


Absolute and incremental wire draw encoders for measuring lengths up to 50 m

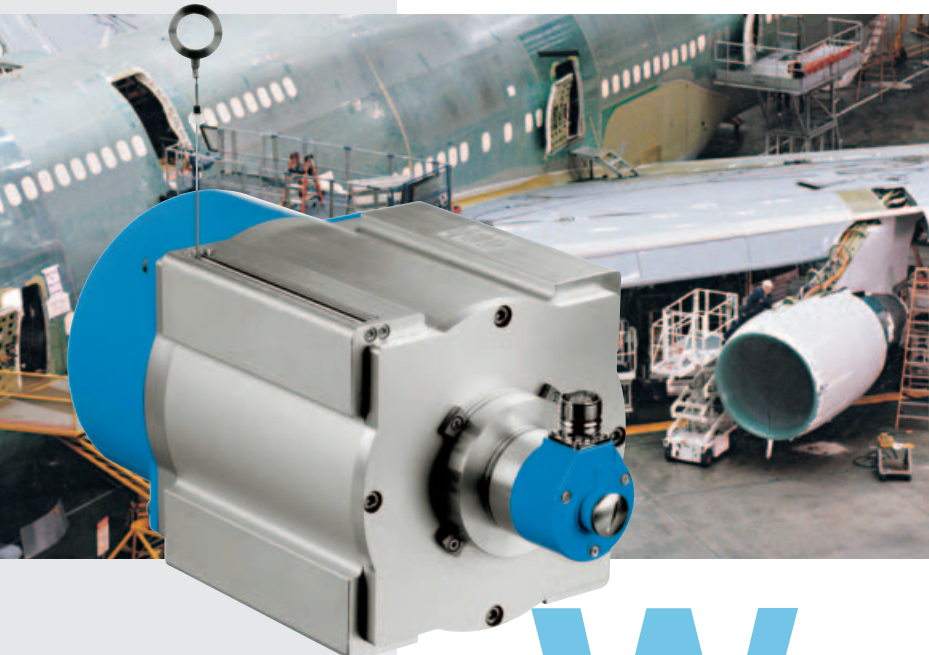
BTF/PRF:

	Resolution up to 0,025 mm
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Absolut Wire Draw Encoders

	Resolution up to 0,025 mm
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Incremental Wire Draw Encoders



The combination of the wire draw mechanism and absolute or incremental encoders manufactured by SICK-STEGMANN enables made-to-measure solutions for almost any application profile.

To comply with the exacting demands of automation technology, these wire draw encoders offer the correct interface for every application:

- SSI, Profibus, CANopen or Device-Net field bus technology for absolute encoders
- HTL or TTL interfaces for incremental encoders.

W

Wire draw encoders consist of wire draw mechanism and an encoder.

The rotation of the drum is proportional to the length being measured.

This movement is counted by an encoder and converted to a measuring signal. This provides high-resolution position or distance information for linear measurement paths, even under difficult ambient conditions.

Precise linear guidance, as required for other length measurement systems, is not necessary.

For example, this product can be utilised in many applications including:

- Crane, drilling and excavator systems
- Presses, punching and injection machines
- Weir systems and locks
- High-bay shelving and theatre stages
- Woodworking and stone processing machines
- Machinery construction, medical technology and many other industries.

BKS/PKS:

	Resolution up to 0,05 mm
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Absolut Wire Draw Encoders

	Resolution up to 0,05 mm
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Incremental Wire Draw Encoders





◀ Wire Draw Encoders assist construction cranes in positioning heavy loads safely.

▼ In fully and partially automated loading stations, Wire Draw Encoders precisely measure travel routes.

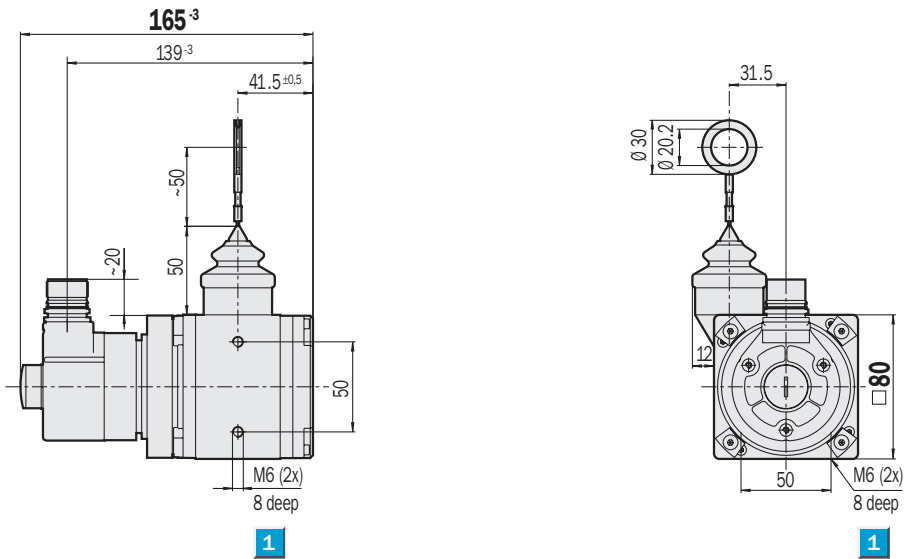


Resolution up to 0.025 mm

Absolute Wire Draw Encoders

- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel

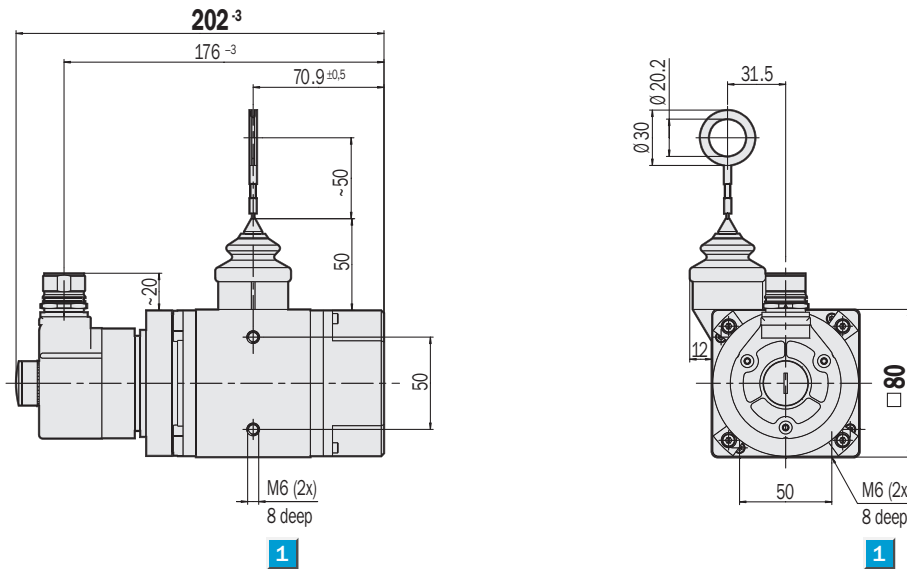
Dimensional drawing wire draw encoder BTF08 SSI, measuring length 2 m



1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

Dimensional drawing wire draw encoder BTF08 SSI, measuring length 3 m



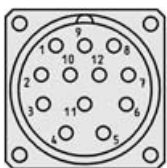
1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	GND	blue	Earth connection
2	Data +	white	Interface signals
3	Clock +	yellow	Interface signals
4	R x D +	grey	RS422 programming line
5	R x D -	green	RS422 programming line
6	T x D +	pink	RS422 programming line
7	T x D -	black	RS422 programming line
8	U _s	red	Supply voltage
9	SET	orange	Electronic adjustment
10	Data -	brown	Interface signals
11	Clock -	lilac	Interface signals
12	N. C.	orange/black	Not connected
	Screen		Housing potential

Caution! PINs labelled "N. C." must not be connected.



View of the connector M23 fitted to the encoder body

See chapter Accessories

Accessories for encoders

Technical data		BTF08	SSI 2m	SSI 3m									
Drum housing	Anodised Aluminium												
Spring housing	Die-cast zinc												
Measuring wire (stainless)	Highly flexible stranded steel, Ø 1.35 mm												
Measuring length	2 m max.												
	3 m max.												
Mass	1.8 kg approx.												
	2.0 kg approx.												
Code type	25 bit/Gray												
Code sequence	Increasing in direction of measurement												
Measuring step	0.025 mm												
Linearity	0.05 % typ.												
Repeatability	± 1 measuring step												
Operating speed	4 m/sec.												
Position forming time	0.15 ms												
Spring return force (typ.)													
start/finish ¹⁾	6 N/14 N												
Working temperature range	- 20 ... + 70 °C												
Storage temperature range	- 40 ... + 100 °C												
Life of wire draw mechanism ²⁾	1 million cycles												
EMC ³⁾													
Resistance													
to shocks ⁴⁾	100/6 g/ms												
to vibration ⁵⁾	20/10 ... 2,000 g/Hz												
Protection to IEC 60529	IP 64 (wire draw mechanism)												
	IP 67 (encoder)												
Operating voltage range (U_s)	10 ... 32 V												
Power consumption max.	0.8 W												
Initialisation time ⁶⁾	1,050 ms												
Interface signals													
Clock +, Clock -, Data +, Data - ⁷⁾	SSI max. clock frequency 1 MHz i.e. min. duration LOW level (Clock +): 500 ns												
T x D +, T x D -, R x D +, R x D -	RS422												
SET (electronic adjustment)	H-active (L ≙ 0 - 4.7 V; H ≙ 10 - U _s V)												

¹⁾ These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

²⁾ Average values, which depend on the loading. At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

³⁾ To DIN EN 61000-6-2 and DIN EN 61000-6-3

⁴⁾ To DIN EN 60068-2-27

⁵⁾ To DIN EN 60068-2-6

⁶⁾ From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.

⁷⁾ For higher clock frequencies, choose synchronous SSI.

Order information

BTF08; U_s 10 ... 32 V; connector M23, 12 pin

25 bit SSI, Gray-Code, Set = 1,000

Type	Part no.	Description
BTF08-A1AM0240	1034299	SSI, measuring length 2 m
BTF08-A1AM0340	1034892	SSI, measuring length 3 m

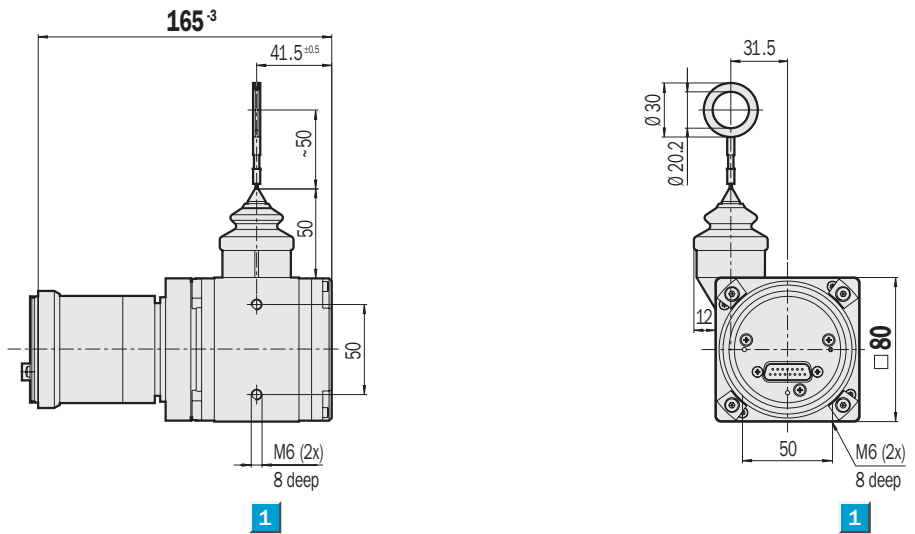
Resolution up to 0.025 mm

Absolute Wire Draw Encoders

- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel



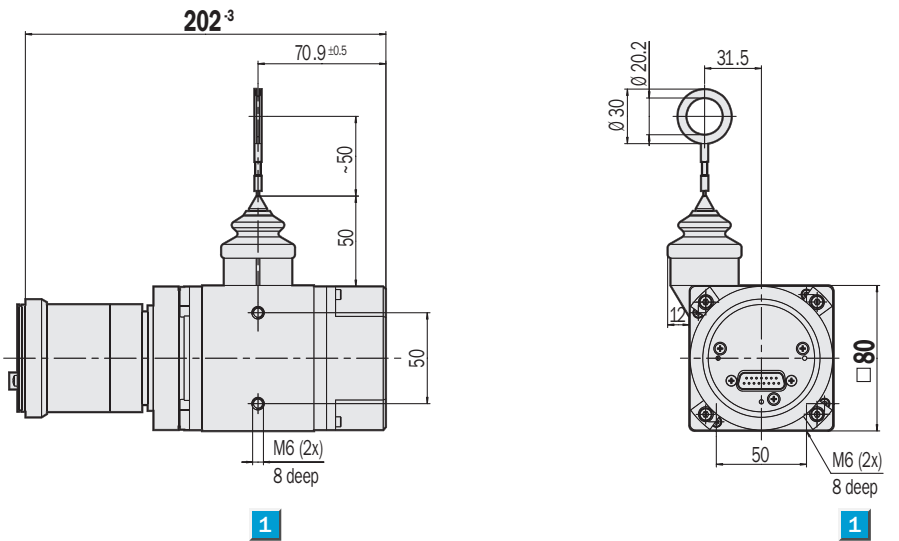
Dimensional drawing wire draw encoder BTF08 Profibus, CANopen, DeviceNet, measuring length 2 m



1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

Dimensional drawing wire draw encoder BTF08 Profibus, CANopen, DeviceNet, measuring length 3 m



1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

See chapter Accessories
Accessories for encoders

Profibus adaptor with PIN and wire allocation see pages 140 / 141
CANopen adaptor with PIN and wire allocation see pages 142 / 143
DeviceNet adaptor with PIN and wire allocation see pages 144 to 146

Technical data		BTF08	PB 2m	CO 2m	DN 2m	PB 3m	CO 3m	DN 3m			
Drum housing	Anodised Aluminium										
Spring housing	Die-cast zinc										
Measuring wire (stainless)	Highly flexible stranded steel, Ø 1.35 mm										
Measuring length	2 m max.										
	3 m max.										
Mass	1.9 kg approx.										
	2.1 kg approx.										
Measuring step (recommended)	0.025 mm 1										
Linearity	0.05 % typ.										
Repeatability	± 1 measuring step										
Operating speed	4 m/sec.										
Position forming time	0.25 ms										
Spring return force (typ.)											
start/finish ¹⁾	6 N/14 N										
Working temperature range	- 20 ... + 70 °C										
Storage temperature range	- 40 ... + 100 °C										
Life of wire draw mechanism ²⁾	1 million cycles										
EMC ³⁾											
Resistance											
to shocks ⁴⁾	100/6 g/ms										
to Vibration ⁵⁾	20/10 ... 2,000 g/Hz										
Protection to IEC 60529	IP 64 (wire draw mechanism)										
	IP 67 (encoder)										
Operating voltage range (U_s)	10 ... 32 V										
Power consumption max.	2.0 W										
Initialisation time ⁶⁾	1,250 ms										
Bus interface											
Electronic adjustment (Number SET)	Via PRESET switch or protocol										
Bus termination ⁷⁾	Via DIP switch										
Electrical connection	Connection adaptor										
Electrical interface ⁸⁾	RS485										
Electrical interface ⁹⁾	ISO-DIS 11898										
Protocol	Profile for encoders (07 _{hex}) – Class 2										
	Communication Profile DS 301 V4.0										
	Device Profile DSP 406 V2.0										
	DeviceNet Specification, Release 2.0										
Address setting (node no.)	0 ... 127 (DIP switch or protocol)										
Address setting (Node ID)	0 ... 63 (DIP switch or protocol)										
Data transmission rate (Baud rate) ¹⁰⁾	9.6 kBaud ... 12 MBaud										
(DIP switch or protocol)	(10, 20, 50, 125, 250, 500) kB, 1 MB										
(DIP switch or protocol)	(125, 250, 500) kB										
Status information	Running (LED green), bus activity (LED red)										
	2-coloured LED for CAN Controller Status										
	Network status LED (NS), 2-coloured										

¹⁾ These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

²⁾ Average values, which depend on the loading.
At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

³⁾ To DIN EN 61000-6-2 and DIN EN 61000-6-3

⁴⁾ To DIN EN 60068-2-27

⁵⁾ To DIN EN 60068-2-6

⁶⁾ From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.

⁷⁾ Connection for terminal device only

⁸⁾ To EN 50 170-2 (DIN 19245 parts 1-3), galvanically separated using an opto-coupler


⁹⁾ (CAN High Speed) and CAN specification 2.0 B, galvanically separated

¹⁰⁾ Automatic detection

1 When the customer configures the encoder to 8,000 steps x 16 revolutions, via the Bus Master. (Factory entry in GSD or EDS file: 8,192 steps x 8,192 revolutions).

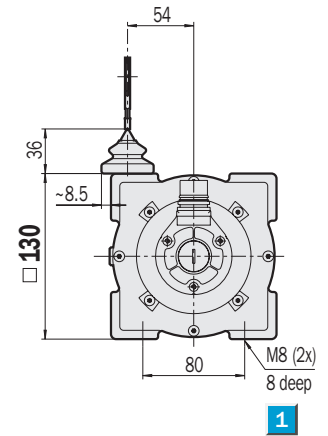
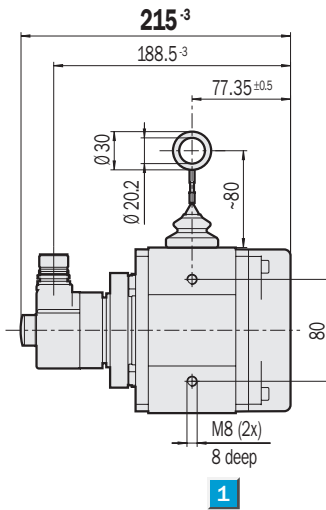
Order information		
BTF08; U _s 10 ... 32 V; field buses		
Type	Part no.	Description
BTF08-P1HM0241	1034305	Profibus, measuring length 2 m
BTF08-D1HM0241	1034311	DeviceNet, measuring length 2 m
BTF08-C1HM0241	1034317	CANopen, measuring length 2 m
BTF08-P1HM0341	1034893	Profibus, measuring length 3 m
BTF08-D1HM0341	1034894	DeviceNet, measuring length 3 m
BTF08-C1HM0341	1034895	CANopen, measuring length 3 m

Please note: connection adaptor must be ordered separately (see pages 140 to 146)

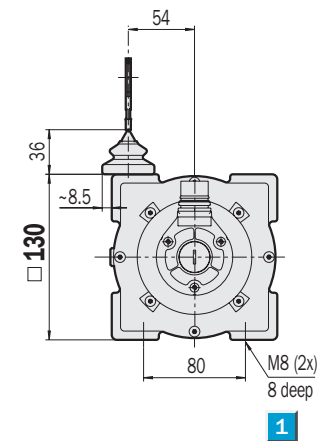
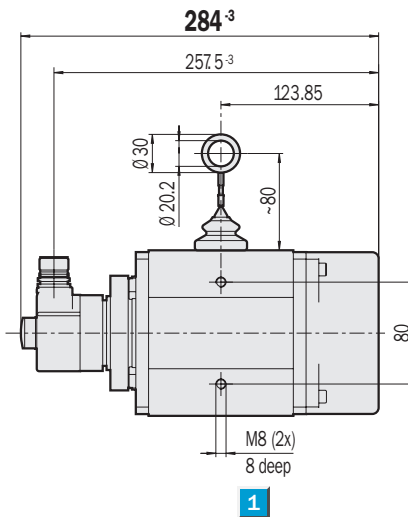
 **Resolution up to 0.025 mm**
Absolute Wire Draw Encoders

- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel

Dimensional drawing wire draw encoder BTF13 SSI, measuring length 5 m



Dimensional drawing wire draw encoder BTF13 SSI, measuring length 10 m



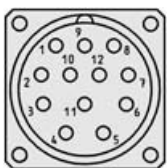
1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	GND	blue	Earth connection
2	Data +	white	Interface signals
3	Clock +	yellow	Interface signals
4	R x D +	grey	RS422 programming line
5	R x D -	green	RS422 programming line
6	T x D +	pink	RS422 programming line
7	T x D -	black	RS422 programming line
8	U _s	red	Supply voltage
9	SET	orange	Electronic adjustment
10	Data -	brown	Interface signals
11	Clock -	lilac	Interface signals
12	N. C.	orange/black	Not connected
	Screen		Housing potential

Caution! PINs labelled "N. C." must not be connected.



View of the connector M23 fitted to the encoder body

See chapter Accessories

Accessories for encoders

Technical data		BTF13	SSI 5m	SSI 10m									
Drum housing	Anodised Aluminium												
Spring housing	Plastic												
Measuring wire (stainless)	Highly flexible stranded steel, Ø 1.35 mm												
Measuring length	5 m max.												
	10 m max.												
Mass	3.3 kg approx.												
	4.0 kg approx.												
Code type	25 bit/Gray												
Code sequence	Increasing in direction of measurement												
Measuring step	0.05 mm												
Linearity	0.05 % typ.												
Repeatability	± 1 measuring step												
Operating speed	4 m/sec.												
Position forming time	0.15 ms												
Spring return force (typ.)													
start/finish ¹⁾	15 N/20 N												
start/finish ¹⁾	10 N/20 N												
Working temperature range	- 20 ... + 70 °C												
Storage temperature range	- 40 ... + 100 °C												
Life of wire draw mechanism ²⁾	1 million cycles												
EMC ³⁾													
Resistance													
to shocks ⁴⁾	100/6 g/ms												
to vibration ⁵⁾	20/10 ... 2,000 g/Hz												
Protection to IEC 60529	IP 64 (wire draw mechanism)												
	IP 67 (encoder)												
Operating voltage range (U_s)	10 ... 32 V												
Power consumption max.	0.8 W												
Initialisation time ⁶⁾	1,050 ms												
Interface signals													
Clock +, Clock -, Data +, Data - ⁷⁾	SSI max. clock frequency 1 MHz i.e. min. duration LOW level (Clock +): 500 ns												
T x D +, T x D -, R x D +, R x D -	RS422												
SET (electronic adjustment)	H-active (L ≙ 0 - 4.7 V; H ≙ 10 - U _s V)												

¹⁾ These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

²⁾ Average values, which depend on the loading. At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

³⁾ To DIN EN 61000-6-2 and DIN EN 61000-6-3

⁴⁾ To DIN EN 60068-2-27

⁵⁾ To DIN EN 60068-2-6

⁶⁾ From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.


