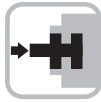


Rotary Position Technology

Absolute Encoders, Singleturn

Absolute, Singleturn Type RS-24 (Shaft) / RS-31 (Hollow Shaft)

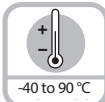
SSI/BiSS-C



Bearing-Lock



High rotational speed



Temperature



High IP



High shaft load capacity



Shock/vibration resistant



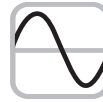
Magnetic field proof



Short-circuit protected



Reverse polarity protection



SIN/COS



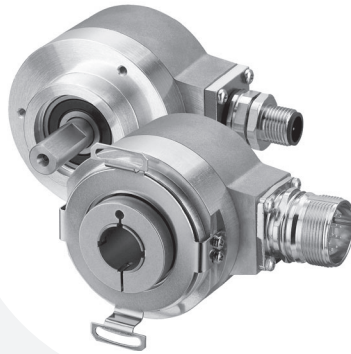
Optical sensor



Seawater-resistant version on request

Reliable

- **Increased ability to withstand vibration and installation errors.** Sturdy Bearing-Lock design structure eliminates machine downtime and repairs.
- **Fewer components and connection points increase the operational reliability.** Turck OptoASIC technology with highest integration density (Chip-on-Board).
- Die cast housing and protection up to IP67: **Remains sealed even when subjected to harsh everyday use.**
- Wide temperature range of -40 to +194 °F (-40 to +90 °C).
- **Easy diagnosis in case of fault condition.** Status indication by means of LED, sensor, voltage and temperature monitoring.



Absolute



Fast

- **High accuracy:** Update rate of the whole position value above 100 kHz for a max. jitter of 1 µs (real-time).
- **High productivity due to very short regulation cycles:** Clock rate with SSI up to 2 MHz, with BiSS-C up to 10 MHz.
- **High-resolution feedback system achievable in real-time:** SinCos incremental outputs.

Versatile

- **Connections for every application:** Cable, M12 connector or M12 connector.
- **Open interfaces ensure flexibility and independence:** SSI or BiSS-C with Sine-Cosine-Option.
- Multiple mounting brackets for easy installation.
- **Only the functionality really needed by the user is implemented:** Status LED and set key are optional.
- **Fast and easy start-up:** Set key or preset by means of a control input.
- **Direct mounting on large diameter shafts** through hollow shaft up to 15 mm.

Mechanical Characteristics:

Shaft Version:

Max. speed without shaft sealing (IP65) up to 158 °F (70 °C):	12,000 RPM, continuous 10,000 RPM
Max. speed without shaft sealing (IP65) up to Tmax:	8,000 RPM, continuous 5,000 RPM
Max. speed with shaft sealing (IP67) up to 158 °F (70 °C):	11,000 RPM, continuous 9,000 RPM
Max. speed with shaft sealing (IP67) up to Tmax:	8,000 RPM, continuous 5,000 RPM

Hollow Shaft Version:

Max. speed without shaft sealing (IP65) up to 158 °F (70 °C):	9,000 RPM, continuous 6,000 RPM
Max. speed without shaft sealing (IP65) up to Tmax:	6,000 RPM, continuous 3,000 RPM
Max. speed with shaft sealing (IP67) up to 158 °F (70 °C):	8,000 RPM, continuous 4,000 RPM
Max. speed with shaft sealing (IP67) up to Tmax:	4,000 RPM, continuous 2,000 RPM

Starting torque without shaft sealing (IP65):	Shaft version: < 1.4 oz-in (< 0.01 Nm) Hollow shaft version: < 4.25 oz-in (< 0.03 Nm)
---	--

