

Rosemount™ 3415 and 3416

Dual-Configuration Gas Ultrasonic Flow Meters



3415 and 3416 Gas Ultrasonic Flow Meters

Advanced check metering

The new Dual-Configuration 3415 and 3416 Gas Ultrasonic Flow Meters deliver exceptional custody transfer accuracy and reliability by combining the power and performance of a field-proven four-path chordal, British Gas-design meter with a second reflective check meter in one body. These self-verification meters provide advanced detection and validation of process disturbances to help operators identify critical issues before measurement is adversely affected.

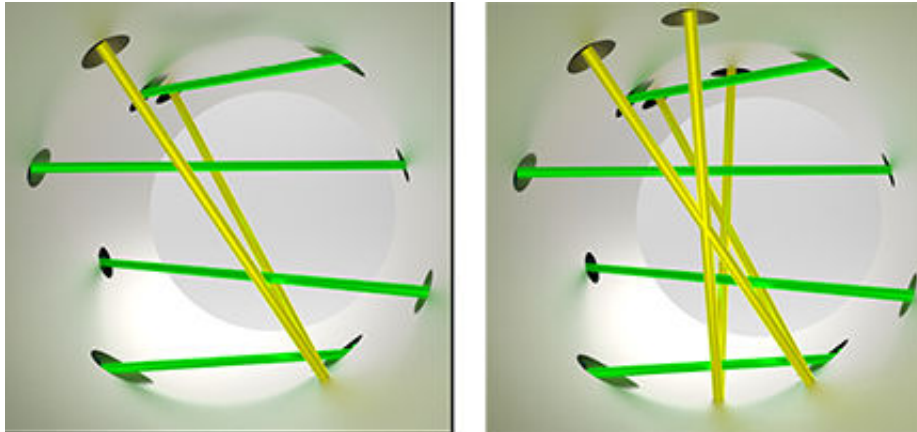
The Model 3415 meter offers a four-path custody transfer meter with a single-path reflective check meter, providing continuous real-time measurement verification and an early warning of process and/or meter deviations. With immediate alerts for blockages, contamination and other flow disturbances, operators can reduce maintenance time and costs as well as implement predictive maintenance practices and eliminate unnecessary trips into the field. In addition, the integrated check meter ensures cost-effective, continuous backup measurement is available. The ultra-reliable Model 3416 meter offers the same 3415 meter configuration along with an additional reflective path positioned vertically. This diagnostic path detects even a thin layer of liquid or buildup on the bottom of the pipe that can cause significant measurement error and higher LAUF product.

Available in DN100 to DN600 (4-in to 24-in) line sizes, each standard Model 3415 or 3416 meter is equipped with modular 3410 Series Electronics and rugged T-20 Series Transducers that offer greater tolerance to wet, rich and/or dirty gas. A new patented transducer synchronization method ensures 3410 Series Electronics provide the highest sampling rates possible, resulting in more stable ultrasonic signals for better flow resolution.

The latest version of MeterLink Software gives operators advanced insight and allows real-time meter monitoring from a PC or laptop to help eliminate unplanned shutdowns.

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Figure 1: Model 3415 meter and model 3416 meter paths

In addition to the 4-path, British Gas-design custody meter, the Model 3415 meter (left) offers a single reflective path for integrated check metering while the Model 3416 meter (right) features a second, vertical path for advanced liquid and build up detection.

Typical application

- Custody transfer for natural gas transmission lines

Application sites

- Transmission pipelines
- Gas plant inlets/outlets
- Production and gathering
- Underground storage
- Industrial interconnects

Features and benefits

- Redundant models with a field-proven 4-path chordal, British Gas-design meter (OIML Accuracy Class 0.5) and a 1-path or 2-path reflective check meter in one body offering:
 - Direct inputs for pressure, temperature and gas composition that allow speed of sound calculations using AGA 10 2003 and GERG-2008 (AGA 8 Part 2, 2017)
 - Automatic calculations and totalization of corrected volume rates, mass rates and energy rates
 - Ethernet connectivity for expedited data transfer
- The Rosemount 3415 and 3416 Gas Ultrasonic Flow Meters are now available with Smart Meter Verification, giving users access to expert flow analysis and providing a simplified and intuitive overall measurement status result minimizing time spent analyzing data. This new feature can be accessed via Modbus or MeterLink Diagnostic Software.
- Immediate detection of process disturbances via integration of chordal and reflective methodologies
 - Provides early warning of process or gas quality issues to minimize LAUF and/or prevent equipment damage
 - Offers a backup measurement, if needed

- Allows for predictive maintenance to minimize trips to the field and reduce maintenance related costs
- Patented transducer synchronization method increases sampling speed, resulting in faster detection of flow disturbances to expedite alerts and troubleshooting
- 3410 Series Electronics provide an expandable platform and an expansive archive data log to simplify accounting and dispute resolution
- New Type 4 CPU Module offers additional I/O with five frequency or digital outputs and one digital input that can be configured as the sixth output, if needed
- Local LCD displays (optional) on each transmitter offer up to ten user-selectable scrolling variables
- High rangeability (>100:1) eliminates an additional meter run
- 5D upstream piping requirement (with flow conditioner) for offshore platforms and other sites with limited straight run
- Simplifies installation with no intermediate flanges required

Standard specifications

Please consult an Emerson Ultrasonics product specialist if requirements are outside of the listed specifications. Other product and material offerings may be available depending on the application.

Meter specifications: Four-Path Custody Transfer Meter

Characteristics

- 4-path (eight transducers) chordal design

Meter Performance

- Flow calibrated accuracy is $\pm 0.1\%$ of reading over entire flow calibration range
- Repeatability is $\pm 0.05\%$ of reading for 5 to 100 ft/s (1.5 to 30.5 m/s)

Velocity Range

- Nominal 0 to 100 ft/s (0 to 30 m/s) with over-range performance exceeding 125 ft/s (38 m/s) on some sizes
- Meter meets or exceeds AGA 9 2017 3rd Edition / ISO 17089 performance specifications

Table 1: AGA 9 / ISO 17089 Flow Rate Values (US Customary Units)

| Meter Size (in) | 4 to 24 |
|-------------------|---------|
| q_{\min} (ft/s) | 1.7 |
| q_t (ft/s) | 10 |
| q_{\max} (ft/s) | 100 |

Table 2: AGA 9 / ISO 17089 Flow Rate Values (Metric Units)

| Meter Size (DN) | 100 to 600 |
|------------------|------------|
| q_{\min} (m/s) | 0.5 |
| q_t (m/s) | 3.048 |
| q_{\max} (m/s) | 30.48 |

Meter specifications: Check Meter

Characteristics

- One-path (two transducer) and two-path (four transducer) reflective designs

Meter Performance

- Flow calibrated accuracy is $\pm 0.2\%$ of reading
- Accuracy is typically $\pm 1.5\%$ of actual volume flow (without flow calibration)
- Repeatability is $\pm 0.1\%$ of reading for 5 to 100 ft/s (1.5 to 30.5 m/s)

Velocity Range

- Nominal up to 100 ft/s (30 m/s)
- Extended range up to 115 ft/s (35 m/s) on some sizes

Electronics performance

Power per Transmitter

- 10.4 VDC to 36 VDC
- 8 watts typical; 15 watts maximum

Total Meter Consumption

- 16 watts typical; 30 watts maximum

Mechanical ratings

Line sizes

- 4-in to 6-in (DN100 to DN150) with Dual-X orientation
- 8-in to 24-in (DN200 to DN600) with British Gas (BG) orientation

Operating Gas Temperature (Transducers)⁽¹⁾

- T-21: -4 °F to +212 °F (-20 °C to +100 °C)
- T-41: -58 °F to +212 °F (-50 °C to +100 °C)
- T-22: -58 °F to +212 °F (-50 °C to +100 °C)

Operating Pressure Range (Transducers)⁽¹⁾

- T-21/T-41/T-22: 150 to 4,000 psig (10.34 to 275.79 bar)

Flanges

- Raised Face (RF) and Ring Type Joint (RTJ) for ANSI Classes 300 to 1,500 (PN 50 to 250)
- Compact flanges/hub end connectors (optional)

NACE, NORSOK and PED Compliance

- Designed for NACE compliance⁽²⁾
- NORSOK available upon request
- PED available upon request

Electronics ratings

Operating Temperature

- -40 °F to +212 °F (-40 °C to +100 °C)

(1) T-21 and T-41 transducers are the only transducers available for the check meter.

