CRT

ACCURATE MEASUREMENT

Technical Library

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Flow-X® *series flow computers*

Spirit it
Innovative Technologies

Spirit Innovative Technologies

Eindhoven - Kuala Lumpur - Houston

- **Serving you on a World-Wide scale**
  - GMT+1: Eindhoven
  - GMT-8: Houston
  - GMT+8: Kuala Lumpur
- **Channel partners in more than 15 countries**
- **Supporting more than 50 countries**

Technology Partner to PETRONAS

- Spirit IT is Technology Partner to PETRONAS for the development, implementation, marketing, and commercialization of Custody Transfer and Allocation Metering solutions.
- SmartCen™, an intelligent and centralized metering supervisory computer software platform is the first jointly developed and implemented product, to establish a standardized metering software platform throughout the PETRONAS organization.
- SmartCen™ provides an intelligent and highly reliable solution which proactively optimizes Hydrocarbon Accounting Management.
- The software addresses current metering-related issues such as unavailability of online real-time verification functionality and the unavailability of remote monitoring functionality.
- Smartcen™ furthermore actively prevents conditions for fiscal exposure.
- By adopting Smartcen™ in PETRONAS' operations, these fiscal exposures can be avoided through the real time verification of computation flow, enabling quick detection of abnormalities.

Flow-X® series flow computers

Some of our customers

- **Install-base Flow-X series**
  - More than 2000 units in 50 countries (per 31/1/12)

- **Systems & solutions worldwide**
  - At major Pipeline companies
  - Gas metering systems
  - Off-shore platforms
  - Calibration management systems

- **Our customers**
  - Worldwide operating oil & gas companies
  - National oil & gas companies
  - R&D institutes

Developments of the last 20 years

1990 1995 2000 2005 2010

15 years

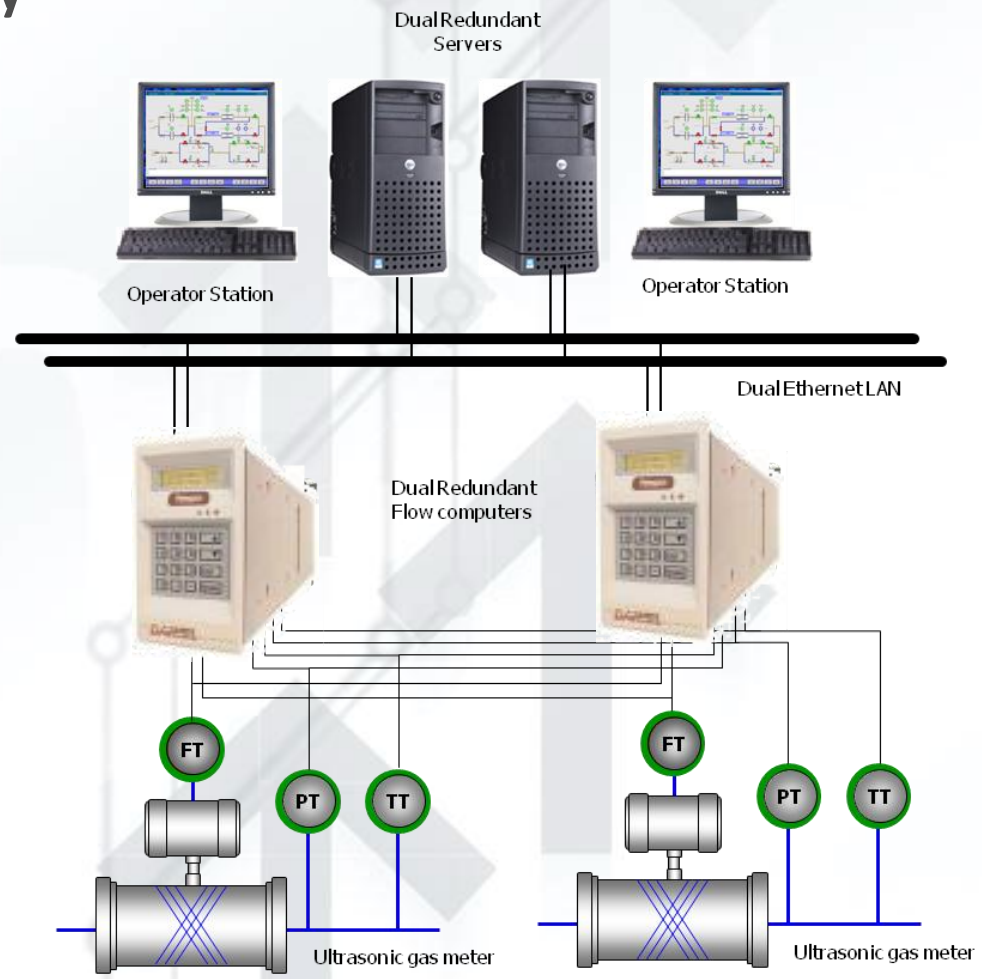
19 years

2011

Why need something new?

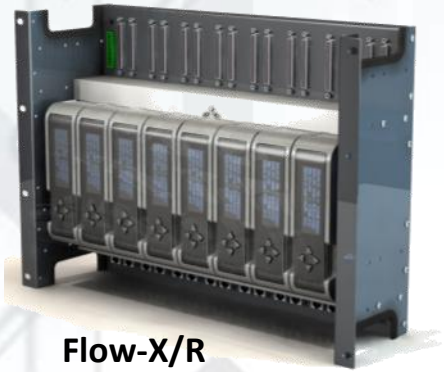
Compelling reasons for new technology

- **We wanted to be able to:**
  - Develop **state-of-the-art** measurement systems. We simply needed to redesign the flow computer hardware platform.
  - Offer our customers **cost effective** and **scalable** solutions.
  - Upgrade legacy systems with maximum flexibility to interface old as well as new technology.
  - Offer solutions with both superb supervisory software fully **integrated** with flow computer technology



Introducing our technology in 2008

Flow-X/S
Single stream for Rail mount



Flow-X/R
19” Rack for 1-8 flow computers

Flow-X/P
Multi-stream panel with 1-4 flow computers

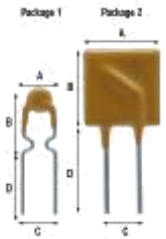
Simple & Strong Product Concept

X/M - Standalone, Single Run, Custody Transfer Flow Computer

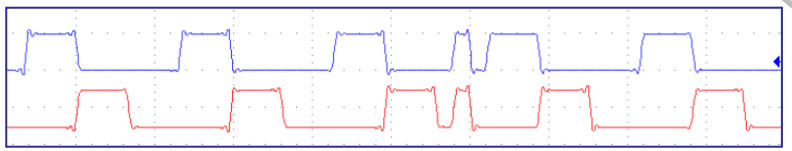
- One module required per meter run
- Gas or Liquid, or other
- Metric or US Units, or a mix

Flow-X Hardware platform

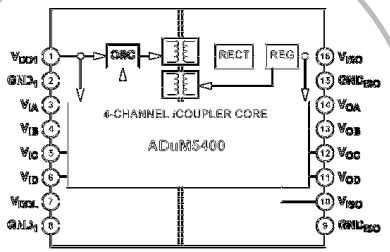
- **High performance hardware using new and state-of-the art electronics**
- **No battery needed to retain memory**
- **Hardware: 10 times as accurate with latest technology**
  - 4-20mA with +/- 0.008% full scale & **full operating range** 0..60 °C (32 to 140°F)
  - Time integration accuracy 0.0002% (1 second per 5 days)
  - Highest standard for Meter Pulse integrity (True Level 'A')