Starting torque with shaft sealing (IP67):	< 7 oz-in (< 0.05 Nm)
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Moment of inertia:	Shaft version: 0.16 oz-in ² (3.0 x 10 ⁻⁶ kgm ²) Hollow shaft version: 0.328 oz-in ² (6.0 x 10 ⁻⁶ kgm ²)
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Radial load capacity of shaft:	18 lbs (80 N)
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Axial load capacity of shaft:	9 lbs (40 N)
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Weight:	approx. 0.77 lbs (0.35 kg)
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Protection acc. to EN 60 529:	Housing: IP67, Shaft: IP65, opt. IP67
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Working temperature:	-40 to +194 °F (-40 to +90 °C) ¹⁾
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Materials:	Shaft/hollow shaft: stainless steel, Flange: aluminum, Housing: die cast zinc, Cable: PVC
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Shock resistance acc. to DIN-IEC 68-2-27:	> 250 g (> 2,500 m/s ²), 6 ms
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Vibration resistance acc. to DIN-IEC 68-2-6:	> 10 g (>100 m/s ²), 55-2,000 Hz
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¹⁾ Cable versions: -22 to +167 °F (-30 to +75 °C)



Encoder with tangential cable outlet

Absolute, Singleturn Type RS-24 (Shaft) / RS-31 (Hollow Shaft)

SSI/BiSS-C

General Electrical Characteristics:

Supply voltage:	5 VDC + 5% or 10-30 VDC
Current consumption (without output load):	5 VDC: max. 70 mA, 10-30 VDC: max. 45 mA
Reverse polarity protection at power supply (+V):	Yes (only 10-30 VDC)
RoHS compliant acc. to EU guideline 2011/65/EU	
UL approval:	file E356899

General Interface Characteristics:

Output driver:	RS485 Transceiver type
Permissible load/channel:	max. 20 mA
Signal level high:	typ. 3.8 V
Signal level low at $I_{load} = 20 \text{ mA}$:	typ. 1.3 V
Short-circuit protected:	Yes ²⁾

Interface Characteristics SSI:

Singleturn resolution:	10-14 bits and 17 bits ³⁾
Code:	Binary or Gray
SSI clock rate:	$\leq 14 \text{ bit}$ 50 kHz-2 MHz $\geq 15 \text{ bit}$ 50 kHz-125 kHz
Monoflop time:	$\geq 15 \mu\text{s}$ ³⁾
Note: If clock starts cycling within monoflop time, a second data transfer starts with the same data. If clock starts cycling after monoflop time, the data transfer starts with updated values. Maximum update rate is dependent on clock speed, data length and monoflop time.	
Time jitter (data request to position latch):	$< 1 \mu\text{s}$ up to 14 bits, 4 μs at 15-17 bits
Status and Parity bit:	optional on request

Interface Characteristics BiSS-C:

Singleturn resolution:	10-14 bits and 17 bits customer programmable ³⁾
Code:	Binary
Interfaces:	RS485
Clock rate:	up to 10 MHz
Max. update rate:	$< 10 \mu\text{s}$, depending on clock speed and data length
Time jitter (data request to position latch):	$\leq 1 \mu\text{s}$
Note: • Bidirectional, programmable parameters are: resolution, code, direction, alarms and warnings • Multicycle data output, e.g. for temperature • CRC data verification	

²⁾ Short-circuit to 0 V or to output, one channel at a time, supply voltage correctly applied

³⁾ Other options upon request

SET (zero or defined value) and DiRection (CW/CCW) Control Inputs:

Input characteristics:	High active
Receiver type:	Comparator
Signal level high:	min. 60% of V+ (Supply voltage), max: V+
Signal level low:	max. 25% of V+ (Supply voltage)
Input current:	$< 0.5 \text{ mA}$
Min. pulse duration (SET):	10 ms
Timeout after SET input:	14 ms
Reaction Time (DIR input):	1 ms

The encoder can be set to zero at any position by means of a HIGH signal on the SET input or by pressing the optional SET key. Other preset values can be factory-programmed. The SET input has a signal delay time of approximately 1 ms. Once the SET function has been triggered, the encoder requires an internal processing time of approximately 15 ms before the new position data can be read. During this time, the LED is ON and the status output is at LOW.

