Liquid transfer application
XSeries and XCore applications

Operating the transfer of liquids through the Liquid Transfer unit while providing custody transfer quality liquid measurement.

Measurement made easy

Automation objective
The application provides automatic or manual operation of a Liquid Transfer unit. The main function of this control is to operate the transfer of liquids through the Liquid Transfer unit while providing custody transfer quality liquid measurement. The application also provides electronic historical trending for run tickets that is capable of being collected remotely. The user interface to this control operation includes:

- Touch screen
- Host operation via Cygnet
- Run ticket printing
- Alarm monitoring
- Emergency shutdown control
- Reservoir / well test control
- Trending of run tickets

ABB Totalflow continues to adapt this application to industry needs and can also adapt them to meet your requirements.

IEC-61131 Application setup
The IEC Liquid Transfer Application can be operated through the PCCU interface. After installing the application, it will appear on your Totalflow Tree. Expanding Liquid Transfer will give you the sub-branch(s) for setup and configuration.

In the Liquid Transfer branch you will be able to expand to see the “Setup” branch.

In the Liquid Transfer branch level, the following tabs are available:

- Liquid Transfer Commands
- Batch Setup
- Proving Mode
- Liquid Transfer State
- Current Batch Data
Transfer States
“Current State” can display the following states:

- **Idle – Ready & Waiting State (No alarms)**
- **Running – Permissives available, transferring product.**
- **Completed and Waiting – Load volume reached, Valve closing and waiting for low flow rate to be reached for completion of batch.**
- **Running Diverted – BS&W High setpoint reached & product diverted back to source**
- **Stopped - Waiting – Product diverted, batch stopped and waiting for low flow rate to be reached.**
- **Proving – Check meter mode for proving meter accuracy**
- **Shutdown ESD – Shutdown condition has been met. ESD command or Disable command has been issued. The unit will stop and the current batch will end.**

Transfer Commands
- Start
- Stop Command
- New Log Command
- New Batch Command

Proving Mode
Note: If the system does not use a separate discharge pump, PID control will be given to the charge pump. To specify the usage of a discharge pump, go to Advance Setup and select the proper option for “Discharge Pump Present” parameter. Depending on the selection chosen, either the “Discharge Pump PID” or the “Charge Pump PID” controls will display.

Proving
- Proving Mode
- Batch and Log Commands
- Clear Transfer Log Command
- Set Batch Number Command
- Specify Batch Number

Proving Mode PID control (with Discharge Pump)
Proving Mode PID control (without Discharge Pump)
**Liquid Transfer State**

This tab displays a collection of run time information about the status of the system: Transfer States, System Devices, System Controls, System Shutdown Statuses, and Liquid Transfer Volume Totals. For System Controls, depending on transfer mode and either tank level/volume control or limit switch tank control have been enabled, different system control parameters are shown to reflect what is selected.

In the System Shutdown Status section, the Discharge Pump Output Tolerance Shutdown status will also be shown if the discharge pump operation mode is set to VFD. PID information is also shown for the charge pump and discharge pump if the respective pump operation modes are set to VFD.

**Current Batch Data**

This tab displays data recorded for the current batch. The data is updated during a running batch. When the batch is completed, the information is recorded in the liquid transfer logs.
Setup
In this branch, you will be able to expand to see the Advance Setup and Alarms Setup branches.

On the Setup branch level, the following tabs are available:
• Transfer Type
• S+W Permissive
• Units
• Hardware Registers
• Liquids Registers
• Charge Pump PID (available when charge pump operation mode is set to VFD)
• Discharge Pump PID (available when discharge pump operation mode is set to VFD)
• Spare Input Registers
• Extra Data Registers

Liquid Transfer Mode Type
Transfer mode – Pipeline/Truck Out. Select the desired transfer method. Transfer mode cannot be changed when system is in one of the running states.

Pipeline Transfer Mode
Pipeline transfer is used as an automatic transfer to a pipeline. Pipeline transfer can be controlled by either Start/Stop limit switches (LS100/LS101), or the tank level/volume transmitter (LIT100).

