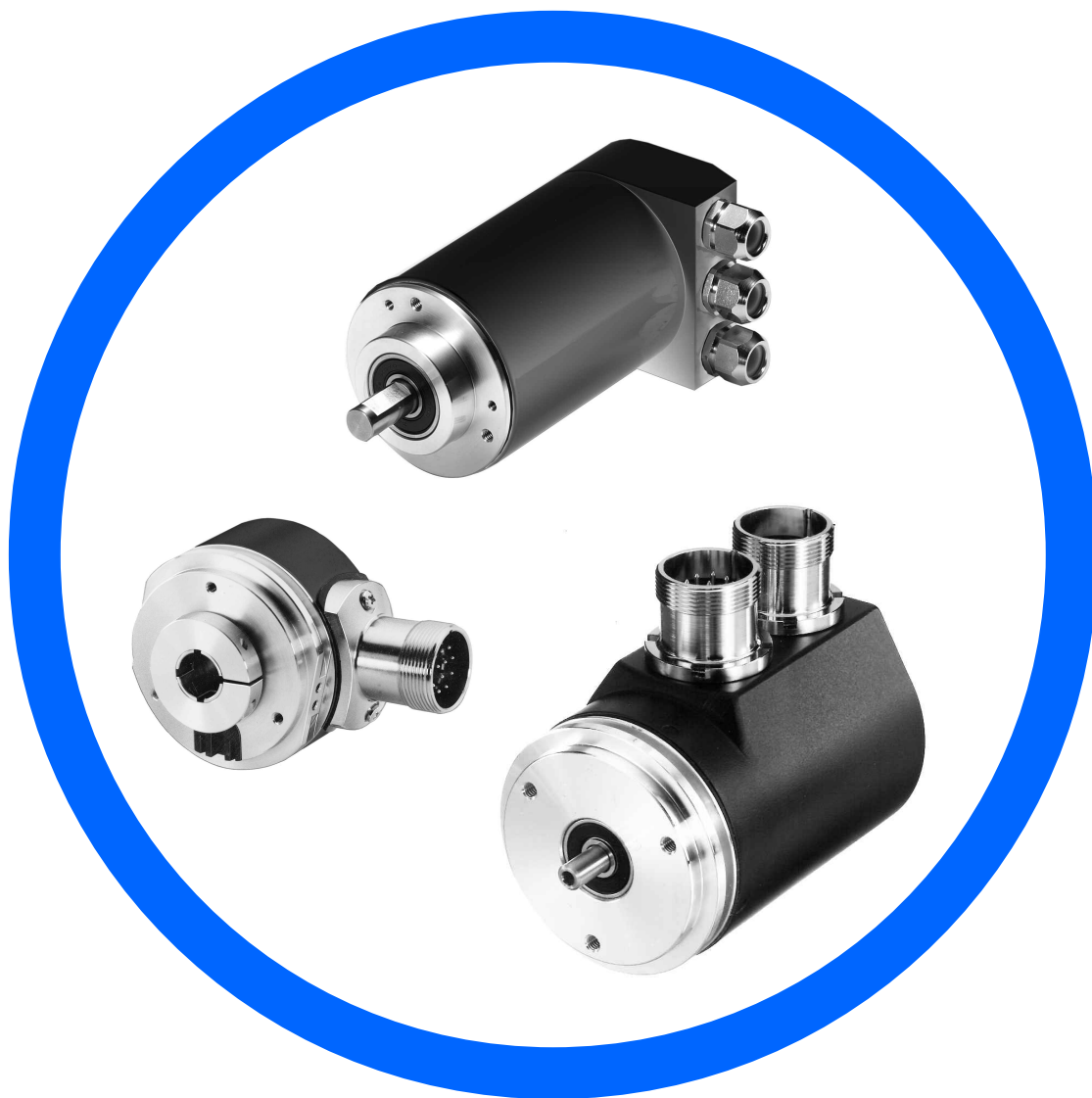


**hohner**

Elektrotechnik Werke

## Hohner Encoder 2014



Absolut Single and Multiturn · Inkremental · Parallel · SSI  
InterBus-S · CAN · CANopen · Profibus-DP and DeviceNet

Your Partner for  
Standard and Special Designs  
– Precise, Reliable and Fast –

---

Absolute Shaft Encoder

Absolute Encoder with fieldbus interface

Incremental Shaft Encoder

Explosion-proof encoder EEx d IIC T6 / PTB 03 ATEX 1163  
absolut / incremental

Special Designs

---

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	PA 02	Page 22
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# Incremental Shaft Encoders

## General Description

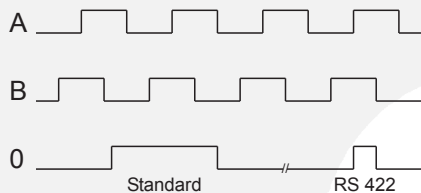
Incremental shaft encoders are sensors to detect rotational movements.

The division delivered by a measuring body (round disk with light and dark fields, also called increments) is converted into a proportional number of electronic pulses by an optoelectronic scanner.

The number of output pulses is a measure for the angle of rotation of the shaft encoder. Angles, paths or speeds can then be measured by the subsequent electronic equipment installed by the user.

Various signal outputs and output circuits are available for adaptation to the particular control systems being used.

## Signal Outputs:



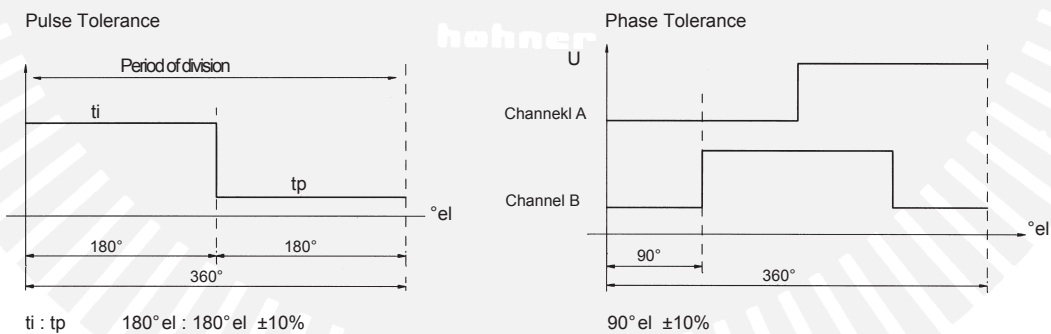
Two square pulse trains offset by 90 °el,, with channel A lagging in clockwise rotation.

Reference pulse 0 once per revolution. Random in position and length. Linked with RS 422.

All output signals measured against GND!

All channels can be inverted.

## Pulse and Phase Tolerances:



## Calculation of Permissible Speed:

$$n \left( \frac{u}{\text{min}} \right) = \frac{f_{\text{max}} \text{ (Hz)}}{\text{pulse number}} \times 60$$

Warning: Do not disregard the permissible mechanical speed !

Power Supply:

$$U_B = 5V \text{ DC } \pm 5\%$$

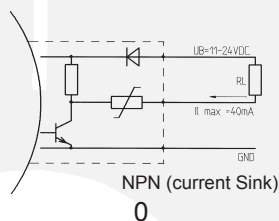
$$U_B = 11V \dots 24V \text{ DC } +20\%$$

$$\text{Residual ripple} = 5\% \text{ von } U_B$$

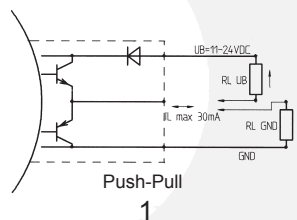
The power supply limits including residual ripple may be exceeded because otherwise malfunctions can occur or the device could be destroyed.

Output Circuits:

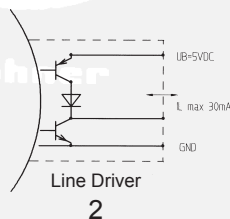
- 0 Darlington Driver  
ULN 2003 or similar  
max. 40mA per channel  
short circuit-proof



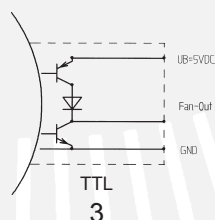
- 1 Push-Pull  
max. 30mA / or 100mA  
per channel  
short circuit-proof



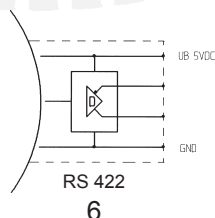
- 2 TTL Line Driver  
75114 or similar.



- 3 TTL  
max. 1,6mA per channel  
(1 TTL-load)

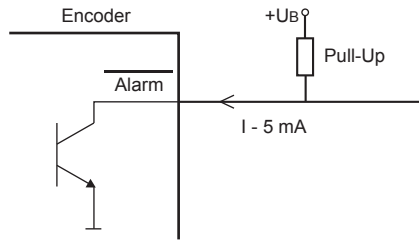


- 6 Driver by I/O Norm  
RS 422  
AM 26 LS 31 C  
DS 26 C 31 C or similar.



## Alarm Output

### Output Circuits



### Technical Data

Output	NPN - open collector	
Output load max.	5 mA/24 V with $U_B = 5$ VDC 5 mA/32 V with $U_B = 10...30$ VDC	
Output Level	Output active (failure condition): L - 0,7 VDC Output inactive: highohmic (if necessary :get H -level by an external pull-up resitor)	
Malfunction indication time	• 20 ms	

### Function

The rotary encoders are equipped with an electronic monitoring system which reports malfunction via a separate alam output.

The alam output can be used for selecting an optical display (LED; for cicuit; see above) or the control system

(SPC or similar).

Moreover the alam output of serveral encoders can be interconnected to a common "system alam" by means of a parallel connection. The following malfunctions are indicated:

Category I	Category II	Category III
- damaged disks	- overtemperature	- voltage range 1 VDC < U < 4 VDC
- defective LED	- overload (eg) due.to.short.circuit	- voltage drop on the supply.lines
- contamination		

Category I malfunctions cannot be corrected: the encoder must be replaced.

Category II malfunctions are detected by means of a thermal monitoring unit in the electronic systems. The alam message is cleared after the cause of temerature increase has been removed.

Category III malfunctions indicate insufficient supply voltage. Also included in the category are transients in the supply voltage, e.g. due to electrostatic discharge, which may distort the output siganls. This is corrected by:

- readjustment to the correct voltage
- eliminating the cause of disturbance, i.e. by careful arrangemant of the cables.

## Cable length at AWI 58 H

Output RS 422 (R)	depending on voltage and frequency (at 25°C):	
	length	RS 422
	10 m	5 VDC, 300 kHz
	50 m	5 VDC, 300 kHz
	100 m	5 VDC, 300 kHz

Output Push pull (K)	depending on voltage and frequency (bei 25°C):		
	length	Push-pull (K)	Push-pull (K)
		5 VDC, 10 mA	10...30 VDC, 30 mA
	10 m	300 kHz	12 VDC, 200 kHz
			24 VDC, 200 kHz
			30 VDC, 200 kHz
	50 m		12 VDC, 200 kHz
			24 VDC, 200 kHz
			30 VDC, 100 kHz
	100 m		12 VDC, 200 kHz
			24 VDC, 100 kHz
			30 VDC, 50 kHz

Output Push-pull antivalent (I)	depending on voltage and frequency (bei 25°C):	
	length	Push-pull antivalent
	10 m	12 VDC, 200 kHz
		24 VDC, 200 kHz
		30 VDC, 200 kHz
	50 m	12 VDC, 200 kHz
		24 VDC, 50 kHz
		30 VDC, 25 kHz
	100 m	12 VDC, 150 kHz
		24 VDC, 25 kHz
		30 VDC, 12 kHz

## AWI 40

Incremental shaft encoder for simple industrial applications.  
 Easy single-hole mounting.  
 Small in size and with high enclosure  
 Also available in high-grade steel.



Illustration shows standard enclosure.  
 See page 52 for high-grade steel version.

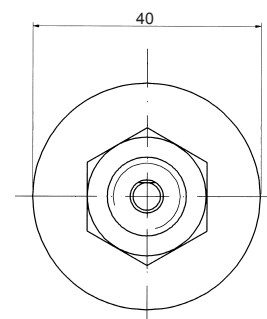
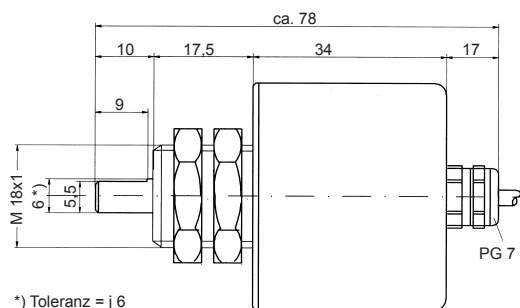
### Electrical Specifications:

Max. pulse frequency:	25 kHz
Permissible temp. range:	-20° . . . +60° C
Power supply:	11V . . . 24V DC +15%
Max. current consumption:	- 80 mA (without load)
Max. fan-out:	30 mA (per channel)
Residual ripple:	max. ± 5% U <sub>B</sub>
Power supply:	5V DC ± 5%
Max. current consumption:	- 40 mA
Max. fan-out:	30 mA (per channel)

### Mechanical Specifications:

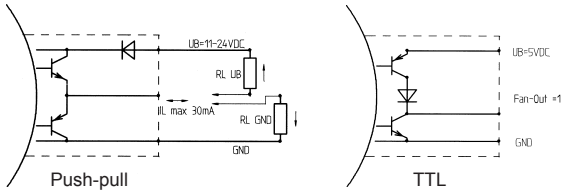
Flange/Enclosure:	Aluminium
Shaft:	Stainless steel
Shaft seal:	Oil/Saltwater-resistant
Bearing:	Deep groove ball bearing
Weight:	ca. 0,3 kg
System of protection:	IP 65
Max. speed:	6000 U/min
Torque:	ca. 3 Ncm
Max. shaft load:	axial 5 N radial 5 N

### Mechanical Dimensions:





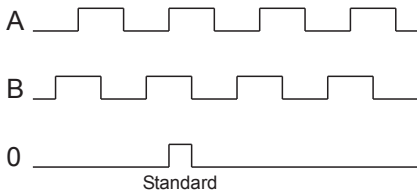
Output Circuits:



Order no.: 1

3

Signal Outputs:



Two square pulse trains offset by 90°el,, with channel A lagging in clockwise rotation.

Reference pulse 0 once per revolution, linked with channel A and B.

C-Version 0-Impuls beliebig  
All channels can also be inverted.

Toleranzen (bat 25 kHz):

Phase offset:  
90° ±20° el

Pulse duty factor:  
180° : 180° ±18° el

Pin configuration:

Typ of connection	00	00	01	01	08, 09	10, 11	GND	+ UB	A	B	$\bar{A}$	$\bar{B}$	0	$\bar{0}$
	(Color code acc. DIN 47100)	White	Brown	Green	Yellow		White	Brown	Green	Yellow			Grey	
	(Color code acc.h DIN 47100)	White	Brown	Green	Yellow	Grey	Pink	Blue	Red					
		Black	Blue	Brown	Beige	Yellow	Green	Pink	Violet					
		Black	Blue	Brown	Beige	Yellow	Green	Pink	Violet					
		1	2	3	4	(5)	5							
		1	2	3	4	(5)	(6)	5	6					

Order No.:

AWI 40  - 0.6  A  - Pulse no. 1...500  C with declaration of conformity (pulse numbers on request)

(higher pulse numbers of request)

Enclosure    Shaft    Signal Output    Position of Connection/Typ of connection (see page 63)    Output Circuit

S = Standard    06 = 6 mm    1 = A    Standard:    1 = Push-pullt 30mA  
 E = High-grade steel    2 = A,B    A = axial :    00, 01, 08, 09, 10, 11    3 = TTL  
 3 = A,B,0  
 4 = A, $\bar{A}$   
 5 = A, B /  $\bar{A}$ , B  
 6 = A, B, 0 /  $\bar{A}$ ,  $\bar{B}$ ,  $\bar{0}$   
 7 = A, 0  
 8 = A, 0 /  $\bar{A}$ ,  $\bar{0}$   
 9 = A, B, 0,  $\bar{0}$

(matching plug with ready made cable upon request)

See page 55 / 56 for mechanical accessories

## AWI 58

Incremental shaft encoder with high enclosure protection. Compact in size, it meets the highest of industrial demands and attains international standard.

Also available in high-grade steel for extremely aggressive ambient conditions.



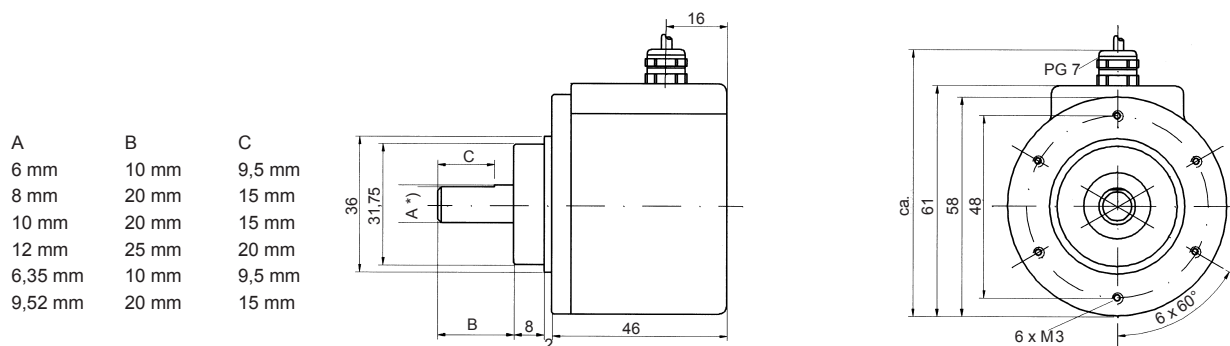
### Electrical Specifications:

Max.pulse frequency:	50 kHz
Permissible temp.range :	-20° . . . +60° C
Power supply:	11V. . . 24V DC +20%
Max.current consumption:	- 80 mA (without load)
Max. fan-out:	30 mA (per channel)
Residual ripple:	max. ± 5% U <sub>B</sub>
Power supply:	5V DC ± 5%
Max.current consumption:	- 80 mA
	(- 150 mA with Line Driver 75114 or similar.)

