

4411e Magnetic Flowmeter Transmitter



The UniMag series of magnetic flowmeters consists of a UniMag flow sensor and a 4411e transmitter.

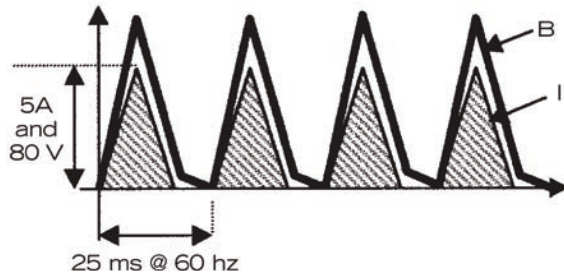
The 4411e uses an innovative and patented Pulsed AC method of coil excitation to create an ultra stable flow signal having a signal to media noise ratio up to 50 times higher than other magmeter technologies. As a result, the 4411e offers a clean and powerful bi-directional signal with unsurpassed fast response and the highest insensitivity to media noise from slurries, low conductivity media, pulps, greasy sewage, paper mill liquors and similar. Signal strength is typically 50% higher than former EMCO Pulsed AC technology.

The 4411e is a most versatile and advanced magmeter transmitter. It features a user friendly keypad for programming, a 10-year memory, data logging capability, batch control, HART protocol or RS232 interfacing, two x 4 - 20mA outputs and a scaleable pulse frequency output.

There are two x 4 - 20mA inputs with 2 - wire capability. One may be used as a level input for use with ChannelMag open channel and other partially filled flowmeter.

| 4411e FEATURE | BENEFIT |
|--|---|
| High excitation current (to 5.5A base to peak) and high exciter frequency (40 Hz or 33 Hz for all size UniMag Sensors) | Suitable for problem media (mining, slurries, pulps, liquors, low conductivity media); Signal to media noise ratio up to 50x higher than other magmeters; Suitable for media that coat the inside of pipes. |
| 4 lines of 20 character alphanumeric, backlit LCD display with sealed, tactile feedback and vandal resistant keyboard | Clear rate display, gross and net totals in forward and reverse directions, and batch control; Field configurable and user-friendly keypad. |
| Noise Countervailence and Auto-Zero Circuits, with RF and VFD filtration | Signal virtually immune to common noise effects. including eddy current drift, radio frequency, variable frequency drives and similar. |
| Bi-directional flow measurement | Accurately eliminates back flow from net totals. |
| Reference coils to compensate for media magnetic fields and media temperature | Allows accurate flow measurement of slurries with magnetite and wide media temperature variation. |
| Fast time constant of 0.30 seconds | Accurate measurement of pulsating pump flow; Suitable for high speed batch fill times to 1 second; Stable, fast acting proportional control. |
| Comprehensive alarm relays and setpoints | Control of min/max and batch flow control; Alarm relays for reverse flow; Non-full pipe alarm actuated by external switch or by uncovered electrodes. |

Not Just Another Magmeter



The 4411e uses a patented type of Pulsed AC coil excitation. The magnetizing current I is fed to the coils of a UniMag magmeter. It is uni-polar and derived from half wave rectification of line voltage.

The magnetizing current is uniquely high, up to 5.5 Amps base to peak. This creates an ultra high signal strength. It is also applied in a series of pulses at the highest practical frequency. This combination provides an unsurpassed signal to media noise ratio, such that the signal is virtually unaffected by noise caused by such media as greasy sewage, paper pulp, paper mill liquors, mining and dredging slurries, low conductivity media and media which coats the internal diameter.

Further signal quality enhancement is provided by a Noise Countervailence Circuit, which continuously integrates the erratic signal of media noise and algebraically compensates for it. The net result is a clean and powerful signal, having a signal to media noise ratio of up to 50 times higher than other magmeters.

The 4411e incorporates the most advanced technology available, allowing for the first time powerful pulses to be used at a common high frequency for all size magmeters, from 1/16" to 80" (1.5 - 2000mm). Other technologies do not allow this ability, such that larger magmeters have to use a lower exciter frequency. Each powerful pulse has a duration of only 16.7ms

(for 60 Hz supply), after which time it is switched off. The resultant generated magnetic field B, which includes the signal function, follows the current I by a few milliseconds and dissipates after 25ms (for 60 Hz supply). As such, an unsurpassed high efficiency energy management is accomplished, where the power consumption, utilizing resistive power only, is typically 20 Watts. This is despite having the highest signal strength and exciter frequency available. A resultant low operational temperature allows all UniMag magmeters to be encapsulated with stiff setting compounds for solid state construction, as well as enhancing the life of the 4411e to be typically double that of common art transmitters.

