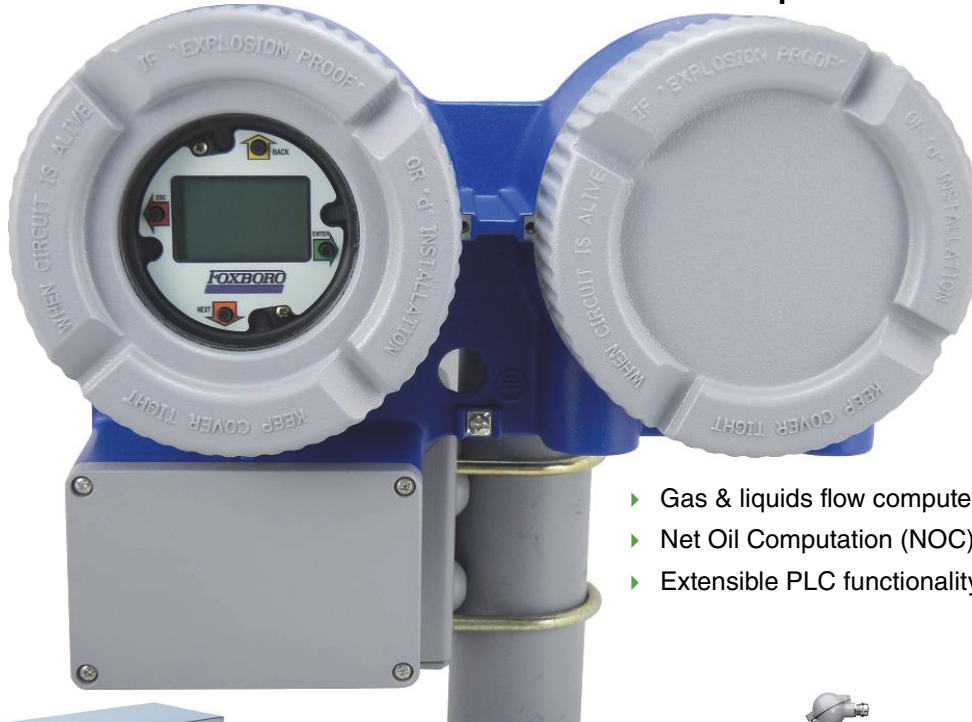


**Model NOCT60A Net Oil Coriolis Transmitter**

**Coriolis Transmitter**

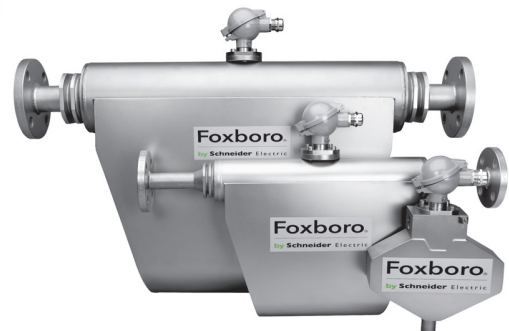
**Flow Computer**



- ▶ Gas & liquids flow computer
- ▶ Net Oil Computation (NOC)
- ▶ Extensible PLC functionality



Use with  
**Foxboro<sup>®</sup> Flowtubes**  
CFS10, CFS20, or CFS25



*The Foxboro<sup>®</sup> Model NOCT60A Net Oil Coriolis Transmitter integrates Foxboro-patented digital Coriolis technology with Realflo<sup>®</sup> industry-leading flow computation software and PLC-style logic to provide a complete solution for liquid net oil measurement.*

- ▶ All-in-one solution streamlines separation and allocation measurement, with auditable flow history data for regulatory compliance.
- ▶ Patented, high-speed digital Coriolis technology solves common problems associated with measuring produced fluids.
- ▶ Built-in programmable logic controller (PLC) and flow computer provide a complete measurement platform for production optimization.

## NOCT60A MEASUREMENT PLATFORM

The NOCT60A measurement platform combines high-speed digital Coriolis technology with flow computation and optional PLC functionality.

### Digital Coriolis Flowmeter

- ▶ Patented digital signal processing (DSP) techniques allow:
  - ▶ Continuous two-phase measurement.
  - ▶ Partial empty tube conditions.
  - ▶ On-line flowtube verification.
  - ▶ On-line pressure compensation.
- ▶ User-configurable, externally powered I/O types include: analog current output and alarm, frequency or scaled pulse output, contact output, contact input.
- ▶ Modbus communication.
- ▶ For use with CFS10, CFS20, and CFS25 flowtubes.

### Built-In Flow Computer

- ▶ Net oil measurement
- ▶ Well test summary data
- ▶ API 21.1 compliance for gas flow history records
- ▶ API 21.2 compliance for liquid flow history records

### Programmable Logic Controller (PLC)

Optional PLC-style logic can be used to extend or enhance built-in features such as:

- ▶ Modbus polling of external devices such as meters, sensors, and accumulators.
- ▶ Grouping of real-time measurement data to optimize host polling efficiency.
- ▶ Interaction with local operator interface terminals.
- ▶ Custom gas (two-phase) detection logic when measuring liquid flow.

The NOCT60A can be configured to run logic programs created using either the Telepace® Studio or SCADAPack® IEC 61131-3 Workbench software, as specified in the model code.

The default configuration, model code selection -P, permits ladder diagrams (LDs) created using Telepace Studio to be downloaded and run on the NOCT60A. The NOCT60A includes a license to run the Telepace Studio software (IDE), so no additional licensing is required.

If the NOCT60A is ordered with model code -Q, it is delivered with a firmware configuration to run IEC 61131-3 logic programs. The IEC 61131-3 development environment (IDE) required to create these logic programs is the SCADAPack Workbench. The SCADAPack Workbench is included on the NOCT60A DVD; however, a license is required to run the IDE software. If needed, this license can be purchased by ordering Foxboro Auxiliary Specification FBP1N300.

