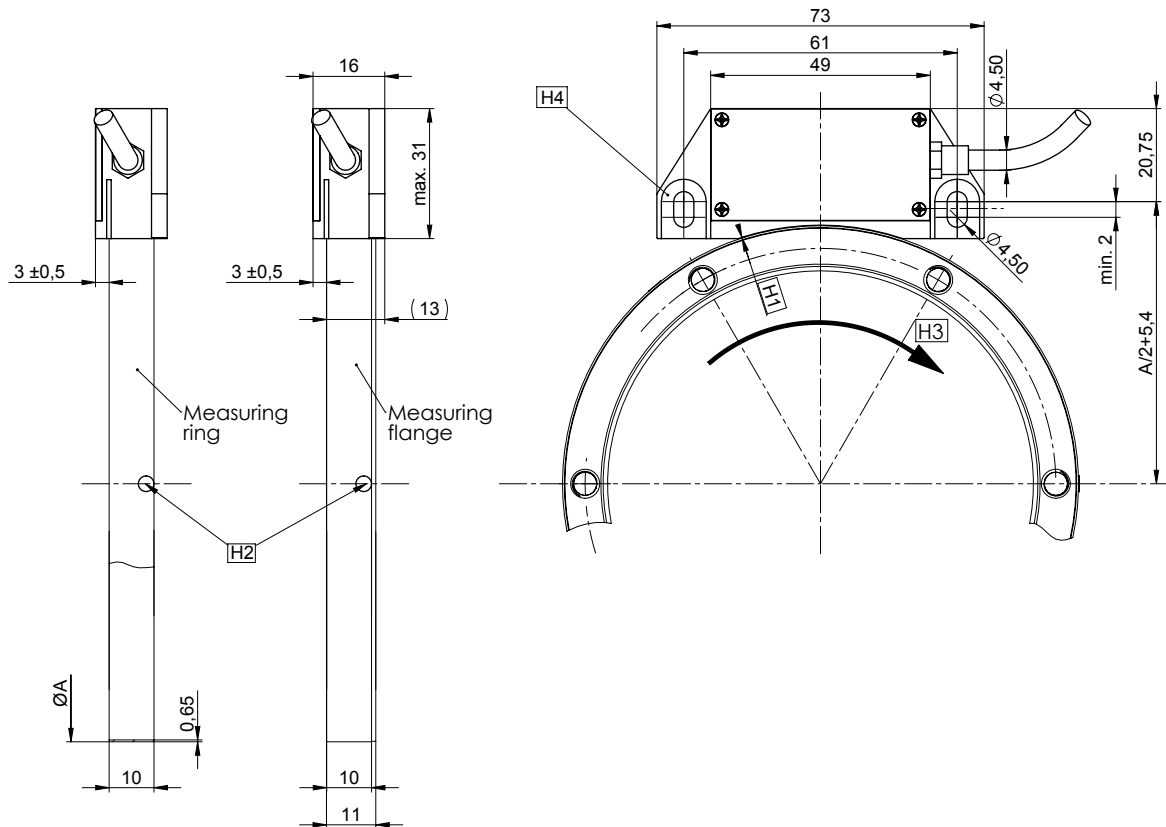


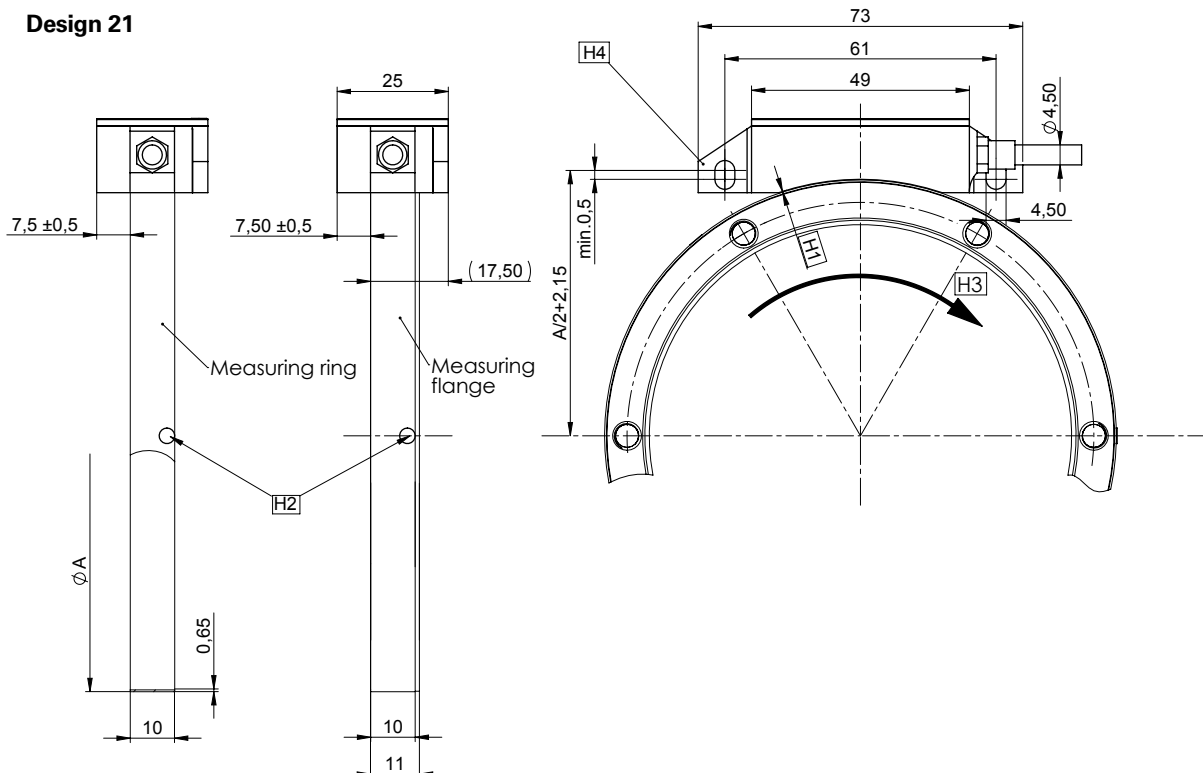
# WMK 2010 series

- Composed of WMK 2010 and scale tape ring on flange or scale tape ring
- Grating period 1000µm
- Scanning head with integrated electronic

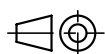
## Design 20



## Design 21



Tolerance principle in accordance with ISO 8015  
 General tolerances in accordance with ISO 2768-fH  
 All dimensions in mm

