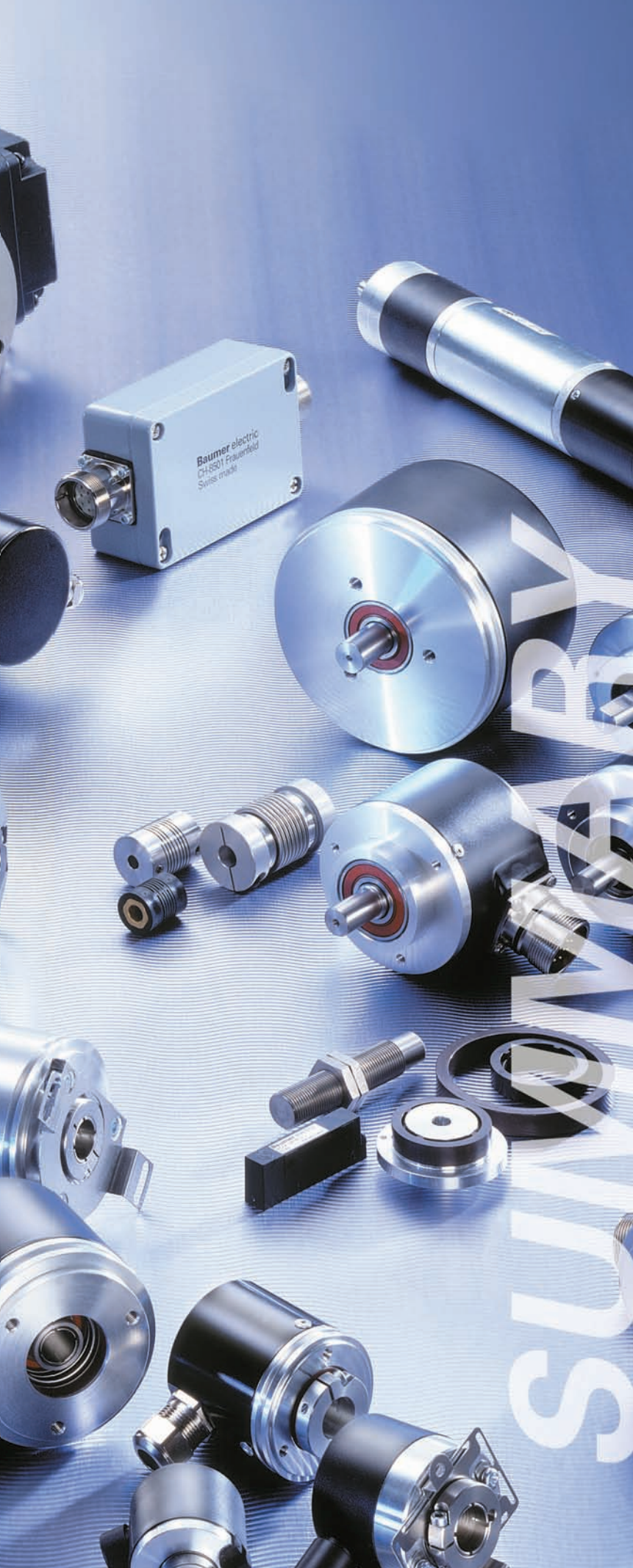


Reliable and precise rotation monitoring.
Incremental and absolute encoders. Actuators
and positioning drives. Magnetic sensors.







Product range Introduction

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Incremental encoders Magnetic sensors

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Absolute multi-turn encoders

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1**2****3****4****5****6**

Incremental encoders

	hollow shaft encoders					
						
type	BTIH	BRIH	BHK	BHF/BHG	BHF	BRIH/BRID
signal						
voltage supply range (output signal)	5 VDC (TTL-compatible) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 20 - 28 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 4,5 - 30 VDC (push-pull, complementary, short-circuit protection) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 10 - 30 VDC (push-pull, short-circuit protection)
pulse range	30 - 1'024	2 - 1'024	10 - 2'048	10 - 10'000	4'096-320'000	64 - 2'048
max. switching frequency	100 kHz	320 kHz	100 kHz	750 kHz	1,3 MHz	320 kHz
temperature range	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C
max. protection class	IP 54	IP 65	IP 64	IP 65	IP 65	IP 65
shaft diameter	4 mm	12 mm	6 / 12 mm	12 mm	12 mm	12 mm
dimensions (ø x length)	24x20 mm	40x32,5 mm	40x32,5 mm	58x31(38) mm	58x40 mm	58x40 mm
connection cable	axial / radial	axial / radial	radial	radial	radial	radial
plug	-	radial	radial	radial	radial	radial
special characteristics	-	-	-	end/through shaft	end shaft	end/through shaft
page	1. 08	1. 10	1. 14	1. 18	1. 22	1. 26

	shaft encoders					
						
type	BTIV	BRIV	BDK	BDH	BRIV	BDT
signal						
voltage supply range (output signal)	5 VDC (TTL-compatible) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 20 - 28 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 4,5 - 30 VDC (push-pull, complementary, short-circuit protection) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 4,5 - 30 VDC (push-pull, complementary, short-circuit protection) 10 - 30 VDC (push-pull, complementary, short-circuit protection)
pulse range	30 - 1'024	2 - 1'024	10 - 2'048	10 - 5'000	64 - 2'048	10 - 10'000
max. switching frequency	100 kHz	320 kHz	100 kHz	300 kHz	320 kHz	750 kHz
temperature range	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C
max. protection class	IP 54	IP 65	IP 65	IP 65	IP 65	IP 65
shaft diameter	4 mm	5 mm	5 mm	10 mm	6 / 10 mm	6 mm
dimensions (ø x length)	24x21 mm	30x32 mm	30x32 mm	55x36 mm	58x40 mm	58x42 mm
connection cable	axial / radial	axial / radial	axial / radial	axial / radial	radial	axial / radial
plug	-	radial	radial	axial / radial	radial	axial / radial
special characteristics	-	-	-	-	-	-
page	1. 48	1. 50	1. 52	1. 54	1. 56	1. 60

							
BHT	BHF/BHG	BHT	BHW	BTID 30	BTID 65	BHID 6E	
							
5 VDC (complementary RS 422) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (sine)	5 VDC (sine)	5 VDC (complementary RS 422) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 8 - 30 VDC (push-pull, complementary, short-circuit protection)	5 VDC (complementary RS 422) 8 - 30 VDC (push-pull, complementary, short-circuit protection)	5 VDC (complementary RS 422) 9 - 26 VDC (push-pull, complementary, short-circuit protection)	
20 - 10'000	2'000 - 5'000	2'000 - 5'000	1'024 - 36'000	1'024 - 5'000	256 - 2'500	1'024 - 4'000	
750 kHz	160 kHz	160 kHz	750 kHz	300 kHz	120 kHz	120 kHz	
-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+65 °C	-20...+65 °C	-20...+85 °C	
IP 65	IP 65	IP 65	IP 65	IP 54	IP 54	IP 54	
10 mm	12 mm	10 mm	27 mm	30 mm	40 - 65 mm	110 mm	
58x48 mm	58x31/38 mm	58x48 mm	80x40 mm	80x45 mm	150x54 mm	227x113 mm	
radial	radial	radial	radial	radial	radial	radial	
radial	radial	radial	radial	radial	radial	-	
flex coupling	end/through shaft	flex coupling	-	-	-	-	
1. 30	1. 34	1. 36	1. 40	1. 42	1. 44	1. 46	

		cable pull	ex-encoder	magnetic encoders			
							
BDT	BDM/BDW	BLS	BHIV EEEx	IHRM/MHRM	MDRM/MDFM	MDFK/MLFK	MDFK/MLFK
							
5 VDC (sine)	5 VDC (complementary RS 422) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 9 - 30 VDC (push-pull, complementary, short circuit protection)	8 - 28 VDC (CHA & CHB) (push-pull, complementary, short circuit protection)	5 VDC (2 Vpp, sin, cos) 10 - 30 VDC (Vout 1 - 9 VDC) (Iout 4 - 20 mA)	5 VDC (RS 422) 8 - 28 VDC (push-pull, complementary, short circuit protection)	5 VDC / 8 - 28VDC (RS 422) 8 - 28 VDC (push-pull, complementary, short circuit protection)
2'000 - 5'000	10 - 5'000	2'048	1 - 5'000	-	-	-	-
160 kHz	300 kHz	100 kHz	250 kHz	1 - 20'000 Hz	20 kHz	3,2 MHz	3,2 MHz
-20...+85 °C	-20...+85 °C	0...+65 °C	-20...+55 °C	-40...120 °C	-25...+85 °C	-25...+85 °C	-25...+85 °C
IP 65	IP 65	IP 52	IP 56	IP 68	IP 67	IP 67	IP 67
6 mm	9,52/10/12 mm	-	11 mm	-	-	-	-
58x42 mm	63x58 (72) mm	90x80x105 mm	120x123 mm	M12x60 mm	divers	45x8,5x15 mm	40x10x15 mm
axial / radial	axial / radial	radial	radial	-	-	-	-
axial / radial	axial / radial	-	-	-	-	-	-
-	-	-	ex-protection	metal housing	-	-	-
1. 62	1. 64	1. 68	1. 70	1. 74 / 1. 75	1. 76 / 1. 78	1. 80 / 1. 84	1. 86 / 1. 88

Absolute single-turn encoders

	magnetic encoder kits					shaft	
							
type	BMSK 42	BMSK 42	BMSK 42	BMSK 58	BMSK 58	BMSV 30	
	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	
interface	parallel	SSI	SSI	parallel	SSI	SSI	
resolution	9 bit	12 bit	12 bit	12 bit	12 bit	10 bit	
voltage supply	5 VDC	5 VDC	5 VDC	10 - 30 VDC	5 VDC 10 - 30 VDC	5 VDC 10 - 30 VDC	
temperature range	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	
max. protection class	IP 67	IP 40	IP 67	IP 67	IP 67	IP 65	
max. revolutions (electr.)	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	
hollow shaft diameter	6 mm	6 mm	6 mm	12 mm	12 mm	5 mm	
dimensions (ø x length)	55x35(16) mm	55x16 mm	55x35 mm	58x38 mm	58x31 mm	30x32 mm	
connection cable	radial	-	radial	radial	radial	radial / axial	
plug	axial	axial	-	-	-	radial	
special characteristics	-	-	-	-	-	-	
page	2. 06	2. 08	2. 08	2. 10	2. 12	2. 14	

	optical hollow shaft encoders						
							
type	BFF	BFG	BFF	BFG	BFF	BFG	
interface	parallel	parallel	SSI	SSI	CANopen	CANopen	
resolution	12 bit	12 bit	13 bit	13 bit	13 bit	13 bit	
voltage supply	5 VDC 10 - 30 VDC	5 VDC 10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	
temperature range	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	
max. protection class	IP 65	IP 65	IP 65	IP 65	IP 65	IP 65	
max. revolutions (electr.)	depends on resol.	depends on resol.	3'000 rpm	3'000 rpm	3'000 rpm	3'000 rpm	
hollow shaft / shaft diameter	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	
dimensions (ø x length)	58x38 mm	58x38 mm	58x38 mm	58x38 mm	58x38 mm	58x38 mm	
connection cable	radial	radial	radial	radial	-	-	
plug	radial	radial	radial	radial	radial / axial	radial	
special characteristics	end shaft	through shaft	end shaft	through shaft	integrated bus	integrated bus	
page	2. 38	2. 38	2. 42	2. 42	2. 46	2. 46	

magnetic hollow shaft encoders

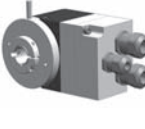
							
BMSH 40	BMSH 42	BMSH 42	BMSH 42	BMSH 58	BMSH 58	BMSH 58	BMSH 58
<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>
SSI	parallel	SSI	CANopen DeviceNet	parallel	SSI	CANopen DeviceNet	Profibus-DP CANopen DeviceNet EtherCAT
10 bit	9 bit	12 bit	12 bit	12 bit	12 bit	12 bit	12 bit
5 VDC 10 - 30 VDC	5 VDC	5 VDC	10 - 30 VDC	10 - 30 VDC	5 VDC 10 - 30 VDC	10 - 30 VDC	10 - 30 VDC
-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C
IP 65	IP 65	IP 65	IP 65	IP 65	IP 65	IP 65	IP 65
6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm
12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm
40x27 mm	42x39 mm	42x39 mm	42x46 mm	58x38 mm	58x31 mm	58x46 mm	58x72 mm
radial / axial	radial	radial	radial	radial	radial	-	radial
radial	-	-	radial	-	radial	radial	-
-	-	-	integrated bus	-	-	integrated bus	bus cover
2. 16	2. 20	2. 22	2. 24 / 2. 26	2. 28	2. 30	2. 32 / 2. 34	2. 36

optical shaft encoders

							
BOSD	BOSH	BOSH	BOSH	BPSD	BISD	BPSV	
<i>Digitalizer</i>	<i>Digitalizer</i>	<i>Digitalizer</i>	<i>Digitalizer</i>			<i>ProCoder</i>	
SSI	SSI	CANopen	Profibus-DP CANopen DeviceNet EtherCAT	Profibus-DP CANopen DeviceNet	Profibus-DP CANopen DeviceNet	Profibus-DP CANopen DeviceNet EtherCAT	
17 bit	18 bit	18 bit	18 bit	13 bit	13 bit	13 bit	
5 VDC	5 VDC 10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	
-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-25...+85 °C	
IP 65	IP 65	IP 65	IP 65	IP 54	IP 54	IP 65	
6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	
12 mm	12 mm	12 mm	12 mm	max. 50 mm	14 mm	6 / 10 mm	
58x32 mm	58x32 mm	58x45 mm	58x74 mm	90x51 mm	58x51 mm	58x82 mm	
radial	radial	-	radial	radial	radial	radial	
radial	radial	axial	-	-	-	-	
-	-	integrated bus	bus cover	bus cover	bus cover	bus cover	
2. 50	2. 54	2. 58	2. 60	2. 62	2. 66	2. 68	

Absolute multi-turn encoders

magnetic encoder kit							
							
type	BMMK 58 <i>MAGRES</i>						
interface	SSI						
resolution single-turn/multi-turn	12/13 bit						
supply voltage	5 VDC 10 - 30 VDC						
temperature range	-20...+85 °C						
max. protection class	IP 67						
max. revolutions (electr.)	6'000 rpm						
hollow shaft diameter	12 mm						
dimensions (ø x lengths)	58x32 mm						
connection cable	radial						
plug	-						
special characteristics	-						
page	3. 04						

optical hollow shaft encoders							
							
type	BOMH <i>Digitalizer</i>	BOMH <i>Digitalizer</i>	BOMH <i>Digitalizer</i>	BPMD	BIMD	BMG	
interface	SSI	CANopen	Profibus-DP CANopen DeviceNet EtherCAT	Profibus-DP CANopen DeviceNet	Profibus-DP CANopen DeviceNet	parallel	
resolution single-turn/multi-turn	18/18 bit	18/14 bit	18/14 bit	13/16 bit	13/16 bit	12/12 bit	
supply voltage	10 - 30 VDC 5 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	
temperature range	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	
max. protection class	IP 65	IP 65	IP 65	IP 54	IP 54	IP 54	
max. revolutions (electr.)	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	
shaft diameter	12 mm	12 mm	12 mm	max. 50,8 mm	14 mm	max. 50,8 mm	
dimensions (ø x length)	58x46 mm	58x46 mm	58x75 mm	75x56 mm	58x51 mm	75x55 mm	
connection cable	radial	-	radial	radial	radial	radial	
plug	radial	axial	-	-	-	-	
special characteristics	-	integrated bus	bus cover	bus cover	bus cover	programmable	
page	3. 22	3. 26	3. 28	3. 30	3. 34	3. 36	

magnetic hollow shaft encoders

							
BMMH 42	BMMH 42	BMMH 58	BMMH 58	BMMH 58	BMMH 58		
<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>		
SSI	CANopen DeviceNet	SSI	Profibus	CANopen DeviceNet	Profibus-DP CANopen DeviceNet EtherCAT		
12/13 bit	12/18 bit	12/13 bit	13/18 bit	12/18 bit	12/18 bit		
5 VDC 10 - 30 VDC	10 - 30 VDC	5 VDC 10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC		
-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C		
IP 65	IP 65	IP 65	IP 65	IP 65	IP 65		
6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm		
12 mm	12 mm	12 mm	12 mm	12 mm	12 mm		
42x46 mm	42x46 mm	58x31 mm	58x41 mm	58x46 mm	58x72 mm		
radial	radial	radial	-	-	radial		
-	-	radial	radial	radial	-		
-	integrated bus	-	integrated bus	integrated bus	bus cover		
3. 06	3. 08 / 3.10	3. 12	3. 14	3. 16 / 3.18	3. 20		

optical shaft encoders

							
BPMV	BEMV	BMA/BMB	BMC/BMD	BMC/BMD	BME/BMF		
<i>ProCoder</i>	<i>ProCoder</i>						
Profibus-DP CANopen DeviceNet EtherCAT	Profibus-DP CANopen DeviceNet	SSI	SSI	parallel	parallel switching cam encoder		
13/16 bit	13/16 bit	13/12 bit	13/12 bit	12/12 bit	12/12 bit		
10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC		
-20...+85 °C	-20...+85 °C	-25...+85 °C	-25...+85 °C	-25...+70 °C	-25...+70 °C		
IP 65	IP 67	IP 65	IP 65	IP 65	IP 65		
6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm		
6 / 10 mm	10 mm	6 / 10 mm	6 / 10 mm	6 / 10 mm	6 / 10 mm		
58x89 mm	58x89 mm	58x46 mm	58x57 mm	58x75 mm	58x75 mm		
radial	radial	radial / axial	radial / axial	radial / axial	radial / axial		
-	-	radial / axial	radial / axial	-	-		
bus cover	high-grade steel	-	programmable	programmable	programmable		
3. 40	3. 44	3. 46	3. 50	3. 54	3. 58		

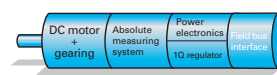
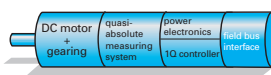
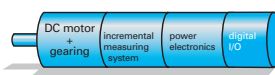
Actuator and positioning drive

FlexiDrive

product range



type	MDBA 42	MSQA 46	MSAA 42	
	<i>Actuator</i>	<i>Actuator</i>	<i>Actuator</i>	
motor	brush DC motor	brush DC motor	brush DC motor	
torque nominal	0,29 - 15 Nm	0,2 - 0,4 Nm	0,29 - 15 Nm	
rotational speed nominal	10 - 750 rpm	64 - 280 rpm	10 - 750 rpm	
power output nominal	16 - 23 W	6 W	16 - 23 W	
voltage supply	24 VDC	24 VDC	24 VDC	
power electronics	integrated	integrated	integrated	
control electronics	-	1Q controller integrated	1Q controller integrated	
positioning measuring system	incremental	quasi-absolute multi-turn	absolute multi-turn	
positioning resolution	0,29 - 22,5°	1 - 5°	0,15 - 11,25°	
ascertainable revolutions	-	up to 1'073 millions	up to 500 millions	
communication / interface	outputs: incremental (CHA, CHB) inputs: 2 digital right/left	CANopen 2 inputs (programmable)	CANopen 2 inputs (programmable)	
operation modes	rotation: right/left	point-to-point	point-to-point	
hours of operation	3'000 h	300 h	3'000 h	
construction				



features	for simple positioning tasks simplest control via digital inputs /outputs	no reference run necessary closed loop controller	no reference run necessary closed loop controller	
----------	--	--	--	--


MSIA 42
Positioning drive

brushless DC motor

0,07 / 0,15 Nm

4'720 / 3'760 rpm

36 / 61 W

24 VDC

integrated

4Q controller integrated

absolute multi-turn

<0,02°

up to 262'144

CANopen

Profibus-DP

4 inputs
(programmable)

point-to-point
run records

2'500 h

MSIA 53
Positioning drive

brushless DC motor

0,06 / 0,2 Nm

3'420 / 2'540 rpm

22 / 50 W

24 VDC

integrated

4Q controller integrated

absolute multi-turn

<0,02°

up to 262'144

CANopen

Profibus-DP

4 inputs
(programmable)

point-to-point
run records

20'000 h

MSIA 68
Positioning drive

brushless DC motor

0,22 / 0,5 Nm

3'500 / 2'800 rpm

80 / 150 W

24 VDC

integrated

4Q controller integrated

absolute multi-turn

<0,02°

up to 262'144

CANopen

Profibus-DP

4 inputs
(programmable)

point-to-point
run records

20'000 h

MSIA 83
Positioning drive

brushless DC motor

0,38 / 0,69 Nm

3'600 / 3'300 rpm

144 / 238 W

24 VDC

integrated

4Q controller integrated

absolute multi-turn

<0,02°

up to 262'144

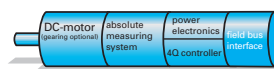
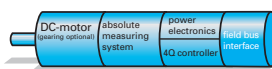
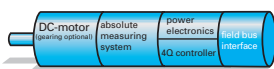
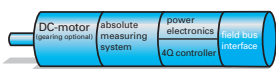
CANopen

Profibus-DP

4 inputs
(programmable)

point-to-point
run records

20'000 h


brushless DC motor
long lifetime
application as direct
drive or with gear
closed loop controller

brushless DC motor
long lifetime
application as direct
drive or with gear
closed loop controller

brushless DC motor
long lifetime
application as direct
drive or with gear
closed loop controller

brushless DC motor
long lifetime
application as direct
drive or with gear
closed loop controller

5. 10 / 5.18

5. 12 / 5. 20

5. 14 / 5. 22

5. 16 / 5. 24

Encoders and actuators – application examples

The indispensable link between the drive and the controller

The right solution for every application

Baumer offers a broad spectrum of encoders and linear sensors for the acquisition of positional and rotational information related to your applications' rotating and linear movements. In order to achieve the optimum balance between performance and economy for every application, our products employ both optical and magnetic techniques to provide incremental and absolute measurements. The main criteria in product selection include design, mechanical and electrical interfaces, acquisition range and accuracy as well as the ambient application conditions. Our solutions for your specific task range from miniature encoders up to intelligent positioning drives. Beyond the standard products listed in our catalog we are also more than willing to create customer-specific solutions based on proven technologies.

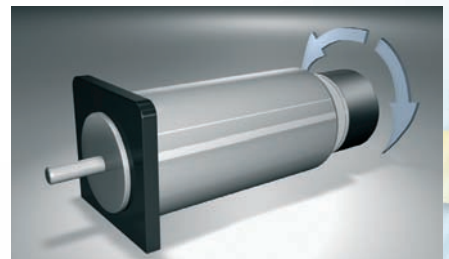


Reliable positioning in the area of medical technology – absolute for the patient's benefit

- Redundant encoders with incremental and absolute position acquisition
- Time saving: reference movements no longer required
- Space-saving compact designs
- All conventional field bus interfaces

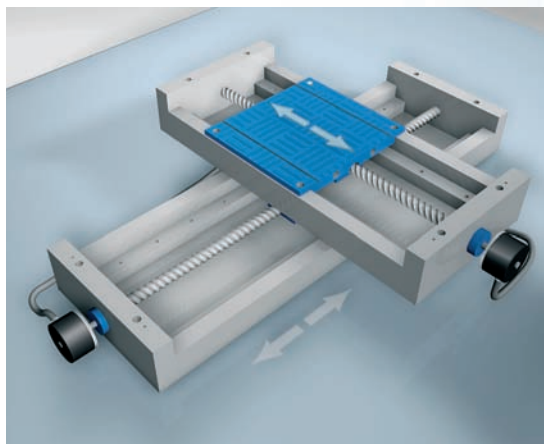
Precise rotational speed measurement – flexible for every drive

- Simple installation of hollow-shaft encoders directly on the "B" side shaft
- Optimal costs combined with the longest service life
- Shaft insulation to protect against bearing currents
- Also available in bearing-free designs



High-dynamic activation of X/Y axes – with clockwork precision

- High-precision positioning in laser cutting equipment
- Assured detection of rotational direction
- Can be used at even the highest speeds and most extreme dynamics



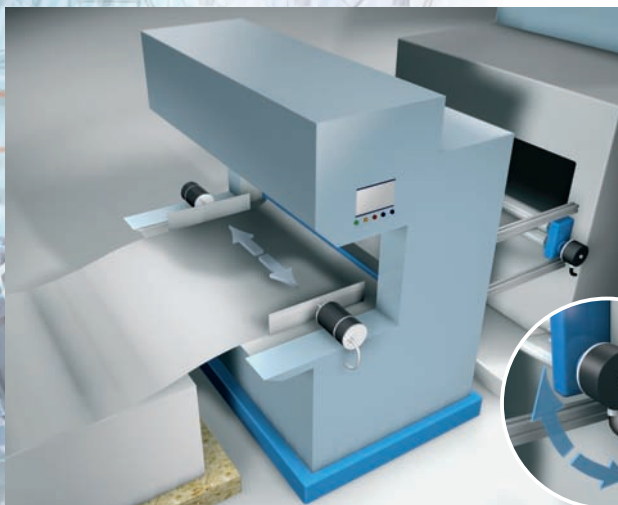


Precise positioning for wind power generators – robust and durable!

- Determination of wind direction and horizontal gondola alignment
- Monitoring rotor blade deflection and the rotor rpm
- Robust, magnetic incremental and absolute encoders
- IP 69K protection class
- Saltwater-resistant versions

Assured vehicle control – safe as fire rescue

- Robust angular measurement for vehicles and outdoor equipment
- Extended temperature range: -40 ... +85 °C
- Shock and vibration resistant
- Resistant to dirt and condensation

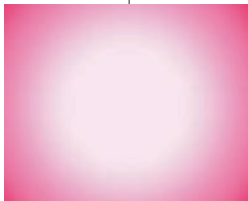
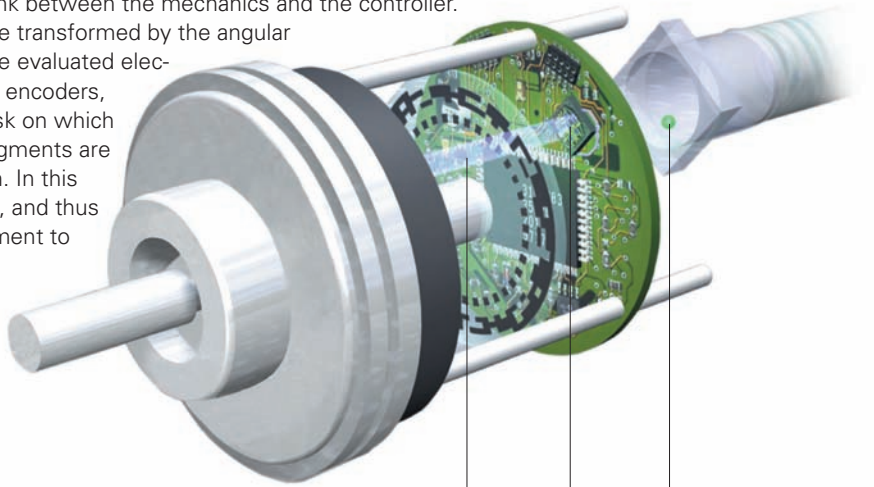


Precise monitoring of textile, print and paper processing – secure and reliable

- Precise rotational speed and linear measurement
- Exact cycle synchronization
- Format adjustment using actuators
- Individual components or complete solutions

Encoder – The indispensable link between the drive and the controller

For monitoring of mechanical movements, the encoder, also referred to as the angular step encoder, is the most important link between the mechanics and the controller. The widest range of rotary motions are transformed by the angular step encoder into signals which can be evaluated electrically. In the case of optical scanning encoders, the heart of the device is the pulse disk on which a specific number of light and dark segments are mounted and scanned by a light beam. In this way, it defines the possible resolution, and thus the positioning accuracy of the movement to be monitored.



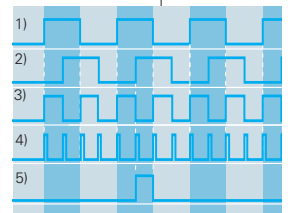
The high quality infrared emitting diode (GaAlAs) transmits light in the invisible range (880 nm). Precise optics focus the beams into a parallel light beam.



Photo diode arrays or opto-ASICs evaluate the optical light patterns of the pulse disk and the diaphragm. Different ageing processes of the opto-electronic components are to a large extent avoided by the use of such arrays. The raw signals gained in this way are then transformed by appropriate electronics into simple square wave signals which can be evaluated.



Since a single signal alone does not allow recognition of the direction of rotation, with incremental encoders a second phase-shifted signal is generated via a grid diaphragm. This signal, leading or lagging by 90°, guarantees exact determination of the direction of rotation at all times. In addition, with each revolution a reference signal is generated.



sense of rotation ccw (counter clockwise) →

A signal period can be subdivided into 4 measurement steps and one evaluates the separation of the two edges of CHA (1) and CHB (2). In this way one receives a 4-fold evaluation of the pulse rate used. With absolute encoders the direction of counting can be defined via the code or the control signal.

- 1) CHA (channel A)
- 2) CHB (channel B 90° phase shifted)
- 3) 2fold gating
- 4) 4fold gating
- 5) CHN



Incremental encoders

form the basis of the Baumer encoder product range. Depending on the sensor application, squarewave- or sinewave-shaped output signals with different output circuitries are possible. Due to the consequent use of chip-on-board technology and SMD components, small housing diameters of only 24 mm in diameter are realized.

For rough industrial tasks, highly robust housings with shaft and hollow shaft are offered.

Recently, the hollow shaft encoder range was expanded significantly. Now, Baumer electric encoders cover the full hollow shaft diameter range from 1,5 mm to 110 mm. New is the shaft encoder BHIV EEx in an explosion-proof version. This encoder already complies with the new ATEX standard.

Magnetic sensors: encoders of a different kind

To detect the speed of moving ferromagnetic objects, IHRM sensors use a magnetically biased Hall semiconductor element. They are preferably used to detect teeth in gears as well as in gear racks.



The magnetic sensors **MDFK** for rotary applications consist of a pole wheel and a magneto-resistive sensor. They can be used similarly to conventional encoders. Identical to optical encoders, they provide incremental pulse signals. And after finishing a revolution, they provide a reference pulse. Even in a dirty environment, the error-free readout of the pole wheel position is guaranteed.

By using this cost efficient, robust and easy-to-mount encoder in combination with a 32-pole wheel and an external 4-fold interpolation, up to 2048 ppr can be realized.



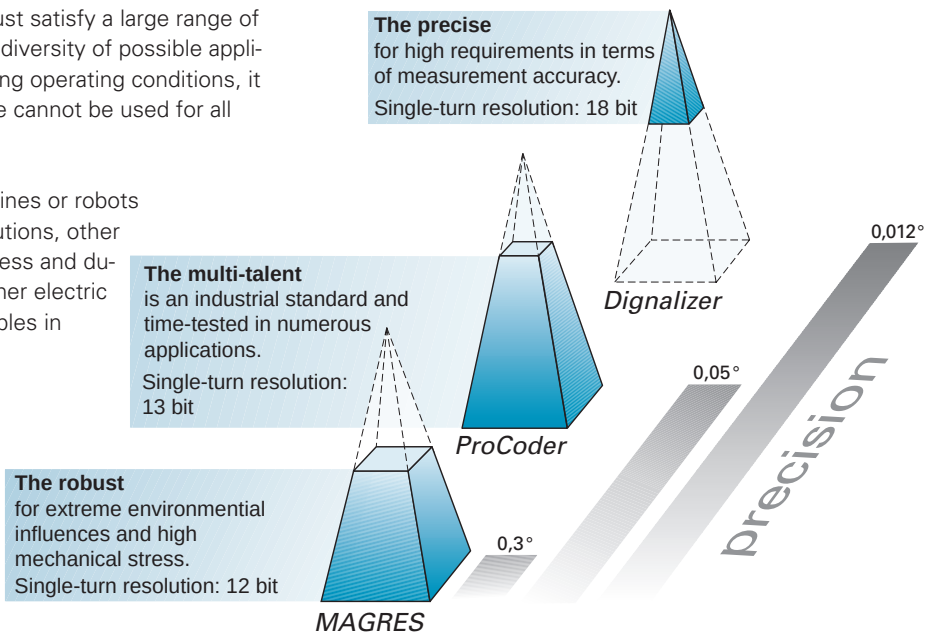
By using the **MLFK** series based on the same technology, even linear distance measurements are possible. Here, resolutions below 10 microns can be achieved.

Absolute encoder concept

Single- and multi-turn

In practical use, encoders must satisfy a large range of requirements. In view of the diversity of possible applications and the widely differing operating conditions, it is clear that one encoder type cannot be used for all applications.

While precision tooling machines or robots often require very high resolutions, other applications demand robustness and durability. For this reason, Baumer electric uses different physical principles in order to meet all needs.



With the three concepts *MAGRES*, *ProCoder* and *Digitalizer*, we offer tailor-made solutions for any type of application.

MAGRES

ST 12 bit	MT 18 bit	0,3°	magne- tic
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MAGRES encoders offer outstanding robustness. They operate in single-turn as well as in multi-turn mode with magnetic readout. Their signals are supplied by a Hall sensor, which contains four sensing elements each rotated by 90° to one another. Thanks to a magnet which is attached to the rotating axis, the sensor detects the angle position within one revolution and signals it to the (patented) readout electronics. Due to the cross-shaped arrangement of the Hall elements, external stray fields are efficiently compensated. This holds true for both temperature differences and aging effects. The number of revolutions is detected by the established touchless encoder principle.





ProCoder

ST 13 bit	MT 16 bit	0,05°	optical
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ProCoder encoders are very versatile in use. In single-turn mode, they operate optically. By using an optical scanning technique, a Gray code is read from a glass disc. By combining this Gray code with a high-speed opto ASIC especially developed for this application, every single position value can be read up to 6'000 rpm. The multi-turn readout is based on the touchless encoder principle. *ProCoder* was the first multi-turn encoder on the market without a mechanical gear. *ProCoder* is now available in a new version with durable stainless steel housing!

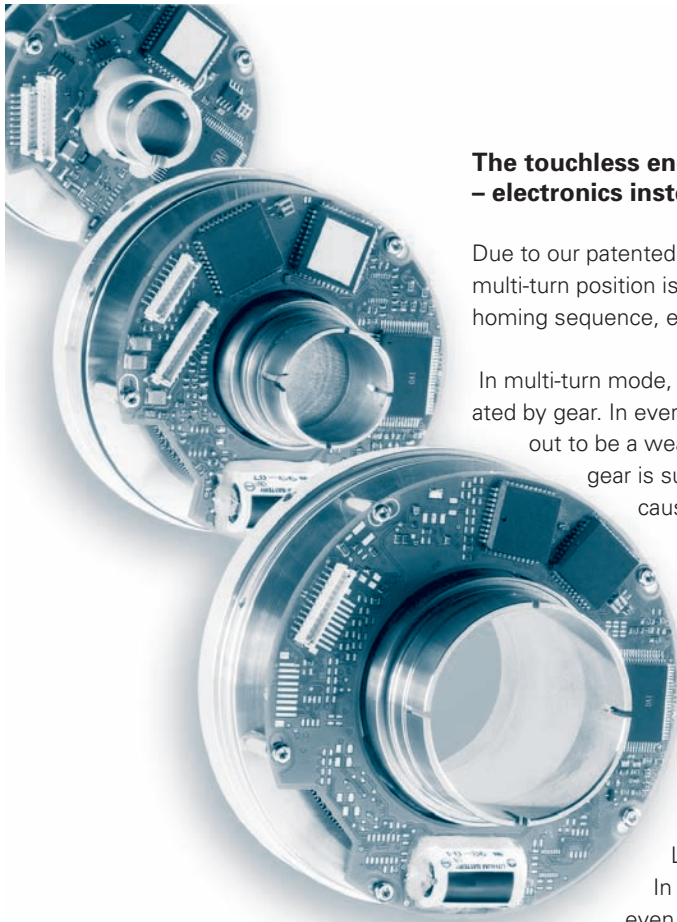
Digitalizer

ST 18 bit	MT 18 bit	0,012°	optical
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Digitalizer encoders are well suited for applications with high demands in terms of resolution. In single-turn mode, they operate with a modified optical readout, i.e. with projection optics and not with standard shadow projection. By using a pseudo random code, absolute position information can be serially encoded on the circumference of the code disc. An additional parallel incremental track with interpolation of the corresponding sine- and cosine-signals inside the encoder increases the resolution to 18 bits. The position value which is generated in the ASIC from the PRC value (pseudo random code) and the analog value is permanently checked for plausibility. In case of an invalid value, a new value is read at once without leading to malfunction. In multi-turn mode, this encoder also works on the basis of the proven touchless encoder principle.



Multi-turn encoder system



The touchless encoder principle – electronics instead of mechanics

Due to our patented readout concept, the absolute multi-turn position is always immediately available without homing sequence, even after a long power outage.

In multi-turn mode, the number of revolutions is usually evaluated by gear. In everyday industrial applications, this often turns out to be a weak point. Similar to other mechanics, the gear is subject to wear, and the resulting abrasion causes the code disc to become dirty.

For this reason, Baumer electric relies on an alternative technique. The mechanical gear is replaced by the touchless encoder principle, patented in 1992. Here, revolutions are electronically detected with the help of two 90° rotated and magnetically actuated sensors. The number of revolutions is evaluated and saved in an ASIC, which is buffered by a Lithium cell.

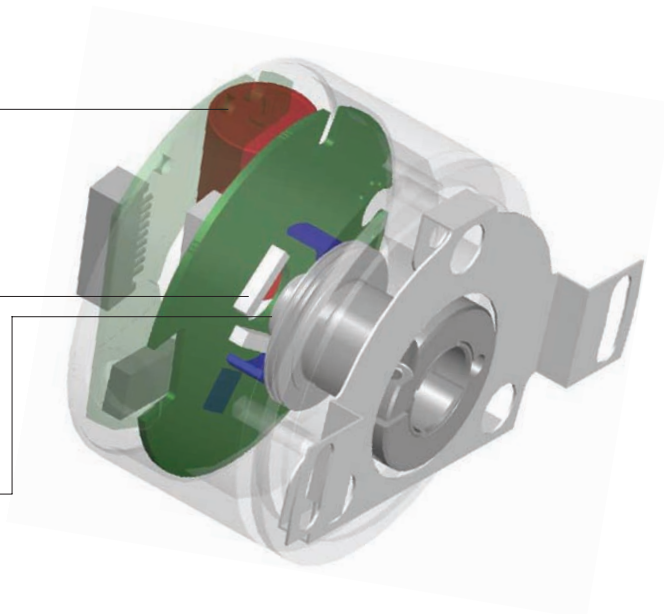
In this way, revolutions stay available even during a power outage.

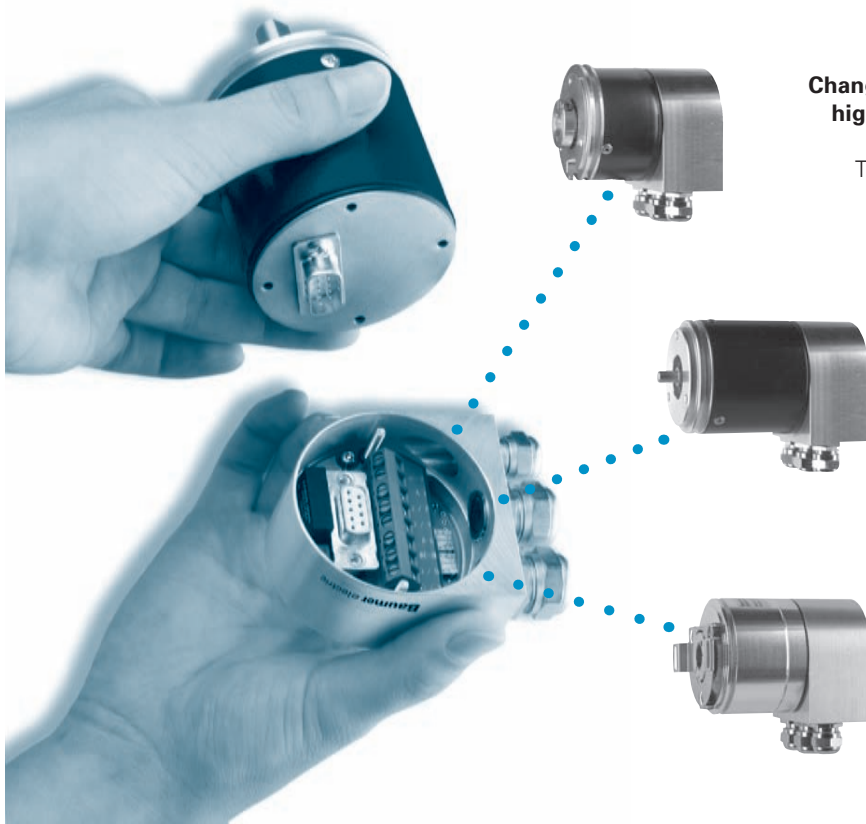
The Lithium cell lifetime is typically specified to 19 years; the cell charging state is available anytime via diagnosis output and can be communicated, e.g. via a field bus. In this way, unpredictable breakdowns like in conventional mechanical systems are avoided and expensive service tasks are a thing of the past.

Lithium cell

Magnetic sensor

Permanent magnet





Changeable bus covers – high flexibility

Thanks to their design principle, the single- and multi-turn encoders can be adapted to almost all field bus systems used today. **MAGRES**, **ProCoder** and **Digitalizer** encoders are simply combined with different bus covers in which the respective field bus electronics are integrated.

For plant and machine manufacturers, flexibility is increased and stock-keeping is reduced, since the desired bus cover is simply plugged onto the base encoder.

CANopen



DeviceNet

EtherCAT

Compact design – saves space during project planning and mounting

If the space available for encoder mounting is limited, the compact encoders with integrated interface are the ideal solution.

The mounting dimensions of the smallest multi-turn version including CANopen interface are only 42 mm x 47 mm (diameter x mounting depth).

Digitalizer



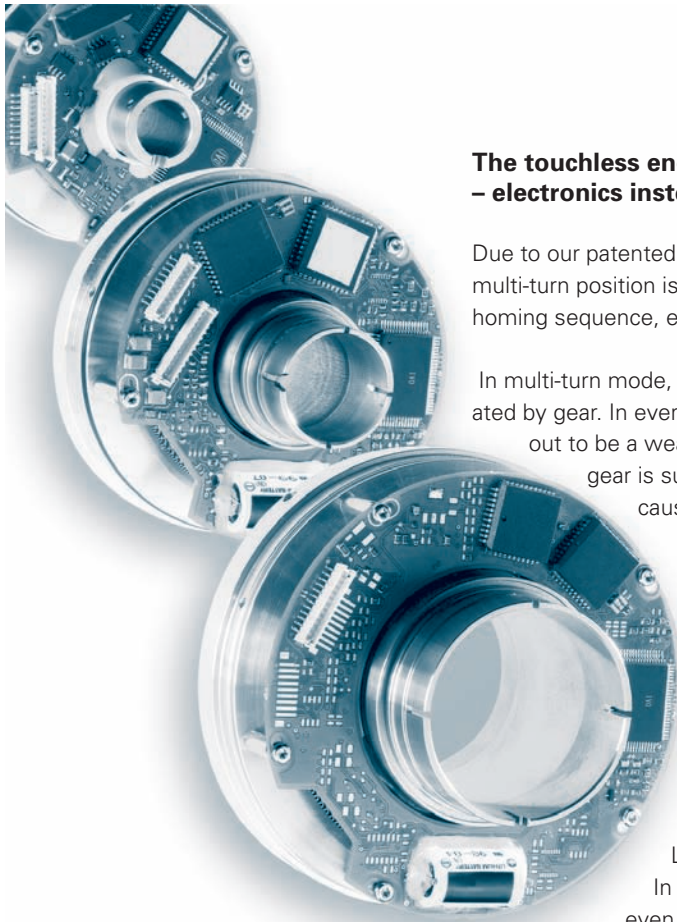
MAGRES



MAGRES



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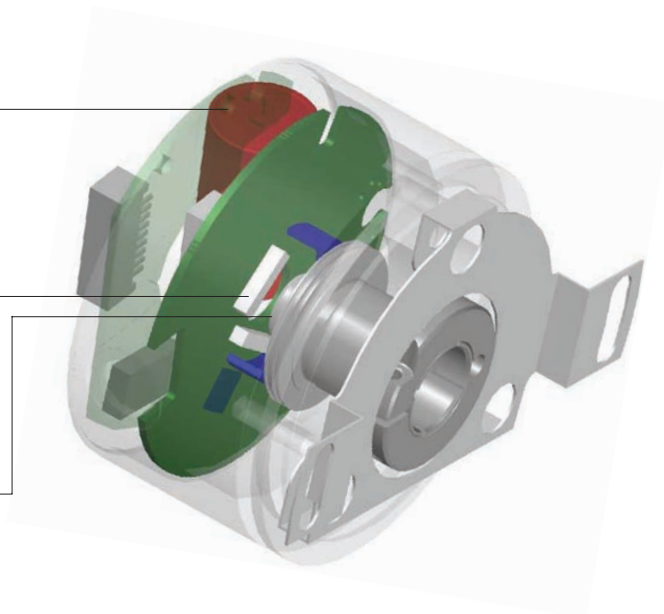
In this way, revolutions stay available even during a power outage.

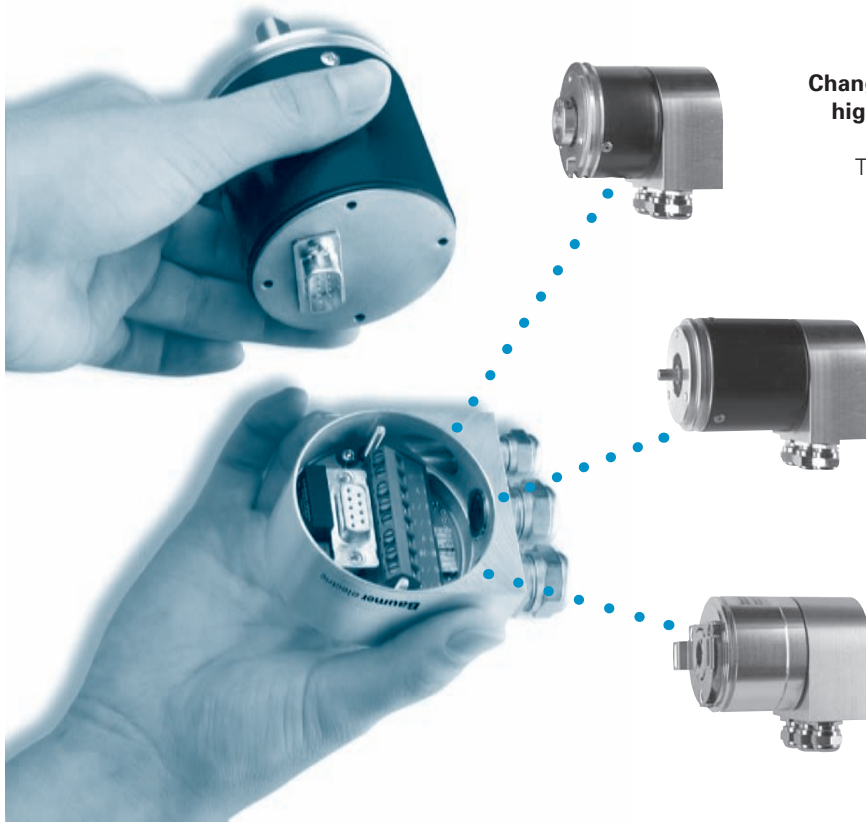
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Digitalizer



MAGRES



MAGRES



Actuator

FlexiDrive

An innovative actuator concept for formatting adjustments will enable you to drastically increase the production rate of your machine. With the following actuator, the converting time, and consequently the total cost can be reliably and economically reduced for the end customer.

The *FlexiDrive* family unifies

- motor
- gear
- power electronics
- controller
- encoder
- interface

in one compact actuator system.

Simple and inexpensive actuator MDBA

For simple, advantageous formatting adjustments with an existing external control that operates without a fieldbus system.

The current position value is obtained with the help of an integrated incremental encoder. These signals can be evaluated with a PLC using standard digital inputs. Since the power electronics are integrated in the actuator, only two digital outputs are required for the drive (left and right run direction).

Compact and decentralized actuator MSAA

Is your machine concept based on CAN-open? Would you like to unburden yourself of your strongest senior control? Then, the compact decentralized actuator MSAA is ready for action.

For the operation of the MSAA actuator, only the power supply (24 VDC) and the fieldbus connections are necessary. For a format adjustment, only the desired target position and the drive instruction are provided via the fieldbus. All other responsibility is assumed by the MSAA. The MSAA actuator can be configured, according to the application, via a simple PC-based software package.

The MSAA is equipped with an absolute position recorder. This makes homing unnecessary, since the absolute position information is immediately available after a cycle of the power supply or an emergency stop. The actuator has at its disposal both 1-quadrant regulating electronics, and power electronics with adjustable current restriction.





MDBA



- Simple mounting and start-up
- Only digital inputs and outputs
- Cost-optimized

MSAA



- Decentralized use, integrated 1Q-controller
- No homing, absolute measuring system
- Fieldbus interface CANopen

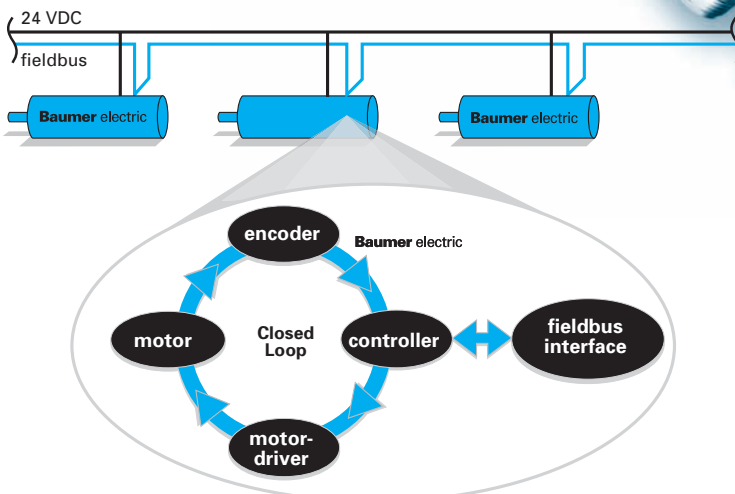
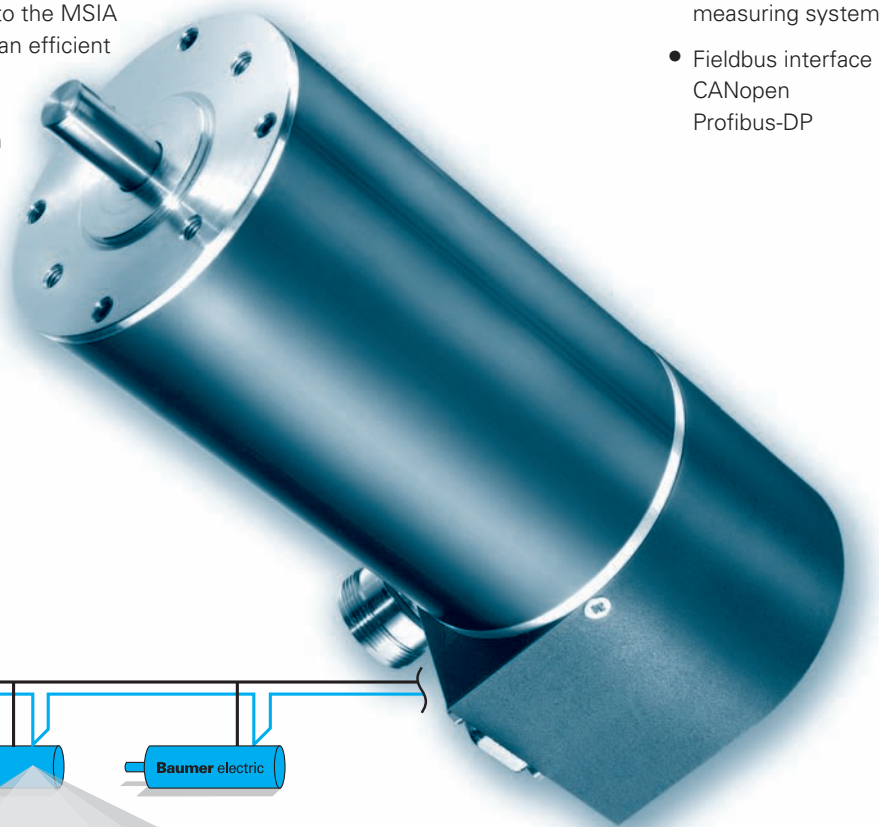
MSIA



- Decentralized use, integrated 4Q-controller, prog. drive data record
- No homing, absolute measuring system
- Fieldbus interface CANopen Profibus-DP

Dynamic and precise actuator MSIA

For increased performance, a widened adjustable speed range, and a longer operating lifetime, a brushless motor was integrated into the MSIA actuator. Through the use of an efficient DSP, a full 4-quadrant regulator is enabled. This allows point-to-point operation, such as storing of drive records. A high position resolution is made possible by the integration of a high resolution absolute encoder. For simple start-up, Siemens S7 PLC function blocks are available.



The entire **FlexiDrive** family makes its mark through space-saving designs and extremely flexible combinations of motors and gears.

Our specialists are standing by to assist you with selection and specification of these drives.

Incremental



Incremental encoders

	hollow shaft encoders					
						
type	BTIH	BRIH	BHK	BHF/BHG	BHF	BRIH/BRID
signal						
voltage supply range (output signal)	5 VDC (TTL-compatible) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 20 - 28 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 4,5 - 30 VDC (push-pull, complementary, short-circuit protection) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 10 - 30 VDC (push-pull, short-circuit protection)
pulse range	30 - 1'024	2 - 1'024	10 - 2'048	10 - 10'000	4'096-320'000	64 - 2'048
max. switching frequency	100 kHz	320 kHz	100 kHz	750 kHz	1,3 MHz	320 kHz
temperature range	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C
max. protection class	IP 54	IP 65	IP 64	IP 65	IP 65	IP 65
shaft diameter	4 mm	12 mm	6 / 12 mm	12 mm	12 mm	12 mm
dimensions (ø x length)	24x20 mm	40x32,5 mm	40x32,5 mm	58x31(38) mm	58x40 mm	58x40 mm
connection cable	axial / radial	axial / radial	radial	radial	radial	radial
plug	-	radial	radial	radial	radial	radial
special characteristics	-	-	-	end/through shaft	end shaft	end/through shaft
page	1. 08	1. 10	1. 14	1. 18	1. 22	1. 24

	shaft encoders					
						
type	BTIV	BRIV	BDK	BDH	BRIV	BDT
signal						
voltage supply range (output signal)	5 VDC (TTL-compatible) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 20 - 28 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 4,5 - 30 VDC (push-pull, complementary, short-circuit protection) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 4,5 - 30 VDC (push-pull, complementary, short-circuit protection) 10 - 30 VDC (push-pull, complementary, short-circuit protection)
pulse range	30 - 1'024	2 - 1'024	10 - 2'048	10 - 5'000	64 - 2'048	10 - 10'000
max. switching frequency	100 kHz	320 kHz	100 kHz	300 kHz	320 kHz	750 kHz
temperature range	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C
max. protection class	IP 54	IP 65	IP 65	IP 65	IP 65	IP 65
shaft diameter	4 mm	5 mm	5 mm	10 mm	6 / 10 mm	6 mm
dimensions (ø x length)	24x21 mm	30x32 mm	30x32 mm	55x36 mm	58x40 mm	58x42 mm
connection cable	axial / radial	axial / radial	axial / radial	axial / radial	radial	axial / radial
plug	-	radial	radial	axial / radial	radial	axial / radial
special characteristics	-	-	-	-	-	-
page	1. 48	1. 50	1. 52	1. 54	1. 56	1. 60

							
BHT	BHF/BHG	BHT	BHW	BTID 30	BTID 65	BHID 6E	
							
5 VDC (complementary RS 422) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (sine)	5 VDC (sine)	5 VDC (complementary RS 422) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 8 - 30 VDC (push-pull, complementary, short-circuit protection)	5 VDC (complementary RS 422) 8 - 30 VDC (push-pull, complementary, short-circuit protection)	5 VDC (complementary RS 422) 9 - 26 VDC (push-pull, complementary, short-circuit protection)	
20 - 10'000	2'000 - 5'000	2'000 - 5'000	1'024 - 36'000	1'024 - 5'000	256 - 2'500	1'024 - 4'000	
750 kHz	160 kHz	160 kHz	750 kHz	300 kHz	120 kHz	120 kHz	
-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+65 °C	-20...+65 °C	-20...+85 °C	
IP 65	IP 65	IP 65	IP 65	IP 54	IP 54	IP 54	
10 mm	12 mm	10 mm	27 mm	30 mm	40 - 65 mm	110 mm	
58x48 mm	58x31/38 mm	58x48 mm	80x40 mm	80x45 mm	150x54 mm	227x113 mm	
radial	radial	radial	radial	radial	radial	radial	
radial	radial	radial	radial	radial	radial	-	
flex coupling	end/through shaft	flex coupling	-	-	-	-	
1. 30	1. 34	1. 36	1. 40	1. 42	1. 44	1. 46	

		cable pull		ex-encoder	magnetic encoders			
								
BDT	BDM/BDW	BLS	BHIV EEx	IHRM/MHRM	MDRM/MDFM	MDFK/MLFK	MDFK/MLFK	
								
5 VDC (sine)	5 VDC (complementary RS 422) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 10 - 30 VDC (push-pull, short-circuit protection)	5 VDC (complementary RS 422) 9 - 30 VDC (push-pull, complementary, short circuit protection)	8 - 28 VDC (CHA & CHB) (push-pull, complementary, short circuit protection)	5 VDC (2 Vpp, sin, cos) 10 - 30 VDC (Vout 1 - 9 VDC) (Iout 4 - 20 mA)	5 VDC (RS 422) 8 - 28 VDC (push-pull, complementary, short circuit protection)	5 VDC / 8 - 28VDC (RS 422) 8 - 28 VDC (push-pull, complementary, short circuit protection)	
2'000 - 5'000	10 - 5'000	2'048	1 - 5'000	-	-	-	-	
160 kHz	300 kHz	100 kHz	250 kHz	1 - 20'000 Hz	20 kHz	3,2 MHz	3,2 MHz	
-20...+85 °C	-20...+85 °C	0...+65 °C	-20...+55 °C	-40...120 °C	-25...+85 °C	-25...+85 °C	-25...+85 °C	
IP 65	IP 65	IP 52	IP 56	IP 68	IP 67	IP 67	IP 67	
6 mm	9,52/10/12 mm	-	11 mm	-	-	-	-	
58x42 mm	63x58(72) mm	90x80x105 mm	120x123 mm	M12x60 mm	divers	45x8,5x15 mm	40x10x15 mm	
axial / radial	axial / radial	radial	radial	-	-	-	-	
axial / radial	axial / radial	-	-	-	-	-	-	
-	-	-	ex-protection	metal housing	-	-	-	
1. 62	1. 64	1. 68	1. 70	1. 74 / 1. 75	1. 76 / 1. 78	1. 80 / 1. 84	1. 86 / 1. 88	

Introduction

Incremental encoders

Incremental output sequence



The resolution of the encoder is determined by the number of dark/bright segments coated onto a disk. Baumer electric offers encoders with various pulse sequences.

The width of the dark/bright segments is determined by the selected number of pulses.

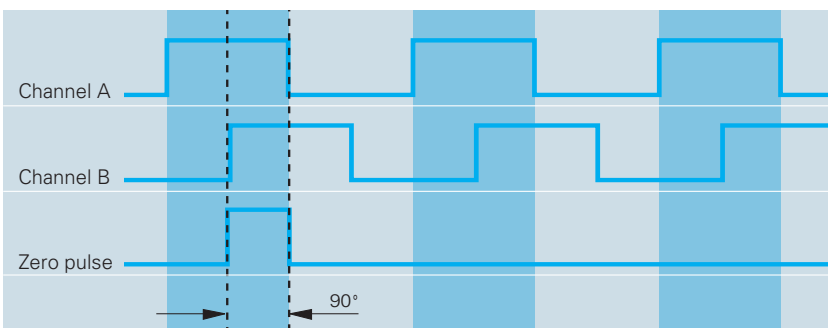
Two pulse sequences, 90° out of phase, are generated by two separate measuring systems. With this method the direction of rotation can be determined.

Looking at the shaft end of the encoder and watching the shaft moving in the counter clockwise direction means that channel B lags channel A for a 1/4 period (by 90°).



3 channel square wave

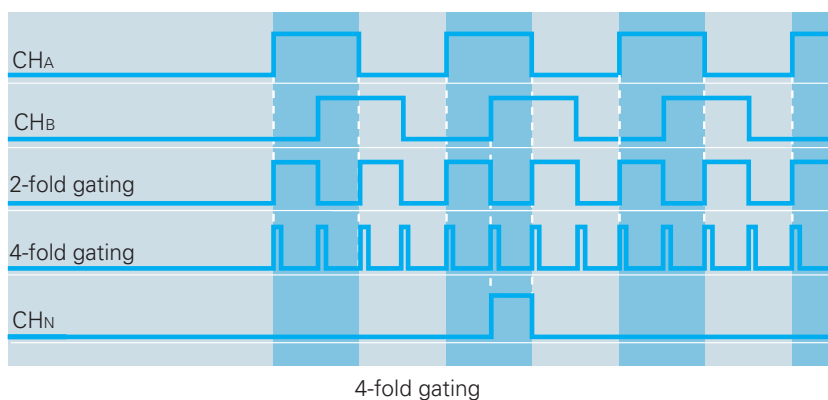
reference 6



The zero pulse with the designation 6 exists as long as the level of channel A and B is HIGH.

This method is standard at Baumer electric.

Signal edge counting



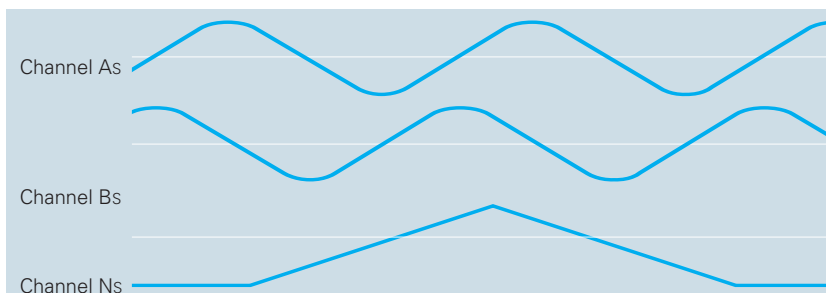
The output signal of the encoder is a square wave. One period is equally subdivided by the four edges of the two channel (CHA and CHB) signals.

This results in the ability to multiply the raw pulse count by a factor of four (quadrature).



reference 8

3 channel sine signal



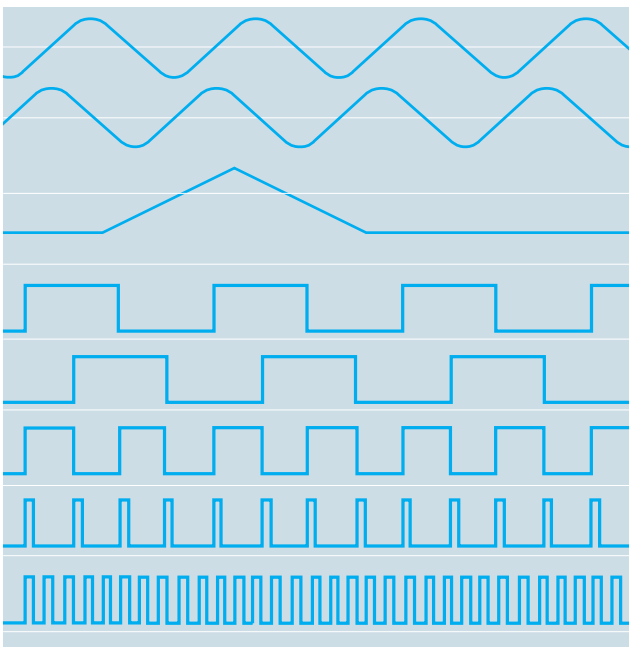
Sine signals (As, Bs, Ns)

Two sinusoidal signals¹⁾ are generated which possess a phase quadrature in relation to one another. One analog zero reference point is generated per revolution, so that its peak value is between the maximum of the sinusoidal signals. Looking at

the shaft end of the encoder and the rotation of the shaft CCW, the As channel lags behind the Bs channel by 1/4 (90°) of a period.

¹⁾ After subtraction in the sequence electronics

Signal edge counting by interpolation box



For the purpose of matching to a given interface or on account of a requirement for higher resolution, there are separate interpolation boxes available for each application. Thus, four counting steps are obtained from the period T; these can then be passed to a counter.

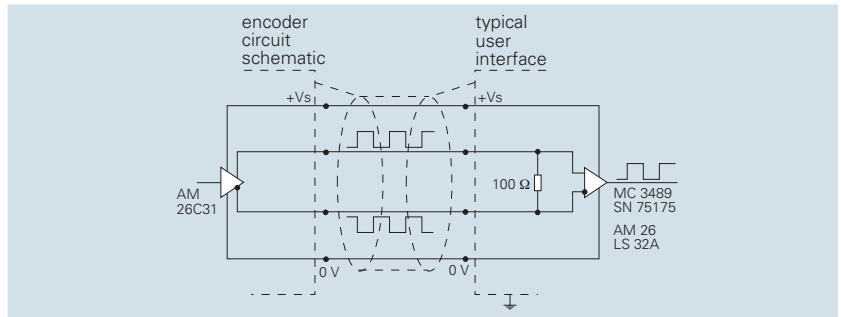
If the basic resolution of T/4 is inadequate for the application, the analog signal must be interpolated. Here, the basic period is subdivided into smaller units by applying trigonometric laws. Thus, with 10 fold interpolation, a 5'000 pulse sinusoidal encoder can supply 200'000 steps per revolution.

Output circuits

Incremental encoders

Complementary line-driver

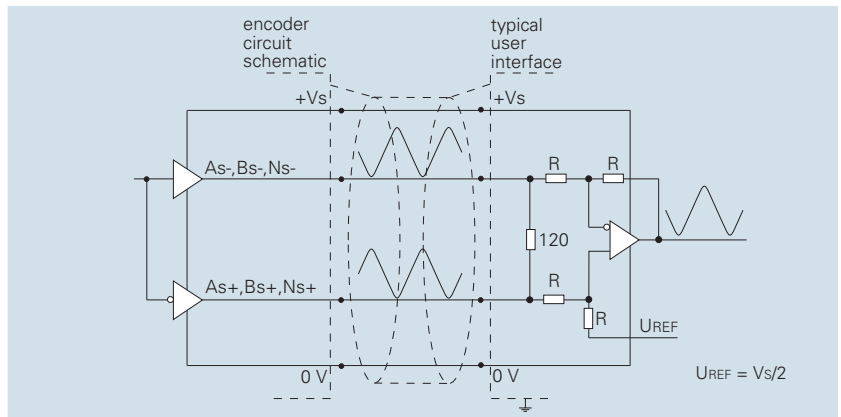
05A



voltage supply	5 VDC $\pm 10\%$
level of signal	$U_{\text{High}} \geq 2,4 \text{ V}$ at $-I_{\text{High}} = 20 \text{ mA}$ $U_{\text{Low}} \geq 0,4 \text{ V}$ at $I_{\text{Low}} = 20 \text{ mA}$
supply current	see product page
special features	EIA-standard RS-422
preferred application	when EMI is present and with long cable lengths

Sine

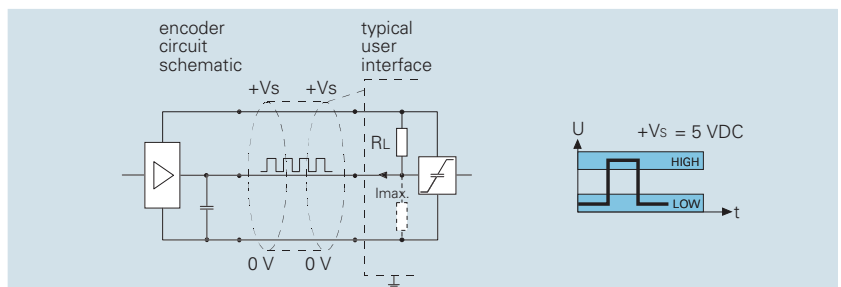
05S



voltage supply	5 VDC $\pm 5\%$
supply current	see product page
level of output signal	approx. 1 Vpp
preferred application	for external interpolation

Push-pull short-circuit protection (TTL-compatible)

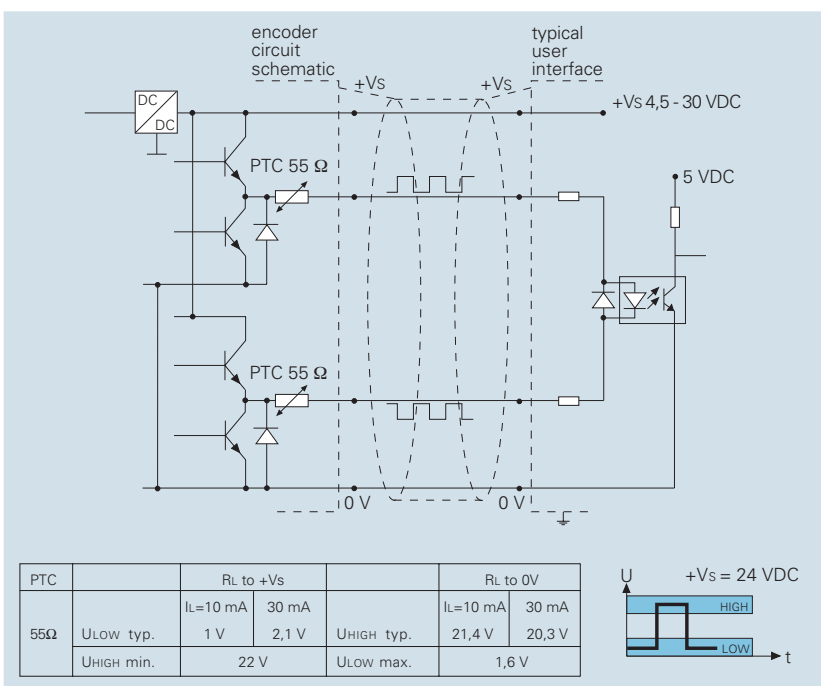
05T



voltage supply	5 VDC $\pm 10\%$
level of signal	$U_{\text{High}} \geq 3,8 \text{ V}$ at $-I_{\text{High}} = 1 \text{ mA}$ $U_{\text{Low}} \geq 0,4 \text{ V}$ at $I_{\text{Low}} = 5 \text{ mA}$
supply current	see product page
preferred application	with short cable lengths

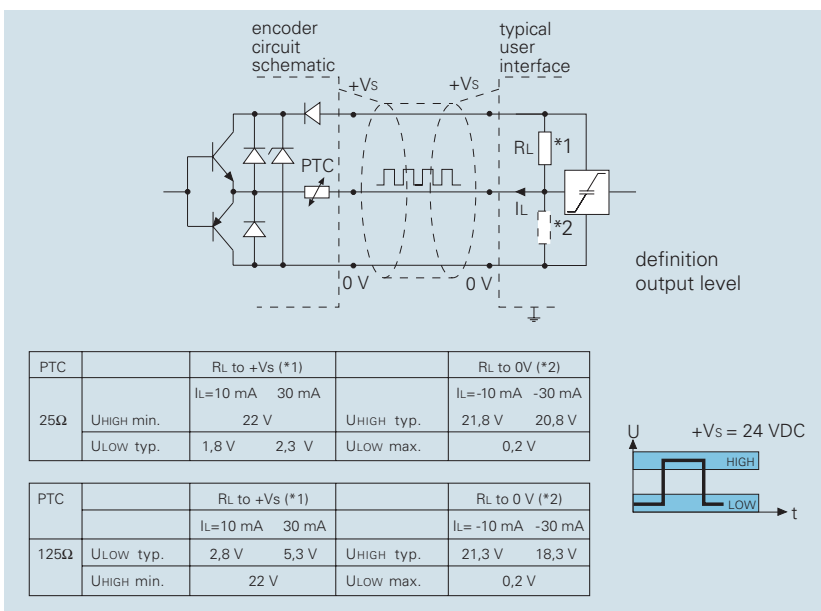


Push-pull complementary short-circuit protection

25W

voltage supply	4,5 - 30 VDC
supply current	see product page
output current	max. 40 mA
preferred application	when EMI is present and with long cable lengths

Push-pull short-circuit protection

24K

voltage supply	10 - 30 VDC reverse polarity protected
supply current	see product page
output current	max. 30 mA
PTC-resistance	25 Ω (BDK, BHK 125 Ω)

Incremental hollow shaft encoder BTIH

features

- miniature hollow shaft encoder
- high resolution up to 1024 pulses
- housing diameter 24 mm
- mounting with clamping ring and spring plate



general data

voltage supply	5 VDC $\pm$ 5% (05T) 10 - 30 VDC (24K)
max. supply current no load	typ. 25 mA (at 5 VDC) (05T) typ. 25 mA (at 24 VDC) (24K)
pulse range	see order designation
pulse tolerance	$\pm$ 10%
max. switching frequency	100 kHz

mechanical data

max. revolutions	12'000 rpm
torque	max. 0,7 cNm (20 °C)
max. protection class	shaft: IP 54 housing: IP 54
material	housing: aluminum
weight	approx. 50 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 ($\leq$ 100 m/s ² / 55-2'000 Hz)
shock	IEC 60068-2-27 ($\leq$ 300 m/s ² / 11 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3

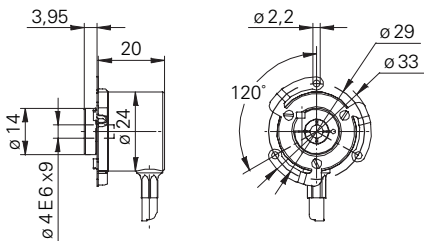
order designation

BTIH 24D16				T4	
					connection
					4 cable 1m axial
					5 cable 1m radial
					shaft
				T4	hollow shaft 4 mm IP 54 with clamping ring and spring plate
					standard pulse range
					30 300 600
					60 360 1000
					100 500 1024
					voltage range, output signals
				05T	5 VDC TTL
				24K	10 - 30 VDC push-pull, short-circuit protection



dimensions

-5



assignment cable

for connection reference **-4** and **-5**

05T (5 VDC TTL)

24K (10 - 30 VDC push-pull, short-circuit protection)

cable color	signals
brown	+Vs
green	CHA
yellow	CHB
grey	CHN
white	0 V
screen	connected to flange

Incremental hollow shaft encoder

BRIH – EcoMag

features

- miniaturized hollow shaft encoder with wide pulse range
- radial cable connection or connector
- end shaft mounting up to $\varnothing$ 12 mm



general data

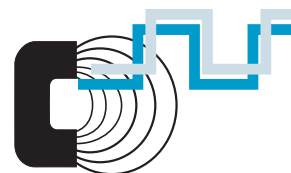
voltage supply	5 VDC $\pm$ 10% (05A) 20 - 28 VDC (17K)
max. supply current no load	typ. 25 mA (at 5 VDC) (05A) typ. 30 mA (at 24 VDC) (17K)
max. measuring steps	4'096 steps
pulse range	see order designation
pulse tolerance	$\pm$ 15%
max. switching frequency	320 kHz

mechanical data

max. revolutions	6'000 rpm
moment of inertia	typ. $3,0 \times 10^{-7}$ kgm ²
torque	typ. 0,75 cNm (3'000 rpm / 20 °C)
product life	depending on ambient conditions (typ. 10^9 revolutions)
max. protection class	IP 65
material	housing: polyamide flange: aluminum
weight	ca. 120 g

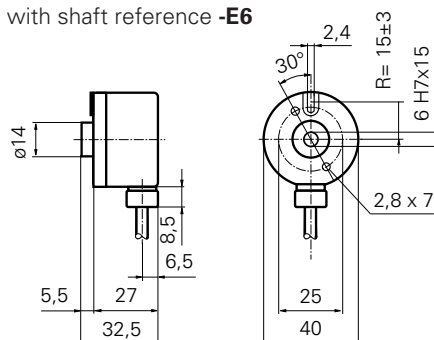
ambient conditions

temperature range	-20...+85 °C (05A) -20...+65 °C (17K)
relative humidity	max. 95%
vibration (sine)	IEC 60068-2-6 (≤ 300 m/s ² / 10 - 2'000 Hz) 150 min per axis
vibration (random)	IEC 60068-2-64 ($\leq 0,1$ g ² /Hz / 20 - 2'000 Hz) 30 min per axis
shock	IEC 60068-2-27 ($\leq 1'000$ m/s ² / 6 ms) 10 pulses per axis and direction
bump	IEC 60068-2-29 ($\leq 1'000$ m/s ² / 2 ms) 4'000 pulses per axis and direction
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3

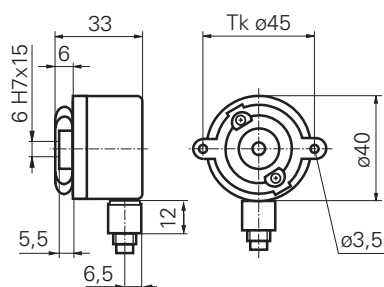


dimensions and connection dimensions

-5 with shaft reference -E6

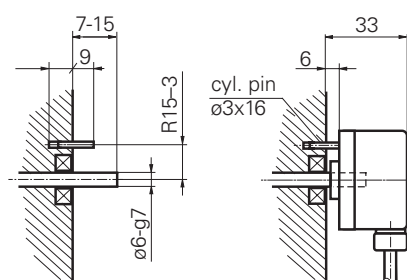


-9 with shaft reference -E6 and spring plate

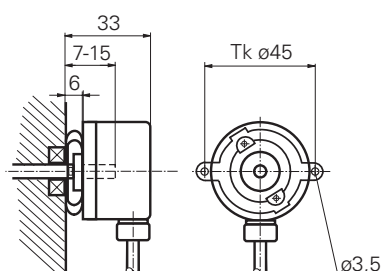


mounting

-E6 end shaft 6 mm no spring plate

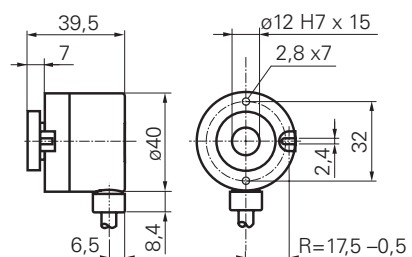


end shaft 6 mm with spring plate

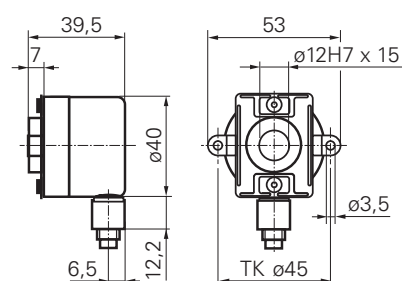


dimensions and connection dimensions

-5 with shaft reference -E2

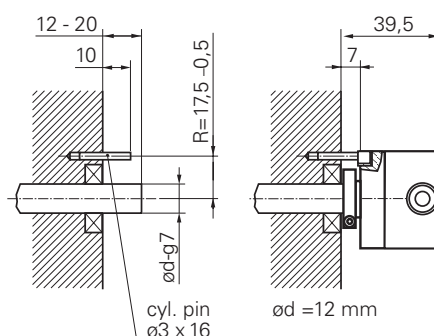


-9 with shaft reference -E2 and spring plate

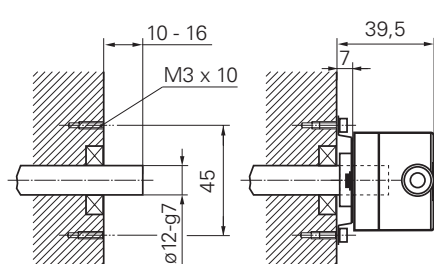


mounting

-E2 end shaft 12 mm no spring plate



end shaft 12 mm with spring plate



Magnetic incremental hollow shaft encoder

BRIH – EcoMag

assignment cable

for connection reference **-5**

05A (5 VDC complementary)

cable color	signals
brown	+Vs
green	CHA
red	CHA compl.
yellow	CHB
blue	CHB compl.
pink	CHN
grey	CHN compl.
white	0 V
screen	connected to flange
cable data	8x0,14 mm ² , max. ext. ø 5,7 mm

17K (20 - 28 VDC push-pull, short-circuit protection)

cable color	signals
brown	+Vs
green	CHA
yellow	CHB
pink	CHN
white	0V
screen	connected to flange
cable data	5x0,14 mm ² , max. ext. ø 5,4 mm

assignment connector M9 male

for connection reference **-9**



05A (5 VDC complementary)

pin number	cable color*	signals
1	white	0 V
2	brown	+Vs
3	green	CHA
4	yellow	CHB
5	grey	CHN compl.
6	pink	CHN
7	blue	CHB compl.
8	red	CHA compl.

for connection reference **-9**



17K (20 - 28 VDC push-pull, short-circuit protection)

pin number	cable color*	signals
1	white	0 V
2	brown	+Vs
3	black	CHA
4	blue	CHB
5	grey	CHN

*Note

These cable colors are valid for the pre-assembled cable socket (see accessories).

order designation

[illegible]

connection

- 4** cable 1 m axial
5 cable 1 m radial
9 connector radial M9

shaft

- E6** end shaft 6 mm IP 65
with clamping ring
- E2** end shaft 12 mm IP 65
with clamping ring

standard pulse range

2	32	100	256	1000
4	40	128	400	1024
8	50	160	512	
16	64	200	500	
20	80	250	800	

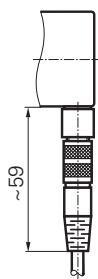
voltage range, output signals

- 05A** 5 VDC complementary
17K 20 - 28 VDC push-pull, short-circuit prot.

temperature range, related to voltage supply

- 1** -20...+85 °C **(05A)**
3 -20...+65 °C **(17K)**

mounting connector



accessories

cable with connector M9 female (pre-assembled) ref. -9		
for compl. 05A	2 m	part nr. 123168 (ES62FB2)
	5 m	part nr. 123169 (ES62FB5)
for push-pull 17K	2 m	part nr. 123166 (ES62CB2)
	5 m	part nr. 123167 (ES62CB5)

connector M9 female reference -9	
for complementary 05A	part nr. 132983
for push-pull 17K	part nr. 123144

spring plate set (round) for < 8 mm end shaft	part nr. 158423
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spring plate set (square) for ≥ 8 mm end shaft	part nr. 158424
--	-----------------

clamping ring set for 12 mm end shaft	part nr. 142556
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clamping ring set for 6 mm end shaft	part nr. 142561
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Incremental hollow shaft encoder BHK

features

- miniaturized hollow shaft encoder with extended pulse range
- radial cable connection or connector
- through shaft mounting $\varnothing$ 6 mm or end shaft mounting $\varnothing$ 12 mm



general data

voltage supply	5 VDC $\pm$ 10% (05A) 10 - 30 VDC (24K)
max. supply current no load	typ. 60 mA (at 5 VDC) typ. 30 mA (at 24 VDC)
max. measuring steps	8'192 steps
pulse range	see order designation
pulse tolerance	$\pm$ 15%
max. switching frequency	50 kHz ($\leq$ 500 ppr) 100 kHz ($>$ 500 ppr)

mechanical data

max. revolutions	12'000 rpm
moment of inertia	typ. $3,0 \times 10^{-7}$ kgm ²
torque	typ. 0,21 cNm IP 42 typ. 0,75 cNm IP 64 (3'000 rpm / 20 °C)
product life	depending on ambient conditions (typ. 10^9 revolutions)
max. protection class	hollow shaft: max. IP 64 housing: IP 42 to max. IP 65 with end cap
material	housing: polyamid flange: aluminum
weight	approx. 100 g

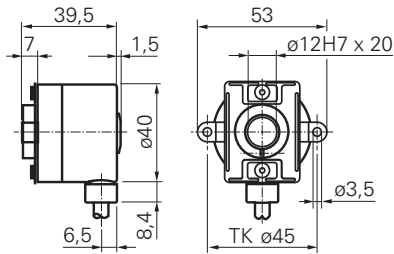
ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 ($\leq$ 100 m/s ² / 10 - 200 Hz)
shock	IEC 60068-2-6 ($\leq$ 500 m/s ² / 11 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3

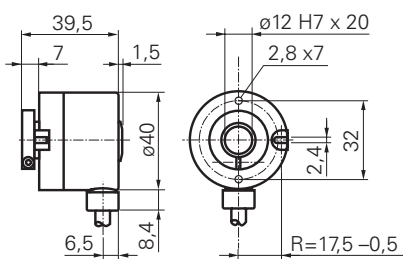


dimensions and connection dimensions

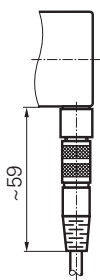
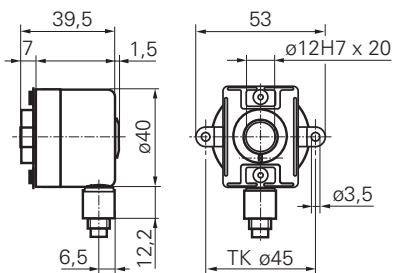
-5 with shaft reference **-I2**



-5 with shaft reference **-B2**

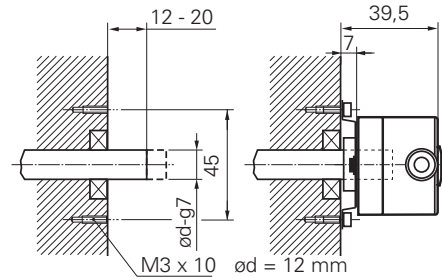


-9

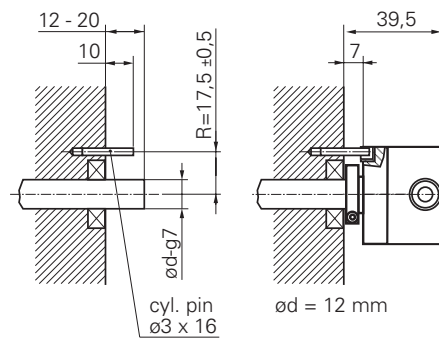


mounting

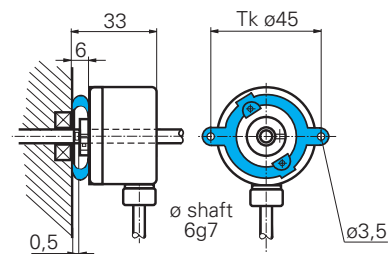
-I2 end shaft 12 mm with clamping ring and spring plate



-B2 end shaft 12 mm with clamping ring no spring plate

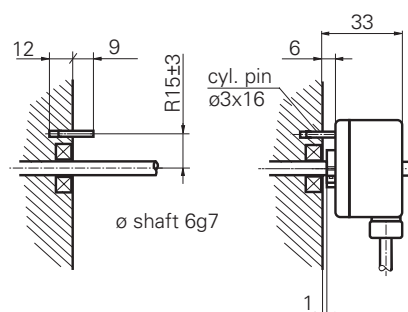


-M6 through shaft 6 mm with clamping ring and spring plate



-B6 through shaft 6 mm with clamping ring no spring plate

-E6 through shaft 6 mm with clamping ring



Incremental hollow shaft encoder BHK

assignment cable

for connection reference **-5**

05A (5 VDC complementary)

cable color	signals
brown	+Vs
green	CHA
red	CHA compl.
yellow	CHB
blue	CHB compl.
pink	CHN
grey	CHN compl.
white	0V
screen	connected to flange
cable data	8x0,14 mm ² , max. ext. ø 5,7 mm

24K (10 - 30 VDC push-pull, short-circuit protection)

cable color	signals
brown	+Vs
green	CHA
yellow	CHB
pink	CHN
white	GND
screen	connected to flange
cable data	5x0,14 mm ² , max. ext. ø 5,4 mm

assignment connector M9 male

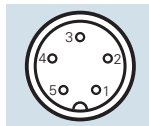
for connection reference **-9**



05A (5 VDC complementary)

pin number	cable color*	signals
1	white	0V
2	brown	+Vs
3	green	CHA
4	yellow	CHB
5	grey	CHN compl.
6	pink	CHN
7	blue	CHB compl.
8	red	CHA compl.

for connection reference **-9**



24K (10 - 30 VDC push-pull, short-circuit protection)

pin number	cable color*	signals
1	white	0V
2	brown	+Vs
3	black	CHA
4	blue	CHB
5	grey	CHN

*Note

These cable colors are valid for the pre-assembled cable socket (see accessories).



order designation

BHK 16.

