ABB MEASUREMENT & ANALYTICS | RELEASE NOTES

Spirit^{IT} Flow-X
Liquid USC application

Liquid_USC v5.2.0 (January 2024)

The Liquid_USC application version 5.2.0 has been released in January 2024.

The application is compatible with Flow-Xpress versions 3.2.6 and higher and runs on version 2 hardware only.

Three separate application files
The Liquid_USC application is released in three different variations:

- **Liquid_USC Master 5.2.0.fxm**
  Application for single run flow computers and X/P2, X/P3, X/P4 flow computers running one run per module.

- **Liquid_USC Master 5.2.0 2runs.fxm**
  Application for flow computers with 2 runs running in a single module.

- **Liquid_USC Master 5.2.0 4runs.fxm**
  Application for flow computers with up to 4 runs running in a single module. This application contains all functionality except loading, driver database and customer data.

New Features/Changes

This release contains around 100 changes (new features, improvements and bug-fixes). The main modifications are described below.

For a complete list of changes please contact ABB.

New calculations

The following calculations have been added:

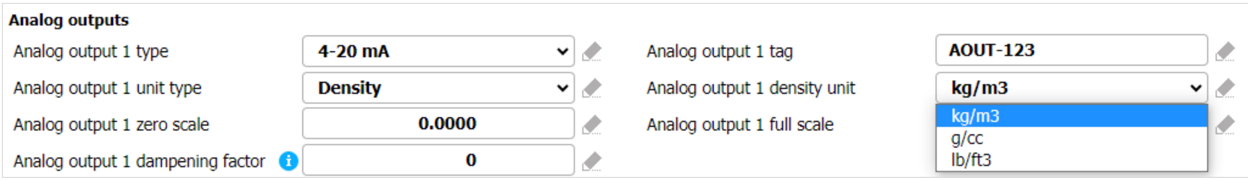
- NIST Liquid Carbon Dioxide density calculation
- API 5.6 Annex D Coriolis meter mass flow pressure effect compensation factor (MBF) calculation

Performance improvements

Several enhancements have been implemented to improve calculation performance, leading to a decrease in cpu load of up to 20%. As a result, responsiveness of the flow computer has been considerably improved, especially when using large, multi-stream applications and / or extensive communication.

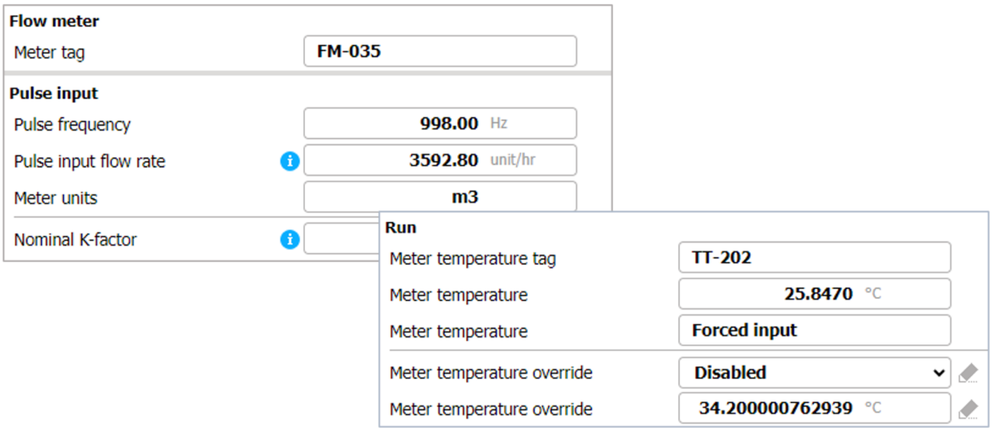
Configurable analog output units

Formerly, analog output configuration was only possible using native application units (e.g. °F for temperature, g/cc for density, bbl/hr for volume flow rate). Now analog outputs can also be configured using non-standard units (similar to the configuration of analog inputs). As the flow computer does the unit conversion, it’s not needed anymore to manually convert the zero and full scale factors.



Meter / transmitter tags shown on all operator displays

Meter tags / transmitter tags have been added to all applicable operator displays for easier interpretation:



Wider definition of ‘technician’ security level

The security level ‘technician’ has been extended so the following tasks can be fully accomplished by a technician:

- I/O configuration, calibration and testing
- Configuration of loading and batching
- Configuration of valve control, flow / pressure control, prove control and sampler control

Enhanced support of flow / pressure control valves

Flow / pressure control functionality has been extended with support of the following inputs from the control valve:

- Local / remote control digital input
- Valve fault digital input
- Valve position feedback analog input

Easily configurable data packets and historical data archives in Modbus lists v20 and v21

Modbus lists v20 and v21 have been provided with configuration tables for easy configuration of custom data packets and historical data archives. Previously it was quite a laborious task to configure these, as for every data point a separate row had to be added to the items table. Form this version on, configuration only requires filling in a table.

Archives

	701		702	
Archive	mod1_Batch		<enter archive name>	
Packet	Point No.	Point count	Point No.	Point count
1	4111	4	0	0
2	4131	8	0	0
3	5150	4	0	
4	5178	4	0	
5	5186	5	0	
6	8501	12	0	
7	8519	1	0	
8	0	0	0	

Custom data packets

	001		201	
Packet	Point No.	Point count	Point No.	Point count
1	4111	4	0	0
2	4131	8	0	0
3	5150	4	0	0
4	5178	4	0	0
5	5186	5	0	0
6	8501	12	0	0
7	8519	1	0	0
8	0	0	0	0

Liquid_USC v5.1.0 (February 2023)

The Liquid_USC application version 5.1.0 has been released in February 2023.

The application is compatible with Flow-Xpress versions 3.2.6 and higher and runs on version 2 hardware only.

Two separate application files
The Liquid_USC application is released in two different variations:

- **Liquid_USC Master 5.1.0.fxm**
  Application for single run flow computers and X/P2, X/P3, X/P4 flow computers running one run per module.

- **Liquid_USC Master 5.1.0 2runs.fxm**
  Application for flow computers with 2 runs running in a single module.

