



UIM Series Flowmeter

May, 2020

Contents

- **Short Introduction to Transus Instruments**
- **The UIM Series Overview**
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- **Test results**
- **Software**
- **Conclusions**



Transus Instruments

- Established in 2013 as a fully independent R&D service provider
- Developed unique IP for signal processing in ultrasonic meters
- Headquarter in Hobart, Tasmania, Australia
- Founding partners and principals are based in Australia, North America and Europe
- Each of the principals have decades of experience in Ultrasonic flowmetering
- December 2016 - launched our own ultrasonic flowmeter



Transus Instruments BV, Netherlands

- Manufacturing
- Transducer design and R&D
- Mechanical Design
- Flow test rig

ZEEWOLDE
NETHERLANDS

BOSTON, MA
USA



Transus Instruments USA

- Embedded Software Development
- PC Software Development
- Digital Signal Processing



Transus Instruments Pty Ltd, Australia

- Company Headquarters
- Electronic design and R&D
- Intrinsic Safety Design

HOBART, TASMANIA
AUSTRALIA

Where we are



MARNICK SWART
R&D/ PRODUCTION
TECHNICIAN

ARIAN STEHOUWER
GENERAL MANAGER

ZEEWOLDE
NETHERLANDS

BOSTON, MA
USA



JOHN LGRECA
SOFTWARE
MANAGER

JEFF TILDEN
FLOW
SPECIALIST



MATT BOTTRILL
ELECTRICAL
ENGINEER

SAUL JACOBSON
CHIEF TECHNICAL
OFFICER

ROSIE
BURGESS-LOWE
DIRECTOR

HOBART, TASMANIA
AUSTRALIA

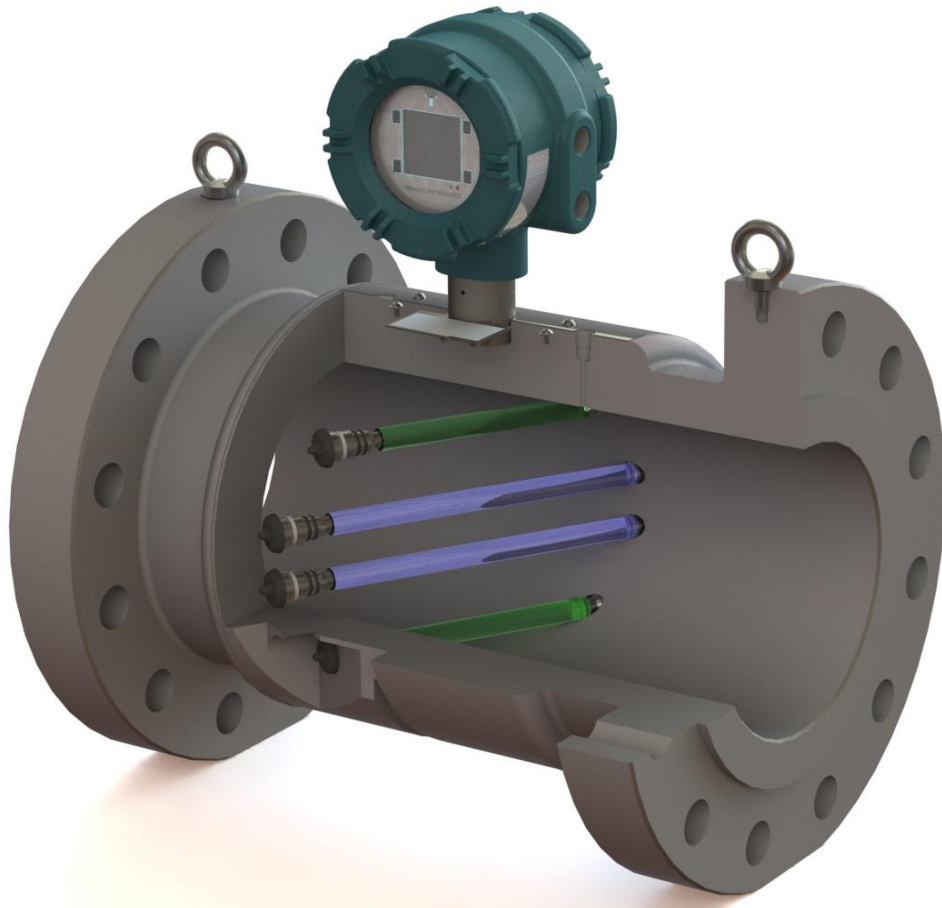
The UIM Series Family

- The **UIM-4F** for Custody Transfer metering of natural gas and other gases
- The **UIM-3/3F** for Industrial Metering - fiscal accuracy at economical cost
- The **UIM-4F DUO** - Two independent accurate fiscal flow measurements in a single flowmeter body.



UIM-4F for Custody Transfer Measurement

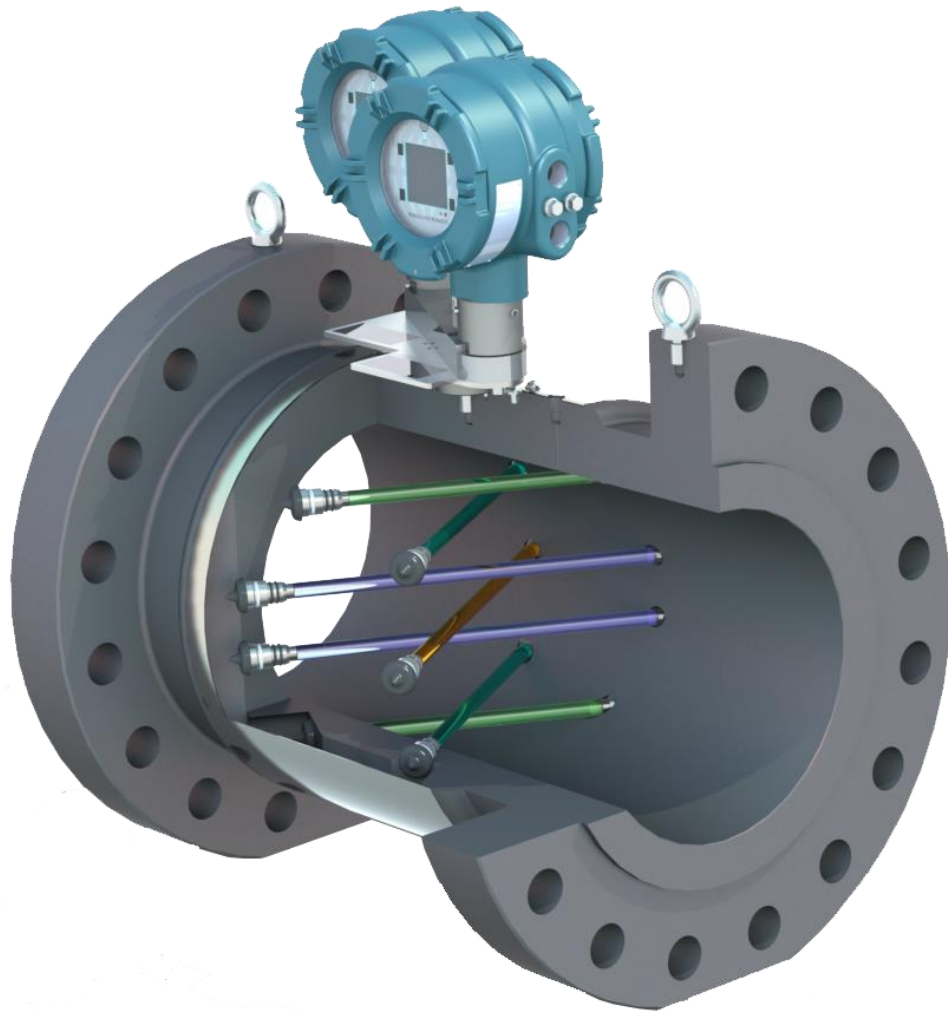
Four paths for accuracy and reliability



Typical Applications

- Custody transfer metering of natural gas and other gases
- Allocation metering

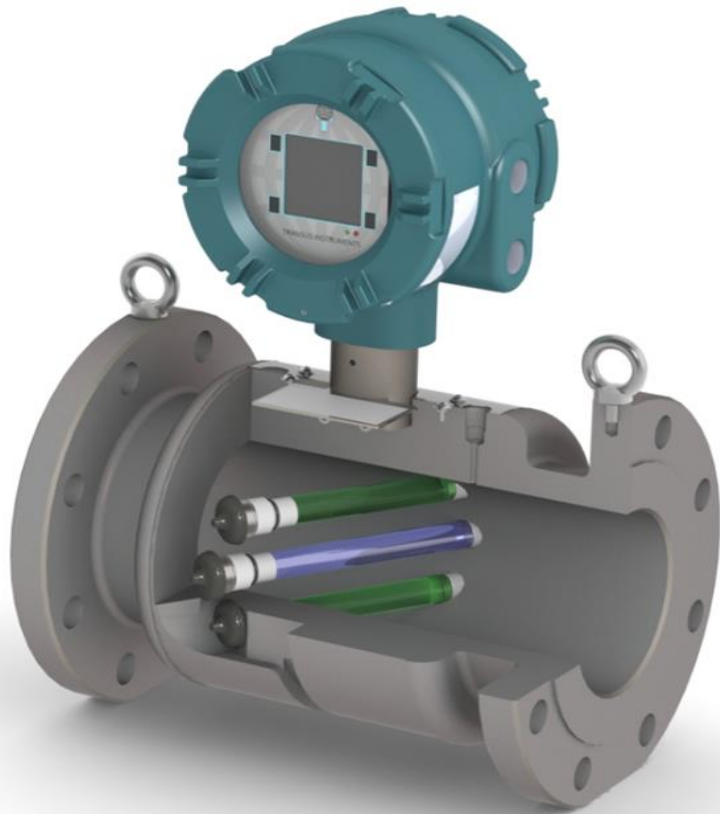
UIM-4F Duo – A new member of the UIM family



Features and Benefits

- Two independent accurate fiscal flow measurements in a single flowmeter body.
- Highly accurate fiscal flow measurement with continuous verification by the secondary measurement.
- An economical solution where a redundant measurement is required for monitoring and verification.

UIM-3 for precise and reliable flow measurement in harsh environments



Typical Applications

- Allocation metering
- Shale gas
- Flare gas
- Coal seam gas
- Biogas
- Landfill gas
- Process gas

UIM-1 / UIM-2 for flare and vent gas flow

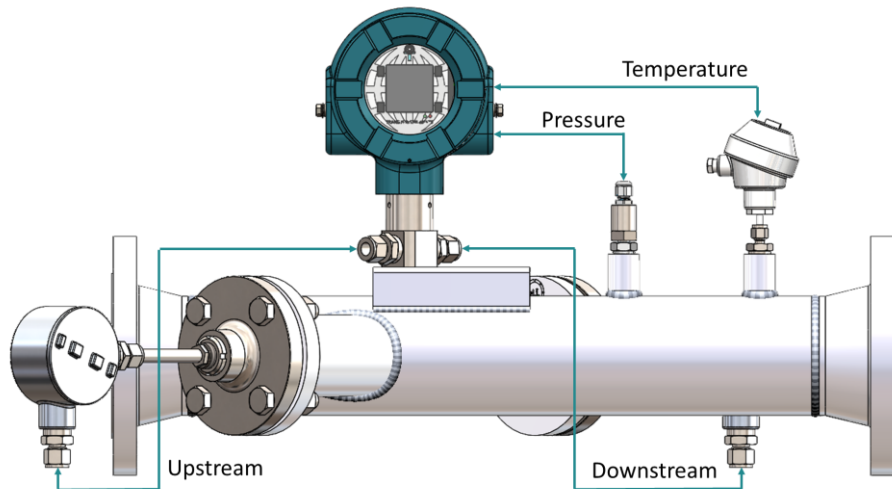


Typical Applications

- Flare gas
- Vent gas
- Fuel gas
- Biogas
- Process gas

Key features

- Custom flowcell design
- Large turn down
- Mw and mass flow



UIM Duo - Enhanced Condition Based Maintenance (CBM) capabilities



Features and Benefits

- The 4-path primary measurement and 3-path secondary measurement ensure that common mode problems are detected.
- Two fiscal measurements ensure that false alarms are avoided.
- Available in sizes from 8" and larger and flange ratings up to 900#.
- UIM Duo provides a wealth of information on the condition of the complete metering system.

