ROTARY POSITION TECHNOLOGY
INCREMENTAL ENCODERS

Miniature Type RI-01 (Shaft) / RI-02 (Blind Hollow Shaft)

High rotational speed | Temperature | Magnetic field proof | Short-circuit protected | Reverse polarity protection

Rugged
- Wide temperature range -4 to +185 °F (-20 to +85 °C)
- Robust strain relief on cable outlet
- Highly flexible cable withstands constant flexing from 32 to 158 °F (0 to 70 °C)
- Very high EMC standard Turck encoder type RI-01, RI-02 meet German Railways standard EN 50121

RoHS compliant

c UL us

Compact
- **Can be used where space is tight**
  Overall diameter of only 24 mm
  Shaft diameter min. 4 mm

Versatile
- Low power consumption despite high scanning rate
- Short-circuit proof
- Temperature compensation
- Broad input voltage range (5-24 V or 8-30 V)
- Shaft and hollow shaft up to 1024 ppr

Mechanical Characteristics:

Speed:	max. 12,000 RPM
Rotor moment of inertia:	approx. 5.5 x 10-3 oz-in2 (0.1 x 10-6 kgm^2)
Starting torque:	< 1.4 oz-in (< 0.01 Nm)
Radial load capacity of shaft:	2.25 lbs (10 N)
Axial load capacity of shaft:	4.5 lbs (20 N)
Weight:	approx 0.14 lbs (0.06 kg)
Protection acc. to EN 60529:	IP65 housing side, IP50 shaft side (IP64 on request)
Working temperature:	-4 to 185 °F (-20 to +85 °C)
Materials:	Shaft: stainless steel Blind hollow shaft: brass
Shock resistance acc. to EN 60068-2-27:	100 g (1,000 m/s^2), 6 ms
Vibration resistance acc. to EN 60068-2-6:	10 g (100 m/s^2), 55-2,000 Hz

Electrical Characteristics:

Output circuit [Key Code]:	Push-Pull [1D/2D] (7272 compatible) [3]	Push-Pull [1A/2A] (7272 compatible) [3]
Supply voltage:	5-24 VDC [5]	8-30 VDC
Power consumption (no load):	max. 50 mA	max. 50 mA
Permissible load/channel:	max. 50 mA	max. 50 mA
Pulse frequency:	max. 160 kHz	max. 160 kHz
Signal level high:	min. +V -2.5 V	min. +V -3 V
Signal level low:	max. 0.5 V	max. 0.5 V
Rise time t_r:	max. 1 µs	max. 1 µs
Fall time t_f:	max. 1 µs	max. 1 µs
Short-circuit protected [1]:	yes [2] [4]	yes [2] [4]
UL approval:	file E356899	
RoHS compliant acc. to EU guideline 2011/65/EU		

[1] If supply voltage correctly applied
[2] Only one channel allowed to be shorted-out:
(If +V=5 V, short-circuit to channel, 0 V, or +V is permitted.)
(If +V=5-30 V, short-circuit to channel or 0 V is permitted.)
[3] Max. recommended cable length 30 m
[4] Approximately one minute
[5] With 24 VDC there is no tolerance above 24 VDC.
Please use output circuit 8-30 VDC.

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Miniature Type RI-01 (Shaft) / RI-02 (Blind Hollow Shaft)

Standard Wiring:

Connection Type	Case Ground	Common (0 V)	+V	A	$\overline{A}$	B	$\overline{B}$	Z	$\overline{Z}$
Cable	Shield/Drain	WH	BN	GN	-	YE	-	GY	-
Cable w/ Inverted Signals	Shield/Drain	WH	BN	GN	YE	GY	PK	BU	RD

Part Number Key: RI-01 Shaft Version

A	B	C		D	E		F
RI-01Q	5	F1	-	1A	1024	-	C

A	Type
RI-01Q	Ø 24 mm, Shaft w/ Flat, IP50 Shaft Seal
RI-01T	Ø 24 mm, Shaft, IP50 Shaft Seal

B	Shaft (Ø x L)
4	Ø 4 mm x 10 mm
5	Ø 5 mm x 10 mm [1]
6	Ø 6 mm x 10 mm
A0	Ø 1/4" x 10 mm [1]

[1] Available only with Type RI-01Q.

C	Flange
F1	Ø 24 mm
F2	Ø 30 mm
F3	Ø 28 mm

D	Voltage Supply and Output Type
1A	8-30 VDC, Push-Pull
1D	5-24 VDC, Push-Pull
2A	8-30 VDC, Push-Pull (w/ Inverted Signals)
2D	5-24 VDC, Push-Pull (w/ Inverted Signals)

E	Pulse Rate
4, 6, 8, 10, 16, 20, 25, 36, 40, 50, 60, 80, 100, 120, 125, 180, 200, 250, 300, 360, 400, 500, 512, 1000, 1024 (e.g. 360 pulses => 360) Other Pulse Rates Available on Request	

F	Type of Connection
C	Radial Cable (2 m PVC)
CA	Axial Cable (2 m PVC)

Part Number Key: RI-02 Blind Hollow Shaft Version

A	B	C		D	E		F
RI-02C	4	S3	-	1A	1024	-	C

A	Type
RI-02C	Ø 24 mm, Blind Hollow Shaft, IP50 Shaft Seal

B	Bore (14 mm Insertion Depth)
4	Ø 4 mm
6	Ø 6 mm
A0	Ø 1/4"

C	Flange
S3	Flange w/ Spring Element

D	Voltage Supply and Output Type
1A	8-30 VDC, Push-Pull
1D	5-24 VDC, Push-Pull
2A	8-30 VDC, Push-Pull (w/ Inverted Signals)
2D	5-24 VDC, Push-Pull (w/ Inverted Signals)

E	Pulse Rate
4, 6, 8, 10, 16, 20, 25, 36, 40, 50, 60, 80, 100, 120, 125, 180, 200, 250, 300, 360, 400, 500, 512, 1000, 1024 (e.g. 360 pulses => 360) Other Pulse Rates on Request	

F	Type of Connection
C	Radial Cable (2 m PVC)
CA	Axial Cable (2 m PVC)

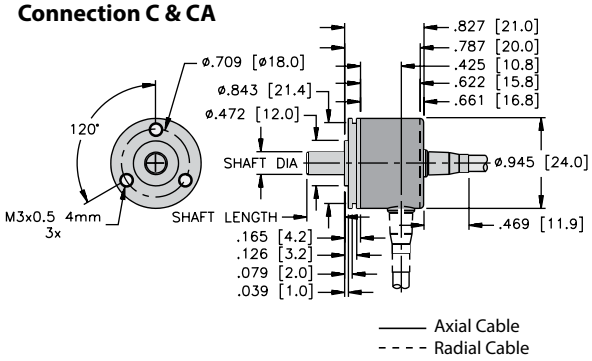
Accessories:

- See page H1, Connectivity, for cables and connectors
- See page G1, Accessories, for mounting attachments and couplings

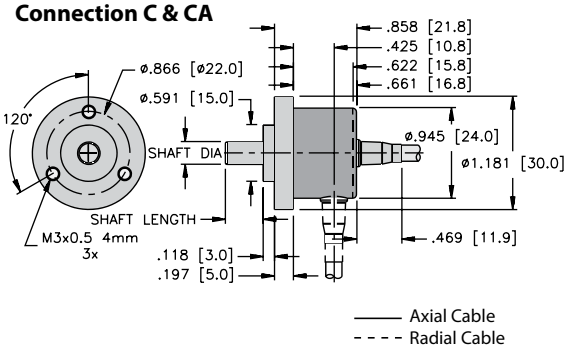
Miniature Type RI-01 (Shaft) / RI-02 (Blind Hollow Shaft)

Dimensions: RI-01 Shaft Version

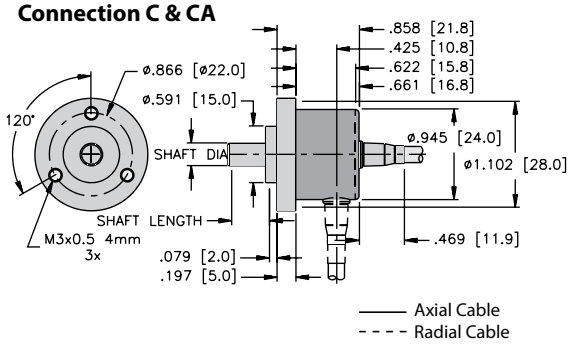
RI-01 Flange F1
Connection C & CA



RI-01 Flange F2
Connection C & CA



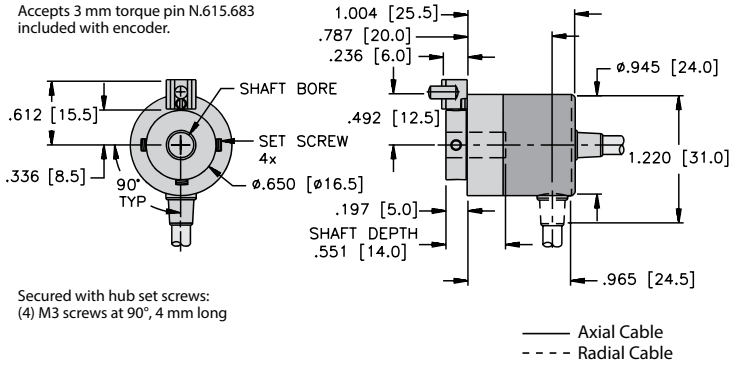
RI-01 Flange F3
Connection C & CA



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).

Dimensions: RI-02 Blind Hollow Shaft Version

RI-02 Flange S3
Connection C & CA



Mounting Advice:
The flanges and shafts of the encoder and drive should not both be rigidly coupled together at the same time. A cylindrical pin (RA-TP-3-S per ISO 2338-A-3m6 x 10), for use as a torque stop, is supplied.

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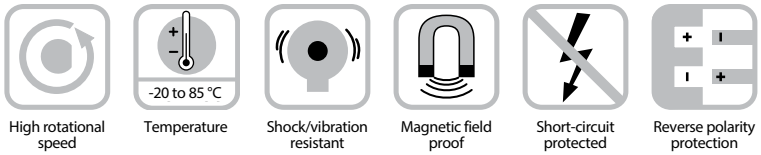
Compact Type RI-04 (Shaft) / RI-05 (Hollow Shaft)



High rotational speed | Temperature | Shock/vibration resistant | Magnetic field proof | Short-circuit protected | Reverse polarity protection

Rugged

- Chromated housing resistant to cooling lubricants and other environmental influences
- IP65 from housing side
- Robust strain relief on cable outlet.
- Highly flexible cable (withstands constant flexing at 32 to 158 °F (0 to 70 °C))
- Short-circuit proof
- Wide temperature range -4 to +185 °F (-20 to +85 °C)
- Temperature and aging compensation

Compact

- **Can be used where space is tight**
  Overall diameter of only 36.5 mm
  Shaft diameter min. 4 mm

Versatile

- Hollow shaft version: Fits directly onto drive shaft - no couplings needed - saves up to 30% on cost and 60% on installation space and time
- Universal application in mechanical engineering, vehicles, conveyors and elevators
- Low current consumption despite high scanning rate
- Broad input voltage range (5-18 V or 8-30 V)

Mechanical Characteristics:

Speed:	Shaft version: max. 12,000 RPM Hollow shaft version: max. 6,000 RPM
Rotor moment of inertia:	approx. 1.1 x 10-2 oz-in^2 (0.2 x 10-6 kgm^2)
Starting torque:	< 7 oz-in (< 0.05 Nm)
Radial load capacity of the shaft:	9 lbs (40 N)
Axial load capacity of the shaft:	4.5 lbs (20 N)
Weight:	approx. 0.175 lbs (0.08 kg)
Protection acc. to EN 60 529:	IP65, housing side, IP50 shaft side (IP64 on request)
Working temperature:	-4 to +185 °F (-20 to +85 °C)
Materials:	Shaft: stainless steel; Hollow shaft: brass Housing: chromated Aluminium Cable: PVC
Shock resistance acc. to EN 60068-2-27:	approx. 100 g (1,000 m/s^2), 6 ms
Vibration resistance acc. to EN 60068-2-6:	approx. 10 g (100 m/s^2), 55-2,000 Hz

Electrical Characteristics:

Output circuit [Key Code]:	Push-Pull [2I] (7272 compatible) [2]	Push-Pull [1H/2H] (7272 compatible) [2]	RS422 [4A/4D]
Supply voltage:	5-18 VDC	8-30 VDC	5 VDC(+/-5%) 8-30 VDC
Power consumption (no load) with inverted signal:	max. 40 mA	max. 40 mA	typ. 40 mA/max. 90 mA
Permissible load/channel:	max. ±20 mA	max. ±20 mA	max. ±20 mA
Pulse frequency:	max. 200 kHz	max. 200 kHz	max. 300 kHz
Signal level high:	min. +V -2.5 V	min. +V -3 V	min. 2.5 V
Signal level low:	max. 0.5 V	max. 0.5 V	max. 0.5 V
Rise time t_r:	max. 1 µs	max. 1 µs	max. 200 µs
Fall time t_f:	max. 1 µs	max. 1 µs	max. 200 µs
Short-circuit protected [1]:	yes	yes	yes
Reverse polarity protection:	yes	yes	yes
UL approval:	file E356899		
RoHS compliant acc. to EU guideline 2011/65/EU			

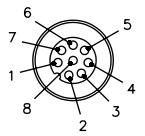
[1] If supply voltage correctly applied
[2] Max. recommended cable length 30 m

Compact Type RI-04 (Shaft) / RI-05 (Hollow Shaft)

Standard Wiring:

Connection Type	Case Ground	Common (0 V)	+V	A	$\overline{A}$	B	$\overline{B}$	Z	$\overline{Z}$
M12 Eurofast	Coupling Nut	1	2	3	4	5	6	7	8
Cable w/ Inverted Signals	Shield/Drain	WH	BN	GN	YE	GY	PK	BU	RD
Cable w/o Inverted Signals	Shield/Drain	WH	BN	GN	-	YE	-	GY	-

Wiring Diagram:

Male Encoder View
 M12 Eurofast pinout
Mating cordset: **E-RKC 8T-930-***

* Length in meters.

Part Number Key: RI-04 Shaft Version

A	B	C		D	E		F
RI-04Q	6	C	-	1H	25	-	H1181

A	Type
RI-04Q	Ø 36 mm, Shaft w/ Flat, IP50 Shaft Seal
RI-04T	Ø 36 mm, Shaft, IP50 Shaft Seal

B	Shaft (Ø x L)
4	Ø 4 mm x 10 mm [1]
5	Ø 5 mm x 10 mm [1]
6	Ø 6 mm x 12.5 mm [2]
A0	Ø 1/4" x 12.5 mm [2]

[1] Available only with Type RI-04T
[2] Available only with Type RI-04Q

C	Flange
C	Clamping Flange
S	Servo Flange

D	Voltage Supply and Output Type
1H	8-30 VDC, Push-Pull
2H	8-30 VDC, Push-Pull (w/ Inverted Signals)
2I	5-18 VDC, Push-Pull (w/ Inverted Signals)
4A	5 VDC, RS422 (w/ Inverted Signals)
4D	8-30 VDC, RS422 (w/ Inverted Signals)

E	Pulse Rate
	25, 100, 200, 360, 500, 512, 600, 1000, 1024, 1250, 1500, 2000, 2048, 2500, 3600 (e.g. 500 Pulses => 500) Other Pulse Rates Available on Request

F	Type of Connection
H1181	Radial 8-pin M12 Eurofast Connector
H1481	Axial 8-pin M12 Eurofast Connector
C	Radial Cable (2 m PVC)
CA	Axial Cable (2 m PVC)

Part Number Key: RI-05 Hollow Shaft Version

A	B	C		D	E		F
RI-05I	6	E	-	1H	25	-	H1181

A	Type
RI-05I	Ø 36 mm, Hollow Shaft, IP50 Shaft Seal

B	Shaft (Ø x L)
6	Ø 6 mm
8	Ø 8 mm
A0	Ø 1/4"

C	Flange
E	Ø 19 mm Flange w/ Slotted Flex Mount
T	Ø 19 mm Flange w/ Long Torque Stop
T1	Ø 19 mm Flange w/ Short Torque Stop

D	Voltage Supply and Output Type
1H	8-30 VDC, Push-Pull
2H	8-30 VDC, Push-Pull (w/ Inverted Signals)
2I	5-18 VDC, Push-Pull (w/ Inverted Signals)
4A	5 VDC, RS422 (w/ Inverted Signals)
4D	8-30 VDC, RS422 (w/ Inverted Signals)

E	Pulse Rate
	25, 100, 200, 360, 500, 512, 600, 1000, 1024, 1250, 1500, 2000, 2048, 2500, 3600 (e.g. 500 Pulses => 500) Other Pulse Rates Available on Request

F	Type of Connection
H1181	Radial 8-pin M12 Eurofast Connector
C	Radial Cable (2 m PVC)

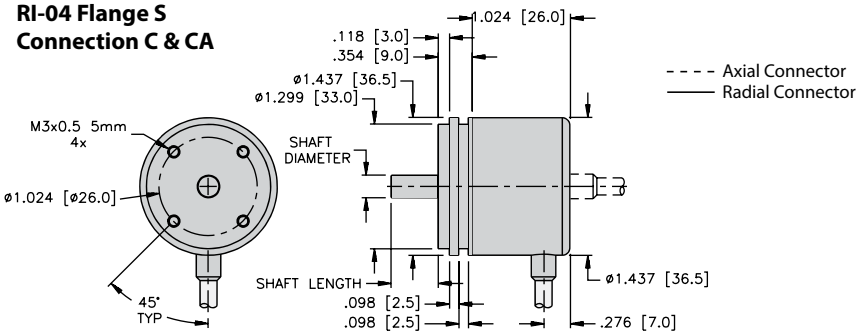
Accessories:

- See page H1, Connectivity, for cables and connectors
- See page G1, Accessories, for mounting attachments and couplings

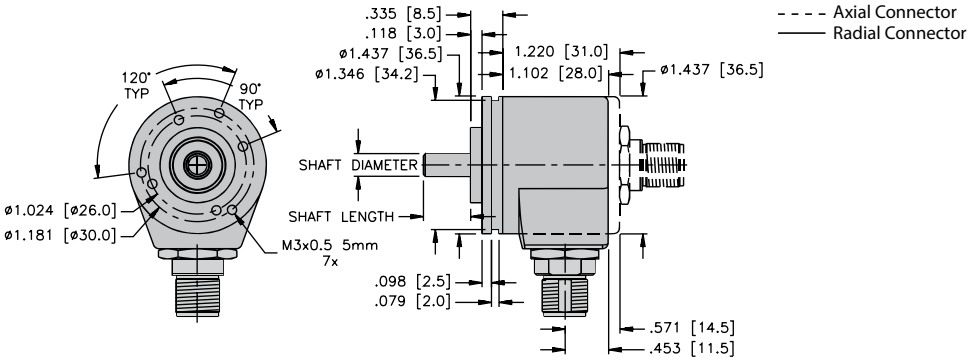
Compact Type RI-04 (Shaft) / RI-05 (Hollow Shaft)

Dimensions: RI-04 Shaft Version

RI-04 Flange S
Connection C & CA



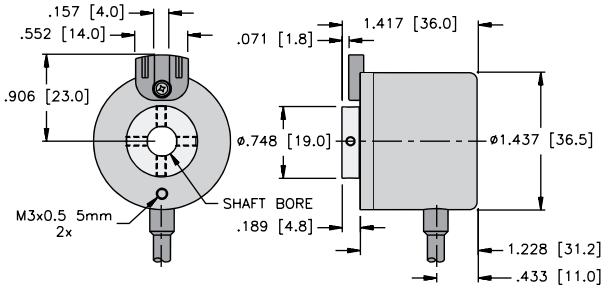
RI-04 Flange C
Connection H1181 & H1481



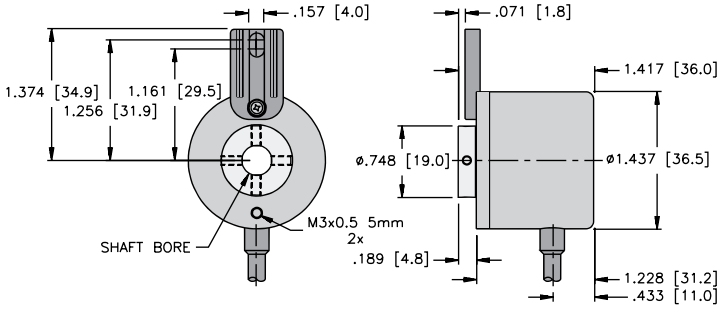
Mounting Advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page G1, Accessories).

