

ENCODER

SSI Multiturn Encoder



Series Sendix SSI F36

Key-Features:

- ***Solid and hollow shaft:***
maximum diameter 10 mm
- ***Housing diameter 36 up to 46 mm***
- ***Protection class IP67***
- ***Temperature range -40...+90 °C***
- ***High insensitivity***
- ***Maximum revolution speed 12.000 U/min***

Content:

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Absolute encoders – multiturn

**Compact
electronic multiturn, optical**

Sendix F3663 / F3683 (shaft / hollow shaft)

SSI / BiSS + incremental



The Sendix F36 multiturn with the patented Intelligent Scan Technology™ is an optical multiturn encoder in miniature format, without gears and with 100% insensitivity to magnetic fields.

With a size of just 36 x 42 mm it offers a through hollow shaft of up to 8 mm or a blind hollow shaft of up to 10 mm.



Safety-Lock™



High rotational speed



Temperature range
-40°C ... +90°C



High protection level



High shaft load capacity



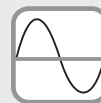
Shock / vibration resistant



Magnetic field proof



Reverse polarity protection



SinCos



Intelligent Scan Technology™



Surface protection salt spray-tested optional

Reliable and insensitive

- Sturdy bearing construction in Safety-Lock™ design for resistance against vibration and installation errors.
- Reduced number of components ensures magnetic insensitivity.
- IP67 protection and wide temperature range -40°C ... +90°C.
- Patented Intelligent Scan Technology™ (with all singleturn and multiturn functions on one single OptoASIC) - offering highest reliability, a high resolution up to 41 bits and 100% magnetic field insensitivity.

Optimized performance

- High precision with data refresh rate of the position value ≤ 1µs.
- High resolution feedback in real-time via incremental outputs SinCos and RS422.
- Short control cycles, clock frequency with SSI up to 2 MHz / with BiSS up to 10 MHz.

Order code Shaft version

8.F3663 . **XXXX** . **XXXX** **2**
Type a b c d e f g

a Flange

- 1 = clamping flange, IP67, ø 36 mm [1.42"]
3 = clamping flange, IP65, ø 36 mm [1.42"]
2 = synchro flange, IP67, ø 36 mm [1.42"]
4 = synchro flange, IP65, ø 36 mm [1.42"]

b Shaft (ø x L), with flat

- 1 = ø 6 x 12.5 mm [0.24 x 0.49"]
3 = ø 8 x 15 mm [0.32 x 0.59"]
5 = ø 10 x 20 mm [0.39 x 0.79"]
2 = ø 1/4" x 12.5 mm [0.49"]
4 = ø 3/8" x 5/8"

c Interface / power supply

- 1 = SSI, BiSS / 5 V DC
2 = SSI, BiSS / 10 ... 30 V DC
3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC
4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC
5 = SSI, BiSS / 5 V DC, with sensor output
6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output
7 = SSI, BiSS + 2048 ppr. RS422 / 5 V DC
8 = SSI, BiSS + 2048 ppr. RS422 / 10 ... 30 V DC

d Type of connection

- 1 = tangential cable, 1 m [3.28'] PUR**
3 = tangential cable, 5 m [16.40'] PUR
U = tangential cable, 10 m [32.81'] PUR
5 = tangential cable, 1 m [3.28'] PUR
with M12 connector for central fastening, 8-pin ¹⁾

e Code

- B = SSI, binary
C = BiSS, binary
G = SSI, gray

f Resolution (singleturn)

- B = 9 bit ST
A = 10 bit ST
2 = 12 bit ST
3 = 13 bit ST
4 = 14 bit ST
7 = 17 bit ST

g Resolution (multiturn)

- 2 = 12 bit MT**
6 = 16 bit MT
4 = 24 bit MT

Optional on request

- surface protection salt spray tested
- other singleturn resolutions

1) Only with interface 1 and 2.