Key Specifications UIM-3 and UIM-4F

	UIM-4F	UIM-3
Principle of operation	Broadband continuous wave – transit time	
Sizes	150, 300, 600 and 900lbs; 3 – 30" other sizes on request	150, 300, 600 and 900lbs; 2 – 30" other sizes on request
Flange type	ANSI, DIN, others on request	
Pressure ranges	Up to 153 bar (2250 psi)	
Ambient temperature	-40 to +60°C (-40 to +140°F)	
Process temperature	-30 to +80°C (-22 to +176°F)	
Typical uncertainty	0.5% ($Q_t - Q_{max}$) factory calibration 1% ($Q_{min} - Q_t$) factory calibration 0.2% ($Q_t - Q_{max}$) flow calibration 0.5% ($Q_{min} - Q_t$) flow calibration	1% ($Q_t - Q_{max}$) factory calibration 2% ($Q_{min} - Q_t$) factory calibration 0.5% ($Q_t - Q_{max}$) flow calibration 1% ($Q_{min} - Q_t$) flow calibration
Metrology	AGA-9 compliant OIML R137- class 0.5	AGA-9 compliant
Repeatability	0.1%	
Turndown	100:1 (pipe size dependent)	
Hazardous area certification	Completely intrinsically safe (Ex ia) for zone 0	

Key Specifications UIM-3 and UIM-4F

Common Specifications			
Meter body materials	Carbon steel ASTM A350-LF2 Cl.1 Stainless steel ASTM A182-F316		
Electronic enclosure material	Epoxy painted, copper free aluminum alloy		
Ingress Protection	IP66, NEMA 4X		
Power supply	Main power: 14 – 29VDC, 670mW max I/O option board power: 14 – 29VDC, 225mW max		
User interface	128x128 dot matrix LC Display, 4 keys		
Interface ports	1x USB Service port (not intrinsically safe) 1x Frequency output		
Optional interface ports	<table border="0"> <tr> <td>Option board 1 1x RS485, two wire, externally powered 2x Digital, software configurable</td> <td>Option board 2 Pressure and temperature sensors OR 1x 4..20mA/HART* output * HART pending</td> </tr> </table>	Option board 1 1x RS485, two wire, externally powered 2x Digital, software configurable	Option board 2 Pressure and temperature sensors OR 1x 4..20mA/HART* output * HART pending
Option board 1 1x RS485, two wire, externally powered 2x Digital, software configurable	Option board 2 Pressure and temperature sensors OR 1x 4..20mA/HART* output * HART pending		
Communication protocols	MODBUS (RS485 and USB)		
Hazardous area certification	ATEX EX II 1 G Ex ia II CT4 Ga, Zone 0 Canada and USA - Class I, Division 1, Group A,B,C,DT4		

AGA-9 and OIML R137 Conformance



Type evaluation report

Type evaluation report NMI-16200107-02
Page 1 of 36

Issued by : NMI Certin B.V.,
Hugo de Grootplein 1
3314 EG Dordrecht
The Netherlands

Applicant : Transus Instruments B.V.,
Duikerweg 37
3897 LM Zeewolde
The Netherlands

Measuring instrument : An **ultrasonic gas meter**
Manufacturer : Transus Instruments B.V.
Type : UIM-4F

Test specifications : **AGA Report No. 9 2007**
"Measurement of Gas by Multipath Ultrasonic Meters"
This type evaluation report only contains the test results of the ultrasonic gas meter type UIM-4F.
The ultrasonic gas meter package, including meter tubes, flow computer, and thermowell are outside of the scope of this type evaluation report.

Testing period : May up to and including November 2016

Result : The measuring instrument complies with the requirements of the AGA Report No. 9 2007, for all performed tests, as reported on the following pages.

Issue date : 2 December 2016

Performed by:

Reviewed by:

Ing. C.E. van Wijngaarden
Approvals Expert

Ing. F.S. Schouten
Senior Approvals Expert



Type evaluation report

Type evaluation report NMI-16200107-01R1
Page 1 of 52

Issued by : NMI Certin B.V.,
accredited by the national accreditation body (RvA), based on the ISO/IEC 17025, with identification number L029. RvA is signatory member of both the Multi-Lateral Agreement of the European cooperation for Accreditation (EA) and the Mutual Recognition Arrangement of the International Laboratory Accreditation Cooperation (ILAC).

Applicant : Transus Instruments B.V.,
Duikerweg 37
3897 LM Zeewolde
The Netherlands

Measuring instrument : An **ultrasonic gas meter**
Manufacturer : Transus Instruments B.V.
Type : UIM-4F
Class : 0,5

Test specifications : **OIML Recommendation 137-1&2 "Gas meters"**
This type evaluation report only contains the test results of the ultrasonic gas meter type UIM-4F.
The ultrasonic gas meter package, including meter tubes, flow computer, and thermowell are outside of the scope of this type evaluation report.

Testing period : May up to and including October 2016

Result : The measuring instrument complies with the requirements for class 0,5 of the OIML R 137-1&2 (2012), for all performed tests, as reported on the following pages.

Issue date : 15 December 2016

Performed by:

Reviewed by:

Ing. C.E. van Wijngaarden
Approvals Expert

Ing. F.S. Schouten
Senior Approvals Expert

UIM Series System details

Connectivity base board
 Frequency
 USB Modbus
Optional
 1 x RS485 Modbus
 2 x Digital out(HF, LF, status)
 PT100 / Pressure sensor input
 1 x 4..20mA (HART)

Sizes:

2 – 12" (150#)
 2 – 30" (300, 600 and 900#)

Ambient temperature

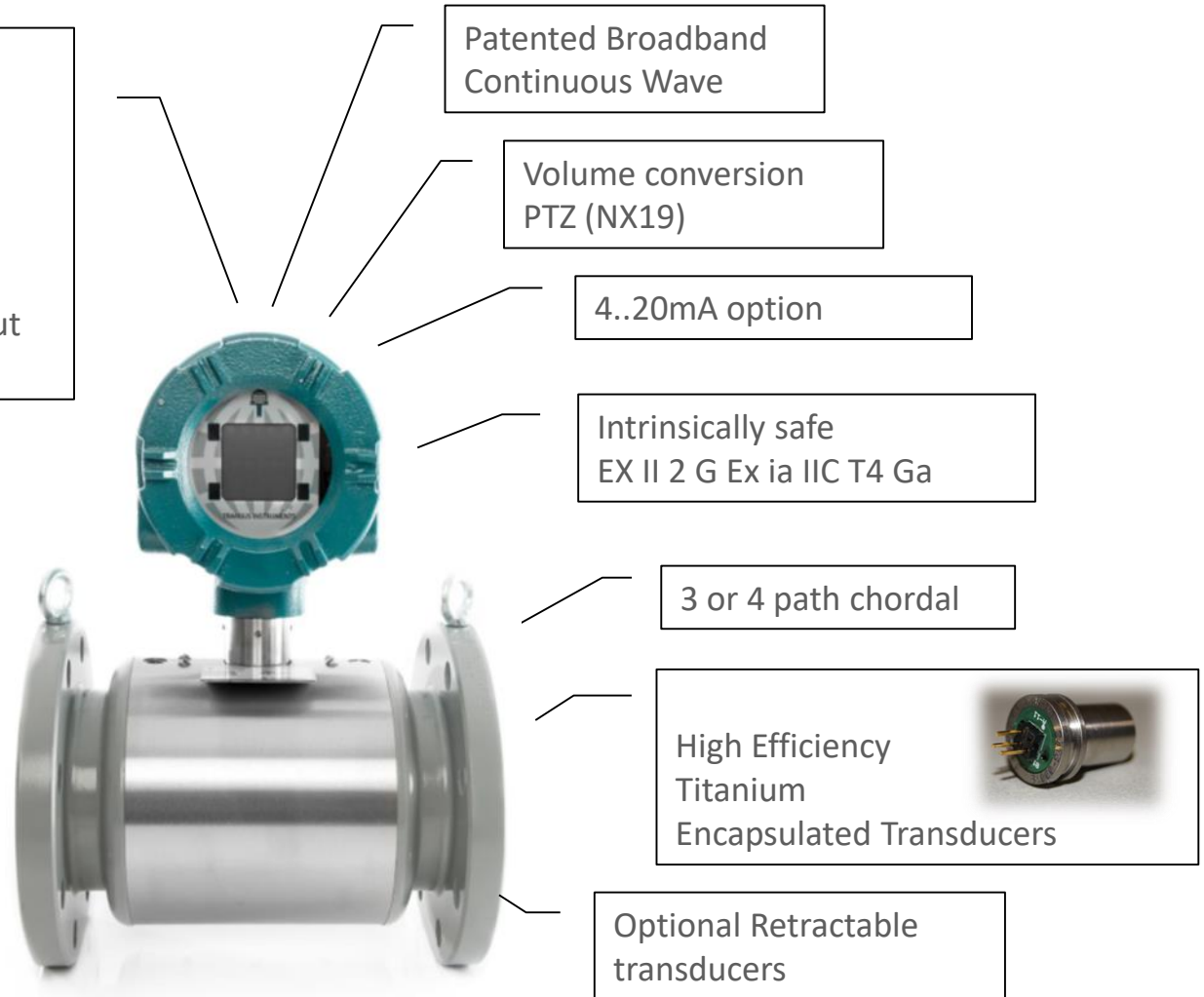
-40 to +60 C (-40 to +140 F)

Process temp

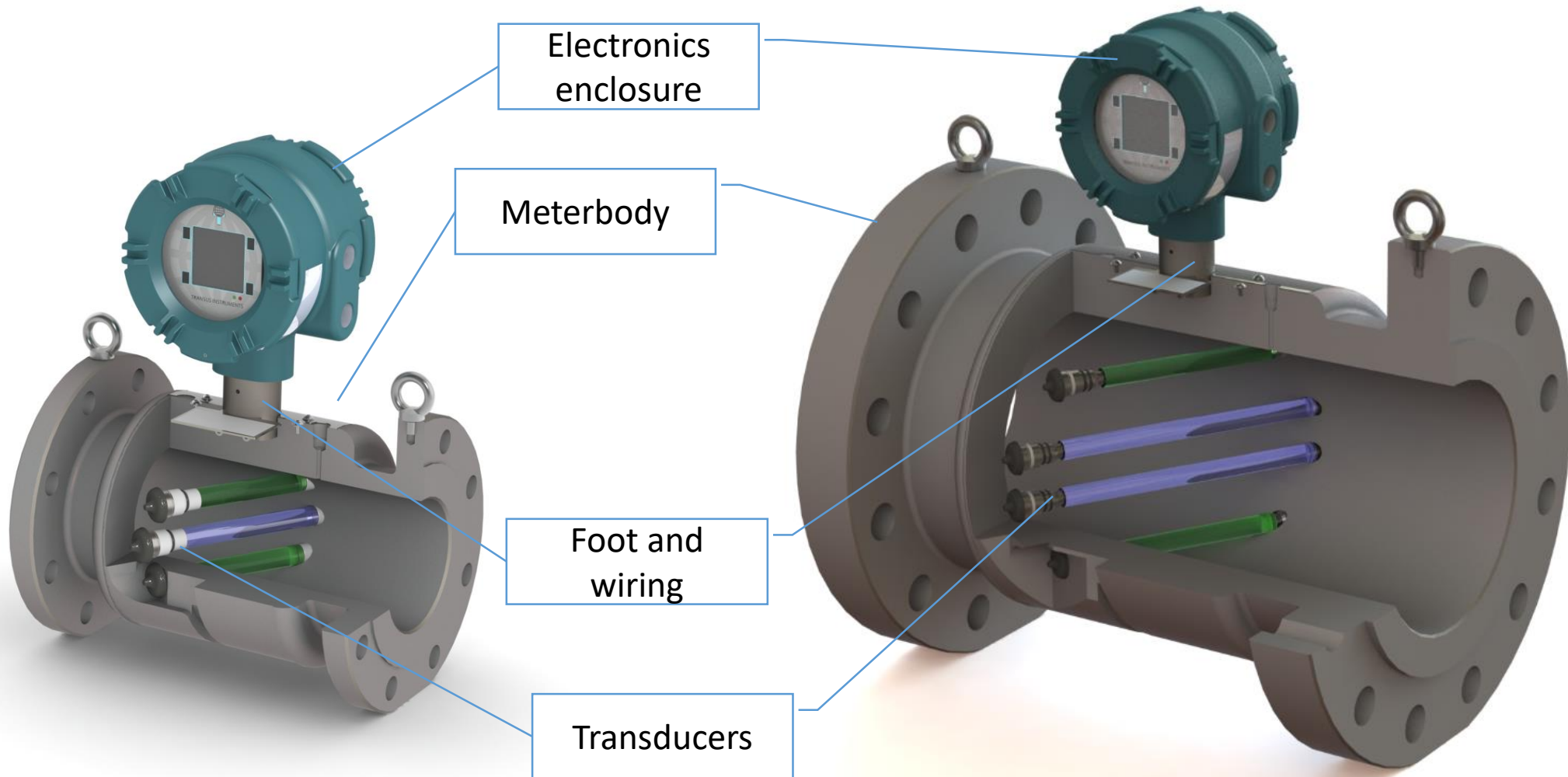
-30 to +80 C (-22 to +176 F)

Pressure:

Up to 153 bar



UIM Series System details



UIM Series System details



User interface

- 4 Keys
- Calibration lock switch
- LED indicators
- USB service port

UIM Series System details

Standard I/O

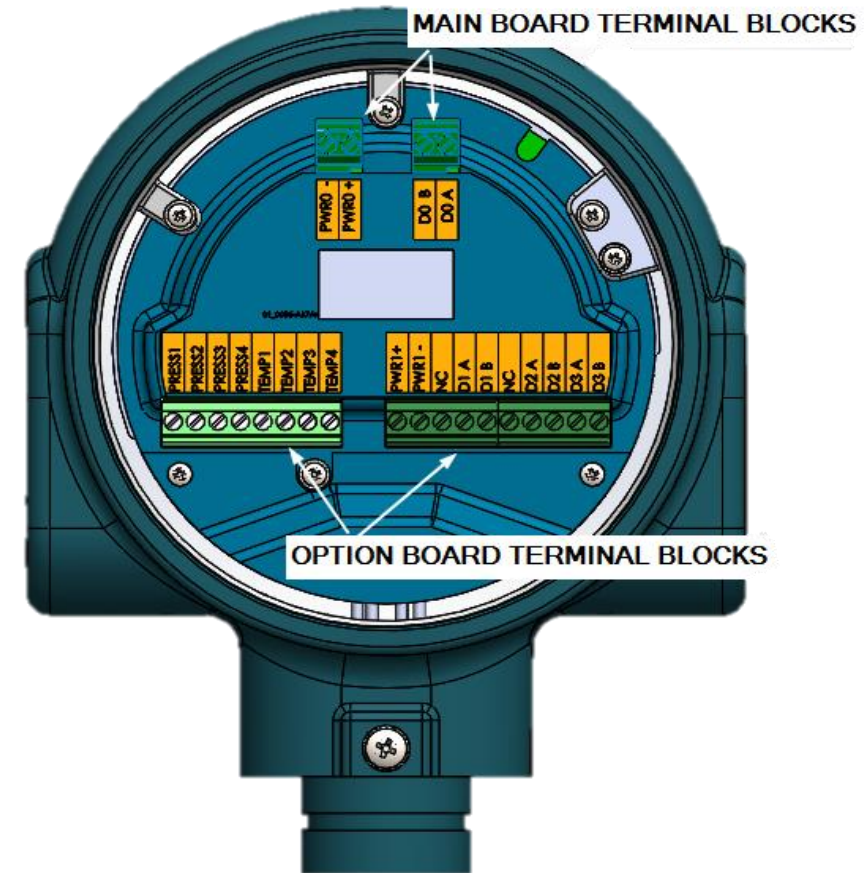
- Frequency/Pulse Output
- USB service port (front panel)