Dimensions: RI-05 Hollow Shaft Version

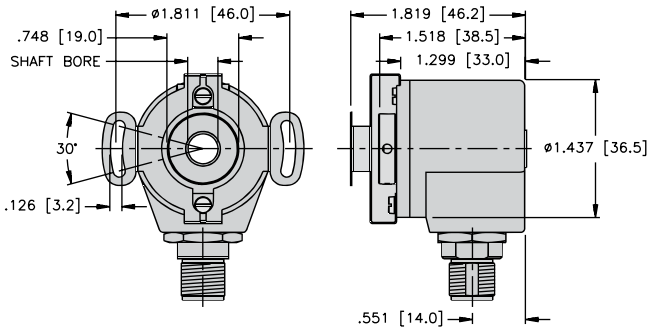
RI-05 Flange T1
Connection C



RI-05 Flange T
Connection C



RI-05 Flange E
Connection H1181



Economy Type RI-08 (Shaft) / RI-09 (Hollow Shaft)

High rotational speed | Temperature | Shock/vibration resistant | Magnetic field proof | Short-circuit protected | Reverse polarity protection | Optical sensor

Rugged
- Temperature and aging compensation
- Short-circuit protected outputs
- Flange and cover made from a new High-Tech-Material (composite material)
- High component integration leads to low profile design, high performance and economical pricing
- Cable outlet guarantees 10x higher strain relief than traditional cabling methods and ensures IP67 protection

RoHS compliant

Compact
- Compact size only Ø 37 x 33 mm

Versatile
- Hollow shaft version: Fits directly onto drive shaft - no couplings needed - saves up to 30% on cost and 60% on installation space and time
- 1 1/2" (37 mm) diameter housing suitable for replacing resolvers

Mechanical Characteristics:

Speed:	max. 6,000 RPM
Rotor moment of inertia:	Shaft version: approx. 2.2 x 10-2 oz-in^2 (0.4 x 10-6 kgm^2) Hollow shaft version: approx. 7.7 x 10-2 oz-in^2 (1.4 x 10-6 kgm^2)
Starting torque:	Shaft version: < 1.0 oz-in (< 0.007 Nm) Hollow shaft version: < 1.4 oz-in (< 0.01 Nm)
Radial load capacity of the shaft:	4.5 lbs (20 N)
Axial load capacity of the shaft:	2.25 lbs (10 N)
Weight:	approx. 0.22 lbs (0.1 kg)
Protection acc. to EN 60 529:	IP65 housing (IP67 on request)

Working temperature:	-4 to 158 °F (-20 up to +70 °C) [1]
Materials:	Shaft/hollow shaft: stainless steel; housing, flange: composite PPA, 40% CF (carbon fiber); cable: PVC
Shock resistance acc. to EN 60068-2-27:	approx. 100 g (1,000 m/s^2), 6 ms
Vibration resistance acc. to EN 60068-2-6:	approx. 10 g (100 m/s^2), 10-2,000 Hz

[1] For versions with push-pull output and supply voltage >15 VDC: max. 131 °F (55 °C)

Electrical Characteristics:

Output circuit [Key Code]:	RS422 [4A] (TTL compatible)	Push-Pull [2F] (7272 compatible) [3]	Push-Pull [2J] (7272 compatible) [3]
Supply voltage:	5 V (±5%)	5-30 VDC	10-30 VDC
Power consumption (no load) with inverted signal:	typ. 40 mA / max. 90 mA	typ. 50 mA / max. 100 mA	typ. 50 mA / max. 50 mA
Permissible load/channel:	max. ±20 mA	max. ±20 mA	max. ±20 mA
Pulse frequency:	max. 250 kHz	max. 250 kHz	max. 250 kHz
Signal level high:	min. 2.5 V	min. +V - 2.0 V	min. +V - 2.0 V
Signal level low:	max. 0.5 V	max. 0.5 V	max. 0.5 V
Rise time t_r:	max. 200 ns	max. 1 µs	max. 1 µs
Fall time t_f:	max. 200 ns	max. 1 µs	max. 1 µs
Short-circuit protected [1]:	yes [2]	yes	yes
Reverse polarity protection:	no	no	yes

RoHS compliant acc. to EU guideline 2011/65/EU

[1] If supply voltage correctly applied
[2] Only one channel allowed to be shorted-out: (If +V=5 V, short-circuit to channel, 0 V, or +V is permitted.) (If +V=5-30 V, short-circuit to channel or 0 V is permitted.)
[3] Max. recommended cable length 30 m

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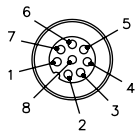
Economy Type RI-08 (Shaft) / RI-09 (Hollow Shaft)

Standard Wiring:

Connection Type	Case Ground	Common (0 V)	+V	A	$\overline{A}$	B	$\overline{B}$	Z	$\overline{Z}$
M12 Eurofast	Coupling Nut	1	2	3	4	5	6	7	8
Cable	Shield/Drain	WH	BN	GN	YE	GY	PK	BU	RD

Wiring Diagram:

Male Encoder View

M12 Eurofast Pinout
Mating Cordset: **E-RKC 8T-930-***

* Length in meters.

Part Number Key: RI-08 Shaft Version

A	B	C		D	E		F
RI-08Q	4	S	-	2F	10	-	C

A	Type
RI-08Q	Ø 37 mm, Shaft w/ Flat, IP65 Shaft Seal

B	Shaft (Ø x L)
4	Ø 4 mm x 12.5 mm
5	Ø 5 mm x 12.5 mm
6	Ø 6 mm x 12.5 mm
8	Ø 8 mm x 12.5 mm
A0	Ø 1/4" x 12.5 mm

C	Flange
S	Ø 20 mm Flange w/o Adapter
S1	Ø 20 mm Flange w/ Adapter

D	Voltage Supply and Output Type
2F	5-30 VDC, Push-Pull (w/ Inverted Signals)
2J	10-30 VDC, Push-Pull (w/ Inverted Signals)
4A	5 VDC (±5%), RS422 (w/ Inverted Signals)

E	Pulse Rate
	10, 25, 50, 60, 100, 200, 250, 300, 360, 400, 500, 512, 600, 1000, 1024 (e.g. 250 Pulses => 250) Other Pulse Rates Available on Request

F	Type of Connection
C	Radial Cable (2 m PVC)
C1M	Radial Cable (1 m PVC)
CA	Axial Cable (2 m PVC)
CA1M	Axial Cable (1 m PVC)

Part Number Key: RI-09 Hollow Shaft Version

A	B	C		D	E		F
RI-09I	4	E	-	2F	10	-	C

A	Type
RI-09I	Ø 36 mm, Hollow Shaft, IP65 Shaft Seal

B	Bore
4	Ø 4 mm
5	Ø 5 mm
6	Ø 6 mm
8	Ø 8 mm
A0	Ø 1/4"

C	Flange
E	Ø 19 mm Flange w/ Slotted Flex Mount
T	Ø 19 mm Flange w/ Long Torque Stop
T1	Ø 19 mm Flange w/ Short Torque Stop

D	Voltage Supply and Output Type
2F	5-30 VDC, Push-Pull (w/ Inverted Signals)
2J	10-30 VDC, Push-Pull (w/ Inverted Signals)
4A	5 VDC (±5%), RS422 (w/ Inverted Signals)

E	Pulse Rate
	10, 25, 50, 60, 100, 200, 250, 300, 360, 400, 500, 512, 600, 1000, 1024 (e.g. 250 Pulses => 250) Other Pulse Rates Available on Request

F	Type of Connection
C	Radial Cable (2 m PVC)
C1M	Radial Cable (1 m PVC)

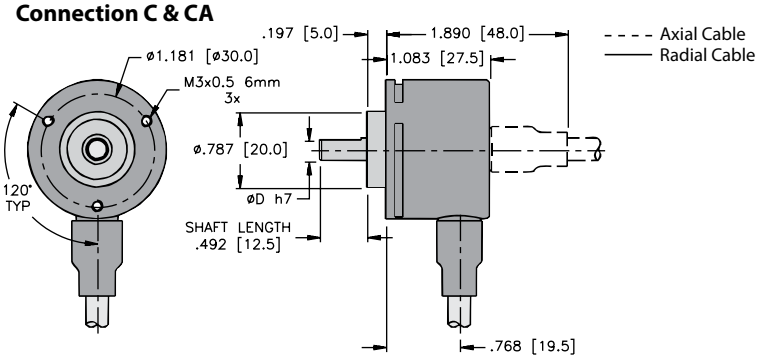
Accessories:

- See page H1, Connectivity, for cables and connectors
- See page G1, Accessories, for mounting attachments and couplings

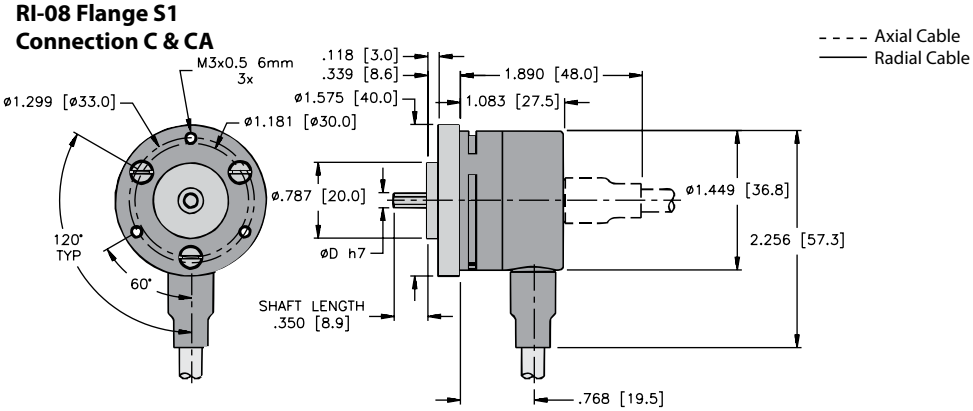
Economy Type RI-08 (Shaft) / RI-09 (Hollow Shaft)

Dimensions: RI-08 Shaft Version

RI-08 Flange S
Connection C & CA



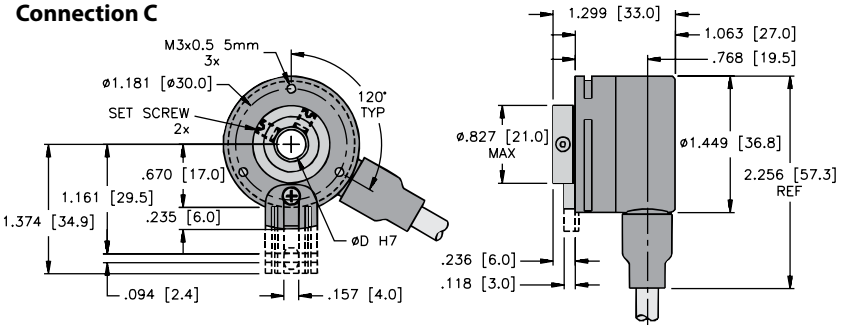
RI-08 Flange S1
Connection C & CA



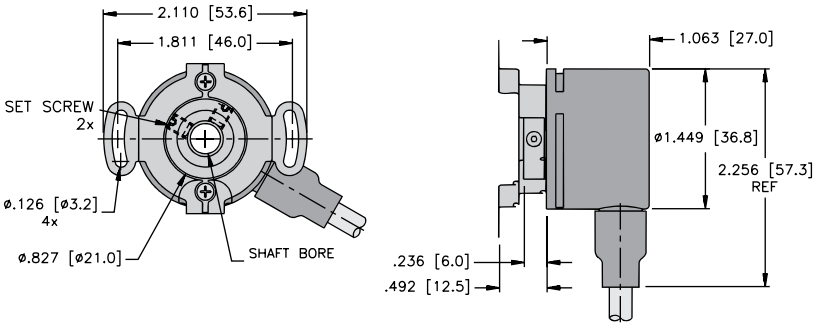
Mounting Advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page G1, Accessories).

Dimensions: RI-09 Hollow Shaft Version

RI-09 Flange T & T1
Connection C



RI-09 Flange E
Connection C



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Incremental Type RI-10 (Shaft) / RI-12 (Hollow Shaft)

Bearing-Lock | High rotational speed | Temperature | High IP | High shaft load capacity | Shock/vibration resistant | Magnetic field proof | Short-circuit protected | Reverse polarity protection | Optical sensor | Seawater-resistant version on request

Versatile

- **The right connection for every application:** Cable, M12 connector, M23 connector, and Mil-Spec Connectors.
- **Wide variety of standard industrial mounting options:** Servo, square, clamping flanges.
- **Standardized designs for worldwide use:** Compatible with US and European standards; 5-30 V supplies; Various output options; Up to 5,000 ppr.

RoHS compliant

c UL us

Compact

- **Small footprint:** Outer diameter 2" x 2" Can utilize 2" or 2.5" flanges.

Rugged and Tough

- **High tolerance to vibration, shock and alignment issues:** Sturdy double bearing lock design.
- **Environmentally protected design:** Die-cast housings; butyl rubber shaft seals and O-rings; robust stainless steel hubs, flanges, and disc tables. Ratings up to IP67.
- **Wide temperature range:** -40 to +185 °F (-40 to +85 °C)
- Also available in seawater resistant version, certified acc. to salt-spray test IEC 68-2-11 ≥ 672 hours

Mechanical Characteristics:

Speed IP65 [1]:	max. 12,000 RPM
Speed IP67 [2]:	max. 6,000 RPM
Rotor moment of inertia:	Shaft: approx. 0.098 oz-in² (1.8 x 10-6 kgm²) Hollow shaft: approx. 0.328 oz-in² (6.0 x 10-6 kgm²)
Starting torque:	< 1.4 oz-in (< 0.01 Nm), IP65 < 7 oz-in (< 0.05 Nm), IP67
Radial load capacity of the shaft:	18 lbs (80 N)
Axial load capacity of the shaft:	9 lbs (40 N)

Weight:	approx. 0.9 lbs (0.4 kg)
Protection acc. to EN 60 529 without shaft sealing:	IP65
Protection acc. to EN 60 529 with shaft sealing:	IP67
Working temperature[3]:	-40 to +185 °F (-40 to +85 °C)
Shaft:	stainless steel
Shock resistance acc. to EN 60068-2-27:	250 g (2,500 m/s²), 6 ms
Vibration resistance to EN 60068-2-6:	10 g (100 m/s²), 10-2,000 Hz

[1] For continuous operation 6000 RPM
[2] For continuous operation max. 3000 RPM
[3] With connector: -40 °F (-40 °C), cable fixed: -22 °F (-30 °C), cable moved: -4 °F (-20 °C)

Electrical Characteristics:

Output circuit [Key Code]:	RS 422 [4B] (TTL compatible)	RS 422 [4A] (TTL compatible)	Push-Pull [2B]	Push-Pull [2K] (7272 compatible) [3]	Open Collector [CA] (7273) [3]
Supply voltage:	5-30 VDC	5 V ±5%	10-30 V DC	5-30 V DC	5-30 V DC
Power consumption (no load):	typ. 40 mA max. 90 mA	typ. 40 mA max. 90 mA	typ. 50 mA max. 100 mA	typ. 50 mA max. 100 mA	100 mA
Permissible load/channel:	max. ±20 mA	max. ±20 mA	max. ±20 mA	max. ±20 mA	20 mA sink@30 VDC
Pulse frequency:	max. 300 kHz	max. 300 kHz	max. 300 kHz	max. 300 kHz	max. 300 kHz
Signal level high:	min. 2.5 V	min. 2.5 V	min. +V -1.0 V	min. +V -2.0 V	n/a
Signal level low:	max. 0.5 V	max. 0.5 V	max. 0.5 V	max. 0.5 V	n/a
Rise time t_r:	max. 200 ns	max. 200 ns	max. 1 µs	max. 1 µs	
Fall time t_f:	max. 200 ns	max. 200 ns	max. 1 µs	max. 1 µs	
Short-circuit protected [1]:	yes [2] [4]	yes [2] [4]	yes	yes [2] [4]	yes
Reverse polarity protection:	yes	no	yes	no	no
UL approval:	file E356899				
RoHS compliant acc. to EU guideline 2011/65/EU					

[1] If supply voltage correctly applied
[2] Only one channel allowed to be shorted-out: (If +V=5 V, short-circuit to channel, 0 V, or +V is permitted.) (If +V=5-30 V, short-circuit to channel or 0 V is permitted.)
[3] Max. recommended cable length 30 m
[4] Approximately one minute

Incremental Type RI-10 (Shaft) / RI-12 (Hollow Shaft)

Standard Wiring :

Connection Type	Case Ground	Common (0V)	+V	A	$\overline{A}$	B	$\overline{B}$	Z	$\overline{Z}$	N/C	N/C	0V [1] Sens	+V [2] Sens
M23 Multifast	Coupling Nut	10	12	5	6	8	1	3	4	-	-	11	2
MS 6-pin	-	A	B	E	-	D	-	C	-	-	-		
MS 7-pin	G	F	D	A	-	B	-	C	-	-	-		E
MS 10-pin	J	F	D	A	G	B	H	C	I	-	-		E
M12 Eurofast 8-pin	Coupling Nut	1	2	3	4	5	6	7	8	-	-		
M12 Eurofast 5-pin	Coupling Nut	3	1	4	-	2	-	5	-	-	-		
Cable	Shield/Drain	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU

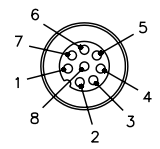
[1] The sensor cables are connected to the supply voltage internally. If long feeder cables are involved they can be used to adjust or control the voltage at the encoder.
[2] Isolate unused outputs before initial startup.

