Fusion4 SSC-A

Installation & Operation Manual

MN06302 (August 2025)

Important

All information and technical specifications in this document have been carefully checked and compiled by the author; however, we cannot completely exclude the possibility of errors. Guidant Measurement is always grateful to be informed of any errors; contact us at TechnicalCommunications@GuidantMeasurement.com.

Caution

The default or operating values used in this document and in the configuration parameters of the product described in this document are for factory testing only and should not be construed as default or operating values for your system. Each system is unique and each configuration parameter must be reviewed and programmed for that specific system application.

Disclaimer

Guidant hereby disclaims all responsibility for damages, including but not included to consequential damages arising out of or related to the inputting of incorrect or improper program or default values entered in connection with the product described in this document.

Technical Support

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Contents

1 General

1.1 Product Introduction

The Fusion4 Single Stream Controller-Additive, or SSC-A, is a hazardous-area, intelligent-additive injection controller, using state-of-the-art microprocessor technology for high-accuracy additive injection applications.

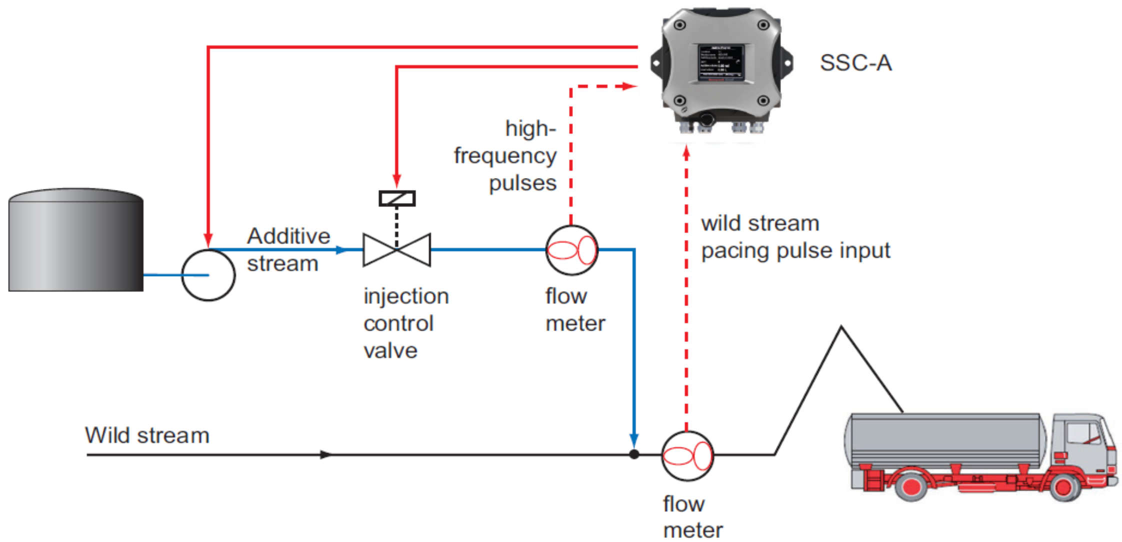
The SSC-A is designed to control a single additive stream. It can operate within any product transfer application, such as road tanker loading, rail off-loading, or pipeline transfer, where chemical additives need to be injected to the process stream.

One basic principle of operation is achieved by the SSC-A monitoring the flow of the wild stream, and using this flow rate to accurately pace the flow of additive stream to a defined recipe (additive volume) in the SSC-A. See the figure below.

> NOTE: Additional pacing modes are available. For details, see Chapter 3 - System Description.

The pacing of the additive stream is realized through accurate, rapid injections of very small volumes of additive into the process, as per wild stream pacing volume.

Figure 1-1: Basic SSC-A Principle of Operation (example)



1.2 Functionality Overview

Functionality	SSC-A
Common hardware platform (Additive & Blending)	√
Common firmware version (Additive & Blending)	√
Global Ex approvals (ATEX, FM, CSA, IECEx)	√
ASTM-compliant temperature compensation	√
ASTM-compliant 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

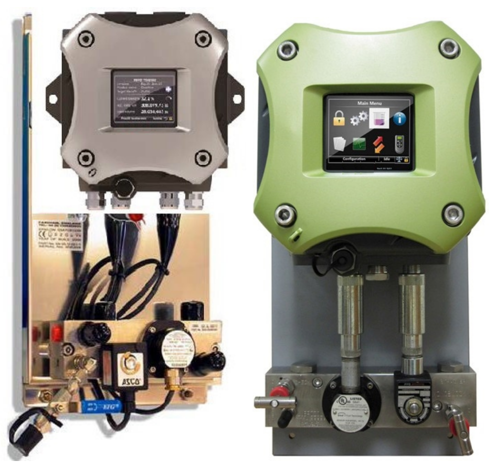
Functionality	SSC-A
Calibration log records	100
Comms ports	2
Digital inputs	13
Digital outputs	7
Analog I/O and RTDs	3

> NOTE: The above functionality is only applicable for the complete SSC stack.
>
> HMI Board : 1
>
> ADD Blend Board : 1
>
> OPTION Board : 1

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-A.

Figure 1-2: SSC-A in Fusion4 MiniPak, EU Market (left) and US Market (FM/UL version, right)



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 recommend your attention to prevent damages to the equipment.

> CAUTION: ElectroStatic Discharge (ESD) sensitive device.

2.2 Safety Instructions for the SSC

2.2.1 General

> 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 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. CAUTION: Seal conduit within 18 inches.	Zone 1	WARNING: Do NOT open when an explosive atmosphere may be present. CAUTION: Seal conduit within 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. CAUTION: Seal conduit within 18 inches.	Zone 2	WARNING: Do NOT open when an explosive atmosphere may be present. CAUTION: Seal conduit within 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 procedure must 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/ -40°F ... +149°F) 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 overalls, safety shoes, safety glasses, working gloves, LEL-meter.
>
> Pay attention to the kind of product involved. If there is any danger to your health, wear a gas mask and take all necessary precautions.
>
> 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 within an explosive hazardous environment, unless otherwise stated on the safety label.
>
> 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 build 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

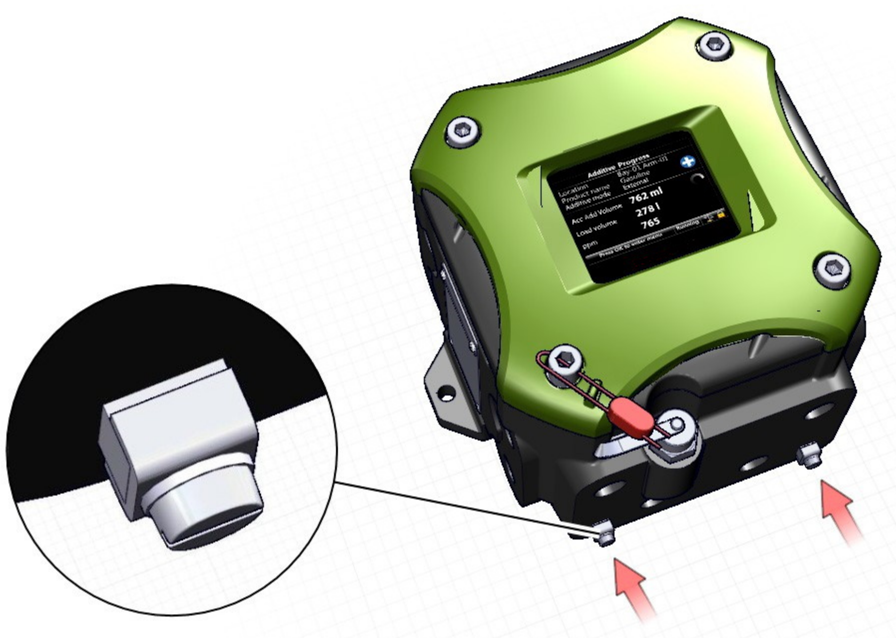
- The entire electrical installation must be in accordance with the International Standard EN IEC 60079-14 for electrical equipment in hazardous areas or with NEC (NFPA70) requirements.
- The stopping plugs, cable glands, and reducers must be installed in accordance with appropriate IP requirements
- 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: Ensure the housing of the device is properly connected to the ground reference. See the following figure.

Ensure the electrical resistance of the ground connections is below the maximum prescribed by local requirements.

Figure 2-1: Grounding Connections of the SSC



2.2.4 Accordance to Regulations

2.2.4.1 Explosion Safety

<table>
<tr><th>Approval</th><th>Certificate No.</th><th colspan="3">Type of Protection Identification</th></tr>
<tr><td>ATEX</td><td>KEMA 10ATEX0095 X</td><td rowspan="2">Ex II 2 G</td><td rowspan="3">Ex db [ia] IIB T6 Gb</td><td rowspan="6">Ta = -40°C ... +65°C (-40°F ... +149°F)</td></tr>
<tr><td>UKEX</td><td>DEKRA 21UKEX0226X</td></tr>
<tr><td>IECEx</td><td>IECEx KEM 10.0044 X</td><td>Zone 1</td></tr>
<tr><td>FM</td><td>3040469</td><td>Class I, Division 1</td><td>group C, D T6</td></tr>
<tr><td rowspan="2">CSA</td><td rowspan="2">2395296</td><td>Class I, Division 1</td><td>group C, D T6</td></tr>
<tr><td>Zone 1</td><td>Ex d [ia] IIB T6</td></tr>
</table>

2.2.4.2 FCC Compliance

This device complies with Part 15 of the FCC Rules. The device does not cause harmful interference and accepts any interference received.

2.2.4.3 Low-Voltage Directive

The device is suitable for:

- Pollution degree 2
- Overvoltage category II
- Class I equipment

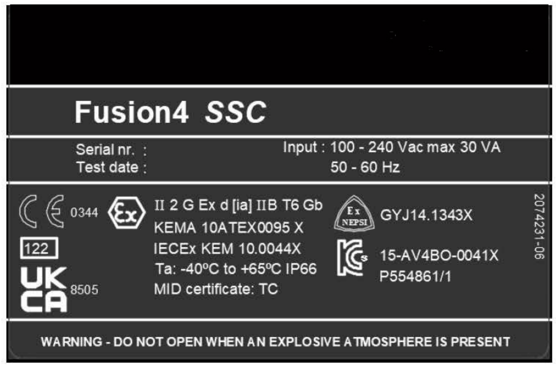
2.2.4.4 Reference of Applicable Standards

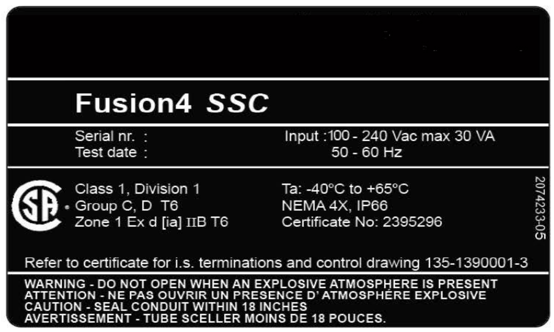
Standard	Description
ATEX 95	Applicable for manufacturers of equipment that is used in places where explosion danger may exist.

Standard	Description
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 Conformity and hence has been tested and manufactured under systems that are under ongoing surveillance by ExCBs.
FM	Factory Mutual Approvals Division 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 The standards generated by CSA are the cornerstone for determining a product's eligibility for certification in hazardous locations in Canada.

2.2.4.5 SSC-A Labels

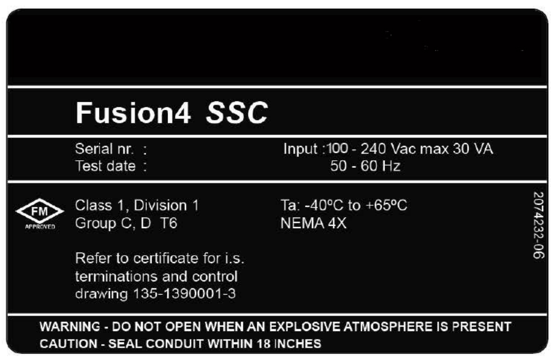
Figure 2-2: Identification Labels with Safety Note on the SSC





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: 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 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 rapid transfer of transaction data, configuration files and calibration records, and also upgrading the firmware in the field.

WARNING: Only use the instrument for its intended purpose.

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

<table>
<tr><th>Approval</th><th>Certificate No.</th><th colspan="3">Type of Protection Identification</th></tr>
<tr><td>ATEX</td><td>KEMA 10ATEX0152</td><td>⟨Ex⟩ II 2 G</td><td>Ex ia IIB T4 Gb</td><td rowspan="6">Ta = -20°C ... +65°C
(-40°F ... +149°F)</td></tr>
<tr><td>UKEX</td><td>DEKRA 21UKEX02228</td><td>⟨Ex⟩ II 2 G</td><td>Ex ia IIB T4 Gb</td></tr>
<tr><td>IECEx</td><td>IECEx KEM 10.0070</td><td>Zone 1</td><td>Ex ia IIB T4 Gb</td></tr>
<tr><td>FM</td><td>3041202</td><td>Class 1, Division 1</td><td>group C, D T4</td></tr>
<tr><td>CSA</td><td>2395571</td><td>Class 1, Division 1</td><td>group C, D T4</td></tr>
<tr><td>CSA</td><td>2395571</td><td>Zone 1</td><td>Ex ia IIB T4</td></tr>
</table>

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.

2.3.4 Commissioning

Commissioning the instrument and Fusion4 parent devices using this controller may be conducted by qualified engineers, trained by Guidant and with 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

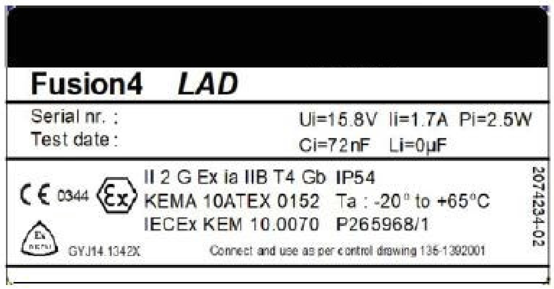
If you require additional information, contact Guidant or its representative.

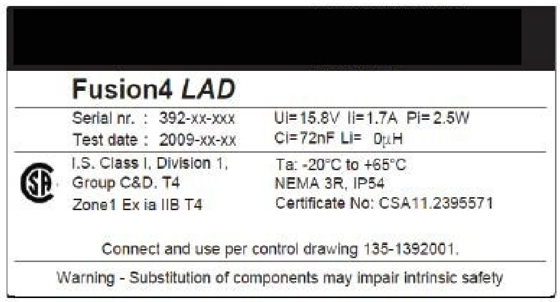
2.3.8 Environmental Conditions

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

2.3.9 LAD Labels

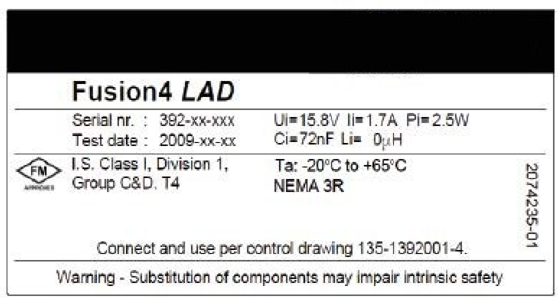
Figure 2-4: Identification Labels with Safety Note on the LAD





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 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. 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 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.
- 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.
- 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

Follow these steps to install the device:

1. Remove the security screws from the compartment lid.
2. Slide the battery compartment lid from the device.
3. 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.

Follow these steps to use the device:

1. Direct the device at the IR port of the equipment to be programmed.
2. Select ATTN on the IR Controller to turn on 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 of inactivity. This helps in preserving the battery life.

2.4.6 Maintenance and Troubleshooting

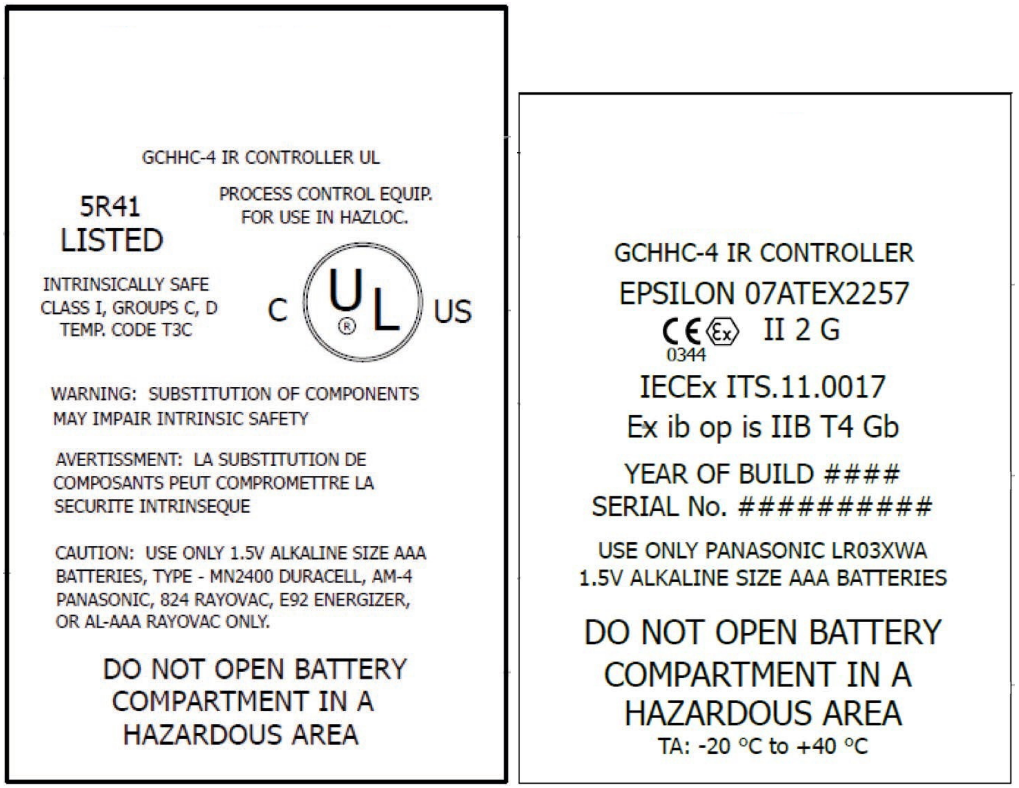
In the unlikely event of malfunction, only a qualified service engineer, trained Guidantand with knowledge of safety regulations for working in hazardous areas is allowed to repair the instrument.

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 equipment caused by:

- Deviation from any of the prescribed procedures
- Execution of activities that are not prescribed
- Neglect of the safety regulations for handling tools and use of electricity

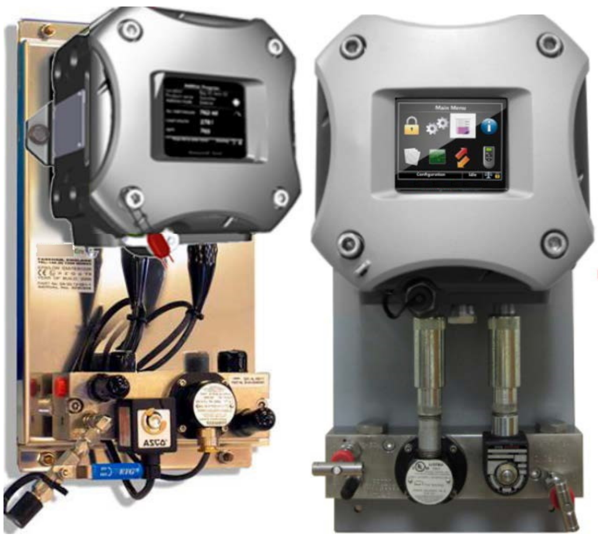
The contents, descriptions, and specifications in this manual are subject to change without notice. Guidant accepts no responsibility for any errors that may appear in this manual.

> 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 invalidate the approval certificates.

3 System Description

3.1 Introduction

3.1.1 General



The main function of the SSC-A is controlling and monitoring the flow of a single additive injection stream.

It can operate within any product transfer application, such as road tanker loading, rail off-loading, or pipeline transfer, where chemical additives need to be injected to process.

3.1.2 Injection Principle

The pacing of the additive stream is achieved through accurate, rapid injections of very small volumes of additive, at frequently and as per wild stream pacing volume.

The SSC-A is a cycle-based injector, meaning that the additive does not dispense continuously. An internal recipe controls the ratio of additive being injected to the process stream. In a typical application, the process flow rate is monitored by the controller. As chemical additive is called, the controller opens a solenoid control valve and injects a small quantity of additive into the process stream. When the required quantity is reached, the controller closes the valve and waits until the next injection is required. The injection cycle repeats in this manner, keeping the additive “in pace” with the process flow. The reason for cyclical injection technology is uniform mixing of product and additive. Two of the recipes used call for a few parts per million ratio of additive to process.

3.1.3 SSC-A Injection Control

In general, the SSC-A requires the following items to operate.

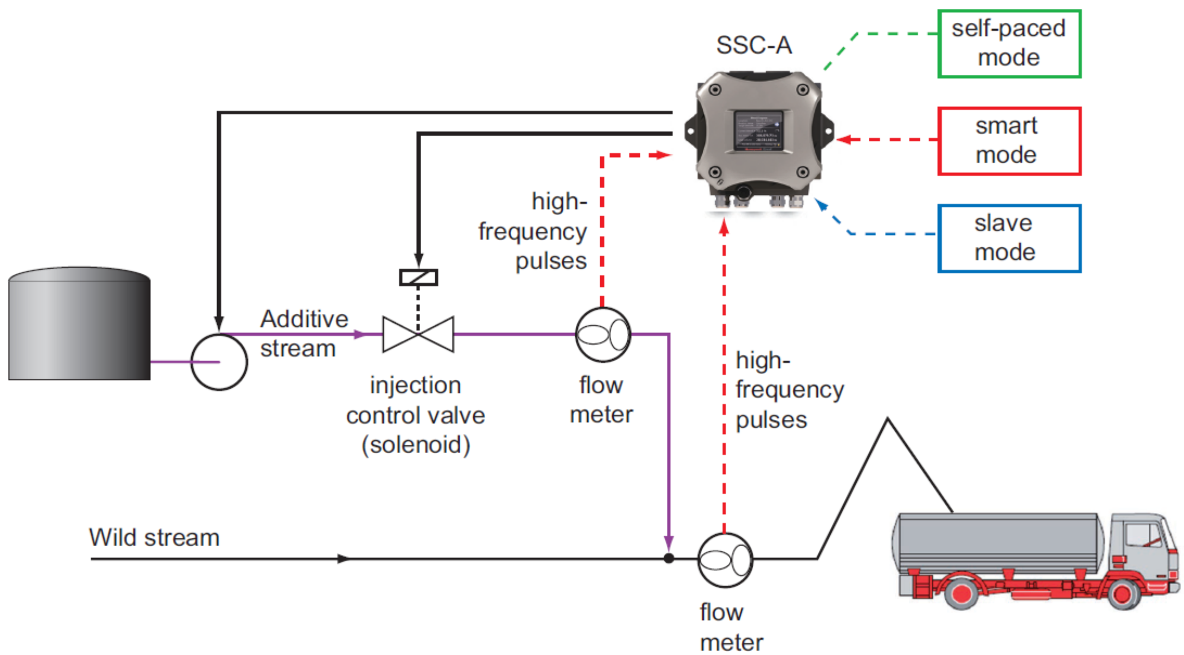
- AC Power
- Pacing-signal setup
- Permissive signal (minimal one)
- Target additive ratio to target product (ppm)

The injection control of the SSC-A can be achieved in different pacing modes:

- Self-paced mode: In self-paced mode the injector will inject without an external pacing signal and will inject based upon a time interval. Time interval could be derived from flow rate of wild stream and total amount of additive volume.
- Smart mode: An external trigger source (Pulse Input, Digital Input, Analog Input, or Comms) makes the SSC-A injecting a configurable additive volume.
- Slave mode: In this case additive injection is fully controlled by an external device. In slave mode, Injection volume control must be provided by an external source such as a PLC or data system. When the pacing signal input is on (voltage present), the solenoid control output is on. The external controlling system must accumulate additive flow and determine when to close the solenoid by turning off the pacing signal input to the SSC-A.

To adequately match the various specific applications, the SSC-A has a number of configurable parameters available. For an explanation of all these parameters and their specific settings, see Chapter 5 - Operation.

Figure 3-1: SSC-A Pacing Control Modes



3.1.4 Menu-Based SSC-A Control

With an external control device, the SSC-A can be fully controlled through its integrated, menu based interface.

This control device can be either:

- The Fusion4 IR Controller
- The RS-485-connection-based Local Access Device (LAD)

Using one of these devices, you can navigate menus, change settings (commissioning), initiate a calibration, and diagnose problems.

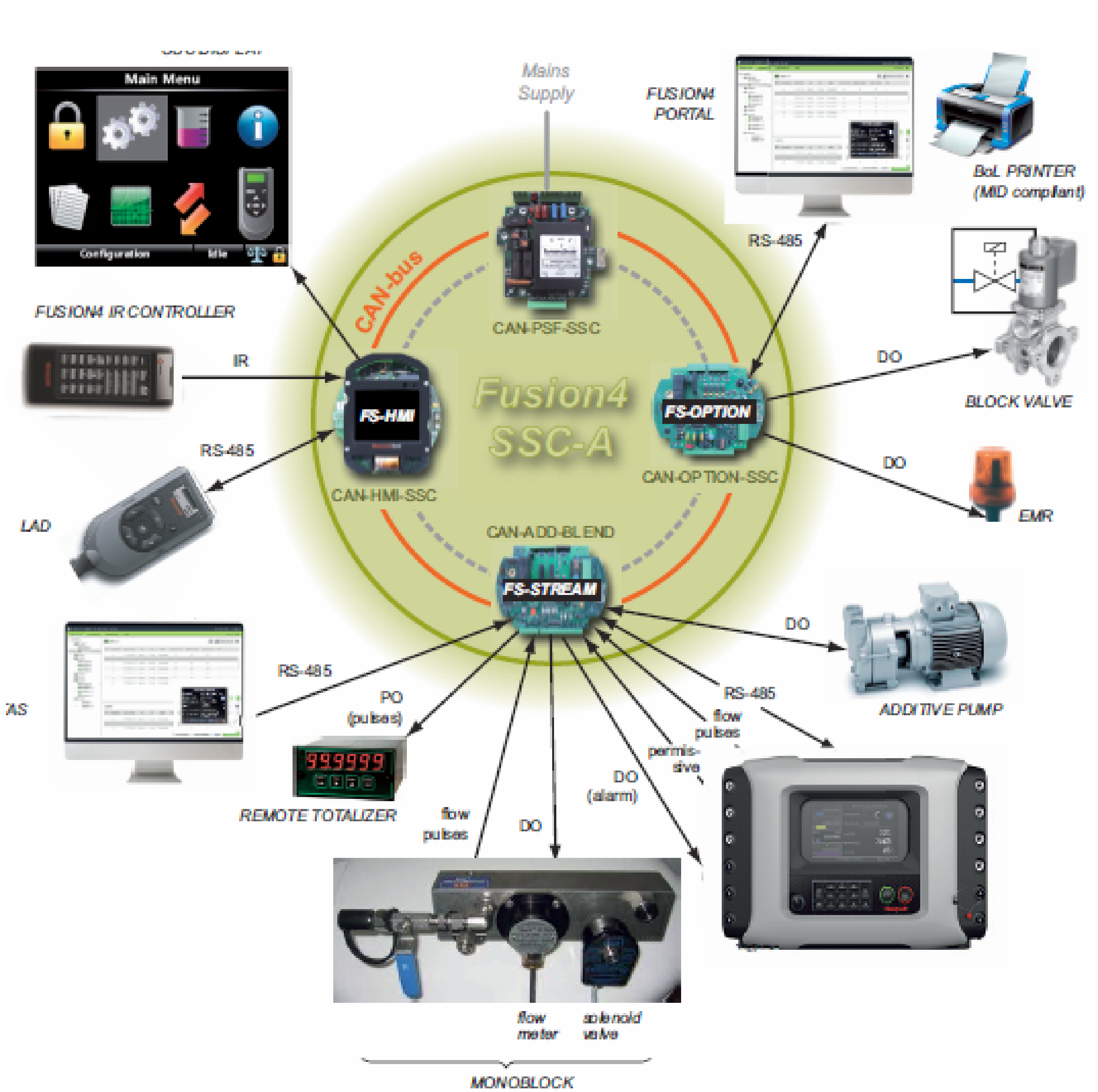
3.2 System Architecture

Founded on FlexConn architecture, the SSC-A is a member of the Fusion4 portfolio of loading automation and control products.

The Fusion4 SSC-A system is built from interchangeable hardware modules. These modules consist of uniform Printed Circuit Boards (PCBs), 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 3-2: Fusion4 SSC-A Architecture Overview

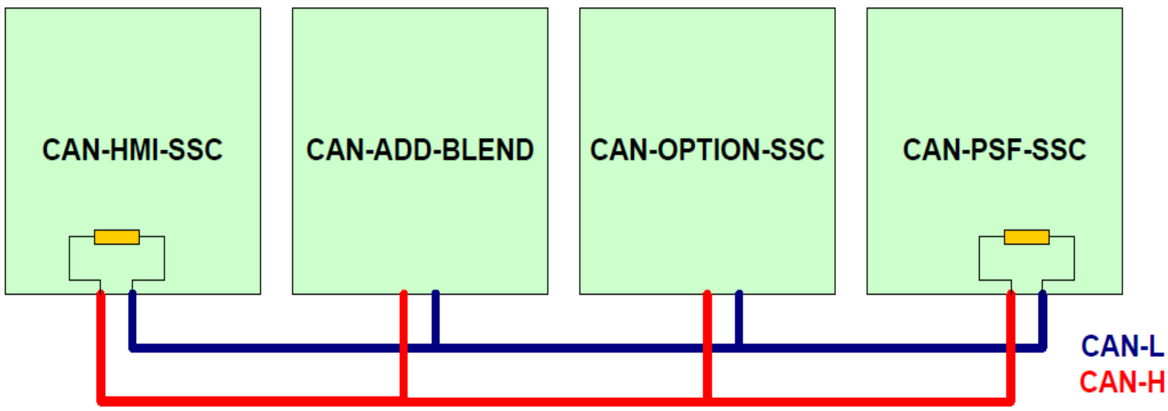


3.3 FlexConn Modules

3.3.1 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 bus to which each FlexConn module connects.

Figure 3-3: 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 instruments around the loading gantry.

A communication function ensures communication with a communication interface unit or with a DCS, SCADA, tank inventory, or another terminal automation system.

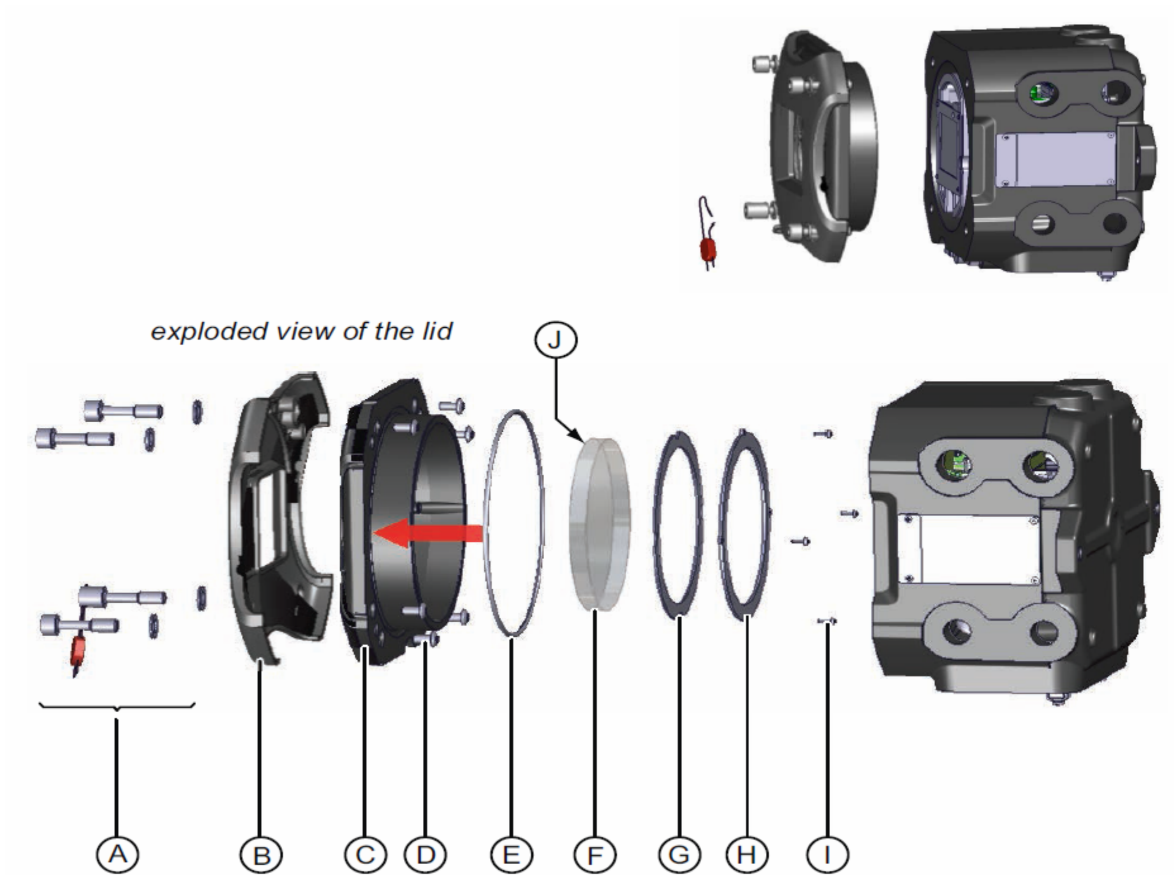
A display function makes it possible to communicate with the module(s) through a Human-Machine Interface.