### PATENTED ON-LINE FLOWTUBE VERIFICATION

Special features are provided in the NOCT60A transmitter to identify adverse effects such as erosion, corrosion, and flowtube coating.

### OTHER PRODUCT PATENTS

This product and its components are protected by one or more of the following US patents: 6311136, 6505519, 6507791, 6754594, 6758102, 6917887, 6950760, 6981424, 7124646, 7136761, 7146280, 7404336, 7505854, 7571062, 7784360, 8000906.

### MODBUS COMMUNICATION

The NOCT60A functions as a Modbus slave device. It communicates with host processors using the Modbus RTU (Remote Terminal Unit) mode over a 2-wire RS-485 multidrop serial connection, or over LAN using Modbus/TCP.

Optional EFM (Enron) Modbus provides access to flow history data and flow computer configuration.

### Modbus Station Addresses Supported

Supports station (or slave) addresses 1 to 247. A second station address is configured for EFM Modbus, thus allowing for interaction with flow computer data, and Coriolis or PLC data over Modbus RTU or Modbus/TCP.

### COMPLIANCE WITH EUROPEAN UNION DIRECTIVES

- ▶ Complies with Electromagnetic Compatibility Requirements of European EMC Directive 2004/108/EC by conforming to the following EN and IEC Standards: EN 61326-1 and IEC 61000H4-2 through 61000-4-6.
- ▶ Complies with NAMUR NE 21 Interference Immunity requirement (EMC).
- ▶ Analog output complies with NAMUR NE 43.
- ▶ Complies with all applicable European Union Directives (CE Logo marked on product).

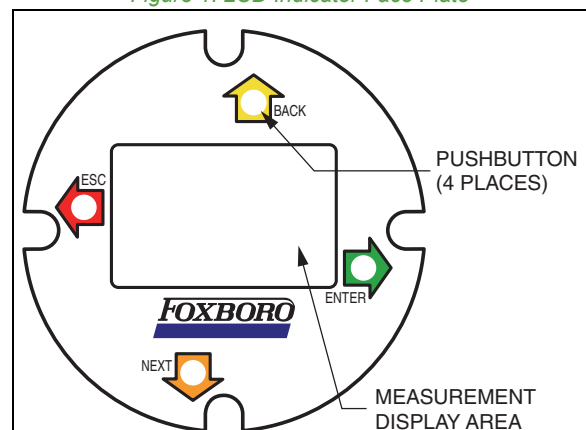
### TAMPERPROOF SEALING OPTION -S

For tamperproof sealing of the enclosure and terminal box covers, select Option -S.

### LCD INDICATOR WITH LOCAL CONFIGURATOR FOR CORIOLIS FUNCTIONS

An LCD indicator displays flow measurement, totals, and other menu-driven parameters for the Coriolis transmitter functions. The indicator keypad's four pushbuttons also allow for flowmeter calibration, configuration, and self-test.

Figure 1. LCD Indicator Face Plate



OPERATING, TRANSPORTATION, AND STORAGE CONDITIONS (A)

Influence	Reference Operating Conditions	Normal Operating Condition Limits	Transportation and Storage Limits
Ambient Temperature (b)	23 ± 2°C (73 ± 3°F)	-40 and +60°C (c) (d) (-40 and +140°F)	-40 and +85°C (-40 and +185°F)
Relative Humidity	50 ± 10%	5 and 100% (e)	5 and 100% (e)
dc Supply Voltage	24 Vdc, ± 5%	10 and 36 Vdc	N/A
Current Output: ▶ Supply Voltage ▶ Load	▶ 24 Vdc ▶ 250 Ω	▶ 24 Vdc, ± 10% ▶ 250 Ω	
Pulse Output: ▶ Supply Voltage ▶ Current	▶ 24 Vdc ▶ 73 mA	▶ 24 Vdc, ± 10% ▶ 80 mA	
Contact Input: ▶ Supply Voltage ▶ Current	▶ 24 Vdc ▶ 12 mA	▶ 24 Vdc, ± 10% ▶ 15 mA minimum	
Contact Output: ▶ Supply Voltage ▶ Current	▶ 24 Vdc ▶ 100 mA	▶ 24 Vdc, ± 10% ▶ 100 mA maximum	
RS485 Receive Input Range	± 5 Vdc	± 5 Vdc (f)	
Vibration	1 m/s <sup>2</sup> (0.1 "g")	5 m/s <sup>2</sup> (0.5 "g") from 5 to 500 Hz	11 m/s <sup>2</sup> (1.1 "g") from 2.5 to 5 Hz (in shipping package)

- a. Values in the table apply when all transmitter covers are properly installed, and unused openings plugged, according to installation instructions.
- b. Including condensation.
- c. If the temperature is between -20 and -40°C, the display may go blank, but the device is still operational.
- d. Refer to the Electrical Safety Specifications section for a restriction in ambient temperature limits with certain electrical approvals and certifications.
- e. Conditions producing sustained condensate are not allowed.
- f. The operative limits are -7 and +12 Vdc.

SYSTEM PERFORMANCE SPECIFICATIONS

- 1 Performance specifications are stated at reference operating conditions (unless otherwise specified) using Foxboro-supplied cables with the output averaged for one minute.
- 2 All transmitters and tubes are interchangeable provided that the tube calibration parameters are loaded into the transmitter.
- 3 Performance specifications apply to the flowtube and transmitter combined as a flowmeter system.
- 4 The performance specifications apply to all transmitter outputs with the following exception: The current output stage adds a maximum error of ±0.1% of the reading or less than 0.001% of meter capacity, whichever is greater.
- 5 Accuracy specifications are made for flows between 100% and 1% of flowtube Upper Range Limit (URL). The flowmeter system will operate below 1% of URL, but no accuracy statements are made for this flow condition.