(2) It is the equipment user's responsibility to select the materials suitable for the intended services.

Operating Relative Humidity

- Up to 95% non-condensing

Storage Temperature

- -40 °F to +185 °F (-40 °C to +85 °C) with a low temperature storage limit of -4 °F (-20 °C) for T-21 transducers and -58 °F (-50 °C) for T-41/T-22 transducers

Electronic Housing

- Integral mount

Materials of construction

The materials of construction are dependent upon application requirements that must be specified by the customer. If needed, an Emerson representative can provide material guidance.

Material specifications

Body and Flange

Forgings

- ASTM A350 Gr LF2 Carbon Steel⁽³⁾
-50 °F to +302 °F (-46 °C to +150 °C)
- ASTM A350 Gr LF2 Carbon Steel⁽³⁾
-58 °F to +302 °F (-50 °C to +150 °C)
- ASTM A182 Gr F316/F316L Stainless Steel (Dual Certified)
-50 °F to +302 °F (-46 °C to +150 °C)
- ASTM A182 Gr F51 Duplex Stainless Steel⁽⁴⁾
-58 °F to +302 °F (-50 °C to +150 °C)
- ASTM A105 Carbon Steel
-20 °F to +302 °F (-29 °C to +150 °C)

Enclosure Housing

- Standard: ASTM B26 Gr A356.0 T6 Aluminum
- Optional: ASTM A351 Gr CF8M Stainless Steel

Electronics Bracket

Stainless Steel

- 316SS

Transducer Components

Transducer Mounts and Holders O-rings

- Standard: Nitrile Butadiene Rubber (NBR)
- Other materials available

Transducer Mounts and Holders

- ASTM A564 Type 630 Stainless Steel Mounts
- ASTM A479 316L Stainless Steel Holders
- INCONEL ASTM B446 (UNS N06625) Gr 1 Mount (optional)
- INCONEL ASTM B446 (UNS N06625) Gr 1 Holder (optional)

(3) Impact tested per specified ASTM standard.

(4) A995 4A material is not yet approved in Canada.

Paint Specifications

Body and Flange Exterior

Carbon Steel Body Material

- 2 coat paint; inorganic zinc primer and acrylic lacquer topcoat (standard)

Stainless Steel or Duplex Body Material

- Paint (optional)

Transducer Shroud

Aluminum Material

- Powder coated

Enclosure Housing

Aluminum Material

- 100% conversion coated and exterior coated with a polyurethane enamel

Stainless Steel Material

- Passivated (optional)

Table 3: Body and Flange Maximum Pressure Ratings by Construction Materials [bar meter sizes DN100 to DN600]⁽¹⁾

| PN | Forged Carbon Steel | Forged 316/316L SS | Duplex SS |
|-----|---------------------|--------------------|-----------|
| 50 | 51.1 | 49.6 | 51.7 |
| 100 | 102.1 | 99.3 | 103.4 |
| 150 | 153.2 | 148.9 | 155.1 |
| 200 | 255.3 | 248.2 | 258.6 |

⁽¹⁾ Pressure rating information is for -29 °C to +38 °C. Other temperatures may reduce the maximum pressure rating of the materials.

Table 4: Body and Flange Maximum Pressure Ratings by Construction Materials [psi meter sizes 4-in to 24-in]⁽¹⁾

| ANSI Class | Forged Carbon Steel | Forged 316/316L SS | Duplex SS |
|------------|---------------------|--------------------|-----------|
| 300 | 740 | 720 | 750 |
| 600 | 1,480 | 1,440 | 1,500 |
| 900 | 2,220 | 2,160 | 2,250 |
| 1,500 | 3,705 | 3,600 | 3,750 |

⁽¹⁾ Pressure rating information is for -20 °F to +100 °F. Other temperatures may reduce the maximum pressure rating of the materials.

Meter sizing

US Customary units

Table 5 and Table 6 can be used to determine the flow range at reference conditions for all meter sizes. All calculations are based on Schedule 40 bore, +60°F and typical gas composition (AGA 8 Amarillo). These values are intended to be a guide in sizing. Please confirm meter sizing with an Emerson Ultrasonics product specialist prior to order placement.

Calculating Meter Capacity

To calculate a volume rate for a given velocity, first find the capacity (flow rate) in Table 5 or Table 6 for the meter size and operating pressure. Next, multiply the capacity by the ratio of the desired velocity divided by 100 ft/s to obtain the desired volume rate.

The example below illustrates how to determine the hourly flow rate at 70 ft/s for an 8-inch meter operating at 800 psig:

If Flow Rate = 7,842 MSCFH and Velocity = 70 ft/s, the calculation is:

$$\frac{7,842 \text{ MSCFH} \times 70 \text{ ft/s}}{100 \text{ ft/s}} = 5,489.4 \text{ MSCFH}$$

Table 5: Flow Rates (MSCFH) Based Upon Max Rated Velocity [4-in to 24-in = 100 ft/s]

| Meter Size (in) | 4 | 6 | 8 | 10 | 12 | 16 | 20 | 24 | |
|---------------------------|-------|--------|--------|--------|--------|--------|---------|---------|---------|
| Operating Pressure (psig) | 100 | 252 | 571 | 989 | 1,559 | 2,213 | 3,494 | 5,495 | 7,948 |
| | 200 | 478 | 1,086 | 1,880 | 2,963 | 4,207 | 6,641 | 10,446 | 15,108 |
| | 300 | 712 | 1,616 | 2,799 | 4,412 | 6,263 | 9,888 | 15,552 | 22,493 |
| | 400 | 954 | 2,164 | 3,747 | 5,906 | 8,384 | 13,236 | 20,819 | 30,111 |
| | 500 | 1,202 | 2,729 | 4,725 | 7,448 | 10,572 | 16,690 | 26,251 | 37,968 |
| | 600 | 1,459 | 3,311 | 5,733 | 9,037 | 12,828 | 20,252 | 31,854 | 46,071 |
| | 700 | 1,723 | 3,911 | 6,772 | 10,675 | 15,153 | 23,923 | 37,627 | 54,422 |
| | 800 | 1,996 | 4,529 | 7,842 | 12,362 | 17,547 | 27,703 | 43,572 | 63,020 |
| | 900 | 2,276 | 5,165 | 8,943 | 14,096 | 20,009 | 31,590 | 49,686 | 71,863 |
| | 1,000 | 2,563 | 5,817 | 10,073 | 15,877 | 22,537 | 35,581 | 55,964 | 80,943 |
| | 1,100 | 2,858 | 6,486 | 11,231 | 17,702 | 25,128 | 39,671 | 62,396 | 90,246 |
| | 1,200 | 3,159 | 7,169 | 12,414 | 19,567 | 27,774 | 43,850 | 68,969 | 99,752 |
| | 1,300 | 3,466 | 7,865 | 13,619 | 21,467 | 30,471 | 48,107 | 75,665 | 109,437 |
| | 1,400 | 3,777 | 8,571 | 14,842 | 23,395 | 33,208 | 52,428 | 82,462 | 119,267 |
| | 1,500 | 4,092 | 9,285 | 16,079 | 25,344 | 35,975 | 56,797 | 89,333 | 129,205 |
| | 1,600 | 4,408 | 10,004 | 17,323 | 27,306 | 38,760 | 61,193 | 96,247 | 139,205 |
| 1,700 | 4,725 | 10,724 | 18,570 | 29,270 | 41,548 | 65,595 | 103,172 | 149,221 | |
| 1,800 | 5,041 | 11,441 | 19,811 | 31,227 | 44,326 | 69,981 | 110,069 | 159,197 | |
| 1,900 | 5,354 | 12,151 | 21,041 | 33,166 | 47,079 | 74,327 | 116,905 | 169,083 | |
| 2,000 | 5,663 | 12,852 | 22,255 | 35,079 | 49,793 | 78,612 | 123,645 | 178,832 | |

