ELECTRO·SENSORS

ST420

4-20mA

Shaft Tachometer Sensor/Transmitter

USERS MANUAL

(with I.S. control drawing)

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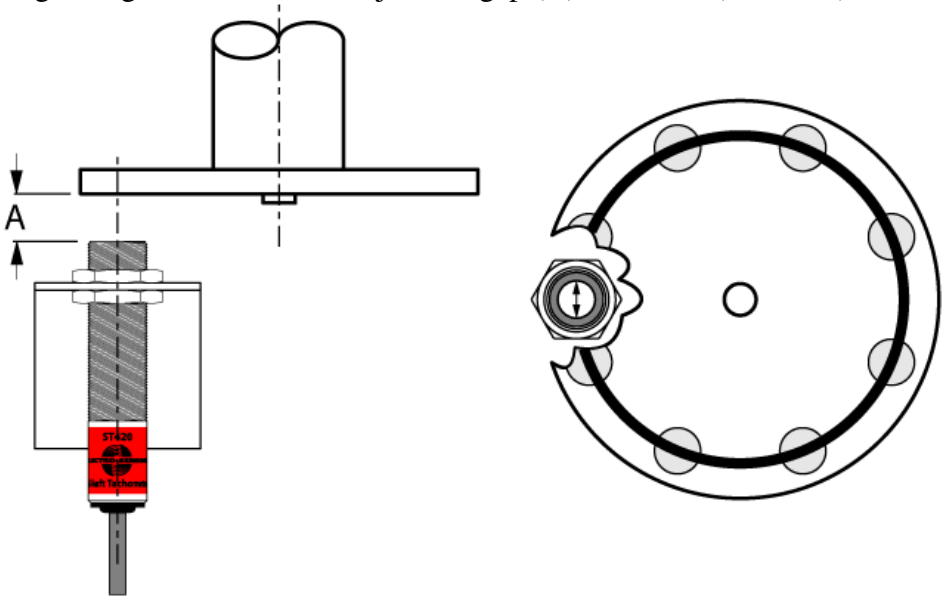
990-003900 Rev D

Description

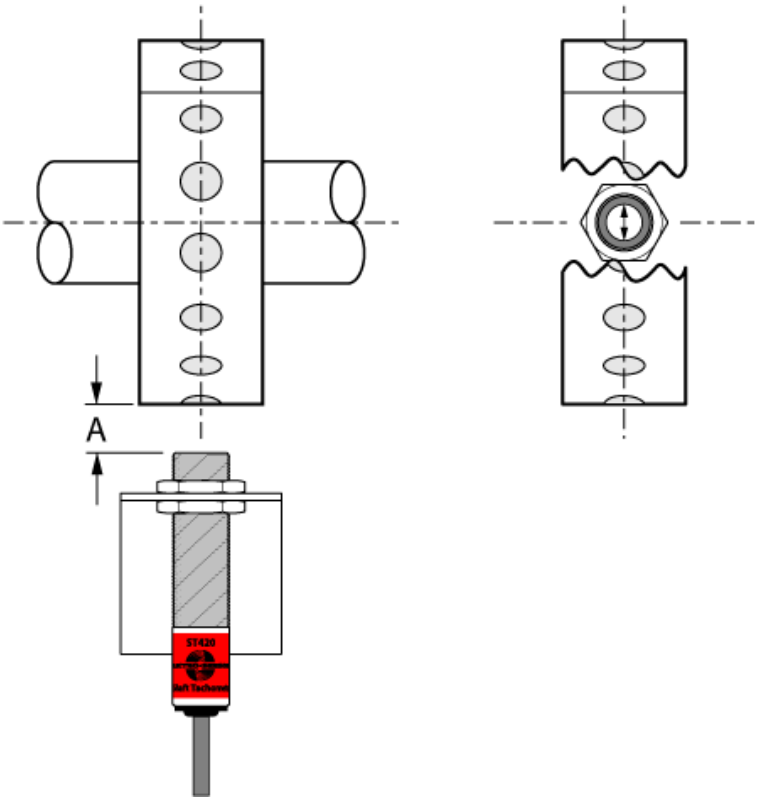
The ST420 is an analog-output shaft speed sensor/transmitter. It detects magnetic pulses from a rotating shaft-mounted pulser target (disc or wrap) and outputs a smooth, continuous 4-20mA analog signal in direct proportion to the pulse frequency (rotating shaft speed). See the Output Function graph on p. 4.
The ST420 combines a magnetic pulse detector, signal processing and 2-wire loop-powered 4-20mA circuitry into a stainless-steel M18x1 sensor housing.