--	--	--	--	--

connection

5

cable 2 m radial

9

connector radial M9

shaft

B6

through shaft 6 mm
IP 42 with clamping ring

E6

through shaft 6 mm
IP 64 with clamping ring

M6

through shaft 6 mm
IP 64 with clamping ring
and spring plate

B2

end shaft 12 mm IP 42
with clamping ring

I2

end shaft 12 mm IP 42
with clamping ring
and spring plate

standard pulse range

10	100	500
20	120	1000
30	200	1024
50	250	2000
60	360	2048

other pulses on request

voltage range, output signals

05A

5 VDC complementary

24K

10 - 30 VDC push-pull, short-circuit protection

Other versions on request.

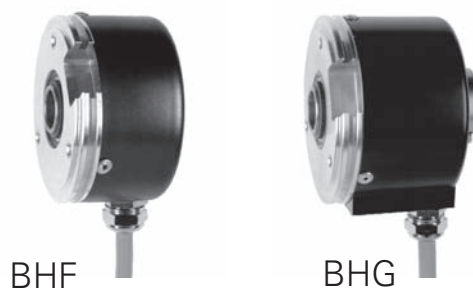
accessories

cable with connector M9 female (pre-assembled) ref. -9		
for complementary 05A	2 m	part nr. 123168 (ES62FB2)
	5 m	part nr. 123169 (ES62FB5)
for push-pull 24K	2 m	part nr. 123166 (ES62CB2)
	5 m	part nr. 123167 (ES62CB5)
connector M9 female reference -9		
for complementary 05A		part nr. 132983
for push-pull 24K		part nr. 123144
spring plate set (round)		part nr. 158423
spring plate set (square)		part nr. 158424
clamping ring set 12 mm hollow shaft		part nr. 142556
clamping ring set 6 mm hollow shaft		part nr. 142561

Incremental hollow shaft encoders BHF/BHG

features

- simple mounting
- end shaft mounting (BHF)
- through shaft mounting (BHG)
- various hollow shaft adapters
- small mounting depth



general data

voltage supply	5 VDC $\pm 10\%$ (05A) 4,5 - 30 VDC (25W) 10 - 30 VDC (24K)
max. supply current no load	typ. 80 mA (at 5 VDC) (05A) typ. 180 mA (at 4,5 VDC) (25W) typ. 60 mA (at 24 VDC) (24K)
max. measuring steps	40'000 steps at 10'000 ppr (05A / 24K)
pulse range	see order designation
pulse tolerance	$\pm 10\%$
max. switching frequency	200 kHz (24K) 300 kHz (05A / 25W) 750 kHz (05A > 5000 ppr)

mechanical data

max. revolutions	12'000 rpm (IP 42) 6'000 rpm (IP 65)
moment of inertia	BHF/BHG with clamp ring typ. $18,5 \times 10^{-7}$ kgm ² BHF without clamp ring typ. $13,6 \times 10^{-7}$ kgm ²
torque BHF	typ. 0,9 cNm IP 42 typ. 3,7 cNm IP 65
BHG	typ. 1,75 cNm IP 42 typ. 4,7 cNm IP 65 (3'000 rpm / 20 °C)
product life	depending on ambient conditions (typ. 10^9 revolutions)
max. protection class	IP 65
material	housing: aluminum BHF with connection ref. -5: steel flange: aluminum
weight	approx. 300 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 (≤ 100 m/s ² / 10 - 200 Hz)
shock	IEC 60068-2-27 (≤ 500 m/s ² / 11 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3

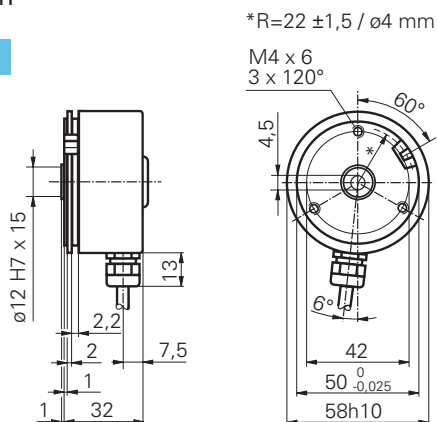


dimensions and connection dimensions

1

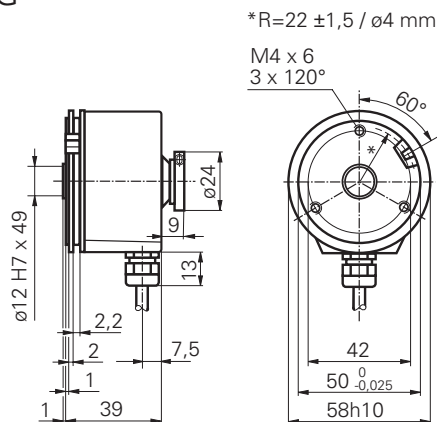
BHF

-5

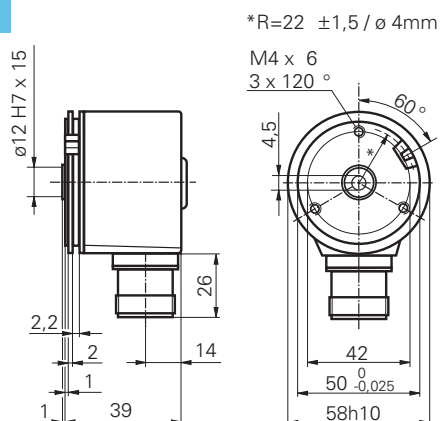


BHG

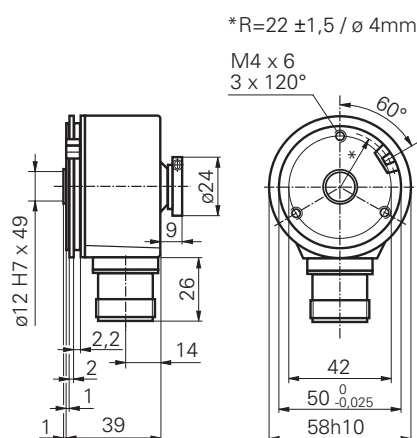
-5



-A



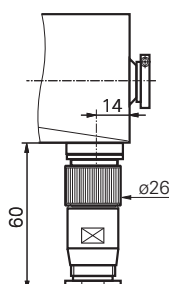
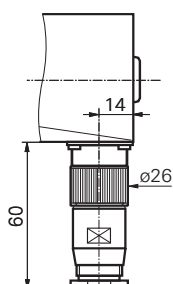
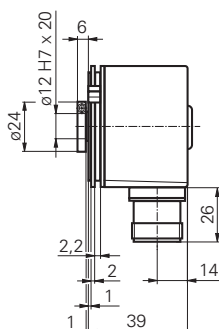
-A



-E2 with clamping ring

-A

-A



Note

Mounting drawings
see end of chapter.

Incremental hollow shaft encoders BHF/BHG

assignment cable

for connection reference **-5**

05A (5 VDC complementary)

25W (4,5 - 30 VDC push-pull, complementary, short-circuit protection)

cable color	signals
brown	+Vs
green	CHA
red	CHA compl.
yellow	CHB
blue	CHB compl.
pink	CHN
grey	CHN compl.
white	0V
screen	connected to connector housing
cable data	8 x 0,14 mm ² , max. ext. ø 5,7 mm

24K (10 - 30 VDC complementary, short-circuit protection)

cable color	signals
brown	+Vs
green	CHA
yellow	CHB
pink	CHN
white	0V
screen	connected to connector housing
cable data	5 x 0,14 mm ² , max. ext. ø 5,4 mm

assignment connector M23 male

for connection reference **-A**



05A (5 VDC complementary)

24K (10 - 30 VDC complementary, short-circuit protection)

25W (4,5 - 30 VDC push-pull, complementary, short-circuit protection)

pin number	signals
1	CHA compl.
2	+Vs
3	CHN
4	CHN compl.
5	CHB
6	CHB compl.
7	n.c.
8	CHA
9	housing
10	0 V
11	0 V
12	+Vs

push-pull version **24K** without CHx complementary signals

BHF 16.

connection

5 cable 2 m radial
A connector radial M23

shaft

12 end shaft 12 mm IP 42 ²⁾
B2 end shaft 12 mm IP 42 ²⁾
 with clamping ring
L2 end shaft 12 mm IP 65
E2 end shaft 12 mm IP 65
 with clamping ring

standard pulse range

10	120	1000	3600
30	200	1024	5000
50	250	1250	7200¹⁾
60	360	2000	8192¹⁾
100	500	2500	10000¹⁾

other pulses on request

voltage range, output signals

05A 5 VDC complementary
24K 10 - 30 VDC push-pull, short-circuit protection
25W 4,5 - 30 VDC push-pull, complementary,
 short-circuit protection

encoder type

F end shaft encoder

¹⁾ only for complementary **05A** and push-pull **24K**

²⁾ shaft adapter must be ordered separately

Other versions on request.

BHG 16.

connection

5 cable 2 m radial
A connector radial M23

shaft

B2 through shaft 12 mm IP 42
 with clamping ring
E2 through shaft 12 mm IP 65
 with clamping ring

standard pulse range

10	120	1000	3600
30	200	1024	5000
50	250	1250	7200¹⁾
60	360	2000	8192¹⁾
100	500	2500	10000¹⁾

other pulses on request

voltage range, output signals

05A 5 VDC complementary
24K 10 - 30 VDC push-pull, short-circuit protection
25W 4,5 - 30 VDC push-pull, complementary, short-circuit protection

encoder type

G through shaft encoder

accessories

connector M23 female reference -A	
12-pin straight	
for complementary 05A	part nr. 107687
for push-pull 24K	part nr. 107687
for complementary 25W	part nr. 107687
cable with connector M23 female (pre-assembled) ref. -A	
2 m	part nr. 130367
5 m	part nr. 118532
clamp set	part nr. 110616
torque pin	part nr. 107540
torque spring ³⁾	part nr. 109520
spring plate set	part nr. 136635
shaft adapters	see chapter accessories
clamping ring set	
12 mm hollow shaft	part nr. 142556

3) encoder is delivered with fixed rubber torque spring

Incremental hollow shaft encoder

BHF high resolution, programmable

features

- high resolution
- programmable over BiSS (accessories necessary)
- end-hollow shaft mounting
- easy mounting with spring plate



general data

voltage supply	5 VDC $\pm 10\%$ (05A) 10 - 30 VDC (24K)
max. supply current no load	typ. 30 mA (at 5 VDC) (05A) typ. 20 mA (at 24 VDC) (24K)
max. measuring steps	1'280'000 steps at 320'000 ppr
pulse range	see order designation
pulse tolerance	$\pm 10\%$
max. switching frequency	1,3 MHz

mechanical data

max. revolutions	6'000 rpm
moment of inertia	BHF with clamping ring typ. $18,5 \times 10^{-7} \text{ kgm}^2$ BHF without clamping ring typ. $13,6 \times 10^{-7} \text{ kgm}^2$
torque	typ. 0,9 cNm IP 42 typ. 3,7 cNm IP 65 (3'000 rpm / 20 °C)
product life	depending on ambient conditions (typ. 10^9 revolutions)
max. protection class	IP 65
material	aluminum
weight	approx. 300 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 10 - 200 Hz)
shock	IEC 60068-2-27 ($\leq 500 \text{ m/s}^2$ / 11 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



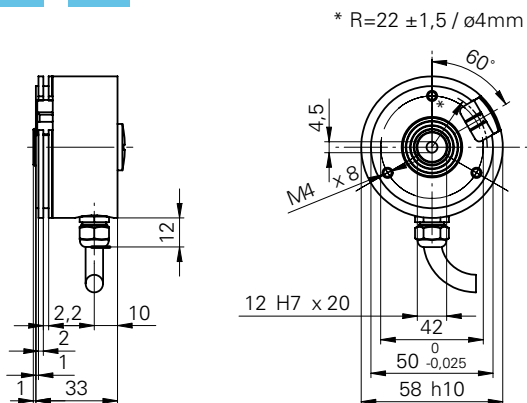
dimensions and connection dimensions

BHF

1

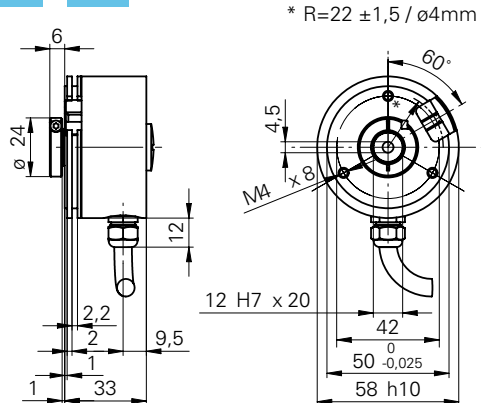
-12

-5



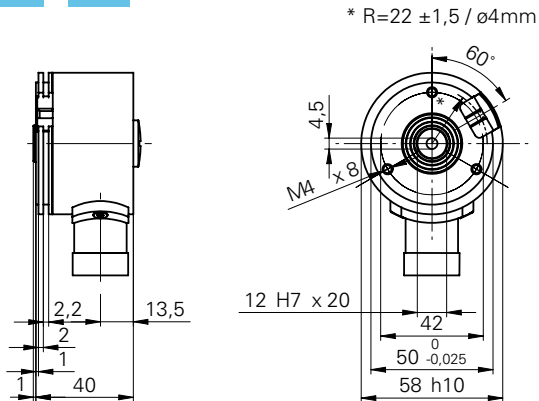
-B2

-5



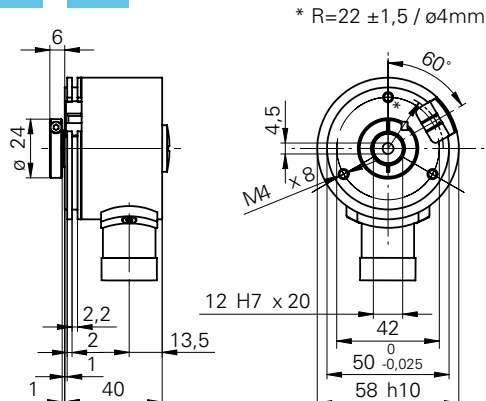
-12

-A



-B2

-A



Incremental hollow shaft encoder

BHF high resolution, programmable

assignment cable

for connection reference **-5**

05A (5 VDC complementary)

cable color	signals
brown	+Vs
green	CHA
red	CHA compl.
yellow	CHB
blue	CHB compl.
pink	CHN
grey	CHN compl.
white	0 V
black	BiSS data
purple	BiSS clock
screen	connected to connector housing
cable data	10 x 0,14 mm ² , max. ext. ø 6,1 mm

24K (10 - 30 VDC push-pull, short-circuit protection)

cable color	signals
brown	+Vs
green	CHA
red	n.c.
yellow	CHB
blue	n.c.
pink	CHN
grey	n.c.
white	0 V
black	BiSS data
purple	BiSS clock
screen	connected to connector housing
cable data	10 x 0,14 mm ² , max. ext. ø 6,1 mm

assignment connector M23 male

for connection reference **-A**



05A (5 VDC complementary)

24K (10 - 30 VDC push-pull, short-circuit protection)

pin number	signals
1	CHA compl.
2	+Vs
3	CHN
4	CHN compl.
5	CHB
6	CHB compl.
7	BiSS data
8	CHA
9	housing
10	0 V
11	BiSS clock
12	n.c.

push-pull version **24K** without CHx complementary signals



order designation BHF

BHF 1P.

connection

5 cable 2 m radialA connector radial M23

shaft

12 end shaft 12 mm IP 42 ²⁾L2 end shaft 12 mm IP 65 ²⁾B2 end shaft 12 mm IP 42 with clamping ringE2 end shaft 12 mm IP 65 with clamping ring

pulse range

programmable (pulse disk 2'048)40968192163843276865536131072

programmable (pulse disk 5'000)10000200004000080000160000320000

voltage range, output signals

05A 5 VDC complementary24K 10 - 30 VDC push-pull, short-circuit protection

programmable (with software and adaptor, refer to accessories)

encoder type

F end shaft encoder

²⁾ shaft adapter must be ordered separately

Other versions on request.

accessories

software and BiSS-adaptor	part nr. 161910
connector M23 female reference -A for 05A and 24K	part nr. 107687
spring plate set	part nr. 136635
shaft adapters	see chapter accessories
clamping ring set	
12 mm hollow shaft	part nr. 142556

Magnetic Incremental hollow shaft encoder

BRIH/BRID – EcoMag

features

- robust against shock and vibration
- high switching frequency
- end shaft mounting type BRIH
- through shaft mounting type BRID



BRIH

BRID

general data

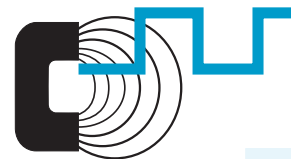
voltage supply	5 VDC $\pm 10\%$ (05A) 10 - 30 VDC (24K)
max. supply current no load	typ. 30 mA (at 5 VDC) (05A) typ. 15 mA (at 24 VDC) (24K)
max. measuring steps	8'192 steps
pulse range	see order designation
pulse tolerance	$\pm 15\%$
max. switching frequency	320 kHz

mechanical data

max. revolutions BRIH	12'000 rpm (IP 42) 6'000 rpm (IP 65)
BRID	6'000 rpm
torque BRIH	typ. 0,9 cNm IP 42 typ. 3,7 cNm IP 65
BRID	typ. 1,75 cNm IP 42 typ. 4,7 cNm IP 65 (3'000 rpm / 20 °C)
product life	depending on ambient conditions (typ. 10^9 revolutions)
max. protection class	shaft: IP 65 housing: IP 65
material	housing: aluminum flange: aluminum
weight	approx. 150 g

ambient conditions

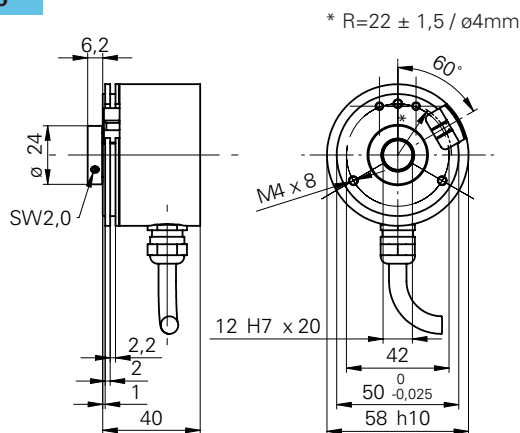
temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration (sine)	IEC 60068-2-6 ($\leq 300 \text{ m/s}^2$ / 10 - 2'000 Hz) 150 min per axis
vibration (random)	IEC 60068-2-64 ($\leq 0,1 \text{ g}^2/\text{Hz}$ / 20 - 2'000 Hz) 30 min per axis
shock	IEC 60068-2-27 ($\leq 1'000 \text{ m/s}^2$ / 6 ms) 10 pulses per axis and direction
bump	IEC 60068-2-29 ($\leq 1'000 \text{ m/s}^2$ / 2 ms) 4'000 pulses per axis and direction
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



dimensions and connection dimensions

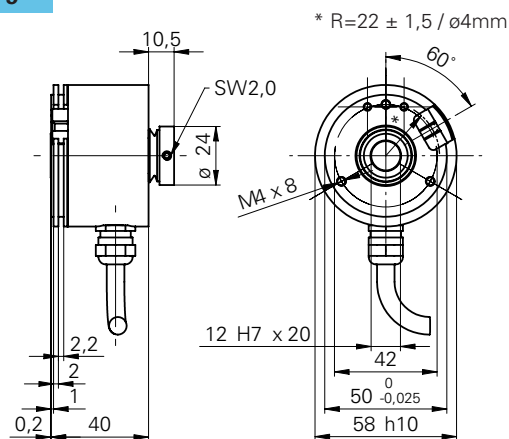
BRIH

-5

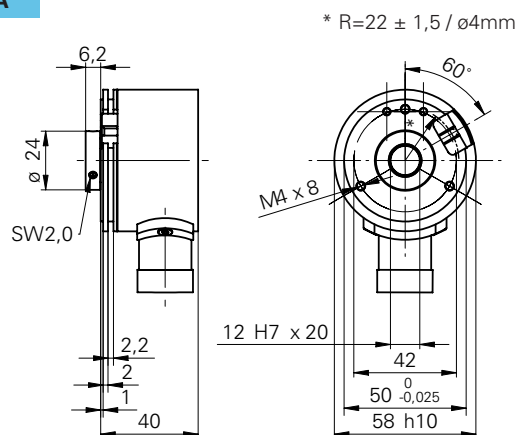


BRID

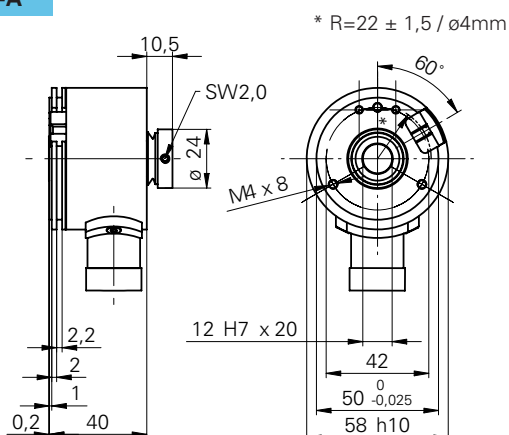
-5



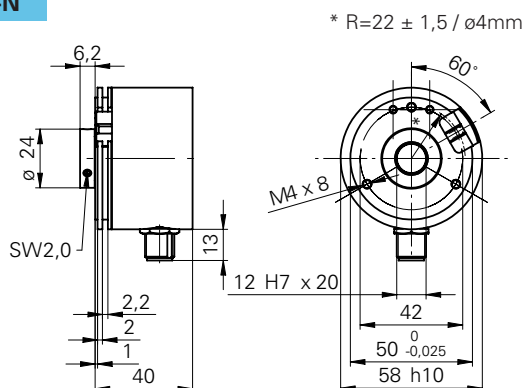
-A



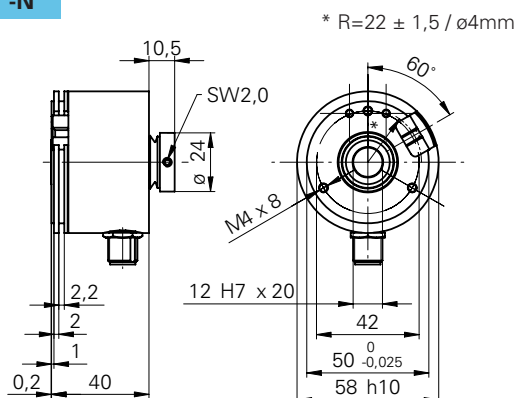
-A



-N



-N



Magnetic Incremental hollow shaft encoder

BRIH/BRID – EcoMag

assignment cable

for connection reference **-5**

05A (5 VDC complementary)

cable color	signals
brown	+Vs
green	CHA
red	CHA complementary
yellow	CHB
blue	CHB complementary
pink	CHN
grey	CHN complementary
white	0 V
screen	connected to connector housing
cable data	8 x 0,14 mm ² , max. ext. ø 5,7 mm

24K (10 - 30 VDC push-pull, short-circuit protection)

cable color	signals
brown	+Vs
green	CHA
yellow	CHB
pink	CHN
white	0 V
screen	connected to flange
cable data	5 x 0,14 mm ² , max. ext ø 5,4 mm

assignment connector M23 male

for connection reference **-A**



view on
encoder

05A (5 VDC complementary)

24K (10 - 30 VDC push-pull,
short-circuit prot.)

pin number	signals
1	CHA compl.
2	+Vs
3	CHN
4	CHN compl.
5	CHB
6	CHB compl.
7	n.c.
8	CHA
9	housing
10	0 V
11	n.c.
12	n.c.

push-pull version **24K** without CHx
complementary signals.

assignment connector M12 male

for connection reference **-N**

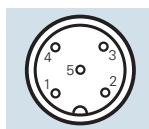


view on
encoder

05A (5 VDC complementary)

pin number	cable color*	signals
1	white	0 V
2	brown	+Vs
3	green	CHA
4	yellow	CHB
5	grey	CHN compl.
6	pink	CHN
7	blue	CHB compl.
8	red	CHA compl.

for connection reference **-N**



view on
encoder

24K (10 - 30 VDC push-pull,
short-circuit prot.)

pin number	cable color*	signals
1	brown	+Vs
2	white	0 V
3	blue	CHA
4	black	CHB
5	grey	CHN

*Note

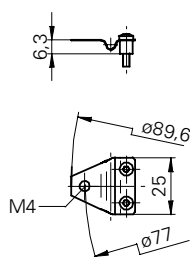
These cable colors are valid for the pre-assembled cable
socket (see accessories).

BRIH	58S16					
						connection
						5 cable 2 m radial
						A connector radial M23
						N connector radial M12
						shaft
						B2 end shaft 12 mm IP 42 with clamping ring
						P2 end shaft 12 mm IP 65 with clamping ring
						standard pulse range
						64 1024
						360 1800
						512 2000
						1000 2048
						other pulses on request
						voltage range, output signals
						05A 5 VDC complementary
						24K 10 - 30 VDC push-pull, short-circuit protection
						encoder type
						H end shaft encoder

[illegible]

Other versions on request.

spring plate set (order separately)



part nr. 154742

accessories

connector M23 female reference -A for 05A as well as 24K	part nr. 107687
connector M12 female reference -N for complementary 05A for push-pull 24K	part nr. 146775 part nr. 153968
cable with connector M23 female (pre-assembled) ref. -A for 05A as well as 24K	2 m part nr. 130367 5 m part nr. 118532
cable with connector M12 female (pre-assembled) ref. -N for complementary 05A	2 m part nr. 127844 5 m part nr. 129332
for push-pull 24K	2 m part nr. 144720 5 m part nr. 137485
torque spring ¹⁾	part nr. 109520
torque pin	part nr. 107540
spring plate set (order separately)	part nr. 154742

¹⁾ encoder is delivered with fixed rubber torque spring

Incremental hollow shaft encoders BHT

features

- integrated flex mounting coupling for simple add-on installation
- mounting by end shaft fixture (cylindrical screw) or clamping element
- high resolution



general data

voltage supply	5 VDC $\pm 10\%$ (05A) 10 - 30 VDC (24K)
max. supply current no load	typ. 80 mA (at 5 VDC) (05A) typ. 60 mA (at 24 VDC) (24K)
max. measuring steps	40'000 steps at 10'000 ppr
pulse range	see order designation
pulse tolerance	$\pm 10\%$
max. switching frequency	200 kHz (24K) 300 kHz (05A) 750 kHz (05A > 5000 ppr)

mechanical data

max. revolutions	6'000 rpm
moment of inertia	typ. $13,7 \times 10^{-7} \text{ kgm}^2$
torque	typ. 3,7 cNm (3000 rpm / 20 °C)
product life	depending on ambient conditions (typ. 10^9 revolutions)
max. protection class	IP 65
material	housing: aluminum flange: aluminum
weight	approx. 300 g
max. play compensation	axial $\pm 0,5 \text{ mm}$ radial dynamic $\pm 0,1 \text{ mm}$ angular dynamic $\pm 1^\circ$

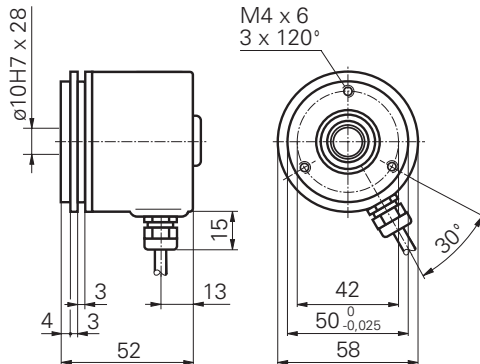
ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 10 - 200 Hz)
shock	IEC 60068-2-27 ($\leq 500 \text{ m/s}^2$ / 11 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3

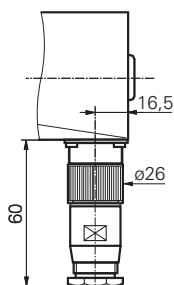
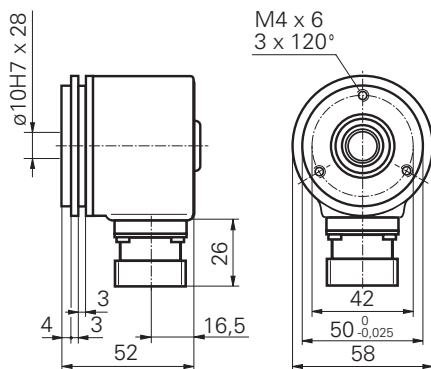


dimensions and connection dimensions

-5



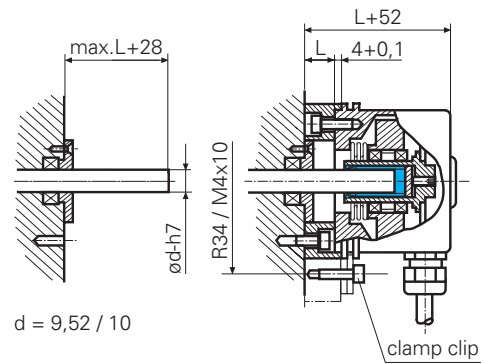
-A



mounting

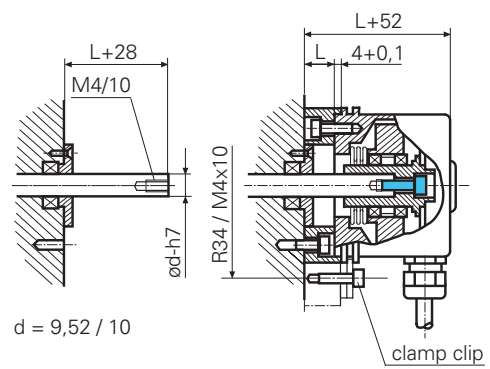
T0 with clamping element

T1



L0 with cylindrical screw

L1



Incremental hollow shaft encoders BHT

assignment cable

for connection reference **-5**

05A (5 VDC complementary)

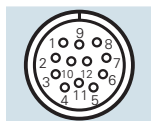
cable color	signals
brown	+Vs
green	CHA
red	CHA compl.
yellow	CHB
blue	CHB compl.
pink	CHN
grey	CHN compl.
white	0V
screen	connected to connector housing
cable data	8 x 0,14 mm ² , max. ext. ø 5,7 mm

24K (10 - 30 VDC complementary, short-circuit protection)

cable color	signals
brown	+Vs
green	CHA
yellow	CHB
pink	CHN
white	0V
screen	connected to connector housing
cable data	5 x 0,14 mm ² , max. ext. ø 5,4 mm

assignment connector M23 male

for connection reference **-A**



05A (5 VDC complementary)

24K (10 - 30 VDC complementary, short-circuit protection)

pin number	signals
1	CHA compl.
2	+Vs
3	CHN
4	CHN compl.
5	CHB
6	CHB compl.
7	n.c.
8	CHA
9	housing
10	0 V
11	0 V
12	+Vs

push-pull version **24K** without CHx complementary signals



order designation

BHT 16.

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connection

5 cable 2 m radial
A connector radial M23

shaft

L1 hollow shaft 9,52 mm IP 65
with cylindrical screw

L0 hollow shaft 10 mm IP 65
with cylindrical screw

T1 hollow shaft 9,52 mm IP 65
with clamping element

T0 hollow shaft 10 mm IP 65
with clamping element

standard pulse range

500	2048	7200¹⁾
1000	2500	8192¹⁾
1024	3600	10000¹⁾
1250	4096	
2000	5000	

other pulses on request

voltage range, output signals

05A 5 VDC complementary

24K 10 - 30 VDC push-pull, short-circuit protection

Other versions on request.

accessories

connector M23 female reference **-A**

straight part nr. 107687

cable with connector M23 female (pre-assembled)

2 m part nr. 130367

5 m part nr. 118532

clamp set part nr. 252773

adjustment key part nr. 114450

allen key part nr. 112431
usage see chapter
accessories

shaft adapter see chapter accessories

Incremental hollow shaft encoders

BHF/BHG

Sine

features

- hollow shaft encoders with sine output
- end shaft mounting (BHF)
- through shaft mounting (BHG)
- various hollow shaft adapters
- small mounting depth

general data

voltage supply	5 VDC ±5%
max. supply current no load	typ. 100 mA
max. measuring steps	200'000 steps with electronic interpolation 10-fold and 4-fold evaluation (see page 4. 18)
pulse range	see order designation
max. switching frequency	160 kHz

mechanical data

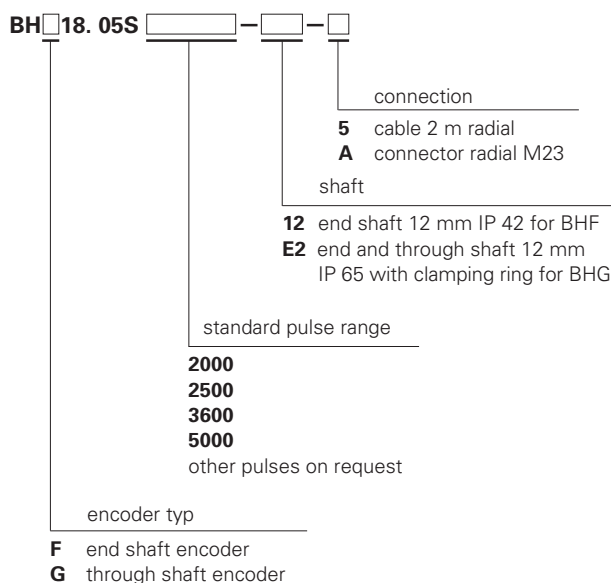
max. revolutions	12'000 rpm (IP 42) 6'000 rpm (IP 65)
moment of inertia	BHF typ. $13,6 \times 10^{-7} \text{ kgm}^2$ BHG typ. $18,5 \times 10^{-7} \text{ kgm}^2$
torque	BHF typ. 0,93 cNm BHG typ. 3,7 cNm (3000 rpm / 20 °C)
product life	depending on ambient conditions (typ. 10^9 revolutions)
max. protection class	IP 65
material	housing: aluminum with connection ref. -5 : steel flange: aluminum
weight	approx. 300 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 10 - 200 Hz)
shock	IEC 60068-2-27 ($\leq 500 \text{ m/s}^2$ / 11 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



order designation

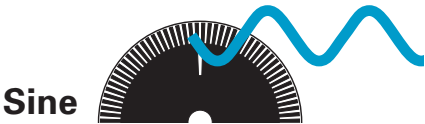


Other versions on request.

accessories

connector M23 female reference -A	
12-pin straight, IP 67	part nr. 116717
cable with connector M23 female (pre-assembled)	
2 m	part nr. 130368
5 m	part nr. 130369
clamp set	part nr. 110616
torque pin	part nr. 107540
torque spring ¹⁾	part nr. 109520
spring plate set	part nr. 136635
couplings	see chapter accessories
clamping ring set	
12 mm hollow shaft	part nr. 142556

¹⁾ encoder is delivered with fixed rubber torque spring



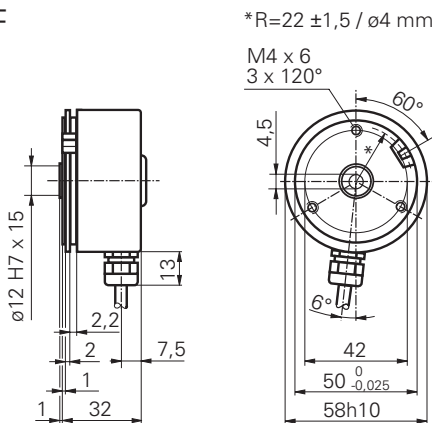
Sine

1

dimensions and connection dimensions

BHF

-5



assignment cable

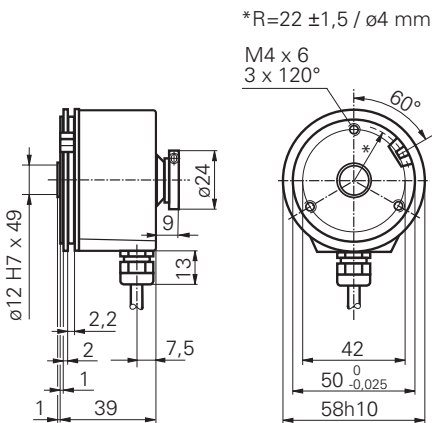
for connection reference -5

05S (5 VDC sine)

cable color	signals
brown	As+
green	As-
red	Ns+
yellow	n.c.
blue	+Vs
pink	Bs-
grey	Bs+
white	0 V
black	Ns-
screen	connected to flange
cable data	9 x 0,14 mm ² , max. ext $\varnothing$ 5,7 mm

BHG

-5



assignment connector M23 male

for connection reference-A

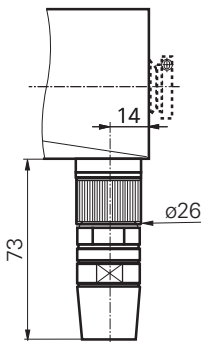
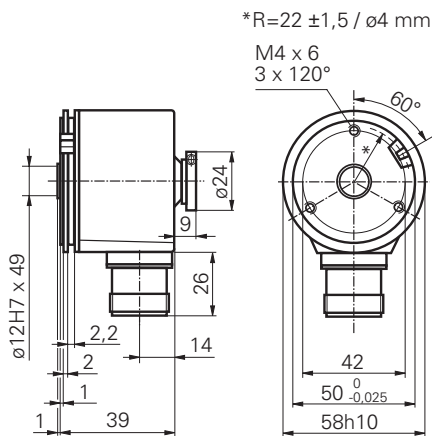


05S (5 VDC sine)

pin number	signals
1	Bs-
2	+Vs
3	Ns+
4	Ns-
5	As+
6	As-
7	n.c.
8	Bs+
9	n.c.
10	0 V
11	0 V
12	+Vs

BHF/BHG

-A



Note

Mounting drawings see end of chapter.

Incremental hollow shaft encoders

BHT

Sine

features

- integrated flex mounting coupling for simple add-on installation
- hollow shaft encoder with sine output
- mounting by end shaft fixture (cylindrical screw) or clamping element



general data

voltage supply	5 VDC $\pm 5\%$
max. supply current no load	typ. 100 mA (at 5 VDC) (05S)
max. measuring steps	200'000 steps with electronic interpolation 10-fold and 4-fold evaluation (see page 4. 18)
pulse range	see order designation
max. switching frequency	160 kHz

mechanical data

max. revolutions	6'000 rpm
moment of inertia	typ. $13,7 \times 10^{-7} \text{ kgm}^2$
torque	typ. 3,7 cNm (3'000 rpm / 20 °C)
product life	depending on ambient conditions (typ. 10^9 revolutions)
max. protection class	IP 65
material	housing: aluminum flange: aluminum
weight	approx. 300 g
max. play compensation	axial dynamic $\pm 0,5 \text{ mm}$ radial dynamic $\pm 0,1 \text{ mm}$ angular dynamic $\pm 1^\circ$

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 10 - 200 Hz)
shock	IEC 60068-2-27 ($\leq 500 \text{ m/s}^2$ / 11 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3

Incremental hollow shaft encoders

BHT

Sine

assignment cable

for connection reference **-5**

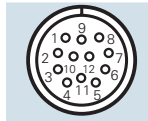
05S (5 VDC sine)

cable color	signals
brown	As+
green	As-
red	Ns+
yellow	n.c.
blue	+Vs
pink	Bs-
grey	Bs+
white	0 V
black	Ns-
screen	connected to flange
cable data	9x0,14 mm ² , max. ext ø 5,7 mm

assignment connector M23 male

for connection reference **-A**

05S (5 VDC sine)



pin number	signals
1	Bs-
2	+Vs
3	Ns+
4	Ns-
5	As+
6	As-
7	n.c.
8	Bs+
9	n.c.
10	0 V
11	0 V
12	+Vs



order designation

BHT 18.05S

connection

5 cable 2 m radial

A connector radial M23

shaft

L1 end shaft 9,52 mm IP 65 with cylindrical screw

L0 end shaft 10 mm IP 65 with cylindrical screw

T1 end shaft 9,52 mm IP 65 with clamping element

T0 end shaft 10 mm IP 65 with clamping element

standard pulse range

2000

2500

3600

5000

other pulses on request

Other versions on request.

accessories

connector M23 female reference -A	
12-pin straight	part nr. 116717
cable with connector M23 female (pre-assembled) ref. -A	
2 m	part nr. 130368
5 m	part nr. 130369
clamp set	part nr. 252773
adjustment key	part nr. 114450
allen key	part nr. 112431
	usage see chapter accessories
shaft adapter and servo clamps	see chapter accessories

Incremental hollow shaft encoder BHW

features

- large hollow shaft encoder up to $\varnothing$ 27 mm
- high resolution up to 36'000 ppr
- small mounting depth



general data

voltage supply	5 VDC $\pm 10\%$ (05A) 10 - 30 VDC (24K)
max. supply current no load	typ. 80 mA (05A) typ. 60 mA (24K)
pulse range	see order designation
max. measuring steps	144'000 steps
max. switching frequency	750 kHz (05A) 200 kHz (05A) >30'000 ppr) 200 kHz (24K)

mechanical data

max. revolutions	12'000 rpm (IP 42) 6'000 rpm (IP 65)
moment of inertia	typ. 4×10^{-5} kgm ²
torque	typ. 0,75 cNm IP 42 typ. 3,0 cNm IP 65 (3'000 rpm / 20 °C)
product life	depending on ambient conditions (typ. 10^9 revolutions)
max. protection class	IP 65
material	housing: aluminum flange: aluminum
weight	approx. 500 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 10 - 200 Hz)
shock	IEC 60068-2-27 ($\leq 500 \text{ m/s}^2$ / 11 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3

order designation

BHW 16.

Diagram showing the terminal block configuration and signal types:

- connection** (pins 1-4)
- 5** cable 2 m radial
- A** connector radial M23
- shaft** (pins 5-8)
- BP** through shaft 27 mm IP 42 with clamping ring
- EP** through shaft 27 mm IP 65 with clamping ring
- standard pulse range** (pins 9-12)
- 1024** **14400**
- 4096** **36000**
- 7200**
- other pulses on request
- voltage range, output signals** (pins 13-16)
- 05A** 5 VDC complementary
- 24K** 10 - 30 VDC push-pull, short-circuit protection

Other versions on request.

accessories

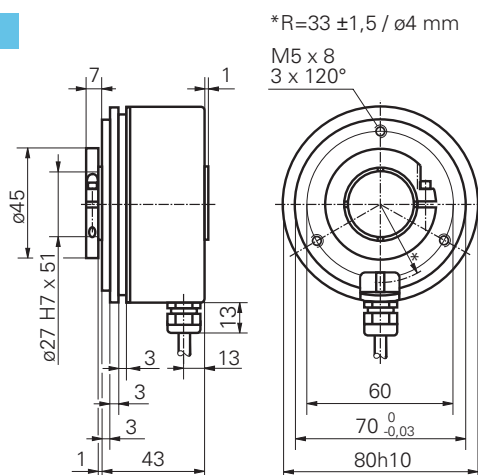
cable with connector M23 female (pre-assembled) ref. -A	
2 m	part nr. 130367
5 m	part nr. 118532
clamp set	part nr. 252773
torque spring ¹⁾	part nr. 109520
torque pin	part nr. 107540
spring plate set	part nr. 130313
connector M23 female for ref. -A	part nr. 107687

¹⁾ encoder is delivered with fixed rubber torque spring

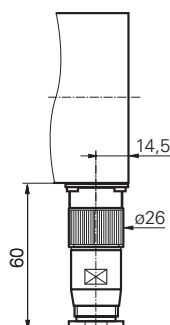
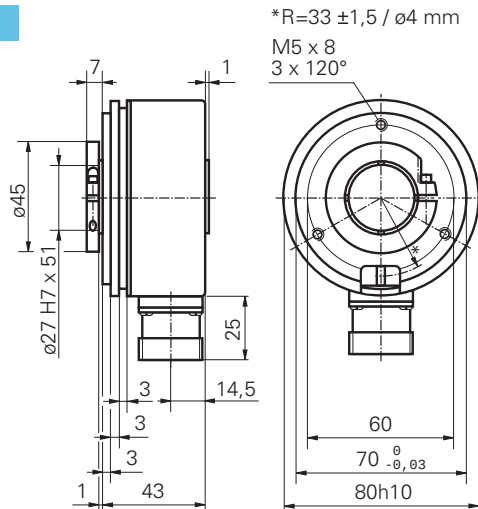


dimensions and connection dimensions

-5



-A



assignment cable

for connection reference **-5**

05A (5 VDC complementary)

cable color	signals
brown	+Vs
green	CHA
red	CHA compl.
yellow	CHB
blue	CHB compl.
pink	CHN
grey	CHN compl.
white	0V
screen	connected to connector housing
cable data	8 x 0,14 mm ² , max. ext. ø 5,7 mm

24K (10 - 30 VDC push-pull, short-circuit protection)

cable color	signals
brown	+Vs
green	CHA
yellow	CHB
pink	CHN
white	0 V
screen	connected to flange
cable data	5 x 0,14 mm ² , max. ext ø 5,4 mm

assignment connector M23 male

for connection reference **-A**



05A (5 VDC complementary)

24K (10 - 30 VDC push-pull, short-circuit pro.)

pin number	signals
1	CHA compl.
2	+Vs
3	CHN
4	CHN compl.
5	CHB
6	CHB compl.
7	n.c.
8	CHA
9	housing
10	0 V
11	0 V
12	+Vs

push-pull version **24K** without CHx complementary signals.

Incremental hollow shaft encoder BTID

features

- large hollow shaft encoder up to $\varnothing$ 30 mm
- small mounting depth

general data

voltage supply	5 VDC $\pm$ 10% (05A) 8 - 30 VDC (25W)
max. supply current no load	typ. 100 mA (at 5 VDC) (05A) typ. 100 mA (at 24 VDC) (25W)
pulse range	see order designation
max. switching frequency	300 kHz (05A) 160 kHz (25W)

mechanical data

max. revolutions	7'000 rpm
torque	$\leq$ 1,5 cNm (at 20 °C)
max. protection class	shaft: IP 54 housing: IP 54
material	housing: aluminum
weight	approx. 580 g

ambient conditions

temperature range	-20...+65 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 ($\leq$ 100 m/s ² / 55 - 2'000 Hz)
shock	IEC 60068-2-27 ($\leq$ 300 m/s ² / 11 ms)



order designation

BTID 30D36 KG .40

connection

5 cable 2 m radial
A connector radial

standard pulse range

1024 2500 4096
2000 3072 5000
2048 3600

other pulses on request

voltage range, output signals

05A 5 VDC complementary
25W 8 - 30 VDC push-pull, complementary,
short-circuit protection

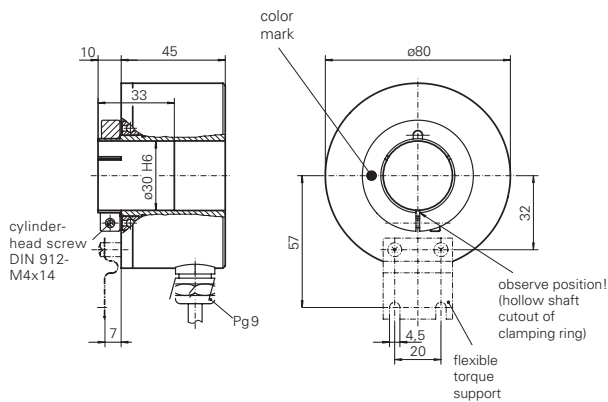
accessories

connector M23 female reference **-A** part nr. 107687
flexible torque arm included in delivery

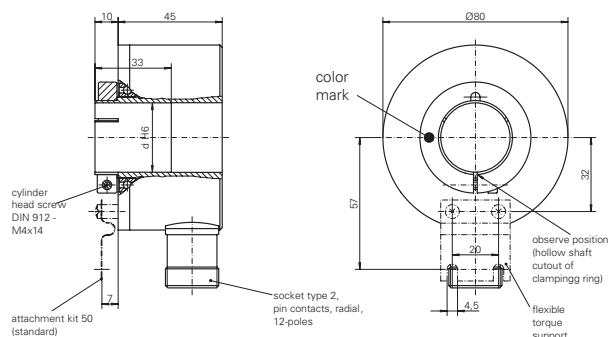


dimensions and connection dimensions

-5



-A



assignment cable

for connection reference **-5**

05A (5 VDC complementary)

25W (8 - 30 VDC push-pull, complementary, short-circuit protection)

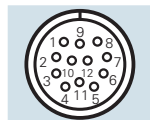
cable color	signals
brown (0,5 mm ²)	+Vs
brown	CHA
green	CHA inv.
grey	CHB
pink	CHB inv.
red	CHN
black	CHN inv.
white (0,5 mm ²)	0 V
screen	connected to connector housing
blue	do not use
white	do not use

assignment connector M23 male

for connection reference **-A**

05A (5 VDC complementary)

25W (8 - 30 VDC push-pull, complementary, short-circuit protection)



view on encoder

pin number	signals
1	CHB inv.
2	do not use
3	CHN
4	CHN inv.
5	CHA
6	CHA inv.
7	n.c.
8	CHB
9	n.c.
10	0 V
11	do not use
12	+Vs

Incremental hollow shaft encoder BTID

features

- large hollow shaft encoder up to $\varnothing$ 65 mm
- small mounting depth



general data

voltage supply	5 VDC $\pm 10\%$ (05A) 8 - 30 VDC (25W)
supply current no load	typ. 100 mA (at 5 VDC) (05A) typ. 100 mA (at 24 VDC) (25W)
pulse rate	see order designation
max. switching frequency	120 kHz

mechanical data

max. revolutions	3'000 rpm
max. protection class	shaft: IP 54 housing: IP 54
material	housing: aluminum
weight	approx. 2'900 g

ambient conditions

temperature range	-20...+65 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 55 - 2'000 Hz)
shock	IEC 60068-2-27 ($\leq 1'000 \text{ m/s}^2$ / 11 ms)

order designation

BTID 65D36

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 .41

					.41
					connection
				5	cable 2 m radial
				A	connector radial
					shaft
				KR	through shaft 40 mm with clamp ring, IP 54
				KS	through shaft 45 mm with clamp ring, IP 54
				KT	through shaft 50 mm with clamp ring, IP 54
				KU	through shaft 55 mm with clamp ring, IP 54
				KV	through shaft 60 mm with clamp ring, IP 54
				KW	through shaft 65 mm with clamp ring, IP 54
					standard pulse range
				256	
				1024	
				2500	
				1000	
				2048	
					voltage range, output signals
05A					5 VDC complementary
25W					10 - 30 VDC push-pull, short-circuit protection

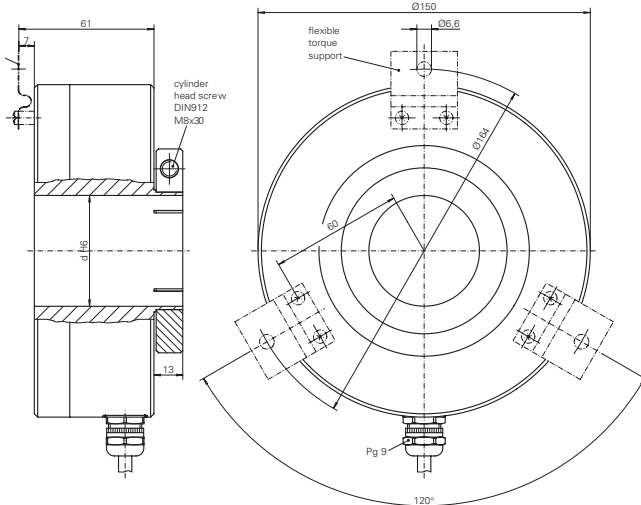
accessories

connector M23 female reference **-A** part nr. 107687
flexible torque arm included in delivery

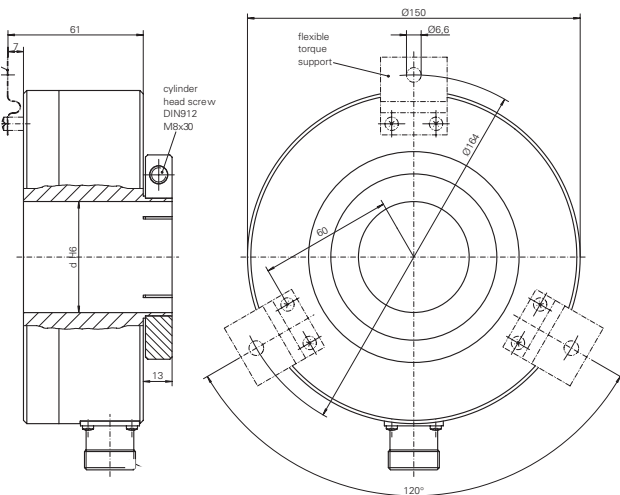


dimensions and connection dimensions

-5



-A



assignment cable

for connection reference **-5**

05A (5 VDC complementary)

25W (8 - 30 VDC push-pull, complementary, short-circuit protection)

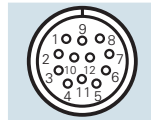
cable color	signals
brown (0,5 mm ²)	+Vs
brown	CHA
green	CHA inv.
grey	CHB
pink	CHB inv.
red	CHN
black	CHN inv.
white (0,5 mm ²)	0 V
screen	connected to connector housing
blue	do not use
white	do not use

assignment connector M23 male

for connection reference **-A**

05A (5 VDC complementary)

25W (8 - 30 VDC push-pull, complementary, short-circuit protection)



view on
encoder

pin number	signals
1	CHB inv.
2	do not use
3	CHN
4	CHN inv.
5	CHA
6	CHA inv.
7	n.c.
8	CHB
9	n.c.
10	0 V
11	do not use
12	+Vs

Incremental hollow shaft encoder BHID

features

- large hollow shaft encoder up to $\varnothing$ 110 mm
- rugged aluminum housing
- small mounting depth

general data

voltage supply	5 VDC $\pm$ 10% (05A) 9 - 26 VDC (25K)
max. supply current no load	typ. 100 mA (at 5 VDC) (05A) typ. 100 mA (at 24 VDC) (25K)
pulse range	see order designation
max. switching frequency	120 kHz

mechanical data

max. revolutions	3'500 rpm
moment of inertia	typ. 102×10^{-4} kgm ²
torque	typ. 50 cNm (at temperature range)
max. protection class	shaft: IP 54 housing: IP 54
material	housing: aluminum
weight	approx. 8'600 g

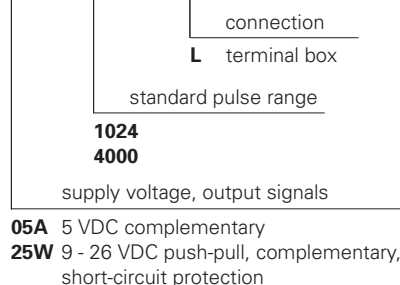
ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 (≤ 100 m/s ² / 55 - 2'000 Hz)
shock	IEC 60068-2-27 ($\leq 2'000$ m/s ² / 16 ms)



order designation

BHID 6ED16 **KK L.20**



accessories

Torque arm is included in delivery.

assignment connector

for connection reference **L**

05A (5 VDC complementary)

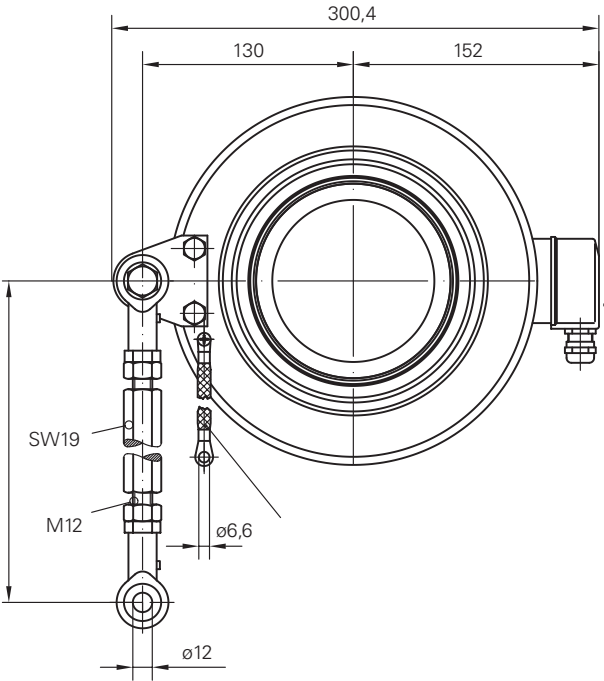
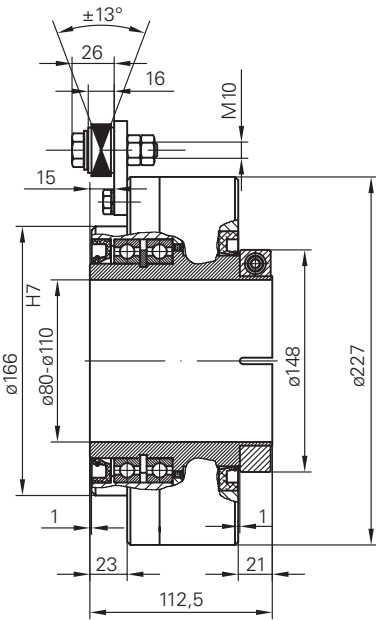
25W (9 - 26 VDC push-pull, complementary, short-circuit protection)

clamps	signals
K1	CHA
K1	CHA inv.
K2	CHB
K2	CHB inv.
K0	CHN
K0	CHN inv.
+	+Vs
-	0 V
screen	screen is connected to housing



dimensions

1



Incremental shaft encoder BTIV

features

- miniature shaft encoder
- high resolution up to 1024 pulses
- housing diameter 24 mm



general data

voltage supply	5 VDC $\pm 5\%$ (05T) 10 - 30 VDC (24K)
max. supply current no load	typ. 25 mA (at 5 VDC) (05T) typ. 25 mA (at 24 VDC) (24K)
pulse range	see order designation
pulse tolerance	$\pm 10\%$ at 30 kHz
max. switching frequency	100 kHz

mechanical data

max. revolutions	18'000 rpm
torque	max. 0,6 cNm (20 °C)
max. shaft load	axial: 5 N radial: 8 N
max. protection class	shaft: IP 54 housing: IP 54
material	housing: aluminum
weight	approx. 50 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 55-2'000 Hz)
shock	IEC 60068-2-27 ($\leq 300 \text{ m/s}^2$ / 11 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3

order designation

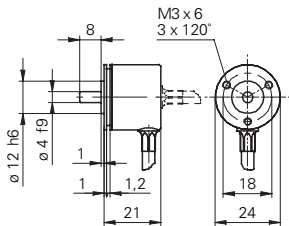
BTIV 24S16				G4	
					connection
					4 cable 1 m axial
					5 cable 1 m radial
					shaft
					G4 shaft 4 mm IP 54
					standard pulse range
					30 300 600
					60 360 1000
					100 500 1024
					voltage range, output signals
					05T 5 VDC TTL
					24K 8 - 30 VDC push-pull, short-circuit protection



dimensions

-4

-5



assignment cable

for connection reference **-4** and **-5**

05T (5 VDC TTL)

24K (10 - 30 VDC push-pull, short-circuit protection)

cable color	signals
brown	+Vs
green	CHA
yellow	CHB
grey	CHN
white	0 V
screen	connected to flange

Magnetic incremental shaft encoder BRIV – EcoMag

features

- miniaturized shaft encoder with wide pulse range
- axial or radial cable connection
- radial connector
- servo flange



general data

voltage supply	5 VDC $\pm 10\%$ (05A) 20 - 28 VDC (17K)
max. supply current no load	typ. 25 mA (at 5 VDC) (05A) typ. 30 mA (at 24 VDC) (17K)
max. measuring steps	4'096 steps
pulse range	see order designation
pulse tolerance	$\pm 15\%$
max. switching frequency	320 kHz

mechanical data

max. revolutions	6'000 rpm
moment of inertia	typ. $0,65 \times 10^{-7} \text{ kgm}^2$
torque	typ. 0,75 cNm (3'000 rpm / 20 °C)
max. shaft load	axial: 10 N radial: 10 N
product life	depending on ambient conditions (typ. 10^9 revolutions)
max. protection class	IP 65
material	housing: polyamide flange: aluminum
weight	approx. 90 g

accessories

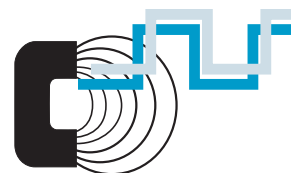
cable with connector M9 female (pre-assembled) ref. -9	
for compl. 05A	2 m part nr. 123168 (ES62FB2)
	5 m part nr. 123169 (ES62FB5)
for push-pull 17K	2 m part nr. 123166 (ES62CB2)
	5 m part nr. 123167 (ES62CB5)
connector M9 female ref. -9	
for complementary 05A	part nr. 132983
for push-pull 17K	part nr. 123144
clamp set	part nr. 106004
couplings	see chapter accessories

order designation

BRIV 30S		6								
						connection				
						4	cable 1 m axial			
						5	cable 1 m radial			
						9	connector radial M9			
						shaft				
						L5 shaft 5mm IP 65				
						standard pulse range				
						2	32	100	256	1000
						4	40	128	400	1024
						8	50	160	500	
						16	64	200	512	
						20	80	250	800	
						voltage range, output signals				
						05A	5 VDC complementary			
						17K	20 - 28 VDC push-pull, short-circuit prot.			
						temperature range, related to voltage supply				
						1	-20...+85 °C (05A)			
						3	-20...+65 °C (17K)			

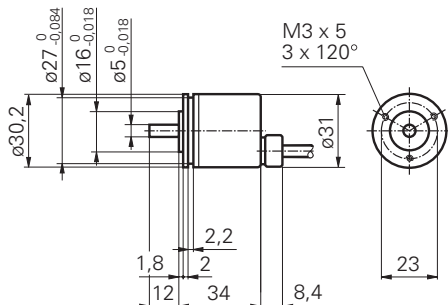
ambient conditions

temperature range	-20...+85 °C (05A) -20...+65 °C (17K)
relative humidity	max. 95%
vibration (sine)	IEC 60068-2-6 ($\leq 300 \text{ m/s}^2 / 10 - 2'000 \text{ Hz}$) 150 min per axis
vibration (random)	IEC 60068-2-64 ($\leq 0,1 \text{ g}^2/\text{Hz} / 20 - 2'000 \text{ Hz}$) 30 min per axis
shock	IEC 60068-2-27 ($\leq 1'000 \text{ m/s}^2 / 6 \text{ ms}$) 10 pulses per axis and direction
bump	IEC 60068-2-29 ($\leq 1'000 \text{ m/s}^2 / 2 \text{ ms}$) 4'000 pulses per axis and direction
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3

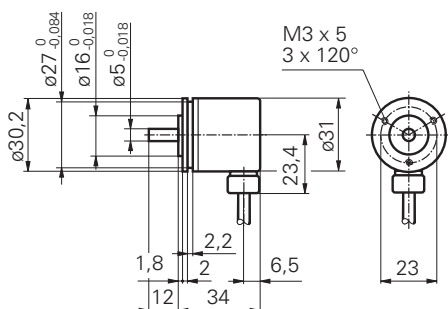


dimensions and connection dimensions

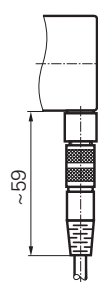
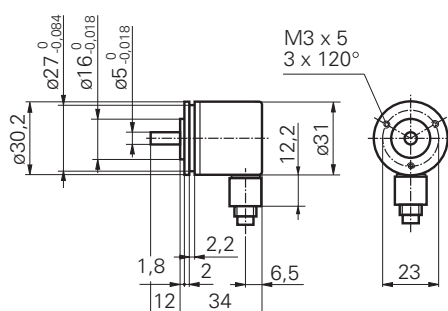
-4



-5



-9



assignment cable

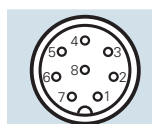
for connection reference **-4** and **-5**
05A (5 VDC complementary)

cable color	signals
brown	+Vs
green	CHA
red	CHA compl.
yellow	CHB
blue	CHB compl.
pink	CHN
grey	CHN compl.
white	0 V
screen	connected to flange
cable data	8x0,14 mm ² , max. ext. ø 5,7 mm

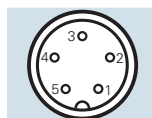
17K (20 - 28 VDC push-pull, short-circuit protection)

cable color	signals
brown	+Vs
green	CHA
yellow	CHB
pink	CHN
white	0 V
screen	connected to flange
cable data	5x0,14 mm ² , max. ext. ø 5,4 mm

assignment connector M9 male

for connection reference **-9**

05A (5 VDC complementary)

pin number	signals
1	0 V
2	+Vs
3	CHA
4	CHB
5	CHN compl.
6	CHN
7	CHB compl.
8	CHA compl.


17K (20 - 28 VDC push-pull, short-circuit protection)

pin number	signals
1	0 V
2	+Vs
3	CHA
4	CHB
5	CHN

Incremental shaft encoder BDK

features

- miniature shaft encoder with extended pulse range
- axial or radial cable connection or radial connector
- servo flange



general data

voltage supply	5 VDC $\pm 10\%$ (05A) 10 - 30 VDC (24K)
max. supply current no load	typ. 60 mA (at 5 VDC) (05A) typ. 30 mA (at 24 VDC) (24K)
max. measuring steps	8'192 steps
pulse range	see order designation
pulse tolerance	$\pm 15\%$
max. switching frequency	50 kHz (≤ 500 ppr) 100 kHz (> 500 ppr)

mechanical data

max. revolutions	12'000 rpm (IP 42) 6'000 rpm (IP 65)
moment of inertia	typ. $0,65 \times 10^{-7} \text{ kgm}^2$
torque	typ. 0,14 cNm IP 42 typ. 0,75 cNm IP 65 (3'000 rpm / 20 °C)
max. shaft load	axial: 10 N radial: 10 N
product life	depending on ambient conditions (typ. 10^9 rev)
max. protection class	IP 65
material	housing: polyamid flange: aluminum
weight	approx. 85 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 10 - 200 Hz)
shock	IEC 60068-2-27 ($\leq 500 \text{ m/s}^2$ / 11 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3

order designation

BDK 16 .

connection

- 4** cable 1 m axial
- 5** cable 1 m radial
- 9** connector radial M9

shaft

- L5** shaft 5 mm IP 65
- 5** shaft 5 mm IP 42

standard pulse range

10	100	500
20	120	1000
30	200	1024
50	250	2000
60	360	2048

other pulses on request

voltage range, output signals

- 05A** 5 VDC complementary
- 24K** 10 - 30 VDC push-pull, short-circuit protection

Other versions on request

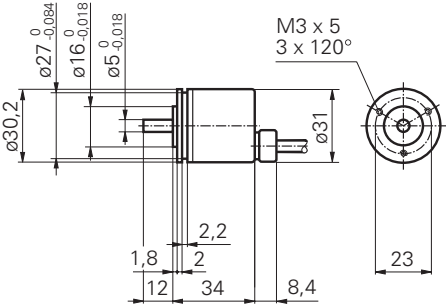
accessories

connector M9 female (pre-assembled) ref. -9	
for complementary 05A	2 m part nr. 123168 (ES62FB2)
	5 m part nr. 123169 (ES62FB5)
for push-pull 24K	2 m part nr. 123166 (ES62CB2)
	5 m part nr. 123167 (ES62CB5)
connector M9 female ref. -9	
for complementary 05A	part nr. 132983
for push-pull 24K	part nr. 123144
mounting clamps	part nr. 106004
couplings	see chapter accessories

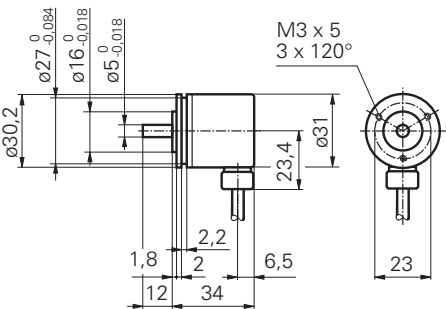


dimensions and connection dimensions

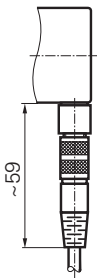
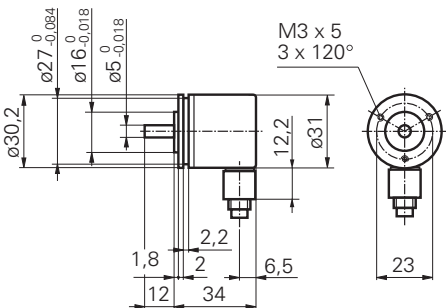
-4



-5



-9



assignment cable

for connection reference **-4** and **-5**

05A (5 VDC complementary)

cable color	signals
brown	+Vs
green	CHA
red	CHA compl.
yellow	CHB
blue	CHB compl.
pink	CHN
grey	CHN compl.
white	0V
screen	connected to flange
cable data	8 x 0,14 mm ² , max. ext. ø 5,7 mm

24K (10 - 30 VDC push-pull, short-circuit protection)

cable color	signals
brown	+Vs
green	CHA
yellow	CHB
pink	CHN
white	0V
screen	connected to flange
cable data	5 x 0,14 mm ² , max. ext. ø 5,4 mm

assignment connector M9 male

for connection reference **-9**



05A (5 VDC complementary)

pin number	signals
1	0V
2	+Vs
3	CHA
4	CHB
5	CHN compl.
6	CHN
7	CHB compl.
8	CHA compl.



24K (10 - 30 VDC push-pull, short-circuit protection)

pin number	signals
1	0V
2	+Vs
3	CHA
4	CHB
5	CHN

Please note the mounting instructions.

Incremental shaft encoder

BDH

features

- industry standard
- small mounting depth
- high protection class
- clamp flange



general data

voltage supply	5 VDC $\pm 10\%$ (05A) 10 - 30 VDC (24K) 4,5 - 30 VDC (25W)
max. supply current no load	typ. 80 mA (at 5 VDC) (05A) typ. 60 mA (at 24 VDC) (24K) typ. 180 mA (at 4,5 VDC) (25W)
max. measuring steps	20'000 steps
pulse range	see order designation
pulse tolerance	$\pm 10\%$ ($\leq 5'000$ pulses) $\pm 15\%$ ($> 5'000$ pulses)
max. switching frequency	200 kHz (24K) 300 kHz (05A/25W)

mechanical data

max. revolutions	12'000 rpm (IP 42) 6'000 rpm (IP 65)
moment of inertia	typ. $17,5 \times 10^{-7}$ kgm ²
torque	typ. 2,2 cNm IP 42 typ. 2,6 cNm IP 65 (3'000 rpm / 20 °C)
max. shaft load	axial: 40 N radial: 60 N
product life	depending on ambient conditions (typ. 10^9 rev)
max. protection class	IP 65
material	housing: steel housing: aluminum with connection -A flange: aluminum
weight	approx. 300 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 10 - 200 Hz)
shock	IEC 60068-2-27 ($\leq 500 \text{ m/s}^2$ / 11 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3

order designation

BDH 16.

connection

4 cable 2 m axial
5 cable 2 m radial
A connector radial M23
B connector axial M23

shaft

L0 shaft 10 mm IP 65
10 shaft 10 mm IP 42

standard pulse range

10	100	360	2000
20	120	400	2500
30	200	500	3600
50	250	1000	4096
60	300	1024	5000

other pulses on request

voltage range, output range

05A	5 VDC complementary
24K	10 - 30 VDC push-pull, short-circuit pro.
25W	4,5 - 30 VDC complementary, push-pull, short-circuit protection

Other versions on request.

accessories

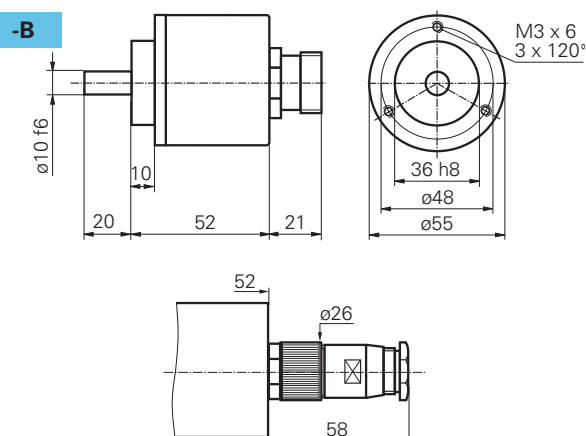
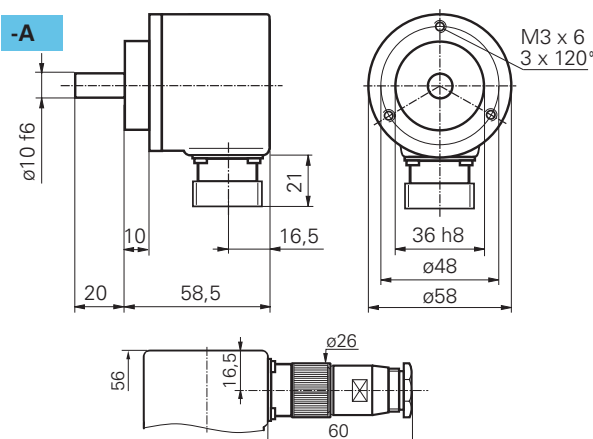
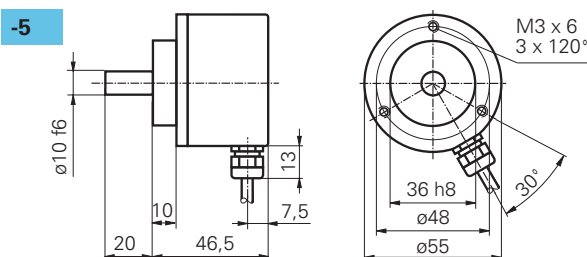
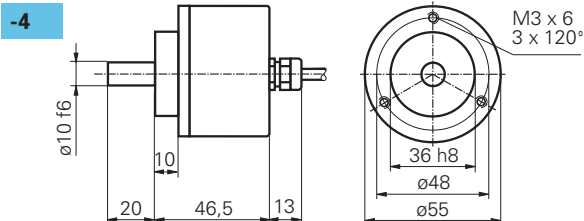
connector M23 female reference **-A** and **-B**
for complementary **05A/25W** part nr. 107687
and push-pull **24K**

cable with connector M23 female (pre-assembled)
reference **-A** and **-B**

2 m	part nr. 130367
5 m	part nr. 118532
couplings	see chapter accessories



dimensions and connection dimensions



assignment cable

for connection reference **-4** and **-5**

05A (5 VDC complementary)

cable color	signals
brown	+Vs
green	CHA
red	CHA compl.
yellow	CHB
blue	CHB compl.
pink	CHN
grey	CHN compl.
white	0V
screen	connected to flange
cable data	8 x 0,14 mm ² , max. ext. ø 5,7 mm

24K (10 - 30 VDC push-pull, short-circuit protection)

cable color	signals
brown	+Vs
green	CHA
yellow	CHB
pink	CHN
white	0V
screen	connected to flange
cable data	5 x 0,14 mm ² , max. ext. ø 5,4 mm

assignment connector M23 male

for connection reference **-A** and **-B**

05A (5 VDC complementary)

24K (10 - 30 VDC push-pull, short-circuit protection)

25W 4,5 - 30 VDC push-pull, complementary, short-circuit protection)



pin number	signals
1	CHA compl.
2	+Vs
3	CHN
4	CHN compl.
5	CHB
6	CHB compl.
7	n.c.
8	CHA
9	housing
10	0 V
11	0 V
12	+Vs

push-pull version **24K** without CHx complementary signals

Magnetic Incremental shaft encoder

BRIV – EcoMag

features

- robust against shock and vibration
- high switching frequency
- clamping flange BRIV 58K
- servo flange BRIV 58S

general data

voltage supply	5 VDC $\pm 10\%$ (05A) 10 - 30 VDC (24K)
max. supply current no load	typ. 30 mA (at 5 VDC) (05A) typ. 15 mA (at 24 VDC) (24K)
max. measuring steps	8'192 steps
pulse range	see order designation
pulse tolerance	$\pm 15\%$
max. switching frequency	320 kHz

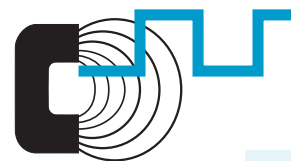


mechanical data

max. revolutions	12'000 rpm (IP 42) 6'000 rpm (IP 65)
torque	typ. 1,75 cNm IP 42 typ. 4,7 cNm IP 65 (3'000 rpm / 20 °C)
max. shaft load	
58K	axial: 40 N radial: 60 N
58S	axial: 40 N radial: 50 N
product life	depending on ambient conditions (typ. 10 ⁹ revolutions)
max. protection class	IP 65
material	housing: aluminum flange: aluminum
weight	approx. 150 g

ambient conditions

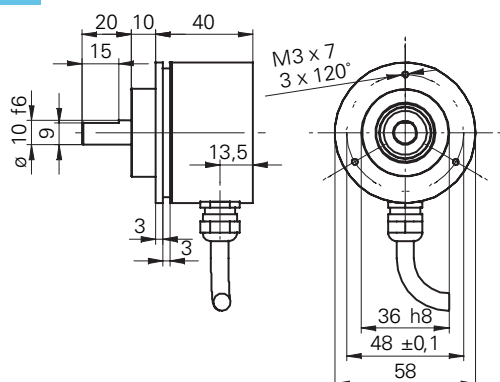
temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration (sine)	IEC 60068-2-6 ($\leq 300 \text{ m/s}^2$ / 10 - 2'000 Hz) 150 min per axis
vibration (random)	IEC 60068-2-64 ($\leq 0,1 \text{ g}^2/\text{Hz}$ / 20 - 2'000 Hz) 30 min per axis
shock	IEC 60068-2-27 ($\leq 1'000 \text{ m/s}^2$ / 6 ms) 10 pulses per axis and direction
bump	IEC 60068-2-29 ($\leq 1'000 \text{ m/s}^2$ / 2 ms) 4'000 pulses per axis and direction
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



dimensions and connection dimensions

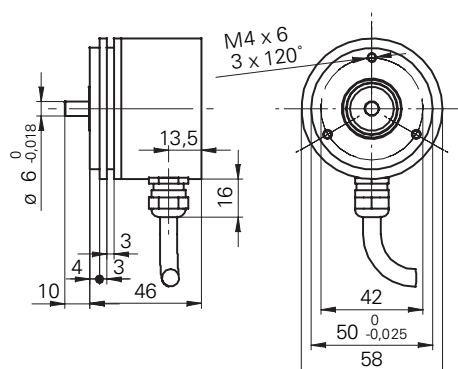
58K

-5

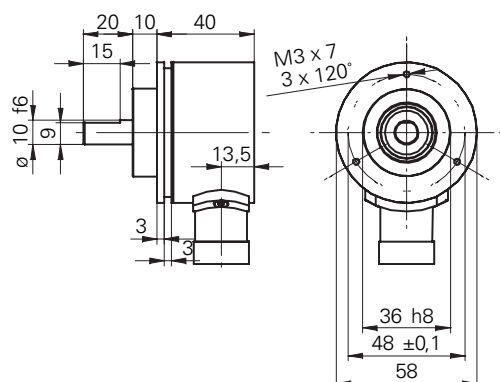


58S

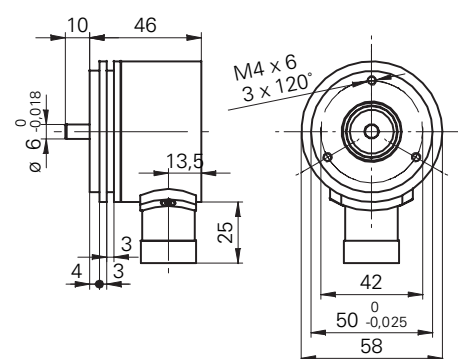
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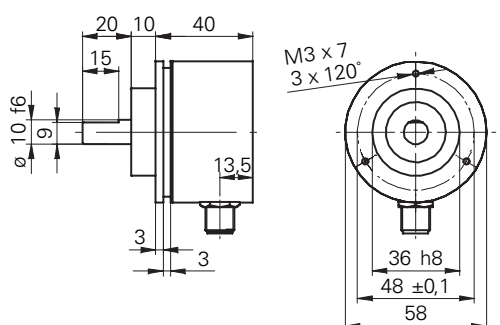
-A



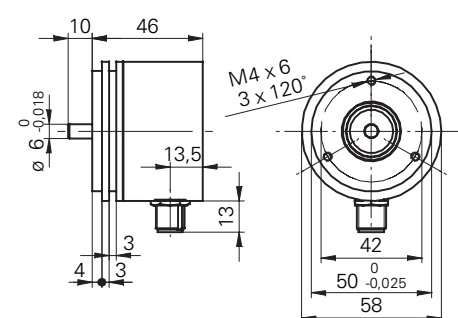
-A



-N



-N



Magnetic Incremental shaft encoder

BRIV – EcoMag

assignment cable

for connection reference **-5**

05A (5 VDC complementary)

cable color	signals
brown	+Vs
green	CHA
red	CHA compl.
yellow	CHB
blue	CHB compl.
pink	CHN
grey	CHN compl.
white	0 V
screen	connected to connector housing
cable data	8 x 0,14 mm ² , max. ext. ø 5,7 mm

24K (10 - 30 VDC push-pull, short-circuit protection)

cable color	signals
brown	+Vs
green	CHA
yellow	CHB
pink	CHN
white	0 V
screen	connected to flange
cable data	5 x 0,14 mm ² , max. ext. ø 5,4 mm

assignment connector M23 male

for connection reference **-A**



view on
encoder

05A (5 VDC complementary)

24K (10 - 30 VDC push-pull, short-circuit protection)

pin number	signals
1	CHA compl.
2	+Vs
3	CHN
4	CHN compl.
5	CHB
6	CHB compl.
7	n.c.
8	CHA
9	housing
10	0 V
11	n.c.
12	n.c.

push-pull version **24K** without CHx
complementary signals.

assignment connector M12 male

for connection reference **-N**



view on
encoder

05A (5 VDC complementary)

pin number	cable color*	signals
1	white	0 V
2	brown	+Vs
3	green	CHA
4	yellow	CHB
5	grey	CHN compl.
6	pink	CHN
7	blue	CHB compl.
8	red	CHA compl.

for connection reference **-N**



view on
encoder

24K (10 - 30 VDC push-pull, short-circuit protection)

pin number	cable color*	signals
1	brown	+Vs
2	white	0 V
3	blue	CHA
4	black	CHB
5	grey	CHN

*Note

These cable colors are valid for the pre-assembled cable
socket (see accessories).