### Mechanical Specifications:

Flange:	Aluminium
Enclosure:	Zinc diecasting
Shaft:	Stainless steel
Shaft seal:	Oil/Saltwater-resistant
Bearing:	Deep groove ball bearing
Weight:	ca. 0,4 kg
System of protection:	IP 65
Max. speed:	6000 U/min
Torquet:	ca. 3 Ncm
Max.shaft load:	axial 15 N
	radial 30 N

### Mechanical Dimensions:





# AWI 58 H

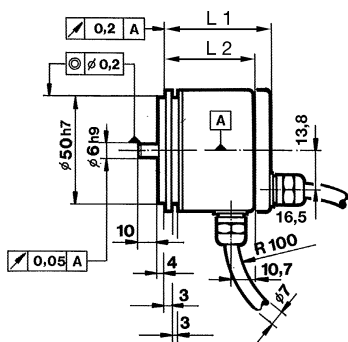
- Incremental shaft encoder
- Protection: IP 65
- max. 10000 Pulses per revolution
- Frequency:
  - 200 kHz / Output Push Pull
  - 300 kHz / Output RS 422



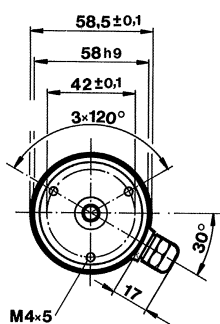
Pulse per revolution:	AWI 58 H	2500 / 3000 / 3400 / 3480 / 3600 / 3750 / 3925 / 3958 / 3968 / 4000 / 4096 / 4445 / 4800 / 5000 / 5400 / 6000 / 6875 / 7200 / 7680 / 7854 / 8000 / 8192 / 9000 / 10000
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Mechanical Dimensions:

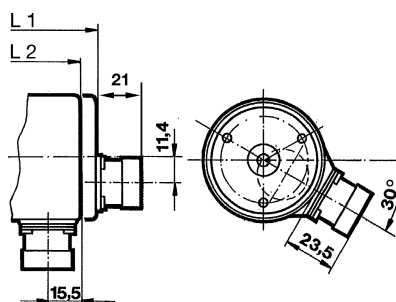
Synchro flange, 58 mm  
Cable, axial/radial



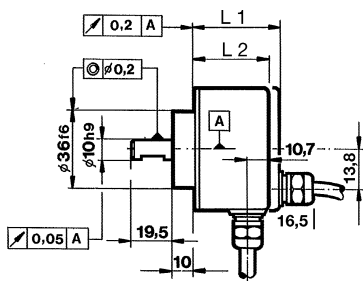
L 1 max: = 57,5 mm  
L 2 max: = 56 mm



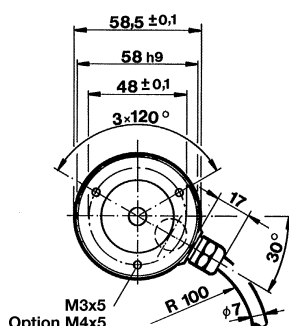
12 Pin plug, axial/radial



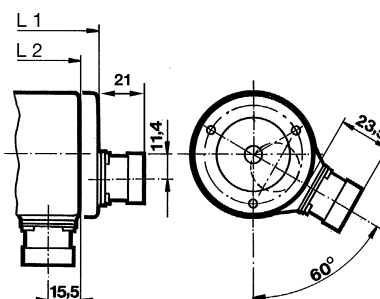
Clamp flange, 58 mm  
Cable, axial/radial



L 1 max: = 57,5 mm  
L 2 max: = 56 mm



12 Pin plug, axial/radial



## Electrical Spezifications:

Declaration of conformity: DIN VDE 0160

Power supply:	RS 422 + Alarm (R):	5 VDC ± 10% oder 10....30 VDC <sub>1</sub> )
	Push Pull (K, I):	10....30 VDC <sub>1</sub> )
Current consumption :	40 mA (5 VDC), 60 mA (10 VDC), 30 mA (24 VDC)	
Output circuits:	RS 422 (R):	A, B, N, A-, B-, N-, Alarm——
	Push Pull (K):	A, B, N, Alarm——
	Push Pullt inverse (I):	A, B, N, A-, B-, N-, Alarm——

## Mechanical Specifications:

Shaft:	6 mm / 10 mm	
Shaft load cacapity:	Ø 10 mm	radial 60 N / axial 40 N
	Ø 6 mm	radial 40 N / axial 20 N
Operating speed:	10000 min. <sup>-1</sup>	
Operating torquet:	- 0,5 Ncm (IP 65)	
Inertia moment of rotor:	Synchro flange	ca. 14 gcm <sup>2</sup>
	Clamp flange	ca. 20 gcm <sup>2</sup>
Protective system:(EN 60529):	IP 65	
Operating temperature:	AWI 58 H: -10....+70° C	
Storage temperature:	AWI 58 H: -25....+85° C	
Vibration resistance (IEC 68-2-6):	100 m/s <sup>2</sup> (10....2000 Hz)	
Thermal shock resistance(IEC 68-2-27):	1000 m/s <sup>2</sup> (6 ms)	
Connection:	1,5 m Cable or connector	
Enclosure:	Aluminium Ø 58 mm	
Flange:	S = Synchro flange, K = Clamp flange	
Wight:	ca. 360 g	

## Connections Cable TPE:

Cable TPE (F) Color	Output RS 422 (R)	Push,Pull (K)	Push,Pull inverset (I)
brown/green	5/10....30 VDC=	10....30 VDC=	10....30 VDC=
blue	Sense Vcc		Sense Vcc
brown	Channell	Channel A	Channel A
green	Channel A		Channel A-
grey	Channel B	Channel B	Channel B
pink	Channel B-		Channel B-
red	Channel N	Channel N	Channel N
black	Channel N-		Channell N-
white/green	GND	GND	GND
violet	Alarm——	Alarm——	Alarm——

## Flange connector 12pole (clockwise)

Pin	RS 422 + Alarm (R)	Push,Pull (K)	Push,Pullt inverse (I)
1	Channel B-	N.C.	Channel B-
2	Sense Vcc	N.C.	Sense Vcc
3	Channel N	Channel N	Channel N
4	Channel N-	N.C.	Channel N-
5	Channel A	Channel A	Channel A
6	Channel A -	N.C.	Channel A-
7	Alarm——	Alarm——	Alarm——
8	Channel B	Channel B	Channel B
9	N.C.*	N.C.*	N.C.*
10	GND	GND	GND
11	N.C.	N.C.	N.C.
12	5/10....30 VDC=	10....30 VDC=	10....30 VDC=

\* shield by cable with connector

## Order No:

AWI 58 H - 0 /    · 4

Version	Pulse per revolution	Supply voltage	Flange	Protection	Shaft	Output Circuit	Art of Connection
0 = Standard	2 500 at 10 000	A = 5 VDC E = 10 .... 30 VDC	S = Synchro flange K = Clamp flange	4 = IP 65	1 = 6 mm (S) 2 = 10 mm (K)	K = Push Pullt, short circuit proof 1) I = Push Pull, inverset 1) R = RS 422+Alarm 2)	D = Flange connector 12pole. radial / clockwise F = TPE-Cable, radial

1) Supply voltage 10 .... 30 VDC  
2) Supply voltage 5 VDC

(matching plug with ready made cable upon request)

See page 55/56 for mechanical accessories

## AWI 90

Due to its size, the incremental shaft encoder meets the highest of mechanical demands.

It is used wherever high mechanical stresses are likely.

Naturally also available in high-grade steel.



Illustration shows standard enclosure.  
See page 52 for high-grade steel version.

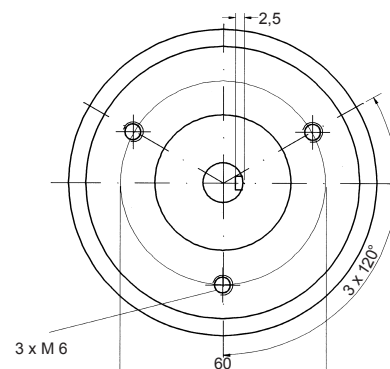
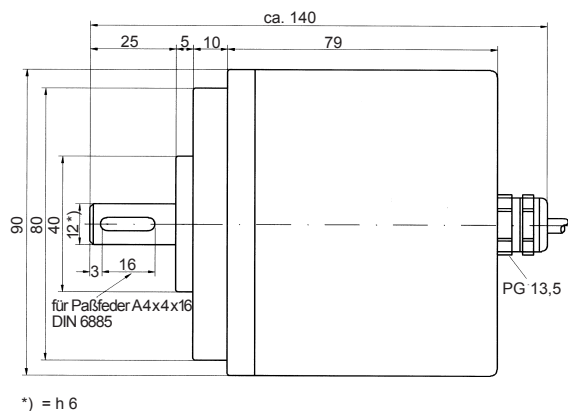
### Electrical Specifications:

Max. pulse frequency:	100 kHz
Permissible temp. range:	-20° . . . +60° C
Power supply:	11V . . . 24V DC +20%
Max. current consumption:	< 80 mA (without load)
Max. fan-out:	30 mA (per channel)
Residual ripple:	max. ± 5% U <sub>B</sub>
Power supply:	5V DC ± 5%
Max. current consumption:	< 80 mA
	(- 150 mA bei Line Driver 75114 or similar)

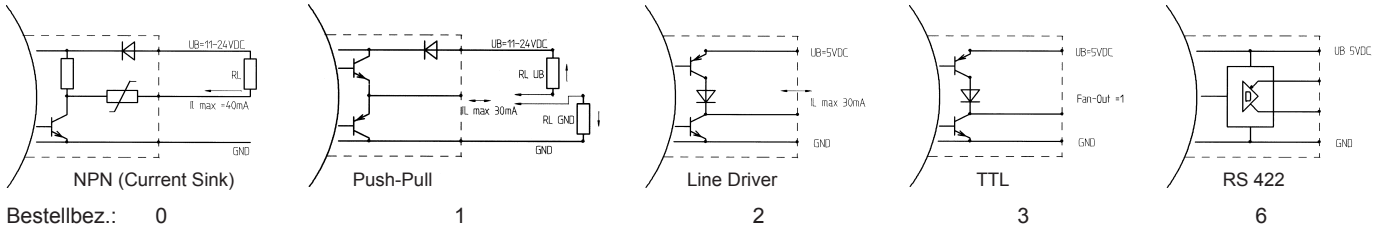
### Mechanical Specification:

Flange:	Aluminium
Enclosure:	Sheetsteel, powdercoated
Shaft:	Stainless steel
Shaft seal:	Oil/Saltwater-resistant
Bearing:	Deep groove ball bearing
Weight:	ca. 1.2 Kg
System of protection:	IP 65
Max. speed:	6000 U/min
Torque:	ca. 5 Ncm
Max. shaft load:	axial 30 N radial 50 N

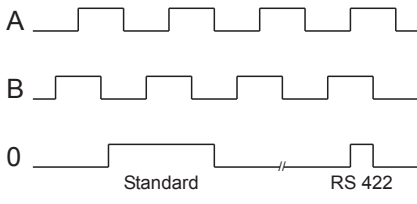
### Mechanical Dimensions:



**Output Circuits:**



**Signal Outputs:**



Two square pulse trains offset by 90 °el, with channel A lagging in clockwise rotation.

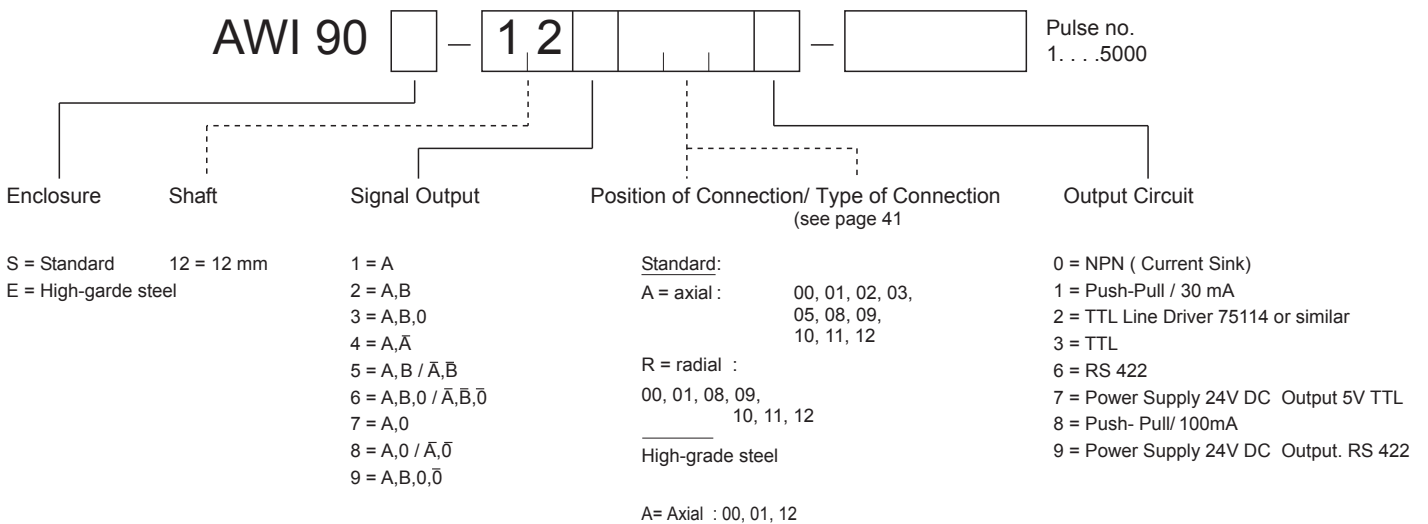
Reference pulse 0 once per revolution. Rodom in position and length. Linked with RS 422.

All channels can also be inverted

**Pin Configuration:**

Type of connection	00	(Colour code acc. DIN 47100)	GND	+ UB	A	B	$\bar{A}$	$\bar{B}$	0	$\bar{0}$
„	00	(Colour code acc. DIN 47100)	White	Brown	Green	Yellow			Grey	
„	01	(Colour code acc. DIN 47100)	White	Brown	Green	Yellow	Grey	Pnk	Blue	Red
„	01		Black	Blue	Brown	Beige			Yellow	
„	01		Black	Blue	Brown	Beige	Yellow	Green	Pink	Violet
„	02, 03		1	2	3	4	5	6	7	
„	05		1	2	3	4				
„	08, 09		1	2	3	4			5	
„	10, 11		1	2	3	4	(5)	(6)	5	6
„	12		1	2	3	4	5	6	7	8

**Order No.:**



# SWI 58

Incremental shaft encoder with plug shaft of direct assembly onto existing shafts.



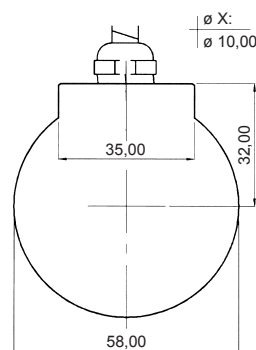
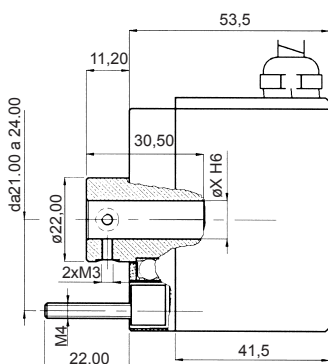
## Electrical Specifications:

Max. impulse frequency:	50 kHz
Permissible temp. range:	-20° . . . +60° C
Supply voltage:	11V. . . 24V DC +20%
Max. current consumption:	- 80 mA (without load)
Max. fan-out:	30 mA (per channel)
Residual ripple:	max. $\pm 5\%$ U <sub>B</sub>
Supply voltage:	5V DC $\pm 5\%$
Max. current consumption:	- 80 mA (- 150 mA for line driver 75114 or similar)

## Mechanical Specifications:

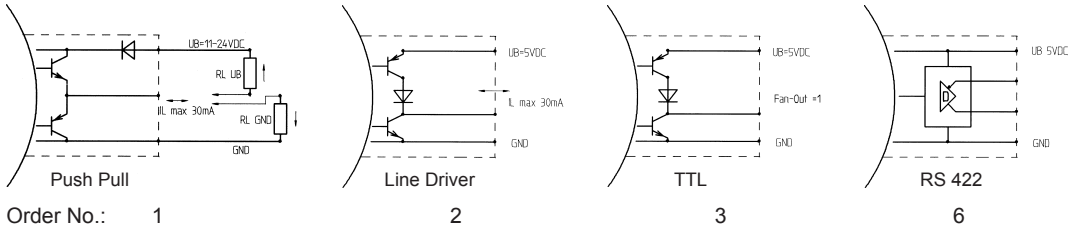
Flange:	Aluminium
Casing:	Zinc diecasting
Shaft:	Stainless steel
Bearing:	deep groove ball bearing
Weight:	ca. 0,4 kg
System of protection:	IP 54
Max. speed:	6000 U/min
Torque:	ca. 5 Ncm
Max. shaft load:	axial 100 N radial 100 N

## Mechanical Dimensions:

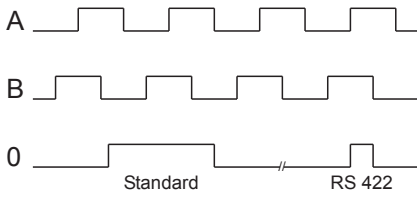




Output Circuit:



Signal Outputs:



Two rectangular pulse sequences displaced at right-angles, whereby channel A lags behind in a clockwise rotation.

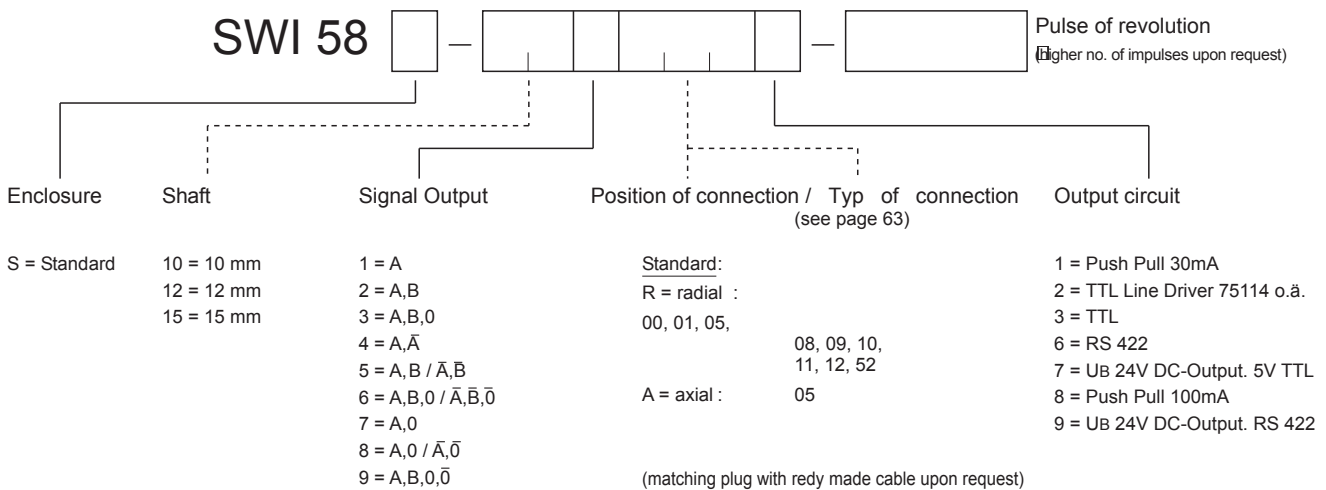
Reference impulse 0 once per revolution. Random position or length. Linked with RS 422.

All channels can also be operated in an inverted mode.

Pin configuration:

		GND	+ UB	A	B	$\bar{A}$	$\bar{B}$	0	$\bar{0}$
Typ of connection	00 (Color code acc. DIN 47100)	white	brown	green	yellow			grey	
	00 (Color code acc. DIN 47100)	white	brown	green	yellow	grey	pink	blue	red
„	01	black	blue	brown	beige			yellow	
„	01	black	blue	brown	beige	yellow	green	pink	violet
„	05	1	2	3	4				
„	08, 09	1	2	3	4	(5)		5	
„	10, 11	1	2	3	4	(5)	(6)	5	6
„	12	1	2	3	4	5	6	7	8
„	52	A	B	C	D	E	F	G	

Order No:



# HWI 40

Incremental shaft encoder with 6 mm hollow shaft for direct mounting on existing shafts. An inexpensive encoder for simple industrial applications.



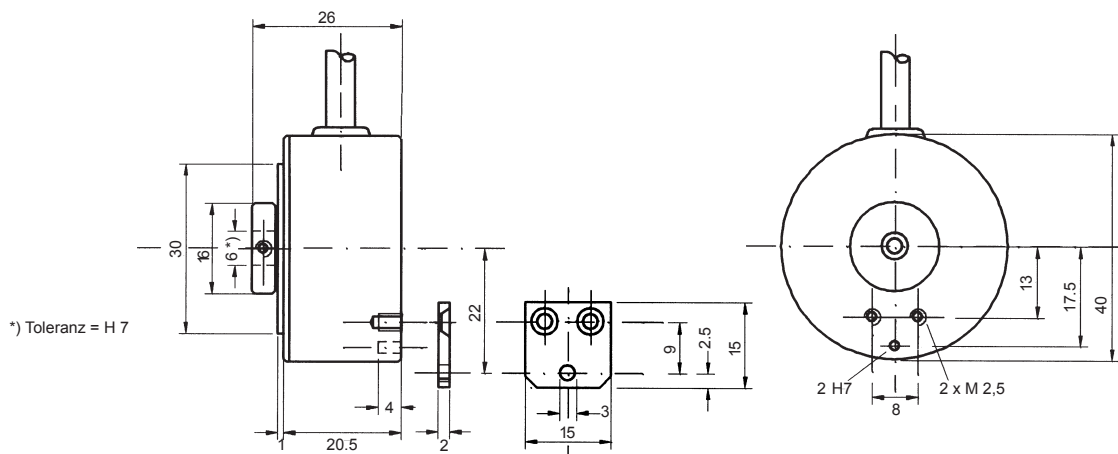
## Electrical Specifications:

Max. pulse frequency:	25 kHz
Permissible temp. range:	-20° . . . +60° C
Supply voltage:	11V . . . 24V DC +15%
Max. current consumption:	40 mA (without load)
Max. fan-out:	30 mA (per channel)
Residual ripple:	max. ± 5% U <sub>B</sub>
Supply voltage:	5V DC ± 5%
Max. current consumption:	40 mA
Max. fan-out:	30 mA (per channel)

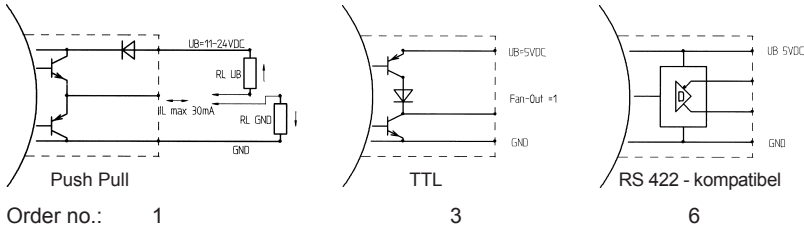
## Mechanical Specifications:

Flange/Enclosure:	Aluminium
Shaft:	Stainless steel
Bearing:	Deep groove ball bearing
Weight:	ca. 0,1 kg
System of protection:	IP 54
Max. speed:	6000 U/min
Torque:	ca. 1 Ncm

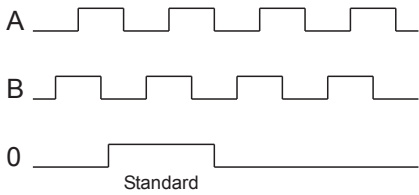
## Mechanical Dimensions:



Output Circuits:



Signal Outputs:



Two square pulse trains offset by 90° el, with channel A lagging in clockwise rotation.

