FLOW COMPUTERS

Flow-X® SERIES

Spirit it
A MEMBER OF THE ABB GROUP

Measurement Data: from Well to Awareness

INTRODUCTION

Flow-X series of flow computers offer a sophisticated concept that combines advanced measurement technology and fast digital signal processing. The high processing power, versatile data communication and large storage capacity result in the ideal platform for even the most demanding flow measurement applications.

Flow-X series are designed for reliability in high-end gas- and liquid applications and include all relevant API, AGA, ISO, IP and many other measurement standards, in a flexible, intuitive and freely configurable software environment.

The core element of Flow-X series is a powerful single stream modules, that can be combined in various enclosures for single or multi-stream application types.

KEY-FEATURES

Flexibility with various Enclosures

Flow-X/M stream modules are used in a specific enclosure, ranging from a single stream DIN-rail mountable device with screw terminals for field connections, to a convenient multi-stream panel mounted flow computer with a 7 inch large color touch-screen for more demanding applications. The 19 inch rack enclosure for up to 8 stream modules allows compact cabinet design, ideal for off-shore platforms or other space limited systems.

Flexibility with Smart Software Templates

Flow-X comes with extensive software templates for both liquid and gas applications. The software incorporates a powerful back-end engine with advanced measurement and control features, combined with the most complete library of flow calculations. On the front end, the software offers a user friendly and intuitive interface, with a high degree of flexibility for users and operators.

Supported Products

The Flow-X series support crude oils, natural gas, NGLs, LPGs, LNG, refined products, special gases, and steam. Either liquid or gas may be combined in multi-stream applications.

Connectivity

Configurable digital communication interfacing is implemented for ultrasonic flow meters, gas chromatographs, HART transmitters and other metering equipment, utilizing various communication protocols for flexible usage – no “firmware” programming is required.

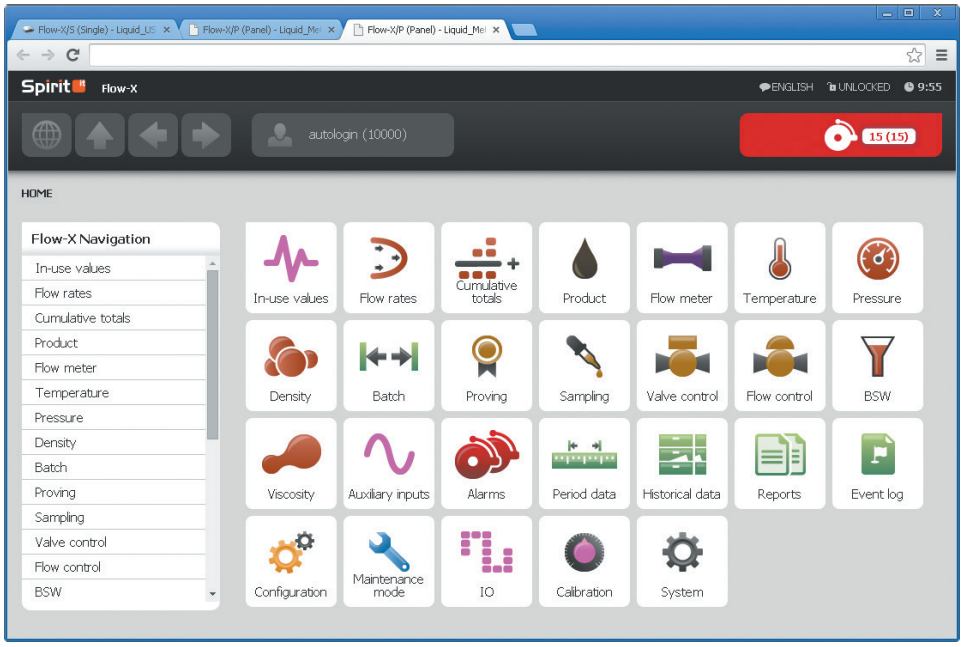
Quality Assurance

All models have passed the highest degree of quality testing, including HALT testing. During production assembly is completed for each model with an automated calibration phase and a significant test and burn-in period to ensure the high quality for end users.

Additional Features

- ✓ *No totalizer rollovers through high resolution 64-bit counters.*
- ✓ *High accuracy of 0.002% FS at 21ºC, and 0.008% FS or better at high ambient temperatures (0-60ºC).*
- ✓ *High precision calculations utilizing a math coprocessor using 64-bit double precision floating point data.*
- ✓ *Prover support with uni-directional, bi-directional, compact prover, master meter, with dual chronometry and pulse interpolation with a resolution of 100ns.*
- ✓ *PID & valve control, prove control, batch control, and sampler control.*
- ✓ *Built-in redundancy for dual power supply, dual Ethernet and software.*
- ✓ *Metrology approvals include MID for liquid and gas, OIML R-117, and EN-12405. WELMEC 7.2, EMC: EN 61326-1997 industrial locations, and EN 55011.*
- ✓ *On-board storage (1 GB) for audit-trail, event- and primary data logging in each module.*

FLOW-XPRESS CONFIGURATION SOFTWARE



To match the large variety of requirements for flow computer functionality in today's international markets, Flow-X is supplied with a unique configuration and test tool, Flow-Xpress™. Distinct levels of expertise for users are recognized, ranging from novice users to demanding expert level engineers, who create their own applications.