Table 6: Flow Rates (MMSCFD) Based Upon Max Rated Velocity [4-in to 24-in = 100 ft/s]

| Meter Size (in) | 4 | 6 | 8 | 10 | 12 | 16 | 20 | 24 | |
|---------------------------|-------|-------|-------|-------|---------|---------|---------|---------|---------|
| Operating Pressure (psig) | 100 | 6.0 | 13.7 | 23.7 | 37.4 | 53.1 | 83.9 | 131.9 | 190.8 |
| | 200 | 11.5 | 26.1 | 45.1 | 71.1 | 101.0 | 159.4 | 250.7 | 362.6 |
| | 300 | 17.1 | 38.8 | 67.2 | 105.9 | 150.3 | 237.3 | 373.2 | 539.8 |
| | 400 | 22.9 | 51.9 | 89.9 | 141.8 | 201.2 | 317.7 | 499.6 | 722.7 |
| | 500 | 28.9 | 65.5 | 113.4 | 178.7 | 253.7 | 400.6 | 630.0 | 911.2 |
| | 600 | 35.0 | 79.5 | 137.6 | 216.9 | 307.9 | 486.1 | 764.5 | 1,105.7 |
| | 700 | 41.4 | 93.9 | 162.5 | 256.2 | 363.7 | 574.2 | 903.1 | 1,306.1 |
| | 800 | 47.9 | 108.7 | 188.2 | 296.7 | 421.1 | 664.9 | 1,045.7 | 1,512.5 |
| | 900 | 54.6 | 123.9 | 214.6 | 338.3 | 480.2 | 758.2 | 1,192.5 | 1,724.7 |
| | 1,000 | 61.5 | 139.6 | 241.7 | 381.1 | 540.9 | 854.0 | 1,343.1 | 1,942.6 |
| | 1,100 | 68.6 | 155.7 | 269.5 | 424.8 | 603.1 | 952.1 | 1,497.5 | 2,165.9 |
| | 1,200 | 75.8 | 172.1 | 297.9 | 469.6 | 666.6 | 1,052.4 | 1,655.3 | 2,394.0 |
| | 1,300 | 83.2 | 188.8 | 326.9 | 515.2 | 731.3 | 1,154.6 | 1,816.0 | 2,626.5 |
| | 1,400 | 90.6 | 205.7 | 356.2 | 561.5 | 797.0 | 1,258.3 | 1,979.1 | 2,862.4 |
| | 1,500 | 98.2 | 222.9 | 385.9 | 608.3 | 863.4 | 1,363.1 | 2,144.0 | 3,100.9 |
| | 1,600 | 105.8 | 240.1 | 415.8 | 655.3 | 930.2 | 1,468.6 | 2,309.9 | 3,340.9 |
| | 1,700 | 113.4 | 257.4 | 445.7 | 702.5 | 997.2 | 1,574.3 | 2,476.1 | 3,581.3 |
| 1,800 | 121.0 | 274.6 | 475.5 | 749.5 | 1,063.8 | 1,679.5 | 2,641.7 | 3,820.7 | |
| 1,900 | 128.5 | 291.6 | 505.0 | 796.0 | 1,129.9 | 1,783.8 | 2,805.7 | 4,058.0 | |
| 2,000 | 135.9 | 308.4 | 534.1 | 841.9 | 1,195.0 | 1,886.7 | 2,967.5 | 4,292.0 | |

Metric units

Table 7 and Table 8 can be used to determine the flow range at reference conditions for all meter sizes. All calculations are based on Schedule 40 bore, +15 °C and typical gas composition (AGA-8 Amarillo). These values are intended to be a guide in sizing. Please confirm meter sizing with an Emerson Ultrasonics product specialist prior to order placement.

Calculating Meter Capacity

To calculate a volume rate for a given velocity, first find the capacity (flow rate) in Table 7 or Table 8 for the meter size and operating pressure. Next, multiply the capacity by the ratio of the desired velocity divided by 30.5 m/s to obtain the desired volume rate.

The example below illustrates how to determine the hourly flow rate at 21 m/s for a DN200 meter operating at 4,500 kPag:

If Flow Rate = 178 MSCMH and Velocity = 21 m/s, the calculation is:

$$\frac{178 \text{ MSCMH} \times 21 \text{ m/s}}{30.5 \text{ m/s}} = 122.6 \text{ MSCMH}$$

Table 7: Flow Rates (MSCMH) Based Upon Max Rated Velocity [DN100 to DN600 = 30.5 m/s]

| Meter Size (DN) | 100 | 150 | 200 | 250 | 300 | 400 | 500 | 600 | |
|---------------------------|-------|-----|-----|-----|-----|-------|-------|-------|-------|
| Operating Pressure (kPag) | 1,000 | 10 | 23 | 39 | 62 | 88 | 139 | 218 | 315 |
| | 1,500 | 58 | 33 | 58 | 91 | 129 | 204 | 320 | 463 |
| | 2,000 | 19 | 44 | 77 | 121 | 171 | 270 | 425 | 615 |
| | 2,500 | 24 | 55 | 96 | 151 | 214 | 339 | 533 | 770 |
| | 3,000 | 29 | 67 | 116 | 182 | 259 | 408 | 642 | 929 |
| | 3,500 | 35 | 78 | 136 | 214 | 304 | 480 | 754 | 1,091 |
| | 4,000 | 40 | 90 | 156 | 247 | 350 | 553 | 869 | 1,257 |
| | 4,500 | 45 | 103 | 178 | 280 | 397 | 627 | 987 | 1,427 |
| | 5,000 | 51 | 115 | 199 | 314 | 446 | 704 | 1,107 | 1,600 |
| | 5,500 | 56 | 128 | 221 | 349 | 495 | 781 | 1,229 | 1,778 |
| | 6,000 | 62 | 141 | 244 | 384 | 545 | 861 | 1,354 | 1,959 |
| | 6,500 | 68 | 154 | 267 | 420 | 597 | 942 | 1,482 | 2,143 |
| | 7,000 | 74 | 168 | 290 | 457 | 649 | 1,025 | 1,612 | 2,331 |
| | 7,500 | 80 | 181 | 314 | 495 | 702 | 1,109 | 1,744 | 2,523 |
| | 8,000 | 86 | 195 | 338 | 533 | 757 | 1,195 | 1,879 | 2,718 |
| | 8,500 | 92 | 209 | 363 | 572 | 812 | 1,281 | 2,015 | 2,915 |
| | 9,000 | 99 | 224 | 388 | 611 | 867 | 1,369 | 2,154 | 3,115 |
| 9,500 | 105 | 238 | 413 | 651 | 924 | 1,458 | 2,294 | 3,318 | |
| 10,000 | 112 | 253 | 438 | 691 | 981 | 1,548 | 2,435 | 3,522 | |

Table 8: Flow Rates (MMSCMD) Based Upon Max Rated Velocity [DN100 to DN600 = 30.5 m/s]

| Meter size (DN) | 100 | 150 | 200 | 250 | 300 | 400 | 500 | 600 | |
|---------------------------|-------|-------|--------|--------|--------|--------|--------|--------|--------|
| Operating Pressure (kPag) | 1,000 | 0.240 | 0.544 | 0.941 | 1.484 | 2.106 | 3.325 | 5.229 | 7.563 |
| | 1,500 | 0.352 | 0.799 | 1.384 | 2.182 | 3.097 | 4.889 | 7.690 | 11.122 |
| | 2,000 | 0.467 | 1.061 | 1.837 | 2.895 | 4.110 | 6.489 | 10.206 | 14.761 |
| | 2,500 | 0.585 | 1.328 | 2.300 | 3.626 | 5.147 | 8.126 | 12.780 | 18.485 |
| | 3,000 | 0.706 | 1.602 | 2.774 | 4.373 | 6.207 | 9.800 | 15.414 | 22.293 |
| | 3,500 | 0.829 | 1.882 | 3.259 | 5.137 | 7.292 | 11.512 | 18.107 | 26.189 |
| | 4,000 | 0.956 | 2.168 | 3.755 | 5.919 | 8.401 | 13.264 | 20.862 | 30.174 |
| | 4,500 | 1.085 | 2.461 | 4.262 | 6.718 | 9.536 | 15.055 | 23.679 | 34.248 |
| | 5,000 | 1.216 | 2.760 | 4.780 | 7.535 | 10.695 | 16.885 | 26.558 | 38.412 |
| | 5,500 | 1.351 | 3.066 | 5.309 | 8.369 | 11.880 | 18.755 | 29.499 | 42.665 |
| | 6,000 | 1.489 | 3.378 | 5.850 | 9.221 | 13.089 | 20.664 | 32.502 | 47.009 |
| | 6,500 | 1.629 | 3.697 | 6.401 | 10.090 | 14.322 | 22.612 | 35.565 | 51.439 |
| | 7,000 | 1.772 | 4.021 | 6.963 | 10.975 | 15.759 | 24.596 | 38.686 | 55.953 |
| | 7,500 | 1.917 | 4.351 | 7.535 | 11.877 | 16.859 | 26.616 | 41.863 | 60.549 |
| | 8,000 | 2.065 | 4.687 | 8.116 | 12.793 | 18.160 | 28.670 | 45.094 | 65.221 |
| | 8,500 | 2.215 | 5.028 | 8.706 | 13.723 | 19.480 | 30.754 | 48.372 | 69.962 |
| | 9,000 | 2.368 | 5.373 | 9.304 | 14.666 | 20.818 | 32.866 | 51.694 | 74.766 |
| 9,500 | 2.521 | 5.722 | 9.909 | 15.619 | 22.170 | 35.002 | 55.053 | 79.625 | |
| 10,000 | 2.677 | 6.075 | 10.519 | 16.580 | 23.535 | 37.157 | 58.442 | 84.527 | |