The 4411e incorporates the first auto zero for Pulsed AC technology. Eddy current drift, which has caused zero instability in Continuous AC meters since their inception as much as $\pm 3\%$ per day, is proportional to rate of change of magnetic field with time, for a given frequency. The 4411e incorporates a patented algebraic compensation of the integrated rate of change of magnetic field with time, resulting in virtual elimination of eddy current drift with unsurpassed signal stability.

The high exciter frequency has a frequency of 40 Hz (for 60 Hz supply) or 33.3 Hz (for 50 Hz supply). Such powerful and "clean" signals have a unique time constant as fast as 30 milli seconds. This allows high accuracy batching, particularly useful with small volumes. This feature is equally important in proportional control systems, where a fast time constant and high quality signal is vital for stable control and improved product quality.

4411e transmitters are normally compatible with Continuous AC magmeters of other manufacturers and will certainly enhance their performance. Knowing the existing μV / Coil Amp / unit volume factor on the Continuous AC magmeter direct compatibility may be established.

4411e Flowmeter Specifications

| | |
|--------------------------|---|
| Accuracy | See appropriate UniMag magmeter specification. This accuracy is unaffected by such electrode coatings as calcium carbonate, sewage grease, iron oxide, algae or similar. For media > 1/4" (6mm) thick, the use of extended electrodes is recommended. |
| Weight | 7 lb (3.2 kg) |
| Enclosure | Wall mounted UV resistant fibre glass with lockable stainless steel latches (locks not supplied). |
| Environmental Protection | NEMA 4X and IP65 |
| Cable Entry | 4 non-threaded holes for 1/2" conduit or M20 connectors. Approved non-conduit connectors are supplied for ATEX Zone 2 requirements. |
| Cable Terminals | Internally accessible, but isolated from the electronics. |
| Security Tabs | Tabs provided for locks. Locks not included. |
| Supply Voltage | 120V 60 Hz, 120V 50 Hz, 230V 50 Hz |
| Power Consumption | 20 Watts typical including sensors. |
| Magnetizing Current | Up to 5.5 A, depending on sensor size. |
| Exciter Frequency | 40 Hz (with 60 Hz) or 33 Hz (with 50 Hz) |
| Media Conductivity | 0.5 microS/cm (micromhos/cm) standard 0.08 microS/cm with booster pre-amp supply to sensor. |

Note: for demineralized, deionized or distilled water, the minimum conductivity is 0.5 microS/cm. A pre-amp is mounted in the remote sensor and recommended for conductivities < 20 microS/cm.

Ambient Temperature -4° to $+140^{\circ}$ F (-20° to $+60^{\circ}$ C)

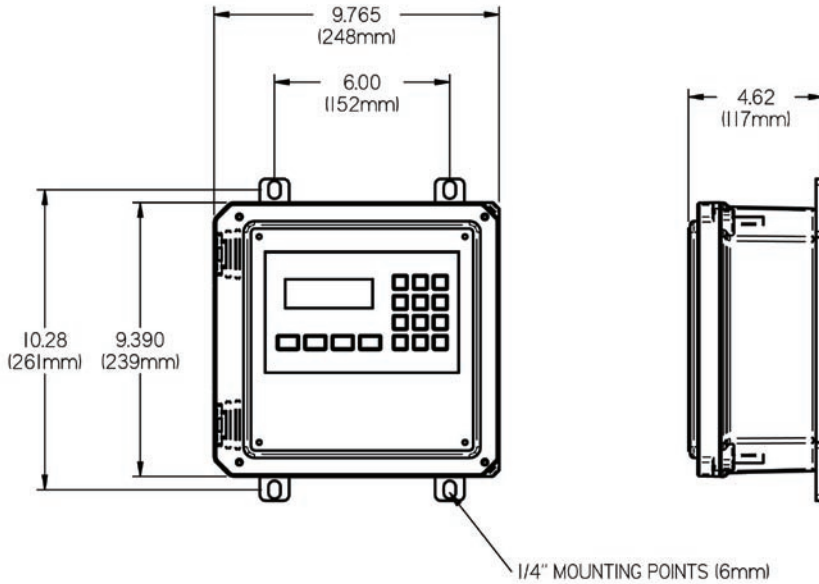
NOTE: Below $+14^{\circ}$ F (-10° C) the LCD display may not be visible. A heated enclosure is recommended for below these temperatures.