Absolute encoders – multiturn

Compact electronic multiturn, optical		Sendix F3663 / F3683 (shaft / hollow shaft)		SSI / BiSS + incremental	
Order code		8.F3683		.XXXXX.XXXX2	
Hollow shaft		Type		a b c d e f g	
a Flange		c Interface / power supply		e Code	
1 = with spring element, short, IP65		1 = SSI, BiSS / 5 V DC		B = SSI, binary	
3 = with spring element, long, IP65		2 = SSI, BiSS / 10 ... 30 V DC		C = BiSS, binary	
2 = with stator coupling, IP65,		3 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC		G = SSI, gray	
ø 46 mm [1.81"]		4 = SSI, BiSS + 2048 ppr. SinCos / 10 ... 30 V DC		Optional on request	
b Through hollow shaft		5 = SSI, BiSS / 5 V DC, with sensor output			
1 = ø 6 mm [0.24"]		6 = SSI, BiSS + 2048 ppr. SinCos / 5 V DC, with sensor output		f Resolution (singleturn)	
3 = ø 8 mm [0.32"]		7 = SSI, BiSS + 2048 ppr. RS422 / 5 V DC		B = 9 bit ST	
2 = ø 1/4"		8 = SSI, BiSS + 2048 ppr. RS422 / 10 ... 30 V DC		A = 10 bit ST	
Blind hollow shaft		d Type of connection		2 = 12 bit ST	
(insertion depth max. 14.5 mm [0.57"])		1 = tangential cable, 1 m [3.28'] PUR		3 = 13 bit ST	
4 = ø 10 mm [0.39"]		3 = tangential cable, 5 m [16.40'] PUR		4 = 14 bit ST	
		U = tangential cable, 10 m [32.81'] PUR		7 = 17 bit ST	
		5 = tangential cable, 1 m [3.28'] PUR		g Resolution (multiturn)	
		with M12 connector for central fastening, 8-pin ¹⁾		2 = 12 bit MT	
				6 = 16 bit MT	
				4 = 24 bit MT	

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 1 + 3)	with fixing thread 	8.0010.4700.0000
Connection technology		Order no.
Cordset, pre-assembled	M12 female connector with coupling nut, 8-pin 2 m [6.56']	K8P2M-S-M12

Technical data		
Mechanical characteristics		
Maximum speed		
shaft version without shaft seal (IP65)	12000 min ⁻¹	
or blind hollow shaft version	10000 min ⁻¹ (continuous)	
Starting torque at 20°C [68°F]		
without shaft seal	< 0.007 Nm	
with shaft seal (IP67)	< 0.01 Nm	
Shaft load capacity		
radial	40 N	
axial	20 N	
Weight		
	approx. 0.2 kg [7.06 oz]	
Protection		
housing side	IP67	
acc. to EN 60529	shaft side	IP65 (solid shaft version opt. IP67)
Working temperature range		
		-40°C ... +90°C [-40°F ... +194°F]
Materials		
shaft / hollow shaft		stainless steel
flange		aluminum
housing		zinc die-cast
cable		PUR
Shock resistance acc. to EN 60068-2-27		
		2500 m/s ² , 6 ms
Vibration resistance acc. to EN 60068-2-6		
		100 m/s ² , 55 ... 2000 Hz

1) Only with output circuits 1 and 2.

Absolute encoders – multiturn

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Electrical characteristics

Power supply	5 V DC ($\pm 5\%$) or 10 ... 30 V DC	
Current consumption (no load)	5 V DC	max. 60 mA
	10 ... 30 V DC	max. 30 mA
Reverse polarity protection of the power supply	yes (only with 10 ... 30 V DC)	
Short-circuit proof outputs	yes ¹⁾	
UL approval	file 224618	
CE compliant acc. to	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU	