⁷⁾ For higher clock frequencies, choose synchronous SSI.

Order information

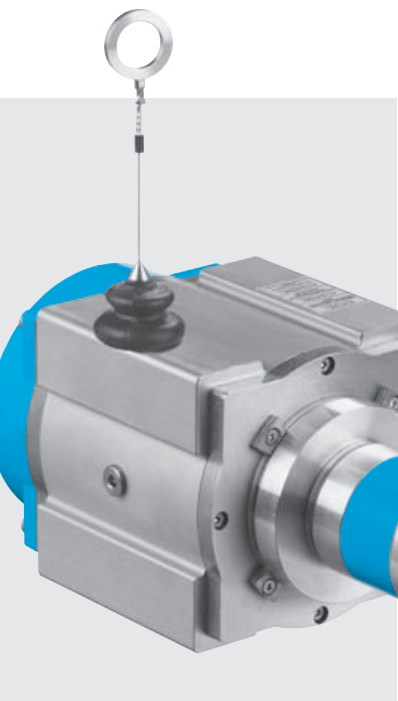
BTF13; U_s 10 ... 32 V; connector M23, 12 pin

25 bit SSI; Gray-Code, Set = 1,000

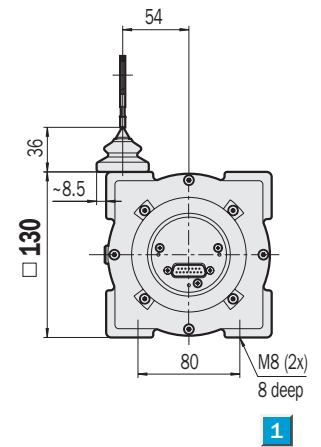
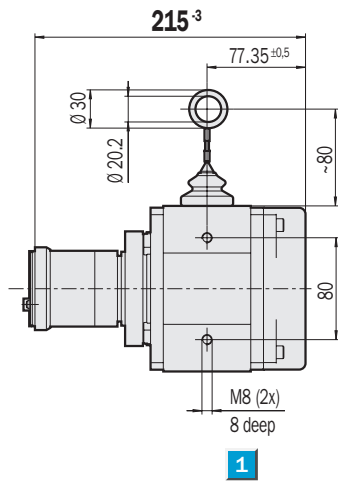
Type	Part no.	Description
BTF13-A1AM0520	1034300	SSI, measuring length 5 m
BTF13-A1AM1020	1034301	SSI, measuring length 10 m

 **Resolution up to 0.025 mm**
Absolute Wire Draw Encoders

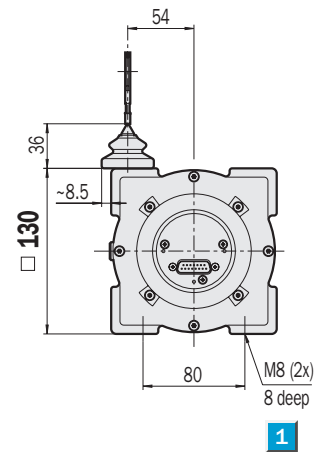
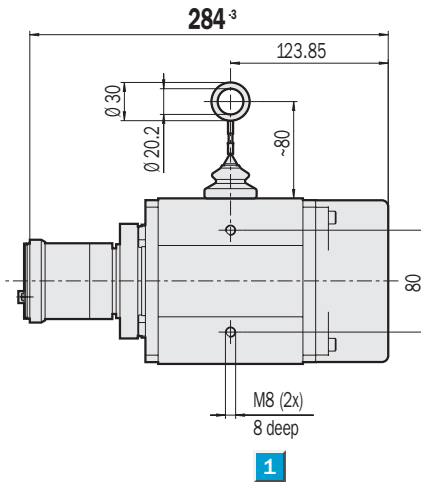
- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel



Dimensional drawing wire draw encoder BTF13 Profibus, CANopen, DeviceNet, measuring length 5 m



Dimensional drawing wire draw encoder BTF13 Profibus, CANopen, DeviceNet, measuring length 10 m



1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

See chapter Accessories

Accessories for encoders

Profibus adaptor with PIN and wire allocation see pages 140 / 141

CANopen adaptor with PIN and wire allocation see pages 142 / 143

DeviceNet adaptor with PIN and wire allocation see pages 144 to 146

Technical data		BTF13	PB 5m	CO 5m	DN 5m	PB 10m	CO 10m	DN 10m				
Drum housing	Anodised Aluminium											
Spring housing	Plastic											
Measuring wire (stainless)	Highly flexible stranded steel, Ø 1.35 mm											
Measuring length	5 m max.											
	10 m max.											
Mass	3.4 kg approx.											
	4.1 kg approx.											
Measuring step (recommended)	0.05 mm ¹											
Linearity	0.05 % typ.											
Repeatability	± 1 measuring step											
Operating speed	4 m/sec.											
Position forming time	0.25 ms											
Spring return force (typ.)												
start/finish ¹⁾	15 N/20 N											
start/finish ¹⁾	10 N/20 N											
Working temperature range	- 20 ... + 70 °C											
Storage temperature range	- 40 ... + 100 °C											
Life of wire draw mechanism ²⁾	1 million cycles											
EMC ³⁾												
Resistance												
to shocks ⁴⁾	100/6 g/ms											
to vibration ⁵⁾	20/10 ... 2,000 g/Hz											
Protection to IEC 60529	IP 64 (wire draw mechanism)											
	IP 67 (encoder)											
Operating voltage range (U_s)	10 ... 32 V											
Power consumption max.	2.0 W											
Initialisation time ⁶⁾	1,250 ms											
Bus interface												
Electronic adjustment (Number SET)	Via PRESET switch or protocol											
Bus termination ⁷⁾	Via DIP switch											
Electrical connection	Connection adaptor											
Electrical interface ⁸⁾	RS485											
Electrical interface ⁹⁾	ISO-DIS 11898											
Protocol	Profile for encoders (07 _{hex}) – Class 2											
	Communication Profile DS 301 V4.0											
	Device Profile DSP 406 V2.0											
	DeviceNet Specification, Release 2.0											
Address setting (node no.)	0 ... 127 (DIP switch or protocol)											
Address setting (Node ID)	0 ... 63 (DIP switch or protocol)											
Data transmission rate (Baud rate) ¹⁰⁾	9.6 kBaud ... 12 MBaud											
(DIP switch or protocol)	(10, 20, 50, 125, 250, 500) kB, 1 MB											
(DIP switch or protocol)	(125, 250, 500) kB											
Status information	Running (LED green), bus activity (LED red)											
	2-coloured LED for CAN Controller Status											
	Network status LED (NS), 2-coloured											

¹⁾ These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

²⁾ Average values, which depend on the loading. At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

³⁾ To DIN EN 61000-6-2 and DIN EN 61000-6-3

⁴⁾ To DIN EN 60068-2-27

⁵⁾ To DIN EN 60068-2-6

⁶⁾ From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.

⁷⁾ Connection for terminal device only

⁸⁾ To EN 50 170-2 (DIN 19245 parts 1-3), galvanically separated using an opto-coupler


⁹⁾ (CAN High Speed) and CAN specification 2.0 B, galvanically separated

¹⁰⁾ Automatic detection

¹ When the customer configures the encoder to 6,680 steps x 32 revolutions, via the Bus Master. (Factory entry in GSD or EDS file: 8,192 steps x 8,192 revolutions).

Order information		
BTF13; U _s 10 ... 32 V; field buses		
Type	Part no.	Description
BTF13-P1HM0525	1 034 306	Profibus, measuring length 5 m
BTF13-D1HM0525	1 034 312	DeviceNet, measuring length 5 m
BTF13-C1HM0525	1 034 318	CANopen, measuring length 5 m
BTF13-P1HM1025	1 034 307	Profibus, measuring length 10 m
BTF13-D1HM1025	1 034 313	DeviceNet, measuring length 10 m
BTF13-C1HM1025	1 034 319	CANopen, measuring length 10 m

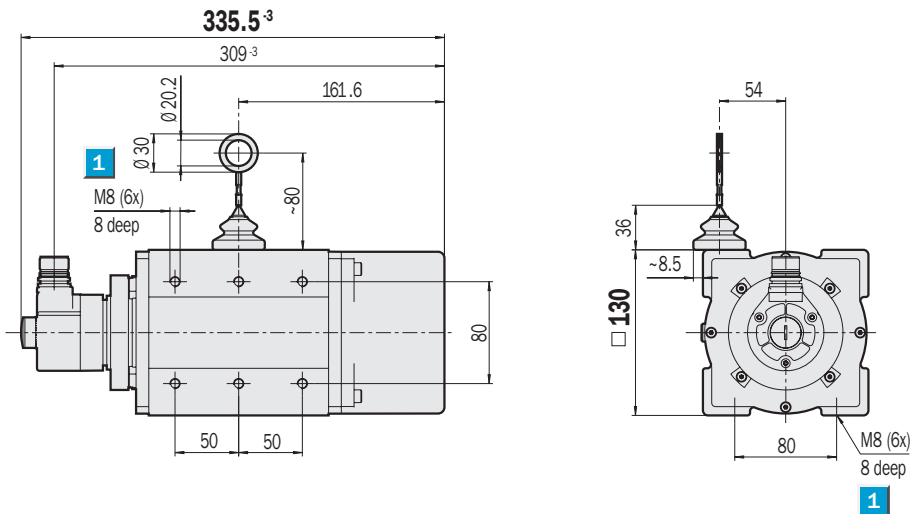
Please note: connection adaptor must be ordered separately (see pages 140 to 146)

 **Resolution up to 0.025 mm**
Absolute Wire Draw Encoders

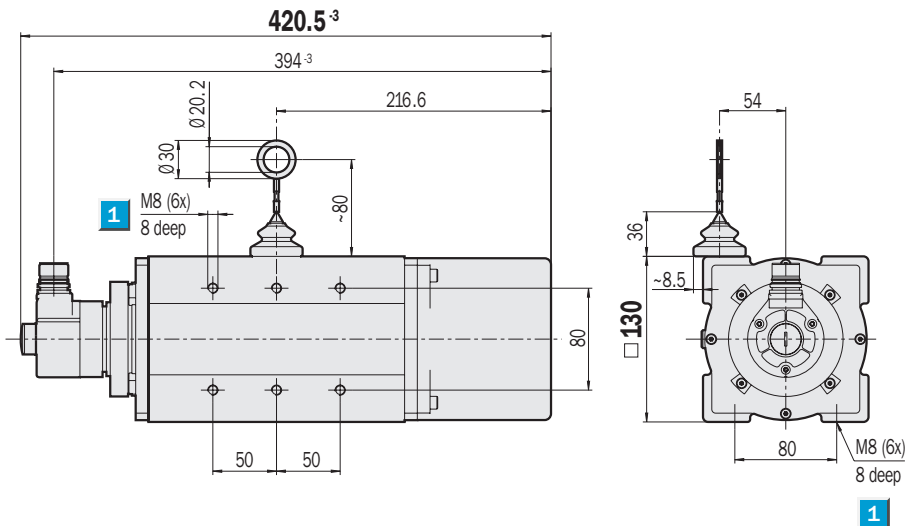
- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel



Dimensional drawing wire draw encoder BTF13 SSI, measuring length 20 m



Dimensional drawing wire draw encoder BTF13 SSI, measuring length 30 m



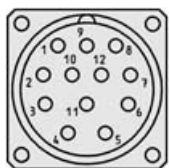
1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	GND	blue	Earth connection
2	Data +	white	Interface signals
3	Clock +	yellow	Interface signals
4	R x D +	grey	RS422 programming line
5	R x D -	green	RS422 programming line
6	T x D +	pink	RS422 programming line
7	T x D -	black	RS422 programming line
8	U _s	red	Supply voltage
9	SET	orange	Electronic adjustment
10	Data -	brown	Interface signals
11	Clock -	lilac	Interface signals
12	N. C.	orange/black	Not connected
	Screen		Housing potential

Caution! PINs labelled "N. C." must not be connected.



View of the connector M23 fitted to the encoder body

See chapter Accessories

Accessories for encoders

Technical data		BTF13	SSI 20m	SSI 30m									
Drum housing	Anodised Aluminium												
Spring housing	Plastic												
Measuring wire (stainless)	Highly flexible stranded steel, Ø 0.81 mm												
Measuring length	20 m max.												
	30 m max.												
Mass	5.3 kg approx.												
	6.5 kg approx.												
Code type	25 bit/Gray												
Code sequence	Increasing in direction of measurement												
Measuring step	0.05 mm												
Linearity	0.05 % typ.												
Repeatability	± 1 measuring step												
Operating speed	4 m/sec.												
Position forming time	0.15 ms												
Spring return force (typ.)													
start/finish ¹⁾	10 N/20 N												
Working temperature range	- 20 ... + 70 °C												
Storage temperature range	- 40 ... + 100 °C												
Life of wire draw mechanism ²⁾	1 million cycles												
EMC ³⁾													
Resistance													
to shocks ⁴⁾	100/6 g/ms												
to vibration ⁵⁾	20/10 ... 2,000 g/Hz												
Protection to IEC 60529	IP 64 (wire draw mechanism)												
	IP 67 (encoder)												
Operating voltage range (U_s)	10 ... 32 V												
Power consumption max.	0.8 W												
Initialisation time ⁶⁾	1,050 ms												
Interface signals													
Clock +, Clock -, Data +, Data - ⁷⁾	SSI max. clock frequency 1 MHz i.e. min. duration LOW level (Clock +): 500 ns												
T x D +, T x D -, R x D +, R x D -	RS422												
SET (electronic adjustment)	H-active (L ≙ 0 - 4.7 V; H ≙ 10 - U _s V)												

¹⁾ These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

²⁾ Average values, which depend on the loading. At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

³⁾ To DIN EN 61000-6-2 and DIN EN 61000-6-3


⁴⁾ To DIN EN 60068-2-27

⁵⁾ To DIN EN 60068-2-6

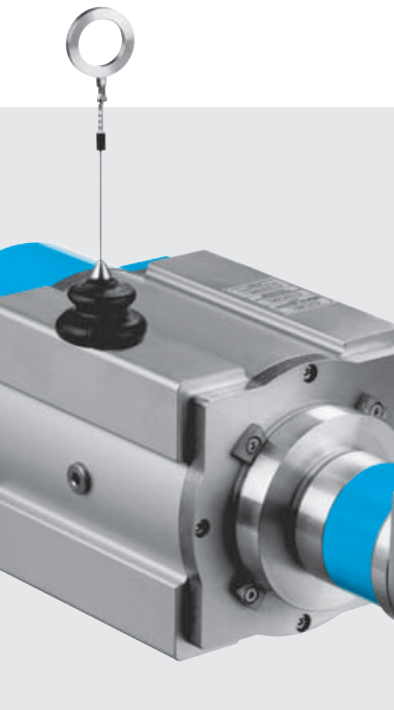
⁶⁾ From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.

⁷⁾ For higher clock frequencies, choose synchronous SSI.

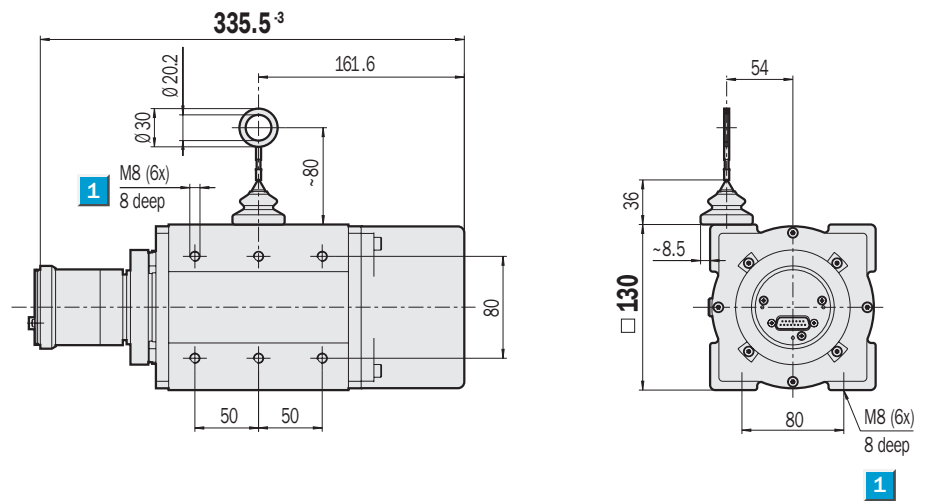
Order information		
BTF13; U _s 10 ... 32 V; connector M23, 12 pin		
25 bit SSI; Gray-Code, Set = 1,000		
Type	Part no.	Description
BTF13-A1AM2020	1034302	SSI, measuring length 20 m
BTF13-A1AM3020	1034303	SSI, measuring length 30 m

 **Resolution up to 0.025 mm**
Absolute Wire Draw Encoders

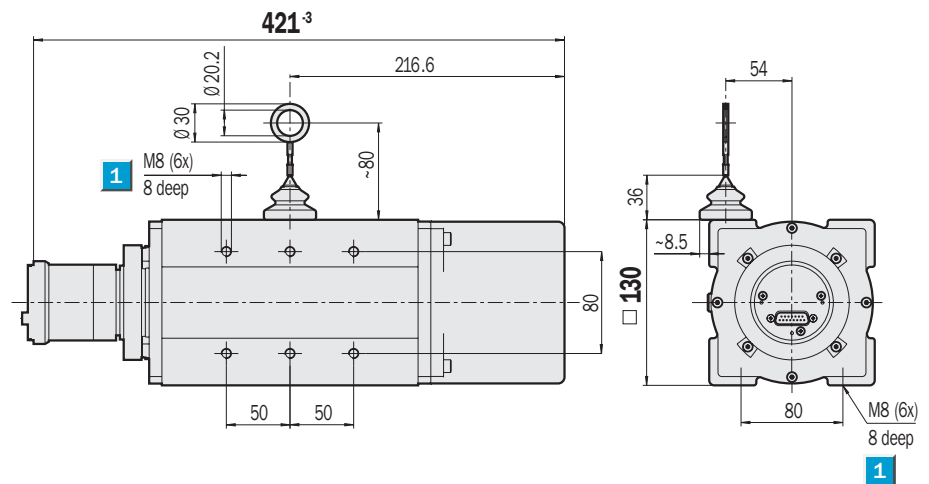
- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel



Dimensional drawing wire draw encoder BTF13 Profibus, CANopen, DeviceNet, measuring length 20 m



Dimensional drawing wire draw encoder BTF13 Profibus, CANopen, DeviceNet, measuring length 30 m



1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk



See chapter Accessories

Accessories for encoders

Profibus adaptor with PIN and wire allocation see pages 140 / 141

CANopen adaptor with PIN and wire allocation see pages 142 / 143

DeviceNet adaptor with PIN and wire allocation see pages 144 to 146

Technical data		BTF13	PB 20m	CO 20m	DN 20m	PB 30m	CO 30m	DN 30m				
Drum housing	Anodised Aluminium											
Spring housing	Plastic											
Measuring wire (stainless)	Highly flexible stranded steel, Ø 0.81 mm											
Measuring length	20 m max.											
	30 m max.											
Mass	5.4 kg approx.											
	6.6 kg approx.											
Measuring step (recommended)	0.05 mm 1											
Linearity	0.05 % typ.											
Repeatability	± 1 measuring step											
Operating speed	4 m/sec.											
Position forming time	0.25 ms											
Spring return force (typ.)												
start/finish ¹⁾	10 N/20 N											
Working temperature range	- 20 ... + 70 °C											
Storage temperature range	- 40 ... + 100 °C											
Life of wire draw mechanism ²⁾	1 million cycles											
EMC ³⁾												
Resistance												
to shocks ⁴⁾	100/6 g/ms											
to vibration ⁵⁾	20/10 ... 2,000 g/Hz											
Protection to IEC 60529	IP 64 (wire draw mechanism)											
	IP 67 (encoder)											
Operating voltage range (U_s)	10 ... 32 V											
Power consumption max.	2.0 W											
Initialisation time ⁶⁾	1,250 ms											
Bus interface												
Electronic adjustment (Number SET)	Via PRESET switch or protocol											
Bus termination ⁷⁾	Via DIP switch											
Electrical connection	Connection adaptor											
Electrical interface ⁸⁾	RS485											
Electrical interface ⁹⁾	ISO-DIS 11898											
Protocol	Profile for encoders (07 _{hex}) – Class 2											
	Communication Profile DS 301 V4.0											
	Device Profile DSP 406 V2.0											
	DeviceNet Specification, Release 2.0											
Address setting (node no.)	0 ... 127 (DIP switch or protocol)											
Address setting (Node ID)	0 ... 63 (DIP switch or protocol)											
Data transmission rate (Baud rate) ¹⁰⁾	9.6 kBaud ... 12 MBaud											
(DIP switch or protocol)	(10, 20, 50, 125, 250, 500) kB, 1 MB											
(DIP switch or protocol)	(125, 250, 500) kB											
Status information	Running (LED green), bus activity (LED red)											
	2-coloured LED for CAN Controller Status											
	Network status LED (NS), 2-coloured											

¹⁾ These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

²⁾ Average values, which depend on the loading. At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

³⁾ To DIN EN 61000-6-2 and DIN EN 61000-6-3

⁴⁾ To DIN EN 60068-2-27

⁵⁾ To DIN EN 60068-2-6

⁶⁾ From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.

⁷⁾ Connection for terminal device only

⁸⁾ To EN 50 170-2 (DIN 19245 parts 1-3), galvanically separated using an opto-coupler

⁹⁾ (CAN High Speed) and CAN specification 2.0 B, galvanically separated

¹⁰⁾ Automatic detection

1 When the customer configures the encoder to 6,646 steps x 128 revolutions, via the Bus Master. (Factory entry in GSD or EDS file: 8,192 steps x 8,192 revolutions).