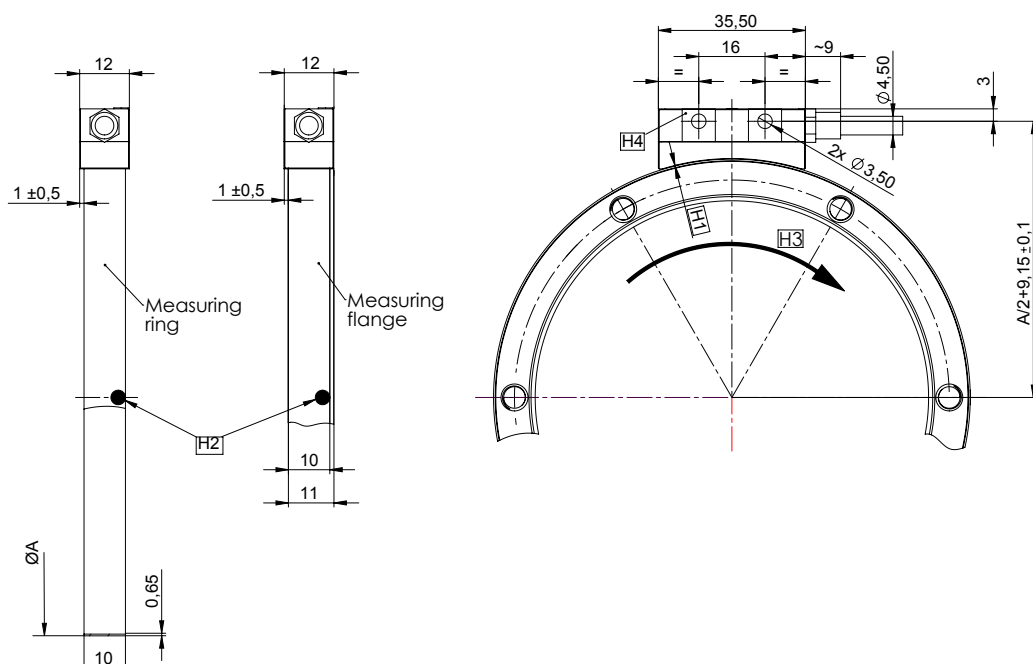


H1 = Air gap 0,15 ± 0,10mm, set with spacer foil  
 H2 = Reference track marking  
 H3 = Direction of shaft rotation for positive counting  
 H4 = Ground plane

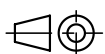
# WMK 1010 series

- Composed of WMK 1010 and scale tape ring on flange or scale tape ring
- Grating period 1000µm
- Scanning head with external electronic

## Design 10 or 12



Tolerance principle in accordance with ISO 8015  
 General tolerances in accordance with ISO 2768-fH  
 All dimensions in mm

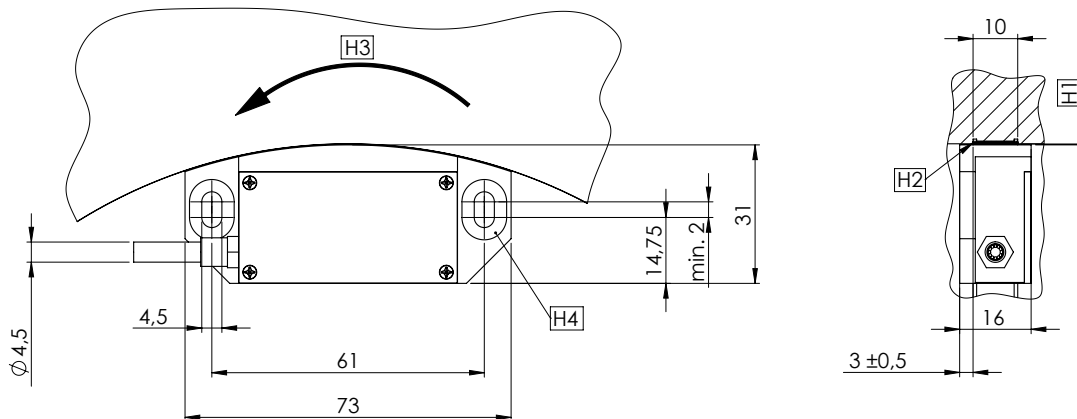


H1 = Air gap 0,15 ± 0,10mm, set with spacer foil  
 H2 = Reference track marking  
 H3 = Direction of shaft rotation for positive counting  
 H4 = Ground plane (both sides)

## WMK 2110 series

- Composed of WMKA 2110 and scale tape ring
- Grating period 1000µm
- Scanning head with external electronic

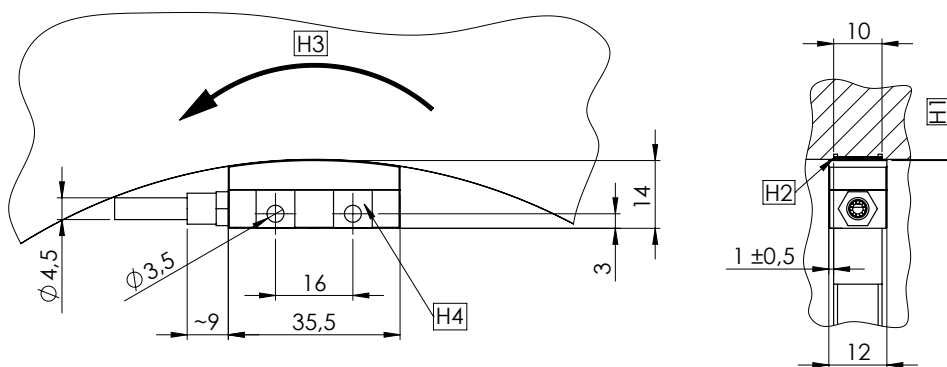
Design 20



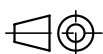
## WMK 1110 series

- Composed of WMKA 1110 and scale tape ring
- Grating period 1000µm
- Scanning head with external electronic