**Accuracy – Mass Flow Rate (Liquids)  
(Includes Linearity, Hysteresis, and Repeatability)**

±0.10% + Zero Instability (see Table 1)

Accuracy in % of rate is therefore:

$$\text{Accuracy} = \pm 0.10\% + \left( \frac{\text{Zero Instability}}{\text{Mass Flow Rate}} \times 100 \right) \%$$

**Accuracy – Mass Flow Rate (Gases)  
(Includes Linearity, Hysteresis, and Repeatability)**

±0.50% + Zero Instability (see Table 1)

Accuracy in % of rate is therefore:

$$\text{Accuracy} = \pm 0.50\% + \left( \frac{\text{Zero Instability}}{\text{Mass Flow Rate}} \times 100 \right) \%$$

**Accuracy – Volumetric Flow Rate (Liquids Only)**

Volumetric flow rate accuracy is the root sum of the squares (RSS) of Mass Flow Rate and Density accuracies. Mass Flow Rate and Density accuracies must be in the same units of measure.

**Accuracy – Density (Liquids Only)**

±0.0005 g/cm<sup>3</sup>, provided by built-in density calibration function.

Table 1. Zero Instability (a)

Flowtube Family	Flowtube Model	Zero Instability	
		kg/min	lb/min
CFS10	3 mm (1/8 in)	0.00016	0.00035
	6 mm (1/4 in)	0.00045	0.001
	15 mm (1/2 in)	0.00204	0.0045
	20 mm (3/4 in)	0.00454	0.010
	25 mm (1 in)	0.00907	0.020
	40 mm (1 1/2 in)	0.0204	0.045
	50 mm (2 in)	0.0340	0.075
CFS20	40 mm (1 1/2 in)	0.0204	0.045
	80 mm (3 in)	0.0907	0.200
CFS25	-0325	0.00054	0.0012
	-0650	0.00108	0.0024
	-1550	0.00260	0.0057
	-3100	0.00517	0.0114
	-5500	0.00917	0.0202
	-7900	0.01317	0.0291
	-028K	0.0467	0.1029
	-065K	0.1083	0.2388

a. In the accuracy equation, Zero Instability and Mass Flow Rate units must be the same.

**Accuracy – Process Temperature**

- ▶ ±1°C (±1.8°F) for process temperatures between -60 and +100°C (-76 and +212°F).
- ▶ ± 3°C (± 5.4°F) for process temperatures from -130 to -60°C (-202 to -76°F) and from 100 to 180°C (212 to 356°F).

**Pressure Compensation**

Elevated pressures can affect flowtube accuracy. NOCT60A allows pressure compensation for density and mass flow measurement.

- ▶ **Static compensation:** A user-defined pressure value is applied during measurement calculations.
- ▶ **Dynamic compensation:** An external pressure sensor providing an analog signal or Modbus slave interface may be used to provide real-time pressure data via the flow computer termination group. Alternatively, an external communication host can provide real-time updates of internal pressure.

A static pressure value is used by default unless an external live measurement is available.

**Humidity Effect**

No effect from 0 to 95% RH, noncondensing.

**Ambient Temperature Effect**

The effect is ± 0.0028% of span per °C for any variation from Reference Operating Temperature within the Operating Limits.

**Supply Voltage Effect**

A change in the supply voltage of +10 or -15% from reference voltage causes the output to change less than 0.1% of reading or less than 0.001% of meter capacity, whichever is greater.

**Electromagnetic Compatibility (EMC)**

The NOCT60A Transmitter complies with International and European Union standards. Transmitter must be properly installed and housing earthed (grounded) per installation instructions. See Table 2.

**Accuracy – Clock/Calendar**

- ±1 minute/month at 25°C (77°F)
- +1 to -3 minutes/month at 0 to 50°C (-32 to 122°F)

Table 2. Electromagnetic Compatibility

Parameter	IEC and CISPR Standards	EN Standard
Radiated RFI Immunity	10 V/m per IEC 61000-4-3	10 V/m per EN 61000-4-3
Conducted RFI Immunity	10 V per IEC 61000-4-6	10 V per EN 61000-4-6
RFI Radiated and Conducted Emissions	Per CISPR 11, Class A	EN 55011 Class A
ESD Immunity	6 kV contact discharge per IEC 61000-4-2	6 kV contact discharge per EN 61000-4-2
Electrical Fast Transients/Burst Immunity: Power	2 kV per IEC 61000-4-4	2 kV per EN 61000-4-4
Electrical Fast Transients/Burst Immunity: I/Os	1 kV per IEC 61000-4-4	1 kV per EN 61000-4-4
Surge Immunity: Power	2 kV per IEC 61000-4-5	2 kV per EN 61000-4-5
Surge Immunity: I/Os	1 kV per IEC 61000-4-5	1 kV per EN 61000-4-5
Power Dips and Interruptions	Per IEC 61000-4-11	Per EN 61000-4-11

FUNCTIONAL SPECIFICATIONS

**Power Requirements<sup>(1)</sup>**

- ▶ Supply Voltage: 10 to 36 Vdc; 24 Vdc nominal
- ▶ Power: 15 W maximum
- ▶ Operating Current: 1 A
- ▶ Start-up Current: 3 A

**Coriolis Transmitter Configurable Outputs**

- ▶ Direct Mass Flow Rate
- ▶ Volumetric Flow Rate
- ▶ Totalized Mass Flow Rate
- ▶ Totalized Volumetric Flow Rate
- ▶ Process Fluid Density
- ▶ Temperature
- ▶ Bidirectional Flow
- ▶ Percent Solids/Concentration
- ▶ Net Flow, Component A, Component B

**Response Time (Undamped)**

Transmitter response time varies with the output selected, and is defined as a 90% recovery time to an 80% input step per ANSI/ISA-S51.1 with zero electronic damping.

Output Selected	Response Time
Digital Output	35 ms
Analog Output	35 ms + 350 ms
Pulse Output	35 ms

**Cold Power-Up/Reset Delay**

Less than 2-second delay for outputs to begin to move toward measured value.

