# Fusion4 SSC-B
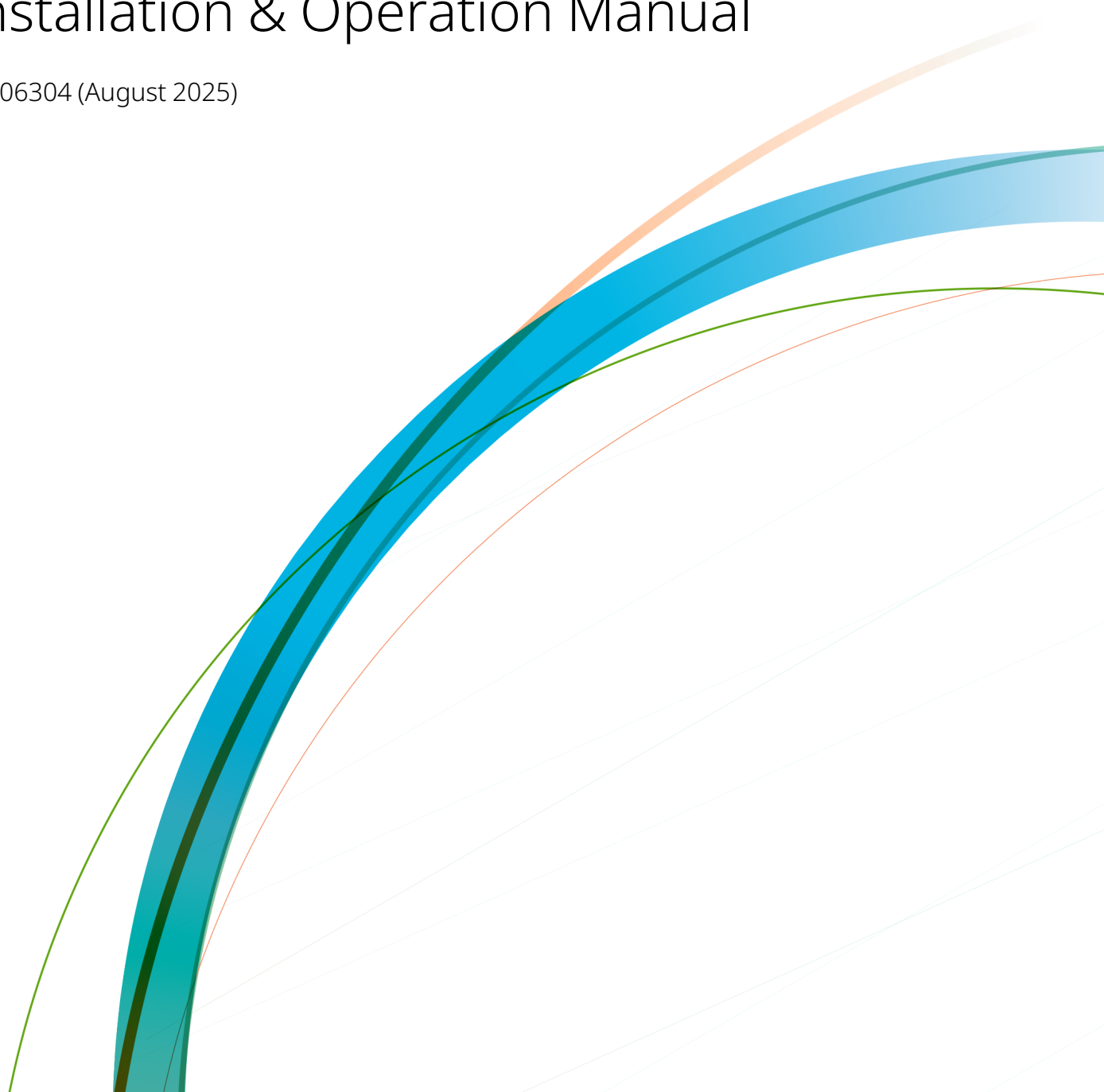
## Installation & Operation Manual

MN06304 (August 2025)

# Contents

# 1  General

## 1.1  Product Introduction

The Fusion4 Single Stream Controller-Blending, further in this manual referred to as SSC-B, is a hazardous area, intelligent blend controller, utilising state-of-the-art microprocessor technology for high-accuracy blending applications.

The MID-compliant SSC-B is designed to control one single blend stream. It can operate in any product transfer application, such as road tanker loading, rail off-loading or pipeline transfer, where multiple products need to be accurately combined.

The basic principle of operation (see the figure below) is achieved by the SSC-B controller monitoring the flow of the wild stream, and using this flow rate to accurately pace the flow of the blend stream to a pre- determined target blend percentage or ratio.

The pacing of the blend stream is achieved through digitally controlled solenoid valves that modulate the position of a variable control valve in the blend stream.

Figure 1-1: Basic SSC-B principle of operation
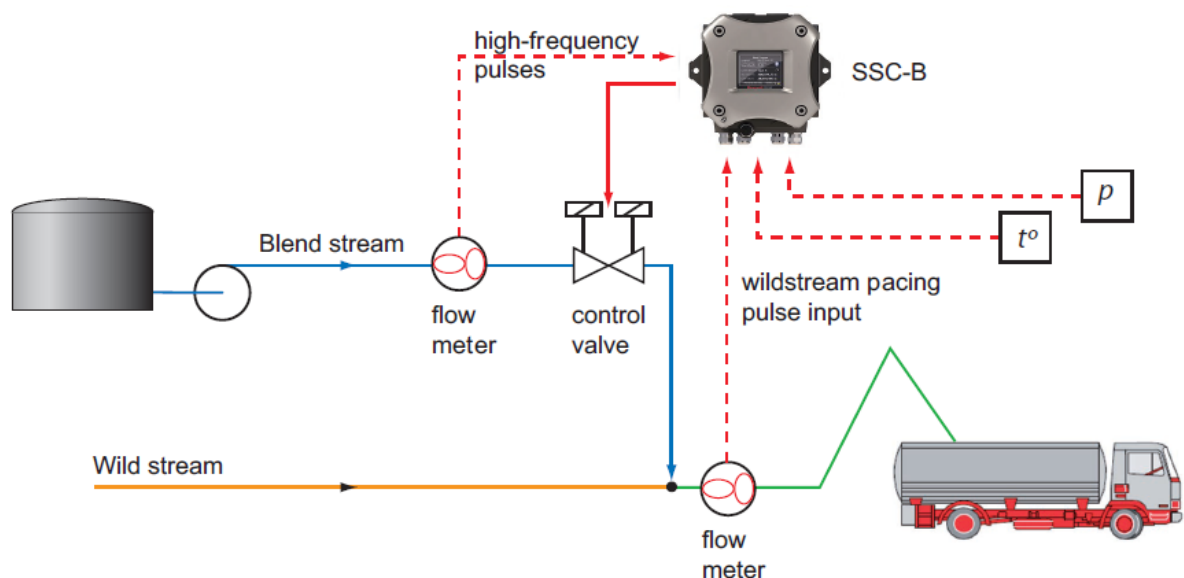
## 1.2 Functionality Overview

| Functionality | SSC-B |
|---|---|
| Common hardware platform (Additive & Blending) | √ |
| Common firmware version (Additive & Blending) | √ |
| Global Ex approvals (ATEX, FM, CSA, IECEx) | √ |
| ASTM-compliant temperature and pressure compensation | √ |
| Expandable I/O hardware | √ |
| Firmware in-situ upgradeable | √ |
| Fully configurable I/O binding | √ |
| Diagnostics dashboard | √ |
| Configuration upload/download | √ |
| Transaction and calibration logs upload/download | √ |
| Interface to Fusion4 Portal (printing, and so on) | √ |
| Multi language display | 11 |
| Free programmable language pack | 1 |
| Transaction storage | 10,000 |
| Alarm log records | 128 |
| Calibration log records | 100 |
| Comms ports | 2 |
| Digital inputs | 13 |
| Digital outputs | 7 |
| Analog I/O and RTDs | 3 |

## 1.3 Target Group for this Manual

This manual is intended for engineers and technicians, who are assigned to install, commission and service the SSC-B.

Figure 1-2: SSC-B in Fusion4 blend stream control arrangement

# 2  Safety

## 2.1  Safety Conventions

### 2.1.1  Warnings

The following warning formatting used in the manual recommends your attention to prevent personal injuries or dangerous situations.

> WARNING:  General warning. It is always explained by text.

### 2.1.2  Cautions

The following caution formatting and symbols used in the manual recommends your attention to prevent damages to the equipment.

> CAUTION:  General caution information.

> CAUTION:  Electrostatic discharge (ESD) sensitive device.

## 2.2  Safety Instructions for the SSC

### 2.2.1  General

> WARNING:  One must strictly follow the safety instructions mentioned in this manual as well as the safety instructions shipped with the device for installation, commissioning, operation, and maintenance, to ensure safe operation.

The SSC may be located in explosion safety areas:

| USA (FM) and Canada (CSA) | | Canada (CSA) | | Rest of the World (ATEX / IECEx) | |
|---|---|---|---|---|---|
| Safety level | Remarks | Safety level | Remarks | Safety level | Remarks |
| Class 1, Division 1 | WARNING:  Do NOT open when an explosive atmosphere may be present.<br><br>CAUTION:  Seal conduit in 18 inches. | Zone 1 | WARNING:  Do NOT open when an explosive atmosphere may be present.<br><br>CAUTION:  Seal conduit in 18 inches. | Zone 1 | WARNING:  Do NOT open when an explosive atmosphere may be present. |
| Class 1, Division 2 | WARNING:  Do NOT open when an explosive atmosphere may be present.<br><br>CAUTION:  Seal conduit in 18 inches. | Zone 2 | WARNING:  Do NOT open when an explosive atmosphere may be present.<br><br>CAUTION:  Seal conduit in 18 inches. | Zone 2 | WARNING:  Do NOT open when an explosive atmosphere may be present. |
| Safe Area | - | Safe Zone | - | Safe Zone | - |

## 2.2.1.1  EC Declaration of Conformity (for EU)

Refer to the EC declaration of conformity shipped with the device.

## 2.2.1.2  Control Drawings for FM & CSA

Refer to the control drawings shipped with the device.

### 2.2.1.3  Users

The mechanical and electrical installation must be carried out only by trained personnel with knowledge of the requirements for installation of explosion-proof equipment in hazardous areas.

The entire installation procedure must be carried out in accordance with national, local, and company regulations.

The entire electrical installation shall be carried out in accordance with the national requirements for electrical equipment to be installed in hazardous areas.

> NOTE:  See EN IEC 60079-14 or NEC (NFPA70).

### 2.2.1.4  Additional Information

If you require additional information, contact Guidant or its representative. See the back cover of this manual.

### 2.2.1.5  Environmental Conditions

Observe the environmental conditions regarding the allowable operating temperature (-40°C ... +65°C/ -40ºF ... +149ºF) and relative humidity (RH 5 ... 95%, non-condensing) function normally up to 2000 meters.

## 2.2.2  Personal Safety

> WARNING:  In hazardous areas it is compulsory to use personal protection and safety gear.
>
> This can be: Safety helmet, fire-resistive overall, safety shoes, safety glasses, working gloves, LEL- meter.
>
> Pay attention to the kind of product involved. If there is any danger for your health, wear a gas mask and take all necessary precautions.
>
> WARNING:  Take appropriate precautions when chemical or toxic product vapors are present (compressed air, chemical protection suit, detection equipment).

### 2.2.2.1  General

#### 2.2.2.1.1  Repairs and Maintenance

> **WARNING:**  Any repairs or parts replacements must be carried out by the manufacturer or its appointed repair agent!

#### 2.2.2.1.2  Opening of the Device

> **WARNING:**  It is forbidden to open the device in an explosive hazardous environment, unless otherwise stated on the safety label.
>
> **WARNING:**  Treat the flange surface of the cover and the housing with care.
>
> Keep the flange surface free of dirt.
>
> The O-ring must be present and undamaged.

#### 2.2.2.1.3  Tools

> **WARNING:**  Use non-sparking tools and explosion-proof testers. Use suitable explosion-proof tools (for example, testing devices)!

#### 2.2.2.1.4  Working Environment

> **WARNING:**  Avoid generation of static electricity. Make sure no explosive gas mixtures are built up in the working area.

#### 2.2.2.1.5  Required Skills

> **WARNING:**  The technician must have technical skills to be able to safely install the equipment. The technician also must be trained to work in accordance with the national requirements for electrical equipment in hazardous areas.

# 2.2.3  Electrical

## 2.2.3.1  Safety Standards

- The entire electrical installation must be in accordance with the Inter- national Standard EN IEC 60079-14 for electrical equipment in hazardous areas or with NEC (NFPA70) requirements.

- The stopping plugs, cable glands and reducers must be installed in accordance with appropriate IP requirements

- Use suitable flameproof (Ex d) compound barrier glands (due > 2 litres IIB) for the SSC.

- Improper installation of cable glands, conduits or stopping plugs invalidates the Ex approval of this device.

## 2.2.3.2  Grounding

> WARNING:  Make sure the housing of the device is properly connected to ground reference! See the figure below.
>
> Make sure the electrical resistance of the ground connections is below the maximum prescribed by local requirements!

Figure 2-1: The grounding connections of the SSC-B
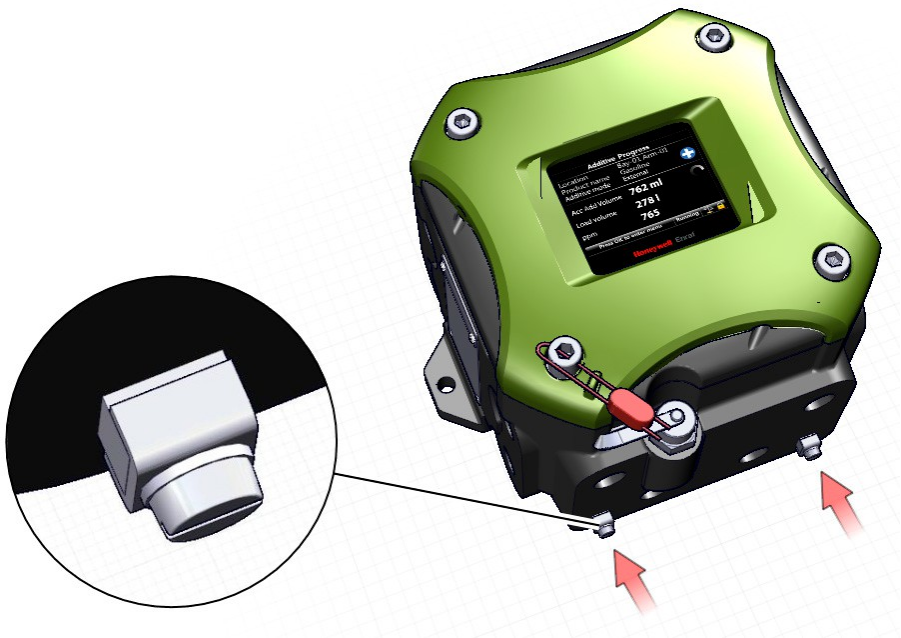


## 2.2.4  Accordance to Regulations

### 2.2.4.1  Explosion Safety

| Approval | Certificate no. | Type of protection identification | | |
|---|---|---|---|---|
| ATEX | KEMA 10ATEX0095 X | (Ex) II 2 G | Ex db [ia] IIB T6 Gb | Ta = -40°C … +65°C (-40°F … +149°F) |
| UKEX | DEKRA 21UKEX0226X | | | |
| IECEx | IECEx KEM 10.0044 X | Zone 1 | | |
| FM | 3040469 | Class I, Division 1 | group C, D T6 | |
| CSA | 2395296 | Class I, Division 1 | group C, D T6 | |
| | | Zone 1 | Ex d [ia] IIB T6 | |

### 2.2.4.2  Low-Voltage Directive

The device is suitable for:

- Pollution degree 2

- Overvoltage category II

- Class I equipment

## 2.2.4.3  Reference of Applicable Standards

| Standard | Description |
|---|---|
| ATEX 95 | Applicable for manufacturers of equipment that is used in places where explosion danger may exist. |
| IECEx | The IECEx System is an International Conformity System where a Mark of Conformity is granted by approved IECEx certifiers (ExCBs) located in IECEx participating countries for equipment that is covered by an IECEx Certificate of Confor- mity and hence has been tested and manufactured under systems that are under ongoing surveillance by ExCBs. |
| FM | Factory Mutual Approvals Division<br><br>The Factory Mutual Approvals Division determines the safety and reliability of equipment, materials, or services utilized in hazardous locations in the United States and elsewhere. |
| CSA | Canadian Standards Association<br><br>The standards generated by CSA are the cornerstone for determining a product's eligibility for certification in hazardous locations in Canada. |

## 2.2.5  SSC-B Labels

Figure 2-2: Identification labels with Safety note on the SSC
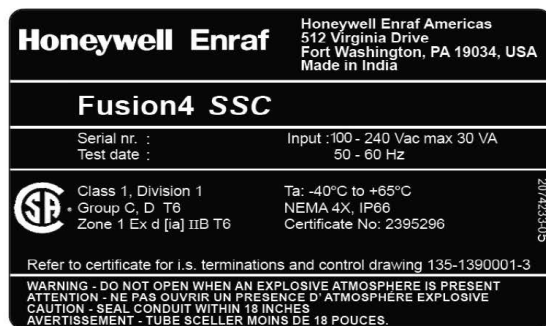


NOTE To FM label:

Ta = -40°F to + 149°F

# 2.3 Safety Instructions for the LAD

Figure 2-3: The Local Access Device (LAD)



> **WARNING:** One must strictly follow the safety instructions mentioned in this manual as well as the safety instructions shipped with the device for installation, commissioning, operation, and maintenance, to ensure safe operation.

The LAD may be located in explosion safety areas:

| USA (FM) and Canada (CSA) | | Canada (CSA) | | Rest of the World (ATEX / IECEx) | |
|---|---|---|---|---|---|
| Safety level | Remarks | Safety Level | Remarks | Safety level | Remarks |
| Class 1, Division 1 | **WARNING:** Substitution of components may impair intrinsic safety. | Class 1, Division 1 resp. Zone 1 | **WARNING:** Substitution of components may impair intrinsic safety. | Zone 1 | - |

| USA (FM) and Canada (CSA) | | Canada (CSA) | | Rest of the World (ATEX / IECEx) | |
|---|---|---|---|---|---|
| Safety level | Remarks | Safety Level | Remarks | Safety level | Remarks |
| Class 1, Division 2 | WARNING: Substitution of components may impair intrinsic safety. | Class 1, Division 2 resp. Zone 2 | WARNING: Substitution of components may impair intrinsic safety. | Zone 2 | - |
| Safe Area | - | Safe Zone | - | Safe Zone | - |

## 2.3.1  General

The Local Access Device (LAD) is a hand-held controller used to interface with the Fusion4 product family, allowing tasks such as parameter adjustment, alarm resetting, and injector calibration. The device facilitates two-way data communication between a parent device and the LAD. It allows the rapid transfer of transaction data, configuration files and calibration records, and also upgrading the firmware in the field.

### 2.3.1.1  EC declaration of conformity (for EU)

Refer to the EC declaration of conformity and ATEX certificate(s), shipped with the device.

### 2.3.1.2  Control Drawings for FM & CSA

Refer to the control drawings shipped with the device.

## 2.3.2  Explosion Safety

| Approval | Certificate no. | Type of protection identification | | |
|----------|----------------|------|------|------|
| ATEX | KEMA 10ATEX0152 | (Ex) II 2 G | Ex ia IIB T4 Gb | Ta = -20°C … +65°C (-4°F … +149°F) |
| UKEX | DEKRA 21UKEX0228 | | | |
| IECEx | IECEx KEM 10.0070 | Zone 1 | | |
| FM | 3041202 | Class I, Division 1 | group C, D T4 | |
| CSA | 2395571 | Class I, Division 1 | group C, D T4 | |
| | | Zone 1 | Ex ia IIB T4 | |

## 2.3.3  Installation

No specific installation requirements apply, the device is factory ready for connection to Fusion4 parent devices (for example, SSC).

> WARNING:  This is an Intrinsically safe device and as such may only be connected to devices with compatible intrinsically safe parameters.
>
> Connection of non-intrinsically safe signals invalidates the approval. The electrical data of the intrinsically safe circuits is to be taken from the certificate.
>
> Connection to SSC is safe by design.

## 2.3.4  Commissioning

Commissioning the instrument and Fusion4 parent devices must be conducted by qualified engineers, trained by Guidant. The engineers must have the knowledge of the (local) requirements for electrical equipment in hazardous areas.

## 2.3.5  Operation

After connecting to a Fusion4 parent device (for example, SSC), the LAD can be used for its intended purpose.

The memory card can be removed and inserted also in hazardous areas, but be aware that the device is then no longer suitably protected against ingress of water.

## 2.3.6  Maintenance and Troubleshooting

In the unlikely event of malfunction, only a qualified service engineer, trained by Guidant and with knowledge of safety regulations for working in hazardous areas is allowed to repair the instrument.

## 2.3.7  Additional Information

If you require additional information, contact Guidant or its representative. See the back cover of this manual.

## 2.3.8  Environmental Conditions

Observe the environmental conditions regarding the allowable operating temperature (-20°C … +65°C/ -4ºF … +149ºF), relative humidity (RH 5 … 95%, non-condensing), and operating pressure (atmospheric).

## 2.3.9  LAD Labels

Figure 2-4: Identification labels with Safety note on the LAD

> **NOTE:**  To FM label: Ta = -4°F to + 149°F

## 2.4  Safety Instructions for the Fusion4 IR Controller

Figure 2-5: Safety instructions for the Fusion4 IR Controller
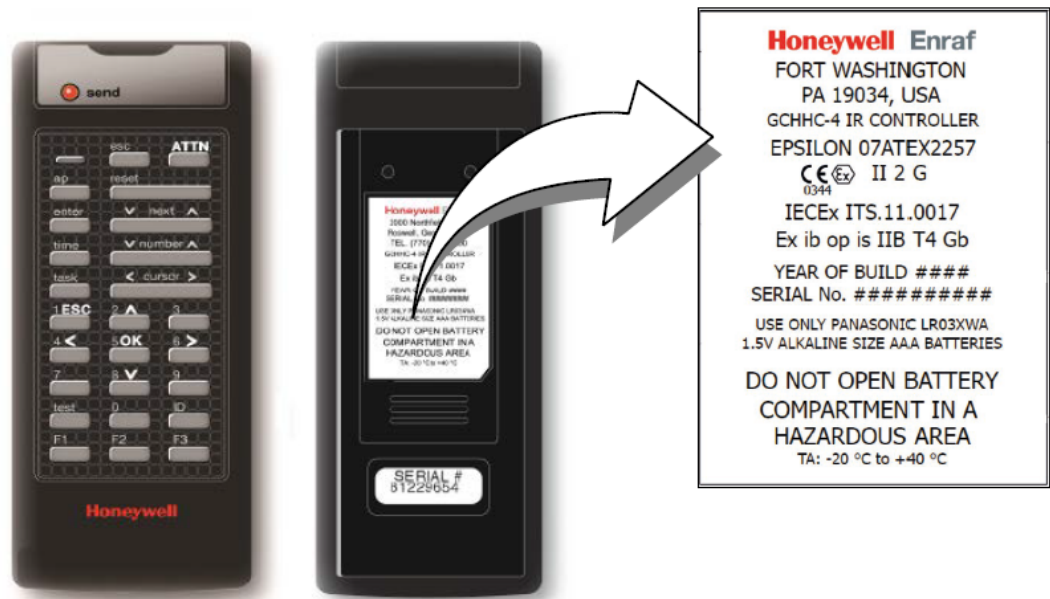
> **WARNING:**  You must strictly follow the safety instructions mentioned in this manual as well as the safety instructions shipped with the device for installation, commissioning, operation, and maintenance to ensure safe operation.

The IR Controller may be located in explosion safety areas as follows:

| USA (FM) and Canada (CSA) | | Canada (CSA) | | Rest of the World (ATEX / IECEx) | |
|---|---|---|---|---|---|
| Safety level | Remarks | Safety Level | Remarks | Safety level | Remarks |
| Class 1, Division 1 | **WARNING:**  Do not open battery compartment in a hazardous area. Use only approved batteries. See label. | Class 1, Division 1 | **WARNING:**  Do not open battery compartment in a hazardous area. Use only approved batteries. See label. | Zone 1 | **WARNING:** Do not open battery compartment in a hazardous area. Use only approved batteries. See label. |
| Class 1, Division 2 | **WARNING:**  Do not open battery compartment in a hazardous area. Use only approved batteries. See label. | Class 1, Division 2 | **WARNING:**  Do not open battery compartment in a hazardous area. Use only approved batteries. See label. | Zone 2 | **WARNING:** Do not open battery compartment in a hazardous area. Use only approved batteries. See label. |
| Safe Area | - | Safe Zone | - | Safe Zone | - |

## 2.4.1  General

The GCHHC-4 IR Controller is a hand-held remote controller which is an infrared type control device. The device facilitates to program the Enraf fluid technology IR Controlled equipment remotely.

The device contains all the necessary program codes installed. Hence, user programming is not required.

## 2.4.2  Precautions

- Clean the device with a damp cloth.
- Use additional protection in areas where damage may occur.
- Do not repair the device without permission to avoid the invalidation of the certificate.
- Do not leave the device in direct sunlight or place it near a heat source.
- Do not drop the device or subject it to other types of stress. Handle the device gently.
- Do not touch any solvent or aggressive substances as the enclosure is made up of plastic.
- Store the device at room temperature in a clean and dry location.
- Ensure to use the correct type of the batteries to prevent damage to the device or shorten the battery life.
- Ensure that the buttons are not pressed to prevent the usage of batteries when storing the device.
- Ensure to remove the batteries to prevent damage caused by leaking batteries before storing the device for a long time.

### 2.4.2.1  EC declaration of conformity (for EU)

Refer to the EC declaration of conformity and ATEX certificate(s), shipped with the device.

## 2.4.3  Installation

Perform the following steps to install the device.

- Remove the security screws from the compartment lid.

- Slide the battery compartment lid from the device.

- Install the 3 AAA Alkaline batteries ensuring that the plus (+) and the minus (-) polarity of the batteries is correct.

> NOTE:  Removing the batteries does not remove the GCHHC-4 memory.
>
> Always replace the batteries with new ones. Use only batteries approved for use.

> WARNING:  Do not open the battery compartment or change the batteries in a hazardous area.

## 2.4.4  Commissioning

IR Controller and Fusion4 parent devices must be commissioned by qualified engineers, trained by Guidant. The engineers must have the knowledge of the local requirements for electrical equipment in hazardous areas.

## 2.4.5  Operation

After connecting to a Fusion4 parent device (for example, SSC) the GCHHC-4 IR Controller can be used for its intended purpose.

Perform the following steps to use the device.

- Direct the device at the IR port of the equipment to be programmed.

- Select ATTN on the IR Controller to turn the device and send the initial program command to the equipment (SSC).

> NOTE:  Refer to the specific equipment's user manual for defined programmed functions.

> The device automatically stops after 30 seconds if an activity is not performed. This helps in preserving the battery life.

## 2.4.6  Maintenance and Troubleshooting

In the unlikely event of malfunction, only a qualified service engineer, trained by Guidant and with knowledge of safety regulations for working in hazardous areas is allowed to repair the instrument.

## 2.4.7  Additional Information

If you require additional information, contact Guidant or its representative.

## 2.4.8  IR Controller Labels

Figure 2-6: Identification labels with Safety note on the GCHHC-4 IR Controller
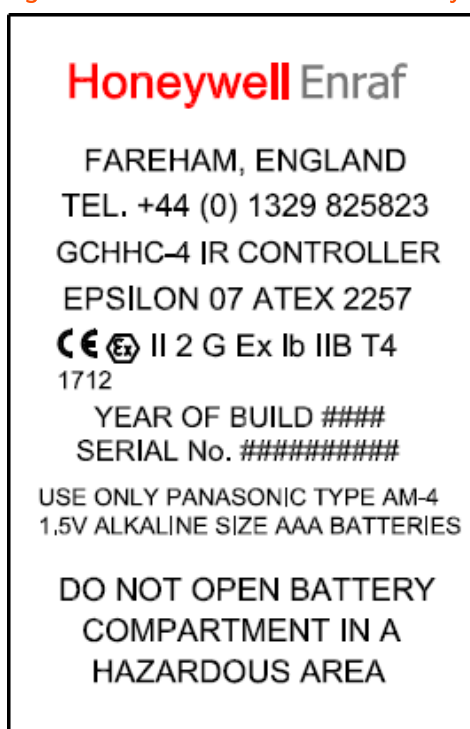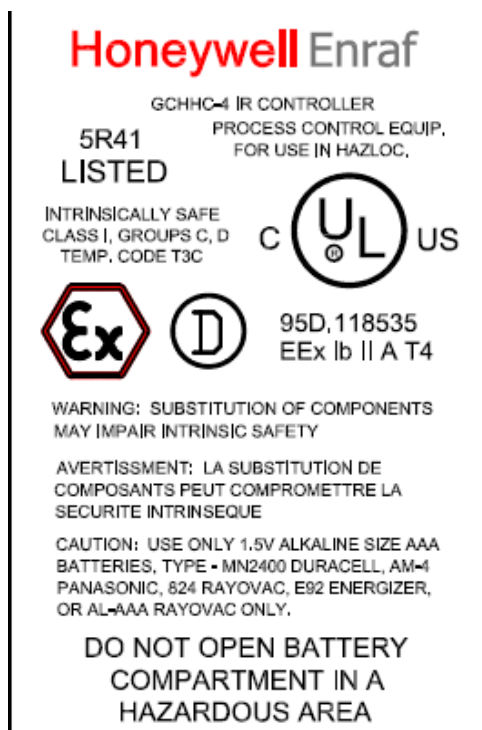
## 2.5  Liability

The information in this installation guide is the copyright property of Guidant. Guidant disclaims any responsibility for personal injury or damage to the equipment caused by the following:

- Deviation from any of the prescribed procedures,

- Execution of activities that are not prescribed,

- Neglecting the safety regulations for handling tools and use of electricity.

The contents, descriptions, and specifications in this manual are subject to change without notice. Guidant accepts no responsibility for any errors that may appear in this manual.

> WARNING:  Only certified technicians are authorized to make changes to the SSC configuration. All modifications must be in accordance with the guidelines as set forth by Guidant. Modifications not authorized by Guidant invalidates the approval certificates.

# 3  System Description

## 3.1  Introduction

### 3.1.1  General

The main function of the MID-compliant SSC-B is to control one single blend stream.

It can operate in any product transfer application, such as road tanker loading, rail off-loading or pipeline transfer, where multiple products need to be accurately combined.

### 3.1.2  Blending Principle

The SSC-B utilizes two product streams; the monitored stream is referred to as the wild stream, and the controlled stream is referred to as the blend stream.

Blend percentages can be adjusted in the SSC-B "on the fly". This allows external sensors to determine product composition and make adjustments to the blending operation through serial communications.

The SSC-B is capable of achieving highly accurate linear control across the complete blend range; allowing for blend ratios from 1% to 100% (practical blend rates are around 5% to 40%) on standard load rack applications.

Temperature and pressure measurements are used to convert the observed blend volume to reference conditions, in order to have very accurate blend transaction data that can be used for W&M-compliant custody transfer.

Figure 3-1: Blending principle diagram
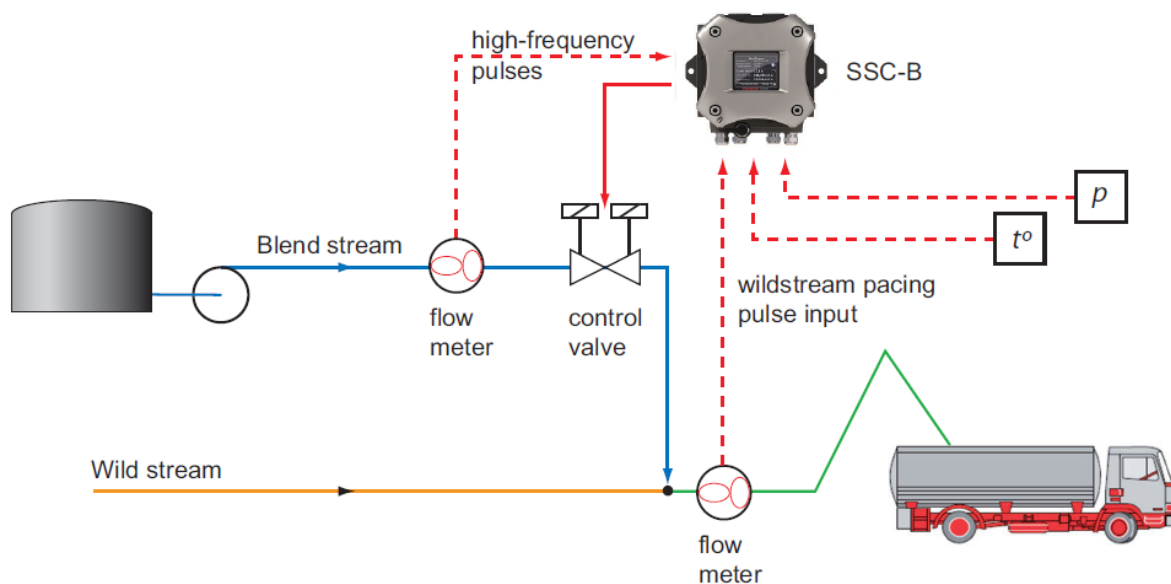
# 3.2  MID Compliance

## 3.2.1  Introduction



The Measuring Instruments Directive (2004/22/EC) was designed to provide a level playing field in Europe, for custody transfer measuring equipment and systems. The MID, as it is called, currently covers 10 instrument categories, for uniform legislation in the 27 EU countries. The implementation of this directive in national legislation became due on the 30th of October 2006.

The SSC is 100% MID-compliant.

This legislation results in breaking down trade barriers and improving competition, which is one of the main objectives of the European Union. In the directive, the specific articles on each of the instrument categories are called Annexes. The Annex relevant to the measurement of petroleum products is "flow metering of liquids other than water" and is identified as Annex MI-005. The requirements in this Annex are based on the OIML recommendation R117-1 which has been the pre-eminent set of guidelines for Weight & Measures for petroleum metering installations for a considerable time.

## 3.2.2  MID Approval Approach

One of the key changes in the Measurement Instruments Directive (MI- 005) compared to previous national legislation, is that the total metering system is now subject to perform in the accuracy specification, and not just specific components. This means that not only the flow meter is subject to certification but also other essential parts of the metering system, such as temperature transmitters, electronic volume converters air-eliminators, and so on. In addition to this, the method with which the system is built is also examined by the Notified body. In turn the Notified Bodies are scrutinized by the European Board of Accreditation.

The system approval process for MID consists of 2 main steps:

- 'Bringing on the market' - type-examination by a Notified body in accordance with Annex-B of the MID. This generates a so-called type-examination certificate.

- 'Putting it into use' - conformity check of the essential parts and a wet calibration in the legal specification. This is implemented in accordance with Annex F or D of the MID. This generates the system approval.

The system can now be used for trade and excise applications. The received approval is subject to recalibration at 1 or 2 year interval, and this is determined on national level.

> NOTE:  Evaluation Certificate provides demonstration that the SSC as a component of a MID-compliant instrument is approved per MID and OIML requirements.

## 3.2.3  Component-level Requirements

For the blending applications, such as ethanol- and biodiesel-blending, the minimum required accuracy of the metering line is ±0.5% (class 0.5).

The flow metering element of the system is allowed ± 0.3% inaccuracy, and the remainder of the system is permitted to show maximum errors to ± 0.2%.

As the errors are directly related to the inaccuracies, they are added to get the total maximum. Therefore, ± 0.5% is the maximum allowed discrepancy between what the seller states as the volume transferred, and the actual volume the buyer receives.

Figure 3-2: Component-level requirements (flow accuracy)

### MID essentials – flow accuracy

| | SSC | Sensor | Total |
|---|---|---|---|
| Flow | ± 0.2 % | ± 0.3 % | ± 0.5 % |

### MID essentials – flow accuracy

| | SSC | Sensor | Total |
|---|---|---|---|
| Flow | ± 0.2 % | ± 0.3 % | ± 0.5 % |
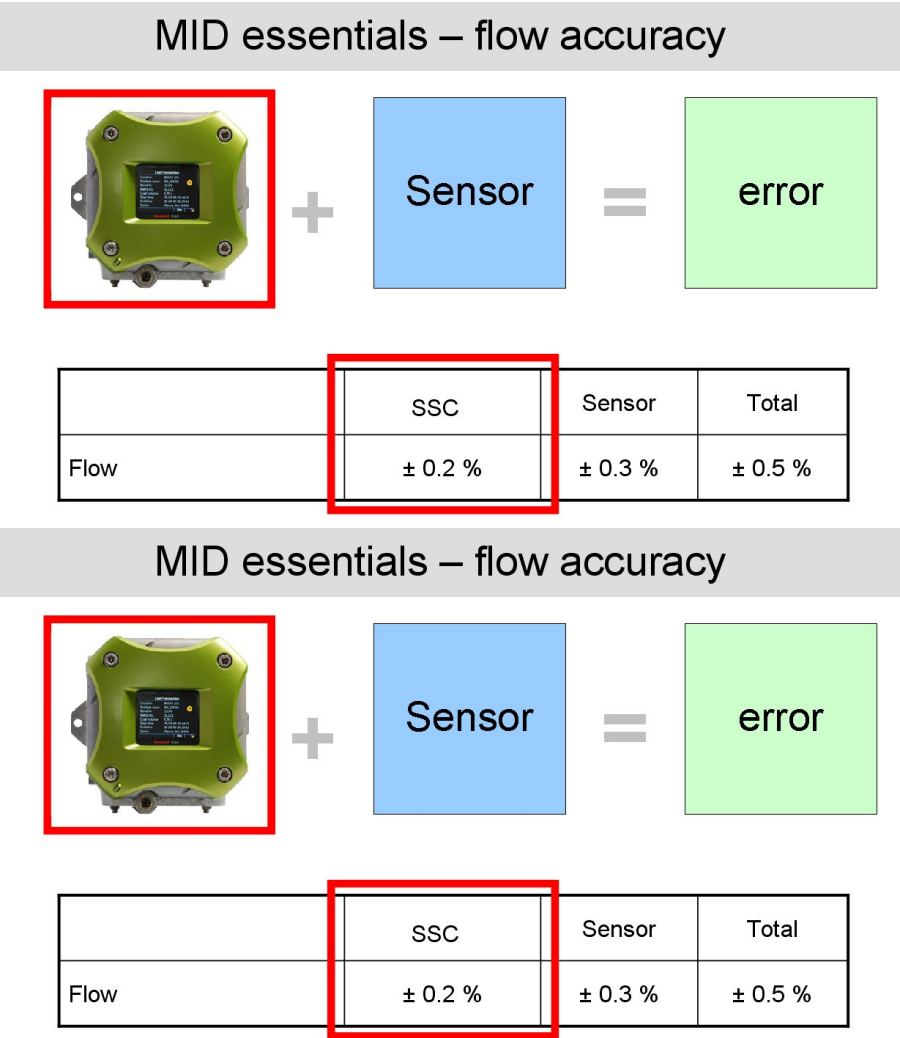
In the blending metering line, the essential parts of the system are the flow meter, the temperature sensor, and the blend controller itself. The flow meter physically measures the flow and generates pulses which are related to the volume passed through the meter. For reliability the pulses are dual phase shifted and are constantly checked by the electronic blend controller for integrity, according to API and ISO. Through the temperature sensor (transmitter) the metered volume can be corrected to base temperature of either 15°C (60°F) or 20°C (68°F) in accordance with ASTM standards. If a temperature transmitter is applied then this has to have an evaluation certificate also. For the temperature sensor (Pt100) this is not required.

Figure 3-3: Component-level requirements (Temperature and Pressure accuracy)



|  |  | SSC | Sensor | Total |
|---|---|---|---|---|
| Temperature |  | ± 0.3 ºC | ± 0.4 ºC | ± 0.5 ºC |
| Pressure | P < 1 MPA | ± 30 kPa | ± 40 kPa | ± 50 kPa |
|  | 1 ≤ P ≥ 2 MPa | ± 3 % | ± 4 % | ± 5 % |
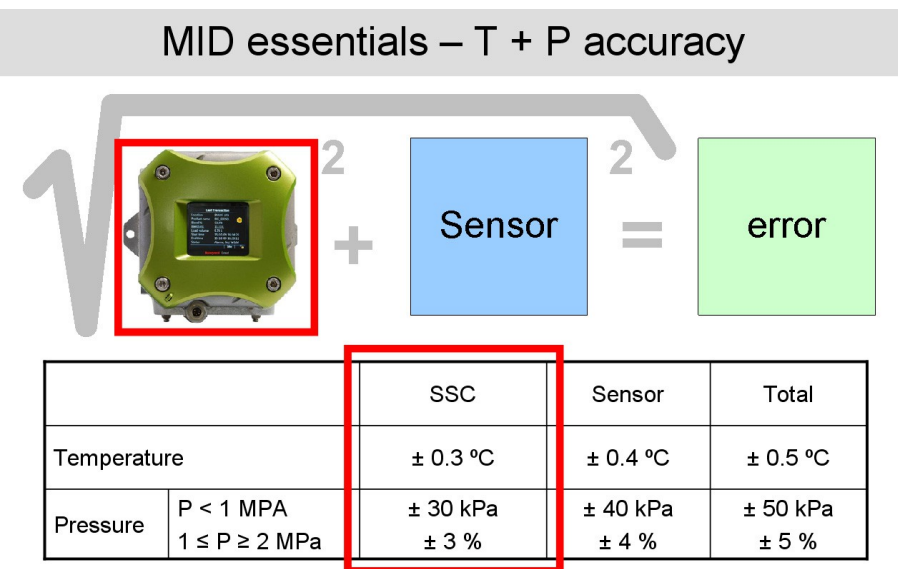
The blend controller evaluation is quite complex, but in principle it has to comply with the security of signal and data handling as required by MID and working documents of WELMEC.

A very stringent requirement is the EMC standard for industrial use of electronic equipment. Electro-magnetic noise might influence the measurement of the metering signal, and this is not allowed to occur outside the maximum given accuracy.

# 3.2.4  System-level Requirements

With any new equipment legislation such as MID, there is a raft of new issues and criteria that need to be understood by both those who are manufacturing the

equipment and those who seek to utilise it. In the downstream oil & gas sector the volume of that legislation is vast. In the case of MID where the legislation crosses the boundaries of mechanical and electronic hardware, software, communications, and reconciliation and reproduction of data, correctly understanding the legislation can be particularly vexing.

For this reason the provision of "system solutions" is seen by many as the most efficient method of procuring equipment that is in compliance of their regulatory needs. Instead of having to understand the individual technical requisites of each individual component of a system, they only need to understand their "end game". "I need an MID compliant ethanol blending system" is far easier to define than specifying the individual technical specifications of each component of that system. For this to work though, the acquirer has to have confidence that the supplier is suitably knowledgeable to accurately provide them with the correct solution for their needs. The provision of a "solution" circumnavigates the minefields associated with integrating multiple components into compliant system arrangement.

Pre-configured biofuel blending systems such as the Fusion4 SSC-B do exactly this. Piecing together accurately specified MID-compliant components to provide an end-to-end solution. Combining the physical measuring element with the electronic control device and associated reconciliation options, such as digital storage or printing of BoLs. Each of these functions is required to operate under the concise guidelines laid out under MID and associated legislation such as OIML R117 and Welmec.

## 3.2.5  The Fusion4 SSC-B

The heart of the system is the Fusion4 SSC (single stream controller).

Founded on FlexConn architecture, the SSC is part of the Fusion4 portfolio of loading automation and control products family. A modular collection of mechanical, electronic, and software sub-systems, that can be integrated with each other to create scalable solutions.

The FlexConn approach takes the well- proven functionality of its additive and blending portfolio, and bring all the options together as a single offering which is configurable to suit the end you need. Subsequently, the Fusion4 SSC incorporates 12 separate devices, each providing individual functionality, and each one configurable from 1 single device, and selectable through a license key.

The Fusion4 SSC-B's solution approach facilitates the ratification of both MID compliance steps mentioned earlier, 'bringing on the market' and 'putting into use', by pre-configuring all components in accordance with MID requirements, and checking conformity through pre-installation testing before delivery, as a complete system. This method not only reduces risk of non-compliance, but also speeds up the MID qualification process for the system owner.

Firstly it implements a large transaction storage memory of over 10,000 transactions, which allows a device to operate for over 3 months without losing a single transaction, in standard operating conditions.

Alternatively, the SSC can have its transaction data securely downloaded through the bespoke Fusion4 LAD (Local Access Device). This allows the SSC to have its memory cleared in preparation for storage of another 10,000 transactions. The transactions subsequently transferred to the LAD can then be manually transferred to any peripheral system for storage or printing through secure SD card.

Finally the preferred method is to link the SSC through Comms to the Fusion4 Portal software package. When connected all transaction data is scanned and collected by Portal from each device. The transaction record is stored and can be printed directly or distributed through OPC to 3rd party systems for separate reconciliation.

The Fusion4 Portal BoL Print facility is fully MID compliant, and therefore can facilitate a stand alone blending infrastructure that meets all MID requirements. Along with MID print functionality and OPC capability, bolt on modules for the Portal software suite also include remote configuration, remote event monitoring and alarm handling and advanced LAD interaction tools.

## 3.3  System Architecture

Founded on FlexConn architecture, the SSC-B is a member of the Fusion4 portfolio of Loading Automation & Control products.

The Fusion4 SSC-B system is built up from interchangeable hardware modules. These modules consist of uniform PCBs (printed circuit boards), each of them representing a different, unique functionality. Together with the software implemented on these hardware parts, each PCB makes up a FlexConn module.

These modules communicate with each other through the serial CAN-bus. See the following figure.

Figure 3-4: Fusion4 SSC-B architecture overview
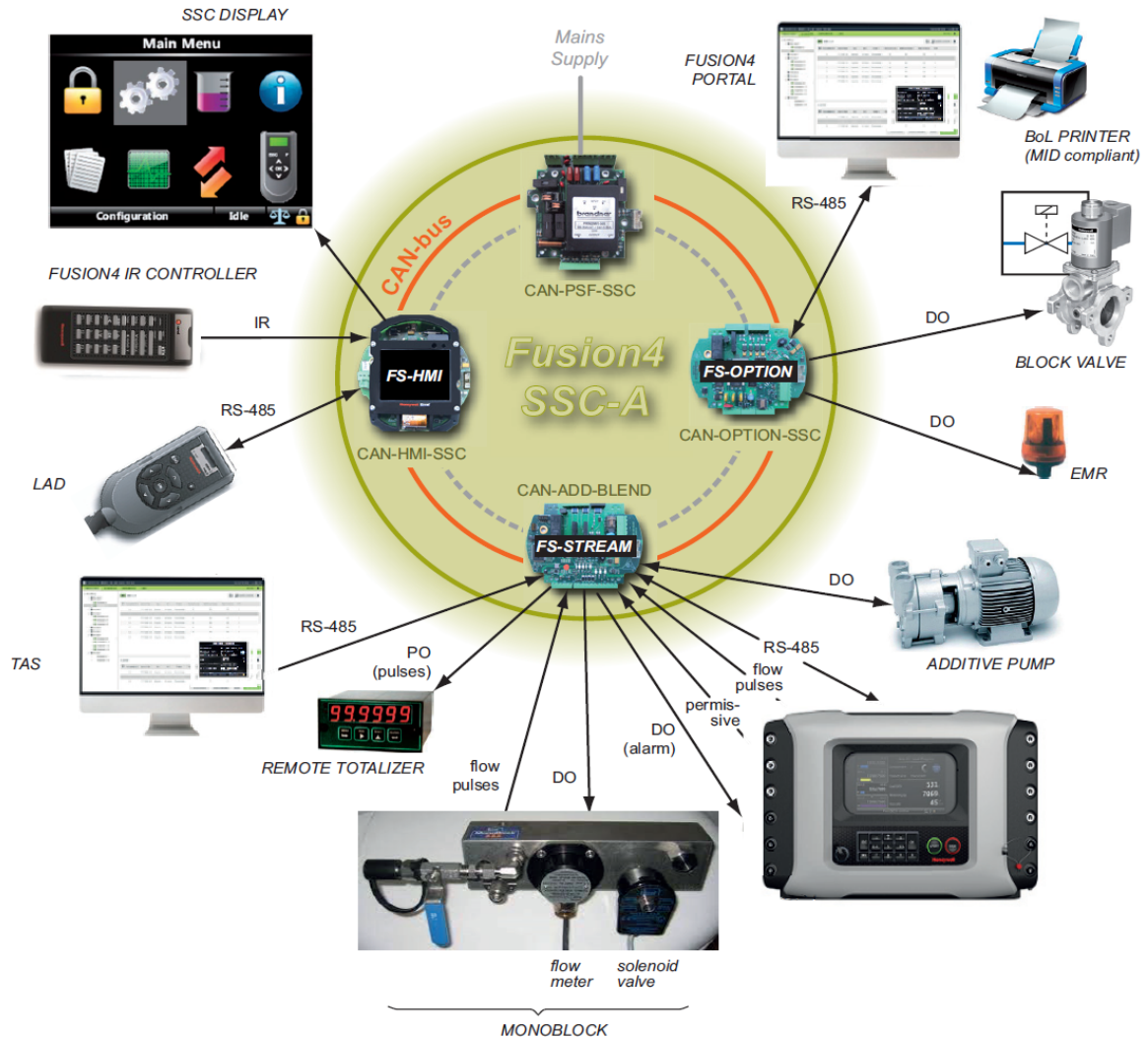


## 3.4  FlexConn Modules

### 3.4.1  General

One of the main characteristics of the FlexConn architecture is its placement flexibility of the FlexConn modules. The backbone of this concept is the serial CAN[1] bus to which each FlexConn module connects.

Figure 3-5: FlexConn CAN bus concept
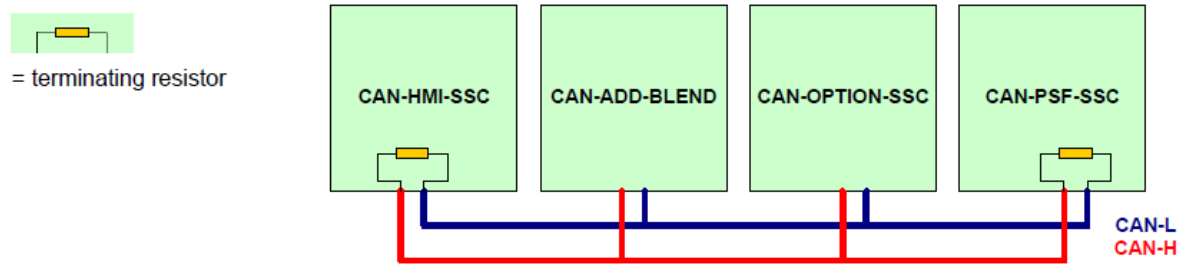


Besides a generic function, each FlexConn module has one or more specific functions. In general, this can be:

- a sensor function

- an application function

- an input/output (I/O) function

- a communication function

- a display function

A sensor function measures or calculates a process value, or it obtains a process value from a connected external instrument.

An application function controlling the high-level operation of a device, for instance stream control, flow control, or device control.

An input/output (I/O) function controls digital output or reads digital input from external instruments.

A communication function takes care of the communication with a communication interface unit or with a DCS, SCADA, tank inventory, or another terminal automation system.

A display function makes it possible to communicate with the module(s) through a Human Machine Interface.

# 3.5  Hardware Structure

## 3.5.1  Housing

The housing of the SSC-B consists of a box and a lid, which can be removed by loosening 4 captive socket-head screws. See the following figure.

Figure 3-6: Housing of SSC-B
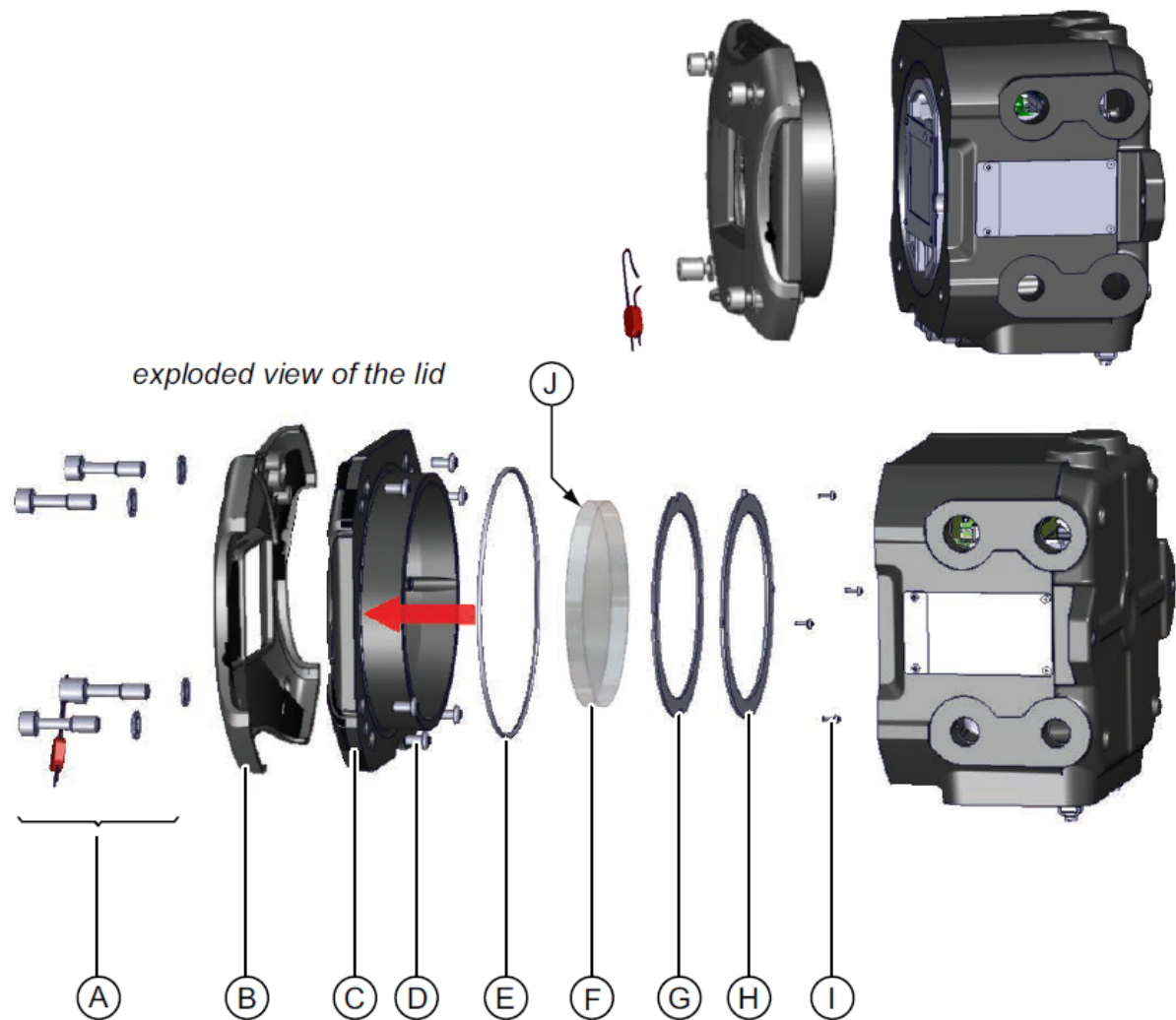
| Label | Description |
|---|---|
| A | Captive socket-head screws (4x), of which 1 has an enlarged head for sealing purposes (see figure left) |
| B | Brand identity cover |
| C | Lid |
| D | Brand identity cover fasteners (6x) |
| E | O-ring (standard available part) |
| F | Glass |
| G/H | Glass retainer rings |
| I | Glass retainer rings fasteners (4x) |
| J | Glass cemented to lid (C) on this side (circular, contact surface) |

## 3.5.2  Interior

- In the rugged, sand-casted housing, the printed circuit boards of the SSC-B are stacked by means of plastic board-retaining clips.

- The metal board spacers provide extra stability, grounding, and EMI performance.

- The boards are interconnected by a flatcable, providing power and serial communication.

- The SSC-B version without CAN-OPTION-SSC has 4 extra mounting studs to compensate for the reduced board assembly height. See the following figure.

