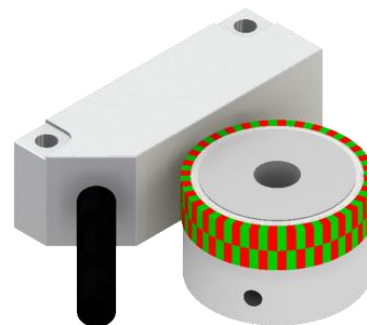


# Datasheet

- singleturn Sensor
- magnetic sensing
- 2port output (absolute + incremental simultaneously)
- Interface: SSI (synchron serial interface)  
 BiSS ® (Bidirectional serial synchron)  
 SPI (serial peripheral interface)  
 ABI (incremental interface)  
 UVW (commutation signals)  
 Sin/ cos (analogue interface)
- High protection class
- Small size
- Operating temperature: -20°C to +85°C
- Compliant EU-directive 2011/65/EU (RoHS)



The WMSA25 is a high-resolution, multi-functional encoder. He offers a variety of common encoder interfaces. The WMSA25 generates simultaneously positon data as well as speed data. Thus, the encoder is ideal for positioning and rotation speed control.

The WMSA25 is based on radial Hall sensing of a 2 track magnetic wheel by using the nonius principle. The sensing is done differentially and offers the advantage that homogenous magnetic fields are effectively suppressed. This is the reason why static fields don't have a significant influence on output signals.

### Applications

- Motor feedback
- BLDC motor commutation
- Hollow shaft
- Multi-axis measurement systems

### Mechanical Data

Dimension		
Magnet Wheel Outer Diameter	24,5 mm	±0,1 mm
Shaft Diameter*	6; 8; 10; 12; 16 mm	H7
Cable Diameter	7,1 mm	
Material		
Cable	LiYCY shielded, twisted-pair; flame retardant to VDE 0482	
Total weight	30 g	
Permissible		
Radial Displacement	±0,1 mm	
Axial Displacement	±0,3 mm	
Tangential Displacement	±0,2 mm	
Eccentricity	±0,05 mm	
Sensor to Magnet Wheel Distance	0,25 mm	±0,05 mm
Moment of Inertia of the Magnet Wheel	20 gmm <sup>2</sup>	±1 gmm <sup>2</sup>
Mounting Screw Size	M3 x16	
Tightening Torque of the Screws	25 Ncm	-5 Ncm
Revolution Speed	12.000 rpm	
Operating Temperature	-20°C to 85 °C	
Storage Temperature	-40°C to 85°C	
IP-Rating (DIN 40500)	IP65	