Incremental shaft encoder BDT

features

- small mounting depth
- radial and axial connector or cable connection
- servo flange



general data

voltage supply	5 VDC $\pm 10\%$ (05A) 10 - 30 VDC (24K) 4,5 - 30 VDC (25W)
max. supply current no load	typ. 80 mA (at 5 VDC) (05A) typ. 60 mA (at 24 VDC) (24K) typ. 180 mA (at 4,5 VDC) (25W)
max. measuring steps	40'000 steps at 10'000 ppr (05A/24K)
pulse range	see order designation
pulse tolerance	$\pm 10\%$ ($\leq 5'000$ pulses) $\pm 15\%$ ($> 5'000$ pulses)
max. switching frequency	200 kHz (24K) 300 kHz (05A/25W) 750 kHz (05A > 5000 pulses)

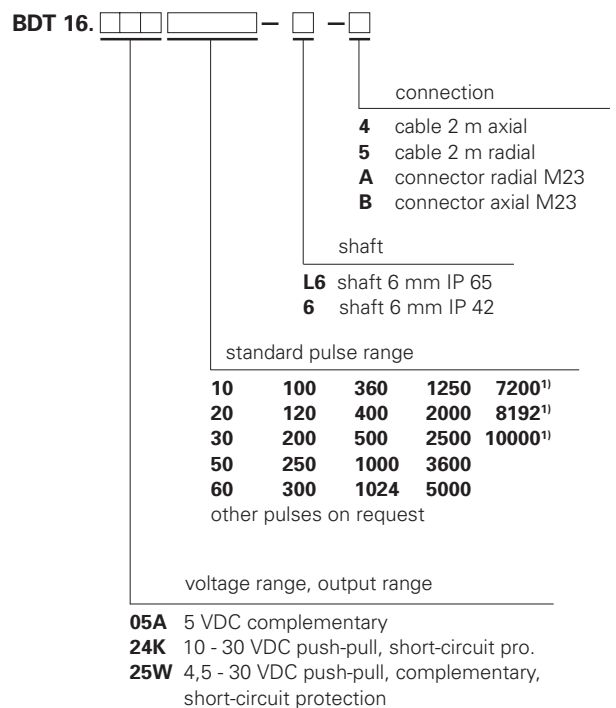
mechanical data

max. revolutions	12'000 rpm (IP 42) 6'000 rpm (IP 65)
moment of inertia	typ. $11,8 \times 10^{-7} \text{ kgm}^2$
torque	typ. 0,23 cNm IP 42 typ. 2,6 cNm IP 65 (3'000 rpm / 20 °C)
max. shaft load	axial: 10 N radial: 20 N
product life	depending on ambient conditions (typ. 10^9 rev)
max. protection class	IP 65
material	housing: steel housing: aluminum with ref. -A flange: aluminum
weight	approx. 300 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	IEC 68 section 2-6 ($\leq 100 \text{ m/s}^2$ / 10 - 200 Hz)
shock	IEC 68 section 2-27 ($\leq 500 \text{ m/s}^2$ / 11 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3

order designation



¹⁾ only for **05A + 24K**

Other versions on request.

accessories

connector M23 female reference **-A** and **-B**
for complementary **05A/25W** part nr. 107687
and push-pull **24K**

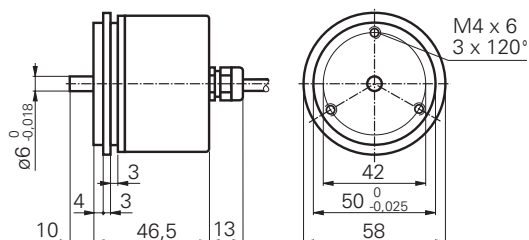
cable with connector M23 female (pre-assembled)
reference **-A** and **-B**

2 m	part nr. 130367
5 m	part nr. 118532
clamp set	part nr. 252773
mounting adapter	part nr. 125051
fixing screws and servo clamps	part nr. 117668
couplings	see chapter accessories

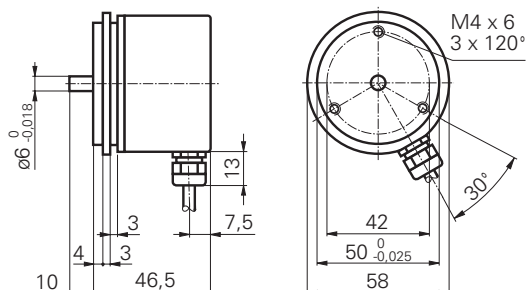


dimensions and connection dimensions

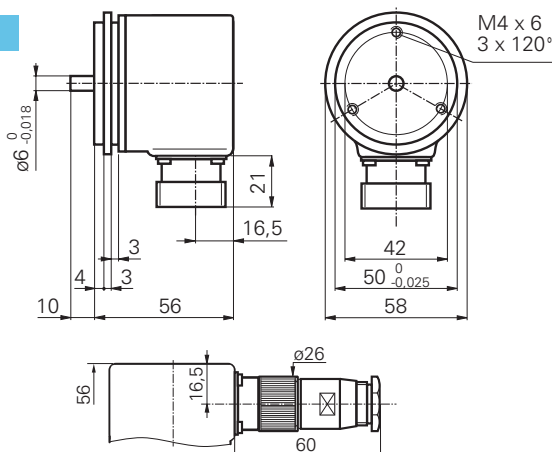
-4



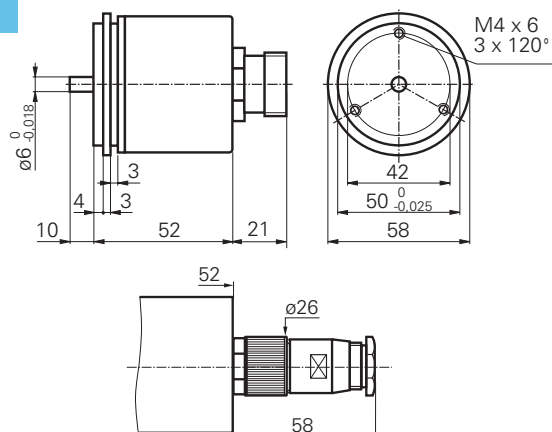
-5



-A



-B



assignment cable

for connection reference **-4** and **-5****05A** (5 VDC complementary)

cable color	signals
brown	+Vs
green	CHA
red	CHA compl.
yellow	CHB
blue	CHB compl.
pink	CHN
grey	CHN compl.
white	0V
screen	connected to flange
cable data	8 x 0,14 mm ² , max. ext. ø 5,7 mm

24K (10 - 30 VDC push-pull, short-circuit protection)

cable color	signals
brown	+Vs
green	CHA
yellow	CHB
pink	CHN
white	0V
screen	connected to flange
cable data	5 x 0,14 mm ² , max. ext. ø 5,4 mm

assignment connector M23 male

for connection reference **-A** and **-B****05A** (5 VDC complementary)**24K** (10 - 30 VDC push-pull, short-circuit protection)**25W** (4,5 - 30 VDC push-pull, complementary, short-circuit protection)

pin number	signals
1	CHA compl.
2	+Vs
3	CHN
4	CHN compl.
5	CHB
6	CHB compl.
7	n.c.
8	CHA
9	housing
10	0 V
11	0 V
12	+Vs

push-pull version **24K** without CHx complementary signals

Incremental shaft encoder

BDT

Sine

features

- small mounting depth
- radial and axial connector or cable connection
- servo flange

general data

voltage supply	5 VDC $\pm 5\%$
max. supply current no load	typ. 100 mA (at 5 VDC)
max. measuring steps	200'000 steps with electronic interpolation 10-fold and 4-fold evaluation (see page 4. 18)
pulse range	see order designation
max. switching frequency	160 kHz

mechanical data

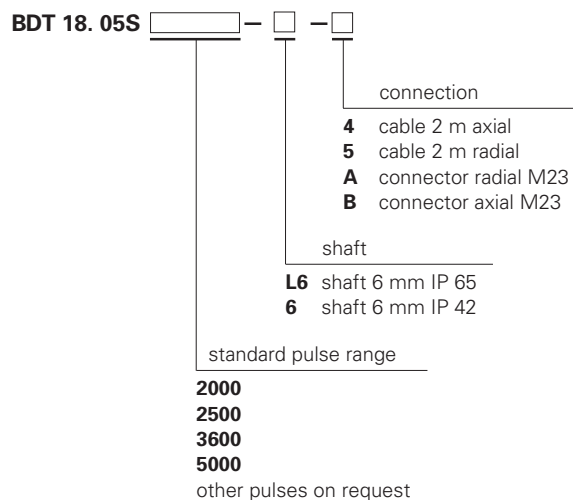
max. revolutions	12'000 rpm (IP 42) 6'000 rpm (IP 65)
rotor inertia	typ. $11,8 \times 10^{-7} \text{ kgm}^2$
torque	typ. 0,23 cNm IP 42 typ. 2,6 cNm IP 65 (3'000 rpm / 20 °C)
max. shaft load	axial: 10 N radial: 20 N
product life	depending on ambient conditions (typ. 10^9 rev)
max. protection class	IP 65
material	housing: steel, housing: aluminum with connection -A , flange: aluminium
weight	approx. 300 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 10 - 200 Hz)
shock	IEC 60068-2-27 ($\leq 500 \text{ m/s}^2$ / 11 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



order designation



Other versions on request.

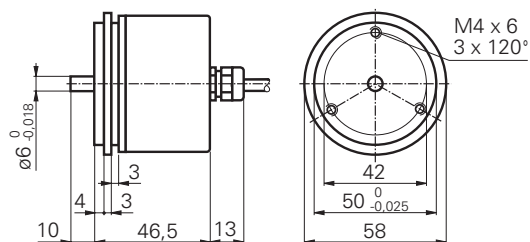
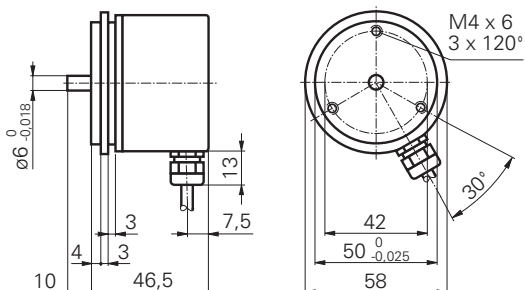
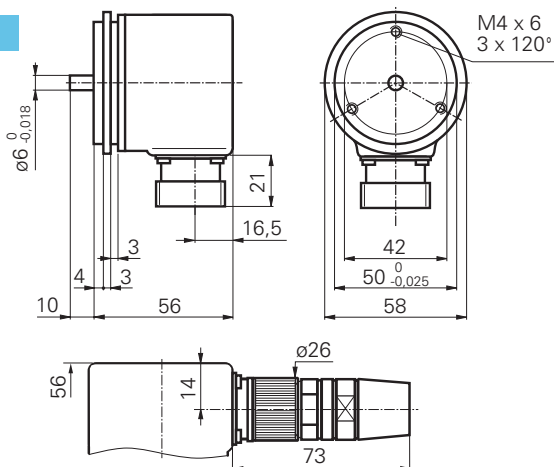
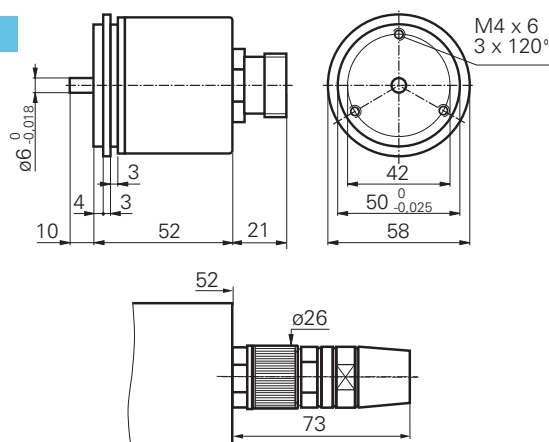
accessories

connector M23 female reference -A and -B	
12-pin straight	part nr. 116717
cable with connector M23 female (pre-assembled) reference -A and -B	
2 m	part nr. 130368
5 m	part nr. 130369
clamp set	part nr. 252773
mounting adapter	part nr. 125051
fixing screws and servo clamps	part nr. 117668
couplings	see chapter accessories

Sine



dimensions and connection dimensions

-4**-5****-A****-B**

assignment cable

for connection reference **-4** and **-5****05S** (5 VDC Sine)

cable color	signals
brown	As+
green	As-
red	Ns+
black	Ns-
yellow	n.c.
blue	+Vs
pink	Bs-
grey	Bs+
white	0 V
screen	connected to flange
cable data	9 x 0,14 mm ² , max. ext. ø 5,7 mm

assignment connector M23 male

for connection reference **-A** and **-B****05S** (5 VDC Sine)

pin number	signals
1	Bs-
2	+Vs
3	Ns+
4	Ns-
5	As+
6	As-
7	n.c.
8	Bs+
9	n.c.
10	0 V
11	0 V
12	+Vs

Incremental shaft encoders

BDM/BDW

features

- square mounting flange
- industry standard 3/8" shaft
- aluminum die-cast housing
- radial and axial connector base or cable connection



BDM



BDW

general data

voltage supply	5 VDC $\pm 10\%$ (05A) 10 - 30 VDC (24K)
max. supply current	60 mA (at 5 VDC)
no load	60 mA (at 24 VDC)
pulse range	see order designation
pulse tolerance	$\pm 10\%$
max. switching frequency	200 kHz (24K) 300 kHz (05A)

mechanical data

max. revolutions	6'000 rpm
moment of inertia	typ. $17,5 \times 10^{-7} \text{ kgm}^2$
torque	typ. 4 cNm (3'000 rpm / 20 °C)
max. shaft load	axial: 50 N radial: 100 N
product life	depending on ambient conditions (typ. 10^9 revolutions)
max. protection class	shaft: IP 65 housing: IP 67
material	housing: aluminum flange: aluminum
weight	BDM approx. 400 g BDW approx. 300 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 10 - 200 Hz)
shock	IEC 60068-2-27 ($\leq 500 \text{ m/s}^2$ / 11 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3

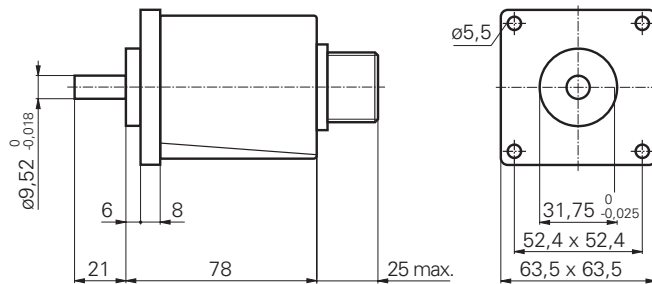


dimensions and connection dimensions

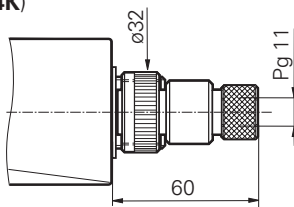
1

BDM

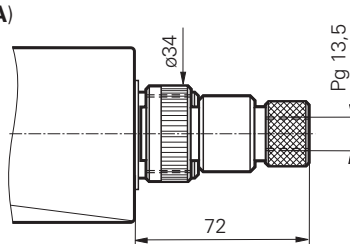
-8



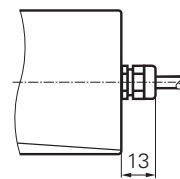
-8 (24K)



-8 (05A)

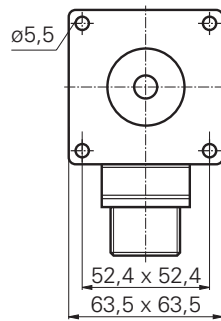
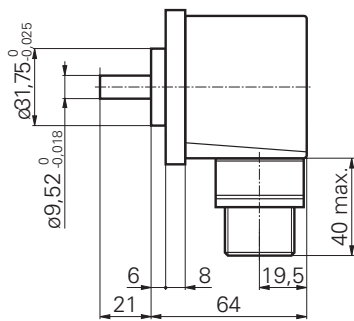


-4

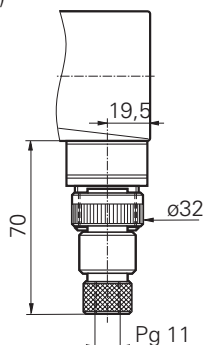


BDW

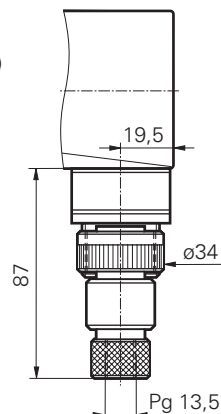
-7



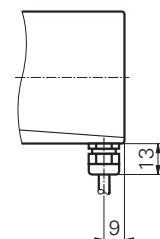
-7 (24K)



-7 (05A)



-5



Incremental shaft encoders

BDM/BDW

assignment cable	
for connection reference -4 and -5	
05A (5 VDC complementary)	
cable color	signals
brown	+Vs
green	CHA
red	CHA compl.
yellow	CHB
blue	CHB compl.
pink	CHN
grey	CHN compl.
white	0V
screen	connected to connector housing
cable	8 x 0,14 mm², max. ext. ø 5,7 mm

24K (10 - 30 VDC push-pull, short-circuit protection)	
cable color	signals
brown	+Vs
green	CHA
yellow	CHB
pink	CHN
white	0V
screen	connected to connector housing
cable	5 x 0,14 mm², max. ext. ø 5,4 mm

assignment connector M23 male	
for connection reference -7 and -8	
05A (5 VDC complementary)	
pin number	signals
A	CHA
B	CHB
C	CHN
D	+Vs
E	+Vs
F	0 V
G	CHA compl.
H	CHB compl.
I	CHN compl.
J	housing

24K (10 - 30 VDC push-pull, short-circuit protection)	
pin number	signals
A	CHA
B	CHB
C	CHN
D	+Vs
E	+Vs
F	0V
G	housing



order designation BDM

BDM 16.

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connection
4 cable 2 m axial
8 axial connector M23

shaft
C0 shaft 10 mm IP 65
C1 shaft 9,52 mm (3/8") IP 65
C2 shaft 12 mm IP 65

standard pulse range

10	100	360	1250
20	120	400	2000
30	200	500	2500
50	250	1000	3600
60	300	1024	5000

other pulses on request

voltage range, output signals

05A 5 VDC complementary
24K 10 - 30 VDC push-pull, short-circuit protection

order designation BDW

BDW 16.

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connection
5 cable 2 m radial
7 radial connector M23

shaft
C0 shaft 10 mm IP 65
C1 shaft 9,52 mm (3/8") IP 65
C2 shaft 12 mm IP 65

standard pulse range

10	100	360	1250
20	120	400	2000
30	200	500	2500
50	250	1000	3600
60	300	1024	5000

other pulses on request

voltage range, output signals

05A 5 VDC complementary
24K 10 - 30 VDC push-pull, short-circuit protection

Other versions on request.

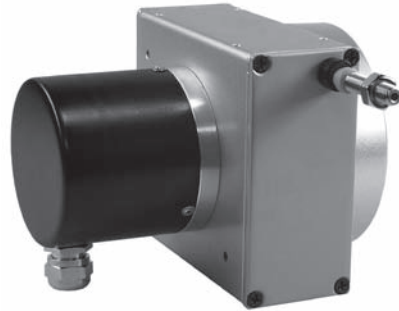
accessories

connector M23 female reference -7 and -8	
for complementary 05A	part nr. 106012
for short-circuit protection 24K	part nr. 106011
couplings	see chapter accessories

Wire actuated incremental encoder BLS

features

- measuring system via rope pulley
- wide measuring range
- high resolution
- simple mounting



general data

voltage supply	5 VDC $\pm 10\%$ (05A) 10 - 30 VDC (24K)
max. supply current no load	typ. 60 mA (at 5 VDC) (05A) typ. 60 mA (at 24 VDC) (24K)
max. rope length	5'000 mm
resolution	0,1 mm 0,025 mm (at 4-fold evalution)
max. switching frequency	100 kHz
precision	1 m $\pm 0,03\%$ 5 m $\pm 0,05\%$

mechanical data

travel speed	max. 2'000 mm/s
pull out force	max. 9 N (don't let the wire snap back)
max. protection class	IP 50 (at all operating modes) IP 52 (wire opening vertically downward)
material	housing: aluminum
weight	approx. 1'000 g
rope	material: nr. 1.4301 DIN: X5 CrNi 1810 breaking load: max. 17 kg diameter: 0,6 mm
lifetime	typ. > 1 mio. cycles (extraction and retraction)

ambient conditions

temperature range	0...+65 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 10 - 200 Hz)
shock	IEC 60068-2-27 ($\leq 500 \text{ m/s}^2$ / 11 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3

order designation

BLS 03.

0	1	2	3	4	5

connection
5 cable 2 m radial

resolution
01 resolution 0,1 mm

measuring range mm
1000
5000
other lengths on request

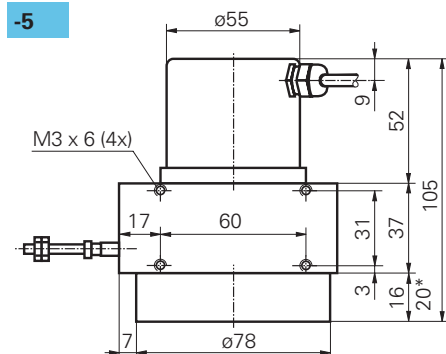
voltage range, output signals

05A 5 VDC complementary
24K 10 - 30 VDC push-pull, short-circuit protection

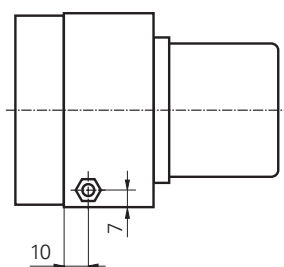
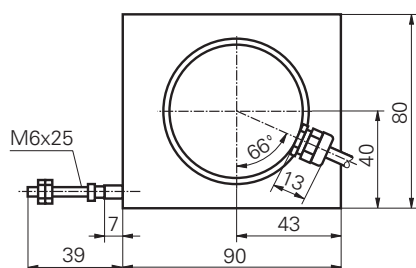


dimensions

-5



* wire length >5000 mm



assignment cable

for connection reference **-5**

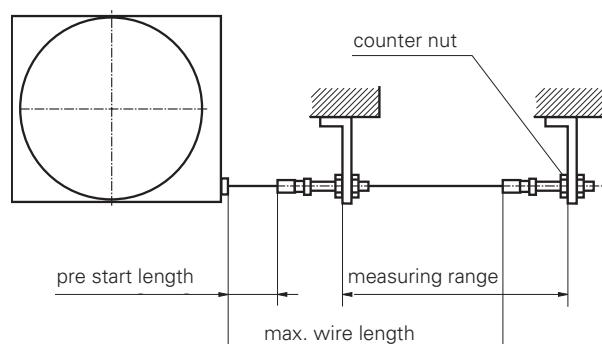
05A (5 VDC complementary)

cable color	signals
brown	+Vs
green	CHA
red	CHA compl.
yellow	CHB
blue	CHB compl.
pink	n.c.
grey	n.c.
white	0 V
screen	connected to flange
cable data	8x0,14 mm ² , max. ext. $\varnothing$ 5,7 mm

24K (10 - 30 VDC push-pull, short-circuit protection)

cable color	signals
brown	+Vs
green	CHA
yellow	CHB
pink	CHN
white	0 V
screen	connected to flange
cable data	5x0,14 mm ² , max. ext. $\varnothing$ 5,4 mm

mounting



Incremental shaft encoder

BHIV EEx

features

- explosion proof ATEX "II2G EEx de IIC T6"
- high resolution
- terminal box

general data

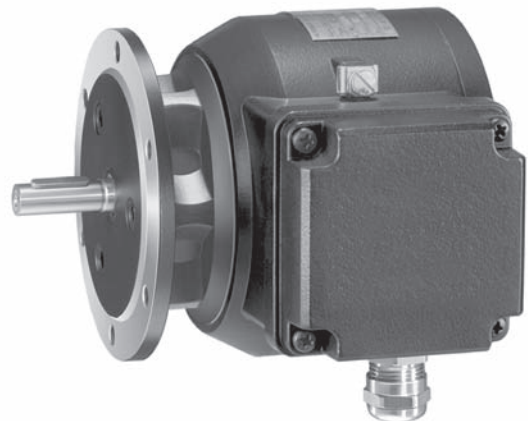
voltage supply	5 VDC $\pm$ 10% (05A) 9 - 30 VDC (24K)
max. supply current no load	typ. 100 mA (at 5 VDC)(05A) typ. 100 mA (at 24 VDC)(25W)
pulse range	see order designation
max. measuring steps	288'000 steps
max. switching frequency	120 kHz ($\leq$ 1'200 pulses) 250 kHz ($>$ 1'200 pulses)

mechanical data

max. revolutions	7'000 rpm
moment of inertia	typ. 288×10^{-7} kgm ²
torque	typ. 4 cNm (at temperature range)
max. protection class	shaft: IP 56 housing: IP 56
material	housing: aluminum flange: aluminum
weight	approx. 3'500 g

ambient conditions

temperature range	-20...+55 °C
vibration	IEC 60068-2-6 ($\leq$ 100 m/s ² / 50 - 2'000 Hz)
shock	IEC 60068-2-27 ($\leq$ 1'000 m/s ² / 6 ms)



order designation

BHIV EEx46 UYL.21

connection
L terminal box

standard pulse range

1	72	400
2	100	500
3	120	512
4	140	600
6	180	1000
10	200	1024
25	240	1200
30	250	2000
50	256	2048
60	300	2500
64	360	5000

supply voltage, output signals

05A 5 VDC complementary

25W 9 - 30 VDC push-pull, complementary,
short circuit protection

assignment connector

for connection option **-L**

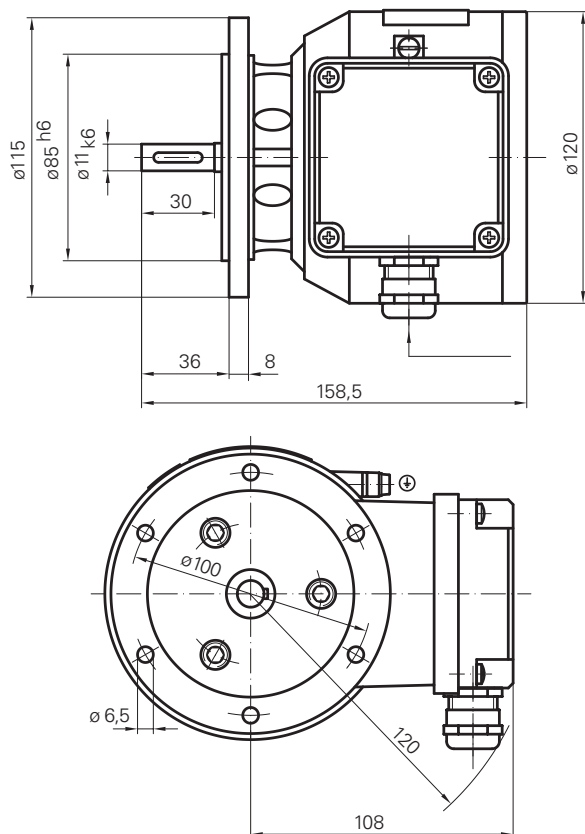
clamps	signals
K1	CHA
K1	CHA inv.
K2	CHB
K2	CHB inv.
K0	CHN
K0	CHN inv.
+	+Vs
-	0 V
screen	connected to connector housing



dimensions

-L

1



Hall sensors

Magnetic sensors

			
type	IHRM/MHRM	MDFM	MDRM
typical use	hall sensor to sense moving ferromagnetic objects such as toothed wheels, gears or toothed racks	as non-contact electronic potentiometer magnetic scanning principle	as non-contact electronic potentiometer magnetic scanning principle
features	protection class IP 68 temperature range -40...+85 °C -40...+120 °C	rectangular construction with plug	cylindrical construction with cable I and U output
voltage supply	8 - 28 VDC	5 VDC ±5%	5 / 24 VDC ±5%
output signals	A & B	2 Vpp (sin, cos)	2 Vpp(sin, cos) / lin 120°, 160°
max. resolution / min. gear size	module 1	10 bit	10 bit
max. switching frequency	1 - 20'000 Hz	20 kHz	20 kHz
dimensions housing (mm)	M12 x 1	20 x 32	M18 x 1
depth (mm)	50/60	10	30
page	1. 74 / 1. 75	1. 76	1. 76 / 1. 78

			
type	MDFK 08 / MLFK 08	MDFK 10 / MLFK 10	
typical use	MDFK 08 to capture rotational speed as well as direction of rotation MLFK 08 to capture linear movement as well as direction of movement	MDFK 10 to capture rotational speed as well as direction of rotation MLFK 10 to capture linear movement as well as direction of movement	
features	2 and 3 channel versions	max. resolution 5µm	
voltage supply	5 VDC / 8 - 30 VDC	5 VDC / 8 - 28 VDC	
output signals	square pulses	square pulses	
max. resolution / min. gear size	512 Imp. / 25 Imp.	2'048 Imp. / 100 Imp.	
max. switching frequency	3,2 MHz	1 MHz / 400 kHz	
dimensions housing (mm)	45 x 8	40 x 10	
depth (mm)	15	15	
page	1. 80 / 1. 82 / 1.84	1. 86 / 1.88	



features

- for sensing moving ferromagnetic objects
- detects toothed wheels, gears and toothed racks

description

IHRM sensors employ a magnetically biased semiconductor Hall element to sense moving ferromagnetic objects. They are preferably used to scan toothed racks as well as gear wheels in gear boxes. The housing made of stainless steel 1.4305 protects the electronics against external influences such as oil and general aggressive environments.

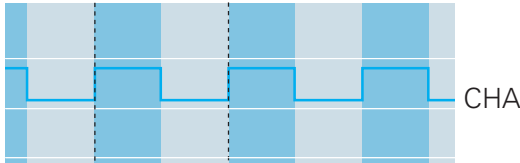
application



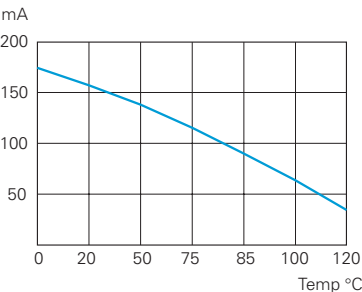
Hall sensors are used, for instance, as tachometer generators in the following situations:

- in dusty and damp environments, e.g. outdoor use, in agriculture, building machinery, etc.
- in textile, tobacco and cement processing (dust, vibration, smoke)
- integrated in portable devices, because of low power consumption, compact construction and shock resistance

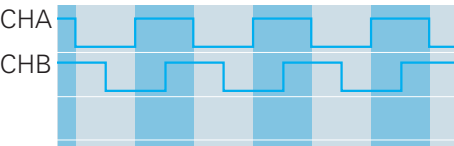
output signal IHRM (One channel)



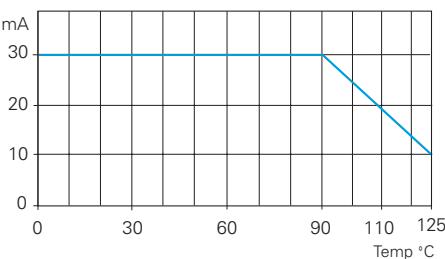
load current reduction (IHRM 12P1501)



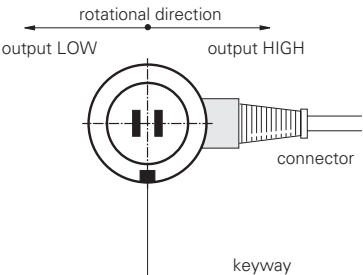
output signal MHRM (Two channel)



load current reduction (MHRM 12G2501)



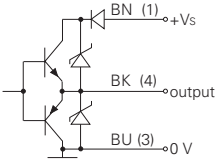
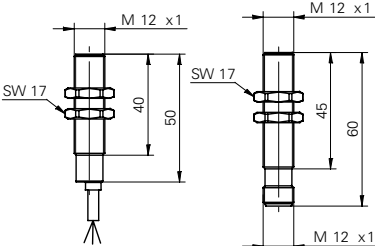
rotational direction



The Hall sensors with keyway must be mounted in the specified orientation.

Hall sensors

MHRM

dimensions	12 mm	
air gap for module 2	1,8 mm	
 Push-Pull		
push-pull	MHRM 12G5501	MHRM 12G5501/S14
output	1 channel	
technical data		
voltage supply	8 - 28 VDC	
supply current	20 mA	
max. switching current	30 mA	
max. switching frequency	0 - 15'000 Hz	
voltage drop	< 5 VDC (I _{OUT} =20mA)	
short-circuit protection	yes	
reverse polarity protection	yes, against GND	
min. gear size	module 1	
air gap for module 1	0,7 mm	
air gap for module 2	1,8 mm	
gear material	ferrous metal	
alignment aid	non defined mounting	
temperature range	-40...+85 °C	
housing material	brass nickel plated	
connection cable	PUR	
protection class	IP 67	
connector options	ES 14, ES 18, ESW 33, ESG 34	
		



dimensions	12 mm	12 mm
Air gap for module 3	2,5 mm	1,0 mm
IHRM 12P1501 PNP BN (1) — +Vs BK (4) — output BU (3) — 0 V output NPN (I_{OUT} = 20 mA) possible MHRM 12G2501 Push Pull BN (1) — +Vs WH (2) — CH A BK (4) — CH B BU (3) — 0 V		
PNP	IHRM 12P1501	MHRM 12G2501
output	1 channel	2 channel
technical data		
voltage supply	8 - 28 VDC	8 - 28 VDC
supply current	20 mA	20 mA
max. switching current	see load current reduction diagram	see load current reduction diagram
max. switching frequency	1 - 20'000 Hz	0 - 15'000 Hz
voltage drop	< 3 VDC	< 5 VDC
output A (CH A)	PNP	push-pull
output B (CH B)	-	push-pull
short-circuit protection	yes	yes
reverse polarity protection	yes	yes, against GND
min. gear size	module 1	module 1
air gap for module 1	1 mm	0,5 mm
air gap for module 3	2,5 mm	1,0 mm
gear material	ferrous metal	ferrous metal
installation aid	keyway	keyway
temperature range	-40...+120 °C	-40...+120 °C
housing material	stainless steel (1.4305)	stainless steel (1.4305)
connection cable	teflon	teflon
protection class sensing face	IP 68 / 20 bar	IP 68 / 20 bar
protection class sensor	IP 67	IP 67
mounting MHRM 12G2501		
Mod 1 Mod 2		

Magnetic sensors

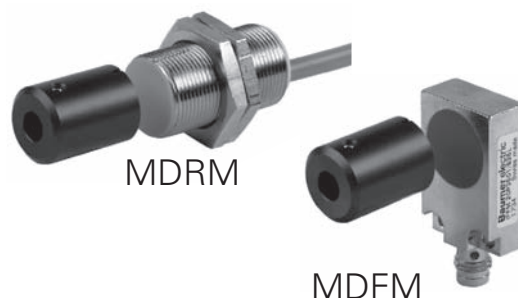
MDRM/MDFM

features

- can replace mechanical potentiometers
- sine/cosine output signals
- high protection class
- cylindrical and rectangular design

description

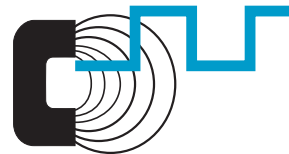
The MDRM/MDFM miniature encoders have been designed to replace mechanical potentiometers in certain motion control applications. They are magnetically controlled by a small rotor closely positioned in front of the active sensing face. The encoders provide 2 sinusoidal signals. Further processing of the signals, having a maximum resolution of 10 bits, is easily accomplished using a standard PLC. The non-contact potentiometers offer IP 67 protection which makes them ideal components for an array of applications in harsh industrial environments involving wide working temperature ranges. The products can be provided either in threaded barrel type housings or in rectangular enclosures.



part numbers

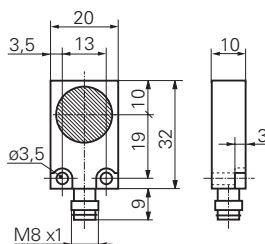
output signals sine/cos	MDRM 18U4501
cylindrical design M18 x 1	MDFM 20U4501/S35A
magnetic rotor	123344

technical data	sine/cos			
voltage supply	5 VDC $\pm 5\%$			
supply range	typ. 10 mA			
output signals	2 Vpp (sine, 2 periods per rev.)			
load	$\geq 400 \Omega$			
offset voltage	2,5 VDC $\pm 5\%$			
linearity error	typ. 2,5%			
temperature range	-20...+85 °C			
temperature coefficient	-0,3%/K			
max. switching frequency	20 kHz			
housing size	M18 x 1 x 30 32 x 20 x 10			
mounting rotor	hollow shaft $\varnothing 6 \times 15$ mm			
installation tolerance	longitudinal $\pm 0,5$ mm horizontal $\pm 0,5$ mm			
zero point adjustment	coarse: by keyway fine: electronically			
protection class	IP 67			
material sensor	brass nickel plated			
material rotor	aluminium anodized			

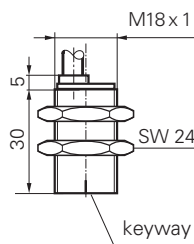


dimensions

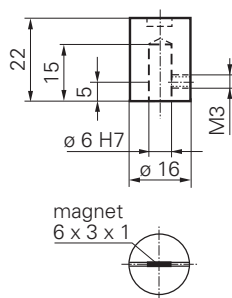
MDFM sine/cos



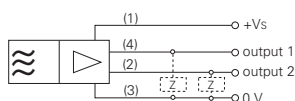
MDRM sine/cos



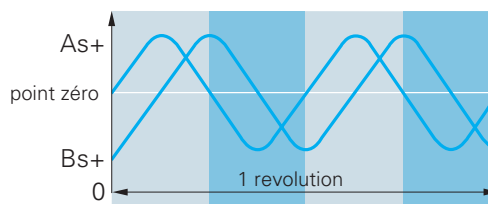
rotor



connection diagram



output signals sine/cos



cable assignment

sine/cos

color	abbreviation	signals
brown	BN	+Vs
black	BK	As+
blue	BU	0 V
white	WH	Bs+

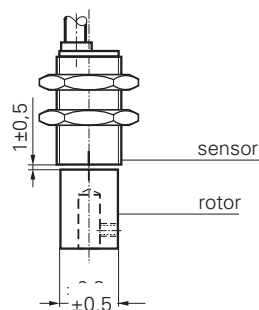
assignment connector

for connector version /S35A (MDFM only)



pin nr.	signals
1	+Vs
2	output Bs+
3	0 V
4	output As+

mounting



accessories

connector 2 m PUR, halogen-free

right angle

straight

part nr. ESW 31AH0200

part nr. ESG 32AH0200

rotor

part nr. 123344

see end of chapter

Magnetic sensors

MDRM

features

- can replace mechanical potentiometers
- linear output signals
- high protection class
- cylindrical design



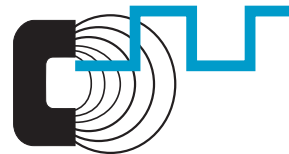
description

The MDRM miniature encoders have been designed to replace mechanical potentiometers in certain motion control applications. They are magnetically controlled by a small rotor closely positioned in front of the active sensing face. The encoders provide a DC voltage signal which is linear over $\pm 80^\circ$ ($\pm 60^\circ$ for current output). Further processing of the signals, having a maximum resolution of 10 bits, is easily accomplished using a standard PLC. The non-contact potentiometers offer IP 67 protection which makes them ideal components for an array of applications in harsh industrial environments involving wide working temperature ranges.

part numbers

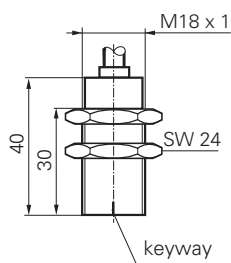
output signals linear	
cylindrical design M18 x 1	
+Vs 5 VDC / Vout 0,5 - 4,5 VDC	MDRM 18U9501
+Vs 24 VDC / Vout 1 - 9 VDC	MDRM 18U9524
+Vs 24 VDC / Iout 4 - 20 mA	MDRM 18I9524
magnetic rotor	123344

technical data	MDRM 18U9501	MDRM 18U9524	MDRM 18I9524
voltage supply	5 VDC $\pm 5\%$	12 - 30 VDC	10 - 30 VDC
supply current	< 20 mA	< 30 mA	< 50 mA
output signals	0,3 - 4,7 VDC	1 - 9 VDC	4 - 20 mA
load	$\geq 400 \Omega$	> 3,3 k Ω	0,5 k Ω @ 15 VDC 1 k Ω @ 25 VDC
linearity	$\pm 80^\circ$ linear	$\pm 80^\circ$ linear	$\pm 60^\circ$ linear
linearity error	2,5%	$\pm 2,5\%$	$\pm 2,5\%$
temperature range	-20...+85 $^\circ\text{C}$	-25...+85 $^\circ\text{C}$	-25...+85 $^\circ\text{C}$
temperature drift full scale (FS)	$\pm 2\%$	$\pm 2\%$	$\pm 2\%$
max. switching frequency	20 kHz	20 kHz	20 kHz
housing size	M18 x 1 x 40	M18 x 1 x 40	M18 x 1 x 40
mounting rotor	hollow shaft $\varnothing 6 \times 15$ mm	hollow shaft $\varnothing 6 \times 15$ mm	hollow shaft $\varnothing 6 \times 15$ mm
installation	longitudinal $\pm 0,3$ mm horizontal $\pm 0,3$ mm	longitudinal $\pm 0,5$ mm horizontal $\pm 0,5$ mm	longitudinal $\pm 0,5$ mm horizontal $\pm 0,5$ mm
zero point adjustment	coarse: by keyway fine: electronically	coarse: by keyway fine: electronically	coarse: by keyway fine: electronically
protection class	IP 67	IP 67	IP 67
material sensor	brass nickel plated	brass nickel plated	brass nickel plated
material rotor	alu anodized	alu anodized	alu anodized

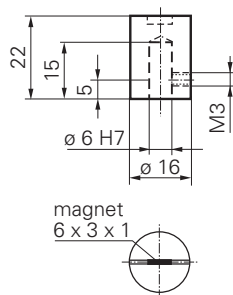


dimensions

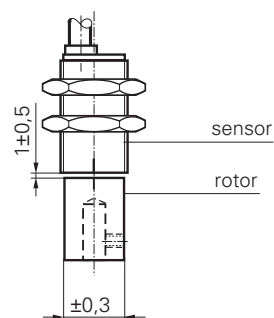
sensor



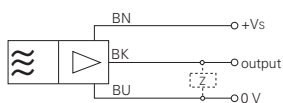
rotor



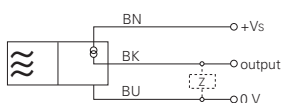
mounting



connection diagrams

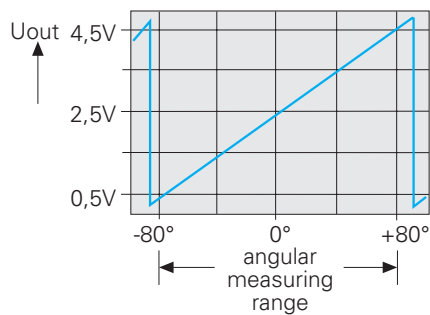


voltage output

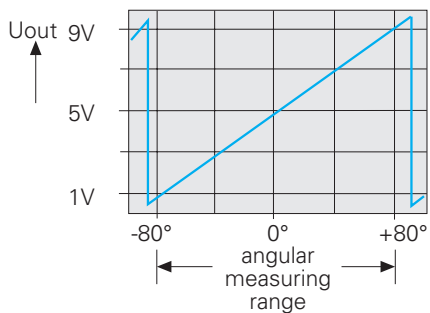


current output

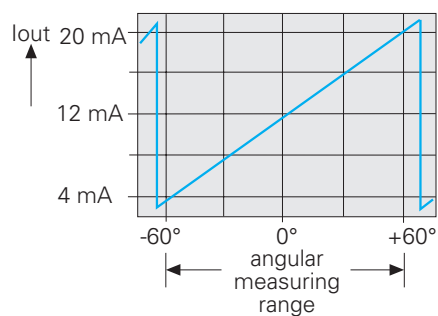
linear output signal 0,5 - 4,5 VDC



linear output signal 1 - 9 VDC



linear output signal 4 - 20 mA



cable assignment

linear

color	abbreviation	signals
brown	BN	+Vs
black	BK	Out
blue	BU	0 V
white	WH	-

accessory

magnetic rotor

part nr. 123344

see end of chapter

Magnetic sensors for rotary applications

MDFK 08, 2 channel

features

- competitively priced angular measurement solution using ring magnet or magnetic rotor
- 2 channel version
- channel A/B 90° shifted
- 8-/16-fold interpolation



description

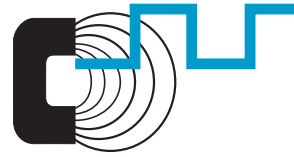
Magnet encoders provide angular information by non-contact tracking of a multi-pole ring magnet based on a magneto resistive sensor. Depending on the angle between the sensor and the magnetic field, the device generates analog signals containing the angular information. These signals are further fed into an electronics circuit for additional conditioning and processing. The rugged and easy to mount sensor generates 4'096 steps when used in conjunction with a ring magnet of 64 poles. Angular resolution of the device can be partly determined by selecting appropriate ring magnets. The IP 67 protected sensor contains absolutely no moving parts and is not subject to any wear when in operation. Air gap between magnet and sensor can be up to 0,8 mm without sacrificing system accuracy.

part numbers

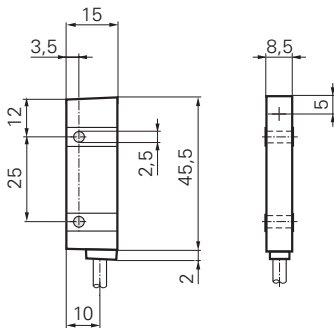
8-fold interpolation	
2 channel push-pull	MDFK 08G2101
2 channel complementary RS 422	MDFK 08T7101
16-fold interpolation	
2 channel push-pull	MDFK 08G2124/N16
2 channel complementary RS 422	MDFK 08T7105/N16

technical data	MDFK 08G2101	MDFK 08T7101	MDFK 08G2124/N16	MDFK 08T7105/N16
	push-pull	RS 422	push-pull	RS 422
voltage supply	8 - 30 VDC	5 VDC ±5%	8 - 28 VDC	5 VDC ±5%
supply current	35 mA	55 mA	30 mA	20 mA
switching current	30 mA	RS 422	50 mA	RS 422
max. switching frequency	160 kHz	160 kHz	3,2 MHz	3,2 MHz
voltage drop	< 4 VDC (I _{OUT} = 20 mA)	RS 422	< 2 VDC (I _{OUT} = 20 mA)	RS 422
output circuit A/B	push-pull	TTL (RS 422)	push-pull	TTL (RS 422)
output signal	CH A/B	CH A/A/B/B	CH A/B	CH A/A/B/B
air gap	max. 0,8 mm	max. 0,8 mm	max. 0,6 mm	max. 0,6 mm
resolution	256 ppr ring magnet 32 poles	256 ppr ring magnet 32 poles	512 ppr ring magnet 32 poles	512 ppr ring magnet 32 poles
interpolation	8-fold*	8-fold*	16-fold*	16-fold*
max. measuring steps	1'024 steps	1'024 steps	2'048 steps	2'048 steps
short-circuit protection	yes	yes	yes	yes
reverse polarity protection	yes	no	yes	no
temperature range	-25...+85 °C	-25...+85 °C	-25...+85 °C	-25...+85 °C
housing material	PC	PC	PC	PC
max. protection class	IP 67	IP 67	IP 67	IP 67
connection cable PUR	4 x 0,25 mm ²	6 x 0,14 mm ²	4 x 0,25 mm ²	6 x 0,14 mm ²

*lower interpolation rates on request

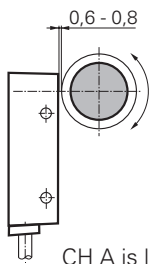


dimensions



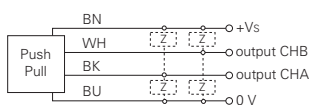
sensor can also be mounted with self-tapping special screws (M3)

mounting and sense of rotation

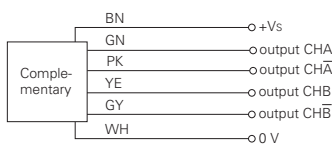


CH A is leading CH B by 90° when rotating CW.

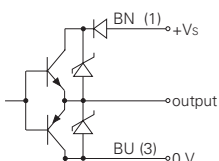
2 channel push-pull



2 channel complementary RS 422



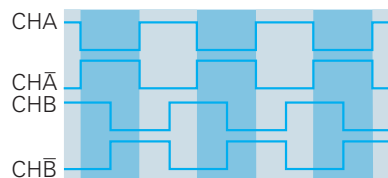
connection diagram push-pull



pin assignment 2 channel push-pull



pin assignment 2 channel RS 422



pin assignment 2 channel push-pull

color	abbreviation	signals
brown	BN	+Vs
blue	BU	GND
black	BK	CH A
white	WH	CH B

pin assignment 2 channel complementary RS 422

color	abbreviation	signals
brown	BN	+Vs
green	GN	CH A
pink	PK	CH A-bar
yellow	YE	CH B
grey	GY	CH B-bar
white	WH	GND

accessories

see end of chapter

Magnetic sensors for rotary applications

MDFK 08, 3 channel

features

- competitively priced angular measurement solution using ring magnet or magnetic rotor
- 3 channel version
- channel A/B 90° shifted and zero pulse
- 10-/16-fold interpolation



description

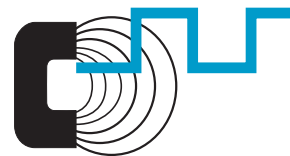
Magnet encoders provide angular information by non-contact tracking of a multi-pole ring magnet based on a magneto resistive sensor. Depending on the angle between the sensor and the magnetic field, the device generates analog signals containing the angular information. These signals are further fed into an electronics circuit for additional conditioning and processing. The rugged and easy to mount sensor generates 2'048 steps when used in conjunction with a ring magnet of 32 poles. Angular resolution of the device can be partly determined by selecting appropriate ring magnets. The IP 67 protected sensor contains absolutely no moving parts and is not subject to any wear when in operation. Air gap between magnet and sensor can be up to 0,5 mm without sacrificing system accuracy.

part numbers

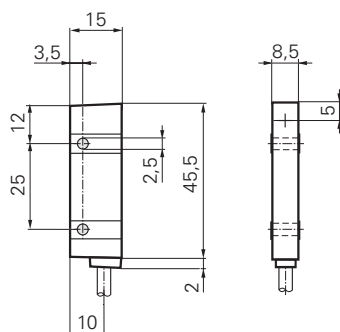
3 channel push-pull	MDFK 08G8124
3 channel complementary RS 422	MDFK 08T8101

technical data	MDFK 08G8124	MDFK 08T8101		
	push-pull	RS 422		
voltage supply	8 - 28 VDC	5 VDC ±5%		
supply current	30 mA	30 mA		
switching current	50 mA	RS 422		
max. switching frequency	3,2 MHz	160 kHz		
voltage drop	< 2 VDC (I _{OUT} = 50 mA)	RS 422		
output circuit A/B	push-pull	TTL (RS 422)		
output signal	CH A/B/N	CH A/ $\bar{A}$ /B/ $\bar{B}$ /N/ $\bar{N}$		
air gap	max. 0,5 mm	max. 0,5 mm		
resolution	512 ppr ring magnet 32 poles	320 ppr ring magnet 32 poles		
interpolation	16-fold*	10-fold*		
max. measuring steps	2'048 steps	1'280 steps		
short-circuit protection	yes	yes		
reverse polarity protection	yes	no		
temperature range	-25...+85 °C	-25...+85 °C		
housing material	PC	PC		
max. protection class	IP 67	IP 67		
connection cable PUR	5 x 0,14 mm ²	8 x 0,14 mm ²		

*lower interpolation rates on request

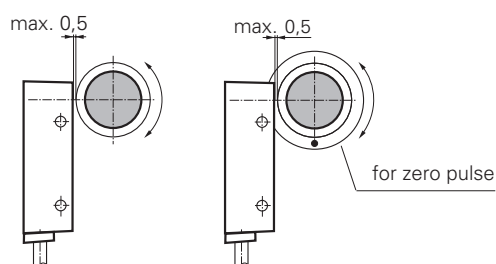


dimensions



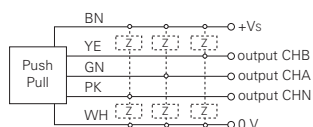
sensor can also be mounted with self-tapping special screws (M3)

montage and sense of rotation

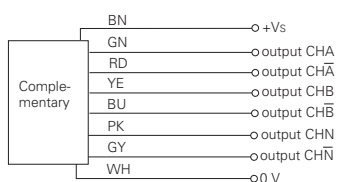


CH A is leading CH B by 90° when rotating CW.

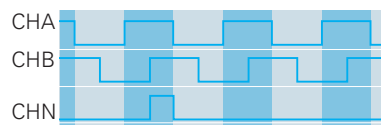
3 channel push-pull (with zero pulse)



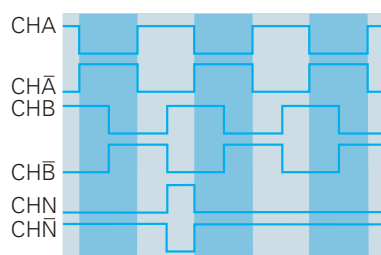
3 channel complementary RS 422 (with zero pulse)



output signals 3 channel push-pull



output signals 3 channel RS 422



3 channel version with zero-pulse (CHN/CHN-bar)

pin assignment 3 channel push-pull

color	abbreviation	signals
brown	BN	+Vs
green	GN	CH A
yellow	YE	CH B
pink	PK	CH N
white	WH	GND

pin assignment 3 channel complementary RS 422

color	abbreviation	signals
brown	BN	+Vs
green	GN	CH A
red	RD	CH A-bar
yellow	YE	CH B
blue	BU	CH B-bar
pink	PK	CH N
grey	GY	CH N-bar
white	WH	GND

accessories

magnet rotor 32 poles (zero pulse)	part nr. 132124 see end of chapter
magnet rotor 64 poles (zero pulse)	part nr. 150984 see end of chapter
mounting bracket	part nr. 134683 see end of chapter

Magnetic sensors for linear applications

MLFK 08, 2 channel

features

- non-contact, magnetic linear measuring sensor
- low cost alternative to linear encoders
- max. resolution 10 µm with external quadrature electronics
- 2 channel version
- max. displacement speed 40 m/s

description

MLFK magnet encoders provide linear position information by non- contact tracking of a magnetic strip based on a magneto resistive sensor. Depending on the angle between the sensor and the magnetic field, the device generates analog signals containing the angular information. These signals are further fed into an electronics circuit for additional conditioning and processing. The rugged and easy to mount linear encoder generates 25 pulses per pole (1 mm width) when used in conjunction with a magnetic strip. The IP67 protected sensor contains absolutely no moving parts and is not subject to wear when in operation.



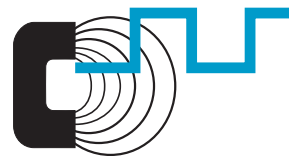
part numbers

2 channel push-pull	MLFK 08G2101
2 channel complementary (RS 422)	MLFK 08T7101
2 channel complementary (RS 422) high resolution	MLFK 08T7105/N16X
2 channel complementary (RS 422) very high resolution	MLFK 08T7105/N25X

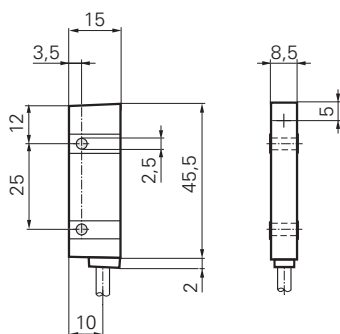
technical data	MLFK 08G2101	MLFK 08T7101	MLFK 08T7105/N16X	MLFK 08T7105/N25X
	push-pull	RS 422	RS 422	RS 422
voltage supply	8 - 30 VDC	5 VDC ±5%	5 VDC ±5% **	5 VDC ±5% **
supply current	35 mA	55 mA	20 mA	20 mA
switching current	30 mA	RS 422	RS 422	RS 422
max. switching frequency	160 kHz	160 kHz	3,2 MHz	3,2 MHz
voltage drop	< 4 VDC (I _{OUT} = 20 mA)	RS 422	RS 422	RS 422
output circuit A/B	push-pull	TTL (RS 422)	TTL (RS 422)	TTL (RS 422)
output signal	CH A/B	CH A/ $\bar{A}$ /B/ $\bar{B}$	CH A/ $\bar{A}$ /B/ $\bar{B}$	CH A/ $\bar{A}$ /B/ $\bar{B}$
air gap	max. 1,0 mm	max. 1,0 mm	max. 0,3 mm	max. 0,3 mm
resolution	8 ppr	8 ppr	16 ppr	25 ppr
interpolation	8-fold*	8-fold*	16-fold*	25-fold*
max. measuring steps	32 steps	32 steps	64 steps	100 steps
short-circuit protection	yes	yes	yes	yes
reverse polarity protection	yes Vs to GND	no	no	no
temperature range	-25...+85 °C	-25...+85 °C	-25...+85 °C	-10...+65 °C
housing material	PC	PC	PC	PC
max. protection class	IP 67	IP 67	IP 67	IP 67
connection cable PUR	4 x 0,25 mm ²	6 x 0,14 mm ²	6 x 0,14 mm ²	6 x 0,14 mm ²
matching magnetic strip	128606	128606	147044	147044

*lower interpolation rates on request

**24 VDC version on request

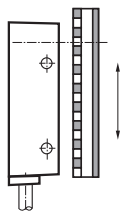


dimensions

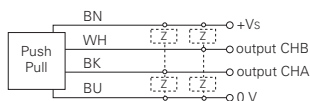


sensor can also be mounted with special self-tapping screws (M3)

mounting and direction of travel



2 channel push-pull



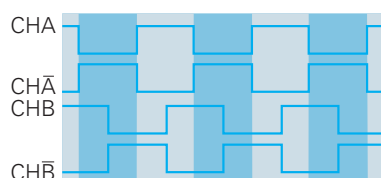
2 channel complementary RS 422



output signals 2 channel push-pull



output signals 2 channel RS 422



pin assignment 2 channel push-pull

color	abbreviation	signals
brown	BN	+Vs
blue	BU	GND
black	BK	CH A
white	WH	CH B

pin assignment 2 channel complementary RS 422

color	abbreviation	signals
brown	BN	+Vs
green	GN	CH A
pink	PK	CH A-bar
yellow	YE	CH B
grey	GY	CH B-bar
white	WH	GND

accessories

magnetic strip

pole width 2 mm, strip width 10 mm, height max. 1,4 mm
length

50 mm	part nr. 128662
150 mm	part nr. 128663
300 mm	part nr. 128664
cut to length	part nr. 128606

pole width 1 mm, strip width 10 mm, height max. 1,4 mm
length

cut to length	part nr. 147044
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for more information see end of chapter

Magnetic sensors for rotary applications

MDFK 10, 3 channel

features

- competitively priced angular measurement solution using ring magnet or magnetic rotor
- 3 channel version
- channel A/B 90° shifted
- 64-fold interpolation



description

Magnet encoders provide angular information by non-contact tracking of a multi-pole ring magnet based on a magneto-resistive sensor. Depending on the angle between the sensor and the magnetic field, the device generates analog signals containing the angular information. These signals are further fed into an electronics circuit for additional conditioning and processing. The rugged and easy to mount sensor generates 8'196 steps when used in conjunction with a ring magnet of 32 poles. The MDFK 10 range of sensors provides a high degree of installation flexibility due to the position of the magneto-resistive pick-up being at the center of the device's face. An important fact when space is at a premium. All 10-series sensors feature a screened PUR cable.

part numbers

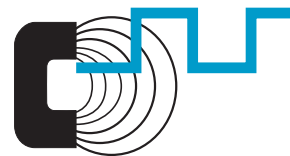
64-fold interpolation

3 channel push-pull **MDFK 10G8124/N64**

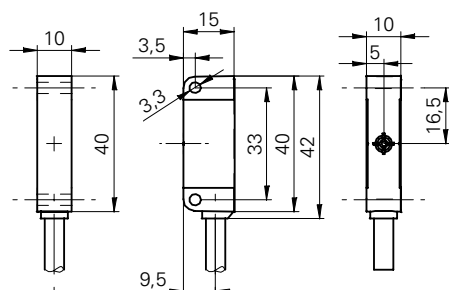
3 channel complementary RS 422 **MDFK 10T8105/N64**

technical data	MDFK 10G8124/N64	MDFK 10T8105/N64		
	push-pull	RS 422		
voltage supply	8 - 28 VDC	5 VDC ±5%		
supply current	40 mA	40 mA		
switching current	50 mA	50 mA		
max. switching frequency	1 MHz	1 MHz		
voltage drop	< 4 VDC (I _{OUT} = 20 mA)	–		
output circuit A/B	3 channel, push-pull	RS 422		
output signal	A/B/N	CH A/A/B/B/N/N̄		
air gap	max. 0,6 mm	max. 0,6 mm		
resolution	2048 ppr ring magnet 32 poles	2048 ppr ring magnet 32 poles		
interpolation	64-fold*	64-fold*		
max. measuring steps	8192 steps	8192 steps		
short-circuit protection	yes	yes		
reverse polarity protection	yes Vs to GND	no		
temperature range	-25...+85 °C	-25...+85 °C		
housing material	PA6	PA6		
max. protection class	IP 67	IP 67		
connection cable PUR	5 x 0,14 mm ²	6 x 0,14 mm ²		

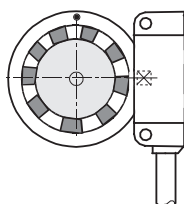
*lower interpolation rates on request



dimensions

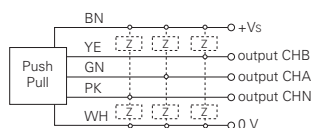


mounting and sense of rotation

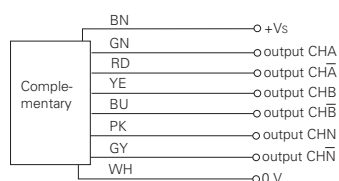


CH A is leading CH B by 90° when rotating CW.

3 channel push-pull (with zero pulse)



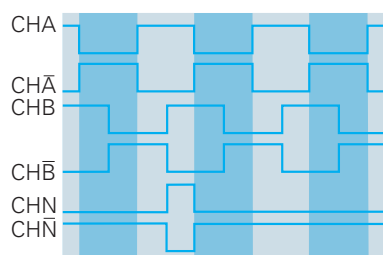
3 channel complementary RS 422 (with zero pulse)



pin assignment 3 channel push-pull



pin assignment 3 channel RS 422



pin assignment 3 channel push-pull

color	abbreviation	signals
brown	BN	+Vs
green	GN	CHA
yellow	YE	CHB
pink	PK	CHN
white	WH	GND

pin assignment 3 channel complementary RS 422

color	abbreviation	signals
brown	BN	+Vs
green	GN	CH A
red	RD	CH $\bar{A}$
yellow	YE	CHB
blue	BU	CH $\bar{B}$
pink	PK	CHN
grey	GY	CH $\bar{N}$
white	WH	GND

accessories

magnet rotor 32 poles (zero pulse)	part nr. 132124 see end of chapter
magnet rotor 64 poles (zero pulse)	part nr. 150984 see end of chapter

Magnetic sensors for linear applications

MLFK 10, 2 channel

features

- non-contact, magnetic linear measuring sensor
- low cost alternative to linear encoders
- max. resolution 10 µm with external quadrature electronics
- 2 channel version
- max. displacement speed 40 m/s



description

Magnet encoders provide angular information by non-contact tracking of a multi-pole ring magnet based on a magneto resistive sensor. Depending on the angle between the sensor and the magnetic field, the device generates analog signals containing the angular information. A resolution of 5µ can be achieved when using a magnetic strip of 2 mm pole width and external signal quadrature. The MDFK 10 range of sensors provides a high degree of installation flexibility due to the position of the magneto-resistive pick-up being at the center of the device's face. An important fact when space is at a premium. All 10-series sensors feature a screened PUR cable.

part numbers

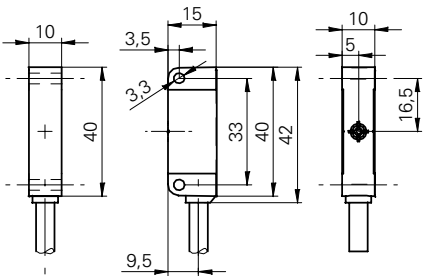
2 channel push-pull	MLFK 10G2124/N100
2 channel (RS 422)	MLFK 10T7105/N100

technical data	MLFK 10G2124/N100	MLFK 10T7105/N100		
	push-pull	RS 422		
voltage supply	8 - 28 VDC	5 VDC ±5%		
supply current	30 mA	20 mA		
switching current	50 mA	50 mA		
max. switching frequency	400 kHz	400 kHz		
voltage drop	2 VDC (I _{OUT} = 20 mA)	RS 422		
output circuit A/B	2 channel, push-pull	RS 422		
output signal	CH A/B	CH A/ $\bar{A}$ /B/ $\bar{B}$		
air gap	0,8 mm	0,8 mm		
resolution	100 ppr	100 ppr		
interpolation	100-fold*	100-fold*		
max. measuring steps	400 steps	400 steps		
short-circuit protection	yes	yes		
reverse polarity protection	yes Vs to GND	no		
temperature range	-25...+85 °C	-25...+85 °C		
housing material	PA6	PA6		
max. protection class	IP 67	IP 67		
connection cable PUR	4 x 0,25 mm ²	6 x 0,14 mm ²		
matching magnetic strip	128606	128606		

*lower interpolation rates on request



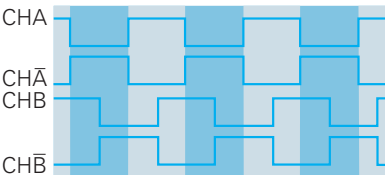
dimensions



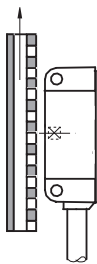
output signals 2 channel push-pull



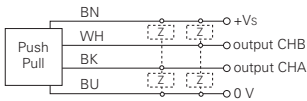
output signals 2 channel RS 422



mounting and direction of travel



2 channel push-pull



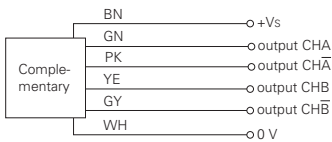
pin assignment 2 channel push-pull

color	abbreviation	signals
brown	BN	+Vs
blue	BU	GND
black	BK	CH A
white	WH	CH B

pin assignment 2 channel complementary RS 422

color	abbreviation	signals
brown	BN	+Vs
green	GN	CH A
pink	PK	CH A-bar
yellow	YE	CH B
grey	GY	CH B-bar
white	WH	GND

2 channel complementary RS 422



accessories

magnetic strip
pole width 2 mm, strip width 10 mm, height max. 1,4 mm

length

50 mm	part nr. 128662
150 mm	part nr. 128663
300 mm	part nr. 128664
cut to length	part nr. 128606

Mounting instructions

Linear and rotary magnetic sensors

MDFK / MLFK

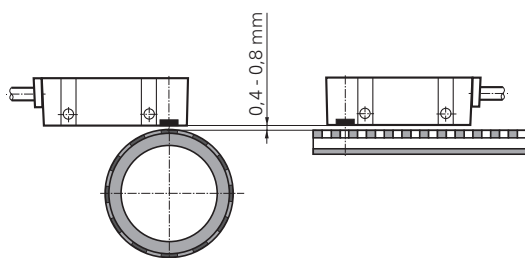


instructions

Magnetic sensors must be mounted in a defined position in relation to ring magnets or magnetic strips. Always maintain air gap, angular and axial misalignment within specifications in order to prevent negative effects on the measuring accuracy.

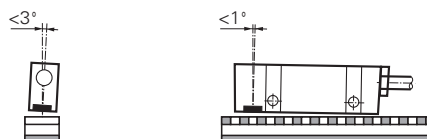
Small misalignments within specifications result in minor system related measuring inaccuracies caused by ring magnets or magnetic strips (inaccuracy of magnetization, glued magnetic strip, true running of ring magnets). Ring magnets or magnetic strips should not be exposed to strong external magnetic fields, excessive ambient temperatures or heavy mechanical abuse like direct hits with hard objects. Also, be certain that ring magnets or magnetic strips are never placed near ferromagnetic parts, as this could cause magnetization resulting in signal distortion.

air gap

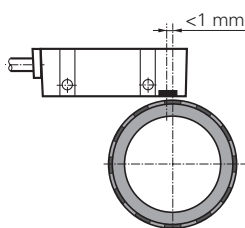


angular misalignment

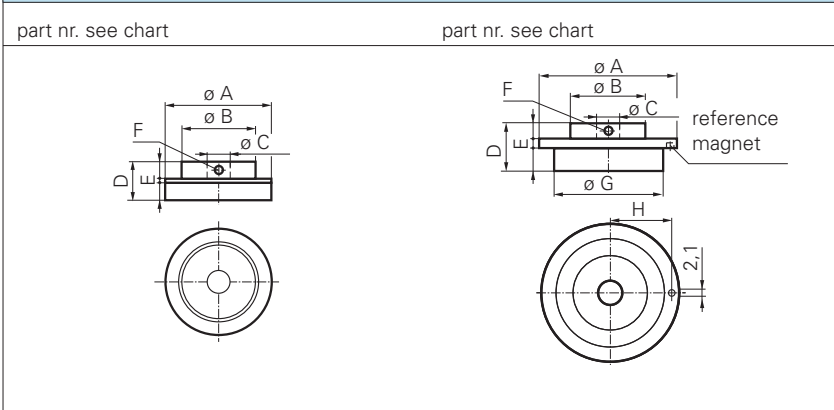
(applies to applications with both ring magnets and magnetized strips)



axial misalignment



magnet rotor **magnet rotor (zero pulse)**



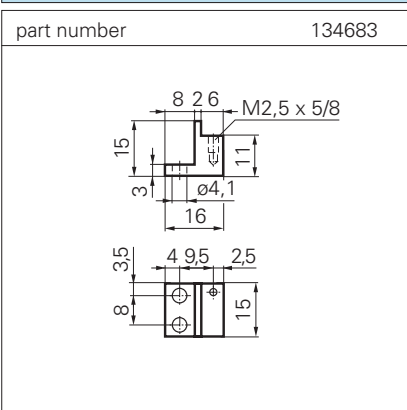
Dimension without zero pulse

	32 poles	36 poles	64 poles
A	30,5	30,5	56
B	20	20	35
C	6H7	6H7	25E7
D	14	14	15
E	7 / 5	7 / 5	8 / 6
F	M3	M3	M4
G	–	–	–
H	–	–	–
material	alu	alu	alu
part number	134061	157948	143924

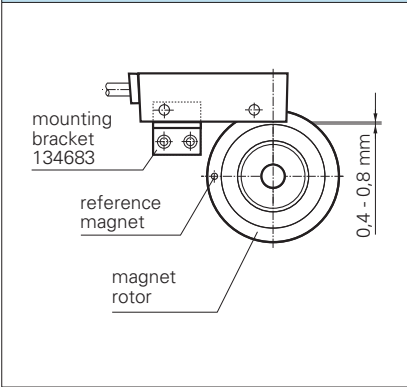
Dimension with zero pulse

	32 poles	36 poles	64 poles
A	40	40	66
B	20	20	66
C	6H7	6H7	25E7
D	17	17	18
E	8 / 5	8 / 5	9 / 9
F	M3	M3	M4
G	30,5	30,5	56
H	18	18	31,3
material	alu	alu	alu
part number	132124	147433	150984

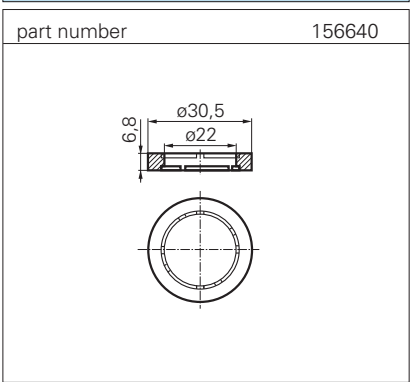
mounting bracket MDFK 08



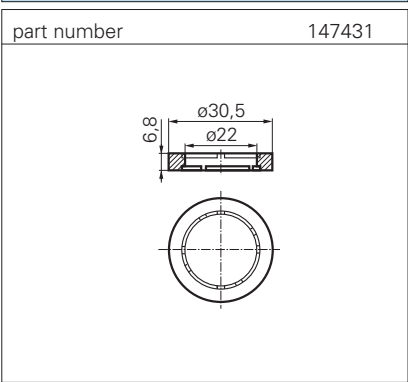
mounting MDFK 08 (0-pulse)



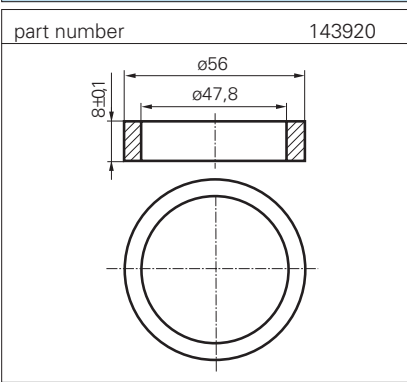
ring magnet 32 poles



ring magnet 36 poles



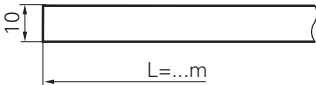
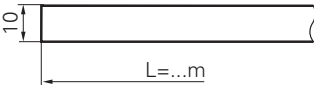
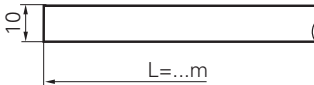
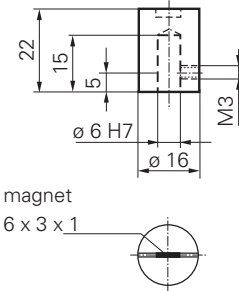
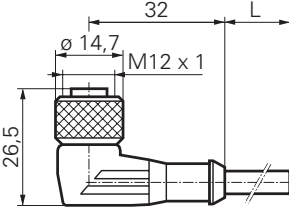
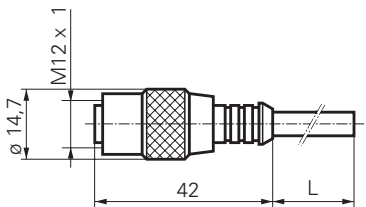
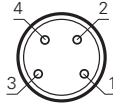
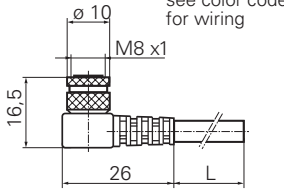
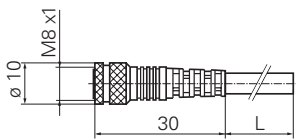
ring magnet 64 poles



Ring magnet can be designed to meet application specific requirements.

Accessories

Connectors

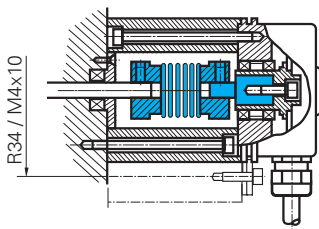
magnetic strip for MLFK		magnetic strip for MLFK		self-adhesive protective tape																
length 50 mm 150 mm 300 mm L= (cut to length)		part number 128662 128663 128664 128606		part number 157164																
																				
pole width 2 mm strip thickness 1,4 mm		pole width 1 mm strip thickness 1,4 mm		strip thickness 0,25 mm																
rotor																				
part number 123344																				
																				
connector ESW 33A		connector ESG 34A		pin-assignment con. 4-pin (M12)																
part number ESW 33AH0200 ESW 33AH0500 ESW 33AH1000 halogen-free		part number ESG 34AH0200 ESG 34AH0500 ESG 34AH1000 halogen-free																		
cable length 4-pin 2 m PUR 4-pin 5 m PUR 4-pin 10 m PUR		cable length 4-pin 2 m PUR 4-pin 5 m PUR 4-pin 10 m PUR		<table><thead><tr><th>pin nr.</th><th>color</th><th>signals</th></tr></thead><tbody><tr><td>1</td><td>BN (brown)</td><td>+Vs</td></tr><tr><td>2</td><td>WH (white)</td><td>NC (output B)</td></tr><tr><td>3</td><td>BU (blue)</td><td>0V</td></tr><tr><td>4</td><td>BK (black)</td><td>NO (output A)</td></tr></tbody></table>		pin nr.	color	signals	1	BN (brown)	+Vs	2	WH (white)	NC (output B)	3	BU (blue)	0V	4	BK (black)	NO (output A)
pin nr.	color	signals																		
1	BN (brown)	+Vs																		
2	WH (white)	NC (output B)																		
3	BU (blue)	0V																		
4	BK (black)	NO (output A)																		
																				
connector ESW 31A		connector ESG 32A		pin-assignment con. 4-pin (M8)																
part number ESW 31AH0200 ESW 31AH0500 ESW 31AH1000 halogen-free		part number ESG 32AH0200 ESG 32AH0500 ESG 32AH1000 halogen-free																		
cable length 4-pin 2 m PUR 4-pin 5 m PUR 4-pin 10 m PUR		cable length 4-pin 2 m PUR 4-pin 5 m PUR 4-pin 10 m PUR		<table><thead><tr><th>pin nr.</th><th>color</th><th>signals</th></tr></thead><tbody><tr><td>1</td><td>BN (brown)</td><td>+Vs</td></tr><tr><td>2</td><td>WH (white)</td><td>NC (output B)</td></tr><tr><td>3</td><td>BU (blue)</td><td>0V</td></tr><tr><td>4</td><td>BK (black)</td><td>NO (output A)</td></tr></tbody></table>		pin nr.	color	signals	1	BN (brown)	+Vs	2	WH (white)	NC (output B)	3	BU (blue)	0V	4	BK (black)	NO (output A)
pin nr.	color	signals																		
1	BN (brown)	+Vs																		
2	WH (white)	NC (output B)																		
3	BU (blue)	0V																		
4	BK (black)	NO (output A)																		
																				

Mounting drawings Incremental hollow shaft encoders BHF/BHG

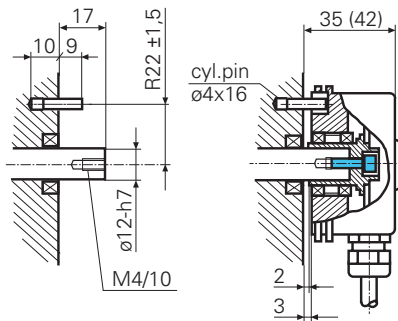
1

mounting

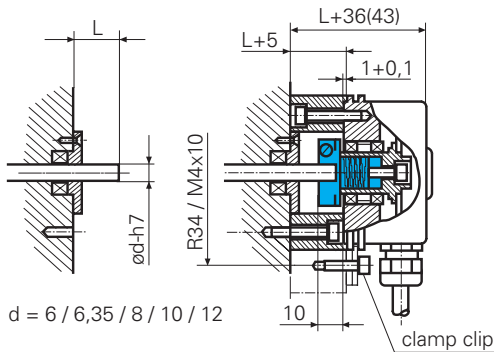
-12 -L2 BHF with shaft adapter and external bellows coupling



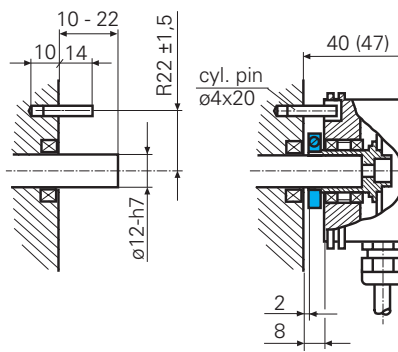
-12 -L2 BHF with end shaft



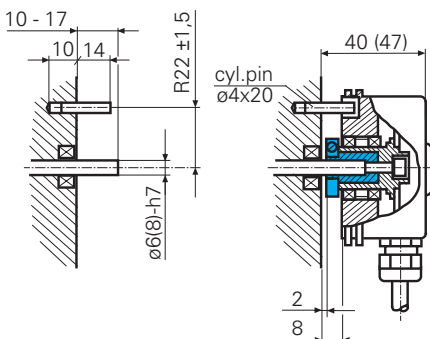
-12 -L2 BHF with integrated coupling



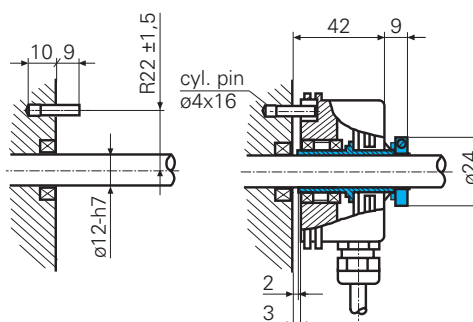
-B2 -E2 BHF with end shaft and clamping ring



-12 -L2 BHF with reducing shaft
ø8 mm-h7 / ø6 mm-h7



-B2 -E2 BHG with through shaft



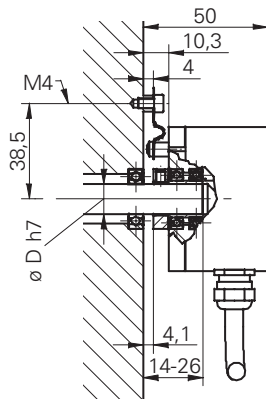
Mounting drawings

Incremental hollow shaft encoders

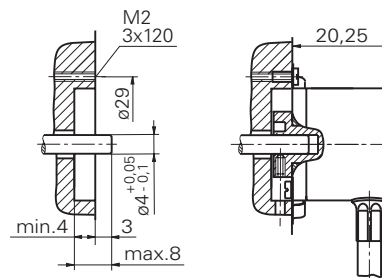
BRIH/BRID/BTIH

mounting

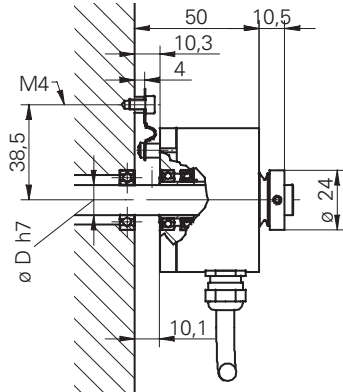
-B2 -P2 BRIH hollow shaft with spring plate



T4 BTIH mounting with spring plate and clamping ring



-B2 -P2 BRID through shaft with spring plate



Absolute single-turn

2



Absolute single-turn encoders

	magnetic encoder kits					shaft	
							
type	BMSK 42	BMSK 42	BMSK 42	BMSK 58	BMSK 58	BMSV 30	
	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	
interface	parallel	SSI	SSI	parallel	SSI	SSI	
resolution	9 bit	12 bit	12 bit	12 bit	12 bit	10 bit	
voltage supply	5 VDC	5 VDC	5 VDC	10 - 30 VDC	5 VDC 10 - 30 VDC	5 VDC 10 - 30 VDC	
temperature range	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	
max. protection class	IP 67	IP 40	IP 67	IP 67	IP 67	IP 65	
max. revolutions (electr.)	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	
hollow shaft diameter	6 mm	6 mm	6 mm	12 mm	12 mm	5 mm	
dimensions (ø x length)	55x35(16) mm	55x16 mm	55x35 mm	58x38 mm	58x31 mm	30x32 mm	
connection cable	radial	-	radial	radial	radial	radial / axial	
plug	axial	axial	-	-	-	radial	
special characteristics	-	-	-	-	-	-	
page	2. 06	2. 08	2. 08	2. 10	2. 12	2. 14	

	optical hollow shaft encoders						
							
type	BFF	BFG	BFF	BFG	BFF	BFG	
interface	parallel	parallel	SSI	SSI	CANopen	CANopen	
resolution	12 bit	12 bit	13 bit	13 bit	13 bit	13 bit	
voltage supply	5 VDC 10 - 30 VDC	5 VDC 10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	
temperature range	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	
max. protection class	IP 65	IP 65	IP 65	IP 65	IP 65	IP 65	
max. revolutions (electr.)	depends on resol.	depends on resol.	3'000 rpm	3'000 rpm	3'000 rpm	3'000 rpm	
hollow shaft / shaft diameter	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	
dimensions (ø x length)	58x38 mm	58x38 mm	58x38 mm	58x38 mm	58x38 mm	58x38 mm	
connection cable	radial	radial	radial	radial	-	-	
plug	radial	radial	radial	radial	radial / axial	radial	
special characteristics	end shaft	through shaft	end shaft	through shaft	integrated bus	integrated bus	
page	2. 38	2. 38	2. 42	2. 42	2. 46	2. 46	

magnetic hollow shaft encoders

							
BMSH 40	BMSH 42	BMSH 42	BMSH 42	BMSH 58	BMSH 58	BMSH 58	BMSH 58
<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>
SSI	parallel	SSI	CANopen DeviceNet	parallel	SSI	CANopen DeviceNet	Profibus-DP CANopen DeviceNet EtherCAT
10 bit	9 bit	12 bit	12 bit	12 bit	12 bit	12 bit	12 bit
5 VDC 10 - 30 VDC	5 VDC	5 VDC	10 - 30 VDC	10 - 30 VDC	5 VDC 10 - 30 VDC	10 - 30 VDC	10 - 30 VDC
-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C
IP 65	IP 65	IP 65	IP 65	IP 65	IP 65	IP 65	IP 65
6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm
12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm	12 mm
40x27 mm	42x39 mm	42x39 mm	42x46 mm	58x38 mm	58x31 mm	58x46 mm	58x72 mm
radial / axial	radial	radial	radial	radial	radial	-	radial
radial	-	-	radial	-	radial	radial	-
-	-	-	integrated bus	-	-	integrated bus	bus cover
2. 16	2. 20	2. 22	2. 24 / 2. 26	2. 28	2. 30	2. 32 / 2. 34	2. 36

optical shaft encoders

							
BOSD	BOSH	BOSH	BOSH	BPSD	BISD	BPSV	
<i>Digitalizer</i>	<i>Digitalizer</i>	<i>Digitalizer</i>	<i>Digitalizer</i>			<i>ProCoder</i>	
SSI	SSI	CANopen	Profibus-DP CANopen DeviceNet EtherCAT	Profibus-DP CANopen DeviceNet	Profibus-DP CANopen DeviceNet	Profibus-DP CANopen DeviceNet EtherCAT	
17 bit	18 bit	18 bit	18 bit	13 bit	13 bit	13 bit	
5 VDC	5 VDC 10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	
-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-25...+85 °C	
IP 65	IP 65	IP 65	IP 65	IP 54	IP 54	IP 65	
6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	
12 mm	12 mm	12 mm	12 mm	max. 50 mm	14 mm	6 / 10 mm	
58x32 mm	58x32 mm	58x45 mm	58x74 mm	90x51 mm	58x51 mm	58x82 mm	
radial	radial	-	radial	radial	radial	radial	
radial	radial	axial	-	-	-	-	
-	-	integrated bus	bus cover	bus cover	bus cover	bus cover	
2. 50	2. 54	2. 58	2. 60	2. 62	2. 66	2. 68	

Introduction

Absolute encoders

Application

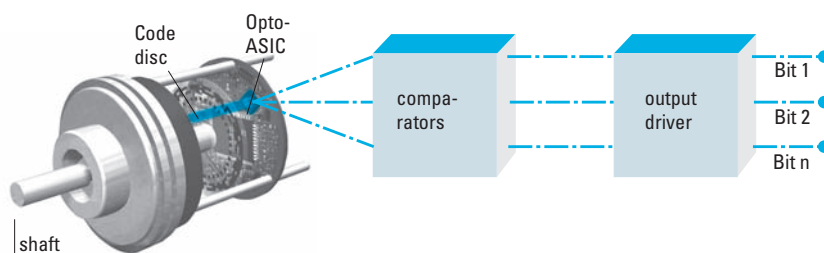


An absolute encoder provides the ability to remember its exact position following any power interruption. There is also no need for synchronization. This is one of the reasons why absolute encoders are used where a HIGH safety standard is required (i.e. robotics industry). Typical applications are for speed or position control circuits.

The features for these encoders are:

- a unique signal for each angular position
- no need for initialization (zero reference)
- immediately after power up or after an interruption of power the position is maintained
- no need for a counter to process the signal

Construction



The electrical signal of the absolute encoder is directly related to the angle of the shaft. The mechanical angular position is sensed by non contact optical elements, causing no wear. The output of an infrared diode is transmitted through a transparent code disc and a diaphragm. The light/dark pattern is converted to an electrical signal by an array of photo

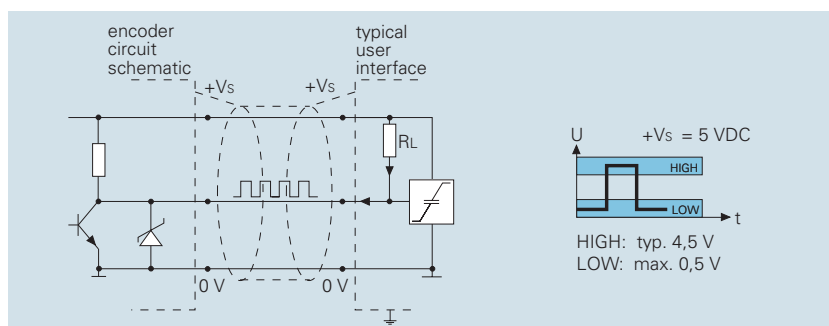
diodes. The same code occurs only once per revolution. This encoder is defined as a "single-turn" encoder.