Figure 3-7: Stacked module construction of the SSC-B
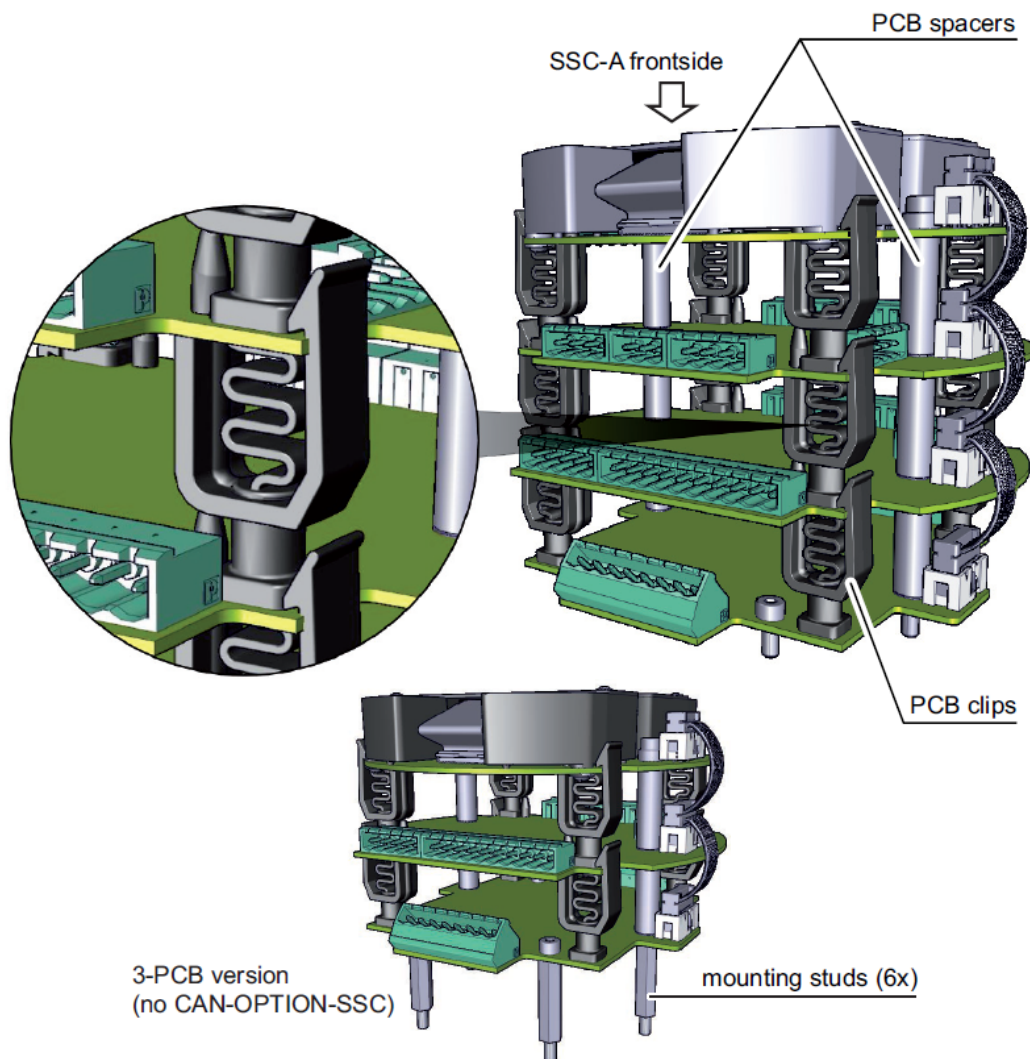


The following boards can be placed into the SSC-B:

- CAN-HMI-SSC

- CAN-OPTION-SSC

- CAN-ADD-BLEND

- CAN-PSF-SSC
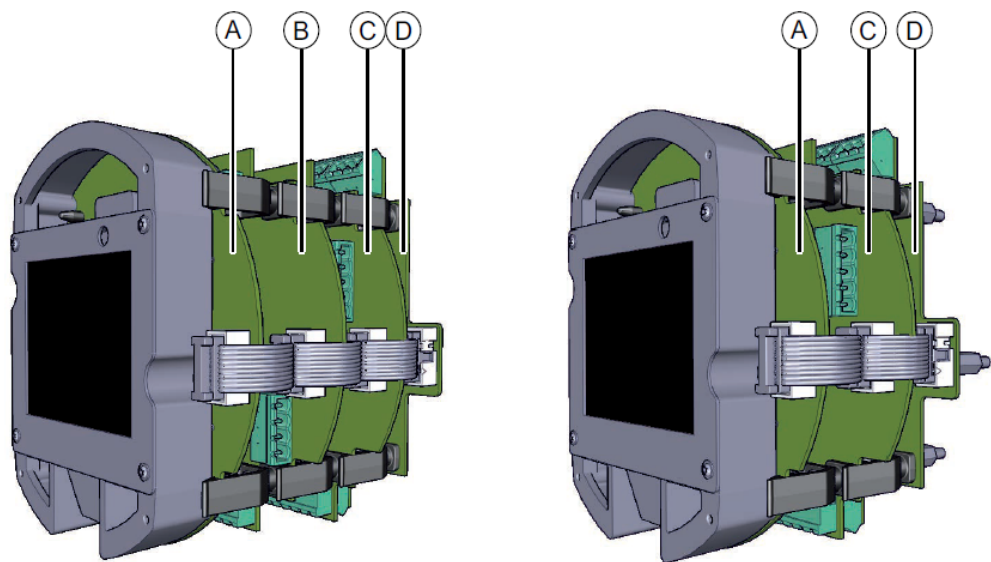
| Refer to Figure 3-8 | PCB name | Description |
|---|---|---|
| A | CAN-HMI-SSC | Controls the display and the LAD (Local Access Device) interfaces. |
| B | CAN-OPTION-SSC | Additional IO functions are available with this optional board. |
| C | CAN-ADD-BLEND | Controls the blend stream. |
| D | CAN-PSF-SSC | Delivers the internal power for the SSC-B. |

\* A PCB with software installed.

## 3.5.3  Grounding Concept

Each printed circuit board has 2 grounding points. These grounding points are used to electrically connect every board with the metal housing. This is done by means of metal spacers, which are pressed into the boards. See the following figure.

**Figure 3-9: Grounding concept (1)**
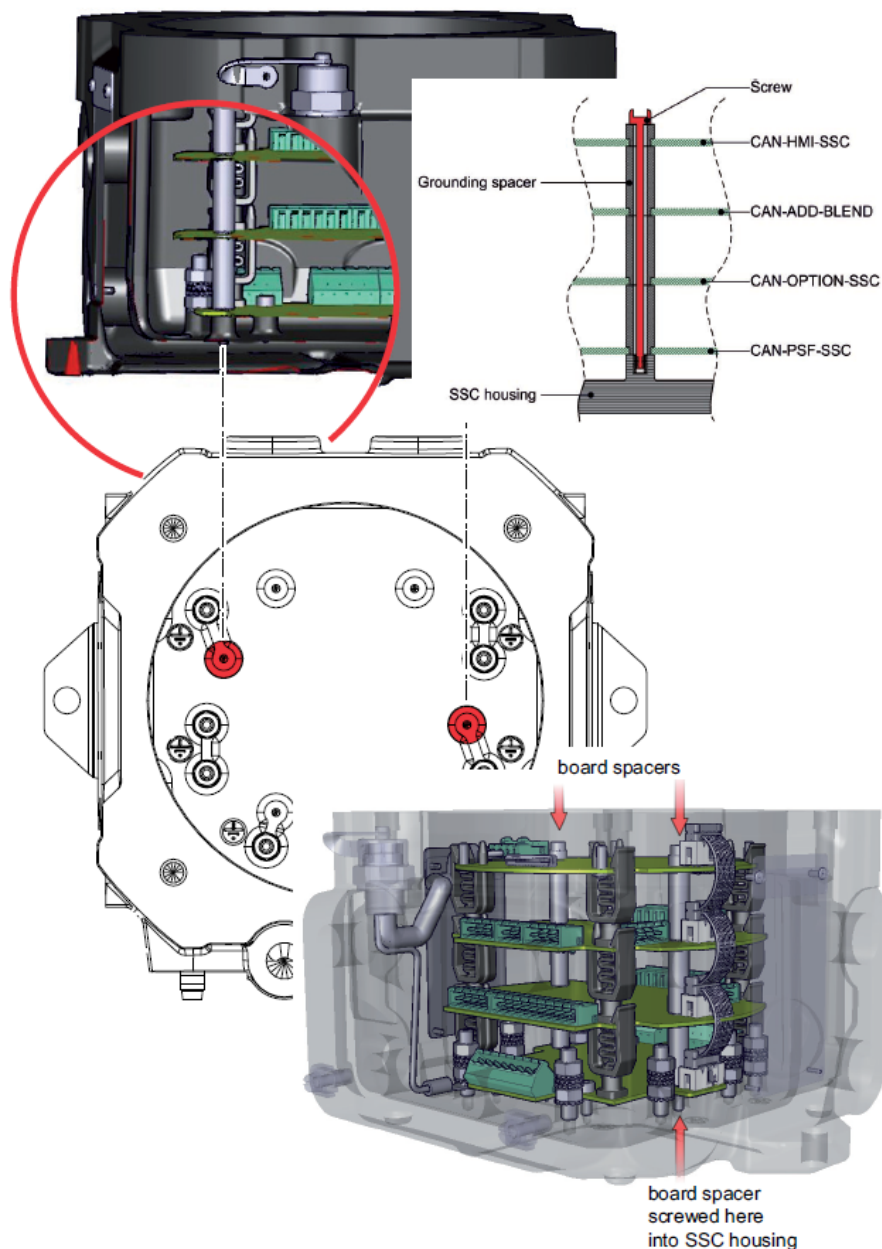


The internal electronics (that is, processing) are directly connected with this ground. All galvanic isolated IO blocks are not connected with this ground to have a proper EMC separation. See the following figure for a visualization of this concept.

Figure 3-10: Grounding concept (2)
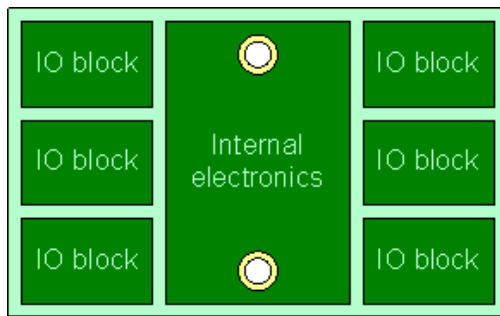


# 3.6  PCB Layout

Each FlexConn PCB consists of a generic and a specific electronics part. The generic part can be found on any FlexConn modules. The specific electronics part represents an application-specific function. On the generic electronics part, the following parts can be found:

- The program memory contains the module-specific software.

- The microprocessor / controller executes the module-specific software stored in the program memory.

- When the power is switched off, the commissioning parameters and the diagnostics data are stored in the non-volatile memory.

- With jumpers, specific hardware settings can be made.

- The Health LED (blue) indicates the general health status of the FlexConn module:

| Health Status | Flashing Pattern |
|---|---|
| Good | ●○○○○○○○○○○○○○●○○○○○○○○ |
| Uncertain | ●○○●○○○○○○●○●○○●○○○○○ |
| Bad | ●○○●○○●○○●○○●○○●○○●○○●○ |

- The Function LEDs indicate module-specific activities, such as data being transmitted or received.

- Voltage monitors and temperature sensors are used for internal diagnostics purposes.

## 3.6.1  PCB Details

### 3.6.1.1  CAN-HMI-SSC

#### 3.6.1.1.1  Functions

This board realizes the interface between the device and the user (HMI = Human Machine Interface). It also controls and manages the information about the blend process and transaction-related data.

The board implements the following functions:

| Function | Description |
| --- | --- |
| Display control interface | Control and interface of the 3.5" QVGA color display |
| Record storage | Data storage of transactions, calibrations, and alarms |
| Display processor | Messages processing |
| IR interface | Fusion4 IR Controller interface |
| LAD Ex i interface | Intrinsically safe (Ex i) interface for the Local Access Device |
| RTC | Real Time Clock. Used for date and time stamping of transaction data. |

Figure 3-11: CAN-HMI-SSC functions (left) and physical layout (right)
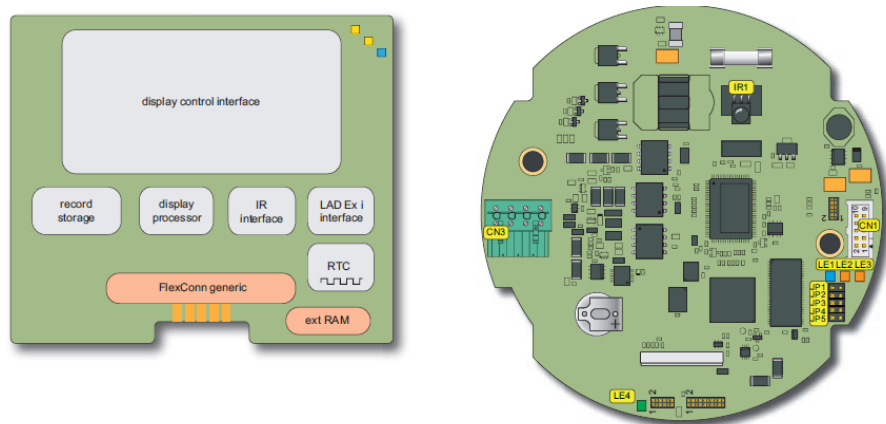
### 3.6.1.1.2  Component Locations

Figure 3-12: CAN-HMI-SSC component location
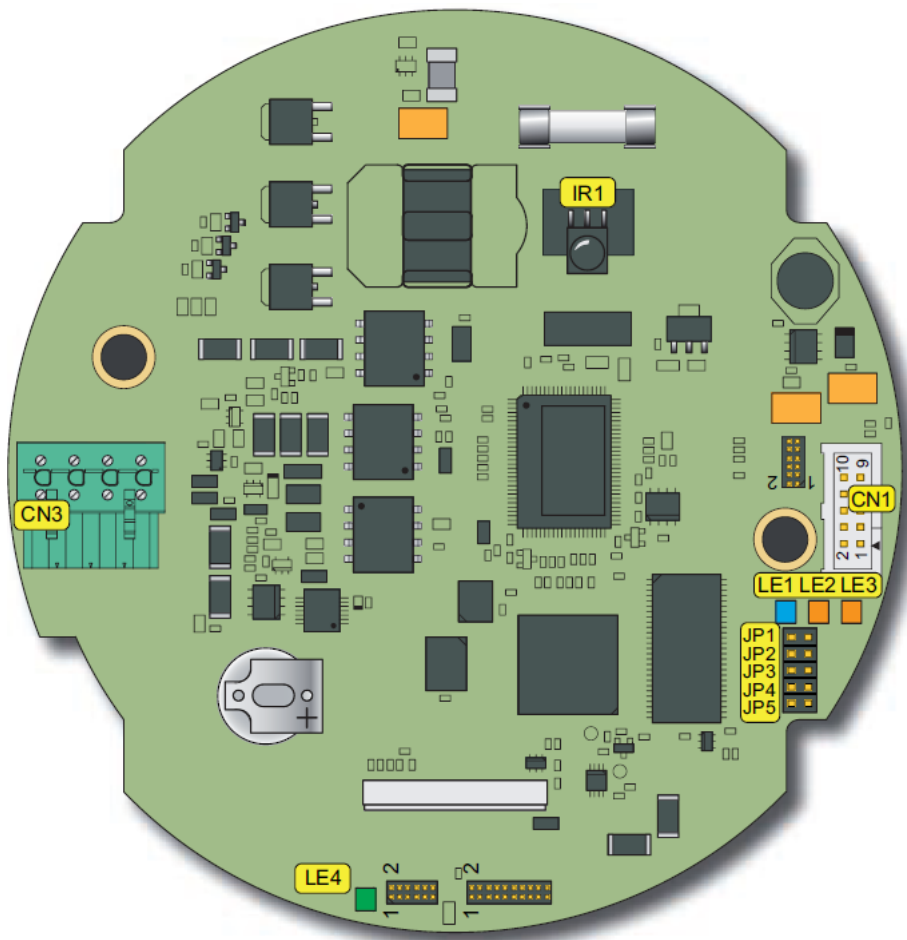


| Item reference | Description |
|---|---|
| JP1 … 5 | FlexConn jumpers |
| JP1 | W&M seal<br><br>NOTE:  Setting the W&M jumper on one of the SSC boards makes the W&M sealing effective for all boards. |
| CN3 | Ex i connector (connects PCB to the LAD connector in the enclosure) |
| LE1 | FlexConn Health LED |
| LE2 | Inter processor activity |
| LE3 | CAN bus activity |
| LE4 | HMI processor LED (LAD activity) |

| Item reference | Description |
|---|---|
| IR1 | Infrared receiver for Fusion4 IR Controller |

Terminal Descriptions

- JP1 … 5
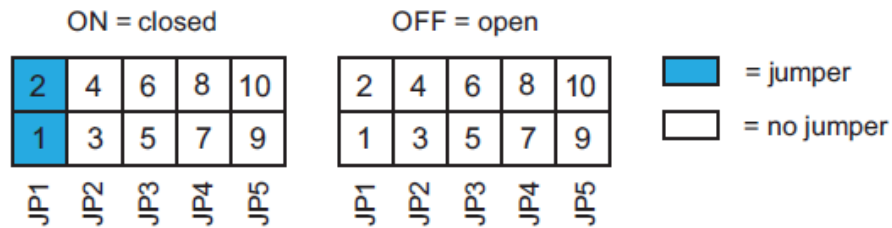


| Name | State | Description |
|---|---|---|
| JP1 | ON (closed) | Connected to ground (GND) --> logical '1' |
| JP1 | OFF (open) | Active low signal to the processor. Pulled up to have a '0'. |

- CN3 - LAD connector
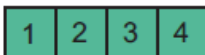


| Pin no. | Name / signal | Description |
|---|---|---|
| 1 | GNDsafe | Ex i safe ground |
| 2 | Vsafe | Ex i safe power |
| 3 | Asafe | Ex i safe RS485 A signal |
| 4 | Bsafe | Ex i safe RS485 B signal |

WARNING:  Leaving the wiring to this connector loose (uncon- nected) inside the SSC creates an explosion risk! Unsafe (non-intrinsically safe) power might be connected to the LAD as a result.

## 3.6.1.2  CAN-ADD-BLEND

### 3.6.1.2.1  Functions

This board takes care of the blend-stream metering and the solenoid control, and also contains the blending algorithms.

The physical board implements the following functions:

| Function | Description |
|---|---|
| 2 Digital Input AC (DI AC) circuits | Convert high-voltage switched AC signals into isolated logic signals. |
| 2 Digital Input DC (DI DC) circuits | Convert switched DC signals into isolated logic signals. |
| Single-Pulse Input (Single PI) circuit | Accepts pulses from wild or main stream source (flow meter). |
| Dual-Pulse Input (Quad PI) circuit | Accepts pulses from blend flow meter. |
| 2 Digital Output Solid State Relay AC (DO AC) circuits | Convert the logic signals from the FlexConn generic microcontroller into isolated, high-voltage rated switched AC signals. |
| 2 Digital Output Pulse Output (PO DC) circuits | Convert the logic signals from the FlexConn generic microcontroller into isolated, high-frequency switched DC signals. |
| A Digital Output Electromechanical Relay (DO EMR) circuit | Converts the logic signals from the FlexConn generic microcontroller such that higher power AC or DC signals can be switched. |
| A COMMS circuit | This RS serial communication block, which can be configured as 2-wire or 4-wire circuit, allows the SSC to communicate with external devices through an RS-485 compliant connection. |

Figure 3-13: CAN-ADD-BLEND functions (left) and physical layout (right)
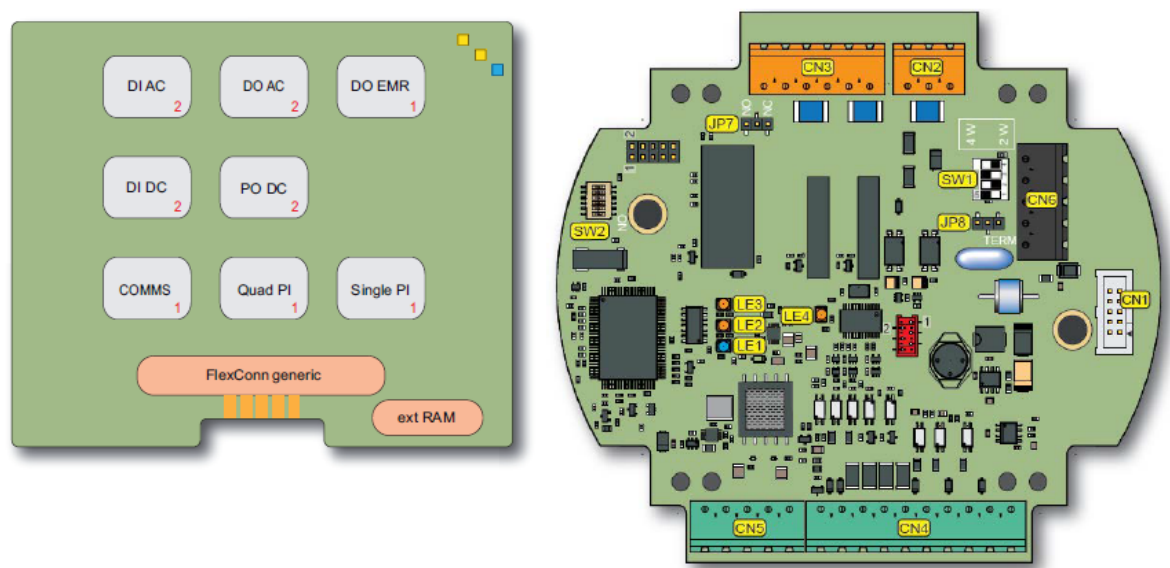


### 3.6.1.2.2  Components Locations

Figure 3-14: CAN-ADD-BLEND component location
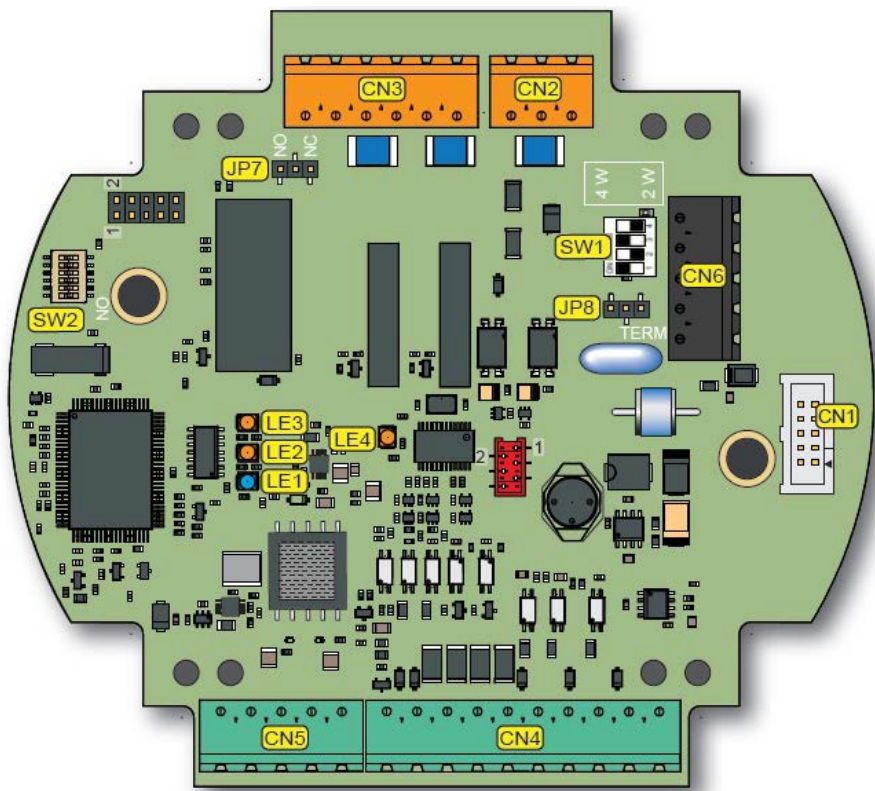
| Item reference | Description |
|---|---|
| SW1 | RS-COMM mode switch |
| SW2 | FlexConn jumper function switches |
| JP7 | Jumper for Digital Output ElectroMechanical Relay contacts setting |
| JP8 | Jumper for RS communication termination setting |
| LE1 | FlexConn Health LED |
| LE2 | Function configurable |
| LE3 | Function configurable |
| LE4 | Pulse Input activity |
| For all connectors: see 4.9.3 - Board Connectors Overview. ||

### 3.6.1.2.3 Terminal Descriptions

#### 3.6.1.2.3.1 SW1 - RS-COMM mode switch
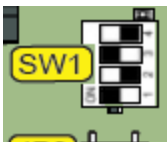


| Reference | Setting | Function | Description |
|---|---|---|---|
| SW1-1 | ON | 2-Wire interface | 2-Wire RS-485 communication |
| SW1-2 | OFF | | |
| SW1-3 | ON | | |
| SW1-4 | OFF | | |
| SW1-1 | OFF | 4-Wire interface | 4-Wire RS-485 communication |
| SW1-2 | ON | | |
| SW1-3 | OFF | | |
| SW1-4 | ON | | |

#### 3.6.1.2.3.2 SW2 - FlexConn jumper function switches
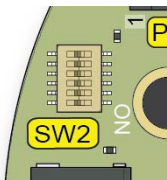
| Reference | Jumper name | Function when set to ON |
|-----------|-------------|-------------------------|
| SW2-1 | FlexConn JP1 | W&M entities protection (not relevant for SSC-A) |
| SW2-2 | FlexConn JP2 | Password read protection |
| SW2-3 | FlexConn JP3 | Write protection all entities |
| SW2-4 | FlexConn JP4 | Spare |
| SW2-5 | FlexConn JP5 | Spare |
| SW2-6 | FlexConn JP6 | CAN bus termination |

### 3.6.1.2.3.3  JP7 - Jumper for Digital Output EM Relay contacts setting
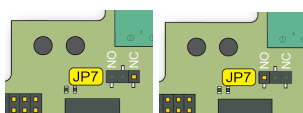


| Position | Description |
|----------|-------------|
| NO (figure left) | Relay contacts normally open |
| NC (figure right) | Relay contacts normally closed |

### 3.6.1.2.3.4  JP8 - Jumper for RS communication terminating setting
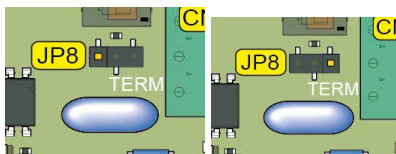


| Position | Description |
|----------|-------------|
| TERM (figure left) | RS-485 communication terminated with 120 W |
| - (figure right) | RS-485 communication NOT terminated |

## 3.6.1.3  CAN-OPTION-SSC

### 3.6.1.3.1  Functions

This board provides additional options that could be needed for a specific customer application. The physical board implements the following functions:

| Function | Description |
|----------|-------------|
| 4 Digital Input AC (OPT DI AC) circuits | Convert high-voltage switched AC signals into isolated logic signals. |

| Function | Description |
|---|---|
| Digital Output Solid State Relay AC (OPT DO AC) circuit | Converts the logic signals from the FlexConn generic microcontroller into isolated, high-voltage rated switched AC signals. |
| Digital Output Electromechanical Relay (OPT DO EMR) circuit | Converts the logic signals from the FlexConn generic microcontroller such that higher power AC or DC signals can be switched. |
| 2-wire passive or active isolated 4-20 mA receiver circuit block (OPT AI DC) | Converts 4-20 mA current loop signals (over long distances) from exter- nal sources, such as temperature or pressure sensors into numeric val- ues. It can be configured to active or passive mode. |
| 2-wire passive isolated 4-20 mA transmitter circuit (OPT AO DC) | Converts logic signals into 4-20 mA current loop signals (over long dis- tances) to control external devices, such as a valve, or to transmit liquid flow rates, and so on. |
| Resistance Temperature Detector (OPT RTD) | Converts temperature data from a remotely connected PT100 resistance temperature detector into a resistance value that can be read by the FlexConn microcontroller. |
| 2-wire isolated OPT COMMS circuit | This 2-wire RS serial communication block allows the SSC to communi- cate with external devices through an RS-485 connection. |
| 2 Digital Input DC (OPT DI DC) circuits | Convert switched DC signals into isolated digital logic signals. |

Figure 3-15: CAN-OPTION-SSC functions (left) and physical layout (right)
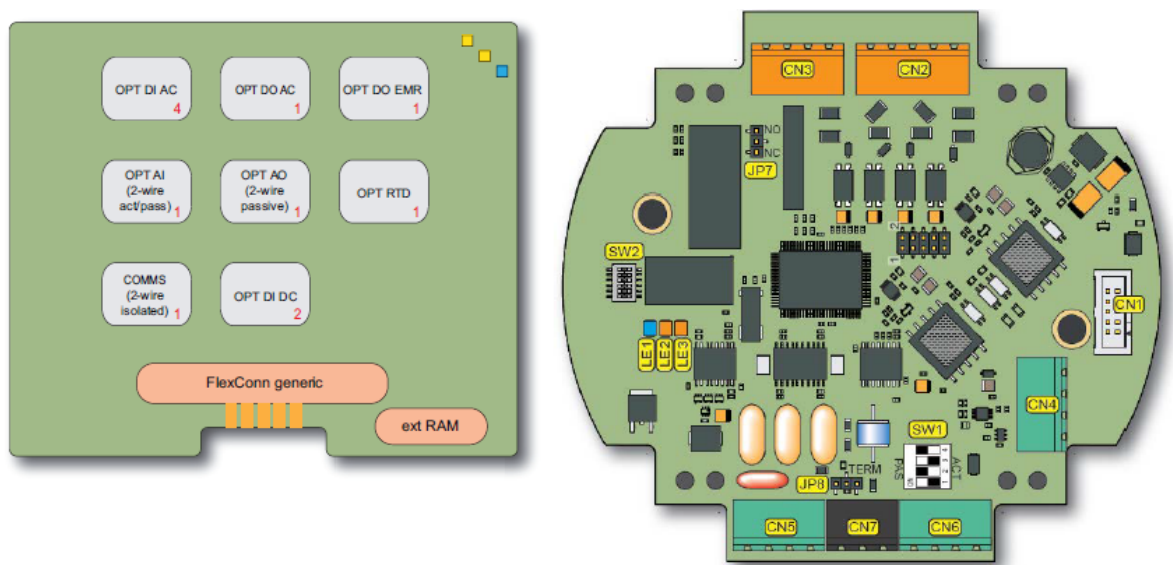


### 3.6.1.3.2  Component Locations

Figure 3-16: CAN-OPTION-SSC component location
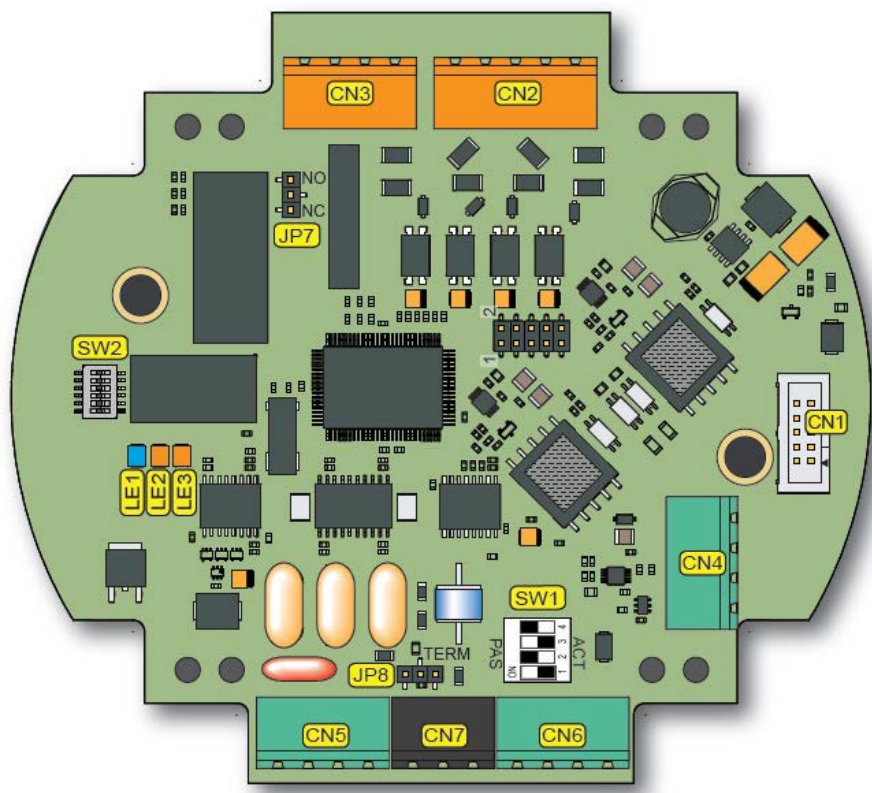
| Item reference | Description |
|---|---|
| SW1 | Active Input mode switch |
| SW2 | FlexConn jumper function switches |
| JP7 | Jumper for Digital Output ElectroMechanical Relay contacts setting |
| JP8 | Jumper for RS communication termination setting |
| LE1 | FlexConn Health LED |
| LE2 | Function configurable |
| LE3 | Function configurable |
| For all connectors: see 4.9.3 - Board Connectors Overview. | |

### 3.6.1.3.3  Terminal Descriptions

#### 3.6.1.3.3.1  SW1 - Analog Input mode switch
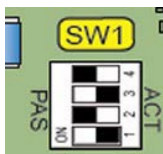


| Reference | Setting | Function | Description |
|---|---|---|---|
| SW1-1 | ON | Active Mode | 4-20 mA input loop powered from CAD-ADD-BLEND board |
| SW1-2 | OFF | | |
| SW1-3 | ON | | |
| SW1-4 | OFF | | |
| SW1-1 | OFF | Passive | 4-20 mA input loop powered from external power supply |
| SW1-2 | ON | | |
| SW1-3 | OFF | | |
| SW1-4 | ON | | |

#### 3.6.1.3.3.2  SW2 - FlexConn jumper function switches
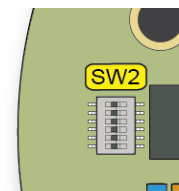
| Reference | Jumper name | Function when set to ON |
|-----------|-------------|-------------------------|
| SW2-1 | FlexConn JP1 | W&M seal (setting effective for all SSC boards) |
| SW2-2 | FlexConn JP2 | Password read protection |
| SW2-3 | FlexConn JP3 | Write protection all entities |
| SW2-4 | FlexConn JP4 | Spare |
| SW2-5 | FlexConn JP5 | Spare |
| SW2-6 | FlexConn JP6 | CAN bus termination |

### 3.6.1.3.3.3  JP7 - Jumper for Digital Output EM Relay contacts setting
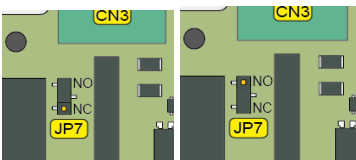


| Position | Description |
|----------|-------------|
| NO (figure left) | Relay contacts normally open |
| NC (figure right) | Relay contacts normally closed |

### 3.6.1.3.3.4  JP8 - Jumper for RS communication terminating setting
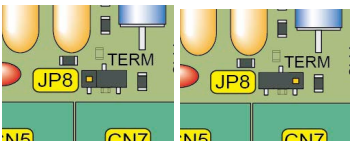


| Position | Description |
|----------|-------------|
| TERM (figure left) | RS-485 communication terminated with 120 W |
| - (figure right) | RS-485 communication NOT terminated |

## 3.6.1.4  CAN-PSF-SSC

### 3.6.1.4.1  Functions

The primary function of the CAN-PSF-SSC board is to convert single phase AC mains voltage into a DC voltage, to power the other SSC modules. It can also deliver fuse-protected AC power for external devices, such as blend control valves. It can also provide DC power for external devices, such as flow meters, temperature sensors, and so on. See the following figure.

The CAN-PSF-SSC board also provides AC power for the DO AC on both the CAN-ADD-BLEND and CAN-OPTION-SSC boards.

Figure 3-17: CAN-PSF-SSC functions (right) and physical layout (left)
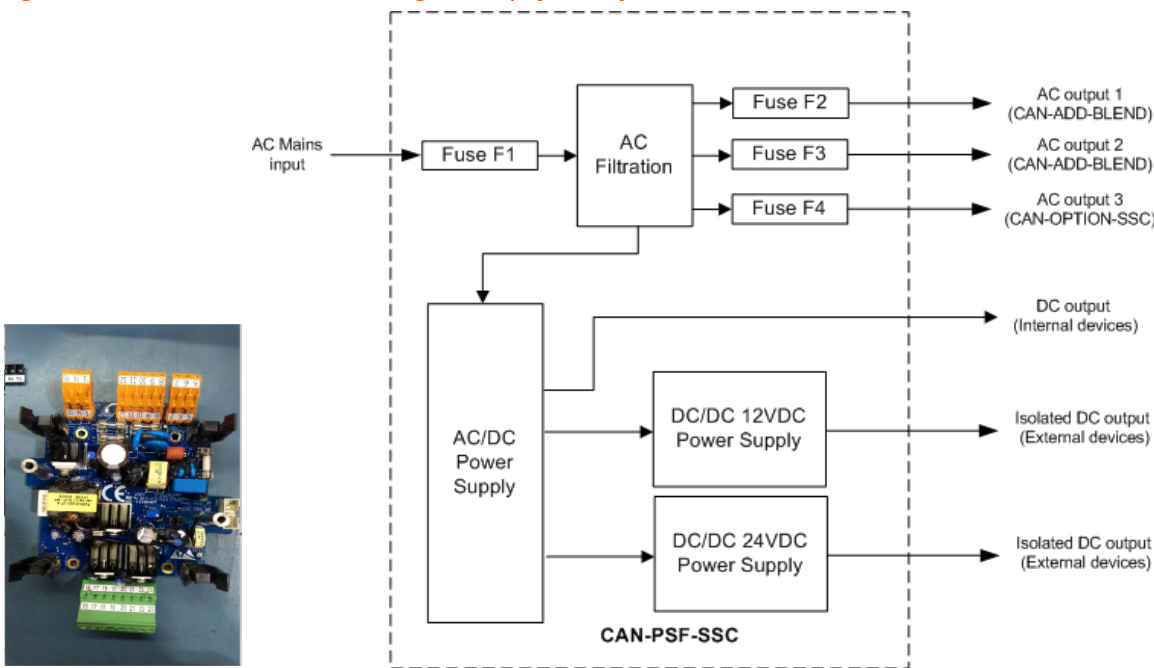


The following table specifies the external DC outputs.

| Item | Conditions | Minimum | Typical | Maximum | Unit |
|---|---|---|---|---|---|
| Output voltage variation | $V_{in}$ = 230 $V_{AC}$ | 23<br>11.5 | 24<br>12 | 25<br>12.8 | $V_{DC}$ |
| Continuous output current | +24 $V_{DC}$<br>12 $V_{DC}$ | -<br> | -<br> | 42<br>83 | mA |
| Short circuit current | +24 $V_{DC}$<br>12 $V_{DC}$ | 42<br>83 | 56.3<br>94 | 80<br>110 | mA |
| Ripple and noise | pk-pk bandwidth = 20 Mhz | - | - | 150 | mV |

Four distinct fuses are used on the CAN-PSF board. F1 provides protection for all AC voltages either used by the AC-DC converters or used as a pass-through supply voltage for external devices. F2 and F3 is used for the CAN-ADD-BLEND board external devices. F4 is used for the CAN-OPTION board external devices.

### 3.6.1.4.2  Board Description

### 3.6.1.4.3  TComponents Locations

Figure 3-18: CAN-PSF-SSC component location
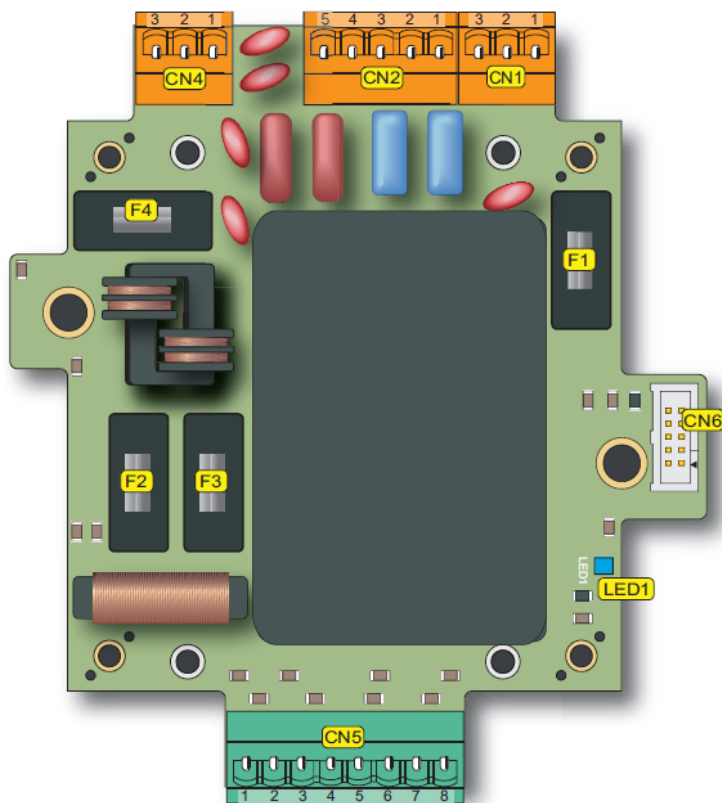


| Item reference | Description | Remark |
|---|---|---|
| F1 | 4A (T) fuse - size 5x20 mm - high-breaking capacity | AC Input for the CAN-PSF-SSC |
| F2 | 1.5A (T) fuse - size 5x20 mm | AC Output for the CAN-ADD-BLEND |
| F3 | 1.5A (T) fuse - size 5x20 mm | AC Output for the CAN-ADD-BLEND |
| F4 | 1.5A (T) fuse - size 5x20 mm | AC Output for the CAN-OPTION-SSC |
| LED1 | FlexConn Health LED | |
| For all connectors: see 4.9.3 - Board Connectors Overview. | | |

# 3.7  Device Features

## 3.7.1  Mechanical

- Mounting facilities: 229 mm [9.016 inches] spacing, and allowing M10 fixing bolts (see the following figure).

Figure 3-19: Mechanical facilities of SSC-B



Ø11 mm (2x)
[0.433 inches]

Shaft: 7.50 h13 mm [0.295 h 0.512 inches]
Thread: M10x1.5 g6
Type: ISO 4762
Material: A2 70
Torque: 16 Nm [11.79 lb-ft]

229 mm [9.016 inches]

LID (back)

BOX

162 (+0.05/+0.02) mm
6.378 (+0.002/+0.001) inches

161.96 (-0.02/-0.06) mm
6.376 (-0.001/-0.002) inches

SPIGOT FLANGE DIAMETERS
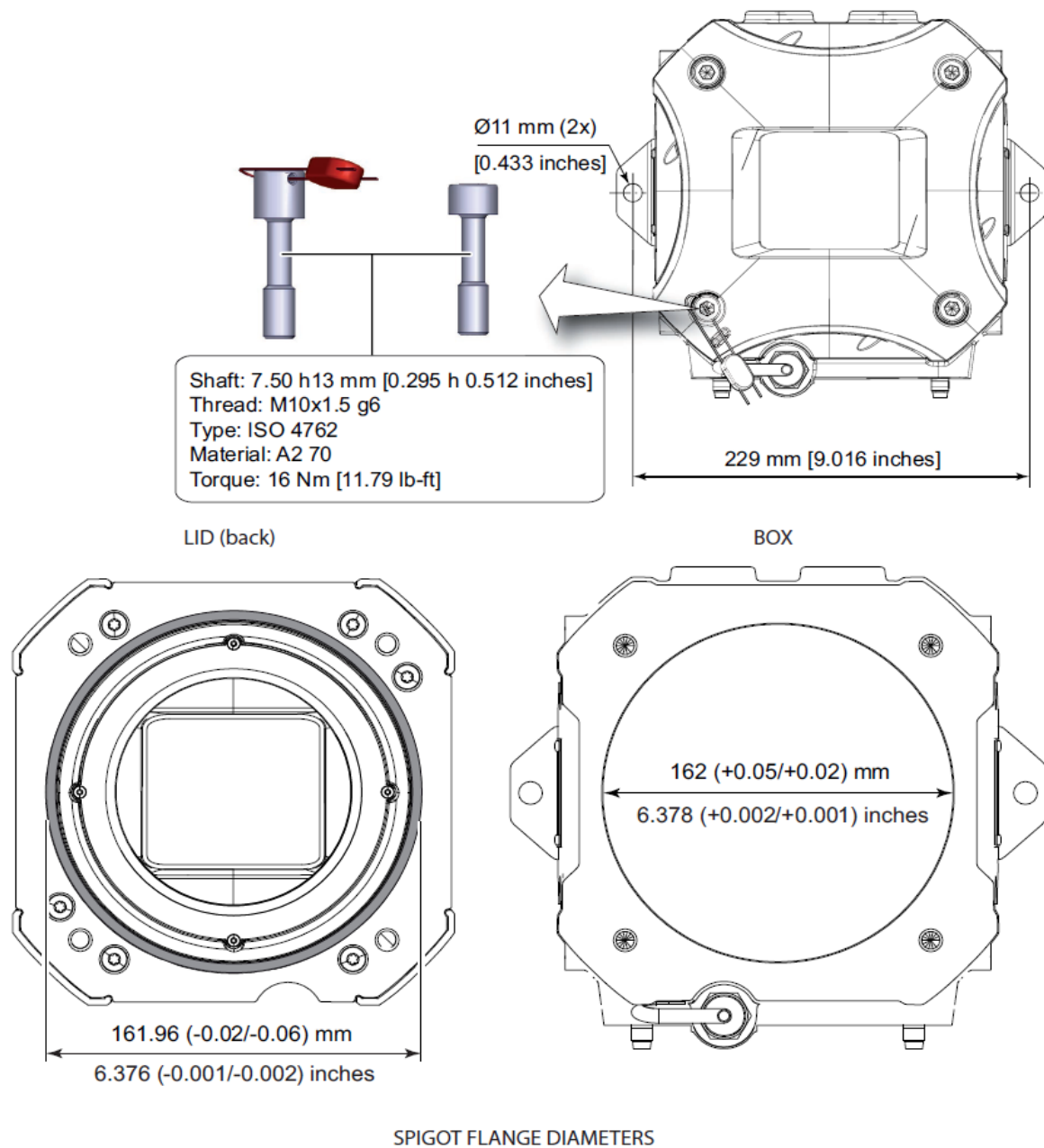
- Captured bolts in lid

- Sealing facility on the lid (see see the following figure)

Figure 3-20: Sealing facility on the SSC-B lid
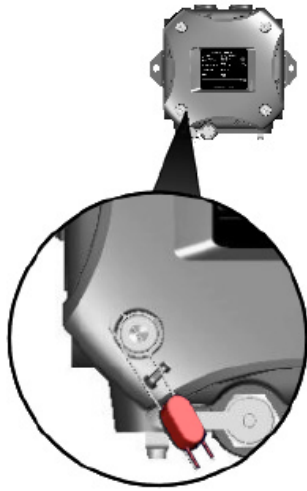


- Sealing bolt for physical device sealing

- Optional tag plate to be mounted on the enclosure

- O-ring in lid, standard available part

- Intrinsically safe interface connector for the LAD

- Metric or NPT cable entries

- Optional breather/drain

- Glass window for display and IR interface for IR remote

## 3.7.2  Electrical

- Internal power supply

- External (2) and internal (8) ground points (see the following figure).

Figure 3-21: Internal power supply of SSC-B



Internal ground points (8)

External ground points (2)
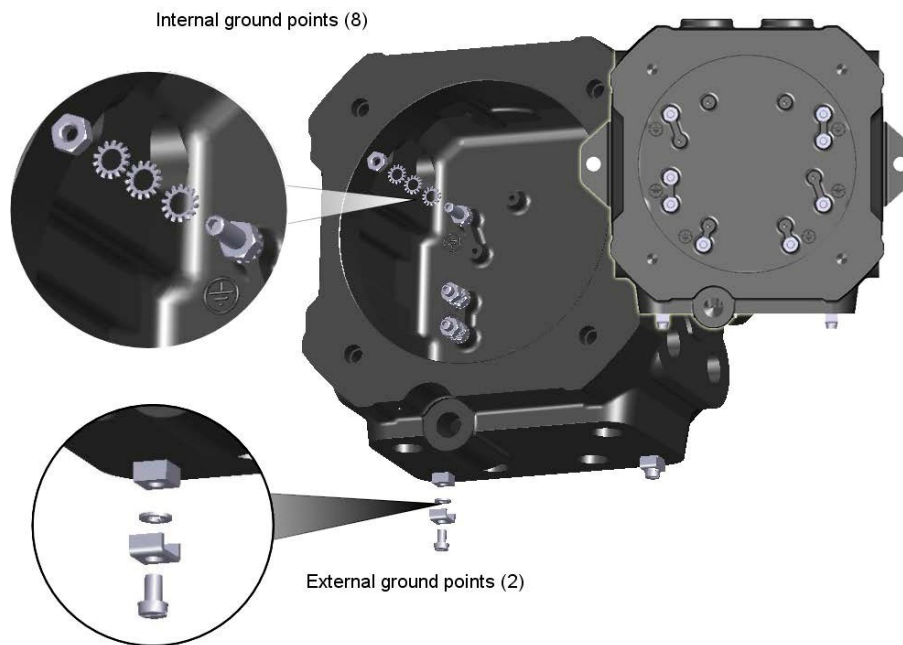
- 3 Internal fuses

- 3 Microprocessor-controlled modules

- Each IO galvanically isolated from internal electronics and from each other (Safety performance)

### 3.7.3  System

- Full-color (16 bits) QVGA 320*240 display, 3.5" diagonal

- Multi-language support for main screens:

  - English US
  - English UK
  - French
  - German
  - Spanish
  - Dutch
  - Italian
  - Portuguese
  - Chinese
  - Japanese

- Polish
- one additional configurable user language (Latin char. set)
- Menu-driven service interface:

  - LAD intrinsic safe interface

  - IR interface, compatible with the actual Fusion4 IR Controller

- Real-time clock used for time stamping

- 2 Communication ports for interfacing with safe-area tools and systems

### 3.7.4 Environment

| Parameter | SSC | LAD |
|---|---|---|
| Operating temperature | -40°C ... +65°C (-40°F ... +149°F) | -20°C ... +65°C (-4°F ... +149°F) |
| Electronics designed for | -40°C ... +85°C (-40°F ... +185°F) and Restriction of Hazardous Substances (RoHS) | -40°C ... +85°C (-40°F ... +185°F) and RoHS |
| Storage temperature | -40°C ... +85°C (-40°F ... +185°F) | -40°C ... +85°C (-40°F ... +185°F) |
| Ingress protection | IP66 / NEMA 4X | IP54 / NEMA 3R |
| SD-card compartment behind lid | - | IP20 |

## 3.8  Available Input/Output Functions on the SSC-B

| I/O block | CAN-ADD-BLEND | CAN-OPTION-SSC | Refer to section |
|---|---|---|---|
| Dual-Pulse Input (Quad PI) | 1 | - | 3.9.5 |

| I/O block | CAN-ADD-BLEND | CAN-OPTION-SSC | Refer to section |
|---|---|---|---|
| Single-Pulse Input (Single PI) | 1 | - | 3.9.4 |
| Analog Input (OPT AI DC) | - | 1 | 3.9.6 |
| Analog Output (OPT AO DC) | - | 1 | 3.10.5 |
| Resistance Temp. Detector (OPT RTD) | - | 1 | 3.9.7 |
| Communication (COMMS/ OPT COMS) | RS-485 | RS-485 | 3.11.1 |
| Pulse Output (PO DC) | 2 | - | 3.10.4 |
| Digital Input DC (DI DC/ OPT DI DC) | 2 | 2 | 3.9.3 |
| Digital Input AC (DI AC/ OPT DI AC) | 2 | 4 | 3.9.2 |
| Digital Output Electromechanical Relay (DO EMR/ OPT DO EMR) | 1 | 1 | 3.10.3 |
| Digital Output Solid State Relay AC (DO AC/ OPT DO AC) | 2 | 1 | 3.10.2 |

For the configuration of these I/O functions, see Chapter 5 - Operation.

# 3.9  Input Functions

## 3.9.1  General

The SSC supports the electronic input functions as follows.

| Input function | I/O block name | |
|---|---|---|
| | CAN-ADD-BLEND | CAN-OPTION-SSC |
| Digital Input AC | DI AC | OPT DI AC |
| Digital Input DC | DI DC | OPT DI DC |
| Single Pulse Input | Single PI | - |
| Dual Pulse Input | Quad PI | - |
| Analog Input | - | OPT AI DC |
| Resistance Temperature Detector | - | OPT RTD |

## 3.9.2 Digital Input AC (DI AC/ OPT DI AC)

### 3.9.2.1 Functional Description

The function of the Digital Input AC is to convert high-voltage switched AC into a signal that can be used by the controller to realize specific functionality needed for the customer application.

Figure 3-22: Digital Input AC connections
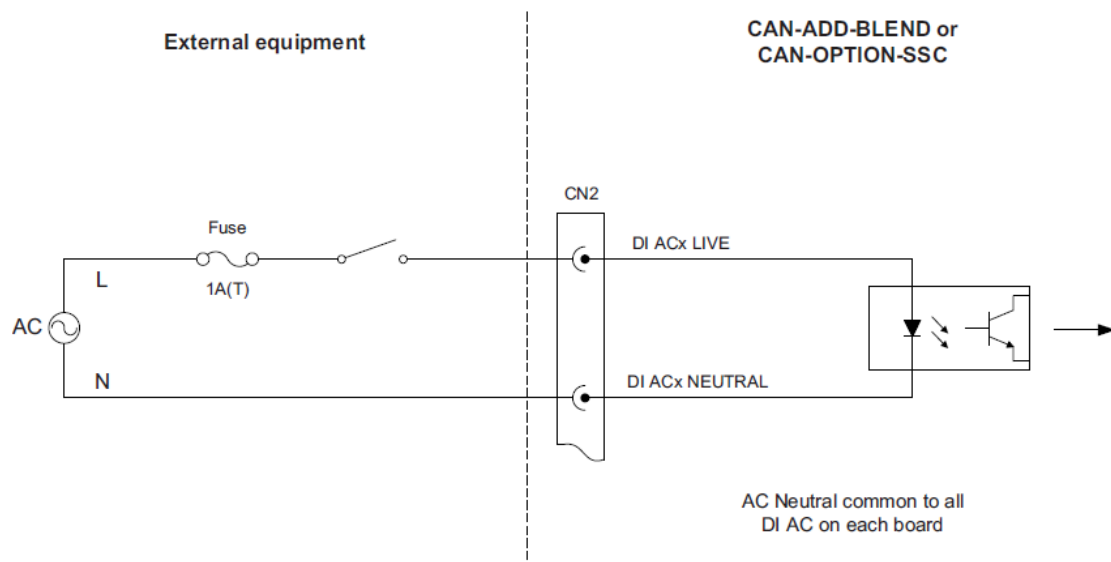


### 3.9.2.2 Characteristics

| Item | Minimum | Typical | Maximum | Unit |
|---|---|---|---|---|
| Input voltage | - | - | 265 | $V_{AC}$ |
| Input frequency | 47 | - | 63 | Hz |
| Input impedance | - | 44 | - | kW |
| High input (must turn on) voltage | 85 | - | - | $V_{AC}$ |
| Low input (must turn off) voltage | - | - | 20 | $V_{AC}$ |
| Input switching frequency | - | - | 4 | Hz |
| AC on time ($T_{ON}$) | 50 | - | - | ms |
| AC off time ($T_{OFF}$) | 200 | - | - | ms |

# 3.9.3  Digital Input DC (DI DC/ OPT DI DC)

## 3.9.3.1  Functional Description

The function of the Digital Input DC is to convert switched DC into a signal that can be used by the controller to realize specific functionality needed for the customer.

A simplified block diagram is illustrated in the following figure.

Figure 3-23: Digital Input DC connections
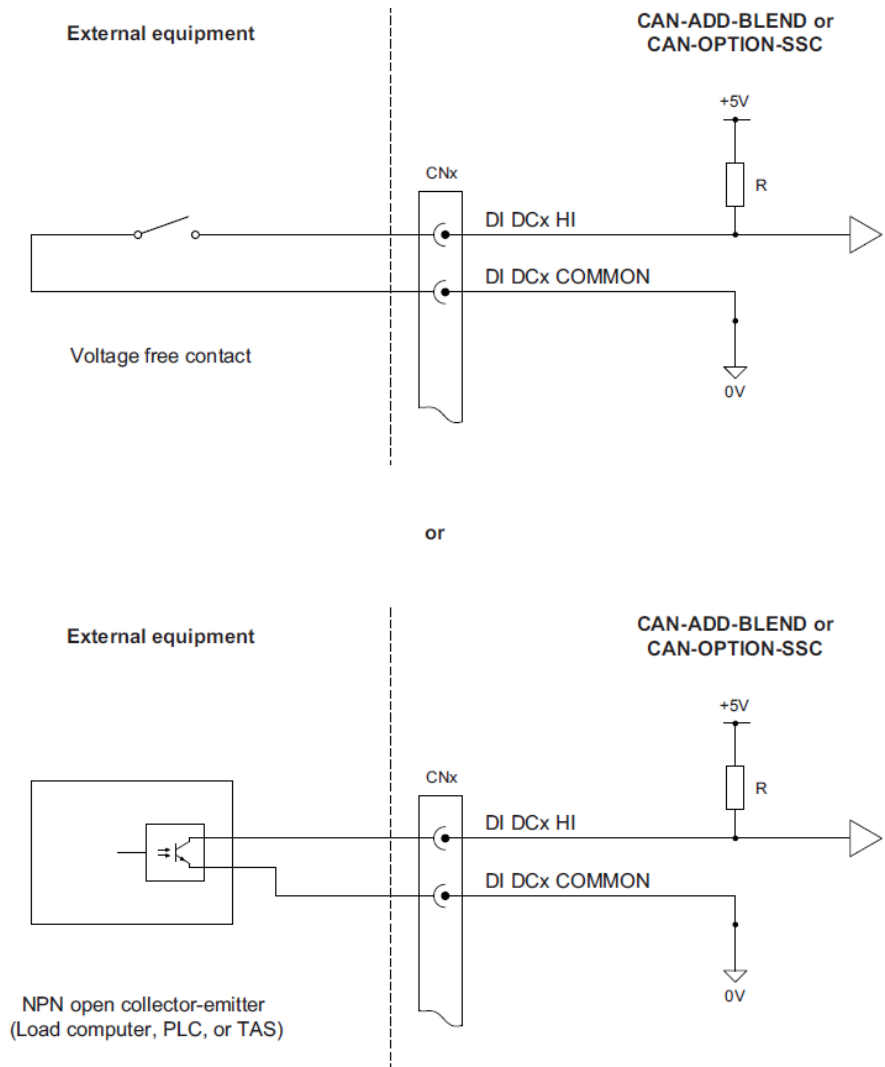


## 3.9.3.2  Characteristics

| Item | Minimum | Typical | Maximum | Unit |
|---|---|---|---|---|
| Switching level $V_H$ | 5 | - | 30 | $V_{DC}$ |

| Item | Minimum | Typical | Maximum | Unit |
|---|---|---|---|---|
| Switching level $V_L$ | - | - | 0.8 | $V_{DC}$ |
| Switching current ($I_{SW}$) | 10 | - | - | mA |
| Input switching frequency | - | - | 1 | kHz |
| Input on time ($T_{ON}$) | 500 | - | - | µs |
| Input off time ($T_{OFF}$) | 500 | - | - | µs |

# 3.9.4  Single-Pulse Input (Single PI)

## 3.9.4.1  Functional Description

The function of the Single-Pulse Input is to accept pulse signals from a wild stream single-pulse flowmeter, or single-scaled pulse signals from a load computer or TAS system.

