

Incremental encoders

Insulated hollow shaft $\varnothing 0.375...1$ inch

Resolution 1024...80000 pulses

HS35F



HS35F with insulated hollow shaft

Technical data - electrical ratings

Voltage supply	4.75...30 VDC
Reverse polarity protection	Yes
Consumption w/o load	≤ 40 mA (24 VDC) ≤ 130 mA (4.75 VDC) + output load, max. 250 mA
Resolution (steps/turn)	1024...80000
Accuracy	≤ 60 arc-seconds
Sensing method	Optical
Output frequency	≤ 300 kHz (TTL) ≤ 160 kHz (HTL) ≤ 160 kHz (OC)
Output signals	A, B, Z A, B, Z + complement, $\frac{1}{2}$ cycle index gated with negative B channel
Output circuit	Linedriver (TTL, 7272) $V_{out} = 5$ V, short-circuit proof Push-pull (HTL, 7272) $V_{out} = V_{in}$, short-circuit proof Open Collector (OC, 7273) $V_{out} = V_{in}$, short-circuit proof
Interference immunity	DIN EN 61000-6-2
Emitted interference	DIN EN 61000-6-4
Approvals	UL approval / file no. E240061, ROHS compliant EU guideline 2002/95/EG, CE conform

Features

- Robust industrial encoder up to IP 67 protection
- Shock resistant up to 200 g's
- Insulating insert to prevent high shaft currents from damaging bearings
- Wide range voltage supply 4.75...30 VDC
- Precision ≤ 60 arc-seconds for perfect process control
- Number of pulses up to 80000 ppr

Optional

- Function control with EMS

Technical data - mechanical design

Dimensions (flange)	$\varnothing 3.15''$ ($\varnothing 80$ mm)
Shaft	$\varnothing 0.375...1''$ ($\varnothing 9.525...25.4$ mm) hollow shaft with insulated insert
Bore runout	0.0016" (0.04 mm) TIR max.
Admitted misalignment	0.004" (0.1016 mm) radial TIR (end of shaft) 0.01" (0.254 mm) axial
Protection DIN EN 60529	IP 54, IP 65, IP 67
Operating speed	≤ 5000 rpm (IP 54) ≤ 3000 rpm (IP 65) ≤ 2000 rpm (IP 67)
Bearing	52100 SAE high carbon steel (ABEC 5)
Starting torque	≤ 3 in-oz (77 °F, IP 65) ≤ 0.02 Nm (+25 °C, IP 65)
Rotor moment of inertia	2.3 oz-in ² (420 gcm ²)
Service life	Bearing: typ. 13 billion rev. (89000 h/2500 rpm)
Materials	Housing: aluminium, powder-coated Shaft: stainless steel
Operating temperature	-40...+212 °F (-40...+100 °C) (fixed cable)
Relative humidity	98 % non-condensing
Resistance	DIN EN 60068-2-6 Vibration 20 g, 55-2000 Hz DIN EN 60068-2-27 Shock 200 g, 6 ms
Connection	MIL-connector, 7-pin MIL-connector, 10-pin Cable (AWG26 wire)
Weight approx.	23 oz., 660 g

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Part number

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Options

without option (standard)

E Enhanced Monitoring System (EMS) *

Mounting kit

T1 Tether arm T1, fixed length, for bolt 3/8"

T3 Tether arm T3, adjustable length, for bolt 1/4"

T4 Tether arm T4, adjustable length, for bolt 5/16"

T5 Tether arm T5, adjustable length, for bolt 3/8"

Protection

IP54 IP 54

IP65 IP 65

IP67 IP 67 (not at $-40...+212$ °F ($-40...+100$ °C), dust cap included)