When the start command is issued while the system is in the “Idle” state, a new batch will be created. If the system controls for either the limit switches or level/volume transmitters are met depending on which method of control has been enabled, the unit will start transfer. If neither Start/Stop limit switches (LS100/LS101), nor the tank level/volume transmitter (LIT100) controls are enabled, the system will remain in the “Idle” state when a start command is issued and no new batch created.

A loss of the system control does not end the batch. The system will go to “Stopped - Waiting” state with pumps and valves operation set to stop transfer. When the permissive becomes available, the system will resume transfer in “Running” state.

When Contract Hour is reached, the data will be logged and the batch continues, a new batch will not be created.

If a shutdown condition occurs, ESD have been issued or a Disable command have been issued, the unit will stop and the current batch will end.

Truck Out Transfer Mode
Truck out transfer is used for transferring to a truck. An operator can set a transfer amount or start/stop the Liquid Transfer unit manually.

Truck ground (XS100) can be used as a start control for the Liquid Transfer by enabling it in the hardware register definitions. Start push button (PB101) can be configured as a trigger to start the liquid transfer. Likewise, Stop push button (PB102) can be configured as a trigger to stop the Liquid Transfer system.

When the Start command is issued, the Liquid Transfer unit will start and a new batch will be created. The operator can set the Volume Transfer Setpoint in the Liquid Transfer Commands tab. When the indicated volume reaches the setpoint, transfer will stop. The unit can also be stopped anytime by issuing a stop command or triggering the stop push button. When the unit stops, the batch is ended and data logged to the Liquid Transfer Logs.

A loss of the truck ground does not end the batch. The system will go to “Stopped - Waiting” state with pumps and valves operation set to stop transfer. When the truck grounded signal indicates that the truck is grounded, the system will resume transfer in “Running” state.

If a shutdown condition occurs, ESD have been issued or a Disable command have been issued, the unit will stop and the current batch will end.
**Advanced Setup**

On the Advanced Setup branch level, the following tab is available:

- PID Control
  - Enable VFD on Charge/Discharge Pump Setup
  - Ensure PID App is set in 101 for Charge
  - Ensure PID App is set in 102 for Discharge

- Sampler Control
  - Enable Sampler
  - Sampler Volume Sample Setpoint
  - Sampler Valve Open Timer Setpoint

Sampler control is to coordinate when each sample is to be taken and how long each sample is to be taken. Each time the indicated volume accumulation reaches the volume sample setpoint, the sampler valve (SOV102) will open for the duration specified by the valve open timer setpoint. For example: Activate sample valve open at every 1 barrel of volume for 5 seconds.

**Alarms Setup**

In this branch, you will be able to expand to see the Digital and Analog branches.

**System Alarm**

For each digital or analog input, when the alarm is enabled and when the alarm condition is met, if the alarm condition persist beyond the specified time limit, an alarm will be triggered. An alarm is non-latching, meaning if the alarm condition is cleared, the alarm will clear automatically without any user reset. Alarms conditions are evaluated in any of the system states.

**System Shutdown**

For each digital or analog input, when the shutdown is enabled and when the shutdown condition is met, if the shutdown condition persist beyond the specified time limit, a shutdown will be triggered. If the start-up bypass is enabled for the input, the shutdown condition is ignored for a specified time duration after a batch start. A shutdown is latching, meaning if the shutdown condition is cleared, the shutdown will not clear until a user reset. Shutdown conditions are only evaluated in running system states (Running, Running Diverted, Proving, and Stopped - Waiting).

**Digital**

On the Digital branch level, the following tab is available:

- Alarms (Digital)
- Shutdowns (Digital)

**Alarms (Digital)**

This tab allow users to configure digital alarm conditions for the digital inputs.

**Shutdowns (Digital)**

This tab allow users to configure digital shutdown conditions for the digital inputs.
Analog

On the Analog branch level, the following tab is available:
- Low Alarms (Analog)
- Low Shutdowns (Analog)
- High Alarms (Analog)
- High Shutdowns (Analog)

Low Alarms (Analog)

This tab allow users to configure analog low alarm conditions for the digital inputs.

Low Shutdowns (Analog)

This tab allow users to configure analog low shutdown conditions for the digital inputs.

High Alarms (Analog)

This tab allow users to configure analog high alarm conditions for the digital inputs.