Multi-turn encoder: see section 3

Output circuits

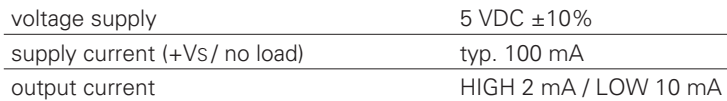
NPN

05N



voltage supply	5 VDC $\pm$ 5%
supply current (+Vs/ no load)	typ. 120 mA
output current	max. 100 mA at 85 °C

05T



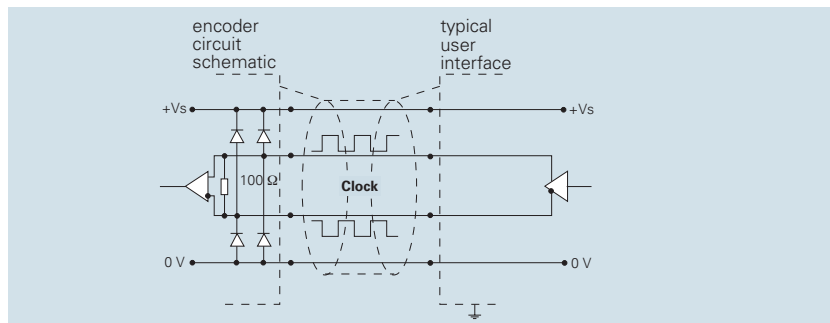
24K



05C



05C



Magnetic absolute single-turn encoder kit

BMSK – MAGRES

parallel

features

- robust single-turn encoder up to 9 bit
- parallel interface
- kit housing
- zero-point programmable

general data

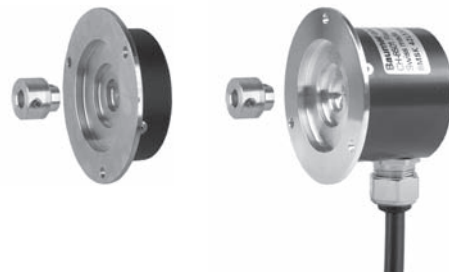
voltage supply	5 VDC $\pm 10\%$ (05T)
max. supply current no load	typ. 100 mA
output circuit	parallel 5 V
max. resolution	9 bit (1 step = 42' 11'')
max. error limit	$\pm 1^\circ$
repeatability	0,3°
max. switching frequency	51,2 kHz
input signal	zero (zero setting: < 0,4 V, > 2 ms off state: 3,3 V or open)
direction of rotation	looking at the MAGRES -flange, position counts up as the shaft rotates clockwise (CW)

mechanical data

max. revolutions	12'000 rpm (mechanical) 6'000 rpm (electrical)
moment of inertia	typ. $1,3 \times 10^{-7}$ kgm ²
mounting tolerance	axial: $\pm 0,3$ mm radial: $\pm 0,1$ mm
max. protection class	IP 67
material	housing: aluminum flange: aluminum
weight	approx. 50 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95%
vibration	IEC 60068-2-6 (≤ 300 m/s ² / 10 - 2'000 Hz)
shock	IEC 60068-2-27 ($\leq 1'000$ m/s ² / 6 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



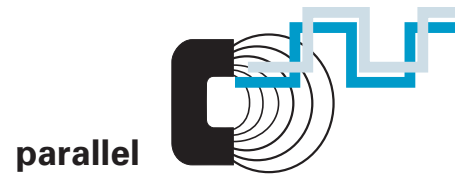
order designation

BMSK 42L1	☐	05T09/0006	☐
			connection
		B	connector axial IP 40
		5	cable 1 m radial IP 67
			dimensions
		06	magnetic rotor shaft $\varnothing$ 6mm
			resolution
		09	resolution 9 bit
			voltage supply/output
		05T	5 VDC TTL
			signal code
		N	binary code
		G	Gray code

The magnetic rotor is included in delivery.

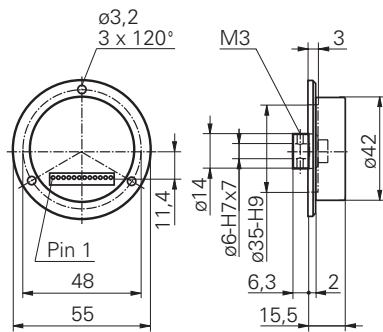
accessories

connector with single wires length 300 mm	part nr. 138525
connector with cable length 1 m (incl. cable gland M12x1,5)	part nr. 138785
Allen key 1,5 mm	part nr. 112433



dimensions

-B

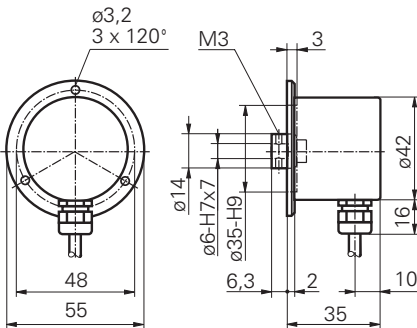


assignment connector

for connection reference **-B**

pin number	signal	description
1	+Vs	voltage supply
2	0 V	voltage supply
3	bit 1 LSB	data
4	bit 2	data
5	bit 3	data
6	bit 4	data
7	bit 5	data
8	bit 6	data
9	bit 7	data
10	bit 8	data
11	bit 9 MSB	data
12	zero	zero setting input

-5



Note

Magnetic rotor integrated in drawing.
Mounting drawings see end of chapter.

assignment cable

for connection reference **-5**

cable color	signal	description
brown	+Vs	voltage supply
white	0 V	voltage supply
green	bit 1 LSB	data
yellow	bit 2	data
grey	bit 3	data
pink	bit 4	data
blue	bit 5	data
red	bit 6	data
black	bit 7	data
purple	bit 8	data
grey/pink	bit 9 MSB	data
red/blue	zero	zero setting input
screen		housing
cable		12 x 0,14 mm ²

Magnetic absolute single-turn encoder kit

BMSK – MAGRES

SSI

features

- robust single-turn encoder up to 12 bit
- SSI interface
- kit housing
- zero-point programmable

general data

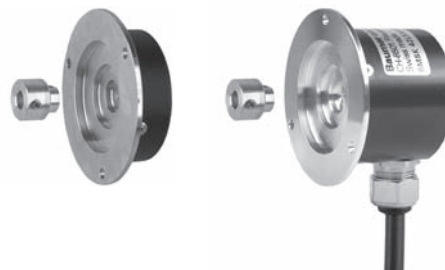
voltage supply	5 VDC $\pm 10\%$ (05C)
max. supply current no load	typ. 100 mA
output circuit	SSI, RS 422
max. resolution	12 bit (1 step = 5' 16'')
max. error limit	$\pm 1^\circ$
repeatability	0,3°
max. clock frequency	1 MHz
input signal	clock input, zero (zero setting: < 0,4 V, > 2 ms off state: 3,3 V or open)
direction of rotation	looking at the MAGRES -flange, position counts up as the shaft rotates clockwise (CW)

mechanical data

max. revolutions	12'000 rpm (mechanical) 6'000 rpm (electrical)
moment of inertia	typ. $1,3 \times 10^{-7} \text{ kgm}^2$
mounting tolerance	axial: $\pm 0,3 \text{ mm}$ radial: $\pm 0,1 \text{ mm}$
max. protection class	IP 67
material	housing: aluminum flange: aluminum
weight	approx. 50 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95%
vibration	IEC 60068-2-6 ($\leq 300 \text{ m/s}^2 / 10 - 2'000 \text{ Hz}$)
shock	IEC 60068-2-27 ($\leq 1'000 \text{ m/s}^2 / 6 \text{ ms}$)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



order designation

BMSK 42L1	05C12/0006	
		connection
	B	connector axial IP 40
	5	cable 0,5 m radial IP 67
		dimensions
	06	magnetic rotor shaft $\varnothing 6 \text{ mm}$
		resolution
	12	resolution 12 bit
		voltage supply/output
	05C	5VDC / SSI interface
		signal code
	N	binary code
	G	Gray code

The magnetic rotor is included in delivery.

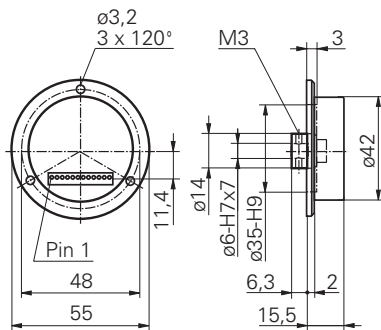
accessories

connector with single wires length 300 mm	part nr. 138525
connector with cable length 1 m (incl. cable gland M12x1,5)	part nr. 138792
Allen key 1,5 mm	part nr. 112433

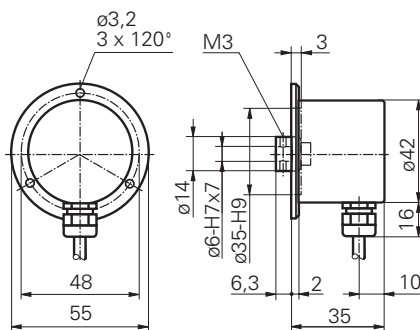


dimensions

-B



-5



Note

Magnetic rotor integrated in drawing.
Mounting drawings see end of chapter.

assignment connector

for connection reference **-B**

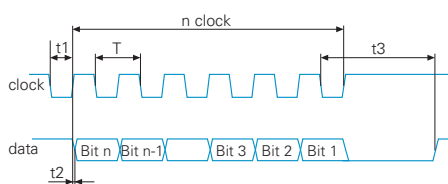
pin number	signal	description
1	0 V	voltage supply
2	+Vs	voltage supply
3	data+	data signal
4	data-	data signal
5	clock+	clock signal
6	clock-	clock signal
7-11	d.u.	do not use
12	zero	zero setting input

assignment cable

for connection reference **-5**

cable color	signal	description
brown	+Vs	voltage supply
white	0 V	voltage supply
grey	data+	data signal
pink	data-	data signal
green	clock+	clock signal
yellow	clock-	clock signal
blue	zero	zero setting input
red	d.u.	do not use
cable		8 x 0,14 mm ²

read out of position values



pulse times:

$T = 1 \mu s$ to $10 \mu s$ / $t_1 = 0,5$ to $5 \mu s$

$t_2 < 0,2 \mu s$ / $t_3 > 12 \mu s$ to $25 \mu s$

Magnetic absolute single-turn encoder kit

BMSK – MAGRES

parallel

features

- robust single-turn encoder up to 12 bit
- parallel interface
- kit housing
- zero-point programmable
- IP 67

general data

voltage supply	10 - 30 VDC (24K)
max. supply current no load	typ. 50 mA (to 24 VDC)
output circuit	parallel 10 - 30 VDC
max. resolution	12 bit (1 step = 5' 16'')
max. error limit	±1°
repeatability	0,3°
max. switching frequency	1 MHz
input signal	zero (zero setting: < 0,4 V, > 2 ms off state: 3,3 V or open)
direction of rotation	looking at the MAGRES -flange, position counts up as the shaft rotates clockwise (CW)

mechanical data

max. revolutions	12'000 rpm (mechanical) 6'000 rpm (electrical)
moment of inertia	typ. 12×10^{-7} kgm ²
mounting tolerance	axial: ±0,3 mm radial: ±0,1 mm
max. protection class	IP 67
material	housing: steel/aluminum flange: aluminum
weight	approx. 300 g

ambient conditions

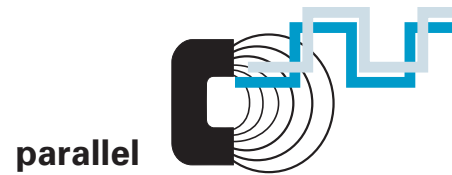
temperature range	-20...+85 °C
relative humidity	max. 95%
vibration	IEC 60068-2-6 (≤ 300 m/s ² / 10 - 2'000 Hz)
shock	IEC 60068-2-27 (≤ 1'000 m/s ² / 6 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



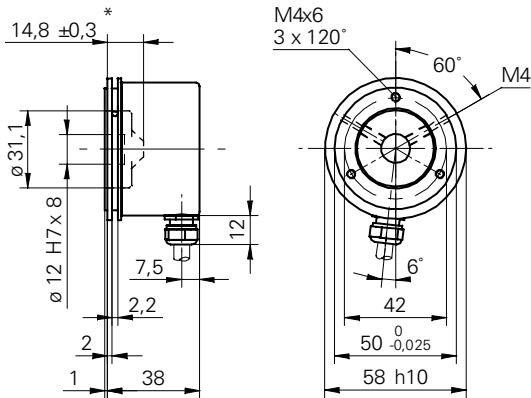
order designation

BMSK 58S1	☐	24K12/00125	
			connection
		5	cable 2 m radial
			dimensions
		12	magnetic rotor shaft ø 12 mm
			resolution
		12	12 bit
			voltage supply/output
		24K	10 - 30 VDC push-pull, short-circuit protection
			signal code
		N	binary code
		G	Gray code

The magnetic rotor is included in delivery.



dimensions



* Place the magnetic rotor as close to the flange as possible.
distance max. $\pm 0,3$ mm, lateral tolerance max. $\pm 0,1$ mm

Note

Magnetic rotor integrated in drawing.
Mounting drawings see end of chapter.

assignment cable

for connection reference -5

cable color	signal	description
brown	+Vs	voltage supply
white	0 V	voltage supply
green	bit 1 LSB	data
yellow	bit 2	data
grey	bit 3	data
pink	bit 4	data
blue	bit 5	data
red	bit 6	data
black	bit 7	data
purple	bit 8	data
grey/pink	bit 9	data
white/green	bit 10	data
brown/green	bit 11	data
yellow/brown	bit 12 MSB	data
white/yellow	¹⁾ bit 12 MSB inv.	(Gray code only)
red/blue	zero	zero setting input
cable		16 x 0,14 mm ²

accessories

clamb set	part nr. 110616
Allen key 2 mm	part nr. 112432

direction of rotation

¹⁾The direction of rotation from encoders using a Gray code can be defined by connecting the MSB or inverted MSB. Both signals are available as an output. If the MSB is connected, the encoder counts up as the shaft rotates clockwise. If the MSB inv. is connected, the encoder counts up if the shaft rotates counter clockwise.

Magnetic absolute single-turn encoder kit

BMSK – MAGRES

SSI

features

- robust single-turn encoder up to 12 bit
- SSI interface
- kit housing
- zero-point programmable
- IP 67

general data

voltage supply	5 VDC $\pm 10\%$ (05C) 10 - 30 VDC (24C)
max. supply current no load	typ. 100 mA (at 5 VDC) (05C) typ. 50 mA (at 24 VDC) (24C)
output circuit	SSI, RS 422
max. resolution	12 bit (1 step = 5' 16'')
max error limit	$\pm 1^\circ$
repeatability	0,3°
max. clock frequency	1 MHz
input signal	clock input, zero (zero setting: < 0,4 V, > 2 ms off state: 3,3 V or open)
direction of rotation	looking at the MAGRES -flange, position counts up as the shaft rotates clockwise (CW)

mechanical data

max. revolutions	12'000 rpm (mechanical) 6'000 rpm (electrical)
moment of inertia	typ. $12 \times 10^{-7} \text{ kgm}^2$
mounting tolerance	axial: $\pm 0,3 \text{ mm}$ radial: $\pm 0,1 \text{ mm}$
max. protection class	IP 67
material	housing: aluminum/steel flange: aluminum
weight	approx. 300 g

ambient conditions

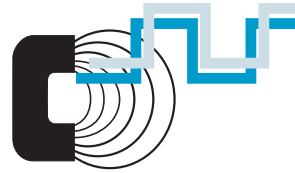
temperature range	-20...+85 °C
relative humidity	max. 95%
vibration	IEC 60068-2-6 ($\leq 300 \text{ m/s}^2$ / 10 - 2'000 Hz)
shock	IEC 60068-2-27 ($\leq 1'000 \text{ m/s}^2$ / 6 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



order designation

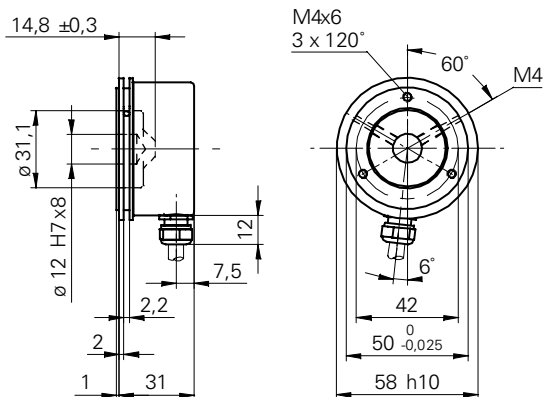
BMSK 58S1	☐	☐	12/00125	
				connection
			5	cable 2 m radial
				dimensions
			12	magnetic rotor shaft $\varnothing 12\text{mm}$
				resolution
			12	12 bit
				voltage supply/output
			24C	10 - 30 VDC SSI
			05C	5 VDC SSI
				signal code
	N			binary code
	G			Gray code

The magnetic rotor is included in delivery.



dimensions

-5



Note

Magnetic rotor integrated in drawing.
Mounting drawings see end of chapter.

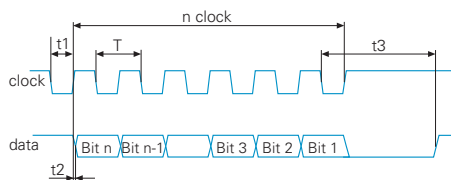
assignment cable

for connection reference **-5**

cable color	signal	description
brown	+Vs	voltage supply
white	0 V	voltage supply
grey	data+	data signal
pink	data-	data signal
green	clock+	clock signal
yellow	clock-	clock signal
blue	zero	zero setting input
red	d.u.	do not use
screened		housing
cable		8 x 0,14 mm ²

2

read out of position values



pulse times:
 $T = 1 \mu\text{s} \text{ to } 10 \mu\text{s}$ / $t_1 = 0,5 \text{ to } 5 \mu\text{s}$
 $t_2 < 0,2 \mu\text{s}$ / $t_3 > 12 \mu\text{s} \text{ to } 25 \mu\text{s}$

accessories

clamb set	part nr. 110616
Allen key 2 mm	part nr. 112432

Magnetic absolute single-turn encoder

BMSV – *MAGRES*

SSI

features

- miniaturized single-turn shaft encoder up to 10 bit
- SSI interface
- miniature housing
- zero-point programmable



general data

voltage supply	5 VDC $\pm 5\%$ (05C) 10 - 30 VDC (24C)
max. supply current no load	typ. 110 mA (at 5VDC) (05C) typ. 40 mA (at 24VDC) (24C)
output circuit	SSI, RS 422
signal code	Gray code or binary code
max. resolution	10 bit
max error limit	$\pm 1^\circ$
repeatability	0,3°
max. clock frequency	1 MHz
zero setting input	zero setting: < 0,4 V, min. 2 ms off state: voltage supply or open
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW)

mechanical data

max. revolutions	6'000 rpm
moment of inertia	typ. $0,65 \times 10^{-7}$ kgm ²
torque	typ. 0,75 cNm (3'000 rpm / 20 °C)
max. shaft load	axial: 10N radial: 10N
product life	depending on ambient conditions (typ. 10^9 revolutions)
max. protection class	IP 65
material	housing: polyamide flange: aluminum
weight	approx. 90 g

order designation

BMSV 30S1 **/00**

connection

4 cable 1 m axial
5 cable 1 m radial
9 connector radial M9

shaft

L5 shaft 5mm IP 65

resolution

10 10 bit

voltage supply, output signals

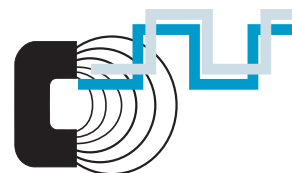
05C 5 VDC SSI
24C 10 - 30 VDC SSI

signal code

N binary code
G Gray code

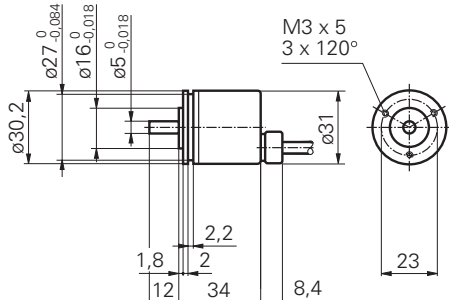
ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95%
vibration (sine)	IEC 60068-2-6 ($\leq 300 \text{ m/s}^2 / 10 - 2'000 \text{ Hz}$) 150 min per axis
vibration (random)	IEC 60068-2-64 ($\leq 0,1 \text{ g}^2/\text{Hz} / 20 - 2'000 \text{ Hz}$) 30 min per axis
shock	IEC 60068-2-27 ($\leq 1'000 \text{ m/s}^2 / 6 \text{ ms}$) 10 pulses per axis and direction
bump	IEC 60068-2-29 ($\leq 1'000 \text{ m/s}^2 / 2 \text{ ms}$) 4'000 pulses per axis and direction
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3

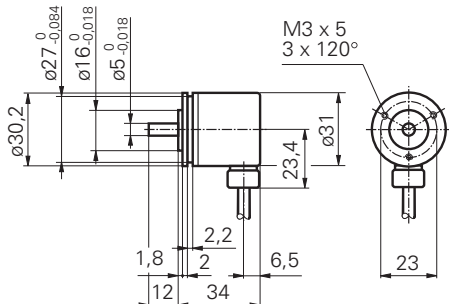


dimensions and connection dimensions

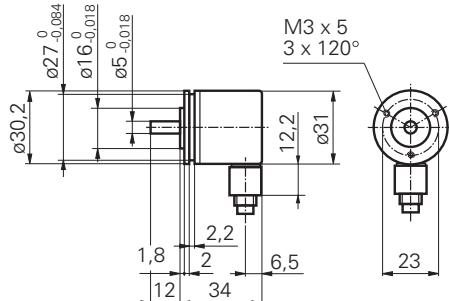
-4



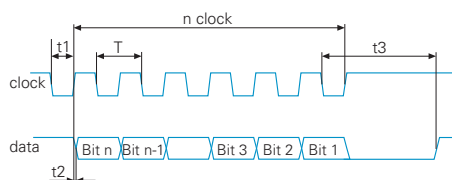
-5



-9



read out of position values



pulse times:

$T = 1 \mu\text{s}$ to $10 \mu\text{s}$ / $t_1 = 0,5$ to $5 \mu\text{s}$

$t_2 < 0,2 \mu\text{s}$ / $t_3 > 12 \mu\text{s}$ to $25 \mu\text{s}$

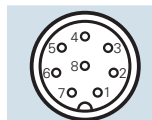
assignment cable

for connection reference **-4** and **-5**

cable color	signal	description
brown	+Vs	voltage supply
white	0 V	voltage supply
grey	Data+	data signal
pink	Data-	data signal
green	Clock+	clock signal
yellow	Clock-	clock signal
blue	Zero	zero setting input
red	d.u.	do not use
screen		housing
cable		$8 \times 0,14 \text{ mm}^2$

assignment connector M9 male

for connection reference **-9**



pin number	signals
1	0 V
2	+Vs
3	Clock+
4	Clock-
5	Data+
6	Data-
7	Zero
8	d.u.

accessories

cable with connector M9 female (pre-assembled) ref. -9	
2 m	part nr. 123168 (ES62FB2)
5 m	part nr. 123169 (ES62FB5)
connector M9 female ref. -9	part nr. 132983
clamp set	part nr. 106004
couplings	see chapter accessories

Magnetic absolute single-turn encoder

BMSH – MAGRES

SSI

features

- miniaturized single-turn hollow shaft encoder up to 10 bit
- SSI interface
- end shaft mounting up to $\varnothing$ 12mm
- zero-point programmable



general data

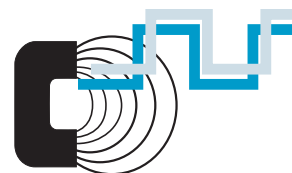
voltage supply	5 VDC $\pm$ 5% (05C) 10 - 30 VDC (24C)
max. supply current no load	typ. 110 mA (at 5 VDC) (05C) typ. 40 mA (at 24 VDC) (24C)
output circuit	SSI, RS 422
signal code	Gray code or binary code
max. resolution	10 bit
max error limit	$\pm 1^\circ$
repeatability	0,3°
max. clock frequency	1 MHz
zero setting input	zero setting: < 0,4 V, min. 2 ms off state: voltage supply or open
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW)

mechanical data

max. revolutions	6'000 rpm
moment of inertia	typ. 3×10^{-7} kgm ²
torque	typ. 0,75 cNm (3'000 rpm / 20 °C)
product life	depending on ambient conditions (typ. 10 ⁹ revolutions)
max. protection class	IP 65
material	housing: polyamide flange: aluminum
weight	approx. 120 g

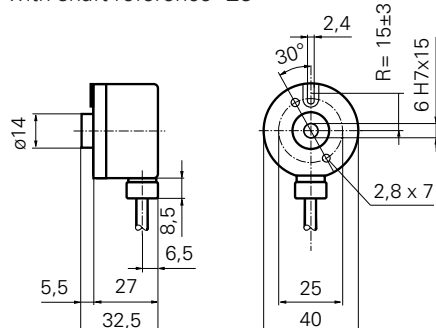
ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95%
vibration (sine)	IEC 60068-2-6 (≤ 300 m/s ² / 10 - 2'000 Hz) 150 min per axis
vibration (random)	IEC 60068-2-64 ($\leq 0,1$ g ² /Hz / 20 - 2'000 Hz) 30 min per axis
shock	IEC 60068-2-27 ($\leq 1'000$ m/s ² / 6 ms) 10 pulses per axis and direction
bump	IEC 60068-2-29 ($\leq 1'000$ m/s ² / 2 ms) 4'000 pulses per axis and direction
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3

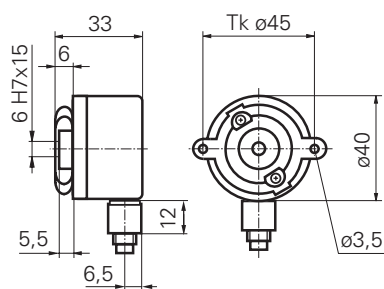


dimensions and connection dimensions

-5 with shaft reference **-E6**

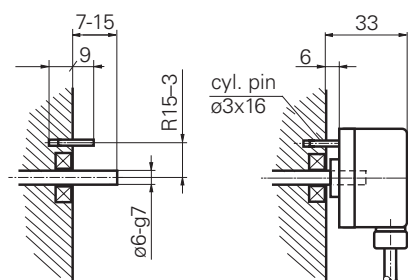


-9 with shaft reference **-E6** and spring plate

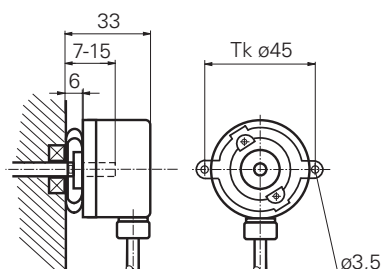


mounting

-E6 end shaft 6 mm no spring plate

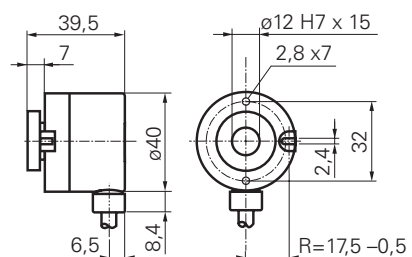


end shaft 6 mm with spring plate

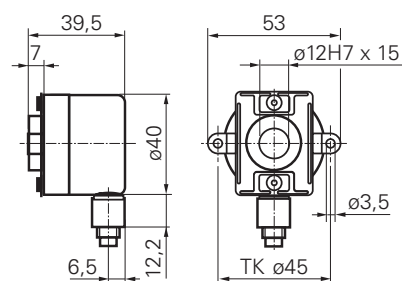


dimensions and connection dimensions

-5 with shaft reference **-E2**

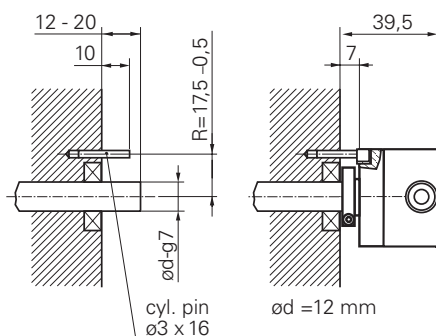


-9 with shaft reference **-E2** and spring plate

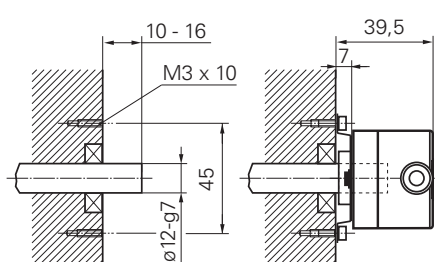


mounting

-E2 end shaft 12 mm no spring plate



end shaft 12 mm with spring plate



Magnetic absolute single-turn encoder

BMSH – MAGRES

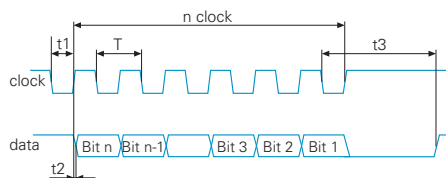
SSI

assignment cable

for connection reference **-4** and **-5**

cable color	signals	description
brown	+Vs	voltage supply
white	0 V	voltage supply
grey	Data+	data signal
pink	Data-	data signal
green	Clock+	clock signal
yellow	Clock-	clock signal
blue	Zero	zero setting input
red	d.u.	do not use
screen		housing
cable data		8 x 0,14 mm ²

read out of position values



pulse time:

$T = 1 \mu\text{s}$ to $10 \mu\text{s}$ / $t_1 = 0,5$ to $5 \mu\text{s}$

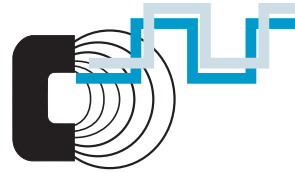
$t_2 < 0,2 \mu\text{s}$ / $t_3 > 12 \mu\text{s}$ to $25 \mu\text{s}$

assignment connector M9 male

for connection reference **-9**



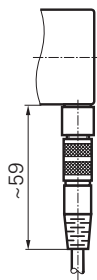
pin number	signals
1	0 V
2	+Vs
3	Clock+
4	Clock-
5	Data+
6	Data-
7	Zero
8	d.u.



order designation

BMSH 40D1					/00		
							connection
						4	cable 1 m axial
						5	cable 1 m radial
						9	connector radial
							shaft
						E6	end shaft 6 mm IP 65 with clamping ring
						E2	end shaft 12 mm IP 65 clamping ring
							resolution
						10	10 bit
							voltage range, output signals
						05C	5 VDC SSI
						24C	10 - 30 VDC SSI
							signal code
						N	binary code
						G	Gray code

mounting connector



accessories

cable with connector M9 female (pre-assembled) ref. -9	
2 m	part nr. 123168 (ES62FB2)
5 m	part nr. 123169 (ES62FB5)
connector M9 female ref. -9	part nr. 132983
spring plate set (round)	
for <8 mm end shaft	part nr. 158423
spring plate set (square)	
for ≥8 mm end shaft	part nr. 158424
clamp set	part nr. 106004
couplings	see chapter accessories

Magnetic absolute single-turn encoder

BMSH – MAGRES

parallel

features

- robust single-turn encoder up to 9 bit
- parallel interface
- miniature housing
- zero-point programmable

general data

voltage supply	5 VDC $\pm 10\%$ (05T)
max. supply current no load	typ. 100 mA
output circuit	parallel 5 VDC
max. measuring step	9 bit (1 step = $42' 11''$)
max error limit	$\pm 1^\circ$
repeatability	0,3°
max. switching frequency	51,2 kHz
input signal	zero (zero setting: $< 0,4 \text{ V}$, $> 2 \text{ ms}$ off state: 3,3 V or open)
direction of rotation	looking at the MAGRES -flange, position counts up as the shaft rotates clockwise (CW)

mechanical data

max. revolutions	12'000 rpm (mechanical) 6'000 rpm (electrical)
moment of inertia	typ. $12 \times 10^{-7} \text{ kgm}^2$
torque	typ. 0,93 cNm (3'000 rpm / 20 °C / IP42)
product life	depending on ambient conditions (typ. 10^9 revolutions)
max. protection class	shaft: IP 65 housing: IP 65
material	housing: steel/aluminum flange: aluminum
weight	approx. 120 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. relative humidity 95%
vibration	IEC 60068-2-6 ($\leq 300 \text{ m/s}^2$ / 10 - 2'000 Hz)
shock	IEC 60068-2-27 ($\leq 1'000 \text{ m/s}^2$ / 6 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



order designation

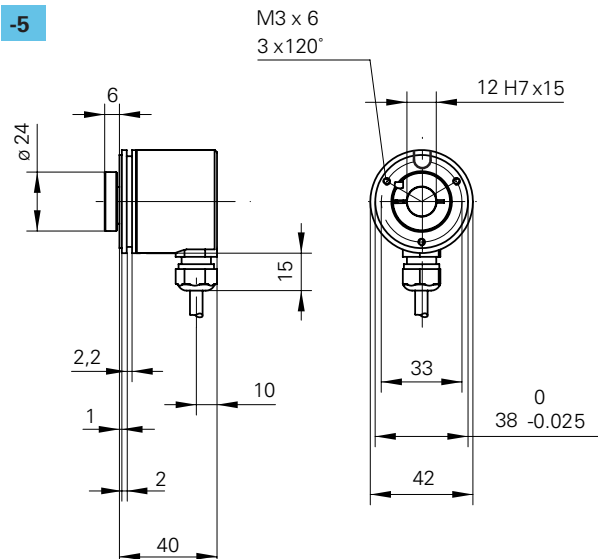
BMSH 42S1	05T09/00	5
		connection
		5 cable 1 m radial
		hollowshaft
		B2 endshaft 12 mm IP 42 withclamping ring
		P2 endshaft 12 mm IP 65 withclamping ring
		resolution
		09 9 bit
		voltage supply/output
		05T 5 VDC output TTL
		signal code
		N binary code
		G Gray code

accessories

clamp set	part nr. 110616
spring plate set	part nr. 138610
shaft adapter	see chapter accessories
clamping ring set 12 mm hollow shaft	part nr. 142556



dimensions



Note

Mounting drawings see end of chapter.

assignment cable

for connection reference **-5**

cable color	signal	description
brown	+Vs	voltage supply
white	0 V	voltage supply
green	bit 1 LSB	data
yellow	bit 2	data
grey	bit 3	data
pink	bit 4	data
blue	bit 5	data
red	bit 6	data
black	bit 7	data
purple	bit 8	data
grey/pink	bit 9 MSB	data
red/blue	zero	zero setting input
screen		housing
cable specs		16 x 0,14 mm ²

Magnetic absolute single-turn encoder

BMSH – MAGRES

SSI

features

- robust single-turn encoder up to 12 bit
- SSI interface
- miniature housing
- zero-point programmable

general data

voltage supply	5 VDC $\pm 10\%$ (05C)
max. supply current no load	typ. 100 mA
output circuit	SSI, RS 422
max. resolution	12 bit (1 step = 5' 16'')
max error limit	$\pm 1^\circ$
repeatability	0,3°
max. clock frequency	1 MHz
input signal	clock input, zero (zero setting: < 0,4 V, > 2 ms off state: 3,3 V or open)
direction of rotation	looking at the MAGRES -flange, position counts up as the shaft rotates clockwise (CW)

mechanical data

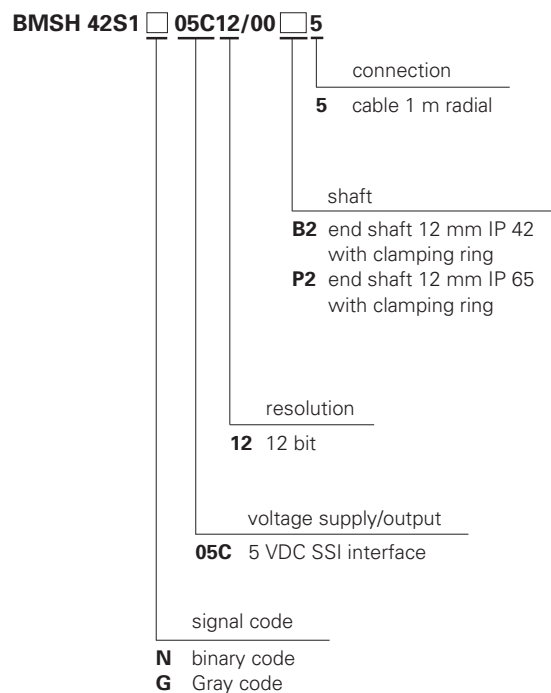
max. revolutions	12'000 rpm (mechanical) 6'000 rpm (electrical)
moment of inertia	typ. 12×10^{-7} kgm ²
torque	typ. 0,93 cNm (3'000 rpm / 20 °C / IP 42)
product life	depending on ambient conditions (typ. 10^9 revolutions)
max. protection class	shaft: IP 65 housing: IP 65
material	housing: steel/aluminum flange: aluminum
weight	approx. 120 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95%
vibration	IEC 60068-2-6 (≤ 300 m/s ² / 10 - 2'000 Hz)
shock	IEC 60068-2-27 ($\leq 1'000$ m/s ² / 6 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



order designation

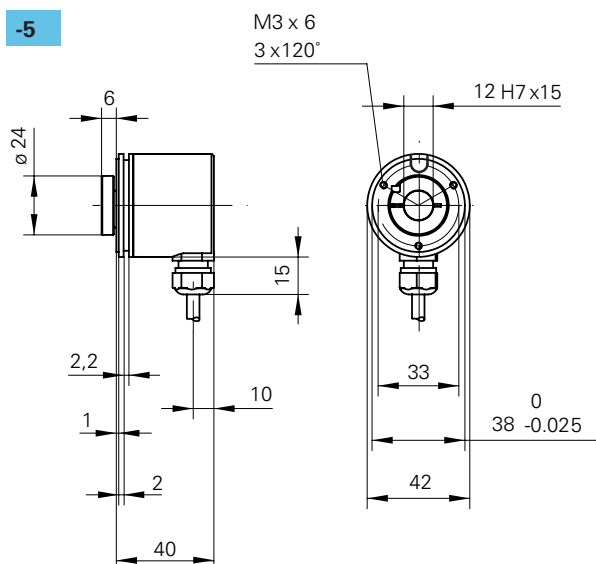


accessories

clamp set	part nr. 110616
spring plate set	part nr. 138610
shaft adapter	see chapter accessories
clamping ring set 12 mm hollow shaft	part nr. 142556



dimensions



Note

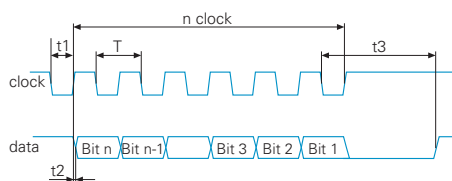
Mounting drawings see end of chapter.

assignment cable

for connection reference **-5**

cable color	signal	description
brown	+Vs	voltage supply
white	0 V	voltage supply
grey	data+	data signal
pink	data-	data signal
green	clock+	clock signal
yellow	clock-	clock signal
blue	zero	zero setting input
red	d.u.	do not use
screen		housing
cable		8 x 0,14 mm ²

read out of position values



pulse times:

$T = 1 \mu\text{s to } 10 \mu\text{s}$ / $t_1 = 0,5 \text{ to } 5 \mu\text{s}$

$t_2 < 0,2 \mu\text{s}$ / $t_3 > 12 \mu\text{s to } 25 \mu\text{s}$

Magnetic absolute single-turn encoder

BMSH – MAGRES

CANopen

features

- robust single-turn encoder up to 12 bit
- CANopen interface integrated
- miniature housing
- programmable resolution and preset values

general data

voltage supply	10 - 30 VDC (24B)
max. supply current no load	typ. 100 mA (at 24 VDC)
output circuit	CAN-Bus, Standard ISO/DIS 11898
specification	CAN 2.0B
protocol/profile	CANopen/CIA, DS-301 V4.01, DSP-305 V1.0 (LSS), DS-406 V3.0
signal code	natural binary code
angular resolution	12 bit (1 step = 5'16'')
max error limit	±1°
repeatability	0,3°
max. baud rate	1 Mbit/s
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

mechanical data

max. revolutions	12'000 rpm (mechanical) 6'000 rpm (electrical)
moment of inertia	12 x 10 ⁻⁷ kgm ²
operation torque	typ. 0,93 cNm (3'000 rpm / 20 °C / IP 42)
product life	depending on ambient conditions (typ. 10 ⁹ revolutions)
max. protection class	IP 65
material	housing: steel flange: aluminum
weight	approx. 190 g

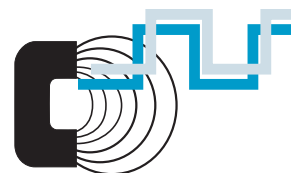


order designation

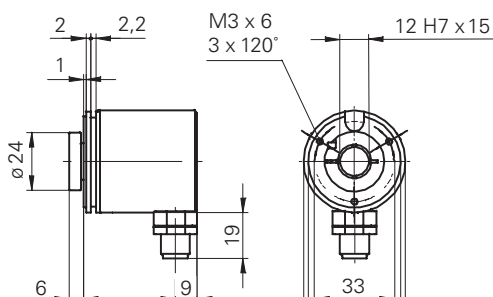
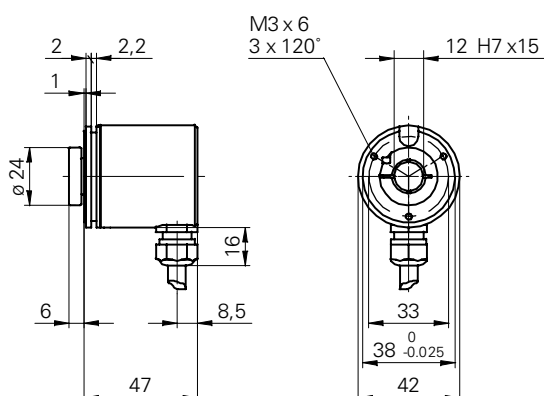
BMSH 42S1N 24B12/00	☐	☐
	connection	
	5 cable 1 m radial	
	N connector radial M12	
	shaft	
	B2 end shaft 12 mm IP 42 with clamping ring	
	P2 end shaft 12 mm IP 65 with clamping ring	
	resolution single-turn	
	12 12 bit	
	voltage range, output signals	
	24B 10 - 30 VDC, CANopen	
	signal code	
	N binary code	

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 (≤ 300 m/s ² / 10 - 2'000 Hz)
shock	IEC 60068-2-27 (≤ 1'000 m/s ² / 6 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



dimensions



Note

Mounting drawings see end of chapter.

assignment cable

cable color	signal	description
brown	+Vs	voltage supply
white	0 V	voltage supply
green	CAN_H	bus line (dominant HIGH)
yellow	CAN_L	bus line (dominant LOW)
grey	CAN_GND	CAN ground
pink	n.c.	
blue	d.u.	do not use
red	d.u.	do not use
screen		housing
cable data		8 x 0,14 mm ²

assignment 5-pin M12 male

pin	signals	connector
1	n.c.	not connected
2	+Vs	voltage supply
3	CAN_GND	CAN ground / 0 VDC
4	CAN_H	bus line (dominant HIGH)
5	CAN_L	bus line (dominant LOW)

accessories

clamp set	part nr. 110616
spring plate set	part nr. 138610
shaft adapter	see chapter accessories
CD-ROM with GSD/EDS/XML-files and manuals	part nr. 147362
clamping ring set	
12 mm hollow shaft	part nr. 142556
connector (female) M12 CAN	part nr. 153968
connector (male) M12 CAN	part nr. 153969
T connector M12 CAN	part nr. 153972
terminating resistor	part nr. 153974

Magnetic absolute single-turn encoder

BMSH – MAGRES

DeviceNet

features

- robust single-turn encoder up to 12 bit
- DeviceNet interface integrated
- miniature housing
- programmable resolution and preset values

general data

voltage supply	10 - 30 VDC
max. supply current no load	typ. 100 mA (at 24 VDC)
output circuit	CAN-Bus, Standard ISO/DIS 11898
protocol/profile	DeviceNet, Device Profile for Encoders V1.0
signal code	natural binary code
angular resolution	12 bit (1 step = 5'16'')
max error limit	±1°
repeatability	0,3°
max. baud rate	500 kbit/s
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

mechanical data

max. revolutions	12'000 rpm (mechanical) 6'000 rpm (electrical)
moment of inertia	12 x 10 ⁻⁷ kgm ²
operation torque	typ. 0,93 cNm (3'000 rpm / 20 °C / IP 42)
product life	depending on ambient conditions (typ. 10 ⁹ revolutions)
max. protection class	IP 65
material	housing: steel flange: aluminum
weight	approx. 190 g

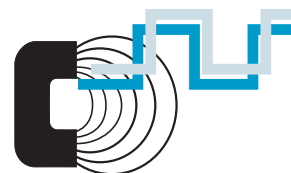


order designation

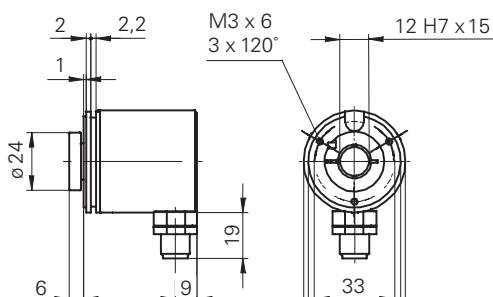
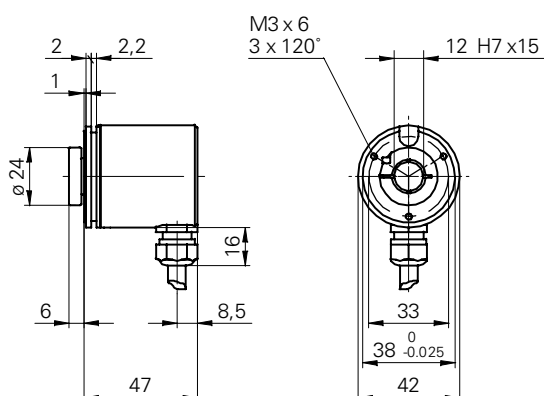
BMSH 42S1N 24D12/00	
	connection
5	cable 1 m radial
N	connector radial M12
	shaft
B2	end shaft 12 mm IP 42 with clamping ring
P2	end shaft 12 mm IP 65 with clamping ring
	resolution single-turn
12	12 bit
	voltage range, output signals
24D	10 - 30 VDC, DeviceNet
	signal code
N	binary code

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 (≤ 300 m/s ² / 10 - 2'000 Hz)
shock	IEC 60068-2-27 (≤ 1'000 m/s ² / 6 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



dimensions



Note

Mounting drawings see end of chapter.

assignment cable

cable color	signal	description
brown	+Vs	voltage supply
white	0 V	voltage supply
green	CAN_H	bus line (dominant HIGH)
yellow	CAN_L	bus line (dominant LOW)
grey	CAN_GND	CAN ground
pink	n.c.	
blue	d.u.	do not use
red	d.u.	do not use
screen	CAN_SHLD	CAN shield
cable data		8 x 0,14 mm ²

assignment 5-pin M12 male

pin	signals	connector
1	CAN_SHLD	CAN shield
2	+Vs	voltage supply
3	CAN_GND	CAN Ground / 0 VDC
4	CAN_H	bus line (dominant HIGH)
5	CAN_L	bus line (dominant LOW)

accessories

clamp set	part nr. 110616
spring plate set	part nr. 138610
shaft adapter	see chapter accessories
CD-ROM with GSD/EDS/XML-files and manuals	part nr. 147362
clamping ring set	
12 mm hollow shaft	part nr. 142556
connector (female) M12 CAN	part nr. 153968
connector (male) M12 CAN	part nr. 153969
T connector M12 CAN	part nr. 153972
terminating resistor	part nr. 153974

Magnetic absolute single-turn encoder

BMSH – MAGRES

parallel

features

- robust single-turn encoder up to 12 bit
- parallel interface
- zero-point programmable

general data

voltage supply	10 - 30 VDC
max. supply current no load	typ. 50 mA (at 24 VDC)
output circuit	parallel 10 - 30 VDC
max. resolution	12 bit (1 step = 5' 16'')
max error limit	±1°
repeatability	0,3°
max. switching frequency	51,2 kHz
input signal	zero (zero setting: < 0,4 V, > 2 ms off state: 3,3 V or open)
direction of rotation	looking at the MAGRES -flange, position counts up as the shaft rotates clockwise (CW)

mechanical data

max. revolutions	12'000 rpm (mechanical) 6'000 rpm (electrical)
moment of inertia	typ. 12×10^{-7} kgm ²
torque	typ. 0,93 cNm (3'000 rpm / 20 °C / IP 42)
product life	depending on ambient conditions (typ. 10 ⁹ revolutions)
max. protection class	shaft: IP 65 housing: IP 65
material	housing: steel/aluminum flange: aluminum
weight	approx. 300 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95%
vibration	IEC 60068-2-6 (≤ 300 m/s ² / 10 - 2'000 Hz)
shock	IEC 60068-2-27 (≤ 1'000 m/s ² / 6 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



order designation

BMSH 58S1	24K12/00	5
		connection
		5 cable 2 m radial
		hollowshaft
		B2 end shaft 12 mm IP 42 with clamping ring
		P2 end shaft 12 mm IP 65 with clamping ring
		resolution
		12 12 bit
		voltage supply/output
		24K 10 - 30 VDC push-pull short-circuit protection
		signal code
		N binary code
		G Gray code

accessories

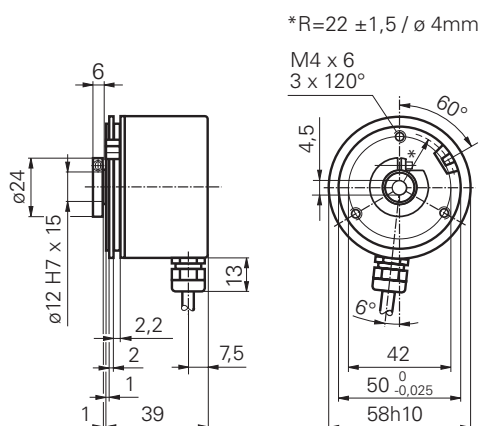
clamp set	part nr. 110616
torque pin	part nr. 107540
torque spring ¹⁾	part nr. 109520
spring plate	part nr. 136635
coupling and shaft adapter	see chapter accessories
clamping ring set 12 mm hollow shaft	part nr. 142556

¹⁾ torque spring included



dimensions

-5



Note

Mounting drawings see end of chapter.

assignment cable

for connection reference **-5**

cable color	signal	description
brown	+Vs	voltage supply
white	0 V	voltage supply
green	bit 1 LSB	data
yellow	bit 2	data
grey	bit 3	data
pink	bit 4	data
blue	bit 5	data
red	bit 6	data
black	bit 7	data
purple	bit 8	data
grey/pink	bit 9	data
white/green	bit 10	data
brown/green	bit 11	data
yellow/brown	bit 12 MSB	data
white/yellow	¹⁾ bit 12 MSB inv.	(only Gray code)
red/blue	zero	zero setting input
screen		housing
cable data		16 x 0,14 mm ²

direction of rotation

¹⁾The direction of rotation from encoders using a Gray code can be defined by connecting the MSB or inverted MSB. Both signals are available as an output. If the MSB is connected, the encoder counts up as the shaft rotates clockwise. If the MSB inv. is connected, the encoder counts up if the shaft rotates counter clockwise.

Magnetic absolute single-turn encoder

BMSH – MAGRES

SSI

features

- robust single-turn encoder up to 12 bit
- SSI interface
- zero-point programmable

general data

voltage supply	5 VDC $\pm 10\%$ (05C) 10 - 30 VDC (24C)
max. supply current no load	typ. 100 mA (05C) typ. 50 mA (24C)
output circuit	SSI, RS 422
max. resolution	12 bit (1 steps = 5' 16")
max error limit	$\pm 1^\circ$
repeatability	0,3°
max. clock frequency	1 MHz
input signal	clock input, zero (zero setting: < 0,4 V, > 2 ms off state: 3,3 V or open)
direction of rotation	looking at the MAGRES -flange, position counts up as the shaft rotates clockwise (CW)

mechanical data

max. revolutions	12'000 rpm (mechanical) 6'000 rpm (electrical)
moment of inertia	typ. $12 \times 10^{-7} \text{ kgm}^2$
torque	typ. 0,93 cNm (3'000 rpm / 20 °C / IP 42)
product life	depending on ambient conditions (typ. 10^9 revolutions)
max. protection class	shaft: IP 65 housing: IP 65
material	housing: steel/aluminum flange: aluminum
weight	approx. 300 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95%
vibration	IEC 60068-2-6 ($\leq 300 \text{ m/s}^2$ / 10 - 2'000 Hz)
shock	IEC 60068-2-27 ($\leq 1'000 \text{ m/s}^2$ / 6 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



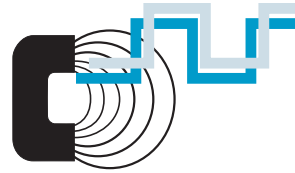
order designation

BMSH 58S1			12/00		
					connection
				5	cable 2 m radial
				A	connector radial M23
					hollowshaft
				B2	end shaft 12 mm IP 42 with clamping ring
				P2	end shaft 12 mm IP 65 with clamping ring
					resolution
			12		12 bit
					voltage supply/output
				05C	5 VDC SSI
				24C	10 - 30 VDC SSI
					signal code
				N	binary code
				G	Gray code

accessories

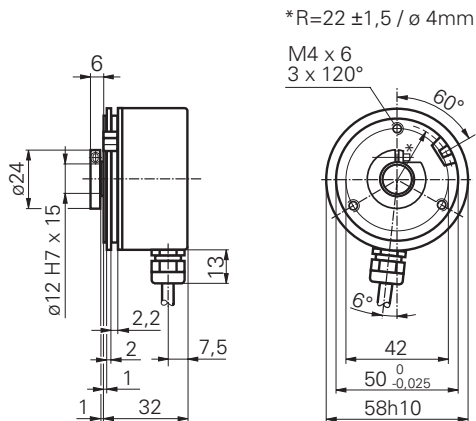
connector M23 female 12-pin reference -A	part nr. 116717
cable with connector M23 female (pre-assembled) ref. -A	
2 m	part nr. 153334
5 m	part nr. 153335
clamp set	part nr. 110616
torque pin	part nr. 107540
torque spring ¹⁾	part nr. 109520
spring plate	part nr. 136635
coupling and shaft adapter	see chapter accessories
clamping ring set 12 mm hollow shaft	part nr. 142556

¹⁾ torque spring included



dimensions and connection dimensions

-5



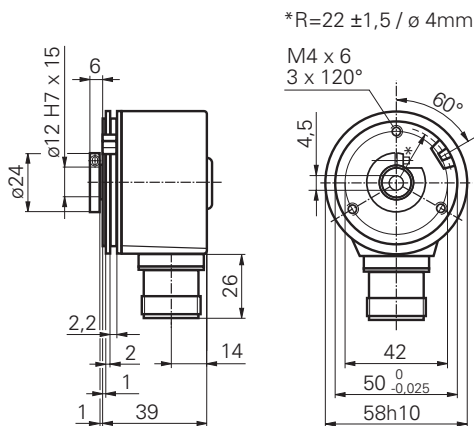
assignment cable/connector M23 male

for connection reference **-5**



pin	cable color	signals	description
1	yellow	clock-	clock signal
2	green	clock+	clock signal
3	grey	data+	data signal
4	pink	data-	data signal
5	blue	zero	zero setting
6	-	n.c.	-
7	-	n.c.	-
8	-	n.c.	-
9	red	d.u.	do not use
10	-	n.c.	-
11	brown	+Vs	voltage supply
12	white	0 V	voltage supply
cable data		8 x 0,14 mm ²	

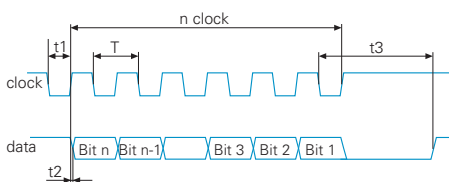
-A



Note

Mounting drawings see end of chapter.

read out of position values



pulse times:

T = 1 µs to 10 µs / t1 = 0,5 to 5 µs

t2 < 0,2 µs / t3 > 12 µs to 25 µs

Magnetic absolute single-turn encoder

BMSH – MAGRES

CANopen

features

- robust single-turn encoder up to 12 bit
- CANopen interface integrated
- programmable resolution and preset values



general data

voltage supply	10 - 30 V (24B)
max. supply current no load	typ. 100 mA (at 24 VDC)
output circuit	CAN-Bus, standard ISO/DIS 11898
specification	CAN 2.0B
protocol/profile	CANopen/CIA, DS-301 V4.01, DSP-305 V1.0, DS-406 V3.0
signal code	natural binary-code
resolution	12 bit (1 = 5' 16'')
max error limit	±1°
repeatability	0.3°
max. baud rate	1 Mbit/s
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

order designation

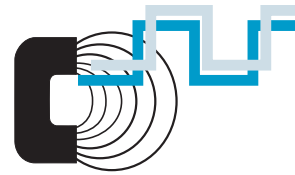
BMSH 58S1N 24B12/00	F	connection
	F	D-Sub connector
		shaft
	B2	end shaft 12 mm IP 42 with clamping ring
	P2	end shaft 12 mm IP 65 with clamping ring
		resolution
	12	12 bit
		voltage range, output signals
	24B	10 - 30 VDC CANopen
		signal code
	N	binary code

mechanical data

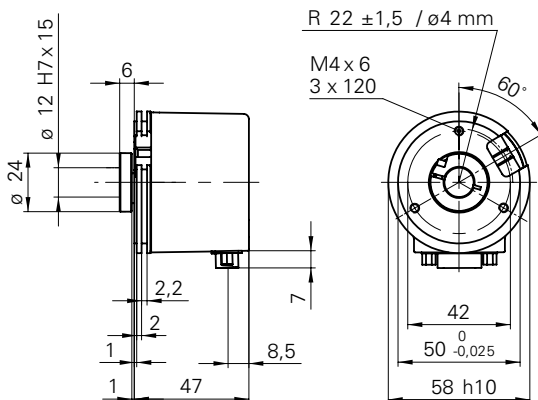
max. revolutions	12'000 rpm (mechanical) 6'000 rpm (electrical)
hollow shaft	ø 12 mm H7 x 15
moment of inertia	typ. 12×10^{-7} kgm ²
torque	typ. 0.93 cNm (3'000 rpm / 20°C / IP 42)
product life conditions	depending on ambient (typ. 10^9 rev.)
max. protection class	shaft: IP 65 housing: IP 65
material	housing: steel flange: aluminum
weight	approx. 300 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 (≤ 300 m/s ² / 10 - 2'000 Hz)
shock	IEC 60068-2-27 (≤ 1'000 m/s ² / 6 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



dimensions and connection dimensions



assignment connector D-Sub male

pin	signal	description
1	n.c.	-
2	CAN_L	bus line (dominant LOW)
3	CAN_GND	CAN ground
4	d.u.	do not use Rx D
5	d.u.	do not use Tx D
6	GND	voltage supply
7	CAN_H	bus line (dominant HIGH)
8	n.c.	-
9	+Vs	voltage supply

accessories

clamp set	part nr. 110616
torque pin	part nr. 107540
torque spring ¹⁾	part nr. 109520
spring plate	part nr. 136635
coupling and shaft adapter	see chapter accessories
CD-ROM with GSD-/EDS-/XML-files and manuals	part nr. 147362
clamping ring set	
12 mm hollow shaft	part nr. 142556

¹⁾ torque spring included

Magnetic absolute single-turn encoder

BMSH – MAGRES

DeviceNet

features

- robust single-turn encoder up to 12 bit
- DeviceNet interface integrated
- programmable resolution and preset values



general data

voltage supply	10 - 30 V
max. supply current no load	typ. 100 mA (at 24 VDC)
output circuit	CAN-Bus, standard ISO/DIS 11898
protocol/profile	DeviceNet, Device Profile for Encoders V1.0
signal code	natural binary-code
resolution	12 bit (1 = 5' 16'')
max error limit	±1°
repeatability	0.3°
max. baud rate	500 kbit/s
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

mechanical data

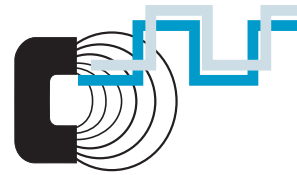
max. revolutions	12'000 rpm (mechanical) 6'000 rpm (electrical)
hollow shaft	ø 12 mm H7 x 15
moment of inertia	typ. 12×10^{-7} kgm ²
torque	typ. 0,93 cNm (3'000 rpm / 20°C / IP 42)
product life conditions	depending on ambient (typ. 10 ⁹ rev.)
max. protection class	shaft: IP 65 housing: IP 65
material	housing: steel flange: aluminum
weight	approx. 300 g

order designation

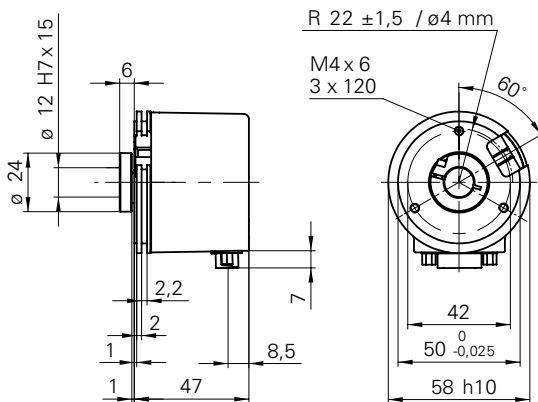
BMSH 58S1N 24D12/00	F	connection
	F	D-Sub connector
		shaft
	B2	end shaft 12 mm IP 42 with clamping ring
	P2	end shaft 12 mm IP 65 with clamping ring
		resolution
	12	12 bit
		voltage range, output signals
	24D	10 - 30 VDC DeviceNet
		signal code
	N	binary code

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 (≤ 300 m/s ² / 10 - 2'000 Hz)
shock	IEC 60068-2-27 (≤ 1'000 m/s ² / 6 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



dimensions and connection dimensions



assignment connector D-Sub male

pin	signal	description
1	d.u.	do not use
2	CAN_L	bus line (dominant LOW)
3	CAN_GND	CAN Ground
4	d.u.	do not use
5	CAN_SHLD	CAN shield
6	0 V	voltage supply
7	CAN_H	bus line (dominant HIGH)
8	n.c.	-
9	+Vs	voltage supply

accessories

clamp set	part nr. 110616
torque pin	part nr. 107540
torque spring ¹⁾	part nr. 109520
spring plate	part nr. 136635
coupling and shaft adapter	see chapter accessories
CD-ROM with GSD/EDS/XML-files and manuals	part nr. 147362
clamping ring set	
12 mm hollow shaft	part nr. 142556

¹⁾ torque spring included

Magnetic absolute single-turn encoder

BMSH flexible – *MAGRES*

Profibus-DP, CANopen, DeviceNet, EtherCAT

features

- robust single-turn encoder up to 12 bit
- modular bus cover
- simple mounting via servo flange
- selectable bus parameters
- programmable resolution and preset values

general data

voltage supply	10 - 30 VDC
max. supply current no load	100 mA (at 24 VDC)
available bus support	CANopen, DeviceNet, Profibus-DP
max. resolution	12 bit (1 step = 5' 16")
max. error limit	±1°
repeatability	0,3°
preset	value programmable within resolution range
address	selectable via dip switches
baud rate	selectable via dip switches
direction of rotation	looking at the <i>MAGRES</i> -flange, position counts up as the shaft rotates clockwise (CW), programmable

mechanical data

max. revolutions	12'000 rpm (mechanical) 6'000 rpm (electrical)
hollow shaft	ø 12 mm H7 x 20
moment of inertia	12 x 10 ⁻⁷ kgm ²
torque	0,93 cNm rpm (3'000 rpm / 20 °C / IP 42)
product life	dependening on ambient conditions (typ. 10 ⁹ revolutions)
max. protection class	shaft: IP 65 housing: IP 65
material	housing: steel bus cover: zinc die cast flange: aluminum
weight	approx. 480 g

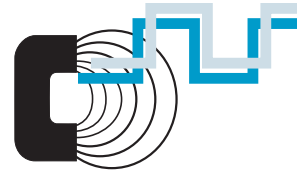


order designation

BMSH 58S1N 24C12/00	☐ G	base encoder (no bus cover)
BMSH 58S1N 24	☐ 12/00	☐ complete encoder
		connection
		D bus cover with PG radial (for Interface B,D,P)
		E bus cover with connector M12 radial (for Interface E)
		hollow shaft
		B2 12 mm IP 42 with clamping ring
		P2 12 mm IP 65 with clamping ring
		interface
		B CANopen
		D DeviceNet
		P Profibus-DP
		E EtherCAT

ambient conditions

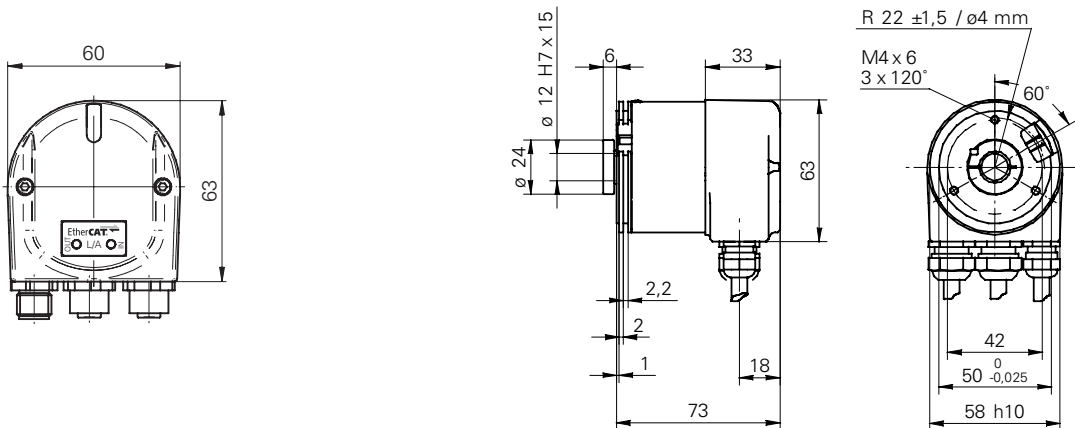
temperature range	-20° to +85 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 (≤ 100 m/s ² / 10 - 2'000 Hz)
shock	IEC 60088-2-27 (≤ 500 m/s ² / 11 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



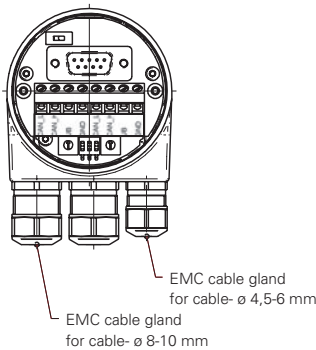
Profibus-DP, CANopen, DeviceNet, EtherCAT

dimensions

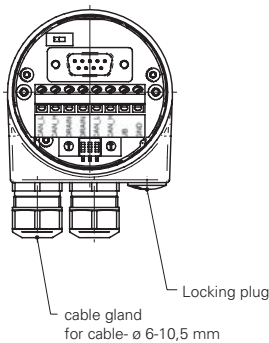
-E bus cover



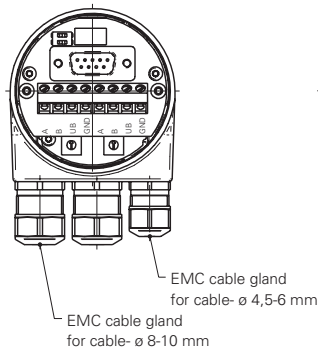
-B bus cover



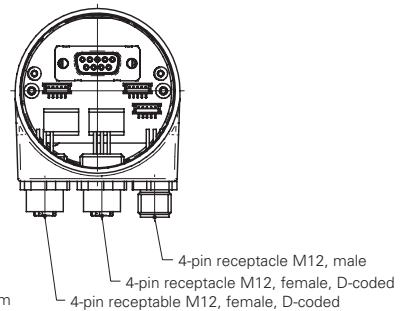
-D bus cover



-P bus cover



-E bus cover



accessories

clamp set	part nr. 110616
torque pin	part nr. 107540
torque spring ¹⁾	part nr. 109520
spring plate	part nr. 136635
bus cover	see chapter accessories
Profibus-DP	part nr. 140831
CANopen	part nr. 140832
DeviceNet	part nr. 140833
EthernetCAT	part nr. 159110

cable EtherCAT M12 male-male, d-coded	
M12 straight, 5 m	part nr. 160565
couplings and shaft adapters	see chapter accessories
CD-ROM with GSD/EDS/XML-files and manuals	part nr. 147362
clamping ring set	
12 mm hollow shaft	part nr. 142556

¹⁾ torque spring included

Absolute single-turn hollow shaft encoders

BFF/BFG

parallel

features

- flat hollow shaft housing
- end shaft mounting (BFF)
- through shaft mounting (BFG)
- 12 bit resolution
- high noise immunity



general data

voltage supply	5 VDC $\pm 5\%$ (05N) 10 - 30 VDC (24K)
max. supply current	120 mA (at 5 VDC) (05N)
no load	70 mA (at 24 VDC) (24K)
output signal	parallel 5 VDC, parallel 10 - 30 VDC
steps/rev	see order designation
max. error limit	12 bit (1 step relates to 5' 16")
pulse tolerance	$\pm 1/2$ step
max. switching frequency	50 kHz

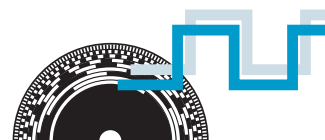
mechanical data

max. revolutions	mech. 12'000 rpm (IP 42) mech. 6'000 rpm (IP 65) electr. dep. on number of steps
moment of inertia	BFF typ. $18,4 \times 10^{-7} \text{ kgm}^2$ BFG typ. $23,8 \times 10^{-7} \text{ kgm}^2$
torque	
BFF	typ. 0,9 cNm IP 42 typ. 3,7 cNm IP 65
BFG	typ. 1,75 cNm IP 42 typ. 4,7 cNm IP 65 (3'000 rpm / 20 °C)
product life	depending on ambient conditions (typ. 10^9 revolutions)
max. protection class	IP 65
material	housing: aluminum BFF with connection ref. -5 : steel flange: aluminum
weight	approx. 300 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 10 - 2'000 Hz)
shock	IEC 60068-2-27 ($\leq 500 \text{ m/s}^2$ / 11 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3

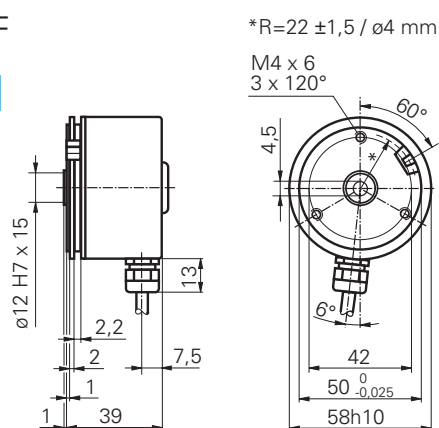
parallel



dimensions and connection dimensions

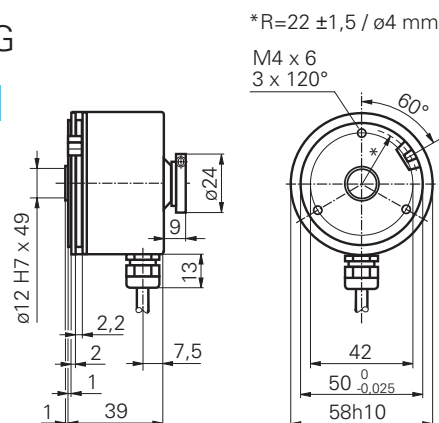
BFF

-5

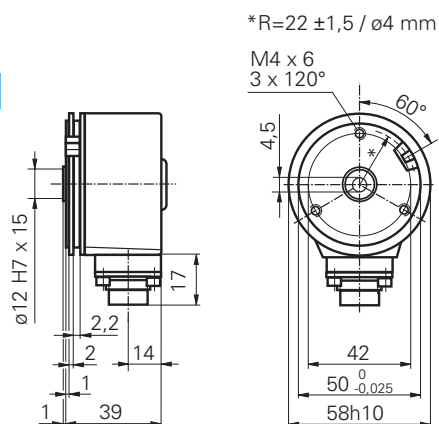


BFG

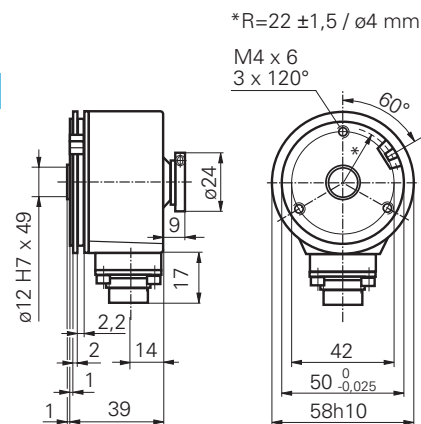
-5



-9

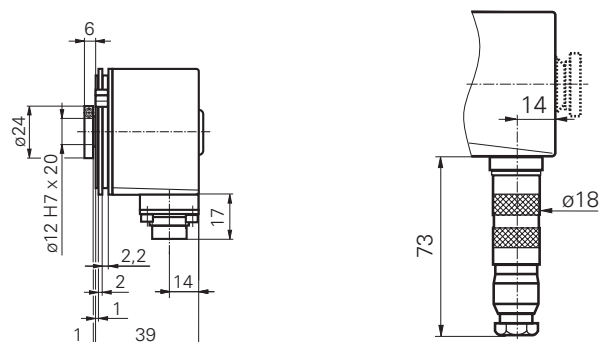


-9



-E2 with clamping ring

-9



Note

Mounting drawings see end of chapter.

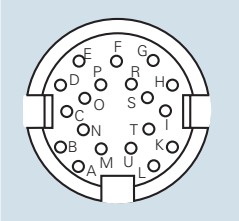
Absolute single-turn hollow shaft encoders

BFF/BFG

parallel

assignment male

pin assignment 19-pin



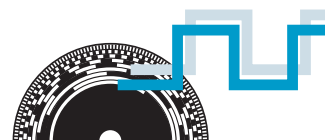
looking at the encoder

cable color	connector 19-pin	resolution 4'096	1'024	360/512
white	A	0 V	0 V	0 V
brown	B	+Vs	+Vs	+Vs
green	D	bit 1 LSB	bit 1 LSB	bit 1 LSB
yellow	E	bit 2	bit 2	bit 2
grey	F	bit 3	bit 3	bit 3
pink	G	bit 4	bit 4	bit 4
blue	H	bit 5	bit 5	bit 5
red	I	bit 6	bit 6	bit 6
black	K	bit 7	bit 7	bit 7
violet	L	bit 8	bit 8	bit 8
grey/pink	M	bit 9	bit 9	bit 9 MSB
white/green	N	bit 10	bit 10 MSB	n.c.
brown/green	O	bit 11	n.c.	n.c.
yellow/brown	P	bit 12 MSB	n.c.	n.c.
white/yellow	R	¹⁾ bit 12 MSB inv.	¹⁾ bit 10 MSB inv.	¹⁾ bit 9 MSB inv.
red/blue	-	n.c.	n.c.	n.c.
screen	C	housing	housing	housing
cable		16 x 0,14 mm ²		

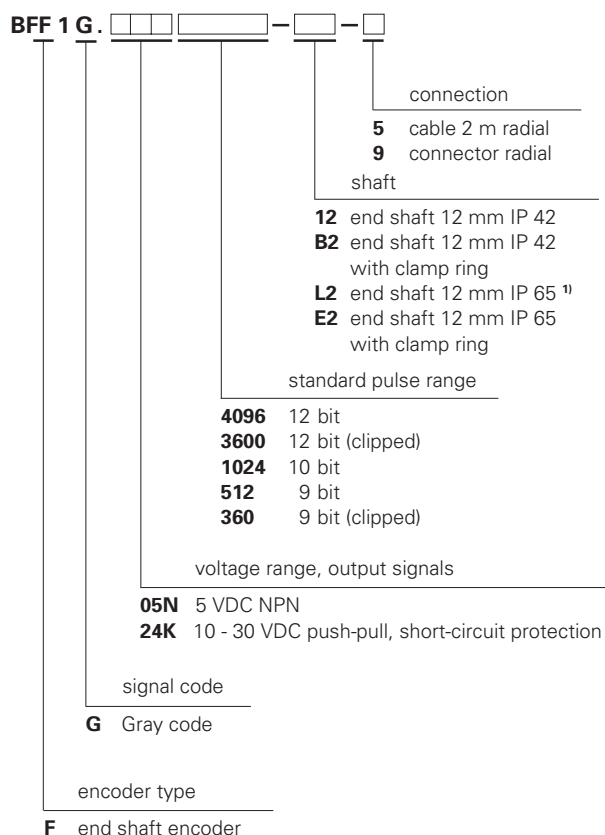
direction of rotation

¹⁾The direction of rotation from encoders using a Gray code can be defined by connecting the MSB or inverted MSB. Both signals are available as an output. If the MSB is connected, the encoder counts up as the shaft rotates clockwise. If the MSB inv. is connected, the encoder counts up if the shaft rotates counter clockwise.

parallel



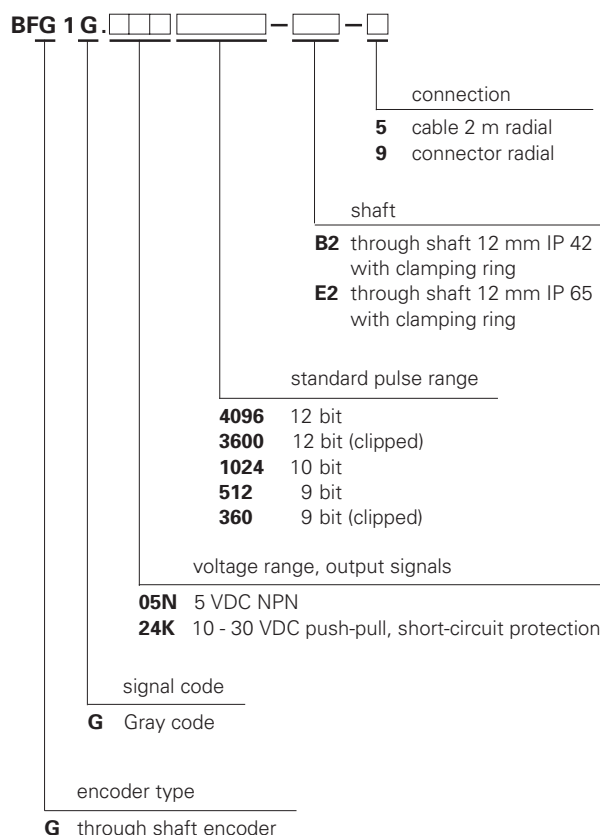
order designation BFF



¹⁾ shaft adapter must be ordered separately

Other versions on request.

order designation BFG



Other versions on request.

accessories

connector female 19-pin	part nr. 111837
cable with connector female (pre-assembled)	
2 m	part nr. 130370
5 m	part nr. 130371
clamp set	part nr. 110616
torque pin	part nr. 107540
torque spring ²⁾	part nr. 109520
spring plate set	part nr. 136635
coupling and shaft adapters	see chapter accessories
clamping ring set	
12 mm hollow shaft	part nr. 142556

²⁾ encoder is delivered with fixed rubber torque spring

Absolute single-turn hollow shaft encoders

BFF/BFG

SSI

features

- SSI interface
- 13 bit resolution



BFF



BFG

general data

voltage supply	10 - 30 VDC
max. supply current no load	typ. 70 mA (at 24 VDC)
output circuit	SSI, complementary RS 422, DV (data valid)
steps/rev	see order designation
max. measuring step	13 bit (1 step relates to 2' 38'')
max. error limit	±1/2 step
max. switching frequency	250 kHz
max. clock frequency	1 MHz
input signal	F/R*-input, clock input

mechanical data

max. revolutions	mech. 12'000 rpm (IP 42) mech. 6'000 rpm (IP 65) electr. dep. on number of steps
moment of inertia	BFF typ. $18,4 \times 10^{-7}$ kgm ² BFG typ. $23,8 \times 10^{-7}$ kgm ²
torque	
BFF	typ. 0,9 cNm IP 42 typ. 3,7 cNm IP 65
BFG	typ. 1,75 cNm IP 42 typ. 4,7 cNm IP 65 (3'000 rpm / 20 °C)
product life	depending on ambient conditions (typ. 10 ⁹ revolutions)
max. protection class	IP 65
material	housing: aluminum BFF with connection ref. -5 : steel flange: aluminum
weight	approx. 300 g

ambient conditions

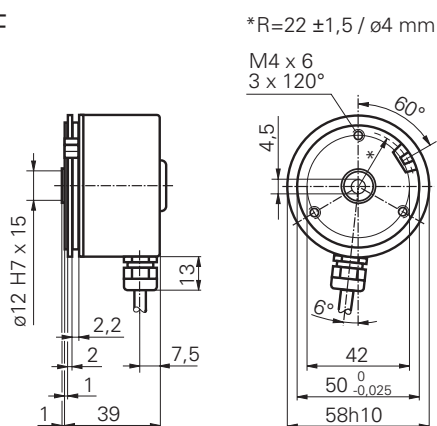
temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 (≤ 100 m/s ² / 10 - 200 Hz)
shock	IEC 60068-2-27 (≤ 500 m/s ² / 11 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



dimensions and connection dimensions

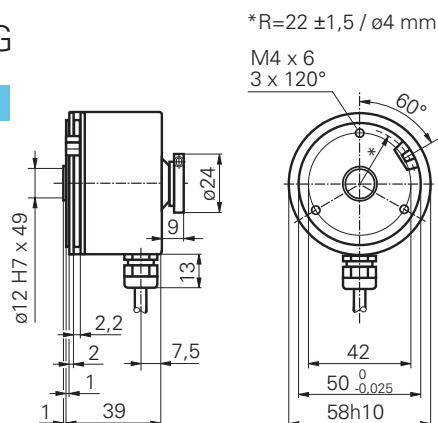
BFF

-5



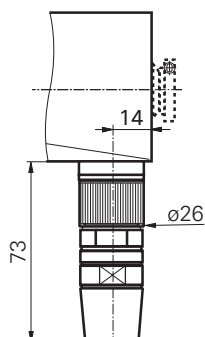
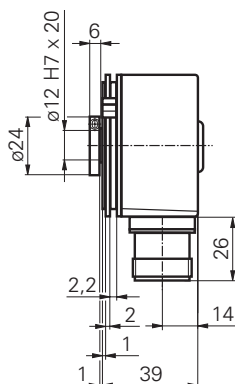
BFG

-5



-E2 with clamping ring

-A



Note

Mounting drawings see end of chapter.