Design 10 or 12



Tolerance principle in accordance with ISO 8015  
 General tolerances in accordance with ISO 2768-fH  
 All dimensions in mm



H1 = Air gap 0,15 ± 0,10mm, set with spacer foil  
 H2 = Reference track marking  
 H3 = Direction of shaft rotation for positive counting  
 H4 = Ground plane

## Technical data

Scanning head 1000µm		WMK 2010./WMK 1010 WMK 2110/WMK 1110								
Performance	Standard					High Accuracy				
Interface	1Vpp		TTL			1Vpp		TTL		
Position error per grating period	± 2µm					± 0,5µm				
TTL - interpolation/ 1Vpp signal period										
Signal period <sup>1)</sup> Interpolation	- -		250µm to 1µm			- -		0,5µm or 0,1µm 500 or 2500		
Signal period Dividing factor	1000µm to 31,25µm 1 to 32		- -			31,25µm or 20µm 32 or 50		- -		
Max. output frequency	400kHz		5MHz			400kHz		5MHz		
Elektrical connection	Cable with M23 coupling 12pin male									
Cable lenght on the scanning head	0,50m - 6,00m									
Power supply	1Vss: DC 4,0V to 7,0V TTL: DC 5,0V +/- 0,5V									
Power consumption	Design 20, 21: ≤ 1300mW at 5V Design 10, 12: ≤ 1500mW at 5V									
Typ. current consumption	Design 20, 21: ≤ 220mA at 5V (without load) Design 10, 12: ≤ 240mA at 5V (without load)									
Vibration	< 200m/s² for 55 - 2000Hz									
Schock	< 2000 m/s² for 6ms									
Operating temperatur range	-10°C to 100°C									
Storage temperature range	-20°C to 100°C									
Protection	IP67									
Weight	38g Design 20, 21 / 10g Design 10, 12									
Line count	256 <sup>2)</sup>	360 <sup>2)</sup>	512	720	900	1024	1440	1800	2048	
Position error per grating period <sup>3)</sup>										
	±11"	±7,5"	±5,5"	±4,0"	±3,0"	±3,0"	±2,0"	±2,0"	±1,5"	
	±3,0"	±2,0"	±1,5"	±1,0"	±1,0"	±1,0"	±0,5"	±0,5"	±0,5"	
Electrical max. speed [min <sup>-1</sup> ]										
Standard	≤ 23430	≤ 16660	≤ 11710	≤ 8330	≤ 6660	≤ 5850	≤ 4160	≤ 3330	≤ 2920	
High Accuracy	≤ 4680	≤ 3330	≤ 2340	≤ 1660	≤ 1330	≤ 1170	≤ 830	≤ 660	≤ 580	

<sup>1)</sup> after 4-edge-evaluation

<sup>2)</sup> Not for inside scanning

<sup>3)</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.

- WMK - scanning head for incremental angle encoder
- Grating period 1000 $\mu$ m

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		1Vpp		TTL	
		S	HA	S	HA
01	1-fold	x		x	
04	4-fold	x		x	
05	5-fold			x	
08	8-fold	x		x	
10	10-fold	x		x	
16	16-fold	x		x	
20	20-fold			x	
25	25-fold	x		x	
32	32-fold		x	x	
50	50-fold		x	x	
A3	250-fold			x	
A4	500-fold				x
A9	2500fold				x