\*further variation on request

# Datasheet

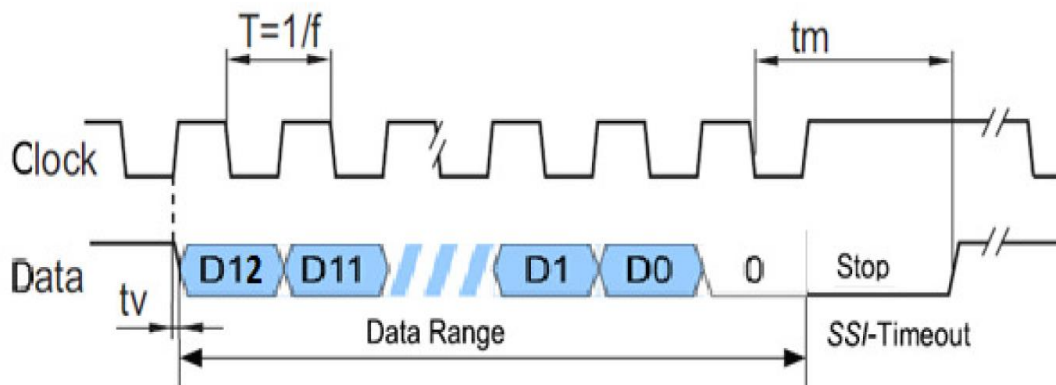
## Electrical Data

Parameter		
Supply Voltage	4,75 - 5,25 V DC 7,75 - 30 V DC	(5 V DC) (8-30 VDC)
Power Supply	30 to 80 mA	(no load)
Reverse Polarity Protection	-36 to 0 VDC	
Start-Up Time	20 ms	
ESD voltage	2 kV	(discharged over 1,5 k $\Omega$ )
SSI / BiSS / SPI (up to 18 Bit)		
Clock Frequency	80 to 5.000 kHz	
Scan Ratio of T	40 to 60%	
Time Lag	150 ns	
Monoflop Time	20 + T/2 $\mu$ s	
Rise Time	3 to 25 ns	
Fall Time	(RL = 50 $\Omega$ , CL = 100pF)	
ABI (up to 65.536 cpr) / UVW (up to 16 pole pairs)		
Output voltage	High 2 to 5,25 VDC Low <0,8 VDC	RL = 50 $\Omega$
Input voltage	High 2 to 5,25 VDC Low <0,8 VDC	
Output current per channel	-1 to 20 mA (overload protection)	
Sin / Cos (up to 64 periods)		
Output driver current	-1 to 1 mA	
Analogy amplitude	0,9 to 1,2 V (with diff. evaluation)	
Analogy offset	2,3 to 2,6 V	
System		
Relative angular accuracy	$\pm 0,02^\circ$	depend on mechanic
Absolute angular accuracy	$\pm 0,1^\circ$	

ESD Warning: Normal handling precautions should be taken to avoid static discharge damage to the sensor

## Interface

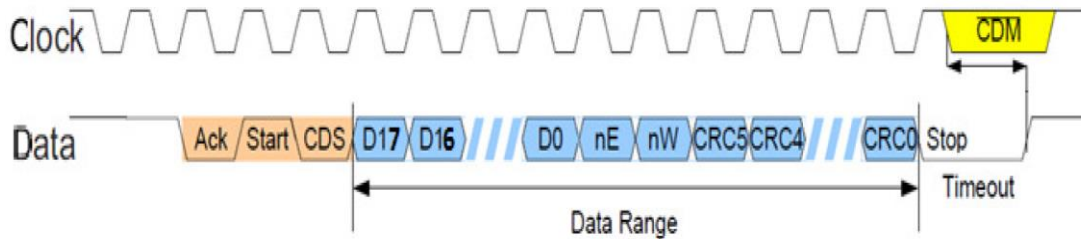
### Data transfer SSI



- Gray-code optionally in binary
- Optionally the protocol is available with error bit. Further variations on request.
- The resolution is eligible between 13 Bit and 18 Bit.

# Datasheet

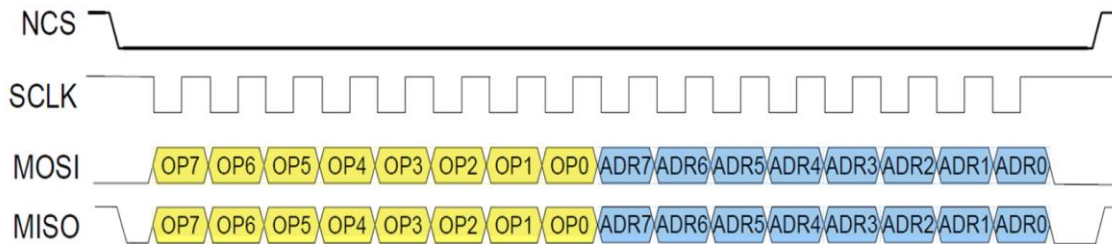
## Data transfer BiSS (C-Mode)



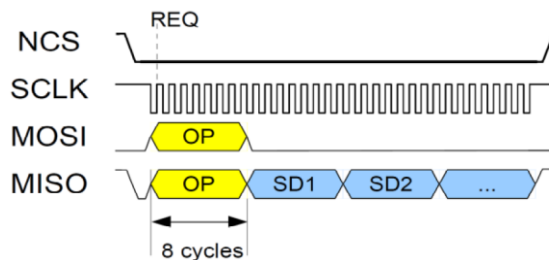
- The Standard resolution is 18 Bit
- For a detailed description of the protocol, see separate interface specification.