High Shutdowns (Analog)

This tab allow users to configure analog high shutdown conditions for the digital inputs.
**PID Tolerance**

On the PID Tolerance branch level, the following tab is available:

- Alarms (PID Tolerance)
- Shutdowns (PID Tolerance)

**Alarms (PID Tolerance)**

This tab allows users to configure PID tolerance alarm conditions for the PID loops used.

**Shutdowns (PID Tolerance)**

This tab allows users to configure PID tolerance shutdown conditions for the PID loops used.

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**Liquid Transfer logs**

On the Liquid Transfer Logs branch level, the following tab is available:

- Batch Log

**Batch Log**

This tab allows users to view past batch logs. The logs contain final information of previous batches. The data that are in the Current Batch Data tab under Liquid Transfer will be recorded here after the batch is completed or a new log condition is triggered. A new log condition is triggered for Pipeline transfer contract hour and using the Send New Values & Log Command in the Proving Mode tab under Liquid Transfer. A maximum of 50 logs are recorded. If logs exceed 50, the oldest logs will be deleted as new logs are recorded. All logs can be deleted permanently by using the Clear Transfer Log Command in the Liquid Transfer Commands tab under Liquid Transfer.
System logs

On the System Logs branch level, the following tab is available:

- Event Log
- Alarm Log
- Shutdown Log

Event Log

This tab allow users to view Event logs. The event that occurred will be logged with the time of occurrence and event description. If the event is related to a specific batch, the batch number will be displayed, else a 0 is displayed.

Alarm Log

This tab allow users to view Alarms logs. The alarm that occurred will be logged with the time of occurrence and alarm description. The value of the analog or digital input that caused the alarm and the limit of which it has exceeded are also displayed.
Shutdown Log

This tab allows users to view Shutdown logs. The shutdown that occurred will be logged with the time of occurrence and shutdown description. The value of the analog or digital input that caused the shutdown and the limit of which it has exceeded are also displayed.

The IEC Liquid Transfer unit is compatible with the Beijer or Red Lion Touch Screen panel. Beijer or Red Lion Touch Screen panels contain Totalflow Remote Protocol capabilities.

Login

By default, there is an administrator account which gives access to changing alarm settings, system settings, and printing reports. The default account is: admin, password: admin.
Appendix A

Liquid calculations
The Liquid Transfer IEC application described in this document requires that an “API Liquid SU” measurement application is enabled and configured correctly in the ABB Totalflow Flow Computer or RTU. The setup/configuration for all units of measure, product type, as well as source of density and if flowing/observed/base conditions is configured in the “API Liquid SU” application.

The “API Liquid SU” application performs the calculations for liquid product measurement per API standards, such as Ctl, Cpl, Mass, Indicated Volume (IV), Gross Standard Volume (GSV), S&W volume, and Net Standard Volume (NSV) that the Liquid Transfer IEC application requires to compile a batch/run measurement ticket. The “API Liquid SU” application retrieves all required inputs and performs all calculations once per second using full double precision math and accumulates all volume and mass accumulators every second.

The data that the Liquid Transfer IEC application retrieves from the “API Liquid SU” application is currently in single precision format. Variables that will be averaged and logged within the Liquid Transfer IEC application are all flow weighted averages (FWA). The Liquid Transfer IEC application retrieves the Opening Reading values from the “API Liquid SU” application when the IEC batch/run transfer begins and continues to read these values every second to provide a flow rate during the transfer. When the transfer is ended, the Closing Reading values are retrieved from the “API Liquid SU” application and the IV, GSV, S&W volume, and NSV are calculated by simply subtracting the Opening values from the Closing values and logged in the Liquid Transfer IEC application. A copy is also stored in the standard Totalflow Trend System.

Correction factors for products with 100 to -10 API Gravity @60°F (610.6 to 1163.5 kg/m3 @ 60°F or .61120 to 1.16464 Relative Density @ 60°F) are calculated per API 11.1, “Temperature and Pressure Volume Correction Factors for Generalized Crude Oils, Refined Products, and Lubricating Oils”.