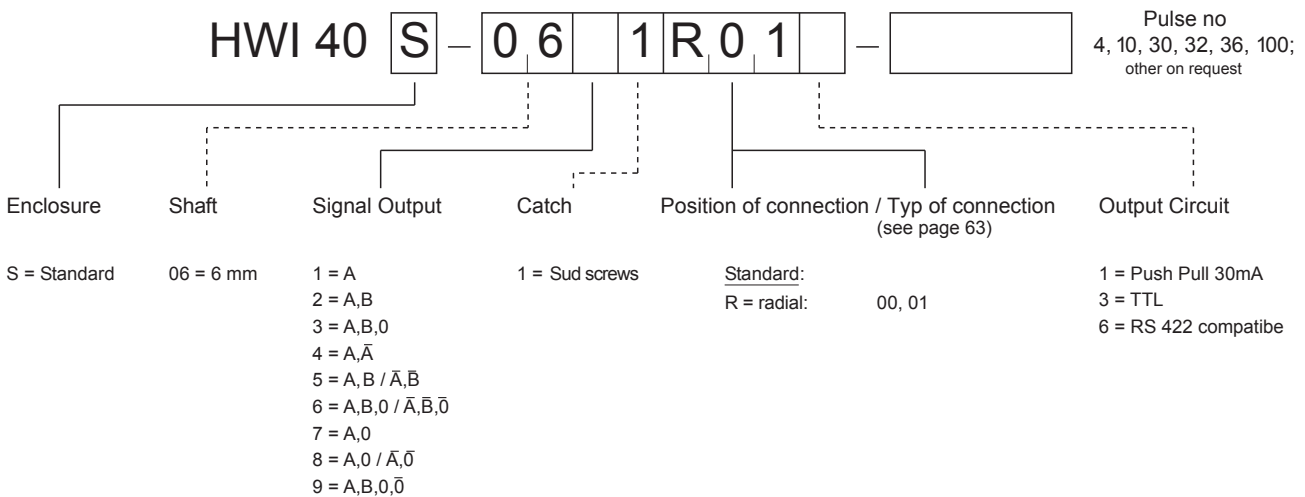
Reference pulse 0 once per revolution. Random in position and length.

All channels can also be inverted

Pin configuration:

Typ of connection	00	(Color code acc. DIN 47100)	GND	+ UB	A	B	$\bar{A}$	$\bar{B}$	0	$\bar{0}$
„	00	(Color code acc. DIN 47100)	white	brown	green	yellow	grey	pink	blue	red
„	01		black	blue	brown	beige	yellow	green	pink	violet

Order No:



# HWI 80

Incremental hollow shaft encoder for direct mounting on existing shafts of 6 - 12 mm diameter.

Its flat shape gives the designer considerably more room to work with.

Also available in high-grade steel.



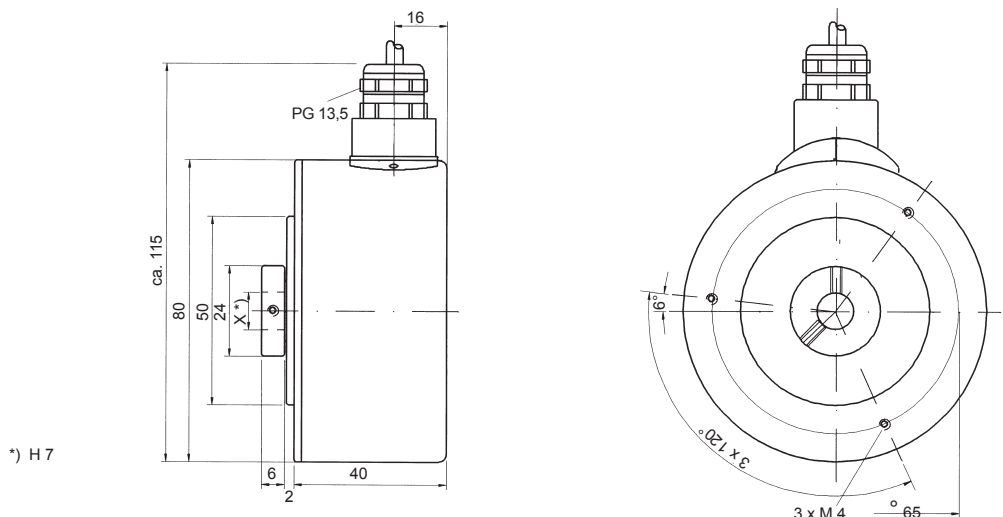
## Electrical Specification:

Max. pulse frequency:	50 kHz
Permissible temp. range:	-20° . . . +60° C
Power supply:	11V . . . 24V DC +20%
Max. current consumption:	- 80 mA (without load)
Max. fan-out:	30 mA (per channel)
Residual ripple:	max. ± 5% U <sub>B</sub>
Power supply:	5V DC ± 5%
Max. current consumption:	- 80 mA

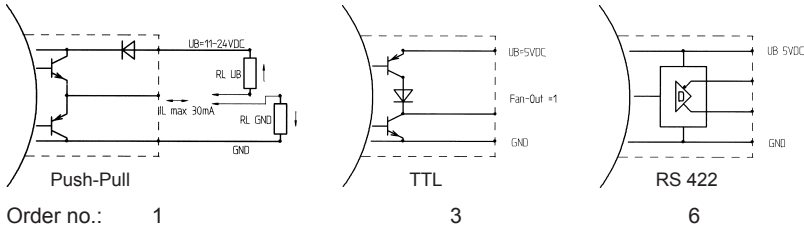
## Mechanical Spezifikation:

Flange/Enclosure:	Aluminium
Hollow shaft:	Stainless steel
Shaft seal:	Oil/Saltwater-resisant
Bearing:	Deep groove ball bearing
Weight:	ca. 0,5 kg
System of protection:	IP 65
Max. speed:	6000 U/min
Torque:	ca. 10 Ncm

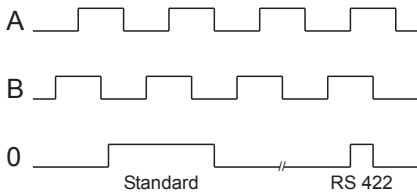
## Mechanical Dimensions:



Output Circuits:



Signal Outputs:



Two square pulse trains offset by 90 °el, with channel A lagging in clockwise rotation.

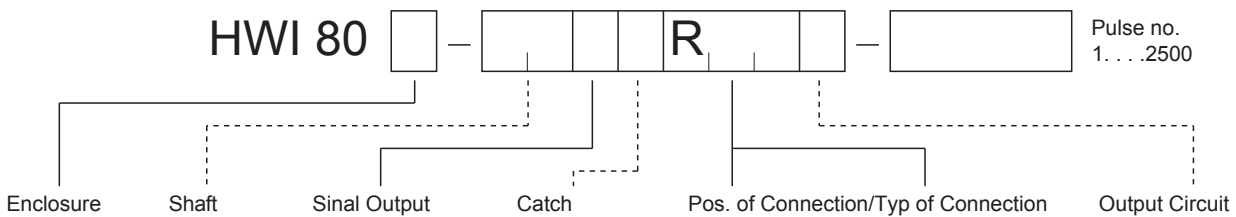
Reference pulse 0 once per revolution. Random in position and length. Linked with RS 422.

All channels can also be inverted.

Pin Configuration:

Connection	Color code acc DIN 47100	GND	+ UB	A	B	$\bar{A}$	B	0	$\bar{0}$
00	(Color code acc DIN 47100)	white	brown	green	yellow			gray	
01	(Color code acc DIN 47100)	white	brown	green	yellow	gray	pink	blue	red
07		black	blue	brown	beige			yellow	
12, 54		black	blue	brown	beige	yellow	green	pink	violet
		1	2	3	4	(5)	(6)	5	6
		1	2	3	4	5	6	7	8

Order No:



- S = Standard
- E = High-grade steel
- 06 = 6 mm
- 07 = 7 mm
- 08 = 8 mm
- 09 = 9 mm
- 10 = 10 mm
- 11 = 11 mm
- 12 = 12 mm
- 59 = 9,52 mm
- 1 = A
- 2 = A,B
- 3 = A,B,0
- 4 = A, $\bar{A}$
- 5 = A,B /  $\bar{A}$ , $\bar{B}$
- 6 = A,B,0 /  $\bar{A}$ , $\bar{B}$ , $\bar{0}$
- 7 = A,0
- 8 = A,0 /  $\bar{A}$ , $\bar{0}$
- 9 = A,B,0, $\bar{0}$
- 1 = Stud screws
- 2 = Coupling
- Standard:
- R = radial:
- 00, 01, 07, 12, 54
- 1 = Push Pull 30mA
- 3 = TTL
- 6 = RS 422
- 7 = Power supply 24V DC- Output 5V TTL
- 8 = Push Pull 100mA
- 9 = Power supply 24V DC- Output RS 422

# HWI 103

Robust incremental hollow shaft encoder for direct mounting on existing shafts of 12-25,4 mm in diameter.

This encoder simultaneously features the advantage of requiring little space while meeting the highest of mechanical demands.



## Electrical Specifications:

Max. pulse frequency : 50 kHz  
 Permissible temp. range: -20° . . . +60° C

Supply voltage: 11V . . . 24V DC +20 %  
 Max. current consumption: - 80 mA (without load)  
 Max. fan-out: 30 mA (per channell)  
 Residual ripple: max. ± 5% U<sub>B</sub>

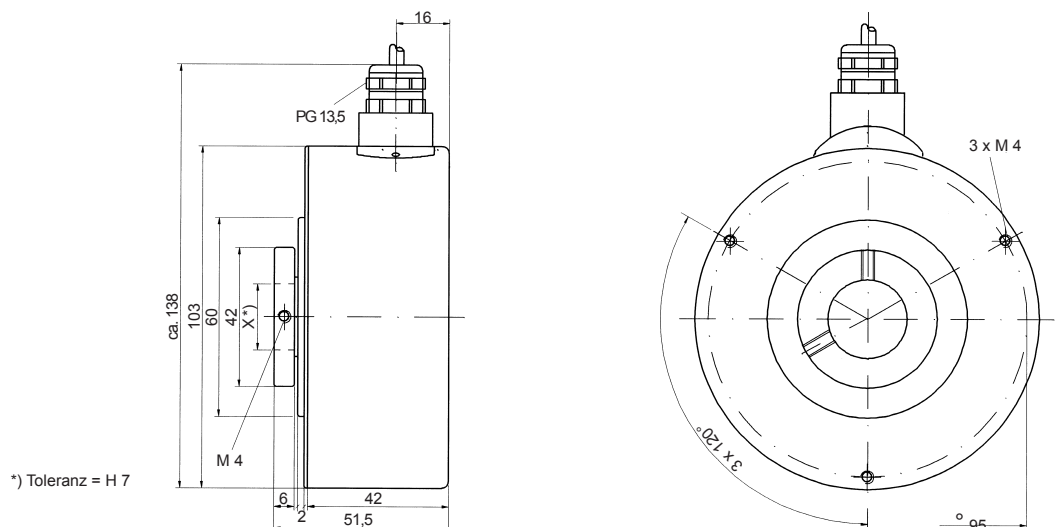
Supply voltage: 5V DC ± 5%  
 Max. current consumption: - 80 mA

## Mechaical Specifications:

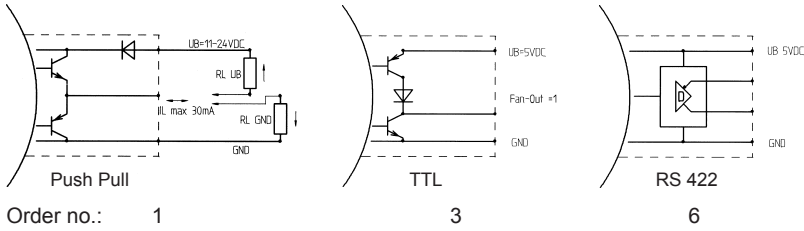
Flange /Enclosure: Aluminium  
 Hollow Shaft: Stainless steel  
 Shaft seal: Oil/Saltwater-resistant  
 Bearing: Deep groove ball bearing  
 Weight: ca. 0,8 kg  
 System of protection: IP 65  
 Max. speed: 6000 U/min  
 Torque: ca. 15 Ncm at 25° C  
 ca. 50 Ncm at 20° C

## Mechanical Dimensions:

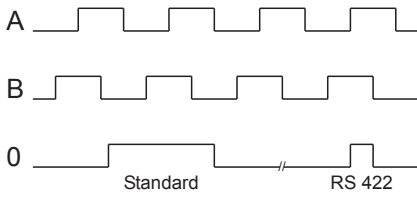
Mounting clip see page 64



Output Circuits:



Signal Outputs:



Two square pulse trains offset by 90° el, with channel A lagging in clockwise rotation..

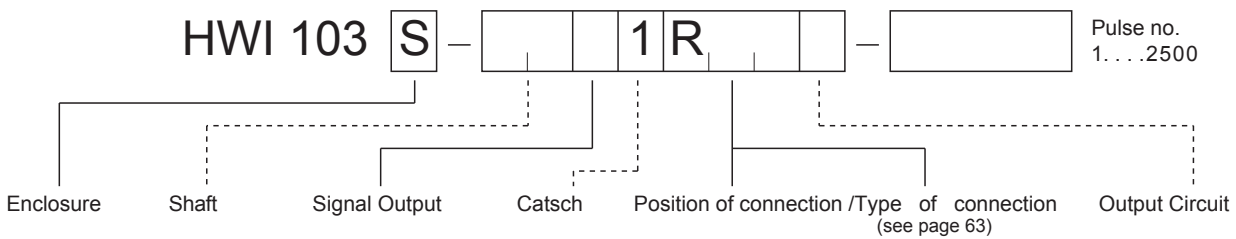
Reference pulse 0 once per revolution. Random in position and length. Linked with RS 422.

All channels can also be inverted.

Pin configuration:

Typ of connection	00	00	01	01	07	12, 54	GND	+ UB	A	B	$\bar{A}$	$\bar{B}$	0	$\bar{0}$
		Color code acc. DIN 47100)					white	brown	green	yellow			grey	
		(Color code acc. DIN 47100)					white	brown	green	yellow	grey	pink	blue	rot
							black	blue	brown	beige			yellow	
							black	blue	brown	beige	yellow	green	pink	violett
							1	2	3	4	(5)	(6)	5	6
							1	2	3	4	5	6	7	8

Order No:



S=Standard E=High-grade steel

- 12 = 12 mm
- 14 = 14 mm
- 15 = 15 mm
- 16 = 16 mm
- 18 = 18 mm
- 19 = 19 mm
- 20 = 20 mm
- 22 = 22 mm
- 24 = 24 mm
- 25 = 25 mm
- 75 = 25,4 mm

- 1 = A
- 2 = A,B
- 3 = A,B,0
- 4 = A, $\bar{A}$
- 5 = A,B /  $\bar{A}$ , $\bar{B}$
- 6 = A,B,0 /  $\bar{A}$ , $\bar{B}$ , $\bar{0}$
- 7 = A,0
- 8 = A,0 /  $\bar{A}$ , $\bar{0}$
- 9 = A,B,0, $\bar{0}$

1 = Stud screws

Standard:

R = radial: 00, 01, 07, 12, 54

matching plug with redy made cable upon request

- 1 = Push Pull 30mA
- 3 = TTL
- 6 = RS 422
- 7 = Ub 24V DC-Output. 5V TTL
- 8 = Push Pull 100mA
- 9 = Ub 24V DC-Output. RS 422

see page 56 for mechanical accessories

# PA 02

Incremental shaft encoder with 12 mm shaft.  
Special merits: robust construction and low torque.

□



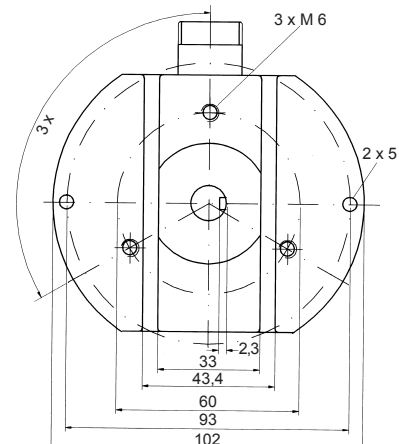
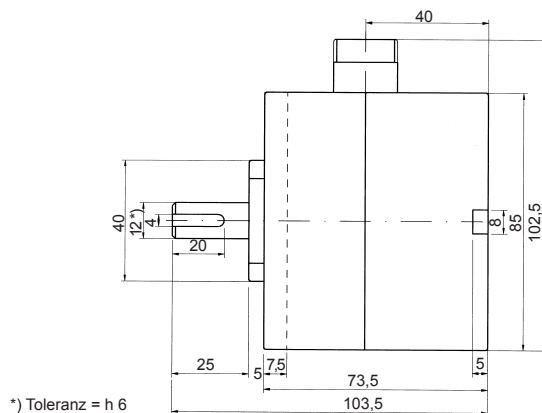
## Electrical Specifications:

Max. pulse frequency:	100 kHz
Permissible temp. range:	-20° . . . +60° C
Supply voltage:	11V . . . 24V DC +20%
Max. current consumption:	- 80 mA (without load)
Max. fan-out:	30 mA (per channel)
Residual ripple:	max. ± 5% U <sub>B</sub>
Supply voltage:	5V DC ± 5%
Max. current consumption	- 80 mA

## Mechanical Specifications:

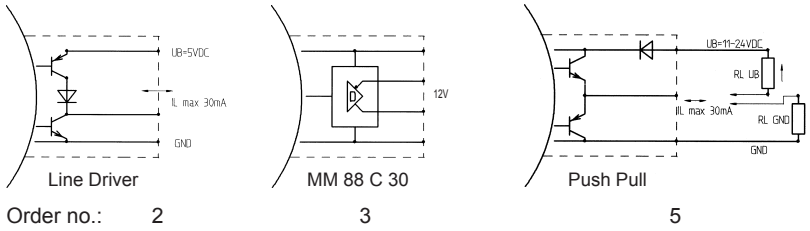
Enclosure:	Zinc diecasting
Shaft:	Stainless steel
Bearing:	Deep groove ball bearing
Weight:	ca. 1,2 kg
System of protection:	IP 54
Max. speed:	6000 U/min
Torque:	ca. 3 Ncm
Max. shaft load:	axial 30 N radial 50 N

## Mechanical Dimensions:





**Output Circuits:**

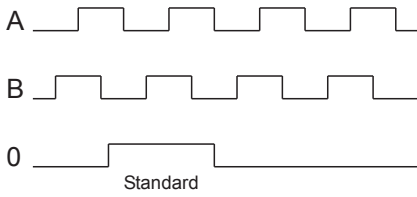


Order no.: 2

3

5

**Signal Outputs:**



Two square pulse trains offset by 90° el, with channel A lagging in clockwise rotation.

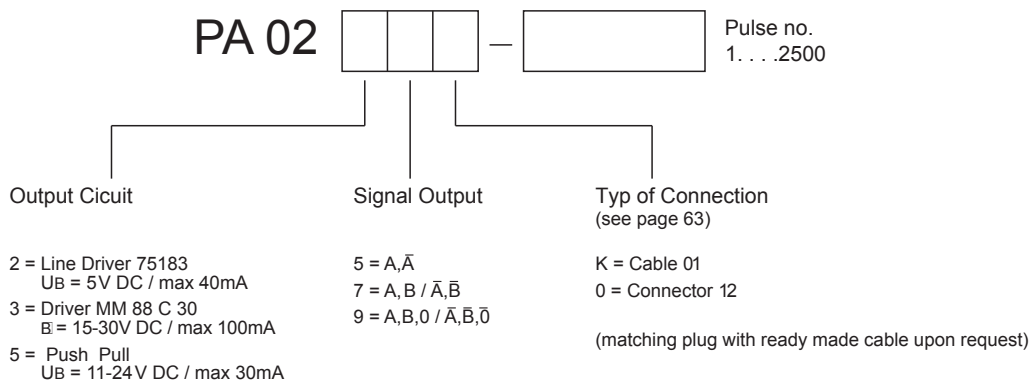
Reference pulse 0 once per revolution. Redom in position and length.

All channels can also be inverted.

**Pin configuration:**

Typ of connection	GND	+ UB	A	B	$\bar{A}$	$\bar{B}$	0	$\bar{0}$	$\perp$
K (01)	black	blue	brown	beige			yellow		gb/gn
„ K (01)	black	blue	brown	beige	yellow	green	pink	violet	gb/gn
„ 0 (Connector12pol.)	1	2	3	4	5	6	7	8	11

**Order No.:**



see page 55/56 for mechanical accessories

# Absolute Shaft Encoders

## General Description

Absolute shaft encoder are optoelectronic sensors with which angles or paths or detected in code.

Every measuring step is allocated a coded digital value defined by the division on a measuring body (code disk).

□

This absolute measured value can be read any number of times, is reproducible and is also not falsified by power failures.