A protective cover is recommended when operating in strong sunlight.

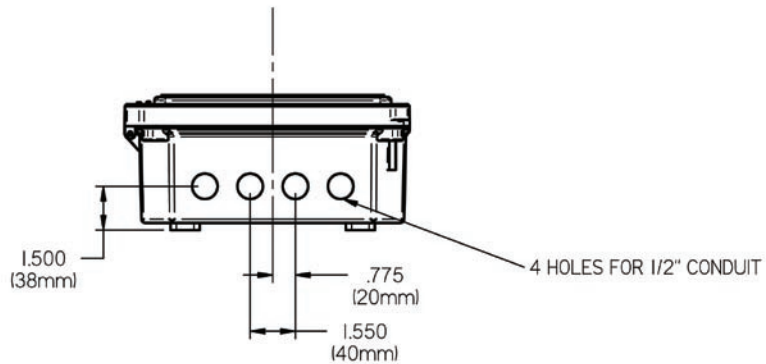
4411e Flowmeter Specifications

| Storage Temperature | - 40° to +140° F (-40° to +70° C) | | | | | | | | | | | | |
|--|--|--------------------------|--------------------|--------------------------|------|-------|------|--------|------|-------|------|-----|--------|
| Temperature Error | < 0.0025% per °F (< 0.005% per °C) for analog output. < 0.5% of span for any variation | | | | | | | | | | | | |
| Time Constant (T) | Minimum 30 milliseconds | | | | | | | | | | | | |
| Signal Averaging (5 T) | Infinitely adjustable 150 ms - 300 seconds. | | | | | | | | | | | | |
| Flowmeter Cable Type | 3 cables are required between the 4411e and the UniMag magmeter. Each cable to be 2 core 18 AWG or 2 core 0.75mm ² multi-stranded, twisted and shielded. We recommend Beldon 8760 or 9318, Alpha 5610/1801, 5611/1801 or equivalent. 1 cable is for a reference coil, which compensates for variation in supply voltage, 1 cable for the electrodes and 1 for the exciter coils. A pre-amp cable of the same type is used for DemiMag DM series as standard supply or an optional booster amplifier for low conductivity media with DemiMag DL series or UniMags. | | | | | | | | | | | | |
| <i>Note: For 4411e transmitters approved by Entela to CSA and NEC standards for use in Class 1, Division 2 or to ATEX Zone 2 explosive atmospheres, used with approved UniMag magnetometers, the 4411e must be used in the safe area. For Class 1, Division 2 areas it is conditional that rigid metal or Teck metal clad conduit (or equivalent) is used for connection to the approved UniMag magmeter. 1/2" conduit connectors are then supplied with the transmitter. For ATEX Zone 2 approval IEC approved cable must be used. 2 cables are not allowed through a single connector for ATEX approval, and conduits are unnecessary.</i> | | | | | | | | | | | | | |
| Maximum Cable Length | 30 feet (10m) for conductivities < 3 microS/cm (micromhos/cm) 300 feet or 10 x C (90m or 3 x C) for conductivities > 3 microS/cm whichever is less, where C is the conductivity in microS/cm. | | | | | | | | | | | | |
| Maggmeter Analog Outputs | Two 4 - 20mA outputs from separate terminals are available for bi-directional flow. Either may be configured as an internally powered 2-wire output or an externally powered 2-wire output. When internally powered a loop voltage of 24 V dc is supplied with a maximum load of 800 Ohms. These outputs are isolated from all circuits, other than the contact inputs and each other. When externally powered the maximum load is calculated by: Maximum Ohms = [(48.83 x dc voltage) - 488.3] For an external 24 Vdc supply this would be [(48.83 x 24) - 488.3] = 683 Ohms. Minimum current 3.75mA, maximum 22mA. | | | | | | | | | | | | |
| Pulsed Outputs | An externally powered , 2-wire scaled output (for totalizing flow) or frequency output (for rate of flow) is available as follows: Scaled Mode: | | | | | | | | | | | | |
| | <table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: left;"><u>Speed</u></th> <th style="text-align: left;"><u>Pulse Width</u></th> <th style="text-align: left;"><u>Maximum Frequency</u></th> </tr> </thead> <tbody> <tr> <td>Slow</td> <td>100ms</td> <td>5 Hz</td> </tr> <tr> <td>Medium</td> <td>50ms</td> <td>10 Hz</td> </tr> <tr> <td>Fast</td> <td>5ms</td> <td>100 Hz</td> </tr> </tbody> </table> | <u>Speed</u> | <u>Pulse Width</u> | <u>Maximum Frequency</u> | Slow | 100ms | 5 Hz | Medium | 50ms | 10 Hz | Fast | 5ms | 100 Hz |
| <u>Speed</u> | <u>Pulse Width</u> | <u>Maximum Frequency</u> | | | | | | | | | | | |
| Slow | 100ms | 5 Hz | | | | | | | | | | | |
