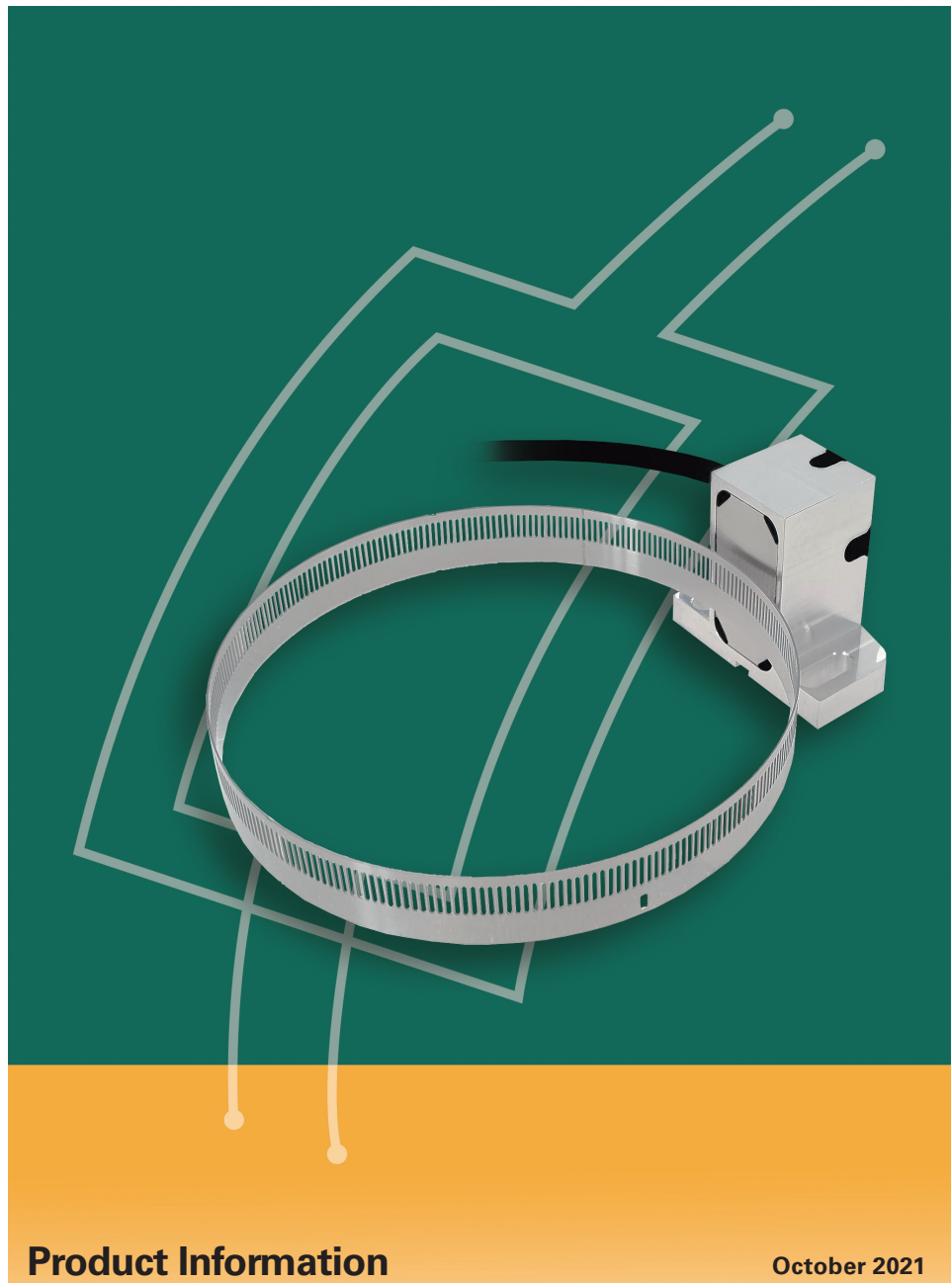


**Rotational speed sensor**  
with implemented capture of  
operating status data



# WMK 3010S – Rotational speed sensor

The WMK 3010S is a rotational speed sensor with implemented capture of operating status data. This sensor is designed for the use in main spindles in milling and turning applications and equipped with an incremental 1Vpp interface

As an inductive modular encoder the WMK 3010S consists a scale tape ring and a scanning head. The design features of the modular encoder assure comparably fast mounting and easy adjustment.



## Features :

- Integrated capture of operating status data
- High robustness due to the inductive scanning principle
- Compact mechanical design
- High maximum speed
- One reading head for all scale tape sizes
- Mechanical fault exclusion for scale tape ring and scanning head

# Operating status data acquisition

The proper mounting and functionality of incremental AMO encoders can be checked by using the STU-60 diagnosis tool together with the AMO-check software.

The rotational speed sensor WMK 3010S supports in addition a capturing of operating status data.

During standard operation of the sensor in the application operating data are captured and stored in a nonvolatile memory.