Multifuse, next generation
Glass fuse



FPGA hardware, next generation
Sophisticated Level 'A' pulse fidelity



iCoupler, next generation
opto coupler

Our software makes the difference

- High performance software using state-of-the art technology
- Software: Merge of Simplicity & Flexibility
  - Managed Standard applications (covers all Omni and S600 functionality)
  - Interfacing to legacy systems
  - Freedom to develop your own field-upgradeable applications
- Configuration and operation with a web browser
- Full fledged liquid and gas applications
  - All OMNI and S600 functionality available
- FREE Software updates from our website

Flow-X/M Stream module

Analog I/O

- 6x Analog inputs, high precision (+/- 0.008%), temperature range 0-60 °C; 4x support HART
- 2x RTD 4-wire temperature inputs (+/- 0.02 °C)
- 4x Analog outputs (+/- 0.075%)

Digital I/O (16x)

- 1x Dual Pulse meter input with true level A integrity
- Status inputs and outputs
- 4x periodic time input (density) (max)
- 4x prover detector inputs (max)
- 4x pulse outputs (max)
- 1x common prover bus output (max)

Fast 32-bit CPU

- 2x serial ports (RS232/RS485)
- 2x Ethernet TCP/IP
- 32-bit fast CPU with integrated Math co-processor
- 1GB of data storage for logging

Display & keys

Flow-X makes the difference

Communication already built-in

- Built-in support for many devices, e.g. Micromotion, Promass, Anton Paar, ABB, Danalyzer, etc.
- Flexible and powerful diagnostics built in
- Built-in data analyzer / datascope
- Support for any dataformat

Communication flexibility

- Listen-only is supported
- Fully fledged Modbus/TCP Server & Client
- Fully fledged Modbus Serial Master & Slave
- Flexible HART protocol
- Any data format, from single bit to 64 bits and more

I/O

- No glass fuses
- No Jumpers or dipswitches - all options are software controlled
- No shutdown or reboot is required when I/O settings are changed
- Calibration of analog inputs is simplistic, RTD also included
- Flexible usage of analog outputs

Flow-X makes the difference

For all fluids

- Natural gas, hydrocarbon liquids, LPG, steam, water, CO2 etc.

Bidirectional meter runs

- Uni- and bidirectional applications for gas and liquid

High Security

- Support for Individual users with multiple levels
- Controlled access to displays & editing of settings
- All access is audited in log file

Standard control functions

- Pipe and compact provers
- Samplers (single and twin)
- Enhanced PID (flow, pressure, cascade)
- Valves and valve sequencing

Loading Control / LACT loading & unloading

- Support for 4 customers
- Flow weighted averages for each customer separately

Flow Control

- Combined Flow / Pressure
- Run, station and prover

MOV Control

- Standard available
- Run and station inlet and outlet valves
- Prover 4-way and outlet valves

Sampler control

- Standard available
- Single and dual can
- Flow and time-proportional
- Auto-stop, auto-restart, auto-switchover

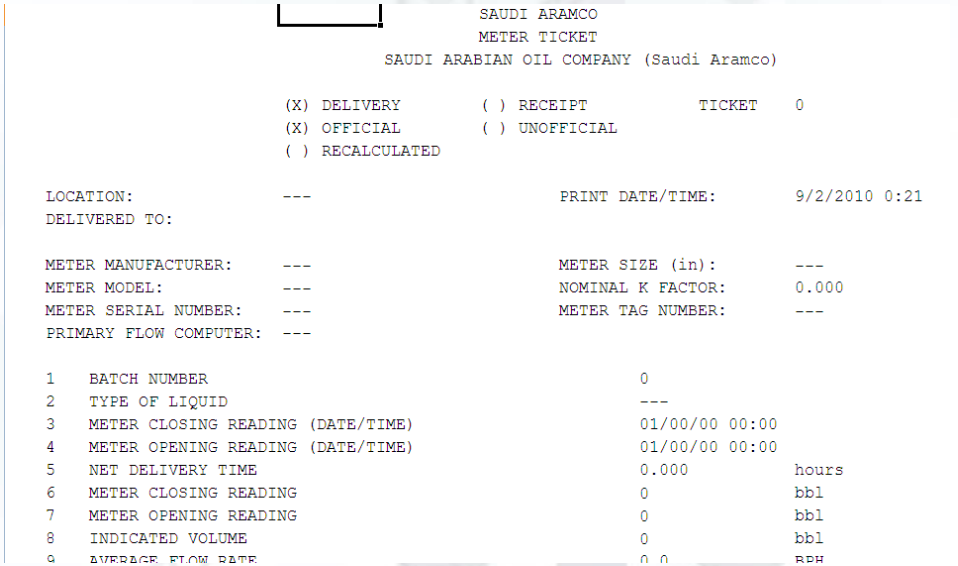
Generic PID

- Simple to complex PID logic
- Cascade control

… any custom-made logic

Reporting

- Unlimited number of reports
- Serial and Ethernet printers
- Text and graphical printers
- MS-Excel type of definition
- Calculations on reports
- 1 GB storage capacity
- Custody transfer integrity / system simplicity
  - All custody transfer reports generated and stored on flow computer and not by Supervisory Computer.



SAUDI ARAMCO
METER TICKET
SAUDI ARABIAN OIL COMPANY (Saudi Aramco)

(X) DELIVERY ( ) RECEIPT TICKET 0
(X) OFFICIAL ( ) UNOFFICIAL
( ) RECALCULATED

LOCATION:	---	PRINT DATE/TIME:	9/2/2010 0:21
DELIVERED TO:			
METER MANUFACTURER:	---	METER SIZE (in):	---
METER MODEL:	---	NOMINAL K FACTOR:	0.000
METER SERIAL NUMBER:	---	METER TAG NUMBER:	---
PRIMARY FLOW COMPUTER:	---		

1	BATCH NUMBER	0	
2	TYPE OF LIQUID	---	
3	METER CLOSING READING (DATE/TIME)	01/00/00 00:00	
4	METER OPENING READING (DATE/TIME)	01/00/00 00:00	
5	NET DELIVERY TIME	0.000	hours
6	METER CLOSING READING	0	bbl
7	METER OPENING READING	0	bbl
8	INDICATED VOLUME	0	bbl
9	AVERAGE FLOW RATE	0.0	BPH