Serial interface protocol	Definition
Ack	Acknowledge-Bit
Start	Start-Bit
CDS	Control-Bit
d0-D17	Position Data
nE	Low active warning
CRC0 - CRC5	Cyclic Redundancy Code
Stop	Stop-Bit
CDM	Control Data Master

## Data transfer SPI



SPI transmission using opcode READ REGISTER as an example



SPI transmission, READ SENSOR DATA

The Data is sent in packages of 8 bits and with the MSB first. Each data transmission starts with the master sending an opcode to the slave.  
 The standard revolution is 18 Bit.

Optionally the protocol is available with low idle level on SCLK. Further variations are on request.

The direction of rotation can be inverted.

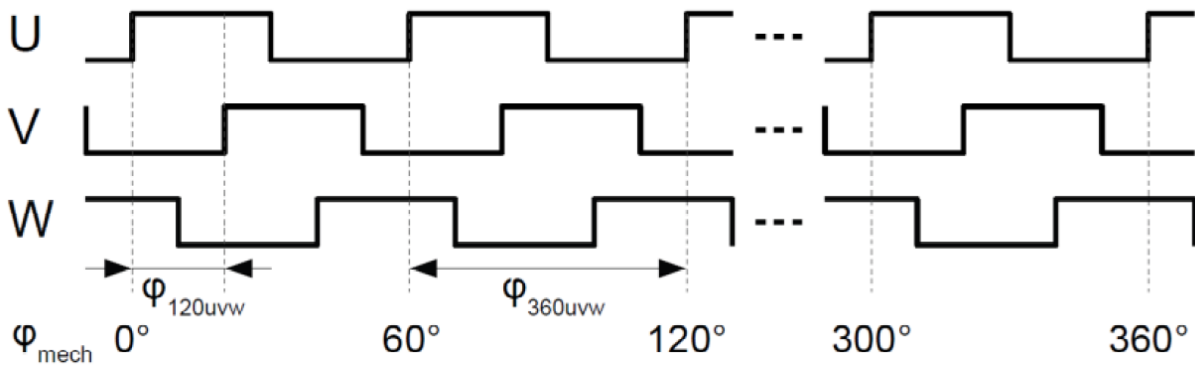
The zero position can be set free at every arbitrary position (Preset).

This interface is especially for the direct connection to the micro-controller from the customer. It is appropriately for short cable length.

# Datasheet



## UVW - Commutation

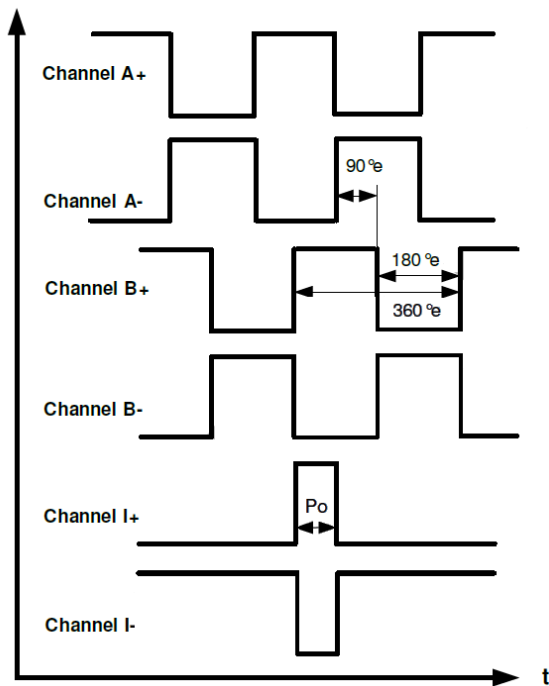


Commutation sequence with 6 pole pairs

- The phase shift between the commutation signals is 120°e
- The number of pole pairs for the commutation signals for BLDC motors are available from 1 up to 16.
- Optionally the direction of rotation can be inverted.
- The start angle for the winding of the BLDC and the Hall sensor signals can be set free.