Hollow shaft

100 Hollow shaft $\varnothing 1.000$ " ($\varnothing 25.4$ mm) | M20 Hollow shaft $\varnothing 20$ mm

087 Hollow shaft $\varnothing 0.875$ " ($\varnothing 22.23$ mm) | M18 Hollow shaft $\varnothing 18$ mm

075 Hollow shaft $\varnothing 0.750$ " ($\varnothing 19.05$ mm) | M16 Hollow shaft $\varnothing 16$ mm

062 Hollow shaft $\varnothing 0.625$ " ($\varnothing 15.88$ mm) | M14 Hollow shaft $\varnothing 14$ mm

050 Hollow shaft $\varnothing 0.500$ " ($\varnothing 12.7$ mm) | M12 Hollow shaft $\varnothing 12$ mm

037 Hollow shaft $\varnothing 0.375$ " ($\varnothing 9.525$ mm) | M10 Hollow shaft $\varnothing 10$ mm

Operating temperature

E $-40...+212$ °F ($-40...+100$ °C)

S $-40...+185$ °F ($-40...+85$ °C)

Phasing

B Standard phasing, CCW rotation, A leads B

D Phasing option, CW rotation, A leads B

Connection

D31SR7 MIL-connector MS3102E-16S-1P, 7-pin (at ABZ, not for option EMS)

D31SR10 MIL-connector MS3102E-18-1P, 10-pin (at ABZC)

CR12 Cable gland with cable and wire end sleeves L=12" (305 mm)

CR18 Cable gland with cable and wire end sleeves L=18" (457 mm)

CR24 Cable gland with cable and wire end sleeves L=24" (610 mm) **

Output signals

ABZ A, B, Z (not for option EMS)

ABZC A, B, Z + complements

Voltage supply / signals

Z $V_{in} = 4.75...30$ VDC, $V_{out} = 5$ V (7272) / TTL-signals

V $V_{in} = 4.75...30$ VDC, $V_{out} = V_{in}$ (7272) / HTL-signals

OC $V_{in} = 4.75...30$ VDC, $V_{out} = V_{in}$ (7273) / Open Collector (OC), (external pull-up resistor required)

See part number (pulses)

Part number (pulses)

1024	3072	8192*	20000*	80000*
2000	3600	10000*	25000*	
2048	4096	15000*	32768*	
2500	5000	16384*	40000*	

* Featured pulse numbers are interpolated and not available for option E (Enhanced Monitoring System).

** Other cable lengths upon request.

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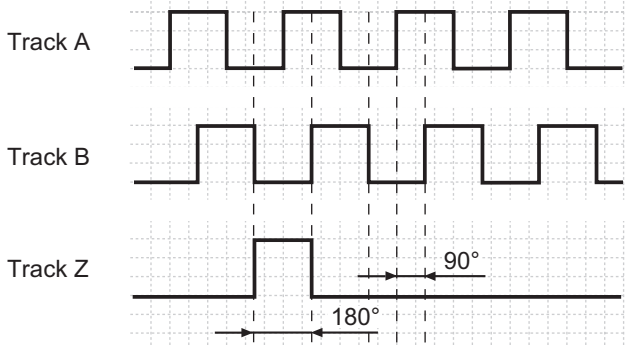
Resolution 1024...80000 pulses

HS35F

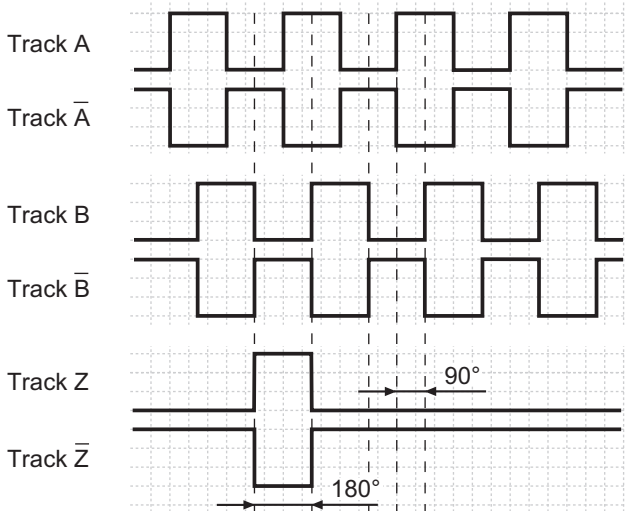
Output signals

Phasing = B: Counterclockwise rotation (standard) from clamping end.
Phasing = D: Clockwise rotation (option) from clamping end.

