

December 2016

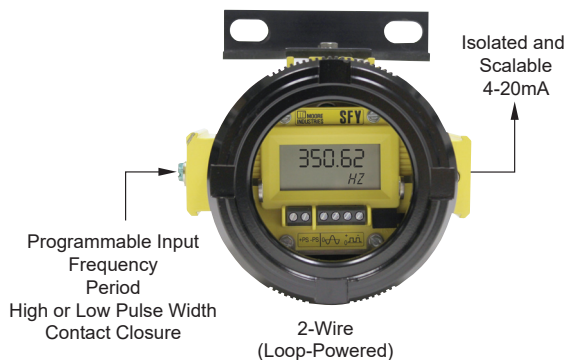
Description

The SFY Functional Safety SIL 3 capable Frequency-to-DC Transmitter with Display is part of Moore Industries' **FS Functional Safety Series**. It monitors frequency, period, high or low pulse width, and contact closure signals and converts the input signal to a proportional, input-to-output isolated 4-20mA output ready for direct interface with a Safety System, readout instrument, recorder, PLC, DCS, SCADA system.

The 2-wire (loop-powered) SFY is ideal for use in your Safety Instrumented System (SIS) in a wide range of process and factory automation monitoring applications:

- Turbine Tachometer Generators
 - Turbine Flow Meters
- Magnetic Pickups • Dry Contact Closures
- Variable Frequency Drives • Rotating Equipment
 - Pulse and Frequency Output Transducers
 - Motor and Conveyor Speed

Figure 1. The SFY configures with application-specific operating parameters in just minutes using our single-window Intelligent PC Configuration Software



The SFY installs quickly and easily in harsh conditions using our protective field-mount enclosures, or on a surface, DIN-rail or relay track.

Features

- **exida certified to IEC 61508:2010.** Certified by exida to IEC 61508 for systematic integrity up to SIL 3 and for random integrity up to SIL 2. This means that an SFY is approved for single use in Safety Instrumented Systems (SIS) up to SIL 2 and in a redundant architecture (1oo2, 2oo3, etc.) up to SIL 3.
- **Comprehensive FMEDA certified safety data.** Upon request, exida-certified FMEDA data is available for a functional safety practitioner to use in determining the SFY's applicability in specific safety-related applications.
- **Exceptional accuracy and long-term stability.** Typical accuracy is $\pm 0.025\%$ of span with up to 5 years between scheduled calibrations.
- **Sets up in minutes with PC software.** You can choose, and then view to confirm, all application-specific operating parameters.
- **Versatile input choices.** Measures frequency ranges between an amazingly low 0.005Hz up to 25kHz; periods from 40microseconds to 200sec; and pulse widths from 0.2msec to 200 seconds.
- **Programmable moving average filter.** Minimizes measurement instability caused by the effects of bent turbine blades and other frequency variations.
- **User-configurable display.** A 5-digit LCD shows the process variable in selectable engineering units.
- **Input-to-output isolated and RFI/EMI protected.** Resistant to unpredictable ground loops and the harmful effects of plant and equipment "noise".

Certifications



SFY

Functional Safety Frequency-to-DC Transmitter with Display

Frequency Monitoring in Safety Systems

The SFY can be used in Safety Instrument Functions (SIF) where frequency or pulse signals need to be monitored. Examples of these include turbine over speed protection, critical exhaust fans for personnel safety, compressor monitoring and protection.

FMEDA reports are available with the required safety data to ensure that the SFY meets the requirements of each SIF.

Turbine Over Speed Protection

In the example below the SFY is used as part of an SIF to shut down a turbine if it exceeds a defined speed.

Figure 2. Turbine Over Speed Protection System



Figure 3. Compressor Monitoring and Protection



Compressor Monitoring and Protection

Critical compressors often need an independent safety protection system. The SFY can be used as part of the SIF to monitor the speed and provide data to a safety logic solver.

To accomplish this, a magnetic pickup is attached to the pump shaft (Figure 3). The pickup provides a frequency output. The SFY takes the pickup signal, converts it to a 4-20mA output proportional to the pump shaft speed, and transmits it to the SIS Logic Solver. Should there be an unwanted change in speed, it can be detected at the Logic Solver.