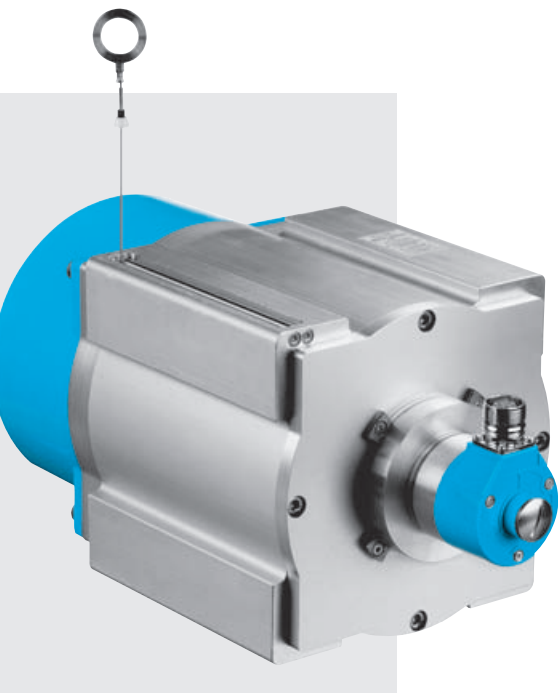
Order information		
BTF13; U _s 10 ... 32 V; field buses		
Type	Part no.	Description
BTF13-P1HM2025	1034308	Profibus, measuring length 20 m
BTF13-D1HM2025	1034314	DeviceNet, measuring length 20 m
BTF13-C1HM2025	1034320	CANopen, measuring length 20 m
BTF13-P1HM3025	1034309	Profibus, measuring length 30 m
BTF13-D1HM3025	1034315	DeviceNet, measuring length 30 m
BTF13-C1HM3025	1034321	CANopen, measuring length 30 m

Please note: connection adaptor must be ordered separately (see pages 140 to 146)

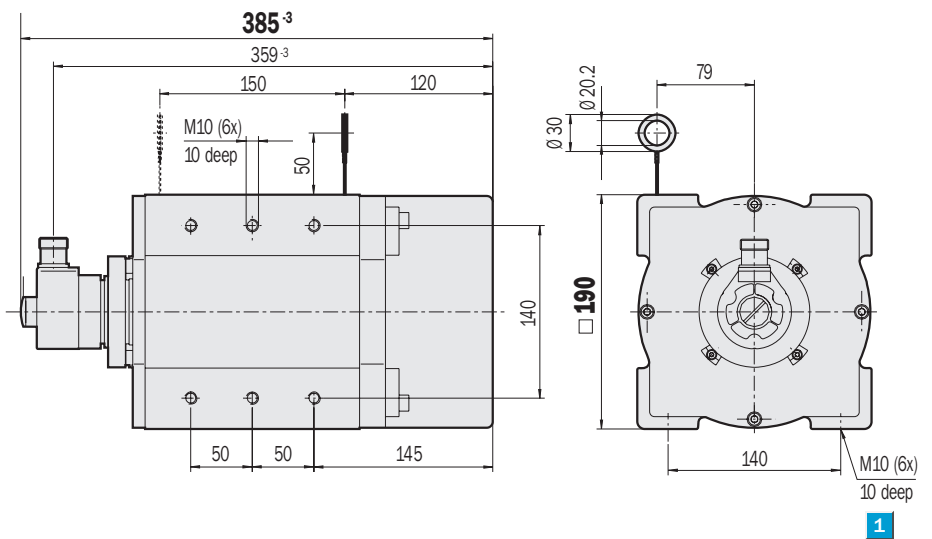
Resolution up to 0.025 mm

Absolute Wire Draw Encoders

- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire

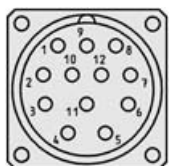


Dimensional drawing wire draw encoder BTF19 SSI, measuring length 50 m



1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk



View of the connector M23 fitted to the encoder body

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	GND	blue	Earth connection
2	Data +	white	Interface signals
3	Clock +	yellow	Interface signals
4	R x D +	grey	RS422 programming line
5	R x D -	green	RS422 programming line
6	T x D +	pink	RS422 programming line
7	T x D -	black	RS422 programming line
8	U _s	red	Supply voltage
9	SET	orange	Electronic adjustment
10	Data -	brown	Interface signals
11	Clock -	lilac	Interface signals
12	N. C.	orange/black	Not connected
	Screen		Housing potential

Caution! PINs labelled "N. C." must not be connected.

See chapter Accessories

Accessories for encoders

Technical data		BTF19	SSI										
			50 m										
Drum housing	Anodised Aluminium												
Spring housing	Die-cast zinc												
Measuring wire (stainless)	Highly flexible stranded steel, Ø 1.35 mm												
Measuring length	50 m max.												
Mass	16.8 kg approx.												
Code type	25 bit/Gray												
Code sequence	Increasing in direction of measurement												
Measuring step	0.1 mm												
Linearity	0.05 % typ.												
Repeatability	± 1 measuring step												
Operating speed	4 m/sec.												
Position forming time	0.15 ms												
Spring return force (typ.)													
start/finish ¹⁾	18 N/37 N												
Working temperature range	- 20 ... + 70 °C												
Storage temperature range	- 40 ... + 100 °C												
Life of wire draw mechanism ²⁾	1 million cycles												
EMC ³⁾													
Resistance													
to shocks ⁴⁾	100/6 g/ms												
to vibration ⁵⁾	20/10 ... 2,000 g/Hz												
Protection to IEC 60529													
	IP 31 (wire draw mechanism)												
	IP 67 (encoder)												
Operating voltage range (U_s)	10 ... 32 V												
Power consumption max.	0.8 W												
Initialisation time ⁶⁾	1,050 ms												
Interface signals													
Clock +, Clock -, Data +, Data - ⁷⁾	SSI max. clock frequency 1 MHz i.e. min. duration LOW level (Clock +): 500 ns												
T x D +, T x D -, R x D +, R x D -	RS422												
SET (electronic adjustment)	H-active (L ≙ 0 - 4.7 V; H ≙ 10 - U _s V)												

¹⁾ These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

²⁾ Average values, which depend on the loading. At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

³⁾ To DIN EN 61000-6-2 and DIN EN 61000-6-3

⁴⁾ To DIN EN 60068-2-27

⁵⁾ To DIN EN 60068-2-6

⁶⁾ From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.

⁷⁾ For higher clock frequencies, choose synchronous SSI.

Order information

BTF19; U_s 10 ... 32 V; connector M23, 12 pin

25 bit SSI, Gray-Code, Set = 1,000

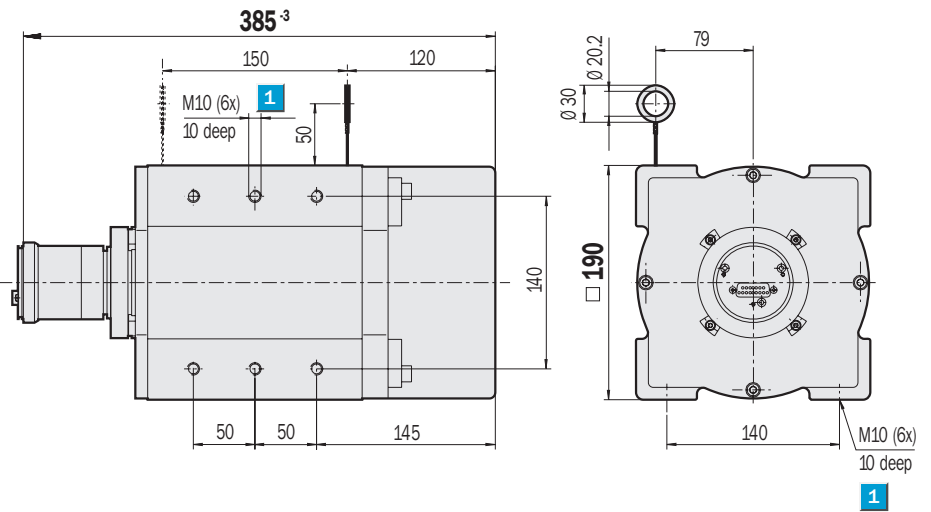
Type	Part no.	Description
BTF19-A1AM5010	1034304	SSI, measuring length 50 m

Resolution up to 0.025 mm

Absolute Wire Draw Encoders

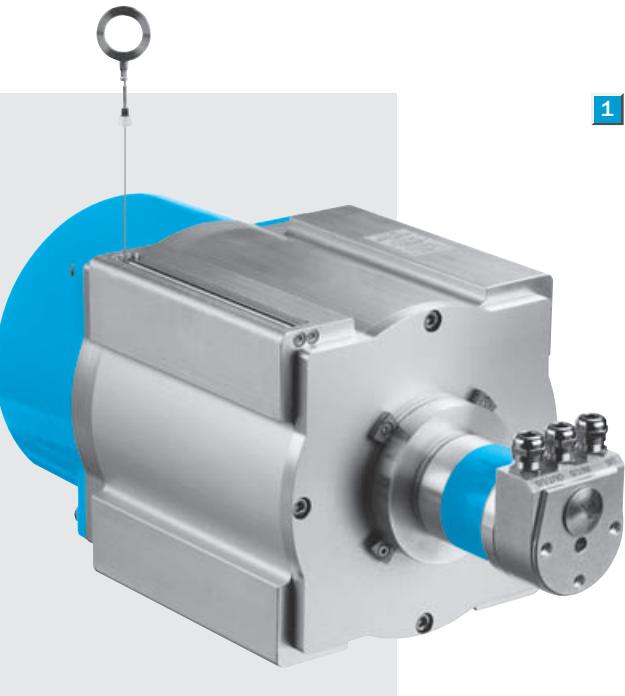
- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire

Dimensional drawing wire draw encoder BTF19 Profibus, CANopen, DeviceNet, measuring length 50 m



1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk



See chapter Accessories
Accessories for encoders

Profibus adaptor with PIN and wire allocation see pages 140/141
CANopen adaptor with PIN and wire allocation see pages 142/143
DeviceNet adaptor with PIN and wire allocation see pages 144 to 146

Technical data		BTF19	PB 50 m	CO 50 m	DN 50 m						
Drum housing	Anodised Aluminium										
Spring housing	Die-cast zinc										
Measuring wire (stainless)	Highly flexible stranded steel, Ø 1.35 mm										
Measuring length	50 m max.										
Mass	16.9 kg approx.										
Measuring step (recommended)	0.1 mm 1										
Linearity	0.05 % typ.										
Repeatability	± 1 measuring step										
Operating speed	4 m/sec.										
Position forming time	0.25 ms										
Spring return force (typ.)											
start/finish ¹⁾	18 N/37 N										
Working temperature range	- 20 ... + 70 °C										
Storage temperature range	- 40 ... + 100 °C										
Life of wire draw mechanism ²⁾	1 million cycles										
EMC ³⁾											
Resistance											
to shocks ⁴⁾	100/6 g/ms										
to vibration ⁵⁾	20/10 ... 2,000 g/Hz										
Protection to IEC 60529	IP 31 (wire draw mechanism)										
	IP 67 (encoder)										
Operating voltage range (U_s)	10 ... 32 V										
Power consumption max.	2.0 W										
Initialisation time ⁶⁾	1,250 ms										
Bus interface											
Electronic adjustment (Number SET)	Via PRESET switch or protocol										
Bus termination ⁷⁾	Via DIP switch										
Electrical connection	Connection adaptor										
Electrical interface ⁸⁾	RS485										
Electrical interface ⁹⁾	ISO-DIS 11898										
Protocol	Profile for encoders (07 _{hex}) – Class 2										
	Communication Profile DS 301 V4.0										
	Device Profile DSP 406 V2.0										
	DeviceNet Specification, Release 2.0										
Address setting (node no.)	0 ... 127 (DIP switch or protocol)										
Address setting (Node ID)	0 ... 63 (DIP switch or protocol)										
Data transmission rate (Baud rate) ¹⁰⁾	9.6 kBaud ... 12 MBaud										
(DIP switch or protocol)	(10, 20, 50, 125, 250, 500) kB, 1 MB										
(DIP switch or protocol)	(125, 250, 500) kB										
Status information	Running (LED green), bus activity (LED red)										
	2-coloured LED for CAN Controller Status										
	Network status LED (NS), 2-coloured										

¹⁾ These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

²⁾ Average values, which depend on the loading. At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

³⁾ To DIN EN 61000-6-2 and DIN EN 61000-6-3

⁴⁾ To DIN EN 60068-2-27

⁵⁾ To DIN EN 60068-2-6

⁶⁾ From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.

⁷⁾ Connection for terminal device only

⁸⁾ To EN 50 170-2 (DIN 19245 parts 1-3), galvanically separated using an opto-coupler

⁹⁾ (CAN High Speed) and CAN specification 2.0 B, galvanically separated

¹⁰⁾ Automatic detection

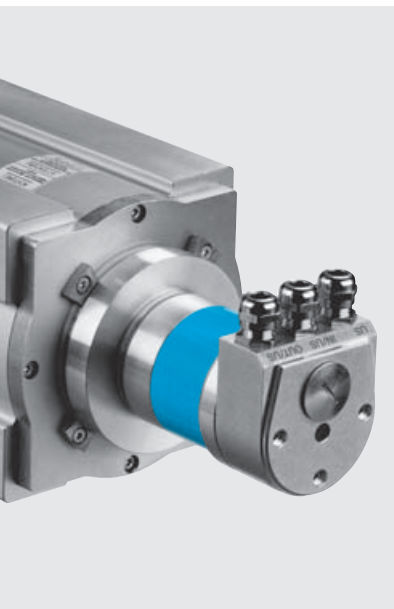
1 When the customer configures the encoder to 4,900 steps x 128 revolutions, via the Bus Master. (Factory entry in GSD or EDS file: 8,192 steps x 8,192 revolutions).

Order information		
BTF19; U _s 10 ... 32 V; field buses		
Type	Part no.	Description
BTF19-P1HM5017	1034310	Profibus, measuring length 50 m
BTF19-D1HM5017	1034316	DeviceNet, measuring length 50 m
BTF19-C1HM5017	1034322	CANopen, measuring length 50 m

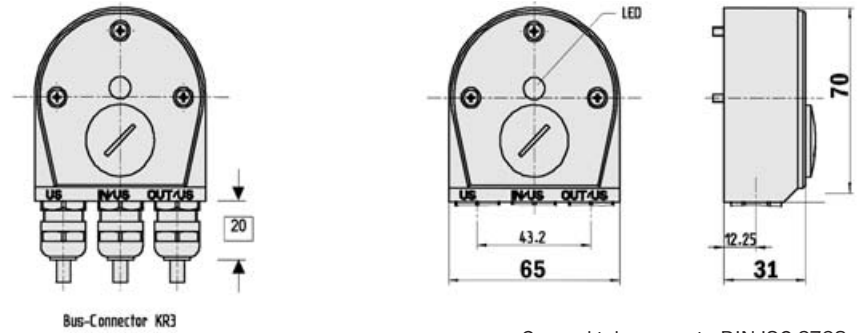
Please note: connection adaptor must be ordered separately (see pages 140 to 146)

Resolution up to 0.025 mm
Absolute Wire Draw Encoders

- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel

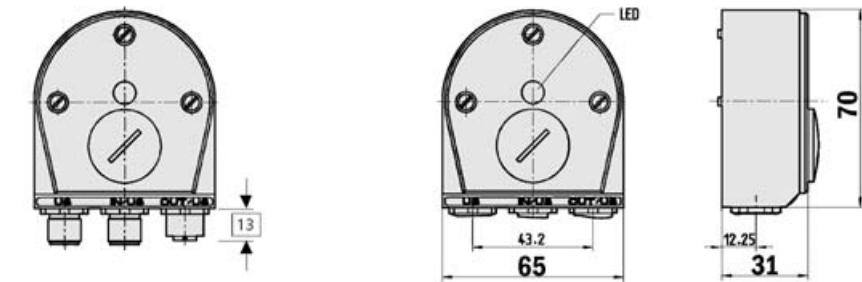


Dimensional drawing Profibus adaptor KA3



General tolerances to DIN ISO 2768-mk

Dimensional drawing Profibus adaptor SR3



General tolerances to DIN ISO 2768-mk

Order information

BTF Profibus adaptor

Type	Part no..	Description
AD-ATM60-KA3PR	2029225	Bus adaptor KA3, 3 x PG
AD-ATM60-SR3PR	2031985	Bus adaptor SR3, 1 x M12, 4 pin 2 x M12, 5 pin

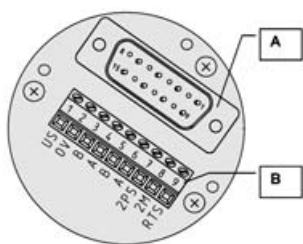
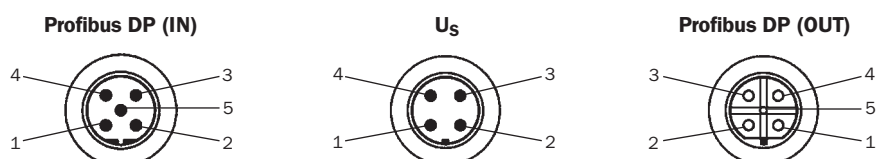
1 PIN and wire allocation for Profibus adaptor

Terminal strip	Connector 4 pin	Connector 5 pin	Conn. female 5 pin	Signal	Explanation
1	1	-	-	U _s (24 V)	Supply voltage 10 ... 32 V
2	3	-	-	0 V (GND)	Ground (0 V)
3	-	-	4	B	Profibus DP B line (out)
4	-	-	2	A	Profibus DP A line (out)
5	-	4	-	B	Profibus DP B line (in)
6	-	2	-	A	Profibus DP A line (in)
7	-	-	1	2P5 ¹⁾	+ 5 V (DC isolated)
8	-	-	3	2M ¹⁾	0 V (DC isolated)
9	-	-	-	RTS ²⁾	Request To Send
-	2	1	-	N. C.	-
-	4	3	-	N. C.	-
-	-	5	5	Screen	Housing potential

¹⁾ Use for external bus termination or to supply the transmitter/receiver of an optical transmission link.

²⁾ Signal is optional, used to detect the direction of an optical connection.

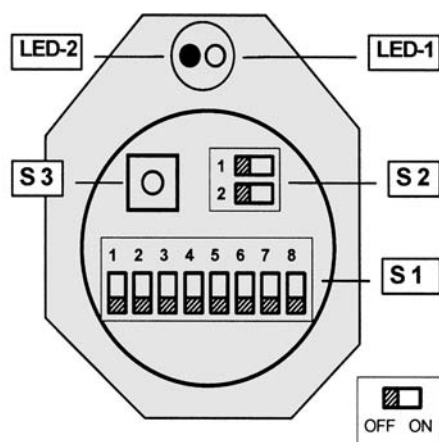
Connector M12 (at Bus adaptor)



A Internal plug connection to the encoder
B External connection to the bus

1 Encoders with a Profibus adaptor have a terminal strip for connecting the bus and supply lines. In order to connect the lines, the Profibus adaptor is unscrewed from the complete device. The figure shows the pin allocation within the bus connection.

Switch settings

**Switch settings**

Access to the switches is gained by opening the removable screw cap (PG) on the rear of the bus adaptor. Use of the following elements.

S 1 (1-7)	Address setting (0 ... 127)
S 1 (8-8)	Counting direction (CW/CCW)
S 2	Bus termination
S 3	Preset push button (Number SET)

Status information via LEDs

LED-1	Operating voltage (green)
LED-2	Bus activity (red)

Implementation

DP Functionalities

in accordance with the Profibus DP basic functions

DP services

- Data interchange (Write_Read_Data)
- Address allocation (Set_Slave_Address)
- Control commands (Global_Control)
- Read the inputs (Read_Inputs)
- Read the outputs (Read_Outputs)
- Read diagnostic data (Slave_Diagnosis)
- Send configuration data (Set_Param)
- Check configuration data (Chk_Config)

Communication

- Cyclic master – slave data traffic

Protective mechanisms

- Data transfer with HD = 4
- Time monitoring of the data traffic

Configuration

Settings in accordance with Encoder Profile

- Counting direction (CW, CCW)
- Class-2 functionality (ON, OFF)
- Scaling function (ON, OFF)
- Steps per turn (1 ... 8192)
- Total resolution (GA) -- 1 ... 67,108,864 steps, with $GA = 2^n \times SpU$. -- ($n=0 \dots 13$)
- "Activation of SSA-service" ²⁾
- Selection of the station address ²⁾

Configuration

Setting the formats (IN/OUT) for the cyclic data interchange via configuration byte (K-1)

2 words IN/OUT data (I-1/O-1) ¹⁾

4 words IN/OUT data (I-1, I-2, I-3/O-1) ²⁾

Data interchange: - Input Data (IN)

I-1	Position value ¹⁾	4 bytes
I-2	Speed (rev/min) ²⁾	2 bytes
I-3	Time stamp ²⁾	2 bytes

Data interchange: - Output data (OUT)

O-1	PRESET Value ¹⁾	4 bytes
-----	----------------------------	---------

Diagnostic information

- Station-related diagnosis (63 bytes in acc. with Encoder Profile Class 2)

Setting: - PRESET value

The PRESET function is used for set into operation and to allocate a specific position value to the current physical angular position.

The following settings are possible:

- by hardware (PRESET push button: S3)
- by software: -- (see Output data)

Setting: - Counting direction

- by hardware via DIP switch S1-(8)
- by software via Telegram

Counting direction increasing:

Rotation of the shaft in the clockwise direction (CW) as viewed on the shaft

Setting: - Station address

- by hardware via DIP switch S1
- by software via Telegram

The setting by software is carried out only if the "SSA-service" has been previously activated.

Setting: - Bus termination

The 2-way DIP switch (S2) permits an internal bus termination to be switched in and out (ON/OFF).

If the bus is terminated externally, switch S2 must be in the OFF position.

Device-specific file (GS.)

For the purpose of automatic set into operation of the encoder, use is made of the GS file.