Figure 3-24: Single-Pulse Input connections



### 3.9.4.2 Characteristics

| Item | Minimum | Typical | Maximum | Unit |
|---|---|---|---|---|
| Switching level $V_H$ | 5 | - | 30 | $V_{DC}$ |

| Item | Minimum | Typical | Maximum | Unit |
|---|---|---|---|---|
| Switching level $V_L$ | - | - | 0.8 | $V_{DC}$ |
| Switching current ($I_{SW}$) | 10 | - | - | mA |
| Input switching frequency | - | - | 5 | kHz |
| Input on time ($T_{ON}$) | 100 | - | - | µs |
| Input off time ($T_{OFF}$) | 100 | - | - | µs |

## 3.9.5  Dual-Pulse Input (Quad PI)

### 3.9.5.1  Functional Description

The Dual-Pulse Input can accept signals from either one dual-pulse flow meter for applications requiring a high level of pulse integrity offered by a dual pulse flow meter (sometimes referred to as a quad (quadrature) flow meter), or one single-pulse flow meter. See 5.11.4.1.1- PI.

NOTE:  The dual-pulse input cannot be used to accept signals from two separate single-pulse flow meters.

Figure 3-25: Dual-Pulse Input connections
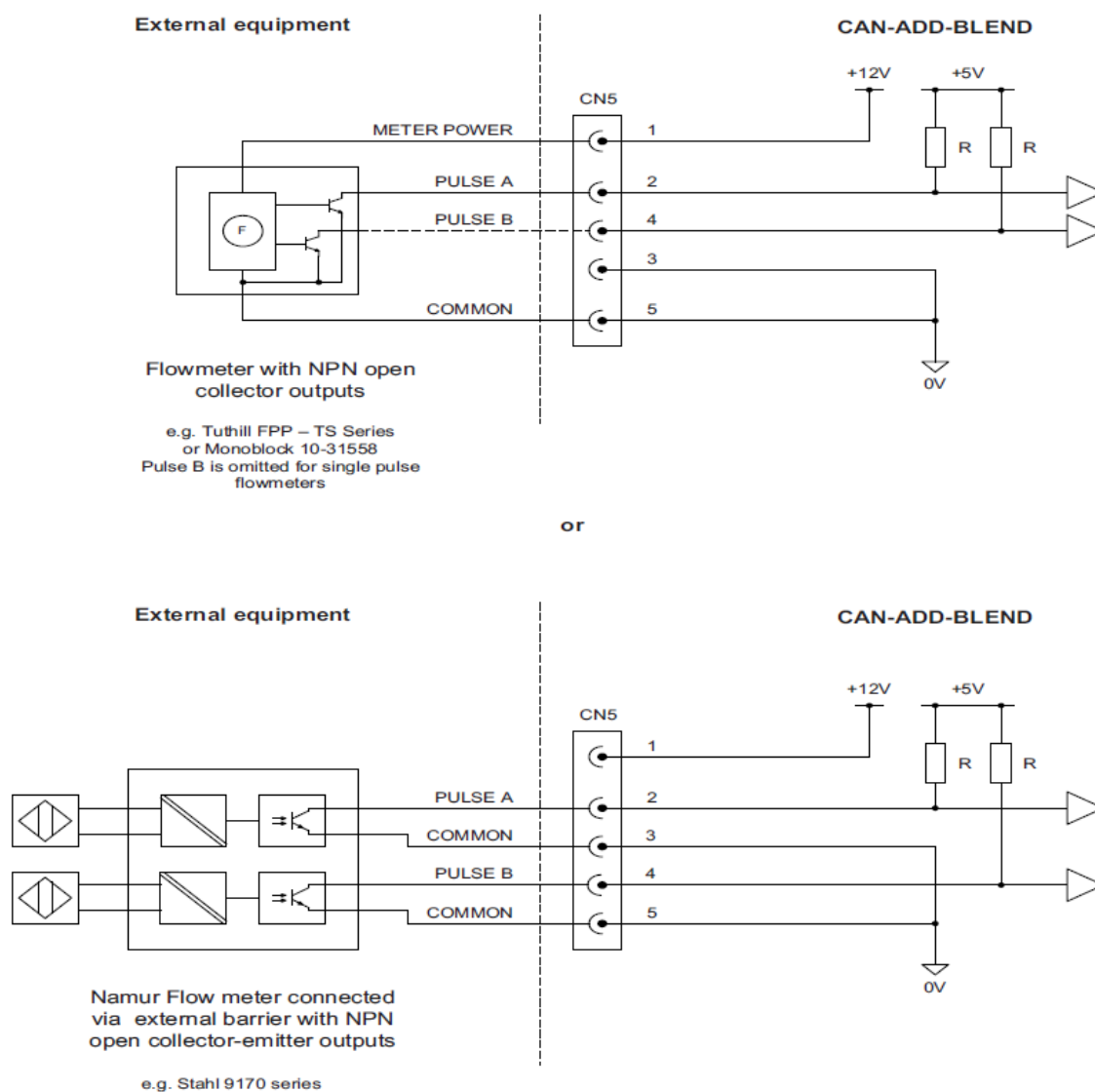
### 3.9.5.2  Characteristics

| Item | Minimum | Typical | Maximum | Unit |
|---|---|---|---|---|
| Switching level $V_H$ | 5 | - | 30 | $V_{DC}$ |
| Switching level $V_L$ | - | - | 0.8 | $V_{DC}$ |
| Switching current ($I_{SW}$) | 10 | - | - | mA |
| Input switching frequency | - | - | 5 | kHz |
| Input on time ($T_{ON}$) | 100 | - | - | µs |
| Input off time ($T_{OFF}$) | 100 | - | - | µs |
| DPI Phase A with respect to B | - | 90º | - | - |

# 3.9.6  Analog Input (OPT AI DC)

## 3.9.6.1 Functional Description

The Analog Input supports 2-wire 4-20mA, and can be configured by a switch to operate in active or passive mode.

Figure 3-26: Analog Input connections - Active mode (top) and Passive mode (bottom)
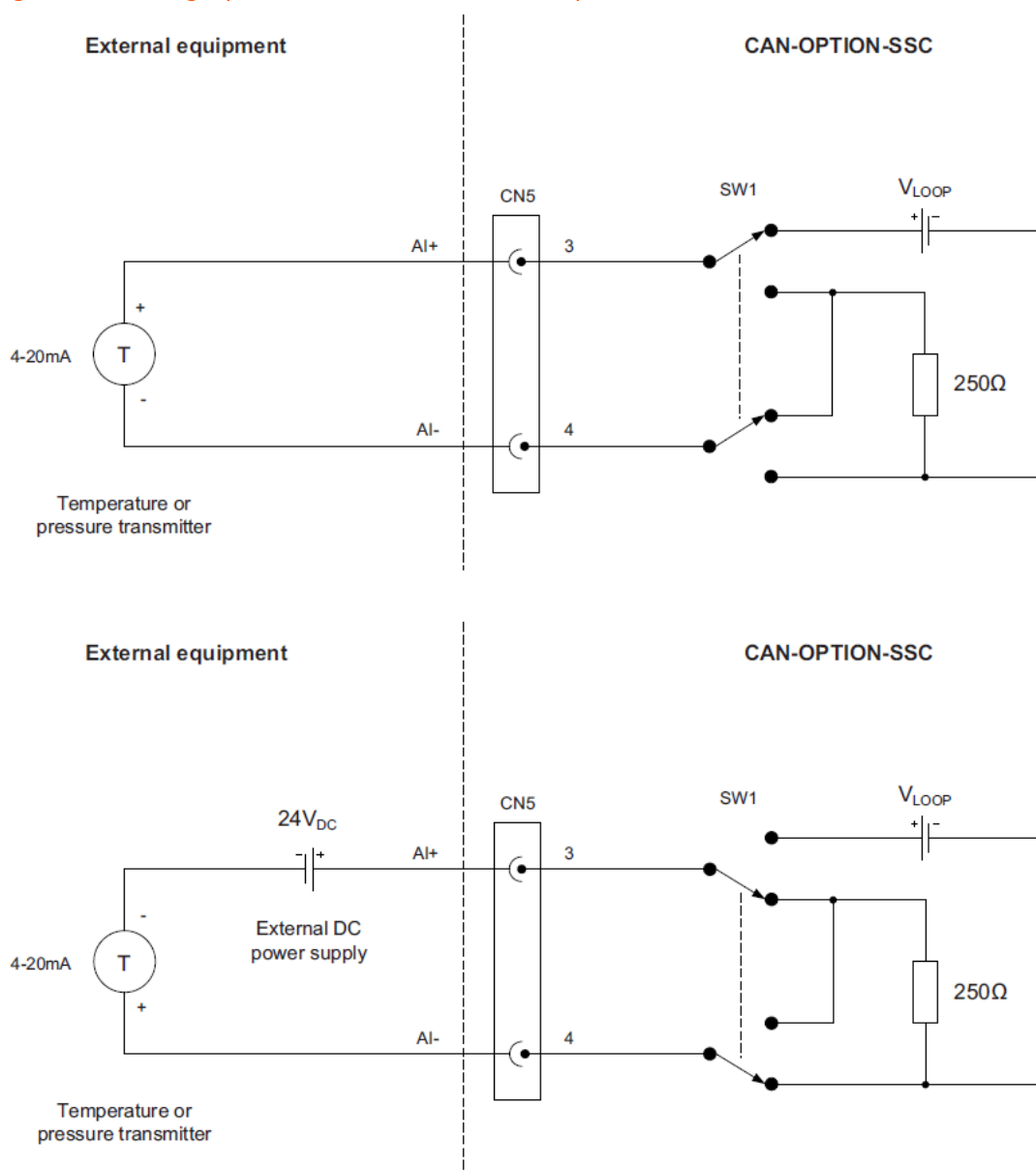


The Analog Input is primarily designed to measure pressure, to allow pressure compensation for MID-blending and -additive applications.

The Analog Input does not support temperature measurement for MID applications. For non-MID applications, the Analog Input can be used for temperature, pressure, or any other type of analog 4-20mA signal measurement.

The Analog Input interface is not intrinsically safe, and external devices connected to the Analog Input must conform to Ex d safety standards when used in a hazardous area.

### 3.9.6.2  Characteristics

| Item | Minimum | Typical | Maximum | Unit |
|---|---|---|---|---|
| $V_{LOOP}$ (passive mode) | 23.0 | 24.0 | 42.5 | $V_{DC}$ |
| $V_{LOOP}$ (ISO) (active mode) | 24.0 | 28.0 | 32.0 | $V_{DC}$ |
| $I_{LOOP}$ (ISO) (active mode) | - | - | 25.0 | mA |
| Nominal loop current range | 4 | - | 20 | mA |
| Loop current measurement range | 0 | - | 25 | mA |
| Max. loop current | - | - | 40 | mA |
| Nominal input resistance ($R_S$) | 249.75 | 250 | 250.25 | ohms |
| External reference voltage ($V_{REF}$) | 2.49875 | 2.5 | 2.5012 | $V_{DC}$ |
| Accuracy (without external transmitter) | - | - | ± 1.0 | % |

# 3.9.7  Resistance Temperature Detector (OPT RTD)

### 3.9.7.1  Functional Description

The RTD input allows the controller to read the temperature of a remotely connected PT100 resistance temperature detector. The RTD input supports 3-wire and 4-wire connections, as illustrated in the following figure.

Figure 3-27: Resistance Temperature Detector connections
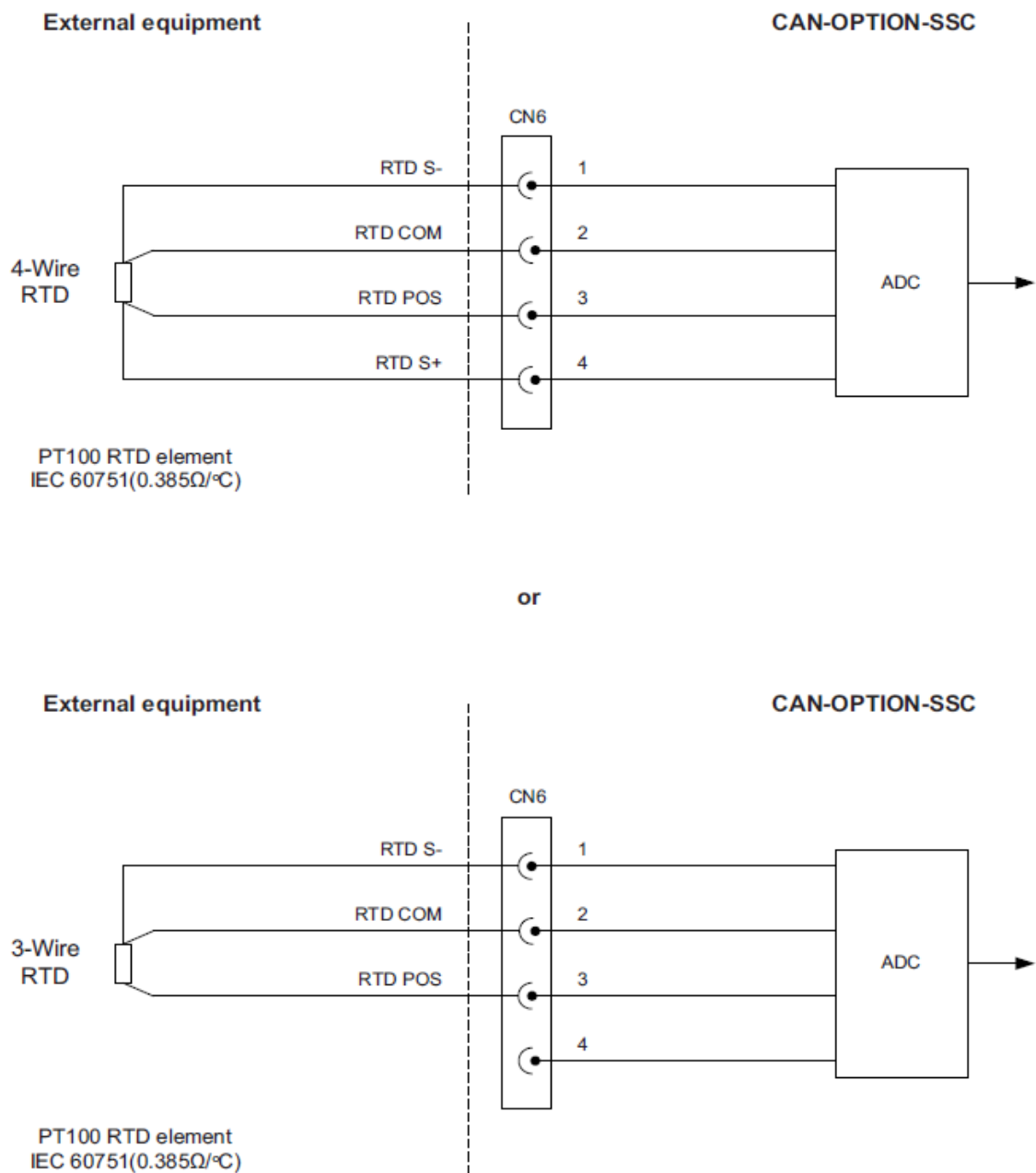


The following RTD types are accepted:

| RTD type | Connection | Alpha co-efficient |
|---|---|---|
| PT100 | 3-Wire or 4-Wire (Kelvin connection) | IEC 60751 (0.385 Ω/°C / 0.214 Ω/°F) |

The selection of 3-Wire or 4-Wire RTD type is performed in software, but the RTD must be connected to the circuit as shown in the following figure.

### 3.9.7.2  Characteristics

| Item | Minimum | Typical | Maximum | Unit |
|------|---------|---------|---------|------|
| Temperature measurement range | -100 [-148] | - | +200 [+392] | °C [°F] |
| MID temperature measurement range | -20 [-4] | - | +55 [+131] | °C [°F] |
| Measurement error (-50 ... +150°C/ -58 ... +302°F) | - | - | ±190 | mΩ |
|  | - | - | ±0.5 [±0.9] | °C [°F] |
| Measurement error (-20 ... +55°C/ -4 ... +131°F) | - | - | ±116 | mΩ |
|  | - | - | ±0.3 [±0.5] | °C [°F] |
| RTD current source | - | 500 | - | µA |
| RTD cable length | - | - | 150 | m |

# 3.10  Output Functions

## 3.10.1  General

The SSC supports the electronic output functions as follows.

| Output function | I/O block name | |
|-----------------|-----------------|-----------------|
|  | CAN-ADD-BLEND | CAN-OPTION-SSC |
| Digital Output Solid State Relay AC | DO AC | OPT DO AC |
| Digital Output Electromechanical Relay | DO EMR | OPT DO EMR |
| Pulse output | PO DC | - |
| Analogue Output | - | OPT AO DC |

## 3.10.2  Digital Output Solid State Relay AC (DO AC/ OPT DO AC)

### 3.10.2.1  Functional Description

The DO AC allows the controller to switch high-voltage AC signals, to control solenoids, digital control valves, alarms and other loads.

The two output terminals behave as a "volt-free" contact and require an external AC power supply to drive a load as illustrated in the following figure.

Figure 3-28: Solid State Relay "Self-powered" connections
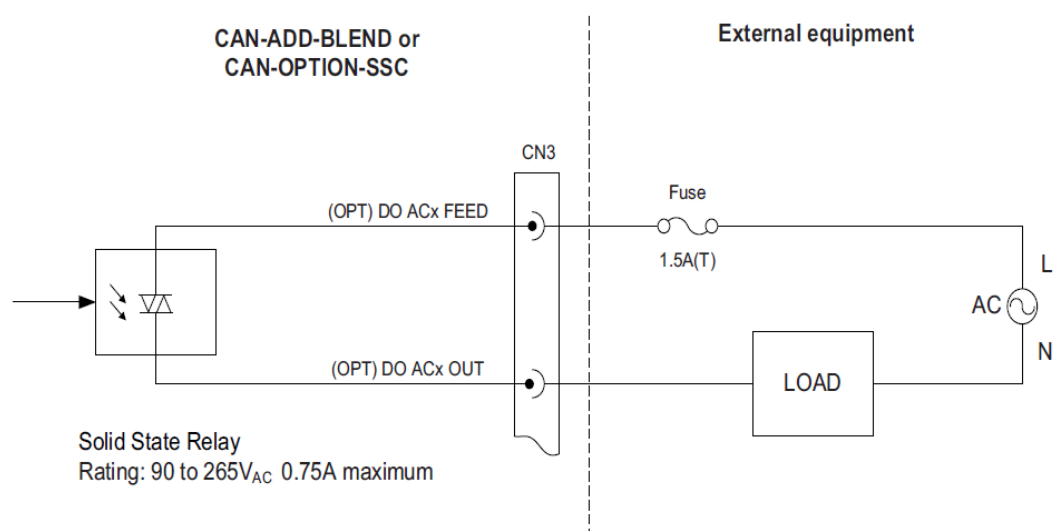
## 3.10.2.2  Characteristics

| Item | Minimum | Typical | Maximum | Unit |
|---|---|---|---|---|
| Output feed voltage | 90 | - | 265 | $V_{AC}$ |
| Output feed frequency | 47 | - | 63 | Hz |
| Output steady state load current | 25 | - | 750 | mA |
| Output surge load current | - | - | 6 | A |
| Off state output leakage current | - | - | 1 | mA |
| Switching time | - | - | 10 | ms |

## 3.10.2.3  Output Specifications

| Description | Unit |
|---|---|
| Operating Voltage (47-63 Hz) [Vrms] | 12-280 |
| Transient Overvoltage [Vpk] | 600 |
| Maximum Off-State Leakage Current @ Rated Voltage [mArms] | 0.1 |
| Maximum Off-State dv/dt @ Maximum Rated Voltage [V/µsec] (3) | 500 |
| Maximum Load Current [Arms] | 1.5 |
| Maximum Load Current [Arms] | 0.025 |
| Maximum Surge Current (16.6ms) [Apk] | 80 |
| Maximum On-State Volatge Drop @ Rated Current [Vpk] | 1.5 |
| Maximum Power Factor (with Maximum Load) | 0.5 |

## 3.10.3  Digital Output Electromech. Relay (DO EMR/ OPT DO EMR)

### 3.10.3.1  Functional Description

The DO EMR allows the controller to switch high-voltage AC signals to control alarms and other loads.

The two output terminals are "volt-free" contacts and require an external power supply to drive a load.

The relay output contacts are effectively SPST (Single Pole Single Throw) and are configurable through a jumper (for physical location(s), see CHAPTER 5.) to be either normally open (NO) or normally closed (NC). See the following figure.

Figure 3-30: Electromechanical Relay connections
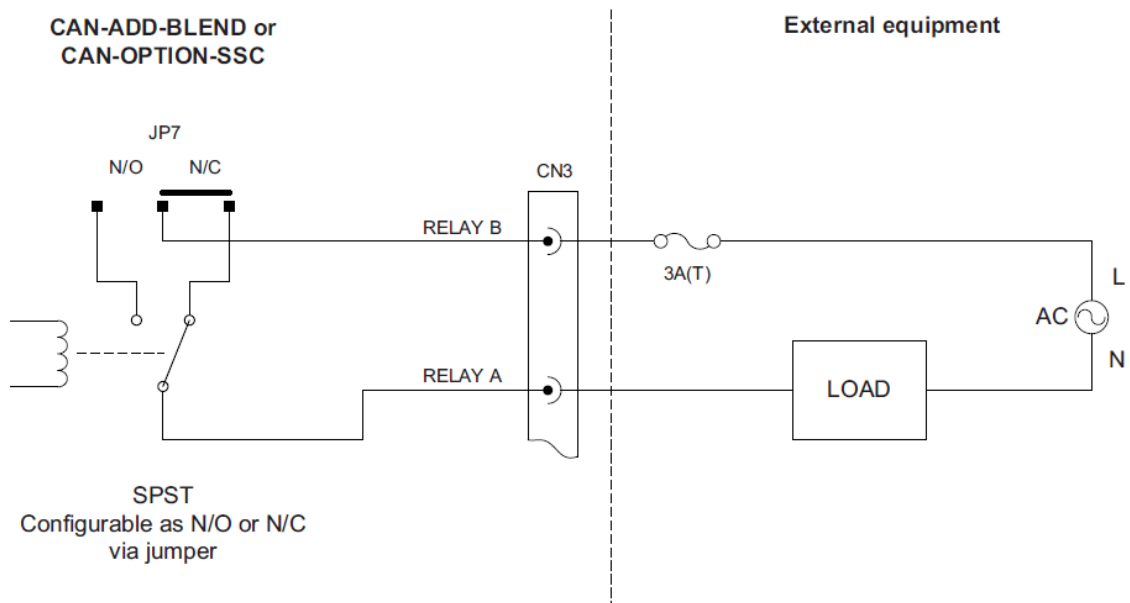


- Contact rating: 265$V_{AC}$ 3A max.

### 3.10.3.2  Characteristics

| Item | Minimum | Typical | Maximum | Unit |
|---|---|---|---|---|
| Load Voltage to be switched | - | - | 265 | $V_{AC}$ |
| Switching current AC | - | - | 3 | A |
| Steady state current AC | - | - | 3 | A |

| Item | Minimum | Typical | Maximum | Unit |
|------|---------|---------|---------|------|
| Output contact type | - | SPST | - | - |
| Operate time | - | - | 10 | ms |
| Release time | - | - | 10 | ms |
| Setting time | - | - | 50 | ms |

## 3.10.4  Pulse Output (PO DC)

### 3.10.4.1  Functional Description

The Pulse Output allows the controller to switch DC signals to interface to a PLC, load computer, TAS, or other system. The PO is not designed to switch high-current loads.

The two output terminals behave as a "volt-free" contact and require an external power supply to drive a load as illustrated in following figure.

Figure 3-31: Pulse Output connections



- PO  Rating: 30V$_{DC}$  0.05A maximum
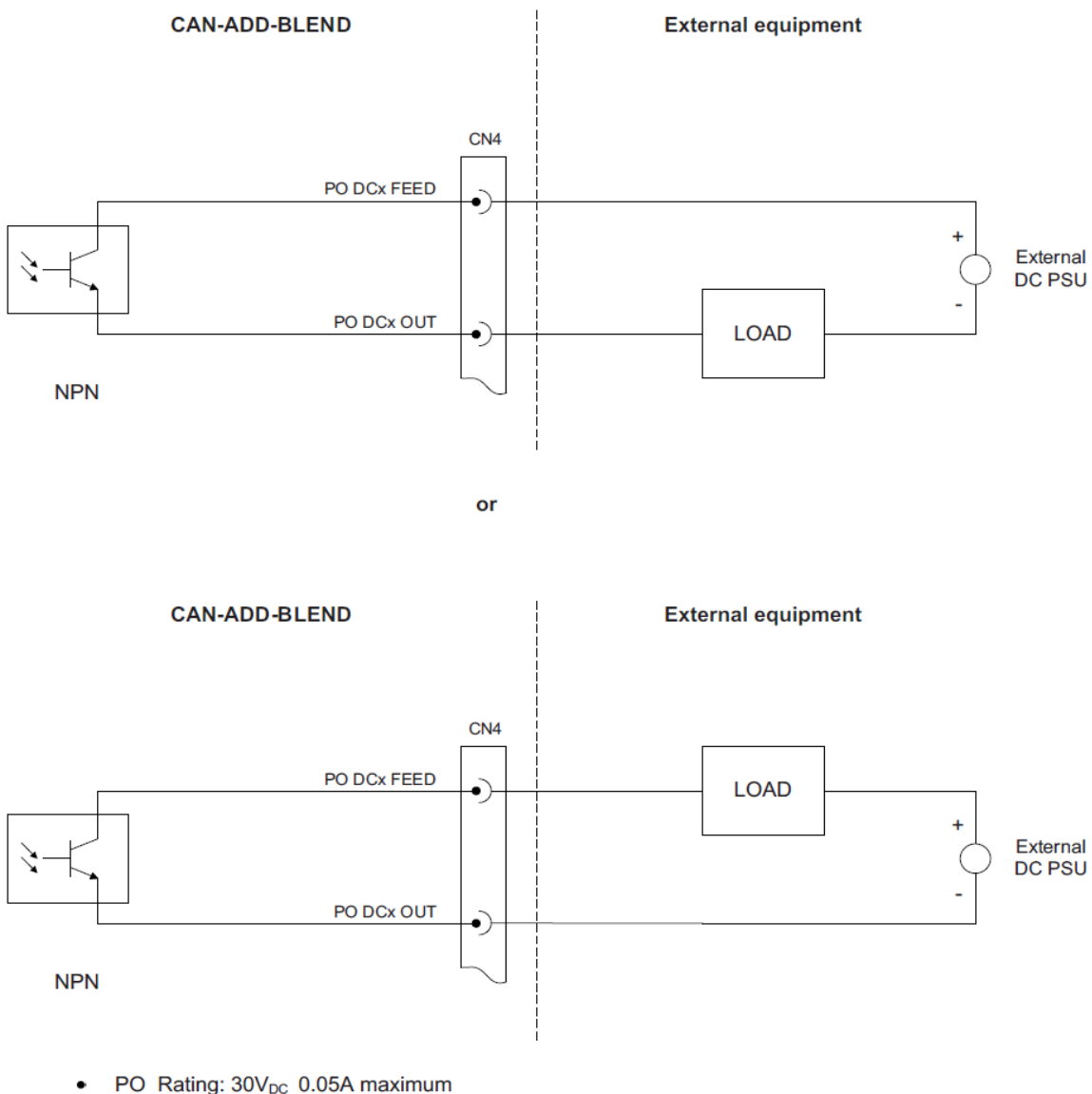
## 3.10.4.2  Characteristics

| Item | Minimum | Typical | Maximum | Unit |
|---|---|---|---|---|
| Output load current (Sink) | - | - | 50 | mA |
| Output load current (Source) | - | - | 50 | mA |
| Saturation voltage V$_{CE(SAT)}$ | - | - | 1.0 | V$_{DC}$ |
| Max. Switching frequency F$_{MAX}$ | - | - | 0.3 | kHz |
| T$_{ON}$ and T$_{OFF}$ pulse width | 3.33 | - | - | ms |

# 3.10.5  Analog Output (OPT AO DC)

## 3.10.5.1  Functional Description

The Analog Output supports 2-wire passive 4-20 mA. The Analog Output does NOT provide a power supply to power the loop. See the following figure.

Figure 3-32: Analog Output connections
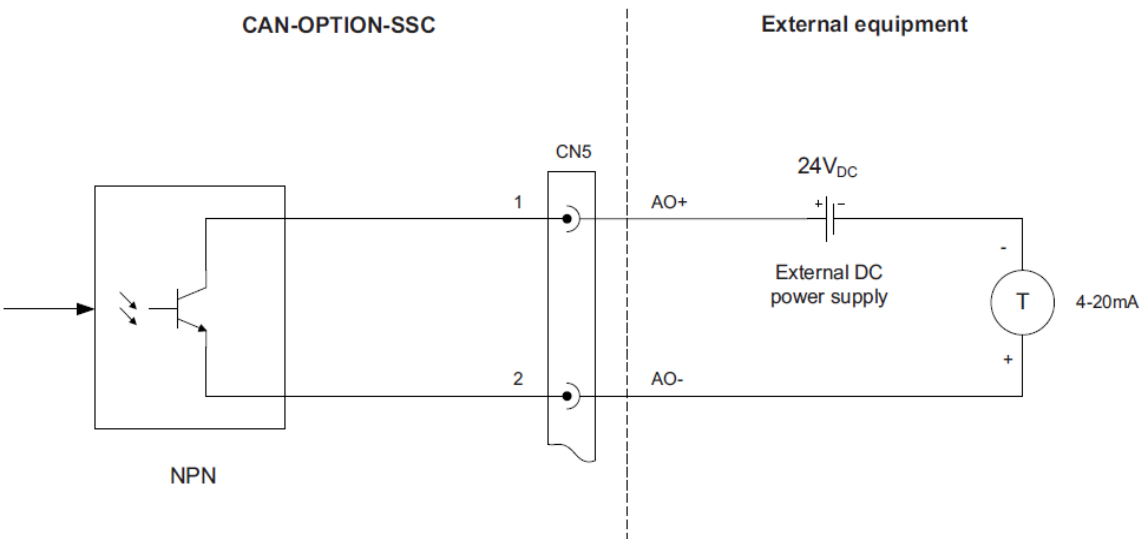


## 3.10.5.2  Characteristics

| Item | Minimum | Typical | Maximum | Unit |
|---|---|---|---|---|
| $V_{LOOP}$ | 23.0 | 24.0 | 36.0 | $V_{DC}$ |
| Nominal loop current range | 4 | - | 20 | mA |
| Loop current control range | 3 | - | 21 | mA |
| Accuracy (without external receiver) | - | - | ±1.0 | % |
| Load resistance | 0 | - | 750 | Ω |

# 3.11  Communication Functions

## 3.11.1  Communication (COMMS)

### 3.11.1.1  Functional Description

The Communication block allows the SSC to communicate through an RS-485 connection with external devices including a load computer, TAS system, Fusion4 Portal, or other remote interface.

For the CAN-ADD-BLEND, the COMMS block can be configured for 2- wire half-duplex or 4-wire full duplex.

The CAN-OPTION-SSC provides 2-wire half-duplex. See the following figures.

Figure 3-33: RS Communication 2-Wire connections
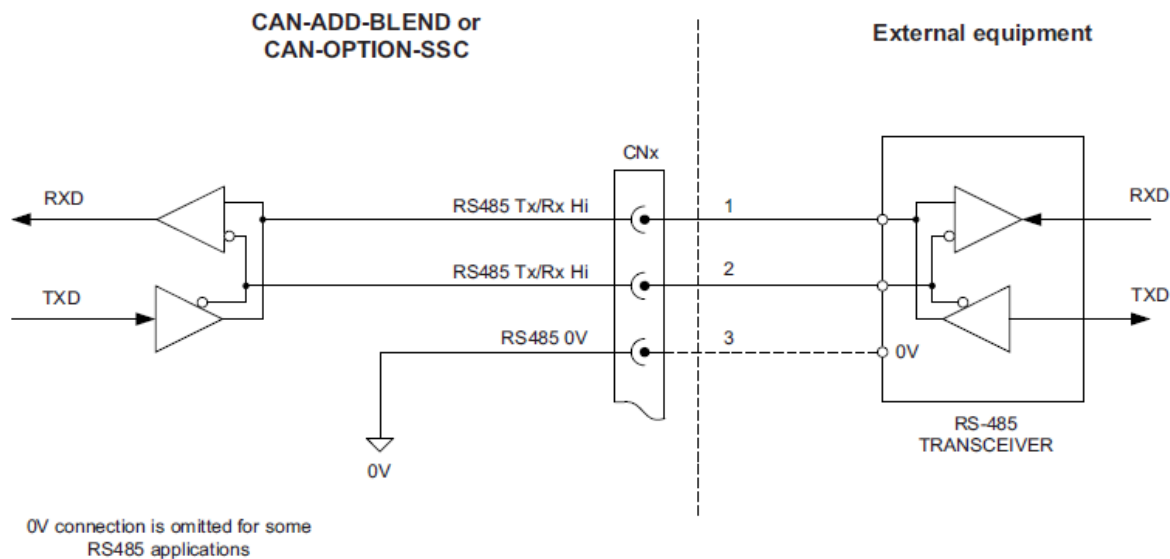
Figure 3-34: RS Communication 4-Wire connections (CAN-ADD-BLEND only)
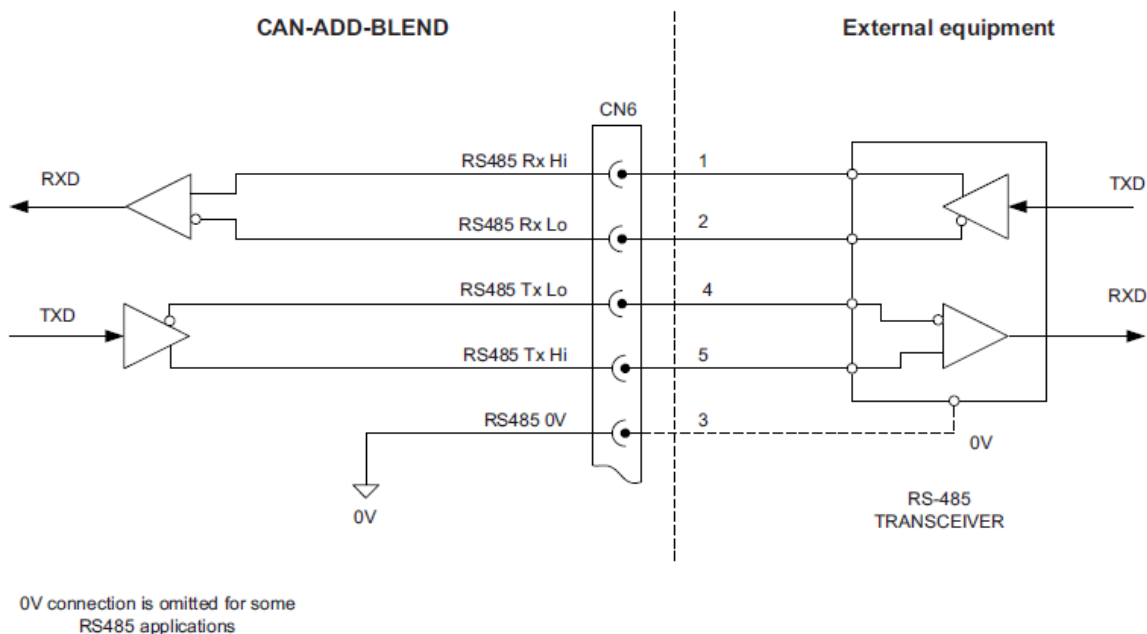
For the 4-wire full-duplex communication, the external device is the always the master and the COMMS block is the slave.

## 3.11.1.2  Characteristics

| Item | Minimum | Typical | Maximum | Unit |
|---|---|---|---|---|
| Terminator resistor RT | 118 | 120 | 122 | Ω |
| Driver common mode voltage | -1 | - | +3 | V |
| Driver output voltage, Open circuit | 1.5 | - | 6 | V |
| | -1.5 | | -6 | |
| Driver output voltage, Loaded | 1.5 | - | 5 | V |
| | -1.5 | | -5 | |
| Driver output short circuit current | - | - | ±250 | mV |
| Receiver common mode voltage | -7 | - | +12 | V |
| Receiver sensitivity | - | - | ±200 | mV |
| Receiver input resistance | 12 | - | - | kΩ |
| Data transmission rate | - | - | 500 | kbps |
| Number of connected devices | - | - | 32 | - |

## 3.11.1.3  Cable Specifications

| Item | Minimum | Typical | Maximum | Unit |
|---|---|---|---|---|
| Cable length | - | - | 1000 | m |
| Cable characteristic impedance | - | 120 | - | Ω |
| Cable DC resistance | - | - | 100 | Ω |
| Cable capacitance | - | - | 55.77 [17] | pF/m [pF/ft] |

# 4  Installation

## 4.1  Mounting and Dimensions

The SSC-B can be mounted by means of 2 x M10 socket-head bolts. See the following figure.

NOTE:  The LAD connector (arrow) should be on the underside of the enclosure, when mounted in the correct orientation.

Figure 4-1: Main dimensions of the SSC-B in mm [inches]
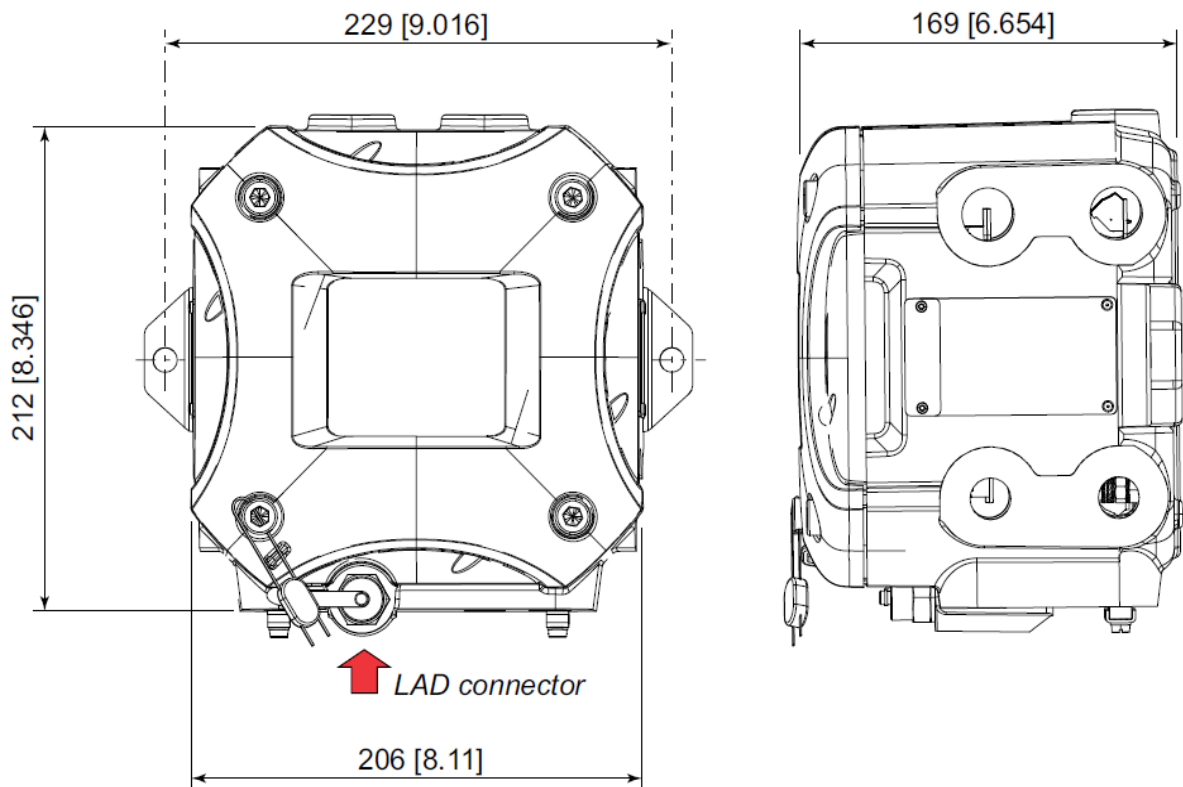


NOTE:  Provision should be made where possible, to minimize the impact of direct sunlight on the SSC. This helps decrease the effect of radiated heat on the enclosure, and prolong screen life.

# 4.2  Gland Entries

## 4.2.1  General

The SSC-B has 12 metric gland entries or 8 NPT gland entries. The following figure shows the metric gland option.

Entries marked A and B are field entries. These are accessible by removing all PCBs (except power board) from the SSC-B. Entries marked C are entries that are typically pre-assembled during manufacture.

Figure 4-2: SSC-B metric gland entries



The temperature rating of the glands must be at least 20°C [68°F] above maximum operating temperature.

Therefore, a rating of 85°C [185°F] is suitable for the entire temperature range.
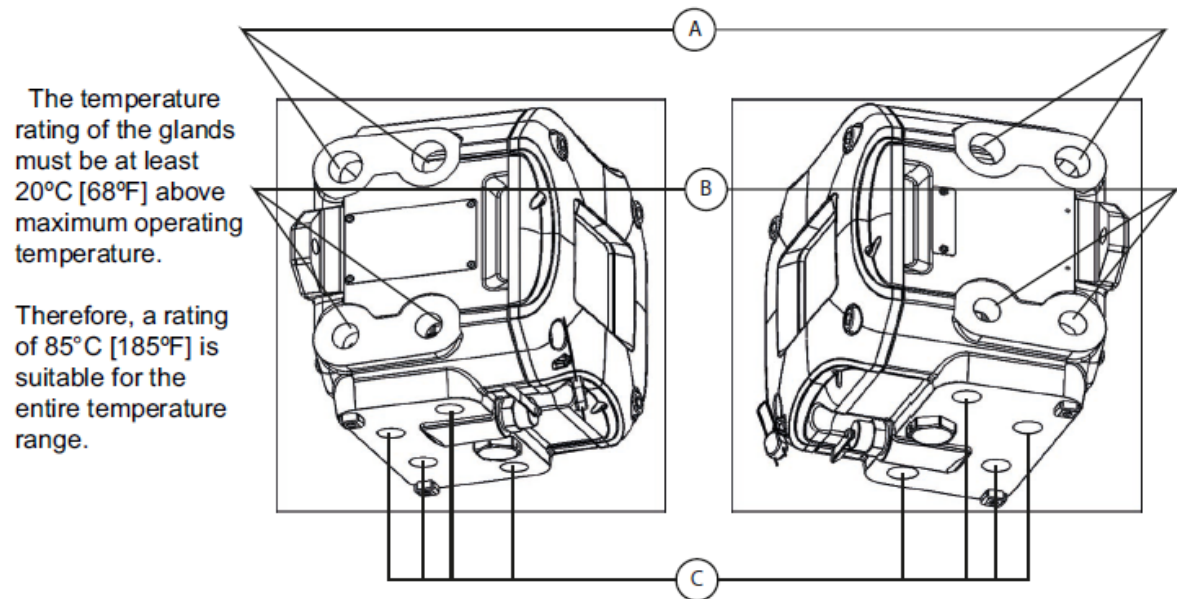
Figure 4-3: Metric gland entries overview
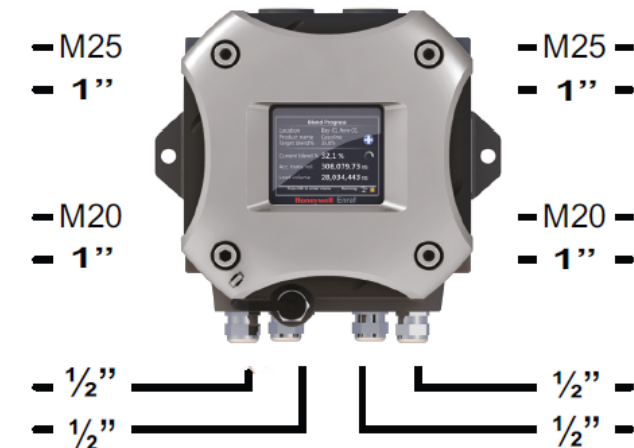
Figure 4-4: NPT gland entries overview



# 4.3  Removing the Lid

1. Remove W&M seal if applicable.

2. Loosen the 4 captive socket-head screws with an 8 mm Allen key.

3. Pull the lid at arrowed locations (figure below - right). Rotate gently to aid removal.

4. If the lid is stuck, carefully force it open with 2 screwdrivers (figure below - left).
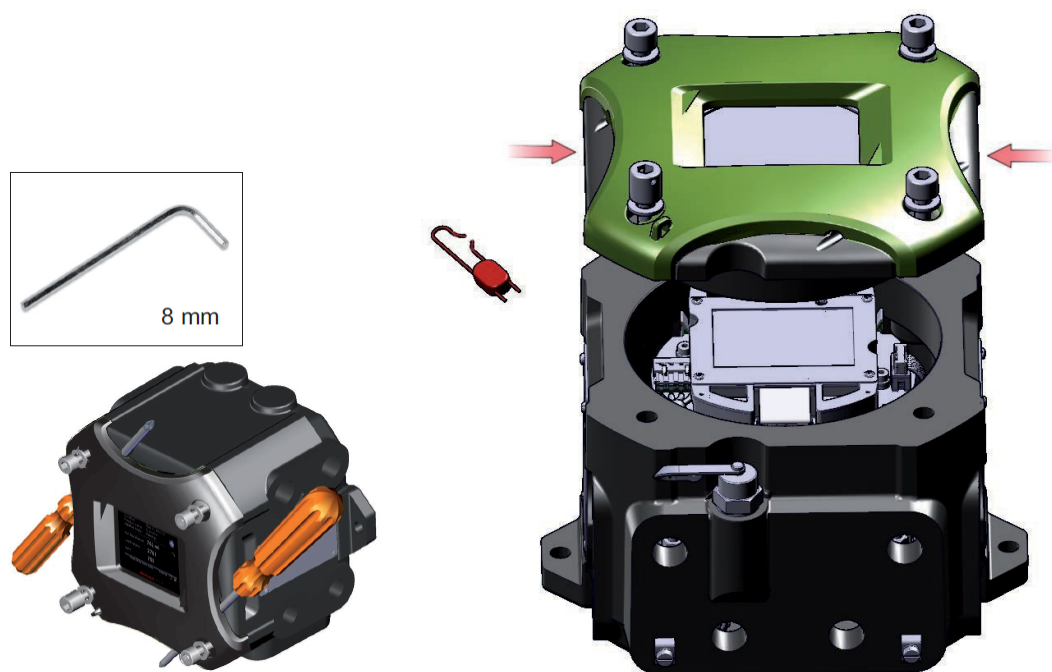
5. Make sure the O-ring is in place (see figure below).

6. Place lid on a clean surface.

# 4.4  Removing the PCBs

Figure 4-5: Full-configuration SSC-B (left) and 3-PCBs configuration (right)
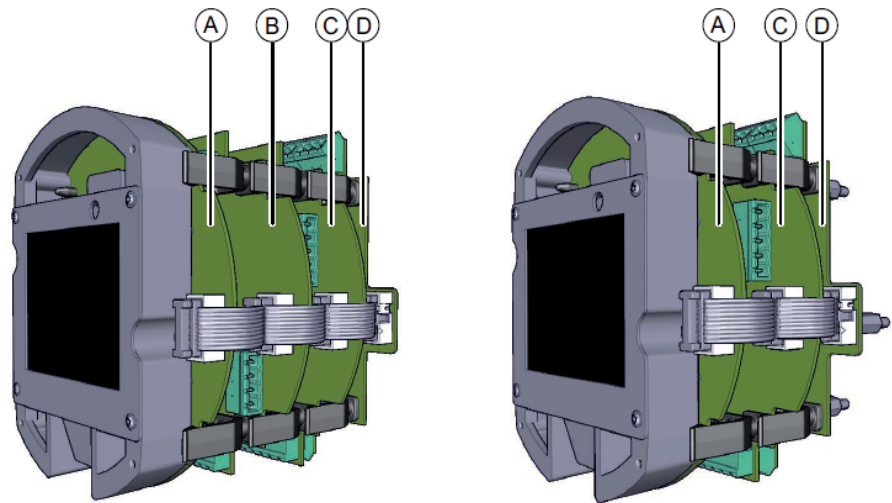


| | PCB name | Module*<br>name | Description |
|---|---|---|---|
| A | CAN-HMI-SSC | FS-HMI | Controls the display and the LAD (Local Access Device) interfaces. |
| B | CAN-OPTION-SSC | FS-OPTION | Additional IO functions are available with this optional board. |
| C | CAN-ADD-BLEND | FS-STREAM | Controls the blend stream. |
| D | CAN-PSF-SSC | - | Delivers the internal power for the SSC-B. |

* A PCB with software installed.

In order to be able to mount the field entries, all PCBs (except the power board) must be removed from the SSC-B.

CAUTION:  Wear an ESD wrist strap while handling a printed circuit board from the SSC-B, to prevent damage by electrostatic discharge (ESD).

1. Remove the CAN-HMI-SSC board. See the following figure.

Figure 4-6: Removing the CAN-HMI-SSC board
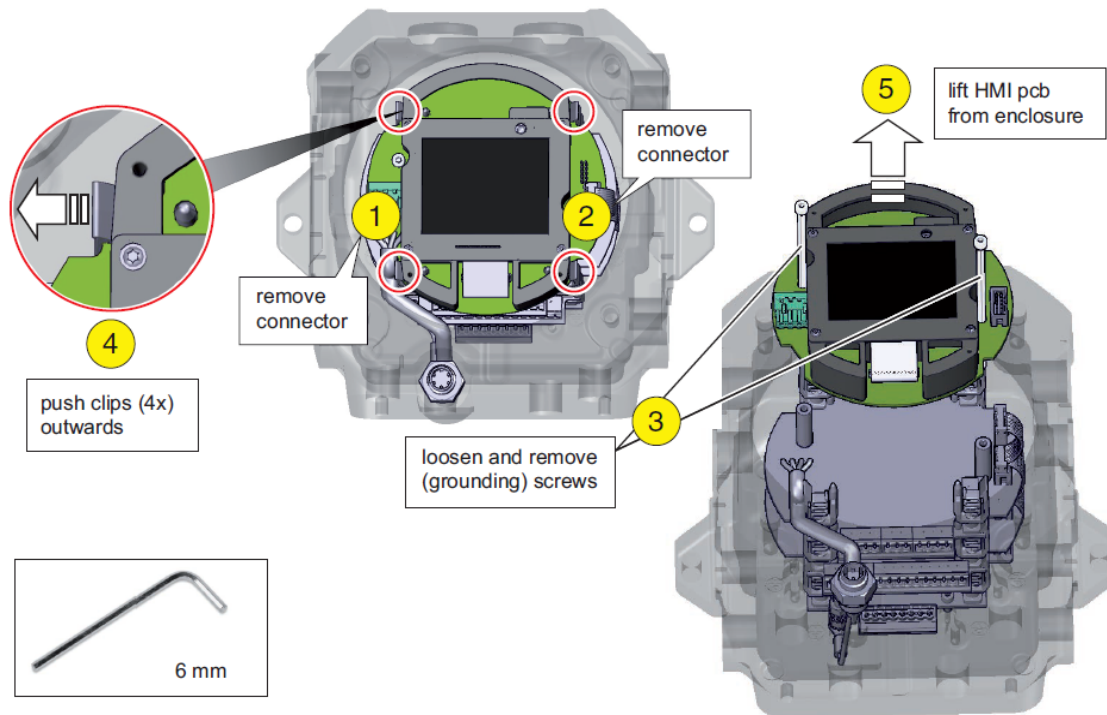


2. Remove the other PCBs (except CAN-PSF-SSC) one after another according to the following figure.

3. After removal of each PCB from the enclosure, disconnect its terminal connectors.

Figure 4-7: Removing the other PCBs
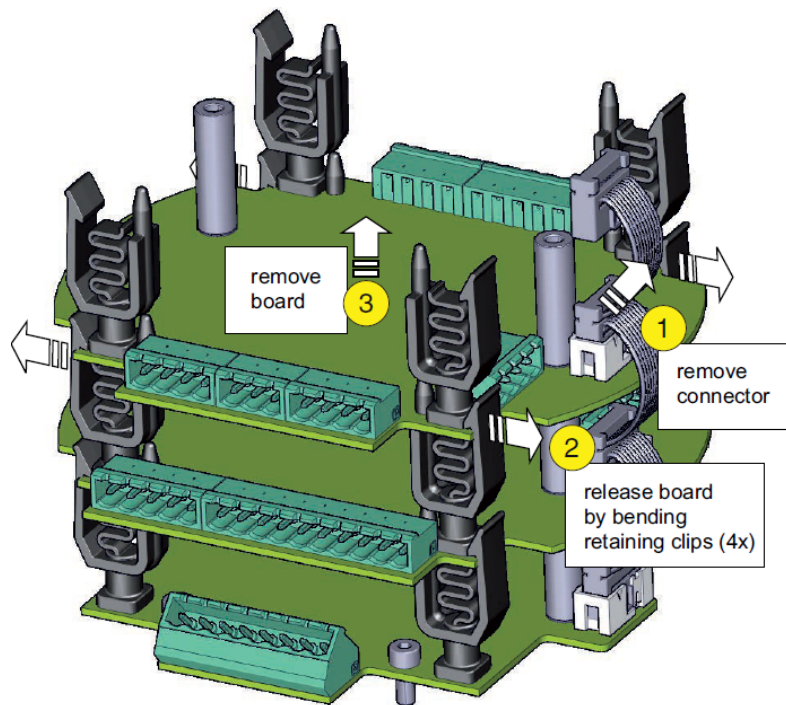


# 4.5  Replacing the PCBs

Replace PCBs in reverse order of removal.

> NOTE:  To ensure correct PCB orientation before replacing, make sure the PC ID label is readable from left to right.

1.  Connect appropriate terminal connectors outside the enclosure.

2.  Carefully replace each PCB into enclosure whilst guiding attached wiring to the sides of the enclosure.

3.  Align PCB with connectors below, and depress into place, ensuring each of the 4 clips clicks into place.

4.  Replace PCB spacers.

5.  Connect flatcable connector.

6.  Repeat for each remaining PCB.

7.  Replace HMI board, and secure with the 2x grounding screws (Allen key 6 mm).

# 4.6  Replacing the Lid

1.  Make sure the O-ring of the lid is in place and not damaged. If damaged, replace O-ring first.

2.  Make sure the spigot faces are not damaged or contain dirt.

    > CAUTION:  Do NOT apply sealant to faces and minimize the use of grease!

3.  Make sure cables are clear of spigot face when re-inserting the lid.

4.  Rotate gently to aid insertion.

5.  Mount the 4 captive socket-head screws with an 8 mm Allen key. Tighten with 16 Nm.

6.  Apply new W&M seal if applicable.

# 4.7  Fusing and Power Consumption

## 4.7.1  Fusing

The CAN-PSF-SSC board converts AC mains voltage into a DC voltage, to power the other SSC modules.

> NOTE:  All fusing is done internally on the CAN-PSF-SSC board, so no external fusing is required.

It also delivers fuse-protected AC power for external devices.

A maximum current of 4 A can be drawn as defined by fuse F1 (AC mains input). For more information, see 3.6.1.4 - CAN-PSF-SSC.

## 4.7.2 Power consumption SSC

| Maximal | Typical |
|---------|---------|
| 15.9 W | 9.9 W |

# 4.8 Wiring Termination Guidance

## 4.8.1 Wiring Architecture

- Ex i wiring is separated from other wiring.

- In order to limit interference between low and high voltage signals, a logical separation between cables carrying these signals has been created. See the following figure.

Figure 4-8: High/low voltages separation concept
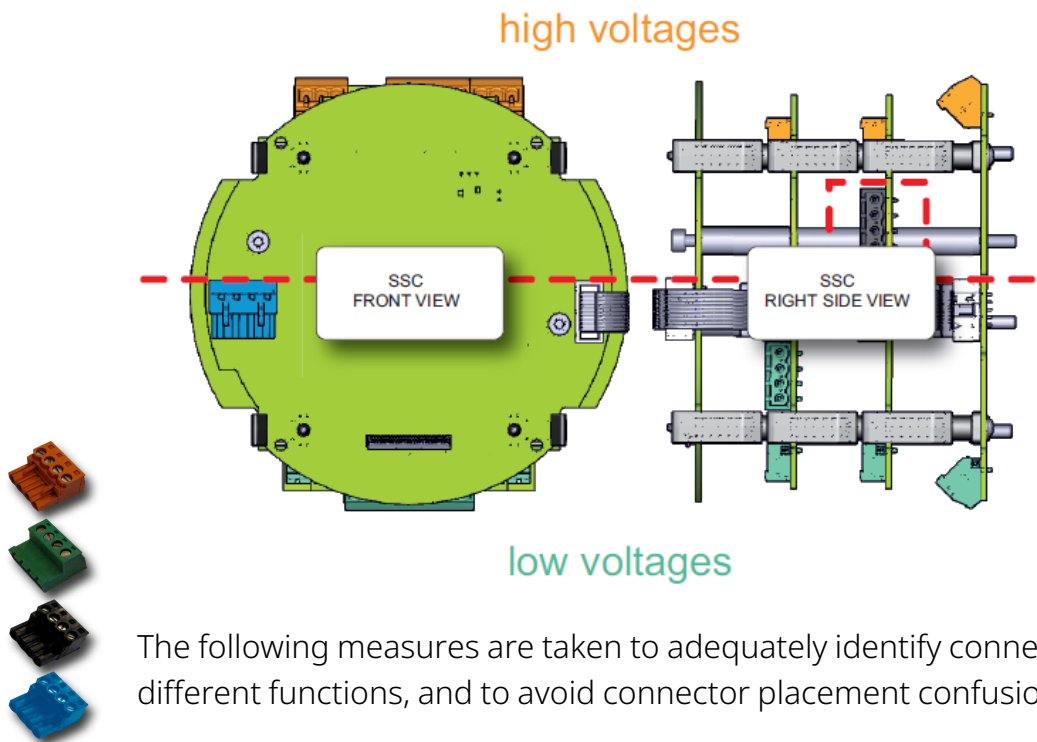


The following measures are taken to adequately identify connections with different functions, and to avoid connector placement confusion:

- Use of different number of pins.

- In case of same number of pins with different functions, a connector coding

profile of insulating material is applied.