Certifications: SFY-HP



Factory Mutual Approvals (FM Global Group):
Non-Incendive
Class I, Division 2, Groups A, B, C & D



CE Conformant:
EMC Directive 2014/30/EU - EN 61326

Certifications: SFY-HP in BH/SB2 Housing



Factory Mutual Approvals (FM Global Group):
Explosion-Proof & Dust/Ignition-Proof
Class I, Division 1, Groups A*, B, C & D
Class II & III, Division 1, Groups E, F & G
Environmental Protection: NEMA 4X & IP66
T6 @ 60°C Maximum Operating Ambient
**For Group A applications, seal all conduits within 18"*



Canadian Standards Association (CSA Group):
Explosion-Proof
Class I, Division 1, Groups A*, B, C & D
Class II, III, Groups E, F & G
Type 4X, IP66
Ambient Temperature Range: -20°C to +60°C; T6
**For U.S. Group A applications, seal all conduits within 18"*



ATEX Directive 2014/34/EU (ISSEp):
Explosion-Proof/Flameproof
⊕ II G Ex d IIC T6 Gb
⊕ II D Ex tb IIIC Db T85°C IP66



ANZEx (TestSafe):
Explosion-Proof/Flameproof
Ex d IIC T6 (Tamb 60°C)

Specifications

Performance

Input Accuracy: See Tables 1-7

Output Accuracy: ±0.015% of span

Overall Accuracy: The overall accuracy of the unit is the combined input and output accuracies. It includes the combined effects of linearity, hysteresis, repeatability, and adjustment resolution. Does not include ambient temperature effect.

Input Hysteresis: See Tables 5-7

Input Threshold: See Tables 5-7

Stability: See Table 1

Minimum Frequency: Twice the lower range

Digital Input Filter: 3dB point is at 10kHz

Step Response Time: 300msec maximum, 200msec typical from the time an input is applied to the output reaching 90% of its final value + actual input

Rise Time: 100msec maximum for the output to change from 10% to 90% of its scale of an input step change of 0% to 100% + actual input

Isolation: 500Vrms between input, output, and case continuous, and will withstand a 500Vac dielectric strength test for one minute with no breakdown

Ripple: 10mV p-p measured across a 250 ohm resistor

Overcurrent Limiting: 25mA maximum

Maximum Voltages: 48Vdc output, maximum; DC input, 48Vdc,

Performance (Continued)

maximum; AC input, 30Vac maximum for 0.02-30AC model, 250Vac maximum for 10-250AC model

Input Impedance: >30kohms for DC and contact closure inputs; 2kohms for input >6V, 4kohms typical@50Hz and 56kohms typical@1kHz for input <6V for 0.02-30AC model; >125kohms for 10-250AC model

Load Capability: 508 ohms@24V

Supply Voltage – 12V
0.0236A = Ohms

Output Current Limiting: 3.8mA and 21.4mA for input under range and over range; 3.6mA and 23.6mA for input failure

Load Effect (current outputs): Negligible within specified power limits

Power Supply Effect: ±0.002% of span per 1V change

Startup Time: Performance within specification less than 1sec after power is applied for frequency higher than 100Hz and average of 8 samples

Damping: Adjustable from 0 to 30 seconds with PC software

Linearization: Configurable up to 128 points with PC software

Moving Average: Configurable up to 16 segments with PC software

Low Pass Filter: On/Off is software configurable

Display Type: LCD; Top Row, 10.16mm (0.4 in) high black digits on a reflective

Display (Continued)

background; Bottom Row, 5.72mm (0.225 in) high black digits on a reflective background

Display Update Rate: 100msec

Format: Top row is five alphanumeric characters, plus sign and decimal point; bottom is five alphanumeric characters

Range: -99999 to 99999

Minimum Display Span: 1.00

Ambient Operating & Storage Conditions Range: -40°C to +85°C (-40°F to +185°F)

Relative Humidity: 0-95%, non-condensing

Ambient Temperature Effect: Input to output, ±0.007% of span/°C maximum; Digital Accuracy, ±0.003% of span/°C maximum

RFI/EMI Immunity: 20V/m@ 80-1000MHz, 1kHz AM, when tested according to IEC61000-4-3

Noise Rejection: Common mode, 120dB typical@100mVp-p input

Weight SFY HP: 227 grams (5.3 ounces)

SFY in BH housing with glass cover: 1451 grams (3 pounds, 12.4 ounces)

Accessories

Each SFY order comes with one copy of our Intelligent PC Configuration Software (Windows® compatible) on CD.

