



FLEXIM

Technical specification

FLUXUS F736

Permanently installed ultrasonic flowmeter for liquids

Features

- 4 measuring channels to compensate highly disturbed flow profiles and to facilitate more accurate and repeatable measurements
- Best suitable for applications with limited straight runs
- High precision at fast and slow flow rates, high temperature and zero point stability

Applications

- Monitoring for large water transport lines
- Surveillance of hydro power penstocks
- Redundant check metering to custody transfer flow measurements
- Allocation flow measurement in transport systems



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Transmitter

Technical data

| | FLUXUS F736**-NN | FLUXUS F736**-A2 | FLUXUS F736**-F2 | | |
|--|---|--|--|--|--|
| | | | | | |
| design | field device with 4 measuring channels in stainless steel housing | | | | |
| measurement | | | | | |
| measurement principle | transit time difference correlation principle, automatic NoiseTrek selection for measurements with high gaseous or solid content | | | | |
| flow direction | bidirectional | | | | |
| synchronized channel averaging | x | | | | |
| flow velocity | ft/s | measuring range: 0.03 to 82 | | | |
| repeatability | | 0.15 % MV ±0.02 ft/s | | | |
| fluid | all acoustically conductive liquids with < 10 % gaseous or solid content in volume (transit time difference principle) | | | | |
| temperature compensation | corresponding to the recommendations in ANSI/ASME MFC-5.1-2011 | | | | |
| measurement uncertainty (volumetric flow rate) | | | | | |
| measurement uncertainty of the measuring system ¹ | ±0.3 % MV ±0.02 ft/s | includes calibration certificate traceable to NIST | | | |
| measurement uncertainty at the measuring point ² | ±1 % MV ±0.02 ft/s | | | | |
| transmitter | | | | | |
| power supply | | <ul style="list-style-type: none"> • 90 to 250 V/50 to 60 Hz or • 11 to 32 V DC | | | |
| power consumption | W | < 15 | | | |
| number of measuring channels | | 4 (1 measuring point) | | | |
| damping | s | 0 to 100 (adjustable) | | | |
| measuring cycle | Hz | 100 to 1000 | | | |
| response time | s | 1 | | | |
| housing material | stainless steel 316L | | | | |
| degree of protection | IP66 | | | | |
| dimensions | inch | see dimensional drawing | | | |
| weight | lb | 15.9 | | | |
| fixation | wall mounting, optional: 2" pipe mounting | | | | |
| ambient temperature | °F | -40 to +140 (< -4 without operation of the display) | | | |
| display | 128 x 64 pixels, backlight | | | | |
| menu language | English, German, French, Spanish, Dutch, Russian, Polish, Turkish, Italian, Chinese | | | | |
| explosion protection | | | | | |
| • ATEX | | | | | |
| marking | - | CE II3G Ex nA ic IIC T4 Gc Ta -40...+60 °C | - | | |
| • FM | | | | | |
| marking | - | - | NI/CI. I, II, III / Div. 2 / GP. A, B, C, D, E, F, G / T5 -20 °C ≤ Ta ≤ 55 °C IP64 | | |
| certification | - | - | FM23US0080, FM23CA0059 | | |
| measuring functions | | | | | |
| physical quantities | volumetric flow rate, mass flow rate, flow velocity, thermal energy rate (if temperature inputs are installed) | | | | |
| totalizer | volume, mass, optional: thermal energy | | | | |
| diagnostic functions | sound speed, signal amplitude, SNR, SCNR, standard deviation of amplitudes and transit times | | | | |
| communication interfaces | | | | | |
| service interfaces | | measured value transmission, parametrization of the transmitter: <ul style="list-style-type: none"> • USB³ • LAN³ | | | |
| process interfaces | max. 1 option: <ul style="list-style-type: none"> • Modbus RTU • BACnet MS/TP • HART • Modbus TCP • BACnet IP • Profibus PA • FF H1 | max. 1 option: <ul style="list-style-type: none"> • Modbus RTU • BACnet MS/TP • HART • Profibus PA • FF H1 | max. 1 option: <ul style="list-style-type: none"> • Modbus RTU • BACnet MS/TP • HART • Profibus PA • FF H1 | | |