3.4 Hardware Structure

3.4.1 Housing

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

Figure 3-4: Housing of the SSC-A



Label	Description
A	Captive socket-head screws (4x), of which 1 has an enlarged head for sealing purposes
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)

3.4.2 Interior

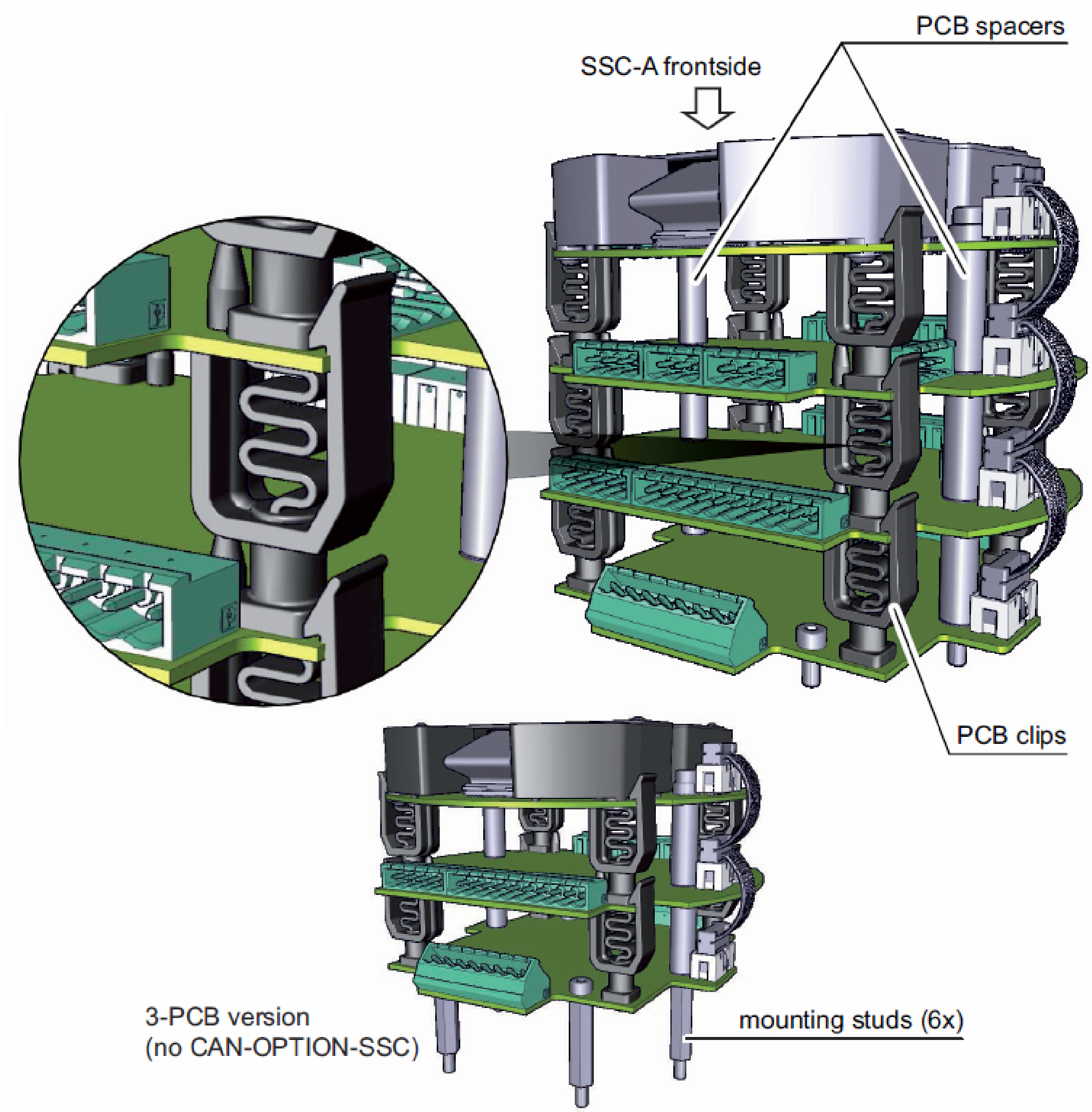
Within the rugged, sand-casted housing, the printed circuit boards of the SSC-A are stacked by means of plastic board-retaining clips.

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

The boards are interconnected by a flat cable, providing power and serial communication.

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

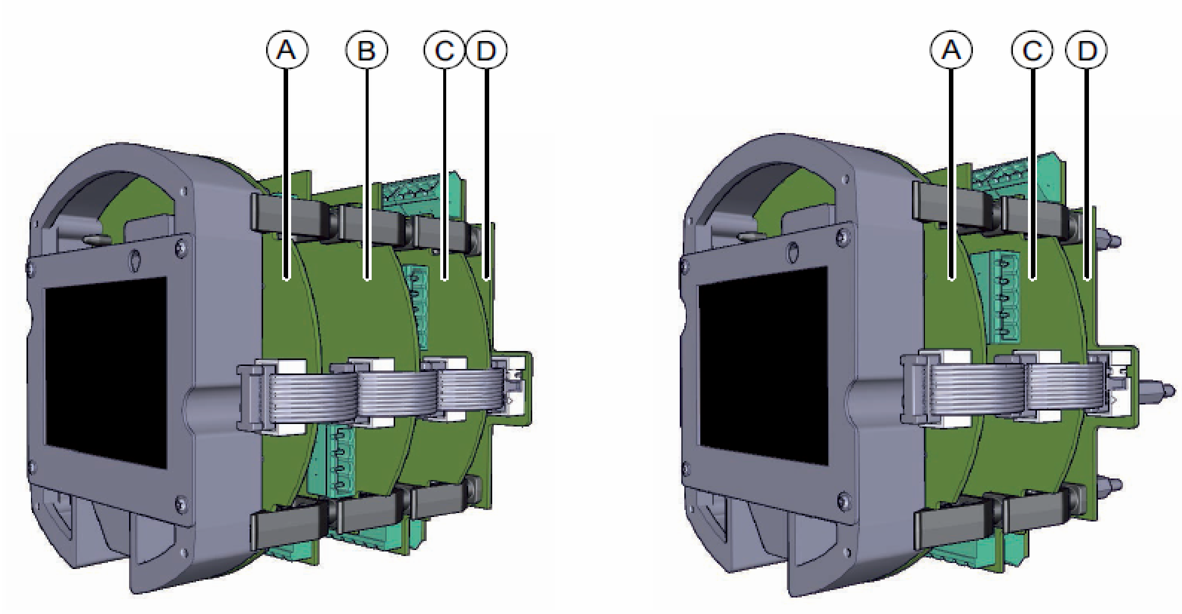
Figure 3-5: Stacked Module Construction of the SSC-A



The following boards can be placed into the SSC-A.

- CAN-HMI-SSC
- CAN-OPTION-SSC
- CAN-ADD-BLEND
- CAN-PSF-SSC

Figure 3-6: Full-Configuration SSC-A (left) and 3-PCB Configuration (right)

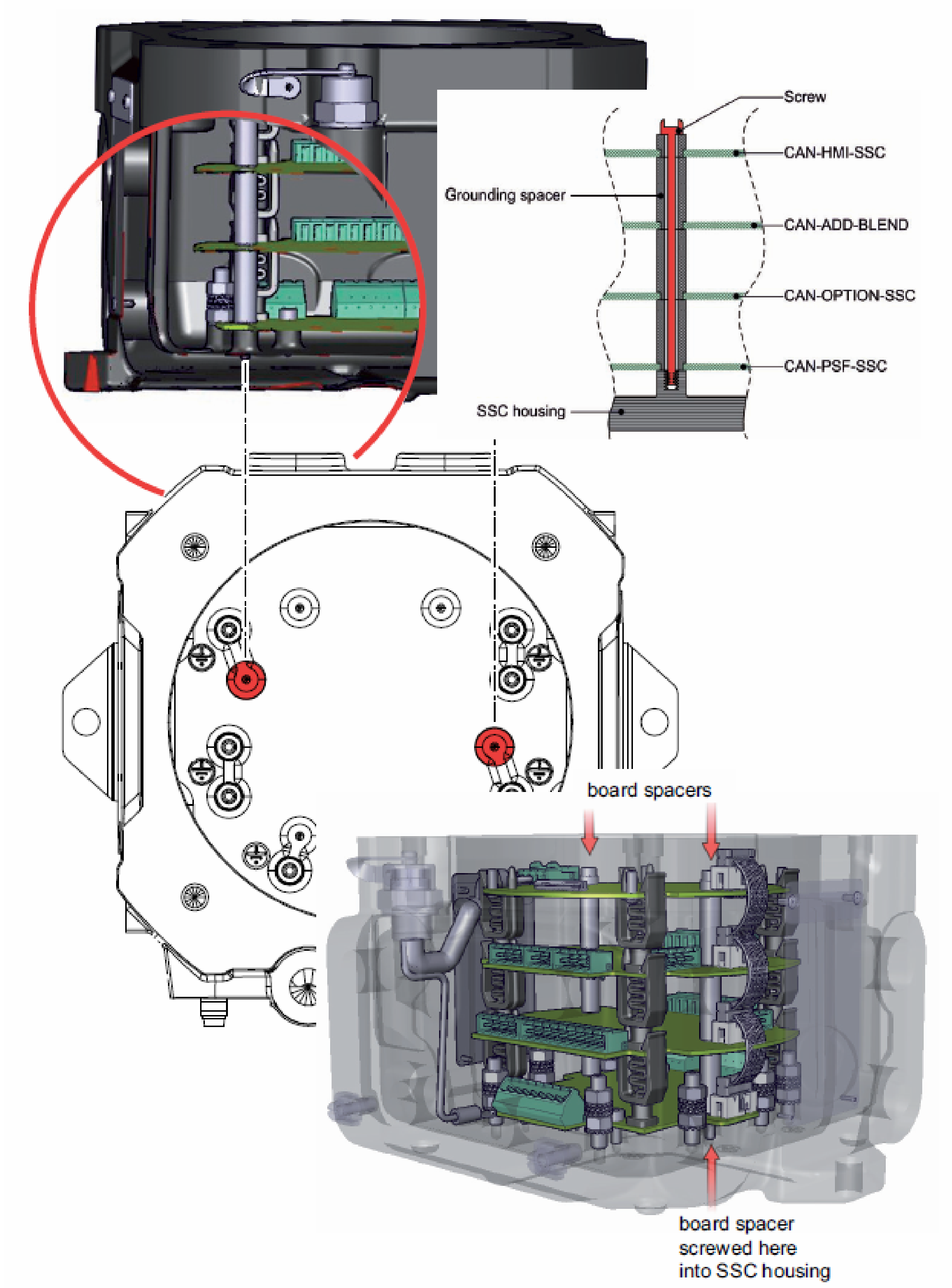


	PCB name	Description
A	CAN-HMI-SSC	Controls the display and the Local Access Device (LAD) interfaces.
B	CAN-OPTION-SSC	Additional IO functions are available with this optional board.
C	CAN-ADD-BLEND	Controls the additive stream.
D	CAN-PSF-SSC	Delivers the internal power for the SSC-A.

3.4.3 Grounding Concept

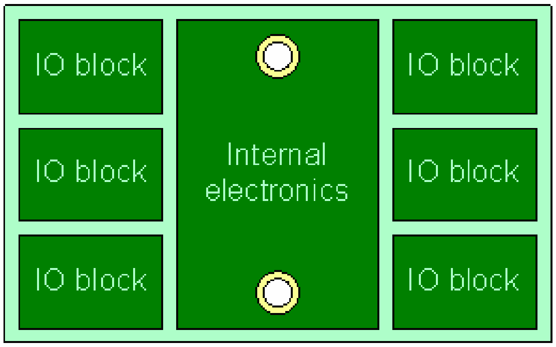
Each printed circuit board has two grounding points. These grounding points are used to electrically connect every board with the metal housing. This is performed by means of metal spacers, which are pressed into the boards. See the following figure.

Figure 3-7: 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.

Figure 3-8: Grounding Concept (2)



3.5 PCB Layout

Each FlexConn PCB consists of a generic and a specific electronics part. The generic part can be found on any FlexConn module. 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.

3.5.1 PCB Details

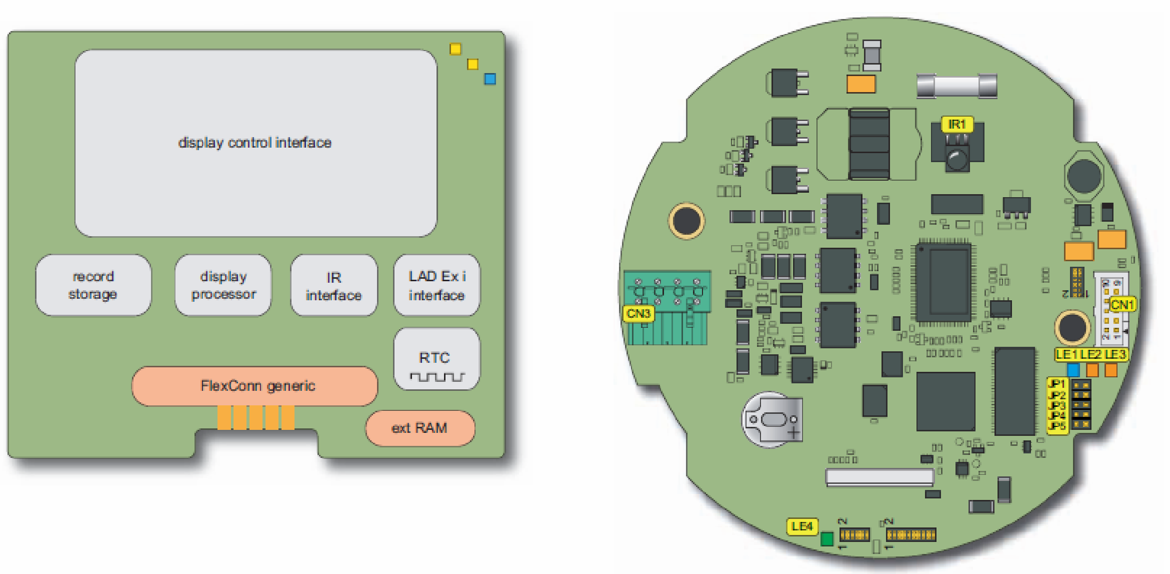
3.5.1.1 CAN-HMI-SSC

3.5.1.1.1 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 additive process and transaction-related data.

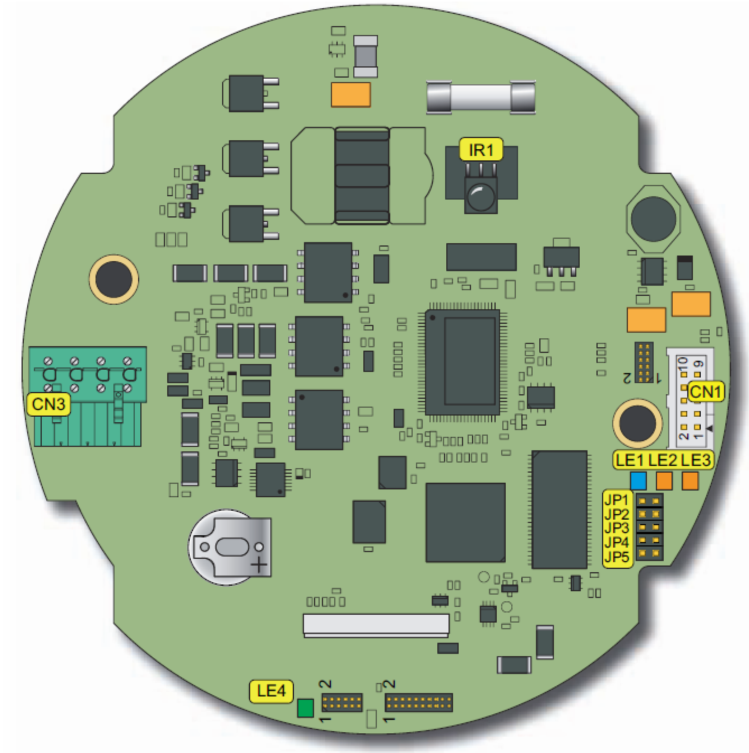
Function	Description
Display control interface	Control and interface of the 3.5" QVGA color display
Record storage	Data storage of transactions, calibrations, and alarms
Display processor	Manages processing
IR interface	IR interface for the Fusion4 IR Controller
LAD Ex i interface	Intrinsically safe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

Figure 3-9: CAN-HMI-SSC Functions (left) and Physical Layout (right)



3.5.1.1.2 Component Locations

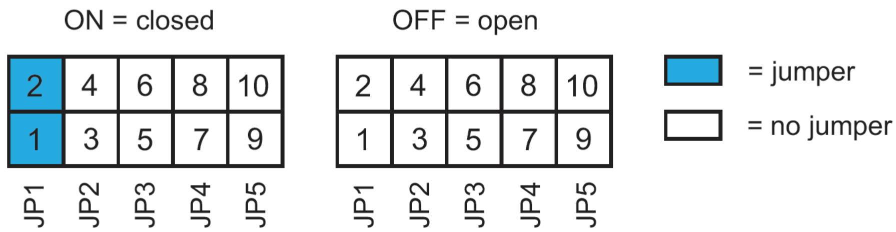
Figure 3-10: CAN-HMI-SSC Component Location



Item Reference	Description
JP1 ... 5	FlexConn jumpers
CN3	LAD connector (connects PCB to Fusion4 IR Controller plug in the enclosure)
LE1	FlexConn Health LED
LE2	Inter processor activity
LE3	CAN bus activity
LE4	HMI processor LED (LAD activity)
IR1	Infrared receiver for Fusion4 IR Controller

3.5.1.1.3 Terminal Descriptions

3.5.1.1.3.1 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'.

3.5.1.1.3.2 CN3 - LAD connector

1	2	3	4

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 (unconnected) inside the SSC creates an explosion risk. Unsafe (non-intrinsically safe) power might be connected to the LAD as a result.

3.5.1.2 CAN-ADD-BLEND

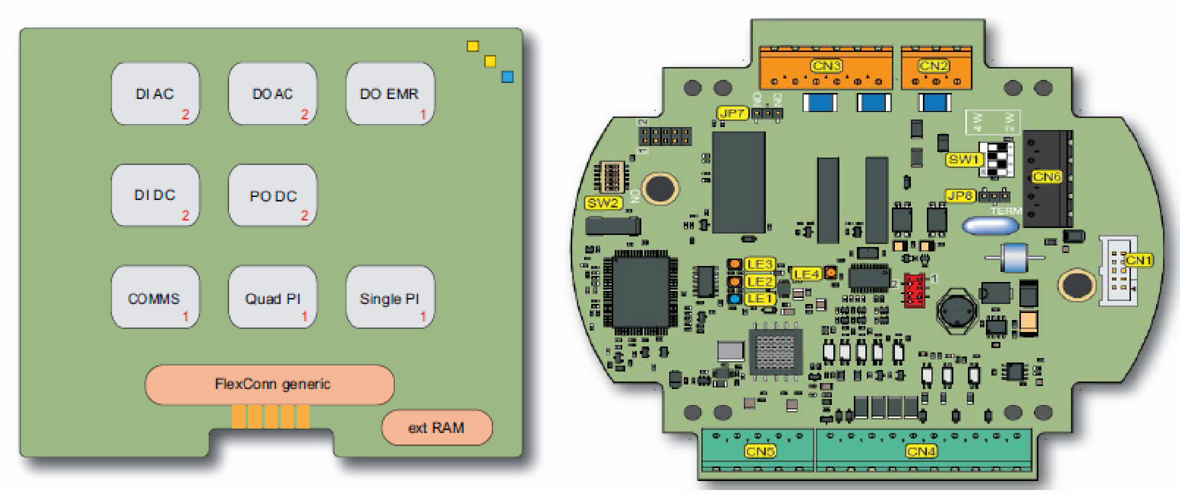
3.5.1.2.1 Functions

This board takes care of the additive-stream metering and the solenoid control, and also contains the algorithms for additive injection.

The physical board implements the following functions.

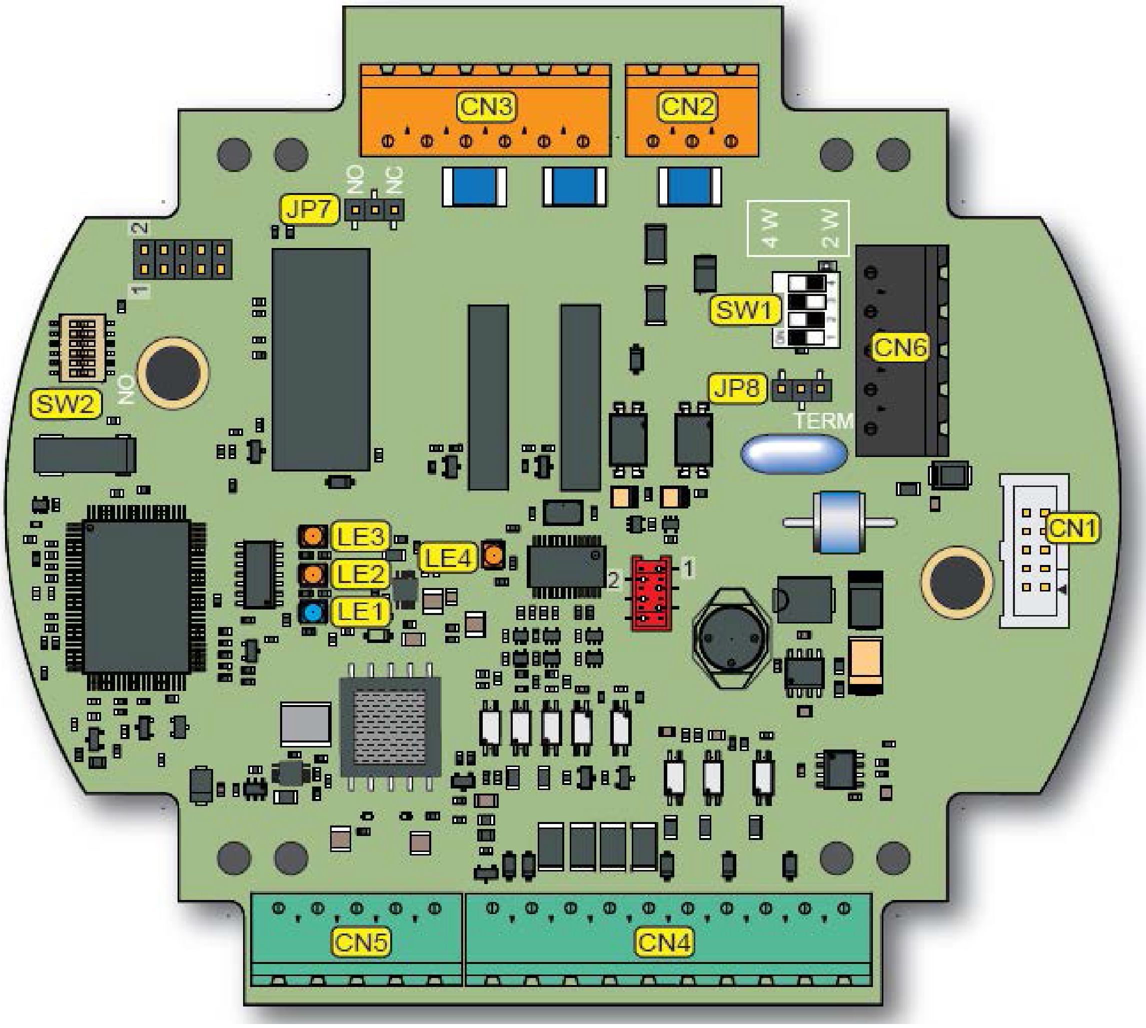
Function	Description
2 Digital Input AC (DI AC) circuits	Convert high-voltage switched AC signals into isolated logic signals.
2 Digital Input DC (DI DC) circuits	Convert switched DC signals into isolated logic signals.
Single-Pulse Input (Single PI) circuit	Accepts pulses from wild or main stream source (flow meter).
Dual-Pulse Input (Quad PI) circuit	Accepts pulses from additive 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) cir- cuits	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 3-11: CAN-ADD-BLEND Functions (left) and Physical Layout (right)



3.5.1.2.2 Component Locations

Figure 3-12: CAN-ADD-BLEND Component Locations

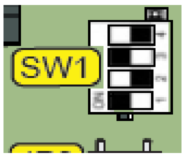


Item Reference	Description
SW1	RS-COMM mode switch
SW2	FlexConn jumper function switches
JP7	Jumper for Digital Output ElectroMechanical Relay contacts setting
JP8	Jumper for RS communication termination setting
LE1	FlexConn Health LED
LE2	Function configurable
LE3	Function configurable

Item Reference	Description
LE4	Pulse Input activity
For all connectors: see 4.9 - Terminal Assignment Guide.	

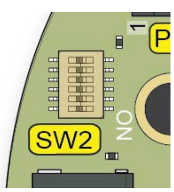
3.5.1.2.3 Terminal Descriptions

3.5.1.2.3.1 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		

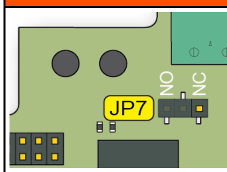
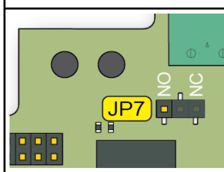
3.5.1.2.3.2 FlexConn Jumper Function Switches



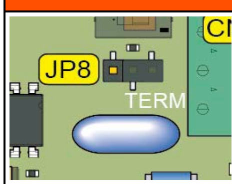
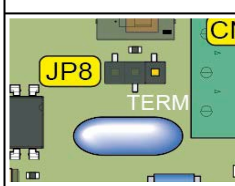
Reference	Jumper Name	Function When Set to ON
SW2-1	FlexConn JP1	W&M entities protection (not relevant for SSC-A)
SW2-2	FlexConn JP2	Password read protection

Reference	Jumper Name	Function When Set to ON
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

3.5.1.2.3.3 JP7 - Jumper for Digital Output EM Relay Contacts Setting

	Position	Description
	NO	Relay contacts normally open
	NC	Relay contacts normally closed

3.5.1.2.3.4 JP8 - Jumper for RS Communication Terminating Setting

	Position	Description
	TERM	RS-485 communication terminated with 120 W
	-	RS-485 communication NOT terminated

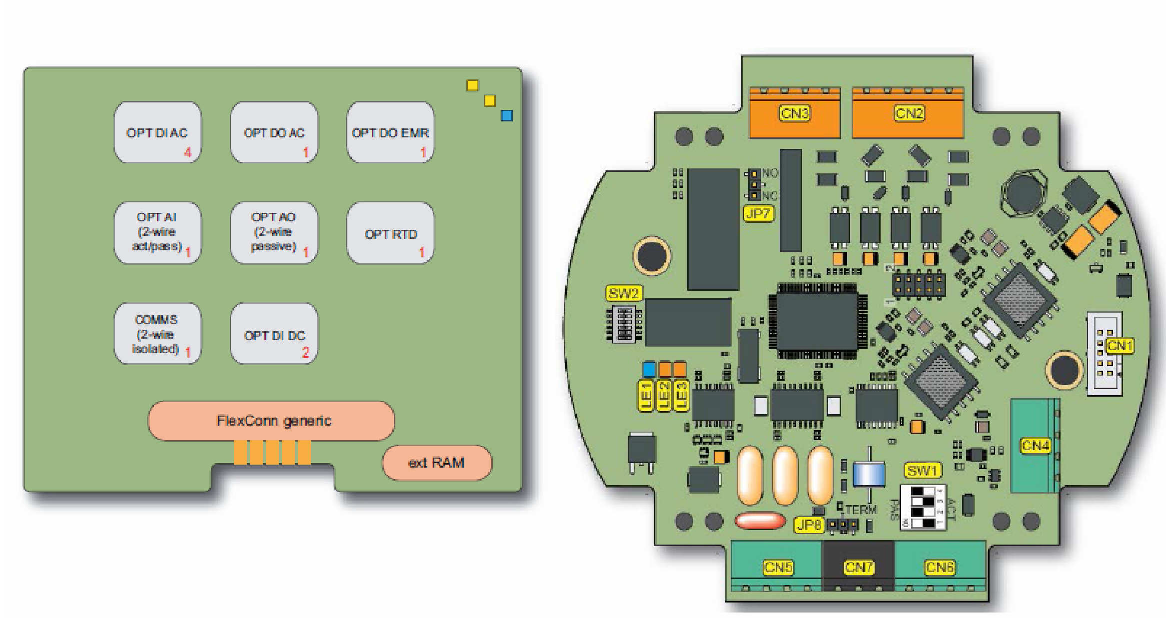
3.5.1.3 CAN-OPTION-SSC

3.5.1.3.1 Functions

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

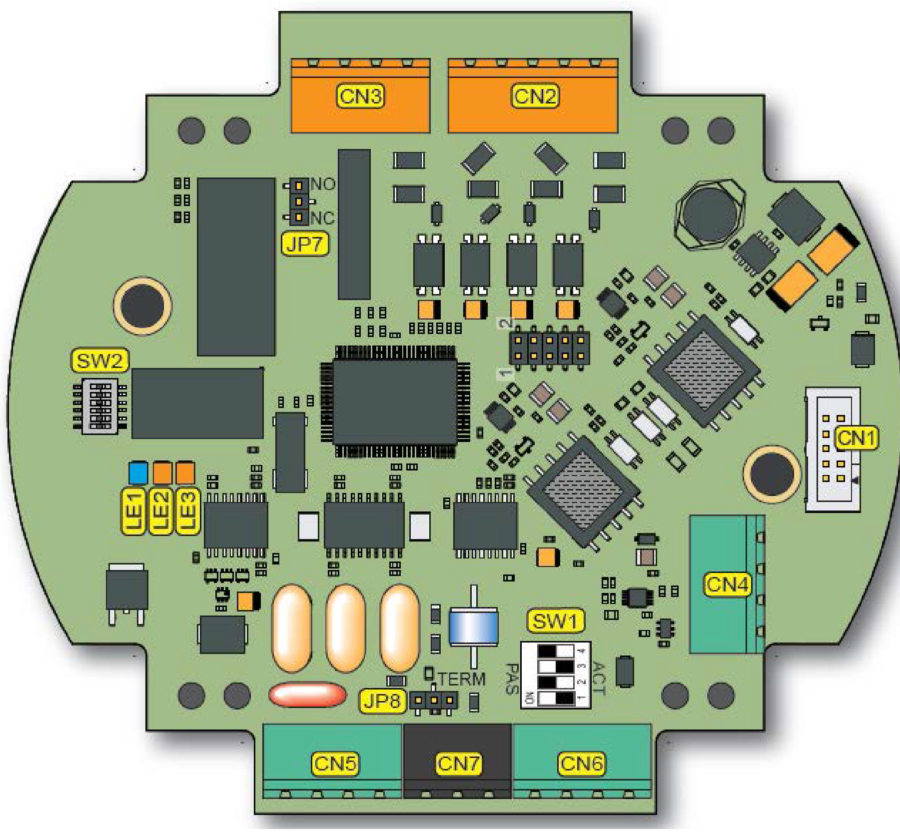
Function	Description
4 Digital Input AC (OPT DI AC) circuits	Convert high-voltage switched AC signals into isolated logic signals.
Digital Output Solid State Relay AC (OPT DO AC) circuit	Converts the logic signals from the FlexConn generic microcontroller into isolated, high-voltage rated switched AC 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 external sources, such as temperature or pressure sensors, into numeric values. 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 distances) 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	2-wire RS serial communication block that allows the SSC to communicate 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 3-13: CAN-OPTION-SSC Functions (left) and Physical Layout (right)



3.5.1.3.2 Component Locations

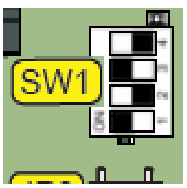
Figure 3-14: CAN-OPTION-SSC Component Locations



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 - Terminal Assignment Guide.	

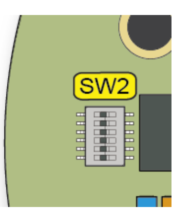
3.5.1.3.3 Terminal Descriptions

3.5.1.3.3.1 SW1 - Analog Input Mode Switch



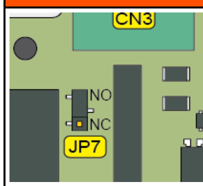
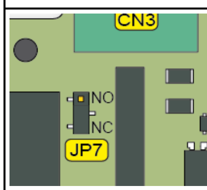
Reference	Setting	Function	Description
SW1-1	ON	Active Mode	4-20 mA input loop powered from CAD-ADD-BLEND board
SW1-2	OFF		
SW1-3	ON		
SW1-4	OFF		
SW1-1	OFF	Passive Mode	4-20 mA input loop powered from external power supply
SW1-2	ON		
SW1-3	OFF		
SW1-4	ON		

3.5.1.3.3.2 SW2 - FlexConn Jumper Function Switches

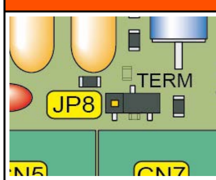
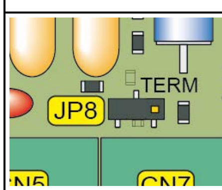


Reference	Jumper function	Description
SW2-1	FlexConn JP1	W&M entities protection (not relevant for SSC-A)
SW2-2	FlexConn JP2	Password read protection
SW2-3	FlexConn JP3	Write protection all entities
SW2-4	FlexConn JP4	Spare
SW2-5	FlexConn JP5	Spare
SW2-6	FlexConn JP6	CAN bus termination

3.5.1.3.3.3 Jumper for Digital Output EM Relay Contacts Setting

	Position	Description
	NO	Relay contacts normally open
	NC	Relay contacts normally closed

3.5.1.3.3.4 JP8 - Jumper for RS Communication Terminating Setting

	Position	Description
	TERM	RS-485 communication terminated with 120 W
	-	RS-485 communication NOT terminated

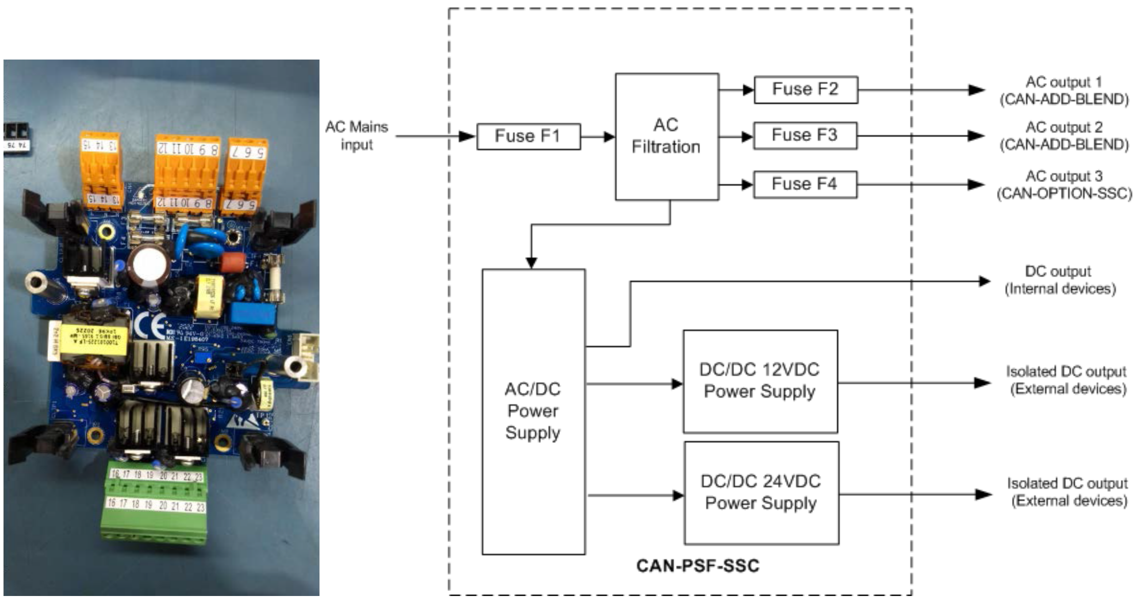
3.5.1.4 CAN-PSF-SSC

3.5.1.4.1 Functions

The primary function of the CAN-PSF-SSC board is to convert single-phase AC mains voltage into DC voltage to power the other SSC modules. It can also deliver fuse-protected AC power for external devices, such as additive solenoids or blend control valves. It can also provide DC power for external devices, such as a 4-20 mA current loop. It also provides DC power to 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 3-15: CAN-PSF-SSC Physical Layout and Functions



The following table specifies the external DC outputs.