Basically the cyclic Gray code is used with the code disk (measuring body).

The advantage of the cyclic code is that intermediate values are avoided during measuring step changes.

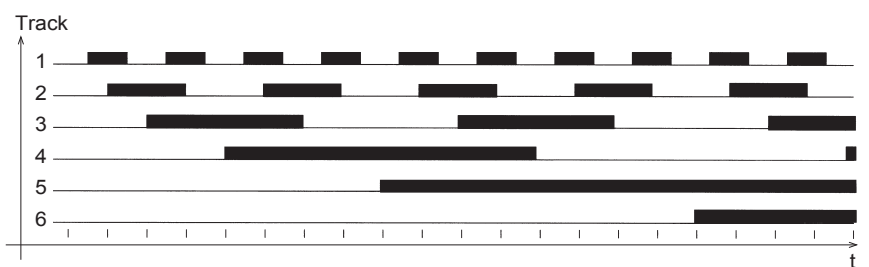
Output Code:

Graycode

Cyclic format code..

The individual positions have no weight.

Only 1 bit changes is every change of measured value. The intermediate values that can occur in multistep codes are avoided through this.



The number of positions to display a position value correspond to those of binary code.

Gray-Excess-Code

The cyclicness of the Gray code applies to resolutions that can be represented as a power (X) of base 2 /2x).

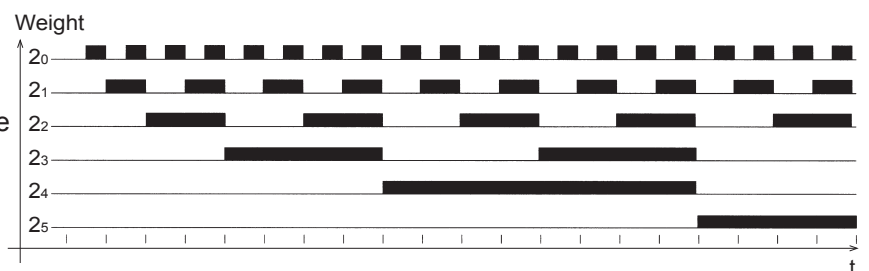
With other resolutions a concentric extract is taken from the Gray code to guarantee that cyclicness is retained. This output code is known as Gray Excess code.

The display range then no longer begins at "0", but shifts by a certain value (e.g.resolution 360 steps/revolution corresponds to range 76-435).

Binär-Code

Evaluative output code.

Every position value is allocated a definite value with a power (x) of base (2x).

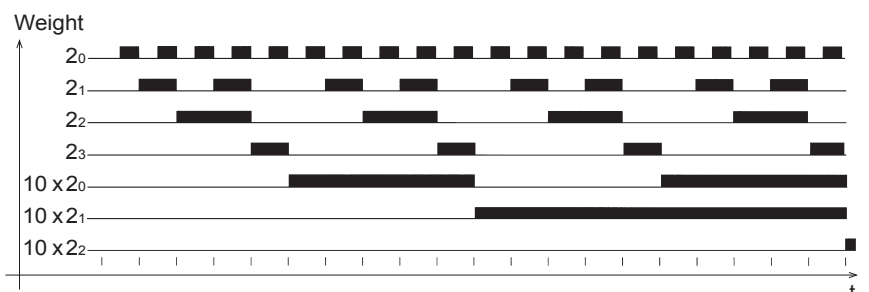


BCD-Code (8-4-2-1 Code)

Evaluative decimal code.

Every decade of the decimal system is represented by a 4-bit binary number.

The 6 redundant combinations (10-15) of the binary code are not used. They are also known as pseudo-tetrads.



**Input- Count Direction Reversal:**

In absolute shaft encoder the output of position values is ascendant in a clockwise direction looking at the shaft. The count direction can be reversed with this input.

**Input- Latch:**

The output data of an absolute shaft encoder can be "frozen" with this input. Through this error-free transfer of position values to a control system is possible.

**Calculation of Permissible Speed:**

The permissible speed is calculated approximately by the following formula in dependence on the maximum signal element frequency of 10 KHz. □

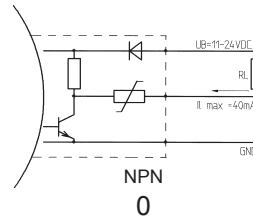
$$n \left( \frac{u}{\text{min}} = \frac{f_{\text{max}} \text{ (Hz)}}{\text{resolution}} \right) \times 60$$

Influence of the cable length not considered!

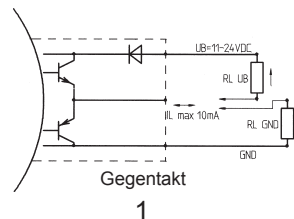
Warning: Do not disregard the permissible mechanical speed!

**Output Cicuits:**

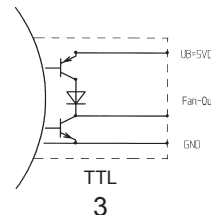
0 Darlington Driver  
ULN 2003 or similar.  
  
max. 40mA per channel  
short circuit-proof



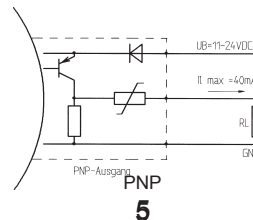
1 Push Pull  
  
max. ±10mA



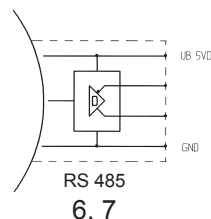
3 TTL  
  
max. 1,6mA per channel  
(1 TTL-load)



5 High-Current Source  
Driver UDN 2982 or sililar  
  
40mA per channel  
short cicuit-proof



6, 7 serieller Output SSI



# Synchronous-serial Transfer (SSI)

## General Aspects

In many cases, absolute shaft encoders are subject to severe mechanical stresses and to electrical and magnetic fields that contaminate the site.

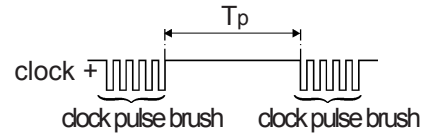
Therefore, special design measures are needed to combat dirt, dust and liquids in industrial environments.

Our absolute shaft encoders are of state-of-the-art rugged mechanical construction, and the electronic components are very compact.

A main consideration for immunity to interference is the data transfer from the shaft encoder to the control system. The control system must be able to read the readings from the shaft encoder without errors. Under no circumstances should undefined data be transmitted, for example at the changeover point.

The major differences between the concept of synchronous-serial data transfer for absolute shaft encoders described here and parallel and asynchronous serial forms of data transfer are:

- less electronic components
- less cabling for data transfer
- the same interface hardware, regardless of the absolute shaft encoder's resolution (word length)
- electrical insulation of the shaft encoder with optocoupler
- open-circuit monitoring by constant current.
- data transfer rates up to 1.5 megabits per second (depending on the length of line)
- ring-register operating possible.



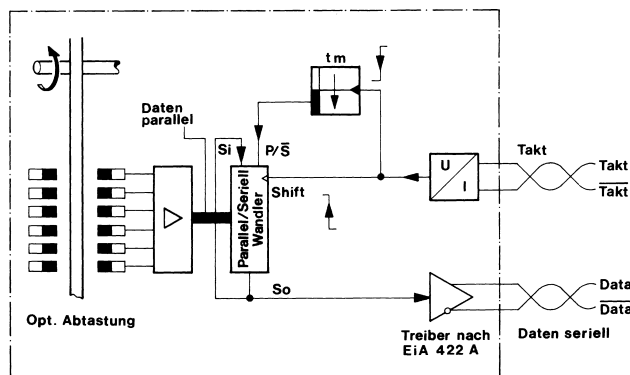
## Transfer Sequence

For correct transfer of the data a defined number of pulses (clock pulse brush) must be applied to the clock input of the absolute shaft encoder. Next, a pause  $T_p$  must be observed. As long as no clock signal is applied to the shaft encoder, its internal parallel/serial shift register remains switched to parallel. The data change continuously, corresponding to the current position of the shaft encoder's shaft. As soon as a clock pulse brush is applied to the clock input again, the instantaneous angular data is recorded.

The first shift of the clock signal from high to low -- actuates the shaft encoder's internal retriggerable monostable element, whose storage time  $t_m$  must be greater than the clock signal's period  $T$ .

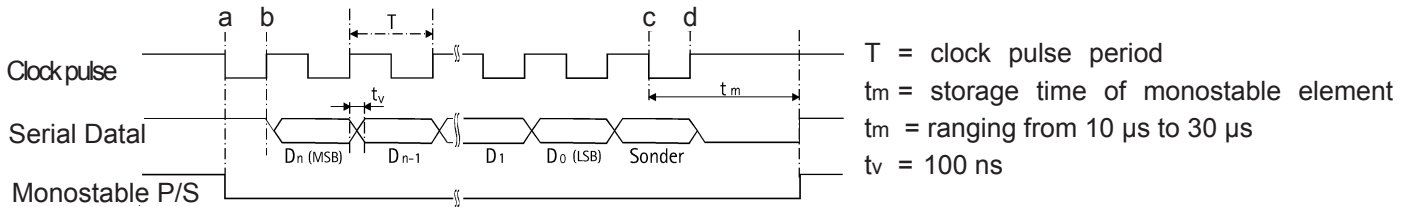
The output of the monostable element controls the parallel/serial register via terminal P/S (parallel/serial).

Block diagram of an absolute shaft encoder



## Synchronous serial Transfer

The number of clock pulses necessary for data transfer is independent of the resolution of the absolute shaft encoder. The clock signal can be interrupted at any point, or continued in ring-register mode for repeated polling.



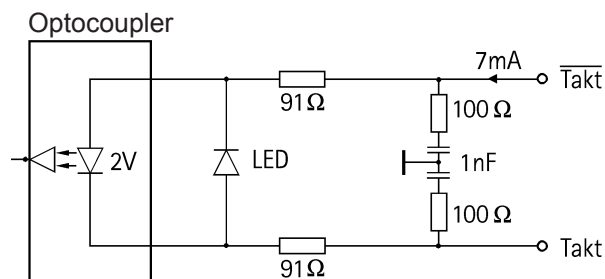
With the first shift of the clock signal from low to high (2) the most significant bit (MSB) of the abgular data is applied to the shaft encoder's serial output.

With each succeeding rising edge, the next less significant bit is shifted to the data output..

After transmission of the least significant bit (LSB) the Alarm bit or other special bits are transferred, depending on configuration. Then the data line switches to low (3) until the time  $t_m$  has passed.

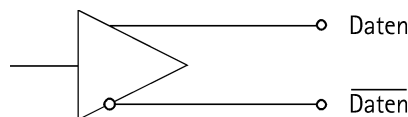
A further transfer of data cannot be started until the data line switches to high(4) again. If the clock pulse sequence is not interrupted at point (3), the ring-register mode is activated automatically. This means that the data stored at the first clock pulse transition (1) are returned to the serial input  $S_i$  via the terminal  $S_o$ . As long as the clock pulse is not interrupted at (3), the data can be read out as often as wanted (multiple transfer).

## Input cicuit



## Output cicuit

### Driver at EIA 422 A



## Recommended data transmission rate

The maximum data transmission rate depends on the engh of cable.

Cable.length	Baud rate
< 50 m	< 400 kHz
< 100 m	< 300 kHz
< 200 m	< 200 kHz
< 400 m	< 100 kHz

# AWA 58

Absolute shaft encoder with high enclosure protection. Compact in size, it meets the highest of industrial demands and attains international standard.

Also available in high-grade steel for extremely aggressive ambient conditions.



Illustration shows standard enclosure see page 52 for high-grade steel version..

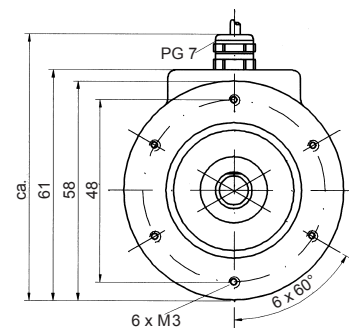
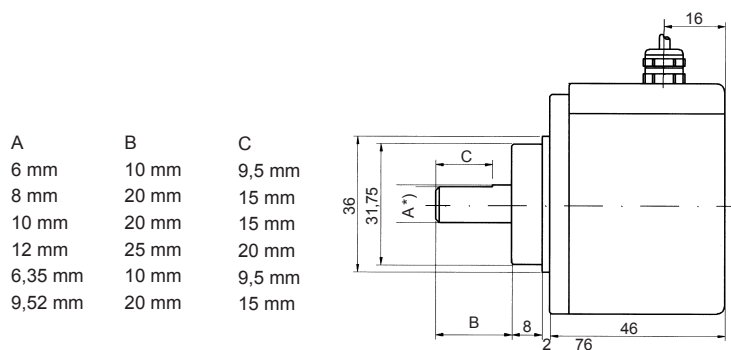
## Elektrical Specifications:

Max. signal element frequency:	10 kHz,
Permissible temp. range:	-20° . . . +60° C
Supply voltage:	12V . . . 24V DC +20%
Max. current consumption:	- 170 mA (without load)
Max. fan-out:	40 mA (per channel),
Residual ripple:	max. ± 5% U <sub>B</sub>

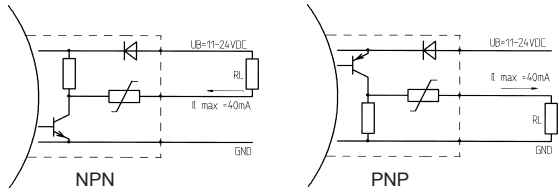
## Mechanical Specifications:

Flange:	Aluminium
Enclosure:	Zic diecasting
Shaft:	Stainless steel
Shaft seal:	Öil/Saltwater-resistant
Bearing:	Deep groove ball bearing
Weight:	ca. 0,4 kg
System of protection:	IP 65
Max. speed:	6000 U/min
Torque:	ca. 3 Ncm
Max. shaft load:	axial 15 N radial 30 N

## Mechanical Dimensions:



Output Circuits:



Order no.: 0

5

Output Code:

Gray  
(beginning at 0)

Gray-Excess  
(beginning  $\neq$  0)

Resolution:

2, 4, 8, 16, 32, 64,  
128, 256, 512, 1024

45, 90, 180, 360

Inputs:

Count direction reversal  
with GND

Optional Extras:

None

Pin configuration:

		BCD		10 <sub>0</sub>				10 <sub>1</sub>				10 <sub>2</sub>				Option		
		GND	+UB	1	2	4	8	1	2	4	8	1	2	4	-	Option		
Type of connection	00	white	brown	green	yellow	grey	pink	blue	red	black	violet	gr/pin	bl/red	wh/gre	-	wh/ye	ye/br	-
„	12	1	2	3	4	5	6	7	8	9	10	11	12	-	-	-	-	-
„	16	1	2	3	4	5	6	7	8	9	10	11	12	13	-	15	16	-

Order No. :

AWA 58 [ ] [ ] [ ] [ ] [ ] [ ] [ ] 0 [ ] Max. Resolution 1024

Enclosure    Shaft    Count Direction    Position of Connection /Art of Connection (see page 63)    Output Circuit    Output Code    Optional Extras

S = Standard	06 = 6 mm	1 = clockwise	Standard:	0 = NPN	E = Gray Excess	0 = None
E = High-grade steel	08 = 8 mm	2 = Counter clockwise	A = axial : 00, 12, 16	5 = PNP	G = Gray	
	10 = 10 mm	3 = Reversible	R = radial :			
	12 = 12 mm (IP 54)		Edelstahl:			
	56 = 6,35		A = axial : 00			
	59 = 9,52		(matching plug with ready made cable upon request)			

see page 55/56 for mechanical accessories

# BC 58

Singleturn / Multiturn  
 short circuit-proof  
 Parallel, SSI, Profibus DP,  
 Interbus (K2) (K3) DeviceNet, CAN, CANopen,

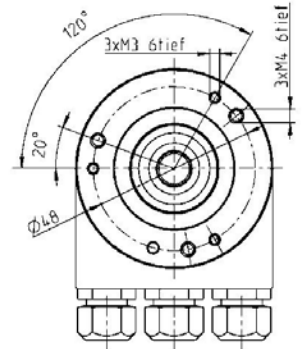
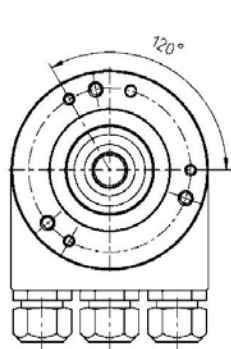
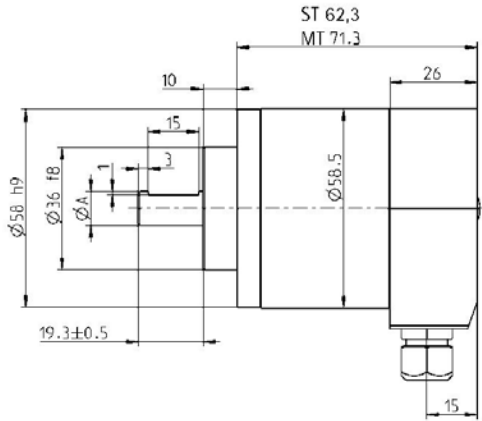


## Mechanical Specifications:

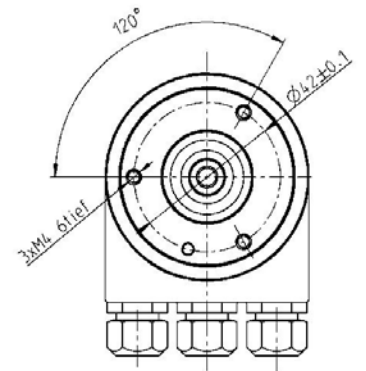
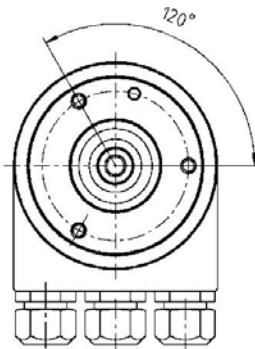
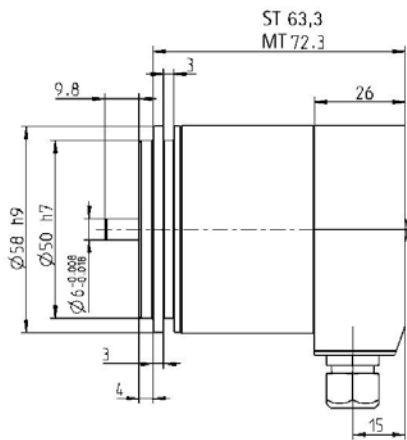
Shaft	6 mm (Synchronus flange)
	10 mm (Clamp flange)
	10 / 12 mm (Plug shaft)
Shaft load capacity	axial 20 N, radial 40 N (6 mm Shaft)
	axial 40 N, radial 60 N (10, 12 mm Shaft)
Operating speed	10 000 min <sup>-1</sup>
Operating torque	< 0,5 Ncm
Inertia moment of the rotor	Synchronus flange: 14 gcm <sup>2</sup>
	Clemp flange: 20 gcm <sup>2</sup>
	Plug shaft: 20 gcm <sup>2</sup>
Protection shaft	IP 64 oder IP 67
Protection enclosure	IP 67
Declaration of confirmiy	DIN EN 61010 protection class III
Operating temperature	- 40 ... 100 ° C
Storage temperature	- 40 ... 85 ° C
Vibration resistance DIN EN 60068-2-6	100 m/s <sup>2</sup> (10 ... 2000 Hz)
Thermal shock resistance DIN EN 60068-2-27	1000 m/s <sup>2</sup> (6 ms)
Connection	axial or radial
Enclosure	S = Synchronus flange, K= Clamp flange
	F = Plug- shaft
Start-torque	< 0,01 Nm
Wight	Singleturn ca. 260 g
	Multiturn ca. 310 g



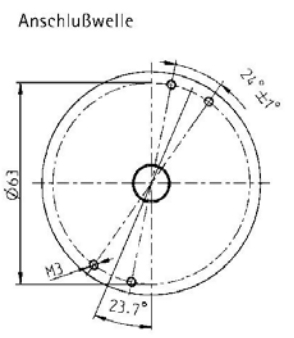
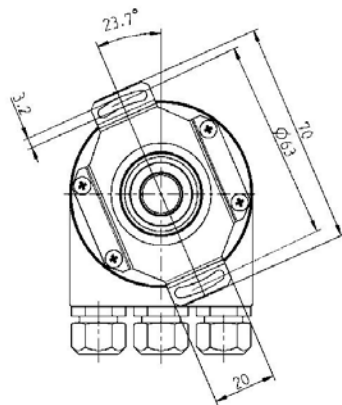
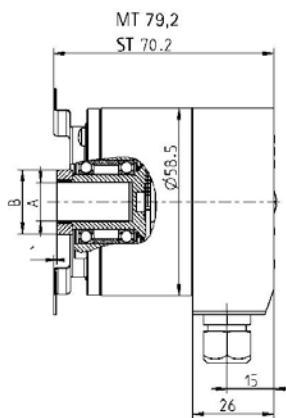
### Clamp flange („K“)