The STU-60 supports the configuration of essential application specific data as for example speed and temperature range individually during commissioning.

Captured operating status data can be downloaded from the sensor offline. The AMO-Check software offers tables and histograms to visualize the captured operating status data.

The collected data are divided into 3 categories:

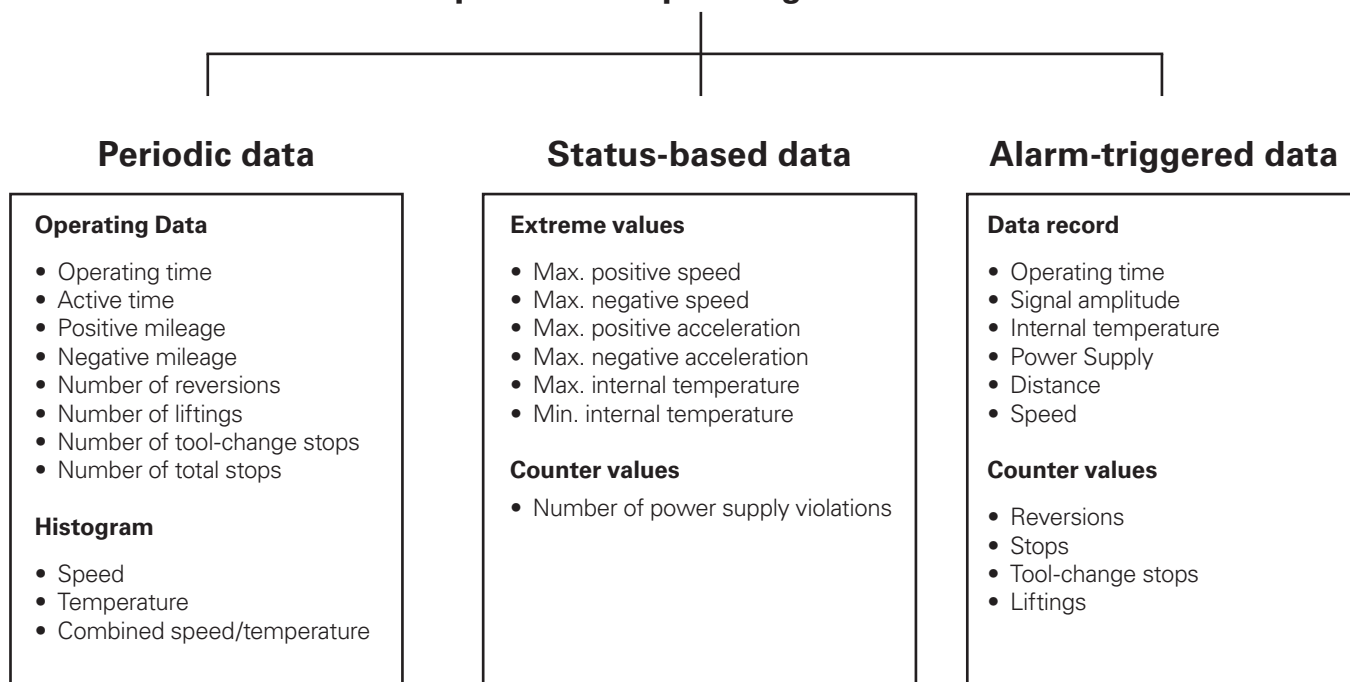
- **Periodic Data**
- **Status-based Data**
- **Alarm-triggered Data**

**Periodic Data** records relevant information about the mileage of the axle during the entire period of use. Histograms are available as an evaluation for the recorded speeds and temperatures. These show the operating hours in relation to speed or temperature ranges and can be configured by the OEM according to the application requirements during commissioning.

**Status-based Data** saves the extreme values of important parameters that occurred over the entire operating time. All stored extreme values are provided with a time stamp.

**Alarm-triggered Data** saves a data record with all essential information when the specified signal amplitude or operating temperature of the speed sensor is exceeded or undershot. The data records are provided with a time stamp.

## Acquisition of operating status data



# Functional Safety

Solution for the position detection on rotary axes for safety-related systems can be offered with the incremental rotational speed sensor WMK 3010S by AMO.

These are scanning heads with a purely analogue output signal 1 Vpp signal period corresponding to a grating period. Corresponding rotational speed sensors are marked with option „FA“ in the order description. These rotational speed sensors can be used for numerous safety functions

of the complete system according to EN 61800-5-2.

AMO provides MTTF values for rotational speed sensors and the annotated table D8 for motion and bearing sensors within the standard EN 61800-5-2 for the safety-related view of the complete system on demand.

In addition to the electrical interface, the mechanical connection of the measuring

encoders to the drive is also relevant to safety.

In the standard for electrical drives EN 61800-5-2, Table D8, the loosening of the mechanical connection between the measuring encoder and the drive is listed as a fault. The fault exclusion against loosening the mechanical connection is required in many cases, because the control can't detect such errors compellingly.