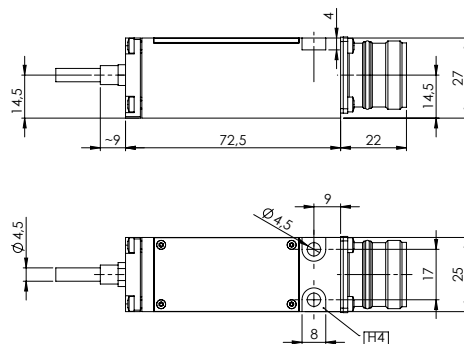
3) Option „FA“ only used for dividing factor „01 “

# External electronics

- General information
- Dimensions

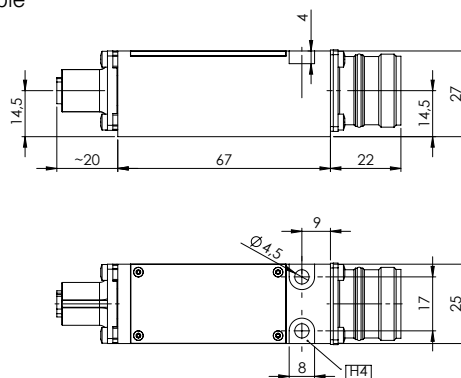
## Design 10

- Miniaturized scanning head
- with external electronics on the cable
- Output: Flange socket M23



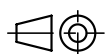
## Design 12

- Miniaturized scanning head
- with external electronics, pluggable on cable via M12 connector
- Output: Flange socket M23



Tolerance principle in accordance with ISO 8015  
 General tolerances in accordance with ISO 2768-fH  
 All dimensions in mm

H4= Mounting surface



# Interfaces

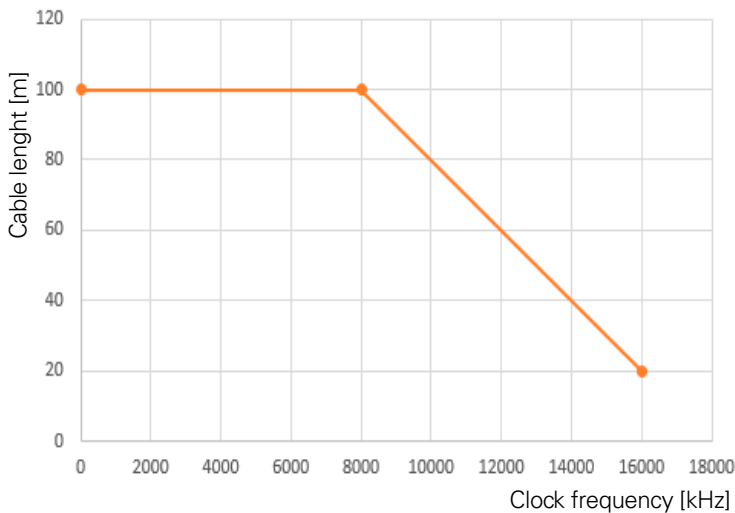
## Position values

The EnDat-Interface is a digital, bi-directional Interface for measuring systems. With this interface you can read out position values and in the measuring system saved informations. This value can also be updated or new values can be saved. Due to the serial data transfer four signal wires are enough. The data DATA gets transferred synchronously to the form the subsequent electronics given clock frequency CLOCK. The selection from the mode of transmission (position values, parameter, diagnostics,...) is done with mode-commands which are sent from the subsequent electronics to the measuring system.



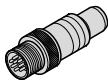


The clock frequency is variable - depending on the cable length (max. 100m). With propagation electronics, either clock frequencies up to 16MHz are possible or cable length up to 100m. For EnDat encoders the maximum clock frequency is stored in the encoder memory. Propagation-delay compensation is provided for EnDat22.

Transmission frequencies up to 16MHz in combination with large cable length place high technological demands in the cable. Greater cable lengths can be realized with an adapter cable no longer than 6m and an extension cable. As a rule, the entire transmission path must be designed for the respective clock frequency.