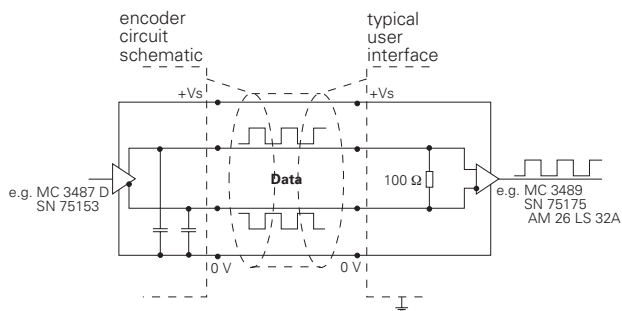
Absolute single-turn hollow shaft encoders

BFF/BFG

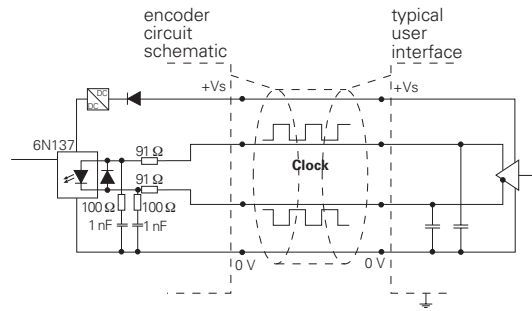
SSI

output circuits

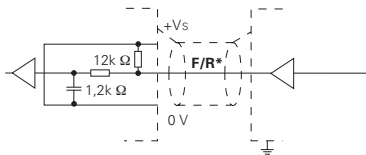
SSI output



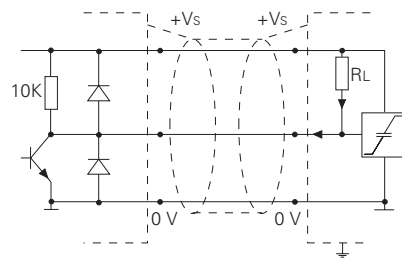
SSI clock input



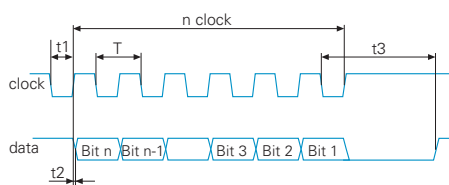
forward/reverse signal input



DV output



read out of position values



pulse times:

$$T = 1 \mu\text{s} \text{ to } 10 \mu\text{s} / t_1 = 0,5 \text{ to } 5 \mu\text{s}$$

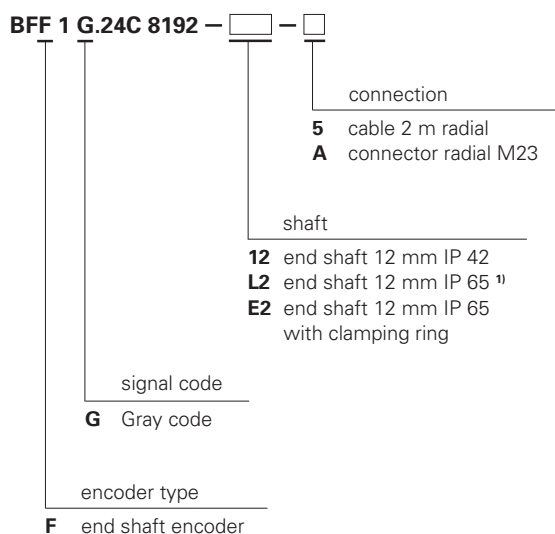
$$t_2 < 0,2 \mu\text{s} / t_3 > 12 \mu\text{s} \text{ to } 25 \mu\text{s}$$

function of the SSI

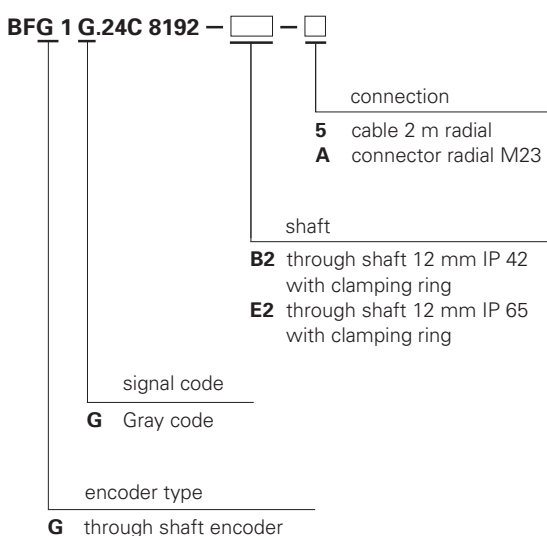
In the stand-by mode both clock and data signals are HIGH. The actual measuring value is stored during the first falling edge. The data transmission takes place with the first rising edge, starting with MSB. It needs $n+1$ rising edges to transmit the data word completely. After the last positive edge has passed, the data output stays in a LOW condition, until the angle measuring device is ready for a new transmission cycle.



order designation BFF



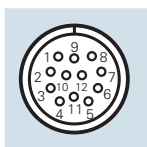
order designation BFG



¹⁾ shaft adapter must be ordered separately

Other versions on request.

pin assignment cable/M23 male

**24C** (10 - 30 VDC)

pin number	cable color	signals
1	yellow	clock-
2	green	clock+
3	grey	data+
4	pink	data-
5	-	n.c.
6	-	n.c.
7	-	n.c.
8	blue	F/R*
9	red	DV
10	screen	housing
11	brown	+Vs
12	white	0 V

accessories

connector M23 female 12-pin reference -A	part nr. 116717
cable with connector M23 female (pre-assembled) ref. -A	
2 m	part nr. 130372
5 m	part nr. 130373
clamp set	part nr. 110616
torque pin	part nr. 107540
torque spring ²⁾	part nr. 109520
spring plate set	part nr. 136635
coupling and shaft adapters	see chapter accessories
clamping ring set	
12 mm hollow shaft	part nr. 142556

²⁾ encoder is delivered with fixed rubber torque spring

Absolute single-turn hollow shaft encoders

BFF/BFG

CANopen

features

- CANopen interface integrated
- 13 bit resolution
- programmable operating modes
- programmable preset values



BFF



BFG

general data

voltage supply	10 - 30 VDC with reverse polarity protection
max. supply current no load	typ. 70 mA (at 24 VDC)
output circuit	CANopen, standard ISO/DIS 11898
signal code	binary
max. measuring step	13 bit (1 step relates to 2' 38'')
max. error limit	±1/2 step
max. switching frequency	250 kHz
operating modes	asynchronous, asynchronous-cyclic, synchronous-cyclic, synchronous-cyclic, programmable
max. baud rate	1 Mbit/s
specification	CAN 2.0B passive
protocol/profile	CANopen/CIA DSP 406, DSP 301 V.4, DSP 305 (LSS)
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

mechanical data

max. revolutions	mech. 12'000 rpm (IP 42) mech. 6'000 rpm (IP 65) electr. 1'830 rpm
moment of inertia	BFF typ. $18,4 \times 10^{-7}$ kgm ² BFG typ. $23,8 \times 10^{-7}$ kgm ²
torque	
BFF	typ. 0,9 cNm IP 42 typ. 3,7 cNm IP 65
BFG	typ. 1,75 cNm IP 42 typ. 4,7 cNm IP 65 (3'000 rpm / 20 °C)
product life	depending on ambient conditions (typ. 10 ⁹ revolutions)
max. protection class	IP 65
material	housing: aluminum flange: aluminum
weight	approx. 300 g

ambient conditions

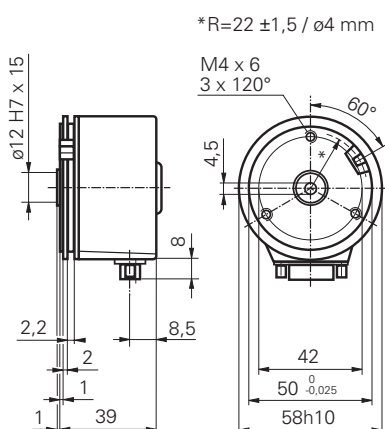
temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	IEC 60068-2-6 (≤ 100 m/s ² / 10 - 200 Hz)
shock	IEC 60068-2-27 (≤ 500 m/s ² / 11 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



dimensions and connection dimensions

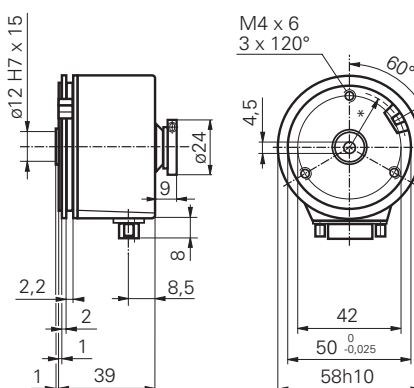
BFF

-F connector D-Sub axial



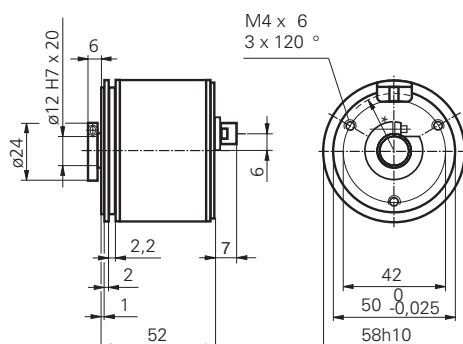
BFG

*R=22 ±1,5 / ø4 mm

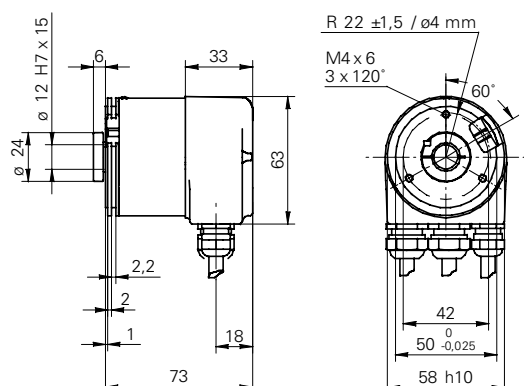


-G connector D-Sub axial

*R=22 ±1,5 / ø4 mm



-D bus cover



Note

Mounting drawings see end of chapter.

Absolute single-turn hollow shaft encoders

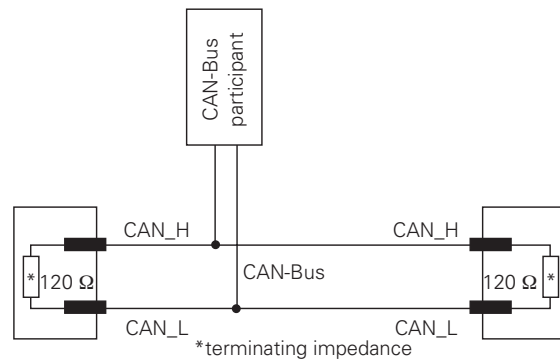
BFF/BFG

CANopen

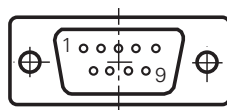
assignment connector D-Sub 9-pin male

pin	signals	description
1	n.c.	-
2	CAN_L	bus line (dominant LOW)
3	CAN_GND	0 VDC
4	n.c.	-
5	n.c.	-
6	GND	voltage supply
7	CAN_H	bus line (dominant HIGH)
8	n.c.	-
9	+Vs	voltage supply

wiring according to ISO/DIS 11898

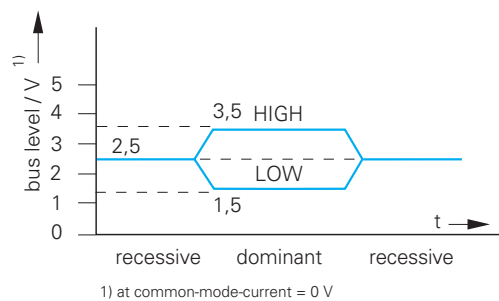


connector male

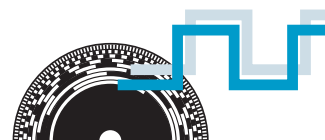


male

output level acc. to ISO/DIS 11898



CANopen



CAN bus protocol

CAN protocol: CANopen

Device asynsprofile: CiA DSP 406, DSP 301 V.4,
DSP 305 (LSS)

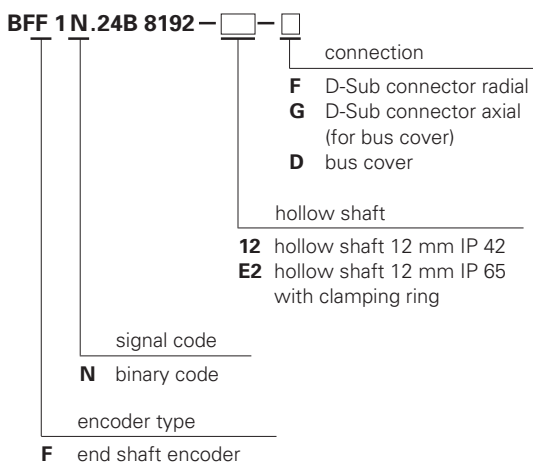
Supported operating modes:

- Polling (async), data transmission on request.
- Cyclic, data transmission periodic, asynchronous (async-cyclic) or synchronous (sync-cyclic) with sync message.
- Acyclic, data transmission if process values change, synchronous with sync message.
- LSS, layer setting service, simplified network configuration.

Note:

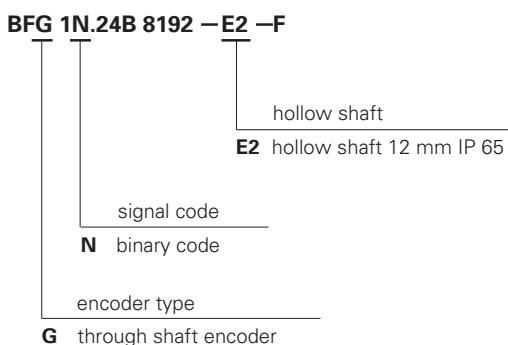
The cable screen end and the encoder housing must be connected to ground potential.

order designation BFF



Other versions on request

order designation BFG



Other versions on request.

accessories

clamp set	part nr. 110616
torque pin	part nr. 107540
torque spring ¹⁾	part nr. 109520
spring plate set	part nr. 136635
couplings and shaft adapters	see chapter accessories
CD-ROM with GSD-/EDS-/XML-files and manuals	part nr. 147362
clamping ring set	
12 mm hollow shaft	part nr. 142556

¹⁾ encoder is delivered with fixed rubber torque spring

Absolute single-turn hollow shaft encoder

BOSD – *Digitalizer*

SSI

features

- high resolution single-turn encoder 17 bit
- SSI interface programmable
- permanent self-test
- reference point programmable
- through hollow shaft



general data

voltage supply	5 VDC $\pm 5\%$
supply current no load	typ. 150 mA
output circuit encoder	SSI, complementary RS 422, binary and Gray code
max. resolution	17 bit (1 step = $10''$)
max. clock frequency	1,1 MHz
repeatability	0,012°
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

mechanical data

max. revolutions	mech. 6'000 rpm electr. 6'000 rpm
moment of inertia	typ. $18,4 \times 10^{-7} \text{ kgm}^2$
torque	typ. 4,5 cNm (3'000 rpm / 20 °C / IP 42)
product life	depending on ambient conditions (typ. 10^9 revolutions)
max. protection class	IP 65
material	housing: aluminum
weight	approx. 300 g

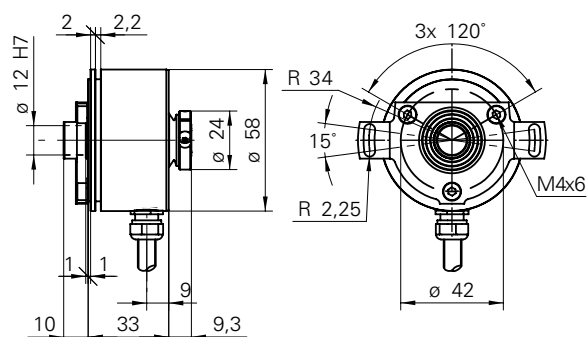
ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration (sine)	IEC 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 10 - 2'000 Hz) 150 min per axis
vibration (random)	IEC 60068-2-64 ($\leq 0,1 \text{ g}^2/\text{Hz}$ / 20 - 1'000 Hz) 30 min per axis
shock	IEC 60068-2-27 ($\leq 500 \text{ m/s}^2$ / 11 ms) 10 pulses per axis and direction
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3

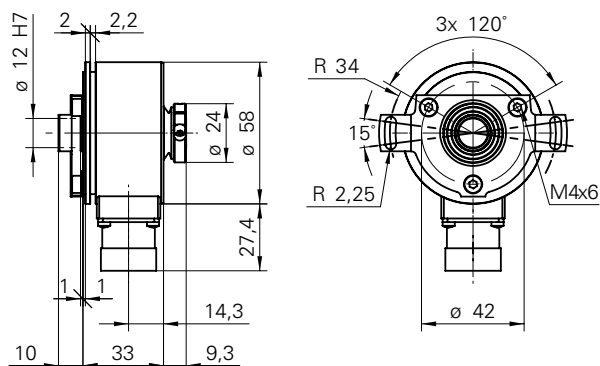


dimensions and connection dimensions

-5



-A



Note

Mounting drawings see end of chapter.

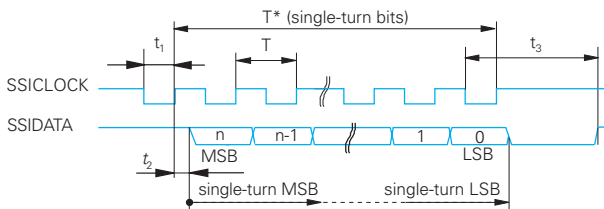
Absolute single-turn hollow shaft encoder

BOSD – *Digitalizer*

SSI

read out of position values

The SSI interface can be used especially for real time signal processing. It is possible to precisely scan the angle information with the first negative clock.



Important: The SSI protocol does not start with zeros. NSSICLOCK and NSSIDATA are not symbolized.

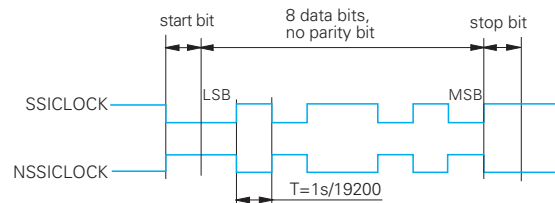
$$T = 0,9 \text{ to } 14 \mu\text{s} \quad t_2 \leq 0,6 \mu\text{s}$$

$$0,45 \mu\text{s} < t_1 < t_3 \quad t_3 = 2, 5, 10 \text{ or } 20 \mu\text{s}$$

The monoflop-time is programmable. (Default 20 μs). Please keep the condition $t_3 \geq 1,4 \cdot T$.

commands to encoder and parameter settings

When using the asynchronous protocol with 19'200 baud, the asynchronous word is interpreted as a command. This is due to the lengths of the LOW and HIGH periods which are longer than the max. monoflop time (t_3).



parameter settings

It is always possible to set parameters over the SSI interface, even if the encoder is in operation.

For example:

- direction of rotation
- monoflop time
- compensation of propagation time

Version of commands:

The version of commands was created for commands which offer a special support of function during operation. The trigger of command will be started as mentioned above over the SSI interface. Therefore i.e. it would be able to set the zero point in real time within the whole working range.

Possible commands:

- zero set permanent/ temporarily
- read offset value
- read/write parameter

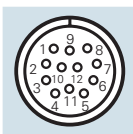
The response on commands has to be read out at the SSI interface before reading the next position value.

Readout of position values and programming of the *Digitalizer* is also possible by PCI-board. See chapter accessories.



assignment connector M23 male

for connection reference **-A**



pin-number	signals
1	NSSICLOCK
2	SSICLOCK
3	SSIDATA
4	NSSIDATA
5	n.c.
6	n.c.
7	n.c.
8	n.c.
9	n.c.
10	n.c.
11	+Vs
12	0 V

order designation

BOSD	58S1	05C	/00		
				connection	
				5 cable 2 m radial	
				A connector radial M23	
				shaft	
				B2 hollow shaft 12 mm IP 42 with clamping ring	
				E2 hollow shaft 12 mm IP 65 with clamping ring	
				I2 hollow shaft 12 mm IP 42 with clamping ring and spring plate	
				M2 hollow shaft 12 mm IP 65 with clamping ring and spring plate	
				resolution	
				17 17 bit	
				signal code	
				N binary code	
				G Gray code	

Other versions on request.

assignment cable

for connection reference **-5**

cable color	signals
brown	+Vs (5 VDC)
green	SSICLOCK
yellow	NSSICLOCK
pink	SSIDATA
grey	NSSIDATA
white	0 V
cable data	6 x 0,14 mm ² , PVC, screened, L = 2 m

accessories

connector 12-pin	part nr. 116717
clamp set	part nr. 110616
spring plate set	part nr. 136635
PCI-board with galvanic isolation	part nr. 139338 see chapter accessories

Absolute single-turn hollow shaft encoders

BOSH – *Dignalizer*

SSI

features

- high resolution single-turn encoders 18 bit
- SSI interface programmable
- permanent self-test
- reference point programmable
- end hollow shaft



version
5 VDC

version
10 - 30 VDC

general data

voltage supply	5 VDC $\pm 5\%$ (05C) 10 - 30 VDC (24C)
supply current no load	typ. 120 mA (at 5VDC) (05C) typ. 50 mA (at 24 VDC) (24C)
output circuit	SSI, complementary RS 422, binary- and Gray code
max. resolution	18 Bit (1 step = 5'')
max. clock frequency	1,1 MHz
repeatability	0,012°
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

mechanical data

max. revolutions	mech. 6'000 rpm electr. 6'000 rpm
moment of inertia	typ. $18,4 \times 10^{-7}$ kgm ²
torque	typ. 1,75 cNm (3'000 rpm 20 °C/ IP 42)
product life	depending on ambient conditions (typ. 10 ⁹ revolutions)
max. protection class	IP 65
material	housing: aluminum
weight	approx. 300 g

ambient conditions

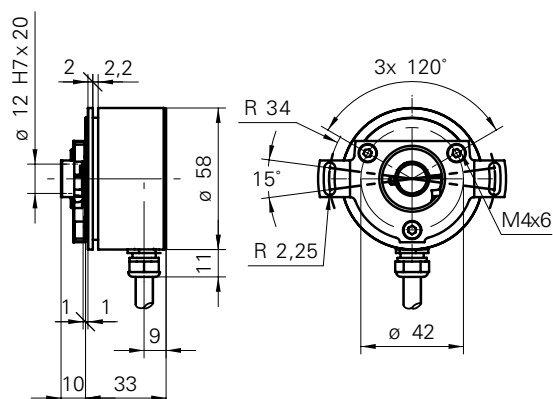
temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration (sine)	IEC 60068-2-6 (≤ 100 m/s ² / 10 - 2'000 Hz) 150 min per axis
vibration (random)	IEC 60068-2-64 ($\leq 0,1$ g ² /Hz / 20 - 1'000 Hz) 30 min per axis
shock	IEC 60068-2-27 (≤ 500 m/s ² , 11 ms) 10 pulses per axis and direction
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



dimensions connection dimensions

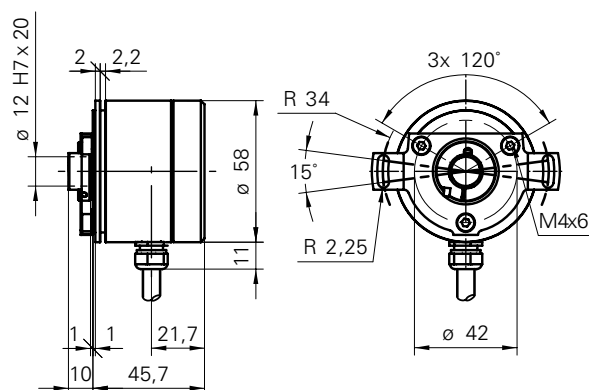
version 5 VDC

-5



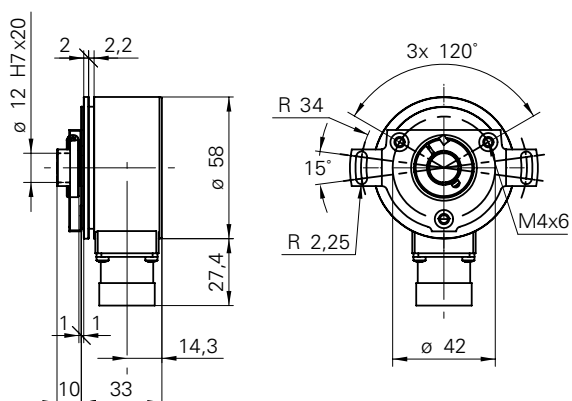
version 10 - 30 VDC

-5

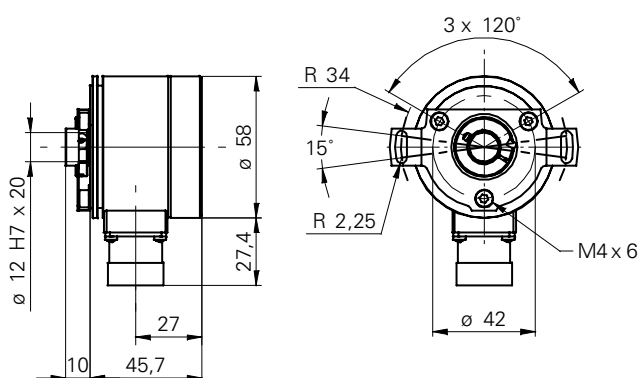


2

-A



-A



Absolute single-turn hollow shaft encoders

BOSH – *Digitalizer*

SSI

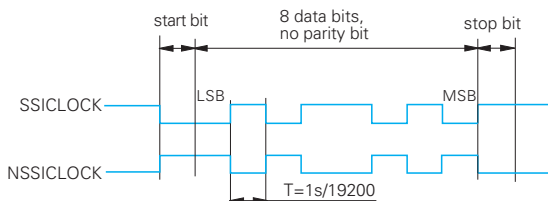
commands to encoder and setting of parameters

Multibyte commands* and parameters can be sent by asynchronous protocol with parameterized baud rate.

The multibyte protocol consists of length byte, address byte, command byte, data bytes and LRC byte.

length	slave address	command	(memory address), (data)	checksum LRC
--------	---------------	---------	-----------------------------	-----------------

The 8 data bits have are embedded between a start bit (LOW) and a stop bit (HIGH).



Setting of parameters

It is always possible to set parameter over the SSI interface, even if the encoder is in operation.

For example:

- SSI bit format (position resolution)
- direction of rotation CW/CCW
- monoflop time
- interface mode
- compensation of propagation time
- baud rate for parameter setting and programming
- signal code (binary, Gray)

Additional features:

- efficient error handling
- memory for operating time
- incremental totalisator (number of rotations)
- preset function

The response on commands (data/„acknowledge“/„negative acknowledge“) has to be read out at the SSI interface before reading the next position value.

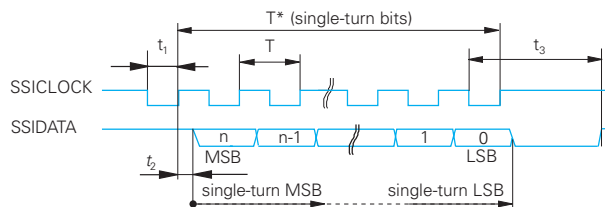
Reading out of position values and programmable of *Digitalizer* is also possible via PCI-board.

See chapter accessories.

* With endshaft mounting, commands and parameter setting by singlebyte protocol. Description on request.

read out of position values

The SSI interface can be used especially for real time signal processing. It is possible to precisely scan the angle information with the first negative clock.



Important: The SSI protocol does not start with zeros. NSSICLOCK and NSSIDATA are not symbolized.

$$T = 0,9 \text{ to } 14 \mu\text{s} \quad t_2 \geq 0,6 \mu\text{s}$$

$$0,45 \mu\text{s} < t_1 < t_3 \quad t_3 = 2, 5, 10 \text{ or } 20 \mu\text{s}$$

The monoflop-time (t3) is programmable (Default 20 μ s). Please keep the condition $t_3 \geq 1,4 * T$.

I/O description

- V/R*** Input to set direction of rotation. Input is normally HIGH. V/R*-HIGH corresponds to increasing position values while looking at flange and shaft rotation in clockwise direction (CW). V/R*-LOW corresponds to increasing position values while looking at flange and shaft rotation in counter-clockwise direction (CCW). Read-in of V/R* voltage occurs during encoder power-on.
- ZERO** Input to set position to zero. Input is normally LOW. Zero setting procedure is initiated by a HIGH-pulse (pulse length $\geq 100 \text{ ms}$). For maximum disturbance immunity, connect input to 0 V.
- DV*** Output for error (data valid). Output is LOW-active, it indicates an error with LOW-voltage.

inputs and outputs

Control signals to V/R* and ZERO

Level HIGH $> 0,8 * +V_s$

Level LOW $< 0,2 * +V_s$

Connection V/R*-input with 15 kOhms against +Vs, ZERO-input with 15 kOhms against 0 V (3 kOhms for version **05C**).

Output signal from DV*

Connection DV*-output push-pull max. 30 mA (with 10 kOhms against +Vs for version **05C**)

pin-number	signals
1	NSSICLOCK
2	SSICLOCK
3	SSIDATA
4	NSSIDATA
5	ZERO
6	DV*
7	V/R*
8	n.c.
9	n.c.
10	n.c.
11	+Vs
12	0 V

BOSH 58S1 /00

			/00		connection
				5	cable 2 m radial
				A	connector radial M23
					shaft
				B2	hollow shaft 12 mm IP 42 with clamping ring
				P2	hollow shaft 12 mm IP 65 with clamping ring
				I2	hollow shaft 12 mm IP 42 with clamping ring and spring plate
				M2	hollow shaft 12 mm IP 65 with clamping ring and spring plate
					resolution
			18		18 bit
					supply voltage, output signals
		05C			5 VDC SSI interface
		24C			10 – 30 VDC SSI interface
					signal code
N					binary code
G					Gray code

Other versions on request.

cable color	signals
brown	+Vs (5 VDC)
green	SSICLOCK
yellow	NSSICLOCK
pink	SSIDATA
grey	NSSIDATA
black	ZERO
red	DV*
blue	V/R*
violet	n.c.
white	0 V
cable data	10 x 0,14 mm ² , PVC, screened, L = 2 m

connector 12 pin	part nr. 116717
clamp set	part nr. 110616
spring plate set	part nr. 136635
PCI-board with galvanic isolation	part nr. 139338 see chapter accessories

Absolute single-turn hollow shaft encoder

BOSH – *Digitalizer*

CANopen

features

- high resolution single-turn encoder up to 18 bit
- CANopen interface integrated
- selectable bus parameters
- programmable resolution and preset values



general data

voltage supply	10 - 30 VDC
supply current no load	typ. 100 mA (at 24 VDC)
output circuit ISO/DIS 11898	CAN bus, standard
specification	CAN 2.0B
protocol/profile	CANopen/CIA, DS-301 V4.01, DSP-305 V1.0 (LSS), DS-406 V3.0
signal code	natural binary code
max. resolution	18 bit (1 step = 5°)
repeatability	0,012°
max. baud rate	1 Mbit/s
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

mechanical data

max. revolutions	mech. 6'000 rpm electr. 6'000 rpm
moment of inertia	typ. $18,4 \times 10^{-7} \text{ kgm}^2$
torque	typ. 1,75 cNm (3'000 rpm / 20 °C / IP 42)
product life	depending on ambient conditions (typ. 10^9 rev.)
max. protection class	IP 65
material	housing: aluminum
weight	approx. 300 g

order designation

BOSH 58S1N 24B 18/00 H

connection

H D-Sub connector

shaft

B2 hollow shaft 12 mm IP 42
with clamping ring

E2 hollow shaft 12 mm IP 65
with clamping ring

I2 hollow shaft 12 mm IP 42
with clamping ring and
spring plate

M2 hollow shaft 12 mm IP 65
with clamping ring and
spring plate

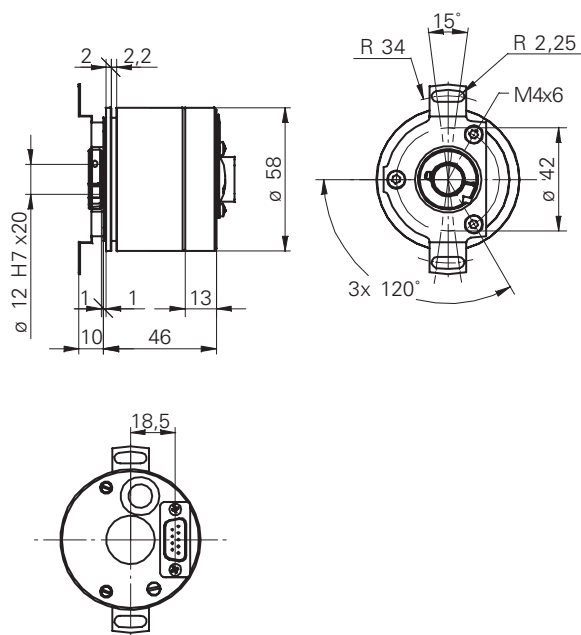
ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration (sine)	IEC 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 10 - 2'000 Hz) 150 min per axis
vibration (random)	IEC 60068-2-64 ($\leq 0,1 \text{ g}^2/\text{Hz}$ / 20 - 1'000 Hz) 30 min per axis
shock	IEC 60068-2-27 ($\leq 500 \text{ m/s}^2$ / 11 ms) 10 pulse per axis and direction
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3

CANopen



dimensions



assignment connector D-Sub

for connection reference **-H**

pin-number	signals	description
1	n.c.	-
2	CAN_L	bus line (dominant LOW)
3	CAN_GND	0 VDC
4	n.c.	-
5	n.c.	-
6	0 V	voltage supply
7	CAN_H	bus line (dominant HIGH)
8	n.c.	-
9	+Vs	voltage supply

accessories

D-Sub female angled CAN-bus	part nr. 145023
mounting clamps	part nr. 110616
spring plate set	part nr. 136635
CD-ROM with GSD-/EDS-/XML-files and manuals	part nr. 147362

Absolute single-turn hollow shaft encoder

BOSH flexible – *Digitalizer*

Profibus-DP, CANopen, DeviceNet, EtherCAT

features

- high resolution single-turn encoder up to 18 bit
- modular bus cover
- simple mounting via servo flange
- selectable bus parameters
- programmable resolution and preset values



general data

voltage supply	10 - 30 VDC
supply current no load	typ. 100 mA (at 24 VDC)
max. resolution	18 bit (1 step = 5")
preset	value programmable within resolution range
address	selectable via dip switches
baud rate	selectable via dip switches
repeatability	0,012°
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

mechanical data

max. revolutions	mech. 6'000 rpm electr. 6'000 rpm
moment of inertia	typ. $18,4 \times 10^{-7}$ kgm ²
torque	typ. 1,75 cNm (3'000 rpm / 20 °C / IP 42)
product life	depending on ambient conditions (typ. 10 ⁹ rev.)
max. protection class	IP 65
material	housing: aluminum bus cover: zinc die cast
weight	approx. 650 g

ambient conditions

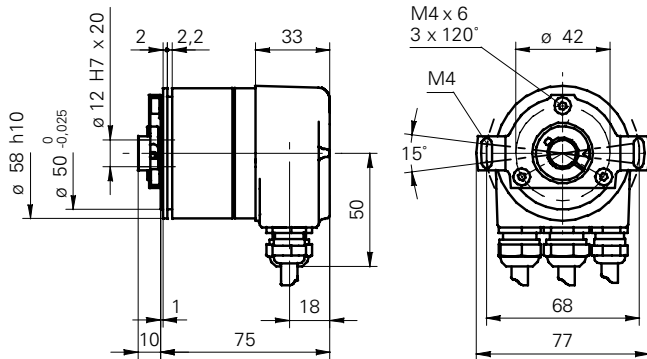
temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration (sine)	IEC 60068-2-6 (≤ 100 m/s ² / 10 - 2'000 Hz) 150 min per axis
vibration (random)	IEC 60068-2-64 ($\leq 0,1$ g ² /Hz / 20 - 1'000 Hz) 30 min per axis
shock	IEC 60068-2-27 (≤ 500 m/s ² / 11 ms) 10 pulse per axis and direction
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3

Profibus-DP, CANopen, DeviceNet, EtherCAT



dimensions

-E bus cover



order designation

BOSH 58S1N24C 18/00 ☐ **G** base encoder without bus cover

BOSH 58S1N24 ☐ **18/00** ☐ complete encoder connection

D bus cover with PG radial (for Interface **B, D, P**)

E bus cover with connector M12 radial (for Interface **E**)

shaft

B2 hollow shaft 12 mm IP 42 with clamping ring

P2 hollow shaft 12 mm IP 65 with clamping ring

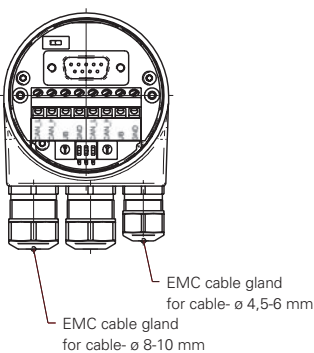
I2 hollow shaft 12 mm IP 42 with clamping ring and spring plate

M2 hollow shaft 12 mm IP 65 with clamping ring and spring plate

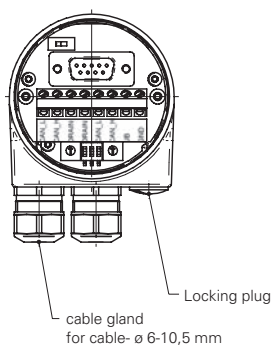
interface

B CANopen
D DeviceNet
P Profibus-DP
E EtherCAT

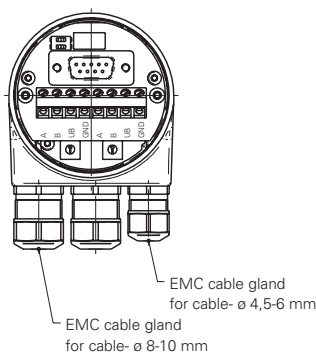
-B bus cover



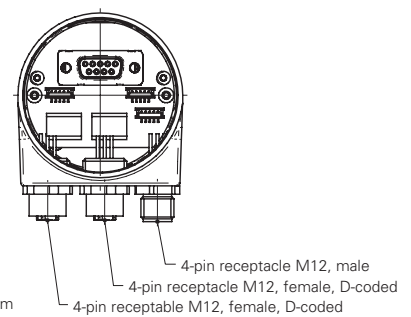
-D bus cover



-P bus cover



-E bus cover



accessories

CD-ROM with GSD/EDS/XML-files and manuals	part nr. 147362
spring plate set	part nr. 136635
bus cover for Profibus-DP	see chapter accessories
CANopen	part nr. 140831
DeviceNet	part nr. 140832
EtherCAT	part nr. 159110

cable EtherCAT M12 male-male, d-coded	
M12 straight, 5 m	part nr. 160565
shaft adapters and couplings	see chapter accessories

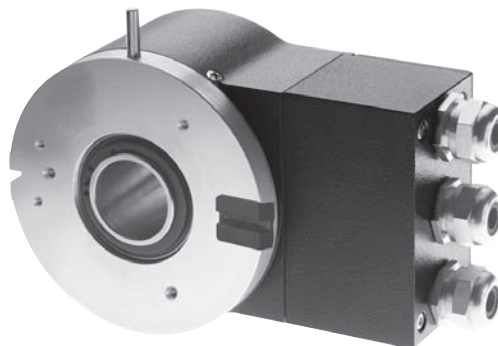
Absolute single-turn hollow shaft encoder

BPSD flexible

Profibus-DP, CANopen, DeviceNet

features

- multi-turn encoder up to 13 bit resolution
- modular bus cover
- programmable operating modes
- programmable bus parameters
- programmable resolution and preset values
- hollow shaft $\varnothing$ 25,4...50,8 mm



general data

voltage supply	10 - 30 VDC with reverse polarity protection
max. current supply no load	100 mA (at 24 VDC)
signal code	binary code
max. resolution	13 bit (1 step = 2' 38")
max. switching frequency	800 kHz
max. error limit	$\pm 0,025^\circ$ at 400 kHz $\pm 0,05^\circ$ at 800 kHz
preset	in state data-exchange encoder can be set to a predefined position
address	selectable via jog-dial
baud rate	selectable via dip switches
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	DIN EN 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 16-2'000 Hz)
shock	DIN EN 60068-2-27 ($\leq 2'000 \text{ m/s}^2$ / 6 ms)
noise immunity	DIN EN 61000-6-2
emitted interference	DIN EN 61000-6-4

mechanical data

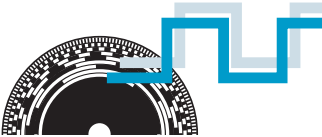
BPSD 25

max. revolutions	mech. 3'800 rpm electr. 6'000 rpm
moment of inertia	$200 \times 10^{-6} \text{ kgm}^2$
max. protection class	IP 54
material	housing: aluminum
weight	approx. 830 g

BPSD 50

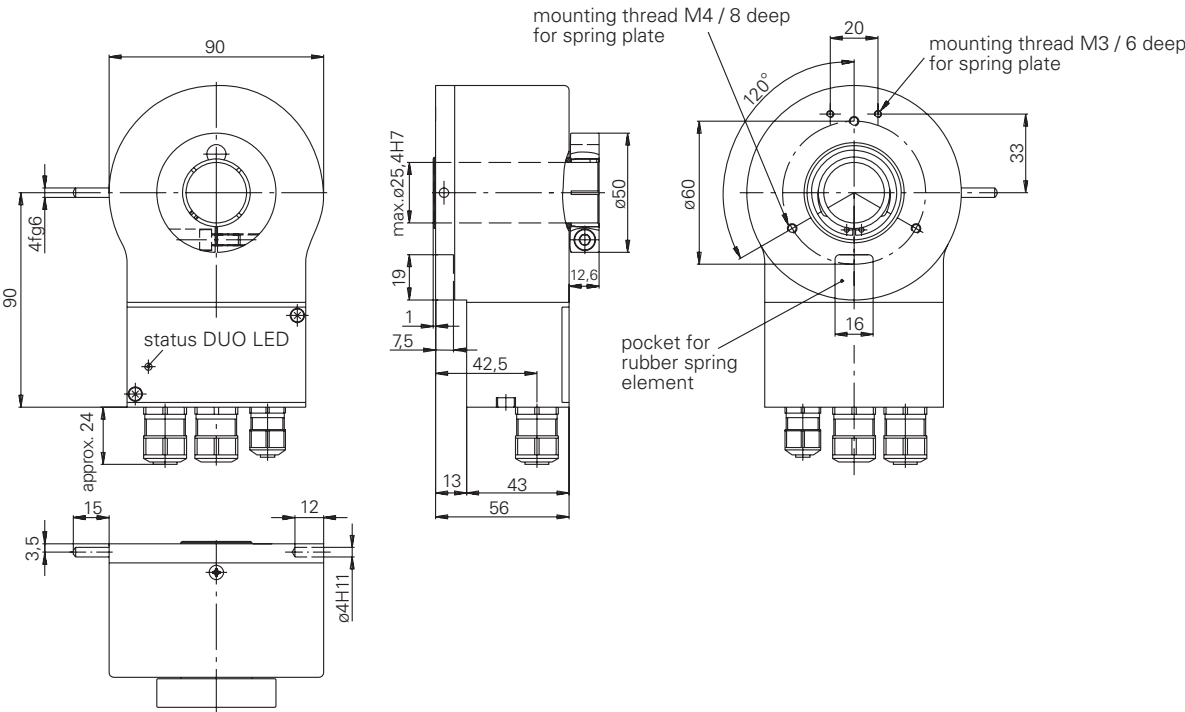
max. revolutions	mech. 2'000 rpm higher on request electr. 6'000 rpm
moment of inertia	$1'100 \times 10^{-6} \text{ kgm}^2$
max. protection class	IP 54
material	housing: aluminum
weight	approx. 1'200 g

Profibus-DP, CANopen, DeviceNet



dimensions

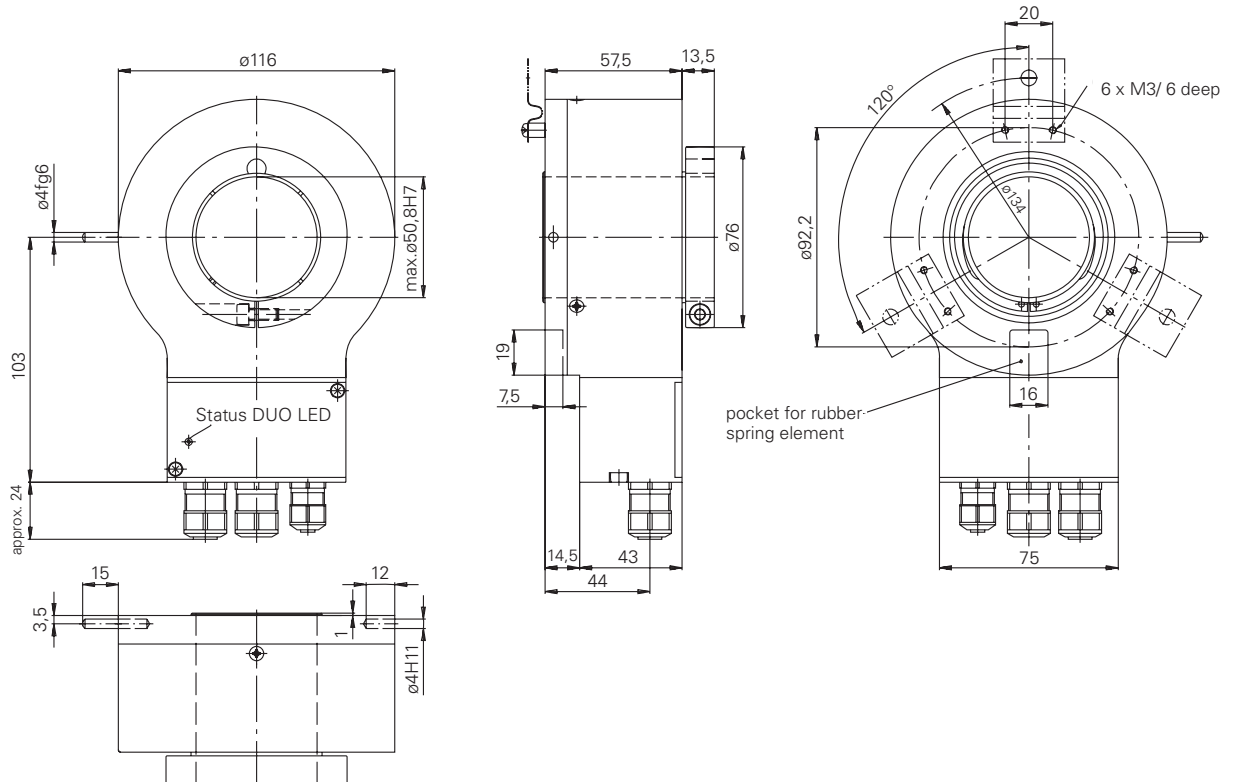
BPSD 25 with Profibus-DP



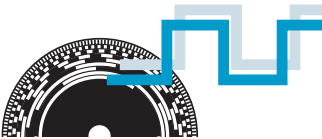
Absolute single-turn hollow shaft encoder BPSD flexible Profibus-DP, CANopen, DeviceNet

dimensions

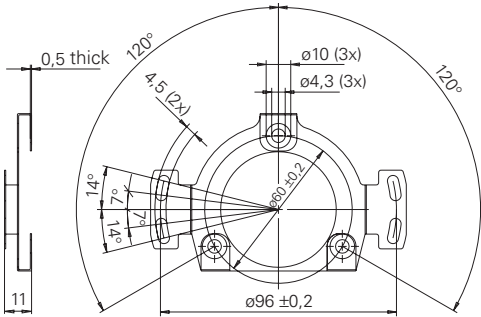
BPSD 50 with Profibus-DP



Profibus-DP, CANopen, DeviceNet

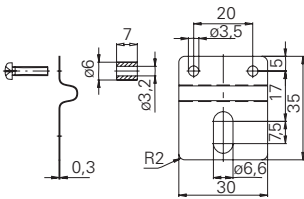


spring plate BPSD 25



part nr. 143969

spring plate BPSD 50



part nr. 147837

order designation

BPSD	☐	☐	G1P24C13/00	☐	☐	G	base encoder without bus cover
BPSD	☐	☐	G1P24	☐	☐	D	complete encoder
							shaft
							KF through hollow shaft 25,4 mm IP 54 with clamping ring
							KQ through hollow shaft 50,8 mm IP 54 with clamping ring
							interface
							P Profibus-DP B CANopen D DeviceNet
							housing diameter
							25 ø 90 mm (for shaft type KF)
							50 ø 116 mm (for shaft type KQ)

accessories

CD-ROM with GSD-/EDS-/XML- files and manuals	part nr. 147362
bus cover for Profibus-DP for CANopen for DeviceNet	part nr. 145145 part nr. 145144 part nr. 145143 see chapter accessories
spring plate BPSD 25 BPSD 50	part nr. 143969 part nr. 147837

included

- rubber spring element and adjustment piece
- 2 cap screws
- 2 cylindrical screws M5 x 12 DIN912

Absolute single-turn hollow shaft encoder

BISD flexible

Profibus-DP, CANopen, DeviceNet

features

- interface: Profibus-DP, CANopen, DeviceNet
- resolution 13 bit
- programmable operating modes
- programmable resolution and preset values
- hollow shaft $\varnothing$ 14 mm
- compact housing

general data

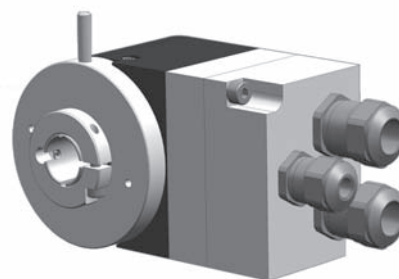
voltage supply	10 - 30 VDC with reverse polarity protection
max. current supply no load	100 mA (at 24 VDC)
signal code	binary
max. resolution	13 bit (1 step = 2' 38")
max. switching frequency	800 kHz
max. error limit	$\pm 0,025^\circ$
preset	value programmable within resolution range
address	selectable via dip switches
baud rate	selectable via dip switches
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

mechanical data

max. revolutions	6'000 rpm
moment of inertia	$200 \times 10^{-6} \text{ kgm}^2$
max. protection class	IP 54
material	housing: aluminum
weight	approx. 600 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	DIN EN 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 16-2'000 Hz)
shock	DIN EN 60068-2-27 ($\leq 2'000 \text{ m/s}^2$ / 6 ms)
noise immunity	DIN EN 61000-6-2
emitted interference	DIN EN 61000-6-4



order designation

BISD 58 ☐ **1P24C13/00** ☐ **G** base encoder
without bus cover

shaft

K2 through hollow shaft 12 mm
KA through hollow shaft 14 mm

G with torque pin

BISD 58 ☐ **1P** ☐ ☐ **13/00** ☐ **D** complete encoder

shaft

K2 through hollow shaft 12 mm
KA through hollow shaft 14 mm

interface

24B CANopen
24D DeviceNet
24P Profibus

G with torque pin

Other versions on request.

accessories

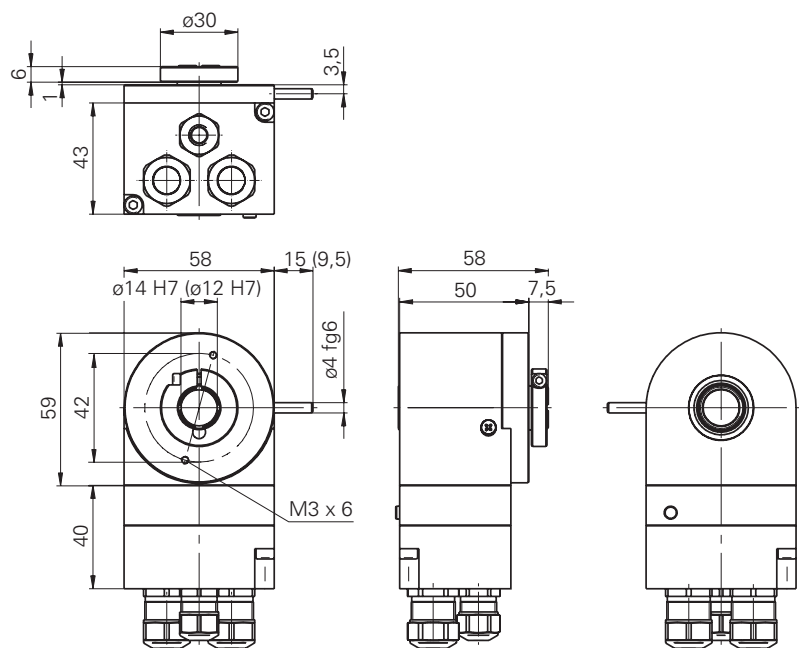
CD-ROM with GSD-/ESD-/XML- files and manuals	part nr. 147362
spring plate for use with torque pin	part nr. 140347

Profibus-DP, CANopen, DeviceNet

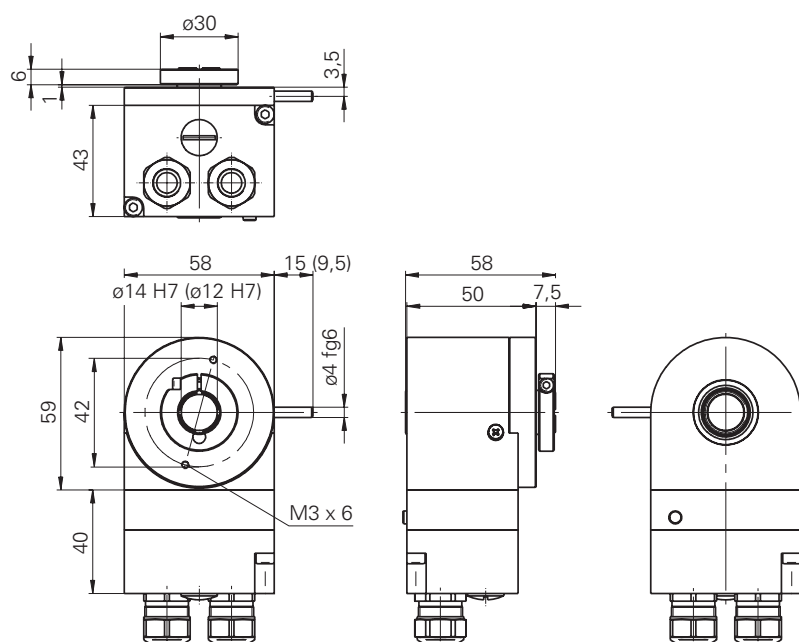


dimensions

BISD CANopen, Profibus



BISD DeviceNet



Absolute single-turn shaft encoders

BPSV flexible – ProCoder

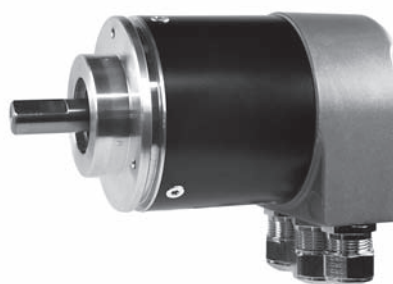
Profibus-DP, CANopen, DeviceNet, EtherCAT

features

- single-turn encoders up to 13 bit
- modular bus cover
- simple mounting via servo flange
- programmable bus parameters
- programmable resolution and preset values



BPSV58S



BPSV58K

general data

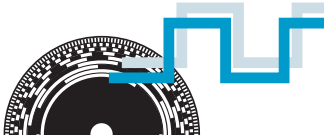
voltage supply	10 - 30 VDC with reverse polarity protection
supply current no load	max. 100 mA (at 24 VDC)
code signal	binary
max. resolution	13 bit (1 step = 2' 38")
code switching frequency	max. 800 kHz
max. error limit	±0,05°
preset	value programmable within resolution range
address	selectable via dip switches
baud rate	selectable via dip switches
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

mechanical data

max. revolution	mech. 10'000 rpm mech. 6'000 rpm (IP 65) electr. 6'000 rpm
moment of inertia	$2 \times 10^{-6} \text{ kgm}^2$
starting torque	≤ 0,015 Nm
max. shaft load	axial: < 20 N radial: < 40 N
product life	depending on ambient conditions (typ. 10 ⁹ rev.)
max. protection class	shaft: IP 65 housing: IP 65
material	housing/flange: aluminium bus cover: zinc die cast
weight	approx. 680 g

ambient conditions

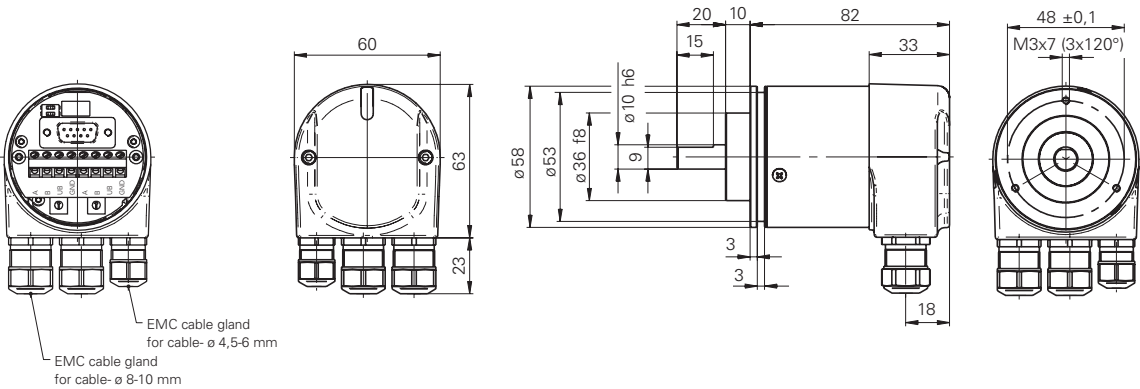
temperature range	-25...+85 °C
vibration	DIN EN 60068-2-6 (≤ 100 m/s ² / 16 - 2'000 Hz)
shock	DIN EN 60068-2-27 (≤ 2'000 m/s ² / 6 ms)
noise immunity	DIN EN 61000-6-2
emitted interference	DIN EN 61000-6-4



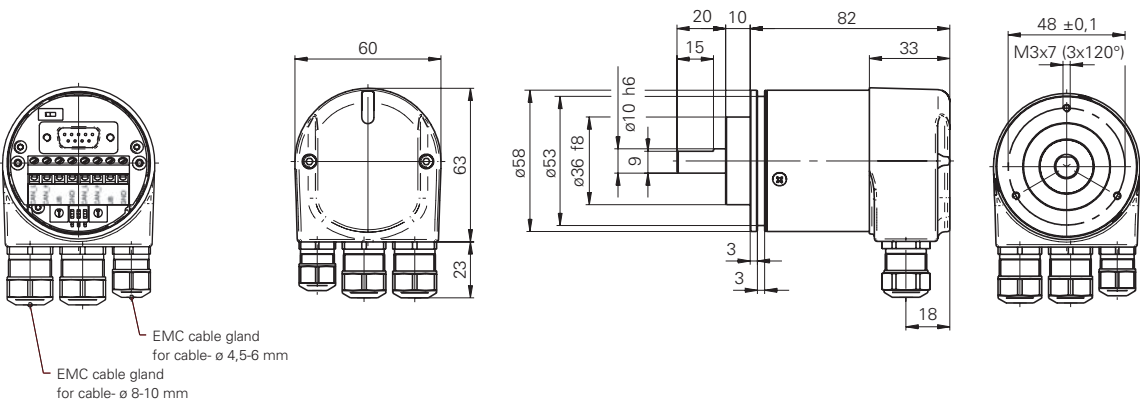
Profibus-DP, CANopen, DeviceNet, EtherCAT

dimensions

BPSV-Profibus



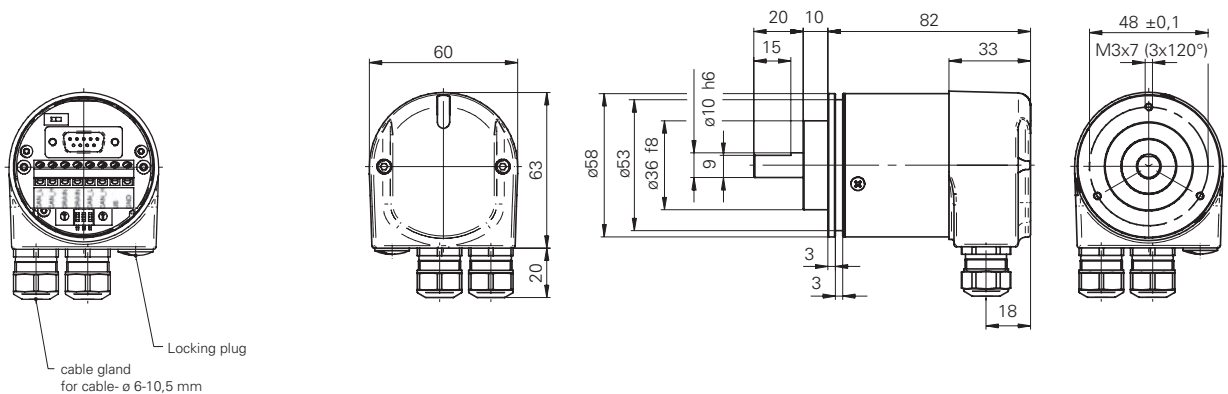
BPSV-CANopen



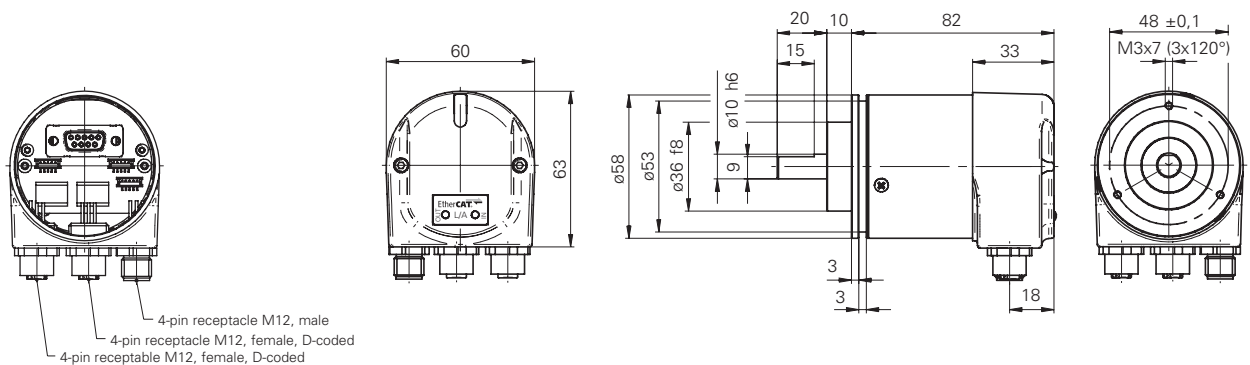
Absolute single-turn shaft encoders
BPSV flexible – ProCoder
Profibus-DP, CANopen, DeviceNet, EtherCAT

dimensions

BPSV-DeviceNET



BPSV-EtherCAT



2

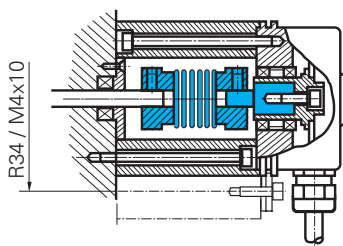
Mounting drawings

Absolute single-turn hollow shaft encoders

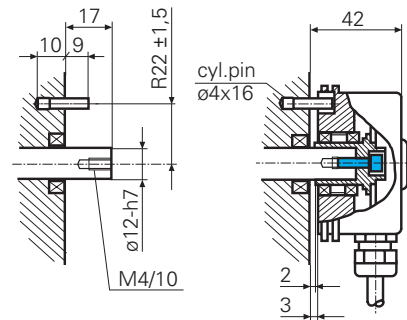
BFF/BFG

mounting

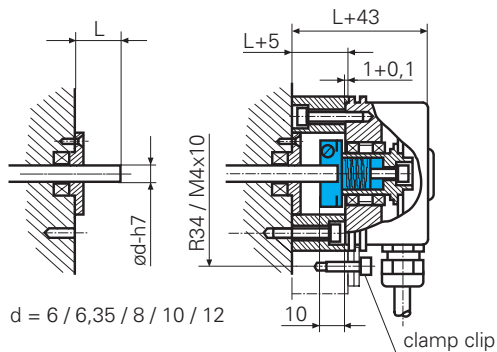
-12 -L2 BFF with shaft adapter and external bellows coupling



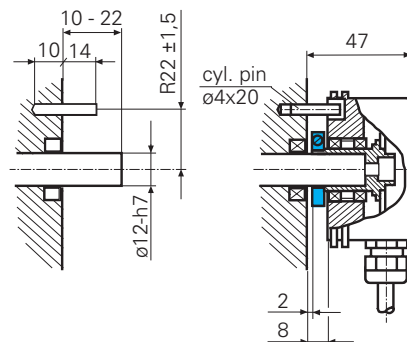
-12 -L2 BFF with end shaft



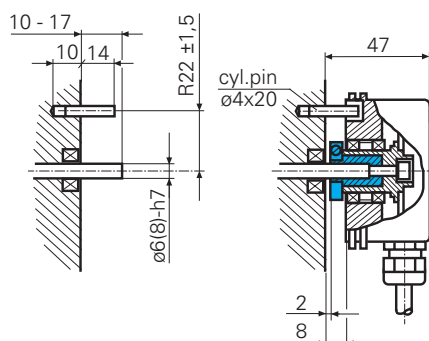
-12 -L2 BFF with integrated coupling



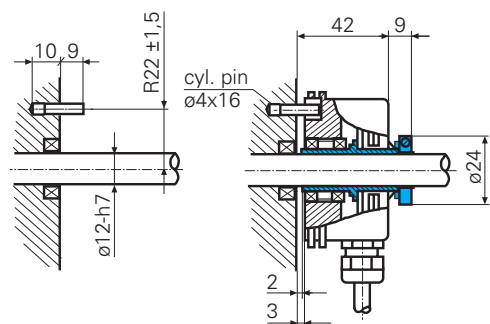
-B2 -E2 BFF with end shaft and clamping ring



-12 -L2 BFF with reducing shaft
ø 8 mm-h7 / ø 6 mm-h7



-B2 -E2 BFG with through shaft



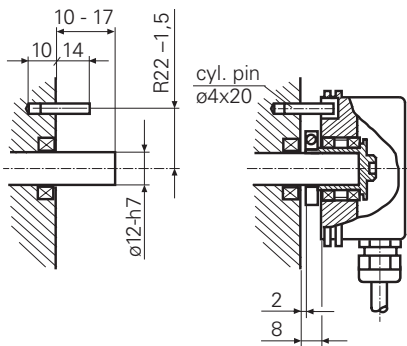
Mounting drawings

Absolute single-turn hollow shaft encoders

BMSH/BMSK

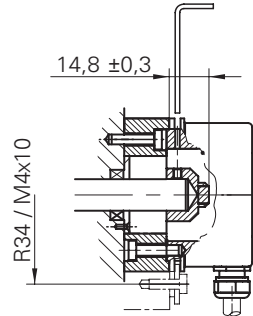
mechanical mounting BMSH/BMMH 42

-B2 -P2 BMSH 58 with torque pin

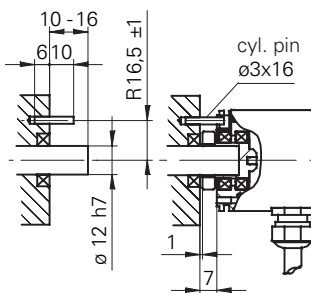


mechanical mounting BMSH/BMSK

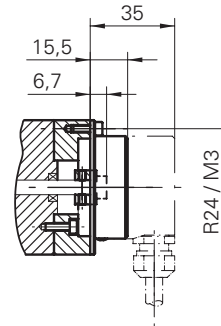
-12 BMSK 58



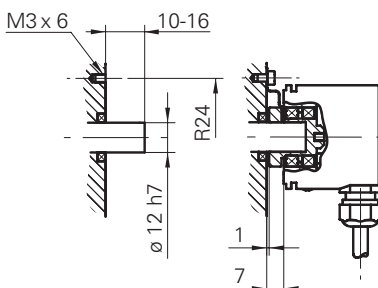
-B2 -P2 BMSH 42 with torque pin



-06 BMSK 42



-B2 -P2 BMSH 42 with clamping ring and spring plate



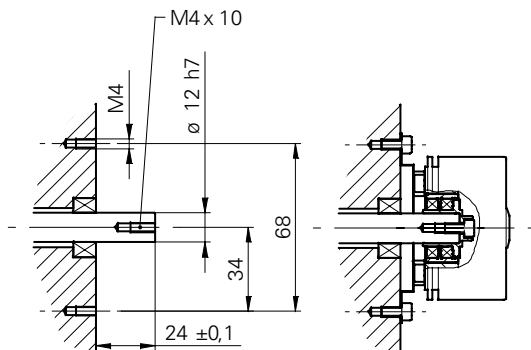
Mounting drawings

Absolute single-turn shaft encoders

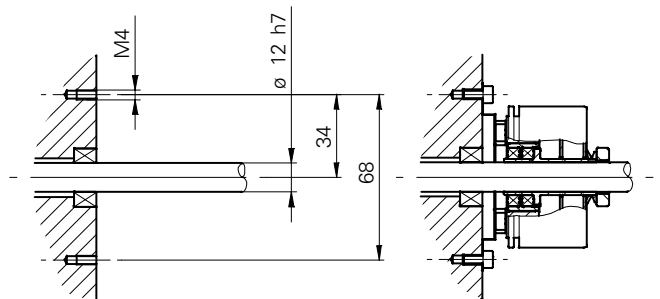
BOSH/BOSD

mounting BOSH/BOSD

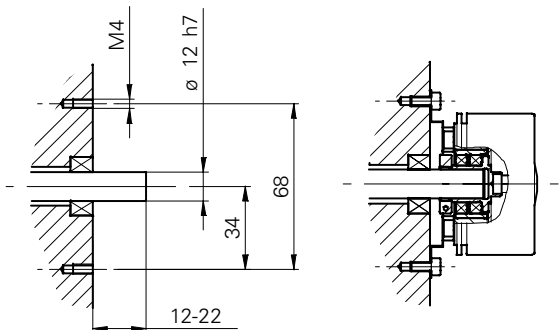
-I2 -M2 BOSH end shaft with spring plate



-I2 -M2 BOSD through shaft with spring plate and clamping ring



-I2 -M2 BOSH end shaft with spring plate and clamping ring

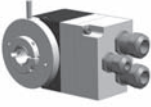




Absolute multi-turn

Absolute multi-turn encoders

magnetic encoder kit							
							
type	BMMK 58 <i>MAGRES</i>						
interface	SSI						
resolution single-turn/multi-turn	12/13 bit						
supply voltage	5 VDC 10 - 30 VDC						
temperature range	-20...+85 °C						
max. protection class	IP 67						
max. revolutions (electr.)	6'000 rpm						
hollow shaft diameter	12 mm						
dimensions (ø x lengths)	58x32 mm						
connection cable	radial						
plug	-						
special characteristics	-						
page	3. 04						

optical hollow shaft encoders							
							
type	BOMH <i>Digitalizer</i>	BOMH <i>Digitalizer</i>	BOMH <i>Digitalizer</i>	BPMD	BIMD	BMG	
interface	SSI	CANopen	Profibus-DP CANopen DeviceNet EtherCAT	Profibus-DP CANopen DeviceNet	Profibus-DP CANopen DeviceNet	parallel	
resolution single-turn/multi-turn	18/18 bit	18/14 bit	18/14 bit	13/16 bit	13/16 bit	12/12 bit	
supply voltage	10 - 30 VDC 5 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	
temperature range	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	
max. protection class	IP 65	IP 65	IP 65	IP 54	IP 54	IP 54	
max. revolutions (electr.)	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	
shaft diameter	12 mm	12 mm	12 mm	max. 50,8 mm	14 mm	max. 50,8 mm	
dimensions (ø x length)	58x46 mm	58x46 mm	58x75 mm	75x56 mm	58x51 mm	75x55 mm	
connection cable	radial	-	radial	radial	radial	radial	
plug	radial	axial	-	-	-	-	
special characteristics	-	integrated bus	bus cover	bus cover	bus cover	programmable	
page	3. 22	3. 26	3. 28	3. 30	3. 34	3. 36	

magnetic hollow shaft encoders

							
BMMH 42	BMMH 42	BMMH 58	BMMH 58	BMMH 58	BMMH 58		
<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>	<i>MAGRES</i>		
SSI	CANopen DeviceNet	SSI	Profibus	CANopen DeviceNet	Profibus-DP CANopen DeviceNet EtherCAT		
12/13 bit	12/18 bit	12/13 bit	13/18 bit	12/18 bit	12/18 bit		
5 VDC 10 - 30 VDC	10 - 30 VDC	5 VDC 10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC		
-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C	-20...+85 °C		
IP 65	IP 65	IP 65	IP 65	IP 65	IP 65		
6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm		
12 mm	12 mm	12 mm	12 mm	12 mm	12 mm		
42x46 mm	42x46 mm	58x31 mm	58x41 mm	58x46 mm	58x72 mm		
radial	radial	radial	-	-	radial		
-	-	radial	radial	radial	-		
-	integrated bus	-	integrated bus	integrated bus	bus cover		
3. 06	3. 08 / 3.10	3. 12	3. 14	3. 16 / 3.18	3. 20		

optical shaft encoders

							
BPMV	BEMV	BMA/BMB	BMC/BMD	BMC/BMD	BME/BMF		
<i>ProCoder</i>	<i>ProCoder</i>						
Profibus-DP CANopen DeviceNet EtherCAT	Profibus-DP CANopen DeviceNet	SSI	SSI	parallel	parallel switching cam encoder		
13/16 bit	13/16 bit	13/12 bit	13/12 bit	12/12 bit	12/12 bit		
10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC	10 - 30 VDC		
-20...+85 °C	-20...+85 °C	-25...+85 °C	-25...+85 °C	-25...+70 °C	-25...+70 °C		
IP 65	IP 67	IP 65	IP 65	IP 65	IP 65		
6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm	6'000 rpm		
6 / 10 mm	10 mm	6 / 10 mm	6 / 10 mm	6 / 10 mm	6 / 10 mm		
58x89 mm	58x89 mm	58x46 mm	58x57 mm	58x75 mm	58x75 mm		
radial	radial	radial / axial	radial / axial	radial / axial	radial / axial		
-	-	radial / axial	radial / axial	-	-		
bus cover	high-grade steel	-	programmable	programmable	programmable		
3. 40	3. 44	3. 46	3. 50	3. 54	3. 58		

Magnetic absolute multi-turn encoder kit

BMMK – MAGRES

SSI

features

- robust multi-turn encoder up to
 - 12 bit single-turn resolution
 - 13 bit multi-turn resolution
- SSI interface
- zero setting input
- kit structure, IP 67

general data

voltage supply	5 VDC $\pm 10\%$ (05C) 10 - 30 VDC (24C)
max. supply current	typ. 100 mA (at 5 VDC) (05C)
no load	typ. 50 mA (at 24 VDC) (24C)
output circuit	SSI, RS 422
signal code	Gray and binary code
max. resolution	
single-turn	12 bit (1 step = 5' 16")
multi-turn	13 bit (8'192 revolutions)
max error limit	$\pm 1^\circ$
repeatability	0,3°
max. clock frequency	1 MHz
input signal	clock input, zero (zerosetting: < 0,4 V, > 2 ms off state: 3,3 V or open)
counter buffering	with Lithium cell typ. 19 years
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW)



order designation

BMMK 58S1	☐	☐	12/13	125	
					connection
				5	cable 2m radial
					dimensions
			12		magnetic rotor shaft $\varnothing$ 12 mm ¹⁾
					resolution multi-turn
			13		13 bit
					resolution single-turn
			12		12 bit
					voltage range, output signals
				05C	5 VDC SSI interface
				24C	10 - 30 VDC SSI interface
					signal code
				N	binary code
				G	Gray code

¹⁾ Other magnetic rotor shafts on request.
The magnetic rotor is included in delivery.

mechanical data

max. revolutions	mech. 12'000 rpm electr. 6'000 rpm
moment of inertia	typ. 12×10^{-7} kgm ²
mounting tolerance	axial: $\pm 0,3$ mm radial: $\pm 0,1$ mm
max. protection class	IP 67
material	housing: steel/aluminum flange: aluminum
weight	approx. 300 g

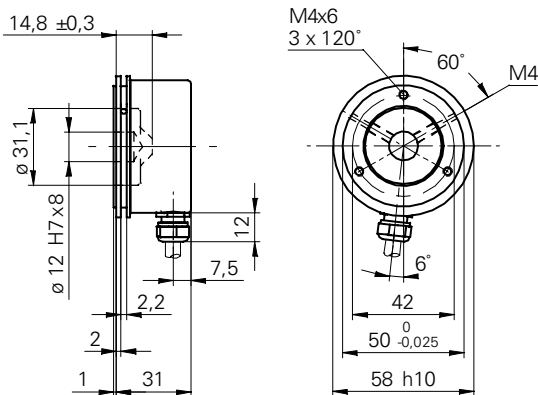
ambient conditions

temperature range	-20...+85 °C -40°C (cable not moved)
relative humidity	max. 95%
vibration	IEC 60068-2-6 (≤ 300 m/s ² / 10 - 2'000 Hz)
shock	IEC 60068-2-27 ($\leq 1'000$ m/s ² / 6 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



dimensions

-5



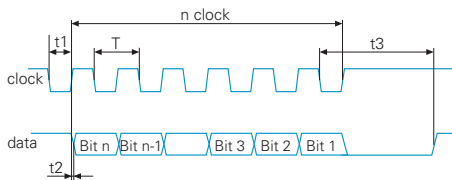
assignment cable

for connection reference -5

cable color	signal	description
brown	+Vs	voltage supply
white	0 V	voltage supply
grey	data+	data signal
pink	data-	data signal
green	clock+	clock signal
yellow	clock-	clock signal
blue	zero	zero setting input
red	d.u.	do not use
screen		housing
cable specs		8 x 0,14 mm ²

3

read out of position values



pulse times:
 $T = 1 \mu s$ to $10 \mu s$ / $t_1 = 0,5$ to $5 \mu s$
 $t_2 < 0,2 \mu s$ / $t_3 > 12 \mu s$ to $25 \mu s$

accessories

clamp set	part nr. 110616
allen key 2 mm	part nr. 112432

SSI data output and clock input

see page 2.05 chapter absolute single-turn encoders

Magnetic absolute multi-turn hollow shaft encoder

BMMH – MAGRES

SSI

features

- robust multi-turn encoder up to
 - 12 bit single-turn resolution
 - 13 bit multi-turn resolution
- miniature housing
- zero point programmable
- SSI Interface

general data

voltage supply	5 VDC $\pm$ 10% (05C) 10 - 30 (24C)
max. supply current no load	typ. 100 mA (at 5 VDC) (05C) typ. 50mA (at 24 VDC) (24C)
output circuit	SSI, RS 422
max. revolution single-turn	12 bit (1 step= 5'16")
multi-turn	13 bit (8'192 revolutions)
max error limit	$\pm 1^\circ$
repeatability	0,3°
max. clock frequency	1 MHz
input signal	clock input, zero (zero setting: < 0,4 V, > 2 ms off state: 3,3 V or open)
counter buffering	with Lithium cell typ. 19 years
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW)

mechanical data

max. revolutions	6'000 rpm
moment of inertia	typ. 12 x 10 ⁻⁷ kgm²
torque	typ. 0,93 cNm (3'000 rpm / 20 °C / IP 42)
product life	depending on ambient conditions (typ. 10 ⁹ revolutions.)
max. protection class	IP 65
material	housing: steel flange: aluminum
weight	approx. 190 g



order designation

BMMH 42S1

12/13

5

connector

5 cable 1 m radial

shaft

B2 end shaft 12 mm IP 42 with clamping ring

P2 end shaft 12 mm IP 65 with clamping ring

resolution multi-turn

13 13 bit

resolution single-turn

12 12 bit

voltage range, output signals

05C SSI interface, 5 VDC

24C 10 - 30 VDC SSI interface

signal code

G Gray code

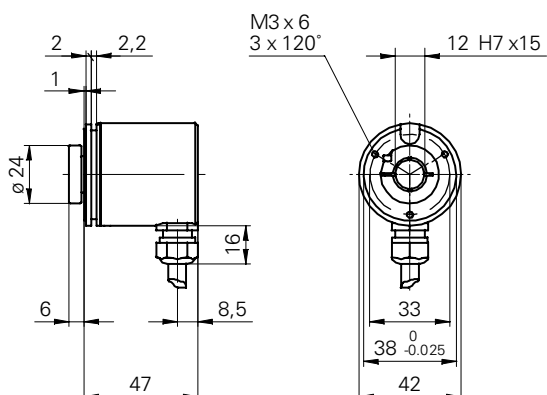
N binary code

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95%
vibration	IEC 60068-2-6 ($\leq$ 300 m/s² / 10 - 2'000 Hz)
shock	IEC 60068-2-27 ($\leq$ 1'000 m/s² / 6 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



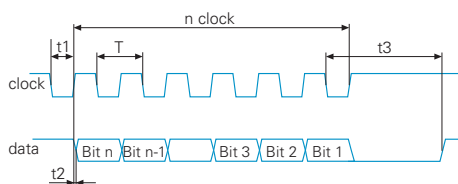
dimensions



Note

Mounting drawings see end of chapter.

read out of position values



pulse times:

$T = 1 \mu\text{s}$ to $10 \mu\text{s}$ / $t_1 = 0.5$ to $5 \mu\text{s}$

$t_2 < 0.2 \mu\text{s}$ / $t_3 > 12 \mu\text{s}$ to $25 \mu\text{s}$

assignment cable

cable color	signal	description
brown	+Vs	voltage supply
white	0 V	voltage supply
grey	data+	data line
pink	data-	data line
green	clock+	clock input
yellow	clock-	clock input
blue	zero	zero setting input
red	d.u.	do not use
cable data		$8 \times 0,14 \text{ mm}^2$

SSI data output and clock input

see page 2.05 chapter absolute single-turn encoders

accessories

clamp set	part nr. 110616
spring plate set	part nr. 138610
shaft adapter	see chapter accessories
clamping ring set	
12 mm hollow shaft	part nr. 142556

Magnetic absolute multi-turn encoder

BMMH – MAGRES

CANopen

features

- robust multi-turn encoder up to
 - 12 bit single-turn resolution
 - 18 bit multi-turn resolution
- miniature housing
- CANopen interface integrated
- programmable resolution and preset values

general data

voltage supply	10 - 30 VDC
max. supply current no load	typ. 100 mA (at 24 VDC)
output circuit	CAN-bus, standard ISO/DIS 11898
specification	CAN 2.0B
protocol/profile	CANopen/CIA, DS-301 V4.01, DSP-305 V1.0, DS-406 V3.0
signal code	natural binary code
max. resolution single-turn	12 bit (1 step = 5' 16'')
multi-turn	18 bit (262'144 revolutions)
max error limit	±1°
repeatability	0,3°
max. baud rate	1 Mbit/s
counter buffering	with Lithium cell typ. 19 years
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

mechanical data

max. revolutions	6'000 rpm
moment of inertia	12 x 10 ⁻⁷ kgm ²
torque	typ. 0,93 cNm (3'000 rpm / 20 °C / IP 42)
product life conditions	depending on ambient (typ. 10 ⁹ revolutions.)
max. protection class	IP 65
material	housing: steel flange: aluminum
weight	approx. 190 g

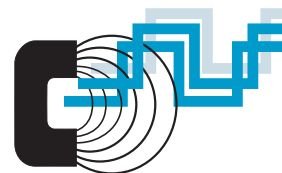


order designation

BMMH 42S1N 24B12/18					
					connection
				5	cable 0,5 m radial
				N	connector radial
					shaft
				B2	end shaft 12 mm IP 42 with clamping ring
				P2	end shaft 12 mm IP 65 with clamping ring
					resolution multi-turn
				18	18 bit
					resolution single-turn
				12	12 bit
					voltage range, output signals
				24B	10 - 30 VDC, CANopen
					signal code
				N	binary code

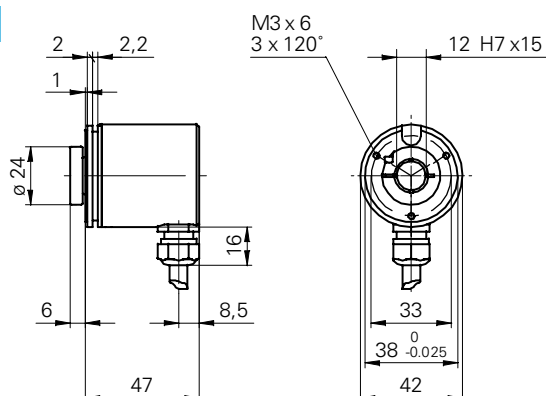
ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95%
vibration	IEC 60068-2-6 (≤ 300 m/s ² / 10 - 2'000 Hz)
shock	IEC 60068-2-27 (≤ 1'000 m/s ² / 6 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



dimensions

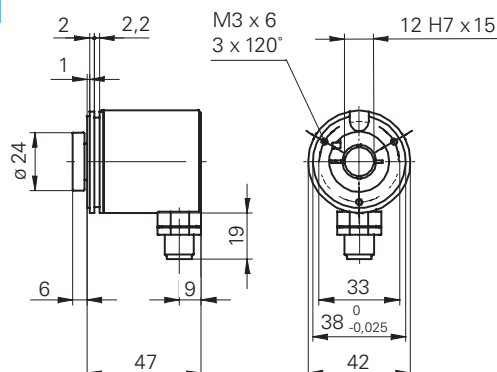
-5



assignment cable

cable color	signal	description
brown	+Vs	voltage supply
white	0 V	voltage supply
green	CAN_H	bus line (dominant HIGH)
yellow	CAN_L	bus line (dominant LOW)
grey	CAN_GND	CAN ground
pink	n.c.	not connected
blue	d.u.	do not use
red	d.u.	do not use
cable data		8 x 0,14 mm ²

-N



assignment connector M12 male

pin	signals	connector
1	n.c.	not connected
2	+Vs	voltage supply
3	CAN_GND	CAN Ground / 0 VDC
4	CAN_H	bus line (dominant HIGH)
5	CAN_L	bus line (dominant LOW)

Note

Mounting drawings see end of chapter.

accessories

spring clamp set	part nr. 110616
field plate set	part nr. 138610
CD-ROM with GSD-/EDS-/XML-files and manuals	part nr. 147362
shaft adapters	see chapter accessories
clamping ring set	
12 mm hollow shaft	part nr. 142556
connector (female) M12 CAN	part nr. 153968
connector (male) M12 CAN	part nr. 153969
T connector M12 CAN	part nr. 153972
terminating resistor	part nr. 153974

Magnetic absolute multi-turn encoder

BMMH – MAGRES

DeviceNet

features

- robust multi-turn encoder up to
 - 12 bit single-turn resolution
 - 16 bit multi-turn resolution
- miniature housing
- DeviceNet interface integrated
- programmable resolution and preset values

general data

voltage supply	10 - 30 VDC
max. supply current no load	typ. 100 mA (at 24 VDC)
output circuit	CAN-bus, standard ISO/DIS 11898
protocol/profile	DeviceNet, Device Profile for Encoders V1.0
signal code	natural binary code
max. resolution single-turn	12 bit (1 step = 5' 16")
multi-turn	16 bit (65'536 revolutions)
max error limit	±1°
repeatability	0,3°
max. baud rate	500 kbit/s
counter buffering	with Lithium cell typ. 19 years
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

mechanical data

max. revolutions	6'000 rpm
moment of inertia	12 x 10 ⁻⁷ kgm ²
torque	typ. 0,93 cNm (3'000 rpm / 20 °C / IP 42)
product life conditions	depending on ambient (typ. 10 ⁹ revolutions.)
max. protection class	IP 65
material	housing: steel flange: aluminum
weight	approx. 190 g

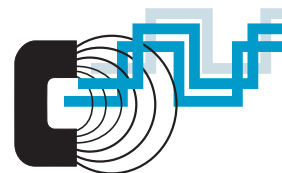


order designation

BMMH 42S1N 24D12/16					
					connection
				5	cable 0,5 m radial
				N	connector radial
					shaft
				B2	end shaft 12 mm IP 42 with clamping ring
				P2	end shaft 12 mm IP 65 with clamping ring
					resolution multi-turn
				16	16 bit
					resolution single-turn
				12	12 bit
					voltage range, output signals
				24D	10 - 30 VDC, DeviceNet
					signal code
				N	binary code

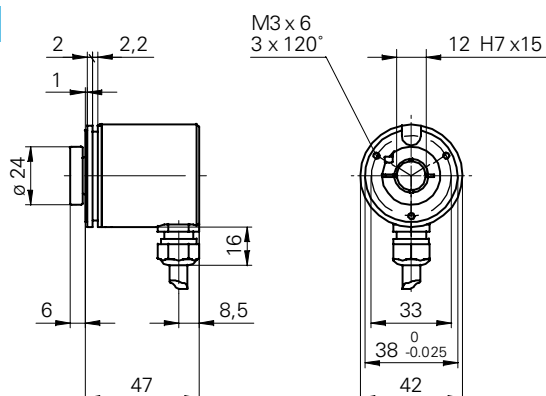
ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95%
vibration	IEC 60068-2-6 (≤ 300 m/s ² / 10 - 2'000 Hz)
shock	IEC 60068-2-27 (≤ 1'000 m/s ² / 6 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



dimensions

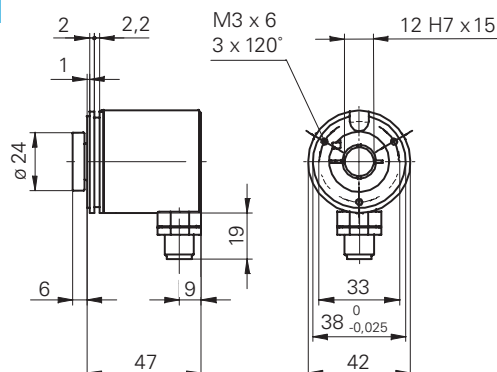
-5



assignment cable

cable color	signal	description
brown	+Vs	voltage supply
white	0 V	voltage supply
green	CAN_H	bus line (dominant HIGH)
yellow	CAN_L	bus line (dominant LOW)
grey	CAN_GND	CAN ground
pink	n.c.	not connected
blue	d.u.	do not use
red	d.u.	do not use
screen	CAN_SHLD	CAN shield
cable data		8 x 0,14 mm ²