- Color-coding of the connectors, see the following table.

| Color | Function |
|-------|----------|
| Orange | High voltage signals |
| Green | Low voltage signals |
| Black | Communication signals |
| Blue | Ex i signals |

## 4.8.2  General

> CAUTION:  All terminated cables should be left with sufficient excess length to allow each PCB to be fully withdrawn from the enclosure when the connectors are still in place. This is to allow connectors to be affixed to each board just outside the enclosure, before locating them inside, and to allow each board to be fully withdrawn from the enclosure before the connectors are removed. This negates the requirement to attach and remove connectors inside the enclosure and facilitates best practice for efficient assembly and disassembly of the electronics stack.

## 4.8.3  Wire Sizes and Types

As there are no strictly prescribed wire sizes, only following guidelines can be given:

- All I/O terminals accepts wires with a cross section area of 0.2 to 2.5 mm$^2$ [AWG 24 to 14].

- For mains / high-voltage wiring, 1.5 mm$^2$ [AWG 16] is recommended.

- For low-voltage wiring (DI, PO, AI, AO, RTD, and so on), 0.75 mm$^2$ [AWG 18] or 0.5 mm$^2$ [AWG 20] is recommended.

All primary wiring needs to be provided with insulation rated for minimum 300 V, with a rated temperature of at least 105°C [221°F] and with a conductor size of at least 0.75 mm$^2$ [AWG 18].

For communications, specific RS-485 cable - typically 0.25 mm$^2$ [AWG 24] - must be used, in conformity with the following table.

| Item | Conditions | Minimum | Type | Maximum | Unit |
|------|-----------|---------|------|---------|------|
| Cable length | - | - | - | 1000 [3281] | m [ft] |
| Cable characteristic impedance | - | - | 120 | - | Ω |
| Cable DC resistance | Conductor end to end | - | - | 100 | Ω |
| Cable capacitance | Conductor to conductor | - | - | 55.77 [17] | pF/m [pF/ft] |

## 4.8.4  Recommended Cables

| Cable type | Number of wires | Function |
|-----------|-----------------|----------|
| XLPE/SWA/PVC 4C X 1.5MM 600/1000V BS5467 | 3 | 230 VAC Mains Supply Input |
| XLPE/SWA/PVC 4C X 1.5MM 600/1000V BS5467 | 2 | 230 VAC Alarm Output |
| XLPE/SWA/PVC 4C X 1.5MM 600/1000V BS5467 | 4 | 230 VAC Permissive Input |
| 3C X 0.75MM2 YYNR PVC | 4 | 230 VAC Digital Controlled Valve Output |
| 3C X 0.75MM2 YYNR PVC | 4 | 230 VAC Solenoid Supply Output |
| BS5308 1X4X0.5MM COL SCREEN SWA P1T2 PVC | 2 | 12 VDC Switched Output |
| BS5308 1X4X0.5MM COL SCREEN SWA P1T2 PVC | 2 | 12 VDC Switched Input |
| BS5308 1X4X0.5MM COL SCREEN SWA P1T2 PVC | 2 | Analog Output (maximum 24 V, 3.2 - 24 mA) |

| Cable type | Number of wires | Function |
|---|---|---|
| BS5308 1X4X0.5MM COL SCREEN SWA P1T2 PVC | 4 | Analog Input (maximum 24 V, 3.2 - 24 mA) |
| BS5308 1X4X0.5MM COL SCREEN SWA P1T2 PVC | 2 | Analog Output (maximum 24 V, 3.2 - 24 mA) |
| BS5308 1X4X0.5MM COL SCREEN SWA P1T2 PVC | 2 | Pulse Output (maximum 12V, 10 KHz) |
| BS5308 1X4X0.5MM COL SCREEN SWA P1T2 PVC | 3 | Pulse Input (maximum 12V, 10 KHz) |
| BS5308 1X4X0.5MM COL SCREEN SWA P1T2 PVC | 4 | Analog input RTD (maximum 24V, 1.5 mA) |
| BELDEN 9842 2PAIR 24AWG LSNH/ SWA, ni 120 Ω | 4 | RS485 Serial Communication Interface |
| BELDEN 9842 2PAIR 24AWG LSNH/ SWA, ni 120 Ω | 4 | RS485 Serial Communication Interface |

## 4.8.5  Wire Crimps



There are no strictly prescribed wire crimps.

However, it is advised as a good practice to fit crimps (bootlace ferrules) to multi-strand cable wires.

> NOTE:  Wire crimps are to reinforce the fine wire strands when terminating a cable into a connector block.

Wire crimps do not need to be fitted for solid-core cable wires.

# 4.9  W&M (MID) Sealing

W&M sealing can be done in 3 ways (see also the following figure):

| Description | Effect | Remarks |
|---|---|---|
| Physical device sealing | Preventing unauthorized opening of the housing | See 3.5.1 and 3.7.1. |
| Jumper/ switch setting | Protection of the legally relevant configuration entities and firmware | See:<br><br>• 3.6.1.1.2 (CAN-HMI-SSC)<br><br>• 3.6.1.2.3 (CAN-ADD-BLEND)<br><br>• 3.6.1.3.3 (CAN-OPTION-SSC) |
| Software sealing | Protection of the legally relevant configuration entities and firmware | Activated by LAD, see 5.17.4.1 - W&M Sealing Wizard |

Figure 4-9: Possible sealing methods
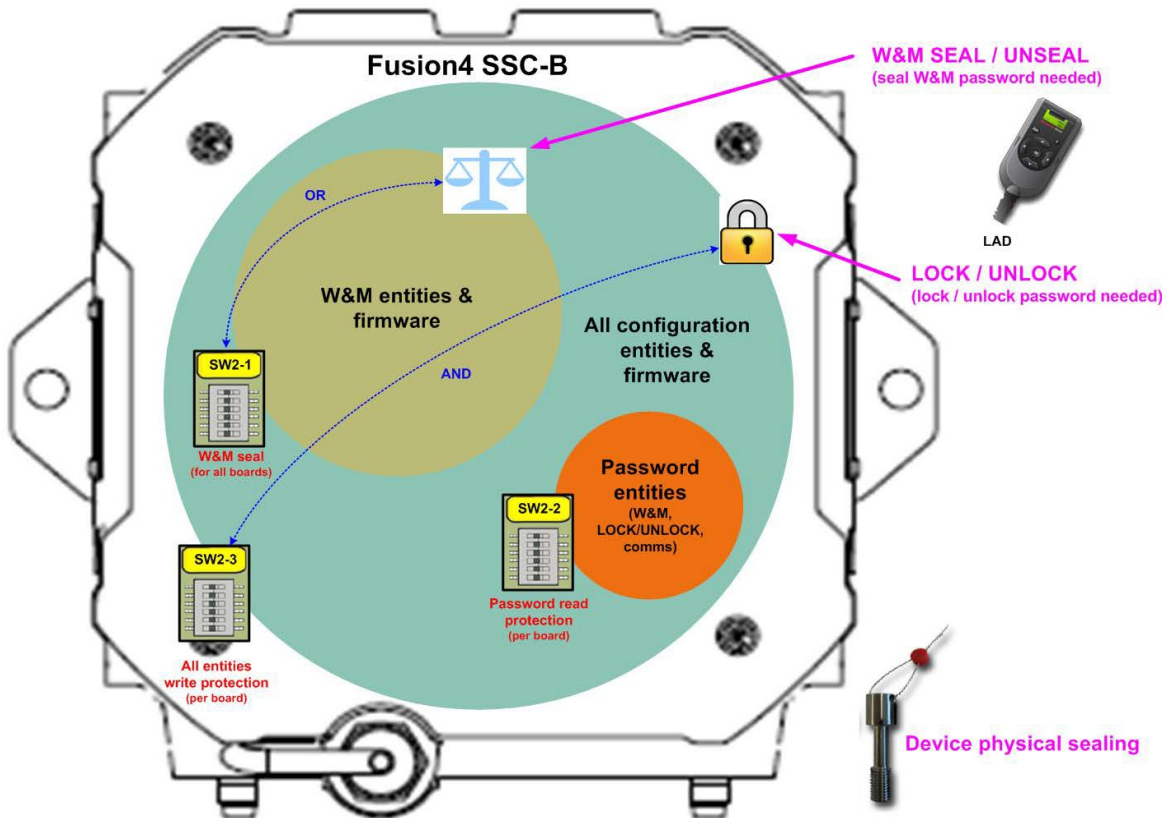
# 4.9.1  Protected Items

The following configuration entities of the SSC-B are protected by "physical" and "software" sealing:

| Entity name | Entity description | Default setting | Location |
|---|---|---|---|
| Temperature unit | Unit of temperature used to display temperature values | DIMENSION_CELCIUS | CAN-HMI-SSC |
| Temperature scale | Temperature scale | ITS_90 | |
| Volume unit | Unit of volume used to display volume values | LITRES | |
| Pressure unit | Unit of pressure used to display pressure values | DIMENSION_PASCAL | |
| Density unit | Unit of density used to display density values | DIMENSION_ KILOGRAM_M3 | |
| Display language | User display language | ENGLISH_US | |
| Local language table | Local language string definitions (unicode) | | |
| Mass Units | Units of mass used on SSC | DIMENSION_ KILOGRAM | |
| Format flash | Format of transaction flash and fram | | |
| Reference temperature | Reference temperature | {15.0, DIMENSION_ CELCIUS} | |
| VCF table | Volume correction table | ASTM_D_1250_04_53_54 | |
| Reference pressure | Reference pressure | {0.0, DIMENSION_ KILO_PASCAL} | |
| Commodity group | Commodity group | COMMODITY_GROUP_ REFINED_ PRODUCTS | |
| Temperature compensation used | Temperature compensation used | False | |
| Pressure compensation used | Pressure compensation used | False | |
| Injection volume units | Injection volume units | INJECTION_VOLUME_ ML | |

| Entity name | Entity description | Default setting | Location |
|---|---|---|---|
| VCF Options | VCF Options | VCF_TABLE_OPTIONS_ EXTENDED_ RANGES | |
| primary stream meter factor | Primary stream meter factor | 1.0 | CAN-ADD-BLEND |
| Primary stream k factor | Primary stream k factor | 750.0 | |
| Secondary stream k factor | Secondary stream k factor | 100.0 | |
| secondary stream meter factor | secondary stream meter factor | 1.0 | |
| Quad pulse integrity check | Quad pulse integrity check | DISABLE | |
| Quad pulse cut off frequency | Quad pulse cut off frequency | 50.0 | |
| VCF calculation interval volume | VCF calculation interval volume | 100.0 | |
| IO binding main stream volume | IO binding - Main stream volume | QPI | |
| IO binding side stream volume | IO binding - Blend stream volume | SPI | |
| IO binding side stream temperature | IO binding - Blend stream temperature | None | |
| IO binding side stream pressure | IO binding - Blend stream pressure | None | |
| Derive manual status | Derive manual status | DISABLE | |
| Lower boundary value | PV value displayed with input == 4 mA | 0 | CAN-OPTION-SSC |
| Upper boundary value | PV value displayed with input == 20 mA | 100 | |

| Entity name | Entity description | Default setting | Location |
|---|---|---|---|
| flexconn instrument address | FlexConn instrument address | 0 | CAN-ADD-BLEND & CAN-OPTION-SSC |
| broadcast address | Broadcast address | 998 | |
| unit address | Unit address | 123 | |

# 4.9.2  Board Connectors Overview

**CAN-HMI-SSC**

CN3
- 1 — LAD (G_SAFE)
- 2 — LAD (V_SAFE)
- 3 — LAD (A_SAFE)
- 4 — LAD (B_SAFE)

**CAN-OPTION-SSC**

CN2
- 53 — OPT DI AC (NEUTRAL)
- 54 — OPT DI AC1 (LIVE)
- 55 — OPT DI AC2 (LIVE)
- 56 — OPT DI AC3 (LIVE)
- 57 — OPT DI AC4 (LIVE)

CN3
- 58 — OPT DO AC (FEED)
- 59 — OPT DO AC (OUTPUT)
- 60 — OPT DO EMR (CONTACT A)
- 61 — OPT DO EMR (CONTACT B)

CN4
- 62 — OPT DI DC1 (HI)
- 63 — OPT DI DC1 (LO)
- 64 — OPT DI DC2 (HI)
- 65 — OPT DI DC2 (LO)

CN5
- 66 — OPT AO (4 to 20mA +)
- 67 — OPT AO (4 to 20mA -)
- 68 — OPT AI (4 to 20mA +)
- 69 — OPT AI (4 to 20mA -)

CN6
- 70 — OPT RTD (RED)
- 71 — OPT RTD (RED)
- 72 — OPT RTD (WHITE)
- 73 — OPT RTD (WHITE)

CN7
- 74 — OPT COMMS (2W Tx/Rx+)
- 75 — OPT COMMS (2WTx/Rx-)
- 76 — OPT COMMS (0V)

**CAN-ADD-BLEND**

CN2
- 24 — DI AC (NEUTRAL)
- 25 — DI AC1 (LIVE)
- 26 — DI AC2 (LIVE)

CN3
- 27 — DO AC1 (FEED)
- 28 — DO AC1 (OUTPUT)
- 29 — DO AC2 (FEED)
- 30 — DO AC2 (OUTPUT)
- 31 — DO EMR (CONTACT A)
- 32 — DO EMR (CONTACT B)

CN4
- 33 — PO DC1 (HI)
- 34 — PO DC1 (LO)
- 35 — PO DC2 (HI)
- 36 — PO DC2 (LO)
- 37 — DI DC1 (HI)
- 38 — DI DC1 (LO)
- 39 — DI DC2 (HI)
- 40 — DI DC2 (LO)
- 41 — SINGLE PI (PULSE A)
- 42 — SINGLE PI (COMMON)

CN5
- 43 — QUAD PI (POWER)
- 44 — QUAD PI (PULSE A)
- 45 — QUAD PI (COMMON)
- 46 — QUAD PI (PULSE B)
- 47 — QUAD PI (COMMON)

CN6
- 48 — COMMS (2W Tx/Rx+ or 4W Rx+)
- 49 — COMMS (2W Tx/Rx- or 4W Rx-)
- 50 — COMMS (0V)
- 51 — COMMS (4W Tx-)
- 52 — COMMS (4W Tx+)

**CAN-PSF-SSC**

CN1
- 5 — MAINS INPUT (LIVE)
- 6 — MAINS INPUT (NEUTRAL)
- 7 — EARTH

CN2
- 8 — MAINS OUTPUT (NEUTRAL)
- 9 — MAINS OUTPUT (LIVE FUSED)
- 10 — MAINS OUTPUT (NEUTRAL)
- 11 — MAINS OUTPUT (LIVE FUSED)
- 12 — MAINS OUTPUT (NEUTRAL)

CN4
- 13 — MAINS OUTPUT (NEUTRAL)
- 14 — MAINS OUTPUT (NEUTRAL)
- 15 — MAINS OUTPUT (LIVE FUSED)

CN5
- 16 — DC OUT (12V COMMON)
- 17 — DC OUT (+12V DC)
- 18 — DC OUT (12V COMMON)
- 19 — DC OUT (+12V DC)
- 20 — DC OUT (24V COMMON)
- 21 — DC OUT (+24V DC)
- 22 — DC OUT (24V COMMON)
- 23 — DC OUT (+24V DC)

# 4.10 Terminal Assignment Guide

- The following tables offer a suggested guide for basic function assignment to specific terminals.

- The majority of the SSC-B functions can be assigned to multiple I/O.

- To complete the installation, bind each function to its I/O in the Configuration Menu (see 5.11.2.3 - Display).

## 4.10.1 CAN-ADD-BLEND

| Terminal | ID | SUGGESTED | OPTIONS |
|---|---|---|---|
| **CN2** | | | |
| 24 | DI-AC | Common Neutral | Pre-installed for For Fusion4 BioBlend |
| 25 | DI-AC1 | Blend Rate Permissive | Blend Rate Permissive (1,2 or 3), Alarm Reset, Hydr. Pump Feedback, Pump Feedback, System Interlock, Tank Low Level, Tank Empty |
| 26 | DI-AC2 | Alarm Reset | Blend Rate Permissive (1,2 or 3), Alarm Reset, Hydr. Pump Feedback, Pump Feedback, System Interlock, Tank Low Level, Tank Empty |
| **CN3** | | | |
| 27 | DO-AC1 | Feed | Pre-installed for For Fusion4 BioBlend Neutral - PSF, CN2, Terminal 10 |
| 28 | DO-AC1 | DCV N.O. | |
| 29 | DO-AC2 | Feed | Pre-installed for For Fusion4 BioBlend Neutral - PSF, CN2, Terminal 12 |
| 30 | DO-AC2 | DCV N.C. | |
| 31 | DO-EMR (Contact A) | Alarm Shutdown | Alarm Indication, Pump Start, Hydr Pump Start, Add. Block Valve |
| 32 | DO-EMR (Contact B) | | |
| **CN4** | | | |

| Terminal | ID | SUGGESTED | OPTIONS |
|---|---|---|---|
| 33 | PO DC1 (Hi) | | Pump Start, Alarm Indication, Alarm Shutdown, Factored Pulse Out |
| 34 | PO DC1 (Lo) | | |
| 35 | PO DC2 (Hi) | | Pump Start, Alarm Indication, Alarm Shutdown, Factored Pulse Out |
| 36 | PO DC2 (Lo) | | |
| 37 | DI DC1 (Hi) | | Blend Rate Permissive (1,2 or 3), Alarm Reset, Hydr. Pump Feedback, Pump Feedback, System Interlock, Tank Low Level, Tank Empty |
| 38 | DI DC1 (Lo) | | |
| 39 | DI DC2 (Hi) | | Blend Rate Permissive (1,2 or 3), Alarm Reset, Hydr. Pump Feedback, Pump Feedback, System Interlock, Tank Low Level, Tank Empty |
| 40 | DI DC2 (Lo) | | |
| 41 | Single PI (Pulse A) | Pacing Source | |
| 42 | Single PI (Common) | | |
| **CN5** | | | |
| 43 | Quad PI (Power) | Blend Flow Meter (single) | Pre-installed for For Fusion4 BioBlend |
| 44 | Quad PI (Pulse A) | | |
| 45 | Quad PI (Common) | | |
| 46 | Quad PI (Pulse B) | Blend Flow Meter (dual) | |
| 47 | Quad PI (Common) | | |
| **CN6** | | | |

| Terminal | ID | SUGGESTED | OPTIONS |
|---|---|---|---|
| 48 49 50 51 52 | Comms (2W+) | RS 485 2 Wire | |
| | Comms (2W-) | | |
| | Comms (0V) | | |
| | Comms (4W-) | RS 485 4 Wire | |
| | Comms (4W+) | | |

## 4.10.2  CAN-OPTION-SSC

| Terminal | ID | SUGGESTED | OPTIONS |
|---|---|---|---|
| **CN2** | | | |
| 53 | OPT DI-AC | Common Neutral | Pre-installed for For Fusion4 BioBlend |
| 54 | OPT DI-AC1 | | Blend Rate Permissive (1,2 or 3), AlarmReset, Hydr. Pump Feedback, Pump Feedback, System Interlock, Tank Low Level, Tank Empty |
| 55 | OPT DI-AC2 | | Blend Rate Permissive (1,2 or 3), AlarmReset, Hydr. Pump Feedback, Pump Feedback, System Interlock, Tank Low Level, Tank Empty |
| 56 | OPT DI-AC3 | | Blend Rate Permissive (1,2 or 3), AlarmReset, Hydr. Pump Feedback, Pump Feedback, System Interlock, Tank Low Level, Tank Empty |
| 57 | OPT DI-AC4 | | Blend Rate Permissive (1,2 or 3), AlarmReset, Hydr. Pump Feedback, Pump Feedback, System Interlock, Tank Low Level, Tank Empty |
| **CN3** | | | |
| 58 | OPT DO-AC1 | Feed | Pre-installed for For Fusion4 BioBlend Neutral - PSF, CN4, Terminal 14 |

| Terminal | ID | SUGGESTED | OPTIONS |
|---|---|---|---|
| 59 | OPT DO-AC1 | | AlarmIndication, AlarmShutdown, Pump Start, Hydr Pump Start, Block Valve |
| 60 | OPT DO-EMR (Contact A) | | AlarmIndication, AlarmShutdown, Pump Start, Hydr Pump Start, Block Valve |
| 61 | OPT DO-EMR (Contact B) | | |
| CN4 | | | |
| 62 | OPT DI DC1 (Hi) | | Blend Rate Permissive (1,2 or 3), AlarmReset, Hydr. Pump Feedback, Pump Feedback, System Interlock, Tank Low Level, Tank Empty |
| 63 | OPT DI DC1 (Lo) | | |
| 64 | OPT DI DC2 (Hi) | | Blend Rate Permissive (1,2 or 3), AlarmReset, Hydr. Pump Feedback, Pump Feedback, System Interlock, Tank Low Level, Tank Empty |
| 54 | OPT DI DC2 (Lo) | | |
| CN5 | | | |
| 66 | OPT AO (4-20mA+) | | Blend streamvolume, Blend streamflow rate, Wild streamflow rate, Blend percentage, Instantaneous temperature, Average temperature, Instantaneous pressure., Average pressure |
| 67 | OPT AO (4-20mA-) | | |
| 68 | OPT AI (4-20mA+) | | Wild StreamFlow rate in Smart Analog input mode, Temperature Sensor, Pressure Sensor, Permissive. |
| 69 | OPT AI (4-20mA-) | | |
| CN6 | | | |

| Terminal | ID | SUGGESTED | OPTIONS |
|---|---|---|---|
| 70 | OPT RTD (red) | RTD Temp Probe | Pre-installed for For Fusion4 BioBlend |
| 71 | OPT RTD (red) | | |
| 72 | OPT RTD (white) | | |
| 73 | OPT RTD (white) | | |
| CN7 | | | |
| 74 | Comms (2W+) | | Comms |
| 75 | Comms (2W-) | | |
| 76 | Comms (0V) | | |

# 4.11  Internal Wiring Diagram

Connection terminals located in Single Stream Controller



BC135-1390001-sh1

**MAINS SUPPLY**

**AC INPUTS**

**ADDITIVE SOLENOID1 or DCV N/O**

**ADDITIVE SOLENOID2 or DCV N/C**

**BLOCK VALVE or PUMP START**

Connection terminals located in Single Stream Controller

Connection terminals located in SIngle Stream Controller



**DC INPUTS**

CAN-ADD-BLEND / CN4-37 (DC1_HI)
CAN-ADD-BLEND / CN4-38 (DC1_LO)
CAN-ADD-BLEND / CN4-39 (DC2_HI)
CAN-ADD-BLEND / CN4-40 (DC2_LO)
CAN-OPTION-SSC / CN4-62 (DC1_HI)
CAN-OPTION-SSC / CN4-63 (DC1_LO)
CAN-OPTION-SSC / CN4-64 (DC2_HI)
CAN-OPTION-SSC / CN4-65 (DC2_LO)

⚠ WARNING
Connect only to earth if the system its
equipotential bonding is reliable and if there is
no potential difference between both sides

BC135-1390001-sh3

Cable gland        Shielded twisted pair cable <50 [m]

CAN-ADD-BLEND / CN4-37 (DC1_HI)
CAN-ADD-BLEND / CN4-38 (DC1_LO)
CAN-ADD-BLEND / CN4-39 (DC2_HI)
CAN-ADD-BLEND / CN4-40 (DC2_LO)
CAN-OPTION-SSC / CN4-62 (DC1_HI)
CAN-OPTION-SSC / CN4-63 (DC1_LO)
CAN-OPTION-SSC / CN4-64 (DC2_HI)
CAN-OPTION-SSC / CN4-65 (DC2_LO)

**PULSE OUTPUT**

CAN-ADD-BLEND / CN4-33 (PO1_HI)
CAN-ADD-BLEND / CN4-34 (PO1_LO)

⚠ WARNING
Connect only to earth if the system its
equipotential bonding is reliable and if there is
no potential difference between both sides

Cable gland        Shielded twisted pair cable <50[m]

CAN-ADD-BLEND / CN4-33 (PO1_HI)
CAN-ADD-BLEND / CN4-34 (PO1_LO)

**PULSE OUTPUT**

CAN-ADD-BLEND / CN4-35 (PO2_HI)
CAN-ADD-BLEND / CN4-36 (PO2_LO)

⚠ WARNING
Connect only to earth if the system its
equipotential bonding is reliable and if there is
no potential difference between both sides

Cable gland        Shielded twisted pair cable <50[m]

CAN-ADD-BLEND / CN4-35 (PO2_HI)
CAN-ADD-BLEND / CN4-36 (PO2_LO)

Connection terminals located in SIngle Stream Controller

**AI**

CAN-OPTION-SSC / CN5-68 (AI_A)
CAN-OPTION-SSC / CN5-69 (AI_B)

Shielded twisted pair cable <150 [m]

Cable gland

BC135-1390001-sh4

WARNING
Connect only to earth if the system its equipotential bonding is reliable and if there is no potential difference between both sides

CAN-OPTION-SSC / CN5-68 (AI_A)
CAN-OPTION-SSC / CN5-69 (AI_B)

**AO**

CAN-OPTION-SSC / CN5-66 (AO_A)
CAN-OPTION-SSC / CN5-67 (AO_B)

Shielded twisted pair cable <150 [m]

Cable gland

WARNING
Connect only to earth if the system its equipotential bonding is reliable and if there is no potential difference between both sides

CAN-OPTION-SSC / CN5-66 (AO_A)
CAN-OPTION-SSC / CN5-67 (AO_B)

**RTD 3-Wire**

CAN-OPTION-SSC / CN6-70 (RTD_S+)
CAN-OPTION-SSC / CN6-71 (RTD_COM)
CAN-OPTION-SSC / CN6-72 (RTD_POS)

Shielded twisted pair cable < 150 [m]

Cable gland

WARNING
Connect only to earth if the system its equipotential bonding is reliable and if there is no potential difference between both sides

CAN-OPTION-SSC / CN6-70 (RTD_S+)
CAN-OPTION-SSC / CN6-71 (RTD_COM)
CAN-OPTION-SSC / CN6-72 (RTD_POS)

**RTD 4-Wire**

CAN-OPTION-SSC / CN6-70 (RTD_S-)
CAN-OPTION-SSC / CN6-71 (RTD_COM)
CAN-OPTION-SSC / CN6-72 (RTD_POS)
CAN-OPTION-SSC / CN6-73 (RTD_S+)

Shielded twisted pair cable < 150 [m]

Cable gland

WARNING
Connect only to earth if the system its equipotential bonding is reliable and if there is no potential difference between both sides

CAN-OPTION-SSC / CN6-70 (RTD_S+)
CAN-OPTION-SSC / CN6-71 (RTD_COM)
CAN-OPTION-SSC / CN6-72 (RTD_POS)
CAN-OPTION-SSC / CN6-73 (RTD_S+)

Connection terminals located in Single Stream Controller

BC135-1390001-sh5

# 5  Operation

## 5.1  General

### 5.1.1  Introduction

This chapter gives commissioning information for the SSC-B.

Commissioning the SSC-B is carried out by configuring entities (or parameters) to the desired specific values. This is done through the Menu functions of the SSC-B (See 5.4 - Menu and Navigation).

### 5.1.2  Text Conventions

In contrast with explanatory text, all instruction text is preceded by a >. All [Entity] and <entity-related> text is recognizably formatted.

## 5.2  Service Interfaces

The SSC-B can be configured through three interfaces:

- Through the infrared interface (see A, FIGURE 5-1) by using the Fusion4 IR Controller.

- Through the wired Ex i interface (see B, FIGURE 5-1) with a LAD.

- Through the RS-485 communication.

Figure 5-1: Service interfaces of the SSC-B
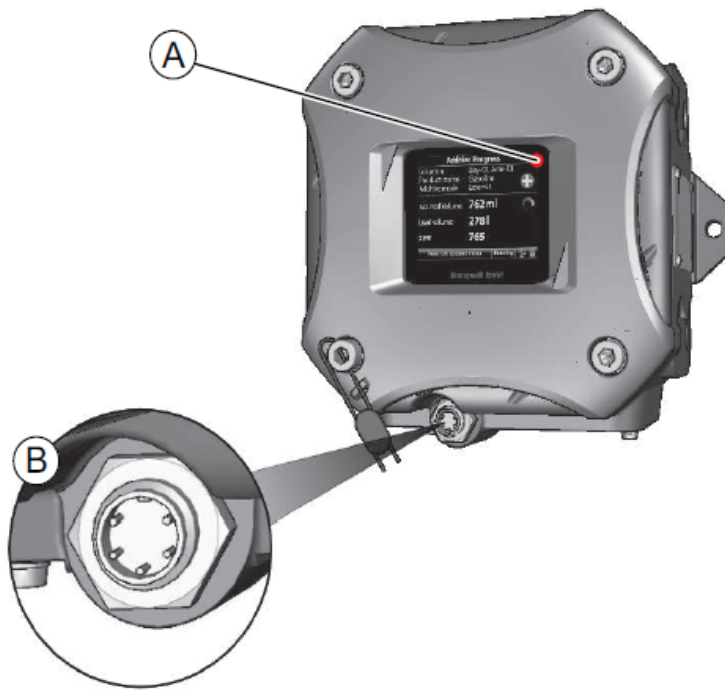


# 5.3  Service Tools

## 5.3.1  Fusion4 IR Controller

The Fusion4 IR Controller uses infrared (IR) signals to transmit ASCII characters to the SSC-B. This allows the operator to make adjustments in programming without removing the cover of the explosion-proof enclosure on-site.

The infrared receiver on the SSC-B is designed to be insensitive to interference from light sources other than the Fusion4 IR controller. All prompts requiring an operator response are clearly indicated on the display of the SSC-B.

The Fusion4 IR controller has all of the infrared commands permanently stored in its micro-controller. Because of this, once the batteries are flat, it can be restored to full operation by inserting a fresh set of batteries. The Fusion4 IR controller has a "sleep" mode to reduce battery consumption. At first use, or after a period of inactivity of approximately 30 seconds, the [ATTN] key must be pressed to "wake-up" the Fusion4 IR controller. Then the [SEND] light blinks, indicating that the Fusion4 IR controller is ready for operation.

The Fusion4 IR controller is approved (ATEX) for use in hazardous atmospheres (not detailed here).

The SSC only uses 7 of the Fusion4 IR controller buttons. These buttons are the ones with the bold text in the following figure.

Figure 5-2: The key functions of the Fusion4 IR controller



> NOTES:
>
> 1. Three AAA batteries are required for operation.
>
> 2. Remote control range limited to 3 m/10 ft.
>
> 3. The switch mounted on the right hand side (if present) is not functional.

## 5.3.2  LAD

### 5.3.2.1  General

The Local Access Device (LAD) is a hand-held controller used to interface with the Fusion4 product family, allowing tasks such as parameter adjustment, alarm

resetting, and blender calibration.

The device facilitates two-way data communications between a parent device and the LAD (see 5.2 - Service Interfaces), allowing the rapid transfer of transaction data, configuration files and calibration records, and even firmware upgrading while in the field.

Figure 5-3: The LAD and its system overview
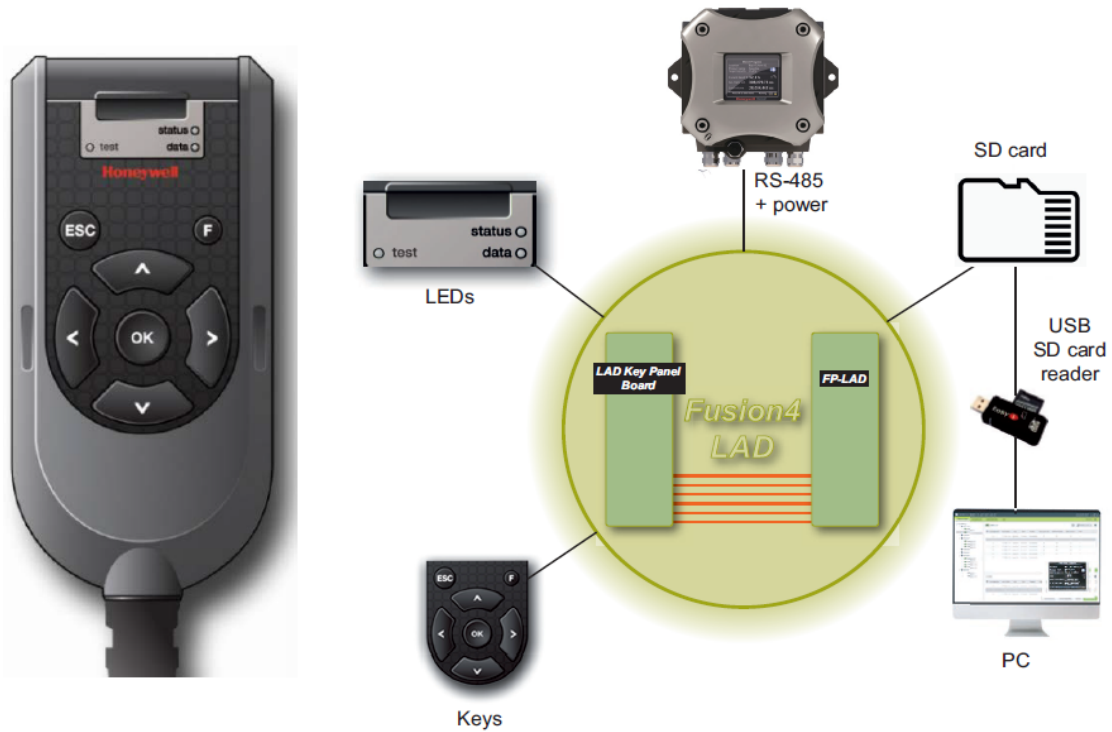
## 5.3.2.2  LAD Application Overview



**Program SSC configuration**
- from SD card
- per board

**Capture SSC configuration**
- stored on SD card
- per device

**Capture SSC recipe**
- stored on SD card

**SSC menu/screen navigation**
- configuration
- calibration
- diagnostics
- execute special function "F"

**Program SSC recipe**
- from SD card

**User feedback**
- LAD status
- SSC data transfer
- SSC I/O test

**Program SSC language pack**
- from SD card

**PC data exchange**
- read and write data from SD card

**Capture SSC transactions**
- stored on SD card

**FP-LAD firmware upgrade**
- firmware located on SD card

**Capture SSC calibration records**
- stored on SD card

**SSC firmware upgrade**
- per micro controller
- SSC must be unsealed first

**Capture SSC event logs records**
- debug log
- W&M log
- alarm log
- stored on SD card

**W&M (MID) sealing**
- function enabled by embedded license key
- LAD for notified body and accredited service engineer

■ = **Basic setup**
■ ■ = **Advanced setup**

**SSC interface**
- comms
- power

# 5.3.3  Navigation with the Fusion4 IR controller and the LAD

## 5.3.3.1  Basic Navigation (Fusion4 IR controller + LAD)

Basic navigation is identical for both the Fusion4 IR controller and the LAD, see the following figure.

| Fusion4 IR controller | LAD |
|---|---|
|  |  |

| ^  = Up |
|---|
| v  = Down |
| <  = Left |
| >  = Right |
| OK   = Select |
| ESC  = Back |

## 5.3.3.2  LEDs (Fusion4 IR controller + LAD)

| Fusion4 IR controller | | LAD | |
| --- | --- | --- | --- |
|  | |  | |
| send blinking | Fusion4 IR controller ready for operation<br><br>NOTE:  when LED is OFF, push ATTN key to "wake up" the Fusion4 IR controller. | status (dual-color) | • green = OK<br><br>• red = Fault |
| | | data (amber) | ON = data transfer<br><br>NOTE:  do NOT disconnect at data transfer. |
| | | test (dual-color) | • green = mapped I/O function has good health and is active |
| | | | • red = mapped I/O is inactive |
| | | | • red (blinking) = mapped I/O has bad health |
| | | | • off = no I/O mapping exists |

### 5.3.3.3  Special Function Key (LAD only)

A user-defined LAD function can be mapped to the F key.

Examples: Transfer transaction to LAD, bring up diagnostics screen, start calibration wizard.

You can configure the special function key through the HMI of the Fusion4 device at hand.

NOTE:  The LAD special function key may not be applicable for all Fusion4 devices.

### 5.3.3.4  SD Card

NOTE:  Format the SD card before using it for the first time. See section 5.17.4 - Format SD Card for more infor- mation about formatting the SD card.

The LAD has an SD card slot located in the top, front face (see the following figure).

Figure 5-4: SD card location in the LAD (lid opened)



- The SD card uses a FAT file system to allow for interoperability with MS Windows platforms.

- The SD card is used for storage of:

  - LAD firmware
  - LAD license key
  - Generic recipes
  - Configuration templates
  - Device firmware
  - Language packs
  - Transaction data
  - Calibration data
  - Configuration data
  - Recipes
  - Alarm logs
  - W&M logs

### 5.3.3.4.1  Product Type Selection

The selection of an SD card for the LAD is important. Due to the intrinsically safe design of the LAD, the current drawn by the SD card is strictly limited. For this reason, commercially available SD cards are NOT recommended, as the specification and construction of these devices change frequently.

The following table describes the card that is recommended.

| Manufacturer | Series | Type | Capacity | Part Number |
|---|---|---|---|---|
| SanDisk | Industrial | SDHC | 8GB | BI1933750878G |

It is possible to use SD cards not included in the list above, but they must conform to the following specification.

| Type | SD or SDHC |
|---|---|
| Operating temperature | -20° to +65° [-4 to +149°F] |
| Maximum current | 70mA |

NOTE:  Note that Guidant does NOT provide support for any cards not listed in the table above. Please contact factory for more information.

NOTE:  Note that miniSD and microSD cards fitted in an SD adaptor should NOT be used in the LAD.

### 5.3.3.4.2 Directory Structure and Files Organization

Figure 5-5: Directory structure and files organization
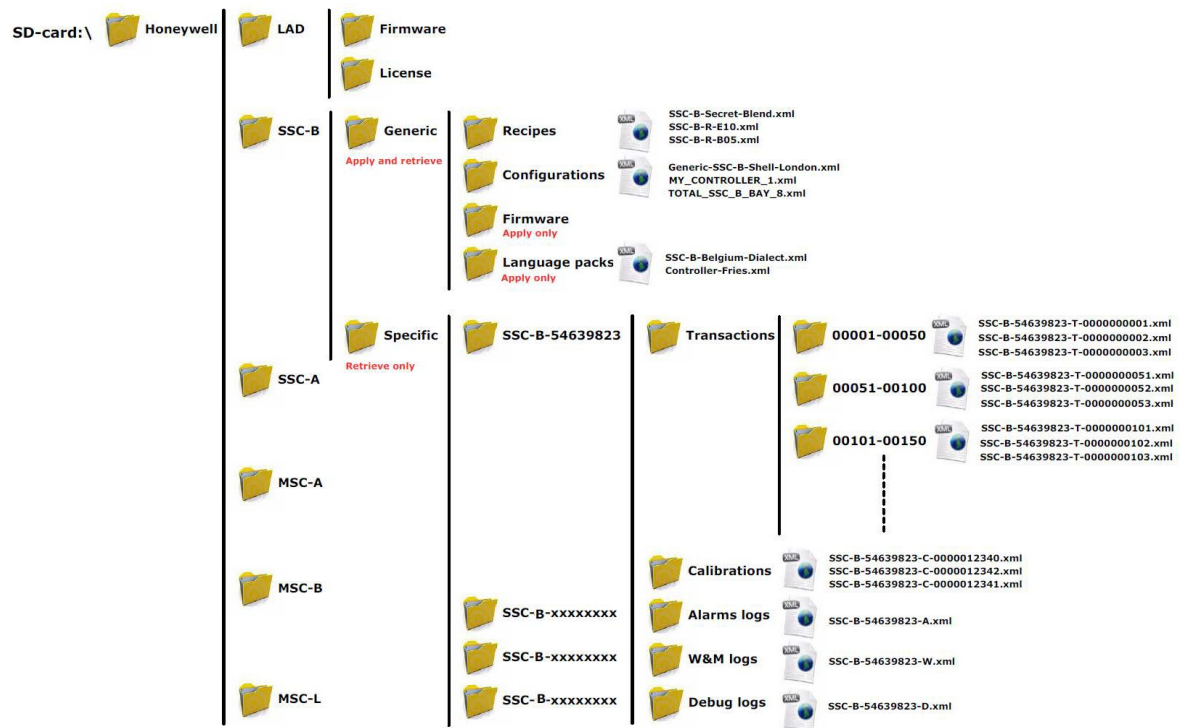


### 5.3.3.4.3 Guidelines

- All files have *.xml-format and -extention (except Firmware and License).
- File name identification (file-id):
    - T = Transactions
    - C = Calibrations
    - A = Alarm logs
    - W = W&M logs
    - D = Debug logs
    - R = for Recipes
- File name format Transactions:
    - &lt;device-type&gt;-&lt;serial number&gt;-&lt;file-id&gt;-&lt;transaction-id&gt;.xml
    - Example: SSC-B-54639823-T-0123456789.xml

- File name format Calibrations:

  - <device-type>-<serial number>-<file-id>-<calibration-id>.xml

  - Example: SSC-B-54639823-C-0123456789.xml

- File name format Alarm logs:

  - <device-type>-<serial number>-<file-id>.xml

  - Example: SSC-B-54639823-A.xml

- File name format W&M logs:

  - <device-type>-<serial number>-<file-id>.xml

  - Example: SSC-B-54639823-W.xml

- File name format Debug logs:

  - <device-type>-<serial number>-<file-id>.xml

  - Example: SSC-B-54639823-D.xml

- File name format Recipes:

  - <device-type>-<file-id>-<recipe-name>.xml

  - Example: SSC-B-R-E20.xml

- File name format Configurations:

  - <user defined string>.xml

  - Example: MY_CONTROLLER_1.xml

> NOTES:
>
> 1. Generic files built / edited in a PC environment can differ from the above format.
>
> 2. Generic files built / edited in a PC environment MUST BE PLACED in the corresponding "Generic" folders, otherwise they cannot be selected during SSC (device) - LAD interaction.
>
> 3. Firmware files MUST be placed in the corresponding folders for the LAD and the SSC, otherwise they cannot be selected during SSC (device) - LAD interaction.

### 5.3.3.4.4  Number of Files

An indication of the typical amount of files that can (at least) be found in the folders is as follows:

| \Honeywell\SSC-B\Generic\Recipes | 100 |
|---|---|
| \Honeywell\SSC-B\Generic\Configurations | 100 |
| \Honeywell\SSC-B\Generic\Firmware | 25 |
| \Honeywell\SSC-B\Generic\Language packs | 25 |
| \Honeywell\SSC-B\Specific\SSC-B-54639823\Transactions | 20,000 |
| \Honeywell\SSC-B\Specific\SSC-B-54639823\Calibrations | 100 |
| \Honeywell\SSC-B\Specific\SSC-B-54639823\Alarm logs | 1 |
| \Honeywell\SSC-B\Specific\SSC-B-54639823\W&M logs | 1 |
| \Honeywell\SSC-B\Specific\SSC-B-54639823\Debug logs | 1 |

### 5.3.3.4.5  Language Pack Configurable Screens

In the following table, the IDLE- AND RUNNING SCREENS text items are listed that is displayed according to the language that is set with the relevant Language Pack.

| LAST TRANSACTION SCREEN | ALARM MESSAGES |
|---|---|
| Last Transaction | General fail alarm |
| Location | Power failure |
| Product name | Communication failure |

| LAST TRANSACTION SCREEN | ALARM MESSAGES |
|---|---|
| Blend % | HMI fatal error |
| Blend volume | Stream board missing |
| Load volume | Option board missing |
| Start time | License key failure |
| End time | Batch permissive failure |
| Status | Service due reminder |
| No transaction on controller | Control failure alarm |
| DAILY TOTAL SCREEN | VCF error alarm |
| DailyTotals | Pulse phase alarm |
| Location | Pulse hardware alarm |
| No. of trans. | Temperature error alarm |
| Total volume | Pressure error alarm |
| BLEND PROGRESS SCREEN | Blend percentage alarm |
| Blend Progress | Leaking valve alarm |
| Location | Wild stream closing alarm |
| Product name | Blend stream closing alarm |
| Target blend % | No activity alarm |
| Current blend % | Flush volume alarm |
| Blend volume | Stream failed alarm |
| Load volume | No pump alarm |
| ADDITIVE PROGRESS SCREEN | Factored pulse out alarm |
| Additive Progress | No hydr. pump alarm |
| Location | Tank low level alarm |
| Product name | Tank empty alarm |
| Additive mode | Block valve alarm |
| ppm | Solenoid failing alarm |
| Additive volume | No additive alarm |
| Load volume | Low vol. dev. alarm |
| STATUS BAR MESSAGES | High vol. dev. alarm |
| Stopped | ALARM STATUS |

| LAST TRANSACTION SCREEN | ALARM MESSAGES |
|---|---|
| Running | Disabled |
| Idle | Inactive |
| Paused | Active |
| Error | Acknowledged |

### 5.3.3.4.6  Building a Local Language Pack for SSC

To create a custom language pack for the Single Stream Controller, perform the following steps.

- Open the file ssc_local_language_template.xml with an XML editor.

Figure 5-6: Screenshot detail of the XML template
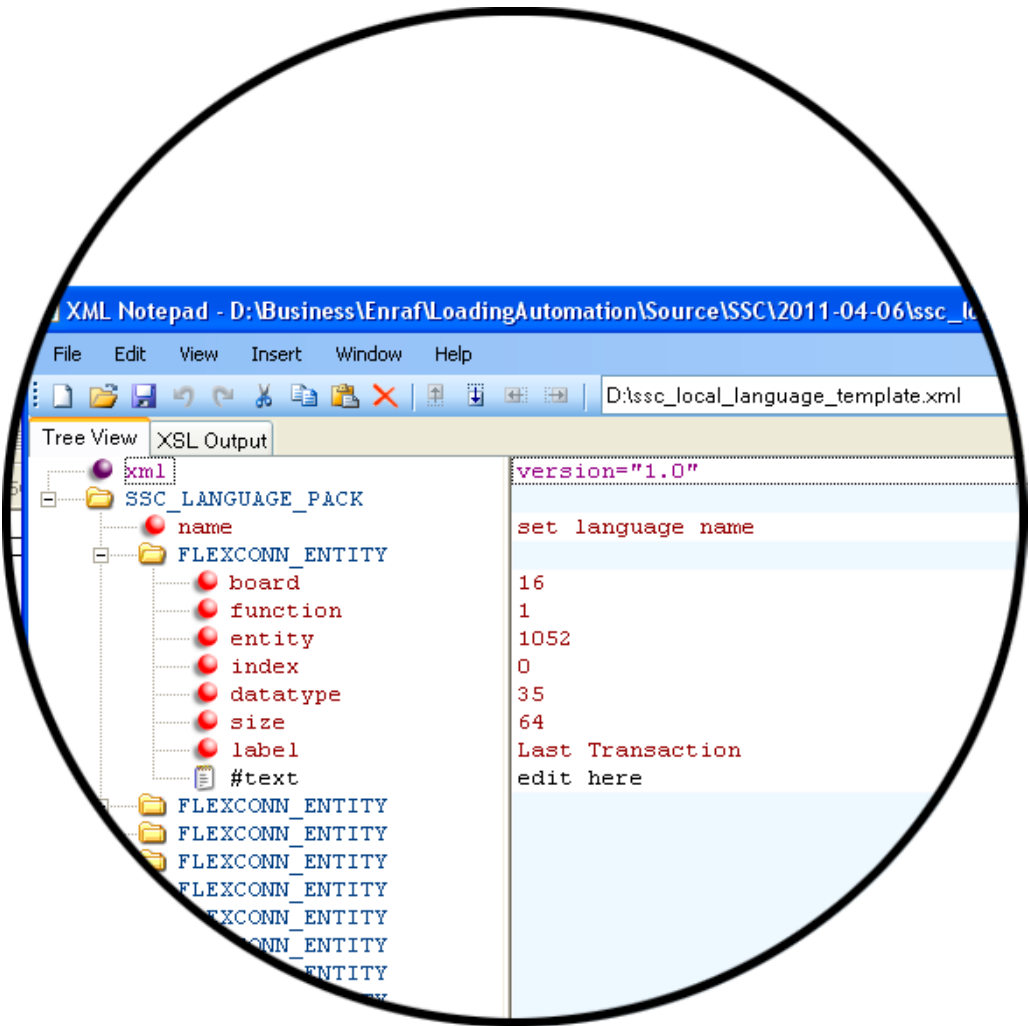
> **NOTE:**  This manual shows screenshots from XML Notepad 2007, but any text editor can be used.

- Replace the text set language name with the name of the language.
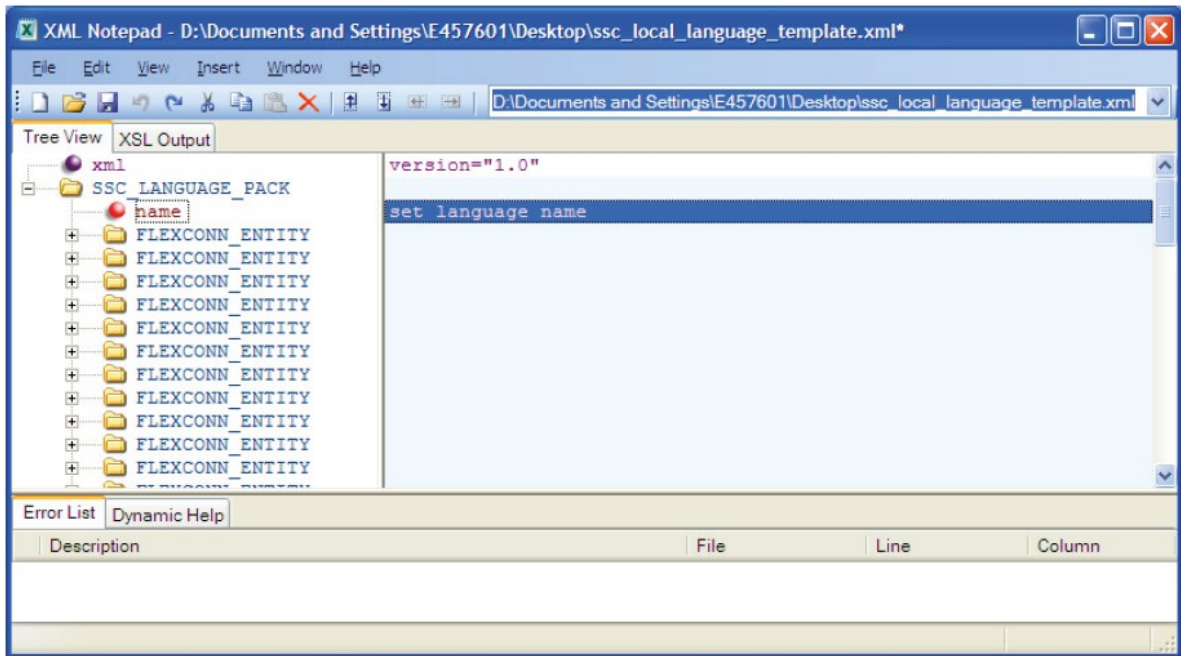


- Provide a translation for every FLEXCONN_ENTITY instance, by replacing the "edit here" text with the local language. Do not edit other fields!
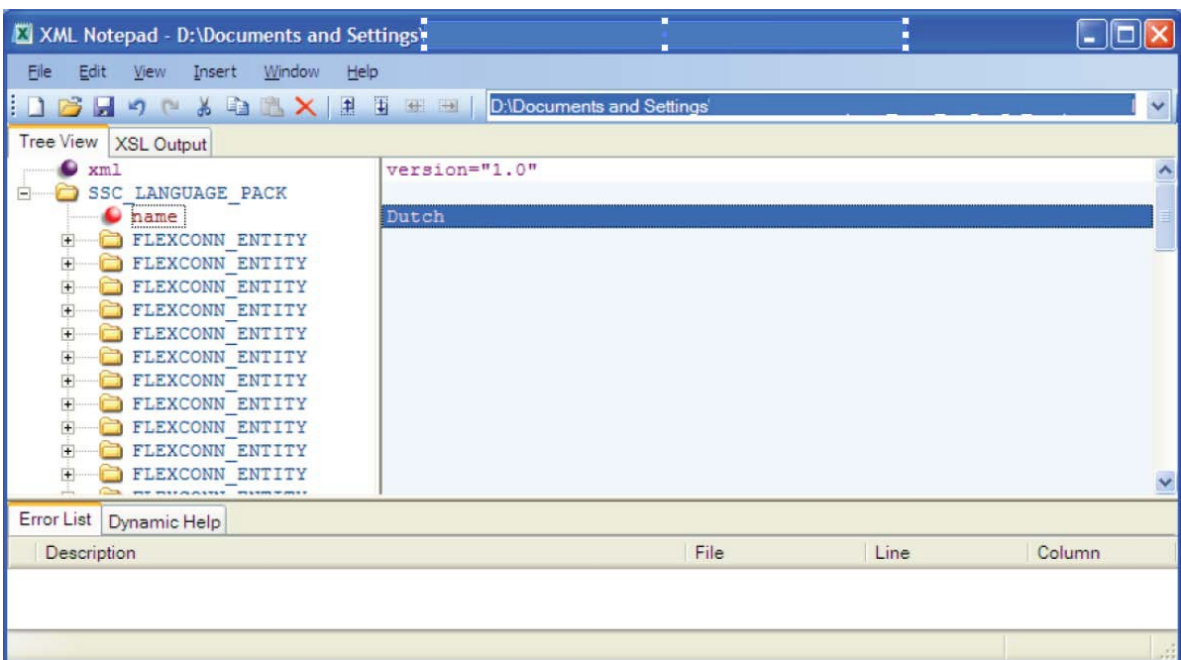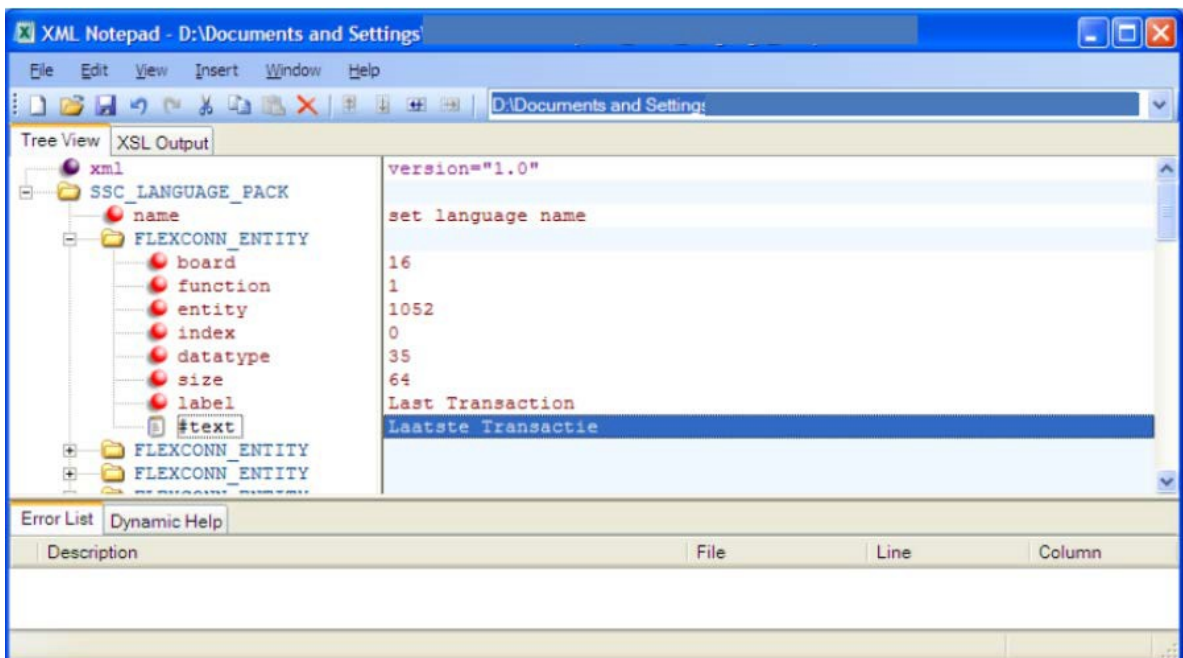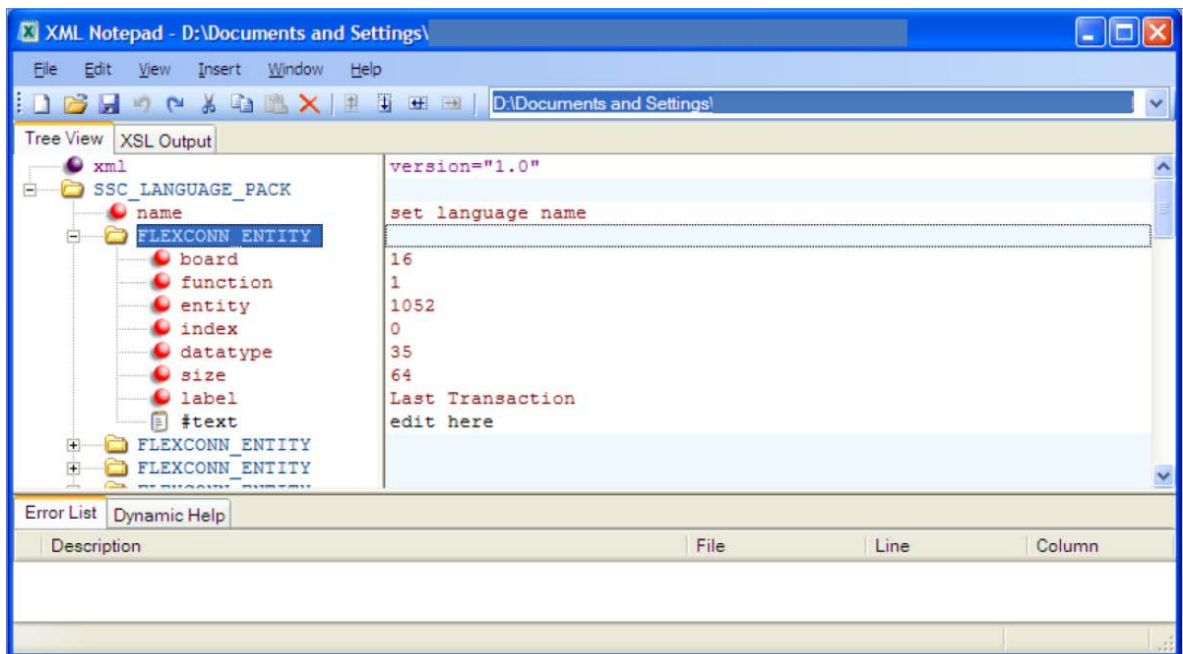
- Save the file and put it on the SD card in: Honeywell\SSC-B\Generic\Language packs.