Local LCD Display

Each 3410 Series transmitter offers an optional LCD display with a three-line readout that indicates variable name, variable value and engineering unit. The displays can easily be configured via MeterLink software or Emerson's AMS Trex Device with HART® interface protocol.

Figure 2: Optional LCD displays scroll the user-selected variables noted in Table 9



The local display shows up to 10 items which are user selectable from 26 variables. The display can be configured to scale volume units as actual or 000's, with an adjustable time base of seconds, hours or days. The scroll rate can be adjusted from 1 to 100 seconds (default 5 seconds).

Table 9: User selectable display variables

| Variables | Description |
|---------------------------------|--|
| Volumetric flow rate | Uncorrected (actual) Corrected (standard or normal) |
| Average flow velocity | (no description necessary) |
| Average speed of sound | (no description necessary) |
| Pressure | Flowing, if utilized |
| Temperature | Flowing, if utilized |
| Frequency output | 1A, 1B, 2A or 2B |
| Frequency output K-factor | Channel 1 or 2 |
| Analog output | 1 or 2 |
| Current day's volume totals | Uncorrected or corrected (forward or reverse) |
| Previous day's volume totals | Uncorrected or corrected (forward or reverse) |
| Total volume totals (non-reset) | Uncorrected or Corrected (forward or reverse) |

Input/Output

Table 10: CPU Module I/O Connections (maximum wire gauge is 18 AWG)

| | I/O Connection Type | Qty | Description |
|---------------------------------|---------------------------------|-----|--|
| Serial Communications | Serial RS232/RS485 Port | 1 | <ul style="list-style-type: none"> ■ Modbus RTU/ASCII ■ 115 kbps baud rate ■ RS232/RS485 Full Duplex ■ RS485 Half Duplex |
| | Ethernet Port (TCP/IP) 100BaseT | 1 | <ul style="list-style-type: none"> ■ Modbus TCP |
| Digital Input ⁽¹⁾ | Contact Closure | 1 | <ul style="list-style-type: none"> ■ Status ■ Single polarity |
| Analog Inputs ⁽²⁾ | 4-20 mA | 2 | <ul style="list-style-type: none"> ■ AI-1 Temperature⁽³⁾ ■ AI-2 Pressure⁽³⁾ |
| Frequency/Digital Outputs | TTL/Open Collector | 6 | <ul style="list-style-type: none"> ■ User Configurable (can configure Digital Input as 6th Frequency/Digital Output) |
| Analog Output ⁽²⁾⁽⁴⁾ | 4-20 mA | 1 | <ul style="list-style-type: none"> ■ Independently configurable analog output ■ HART[®] 7 Compliant, consult factory for HART 5 |

- (1) The analog-to-digital conversion accuracy is within ±0.05% of full scale over the operating temperature range.
- (2) A 24 volt DC power supply is available to provide power to the sensors.
- (3) AI-1 and AI-2 are electronically isolated and operate in sink mode. The input contains a series resistance for HART[®] Communicators to be connected for sensor configuration.
- (4) The analog output zero scale offset error is within ±0.1% of full scale and gain error is within ±0.2% of full scale. The total output drift is within ±50 ppm of full scale per °C.

Table 11: Optional I/O Expansion Module

| | I/O Connection Type | Qty | Description |
|-----------------------|-------------------------|-----|---|
| Serial Communications | Serial RS232/RS485 Port | 1 | <ul style="list-style-type: none"> ■ Modbus RTU/ASCII ■ 115 kbps baud rate ■ RS232/RS485 Half Duplex |
| | Ethernet switch | 3 | <ul style="list-style-type: none"> ■ 100BaseT ■ Three Ports |
| Analog Input | 4-20 mA | 1 | <ul style="list-style-type: none"> ■ Reserved for future use |

Optional I/O Expansion Slot: RS232/RS485 Half Duplex, 2-Wire OR 1 I/O Expansion Module

Diagnostics and software

Significantly reduce time previously spent on data analysis and troubleshooting with the new Smart Meter Verification feature now included in the latest meter firmware update. Walk away with more confidence in your measurement with a clear measurement verification result as well as meter and process status results.

Every Ultrasonic flow meter works with advanced MeterLink Software to simplify monitoring and troubleshooting. This advanced software displays a number of performance-based diagnostics that indicate meter health. In addition, dynamic flow-based diagnostics help operators identify flow disturbances that may affect measurement uncertainty. The latest version of MeterLink has been optimized to work with Smart Meter Verification, allowing for easy collection of monthly scheduled or on-demand SMV reports.

Figure 3: MeterLink Monitor Screen

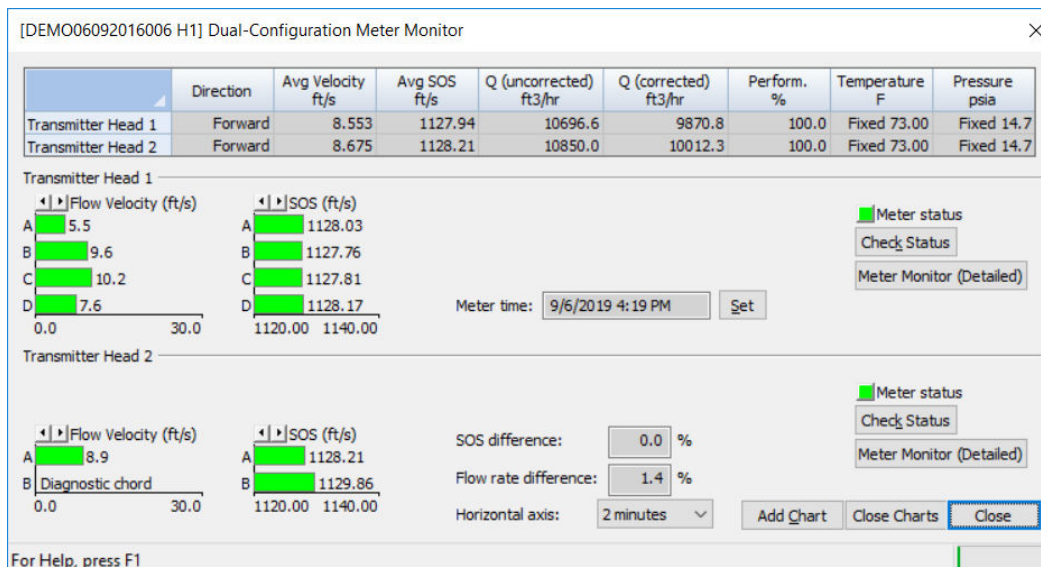
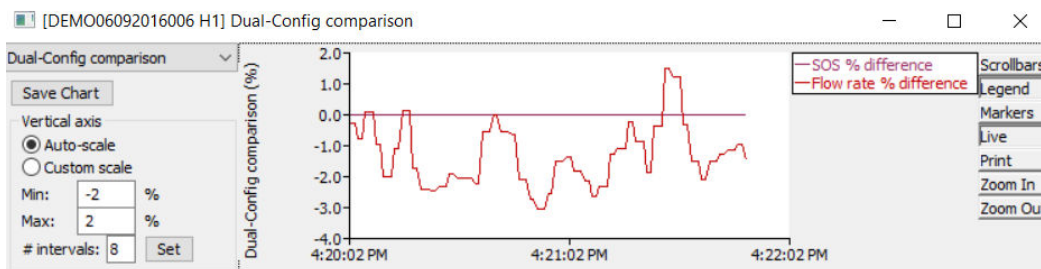