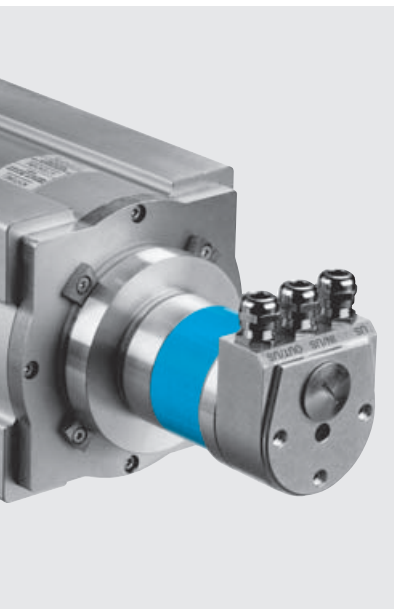
All the characteristic features of the device are defined in it.
 STEG 5952.GSD German
 STEG 5952.GSE English

¹⁾ As per Encoder Profile

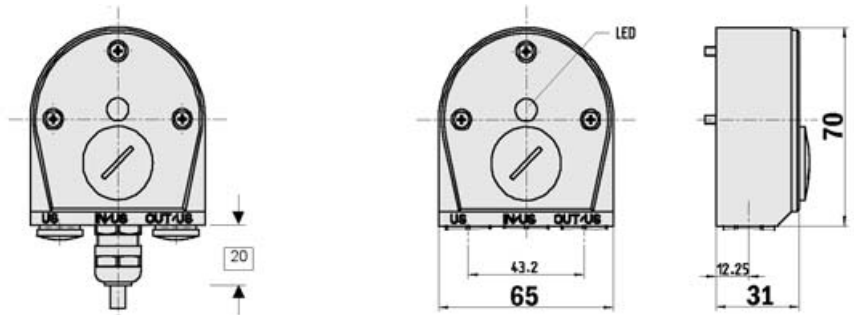
²⁾ Manufacturer specific function

Resolution up to 0.025 mm
Absolute Wire Draw Encoders

- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel

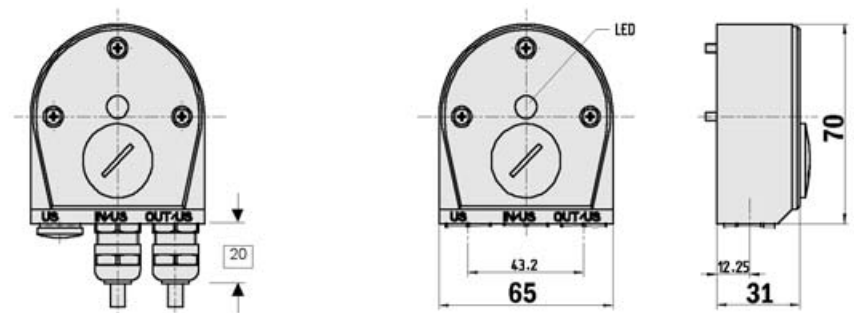


Dimensional drawing CANopen adaptor KR1



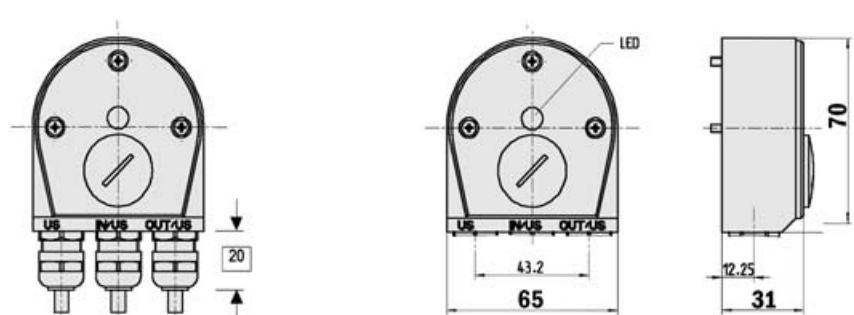
General tolerances to DIN ISO 2768-mk

Dimensional drawing CANopen adaptor KR2



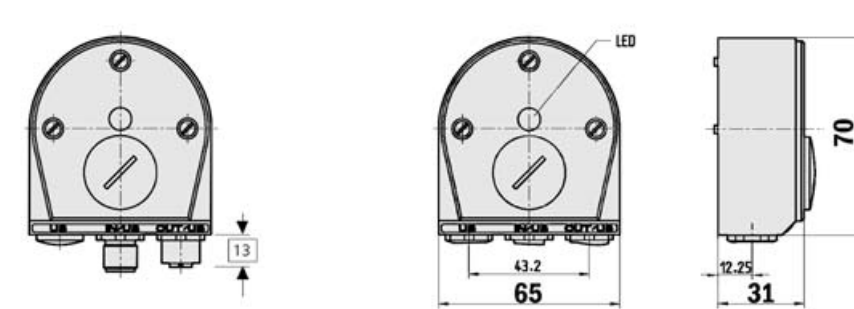
General tolerances to DIN ISO 2768-mk

Dimensional drawing CANopen adaptor KR3

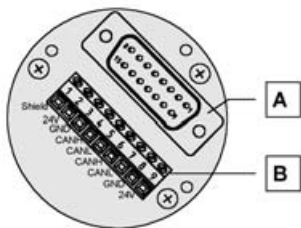


General tolerances to DIN ISO 2768-mk

Dimensional drawing CANopen adaptor SR2

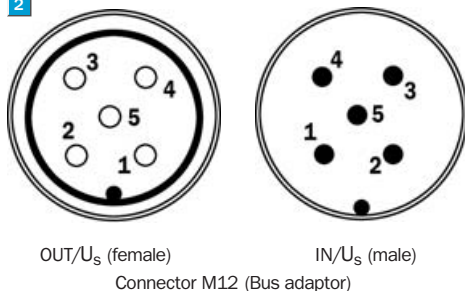


General tolerances to DIN ISO 2768-mk



- A Internal plug connection to the encoder
- B External connection to the bus

2



Order information

BTF CANopen adaptor

Type	Part no.	Description
AD-ATM60-KR1CO	2029230	Bus adaptor KR1, 1 x PG
AD-ATM60-KR2CO	2029231	Bus adaptor KR2, 2 x PG
AD-ATM60-KR3CO	2029232	Bus adaptor KR3, 3 x PG
AD-ATM60-SR2CO	2020935	Bus adaptor SR2, 2 x M12, 5 pin

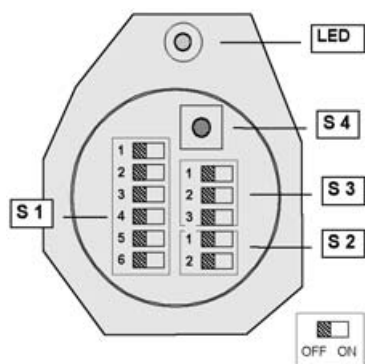
1 PIN and wire allocation for CANopen adaptor

Terminal Strip	Connector	Signal	Explanation
1	1	Shield	Screen
2	2	U _s (24 V)	Supply voltage 10 ... 32 V
3	3	GND (COM)	0 V (Gnd)
4	4	CAN _H	CAN-Bus-Signal HIGH
5	5	CAN _L	CAN-Bus-Signal LOW
6		CAN _H	CAN-Bus-Signal HIGH
7		CAN _L	CAN-Bus-Signal LOW
8		GND (COM)	0 V (Gnd)
9		U _s (24 V)	Supply voltage 10 ... 32 V

1 Encoders with a CANbus adaptor have a terminal strip for connecting the bus and supply lines. In order to connect the lines, the CANbus adaptor is unscrewed from the complete device. The figure shows the pin allocation within the bus connection.

2 See page 142 below

Switch settings



Switch settings

Access to the switches is gained by opening the removable screw cap (PG) on the rear of the bus adaptor. Use of the following elements.

- S 1 Address setting (Node ID)
- S 2 Bus termination
- S 3 Baud rate setting (Data Rate)
- S 4 Preset push button (Number zero SET)

Status information via LED

LED 2-colour red/green CAN Controller status

Implementation

CANopen Functionality

Predefined Connection Set

- Sync Object
- Emergency Object
- NMT Network Object (Error Control services, Boot-Up service)
- One Service Data Object (SDO)
- Two Process Data Object (PDO)

I/O-Operating Modes

- Synchronic: -- Depends on Sync Object
- Asynchronous. -- No reference to Sync Object. Triggered by "Timer" (Cyclic) or by event (COS)
- Remote Transmission (RTR)

Encoder Parameters

according the Device Profile for Encoders:

- Code direction (CW, CCW)
- Scaling function (ON, OFF)
- PRESET value
- Steps per revolution (CPR) - 1 ... 8,192
- Total resolution (TR) -- 1 ... 67,108,864 steps, with TR = 2ⁿ x CPR -- (n=0 ... 13)
- Limits for the working range
- Cycle Timer for asynchronous PDOs
- 8 programmable cams with HIGH/LOW limits and hysteresis
- General Diagnostic parameters (Offset Value, Alarms, Warnings, version of profile and software)

Manufacturer specific Profile:

- Node commissioning. -- Location and values for Node-ID and Baud rate
- Hysteresis to position change required for Async PDOs with COS mode
- Limits and display format for the speed and acceleration values

PDO Data Mapping

Mapping of up to four data objects to each of the two Transmit PDOs. The resulting data length within one PDO is limited to 8 Byte.

- (1) Object 1/Pos Val¹⁾ I-1
- (n) Object 2 ... Object 4 I-1 to I-7

Input Data Objects

- I-1 Position value [Pos Val] 4 Byte
- I-2 Status of cam 1 Byte
- I-3 Status of working range 1 Byte
- I-4 Alarms 1 Byte
- I-5 Warnings 1 Byte
- I-6 Speed value 4 Byte
- I-7 Acceleration value 4 Byte

Setting: - Address (Node ID)

0 to 63 by Hardware (DIP Switch) or EEPROM

Setting: - Baud rate

10kb, 20kb, 50kb, 125kb, 250kb, 500kb, 1 MB by Hardware (DIP Switch) or EEPROM

Setting: - Bus Termination

The DIP-Switch (S2) is used to switch on/ off an internal bus termination (ON/OFF). Not used (OFF) in case of using an external termination of the network

Setting: - PRESET Value

The Preset function supports adaptation of the encoder zero point to the mechanical zero point of the encoder system. The factory PRESET value is zero [0]. The adjustment is carried out in 2 ways:

- by Hardware (PRESET push button)
- by Software (CANopen Protocol)

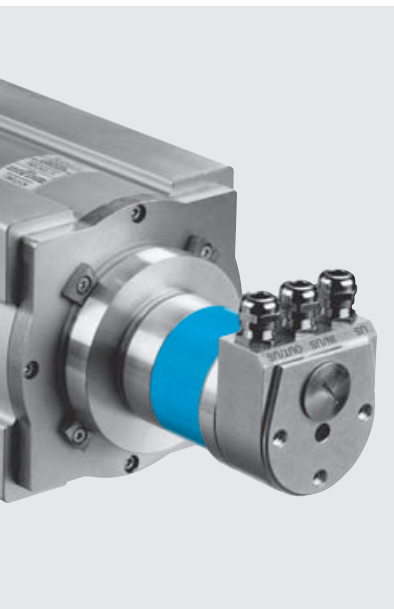
Equipment Configuration

Configuring parameters of the encoder can be achieved by a configuration tool in conjunction with an EDS file (Electronic Data Sheet). It contains all the characteristics of the encoder.

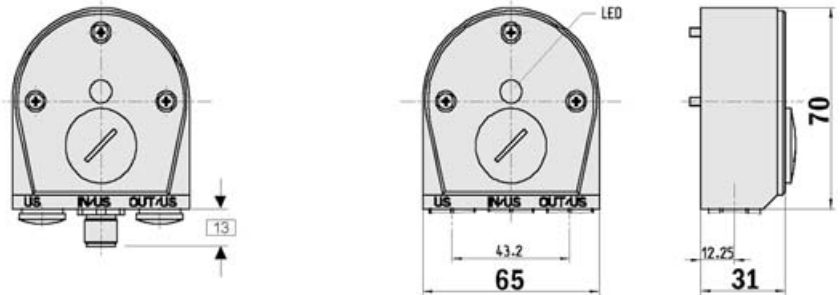
¹⁾ Setting cannot be changed

Resolution up to 0.025 mm
Absolute Wire Draw Encoders

- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel

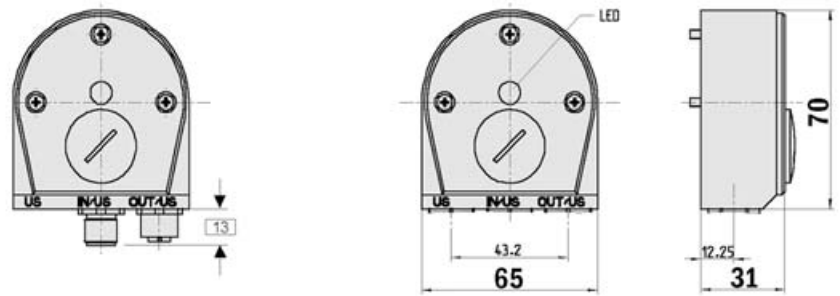


Dimensional drawing DeviceNet adaptor SR1



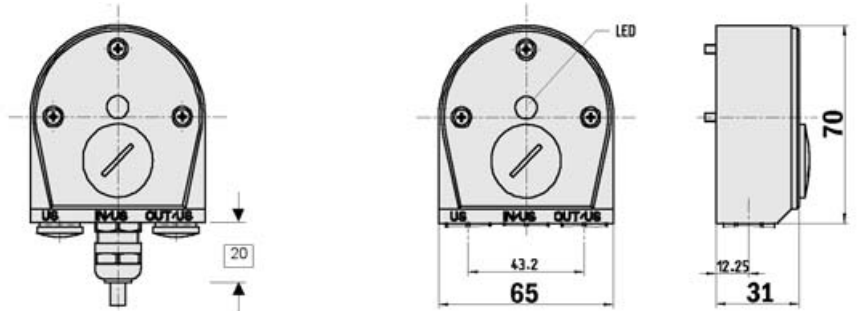
General tolerances to DIN ISO 2768-mk

Dimensional drawing DeviceNet adaptor SR2



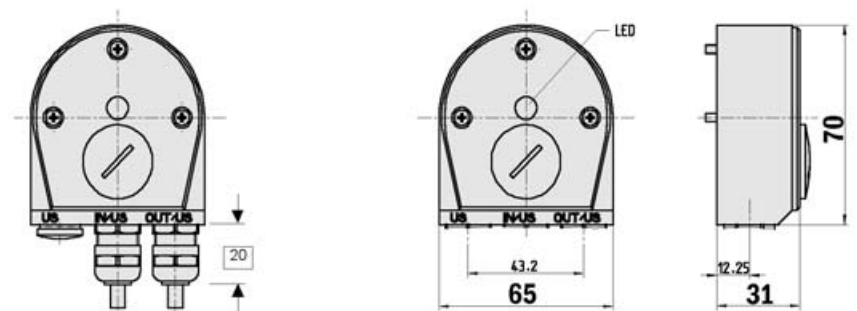
General tolerances to DIN ISO 2768-mk

Dimensional drawing DeviceNet adaptor KR1



General tolerances to DIN ISO 2768-mk

Dimensional drawing DeviceNet adaptor KR2



General tolerances to DIN ISO 2768-mk

Order information

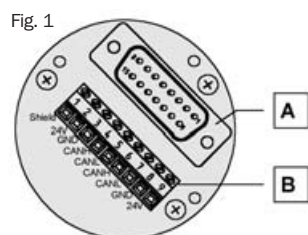
BTF DeviceNet adaptor

Type	Part no.	Description
AD-ATM60-SR1DN	2029226	Bus adaptor SR1, 1 x M12, 5 pin
AD-ATM60-SR2DN	2029227	Bus adaptor SR2, 1 x M12, 5 pin
AD-ATM60-KR1DN	2029228	Bus adaptor KR1, 1 x PG
AD-ATM60-KR2DN	2029229	Bus adaptor KR2, 2 x PG



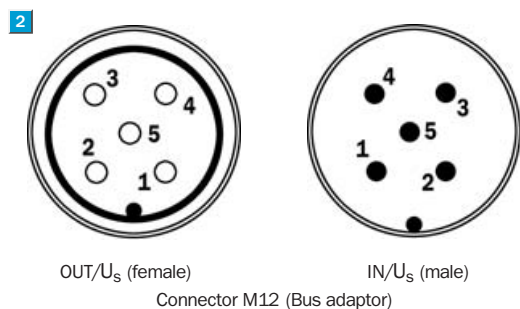
1 PIN and wire allocation for DeviceNet adaptor

Terminal Strip	Connector	Signal	Explanation
1	1	Shield	Screen
2	2	U _s (24 V)	Supply voltage 10 ... 32 V
3	3	GND (COM)	0 V (Gnd)
4	4	CAN _H	CAN-Bus signal HIGH
5	5	CAN _L	CAN-Bus signal LOW
6		CAN _H	CAN-Bus signal HIGH
7		CAN _L	CAN-Bus signal LOW
8		GND (COM)	0 V (Gnd)
9		U _s (24 V)	Supply voltage 10 ... 32 V



1 Encoders with a DeviceNet adaptor have a terminal strip for connecting the bus and supply lines. In order to connect the lines, the DeviceNet adaptor is unscrewed from the complete device. The figure shows the pin allocation within the bus connection.

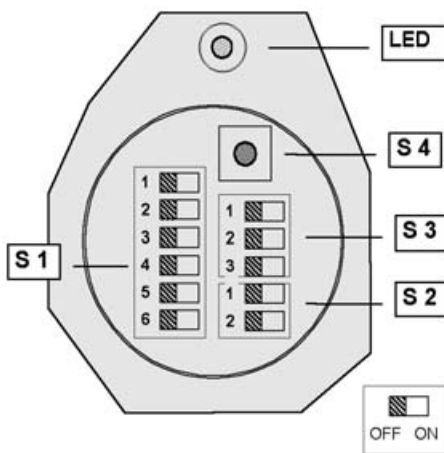
A Internal plug connection to the encoder
B External connection to the bus



2

OUT/U_s (female) IN/U_s (male)
 Connector M12 (Bus adaptor)

Switch settings



Switch settings

Access to the switches is gained by opening the removable screw cap (PG) on the rear of the bus adaptor. Use of the following elements.

S 1	Address setting (Node ID)
S 2	Bus termination
S 3	Baud rate setting (Data Rate)
S 4	Preset push button (Number zero SET)

Status information (NS) via LED

LED	2-colour red/green
	Network communication status

Implementation

DN Functionality

Object model

- Identity Object
- Message Router Object
- DeviceNet Object
- Assembly Object
- Connection Object
- Acknowledge Handler Object
- Encoder Object

I/O-Operating Modes

- Polling
- Change of State/Cyclic
- Bits Strobe

Encoder Parameters

according to the Device Profile for Encoders:

- Code direction (CW, CCW)
- Scaling function (ON, OFF)
- PRESET value
- Hysteresis to position change of required for COS communication
- Steps per revolution (CPR) - 1 ... 8,192
- Total resolution (TR) -- 1 ... 67,108,864 steps, with TR = 2ⁿ x CPR -- (n=0 ... 13)
- Limits for the working range (software limit switches)
- Limits and display format for the speed and acceleration values
- 8 programmable cams with HIGH/LOW limits and hysteresis
- General Diagnostic parameters (Offset Value, Alarms, Warnings, version of profile and software)

Manufacturer specific parameters:

- Assignment of the I/O Data Assembly to the different I/O operating modes
- Diagnostic data indicating the current maximum results of the encoder

- Device-specific data

I/O Data Assembly

1)	Pos Val (Position Value) ¹⁾	I-1
2)	Pos Val + Flag	I-1, I-2
3)	Pos Val + Speed	I-1, I-3
4)	Pos Val + Status of Cam	I-1, I-4

Sheet). It contains all the characteristics of the encoder.

¹⁾ Setting cannot be changed

Input Data Objects

I-1	Position value [Pos Val]	4 Byte
I-2	Flag (Alarm, Warning)	1 Byte
I-3	Speed	4 Byte
I-4	Status of cam	1 Byte

Setting: - Address (Node ID)

0 to 63 by Hardware (DIP Switch)

Setting: - Baud rate

125kb, 250kb, 500kb by Hardware (DIP Switch)

Setting: - Bus Termination

The DIP Switch (S2) is used to switch on/off an internal bus termination (ON/OFF). Not used (OFF) in case of using an external termination of the network

Setting: - PRESET Value

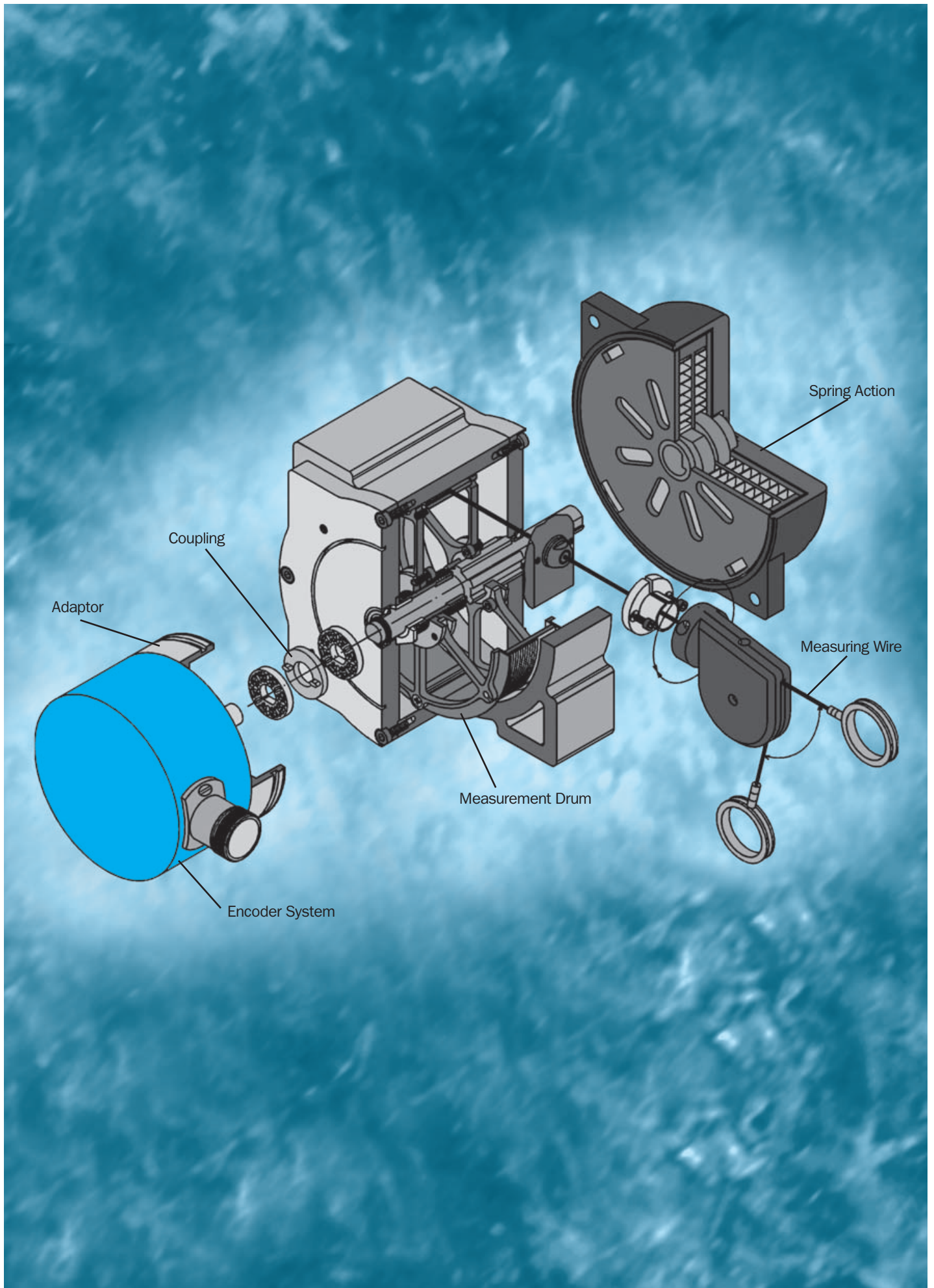
The Preset function supports adaptation of the encoder zero point to the mechanical zero point of the encoder system. The factory PRESET value is zero [0]


