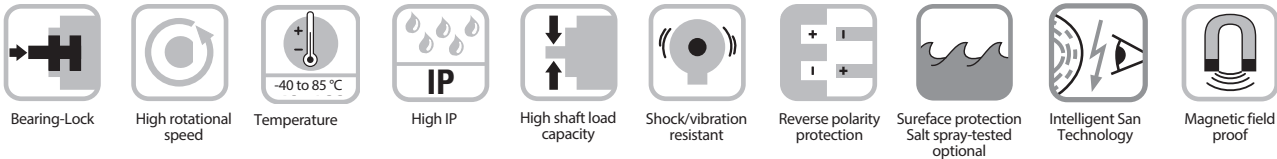


Absolute, Multiturn Type RM-103 (Shaft) / RM-104 (Hollow Shaft)

SSI/BISS



Reliable

- Sturdy bearing construction in Bearing-Lock design for resistance against vibration and installation errors.
- Ideal for use outdoors thanks to IP67 protection and wide temperature range from -40 to +85 °C.



Absolute



Versatile

- Available with SSI or BiSS interface and combined with SinCos incremental signals.
- The right fixing solution or type of connection available for every application.
- SET button and LED for simple start-up.
- 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.

Inensitive

- Turck OptoASIC technology with all singleturn and multiturn functions on one single OptoASIC - offering the highest reliability, a high resolution up to 41 bits and 100 % magnetic field insensitivity.

Mechanical Characteristics:

Max. speed shaft version:	
IP65 up to 158 °F 70 °C:	12000 RPM, continuous 10000 RPM
IP65 up to T max:	8000 RPM, continuous 5000 RPM
IP67 up to 158 °F 70 °C:	11000 RPM, continuous 9000 RPM
IP67 up to T max:	8000 RPM, continuous 5000 RPM
Max. speed hollow shaft version:	
IP65 up to 158 °F 70 °C:	9000 RPM, continuous 6000 RPM
IP65 up to T max:	6000 RPM, continuous 3000 RPM
IP67 up to 158 °F 70 °C:	8000 RPM, continuous 4000 RPM
IP67 up to T max:	4000 RPM, continuous 2000 RPM
Starting torque (68 °F 20 °C):	
IP65:	< 1.4 oz - in (0.01 Nm)
IP67:	< 7 oz - in (0.05 Nm)
Shaft load capacity:	
Radial:	18 lbs (80 N)
Axial:	9 lbs (40 N)
Mass moment of inertia:	
Shaft version:	0.16 oz - in ² (3.0 × 10 ⁻⁶ kgm ²)
Hollow shaft version:	0.328 oz - in ² (6.0 × 10 ⁻⁶ kgm ²)
Weight:	approx. 1.0 lbs (0.45 kg)
Protection acc. to EN 60529:	
Housing:	IP67
Shaft:	IP65, opt. IP67
Working temperature range:	-40 to +185 °F (-40+85 °C) ¹⁾
Materials:	
Shaft:	stainless steel
Flange:	aluminium
Housing:	zinc die-cast
Cable:	PVC
Shock resistance acc. to EN 60068-2-27:	250 g (2,500 m/s ²), 6 ms
Vibration resistance acc. to EN 60068-2-6:	10 g (100 m/s ²), 55 - 2,000 Hz

Rotary Position Technology

Absolute Encoders, Multiturn

Absolute, Multiturn Type RM-103 (Shaft) / RM-104 (Hollow Shaft)

SSI/BiSS

General Electrical Characteristics:

Power supply:	5 VDC (+5%) or 10 - 30 VDC
Current consumption (no load): 5 VDC 10...30 VDC	max. 60 mA max. 30 mA
Reverse polarity protection at power supply (+V):	yes (at 10 - 30 VDC)
Short-circuit protected outputs:	yes ¹⁾
UL approval:	file E356899
CE compliant acc. to:	EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Interface Characteristics SSI:

Output driver:	RS485 transceiver type
Permissible load / channel:	max +/- 30 mA
Signal high:	typ 3.8 V
Signal level low with $I_{load} = 20 \text{ mA}$:	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: ST resolution ≥ 15 bit:	$\leq 1 \mu\text{s}$ 4 μs
Monoflop time:	$\leq 15 \mu\text{s}$

Note: If the clock starts cycling within the monoflop time, a second data transfer starts with the same data. If the clock starts cycling after the monoflop time, the data transfer starts 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 - 10MHz
Max. update rate:	$< 10 \mu\text{s}$, depends on the clock rate and the data length
Data refresh rate:	$\leq 1 \mu\text{s}$

Note:

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

¹⁾ Short circuit to 0V or to output; if power supply correctly applied

Status Output And LED:

Output driver:	open collector, internal pull up resistor 22 k Ω
Permissible load:	max 20 mA
Signal level:	HIGH: +V / LOW: $< 1V$
Active:	LOW

The optional LED (red) and the status output serve to display various alarm or error messages. In normal operation the LED is OFF and the status output is HIGH (open collector with int. pull up 22 k Ω).