## Incremental

Amplitude



Incremental interface with differential signals

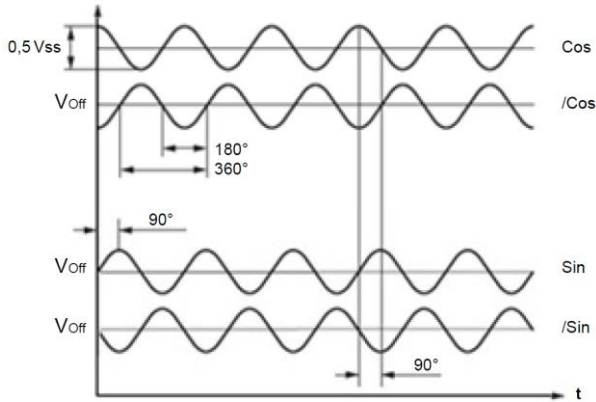
Optionally the Index pulses I (Po) is available in for different lengths (90°e, 180°e, 270°e and 360°e). The position of the index pulse is in relation to the A/B signals.

The direction of rotation can be inverted. The position of the Index can be set free (Preset). Further variations are on request

The resolution of incremental signals ABI can be programmed for each single turn cycle within a range of 4 to 262, 144 edges. That means a resolution from 1 to 65.536 cps.

# Datasheet

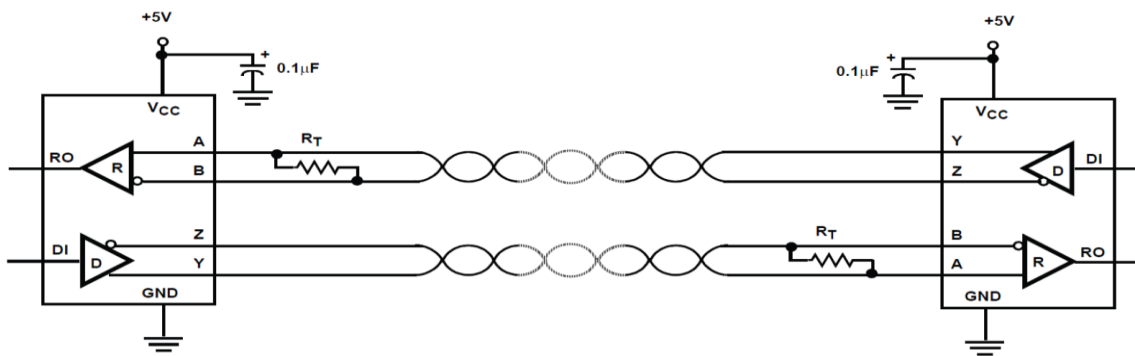
## Analogue



The number of sinus / cosines signals per revolution is depended on the magnet outer diameter.  
 WMSA25 : 32 Sin / Cos

As result of the differential evaluation of the both complementary signals  $\overline{\text{Sin}}$  and  $\overline{\text{Sin}}$  as well as  $\overline{\text{Cos}}$  and  $\overline{\text{COS}}$  by using the recommended receiving circuit you will get a sinus and a cosines signal with an amplitude of  $1 V_{ss}$

## Circuit

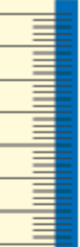


for SSI; BiSS; ABI, UVW and Sin/ Cos ( $= R_T = \infty$ )