Correction factors for Light Hydrocarbons are calculated per API Chapter 11.2.2, “Compressibility Factors for Hydrocarbons: .350-.637 Relative Density (60°F/60°F) and -50°F to 140°F Metering Temperature” for Pressure Correction (Cpi); and API Chapter 11.2.4 “Temperature Correction for the Volume of NGL and LPB, Tables 23E, 24E, 53E, 54E, 59E, and 60E; GPA Technical Publication TP-27” for Temperature Correction (Ctl) for products between .350-.688 Relative Density.

Water volumes correction factors are calculated per API Chapter 11.4.1, “Density of Water and Water Volumetric Correction Factors for Water Calibration of Volumetric Provers”.

Disclaimer
Volumes are calculated per API standards in the “API Liquid SU” application and have been verified against the equations provided in API 11.1 for Crude oil products. The “API Liquid SU” application data logs in the flashes listed below are not in full compliance with MPMS API Chapter 21- Flow Measurement Using Electronic Metering Systems, Section 2- Electronic Liquid Volume Measurement Using Positive Displacement and Turbine Meters” (API 21.2).

Averages in the following flashes (or earlier part numbers) are not Flow Weighted but are linear averages in the “API Liquid SU” app... the IEC app log averages are Flow Weighted. All “API Liquid SU” measurement application logs in later versions of flashes that those listed below are Flow Weighted and API 21.2 compliant.

XFC – 2102861-059, 2104339-024, 2105151-001, 2105152-001
XRC – 2103132-059, 2104340-024, 2105153-001, 2105154-001
µFLO – 2104497-019, 2104498-019
XFC EX – 2104158-032, 2104159-032

The Liquid Transfer IEC application logs the variables listed in API 21.2 as required variables for a Quantity Transaction Record (QTR) as well as those shown in examples of meter tickets in API 12.2 “Calculations of Liquid Petroleum Quantities Measured by Turbine or Displacement Meters”. However, several of the logged variables are currently “Informational” only and not used in the calculation of GSV or NSV.

Currently, none of the Liquid Transfer IEC log records specify the units of measure and in the case of Density, the source or measured condition is not specified. The user should be aware of these limits and use the application as it meets their respective needs and or requirements. Specifics regarding each logged variable are listed in Appendix B.
The IEC Liquid Transfer application is user configurable and it is critical that the user verifies that all registers are setup correctly.

1. The user must configure the “API Liquid SU” application for the correct product type to be measured and verify that all units of measurement are per the user’s requirements.

2. The user must configure the “Setup; Liquid Registers” in the IEC Liquid Transfer application to access the appropriate registers from the “API Liquid SU” application. These are outlined in the Blue Box shown below. Each item in the outlined Blue Box must have the correct register of the appropriate “API Liquid SU” application entered. **It is the user’s responsibility to verify that these are correctly configured.** Changes to these settings are not logged in any event log. **These registers MUST be correct for the IEC Liquid Transfer to provide the correct information to the Batch/Run Tickets.** The “Units” that are shown in the Yellow Box are informational only and do not change the Values shown to the left nor are the “Units” shown in the Batch/Run Ticket.
Appendix B

Batch/Run ticket items
The batch or run ticket contains final information of previous batches or runs. Data in the “Batch Logs” tab under Liquid Transfer will be recorded when the batch/run is completed or a new log condition is triggered. A new log condition is triggered for Pipeline transfer at contract hour and/or by using the Send New Values and Log command in the Proving mode tab under Liquid Transfer. A max of 50 logs are recorded within the IEC application. Data from these logs is retrievable by “register access” only. If the logs exceed 50 then the oldest logs will be deleted as new logs are recorded. All logs can be deleted permanently by using the Clear Transfer Log Command in the Liquid Transfer command tab under Liquid Transfer. The IEC application logs are not retrievable using PCCU or WinCCU. Correction factors for products with 100 to -10 API Gravity@60°F (610.6 to 1163.5 kg/m3 @ 60°F or .61120 to 1.16464 Relative Density @ 60°F) are calculated per API 11.1, “Temperature and Pressure Volume Correction Factors for Generalized Crude Oils, Refined Products, and Lubricating Oils”.

