

Spirit^{IT} Flow-X

Liquid USC application

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.

PERIOD DEFINITION	
SNTP period duration (days)	1
SNTP time of day (hh:mm)	01:33
NTP SERVER 1	
NTP server 1 - hostname / IP-address	0.nl.pool.ntp.org
NTP server 1 - port number	123
NTP SERVER 2	
NTP server 2 - hostname / IP-address	1.nl.pool.ntp.org
NTP server 2 - port number	123

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.

SELECTED HART INPUT	
HART device	No device
SCAN HART ID	
HART slave ID	0
Communication status	OK
Scan from slave ID 0	Scan from slave ID 0
Abort scan	Abort scan
Continue scan	Continue scan
Max scan time	15 s
Scanning wait time	0 s
Scanning active	No
HART TRANSMITTER INFO	
Manufacturer	0
Device ID	0
Variable 1 units	0

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.

CONTROL CHART MF TEST	
Control chart MF test	Enabled
Control chart MF test limits	Warning (90%)

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.

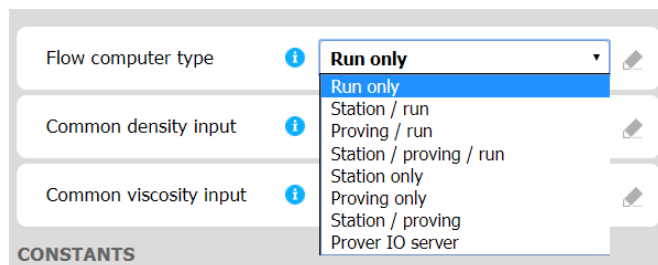
If enabled, the logic checks whether the inputs are varying within a configurable time span. If an input value hasn't changed during this time span, the flow computer creates an 'input frozen' alarm.



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.

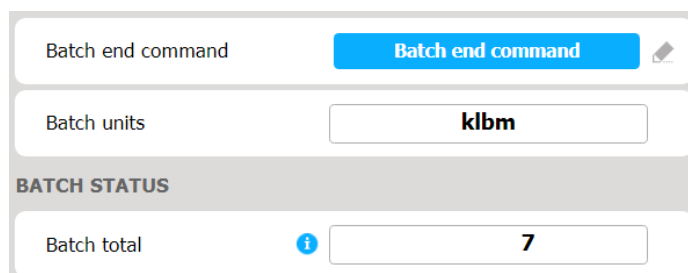
In the new application version 3.0.0 this functionality is still available, but the FC type 'remote run' has been removed from the selection list. Now it suffices to configure the remote run as 'Run only' (and configure the 'Connect to remote station' Modbus list). Please refer to the application manual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

DENSITY

Prove required flag on density change

i

Enabled

III

Density change threshold

i

10 kg/sm3

Density deviation period

i

5 min

Standard density change

6.4 kg/sm3

Prove required - std. density change

False

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**

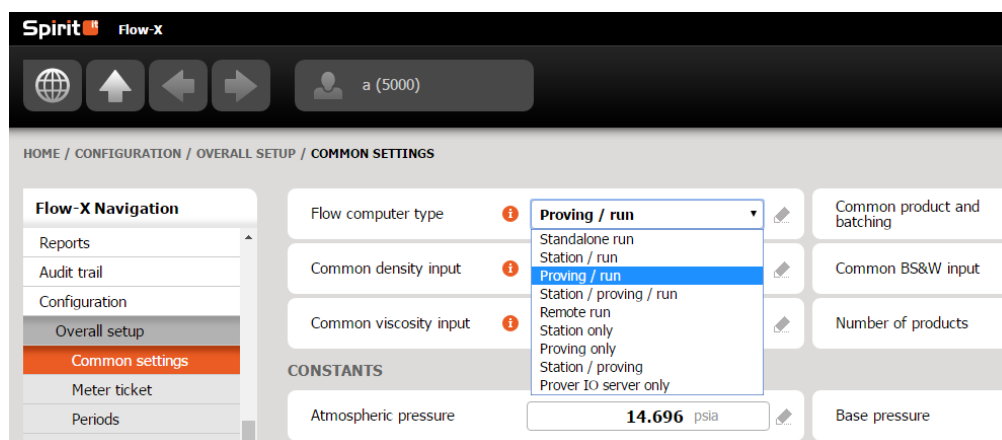
Full application for single run flow computers (X/S, X/P1, X/R1) with added loading functionality

- **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'.

Spirit Flow-X

HOME / CONFIGURATION / PROVING / PROVER A / MASTER METER PROVING

Flow-X Navigation

- Configuration
- Overall setup
- Run 1
- Run 2
- Proving
- Proving setup
- Prover A
- Master meter proving**
- Operational
- Stability check
- Meter factor tests

Master meter proving type: Pulses

Master meter number: 0

PROVE SIZE

Master meter prove size type: Prove volume / mass

Time per prove run: 60 min

Volume / mass per prove run: 20

Meter units: bbl

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.

BATCH COMMANDS

Batch start command **Batch start command**

Batch end command **Batch end command**

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.