New Features/Changes

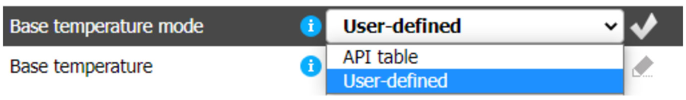
This release contains around 50 changes (new features, improvements and bug-fixes). The main modifications are described below.

For a complete list of changes please contact ABB.

New density conversion method: 'None (density ratio)'

With this option it is possible to calculate the CTPL for products for which no conversion standard is available, using the quotient of measured density and a fixed (configurable) standard density.

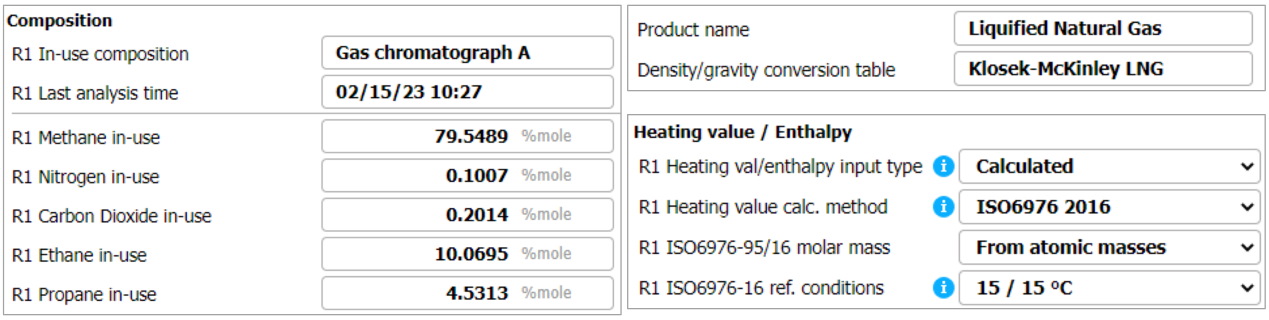
Alternative base temperature
In previous versions, the base temperature was fixed for the selected density conversion method / API table. Now there's an option to use a user defined base temperature independent of the selected density conversion method.



LNG (Klosek-McKinley)

From now on, the Flow-X supports LNG (Liquified Natural Gas) metering. To this end the liquid application has been extended with:

- A composition input for reading the composition from a gas chromatograph
- LNG density calculation according to Klosek-McKinley
- A heating value input, including heating value calculation according to ISO-6976 or GPA-2172
- Energy totalizers



Enthalpy calculation for steam / water according to IAPWS-IF97

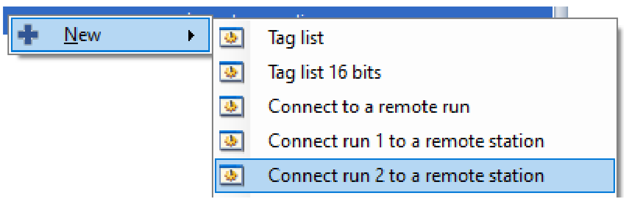
If IAPWS-IF97 is selected as density conversion method for steam or water, the flow computer can be configured to calculate the enthalpy, which is used to maintain energy totalizers.

Auto prove

Logic has been added for automatically starting a prove based on the configured 'prove required flags'. This way, the flow computer can automatically start a prove at a change of flow rate, density, temperature, etc, after a certain time has passed since the last prove, or after the meter has been idle for a certain time. Optionally, this auto prove logic can work together with a PLC that controls the valve lineup.

Use second run of remote flow computer as remote run

In previous versions, a remote run could only be the first (or only) run of a remote flow computer. From this version, it's also possible to connect to the second run.



Prover configuration only needs to be configured on remote prover IO server FC

On flow computers that make use of a remote prover IO server flow computer, the prover configuration only has to be configured on the remote prover IO flow computer. All individual flow computers copy the configuration from the prover IO server flow computer.

All reports enabled by default

It’s not needed anymore to enable applicable reports in Flow-Xpress. Instead all reports are enabled by default and the flow computer decides which reports are to be generated based on the actual configuration.

Liquid_USC v5.0.0 (July 2022)

The Liquid_USC application version 5.0.0 has been released in July 2022.

The application is compatible with Flow-Xpress versions 3.2.0 and higher and runs on version 2 hardware only.

Two separate application files
The Liquid_USC application is released in two different variations:

- **Liquid_USC Master 5.0.0.fxm**
  Application for single run flow computers and X/P2, X/P3, X/P4 flow computers running one run per module.

- **Liquid_USC Master 5.0.0 2runs.fxm**
  Application for flow computers with 2 runs running in a single module.

Both variations include all functionality (including optional loading functionality). No cut-down version without loading functionality has been released.

New Features/Changes

This release contains around 50 changes (new features, improvements and bug-fixes). The main modifications are described below.

For a complete list of changes please contact ABB.

Synchronization between Liquid_USC and Liquid_Metric applications

Starting from this version 5.0.0, the Liquid_Metric and Liquid_USC applications are released together and, except for the different native units, share the same functionality.

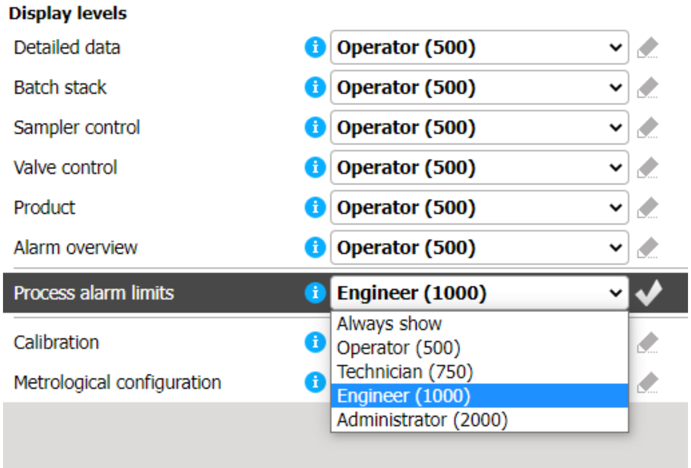
Implementation of API 12.2:2021 rounding rules