Batch/Run ticket definitions

IEC Liquid Transfer application logs

<table>
<thead>
<tr>
<th>Batch/Run Ticket Item</th>
<th>Description</th>
<th>User Configurable</th>
<th>Data Type</th>
<th>Batch/Run Ticket Record #1 Register See Note (1)</th>
<th>Batch/Run Ticket Record #2 Register See Note (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch Number</td>
<td>Unique batch or run ticket number</td>
<td>Starting number is configurable. Each following batch will increment</td>
<td>Int 32</td>
<td>91.6.1000</td>
<td>91.6.1015</td>
</tr>
<tr>
<td>Transfer type</td>
<td>Type choices = Truck Out or Pipeline</td>
<td>Yes</td>
<td>Int 32</td>
<td>91.6.1001</td>
<td>91.6.1016</td>
</tr>
<tr>
<td>Meter ID</td>
<td>Numeric Only. User enterable and is specific to the IEC Liquid Transfer app. This is NOT the Meter ID that may be assigned to the “API Liquid SU” application</td>
<td>Yes</td>
<td>Int 32</td>
<td>91.6.1002</td>
<td>91.6.1017</td>
</tr>
<tr>
<td>Product ID</td>
<td>Numeric Only. It is vital that the user correctly identifies the product using only the Selections that are in the “API Liquid SU” app and that it is the same</td>
<td>Yes</td>
<td>Int 32</td>
<td>91.6.1003</td>
<td>91.6.1018</td>
</tr>
<tr>
<td>Company ID</td>
<td>Numeric Only. entered by the user in the Liquid Transfer IEC application</td>
<td>Yes</td>
<td>Int 32</td>
<td>91.6.1004</td>
<td>91.6.1019</td>
</tr>
<tr>
<td>Truck ID</td>
<td>Numeric Only entered by the user in the Liquid Transfer IEC application</td>
<td>Yes</td>
<td>Int 32</td>
<td>91.6.1005</td>
<td>91.6.1020</td>
</tr>
<tr>
<td>Observed Temperature</td>
<td>This is a user entered value in the Liquid Transfer IEC application and is NOT used in any calculations. Informational ONLY at this time.</td>
<td>Yes</td>
<td>32 Bit Flt</td>
<td>91.9.1000</td>
<td>91.9.1015</td>
</tr>
<tr>
<td>Observed Density</td>
<td>This is a user entered value in the Liquid Transfer IEC application and is NOT used in any calculations. Informational ONLY at this time.</td>
<td>Yes</td>
<td>32 Bit Flt</td>
<td>91.9.1001</td>
<td>91.9.1016</td>
</tr>
<tr>
<td>Observed Pressure</td>
<td>This is a user entered value in the Liquid Transfer IEC application and is NOT used in any calculations. Informational ONLY at this time.</td>
<td>Yes</td>
<td>32 Bit Flt</td>
<td>91.9.1014</td>
<td>91.9.1029</td>
</tr>
<tr>
<td>Start Time</td>
<td>Julian time or # of seconds since 1/1/1970</td>
<td>No</td>
<td>Int 32</td>
<td>91.6.1006</td>
<td>91.6.1021</td>
</tr>
<tr>
<td>Stop Time</td>
<td>Julian time or # of seconds since 1/1/1970</td>
<td>No</td>
<td>Int 32</td>
<td>91.6.1007</td>
<td>91.6.1022</td>
</tr>
<tr>
<td>Closing Indicated Volume Reading</td>
<td>The register is user configurable in the IEC Liquid Transfer app “Setup” and must be verified by the user as being correct. It should be the register for the Indicated Volume accumulator in the “API Liquid SU” app and is a snapshot of the accumulator at the end of the ticket</td>
<td>Yes; only the register from which the values are read</td>
<td>91.9.1002</td>
<td>91.9.1017</td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
<td>Verification Required</td>
<td>Data Type</td>
<td>IEC Code 1</td>
<td>IEC Code 2</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------</td>
<td>-------------------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>Open Indicated</td>
<td>The register is user configurable in the IEC Liquid Transfer app “Setup” and must be verified by the user as being correct. It should be the register for the Indicated Volume accumulator in the “API Liquid SU” app and is a snapshot of the accumulator at the beginning of the ticket.</td>