-N



assignment connector M12 male

pin	signals	connector
1	CAN_SHLD	CAN shield
2	+Vs	voltage supply
3	CAN_GND	CAN Ground / 0 VDC
4	CAN_H	bus line (dominant HIGH)
5	CAN_L	bus line (dominant LOW)

Note

Mounting drawings see end of chapter.

accessories

spring clamp set	part nr. 110616
field plate set	part nr. 138610
CD-ROM with GSD-/EDS-/XML-files and manuals	part nr. 147362
shaft adapters	see chapter accessories
clamping ring set	
12 mm hollow shaft	part nr. 142556
connector (female) M12 CAN	part nr. 153968
connector (male) M12 CAN	part nr. 153969
T connector M12 CAN	part nr. 153972
terminating resistor	part nr. 153974

Magnetic absolute multi-turn hollow shaft encoder

BMMH – MAGRES

SSI

- features
- robust multi-turn encoder up to
 - 12 bit single-turn resolution
 - 13 bit multi-turn resolution
 - SSI interface
 - zero setting input

general data

voltage supply	5 VDC $\pm$ 10% (05C) 10 - 30 VDC (24C)
max. supply current no load	typ. 100 mA (at 5 VDC) (05C) typ. 50 mA (at 24 VDC) (24C)
output circuit	SSI, RS 422
signal code	Gray and binary code
max. resolution single-turn	12 bit (1 step = 5' 16'')
multi-turn	13 bit (8'192 revolutions)
max. error limit	$\pm$ 1°
repeatability	0,3°
max. clock frequency	1 MHz
input signal	clock input, zero (zero setting: < 0,4 V, > 2 ms off state: 3,3 V or open)
counter buffering	with Lithium cell typ. 19 years
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW)

mechanical data

max. revolutions	6'000 rpm
moment of inertia	12 x 10 ⁻⁷ kgm ²
torque	typ. 0,93 cNm (B2) (3'000 rpm / 20 °C / IP 42)
product life	depending on ambient conditions (typ. 10 ⁹ revolutions.)
max. protection class	IP 65
material	housing: steel flange: aluminum
weight	approx. 300 g



order designation

BMMH 58S1

12/13

connection

5 cable 2 m radial

A connector radial

shaft

B2 end shaft 12 mm IP 42 with clamping ring

P2 end shaft 12 mm IP 65 with clamping ring

resolution multi-turn

13 13 bit

resolution single-turn

12 12 bit

voltage range, output signals

05C 5 VDC SSI interface

24C 10 - 30 VDC SSI interface

signal code

G Gray code

N binary code

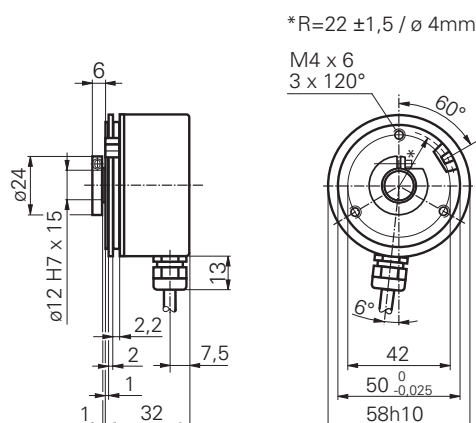
ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95%
vibration	IEC 60068-2-6 ($\leq$ 300 m/s ² / 10 - 2'000 Hz)
shock	IEC 60068-2-27 ($\leq$ 1'000 m/s ² / 6 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3

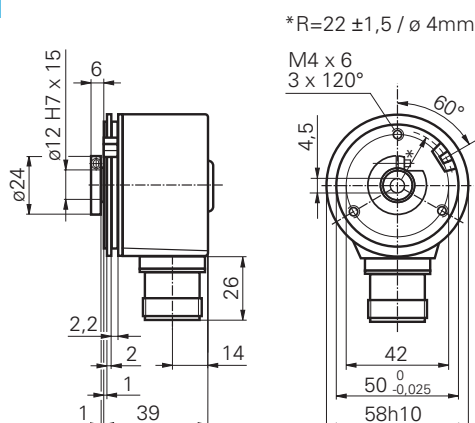


dimensions and connection dimensions

-5



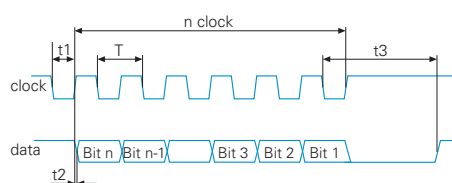
-A



Note

Mounting drawings see end of chapter.

read out of position values



pulse times:

$T = 1 \mu s$ to $10 \mu s$ / $t_1 = 0,5$ to $5 \mu s$

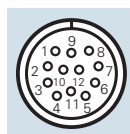
$t_2 < 0,2 \mu s$ / $t_3 > 12 \mu s$ to $25 \mu s$

SSI-data output and clock input

see page 2.05 chapter absolute singleturn encoder

assignment cable / connector M23 male

for connection reference **-A** and **-5**



view on
encoder

pin	color	signals	description
1	yellow	clock-	clock signal
2	green	clock+	clock signal
3	grey	data+	data signal
4	pink	data-	data signal
5	blue	zero	zero setting input
6	-	n.c.	-
7	-	n.c.	-
8	-	n.c.	-
9	red	d.u.	do not use
10	-	n.c.	-
11	brown	+Vs	voltage supply
12	white	0 V	voltage supply
cable data			8 x 0,14 mm ²

accessories

connector 12-pin	part nr. 116717
cable with connector (pre-assembled)	
2 m	part nr. 153334
5 m	part nr. 153335
clamp set	part nr. 110616
torque pin	part nr. 107540
torque spring ¹⁾	part nr. 109520
spring plate set	part nr. 136635
couplings	see chapter accessories
clamping ring set	
12 mm hollow shaft	part nr. 142556

¹⁾ encoder is delivered with fixed rubber torque spring

Magnetic absolute multi-turn hollow shaft encoder

BMMH – MAGRES

Profibus-DP

features

- robust and compact multi-turn encoder
 - 13 bit single-turn resolution
 - 16 bit multi-turn resolution
- Profibus-DP interface
- bus in and bus out connector
- switches for bus address

general data

voltage supply	10 - 30 VDC
max. supply current no load	typ. 100 mA (24 VDC)
bus protocol	Profibus-DP
Profibus features	device class 1 and 2
default setting	user address 03
max. resolution single-turn	13 bit (1 step = 2' 38'')
multi-turn	16 bit (65'536 revolutions)
max. error limit	±1°
repeatability	0,3°
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable



order designation

BMMH 58S1N 24P13/16 **W**

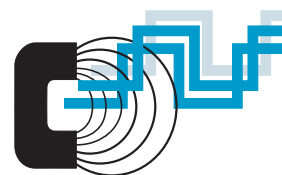
	connection
W	M12 for bus M8 for voltage supply shaft
B2	end shaft 12 mm IP 42 with clamping ring
P2	end shaft 12 mm IP 65 with clamping ring
	resolution multi-turn
16	16 bit
	resolution single-turn
13	13 bit
	voltage range, output signals
24P	10 - 30 VDC Profibus-DP
	signal code
N	binary code

mechanical data

max. revolutions	6'000 rpm
moment of inertia	12 x 10 ⁻⁷ kgm ²
torque	typ. 0,93 cNm (3'000 rpm 20 °C / IP 42)
storage life	depending on ambient conditions (typ. 10 ⁹ revolutions)
max. protection class	IP 65
material	housing: steel flange: aluminum
weight	approx. 300 g

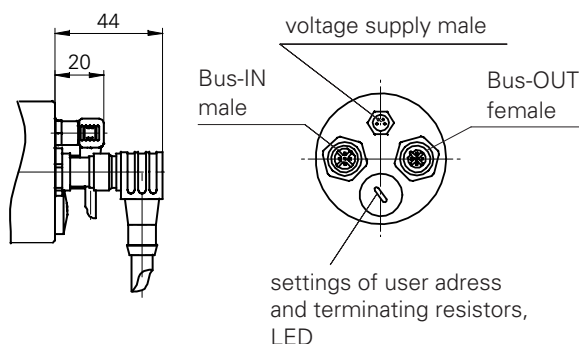
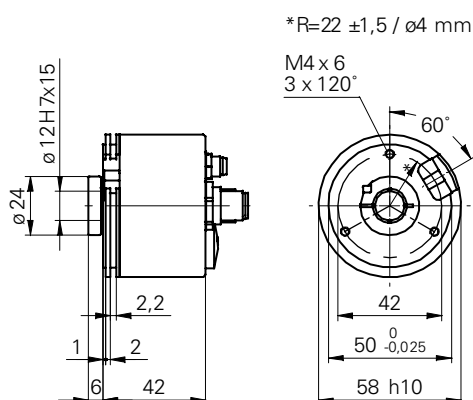
ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95%
vibration	IEC 60068-2-6 (≤ 300 m/s ² / 10 - 2'000 Hz)
shock	IEC 60068-2-27 (≤ 1000 m/s ² / 6 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



Profibus-DP

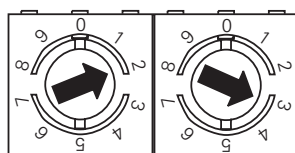
dimensions and connection dimensions



Note

Mounting drawings see end of chapter.

settings of user address for Profibus-DP



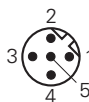
Address can be set with rotary switch.
Example: User address 23

settings of terminating resistors for Profibus-DP



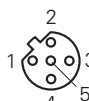
ON = Last User
OFF = User X

assignment M12 Bus-IN male



pin	signal	description
1	n.c.	-
2	A line green	cable green / Profibus-DP
3	n.c.	-
4	B line red	cable red / Profibus-DP
5	n.c.	-
B-coded		

assignment M12 Bus-OUT female



pin	signal	description
1	+VsDP	VP Profibus +5 VDC ¹⁾
2	A line green	cable green / Profibus-DP
3	0 VDP	DGND Profibus ¹⁾
4	B line red	cable red / Profibus-DP
5	n.c.	-
B-coded		

assignment M8 voltage supply



pin	signal	description
1	+Vs	voltage supply
2	n.c.	-
3	0 V	voltage supply
4	0 V	voltage supply

accessories

CD-ROM with GSD-/EDS-/XML-files and manuals	part nr. 147362
cable with M8 connector (female) for voltage supply, shielded	
connector straight	5 m part nr. 148326
connector angled	5 m part nr. 148328
cable with M12 connector (male) and M12 connector (female) for Bus-IN, Bus-OUT	
connector straight	2 m part nr. 157909
	5 m part nr. 157910
connector angled	2 m part nr. 157911
	6 m part nr. 157912
clamp set	part nr. 110616
torque pin	part nr. 107540
torque spring ²⁾	part nr. 109520
spring plate set	part nr. 136635

¹⁾ for optional external terminating resistor

²⁾ encoder is delivered with fixed rubber torque spring

Magnetic absolute multi-turn encoder

BMMH – MAGRES

CANopen

features

- robust multi-turn up to
 - 12 bit single-turn resolution
 - 18 bit multi-turn resolution
- CANopen interface integrated
- programmable resolution and preset values

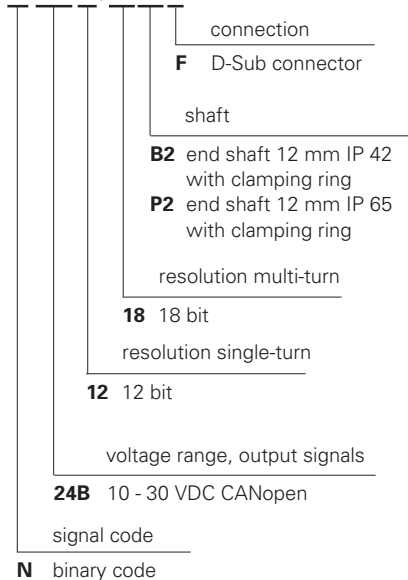


general data

voltage supply	10 - 30 VDC
max. supply current no load	typ. 100 mA (at 24 VDC)
output circuit	CAN-bus, standard ISO/DIS 11898
specification	CAN 2.0B
protocol/profile	CANopen/CIA, DS-301 V4.01, DSP-305 V1.0 (LSS), DS-406 V3.0
signal code	natural binary code
max. resolution single-turn	12 bit (1 step = 5' 16'')
multi-turn	18 bit (262'144 revolutions)
max. error limit	±1°
repeatability	0,3°
max. baud rate	1 Mbit/s
product life	with Lithium cell typ. 19 years
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

order designation

BMMH 58S1N 24B 12/18 ☐ **F**

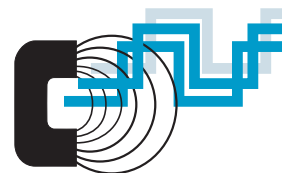


mechanical data

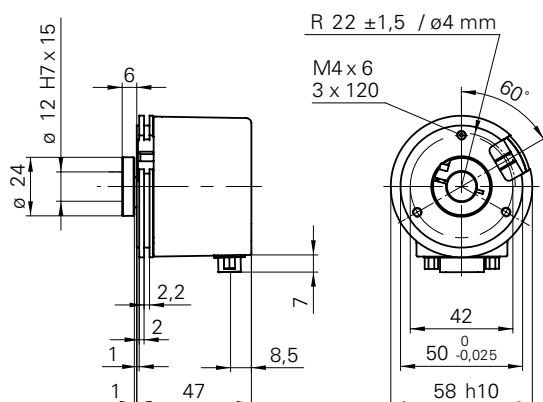
max. revolutions	6'000 rpm
moment of inertia	12 x 10 ⁻⁷ kgm ²
torque	typ. 0,93 cNm (3'000 rpm 20 °C / IP 42)
storage life	depending on ambient conditions (typ. 10 ⁹ revolutions)
max. protection class	IP 65
material	housing: steel flange: aluminum
weight	approx. 300 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95%
vibration	IEC 60068-2-6 (≤ 300 m/s ² / 10 - 2'000 Hz)
shock	IEC 60068-2-27 (≤ 1'000 m/s ² / 6 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



dimensions and connection dimensions



assignment D-Sub 9-pin male connector

pin number	signal	description
1	d.u.	do not use
2	CAN_L	bus line (dominant LOW)
3	CAN_GND	CAN ground
4	d.u.	do not use
5	n.c.	-
6	0 V	voltage supply
7	CAN_H	bus line (dominant HIGH)
8	n.c.	-
9	+Vs	voltage supply

accessories

CD-ROM with GSD-/EDS-/XML-files and manuals	part nr. 147362
D-Sub female angled CAN-bus	part nr. 145023
clamp set	part nr. 110616
torque pin	part nr. 107540
torque spring ¹⁾	part nr. 109520
spring plate set	part nr. 136635
coupling and shaft adapter	see chapter accessories
clamping ring set	
12 mm hollow shaft	part nr. 142556

¹⁾ encoder is delivered with fixed rubber torque spring

Magnetic absolute multi-turn encoder

BMMH – MAGRES

DeviceNet

features

- robust multi-turn up to
 - 12 bit single-turn resolution
 - 16 bit multi-turn resolution
- DeviceNet interface integrated
- programmable resolution and preset values



general data

voltage supply	10 - 30 VDC
max. supply current no load	typ. 100 mA (at 24 VDC)
output circuit	CAN-bus, standard ISO/DIS 11898
protocol/profile	DeviceNet, Device Profile for Encoder V1.0
signal code	natural binary code
max. resolution single-turn multi-turn	12 bit (1 step = 5' 16'') 16 bit (65'536 revolutions)
max. error limit	±1°
repeatability	0,3°
max. baud rate	500 kbit/s
product life	with Lithium cell typ. 19 years
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

order designation

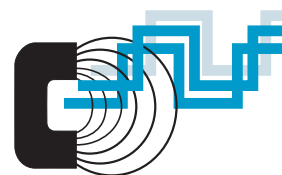
BMMH 58S1N 24D12/16	F	connection
	F	D-Sub connector
		shaft
	B2	end shaft 12 mm IP 42 with clamping ring
	P2	end shaft 12 mm IP 65 with clamping ring
		resolution multi-turn
	16	16 bit
		resolution single-turn
	12	12 bit
		voltage range, output signals
	24D	10 - 30 VDC DeviceNet
		signal code
	N	binary code

mechanical data

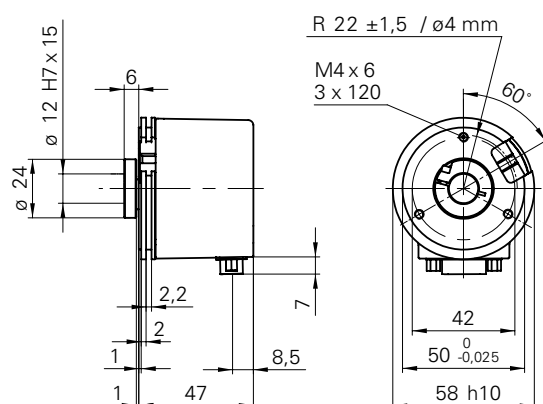
max. revolutions	6'000 rpm
moment of inertia	12 x 10 ⁻⁷ kgm ²
torque	typ. 0,93 cNm (3'000 rpm 20 °C / IP 42)
storage life	depending on ambient conditions (typ. 10 ⁹ revolutions)
max. protection class	IP 65
material	housing: steel flange: aluminum
weight	approx. 300 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95%
vibration	IEC 60068-2-6 (≤ 300 m/s ² / 10 - 2'000 Hz)
shock	IEC 60068-2-27 (≤ 1'000 m/s ² / 6 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



dimensions and connection dimensions



assignment D-Sub 9-pin male connector

pin number	signal	description
1	d.u.	do not use
2	CAN_L	bus line (dominant LOW)
3	CAN_GND	CAN Ground
4	d.u.	do not use
5	CAN_SHLD	CAN shield
6	0 V	voltage supply
7	CAN_H	bus line (dominant HIGH)
8	n.c.	-
9	+Vs	voltage supply

accessories

CD-ROM with GSD-/EDS-/XML-files and manuals	part nr. 147362
D-Sub female angled CAN-bus	part nr. 145023
clamp set	part nr. 110616
torque pin	part nr. 107540
torque spring ¹⁾	part nr. 109520
spring plate set	part nr. 136635
coupling and shaft adapter	see chapter accessories
clamping ring set	
12 mm hollow shaft	part nr. 142556

¹⁾ encoder is delivered with fixed rubber torque spring

Magnetic absolute multi-turn hollow shaft encoder

BMMH flexible – *MAGRES*

Profibus-DP, CANopen, DeviceNet, EtherCAT

features

- robust multi-turn up to
 - 12 bit single-turn resolution
 - 18 bit multi-turn resolution
- modular bus cover
- simple mounting via servo flange
- programmable bus parameter
- programmable resolution and preset values

general data

voltage supply	10 - 30 VDC
supply current no load	typ. 100 mA (at 24 VDC)
max. resolution single-turn	Profibus-DP, DeviceNet 12 bit (1 step = 5' 16")
multi-turn	16 bit (65'536 revolutions)
single-turn	CANopen 12 bit (1 step = 5' 16")
multi-turn	18 bit (262'144 revolutions)
max. error limit	±1°
repeatability	0,3°
preset	value programmable within resolution range
address	selectable via dip switches
baud rate	selectable via dip switches
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

mechanical data

max. revolutions	6'000 rpm
moment of inertia	12 x 10 ⁻⁷ kgm ²
torque	typ. 0,93 cNm (3'000 rpm / 20 °C / IP 42)
product life	depending of ambient conditions (typ. 10 ⁹ revolutions)
max. protection class	IP 65
material	housing: steel bus cover: zinc die cast flange: aluminum
weight	approx. 480 g



order designation

BMMH 58S1N 24C12/18 ☐ **G**

base encoder
without bus cover
complete encoder

BMMH 58S1N 24 ☐ ☐ ☐ ☐

connection

D bus cover with PG radial
(for interface **B,D,P**)

E bus cover with
connector M12 radial
(for interface **E**)

shaft

B2 end shaft 12 mm IP 42
with clamping ring

P2 end shaft 12 mm IP 65
with clamping ring

resolutions

single-turn / multi-turn

12 / 18 bit CANopen

12 / 16 bit DeviceNet/EtherCAT

12 / 16 bit Profibus-DP

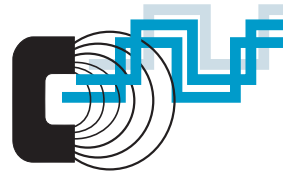
other resolutions programmable

interface

B CANopen
D DeviceNet
P Profibus-DP
E EtherCAT

ambient conditions

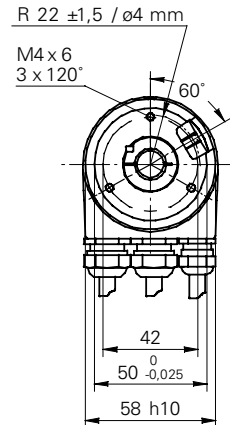
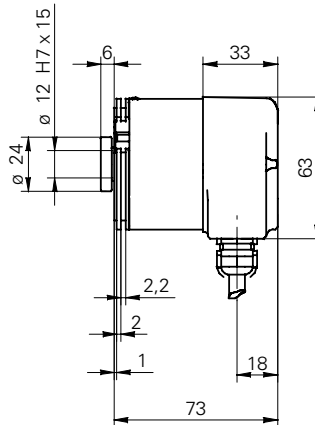
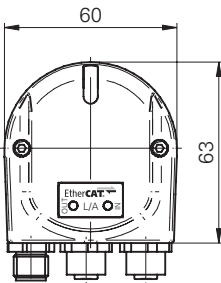
temperature range	-20...+85 °C
relative humidity	max. 95%
vibration	IEC 60068-2-6 (≤ 100 m/s ² / 10 - 2'000 Hz)
shock	IEC 60068-2-27 (≤ 500 m/s ² / 11 ms)
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



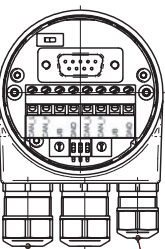
Profibus-DP, CANopen, DeviceNet, EtherCAT

dimensions

-B bus cover



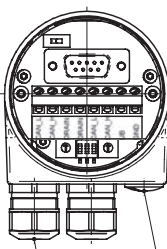
-B bus cover



EMC cable gland
for cable- ø 4,5-6 mm

EMC cable gland
for cable- ø 8-10 mm

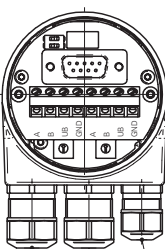
-D bus cover



cable gland
for cable- ø 6-10,5 mm

Locking plug

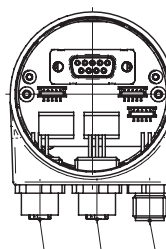
-P bus cover



EMC cable gland
for cable- ø 4,5-6 mm

EMC cable gland
for cable- ø 8-10 mm

-E bus cover



4-pin receptacle M12, male

4-pin receptacle M12, female, D-coded

4-pin receptacle M12, female, D-coded

accessories

clamp set	part nr. 110616
torque pin	part nr. 107540
torque spring ¹⁾	part nr. 109520
spring plate set	part nr. 136635
CD-ROM with GSD-/EDS-/XML- files and manuals	part nr. 147362
coupling and shaft adapter	see chapter accessories
bus cover	see chapter accessories
for Profibus-DP	part nr. 145145
for CANopen	part nr. 145144
for DeviceNet	part nr. 145143
for EtherCAT	part nr. 159110
cable EtherCAT M12 male-male, d-coded	
M12 straight, 5 m	part nr. 160565
clamping ring set	
12 mm hollow shaft	part nr. 142556

Absolute multi-turn hollow shaft encoder

BOMH – *Digitalizer*

SSI

features

- high resolution multi-turn encoder up to
 - 18 bit single-turn
 - 18 bit multi-turn
- SSI interface programmable
- permanent self-test
- reference point programmable



general data

voltage supply	5 VDC (05C) 10 - 30 VDC (24C)
supply current no load	typ. 120 mA (at 5 VDC) (05C) typ. 50 mA (at 24 VDC) (24C)
output circuit	SSI, complementary RS 422 binary or Gray code
max. resolution single-turn	18 bit (1 step = 5°)
multi-turn	18 bit (262'144 revolutions)
max. clock frequency	1.1 MHz
repeatability	0,012°
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

mechanical data

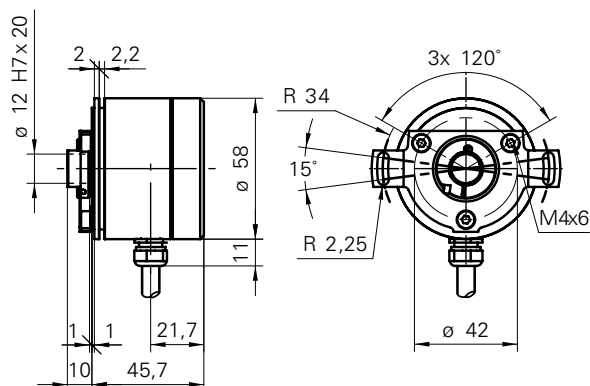
max. revolutions	mech. 6'000 rpm electr. 6'000 rpm
moment of inertia	typ. $18,4 \times 10^{-7} \text{ kgm}^2$
torque	typ. 1,75 cNm (3'000 rpm / 20 °C / IP 42)
product life	depending on ambient conditions (typ. 10^9 revolutions)
max. protection class	IP 65
material	housing: aluminum
weight	approx. 370 g

ambient conditions

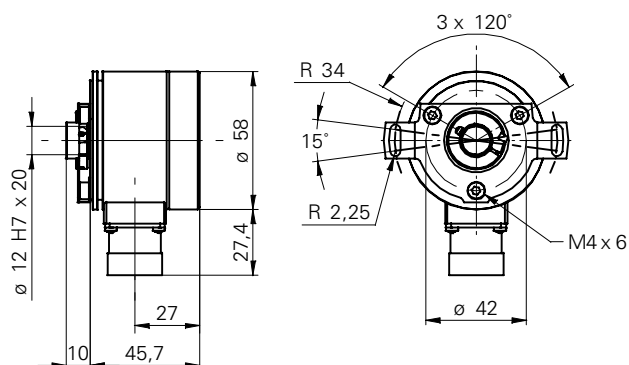
temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration (sine)	IEC 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 10 - 2'000 Hz) 150 min per axis
vibration (random)	IEC 60068-2-64 ($\leq 0,1 \text{ g}^2/\text{Hz}$ / 20 - 1'000 Hz) 30 min per axis
shock	IEC 60068-2-27 ($\leq 500 \text{ m/s}^2$ / 11 ms) 10 pulses per axis and direction
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3

dimensions and connection dimensions

-5



-A



Note

Mounting drawings see end of chapter.

Absolute multi-turn hollow shaft encoder

BOMH – *Digitalizer*

SSI

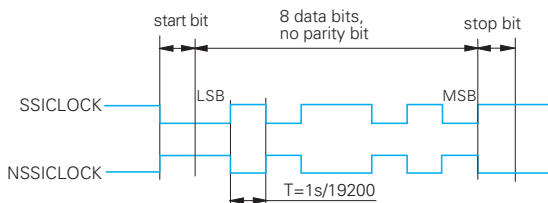
commands to encoder and setting of parameters

Multibyte commands* and parameters can be sent by asynchronous protocol with parameterized baud rate.

The multibyte protocol consists of length byte, address byte, command byte, data bytes and LRC byte.

length	slave address	command	(memory address), (data)	checksum LRC
--------	---------------	---------	-----------------------------	-----------------

The 8 data bits have are embedded between a start bit (LOW) and a stop bit (HIGH).



Setting of parameters

It is always possible to set parameter over the SSI interface, even if the encoder is in operation.

For example:

- SSI bit format (position resolution)
- direction of rotation CW/CCW
- monoflop time
- interface mode
- compensation of propagation time
- baud rate for parameter setting and programming
- signal code (binary, Gray)

Additional features:

- efficient error handling
- memory for operating time
- incremental totalisator (number of rotations)
- preset function

The response on commands (data/„acknowledge“/„negative acknowledge“) has to be read out at the SSI interface before reading the next position value.

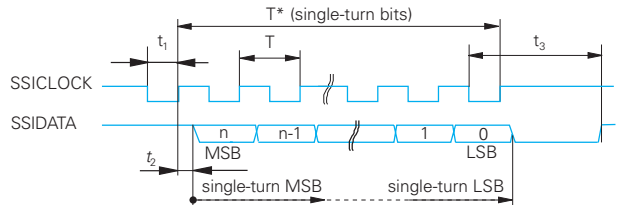
Reading out of position values and programmable of *Digitalizer* is also possible via PCI-board.

See chapter accessories.

* With end shaft mounting, commands and parameter setting by singlebyte protocol. Description on request.

read out of position values

The SSI interface can be used especially for real time signal processing. It is possible to precisely scan the angle information with the first negative clock.



Important: The SSI protocol does not start with zeros. NSSICLOCK and NSSIDATA are not symbolized.

$$T = 0,9 \text{ to } 14 \mu\text{s} \quad t_2 \geq 0,6 \mu\text{s} \\ 0,45 \mu\text{s} < t_1 < t_3 \quad t_3 = 2, 5, 10 \text{ or } 20 \mu\text{s}$$

The monoflop-time (t3) is programmable (Default 20 μs). Please keep the condition $t_3 \geq 1,4 * T$.

I/O description

- V/R*** Input to set direction of rotation. Input is normally HIGH. V/R*-HIGH corresponds to increasing position values while looking at flange and shaft rotation in clockwise direction (CW). V/R*-LOW corresponds to increasing position values while looking at flange and shaft rotation in counter-clockwise direction (CCW). Read-in of V/R* voltage occurs during encoder power-on.
- ZERO** Input to set position to zero. Input is normally LOW. Zero setting procedure is initiated by a HIGH-pulse (pulse length $\geq 100 \text{ ms}$). For maximum disturbance immunity, connect input to 0 V.
- DV*** Output for error (data valid). Output is LOW-active, it indicates an error with LOW-voltage.

inputs and outputs

Control signals to V/R* and ZERO

Level HIGH $> 0,8 * +V_s$

Level LOW $< 0,2 * +V_s$

Connection V/R*-input with 15 kOhms against +Vs, ZERO-input with 15 kOhms against 0 V

Output signal from DV* and DVMT*

Connection DV*-output push-pull max. 30 mA

DVMT*-output push-pull max. 30mA

SSI



assignment connector M23 male

for connection reference **-A**



view to
encoder

pin number	signals
1	NSSICLOCK
2	SSICLOCK
3	SSIDATA
4	NSSIDATA
5	ZERO
6	DV*
7	V/R*
8	DVMT*
9	n.c.
10	n.c.
11	+Vs
12	0 V

order designation

BOMH 58S1					connection
					5 cable 2 m radial
					A connector radial M23
					shaft
					B2 hollow shaft 12 mm IP 42 with clamping ring
					E2 hollow shaft 12 mm IP 65 with clamping ring
					I2 hollow shaft 12 mm IP 42 with clamping ring and spring plate
					M2 hollow shaft 12 mm IP 65 with clamping ring and spring plate
					resolution
					single-turn / multi-turn 18 / 18 bit other resolutions programmable
					supply voltage, output signals
					05C 5 VDC SSI interface
					24C 10 - 30 VDC SSI interface
					signal code
					N binary code
					G Gray code

Other versions on request.

assignment cable

for connection reference **-5**

cable color	signals
brown	+Vs
green	SSICLOCK
yellow	NSSICLOCK
pink	SSIDATA
grey	NSSIDATA
black	ZERO
red	DV*
blue	V/R*
violet	DVMT*
cable data	10 x 0,14 mm ² , PVC, screened

accessories

connector 12-pin	part nr. 116717
spring plate set	part nr. 136635
clamp set	part nr. 110616
see chapter accessories	
PCI-board with galvanic isolation	part nr. 139338

Absolute multi-turn hollow shaft encoder

BOMH – *Signalizer*

CANopen

features

- high resolution multi-turn encoder up to
 - 18 bit single-turn
 - 14 bit multi-turn
- integrated CANopen interface
- programmable bus parameter
- programmable scaling and preset values



general data

voltage supply	10 - 30 VDC
supply current no load	typ. 150 mA (at 24 VDC)
output circuit ISO/DIS 11898	CAN-bus, standard
specification	CAN 2.0B
protocol/profile	CANopen/CIA, DS-301 V4.01, DSP-305 V1.0 (LSS), DS-406 V3.0
signal coding	natural binary code
max. resolution single-turn	18 bit (1 step = 5")
multi-turn	14 bit (16'384 revolutions)
repeatability	0,012°
max. baud rate	1 Mbits/s
counter buffering	with Lithium cell typ. 19 years
direction of rotation	programmable, standard rising position values at view on the floor and clockwise rotation of the shaft (CW)

mechanical data

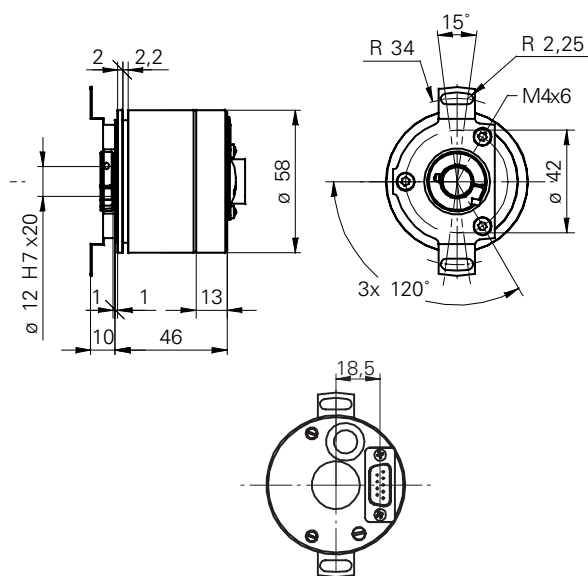
max. revolutions	mech. 6'000 rpm electr. 6'000 rpm
moment of inertia	typ. $18,4 \times 10^{-7}$ kgm ²
torque	typ. 1,75 cNm (3'000 rpm / 20 °C / IP 42)
product life	depending on ambient conditions (typ. 10 ⁹ revolutions)
max. protection class	IP 65
material	housing: aluminum
weight	approx. 300 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration (sine)	IEC 60068-2-6 (≤ 100 m/s ² / 10 - 2'000 Hz) 150 min per axis
vibration (random)	IEC 60068-2-64 ($\leq 0,1$ g ² /Hz / 20 - 1'000 Hz) 30 min per axis
shock	IEC 60068-2-27 (≤ 500 m/s ² / 11 ms) 10 pulses per axis and direction
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



dimensions



order designation

BOMH 58S1 N24B

		H
	connection	
	H	D-Sub connector
	shaft	
	B2	hollow shaft 12 mm IP 42 with clamping ring
	E2	hollow shaft 12 mm IP 65 with clamping ring
	I2	hollow shaft 12 mm IP 42 with clamping ring and spring plate
	M2	hollow shaft 12 mm IP 65 with clamping ring and spring plate
	resolution	
	single-turn / multi-turn	
	18 / 14	bit
	other resolutions programmable	
	signal code	
N	binary code	

Note

Mounting drawings see end of chapter.

Other versions on request.

assignment D-Sub 9-pin male connector

for connection reference **-H**

pin number	signals	description
1	n.c.	-
2	CAN_L	bus line (dominant LOW)
3	CAN_GND	CAN ground
4	n.c.	-
5	n.c.	-
6	GND	ground
7	CAN_H	bus line (dominant HIGH)
8	n.c.	-
9	+Vs	voltage supply

accessories

CD-ROM with GSD-/EDS-/XML-files and manuals	part nr. 147362
D-Sub connector angled	part nr. 145023
spring plate set	part nr. 136635
clamp set	part nr. 110616

Absolute multi-turn hollow shaft encoder

BOMH flexible – *Digitalizer*

Profibus-DP, CANopen, DeviceNet, EtherCAT

features

- high resolution multi-turn encoder
 - 18 bit single-turn
 - 14 bit multi-turn
- modular bus cover
- simple mounting via servo flange
- programmable bus parameters
- programmable resolution and preset values



general data

voltage supply	10 - 30 VDC
supply current no load	100 mA (at 24 VDC)
max. resolution	Profibus-DP, DeviceNet
single-turn	18 bit (1 step = 5°)
multi-turn	13 bit (8'192 revolutions)
	CANopen
single-turn	18 bit (1 step = 5°)
multi-turn	14 bit (16'384 revolutions)
repeatability	0,012°
output circuit	RS 485
preset	in state data-exchange encoder can be set to a predefined position
address	selectable via dip switches
baud rate	selectable via dip switches
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

mechanical data

max. revolutions	mech. 6'000 rpm electr. 6'000 rpm
moment of inertia	typ. $18,4 \times 10^{-7} \text{ kgm}^2$
torque	typ. 1,75 cNm (3'000 rpm / 20 °C / IP 42)
product life	depending on ambient conditions (typ. 10^9 revolutions)
max. protection class	IP 65
material	housing: aluminum bus cover: zinc die cast
weight	approx. 650 g

ambient conditions

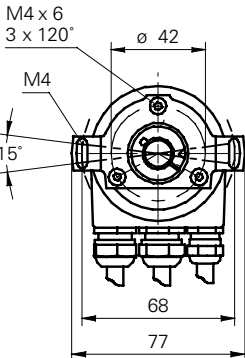
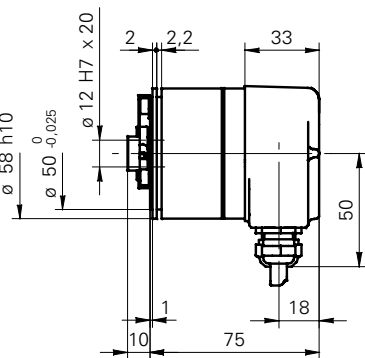
temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration (sine)	IEC 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 10 - 2'000 Hz) 150 min per axis
vibration (random)	IEC 60068-2-64 ($\leq 0,1 \text{ g}^2/\text{Hz}$ / 20 - 1'000 Hz) 30 min per axis
shock	IEC 60068-2-27 ($\leq 500 \text{ m/s}^2$ / 11 ms) 10 pulses per axis and direction
noise immunity	EN 61000-6-2
emitted interference	EN 61000-6-3



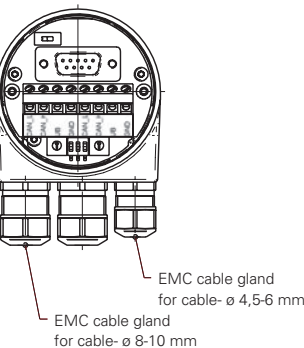
Profibus-DP, CANopen, DeviceNet, EtherCAT

dimensions

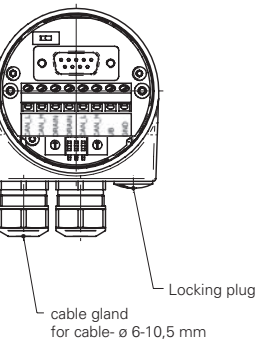
-E bus cover



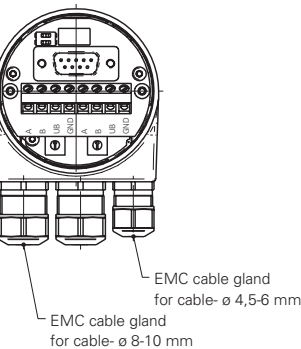
-B bus cover



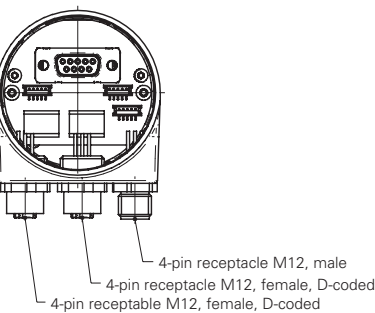
-D bus cover



-P bus cover



-E bus cover



order designation

BOMH 58S1N 24C ☐ ☐ **G** base encoder
without bus cover
BOMH 58S1N 24 ☐ ☐ ☐ complete encoder

connection

D bus cover with PG radial
(for interface **B,D,P**)
E bus cover with
connector M12 radial
(for interface **E**)

shaft

B2 hollow shaft 12 mm IP 42
with clamping ring
P2 hollow shaft 12 mm IP 65
with clamping ring
I2 hollow shaft 12 mm IP 42
with clamping ring and spring
plate
M2 hollow shaft 12 mm IP 65
with clamping ring and spring
plate

resolution

single-turn / multi-turn

18 / 14 bit CANopen, EtherCAT
18 / 13 bit Profibus-DP, DeviceNet
other resolutions programmable

interface

B CANopen
D DeviceNet
P Profibus-DP
E EtherCAT

accessories

CD-ROM with GSD-/EDS-/XML-
files and manuals part nr. 147362

bus cover see chapter accessories
for Profibus-DP part nr. 140831
for CANopen part nr. 140832
for DeviceNet part nr. 140833
for EtherCAT part nr. 159110

cable EtherCAT M12 male-male, d-coded
M12 straight, 5 m part nr. 160565

spring plate set part nr. 136635

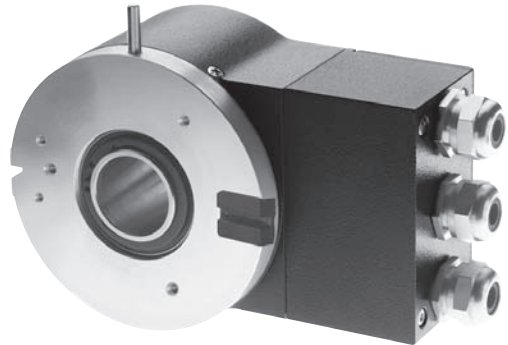
Absolute multi-turn hollow shaft encoder

BPMD flexible

Profibus-DP, CANopen, DeviceNet

features

- multi-turn encoder up to
 - 13 bit single-turn
 - 16 bit multi-turn
- modular bus cover
- programmable operating modes
- programmable bus parameters
- programmable resolution and preset values
- hollow shaft $\varnothing$ 25,4...50,8 mm



general data

voltage supply	10 - 30 VDC with reverse polarity protection
max. supply current no load	100 mA (at 24 VDC)
signal coding	binary code
max. resolution single-turn	13 bit (1 step = 2' 38")
multi-turn	16 bit (65'536 rev.)
max. switching frequency	800 kHz
max. error limit	$\pm 0,025^\circ$ at 400 kHz $\pm 0,05^\circ$ at 800 kHz
preset	in state data-exchange encoder can be set to a predefined position
address	adjustable via jog-dial
baud rate	selectable via dip switches
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	DIN EN 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 16 - 2'000 Hz)
shock	DIN EN 60068-2-27 ($\leq 2'000 \text{ m/s}^2$ / 6 ms)
noise immunity	DIN EN 61000-6-2
emitted interference	DIN EN 61000-6-4

mechanical data

BPMD 25

max. revolutions	mech. 3'800 rpm electr. 6'000 rpm
moment of inertia	$200 \times 10^{-6} \text{ kgm}^2$
max. protection class	IP 54
material	housing: aluminum
weight	approx. 830 g

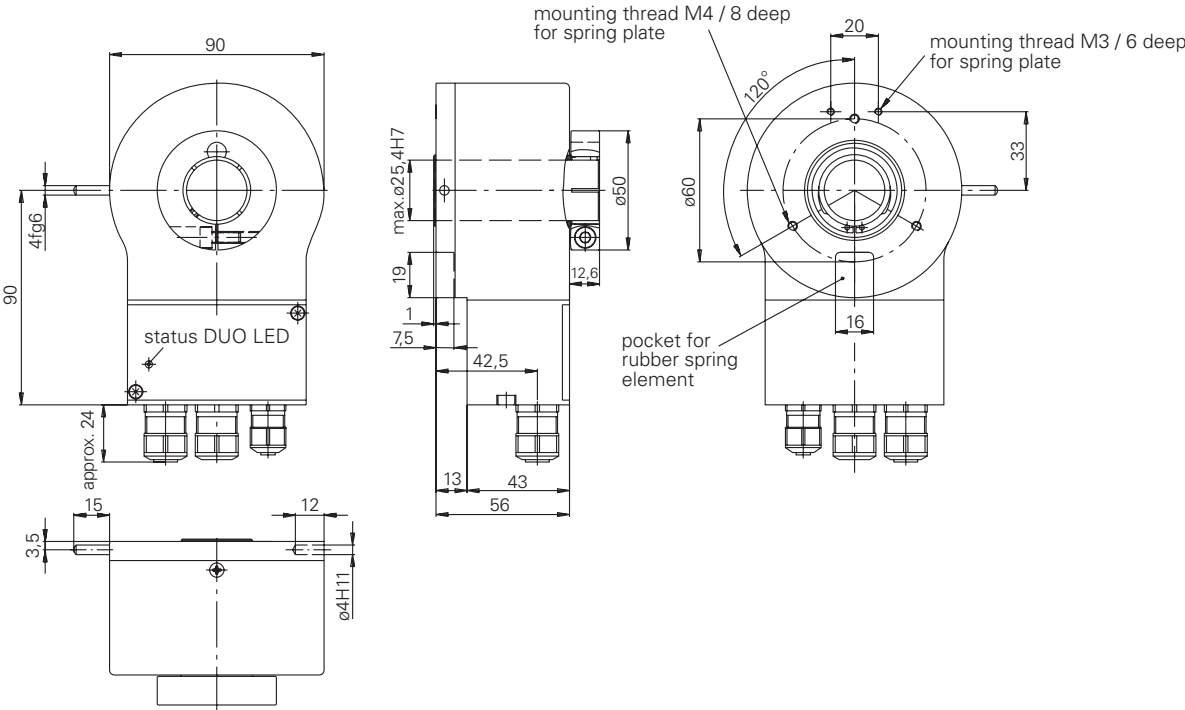
BPMD 50

max. revolutions	mech. 2'000 rpm higher on request electr. 6'000 rpm
moment of inertia	$1'100 \times 10^{-6} \text{ kgm}^2$
max. protection class	IP 54
material	housing: aluminum
weight	approx. 1'200 g



dimensions

BPMD 25 with Profibus-DP



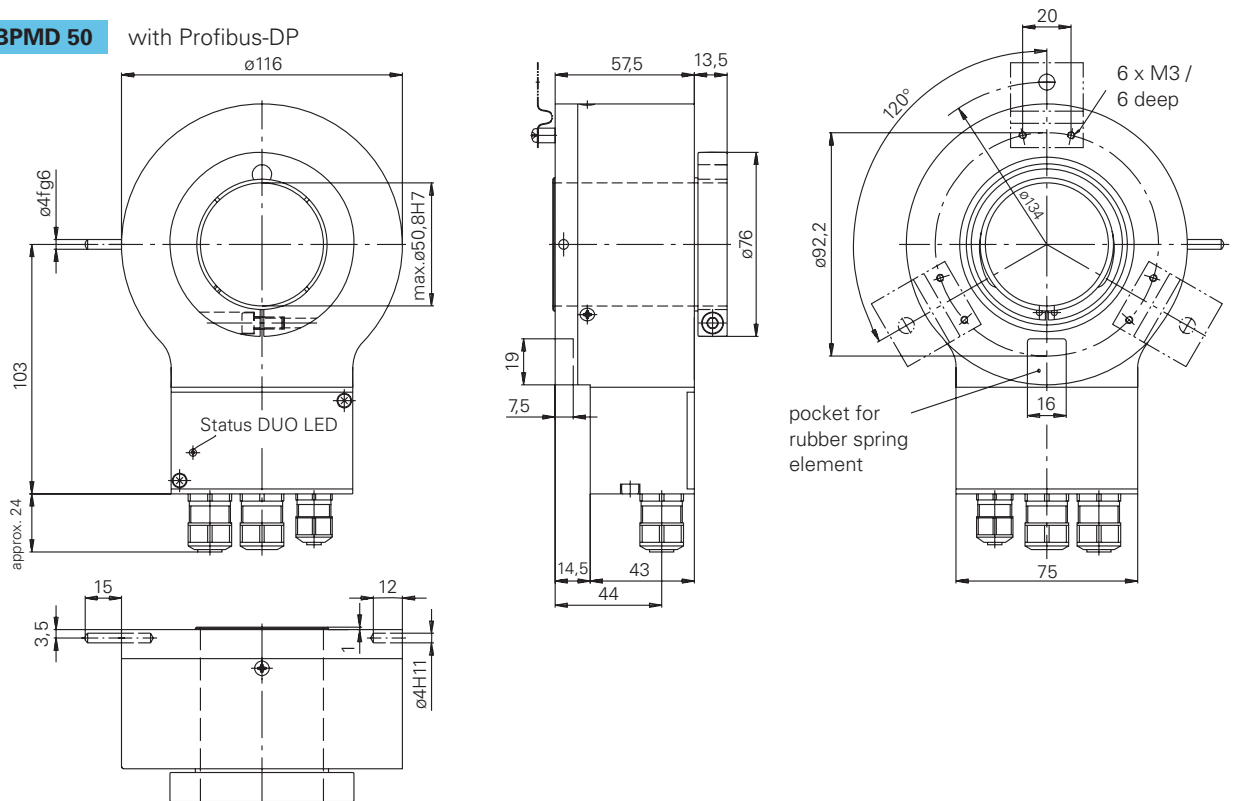
Absolute multi-turn hollow shaft encoder

BPMD flexible

Profibus-DP, CANopen, DeviceNet

dimensions

BPMD 50 with Profibus-DP



Absolute multi-turn hollow shaft encoder

BIMD flexible

Profibus-DP, CANopen, DeviceNet

features

- interface: Profibus-DP, CANopen, DeviceNet
- resolution 13 bit single-turn
- resolution 16 bit multi-turn
- programmable operating modes
- programmable resolution and preset values
- hollow shaft $\varnothing$ 14 mm
- compact housing

general data

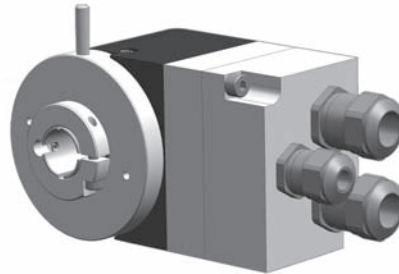
voltage supply	10 - 30 VDC with reverse polarity protection
max. current supply no load	100 mA (at 24 VDC)
signal code	binary
max. resolution single-turn	13 bit (1 step = 2' 38")
multi-turn	16 bit (65'536 rev.)
max. switching frequency	800 kHz
max. error limit	$\pm 0,025^\circ$
preset	value programmable within resolution range
address	selectable via dip switches
baud rate	selectable via dip switches
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

mechanical data

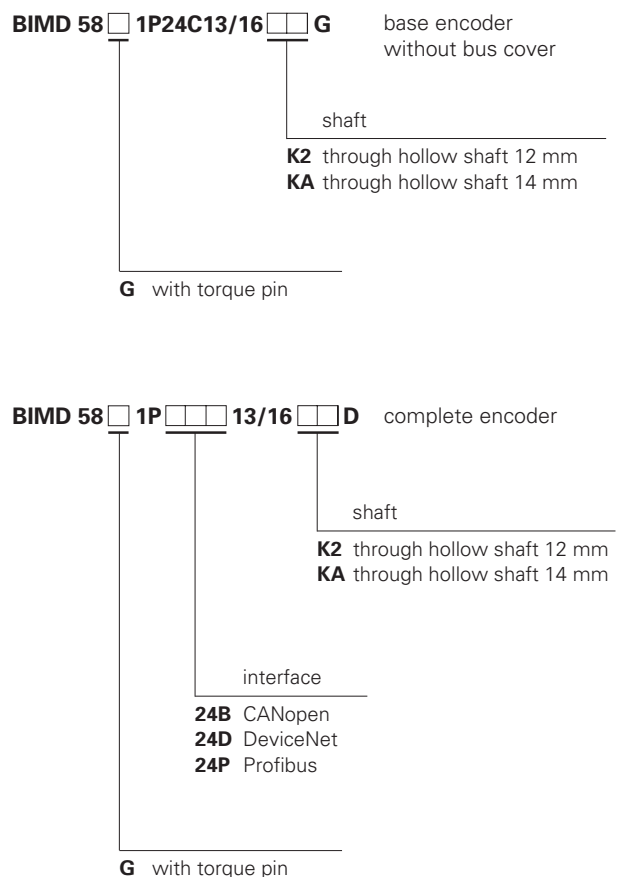
max. revolutions	6'000 rpm
moment of inertia	$200 \times 10^{-6} \text{ kgm}^2$
max. protection class	IP 54
material	housing: aluminum
weight	approx. 600 g

ambient conditions

temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	DIN EN 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 16-2'000 Hz)
shock	DIN EN 60068-2-27 ($\leq 2'000 \text{ m/s}^2$ / 6 ms)
noise immunity	DIN EN 61000-6-2
emitted interference	DIN EN 61000-6-4



order designation

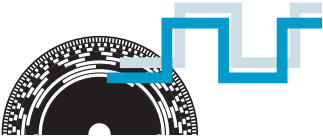


Other versions on request.

accessories

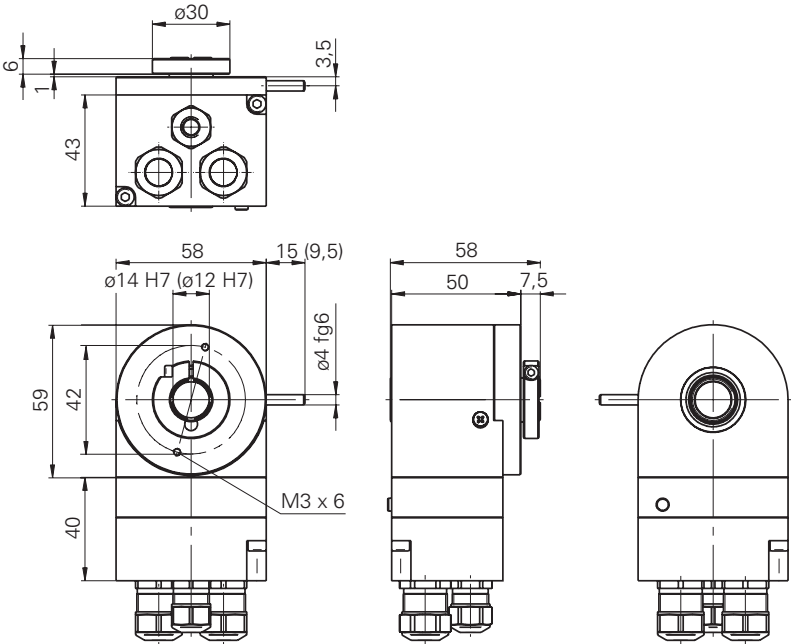
CD-ROM with GSD-/ESD-/XML- files and manuals	part nr. 147362
spring plate for use with torque pin	part nr. 140347

Profibus-DP, CANopen, DeviceNet

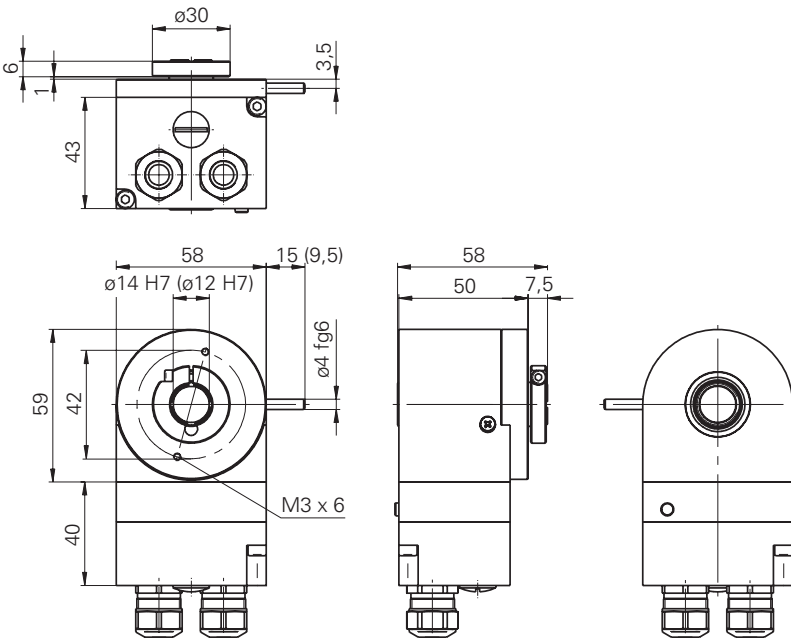


dimensions

BIMD CANopen, Profibus



BIMD DeviceNet



2

Programmable absolute multi-turn hollow shaft encoders

BMG

parallel

features

- multi-turn encoders up to
 - 12 bit single-turn
 - 12 bit multi-turn
- parallel interface
- Gray, BCD and binary code
- self-testing
- hollow shaft $\varnothing$ 12...50,8 mm
- programmable



general data

voltage supply	10 - 30 VDC with reverse polarity protection
supply current	50 mA (at 24 VDC)
max. resolution single-turn	12 bit (1 step = 5' 16") resolution from 1 to 4'096 steps/rev as desired
multi-turn	12 bit (4'096 revolutions) from 1 to 4'096 rev. in two exponential steps
max. error limit	$\pm 1/2$ step
input signal	F/R input, STORE/ENABLE, zero setting
max. switching frequency	400 kHz

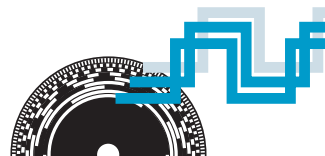
mechanical data

max. revolutions	mech. 6'000 rpm electr. 6'000 rpm
moment of inertia	2×10^{-6} kgm ²
max. protection class	IP 54
material	housing: steel flange: aluminum
weight	approx. 700 g

ambient conditions

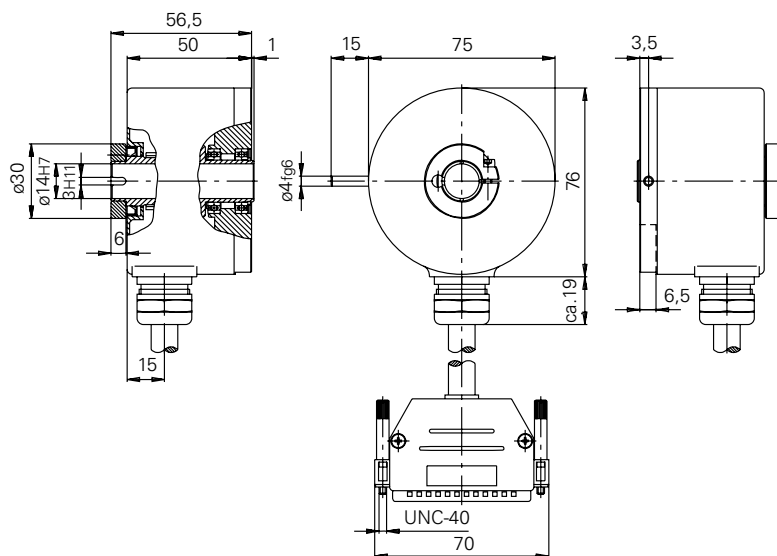
temperature range	-20...+85 °C
relative humidity	max. 95% non condensing
vibration	DIN EN 60068-2-6 (≤ 100 m/s ² / 16 - 2'000 Hz)
shock	DIN EN 60068-2-27 ($\leq 2'000$ m/s ² / 6 ms)
noise immunity	DIN EN 61000-6-2
emitted interference	DIN EN 61000-6-4

parallel



dimensions and connection dimensions

BMG



Programmable absolute multi-turn hollow shaft encoders

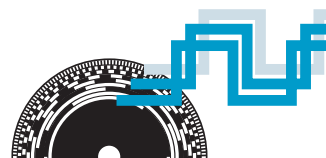
BMG

parallel

assignment			signals parallel interface	
pin	cable color	assignment		
1	white	D0	1 - 24 D0 - D23	Data lines D0 to D23. 24 parallel output signals. For each data line, we recommend pull-down resistors for PNP and pull-up resistors for NPN, both with 4.7 kOhms. D19 - D23 for low resolutions these outputs can be assigned for special outputs.
2	brown	D1		
3	green	D2		
4	yellow	D3		
5	grey	D4		
6	pink	D5		
7	black	D6	27 ZERO	Zero setting input for setting a zero at any point within the programmed encoder resolution. The zero setting process is triggered by a HIGH pulse and should take place after direction of rotation selection (F/R̄). For maximum interference immunity after zero setting, connect to GND. Pulse duration ≥ 100 ms.
8	violet	D7		
9	grey/pink	D8		
10	red/blue	D9		
11	white/green	D10		
12	brown/green	D11		
13	white/yellow	D12		
14	yellow/brown	D13		
15	white/gray	D14	28 $\overline{\text{ENABLE}}$	If this input is at LOW level, the output drivers will be activated. On application of HIGH potential (or unconnected), the output drivers assume a HIGH-resistance state.
16	grey/brown	D15		
17	white/pink	D16		
18	pink/brown	D17		
19	white/black	D18	29 $\overline{\text{STORE}}$	By applying a LOW level, the data of the absolute encoder will be buffered. If this input is connected to HIGH potential or remains open, the current position data of the absolute encoder will be switched through to the output drivers. For reliable readout of the data, this line must be used in the case of binary code.
20	brown/black	D19		
21	grey/green	D20		
22	yellow/grey	D21		
23	pink/green	D22		
24	yellow/pink	D23		
25		—		
26		—		
27	yellow/blue	ZERO	30 F/R̄	F/R̄ counting direction input. When not connected, this input is on HIGH. F/R̄-HIGH means increasing output data with a clockwise hollow shaft rotating direction when looking at the flange.
28	brown/blue	$\overline{\text{ENABLE}}$		
29	brown/red	$\overline{\text{STORE}}$		
30	green/blue	UP/DOWN		
31		—		
32		—		
33		—		F/R̄-LOW means increasing values with a counter-clockwise hollow shaft rotating direction when looking at the flange.
34	white/blue	TxD	34 TxD	Data send line of the RS-232 interface for encoder programming.
35	white/red	RxD	35 RxD	Data receive line of the RS-232 interface for encoder programming.
36	red	+Vs	36 +Vs	Voltage supply
37	blue	GND	37 GND	Ground connection of the encoder.

Recommendation: Please use leads twisted in pairs for extension cord.

parallel



inputs

HIGH level	$> 0,7 +V_s$
LOW level	$< 0,3 +V_s$
wiring diagram:	Inputs with 10 k Ω against +Vs; except zero setting with 10 k Ω against GND.

outputs

HIGH (PNP) level	$> +V_s - 4,5 \text{ V}$	(at $I = -15 \text{ mA}$)
LOW (NPN) level	$< 3,5 \text{ V}$	(at $I = 15 \text{ mA}$)

HIGH load (PNP)	$< -20 \text{ mA}$
LOW load (NPN)	$< 20 \text{ mA}$
Tristate	$< 200 \mu\text{A}$

All outputs with short-circuit protection PNP or NPN
OC output levels.

preconditions for programming

- PC with RS 232 interface and Windows operating system
- programming software ProGeber, manual
- programming cable connection, connecting the absolute encoder with the PC

If necessary order separately under accessories.

description of diagnosis and special functions

When turned on, the encoder will carry out a self-testing.
The following is monitored during operation:

- check of the code steadiness
- whether admissible signal frequency is exceeded
- LED failure, aging
- whether receiver has failed
- code disc, broken glass
- supply voltage of electronically controlled gearbox

Special functions:

- two preselections „limit switch function“
- speed monitoring can be programmed
- status of diagnosis and mode

order designation BMG

BMG 1P.24  4096 – GA – K

shaft
shaft 14 mm, IP 54

output signals

N NPN (short circuit protection), OC
P PNP (short circuit protection), OC

accessories

programming software
cable and manual part nr. 117665

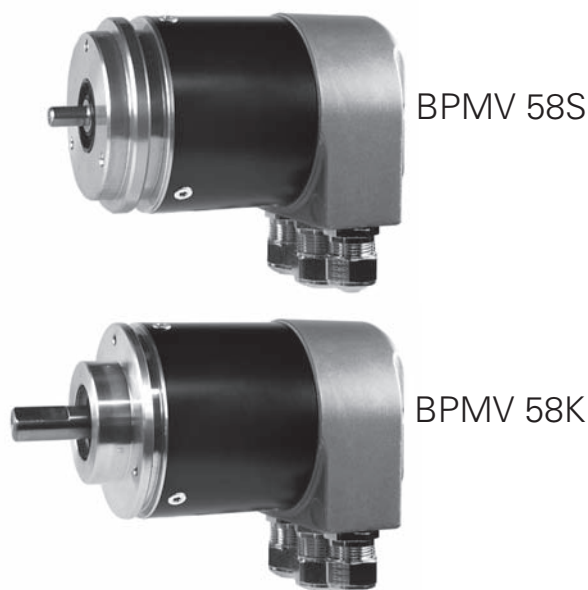
Absolute multi-turn shaft encoders

BPMV flexible – ProCoder

Profibus-DP, CANopen, DeviceNet, EtherCAT

features

- multi-turn encoders up to
 - 13 bit single-turn
 - 16 bit multi-turn
- modular bus cover
- simple mounting via servo flange
- programmable bus parameters
- programmable resolution and preset values



general data

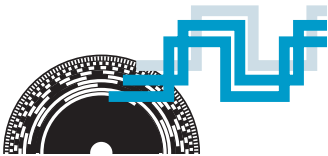
voltage supply	10 - 30 VDC with reverse polarity protection
supply current no load	max. 100 mA (at 24 VDC)
max. resolution	
single-turn	13 bit (1 step = 2' 38")
multi-turn	16 bit (65'536 step)
max. switching frequency	800 kHz
max. error limit	±0,05°
preset	in state data-exchange encoder can be set to a predefined position
baud rate	selectable via dip switches
address	adjustable via Jog-dial
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

mechanical data

max. revolutions	mech. 10'000 rpm electr. 6'000 rpm
moment of inertia	$2 \times 10^{-6} \text{ kgm}^2$
starting torque	≤ 0,015 Nm
max. shaft load	axial: < 20 N radial: < 40 N
product life	depending on ambient conditions (typ. 10^9 revolutions)
max. protection class	IP 65
material	housing: steel bus cover: zinc die cast flange: aluminum
weight	approx. 680 g

ambient conditions

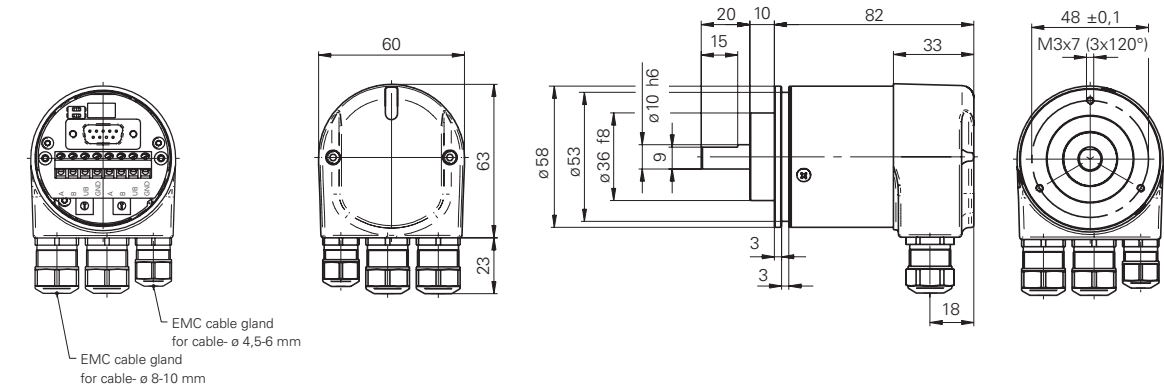
temperature range	-25...+85 °C
vibration	DIN EN 60068-2-6 (≤ 100 m/s ² / 16 - 2'000 Hz)
shock	DIN EN 60068-2-27 (≤ 2'000 m/s ² / 6 ms)
noise immunity	DIN EN 61000-6-2
emitted interference	DIN EN 61000-6-4



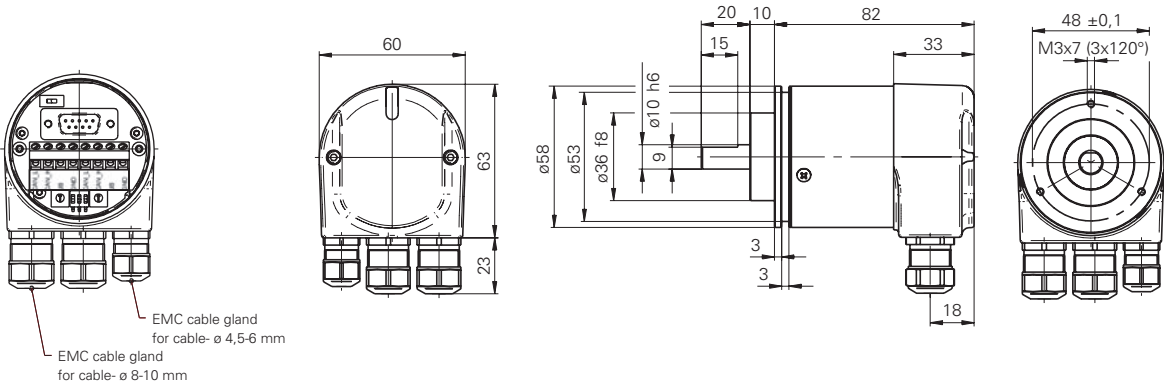
Profibus-DP, CANopen, DeviceNet, EtherCAT

dimensions

BPMV-Profibus



BPMV-CANopen



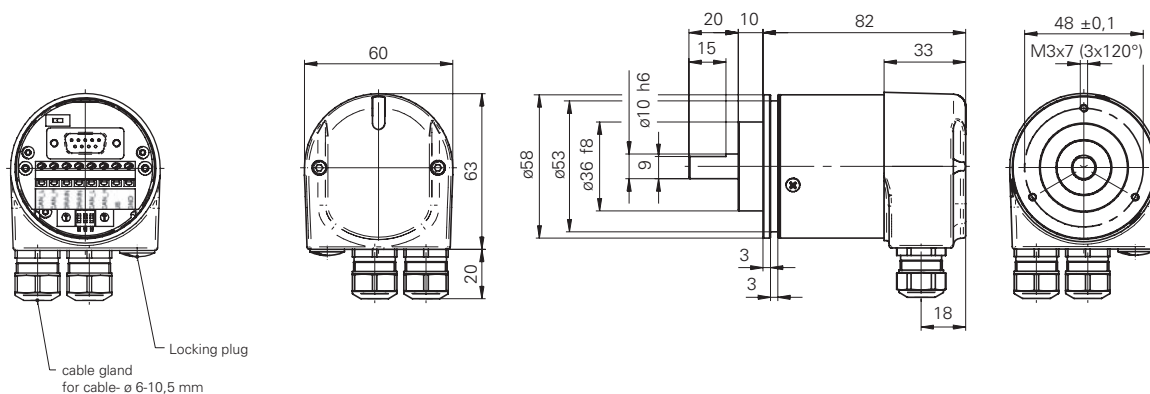
Absolute multi-turn shaft encoders

BPMV flexible – ProCoder

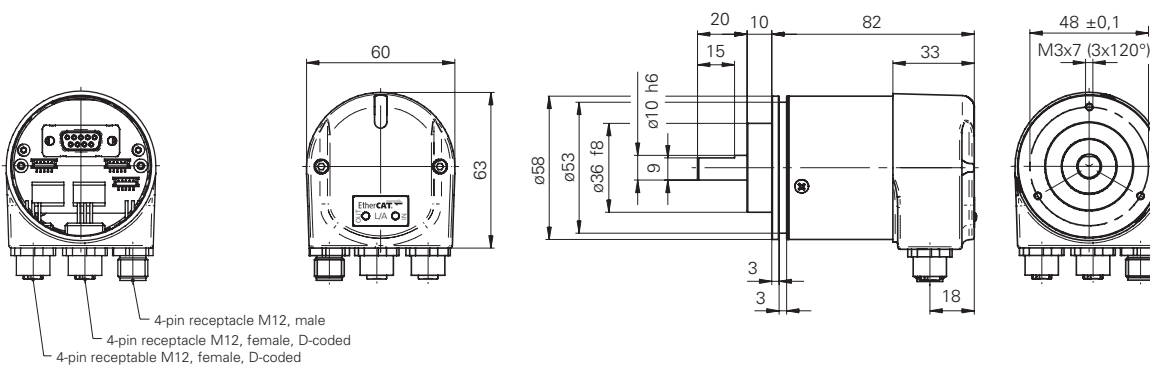
Profibus-DP, CANopen, DeviceNet, EtherCAT

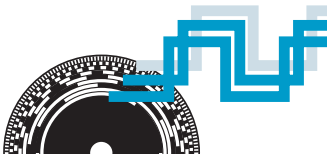
dimensions

BPMV-DeviceNet



BPMV-EtherCAT





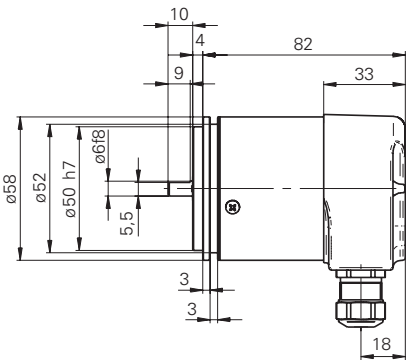
Profibus-DP, CANopen, DeviceNet, EtherCAT

order designation

BPMV 58	1P24	C13/16	G	base encoder without bus cover
BPMV 58	1P24	13/16		complete encoder
				connection
			D	bus cover with PG radial (for interface B,D,P)
			E	bus cover with connector M12 radial (for interface E)
				shaft
			C6	shaft 6 mm IP 65 (servo flange)
			C0	shaft 10 mm IP 65 (clamping flange)
				interface
			B	CANopen
			D	DeviceNet
			P	Profibus-DP
			E	EtherCAT
				housing
			S	servo flange
			K	clamping flange

dimensions

BPSV servo flange



accessories

spring washer coupling	
hole 6 mm / 10 mm	part nr. 141132
hole 6 mm / 6 mm	part nr. 141131
hole 10 mm / 10 mm	part nr. 141133
CD-ROM with GSD-/EDS-/XML- files and manuals	part nr. 147362
bus cover for	see chapter accessories
Profibus-DP	part nr. 140831
CANopen	part nr. 140832
DeviceNet	part nr. 140833
EtherCAT	part nr. 159110
cable EtherCAT M12 male-male, d-coded M12 straight, 5 m	part nr. 160565

type BPMV 58S servo flange

mounting	part nr. 125051
scews and servo clamps	part nr. 117668

type BPMV 58S clamping flange

mounting bracket	part nr. 117698
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High-grade steel absolute multi-turn shaft encoder

BEMV flexible – ProCoder

Profibus-DP, CANopen, DeviceNet

features

- high-grade steel housing 1.4305
- multi-turn encoder up to
 - 13 bit single-turn
 - 16 bit multi-turn
- modular bus cover
- simple mounting via servo flange
- programmable bus parameters
- programmable resolution and preset values



general data

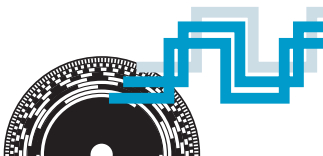
voltage supply	10 - 30 VDC with reverse polarity protection
supply current no load	max. 100 mA (at 24 VDC)
max. resolution single-turn	13 bit (1 step = 2' 38")
multi-turn	16 bit (65'536 revolutions)
max. switching frequency	800 kHz
max. error limit	±0,05°
preset	in state data-exchange encoder can be set to a predefined position
address	adjustable via Jog-dial
direction of rotation	looking at the flange, position counts up as the shaft rotates clockwise (CW), programmable

mechanical data

max. revolutions	mech. 10'000 rpm electr. 6'000 rpm
moment of inertia	$2 \times 10^{-6} \text{ kgm}^2$
starting torque	≤ 0,015 Nm
max. shaft load	axial: < 20 N radial: < 40 N
max. protection class	IP 67
material	housing: high-grade steel 1.4305
weight	approx. 900 g

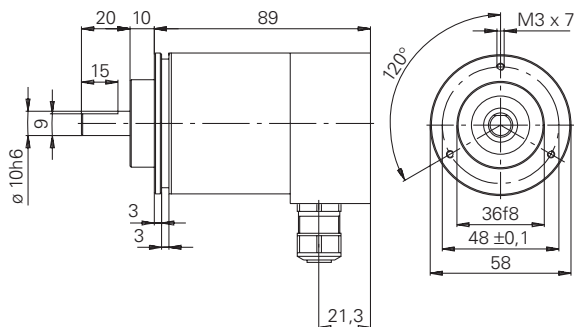
ambient conditions

temperature range	-25...+85 °C
vibration	DIN EN 60068-2-6 (≤ 100 m/s ² / 16 - 2'000 Hz)
shock	DIN EN 60068-2-27 (≤ 2'000 m/s ² / 6 ms)
noise immunity	DIN EN 61000-6-2
emitted interference	DIN EN 61000-6-4



Profibus-DP, CANopen, DeviceNet

dimensions



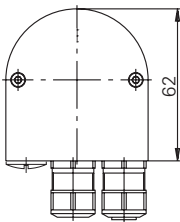
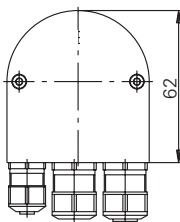
order designation

BEMV 58K1P24 C 13/16N0 G base encoder
without bus cover
BEMV 58K1P24 ☐ 13/16N0 D complete encoder

interface
B CANopen
D DeviceNet
P Profibus-DP

Profibus-DP
CANopen

DeviceNet



accessories

mounting bracket	part nr. 117698
CD-ROM with GSD-/EDS-/XML- files and manuals	part nr. 147362
bus cover for Profibus-DP	see chapter accessories part nr. 147369
for CANopen	part nr. 147370
for DeviceNet	part nr. 147371

Absolute multi-turn shaft encoders

BMA/BMB

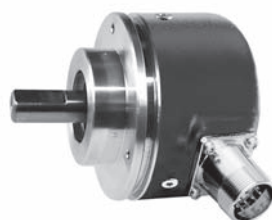
SSI

features

- multi-turn encoders up to
 - 13 bit single-turn
 - 12 bit multi-turn
- SSI interface
- Gray and binary code
- self-testing
- counting direction setting input
- zero setting input
- optional: with incremental signals



BMA



BMB

general data

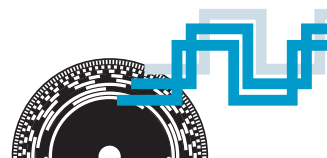
voltage supply	10 - 30 VDC with reverse polarity protection
max. supply current no load	50 mA (at 24 VDC)
max. resolution	
single-turn	13 bit (1 step = 2' 38")
multi-turn	12 bit (4'096 rev.)
max. error limit	±1/2 step
input signal	clock input SSI, F/R-input, zero set input
max. switching frequency	800 kHz
SSI clock frequency	min. 62,5 kHz up to max. 1,5 MHz (depending on cable length)

mechanical data

max. revolutions	mech. 10'000 rpm electr. 6'000 rpm
moment of inertia	$2 \times 10^{-6} \text{ kgm}^2$
torque	$\leq 0,010 \text{ Nm}$ (without sealing ring) $\leq 0,015 \text{ Nm}$ (with sealing ring)
max. shaft load	axial: 20 N radial: 40 N
max. protection class	IP 65
material	housing: steel flange: aluminum
weight	approx. 400 g

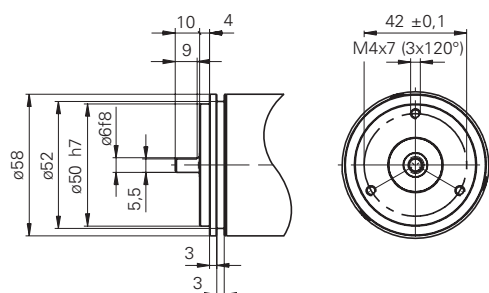
ambient conditions

temperature range	-25...+85 °C
relative humidity	max. 95% non condensing
vibration	DIN EN 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 16 - 2'000 Hz)
shock	DIN EN 60068-2-27 ($\leq 2'000 \text{ m/s}^2$ / 6 ms)
noise immunity	DIN EN 61000-6-2
emitted interference	DIN EN 61000-6-4



dimensions and connection dimensions

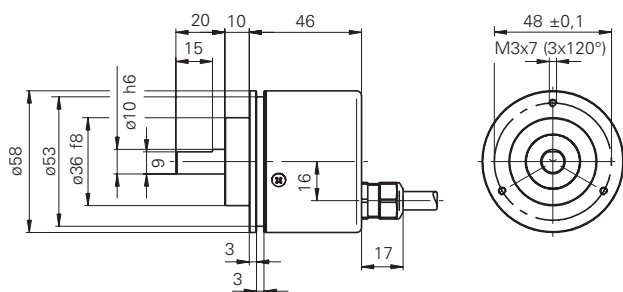
BMA



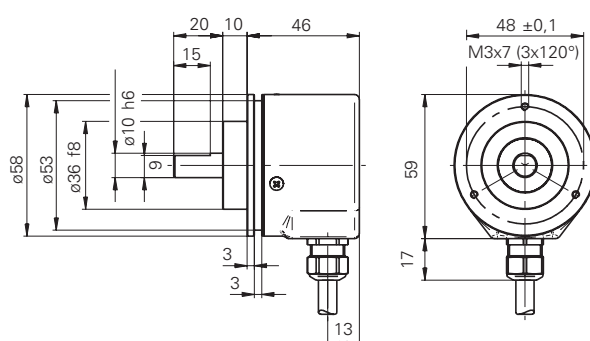
BMB

3

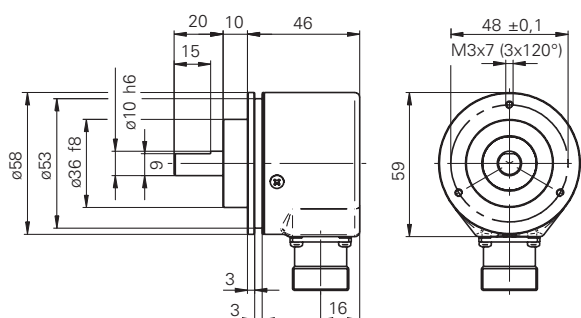
-4



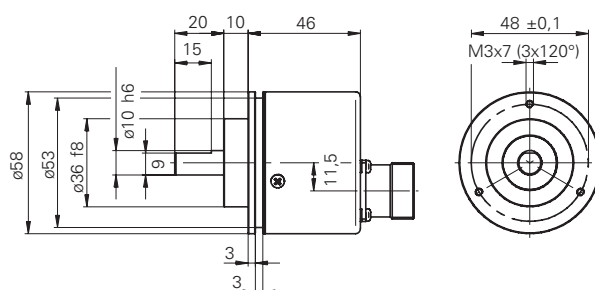
-5



-A



-B



Absolute multi-turn shaft encoders

BMA/BMB

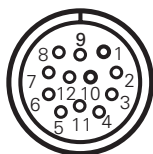
SSI

assignment

Designation		
cable	connector	signal (SSI)
color	12-pin	
brown	1	+Vs
black	2	GND
blue	3	clock+
beige	4	data+
green	5	ZERO
yellow	6	data-
violet	7	clock-
brown/yellow	8	$\overline{DV}$
pink	9	$F/\overline{R}$
black/yellow	10	$\overline{DV}/MT$
-	11	-
-	12	-

Screen: In the case of encoders with cable output, the screen is connected to the housing.

pin assignment M23 male



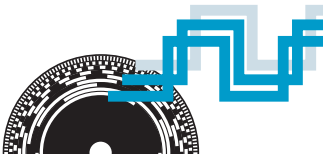
seen from outside

connector 12-pin M23



signals for serial input interface

- +Vs Voltage supply connection of the encoder.
- GND Ground connection of the encoder. The voltage relating to GND is +Vs.
- clock+ Clock, together with clock-, forms a current loop. A current of 7 mA in input clockdirection produces a logical 0 in positive logic.
- data+ Positive, serial data output of the differential line driver. A HIGH level at the output corresponds to logic 1 in positive logic.
- ZERO Zero setting input for setting a zero at any point within the overall resolution. The zero setting process is triggered by a HIGH pulse and should take place after direction of rotation selection ($F/\overline{R}$). Min. signal duration > 100 ms.
- data- Negative, serial data output of differential line driver. A HIGH level at the output corresponds to logical 0 in positive logic.
- clock- Clock-, together with clock+, forms a current loop. A current of 7 mA in input clock-direction produces a logical 0 in positive logic.
- 8 / 10 $\overline{DV}$; $\overline{DV}/MT$ Diagnosis outputs $\overline{DV}$ and $\overline{DV}/MT$ jumps in data word, e.g. due to defective LED or photoreceiver, are displayed via the $\overline{DV}$ output. In addition, the power supply of the multiturn sensor unit is monitored and the $\overline{DV}/MT$ output is set when a specified voltage level is dropped below. Both outputs are Low-active, i.e. are switched through to GND in the case of an error.
- $F/\overline{R}$ $F/\overline{R}$ counting direct input. If connected, this input is in HIGH state. $F/\overline{R}$ -High means increasing output data with cw shaft rotation. $F/\overline{R}$ -Low means increasing output values with ccw shaft rotation, in each case looking at the shaft.