To order additional software or cables:

Part Number	Part
750-75E05-01	Intelligent PC Configuration Software
804-030-26	Fuse Protected, Non-Isolated USB Communication Cable
803-039-26	Isolated Configuration Cable (9-pin Serial Port)
803-040-26	Non-Isolated Configuration Cable (9-pin Serial Port)

Functional Safety Frequency-to-DC Transmitter with Display

Table 1. Stability for All Models*

		Input-to-Display (% of Reading)			Display-to-Output (% of Output Span**)		
		1 year	3 years	5 years	1 year	3 years	5 years
Frequency/Period		0.001	0.0017	0.0022	0.08	0.139	0.179
Pulse Width	1 Sec	0.001	0.0017	0.0022			
	0.1 Sec	0.0015	0.0026	0.0034			

*Combine Input-to-Display and Display-to-Output values to determine overall stability.

**Consult factory for improved long-term drift specifications.

Table 2. DC Input Range and Accuracy for All SFY Models

Input Type	Input Range		Accuracy (% of reading)	Min. Span
	Frequency	Amplitude		
Frequency	0.02Hz to 5kHz	100mV-30V	0.01±1LSD	See Table 8
	0.02Hz to 25kHz	200mV-30V	0.05±1LSD	
Period	200µsec to 50sec	100mV-30V	0.01±1LSD	500µsec
	40µsec to 50sec	200mV-30V	0.05±1LSD	
Pulse Width	0.5msec to 50sec	1-30V	0.05±1LSD ±2µsec	500µsec
Contact Closure	<20Hz		0.01±1LSD	0.1Hz

NOTE:

AC indicates zero-crossing signal.
DC indicates non-zero crossing signal.

Table 3. AC Input Range and Accuracy for PRG Input Type

Input Type	Input Range		Accuracy (% of Reading)	Min. Span
	Frequency	Amplitude		
Frequency	0.5Hz to 25kHz	1-30V	0.05±1LSD	See Table 8
	1Hz to 5kHz	200mV-30V	0.01±1LSD	
	1Hz to 25kHz	200mV-30V	0.05±1LSD	
	10Hz to 5kHz	20mV-30V	0.01±1LSD	
Period	40µsec to 2sec	1-30V	0.05±1LSD	500µsec
	200µsec to 1sec	200mV-30V	0.01±1LSD	
	40µsec to 50sec	200mV-30V	0.05±1LSD	
	200µsec to 100msec	20mV-30V	0.01±1LSD	

Table 4. AC Input Range and Accuracy for 10-250V Input Type

Input Type	Input Range		Accuracy (% of reading)	Min. Span
	Frequency	Amplitude		
Frequency	1Hz to 5kHz	10-250V	0.01±1LSD	See Table 8
	1Hz to 25kHz	10-250V	0.05±1LSD	
Period	200µsec to 1sec	10-250V	0.01±1LSD	500µsec
	40µsec to 50sec	10-250V	0.05±1LSD	

Table 5. Frequency Input Parameters

Input Range	Threshold		Hysteresis		Filter (3db Point)	Measured Frequency
	Resolution	Range	Resolution	Range		
100mV-30V (DC)	1mV	0.01-2.5V	1mV	0.01-1.5V	10kHz	0.02Hz to 25kHz
20mV-30V (AC)			1mV	0.002-0.15V	10kHz	0.5Hz to 25kHz
10V-250V(AC)			1mV	0.002-0.15V	10kHz	0.5Hz to 25kHz

Table 6. Period Input Parameters

Input Range	Threshold		Hysteresis		Filter (3db Point)	Measured Period
	Resolution	Range	Resolution	Range		
100mV-30V (DC)	1mV	0.01-2.5V	1mV	0.01-1.5V	10kHz	40µsec to 50sec
20mV-30V (AC)			1mV	0.002-0.15V	10kHz	40µsec to 2sec
10V-250V (AC)			1mV	0.002-0.15V	10kHz	40µsec to 2sec