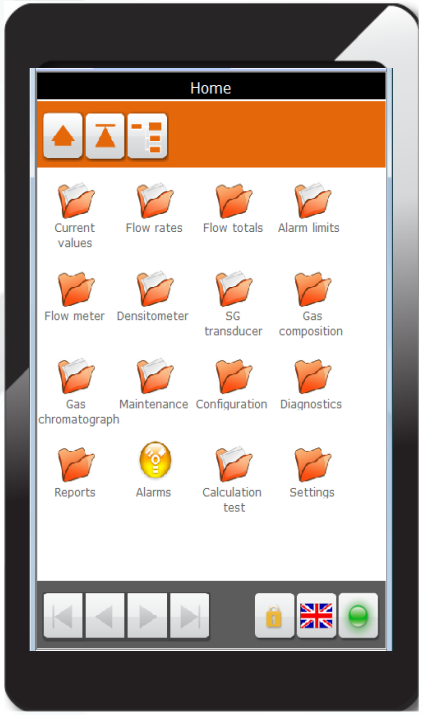
Flow-X software benefits

Superb diagnostics and troubleshooting capabilities

- Remote online debugging (full transparency from a distance)
- Embedded protocol analyser (shows all HART and Modbus messages)
- Full ultrasonic, coriolis, GC diagnostics available in FC

User-friendly and intuitive operation

- Touch and web
- You see what you need to see; no more no less
- Separate displays for operators, technicians and engineers
- Flow computers can share one and the same touch panel
- Multiple touch panels to access same group of flow computers



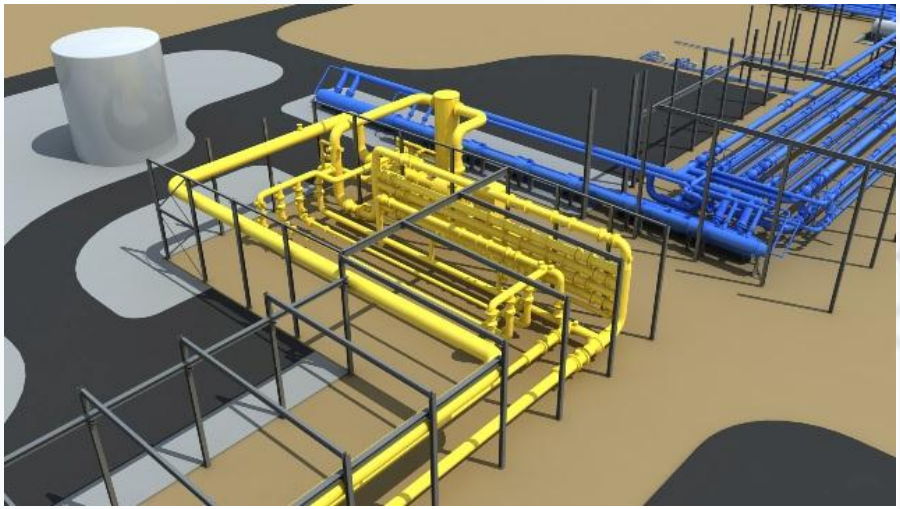
Powerful and flexible reporting

- Unlimited number of report templates
- Free format graphical reports
- 24 hourly records, 31 daily records, etc. on a single report
- Bi-directional totals and averages for 4 period types and batch
- Batch scheduler with 5 dates to be programmed, including daily, weekly, monthly periods
- Support for Batch Stack

Example : Euroloop

Versatile

- Flow-X used to calibrate flow meters
- eXLerate Metering Supervisory software used for Calibration Management system