- Upload the file to the device.

- Change the "User display language" entity (Configuration → Device → Display → User display language) to "Local Language".

# 5.4  Menu and Navigation

## 5.4.1  General

An intuitive and informative Human Machine Interface (HMI) is available to operate, configure, and service the SSC-B. This menu-based user interface is as clear and accessible as possible, using easily understandable colored icons for the Main Menu and logically structured sub-menus.

## 5.4.2  Key benefits

- Clean, intuitive, and informative user interface

- No need to memorize parameter codes, enumeration value

- Wizard-based configuration for blend meter calibration

- Flexible I/O configuration

- Diagnostic screens

- Record-based approach to transactions, recipes, and calibrations make re-use possible

- Interoperable with both the Fusion4 IR Controller and the LAD

- Provides a graphical user interface to the LAD

The following sections briefly clarify all main menu items/aspects.

## 5.4.3 Main Menu



- Title
- Main Menu icon
- Name of selected item

- Selected item (focus rectangle)
- Only available if LAD is connected

## 5.4.4 Text Input Screen



- Title bar
- Single line edit field

- Selected letter
- Action message

- Numbers grouped
- Letters grouped
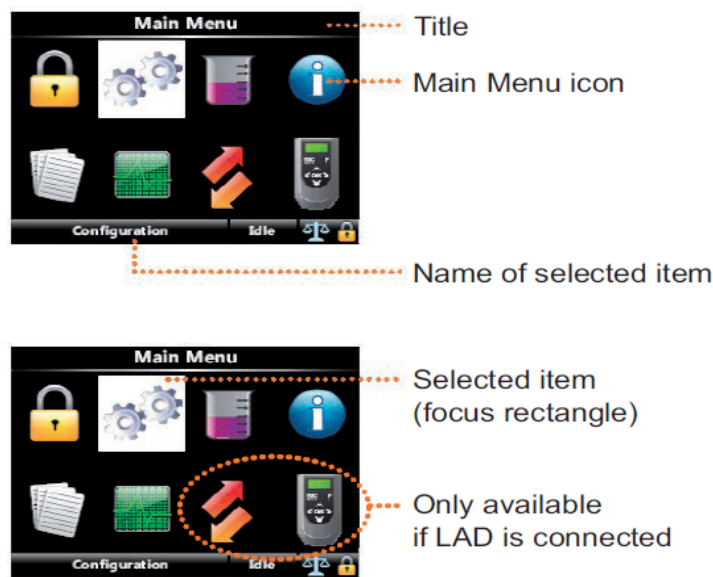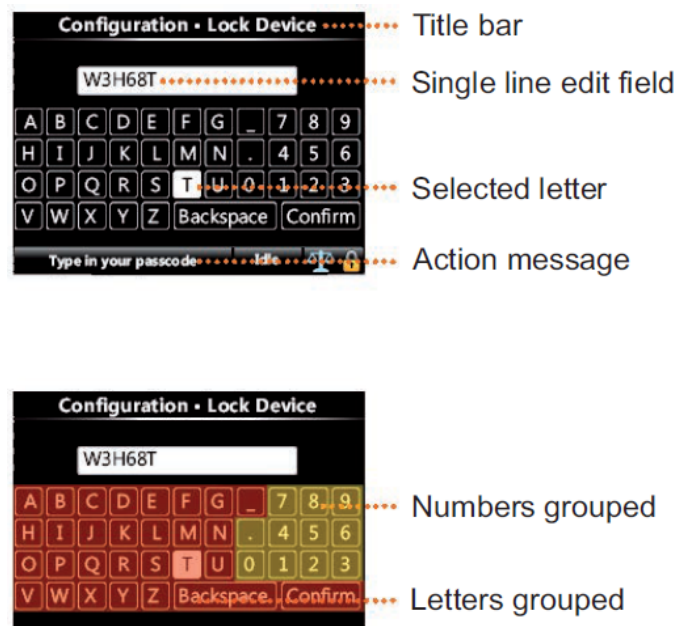
## 5.4.5 Numeric Input Screen



Single line edit field
Confirm & Backspace b[...]
Number buttons



Single line edit field

Point button
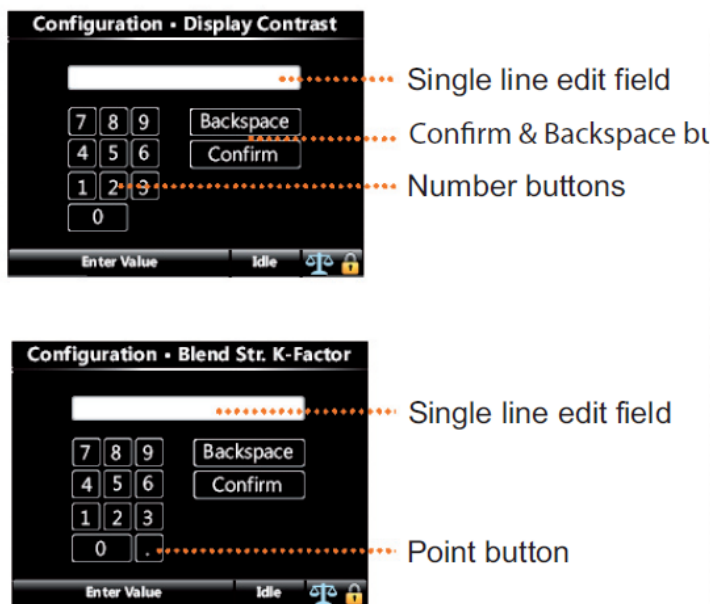
## 5.4.6 Enumeration Input Screen



Scrollbar
Focus rectangle

Action message

## 5.4.7  Status Bar



Status/Message bar

Open lock



No W&M icon

- Always visible on all screens

- Contains the following information:

  - Context-specific information/directions

  - Status of the transactions (for example, Idle, Running, Error)

  - W&M Compliance Icon

  - Device Locking Icon

# 5.5  Running Screens

## 5.5.1  Blend Progress

- During an active transaction, the following screen appears.
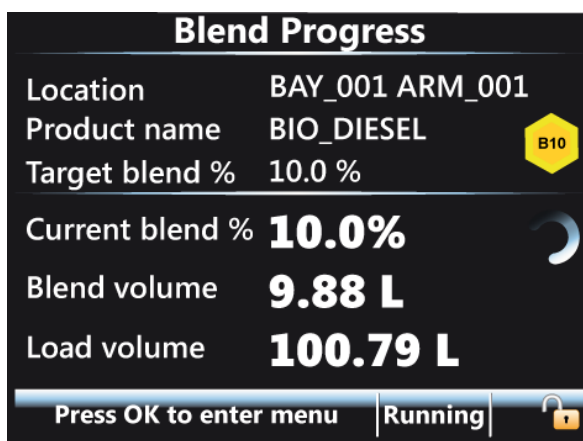
| See screen above | Explanation |
|---|---|
| Target blend % | desired target blend percentage |
| Current blend % | actual blend percentage |
| Blend volume | Gross Observed Volume of the blend product |
| Load volume | Gross Observed Volume of the wild stream |

## 5.5.2  Last Transaction and Daily Totals

- After the transaction has been stopped, the SSC toggles each 20 seconds between the "Last Transaction" screen and the "Daily Totals" screen. See the following screens.

- You can also use the "<" and ">" navigation buttons on the Fusion4 IR controller or LAD to explicitly toggle between these screens.
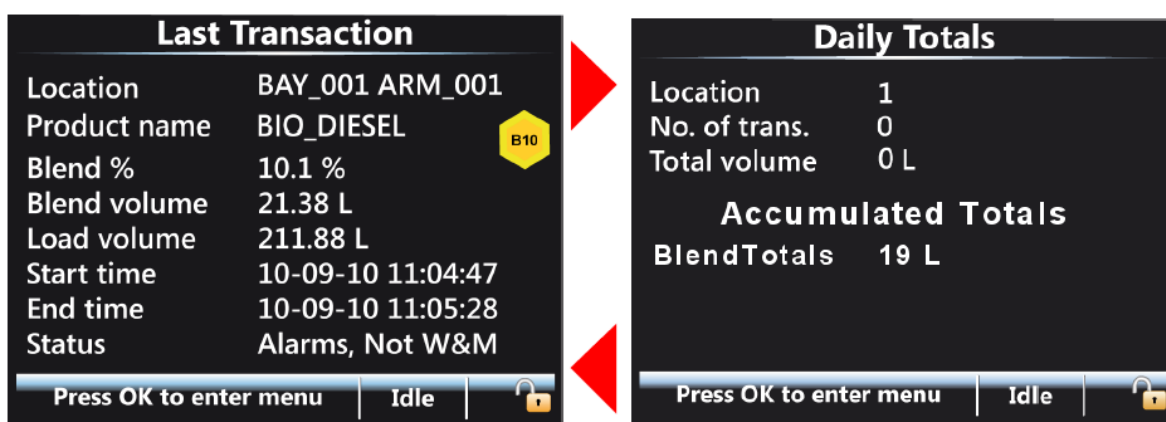


| See screens above | Explanation |
|---|---|
| Blend % | Actual blend percentage achieved (can differ from the tar- get blend %) |
| Blend volume | Transactional Gross Observed Volume of the blend stream |
| Load volume | Transactional Gross Observed Volume of the wild stream |
| No. of trans. | Number of transactions for that particular day |
| Total volume | Daily Accumulated Transactional Observed Volume of the blend stream |

# 5.6 Transfer



NOTE:  Only when the LAD is connected!

- Through this user's interface, the following type of records can be transferred between the SSC and the LAD:

  - transactions
  - calibrations
  - alarms
  - recipes
  - configurations
  - languages

# 5.7  LAD Functions
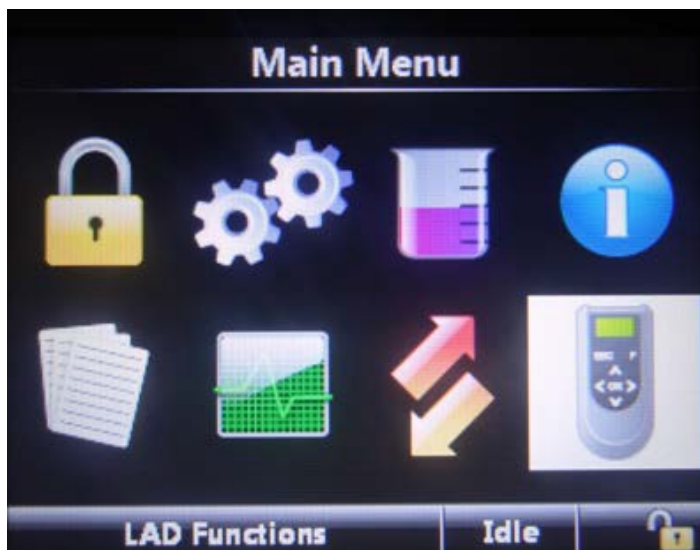


> NOTE:  Only when the LAD is connected!

- This is the user's interface to LAD- specific functionality:

    - Firmware download to the SSC and the LAD
    - Configuration of the LAD's special function key
    - Format SD card
    - W&M sealing
    - Configuration of the Test LED
    - LAD information

# 5.8  Device Locking

In this screen, you can lock and unlock the SSC-B.

- A single password is used to lock the device from further configu- ration through HMI.

- Password consists of all char- acters and the size of the password must be between 1 and 6 characters.

- Device   remains   unlocked   until explicitly locked again.

- Reading the password used for locking the device can be disabled by the jumper JP2.

The "lock status" is shown at the status bar in the bottom right corner (padlock). See the following screen.

When the device is locked, no configuration entities can be changed through the SSC-B menu until you unlock the device again. Also calibration activities, all available tasks and commands, and the clear alarm function are disabled when the device is locked.

When SSC-B is locked, configuration, recipes, and language pack cannot be applied through LAD.

To lock the device, you must enter a password. This password must have a fixed length of 6 characters.
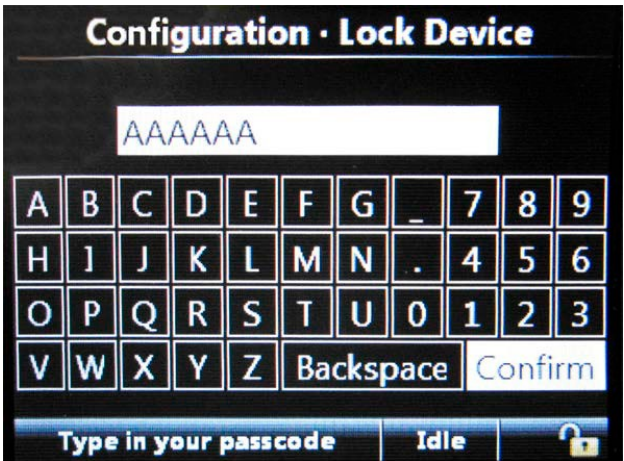
To unlock the device, you must enter the password entered during locking the device.
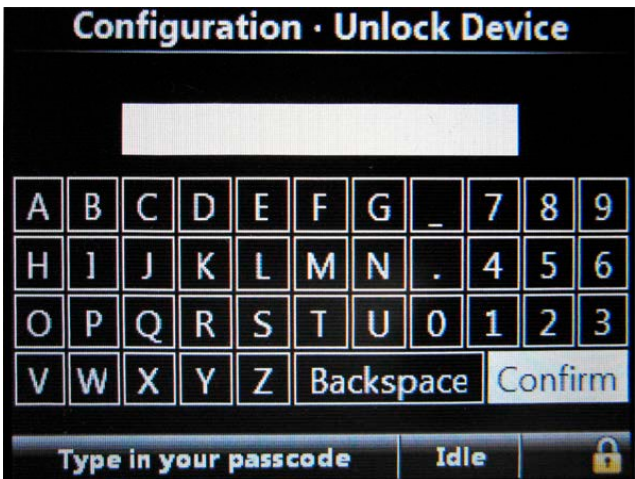


The password is stored in non-volatile memory.

Figure 5-7: Lock the device password read protection by jumper JP2
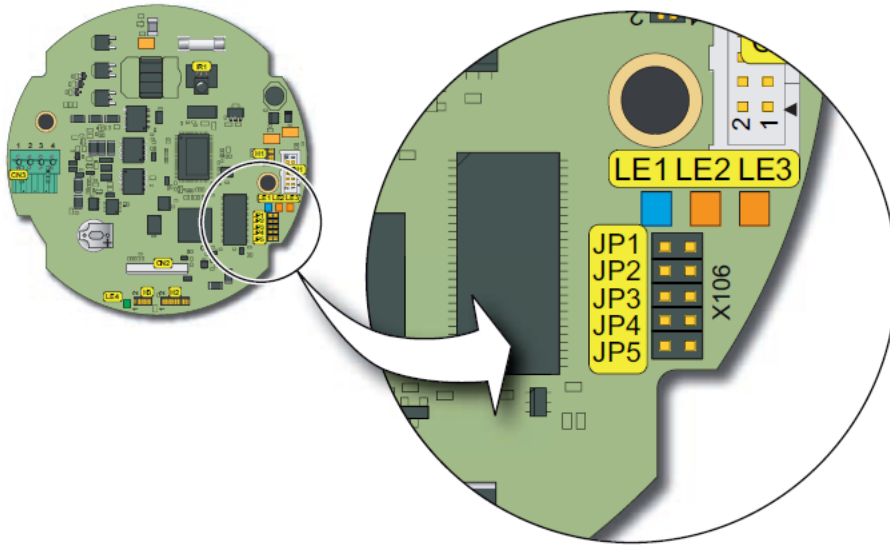


# 5.9  Device Commissioning

## 5.9.1  Setup Explanation and Configuring Using the Menu

In section 5.11 - Configuration, each setup item is described followed by a hands-on part that informs how to commission the relevant parameter setting(s) through the menu-based interface.

By using the Fusion4 IR Controller or the LAD, and starting from the Main menu, the various sub-menus can be selected.

In this way all entities can be reached and set.

## 5.9.2  Menu Structure

For an overview of the menu structure with all entities and parameters, see the following diagrams.

**Configuration**
*Device*
*I/O binding*
*I/O settings*
*Control settings*
*Recipes*
*Volume conversion*
*Alarms*

A

**Calibration**
*Wizard*
*Manual*

F

**Info**
*Device*
*Board*
*Versions*

B

**Logs**
*Transaction*
*Calibration*
*Alarm*
*Debug*
*W&M*

**Diagnostics**
*Dashboard*
*System health*
*Active alarms*
*Storage info*
*Accumulated totals*
*Device tasks*
*Advanced diagnostics*

C

**Transfer**
*Transaction records*
*Configurations*
*Events / Logs*
*Calibration records*
*Recipes*
*Language packs*

D

**LAD functions**
*Firmware update*
*Test LED*
*Function key*
*LAD information*
*W&M sealing*
*Format SD card*

E

= level 1

= level 2

= level 3

= level 4

*Configuration*

**A**

**Device**
*Identification*
*Units*
*Display*
*Time*

**A1**

**I/O binding**
*Inputs*
*Outputs*

**A2**

**I/O settings**
*Inputs*
*Outputs*
*Communication*

**A3**

**Control settings**
*Blend control*
*Wild stream*
*Calibration*
*Window control*
*DCV control*
*Clean arm*
*Continuous blend*

**A4**

**Recipes**
*1.*
*2.*
*3.*
*4.*
*5.*

**Volume conversion**
*Setup*
*Density data*
*Calculation Interval*

**A5**

**Alarms**
*Leaking valve*
*Flush volume*
*No activity*
*No pump*
*Deviation*
*Blend stream closing*
*Wild stream closing*
*Control fault*
*No hydr. pump*
*Fixed*

**A6**

*Calibration*

**F**

**Manual**
*Enter meter factor*
*Ack or reject new meter factor*

**Wizard**
*Enter preset volume*
*Enter start delay*
*Start calibration wizard*
*Enter actual volume*
*Ack or reject new meter factor*
*Overview calibration record*

*Info*

B

**Device**
*Device Serial Number*
*Production Date*
*Sales Code*

**Board**
*HMI*
*STREAM*
*OPTION*

B1

**Versions**
*Board*
*Boot ver.*
*App. ver.*
*App. build*

*Diagnostics*

C

**System health**
*HMI*
*STREAM*
*OPTION*

C1

**Storage info**
*Free space (transaction)*
*Total space (transaction)*
*Total transaction records*
*Total calibration records*
*Total alarm records*

**Accumulated totals**
*Blend stream volume*
*Wild stream volume*

**Device tasks**
*Reset task*
*Comms task*
*Clear task*

C2

**Advanced diagnostics**
*Flow rates*
*Deviation graph*
*Process overview*

*Transfer*

◁ D

**Transaction records**

*Retrieve all transaction records*
*Retrieve range of transaction records*
*Retrieve single transaction record*

**Configurations**

*Apply configuration*
*Retrieve configuration*

**Events / Logs**

*Retrieve debug logs*
*Retrieve alarms logs*
*Retrieve W&M logs*

**Calibration records**

*Retrieve all calibration records*
*Retrieve single calibration record*

**Recipes**

*Install recipe*
*Retrieve recipes*

*LAD functions*

◁ E

**Firmware update**

*Fusion4 device*
*LAD*

**Function key**

*None*
*Retrieve all transactions*
*Reset device*

**LAD information**

*Serial number*
*SD card memory*
*NVRAM memory*
*Voltage*
*Temperature*
*Hardware version*
*Application version*
*Bootloader version*

## Device

**A1**

**Identification**
Site name
Bay name
Arm name
Arn number
Device name
Product name
Product symbol

**Units**
Haz. mat. class.
Units of density
Units of volume
Units of temperature
Units of pressure
Units of mass

**Display**
Display brightness
Display contrast
Session timeout value
User display language

**Time**
Date display format
Time display format
Date
Time
Next scheduled service
Display total reset time

## I/O binding

**A2**

**Inputs**
Temperature input
Pressure input
Blend rate 1 permissive
Blend rate 2 permissive
Blend rate 3 permissive
System interlock
Pump feedback
Hydr. pump feedback
Tank low level
Tank empty
Alarm reset

**Outputs**
DCV N.O.
DCV N.C.
Alarm indication
Alarm shutdown
Block valve control
Pump start
Hydr. pump start
Factored pulse out 1
Factored pulse out 2

## I/O settings

**A3**

**Inputs**
PI
DI AC 1
DI AC 2
DI DC 1
DI DC 2
OPT DI AC 1
OPT DI AC 2
OPT DI AC 3
OPT DI AC 4
OPT DI DC 1
OPT DI DC 2
OPT RTD
OPT AI DC

**A3-1**

**Outputs**
DO EMR
OPT DO EMR
OPT AO DC

**A3-2**

**Communication**
IR COMMS
COMMS
OPT COMMS

**A3-3**

## Control settings

**A4**

**Blend control**
K-factor
Permissive condition
Blend point
Pump run timeout
Hydr. pump run timeout
Pulse timeout
Makeup period
Factored pulse out 1
Factored pulse out 2
Clear leaking at permissive

**Wild stream**
K-factor
Meter factor
Pulse timeout

**Calibration**
High flow rate
Low flow rate
Inner control window
Outer control window
Low flow volume
End flow volume
Final shutdown volume
Flow calc. smoothing val.

**Window control**
Dead band window
Inner control window
Middle control window
Outer control window
Dev. count smoothing val.
Deviation count reset

**DCV control**
Active dwell
Rest dwell

**Clean arm**
Preset volume
Flush volume
Pre-shutdown control
Pre-shutdown volume
Clean start control

**Continuous blend**
Continuous blend mode
Continuous blend window

## Volume conversion

**A5**

**Setup**
Commodity group
Temp. compensation used
Press. compensation used
Base temperature
Base pressure
VCF table
VCF Options

**Density data**
Observed density
Density temperature
Density pressure
Derive manual status
Glass hydrometer used
Expansion coefficient

**Calculation Interval**
Calculation interval vol.
Min. calc. interval time
Max. calc. interval time

## Alarms

**A6**

**Leaking valve**
Alarm action
Leaking volume limit

**Flush volume**
Alarm action
Flush volume deviation

**No activity**
Alarm action
No activity timeout

**No pump**
Alarm action
Feedback timeout

**Deviation**
Alarm action
Min. volume for alarm
Low deviation
High deviation

**Blend stream closing**
Alarm action
Closing timeout

**Wild stream closing**
Alarm action
Closing volume limit

**Control fault**
Alarm action
Control failure timeout

**No hydr. pump**
Alarm action
Feedback timeout

**Fixed**
Pulse phase
Pulse hardware
Factored pulse out
Volume correction
Temperature sensor
Pressure sensor
Block valve fault
Tank low level
Tank empty
Service due expired

## Board

**B1**

**HMI**
Board serial #
HW version
App. firmware
App. build
Boot firmware
FlexConn version
FlexConn build

**STREAM**
Board serial #
HW version
App. firmware
PIC. firmware
App. build
Boot firmware
FlexConn version
FlexConn build

**OPTION**
Board serial #
HW version
App. firmware
App. build
Boot firmware
FlexConn version
FlexConn build

## System health

**C1**

**HMI**
Device manager
Alarm manager
Trans. manager
Batch manager
Module manager
Display manager
LAD

**STREAM**
COMMS
DI AC 2
DI DC 1
DI DC 2
DO AC 1
DO AC 2
PO DC 1
PO DC 2
Pulse input
DI AC 1
DO EMR
Blend manager
Additive manager
Module manager

**OPTION**
COMMS
DO EMR
DI AC 1
DI AC 2
DI AC 3
DI AC 4
AO DC
RTD
DO AC
DI DC 1
DI DC 2
Module manager
AI DC

*Device tasks*

**C2**

**Reset task**
Reset device
Reset to factory settings

**Comms task**
Disable blending
Enable blending rate 1
Enable blending rate 2
Enable blending rate 3
Enable blending rate 4
Enable blending rate 5

**Clear task**
Clear all alarms
Clear all totals
Clear wild stream totals only
Clear blend stream totals only

*Inputs*

**A3-1**

**PI**
Blend meter integrity check
Blend meter cut-off frequency
Blend meter error threshold
Blend stream meter serial #
Wild stream meter serial #

**Opt RTD**
RTD serial #
HH Alarm Threshold
H Alarm Threshold
L Alarm Threshold
LL Alarm Threshold
Alarm Hysteresis

**OPT AI DC**
PV value @20mA
PV value @4mA
AI threshold
AI logic state
AI serial #
HH Alarm Threshold
H Alarm Threshold
L Alarm Threshold
LL Alarm Threshold
Alarm Hysteresis

*Outputs*

**A3-2**

**OPT AO DC**
Operational mode
PV address
Lower boundary
Upper boundary

*Communication*

**A3-3**

**IR COMMS**
IR access
Long IR access

**COMMS**
FlexConn instrument addr.
Communication protocol
Baudrate
Parity
Stop bits
Datastream max. gap time
Turn around delay
Broadcast address
Unit address
Modbus byte order

**OPT COMMS**
FlexConn instrument addr.
Communication protocol
Baudrate
Parity
Stop bits
Datastream max gap time
Turn around delay
Broadcast address
Unit address
Modbus byte order

# 5.10  Blending Application Overview

**Blend volume output**
- hard wired (pulses)
- comms

■ = Basic setup
■ ■ = Advanced setup
■ ■ ■ = Sophisticated setup

**Alarm shutdown**
- hard wired
- comms

**Blend recipe (between batches)**
- comms
- Fusion4 IR contr./LAD

**Alarm indication**
- hard wired
- comms

**Pump start**
- hard wired

**Temperature input**
- hard wired (RTD, AI)

**Pump feedback**
- hard wired

**Pressure input**
- hard wired (AI)

**Hydraulic pump start (HPP)**
- hard wired

**Analog blend volume output**
- hard wired (AO)

**Hydraulic pump feedback (HPP)**
- hard wired

**Enable (Permissive)**
- hard wired (r1/r2/r3)*
- comms (r1/r2/r3/r4/r5)
- Fusion4 IR controller/ LAD (r1/r2/r3/r4/r5)

**Slow-flow signal ***
- load computer (pulse freq.)
- start clean arm (hard wired)
- start clean arm (comms)

**Volume conversion**
- API tables
- mass calculation
- manual density
- Fusion4 IR controller/ LAD/ comms

**Wild stream flow**
- load computer (factored)
- flow meter pulses (S-PI)

**System interlock**
(ESD, keylock switch etc.)
- hard wired
- comms

**Blend flow pulses**
- hard wired (S-PI, Q-PI)
**Solenoid control**
- hard wired (2 x DO)

**W&M (MID) sealing**
- FlexConn jumper
- LAD

**Block valve control**
- hard wired

**Tank low level**
- hard wired

**Alarm reset**
- hard wired
- comms
- Fusion4 IR contr./ LAD

**Tank empty**
- hard wired

* r1 = rate 1, r2 = rate 2 etc.

** Clean arm

# 5.11  Configuration

## 5.11.1  Using the Configuration Menu



- Through the Configuration menu, you can access the device configuration parameters, except the blend meter calibration entities.

- The structured menu system with device configuration are grouped in a logical order.

- The current device configuration values are always shown.

- In the type-specific data entry window, all configuration values are edited one at a time.

## 5.11.2  Device

For the SSC-B itself several parameters such as site identification, used units, display settings, and so on can be set.

### 5.11.2.1  Identification

| Entity | Description | Value range |
|---|---|---|
| [Site name] | With this entity you can enter the name of the site at which the SSC is located. | Can be a text string of maximum 20 characters. |

| Entity | Description | Value range |
|---|---|---|
| [Bay name] | With this entity you can enter the name of the loading bay at which the SSC is located at the site.<br><br>The Bay name is shown in the running screens. | Can be a text string of maximum 20 characters. Use maximum 7 characters in order to see the complete name on the SSC screen. |
| [Arm name] | With this entity you can enter the name of the loading arm at which the SSC is located at the site.<br><br>The Arm name is shown in the running screens. | Can be a text string of maximum 20 characters. Use maximum 7 characters in order to see the complete name on the SSC screen. |
| [Arm Number] | The number of the loading arm at which the SSC is located at site. | A value which is less than 32. |
| [Device name] | With this entity you can enter the name of the SSC itself, in order to have a unique identification of the device by a text string. | Can be a text string of maximum 20 characters.<br><br>By default, the device name is SSC_BLND. |
| [Product name] | With this entity you can enter the name of the wild stream product.<br><br>The Product name is shown in the running screens. | A text string of max. 20 characters. Use maximum 12 characters in order to see the complete name on the SSC screen. |
| [Product symbol] | With this entity you can enter a symbol or icon which can be associated to identify the product of the wild stream. This icon is shown in the running screens. | For the U.S.-related market, you can select from a list of API symbols. For the EU-related market, you can select from a list of EI symbols. |

### 5.11.2.1.1  Recipe Identification

In general, the recipe can be associated with a name [Product name]. To the configured blend recipe, a symbol or icon can be associated to identify the wild stream <Wild stream identification>. Both entities [Product name] and <Wild stream identification> are shown in the running screen.

For the USA-related market, you can select from a list of API symbols as defined in: API Recommended Practice 1637, Third edition, July 2006.

The following product symbols are available:

| Description | Menu text displayed | Symbol |
|---|---|---|
| High-grade unleaded gasoline | HGU gasoline | |
| Mid-grade unleaded gasoline | MGU gasoline | |
| Low grade unleaded gasoline | LGU gasoline | |
| Ultra low sulfer diesel | ULS diesel | |
| Low sulfer diesel | LS diesel | |
| High sulfer diesel | HS diesel | |
| Low sulfer no. 1 fuel oil | LS no. 1 fuel oil | |
| High sulfer no. 1 fuel oil | HS no. 1 fuel oil | |
| Low sulfer no. 2 fuel oil | LS no. 2 fuel oil | |
| High sulfer no. 2 fuel oil | HS no. 2 fuel oil | |
| Ultra low sulfer kerosene | ULS kerosene | |
| Low sulfer kerosene | LS kerosene | |
| High sulfer kerosene | HS kerosene | |
| E5 (5% Alcohol based fuel) | API E5 | |
| E10 (10% Alcohol based fuel) | API E10 | |
| E20 (20% Alcohol based fuel) | API E20 | |

| Description | Menu text displayed | Symbol |
|---|---|---|
| B5 (5% Bio blended diesel) | API B5 | |
| B10 (10% Bio blended diesel) | API B10 | |
| B20 (20% Bio blended diesel) | API B20 | |
| Used oil | | |
| Observation or monitoring well | Monitoring well | |
| Vapor recovery | | |

For the EU-related market, you can select from a list of symbols as defined in: Code of practice for a product identification system for petroleum products (Energy Institute).

The following product symbols are available:

| Description | Menu text displayed | Symbol |
|---|---|---|
| Lead Replacement Petrol | Lead repl. petrol | |
| Premium unleaded Petrol (95 octane) | PU petrol | |
| Super unleaded petrol (97 octane) | SU petrol | |
| E5 (5% ethanol, 95% petrol) | EU E5 | |
| E10 (10% ethanol, 90% petrol) | EU E10 | |
| E20 (20% ethanol, 80% petrol) | EU E20 | |
| DERV | | |

| Description | Menu text displayed | Symbol |
|---|---|---|
| B5 (5% FAME, 95% diesel) | EU B5 | |
| B10 (10% FAME, 90% diesel) | EU B10 | |
| B20 (20% FAME, 80% diesel) | EU B20 | |
| Gas oil (marked heating oil) | | |
| Marine Gas Oil | | |
| Ultra low sulfur gas oil (marked) (with less than 10 ppm sulfur) | ULS gas oil | |
| Premium kerosine | | |
| Regular kerosine | | |
| Fuel oil: light, medium, heavy<br><br>For example, HFO for heavy fuel oil | | |
| Bitumen: penetration, cutback, oxidised<br><br>For example,100 PEN for 100 penetration | | |
| FAME | | |
| Fuel grade ethanol | | |

## 5.11.2.2  Units

| Entity | Description | Value range |
|---|---|---|
| [Haz. mat. class] | With this entity, you can specify the hazardous material classification. This entity can describe the following:<br><br>• name of the product<br><br>• character of the product (flammable, explosive, and so on)<br><br>• potential harm to people or the environment<br><br>• physical condition of the product (liquified, hot, compressed, and so on) | A common way to describe the dangerous or hazardous material is defined in the ADR-code defined by the "European Agreement concerning the International Carriage of Dangerous Goods by Road". The ADR code consist of a class and a four-digit UN-number.<br><br>Example:<br><br><ALLYL ALCOHOL, 6.1, UN 1098><br><br>Product: Allyl alcohol<br><br>Class = 6.1: Toxic substances<br><br>UN number: 1098 |
| [Units of density] | With this entity you can select the engineering units for density. | <kg/m3> (default)<br><br><°API><br><br><lb/ft$^3$><br><br><RD @60°F> |

| Entity | Description | Value range |
|---|---|---|
| [Units of volume] | With this entity you can select the engineering units for volume. | <L> (default)<br><br><m3><br><br><cm3><br><br><dm3><br><br><US Gal><br><br><UK Gal><br><br><bbls> |
| [Units of temperature] | With this entity you can select the engineering units for temperature. | <0C> (default)<br><br><0F> |
| [Units of pressure] | With this entity you can select the engineering units for pressure. | <Pa> (default)<br><br><KPa><br><br><PSI><br><br><bar> |
| [Units of mass] | With this entity you can select the engineering units for mass. | <kg (default)<br><br><ton><br><br><lbs><br><br><ton (UK)><br><br><ton (US)> |

| Description | Name | Unit | Range min | Range max | Format |
|---|---|---|---|---|---|
| Transaction volume | Litre | L | 0 | 999999.99 | 6 [ds] 2 |
| | Cubic meter | m3 | 0 | 999.99999 | 3 [ds] 5 |
| | Cubic centimeter | cm3 | 0 | 999999990 | 9 |
| | Cubic decimeter | dm3 | 0 | 999999.99 | 6 [ds] 2 |
| | US gallons | US gal | 0 | 99999.999 | 5 [ds] 3 |
| | UK gallons | UK gal | 0 | 99999.999 | 5 [ds] 3 |
| | Barrel | bbls | 0 | 9999.9999 | 4 [ds] 4 |
| Accumulated total volume | Litre | L | 0 | 99999999 | 8 |
| | Cubic meter | m3 | 0 | 99999.999 | 5[ds]3 |
| | Cubic centimeter | cm3 | 0 | 99999999000 | 11 |
| | Cubic decimeter | dm3 | 0 | 99999999 | 8 |
| | US gallons | US gal | 0 | 9999999.9 | 7[ds]1 |
| | UK gallons | UK gal | 0 | 9999999.9 | 7[ds]1 |
| | Barrel | bbls | 0 | 999999.99 | 6[ds]2 |
| Transaction additive volume | Millilitre | ml | 0 | 999999.99 | 6[ds]2 |
| | Cubic centimeter | cc | 0 | 999999.99 | 6[ds]2 |
| Accumulated total additive volume | Liter | L | 0 | 99999.999 | 5[ds]3 |
| | Cubic meter | m3 | 0 | 99.999999 | 2[ds]6 |
| | Cubic centimeter | cm3 | 0 | 99999999 | 8 |
| | Cubic decimeter | dm3 | 0 | 99999.999 | 5[ds]3 |
| | US Gallons | US gal | 0 | 99999.999 | 5[ds]3 |
| | UK Gallons | UK gal | 0 | 99999.999 | 5[ds]3 |
| | Barrel | bbl | 0 | 999.99999 | 3[ds]5 |
| Mass | Kilogram | kg | 0 | 999999.99 | 6[ds]2 |
| | Metric ton | ton | 0 | 999.99999 | 3[ds]5 |
| | Pound | lb | 0 | 999999.99 | 6[ds]2 |
| | Long ton (UK) | long ton | 0 | 999.99999 | 3[ds]5 |
| | Short ton (US) | US ton | 0 | 999.99999 | 3[ds]5 |

| Description | Name | Unit | Range min | Range max | Format |
|---|---|---|---|---|---|
| Temperature | Celsius | °C | -300.00 | 300.00 | 3[ds]2 |
| | Fahrenheit | °F | -400.0 | 572.0 | 3[ds]1 |
| Density | Kilogram cubic meter | kg/m3 | 0 | 9999.9 | 4[ds]1 |
| | Degrees API | °API | -50.0 | 600.0 | 3[ds]1 |
| | Pounds cubic feet | lb/ft3 | 0 | 999.99 | 3[ds]2 |
| | Relative density @ 60°F | RD60 | 0 | 9.9999 | 1[ds]4 |
| Pressure | Bar | bar | 0 | 999.99 | 3[ds]2 |
| | Pascal | Pa | 0 | 99999000 | 8 |
| | Kilo Pascal | kPa | 0 | 99999 | 5[ds]0 |
| | PSI RANGE 100 | psi_r100 | 0 | 999.9999 | 3[ds]4 |
| | PSI RANGE 1000 | psi_r1000 | 0 | 999.999 | 3[ds]3 |
| Ratio | Percentage | % | 0.00 | 99.99 | 2 [ds] 2 |
| | Parts per million | ppm | 0 | 999999 | 6 |
| Expansion coefficient | Inverse Fahrenheit | 10-7/°F | 00000 | 99999 | 5 |
| | Inverse Celsius | 10-7/°C | 00000 | 99999 | 5 |
| Flow rate | Liter per minute | L/min | 0 | 999999.99 | 6 [ds] 2 |
| | Cubic meter per minute | m3/min | 0 | 999.99999 | 3 [ds] 5 |
| | Cubic centimeter per minute | cm3/min | 0 | 999999990 | 9 |
| | Cubic decimeter per minute | dm3/min | 0 | 999999.99 | 6[ds]2 |
| | US Gallons per minute | US gal/min | 0 | 99999.999 | 5[ds]3 |
| | UK Gallons per minute | UK gal/min | 0 | 99999.999 | 5[ds]3 |
| | Barrel per minute | bbl/min | 0 | 9999.9999 | 4[ds]4 |

| Description | Name | Unit | Range min | Range max | Format |
|---|---|---|---|---|---|
| Additive Flow rate | Milliliter per minute | ml/min | 0 | 999999.99 | 6[ds]2 |
| | Cubic centimeter per minute | cc/min | 0 | 999999.99 | 6[ds]2 |

## 5.11.2.3 Display

| Entity | Description | Value range |
|---|---|---|
| [Display brightness] | With this entity you can enter the brightness of the display. The brightness is controlled by the backlight of the display. | <0> % (low) ... <100> % (high)<br><br>(default = <75> %) |
| [Display contrast] | With this entity you can enter the contrast of the display. | <0> % (low) ... <100> % (high)<br><br>(default = <75> %) |
| [Session timeout value] | With this entity you can enter the time in seconds between last keypress on Fusion4 IR controller and the moment the display switches back to one of the running screens. | <10> s.. <600> s<br><br>(default = <300> s |

| Entity | Description | Value range |
|---|---|---|
| [User display language] | With this entity you can select the display language for the running screens. | <English UK> <English US> (default) <French> <German> <Dutch> <Spanish> <Chinese> <Japanese> <Polish> <Portuguese> <Italian> <Local language> |

### 5.11.2.4 Time

| Entity | Description | Value range |
|---|---|---|
| [Date display format] | This entity selects the format of the date. | <DD_MM_YY> (default) <MM_DD_YY> <YY_MM_DD> <DD_MM_YYYY> <MM_DD_YYYY> NOTE:  Only the first 3 selections is completely visible on the SSC screen. |

| Entity | Description | Value range |
|---|---|---|
| [Time display format] | This entity selects the format of the time. | <12-hour><br><br><24-hour> (default)<br><br>NOTE:  Only the 24-hours selection is completely visible on the SSC screen. |
| [Date] | This entity selects the actual date and is used for time stamping of transactions, calibrations, and alarms. | Year<br><br>Month<br><br>Day<br><br>NOTE:  By default, the current date appears. However, to change the default date, enter the year, month, and day. |
| [Time] | This entity selects the actual time and is used for time stamping of transactions, calibrations, and alarms. | Hour<br><br>Minute<br><br>Second<br><br>Millisecond<br><br>NOTE:  By default, the current time appears. However, to change the default time, enter the hour, minute, second, and millisecond. |

| Entity | Description | Value range |
|---|---|---|
| [Next scheduled service] | This entity selects the date when the next service activities should take place for the SSC-B. It is handled like an alarm so it can be configured to desired alarm behaviour (Disable, Display or Shutdown). | Year<br><br>Month<br><br>Day<br><br>NOTE:  By default, 01-01-10 appears. However, to change the default date enter the year, month, and day. |
| [Daily total reset time] | With this entity you can select the time at which the daily totals is cleared. | Hour<br><br>Minute<br><br>Second<br><br>Millisecond<br><br>NOTE:  By default, 00:00:00 appears. However to change the daily totals reset time, enter the hour, minute, second, and millisecond. |

## 5.11.3  I/O binding

The flexible I/O allocation architecture forms the basis of the Fusion4 product family. It is designed around common I/O building blocks that can be arranged in different configurations to be used in the Fusion4 Single Stream Controller (SSC).

I/O allocation can either be done through a Fusion4 IR Controller through the infrared link or a LAD connected to front connector of the SSC-B (see the following figure).

Figure 5-8: I/O allocation using a Fusion4 IR controller or a LAD
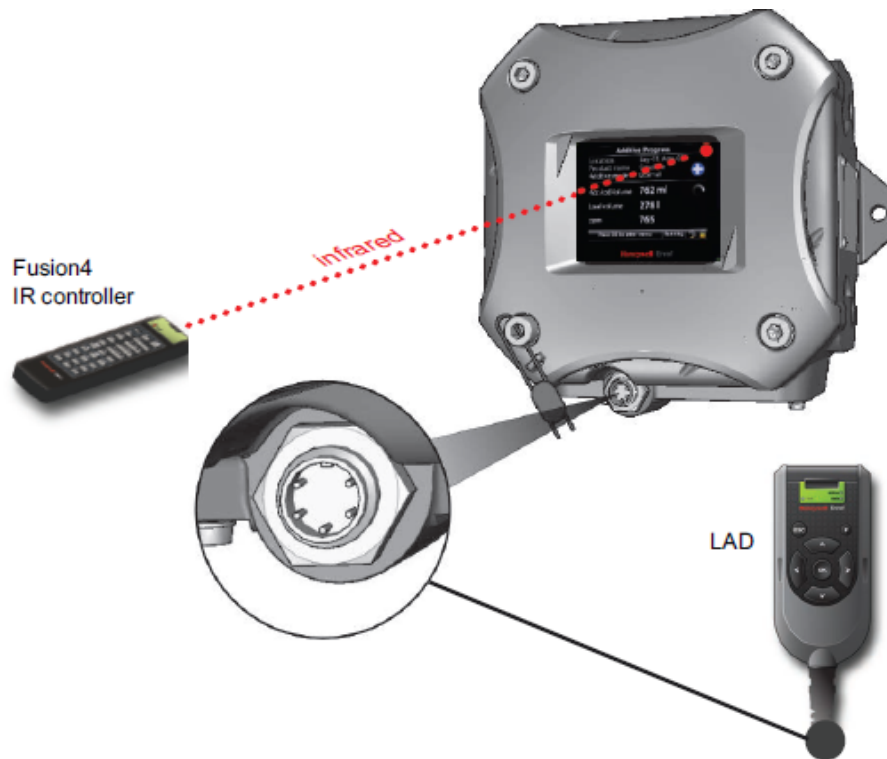
> Select Configuration in the Main Menu (see screen below)

> Select [I/O binding] + <OK>

> Select [Inputs] or [Outputs] + <OK>

Now you can select a specific entity, for example, [Blend rate 1 permissive], [Pump feedback], and so on, and link it to a specific I/O function, for example, to <DI AC 1> (Digital Input AC, number 1), <DO EMR> (Digital Output Electromechanical Relay), and so on.

The possible entities and the I/O functions to which a specific entity can be linked is given in following table.

For I/O functions description, see 3.9 ... 3.11.1.3.

## 5.11.3.1  Possible I/O bindings Survey

| Inputs/ Outputs | Entity | Link is possible to ... |
|---|---|---|
| Inputs<br><br>NOTE:  The default value for the Input entities are None. | [Temperature input] | None, OPT RTD, OPT AI DC |
| | [Pressure input] | None, OPT AI DC |
| | [Blend rate 1 permissive] | None, Comms., DI AC 1, DI AC 2, DI DC 1, DI DC 2, OPT DI AC 1, OPT DI AC 2, OPT DI AC 3, OPT DI AC 4, OPT DI DC 1, OPT DI DC 2, OPT AI DC |
| | [Blend rate 2 permissive] | None, Comms., DI AC 1, DI AC 2, DI DC 1, DI DC 2, OPT DI AC 1, OPT DI AC 2, OPT DI AC 3, OPT DI AC 4, OPT DI DC 1, OPT DI DC 2, OPT AI DC |
| | [Blend rate 3 permissive] | None, Comms., DI AC 1, DI AC 2, DI DC 1, DI DC 2, OPT DI AC 1, OPT DI AC 2, OPT DI AC 3, OPT DI AC 4, OPT DI DC 1, OPT DI DC 2, OPT AI DC |
| | [System interlock] | None, DI AC 1, DI AC 2, DI DC 1, DI DC 2, OPT DI AC 1, OPT DI AC 2, OPT DI AC 3, OPT DI AC 4, OPT DI DC 1, OPT DI DC 2 |
| | [Pump feedback] | None, DI AC 1, DI AC 2, DI DC 1, DI DC 2, OPT DI AC 1, OPT DI AC 2, OPT DI AC 3, OPT DI AC 4, OPT DI DC 1, OPT DI DC 2 |
| | [Hydr. pump feedback] | None, DI AC 1, DI AC 2, DI DC 1, DI DC 2, OPT DI AC 1, OPT DI AC 2, OPT DI AC 3, OPT DI AC 4, OPT DI DC 1, OPT DI DC 2 |
| | [Tank low level] | None, DI AC 1, DI AC 2, DI DC 1, DI DC 2, OPT AI DC, OPT DI AC 1, OPT DI AC 2, OPT DI AC 3, OPT DI AC 4, OPT DI DC 1, OPT DI DC 2 |
| | [Tank empty] | None, DI AC 1, DI AC 2, DI DC 1, DI DC 2, OPT AI DC, OPT DI AC 1, OPT DI AC 2, OPT DI AC 3, OPT DI AC 4, OPT DI DC 1, OPT DI DC 2 |

| Inputs/ Outputs | Entity | Link is possible to ... |
|---|---|---|
| | [Alarm reset] | None, DI AC 1, DI AC 2, DI DC 1, DI DC 2, OPT DI AC 1, OPT DI AC 2, OPT DI AC 3, OPT DI AC 4, OPT DI DC 1, OPT DI DC 2 |
| Outputs<br><br>NOTE:  The default value for the Output entities are None. | [DCV N.O.] | None, DO AC 1, DO AC 2, OPT DO AC1 |
| | [DCV N.C.] | None, DO AC 1, DO AC 2, OPT DO AC1 |
| | [Alarm indication] | None, DO AC 1, DO AC 2, DO EMR, PO DC 1, PO DC 2, OPT DO EMR, OPT DO AC |
| | [Alarm shutdown] | None, DO AC 1, DO AC 2, DO EMR, PO DC 1, PO DC 2, OPT DO EMR, OPT DO AC |
| | [Block valve control] | None, DO AC 1, DO AC 2, DO EMR, PO DC 1, PO DC 2, OPT DO EMR, OPT DO AC |
| | [Pump start] | None, DO AC 1, DO AC 2, DO EMR, PO DC 1, PO DC 2, OPT DO EMR, OPT DO AC |
| | [Hydr. pump start] | None, DO AC 1, DO AC 2, DO EMR, PO DC 1, PO DC 2, OPT DO EMR, OPT DO AC |
| | [Factored pulse out 1] | None, PO DC 1, PO DC 2 |
| | [Factored pulse out 2] | None, PO DC 1, PO DC 2 |

## 5.11.3.2  Inputs

### 5.11.3.2.1  Temperature Input

The SSC-B temperature input is available for volume conversion of the measured gross observed volume, to facilitate high-accuracy custody transfer of the blend stream product.

For temperature measurement, one of the following inputs of the option board can be used:

- AI

- RTD (Mandatory for MID (W&M))

The RTD (Resistance Temperature Detector) temperature converter is more accurate (± 0.3 °C/ ± 0.5 °F) than the AI (Analog Input) circuitry, and to meet the MID requirements this input must be used for temperature measurement.

The external connected RTD should be a PT100 industrial platinum resistance thermometer sensor that is compliant with IEC 60751 (edition 1995).

The IEC 60751 defines:

- How to be made (platinum with an α = 0.00385 Ω/Ω/°C [0.00214 Ω/Ω/°F)

- How to calculate temperature from resistance

- Accuracy classes

For MID compliance, it is required to use an RTD sensor with an accuracy equal or better: ± 0.4 °C [± 0.7 °F].

It is highly recommended to use a Class A or Class 1/10 DIN PT100:

- Class A is 100Ω +/- 0.06Ω at 0˚C [32˚F]

- Class B is 100Ω +/- 0.12Ω at 0˚C [32˚F]

Not explicitly defined in IEC 60751 but compatible:

- Class 1/3 DIN is 100Ω +/- 0.04Ω at 0˚C [32˚F] (0.12Ω / 3 = 0.04Ω)

- Class 1/5 DIN is 100Ω +/- 0.024Ω at 0˚C [32˚F] (0.12Ω / 5 = 0.024Ω)

- Class 1/10 DIN is100Ω +/- 0.012Ω at 0˚C [32˚F] (0.12Ω / 10 = 0.012Ω)

| Entity | Description | Value range |
|---|---|---|
| [Temperature input] | This entity selects the physical source for the blend stream temperature measurement. | None, OPT RTD, OPT AI DC |

### 5.11.3.2.2  Pressure Input

The SSC-B pressure input is available for volume conversion of the measured gross observed volume to be able to facilitate high-accuracy custody transfer of the blend stream product. For pressure measurement the Analog Input circuitry of the option board must be used.

The accuracy of this pressure converter is:

- ± 30 kPa [4.35 psi] (P < 1 MPa [145 psi])

- ± 3 % (1 ≤ P ≥ 2 MPa [290 psi])

It is highly recommended to use a 4-20 mA pressure sensor with accuracy equal or better:

- ± 40 kPa [5.80 psi] (P < 1 MPa [145 psi])

- ± 4 % (1 ≤ P ≥ 2 MPa [290 psi])

| Entity | Description | Value range |
|---|---|---|
| [Pressure input] | This entity selects the physical source for the permissive function. | None, OPT AI DC |

### 5.11.3.2.3  Blend Rate # Permissive

All transactions begin when the stream permissive conditions become true and end when the stream permissive becomes false.

The permissive I/O binding defines three general means of permissive configuration for the device. The value of the permissive I/O binding can be one of the following values:

- Comms

    - Transaction start condition - When a serial command is received to enable the device

        - Enable rate 1

        - Enable rate 2

        - Enable rate 3

        - Enable rate 4

        - Enable rate 5

    - Transaction end condition - When a serial command is received to disable the device

- Digital Input

- Transaction start condition - When the digital input is active.

    - Enable rate 1

    - Enable rate 2

    - Enable rate 3

  - Transaction end condition – When the digital input is inactive.

| Entity | Description | Value range |
|---|---|---|
| [Blend rate 1 permissive] | This entity selects the physical source for blend rate 1 permissive function. | None, Comms., DI AC 1, DI AC 2, DI DC 1, DI DC 2, OPT DI AC 1, OPT DI AC 2, OPT DI AC 3, OPT DI AC 4, OPT DI DC 1, OPT DI DC 2, OPT AI DC |
| [Blend rate 2 permissive] | This entity selects the physical source for blend rate 2 permissive function. | |
| [Blend rate 3 permissive] | This entity selects the physical source for blend rate 3 permissive function. | |

### 5.11.3.2.4  System Interlock

- An optional secondary permissive can be defined with an I/O binding for typical use of for example, ESD (emergency shut down, keylock switch, or deadman input).

- When a secondary permissive is defined, then it is combined with the normal (primary) permissive through a logical AND or OR function (Configuration > Control Settings > Blend Control).

    - If the permissive condition is OR, then the device is enabled when either (or both) the primary or secondary permissives are true.

    - If the permissive condition is AND, then the device is enabled when both the primary and secondary permissives are true.

- If the secondary I/O binding is not defined, then secondary permissive is not used, and the permissive condition is not applicable.

| Entity | Description | Value range |
|---|---|---|
| [System interlock] | This entity selects the physical source for the alarm reset function. | None, DI AC 1, DI AC 2, DI DC 1, DI DC 2, OPT DI AC 1, OPT DI AC 2, OPT DI AC 3, OPT DI AC 4, OPT DI DC 1, OPT DI DC 2 |

### 5.11.3.2.5  Pump Feedback

This input is a feedback from the blend pump, to be able to check if the pump is running.

- If the blend [Pump feedback] I/O binding is defined, then the controller

    - should generate an error in the [pump feedback timeout] if the pump indication input is inactive;

    - after the pump demand is active.

- The allowable delay is defined by the [Pump feedback timeout] entity (defined in the alarm settings submenu for this alarm).

| Entity | Description | Value range |
|---|---|---|
| [Pump feedback] | This entity selects the physical source for the slow flow signal. | None, DI AC 1, DI AC 2, DI DC 1, DI DC 2, OPT DI AC 1, OPT DI AC 2, OPT DI AC 3, OPT DI AC 4, OPT DI DC 1, OPT DI DC 2 |

### 5.11.3.2.6  Hydraulic Pump Feedback (HPP)

This feedback signal is used to control the HPP (Hydraulic Power Pack) system.

The Hydraulic Power Pack system is used to pressurize the product in the piping going to the control valve.

The hydraulic pump feedback works identical as the pump feedback function, using the [Hydr. pump feedback] I/O binding.

| Entity | Description | Value range |
|---|---|---|
| [Hydr. pump feedback] | This entity selects the physical source for the pump feedback function. | None, DI AC 1, DI AC 2, DI DC 1, DI DC 2, OPT DI AC 1, OPT DI AC 2, OPT DI AC 3, OPT DI AC 4, OPT DI DC 1, OPT DI DC 2 |

### 5.11.3.2.7  Tank Low Level

Supply-tank level monitoring is useful in applications where a very small supply tank is used. This is typical in portable or mobile applications such as truck-mounted systems.

By monitoring a hardware input connected to a level switch in the supply tank, the controller can detect when the level in the tank is nearing empty, and take appropriate action. This prevents the pump from running completely dry, and prevents fueling operations from being interrupted mid-load.

The tank-level signals used should provide a simple form contact closure upon detection of a low level (in excess of some low point) in the supply tank. Consideration should be given to the pump intake position in the tank and to the amount of blend volume required for a normal fuel delivery.

The switch-activation level should be positioned so that it is slightly higher than the level required for normal delivery. Thus, if the tank low- level switch indicates "low" immediately upon start of the delivery, there is still an adequate volume in the tank to allow the delivery to complete prior to the pump inlet drawing air.

If the low-level condition exists, the SSC-B can still operate under normal condition. To clear the tank low-level signal, the tank must be refilled to a point that closes the level switch. At that time, the alarm disappears. There is no need to reset the condition as with normal alarms.

| Entity | Description | Value range |
|--------|-------------|-------------|
| [Tank low level] | This entity selects the physical source for the tank low level function. | None, DI AC 1, DI AC 2, DI DC 1, DI DC 2, OPT AI DC, OPT DI AC 1, OPT DI AC 2, OPT DI AC 3, OPT DI AC 4, OPT DI DC 1, OPT DI DC 2 |

### 5.11.3.2.8  Tank Empty

If the tank-empty condition exists, the SSC-B cannot operate under normal condition. To clear the tank-empty signal, the tank must be refilled to a point that closes the level switch. At that time, the alarm disappears and the SSC-B can then resume normal use. There is no need to reset the condition as with normal alarms.

| Entity | Description | Value range |
|--------|-------------|-------------|
| [Tank empty] | This entity selects the physical source for the tank empty function. | None, DI AC 1, DI AC 2, DI DC 1, DI DC 2, OPT AI DC, OPT DI AC 1, OPT DI AC 2, OPT DI AC 3, OPT DI AC 4, OPT DI DC 1, OPT DI DC 2 |

### 5.11.3.2.9  Alarm Reset

Any active alarms can be reset through any one of three ways:

- Through hard-wired digital input, defined by I/O binding

- Through a serial comms command

- With the Fusion4 IR controller/LAD through the alarm summary screen

| Entity | Description | Value range |
|--------|-------------|-------------|
| [Alarm reset] | This entity selects the physical source for the alarm reset function. | None, DI AC 1, DI AC 2, DI DC 1, DI DC 2, OPT DI AC 1, OPT DI AC 2, OPT DI AC 3, OPT DI AC 4, OPT DI DC 1, OPT DI DC 2 |

## 5.11.3.3  Outputs

### 5.11.3.3.1  Digital Control Valve Normally Open (DCV N.O.)

A digital control valve (DCV) is an electrically-controlled, hydraulically- operated multi-function control valve. Because of its precision multi- stage opening and closing and its fail-safe design, it is used to control the blend flow.

| Entity | Description | Value range |
|--------|-------------|-------------|
| [DCV N.O.] | This entity selects the physical source for the Normally Open solenoid of the Digital Control Valve that controls the blend stream. | None, DO AC 1, DO AC 2, OPT DO AC1 |

### 5.11.3.3.2  Digital Control Valve Normally Closed (DCV N.C.)

Description: see 5.11.3.3.1.

| Entity | Description | Value range |
|--------|-------------|-------------|
| [DCV N.C.] | This entity selects the physical source for the Normally Closed solenoid of the Digital Control Valve that controls the blend stream. | None, DO AC 1, DO AC 2, OPT DO AC1 |

### 5.11.3.3.3  Alarm Indication

This output is used to signal alarms to other instruments or systems in the environment of the SSC-B.

When the [Alarm indication] becomes active, the SSC-B still operates under required conditions for example, finalize the running batch.

If [Alarm action] is set to <Display>, the following actions occur:

- The alarm-indication output is set to ON.