Order code	Instruction set	Incremental signals
EnDat22	EnDat 2.2	Without



### Pin configuration

<b>Electrical connection:</b> 1SS08 <b>8-pin coupling M12</b> <div></div>								
	Power supply				Absolute position values			
	8	2	5	1	3	4	7	6
	U <sub>P</sub>	Sensor U <sub>P</sub>	0V	Sensor 0V	DATA+	DATA-	CLOCK+	CLOCK-
	brown/green	blue	white/green	white	grey	pink	violet	yellow

**Cable Shield** is connected with the housing; **U<sub>P</sub>** = Power supply voltage  
**Sensor:** The sensor wire is connected internally with the corresponding power supply.  
Non-used pins or wires must not be assigned!

# Interfaces

## Pin layouts Fanuc, Mitsubishi and BiSS/C<sup>®</sup>

### Fanuc

AMO measuring systems with Fanuc Interface are for connection to a Fanuc-Control.

#### Fanuc Serial Interface - $\alpha$ interface

Order code: Fanuc02  
normal and high speed,  
two-pair transmission.

### BiSS/C

AMO measuring systems with BiSS/C<sup>®</sup> Interface are for connection to controls which have the BiSS/C Interface implemented.

#### BiSS/C bidirectional protocol

Order code: BiSS  
The Standard Encoder Profile - 32bit will be in use.



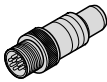


### Mitsubishi

AMO measuring systems with Mitsubishi Interface are for connection to a Mitsubishi-Control.

#### Mitsubishi high speed interface

Order code: MitA1-2 (full duplex)  $\rightarrow$  one pair transmission  
Order code: MitA1-4 (duplex)  $\rightarrow$  two pair transmission

### Pin configuration

<b>Electrical connection: 1SS08</b> <b>8-pin coupling M12</b> <div></div>								
	Power supply				Absolute position values			
	<b>8</b>	<b>2</b>	<b>5</b>	<b>1</b>	<b>3</b>	<b>4</b>	<b>7</b>	<b>6</b>
	<b>Up</b>	<b>Sensor</b> Up	<b>0V</b>	<b>Sensor</b> 0V	<b>DATA+</b>	<b>DATA-</b>	<b>CLOCK+</b>	<b>CLOCK-</b>
	brown/green	blue	white/green	white	grey	pink	violet	yellow

**Cable Shield** is connected with the housing; **Up** = Power supply voltage  
**Sensor:** The sensor wire is connected internally with the corresponding power supply.  
Non-used pins or wires must not be assigned!



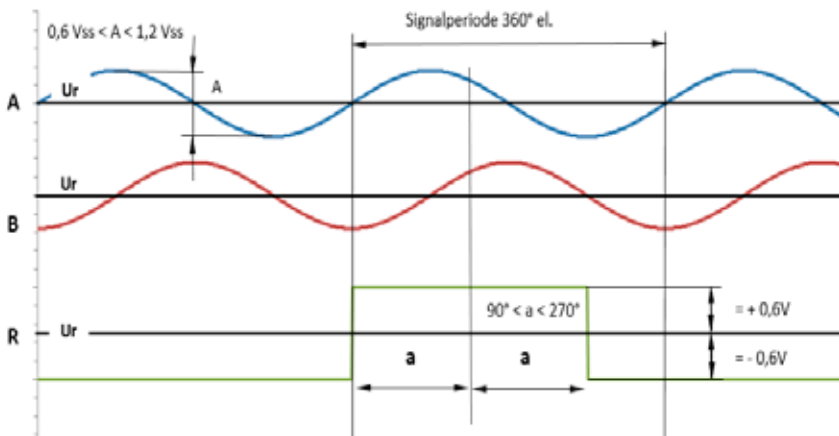
# Interface

Incremental signals  $\sim 1 V_{pp}$


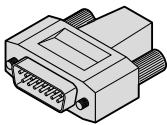
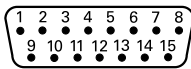

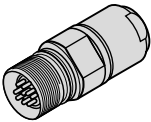
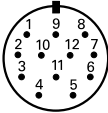

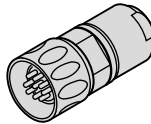
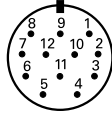



AMO-Measuring systems with  $\sim 1 V_{pp}$ -Interface are outputing signals which can be highly interpolated.