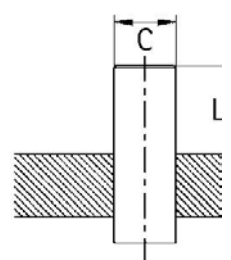
### Synchronus flange („S“)



### Plug -shaft („F“)



	Mass		Einheit
Hohlwellen- $\varnothing A$	10 <sup>+0.012</sup>	12 <sup>+0.012</sup>	mm
Anschlusswellen- $\varnothing C$	10 <sub>07</sub>	12 <sub>07</sub>	mm
Klemmring- $\varnothing B$	18	20	mm
L min.	15	18	mm
L max.	20	20	mm
Wellen-Code	"2"	"7"	



## BC 58 with parallel interface: Singleturn

Parallel interface with cable:				
color (PVC)	10 Bit	12 Bit	13 Bit	14 Bit
grey/pink	N.C.	N.C.	N.C.	S0 (LSB)
brown/yellow	N.C.	N.C.	S0 (LSB)	S1
brown/grey	N.C.	S0 (LSB)	S1	S2
red/blue	N.C.	S1	S2	S3
violet	S0 (LSB)	S2	S3	S4
white/brown	S1	S3	S4	S5
white/green	S2	S4	S5	S6
white/yellow	S3	S5	S6	S7
white/grey	S4	S6	S7	S8
white/pink	S5	S7	S8	S9
white/bleu	S6	S8	S9	S10
white/red	S7	S9	S10	S11
white/black	S8	S10	S11	S12
brown/green	S9 (MSB)	S11 (MSB) Tristate	S12 (MSB)	S13 (MSB)
yellow	Tristate S0...S9	S0... S11 Latsch	Tristate S0...S1	Tristate S0...S13
pink	Latsch (only binär)	Latsch (only binär)	Latsch (only binär)	Latsch (only binär)
green	Direction	Direction	Direction	Direction
Black	0 V	0 V	0 V	0 V
red	5V/10..30VDC	5 V/10..30VDC	5V/10..30VDC	5V/10..30VDC
brown	Alarm	Alarm	Alarm	Alarm

Parallel interface with connector, 17 pins				
Pin	10 Bit	12 Bit	13 Bit	14 Bit
1	S0 (LSB)	S0	S12 (MSB)	S13 (MSB)
2	S1	S1	S11	S12
3	S2	S2	S10	S11
4	S3	S3	S9	S10
5	S4	S4	S8	S9
6	S5	S5	S7	S8
7	S6	S6	S6	S7
8	S7	S7	S5	S6
9	S8	S8	S4	S5
10	S9 (MSB)	S9	S3	S4
11	N.C.	S10	S2	S3
12	Tristate S0..S9	S11 (MSB) Latsch	S1	S2
13	Latsch (only binär)	Latsch (only binär)	S0 (LSB)	S1
14	Direction	Direction	Direction	S0 (LSB)
15	0 V	0 V	0 V	0 V
16	5V/10..30VDC	5 V/10..30VDC	5V/10..30VDC	5V/10..30VDC)
17	Alarm	Alarm	Alarm	Alarm

## BC 58 with parallel interface: Multiturn

Cabel (PVC) Color	Cabel(PVC) Configuration	Cabel (PVC) Color	Cabel (PVC) Configuration	Cable (PVC) Color	Color(PVC) Configuration
brown	S 0	yellow/brown	S 11	grey/green	M 10 (2)
green	S 1	wite/grey	M 0	Yellow/grey	M 11 (2)
yellow	S 2	grey/brown	M 1	pink/green	<u>Alarm</u>
grey	S 3	white/pink	M 2	yello/pink	<u>Direction</u>
pink	S 4	yello/brown	M 3	green/blue	Latsch
Violet	S 5	white/blue	M 4 (1)	yellow/blue	Tristate
grey/pink	S 6	brown/blue	M 5 (1)	red (0,5 mm <sup>2</sup> )	10..30 V DC
red/bleu	S 7	white/red	M 6 (1)	white (0,5mm <sup>2</sup> )	10..30 V DC
white/green	S 8	brown/red	M 7 (1)	blue (0,5 mm <sup>2</sup> )	0 V
brown/green	S 9	white/black	M 8 (2)	black (05 mm <sup>2</sup> )	0 V
white/yellow	S 10	brown/black	M 9 (2)		

- 1) N.C. about 16 Bit
- 2) N.C. about 16 or 20 Bit

Electrical Specification	
Power supply	10-30 V
Max. current consumption ST / MT	200 mA /300 mA
Interface	Parallel
Output Code	Binär, Gray, Gray-Excess
Resolution Singleturn	10-14 Bit , 12 Bit at MT Variante
	Gray Excess: 360, 720 Steps
Resolution Multiturn	12 Bit
Linearity	+/- ½ LSB
Permissible load/ per Bit	30 mA, Short circuit proof outputs
Programmable funktions	<u>Latsch</u> , <u>Direction</u> , <u>Tristate</u> by ST ; Tristate by MT
Connection	Cable or Connector 17 pins. axial oder radial, Sub D-37 pins

## Order No:

**BC 58 / 1212 E K.42 PB B**

Resolution	Supply voltage	Flange	Protection	Shaft	Interface	Connection
<b>0010</b> 10 Bit ST	E= 10-30 V	<b>S.41</b> Sychro	IP 64	6 mm	<b>PB</b> = Parallel	<b>A</b> = Cable axial
<b>0012</b> 12 Bit ST		<b>S.71</b> Sychro	IP 67	6 mm	Binär	<b>B</b> = Cable radial
<b>0013</b> 13 Bit ST		<b>K.42</b> Clamp	IP 64	10 mm	<b>PG</b> = Parallel	<b>W</b> = Connector 17 pins. axial
<b>0014</b> 14 Bit ST		<b>K.72</b> Clamp	IP 67	10 mm	Gray	<b>Y</b> = Connector 17pinsl. radial
<b>0360</b> 360 ST		<b>F.42</b> Plug-shaft	IP 64	10 mm H-shaft		<b>A-A1-F</b> = 0,1 m Cable /axial
<b>0720</b> 720 St		<b>F.47</b> Plug-shaft	IP 64	12 mm H-shaft		+ 37 pins connector
<b>1212</b> 12 MT+12 S					<b>B-A1-F</b> = 0,1 m Cable/ radial	
						+ 37 pins connector

---

## BC 58 with SSI Interface

### Synchronous-serial transfer (SSI):

Synchronous readout of the encoder data is according to the clock rate given by the SSI-counterpart. The number of clock rates is determined by the type of encoder and the configuration of the special bits as defined.

For multiple transactions (the stored value is readout several times successively) a fixed clock rate per transaction must be kept (for singleturn 13 resp. 14 clocks, for multiturn 25 resp. 26 clocks). In the rest position, when the last clock brush has passed by more than 30 µm, the data outputs is logically at "1".

With the first descending clock edge the encoder data and the special bits are loaded in the shift register of the encoder interface. With each ascending clock edge the data bits are serially readout, beginning with the MSB. At the end of the data transfer the data output is set to logically "0" for approx 20 µs.

### Recommended data transmission rate for SSI:

The maximum data transmission rate depends on the cable length.

Cable length	Baud rate
< 50 m	< 400 KHz
< 100 m	< 300 KHz
< 200 m	< 200 KHz
< 400 m	< 100 KHz

### Pin Configuration SSI Interface:

Cable	Connector	Signal
brown (0,5mm <sup>2</sup> )	1	0 V (Supply voltage)
pink	2	Data
yellow	3	Takt
		N.C.
blue	5	Direction
	6	N.C.
	7	N.C.
white (0,5 mm <sup>2</sup> )	8	10 ... 30 V DC
	9	N.C.
		Data
green	11	Takt
	12	0 V- Signal Output

## BC 58 with SSI Interface

Electrical Specification	
Power supply	5V or 10-30 V
Max. current consumption ST / MT	50 mA / 100 mA
Interface	SSI
Output Code	Binär or Gray
Resolution Singleturn	10-17 Bit , max. 13 Bit in MT Variante
	Gray Excess: 360, 720 Steps
Absolut Linearity	+/- 35 ''
Revers Linearity	+/- 7 ''
Status LED	Green = ok; Red = Alarm
Steuereingänge	Direction
Programmable funktions	Resolution, Cods, Direction, Warning, Alarm
Resettaste	stop per Parametrierung
Connection	Cable or Connector axial or radial

### Order No:

**BC 58 / 1212 E K.42 SB B**

<b>Resolution</b>	<b>Supply voltage</b>	<b>Flange</b>	<b>Protection</b>	<b>Shaft</b>	<b>Interface</b>	<b>Connection</b>
<b>0010</b> 10 Bit ST	A = 5 V E = 10-30 V	<b>S.41</b> Sychro	IP 64	6 mm	<b>SB = SSI</b>	<b>A = Cable axial</b>
<b>0012</b> 12 Bit ST		<b>S.71</b> Sychro	IP 67	6 mm	Binär	<b>B = Cable radial</b>
<b>0013</b> 13 Bit ST		<b>K.42</b> Clamp	IP 64	10 mm	<b>SG = SSI</b>	<b>C = Connector 12 pins axial</b>
<b>0014</b> 14 Bit ST		<b>K.72</b> Clamp	IP 67	10 mm	Gray	<b>D = Connector 12 pins radial</b>
<b>0017</b> 17 Bit ST		<b>F.42</b> Plug-shaft	IP 64	10 mm H-Shaft		
<b>1212</b> 12 MT+ 12 S		<b>F.47</b> Plug-shaft	IP 64	12 mm H-Shaft		
<b>1213</b> 12 MT+13 S						

## BC 58 with Profibus DP Interface

Electrical Specifications	
Supply Voltage	11- 30 V DC
Max. current consumption ST / MT	220mA / 250 mA
Interface	Profibus- DP , Encoder Profil
Certifiziert	PNO
Programmable funktions	Class 2 : Resolution, Preset, Direction
Output Code	Binär
Baud rat	9,6 K Baud- 12 M Baud
Resolution Singleturn	10 – 14 Bit
Resolution Mutltiurn	12 Bit
Integratet Funktion	Speed, Turn-speed, worktime
Connection	Enclosure with 2 x connector, Encolure with 3 x PG
Mechanical Spezifikationen	
Permissible temp. range	- 40 ° C bis + 85 ° C
Weight ca, ST/ MT	350 g / 400 g

Preset only for the bus, no switsches

### Order No:

**BC 58 / 1212 E K.42 DP Z**

Resolution	Supply voltage	Flange	Protection	Shaft	Interface	Connection
<b>0010</b> 10 Bit ST	E = 10-30 V	<b>S.41</b> Sychro	IP 64	6 mm	DP =Profibus DP	I = 2 x 12 pins Connector  Z = 3 x PG Bus Terminal
<b>0012</b> 12 Bit ST		<b>S.71</b> Sychro	IP 67	6 mm		
<b>0013</b> 13 Bit ST		<b>K.42</b> Clamp	IP 64	10 mm		
<b>0014</b> 14 Bit ST		<b>K.72</b> Clamp	IP 67	10 mm		
<b>1212</b> 12 MT+ 12 S		<b>F.42</b> Plug-shaft	IP 64	10 mm H-shaft.		
<b>1213</b> 12 MT+ 13 S		<b>F.47</b> Plug-shaft	IP 64	12 mm H-shaft.		
<b>1214</b> 12 MT + 14 S						

## BC58 with Interbus Interface

<b>Electrical Specifications</b>	
Supply voltage	11- 30 V DC
Max. current consumption ST / MT	220mA / 250 mA
Interface	Interbus, ENCOM Profil K 3 (programable), K 2
DÜ format	Sypi Adresse 0123, Byte Nr. 3210
Programmable funktions	Direction, Skalierungsfaktor, Preset, Offset
Output Code	32 Bit Binär
Baud rate	500 Kbaud ENCOM
Resolution Singleturn	10 – 17 Bit , 12 Bit MT Variante
Resolution Mutltiurn	12 Bit
ID.Code K 3	37H (055 dezimal)
Connection	Enclosure with 2 x connector, Encolure with 3 x PG
<b>Mechanical Specifications</b>	
Permissible temp. range	- 40 ° C bis + 85 ° C
Weight ca, ST/ MT	350 g / 400 g

### Order No:

**BC 58 / 1212 E K.42 I3 I**

<b>Resolution</b>	<b>Supply voltage</b>	<b>Flange</b>	<b>Protection</b>	<b>Shaft</b>	<b>Interface</b>	<b>Connection</b>
0010 10 Bit ST	E = 10-30 V	S.41 Sychro	IP 64	6 mm	I2 Interbus K2	I = 2 x 12 pins Connector
0012 12 Bit ST		S.71 Sychro	IP 67	6 mm	I3 Interbus K 3	Z = 3 x PG Bus Terminal
0013 13 Bit ST		K.42 Clamp	IP 64	10 mm		
0014 14 Bit ST		K.72 Clamp	IP 67	10 mm		
1212 12 MT+ 12 S		F.42 Plug-shaft	IP 64	10 mm H-shaft		
		F.47 Plug-shaft	IP 64	12 mm H-shaft		

## BC58 with DeviceNet Interface

<b>Electrical Specifications</b>	
Supply voltage	11- 30 V DC
Max. current consumption ST/ MT	220mA / 250 mA
Schnittstelle	CAN-Highspeed ISO/DIS 11898, CAN- Spezifikation 2.0 B
Profil	Customer spezial. Profil, Encoder profil - DeviceNet
Programmable funktions	Class 2; Resolution, Preset, Direction
Output Code	Binär
Baud rate	125,250,500 KBAud
Resolution Singleturn	10 – 14 Bit , 12 Bit MT Variante
Resolution Mutltiurn	12 Bit
Transfermodus	Pollmodus, Change of State. Zyklisch with programable Zyklustimer
Connection	Enclosure with 2 x connector, Encolure with 3 x PG
<b>Mechanical Spezifications</b>	
Permissible temp. range	- 40 ° C bis + 85 ° C
Weight ca, ST/ MT	350 g / 400 g

### Order No:

**BC 58 / 1212 E K.42 VD Z**

Resolution	Supply voltage	Flange	Protection	Shaft	Interface	Connection
<b>0010</b> 10 Bit ST	E = 10-30 V	<b>S.41</b> Sychro	IP 64	6 mm	VD =DiviceNet	I = 2 x 12 pins Connector Z = 3 x PG Bus Terminal
<b>0012</b> 12 Bit ST		<b>S.71</b> Sychro	IP 67	6 mm		
<b>0013</b> 13 Bit ST		<b>K.42</b> Clamp	IP 64	10 mm		
<b>0014</b> 14 Bit ST		<b>K.72</b> Clamp	IP 67	10 mm		
<b>1212</b> 12 MT+ 12 S		<b>F.42</b> Plug-shaft	IP 64	10 mm H-shaft.		
<b>1213</b> 12 MT+ 12 S		<b>F.47</b> Plug-shaft	IP 64	12 mm H-shaft		
<b>1214</b> 12 MT + 12 S						



## BC58 with CANopen / CAN Layer 2 Interface

<b>Electrical Spezifications</b>	
Supply voltage	11- 30 V DC
Max. current consumption ST/ MT	220mA / 250 mA
Schnittstelle	CAN-Highspeed ISO/DIS 11898, Basic- and Full-CAN CAN- Spezifikation 2.0 B (11 and 29 Bit Identifier)
Profil	CANopen Profil DSP 406, with programable Funktion
Programmable funktions	CANopen: Direction, Resolution, Preset, Offset, Maximale: CAN L2: Direction, Maximale, Binär
Output Code	Binär
Baud rate	programmable 10 - 1.000 KBAud
Basisidentifizier	DIP Switches
Integratet funktionen	speed, Turn-speed, Maximale only CANopen
Resolution Singleturn	10 – 14 Bit , 12 Bit MT Variante
Resolution Mutltiurn	12 Bit
Transfermodus	Pollmodus, Change of State Zyklisch with programmable Zyklustimer
Connection	Enclosure with 2 x connector, Encolure with 3 x PG
<b>Mechanical Spezifications</b>	
Permissible temp. range	- 40 ° C bis + 85 ° C
Weight ca, ST/ MT	350 g / 400 g

### Order No:

**BC 58 / 1212 E K.42 OL Z**

<b>Resolution</b>	<b>Supply voltage</b>	<b>Flange</b>	<b>Protection</b>	<b>Shaft</b>	<b>Interface</b>	<b>Anschluss</b>
<b>0010</b> 10 Bit ST	E = 10-30 V	<b>S.41</b> Sychro	IP 64	6 mm	<b>OL</b> = CANopen	<b>D</b> = 1 x 12 pins Connector
<b>0012</b> 12 Bit ST		<b>S.71</b> Sychro	IP 67	6 mm	<b>CL</b> = CAN L2	<b>I</b> = 2 x 12 pins Connector
<b>0013</b> 13 Bit ST		<b>K.42</b> Clamp	IP 64	10 mm		<b>Z</b> = 3 x PG Bus Terminal
<b>0014</b> 14 Bit ST		<b>K.72</b> Clamp	IP 67	10 mm		
<b>1212</b> 12 MT+ 12 S		<b>F.42</b> Plug-shaft	IP 64	10 mm H-shaft.		
<b>1213</b> 12 MT+ 12 S		<b>F.47</b> Plug-shaft	IP 64	12 mm H-shaft		
<b>1214</b> 12 MT + 12 S						

# AWA 90

Due to its size, this absolut shaft encoder meets the highest of mechanical demands.

It is used wherever high mechanical stresses are likely.

Naturally also available in high-grade steel.



Illustration shows standard enclosure  
see page 52 for high-grade steel.

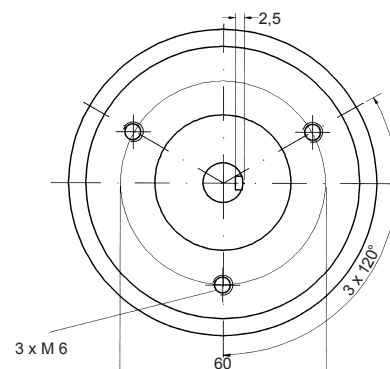
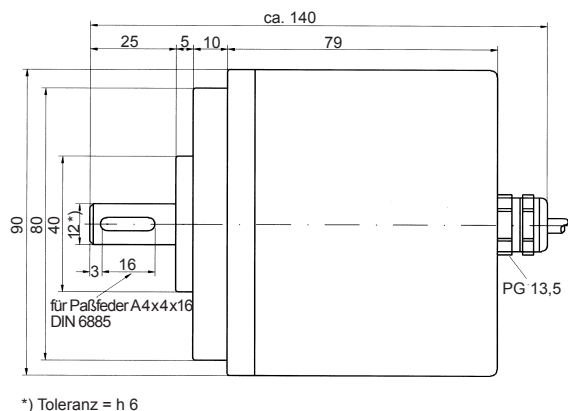
## Elektrical Specifications:

Max. signal element frequency:	10 kHz
Permissible temp. range:	-20° . . . +60° C
Supply voltage:	12V . . . 24V DC +20 %
Max. current consumption:	max. 160 mA (without load)
Max. fan-out:	40 mA (per channel)
Residual ripple:	max. ± 5% U <sub>B</sub>

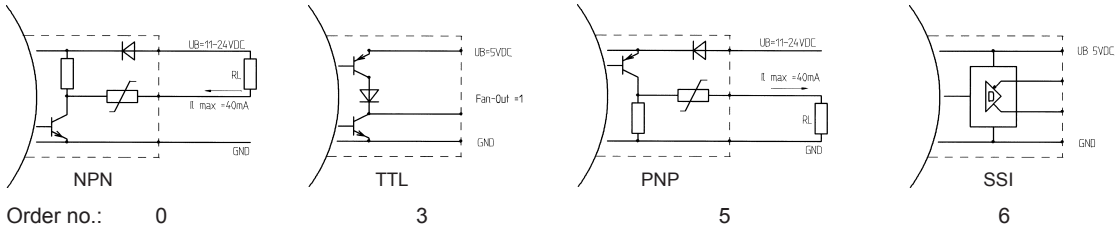
## Mechanical Specifications:

Flange:	Aluminium
Enclosure:	Sheet steel/powder coated
Shaft:	Stainless steel
Shaft seal:	Oil/Saltwater-resistant
Bearing:	Deep groove ball bearing
Weight:	ca. 1,2 kg
System of protection:	IP 65
Max. speed:	6000 U/min
Torque:	ca. 5 Ncm
Max. shaft load:	axial 30 N radial 50 N

## Mechanical Dimensions:



Output Circuits:



Output Code:

Binary, BCD

Gray  
(beginning at 0)

Gray-Excess  
(beginning ≠ 0)

Resolution:

2, 4, 8, 16, 32, 64, 128, 256,  
512, 1024, 2048

2, 4, 8, 16, 32, 64, 128, 256,  
512, 1024, 2048, 4096

45, 90, 180, 360, 720,  
1440, 2880, 3600

Inputs:

(Optocouplerr)

Count direction reversal  
with + UB

Optional Extras:

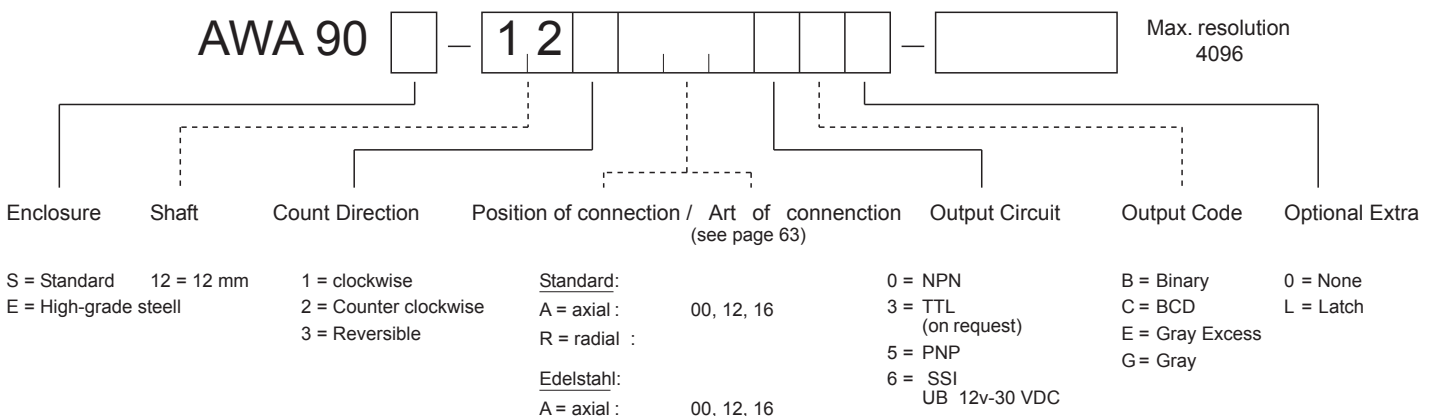
Latch  
(Optocoupler input,  
driver with + UB)

Pin Configuration:

Art of Connection	*BCD		10 <sub>0</sub>				10 <sub>1</sub>				10 <sub>2</sub>				10 <sub>3</sub>				Option ←→	
	GND	+UB	1	2	4	8	1	2	4	8	1	2	4	8	1	2	4	Option ←→		
12	1	2	3	4	5	6	7	8	9	10	11	12	-	-	-	-	-	-	-	-
16	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	-	-	-	-
00	white	brown	green	yellow	grey	pink	blue	red	black	violet	gr/pin	bl/red	wh/gre	br/gre	wh/ye	ye/br	wh/gr	gr/br	wh/rpin	-

\* Upwards of resolution 2048 BCD only cable output!