Special Pin Configuration:

		Connection Type	Case Ground	Common (0V)	+V	A	$\overline{A}$	B	$\overline{B}$	Z	$\overline{Z}$
Wiring Code	N41	M12 Eurofast 8-pin	Coupling Nut	7	2	1	3	4	5	6	8
	N35	MS 6-pin	-	A, F	B	D	-	E	-	C	-
	N38	MS 7-pin	G	F	D	A	C	B	E	-	-
	N40	MS 10-pin	G	F	D	A	H	B	I	C	J
	N78	M12 Eurofast 5-pin	Coupling Nut	1	2	3	-	4	-	5	-

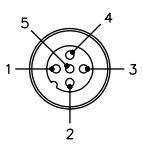
Wiring Diagrams:

Male Encoder View



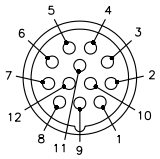
M12 Eurofast Pinout

Mating Cordset:
E-RKC 8T-930-*



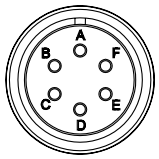
M12 Eurofast Pinout

Mating Cordset:
E-RKC 4.5T-930-*



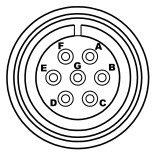
M23 Multifast Pinout

Mating Cordset:
E-CKM 12-931-*



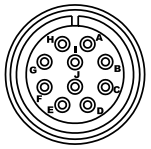
MS Pinout (6-pin)

Mating Cordset:
E-MK 6-0-*



MS Pinout (7-pin)

Mating Cordset:
E-MK 7-930-*



MS Pinout (10-pin)

Mating Cordset:
E-MK 10-931-*

* Length in meters.

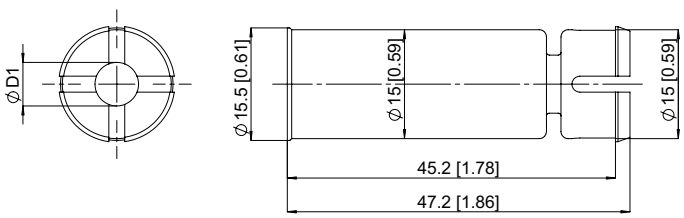
Incremental Type RI-10 (Shaft) / RI-12 (Hollow Shaft) Accessories - Inserts

Isolation/Adapter Inserts for Hollow Shaft Encoders

Thermal and Electrical Isolation of the Encoders:
Isolation inserts prevent currents from passing through the encoder bearings. These currents can occur when using inverter controlled three-phase or AC vector motors and considerably shorten the service life of the encoder bearings. In addition, the encoder is thermally isolated as the plastic does not transfer the heat to the encoder.

Tip:
By using these adapter inserts, you can achieve six different hollow shaft diameters, all on the basis of one 15 mm encoder.

Dimensions:



Isolation Insert	D1 [mm]	D1 [in]
RSA-6-12	6	
RSA-A0-12	6.35	(1/4)
RSA-10-12	10	
RSA-A1-12	9.53	(3/8)
RSA-12-12	12	
RSA-A3-12	12.7	(1/2)

Note: Use with 15 mm bore size hollow shaft RI-12 encoder.

Incremental Type RI-10 (Shaft)

Part Number Key: RI-10 Shaft Version

A	B	C		D	E		F		G/H
RI-10S	6	Z2	-	2B	1024	-	H1181	/	Specials

A	Type
RI-10S	Ø 2", Shaft, IP67 Shaft Seal
RI-10T	Ø 2", Shaft, IP65 Shaft Seal

B	Shaft (Ø x L)
6	Ø 6 mm x 10 mm
8	Ø 8 mm x 15 mm
10	Ø 10 mm x 20 mm
12	Ø 12 mm x 20 mm
A0	Ø 1/4" [1]
A1	Ø 3/8" [2]

[1] 1/4" x 5/8" for Flange Z2, Z4, C & S. 1/4" x 7/8" for Flange R & S0.
[2] 3/8" x 5/8" for Flange Z2, Z4, C & S. 3/8" x 7/8" for Flange R & S0.

C	Flange
Z2	Ø 2" Servo Flange
Z4	2" Square Flange
C	Ø 58 mm Clamping Flange
S	Ø 58 mm Servo Flange
R	2.5" Square Flange
S0	Ø 2.5" Servo Flange

D	Voltage Supply and Output Type
2B	10-30 VDC, Push-Pull
2K	5-30 VDC, Push-Pull (7272 comp. w/o bypass capacitor)
4A	5 VDC, RS422 (TTL compatible)
4B	5-30 VDC, RS422 (TTL compatible)
CA	5-30 VDC, Open Collector

E	Pulse Rate
1, 2, 4, 5, 10, 12, 14, 20, 25, 28, 30, 32, 36, 50, 60, 64, 80, 100, 120, 125, 150, 180, 200, 240, 250, 256, 300, 342, 360, 375, 400, 500, 512, 600, 625, 720, 800, 900, 1000, 1024, 1200, 1250, 1500, 1800, 2000, 2048, 2500, 3000, 3600, 4000, 4096, 5000 (e.g. 250 Pulses => 250) Other Pulse Rates Available on Request	

F	Type of Connection
H1181	Radial 8-pin M12 Eurofast Connector
H1481	Axial 8-pin M12 Eurofast Connector
H1151	Radial 5-pin M12 Eurofast Connector
H1451	Axial 5-pin M12 Eurofast Connector
12M23	Radial 12-pin M23 Multifast® Connector
12M23A	Axial 12-pin M23 Multifast Connector
6MIL	Radial 6-pin MS Connector
7MIL	Radial 7-pin MS Connector
10MIL	Radial 10-pin MS Connector
C1M	Radial Cable (1 m PVC)
CA1M	Axial Cable (1 m PVC)

G	Special Output Signal Formats
N21 to N33 (See Page E38)	

H	Special Connector Pin Configuration
N35 to N41 (See Page E12)	

Accessories:

- See page H1, Connectivity, for cables and connectors
- See page G1, Accessories, for mounting attachments and couplings

Incremental Type RI-12 (Hollow Shaft)

Part Number Key: RI-12 Hollow Shaft Version

A	B	C		D	E		F		G/H
RI-12H	6	S1	-	2B	1024	-	H1181	/	Specials

A	Type
RI-12H	Ø 2" Hollow Shaft, IP67 Shaft Seal
RI-12I	Ø 2" Hollow Shaft, IP65 Shaft Seal

B	Bore
6	Ø 6 mm
8	Ø 8 mm
10	Ø 10 mm
12	Ø 12 mm
14	Ø 14 mm
15	Ø 15 mm
A0	Ø 1/4"
A1	Ø 3/8"
A3	Ø 1/2"
A4	Ø 5/8"

C	Flange
S1	Flange w/ Long Tether Arm
T	Flange w/ Torque Stop*
E2	Ø 2.25" w/ Flex Mount
E	Ø 63 mm w/ Slotted Flex Mount
E1	Ø 65 mm w/ Flex Mount

* Requires 4 mm torque pin

D	Voltage Supply and Output Type
2B	10-30 VDC, Push-Pull
2K	5-30 VDC, Push-Pull (7272 comp. w/o bypass capacitor)
4A	5 VDC, RS422 (TTL compatible)
4B	5-30 VDC, RS422 (TTL compatible)
CA	5-30 VDC, Open Collector

E	Pulse Rate
1, 2, 4, 5, 10, 12, 14, 20, 25, 28, 30, 32, 36, 50, 60, 64, 80, 100, 120, 125, 150, 180, 200, 240, 250, 256, 300, 342, 360, 375, 400, 500, 512, 600, 625, 720, 800, 900, 1000, 1024, 1200, 1250, 1500, 1800, 2000, 2048, 2500, 3000, 3600, 4000, 4096, 5000 (e.g. 250 Pulses => 250) Other Pulse Rates Available on Request	

F	Type of Connection
H1181	Radial 8-pin M12 Eurofast Connector
H1151	Radial 5-pin M12 Eurofast Connector
12M23	Radial 12-pin M23 Multifast Connector
10MIL	Radial 10-pin MS Connector
C1M	Radial Cable (1 m PVC)
CT1M	Tangential Cable (1 m PVC)
CT0.3M-FSFDS	Tangential Cable w/ 0.3 m M12 Eurofast Connector

G	Special Output Signal Formats
N21 to N33 (See Page E38)	

H	Special Connector Pin Configuration
N36 - N41 (See Page E12)	

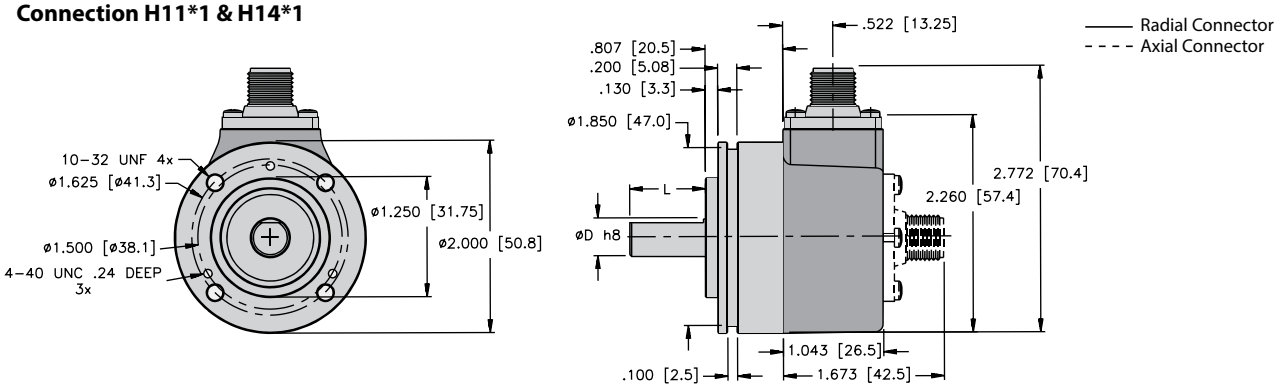
Accessories:

- See page H1, Connectivity, for cables and connectors
- See page G1, Accessories, for mounting attachments and couplings

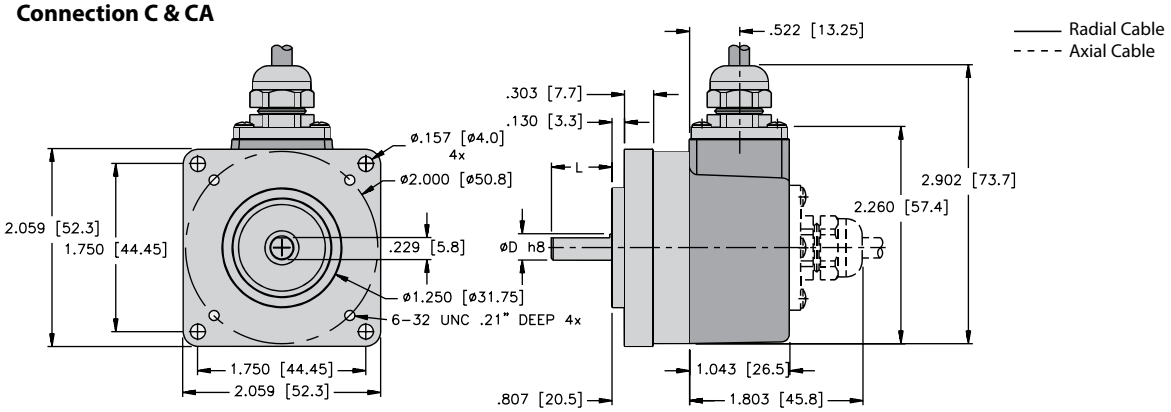
Incremental Type RI-10 (Shaft) / RI-12 (Hollow Shaft)

Dimensions: RI-10 Shaft Version

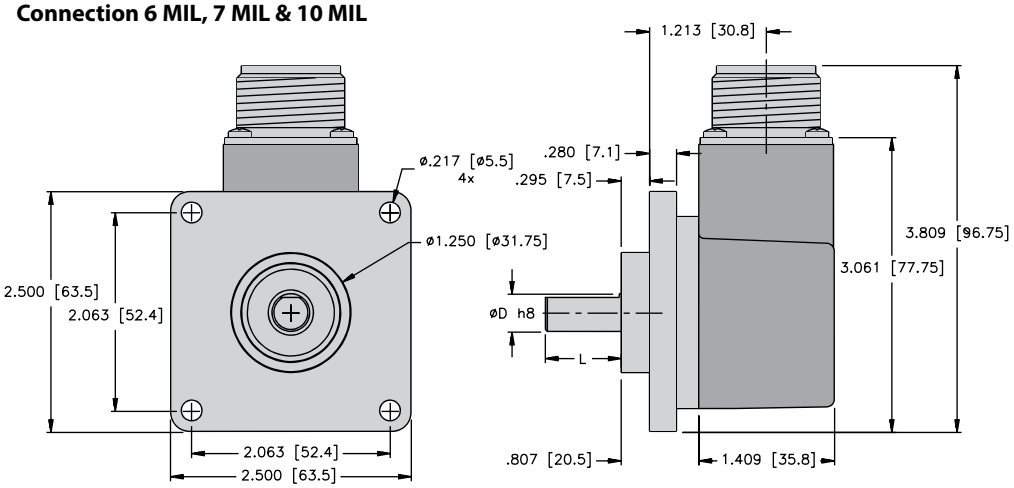
RI-10 Flange Z2
Connection H11*1 & H14*1



RI-10 Flange Z4
Connection C & CA



RI-10 Flange R
Connection 6 MIL, 7 MIL & 10 MIL

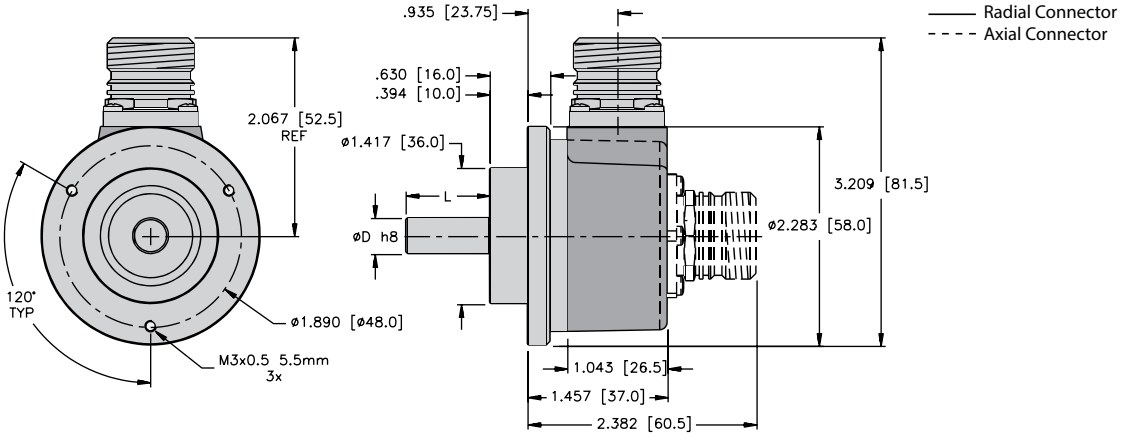


Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page G1, Accessories).

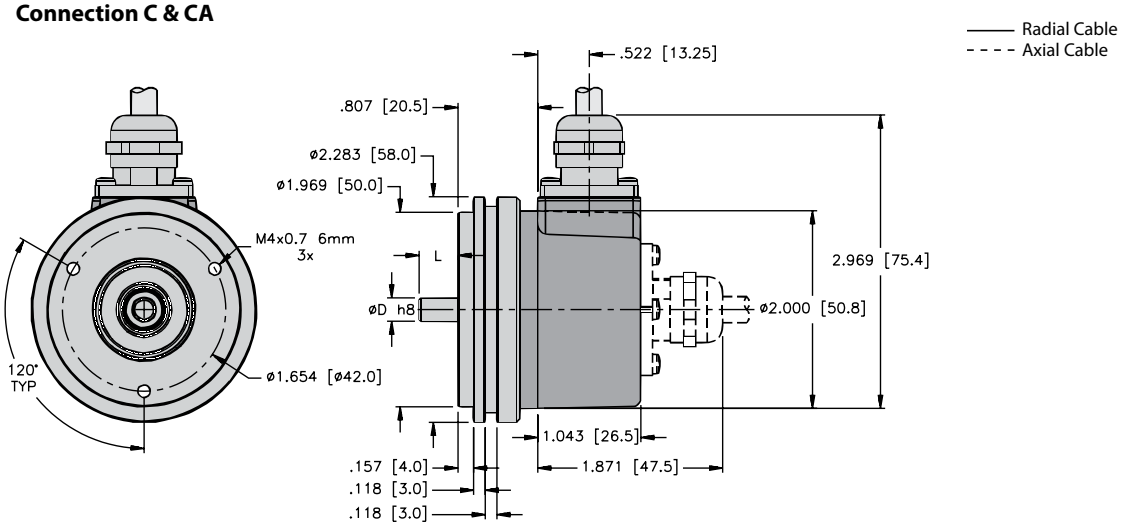
Incremental Type RI-10 (Shaft) / RI-12 (Hollow Shaft)

Dimensions: RI-10 Shaft Version

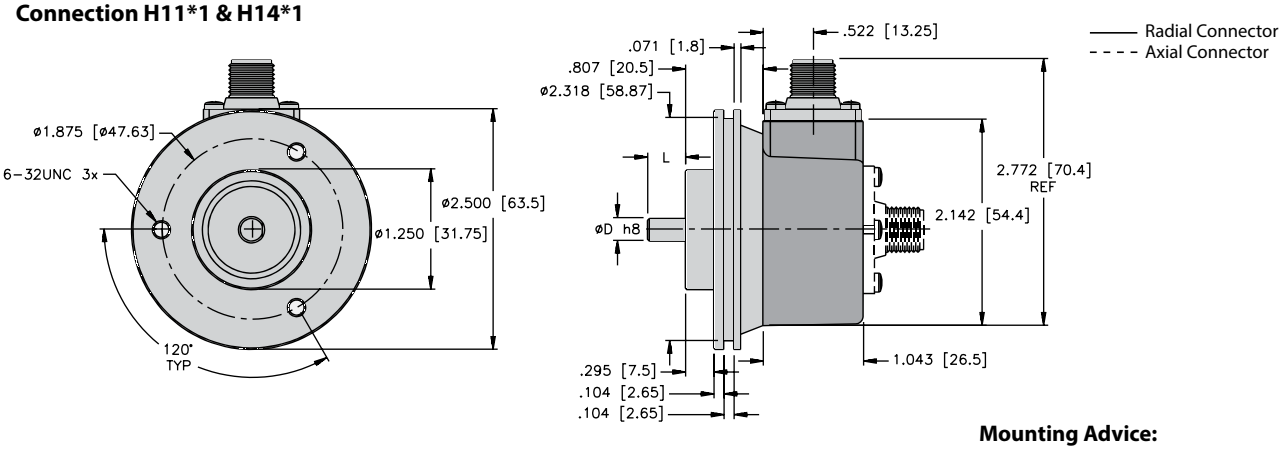
RI-10 Flange C
Connection 12M23 & 12M23A



RI-10 Flange S
Connection C & CA



RI-10 Flange S0
Connection H11*1 & H14*1



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).