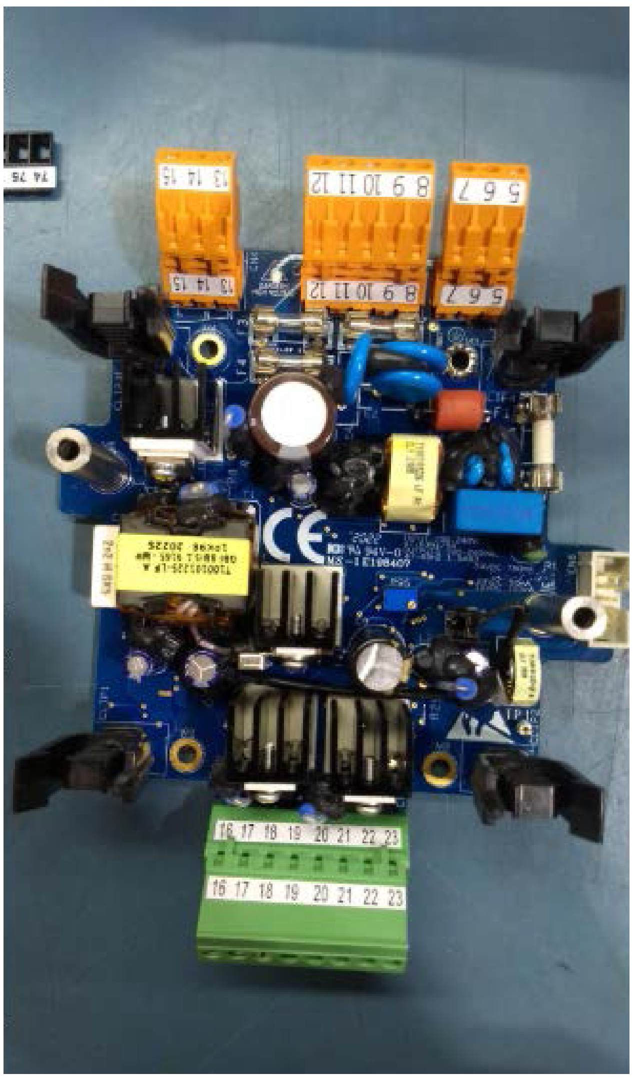
Item	Conditions	Minimum	Type	Maximum	Unit
Output voltage variation	Vin = 230 VAC	23 11.5	24 12	25 12.8	VDC
Continuous output current	+24 VDC +12 VDC	-	-	42 83	mA

Item	Conditions	Minimum	Type	Maximum	Unit
Short circuit current	+24 VDC	42	56.3	80	mA
	+12 VDC	83	94	110	
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 passthrough 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.

3.5.1.4.2 TComponents Locations

Figure 3-16: CAN-PSF-SSC TComponents Locations



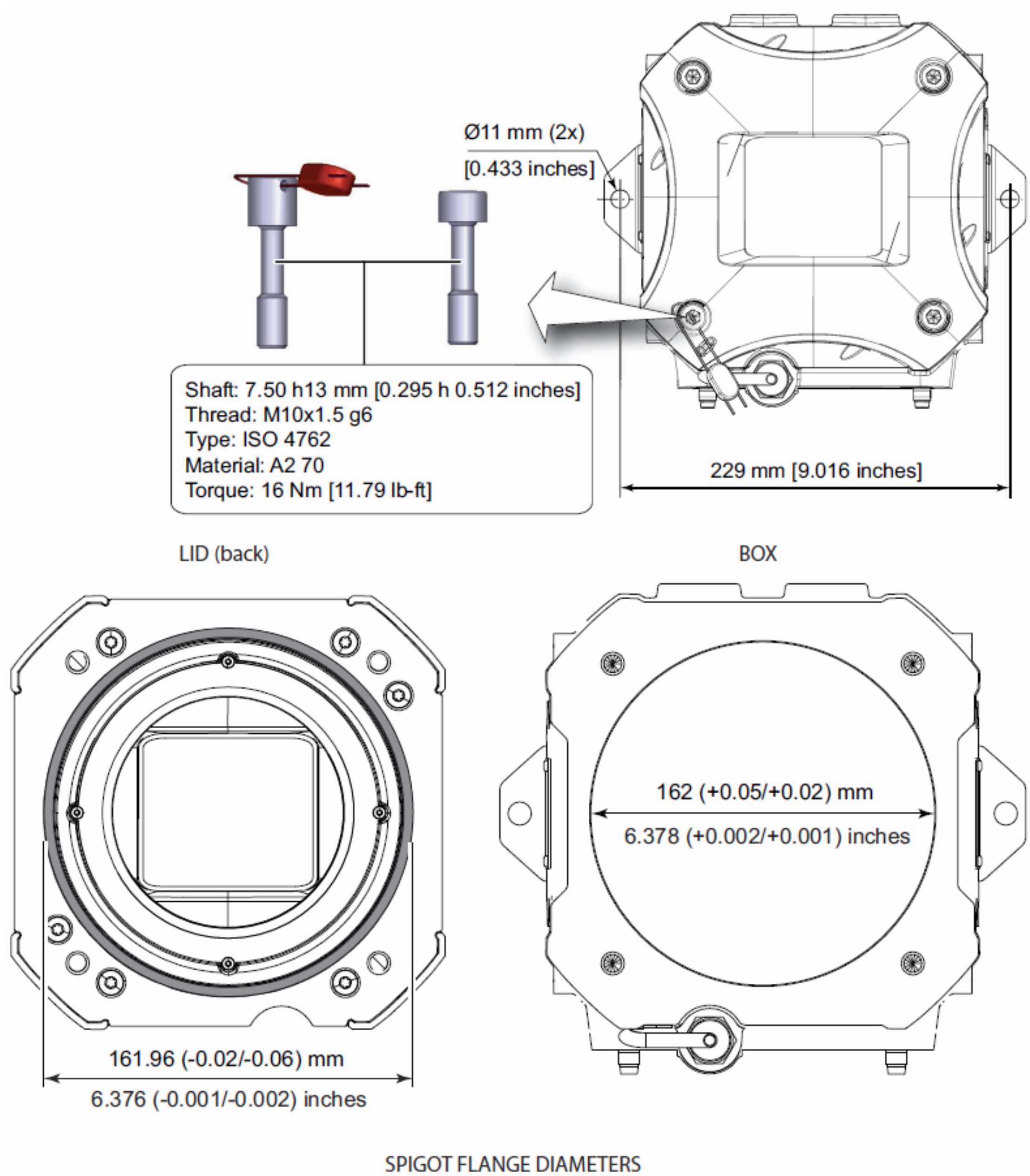
Item reference	Description	Remark
F1	4A (T) fuse - size 5x20 mm - high-breaking capacity	AC Input for the CAN-PSF-SSC
F2	1.5A (T) fuse - size 5x20 mm	AC Output for the CAN-ADD-BLEND
F3	1.5A (T) fuse - size 5x20 mm	AC Output for the CAN-ADD-BLEND
F4	1.5A (T) fuse - size 5x20 mm	AC Output for the CAN-OPTION-SSC
LED1	FlexConn Health LED	
For all connectors: see 4.9 - Terminal Assignment Guide.		

3.6 Device Features

3.6.1 Mechanical

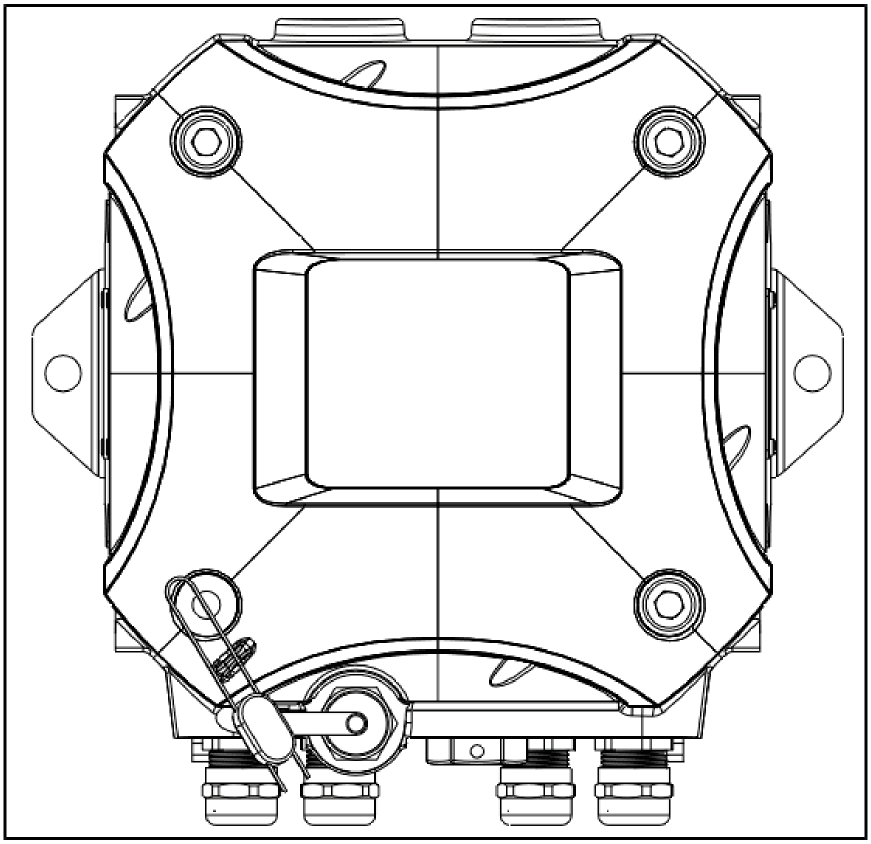
- Mounting facilities: 229 mm spacing, and allowing M10 fixing bolts (see the following figure)

Figure 3-17: Mechanical Facilities of the SSC-A



- Captured bolts in lid
- Sealing facility on the lid (see the following figure)

Figure 3-18: Sealing Facility on the SSC-A Lid



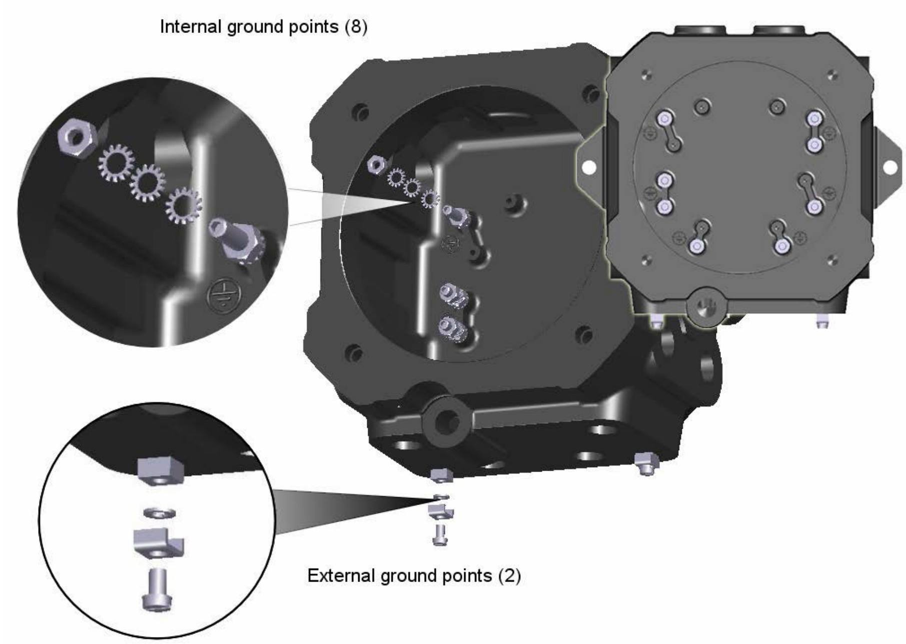
- Sealing bolt for physical device sealing
- Optional tag plate to be mounted on the enclosure
- O-ring in lid, standard available part
- Intrinsically safe interface connector for the LAD
- Metric or NPT cable entries
- Optional breather/drain
- Glass window for display and IR interface for IR remote

3.6.2 Electrical

- Internal power supply

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

Figure 3-19: Internal power supply of SSC-A



- 3 Internal fuses
- 3 Microprocessor-controlled modules
- Each IO galvanic isolated from internal electronics and from each other (safety performance)

3.6.3 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 character 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

3.6.4 Environment

Parameter	SSC	LAD
Operating temperature	-40°C ... +65°C (-40ºF ... +149ºF)	-20°C ... +65°C (-4ºF ... +149ºF)
Electronics designed for	-40°C ... +85°C (-40ºF ... +185ºF) and RoHS	-40°C ... +85°C (-40ºF ... +185ºF) and RoHS1
Storage temperature	-40°C ... +85°C (-40ºF ... +185ºF)	-40°C ... +85°C (-40ºF ... +185ºF)
Ingress protection	IP66 / NEMA 4X	IP54 / NEMA 3R
SD-card compartment behind lid	-	IP20

3.7 Available Input/Output Functions

I/O Block	CAN-ADD-BLEND	CAN-OPTION-SSC	Refer to Section
Dual-Pulse Input (Quad PI)	1	-	3.8.5
Single-Pulse Input (Single PI)	1	-	3.8.4
Analog Input (OPT AI DC)	-	1	3.8.6
Analog Output (OPT AO DC)	-	1	3.9.5
Resistance Temp. Detector (OPT RTD)	-	1	3.8.7
Communication (COMMS/ OPT COMS)	RS-485	RS-485	3.10.1
Pulse Output (PO DC)	2	-	3.9.4
Digital Input DC (DI DC/ OPT DI DC)	2	2	3.8.3
Digital Input AC (DI AC/ OPT DI AC)	2	4	3.8.2
Digital Output Electromechanical Relay (DO EMR/ OPT DO EMR)	1	1	3.9.3
Digital Output Solid State Relay AC (DO AC/ OPT DO AC)	2	1	3.9.2

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

3.8 Input Functions

3.8.1 General

The following table describes the electronic input functions SSC-A supports.

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	-

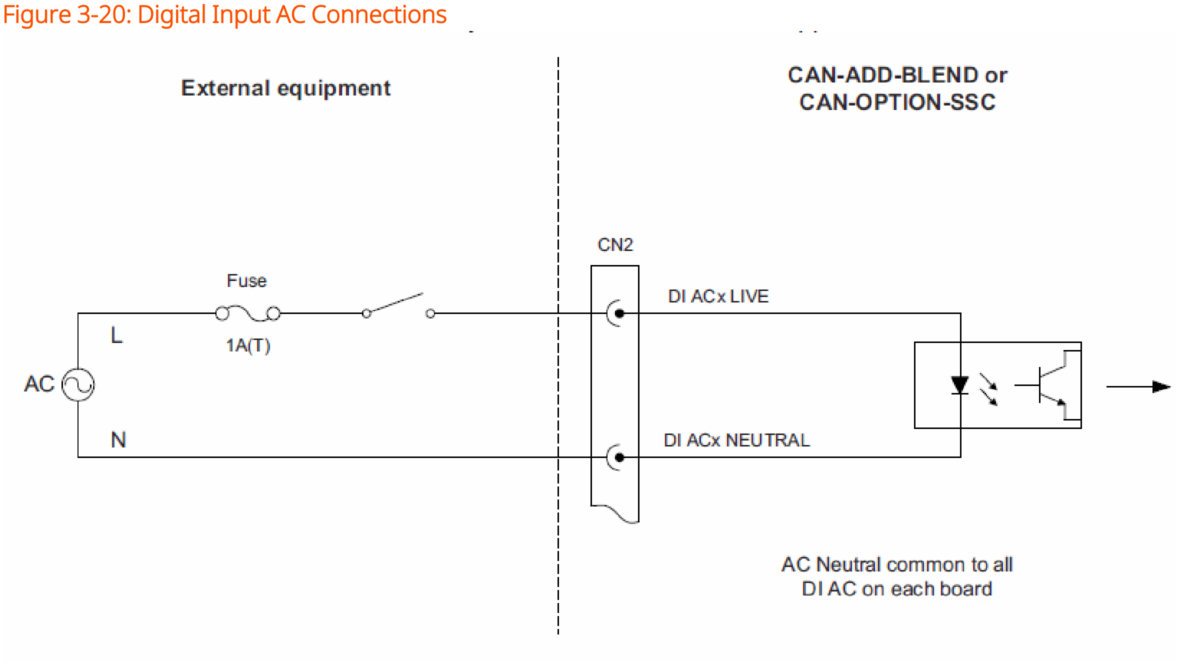
Input Function	I/O Block Name	
	CAN-ADD-BLEND	CAN-OPTION-SSC
Dual Pulse Input	Quad PI	-
Analog Input	-	OPT AI DC
Resistance Temperature Detector	-	OPT RTD

3.8.2 Digital Input AC (DI AC/ OPT DI AC)

3.8.2.1 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 3-20: Digital Input AC Connections



3.8.2.2 Characteristics

Item	Minimum	Type	Maximum	Unit
Input voltage	-	-	265	VAC
Input frequency	47	-	63	Hz
Input impedance	-	44	-	kW
High input (must turn on) voltage	85	-	-	VAC

Item	Minimum	Type	Maximum	Unit
Low input (must turn off) voltage	-	-	20	VAC
Input switching frequency	-	-	4	Hz
AC on time (TON)	50	-	-	ms
AC off time (TOFF)	200	-	-	ms

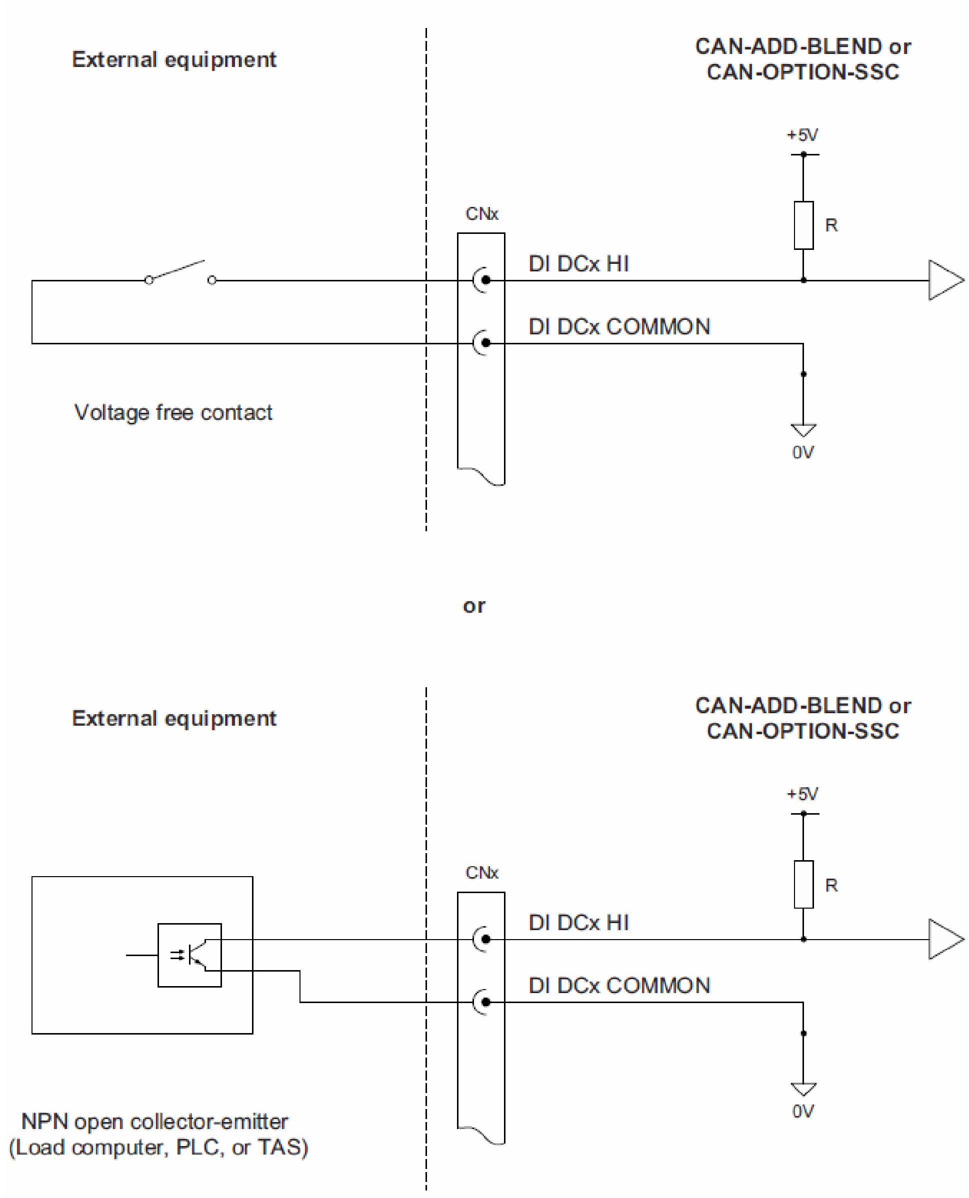
3.8.3 Digital Input DC (DI DC/OPT DI DC)

3.8.3.1 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.

The following image illustrates a simplified block diagram.

Figure 3-21: Digital Input DC Connections



3.8.3.2 Characteristics

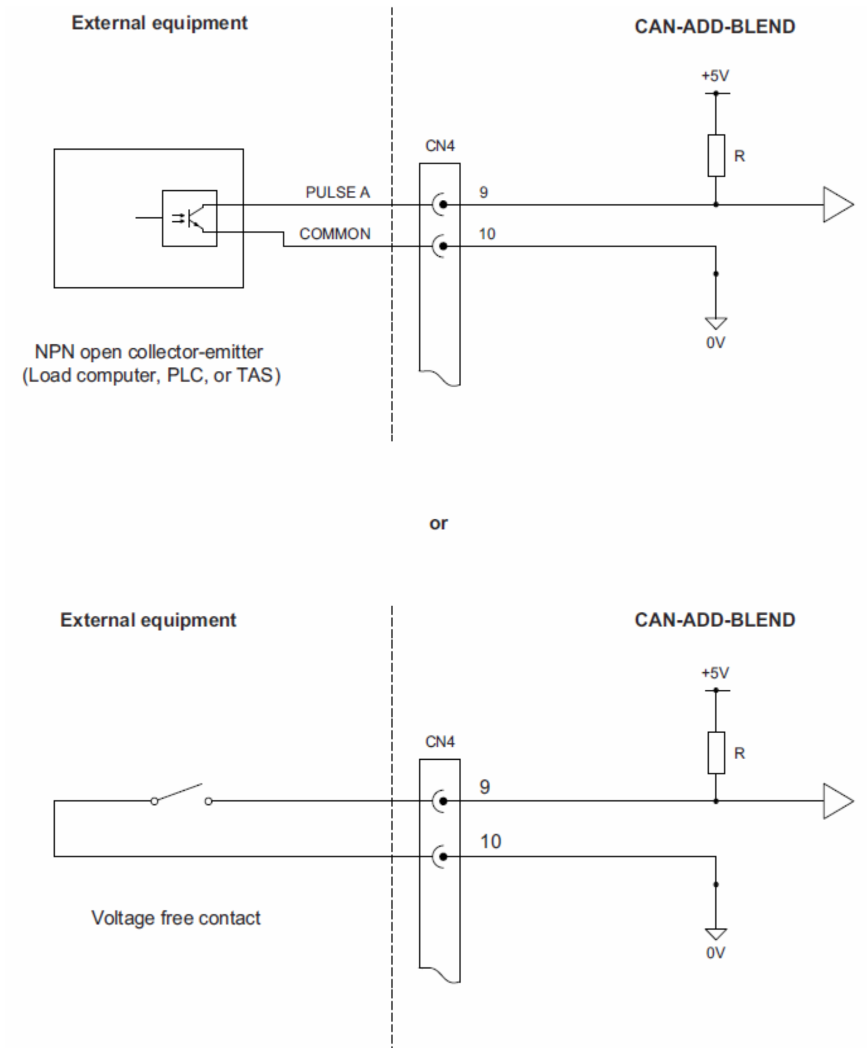
Item	Minimum	Type	Maximum	Unit
Switching level VH	5	-	30	VDC
Switching level VL	-	-	0.8	VDC
Switching current (ISW)	10	-	-	mA
Input switching frequency	-	-	1	kHz
Input on time (TON)	500	-	-	µs
Input off time (TOFF)	500	-	-	µs

3.8.4 Single-Pulse Input (Single PI)

3.8.4.1 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 3-22: Single-Pulse Input Connections



3.8.4.2 Characteristics

Item	Minimum	Type	Maximum	Unit
Switching level VH	5	-	30	VDC
Switching level VL	-	-	0.8	VDC

Item	Minimum	Type	Maximum	Unit
Switching current (ISW)	10	-	-	mA
Input switching frequency	-	-	5	kHz
Input on time (TON)	100	-	-	µs
Input off time (TOFF)	100	-	-	µs

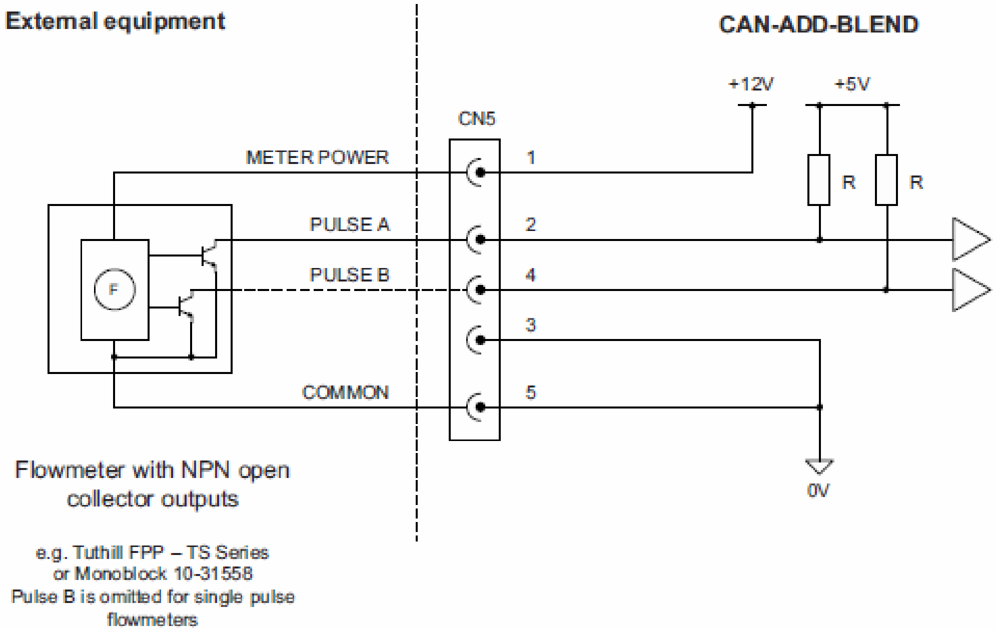
3.8.5 Dual-Pulse Input (Quad PI)

3.8.5.1 Functional Description

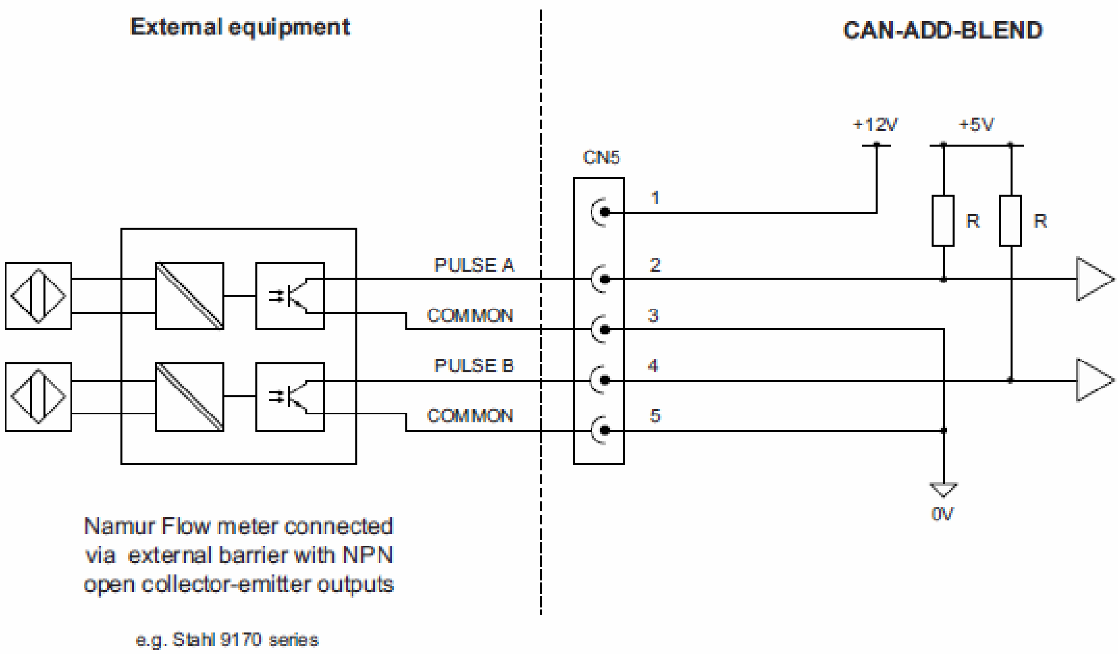
The Dual-Pulse Input can accept signals from either one dual-pulse flow meter for applications requiring a high level of pulse integrity offered by a dual pulse flow meter (sometimes referred to as a quad (quadrature) flow meter), or one single-pulse flow meter.

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

Figure 3-23: Dual-Pulse Input Connections



or



3.8.5.2 Characteristics

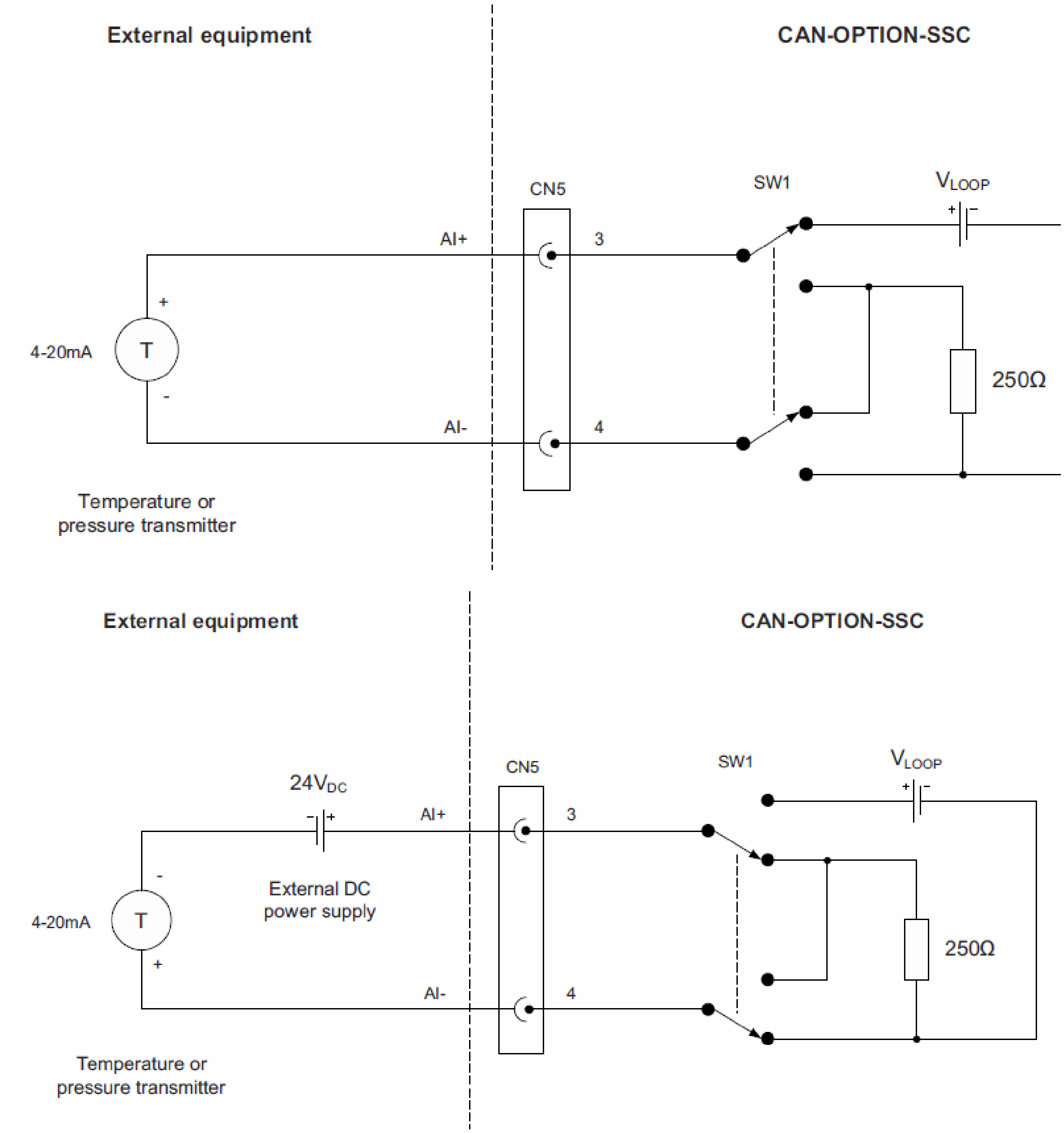
Item	Minimum	Type	Maximum	Unit
Switching level VH	5	-	30	VDC
Switching level VL	-	-	0.8	VDC
Switching current (ISW)	10	-	-	mA
Input switching frequency	-	-	5	kHz
Input on time (TON)	100	-	-	µs
Input off time (TOFF)	100	-	-	µs
DPI Phase A with respect to B	-	90º	-	-

3.8.6 Analog Input (OPT AI DC)

3.8.6.1 Functional Description

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

Figure 3-24: 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 4-20 mA 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.