ABZ-Output signals



ABZC-Output signals



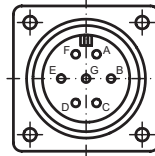
EMS: LED status / error output

flash light red	Error of signal sequence, marker pulse or cycles (Error output = high-low alternation)
red	Overload output driver (Error output = low)
flash light green	Encoder o.k., rotating (Error output = high)
green	Encoder o.k., stopped (Error output = high)
no light	No output voltage connection or wrong connection (Error output = low)

Terminal assignment

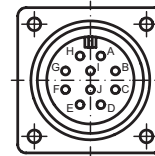
D31SR7: MIL-connector MS3102E-16S-1P, 7-pin

Connector	Assignment
Pin A	Track A
Pin B	Track B
Pin C	Track Z
Pin D	+Vs
Pin E	-
Pin F	0 V
Pin G	Housing



D31SR10: MIL-connector MS3102E-18-1P, 10-pin

Connector	Assignment
Pin A	Track A
Pin B	Track B
Pin C	Track Z
Pin D	+Vs
Pin E	\bar{Err} (only EMS)
Pin F	0 V
Pin G	Housing
Pin H	Track A complement
Pin I	Track B complement
Pin J	Track Z complement



Cable gland (AWG26 wire)

Core colour	Assignment
green	Track A
grey	Track B
pink	Track Z
red	+Vs
violet	\bar{Err} (only EMS)
blue	0 V
transparent	Shield/Housing
brown	Track A complement
black	Track B complement
white	Track Z complement

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Trigger level	
Outputs	Linedriver (TTL, ET7272)
Output level High	≥ 2.4 V
Output level Low	≤ 0.5 V
Load	≤ 40 mA
Outputs	Push pull (HTL, ET7272)
Output level High	$\geq UB - 3$ V
Output level Low	≤ 1.5 V
Load	≤ 40 mA

Accessories	
Connectors and cables	
11075211	NAC 25E 7-pin Mil Spec Mating Connector
11078440	CNAC 25E 7-pin Mil Spec Mating Connector + cable L = 10 feet (3.05 m)
11078442	CNAC 25E 7-pin Mil Spec Mating Connector + cable L = 20 feet (6.10 m)
11078446	CNAC 25E 7-pin Mil Spec Mating Connector + cable L = 30 feet (9.15 m)
11075212	NAC 29H 10-pin Mil Spec Mating Connector
11078307	CNAC 29H 10-pin Mil Spec Mating Connector + cable L = 10 feet (3.05 m)
11078427	CNAC 29H 10-pin Mil Spec Mating Connector + cable L = 20 feet (6.10 m)
11078428	CNAC 29H 10-pin Mil Spec Mating Connector + cable L = 30 feet (9.15 m)
Mounting accessories	
11076339	Tether arm T1, fixed length, for bolt 3/8" with plastic clip and screws
11075692	Tether arm T3, adjustable length, for bolt 1/4" with plastic clip and screws
11075690	Tether arm T4, adjustable length, for bolt 5/16" with plastic clip and screws
11071506	Tether arm T5, adjustable length, for bolt 3/8" with plastic clip and screws
11084462	Reducer insert HS35 $\varnothing 0.375"$ ($\varnothing 9.525$ mm)
11078636	Reducer insert HS35 $\varnothing 0.50"$ ($\varnothing 12.7$ mm)
11080114	Reducer insert HS35 $\varnothing 0.625"$ ($\varnothing 15.875$ mm)
11078639	Reducer insert HS35 $\varnothing 0.75"$ ($\varnothing 19.05$ mm)
11078654	Reducer insert HS35 $\varnothing 0.87"$ ($\varnothing 22.225$ mm)
11087744	Reducer insert HS35 $\varnothing 10$ mm
11087745	Reducer insert HS35 $\varnothing 12$ mm
11087746	Reducer insert HS35 $\varnothing 14$ mm
11087747	Reducer insert HS35 $\varnothing 16$ mm
11087748	Reducer insert HS35 $\varnothing 18$ mm
11087750	Reducer insert HS35 $\varnothing 20$ mm
11075459	Dust cap HS35
11080884	Protective cover HS35