## Mechanical fault exclusion

Based on calculations and internal tests, AMO provides an opportunity for a mechanical fault exclusion for the rotational speed sensor WMK 3010S in combination with the scale tape ring WMR 3010.

In compliance with the specific mounting requirements and conditions of use below a mechanical fault exclusion against loosening of the mounting screws and loosening the scale tape

ring from the carrier flange is available according to EN 61800-5-2, table D8.

## Fault exclusion against loosening of the mounting screws on the scanning head

The scanning head must be mounted at room temperature and the components must be balanced in terms of temperature.

The tightening of the screws must be torque-controlled. Due to the free clamping length of the scanning head WMK 3010S, there is no need for an additional

screw locking device for the screw connection.

	WMK 3010S
<b>Design</b>	40, 41, 42
<b>Mounting screws</b>	
Screws	M4 x 16 BN 1392 12.9
Torque $M_d$	$2,0 \pm 0,2 \text{ Nm}$
Length of thread engagement <sup>1)</sup>	> 13,5mm
<b>Mating stator</b>	
Material	Steel
Elastic limit $R_p 0,2$	$\geq 370 \text{ N/mm}^2$
Surface roughness $R_z$	10 to 40 $\mu\text{m}$
Coefficient of thermal expansion $\alpha$	(10 to 12) $\cdot 10^{-6} \text{ K}^{-1}$
Shock	6ms < 1000 $\text{m/s}^2$ ( EN 600068-2-27)

<sup>1)</sup> There must be a blind hole  $\varnothing 4,3 \times 1 \text{ mm}$  on the stator side at the mounting holes or a countersink with a corresponding depth can be provided.

## Fault exclusion against loosening the measuring ring from the carrier flange

A mechanical fault exclusion for the loosening of the measuring ring from the carrier flange is given, when the carrier flange is designed according to the mechanical requirements specified by AMO for the respective measuring ring type.

The maximum permissible speeds and accelerations for standard measuring ring sizes are listed in the technical parameters.

Carrier flange	
Material	Steel
Elastic limit $R_p 0,2$	$\geq 430\text{N/mm}^2$
Coefficient of thermal expansion $\alpha$	$(10 \text{ to } 12) \cdot 10^{-6} \text{ K}^{-1}$
Shock	$6\text{ms} \leq 1000 \text{ m/s}^2$ (EN 600068-2-27)

The values for the maximum angular acceleration as stated in the technical data of the scale tape ring are based on calculations and test at AMO.

These values includes a 10-fold coefficient of safety.

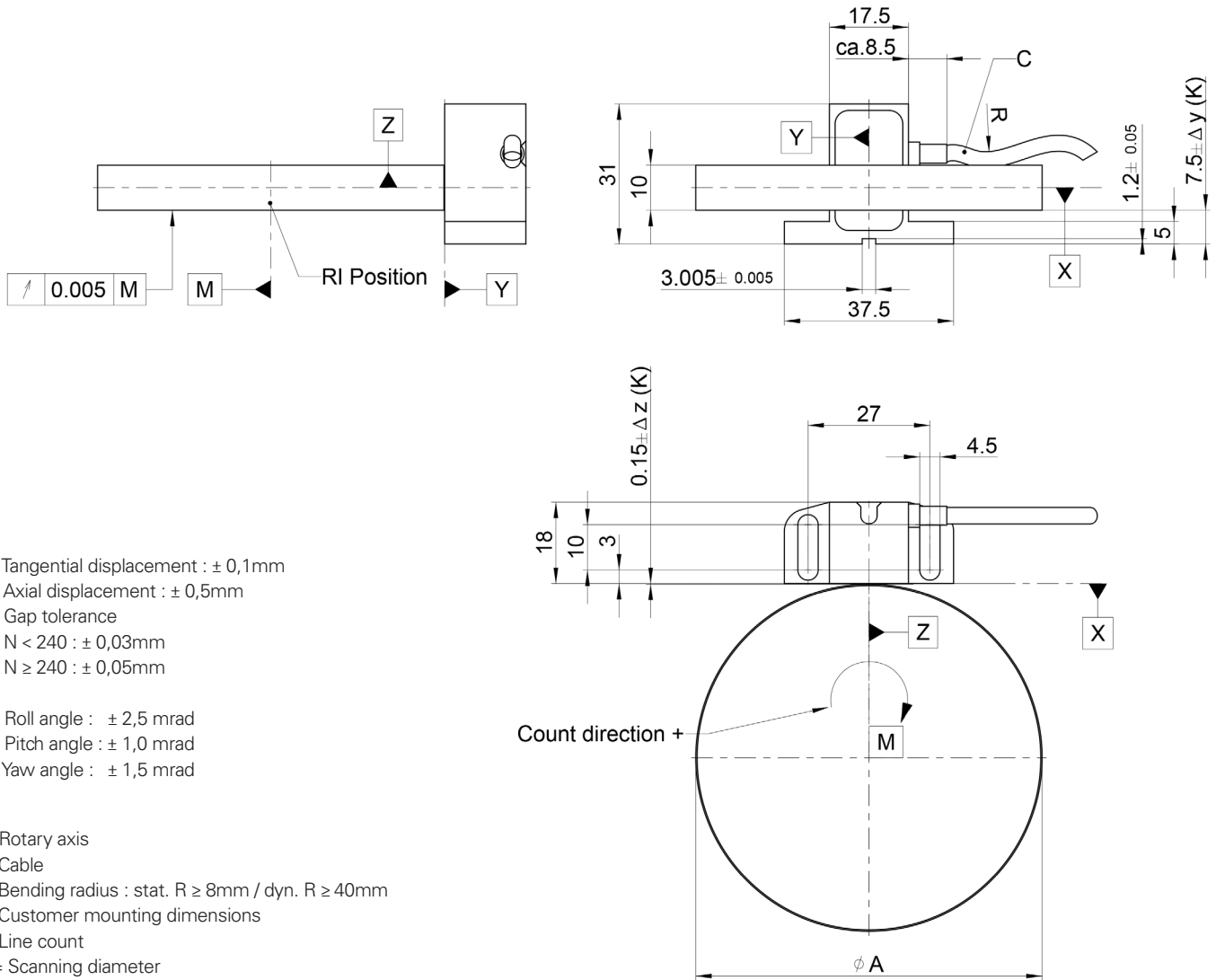
The OEM has the possibility to considerably reduce this coefficient of safety by further analysis and tests.