- Alarm is shown on the display.

| Entity | Description | Value range |
|--------|-------------|-------------|
| [Alarm indication] | This entity selects the physical source for the alarm indication function.<br><br>The alarm indication is driven as long as there is at least one non-acknowledged alarm. | None, DO AC 1, DO AC 2, DO EMR, PO DC 1, PO DC 2, OPT DO EMR, OPT DO AC |

### 5.11.3.3.4  Alarm Shutdown

This output is used to signal fatal alarms to other instruments or systems in the environment of the SSC-B.

When the [Alarm shutdown] becomes active, the SSC-B stops running batch or transaction. New transactions can only be started after solving the problem and clearing this alarm condition.

If [Alarm action] is set to <Display shutdown>, the following actions occur:

- Alarm-indication output is set to ON.

- Alarm is shown on the display.

- Alarm-shutdown output is set to ON.

- Running transactions are stopped.

- Start-up of new transactions is prohibited until alarm condition is reset.

| Entity | Description | Value range |
|---|---|---|
| [Alarm shutdown] | This entity selects the physical source for the alarm shutdown function. | None, DO AC 1, DO AC 2, DO EMR, PO DC 1, PO DC 2, OPT DO EMR, OPT DO AC |

### 5.11.3.3.5  Block Valve Control

A block valve is a valve that can block the flow of product in a pipeline in both directions.

- If the [Block valve control] I/O binding is defined, then the block valve output is active when the permissive is true.

- The block valve remains active until the stream permissive is false.

| Entity | Description | Value range |
|---|---|---|
| [Block valve control] | This entity selects the physical source for the block valve control function. | None, DO AC 1, DO AC 2, DO EMR, PO DC 1, PO DC 2, OPT DO EMR, OPT DO AC |

### 5.11.3.3.6  Pump Start

This signal starts and stops the blending pump running the blend product from the storage tank to the blend point of the wild stream.

- Pump start output should be driven high when the permissive becomes true (if the [Pump start] I/O binding is defined).

- The pump is deasserted when the permissive becomes false and when not receiving wild stream pulses for a time-out period in minutes.

| Entity | Description | Value range |
|---|---|---|
| [Pump start] | This entity selects the physical source for the blend pump start function. | None, DO AC 1, DO AC 2, DO EMR, PO DC 1, PO DC 2, OPT DO EMR, OPT DO AC |

### 5.11.3.3.7  Hydr. Pump Start

This signal is used to control the Hydraulic Power Pack system. The hydraulic Power Pack is used to provide pressurised oil to the actuated control valve of the blend stream.

It works identical to the [Pump start] function using the [Hydraulic pump start] I/O binding.

| Entity | Description | Value range |
|---|---|---|
| [Hydr. pump start] | This entity selects the physical source for the hydraulic pump start function. | None, DO AC 1, DO AC 2, DO EMR, PO DC 1, PO DC 2, OPT DO EMR, OPT DO AC |

### 5.11.3.3.8  Factored Pulse Out #

The SSC-B implements two blend volume output functions that can be configured to a specific digital output.

This functionality is enabled by defining the [Factored pulse out] I/O binding.

- When the functionality is enabled, the output is driven based upon the transaction blend volume and the factored pulse output setting.

- The factored pulse output setting can be one of the following values:

    - 1 pulse for each unit of blend volume

    - 10 pulses for each unit of blend volume

    - 100 pulses for each unit of blend volume

    - 1000 pulses for each unit of blend volume

- The unit of volume is defined by the device [Units of volume] configu- ration entity.

- The maximum frequency of the pulse output channel is 300 Hz.

| Entity | Description | Value range |
|---|---|---|
| [Factored pulse out 1] | This entity selects the physical source for the "Blend volume output 1" function (factored pulses). | None, PO DC 1, PO DC 2 |
| [Factored pulse out 2] | This entity selects the physical source for the "Blend volume output 2" function (factored pulses). | |

# 5.11.4  I/O Settings

## 5.11.4.1  Inputs

### 5.11.4.1.1  Pulse Input (PI)

#### 5.11.4.1.1.1  General

The SSC-B receives pulses from the wild stream meter and blend stream meter and ratios the two flows based upon the blend percentage set by configuration. The blend stream control valve is directly controlled by the SSC-B electronics in order to maintain that ratio. The wild stream flow is not controlled by the SSC-B electronics.

- The Pulse Input (PI) function should meter both the blend and wild stream flow.

- The blend stream must use the quad-pulse channel A input, and the single-pulse input can be used for wild stream metering.

- The pulse input functions also supports new entities for flow rate for both the wild and blend streams. These values are always in units of litre(litres)/minute (gallons/minute). These flow entities are not visible anywhere in the user Interface but may be viewable through the future versions of the Fusion4 portal.

CAUTION:  The wild stream pulse input should always be furnished with a Gross Observed Volume pulse, regardless of whether temperature compensation is turned on or not. Providing a Gross Standard Volume pulse to the wild stream pulse input results in errors in the final blend percentage. The amount of errors depends upon the configuration of the loading equipment and the difference in temperature between the wild and blend streams.

| Entity | Description | Value range |
|---|---|---|
| [Blend meter integrity check] | With this entity you can select the pulse type of the blend flow meter. | <Disable> = single pulse (default)<br><br><Enable> = dual pulse (quad); mandatory for W&M (MID) |
| [Blend meter cut-off frequency] | With this entity you can enter the minimum frequency at which the [Blend meter integrity check] is enabled. At slow flow it is difficult to guarantee the integrity of the dual pulse. | Recommended value = 50% of the slow flow threshold value.<br><br>(default = <50> Hz) |
| [Blend meter error threshold] | With this entity you can provide the maximum number of dual pulse flow meter errors permitted every 1000 pulses. If more than the specified number of pulses are missing in a batch of 1000 pulses, then an alarm is generated. | 3 (default) |
| [Blend stream meter serial #] | With this entity you can enter the serial number of the connected blend flow meter. This then is part of the calibration record. | |
| [Wild stream meter serial #] | With this entity you can enter the serial number of the wild stream flow meter. | |

### 5.11.4.1.2  DI (for both AC# and DC#)

| Entity | Description | Value range |
|---|---|---|
| [DI hysteresis time] | With this entity you can set the active time in milliseconds (ms) of the input signal before accepting it as a valid input signal. The time between two signal transitions must be greater than the [Hysteresis time]. | default = <250> ms |

### 5.11.4.1.3  OPT RTD

| Entity | Description | Value range |
|---|---|---|
| [RTD serial #] | With this entity you can enter the serial number of the connected PT100 temperature probe. | |
| [HH Alarm Threshold] | With this entity you can set the High High temperature alarm threshold. When exceeded, a temperature alarm occurs. | default = <0.0> |
| [H Alarm Threshold] | With this entity you can set the High temperature alarm threshold. When exceeded, a temperature alarm occurs. | default = <0.0> |
| [L Alarm Threshold] | With this entity you can set the Low temperature alarm threshold. When exceeded, a temperature alarm occurs. | default = <0.0> |
| [LL Alarm Threshold] | With this entity you can set the Low Low temperature alarm threshold. When exceeded, a temperature alarm occurs. | default = <0.0> |

| Entity | Description | Value range |
|--------|-------------|-------------|
| [Alarm Hysteresis] | With this entity you can set the hysteresis around the alarm levels. This hysteris is used to avoid alarm ON/OFF-toggling situations at an alarm level.<br><br>• A High (High) alarm occurs when the value becomes higher then [HH/H Alarm Threshold].<br><br>• A Low (Low) alarm occurs when the value becomes lower then [LL/L Alarm Threshold].<br><br>• So a High (High) alarm disappears when the value becomes lower then [HH/H Alarm Threshold] - [Alarm Hysteresis], and<br><br>• a Low (Low) alarm disappears when the value becomes higher then [L/LL Alarm Threshold] + [Alarm Hysteresis]. | default = <0.0> |

### 5.11.4.1.4  OPT AI DC

The Analog Input (AI) is only used for PV measurements, that is pressure and temperature (non-MID-compliant).

| Entity | Description | Value range |
|--------|-------------|-------------|
| [PV value @20 mA] | With this entity you can enter the Primary Variable value equivalent to 20 mA.<br><br>For real PV determination, lineair interpolation is used between [PV value @4 mA] and [PV value @20 mA]. | default = <100.0> |
| [PV value @4 mA] | With this entity you can enter the Primary Variable value equivalent to 4 mA.<br><br>For real PV determination, lineair interpolation is used between [PV value @4 mA] and [PV value @20 mA]. | default = <0.0> |
| [AI threshold] | With this entity the digital mode of the analog input can be defined. That is, the definition of the logic "0" and logic "1" can be defined. | default = 12 |

| Entity | Description | Value range |
|---|---|---|
| [AI logic state] | With this entity you can determine how the blend controller uses the analog input in "digital mode".<br><br>• <Positive>: 0 or inactive from 4-[AI threshold] mA and 1 or active from [AI threshold] to 20 mA.<br><br>• <Negative>: 1 or active from 4-[AI threshold] mA and 0 or inactive from [AI threshold] to 20 mA. | <Positive> (default)<br><br><Negative> |
| [AI serial #] | With this entity you can enter the serial number of the connected 4-20 mA pressure sensor. | |
| [HH Alarm Threshold] | With this entity you can enter the High High temperature alarm threshold.<br><br>When exceeded, a temperature alarm occurs. | default = <0.0> |
| [H Alarm Threshold] | With this entity you can enter the High temperature alarm threshold. When exceeded, a temperature alarm occurs. | default = <0.0> |
| [L Alarm Threshold] | With this entity you can enter the Low temperature alarm threshold. When exceeded, a temperature alarm occurs. | default = <0.0> |
| [LL Alarm Threshold] | With this entity you can enter the Low Low temperature alarm threshold.<br><br>When exceeded, a temperature alarm occurs. | default = <0.0> |

| Entity | Description | Value range |
|---|---|---|
| [Alarm Hysteresis] | With this entity you can enter the hysteresis around the alarm levels. This hysteris is used to avoid alarm ON/OFF-toggling situations at an alarm level.<br><br>• A High (High) alarm occurs when the value becomes higher then [HH/H Alarm Threshold].<br><br>• A Low (Low) alarm occurs when the value becomes lower then [LL/L Alarm Threshold].<br><br>• So a High (High) alarm disappears when the value becomes lower then [HH/H Alarm Threshold] - [Alarm Hysteresis], and<br><br>• a Low (Low) alarm disappears when the value becomes higher then [L/LL Alarm Threshold] + [Alarm Hysteresis]. | default = <0.0> |

NOTE:  When this binding is selected for the pacing source or the temperature source, it acts in 4-20 mA mode. For all the other selections, it acts in digital mode.

## 5.11.4.2  Outputs

### 5.11.4.2.1  (OPT) DO EMR

Each individual relay can be set to be energized or de-energized during operation, by setting the [Relay mode] entity to <Energized> (default setting) or <De-energized> respectively.

If the [Relay mode] entity is set to <Energized>, the relay coil is energized when the relay state is <Deactivated>, and the relay coil is de-energized when the relay state is <Activated>.

If the [Relay mode] entity is set to <De-Energized>, the relay coil is de- energized when the relay state is <Deactivated>, and the relay coil is energized when the relay state is <Activated>.

The <Energized> option is used for fail-safe operation whereas the <De-Energized> option is used for non-fail-safe operation.

> Set each individual relay to the required configuration, by selecting the proper entities. See also next overview (fail-safe configuration is colored).

| Physically Configured | Relay mode | Relay State | Physical Result |
|---|---|---|---|
| Normally Open (N.O.) | De-Energized | Activated | Closed |
| | | Deactivated | Open |
| | Energized | Activated | Open |
| | | Deactivated | Closed |
| Normally Closed (N.C.) | De-Energized | Activated | Open |
| | | Deactivated | Closed |
| | Energized | Activated | Closed |
| | | Deactivated | Open |

### 5.11.4.2.2  OPT AO DC

- This functionality requires a CAN-OPTION-SSC board.

- The value of the 4-20 mA analog output follows one of several process variables.

    In addition, the SSC-B also supports the mapping of internal primary values to an analog output (4-20 mA). For example,

    - The actual (running) additive volume per stream.

    - The temperature per stream.

    - The flow per stream.

- To enable this functionality, the following settings must be set in the I/O setting menu for the Analog Output function:

    - The [Upper boundary] entity should be set to the maximum process variable value (in default units) to be associated with a 20 mA output.

    - The [Lower boundary] entity should be set to the process variable value (in default units) to be associated with a 4 mA output.

    - The operational mode should be set to <Follow PV>.

| Entity | Description | Value range |
|---|---|---|
| [Operational mode] | With this entity you can select between 2 modes for the analog output. | • <Explicitly Driven> (default) --> the output value is set by the application<br><br>• <Follow PV> --> the output reflects one of the Primary Values measured by the SSC) |
| [PV address] | With this entity you can select the process variable to be mapped on the analog output (4-20 mA). | <None> (default)<br><br><Blend volume> L<br><br><Blend flow rate> L/min<br><br><Wild flow rate> L/min<br><br><Blend percentage> %<br><br><Instan. temp.> °C<br><br><Average temp.> °C<br><br><Instan. pressure> Pa<br><br><Average press.> Pa |
| [Lower boundary] | With this entity you can select the PV value at 4 mA.<br><br>For the actual current value lineair interpolation is used between [Lower boundary] and [Upper boundary]. | default = <0.0><br><br>For units, see Value range of [PV address] |
| [Upper boundary] | With this entity you can select the PV value at 20 mA.<br><br>For the actual current value lineair interpolation is used between [Lower boundary] and [Upper boundary]. | default = <0.0>L<br><br>For units, see Value range of [PV address] |

## 5.11.4.3  Communication

### 5.11.4.3.1  IR COMMS

| Entity | Description | Value range |
|---|---|---|
| [IR access] | With this entity you can enable the IR interface if it was turned off. | <IR enabled> (default)<br><br><IR disabled><br><br>NOTE: IR communication cannot be disabled from IR remote control device when LAD is not attached to the device. |
| [Long IR access] * | Disabling this entity (default) uses the short login sequence of pressing only the [ATTN] key.<br><br>Enabling this entity makes the controller require the long login sequence of four buttons being pressed. Use [ATTN], [F1], [F2], [F3]. | <Long IR enabled><br><br><Long IR disabled> (default) |

* In a few installations of controllers, it has been reported that sunlight or strong artificial light sources can "unlock" the infrared port the same way as pressing the ATTN key on the Fusion4 IR Controller. If this occurs, parameter values could accidentally be changed. It should be noted that this is an EXTREMELY rare possibility, but could happen.

The Long Infrared access parameter enables or disables an extended login sequence of characters for the infrared communications port on the bezel of the SSC. Using an extended login character sequence raises the odds of a random pattern of interference matching the correct login sequence to astronomical levels.

### 5.11.4.3.2  (OPT) COMMS

#### 5.11.4.3.2.1  Introduction

Full control of and full access to all setup entities can be realized by using a hard-wired, serial EIA RS-485 communications port, which is connected to a master system through a data communications line.

This master system can be a PC service program, a load computer, a SCADA system, DCS, or any other type of Terminal Automation System.

The SSC-B includes several different communications protocols. These include FlexConn, FMC Smith AccuLoad, Brooks PetroCount, and Modbus RTU ASCII.

The SSC-B supports 2 serial communication ports.

- The CAN-ADD-BLEND board houses a 2-wire or 4-wire isolated RS-485 communication port.

- The CAN-OPTION-SSC board houses a 2-wire isolated RS-485 communication port.

The communication settings for all of the protocols are as follows:

- RS-485 Multi-drop, poll and reply, slave only.

- 2-wire or 4-wire, (physical switch on the board)

- 32 blenders total on one drop.

- Data rates: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200,

- and 128000 baud.

- Data bits: 8

- Parity: none

- Stop bits: 1

Alarms are reported through the protocols of the RS-485 communications interface. Alarms may also be cleared using the RS-485 communications interface.

> CAUTION:  It is strongly recommended to only transmit configu- ration data, from remote network systems such as TAS, between blend transactions when the device is idle, as any changes sent has immediate effect.

### 5.11.4.3.2.2  FlexConn Instrument Address

The entity [FlexConn instrument address] selects the instrument address for the FlexConn protocol.

### 5.11.4.3.2.3  Communication Protocol

The entity [Communication protocol] selects the protocol that is used for communications through the serial port.

Setting values are:

- AccuLoad

- Brooks PetroCount

- Modbus RTU ASCII

- AccuLoad Comms Mini-Pak emulation

- FlexConn Protocol (= default setting)

Refer to the Communications Manual for complete details regarding your specific protocol.

### 5.11.4.3.2.4  Baudrate

The entity [Baudrate] selects the serial port baudrate used for communications. Possible setting values are:

- Baudrate1200

- Baudrate 2400

- Baudrate 4800

- Baudrate 9600

- Baudrate 19200

- Baudrate 38400

- Baudrate 57600

- Baudrate 115200

- Baudrate 128000

#### 5.11.4.3.2.5  Datastream Maximum Gap Time

The entity [Datastream max gap time] selects the time out between characters in one single record.

#### 5.11.4.3.2.6  Turn-around Delay

The entity [Turn around delay] selects the time between the received request from the master system and the moment the answer is returned.

#### 5.11.4.3.2.7  Broadcast Address

The entity [Broadcast address] selects the secondary communications address, recognized by the SSC-B. It is not necessarily unique to any particular unit. This address is used by the master system if it wants to transmit a command to more than one unit simultaneously. All SSC-B units on the system respond to broadcast messages. The SSC-B act on a message addressed to its own broadcast address, but does not acknowledge it. This permits many units to be controlled by the master system with only a single command sent. A typical use for this is setting the date or time.

Examples:

- To assign the SSC-B a Broadcast Address of 999 enter: 999

- To assign the SSC-B a Broadcast Address of 000 enter: 000

#### 5.11.4.3.2.8  Unit Address

The entity [Unit address] selects the primary communications address of the SSC-B. The primary address is the value used to identify a particular unit to the master system. This 3-digit number must be unique to each unit on a communication loop.

Examples:

- To assign the SSC-B an Address of 10, enter: 010

- To assign the SSC-B an Address of 252, enter: 252

#### 5.11.4.3.2.9  Protocols

AccuLoad

The AccuLoad protocol is closely related to the protocol defined by Guidant for use with the AccuLoad Electronic Preset.

In AccuLoad protocol, there are 2 different message formats, depending on whether the message originated from the master system or from a controller.

### Brooks PetroCount

The Brooks PetroCount protocol is provided to allow you with Brooks Instrument's PetroCount IMS Presets to easily communicate with the controller.

Existing software communications drivers used to communicate with the Brooks units can be used to communicate with the controller. All that needs to be taken into account is the entity code table for the controller.

In the Brooks PetroCount protocol, the message format is the same, regardless of whether the transmission originated from the master system or from the controller.

### Modbus RTU ASCII

The Modbus RTU ASCII protocol is a modified subset of Modicon Inc.'s Modbus RTU Protocol. While the protocol supports a large number of commands, only 3 are supported in microprocessor-based control devices. These commands adhere to the message framing defined by Modbus, but are not necessarily used for the same purpose. For example, function code <06h> is defined by Modbus to 'Preset a Single Register'. The microprocessor devices use this function code to 'Execute a Task'. The key to implementation of this protocol is that it allows the slave devices to communicate over a communications bus that uses Modbus without interfering with other devices on the bus.

### AccuLoad Comms Mini-Pak emulation

The AccuLoad Comms Mini-Pak emulation Protocol implements Comms Mini-Pak emulation together with the AccuLoad protocol. It is used for the SSC-B only.

### FlexConn Protocol

The FlexConn protocol is used to communicate with the Fusion4 Portal PC program.

The Fusion4 Portal covers a broad range of functions:

- BoL printing and viewing

- Commissioning and diagnosing of controllers

- OPC interfacing

- Monitoring of field devices for the control room

## Communication Wiring

The SSC-B uses the EIA-485 standard for communications. A converter is required to enable communications with peripheral devices such as modems or personal computers that use the EIA-232 interface standard.

Guidant can provide an EIA-485 to EIA-232 converter if your application requires one.

Communications through a modem requires a modem to be installed at each end of the communications link, and an appropriate converter (if required). The modem must be programmed to auto answer, and the cabling must be designed to provide auto-answer capabilities on the terminal end.

Although often overlooked, proper system wiring is critical to the reliable operation of serial communication interfaces. Improper wiring can cause high data-error rates and reduce data throughput.

Although exact wiring requirements vary depending on the type of interface used, each of the following is important to the overall success of a communications system:

- Cable lengths and types

- Shielding

- Twisted Pair Wiring

RS-485 interfaces are typically used in multi-drop configurations. The system wiring can become very complex. When installing a 2-wire cable for use with the SSC-B, receive and transmit share the same conductor pair. The wires must be a twisted pair.

Wiring for RS-485 must be designed as a Daisy chain. Cable stubs are permitted so long as they are 4.5 m (15 feet) or less in length.

Conductor pairs must be terminated with a 100 ohm resistor at the most distant end, to ensure proper line impedance for maximum signal reception.

Using the recommended cable (Belden Cable 9841 for 2-wire), an RS-485 interface may support multiple devices (stations) over a maximum wire length of 1200 m (3600 feet)

| Entity | Description | Value range |
|---|---|---|
| [FlexConn instrument addr.] | With this entity you can enter the device address for the FlexConn protocol. | <0> ... <1900> <br> (default = <0>) |
| [Communication protocol] | With this entity you can select the protocol for the communication port. | <FlexConn> (default) <br> <AccuLoad> <br> <Brooks> <br> <Modbus RTU> <br> <Modbus legacy> <br> <Minipak emul.> |

| Entity | Description | Value range |
|---|---|---|
| [Baudrate] | With this entity you can select baudrate for the communication port. | <Baudrate 1200><br><br><Baudrate 2400><br><br><Baudrate 4800><br><br><Baudrate 9600> (default)<br><br><Baudrate 19200><br><br><Baudrate 38400><br><br><Baudrate 57600><br><br><Baudrate 115200><br><br><Baudrate 128000> |
| [Parity] | With this entity you can select the parity type. | <Odd><br><br><Even><br><br><None> (default) |
| [Stop bits] | With this entity you can select the number of stop bits to be used with each byte. | <One> (default)<br><br><Two> |

| Entity | Description | Value range |
|---|---|---|
| [Datastream max gap time] | With this entity you can enter the time- out between characters in one single record (ms). | <0> ms … <10000> ms<br><br>(default = <1000> ms) |
| [Turn around delay] | With this entity you can enter the time between the received request from the master and the moment the answer is sent (ms). | <0> ms … <1000> ms<br><br>(default = <100> ms) |
| [Broadcast address] | With this entity you can enter the secondary address recognized by the SSC. It is not necessarily unique to any particular unit. This address is used by the master if it wants to transmit a command to more than one unit, simultaneously. The SSC does not respond to a message addressed to its broadcast address. | default = <998> |
| [Unit address] | With this entity you can enter the primary address of the SSC. The primary address is the value used to identify a particular unit to the master computer. This 3-digit number must be unique to each unit on a communication loop. | default = <123> |
| [Modbus byte order] | With this entity you can select the byte representation of the information retrieved by the modbus protocol:<br><br>• Little endian: the LSB is sent first<br><br>• Big endian: the MSB is sent first | <Little endian> (default)<br><br><Big endian> |

# 5.11.5  Control Settings

## 5.11.5.1  Blend Control

| Entity | Description | Value range |
|---|---|---|
| [K-factor] | With this entity you can enter the K- factor of the blend flow meter supplied by the vendor, in pulses per [Units of volume]. | The K-factor must be the number of pulses per litre (gallon), regardless of the configured unit of volume selection. (default = <750.000>) |
| [Permissive condition] | With this entity you can select the logical relation between the permissive and system interlock functions.<br><br>NOTE:  The entity [Permissive condition] is only relevant when the System Interlock I/O binding is configured other then <None>. | • <AND> (default) (Both signals should be available to permit the device)<br><br>• <OR> (One of those signals should be available to permit the device) |
| [Blend point] | With this entity you can select the insertion point of the physical blend piping. | • <Upstream> = before wild custody transfer meterstream<br><br>• <Downstream> (default) = after wild stream custody transfer meter |

| Entity | Description | Value range |
|---|---|---|
| [Pump run timeout] | With this entity you can enter the time in minutes between stopping the blend stream flow and closing the pump. | <1> min ... <255> minutes<br><br>(default = <10> min) |
| [Hydr. Pump run timeout] | With this entity you can enter the time in minutes between stopping the blend stream flow and closing the hydraulic pump. | <1> min... <255> minutes<br><br>(default = <10> min) |
| [Pulse timeout] | With this entity you can determine how long in seconds the SSC-B is active after the blend stream pulses stop and the permissive is removed. Once the permissive is removed, the SSC-B does not report a control failure alarm. After the permissive is removed, the SSC-B closes the DCV immediately. The remaining blend stream volume during the Pulse Timeout period is used to determine the final blend percentage. | <1> s ... <90> s<br><br>(default = <2> s) |
| [Makeup period] | With this entity you can configure the maximum period in seconds that the SSC-B switches to make-up mode after the permissive is removed. Normally, flow through the SSC-B is stopped prior to removal of the permissive signal. As long as the make-up period lasts, the SSC-B tries to maintain the blend ratio. The make-up mode is stopped after the wild stream is stopped and the blend ratio is equal or bigger than the target ratio, or if the make up period is elapsed. | <1> s ... <30> s<br><br>(default = <10> s) |

| Entity | Description | Value range |
|---|---|---|
| [Factored pulse out 1, 2] | With this entity you can select the amount of pulses for each unit of blend volume. | <1> Pulse/Unit (default)<br><br><10> Pulses/Unit<br><br><100> Pulses/Unit<br><br><1000> Pulses/Unit |

## 5.11.5.2 Wild Stream

| Entity | Description | Value range |
|---|---|---|
| [K-factor] | With this entity you can enter the K- factor of the wild stream. Used by the SSC to determine the volume from the wild stream or product flow meter. This K-factor must be the number of pulses per litre (gallon), regardless of the configured unit of volume selected. | Meter pulses per unit volume of product<br><br>Example: One input pulse from product meter = 2 litres --> Enter: 0000.500<br><br>NOTE:  Note: To determine the [K-factor] for any other value, divide 1 by the flow meter pulse output.<br><br>(default = <100>) |
| [Meter factor] | With this entity you can enter the K- factor correction of the wild stream in case the wild stream flow is measured by a real flow meter. The meter factor is determined during the calibration of the wild stream flow meter. | default = <1.00000> |

| Entity | Description | Value range |
|---|---|---|
| [Pulse timeout] | With this entity you can configure how long the SSC-B in seconds delays after the removal of permissive and the absence of wild stream flow before determining final transaction totals. | <1> s ... <90> s<br><br>(default = <5> s) |

### 5.11.5.3 Calibration

| Entity | Description | Value range |
|---|---|---|
| [High flow rate] | With this entity you can enter the maximum flow rate that is allowed through the blend stream. The flow rate is determined on a per minute basis. This entity is only applicable when doing a calibration of the blend stream flow meter. | <1> L/min ... <9999> L/min<br><br>(default = <60.00> L/min) |
| [Low flow rate] | With this entity you can enter the minimum flow rate that is allowed through the blend stream. The flow rate is determined on a per minute basis. This entity is only applicable when doing a calibration of the blend stream flow meter. | <1> L/min ... <100> L/min<br><br>(default = <15.00> L/min) |

| Entity | Description | Value range |
|---|---|---|
| [Inner control window] | With this entity you can determine when the DCV is pulsed open or closed. If the flow rate is determined to be less than the value set by the inner control window, the control valve remains locked at the current flow rate. If the flow rate is determined to be outside the value set by the Inner Control Window, the SSC-B signals the DCV to either open or close, depending if the deviation volume is positive or negative. The maximum value for the [Inner control window] must not be greater than the [Outer control window]. This entity is only applicable when doing a calibration of the blend stream flow meter. | <1> L ... <9999> L (default = <10> L) |
| [Outer control window] | With this entity you can determine when the DCV is continuously signaled to open or close. If the flow rate is determined to be less than the value set by outer control window, the DCV remains under control of [Inner control window]. If the flow rate is determined to be outside the value set by the [Outer control window], the SSC-B signals the DCV to either open or close by holding the proper solenoid continuously open or closed, depending if the deviation volume is positive or negative. The maximum value for the [Outer control window] must be greater than the [Inner control window]. This entity is only applicable when doing a calibration of the blend stream flow meter. | <1> L ... <9999> L (default = <25> L) |
| [Low flow volume] | With this entity you can enter the amount of volume that is delivered at the low flow rate during the calibration procedure before the SSC-B begins the transition to the high flow rate. This entity is only applicable when doing a calibration of the blend stream flow meter. | <1> L ... <9999> L (default = <25.00> L) |

| Entity | Description | Value range |
|---|---|---|
| [End flow volume] | With this entity you can enter the amount of volume before the end of delivery of the calibration procedure when the SSC-B transitions from the high flow rate to the low flow rate. This entity is only applicable when doing a calibration of the blend stream flow meter. | <1> L ... <9999> L (default = <25.00> L) |
| [Final shutdown volume] | With this entity you can determine the amount of volume before the end of delivery, when the SSC-B signals the DCV to close. Normally used when using slow valves to prevent "over" flow at the end of the calibration process. This entity is only applicable when doing a calibration of the blend stream flow meter. | <0> L ... <9999> L (default = <20.00> L) |
| [Flow calc. smoothing val.] | With this entity you can enter how many successive samples are averaged before calculating an actual deviation volume. This entity eliminates incremental dips and spikes in the deviation volume calculation. This entity is only applicable when doing a calibration of the blend stream flow meter. | <1> ... <99> (default = <10>) |

### 5.11.5.4  Window Control

For measuring the flow of the wild stream, the SSC-B uses dual-pulse input or quadrature input (90° signal shift). By having this input the SSC-B provides pulse input integrity checking which is required for custody transfer and therefore for MID compliance.

The pulse security is governed by standards, ISO 6551 in particular. ISO 6551 implies different levels of pulse security with the most common acceptable in the industry being ISO 6551 Level B pulse security. The pulse integrity checking flags alarms on:

- Dual (A/B) pulse trains not having phase shift, that is, matching signals (to reflect possibility of short circuit);

- Missing or extra pulses on A and/or B (to reflect possibility of broken wire or unstable connection).

A series of control windows must be set up in the entity settings. Each control window value establishes the outer limit in deviation volume for that window. When the deviation volume is inside that window, the controller reacts in a specific way when controlling the blend stream control valve. The deviation volume falling in a specific control window changes the active and rest solenoid dwell values used.

### 5.11.5.4.1  Dead Band Control Window Limit

The Dead Band Control Window Limit configures the allowed volume deviation from target blend volume. When the observed blend volume is less than "Dead band Control Window Limit", the control output from the controller is locked. No correction is made to the blend stream control valve. This value effectively establishes the "dead band" in which the blend stream volume can deviate without correction. The dead band is plus or minus this value.

### 5.11.5.4.2  Inner Control Window Limit

The "Inner Control Window Limit" volume should be greater than the "Dead band Control Window Limit" and less than "Middle Control Window Limit". When deviation volume is greater than the "Dead Band Control Window Limit" and less than The "Inner Control Window Limit" volume, the controller uses one-half the "active dwell" configuration setting and double the "rest dwell" configuration settings for controlling the blend stream control valve.

### 5.11.5.4.3  Middle Control Window Limit

The "Middle Control Window Limit" volume should be greater than "Inner Control Window Limit" and less than "Outer Control Window Limit". When the deviation volume is greater than the "Inner Control Window Limit" and less than the "Middle Control Window Limit", the controller uses the "active dwell" value and the "rest dwell" configuration settings for controlling the blend stream control valve.
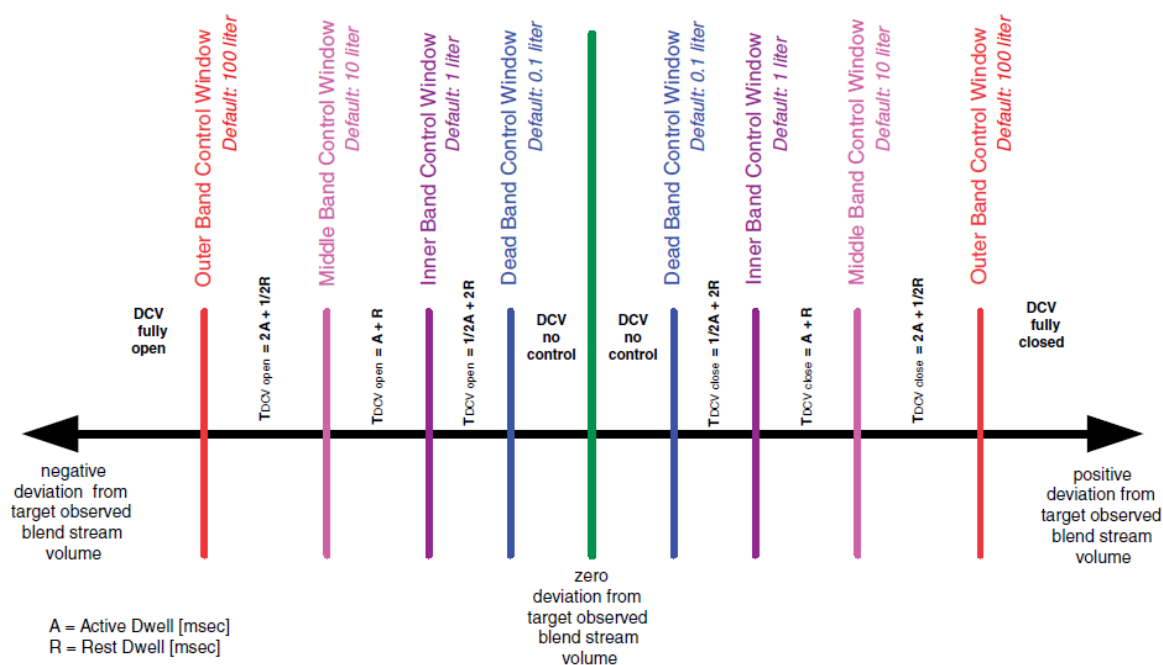
### 5.11.5.4.4  Outer Control Window Limit

The "Outer Control Window Limit" volume should be greater than "Middle Control Window Limit". When the deviation volume is greater than "Middle Control Window Limit" value and less than "Outer Control Window Limit", the controller uses double

the "active dwell" value and one-half the "rest dwell" configuration settings for controlling the blend stream control valve.

> NOTE:  During operation a real-time Deviation Graph can be viewed in the Diagnostics menu (5.15). This graph illustrates the setting of each control window and traces the real-time control of the blend ratio in them. This is a useful tool for observing the effectiveness of control window settings.

Figure 5-9: Visualization of the control windows



| Entity | Description | Value range |
|---|---|---|
| [Dead band window] | With this entity you can configure the allowed volume deviation from the target blend volume. When the observed blend volume is less than [Dead band window] limit, the control output from the controller is locked. No correction is made to the blend stream control valve. This value effectively establishes the "dead band" in which the blend stream volume can deviate without correction. The dead band is plus or minus this value. | <0.01> L … <10000> L (default = <0.1> L) |

| Entity | Description | Value range |
|---|---|---|
| [Inner control window] | With this entity you can configure the allowed volume deviation from target blend volume.<br><br>The [Inner control window] limit volume should be greater than the [Dead band window] limit and less than [Middle control window] limit. When deviation volume is greater than the [Dead band window] limit and less than The [Inner control window] limit volume, the controller uses one-half the [Active dwell] configuration setting and double the [Rest dwell] configuration settings for controlling the blend stream control valve. | <0.01> L ... <10000> L<br><br>(default = <1.00> L) |
| [Middle control window] | With this entity you can configure the allowed volume deviation from target blend volume.<br><br>The [Middle control window] limit volume should be greater than the [Inner control window] limit and less than [Outer control window] limit.<br><br>When the deviation volume is greater than the [Inner control window] limit and less than the [Middle control window] limit, the controller uses the [Active dwell] value and the [Rest dwell] configuration settings for controlling the blend stream control valve. | <0.01> L ... <10000> L<br><br>(default = <10.00> L) |
| [Outer control window] | With this entity you can configure the allowed volume deviation from target blend volume.<br><br>The [Outer control window] limit volume should be greater than [Middle control window] limit. When the deviation volume is greater than the [Middle control window] limit value and less than [Outer control window] limit, the controller uses double the [Active dwell] value and one-half the [Rest dwell] configuration settings for controlling the blend stream control valve. | <0.01> L ... <10000> L<br><br>(default = <100.00> L) |

| Entity | Description | Value range |
|---|---|---|
| [Dev. count smoothing val.] | With this entity you can enter how many successive samples are averaged before calculating an actual deviation volume. This entity eliminates incremental dips and spikes in the deviation volume calculation. | <1> ... <99> (default = <10>) |
| [Deviation count reset] | With this entity you can configure if the deviation count is reset at the start of a new transaction.<br><br>No-reset = The deviation volume is never reset to 0.<br><br>Reset deviation = Every transaction resets the deviation volume to 0. | <No Reset> <Reset Deviation> (default) |

## 5.11.5.5  DCV Control

### 5.11.5.5.1  Digital Control Valves

- A digital control valve (DCV) is an electrically-actuated, hydraulically- operated control valve.

- In any operation mode, the solenoids is controlled for an accurate control of the blending DCV.

The SSC-B utilize two different types of control valves depending upon the application. Some blenders use a globe or plug valve in which the product line pressure is used to modulate the valve open and closed. The control valve is operated by cycling product pressure to and from the control chamber on top of the valve. See FIGURE 5-11.

Other blenders utilize a hydraulic power-pak pump and reservoir for valve actuation power. This method is typically used on V-port ball valves. The valve is controlled by cycling hydraulic fluid to and from the actuator on the valve.

### 5.11.5.5.2  Solenoid Valves

To manage the flow of the actuation fluid to the control valve, electrically operated 2-way solenoid valves are used. Two valves are required; a normally open (N.O.) solenoid controls the closing of the control valve; a normally closed (N.C.) solenoid

controls the opening of the control valve. When the N.O. solenoid is pulsed, the control valve is closing. When the N.C. solenoid is pulsed, the control valve is opening. This statement is true for both product actuated valves and hydraulic fluid actuated valves. This method of using both N.O. and N.C. valves offers a fail-safe operation, in that upon power failure the solenoid valves de- energize and the control valve goes closed.

### 5.11.5.5.3  Solenoid Positions

The position of the N.O. and N.C. solenoids on the control valve are different for product-actuated valves and hydraulic fluid-actuated valves. Globe and plug style valves have the N.O. solenoid on the upstream leg of the control loop and the N.C. solenoid on the downstream leg. Hydraulic actuated control valves have the N.C. solenoid between the high pressure line from the power-pak and the actuator. The N.O. solenoid is in the return line to power-pak reservoir.

This is mentioned for reference only and does not vary the operation or electrical connections.

Figure 5-10: Blend stream control principle
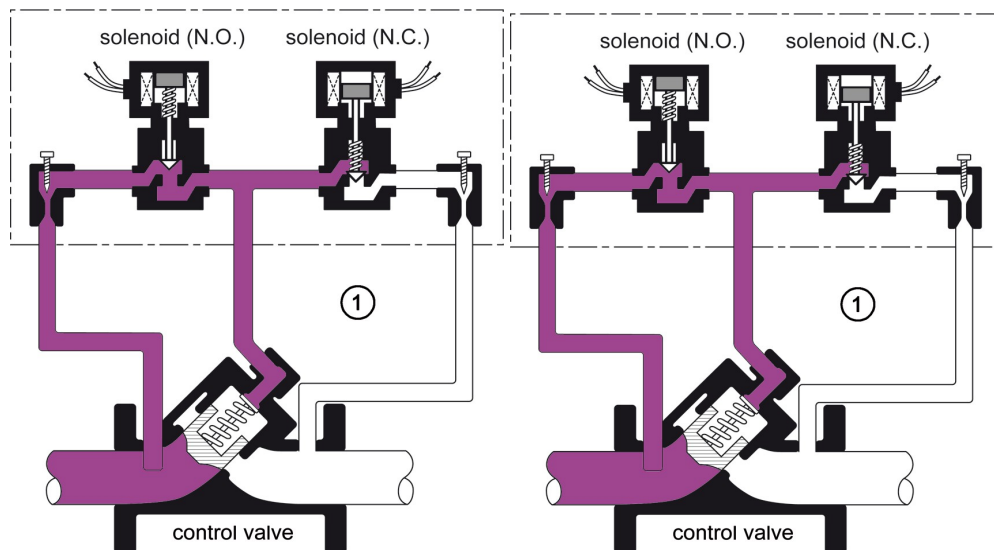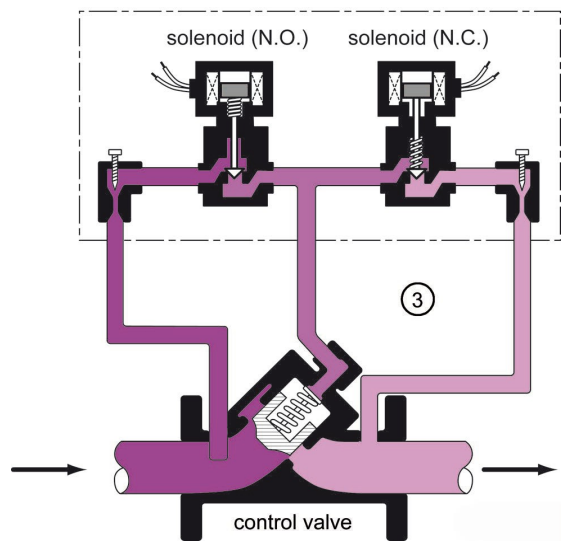
| Control valve state | solenoid N.O. (output 1) | solenoid N.C. (output 2) | See figure... |
|---|---|---|---|
| Closed | OFF | OFF | 1 |
| Fast opening | ON | ON | 2 |
| Slow opening | ON | PULSE | |
| Locked in position | ON | OFF | 3 |
| Slow closing | PULSE | OFF | |
| Fast closing | OFF | OFF | |

### 5.11.5.5.4  Signal Description

The SSC-B is capable of driving the normally open (N.O.) solenoid and the normally closed (N.C.) solenoid.

### 5.11.5.5.5  Control Valve States

There are 6 "states" that the blend stream control valve can be at. See the above table.

### 5.11.5.5.6  Solenoid Dwell

The SSC-B output circuit can energize the solenoids in two different ways. The output can be turned on and held on continuously, or it can be cycled ON-OFF-ON-OFF. This cycling or pulsing of the output is called "dwell". The time period that the solenoid allows flow through it is called active dwell and is part of the configuration of the device.

Because the normally open solenoid allows flow through it when de- energized and the normally closed solenoid allows flow through it when energized, the SSC-B treats active dwell and rest dwell differently. This difference is depicted in the following figure.

Figure 5-11: Solenoid active/rest dwell cycles
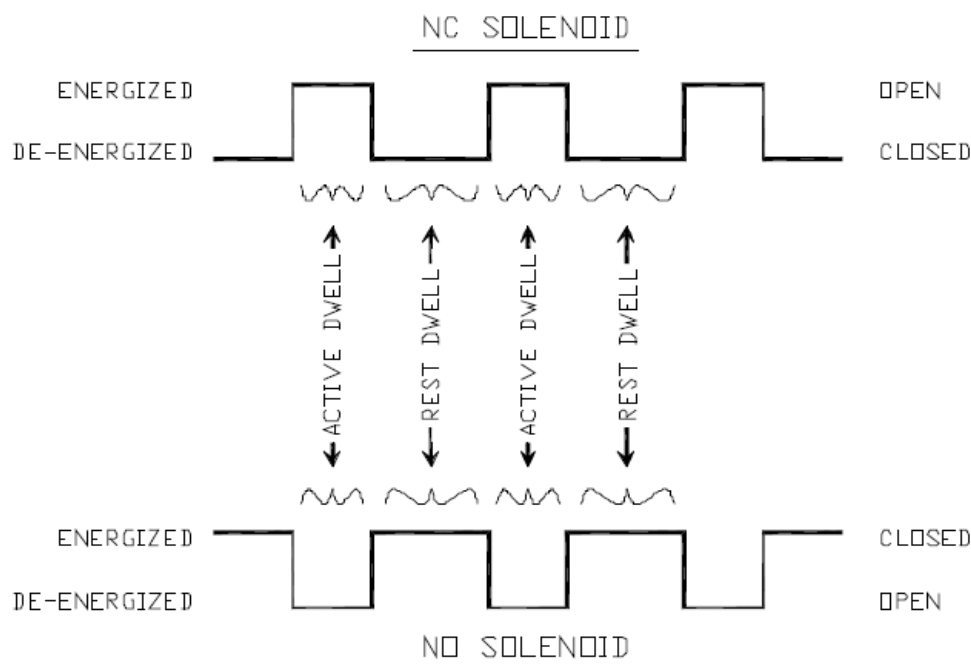


### 5.11.5.5.7  Blend Flow Pulses

The SSC-B is a batch blender. It requires a permissive signal at the beginning of the batch, to zero the delivery totals for the batch and (optionally) resets the deviation count. When permissive is removed at the end of the batch, a blend percentage is calculated for the delivered volumes and compared to the target percentage for the purpose of alarm generation.

The deviation volume is a positive or negative value that represents the error between the actual blend stream and wild stream volumes vs. a "perfect" blend. The deviation volume is in units of Gross Observed Volume. Negative values mean that the blend stream is running behind target. Positive values mean that the blend stream is ahead or too great.

Control valve action is based upon the magnitude and polarity of the error. Stated simply, if the value is negative, the blend control valve is opened. If the value is

positive, it is closed. If the value falls very near zero, the control valve is locked in its present position.

| Entity | Description | Value range |
|---|---|---|
| [Active dwell] | With this entity you can determine how long in milliseconds a solenoid is held in the state (energized or de-energized) that allow flow through it. In case of the normally-closed (N.C.) solenoid, it is the energized open state. In case of the normally-open (N.O.) solenoid, it is the de-energized open state. | <50> ms ... <1000> ms (default = <100> ms) |
| [Rest dwell] | With this entity you can determine how long in milliseconds a solenoid is held in the state (energized or de-energized) that stops flow through it. In the case of the normally-closed (N.C.) solenoid, it is the de-energized closed state. In the case of the normally-open (N.O.) solenoid, it is the energized closed state. | <50> ms ... <1000> ms (default = <100> ms) |

### 5.11.5.6  Clean Arm

The term Clean Arm (Clean Start) is used to indicate the technique of ending the fuel transaction with the loading arm free of contaminating additives, blend product, and so on. Thus the loading arm is "Clean" during the "Start" of the next transaction.

Blend chemical is typically injected upstream of the main product flow control valve and product flow meter. This is due to regulations by most states preventing injection of any fluids downstream of the custody transfer meter. The net result is that blend chemical may be trapped in the loading arm, piping, meter, and control valve. In some cases this can be a significant volume. The next truck compartment loaded from the arm receives these chemicals. In the case of detergent additives, the effects are minimal. But in the case of ethanol or biodiesel, this trail- back of chemical into the next compartment or truck is detrimental.

The solution to trail-back of blended products is to stop blending early enough in the delivery to allow all of the blend stream chemical to be flushed into the truck compartment by the main or wild stream flow. In this way the loading arm is clean for the next delivery.

Stopping the blend flow prior to the wild stream stopping at the end of the delivery requires that the blender know several pieces of information in advance:

- The blender must know the compartment volume being loaded. This is required to know how much blend stream volume is necessary to meet the recipe requirements.

- The blender must know how much pipe volume there is between the point of injection of the blend stream into the wild stream and the end of the loading arm coupling. This is the minimum volume that must be flushed at the end of the load to ensure all of the blend is in the truck.

- The blender also requires the target recipe or percentage of blend stream to the total volume delivered for the compartment.

Each of these pieces of information is needed prior to the start of the delivery. Although, the recipe may be fixed in many applications, it can vary from delivery to delivery. Compartment volumes certainly vary from truck to truck and even in the same truck. For this reason the SSC-B typically requires full communications control with the terminal automation system, in order to accurately perform Clean Start.

[Clean arm] is used to clean out the arm of any blend product, meaning the next transaction starts with no remaining blend product in the line.

The following entities are relevant:

- [Preset volume]: the volume of the load;

- [Flush volume]: the volume needed to clean the arm;

- [Pre-shutdown volume]: the volume flowing through the valve while closing.

In general there are two different ways to handle the clean arm functionality:

- Volume control: For the volume control there are three different options:

    - No pre shutdown: the clean-arm state is reached when the load volume >= (preset volume - clean start volume)

    - Fixed pre-shutdown: the clean-arm state is reached when the load volume >= (preset volume - clean start volume - pre shutdown volume). For slow valves, you can configure an additional volume to close the valve a little bit earlier to correct for the blend stream volume during the process of closing the valve.

    - Calculated pre shutdown: the clean arm state is reached when the load volume >= (preset volume - clean start volume – pre shutdown volume). The same as fixed pre-shutdown, only now, the system calculates the pre-shutdown volume at the end of every transaction to get a more precise shutdown volume. It can be seen as a correction factor for the valve closing time.

- Permissive control: The clean arm state is started as soon as the permissive is lost. After the permissive the system is measuring the wild stream volume from that point. At the end it should match the flush volume configured.

> NOTE:  Should be used only when Preset Load Volume (PLV) cannot be provided. In this option the PLV is not known thus the amount of blend product needed to makeup for the Flush Volume is blended at the beginning of the load. Therefore, when permissive signal is removed, the blender then expects the flush volume in to flow, bringing the blend percentage down to the target percentage.

| Entity | Description | Value range |
|---|---|---|
| [Preset volume] | With this entity you can store the volume of product to be loaded during the transaction. The blend percentage is adjusted according to the amount entered into Preset Volume in order to increase the amount of blend stream product going into the load prior to flushing the arm at the end of the delivery. This entity is only applicable if the [Flush volume] is non-zero. | <0> L … <999999> L  (default = <0.00> L) |

| Entity | Description | Value range |
|---|---|---|
| [Flush volume] | With this entity you can enter the amount of wild stream volume to realize the flushing by stopping the blending before the end of the transaction. The [Flush volume] is the amount of wild stream product that is to remain blend-product free in order to realize a clean arm when the flow stops. When [Flush volume] equals zero, the clean arm operation is disabled. | <0> L … <999> L (default = <0.00> L) |
| [Pre-shutdown control] | With this entity you can configure the mode of pre-shutdown control. This entity is only applicable if the [Clean start control] is configured for <Volume>.<br><br>• No pre-shutdown control = The SSC-B enters the clean arm operation when the measured volume is equal to the [Preset volume] minus the [Flush volume].<br><br>• Fixed pre-shutdown control = The SSC-B enters the clean arm operation when the measured volume is equal to the [Preset volume] minus the [Flush volume] and the [Pre-shutdown volume].<br><br>• Calculated pre-shutdown control = The SSC-B enters the clean arm operation when the measured volume is equal to the [Preset volume] minus the [Flush volume] and the [Pre-shutdown volume]. At the end of every transaction the [Pre- shutdown volume] is calculated to get a more precise number on when to stop blending. | <None> (default) <Fixed> <Calculated> |
| [Pre-shutdown volume] | With this entity you can configure the pre-shutdown volume used to correct the volume that is measured while closing the valve. | <0> L … <9999> L (default = <0.00> L) |

| Entity | Description | Value range |
|---|---|---|
| [Clean start control] | With this entity you can configure how the SSC-B knows when to stop blending while doing a clean arm operation.<br><br>• Permissive = The SSC-B stops blending when the permissive is removed. The SSC-B expects the [Flush volume] to flow to bring the blend percentage down to the target blend percentage.<br><br>• Volume = The SSC-B is monitoring the delivered volume and determine when to stop blending, regardless of the permissive signal. To enable this functionality the SSC-B needs to know the [Preset volume]. | <Permissive> (default)<br><br><Volume> |

### 5.11.5.7  Limiter

This functionality enables blend percent to be restricted within the configured value. It could be used in various applications, where we want to restrict blend ratio or percent to a configured value.

Ex: In case of butane blending, if the butane percent increases more than 15%, the product vaporization starts, which is a major safety concern. So by enabling this feature user can limit blend percent to some preconfigured value example 13%.

SSC -B uses clean arm mode to ensure that the last configured volume of batch is free from blend product. To compensate the quantity of SSC over blend, it increases the blend percentage until permissive is ON. To limit this sudden spike in blend percent this limiter functionality can be used.

Limiter functionality will never allow the current blend percent to exceed the maximum blend percent. In case, the current blend percent exceeds the configured value [Maximum Blend Percentage Allowed], a timer [Maximum Blend Percentage Time-out] will start and after timeout Blend percent Alarm will trigger.

NOTE:  To avoid the Blend percent alarm during the trans- action, the Wild stream flow rate, and the Blend stream flow should maintain a relationship mentioned below:

Blend stream flow rate)/ (Wild stream flow rate) * 100 <= Max Blend percentage value.

| Entity | Description | Value range |
|---|---|---|
| [Limiter] | To enable/disable butane blend algorithm in SSC. | (default = <Disable>) |
| [Maximum Blend Percentage Allowed] | By this entity user can set max hard limit blend percent that SSC could maintain during a transaction. | <1> %... <99> % (default = <15> %) |
| [Limiter Value] | If the blend percent is within this limit DCV control is hold back. [Limiter Value] is configured as [Maximum Blend Percentage Allowed]. Ex: If max blend percent is 15 and limiter value is 0.30. Then range would be from 14.70 to 15.0 | <0.10> %... <0.90> % (default = <0.20> %) |
| [Maximum Blend Percentage Time-out] | By this entity user can set a time for which current blend percent could remain more than Max Blend Percentage allowed without blend percent alarm. After timeout alarm, would be triggered. | <1> Secs... <240> Secs (default = <10> Secs) |

## 5.11.5.8  Continuous Blend

The continuous blend mode is available for applications where very large volumes of product are being continuously flowed. Unlike batch applications, where the product flows typically flow for several thousand litres or gallons before shutting down, continuous applications can flow for 10's or 100's of thousands of litres or gallons.

To maintain the accuracy of the blend during such large transactions, it is technically more effective to calculate the blend ratio against a smaller wildstream volume. Therefore, the continuous blend mode can be used to initiate [Continuous blend mode] and determine the pseudo batch size [Continuous blend window] that the blend ratio is calculated against. Thus if the [Continuous blend mode] is

enabled, and the [Continuous blend window] is set to 1000, the control algorithm controls the blend ratio against the last 1000 litres (gallons) only, while still maintaining the overall transaction totals.

| Entity | Description | Value range |
|---|---|---|
| [Continuous blend mode] | With this entity you can enable continuous blend mode when doing very long transactions.<br><br>• Enable = The SSC-B is used [Continuous blend window] to do blend control.<br><br>• Disable = The SSC-B is used to do the batch totals to do blend control. | <Enable><br><br><Disable> (default) |
| [Continuous blend window] | With this entity you can configure the window of volume over which the control is done.<br><br>Example: If you configure this entity for 500L the SSC-B controls over the last 500L only to maintain an accurate blend ratio. | <0> L … <10000> L<br><br>(default = <500.00> L) |

## 5.11.6  Recipes

- There are 5 recipes for blending, and their configuration entities exist of:

  - Recipe name

  - Blend ratio (%)

  - Product symbol

- The recipe definition can be changed between transactions.

| Entity | Description | Value range |
|---|---|---|
| [Recipe 1] | With this entity you can define the recipe name, blend ratio, and product symbol. This recipe is selected when using blend rate 1 permissive. | • Name = 20 characters<br><br>• Blend ratio = 0-100 % (default = <0.0>)<br><br>• Product symbol = API symbol |
| [Recipe 2] | With this entity you can define the recipe name, blend ratio, and product symbol. This recipe is selected when using blend rate 2 permissive. | see [Recipe 1] |
| [Recipe 3] | With this entity you can define the recipe name, blend ratio, and product symbol. This recipe is selected when using blend rate 3 permissive. | see [Recipe 1] |
| [Recipe 4] | With this entity you can define the recipe name, blend ratio, and product symbol. This recipe can only be selected by Comms. | see [Recipe 1] |
| [Recipe 5] | With this entity you can define the recipe name, blend ratio, and product symbol. This recipe can only be selected by Comms. | see [Recipe 1] |

## 5.11.7  Volume Conversion

### 5.11.7.1  Introduction

The SSC-B volume conversions are meant for the conversion of the measured Gross Observed Volume (GOV) to the Gross Standard Volume (GSV).

The Gross Standard Volume is defined at reference conditions for temperature and pressure, and for that reason it is suitable for high- accurate custody transfer of the blend stream product.