**Bi-Directional Flow**

All necessary functionality is available to provide all flow measurements in the forward or reverse direction. Quadrature pulse output has the ability to indicate flow direction.

**Totalization**

The transmitter has nonvolatile memory for the four on-board totalizers, each of which support:

- ▶ Forward Total
- ▶ Reverse Total
- ▶ Bi-directional Total

Each totalizer can be configured to have either of two levels of password protection.

**Diagnostics/Alarms (Coriolis)**

Diagnostic and alarm functions are provided. The diagnostics and alarms can be retrieved and viewed from within the Realflo flow computer configuration software; configured to be visual via the local LCD indicator; as a signal output via the 4 to 20 mA and/or pulse outputs; as a contact output; or read via the digital communications interface.

**Non-Volatile RAM (Flow Computer)**

Non-volatile RAM, and the realtime clock and calendar, are maintained by a lithium battery rated for two years of power-off time.

1. Also refer to "OPERATING, TRANSPORTATION, AND STORAGE CONDITIONS".



## I/O SPECIFICATIONS - CORIOLIS TRANSMITTER

### Coriolis Transmitter Digital Communications

The transmitter is configurable using the pushbuttons on the LCD indicator keypad. The transmitter is also factory configured for Modbus communication via the PC-based Configurator.

### Coriolis Transmitter I/O

The transmitter's nondigital communications I/O are user-configurable. These inputs/outputs are isolated from one another and must be externally powered. The following nondigital I/O types are available:

- ▶ Analog Current Outputs
- ▶ Analog Current Output Alarm
- ▶ Frequency or Scaled Pulse Outputs
- ▶ Quadrature Pulse Output
- ▶ Contact Output - Configurable
- ▶ Contact Input - Configurable

#### Analog Current Outputs

There are three independent, 4 to 20 mA outputs. All transmitter I/Os must be externally powered. Specifications are:

- ▶ Output Load: 0 to 680  $\Omega$
- ▶ Supply Voltage: 24 Vdc  $\pm$ 10%
- ▶ Current: 22 mA maximum, 3.9 mA minimum
- ▶ Output Ripple: Less than 0.05% of span

#### Analog Current Output Alarm (High/Low)

This output alarm feature allows communicating a diagnostic error to the current loop receiver. When the error is flagged, the current output can go Upscale, go Downscale, or remain at last value.

Specifications are as follows:

- ▶ Supply Voltage: 24 Vdc  $\pm$ 10%
- ▶ Current: 4 to 20 mA nominal
- ▶ Underrange/Overrange: 3.8 to 20.5 mA (measurement still valid)
- ▶ Alarm Range  $\leq$  3.6 or  $\geq$  21.0 mA

### Selectable Pulse Outputs

There are two independent pulse outputs. Each output can be configured as a frequency output or as a frequency or scaled pulse output signal.

#### *Frequency Output*

This output configuration can be assigned to mass or volume flow rate, density, temperature, or percent solids measurements. The frequency can be configured to as high as 10 kHz. Frequency Output specifications are as follows:

- ▶ Selectable Frequency: 0 to 10 kHz
- ▶ Frequency Duty Cycle: 50% nominal
- ▶ Supply Voltage: 24 Vdc  $\pm$ 10%
- ▶ Load Current: 80 mA maximum

#### *Scaled Pulse Output*

This output drives low-speed totalizers. A pulse is sent for every user-configured mass total that has accumulated. Specifications are as follows:

- ▶ Supply Voltage: 24 Vdc  $\pm$ 10%
- ▶ Load Current: 80 mA maximum
- ▶ Pulse Width and Maximum Frequency:

Configurable Speed	Pulse Width	Maximum Frequency
SLOW	50 ms	10 Hz
FAST	5 ms	100 Hz

#### NOTE

A 256 pulse buffer stores pulses in case of temporary overrange conditions.



**Quadrature Pulse Output**

A quadrature pulse output uses two pulsed outputs that are  $\pm 90^\circ$  out of phase with one another. The polarity ( $\pm$ ) indicates the flow direction. The quadrature output can be configured to output any reading that a pulsed output can.

**Contact Output - Configurable**

A contact output is provided and configurable as:

- ▶ Hi-Lo Level Alarm Indicator
- ▶ Diagnostic Alarm Indicator
- ▶ Alarm/Diagnostic Indicator

Specifications are as follows:

- ▶ Type: Relay, 1 Form A
- ▶ Supply Voltage: 24 Vdc  $\pm 10\%$
- ▶ Current Rating: 100 mA maximum

**Contact Input - Configurable**

A contact input is externally powered and configurable as:

- ▶ A 4 to 20 mA Output Lock
- ▶ An External Totalizer Reset
- ▶ Initiate a Flow Zero
- ▶ Select a Zero Flow Value

Specifications are as follows:

- ▶ Type: Requires current linking device such as contact closure or transistor switch between terminal block connections provided
- ▶ Supply Voltage: 24 Vdc  $\pm 10\%$
- ▶ Current Rating: 15 mA minimum

## I/O SPECIFICATIONS - FLOW COMPUTER TERMINATION GROUP

### Communication Ports

User accessible communication ports are listed below. The USB port is dedicated to local configuration and diagnostic monitoring of the flow computer and PLC functionality. All other ports allow access to Coriolis and flow computer data, configuration, and diagnostics.