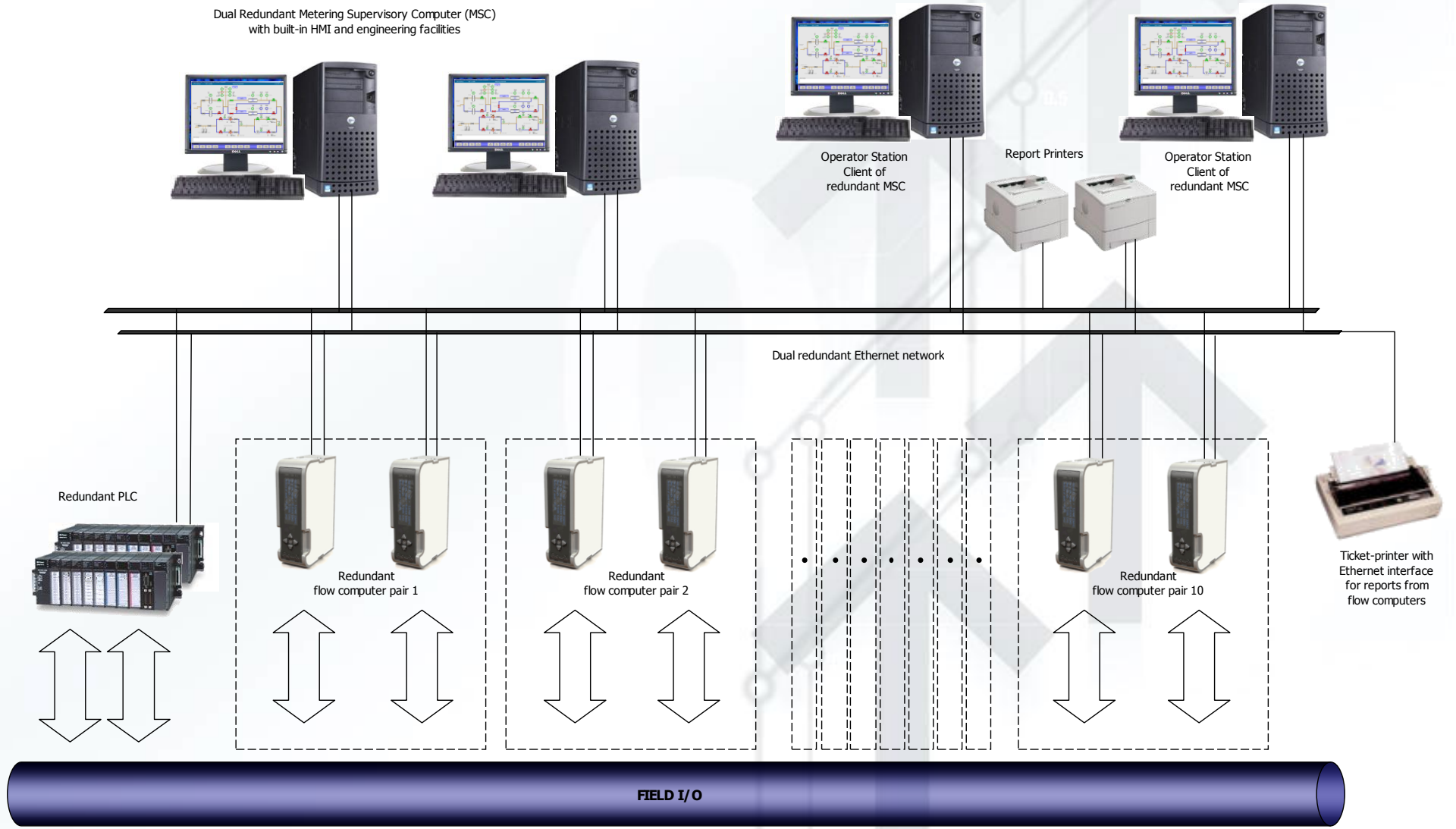


NMi

EuroLoop

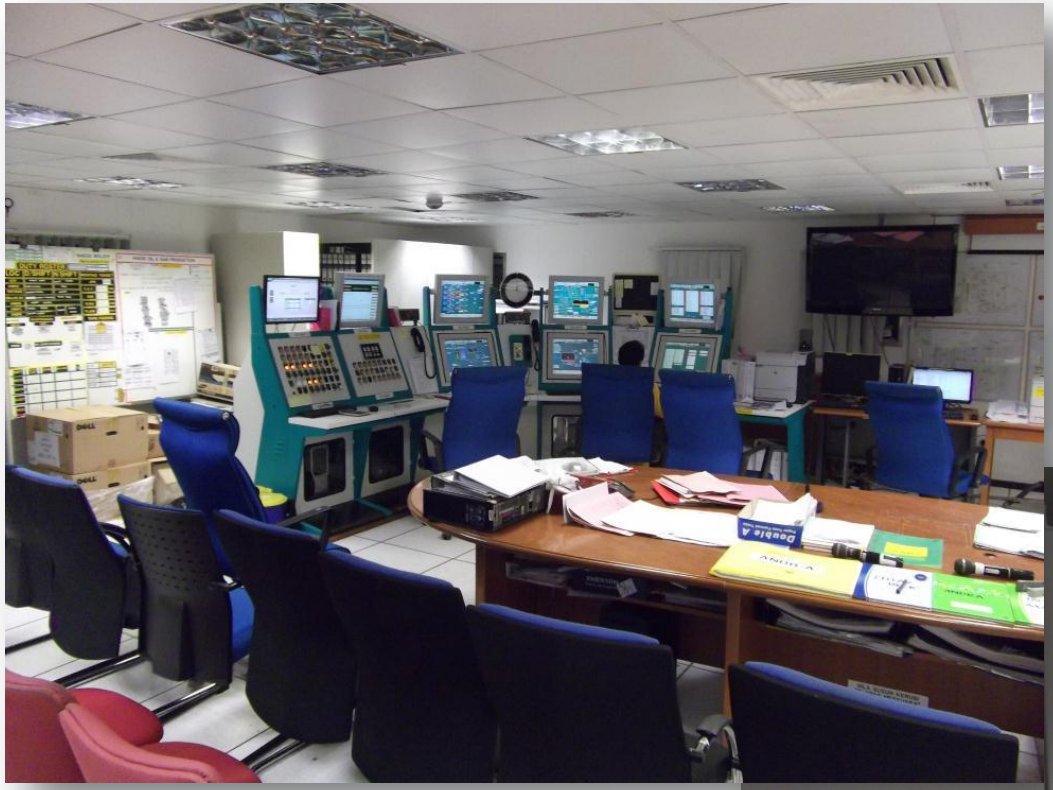
Flow-X® series flow computers

Fully Integrated solutions with eXLerate



Flow-X/P - Panel Mount

Offshore Platform at PETRONAS

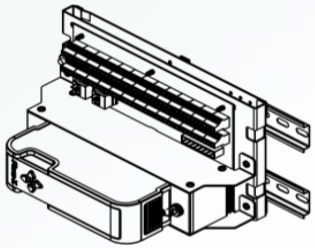


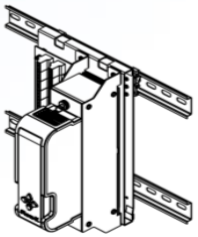
Flow-X/S – Rail Mounting

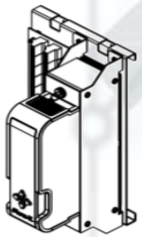
Single stream flow computer

Direct screw terminal I/O

- 6x Analog inputs 4-20mA
- 4x HART loops
- 2x RTD inputs
- 1x Dual Meter pulse
- 16x DI/DO/PO/Density
- 2x RS232/485
- 2x Ethernet





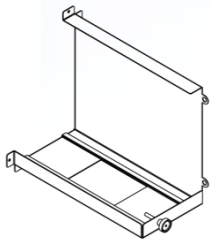


Flow-X/ST

Flow-X/P - Panel Mount

Multi-stream flow computer

- Sealable with single lead seal
- Panel mountable
- Usable as:
  - 1…4 x single stream
  - 2x dual stream redundant
  - Contains internal bus



Additional features

- Additional station processor with 7” touch screen
- Horizontally or vertically installation
- Multi-lingual, user selectable
- Additional 1 GB storage

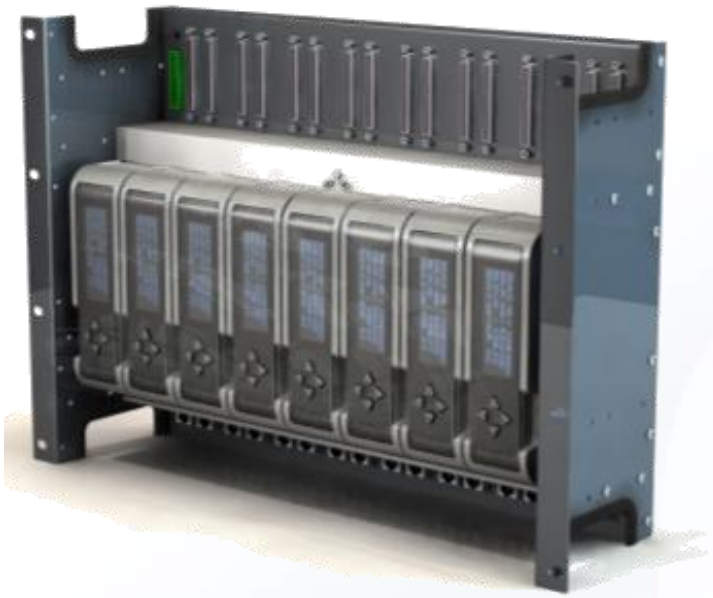
Connections via backplane

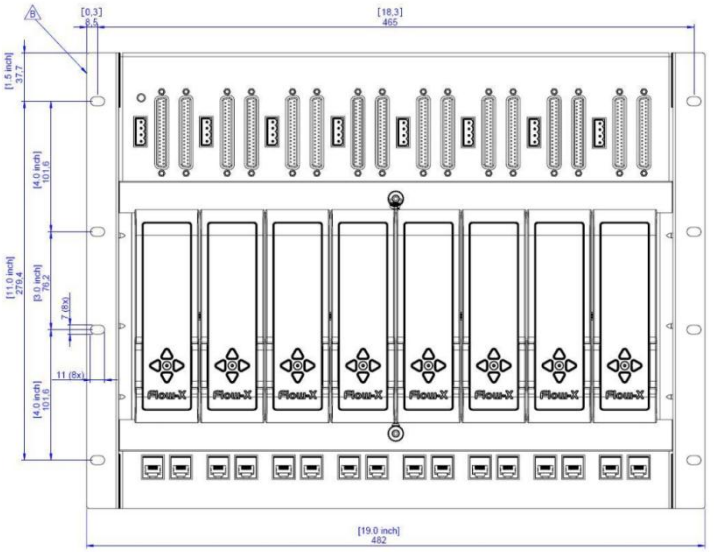
- Per stream 2x 37-pin D-SUB
- 3x Additional RS232/485 via 9-pin D-SUB
- 2x Ethernet via RJ45

Externally powered with 24VDC

- Redundant connections for 2x power supply

Flow-X/R, Rack Mount





Multiple stream flow computer

- Sealable with single lead seal
- Standard 19” Rack mounting
- Usable as 8 x single stream flow computers