The sine shaped incremental signals A and B are electrically 90° phase shifted and have a signal strenght from 1Vpp. 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 as-ignment to the incremental signals.



## Pin configuration

<b>Electrical connection: 16S15</b> <b>15-pin Sub-D-connector</b>   													
<b>Electrical connection: 03S12</b> <b>12-pin coupling M23</b>   							<b>Electrical connection: 02S12</b> <b>12-pin connector M23</b>   						
	Power supply				Incremental signals						Other signals		
	4	12	2	10	1	9	3	11	14	7	5/15	8	6
	12	2	10	11	5	6	8	1	3	4	/	7	9
	<b>U<sub>P</sub></b>	<b>Sensor U<sub>P</sub></b>	<b>0 V</b>	<b>Sensor 0 V</b>	<b>A+</b>	<b>A–</b>	<b>B+</b>	<b>B–</b>	<b>R+</b>	<b>R–</b>	<b>frei</b>	<b>Diag+</b>	<b>Diag–</b>
	brown/ green	blue	white/ green	white	brown	green	grey	pink	red	black	/	violet	yellow

**Cable Shield** is connected with the housing; **U<sub>P</sub>** = 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.

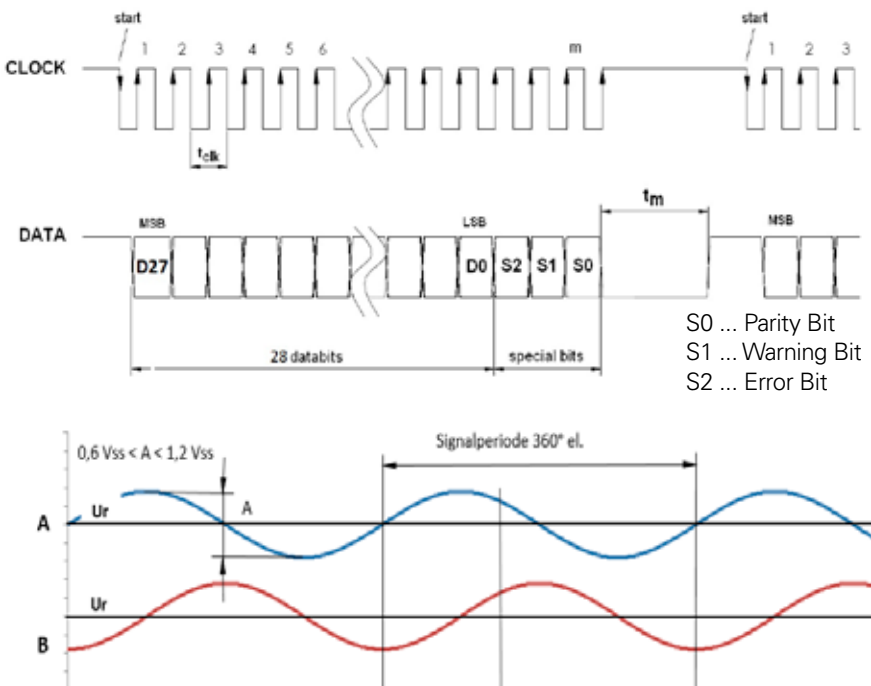
# Interfaces

SSI +  $\sim 1V_{pp}$

SSI Interface is an unidirectional Interface which can output position values.  
 The Data DAATA gets transferred synchronously to the from the subsequent electro- nic given Clock frequency CLOCK.  
 Additionally three special bits (Error, War- ning and Parity) will be transferred

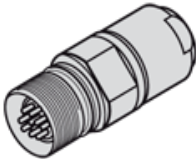

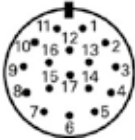


AMO-Measuring systems with  $\sim 1 V_{pp}$ - Interface are outputting signals which can be highly interpolated.

The sine shaped incremental signals A and B are electrically 90° phase shifted and have a signal - B after A - is valid for the in the connection drawing stated movement direction.