- ▶ Two RS-232/RS-485 serial ports
- ▶ One USB device port
- ▶ One LAN port

### Serial Ports

- ▶ Two RS-232 or RS-485, selectable by DIP switch; COM1 and COM2
- ▶ Connector: Terminal block
- ▶ RS-232 signals:  
TxD, RxD and COMMON  
RS-232 compatible (0-5 V)
- ▶ RS-485: 2-wire half duplex;  
5100  $\Omega$  bias resistors
- ▶ Baud Rate: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200
- ▶ Parity: None, even, or odd
- ▶ Word Length: 7 or 8 bits
- ▶ Stop Bits: 1 or 2 bits
- ▶ Isolation: Non-isolated
- ▶ Cable Length, Maximum:  
RS-232 maximum 3 m (10 ft)  
RS-485 maximum 1200 m (4,000 ft)
- ▶ Protocols: TeleBUS (compatible with Modbus RTU and Modbus ASCII); EFM Modbus (slave only)
- ▶ Protocol Modes: Slave, master, master/slave, store and forward

### USB Device Port

- ▶ Type: USB 2.0-compliant peripheral port, "B" connector
- ▶ Low speed: 1.5Mb/s
- ▶ Full speed: 12MB/s

### LAN Port

- ▶ Terminations: RJ45 modular connector
- ▶ Speed: 10BaseT (twisted pair) 10/100M bits per second
- ▶ Max Server Connections: 20
- ▶ Protocols Supported:  
Modbus/TCP; Modbus RTU in UDP;  
Modbus ASCII in UDP;  
DNP in TCP; DNP in UDP;  
FTP

### I/O (Flow Computer Group Terminations)

The I/O listed below is included in the flow computer termination group:

- ▶ One 3/4 wire RTD input
- ▶ One digital output
- ▶ Two pulse counter inputs
- ▶ One digital input (Well Test)
- ▶ Two analog inputs

### RTD Input (AI0)

- ▶ Type: 100  $\Omega$  platinum 0.385  $\Omega/^{\circ}\text{C}$   
ASTM E 1137/E 1137M-04 ITS-90
- ▶ 3 or 4 wire, auto detection and compensation
- ▶ Resistance Range: 18.5 to 329.6  $\Omega$
- ▶ Temperature Range:  
-200 to +650 $^{\circ}\text{C}$  (-328 to +1202 $^{\circ}\text{F}$ )
- ▶ Accuracy, 4 wire operation, -40 $^{\circ}\text{C}$  to 70 $^{\circ}\text{C}$  (-40 to +58 $^{\circ}\text{F}$ ):  
 $\pm 0.3^{\circ}\text{C}$  ( $\pm 0.54^{\circ}\text{F}$ ) for process temperatures  
-100 $^{\circ}\text{C}$  to +200 $^{\circ}\text{C}$  (-148 to +392 $^{\circ}\text{F}$ )
- ▶ Accuracy, 3 wire operation, -40 $^{\circ}\text{C}$  to 70 $^{\circ}\text{C}$  (-40 to +58 $^{\circ}\text{F}$ ):  
 $\pm 0.5^{\circ}\text{C}$  ( $\pm 0.90^{\circ}\text{F}$ ) for process temperatures  
-100 $^{\circ}\text{C}$  to +200 $^{\circ}\text{C}$  (-148 to +392 $^{\circ}\text{F}$ )
- ▶ Response Time: 300ms
- ▶ Converter type: 24-bit delta-sigma
- ▶ Excitation Current: Pulsed, 0.8mA
- ▶ Wiring Resistance: 100  $\Omega$  max in each line

#### Digital Output (SINK D00)

For alarm indication or control output from logic.

- ▶ Type: Sinking low side switch
- ▶ Load: 250 mA maximum
- ▶ Voltage: 36 Vdc max
- ▶ Isolation: Non-isolated

#### Pulse Counter Input (TURBINE C10)

For direct connection to a turbine coil with no pre-amp.

- ▶ Type: Digital pulse counter
- ▶ Sensitivity - Minimum Input:  
30mVp-p at 5-50Hz  
150mVp-p at 150Hz  
650mVp-p at 5kHz  
750mVp-p at 10kHz
- ▶ Sensitivity - Maximum Input: 4Vp-p
- ▶ Maximum cable length: 3 m (10 ft)
- ▶ Isolation: Non-isolated

#### Pulse Counter Input (COUNTER C11)

For connection to a vortex or other compatible meter.

- ▶ Operation range:  
12 to 24 Vdc nominal; 36 Vdc max
- ▶ Turn on voltage: 8 Vdc (minimum)
- ▶ Turn off voltage: 4 Vdc (maximum)
- ▶ DC Input Current:  
0.35 mA to 0.45 mA at 12 Vdc  
0.75 mA to 0.85 mA at 24 Vdc
- ▶ Frequency Range: 5 KHz
- ▶ Isolation: Non-isolated

#### Well Test Digital Input (D10)

- ▶ Operation Range:  
12 to 24 Vdc nominal  
36 Vdc max
- ▶ Turn On Voltage: 8 Vdc (minimum)
- ▶ Turn Off Voltage: 4 Vdc (maximum)
- ▶ DC Input Current:  
0.35 mA to 0.45 mA at 12 Vdc  
0.75 mA to 0.85 mA at 24 Vdc
- ▶ Isolation: Non-isolated

#### Analog Inputs (AI1, AI2)

- ▶ Quantity: 2
- ▶ Input Resistance: 250  $\Omega$  max. burden
- ▶ Accuracy:  
 $\pm 0.1\%$  of full scale at 25°C (77°F)  
 $\pm 0.2\%$  over temperature range
- ▶ Converter type: 24-bit delta-sigma
- ▶ Isolation: Non-isolated
- ▶ Range: 0 to 25 mA

#### Internal I/O

##### Analog Inputs

- ▶ Power Input Voltage Monitor:  
40 V full scale; accuracy 0.5% FS
- ▶ Onboard Battery Voltage Monitor:  
4 V full scale; accuracy  $\pm 100$  mV
- ▶ Internal Temperature Monitor:  
measurement range -40°C to +75°C  
(-40°F to +167°F); accuracy  $\pm 5^\circ\text{C}$  ( $\pm 9^\circ\text{F}$ )

##### Serial Port (COM3)

Internal communications only. This port transfers data and communications between the Coriolis and flow computer sections of the NOCT60A electronics.