¹ with aperture calibration of the transducers² for transit time difference principle and reference conditions³ outside the explosive atmosphere (housing cover open)

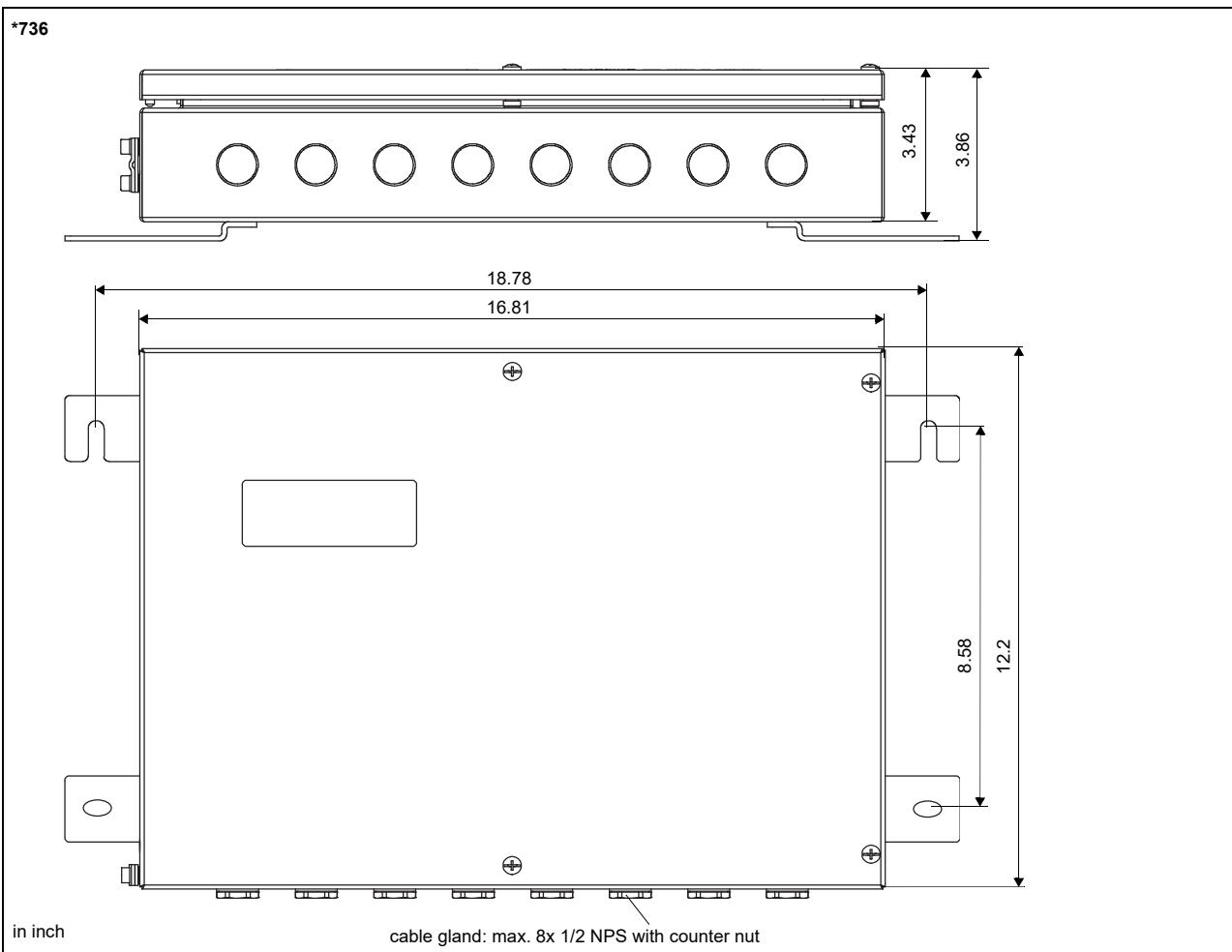
| | FLUXUS F736**-NN | FLUXUS F736**-A2 | FLUXUS F736**-F2 | | |
|------------------------------------|--|---|------------------|--|--|
| accessories | | | | | |
| data transmission kit | USB cable | | | | |
| software | <ul style="list-style-type: none"> FluxDiagReader: reading of measured values and parameters, graphical representation FluxDiag (optional): reading of measurement data, graphical representation, report generation, parametrization of the transmitter | | | | |
| data logger | | | | | |
| loggable values | all physical quantities, totalized physical quantities and diagnostic values | | | | |
| capacity | max. 800 000 measured values | | | | |
| outputs | | | | | |
| | The outputs are galvanically isolated from the transmitter. | | | | |
| number | active current inputs and outputs: max. 4 | | | | |
| • switchable current output | | | | | |
| | configurable according to NAMUR NE43 | | | | |
| | All switchable current outputs are jointly switched to active or passive. | | | | |
| number | max. 4 | | | | |
| range | mA | 4 to 20 (alarm current: 3.2 to 3.99, 20.01 to 24, hardware fault current: 3.2) | | | |
| uncertainty | | 0.04 % of output value $\pm 3 \mu\text{A}$ | | | |
| active output | | $R_{\text{ext}} = 250$ to 530Ω , $U_{\text{opencircuit}} = 28 \text{ V DC}$ | | | |
| passive output | | $U_{\text{ext}} = 9$ to 30 V DC , depending on R_{ext} ($R_{\text{ext}} < 458 \Omega$ at 20 V) | | | |
| current output in HART mode | | option | | | |
| • range | mA | 4 to 20 (alarm current: 3.5 to 3.99, 20.01 to 22, hardware fault current: 3.2) | | | |
| • active output | | $R_{\text{ext}} = 250$ to 530Ω , $U_{\text{opencircuit}} = 28 \text{ V DC}$ | | | |
| • passive output | | $U_{\text{ext}} = 9$ to 30 V DC , depending on R_{ext} ($R_{\text{ext}} = 250$ to 458Ω at 20 V) | | | |
| • digital output | | | | | |
| number | max. 4 | | | | |