3.8.6.2 Characteristics

Item	Minimum	Type	Maximum	Unit
VLOOP (passive mode)	23.0	24.0	42.5	VDC
VLOOP (ISO) (active mode)	24.0	28.0	32.0	VDC
ILOOP (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 (Rs)	249.75	250	250.25	W
External reference voltage (VREF)	2.49875	2.5	2.5012	VDC
Accuracy (without external transmitter)	-	-	± 1.0	%

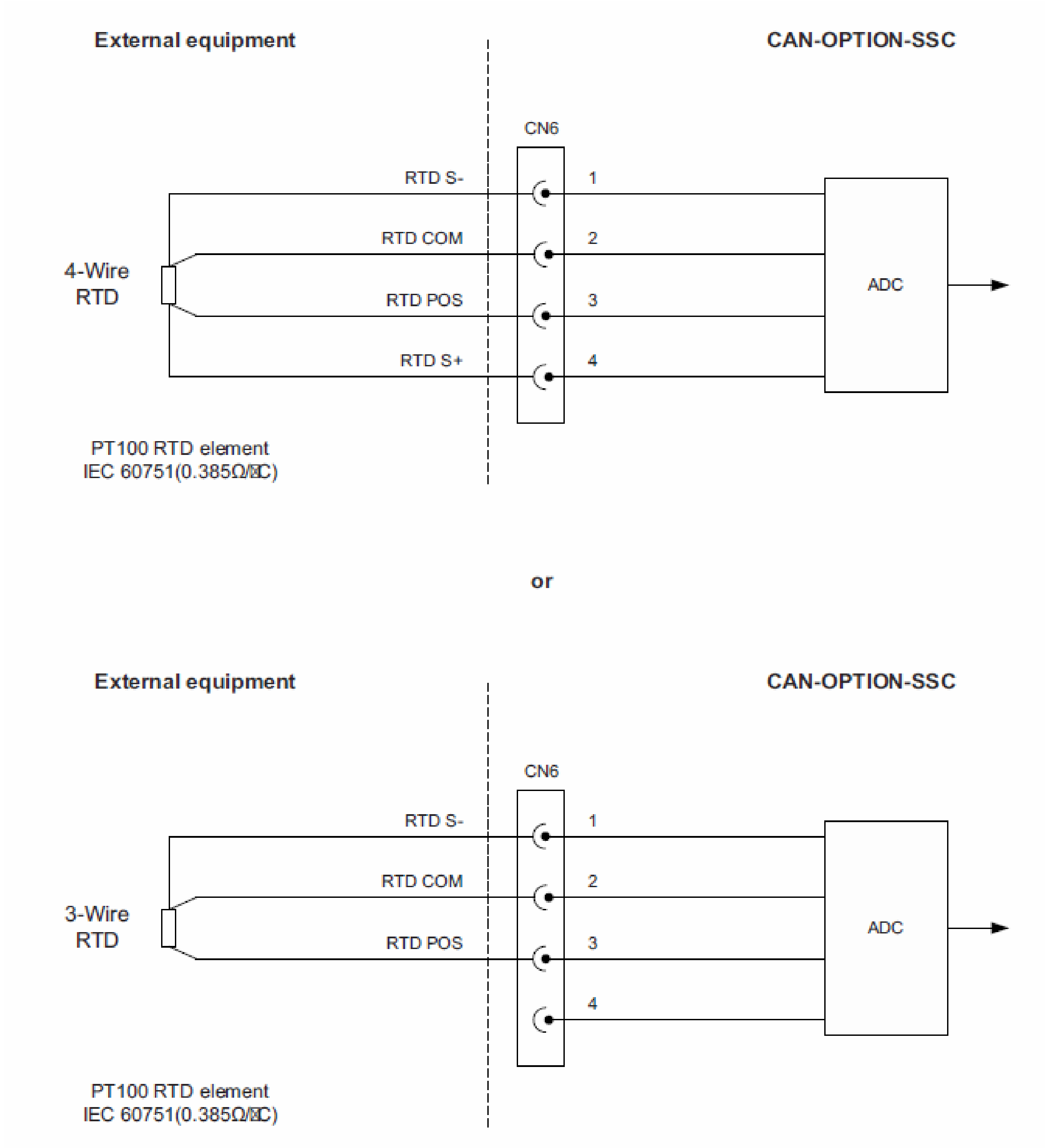
3.8.7 Resistance Temperature Detector (OPT RTD)

3.8.7.1 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 connections and 4-wire connections.

The following image illustrates the RTD connections.

Figure 3-25: RTD Connections



The following RTD types are accepted.

RTD type	Connection	Alpha Coefficient
PT100	3-Wire or 4-Wire (Kelvin connection)	IEC 60751 (0.385 W/°C / 0.214 W/°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 previous diagrams.

3.8.7.2 Characteristics

Item	Minimum	Type	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	mW
	-	-	±0.5 [±0.9]	°C [°F]
Measurement error (-20 ... +55°C/ -4 ... +131°F)	-	-	±116	mW
	-	-	±0.3 [±0.5]	°C [°F]
RTD current source	-	500	-	µA
RTD cable length	-	-	150	m

3.9 Output Functions

3.9.1 General

The following table describes the electronic output functions SSC-A supports.

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

3.9.2 Digital Output Solid State Relay AC (DO AC/ OPT DO AC)

3.9.2.1 Functional Description

The DO AC allows the controller to switch high-voltage AC signals and 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.

The following figure illustrates a simplified block diagram of the Digital Output Solid State Relay AC connections.

Figure 3-26: Solid State Relay "Self-Powered" Connections

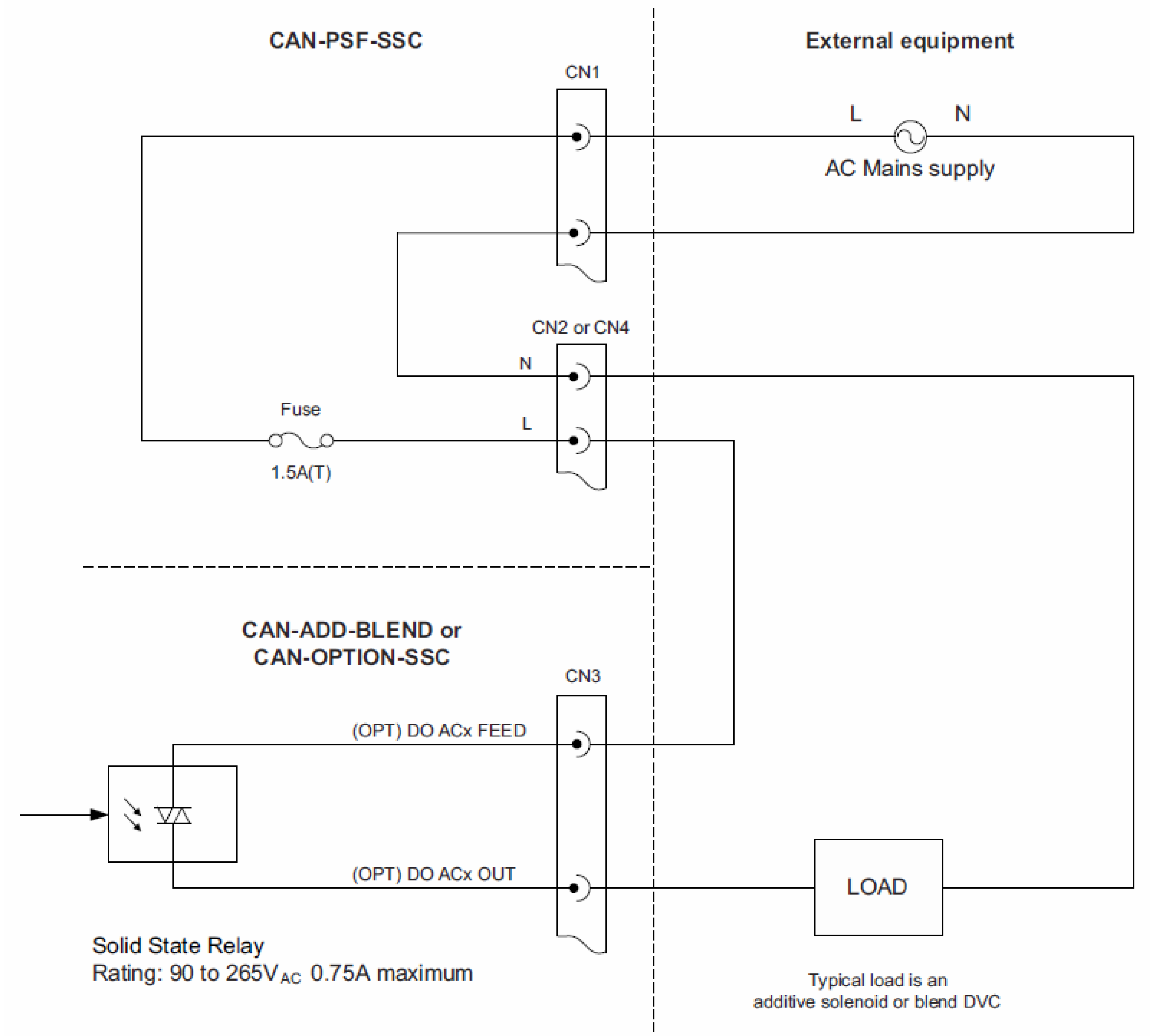
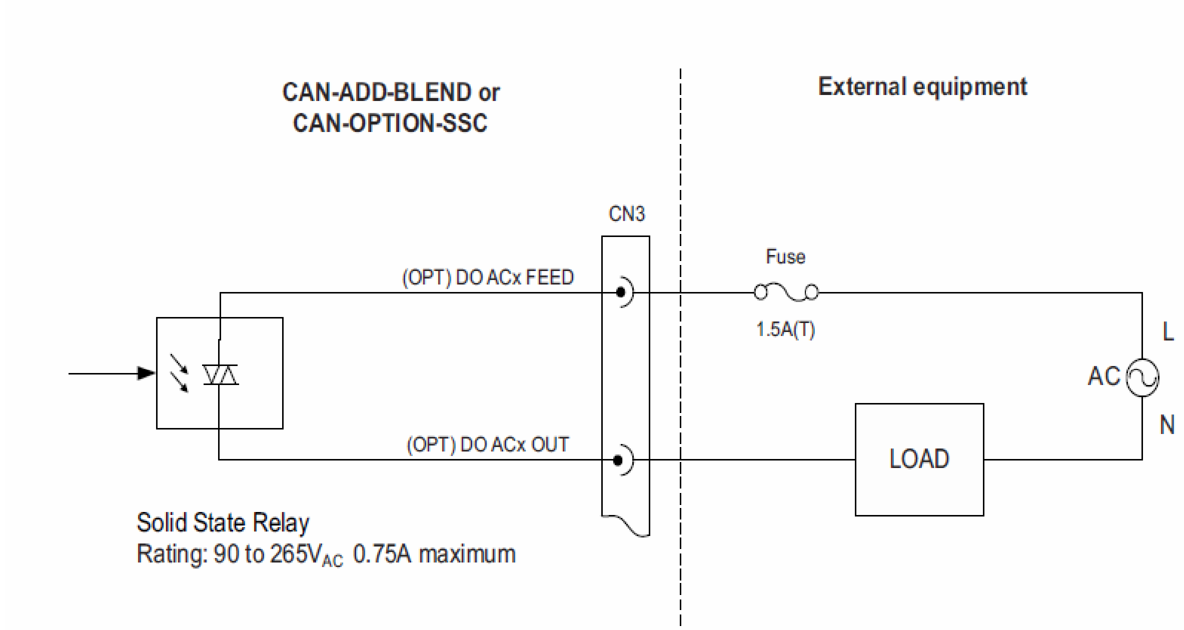


Figure 3-27: Solid State Relay "Externally Powered" Connections



3.9.2.2 Characteristics

Item	Minimum	Type	Maximum	Unit
Output feed voltage	90	-	265	VAC
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

3.9.2.3 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/msec] (3)	500
Maximum Load Current [Arms]	1.5
Maximum Load Current [Arms]	0.025
Maximum Surge Current (16.6ms) [Apk]	80

Description	Unit
Maximum On-State Volatge Drop @ Rated Current [Vpk]	1.5
Maximum Power Factor (with Maximum Load)	0.5

3.9.3 Digital Output Electromechanical Relay (DO EMR/OPT DO EMR)

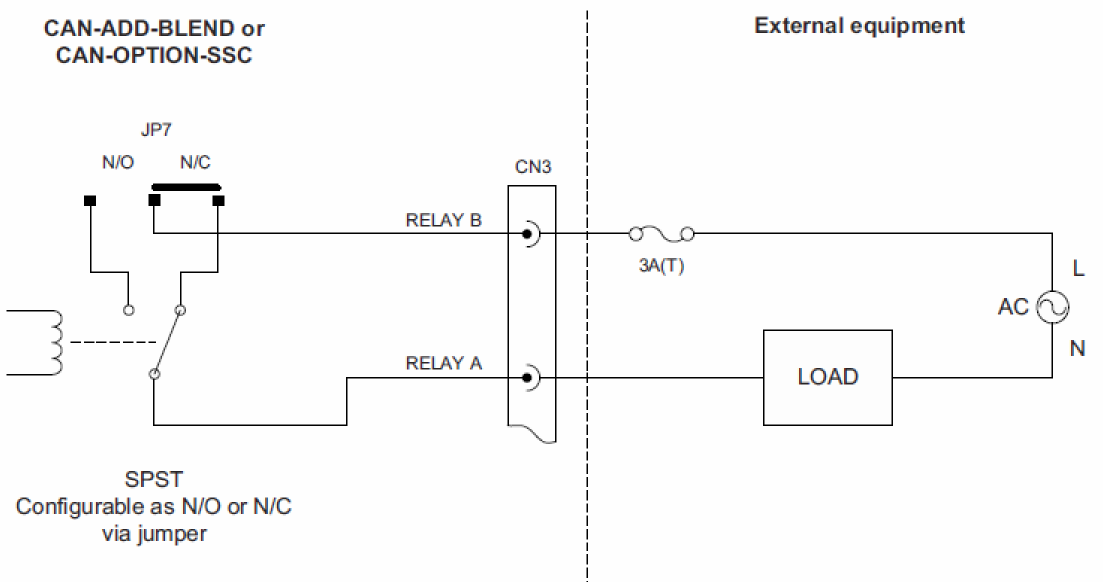
3.9.3.1 Functional Description

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 Single Pole Single Throw (SPST) and are configurable through a jumper to be either Normally Open (NO) or Normally Closed (NC). See the following figure.

Figure 3-28: Electromechanical Relay Connections



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

3.9.3.2 Characteristics

Item	Minimum	Type	Maximum	Unit
Load Voltage to be switched	-	-	265	VAC
Switching current AC	-	-	3	A
Steady state current AC	-	-	3	A
Output contact type	-	SPST	-	-
Operate time	-	-	10	ms
Release time	-	-	10	ms
Setting time	-	-	50	ms

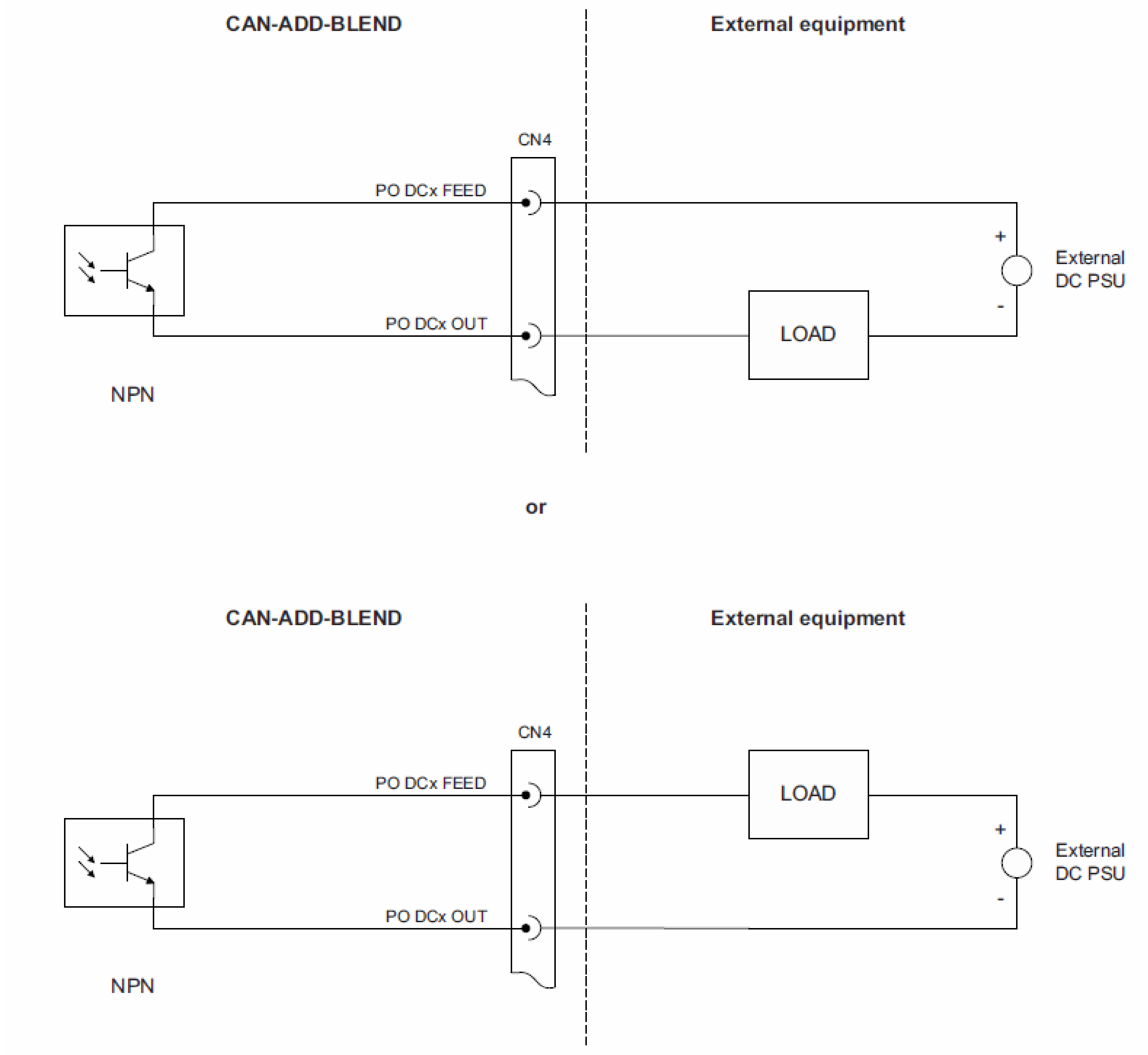
3.9.4 Pulse Output (PO DC)

3.9.4.1 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. See the following figure.

Figure 3-29: Pulse Output Connections



3.9.4.2 Characteristics

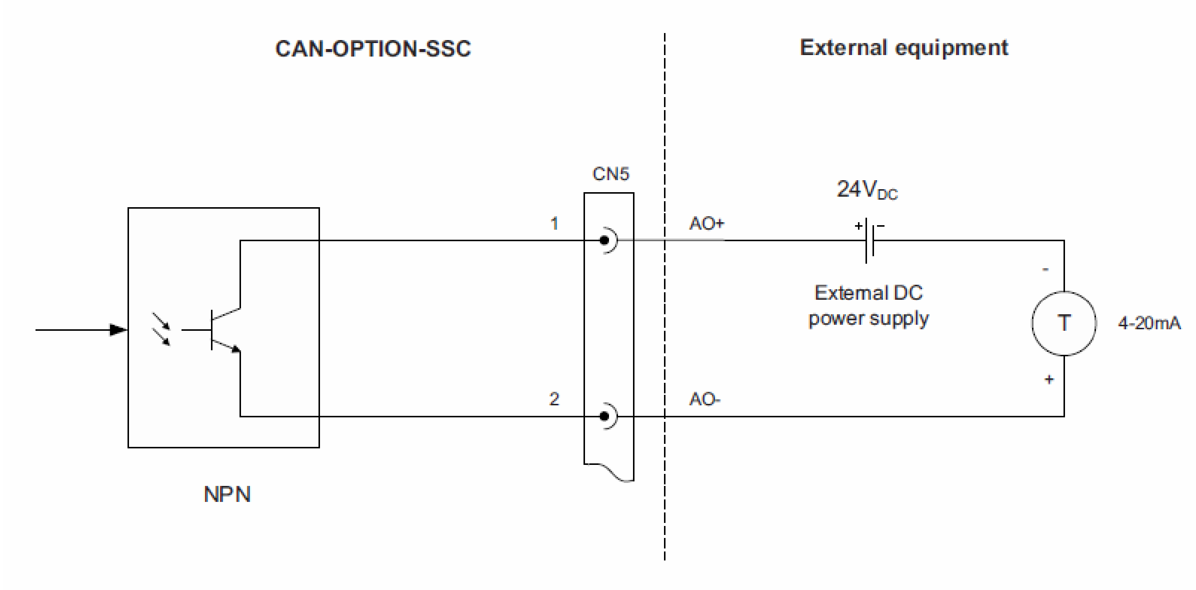
Item	Minimum	Type	Maximum	Unit
Output load current (Sink)	-	-	50	mA
Output load current (Source)	-	-	50	mA
Saturation voltage VCE(SAT)	-	-	1.0	VDC
Max. Switching frequency FMAX	-	-	0.3	kHz
TON and TOFF pulse width	3.33	-	-	ms

3.9.5 Analog Output (OPT AO DC)

3.9.5.1 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. Seethe following figure.

Figure 1: Analog Output Connections



3.9.5.2 Characteristics

Item	Minimum	Type	Maximum	Unit
VLOOP	23.0	24.0	36.0	VDC
Nominal loop current range	4	-	20	mA
Loop current control range	3	-	21	mA
Accuracy (without external receiver)	-	-	±1.0	%
Load resistance	0	-	750	W

3.10 Communication Functions

3.10.1 Communication (COMMS)

3.10.1.1 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 3-30: RS Communication 2-Wire Connections

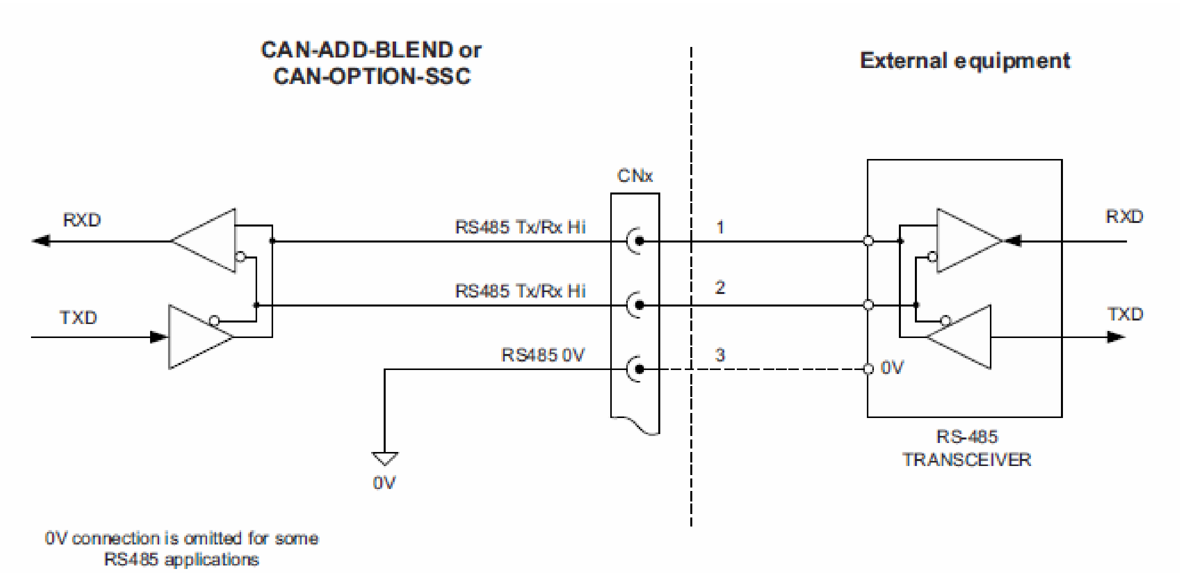
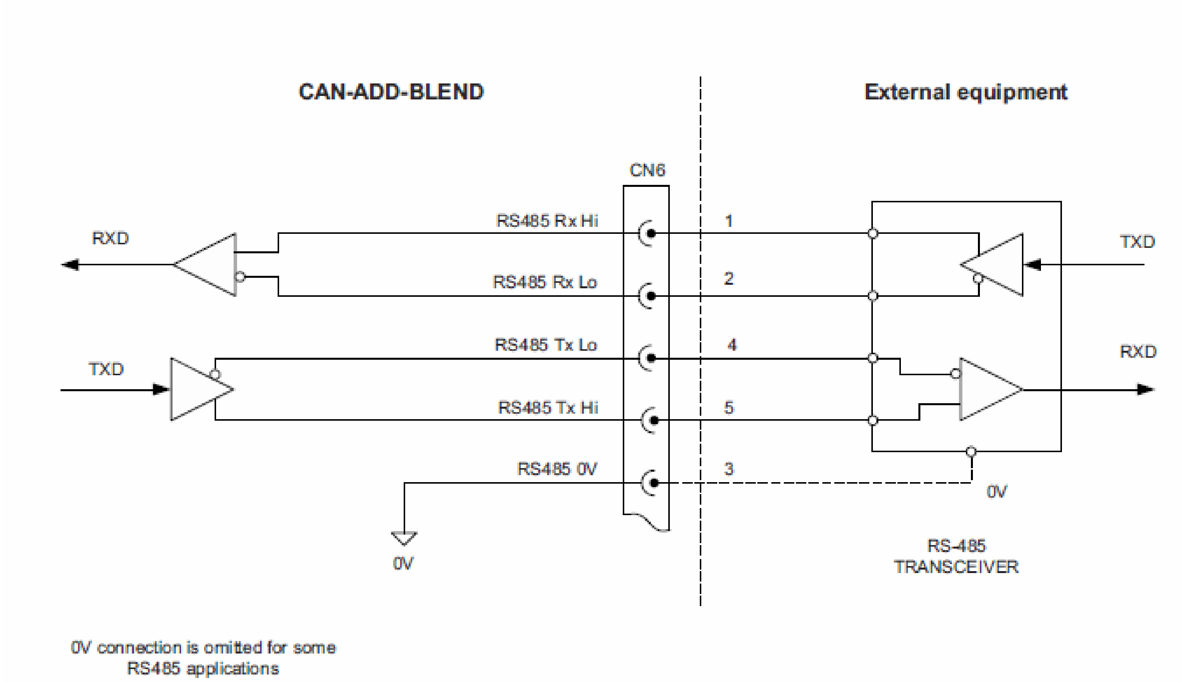


Figure 3-31: Communication 4-Wire Connections (CAN-ADD-BLEND Only)



For the 4-wire full-duplex communication, the external device is always the master and the COMMS block is the slave.

3.10.1.1.1 Characteristics

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

3.10.1.1.2 Cable Specifications

Item	Minimum	Type	Maximum	Unit
Cable length	-	-	1000	m
Cable characteristic impedance	-	120	-	W
Cable DC resistance	-	-	100	W
Cable capacitance	-	-	55.77	pF/m

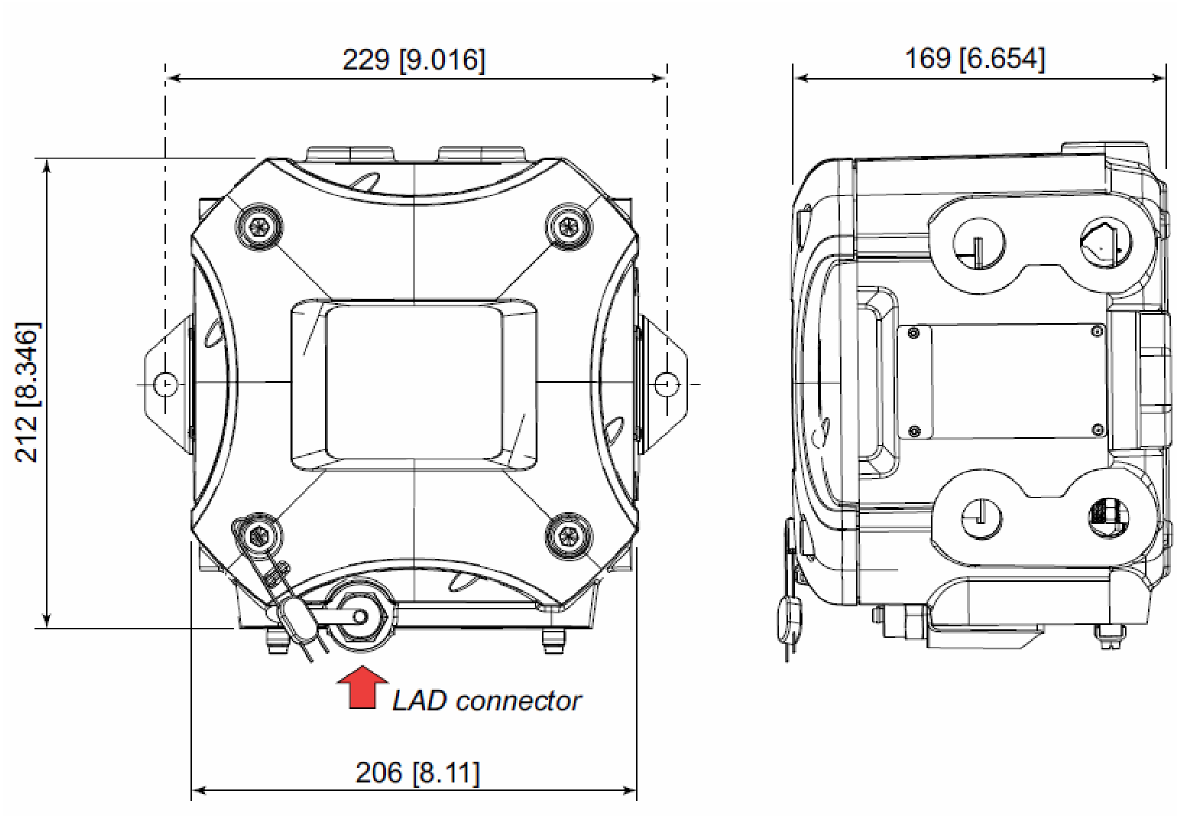
4 Installation

4.1 Mounting and Dimensions

The SSC-A can be mounted by means of two 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-A in mm [inches]



> NOTE: Where possible, minimize the impact of direct sunlight on the SSC. This helps decrease the effect of radiated heat on the enclosure and prolong screen life.

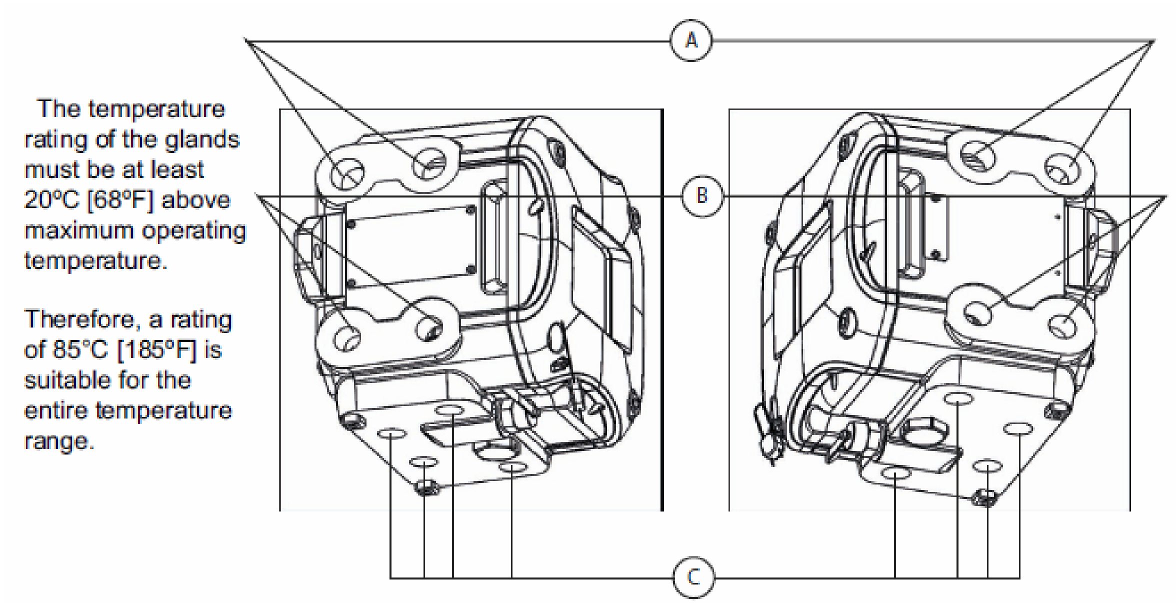
4.2 Gland Entries

4.2.1 General

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

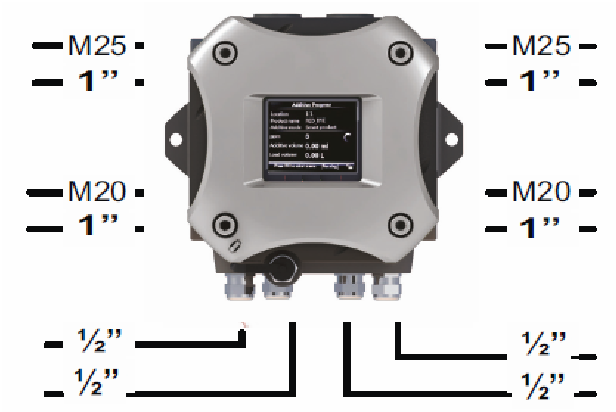
Entries marked A and B are field entries. These are accessible by removing all PCBs (except power board) from the SSC-A. Entries marked C are entries that are typically pre-assembled during manufacture.

Figure 4-2: SSC-A Metric Gland Entries



4.2.2 Metric Gland Entries

Figure 4-3: Metric Gland Entries Overview

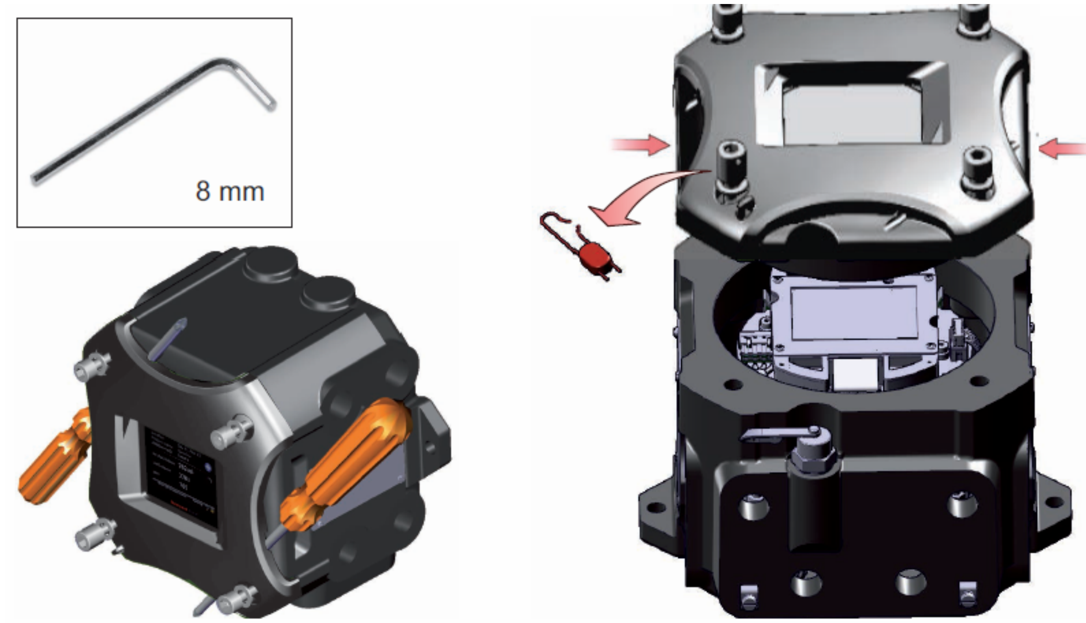


4.2.3 NPT Gland Entries

Figure 4-4: NPT Gland Entries Overview

4.3 Removing the Lid

1. Remove the W&M seal, if applicable.
2. Loosen the four captive socket-head screws with an 8 mm Allen key.
3. Pull the lid at arrowed locations (see the figure below, right). Rotate gently to aid removal.
4. If the lid is stuck, carefully force it open with two screwdrivers (see the figure below, left).