In addition to the existing API 12.2:2002/2003 rounding rules for meter tickets and prove reports, the new 2021 standard has been implemented, so now there are 3 options:

- Unrounded
- Rounded in compliance with API 12.2.2:2003 (meter tickets) and API 12.2.3:2002 (prove reports)
- Rounded in compliance with API 12.2:2021 (meter tickets and prove reports)

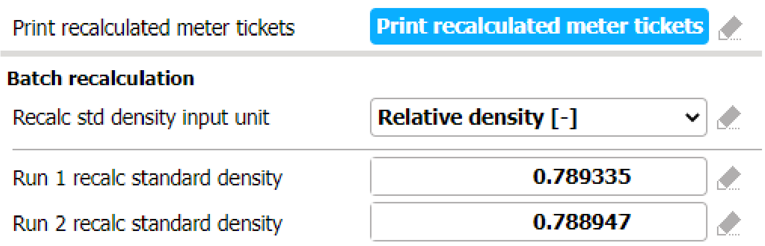
Option to show / hide process alarm limits on operator displays

The process alarm limits are hidden from the (detailed) operator displays if the Process alarm limit display level is configured higher than the Detailed data display level. In that case, the process alarm limits can only be set from the configuration displays. If the Process alarm limit display level is configured lower than or equal to the Detailed data display level, process alarm limits can be set both from the operator displays and configuration displays.



Station recalculation

On systems that consists of a station with multiple runs, it's now possible to enable station recalculation, which allows for entering lab data (BS&W, standard density and/or viscosity) for all separate runs on one single display. Alternatively, if station BS&W, station density and/or station viscosity are enabled, generic lab data can be entered, which is then applied to all runs simultaneously. A click on the 'Print recalculated meter tickets' button generates a recalculated station report as well as recalculated meter tickets for the individual runs.



Retroactively apply standard density and / or BS&W override values

By selecting these options, it is not needed anymore to wait until a batch has been closed and the meter ticket has been generated, before entering the standard density and / or BS&W value for recalculation. The entered values will directly be used on the meter ticket, so it's not needed to create an extra recalculated ticket.

Features inherited from Liquid_Metric

Because the Liquid_Metric and Liquid_USC applications are from now on derived from one and the same source, the Liquid_USC application has inherited a large number of features and improvements that were already available in Liquid_Metric.

These include a.o.:

- Data valid digital input
- Support for Faure Herman 8400 flow meter

- Support for dual transmitters for meter temperature and meter pressure
- Support for venturi nozzles, long radius nozzles and ISA1932 nozzles
- Support for dual densitometers on run and station
- Support for Anton Paar densitometers (time period, analog, Modbus and HART)
- Metric API tables 53/54 and 59/60 (A,B,D,E)
- OIML-R22 calculations for Ethanol / water mixtures
- Asphalt calculations ASTM D4311/4311M-09
- Product selection based on viscosity
- Density correction for Coriolis meters
- Prover FCV control

Liquid_USC v4.0.1 (June 2021)

Bugfix version, includes about 10 fixes, including:

- Compile errors when opening application in older versions of Excel
- Calibration values for differential pressure transmitters were not stored
- Spurious deviation alarms during calibration of differential pressure transmitters
- Sampler pulse output was not working correctly in some cases
- Sometimes, with repeatability limit mode 'Progressive (uncertainty limit)', prove runs that were just out of limits were accepted anyway
- Incorrect density read from Caldon 8-path ultrasonic meter
- Always use rounded Ctpl to calculate standard volume

Liquid_USC v4.0.0 (April 2021)

The Liquid_USC application version 4.0.0 has been released in April 2021.

This application requires Flow-Xpress 3.2.0 or later.

Besides the features and changes described below, this release also contains around 30 minor improvements and bug-fixes.

For a complete list of changes please contact ABB.

Two separate application files
The Liquid_USC application is released in two different variations:

- **Liquid_USC Master 4.0.0.fxm**
  Application for single run flow computers (X/C, X/M, X/P1) or multiple run flow computers (one run per module). Loading functionality is available and can be facultatively used.

- **Liquid_USC Master 4.0.0 v2 2runs.fxm**
  Application for version 2 flow computers with 2 runs (X/C, X/M, X/P1). Loading functionality is available and can be facultatively used.

No 'abbreviated' version (for version 1 multiple run flow computers) has been released.

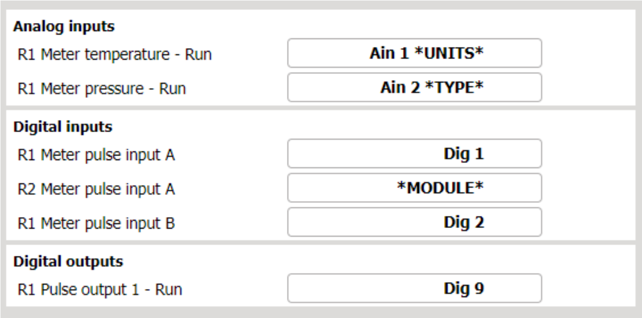
New Features/Changes

New menu structure for improved ease of configuration

Configuration has been made easier, using a more intuitive menu structure. All configuration parameters are now collected within one configuration menu which can be followed top down to configure the complete flow computer. **Furthermore, c**onfiguration displays have been optimised, hiding all non-applicable settings and thus avoiding confusion as much as possible.

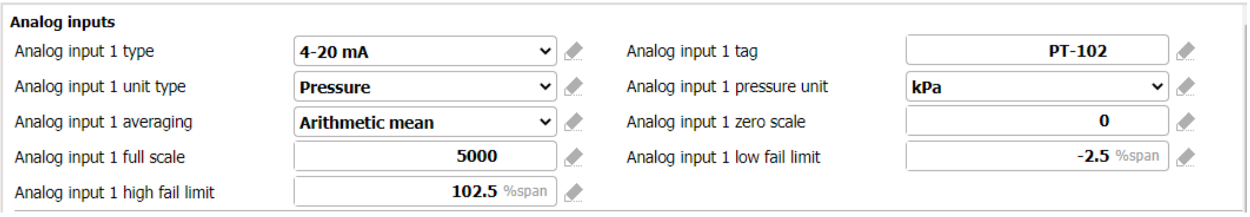
Improved 'IO assignment' display.