## Terminal Assignment

Signal description						cable
SPI	SSI, BiSS	ABI	UVW	Sin / Cos	Supply	color of wire
					GND	blue
					UB	red
		A	U	Sin+		green
		$\overline{A}$	$\overline{U}$	Sin-		yellow
		B	V			brown
		$\overline{B}$	$\overline{V}$			white
		I	W	Cos+		black
		$\overline{I}$	$\overline{W}$	Cos-		purple
MISO	Da+					pink
MOSI	Da-					grey
SCLK	Cl+					blue / red
NCS	Cl-					pink / grey

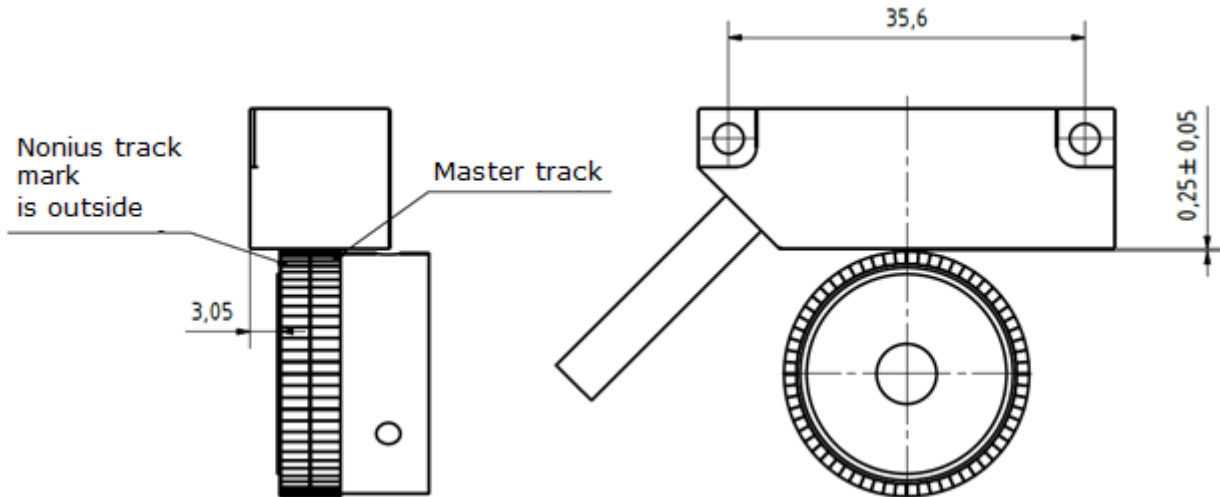
- optionally with error signal
- data transmission cable 6 x 2 x 0,14 mm