SSI interface

Output driver	RS485 transceiver type	
Permissible load / channel	max. ± 30 mA	
Signal level	HIGH	typ 3.8 V
	LOW with $I_{Load} = 20$ mA	typ 1.3 V
Resolution singleturn	10 ... 17 bit	
Number of revolutions (multiturn)	max. 24 bit	
Code	binary or gray	
SSI clock rate	50 kHz ... 2 MHz	
Data refresh rate	ST resolution ≤ 14 bit	$\leq 1 \mu s$
	ST resolution ≥ 15 bit	4 μs
	Monoflop time	$\leq 15 \mu s$

Note: If the clock cycle starts within the monoflop time a second data transfer begins with the same data. If the clock cycle starts after the monoflop time the cycle begins with the new values. The update rate is dependent on the clock speed, data length and monoflop time.

BiSS interface

Resolution singleturn	10 ... 17 bit	
Number of revolutions (multiturn)	max. 24 bit	
Code	binary	
BiSS Clock rate	50 kHz ... 10 MHz	
Max. update rate	< 10 μs , depends on the clock rate and the data length	
Data refresh rate	ST resolution ≤ 14 bit	$\leq 1 \mu s$
	ST resolution 17 bit	2.4 μs

Note:

- bidirectional, factory programmable parameters are: resolution, code, direction, alarms and warnings
- CRC data verification

Incremental outputs (A/B), 2048 ppr

	SinCos	RS422 TTL-compatible
Max. frequency -3dB	400 kHz	400 kHz
Signal level	1 Vpp ($\pm 20\%$)	HIGH: min. 2.5 V LOW: max. 0.5 V
Short circuit proof	yes ¹⁾	yes ¹⁾

Status output

Output driver	open collector, internal pull up resistor 22 kOhm	
Permissible load	max. 20 mA	
Signal level	HIGH	+V
	LOW	< 1 V
Active	LOW	

The status output serves to display various alarm or error messages. In normal operation the status output is HIGH (open collector with int. pull-up 22 kOhm).

An active status output (LOW) displays:
LED fault (failure or ageing) – over-temperature – undervoltage
In the SSI mode, the fault indication can only be reset by switching off the power supply to the device.

SET input

Input	active HIGH	
Input type	comparator	
Signal level (+V = power supply)	HIGH	min. 60 % of +V, max: +V
	LOW	max. 30 % of +V
Input current	< 0.5 mA	
Min. pulse duration (SET)	10 ms	
Input delay	1 ms	
New position data readable after	1 ms	
Internal processing time	200 ms	

The encoder can be set to zero at any position by means of a HIGH signal on the SET input. Other preset values can be factory-programmed. The SET input has a signal processing time of approx. 1 ms, after which the new position data can be read via SSI or BiSS. Once the SET function has been triggered, the encoder requires an internal processing time of typ. 200 ms; during this time the power supply must not be switched off.

The SET function should be carried out whilst the encoder is at rest.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

DIR input

Direction input: A HIGH signal switches the direction of rotation from the default cw to ccw. This inverted function can also be factory-programmed.

If this input is not used, it should be connected to 0 V (Encoder ground GND) in order to avoid interferences.

Response time (DIR input)	1 ms
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Power-ON

After Power-ON the device requires a time of approx. 150 ms before valid data can be read.

Hot plugging of the encoder should be avoided.

¹⁾ Short circuit proof to 0 V or to output when power supply correctly applied.