Table 7. Pulse Width Input Parameters

Input Range	Threshold		Hysteresis		Filter (3db Point)	Measured Pulse Width
	Resolution	Range	Resolution	Range		
100mV-30V (DC)	1mV	0.01-2.5V	1mV	0.01-1.5V	10kHz	0.2msec to 50sec

Table 8. Frequency Range Minimum Span

Maximum Frequency Range	Minimum Span
10Hz	0.1Hz
5kHz	1Hz
25kHz	25Hz

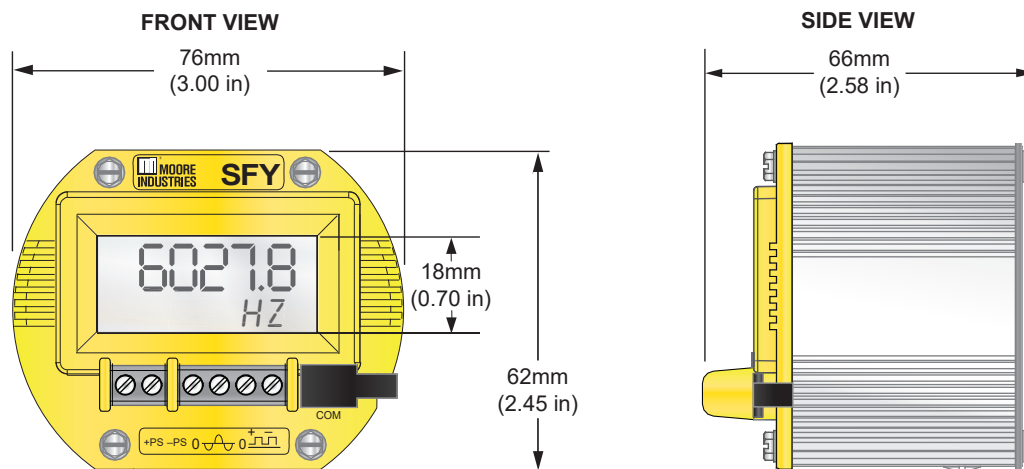
Ordering Information

Unit	Input	Output	Power	Options	Housings
SFY Functional Safety Frequency-to-DC Transmitter with Display	PRG Input Amplitudes Supported: 0.02-30Vac* 0.1-30Vdc* (Programmable with supplied configuration software, see Tables on Page 4 for details) 10-250V Input Amplitudes Supported: 10-250Vac* 0.1-30Vdc* (Programmable with supplied configuration software, see Tables on Page 4 for details)	4-20MA User scalable with supplied software	12-42DC Loop-Powered	None	BH2NG (*) or (‡) Aluminum Explosion-Proof enclosure with two, ½-inch NPT entry ports and a glass cover BH2TG (*) or (‡) Aluminum Explosion-Proof enclosure with two, ¾-inch NPT entry ports and a glass cover BH2MG (*) or (‡) Aluminum Explosion-Proof enclosure with two, M20 x 1.5 entry ports and a glass cover BH3NG (*) or (‡) Aluminum Explosion-Proof enclosure with three, ½-inch NPT entry ports and a glass cover BH3TG (*) or (‡) Aluminum Explosion-Proof enclosure with two, ¾-inch NPT side-entry ports, one ½-inch NPT bottom-entry port, and a glass cover BH3MG (*) or (‡) Aluminum Explosion-Proof enclosure with two, M20 x 1.5 side-entry ports, one ½-inch NPT bottom-entry port, and a glass cover SB2NG (*) or (‡) 316 Stainless Steel 2-Hub, Explosion-Proof enclosure with two, ½-inch NPT entry ports and a glass cover SB2MG (*) or (‡) 316 Stainless Steel 2-Hub Explosion-Proof enclosure with two, M20 x 1.5 entry ports and a glass cover HP Hockey-puck housing with spring clips for mounting in standard field enclosures DN Snap-in mounting for HP case on TS-32 DIN-rail FL Mounting flanges on HP suitable for relay track or surface-mounting FLD Mounting flanges on HP suitable for 3½" relay track mounting * Either A or E suffix (comes supplied with 2" pipe mount hardware) A suffix indicates ANZEx/TestSafe (Ex d) Flameproof approvals (i.e. BH2MGA) E suffix indicates ATEX (Ex d and tb) Flameproof approvals (i.e. BH2MGE) ‡ P suffix indicates enclosure comes equipped with base plate and U-bolts for mounting on a 2-inch pipe (i.e. BH2NGP) See BH and SB Datasheets for additional information.