The adjustment is carried out in 2 ways:

- by Hardware (PRESET push button)
- by Software (DeviceNet Protocol)

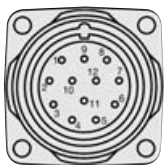
Equipment Configuration

Configuring parameters of the encoder can be achieved by a configuration tool in conjunction with an EDS file (Electronic Data



 **Resolution up to 0.025 mm**
Incremental Wire Draw Encoders

- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel

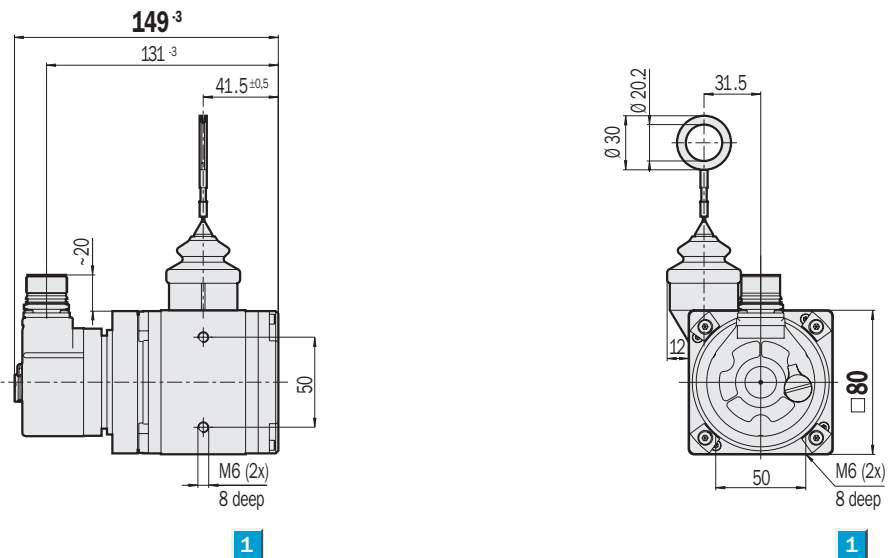


View of the connector M23 fitted to the encoder body

See chapter Accessories

Accessories for encoders

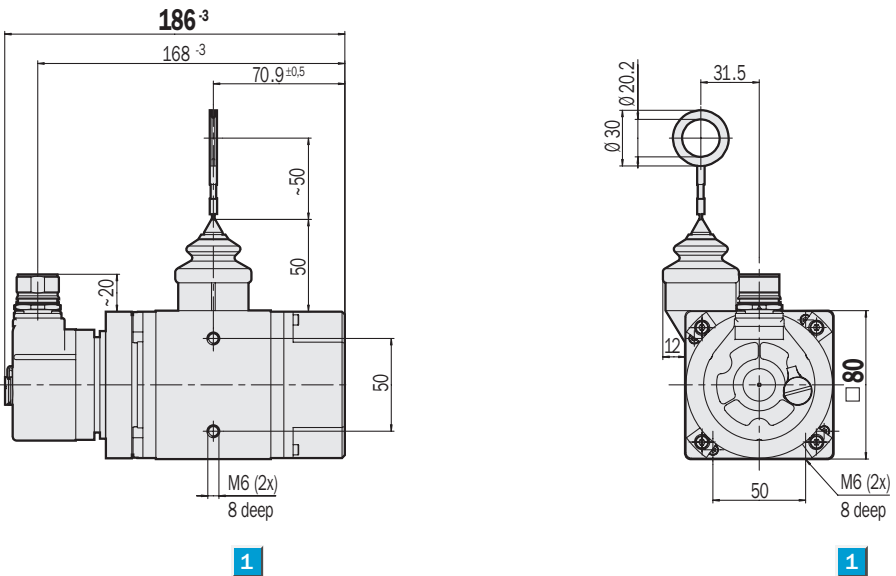
Dimensional drawing wire draw encoder PRF08 TTL, HTL, measuring length 2 m



1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

Dimensional drawing wire draw encoder PRF08 TTL, HTL, measuring length 3 m



1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

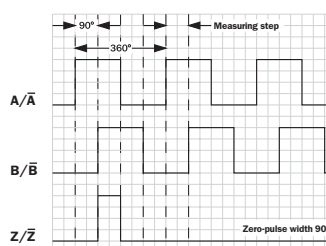
PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	\bar{A}	black	Signal line
2	Sense +	grey	Connected internally to U_s
3	Z	lilac	Signal line
4	\bar{Z}	yellow	Signal line
5	B	white	Signal line
6	\bar{B}	brown	Signal line
7	N. C.		Not connected
8	A	pink	Signal line
9	Screen		Housing potential
10	GND	blue	Earth connection
11	Sense -	green	Connected internally to GND
12	U_s	red	Supply voltage ¹⁾

¹⁾ Volt-free to the housing
N. C. = Not connected


Technical data		PRF08	TTL 2m	TTL 2m	HTL 2m	TTL 3m	TTL 3m	HTL 3m				
Drum housing	Anodised Aluminium											
Spring housing	Die-cast zinc											
Measuring wire (stainless)	Highly flexible stranded steel, Ø 1.35 mm											
Measuring length	2 m max.											
	max. 3 m											
Mass	1.6 kg approx.											
	ca. 1,8 kg											
Electrical Interfaces	TTL/RS422, 6 channels											
	HTL/push-pull, 6 channels											
Measuring step	0.025 mm ¹											
Reference signal	Number: 1/position 90°											
Linearity	0.05 % typ.											
Repeatability	± 1 measuring step											
Operating speed	4 m/sec.											
Spring return force (typ.)												
start/finish ¹⁾	6 N/14 N											
Working temperature range	- 20 ... + 70 °C											
Storage temperature range	- 40 ... + 100 °C											
Life of wire draw mechanism ²⁾	1 million cycles											
EMC ³⁾												
Resistance												
to shocks ⁴⁾	50/11 g/ms											
to vibration ⁵⁾	20/10 ... 150 g/Hz											
Protection to IEC 60529	IP 64 (wire draw mechanism)											
	IP 65 (encoder)											
Operating voltage range (U_s)												
load	TTL/RS422, 4.5 ... 5.5 V	20 mA max.										
current	TTL/RS422, 10 ... 32 V	20 mA max.										
	HTL/push-pull, 10 ... 32 V	60 mA max.										
Operating current, no load												
at 5 V		120 mA typ.										
at 10 ... 32 V		100 mA typ.										
Operating Set button ⁶⁾		≥ 100 ms										
Initialisation time after power on		40 ms										

- ¹⁾ These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.
- ²⁾ Average values, which depend on the loading. At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.
- ³⁾ To DIN EN 61000-6-2 and DIN EN 61000-6-3
- ⁴⁾ To DIN EN 60068-2-27
- ⁵⁾ To DIN EN 60068-2-6
- ⁶⁾ For stationary shaft only.

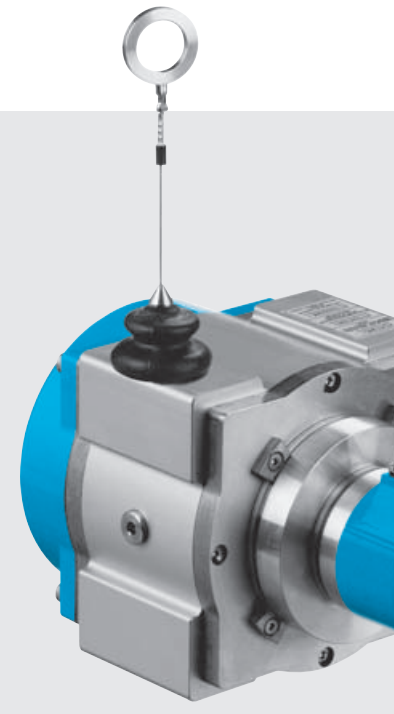


¹ Based on the control/counter evaluating the flanks of the A+B pulses.

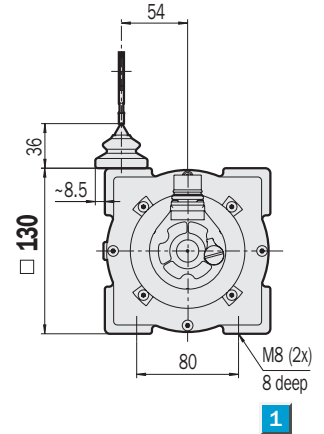
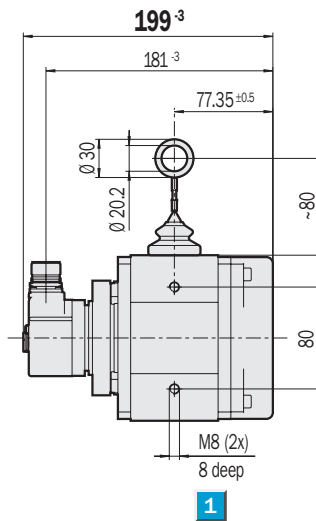
Order information		
PRF08; connector M23, 12 pin		
Type	Part no.	Description
PRF08-A1AM0240	1034323	TTL 4.5 ... 5.5 V; measuring length 2 m
PRF08-C1AM0240	1034329	TTL 10 ... 32 V; measuring length 2 m
PRF08-E1AM0240	1034335	HTL 10 ... 32 V; measuring length 2 m
PRF08-A1AM0340	1034896	TTL 4.5 ... 5.5 V; measuring length 3 m
PRF08-C1AM0340	1034897	TTL 10 ... 32 V; measuring length 3 m
PRF08-E1AM0340	1034898	HTL 10 ... 32 V; measuring length 3 m

 **Resolution up to 0.025 mm**
Incremental Wire Draw Encoders

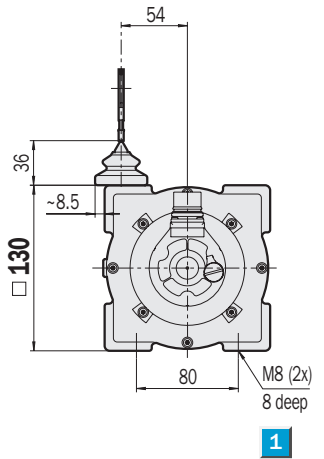
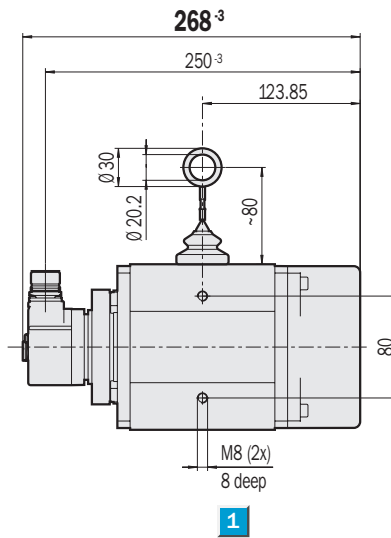
- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel



Dimensional drawing wire draw encoder PRF13 TTL, HTL, measuring length 5 m



Dimensional drawing wire draw encoder PRF13 TTL, HTL, measuring length 10 m



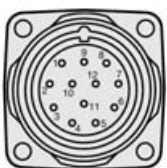
1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	\bar{A}	black	Signal line
2	Sense +	grey	Connected internally to U_s
3	Z	lilac	Signal line
4	\bar{Z}	yellow	Signal line
5	B	white	Signal line
6	\bar{B}	brown	Signal line
7	N. C.		Not connected
8	A	pink	Signal line
9	Screen		Housing potential
10	GND	blue	Earth connection
11	Sense -	green	Connected internally to GND
12	U_s	red	Supply voltage ¹⁾

¹⁾ Volt-free to the housing
N. C. = Not connected



View of the connector M23 fitted to the encoder body

See chapter Accessories

Accessories for encoders

Technical data		PRF13	TTL 5m	TTL 5m	HTL 5m	TTL 10m	TTL 10m	HTL 10m				
Drum housing	Anodised Aluminium											
Spring housing	Plastic											
Measuring wire (stainless)	Highly flexible stranded steel, Ø 1.35 mm											
Measuring length	5 m max.											
	10 m max.											
Mass	3.1 kg approx.											
	3.8 kg approx.											
Electrical Interfaces	TTL/RS422, 6 channels											
	HTL/push-pull, 6 channels											
Measuring step	0.05 mm ¹											
Reference signal	Number: 1/position 90°											
Linearity	0.05 % typ.											
Repeatability	± 1 measuring step											
Operating speed	4 m/sec.											
Spring return force (typ.)												
start/finish ¹⁾	15 N/20 N											
start/finish ¹⁾	10 N/20 N											
Working temperature range	- 20 ... + 70 °C											
Storage temperature range	- 40 ... + 100 °C											
Life of wire draw mechanism ²⁾	1 million cycles											
EMC ³⁾												
Resistance												
to shocks ⁴⁾	50/11 g/ms											
to vibration ⁵⁾	20/10 ... 150 g/Hz											
Protection to IEC 60529	IP 64 (wire draw mechanism)											
	IP 65 (encoder)											
Operating voltage range (U_s)												
load	TTL/RS422, 4.5 ... 5.5 V	20 mA max.										
current	TTL/RS422, 10 ... 32 V	20 mA max.										
	HTL/push-pull, 10 ... 32 V	60 mA max.										
Operating current, no load												
at 5 V		120 mA typ.										
at 10 ... 32 V		100 mA typ.										
Operating Set button ⁶⁾		≥ 100 ms										
Initialisation time after power on		40 ms										

¹⁾ These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

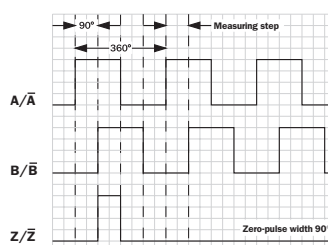
²⁾ Average values, which depend on the loading.
At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

³⁾ To DIN EN 61000-6-2 and DIN EN 61000-6-3

⁴⁾ To DIN EN 60068-2-27


⁵⁾ To DIN EN 60068-2-6

⁶⁾ For stationary shaft only.

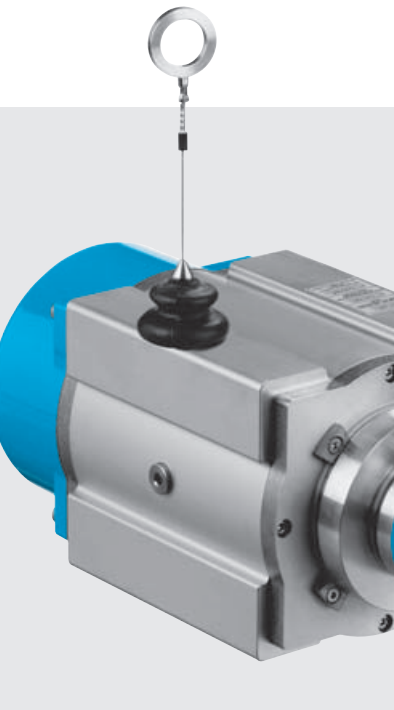


¹ Based on the control/counter evaluating the flanks of the A+B pulses.

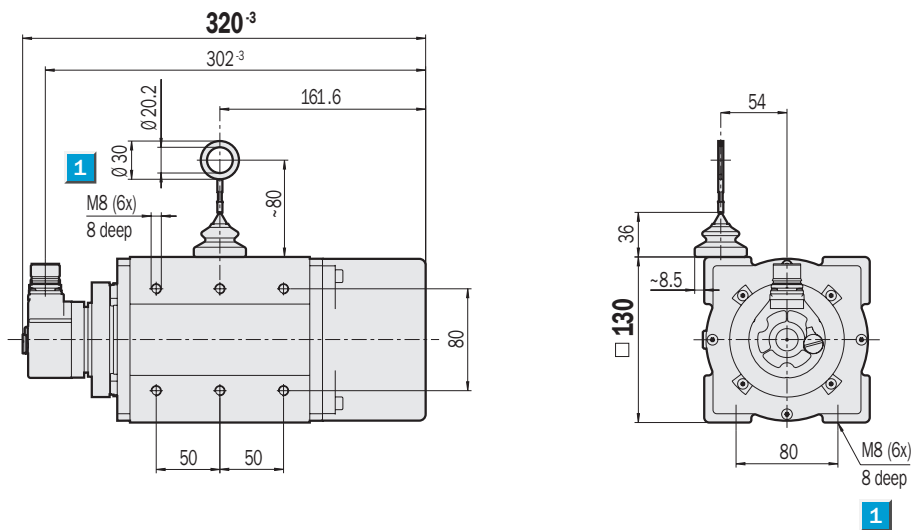
Order information		
PRF13; connector M23, 12 pin		
Type	Part no.	Description
PRF13-A1AM0520	1034324	TTL 4.5 ... 5.5 V; measuring length 5 m
PRF13-C1AM0520	1034330	TTL 10 ... 32 V; measuring length 5 m
PRF13-E1AM0520	1034336	HTL 10 ... 32 V; measuring length 5 m
PRF13-A1AM1020	1034325	TTL 4.5 ... 5.5 V; measuring length 10 m
PRF13-C1AM1020	1034331	TTL 10 ... 32 V; measuring length 10 m
PRF13-E1AM1020	1034337	HTL 10 ... 32 V; measuring length 10 m

 **Resolution up to 0.025 mm**
Incremental Wire Draw Encoders

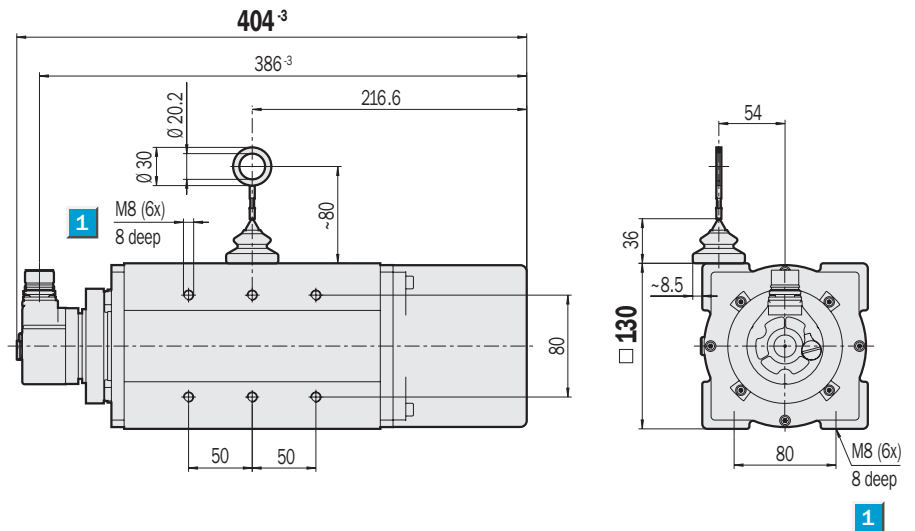
- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel



Dimensional drawing wire draw encoder PRF13 TTL, HTL, measuring length 20 m



Dimensional drawing wire draw encoder PRF13 TTL, HTL, measuring length 30 m



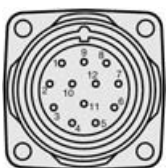
1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	\bar{A}	black	Signal line
2	Sense +	grey	Connected internally to U_s
3	Z	lilac	Signal line
4	\bar{Z}	yellow	Signal line
5	B	white	Signal line
6	\bar{B}	brown	Signal line
7	N. C.		Not connected
8	A	pink	Signal line
9	Screen		Housing potential
10	GND	blue	Earth connection
11	Sense -	green	Connected internally to GND
12	U_s	red	Supply voltage ¹⁾

¹⁾ Volt-free to the housing
N. C. = Not connected



View of the connector M23 fitted to the encoder body

See chapter Accessories

Accessories for encoders

Technical data		PRF13	TTL 20m	TTL 20m	HTL 20m	TTL 30m	TTL 30m	HTL 30m				
Drum housing	Anodised Aluminium											
Spring housing	Plastic											
Measuring wire (stainless)	Highly flexible stranded steel, Ø 0.81 mm											
Measuring length	20 m max.											
	30 m max.											
Mass	5.3 kg approx.											
	6.5 kg approx.											
Electrical Interfaces	TTL/RS422, 6 channels											
	HTL/push-pull, 6 channels											
Measuring step	0.05 mm ¹											
Reference signal	Number: 1/position 90°											
Linearity	0.05 % typ.											
Repeatability	± 1 measuring step											
Operating speed	4 m/sec.											
Spring return force (typ.)												
start/finish ¹⁾	10 N/20 N											
Working temperature range	- 20 ... + 70 °C											
Storage temperature range	- 40 ... + 100 °C											
Life of wire draw mechanism ²⁾	1 million cycles											
EMC ³⁾												
Resistance												
to shocks ⁴⁾	50/11 g/ms											
to vibration ⁵⁾	20/10 ... 150 g/Hz											
Protection to IEC 60529	IP 64 (wire draw mechanism)											
	IP 65 (encoder)											
Operating voltage range (U_s)												
load	TTL/RS422, 4.5 ... 5.5 V	20 mA max.										
current	TTL/RS422, 10 ... 32 V	20 mA max.										
	HTL/push-pull, 10 ... 32 V	60 mA max.										
Operating current, no load												
at 5 V		120 mA typ.										
at 10 ... 32 V		100 mA typ.										
Operating Set button ⁶⁾		≥ 100 ms										
Initialisation time after power on		40 ms										

¹⁾ These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

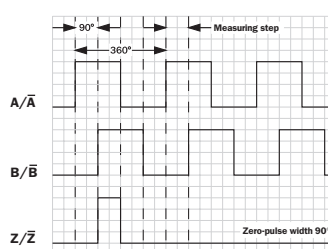
²⁾ Average values, which depend on the loading.
At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

³⁾ To DIN EN 61000-6-2 and DIN EN 61000-6-3

⁴⁾ To DIN EN 60068-2-27


⁵⁾ To DIN EN 60068-2-6

⁶⁾ For stationary shaft only.