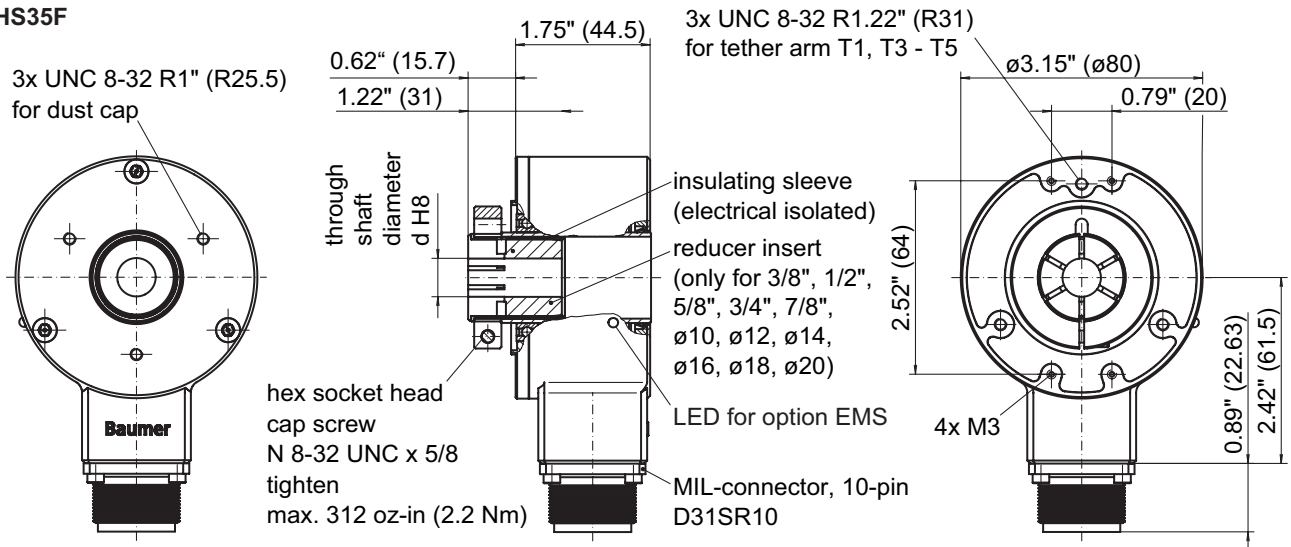
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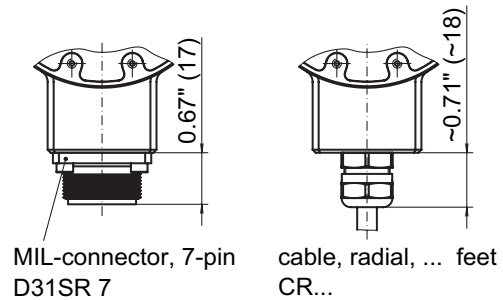
HS35F

Dimensions

HS35F



H8	through shaft \varnothing (inch)	through shaft \varnothing (metric)
$\varnothing 1"$	$\varnothing 1.000"$ $+0.0013"$ $-0.000"$	$\varnothing 25.400$ mm $+0.033$ mm -0.000 mm
$\varnothing 0.875"$	$\varnothing 0.875"$ $+0.0013"$ $-0.000"$	$\varnothing 22.225$ mm $+0.033$ mm -0.000 mm
$\varnothing 0.75"$	$\varnothing 0.750"$ $+0.0013"$ $-0.000"$	$\varnothing 19.050$ mm $+0.033$ mm -0.000 mm
$\varnothing 0.625"$	$\varnothing 0.625"$ $+0.0011"$ $-0.000"$	$\varnothing 15.875$ mm $+0.027$ mm -0.000 mm
$\varnothing 0.5"$	$\varnothing 0.500"$ $+0.0011"$ $-0.000"$	$\varnothing 12.700$ mm $+0.027$ mm -0.000 mm
$\varnothing 0.375"$	$\varnothing 0.375"$ $+0.0009"$ $-0.000"$	$\varnothing 9.525$ mm $+0.022$ mm -0.000 mm
$\varnothing 20$ mm		$\varnothing 20$ mm $+0.033$ mm -0.000 mm
$\varnothing 18$ mm		$\varnothing 18$ mm $+0.027$ mm -0.000 mm
$\varnothing 16$ mm		$\varnothing 16$ mm $+0.027$ mm -0.000 mm
$\varnothing 14$ mm		$\varnothing 14$ mm $+0.027$ mm -0.000 mm
$\varnothing 12$ mm		$\varnothing 12$ mm $+0.027$ mm -0.000 mm
$\varnothing 10$ mm		$\varnothing 10$ mm $+0.022$ mm -0.000 mm