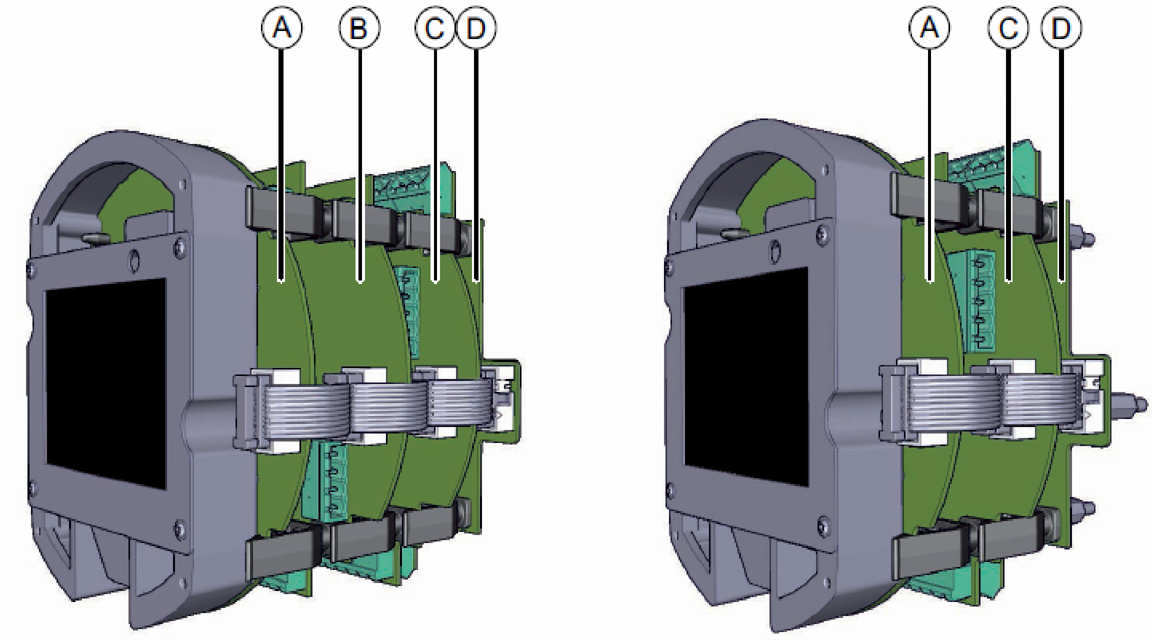


5. Make sure the O-ring is in place (see the figure below).

6. Place lid on a clean surface.

4.4 Removing the PCBs

Figure 4-5: Full-Configuration SSC-A (left) and 3-PCBs Configuration (right)



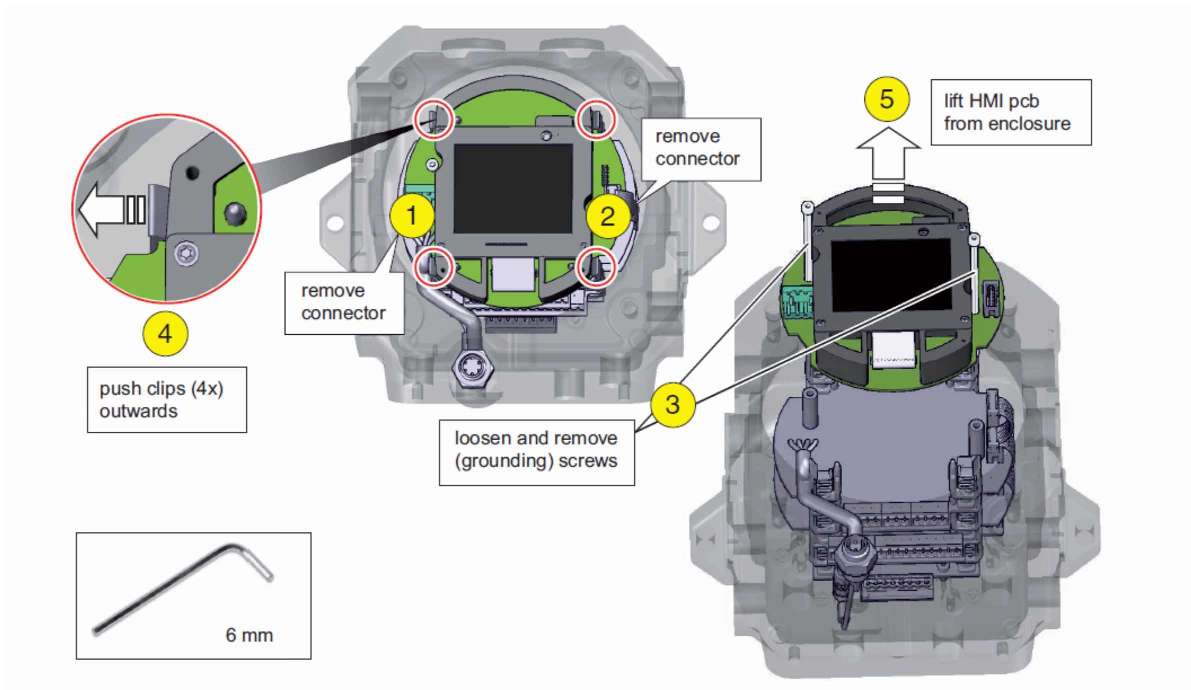
	PCB Name	Module Name	Description
A	CAN-HMI-SSC	FS-HMI	Controls the display and the Local Access Device (LAD) interfaces.
B	CAN-OPTION-SSC	FS-OPTION	Additional IO functions are available with this optional board.
C	CAN-ADD-BLEND	FS-STREAM	Controls the additive stream.
D	CAN-PSF-SSC	-	Delivers the internal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

To mount the field entries, all PCBs (except the power board) must be removed from the SSC-A.

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

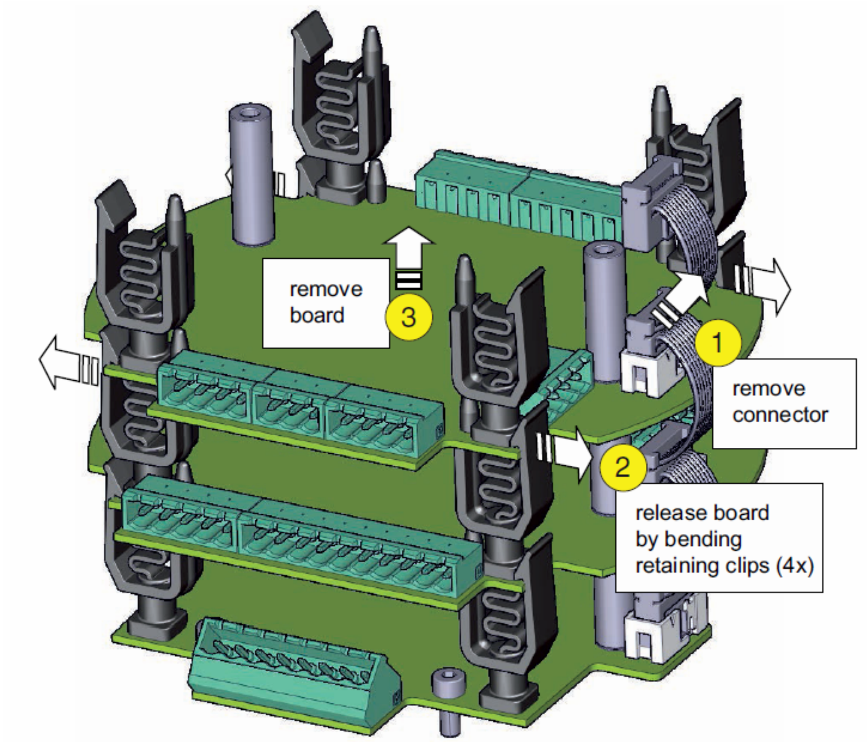
1. Remove the CAN-HMI-SSC board. See the following figure.

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



2. Remove the other PCBs (except CAN-PSF-SSC) one after another, as shown in the following figure.

Figure 4-7: Removing the Other PCBs



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

4.5 Replacing the PCBs

Replace PCBs in the 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 while guiding the attached wiring to the sides of the enclosure.
3. Align PCB with connectors below, and depress into place, ensuring each of the four clips clicks into place.
4. Replace PCB spacers.

5. Connect the flat cable connector.
6. Repeat for each remaining PCB.
7. Replace the HMI board, and secure with the two grounding screws (Allen key 6 mm).

4.6 Replacing the Lid

1. Ensure the O-ring of the lid is in place and not damaged. If damaged, replace the O-ring first.
2. Ensure the spigot faces are not damaged and do not contain dirt.

> CAUTION: Do not apply sealant to faces, and minimize the use of grease.

3. Ensure cables are clear of spigot face when reinserting the lid.
4. Rotate gently to aid insertion.
5. Mount the four captive socket-head screws with an 8 mm Allen key. Tighten with 16 Nm.

4.7 Fusing and Power Consumption

4.7.1 Fusing

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

> NOTE: All fusing is performed 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 3.5.1.4 - CAN-PSF-SSC.

4.7.2 SSC Power Consumption

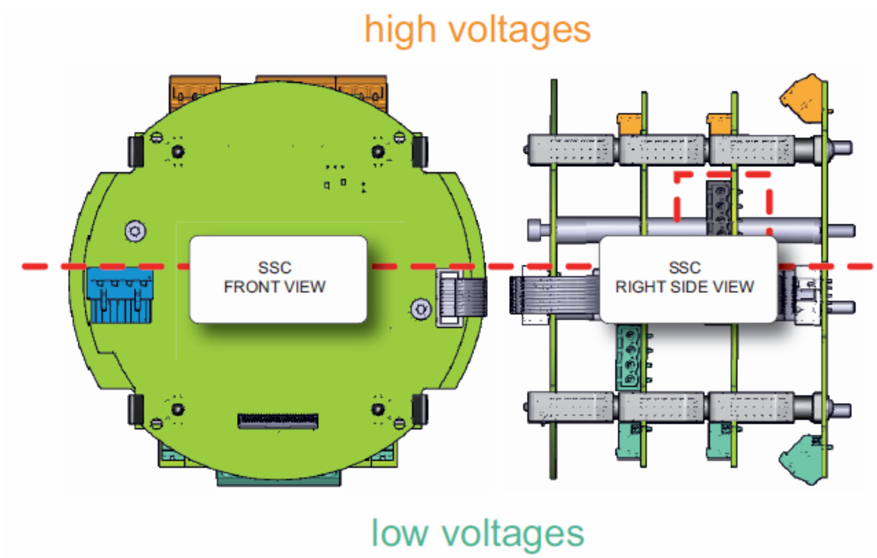
Maximal	Typical
15.9 W	9.9 W

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 Voltage 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 cases of the 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 practices 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	-	W
Cable DC resistance	Conductor end to end	-	-	100	W
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	230VAC Mains Supply Input
XLPE/SWA/PVC 4C X 1.5MM 600/1000V BS5467	2	230VAC Alarm Output
XLPE/SWA/PVC 4C X 1.5MM 600/1000V BS5467	4	230VAC Permissive Input
3C X 0.75MM2 YYNR PVC	4	230VAC Digital Controlled Valve Output
3C X 0.75MM2 YYNR PVC	4	230VAC Solenoid Supply Output
BS5308 1X4X0.5MM COL SCREEN SWA P1T2 PVC	2	12VDC Switched Output
BS5308 1X4X0.5MM COL SCREEN SWA P1T2 PVC	2	12VDC Switched Input
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	4	Analog Input (maximum 24 V, 3.2 - 24 mA)

Cable Type	Number of Wires	Function
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 12 V, 10 KHz)
BS5308 1X4X0.5MM COL SCREEN SWA P1T2 PVC	3	Pulse Input (maximum 12 V, 10 KHz)
BS5308 1X4X0.5MM COL SCREEN SWA P1T2 PVC	4	Analog input RTD (maximum 24 V, 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

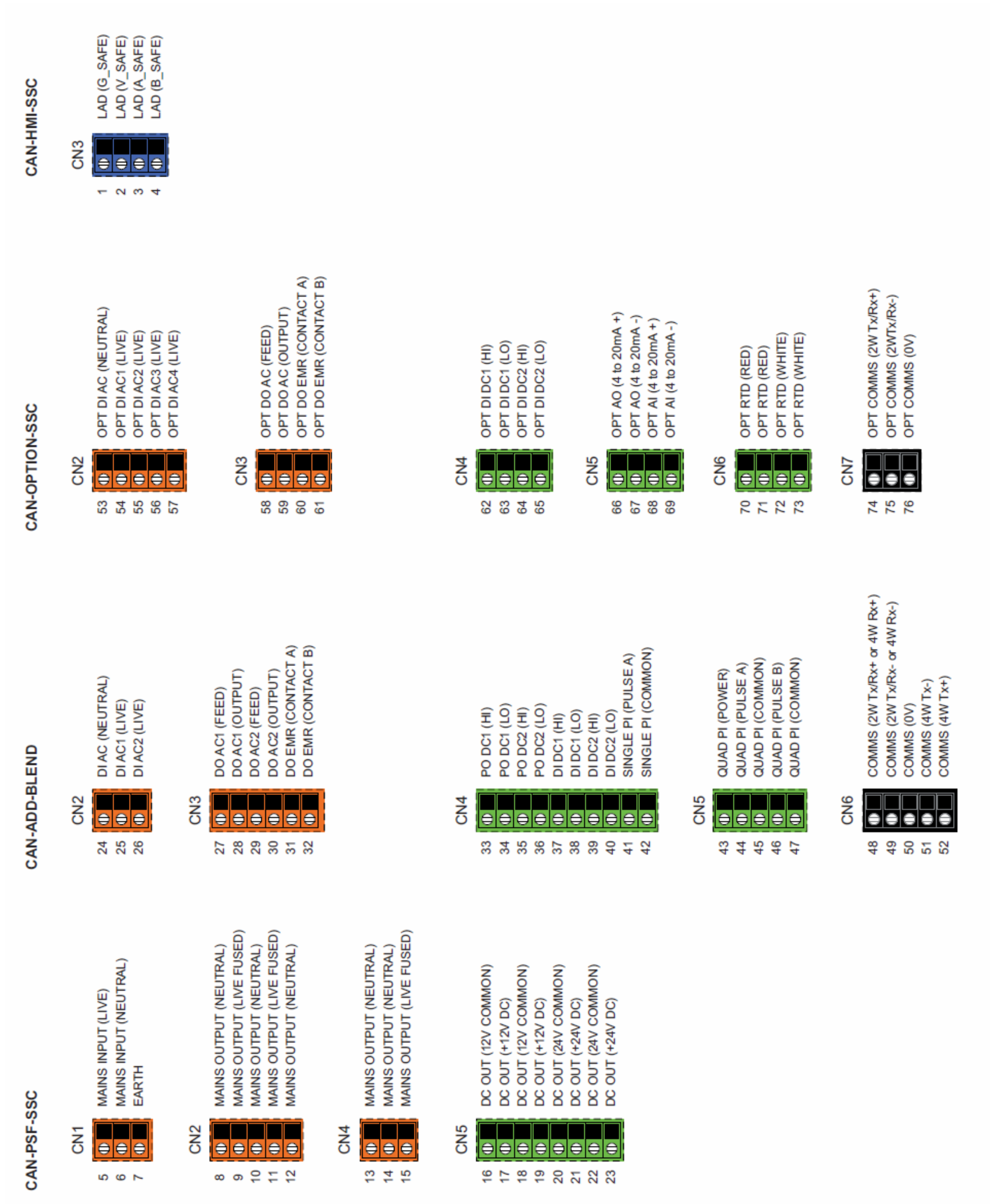
4.8.5 Wire Crimps

There are no strictly prescribed wire crimps. However, it is advised to fit crimps (bootlace ferrules) to multi-strand cable wires.

NOTE: Wire crimps are used 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.

4.8.6 Board Connectors Overview



4.9 Terminal Assignment Guide

- The following tables offer a suggested guide for basic function assignment to specific terminals.
- The majority of the SSC-A functions can be assigned to multiple I/O.
- To complete the installation, bind each function to its I/O within the Configuration Menu (see 5.11.3 - I/O binding).

4.9.1 CANN-ADD-BLEND

<table>
<tr><th>Terminal</th><th>ID</th><th>Suggested</th><th>Options</th></tr>
<tr><td>CN2</td><td colspan="3"></td></tr>
<tr><td>24</td><td>DI-AC</td><td>Common Neutral</td><td>Pre-installed for Fusion4 MiniPak</td></tr>
<tr><td>25</td><td>DI-AC1</td><td>Permissive</td><td>Alarm Reset, Slow Flow Signal, Pump Feedback, System Interlock, Tank Low Level, Tank Empty, Pacing Source, Ext. Solenoid Control</td></tr>
<tr><td>26</td><td>DI-AC2</td><td>Alarm Reset</td><td>Alarm Reset, Slow Flow Signal, Pump Feedback, System Interlock, Tank Low Level, Tank Empty, Pacing Source, Ext. Solenoid Control</td></tr>
<tr><td>CN3</td><td colspan="3"></td></tr>
<tr><td>27</td><td>DO-AC1</td><td>Feed</td><td rowspan="3">Pre-installed for Fusion4 MiniPak</td></tr>
<tr><td>28</td><td>DO-AC1</td><td>Add. Control Solenoid</td></tr>
<tr><td>29</td><td>DO-AC2</td><td>Feed</td></tr>
</table>

Terminal	ID	Suggested	Options
30	DO-AC2		Add. Control Solenoid, Alarm Shutdown, Pump Start, Alarm Indication, Add. Blocking Solenoid, Add. Inj. Feedback
31	DO-EMR (Contact A)	Alarm Shutdown	Pump Start, Alarm Indication, Add. Blocking Solenoid
32	DO-EMR (Contact B)		
CN4			
33	PO DC1 (Hi)		Pump Start, Alarm Indication, Factored Pulse Out, Add. Inj. Feedback
34	PO DC1 (Lo)		
35	PO DC2 (Hi)		Pump Start, Alarm Indication, Factored Pulse Out, Add. Inj. Feedback
36	PO DC2 (Lo)		
37	DI DC1 (Hi)		Permissive, Alarm Reset, Slow Flow Signal, Pump Feedback, System Interlock, Tank Low Level, Tank Empty, Pacing Source, Ext. Solenoid Control
38	DI DC1 (Lo)		
39	DI DC2 (Hi)		Permissive, Alarm Reset, Slow Flow Signal, Pump Feedback, System Interlock, Tank Low Level, Tank Empty, Pacing Source, Ext. Solenoid Control
40	DI DC2 (Lo)		
41	Single PI (Pulse A)	Pacing Source	
42	Single PI (Common)		

Terminal	ID	Suggested	Options
CN5			
43	Quad PI (Power)	Additive Flow Meter (single)	Pre-installed for Fusion4 MiniPak
44	Quad PI (Pulse A)		
45	Quad PI (Common)		
46	Quad PI (Pulse B)	Additive Flow Meter (dual)	
47	Quad PI (Common)		
CN6			
48	Comms (2W)	RS-485 2-wire	
49	Comms (2W)		
50	Comms (0V)		
51	Comms (4W)	RS-485 4-wire	
52	Comms (4W)		

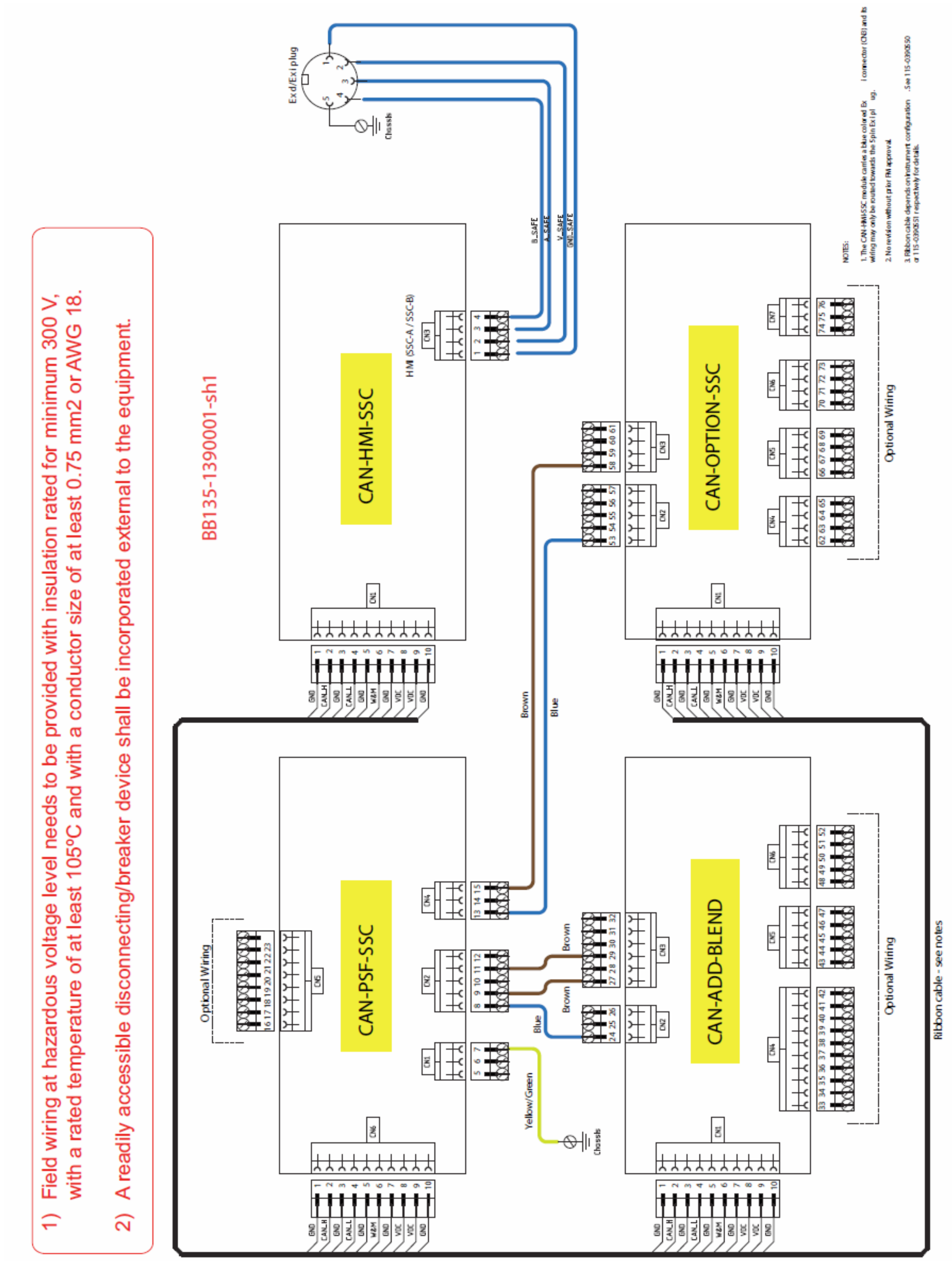
4.9.2 CAN-OPTION-SSC

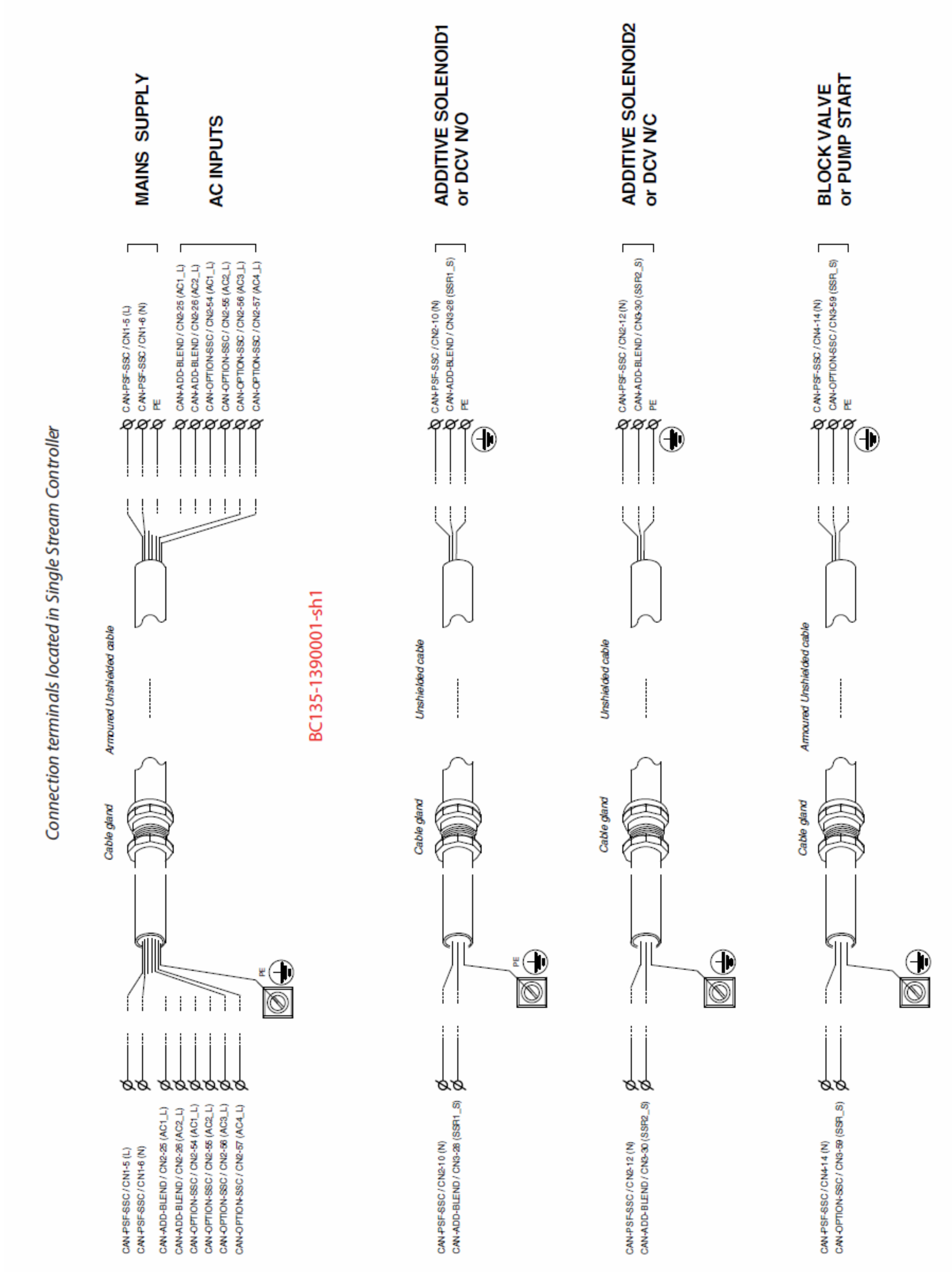
The CAN-OPTION-SSC card is not fitted as standard in the Fusion4 MiniPak arrangement. However, if included as a requested upgrade option, the following terminal assignment guidance is provided.

Terminal	ID	Suggested	Options
CN2			
53	OPT DI-AC	Common Neutral	Pre-installed for Fusion4 MiniPak
54	OPT DI-AC1		Alarm Reset, Slow Flow Signal, Pump Feedback, System Interlock, Tank Low Level, Tank Empty, Pacing Source, Ext. Solenoid Control
55	OPT DI-AC2		
56	OPT DI-AC3		
57	OPT DI-AC4		
CN3			
58	OPT DO-AC1	Feed	Pre-installed for Fusion4 MiniPak Neutral - PSF, CN4, Terminal 14

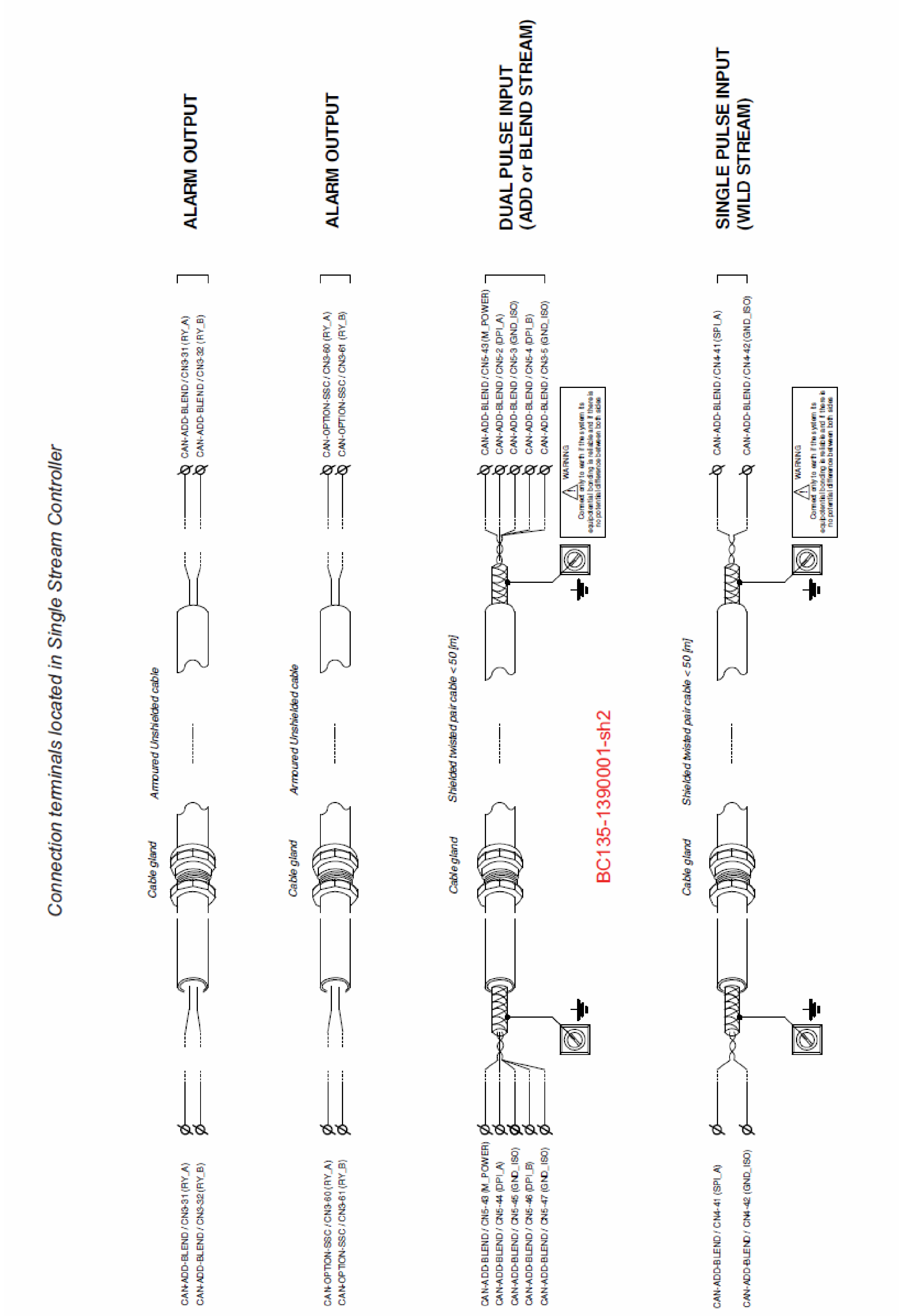
Terminal	ID	Suggested	Options
59	OPT DO-AC1		Add. Control Solenoid, Alarm Shutdown, Pump Start, Alarm Indication, Add. Blocking Solenoid, Add. Inj. Feedback
60	OPT DO-EMR(Contact A)		Pump Start, Alarm Indication, Add. Blocking Solenoid
61	OPT DO-EMR (Contact B)		
CN4			
62	OPT DI DC1 (Hi)		Permissive, Alarm Reset, Slow Flow Signal, Pump Feedback, System Interlock, Tank Low Level, Tank Empty, Pacing Source, Ext. Solenoid
63	OPT DI DC1 (Lo)		
64	OPT DI DC2 (Hi)		
54	OPT DI DC2 (Lo)		
CN5			
66	OPT AO (4-20mA+)		Additive Volume, Additive Flowrate, Wildstream Flowrate, PPM, Accumulated Additive Total.
67	OPT AO (4-20mA-)		
68	OPT AI (4-20mA+)		Wildstream Flowrate in Smart Analog input mode, Temperature Sensor, Pressure Sensor, Permissive.
69	OPT AI (4-20mA-)		
CN6			
70	OPT RTD (red)		Temperature
71	OPT RTD (red)		
72	OPT RTD (white)		
73	OPT RTD (white)		
CN7			
74	Comms (2W+)		Comms
75	Comms (2W-)		
76	Comms (0V)		