| Medium | 50ms | 10 Hz | | | | | | | | | | | |
| Fast | 5ms | 100 Hz | | | | | | | | | | | |
| Frequency Mode | 0 - 1000 Hz up to 10000 Hz square wave. The external isolated outputs are rated 30V dc maximum, current of 250mA. | | | | | | | | | | | | |
| Communication Outputs | HART Protocol and RS 232 are available as standard. | | | | | | | | | | | | |
| Relay Outputs | 2 user configurable form C (changeover) relays with contact rating 125V ac, 1A, 30VA. | | | | | | | | | | | | |
| Contact Inputs | 2 user configurable inputs, rated 12V dc, 10mA. These inputs require a contact closure or transistor switch between the terminals. | | | | | | | | | | | | |
| Non-Full Pipe Detection | Output signals are clamped at 4mA and 0 Hz when the level falls below the upper most electrode pair. Alternatively this can be actuated by an external pump switch or similar, via a contact input. | | | | | | | | | | | | |
| Pre-Amp Supply | A pre-amp is internally supplied on all DM series DemiMags as standard. On other UniMag magnetometers an internal booster pre-amp is recommended for media conductivity < 20 microS/cm. A supply of ± 5V, 10mA is available on 4411e as standard. | | | | | | | | | | | | |
| Input Impedance | 10 ¹² Ohms | | | | | | | | | | | | |
| <i>Note: Has driven shield capability used for updating existing continuous AC magnetic flowmeters of other manufacture.</i> | | | | | | | | | | | | | |
| Analog Inputs (Including Level) | Two x 4 - 20mA inputs with 2 wire, 18V dc supply. One may be a level input for use with ChannelMag open channel or partially filled pipe flowmeter. The level signal is linearized if necessary and multiplied by the mean velocity from the ChannelMag to provide continuous measurement of volumetric flow. | | | | | | | | | | | | |
| Optional Batch Control | For batch control the total set amount is entered via the keypad and displayed. Keypad actuation of batch flow via a 4411e relay initiates flow, counting from zero to total set amount. | | | | | | | | | | | | |
| Display | 4 lines of 20 character of waterproof, backlit LCD display. Totals may be programmed as Forward Total, Reverse Total, or Net Forward Total. Rate of flow may be programmed as Forward Rate or Reverse Rate. | | | | | | | | | | | | |
| Front Panel Keypad | Tactile feedback, waterproof sealed. | | | | | | | | | | | | |
| Diagnostics | All necessary diagnostics, readings and system status are available via front panel keypad without opening the door. A user security password is programmable. This allows revalidation of magmeter NIST traceable Calibration Certificates. A separate calibration box is unnecessary. | | | | | | | | | | | | |
| Windows Interface Program | Computer interface via serial connection, enabling programming of setup, ability to upload new firmware and download diagnostics and status. | | | | | | | | | | | | |

4411e Dimensions



Mounting Hole Location



4411e Ordering Code

DSM 1 1 C

DSM = 4411e Identification

Approvals

- O = Basic Version
- 1 = Entela certified compliant to UL and CSA Ordinary Locations and CE Health and Safety Requirements
- 2 = Entela certified compliant to NEC and CSA Class 1, Division 2, Groups C, D, temperature rating T4
- 3 = Entela certified to ATEX Zone 2, temperature rating T4 and CE Health and Safety Requirements

Options

- O = No further options
- C = 2 wire level 12 -- 30 V dc supply / 4 -- 20mA input for use with ChannelMag open channels
- D = 2 wire level 12 -- 30V dc supply / 4 -- 20mA input for use with UniMag non-full pipes or ChannelMag non-full pipes
- B = Batch control

Power Supply

- 1 = 120V ac, 60 Hz
- 2 = 120V ac, 50 Hz
- 3 = 230V ac, 50 Hz



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