The 'IO assignment' display, which provides a complete overview of all assigned IO, now also shows configuration errors like 'incorrect input type', 'incorrect module', 'incorrect unit' etc.



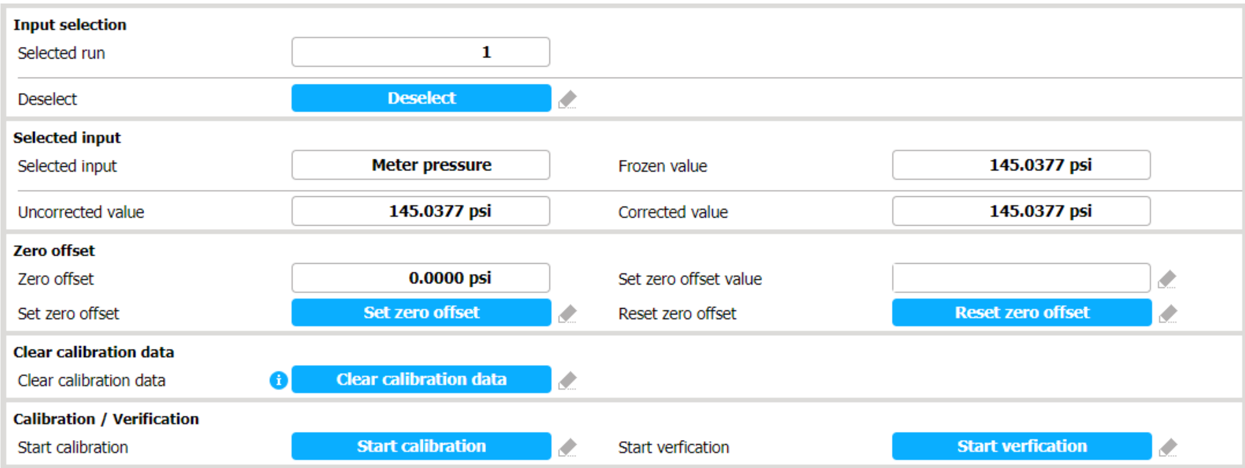
Support of non-standard transmitter units

Now transmitters with non-standard units (like temperature transmitters in kPa, or temperature transmitters in °C) can be easily used, making use of the new capability to convert the input into the right units.



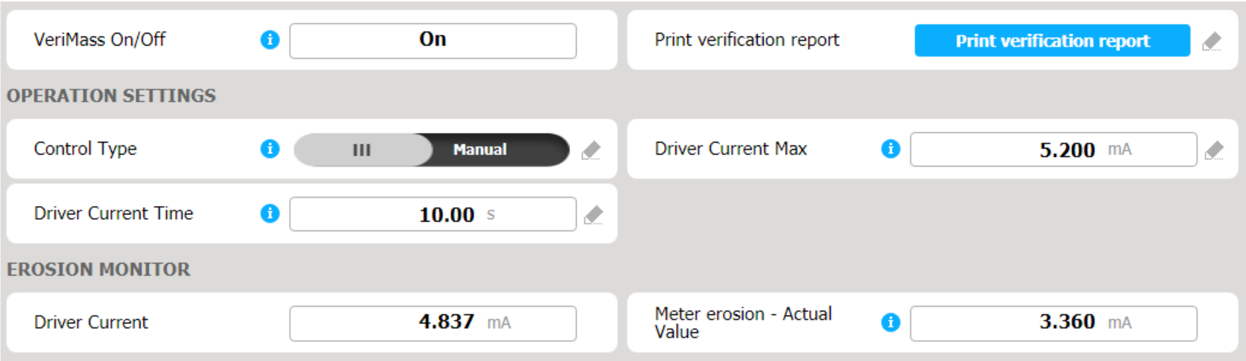
New calibration / verification procedure

The application is provided with a new, extended procedure for calibration, verification and zeroing of process inputs, analog inputs, PT100 inputs, analog outputs and multivariable transmitters. Selection is by 'Meter run' (for process inputs) or by 'IO module' (for IO points). Inputs selected for calibration, verification or zero offset adjustment can be frozen before the calibration is started. Up to 5 calibration and up to 8 verification points are supported. Calibration results are stored at the end of the calibration sequence and a calibration / verification report is generated.



Verification report for ABB Coriolismaster meter

The Flow-X closely works together with the ABB Coriolismaster Verimass technology to safeguard the meter's health and accuracy. The Verimass functionality can be fully controlled from the flow computer display and the flow computer can create a meter verification report that contains detailed diagnostic data on the meter's behaviour.



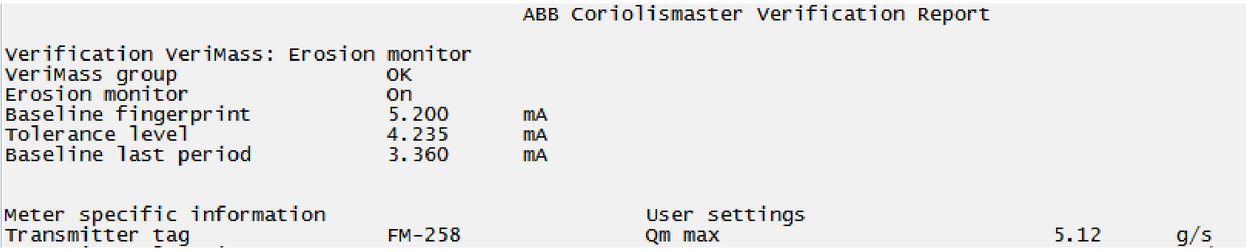


ABB Coriolismaster Verification Report

Verification VeriMass: Erosion monitor

VeriMass group	OK	
Erosion monitor	On	
Baseline fingerprint	5.200	mA
Tolerance level	4.235	mA
Baseline last period	3.360	mA

Meter specific information		User settings		
Transmitter tag	FM-258	Qm max	5.12	g/s

Liquid_USC v3.0.0 (November 2019)

The Liquid_USC application version 3.0.0 has been released in November 2019.