According to this higher values for the maximum angular acceleration can be achieved.

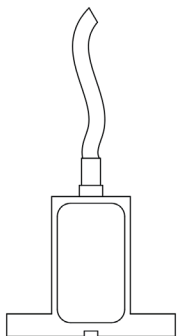
# Series WMK 3010S

- In combination with scale tap ring WMR 3010A
- Grating period 1000 $\mu$ m
- Scanning head with integrated electronics

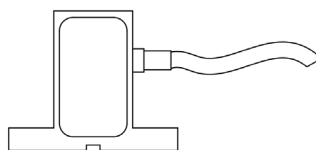
## Design 41



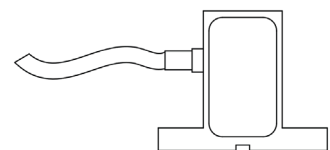
## Available designs



**Design 40**  
Cable outlet top



**Design 41**  
Cable outlet right



**Design 42**  
Cable outlet left

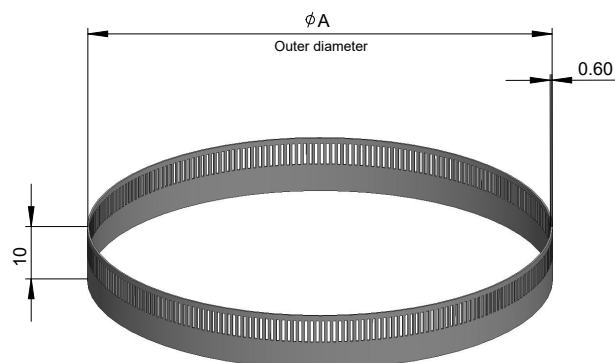
## Technical data

Scanning head WMK 3010S 1000µm						
Interface	1Vpp					
Max. positional deviation within a signal period	± 15µm	± 10µm				
1Vpp signal period						
Signal period multiplication	1000µm to 100µm 1 to 10					
Max. frequency output signal	400kHz					
Electrical connection	free cable end					
Cable length at scanning head	0,50m - 3,00m					
Supply voltage	DC 4,5V to 7,0V					
Power consumption	≤ 1300mW at 5V					
Typ. electricity recording	190mA at 5V (without load)					
Vibration	< 200m/s² for 55 - 2000Hz (EN 60068-2-6)					
Shock	< 2000 m/s² for 6ms (EN 60068-2-27)					
Operating temperature	-10°C to 110°C					
Storage temperature	-20°C to 110°C -20°C to 85°C in original packaging					
Protection	IP67					
Mass approximate	30g					
Line count	192	240	256	360	400	512
Positional deviation within a grating period <sup>1)</sup>	±105"	±55"	±55"	±40"	±35"	±30"
Electrical max. speed [min <sup>-1</sup> ]	≤ 62500	≤ 50000	≤ 47000	≤ 33000	≤ 30000	≤ 23500

<sup>1)</sup>The position error per grating period and the accuracy of the grating result together in the encoder specific error; additional deviations caused by mounting and bearing are not considered in this error.