Additional features

- Highly condense 19” cabinets

Connections at rack

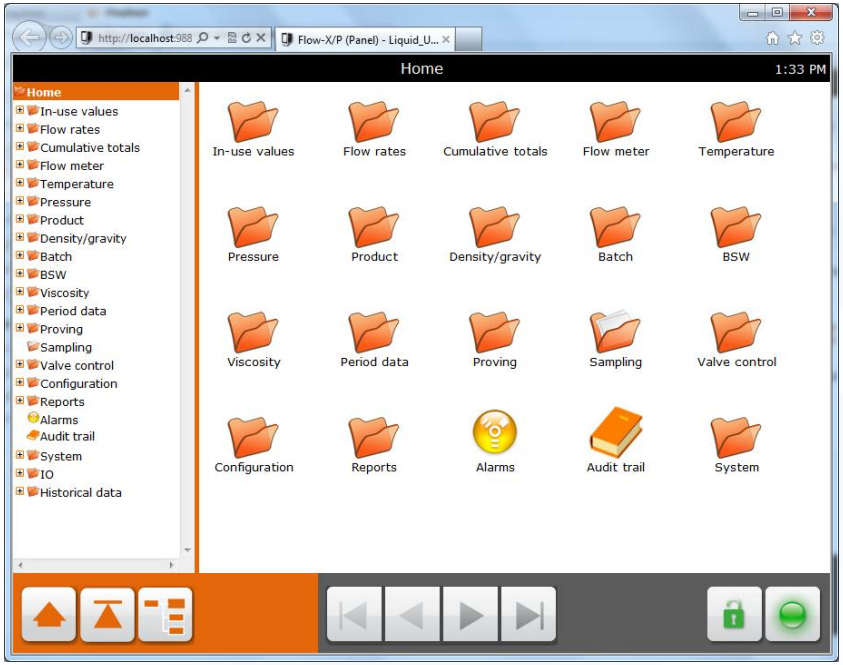
- Per stream 2x 37-pin D-SUB at top
- Per stream 2x Ethernet via RJ45 at bottom

Externally powered with 24VDC

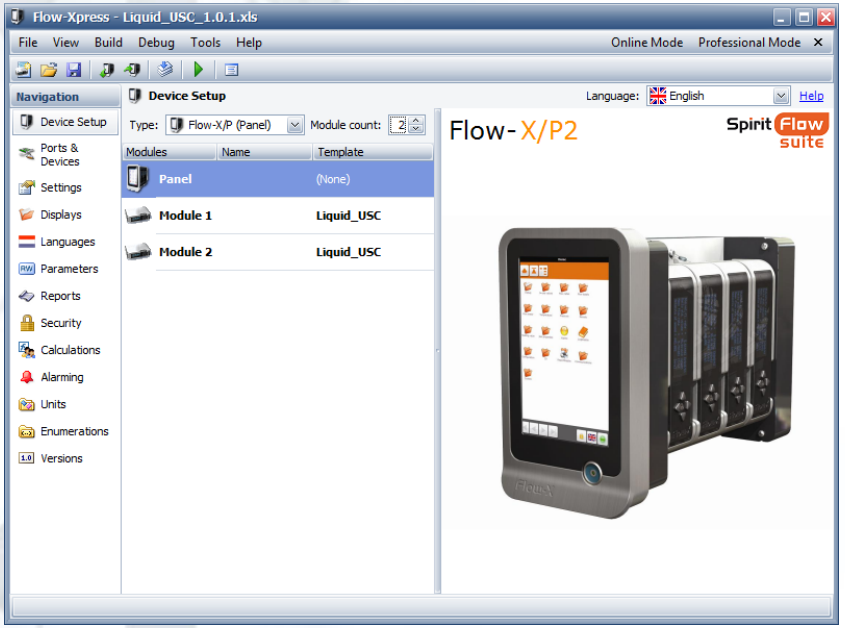
- Redundant connections for 2x power supply