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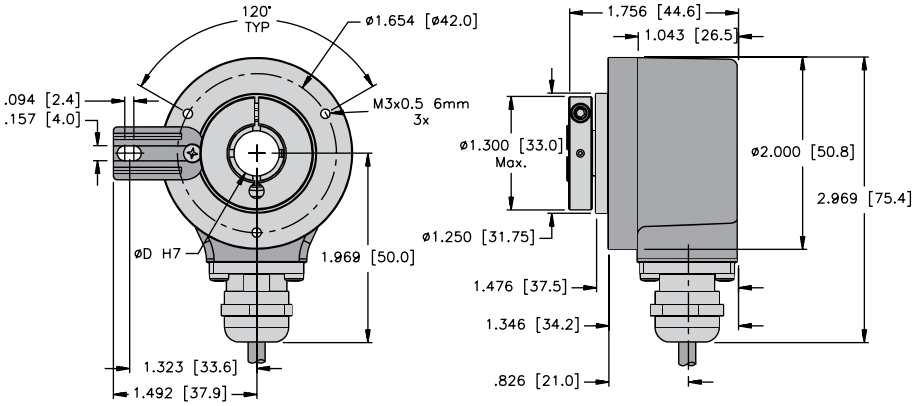
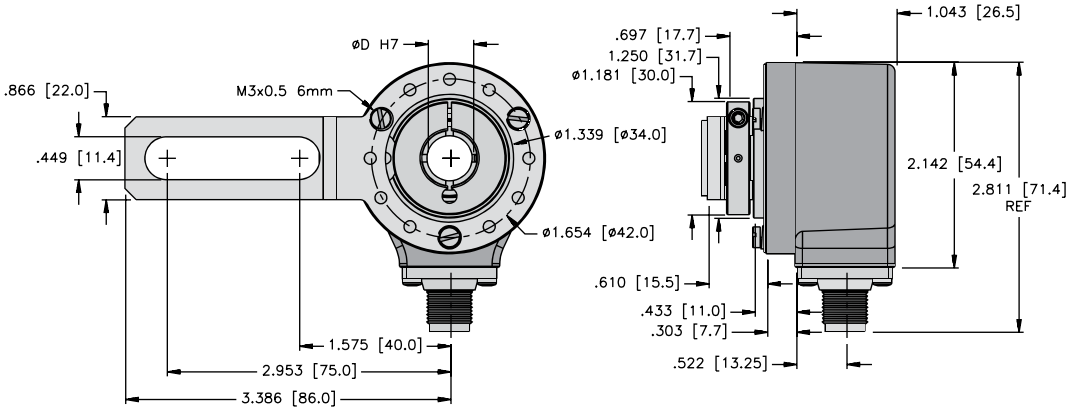
Incremental Type RI-10 (Shaft) / RI-12 (Hollow Shaft)

Dimensions: RI-12 Hollow Shaft Version

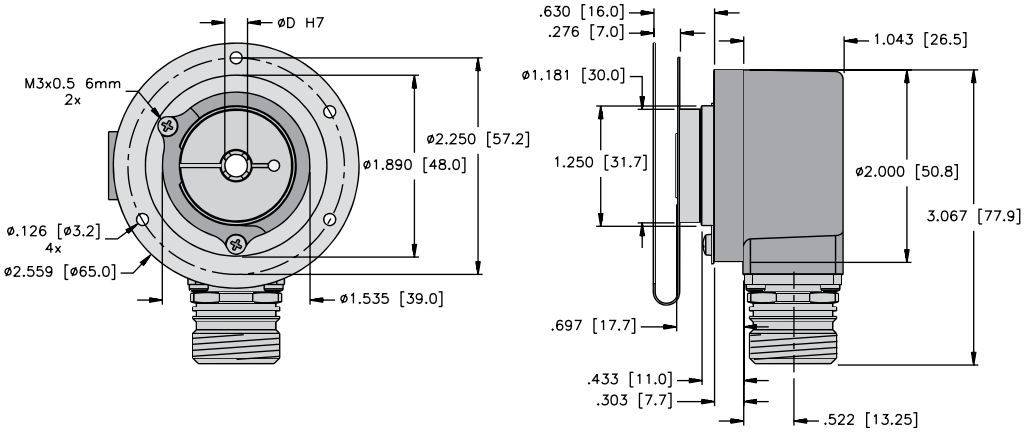
RI-12 Flange T
Connection C



RI-12 Flange S1
Connection H11*1



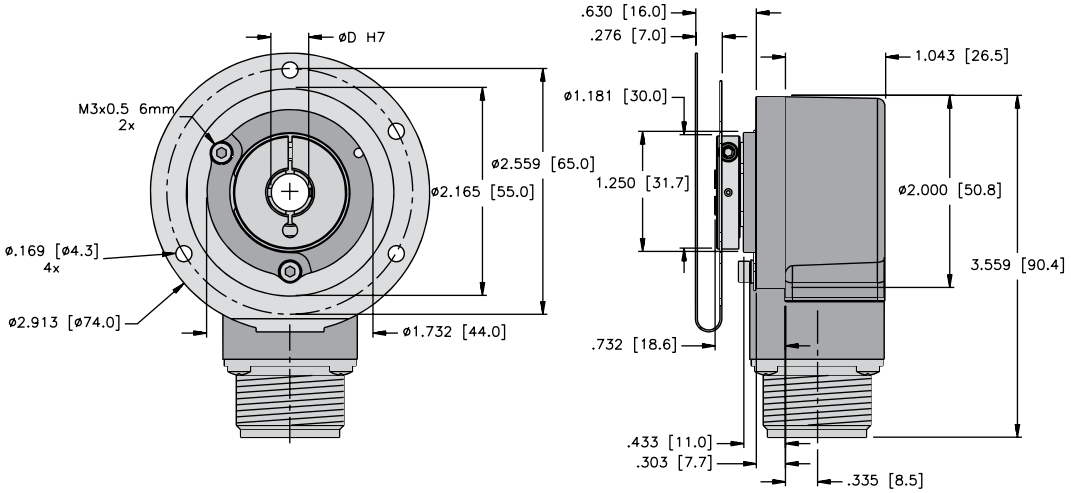
RI-12 Flange E2
Connection 12M23



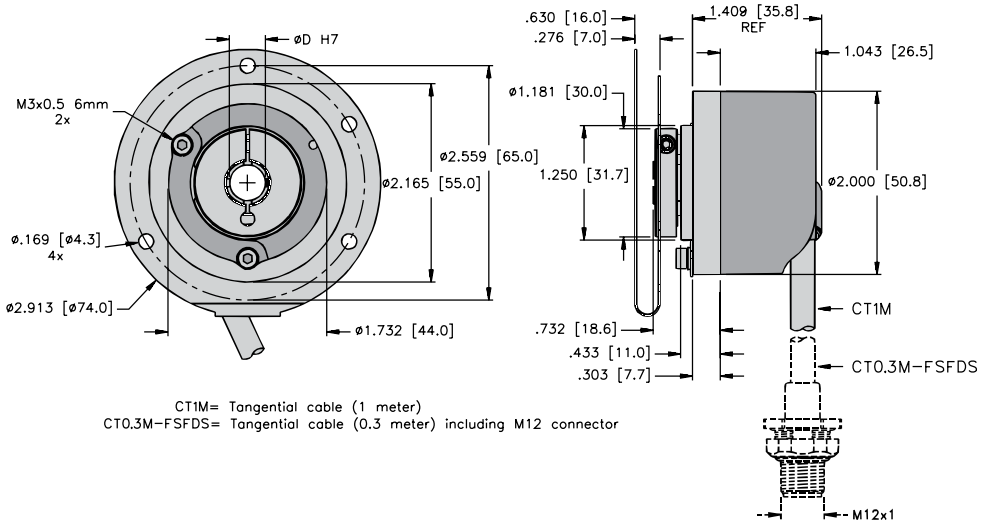
Incremental Type RI-10 (Shaft) / RI-12 (Hollow Shaft)

Dimensions: RI-12 Hollow Shaft Version

RI-12 Flange E1
Connection 10 MIL

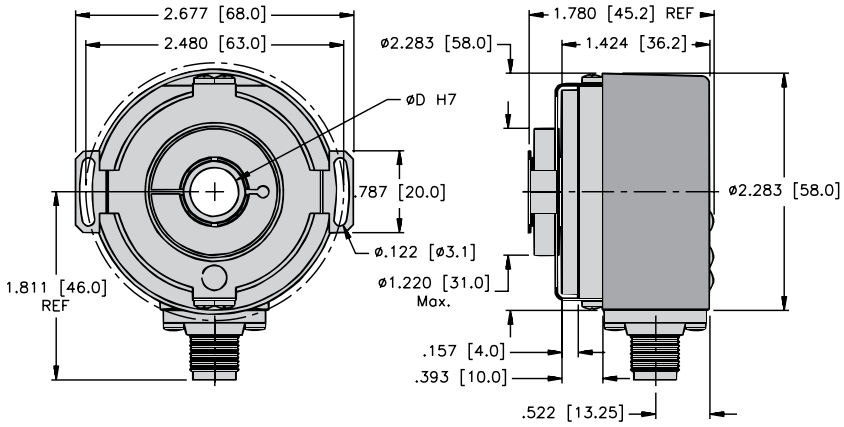


RI-12 Flange E1
Connection CT



CT1M= Tangential cable (1 meter)
CT0.3M-FSFDS= Tangential cable (0.3 meter) including M12 connector

RI-12 Flange E
Connection H11*1



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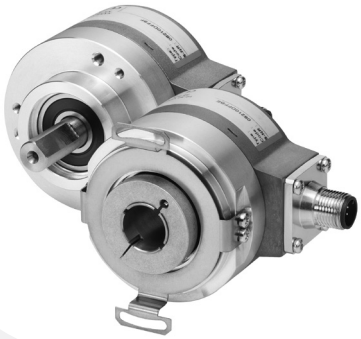
Incremental Type RI-60 (Shaft) / RI-61 (Hollow Shaft), SinCos

Bearing-Lock | High rotational speed | Temperature | High IP | High shaft load capacity | Shock/vibration resistant | Magnetic field proof | Reverse polarity protection | SinCos | Optical sensor | Surface protection salt spray-tested optional

Versatile
- **With incremental SinCos tracks.**
- **Shaft and hollow shaft versions.**
- **Cable and connector variants.**



RoHS compliant

Compact
- **Can be used even where space is tight:** outer diameter 58 mm

Rugged
- **Suited for motor feedback applications.**
- **Very high signal quality.**
- **Various mounting options available.**

Mechanical Characteristics:

Max speed:		
	IP65	12000 rpm, 5000 rpm (continuous)
	IP67	8000 rpm, 2000 rpm (continuous)
Starting torque at 68 °F (20 °C):		
	IP65	<1.4 oz-in (<0.01 Nm)
	IP67	<7 oz-in (<0.05 Nm)
Mass moment of inertia:		
	shaft	0.21 oz-in^2 (4.0 x 10^{-6} kgm^2)
	hollow shaft	0.38 oz-in^2 (7.0 x 10^{-6} kgm^2)
Load capacity of shaft:		
	radial	18 lbs (80 N)
	axial	9 lbs (40 N)
Weight:		approx. 1 lbs (0.45 kg)
Protection:		IP65
Working temperature range:		-40 to +194 °F (-40 to +90 °C)[1]
Materials:		
	shaft/hollow shaft	stainless steel
	flange	aluminum
	housing	zinc die-cast
	cable	PVC
Shock resistance acc. to EN60068-2-27:		250 g (2500 m/s^2), 6 ms
Vibration resistance acc. to EN60068-2-6:		10 g (100 m/s^2), 55-200 Hz

[1] Cable version -22 to +194 °F (-30 to +90 °C), fixed installation

Incremental Type RI-60 (Shaft) / RI-61 (Hollow Shaft), SinCos

Electrical characteristics:

Power supply:	5 VDC (±5%) or 10-30 VDC
Current consumption (no load):	
5 VDC	70 mA max.
10-30 VDC	45 mA max.
Reverse polarity protection:	yes
RoHS compliant acc. to guideline 2011/65/EU	

SinCos interface:

Max. frequency -3dB:	400 kHz
Signal level:	1 Vpp (±10%)
Short circuit protected:	yes [2]
Pulse rate:	1024/2048 ppr

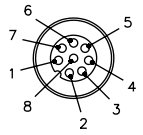
[2] Short circuit to 0V or to output, one channel at a time, power supply correctly applied

Standard Wiring:

Connection Type	Case Ground	Common (0 V)	+V	A	$\overline{A}$	B	$\overline{B}$
M12 Eurofast	Coupling Nut	1	2	3	4	5	6
Cable	Shield/Drain	WH	BN	GN	YE	GY	PK

Wiring Diagram:

Male Encoder View



M12 Eurofast Pinout

Mating Cordset:
E-RKC 8T-930-*

* Length in meters.

Part Number Key: RI-60 Shaft Version

A	B	C		D	E		F
RI-60S	10	C	-	GA	1024	-	H1181

A	Type
RI-60S	Ø 58 mm, Shaft w/ Flat, IP67 Shaft Seal
RI-60T	Ø 58 mm, Shaft w/ Flat, IP65 Shaft Seal

B	Shaft (Ø x L)
10	Ø 10 mm x 20 mm

C	Flange
C	Ø 58 mm Clamping Flange

D	Voltage Supply and Output Type
GA	10-30 VDC, SinCos
GB	5 VDC, SinCos

E	Pulse Rate
1024, 2048	

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

Accessories:

- See page H1, Connectivity, for cables and connectors
- See page G1, Accessories, for mounting attachments and couplings

Incremental Type RI-60 (Shaft) / RI-61 (Hollow Shaft), SinCos

Part Number Key: RI-61 Hollow Shaft Version

A	B	C		D	E		F
RI-61H	10	E	-	GA	1024	-	H1181

A	Type
RI-61H	Ø 58 mm, Hollow Shaft, IP67 Shaft Seal
RI-61I	Ø 58 mm, Hollow Shaft, IP65 Shaft Seal

B	Bore
10	Ø 10 mm
1T	Ø 10 mm (Tapered Shaft)
12	Ø 12 mm
14	Ø 14 mm
15	Ø 15 mm
A1	Ø 3/8"
A3	Ø 1/2"

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

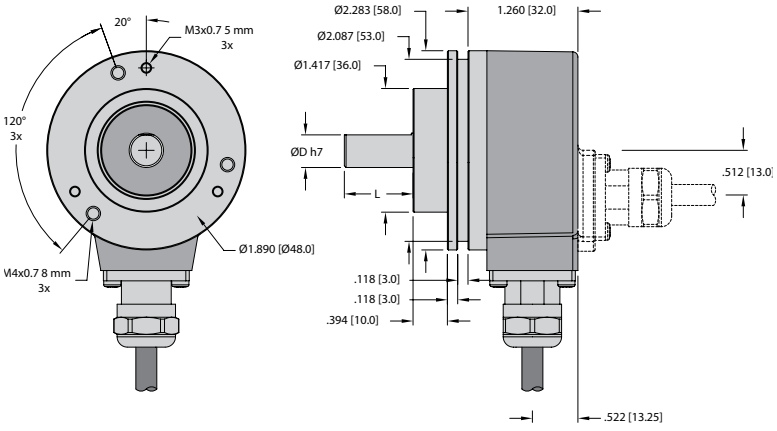
D	Voltage Supply and Output Type
GA	10-30 VDC, SinCos
GB	5 VDC, SinCos

E	Pulse Rate
1024, 2048	

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

Dimensions: RI-60 Shaft Version

RI-60 Flange C
Connection C & CA



Accessories:

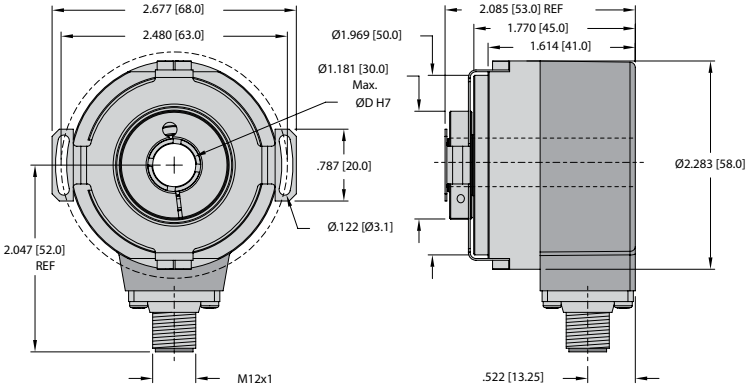
- See page H1, Connectivity, for cables and connectors
- See page G1, Accessories, for mounting attachments and couplings

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).

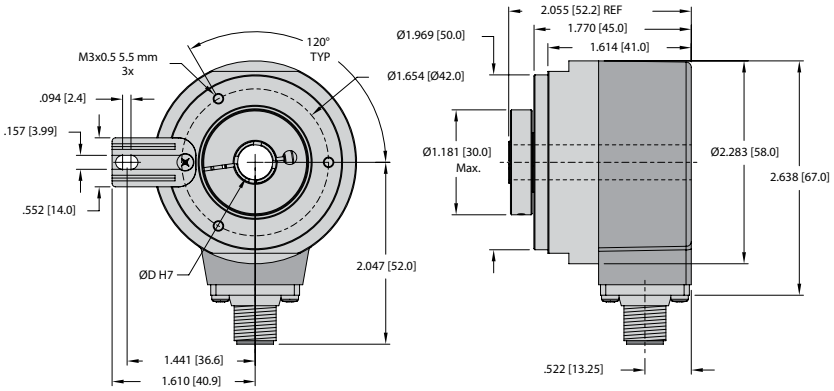
Incremental Type RI-60 (Shaft) / RI-61 (Hollow Shaft), SinCos

Dimensions: RI-61 Hollow Shaft Version

RI-61 Flange E
Connection H1181

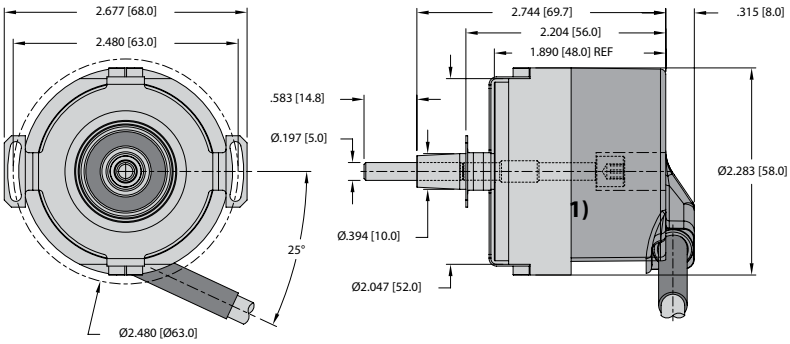


RI-61 Flange T
Connection H1181



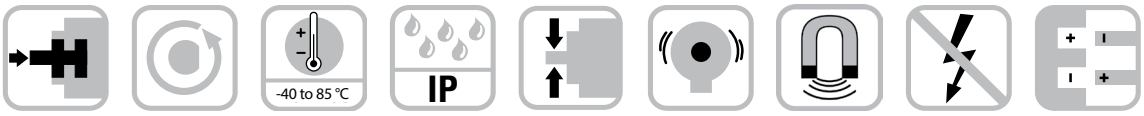
1) Torque stop recommendation: cylindrical pin DIN 7, Ø0.16 [4.0]

RI-61 Flange E (Bore 1T)
Connection CT



1) SW 4

Incremental Type RI-65 (Shaft) / RI-96 (Hollow Shaft), Stainless Steel



Bearing-Lock | High rotational speed | Temperature | High IP | High shaft load capacity | Shock/vibration resistant | Magnetic field proof | Short-circuit protected | Reverse polarity protection

Versatile

- **Reliable mounting in a wide variety of installation situations:** Comprehensive and proven mounting options.
- **Standard encoder for use worldwide:** compatible with ll US and European standards, supply voltage 5-30 VDC, various interface options, max. 5000 ppr.