Installation

Mount the pulser target (disc or wrap) to the shaft.
Mount the ST420 with the arrow label aligned with the center path of the pulser target magnets as shown. Adjust the gap (A) to ¼ inch (6.35 mm).

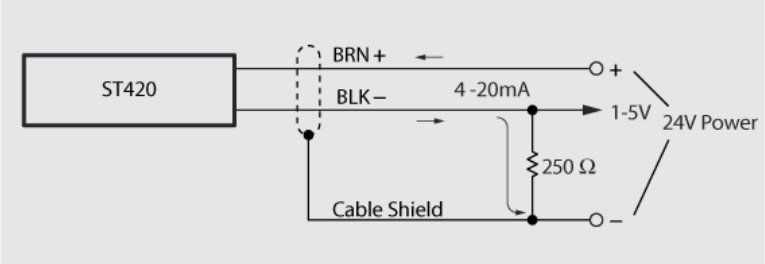


With Pulser Disc



With Pulser Wrap

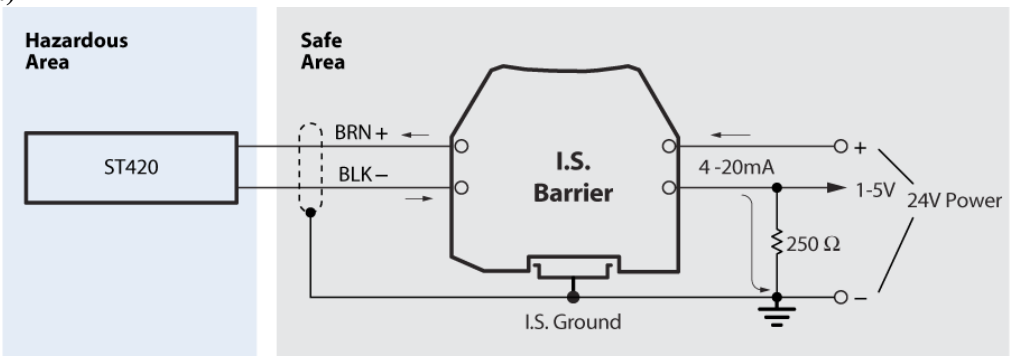
Wiring Diagram (non I.S.)



I.S. Control Drawing

Entity Parameters	Vmax	30 Vdc
	Imax	100mA
	Pmax	0.75 W
	Ci	0.3 uF
	Li	0 uH

Wiring Diagram (I.S.)



I.S. Requirements

Equip		Barrier	Notes
Vmax	≥	Voc	Voc is the barrier max open-circuit voltage
I max	≥	Isc	Isc is the barrier max short-circuit current
Pmax	≥	Po	If Po is not known, use Po = (Voc * Isc)/4
Ci + Cc	≤	Ca	Cc = (cable pF/ft) * length (in ft), Ca is the barrier max allowed external capacitance
Li + Lc	≤	La	Lc = (cable µH/ft) * length (in ft), La is the barrier max allowed external inductance