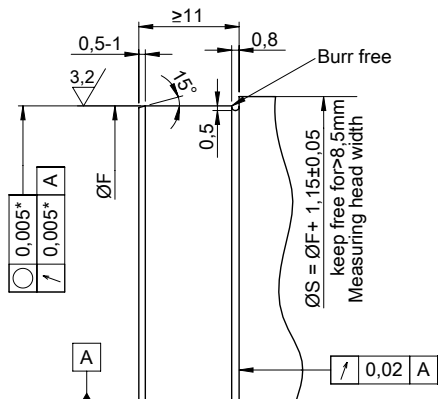
# Incremental scale tape ring for outside scanning WMR 3010A

- Combinable with the scanning head WMK 3010S
- Grating period 1000µm



WMR 3010A

## Mechanical requirements on the carrier flange



Line count	ØF [mm]
192	60,28 ±0,01
240	75,55 ±0,01
256	80,65 ±0,01
360	113,82 ±0,01
400	126,55 ±0,01
512	162,24 ±0,02

\*) Recommended eccentricity: Higher values affect the positioning accuracy proportionally.

## Technical data

Scale tape ring 1000µm	WMR 3010A					
Line count	192	240	256	360	400	512
Reference mark	Single					
Grating period accuracy <sup>1)</sup>						
± 15µm arc length	±105″	±85″	±80″	±55″	±50″	±40″
Outside ring diameter [mm]	61,48	76,75	81,85	115,02	127,75	163,44
Mech. speed [min <sup>-1</sup> ] <sup>2)</sup>	62500	50000	47000	33000	30000	23500
Max. angle acceleration [Krad/s <sup>2</sup> ] <sup>2)</sup>	150	50	45	25	18	13

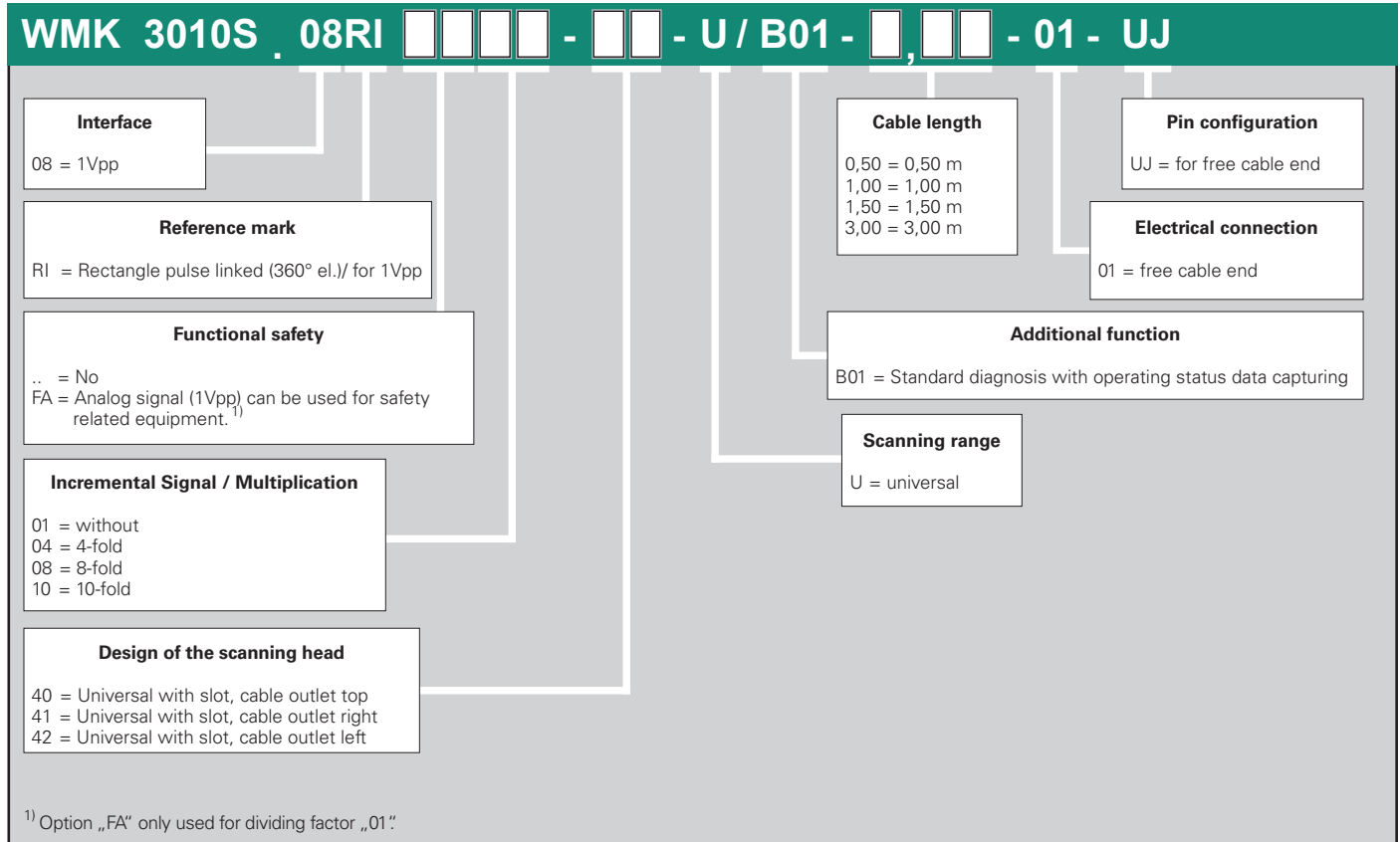
<sup>1)</sup> The position error per grating period and the accuracy of the grating result together in the encoder specific error; additional deviations caused by mounting and bearing are not considered in this error.