I/O Option Boards

- RS485 Communications
 - Modbus protocol
- Pulse/Frequency/Alarm
- 4-20mA output

Pressure/Temperature Option Board

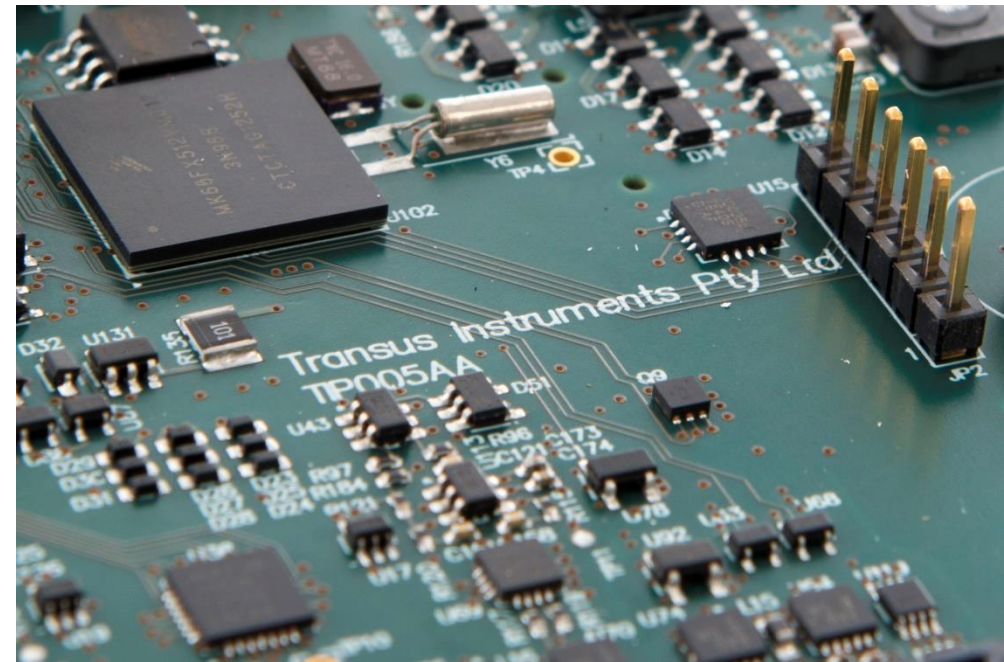
- Pressure Sensor
 - Voltage mode bridge Sensor
- Temperature Sensor
 - 4-wire Pt RTD



UIM Series System details

Measurement parameters

- Actual flowrate / velocity
m³ totalizers and alarm / warning totalizers
- Standard / Normal conditions flowrate according SGERG, NX-19
Nm³ totalizers and alarm / warning totalizers
- Molecular weight / mass flow
- Extensive diagnostics



Advantages



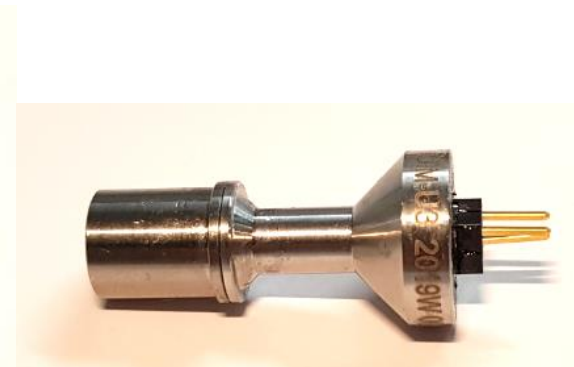
The UIM Advantage

1. Efficient All-metal Transducers
2. Broadband Continuous Wave© Signal Processing
3. Differential Transmit and Receive
4. Simultaneous Transmission and Reception on 2 or more Channels
5. Complete Intrinsic Safety

Advantages

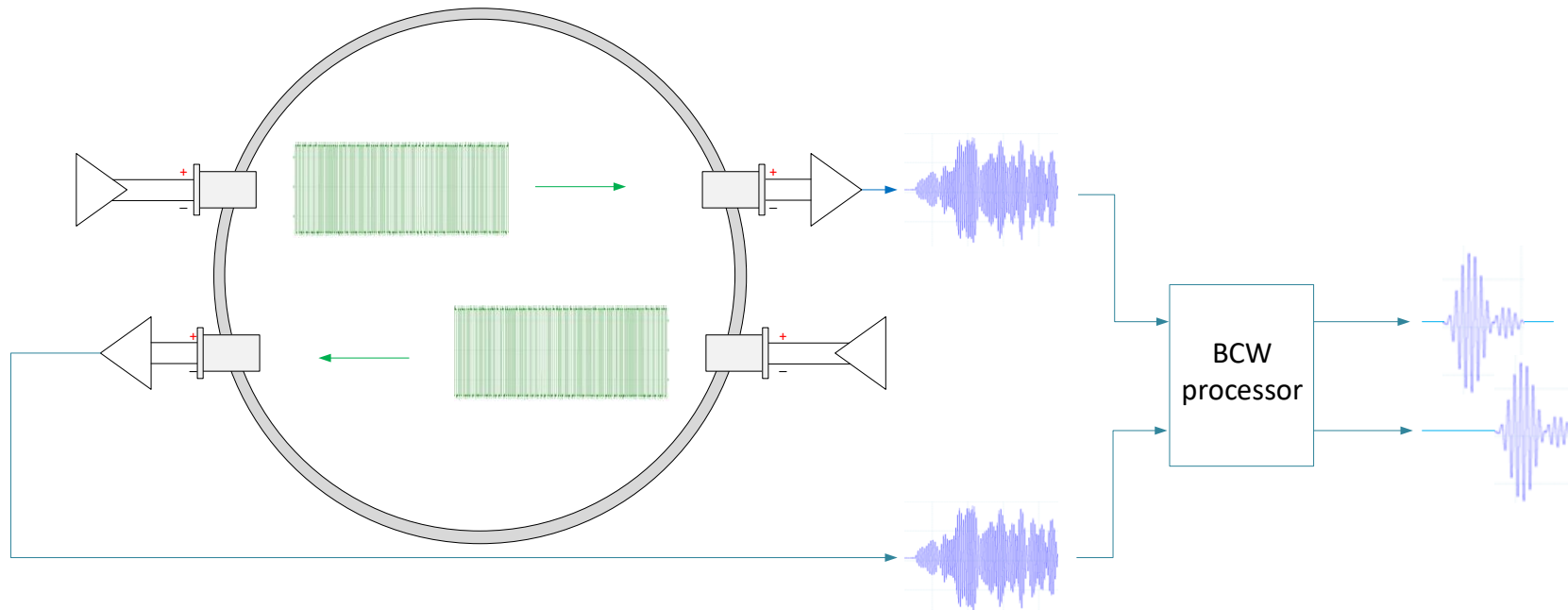
1. Efficient All-metal Transducers

- Full metal wetted surfaces
- Up to 153 bar
- 100, 200 and 250kHz versions
- Very high efficiency
- Retractable option for 14" and up
- Burst tested up to 15000 psi (1020 bar)



Advantages

2. Broadband Continuous Wave

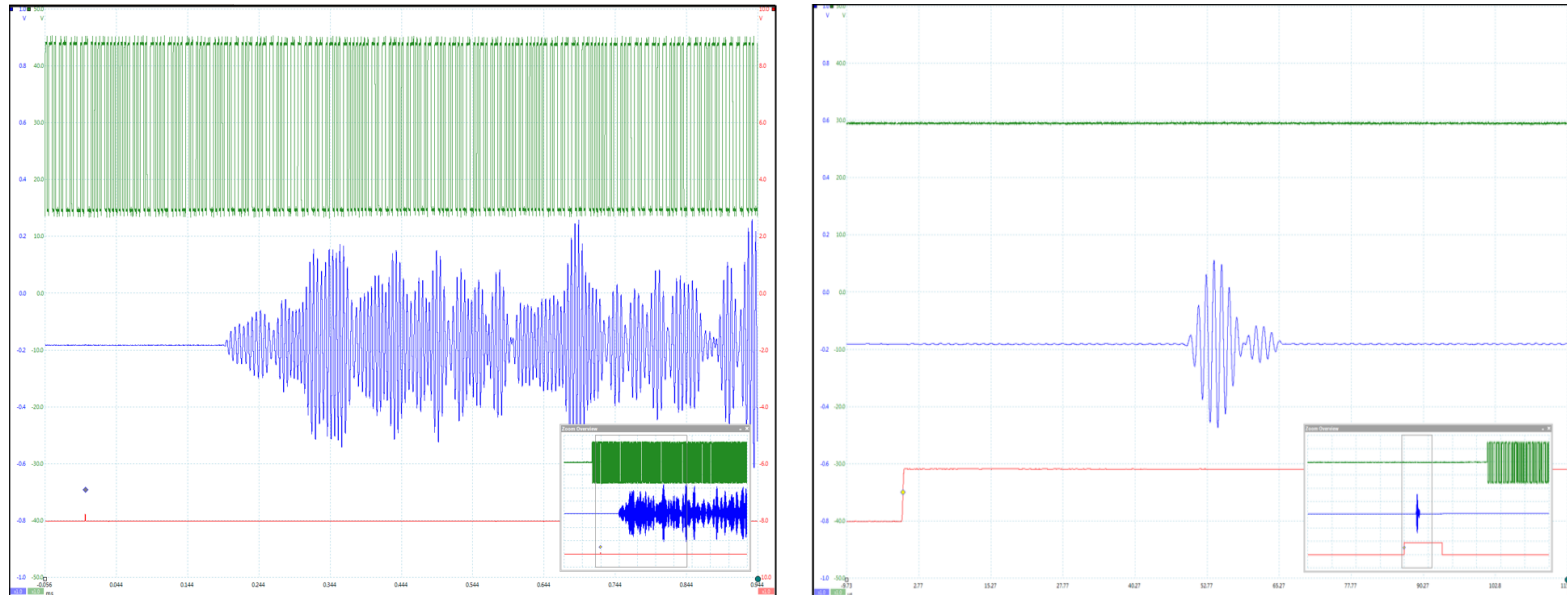


The transmitted signal consists of a quasi-continuous carrier wave encoded with a “code” or pattern. In real time the BCW processor performs a pattern recognition to reconstruct the “receive signal”.