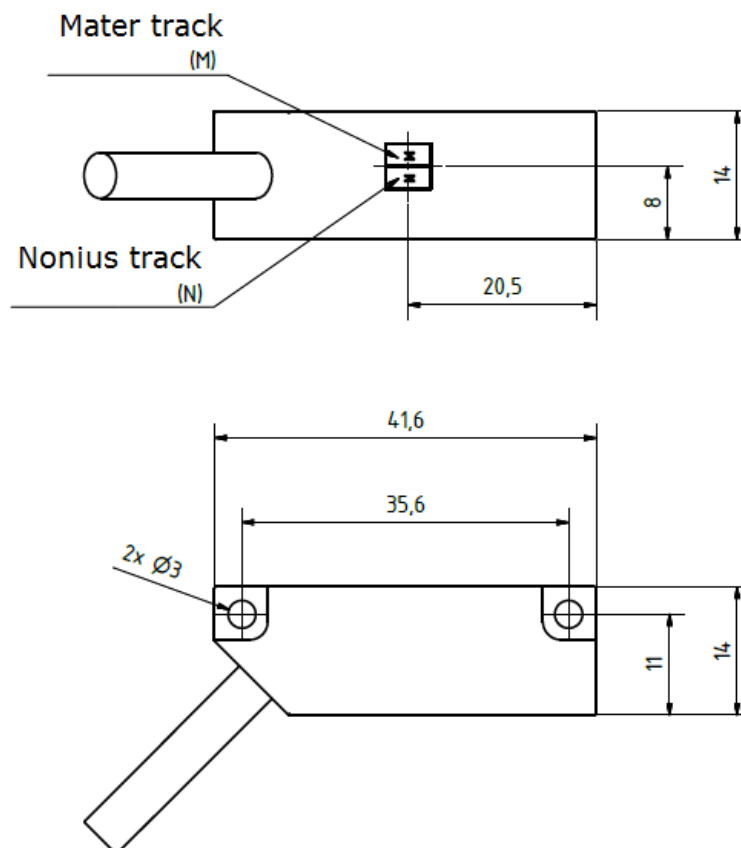
# Datasheet

## Dimensions

### Position



### Sensor Head

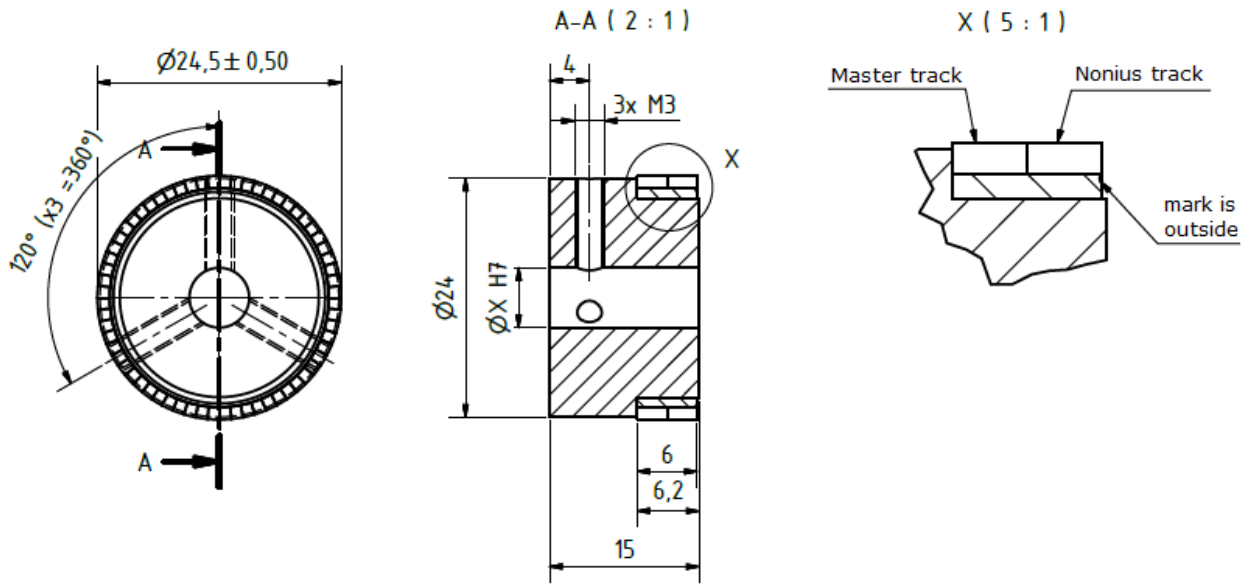


- The sensor head and the accompanying magnet wheel constitute an unit which belongs together.
- Every Sensor head is initialised for his own accompanying magnet wheel. He is matched with the magnet wheel and programmed by his first operation by **Willtec Messtechnik**.
- Don't mix up this combination with other ones. If you exchange the magnet wheel, it may be in function, but the values at the datasheet couldn't guarantee.