An active status output (LOW) displays:

- sensor error, singleturn or multiturn (soiling, glass breakage etc.)
- LED fault (failure or aging)
- over- or under-temperature

In the SSI mode, the fault indication can only be reset by switching off the power-supply to the device.

Option 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 protected	yes ¹⁾	yes ¹⁾

SET Input:

Input characteristics:	active HIGH
Input type:	comparator
Signal level high:	min. 60% of +V (supply voltage), max: +V
Signal level low:	max. 30% of +V (supply voltage)
Input current:	$< 0.5 \text{ mA}$
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 while 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.

Absolute, Multiturn Type RM-103 (Shaft) / RM-104 (Hollow Shaft)

SSI/BiSS

Standard Wiring:

Output Circuit *C and *F (2 Control Inputs, 1 Status Output) (Connection C*1M or 12M23*)

Connection Type:	Common (0 V)	+V	+Clock	-Clock	+Data	-Data	ST	DIR	Status	NC	NC	NC	PE
M23 Multifast:	1	2	3	4	5	6	7	8	9	10	11	12	PH
Cable:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	-	-	Shield

Output Circuit *H (2 Control Inputs, 1 Status Output, Voltage Monitor Outputs) (Connection C*1M or 12M23*)

Connection Type:	Common (0 V)	+V	+Clock	-Clock	+Data	-Data	ST	DIR	Status	NC	0 V Sens	+V Sens	PE
M23 Multifast:	1	2	3	4	5	6	7	8	9	10	11	12	PH
Cable:	WH	BN	GN	YE	GY	PK	BU	RD	BK	-	GY/PK	RD/BU	Shield

Output Circuit *E, *G, *K or *L (2 Control Inputs, Incremental Track or Sine/Cosine) (Connection C*1M or 12M23*)

Connection Type:	Common (0 V)	+V	+Clock	-Clock	+Data	-Data	ST	DIR	Sin A	Sin \bar{A}	Cos B	Cos	PE
M23 Multifast:	1	2	3	4	5	6	7	8	9	10	11	12	PH
Cable:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU	Shield

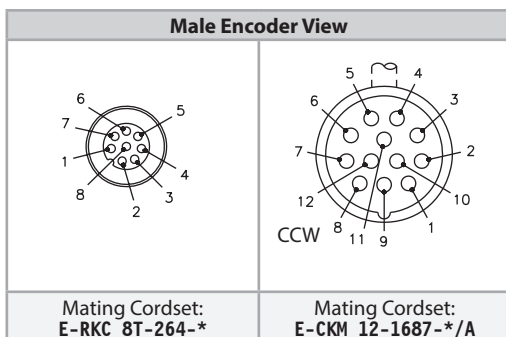
Output Circuit *J (Sine/Cosine Monitor or Voltage Outputs) (Connection C*1M or 12M23*)

Connection Type:	Common (0 V)	+V	+Clock	-Clock	+Data	-Data	Sin A	Sin \bar{A}	Cos B	Cos \bar{B}	0 V Sens	+V Sens	PE
M23 Multifast:	1	2	3	4	5	6	7	8	9	10	11	12	PH
Cable:	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU	Shield

Output Circuit *C and *F (2 Control Inputs) (Connection H1*81)

Connection Type:	Common (0 V)	+V	+Clock	-Clock	+Data	-Data	ST	DIR	PE
M12 Eurofast:	1	2	3	4	5	6	7	8	PH

Wiring Diagrams:



* Length in meters.

Rotary Position Technology

Absolute Encoders, Multiturn

Absolute, Multiturn Type RM-103 (Shaft) / RM-104 (Hollow Shaft)

SSI/BiSS

Part Number Key: RM-103 Shaft Version

A	B	C		D	E1	E2		F		G
RM-103S	6	C	-	5F	9S	12M	-	H1181	/	N16

A	Type
RM-103S	Ø 58 mm, Shaft w/ Flat, IP67 Shaft Seal
RM-103T	Ø 58 mm, Shaft w/ Flat, IP65 Shaft Seal

B	Shaft (Ø x L)
6	Ø 6 mm x 10 mm
10	Ø 10 mm x 20 mm
A0	Ø 1/4" x 7/8"
A1	Ø 3/8" x 7/8"