The SSC-B implements volume conversions for the following product groups or Commodity groups:

- A = Crude oil

- B = Refined products

- C = Special applications (thermal expansion factor needed)

- D = Lubricating oils

- E = NGL and LPG

- FAME = Fatty Acid Methyl Esters

The SSC-B implements several volume conversion standards:

| Standard | Volume correction table used | Commodity group |
|---|---|---|
| ASTM D 1250-04 | 5/6 | A |
| ASTM D 1250-04 | 5/6 | B |
| ASTM D 1250-04 | 5/6 | C |
| ASTM D 1250-04 | 5/6 | D |
| ASTM D 1250-04 | 23/24 | A |
| ASTM D 1250-04 | 23/24 | B |
| ASTM D 1250-04 | 23/24 | C |
| ASTM D 1250-04 | 23/24 | D |
| ASTM D 1250-04 | 53/54 | A |
| ASTM D 1250-04 | 53/54 | B |
| ASTM D 1250-04 | 53/54 | C |
| ASTM D 1250-04 | 53/54 | D |
| ASTM D 1250-04 | 59/60 | A |
| ASTM D 1250-04 | 59/60 | B |
| ASTM D 1250-04 | 59/60 | C |
| ASTM D 1250-04 | 59/60 | D |
| ASTM GPA TP-27 (2007) | 23/24 | E |
| ASTM GPA TP-27 (2007) | 53/54 | E |
| ASTM GPA TP-27 (2007) | 59/60 | E |
| EN 14214 (2008) | - | FAME |

The units of the (manually) measured data together with the desired base or reference temperature defines the table set to be used:
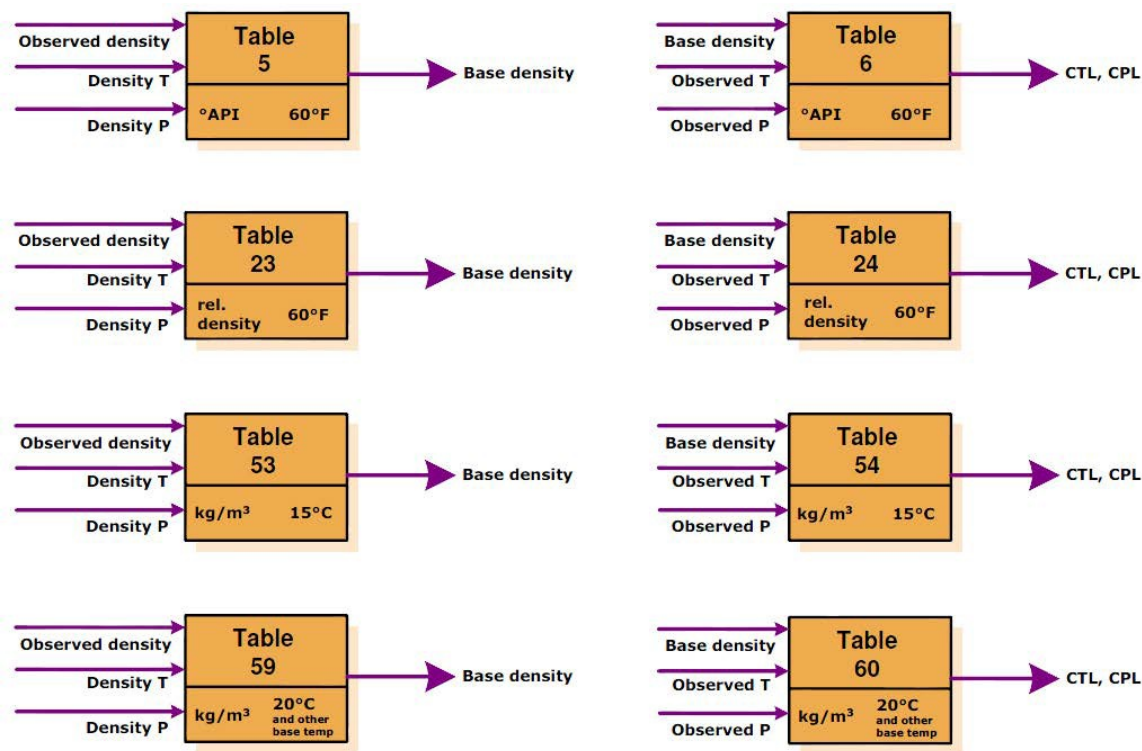


| Legends | |
|---------|---|
| T | Temperature |
| P | Pressure |
| CTL | Temperature correction factor |
| CPL | Pressure correction factor |

## 5.11.7.2 Commodity Groups Calculations Diagrams

### 5.11.7.2.1 Commodity Groups A, B, D (Crude Oil, Refined Products, Lubricating Oils)

Figure 5-12: VCF calculation for commodity groups A, B, and D
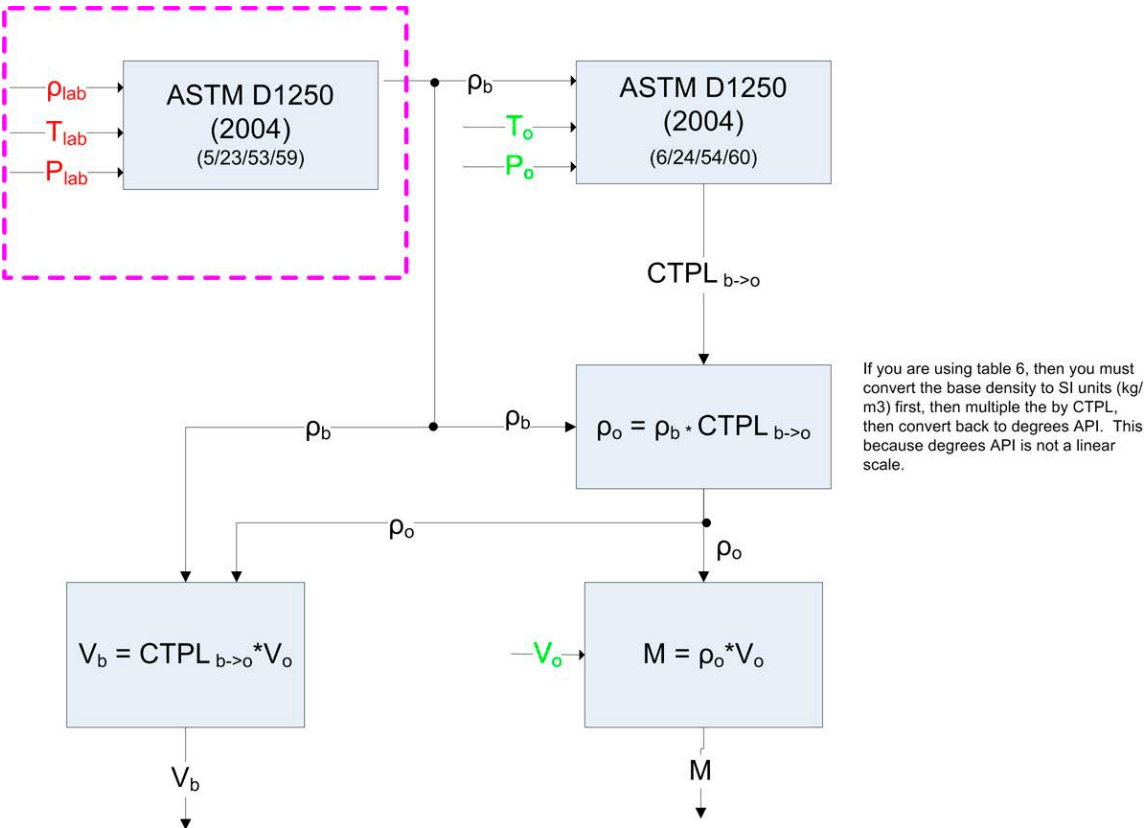
## 5.11.7.2.2  Commodity Group C (Special Applications)

Figure 5-13: VCF calculations for commodity group C



Volume Conversion with Manual Density Entry
(Commodity Group C)
[Temperature Only]

ASTM D1250
(2004)
(6/24/54/60)

$\alpha_{60}$
$T_{lab}$

The expansion factor is always saved in units 1/degrees C, but the library functions always assume this factor is in units of 1/ degrees F. Therefore you must convert valid before calling the library function.

N.B.:  This is not a normal temperature conversion!! This should not include the 32 degree bias.

$CTPL_{lab->b}$

$\rho_{lab}$
$\rho_b = \rho_{lab} / CTPL_{lab->b}$

If you are using table 6, then you must convert the lab density to SI units (kg/m3) first, then divide the by CTPL, then convert back to degrees API.

In all cases, the base density has to be rounded to the standard at the end.

$\rho_b$

$\rho_b$
$T_o$

ASTM D1250
(2004)
(6/24/54/60)

$CTPL_{b->o}$

$\rho_o = \rho_b * CTPL_{b->o}$

If you are using table 6, then you must convert the base density to SI units (kg/m3) first, then multiple the by CTPL, then convert back to degrees API.

In all cases, the base observed has to be rounded to the standard at the end.

$\rho_o$        $\rho_o$

$V_o$
$V_b = CTPL_{b->o} * V_o$

$V_o$
$M = \rho_o * V_o$

$V_b$        $M$

### 5.11.7.2.3  Commodity Group E (NLG & LPG)

Both temperature and pressure compensation are possible for commodity group E (NGL & LPG) by use of the MPMS 11.2.5 and MPMS 11.2.2 tables. Calculation of the CTL for commodity group E is straightforward using the GPA TP-27 tables. These tables are available for the standard reference temperatures (60F, 15C, 20C) and table 59E can be used to calculate a base density at a non-standard base temperature.

However, the calculation of the pressure conversion factor cannot be done directly through the use of the GPA-T27 tables. The MPMS chapter 11.2.2 and 11.2.5 must be used to calculate the equilibrium pressure and the compressibility of the fluid. Since MPMS 11.2.5 is only possible using non-meteric units, the base density must always be calculated for 60 F regardless of the selected reference temperature. This density at 60F is then used as an input to MPMS 11.2.5 to calculate the equilibrium pressure of the product at the observed temperature.

Sometimes the containment vessel for the product contains a means of altering the vapor pressure in the vessel to some value other than the equilibrium pressure (Pe) at the current temperature (To). The difference between the calculated equilibrium pressure at the observed temperature and the actual measured pressure (Po) in the vessel results in a pressure difference ($\Delta P$) that is then used calculate the compressibility factor (Fp) of the product at the observed conditions using MPMS 11.2.2. Finally the compressibility factor and the pressure differential between the observed pressure and the equilibrium vapor is used to calculate the CPL for blend product.

Volume conversion for commodity group E is only possible when the observed density, temperature, and pressure are in the range supported by the GPA TP-27 tables used to do the volume correction. The following table shows the valid range for these tables. Not all sets of observation values in these ranges result in a proper value. In some instances the observed are all in the bounds of the table but the calculations do not converge. This is expected behaviour for these tables.

| Value | GPA TP-27 23E | | GPA TP-27 53E | | GPA TP-27 59E | |
|---|---|---|---|---|---|---|
| | Normal | Ext. Range | Normal | Ext. Range | Normal | Ext. Range |
| $\rho_{min}$ | 0.21 [rel] | 0.21 [rel] | 209.7 [kg/m$^3$] | 209.7 [kg/m$^3$] | 209.7 [kg/m$^3$] | 209.7 [kg/m$^3$] |
| $\rho_{max}$ | 0.74 [rel] | 0.75 [rel] | 739.3 [kg/m$^3$] | 749.3 [kg/m$^3$] | 739.3 [kg/m$^3$] | 749.3 [kg/m$^3$] |
| $T_{min}$ | -50.8 °F | -75.82 °F | 227.15 [K] | 213.25 [K] | 227.15 [K] | 213.25 [K] |
| $T_{max}$ | 199.4 °F | 206.01 °F | 366.15 [K] | 369.82 [K] | 366.15 [K] | 369.82 [K] |
| $P_{min}$ | None | None | None | None | None | None |
| $P_{max}$ | None | None | None | None | None | None |

CAUTION:  Pressure correction must be used above 10 bar product pressure in the blend stream piping.

Figure 5-14: VCF calculations for commodity group E



If you are using table 6E, then you must convert the base density to SI units (kg/m3) first, then multiple the by CTPL, then convert back to degrees API.

In all cases, the base observed has to be rounded to the standard at the end.
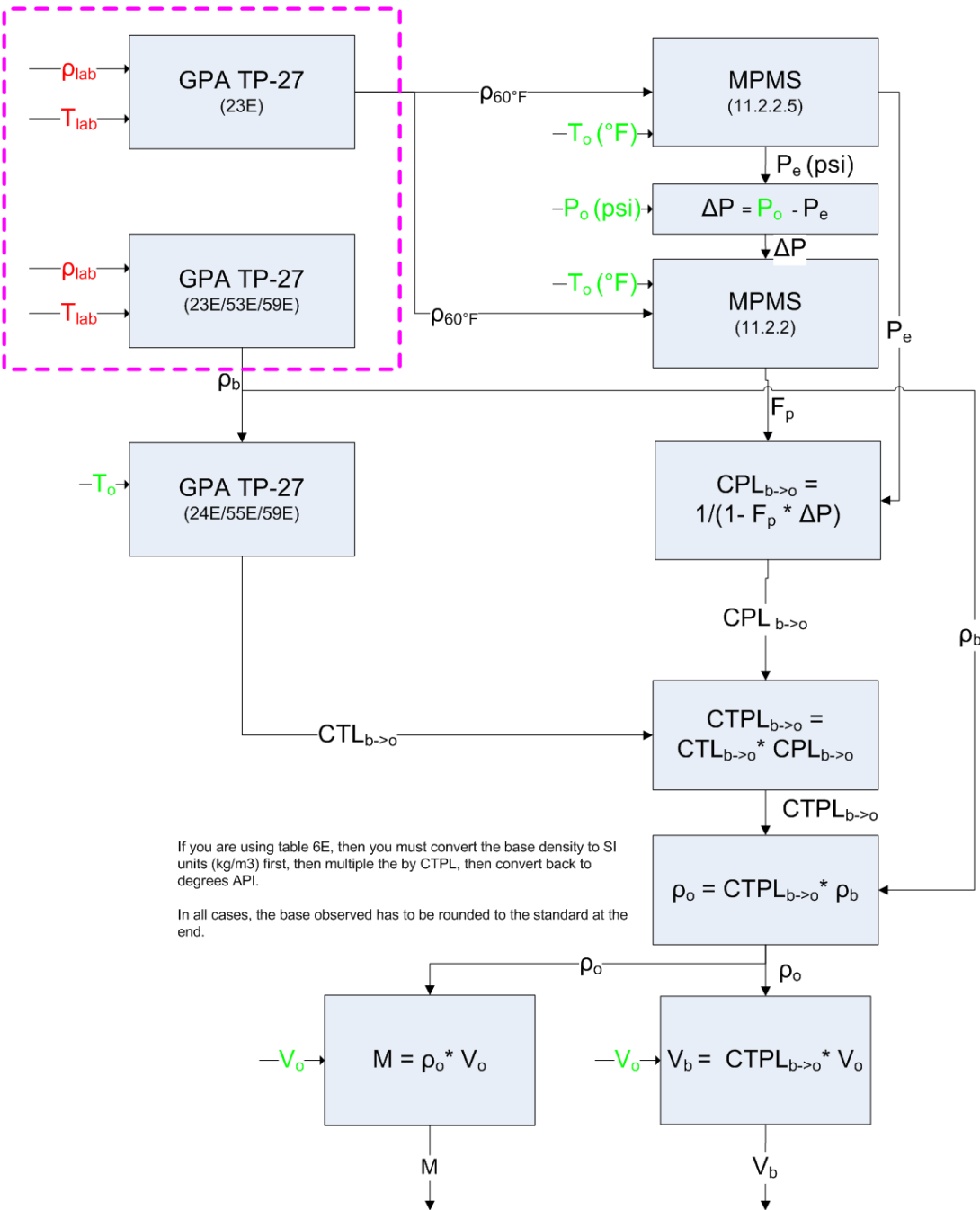
## 5.11.7.2.4  Commodity Group FAME (Fatty Acid Methyl Esters)

Figure 5-15: VCF calculations for commodity group FAME



$$T_{lab}$$
$$\rho_{lab}$$

EN 14214

CTL

$$\rho_b = \rho_{lab} / CTL$$

N.B. We will apply ASTM rounding rules to value resulting from EN 14214 table

$$\rho_b$$

$$T_o \quad \rho_o = \rho_b - 0.723 * (T_o - 15.0)$$

$$\rho_b$$

$$\rho_o$$

$$\rho_o$$

$$V_o \quad M = \rho_o * V_o$$

$$V_o \quad V_b = (\rho_o / \rho_b) * V_o$$

M

$$V_b$$
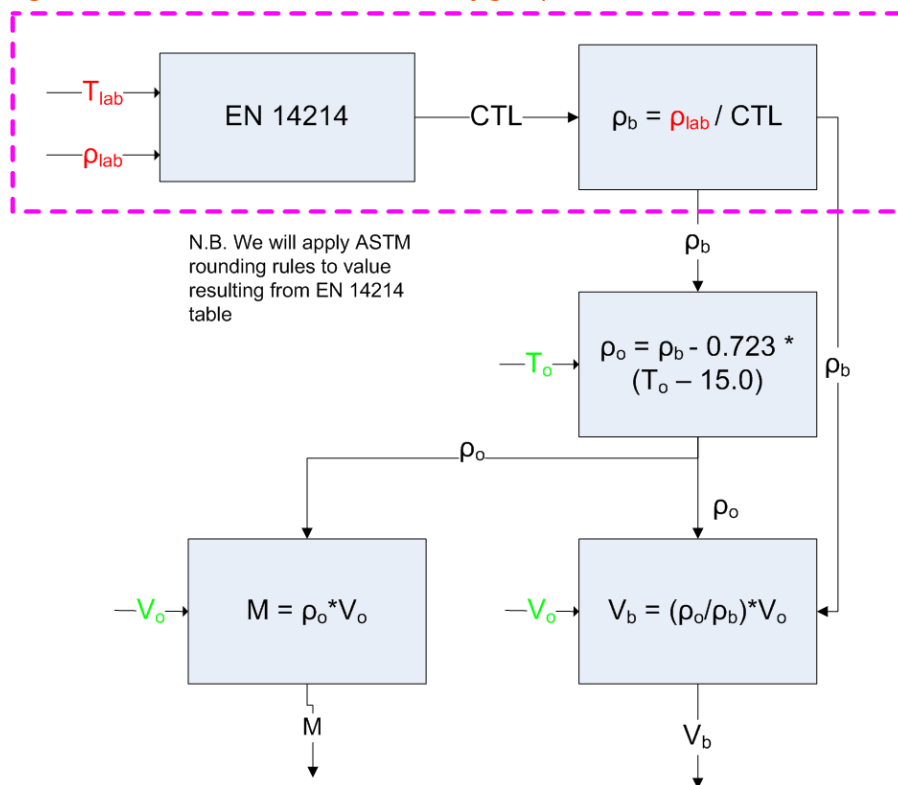
## 5.11.7.2.5  Volume Correction Terms

$\alpha_{60}$ = expansion coefficient (for commodity group C)

$\rho_{lab}$ = blend product density of lab sample
(`blend_product_observed_density`)

$T_{lab}$ = blend product temperature of lab sample
(`blend_product_observed_temperature`)

$T_{lab}$ = blend product pressure of lab sample
(`blend_product_observed_pressure`)

$T_o$ = blend product temperature in pipe
(`instantaneous_blend_stream_temperature`)

$P_o$ = blend product pressure in pipe
(`instantaneous_blend_stream_pressure`)

$V_o$ = blend product volume as measured
(`transaction_blend_stream_gross_observed_volume`)

$\rho_o$ = blend product observed density

$\rho_b$ = blend product density at base conditions

$\rho_{60°F}$ = blend product density at 60 °F

$V_b$ = blend product volume adjusted for base conditions
(`transaction_blend_stream_gross_standard_volume`)

M = blend product volume mass
(`transaction_blend_stream_gross_mass`)

$CTPL_{x-y}$ = temperature and pressure correction factor from conditions x to conditions y

$CTL_{x-y}$ = temperature correction factor from conditions x to conditions y

$P_e$ = blend product equilibrium pressure (commodity group E)

$F_p$ = blend product compressibility factor (commodity group E)

### Colors

Red = Manually measured value

Green = Real time sensor value

Black = Calculated value

Blue = Constant

(entity name)

Calculations executed only when there is a change to the lab sample values

## 5.11.7.2.6  Calculation of Transactional Gross Standard Volume

The calculation of the transactional Gross Standard Volume (GSV) is done incrementally by performing a volume-conversion calculation on an incremental

measured blend stream volume. The volume-converted values of these incremental blend stream observed volumes are then calculated together, to generate the running accumulative transactional GSV value.

The rate at which the incremental volume conversion is done depends on the blend stream flow rate and three configuration entities. The volume conversion is done on a fixed amount of incremental volume as specified by the calculation interval volume configuration entity. However, if the elapsed time since the last volume conversion is greater than the maximum calculation time configuration entity value, then the current increment observed volume is used in the volume conversion. Similarly, the minimum calculation interval configuration entity ensures that the incremental volume conversion does not happen if the incremental observed volume reaches the calculation interval volume before the minimum calculation interval time has elapsed.

The minimum and maximum calculation interval time configuration entities ensure the following two possibilities:

- That transactional GSV displayed on the HMI is updated in a timely manner even in slow flow conditions;

- That rate of volume conversion calculation does not damage the SSC when there is a high blend stream flow rate.

Ideally the SSC should be configured such that in a high flow situation, the calculation interval volume is dispensed before the maximum calculation interval time is reached.

The transactional gross standard volume after N number of incremental calculation internals is provide by the following formula:

$$GSV_{transaction} = \sum_{i=1}^{N} VCF(GOV_i - GOV_{i-1})$$

Whereas GOVi represent the total accumulative gross observed volume after i calculation intervals. $GOV_0$ is always 0.

A calculation interval ends if the following conditions are met:

- elapsed interval time > minimum calculation interval

  AND

- (GOVi – GOVi-1) > calculation interval volume OR elapsed interval time > maximum calculation interval time.

## 5.11.7.3  Setup

| Entity | Description | Value range |
|--------|-------------|-------------|
| [Commodity group] | With this entity you can select the product or commodity group of the blend stream product. | <None><br><br><Crude Oil><br><br><Refined Prod.> (default)<br><br><Special Apps.><br><br><Lub. Oils><br><br><NGL & LPG><br><br><FAME> |
| [Temp. compensation used] | With this entity you can enable (= <true>) or disable (=<false>) temperature correction during the calculation of GSV and mass. | <True><br><br><False> (default) |
| [Press. compensation used] | With this entity you can enable (= <true>) or disable (=<false>) temperature correction during the calculation of GSV and mass. (Not applicable for FAME commodity group or special application). | <True><br><br><False> (default) |

| Entity | Description | Value range |
|---|---|---|
| [Base temperature] | With this entity you can select the temperature reference used to determine the base conditions of the volume correction of the GSV and mass. This base temperature must be set to a value accepted by the associated VCF table configuration entity. | default = <15.0> °C |
| [Base pressure] | With this entity you can select the pressure reference used to determine the base conditions of the volume correction of the GSV and mass. This base pressure must be set to a value accepted by the associated VCF table configuration entity. | default = <0.0> kPa |

| Entity | Description | Value range |
|---|---|---|
| [VCF table] | With this entity you can select the selected VCF table. | <No Table> <br> <1250 (2004) 5/6> <br> <1250 (2004) 23/24> <br> <1250 (2004) 53/54> (default) <br> <1250 (2004) 59/60> <br> <GPA TP-27 (07) 23/24> <br> <GPA TP-27 (07) 53/54> <br> <GPA TP-27 (07) 59/60> <br> <EN 14214 (08)> |

| Entity | Description | Value range |
|---|---|---|
| [VCF Options] | With this entity you can select the options enabled when using the VCF table.<br><br>The extended temperature and pressure and range give the ability to do the volume conversion over a broader range than covered by the earlier versions of the standard. For instance at locations where it is very cold, like Alaska.<br><br>When <none> is selected and the application goes beyond the normal range, an error occurs. | <None><br><br><Ext. Range> (default) |

## 5.11.7.4  Density Data

| Entity | Description | Value range |
|---|---|---|
| [Observed density] | With this entity you can enter the density of the blend stream product as it was measured in a lab. | default = <0.0>kg/m3 |
| [Density temperature] | With this entity you can enter the temperature of the lab sample used to determine the blend product observed density. | default = <0.0>°C |
| [Density pressure] | With this entity you can enter the pressure of the lab sample used to determine the blend product observed density. | default = <0> Pa |
| [Derive manual status] | With this entity you can select if the manual status of the density is propagated in the status of the Gross Observed Volume or not.<br><br><Disable>: Manual status does not appear in the status of the GSV (default setting).<br><br><Enable>: Manual status appears in the status of the GSV. | <Disable> (default)<br><br><Enable> |

| Entity | Description | Value range |
|---|---|---|
| [Glass hydrometer used] | With this entity you can specify if a glass hydrometer was used, to meter the observed blend product density. If <True>, the blend product observed density is corrected for measurement error associated with glass hydrometers. | <True> (default) <br> <False> |
| [Expansion coefficient] | With this entity you can enter the expansion coefficient used during volume correction. This is only applicable for Special application commodity group. | default = <0.00000001>°C |

## 5.11.7.5  Calculation Interval

| Entity | Description | Value range |
|---|---|---|
| [Calculation interval vol.] | With this entity you can enter the amount of incremental GOV over which the VCF calculations are done (as long at the time since the last VCF is between the minimum and maximum calculation interval values). | <1> L ... <1000> L <br><br> (default = <100.00> L) |
| [Min. calc. interval time] | With this entity you can enter the minimum amount of time between VCF calculations on the incremental GOV. | <1> s ... <60> s <br><br> (default = <1> s) |
| [Max. calc. interval time] | With this entity you can enter the maximum amount of time between VCF calculations on the incremental GOV. | <1> s ... <60> s <br><br> (default = <3> s) |

# 5.11.8  Alarms

## 5.11.8.1  Leaking Valve

| Entity | Description | Value range |
|---|---|---|
| [Alarm action] | With this entity you can configure the alarm behaviour in case this particular alarm occurs.<br><br><Disabled>:The alarm is ignored.<br><br><Display>:Alarm shown on the display Alarm-indication output set to ON<br><br><Display shutdown>: Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br>Alarm-shutdown output set to ON<br><br>Running transactions are stopped<br><br>Start-up of new transactions impossible | <Disabled><br><br><Display><br><br><Display shutdown> (default) |
| [Leaking volume limit] | With this entity you can set the maximum amount of leaking blend volume permitted. If this limit is exceeded an alarm occurs depending on [Alarm action]. | <0> L ...<br><9999> L<br><br>(default = <100.00> L) |

## 5.11.8.2  Flush Volume

| Entity | Description | Value range |
|---|---|---|
| [Alarm action] | With this entity you can configure the alarm behaviour in case this particular alarm occurs.<br><br><Disabled>:The alarm is ignored.<br><br><Display>:Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br><Display shutdown>: Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br>Alarm-shutdown output set to ON<br><br>Running transactions are stopped<br><br>Start-up of new transactions impossible | <Disabled><br><br><Display><br><br><Display shutdown> (default) |
| [Flush volume deviation] | With this entity you can set the maximum percentage of the [Flush volume] that is allowed to be lower than the [Flush volume] without resulting in an alarm situation (Slow flow alarm). | <0> … <100><br><br>(default = <25> %) |

### 5.11.8.3  No Activity

| Entity | Description | Value range |
|---|---|---|
| [Alarm action] | With this entity you can configure the alarm behaviour in case this particular alarm occurs.<br><br><Disabled>:The alarm is ignored.<br><br><Display>:Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br><Display shutdown>: Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br>Alarm-shutdown output set to ON Running transactions are stopped<br><br>Start-up of new transactions impossible | <Disabled><br><br><Display><br><br><Display shutdown> (default) |
| [No activity timeout] | With this entity you can set the time in seconds in which wild stream pulses should be received if the device is permitted. When after this time no wild stream pulses has been received, an alarm occurs depending on [Alarm action]. | <1> s ... <65535> s<br><br>(default = <30> s) |

## 5.11.8.4  No Pump

| Entity | Description | Value range |
|---|---|---|
| [Alarm action] | With this entity you can configure the alarm behaviour in case this particular alarm occurs.<br><br><Disabled>:The alarm is ignored.<br><br><Display>:Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br><Display shutdown>: Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br>Alarm-shutdown output set to ON Running transactions are stopped<br><br>Start-up of new transactions impossible | <Disabled><br><br><Display><br><br><Display shutdown> (default) |
| [Feedback timeout] | With this entity you can set the time in seconds in which the blend pump should give feedback to the SSC. If no pump feedback has been received in [Pump feedback timeout] an alarm occurs depending on [Alarm action]. | <1> s ... <30> s<br><br>(default = <15> s) |

## 5.11.8.5  Deviation

| Entity | Description | Value range |
|---|---|---|
| [Alarm action] | With this entity you can configure the alarm behaviour in case this particular alarm occurs.<br><br><Disabled>:The alarm is ignored.<br><br><Display>:Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br><Display shutdown>: Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br>Alarm-shutdown output set to ON<br><br>Running transactions are stopped<br><br>Start-up of new transactions impossible | <Disabled><br><br><Display><br><br><Display shutdown> (default) |
| [Min. volume for alarm] | With this entity you can enter the minimum volume before the SSC-B does a comparison between the actual percentage and the required percentage, to minimize false alarms when small volumes are concerned. | <1> L ... <999> L<br><br>(default = <5.00> L) |
| [Low deviation] | With this entity you can enter the low percentage allowed before the blend percentage deviation is set. This is only evaluated at the end of the transaction with the total volumes. | <0> % ... <99> %<br><br>(default = <95> %) |
| [High deviation] | With this entity you can enter the high percentage allowed before the blend percentage deviation is set. This is only evaluated at the end of the transaction with the total volumes. | <101> % ... <999> %<br><br>(default = <105> %) |

## 5.11.8.6  Blend Stream Closing

| Entity | Description | Value range |
|--------|-------------|-------------|
| [Alarm action] | With this entity you can configure the alarm behaviour in case this particular alarm occurs.<br><br><Disabled>:The alarm is ignored.<br><br><Display>:Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br><Display shutdown>: Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br>Alarm-shutdown output set to ON<br><br>Running transactions are stopped<br><br>Start-up of new transactions impossible | <Disabled><br><br><Display><br><br><Display shutdown> (default) |
| [Closing timeout] | With this entity you can enter the maximum time in seconds that is allowed for closing the blend valve. If the SSC-B still measures blend stream volume after this timeout period, it generates the blend valve closing alarm. | <1> s … <240> s<br><br>(default = <60> s) |

## 5.11.8.7  Wild Stream Closing

| Entity | Description | Value range |
|---|---|---|
| [Alarm action] | With this entity you can configure the alarm behaviour in case this particular alarm occurs.<br><br><Disabled>:The alarm is ignored.<br><br><Display>:Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br><Display shutdown>: Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br>Alarm-shutdown output set to ON<br><br>Running transactions are stopped<br><br>Start-up of new transactions impossible | <Disabled><br><br><Display><br><br><Display shutdown> (default) |
| [Closing volume limit] | With this entity you can configure the maximum wild stream volume that is allowed after the permissive is removed. If the SSC-B detects more wild stream volume, it generates wild stream closing alarm. | <1> L ... <9999> L<br><br>(default = <150.00> L) |

## 5.11.8.8  Control Fault

| Entity | Description | Value range |
|---|---|---|
| [Alarm action] | With this entity you can configure the alarm behaviour in case this particular alarm occurs.<br><br><Disabled>:The alarm is ignored.<br><br><Display>:Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br><Display shutdown>: Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br>Alarm-shutdown output set to ON<br><br>Running transactions are stopped<br><br>Start-up of new transactions impossible | <Disabled><br><br><Display><br><br><Display shutdown> (default) |
| [Control failure timeout] | With this entity you can configure the time in seconds the SSC-B tries to correct an out-of-tolerance blend, before generating the Control failure alarm. | <1> s … <30> s<br><br>(default = <10> s) |

## 5.11.8.9  No Hydr. Pump

| Entity | Description | Value range |
|---|---|---|
| [Alarm action] | With this entity you can configure the alarm behaviour in case this particular alarm occurs.<br><br><Disabled>:The alarm is ignored.<br><br><Display>:Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br><Display shutdown>: Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br>Alarm-shutdown output set to ON<br><br>Running transactions are stopped<br><br>Start-up of new transactions impossible | <Disabled><br><br><Display><br><br><Display shutdown> (default) |
| [Feedback timeout] | With this entity you can enter the time in seconds in which the hydraulic pressure pump should give geedback to the SSC. If no pump feedback has been received in [Pump feedback timeout], an alarm occurs depending on [Alarm action]. | <1> s ... <30> s<br><br>(default = <15> s) |

## 5.11.8.10  Fixed

| Entity | Description | Value range |
|---|---|---|
| [Pulse phase] | With this entity you can configure the [Pulse phase] alarm behaviour in case this particular alarm occurs.<br><br><Disabled>:The alarm is ignored.<br><br><Display>:Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br><Display shutdown>: Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br>Alarm-shutdown output set to ON<br><br>Running transactions are stopped<br><br>Start-up of new transactions impossible | <Disabled><br><br><Display><br><br><Display shutdown> (default) |
| [Pulse hardware] | With this entity you can configure the [Pulse hardware] alarm behaviour in case this particular alarm occurs.<br><br><Disabled>:The alarm is ignored.<br><br><Display>:Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br><Display shutdown>: Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br>Alarm-shutdown output set to ON<br><br>Running transactions are stopped<br><br>Start-up of new transactions impossible | <Disabled><br><br><Display><br><br><Display shutdown> (default) |

| Entity | Description | Value range |
|---|---|---|
| [Factored pulse out] | With this entity you can configure the [Factored pulse out] alarm behaviour in case this particular alarm occurs.<br><br><Disabled>:The alarm is ignored.<br><br><Display>:Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br><Display shutdown>: Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br>Alarm-shutdown output set to ON<br><br>Running transactions are stopped<br><br>Start-up of new transactions impossible | <Disabled><br><br><Display><br><br><Display shutdown> (default) |
| [Volume correction] | With this entity you can configure the [Volume correction] alarm behaviour in case this particular alarm occurs.<br><br><Disabled>:The alarm is ignored.<br><br><Display>:Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br><Display shutdown>: Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br>Alarm-shutdown output set to ON Running transactions are stopped<br><br>Start-up of new transactions impossible | <Disabled><br><br><Display><br><br><Display shutdown> (default) |

| Entity | Description | Value range |
|---|---|---|
| [Temperature sensor] | With this entity you can configure the [Temperature sensor] alarm behaviour in case this particular alarm occurs.<br><br><Disabled>:The alarm is ignored.<br><br><Display>:Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br><Display shutdown>: Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br>Alarm-shutdown output set to ON<br><br>Running transactions are stopped<br><br>Start-up of new transactions impossible | <Disabled><br><br><Display><br><br><Display shutdown> (default) |
| [Pressure sensor] | With this entity you can configure the [Pressure sensor] alarm behaviour in case this particular alarm occurs.<br><br><Disabled>:The alarm is ignored.<br><br><Display>:Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br><Display shutdown>: Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br>Alarm-shutdown output set to ON<br><br>Running transactions are stopped<br><br>Start-up of new transactions impossible | <Disabled><br><br><Display><br><br><Display shutdown> (default) |

| Entity | Description | Value range |
|---|---|---|
| [Block valve fault] | With this entity you can configure the [Block valve fault] alarm behaviour in case this particular alarm occurs.<br><br><Disabled>:The alarm is ignored.<br><br><Display>:Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br><Display shutdown>: Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br>Alarm-shutdown output set to ON<br><br>Running transactions are stopped<br><br>Start-up of new transactions impossible | <Disabled><br><br><Display><br><br><Display shutdown> (default) |
| [Tank low level] | With this entity you can configure the [Tank low level] alarm behaviour in case this particular alarm occurs.<br><br><Disabled>:The alarm is ignored.<br><br><Display>:Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br><Display shutdown>: Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br>Alarm-shutdown output set to ON Running transactions are stopped<br><br>Start-up of new transactions impossible | <Disabled><br><br><Display> (default)<br><br><Display shutdown> |

| Entity | Description | Value range |
|---|---|---|
| [Tank empty] | With this entity you can configure the [Tank empty] alarm behaviour in case this particular alarm occurs.<br><br><Disabled>:The alarm is ignored.<br><br><Display>:Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br><Display shutdown>: Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br>Alarm-shutdown output set to ON<br><br>Running transactions are stopped<br><br>Start-up of new transactions impossible | <Disabled><br><br><Display><br><br><Display shutdown> (default) |
| Service due expired | With this entity you can configure the [Service due expired] alarm behaviour in case this particular alarm occurs.<br><br>The [Next scheduled service] entity is configured with the date when the next service activities should take place for the SSC-B.<br><br><Disabled>:The alarm is ignored.<br><br><Display>:Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br><Display shutdown>: Alarm shown on the display<br><br>Alarm-indication output set to ON<br><br>Alarm-shutdown output set to ON<br><br>Running transactions are stopped<br><br>Start-up of new transactions impossible | <Disabled><br><br><Display><br><br><Display shutdown> (default) |

# 5.12  Calibration

## 5.12.1  Why Calibrate?

A flow meter gives a number of pulses per amount of fuel that passes through the meter. The number of pulses per volume unit this meter gives is called its K-factor. By the manufacturer, this K-factor is exactly specified per delivered flow meter.

To increase the accuracy of the flow meter, a calibration can be performed. This is done by comparing the actual resulting fuel volume received in a calibrated vessel (see the following figure) with the displayed value on the SSC-B screen, being the result of the value returned from the flow meter.

Figure 5-16: Calibrating the flow meter
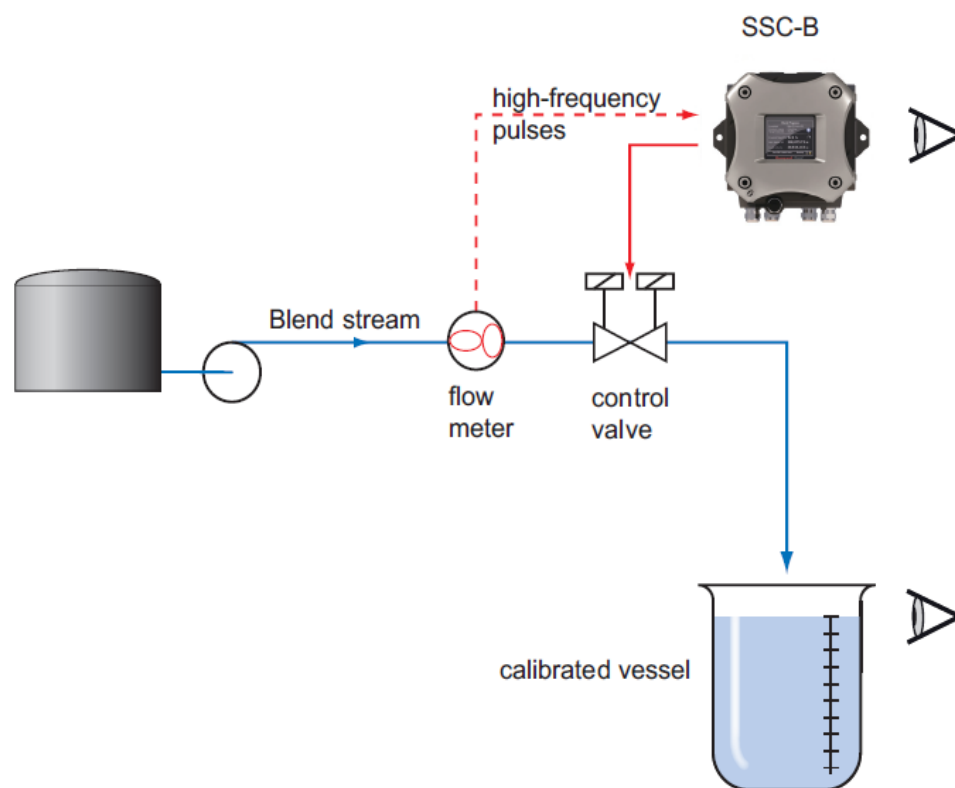
With these 2 values a correction factor can be calculated, which then is used to (re-)calibrate the flow meter.

This correction factor is called the meter factor. The resulting blending volume (V) is then:

V = number of pulses / (K-factor * meter factor).

## 5.12.2  Calibration Menu Choice

From the Main Menu > Calibration menu, you can select either the Wizard or the Manual calibration method (see second screen).



## 5.12.3  Manual Calibration

> From   the   Calibration   menu, choose Manual and select <OK>

> Enter meter factor and confirm

> Select <OK>
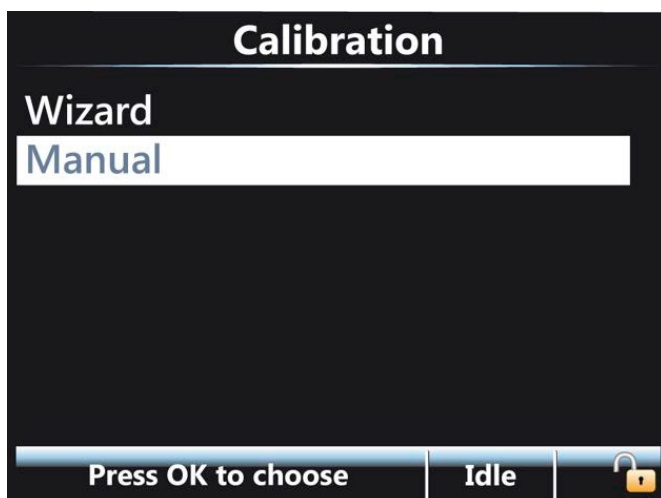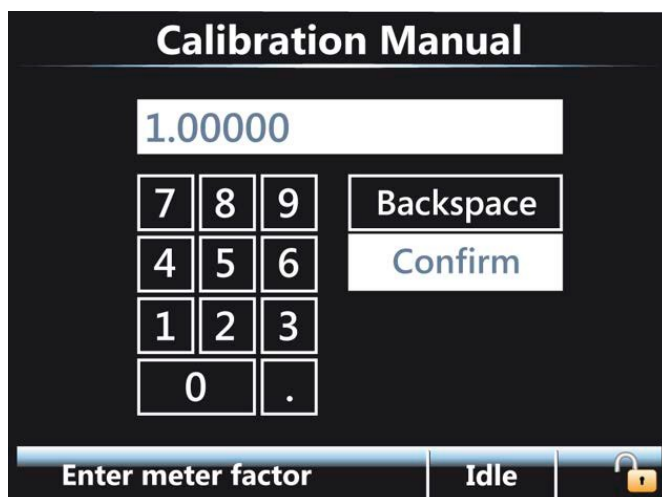
## 5.12.4  Calibrating Using the Calibration Wizard

The built-in calibration wizard makes it easy to (re-)calibrate the flow meter, by executing the following steps through the SSC-B menu:

> CAUTION:  Ensure the desired calibration flow conditions are configured at Configuration > Control Settings > Cali- bration (see 5.11.5.3).

> Enter volume to be injected

> Measure actual volume result (calibrated vessel)

> Enter this result

New meter factor is displayed now.

> Accept new meter factor

- Flow meter is (re-)calibrated

In the following, this process is explained in detail.

> **WARNING:**  Do all necessary preparations (calibrated vessel in place, and so on), before starting the actual cali- bration!

- A sequence of input screens is used to calibrate the blend meter factor

> Step 1: Enter amount to dispense

> Step 2: Press start and wait for blend volume to be dispensed (progress bar)

> Step 3: Enter measured volume

> Step 4: Confirm new blend meter factor

- Each calibration is saved in non- volatile memory with date, time, old, and new values



> Enter preset volume

Enter here the volume the SSC-B must blend for the calibration process.
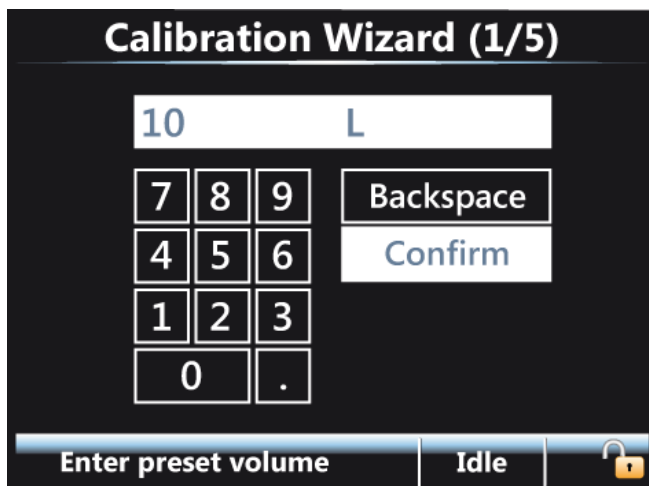
- Calibration starting...

As soon as you enter <OK>, the calibration process starts.

The screen shows the progress of the blending process, by displaying a progress bar.



- Blending in progress

> Enter the actual measured volume (calibrated vessel).

With this entered value and the value the SSC-B measured, a new meter factor is calculated.
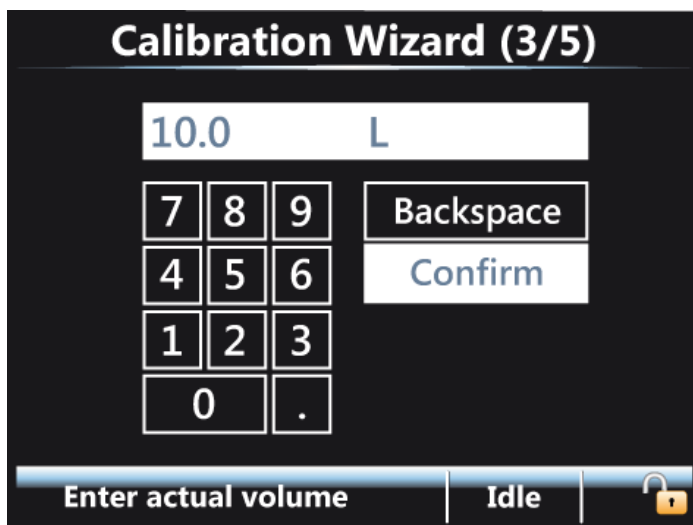


The new meter factor is displayed.

> Select <OK> to accept new meter factor.

or

> Select <ESC> to reject new meter factor.

NOTE:  In case <ESC> is selected, the old meter factor is restored.
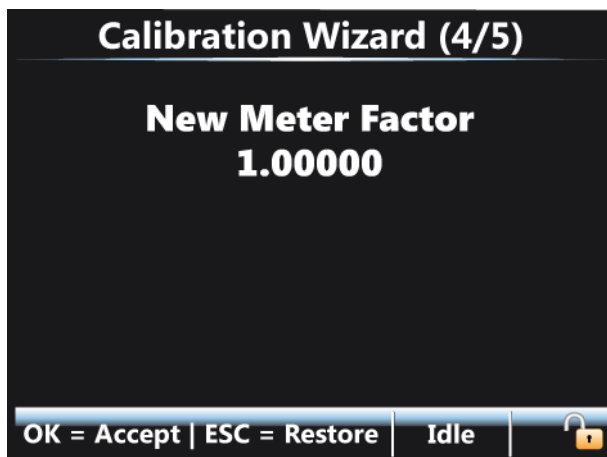
- Calibration process overview

A new calibration record is created and stored into the system.

An overview of the calibration process is shown here.

> Select <OK> to exit to the Main Menu
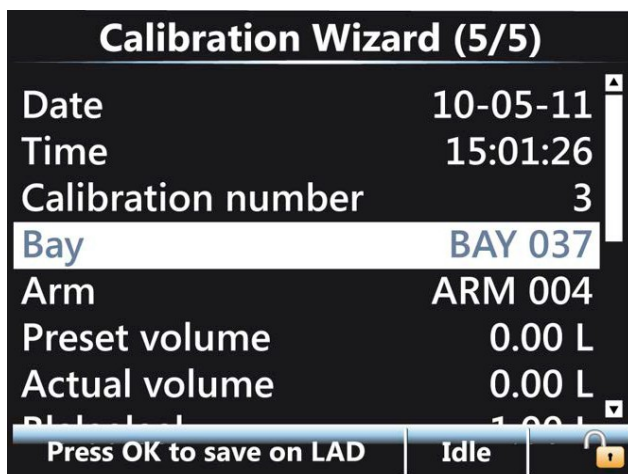


# 5.13  Info (Information of the device)

The SSC "About" box is showing important information about:

- FlexConn protocol
- FlexConn build
- Application firmware build
- Device serial number

- Board serial number
- Bootloader firmware version



In this screen identification information is shown of the following device components:

- Serial number of each FlexConn board

- Hardware version of each FlexConn board

- Application firmware version of each FlexConn board

- Build information of the firmware of each FlexConn board

- FlexConn stack firmware version of each FlexConn board

- Build information of the FlexConn stack firmware of each FlexConn board

- Select <Device> in the System Info screen and then select <OK>. The Device Info screen appears.



- Select <Versions> in the System Info screen and then select <OK>. The Firmware versions screen appears.



- Select <Board> in the System Info screen and then select <OK>. The Board Info screen appears.

  Select the relevant board, which provides an overview of the particular board, such as serial number, hardware version, and software-related version numbers.
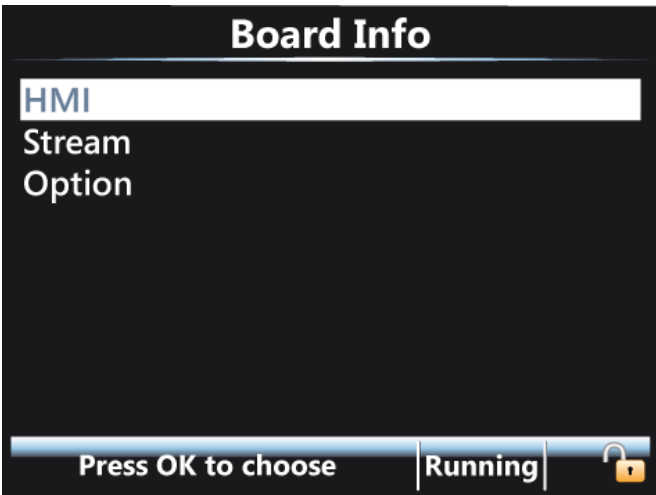
- Select <HMI> in the Board Info screen and then select <OK>. The HMI Info screen appears with the following details.

  - Board serial #
  - HW version
  - App. firmware
  - App. build
  - App. checksum
  - Boot firmware
  - FlexConn version
  - FlexConn build
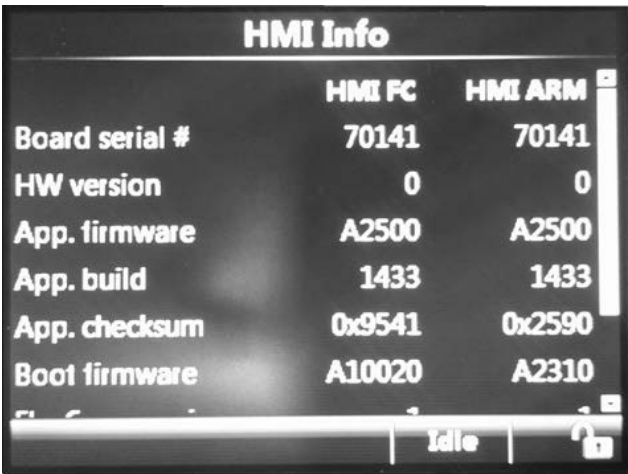


- Select <Stream> in the Board Info screen and then select <OK>. The Stream Info screen appears with the following details.

- Board serial #
- HW version
- App. firmware
- PIC firmware
- App. build
- App. checksum
- PIC checksum
- Boot firmware
- FlexConn build
- FlexConn version
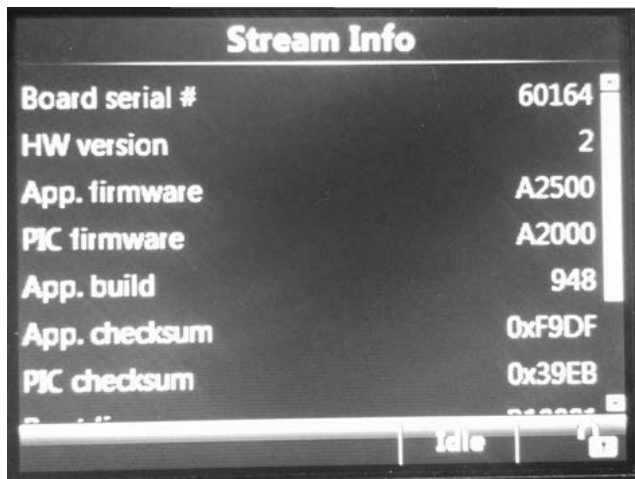


- Select <Option> in the Board Info screen and then select <OK>. The Option Info screen appears with the following details.

  - Board serial #
  - HW version
  - App. firmware
  - App. build
  - App. checksum
  - Boot firmware
  - FlexConn version
  - FlexConn build
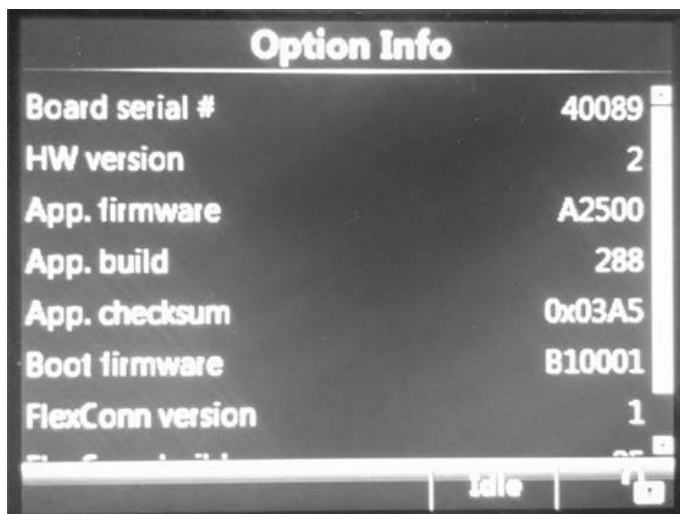
# 5.14  Logs

This is the user interface to various logs maintained in non- volatile memory including:

- Transaction log: complete infor- mation for each transaction

- Calibration log: shows the sequence of blend meter factor calibrations over time

- Alarm Log: a chronological list on when alarms occurred and what type of alarms they were

- Debug Log: a list of device events that can be retrieved for fault finding purposes

- W&M Log: shows the software W&M seal events

In this screen, the following data logs can be viewed:

- all available transaction records

- all available calibration records

- all available alarm records
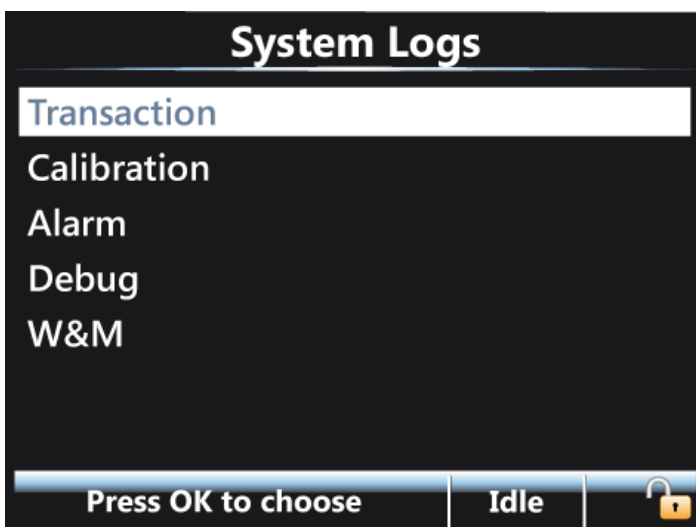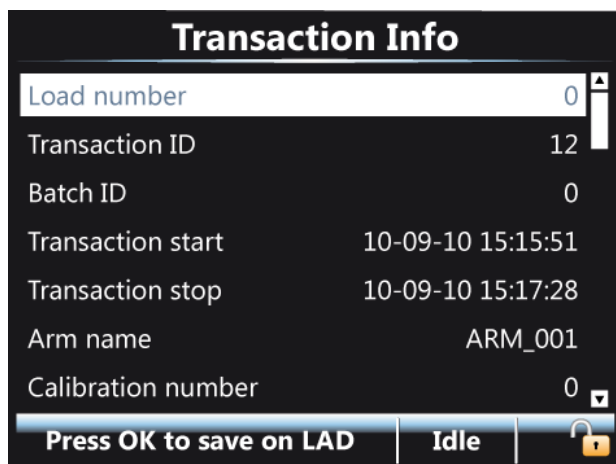


## 5.14.1  Transaction Log

- Select <OK> for <Transaction>, the Transaction log appears.

**Transaction Log**

| 10-09-10 15:17:28 | BIO_DIESEL | 32.46 L |
|---|---|---|
| 10-09-10 15:13:15 | BIO_DIESEL | 0.00 L |
| 10-09-10 15:13:06 | BIO_DIESEL | 0.00 L |
| 10-09-10 11:05:28 | BIO_DIESEL | 21.38 L |
| 10-09-10 11:02:57 | BIO_DIESEL | 0.00 L |
| 10-09-10 11:01:54 | BIO_DIESEL | 0.00 L |
| 06-09-10 10:13:07 | BIO_DIESEL | 21.38 L |

Record 12 of 12 | Idle

- Select <OK> for one specific transaction from the Transaction log list. The Transaction info is displayed.

  - Load number
  - Transaction ID
  - Transaction start
  - Transaction stop
  - Arm name
  - Calibration number
  - Product name
  - Additive name
  - ppm
  - Load volume
  - Critical error
  - Non critical error
  - Additive vol per inj.
  - Additive deviation
  - Vol per inj. cycle
  - Batch start acc. GOV
  - Batch stop acc. GOV
  - Batch additive GOV
  - Haz. mat. class.
  - Bay name
  - Site name

- Device type
- Trans. record version
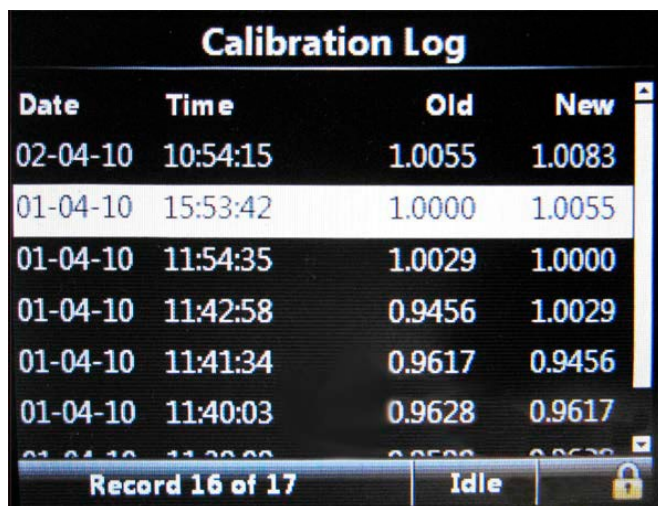


## 5.14.2  Calibration Log

- Select <OK> for <Calibration> from the System logs menu, the Cali- bration log appears.



- Select <OK> for one specific calibration log from the Calibration log list. The Calibration log appears.

  - Date
  - Time
  - Calibration number
  - Bay
  - Arm

- Preset volume
- Actual volume
- Metered volume
- Difference
- Original meter factor
- New meter factor
- Quad pulse serial #
- RTD serial #
- AI serial #



## 5.14.3  Alarm Log

- Select <OK> for <Alarm> from the System logs menu, the Alarm log appears.

## 5.14.4  W&M Log

The W&M log contains the "software W&M sealing" activities.

These logs are identified by a Person and the Sealing date and time.

- Select <OK> for <W&M> from the System logs menu, the W&M log appears.



- Select a W&M log. The following information appears.

# 5.15  Diagnostics



This menu provides the following features:

- High-level view of the current state of all device I/O functions.