<sup>2)</sup> Values should be considered to ensure a mechanical fault exclusion.



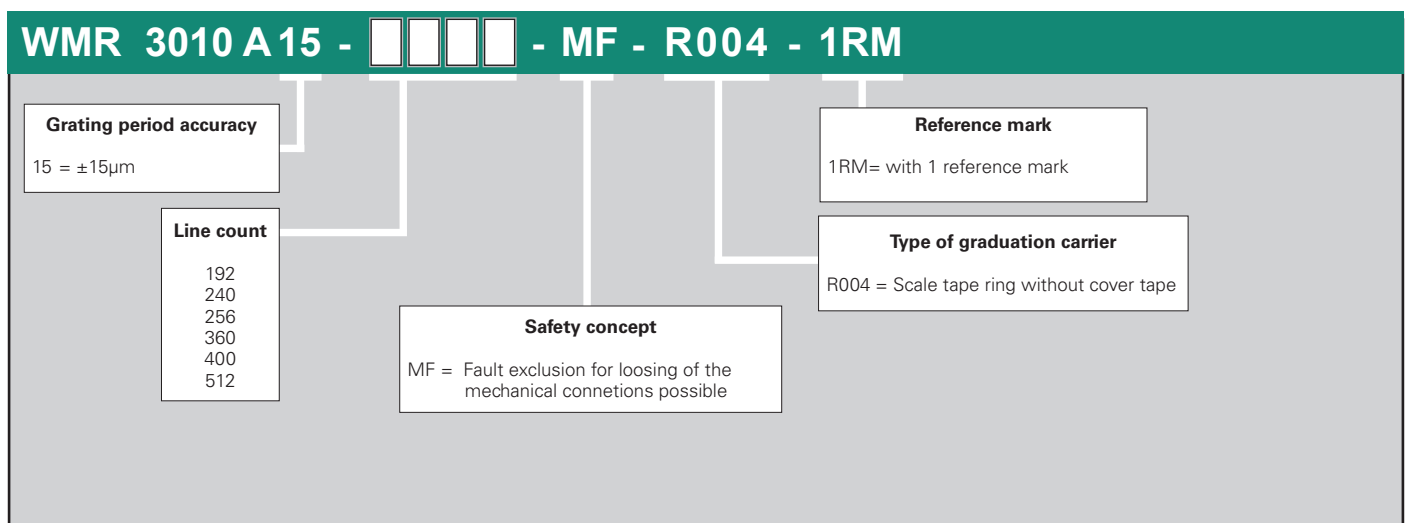
## Ordering code

- WMK 3010S - Scanning head for incremental rotational speed sensor
- Grating period 1000µm



## Ordering code

- WMR 3010 scale tape ring for incremental rotational speed sensor
- Grating period 1000µm



# General electrical information

## Supply voltage

Connect AMO-Encoders only to subsequent electronics whose supply voltage comes from PELV systems (for a definition, see EN 50178).

AMO-Encoders meet the requirements of the IEC 61010-1 standard if power is supplied from a secondary circuit with limited energy as per IEC 61010-1<sup>3rd Ed.</sup>, Section 9.4, or with limited power as per IEC 62368-1<sup>2nd Ed.</sup>, Section 6.2.2.5 PS2, or from a Class 2 secondary circuit as per UL1310.1)

A stabilized DC voltage  $U_P$  is required for powering the encoders. Information on voltage and current consumption or power consumption can be obtained from the respective specifications.

Regarding the ripple voltage of the DC power, the following parameters apply:

- High-frequency interference  
 $U_{PP} < 250 \text{ mV}$  with  $dU/dt > 5 \text{ V}/\mu\text{s}$
- Low-frequency fundamental ripple  
 $U_{PP} < 100 \text{ mV}$

However, the limits of the supply voltage must not be violated by the ripple content.

The required supply voltage depends on the encoder interface. A distinction is made between encoders without an extended supply voltage range (e.g., DC  $5.0 \text{ V} \pm 0.25 \text{ V}$ ) and those with an extended supply voltage range (e.g., DC  $3.6 \text{ V}$  to  $14 \text{ V}$ ).