C	Flange
C	Ø 58 mm Clamping Flange
S	Ø 58 mm Servo Flange

D	Voltage Supply and Output Type			
	SSI (BINARY)	SSI (GRAY)	BiSS	Features
5 V	5F	3F	DF	—
	5E	3E	DE	2048 PPR SinCos
	5H	3H	DH	Voltage Monitoring
	5J	3J	DJ	2048 PPR SinCos Plus Voltage Monitoring
	5K	3K	DK	2048 PPR Incr., RS422 (TTL-compatible)
10 - 30 V	5C	3C	DC	—
	5G	3G	DG	2048 PPR SinCos
	5L	3L	DL	2048 PPR Incr., RS422 (TTL - compatible)

E1	Resolution (singleturn)
9S	9 bit
10S	10 bit
12S	12 bit
13S	13 bit
14S	14 bit
17S	17 bit

E2	Resolution (multiturn)
12M	12 bit
16M	16 bit
24M	24 bit

F	Type of Connection
H1181	Radial 8-pin M12 Eurofast Connector*
H1481	Axial 8-pin M12 Eurofast Connector*
12M23	Radial 12-pin M23 Multifast Connector
12M23A	Axial 12-pin M23 Multifast Connector
C1M	Radial Cable (1m PVC)
CA1M	Axial Cable (1m PVC)

* = only available with output type *C and *F

G	Options
(BLANK)	SET button and Status LED (standard)
N16	No Option
N43	Status LED

Absolute, Multiturn Type RM-103 (Shaft) / RM-104 (Hollow Shaft)

SSI/BiSS

Part Number Key: RM-104 Hollow Shaft Version

A	B	C		D	E1	E2		F		G
RM-104H	10	T	-	5F	9S	12M	-	H1181	/	N16

A	Type
RM-104H	Ø 58 mm, Hollow Shaft, IP67 Shaft Seal
RM-104I	Ø 58 mm, Hollow Shaft, IP65 Shaft Seal

B	Bore
10	Ø 10 mm
12	Ø 12 mm
14	Ø 14 mm
15	Ø 15 mm
A1	Ø 3/8"
A3	Ø 1/2"

C	Flange
T	Ø 50 mm Flange w/ Torque Stop
E	Ø 63 mm Flange w/ Slotted Flex Mount
E1	Ø 65 mm Flange w/ Flex Mount

D	Voltage Supply and Output Type			
	SSI (BINARY)	SSI (GRAY)	BiSS	Features
5 V	5F	3F	DF	—
	5E	3E	DE	2048 PPR SinCos
	5H	3H	DH	Voltage Monitoring
	5J	3J	DJ	2048 PPR SinCos Plus Voltage Monitoring
	5K	3K	DK	2048 PPR Incr., RS422 (TTL-compatible)
10 - 30V	5C	3C	DC	—
	5G	3G	DG	2048 PPR SinCos
	5L	3L	DL	2048 PPR Incr., RS422 (TTL - compatible)

E1	Resolution (singleturn)
9S	9 bit
10S	10 bit
12S	12 bit
13S	13 bit
14S	14 bit
17S	17 bit

E2	Resolution (multiturn)
12M	12 bit
16M	16 bit
24M	24 bit

F	Type of Connection
H1181	Radial 8-pin M12 Eurofast Connector*
12M23	Radial 12-pin M23 Multifast Connector
C1M	Radial Cable (1 m PVC)
CT1M	Tangential Cable (1 m PVC)

* = only available with output type *C and *F

G	Options
(BLANK)	SET button and Status LED (standard)
N16	No Option
N43	Status LED

Rotary Position Technology

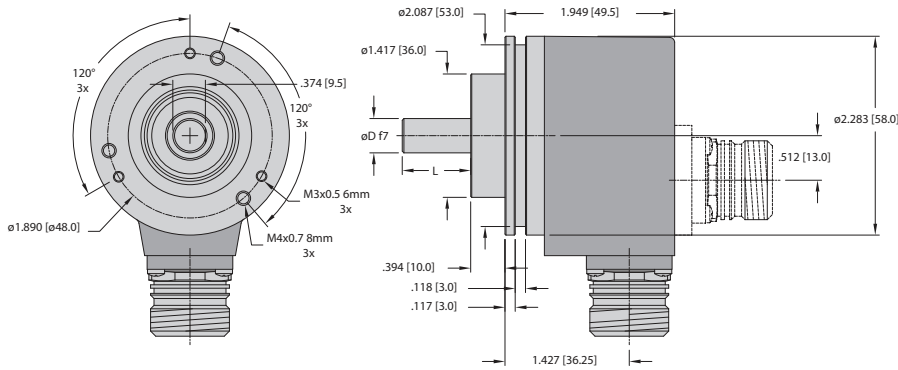
Absolute Encoders, Multiturn

Absolute, Multiturn Type RM-103 (Shaft) / RM-104 (Hollow Shaft)