Order No:



see page 55/56 for mechanical accessories

(matching plug with ready made cable upon request)

# HWA 58



General characteristics:  
 10, 12 or 13 Bit resolution, singleturn  
 hollow shaft version, casing 58 mm  
 Protective system IP 66  
 SSI or parallel section port  
 Electronic temperature and ageing  
 compensation  
 Short circuit proof outlets

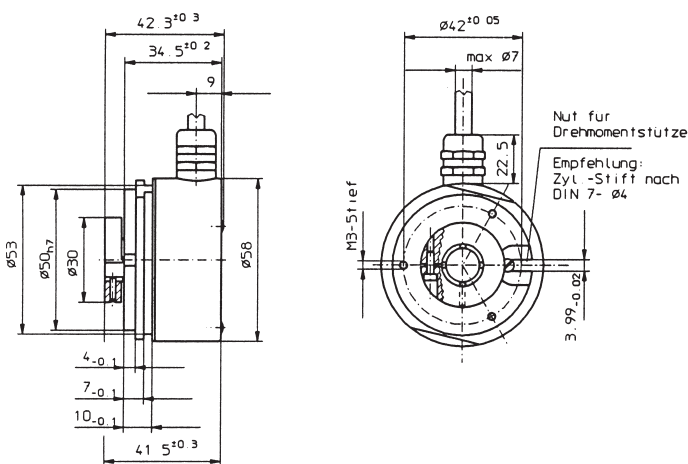
Mechanical Specifications:

Revolution speed: max. 6000 U/min.\*  
 Inertia moment of the rotor: ca.  $6 \times 10^{-6}$  kgm<sup>2</sup>  
 Motor starter torque(25° C): < 0,05 Nm  
 Weight: ca. 0,4 kg  
 Protective system acc.to EN 60529: IP 66  
 Working temp. range: -20° C bis + 70° C  
 Shaft: stainless steel

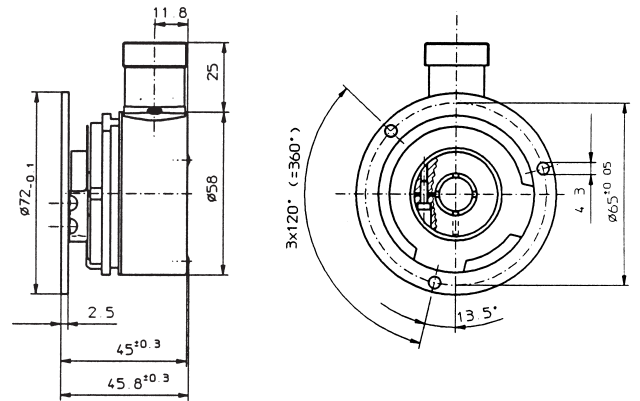
Thermal shock resistance according to  
 DIN - IEC 68-2-27 200 g, 6 ms  
 Vibration resistance according to  
 DIN - IEC 68-2-6 10 g, 10. . . .2000 Hz  
 \*under continuous operation max. 1500 R/min).

Mechanical Dimensions:

Flange Typ 1



Flange STN 1 with stator coupling



Assembly notes:

Flange and shaft of encoder and actuation must not be simultaneously rigidly coupled together!  
 The torque converter bearing offers the easiest system of flange-mounting (see dimensions pictures).

In this case, the max. permissible resolutions are 4096 divisible (12 Bit) at a measurement error rate of approx. +/- 0.5 Bit and an assembly radius of the torque converter bearing of 22.5 mm..  
 When using the stator coupling the radial deviation of the actuation shaft may be a maximum of 10 µm at 13 Bit, 20 µm at 12 Bit and 80 µm at 10 Bit so that error of measurement does not exceed +/- 1/2 Bit.

**Elektrical Specifications:**

	Synchronous-serial(SSI).	Synchronous-serial(SSI)	Parallel	Parallel
Supply voltage (U <sub>B</sub> )	5 VDC (+/- 5%)	10 - 30 VDC	5 VDC (+/- 5%)	10 - 30 VDC
Output driver	RS 485	RS 485	Push.Pull	Push.Pull
Current consumption typ.	89 mA	89 mA	109 mA	109 mA
max.	138 mA	138 mA	169 mA	169 mA
Permissible load/channels	max. +/- 20 mA	max. +/- 20mA	max. +/-10 mA	max. +/- 10 mA
Data element exchange rate	max. 15.000/s	max. 15.000/s	40.000/s	40.000/s
Rate of cycles, min./max..	100 kHz / 500 kHz	100 kHz / 500 kHz	—	—
Short circuit proof outputs	yes	yes	yes	yes
Reverse battery protection on U <sub>B</sub>	no	yes	no	yes
CE - conformity acc. to EN 50081-2 and EN 55011 class B				

**Count direction**

Ascending code values when turning the shaft in a clockwise direction (when facing the shaft).

**Pin configuration:**

Typ of connection / Pine	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Enclosure
„ 12 (SSI)	GND	+UB	+T	-T	+D	-D	-	-	-	-	-	-	-	-	-	-	-	⏏
„ 12 (parallel)	GND	+UB	2 <sub>0</sub>	2 <sub>1</sub>	2 <sub>2</sub>	2 <sub>3</sub>	2 <sub>4</sub>	2 <sub>5</sub>	2 <sub>6</sub>	2 <sub>7</sub>	2 <sub>8</sub>	2 <sub>9</sub>	-	-	-	-	-	⏏
„ 17	GND	+UB	2 <sub>0</sub>	2 <sub>1</sub>	2 <sub>2</sub>	2 <sub>3</sub>	2 <sub>4</sub>	2 <sub>5</sub>	2 <sub>6</sub>	2 <sub>7</sub>	2 <sub>8</sub>	2 <sub>9</sub>	2 <sub>10</sub>	2 <sub>11</sub>	2 <sub>12</sub>	-	-	⏏

Funktions specification SSI see page 26.

**Order No.:**



Hollow shaft	Count direction	Position of conenc.	Typ of connection	Output circuit	Output code	Optional extra	Resolution
10 = 10 mm 12 = 12 mm	1 = rechts	R = radial	12 = connector 12 pol. (for SSI and 10 Bit Parallel output)	1 = Push Pull 3 = TTL 6 = SSI with U <sub>B</sub> 10 V - 30 V 7 = SSI with U <sub>B</sub> 5 V	G = Gray	0 = none	1024 4096 8192

Accessories: stator coupling STN 1  
(see mechanical dimensions)

(matching plug with ready made cable upon request)

# HWA 103

Robust absolute hollow shaft encoder for direct mounting on existing shafts of 12- 25,4 mm in diameter.

This encoder simultaneously features the advantage of requiring little space while meeting the highest of mechanical demands.



## Elektrical Specifications:

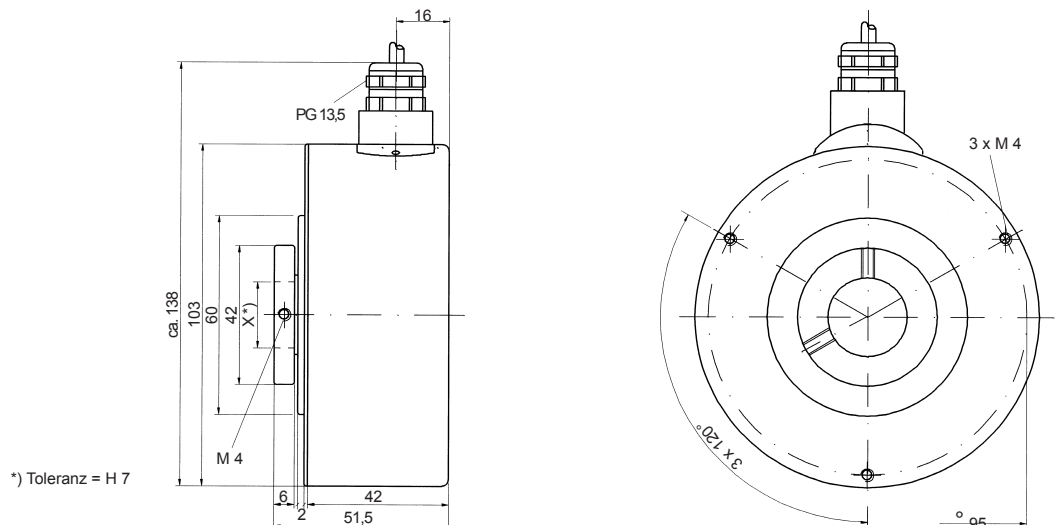
Max. signal element frequency:	10 kHz
Permissible temp. range:	-20° . . . +60° C
Power supply:	12V . . . 24V DC +20%
Max. current consumption:	max. 160 mA (without load)
Max. fan-out:	40 mA (per channel)
Residual ripple:	max. ± 5% U <sub>B</sub>

## Mechanical Specifications:

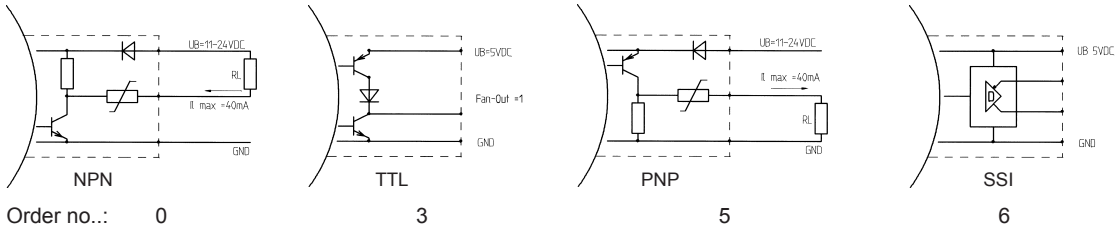
Flange/Enclosure:	Aluminium
Hollow shaft:	Stainless steel
Shaft seal:	Oil/Saltwater-resistant
Bearing:	Deep groove ball bearing
Weight:	ca. 0,8 kg
System of protection:	IP 65
Max. speed:	6000 U/min
Torque:	ca. 15 Ncm

## Mechanical Dimensions:

Mounting clip see page 54



### Output Circuits:



### Output Code:

Binary, BCD,

Gray  
(beginning at 0)

Gray-Excess  
(beginning ≠ 0)

### Resolution:

2, 4, 8, 16, 32, 64, 128, 256,  
512, 1024, 2048

2, 4, 8, 16, 32, 64, 128, 256,  
512, 1024, 2048, 4096

45, 90, 180, 360, 720,  
1440, 2880, 3600

### Inputs:

(Optocoupler)

Count direction reversal  
with + UB

### Optional Extras:

Latch  
(Optocoupler input,  
driver with + UB)

### Pin Configuration:

Typ of connection	*BCD		10 <sub>0</sub>				10 <sub>1</sub>				10 <sub>2</sub>				10 <sub>3</sub>				Option ←→
	1	2	4	8	1	2	4	8	1	2	4	8	1	2	4	Option ←→			
	2 <sub>0</sub>	2 <sub>1</sub>	2 <sub>2</sub>	2 <sub>3</sub>	2 <sub>4</sub>	2 <sub>5</sub>	2 <sub>6</sub>	2 <sub>7</sub>	2 <sub>8</sub>	2 <sub>9</sub>	2 <sub>10</sub>	2 <sub>11</sub>	Option ←→	-	-	-			
12	1	2	3	4	5	6	7	8	9	10	11	12	-	-	-	-	-	-	-
16	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	-	-	-
00	brown		green	yellow	grey	pink	blue	red	black	violet	gr/pin	bl/re	wh/gre	br/gre	wh/ye	ye/br	wh/gr	gr/br	wh/pin

\* Upwards of resolution 2048 BCD only cable output!

### Order No.:

**HWA 103** **S** - **1** **R** - [ ] - [ ] Max. resolution 4096

Enclosure    Shaft    Catch    Count Direction    Pos. of Connenc. / Typ of Connec.    Output Circuit    Output Code    Optional Extras

S = Standard    12 = 12 mm    1 = Stiftschraube    1 = clockwise    Standard:    0 = NPN    B = Binary    0 = None  
                   14 = 14 mm                    2 = counter clockwise    R = radial :    3 = TTL    C = BCD    L = Latch  
                   15 = 15 mm                    3 = reversible                    on request)    E = Gray Excess  
                   16 = 16 mm                                                                                G = Gray  
                   18 = 18 mm                                                                                5 = PNP  
                   19 = 19 mm                                                                                6 = SSI  
                   20 = 20 mm                                                                                matching plug with ready  
                   22 = 22 mm                                                                                made cable upon request)

See page 56 for mechanical accessories

# 70-140

Absolute shaft encoder with 12 mm shaft.  
 Special merits: robust construction and low torque.



## Electrical Specifications:

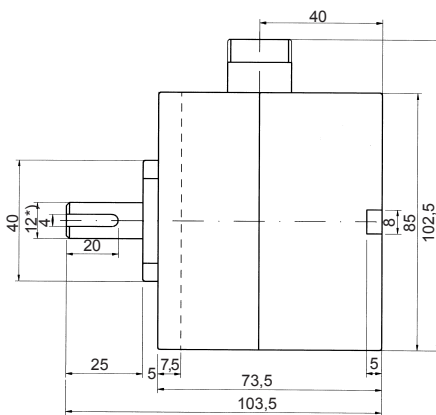
Max. signal element frequency: 10 KHz  
 Permissible temp. range:  $-20^{\circ} \dots +60^{\circ} \text{C}$

Power supply: 12V . . . 24V DC +20%  
 Max. current consumption: max. 100 mA (without load)  
 Max. fan-out: 40 mA (per channel)  
 Residual ripple: max.  $\pm 5\% U_B$

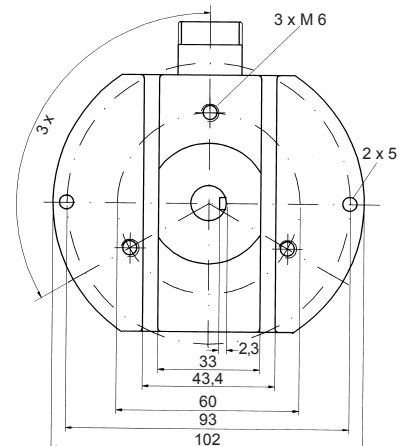
## Mechanical Specifications:

Enclosure: Zinc diecasting  
 Shaft: Stainless steel  
 Bearing: Deep groove ball bearing  
 Weight: ca. 1,2 kg  
 System of protection: IP 54  
 Max. speed: 6000 U/min  
 Torque: ca. 3 Ncm  
 Max: shaftload: axial 30 N  
 radial 50 N

## Mechanical Dimensions:

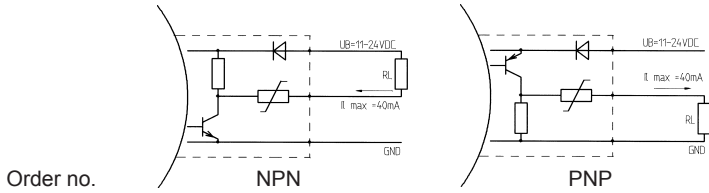


\*) h 6





Output Circuits:



Output Code

Binary, BCD

Gray  
(beginning at 00)

Gray-Excess  
(beginning ≠ 0)

Resolution:

2, 4, 8, 16, 32, 64, 128,  
256, 512, 1024

2, 4, 8, 16, 32, 64, 128,  
256, 360, 512, 1024,

45, 90, 180, 360, 720

Inputs:

Count direction reversal (looking at the shaft)

Input open = clockwise

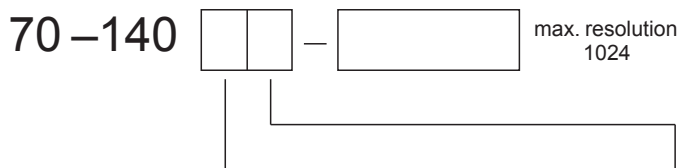
Input + UB = counter-clockwise

Pin Configuration:

	*BCD		10 <sub>0</sub>				10 <sub>1</sub>				10 <sub>2</sub>				10 <sub>3</sub>		
	GND	+UB	1	2	4	8	1	2	4	8	1	2	4	8	1	↔	
Typ of connection			2 <sub>0</sub>	2 <sub>1</sub>	2 <sub>2</sub>	2 <sub>3</sub>	2 <sub>4</sub>	2 <sub>5</sub>	2 <sub>6</sub>	2 <sub>7</sub>	2 <sub>8</sub>	2 <sub>9</sub>	2 <sub>10</sub>	2 <sub>11</sub>	optional	↔	
F (12pol.)	1	2	3	4	5	6	7	8	9	10	11	12	-	-	-	-	
„ F (16pol.)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
„ K (00)			brown	green	yellow	grey	pink	blue	red	black	violet	gr/pi	bl/re	wh/gn	br/gn	wh/ye	ye/br

\* Binär, BCD, only 1024

Order No.:



Coding + Count-Direction + Output

- |                |               |               |
|----------------|---------------|---------------|
| A = Gray → NPN | E = Bin → NPN | I = BCD → NPN |
| B = Gray ← NPN | F = Bin ← NPN | L = BCD ← NPN |
| C = Gray → PNP | G = Bin → PNP | K = BCD → PNP |
| D = Gray ← PNP | H = Bin ← PNP | M = BCD ← PNP |
| N = Gray ↔ NPN | P = Bin ↔ NPN | S = BCD ↔ NPN |
| O = Gray ↔ PNP | R = Bin ↔ PNP | T = BCD ↔ PNP |

Modification

- A = None  
 B = Parity (odd)  
 C = Parity (even)  
 F = Connector ax. ↔ 12pol ↔ 16pol.)  
 K = Cable output (00)  
 (matching plug with ready made cable upon request)

See page 53/54 for mechanical accessories

# AWI 70 Ex HWI 70 Ex

Compact version, diameter 70 mm in design  
 "Compression proof metal protection" with  
 EX II 2G EEX d II T 6 (PTB 03 ATEX 1163)  
 Electronic temperature and  
 ageing compensation  
 Short circuit proof outlets  
 Over-voltage and reserve battery protection  
 on the operating voltage (at  $U_B = 10 - 30$  VDC)  
 Diameter of the shafts 12 mm  
 Resolution up to 5000 impulses