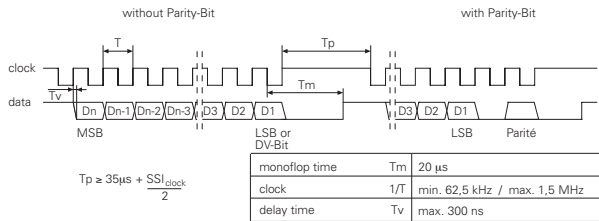
inputs F/R and ZERO

Control signal F/R and ZERO

input voltage	(Vs = 10 - 30 VDC)
HIGH level	> 0,7 - +Vs
LOW level	< 0,3 +Vs

Connection: F/R inputs with 10 kΩ to +Vs for F/R, zero setting input with 10 kΩ to GND.

signal characteristic, SSI serial output



outputs DV and DV/MT

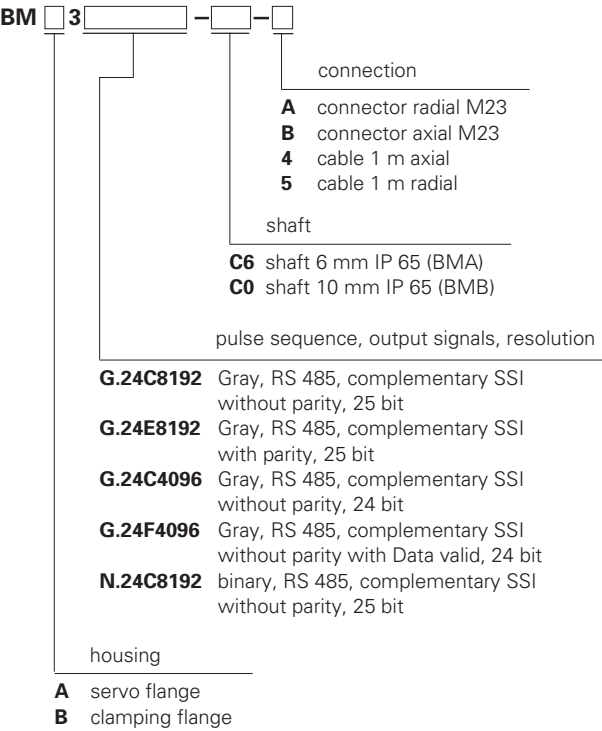
Outputs push-pull short-circuit protected

HIGH level	> Vs -3,5 V (up to I = -20 mA)
LOW level	≤ 0,5 V (up to I = 20 mA)

accessories

connector 12-Pol M23	part nr. 118319
type BMA servo flange	
mounting	part nr. 125051
screws and servo clamps	part nr. 117668
type BMB clamping flange	
mounting bracket	part nr. 117698

order designation



Please use the programmable version of type BMC/BMD for single pieces.

parity bit

reference 24E

For simple error detection during data transmission, an additional parity bit can be transmitted. Two additional clocks are required for transmission (by MT various).

Parity bit = „1“ for odd number of HIGH levels in the data word (without parity bit).

Parity bit = „0“ for even number of HIGH levels in the data word (without parity bit).

data valid bit (DV)

reference 24F

The DV bit can be transmitted instead of the LSB (D1). The maximum single-turn resolution is then reduced to 12 bits.

The transmitted DV bit is HIGH active, that is to say if a HIGH level is transmitted, data information is invalid. The data are valid where DV bit = LOW.

Programmable absolute multi-turn shaft encoders

BMC/BMD

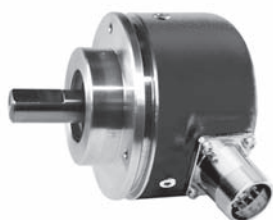
SSI

features

- multi-turn encoders up to
 - 13 bit single-turn
 - 12 bit multi-turn
- SSI interface
- Gray and binary code
- programmable
- counting direction setting input
- zero setting input



BMC



BMD

general data

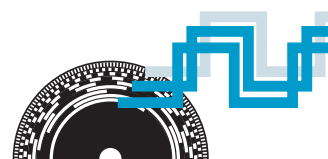
voltage supply	10 - 30 VDC with reverse polarity protection
supply current	50 mA (at 24 VDC)
max. resolution single-turn	13 bit (1 step = 2' 38") resolution from 2 to 8'192 steps/rev as desired
multi-turn	12 bit (4'096 revolutions) from 1 to 4'096 rev. in two exponential steps
max. error limit	±1/2 step
input signal	clock input SSI, F/R-input, zero setting input
max. clock frequency	800 kHz
clock frequency SSI	min. 62,5 kHz to max. 1,5 MHz (depending on cable length)

mechanical data

max. revolutions	mech. 10'000 rpm electr. 6'000 rpm
moment of inertia	$2 \times 10^{-6} \text{ kgm}^2$
torque	$\leq 0,010 \text{ Nm}$ (without sealing ring) $\leq 0,015 \text{ Nm}$ (with sealing ring)
max. shaft load	axial: 20 N radial: 40 N
max. protection class	IP 65
material	housing: steel flange: aluminum
weight	approx. 600 g

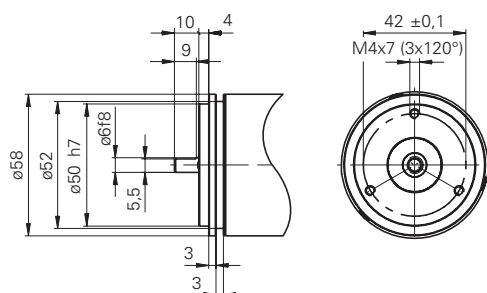
ambient conditions

temperature range	-25...+85 °C
relative humidity	max. 95% non condensing
vibration	DIN EN 60068-2-6 ($\leq 100 \text{ m/s}^2$ / 16 - 2'000 Hz)
shock	DIN EN 60068-2-27 ($\leq 2'000 \text{ m/s}^2$ / 6 ms)
noise immunity	DIN EN 61000-6-2
emitted interference	DIN EN 61000-6-4



dimensions and connection dimensions

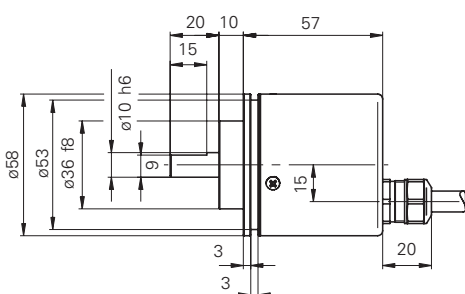
BMC



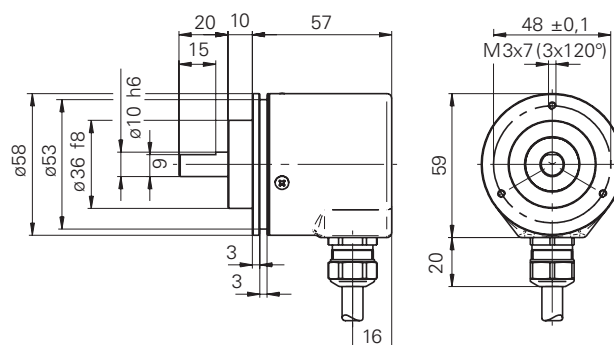
BMD

3

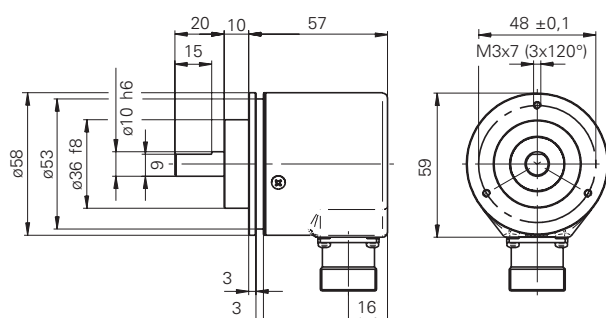
-4



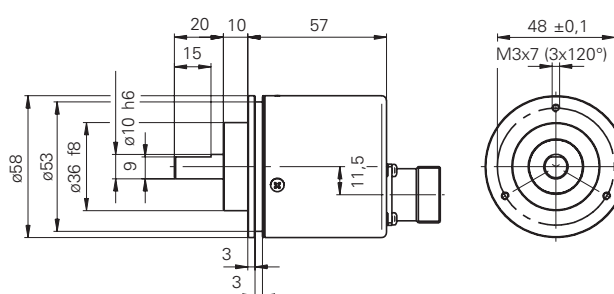
-5



-A



-B



Programmable absolute multi-turn shaft encoders

BMC/BMD

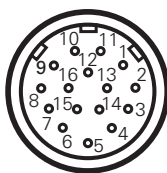
SSI

assignment

Designation SSI		
cable	connector	signal
color	16-pin	
violet	1	data+
brown/white	2	data-
green/white	3	n.c.
yellow/white	4	TxD
grey/white	5	RxD
white/pink	6	clock+
blue/white	7	clock-
red/white	8	output 1
black/white	9	Preset-OUT: output 2
brown/green	10	output 3
green/grey	11	output 4
blue	12	GND
green	13	Preset-IN
brown	14	F/R UP/DOWN
red	15	+Vs
pink	16	n.c.

Screen: In the case of encoders with cable output, the screen is connected to the housing.

connector encoder M23 male



seen from outside

connector 16-pin M23



signals for serial input interface

- 1 data+ Positive serial data output of differential line driver. A HIGH level at the output logically corresponds to 1 in positive logic.
- 2 data- Negative serial data output of differential line driver. A HIGH level at the output logically corresponds to 0 in positive logic.
- 3 n.c. Connection without function
- 4 TxD Transmission output of encoder for the RS-232 programming interface.
- 5 RxD Receiver input of encoder for the RS-232 programming interface.
- 6 clock+ Positive SSI pulse input. Clock+ produces a current loop together with clock-. A current of approximately 7 mA in direction of the input Pulse + generates a logical 1 in positive logic.
- 7 clock- Negative SSI pulse input. Clock- produces a current loop together with clock+. A current of approximately 7 mA in direction of the input Pulse - generates a logical 0 in positive logic.
- 8, 10, 11 output 1,3,4 The special outputs 1,3 and 4 may be optionally assigned, by programming, to the special functions preselection 1, preselection 2, speed monitoring or diagnosis.
- 9 Preset-OUT output 2 Special output for preset monitoring. Cannot be optionally programmed.
- 12 GND Housing contact of encoder. The specific GND voltage is +Vs.
- 13 Preset-IN Preset input for setting a preset anywhere within entire resolution. The preset setting is triggered by a HIGH pulse (pulse duration ≥ 100 ms).
- 14 F/R UP/DOWN Input for counting up and down. If open-circuited, it is set to HIGH. UP/DOWN HIGH means increasing output data if shaft rotates clockwise when looking at the flange. UP/DOWN LOW means increasing values if shaft rotates counter-clockwise when looking at the flange.
- 15 +Vs Voltage supply of encoder
- 16 GND-PRG Ground for programmable interface. Internally not connected with GND.

SSI

inputs $F/\bar{R}$ and ZERO

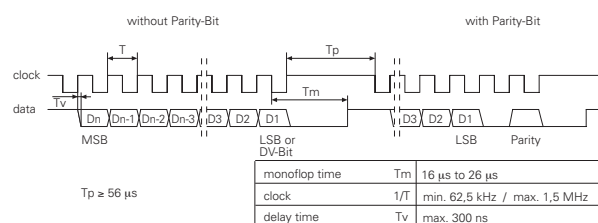
One control signal $F/\bar{R}$ for selection of positive direction of rotation and ZERO for zeroing in any position.

input voltage	(Vs = 10 - 30 VDC)
HIGH level	0,7 Vs up to Vs
LOW level	0 up to 0,3 Vs

Wiring:

Inputs with 10 k Ω to Vs for F/ $\bar{R}$ and with 10 k Ω to GND for ZEO.

signal characteristic, SSI serial output



output 1...4

Outputs push-pull short-circuit protected

HIGH level	$\geq V_s - 3,5 \text{ V}$ (at $I = -20 \text{ mA}$)
LOW level	$\geq 0,5 \text{ V}$ (at $I = 20 \text{ mA}$)

$\overline{DV}$ for error display can be programmed to one of the outputs. LOW level indicates an error.

parity bit programmable

For simple error detection during data transmission, an additional parity bit can be transmitted. Two additional clocks are required for transmission (by MT various).

Parity bit = „1“ for odd number of HIGH levels in the data word (without parity bit).

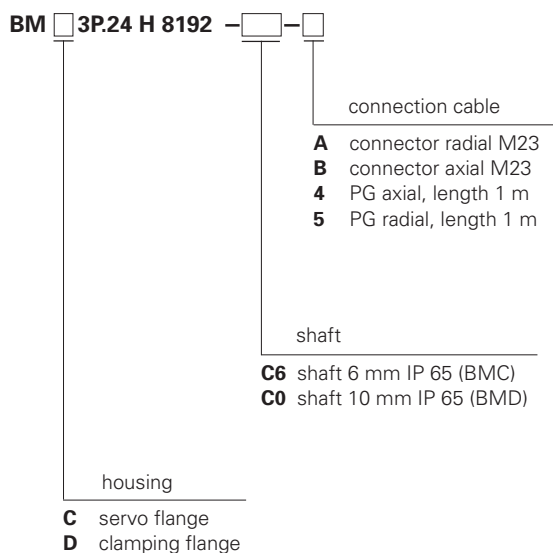
Parity bit = „0“ for even number of HIGH levels in the data word (without parity bit).

data validity bit ($\overline{DV}$) programmable

The $\overline{DV}$ bit can be transmitted after the LSB (D 1).

The transmitted $\overline{DV}$ bit is HIGH active, that is to say if a HIGH level is transmitted, the data information is invalid. The data are valid where $\overline{DV}$ bit = LOW.

order designation



preconditions for programming

- PC with RS 232 interface and Windows operating system
- programming software ProGeber, manual
- programming cable connection, connecting the absolute encoder with the PC

Order separately under chapter accessories if necessary.

accessories

connector 16-Pol M23	part nr. 117731
type BMC servo flange	
mounting	part nr. 125058
screws and servo clamps	part nr. 117668
type BMD clamping flange	
mounting bracket	part nr. 117698
programming software	
cable and manual	part nr. 117729

Programmable absolute multi-turn shaft encoders

BMC/BMD

parallel

features

- multi-turn encoders up to
 - 12 bit single-turn
 - 12 bit multi-turn
- parallel interface
- Gray, BCD and binary code
- programmable
- counting direction setting input
- zero setting input



BMC



BMD

general data

supply voltage	10 - 30 VDC with reverse polarity protection
supply current	50 mA (at 24 VDC)
max. resolution single-turn	12 bit (1 step = 5' 16") resolution from 1 to 4'096 steps/rev as desired
multi-turn	12 bit (4'096 revolutions) from 1 to 4'096 rev. in two exponential steps
max. error limit	±1/2 step
input signal	F/R-input, STORE/ENABLE, zero setting input
max. switching frequency	400 kHz

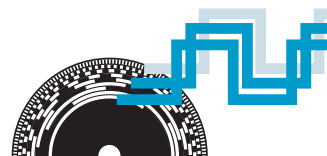
mechanical data

max. revolutions	mech. 10'000 rpm electr. 6'000 rpm
moment of inertia	$2 \times 10^{-6} \text{ kgm}^2$
torque (3'000 rpm / 20 °C)	≤ 0,010 Nm (without sealing ring) ≤ 0,015 Nm (with sealing ring)
max. shaft load	axial: 20 N radial: 40 N
max. protection load	IP 65
material	housing: steel flange: aluminum
load	approx. 600 g

ambient conditions

temperature range	-25...+70 °C
relative humidity	max. 95% non condensing
vibration	DIN EN 60068-2-6 (≤ 100 m/s ² / 16 - 2'000 Hz)
shock	DIN EN 60068-2-27 (≤ 2'000 m/s ² / 6 ms)
noise immunity	DIN EN 61000-6-2
emitted interference	DIN EN 61000-6-4

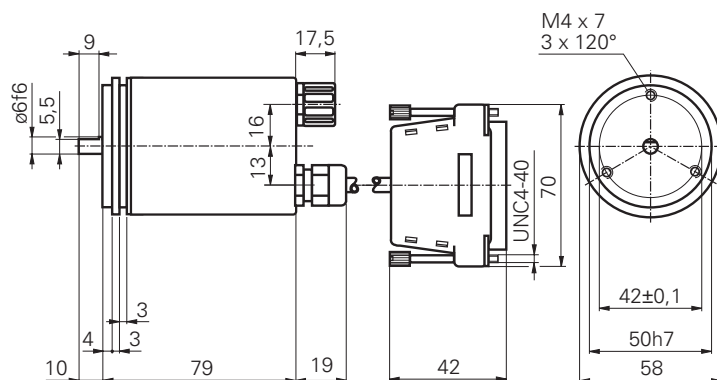
parallel



dimensions and connection dimensions

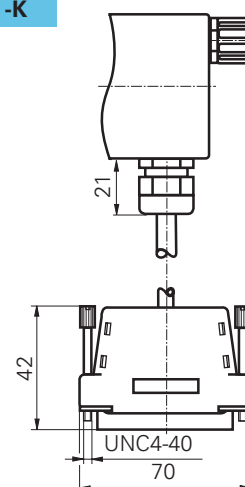
BMC

-J



cable length 1 m

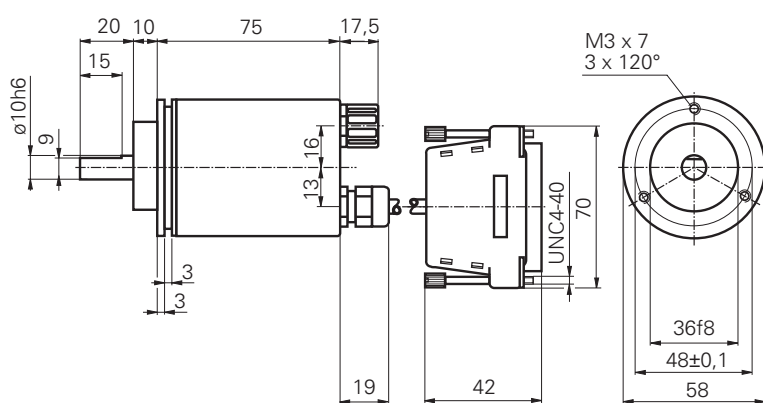
-K



cable length 1 m

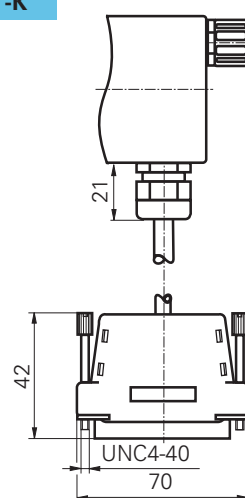
BMD

-J



cable length 1 m

-K



cable length 1 m

Programmable absolute multi-turn encoders

BMC/BMD

parallel

assignment

Designation parallel			
cable connector	signal	cable color	
37-pin			
1	D0	WH	white
2	D1	BN	brown
3	D2	GN	green
4	D3	YE	yellow
5	D4	GY	grey
6	D5	PK	pink
7	D6	BK	black
8	D7	VT	violet
9	D8	GY/PK	grey/pink
10	D9	RD/BU	red/blue
11	D10	WH/GN	white/green
12	D11	BN/GN	brown/green
13	D12	WH/YE	white/yellow
14	D13	YE/BN	yellow/brown
15	D14	WH/GY	white/grey
16	D15	GY/BN	grey/brown
17	D16	WH/PK	white/pink
18	D17	PK/BN	pink/brown
19	D18	WH/BK	white/black
20	D19	BN/BK	brown/black
21	D20	GY/GN	grey/green
22	D21	YE/GY	yellow/grey
23	D22	PK/GN	pink/green
24	D23	YE/PK	yellow/pink
25	-	-	-
26	-	-	-
27	ZERO	YE/BU	yellow/blue
28	ENABLE	BN/BU	brown/blue
29	STORE	BN/RD	brown/red
30	F/R	GN/BU	green/blue
31	-	-	-
32	-	-	-
33	-	-	-
34	GND-Sense	WH/BU	white/blue
35	Vs-Sense	WH/RD	white/red
36	+Vs	RD	red
37	GND	BU	blue

signals for parallel input interface

- 1 - 24 24 parallel output signals.
- D0 - D23 Data lines D0 to D23. With PNP, pull down; with NPN, 4,7 kΩ pull up resistors recommended for each data line.
- 27 ZERO Zero setting input for setting a zero at any point within the programmed encoder resolution. The zero setting process is triggered by a HIGH pulse and should take place after direction of rotation selection (F/R). For maximum interference immunity after zero setting, connect to GND. Pulse duration ≥ 100 ms.
- 28 $\overline{\text{ENABLE}}$ If this input is at LOW level, the output drivers will be activated. On application of HIGH potential (or unconnected), the output drivers assume a HIGH-resistance state.
- 29 $\overline{\text{STORE}}$ By applying a LOW level, the data of the absolute encoder will be buffered. If this input is connected to HIGH potential or remains open, the current position data of the absolute encoder will be switched through to the output drivers. For reliable readout of the data, this line must be used in the case of Binary-Code.
- 30 F/R By applying a HIGH potential, ascending values will be output when the shaft rotates cw (looking at shaft). If LOW potential is applied, descending values will be output.
- 34 GND-Sense This contact is connected internally to GND and assists, together with VS-sense, to measure the supply voltage at the encoder via the follow-up electronic.
- 35 VS-Sense This contact is connected internally to +VS. If the sensor line is not to be used, this contact must be isolated (danger of short circuit).
- 36 +VS Voltage supply.
- 37 GND Ground connection to encoder.

Screen: In the case of encoders with cable output, the screen is connected to the housing.



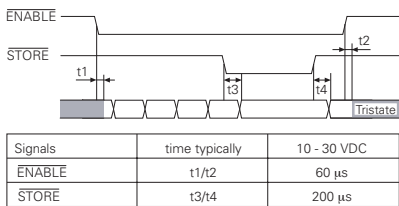
inputs

One control signal each $\overline{\text{ENABLE}}$ for activation of the output driver, $\overline{\text{STORE}}$ for storing the output data, F/R for selection at positive direction of rotation and ZERO for zeroing in any position.

input voltage	(Vs = 10 - 30 VDC)
HIGH level	0,7 Vs up to Vs
LOW level	0 up to 0,3 Vs

Wiring:
Inputs with 10 k Ω to Vs, except zero set input with 10 k Ω to GND.

signal characteristic $\overline{\text{STORE/ENABLE}}$



outputs

24 parallel output signals with $\overline{\text{STORE}}$ and tristate function (ENABLE).
All outputs with short-circuit protection PNP or NPN output stages (OC).

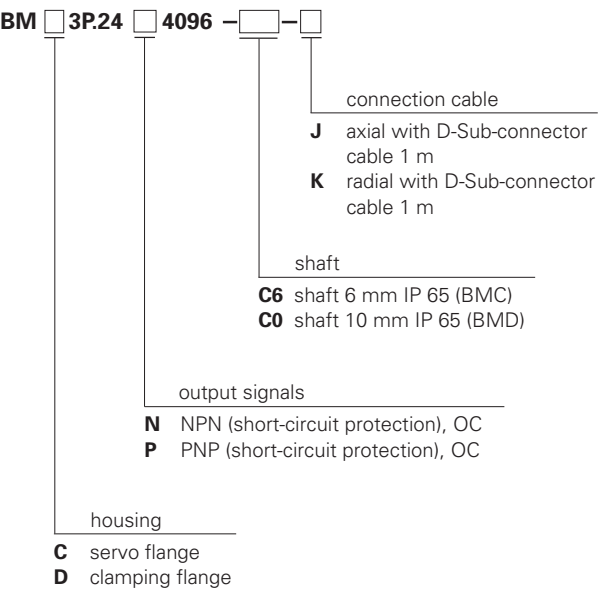
HIGH (PNP) level	$\geq +V_s - 4,5 \text{ V}$ (at I = -15 mA)
LOW (NPN) level	$\leq 3,5 \text{ V}$ (at I = 15 mA)
HIGH (PNP) load	$\leq -20 \text{ mA}$
LOW (NPN) load	$\leq 20 \text{ mA}$
tristate	$\leq 200 \mu\text{A}$

pin assignment programming cable

encoder-function	5-Pol. enc. plug	cable color	PC connection 9 pin D-Sub	PC connection 25 pin D-Sub
-	pin 1	brown	-	-
RxD	pin 2	white	pin 3	pin 2
GND	pin 3	bue	pin 5	pin 7
P/ $\overline{\text{R}}$ -mode	pin 4	black	pin 5	pin 7
TxD	pin 5	grey	pin 2	pin 3
-	-	-	bridge 4 - 6	bridge 4 - 5
-	-	-	bridge 7 - 8	bridge 6 - 20

Also connect encoder via device plug to voltage (+Vs and GND).

order designation



preconditions for programming

- PC with RS 232 interface and Windows operating system
 - programming software ProGeber, manual
 - programming cable connection, connecting the absolute encoder with the PC
- Order separately under chapter accessories if necessary.

accessories

programming software incl. cable and manual	part nr. 117666
type BMC servo flange	
mounting	part nr. 125051
screws and servo clamps	part nr. 117668
type BMD clamping flange	
mounting bracket	part nr. 117698

Programmable switching cam encoders

BME/BMF

parallel

features

- switching cam encoders up to
 - 12 bit single-turn
 - 12 bit multi-turn
- 16 outputs with up to 250 cams programmable
- binary code
- programmable:
 - direction of rotation CW/CCW
 - output logic normal/inverted
 - zero and offset setting



BME



BMF

general data

voltage supply	10 - 30 VDC with reverse polarity protection
supply current no load	max. 50 mA (at 24 VDC)
max. resolution single-turn	12 bit (1 step = 5' 16") resolution from 1 to 4'096 steps/rev as desired
multi-turn	12 bit (4'096 revolutions) from 1 to 4'096 rev. in two exponential steps
max. error limit	±0,03° at 200 kHz ±0,05° at 400 kHz
max. switching frequency	400 kHz

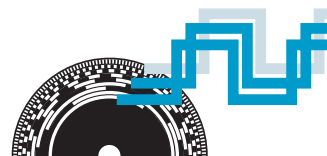
mechanical data

max. revolutions	mech. 10'000 rpm electr. 6'000 rpm
moment of inertia	$2 \times 10^{-6} \text{ kgm}^2$
torque	≤ 0,010 Nm (without sealing ring) ≤ 0,015 Nm (with sealing ring)
max. shaft load	axial: < 20 N radial: < 40 N
max. protection class	IP 65
material	housing: steel flange: aluminum
weight	approx. 600 g

ambient conditions

temperature range	-25...+70 °C
relative humidity	max. 95% non condensing
vibration	DIN EN 60068-2-6 (≤ 100 m/s ² / 16 - 2'000 Hz)
shock	DIN EN 60068-2-27 (≤ 2'000 m/s ² / 6 ms)
noise immunity	DIN EN 61000-6-2
emitted interference	DIN EN 61000-6-4

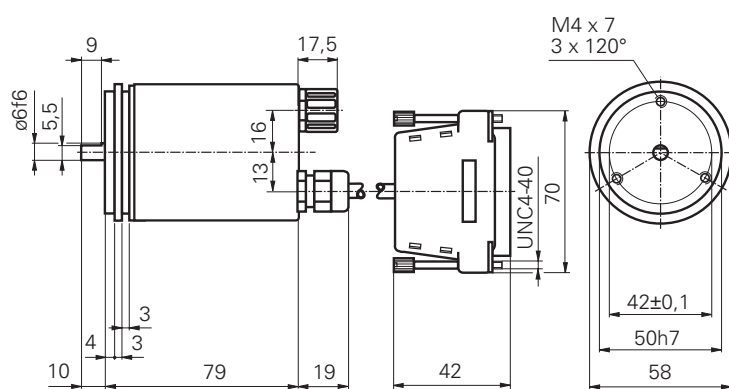
parallel



dimensions and connection dimensions

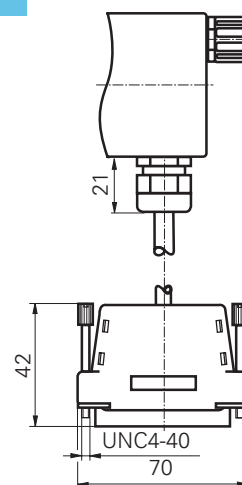
BME

-J



cable length 1 m

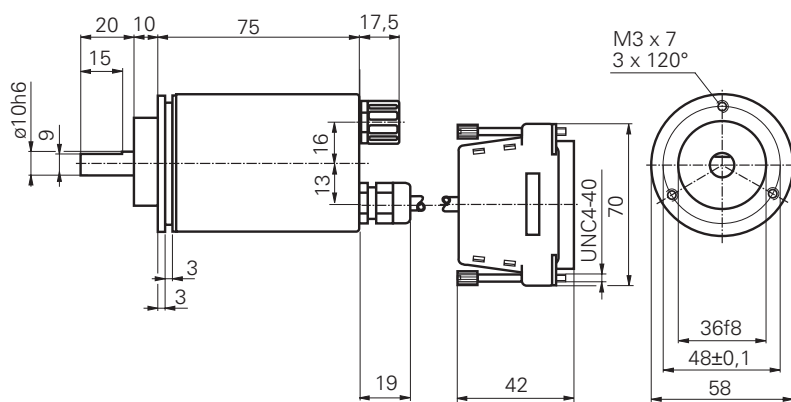
-K



cable length 1 m

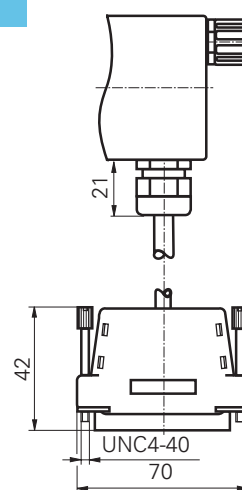
BMF

-J



cable length 1 m

-K



cable length 1 m

3

Programmable switching cam encoders

BME/BMF

parallel

assignment

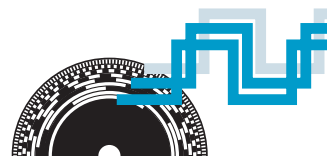
Designation parallel			
connector 37-pin	signal	cable color	
1	S0	WH	white
2	S1	BN	brown
3	S2	GN	green
4	S3	YE	yellow
5	S4	GY	grey
6	S5	PK	pink
7	S6	BK	black
8	S7	VT	violet
9	S8	GY/PK	grey/pink
10	S9	RD/BU	red/blue
11	S10	WH/GN	white/green
12	S11	BN/GN	brown/green
13	S12	WH/YE	white/yellow
14	S13	YE/BN	yellow/brown
15	S14	WH/GY	white/grey
16	S15	GY/BN	grey/brown
17	-	WH/PK	white/pink
18	-	PK/BN	pink/brown
19	-	WH/BK	white/black
20	D19	BN/BK	brown/black
21	D20	GY/GN	grey/green
22	D21	YE/GY	yellow/grey
23	D22	PK/GN	pink/green
24	D23	YE/PK	yellow/pink
25	-	-	-
26	-	-	-
27	ZERO	YE/BU	yellow/blue
28	ENABLE	BN/BU	brown/blue
29	STORE	BN/RD	brown/red
30	F/R	GN/BU	green/blue
31	-	-	-
32	-	-	-
33	-	-	-
34	GND Sense	WH/BU	white/blue
35	+V Sense	WH/RD	white/red
36	+Vs	RD	red
37	GND	BU	blue

Screen: In the case of encoders with cable output, the screen is connected to the housing.

signals parallel interface

1 - 16	16 cam outputs
S0 - S15	Up to 250 cams can be programmed to these 16 outputs. For each data line, we recommend pull-down resistors for PNP and pull-up resistors for NPN, both with 4.7 kΩ.
17 - 19	Outputs without function. They may not be assigned externally.
20 - 24	Special outputs
D19 - D23	These outputs may be assigned, at choice, to the functions preselection 1, preselection 2, speed monitoring or diagnosis.
27 ZERO	Reset input for setting a zero at any point within the programmed encoder resolution. The zero setting is triggered by a HIGH pulse imperatively after the sense of direction has been chosen (F/R). Assign to GND for maximum interference immunity after zero setting. Pulse duration ≥ 100 ms.
28 ENABLE	If this input is at LOW level, the output drivers will be activated. If HIGH potential is applied (or if open-circuited), the output drivers will turn to the HIGH-resistance state (Tristate).
30 F/R	Input for counting up and down. If open-circuited, it is set to HIGH. HIGH means increasing output data if shaft rotates clockwise when looking at the flange. LOW means increasing values if shaft rotates counter-clockwise when looking at the flange.
34 GND-Sense	This contact is connected internally to GND and assists, together with VS-sense, to measure the supply voltage at the encoder via the FOLLOWer electronic.
35 VS-Sense	This contact is connected internally to +Vs. If the sensor line is not to be used, this contact must be isolated (danger of short circuit).
36 +Vs	Voltage supply of encoder
37 GND	Ground contact of encoder with reference to +Vs.

parallel



inputs

input voltage	(Vs = 10 - 30 VDC)
HIGH level	0,7 Vs up to Vs
LOW level	0 up to 0,3 Vs

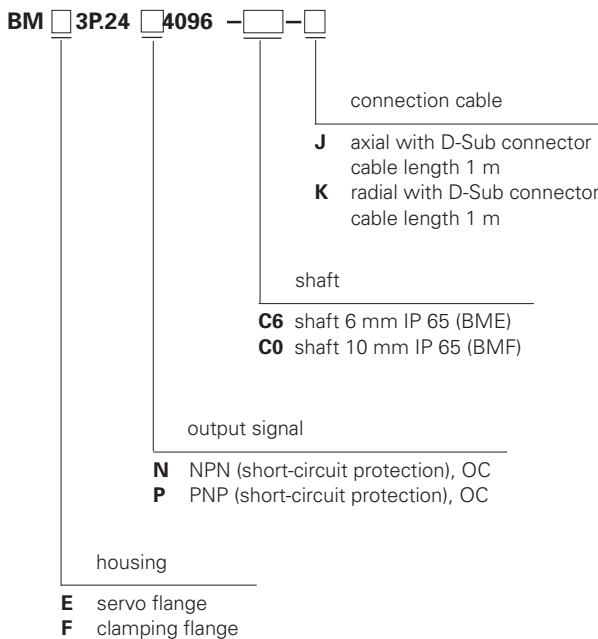
Wiring:
inputs with 10 kΩ against Vs, except zero setting
input with 10 kΩ against GND.

outputs

HIGH (PNP) level	$\geq +Vs - 4,5 \text{ V}$ (bei I = -15 mA)
LOW (NPN) level	$\leq 3,5 \text{ V}$ (bei I = 15 mA)
HIGH (PNP) load	$\leq -20 \text{ mA}$
LOW (NPN) load	$\leq 20 \text{ mA}$
tristate	$\leq 200 \mu\text{A}$

All outputs with short-circuit protected PNP or NPN open collector (OC) output stages.

order designation



3

preconditions for programming

- PC with RS 232 interface and Windows operating system
 - programming software ProGeber, manual
 - programming cable connection, connecting the absolute encoder with the PC
- Order separately under chapter accessories if necessary.

assignment programming cable

encoder-function	5-Pol. enc. plug	cable color	PC connection 9 pin D-Sub	PC connection 25 pin D-Sub
-	pin 1	brown	-	-
RxD	pin 2	white	pin 3	Pin 2
GND	pin 3	bue	pin 5	Pin 7
P/R-mode	pin 4	black	pin 5	Pin 7
TxD	pin 5	grey	pin 2	Pin 3
-	-	-	bridge 4 - 6	bridge 4 - 5
-	-	-	bridge 7 - 8	bridge 6 - 20

Also connect encoder via device plug to voltage (+Vs and GND).

accessories

programming software
incl. cable and manual part nr. 117666

type BME servo flange

mounting part nr. 125051
screws and servo clamps part nr. 117668

type BMF clamping flange

mounting bracket part nr. 117698

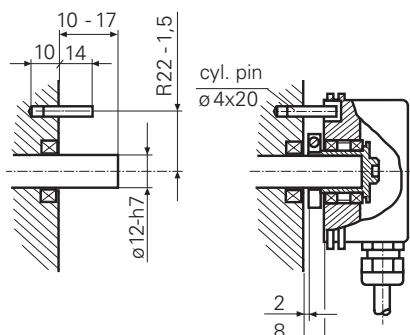
Mounting drawings

Absolute multi-turn hollow shaft encoders

BMMH/BOMH/BMMK

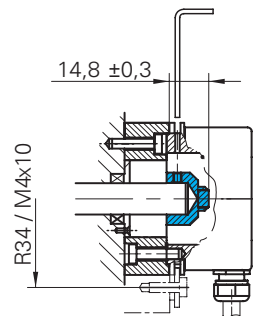
mechanical mounting BMMH

-B2 -P2 BMMH 58 with torque pin



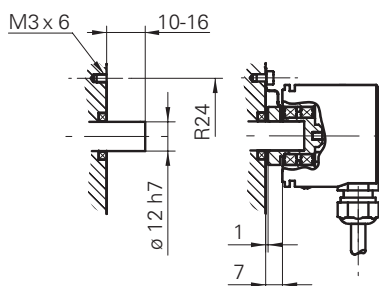
mechanical mounting BMMK 58

-I2 BMMK 58 with servo clamps

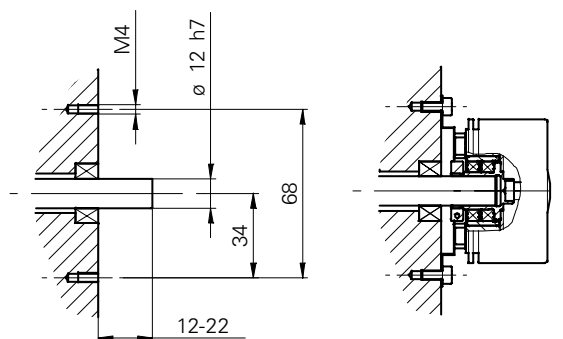


mechanical mounting BOMH

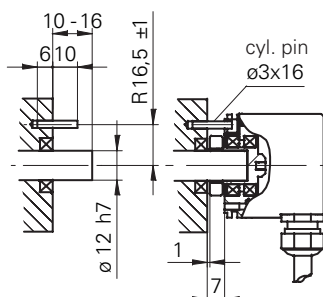
-B2 -P2 BMMH 42 with spring plate

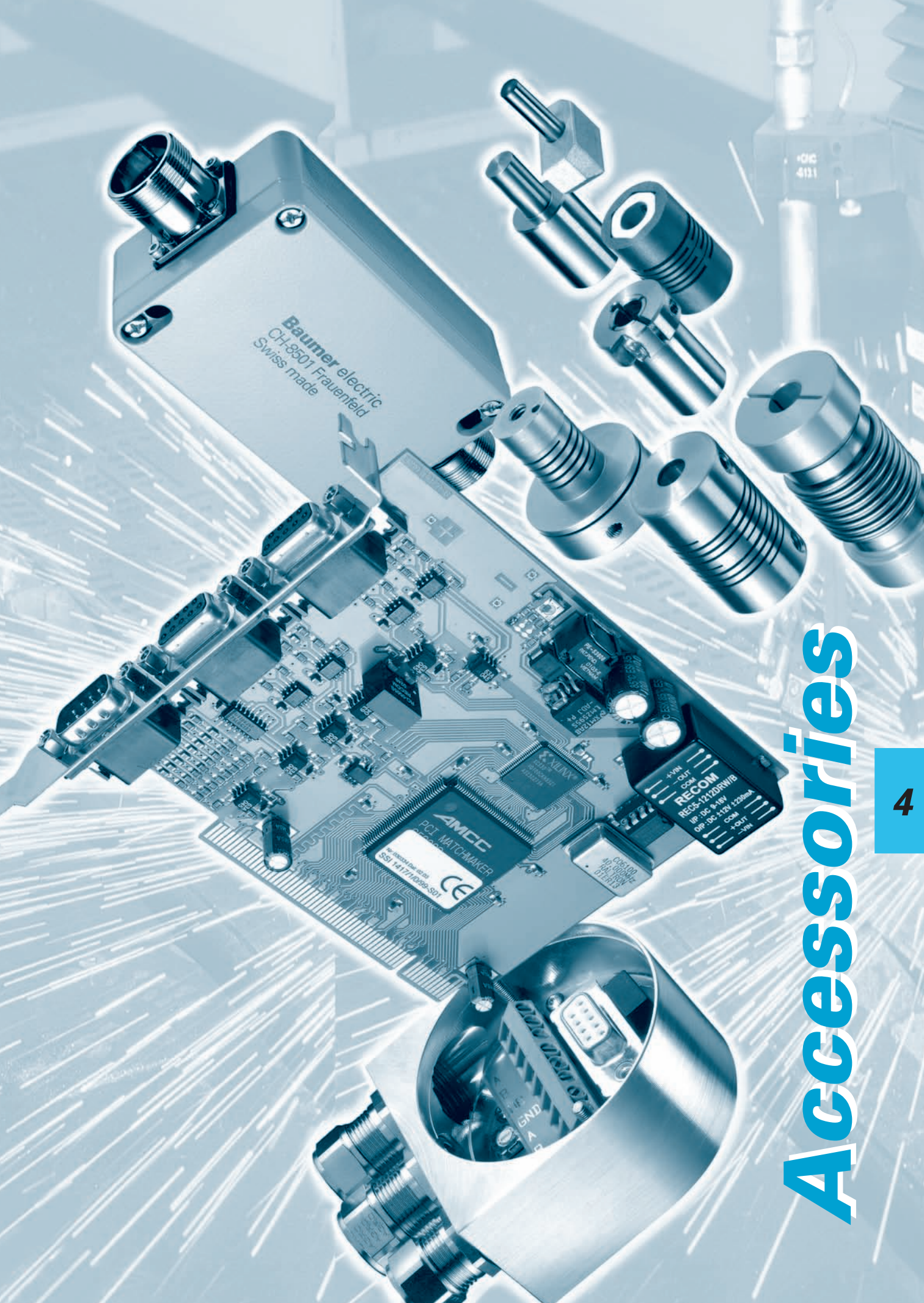


-I2 -M2 BOMH 58 with spring plate



-B2 -P2 BMMH 42 with torque pin



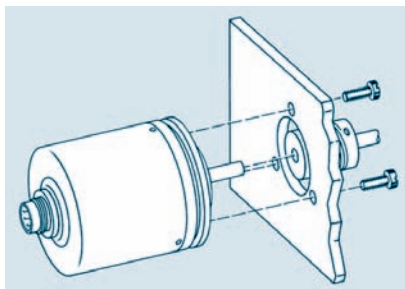


Accessories

Mounting instructions

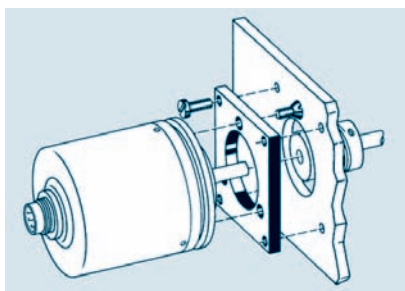
Shaft encoders

Mounting



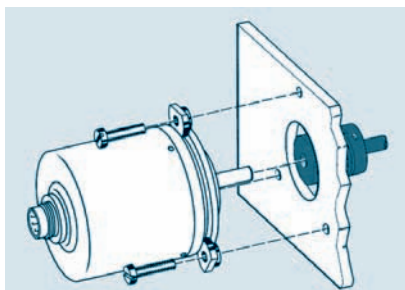
...by screw fastening directly onto the encoder flange

All shaft encoders may be mounted in this way.



...by screw fastening onto a mounting adapter

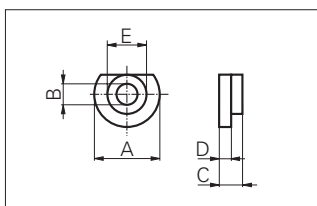
All collar type encoders may be mounted in this way.



...with servo clamps

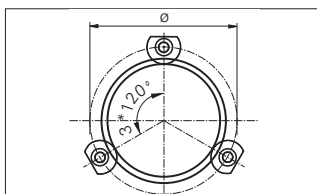
With this type of mounting the installed encoder can be turned so as to set the encoders reference pulse (marker pulse) to the drive shaft mechanical zero position. Clamp options are shown in the accessories section.

Clamp set



part nr.		106004	252773	117668
dimensions	ø A	10	15	14
	ø B	3,2	4,2	4,3
	C	3,8	5,4	6,5
	D	2	2,6	2,75
	ø E	6	9,5	9

Mounting clamps

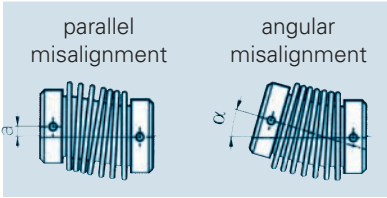


encoder	part nr.	ø
BDK	106004	37
BDT, BMSV, BMMV, BRIV	252773	68
BHW	252773	90
BMA, BMB, BMC, BMD, BME, BMF, BPMV58S, BPSV58S	117668	68

Shaft connections

Each shaft encoder can be easily fastened to the drive shaft by means of a flexible coupling. The purpose of this coupling is to transmit rotary movement to the encoder without torsional error. Small inaccuracies in alignment are equalized by parallel or angular compensation (see drawing). Different styles for various applications are available. A selection guide with specifications is shown under the accessories section.

In the choice of the correct coupling for measurement tasks, the torsional stiffness of the coupling is decisive. Other



selection criteria are various environmental effects, such as temperature, aggressive media, mechanical misalignment and operating modes. Also, care should be taken that no damaging natural resonances can occur in the relevant application.

Axial misalignment ΔA

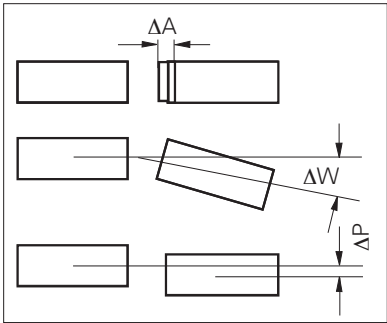
Produces tension or pressure with single piece couplings. Split couplings can compensate for this error.

Angular misalignment ΔW

Produces bending of the flexible coupling section and leads to alternating tensile and compressive loads.

Parallel misalignment ΔP

With rigid couplings, high restoring forces occur, which have a harmful effect on the ball bearings.



Installation notes

The power transmission between coupling and shaft is effected by means of frictional locking between contact surfaces. Precautions must be taken to ensure equal tightening of the mounting screws.

Before installation, check that the shaft misalignment is within permissible limits. Excessive misalignment will impair the service life of the coupling.

Selection by coupling torque

The torque applied is obtained from:

$$M_k = M_{max} * K * JK$$

- Mk = coupling torque in Nm
- Mmax = accelerating torque of the drive
- K = load factor, for servo-motors in reversing operation → K = 2...3
- JK = mass moment of inertia of the hollow shaft and coupling kg m²

Selection by
torsional stiffness

The transmission error due to elastic deformation of the flexible part is obtained from:

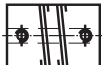
$$f_i = (180 / \pi) * (M_k / C_t)$$

- fi = angle of rotation in degrees
- Ct = torsional stiffness in Nm / rad
- Mk = coupling torque in Nm

Couplings

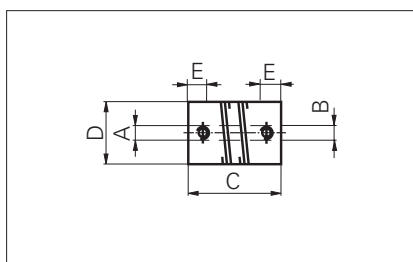
Shaft encoders

Overview couplings

				
	spiral coupling aluminum	bellows coupling alu/stainless steel	slit coupling aluminum	slit coupling polyamid
high torsional stiffness		○	○	
high torque	○	○	○	
low moment of inertia		○		○
vibration absorption				○
electrically insulating				○
clamp fastening		○	○	
stud bolt fastening	○			○

Spiral coupling

aluminum

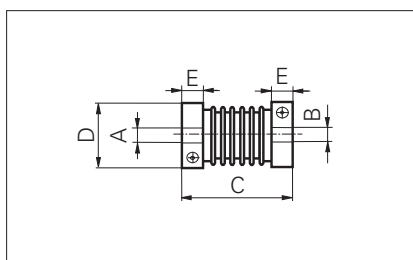


part nr. mm	106009	251401	251402
∅	5...9,5	6...9,5	6...12
A	5	6	5,88
B	6	6	7,5
C	25,4	25,4	38
D	19	19	25,4
E	6,3	6,3	11,6

max. rated torque	(Nm)	1	1	5
axial axis misalignment	(mm)	≤ 0,2	≤ 0,2	≤ 0,3
parallel axis misalignment	(mm)	≤ 0,2	≤ 0,2	≤ 0,3
angular axis misalignment	(°)	≤ 2,5	≤ 2,5	≤ 2,5
torsional stiffness	(Nm/rad)	60	60	250
moment of inertia	(kgm ² *10E-7)	5	5	20

Bellows coupling

aluminum / stainless steel

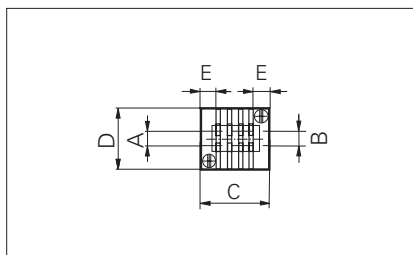


part nr. mm	106008		
∅	6...12		
A	∅ 6		
B	∅ 8		
C	42		
D	∅ 25		
E	12		

max. rated torque	(Nm)	2		
axial axis misalignment	(mm)	≤ 0,2		
parallel axis misalignment	(mm)	≤ 0,2		
angular axis misalignment	(°)	≤ 2		
torsional stiffness	(Nm/rad)	1290		
moment of inertia	(kgm ² *10E-7)	12		

Slit coupling

aluminum

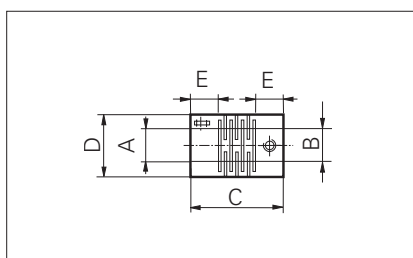


part nr. mm	107671	107670	
ø	5...6	6...12	
A	6	6	
B	5	6	
C	16,6	28	
D	18	25	
E	6	8	

max. rated torque	(Nm)	1	5	
axial axis misalignment	(mm)	≤ 0,1	≤ 0,2	
parallel axis misalignment	(mm)	≤ 0,1	≤ 0,2	
angular axis misalignment	(°)	≤ 1,5	≤ 2	
torsional stiffness	(Nm/rad)	200	3400	
moment of inertia	(kgm ² *10E-7)	3	15	

Slit coupling

polyamid

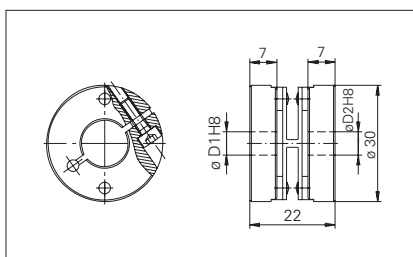


part nr. mm	115110	124461	
ø	6	5	
A	ø 6	ø 5	
B	ø 6	ø 5	
C	20,2	20,2	
D	ø 15	ø 15	
E	6	6	

max. rated torque	(Nm)	0,2	0,2	
axial axis misalignment	(mm)	±0,2	±0,2	
parallel axis misalignment	(mm)	±0,3	±0,3	
angular axis misalignment	(°)	±2,5	±2,5	
torsional stiffness	(Nm/rad)	15	15	
moment of inertia	(kgm ² *10E-7)	0,5	0,5	

Spring washer coupling

clamping ring: aluminum
spring washer: plastic



part nr. mm	141131	141132	141133
D1	6	6	10
D2	10	6	10

max. rated torque	(Nm)	0,6
axial axis misalignment	(mm)	±0,4
parallel axis misalignment	(mm)	±0,3
angular axis misalignment	(°)	±2,5
torsional stiffness	(Nm/rad)	50
moment of inertia	(kgm ² *10E-7)	29,5

Mounting accessories

Shaft encoders

Measuring wheel



dimensions			
meas. wheel circumference		0,2m	0,5m
bore		10 mm	10 mm
measuring width		12 mm	25 mm
material	profile	part nr.	part nr.
aluminum	knurled	117671	117677
plastic	smooth	117673	117679
plastic	corrugated	117675	117681

Adapter

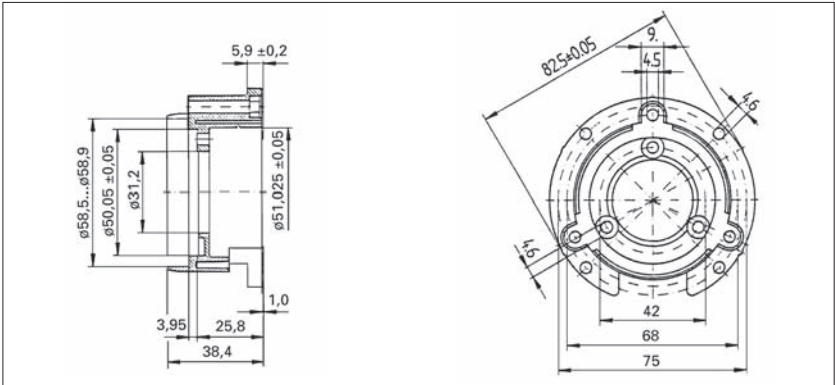


for encoder:
BAV, BDT, BPxV 58S, BMA/BMB,
BMC/BMD, BME/BMF

mounting adapter part nr. 117667

fixing screws
and servo clamps part nr. 117668

Note for BPxV
For mounting please use the according
coupling springs.

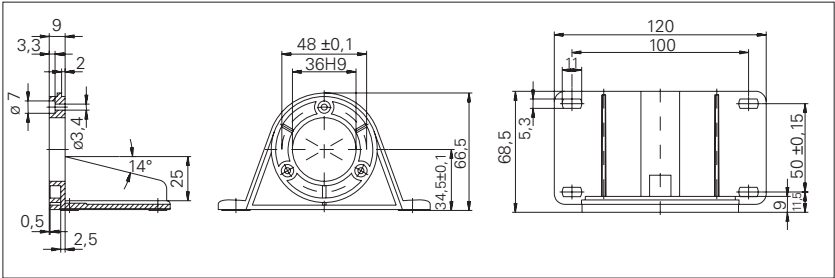


Mounting bracket

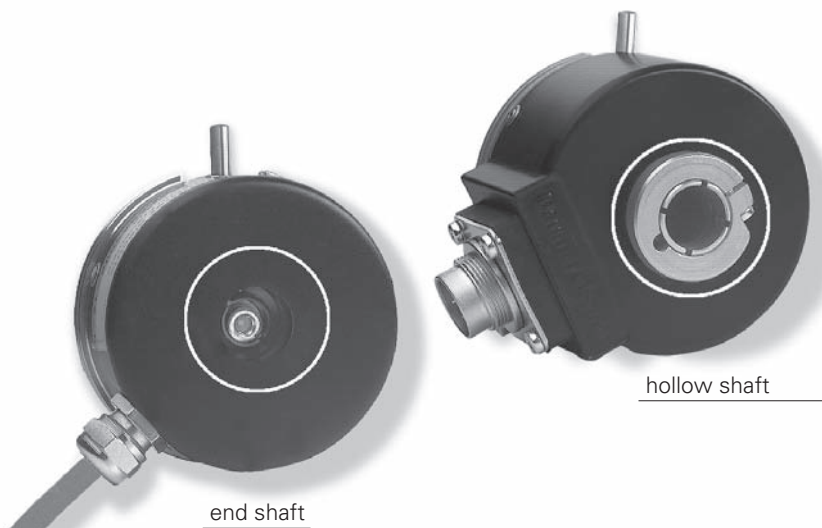


for clamping flange encoder:
BPxV 58K, BDH

mounting bracket part nr. 125051
of PPS

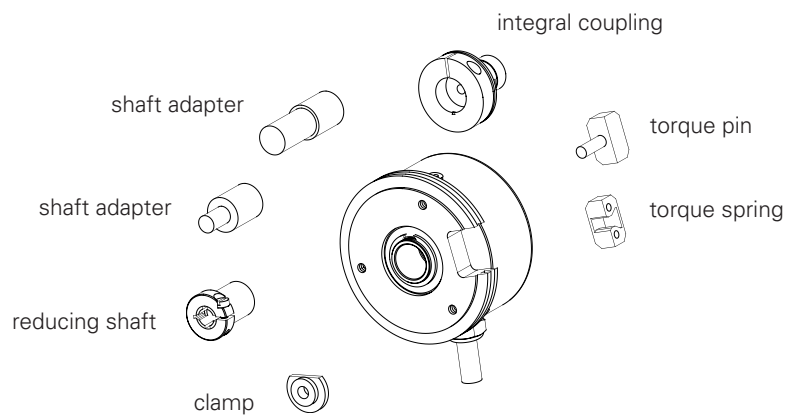


Mounting shaft versions



Advantages of hollow shaft encoders are less depth, simple mounting and a flexible mechanical interface. Neither shaft load nor misalignments occur. Fixing is done by hollow shaft or end shaft.

Mounting accessories



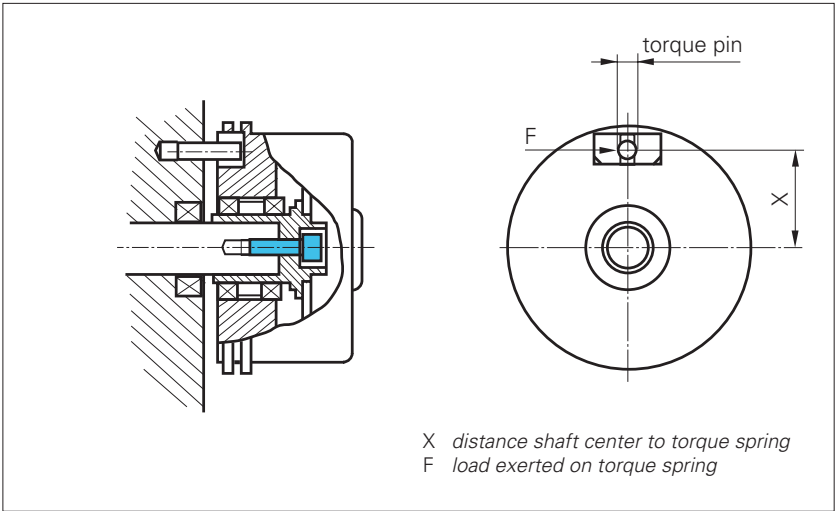
The principle of the flexible mechanical interface makes it possible to adapt the drive/encoder connection to the appropriate situation using various accessories.

Mounting with torque spring

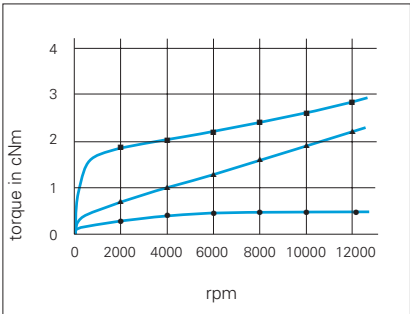
Hollow shaft encoder

Drag angle error

The characteristic curve of the spring steel bracket has been designed for the minimum possible hysteresis and maximum stiffness. Because of this, small drag angles are achieved. The permissible drag angle error must be included in the required positioning accuracy.



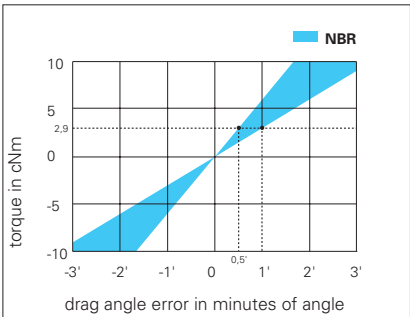
Torque curve



From the torque curve, it is possible to determine that with different encoders, at a rotational speed of 6'000 rpm, the following loads are to be expected:

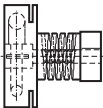
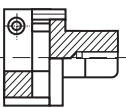
	type	shaft	6'000 rpm
■	BHG	-B2	2,2 cNm
▲	BHF	-12	1,3 cNm
●	BHK	-B6	0,5 cNm

Spring characteristic curve



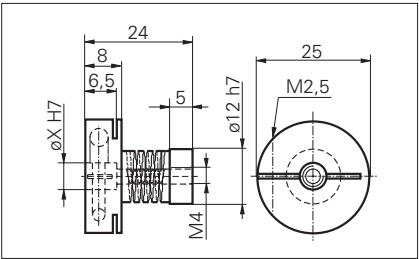
As can be seen from the characteristic curve, it is necessary with a torque of 2,2 cNm, to expect a drag angle error of $\pm 0,5$ to 1 minute of angle.

Overview couplings

	 spiral coupling stainless steel	 controlflex Alu/POM
high torque		○
low moment of inertia		○
vibration absorption		○
electrically insulating		○
multi-section		○
rust and chemical resistant	○	
clamp fastening	○	○

Integral coupling

stainless steel

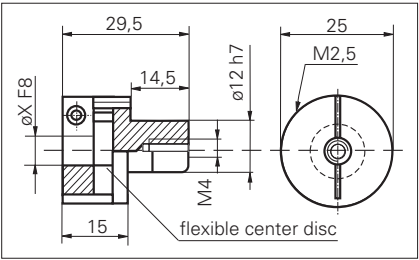


ø X	part nr.	
ø 6 mm	110595	
ø 6,35 mm	111342	
ø 8 mm	111097	
ø 10 mm	111100	
ø 12 mm	111102	

max. rated torque	(Nm)	0,42		
axial axis misalignment	(mm)	±0,2		
parallel axis misalignment	(mm)	±0,2		
angular axis misalignment	(°)	1		
torsional stiffness	(Nm/rad)	32		
moment of inertia	(kgm ² *10E-7)	12,5		

Controlflex coupling

Alu/POM (Poly Oxide Methyl)

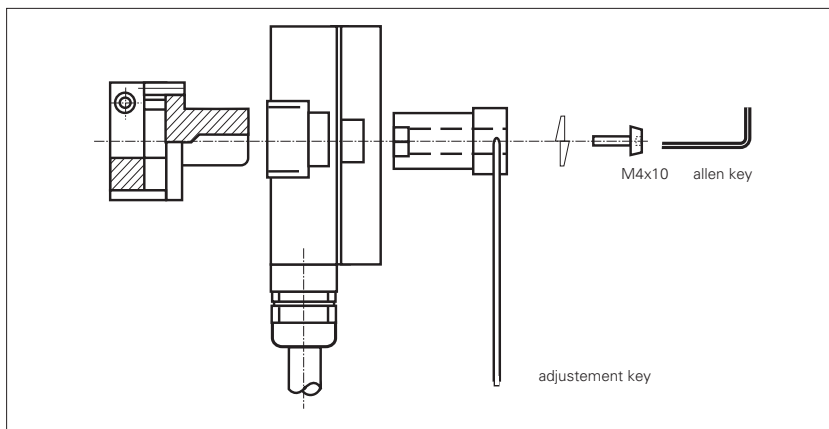


ø X	part nr.	
ø 6 mm	114826	
ø 8 mm	114823	
ø 10 mm	114824	
ø 12 mm	114825	

max. rated torque	(Nm)	1		
axial axis misalignment	(mm)	±0,4		
parallel axis misalignment	(mm)	±0,25		
angular axis misalignment	(°)	1		
torsional stiffness	(Nm/rad)	29		
moment of inertia	(kgm ² *10E-7)	8		

Mounting couplings Hollow shaft encoders

Mounting example



1. Insert coupling in hollow shaft
2. Place adjustment key through hood in slot of hollow shaft
3. Insert spring washer and screw in hollow shaft
4. Screw the screw into coupling with allen key
Tightening torque 250 Ncm.

allen key 3 mm

part nr. 112430

adjustment key

part nr. 114450

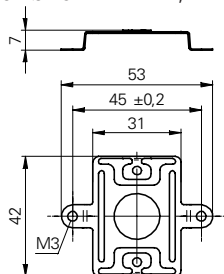
allen key for BHT

for clamping element 2,5 mm

part nr. 112431

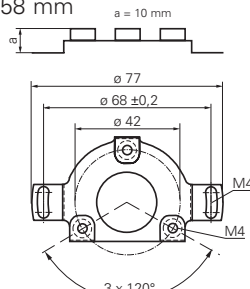
Spring plate set

For hollow shaft encoder ($\varnothing \geq 8\text{mm}$)
dimension $\varnothing 40\text{ mm}$: BHK, BRIH



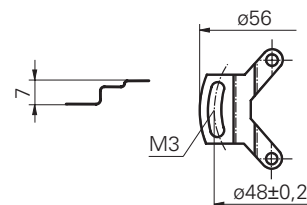
spring plate incl. screws
part nr. 158424

For hollow shaft encoder:
dimension $\varnothing 58\text{ mm}$



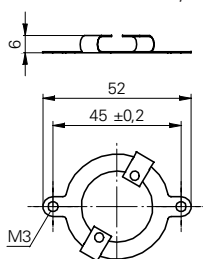
spring plate incl. screws
part nr. 136635

For hollow shaft encoder:
dimension $\varnothing 42\text{ mm}$
BMSH, BMMH



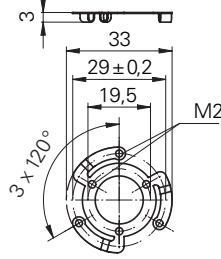
spring plate incl. screws
part nr. 138610

For hollow shaft encoder ($\varnothing < 8\text{mm}$)
dimension $\varnothing 40\text{ mm}$: BHK, BRIH



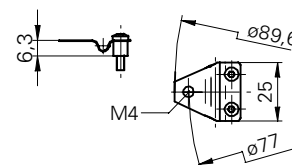
spring plate incl. screws
part nr. 158423

For hollow shaft encoder:
BTIH 24



spring plate incl. screws
part nr. 159530

For hollow shaft encoder:
dimension $\varnothing 58\text{ mm}$
BRIH, BRID



spring plate incl. screws
part nr. 154742



Torque pin for locking the shaft encoder

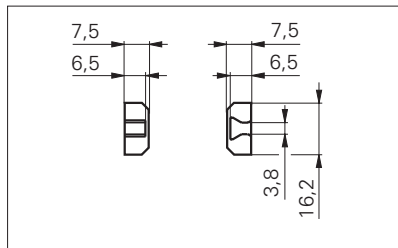


Turns the hollow shaft encoder into a shaft encoder



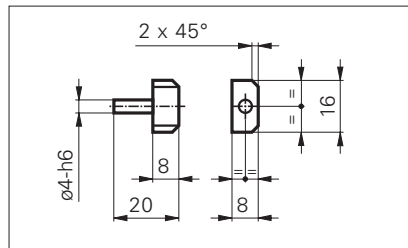
Reduces the diameter of the hollow shaft

Torque spring



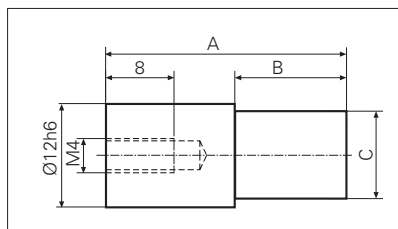
part nr. 109520

Torque pin



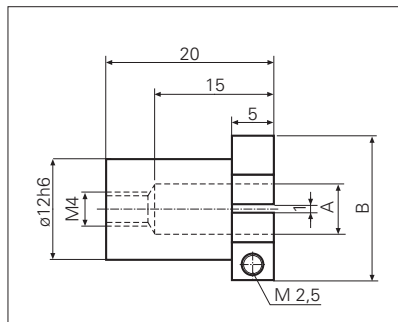
part nr. 107540

shaft adapter



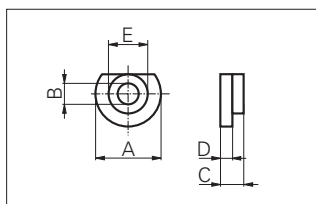
part nr.	110844	110843
dimensions	shaft 12/6	shaft 12/10
A	25 mm	34 mm
B	10 mm	19 mm
C	6 h7	10 h7

Reducing shaft



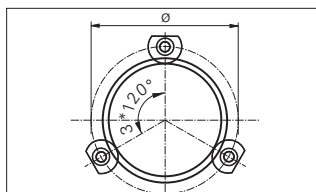
part nr.	112322	110574
dimensions	shaft 12/8	shaft 12/6
A	8 h7	6 h7
B	19,5 h13	16 h11

Clamp set



part nr.	110616	252773
dimensions	15	15
ø A	4,2	4,2
ø B	3,6	5,4
C	1,8	2,6
D	9,5	9,5
ø E		

Mounting servo clamps



encoder	part nr.	ø
BDT, BFF, BFG, BHF, BHG, BMSH, BMMH, BMSK, BMMK, BOSD, BOSH, BOMH	110616	68
BHT, BHW	252773	90

Note

Adapters for shafts up to 16 mm on request.

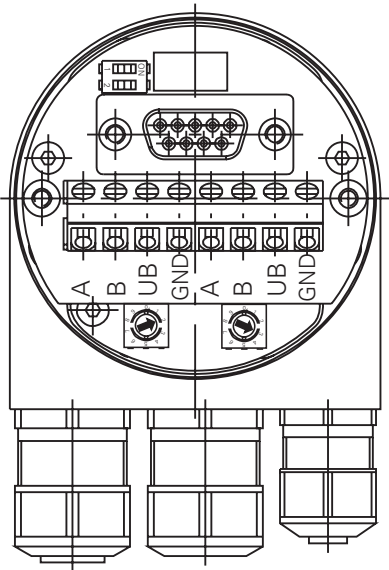
**Bus cover Profibus-DP
for shaft encoders**

**BMSH, BMMH, BPSV, BPMV,
BEMV, BOSH, BOMH**

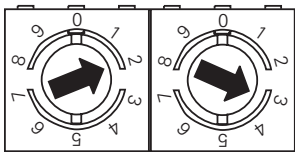


Profibus-DP features	
bus protocol	Profibus-DP
Profibus features	Device Class 1 and 2
data exch. functions	Input: Position value
	Additional parameterized speed signal (readout of the current rotary speed)
	Output: Preset value
preset value	With the „Preset“ parameter the encoder can be set to a desired actual value that corresponds to the defined axis position of the system.
parameter functions	Rotating direction
	With the operating parameter the rotating direction for which the output code is to increase or decrease can be parameterized.
	Scaling: The steps per revolution and the total revolution can be parameterized.
diagnosis	The encoder supports the following error messages: - Position error - Lithium cell voltage at lower limit (multi-turn)
default setting	User address 00 For operation, user address must be set first.

view inside Profibus-DP bus cover



settings of user address for Profibus-DP



Address can be set with rotary switch.
Example: User address 23

settings of terminating resistors for Profibus-DP



ON = Last User
OFF = User X

contact description Profibus-DP

A	a negative serial data line, pair 1 and pair 2
B	positive serial data line, pair 1 and pair 2
UB	voltage supply 10...30 VDC
GND	ground contact for UB

(Terminals with the same designation are internally interconnected)

order designation

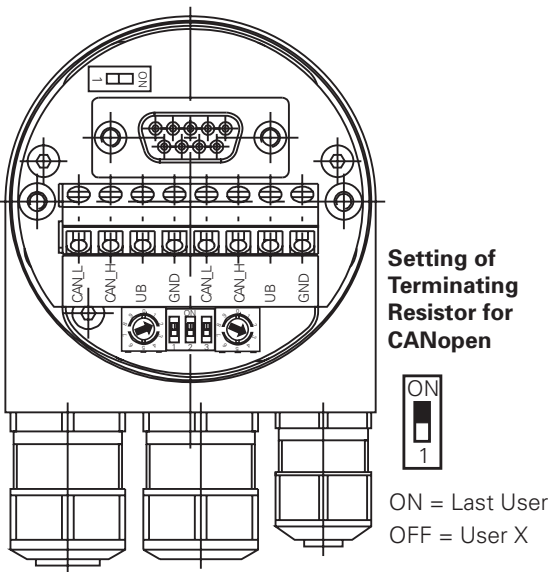
bus cover for Profibus-DP	part nr. 140831
bus cover for Profibus-DP, high-grade steel	part nr. 147369

CANopen features

bus protocol	CANopen
device profile	CANopen - CiA DSP 406
CANopen features	Device Class 2
operating modes (with SDO progr.)	Polling Mode (async, via SDO) Cyclic Mode (async-cyclic) The encoder cyclically sends the current process actual value without a request by a master. The cycle time can be parameterized for values between 1 and 65'535 ms. Sync Mode (sync-cyclic) The encoder sends the current actual process value after receiving a sync telegram sent by a master. The sync counter in the encoder can be parameterized so that the position value is not sent until after a defined number of sync telegrams.
preset value	Acyclic Mode (sync-acyclic) With the „Preset“ parameter the encoder can be set to a desired actual process value that corresponds to the defined axis position of the system. The offset value between the encoder zero point and the mechanical zero point of the system is saved in the encoder.
rotating direction	With the operating parameter the rotating direction in which the output code is to increase or decrease can be parameterized.
scaling	The steps per revolution and the total revolution can be parameterized.
diagnosis	The encoder supports the following error messages: - Position and parameter error - Lithium cell voltage at lower limit (multi-turn)
default setting	When address of rotary switch is set to 0 then the following default parameters are read out of the EEPROM: 50 kbit/s, node number 1

order designation	
bus cover for CANopen	part nr. 140832
bus cover for CANopen, high-grade steel	part nr. 147370

view inside CANopen bus cover



setting CANopen baud rate

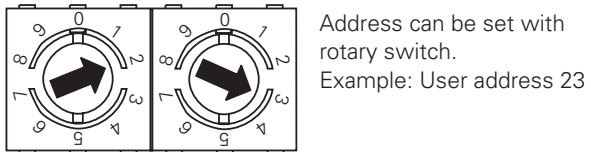
baud rate	setting dip switch		
	1	2	3
10 kbit/s	OFF	OFF	OFF
20 kbit/s	OFF	OFF	ON
50 kbit/s	OFF	ON	OFF
125 kbit/s	OFF	ON	ON
250 kbit/s	ON	OFF	OFF
500 kbit/s	ON	OFF	ON
800 kbit/s	ON	ON	OFF
1 Mbit/s	ON	ON	ON

contact description CANopen

CAN_L	negative serial data line, pair 1 and pair 2
CAN_H	positive serial data line, pair 1 and pair 2
UB	voltage supply 10...30 VDC
GND	ground contact for UB

(Terminals with the same designation are internally interconnected)

settings of user address for CANopen



Bus cover DeviceNet
for shaft encoders

BMSH, BMMH, BPSV, BPMV,
 BEMV, BOSH, BOMH



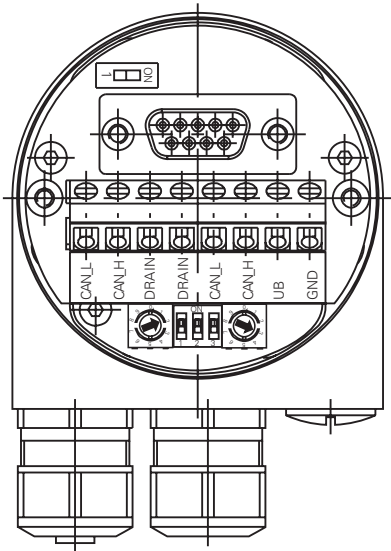
deviceNet features	
bus protocol	DeviceNet
device profile	Proposal: Device Profile for Encoders V 1.0
operating modes	I/O Polling, Cyclic and Change of State
preset value	With the „Preset“ parameter the encoder can be set to a desired actual process value that corresponds to the defined axis position of the system. The offset value between the encoder zero point and the mechanical zero point of the system is saved in the encoder.
rotating direction	With the operating parameter the rotating direction in which the output code is to increase or decrease can be parameterized.
scaling	The steps per revolution and the total revolution can be parameterized.
diagnosis	The encoder supports the following error messages: - Position error - Lithium cell voltage at lower limit (multi-turn)
default setting	125 kbit/s, Mac Id 63

settings of user address for DeviceNet

Address can be set with rotary switch.
 Example: User address 23

order designation	
bus cover for DeviceNet	part nr. 140833
bus cover for DeviceNet, high-grade steel	part nr. 147371

view inside DeviceNet bus cover



setting of terminating resistor for DeviceNet

ON = Last User
 OFF = User X

setting DeviceNet baud rate

baud rate	setting dip switch		
	1	2	3
125 kbit/s	X	OFF	OFF
250 kbit/s	X	OFF	ON
500 kbit/s	X	ON	OFF
125 kbit/s*	X	ON	ON

X = no function
 * This switch setting is not defined, and is therefore set internally to the default value 125 kbit/s.

contact description DeviceNet	
CAN_L	negative serial data line, pair 1 and pair 2
CAN_H	positive serial data line, pair 1 and pair 2
DRAIN	screen contact
UB	voltage supply 10...30 VDC
GND	ground contact for UB

(Terminals with the same designation are internally inter-connected)

Bus cover EtherCAT for shaft encoders

BPSV, BPMV, BEMV,
BMSH 58, BMMH 58,
BOSH 58, BOMH 58



EtherCAT features	
bus protocol	EtherCAT
device profile	CoE (CANopen over EtherCAT) DSP406
address	automatic address designation
features	- 100 MBaud Ethernet - Distributed clock for precise synchronization. Optional device configuration as „Reference Clock“ - Time-Stamp-Data Type
prozess data	- position value - warnings - system time

assignment voltage supply M12 male			
pin nr.	connection	color	description
1	UB	brown	voltage supply
2	n.c.	white	not connected
3	GND	blue	voltage supply
4	n.c.	black	not connected
A-coded			

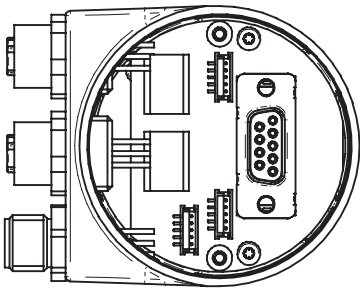


assignment bus in/out M12 female			
pin nr.	connection	color	description
1	TxD+	yellow	transmission data+
2	RxD+	white	receiving data+
3	TxD-	orange	transmission data-
4	RxD-	blue	receiving data-
D-coded			

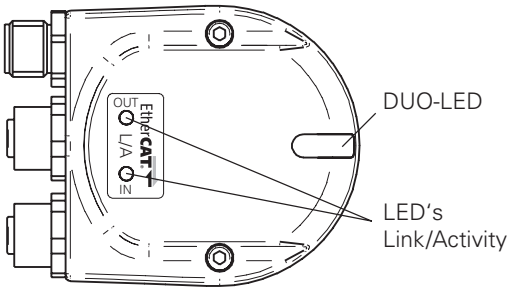


order designation	
bus cover for EtherCAT	part nr. 159110

view inside EtherCAT bus cover



bus cover



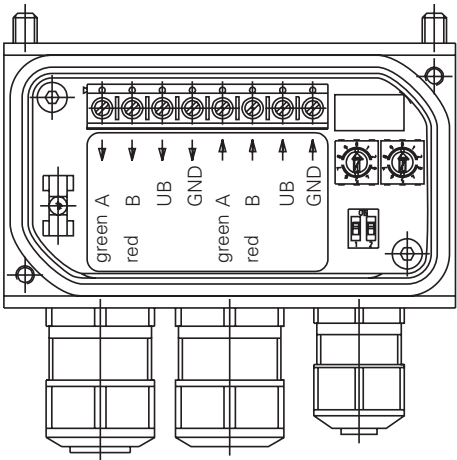
accessories	
cable EtherCAT M12 male-male, d-coded	
M12 straight, 5 m	part nr. 160565



Profibus-DP features

bus protocol	Profibus-DP
Profibus features	Device Class 1 and 2
data exch. functions	Input: Position value
	Additional parameterized speed signal (readout of the current rotary speed)
preset value	Output: Preset value
	With the „Preset“ parameter the encoder can be set to a desired actual value that corresponds to the defined axis position of the system.
parameter functions	Rotating direction
	With the operating parameter the rotating direction for which the output code is to increase or decrease can be parameterized.
	Scaling: The steps per revolution and the total revolution can be parameterized.
diagnosis	The encoder supports the following error messages: - Position error - Lithium cell voltage at lower limit (multi-turn)
default setting	User address 00 For operation, user address must be set first.

view inside Profibus-DP bus cover

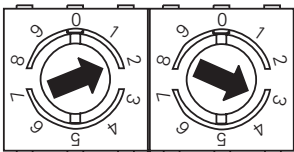


setting of terminating resistor for DeviceNet



ON = Last User
 OFF = User X

settings of user address for Profibus-DP



Address can be set with rotary switch.
 Example: User address 23

order designation

bus cover Profibus-DP part nr. 145145

contact description Profibus-DP

A	a negative serial data line, pair 1 and pair 2
B	positive serial data line, pair 1 and pair 2
UB	voltage supply 10...30 VDC
GND	ground contact for UB

(Terminals with the same designation are internally interconnected)



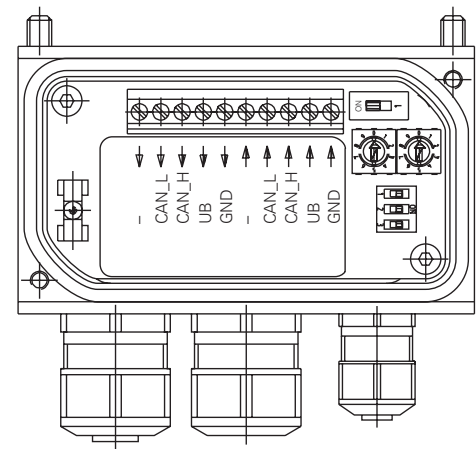
CANopen features

bus protocol	CANopen
device profile	CANopen - CiA DSP 406
CANopen features	Device Class 2
operating modes (with SDO progr.)	Polling Mode (async, via SDO) Cyclic Mode (async-cyclic) The encoder cyclically sends the current process actual value without a request by a master. The cycle time can be parameterized for values between 1 and 65'535 ms. Sync Mode (sync-cyclic) The encoder sends the current actual process value after receiving a sync telegram sent by a master. The sync counter in the encoder can be parameterized so that the position value is not sent until after a defined number of sync telegrams.
preset value	Acyclic Mode (sync-acyclic) With the „Preset“ parameter the encoder can be set to a desired actual process value that corresponds to the defined axis position of the system. The offset value between the encoder zero point and the mechanical zero point of the system is saved in the encoder.
rotating direction	With the operating parameter the rotating direction in which the output code is to increase or decrease can be parameterized.
scaling	The steps per revolution and the total revolution can be parameterized.
diagnosis	The encoder supports the following error messages: - Position and parameter error - Lithium cell voltage at lower limit (multi-turn)
default setting	When address of rotary switch is set to 0 then the following default parameters are read out of the EEPROM: 50 kbit/s, node number 1

order designation

bus cover for CANopen	part nr. 145144
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view inside CANopen bus cover



setting of terminating resistor for CANopen

ON

OFF

1

ON = Last User
OFF = User X

setting CANopen baud rate

baud rate	setting dip switch		
	1	2	3
10 kBit/s	OFF	OFF	OFF
20 kBit/s	OFF	OFF	ON
50 kBit/s	OFF	ON	OFF
125 kBit/s	OFF	ON	ON
250 kBit/s	ON	OFF	OFF
500 kBit/s	ON	OFF	ON
800 kBit/s	ON	ON	OFF
1 MBit/s	ON	ON	ON

contact description CANopen

CAN_L	negative serial data line, pair 1 and pair 2
CAN_H	positive serial data line, pair 1 and pair 2
UB	voltage supply 10...30 VDC
GND	ground contact for UB

(Terminals with the same designation are internally interconnected)

settings of user address for CANopen

0

1

2

3

4

5

6

7

8

9

7

6

5

4

3

2

1

0

Address can be set with rotary switch.
Example: User address 23



deviceNet features

bus protocol

device profile

operating modes

preset value

rotating direction

scaling

diagnosis

default setting

DeviceNet

Proposal:

Device Profile for Encoders V 1.0

I/O Polling,
Cyclic and Change of State

With the „Preset“ parameter the encoder can be set to a desired actual process value that corresponds to the defined axis position of the system. The offset value between the encoder zero point and the mechanical zero point of the system is saved in the encoder.

With the operating parameter the rotating direction in which the output code is to increase or decrease can be parameterized.

The steps per revolution and the total revolution can be parameterized.

The encoder supports the following error messages:
- Position error
- Lithium cell voltage at lower limit (multi-turn)

125 kbit/s, Mac Id 63

view inside DeviceNet bus cover

setting of terminating resistor for DeviceNet

ON

1

ON = Last User

OFF = User X

setting DeviceNet baud rate

ON

1 2 3

baud rate	setting dip switch		
	1	2	3
125 kBit/s	X	OFF	OFF
250 kBit/s	X	OFF	ON
500 kBit/s	X	ON	OFF
125 kBit/s*	X	ON	ON

X = no function

* This switch setting is not defined, and is therefore set internally to the default value 125 kbit/s.

settings of user address for DeviceNet

Address can be set with rotary switch.

Example: User address 23

order designation

bus cover for DeviceNet

part nr. 145143

contact description DeviceNet

CAN_L	negative serial data line, pair 1 and pair 2
CAN_H	positive serial data line, pair 1 and pair 2
DRAIN	screen contact
UB	voltage supply 10...30 VDC
GND	ground contact for UB

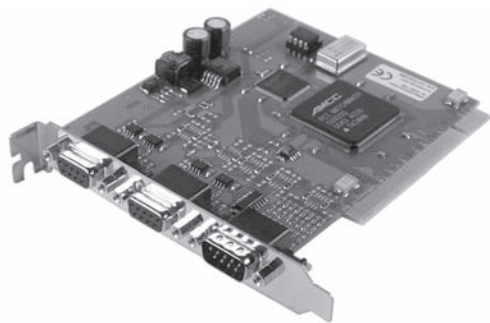
(Terminals with the same designation are internally interconnected)

4. 18

www.baumerelectric.com

Standard PCI plug-in board for SSI encoders

optimized for read out and programming of encoder types BOSD, BOSH, BOMH



description

The standard PCI plug-in board is used to analyze single-turn and multi-turn rotary encoders with a SSI-interface and a personal computer. Optimized is the PCI plug-in board to analyze and to set the parameters of SSI-encoder of the *Digitalizer* series.