Figure 4: Dual Configuration Comparison Chart



- MeterLink software is downloadable at no charge
- MeterLink is required for transmitter configuration
 - Meter also configurable with AMS Device Manager or Trex Device, if HART® is used.
- MeterLink connects to meters using Ethernet (recommended), RS232, or RS485 full duplex
- Supports Microsoft® Windows 7, 8.1, and 10
- Microsoft Office 2010-2019

Table 12: Features of Meter, MeterLink and Net Monitor⁽¹⁾

| | | Meter | Accessible through MeterLink | Accessible through Net Monitor |
|----------------------|--|-------|------------------------------|--------------------------------|
| SMV | Scheduled or On-Demand Reports (PDF or XML) | • | • | • |
| | Clear Measurement Verification Results | • | • | • |
| | Automatic Report Collection by Meter Group | | | • |
| | Last scheduled SMV result status multiple meter overview | | | • |
| | Bundle all scheduled meter reports | | • | • |
| | Alarm prioritization | • | • | • |
| Operation | Configurable Modbus GC component data table | • | | |
| | Speed of Sound Comparison ⁽²⁾ | • | • | |
| | Transducer health monitoring | • | • | |
| | Baseline Viewer | | • | |
| | Monitor screen | | • | |
| | Multiple charts with green limit bands | | • | |
| | View waveforms | | • | |
| | Speed of Sound Calculator ⁽²⁾ | | • | |
| | Help topics/troubleshooting guidance | | • | |
| | Maintenance logs | | • | |
| History | Hourly logs (180 days) and daily logs (5 years) | • | • | |
| | Trend maintenance logs | | • | |
| | Hourly/Daily log graphing | | • | |
| Configuration | Field Setup Wizard and Baseline Configuration Wizard | | • | |
| | User name identified on audit log | • | • | |
| | Write protect switch | • | | |
| | Compare configuration from logs | | • | |
| | GC Master - Modbus serial/TCP | • | | |
| | Modbus TCP slave | • | | |
| Alarms | Alarm/audit/system logs | • | • | |
| | Bore buildup alarm | • | • | |
| | Blockage alarm | • | • | |
| | Abnormal profile alarm | • | • | |
| | Liquid detection alarm | • | • | |
| | Latched alarms | • | • | |
| | Severity alarm display | | • | |
| | Reverse flow alarm | • | • | |

- (1) *Net Monitor is an application automatically available with MeterLink that allows the user to access and monitor all Ultrasonic Flow Meters that are part of a network.*
- (2) *AGA 10 2003 and GERG-2008 (AGA 8 Part 2, 2017) supported.*

Safety and compliance


The 3415 and 3416 Gas Ultrasonic Flow Meter meets worldwide industry standards for electrical and intrinsic safety certifications and approvals. Consult an Emerson Ultrasonics technical specialist for a complete list of agencies and certifications.

Safety classifications

Underwriters Laboratories (UL / cUL)

- Hazardous Locations — Class I, Division 1, Groups C and D

CE Marked to Directives

- Explosive Atmospheres (ATEX)
- Certificate — Demko II ATEX 1006133X
- Marking —  II 2G Ex d ia IIB T4 Gb (-40 °C ≤ T ≤ +60 °C)
- Pressure Equipment Directive (PED)
- Electromagnetic Compatibility (EMC)

INMETRO

- Certificate — NCC 11.0163 X
- Marking — Ex d [ia] IIB T4 Gb IP66W

International Electrotechnical Commission (IECEx)

- Marking — Ex d ia IIB T4

Canadian Registration Number

- Certificate — 0F14855

Figure 5: Dual transducer shrouds are standard on DN400 (16-in) and larger 3415 and 3416 meters



Environmental ratings

Aluminum

- NEMA® 4
- IP66 to EN60529

Stainless Steel

- NEMA® 4X
- IP66 to EN60529

Metrology approval

OIML⁽⁵⁾

- OIML R137-1&2 Edition 2012(E)
- Class 0.5

MID⁽⁵⁾

- Directive 2014/32/EU (MID MI-002)
- Class 1.0

Measurement Canada⁽⁵⁾

- Approval — AG-0623
- Class 0.5

Figure 6: A single transducer shroud is standard on DN100 to DN300 (4-in to 12-in) 3415 and 3416 meters



(5) Metrology approval only applies to four-path meter.

Operation limits

Smaller diameter meters are less affected by lower minimum pressures than larger diameter meters. For example, under certain conditions, a DN200 (8-in) diameter meter may be able to operate at a velocity higher than 50 ft/s at 50 psig. Consult an Emerson Ultrasonics product specialist if requirements are outside of the operation limits shown below for T-21/T-41/T-22 transducers.

Table 13: Recommended Maximum Velocity (US Customary Units)

| Nominal Meter Size (in) | Maximum Velocity Rating at 50 psig (ft/s) ⁽¹⁾ | Capacity between 50 and 100 psig (ACFH) | Maximum Velocity Rating at 100 psig (ft/s) ⁽¹⁾ | Capacity at Max Rated Velocity (ACFH) | Schedule STD Bore (in) |
|-------------------------|--|---|---|---------------------------------------|------------------------|
| 4 | 50 | 15,913 | 100 | 31,826 | 4.026 |
| 6 | 50 | 36,113 | 100 | 72,226 | 6.065 |
| 8 | 50 | 62,534 | 100 | 125,068 | 7.981 |
| 10 | 50 | 98,568 | 100 | 197,136 | 10.020 |
| 12 | 50 | 141,372 | 100 | 282,743 | 12.000 |
| 16 | 50 | 228,318 | 100 | 456,635 | 15.250 |
| 20 | 50 | 363,799 | 100 | 727,598 | 19.250 |
| 24 | 50 | 530,696 | 100 | 1,061,392 | 23.250 |

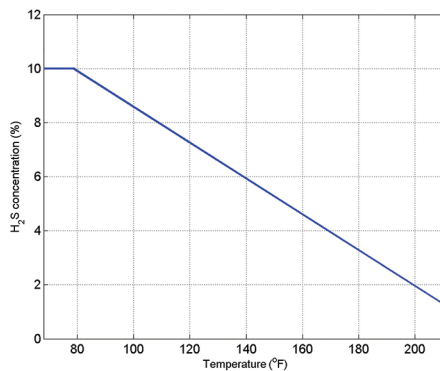
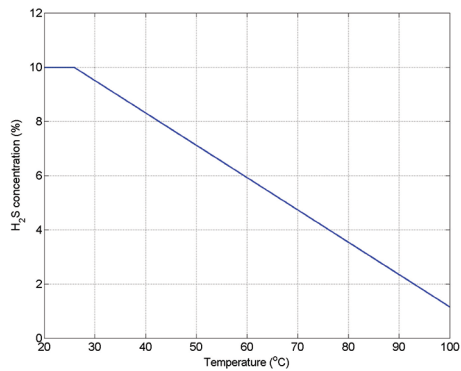
(1) Q_{max} maximum velocity generally increases linearly with increase in minimum pressure (ie: 50 psig = 50 ft/s, 75 psig = 75 ft/s, 100 psig = 100 ft/s) for 8-in to 24-in meters.