Flow-X/R - Rack Mount

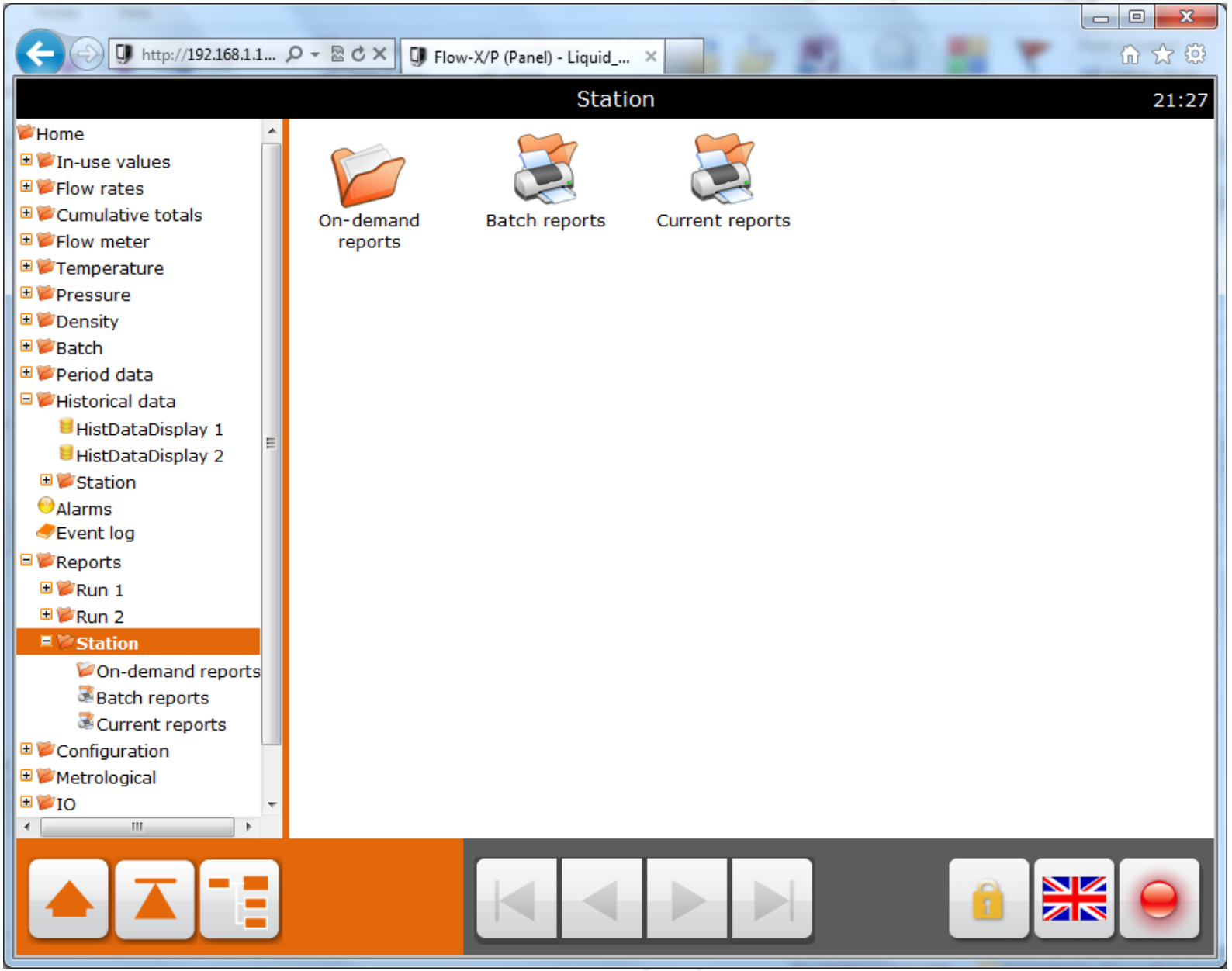
Different ways to configure a Flow-X



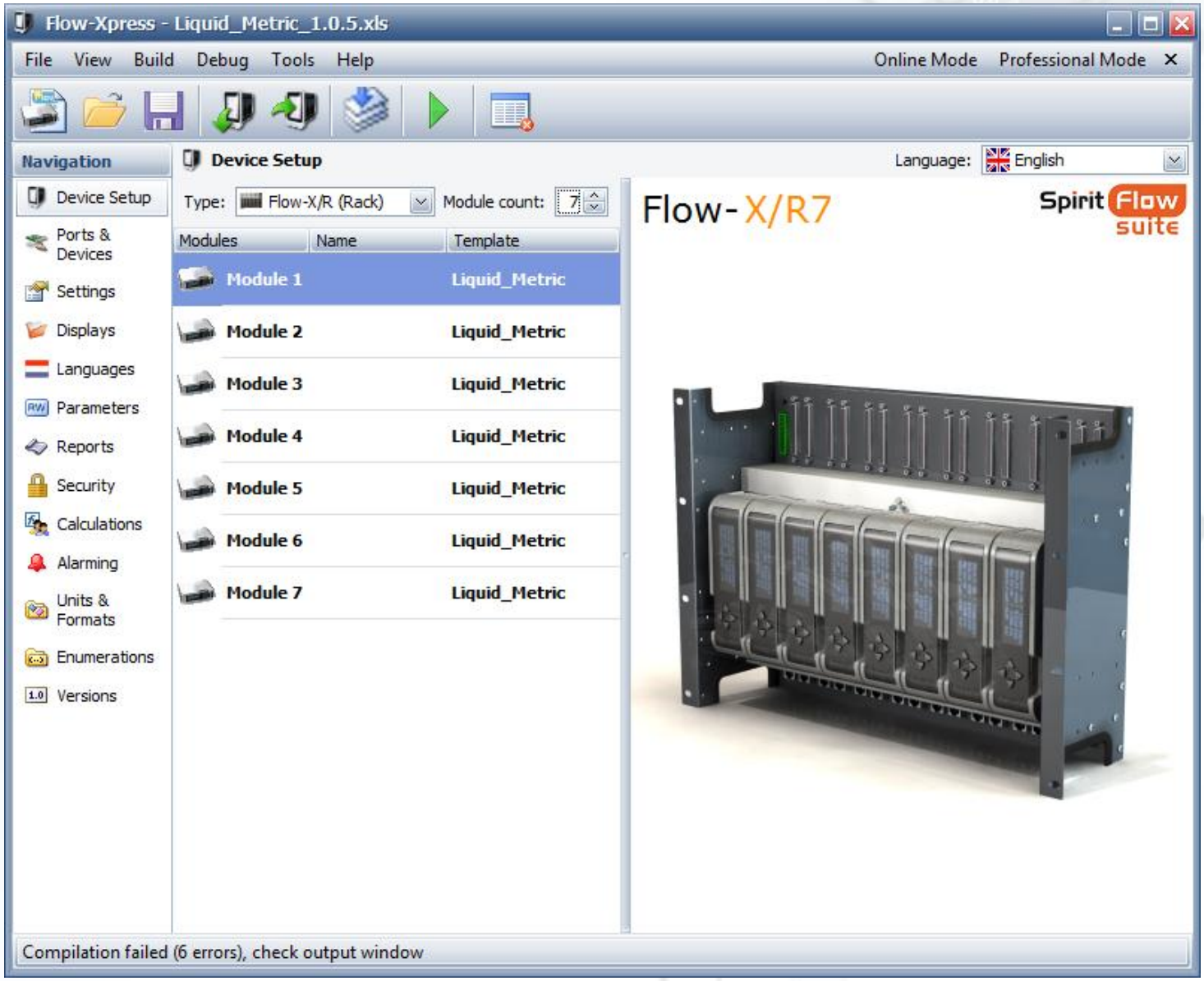
Using a simple Web-browser, or:



Flow-Xpress advanced software


http://192.168.1.1...
Flow-X/P (Panel) - Liquid_...
Station
21:27
Home
In-use values
Flow rates
Cumulative totals
Flow meter
Temperature
Pressure
Density
Batch
Period data
Historical data
HistDataDisplay 1
HistDataDisplay 2
Station
Alarms
Event log
Reports
Run 1
Run 2
Station
On-demand reports
Batch reports
Current reports
Configuration
Metrological
IO
On-demand reports
Batch reports
Current reports

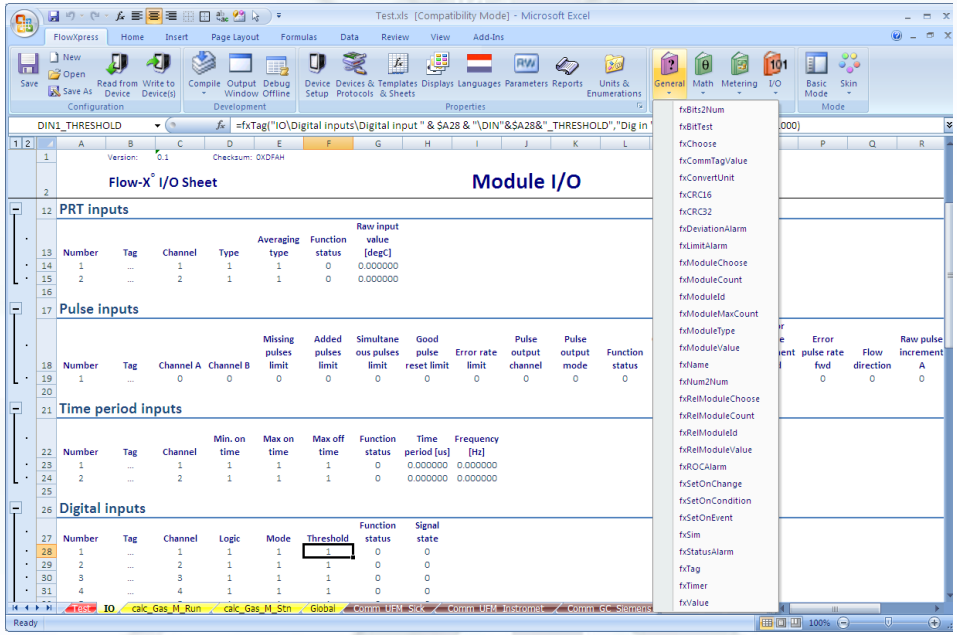
Flow-Xpress Basic Mode



Flow-Xpress Professional Mode

Open configuration mode

- Virtually unlimited number of logic & calculations
- Storage of primary & calculated data in historical database for time-stamping
- Unlimited number of user-definable period & batch totals, flow & time weighted averages