Recommended motor shaft tolerance

g6	customer shaft \varnothing (inch)	customer shaft \varnothing (metric)
$\varnothing 1"$	$\varnothing 1.000"$ $-0.000276"$ $-0.000787"$	$\varnothing 25.400$ mm -0.007 mm -0.020 mm
$\varnothing 0.875"$	$\varnothing 0.875"$ $-0.000276"$ $-0.000787"$	$\varnothing 22.225$ mm -0.007 mm -0.020 mm
$\varnothing 0.75"$	$\varnothing 0.750"$ $-0.000276"$ $-0.000787"$	$\varnothing 19.050$ mm -0.007 mm -0.020 mm
$\varnothing 0.625"$	$\varnothing 0.625"$ $-0.000236"$ $-0.000669"$	$\varnothing 15.875$ mm -0.006 mm -0.017 mm
$\varnothing 0.5"$	$\varnothing 0.500"$ $-0.000236"$ $-0.000669"$	$\varnothing 12.700$ mm -0.006 mm -0.017 mm
$\varnothing 0.375"$	$\varnothing 0.375"$ $-0.000197"$ $-0.000551"$	$\varnothing 9.525$ mm -0.005 mm -0.014 mm
$\varnothing 20$ mm		$\varnothing 20$ mm -0.007 mm -0.020 mm
$\varnothing 18$ mm		$\varnothing 18$ mm -0.006 mm -0.017 mm
$\varnothing 16$ mm		$\varnothing 16$ mm -0.006 mm -0.017 mm
$\varnothing 14$ mm		$\varnothing 14$ mm -0.006 mm -0.017 mm
$\varnothing 12$ mm		$\varnothing 12$ mm -0.006 mm -0.017 mm
$\varnothing 10$ mm		$\varnothing 10$ mm -0.005 mm -0.014 mm

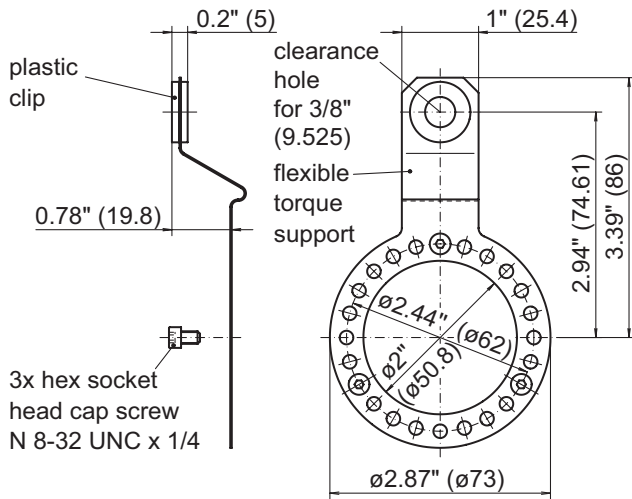
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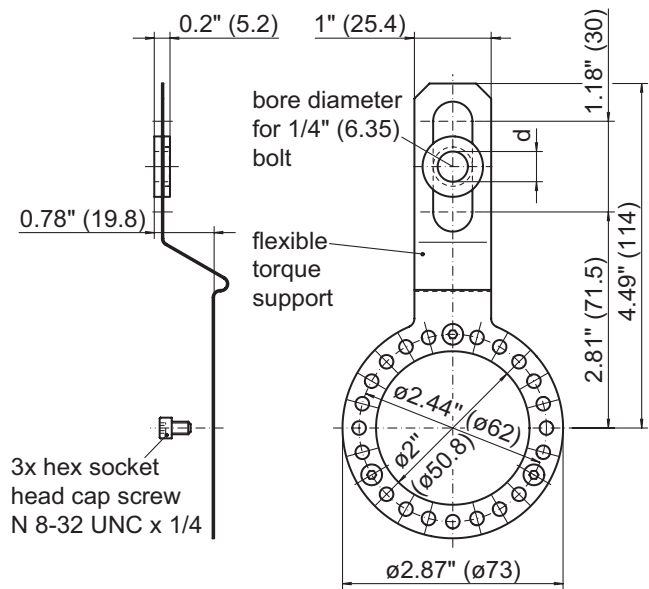
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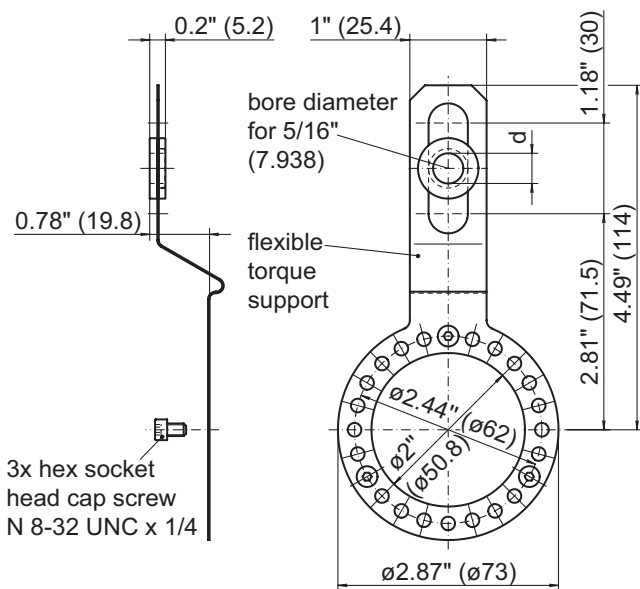
Tether arm T1



