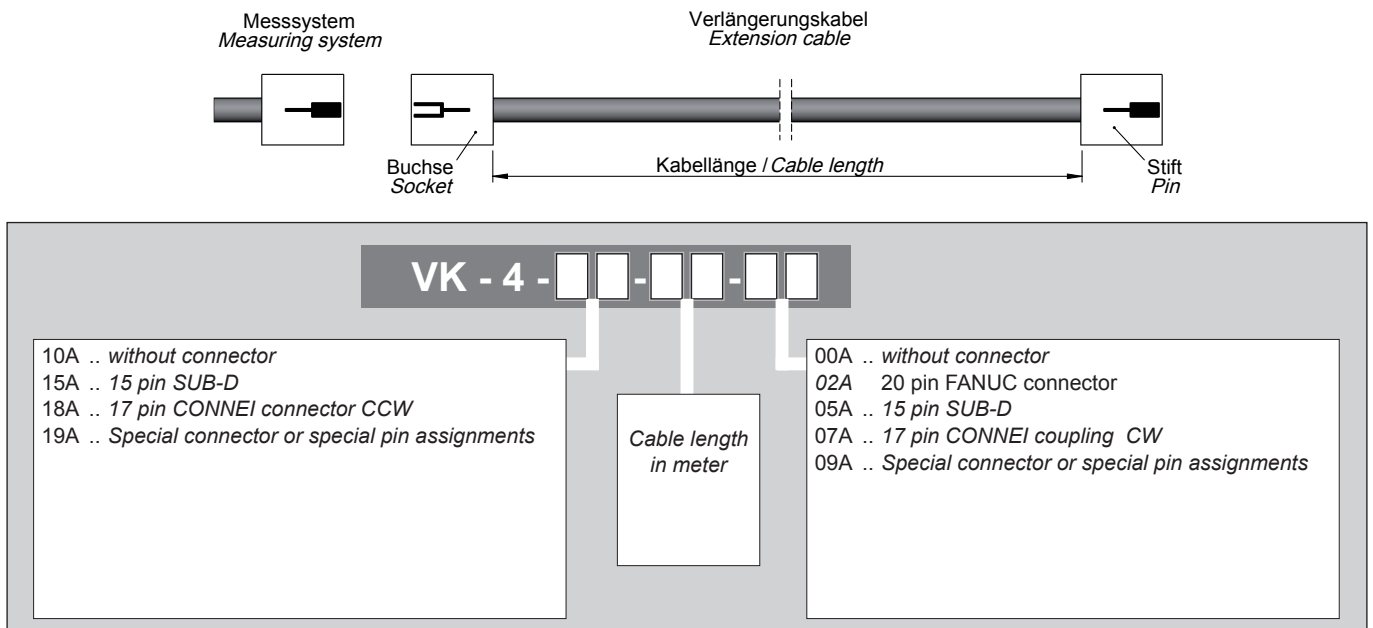
Type	Max. input frequency f [kHz]	Rotary speed n [rev/min]								
		Standard measuring flange WMFA-210x or measuring ring WMRA-210x								
		0256	0360	0512	0720	0900	1024	1440	1800	2048
WMKA-2x100.100	9	2100	1500	1050	750	600	520	370	300	260
WMKA-2x10x.1xx	9	2100	1500	1050	750	600	520	370	300	260
WMKA-2x100.130	60	14000	10000	7000	5000	4000	3500	2500	2000	1750
WMKA-2x10x.2xx	2,4	560	400	280	200	160	140	100	80	70

Cable

Technical data

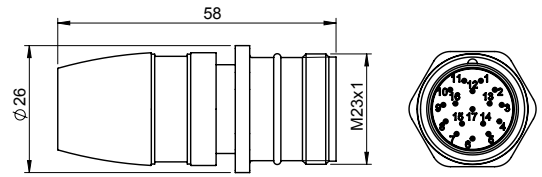
	Cable for measuring system	Extension cable
Jacket:	PUR, high flexible, suitable for energy chains	
Diameter:	5,3mm	~ 8mm
Wires:	5 (2 x 0,05) + 1 (2 x 0,14) mm ²	4 (2 x 0,14) + 2 (2 x 0,5) mm ²
Bending radius:		
Single bending:	5 x d = 25mm	5 x d = 40mm
Continuous bending:	10 x d = 50mm	10 x d = 80mm
Max. length:	9m	50m