<sup>1)</sup> In place of IEC 61010-1<sup>3rd Ed.</sup>, Section 9.4, the corresponding sections of the following standards can be used: DIN EN 61010-1, EN 61010-1, UL 61010-1, and CAN/CSA-C22.2 No. 61010-1. In place of IEC 62368-1<sup>2nd Ed.</sup>, Section 6.2.2.5 PS2, the corresponding sections of the following standards can be used: DIN EN 62368-1, EN 62368-1, UL 62368-1, and CAN/CSA-C22.2 No. 62368-1.

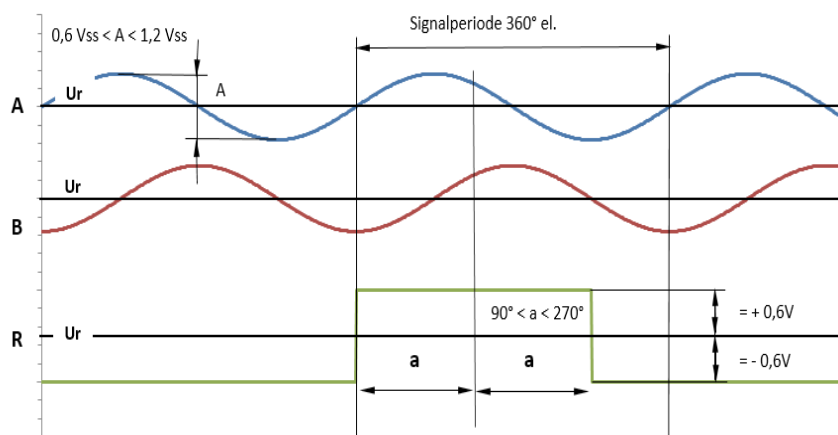
## Interface

### Incremental signals $\sim 1 \text{ V}_{pp}$

AMO-Measuring systems with  $\sim 1 \text{ V}_{PP}$ -Interface are outputting signals which can be highly interpolated.

The sine shaped incremental signals A and B are electrically  $90^\circ$  phase shifted and have a signal strength from  $1 \text{ V}_{pp}$ . The showed sequence of the outputet signals - B after A - is valid for the in the connection drawing stated movement direction.

The reference mark signal R has a clear assignment to the incremental signals.



## Pin configuration

**Electrical connection:** 01 (free cable end)



	Power supply				Incremental signals						Other signals	
	$U_P$	Sensor $U_P$	0V	Sensor 0V	A+	A-	B+	B-	R+	R-	Diag+	Diag-
	brown/green	blue	white/green	white	brown	green	grey	pink	red	black	violet	yellow

**Cable Shield** is connected with the housing;  $U_P$  = Power supply voltage

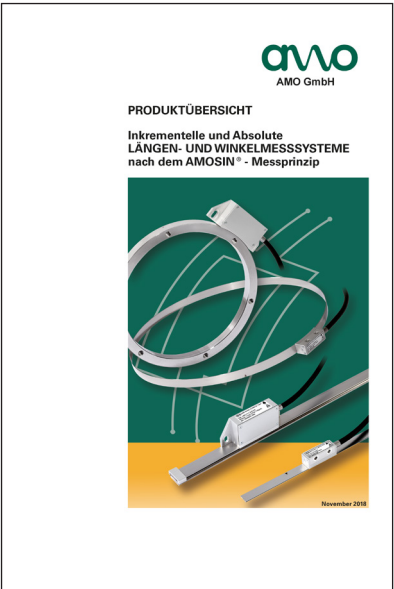
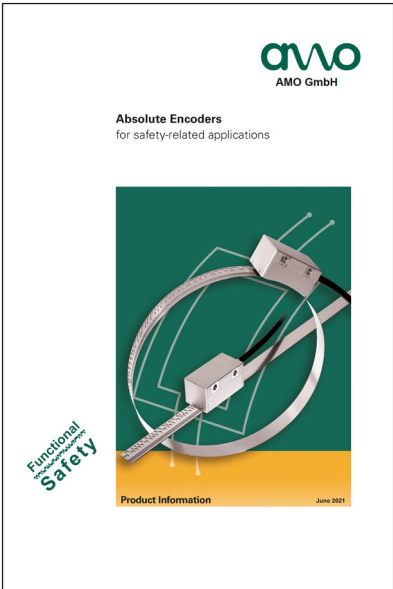
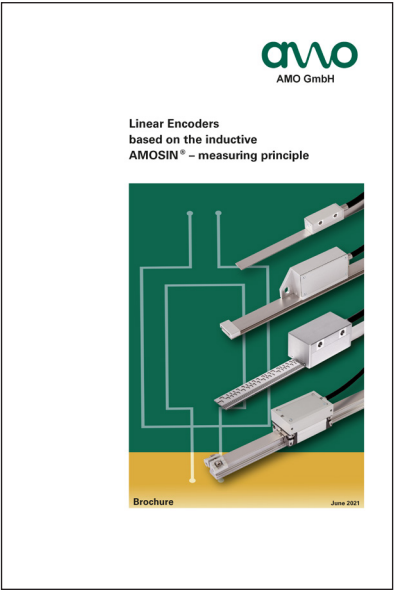
**Sensor:** The sensor wire is connected internally with the corresponding power supply.