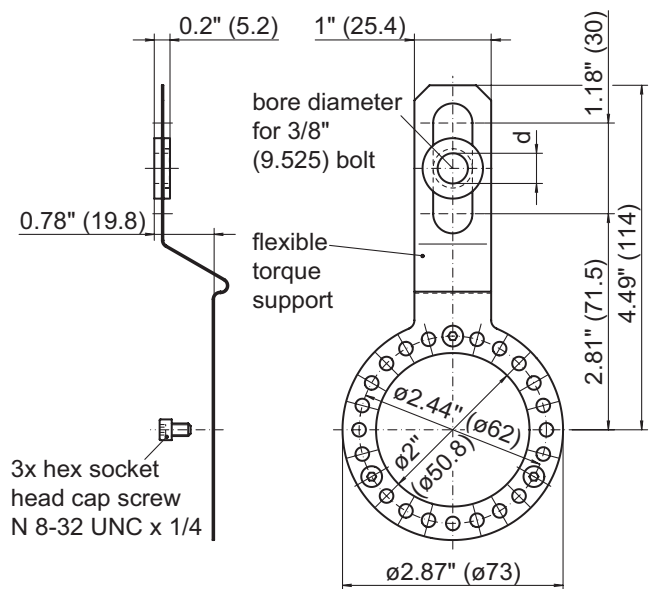
Tether arm T3



Tether arm T4



Tether arm T5



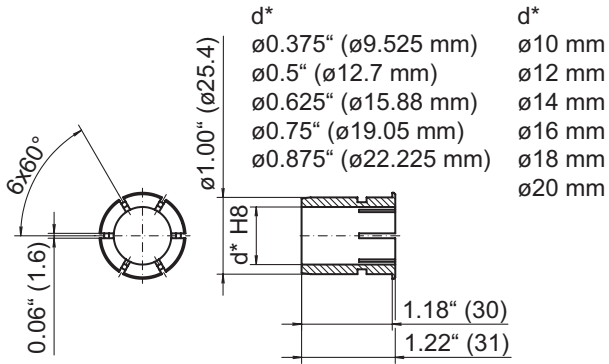
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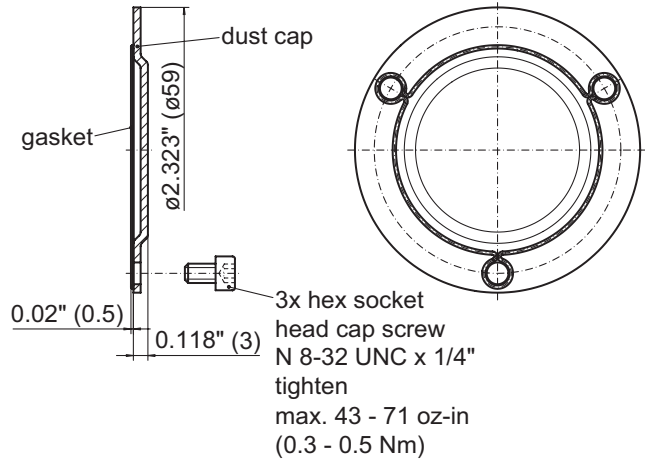
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Dimensions