| functions | | <ul style="list-style-type: none"> frequency output binary output pulse output | | | |
| type | open collector (passive) | | | | |
| operating parameters | 8.2 V/30 mA (NAMUR) | | | | |
| max. values | 8 mA at 29 V DC | | | | |
| frequency output | | | | | |
| • range | kHz | 2 to 10 | | | |
| • damping | s | 0 to 999.9 | | | |
| • pulse-to-pause ratio | | 1:1 | | | |
| binary output | | | | | |
| • binary output as alarm output | | limit, change of flow direction or error | | | |
| pulse output | | | | | |
| • pulse value | units | 0.01 to 1000 | | | |
| • pulse width | ms | 0.05 to 1000 | | | |
| • pulse rate | | max. 10 000 pulses | | | |
| inputs | | | | | |
| | The inputs are galvanically isolated from the transmitter. | | | | |
| number | active current inputs and outputs: max. 4 | | | | |
| • temperature input | | | | | |
| number | max. 4 | | | | |
| type | Pt100/Pt1000 | | | | |
| connection | 4-wire | | | | |
| range | °F | -238 to +1040 | | | |
| resolution | K | 0.01 | | | |
| accuracy | | $\pm 0.01 \% \text{ MV} \pm 0.03 \text{ K}$ at 64 to $82 \text{ }^{\circ}\text{F}$ $\pm 0.01 \% \text{ MV} \pm 0.03 \text{ K} \pm 0.0005 \%/\text{K}$ at $<64 \text{ }^{\circ}\text{F}/>82 \text{ }^{\circ}\text{F}$ | | | |
| cable resistance | Ω | max. 1000 | | | |
| • switchable current input | | | | | |
| | All switchable current inputs are jointly switched to active or passive. | | | | |
| number | max. 4 | | | | |
| accuracy | | $\pm 0.1 \% \text{ MV} \pm 0.01 \text{ mA}$ at 64 to $82 \text{ }^{\circ}\text{F}$ $\pm 0.1 \% \text{ MV} \pm 0.01 \text{ mA} \pm 0.005 \%/\text{K}$ at $<64 \text{ }^{\circ}\text{F}/>82 \text{ }^{\circ}\text{F}$ | | | |
| resolution | µA | 0.1 | | | |
| active input | | $R_{\text{int}} = 75 \Omega$, $I_{\text{max}} \leq 30 \text{ mA}$ $U_{\text{opencircuit}} = 28 \text{ V}$ (open circuit) $U_{\text{min}} = 21.4 \text{ V}$ at 20 mA | | | |
| • range | mA | 0 to 20 | | | |
| passive input | | $U_{\text{ext}} = 24 \text{ V}$, $R_{\text{int}} = 35 \Omega$, $I_{\text{max}} \leq 24 \text{ mA}$ | | | |
| • range | mA | 0 to 20 | | | |