- Digital inputs/outputs show state as "High"/ "Low".

- The values of all output channels (digital and analog) can be set explicitly. Outputs can be operated manually to activate, control, and test field equipment. This is extremely useful for commissioning tests.

- Internal memory usage overview.

- System health overview.

- Active alarms overview.

In this screen, you can view the diagnostics about the following subjects:

- Dashboard - Overview of all I/O (Dashboard).

- System health - Overview of system health.

- Active alarms - Overview of all active alarms.

- Storage info - Overview of available memory space for data logs and total number of available logs.

- Accumulated totals - Total volume of the blend stream and wild stream since last Clear totals command.

- Device tasks

  - Reset task - possibility to reset:

    - total device

    - to factory default settings

  - Comms task; possibility to simulate actions by Comms

  - Clear task:

    - clear all alarms

    - clear all totals

    - clear wild stream totals only

    - clear blend stream totals only

- Advanced diagnostics

  - Flow rates

  - Deviation graph

  - Process overview

**Diagnostics**

| |
|---|
| Dashboard |
| System health |
| Active alarms |
| Storage info |
| Accumulated totals |
| Device tasks |
| Advanced diagnostics |

**Press OK to choose** | **Idle** |
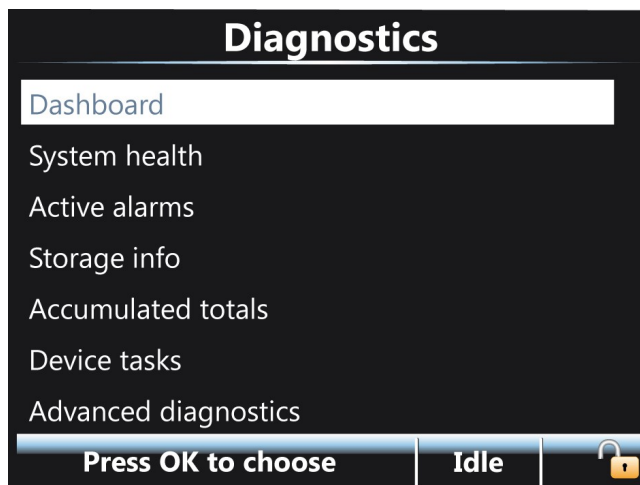
## 5.15.1  Dashboard

The I/O Dashboard displays the state or value of all available I/O blocks in the SSC-B.

Select each output function to test and activate it.



To change the value from Inactive to Active or vice versa for an output function (DO, DO EMR, AO, or PO), select the function and then select <OK>.

To change the value from Low to High for input functions (DI or PI), wire a DO to a DI in order to change the DI value from Low to High or vice versa.

When an output function is activated by the I/O Dashboard, ensure that the output is not "bound" (I/O binding) to a certain function. In some situations the firmware takes over the control of that particular output.

To enter the value of AO, perform the following steps.

1. Select <Diagnostics> from the Main Menu.

2. Select Dashboard.

3. Select OPT AO DC function in the Dashboard. The Diagnostics - OPT AO DC screen appears.
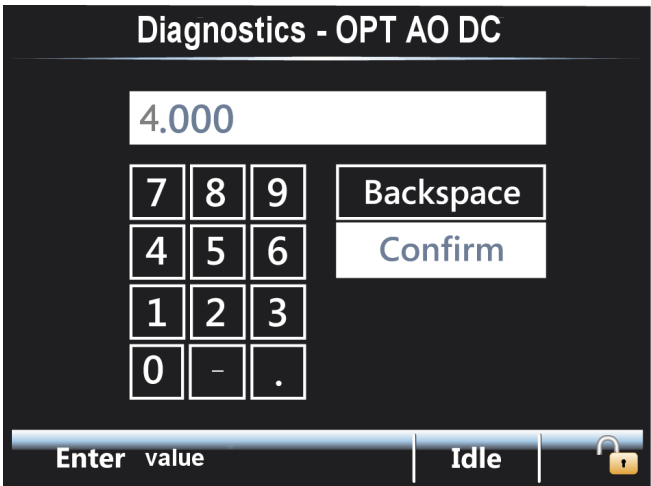
4.  Enter the value for AO and then select Backspace or Confirm. The default value is 4.000.

> NOTE:  Ensure that you unbind the I/O when forcing the outputs to avoid unpredictable control errors.

## 5.15.2  System Health

- Select <System health> to display the health of the system. The following screen appears.
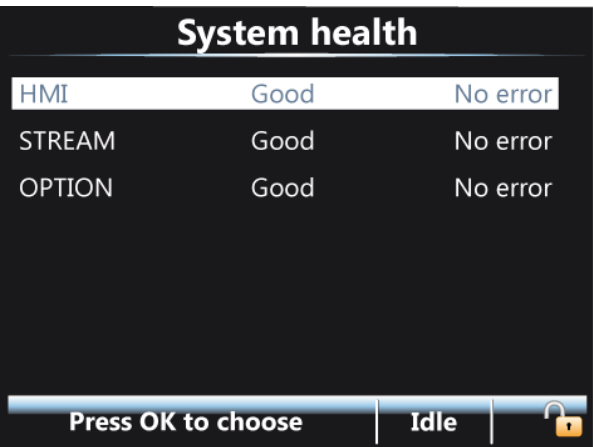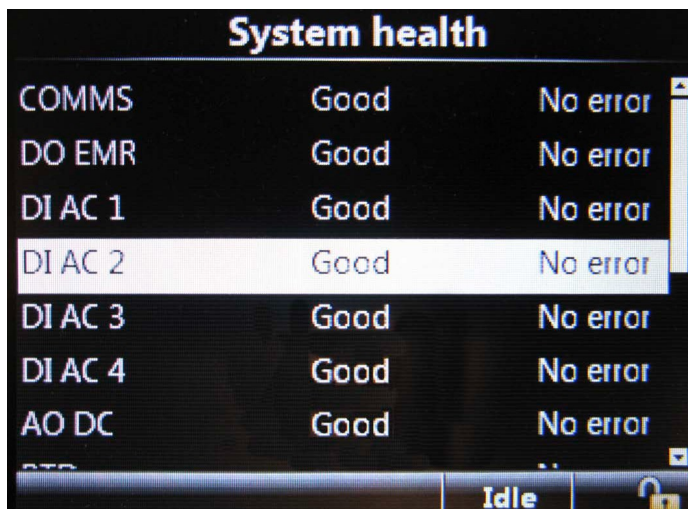


- Select <HMI> to view the details of HMI board. The following screen appears.

- Select <STREAM> to view following details of the STREAM board.

  - COMMS
  - DI AC 2
  - DI DC 1
  - DI DC 2
  - DO AC 1
  - DO AC 2
  - PO DC 1
  - PO DC 2
  - Pulse input
  - DI AC 1
  - DO EMR
  - Blend manager
  - Additive manager
  - Module manager

- Select <OPTION> to view following details of the OPTION board.

  - COMMS
  - DO EMR
  - DI AC 1
  - DI AC 2
  - DI AC 3
  - DI AC 4
  - AO DC
  - RTD
  - DO AC
  - DI DC 1
  - DI DC 2
  - Module manager
  - AI DC

### 5.15.3  Active Alarms

- Select <Active alarms> from the Diagnostics main menu, an overview of all active alarms appears.
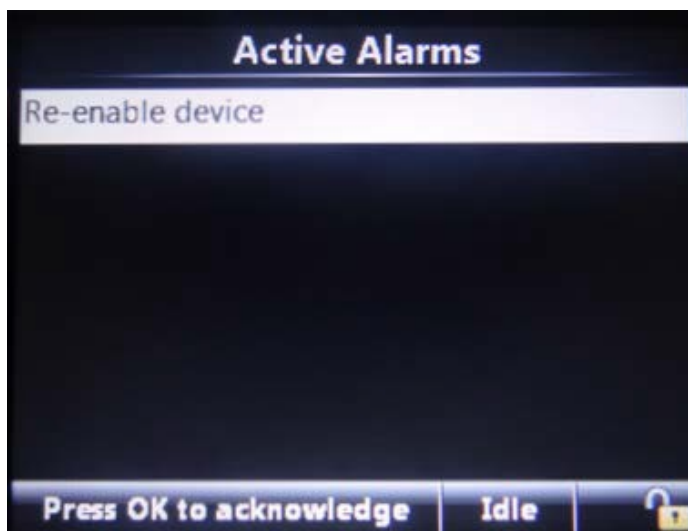


### 5.15.4  Storage Info

- Select <Storage info>, from the Diagnostics main menu, an overview of actual stored logs appears.

**Storage Info**

| | |
|---|---|
| Free space (transaction) | 7857 KB |
| Total space (transaction) | 7935 KB |
| Total transaction records | 23 records |
| Total calibration records | 3 records |
| Total alarm records | 53 records |

Idle

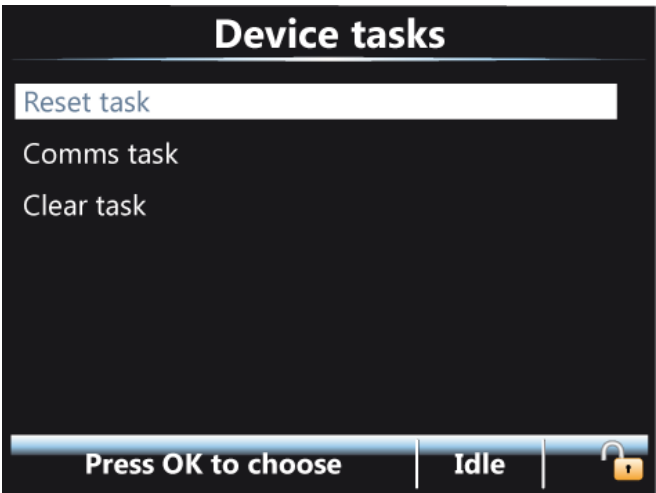## 5.15.5  Accumulated Totals

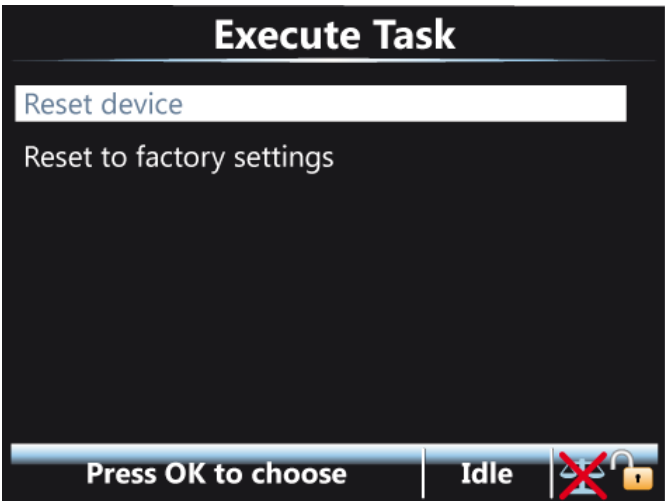- Select <Accumulated totals> from the Diagnostics main menu, an overview of accumulated totals appears.

**Accumulated totals**

| | |
|---|---|
| Blend stream volume | 34 L |
| Wild stream volume | 281 L |

Idle

## 5.15.6  Device Tasks

- Select <Device tasks> from the Diagnostics main menu, the <Device tasks> submenu appears.
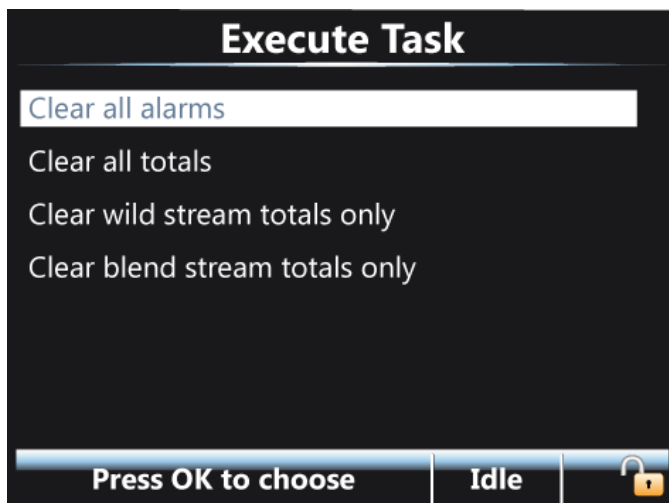
**Device tasks**

Reset task

Comms task

Clear task

Press OK to choose | Idle

- Select <Reset task>. The following screen appears.

**Execute Task**

Reset device

Reset to factory settings

Press OK to choose | Idle

- Select <Comms task>. The following screen appears.

**Execute Task**

Disable blending

Enable blending rate 1

Enable blending rate 2

Enable blending rate 3

Enable blending rate 4

Enable blending rate 5

Press OK to choose | Idle
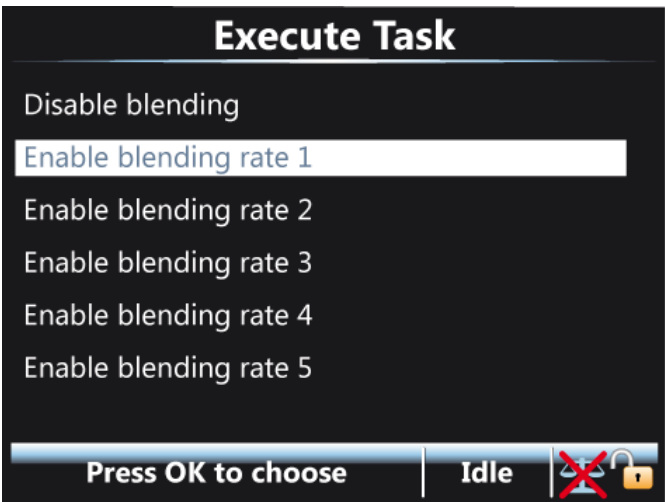
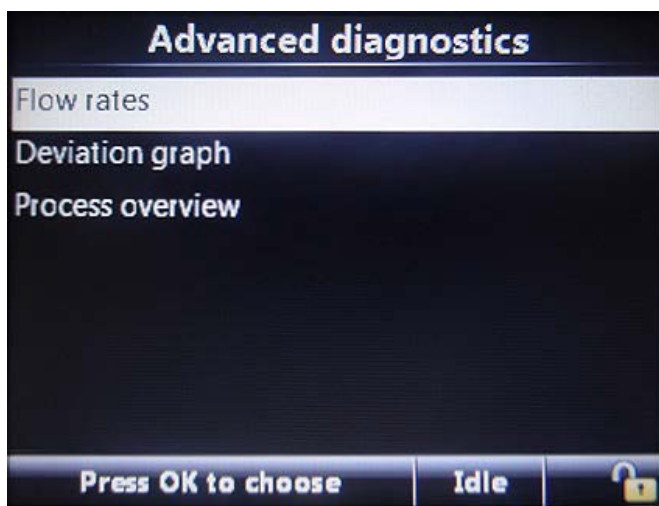- Select <Clear task>. The following screen appears.



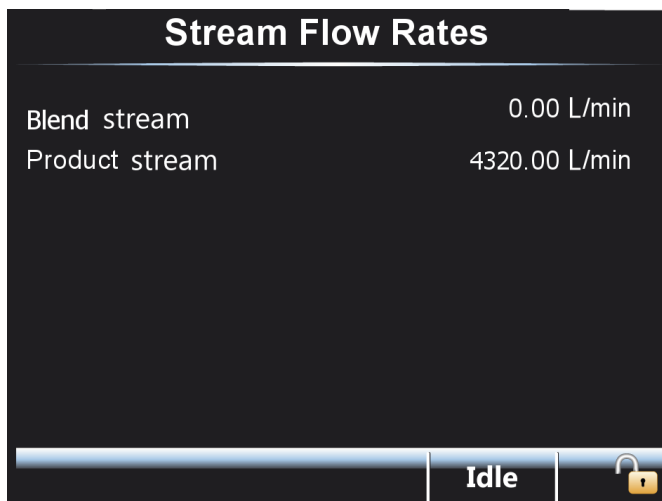## 5.15.7  Advanced Diagnostics

- Select <Advanced diagnostics> from the Diagnostics main menu, the <Advanced diagnostics> submenu appears.



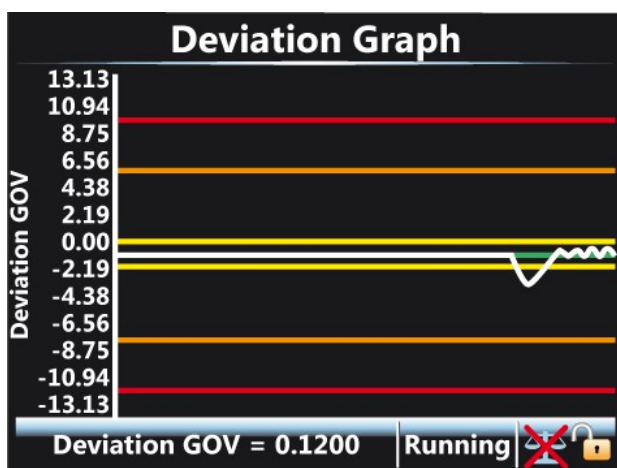### 5.15.7.1  Flow rates

- Select <Flow rates> from the Diagnostics main menu, the <Stream Flow Rates> submenu appears.

## 5.15.7.2  Deviation Graph

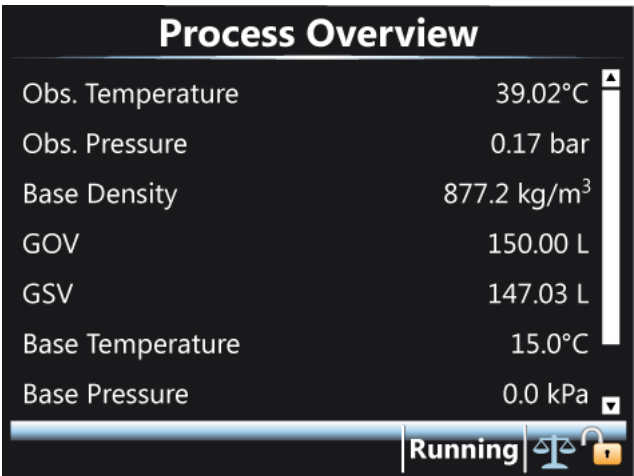- Select <Deviation graph>, the following screen appears.



The horizontal lines drawn on this graph represent the control window boundaries.

Red     = Outer window
Orange  = Middle window
Yellow  = Inner window
Green   = Dead band

Use the ^ LAD key to zoom in
Use the v LAD key to zoom out

## 5.15.7.3  Process Overview
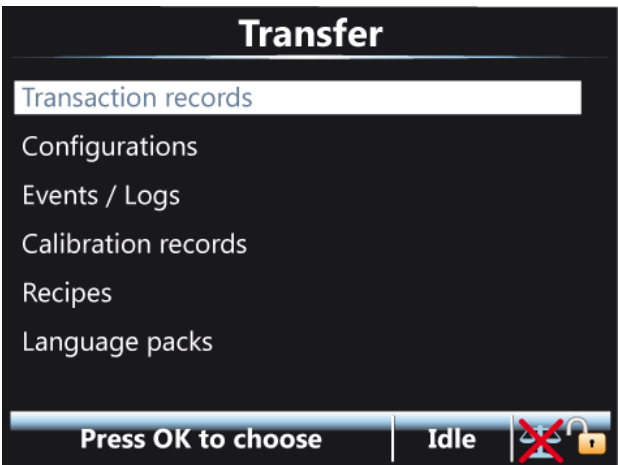
- Select <Process overview>, the following screen appears.

# 5.16  Transfer

## 5.16.1  General

In this menu option, various data sets can be transferred between the SSC-B and the LAD; see the following screen.



The data-transfer directions are defined as follows.
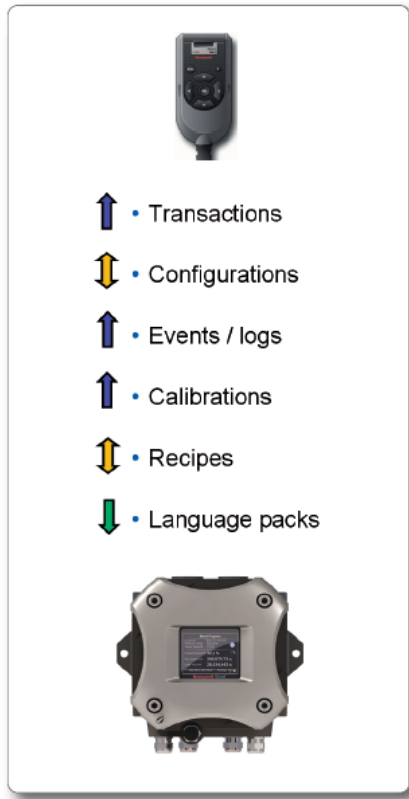
## 5.16.2  Retrieving Transaction Records

The SSC-B provides an interface to read transaction records through FlexConn entities. These entities are used to transfer transactional data to the Fusion4 Portal through a serial link.

- Select <Transaction records> from the Transfer main menu, the following screen appears.

- Retrieving All Transaction Records

Using the LAD or Fusion4 Portal, all archived transaction records can be retrieved. The definition of these records extends the definition used by communication.

Each transaction record includes: start date, start time, product volume, blend volume, alarms, percent deviation, and end time.

These parameters are "read only", meaning they cannot be changed by you.

For an explanation of all transaction record parameters, see 5.16.3 - Blend Transaction Record Explained.

NOTE:  The <Retrieve single transaction record> command cannot be used through Fusion4 Portal. This screen is only used by copying a transaction record to the LAD.

NOTE:  All transactions are overwritten and the transaction cannot be retrieved through the Fusion4 Portal or the LAD. The user must have settled all transactions before the oldest one is automatically deleted and overwritten. Maximum 10.000 un-settled transactions can reside in the transaction memory of the SSC-B.

# 5.16.3 Blend Transaction Record Explained

## 5.16.3.1 Transaction Record Parameters

| Transaction record parameter | Description |
|---|---|
| [arm_name] | The name of ARM used to dispense the blended product |
| [base_pressure] | Reference pressure that you define for volume correction |
| [base_temperature] | Reference temperature that you define for volume correction |
| [batch_actual_blend_percentage] | The actually blend percentage of the final product |
| [batch_gross_mass] | The total gross mass of the blend product dispensed during the batch |
| [batch_gross_observed_volume] | The total observed volume of blend stream product dispensed during the batch |
| [batch_gross_standard_volume] | The total gross standard volume of blend stream product dis- pensed during the batch |
| [batch_ID] | The batch ID associated with the following batch record |
| [batch_recipe_definition] | The blend recipe used during the batch (name, blend %, API symbol) |
| [batch_start_accumulated_gross_observed_volume] | The gross accumulated volume at the start of the batch |
| [batch_start_accumulated_gross_standard_volume] | The net accumulated volume at the start of the batch<br><br>NOTE: The Gross Standard Volume is sometimes referred as either Net Volume or Alternate Volume. |
| [batch_stop_accumulated_gross_observed_volume] | The gross accumulated volume at the end of the batch |
| [batch_stop_accumulated_gross_standard_volume] | The net accumulated volume at the end of the batch |
| [bay_name] | The name of the bay at which the transaction happened |

| Transaction record parameter | Description |
|---|---|
| [blend_point] | Specifies where the blend point was - upstream or down-stream |
| [blend_stream_average_pressure] | The average blend stream pressure during the transaction |
| [blend_stream_average_temperature] | The average blend stream temperature during the transaction |
| [calibration_number] | A counter incremented each time flow meter calibration is done |
| [commodity_group] | The commodity group of the blend product |
| [device_id] | A user-specified identifier for the unit |
| [device_type] | This describes the type of Fusion4 device the transaction record comes from |
| [expansion_coefficient] | The expansion factor used for commodity group C (special application) |
| [hazardous_material_classification] | A string that describes the hazardous material classification of the resulting product |
| [hydrometer_correction_used] | Indication whether a hydrometer correction was applied to the observed product density |
| [load_number] | An optional number supplied by TAS when the blender is used with loader |
| [non_W&M_error] | An error condition associated with the transaction that does not break W&M compliance |
| [observed_density] | The observed product density used to do density compensa- tion |
| [observed_pressure] | Pressure at which the product density measurement was done |
| [observed_temperature] | Temperature at which the product density measurement was done |
| [preset_volume] | When used with a preset, this value defines the preset volume amount. If not used in a preset mode, this value should be 0. |

| Transaction record parameter | Description |
|---|---|
| [pressure_compensation_used] | Expresses whether pressure compensation was used to cal- culate the gross standard volume |
| [site_name] | The name of the site where the transaction happened |
| [temperature_compensation_used] | Expresses whether temperature was used to calculate the gross standard volume |
| [transaction_record_integrity_value] | 160-bit digest value generated from SHA-1 hash function |
| [transaction_record_version] | The version of this transaction record |
| [transaction_start_date] | The date when the transaction began (sampled from RTC entity) |
| [transaction_start_time] | The time at which the transaction began (sampled from RTC entity) |
| [transaction_status] | Whether the device was W&M-compliant during the whole transaction |
| [transaction_stop_date] | The date when the transaction ended (sampled from RTC entity) |
| [transaction_stop_time] | The time at which the transaction ended (sampled from RTC entity) |
| [transaction_unique_identifier] | A string that uniquely identifies the transaction from all other transactions for all Fusion4 devices |
| [units_of_density] | The engineering units associated with all density measure- ments in this record |
| [units_of_mass] | The engineering units associated with all mass measure- ments in this record |
| [units_of_pressure] | The engineering units associated with all pressure measure- ments in this record |
| [units_of_temperature] | The engineering units associated with all temperature mea- surements in this record |
| [units_of_volume] | The engineering units associated with all volume measure- ments in this record |

| Transaction record parameter | Description |
|---|---|
| [volume_correction_ table] | An enumeration that specifically identifies the volume correc- tion method use during the transaction |
| [W&M_error] | An error condition associated with the transaction that breaks W&M compliance |
| [wild_stream_total_ transaction_volume] | The total wild stream volume moved during the transaction |

## 5.16.3.2  Transaction Alarm Codes

On the BOL (Bill of Lading) document, an alarm message is denoted as an alarm code. In the following tables, these alarm codes are explained.

> NOTE:  For an overview of all critical and non-critical alarms, see also Chapter 6 - Alarm Handling.

### 5.16.3.2.1  W&M Related Alarm Codes

| Alarm code | Description |
|---|---|
| 1 | ALARM_GENERAL_FAIL |
| 2 | ALARM_POWER_FAILURE |
|  |  |
| 50 | HMI_ALARM_NO_COMMUNICATION |
| 51 | HMI_ALARM_FATAL_ERROR |
| 52 | HMI_ALARM_STREAM_BOARD_FAILURE |
| 53 | HMI_ALARM_OPTION_BOARD_FAILURE |
| 54 | HMI_ALARM_LICENSE_FAILURE |
| 55 | HMI_ALARM_BATCH_PERMISSIVE |
|  |  |
| 100 | STREAM_ALARM_CONTROL_FAILURE |
| 103 | STREAM_ALARM_STREAM_START_ERROR |
| 104 | STREAM_ALARM_PULSE_PHASE |
| 105 | STREAM_ALARM_PULSE_GENERAL |
| 200 | STREAM_ALARM_VCF_ERROR |

| Alarm code | Description |
|---|---|
| 201 | STREAM_ALARM_TEMPERATURE_ERROR |
| 202 | STREAM_ALARM_PRESSURE_ERROR |

### 5.16.3.2.2  Non-W&M Related Alarm Codes

| Alarm code | Description |
|---|---|
| 56 | HMI_ALARM_SERVICE_DUE_REMINDER |
| 101 | STREAM_ALARM_NO_ACTIVITY_TIMEOUT |
| 102 | STREAM_ALARM_SOLENOID_FAILING |
| 106 | STREAM_ALARM_LEAKING_STREAM_VALVE |
| 107 | STREAM_ALARM_SLOW_FLOW_VOLUME |
| 108 | STREAM_ALARM_NO_PUMP_SENSE |
| 109 | STREAM_ALARM_BLOCK_VALVE_FAILING |
| 110 | STREAM_ALARM_FACTORED_PULSE_OUT |
| 111 | STREAM_ALARM_NO_HYDRAULIC_PRESSURE |
| 112 | STREAM_ALARM_TANK_LOW_LEVEL |
| 113 | STREAM_ALARM_TANK_EMPTY |
| 203 | STREAM_ALARM_STREAM_PERCENTAGE |
| 204 | STREAM_ALARM_WILD_STREAM_CLOSING_VOL |
| 205 | STREAM_ALARM_BLEND_STREAM_CLOSING_TIMEOUT |

# 5.16.4  Configurations

- Select <Configurations> from the Transfer main menu, the following screen appears.
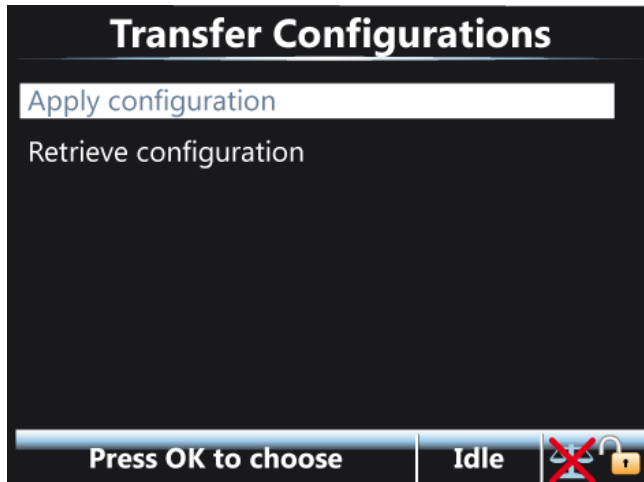
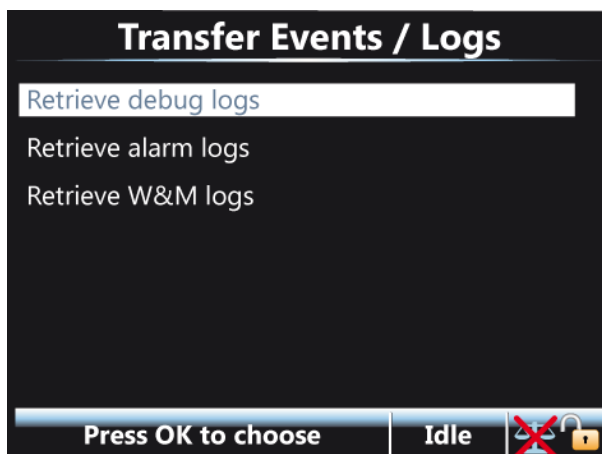- <Apply configuration> - Select <Apply configuration> to install the configu-ration present on the SD card.

- <Retrieve configuration> - Select <Retrieve configuration> to save the current configuration on the SD card.

  - Enter the name of the file you want to create on the SD card for the configuration setup and select Confirm.

    The process takes approximately 1 minute to complete.

## 5.16.5  Events / Logs

- Select <Events / Logs> from the Transfer main menu, the following screen appears.

- In the <Events / Logs> submenu, 3 types of logs can be retrieved from the SSC-B:

  - debug logs = advanced technology diagnostics;

  - alarm logs = historian of enabled device alarms;

  - W&M logs = software sealing activities of the SSC-B, performed by a notified body or accredited service engineer.

## 5.16.6  Recipes
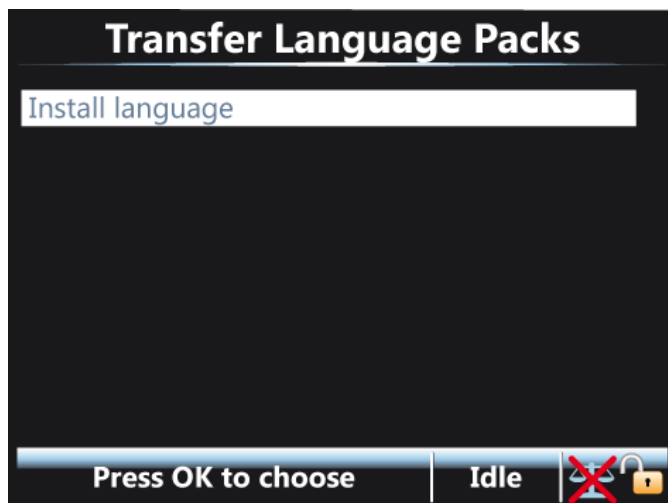
- Select <Recipes> from the Transfer main menu, the following screen appears.



- <Install recipe> installs a recipe present on the SD card.

- <Retrieve recipes> saves the current recipes to the SD card.
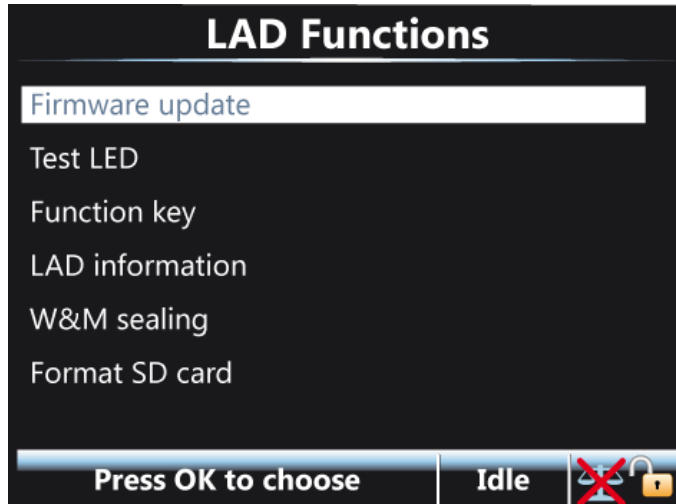
## 5.16.7  Language Packs

- Select <Language packs> from the Transfer main menu, the following screen appears.

# 5.17  LAD Functions

## 5.17.1  General

In this menu option, several typical LAD functions and activities can be invoked.



## 5.17.2  Firmware Upgrade

> NOTE:  Remove the old files that are available in this folder from previous upgrades before updating the files.

Perform the following steps to upgrade the device using the LAD.

1. Replace the following updated firmware files received in the \Honeywell\SSC-B\Generic\Firmware\ directory.

   - FS-HMI-ARM-APP_DSP_.bin

   - FS-HMI-FC-APP.mhx

   - FS-STREAM-FC-APP.mhx

   - FS-OPTION-FC-APP.mhx (Optional)

     > NOTE:  FS-OPTION-FC-APP.mhx file is only required if the Option card is installed in the device.

2. Plug-in the LAD to the SSC and make sure the SD card is in the LAD before plugging the LAD.

   A green status light on the LAD indicates that the SD card is inserted correctly and a red status light indicates that the SD card is missing.

   > NOTE:  Update the firmware only when the device is not being used.
   >
   > Do not insert or remove the SD card when the LAD is connected to the device and do not remove the LAD when an upgrade file is downloading.
   >
   > Do not perform the update procedure when there is a chance of a power outage as this can cause problems and/or make the device unusable.

3. Select <Firmware update> to either update the firmware of the SSC boards or the LAD firmware itself.
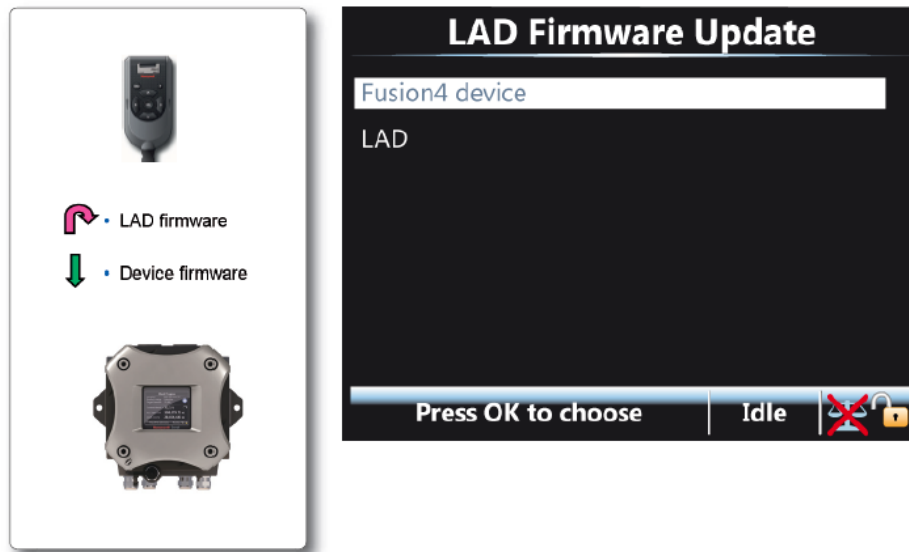
4.  Select <Fusion4 device>. The Transfer Select Item screen appears.
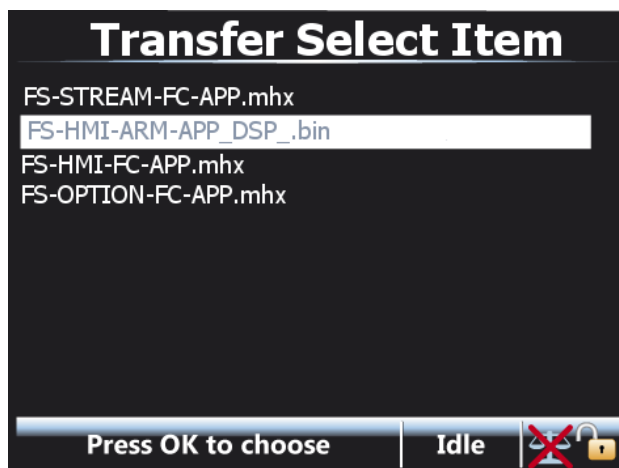


Select the firmware files in the following order to update the files.

1.  FS-HMI-ARM-APP_DSP_.bin

    - The total time for the firmware update file is 6 minutes approxi- mately.

    - After the file is updated, remove and plug the LAD again to re- initialize it. If you do not plug the LAD again, then the device may not recognize the SD card when the next file is downloaded.

2.  FS-HMI-FC-APP.mhx

- The total time for the firmware update file is 3 minutes approxi- mately.

- After the file is updated, remove and plug the LAD again to re- initialize it. If you do not plug the LAD again, then the device may not recognize the SD card when the next file is downloaded.

3. FS-STREAM-FC-APP.mhx

- The total time for the firmware update file is 9 minutes approxi- mately.

- After the file is updated, acknowledge and reset the alarm by performing the following steps.

  1. Select <Active alarms> from the Diagnostics main menu.

  2. Select <Reset Device> to reset the device.

  3. FS-OPTION-FC-APP.mhx (if required)

     - The total time for the firmware update file is 6 minutes approxi- mately.

     - Update the file only if it is available.

Once the firmware updation is successful, a message is displayed confirming the same.

If you see an alarm "Stream board missing" when updating the stream board firmware or "Option board missing" when updating the option board firmware, ignore the alarm and re-enable the device once.

NOTE:  If the Fusion4 portal is interfaced with the SSC-B device, make sure that there are no unprocessed transactions from the portal side before starting the firmware updation sequence.

## 5.17.2.1  Verify the Firmware Update

Verify the following to make sure that the files are updated.

1. Select <Versions> from the Info main menu to ensure the latest version is available in the column App. ver.

**Firmware versions**

| Board | Boot ver. | App. ver. | App. build |
|---|---|---|---|
| HMI FC | A10020 | A2310 | 1207 |
| HMI ARM | A2310 | A2310 | 1207 |
| STREAM | B10001 | A2310 | 707 |
| OPTION | B10001 | A2310 | 207 |

Idle

2.  Verify the parameter settings to check if they are the same as they were previously in the old firmware.

3.  Select <System health> from the Diagnostic main menu. Select one of the boards and then select <Ok>. The test should display, "Good/No Error".

## 5.17.3  Test LED, Function Key, and LAD Information Submenus

- In the <Test LED> submenu (see the following screen), the following diagnostics or I/O tests can be visualized on the "Test" LED of the LAD.

    - HMI board
    - Device manager
    - Alarm manager
    - Transaction manager
    - Batch manager
    - HMI module
    - Display manager
    - LAD
    - STREAM board
    - Comms
    - D1 AC 2
    - DI DC 1
    - DI DC 2

- DO AC 1
- DO AC 2
- PO DC 1
- PO DC 2
- PI
- DI AC1
- DO EMR
- Blend manager
- Additive manager
- STREAM module
- OPTION board
- OPT Comms
- OPT DO EMR
- OPT DI AC 1
- OPT DI AC 2
- OPT DI AC 3
- OPT DI AC 4
- OPT AO DC
- OPT RTD
- OPT DO AC
- OPT DI DC 1
- OPT DI DC 2
- OPTION module
- OPT AI DC
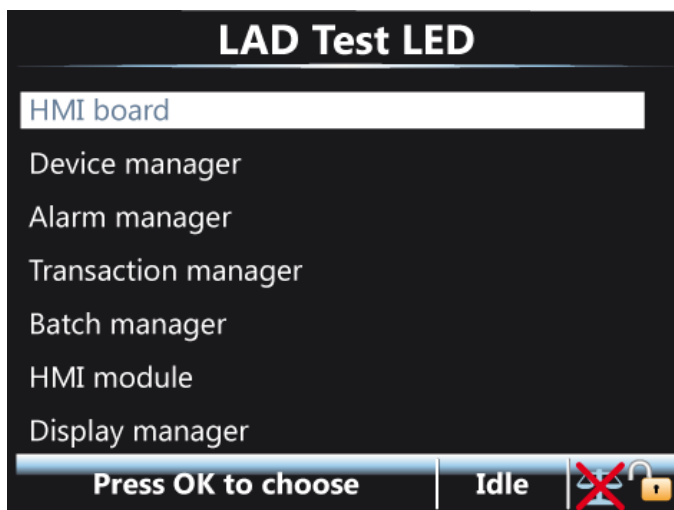
> **NOTE:** Test LED functions are inactive while retrieving other records from the LAD.

- In the <Function key> submenu, specific functions can be programmed to the "F key" of the LAD, in order to achieve a much quicker operation of the SSC.

- This configuration is saved on the LAD, so changes made to the function key works with other devices as well.
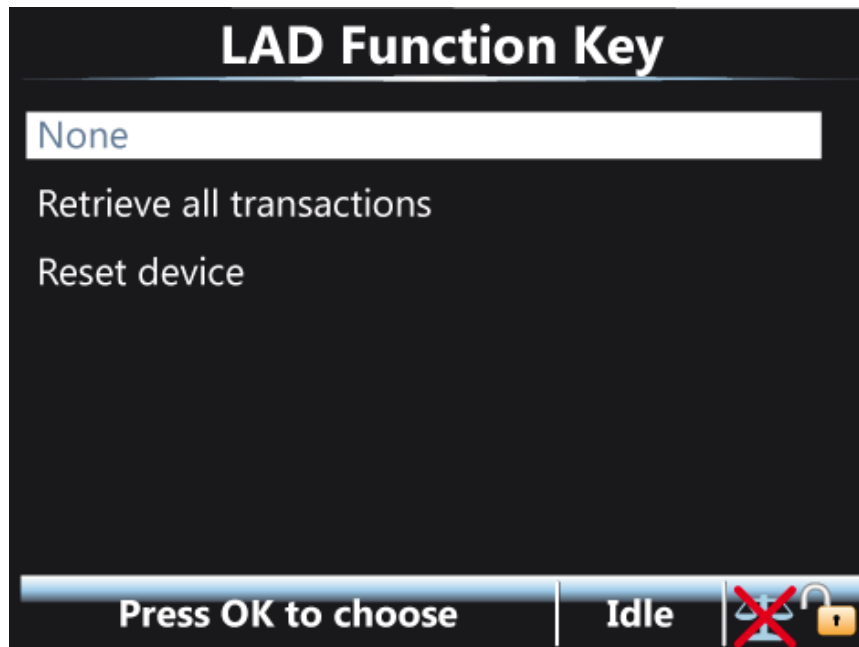


- Select the <LAD information> submenu results in an overview of all relevant LAD information and diagnostics.

  - Serial number
  - SD card memory
  - NVRAM memory
  - Voltage
  - Temperature
  - Hardware version
  - Application version
  - Bootloader version
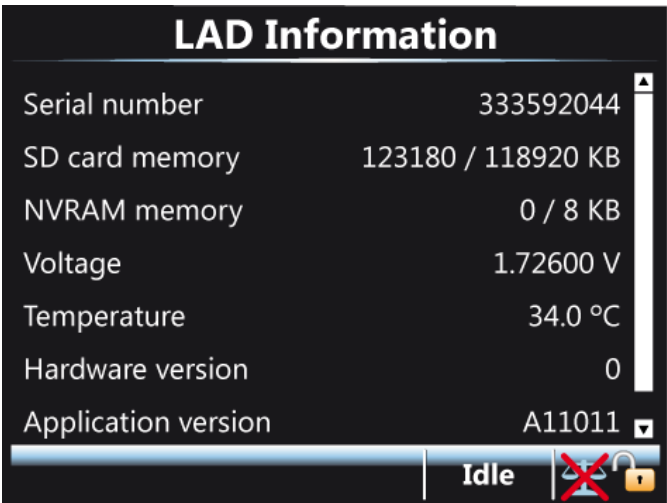
## 5.17.4  Format SD Card

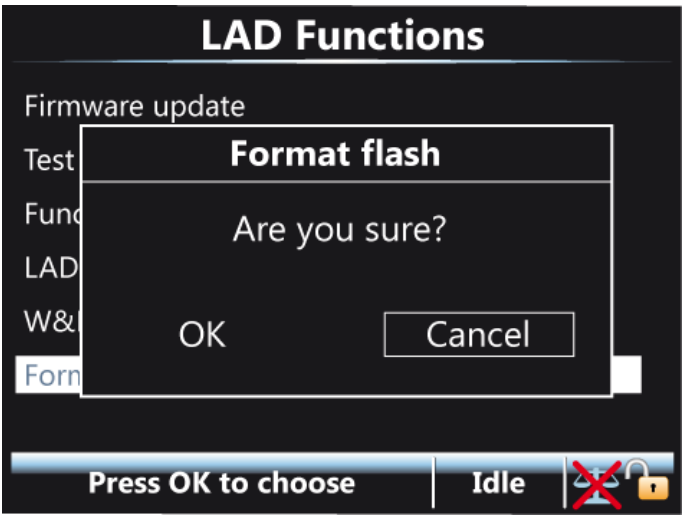With this option the SD card of the LAD can be formatted.

CAUTION:  All content is erased!

# 6  Alarm Handling

## 6.1  General

Through the SSC menu, various alarm configurations can be set. Moreover, active alarms, transactions alarms, and alarm logs can be displayed.

## 6.2  Alarm Output Configuration

- The alarm-indication output can be set with [Alarm indication] I/O binding.

- The alarm-permissive output can be set with [Alarm shutdown] I/O binding.

### 6.2.1  Alarm Configuration

Each alarm initiates an action, which can be configured. See the following table.

| Alarm setting | Effect |
|---|---|
| Disabled | The alarm is ignored. |
| Display | - Alarm shown on the display<br>- Alarm-indication output set to ON |
| Shutdown (default) | - Alarm shown on the display<br>- Alarm-indication output set to ON<br>- Alarm-shutdown output set to ON<br>- Running transactions are stopped<br>- Start-up of new transactions impossible |

NOTE:  Per alarm, more options can be configured.

# 6.3  Stream Alarms

| Alarm | Cause |
|---|---|
| Control failure | The control failure alarms are generated when the deviation count is outside the [outer control window] for [control failure timeout]. |
| VCF error | The volume correction calculations detected an error. |
| Pulse phase | Pulses are out of phase. Only if the device has been configured for quad pulse. |
| Temperature error | The temperature sensor returned an invalid value or the value exceeds the configured alarm threshold value. |
| Pressure error | The pressure sensor returned an invalid value or the value exceeds the configured alarm threshold value. |
| Blend stream percentage | The transactional blend stream percentage is higher than the target blend percentage plus the [high percentage allowed], or the transactional blend stream percentage is lower than the target blend percentage minus the [low percentage allowed]. |
| Leaking valve | Device was idle, but more than the [leaking volume limit] was measured. |
| Wild stream closing volume | The permissive was dropped, but the SSC is measuring more wild stream volume than the [wild stream closing volume]. |
| Blend stream closing timeout | The blend valve was not closed in the [Blend stream closing time]. |
| No activity | The SSC started a new transaction, but after the [no activity timeout] still no wild stream was detected. |
| Flush volume | The SSC was in the slow-flow state (clean-arm function), and [Flush volume] (wild stream) minus the [Flush volume deviation] was not measured. |
| Stream start error | Error during new transaction start-up. |

| Alarm | Cause |
|---|---|
| No pump | The pump did not receive a feedback signal in the [pump feedback timeout].<br><br>Only possible if the I/O binding for pump ON/OFF and pump indication are configured. |
| Factored pulse out | The factored pulse output channel (blend volume output) was configured such that it cannot keep track of the blend volume. |
| No hydraulic pump | The hydraulic pump did not receive a feedback signal in the [hydraulic feedback timeout]. Only possible if the I/O binding for hydraulic pump ON/OFF and hydraulic pump indication have been configured. |
| Tank low level | The tank is almost empty but the running transaction can be continued until the "Tank empty" alarm is set. |
| Tank empty | The tank is empty, the transaction cannot be finished. |
| Block valve fault | When the system is not able to activate or deactivate the block valve. |
| Pulse hardware fault | This alarm is generated when the pulse input module detects the following error conditions.<br><br>• Error reading information from the PIC controller<br><br>• Pulse overflow errors<br><br>• BAD health of pulse input function |

# 6.4  HMI Alarms

| Alarm | Cause |
|---|---|
| No option board | Option board disappeared.<br><br>Only if an option board was detected during start-up.<br><br>NOTE:  If this alarm appears just after the firmware upgrade of the option board, ignore the alarm and re-enable the device. |

| Alarm | Cause |
|---|---|
| No stream board | Stream board disappeared.<br><br>NOTE:  If this alarm appears just after the firmware upgrade of the stream board, ignore the alarm and re-enable the device. |
| License key | No license key set.<br><br>Determines additive or blending mode. |
| Batch permissive | SSC was about to start transaction, but during creating a transaction record some error occurred. |
| Interboard connection | Communication between ARM processor and the HMI processor failed. |
| HMI fatal error | Unknown fatal error |
| Service due expired | The [Next scheduled service] date has been expired. |

# 6.5  Alarm Logs

Any alarm-state change that occurs is logged with a time stamp.

In the Alarm log screen, all alarm states that have been changed can be examined.

# 6.6  Active Alarms

The Active alarms screen shows all active and acknowledged alarms.

An active alarm can be acknowledged in the Active alarm screen by selecting this alarm and then select <OK>. The state of the alarm now changes to <ACKNOWLEDGED>, and a new alarm log item is created.

This can also be done through Comms, by entering the relevant alarm number into [acknowledge the specified alarm].

It is also possible to reset all alarms with the command <RE-ENABLE>. This results in all alarms being reset to the state <INACTIVE>.

This can also be done through Comms through [reset all alarms], or hard- wired. For the latter, the entity [I/O binding alarm reset input] must be configured accordingly.

## 6.6.1  Alarm Manager Entities

- By reading the [active alarm bitmask] using the Fusion4 Portal, the active alarm ID appears. Each alarm has a unique ID. Combined alarms are possible as well.

| ID | Alarm message |
| --- | --- |
| 0x0000 | NO_ALARM |
| 0x0001 | ALARM_GENERAL_FAIL_HMI |
| 0x0002 | ALARM_NO_COMMUNICATION |
| 0x0004 | ALARM_FATAL_ERROR |
| 0x0008 | ALARM_STREAM_BOARD_FAILURE |
| 0x0010 | ALARM_OPTION_BOARD_FAILURE |
| 0x0020 | ALARM_LICENSE_FAILURE |
| 0x0040 | ALARM_BATCH_PERMISSIVE |
| 0X0080 | ALARM_SERVICE_DUE_REMINDER |
| 0x0100 | STREAM_ALARM_GENERAL_FAIL_STREAM |
| 0x0200 | STREAM_ALARM_CONTROL_FAILURE |
| 0x0400 | STREAM_ALARM_VCF_ERROR |
| 0x0800 | STREAM_ALARM_PULSE_PHASE |
| 0x1000 | STREAM_ALARM_PULSE_GENERAL |
| 0x2000 | STREAM_ALARM_TEMPERATURE_ERROR |
| 0x4000 | STREAM_ALARM_PRESSURE_ERROR |
| 0x8000 | STREAM_ALARM_STREAM_PERCENTAGE |
| 0x10000 | STREAM_ALARM_LEAKING_STREAM_VALVE |
| 0x20000 | STREAM_ALARM_WILD_STREAM_CLOSING_VOLUME |
| 0x40000 | STREAM_ALARM_BLEND_STREAM_CLOSING_TIME |
| 0x80000 | STREAM_ALARM_NO_ACTIVITY_TIMEOUT |

| ID | Alarm message |
|----|---------------|
| 0x100000 | STREAM_ALARM_FLUSH_VOLUME |
| 0x200000 | STREAM_ALARM_STREAM_START_ERROR |
| 0x400000 | STREAM_ALARM_NO_PUMP_SENSE |
| 0x800000 | STREAM_ALARM_FACTORED_PULSE_OUT |
| 0x1000000 | STREAM_ALARM_NO_HYDRAULIC_PUMP_SENSE |
| 0x2000000 | STREAM_ALARM_TANK_LOW_LEVEL |
| 0x4000000 | STREAM_ALARM_TANK_EMPTY |

- By reading the [Total numbers of implemented alarms] using the Fusion4 Portal, the number of alarms available is shown.

- By reading the [Alarm state] using the Fusion4 Portal, the state of all alarms in the device are shown.

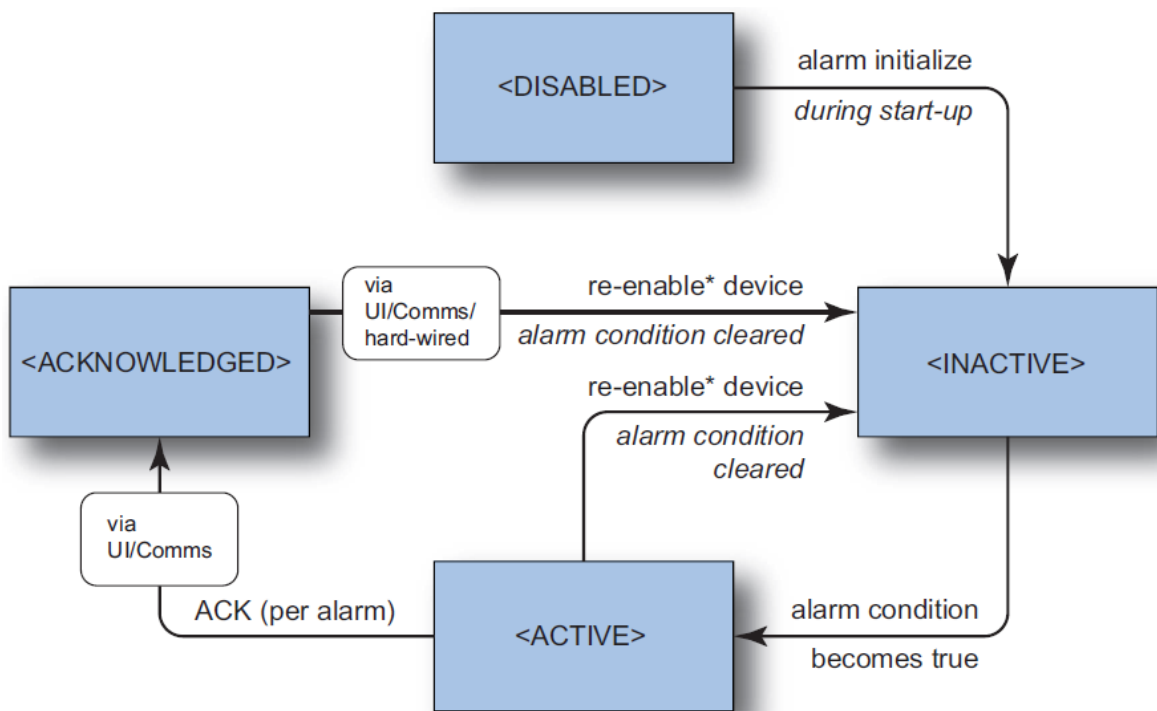  There are four possibilities:

  - <DISABLED>
  - <INACTIVE>
  - <ACTIVE>
  - <ACKNOWLEDGED>

- [Critical] If an alarm is WnM-related, this field is set.

  Used in transaction record. If an alarm is configured for shutdown, display = critical. If any other alarm configuration, display = not critical.

- [Non-critical] Any other alarm that is not WnM-related. Used in transaction record.

Figure 6-1: Operational alarm states



* re-enable = clear all alarms

# 6.7 Alarms through Communication

Also SSC-B alarms - as listed in the table from section 6.7.1 - are used in the protocols running through the communication channel (Comms). These values are determined by reading the 4-digit alarm value in the transaction-record detail for a previously completed transaction.

The entity [alarm_name_alarm_action] defines if the particular alarm is handled as a "Critical transaction alarm" or a "Non-critical transaction alarm".

When configured as "Shutdown", the particular entity is handled as a "Critical transaction alarm".

See the following table.

| ID | Alarm message |
|---|---|
| 0x0000 | NO_ALARM |

| ID | Alarm message |
|---|---|
| 0x0001 | ALARM_CONTROL_FAILURE |
| 0x0002 | ALARM_BLEND_PERCENTAGE |
| 0x0004 | ALARM_LEAKING_BLEND_VALVE |
| 0x0008 | ALARM_WILD_STREAM_CLOSING_VOL |
| 0x0010 | ALARM_BLEND_STREAM_CLOSING_TIME |
| 0x0020 | ALARM_NO_ACTIVITY |
| 0x0040 | ALARM_FIRMWARE_CORRUPT |
| 0x0080 | ALARM_VCF_ERROR |
| 0x0100 | ALARM_FLUSH_VOLUME |
| 0x0200 | ALARM_LICENSE_ERROR |
| 0x0400 | ALARM_VALVE_ERROR |
| 0x0800 | ALARM_POWER_FAILURE |
| 0x1000 | ALARM_PULSE_ERROR |
| 0x2000 | ALARM_NO_PUMP |
| 0x4000 | ALARM_SENSOR_ERROR |
| 0x8000 | ALARM_TANK_MONITOR_ERROR |

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MN06304