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SSI / BiSS

Terminal assignment

Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
1, 2	1, 3, U	SET, DIR, Status	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	Stat	⊥			
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	VT	shield			
Interface	Type of connection	Features	M12 connector, 8-pin													
1, 2	5	SET, DIR	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	⊥				
			Pin:	1	2	3	4	5	6	7	8	PH				
Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
3, 4	1, 3, U	SET, DIR, 2048 SinCos	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	A	$\bar{A}$	B	$\bar{B}$	⊥
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield
Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
5	1, 3, U	SET, DIR, Sensor output	Signal:	0 V	+V	C+	C-	D+	D-	SET	DIR	0 Vsens		+Vsens	⊥	
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	VT		RD-BU		shield
Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
6	1, 3, U	2048 SinCos, Sensor output	Signal:	0 V	+V	C+	C-	D+	D-	0 Vsens	+Vsens	A	$\bar{A}$	B	$\bar{B}$	⊥
			Cable color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY-PK	RD-BU	shield
Interface	Type of connection	Features	Cable (isolate unused wires individually before initial start-up)													
7, 8	1, 3, U	2048 incr. RS422	Signal:	0 V	+V	C+	C-	D+	D-	A	$\bar{A}$	B	$\bar{B}$	⊥		
			Cable color:	WH	BN	GN	YE	GY	PK	BK	VT	GY-PK	RD-BU	shield		

+V: Encoder power supply +V DC
 0 V: Encoder power supply ground GND (0 V)
 0 V_{sens} / +V_{sens}: Using the sensor outputs of the encoder, the voltage present can be measured and if necessary increased accordingly.
 C+, C-: Clock signal
 D+, D-: Data signal
 A, $\bar{A}$: Incremental output channel A (cosine)
 B, $\bar{B}$: Incremental output channel B (sine)
 SET: Set input
 DIR: Direction input
 Stat: Status output
 PH ⊥: Plug connector housing (shield)

Top view of mating side, male contact base



M12 connector, 8-pin

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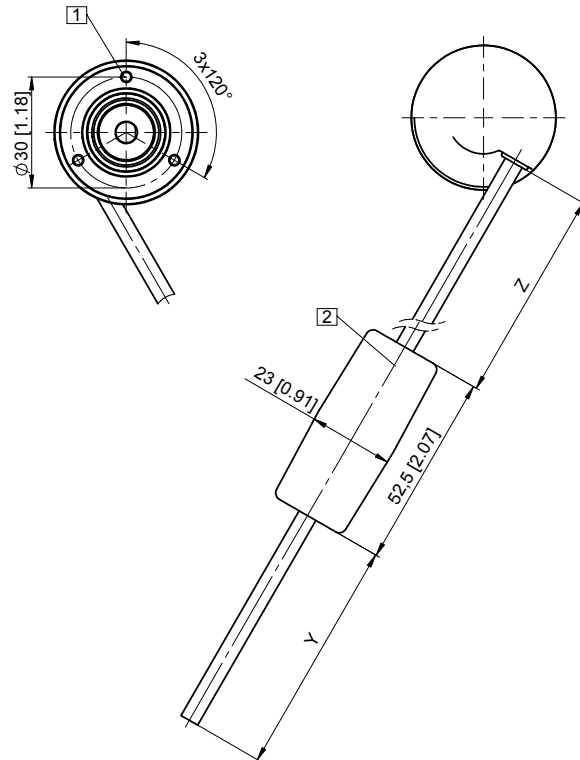
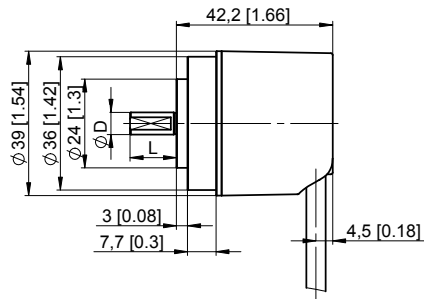
Dimensions shaft version

Dimensions in mm [inch]

Clamping flange, $\varnothing 36$ [1.42]

Flange type 1 and 3

- 1 3 x M3, 6 [0.24] deep
2 Battery (in the cable)



D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]
3/8"	h7	5/8"