This application requires Flow-Xpress 3.0.0 or later.

Besides the features and changes described below, this release also contains around 150 minor improvements and bug-fixes.

For a complete list of changes please contact ABB.

New Features/Changes

Three separate application files
The Liquid_USC application is released in three different variations:

- **Liquid_USC Master 3.0.0.fxm**
  Full application for single and multiple run flow computers (one run per module)

- **Liquid_USC Master 3.0.0 loading.fxm**
  Full application for single and multiple run flow computers (one run per module) with added loading functionality

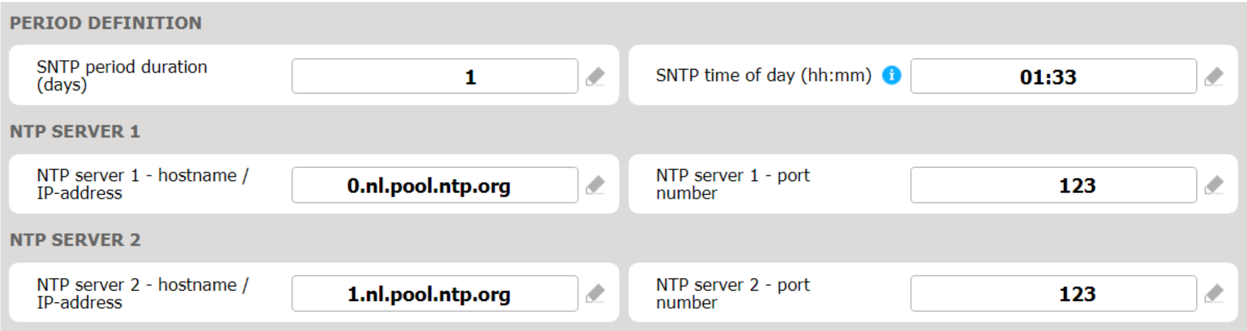
- **Liquid_USC Master 3.0.0 v2 2runs.fxm**
  Application for version 2 flow computers with 2 runs running in one module (X/M or X/C).

Multistream application for version 2 hardware

With the release of version 2 hardware (X/M and X/C), which has much more memory available, it has become possible to control more than one run from one Flow-X module. The new Liquid_USC v2 2runs application supports up to 2 runs on a single X/M or X/C flow computer.

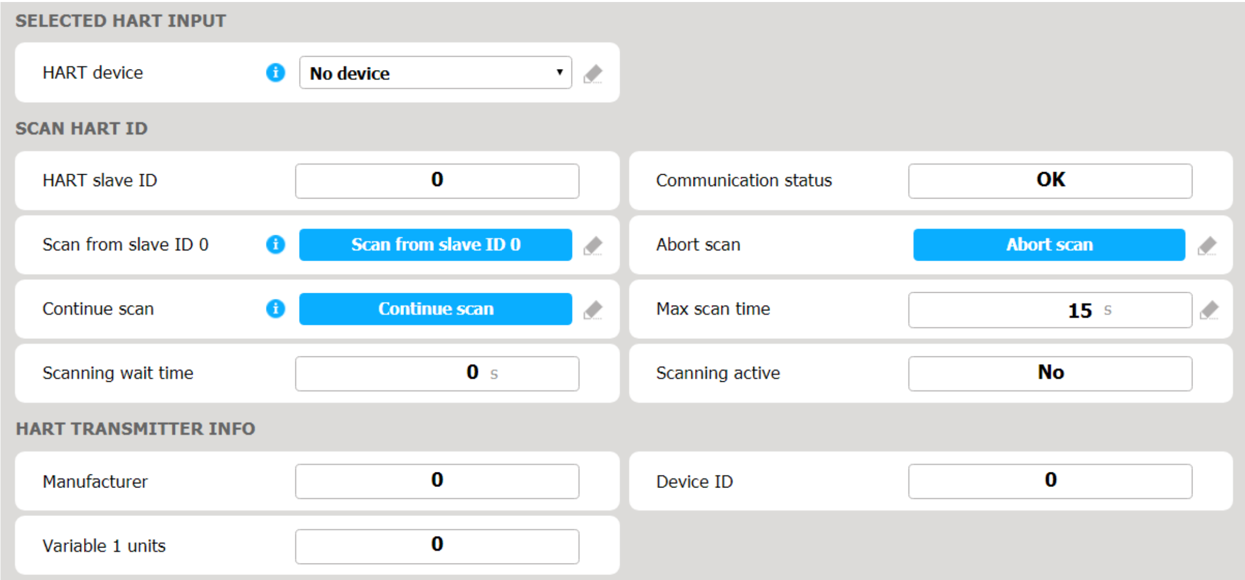
SNTP Time Synchronization

From this application version, the Flow-X supports time synchronization with one or more NTP time servers. Both servers on local networks and on the Internet are supported. It's possible to configure communication with up to four separate NTP servers.



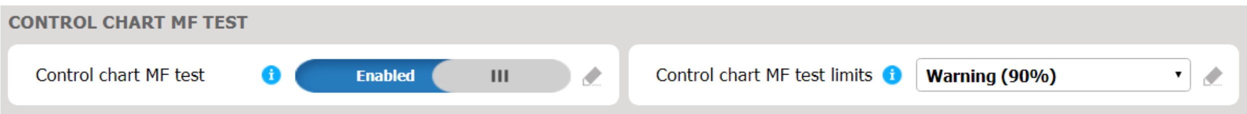
Automatic HART slave ID lookup

With this new feature, finding the configured slave ID of a connected HART transmitter is made very simple. Just tell the flow computer to search for a transmitter, upon which flow computer starts a search on the HART loop and reports back any transmitter it has found.



Prove result test based on API 13.2 Control Chart

For this test the flow computer maintains an API 13.2 control chart with the last 10 proved meter factors. Before accepting a new meter factor, it is added to the chart and a check is done against the selected probability range.