Selected barriers must be third party approved as providing intrinsically safe circuits for the application.
The transmitter-barrier cable length is limited by the Cc, Lc restrictions given above.
If the cable pF/ft and/or µH/ft values are unknown, use 60 pF/ft and/or 0.2µH/ft.
The DIN rail (I.S. Ground) must be insulated from the surrounding cabinet (and all other potentials) and connected to earth ground at the 24V supply only. See NEC Article 504, CEC Section 18.
Barrier output current must be limited by a resistor such that the output voltage-current plot is a straight line drawn between open-circuit voltage and short-circuit current.
Barriers must be installed in accordance with barrier manufacturer's control drawing and Article 504 of the National Electrical Code, ANSI/NFPA 70, for installation in the United States, or Section 18 of the Canadian Electrical Code for installations in Canada.
When required by the manufacturer's control drawing, the barrier must be connected to a suitable ground electrode per the National Electrical Code, ANSI/NFPA 70 or the Canadian Electrical Code, as applicable. The resistance of the ground path must be less than 1 ohm.
Control equipment must not use or generate more than 250 V rms or dc with respect to earth.

Warning: Substitution of components may impair intrinsic safety.

Warning: To prevent ignition of flammable or combustible atmospheres, read, understand and adhere to the manufacturer's procedures.

Specifications

Sensor Gap	1/4 in ±1/8 in
Vin (min → max)	8 → 30 Vdc (nominal loop power: 24Vdc)
Operating Temp	-20 → 80 °C
Accuracy	Max error at 25°C ± 0.25%
	Max error over temp ± 0.50%
Output response time	< 9 mS

Cable

Type	Alpha 5092C (shielded, 2 x 24 (7/32) AWG)
Length	10 ft
Color code	Brown (V+), Black (V-)

Protection

Intrinsically safe for use in Class I (Grp C,D), Class II (Grp E,F,G)

c UL US LISTED

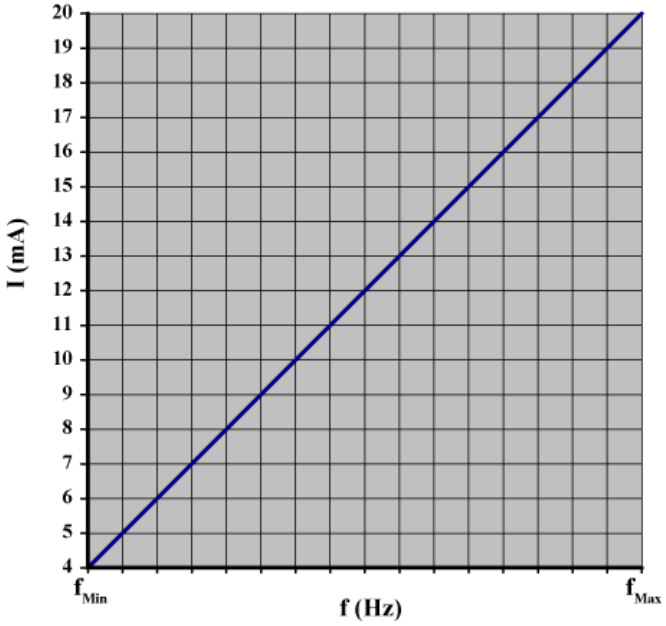
Reverse-wiring protected.

Dimensions

80 mm (3.15 in) long, 18 mm (0.71 in) diameter

Output Function

$I(f) = 4mA + 16mA*(f - f_{min})/(f_{max} - f_{min})$



Models/p.n.

Model	p.n.	$f_{min} \rightarrow f_{max}$	ppr	rpm range @ ppr
ST420-H	800-001601	0.267 → 266.7 Hz	8	2 → 2000
ST420-L	800-001600	0.267 → 26.67 Hz	8	2 → 200
ST420-C-XXXX	800-0016XX	Specified by customer		

Notes

rpm = f * 60/ppr

ppr is the number of disc/wrap pulses-per-revolution.

The ST420 detects each passing magnet as a pulse, regardless of north/south polarity. The ST420 PPR must be matched to the number of magnets in the disc/wrap.

Custom ppr and frequency range ST420 models may be ordered – consult factory.