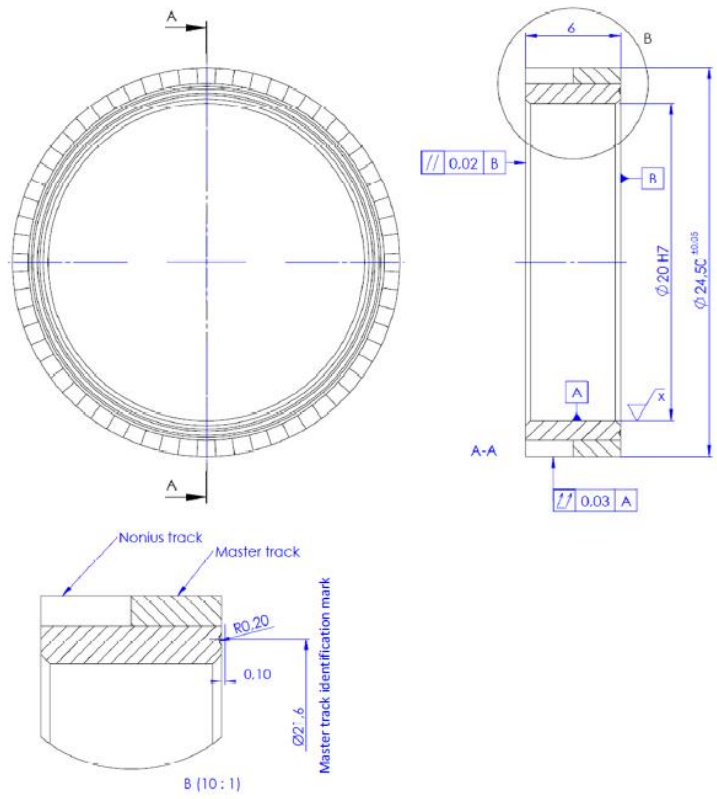


# Datasheet

**Magnet Wheel (Screwed Version)**



**magnet Wheel (Press Fit Version)**





# Datasheet

## Ordering Example

<b>Type</b>	<b>WMSA25</b>	-	<b>10</b>	-	<b>SSI 18</b>	-	<b>ABI 1024</b>	-	<b>05</b>	-	<b>1,0</b>	-	<b>S</b>
<b>Mag. Wheel Diameter</b>	<b>25</b>	= 24,5 mm											
<b>Shaft Diameter</b>	06	= 6 H7 mm											
	08	= 8 H7 mm											
	<b>10</b>	= 10 H7 mm											
	12	= 12 H7 mm											
	16	= 16 H7 mm											
<b>Interface Absolute</b>	<b>SSI</b>	= synchron serial interface											
	BiSS	= Bidirectional serial synchron											
	SPI	= serial peripheral interface											
<b>Resolution absolute</b>	13	= 13 Bit (only SSI)											
	<b>18</b>	= 18 Bit											
<b>Interface Incremental</b>	<b>ABI</b>	= incremental interface											
	UVW	= commutation signals											
	SIN	= analogue interface											
<b>Resolution Incremental</b>	<b>XXXXX</b>	= 1 to 65536 cpr (ABI)											
	XX	= 1 to 16 pp (UVW)											
	32	= 32 sin (SIN)											
<b>Supply voltage</b>	<b>05</b>	= 5V											
	12	= 8 - 30 V (TTL output)											
	24	= 8 - 30 V (HTL output)											
<b>Cable Length</b>	<b>X,X</b>	= e.g. 1,0 m											
<b>Sensor Option</b>	<b>S</b>	= Standard											
	E	= Extended											

The incremental interface and the absolute interface are chosen freely combination.

## WILLTEC MESSTECHNIK RESTRICTED

- The guarantee will be voided by misuse, accident, modification, unsuitable physical or operating environment, operation in other than the specified operating environment, or failure caused by a product for which **Willtec Messtechnik** is not responsible.
- This document and any associated data contains restricted information that is property of **Willtec Messtechnik** and may not be disclosed or duplicated for others except as authorized by **Willtec Messtechnik** information contained in this publication may be superseded by updates.
- **Willtec Messtechnik** reserves the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services also datasheets at any time.
- It is your responsibility to ensure that your application meets with your specifications.