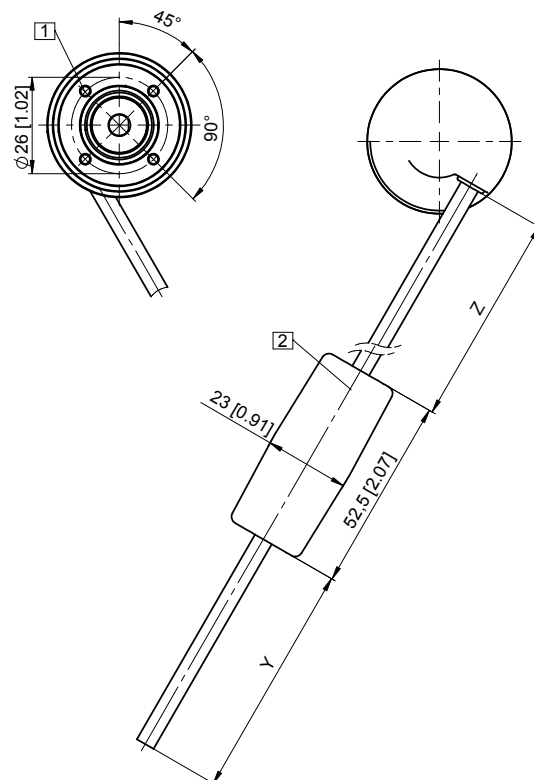
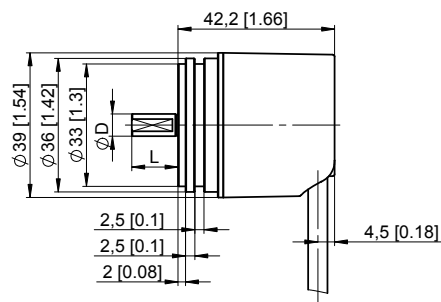
Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

Synchro flange, $\varnothing 36$ [1.42]

Flange type 2 and 4

(drawing with cable)

- 1 4 x M3, 6 [0.24] deep
2 Battery (in the cable)



D	Fit	L
6 [0.24]	h7	12.5 [0.49]
8 [0.32]	h7	15 [0.59]
10 [0.39]	f7	20 [0.79]
1/4"	h7	12.5 [0.49]
3/8"	h7	5/8"

Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

Absolute encoders – multitrans

Compact electronic multitrans, optical

Sendix F3663 / F3683 (shaft / hollow shaft)

SSI / BiSS

Dimensions hollow shaft version

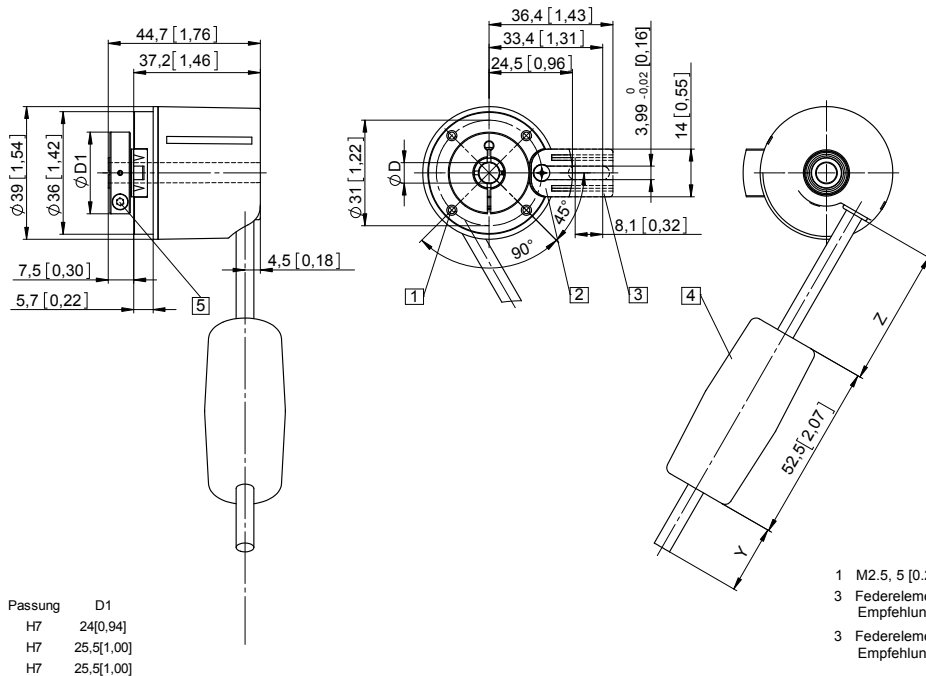
Dimensions in mm [inch]