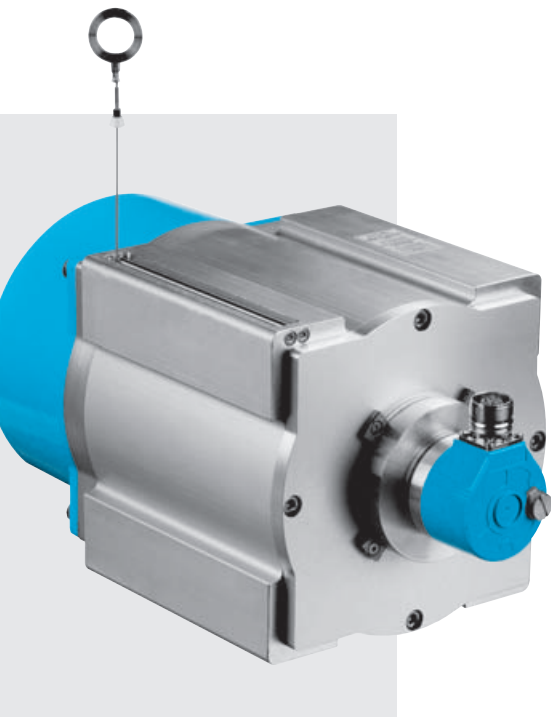


¹ Based on the control/counter evaluating the flanks of the A+B pulses.

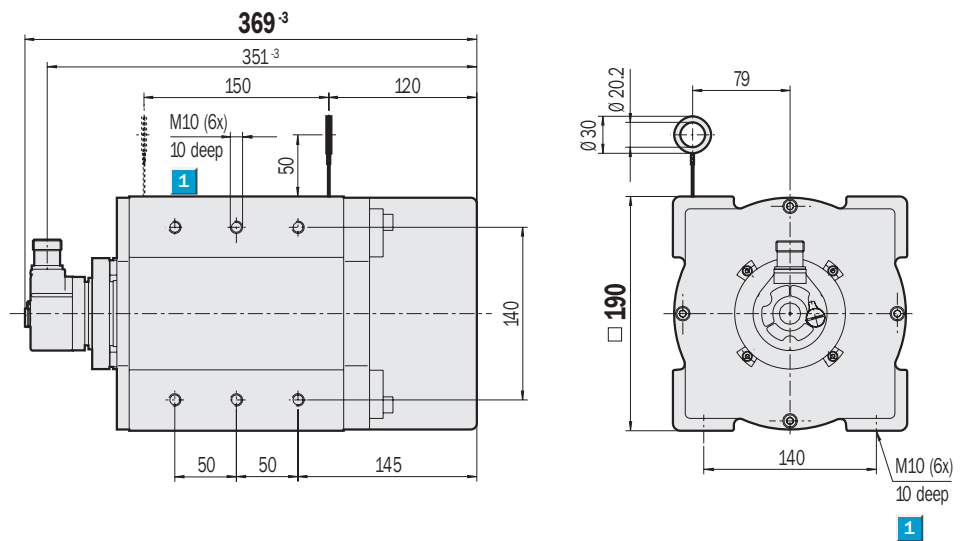
Order information		
PRF13; connector M23, 12 pin		
Type	Part no.	Description
PRF13-A1AM2020	1034326	TTL 4.5 ... 5.5 V; measuring length 20 m
PRF13-C1AM2020	1034332	TTL 10 ... 32 V; measuring length 20 m
PRF13-E1AM2020	1034338	HTL 10 ... 32 V; measuring length 20 m
PRF13-A1AM3020	1034327	TTL 4.5 ... 5.5 V; measuring length 30 m
PRF13-C1AM3020	1034333	TTL 10 ... 32 V; measuring length 30 m
PRF13-E1AM3020	1034339	HTL 10 ... 32 V; measuring length 30 m

 **Resolution up to 0.025 mm**
Incremental Wire Draw Encoders

- Linear path measurement using a wire draw mechanism
- High resolution
- Easy to mount
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire

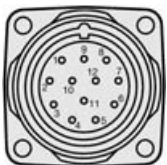


Dimensional drawing wire draw encoder PRF19 TTL, HTL, measuring length 50 m



1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk



View of the connector M23 fitted to the encoder body

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	\bar{A}	black	Signal line
2	Sense +	grey	Connected internally to U_s
3	Z	lilac	Signal line
4	\bar{Z}	yellow	Signal line
5	B	white	Signal line
6	\bar{B}	brown	Signal line
7	N. C.		Not connected
8	A	pink	Signal line
9	Screen		Housing potential
10	GND	blue	Earth connection
11	Sense -	green	Connected internally to GND
12	U_s	red	Supply voltage ¹⁾

¹⁾ Volt-free to the housing
N. C. = Not connected

See chapter Accessories

Accessories for encoders

Technical data		PRF19	TTL 50 m	TTL 50 m	HTL 50 m							
Drum housing	Anodised Aluminium											
Spring housing	Die-cast zinc											
Measuring wire (stainless)	Highly flexible stranded steel, Ø 1.35 mm											
Measuring length	50 m max.											
Mass	16.8 kg approx.											
Electrical Interfaces	TTL/RS422, 6 channels											
	HTL/push-pull, 6 channels											
Measuring step	0.1 mm ¹											
Reference signal	Number: 1/position 90°											
Linearity	0.05 % typ.											
Repeatability	± 1 measuring step											
Operating speed	4 m/sec.											
Spring return force (typ.)												
start/finish ¹⁾	18 N/37 N											
Working temperature range	- 20 ... + 70 °C											
Storage temperature range	- 40 ... + 100 °C											
Life of wire draw mechanism ²⁾	1 million cycles											
EMC ³⁾												
Resistance												
to shocks ⁴⁾	50/11 g/ms											
to vibration ⁵⁾	20/10 ... 150 g/Hz											
Protection to IEC 60529	IP 31 (wire draw mechanism)											
	IP 65 (encoder)											
Operating voltage range (U_s)												
load	TTL/RS422, 4.5 ... 5.5 V	20 mA max.										
current	TTL/RS422, 10 ... 32 V	20 mA max.										
	HTL/push-pull, 10 ... 32 V	60 mA max.										
Operating current, no load												
at 5 V		120 mA typ.										
at 10 ... 32 V		100 mA typ.										
Operating Set button ⁶⁾		≥ 100 ms										
Initialisation time after power on		40 ms										

¹⁾ These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

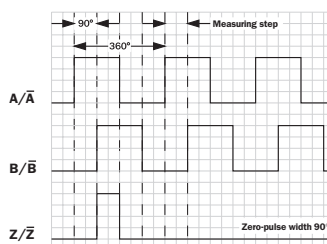
²⁾ Average values, which depend on the loading.
At high operating speeds over long lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

³⁾ To DIN EN 61000-6-2 and DIN EN 61000-6-3

⁴⁾ To DIN EN 60068-2-27

⁵⁾ To DIN EN 60068-2-6

⁶⁾ For stationary shaft only.



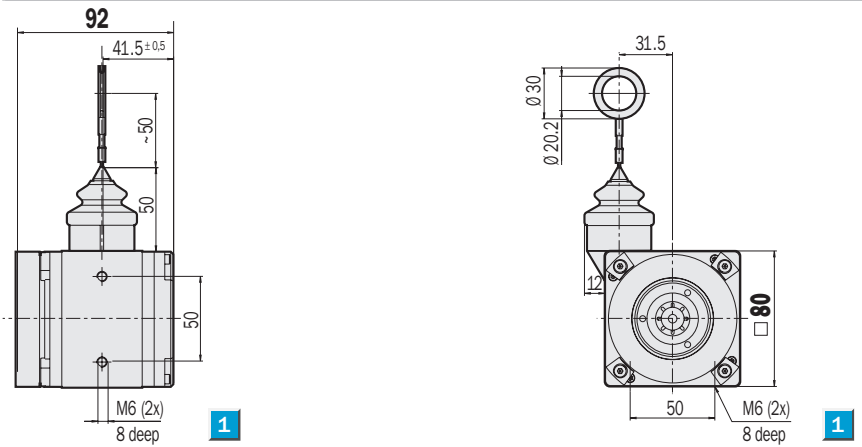
¹ Based on the control/counter evaluating the flanks of the A+B pulses.

Order information		
PRF19; connector M23, 12 pin		
Type	Part no.	Description
PRF19-A1AM5010	1034328	TTL 4.5 ... 5.5 V; measuring length 50 m
PRF19-C1AM5010	1034334	TTL 10 ... 32 V; measuring length 50 m
PRF19-E1AM5010	1034340	HTL 10 ... 32 V; measuring length 50 m

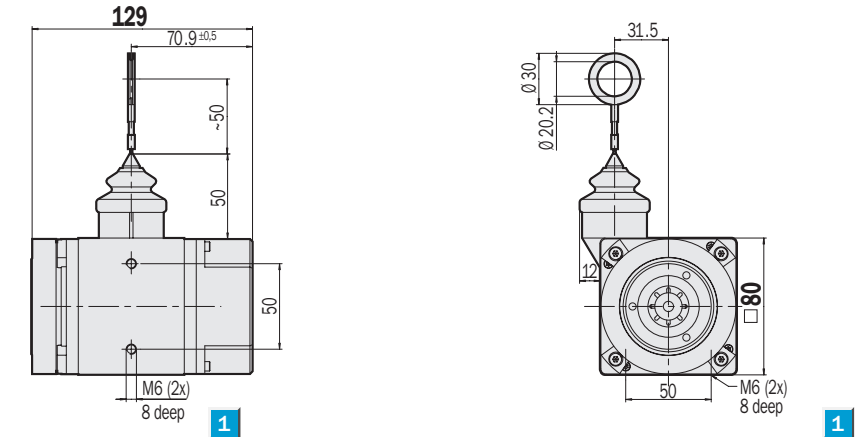
- Linear path measurement using a wire draw mechanism
- Easy mounting of the encoder
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel



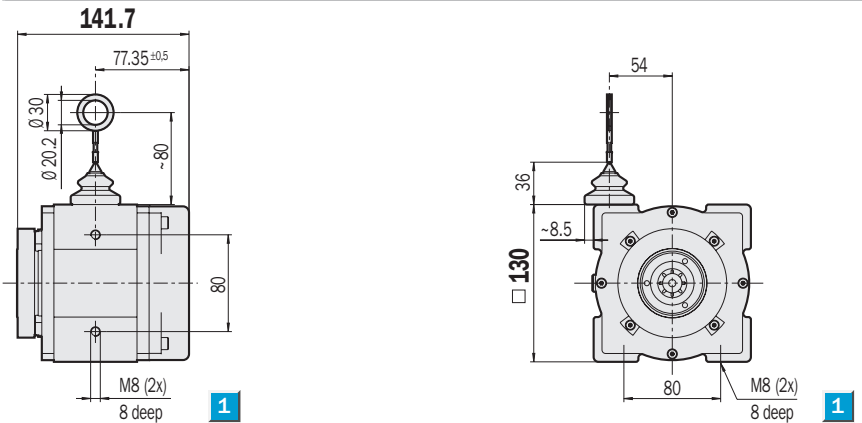
Dimensional drawing wire draw mechanism 2 m; measuring wire Ø 1.35 mm, servo flange



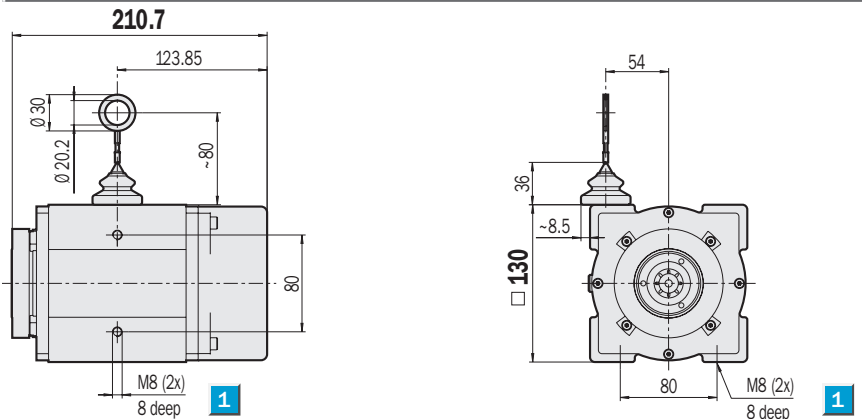
Dimensional drawing wire draw mechanism 3 m; measuring wire Ø 1.35 mm, servo flange



Dimensional drawing wire draw mechanism 5 m; measuring wire Ø 1.35 mm, servo flange



Dimensional drawing wire draw mechanism 10 m; measuring wire Ø 1.35 mm, servo flange

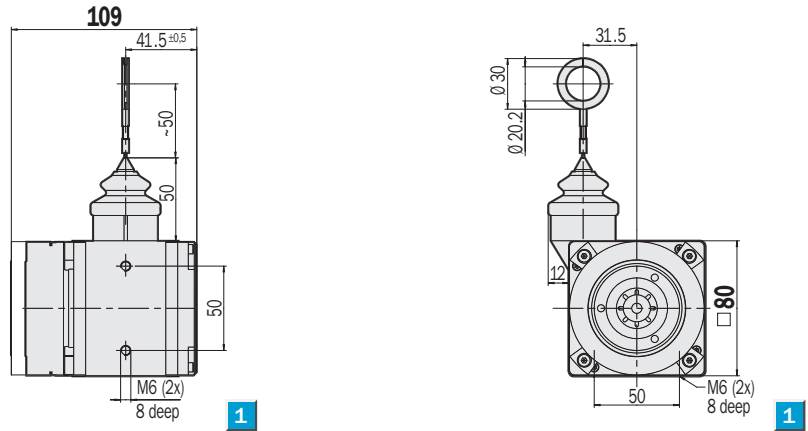


Accessories to suit this unit matching this:
Wire guiding rollers and spare parts kit
(page 162)

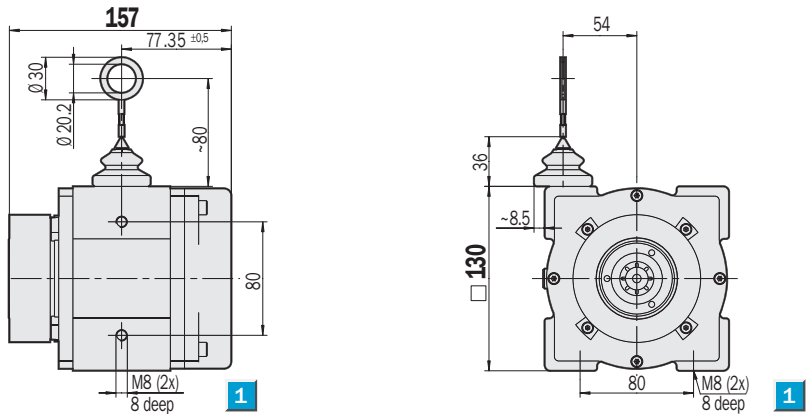
1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

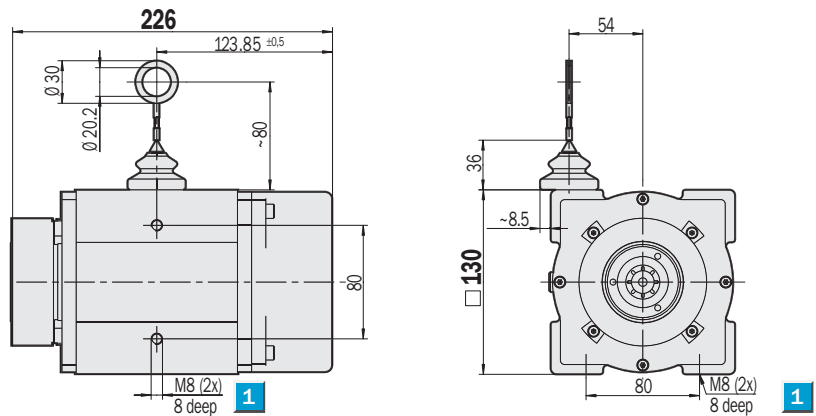
Dimensional drawing wire draw mechanism 2 m; measuring wire \varnothing 1.35 mm, Face mount flange



Dimensional drawing wire draw mechanism 5 m; measuring wire \varnothing 1.35 mm, Face mount flange



Dimensional drawing wire draw mechanism 10 m; measuring wire \varnothing 1.35 mm, Face mount flange



Accessories to suit this unit matching this:
Wire guiding rollers and spare parts kit
(page 162)

1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

Technical data		Wire draw mechanism	Measuring length																	
			2 m	3 m	5 m	10 m														
Measuring wire (stainless)	Highly flexible stranded steel, Ø 1.35 mm																			
Drum housing	Anodised Aluminium																			
Spring housing	Die-cast zinc																			
	Plastic																			
Drum diameter	62.31 mm																			
	105 mm																			
Number of turns for full extension	10 approx.																			
	15 approx.																			
	30 approx.																			
Drum precision	0.05 %																			
Operating speed	4 m/sec.																			
Spring return force (typ.)																				
start/finish ¹⁾	6 N/14 N																			
start/finish ¹⁾	15 N/20 N																			
start/finish ¹⁾	10 N/20 N																			
Working temperature range	- 20 ... + 70 °C																			
Protection to IEC 60529	IP 64																			
Life ²⁾	1 million cycles																			
Masse	1.3 kg																			
	1.5 kg																			
	2.8 kg																			
	3.5 kg																			

¹⁾ These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

²⁾ Average values, which depend on the loading.
At high operating speeds over long lengths, this figure can decrease;
at slow operating speeds over short lengths, it can increase.

Absolute encoders: determining the matching number of steps of the encoder for the required linear resolution

$$\text{No. of encoder steps per revolution} = \frac{3.1416 \times (\text{drum diameter} + \text{wire diameter})}{\text{Linear resolution per measuring step}}$$

Example: required linear resolution 0.05 mm; wire draw mechanism 5 m

$$\text{No. of encoder steps per revolution} = \frac{3.1416 \times (105 \text{ mm} + 1.35 \text{ mm})}{0.05 \text{ mm}} = 6682$$

Incremental encoders: determining the matching number of pulses of the encoder for the required linear resolution

$$\text{No. of encoder pulses per revolution} = \frac{3.1416 \times (\text{drum diameter} + \text{wire diameter})}{4 \times \text{Linear resolution per measuring step}} \quad \text{1}$$

Example: required linear resolution 0.025 mm; wire draw mechanism 2 m

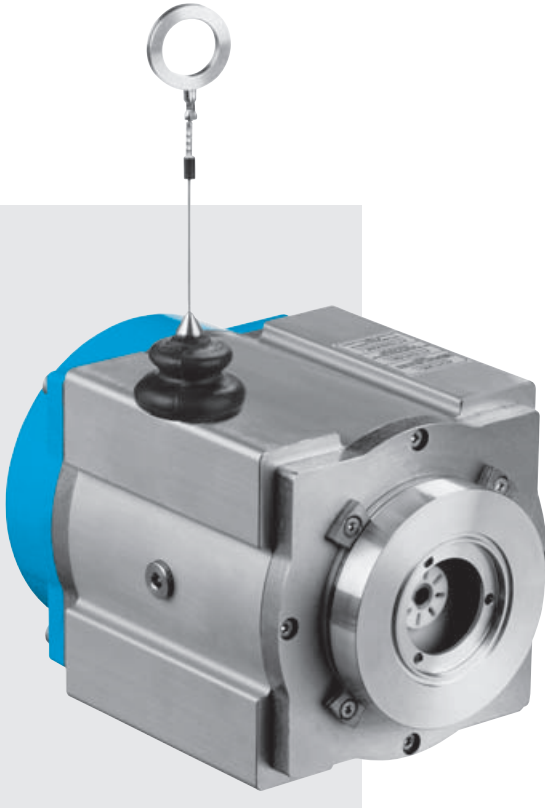
$$\text{No. of encoder pulses per revolution} = \frac{3.1416 \times (62.31 \text{ mm} + 1.35 \text{ mm})}{4 \times 0.025 \text{ mm}} = 2000$$

¹ Based on the control/counter evaluating the flanks of the A+B pulses.