1 with aperture calibration of the transducers

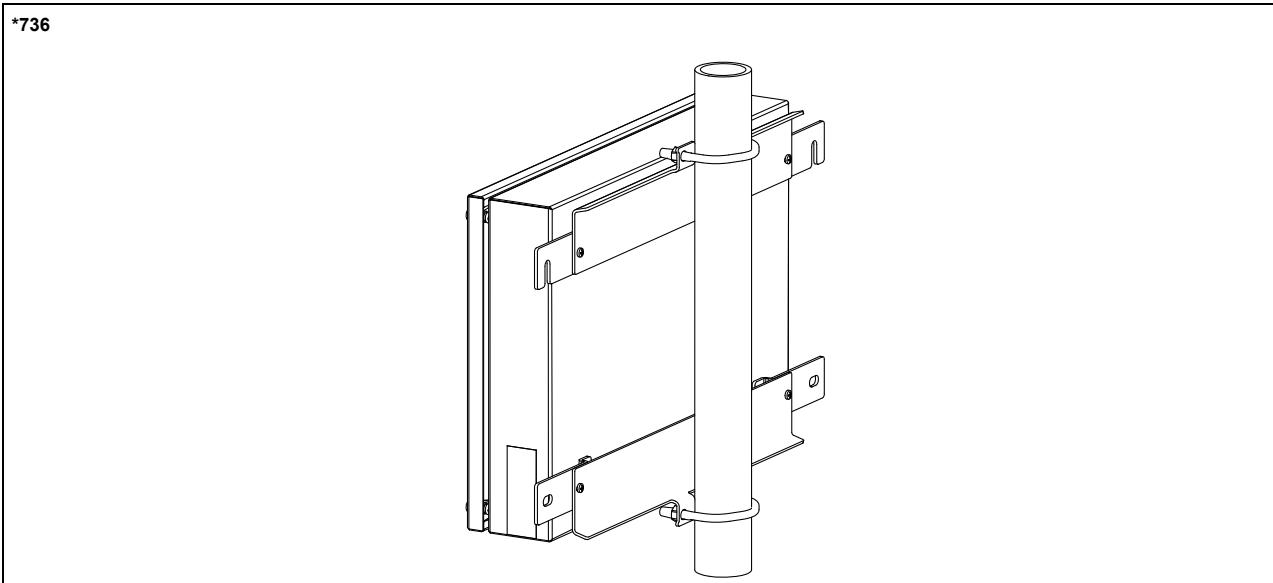
2 for transit time difference principle and reference conditions