Compact

- **Can be used even where space is tight:** outer diameter 50 mm, installation depth max. 47 mm.

Rugged

- Stays sealed even when subjected to harsh everyday use:
  – IP67 Protection
  – Rugged stainless-steel housing
  – Viton seals
  – High security against failures in the field, ideal for use in outdoor applications
- **Can be used in a wide temperature range:** -40 to +185 °F (-40 to +85 °C)
- **Increased ability to withstand vibration and installation errors:** Eliminates machine downtime and repairs. Sturdy double bearing lock design.

Mechanical Characteristics:

Speed [1]:	max. 6,000 RPM
Rotor moment of inertia:	approx. 0.098 oz-in² (1.8 x 10⁻⁶ kgm²)
Starting torque:	< 7 oz-in (< 0.05 Nm)
Weight:	approx. 0.9 lbs (0.4 kg)
Radial load capacity of the shaft:	18 lbs (80 N)
Axial load capacity of the shaft:	9 lbs (40 N)
Protection acc. to EN 60 529 with shaft sealing:	IP66/IP67

[1] For continuous operation 3,000 RPM

Working temperature:	-40 to +185 °F (-40 to +85 °C)
Materials:	Housing, flange, Shaft: 1.4305 (303) stainless steel Connector: stainless steel Seals: viton
Shock resistance acc. to EN 60068-2-27:	250 g (2,500 m/s²), 6 ms
Vibration resistance to EN 60068-2-6:	10 g (100 m/s²), 10-2,000 Hz

Electrical Characteristics:

Output circuit [Key Code]:	RS 422 [4A] (TTL compatible)	Push-Pull [2B]	Push-Pull [2F] (7272 compatible)
Supply voltage:	5 V ±5%	10-30 VDC	5-30 VDC
Power consumption (no load):	typ. 40 mA max. 90 mA	typ. 50 mA max. 100 mA	typ. 50 mA max. 100 mA
Permissible load/channel:	max. ±20 mA	max. ±20 mA	max. ±20 mA
Pulse frequency:	max. 300 kHz	max. 300 kHz	max. 300 kHz [3]
Signal level high:	min. 2.5 V	min. +V -1.0 V	min. +V -2.0 V
Signal level low:	max. 0.5 V	max. 0.5 V	max. 0.5 V
Rise time t_r:	max. 200 ns	max. 1 µs	max. 1 µs
Fall time t_f:	max. 200 ns	max. 1 µs	max. 1 µs
Short-circuit protected[1]:	yes [2]	yes	yes [2] [4]
Reverse polarity protection:	no	yes	no
UL approval	file E356899		
RoHS compliant acc. to EU guideline 2011/65/EU			

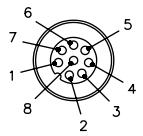
[1] If supply voltage correctly applied
[2] Only one channel allowed to be shorted-out:
(If +V=5 V, short-circuit to channel, 0 V, or +V is permitted.) (If +V=5-30 V, short-circuit to channel or 0 V is permitted.)
[3] Max. recommended cable length 30 m
[4] Approximately one minute

Incremental Type RI-65 (Shaft) / RI-96 (Hollow Shaft), Stainless Steel

Standard Wiring:

Connection Type	Case Ground	Common (0 V)	+V	A	$\overline{A}$	B	$\overline{B}$	Z	$\overline{Z}$
M12 Eurofast	Coupling Nut	1	2	3	4	5	6	7	8
Cable	Shield/Drain	WH	BN	GN	YE	GY	PK	BU	RD

Wiring Diagram:

Male Encoder View
 M12 Eurofast Pinout
Mating Cordset: **E-RKC 8T-930-***

* Length in meters.

Part Number Key: RI-65 Shaft Version

A	B	C		D	E		F
RI-65S	6	C	-	2B	360	-	H1181

A	Type
RI-65S	Ø 2" Shaft, IP67 Shaft Seal

B	Shaft (Ø x L)
6	Ø 6 mm x 10 mm
10	Ø 10 mm x 20 mm
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

D	Voltage Supply and Output Type
2B	10-30 VDC, Push-Pull (w/ Inverted Signal)
2F	5-30 VDC, Push-Pull (w/ Inverted Signal)
4A	5 VDC, RS 422 (w/ Inverted Signal)

E	Pulse Rate
1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000 (e.g. 250 Pulses => 250) Other Pulse Rates Available on Request	

F	Type of Connection
H1181	Radial 8-pin M12 Eurofast Connector

Part Number Key: RI-96 Hollow Shaft Version

A	B	C		D	E		F
RI-96H	A0	E	-	2B	360	-	H1181

A	Type
RI-96H	Ø 2" Hollow Shaft, IP67 Shaft Seal

B	Bore
10	Ø 10 mm
12	Ø 12 mm
15	Ø 15 mm
A0	Ø 1/4"
A1	Ø 3/8"
A3	Ø 1/2"

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

D	Voltage Supply and Output Type
2B	10-30 VDC, Push-Pull (w/ Inverted Signal)
2F	5-30 VDC, Push-Pull (w/ Inverted Signal)
4A	5 VDC, RS 422 (w/ Inverted Signal)

E	Pulse Rate
1, 5, 10, 12, 36, 100, 200, 250, 256, 360, 400, 500, 512, 600, 800, 1000, 1024, 1200, 2000, 2048, 2500, 3600, 4096, 5000 (e.g. 250 Pulses => 250) Other Pulse Rates Available on Request	

F	Type of Connection
H1181	Radial 8-pin M12 Eurofast Connector

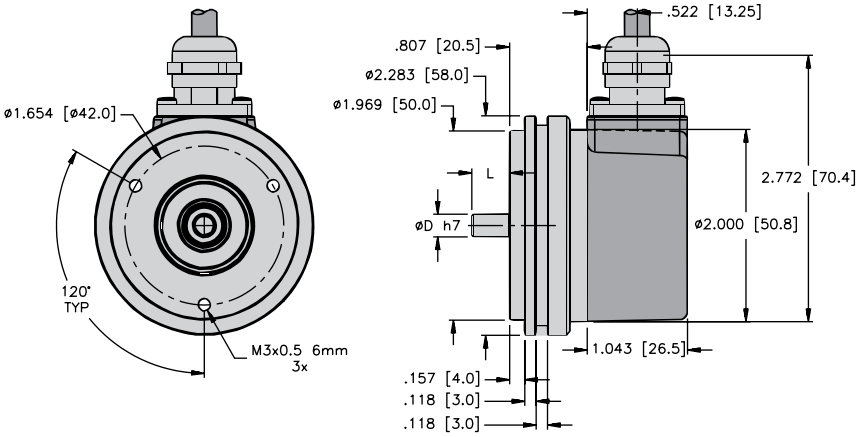
Accessories:

- See page H1, Connectivity, for cables and connectors
- See page G1, Accessories, for mounting attachments and couplings

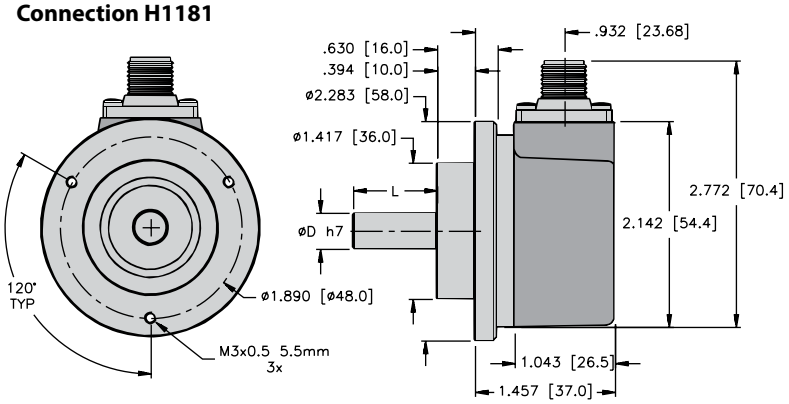
Incremental Type RI-65 (Shaft) / RI-96 (Hollow Shaft), Stainless Steel

Dimensions: RI-65 Shaft Version

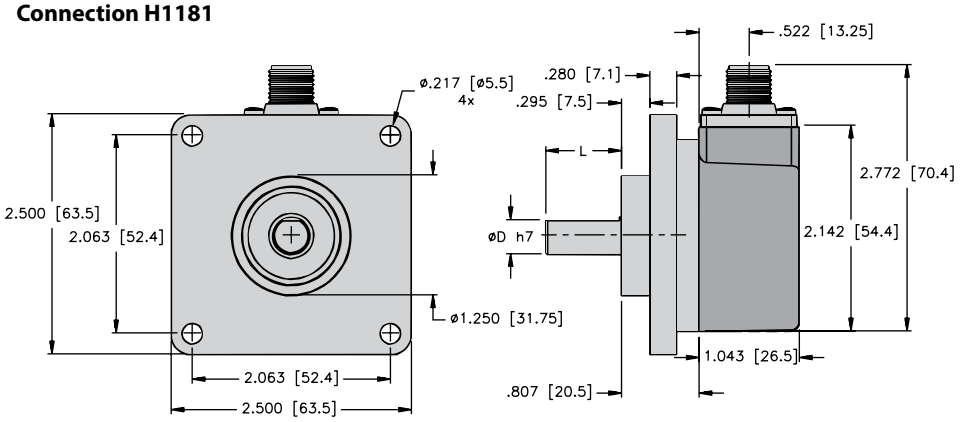
RI-65 Flange S
Connection C



RI-65 Flange C
Connection H1181



RI-65 Flange R
Connection H1181

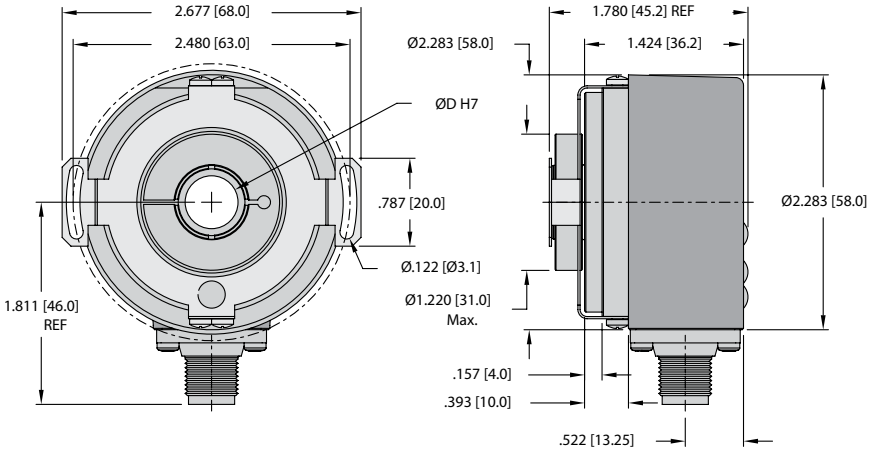


Mounting advice:
The flanges and shafts of the encoder and drive should not be rigidly coupled together at the same time. We recommend the use of suitable couplings (see page G1, Accessories).

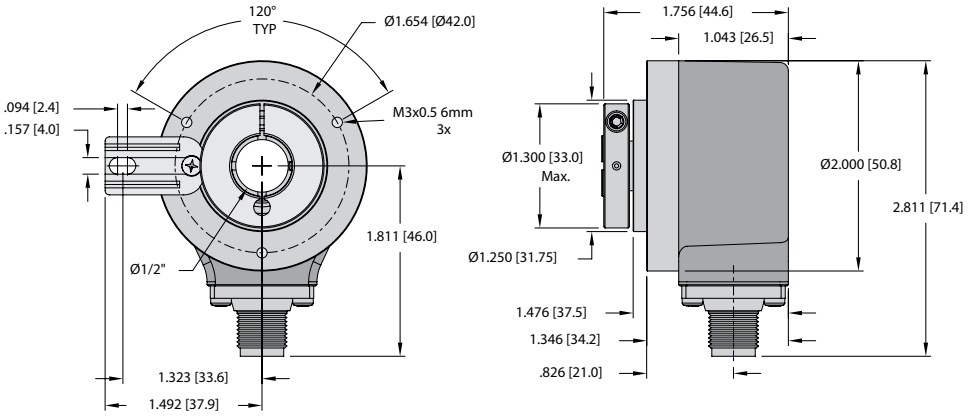
Incremental Type RI-65 (Shaft) / RI-96 (Hollow Shaft), Stainless Steel

Dimensions: RI-96 Hollow Shaft Version

RI-96 Flange E
Connection H1181



RI-96 Flange T
Connection H1181



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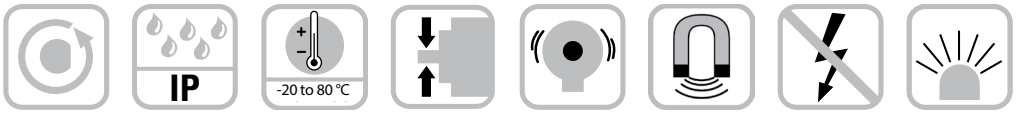
Incremental Type RI-16 (Shaft) / RI-64 (Hollow Shaft), High Resolution



High rotational speed | High IP | Temperature | High shaft load capacity | Shock/vibration resistant | Magnetic field proof | Short-circuit protected | Optical sensor

High Performance
- High shaft loading capability
- Maximum speed up to 12000 revolutions per minute
- High IP protection up to max. IP66

Many Variants
- With RS422 or push-pull interface
- With cable or connector

Compact
- Ø 58 mm housing, industry standard

Mechanical Characteristics:

Speed:	Shaft IP65 Hollow Shaft IP40 Hollow Shaft IP66[1)]	12000 RPM 12000 RPM 6000 RPM
Moment of inertia:	Shaft version Hollow shaft version	approx. 0.098 oz-in2 (1.8 x 10-6 kgm2) approx. 0.328 oz-in2 (6 x 10-6 kgm2)
Starting torque at 68 °F (20 °C):		<1.4oz-in (0.01 Nm), IP40/IP65 <7oz-in (0.05 Nm), IP66
Radial load capacity of the shaft:		18 lbs (80 N)
Axial load capacity of the shaft:		9 lbs (40 N)
Weight:		approx. 0.9 lbs (0.4 kg)
Protection acc. to EN 60529 :		IP40, IP65, IP66
Working temperature:		-4 to +221 °F (-20 to +105 °C), IP40/IP65 -4 to +194 °F (-20 to +90 °C), IP66
Materials:	Shaft/hollow shaft	stainless steel
Shock resistance acc. to EN 60068-2-27:		approx. 100 g (1000 m/s2), 6 ms
Vibration resistance acc. to EN 60068-2-27:		approx. 10 g (100 m/s2), 10-2000 Hz

[1)] For continuous operation max 3000 RPM, ventilated

Incremental Type RI-16 (Shaft) / RI-64 (Hollow Shaft), High Resolution

Electrical Characteristics:

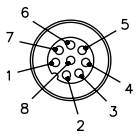
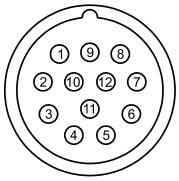
Output circuit [Key Code]:	RS 422 [4A/4C] (TTL compatible)	Push-Pull [2B]
Supply voltage:	5 VDC (±5 %) or 10-30 VDC	10-30 VDC
Power consumption (no load):	typ. 70 mA / max. 120 mA	typ. 115 mA / max. 160 mA
Permissible load/channel:	max. ±20 mA	max. ±30 mA
Pulse frequency:	max. 800 kHz	max. 600 kHz
Signal level high:	min. 2.5 V	min. +V -2.5 V
Signal level low:	max. 0.5 V	max. 2.0 V
Rise time t_r:	max. 200 ns	max. 1 µs
Fall time t_f:	max. 200 ns	max. 1 µs
Short-circuit protected:	yes [1)]	yes
Reverse polarity protection:	5 VDC: No, 10-30 VDC: yes	yes
UL approval:	file E356899	
RoHS compliant acc. to EU guideline 2011/65/EU		

[1)] Only one channel allowed to be shorted-out: (If +V = 5 V, short-circuit to channel, 0 V, or +V is permitted) (If +V = 10-30 V, short-circuit to channel or 0 V is permitted)

Standard Wiring:

Connection Type	Case Ground	Common (0 V)	+V	A	$\overline{A}$	B	$\overline{B}$	Z	$\overline{Z}$	-	-	Com / Sensor	+V Sensor
M23 Multifast	Coupling Nut	10	12	5	6	8	1	3	4	-	-	11	2
M12 Eurofast	Coupling Nut	1	2	3	4	5	6	7	8	-	-	-	-
Cable	Shield/Drain	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU

Wiring Diagrams:

Male Encoder View	
	
M12 Eurofast pinout	M23 Multifast pinout
Mating cordset: **E-RKC 8T-930-***	Mating cordset: **E-CKM 12-931-***

* Length in meters.