Table 14: Recommended Maximum Velocity (Metric Units)

| Nominal Meter Size (DN) | Maximum Velocity Rating at 345 kPa (m/s) ⁽¹⁾ | Capacity between 345 and 689 kPa (ACMH) | Maximum Velocity Rating at 689 kPa (m/s) ⁽¹⁾ | Capacity at Max Rated Velocity (ACMH) | Schedule STD Bore (mm) |
|-------------------------|---|---|---|---------------------------------------|------------------------|
| 100 | 15.2 | 450 | 30.5 | 901 | 102.2 |
| 150 | 15.2 | 1,022 | 30.5 | 2,045 | 154 |
| 200 | 15.2 | 1,779 | 30.5 | 3,541 | 202.7 |
| 250 | 15.2 | 2,791 | 30.5 | 5,582 | 254.5 |
| 300 | 15.2 | 4,003 | 30.5 | 8,006 | 303.2 |
| 400 | 15.2 | 6,465 | 30.5 | 12,930 | 381 |
| 500 | 15.2 | 10,301 | 30.5 | 20,603 | 477.9 |
| 600 | 15.2 | 15,027 | 30.5 | 30,055 | 574.7 |

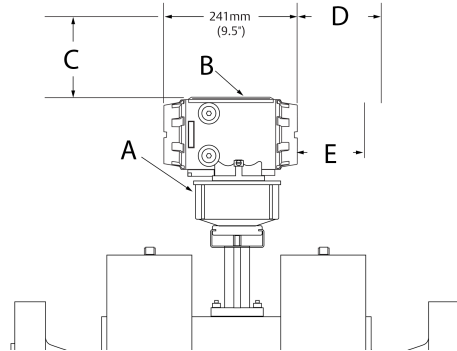
(1) Q_{max} maximum velocity generally increases linearly with increase in minimum pressure (ie: 345 kPa = 15 m/s, 520 kPa = 23 m/s, 690 kPa = 30 m/s) for DN200 to DN600 meters.

Figure 7: H₂S Limits by Temperature and Pressure for Ultrasonics T-20 Series Transducers



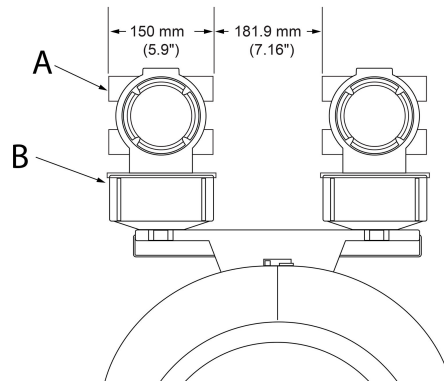
Weights and dimensions

Figure 8: Dimensions of Enclosure Housing



- A. Enclosure base
- B. Enclosure housing
- C. 2-in (51 mm) Removal
- D. 4.75-in (121 mm) Board removal
- E. 1.75-in (44 mm) Endcap removal

Figure 9: Additional Dimensions of Enclosure Housing



- A. Enclosure housing
- B. Enclosure base

Figure 10: Overhead View of Meter

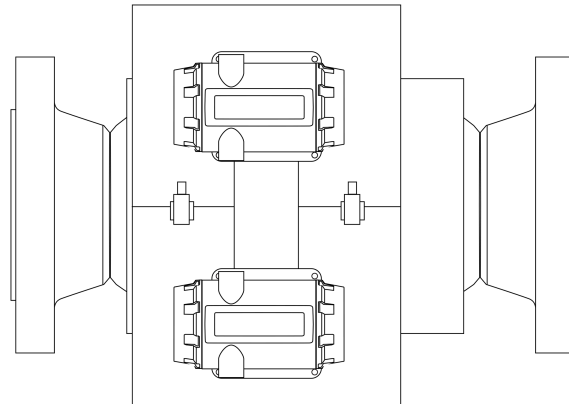
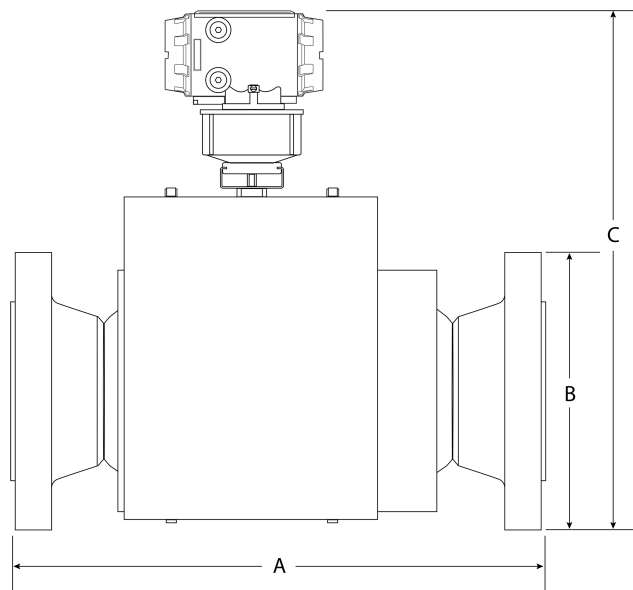
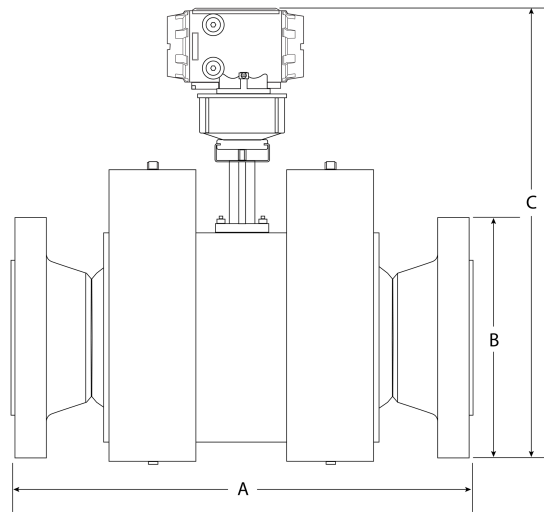


Figure 11: Dimension Key for DN100 to DN300 (4-in to 12-in) Meters with Single Transducer Shroud



To determine the values of A, B and C, see [Table 15](#) and [Table 16](#).

Figure 12: Dimension Key for DN400 and larger (16-in and larger) Meters with Dual Transducer Shrouds



To determine the values of A, B and C, see [Table 15](#) and [Table 16](#).

Tables

The Meter Dimension Key diagram ([Figure 11](#) and [Figure 12](#)) illustrates the meter component measurements that correspond to A, B and C in the chart below. All weights and dimensions are based on the standard electronics enclosure. The certified approval drawing will include the actual weights and dimensions.

Table 15: Weights and Dimensional Data (US Customary Units)

| Nominal Line Size (in) | | 4 | 6 | 8 | 10 | 12 | 16 | 20 | 24 | 30 | 36 |
|------------------------|-------------|-------|-------|-------|-------|-------|------|-------|-------|-------|-------|
| 300 ANSI | Weight (lb) | 1029 | 1425 | 1250 | 1700 | 1700 | 220 | 3200 | 4800 | 5050 | 6300 |
| | A (in) | 44.5 | 49 | 35.3 | 39.8 | 36.5 | 37.5 | 42.8 | 47.5 | 44.5 | 46.5 |
| | B (in) | 9.9 | 12.4 | 15 | 17.5 | 20.5 | 25.5 | 30.5 | 36 | 43 | 50 |
| | C (in) | 28.2 | 30.2 | 31.1 | 33.1 | 35.5 | 39.5 | 44.3 | 49.3 | 55.9 | 62.5 |
| 600 ANSI | Weight (lb) | 1061 | 1523 | 1350 | 1850 | 1900 | 2400 | 3700 | 5300 | 5800 | 7350 |
| | A (in) | 46.25 | 51 | 37.5 | 43 | 39 | 40.5 | 45.5 | 50.8 | 48 | 50.3 |
| | B (in) | 10.7 | 13.9 | 16.5 | 20 | 22 | 27 | 32 | 37 | 44.5 | 51.8 |
| | C (in) | 28.2 | 30.2 | 31.5 | 34.2 | 36.3 | 40.3 | 45 | 49.8 | 56.6 | 63.4 |
| 900 ANSI | Weight (lb) | 1109 | 1627 | 1580 | 2230 | 2560 | 3580 | 5110 | 7930 | 10300 | 15230 |
| | A (in) | 47.88 | 53.38 | 41.25 | 49.25 | 48.75 | 51 | 53.12 | 62.13 | 61.5 | 67 |
| | B (in) | 11.4 | 14.9 | 18.5 | 21.5 | 24 | 27.8 | 33.8 | 41 | 48.5 | 57.5 |
| | C (in) | 28.2 | 30.2 | 32.3 | 35 | 37.4 | 41 | 46.2 | 51.9 | 60 | 68.5 |
| 1500 ANSI | Weight (lb) | 1144 | 1725 | 1780 | 2722 | 3380 | 5130 | 7410 | 11430 | CF | CF |