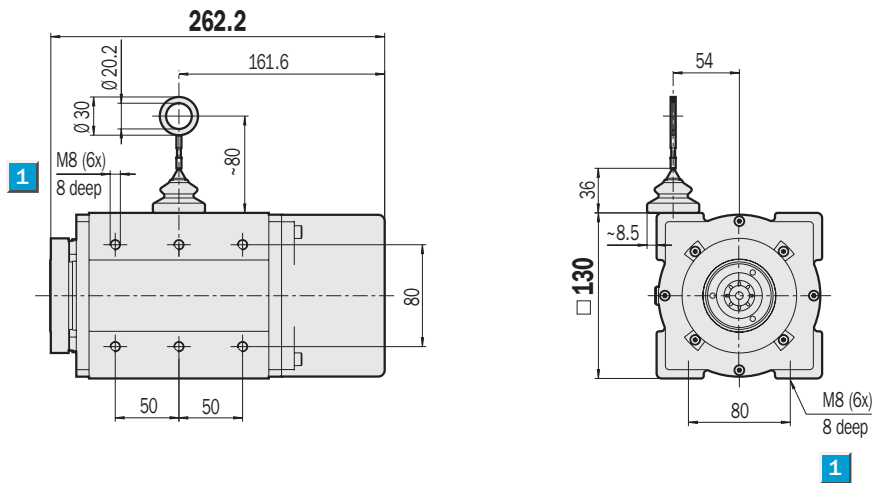
Order information		
MRA-F wire draw mechanism for attaching encoders with servo flange (or compatible flanges)		
Type	Part no.	Description
MRA-F080-102D2	6028625	measur. length 2m
MRA-F080-103D2	6030125	measur. length 3m
MRA-F130-105D2	6028626	measur. length 5m
MRA-F130-110D2	6028627	measur. length 10m

Order information		
MRA-F wire draw mechanism for attaching encoders with face mount flange (or compatible flanges)		
Type	Part no.	Description
MRA-F080-402D2	6029788	measur. length 2m
MRA-F130-405D2	6029789	measur. length 5m
MRA-F130-410D2	6029790	measur. length 10m

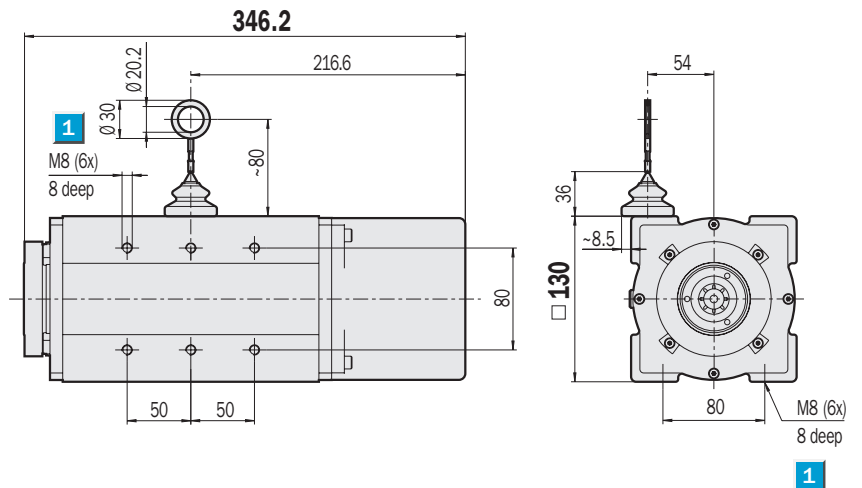
- Linear path measurement using a wire draw mechanism
- Easy mounting of the encoder
- High-precision measurement drum
- Extremely stable spring return
- Highly flexible steel wire
- Dirt remover made of steel



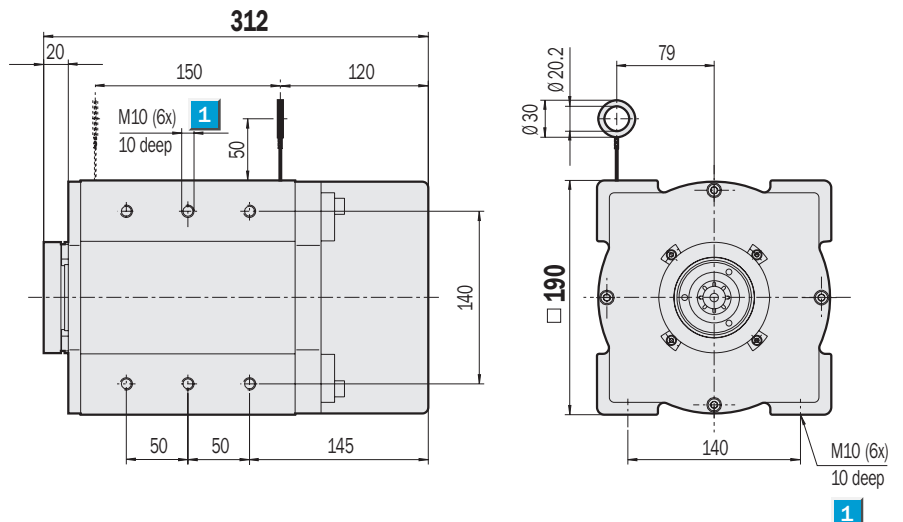
Dimensional drawing wire draw mechanism 20 m; measuring wire Ø 0.81 mm, servo flange



Dimensional drawing wire draw mechanism 30 m; measuring wire Ø 0.81 mm, servo flange



Dimensional drawing wire draw mechanism 50 m; measuring wire Ø 1.35 mm, servo flange

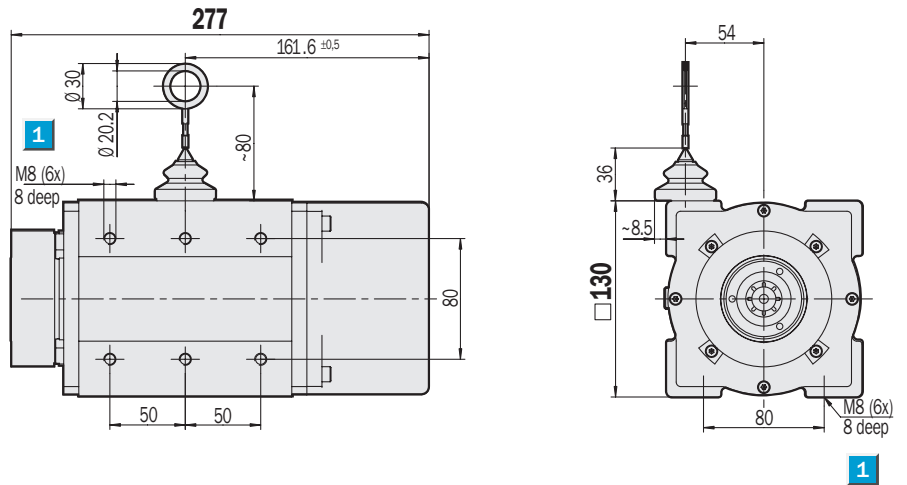


Accessories to suit this unit matching this:
Wire guiding rollers and spare parts kit
(page 162)

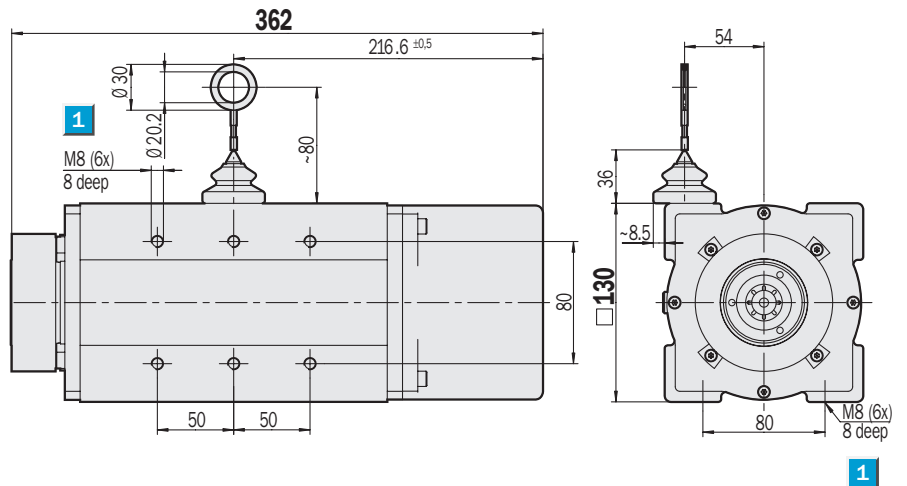
1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

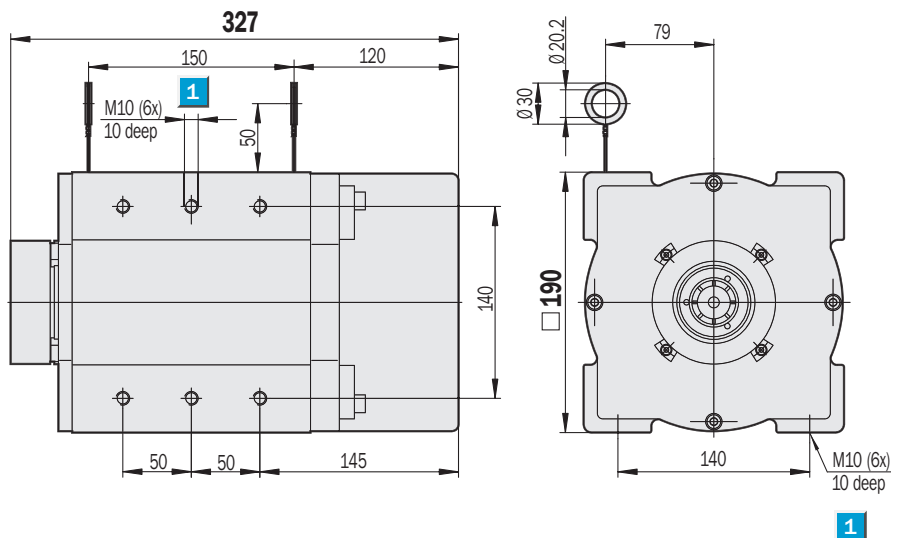
Dimensional drawing wire draw mechanism 20 m; measuring wire \varnothing 0.81 mm, Face mount flange



Dimensional drawing wire draw mechanism 30 m; measuring wire \varnothing 0.81 mm, Face mount flange



Dimensional drawing wire draw mechanism 50 m; measuring wire \varnothing 1.35 mm, Face mount flange



Accessories to suit this unit matching this:
Wire guiding rollers and spare parts kit
(page 162)

1 Threaded blind hole for mounting

General tolerances to DIN ISO 2768-mk

Technical data		Wire draw mechanism	Measuring length												
			20 m	30 m	50 m										
Measuring wire (stainless)	Highly flexible stranded steel, Ø 0.81 mm														
	Highly flexible stranded steel, Ø 1.35 mm														
Drum housing	Anodised Aluminium														
Spring housing	Plastic														
	Die-cast zinc														
Drum diameter	105 mm														
	155.1 mm														
Number of turns for full extension	61 approx.														
	91 approx.														
	102 approx.														
Drum precision	0.05 %														
Operating speed	4 m/sec.														
Spring return force (typ.)															
start/finish ¹⁾	10 N/20 N														
start/finish ¹⁾	18 N/37 N														
Working temperature range	- 20 ... + 70 °C														
Protection to IEC 60529	IP 64														
	IP 31														
Life ²⁾	1 million cycles														
Mass	5.0 kg														
	6.2 kg														
	16.5 kg														

¹⁾ These values were measured at an ambient temperature of 25 °C. The values may be different at other temperatures.

²⁾ Average values, which depend on the loading.
At high operating speeds over long lengths, this figure can decrease;
at slow operating speeds over short lengths, it can increase.

Absolute encoders: determining the matching number of steps of the encoder for the required linear resolution

$$\text{No. of encoder steps per revolution} = \frac{3.1416 \times (\text{drum diameter} + \text{wire diameter})}{\text{Linear resolution per measuring step}}$$

Example: required linear resolution 0.05 mm; wire draw mechanism 30 m

$$\text{No. of encoder steps per revolution} = \frac{3.1416 \times (105 \text{ mm} + 0.81 \text{ mm})}{0.05 \text{ mm}} = 6648$$

Incremental encoders: determining the matching number of pulses of the encoder for the required linear resolution

$$\text{No. of encoder pulses per revolution} = \frac{3.1416 \times (\text{drum diameter} + \text{wire diameter})}{4 \times \text{Linear resolution per measuring step}} \quad \text{1}$$

Example: required linear resolution 0.025 mm; wire draw mechanism 20 m

$$\text{No. of encoder pulses per revolution} = \frac{3.1416 \times (105 \text{ mm} + 0.81 \text{ mm})}{4 \times 0.025 \text{ mm}} = 1662$$

¹ Based on the control/counter evaluating the flanks of the A+B pulses.

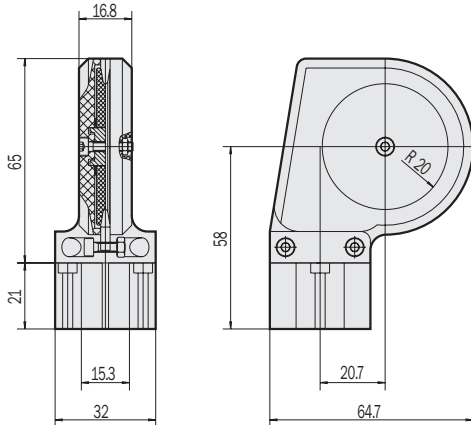
Order information		
MRA-F wire draw mechanism for attaching encoders with servo flange (or compatible flanges)		
Type	Part no.	Description
MRA-F130-120D1	6028628	measur. length 20 m
MRA-F130-130D1	6028629	measur. length 30 m
MRA-F190-150D2	6028630	measur. length 50 m

Order information		
MRA-F wire draw mechanism for attaching encoders with face mount flange (or compatible flanges)		
Type	Part no.	Description
MRA-F130-420D1	6029791	measur. length 20 m
MRA-F130-430D1	6029792	measur. length 30 m
MRA-F190-450D2	6029793	measur. length 50 m

Dimensional drawings and order information

Wire guiding roller for wire draw mechanism 2 m and 3 m

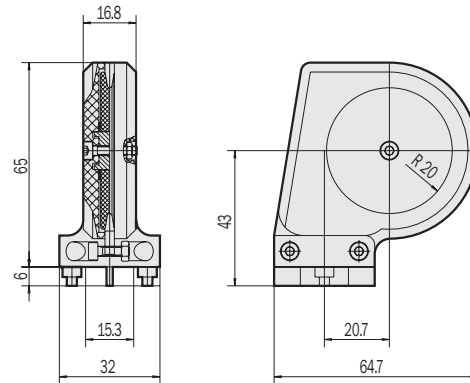
Type	Part no.
MRA-F080-R	6028632



General tolerances to DIN ISO 2768-mk

Wire guiding roller for wire draw mechanisms 5 m, 10 m, 20 m and 30 m

Type	Part no.
MRA-F130-R	6028631



General tolerances to DIN ISO 2768-mk

Spare parts kit for all versions of wire draw mechanisms

Type	Part no.	Description
MRA-F-K	6028633	Assembly fittings: 4 servo clamps + screws, 3 screws M4 x 8, coupling 2 sealing rings to suit wire drive mechanisms for attaching encoders with servo flange
MRA-F-L	6030124	Assembly fittings: 4 servo clamps + screws, 3 screws M4 x 8, coupling 2 sealing rings to suit wire drive mechanisms for attaching encoders with face mount flange

Dimensional drawings and order information

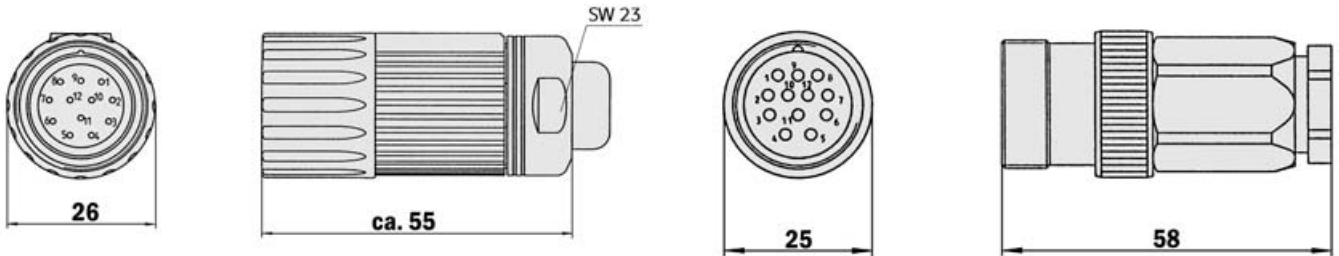
Round screw-in system M23, 12 pin for wire draw encoder BTF with SSI interface

Connector M23 female, 12 pin, straight, screened

Type	Part no.	Contacts
DOS-2312-G	6027538	12

Connector M23 male, 12 pin, straight, screened

Type	Part no.	Contacts
STE-2312-G	6027537	12



Connector M23 female, 12 pin, straight, cable 12 cores, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm² screened, capable of being dragged, cable diameter 7.8 mm for wire draw encoders BTF with SSI interface

Type	Part no.	Contacts	Cable length
DOL-2312-G1M5MA1	2029200	12	1.5 m
DOL-2312-G03MMA1	2029201	12	3.0 m
DOL-2312-G05MMA1	2029202	12	5.0 m
DOL-2312-G10MMA1	2029203	12	10.0 m
DOL-2312-G20MMA1	2029204	12	20.0 m
DOL-2312-G30MMA1	2029205	12	30.0 m

Cable, 8 core, per metre, 4 x 2 x 0.15 mm² with screen, cable diameter 5.6 mm for wire draw encoder BTF with SSI interface

Type	Part no.	Wires
LTG-2308-MW	6027529	8

Cable, 11 cores, per metre, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm² with screen, cable diameter 7.5 mm for wire draw encoder BTF with SSI interface

Type	Part no.	Wires
LTG-2411-MW	6027530	11

Cable, 12 cores, per metre, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm² with screen, capable of being dragged, cable diameter 7.8 mm for wire draw encoder BTF with SSI interface

Type	Part no.	Wires	Description
LTG-2512-MW	6027531	12	
LTG-2612-MW	6028516	12	UV- and salt water resistant

Dimensional drawings and order information

Adaptor modules for wire draw encoder BTF with SSI interface

Serial Parallel Adaptors

Type	Part no.	Description
AD-SSIG-PA	1030106	SSI Parallel adaptor module, in plastic housing
AD-SSI-PA	1030107	SSI Parallel adaptor module, without plastic housing
AD-SSIPG-PA	1030108	SSI Parallel adaptor module, programmable, in plastic housing
AD-SSIPF-PA	1030109	SSI Parallel adaptor module, programmable, without plastic housing, with front plate
AD-SSIP-PA	1030110	SSI Parallel adaptor module, programmable, without plastic housing, without front plate

Programming tool for programmable serial parallel adaptor

Type	Part no.
PGT-02-S	1030112

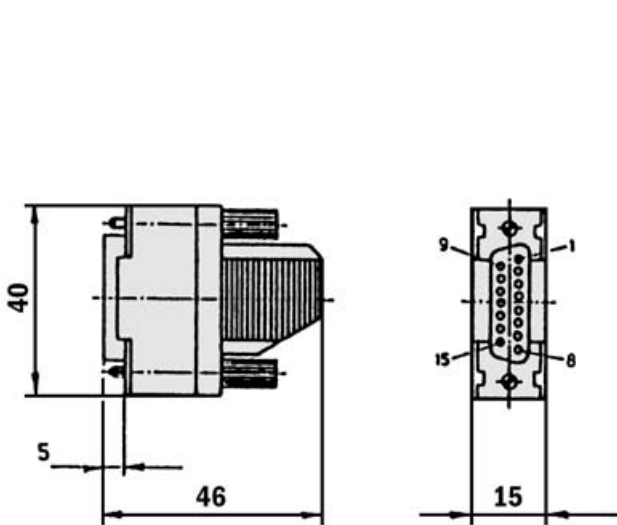
Plug-in system Sub-D connectors for serial parallel adaptor

Cable connector Sub-D male, 15 pin, straight, screened

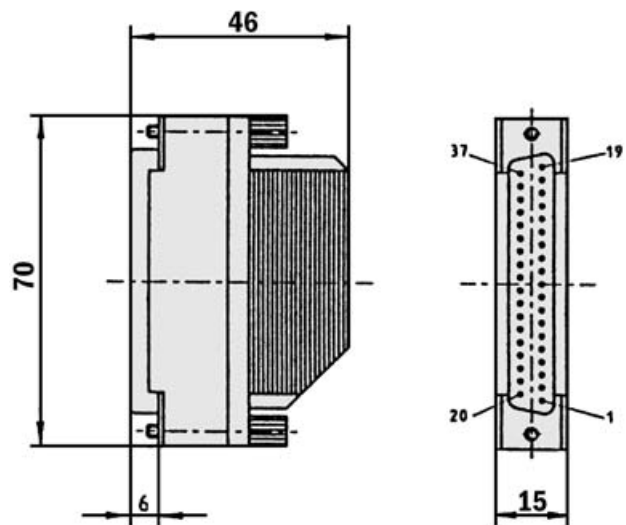
Type	Part no.	Contacts
STE-0D15-G	2029223	15

Cable connector Sub-D female, 37 pin, straight, screened

Type	Part no.	Contacts
DOS-0D37-G	2029224	37



General tolerances to DIN ISO 2768-mk



General tolerances to DIN ISO 2768-mk

Dimensional drawings and order information

Screw-in system M12 for BTF wire draw encoder with Profibus Interface

SENSICK circular connector M12, can be wired for operating voltage (BTF with Profibus Interface)

Type	Part no.	Contacts	Description
DOS-1204-G	6007302	4	Female connector, M12, 4 pin, straight

SENSICK circular connector M12, can be wired for bus cable (BTF with Profibus Interface)

Type	Part no.	Description
PR-DOS-1205-G	6021353	Profibus-female connector, M12, 5 pin, straight, shielded, B-coding
PR-STE-1205-G	6021354	Profibus-male connector, M12, 5 pin, straight, shielded, B-coding

SENSICK pre-wired female M12 connector, 4 pin, straight for operating voltage (BTF with Profibus Interface)

Type	Part no.	Description
DOL-1204-G05M	6009866	Cable 5 m, PVC

SENSICK pre-wired female M12 connector, 5 pin, straight, 2 core cable, with screening for wire draw encoder BTF with Profibus Interface

Type	Part no.	Description
DOL-12PR-G05M	6026006	Profibus cable 5 m, B-coding
DOL-12PR-G10M	6026007	Profibus cable 10 m, B-coding

SENSICK pre-wired male M12 connector, 5 pin, straight, 2 core cable, with screening for wire draw encoder BTF with Profibus Interface

Type	Part no.	Description
STL-12PR-G05M	6026005	Profibus cable 5 m, B-coding
STL-12PR-G10M	6026008	Profibus cable 10 m, B-coding

Bus cable 2 core, per metre, with screening, for BTF with Profibus interface

Type	Part no.	Wires
LTG-2102-MW	6021355	2

Screw-in system M23, 5 pin for BTF wire draw encoder with DeviceNet interface

Cable connector M12 female, 5 pin, straight, screened

Type	Part no.	Contacts
DOS-1205-G	6027534	5

Cable connector M12 male, 5 pin, straight, screened

Type	Part no.	Contacts
STE-1205-G	6027533	5

Dimensional drawings and order information

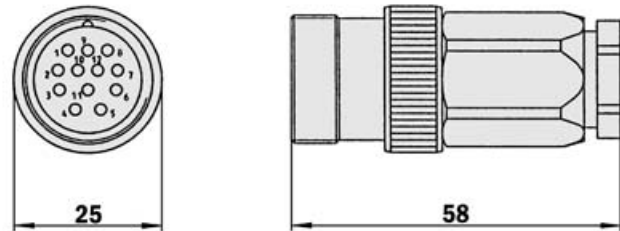
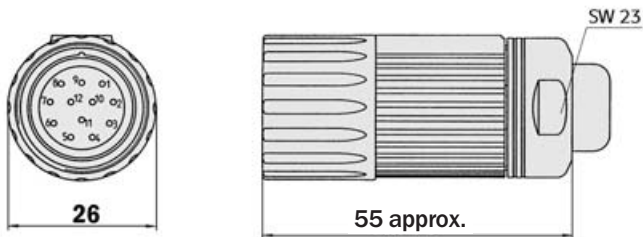
Round screw-in system M23, 12 pin for wire draw encoder PRF with TTL/HTL interface

Cable connector M23 female, 12 pin, straight, screened

Type	Part no.	Contacts
DOS-2312-G	6027538	12

Cable connector M23 male, 12 pin, straight, screened

Type	Part no.	Contacts
STE-2312-G	6027537	12



Cable connector M23 female, 12 pin, straight, Cable 12 core, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm² with screen, capable of being dragged, cable diameter 7.8 mm for wire draw encoder PRF with TTL/HTL interface