## PHYSICAL SPECIFICATIONS

### Transmitter Enclosure

The transmitter is comprised of a cast aluminum alloy material with three separate compartments. The main compartment houses the transmitter electronics (PWAs) and LCD indicator. A second compartment houses terminals to accommodate power and I/O cables (field wiring), and the third compartment houses terminals for sensor input and PE (physical earth) wiring. A gasketed cover is provided for each compartment.

The enclosure has a blue polyester paint finish and an optional blue epoxy powder finish. Compartment covers have a gray epoxy powder finish.

The three-compartment enclosure and electronics design allow for use in Division 1 intrinsically safe, explosionproof, and flameproof installations. Tamperproof sealing of the enclosure covers is provided with Tamperproof Sealing Option -S.

### Transmitter Mounting

Four 0.437-20 UNS threaded holes are provided on the surface of the enclosure on which a carbon steel mounting bracket or optional stainless steel mounting bracket can be attached. The other surface of the bracket allows for mounting to a surface, or to a nominal DN50 (2 inch) vertical or horizontal pipe, or an optional mounting bracket for a DN80 (3 inch) pipe.

### Environmental Protection

Printed wiring assemblies (PWAs) are conformally coated for moisture and dust protection. The enclosure has the dusttight and weatherproof rating of IP66/67 as defined by IEC 60529, and provides the environmental and corrosion resistant protection rating of NEMA 4X.

### Electrical Connections

#### Sensor Input and PE Connections

Two 1/2 NPT threaded ports are provided in the sensor input and PE (physical earth) connections compartment (junction box).

### Field Wiring Connections

Two M25 or 3/4 NPT threaded ports are provided in the field wiring compartment for power and I/O wires.

### Earth (Ground) Connections

In addition to internal ground connections, an external ground terminal is provided on the front surface of the enclosure.

### Transmitter to Flowtube Wiring

A cable is available in lengths up to 300 meters or 1000 feet for CFS10 and CFS20 flowtubes; up to 30 meters or 100 feet for CFS25 flowtubes (see "MODEL CODE"). An IPVC insulated cable is offered with a temperature range of -20 to +80°C (-4 to +176°F). An FEP insulated cable is offered with a temperature range of -40 to +85°C (-40 to +185°F).

### Dual Seal Certification

CFS10 and CFS20 flowtubes are dual seal approved to meet ANSI/ISA 12.27.01 requirements when connected to a NOCT60A transmitter. Refer to PSS 1-2B1 A for CFS10/CFS20 specifications.

### LCD Indicator with Keypad (Coriolis)

Four softkeys provide full configuration capability for the Coriolis functions. The electronics compartment cover must be removed to access the keypad. See Figure 1 for the indicator faceplate configuration.

### LED Indicators

LEDs on the controller board indicate the presence of power, boot mode status, LAN Link status, and communication activity for the LAN and serial ports.

### Approximate Mass

8.46 kg (18.65 lb)

### Dimensions

See "DIMENSIONS – NOMINAL" section.

## ELECTRICAL SAFETY SPECIFICATIONS

These transmitters have been designed to meet the electrical safety specifications listed in the table below. Contact Global Customer Support for the status of agency approvals or certifications.

Types of Protection and Area Classification	Application Conditions	Electrical Safety Design Code
<b>ATEX, II 2 (1) G Ex d [ia IIB Ga] IIC T6 Gb</b>	Flameproof enclosure with Intrinsic safe sensor outputs. Temperature Class T6. Ta = -40°C to +60°C.	ADA
<b>ATEX, II 2 (3) G Ex d [ic IIB Gc] IIC T6 Gb</b>	Flameproof enclosure with Energy Limited or intrinsic safe zone 2 sensor outputs. Temperature Class T6. Ta = -40°C to +60°C.	ADN (a)
<b>ATEX, II 3 (1) G Ex nA [ia IIB Ga] IIC T4 Gc</b>	Non-sparking enclosure with Intrinsic safe sensor Temperature Class T4. Ta = -40°C to +60°C.	ANA
<b>ATEX, II 3 G Ex nA IIC T4 Gc</b>	Non-sparking Temperature Class T4. Ta = -40°C to +60°C	ANN (a)
<b>CSA/CSAus</b> XP Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1; AIS Class I, Division 1, Groups A, B, C, and D; Ex d [ia] IIC	Explosionproof and Flameproof enclosure with intrinsically safe outputs Temperature Class T6. Ta = -40°C to +60°C Temperature Class T4. Ta = -40°C to +60°C	CDA
<b>CSA/CSAus</b> XP Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1; ANI Class I, Division 2, Groups A, B, C, and D; AEx d [nL] IIC	Explosionproof and Flameproof enclosure with Non-Incendive outputs Temperature Class T6. Ta = -40°C to +60°C Temperature Class T4. Ta = -40°C to +60°C	CDN (a)
<b>CSA/CSAus</b> NI Class I, Division 2, Groups A, B, C, and D; also intrinsically safe for ASI Class I, Division 1, Groups A, B, C, and D; AEx nA [ia] IIC	Non-incendive enclosure with intrinsically safe outputs Temperature Class T4. Ta = -40°C to +60°C	CNA
<b>CSA/CSAus</b> NI Class I, Division 2, Groups A, B, C, and D; also nonincendive for ASI Class I, Division 1, Groups A, B, C, and D; Ex nA IIC	Non-incendive and Non-sparking Temperature Class T4. Ta = -40°C to +60°C	CNN (a)
<b>IECEX, Ex d [ia IIB Ga] IIC T6 Gb</b>	Flameproof enclosure with Intrinsic safe sensor outputs. Temperature Class T6 Ta = -40°C to +60°C	EDA
<b>IECEX, Ex d [ic IIB Gc] IIC T6 Gb</b>	Flameproof enclosure with Energy Limited or intrinsic safe zone 2 sensor outputs Temperature Class T6. Ta = -40°C to +60°C	EDN (a)
<b>IECEX, Ex nA [ia IIB Ga] IIC T4 Gc</b>	Non-sparking enclosure with Intrinsic safe sensor. Temperature Class T4 Ta = -40°C to +60°C	ENA
<b>IECEX, Ex nA IIC T4 Gc</b>	Non-sparking Temperature Class T4. Ta = -40°C to +60°C	ENN (a)
<b>No Certifications</b>	Not Applicable	ZZZ

a. Not available with CFS25 flowtubes.