Table 15: Weights and Dimensional Data (US Customary Units) (continued)

| Nominal Line Size (in) | | 4 | 6 | 8 | 10 | 12 | 16 | 20 | 24 | 30 | 36 |
|------------------------|--------|-------|------|------|------|------|------|------|------|----|----|
| | A (in) | 48.63 | 56 | 45.5 | 55 | 55.8 | 59 | 62 | 71.5 | CF | CF |
| | B (in) | 12.2 | 15.4 | 19 | 23 | 26.5 | 32.5 | 38.8 | 46 | CF | CF |
| | C (in) | 28.2 | 30.2 | 32.5 | 35.7 | 38.7 | 43.4 | 48.7 | 54.4 | CF | CF |

Table 16: Weights and Dimensional Data (Metric Units)

| Nominal Line Size (DN) | | 100 | 150 | 200 | 250 | 300 | 400 | 500 | 600 | 750 | 900 |
|------------------------|-------------|--------|--------|------|------|------|------|------|------|------|------|
| PN 50 | Weight (kg) | 466 | 658 | 567 | 771 | 771 | 998 | 1452 | 2177 | 2291 | 2858 |
| | A (mm) | 1130.3 | 1244.6 | 897 | 1011 | 927 | 953 | 1087 | 1207 | 1130 | 1181 |
| | B (mm) | 252 | 315 | 381 | 445 | 521 | 648 | 775 | 914 | 1092 | 1270 |
| | C (mm) | 715.3 | 766 | 790 | 841 | 902 | 1004 | 1125 | 1252 | 1420 | 1588 |
| PN 100 | Weight (kg) | 481 | 690 | 612 | 839 | 862 | 1089 | 1678 | 2404 | 2631 | 3334 |
| | A (mm) | 1174.7 | 1295.4 | 953 | 1093 | 991 | 1029 | 1156 | 1290 | 1219 | 1278 |
| | B (mm) | 271.5 | 353.2 | 419 | 508 | 559 | 686 | 813 | 940 | 1130 | 1316 |
| | C (mm) | 715.3 | 766 | 800 | 867 | 922 | 1023 | 1143 | 1265 | 1438 | 1610 |
| PN 150 | Weight (kg) | 503 | 738 | 717 | 1012 | 1162 | 1624 | 2318 | 3597 | 4672 | 6908 |
| | A (mm) | 1216.1 | 1355.8 | 1049 | 1252 | 1201 | 1295 | 1349 | 1577 | 1562 | 1072 |
| | B (mm) | 289.7 | 378.6 | 470 | 546 | 610 | 706 | 859 | 1041 | 1232 | 1461 |
| | C (mm) | 715.3 | 766 | 820 | 889 | 950 | 1044 | 1174 | 1318 | 1524 | 1740 |
| PN 250 | Weight (kg) | 518 | 782 | 807 | 1235 | 1533 | 2327 | 3361 | 5185 | CF | CF |
| | A (mm) | 1235.2 | 1422.4 | 1156 | 1397 | 1379 | 1499 | 1575 | 1816 | CF | CF |
| | B (mm) | 308.7 | 391.3 | 483 | 584 | 673 | 826 | 986 | 1168 | CF | CF |
| | C (mm) | 715.3 | 766 | 826 | 907 | 983 | 1102 | 1237 | 1382 | CF | CF |

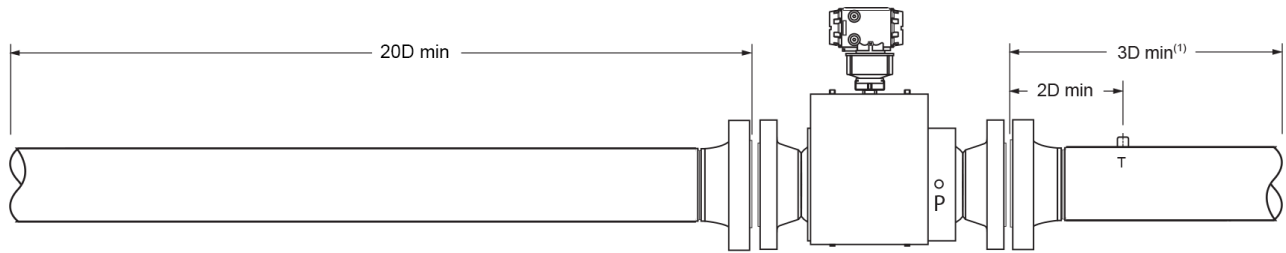
CF: Consult factory

Recommended installation

Recommended Pipe Lengths

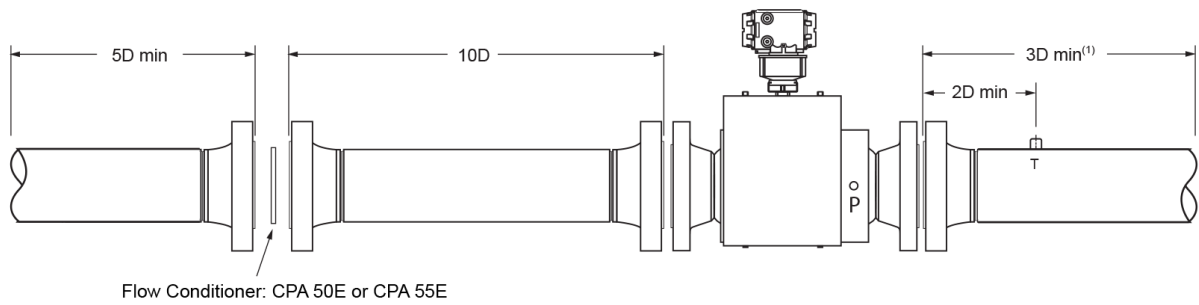
The drawings below represent the manufacturer's recommended minimum pipe lengths for installation of 3415 and 3416 Gas Ultrasonic Meters. The final recommendations are dependent upon application requirements that must be specified by the customer. Other lengths and flow conditioners can be accommodated.

Figure 13: Piping Recommendation for Gas Ultrasonic Meter (No Flow Conditioner)



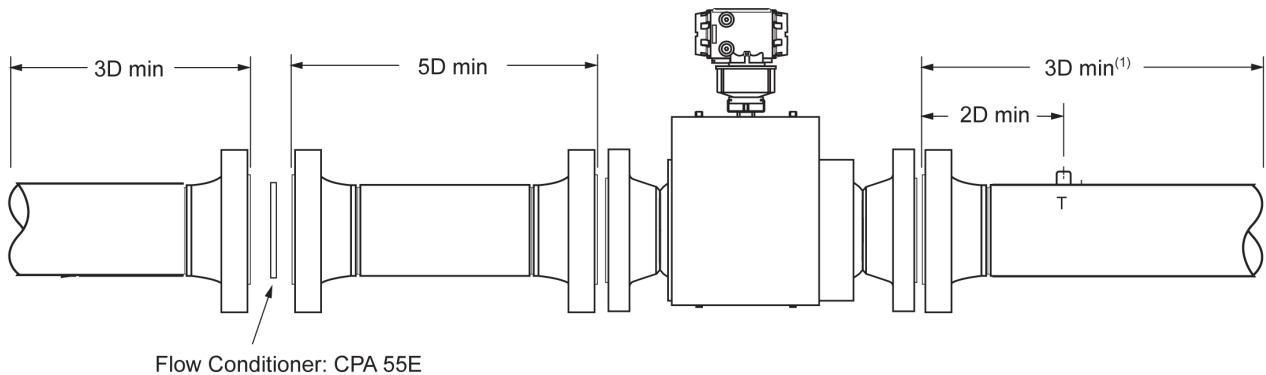
(1) Additional pipe length may be required for additional taps (i.e. sample probe, test well, etc.).