Non-used pins or wires must not be assigned!

DIAG-wires must not be assigned.

DIAG-signals are for checking the encoder with AMO-STU-60.

# Other brochures



## AMO Automatisierung Messtechnik Optik GmbH

Nöfing 4  
A-4963 St. Peter am Hart  
Austria  
☎ +43 7722 658 56-0  
☎ +43 7722 658 56-11  
E-Mail: office@amo.at



For complete and further addresses see [www.amo-gmbh.com](http://www.amo-gmbh.com)

### DE HEIDENHAIN Vertrieb Deutschland

83301 Traunreut, Deutschland  
☎ 08669 31-3132  
☎ 08669 32-3132  
E-Mail: hd@heidenhain.de

### HEIDENHAIN Technisches Büro Nord

12681 Berlin, Deutschland  
☎ 030 54705-240

### HEIDENHAIN Technisches Büro Mitte

07751 Jena, Deutschland  
☎ 03641 4728-250

### HEIDENHAIN Technisches Büro West

44379 Dortmund, Deutschland  
☎ 0231 618083-0

### HEIDENHAIN Technisches Büro Südwest

70771 Leinfelden-Echterdingen, Deutschland  
☎ 0711 993395-0

### HEIDENHAIN Technisches Büro Südost

83301 Traunreut, Deutschland  
☎ 08669 31-1345

### AT HEIDENHAIN Techn. Büro Österreich

83301 Traunreut, Germany  
[www.heidenhain.de](http://www.heidenhain.de)

### BE HEIDENHAIN NV/SA

1760 Roosdaal, Belgium  
[www.heidenhain.be](http://www.heidenhain.be)

### CH HEIDENHAIN (SCHWEIZ) AG

8603 Schwerzenbach, Switzerland  
[www.heidenhain.ch](http://www.heidenhain.ch)

### CN DR. JOHANNES HEIDENHAIN (CHINA) Co., Ltd.

Beijing 101312, China  
[www.heidenhain.com.cn](http://www.heidenhain.com.cn)

### CZ HEIDENHAIN s.r.o.

102 00 Praha 10, Czech Republic  
[www.heidenhain.cz](http://www.heidenhain.cz)

### FI HEIDENHAIN Scandinavia AB

01740 Vantaa, Finland  
[www.heidenhain.fi](http://www.heidenhain.fi)

### FR HEIDENHAIN FRANCE sarl

92310 Sèvres, France  
[www.heidenhain.fr](http://www.heidenhain.fr)

### GB HEIDENHAIN (G.B.) Limited

Burgess Hill RH15 9RD, United Kingdom  
[www.heidenhain.co.uk](http://www.heidenhain.co.uk)

### HU HEIDENHAIN Kereskedelmi Képviselet

1239 Budapest, Hungary  
[www.heidenhain.hu](http://www.heidenhain.hu)

### IT HEIDENHAIN ITALIANA S.r.l.

20128 Milano, Italy  
[www.heidenhain.it](http://www.heidenhain.it)

### JP HEIDENHAIN K.K.

Tokyo 102-0083, Japan  
[www.heidenhain.co.jp](http://www.heidenhain.co.jp)

### KR HEIDENHAIN Korea LTD.

Anyang-si, Gyeonggi-do, Korea 14087  
[www.heidenhain.co.kr](http://www.heidenhain.co.kr)

### NL HEIDENHAIN NEDERLAND B.V.

6716 BM Ede, Netherlands  
[www.heidenhain.nl](http://www.heidenhain.nl)

### NO HEIDENHAIN Scandinavia AB

7300 Orkanger, Norway  
[www.heidenhain.no](http://www.heidenhain.no)

### RO HEIDENHAIN Reprezentantă Romania

Braşov, 500407, Romania  
[www.heidenhain.ro](http://www.heidenhain.ro)

### SE HEIDENHAIN Scandinavia AB

12739 Skärholmen, Sweden  
[www.heidenhain.se](http://www.heidenhain.se)

### SG HEIDENHAIN PACIFIC PTE LTD

Singapore 408593  
[www.heidenhain.com.sg](http://www.heidenhain.com.sg)

### TH HEIDENHAIN (THAILAND) LTD

Bangkok 10250, Thailand  
[www.heidenhain.co.th](http://www.heidenhain.co.th)

### TW HEIDENHAIN Co., Ltd.

Taichung 40768, Taiwan R.O.C.  
[www.heidenhain.com.tw](http://www.heidenhain.com.tw)

### US HEIDENHAIN CORPORATION

Schaumburg, IL 60173-5337, USA  
[www.heidenhain.us](http://www.heidenhain.us)

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This brochure supersedes all previous editions, which thereby become invalid.

Standards (ISO, EN, etc.) apply only where explicitly stated in the catalog.

The basis for ordering from AMO is always the brochure edition valid when the order is made.