Advantages

2. Broadband Continuous Wave

- Quasi-continuous stream of encoded pulses
- Real time reconstruction of receive signal
- Power distributed over time rather than amplitude



Left Encoded Transmitted Signal (green) and received signal (blue)
Right Decoded receive signal (blue)

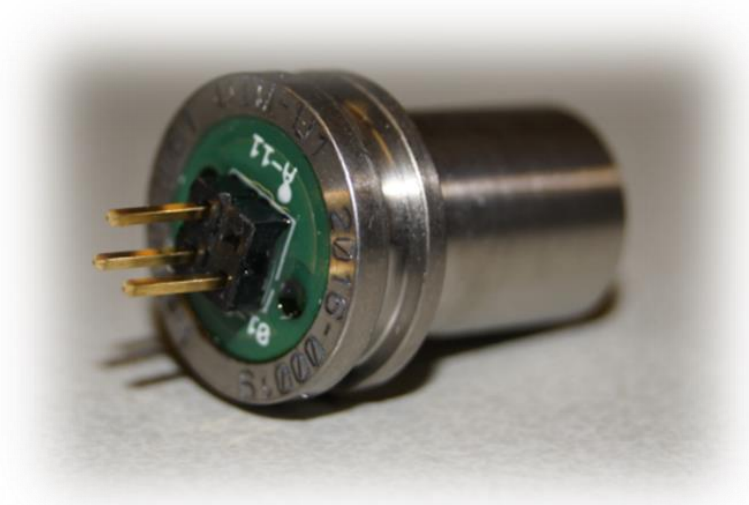
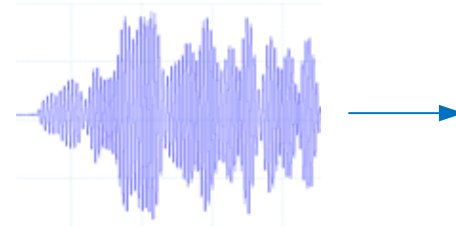
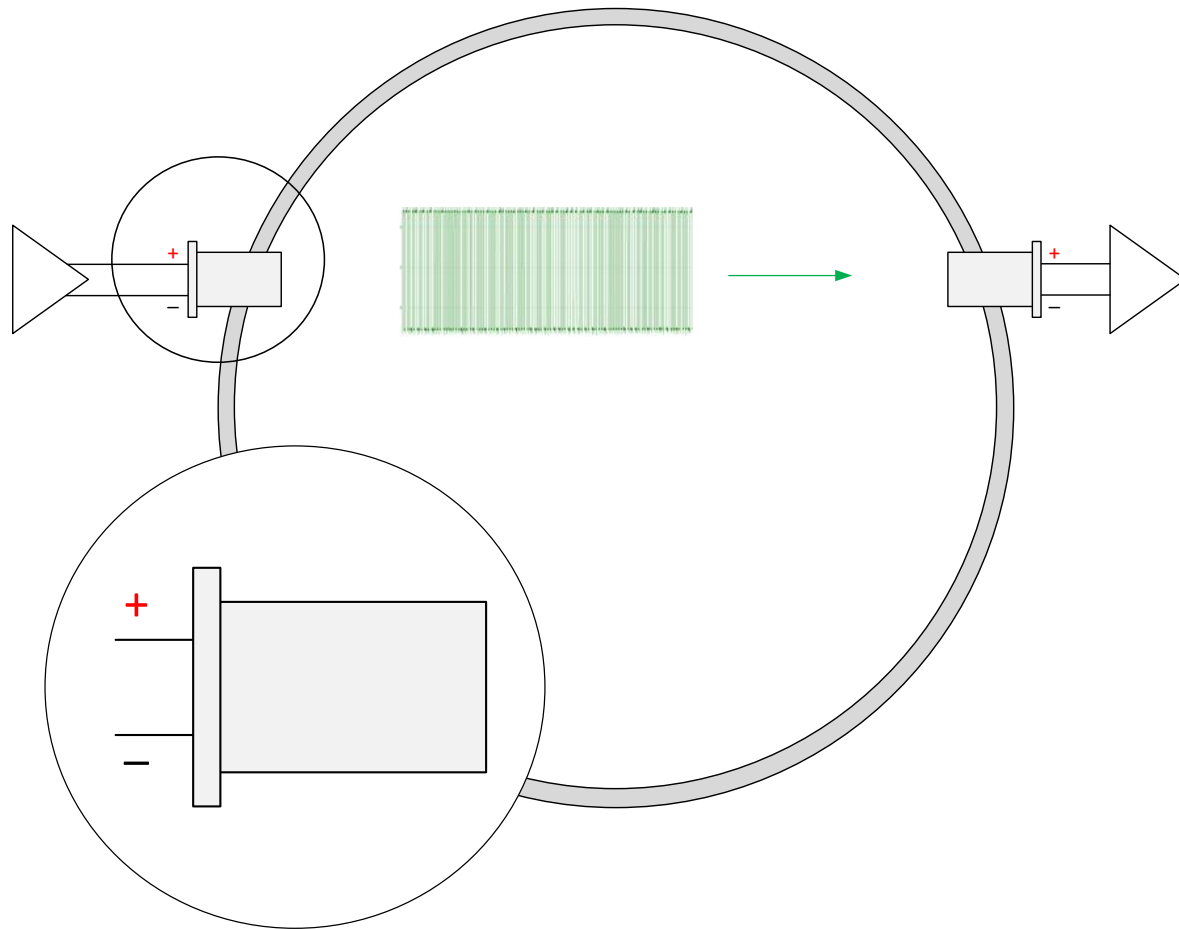
Advantages

2. Advantages of Broadband Continuous Wave

- Precise – averaging over a large number of pulses increases precision and resolution
- More immune to external noise and electrical interference – averaging over a large number of pulses also rejects acoustic and electrical noise
- Allows very low transmitting voltage (3.6V)
- Allows 100% Intrinsically safe electronics
- By using different codes simultaneous operation of two or more channels is possible without interference. This means faster response and better performance in pulsating and fluctuating flow conditions
- Two meters in one body (UIM-4F Duo) configuration without need for sync signal

Advantages

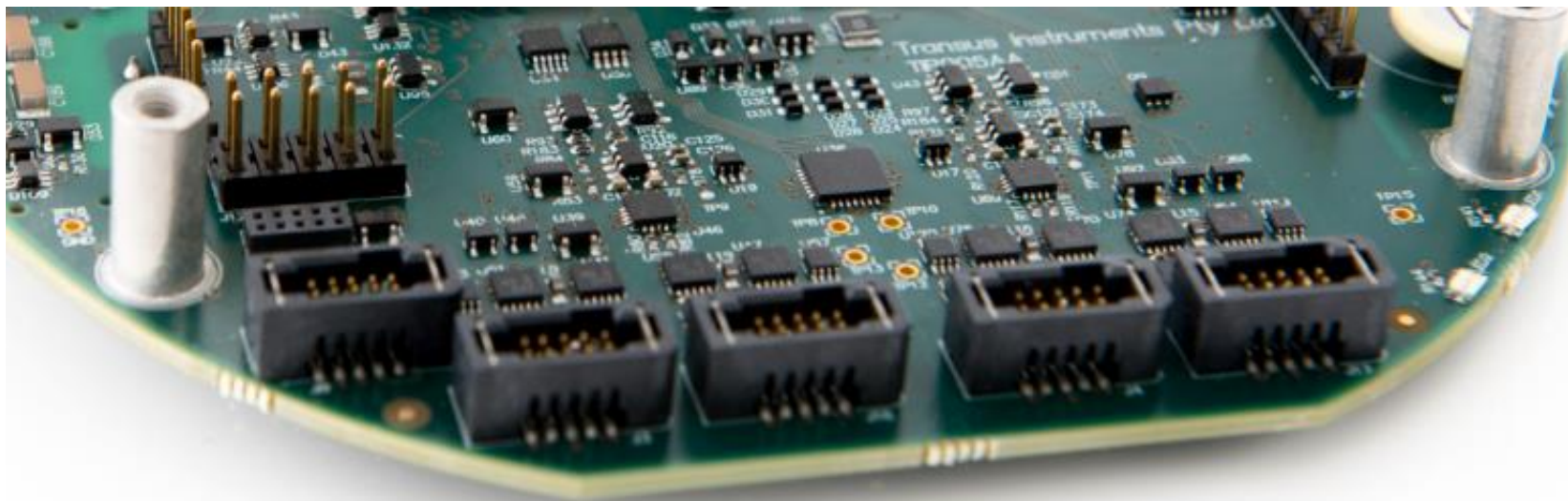
3. Differential transmit and receive



Advantages

3. Advantages of Differential transmit and receive

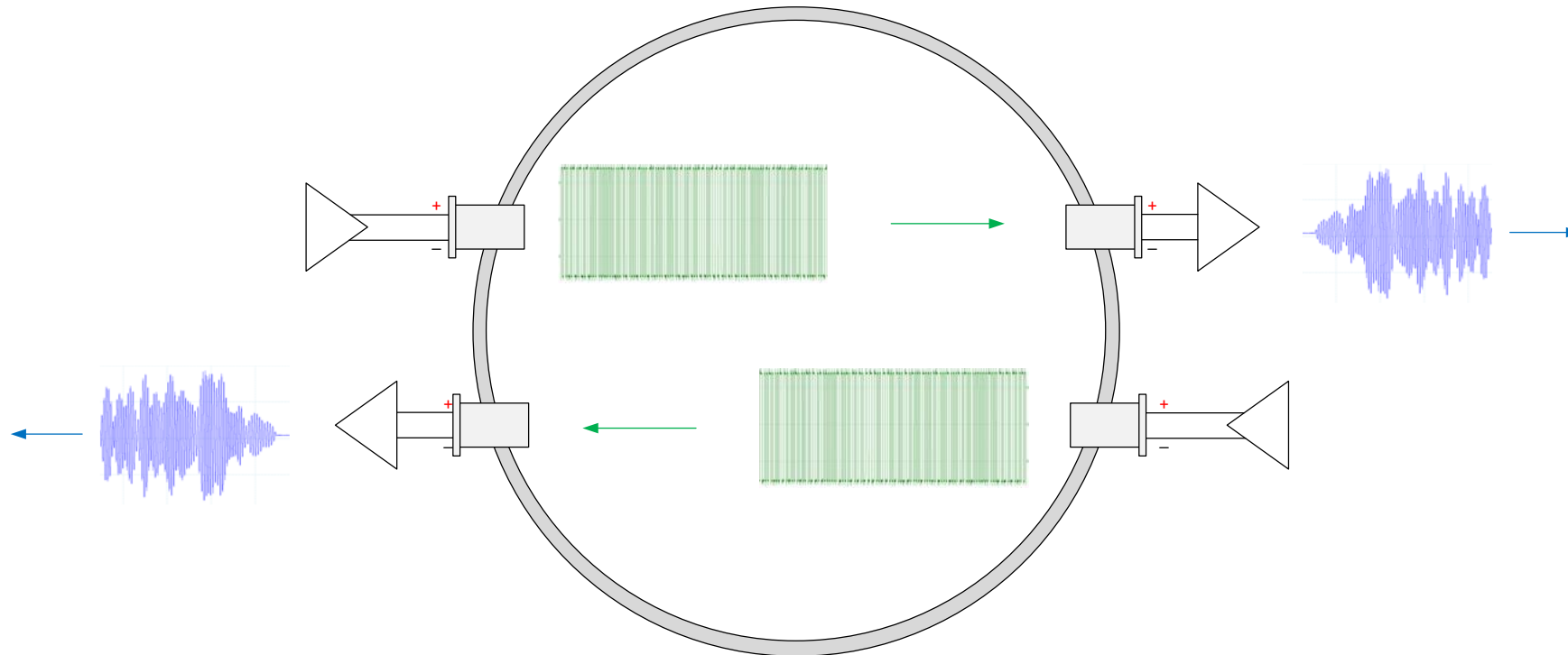
- Increase peak-to-peak transmit voltage by a factor of 2 without increasing operating voltage
- Differential receive rejects “common mode” electrical and electronic noise. Improves performance in presence of noise sources such as electrical motors and transmitters.



Advantages

4. Simultaneous transmission on two or more paths

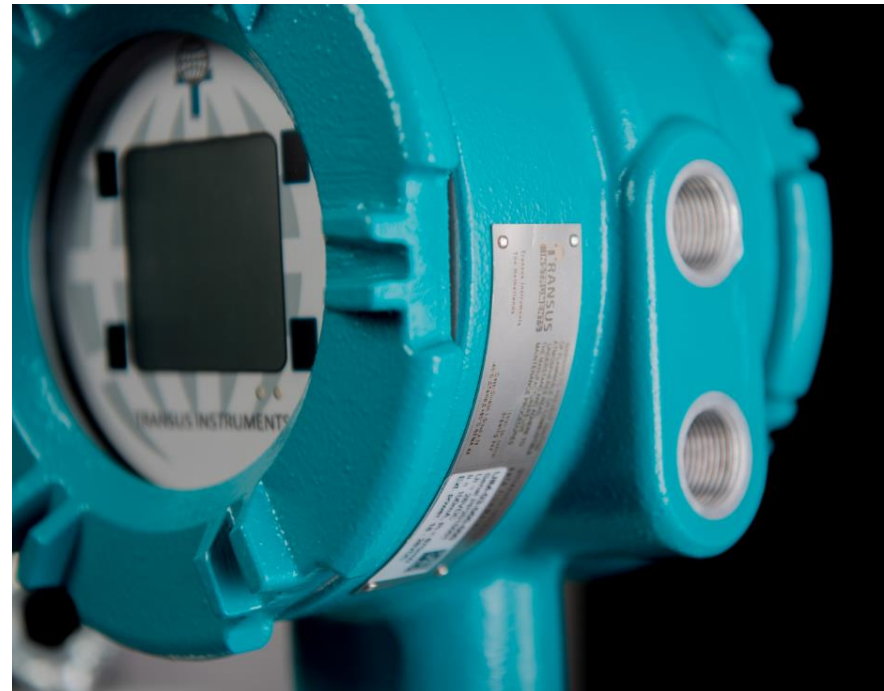
- Increased response time
- Increased flow sampling resulting in better accuracy and repeatability especially at fluctuating conditions



Advantages

5. Complete Intrinsic safety

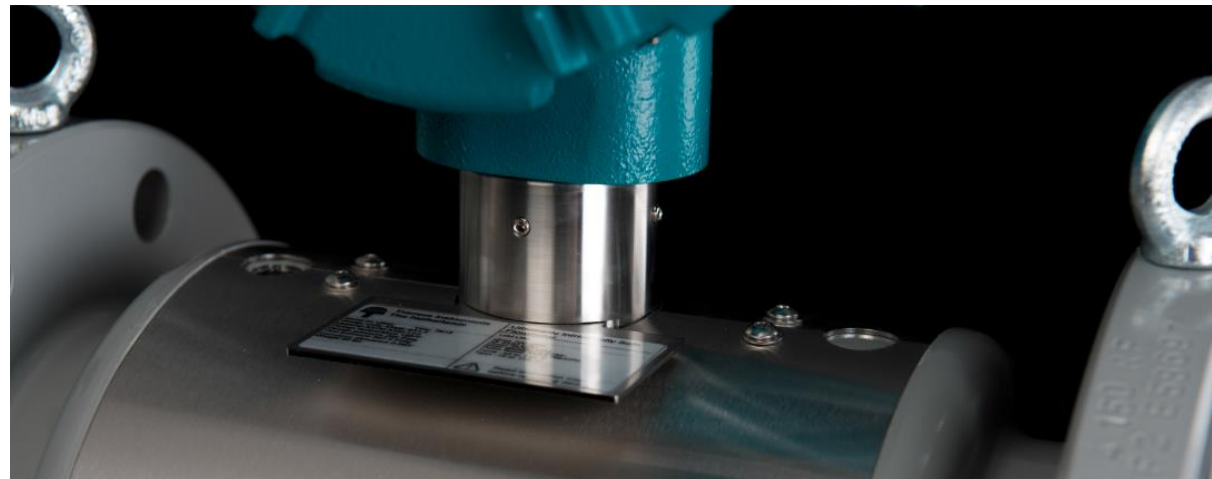
- BCW allows very low transmit voltage of 3.6V compared to 40V to 400V by competitors
- The low transmit voltage allows 100% intrinsically safe electronics as well as low power.
- Certification to:
ATEX/ IECEx - Ex ia IIC T₄ Ga, Zone 0
CSA/FM - Class I, Division 1, Group A,B,C,D T₄