Using Flow-Xpress, a user can simply configure the flow computer by setting vital parameters, such as meter type and Modbus mapping. With Flow-Xpress Pro, an expert user is enabled to develop a dedicated application, utilizing the user-friendly and familiar spreadsheet oriented development environment.

Flow Computer Configuration

Calculations, displays, reports, alarms, Modbus or HART communication interfaces and much more can be freely defined from a rich library of functions and tools.

Template applications are fully user definable. Predefined configurations from a directory of templates can be used to easily match existing flow computer applications.

Ready-to-run application templates are available for both liquid and gas applications with MID approvals from the Dutch Metrology Institute NMi.

Testing and Debugging

A unique feature of Flow-Xpress is the application simulation and debugging tool. This allows transparent local and remote online and offline simulation of a Flow-X application on detailed level. Report and display layouts, including the local Flow-X/M LCD display, as well as the touchscreen interface can easily be simulated, tested & previewed.

FROM NOVICE TO EXPERT USER LEVEL

Integration & Connectivity

Flow-X supports various communication protocols, such as: HTTP, Modbus Master & Slave, RTU & ASCII, Modbus/TCP Client & Server, HART Master, UNIFORM, ASCII and other protocols for maximum connectivity.

Easy integration is ensured, even with complex SCADA / HMI systems. The Flow-X series software has a natural fit with eXLerate® Metering Supervisory software.

Key Software Features

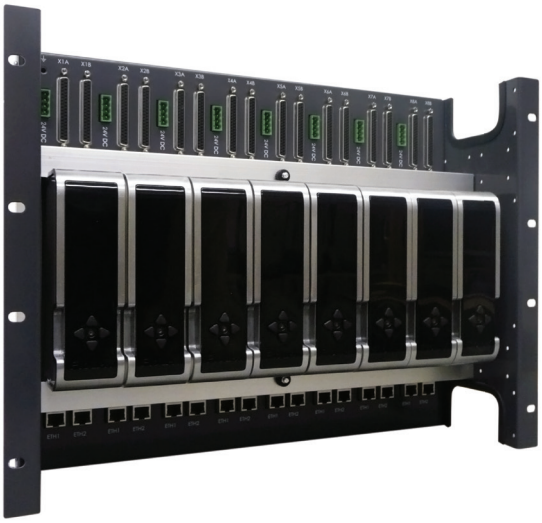
- ✓ *Configurable/programmable software platform, with unlimited 'logic' and calculations.*
- ✓ *Storage of primary and calculated data in historical database for time-stamped data retrieval.*
- ✓ *Unlimited number of user-definable period and batch totals, and flow and time weighted averages.*
- ✓ *Configurable data packets for all drivers including HART, Modbus Master, Slave, Client and Server protocols.*
- ✓ *Calibration curves with an unlimited number of calibration points.*
- ✓ *Multi-lingual interface for touch screen devices with online language selections.*
- ✓ *Embedded web-server allows for fully remote PC based operation.*
- ✓ *Mix of imperial units and metric units, and gas and liquid, in any combination.*
- ✓ *Secured local & remote upload and download of configurations and firmware over internet & intranet allows true remote support; yet tamper-proof under WELMEC 7.2 specifications.*

AVAILABLE MODELS

Flow-X/M modules can be delivered with various mounting assemblies to create a variety of form factors, each with specific features for maximum flexibility and many different system architectures. All options require an external 24VDC power supply with optional redundant connections.

FLOW-X/P

- ✓ *Panel mounted flow computer for up to four streams (0-4)*
- ✓ *7” multi-lingual color touch screen*
- ✓ *Serial (3x) and Ethernet interfaces (2x RJ45)*
- ✓ *Standard 37-pole and 9-pole D-Sub type connectors*
- ✓ *Horizontal or vertical position*



FLOW-X/R

- ✓ *Rack model for up to 8 streams*
- ✓ *Mounting in 19” cabinets or directly against the wall*
- ✓ *Stream modules can be used as 8-stream application, as separate streams, or combinations.*
- ✓ *Ethernet interfaces (2x RJ45)*
- ✓ *Standard 37-pole and 9-pole D-Sub type connectors*
- ✓ *Each individual stream module is individually and independently powered (24DVC) and individually exchangeble*