*AC indicates zero-crossing signal; DC indicates non-zero crossing signal

When ordering, specify: Unit / Input / Output / Power / Options [Housing]
Model number example: SFY / PRG / 4-20MA / 12-42DC [BH2NGP]

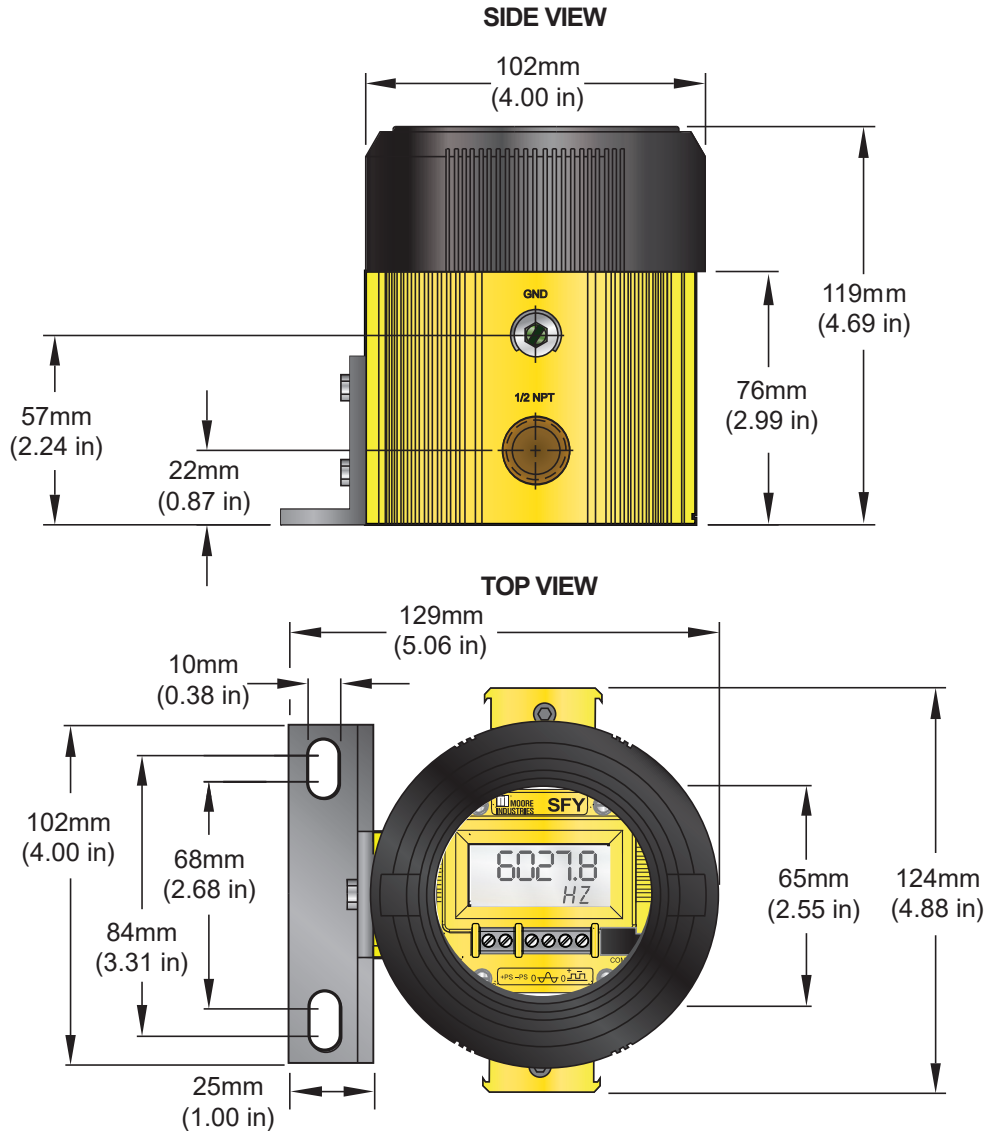
Figure 4. SFY HP Dimensions



SFY

Functional Safety Frequency-to-DC Transmitter with Display

Figure 5. BH Enclosure Dimensions



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