Advantages

5. Advantages complete Intrinsic safety

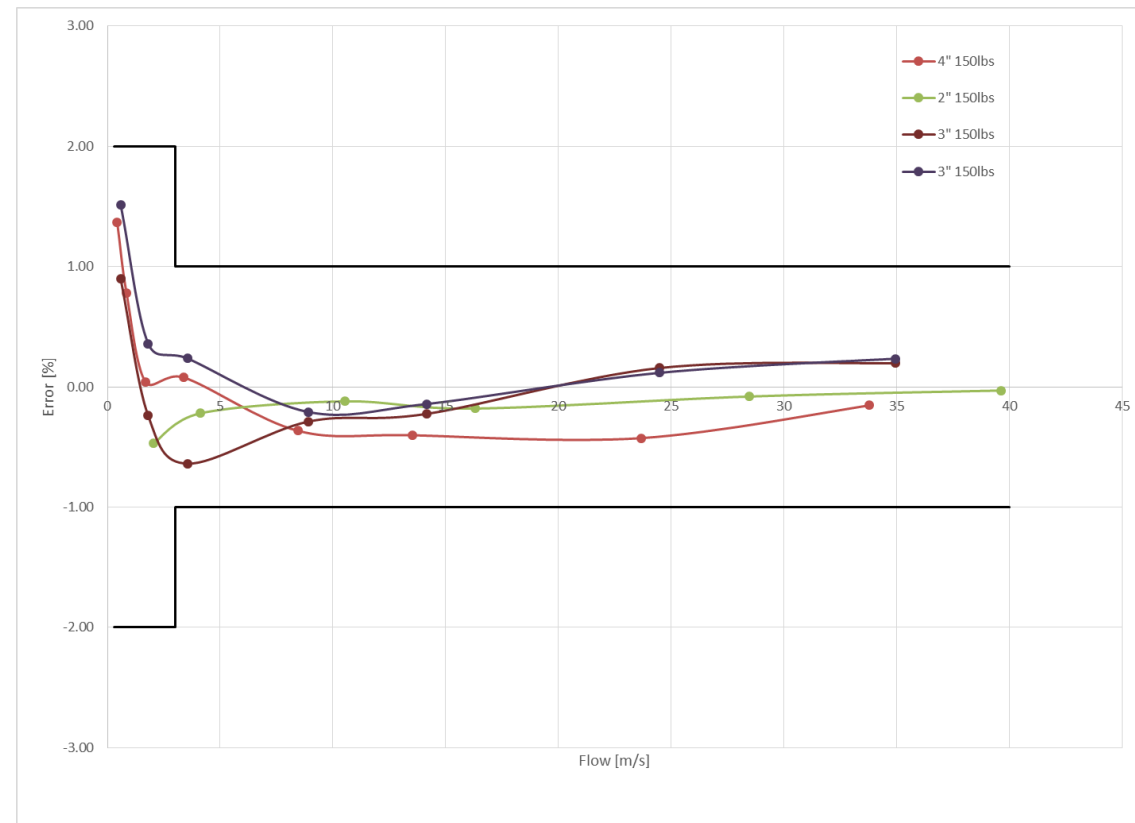
- Simpler, more economical wiring, installation and commissioning
- Access to terminal wiring and keypad display during operation without special precautions.
- Highest degree of explosion safety (Zone 0)



UIM-3 Test results



R&D Tests on natural gas facility 9 bara -
2, 3 and 4" sizes (November 2015)
(First time on natural gas)