Type	Part no.	Contacts	Cable length
DOL-2312-G1M5MA3	2029212	12	1.5 m
DOL-2312-G03MMA3	2029213	12	3.0 m
DOL-2312-G05MMA3	2029214	12	5.0 m
DOL-2312-G10MMA3	2029215	12	10.0 m
DOL-2312-G20MMA3	2029216	12	20.0 m
DOL-2312-G30MMA3	2029217	12	30.0 m

Cable, 8 core, per metre, 4 x 2 x 0.15 mm² with screen, cable diameter 5.6 mm for wire draw encoder PRF with TTL/HTL interface

Type	Part no.	Wires
LTG-2308-MW	6027529	8


Cable, 11 core, per metre, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm² with screen, cable diameter 7.5 mm for wire draw encoder PRF with TTL/HTL interface

Type	Part no.	Wires
LTG-2411-MW	6027530	11

Cable, 12 core, per metre, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm² with screen, capable of being dragged, cable diameter 7.8 mm for wire draw encoder PRF with TTL/HTL interface

Type	Part no.	Wires	Description
LTG-2512-MW	6027531	12	
LTG-2612-MW	6028516	12	UV- and salt water resistant

SICK

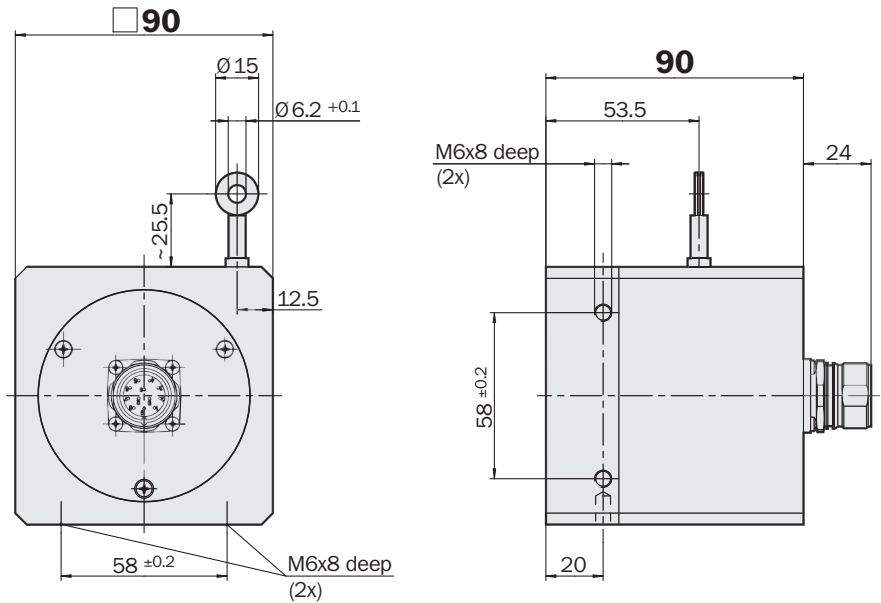
 **Resolution**
0.05 mm

Absolute Wire draw encoder

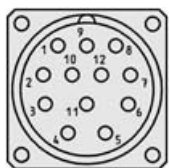
- Extremely compact construction
- High resolution
- Easy to mount
- High-precision measurement drum
- Stable spring return
- Highly flexible steel wire
- Robust aluminium housing



Dimensional drawing of absolute wire draw encoder BKS09 SSI, measuring lengths 2 m and 5 m



General tolerances to DIN ISO 2768-mk



View of the M23 connector on the encoder

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	GND	blue	Earth connection
2	Data +	white	Interface signals
3	Clock +	yellow	Interface signals
4	N.C.	grey	Not connected
5	N.C.	green	Not connected
6	N.C.	pink	Not connected
7	N.C.	black	Not connected
8	U _s	red	Operating voltage
9	N.C.	orange	Not connected
10	Data -	brown	Interface signals
11	Clock -	lilac	Interface signals
12	N. C.	orange/black	Not connected
	Screen		Housing potential

Caution! PINs labelled "N. C." must not be connected!

See chapter Accessories

Accessories for encoders

Technical Data		BKS09	SSI 2m	SSI 5m										
Housing	Aluminium													
Measuring wire (stainless)	Highly flexible stranded steel, Ø 0.6 mm (PA 12 sheathed)													
Measuring length	2 m max.													
	5 m max.													
Mass	1.5 kg approx.													
Type of code	24 Bit/Gray													
Path of code	Rising at wire pull-out													
Measuring step	0.05 mm													
Linearity	≤ ± 0.7 mm													
Repeatability	± 3 measuring steps													
Operating speed	3.5 m/sec. max.													
Wire acceleration	20 m/s ² max.													
Position forming time	0.1 ms													
Spring return force (typ.)														
Start/finish ¹⁾	5 N/6 N													
Start/finish ¹⁾	4 N/6 N													
Working temperature range	- 10 ... + 70 °C													
Storage temperature range	- 20 ... + 80 °C													
Permitted relative humidity ²⁾	90 %													
Life of wire draw mechanism ³⁾	800,000 cycles													
EMC ⁴⁾														
Resistance														
to shocks ⁵⁾	20/6 g/ms													
to vibration ⁶⁾	10 g (10 ... 2,000 Hz)													
Protection to IEC 60529 ⁷⁾	IP 52													
Operating voltage range (U_s)	12 ... 30 V													
Max. Power consumption	1.5 W													
Initialisation time ⁸⁾	150 ms													
Interface signals														
Clock +, Clock -, Data +, Data -	SSI max. clock frequency 1.0 MHz or min. LOW level (Clock +): 500 ns													

¹⁾ These values were measured at an ambient temperature of 25°C. There may be variations at other temperatures.

²⁾ Condensation not permitted

³⁾ Average values, which depend on the application.

At high operating speeds over great lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.

⁴⁾ To DIN EN 61000-6-2 and DIN EN 61000-6-3

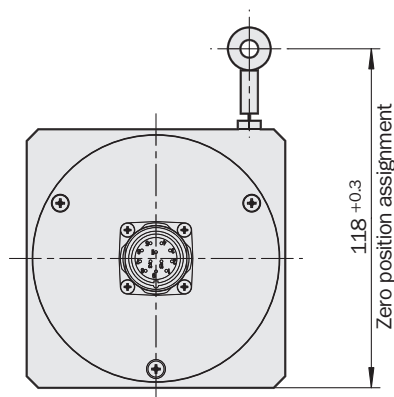
⁵⁾ To DIN EN 60068-2-27

⁶⁾ To DIN EN 60068-2-6

⁷⁾ Note required mounting position

⁸⁾ From the moment the supply voltage is applied, this is the time which elapses before the data word can be correctly read in.

Zero pulse assignment



Order information

BKS09; U_s 12 ... 30 V; connector M23, 12 pin

24 Bit SSI, Gray code, Measuring range starts at 0

Type	Part no.	Description
BKS09-ATBM0220	1035240	SSI, measuring length 2 m
BKS09-ATBM0520	1035241	SSI, measuring length 5 m

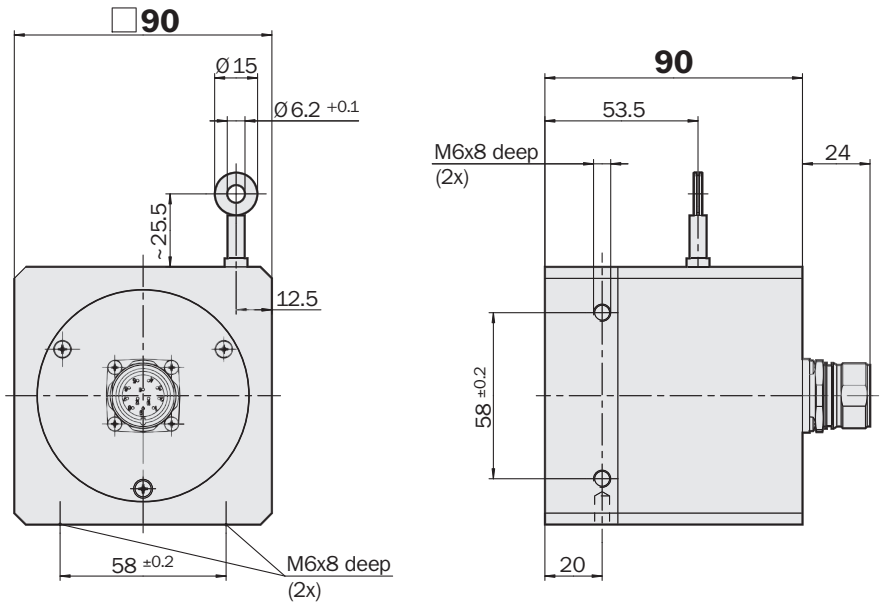
Resolution
0.05 mm

Incremental Wire draw encoder

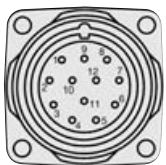
- Extremely compact construction
- High resolution
- Easy to mount
- High-precision measurement drum
- Stable spring return
- Highly flexible steel wire
- Robust aluminium housing



Dimensional drawing of wire draw encoder PKS09 TTL, measuring lengths 2 m and 5 m



General tolerances to DIN ISO 2768-mk



View of the M23 connector on the encoder

PIN and wire allocation

PIN	Signal	Wire colours (cable outlet)	Explanation
1	\bar{A}	black	Signal line
2	N. C.	grey	Not connected
3	Z	lilac	Signal line
4	\bar{Z}	yellow	Signal line
5	B	white	Signal line
6	\bar{B}	brown	Signal line
7	N. C.		Not connected
8	A	pink	Signal line
9	Screen		Housing potential
10	GND	blue	Earth connection
11	N. C.	green	Not connected
12	U_s	red	Supply voltage ¹⁾

¹⁾ Potential-free to housing

Caution! PINs labelled "N. C." must not be connected!

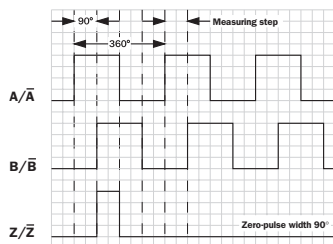
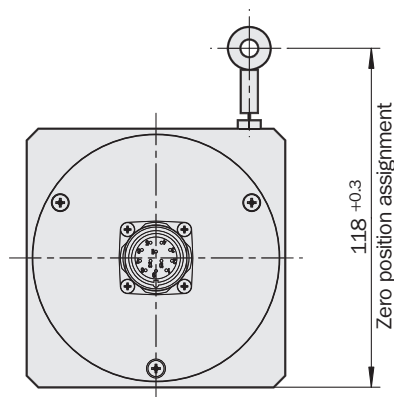
See chapter Accessories

Accessories for encoders

Technical Data		PKS09	TTL 2m	TTL 5m								
Housing	Aluminium											
Measuring wire (stainless)	Highly flexible stranded steel, Ø 0.6 mm (PA 12 sheathed)											
Measuring length	2 m max.											
	5 m max.											
Mass	1.5 kg approx.											
Electrical interfaces	TTL/RS 422, 6 channels											
Measuring step	0.05 mm ¹											
Reference signal	Number off 1/765 measuring steps											
Linearity	≤ ± 0.7 mm											
Repeatability	± 3 measuring steps											
Operating speed	3.5 m/sec. max.											
Wire acceleration	20 m/s ² max.											
Spring return force (typ.)												
Start/finish ¹⁾	5 N/6 N											
Start/finish ¹⁾	4 N/6 N											
Working temperature range	- 10 ... + 70 °C											
Storage temperature range	- 20 ... + 80 °C											
Permitted relative humidity ²⁾	90 %											
Life of wire draw mechanism ³⁾	800,000 cycles											
EMC ⁴⁾												
Resistance												
to shocks ⁵⁾	20/11 g/ms											
to vibration ⁶⁾	10 g (10 ... 150 Hz)											
Protection to IEC 60529 ⁷⁾	IP 52											
Operating voltage range (U_s)												
TTL/RS 422, 4,5 ... 5,5 V load current	max. 20 mA											
Operating current, no load												
at 5 V	60 mA typ.											
Initialisierungszeit nach Power on	40 ms											

- ¹⁾ These values were measured at an ambient temperature of 25°C. There may be variations at other temperatures.
- ²⁾ Condensation not permitted
- ³⁾ Average values, which depend on the application.
At high operating speeds over great lengths, this figure can decrease; at slow operating speeds over short lengths, it can increase.
- ⁴⁾ To DIN EN 61000-6-2 and DIN EN 61000-6-3
- ⁵⁾ To DIN EN 60068-2-27
- ⁶⁾ To DIN EN 60068-2-6
- ⁷⁾ Note required mounting position

Zero pulse assignment



¹ Based on the control/counter evaluating the edges of the A+B pulses.

Order information

PKS09; connector M23, 12 pin

Type	Part no.	Description
PKS09-ATBM0220	1035242	TTL 4.5 ... 5.5 V; measuring length 2 m
PKS09-ATBM0520	1035243	TTL 4.5 ... 5.5 V; measuring length 5 m

Dimensional drawings and order information

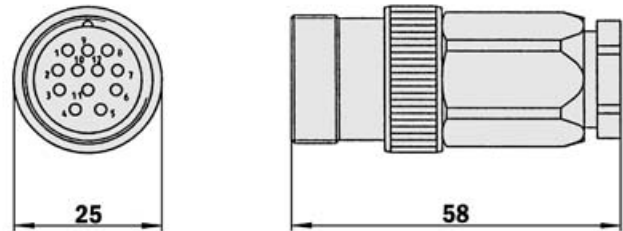
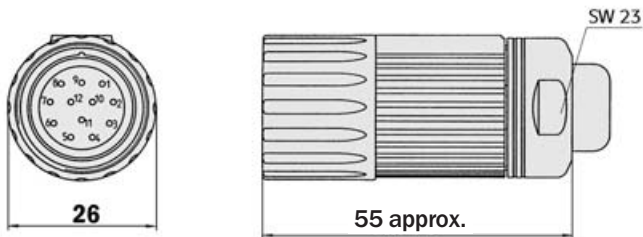
Round screw-in system M23, 12 pin for wire draw encoder BKS with SSI interface

Connector M23 female, 12 pin, straight

Type	Part no.	Contacts
DOS-2312-G	6027538	12

Connector M23 male, 12 pin, straight

Type	Part no.	Contacts
STE-2312-G	6027537	12



Connector M23 female, 12 pin, straight, cable 12 cores, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm² screened, capable of being dragged, cable diameter 7.8 mm for wire draw encoder BKS with SSI interface

Type	Part no.	Contacts	Cable length
DOL-2312-G1M5MA1	2029200	12	1.5 m
DOL-2312-G03MMA1	2029201	12	3.0 m
DOL-2312-G05MMA1	2029202	12	5.0 m
DOL-2312-G10MMA1	2029203	12	10.0 m
DOL-2312-G20MMA1	2029204	12	20.0 m
DOL-2312-G30MMA1	2029205	12	30.0 m

Connector M23 female, 12 pin, straight, cable 11 cores, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm² cable diameter 7.8 mm for wire draw encoder BKS with SSI interface

Type	Part no.	Contacts	Cable length
DOL-2312-G02MLA5	2030680	12	2.0 m
DOL-2312-G07MLA5	2030683	12	7.0 m
DOL-2312-G10MLA5	2030686	12	10.0 m
DOL-2312-G15MLA5	2030690	12	15.0 m
DOL-2312-G20MLA5	2030693	12	20.0 m
DOL-2312-G25MLA5	2030697	12	25.0 m
DOL-2312-G30MLA5	2030700	12	30.0 m

Cable, 8 core, per metre, 4 x 2 x 0.15 mm² with screen, cable diameter 5.6 mm

Type	Part no.	Wires
LTG-2308-MW	6027529	8

Cable, 11 cores, per metre, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm² with screen, cable diameter 7.5 mm

Type	Part no.	Wires
LTG-2411-MW	6027530	11

Cable, 12 cores, per metre, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm² with screen, capable of being dragged, cable diameter 7.8 mm for wire draw encoder BKS with SSI interface

Type	Part no.	Wires	Description
LTG-2512-MW	6027531	12	
LTG-2612-MW	6028516	12	Resistant to UV and salt water

Dimensional drawings and order information

Adaptor modules for wire draw encoder BTF with SSI interface

Serial Parallel Adaptors

Type	Part no.	Explanation
AD-SSIG-PA	1030106	SSI Parallel Adaptor module, in plastic housing
AD-SSI-PA	1030107	SSI Parallel Adaptor module, without plastic housing
AD-SSIPG-PA	1030108	SSI Parallel Adaptor module, programmable, in plastic housing
AD-SSIPF-PA	1030109	SSI Parallel Adaptor module, programmable, without plastic housing, with front plate
AD-SSIP-PA	1030110	SSI Parallel Adaptor module, programmable, without plastic housing, without front plate

Programming tool for programmable serial parallel adaptor

Type	Part no.
PGT-02-S	1030112

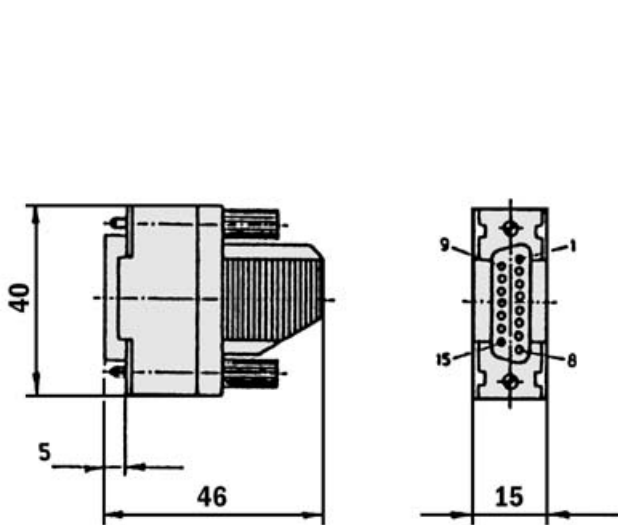
Plug-in system Sub-D connectors for serial parallel adaptor

Cable connector Sub-D male, 15 pin, straight, screened

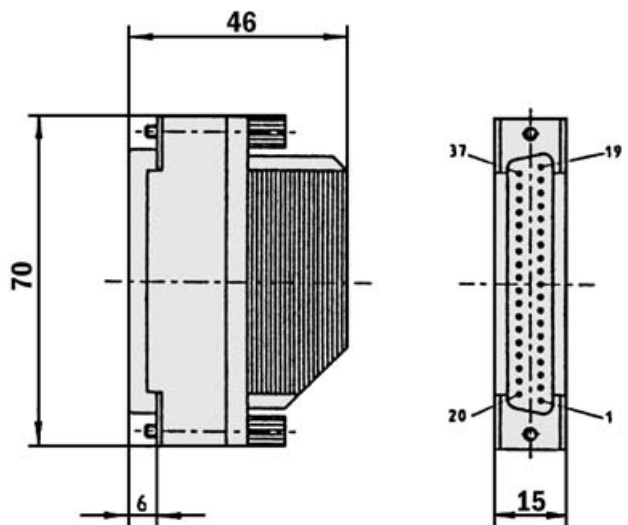
Type	Part no.	Contacts
STE-0D15-G	2029223	15

Cable connector Sub-D female, 37 pin, straight, screened

Type	Part no.	Contacts
DOS-0D37-G	2029224	37



General tolerances to DIN ISO 2768-mk



General tolerances to DIN ISO 2768-mk

Dimensional drawings and order information

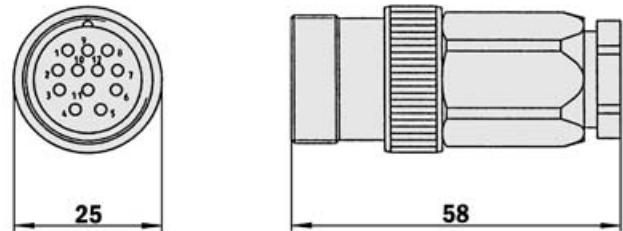
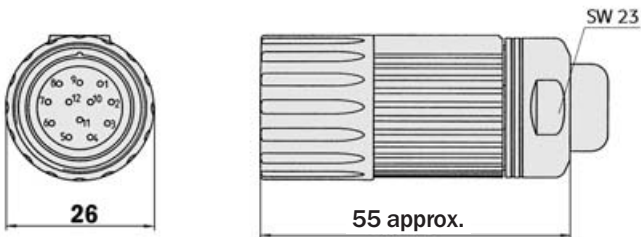
Round screw-in system M23, 12 pin for wire draw encoder PKS with TTL interface

Cable connector M23 female, 12 pin, straight

Type	Part no.	Contacts
DOS-2312-G	6027538	12

Cable connector M23 male, 12 pin, straight

Type	Part no.	Contacts
STE-2312-G	6027537	12



Cable connector M23 female, 12 pin, straight, Cable 12 core, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm² with screen, capable of being dragged, cable diameter 7.8 mm for wire draw encoder PKS with TTL interface

Type	Part no.	Contacts	Cable length
DOL-2312-G1M5MA3	2029212	12	1.5 m
DOL-2312-G03MMA3	2029213	12	3.0 m
DOL-2312-G05MMA3	2029214	12	5.0 m
DOL-2312-G10MMA3	2029215	12	10.0 m
DOL-2312-G20MMA3	2029216	12	20.0 m
DOL-2312-G30MMA3	2029217	12	30.0 m

Connector M23 female, 12 pin, straight, cable 11 cores, 4 x 2 x 0.25 + 2 x 0.5 + 2 x 0.14 mm² cable diameter 7.8 mm for wire draw encoder PKS with TTL interface

Type	Part no.	Contacts	Cable length
DOL-2312-G02MLA3	2030682	12	2.0 m
DOL-2312-G07MLA3	2030685	12	7.0 m
DOL-2312-G10MLA3	2030688	12	10.0 m
DOL-2312-G15MLA3	2030692	12	15.0 m
DOL-2312-G20MLA3	2030695	12	20.0 m
DOL-2312-G25MLA3	2030699	12	25.0 m
DOL-2312-G30MLA3	2030702	12	30.0 m

Cable, 8 core, per metre, 4 x 2 x 0.15 mm² with screen, cable diameter 5.6 mm

Type	Part no.	Wires
LTG-2308-MW	6027529	8

Cable, 11 core, per metre, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm² with screen, cable diameter 7.5 mm

Type	Part no.	Wires
LTG-2411-MW	6027530	11

Cable, 12 core, per metre, 4 x 2 x 0.25 + 2 x 0.5 + 1 x 0.14 mm² with screen, capable of being dragged, cable diameter 7.8 mm for wire draw encoder PKS with TTL interface

Type	Part no.	Wires	Description
LTG-2512-MW	6027531	12	
LTG-2612-MW	6028516	12	Resistant to UV and salt water

SICK