Flange with spring element

Flange type 1 and 3

(drawing with spring element short, spring element long is shown dashed)

- 1 4 x M2.5, 5 [0.20] deep
- 2 Spring element, short recommendation: cylindrical pin DIN 7, $\varnothing$ 4 [0.16]
- 3 Spring element, long recommendation: cylindrical pin DIN 7, $\varnothing$ 4 [0.16]
- 4 Battery (in the cable)
- 5 Recommended torque for the clamping ring 0.6 Nm



D	Fit	D1
6 [0.24]	H7	24 [0.94]
8 [0.32]	H7	25.5 [1.00]
10 [0.39] *)	H7	25.5 [1.00]
1/4"	H7	24 [0.94]

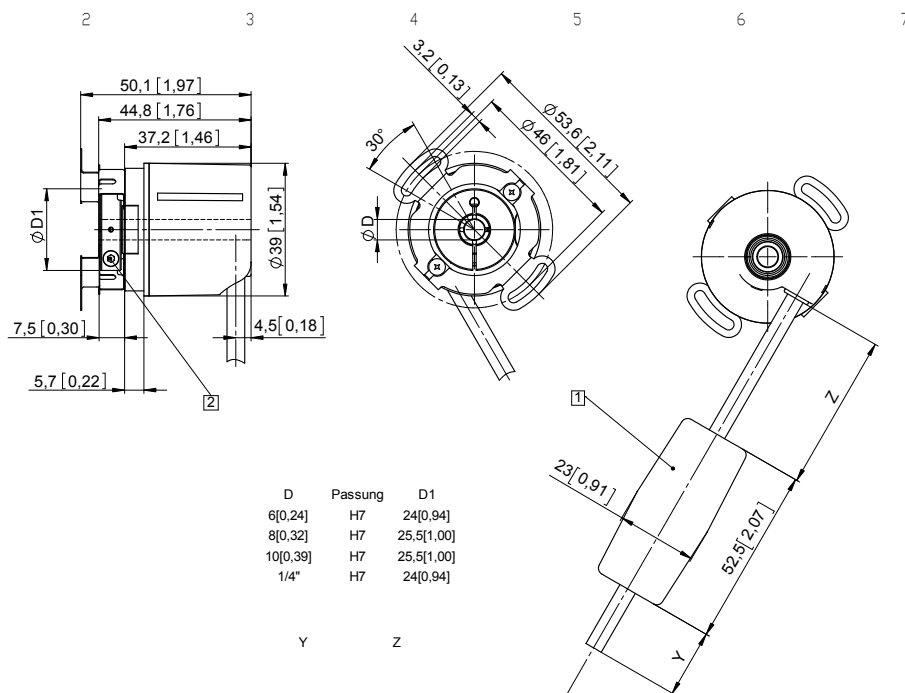
*) Blind hollow shaft, insertion depth max. = 14.5 mm [0.57"]

Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

Flange with stator coupling, $\varnothing$ 46 [1.81]

Flange type 2

- 1 Battery (in the cable)
- 2 Recommended torque for the clamping ring 0.6 Nm



D	Fit	D1
6 [0.24]	H7	24 [0.94]
8 [0.32]	H7	25.5 [1.00]
10 [0.39] *)	H7	25.5 [1.00]
1/4"	H7	24 [0.94]

*) Blind hollow shaft, insertion depth max. = 14.5 mm [0.57"]

Y	Z
1 m [3.28']	0.15 m [0.49']
5 m [16.40']	0.15 m [0.49']

Subject to change without prior notice.

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