Incremental Type RI-16 (Shaft) / RI-64 (Hollow Shaft), High Resolution

Part Number Key: RI-16 Shaft Version

A	B	C		D	E		F
RI-16T	6	C	-	2B	6000	-	H1181

A	Type
RI-16T	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

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

D	Voltage Supply and Output Type
2B	10-30 VDC, Push-Pull (w/ Inverted Signals)
4A	5 VDC, RS422 (w/ Inverted Signals)
4C	10-30 VDC, RS422 (w/ Inverted Signals)

E	Pulse Rate
6000, 7200, 8000, 8192, 9000, 10000, 18000, 36000 Other Pulse Rates Available on Request	

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 (1 m PUR)
CA1M	Axial Cable (1 m PUR)

Part Number Key: RI-64 Hollow Shaft Version

A	B	C		D	E		F
RI-64B	6	T	-	2B	6000	-	H1181

A	Type
RI-64B	Ø 58 mm, Blind Hollow Shaft, IP66 Shaft Seal
RI-64C	Ø 58 mm, Blind Hollow Shaft, IP40 Shaft Seal
RI-64H	Ø 58 mm, Hollow Shaft, IP66 Shaft Seal
RI-64I	Ø 58 mm, Hollow Shaft, IP40 Shaft Seal

B	Bore (30 mm max insertion depth for blind hollow shaft)
6	Ø 6 mm
8	Ø 8 mm
10	Ø 10 mm
12	Ø 12 mm

C	Flange
T	Ø 58 mm Flange w/ Torque Stop
E1	Ø 65 mm Flange w/ Flex Mount

D	Voltage Supply and Output Type
2B	10-30 VDC, Push-Pull (w/ Inverted Signals)
4A	5 VDC, RS422 (w/ Inverted Signals)
4C	10-30 VDC, RS422 (w/ Inverted Signals)

E	Pulse Rate
6000, 7200, 8000, 8192, 9000, 10000, 18000, 36000 Other Pulse Rates Available on Request	

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

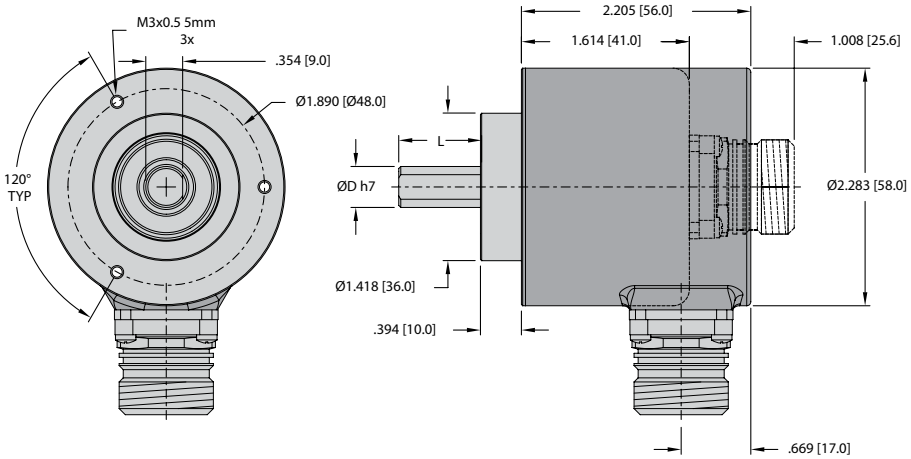
Accessories:

- See page H1, Connectivity, for cables and connectors
- See page G1, Accessories, for mounting attachments and couplings

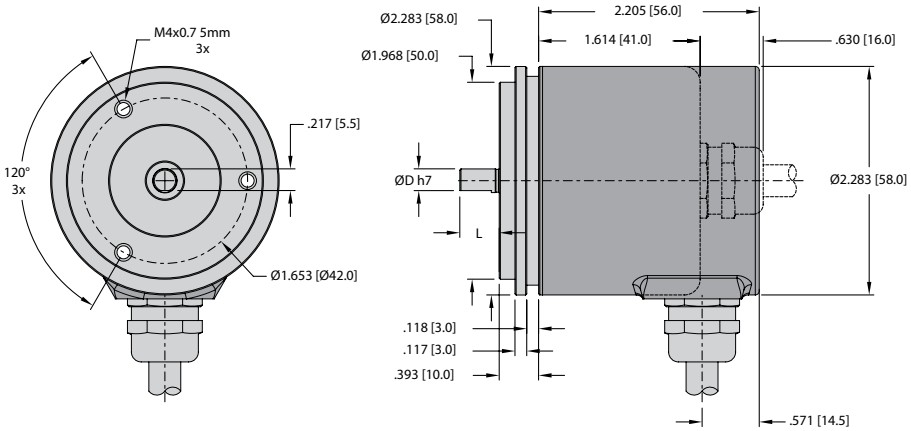
Incremental Type RI-16 (Shaft) / RI-64 (Hollow Shaft), High Resolution

Dimensions: RI-16 Shaft Version

RI-16 Flange C
Connection 12M23 & 12M23A



RI-16 Flange S
Connection C1M & CA1M



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).

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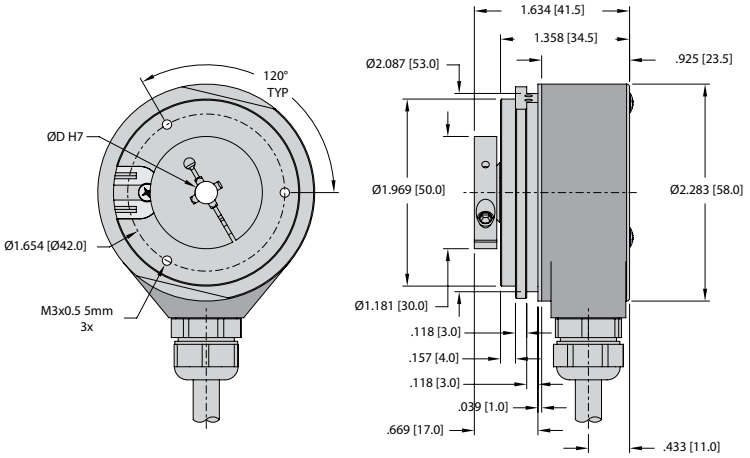
Incremental Type RI-16 (Shaft) / RI-64 (Hollow Shaft), High Resolution

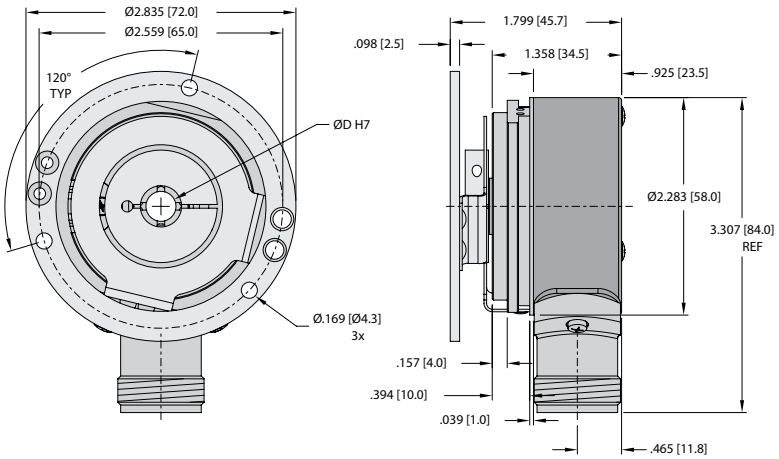
Dimensions: RI-64 Hollow Shaft Version

RI-64 Flange T
Connection C



- - - - Axial Cable
——— Radial Cable

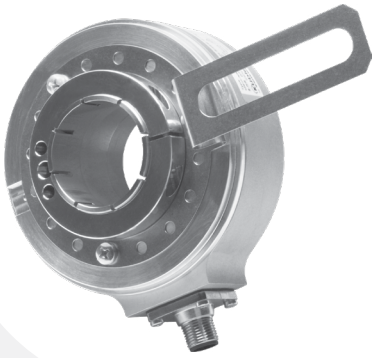
RI-64 Flange E1
Connection 12M23



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).

Large Bore Type RI-43 (Hollow Shaft)

Rugged
- Balanced, stainless-steel clamping rings, special bearing-shaft connection increases stability and vibration resistance.
- Optional plastic isolating inserts protect against damage from shaft currents.
- New type of mechanical construction, ideal for handling tough mechanical stresses and strains.



Economical
- Alternative to traditional heavy duty encoders that are often over-engineered and expensive.

Versatile
- Very compact. Optional isolating inserts protect against damage from shaft currents, e.g. with AC vector motors.
- Only 49 mm clearance needed.
- Hollow shaft diameter up to Ø 42 mm.
- RS422, push-pull or SIN/COS outputs.
- Extended speed range up to 6,000 RPM.
- High-quality construction, balanced, stainless steel ensures quiet vibration-free running.

Mechanical Characteristics:

Speed:	max. 6,000 RPM at 158 °F (70 °C) [1] max. 3,500 RPM at 176 °F (80 °C) [1]
Rotor moment of inertia:	< 12 oz-in² (< 220 x 10-6 kgm²) [2]
Starting torque with sealing:	< 28.3 oz-in (< 0.2 Nm)
Weight:	approx. 1.8 lbs (0.8 kg)
Protection acc. to EN 60 529:	IP65
Working temperature:	-40 to +176 °F (-40 to +80 °C) [3]
Materials: Housing: Flange: Shaft:	 die-cast aluminium stainless steel
Shock resistance acc. to DIN-IEC 68-2-27	200 g (2,000 m/s²), 6 ms
Vibration resistance acc. to DIN-IEC 68-2-6:	10 g (100 m/s²), 10-2,000 Hz

[1] During the run-in-phase of approx. 2 hours, reduce the limits for working temperature max or speed max by 1/3
[2] Dependent on the shaft diameter
[3] With connectors, -40 °C, cable securely installed; -30 °C, cable flexibly installed; -20 °C

Electrical Characteristics Sine Wave Output:

Output circuit [Key Code]:	SinCos [AB] U = 1 Vpp (±20%)	SinCos [AA] U = 1 Vpp (±20%)
Supply voltage:	5 VDC (±5%)	10-30 VDC
Current consumption (no load) with inverted signal:	typ. 65 mA / max. 110 mA	typ. 65 mA / max. 110 mA
-3 dB frequency:	< 180 kHz	< 180 kHz
Signal level channels A/B:	1 Vpp (±20%)	1 Vpp (±20%)
Signal level channel 0:	0.1-1.2 V	0.1-1.2 V
Short-circuit protected [1]	yes	yes
Reverse polarity protection:	no	yes
UL approval:	file E356899	

RoHS compliant acc. to EU guideline 2011/65/EU

[1] If supply voltage correctly applied

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Large Bore Type RI-43 (Hollow Shaft)

Electrical Characteristics RS422 or Push-Pull Output:

Output circuit [Key Code]:	RS 422 [4A/4B/4C] (TTL compatible)	Push-Pull [1B/2B/2E]	Push-Pull [2F] (7272 compatible) [3]
Supply voltage:	5 VDC (+/-5%) 5-30 VDC 10-30 VDC	5-30 VDC 10-30 VDC	5-30 VDC
Power consumption (no load) without inverted signal:	-	typ. 55 mA / max. 125 mA	-
Power consumption (no load) with inverted signal:	typ. 40 mA / max. 90 mA	typ. 80 mA / max. 150 mA	typ. 50 mA / max. 100 mA
Permissible load/channel:	max. ±20 mA	max. ±30 mA	max. ±20 mA
Pulse frequency:	max. 300 kHz	max. 300 kHz	max. 300 kHz
Signal level high:	min. 2.5 V	min. +V -3 V	min. +V -2.0 V
Signal level low:	max. 0.5 V	max. 2.5 V	max. 0.5 V
Rise time t_r:	max. 200 ns	max. 1 µs	max. 1 µs
Fall time t_f:	max. 200 ns	max. 1 µs	max. 1 µs
Short-circuit protected [1]:	yes	yes	yes
UL approval	file E356899		
Reverse polarity protection:	no, 10-30 VDC: yes	yes	no

[1] If supply voltage correctly applied
[2] Only one channel allowed to be shorted-out:
(If +V = 5 VDC, short-circuit to channel, 0 V, or +V is permitted) (If +V = 5-30 VDC, short-circuit to channel or 0 V is permitted)
[3] Max. recommended cable length 30 m

Standard Wiring:

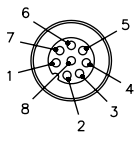
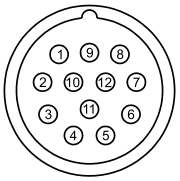
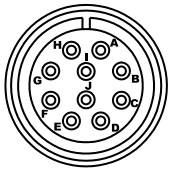
Connection Type	Case Ground	Common (0 V)	+V	A	$\overline{A}$	B	$\overline{B}$	Z	$\overline{Z}$	-	-	OV Sensor	+V Sensor
M23 Multifast	Coupling Nut	10	12	5	6	8	1	3	4	-	-	11	2
MS 10-pin	J	F	D	A	G	B	H	C	I	-	-	-	-
M12 Eurofast	Coupling Nut	1	2	3	4	5	6	7	8	-	-	-	-
Cable	Shield/Drain	WH	BN	GN	YE	GY	PK	BU	RD	BK	VT	GY/PK	RD/BU

Individually isolate unused outputs before inital start up.

Special Pin Configuration:

		Connection Type	Case Ground	Common (0 V)	+V	A	$\overline{A}$	B	$\overline{B}$	Z	$\overline{Z}$	-	-
Output Code	N41	M12 Eurofast	Coupling Nut	7	2	1	3	4	5	6	8	-	-
	N40	MS 10-pin	G	F	D	A	H	B	I	C	J	-	-

Wiring Diagrams:

Male Encoder View		
		
M12 Eurofast Pinout	M23 Multifast Pinout	MS Pinout (10-pin)
Mating Cordset: **E-RKC 8T-930-***	Mating Cordset: **E-CKM 12-931-***	Mating Cordset: **E-MK 10-931-***

* Length in meters.

Large Bore Type RI-43 (Hollow Shaft)

Part Number Key: RI-43 Hollow Shaft Version

A	B	C		D	E		F		G/H/I
RI-43H	20	E2	-	1B	50	-	H1181	/	Specials

A	Type
RI-43H	Ø 100 mm, Hollow Shaft, IP65 Shaft Seal

B	Bore
20	Ø 20 mm [1)]
24	Ø 24 mm
25	Ø 25 mm [1)]
28	Ø 28 mm
30	Ø 30 mm [1)]
32	Ø 32 mm [2)]
35	Ø 35 mm
38	Ø 38 mm
40	Ø 40 mm
42	Ø 42 mm
A3	Ø 1/2" [2)]
A4	Ø 5/8" [1)]
A5	Ø 3/4" [2)]
A6	Ø 1" [1)]
A7	Ø 1-1/8" [2)]
A8	Ø 1-1/4" [1)]

[1)] Bores Available with Isolation Inserts.
[2)] Only Available with an Isolation Insert.

C	Flange
E2	4 -1/2" C-Face Tether
S	Face Mount
S4	Long Anti-Rotation Spring
S5	Short Anti-Rotation Spring
S8	Long Tether Arm

D	Voltage Supply and Output Type
1B	10-30 VDC, Push-Pull
2B	10-30 VDC, Push-Pull (w/ Inverted Signals)
2E	5-30 VDC, Push-Pull (w/ Inverted Signals)
2F	5-30 VDC, Push-Pull (7272 compatible w/ Inverted Signals)
4A	5 VDC, RS422 (w/ Inverted Signals)
4B	5-30 VDC, RS422 (w/ Inverted Signals)
4C	10-30 VDC, RS422 (w/ Inverted Signals)
AA	10-30 VDC[3)], SIN/COS, 1 Vpp (w/ Inverted Signals)
AB	5 VDC [3)], SIN/COS, 1 Vpp (w/ Inverted Signals)

[3)] N24 is the Only Valid Special Output Code for SIN/COS Outputs.

E	Pulse Rate
	50*,360*, 512*, 600*, 1000*, 1024, 1500, 2000, 2048, 2500, 4096, 5000 (e.g. 360 Pulses => 360) Other Pulse Rates Available on Request

* SIN/COS Version not Available with Pulses < 1024

F	Type of Connection
H1181	Radial 8-pin M12 Eurofast Connector
12M23	Radial 12-pin M23 Multifast Connector
10MIL	Radial 10-pin MS Connector
C1M	Radial Cable (1 m PVC)

G	Special Output Signal Formats
	See N21 thru N33 on Page E38

H	Special Insert Options
N42	Isolation Insert Included [4)]

[4)] Includes Plastic Hollow Shaft Inserts for Electrical Isolation.

I	Special Connector Pin Configuration
	See N40 or N41 on Page E29

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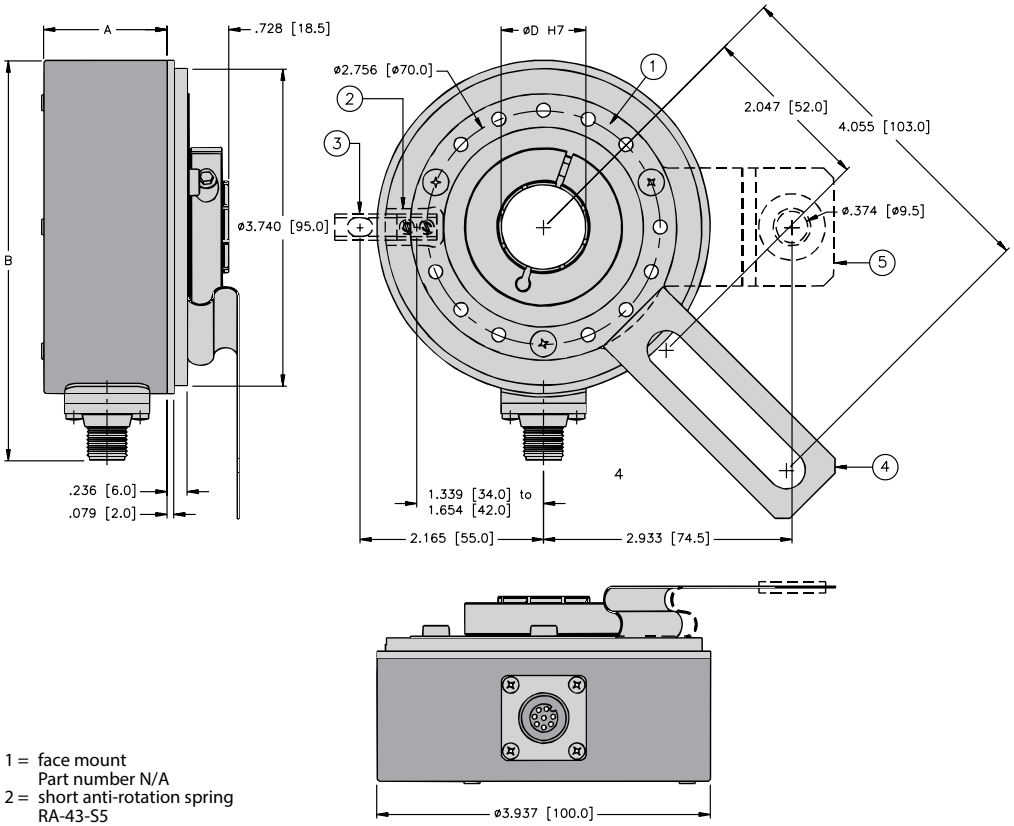
Large Bore Type RI-43 (Hollow Shaft)

Dimensions: RI-43 Hollow Shaft Version

RI-43 Flange S8/E2
Connection H1181



1 = face mount
Part number N/A
2 = short anti-rotation spring
RA-43-S5
3 = long anti-rotation spring
RA-43-S4
4 = tether arm (long)
RA-43-S8
5 = 4 1/2" C-face tether
RA-43-E2

Dimensions for Radial Connector - in [mm]

Connection Style				
DIM	**Cable**	**M12**	**M23**	**MS** (10-pin)
A	1.181 [30.0]	1.181 [30.0]	1.181 [30.0]	1.457 [37.0]
B	-	4.705 [119.5]	4.961 [126.0]	5.394 [137.0]

Large Bore Type RI-43 (Hollow Shaft)

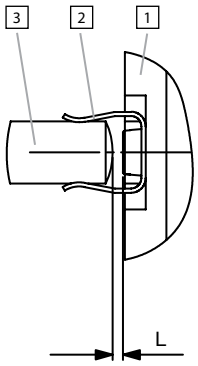
Mating Shaft Requirements:

Type of Flange	Axial End Play	Radial Runout	Angular Offset
S5 (anti-rotational spring short)	max. ±1 mm	max. ±0.3 mm	max. ±2°
S4 (anti-rotational spring long)	max. ±1 mm	max. ±0.3 mm	max. ±2°
S8 (tether arm long)	max. ±0.5 mm	max. ±0.3 mm	max. ±2°
E2 (C-face tether)	max. ±0.5 mm	max. ±0.3 mm	max. ±2°

Mounting:

Mounting using the spring element - short:

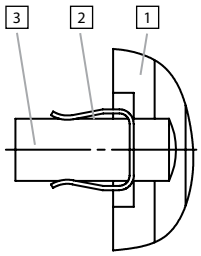
When mounting the encoder, ensure that dimension **L** is larger than the maximum axial play of the drive in the direction of the arrow.