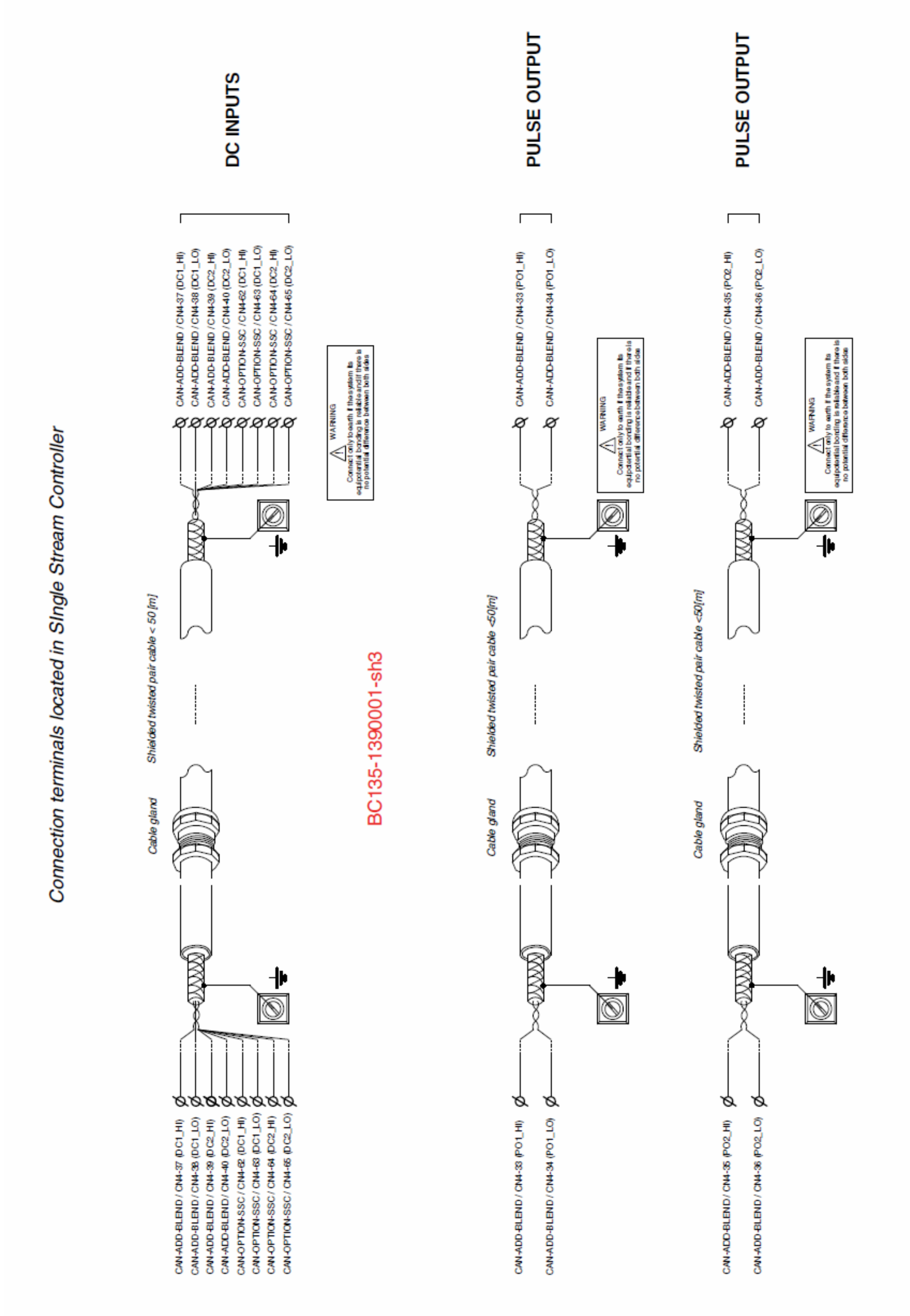
4.9.3 Internal Wiring Diagram

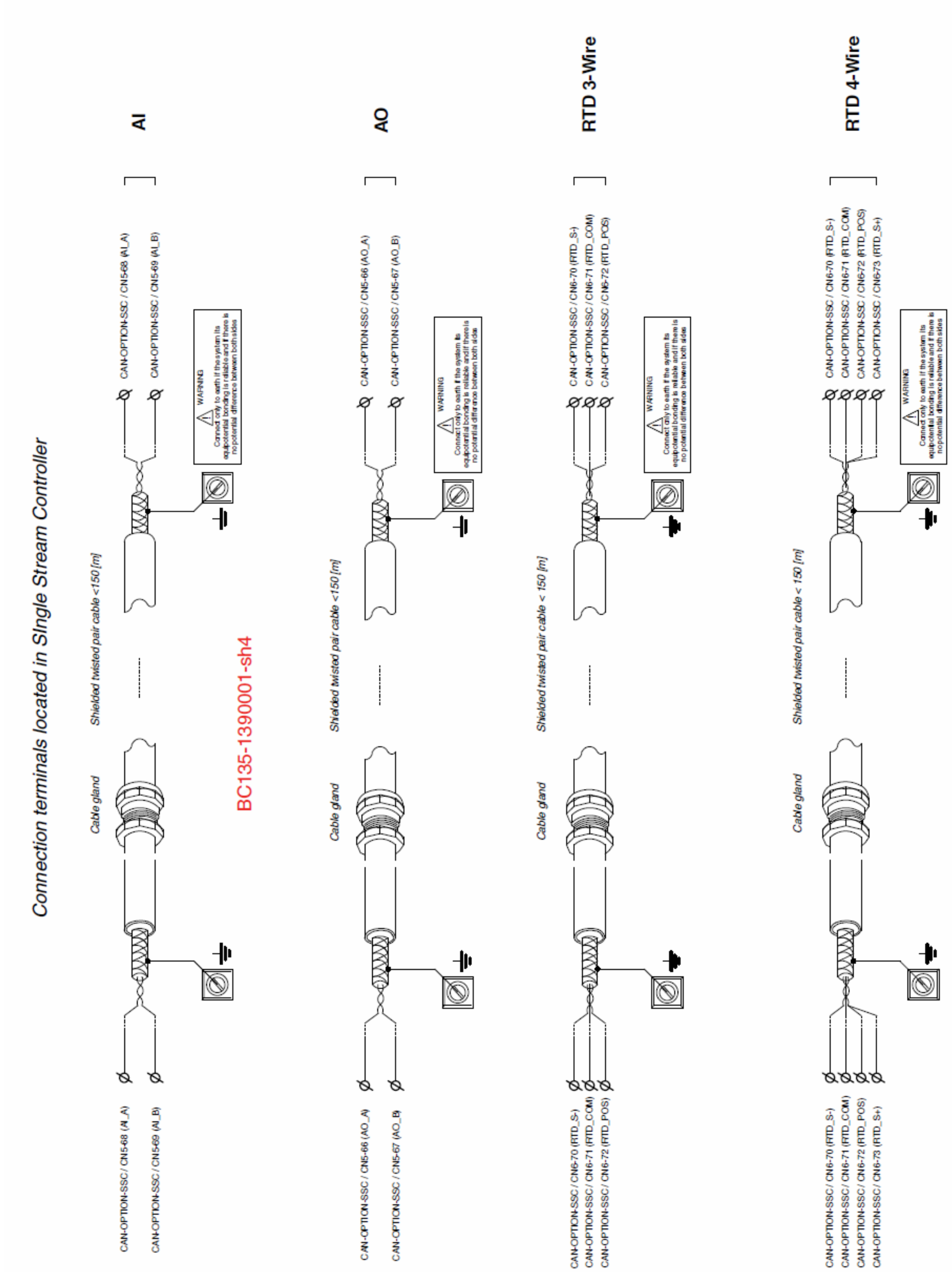


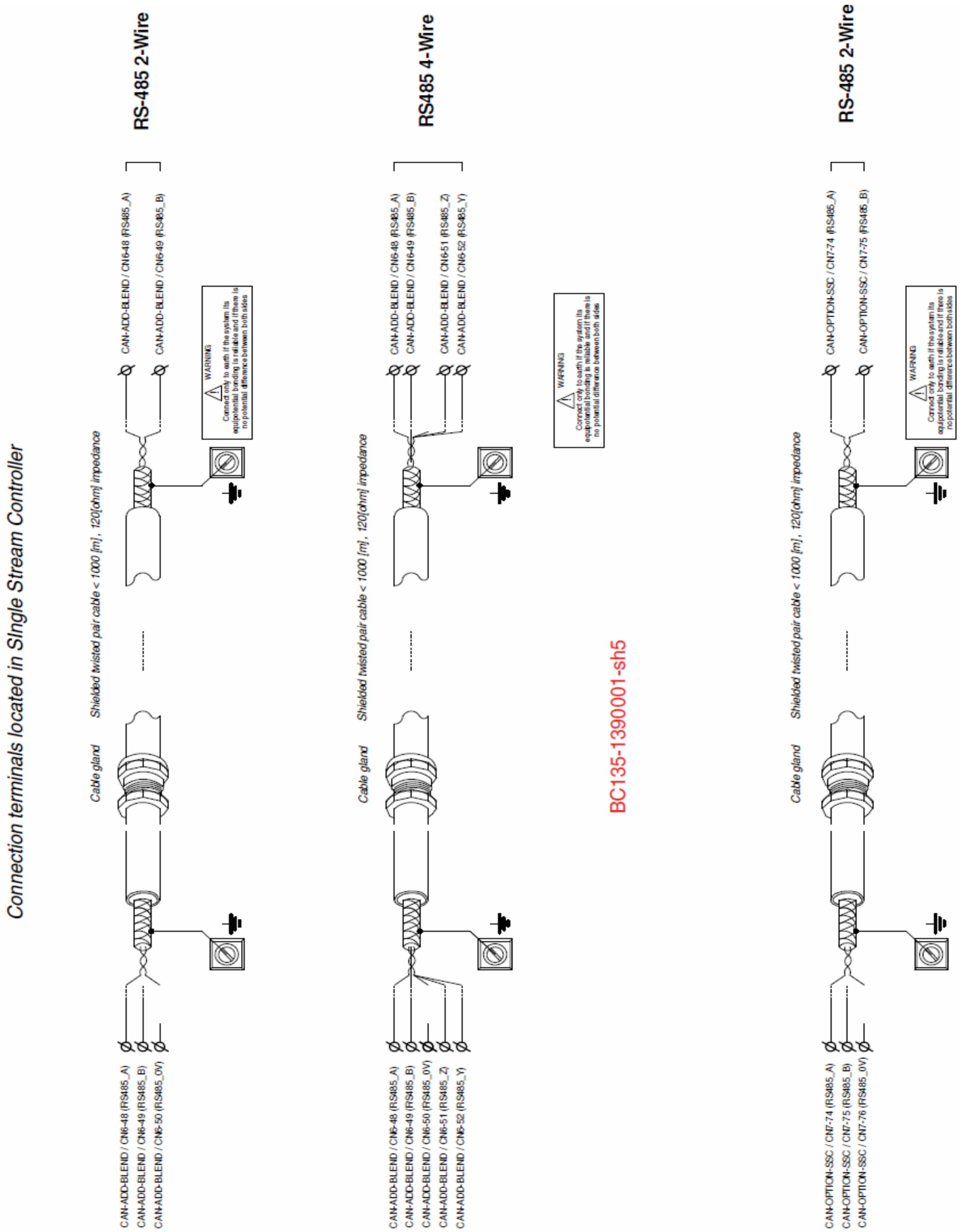


Connection terminals located in Single Stream Controller
MAINS SUPPLY
AC INPUTS
ADDITIVE SOLENOID1 or DCV N/O
ADDITIVE SOLENOID2 or DCV N/C
BLOCK VALVE or PUMP START
BC135-1390001-sh1
Cable gland
Armoured Unshielded cable
Unshielded cable
CAN-PSF-SSC / CN1-5 (L)
CAN-PSF-SSC / CN1-6 (N)
PE
CAN-ADD-BLEND / CN2-25 (AC1_L)
CAN-ADD-BLEND / CN2-26 (AC2_L)
CAN-OPTION-SSC / CN2-54 (AC1_L)
CAN-OPTION-SSC / CN2-55 (AC2_L)
CAN-OPTION-SSC / CN2-56 (AC3_L)
CAN-OPTION-SSC / CN2-57 (AC4_L)
CAN-PSF-SSC / CN2-10 (N)
CAN-ADD-BLEND / CN3-28 (SSR1_S)
CAN-PSF-SSC / CN2-12 (N)
CAN-ADD-BLEND / CN3-30 (SSR2_S)
CAN-PSF-SSC / CN4-14 (N)
CAN-OPTION-SSC / CN3-59 (SSR_S)


Connection terminals located in Single Stream Controller
ALARM OUTPUT
CAN-ADD-BLEND / CN3-31 (RY_A)
CAN-ADD-BLEND / CN3-32 (RY_B)
Cable gland
Armoured Unshielded cable
ALARM OUTPUT
CAN-OPTION-SSC / CN3-60 (RY_A)
CAN-OPTION-SSC / CN3-61 (RY_B)
Cable gland
Armoured Unshielded cable
DUAL PULSE INPUT
(ADD or BLEND STREAM)
CAN-ADD-BLEND / CN5-43 (M_POWER)
CAN-ADD-BLEND / CN5-2 (DPI_A)
CAN-ADD-BLEND / CN5-3 (GND_ISO)
CAN-ADD-BLEND / CN5-4 (DPI_B)
CAN-ADD-BLEND / CN3-5 (GND_ISO)
CAN-ADD-BLEND / CN5-43 (M_POWER)
CAN-ADD-BLEND / CN5-44 (DPI_A)
CAN-ADD-BLEND / CN5-45 (GND_ISO)
CAN-ADD-BLEND / CN5-46 (DPI_B)
CAN-ADD-BLEND / CN5-47 (GND_ISO)
Cable gland
Shielded twisted pair cable < 50 [m]
BC135-1390001-sh2
SINGLE PULSE INPUT
(WILD STREAM)
CAN-ADD-BLEND / CN4-41 (SPI_A)
CAN-ADD-BLEND / CN4-42 (GND_ISO)
Cable gland
Shielded twisted pair cable < 50 [m]
WARNING


Connection terminals located in SIngle Stream Controller
DC INPUTS
PULSE OUTPUT
PULSE OUTPUT
Cable gland
Shielded twisted pair cable < 50 [m]
Shielded twisted pair cable <50[m]
BC135-1390001-sh3
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)
CAN-ADD-BLEND / CN4-33 (PO1_HI)
CAN-ADD-BLEND / CN4-34 (PO1_LO)
CAN-ADD-BLEND / CN4-35 (PO2_HI)
CAN-ADD-BLEND / CN4-36 (PO2_LO)
WARNING
Connect only to earth if the system is equipotential bonding is reliable and if there is no potential difference between both sides


Connection terminals located in Single Stream Controller
AI
AO
RTD 3-Wire
RTD 4-Wire
BC135-1390001-sh4
Cable gland
Shielded twisted pair cable <150 [m]
CAN-OPTION-SSC / CN5-68 (AI_A)
CAN-OPTION-SSC / CN5-69 (AI_B)
CAN-OPTION-SSC / CN5-66 (AO_A)
CAN-OPTION-SSC / CN5-67 (AO_B)
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+)
WARNING
Connect only to earth if the system its equipotential bonding is reliable and if there is no potential difference between both sides


Connection terminals located in Single Stream Controller
RS-485 2-Wire
CAN-ADD-BLEND / CN6-48 (RS485_A)
CAN-ADD-BLEND / CN6-49 (RS485_B)
CAN-ADD-BLEND / CN6-50 (RS485_0V)
Cable gland
Shielded twisted pair cable < 1000 [m], 120[ohm] impedance
CAN-ADD-BLEND / CN6-48 (RS485_A)
CAN-ADD-BLEND / CN6-49 (RS485_B)
WARNING
Connect only to earth if the system its equipotential bonding is reliable and if there is no potential difference between both sides
RS485 4-Wire
CAN-ADD-BLEND / CN6-48 (RS485_A)
CAN-ADD-BLEND / CN6-49 (RS485_B)
CAN-ADD-BLEND / CN6-50 (RS485_0V)
CAN-ADD-BLEND / CN6-51 (RS485_Z)
CAN-ADD-BLEND / CN6-52 (RS485_Y)
Cable gland
Shielded twisted pair cable < 1000 [m], 120[ohm] impedance
CAN-ADD-BLEND / CN6-48 (RS485_A)
CAN-ADD-BLEND / CN6-49 (RS485_B)
CAN-ADD-BLEND / CN6-51 (RS485_Z)
CAN-ADD-BLEND / CN6-52 (RS485_Y)
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-sh5
RS-485 2-Wire
CAN-OPTION-SSC / CN7-74 (RS485_A)
CAN-OPTION-SSC / CN7-75 (RS485_B)
CAN-OPTION-SSC / CN7-76 (RS485_0V)
Cable gland
Shielded twisted pair cable < 1000 [m], 120[ohm] impedance
CAN-OPTION-SSC / CN7-74 (RS485_A)
CAN-OPTION-SSC / CN7-75 (RS485_B)
WARNING
Connect only to earth if the system its equipotential bonding is reliable and if there is no potential difference between both sides

5 Operation

5.1 General

5.1.1 Introduction

This chapter contains commissioning information for the SSC-A.

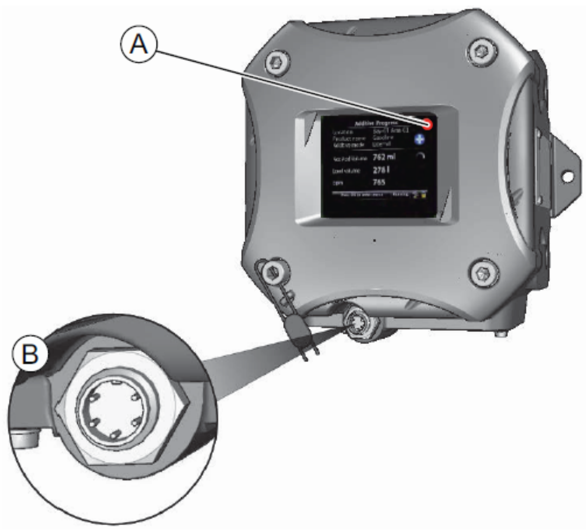
Commissioning the SSC-A is carried out by configuring entities (or parameters) to the desired specific values. This is performed through the menu functions of the SSC-A (see 5.4 - Menu and Navigation).

5.2 Service Interfaces

The SSC-A can be configured through three interfaces:

- The infrared interface with the IR Controller (see the following figure)
- The wired Ex i interface with a LAD (see the following figure)
- RS-485 communication

Figure 5-1: Service Interfaces of the SSC-A



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-A. 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-A 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-A.

The Fusion4 IR Controller has all the infrared commands permanently stored in its micro-controller. Due to this, if the batteries are drained, it can be restored to complete 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 activate 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-A uses seven of the Fusion4 IR Controller buttons (^, v, <, >, OK, ESC).

Figure 5-2: Key Functions of the Fusion4 IR Controller

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

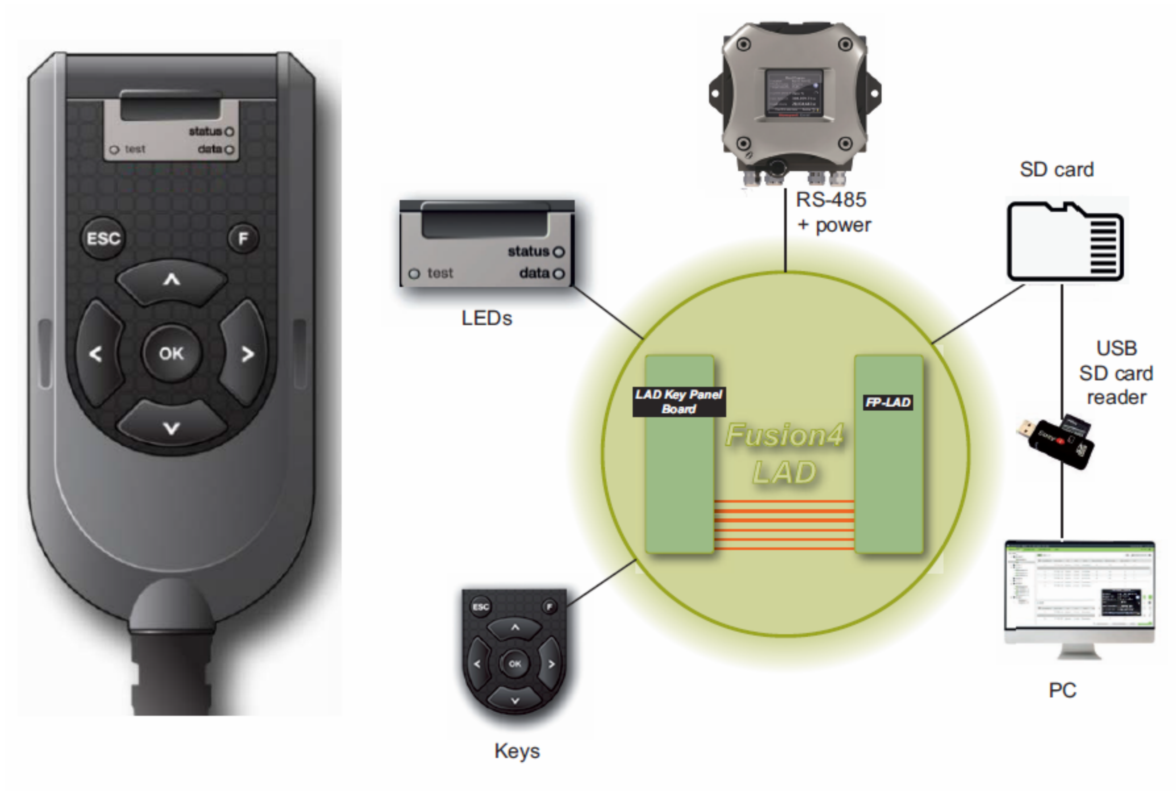
5.3.2 LAD

5.3.2.1 General

The LAD is a hand-held controller used to interface with the Fusion4 product family, allowing tasks such as parameter adjustment, alarm resetting, and additive calibration.

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

Figure 5-3: LAD System Overview



5.3.2.2 LAD Appllication Overview

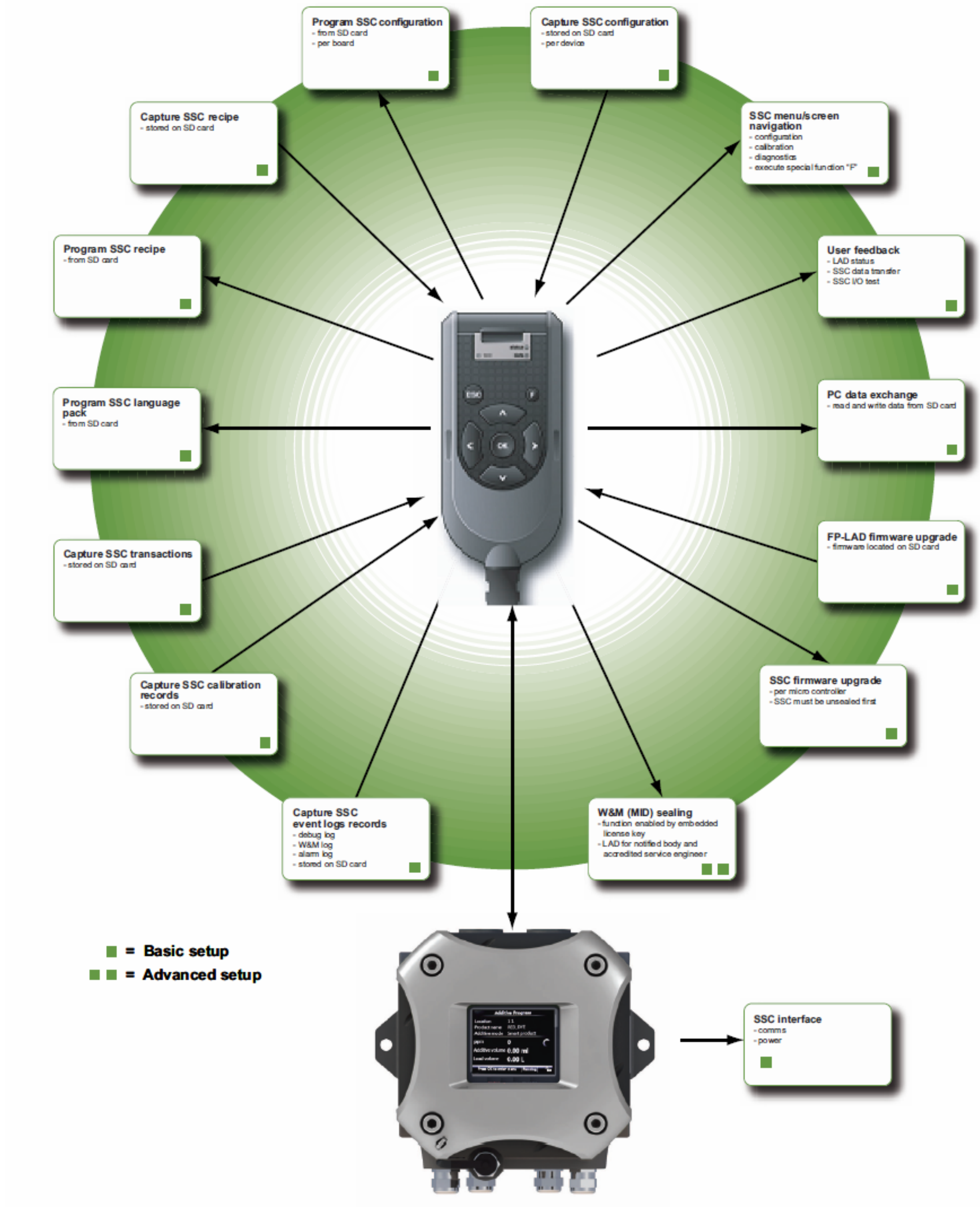


Figure 5-4: LAD Application Overview

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.

Figure 5-5: Basic Navigation (Fusion4 IR Controller + LAD)

<table>
<tr><th>Fusion4 IR Controller</th><th>LAD</th></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td colspan="2">Λ = Up</td></tr>
<tr><td colspan="2">V = Down</td></tr>
<tr><td colspan="2">< = Left</td></tr>
<tr><td colspan="2">> = Right</td></tr>
<tr><td colspan="2">OK = Select</td></tr>
<tr><td colspan="2">ESC = Back</td></tr>
</table>

5.3.3.2 LEDs (Fusion4 IR Controller + LAD)

<table>
<tr><th colspan="2">Fusion IR Controller</th><th colspan="2">LAD</th></tr>
<tr><td colspan="2">

</td><td colspan="2">

</td></tr>
<tr><th>Button</th><th>Description</th><th>Button</th><th>Description</th></tr>
<tr><td rowspan="3">send (blinking)</td><td rowspan="3">Fusion4 IR Controller is ready for operation.

NOTE: When LED is OFF, press the ATTN key to “wake up” the Fusion4 IR Controller.</td><td>status (dual-color)</td><td>• green = OK
• red = Fault</td></tr>
<tr><td>data (amber)</td><td>ON = data transfer

NOTE: Do not disconnect at data transfer.</td></tr>
<tr><td>test (dual color)</td><td>• green = mapped I/O function has good health and is active
• red (solid) = mapped I/O is inactive
• red (blinking) = mapped I/O has bad health
• off = no I/O mapping exists</td></tr>
</table>

5.3.3.3 Special Function Key (LAD only)

A user-defined LAD function can be mapped to the F key. Examples include transferring a transaction to LAD, bringing up the Diagnostics screen, and starting the calibration wizard.

The special function key can be configured by the HMI of the Fusion4 device.

> NOTE: The LAD special function key may not be applicable to all the Fusion4 devices.

Figure 5-6: LAD Special Function Key

5.3.3.4 SD Card

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

> NOTE: Format the SD card before using it for the first time. See section 5.17.4 for more information about formatting the SD card.

Figure 5-7: SD Card Location in the LAD (Lid Opened)

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

The SD card is used for storing the following:

- 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 (for SSC-B only)

5.3.3.4.1 Product Type Selection

The selection of an SD card for the LAD is important. Due to the safe design of the LAD, the current drawn by the SD card is strictly limited. 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 by Guidant.

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

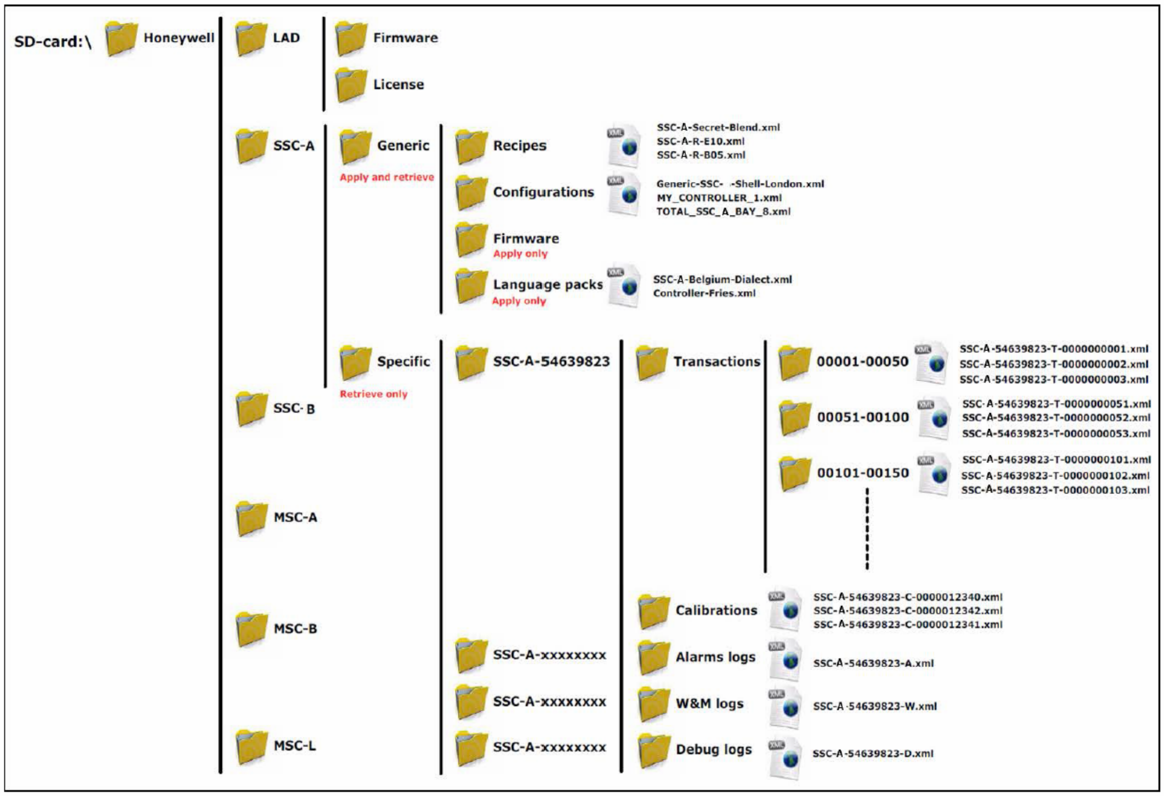
> NOTE: Guidant does not provide support for any other SD card. Contact the factory for more information.

It is possible to use other SD cards, but they must conform to the following specifications.

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

> NOTE: 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



5.3.3.4.3 Guidelines

- All files have *.xml format and extension (except Firmware and License).
- File name identification (file-ID):
  - T = Transactions
  - C = Calibrations
  - A = Alarm logs
  - W = W&M logs
  - D = Debug logs
  - R = Recipes
- **Transactions** file name format:

  - <device-type>-<serial number>-<file-id>-<transaction-id>.xml
  - Example: SSC-A-54639823-T-0123456789.xml
- **Calibrations** file name format :
  - <device-type>-<serial number>-<file-id>-<calibration-id>.xml
  - Example: SSC-A-54639823-C-0123456789.xml
- **Alarm logs** file name format:
  - <device-type>-<serial number>-<file-id>.xml
  - Example: SSC-A-54639823-A.xml
- **Debug logs** file name format :
  - <device-type>-<serial number>-<file-id>.xml
  - Example: SSC-A-54639823-D.xml
- **Recipes** file name format :
  - <device-type>-<file-id>-<recipe-name>.xml
  - Example: SSC-A-R-E20.xml
- **Configurations** file name format :
  - <user defined string>.xml
  - Example: MY_CONTROLLER_1.xml

Generic files built/edited in a PC environment can differ from the above format.

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.

Firmware files must be placed in the corresponding folders for the LAD and the SSC-A; otherwise they cannot be selected during SSC-A (device) - LAD interaction.

5.3.3.4.4 Number of Files

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

File Location	Number of Files
\SSC-A\Generic\Recipes	100
\SSC-A\Generic\Configurations	100
\SSC-A\Generic\Firmware	25
\SSC-A\Generic\Language packs	25
\SSC-A\Specific\SSC-A-54639823\Transactions	10,000
\SSC-A\Specific\SSC-A-54639823\Calibrations	100
\SSC-A\Specific\SSC-A-54639823\Alarm logs	1
\SSC-A\Specific\SSC-A-54639823\W&M logs	1
\SSC-A\Specific\SSC-A-54639823\Debug logs	1

5.3.3.4.5 Language Pack Configurable Screens

In the following table, the idle and running screens are listed 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
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

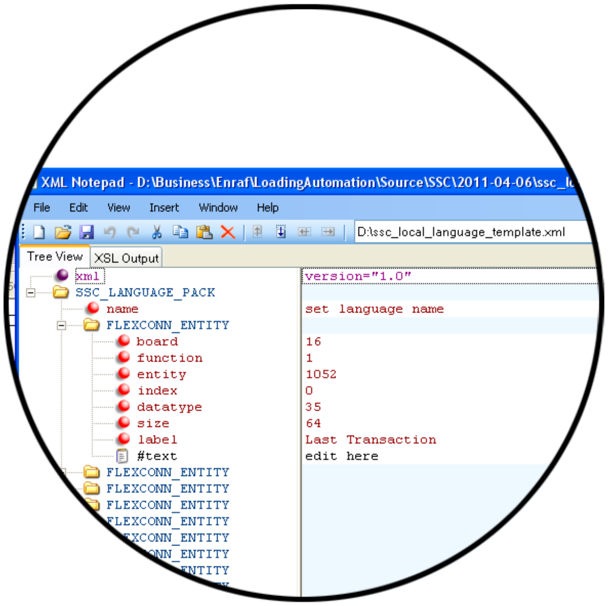
Last Transaction Screen	Alarm Messages
Location	Pulse hardware alarm
No. of trans.	Temperature error alarm
Total volume	Pressure error alarm
Blend Progress Screen	Blend percentage alarm
Blend Progress	Leaking valve alarm
Location	Wild stream closing alarm
Product name	Blend stream closing alarm
Target 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**
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 SSC, follow these steps.

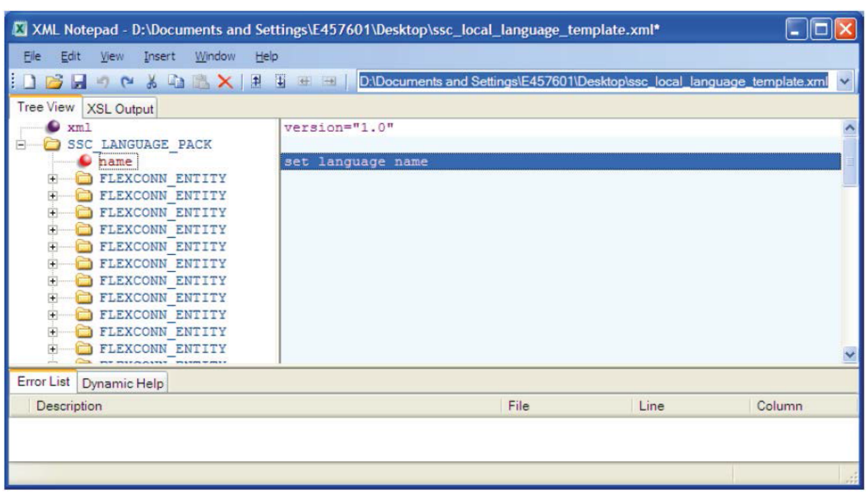
1. Open the file ssc_local_language_template.xml with an XML editor.

Figure 5-8: Screenshot Detail of the XML Template



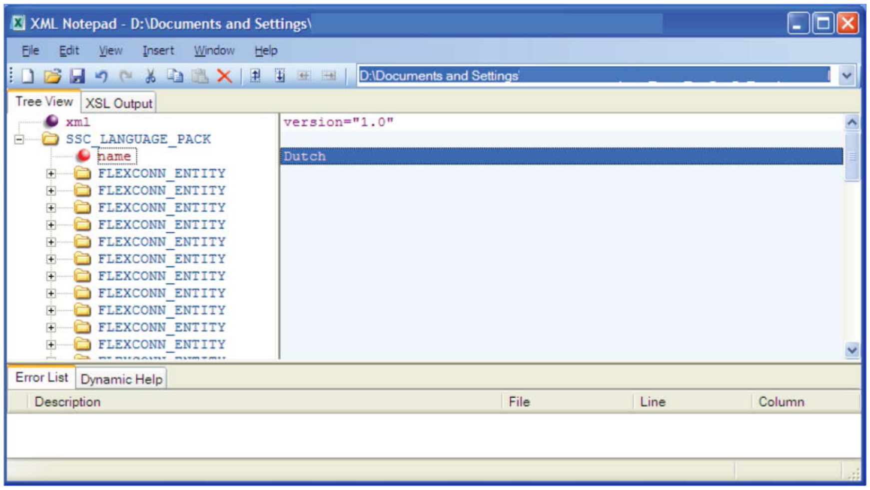
> NOTE: This manual displays screenshots from XML Notepad 2007, but any text editor can be used.