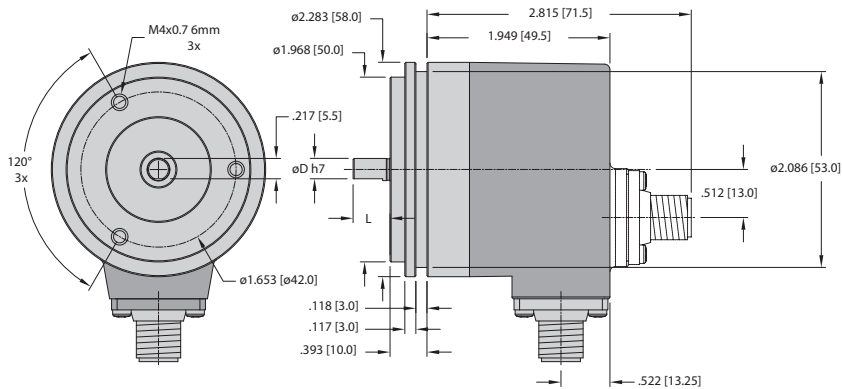
SSI/BiSS

Dimensions: RM-103 Shaft Version

RM-103 Flange C
Connection 12M23 & 12M23A



RM-103 Flange S
Connection H1181 & H1481



Mounting Advice:

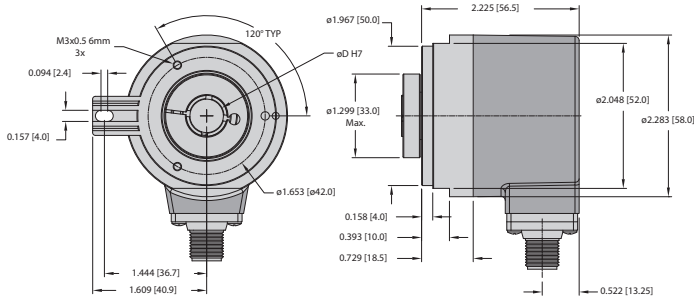
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page G1, Accessories).

Absolute, Multiturn Type RM-103 (Shaft) / RM-104 (Hollow Shaft)

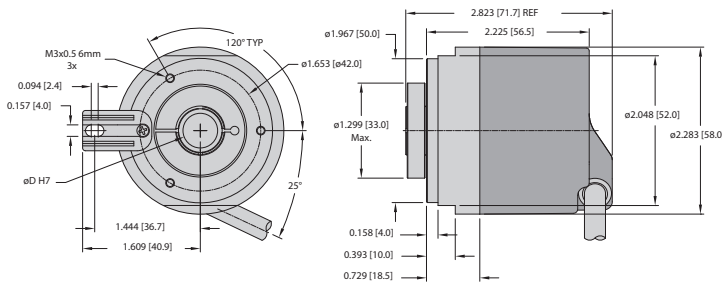
SSI/BISS

Dimensions: RM-104 Hollow Shaft Version

**RM-104 Flange T
 Connection H1181**

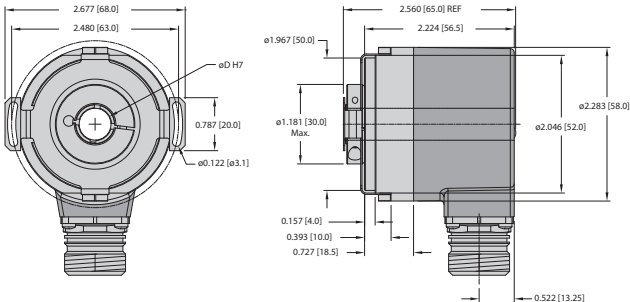


**RM-104 Flange T
 Connection CT1M**

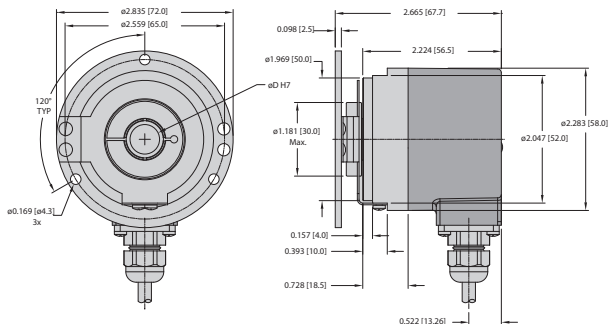


Dimensions: RM-104 Hollow Shaft Version

**RM-104 Flange E
 Connection 12M23**



**RM-104 Flange E1
 Connection C1M**



Mounting Advice:

The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page G1, Accessories).