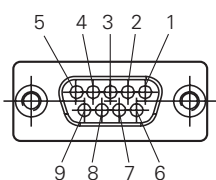
properties

- PCI plug-in board for PC with: Windows 95/98 and NT 4.0/2000/XP
- connection of 2 SSI encoders optimized for *Digitalizer*
- driver and demo software included

connections

Each encoder is connected to the board via separate D-Sub connector.

for encoders 1/2



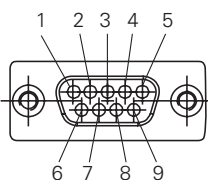
External view of socket (female)

pin number	signals
1	UBat
2	0 V
3	SSIDATA
4	NSSICLOCK
5	0 V
6	+Vs
7	NSSIDATA
8	+Vs
9	SSICLOCK

trigger and zero setting input

The trigger and set-zero signals for the two rotary encoders are implemented on the DSUB 9-pin connector.

pin assignment of D-Sub 9 pin connector male



External view of connector

pin nr.	signals
1	Trig_1
2	NTrig_1
3	SetZero_1
4	NSetZero_1
5	0 V
6	Trig_2
7	NTrig_2
8	SetZero_2
9	NSetZero_2

PCI board technical data

encoder connection	2 x SSI interface EIA RS 422
SSICLOCK frequency	max. 5 MHz, selectable
SSI measurement rate	variable from 6 µs - 200 ms, or can be triggered externally
number of bits	max. 44 bit
trigger inputs	RS 422
set-zero inputs	RS 422
baud rate for setting encoder parameters	9'600, 19'200, 57'600, 115'200 baud
voltage supply	+Vs = 5,25 V / 2 x 300 mA
special	The encoders are supplied with 5 V directly from the board. Electrical separation of the rotary encoder power supply line is available as an option

order designation

PCI-board with galvanic isolation	part nr. 139338
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Actuators and positioning dri

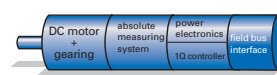
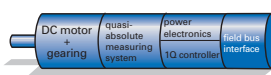
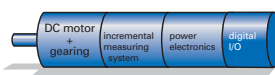
Actuators and positioning drives

FlexiDrive

product range



type	MDBA 42 <i>Actuator</i>	MSQA 46 <i>Actuator</i>	MSAA 42 <i>Actuator</i>	
motor	brush DC motor	brush DC motor	brush DC motor	
torque nominal	0,29 - 15 Nm	0,2 - 0,4 Nm	0,29 - 15 Nm	
rotational speed nominal	10 - 750 rpm	64 - 280 rpm	10 - 750 rpm	
power output nominal	16 - 23 W	6 W	16 - 23 W	
voltage supply	24 VDC	24 VDC	24 VDC	
power electronics	integrated	integrated	integrated	
control electronics	-	1Q controller integrated	1Q controller integrated	
positioning measuring system	incremental	quasi-absolute multi-turn	absolute multi-turn	
positioning resolution	0,29 - 22,5°	1 - 5°	0,15 - 11,25°	
ascertainable revolutions	-	up to 1'073 millions	up to 500 millions	
communication / interface	outputs: incremental (CHA, CHB) inputs: 2 digital right/left	CANopen 2 inputs (programmable)	CANopen 2 inputs (programmable)	
operation modes	rotation: right/left	point-to-point	point-to-point	
hours of operation	3'000 h	300 h	3'000 h	
construction				



features	for simple positioning tasks simplest control via digital inputs / outputs	no reference run necessary closed loop controller	no reference run necessary closed loop controller	
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MSIA 42

Positioning drive

brushless DC motor

0,07 / 0,15 Nm

4'720 / 3'760 rpm

36 / 61 W

24 VDC

integrated

4Q controller integrated

absolute multi-turn

<0,02°

up to 262'144

CANopen

Profibus-DP

4 inputs
(programmable)

point-to-point
run records

2'500 h

MSIA 53

Positioning drive

brushless DC motor

0,06 / 0,2 Nm

3'420 / 2'540 rpm

22 / 50 W

24 VDC

integrated

4Q controller integrated

absolute multi-turn

<0,02°

up to 262'144

CANopen

Profibus-DP

4 inputs
(programmable)

point-to-point
run records

20'000 h

MSIA 68

Positioning drive

brushless DC motor

0,22 / 0,5 Nm

3'500 / 2'800 rpm

80 / 150 W

24 VDC

integrated

4Q controller integrated

absolute multi-turn

<0,02°

up to 262'144

CANopen

Profibus-DP

4 inputs
(programmable)

point-to-point
run records

20'000 h

MSIA 83

Positioning drive

brushless DC motor

0,38 / 0,69 Nm

3'600 / 3'300 rpm

144 / 238 W

24 VDC

integrated

4Q controller integrated

absolute multi-turn

<0,02°

up to 262'144

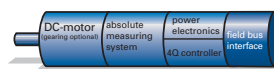
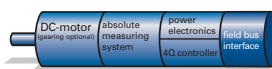
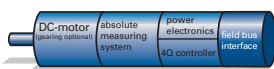
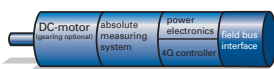
CANopen

Profibus-DP

4 inputs
(programmable)

point-to-point
run records

20'000 h



brushless DC motor
long lifetime
application as direct
drive or with gear
closed loop controller

brushless DC motor
long lifetime
application as direct
drive or with gear
closed loop controller

brushless DC motor
long lifetime
application as direct
drive or with gear
closed loop controller

brushless DC motor
long lifetime
application as direct
drive or with gear
closed loop controller

5. 10 / 5.18

5. 12 / 5. 20

5. 14 / 5. 22

5. 16 / 5. 24

Actuator

MDBA – FlexiDrive

Incremental

features

- power nominal 23 W
- incremental encoder
- easy rotation selection



technical data

voltage supply	24 VDC $\pm 10\%$
internal current limit	2 A
operation mode	S2 short-time operation
current nom.	1,75 A
power output nom.	16 - 23 W
rotational speed nom.	10 - 750 rpm
torque nom.	0,29 - 15 Nm
positioning resolution ¹⁾	90°
repeatability ¹⁾	$\pm 10^\circ$
transmission play	$\leq 0,9^\circ$
operating hours	3'000 h
material	housing: steel, aluminum
max. shaft load	axial: 110 N radial: 300 N

¹⁾ without gear, with 4-fold gating

specification at ambient temperature +40 °C

communication

encoder signals	CHA and CHB
motor control	left, right

order designation

MDBA 42INOC-G42028P

gear ratio

004
007
014
025
046
093
169
308

ambient conditions

protection class	IP 42
ambient temperature	-15...+40 °C
overtemp. protection	yes
isolation class	E (+120 °C, DIN EN 60034-1)

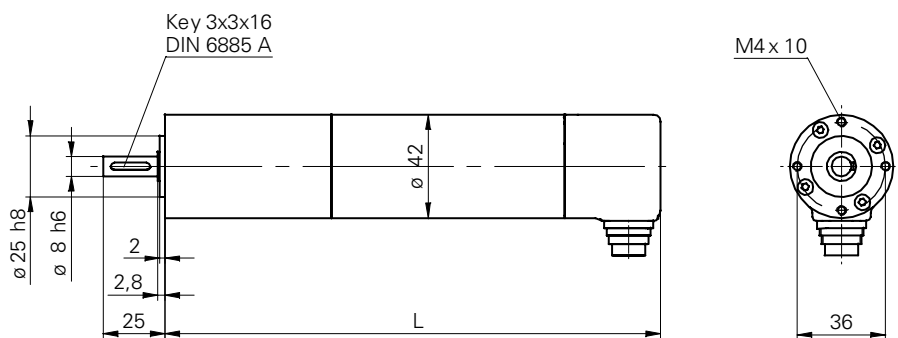
motor-gear-combinations

torque nominal (Nm)	output speed (rpm)	output resolution (in degrees)	gear ratio	shaft load		weight (kg)	total length L (mm)
				axial (N)	radial (N)		
0,29	750	22,5	4 : 1	50	160	1,1	189
0,50	429	12,8	7 : 1				
0,94	214	6,4	14 : 1	80	230	1,2	202
1,67	120	3,6	25 : 1				
3,10	65	1,9	46 : 1	110	300	1,3	215
5,86	32	0,96	93 : 1				
10,65	18	0,53	169 : 1				
15,00*	10	0,29	308 : 1				

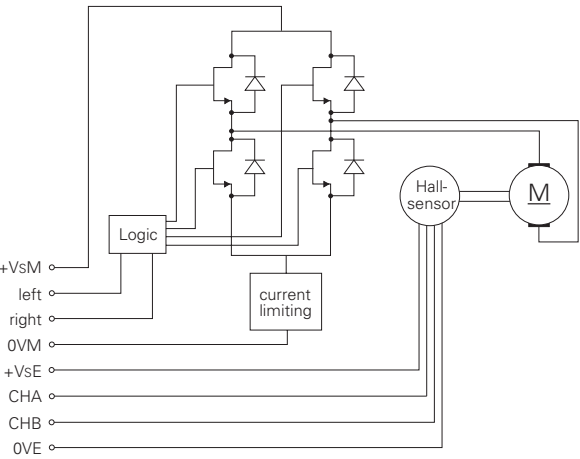
* external current limit 1A

Additional motor - gear combinations are available on request.

dimensions



block diagram



assignment connector 8-pin Binder 423 male



pin number	signals
1	+VsE
2	CHA
3	0VE
4	CHB
5	input right
6	input left
7	+VsM
8	0VM

accessories

connector 8-pin straight	part nr. 153202
connector 8-pin angled	part nr. 123301

Actuator MSQA – FlexiDrive CANopen

features

- power nominal 6 W
- quasi-absolute multi-turn encoder
- 2 programmable inputs
- bus in and bus out connector
- separate power supply for electronics



technical data

voltage supply	24 VDC $\pm 10\%$
internal current limit	0,5 A
operation mode	S2 short-time operation
current nom.	0,5 A
power output nom.	5,9 W
rotational speed nom.	64 - 280 rpm
torque nom.	0,2 - 0,4 Nm
positioning resolution ¹⁾	90°
repeatability ¹⁾	$\pm 45^\circ$
revolutions ¹⁾	1'073 Mio.
operating hours	300 h
material	housing: aluminum
max. shaft load	axial: 20 N radial: 45 N

¹⁾ without gear

specification at ambient temperature +40 °C

order designation

MSQA 46C2PA92 - I36BS3

	gear ratio
	018
	090

communication

fieldbus	CANopen	version 2.0B
profile	DS-301	version 4.02
	DSP-305	version 1.0
	DSP-402	version 2.0
max. baud rate	1 Mbit/s	

ambient conditions

protection class	IP 42
ambient temperature	-15...+40 °C
overtemp. protection	yes
isolation class	F (+155 °C, DIN EN 60034-1)

motor-gear-combinations

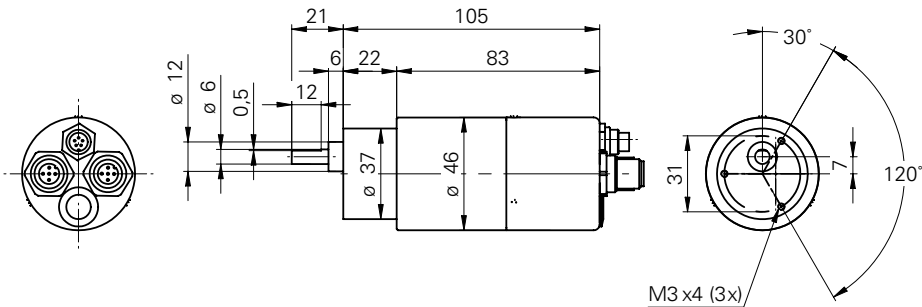
torque nominal (Nm)	output speed (rpm)	self-holding torque	output resolution (in degrees)	gear ratio	shaft load axial (N)	shaft load radial (N)	weight (kg)	total length L (mm)
0,2	280	typ. 0,25 Nm	2,5	18 : 1	15	30	0,5	104
0,4	64	typ. 2,8 Nm	0,5	90 : 1	20	45	0,5	

Additional motor - gear combinations are available on request.

CANopen

dimensions

S with spur gear



hint

switches for bus address and baud rate adjustment are located behind rubber cover

assignment connector 5-pin M9 male

pin nr.	signal	description
1	0 VME	0 VDC voltage supply motor/electronics
2	+VsM	+24 VDC voltage supply motor
3	Input 2	programmable input
4	+VsE	+24 VDC voltage supply electronics
5	Input 1	programmable input

assignment connector 5-pin M12 male/female

pin nr.	signal	description
1	n.c.	
2	+VsE	+24 VDC voltage supply electron.
3	CAN_GND/0 VE	CAN ground/0 VE
4	CAN_H	bus dominant HIGH
5	CAN_L	bus dominant LOW

A-coded

accessories

CD-ROM with GSD-/EDS-/XML-
files and manuals part nr. 147362
refer to fieldbus accessories, page 5.27

Actuator
MSAA – *FlexiDrive*
CANopen

features

- power nominal 23 W
- absolute multi-turn encoder
- 2 programmable inputs



general data

voltage supply	24 VDC $\pm 10\%$
current limit adjustable	0 - 4 A
operation mode	S2 short-time operation
current nom.	1,75 A
power output nom.	16 - 23 W
rotational speed nom.	10 - 750 rpm
torque nom.	0,29 - 15 Nm
positioning resolution ¹⁾	45°
repeatability ¹⁾	$\pm 36^\circ$
transmission play	$\leq 0,9^\circ$
revolutions ¹⁾	500 Mio.
operating hours	3'000 h
ascertainable revolutions ¹⁾	up to 500 mio.
material	housing: steel
max. shaft load	axial: 110 N radial: 300 N

¹⁾ without gear

specification at ambient temperature of +40 °C

communication

fieldbus	CANopen	version 2.0B
profile	DS-301	version 4.02
	DSP-305	version 1.0
	DSP-402	version 2.0
max. baud rate	1 Mbit/s	

order designation

MSAA 42C2N -K44BP4

gear ratio	
004	046
007	093
014	169
025	308

connector

A23 bus and power axially

RC0 bus and power combined radially

ambient conditions

protection class	IP 42
ambient temperature	-15...+40 °C
overtemp. protection	yes
isolation class	E (+120 °C, DIN EN 60034-1)

motor-gear-combinations

torque nominal (Nm)	output speed (rpm)	output resolution (in degrees)	gear ratio	shaft load axial (N)	shaft load radial (N)	weight (kg)	total length L (mm)
0,29	750	11,3	4 : 1	50	160	1,1	200
0,50	429	6,4	7 : 1				
0,94	214	3,2	14 : 1				
1,67	120	1,8	25 : 1	80	230	1,2	213
3,10	65	0,98	46 : 1				
5,86	32	0,48	93 : 1				
10,65	18	0,27	169 : 1	110	300	1,3	226
15,00*	10	0,14	308 : 1				

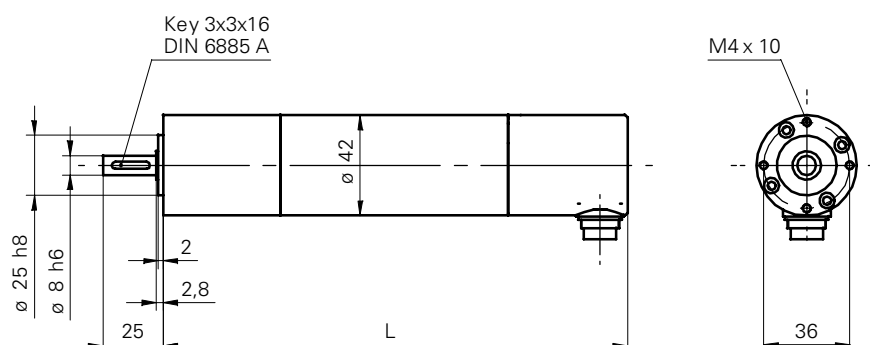
* internal current limit 1 A

Additional motor - gear combinations are available on request.

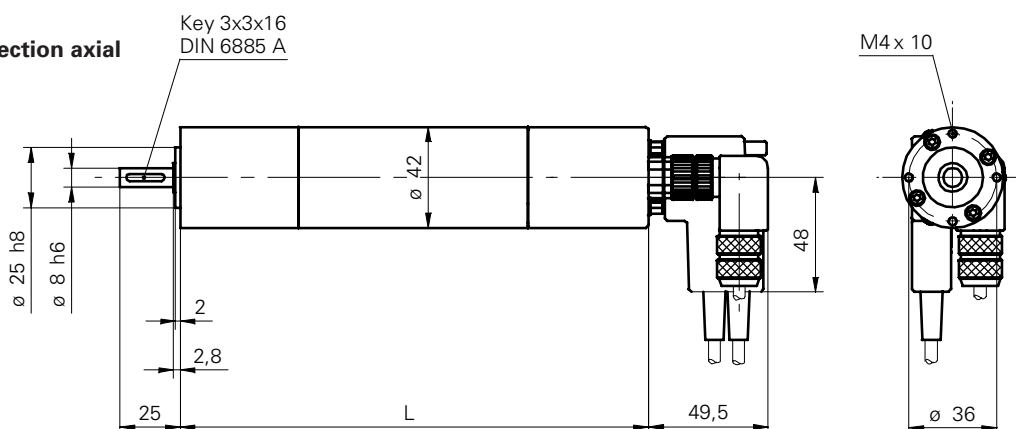
CANopen

dimensions

R connection radial



A connection axial



assignment connector A: 9-pin Sub-D male

pin number	signal	description
1	n.c.	-
2	CAN_L	bus dominant LOW
3	CAN_GND	CAN ground
4	n.c.	-
5	n.c.	-
6	n.c.	-
7	CAN_H	bus dominant HIGH
8	n.c.	-
9	n.c.	-

assignment connector male R: 12-pin Binder 423 male

pin number	signal	description
A	0 V	0 VDC voltage supply
B	0 V	0 VDC voltage supply
C	+Vs	+24 VDC voltage supply
D	+Vs	+24 VDC voltage supply
E	GND	connected to motor housing
F	CAN_H	bus dominant HIGH
G	CAN_L	bus dominant LOW
H	CAN_GND	CAN ground
J	CAN_H	bus dominant HIGH
K	CAN_L	bus dominant LOW
L	Input 1	programmable input
M	Input 2	programmable input

assignment connector A: 5-pin M12 male

pin number	signal	description
1	+Vs	+24 VDC voltage supply
2	Input 1	programmable input
3	Input 2	programmable input
4	GND	GND for inputs
5	0 V	0 VDC voltage supply

accessories

CD-ROM with GSD/EDS/XML-files and manuals	part nr. 147362
connection R: connector 12-pin, Binder 423 female	part nr. 159374
connection A: connector 9-pin D-Sub female, angled	part nr. 145023
connector 5-pin female, angled	part nr. 145021

Positioning drive MSIA – FlexiDrive CANopen

features

- power nominal 61 W
- absolute multi-turn encoder
- 4 programmable inputs
- bus in and bus out connector
- separate power supply for electronics
- run records programmable

technical data

voltage supply	24 VDC $\pm 10\%$	
max. supply current	10 A	
operation mode	S1 ²⁾	S3 ³⁾
current nom.	2,3 A	4,3 A
power output nom. ¹⁾	36 W	61 W
rotational speed nom. ¹⁾	4'720 rpm	3'760 rpm
torque nom. ^{1) 4)}	0,07 Nm	0,15 Nm
positioning resolution ¹⁾	0,02°	
positioning accuracy ¹⁾	$\pm 1^\circ$	
repeatability ¹⁾	0,3°	
revolutions ¹⁾	262'144	
operating hours	2'500 h	
material	housing: zinc die cast	
max. shaft load	axial: 110 N radial: 300 N	

¹⁾ without gear

²⁾ S1 continuous duty (DIN EN 60034-1)

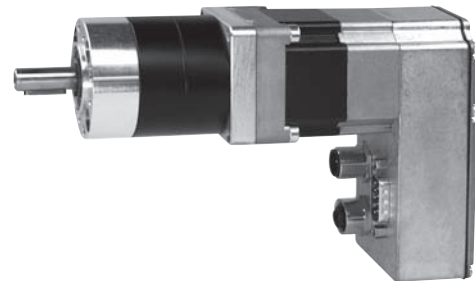
specifications at ambient temperature +40 °C

communication

fieldbus	CANopen	version 2.0B
profile	DS-301	version 4.02
	DSP-305	version 1.0
	DSP-402	version 2.0
max. baud rate	1 Mbit/s	

motor-gear-combinations

torque nominal (Nm)		output speed (rpm)		gear ratio	revolution	transmission play (in degrees)	shaft load (N)		weight (kg)	total length L (mm)
S1	S3	S1	S3				axial (N)	radial (N)		
0,21	0,44	1'276	1'016	3,7	70'850	0,8	50	160	1,3	144
0,38	0,81	699	575	6,75	38'836				1,3	
0,77	1,65	344	274	13,73	19'093	0,85	80	230	1,5	157
2,39	5,13	104	83	45,56	5'754				1,5	
7,87	16,86	31	25	149,9	1'749	0,9	110	300	1,7	170



order designation

MSIA 42C2PL12-C43		P4	
		gear ratio	
		004	046
		007	150
		014	
		protection class	
C	IP 54		
E	IP 65		

³⁾ S3 intermittent duty, cycle 1 min, power on duration 25%

⁴⁾ at operation factor = 1

⁵⁾ only with leak-proof D-Sub connector

ambient conditions

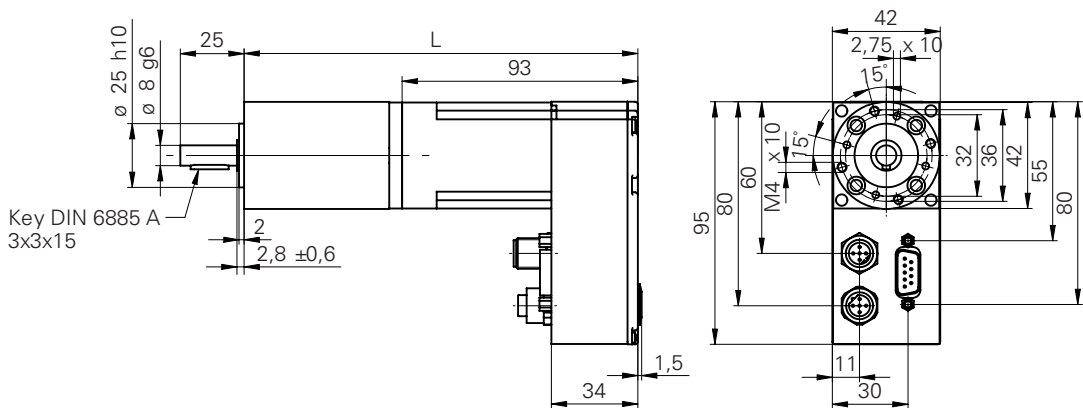
protection class	IP 65 ⁵⁾
ambient temperature	-15...+40 °C
overtemp. protection	yes
isolation class	B (+130 °C, DIN EN 60034-1)

Additional motor - gear combinations are available on request.

CANopen

dimensions

P planetary gear



hint

switches for bus address and baud rate adjustment are located behind removable cover

assignment connector 9-pin D-Sub male

pin nr.	signal	description
1	+VsE	+24 VDC voltage supply electronics
2	Input 1	programmable input
3	Input 2	programmable input
4	Input 3	programmable input
5	Input 4	programmable input
6	0 VME	0 VDC voltage supply motor/electronics
7	0 VME	0 VDC voltage supply motor/electronics
8	+VsM	+24 VDC voltage supply motor
9	+VsM	+24 VDC voltage supply motor

assignment connector 5-pin M12 male/female

pin nr.	signal	description
1	n.c.	
2	n.c.	
3	CAN_GND	CAN ground
4	CAN_H	bus dominant HIGH
5	CAN_L	bus dominant LOW

A-coded

accessories

CD-ROM with GSD-/EDS-/XML-files and manuals	part nr. 147362
D-Sub connector (female)	part nr. 153493
refer to fieldbus accessories, page 5.27	

Positioning drive

MSIA – FlexiDrive

CANopen

features

- power nominal 50 W
- absolute multi-turn encoder
- 4 programmable inputs
- bus in and bus out connector
- separate power supply for electronics
- run records programmable

technical data

voltage supply	24 VDC $\pm$ 10 %	
max. supply current	8 A	
operation mode	S1 ²⁾	S3 ³⁾
current nom.	1,7 A	5,0 A
power output nom. ¹⁾	22 W	50 W
rotational speed nom. ¹⁾	3'420 rpm	2'540 rpm
torque nom. ^{1) 4)}	0,06 Nm	0,2 Nm
positioning resolution ¹⁾	0,02°	
positioning accuracy ¹⁾	$\pm$ 1°	
repeatability ¹⁾	0,3°	
revolutions ¹⁾	262'144	
operating hours	20'000 h	
material	housing: aluminum	
max. shaft load ¹⁾	axial: 40 N radial: 400 N	

¹⁾ without gear

²⁾ S1 continuous duty (DIN EN 60034-1)

specifications at ambient temperature +40 °C

communication

fieldbus	CANopen version 2.0B	
profile	DS-301	version 4.02
	DSP-305	version 1.0
	DSP-402	version 2.0
max. baud rate	1 Mbit/s	

motor-gear-combinations

torque nominal (Nm)		output speed (rpm)		gear ratio	revolution	transmission play (in degrees)	shaft load (N)		weight (kg)	total length L (mm)
S1	S3	S1	S3				axial (N)	radial (N)		
0,2	0,7	841	561	3,7	70'850	0,7	60	200	1,3	188
0,3	1,1	533	356	6,75	38'836				1,3	
0,6	2,0	262	175	13,73	19'093	0,75	100	320	1,5	202
2,0	6,8	79	53	45,56	5'754				1,5	
6,3	21	24	16	149,9	1'749	0,8	150	450	1,7	216



order designation

MSIA 53C2PA11-N52					
			gear ratio		
			004	046	
			007	150	
			014	000 (without gear)	
			gear variant		
			K0 without gear		
			P5 planetary gear		
			protection class		
			C IP 54		
			E IP 65		

³⁾ S3 intermittent duty, cycle 1 min, power on duration 25%

⁴⁾ at operation factor = 1

⁵⁾ only with leak-proof D-Sub connector

ambient conditions

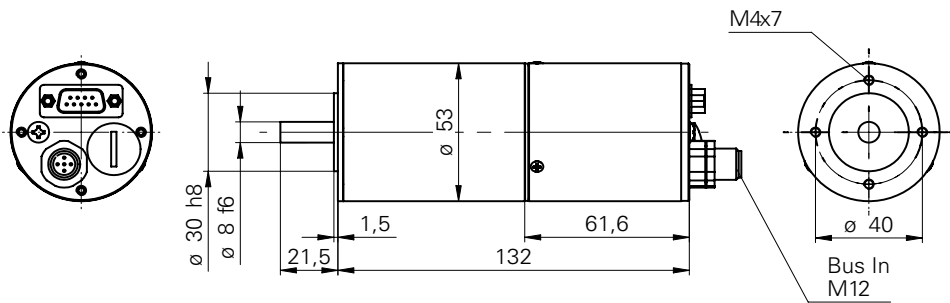
protection class	IP 65 ⁵⁾
ambient temperature	-15...+40 °C
overtemp. protection	yes
isolation class	B (+130 °C, DIN EN 60034-1)

Additional motor - gear combinations are available on request.

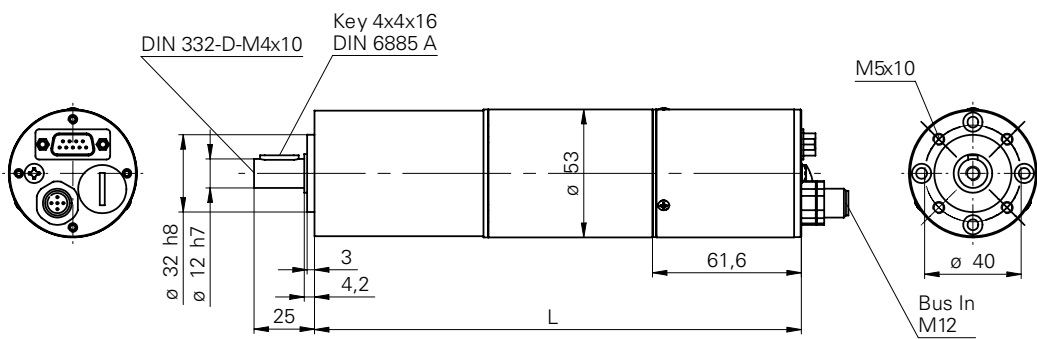
CANopen

dimensions

K without gear



P planetary gear



hint
switches for bus address and baud rate adjustment are located behind removable cover

assignment connector 9-pin D-Sub male

pin nr.	signal	description
1	+VsE	+24 VDC voltage supply electronics
2	Input 1	programmable input
3	Input 2	programmable input
4	Input 3	programmable input
5	Input 4	programmable input
6	0 VME	0 VDC voltage supply motor/electronics
7	0 VME	0 VDC voltage supply motor/electronics
8	+VsM	+24 VDC voltage supply motor
9	+VsM	+24 VDC voltage supply motor

assignment connector 5-pin M12 male

pin nr.	signal	description
1	n.c.	
2	n.c.	
3	CAN_GND	CAN ground
4	CAN_H	bus dominant HIGH
5	CAN_L	bus dominant LOW

A-coded

accessoires

CD-ROM with GSD-/EDS-/XML-files and manuals	part nr. 147362
D-Sub connector (female)	part nr. 153493
refer to fieldbus accessories, page 5.27	

Positioning drive MSIA – FlexiDrive CANopen

features

- power nominal 150 W
- absolute multi-turn encoder
- 4 programmable inputs
- bus in and bus out connector
- separate power supply for electronics
- run records programmable

technical data

voltage supply	24 VDC ±10 %	
max. supply current	20 A	
operation mode	S1 ²⁾	S3 ³⁾
current nom.	5,8 A	12,8 A
power output nom. ¹⁾	80 W	150 W
rotational speed nom. ¹⁾	3'500 rpm	2'800 rpm
torque nom. ^{1) 4)}	0,22 Nm	0,5 Nm
positioning resolution ¹⁾	0,02°	
positioning accuracy ¹⁾	±1°	
repeatability ¹⁾	0,3°	
revolutions ¹⁾	262'144	
operating hours	20'000 h	
material	housing: aluminum	
max. shaft load ¹⁾	axial: 40 N radial: 400 N	

¹⁾ without gear

²⁾ S1 continuous duty (DIN EN 60034-1)

specifications at ambient temperature +40 °C

communication

fieldbus	CANopen version 2.0B	
profile	DS-301	version 4.02
	DSP-305	version 1.0
	DSP-402	version 2.0
max. baud rate	1 Mbit/s	

motor-gear-combinations

torque nominal (Nm)		output speed (rpm)		gear ratio	revolution	transmission play (in degrees)	M _{max} gear (Nm)	shaft load		weight (kg)
S1	S3	S1	S3					axial (N)	radial (N)	
2,1	4,7	337	269	10,4	25'206	0,9	5,5	22	220	1,9
3,1	6,9	227	182	15,4	17'022					1,9
5,9	13,4	111	89	31,6	8'296	0,85	6,5	22	220	2,0



order designation

MSIA	68C2P	12-N64			
				gear ratio	
					010
					015
					032
					000 (without gear)
				gear variant	
					K0 without gear
					S6 spur gear with shaft ø 8 mm
					T6 spur gear with shaft ø 10 mm and key
				protection class	
					C IP 54
					E IP 65
				connection direction	
					A axial
					R radial

³⁾ S3 intermittent duty, cycle 1 min, power on duration 25%

⁴⁾ at operation factor = 1

⁵⁾ only with leak-proof D-Sub connector

ambient conditions

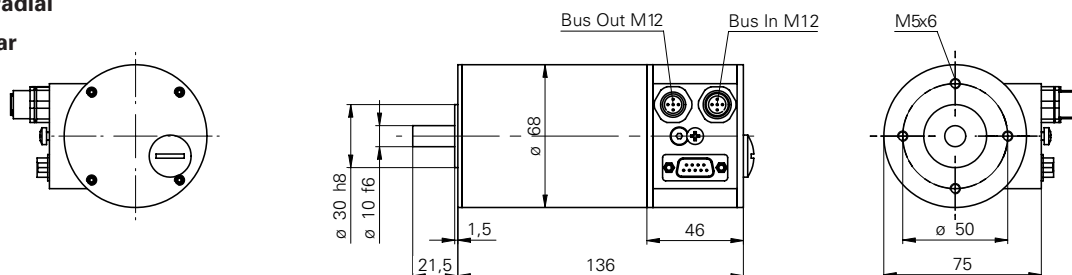
protection class	IP 65 ⁵⁾
ambient temperature	-15...+40 °C
overtemp. protection	yes
isolation class	B (+130 °C, DIN EN 60034-1)

CANopen

dimensions

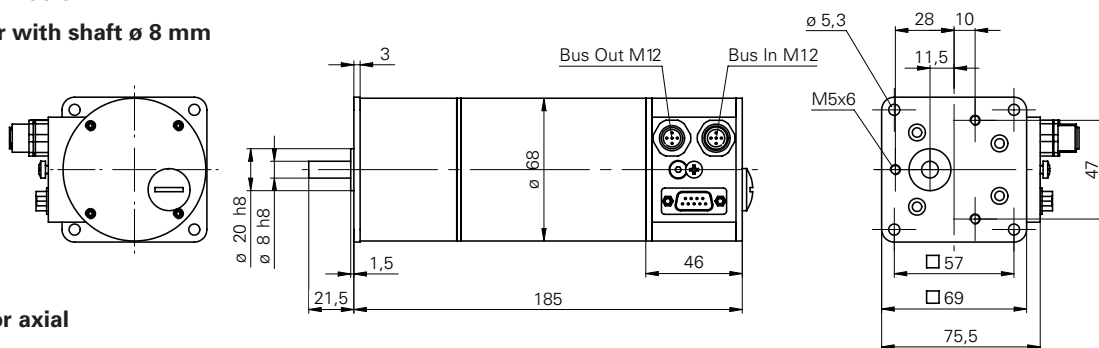
R connector radial

K without gear



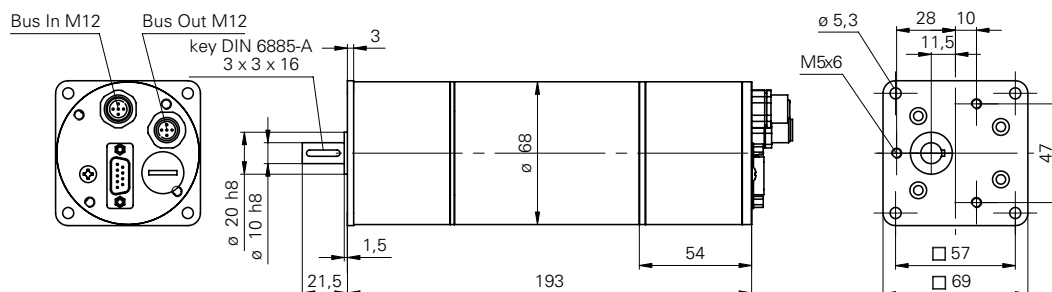
R connector radial

S spur gear with shaft $\varnothing$ 8 mm



A connector axial

T spur gear with shaft $\varnothing$ 10 mm and key



hint

switches for bus address and baud rate adjustment are located behind removable cover

assignment connector 9-pin D-Sub male

pin nr.	signal	description
1	+VsE	+24 VDC voltage supply electronics
2	Input 1	programmable input
3	Input 2	programmable input
4	Input 3	programmable input
5	Input 4	programmable input
6	0 VME	0 VDC voltage supply motor/electronics
7	0 VME	0 VDC voltage supply motor/electronics
8	+VsM	+24 VDC voltage supply motor
9	+VsM	+24 VDC voltage supply motor

assignment connector 5-pin M12 male/female

pin nr.	signal	description
1	n.c.	
2	n.c.	
3	CAN_GND	CAN ground
4	CAN_H	bus dominant HIGH
5	CAN_L	bus dominant LOW

A-coded

accessoires

CD-ROM with GSD/EDS/XML-files and manuals

part nr. 147362

D-Sub connector (female)

part nr. 153493

refer to fieldbus accessories, page 5.27

Positioning drive MSIA – FlexiDrive CANopen

features

- power nominal 238 W
- absolute multi-turn encoder
- 4 programmable inputs
- bus in and bus out connector
- separate power supply for electronics
- run records programmable

technical data

voltage supply	24 VDC $\pm 10\%$	
max. supply current	20 A	
operation mode	S1 ²⁾	S3 ³⁾
current nom.	7,8 A	13 A
power output nom. ¹⁾	144 W	238 W
rotational speed nom. ¹⁾	3'600 rpm	3'300 rpm
torque nom. ^{1) 4)}	0,38 Nm	0,69 Nm
positioning resolution ¹⁾	0,02°	
positioning accuracy ¹⁾	$\pm 1^\circ$	
repeatability ¹⁾	0,3°	
revolutions ¹⁾	262'144	
operating hours	20'000 h	
material	housing: aluminum	
max. shaft load ¹⁾	axial: 40 N radial: 400 N	

¹⁾ without gear

²⁾ S1 continuous duty (DIN EN 60034-1)

specifications at ambient temperature +40 °C

communication

fieldbus	CANopen version 2.0B		
profile	DS-301	version 4.02	
	DSP-305	version 1.0	
	DSP-402	version 2.0	
max. baud rate	1 Mbit/s		

motor-gear-combinations

torque nominal (Nm)		output speed (rpm)		gear ratio	revolution	transmission play (in degrees)	shaft load (N)		weight (kg)	total length L (mm)
S1	S3	S1	S3				axial	radial		
1,1	2,0	973	892	3,70	70'850	1,0	80	400	4,8	240
2,1	3,7	533	489	6,75	38'836					
3,9	7,1	262	240	13,73	19'093	1,5	120	600	5,5	261
13,0	23,6	79	72	45,56	5'754					
39,9	72,4	24	22	149,9	1'749	2,0	200	1'000	6,2	283



order designation

MSIA	83C2P	32-N86			
				gear ratio	
				004	046
				007	150
				014	000 (without gear)
				gear variant	
			K0	without gear	
			P8	planetary gear	
				protection class	
		C	IP 54		
		E	IP 65		
			connection direction		
	A	axial			
	R	radial			

³⁾ S3 intermittent duty, cycle 1 min, power on duration 25%

⁴⁾ at operation factor = 1

ambient conditions

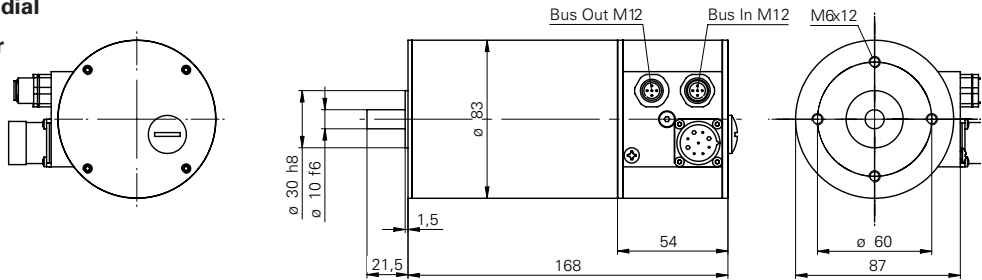
protection class	IP 65
ambient temperature	-15...+40 °C
overtemp. protection	yes
isolation class	B (+130 °C, DIN EN 60034-1)

Additional motor - gear combinations are available on request.

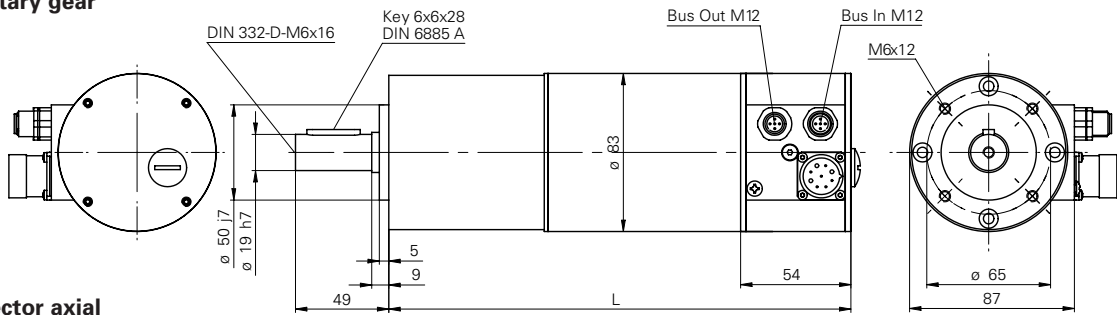
CANopen

dimensions

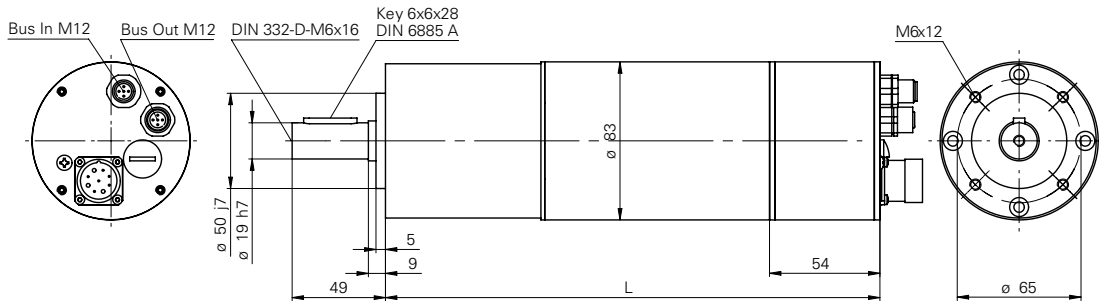
R connector radial
K without gear



R connector radial
P planetary gear



A connector axial
P planetary gear



hint
switches for bus address and baud rate adjustment are located behind removable cover

assignment connector 9-pin M23 male

pin nr.	signal	description
1	Input 1	programmable input
2	Input 2	programmable input
3	Input 3	programmable input
4	PE	GND
5	Input 4	programmable input
6	0 VME	0 VDC voltage supply motor/electronics
7	Output	programmable output
8	+VsM	+24 VDC voltage supply motor
9	+VsM	+24 VDC voltage supply electronics

assignment connector 5-pin M12 male/female

pin nr.	signal	description
1	n.c.	
2	n.c.	
3	CAN_GND	CAN ground
4	CAN_H	bus dominant HIGH
5	CAN_L	bus dominant LOW

A-coded

accessoires

CD-ROM with GSD/EDS/XML-
files and manuals part nr. 147362
refer to fieldbus accessories, page 5.27

Positioning drive

MSIA – FlexiDrive

Profibus-DP

features

- power nominal 61 W
- absolute multi-turn encoder
- 4 programmable inputs
- bus in and bus out connector
- separate power supply for electronics
- run records programmable

technical data

voltage supply	24 VDC $\pm 10\%$	
max. supply current	10 A	
operation mode	S1 ²⁾	S3 ³⁾
current nom.	2,3 A	4,3 A
power output nom. ¹⁾	36 W	61 W
rotational speed nom. ¹⁾	4'720 rpm	3'760 rpm
torque nom. ^{1) 4)}	0,07 Nm	0,15 Nm
positioning resolution ¹⁾	0,02°	
positioning accuracy ¹⁾	$\pm 1^\circ$	
repeatability ¹⁾	0,3°	
revolutions ¹⁾	262'144	
operating hours	2'500 h	
material	housing: zinc die cast	
max. shaft load	axial: 110 N radial: 300 N	

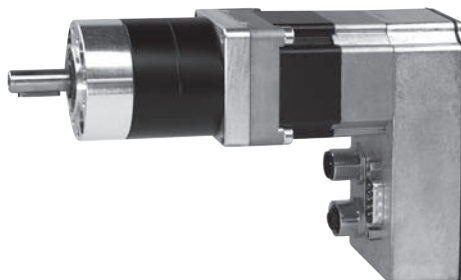
¹⁾ without gear

²⁾ S1 continuous duty (DIN EN 60034-1)

specifications at ambient temperature +40 °C

communication

fieldbus	Profibus-DP
profile	Profibus nr. 3 version 2.0
max. baud rate	12 Mbit/s



order designation

MSIA 42P2PL12 - C43		P4	
		gear ratio	
		004	046
		007	150
		014	000 (without gear)
		protection class	
C	IP 54		
E	IP 65		

³⁾ S3 intermittent duty, cycle 1 min, power on duration 25%

⁴⁾ at operation factor = 1

⁵⁾ only with leak-proof D-Sub connector

ambient conditions

protection class	IP 65 ⁵⁾
ambient temperature	-15...+40 °C
overtemp. protection	yes
isolation class	B (+130 °C, DIN EN 60034-1)

motor-gear-combinations

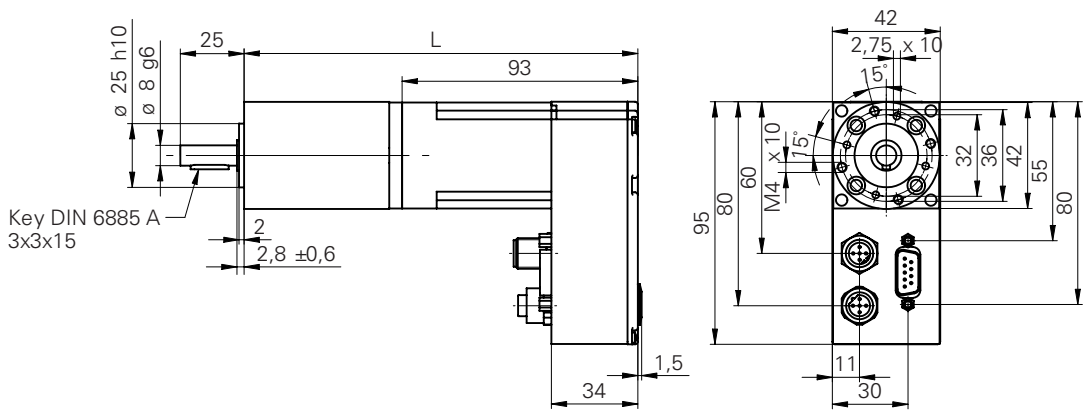
torque nominal (Nm)		output speed (rpm)		gear ratio	revolution	transmission play (in degrees)	shaft load		weight (kg)	total length L (mm)
S1	S3	S1	S3				axial (N)	radial (N)		
0,21	0,44	1'276	1'016	3,7	70'850	0,8	50	160	1,3	144
0,38	0,81	699	575	6,75	38'836				1,3	
0,77	1,65	344	274	13,73	19'093	0,85	80	230	1,5	157
2,39	5,13	104	83	45,56	5'754				1,5	
7,87	16,86	31	25	149,9	1'749	0,9	110	300	1,7	170

Additional motor - gear combinations are available on request.

Profibus-DP

dimensions

P planetary gear



hint

switches for bus address adjustment are located behind removable cover

assignment connector 9-pin D-Sub male

pin nr.	signal	description
1	+VsE	+24 VDC voltage supply electronics
2	Input 1	programmable input
3	Input 2	programmable input
4	Input 3	programmable input
5	Input 4	programmable input
6	0 VME	0 VDC voltage supply motor/electronics
7	0 VME	0 VDC voltage supply motor/electronics
8	+VsM	+24 VDC voltage supply motor
9	+VsM	+24 VDC voltage supply motor

assignment connector 5-pin M12 male/female

pin nr.	signal	description
1	+VsDP	VP Profibus +5VDC
2	A line green	cable green / Profibus-DP
3	0 VDP	DGND Profibus
4	B line red	cable red / Profibus-DP
5	screen	housing

B-coded

accessories

CD-ROM with GSD/EDS/XML-
files and manuals part nr. 147362
D-Sub connector (female) part nr. 153493
refer to fieldbus accessories, page 5.27

Positioning drive

MSIA – FlexiDrive

Profibus-DP

features

- power nominal 50 W
- absolute multi-turn encoder
- 4 programmable inputs
- bus in and bus out connector
- separate power supply for electronics
- run records programmable

technical data

voltage supply	24 VDC $\pm$ 10 %	
max. supply current	8 A	
operation mode	S1 ²⁾	S3 ³⁾
current nom.	1,7 A	5,0 A
power output nom. ¹⁾	22 W	50 W
rotational speed nom. ¹⁾	3'420 rpm	2'540 rpm
torque nom. ^{1) 4)}	0,06 Nm	0,2 Nm
positioning resolution ¹⁾	0,02°	
positioning accuracy ¹⁾	$\pm$ 1°	
repeatability ¹⁾	0,3°	
revolutions ¹⁾	262'144	
operating hours	20'000 h	
material	housing: aluminum	
max. shaft load ¹⁾	axial: 40 N radial: 400 N	

¹⁾ without gear

²⁾ S1 continuous duty (DIN EN 60034-1)

specifications at ambient temperature +40 °C

communication

fieldbus	Profibus-DP
profile	Profibus nr. 3 version 2.0
max. baud rate	12 Mbit/s



order designation

MSIA 53P2PA11-N52					
			gear ratio		
			004	046	
			007	150	
			014	000 (without gear)	
			gear variant		
			K0 without gear		
			P5 planetary gear		
			protection class		
C			IP 54		
E			IP 65		

³⁾ S3 intermittent duty, cycle 1 min, power on duration 25%

⁴⁾ at operation factor = 1

⁵⁾ only with leak-proof D-Sub connector

ambient conditions

protection class	IP 65 ⁵⁾
ambient temperature	-15...+40 °C
overtemp. protection	yes
isolation class	B (+130 °C, DIN EN 60034-1)

motor-gear-combinations

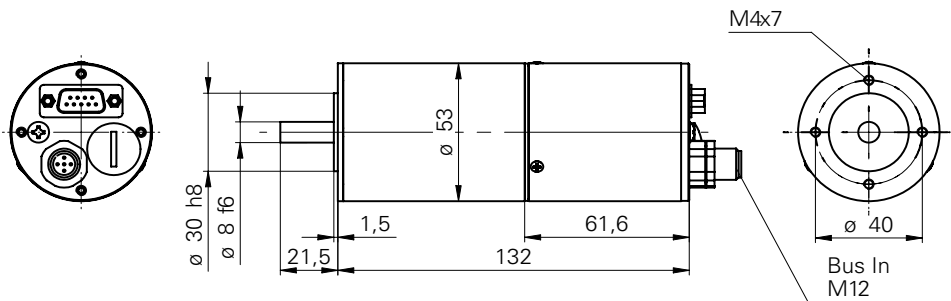
torque nominal (Nm)		output speed (rpm)		gear ratio	revolution	transmission play (in degrees)	shaft load (N)		weight (kg)	total length L (mm)
S1	S3	S1	S3				axial	radial		
0,2	0,7	841	561	3,7	70'850	0,7	60	200	1,3	188
0,3	1,1	533	356	6,75	38'836				1,3	
0,6	2,0	262	175	13,73	19'093	0,75	100	320	1,5	202
2,0	6,8	79	53	45,56	5'754				1,5	
6,3	21	24	16	149,9	1'749	0,8	150	450	1,7	216

Additional motor - gear combinations are available on request.

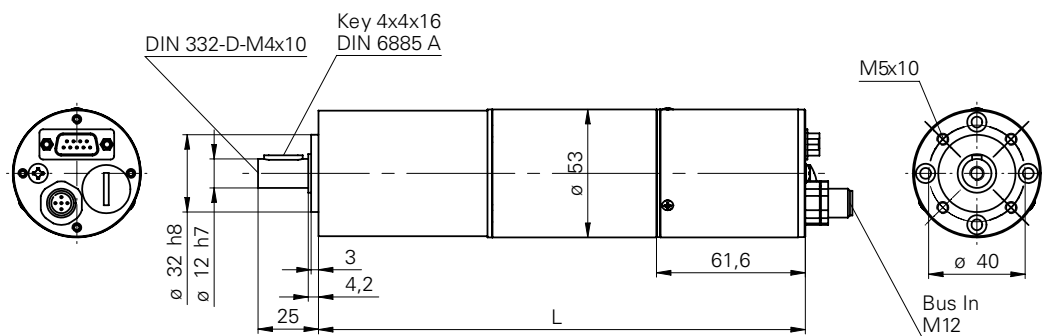
Profibus-DP

dimensions

K without gear



P planetary gear



hint

switches for bus address adjustment are located behind removable cover

assignment connector 9-pin D-Sub male

pin nr.	signal	description
1	+VsE	+24 VDC voltage supply electronics
2	Input 1	programmable input
3	Input 2	programmable input
4	Input 3	programmable input
5	Input 4	programmable input
6	0 VME	0 VDC voltage supply motor/electronics
7	0 VME	0 VDC voltage supply motor/electronics
8	+VsM	+24 VDC voltage supply motor
9	+VsM	+24 VDC voltage supply motor

assignment connector 5-pin M12 male

pin nr.	signal	description
1	+VsDP	VP Profibus +5VDC
2	A line green	cable green / Profibus-DP
3	0 VDP	DGND Profibus
4	B line red	cable red / Profibus-DP
5	screen	housing

B-coded

accessoires

CD-ROM with GSD/EDS/XML-
files and manuals part nr. 147362
D-Sub connector (female) part nr. 153493
refer to fieldbus accessories, page 5.27

Positioning drive

MSIA – FlexiDrive

Profibus-DP

features

- power nominal 150 W
- absolute multi-turn encoder
- 4 programmable inputs
- bus in and bus out connector
- separate power supply for electronics
- run records programmable

technical data

voltage supply	24 VDC $\pm 10\%$	
max. supply current	20 A	
operation mode	S1 ²⁾	S3 ³⁾
current nom.	5,8 A	12,8 A
power output nom. ¹⁾	80 W	150 W
rotational speed nom. ¹⁾	3'500 rpm	2'800 rpm
torque nom. ^{1) 4)}	0,22 Nm	0,5 Nm
positioning resolution ¹⁾	0,02°	
positioning accuracy ¹⁾	$\pm 1^\circ$	
repeatability ¹⁾	0,3°	
revolutions ¹⁾	262'144	
operating hours	20'000 h	
material	housing: aluminum	
max. shaft load ¹⁾	axial: 40 N radial: 400 N	

¹⁾ without gear

²⁾ S1 continuous duty (DIN EN 60034-1)

specifications at ambient temperature +40 °C

communication

fieldbus	Profibus-DP
profile	Profibus nr. 3 version 2.0
max. baud rate	12 Mbit/s



order designation

MSIA	68P2P	12-N64			
					gear ratio
					010
					015
					032
					000 (without gear)
					gear variant
					K0 without gear
					S6 spur gear with shaft $\varnothing$ 8 mm
					T6 spur gear with shaft $\varnothing$ 10 mm and key
					protection class
					C IP 54
					E IP 65
					connection direction
					A axial
					R radial

³⁾ S3 intermittent duty, cycle 1 min, power on duration 25%

⁴⁾ at operation factor = 1

⁵⁾ only with leak-proof D-Sub connector

ambient conditions

protection class	IP 65 ⁵⁾
ambient temperature	-15...+40 °C
overtemp. protection	yes
isolation class	B (+130 °C, DIN EN 60034-1)

motor-gear-combinations

torque nominal (Nm)		output speed (rpm)		gear ratio	revolution	transmission play (in degrees)	M _{max} gear (Nm)	shaft load (N)		weight (kg)
S1	S3	S1	S3					axial (N)	radial (N)	
2,1	4,7	337	269	10,4	25'206	0,9	5,5	22	220	1,9
3,1	6,9	227	182	15,4	17'022					1,9
5,9	13,4	111	89	31,6	8'296	0,85	6,5	22	220	2,0

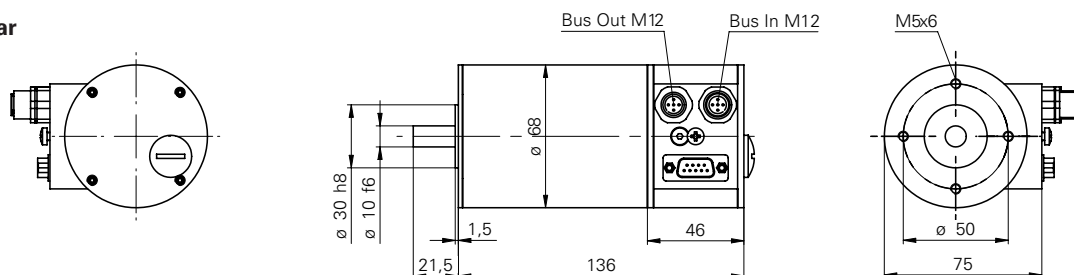
Additional motor - gear combinations are available on request.

Profibus-DP

dimensions

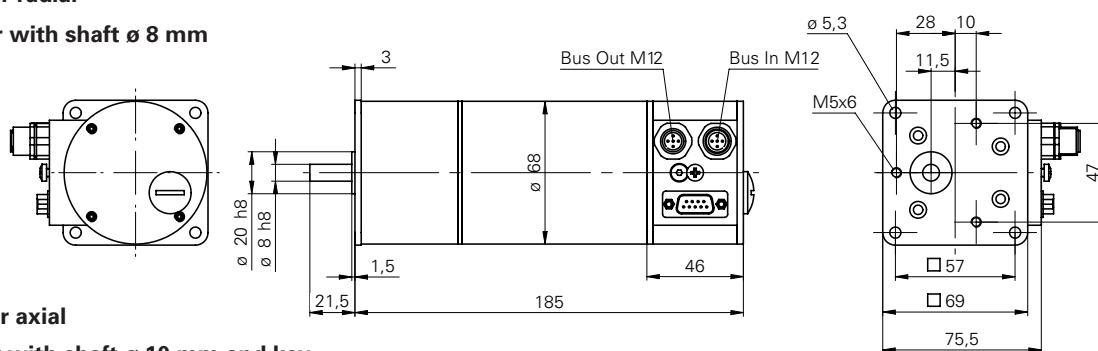
R connector radial

K without gear



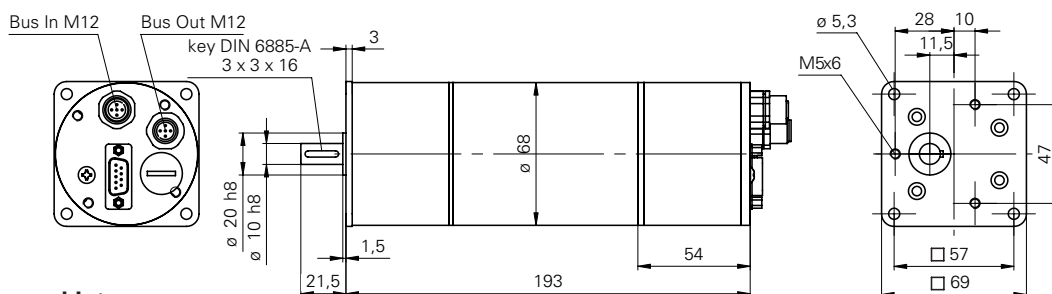
R connector radial

S spur gear with shaft $\varnothing$ 8 mm



A connector axial

T spur gear with shaft $\varnothing$ 10 mm and key



hint

switches for bus address adjustment are located behind removable cover

assignment connector 9-pin D-Sub male

pin nr.	signal	description
1	+VsE	+24 VDC voltage supply electronics
2	Input 1	programmable input
3	Input 2	programmable input
4	Input 3	programmable input
5	Input 4	programmable input
6	0 VME	0 VDC voltage supply motor/electronics
7	0 VME	0 VDC voltage supply motor/electronics
8	+VsM	+24 VDC voltage supply motor
9	+VsM	+24 VDC voltage supply motor

assignment connector 5-pin M12 male/female

pin nr.	signal	description
1	+VsDP	VP Profibus +5VDC
2	A line green	cable green / Profibus-DP
3	0 VDP	DGND Profibus
4	B line red	cable red / Profibus-DP
5	screen	housing

B-coded

accessories

CD-ROM with GSD-/EDS-/XML-files and manuals	part nr. 147362
D-Sub connector (female)	part nr. 153493
refer to fieldbus accessories, page 5.27	

Positioning drive MSIA – FlexiDrive Profibus-DP

features

- power nominal 238 W
- absolute multi-turn encoder
- 4 programmable inputs
- bus in and bus out connector
- separate power supply for electronics
- run records programmable

technical data

voltage supply	24 VDC $\pm 10\%$	
max. supply current	20 A	
operation mode	S1 ²⁾	S3 ³⁾
current nom.	7,8 A	13 A
power output nom. ¹⁾	144 W	238 W
rotational speed nom. ¹⁾	3'600 rpm	3'300 rpm
torque nom. ^{1) 4)}	0,38 Nm	0,69 Nm
positioning resolution ¹⁾	0,02°	
positioning accuracy ¹⁾	$\pm 1^\circ$	
repeatability ¹⁾	0,3°	
revolutions ¹⁾	262'144	
operating hours	20'000 h	
material	housing: aluminum	
max. shaft load ¹⁾	axial: 40 N radial: 400 N	

¹⁾ without gear

²⁾ S1 continuous duty (DIN EN 60034-1)

specifications at ambient temperature +40 °C

communication

fieldbus	Profibus-DP
profile	Profibus nr. 3 version 2
max. baud rate	12 Mbit/s

motor-gear-combinations

torque nominal (Nm)		output speed (rpm)		gear ratio	revolution	transmission play (in degrees)	shaft load (N)		weight (kg)	total length L (mm)
S1	S3	S1	S3				axial	radial		
1,1	2,0	973	892	3,70	70'850	1,0	80	400	4,8	240
2,1	3,7	533	489	6,75	38'836					
3,9	7,1	262	240	13,73	19'093	1,5	120	600	5,5	261
13,0	23,6	79	72	45,56	5'754					
39,9	72,4	24	22	149,9	1'749	2,0	200	1'000	6,2	283



order designation

MSIA	83P2P	32-N86			
				gear ratio	
				004	046
				007	150
				014	000 (without gear)
				gear variant	
			K0	without gear	
			P8	planetary gear	
				protection class	
			C	IP 54	
			E	IP 65	
				connection direction	
			A	axial	
			R	radial	

³⁾ S3 intermittent duty, cycle 1 min, power on duration 25%

⁴⁾ at operation factor = 1

ambient conditions

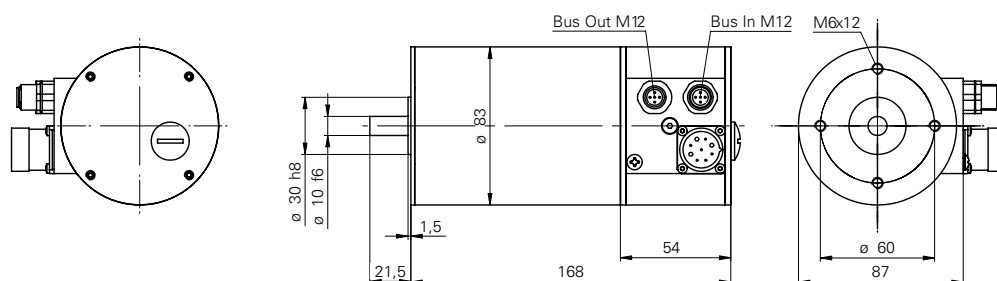
protection class	IP 65
ambient temperature	-15...+40 °C
overtemp. protection	yes
isolation class	B (+130 °C, DIN EN 60034-1)

Additional motor - gear combinations are available on request.

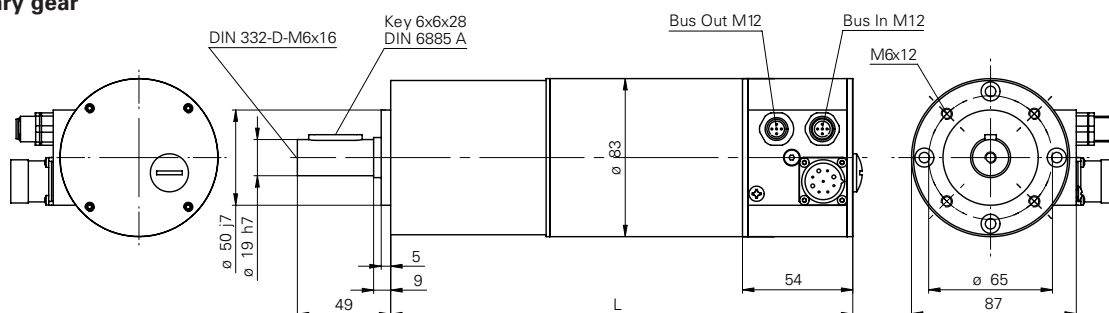
Profibus-DP

dimensions

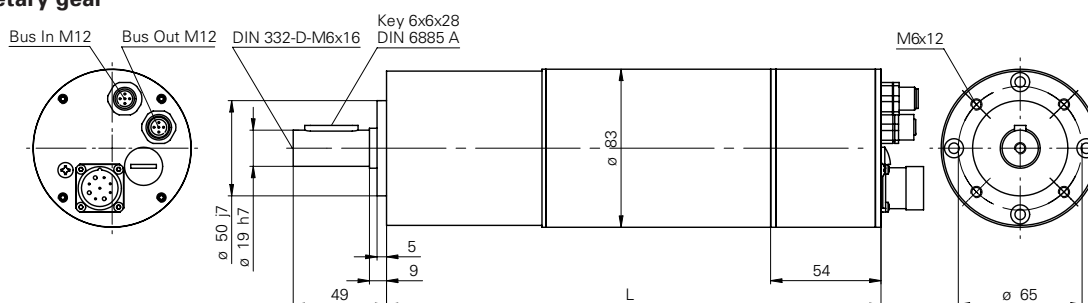
- R** connector radial
K without gear



- R** connector radial
P planetary gear



- A** connector axial
P planetary gear



hint

switches for bus address adjustment are located behind removable cover

assignment connector 9-pin D-Sub male

pin nr.	signal	description
1	Input 1	programmable input
2	Input 2	programmable input
3	Input 3	programmable input
4	PE	GND
5	Input 4	programmable input
6	0 VME	0 VDC voltage supply motor/electronics
7	Output	programmable output
8	+VsM	+24 VDC voltage supply motor
9	+VsM	+24 VDC voltage supply electronics

assignment connector 5-pin M12 male/female

pin nr.	signal	description
1	+VsDP	VP Profibus +5VDC
2	A line green	cable green / Profibus-DP
3	0 VDP	DGND Profibus
4	B line red	cable red / Profibus-DP
5	screen	housing

B-coded

accessoires

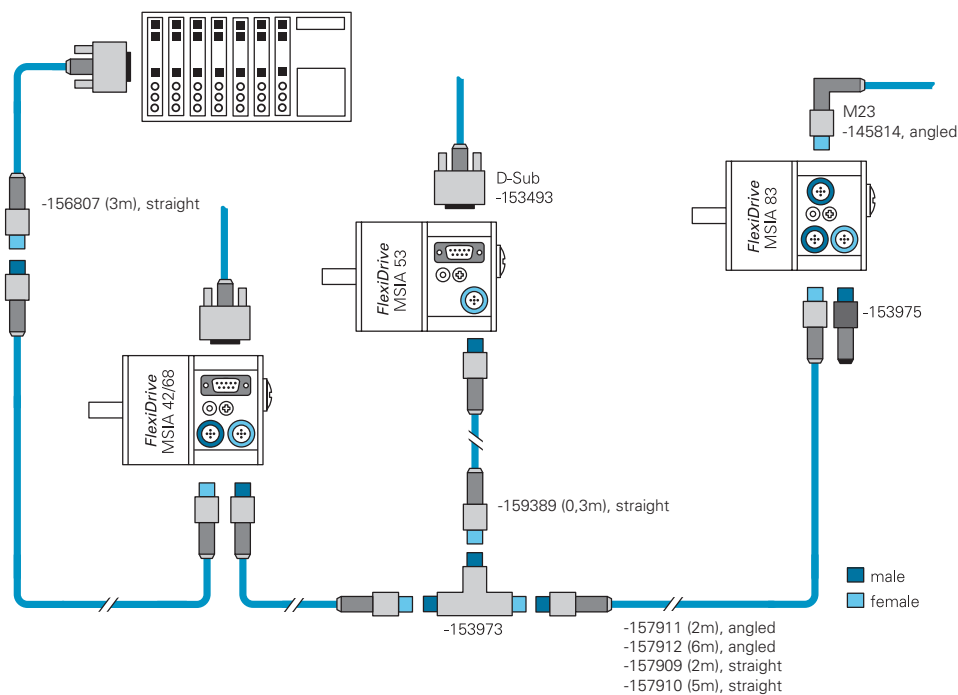
CD-ROM with GSD-/EDS-/XML-
files and manuals part nr. 147362
refer to fieldbus accessories, page 5.27

Fieldbus wiring of actuator and positioning drives

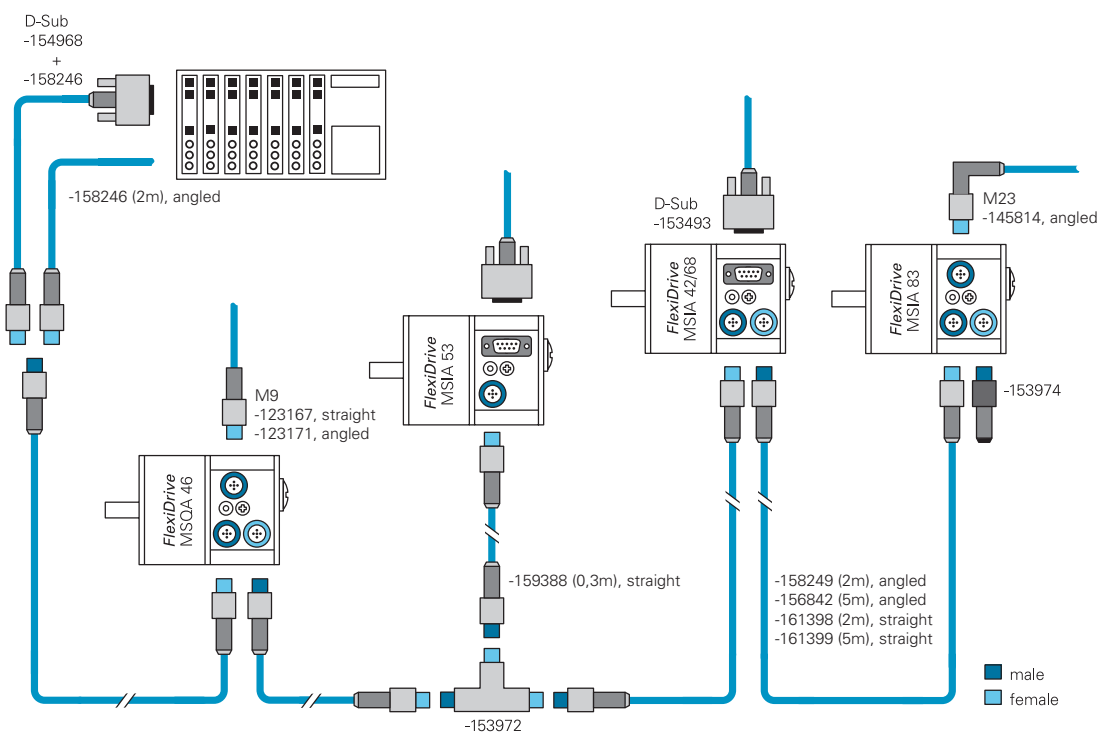
FlexiDrive

fieldbus wiring (valid only for MSIA and MSQA)

Profibus-DP, M12 B-coded



CANopen, M12 A-coded



Profibus-DP

premolded Profibus cable with M12 connector male/female (B-coded)		
M12 male/female angled 2 m	ESW 33A/KSW 33AP0200G/P	part nr. 157911
M12 male/female angled 6 m	ESW 33A/KSW 33AP0600G/P	part nr. 157912
M12 male/female straight 0,3 m (spur)	ESW 33A/KSW 33AP0030G/P	part nr. 159389
M12 male/female straight 2 m		part nr. 157909
M12 male/female straight 5 m		part nr. 157910
T-connector M12 Profibus (2 male/1 female)		part nr. 153973
terminator M12 Profibus		part nr. 153975
protection cap M12		part nr. 156808
USB-to-Profibus adaptor		part nr. 154326
adaptor cable D-Sub (male) to M12 (female) straight 3 m		part nr. 156807
CD-ROM with GSD-/EDS-/XML-files and manuals		part nr. 147362
connector M12 for self-fabricating of Profibus wires (B-coded)		
M12 female straight		part nr. 153970
M12 male straight		part nr. 153971
M12 female angled		part nr. 156585
M12 male angled		part nr. 156555

CANopen

premolded CANopen cable with M12 connector male/female (A-coded)		
M12 male/female angled 2 m	ESW 33A/KSW 33AP0200G/C	part nr. 158249
M12 male/female angled 5 m	ESW 33A/KSW 33AP0500G/C	part nr. 156842
M12 male/female straight 0,3 m (spur)	ESW 33A/KSW 33AP0030G/C	part nr. 159388
M12 male/female straight 2 m		part nr. 161398
M12 male/female straight 5 m		part nr. 161399
T-connector M12 CAN (1 male/2 female)		part nr. 153972
terminator M12 CAN		part nr. 153974
protection cap M12		part nr. 156808
USB-to-CAN adaptor		part nr. 147798
adaptor cable M12 (female) angled 2 m to open-end		part nr. 158246
CD-ROM with GSD-/EDS-/XML-files and manuals		part nr. 147362
connector M12 for self-fabricating of CANopen wires (A-coded)		
M12 female straight		part nr. 153968
M12 male straight		part nr. 153969
M12 female angled		part nr. 145021
M12 male angled		part nr. 156584
connector 9-pin D-Sub female angled (with terminator)		part nr. 154968
connector 9-pin D-Sub female angled (without terminator)		part nr. 145023

voltage supply

prefabricated cable with screened connector M9 (female) to open-end		
connector M9 straight, screened 5 m	ES 62CB5	part nr. 123167
connector M9 angled, screened 5 m	ES 61CB5	part nr. 123171
connectors for self-fabrication		
connector 5-pin M12 female angled		part nr. 145021
connector 9-pin D-Sub female straight		part nr. 153493
connector 9-pin M23 female angled		part nr. 145814

Interface

Multiturn

Profibus-D

Signalizer

torque

BUS

absol

Device

Appendix

Technical definitions of A to Z

Absolute single-turn encoder	Encoder which outputs a unique, coded item of information for each measuring step within a revolution. The information is retained even after a power failure.
Baud rate	Transmission frequency of serial interface in bits per second.
BCD (binary coded decimal) code	To avoid converting a decimal number into a binary number, instead of using natural binary code, often only the individual digits of the decimal number are encoded in binary.
Binary code	This code type is constructed similarly to the decimal system, but has only the digit values „0“ and „1“.
Clock+, clock-	Control lines of the SSI interface for synchronous data transmission. Clock+ and clock- together form a current loop, for potential-free reception of the clock frequency in SSI encoders.
Clock frequency (SSI)	For absolute encoders with synchronous serial interface (SSI), the clock frequency is the frequency of the clock signal during data transmission. The clock frequency is specified by the sequence electronics, and must be within the corresponding limits.
Code switching speed	Number of measuring steps per second for absolute multiturn encoders. For encoders with 13 bit resolution and 400 kHz code switching frequency, the maximum rotational speed is 3'000 rpm.
Connection cables	For shaft encoders, equipped with a connector base, the appropriate connector can be ordered as an accessory. For encoders with cable connection, the standard length of cable provided is 2 m respectively 1 m. The sheathing material for the incremental encoder is PUR. The wire size is 0,14 mm ² . The cable screen is connected to the housing respectively to the flange. The operating temperature range is -20 °C to +85 °C. Permissible bending radius at 20 °C: cable with a PUR sheath 12x cable ø
Couplings	The most suitable flexible coupling can be chosen from the data of a servo drive system. Resolution, acceleration and the desired positional precision must be considered. The lag angle can be judged from the torque stiffness. This torque might be considerable, if high dynamic drive systems are used. The inertia moment is specified on the product data pages.
Data valid	Diagnostic output for checking validity of output data.
Direction of rotation (F/R)	Forward/reverse counting direction input. The input is HIGH when disconnected. F/R HIGH means increasing output data when the shaft is rotating to the right (cw). F/R LOW means increasing output data when the shaft is rotating to the left (ccw), looking at the shaft in each case.

Drive operating modes

A definition of drive operating modes is necessary to guarantee, that drive temperature limits are not exceeded. The following operating modes exist according to EN 60034-1:

Continuous operation S1

An operation with constant load, whose duration is sufficient to reach the thermal steady conditions. This corresponds to the nominal operation. The abbreviation is S1.

Short time operation S2

An operation with constant load, whose duration is not sufficient to reach the thermal steady condition, with a following pause with a duration, where the lowered machine temperature deviates less than 2°C from ambient temperature. The abbreviation is S2, supplemented with data about operation time, e.g. S2 60 min.

Intermittent operation S3

An operation made up of a series of periodic duties, each of which consisting of a time with constant load and a pause. The starting current does not noticeably effect the temperature rise. The abbreviation is S3, supplemented with data about relative operation time, e.g. S3 25%.

Duty factor f_B

The duty factor f_B is used for drive dimensioning to optimum lifetime. It is important to note, that the useable torque T_{use} can be reduced with respect to the maximum torque T_{max} . This reduction depends on the operating mode and load type in the application and is calculated according to:

$$T_{use} = f_B * T_{max}$$

The duty factor f_B is based on experience data. Example: For operating mode „reversal“, load type „even“ operating time of 8 h/day and more than 10 reversals/h, the duty factor is $f_B = 0,63$.

operating mode	load type			operating time in h/day					
	even	pulsating	impulsive	3h	8h	24h	3h	8h	24h
				up to 10 cycles/h			more than 10 cycles/h		
one turn direction	■			1	1	0.83	1	0.83	0.66
direction change	■			1	0.77	0.63	0.83	0.63	0.52
one turn direction		■		0.9	0.77	0.63	0.77	0.66	0.55
direction change		■		0.71	0.58	0.5	0.63	0.53	0.43
one turn direction			■	0.83	0.66	0.55	0.66	0.55	0.45
direction change			■	0.63	0.5	0.43	0.5	0.43	0.35

Enable

Control input via which the data outputs of absolute encoders can be switched active.

Gear

A gear is necessary to

- reduce the speed to be used
- to increase the available torque.

Based on gear transmission ratio i and motor speed $n[\text{motor}]$, the gear speed $n[\text{gear}]$ can be calculated according to:

$$n[\text{gear}] = \frac{n[\text{motor}]}{i}$$

$n[\text{gear}]$ = output shaft of gear
 $n[\text{motor}]$ = motor speed
 i = gear ratio

Based on motor torque $M[\text{motor}]$ and gear efficiency η , the gear torque $M[\text{gear}]$ can be calculated according to:

$$M[\text{gear}] = M[\text{motor}] \times i \times \eta$$

$M[\text{gear}]$ = output shaft of gear
 $M[\text{motor}]$ = motor torque
 i = gear ratio
 η = gear coefficient

In order to calculate power from torque and speed, the following approximation can be used:

$$P[\text{W}] = \frac{M[\text{Nm}] \times n[\text{min}^{-1}]}{955}$$

Gear types

Planetary gears offer triple meshing and the highest torque at any given volume. Furthermore, they are characterized by a central output shaft and a high efficiency.

Spur gears have a high efficiency even with large transmission ratios and offer an excellent price-performance ratio.

Worm gears offer a continuous power transmission, 90° power deviation, self-locking, and an optional second shaft. The poor efficiency at high transmission ratios should be kept in mind.

Gray code

Gray code fulfils the conditions for a single-step code. This code is used in most absolute encoders. Symmetrically capped Gray code is a particular section of a full Gray code. In this way, any evenly divided step division is always obtained.

Hall sensor

Hall sensors employ a magnetically biased semiconductor Hall element to sense moving ferromagnetic objects.

Incremental encoder

Rotary encoder which outputs an electrical signal (HIGH/LOW) for every measuring step. Two signals phase-shifted by 90° and the zero signal are outputs. For zero point determination, it must first be referenced.

Interpolation

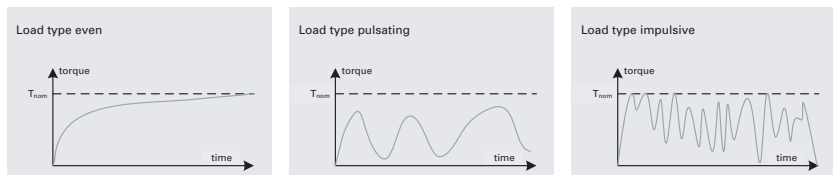
Using electronics and the laws of trigonometry, the basic period is subdivided into smaller units. 10 times the basic resolution is possible.

Load type

To determine duty factor f_B and useable gear torque T_{use} , the following load types exist:

- even
- pulsating
- impulsive

These load types are illustrated in Figure 1 to 3. „Running against stop“ is generally not permissible because very strong forces may occur which can destroy the gear.



Magnetic sensor

Magnetic sensors are magnetically controlled by a small rotor closely positioned in front of the active sensing face.

Maximum error limit

The maximum error limit is the maximum difference between measured and reference position over one 360-degree-rotation over the full operating temperature (range).

Measuring step

In the case of incremental encoders, the time between the positive edges of CHA and CHB is evaluated as measuring step. In this way, it is possible to achieve measuring step resolutions four times greater than the pulse rate used. This signal multiplication must be implemented by means of external sequence electronics.

Multi-turn encoder

Encoder which, as well as the singleturn signal, can uniquely sense and output revolutions. Here too, the information is retained even after a power failure, and continues to be sensed even during it.

Profibus-DP

Master-slave bus system with two-wire line. Linear bus with EIA RS 485 hardware interface. Standard Profibus DP protocol specified for encoders.

Protection class

Protection class is defined according to DIN VDE 0470 (EN 60529, IEC 529) standards. The protection class specified is valid for the installed encoder. There is a separate protection class for the housing and for the shaft. The protection class of the housing depends on the connector base and the type of connector used.

Pulse rate

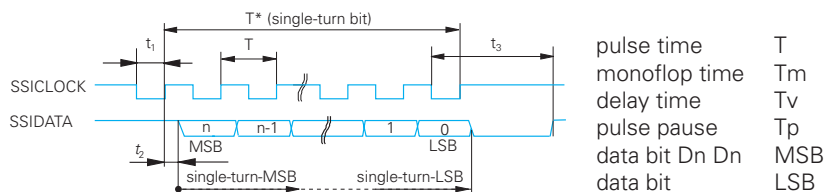
A number of light and dark segments are put onto a glass pulse disk. In the encoder, these segments are scanned by the light beam and thus determine the possible resolution.

Pulse tolerances

The tolerance of the pulse/period ratio is $\pm 10\%$. Values outside this range are specially marked on the product data pages. This tight tolerance is also valid between the two channels CHA and CHB, which are 90 degrees out of phase. Therefore the sense of rotation can be clearly defined and a quadrature of the signal can be attained.

Technical definitions of A to Z

Repeatability	The repeatability (according to DIN 32878) is defined as the maximum variance of measurement data of at least five deviation diagrams, taken sequentially with an identical rotational direction and at a fixed temperature.
Rpm	The maximum mechanical rpm is dependent on the bearing; an rpm of 12'000 should not be exceeded. The max. electrical rpm is defined by the max. frequency of the internal electronics and the user interface.
Resolution	For singleturn encoders, the resolution indicates the number of measuring steps per revolution. For multiturn encoders, it indicates the number of measuring steps per revolution and the number of revolutions.
Safety concept	The described products conform to EU rules and carry the CE mark. The safety concept defines the technical, training and legal actions which guarantee the user great safety in handling our sensors.
Scaling	Customer setting of the encoder resolution. The sensor calculates the desired customer resolution from the basic resolution and the scaling factor.
Set zero point	Control input to set a zero point at any point of the resolution range of an absolute encoder, without mechanical adjustment. In the case of programmable absolute encoders, an offset value can also be set using "set zero point".
Shaft loading	During operation encoders are exposed to various influences. Even if load and number of revolutions are known, other influences like temperature, humidity, vibration and greasing must be considered. The expected lifetime can only be predicted. Due to many influences and depending on the operational environment, the lifetime may fluctuate from less than 10⁶ revolutions under heavy load conditions to over 10⁹ revolutions under optimal conditions.
Shock and vibration	All encoders are tested according to the following standards. shock test IEC 60068-2-27 vibration test IEC 60068-2-6
SSI	The SSI (Synchronous Serial Interface) transfer the position value serially, i. e. bit by bit from the encoder to the controller. The transfer is carried out as follows:



In the idle state the data and pulse lines are at High level. The transfer begins with the first trailing edge. With each following rising edge, the data bits are output consecutively to the data line. The transfer begins with the MSB. If the number of pulses is higher than the number of data bits, only zeros are sent after the data bits.

After the end of the pulse sequence, the data lines are kept at Low during the monoflop time T_m . Twisted-pair data and pulse lines should be used for wiring. With line lengths exceeding 100 m, the data and pulse lines should have a minimum cross section of 0,25 mm² and the power supply line should be at least 0,5 mm².

The range for the pulse rate is a maximum of 1,5 MHz.

The maximum line length is dependent on the SSI pulse frequency and should be adapted as follows:

Line lengthSSI pulse frequency	
12,5 m	810 kHz
25 m	750 kHz
50 m	570 kHz
100 m	360 kHz
200 m	220 kHz
400 m	120 kHz
500 m	100 kHz

Store	Control input by which the data outputs of absolute encoders are stored for safe reading. It is recommended that the store input should be used above all for multi-step data codes.
Switching frequency	With the following formula the maximum rpm is calculated as a function of the number of pulses or steps P. The maximum rpm however must be lower than the allowable mechanical value. $f_{\max.} = \frac{\text{rpm} \times P}{60}$
Temperature range	The temperature range indicated under ambient conditions corresponds to the operating temperature range.
Torque	Because the encoder should not affect the load of the machine shaft, the torque is small. The torque depends on the size and the type of the bearing, grease, temperature, number of revolutions per minute and various other influences. The diagram on page 4.08 shows a typical overview of various encoder torques as a function of revolutions per minute. The torque decreases with lower rev/min, smaller shaft diameter and lower protection class.

Safety concept

CE-Information

International marks of conformity

Safety concept

The safety concept defines the technical, instructive and legal measures that will ensure a high degree of safety for the end user (system manufacturer, operator and user) when handling our components. This safety concept also serves as a basis for the CE marking of products and is available in German, French and English.

General

The size of many products of Baumer electric is too small for placing the mark on the product itself. Therefore the following markings are generally affixed to attachment sheets, installation manuals and packing.



CE Mark

The CE mark is not a quality-mark. First, it refers to the safety rather than to the quality of a product. Second, most quality markings are voluntary opposite to the CE marking, which is mandatory for the products it applies to. Through the CE marking for the respective product, the manufacturer confirms conformity with all the European Union (EU) Directives relating to this product. The CE marking must therefore be seen as proof of conformity with the Directives and has an official status, directed at the supervisor authorities in charge. For the different products Baumer electric is manufacturing, he is taking account the following pertinent EC Directives:

- Machine Directive (98/37/EEC)
- Low-voltage Directive (73/23/EEC)
- EMC Directive (89/336/EEC)
- Radio & Telecom Terminal Equipment Directive (99/5/EEC)

The declaration of conformity for the products is kept available to the issuer.



C-UL US Listing Mark

UL (Underwriters Laboratory Inc.) introduced this new Listing Mark in early 1998. According to UL it indicates compliance with both Canadian and U.S. requirements. The UL Listing Mark on a product is the manufacturer's representation that samples of that complete product have been tested by UL to nationally recognized Safety Standards and found to be free from reasonably foreseeable risk of fire, electric shock and related hazards and that the product was manufactured under UL's Follow-Up Services program. Most of the products of Baumer electric are UL listed. The file with the listed products can be looked into <http://www.ul.com/database>.



Recognized Component Mark for Canada and the United States

This UL Recognized Component Mark, which became effective also in early 1998, may be used on components certified by UL to both Canadian and U.S. requirements. The UL Recognized Component Mark means that the component alone meets the requirements for a limited, specified use and that the product also was manufactured under UL's Follow-Up Services program. Earlier products of Baumer electric were only UL recognized and are now generally certified as UL listed.

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