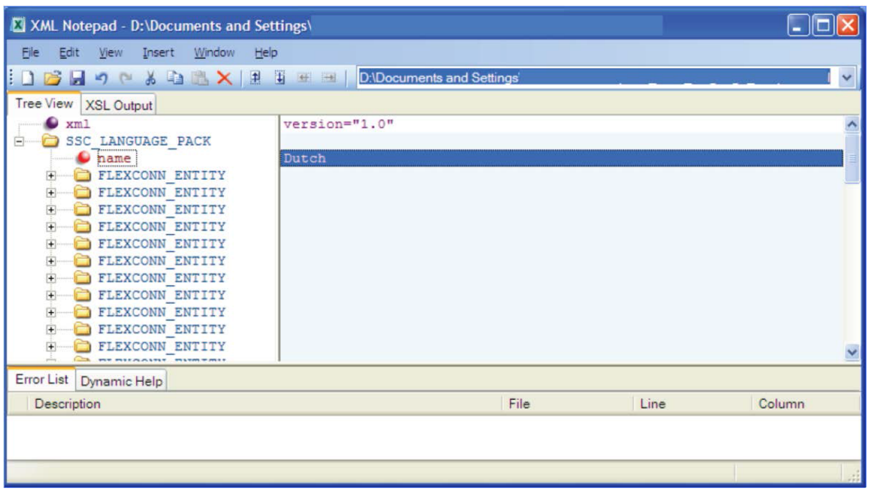
2. Replace the text **set language name** with the name of the language.

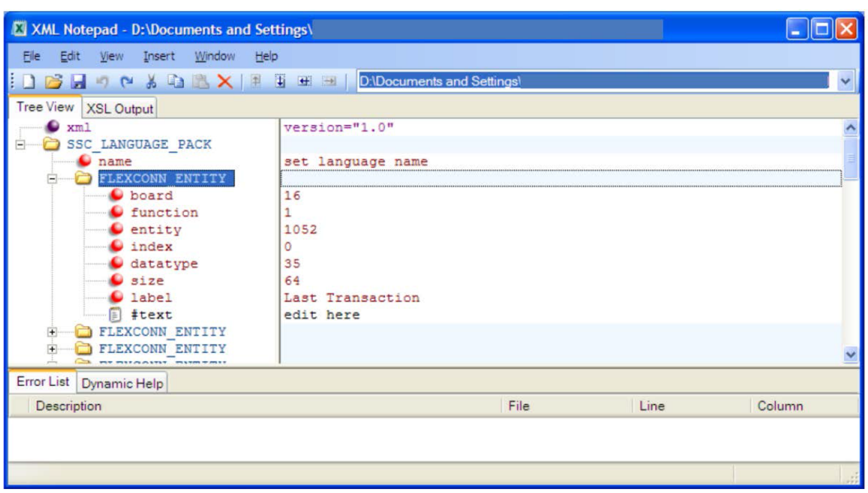


3. Provide a translation for every FLEXCONN_ENTITY instance, by replacing the "edit here" text with the local language.

> NOTE: Do not edit other fields.







4. Save the file and place it on the SD card in the following location:

   \SSC-A\Generic\Language packs

5. Upload the file to the device.
6. 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-A. 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

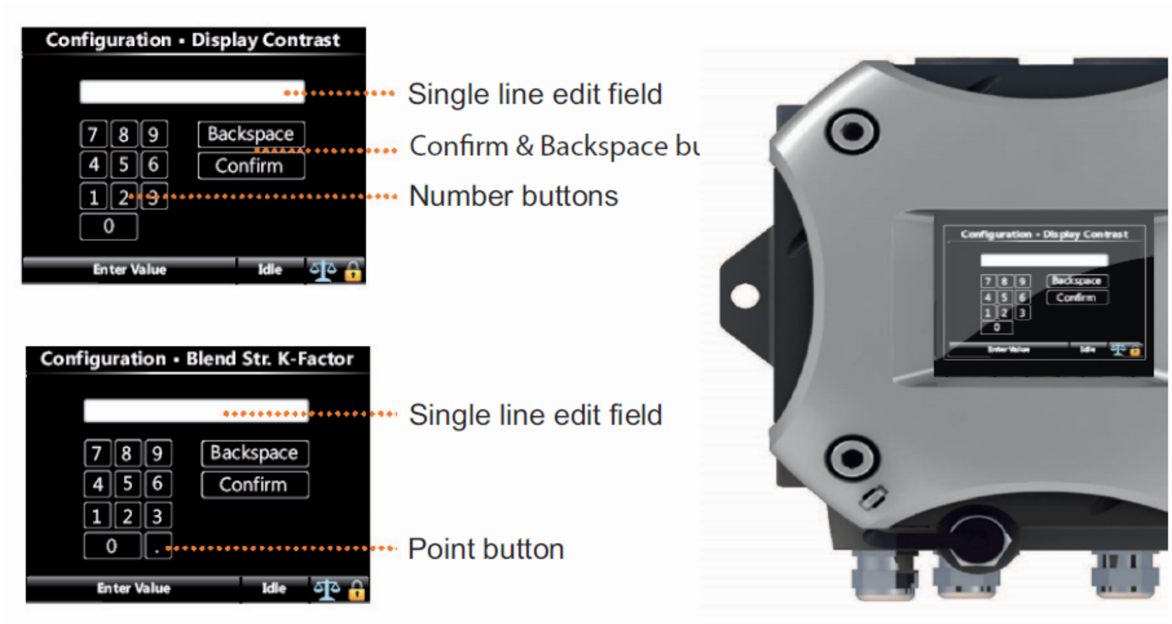
- Clean, intuitive, and informative user interface
- You do not have to memorize parameter codes, enumeration values
- Wizard-based configuration for additive meter calibration
- Flexible I/O configuration
- Diagnostic screens
- Record-based approach to transactions, recipes, and calibrations make reuse possible
- Interoperable with both the Fusion4 IR Controller and the LAD
- A graphical user interface to the LAD

The following sections briefly explain all the Main Menu items/aspects.

5.4.3 Main Menu

5.4.4 Text Input Screen

5.4.5 Numeric Input Screen



5.4.6 Enumeration Input Screen

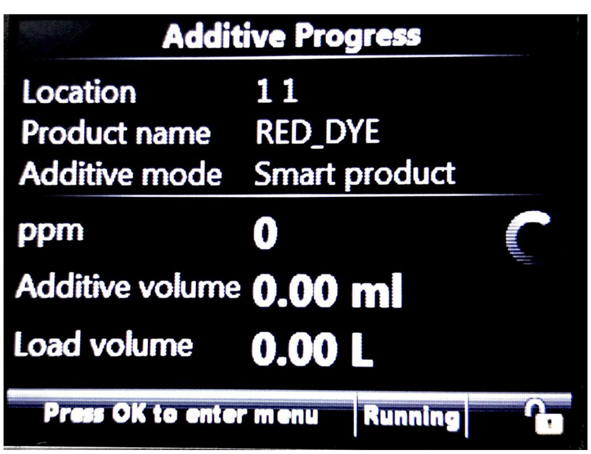
5.4.7 Status Bar

- Always visible on all screens
- Contains the following information:
  - Context-specific information/directions
  - Status of the transactions (for example, Idle, Running, or Error)
  - W&M Sealing Icon
  - Device Locking Icon

5.5 Running Screens

5.5.1 Additive Progress

During an active transaction, the following screen appears.



FIeld	Explanation
ppm	Parts per million of additive in the Load volume
Additive volume	Injected amount of additive
Load volume	Wild stream measured volume

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 screens below.

The “<” and “>” navigation buttons on the Fusion4 IR Controller or LAD can be used to toggle between these screens.

5.6 Transfer

Through the Transfer option, the following types of records can be transferred between the SSC and the LAD:

- Transactions
- Configurations
- Events / Logs
- Calibration records
- Recipes
- Language packs

> NOTE: Only available when the LAD is connected.

5.7 LAD Functions

This is the user interface to the following LAD-specific functionality.

> NOTE: Only available when the LAD is connected.

- Firmware download to the SSC and the LAD
- Configuration of the Test LED
- Configuration of the LAD's special function key
- LAD information

- W&M sealing
- Format SD card

5.8 Device Locking

Through the Lock/Unlock menu, you can lock or unlock the SSC.

A single password is used to lock the device from further configuration through HMI.

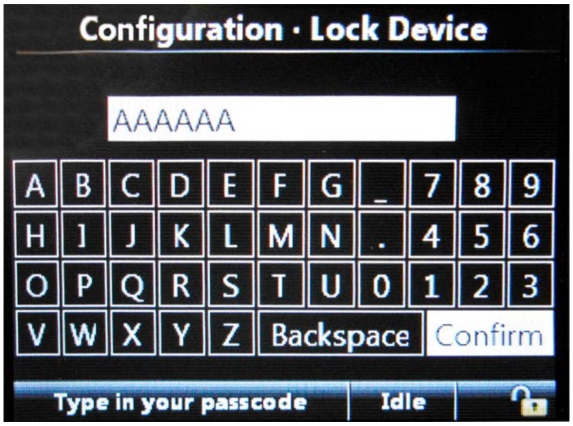
- The password consists of any character, and the size of the password must be between 1 and 6 characters.
- The device remains unlocked until explicitly locked again.
- Reading the password used for locking the device can be disabled by the jumper JP2.

The "lock status" appears in the status bar in the bottom right corner (padlock).

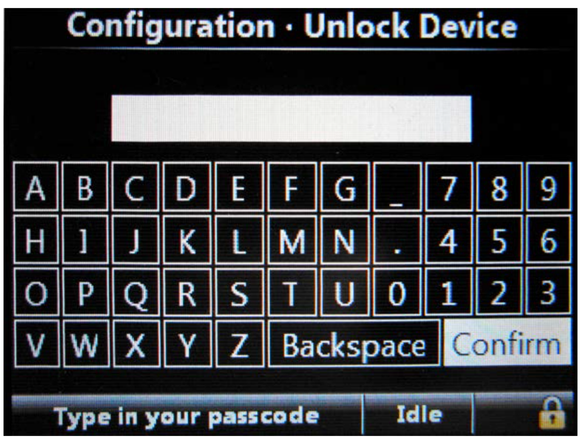
When the device is locked, no configuration entities can be changed through the SSC-A menu until you unlock the device again. Also, calibration activities, available tasks and commands, and s clear alarm function are disabled when the device is locked.

When the SSC-A is locked, configuration, recipes, and language packs cannot be applied through LAD.

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



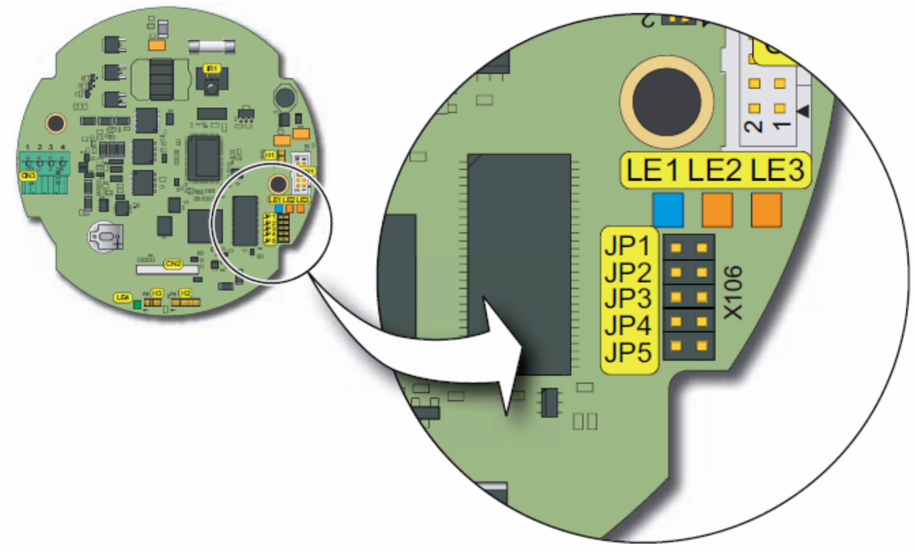
To unlock the device, enter the same password entered during locking the device.



The password is stored in non-volatile memory.

When the password read is protected by jumper JP2 on the connector X106 of the CAN-HMI-SSC and the password is forgotten, then the jumper should be removed or replaced in order to read the password again (see the following figure).

Figure 5-9: Lock the Device Password Read Protection by Jumper JP2



5.9 Device Commissioning

5.9.1 Using the Menu

The SSC-A is commissioned using its menu-based interface.

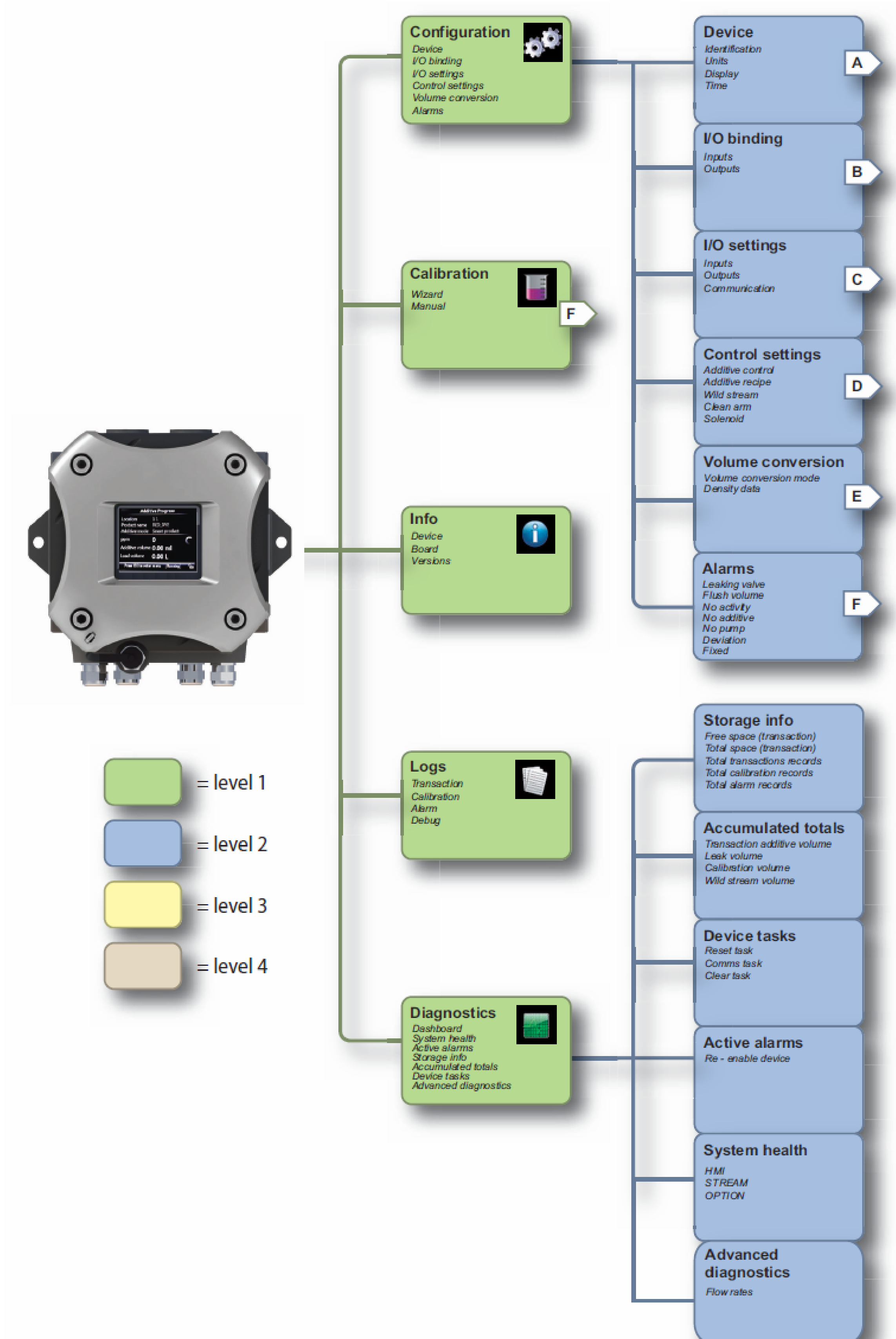
By using the Fusion4 IR Controller or the LAD, and starting from the Main Menu, the various sub-menus can be selected.

In this way all entities can be reached and set.

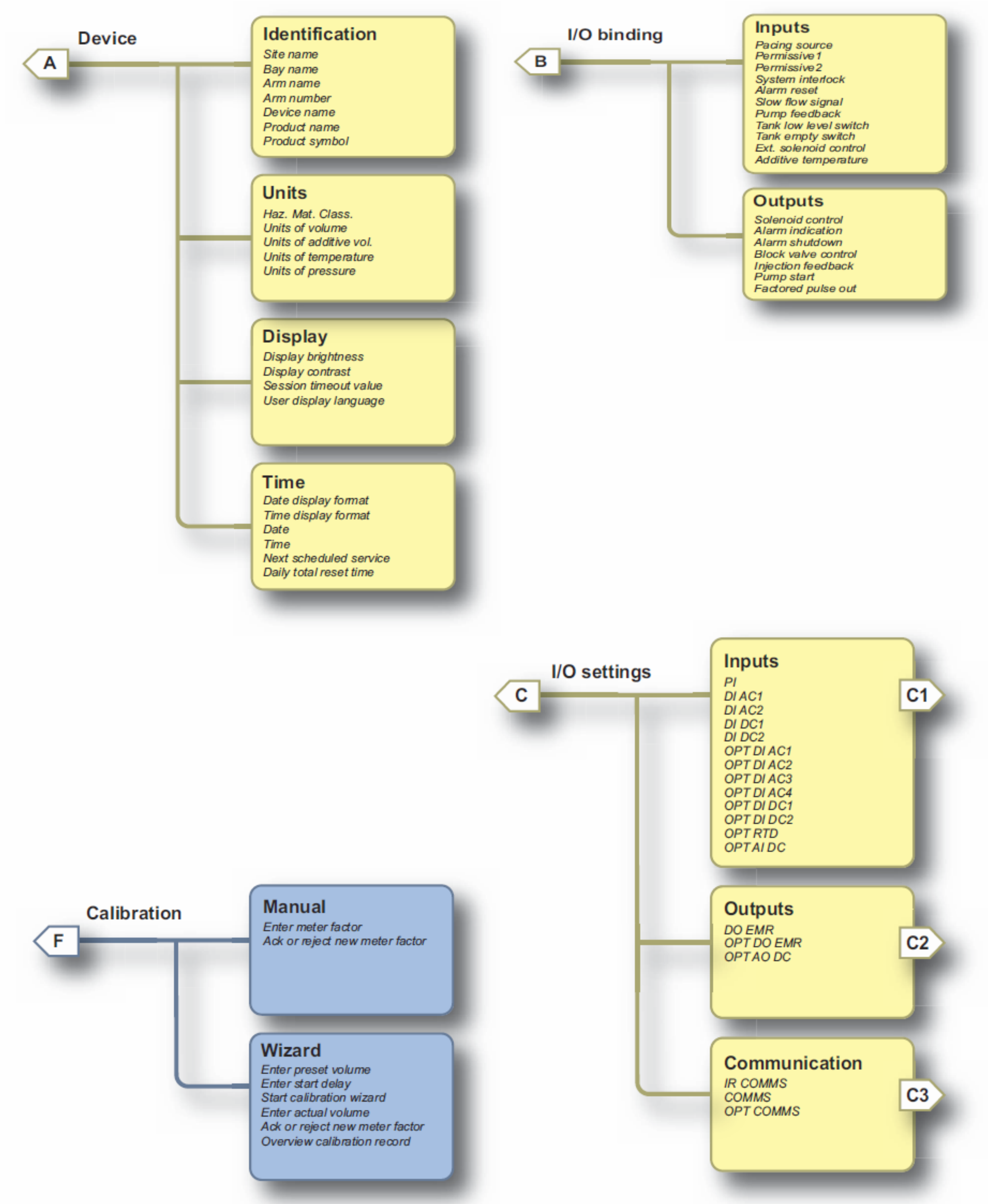
5.9.2 Menu Structure

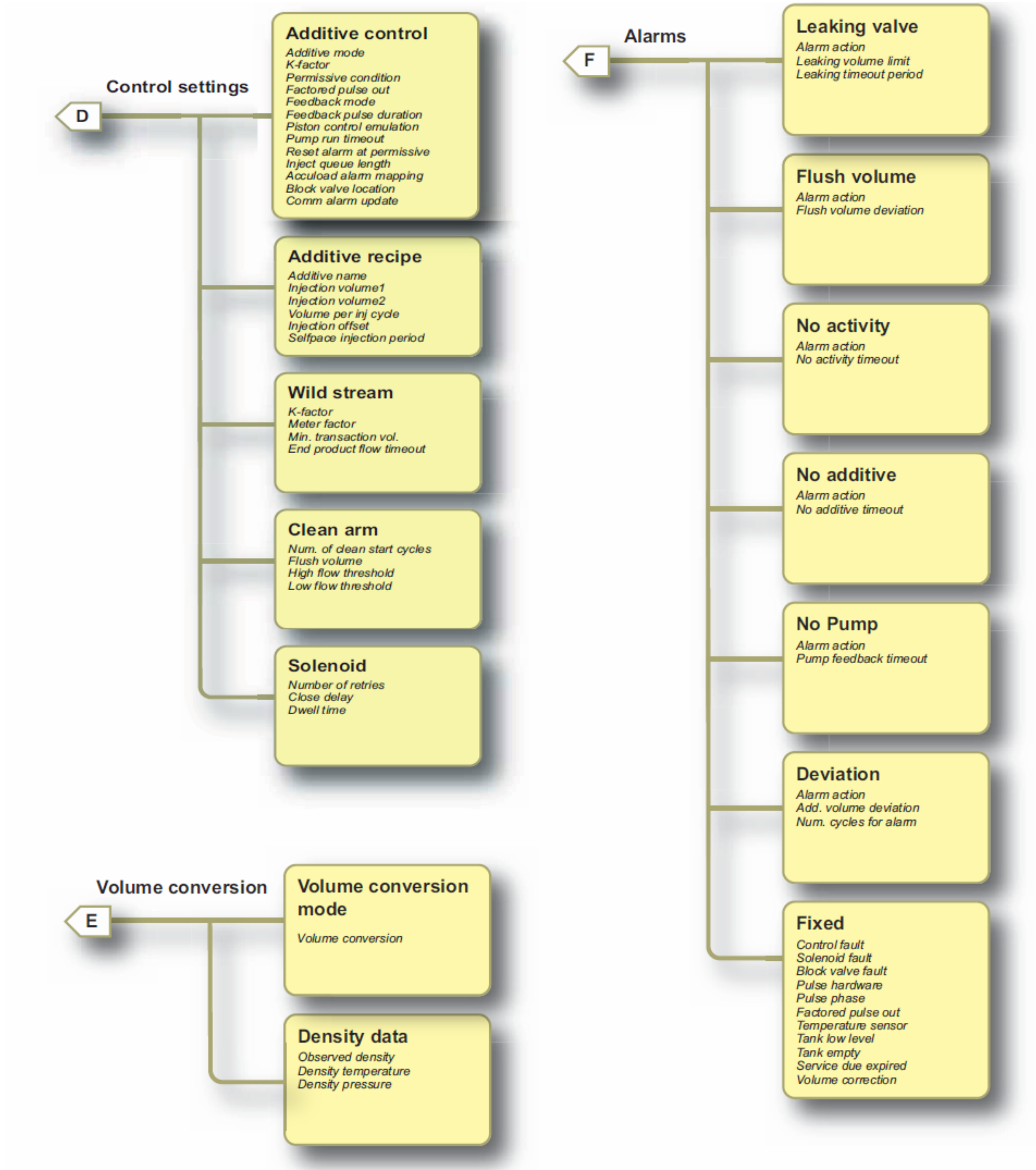
For an overview of all the entities and the parameters, see the following diagrams.

For complete description of all the possible configuration settings, see 5-10-Additive Injection Application Overview.

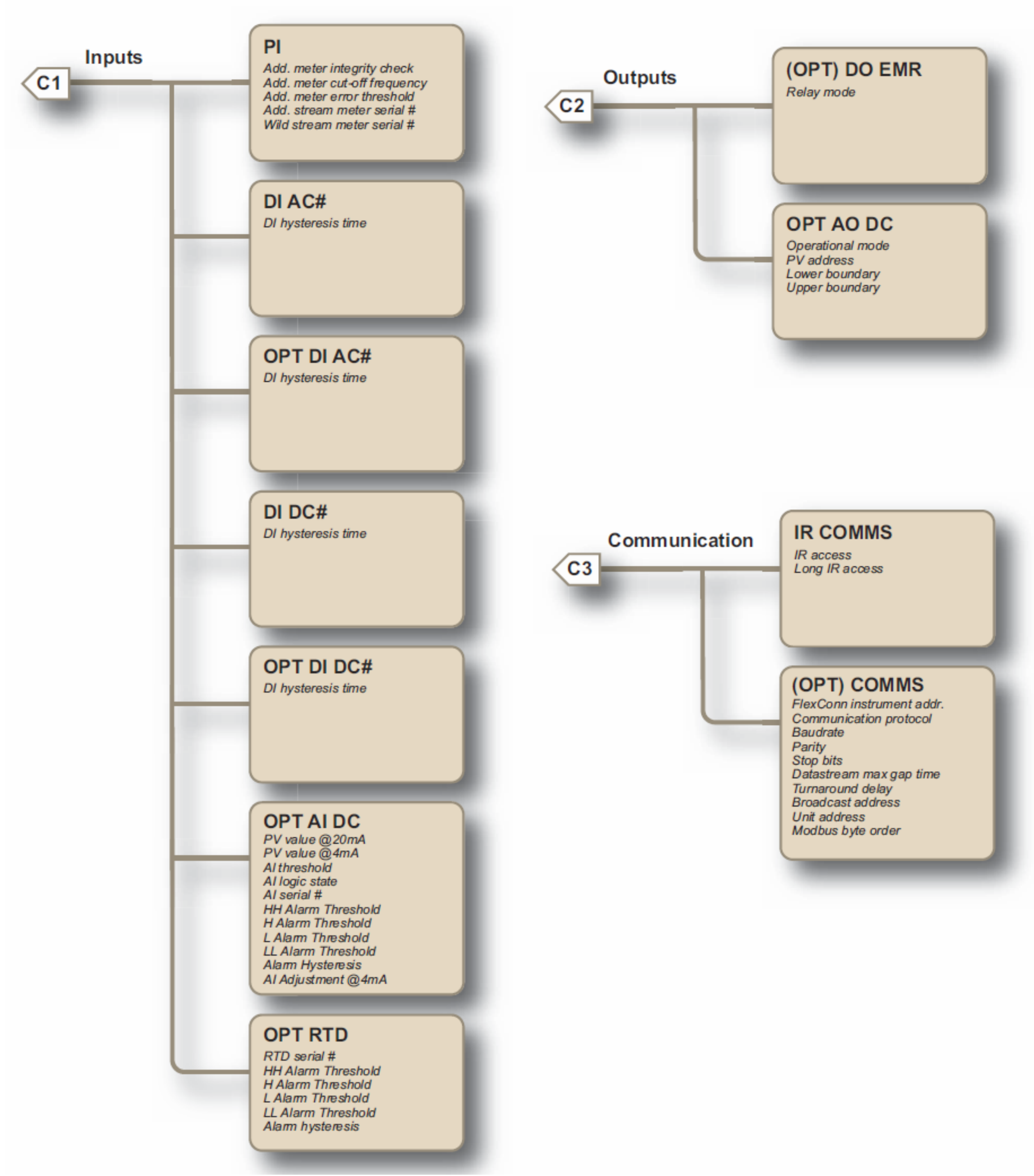


Configuration
Device
I/O binding
I/O settings
Control settings
Volume conversion
Alarms
Calibration
Wizard
Manual
F
Info
Device
Board
Versions
Logs
Transaction
Calibration
Alarm
Debug
Diagnostics
Dashboard
System health
Active alarms
Storage info
Accumulated totals
Device tasks
Advanced diagnostics
Device
Identification
Units
Display
Time
A
I/O binding
Inputs
Outputs
B
I/O settings
Inputs
Outputs
Communication
C
Control settings
Additive control
Additive recipe
Wild stream
Clean arm
Solenoid
D
Volume conversion
Volume conversion mode
Density data
E
Alarms
Leaking valve
Flush volume
No activity
No additive
No pump
Deviation
Fixed
F
Storage info
Free space (transaction)
Total space (transaction)
Total transactions records
Total calibration records
Total alarm records
Accumulated totals
Transaction additive volume
Leak volume
Calibration volume
Wild stream volume
Device tasks
Reset task
Comms task
Clear task
Active alarms
Re - enable device
System health
HMI
STREAM
OPTION
Advanced diagnostics
Flow rates
= level 1
= level 2
= level 3
= level 4


A
Device
Identification
Site name
Bay name
Arm name
Arm number
Device name
Product name
Product symbol
Units
Haz. Mat. Class.
Units of volume
Units of additive vol.
Units of temperature
Units of pressure
Display
Display brightness
Display contrast
Session timeout value
User display language
Time
Date display format
Time display format
Date
Time
Next scheduled service
Daily total reset time
B
I/O binding
Inputs
Pacing source
Permissive1
Permissive2
System interlock
Alarm reset
Slow flow signal
Pump feedback
Tank low level switch
Tank empty switch
Ext. solenoid control
Additive temperature
Outputs
Solenoid control
Alarm indication
Alarm shutdown
Block valve control
Injection feedback
Pump start
Factored pulse out
C
I/O settings
Inputs
PI
DI AC1
DI AC2
DI DC1
DI DC2
OPT DI AC1
OPT DI AC2
OPT DI AC3
OPT DI AC4
OPT DI DC1
OPT DI DC2
OPT RTD
OPT AI DC
C1
Outputs
DO EMR
OPT DO EMR
OPT AO DC
C2
Communication
IR COMMS
COMMS
OPT COMMS
C3
F
Calibration
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

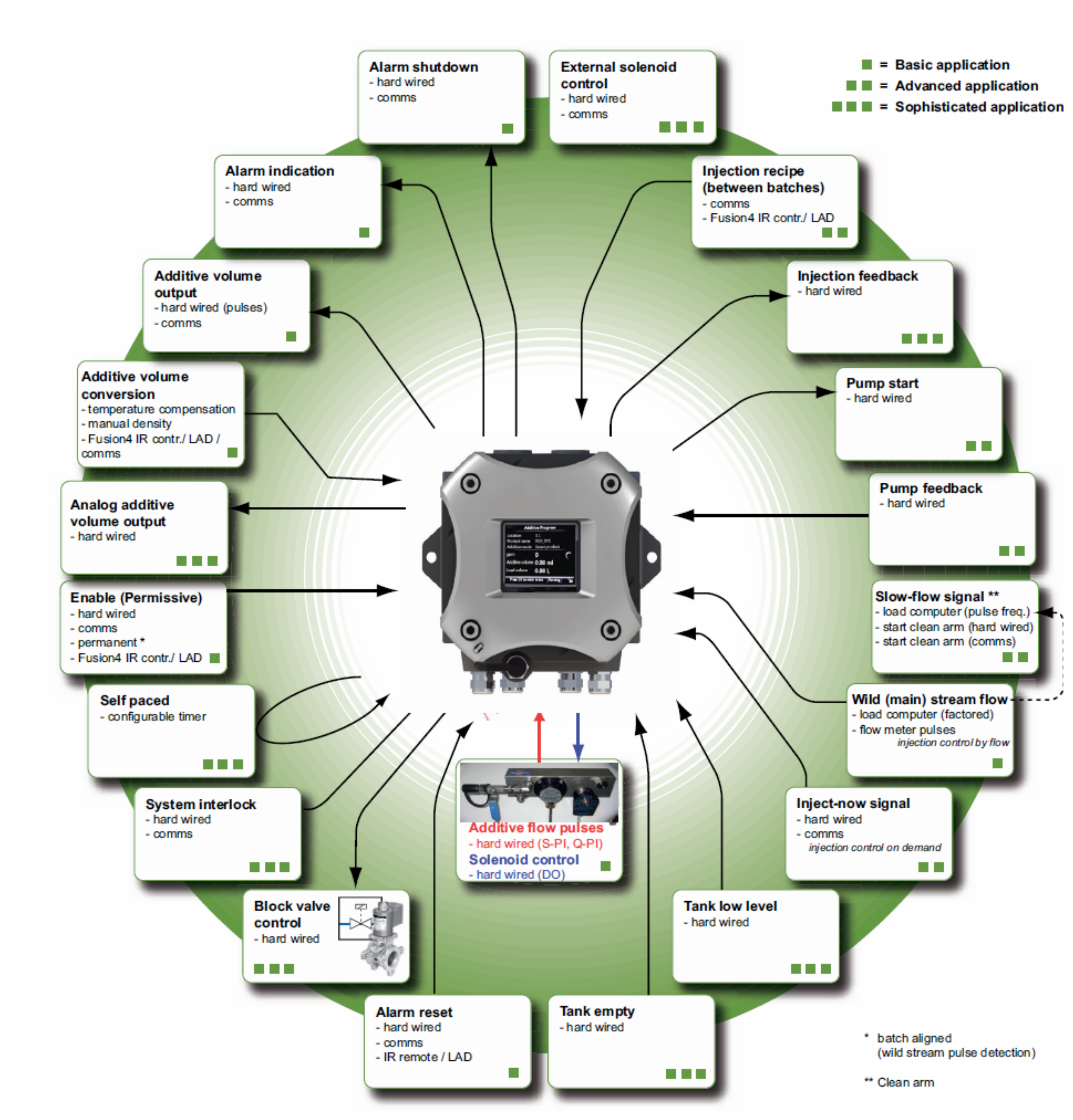


Control settings
D
Additive control
Additive mode
K-factor
Permissive condition
Factored pulse out
Feedback mode
Feedback pulse duration
Piston control emulation
Pump run timeout
Reset alarm at permissive
Inject queue length
Accuload alarm mapping
Block valve location
Comm alarm update
Additive recipe
Additive name
Injection volume1
Injection volume2
Volume per inj cycle
Injection offset
Selfpace injection period
Wild stream
K-factor
Meter factor
Min. transaction vol.
End product flow timeout
Clean arm
Num. of clean start cycles
Flush volume
High flow threshold
Low flow threshold
Solenoid
Number of retries
Close delay
Dwell time
Volume conversion
E
Volume conversion mode
Volume conversion
Density data
Observed density
Density temperature
Density pressure
Alarms
F
Leaking valve
Alarm action
Leaking volume limit
Leaking timeout period
Flush volume
Alarm action
Flush volume deviation
No activity
Alarm action
No activity timeout
No additive
Alarm action
No additive timeout
No Pump
Alarm action
Pump feedback timeout
Deviation
Alarm action
Add. volume deviation
Num. cycles for alarm
Fixed
Control fault
Solenoid fault
Block valve fault
Pulse hardware
Pulse phase
Factored pulse out
Temperature sensor
Tank low level
Tank empty
Service due expired
Volume correction


Inputs
C1
PI
Add. meter integrity check
Add. meter cut-off frequency
Add. meter error threshold
Add. stream meter serial #
Wild stream meter serial #
DI AC#
DI hysteresis time
OPT DI AC#
DI hysteresis time
DI DC#
DI hysteresis time
OPT DI DC#
DI hysteresis time
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
AI Adjustment @4mA
OPT RTD
RTD serial #
HH Alarm Threshold
H Alarm Threshold
L Alarm Threshold
LL Alarm Threshold
Alarm hysteresis
Outputs
C2
(OPT) DO EMR
Relay mode
OPT AO DC
Operational mode
PV address
Lower boundary
Upper boundary
Communication
C3
IR COMMS
IR access
Long IR access
(OPT) COMMS
FlexConn instrument addr.
Communication protocol
Baudrate
Parity
Stop bits
Datastream max gap time
Turnaround delay
Broadcast address
Unit address
Modbus byte order

5.10 Additive Injection Application Overview

Figure 5-10: Additive Injection Application Overview



5.11 Configuration

5.11.1 Using the Configuration Menu

From the Configuration menu, you can access the device configuration parameters, except the additive meter calibration entities.