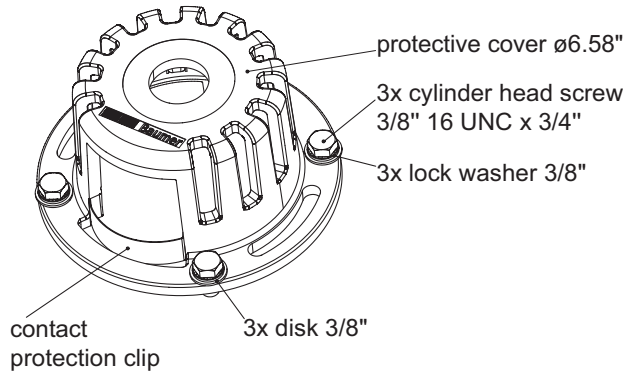
Reducer inserts



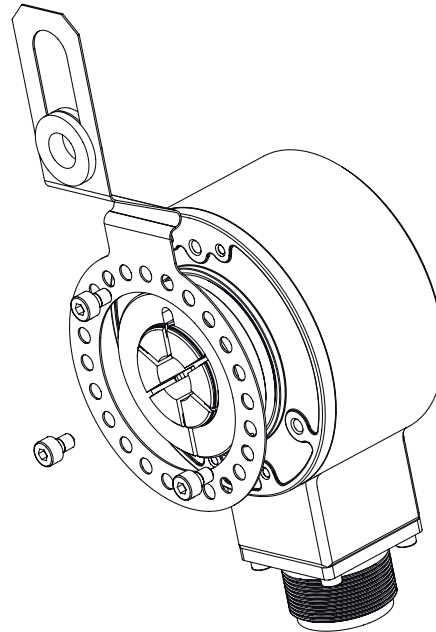
Dust cap HS35



Protective cover HS35



Example fitting tether arm



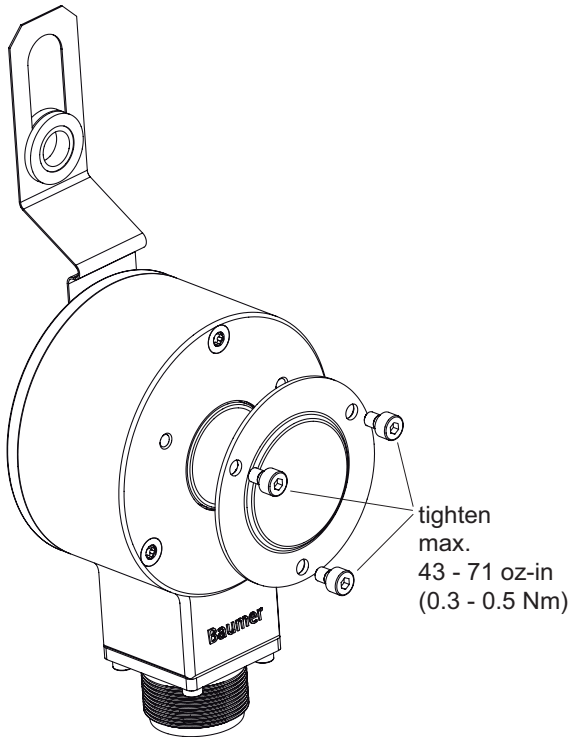
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Example fitting dust cap HS35



Example fitting protective cover HS35