S0 ... Parity Bit  
 S1 ... Warning Bit  
 S2 ... Error Bit


## Pin configuration

<b>Electrical connection: 03S17</b> <b>17-pin coupling M23</b>   												
	Power supply				Increment signals				Absolut position value			
	7	1	10	4	15	16	12	13	14	17	8	9
	U <sub>P</sub>	Sensor U <sub>P</sub>	0V	Sensor 0V	A+	A-	B+	B-	DATA+	DATA-	CLOCK+	CLOCK-
	brown/ green	blue	white/ green	white	brown	green	grey	pink	red	black	violet	yellow

**Cable Shield** is connected with the housing; **U<sub>P</sub>** = Power supply voltage  
**Sensor:** The sensor wire is connected internally with the corresponding power supply.  
 Non-used pins or wires must not be assigned!

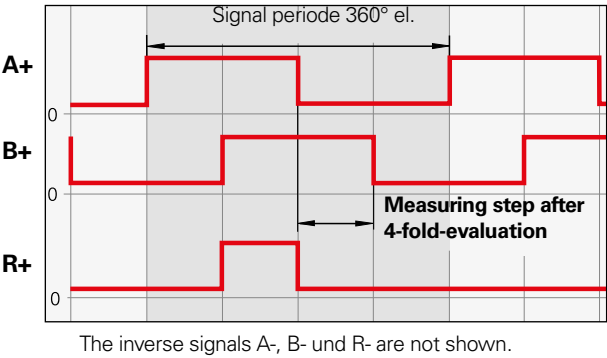
# Interface

## Incremental signals TTL

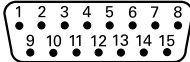
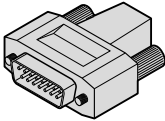

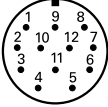
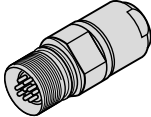

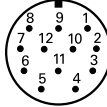
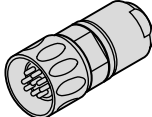




AMO-measuring with  TTL Interface contain electronic, which form the since-form signals - with or without- Interpolation into digital signals.

The incremental signals are outputed as rectangle pulses A+ and B + with 90° el. phase shifting.  
The rectandle-mark-signal is composed from one or more reference impulses R+, which are assigned with the incremental si-gnals:  
The integrated electronic additionally crea-tes the inverse signals A-, B- and R- for a safe transmission.  
The showed sequence of the outputed sig-nals - B after A - is valid for the in the con-nection drawing stated movement direc-tion.

The measuring step results throught the di-stance between two flanks frim the incre-mental signals A+ and B+ throught 1-fold, 2-fold or 4-fold evaluation.



### Pin configuration

<b>Electrical connection: 16S15</b> <b>15-pin Sub-D-connector</b> <div></div>													
<b>Electrical connection: 03S12</b> <b>12-pin coupling M23</b> <div></div>							<b>Electrical connection: 02S12</b> <b>12-pin connector M23</b> <div></div>						
	Power supply				Incremental signals						Other signals		
	4	12	2	10	1	9	3	11	14	7	5/15	8	6
	12	2	10	11	5	6	8	1	3	4	/	7	9
	Up	Sensor Up	0V	Sensor 0V	A+	A-	B+	B-	R+	R-	Free	Diag+	Diag-
	brown/ green	blue	white/ green	white	brown	green	grey	pink	red	black	/	violet	yellow

**Cable Shield** is connected with the housing; **Up** = 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 me assigned!  
DIAG-signals are for checking the encoder with AMO-STU-60

# Cable

- Technical Data

	cable for incremental measuring systems and SSI+1Vpp	cable for measuring systems with pure serial interfaces
Jacket	PUR, high flexible, suitable for energy chains	
Diameter	4,5 +/-0,1mm	
Wires	6x2x0,09mm <sup>2</sup>	1x(4*0,09mm <sup>2</sup> ) + 4x0,14mm <sup>2</sup>
Bending radius	≥ 10mm for single bending	
	≥ 50mm for continuous bending	
Max. length	6m	
Resistance according to	UL according to Style 20963 80°C 30V	