<td>Yes; only the register from which the values are read</td>
<td>32 Bit Flt</td>
<td>91.9.1003</td>
<td>91.9.1018</td>
</tr>
<tr>
<td>Volume Reading</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indicated Volume</td>
<td>Difference between the Closing Volume Reading and the Opening Volume Reading</td>
<td>No. The accumulator register is configurable</td>
<td>32 Bit Flt</td>
<td>91.9.1004</td>
<td>91.9.1019</td>
</tr>
<tr>
<td>Flow Rate</td>
<td>The register where this data is obtained is user configurable in the IEC Liquid Transfer app “Setup” as the Net Standard Flow rate.</td>
<td>Yes; only the register from which the values are read</td>
<td>32 Bit Flt</td>
<td>91.10.1000</td>
<td>91.10.1015</td>
</tr>
<tr>
<td>Pressure</td>
<td>The register where this data is obtained is user configurable in the IEC Liquid Transfer app Setup. User must verify that it is the pressure used in the “API Liquid SU” app. Flow Weighted Average is logged. No units are shown.</td>
<td>Yes; only the register from which the values are read</td>
<td>32 Bit Flt</td>
<td>91.10.1001</td>
<td>91.10.1016</td>
</tr>
<tr>
<td>Temperature</td>
<td>The register where this data is obtained is user configurable in the IEC Liquid Transfer app Setup. User must verify that it is the temperature used in the “API Liquid SU” app. Flow Weighted Average is logged. No units are shown.</td>
<td>Yes; only the register from which the values are read</td>
<td>32 Bit Flt</td>
<td>91.10.1002</td>
<td>91.10.1017</td>
</tr>
<tr>
<td>Density</td>
<td>The register where this data is obtained is user configurable in the IEC Liquid Transfer app Setup. User must verify that it is the density used in the “API Liquid SU” app. Flow Weighted Average is logged. No units are shown. The log record does not identify if this value is at base conditions or flowing conditions.</td>
<td>Yes; only the register from which the value is read. User must select a different register depending on Base or Flowing conditions</td>
<td>32 Bit Flt</td>
<td>91.10.1003</td>
<td>91.10.1018</td>
</tr>
<tr>
<td>Meter Factor</td>
<td>The register is user configurable in the IEC Liquid Transfer app Setup. User must verify that it is the Meter Factor used in the “API Liquid SU” app. Flow Weighted Average is logged.</td>
<td>Yes; only the register from which the values are read</td>
<td>32 Bit Flt</td>
<td>91.10.1004</td>
<td>91.10.1019</td>
</tr>
<tr>
<td>Press Correction</td>
<td>The register is user configurable in the IEC Liquid Transfer app Setup. User must verify that it is the Cpl used in the “API Liquid SU” app. Flow Weighted Average is logged.</td>
<td>Yes; only the register from which the values are read</td>
<td>32 Bit Flt</td>
<td>91.10.1005</td>
<td>91.10.1020</td>
</tr>
<tr>
<td>Factor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temp Correction</td>
<td>The register where is user configurable in the IEC Liquid Transfer app Setup. User must verify that it is the Ctl used in the “API Liquid SU” app. Flow Weighted Average is logged.</td>
<td>Yes; only the register from which the values are read</td>
<td>32 Bit Flt</td>
<td>91.10.1006</td>
<td>91.10.1021</td>
</tr>
</tbody>
</table>
### S&W%
The register is user configurable in the IEC Liquid Transfer app Setup. User must verify that it is the S&W% used in the “API Liquid SU” app. Flow Weighted Average is logged. Yes; only the register from which the values are read
| 32 Bit Flt | 91.10.1007 | 91.10.1022 |