Free configurable communication

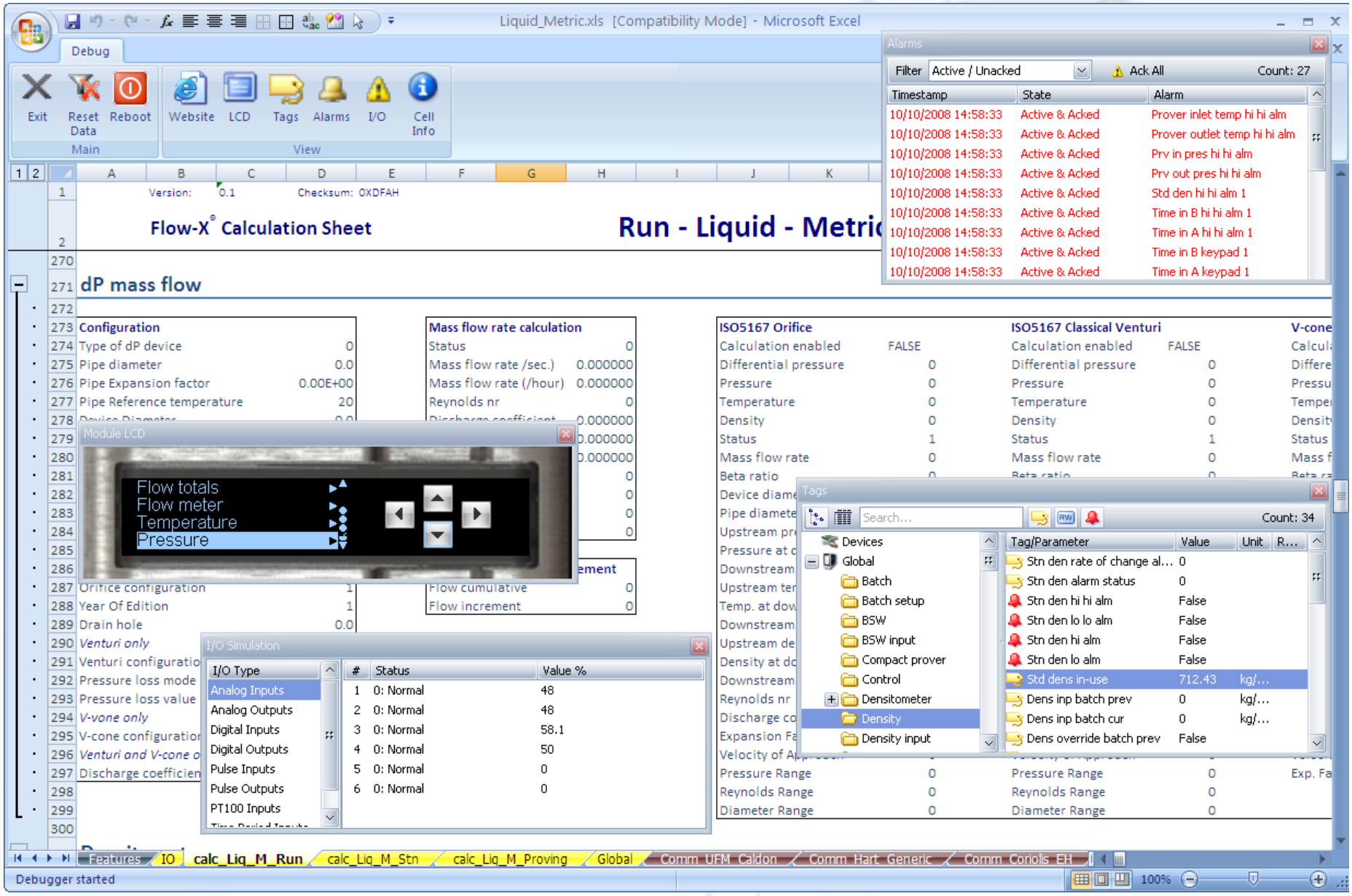
- Standard Flow-X communication list
- Any custom-made Modbus list
- Fully emulates any other Modbus interface

No limits

- Communicates with any external device (flow meter, process analyser, DCS, data historian)
- Unlimited number of meter calibration points
- Unlimited number of prover runs
- Unlimited number of historical batches
- Imperial & metric units - in one unit
- Mix gas & liquid applications in same flow computers