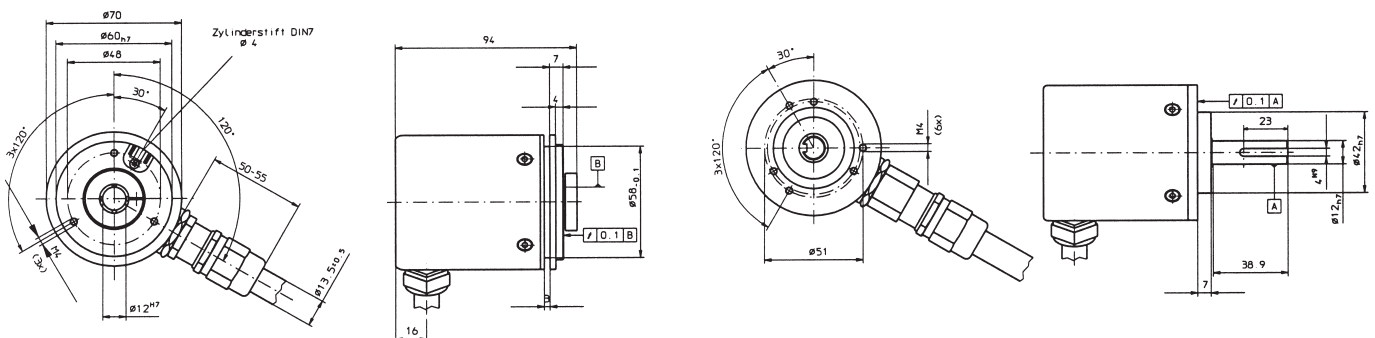
## Mechanical Specifications:

Revolution speed: max. 6000 U/min.\*  
 Inertia moment of the rotor : ca.  $8 \times 10^{-6}$  kgm<sup>2</sup>  
 Permissible shaft load:(radial) 20 N (at shaft end)<sub>1</sub>  
 Permissible shaft load:(axial) 10 N  
 Motor starting torque (25°C): < 0,05 Nm  
 Weight: ca. 0,9 kg  
 Protective system acc. to EN 60529: IP 64

Working temp. range : -20° C bis + 70° C  
 Shaft: Stainless steel  
 Thermal shock resistance  
 acc. to DIN - IEC 68-2-27 1000 m/s<sup>2</sup>, 6 ms  
 Vibration resistance  
 acc. to DIN - IEC 68-2-6 100 m/s<sup>2</sup>, 10. . . .2000 Hz

\* under continuous operation 1500 R/min.  
 1) with shaft version

## Mechanical Dimensions:



### Assembly notes:

Flange and shaft of encoder and actuation must not be simultaneously rigidly coupled together!  
 With the hollow shaft version, the torque converter bearing offers the easiest system of flange-mounting (see dimension pictures).

impulse count	permissible radial deviation of the actuation shaft provides an accuracy of +/- 0,5 Bit when using the torque converter bearing.
1000	+/- 0,08
2500	+/- 0,035
5000	+/- 0,017

## Please note !

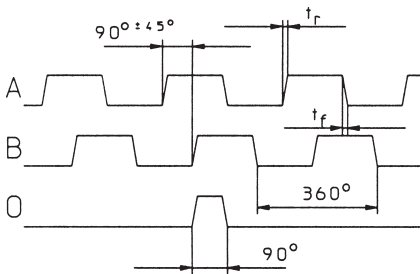
When installing, all valid norms for the assembly of electrical appliances in potentially explosive areas must be complied with!  
 Manipulation of the encoder (opening, mechanical alterations) will lead to a loss of the Expermit and the guarantee cover!  
 The installer takes all responsibility for any attributable consequences!

**Electrical Specifications:**

Output circuit:	RS 422 (TTL compatible)	Push.Pull-connection
Supply voltage:	5 V (± 5%) bzw. 10 - 30 VDC	10 - 30 VDC
Current consumption without inverting (without load):	_____	typ. 46 mA / max. 78 mA
Current consumption with inverting (without load):	typ. 20 mA / max. 33 mA	typ. 77 mA / max. 126 mA
Permissible load / channel:	max. +/- 20 mA	max. +/- 30 mA
Impulse frequency:	max. 200 kHz	max. 200 kHz
Signal level high:	min. 2,5 V	min. $U_B - 3 V$
Signal level low:	max. 0,5 V	max. 2,5 V
Build-up time $t_r$ :	max. 200 ns	max. 1µs
Fall time $t_f$ :	max. 200 ns	max. 1µs
Short circuit proof 1):	yes 2)	yes 2)
Reverse battery protection of the distribution voltage:	no	no

1) At a correctly installed distribution voltage  $U_B$   
 2) Only one channel at a time: at  $U_B = 5 V$  the short circuit is opposite the channel, 0 V and +  $U_B$  permissible.  
 at  $U_B = 10 - 30 V$  the short circuit is opposite the channel and 0 V permissible.

**Impuls illustration:**



Direction of rotation (referring to impulse illustration)  
 Shaft turning in clockwise direction whilst facing the shaft.

Recommended Receiver according to RS 422- specification  
 e.g. DS 3486 or AM 26LS32

All channels can also be operated in a inverted mode.

**Impulse numbers that can be supplied at short notice:**

10, 20, 30, 50, 60, 100, 120, 125, 127, 150, 180, 200, 216, 240, 250, 254, 256, 300, 340, 360, 400, 500, 512, 600, 625, 720, 750, 800, 900, 1000, 1024, 1250, 1270, 1400, 1500, 1800, 2000, 2048, 2400, 2500, 3000, 3600, 4000, 4096, 5000

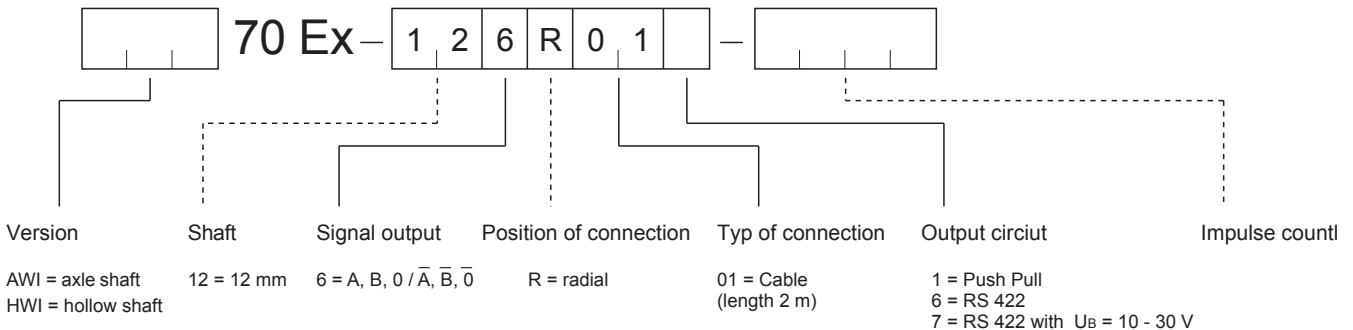
Other Impulse number upon request

**Pin configuration:**

Sig. color	0 V white	0 V Sensor grey/pink	+ $U_B$ brown	+ $U_B$ Sensor red/blue	A green	$\bar{A}$ yellow	B grey	$\bar{B}$ pink	0 blue	$\bar{0}$ red	sheath SG
------------	--------------	-------------------------	------------------	----------------------------	------------	---------------------	-----------	-------------------	-----------	------------------	--------------

SG = Sheath is positioned on casing of screwed cable gland.  
 The sensor wires are internally connected to the power supply.  
 Unused outlets must be insulated before the initial operation.

**Order No.:**



\* Other cable lengths upon request  
 Accessories: adapter flange F 70/ 14  
 (AWI version only)

# AWA 70 Ex HWA 70 Ex

Compact version, diameter 70 mm in design  
 "Compression proof metal protection" with  
 EXII 2G EEX d II CT6 (PTB 03 ATEX 1163)  
 Electronic temperature and  
 ageing compensation.  
 Short circuit proof outlets  
 Over-voltage and reserve battery protection  
 on the operating voltage inlet (at  $U_B = 10 - 30$  VDC)  
 Diameter of the shaft 12 mm  
 Resolution up to 13 Bit  
 SS and parallel section port

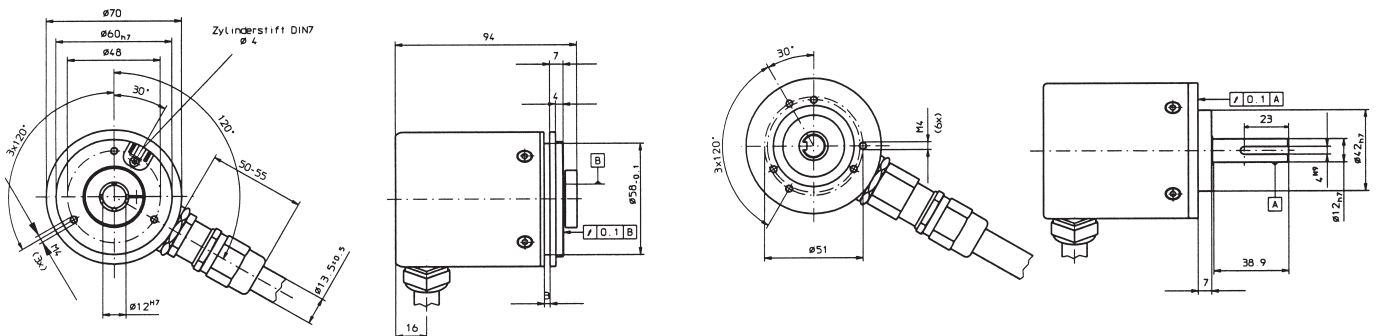


## Mechanical Specifications:

Revolution speed: max. 6000 U/min.\*  
 Inertia moment of the rotor: ca.  $8 \times 10^{-6}$  kgm<sup>2</sup>  
 Permissible shaft load(radial): 20 N (at shaft end)<sub>1</sub>  
 Permissible shaft load(axial): 10 N  
 Motor starting torque(25° C): < 0,05 Nm  
 Weight: ca. 0,9 kg  
 Protective system acc. to EN 60529: IP 64

Working temp. range: -20° C bis + 70° C  
 Shaft: Stainless steel  
 Thermal shock resistance  
 acc. to DIN - IEC 68-2-27 1000 m/s<sup>2</sup>, 6 ms  
 Vibration resistance  
 acc. to DIN - IEC 68-2-6 100 m/s<sup>2</sup>, 10. . . .2000 Hz  
 \* under continuous operation max. 1500 R/min.  
 1) with shaft version

## Mechanical Dimensions:



### Assembly notes:

Flange and shaft of encoder and actuation must not be  
 simultaneously rigidly coupled together!  
 With the hollow shaft version, the torque converter bearing  
 offers the easiest system of flange-mounting (see dimension pictures).

impulse count	permissible radial deviation of the actuation shaft provides an accuracy of +/- 0,5 Bit when using the torque converter bearing.
1024 or 10 Bit	+/- 0,08
4096 or 12 Bit	+/- 0,02
8192 or 13 Bit	+/- 0,01

### Please note !

When installing, all valid norms for the assembly of electrical appliances in potentially areas must be complied with!  
 Manipulation of the encoder (opening, mechanical alterations) will lead to a loss of the Expermit and the guarantee cover!  
 The installer takes all responsibility for any attributable consequences!

**Electrical Specifications:**

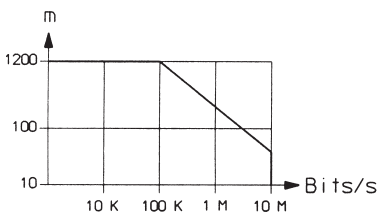
Interface	Synchron - Seriell (SSI)	Synchron - Seriell (SSI)	Parallel	Parallel
Supply voltage (U <sub>B</sub> )	5 VDC (+/- 5%)	10 - 30 VDC	5 VDC (+/- 5%)	10 - 30 VDC
Output driver	RS 485	RS 485	Gegentakt	Gegentakt
Current consumption typ.	89 mA	89 mA	109 mA	109 mA
max.	138 mA	138 mA	169 mA	169 mA
Permissible load	max. +/- 20 mA	max. +/- 20 mA	max. +/-10 mA	max. +/- 10 mA
Data element exchange rate	max. 15.000/s	max. 15.000/s	40.000/s	40.000/s
Rate of cycles,min/max	100 kHz / 500 kHz	100 kHz / 500 kHz	—	—
Short circuit proof outputs 1)	Yes	Yes 1)	Yes 2)	Yes 2)
Reverse battery protection on UB	No	Yes	No	Yes

1) At a correctly installed distribution voltage U<sub>B</sub>  
 2) Only one channel at a time: at U<sub>B</sub> = 5 V the short circuit is opposite the channel, 0 V and + U<sub>B</sub> permissible  
 at U<sub>B</sub> = 10 - 30 V the short circuit is opposite and 0 V permissible

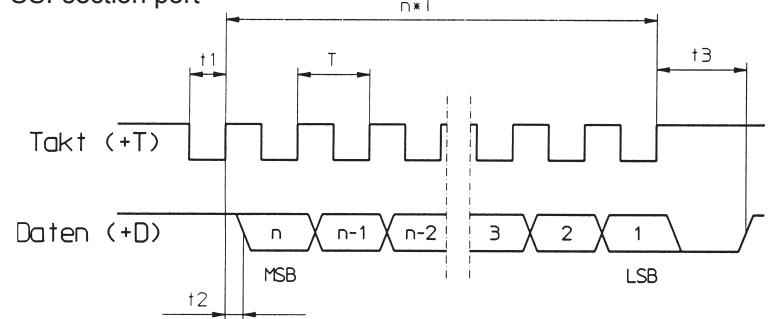
**Count direction:**

Ascending code values when turning the shaft in a clockwise direction (when facing the shaft).

**Max. permissible rate of conduction with SSI:**  
 (dependent on length of cable)



**SSI-section port**



t1 M 1µs; t2 < 0,5µs (without cable); t3 = max. 40µs; 2µs m T m 10µs; n = resolution in Bit

**Functional description of the SSI section port.**

In an off-position, the cycle and data lines are High Level. The first descending cycle edge signals the beginning of the data transfer. The data is then transferred in Bits, commencing with MSB, with the thereafter increasing cycle edge. The transfer of a complete data element requires n + 1 increasing cycle edges (n = resolution in Bit). After the last positive cycle edge, the data line remains on Low until the encoder is once again ready for a new data element. The cycle line must also remain at High for at least the same amount of time and can then once again begin a new read-out sequence of the encoder with a descending cycle..

**Please note!**

The data update occurs in synchrony with the read-out cycle. The data is therefore equally as up-to-date as the time difference between two read-outs; a periodic read-out of the encoder is therefore recommended. If a long period of time has passed since the last read-out and a rotation of the shaft encoder is then undertaken, then the contents of the data will be "outdated" at the first read-out and should be ignored.

**Order No:**

**70 Ex - 1 2 1 R 0 1 G 0**

Version	Shaft	Count direction	Pos. of connec. / Typ of connec.	Output Circuit	Output code	Optional extras	Resolution
AWA = Axle shaft HWA = Hollow shaft	12 = 12 mm	1 = rechts	R = radial	01 = Cable (Length 2 m)	1 = Push Pull 3 = TTL 6 = SSI at U <sub>B</sub> 10 V - 30 V 7 = SSI at U <sub>B</sub> 5 V	G = Gray 0 = keine	1024 4096 8192

\* Other cable length available upon request  
 Accessories: Adapter flange F 70/14  
 (only for version AWA)

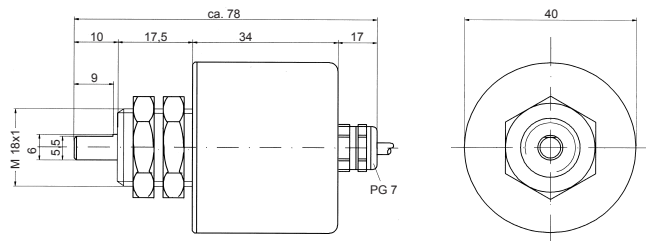
# Dimensions High-Grade Steel Encoders

## AWI 40 E

Material  
1.4305



Encoder description page 6 / 7

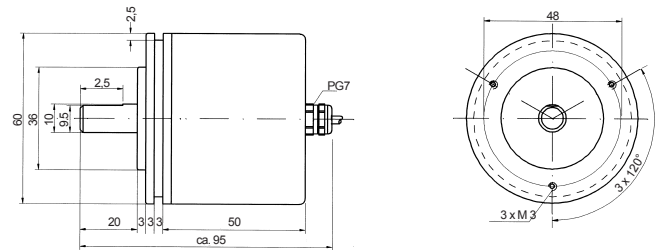


## AW\* 58 E

Material  
1.4541



Encoder description  
Inkremental page 8 / 9  
Absolute page 28 / 29

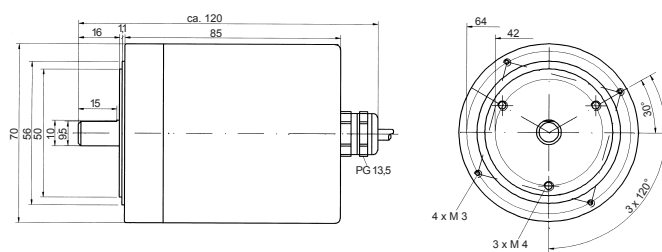


## AW\* 70 E

Material  
1.4541



Encoder description on request

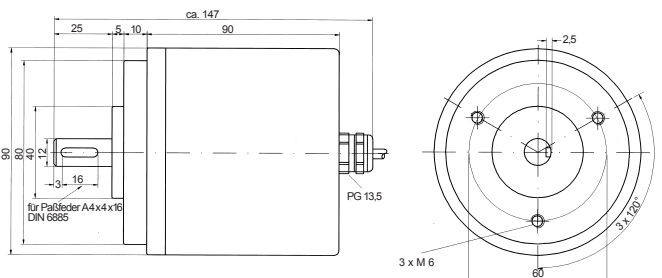


## AW\*90 E


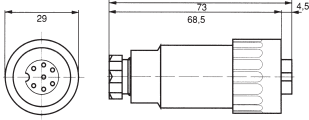

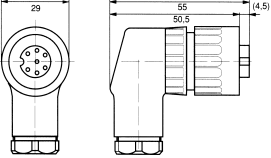

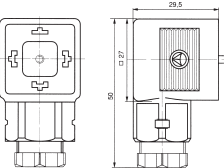

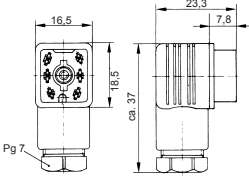

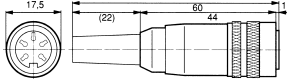

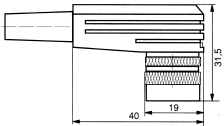

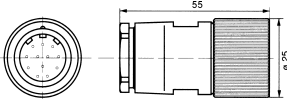
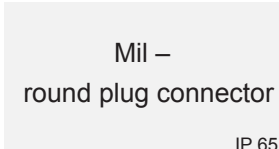
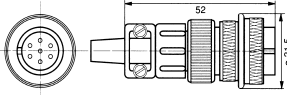
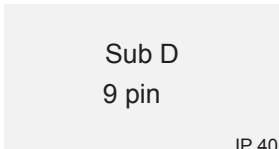
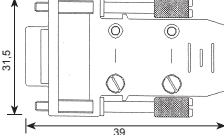
Material  
1.4541