### Density Meter Factor
Not currently implemented in calculations
| 91.10.1008 | 91.10.1023 |

### Net Standard Volume
The register is user configurable in the IEC Liquid Transfer app Setup. User must verify that it is the register for Net Standard Volume Accumulator used in the “API Liquid SU” app. The volume is the difference between a snapshot of this register at the beginning of a ticket and a snapshot of this register at the end of a ticket.
No. The accumulator register is configurable
| 32 Bit Flt | 91.9.1005 | 91.9.1020 |

### S&W Volume
The register is user configurable in the IEC Liquid Transfer app Setup. User must verify that it is the register for Sediment and Water Volume Accumulator used in the “API Liquid SU” app. The volume is the difference between a snapshot of this register at the beginning of a ticket and a snapshot of this register at the end of a ticket.
No. The accumulator register is configurable
| 32 Bit Flt | 91.9.1006 | 91.9.1021 |

### Gross Volume
The register is user configurable in the IEC Liquid Transfer app Setup. User must verify that it is the register for Gross Standard Volume Accumulator used in the “API Liquid SU” app. The volume is the difference between a snapshot of this register at the beginning of a ticket and a snapshot of this register at the end of a ticket.
No. The accumulator register is configurable
| 32 Bit Flt | 91.9.1007 | 91.9.1022 |

### Mass
The register is user configurable in the IEC Liquid Transfer app Setup. User must verify that it is the register for Mass Accumulator used in the “API Liquid SU” app. The volume is the difference between a snapshot of this register at the beginning of a ticket and a snapshot of this register at the end of a ticket.
No. The accumulator register is configurable
| 32 Bit Flt | 91.9.1008 | 91.9.1023 |

### Extra Data 1
User Definable: Yes
| 32 Bit Flt | 91.9.1009 | 91.9.1024 |

### Extra Data 2
User Definable: Yes
| 32 Bit Flt | 91.9.1010 | 91.9.1025 |

### Extra Data 3
User Definable: Yes
| 32 Bit Flt | 91.9.1011 | 91.9.1026 |

### Extra Data 4
User Definable: Yes
| 32 Bit Flt | 91.9.1012 | 91.9.1027 |

### Extra Data 5
User Definable: Yes
| 32 Bit Flt | 91.9.1013 | 91.9.1028 |

### Extra Data 6
User Definable: Yes
| Int 32 | 91.6.1008 | 91.6.1023 |

### Extra Data 7
User Definable: Yes
| Int 32 | 91.6.1009 | 91.6.1024 |

### Extra Data 8
User Definable: Yes
| Int 32 | 91.6.1010 | 91.6.1025 |

### Extra Data 9
User Definable: Yes
| Int 32 | 91.6.1011 | 91.6.1026 |

### Extra Data 10
User Definable: Yes
| Int 32 | 91.6.1012 | 91.6.1027 |

[Note 1] Batch/Run ticket records increment by 15 Register Addresses for each batch/run ticket.
[Note 2] Product ID selection is vital to correctly identifying the product using only the Selections that are in the “API Liquid SU” app and that the selection is the same.
**Product** | **ID (Enumerated List)**
--- | ---
Crude Oil | 0
Fuel Oil | 1
Jet Fuel | 2
Transition/Diesel | 3
Gasoline | 4
Lube Oil | 5
Special Application | 6
Water | 7
Light Hydros | 8

**Standard Trend Logs**
A Standard ABB Totalflow Trend is also available which has a copy of each the Batch/Run Tickets that were generated by the IEC Liquid Transfer application. There are two additional items logged in the standard ABB Totalflow Trend.

1. Time stamp of when the data was transferred to the Trend from IEC
2. The sequence number of the Batch or Run ticket row in the Trend. This trend can be collected with PCCU, WinCCU or the TCI for data to 3rd party host systems

The order in which the data is logged in the standard Trend system is in a different order than the IEC Liquid Transfer Batch/Run ticket.

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**Data Path**

**HMI**
User can read information from the IEC app and make control changes. Some calculation parameters are changeable.

**IEC Liquid Transfer Application**
- User enters the correct registers from the “API Liquid SU” app so the Batch/Run ticket will know where to retrieve its data. Only values will be retrieved. **Units of measure are NOT retrieved.**
- Flow weighted averaging for pressure, temperature, density, and correction factors are performed by this application
- IEC app creates a Batch/Run ticket that can be polled from the HMI or a host system using individual “register access”.

**Trend Application**
- Batch/Run Tickets are copied to standard ABB Trend System. Can be collected with PCCU, WinCCU or TCI
- User can change Meter Factor, User Entered Density Value, and S&W %
- Calculated factors and Accumulator values (no units of measure)

**API Liquid SU Application**
- Configuration for the correct product type and all factors, units of measure, etc. must be setup correctly
- Performs ALL of the calculations for volumes, mass, Ctl and Cpl and density