FLOW-X/S

- ✓ *Single stream*
- ✓ *Graphical LCD multi-lingual display with 4-8 lines*
- ✓ *Ethernet interfaces (2x RJ45)*
- ✓ *DIN Rail mounting or directly against the wall*

FLOW-X/ST

- ✓ *7” inch color touch screen based User Interface module*
- ✓ *Ethernet interfaces (2xRJ45)*
- ✓ *Mountable in a panel*
- ✓ *Compatible with Flow-X/R and Flow-X/S*

SOFTWARE SPECIFICATIONS

Library of certified flow calculations for all models:

- ✓ *AGA3, AGA5, AGA8, AGA10. Compliant with AGA7, AGA9, AGA11.*
- ✓ *API chapters 11.1, 11.2, 12.2, 21.1 and 21.2, API 2540, API 1952, 1980, 2004 tables (both metric and US versions)*
- ✓ *ISO 5167 (all editions), ISO 6976 (all editions).*
- ✓ *NX19, SGERG, GOST, PTZ, Costald, Peng-Robinson, GERG2004, GERG2008 calculations.*
- ✓ *GPA 2172 / ASTM D3588, TP15, TP16, TP25, TP27.*
- ✓ *IAPWS-IF97 steam and water tables.*
- ✓ *NIST-1045 for Ethylene.*
- ✓ *API 11.3.2.1 Ethylene (API-2565).*
- ✓ *ASTM D1550.*
- ✓ *Batch and period recalculation (meter factor, BS&W, density, etc.)*
- ✓ *Support for all meter types, such as coriolis, orifice, venturi, etc.*
- ✓ *Supports all major Ultrasonic Flow Meters (e.g. SICK, Caldon, Daniel, Elster, GE, FMC, Krohne).*
- ✓ *Supports all major gas chromatographs (e.g. ABB, Daniel, Siemens, Yamatake, Yokogawa, Elster).*
- ✓ *Calibration curve up to unlimited number of points (linear and polynome).*
- ✓ *Prover support : uni-directional, bi-directional (2 / 4 detector inputs), compact prover, master meter, dual chronometry, pulse interpolation.*
- ✓ *Unlimited number of period and batch totals and flow and time weighted averages. Periods can be of any type.*
- ✓ *Support for densitometers and specific gravity transducers (Solartron, Sarasota, UGC, Densitrak, Anton Paar).*
- ✓ *PID control, valve control, prove control, batch control, sampler control.*
- ✓ *Support for McCrometer V-Cone, Density of Moist Air, CUSUM transmitter drift detection.*
- ✓ *Support for all common spreadsheet functions to obtain maximum flexibility.*

APPROVALS & TESTING

Below we present the results of various certification processes of our Flow-X series of flow computers by various internationally recognised testing authorities, including the Dutch Metrology Institute NMi.

A complete list of certificates, documents and test reports is available on request. The metrology approvals of our Flow-X include:

✓ *CE*	*Marking as per Conformité Européene, Directive 93/68/EEC. Declaration of conformity*
✓ *EN 12405-1*	*European Standard for Gas meters and Gas-volume electronic conversion devices; part of MID*
✓ *OILML R117-1*	*Organisation Internationale de Metrologie Legale, Dynamic measuring systems for liquids other than water standard, Edition 2007; part MID*
✓ *WELMEC 7.2*	*Software Guide - Measuring Instruments Directive 2004/22/EC; included in MID*
✓ *WELMEC 8.3*	*Quality of production, final product inspection and product testing*
✓ *WELMEC 8.8*	*Intended use as 'electronic calculating and indicating device' part of measuring system of liquids other than water (MI-005) and intended use as 'Calculator and Indicator device for a gas meter' (MI-002)*
✓ *EN 61326-1997*	*Electromagentic Compliance specification for Industrial locations; included in MID*
✓ *EN 55011*	*Electromagnetic Compliance specificationl included MID*
✓ *CSA C22.2 61010-1*	*Issued:2004/07/12 Ed:2 (R2009) Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use Part 1: General Requirements, with general instruction No. 1: 2008/10/28 - (R2009)*
✓ *UL 61010-1*	*Issued: 2004/07/12 Ed:2 Rev:2008/10/28 UL Standard for Safety Electrical Equipment for Measurement, Control, and Laboratory Usel; Part 1: General Requirements*
✓ *2004/108/EC*	*Electric compatibility directive*
✓ *2004/22/EC*	*Measuring Instruments Directive*

For the above approvals, tests were conducted to the flow computer, in accordance with the following IEC test procedure standards:

- ✓ *IEC 60068-2-1*
- ✓ *IEC 60068-2-2*
- ✓ *IEC 60068-2-3*
- ✓ *IEC 60068-2-31*
- ✓ *IEC 60068-2-36*
- ✓ *IEC 60654-2*
- ✓ *IEC 61000-4-2*
- ✓ *IEC 61000-4-3*
- ✓ *IEC 61000-4-4*
- ✓ *IEC 61000-4-5*
- ✓ *IEC 61000-4-6*
- ✓ *IEC 61000-4-8*
- ✓ *IEC 61000-4-17*
- ✓ *IEC 61000-4-29*
- ✓ *IEC 61000-6-2*
- ✓ *IEC 61000-6-4:2001 + A1:2011*

TECHNICAL SPECIFICATIONS

Specifications per Flow-X/M flow module:

Analog inputs	Analog transmitter input, high accuracy. Input types are 4-20mA, 0-20mA, 0-5V, 1-5V. Accuracy 0.002% FS at 21°C, 0.008% at full ambient range of 0-60°C, resolution 24 bits. Inputs are fully floating (optically isolated).	6 (1)
4-wire PRT inputs	Resolution 0.02 °C for 100 ohms input. Error depending on range: 0 - 50 °C: Error <0.05 °C or better -220 - +220 °C: Error <0.5 °C or better	2
HART	Independent HART loop inputs, on top of 4-20mA signals. Support includes multi-drop for each transmitter loop, as well as support for redundant FC operation	4 (1)
Pulse inputs	High speed single or dual pulse input. Adjustable trigger level at various voltages. Compliant with ISO6551, IP252, and API 5.5. True Level A and level B implementation.	1
Density/viscosity	Periodic time input, 100µs - 5000µs. Resolution < 1ns.	4 (2)
Digital inputs	Digital status inputs. Resolution 100ns (10MHz)	16 (2)
Digital outputs	Digital output, open collector (0.5A DC). Rating 100mA @24V.	16 (2)
Pulse outputs	Open collector, max. 10Hz	4 (2)
Sphere detector inputs	Supports 1, 2 and 4 detector configurations mode. Resolution 100ns (10MHz)	4 (2)
Analog outputs	Analog output for flow control, pressure control 4-20mA, outputs floating. Resolution 14 bits, 0.075% FS.	4
Prover bus outputs	Pulse outputs for remote proving flow computers. Resolution 100ns.	2
Frequency outputs	Frequency outputs for emulation of flow meter signals. Maximum frequency 10KHz, accuracy 0.1%.	4
Serial	RS485/RS232 serial input for ultrasonic meter, printer or generic, 115kb.	2
Ethernet	RJ45 Ethernet interface, TCP/IP.	2
Operating	+5 °C to +55 °C, Max.90% relative humidity, non-condensing.	
Storage	-20 °C to 70 °C	
Power supply	External, 20 VDC - 32 VDC, nominal 24 VDC, with redundant connections.	
Processors	32-bit microprocessor with math coprocessor, and FPGA.	
Memory	1 GB on-board memory for time-stamped data, report archive and audit trail.	
Clock	RTC 2 PPM, with internal lithium cell, Accuracy better than 1 s/day.	
Watchdog	Watchdog timer for general protection of the flow computer correct operation.	1
Weight	Flow-X/M: 1 kg Flow-X/S0: 3 kg Flow-X/P0: 4 kg Flow-X/R0: 6 kg	
Dimensions	Flow-X/S (h x w x d): 250/9.8 x 142/5.6 x 164/6.5 [mm/inch] Flow-X/P (h x w x d): 238/9.3 x 139/5.5 x 294/11.6 [mm/inch] Flow-X/R (h x w x d): 355/13.9 x 482/19.0 x 135/5.3 [mm/inch]	

NOTES

(1) Total number of analog inputs + HART inputs = 6

(2) Total number of digital inputs + digital outputs + pulse outputs + density inputs + sphere detector inputs = 16

ABOUT SPIRIT IT

We make flow measuring systems better, smarter and more accurate.

A MEMBER OF THE ABB GROUP

Power and productivity for a better world™

Since November 2014, Spirit IT has become a member of the ABB Group. The acquisition adds a new line of high-performance custody transfer solutions to ABB's measurement business unit.

ABB is a leader in power and automation technologies that improve performance while lowering environmental impact. With thousands of experts around the world and high-performance innovations, ABB's team is dedicated to making measurement easy for its customers.

WEB
www.SpiritIT.com

MAIL
sales@SpiritIT.com

EINDHOVEN
The Netherlands

Prof Dr Dorgelolaan 20
5613 AM Eindhoven
The Netherlands

PO Box 2019
5600 CA Eindhoven
The Netherlands

***T** +31 40 23 69 445*

HOUSTON
United States of America

201 Kingwood
Medical Drive
Suite A200
Kingwood TX 77339
United States of
America

***T** +12 81 97 31 740*

KUALA LUMPUR
Asia Pacific/Malaysia

Vista Tower, Suite 13D
Level 13
348 Jalan Tun Razak
50400 Kuala Lumpur
Malaysia

***T** +60 3 2166 5266*