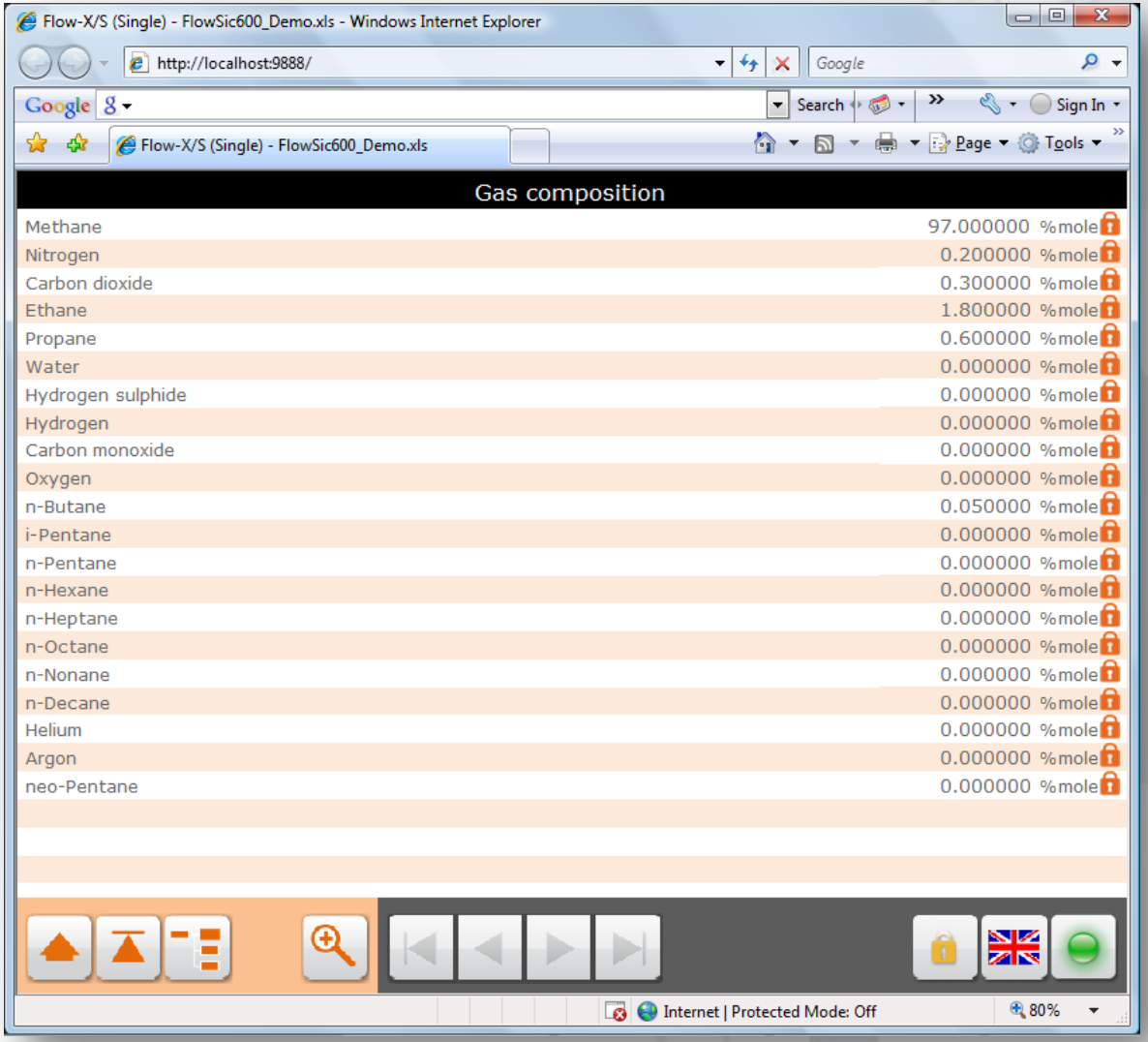
Flow-X® *series flow computers*

Made for Testing & Trouble shooting



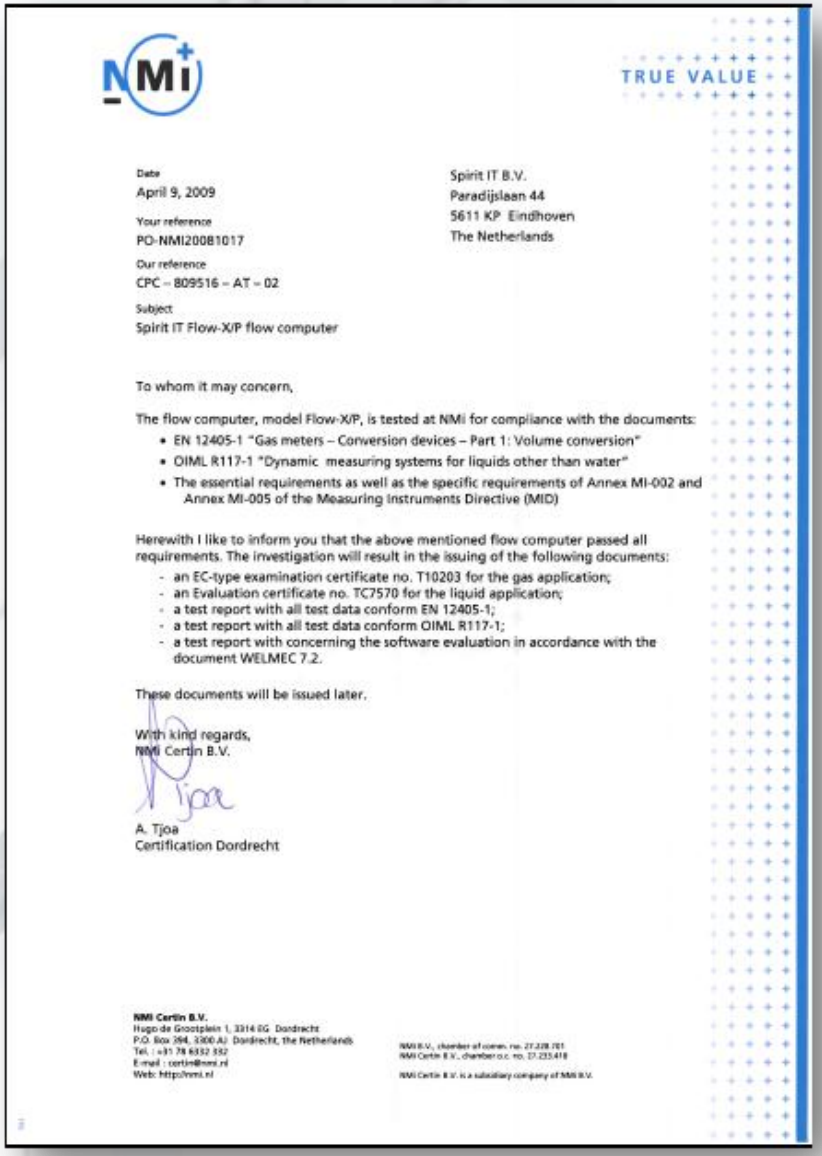
Remote operation

Only requires a web browser



Approvals

- **CE (Europe), UL (USA) and CSA (Canada)**
- **MID Approval comprises:**
  - Measuring Instruments Directive MID, Annex MI-002 and Annex MI-005
  - Valid in 30 EU countries
  - Basis for other approvals
- **OIML R117-1**
  - Dynamic measuring systems for liquids other than water
- **EN 12405-1**
  - Gas Meters - Conversion devices
- **WELMEC 7.2**
  - software evaluation



NMi

TRUE VALUE

Date
April 9, 2009

Your reference
PO-NMI20081017

Our reference
CPC – 809516 – AT – 02

Subject
Spirit IT Flow-X/P flow computer

Spirit IT B.V.
Paradijslaan 44
5611 KP Eindhoven
The Netherlands

To whom it may concern,

The flow computer, model Flow-X/P, is tested at NMi for compliance with the documents:

- EN 12405-1 "Gas meters – Conversion devices – Part 1: Volume conversion"
- OIML R117-1 "Dynamic measuring systems for liquids other than water"
- The essential requirements as well as the specific requirements of Annex MI-002 and Annex MI-005 of the Measuring Instruments Directive (MID)

Herewith I like to inform you that the above mentioned flow computer passed all requirements. The investigation will result in the issuing of the following documents:

- an EC-type examination certificate no. T10203 for the gas application;
- an Evaluation certificate no. TC7570 for the liquid application;
- a test report with all test data conform EN 12405-1;
- a test report with all test data conform OIML R117-1;
- a test report with concerning the software evaluation in accordance with the document WELMEC 7.2.

These documents will be issued later.

With kind regards,
NMi Certin B.V.

A. Tjoa
Certification Dordrecht

NMi Certin B.V.
Hugo de Grootplein 1, 3314 EG Dordrecht
P.O. Box 394, 3300 AJ Dordrecht, the Netherlands
Tel.: +31 78 6332 332
E-mail : certin@nmi.nl
Web: http://nmi.nl

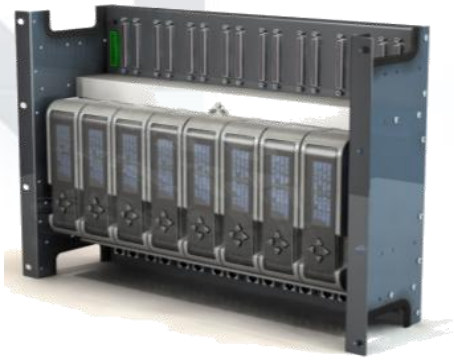
NMi B.V., chamber of comm. no. 27.228.781
NMi Certin B.V., chamber o.c. no. 27.235.418

NMi Certin B.V. is a subsidiary company of NMi B.V.

Summary

- **Industry leading high performance hardware platforms**
  - Mounting options to suit customer budgets and applications
  - Single stream modules that can be scaled in groups from 1 to 8 and beyond
  - True redundancy in hardware and software

- **Flexible Software**
  - Standard full featured applications or fully user defined (and anything in-between)
  - Mixed gas and liquid calculations
  - Metric or US customary measurement units or mix of both
  - Multi language
  - Fully test and debug before going live (transparency)
  - Only show the relevant information
  - Unlimited number of displays, reports, communication links and calculations




Questions?
Thank you!
Please feel free to ask!