1 Flange
2 Spring element - short
3 Cylindrical pin

Mounting using the spring element - long:

Cylindrical pin fed through the bore of the spring.



1 Flange
2 Spring element - short
3 Cylindrical pin

Large Bore Type RI-43 (Hollow Shaft) Accessories

Isolation Insert

Part Number:	Inner Dimensions
RSA-A3	12.7 mm (1/2")
RSA-A4	15.875 mm (5/8")
RSA-12	12 mm
RSA-14	14 mm
RSA-15	15 mm
RSA-16	16 mm
RSA-18	18 mm
RSA-A5	19.05 mm (3/4")
RSA-20	20 mm
RSA-25	25 mm
RSA-A6	25.4 mm (1")
RSA-A7	28.58 mm (1-1/8")
RSA-30	30 mm
RSA-A8	31.75 mm (1-1/4")
RSA-32	32 mm

The RI-43 encoder is used for AC vector motor and general industrial applications. For AC vector motor applications, the encoder should be electrically isolated from the motor chassis to minimize encoder bearing currents and ground noise. An isolation insert for the hollow shaft is provided with the encoder by specifying N42 in the "special insert option" decode. **When ordering isolation inserts separately, choose option 38 with a bore diameter of 38 mm.**

For general industrial applications, isolation is not required and the decode for "special insert options" can be left blank.

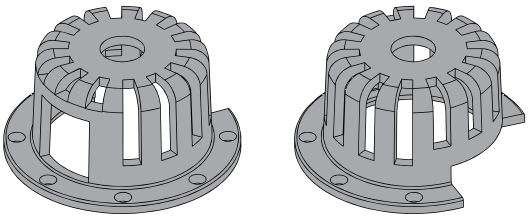
Isolation insert for hollow shaft Ø 42 mm:
External diameter 42 mm
Internal diameter 38 H7 in accordance with ISO 286-2
Order Number: RSA-38

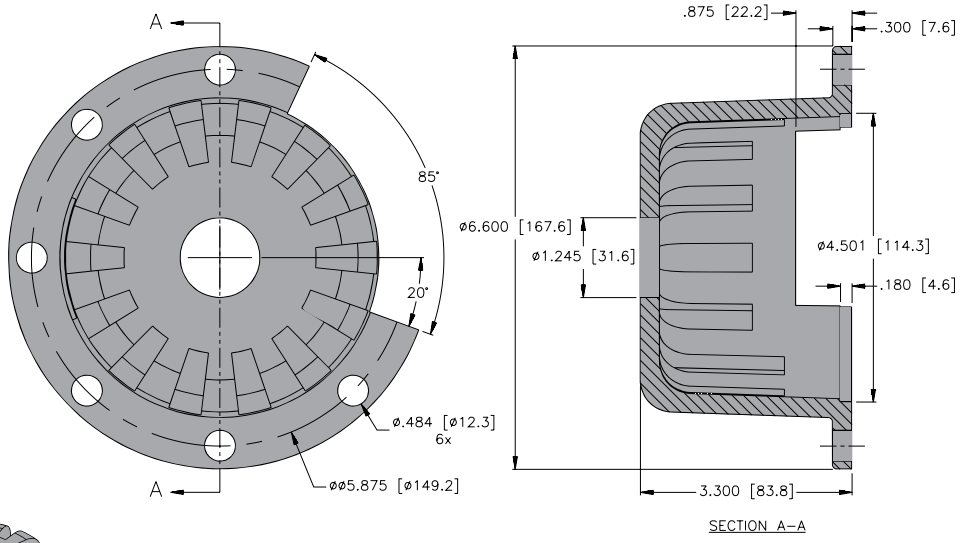
Large Bore Type RI-43 (Hollow Shaft) Accessories

Part Number:
ENCODER COVER KIT

Description:
Cover kit for 4.5" C-face motors

Included: (3) 3/8 x 16 x 3/4 bolts, (3) washers

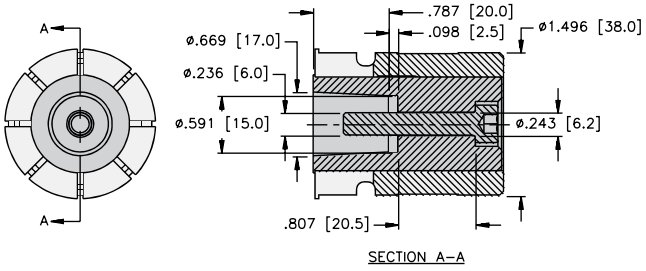




Part Number:
RSA-TAPER

Description:
Mounting kit adapts the RI-43 hollow shaft encoder for mounting onto a tapered shaft. Tapered shafts are used for high-precision direct coupling to devices. An isolating insert is also included in the mounting kit; this reliably protects the encoder from shaft currents.

Included: Insert for cone blind hole, cone 1:10, 17 mm length, isolation insert, allen screw for tightening

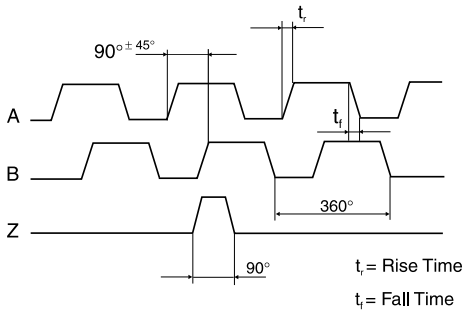


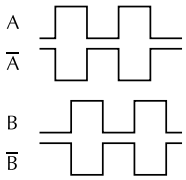
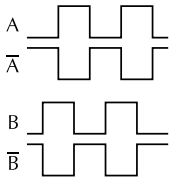
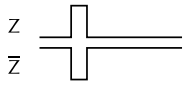
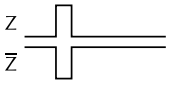
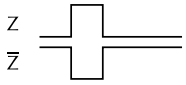
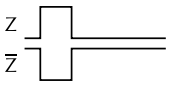
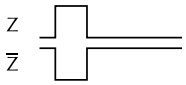
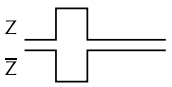
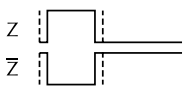
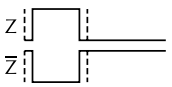
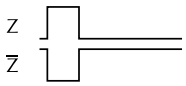
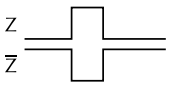
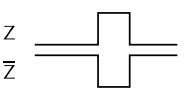
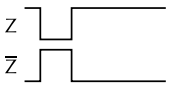
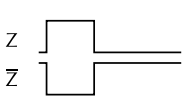
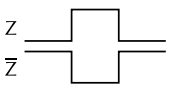
Wave Forms

Outputs

All Turck encoders come standard with six channels, where A leads B in the clockwise direction and the standard index is gated with A & B. The tolerance of the wave form affects the control, and in some cases it may affect the smoothness of system operation.

Wave Form Tolerances



A leads B when the shaft is turned in the clockwise direction viewing the shaft or collet end. This is Turck's standard. This format applies to the pin key codes listed below.		B leads A when the shaft is rotated in the clockwise direction viewing the shaft or collet end. This format applies to the pin key codes listed below.	
A leads B, Z gated with A & B. This is Turck's standard. Z is 90° wide.		**Code N24:** B leads A, Z gated with A & B. Z is 90° wide.	
Code N21: A leads B, Z gated with B. Z is 180° wide.		**Code N25:** B leads A, Z gated with B. Z is 180° wide.	
Code N22: A leads B, Z gated with A. Z is 180° wide.		**Code N26:** B leads A, Z gated with A. Z is 180° wide.	
Code N23: A leads B, Z ungated. Z is 330° to 360° wide.		**Code N27:** B leads A, Z is ungated. Z is 330° to 360° wide.	
Code N28: A leads B, Z is 180° wide.		**Code N29:*** B leads A, Z gated with $\overline{B}$. Z is 180° wide.	
Code N33:* A leads B, Z gated with $\overline{B}$. Z is 180° wide.		**Code N30:** B leads A, Z is a negative marker gated with B. Z is 180° wide.	
Code N31: A leads B, Z is a minimum with of 270° (electrical degrees).		**Code N32:** B leads A. Z has a minimum width of 270°.	

Note: * For RI-10/12/65 encoders, Z is 160° Wide

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Magnetic Ring Assembly Type RMK-2

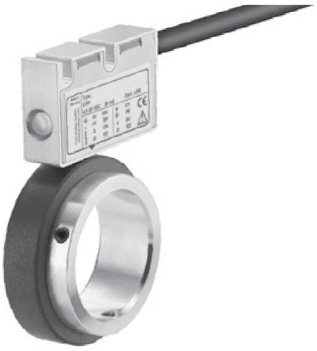

High rotational speed

High IP


Shock/vibration resistant


Reverse polarity protection

Robust
- **High shock and vibration resistance.**
- **Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69K, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).**
- **Non-contact measuring system, free from wear, ensures a long service life.**



RoHS compliant

Compact
- **Requires very little installation space Bore sizes available up to 30 mm.**

Simple Installation
- **Large mounting tolerance between magnetic band and sensor head.**
- **Slotted hole mounting ensures simple alignment.**
- **Function display via LED.**

Mechanical characteristics:

Max speed:		12000 rpm
Protection:		
	Q10	IP67 acc. to EN 60529
	P10	IP68 / IP69K acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78
Working temperature:		-4 to +176 °F [-20 to +80 °C]
Shock resistance:		500 g (5000 m/s²), 1 ms
Vibration resistance:		30 g (300 m/s²), 10-2000 Hz
Pole gap:		2 mm from pole to pole
Housing (sensor head):		aluminum
Cable:		2 m [6.56'] long, PUR 8 x 0.14 mm² [AWG 26], shielded, may be used in flexing cable installations
Status LED:		
	green	pulse index
	red	error; speed too high or magnetic fields too weak

RoHS compliant acc. to guideline EU 2011/65/EU

Magnetic Ring Assembly Type RMK-2

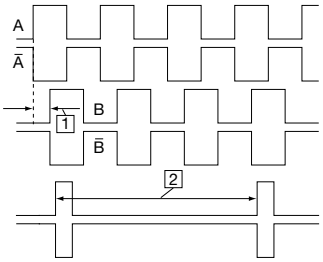
Electrical characteristics:

Output circuit [Key Code]:		Push-Pull [2R]		RS422 [4K]		
Power supply:		4.8 - 30 VDC		4.8 - 26 VDC		
Power consumption (no load):		typ. 25 mA max. 60 mA		typ. 25 mA max. 60 mA		
Permissible load/channel:		±20 mA		120 ohm		
Min. pulse edge interval:				1 µs		
Signal level:						
	High	min. +V - 2.0 V		min. 2.5 V		
	Low	max. 0.5 V		max. 0.5 V		
Reference signal:		index periodical [1]				
System accuracy:		typ. 0.3° with shaft tolerance g6				
Pulse rate [ppr] [2]:		250,360	1000	1024	2500	3600
	max speed rpm	12000	2400	7000	3900	2700

[1] At every pole change. The signal is generated by the sensor.
[2] With an input frequency of the evaluation unit of 250kHz.

Signal Figures:

With rotation of the magnetic ring in the CW-direction (see draft "Permissible Mounting tolerances").



1 Min. pulse interval: pay attention to the instructions in the technical data

2 Periodic index signal (every 2 mm); the logical assignment A, B and 0-signal can change

Standard Wiring:

Connection Type:	Common (0V)	+V	A	Ā	B	B̄	0	0̄	⏚
Cable:	WH	BN	GN	YE	GY	PK	BU	RD	shield[3]

[3] Shield is attached to sensor housing.

Part Number Key: RMK-2

A		B		C		D	E		F
RMK-2	-	P10	-	8	-	2R	250	-	C

A	Type
RMK-2	Rotary Magnetic, 2 mm Pole Gap

B	Housing
P10	10 mm, IP68/IP69K
Q10	10 mm, IP67

C	Bore
8	8 mm
10	10 mm
12	12 mm
15	15 mm
18	18 mm
20	20 mm
25	25 mm [1]
30	30 mm [1]
A1	3/8"
A4	5/8"
A6	1" [1]

[1] Only available with Pulse Rate '360' or '3600'

D	Voltage Supply and Output Type
2R	4.8-30 VDC, Push-Pull
4K	4.8-26 VDC, RS422

E	Pulse Rate
	250, 360, 1000, 1024, 2500, 3600

F	Type of Connection
C	Cable (2 m PUR)

Accessories:

- See page H1, Connectivity, for cables and connectors
- See page G1, Accessories, for mounting attachments and couplings

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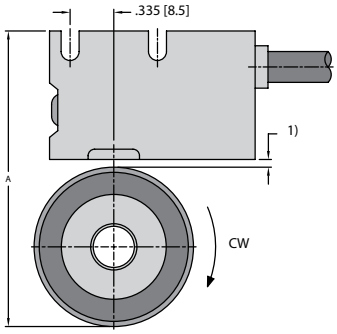
Magnetic Ring Assembly Type RMK-2

Mounting orientation and permissible mounting tolerances

Dimensions: RMK-2

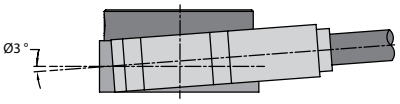
Distances



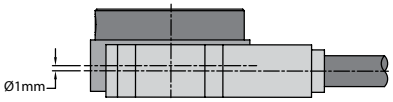
1) Distance sensor head / magnetic ring:
0.004-0.04 [0.1-1.0] (0.02 [0.4] recommended)

Pulse rate	A for distance sensor head / magnetic ring = 0.02 [0.4]
250, 1000, 2500	2.22 [56.4]
1024	2.62 [66.6]
360, 3600	2.77 [70.4]

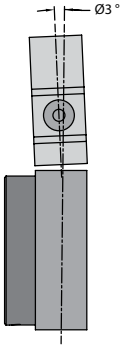
Torsion



Offset

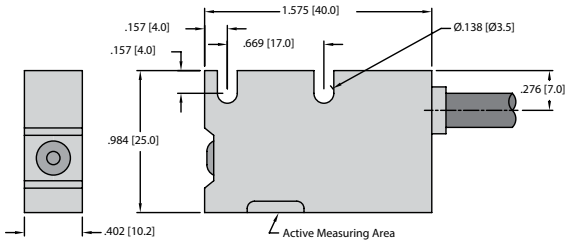


Tilting

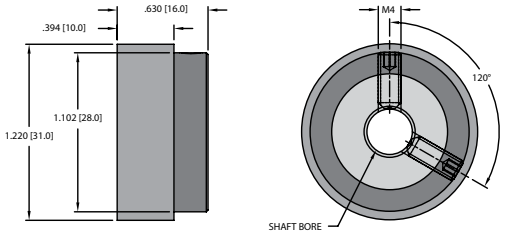


Dimensions: RMK-2

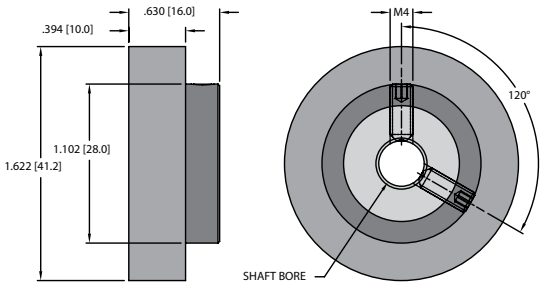
Sensor head



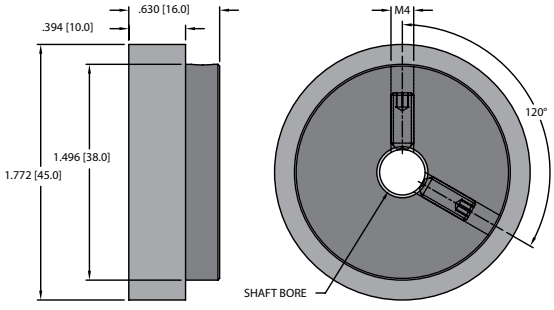
Magnetic Ring for pulse rate: 250, 1000 or 2500



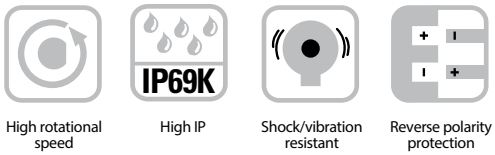
Magnetic Ring for pulse rate: 1024



Magnetic Ring for pulse rate: 360 or 3600



Magnetic Ring Assembly Type RMK-5



High rotational speed | High IP | Shock/vibration resistant | Reverse polarity protection

Robust
- **High shock and vibration resistance.**
- **Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69K, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).**
- **Non-contact measuring system, free from wear, ensures a long service life.**

RoHS compliant

Compact
- **Requires very little installation space Bore sizes available up to 30 mm.**

Simple Installation
- **Large mounting tolerance between magnetic band and sensor head.**
- **Slotted hole mounting ensures simple alignment.**
- **Function display via LED.**

Mechanical characteristics:

Max speed:		12000 rpm
Protection:		
	Q10	IP67 acc. to EN 60529
	P10	IP68 / IP69K acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78
Working temperature:		-4 to +176 °F [-20 to +80 °C]
Shock resistance:		500g (5000 m/s²), 1ms
Vibration resistance:		30g (300 m/s²), 10-2000 Hz
Pole gap:		5 mm from pole to pole
Housing (sensor head):		aluminum
Cable:		2 m [6.56'] long, PUR 8 x 0.14 mm² [AWG 26], shielded, may be used in flexing cable installations
Status LED:		
	green	pulse index
	red	error; speed too high or magnetic fields too weak

RoHS compliant acc. to guideline EU 2011/65/EU

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Magnetic Ring Assembly Type RMK-5

Electrical characteristics:

Output circuit [Key Code]:	Push-Pull [2R]		RS422 [4K]		
Power supply:	4.8-30 VDC		4.8 - 26 VDC		
Power consumption (no load):	typ. 25 mA max. 60 mA		typ. 25 mA max. 60 mA		
Permissible load/channel:	±20 mA		120 ohm		
Min. pulse edge interval:	1 µs		1 µs		
Signal level:					
High	min. +V - 2.0 V		min. 2.5 V		
Low	max. 0.5 V		max. 0.5 V		
Reference signal:	1 x per revolution				
System accuracy:	typ. 0.3 ° with shaft tolerance g6				
Pulse rate [ppr] [1]:	1000	1024	2000	2048	3600
max speed rpm w/o using zero pulse	9000	9000	4000	4000	2500
Pulse rate [ppr] [1]:					
max speed rpm using zero pulse	3000	2000	3000	2000	1700

[1] With an input frequency of the evaluation unit of 250kHz.