UIM Series Test results

Disturbance Tests per OIML R137 – example setups

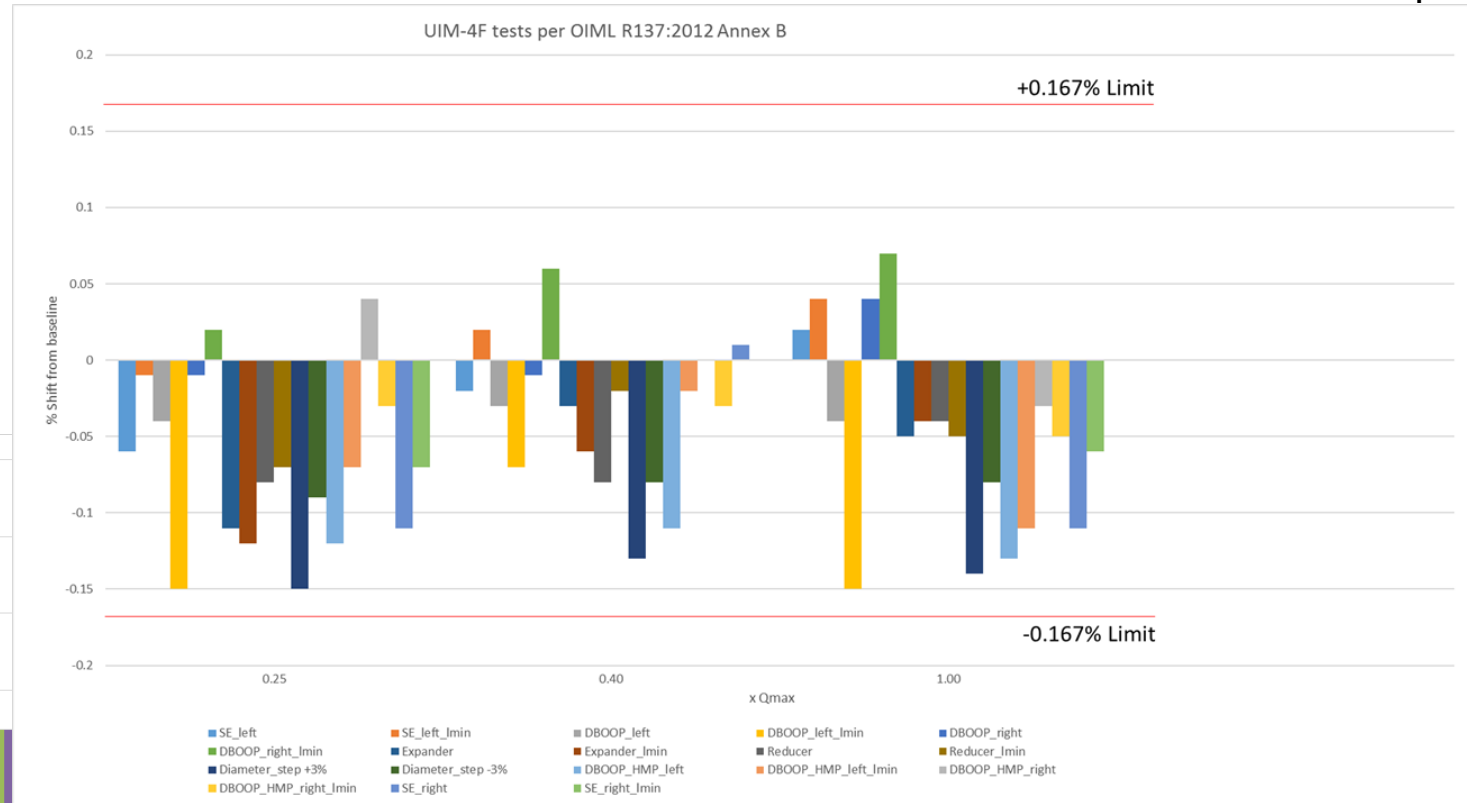


UIM Series Test results

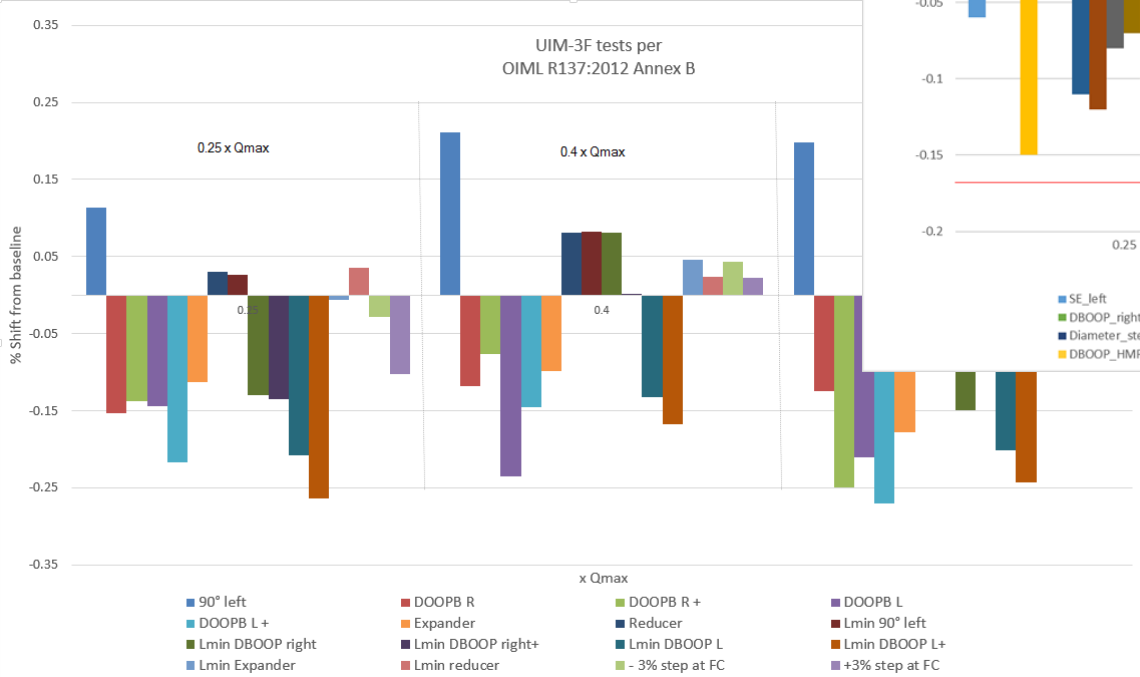
UIM-4F

Disturbance Tests with FC

OIMLR137



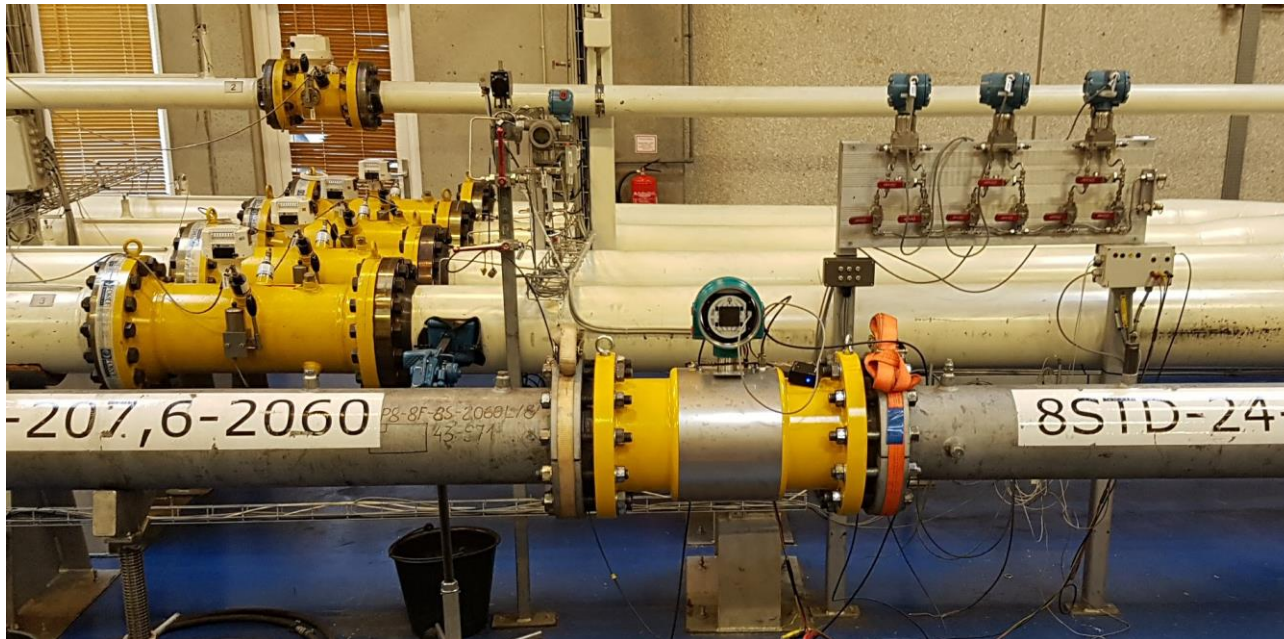
UIM-3



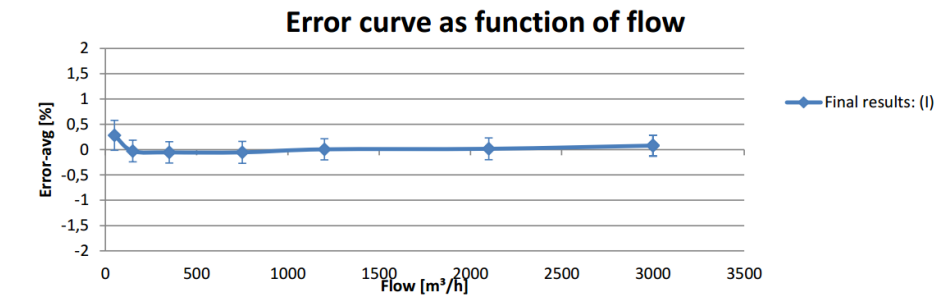
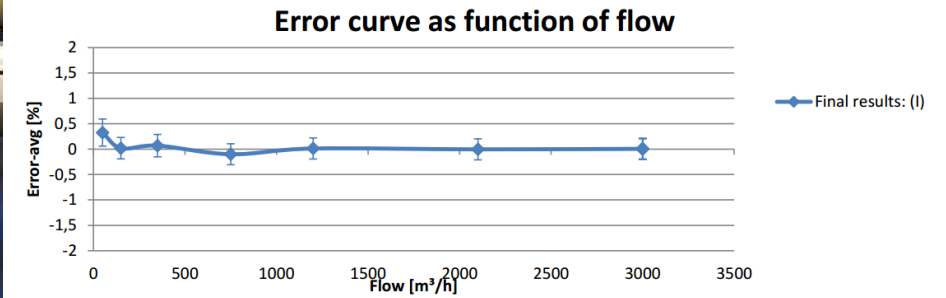
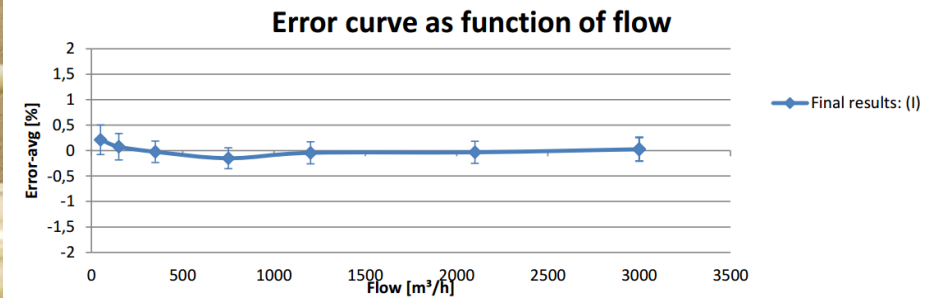
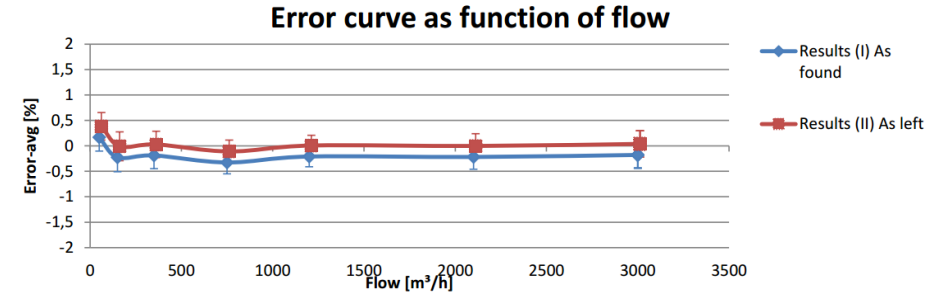
Test results

UIM Series Test results

Calibration of four 8" 300lbs meters



30bar Natural Gas at FORCE Technology calibration laboratory. Shown are out of the box results (blue) and adjusted (red)