Status Output and LED:

Output driver:	Open collector, internal pull up resistor 22 kOhm
Permissible load:	Max. 20 mA
Signal level high:	+V
Signal level low:	$< 1 \text{ V}$
Active at:	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 22k).

If the LED is ON (status output LOW) this indicates:

- Sensor error, singleturn or multiturn (soiling, glass breakage etc.)
- LED error, 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.

DIR Input:

A HIGH signal switches the direction of rotation from the default clockwise to counter-clockwise. This inverted function can also be factory-programmed. If DIR is changed when the device is already switched on, then this will be interpreted as an error. The LED will come ON and the status output will switch to LOW.

Option Incremental Output (A/B), 2048 ppr:

	Sin/Cos	RS422 (TTL compatible)
-3dB frequency:	400 kHz	400 kHz
Signal level:	1 Vpp ($\pm 20 \%$)	high: min. 2.5 V low: max. 0.5 V
Short-circuit proof:	Yes	Yes

Power-On Delay:

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

Rotary Position Technology

Absolute Encoders, Singleturn

Absolute, Singleturn Type RS-24 (Shaft) / RS-31 (Hollow Shaft)

SSI/BiSS-C

Standard Wiring:

Output Circuit *C or *F and (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 and (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, and (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 inv A-	Cos B	Cos inv B-	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

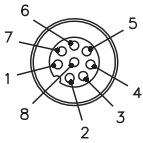
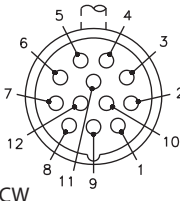
Output Circuit *J or *M, and (Sine/Cosine or Incremental Monitor, Voltage Outputs) (Connection C*1M or 12M23*)

Connection Type:	Common (0 V)	+V	+Clock	-Clock	+Data	-Data	Sin A	Sin inv A-	Cos B	Cos inv 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

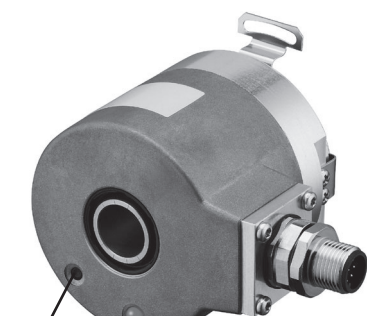
Output Circuit *C or *F, and (2 Control Inputs) (Connection H1*81)

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

Wiring Diagrams:

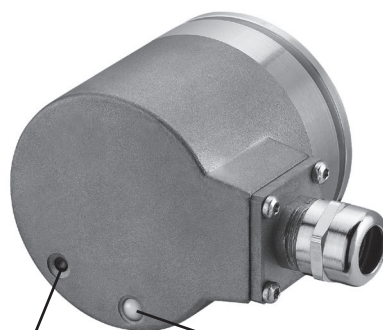
Male Encoder View	
 M12 Eurofast Pinout Mating Cordset: E-RKC 8T-264-*	 M23 Multifast Pinout Mating Cordset: E-CKM 12-1687-*/A

* Length in meters.



SET key:
For quick, simple
on-site start-up.

LED:
Status indication for sensor,
voltage and temperature
monitoring.



SET key:
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Status indication for sensor,
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Absolute, Singleturn Type RS-24 (Shaft) / RS-31 (Hollow Shaft)

SSI/BiSS-C

Part Number Key: RS-24 Shaft Version

A	B	C		D	E		F		G
RS-24S	6	C	-	5F	10B	-	H1181	/	N16

A	Type
RS-24S	Ø 58 mm, Shaft, IP67 Shaft Seal
RS-24T	Ø 58 mm, Shaft, 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
R	2.5" Square Flange

E	Resolution
10B	10 bit ST
11B	11 bit ST
12B	12 bit ST
13B	13 bit ST
14B	14 bit ST
17B	17 bit ST
21B	21 bit ST ¹

¹ Only available with output "F" and "C"