3 outside the explosive atmosphere (housing cover open)

Dimensions



Wall and 2" pipe mounting kit



Storage

- do not store outdoors
- store within the original package
- store in a dry and dust-free place
- protect against sunlight
- keep all openings closed
- storing temperature: -4...+140 °F

Terminal assignment

*736

equipotential bonding terminal

| power supply ¹ | | | |
|---------------------------|----------------------|----------|----------------------|
| AC | | DC | |
| terminal | connection | terminal | connection |
| L | outer conductor | (+) | + |
| N | neutral conductor | (-) | - |
| | protective conductor | | protective conductor |

¹ cable (by customer): e.g., flexible wires, with insulated wire ferrules, wire cross-section: AWG14 to 24

| transducers, extension cable | | | | |
|------------------------------|-----------------|---------------------|-----------------|------------|
| measuring channel A | | measuring channel B | | transducer |
| terminal | connection | terminal | connection | |
| AV | signal | BV | signal | |
| AVS | internal shield | BVS | internal shield | |
| ARS | internal shield | BRS | internal shield | |
| AR | signal | BR | signal | |

| outputs, inputs ^{1, 2} | |
|---|---|
| terminal | connection |
| depending on configuration | current output, digital output, current input |
| 1, 2, 3, 4 5, 6, 7, 8 9, 10, 11, 12 13, 14, 15, 16 | temperature input |
| 33+, 34- | passive current output/HART |
| 33-, 34+ | active current output/HART |
| 33, 34 | Modbus RTU, BACnet MS/TP, Profibus PA, FF H1 |

| temperature probe | | |
|-------------------|-----------------------------------|--|
| terminal | direct connection | connection with extension cable, inline temperature probe |
| 1, 5, 9, 13 | red | white |
| 2, 6, 10, 14 | white | red |
| 3, 7, 11, 15 | red | black |
| 4, 8, 12, 16 | white | green |
| USB | type C Hi-Speed USB 2.0 Device | service (FluxDiag/FluxDiagReader) |
| LAN | RJ45 10/100 Mbps Ethernet | <ul style="list-style-type: none"> service (FluxDiag/FluxDiagReader) Modbus TCP BACnet IP |

¹ cable (by customer): e.g., flexible wires, with insulated wire ferrules, wire cross-section: AWG14 to 24

² The number, type and terminal assignment are customized.

Transducers

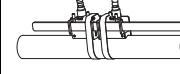
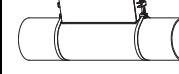
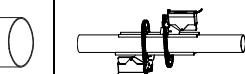
Overview

Shear wave transducers

| | technical type | | | | | |
|--|--------------------|--------------------|--------------------|--------------------|--------------------|---------|
| | G | K | M | P | Q | S |
| zone 2 - FM Class I Div. 2 - nonEx normal temperature range | CDG1N52 CLG1N52 | CDK1N52 CLK1N52 | CDM2N52 CLM2N52 | CDP2N52 CLP2N52 | CDQ2N52 CLQ2N52 | CDS2N52 |
| zone 2 - nonEx IP68 | CDG1L18 | CDK1L18 | CDM2L18 | CDP2L18 | | |
| zone 2 - FM Class I Div. 2 - nonEx extended temperature range | CDG1E52 CLG1E52 | CDK1E52 CLK1E52 | CDM2E52 CLM2E52 | CDP2E52 CLP2E52 | CDQ2E52 CLQ2E52 | |
| zone 1 normal temperature range | CDG1N81 CLG1N81 | CDK1N81 CLK1N81 | CDM2N81 CLM2N81 | CDP2N81 CLP2N81 | CDQ2N81 CLQ2N81 | |
| zone 1 IP68 | CDG1L11 | CDK1L11 | CDM2L11 | CDP2L11 | | |
| zone 1 extended temperature range | CDG1E83 CLG1E83 | CDK1E83 CLK1E83 | CDM2E85 CLM2E85 | CDP2E85 CLP2E85 | CDQ2E85 CLQ2E85 | |
| inner pipe diameter d | | | | | | |
| min. extended | inch | 15.7 | 3.9 | 2 | 0.98 | 0.39 |
| min. recommended | inch | 19.7 | 7.9 | 3.9 | 2 | 0.98 |
| max. recommended | inch | 157.5 | 78.7 | 39.4 | 15.7 | 5.9 |
| max. extended | inch | 255.9 | 94.5 | 47.2 | 18.9 | 9.4 |
| pipe wall thickness | | | | | | |
| min. | inch | 0.43 | 0.2 | 0.1 | 0.05 | 0.02 |
| | | | | | | 0.01 |