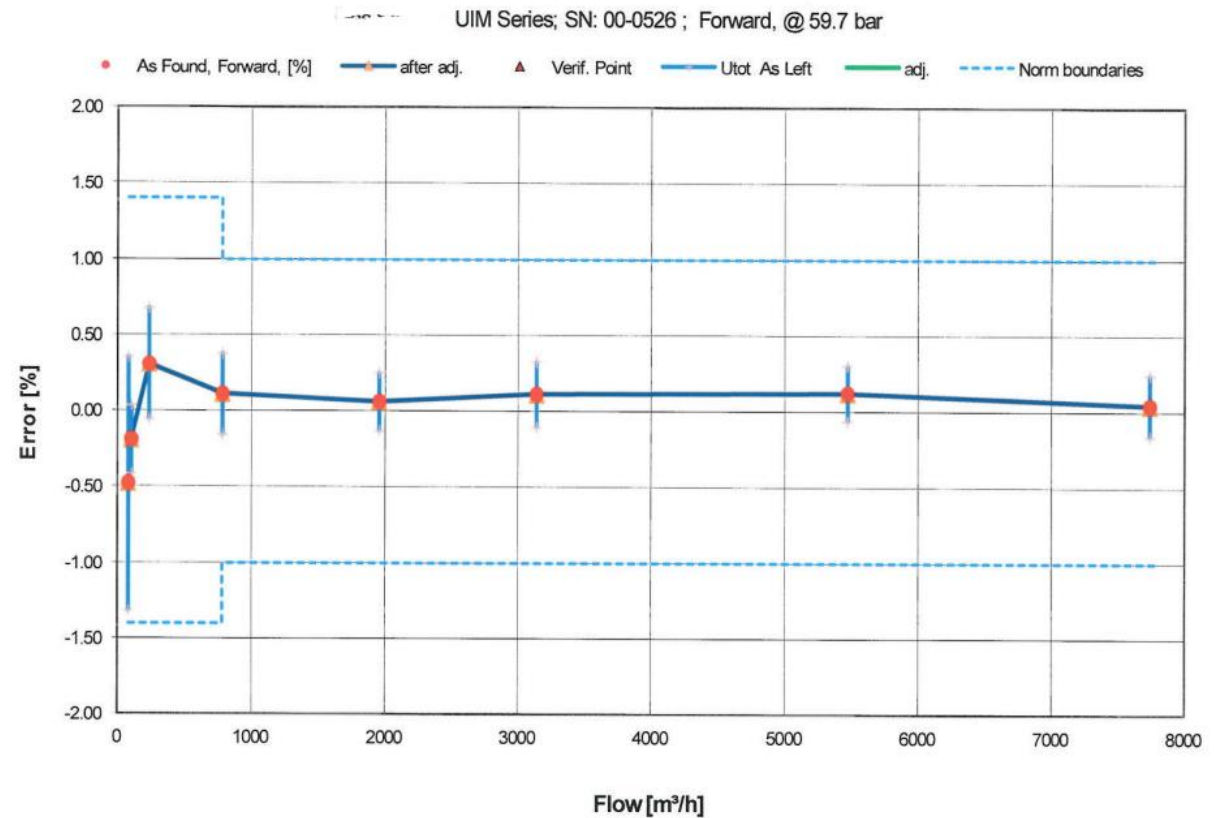


UIM Series Test results

Calibration of 12" 600lbs meters



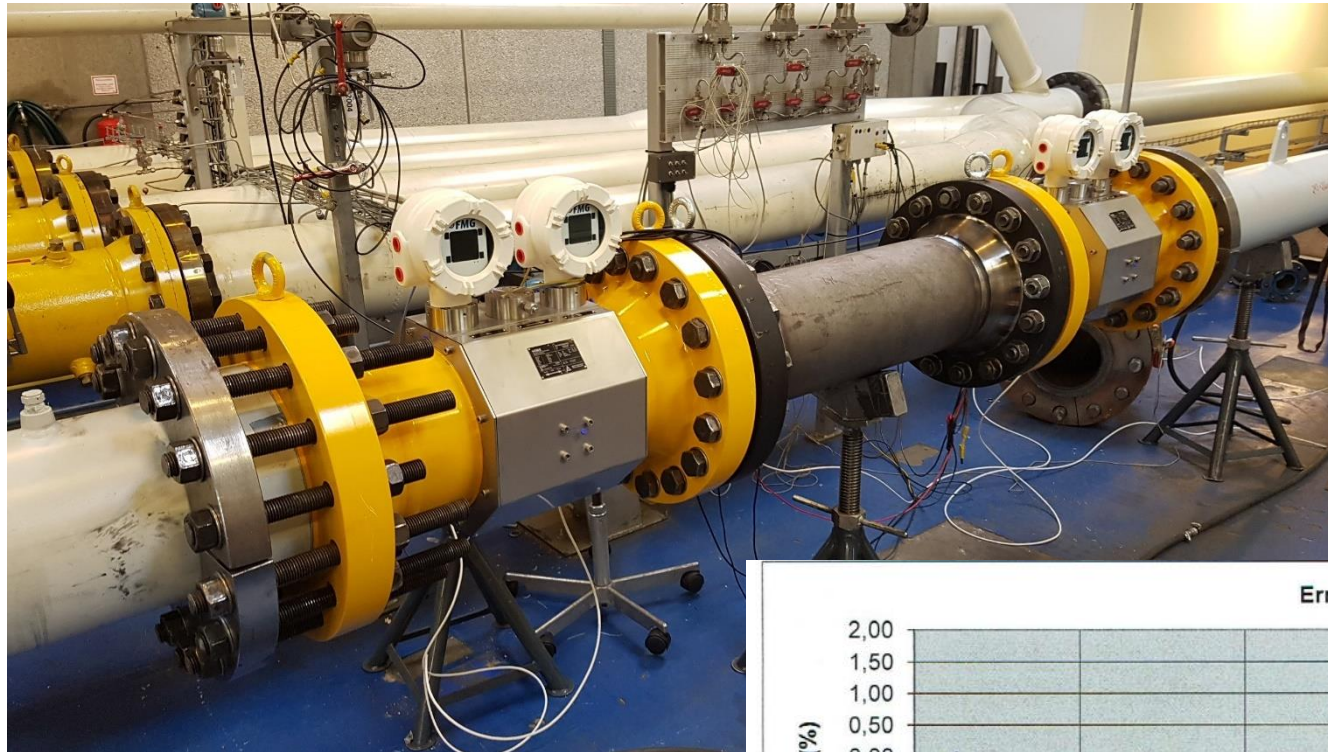
60bar Natural Gas at Euroloop



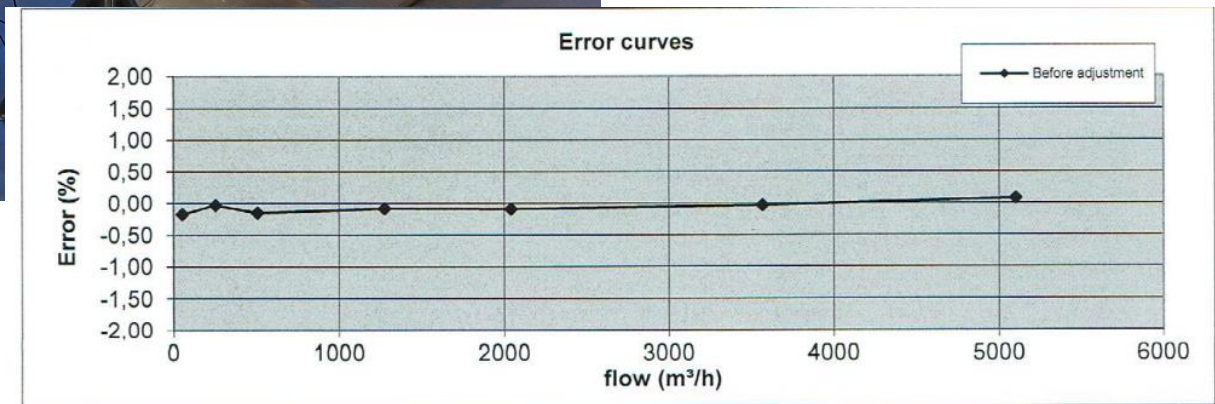
Test results

UIM Series Test results

Calibration of two UIM-4F Duo (FMG version) in series

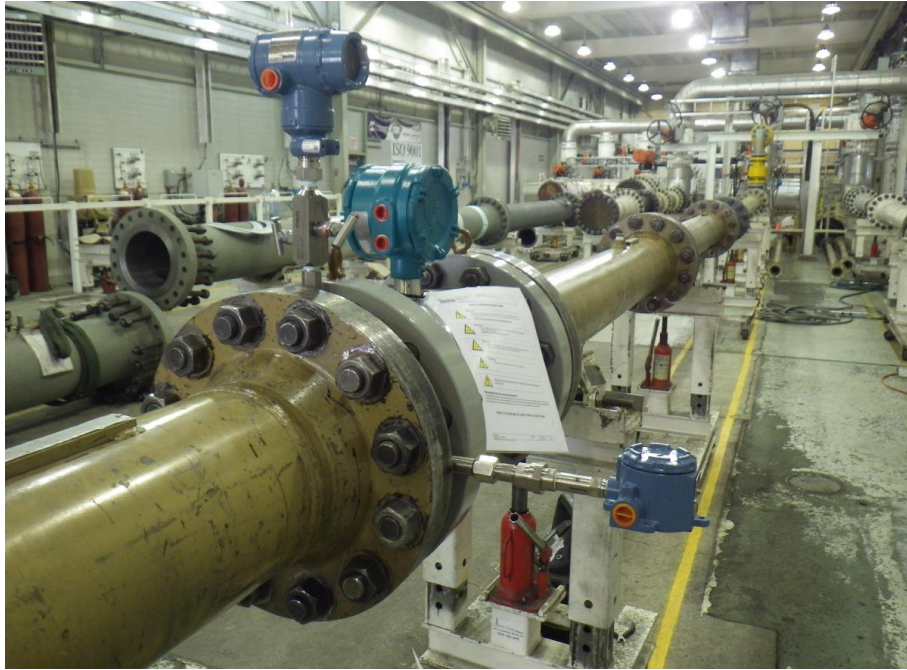


38bar Natural Gas at Force Technology



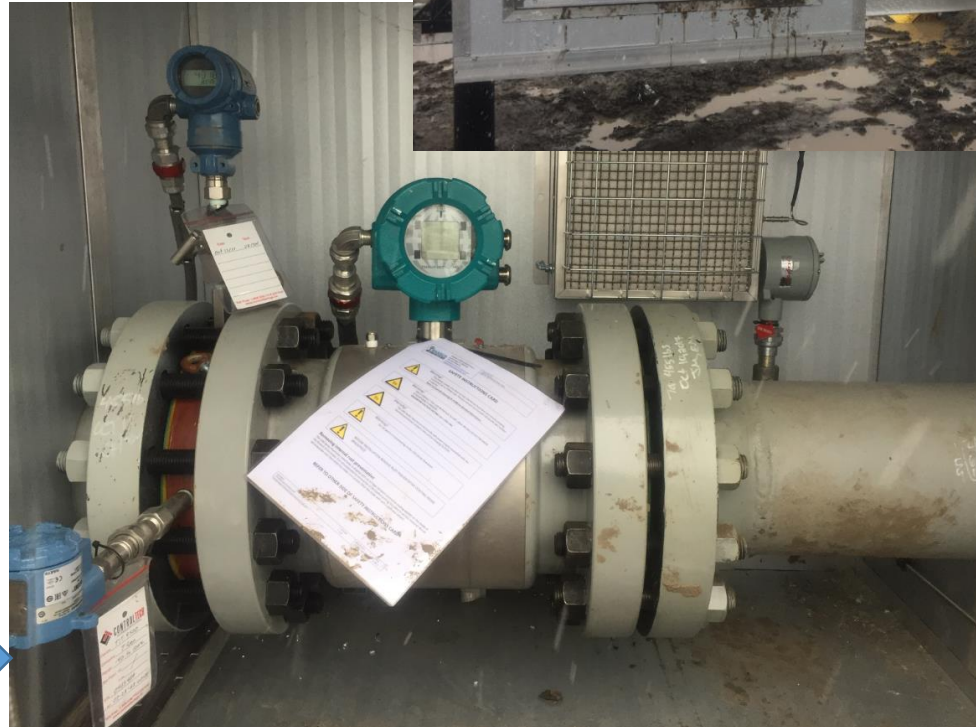
UIM Series Field installations

UIM-4F – 8" Sales gas



↑ TCC - Calibration

Customer site →



↑ Customer site

Field installations

UIM Series Field installations

UIM-4F – 6" natural gas. Connected to SFC3000 flowcomputer – Middle east



UIM Series Field installations

UIM-4F – 6" in metering skid – Argentina



UIM Series Field installations

UIM-3 – 3" flare gas. Remote location



Transus Instrument Manager (TIM)

Software for Programming, diagnostics, troubleshooting and maintenance

The screenshot displays the Transus Instrument Manager (TIM) software interface, which is used for programming, diagnostics, troubleshooting, and maintenance of Transus instruments. The interface is divided into several sections:

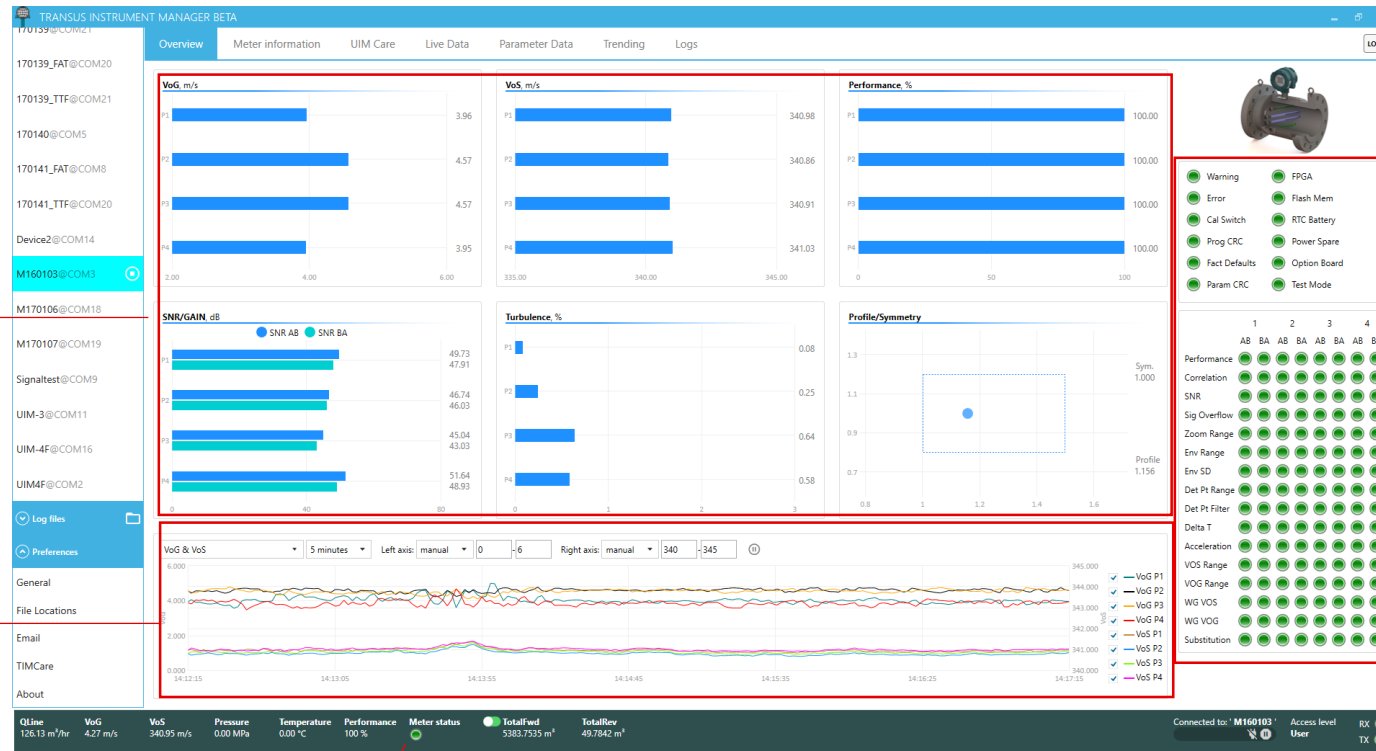
- Overview:** Shows a list of instruments connected to the system, including their names and addresses (e.g., 170139_FAT@COM2).
- Meter Information:** Provides detailed data for a selected instrument, including:
 - General Information:** Meter type (UM-4F), meter serial no., mechanical serial no., custom ID no., spare current, meter factor QD, meter units, and meter mode.
 - Actual/Reverse:** Displays actual and reverse values for various parameters.
 - Site Information:** Includes station name, meter name, description, company, address, city, ZIP code, and country.
 - Verification and Checks:** Shows firmware version, FPGA version, parameter version, and option board versions.
 - Parameters:** Allows for saving, loading, and writing parameters to the meter.
- Diagnosis:** Features a large waveform display showing signal data over time. It includes controls for signal selection, zoom, and pan.
- Performance & Diagnostics:**
 - Performance %:** A bar chart showing performance levels for different parameters (P1, P2, P3, P4).
 - SNR & Gain:** A bar chart showing Signal-to-Noise Ratio (SNR) and Gain for different parameters.
 - Turbulence %:** A bar chart showing turbulence levels.
 - Profile/Symmetry:** A scatter plot showing profile and symmetry data.
 - Final Error:** A table of error codes and their descriptions.
 - Signal Error:** A table of signal error codes and their descriptions.
 - Zoom Error:** A table of zoom error codes and their descriptions.
 - Delta Error:** A table of delta error codes and their descriptions.
 - Delta T:** A table of delta T error codes and their descriptions.
 - Acceleration:** A table of acceleration error codes and their descriptions.
 - VOS Range:** A table of VOS range error codes and their descriptions.
 - WGS VOS:** A table of WGS VOS error codes and their descriptions.
 - Substitution:** A table of substitution error codes and their descriptions.
- Log & Settings:** Includes a log viewer and a preferences menu.
- Status Bar:** Displays system status, including connection to the instrument (M160103), access level (User), and various system metrics.

Transus Instrument Manager (TIM)

Overview – shows general information on the “health” of the flow measurement

Live path data shows performance of key measurements.

Trending graphs show a history of selectable parameters



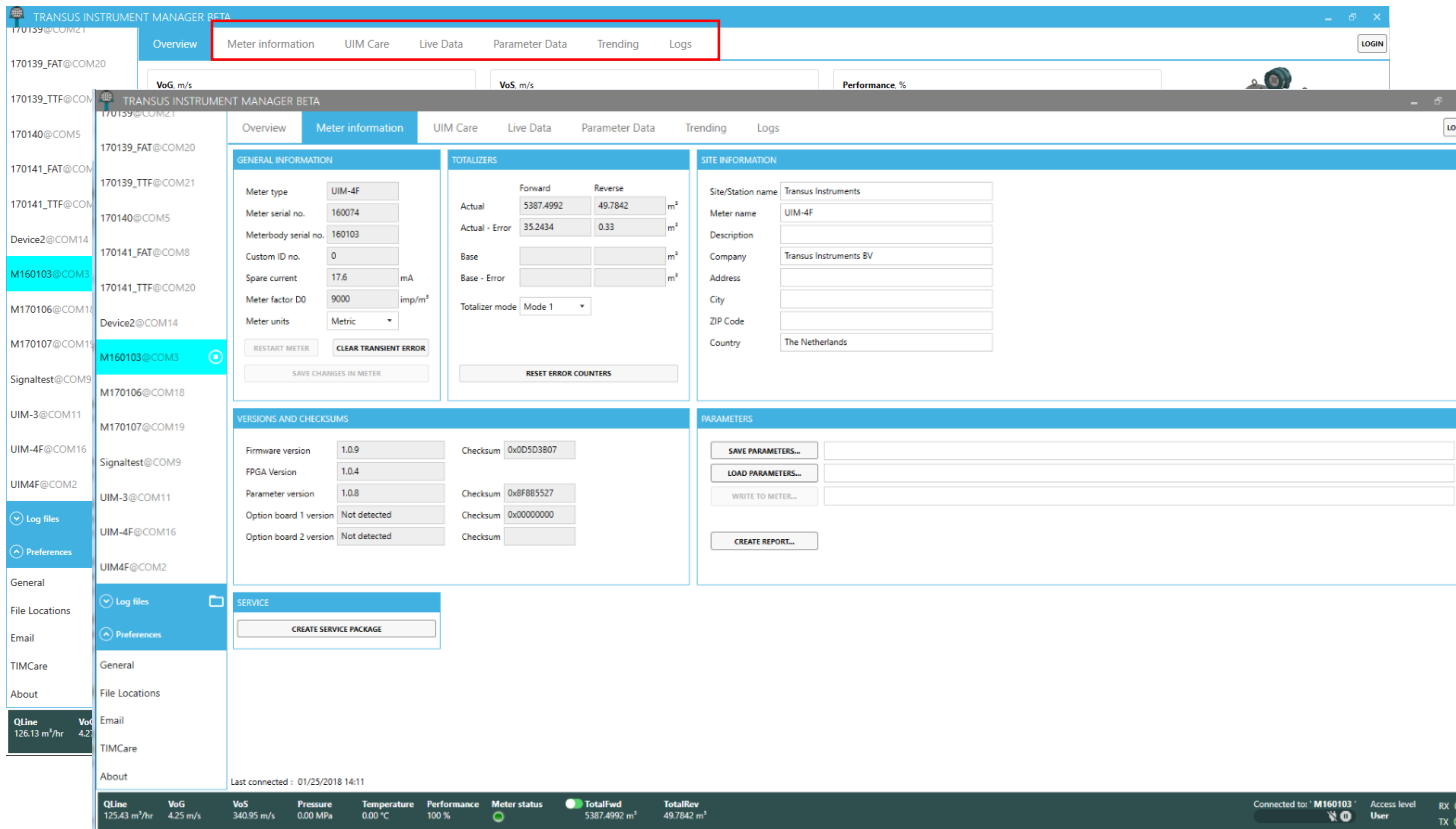
Diagnostic Information

Meter Status “traffic light” gives an instant indication of warnings or errors

- good
- warning
- error

Transus Instrument Manager (TIM)

Other screens provide in-depth information for Information and Programming



The screenshot displays the Transus Instrument Manager (TIM) interface. The main window is titled 'TRANSUS INSTRUMENT MANAGER BETA' and shows a list of devices on the left sidebar. The selected device is 'M160103@COM5'. The main content area is divided into several sections:

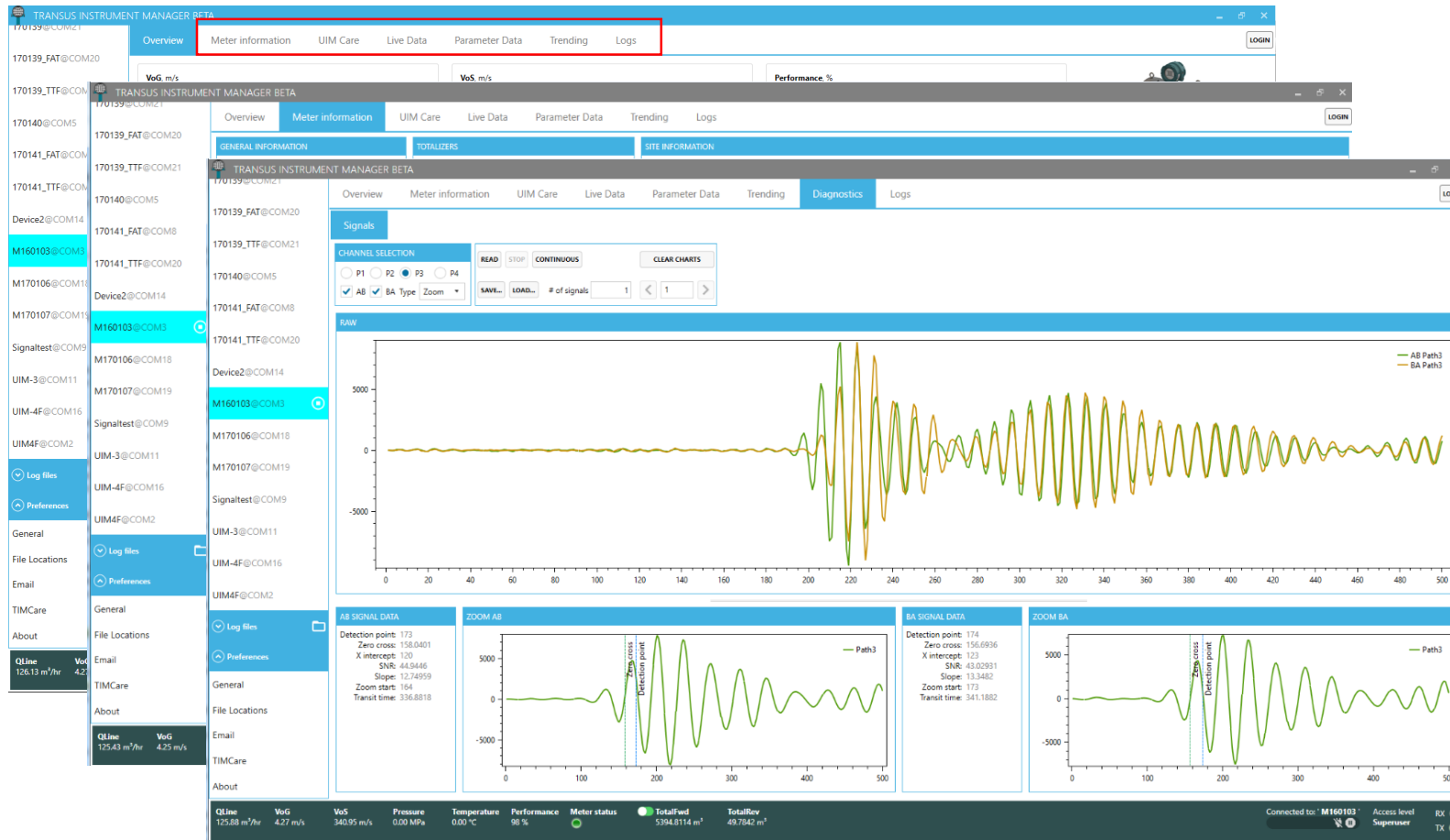
- GENERAL INFORMATION:**
 - Meter type: UIM-4F
 - Meter serial no.: 160074
 - Meterbody serial no.: 160103
 - Custom ID no.: 0
 - Spare current: 17.6 mA
 - Meter factor D0: 9000 imp/m³
 - Meter units: Metric
- TOTALIZERS:**

	Forward	Reverse	Unit
Actual	5387.4992	49.7842	m ³
Actual - Error	352434	0.33	m ³
Base			m ³
Base - Error			m ³
- SITE INFORMATION:**
 - Site/Station name: Transus Instruments
 - Meter name: UIM-4F
 - Description:
 - Company: Transus Instruments BV
 - Address:
 - City:
 - ZIP Code:
 - Country: The Netherlands
- VERSIONS AND CHECKSUMS:**
 - Firmware version: 1.0.9 Checksum: 0x0D5D3807
 - FGPA Version: 1.0.4
 - Parameter version: 1.0.8 Checksum: 0x8F8B5527
 - Option board 1 version: Not detected Checksum: 0x00000000
 - Option board 2 version: Not detected Checksum:
- SERVICE:**
 - CREATE SERVICE PACKAGE

At the bottom, a status bar shows various system metrics: QLine (125.43 m³/hr), VoG (4.25 m/s), Pressure (340.95 m/s), Temperature (0.00 °C), Performance (100%), Meter status (green), TotalFwd (5387.4992 m³), and TotalRev (49.7842 m³). The interface is connected to 'M160103' with an access level of 'User'.

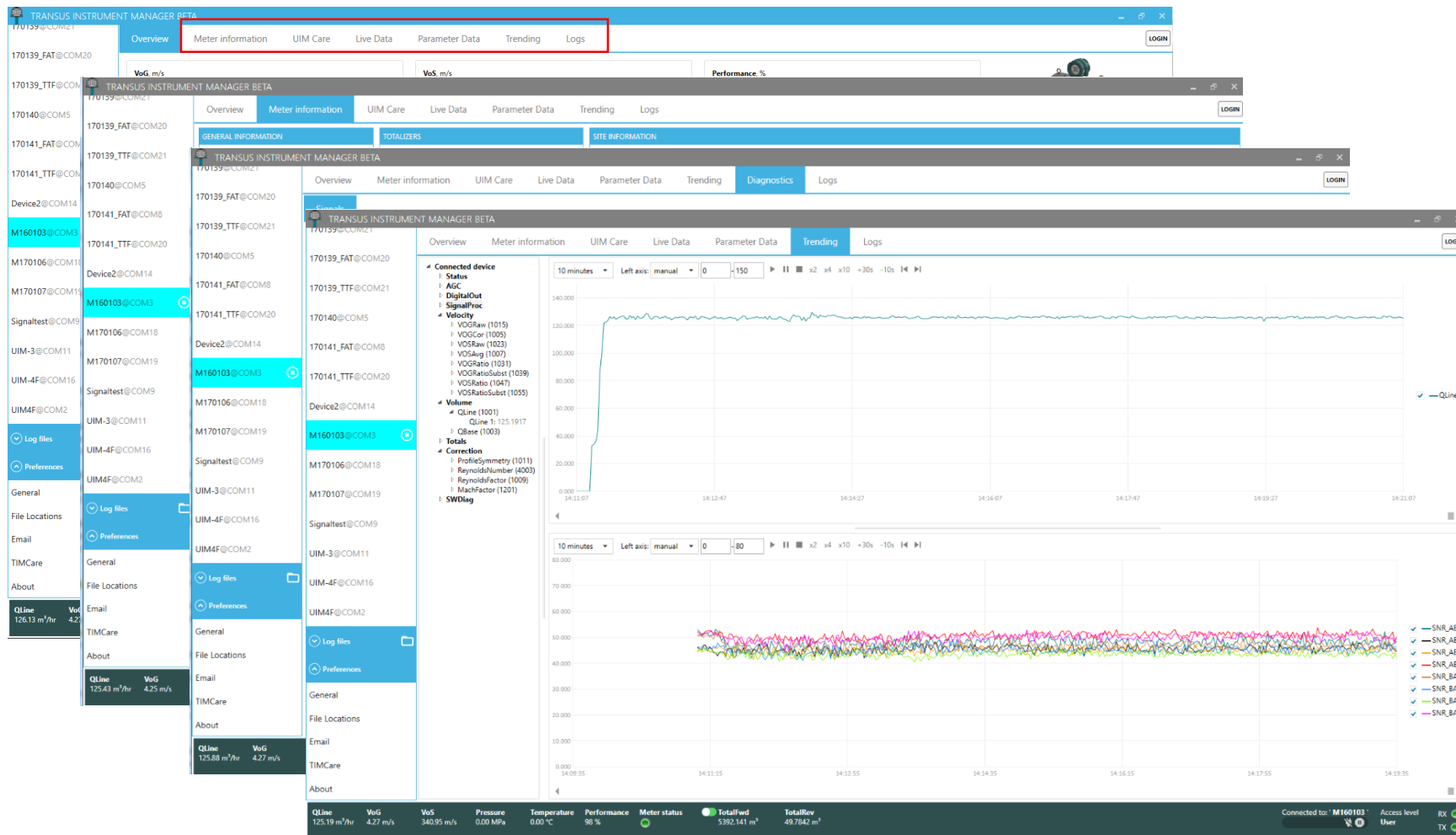
Transus Instrument Manager (TIM)

Other screens provide in-depth information for Diagnostics and Signals



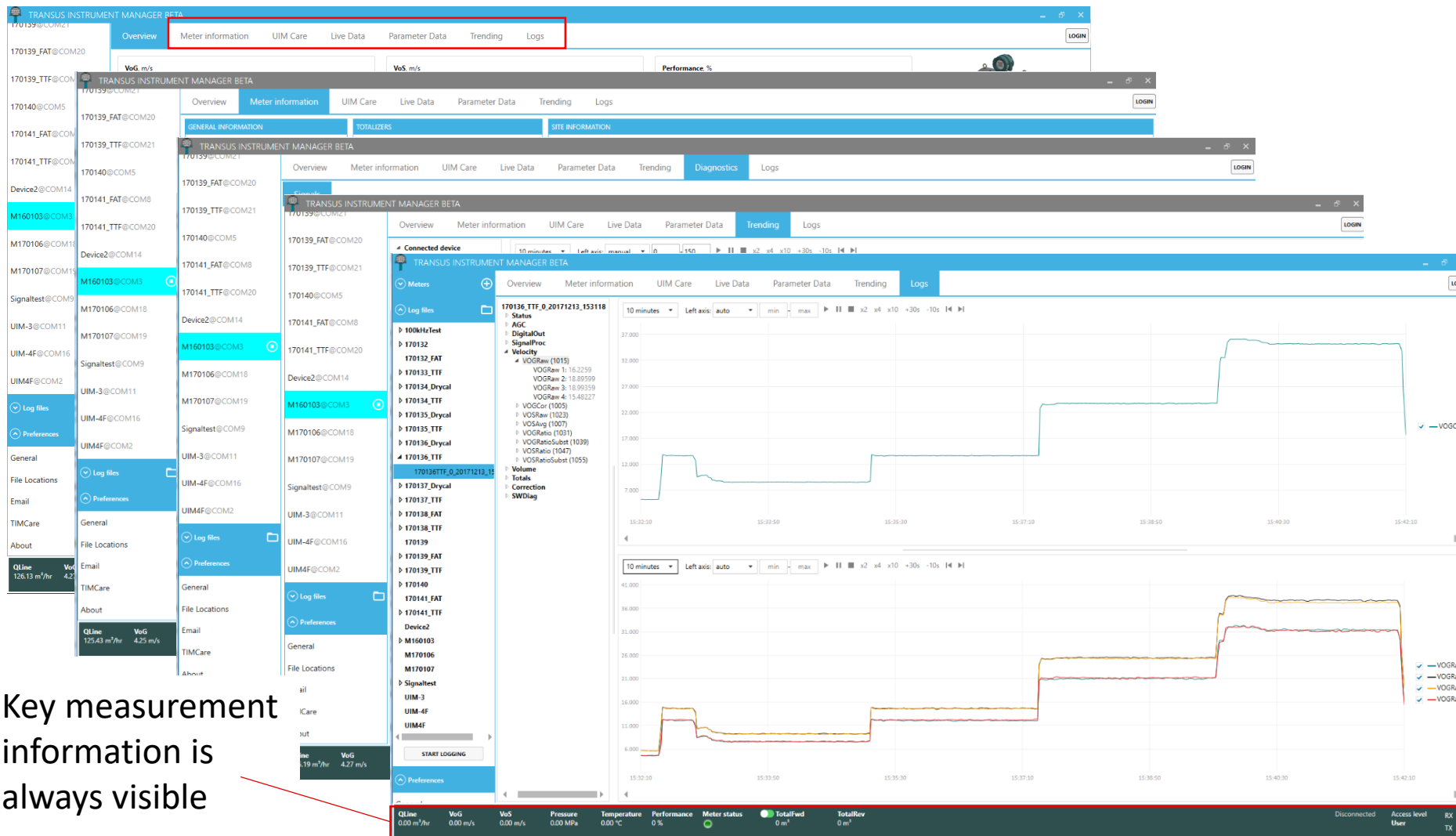
Transus Instrument Manager (TIM)

Other screens provide in-depth information for Live Data Trending



Transus Instrument Manager (TIM)

Other screens provide in-depth information for **Replay of Logs**



Key measurement information is always visible

UIM Series conclusions

The UIM Series Ultrasonic flowmeters provide

- Versatility – a wide range of options and I/O to suit most industrial applications.
- Accuracy and precision – enabled by the combination of 3 or 4 paths with the patented BCW processing
- Fast Response – multi-path simultaneous transmission and high speed processing mean fast response for pulsating flow and control
- Redundancy and enhanced Condition based Maintenance utilizing the UIM-4F Duo setup
- Ruggedness – all-metal transducers and industrial electronics.
- Explosion Safety – Intrinsic Safety design and certification means simpler installation, wiring and maintenance.

Any Questions?



Thank you

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