Ordering code: extension cable



Plug and connection assignments

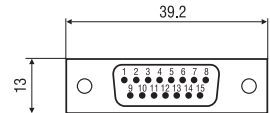
17 pin CONNEI - coupling (male)



	Power supply				Incremental signals				Absolute interface			
PIN	7	1	10	4	15	16	12	13	14	17	8	9
Signal	+5V	5V-Sensor	0V	0V-Sensor	A+	A-	B+	B-	Data+	Data-	Clock+	Clock-
Color	red	red-white	blue	blue-white	green	yellow	brown	white	violet	black	pink	grey

Shield on housing

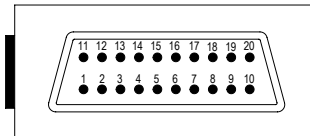
15-pin SUB-D connector



	Power supply				Incremental signals				Absolute interface			
PIN	4	12	2	10	1	9	3	11	5	13	8	15
Signal	+5V	5V-Sensor	0V	0V-Sensor	A+	A-	B+	B-	Data+	Data-	Clock+	Clock-
Color	red	red-white	blue	blue-white	green	yellow	brown	white	violet	black	pink	grey

Shield on housing

20 pin FANUC connector



	Power supply				Absolute interface				shield
PIN	18	20	14	12	1	2	5	6	16
Signal	+5V	+5V	0V	0V	Data+	Data-	Clock+	Clock-	shield
Color	red	red-white	blue	blue-white	violet	black	pink	grey	

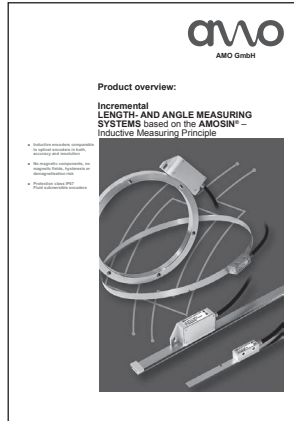
Shield on housing

No connection allowed on unused pins.

Notes

Additional product brochures

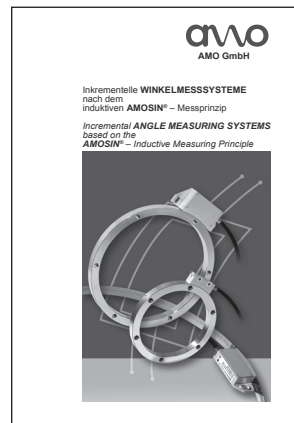
Product overview



Length measuring systems



Angle measuring systems



Spindle encoder



Headquarter:



AMO GmbH

A-4963 St. Peter am Hart, Nöfing 4 - Austria

Phone: +43 7722 658 56-0

Fax: +43 7722 658 56-11

e-mail: office@amo.at

www.amo-gmbh.com

Branches:

Germany:

AMO GmbH

Zweigniederlassung Deutschland
Bussardstrasse 10
D 78655 Dunningen

Phone: +49 7403 913 283

Fax.: +49 7403 913 267

e-mail: office@amo-gmbh.com

USA:

AMO Corporation

9580 Oak Ave Parkway Suite 7-162
Folsom, CA 95630

Phone: +1 916 791 2001

Fax: +1 916 720 0430

E-mail: sales@amosin.com

Homepage: www.amosin.com

Italy:

AMO Italia s.r.l.

20037 Paderno Dugnano MI - Italia
Via Gorizia 35

Phone: +39 029 108 23 41

E-mail: info@amoitalia.it

Homepage: www.amoitalia.it

Authorized distributors and sales partners in other countries:

Please look at www.amo-gmbh.com