Figure 14: Piping Recommendation for Gas Ultrasonic Meter with a Flow Conditioner



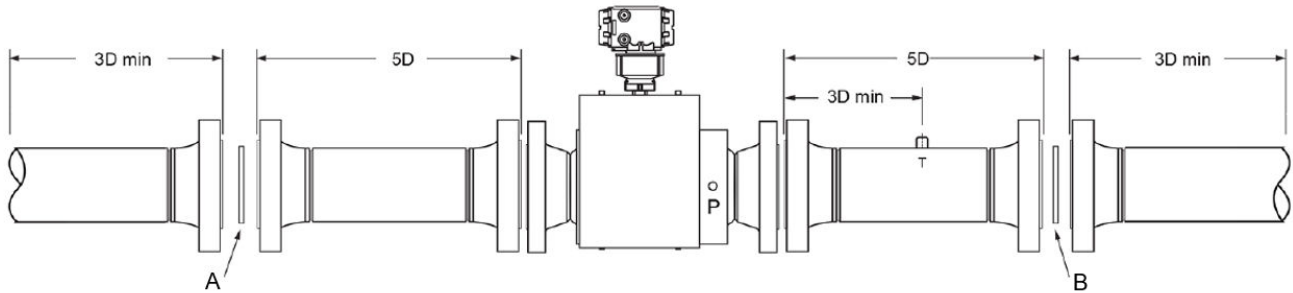
(1) Additional pipe length may be required for additional taps (i.e. sample probe, test well, etc.).

Figure 15: Piping Recommendation for Gas Ultrasonic Meter with a Flow Conditioner (Compact Installation)



(1) Additional pipe length may be required for additional taps (i.e. sample probe, test well, etc.).

Figure 16: Piping Recommendation for Bi-directional Gas Ultrasonic Meter with Flow Conditioners (Compact Installation)



Longer upstream lengths can increase long term baseline diagnostics stability. This configuration is not applicable to OIML installations.

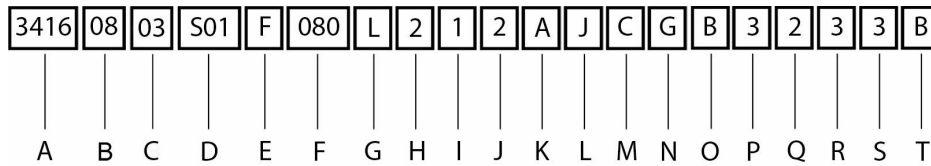
- A. Profiler, CPA 50E or CPA 55E
- B. Profiler, CPA 50 E or CPA 55E

Note

- For best results, flow conditioning is recommended.
- D = Nominal pipe size in inches (i.e., 8-in pipe size; 10D = 80-in)
- T = Temperature measurement location
- Pressure measurement location provided on meter body

Configuration code

This is an example of a configurator code. This is for informational purposes only. Not every option is listed and some options are contingent on others. Please consult factory for assistance designing your optimal meter.



| | |
|-----------------------------|--|
| A. Device | K. Electronics mounting |
| B. Line size | L. CPU/Display/Keys |
| C. Pressure rating | M. Transmitter Head 1 Expansion module |
| D. Flange type | N. Transmitter Head 2 Expansion module |
| E. Body and flange material | O. Wireless |
| F. Schedule (pipe bore) | P. Tagging format (for all tags) |
| G. Transducer assembly | Q. Tagging language |
| H. Enclosure type | R. Pressure Directive Certification |
| I. Pressure taps | S. Electrical approvals |
| J. Conduit type | T. Metrology approval |

| Category | Code | Description |
|------------------------|------|---------------------------------------|
| Device | 3415 | 3415 Custody/Check Meter |
| | 3416 | 3416 Custody/Check Meter + Diagnostic |
| Line size | 04 | DN100 (4-in) |
| | 06 | DN150 (6-in) |
| | 08 | DN200 (8-in) |
| | 10 | DN250 (10-in) |
| | 12 | DN300 (12-in) |
| | 16 | DN400 (16-in) |
| | 20 | DN500 (20-in) |
| | 24 | DN600 (24-in) |
| Pressure rating | 03 | PN 50/ANSI 300 |
| | 05 | PN 100/ANSI 600 |
| | 06 | PN 150/ANSI 900 |
| | 07 | PN 250/ANSI 1500 |
| Flange type | S01 | RF/RF |
| | S02 | RTJ/RTJ |

| | S03 | FEFA/FEFA |
|--------------------------|------------------|---------------------------------------|
| Category | Code | Description |
| Body and flange material | F ⁽¹⁾ | Forged: Carbon Steel/316 SS/Duplex SS |

(1) Consult factory for specific model code for desired material.

| | | |
|----------------------|-----|--------------|
| Schedule (pipe bore) | LW0 | Schedule LW |
| | 020 | Schedule 20 |
| | 030 | Schedule 30 |
| | 040 | Schedule 40 |
| | 060 | Schedule 60 |
| | 080 | Schedule 80 |
| | 100 | Schedule 100 |
| | 120 | Schedule 120 |
| | 140 | Schedule 140 |
| | 160 | Schedule 160 |
| | STD | Schedule STD |
| | XS0 | Schedule XS |
| | XXS | Schedule XSS |

| | | |
|------------------------------------|---|---|
| Transducer assembly ⁽¹⁾ | A | T-22/T-41 (-50 °C to +100 °C) - Low Pressure Standard Mounts/ HOLDERS, NBR O-ring |
| | F | T-22/T-21 (-20 °C to +100 °C) - Low Pressure Inconel Mounts/316L HOLDERS, FKM O-ring |
| | G | T-21 (-20 °C to +100 °C) - Standard Mounts/ HOLDERS, NBR O-ring |
| | H | T-22/T-41 (-50 °C to +100 °C) - Standard Mounts/ HOLDERS, NBR O-ring |
| | J | T-22/T-21 (-20 °C to +100 °C) - Low Pressure Standard Mounts/ HOLDERS, NBR O-ring |
| | L | T-21 (-20 °C to +100 °C) - Inconel Mounts/Inconel HOLDERS, FKM O-ring |
| | M | T-22/T-41 (-40 °C to +100 °C) - Inconel Mounts/Inconel HOLDERS, FKM O-ring |
| | N | T-41 (-50 °C to +100 °C) - Standard Mounts/ HOLDERS, NBR O-ring |
| | U | T-21/T-22 (-20 °C to +100 °C) - Standard Mounts/ HOLDERS, NBR O-ring |
| | W | T-21/T-22 (-20 °C to +100 °C) - Inconel Mounts/Inconel HOLDERS, FKM O-ring |
| | Z | T-22/T-21 (-20 °C to +100 °C) - Low Pressure Inconel Mounts/Inconel HOLDERS, FKM O-ring |

(1) T-21 and T-41 transducers are the only transducers available for the single-path check meter.

| Category | Code | Description |
|-------------------------------------|------|--|
| Enclosure type | 1 | Standard Aluminum |
| | 2 | Optional Stainless Steel |
| Pressure taps | 1 | ½-in NPT |
| | 3 | Pipette |
| Conduit type | 1 | ¾-in NPT |
| | 2 | M20 (reducers required) |
| Electronics mounting | A | Integral mount |
| CPU/Displays | J | I/O Type 4 (6 Frequency/Digital Outputs, 1 Analog Output) |
| | K | I/O Type 4 (6 Frequency/Digital Outputs, 1 Analog Output)/Displays |
| Transmitter Head 1 Expansion module | A | None |
| | B | Serial RS232 |
| | C | Serial RS485 |
| | D | Expansion I/O module |
| Transmitter Head 2 Expansion module | A | None |
| | B | Serial RS232 |
| | C | Serial RS485 |
| | G | Expansion I/O Module |
| Wireless | A | None |
| | B | THUM |
| Tagging format | 1 | Inch/ANSI/US Customary |
| | 2 | Inch/ANSI/Metric |
| | 3 | DN/PN/US Customary |
| | 4 | DN/PN Metric |
| Tagging language | 1 | English |
| | 2 | French |
| | 3 | Russian |
| | 4 | Chinese |
| Category | Code | Description |
| Pressure Directive Certification | 1 | None |
| | 2 | PED (must select electrical approval 2) |
| | 3 | CRN (Canadian Boiler Branch) |

| Category | Code | Description |
|-----------------------------|------|--------------------------------|
| | 4 | Russia (EAC) |
| Electrical approvals | 1 | UL/c-UL |
| | 2 | ATEX/IECEX |
| | 3 | INMETRO |
| | 4 | Russia (EAC) |
| Metrology approval | A | None |
| | B | European Union - MID Directive |
| | C | China |
| | F | Russia (EAC) |

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