Input frozen alarms for all process inputs

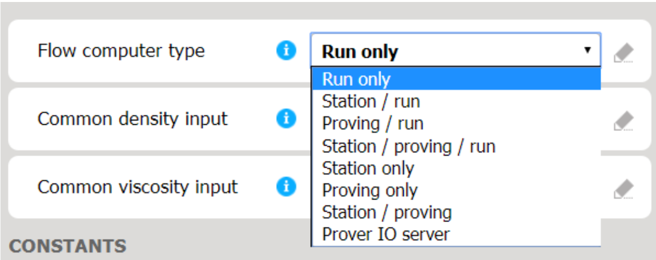
The application now features 'input frozen' alarms for all live process inputs like meter temperature, meter pressure, density, differential pressure etc.

If enabled, the logic checks whether the inputs are varying within a configurable time span. If an input value hasn't changed during this time span, the flow computer creates an 'input frozen' alarm.

Removed FC type 'Remote run'

In the previous application version 2.2.0 a common configuration parameter 'FC type' has been introduced, which enables or disables the run, station and proving functionality of the flow computer. One of the options was 'remote run', which configured the flow computer as a 'remote run' to another flow computer that was serving as station or proving flow computer.

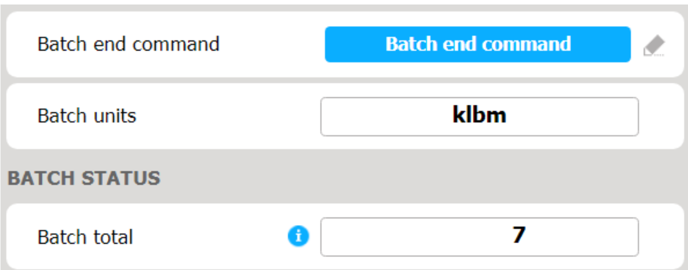
In the new application version 3.0.0 this functionality is still available, but the FC type 'remote run' has been removed from the selection list. Now it suffices to configure the remote run as 'Run only' (and configure the 'Connect to remote station' Modbus list). Please refer to the application manual for more information.



Mass based batching / loading

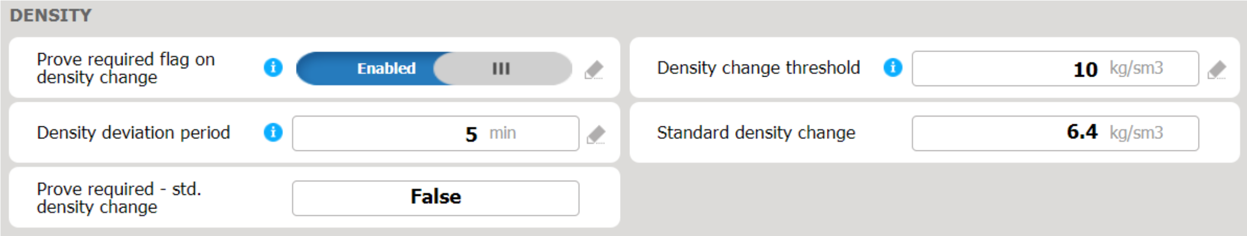
In previous versions of the application, batching was solely done on a volume basis. The batch size was entered as a volume, the batch progress was reported as a volume, the batch size reached alarm was based on volume and the optional auto batch end on batch size reached was acting on volume. Likewise, the optional loading logic was solely based on volume.

From version 3.0.0 it's possible to switch between volume based or mass based batching and loading.



Prove required flags / alarms

From version 3.0.0 it's possible to configure prove required flags that are raised if the actual flowrate, standard density, meter temperature or meter pressure deviates more than a configurable amount from the values at the last prove, or if a configurable maximum flow between proves has been exceeded. These flags can be read by an external system or used in custom logic to create an auto prove command. Alternatively, prove required alarms can be switched on to signal the operator that a prove is required.



Flow computer configuration report
From version Liquid_USC v3.0.0 it is possible to generate a configuration report directly from the flow computer. This report contains an extensive overview of the flow computer's configuration settings.

```
COMMON SETTINGS            Display: Configuration, Overall setup, Common settings

Flow computer type         Standalone run
Station product / batching Disabled
Station density            Disabled
Station BS&W               Disabled
Station viscosity          Disabled
Nr. of products            1
Volume rollover [m3]       1000000000
Mass rollover [tonne]      1000000000
Mass totals type           Mass in vacuum
Dis. totals on inactive    Yes
Flow 0 on inactive         No
Auto reset maint totals    No
Reverse totals             Disabled
Dis. alarms on inactive    Yes
Dis. alarms on maint       Yes
Deviation alm delay [s]    10
MID compliance             Disabled
Allow overrides            Yes
Date format                dd/mm/yy
Time set inhibit [s]       30

CALCULATION SETTINGS       Display: Configuration, Overall setup, Meter ticket

API 12.2.2 Meas tickets    Disabled
Implement MF retroact.     Disabled
API rounding               Disabled
Use last good corr factors Yes
Calc. extrapolation        Yes
Calc. out of range alms    Enabled
Averaging method           Flow weighted on gross volume
Volume totals dec places   3
Mass totals dec places     3
CTL dec places             6
CPL dec places             6
CCF dec places             6

BATCH SETTINGS             Display: Configuration, Overall setup, Common settings

Allow batch end if inact.  Yes
```

Liquid_USC v2.2.0 (April 2016)

The Liquid_USC application version 2.2.0 has been released in April 2016.

Besides the features and changes described below, this release also contains around 200 minor improvements and bug-fixes.

For a complete list of changes please contact ABB.