for further data see Technical specification TS_F7xx-transducersVx-xXX_Lus

Transducer mounting fixture

| PermaRail | PermaLok PL | quick release clasps and tension straps | WaveInjector with chains |
|---|---|---|---|
|  |  |  |  |
| transducer frequency S | transducer frequency M, P | transducer frequency M, P, Q | |
| | | | WaveInjector with threaded rods |
| | | |  outer pipe diameter: 1.4 to 15 inch |

for further data see Technical specification TS_F7xx-transducersVx-xXX_Lus

Coupling materials for transducers

| | normal temperature range | extended temperature range | WaveInjector |
|-----------------------|--|--|--|
| < 212 °F | < 338 °F | < 302 °F | < 536 °F |
| < 24 h | coupling compound type N or coupling pad type VT | coupling compound type E or coupling pad type VT | coupling pad type TF |
| long time measurement | coupling pad type VT | coupling pad type VT | coupling pad type A and coupling pad type VT |

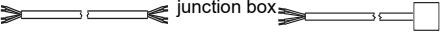
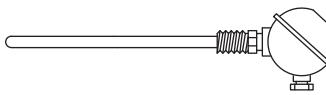
for further data see Technical specification TS_F7xx-transducersVx-xXX_Lus

Connection systems

| connection system TS | | |
|---------------------------------|--------------------|-------------------------------|
| connection with extension cable | direct connection | transducers technical type |
| <p>JB02, JB03, JB04</p> | <p>transmitter</p> | *****52 |
| connection system T1 | | |
| connection with extension cable | direct connection | transducers technical type |
| <p>JB01</p> | <p>transmitter</p> | *****8* |
| <p>JB01, JBP2, JBP3</p> | <p>transmitter</p> | *****L1* |

for further data see Technical specification TS_F7xx-transducersVx-xXX_Lus

Temperature probes

| PT13N | PT13F | A2179 |
|--|--|--|
| <ul style="list-style-type: none"> Pt1000 clamp-on -40 to +392 °F | <ul style="list-style-type: none"> Pt1000 clamp-on response time: 8 s -49 to +482 °F | <ul style="list-style-type: none"> Pt1000 inline -58 to +500 °F |
| direct connection | | |
|  | | |
| connection with extension cable | | |
| extension cable | | |
|  | |  |

Annex

Reference conditions

as available at e.g. the test facilities of Physikalisch-Technische Bundesanstalt

| | |
|-------------------------------------|--|
| measurement principle | transit time difference correlation principle |
| all uncertainties | % 95 |
| fluid temperature | 77 °F ±9 °F |
| ambient temperature | 77 °F ±9 °F |
| warm-up time | min 10 |
| flow profile at the measuring point | fully developed, rotationally symmetric |
| installation | installation according to specifications using the recommended transducers |
| Reynolds number | > 10 000 |
| pipe diameter uncertainty | % 0.2 |
| pipe wall thickness uncertainty | % 1 |
| circularity tolerance | 0.08 % of inner pipe diameter |
| SCNR | dB > 48 |
| SNR | dB > 12 |