MODEL CODE

<u>Description</u>	<u>Model</u>
Digital Coriolis Mass Flow Transmitter	NOCT60A
<b><u>Communication Interface</u></b> Modbus Communication Protocol	-M
<b><u>Mass Flowtube Sensor</u></b> Models CFS10 and CFS20 Mass Flowtubes Model CFS25 Mass Flowtube	B D
<b><u>Transmitter Mounting</u></b> Remote Mounted Transmitter	1
<b><u>Language</u></b> English	E
<b><u>Supply Voltage</u></b> 10 to 36 Vdc, Externally Powered I/O	B
<b><u>Display</u></b> Integral LCD Indicator with Keypad	B
<b><u>Output and Power Cable Entrance</u></b> 3/4 NPT Connections M25 Connections	C D
<b><u>Interconnecting Cable Insulation Material</u></b> No Cable IPVC Insulated Cable; Temperature Range from -20 to +80°C (-4 to +176°F) FEP Insulated Cable; Temperature Range from -40 to +85°C (-40 to +185°F)	N P F
<b><u>Interconnecting Cable Length</u></b> No Cable 20 foot cable/6 meter cable 50 foot cable/15 meter cable 100 foot cable/31 meter cable 200 foot cable/61 meter cable (a) 500 foot cable/152 meter cable (a) 750 foot cable/229 meter cable (a) 1000 foot cable/305 meter cable (a)	N G P H J K L M
<b><u>Electrical Safety (Also see "ELECTRICAL SAFETY SPECIFICATIONS")</u></b> ATEX flameproof with intrinsically safe flowtube connections ATEX flameproof with energy limited flowtube connections (a) ATEX nonsparking with intrinsically safe flowtube connections ATEX nonsparking with energy limited flowtube connections (a)  CSA/CSAus explosionproof with intrinsically safe flowtube connections CSA/CSAus explosionproof with nonincendive flowtube connections (a) CSA/CSAus nonincendive and energy limited with intrinsically safe flowtube connections CSA/CSAus nonincendive with nonincendive flowtube connections (a)  IECEX flameproof with intrinsically safe flowtube connections IECEX flameproof with energy limited flowtube connections (a) IECEX nonsparking with intrinsically safe flowtube connections IECEX nonsparking with energy limited flowtube connections (a)  No Certifications	ADA ADN ANA ANN  CDA CDN CNA CNN  EDA EDN ENA ENN  ZZZ
<b><u>Tamperproof Sealing Option</u></b> Tamperproof Sealing for Housing and Terminal Block Covers	-S

MODEL CODE (CONTINUED)

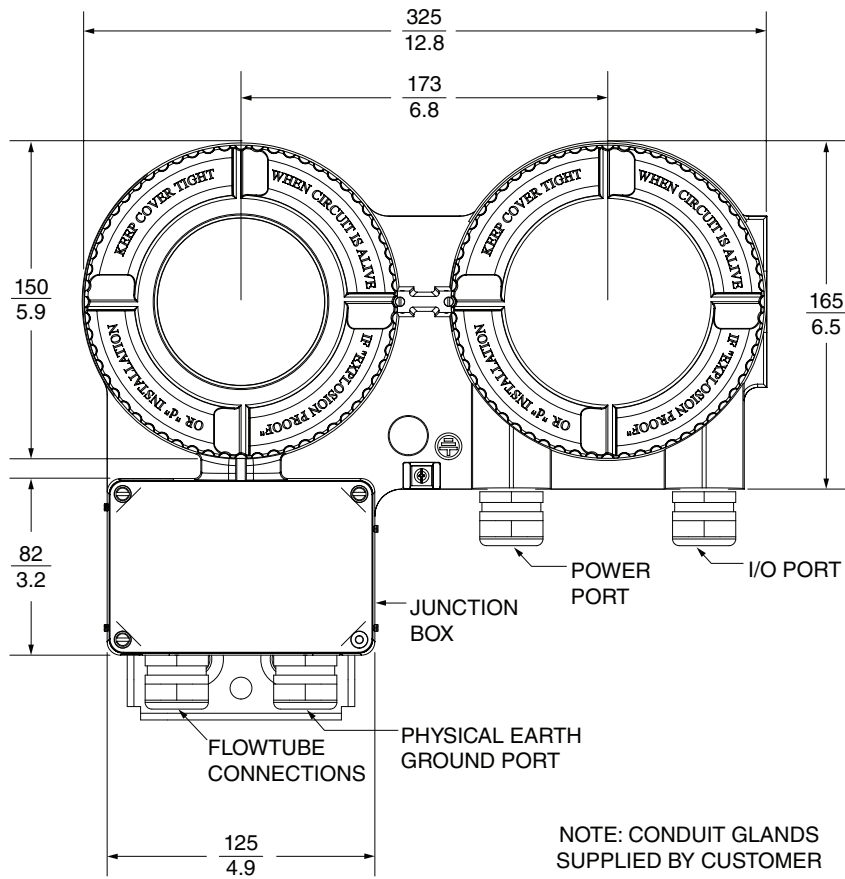
Description	Model
<u>Paint Options</u> Epoxy Paint (b)	-E
<u>Mounting Bracket Material and Pipe Size (c)</u> Stainless Steel, 2-inch pipe Carbon Steel, 3-inch pipe Stainless Steel, 3-inch pipe	-F -G -H
<u>Optional Flow Computation License</u> Configured for Telepace® Ladder Logic Programming Configured for IEC61131-3 Logic Programming (d)	-P -Q

- a. Not available with CFS25 flowtubes.
- b. Epoxy paint finish option applies to the enclosure body; the enclosure covers use an epoxy paint finish as standard.
- c. Standard mounting bracket is carbon steel, 2 inches.
- d. Programming environment software requires purchase of a separate license.