F	Type of Connection
H1181	Radial 8-pin M12 Eurofast Connector ²
H1481	Axial 8-pin M12 Eurofast Connector ²
12M23	Radial 12-pin M23 Multifast Connector
12M23A	Axial 12-pin M23 Multifast Connector
C1M	Radial Cable (1 m PVC)
CA1M	Axial Cable (1 m PVC)

² Only available with output "F" and "C"

G	Options
(BLANK)	SET Button and Status LED (Standard)
N16	No Options
N43	Status LED

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

(B) = Binary, (G) = Gray

Rotary Position Technology

Absolute Encoders, Singleturn

Absolute, Singleturn Type RS-24 (Shaft) / RS-31 (Hollow Shaft)

SSI/BiSS-C

Part Number Key: RS-31 Hollow Shaft Version

A	B	C		D	E		F		G
RS-31H	10	E	-	5F	10B	-	H1181	/	N16

A	Type
RS-31H	Ø 58 mm, Hollow Shaft, IP67 Shaft Seal
RS-31I	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
E	Flange w/ Ø 63 mm Slotted Flex Mount
E1	Flange w/ Ø 65 mm Flex Mount
T	Flange w/ Torque Stop

E	Resolution
10B	10 bit ST
11B	11 bit ST
12B	12 bit ST
13B	13 bit ST
14B	14 bit ST
17B	17 bit ST
21B	21 bit ST ¹

¹ Only available with output "F" and "C"

F	Type of Connection
H1181	Radial 8-pin M12 Eurofast Connector ²
12M23	Radial 12-pin M23 Multifast Connector ²
C1M	Radial Cable (1 m PVC)
CT1M	Tangential Cable (1 m PVC)

² Only available with output "F" and "C"

G	Options
(BLANK)	SET Button and Status LED (Standard)
N16	No Option
N43	Status LED

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

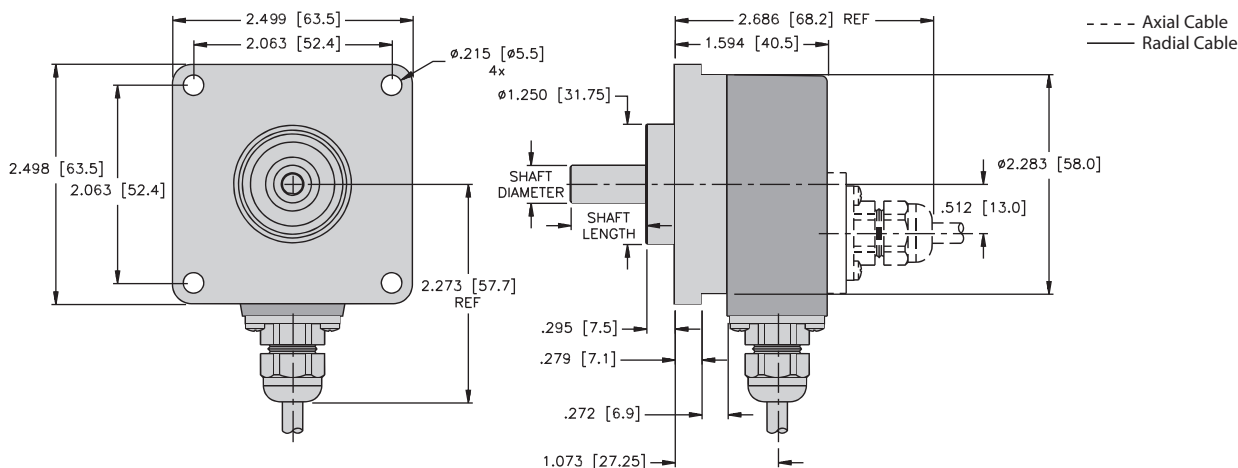
(B) = Binary, (G) = Gray

Absolute, Singleturn Type RS-24 (Shaft) / RS-31 (Hollow Shaft)