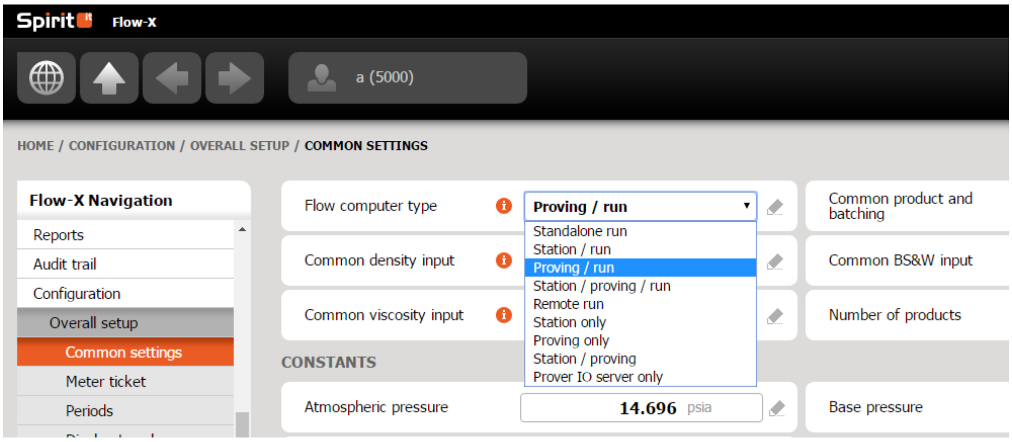
New Features/Changes

Three separate application files
The Liquid_USC application is released in three different variations:

- **Liquid_USC Master 2.2.0.fxm**
  Full application for single run flow computers (X/S, X/P1, X/R1)

- **Liquid_USC Master 2.2.0 loading.fxm**
  Full application for single run flow computers (X/S, X/P1, X/R1) with added loading functionality
- **Liquid_USC Master 2.2.0 abridged.fxm**
  Abridged application for multiple run flow computers (X/P2, X/P3, XP4, X/R2, X/R3, X/R4). This application has the following restrictions: no reverse totals and averages, no hourly and period B totalizers and averages, no station sampler logic only, number of products limited to 8, no support of dP meters (orifice, venturi, etc.).

Parameter 'FC type' for easy configuration of run/station/proving combinations
In previous application versions enabling / disabling of the run, station and proving functionality was done by setting several parameters on a number of different displays. In this new version these parameters have been replaced by one global parameter 'FC type' on the common settings display. Based on this parameter the flow computer enables or disables the run, station and proving functionality and shows the appropriate display screens for configuration and operation. For more information please refer to the application manual.



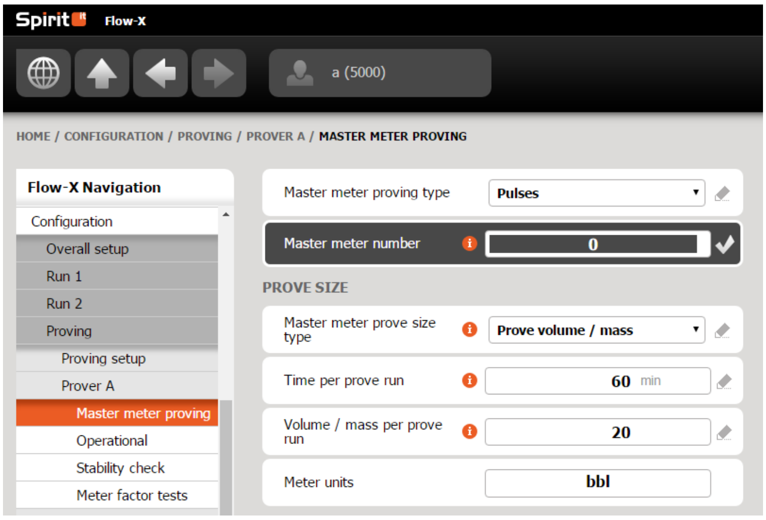
When upgrading a flow computer from a previous application version to this new version, please remember to set this parameter accordingly.

Master meter proving in one module only (with limited functionality)
Formerly for master meter proving at least 2 modules were required: one for the meter under prove and one for the master meter. In this new application version it's also possible to do master meter proving using one single module, albeit with limited functionality:

- Only for master meters that give pulses
- Meter pulse input B is used for the master meter pulses, so only one pulse of the meter under prove can be used (no dual pulse)
- There's no master meter K-factor curve and only one master meter factor curve.
- No meter body correction or viscosity correction on the master meter.

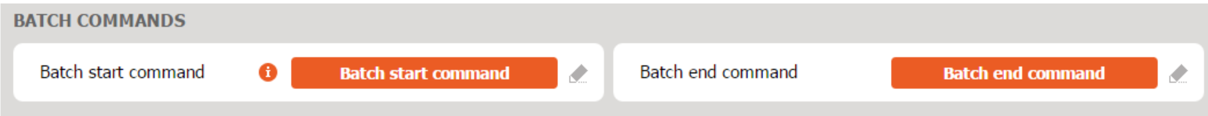
When using separate modules for the master meter and the meter under prove, the master meter is treated as a full-blown meter without any restrictions.

Master meter proving in one module only is enabled by selecting master meter nr. '0'.



Batch start command

In former application versions there was only a **Batch end command**. This command closed the active batch and immediately opened the next batch. Now there's an option to use separate Batch start and Batch end commands. When using this option the next batch is only opened when the Batch open command is activated. Any flow between the closing of the batch and the opening of the next batch is not counted in the batch totals.



Implementation of API MPMS 12.2.2 / 12.2.3 rounding rules

This version includes an new option to apply the API MPMS 12.2.2 rounding rules for meter tickets and the API MPMS 12.2.3 rounding rules for prove reports. When this option is enabled the results of each calculation step are rounded to the number of digitals specified in the API standard, before they are used in the next calculation step.

API MPMS 12.2.2 requires the batch to be recalculated after closing, because the calculations are based on the average batch process values. Therefore, when 'API 12.2.2 Measurement Tickets' compliance is enabled, a batch recalculation is conducted by the flow computer and a **recalculated meter ticket** is printed (instead of the normal meter ticket).

Apply meter factor retroactively

A new option makes it possible to apply a meter factor retroactively. This means that the end-of-batch meter factor is retroactively applied to the whole batch. With this option it is possible to use the meter factor that is obtained from a prove during the execution of a batch to the whole batch, including the part before the prove was conducted.

As this option requires the batch to be recalculated after closing, the results will be printed on the **recalculated meter ticket**.