Standard Wiring:

Connection Type:	Common (0V)	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
Cable:	WH	BN	GN	YE	GY	PK	BU	RD	shield[3]

[3] Shield is attached to sensor housing.

Part Number Key: RMK-5

A		B		C		D	E		F
RMK-5	-	P10	-	6	-	2R	1000	-	C

A	Type
RMK-5	Rotary Magnetic, 5 mm Pole Gap

B	Housing
P10	10 mm, IP68/IP69K
Q10	10 mm, IP67

C	Bore
6	6 mm
8	8 mm
10	10 mm
12	12 mm
15	15 mm
20	20 mm
25	25 mm [1]
30	30 mm [1]
35	35 mm [2]
A4	5/8"
A6	1" [1]

[1] Only available with Pulse Rate '1024', '2048' and '3600'
[2] Only available with Pulse Rate '3600'

D	Voltage Supply and Output Type
2R	4.8-30 VDC, Push-Pull
4K	4.8-26 VDC, RS422

E	Pulse Rate
	1000, 1024, 2000, 2048, 3600

F	Type of Connection
C	Cable (2 m PUR)

Accessories:

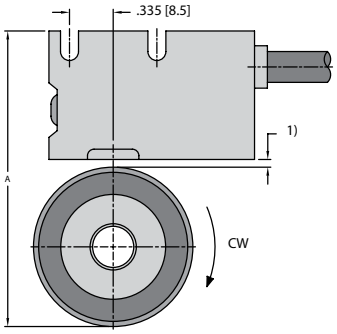
- See page H1, Connectivity, for cables and connectors
- See page G1, Accessories, for mounting attachments and couplings

Magnetic Ring Assembly Type RMK-5

Mounting orientation and permissible mounting tolerances

Dimensions: RMK-5

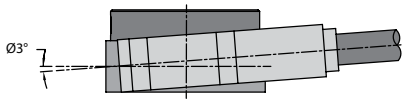
Distances



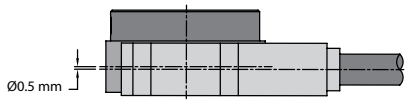
1) Distance sensor head / magnetic ring:
0.004 - 0.06 [0.1 - 1.5] (0.04 [1] recommended)

Pulse rate	A for distance sensor head / magnetic ring = 0.04 [1]
1000, 2000	2.24 [57.0]
1024, 2048	2.93 [74.3]
3600	3.18 [80.7]

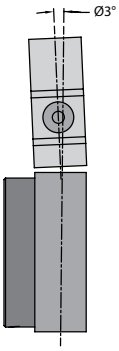
Torsion



Offset

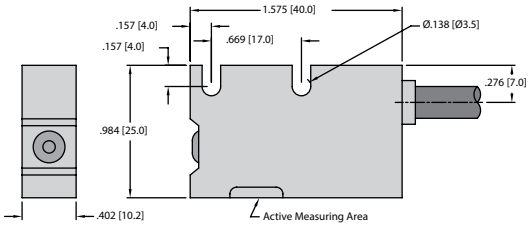


Tilting

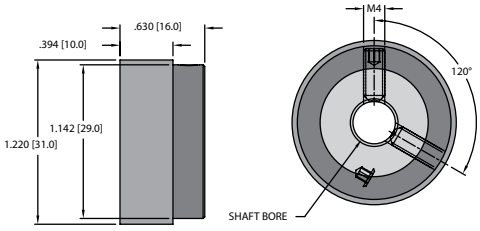


Dimensions: RMK-5

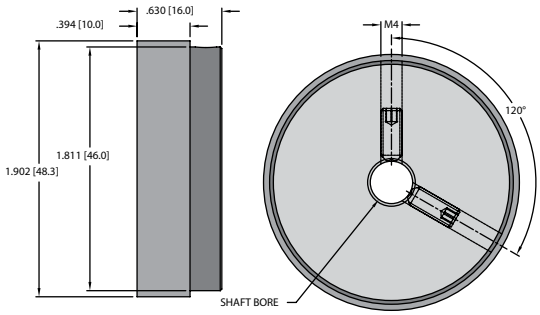
Sensor head



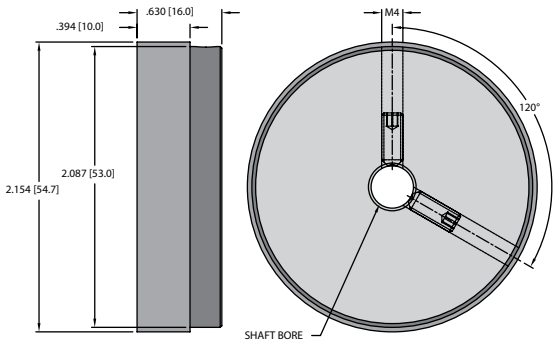
Magnetic ring for pulse rate: 1000 or 2000



Magnetic ring for pulse rate: 1024 or 2048



Magnetic ring for pulse rate: 3600



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Large Bore Magnetic Ring Assembly Type RMKL-2


High rotational speed

High IP


Shock/vibration resistant


Reverse polarity protection

Robust
- **High shock and vibration resistance.**
- **Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69K, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).**
- **Non-contact measuring system, free from wear, ensures a long service life.**

RoHS compliant

Compact
- **Requires very little installation space.**

Simple Installation
- **Large mounting tolerance between magnetic band and sensor head.**
- **Slotted hole mounting ensures simple alignment.**
- **Function display via LED.**

Mechanical characteristics:

Max speed:		12000 rpm
Protection:		
	Q10	IP67 acc. to EN 60529
	P10	IP68 / IP69K acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78
Working temperature:		-4 to +176 °F [-20 to +80 °C]
Shock resistance:		500 g (5000 m/s²), 1 ms
Vibration resistance:		30 g (300 m/s²), 10-2000 Hz
Pole gap:		2 mm from pole to pole
Housing (sensor head):		aluminum
Cable:		2 m [6.56'] long, PUR 8 x 0.14 mm² [AWG 26], shielded, may be used in flexing cable installations
Status LED:		
	green	pulse index
	red	error; speed too high or magnetic fields too weak

RoHS compliant acc. to guideline EU 2011/65/EU

Large Bore Magnetic Ring Assembly Type RMKL-2

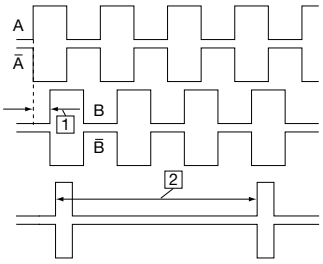
Electrical characteristics:

Output circuit [Key Code]:		Push-Pull [2R]		RS422 [4K]	
Power supply:		4.8 - 30 VDC		4.8 - 26 VDC	
Power consumption (no load):		typ. 25 mA max. 60 mA		typ. 25 mA max. 60 mA	
Permissible load/channel:		±20 mA		120 ohm	
Min. pulse edge interval:				1 µs	
Signal level:					
	High	min. +V - 2.0 V		min. 2.5 V	
	Low	max. 0.5 V		max. 0.5 V	
Reference signal:		index periodical [1]			
System accuracy:		typ. 0.3° with shaft tolerance g6			
Pulse rate [ppr] [2]:		700	2240	2800	7000
	max. speed rpm	12000	6600	5300	2100
Pulse rate [ppr] [2]:		1600	5120	6400	16000
	max. speed rpm	9300	2900	2300	900

[1] At every pole change. The signal is generated by the sensor.
[2] With an input frequency of the evaluation unit of 250kHz.

Signal Figures:

With rotation of the magnetic ring in the CW-direction (see draft "Permissible Mounting tolerances").



1 Min. pulse interval: pay attention to the instructions in the technical data

2 Periodic index signal (every 2 mm); the logical assignment A, B and 0-signal can change

Standard Wiring:

Connection Type:	Common (0V)	+V	A	Ā	B	B̄	0	0̄	⏚
Cable:	WH	BN	GN	YE	GY	PK	BU	RD	shield[3]

[3] Shield is attached to sensor housing.

Part Number Key: RMKL-2

A		B		C		D	E		F
RMKL-2	-	P10	-	76	-	2R	700	-	C

A	Type
RMKL-2	Rotary Magnetic, 2 mm Pole Gap

B	Housing
P10	10 mm, IP68/IP69K
Q10	10 mm, IP67

C	Bore
76	76 mm
180	180 mm

D	Voltage Supply and Output Type
2R	4.8-30 VDC, Push-Pull
4K	4.8-26 VDC, RS422

E	Pulse Rate
	700, 2240, 2800, 7000 (for Bore size '76') 1600, 5120, 6400, 16000 (for Bore size '180')

F	Type of Connection
C	Cable (2 m PUR)

Accessories:

- See page H1, Connectivity, for cables and connectors
- See page G1, Accessories, for mounting attachments and couplings

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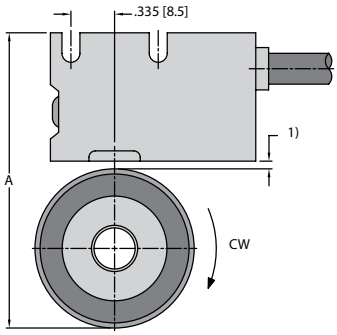
Large Bore Magnetic Ring Assembly Type RMKL-2

Mounting orientation and permissible mounting tolerances

Dimensions: RMKL-2

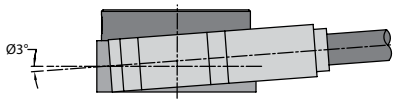
Distances



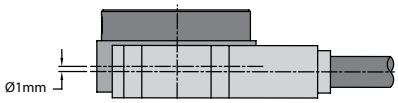
1) Distance sensor head / magnetic ring:
0.004-0.04 [0.1-1.0] (0.02 [0.4] recommended)

Pulse rate	A for distance sensor head / magnetic ring = 0.02 [0.4]
700, 2240, 2800, 7000	4.43 [112.5]
1600, 5120, 6400, 16000	8.96 [227.7]

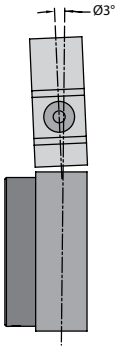
Torsion



Offset

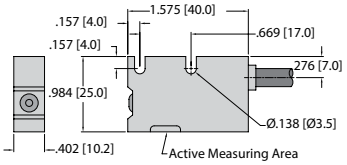


Tilting

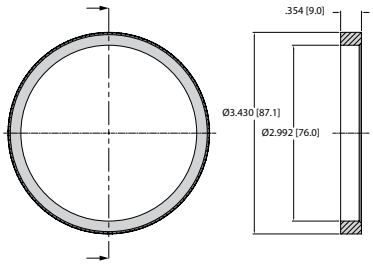


Dimensions: RMKL-2

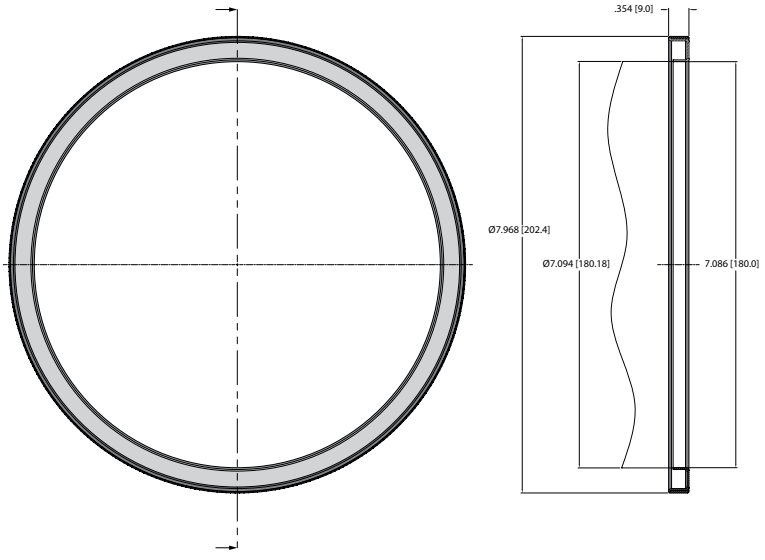
Sensor head



Magnetic Ring (press fit) for pulse rate: 700, 2240, 2800, 7000



Magnetic Ring (press fit) for pulse rate: 1600, 5120, 6400, 16000



Large Bore Magnetic Ring Assembly Type RMKL-5

High rotational speed | High IP | Shock/vibration resistant | Reverse polarity protection

Robust
- **High shock and vibration resistance.**
- **Sturdy housing with IP67 protection. Option: special housing for maximum resistance against condensation (IP68 / IP69K, resistance to cyclic humidity acc. to EN 60068-3-38 as well as damp heat acc. to EN 60068-3-78).**
- **Non-contact measuring system, free from wear, ensures a long service life.**

RoHS compliant

Compact
- **Requires very little installation space.**

Simple Installation
- **Large mounting tolerance between magnetic band and sensor head.**
- **Slotted hole mounting ensures simple alignment.**
- **Function display via LED.**

Mechanical characteristics:

Max speed:		12000 rpm
Protection:		
	Q10	IP67 acc. to EN 60529
	P10	IP68 / IP69k acc. to EN 60529, DIN 40050-9 and humidity tested acc. to EN 60068-3-38, EN 60068-3-78
Working temperature:		-4 to +176 °F [-20 to +80 °C]
Shock resistance:		500 g (5000 m/s²), 1ms
Vibration resistance:		30 g (300 m/s²), 10-2000 Hz
Pole gap:		5 mm from pole to pole
Housing (sensor head):		aluminum
Cable:		2 m [6.56'] long, PUR 8 x 0.14 mm² [AWG 26], shielded, may be used in flexing cable installations
Status LED:		
	green	pulse index
	red	error; speed too high or magnetic fields too weak

RoHS compliant acc. to guideline EU 2011/65/EU

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Large Bore Magnetic Ring Assembly Type RMKL-5

Electrical characteristics:

Output circuit [Key Code]:		Push-Pull [2R]		RS422 [4K]	
Power supply:		4.8 - 30 VDC		4.8 - 26 VDC	
Power consumption (no load):		typ. 25 mA max. 60 mA		typ. 25 mA max. 60 mA	
Permissible load/channel:		± 20 mA		120 ohm	
Min. pulse edge interval:		1 x per revolution		1 µs	
Signal level:					
	High	min. +V - 2.0 V		min. 2.5 V	
	Low	max. 0.5 V		max. 0.5 V	
Reference signal:		1 x per revolution			
System accuracy:		typ. 0.3° with shaft tolerance g6			
Pulse rate [ppr] [1]:		2048	3200	4096	6400
	max. speed rpm	7300	4600	3600	2300

[1] With an input frequency of the evaluation unit of 250kHz.

Standard Wiring:

Connection Type:	Common (0V)	+V	A	$\overline{A}$	B	$\overline{B}$	0	$\overline{0}$	⏚
Cable:	WH	BN	GN	YE	GY	PK	BU	RD	shield[2]

[2] Shield is attached to sensor housing.

Part Number Key: RMKL-5

A		B		C		D		E	F		G
RMKL-5	-	P10	-	70	-	F	-	2R	2048	-	C

A	Type
RMKL-5	Rotary Magnetic, 5 mm Pole Gap

B	Housing
P10	10 mm, IP68/IP69K
Q10	10 mm, IP67

C	Bore
70	70 mm

D	Magnetic Ring Mounting Method
F	Screwed Flange
H	Hub Screw*
P	Press Fit

*Standard

E	Voltage Supply and Output Type
2R	4.8-30 VDC, Push-Pull
4K	4.8-26 VDC, RS422

F	Pulse Rate
	2048, 3200, 4096, 6400

G	Type of Connection
C	Cable (2 m PUR)

Accessories:

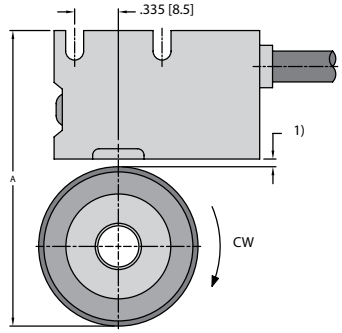
- See page H1, Connectivity, for cables and connectors
- See page G1, Accessories, for mounting attachments and couplings

Large Bore Magnetic Ring Assembly Type RMKL-5

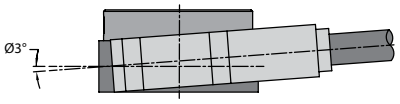
Mounting orientation and permissible mounting tolerances

Dimensions: RMKL-5

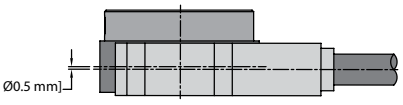
Distances



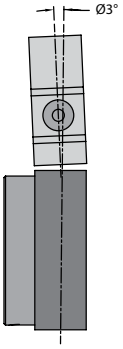
Torsion



Offset



Tilting

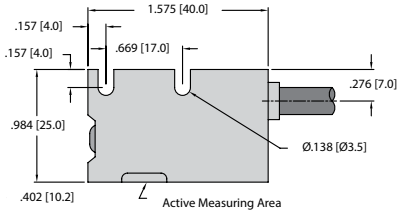


1) Distance sensor head / magnetic ring:
0.004-0.06 [0.1-1.5] (0.002 [0.04] recommended)

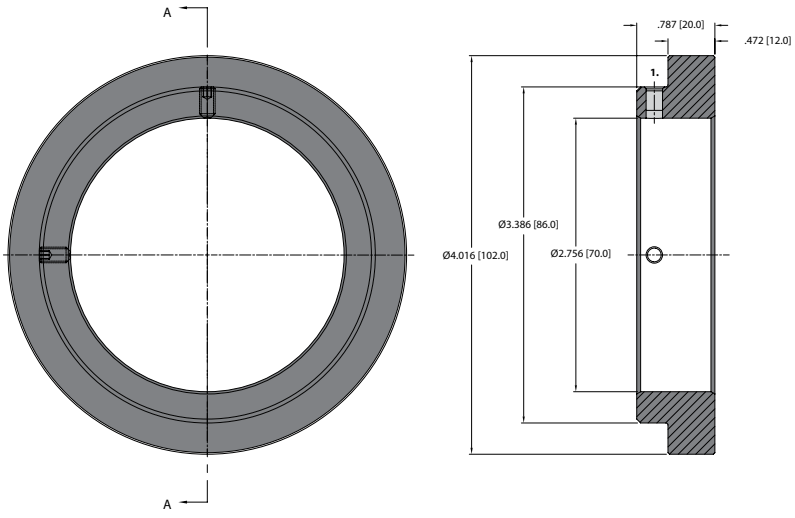
Pulse rate	A for distance sensor head / magnetic ring = 0.04 [1]
2048, 3200, 4096, 6400	5.04 [128.0]

Dimensions: RMKL-5

Sensor head



Magnetic ring (hub screw) for pulse rate: 2048, 3200, 4096, 6400



1. M5 set screw M4

Notes:

Notes:

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