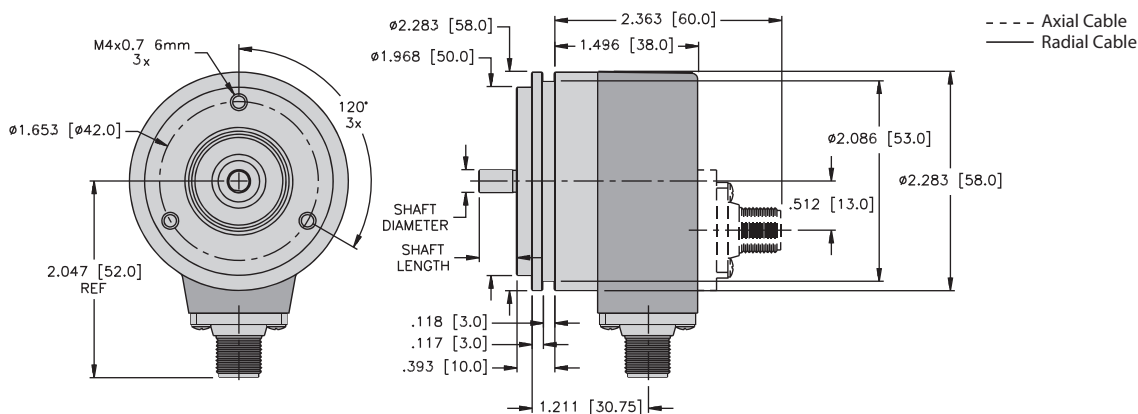
SSI/BiSS-C

Dimensions: RS-24 Shaft Version

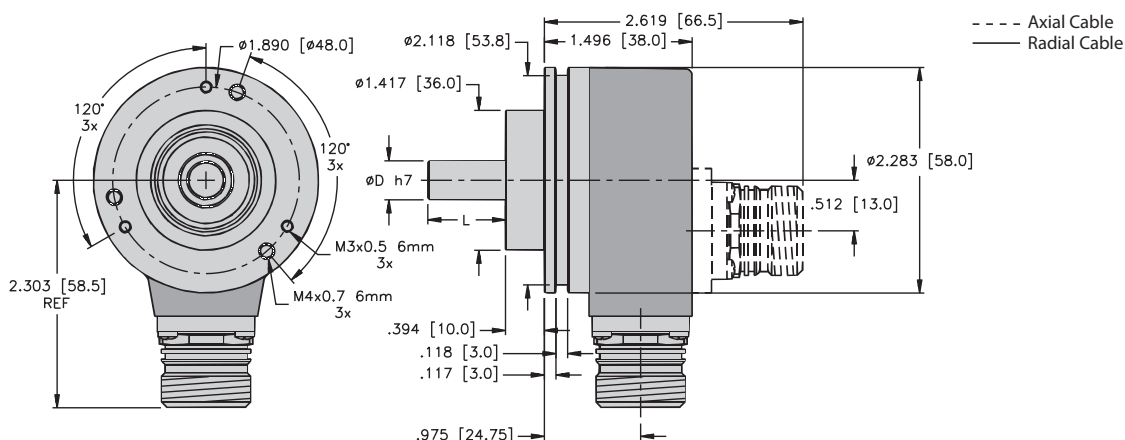
RS-24 Flange R
Connection C1M & CA1M



RS-24 Flange S
Connection H1181 & H1481

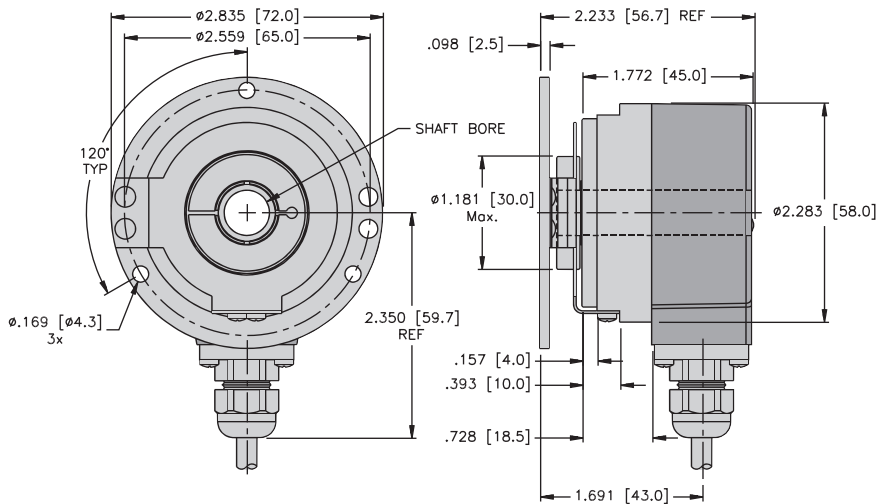


RS-24 Flange C
Connection 12M23 & 12M23A

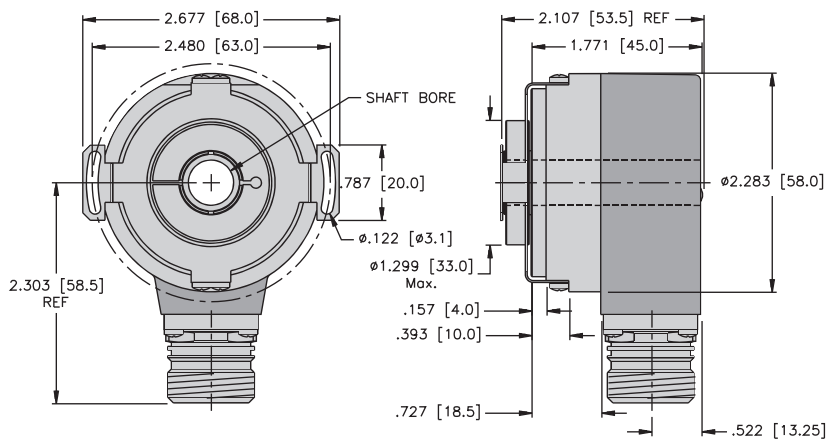