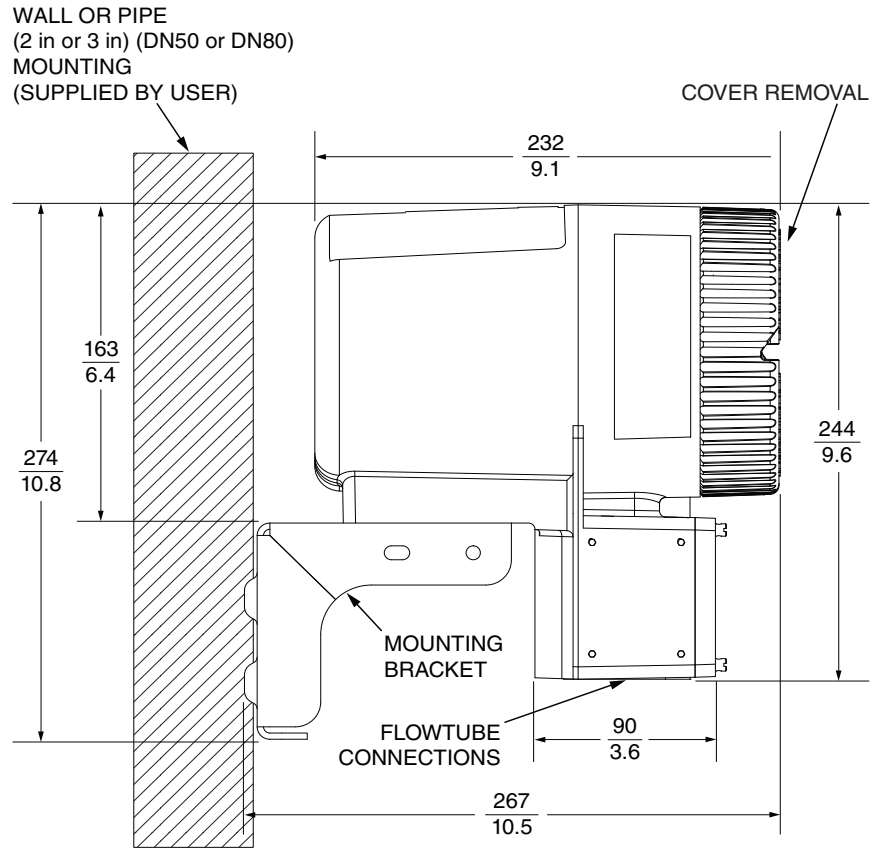
DIMENSIONS – NOMINAL

NOCT60A - FRONTAL VIEW

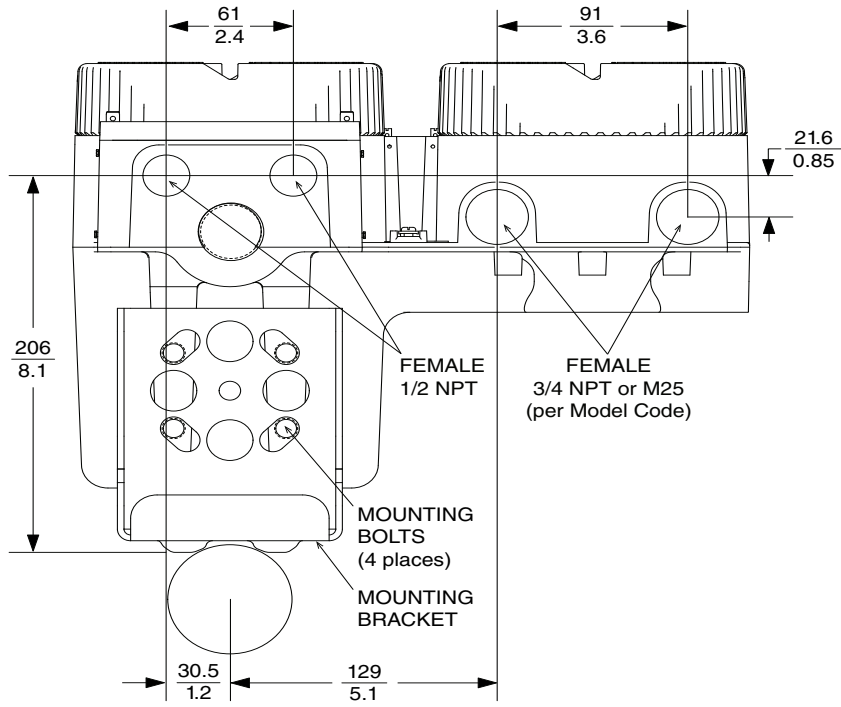


$\frac{\text{mm}}{\text{in}}$

NOCT60A - SIDE VIEW



NOCT60A - BOTTOM VIEW



mm  
in

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NOTES

### ORDERING INSTRUCTIONS

1. Flowtube Model: visit FlowExpertPro.com for sizing program.
2. Transmitter Model Number.
3. If ordering a replacement for a NOCT60A Net Oil Coriolis Transmitter, specify the meter serial number.
4. User Tag Data.

### FLOWEXPERTPRO SIZING APPLICATION

FlowExpertPro.com



Mobile application



### REFERENCE DOCUMENTS

Description	PSS Number
CFS10 Mass Flowtube; 3 to 50 mm (1/8 to 2 in) sizes	PSS 1-2B1 A
CFS20 Mass Flowtube; 40 and 80 mm (1.5 and 3 in) sizes	
CFS25 Mass Flowtubes	PSS 1-2B3 A

### OTHER FOXBORO PRODUCTS

The Foxboro product lines offer a broad range of measurement and instrument products, including solutions for pressure, flow, analytical, temperature, positioning, controlling, and recording. For a list of these offerings, visit our web site at:

[www.fielddevices.foxboro.com](http://www.fielddevices.foxboro.com)