Encoder description  
Inkremental page 12 / 13  
Absolute page 40 / 41



# Typ of Connection

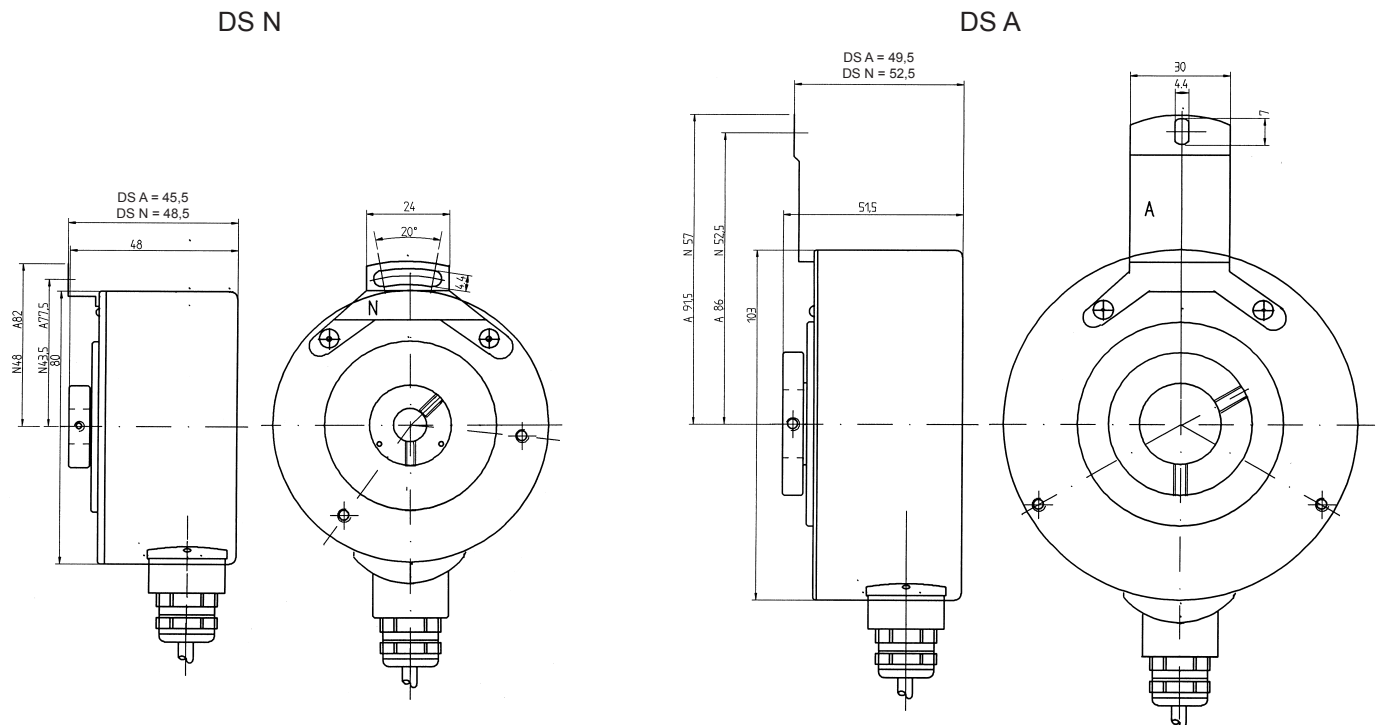
No.	Illustration	Dimensions
00	Cable connection (IP 65) Standard: 2 m / AWI 40: 3 m	Cable code DIN 47100
01	Cable connection (IP 65) Standard: 2 m / AWI 40: 3 m	
B, F	Cable connection (IP 65) Standard: 1,5 m	
02	 <p>Material: Plastic Pin no.: 6 + E Total length: 77 mm</p> <p>IP 65</p>	
03	 <p>Material: Plastic Pin no.: 6 + E Total length: 60 mm</p> <p>IP 65</p>	
05	 <p>Material: Plastic Pin no.: 3 + E Total length: 40 mm</p> <p>IP 65</p>	
07	 <p>Material: Plastic Pin no.: 6 Total length: 33 mm</p> <p>IP 65</p>	
08, 10	 <p>Material: Brass Pin no.: 5 / 6 Total length: 62 mm</p> <p>IP 40</p>	 <p>Please note! This connector reduces the system of protection of the encoder to IP 40.</p>
09, 11	 <p>Material: Brass Pin no.: 5 / 6 Total length: 34 mm</p> <p>IP 40</p>	 <p>Please note! This connector reduces the system of protection of the encoder to IP 40.</p>
12, 16, 17, D, H, I, Y	 <p>Material: Brass Pin no.: 09 / 12 / 16 / 17 Total length: 60 mm</p> <p>IP 65</p>	 <p>D = 12pole clockwise H = 12pole counter clockwise I = 9pole clockwise Y = 17pole clockwise</p>
52	 <p>Mil – round plug connector</p> <p>Material: Aluminium Pin no.: 7 Total length: 52 mm</p> <p>IP 65</p>	
54	 <p>Sub D 9 pin</p> <p>Material: Plastic Pin no.: 9 Total length: ca. 50 mm</p> <p>IP 40</p>	 <p>Please note! This connector reduces the system of protection of the encoder to IP 40.</p>

Matching plug with ready made cable upon request

# Accessories

## Mounting clip

### Mechanical Specifications:



### Please note:

In order to compensate for axial and radial shaft eccentricity as well as any angle offset, the encoder flange may not be rigidly mounted..

Please mount the flange with a flexible mounting clip as torque support:

DS A to encoder Typ HWI 103 ], HWA 103 ]

DS N to encoder Typ HWI 80 ]



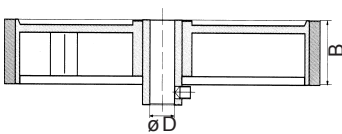
## Measuring Wheels



Typ	Circumference	Covering	D	B
M 120	500 mm	Knobbed rubber	10 mm / 12 mm	25 mm
M 130	500 mm	Knurled aluminium	10 mm / 12 mm	25 mm
M 140	500 mm	Vulkollan plastic	10 mm / 12 mm	25 mm
M 110	200 mm	Knurled aluminium	6 mm	12 mm
M 190	200 mm	Knobbed rubber	6 mm	12 mm



Typ	Circumference	Covering	D	B
M 101	500 mm	Smooth plastic	10 mm / 12 mm	25 mm
M 102	500 mm	Ribbed plastic	10 mm / 12 mm	25 mm
M 108	200 mm	Smooth plastic	6 mm	12 mm
M 109	200 mm	Ribbed plastic	6 mm	12 mm



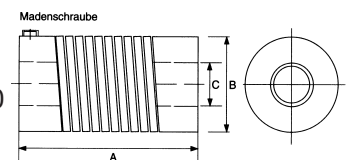
Tolerance  
0,2 % - 0,5 %

## Couplings



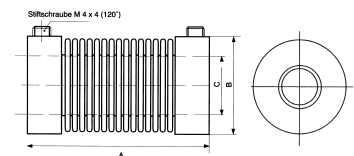
### Standard

Typ	A	B	C
K 401	50	28	6-14 Not for AWI40
K 402	35	16	6-8



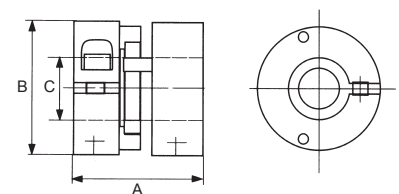
### Bellows Coupling

Typ	A	B	C
K 409	35	20	12 mm

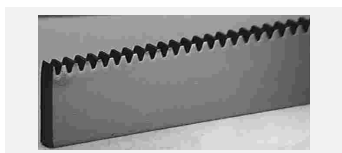


### Precision Coupling

Typ	A	B	C
K 410	25	25	6-12 mm



## Rack



Typ	B	H	L
Z 214	5	20	1000 mm

## Pinion



Typ	
R 218	16 teeth/rev. = 50,26 mm

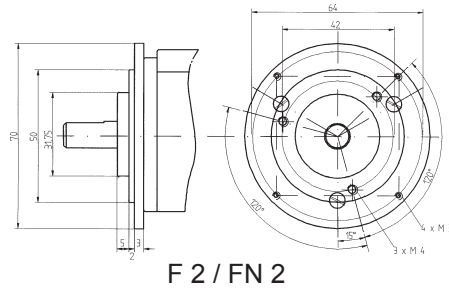
# Accessories

## Flanges F

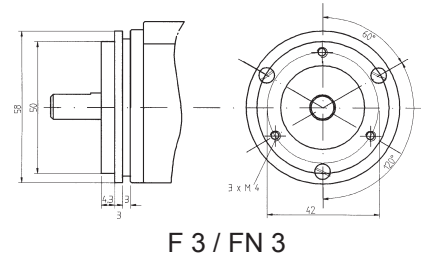
for encoder  
AW J 58 S

## Flanges FN

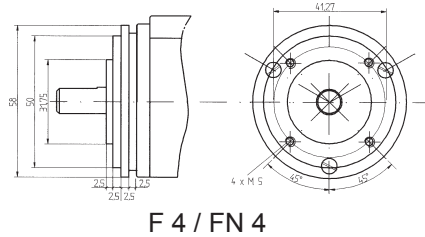
for encoder  
AWI 58 H,  
BC 58



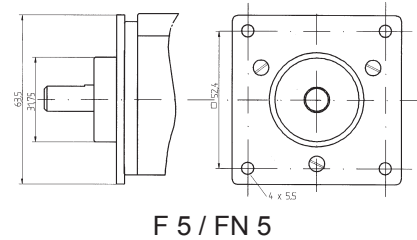
F 2 / FN 2



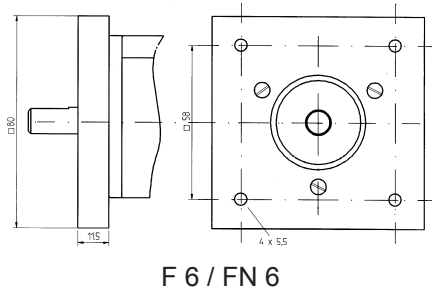
F 3 / FN 3



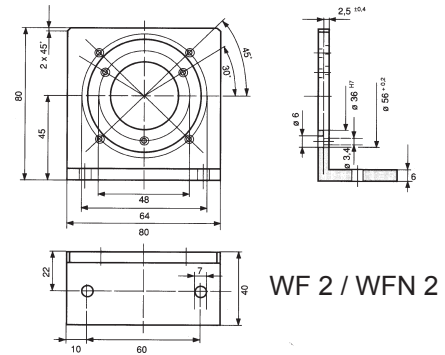
F 4 / FN 4



F 5 / FN 5



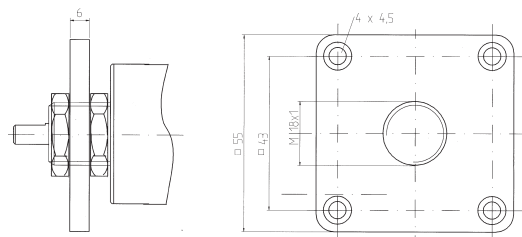
F 6 / FN 6



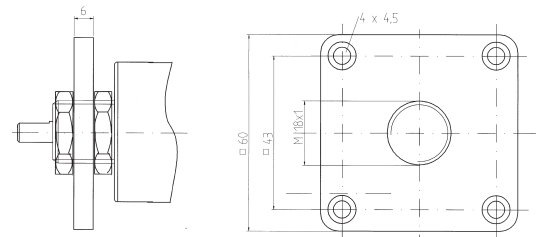
WF 2 / WFN 2

## Flanges

for encoder  
AWI 40 S/E



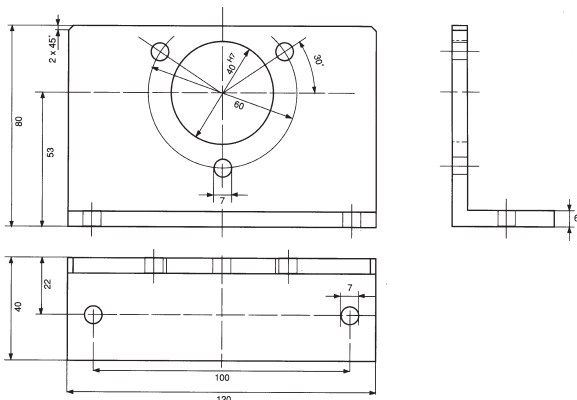
F 7 S (Standard)



F 7 E (High-grade steel)

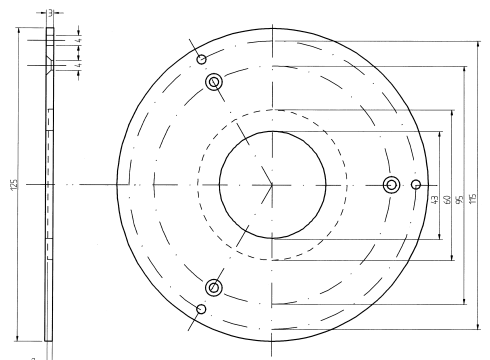
## Angle Flange WF 1

for encoder  
AW J 90 S, PA 02, 70-140



## Flange F 8

for encoder  
HW J 103 S



Hohner shaft encoders can be used both in simple industrial applications and in the toughest of ambient conditions depending on the type and version.

The precision mechanical and optoelectronic parts used in incremental and absolute shaft encoder today generally no longer represent any problem as far as the above fields of application are concerned. However, to ensure that your shaft encoder works faultlessly, attention should be paid to the following mounting and installation tips:

### Mechanical:

- Avoid blows to the shaft.
- Do not exceed the maximum shaft load.
- Any axial or radial shaft offset is to be compensated for by suitable measures, e.g. by using couplings, torque support, belt drives, etc.
- Do not make any mechanical changes to the device.
- When mounting hollow shaft encoder, make sure that the shaft is not distorted.

### Electrical:

- Make sure that the power supply is off before carrying out wiring work or pulling the connector.
- Electrostatic discharges on the connectors can result in damage.
- Connect the shielded line to PE in the switch cabinet.  
(the shield is not connected in the device, i.e. one-sided shielding).
- Dry connect unused cables and make sure that they are insulated from each other.
- Do not lay the encoder line parallel to or in the vicinity of load lines.
- The tests specified in the certificate of conformity were carried out with the standard version and a 2 m cable.

These are only a few tips on how to avoid problems when using shaft encoder. Should you have any questions when mounting or operating Hohner shaft encoder, please contact our expert staff. They will be glad to help you.

# EC-Declaration of Conformity

The manufacturer  
and distributor: Hohner Elektrotechnik GmbH  
Gewerbehof 1  
59368 Werne

declares of follows

Product: Inkrementaler / absoluter  
shaft encoder

Typ: AWI 40<sub>k</sub>, AW<sub>k</sub> 58, AW<sub>k</sub> 70<sub>k</sub>, AW<sub>k</sub> 90<sub>k</sub>,  
HWI 40 S, HWI 80 S, HW<sub>k</sub> 103 S,  
SWA 90, PA02, 70-140, Serie 10, Serie 30

Options: All, AWI 40<sub>k</sub> only with ending C

the following product specifications comply with:  
EN 50082 Part 2, EN 55011, IEC 1000-4-2, IEC 1000-4-4

Typ: HWA 58 S

this product complies fully with the following European guidelines.  
( 89 / 336 / EWG )

„Guidelines of the Council for the Standardisation of Legal  
requirements of the member states regarding electromagnetic compatibility”

The conformity of the listed products with the requirements of the guidelines  
is proved by the adherence to the following norms.

European Norm: EN 50082 - 2, EN 50081 - 2, EN 55011 Klasse B

Typ: AWI 70 Ex, HWI 70 Ex, AWA 70 Ex, HWA 70 Ex

The listed products comply with the following compatible European Norms:  
EN 50 014: 1977 + A1., A5 ( VDE 0170 / 0171 Teil 1/1.87 ) General Regulations  
EN 50 018: 1977 + A1., A3 ( VDE 0170 / 0171 Teil 5/1.87 ) Compression proof mrtal protection „d”

Typ: AWI58 H, BC58

The listed products comply with the requirements of the following European Norms.

Number: 89/336/EWG superceded by 91/263/EWG and 92/31/EWG und 93/68 EWG  
(Text: Guidelines of the Council for the Standardisation of Legal requirements  
of the member states regarding electromagnetic compatibility.)

The conformity of the listed products with the requirements of the guidelines  
is proved by the adherence to the following norms:

EN 50082 - 2, EN 50081 - 2, ENV 50140, EN 61000 - 4 - 2, ENV 50141, EN 55011

Werne, 01. 06. 1998

Hohner Elektrotechnik GmbH  
Peter Scherer, Managing Director



**General:** The following general terms of sale apply exclusively to all transactions between us and our business partner, even if other terms are sent or prescribed to us. All orders placed through travellers or agents require our written acknowledgement for validity.

**Prices:** Our prices are quoted ex works, purely net, excluding packing coast and similar, and are subject to change without notice at the times.

**Delivery periods:** Any agreed delivery dates or periods are prospective in nature. We reserve the right to withdraw from contracts should circumstance that change the conditions prevailing at the time of the offer, order or acknowledgement of the order arise. In the case we have the right, at our discretion, to abide by the contract and to change the ruling prices for the goods valid at the time of delivery.

**Shipment:** All goods are shipped for the account and risk of the buyer, even in the case of free deliveries. Shipments will be insured against transport damage at the request of the buyer at his expense. We, however, reserve the right to insure shipments in whole or in part at the expense of the buyer, albeit without being obliged to do so. The terms and deadlines of the respective carrier and insurance firm apply for notification of damage to shipments insured through us.

**Packing:** If not otherwise agreed, the goods will be packed as deemed necessary by us. We reserve the right to change a deposit on special packing in addition to the coast of the packing. Packing is charged for at cost price and is not taken back.

**Payment:** The place of performance for deliveries and payments for all current and future orders is Werne. If not otherwise agreed, payments are to be remitted to our account in Werne free of charge within 30 days of the invoice date in net and without any deductions. The date of performance is the day on which we can dispose of the funds. We grant a 2 % discount on payment received within 8 days of the invoice date. In the event of a term of payment being exceeded we change default interest of 3 % above the legal bank discount rate, while reserving the right to claim a higher loss. In the event of a deterioration in the solvency of the customer or should we receive adverse information on him, we have the right to demand advance payment or sufficient security of invoice sums, even if other terms were actually provided or agreed. In such cases outstanding invoice are due immediately. The same applies if the buyer pledges stocks, receivables, etc. or furnishes same as security for other creditors or if he does not pay in spite of repeated reminders. Our payment claims cannot and may be retained or offset against any claims by the customer.

**Reservation of title:** We retain title to the goods delivered until full payment of the purchase as well as payment of all past future deliveries within the business relationship - including all subsidiary claims (on payment by cheque or bill of exchange until the cheque or bill is honoured). The buyer is not entitled to pledge the goods or pass title to them to a third party as security until this time. This, however, does not affect the right of the buyer to resell the goods in the ordinary course of business. If the goods are resold, it is deemed as agreed that the reservation of title to the resold goods will be passed on to the buyer or new seller by the original buyer. The proceeds from a resale are to be kept separately in our favour. The buyer herewith cedes all claims against a third party arising from the resale of the goods or for any other legal reason to us for our security. The buyer is authorised to collect these claims for our account as long as he duly meets his payment obligations to us. We, however, are entitled to notify the purchaser (Third party), who is to be named on request, of the transmission and to issue instructions to same. The buyer is to notify us immediately of any action by a third party on goods delivered under reserved title or on ceded claims. Our title to the goods is also valid vis-a-vis the carrier to whom the goods are handed over at the request of the buyer or our doing.

**Custom-made goods:** In the case of custom-made goods we are entitled to demand advance payment of their equivalent value in whole or in part. In the case of mass-produced articles we are entitled to deliver within a tolerance of +/- 20 % of the quantity ordered and in instalments. Tools remain our property at times, even if they were paid for by the buyer in whole or in part. It is solely the responsibility of the customer to make sure that goods ordered from us do not infringe the property right of a third party. He assumes full liability for any claim against us in this regard.

**Complaints:** We are to be notified of complaints in writing immediately after they are discovered. Should we not receive an itemised notice of complaint within 4 weeks of arrival of the shipment at its addressed destination (i.e. the post office, railway forwarder, air freight or sea port agent, etc. at the addressed destination) at the latest, the quality, quantity, etc. of the shipment will be deemed to have been accepted under relinquishment of any right to complaint regarding apparent or allegedly concealed defects. For defective goods delivered by us and for which we can be shown to be responsible we will - after free return of the goods to us in a unchanged and presuming a notice of complaint was received in time and in correct form - at our discretion render free replacement or repair or reimburse the value of the goods at the price on the day we receive them back. Any other claims be the buyer or a third party are precluded. Tolerance ranges in keeping with the latest developments in technology are deemed as accepted save that special arrangements were expressly made.

**Warranty:** We are liable for defects to the shipment, which includes the lack of expressly warranted properties, to the extent that we are to repair or, at our discretion, replace free of charge all those parts that become unusable 6 months (in multishift operation: within 3 months) of the day of delivery /date of shipment from our works) as a result of defective design or poor workmanship. We are only liable for defective materials insofar as we should have detected the flaws by applying expert care. Any other claims- of whatever type- by the buyer or a third party are precluded. The buyer is to bear any costs we incur as a result of unjustified complaint.

We are to be notified of complaints in writing immediately after they are discovered and the affected parts are to be returned to us on demand. The time for filing a claim expires at the latest at the end of the seventh month after the day of delivery (date of shipment from our works). The buyer is to grant us the necessary time and opportunity free of charge to make all the changes we deem necessary and to deliver spare parts. Replaced objekt become our property.

We accept no liability: a) for damage from natural wear and tear; b) as long as the buyer has not met his obligations, in particular the agreed terms of payment, to us; c) if the buyer causes changes or repair work to be carried out without our authorisation. Tolerance ranges in keeping with the latest developments in technology are deemed as accepted save that special arrangements were expressly made.

We have carefully checked all the details in this catalogue (technical specifications, illustrations, dimensions, etc.) They agree with our level of knowledge and production on going to press. However, they do not represent any binding warranty.

**Jurisdiction:** The relationship between us and our customers is governed by German law. Any disputes arising from a delivery contract or for any other legal reason will - at our discretion- be settled before a competent court for Werne or for the domicile of the buyer.

January 2000

Hohner-Elektrotechnik GmbH, 59368 Werne

**hohner**

Elektrotechnik Werne

Hohner Elektrotechnik GmbH

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D-59368 Werne

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Internet:

<http://www.hohner-elektrotechnik.de>