Average Meter Factor method for pipe and compact proving

API MPMS 12.2.3 allows for two different meter factor calculation methods:

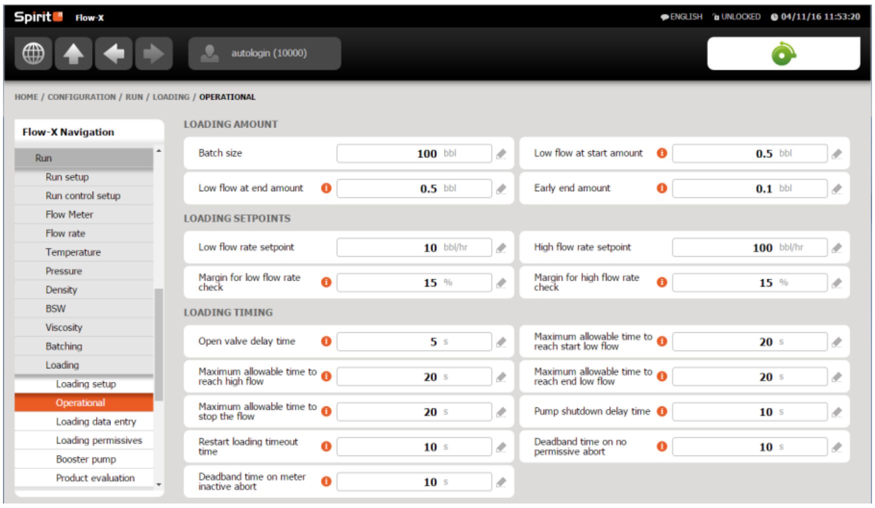
- the **average data method** (calculating the proved meter factor from input data averaged over all prove runs)
- the **average meter factor method** (calculating the proved meter factor as the average of the individually calculated run meter factors)

Formerly for pipe and compact proving the Flow-X only was supporting the average data method. In this application version alternatively the average meter factor method can be selected.

Loading functionality

Liquid_USC Master 2.2.0 loading.fxm contains the following added loading functionality:

- Loading data entry
- Loading sequence with optional low flow start, high flow and optional low flow end stages.
- 4 loading commands (start loading, stop loading, finish loading, emergency shutdown) through user interface and / or digital inputs
- Ground connected permissive, 4 extra digital input permissives
- Data entry permissives, max. BS&W permissive, 3 custom permissives
- Flow control by means of flow control valve or two stage valve
- Control of inlet and outlet valves
- Pump control
- Booster pump control (analog or digital)
- Divert valve control



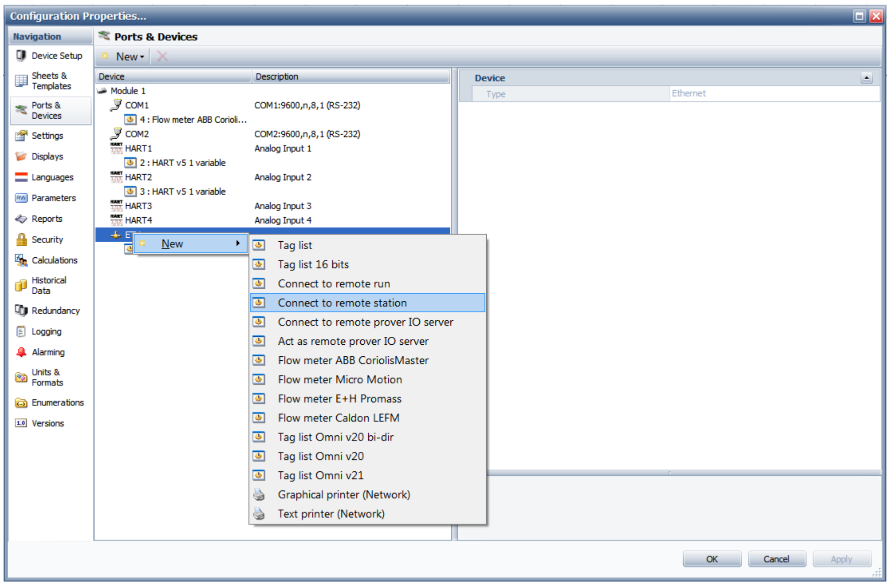
Remote station / remote run configuration

Several flow computers can be set up to operate in a remote station / remote run configuration. In this configuration one flow computer is set up as a remote station that is communicating to a number of (max. 8) remote run flow computers. Each flow computer is running a separate application. Inter-FC communication is done through Modbus TCP/IP. All station functionality is executed by the remote station flow computer, all run functionality is executed by the individual remote run flow computers.

Remote station functionality may include:

- Station totalizing based on the totalizer data from the individual remote runs
- Read data from station transmitters (density, BS&W and/or viscosity transmitters connected to the remote station flow computer) and send the process values to all remote run flow computers
- Prove a remote meter run, using a pipe, compact or small volume prover, and send the resulting meter factor to the remote run flow computer
- Prove a remote meter run against a local or remote master meter and send the resulting meter factor to the remote run flow computer
- Station batch control
- Station flow control
- Station sampler control

Dedicated **connect to remote run** and **connect to remote station** Modbus drivers are available to handle inter-FC communication.


Configuration Properties...
Navigation
Device Setup
Sheets & Templates
Ports & Devices
Settings
Displays
Languages
Parameters
Reports
Security
Calculations
Historical Data
Redundancy
Logging
Alarming
Units & Formats
Enumerations
Versions
Ports & Devices
New
Device
Description
Module 1
COM1
COM1:9600,n,8,1 (RS-232)
4 : Flow meter ABB Corioli...
COM2
COM2:9600,n,8,1 (RS-232)
HART1
Analog Input 1
2 : HART v5 1 variable
HART2
Analog Input 2
3 : HART v5 1 variable
HART3
Analog Input 3
HART4
Analog Input 4
New
Tag list
Tag list 16 bits
Connect to remote run
Connect to remote station
Connect to remote prover IO server
Act as remote prover IO server
Flow meter ABB CoriolisMaster
Flow meter Micro Motion
Flow meter E+H Promass
Flow meter Caldon LEFM
Tag list Omni v20 bi-dir
Tag list Omni v20
Tag list Omni v21
Graphical printer (Network)
Text printer (Network)
Device
Type
Ethernet
OK
Cancel
Apply