Dimensions: RS-31 Hollow Shaft Version

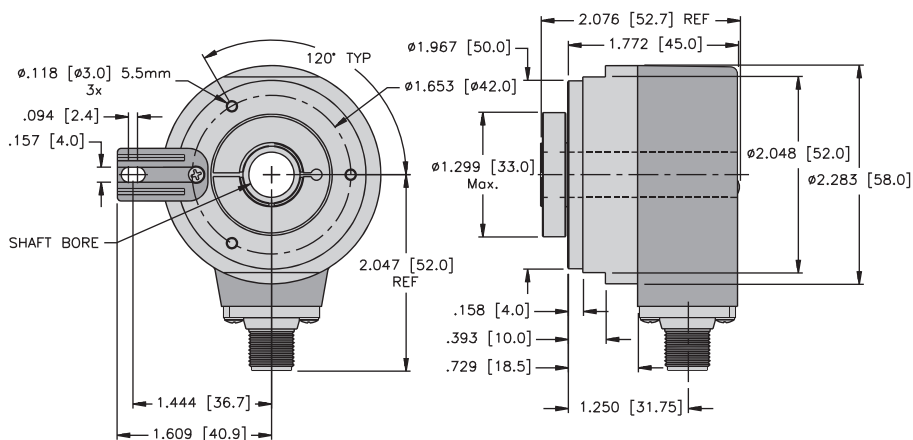
RS-31 Flange E1 Connection C1M



RS-31 Flange E Connection 12M23



RS-31 Flange T Connection H1181



Absolute, Singleturn Type RS-24 (Shaft) / RS-31 (Hollow Shaft)

SSI/BiSS-C

Dimensions: RS-31 Hollow Shaft Version

RS-31 Flange T Connection CT1M