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

The current device configuration values appear.

All configuration values are edited one at a time in a type-specific data entry window.

5.11.2 Device

5.11.2.1 Identification

Entity	Description	Value Range
[Site name]	The name of the site at which the SSC is located.	Can be a text string of maximum 20 characters.
[Bay name]	The name of the loading bay at which the SSC is located at site. The name appears in the running screens.	Can be a text string of maximum 20 characters. Use a maximum of 7 characters in order to see the complete name on the SSC screen.

Entity	Description	Value Range
[Arm name]	The name of the loading arm at which the SSC is located at site. The name appears in the running screens.	Can be a text string of maximum 20 characters. Use a maximum of 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 less than 32.
[Device name]	The name of the SSC itself, in order to have a unique identification of the device by a text string. The name appears in the running screens.	Can be a text string of maximum 20 characters. By default, the device name is SSC_BLND.
[Product name]	The name of the wild stream product. The name appears in the running screens.	A text string of maximum 20 characters. Use a maximum of 12 characters in order to see the complete name on the SSC screen.
[Product symbol]	A symbol or icon can be associated to identity the product of the wild stream. This icon appears in the running screens.	For the USA-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. By default, the product symbol is None.

5.11.2.1.1 Recipe Identification

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

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

  The product symbols are available as follows.

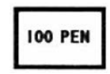
Description	Menu Text Displayed	Symbol
High-grade unleaded gasoline	HGU gasoline	
Mid-grade unleaded gasoline	MGU gasoline	
Low-grade unleaded gasoline	LGU gasoline	
Ultra-low sulfur diesel	ULS diesel	
Low-sulfur diesel	LS diesel	
High-sulfur diesel	HS diesel	
Low-sulfur no. 1 fuel oil	LS no. 1 fuel oil	
High-sulfur no. 1 fuel oil	HS no. 1 fuel oil	
Low-sulfur no. 2 fuel oil	LS no. 2 fuel oil	
High-sulfur no. 2 fuel oil	HS no. 2 fuel oil	
Ultra-low sulfur kerosene	ULS kerosene	
Low-sulfur kerosene	LS kerosene	

Description	Menu Text Displayed	Symbol
High-sulfur kerosene	HS kerosene	
E5 (5% Alcohol-based fuel)	API E5	
E10 (10% Alcohol-based fuel)	API E10	
E20 (20% Alcohol-based fuel)	API E20	
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, select from a list of symbols as defined in: Code of practice for a product identification system for petroleum products (Energy Institute).

  The product symbols are available as follows.

Description	Menu Text Displayed	Symbol
Lead replacement petrol	Lead repl. petrol	LRP
Premium unleaded petrol (95 octane)	PU petrol	PREMIUM UNLEADED
Super unleaded petrol (97 octane)	SU petrol	SUPER UNLEADED
E5 (5% ethanol, 95% petrol)	EU E5	E5
E10 (10% ethanol, 90% petrol)	EU E10	E10
E20 (20% ethanol, 80% petrol)	EU E20	E20
DERV		DERV
B5 (5% FAME, 95% diesel)	EU B5	B5
B10 (10% FAME, 90% diesel)	EU B10	B10
B20 (20% FAME, 80% diesel)	EU B20	B20
Gas oil (marked heating oil)		GO
Marine Gas Oil		MAR GO
Ultra-low-sulfur gas oil (marked) (with less than 10 ppm sulfur)	ULS gas oil	RED DIESEL
Premium kerosene		KERO P.

Description	Menu Text Displayed	Symbol
Regular kerosene		
Fuel oil: light, medium, heavy For example, HFO for heavy fuel oil		
Bitumen: penetration, cutback, oxidized For example,100 PEN for 100 penetration		
FAME		
Fuel-grade ethanol		

5.11.2.2 Units

Entity	Description	Value Range
[Haz. mat. class]	Hazardous material classification. This entity can describe the following: • Name of the product • Character of the product (flammable, explosive, and so on) • Potential harm to people or the environment • 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. Example: <ALLYL ALCOHOL, 6.1, UN 1098> Product: Allyl alcohol Class = 6.1: Toxic substances UN number: 1098
[Units of volume]	Engineering units for volume	<L> (default) <m^3> <cm^3> <dm^3> <US Gal> <UK Gal> <bbls>
[Units of additive vol.]	Engineering units for additive volume	<ml> (default) <cc>

Entity	Description	Value Range
[Units of temperature]	Engineering units for temperature	<°C> (default) <°F>
[Units of pressure]	Engineering units for pressure	<Pa> (default) <KPa> <PSI Small> <PSI Large> <bar>

Description	Name	Unit	Range Min	Range Max	Format
Transaction volume	Liters	L	0	999999.99	6 [ds] 2
	Cubic meters	m^3	0	999.99999	3 [ds] 5
	Cubic centimeters	cm^3	0	999999990	9
	Cubic decimeters	dm^3	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
	Barrels	bbls	0	9999.9999	4 [ds] 4
Accumulated total volume	Liters	L	0	99999999	8
	Cubic meters	m^3	0	99999.999	5[ds]3
	Cubic centimeters	cm^3	0	99999999000	11
	Cubic decimeters	dm^3	0	99999999	8
	US gallons	US gal	0	9999999.9	7[ds]1
	UK gallons	UK gal	0	9999999.9	7[ds]1
	Barrels	bbls	0	999999.99	6[ds]2

Description	Name	Unit	Range Min	Range Max	Format
Transaction additive volume	Milliliters	ml	0	999999.99	6[ds]2
	Cubic centimeters	cc	0	999999.99	6[ds]2
Accumulated total additive volume	Liters	L	0	99999.999	5[ds]3
	Cubic meters	m^3	0	99.999999	2[ds]6
	Cubic centimeters	cm^3	0	99999999	8
	Cubic decimeters	dm^3	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
	Barrels	bbl	0	999.99999	3[ds]5
Mass	Kilograms	kg	0	999999.99	6[ds]2
	Metric tons	ton	0	999.99999	3[ds]5
	Pounds	lb	0	999999.99	6[ds]2
	Long tons (UK)	long ton	0	999.99999	3[ds]5
	Short tons (US)	US ton	0	999.99999	3[ds]5
Temperature	Celsius	°C	-300.00	300.00	3[ds]2
	Fahrenheit	°F	-400.0	572.0	3[ds]1
Density	Kilograms per cubic meter	kg/m^3	0	9999.9	4[ds]1
	Degrees API	°API	-50.0	600.0	3[ds]1
	Pounds per cubic feet	lb/ft^3	0	999.99	3[ds]2
	Relative density @ 60°F	RD60	0	9.9999	1[ds]4

Description	Name	Unit	Range Min	Range Max	Format
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	Liters per minute	L/min	0	999999.99	6 [ds] 2
	Cubic meters per minute	mt^3/min	0	999.99999	3 [ds] 5
	Cubic centimeters per minute	cmt^3 /min	0	999999990	9
	Cubic decimeters per minute	dmt^3 /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
	Barrels per minute	bbl/min	0	9999.9999	4[ds]4
Additive Flow rate	Milliliters per minute	ml/min	0	999999.99	6[ds]2
	Cubic centimeters per minute	cc/min	0	999999.99	6[ds]2

5.11.2.3 Display

Entity	Description	Value Range
[Display brightness]	Brightness of the display, controlled by the backlight	<0> % (low) ... <100> % (high) (default = <75> %)
[Display contrast]	Contrast of the display	<0> % (low) ... <100> % (high) (default = <75> %)
[Session timeout value]	Time in seconds between the last key pressed on the Fusion4 IR Controller and the moment the display switches back to one of the running screens	<10> s ... <600> s (default = <300> s)

Entity	Description	Value Range
[User display language]	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]	Format of the date	<DD_MM_YY> (default) <MM_DD_YY> <YY_MM_DD> <DD_MM_YYYY> <MM_DD_YYYY> NOTE: Only the first three selections are completely visible on the SSC screen.
[Time display format]	Format of the time	<12-hour> <24-hour> (default) NOTE: Only the 24-hour selection is completely visible on the SSC screen.

Entity	Description	Value Range
[Date]	Actual date used for time stamping of transactions, calibrations, and alarms	Year Month Day NOTE: By default, the current date appears. To change the default date, enter the year, month, and day.
[Time]	Actual time used to time-stamp transactions, calibrations, and alarms	Hour Minute Second Millisecond NOTE: By default, the current time appears. To change the default time, enter the hour, minute, second, and millisecond.

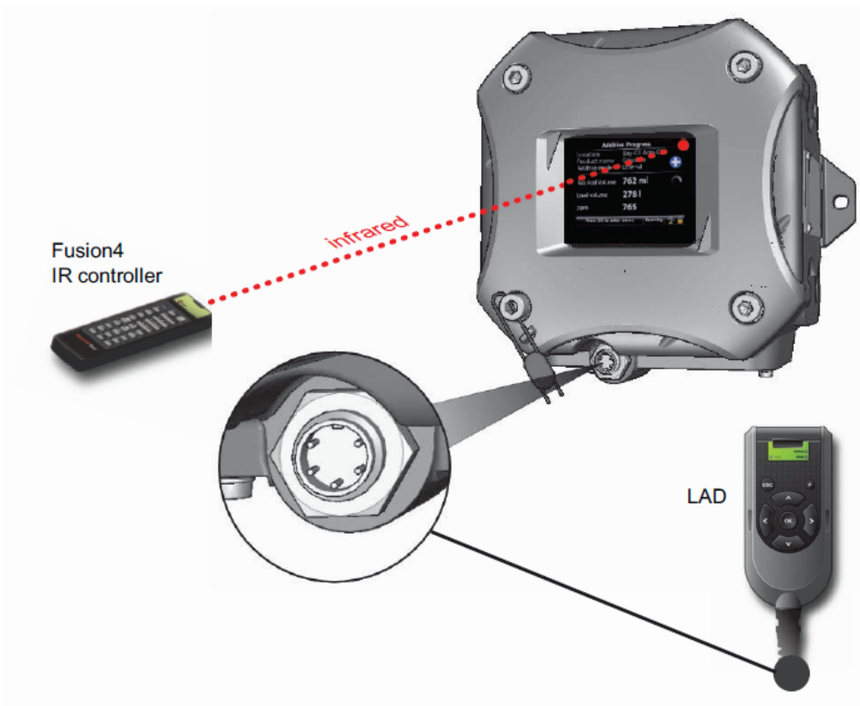
Entity	Description	Value Range
[Next scheduled service]	Date when the next service activities should take place for the SSC-A. This is handled like an alarm and can be configured to desired alarm behavior (Disable, Display, or Shutdown).	Year Month Day NOTE: By default, 01-01-10 appears. To change the default date, enter the year, month, and day.
[Daily total reset time]	Time at which the daily totals are cleared	Hour Minute Second Millisecond NOTE: By default, 00:00:00 appears. To change the daily totals reset time, enter the hour, minute, second, and millisecond.

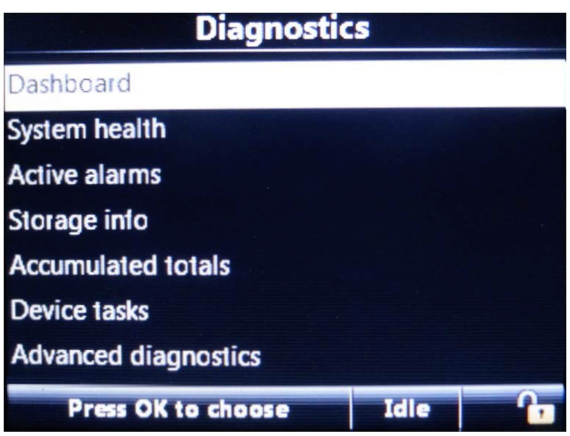
5.11.3 I/O Binding

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

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

Figure 5-11: I/O Allocation Using the Fusion4 IR Controller of LAD





1. Select Configuration in the Main Menu.
2. Select [I/O binding] + <OK>.
3. Select [Inputs] or [Outputs] + <OK>.

A specific entity can be selected—for example, [Pacing source], [Pump feedback], and so on—and linked to a specific I/O function—for example, <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 are provided in the following table (as in TestPack 6).

Input/Output	Entity	Possible Links
Inputs NOTE: The default value for the Input entities is None.	[Pacing source]	None, Pulse Input, 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
	[Permissive1]	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
	[Permissive2]	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, OPT AI DC
	[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
	[Slow flow signal]	None, Pulse Input, 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
	[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 switch]	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 switch]	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

Input/Output	Entity	Possible Links
	[Ext. solenoid control]	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
	[Additive temperature]	None, OPT RTD, OPT AI DC
Outputs NOTE: The default value for the Output entities is None, except for the Solenoid control entity.	[Solenoid control]	None, DO AC 1(default), DO AC 2, DO EMR, PO DC 1, PO DC 2, OPT DO EMR, OPT DO AC
	[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
	[Injection feedback]	None, DO AC 1, DO AC 2, DO EMR, OPT DO EMR, OPT DO AC, PO DC 1, PO DC 2
	[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]	None, PO DC 1, PO DC 2

5.11.3.1 Inputs

Entity	Description	Value Range
[Pacing source]	Physical source for additive pacing	See section 5.11.3
[Permissive1]	Physical source for the permissive function	
[Permissive2]	Physical source for the permissive function	
[System interlock]	Physical source for a system interlock or secondary permissive function. The secondary permissive acts as an additional check on the existing permissive1 or permissive2, whichever is enabled at that time.	
[Alarm reset]	Physical source for the alarm reset function	
[Slow flow signal]	Physical source for the slow flow signal	
[Pump feedback]	Physical source for the pump feedback function	
[Tank low level switch]	Physical source for the tank low level 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, OPT AI DC
[Tank empty switch]	Physical source for the tank empty 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, OPT AI DC

Entity	Description	Value Range
[Ext. solenoid control]	With this entity you can select the physical source for the external solenoid control 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
[Additive temperature]	With this entity you can select the physical source for the blend stream temperature measurement.	None, OPT RTD, OPT AI DC

5.11.3.1.1 Pacing Source I/O Binding

Fusion4 injectors use product pacing signals that are pulse-signal based. Pacing consists of either AC, one pulse per injection cycle, or DC, multiple pulses per unit volume product signaling. This pacing signal accumulates product volume in the injector electronic controller and causes it to periodically inject additive to keep pace with the customer’s recipe requirements.

Six additive injection modes of operation are supported. The mode of operation is determined by configuring the following three entities:

- Pacing source
- [Pacing source] I/O binding
- [Ext. solenoid control] I/O binding

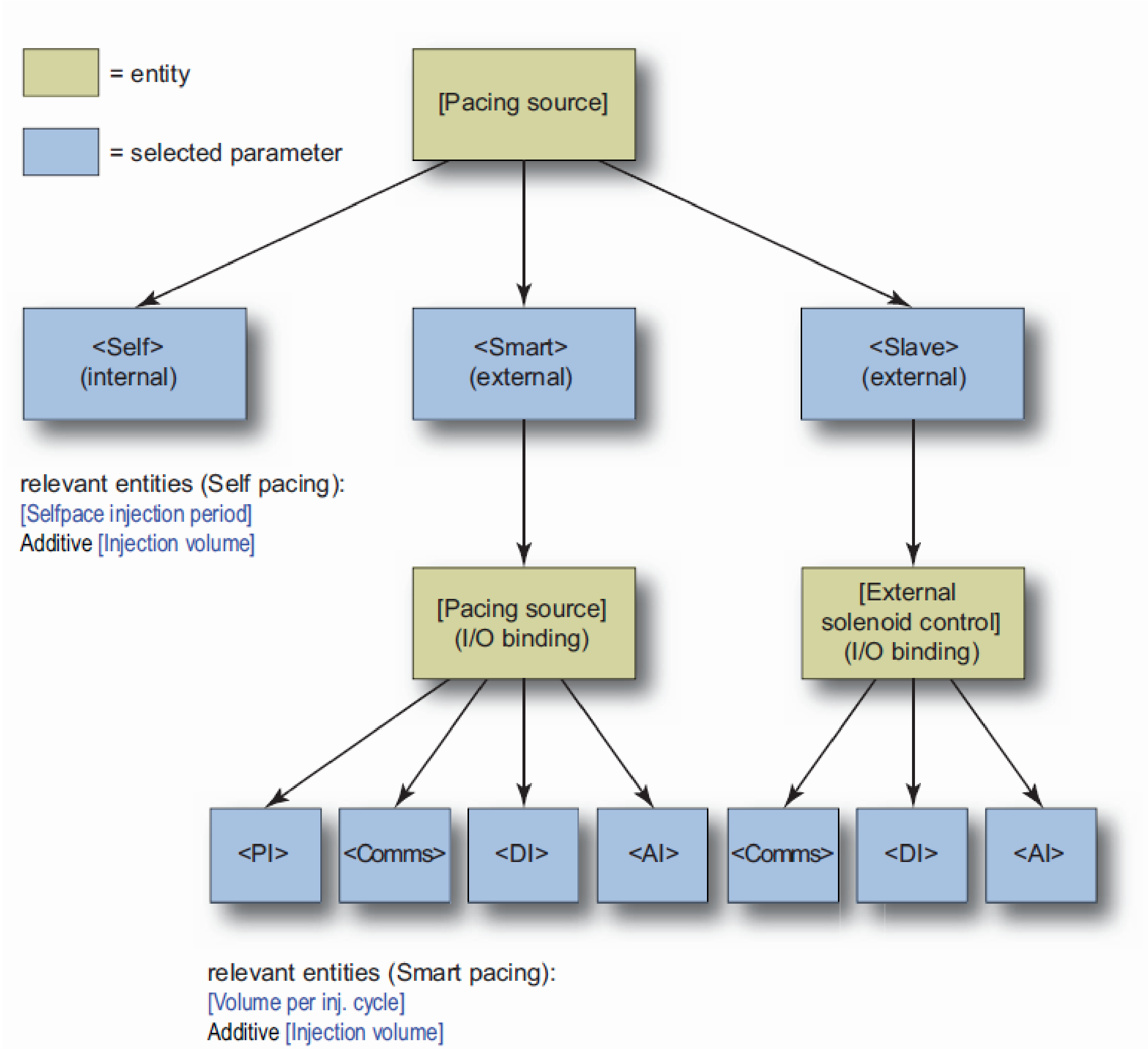
The requirements for each of these modes are as follows:

- Smart product pulse
  - [Additive mode] = Smart
  - [Pacing source] I/O Binding = PI
  - [Ext. solenoid control] I/O Binding = N/A
- Smart analog

  - [Additive mode] = Smart analog
  - [Pacing source] I/O Binding = AI
  - [Ext. solenoid control] I/O Binding = N/A
- Smart inject (DI)
  - [Additive mode] = Smart
  - [Pacing source] I/O Binding = Any digital Input
  - [Ext. solenoid control] I/O Binding = N/A
- Smart Inject (Comms)
  - [Additive mode] = Smart
  - [Pacing source] I/O Binding = Comms
  - [Ext. solenoid control] I/O Binding = N/A
- Slave (DI)
  - [Additive mode] = Slave
  - [Pacing source] I/O Binding = N/A
  - [Ext. solenoid control] I/O Binding = any digital input
- Slave (Comms)
  - [Additive mode] = Slave
  - [Pacing source] I/O Binding = N/A
  - [Ext. solenoid control] I/O Binding = Comms
- Self-paced
  - [Additive mode] = Self
  - [Pacing source] I/O Binding = N/A
  - [Ext. solenoid control] I/O Binding = N/A

NOTE: For self-paced mode, the configuration of the [Pacing source] I/O binding is not relevant.

Figure 5-12: Additive Pacing Mode Selection



5.11.3.1.1.1 Smart

Smart mode offers four different options, which can be selected by the [Pacing source] I/O binding entity.

- Pulse Input (PI) mode

  In this mode, the SSC-A measures the wild stream itself.

The [Volume per inj cycle] entity determines when an injection is started. The amount of additive volume is determined by setting the additive [Injection volume] entity. The K-factor of the pacing pulse is determined by setting the [K-factor] entity.

- Comms mode

  On receipt of a trigger message from an RS-485 source (Comms), the SSC-A injects the proper amount of additive into the wild stream. The amount of additive can be configured by the additive [Injection volume] entity.

- Digital Input (DI) mode

  On receipt of a trigger signal from a Digital Input (DI) source, the SSC-A injects the proper amount of additive into the wild stream. The amount of additive can be configured by the additive [Injection volume] entity.

- Analog Input (AI) mode

  In this mode, the SSC-A receives wild stream flow from an Analog Input (AI) source. The [Volume per inj cycle] entity determines when an injection is started. The amount of additive volume is determined by setting the additive [Injection volume] entity.

5.11.3.1.1.2 Inject-Now Signal

The [Pacing source] I/O binding is used to determine the operational mode of the additive injector. If the pacing source I/O binding is set to <Pulse input>, then the wild stream flow is monitored to determine when to inject. This is performed through a hard-wired connection from the pulse source to the single-pulse input (S-PI) or dual-pulse input (Q-PI) of the SSC-A.

When the pacing source is a <Digital input> function, then the input works as an “inject now” indication to the controller. Any low-to-high transition on an “inject now” input results in an injection cycle.

When the pacing source is a <Analog input> function, then the analog input is used in a digital mode to indicate the “inject now” signal. Any low-to-high transition on an “inject now” input results in an injection cycle.

The [Pacing source] I/O binding can also be set to <Comms>, which means the “inject now” indication is sent to the controller through a message received by the controller's serial port. The "inject now" message is supported by several serial communication protocols.

5.11.3.1.1.3 Slave

In this case, the solenoid is controlled by an external device. The SSC-A receives a command to open the solenoid. The solenoid then remains open until the SSC-A receives a command to close it again.

This command signal can be received either from a Comms (RS-485), a DI (Digital Input), or an AI (Analog Input) source.

This can be configured by the [Ext. solenoid control] I/O binding entity.

> **NOTE:** In slave mode, the SSC-A electronics provide a local display of additive volume usage and meter calibration functions, but does not provide additive injection control. Injection-volume control must be provided by an external source, such as a PLC or data system. When the pacing-signal input is ON (voltage present), the solenoid-control output is ON. The external controlling system must accumulate additive flow and determine when to close the solenoid by turning off the pacing-signal input to the SSC-A.

5.11.3.1.1.4 Self-Paced

In situations where no pacing signals are available from outside sources like flow meters or other instruments, the SSC-A can be configured to the Self-Paced mode. In this mode, the SSC-A injects on a time and fluid volume basis.

The Self-Paced mode uses an internal timer, which can be configured by the [Selfpace injection period] entity. On expiration of each timer cycle, an injection is initiated. The volume per injection can be configured by the additive [Injection volume] entity.

5.11.3.1.2 Enable Permissive1/Permissive2

All transactions start when the stream permissive conditions become <True>, and they stop when the stream permissive becomes <False>. The [Permissive] I/O binding defines three general means of permissive configuration for the device.

Permissive1 operates the transaction on additive recipe1 and Permissive2 operates the transaction on additive recipe2.

The value of the [Permissive] I/O binding can be one of the following values:

- None—If the [Permissive] I/O binding is set to "None" then the permissive is internally active based upon the injector mode.
  - Smart analog (Analog mode)
    - Transaction start condition—When the wild stream volume is greater than the [Min. transaction volume] entity.
    - Transaction end condition—When the wild stream flow rate is less than the low flow rate for an amount of time defined by the [End transaction time] entity.
  - Smart product pulse
    - Transaction start condition—When the wild stream volume is greater than the [Min. transaction volume] entity.
    - Transaction end condition—When the wild stream flow rate is less than the low flow rate for an amount of time defined by the [End transaction time] entity.
  - Smart inject (DI or Comms)
    - Transaction start condition—When the first inject signal is received.
    - Transaction end condition—When there is no inject signals for an amount of time defined by the [End transaction time] entity.
  - Slave (DI or Comms)
    - Transaction start condition—When the first solenoid-open condition is detected.
    - Transaction end condition—When there is no solenoid open condition detected for an amount of time defined by the [End transaction time] entity.
    - Self-paced—Not applicable
  - Comms – Regardless of the injection mode

    - Transaction start condition—When a serial command is received to enable the device.
    - Transaction end condition—When a serial command is received to disable the device.
- Digital Input – Regardless of the injection mode
    - Transaction start condition—When a serial command is received to enable the device.
    - Transaction end condition – When the digital input is inactive.

If permissive1 I/O binding is set to None and permissive2 I/O binding is set to any other value other than None, then the pacing source is present with permissive2 absent, and the transaction operates on recipe1. When there is pacing source present with permissive2 present, then the transaction operates on recipe2.

5.11.3.1.3 Enable Secondary Permissive (System Interlock)

The normal permissive signal can either be permissive1 or permissive2, whichever is active at that point.

An optional secondary interlock can be defined with an I/O binding.

The secondary interlock can be used as a secondary permissive signal and combined with the normal permissive signal through a logical AND or OR function. The normal permissive signal can either be Permissive 1 or Permissive 2, whichever is active at that point.

- If the permissive condition is OR, then the device is enabled when either (or both) the permissive or secondary interlock is/are <True>.
- If the permissive condition is AND, then the device is enabled when both the permissive and secondary interlock are <True>.

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

5.11.3.1.4 Alarm Reset

Any active alarms should be resettable through any one of the following three methods:

- Hard-wired digital input defined by [Alarm reset] I/O binding
- Serial comms command
- Fusion4 IR Controller/LAD, through the Alarm Summary screen

5.11.3.1.5 Wild Stream Low Flow (Slow-Flow Signal/Clean Arm)

If the flush volume entity [Num of clean start cycles] is greater than zero, the [Wild stream low flow] I/O binding is defined, and if you are running in a "smart" injector mode as well, then clean-arm functionality is enabled.

A clean-arm transaction intentionally over-injects at the start of a transaction for a number of cycles.

The over-inject quantity per injection equals the flush volume divided by the number of clean start cycles.

The number of over-injection cycles is configured by the [Num of clean start cycles] entity.

During a clean-arm transaction, the slow-flow signal must be provided towards the end of the transaction. When the slow-flow signal is active, the injections stops.

If the wild stream volume dispensed after the slow-flow signal is active than the flush volume, then a flush-volume alarm should be generated at the end of the transaction.

If the wild stream flow rate is greater than the high-flow threshold, then the controller should assume a high-flow state.

The slow-flow signal can be configured through an I/O binding. The determination of the slow-flow state depends on this I/O binding.

- PI – The wild stream flow rate is used to determine the slow-flow condition. If the wild stream flow rate is less than the slow-flow rate threshold, then the controller should assume a slow-flow state.
- DI – The active slow-flow digital input signal indicates when the device should assume a slow-flow state.
- Comms – A serial command used to indicate when to enter the slow-flow state.

5.11.3.1.6 Pump Feedback

If the additive [Pump feedback] I/O binding is defined, then the controller should generate an error 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).

5.11.3.1.7 Slave Solenoid (External Solenoid Control)

In this case, the solenoid is controlled by an external device. The SSC-A receives a command to open the solenoid. The solenoid then remains open until the SSC-A receives a command to close it again.

This command signal can be received either from a Comms (RS-485), a DI (Digital Input), or an AI (Analog Input) source.

This can be configured by the [Ext. solenoid control] I/O binding entity.

5.11.3.1.8 Tank Low Level Switch

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 additive 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. 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-A can still operate under normal conditions. 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.

5.11.3.1.9 Tank Empty Switch

If the tank-empty condition exists, the SSC-A cannot operate under normal conditions. 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-A can then resume normal use. It is not required to reset the condition as with normal alarms.

5.11.3.1.10 Additive Temperature

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

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

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

The Resistance Temperature Detector (RTD) temperature converter is more accurate (± 0.3 ºC/ ± 0.5 ºF) than the Analog Input (AI) circuitry. 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 the following:

- How to be made (platinum with an a = 0.00385 W/W/ºC [0.00214 W/W/ºF)
- How to calculate temperature from resistance
- Accuracy classes

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

- Class A is 100W +/- 0.06W at °C [32°F]
- Class B is 100W +/- 0.12W at °C [32°F]

Not explicitly defined in IEC 60751 but compatible:

- Class 1/3 DIN is 100W +/- 0.04W at 0°C [32°F] (0.12W / 3 = 0.04W)
- Class 1/5 DIN is 100W +/- 0.024W at 0°C [32°F] (0.12W / 5 = 0.024W)
- Class 1/10 DIN is100W +/- 0.012W at 0°C [32°F] (0.12W / 10 = 0.012W)

Entity	Description	Value Range
[Temperature input]	Physical source for the additive stream temperature measurement	None, OPT RTD, OPT AI DC

5.11.3.2 Outputs

Entity	Description	Value Range
[Solenoid control]	Physical source for the additive solenoid control function	See section 5.11.3
[Alarm indication]	Physical source for the alarm indication function	
[Alarm shutdown]	Physical source for the alarm shutdown function	
[Block valve control]	Physical source for the block valve control function	
[Injection feedback]	Physical source for the injection feedback function	
[Pump start]	Physical source for the additive pump start function	
[Factored pulse out]	Physical source for the factored pulse out function	

5.11.3.2.1 Solenoid Control

In any operation modes, the additive solenoid should be opened and closed when an additive injection trigger (or solenoid open/close signal) is received.

5.11.3.2.2 Alarm Indication

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

- The [Alarm indication] output is set to ON.
- Alarm appears on the display.

5.11.3.2.3 Alarm Shutdown

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

- The [Alarm indication] output is set to ON.
- Alarm appears on the display.
- [Alarm shutdown] output is set to ON.
- Running transactions are stopped.
- Start-up of new transactions is impossible.

5.11.3.2.4 Block Valve Control

If the [Block valve] I/O binding is defined, then the block valve output should be active when the permissive is <True>.

The block valve should remain active until the stream permissive is <False>.

5.11.3.2.5 Injection Feedback

This functionality is enabled by defining the additive injector feedback I/O binding.

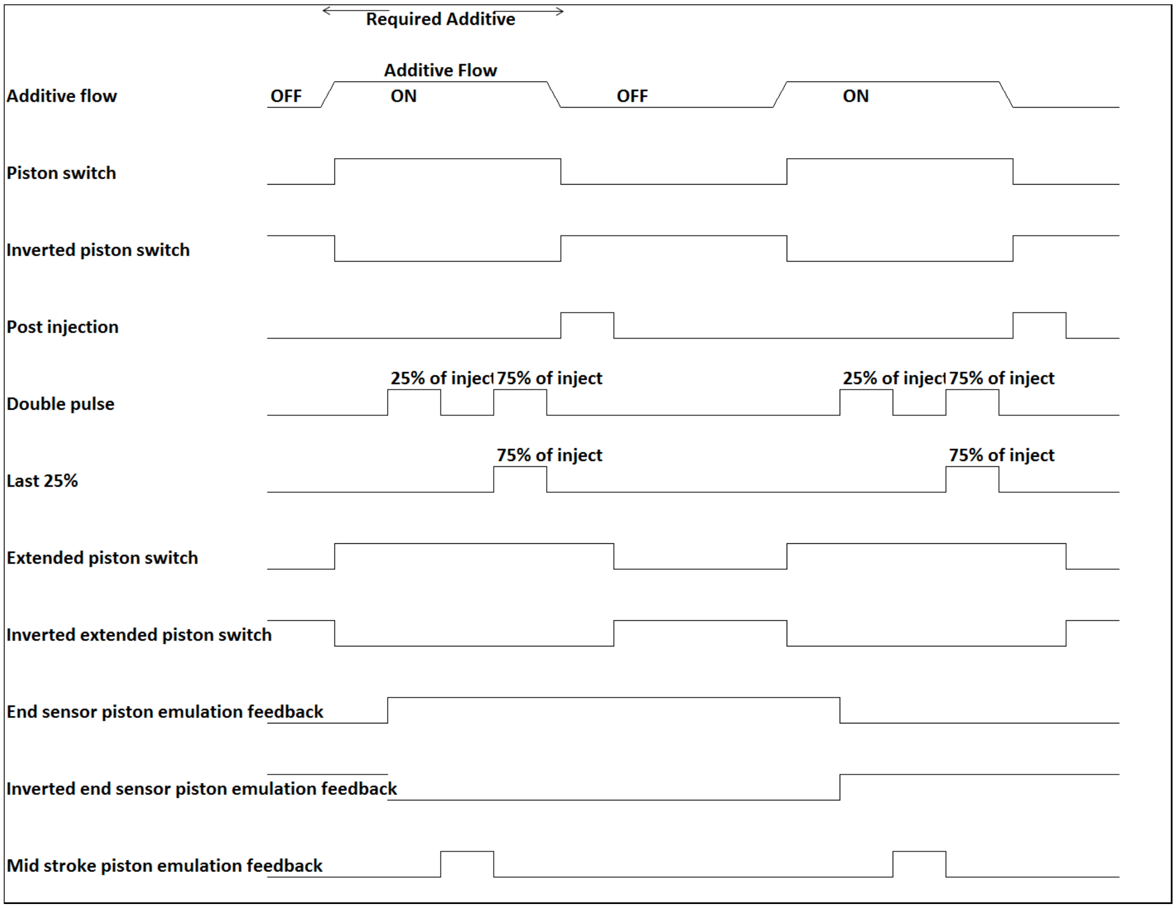
Some injector-feedback modes produce pulses of a fixed length. For these modes, the length of the pulse is determined by the feedback pulse duration entity.

The specific behaviour of the additive injector feedback is defined by entities located in the Solenoid submenu:

- Piston switch—The injector feedback output is active as long as the additive injection solenoid is active.
- Inverted piston switch—The injector output is inactive as long as the additive injector solenoid is active (inverse of previous mode).

- Post injection—A pulse is generated as soon as the additive injector solenoid becomes inactive.
- Double pulse—A pulse is generated after 25% of the injection volume is injected during an injection cycle. Another pulse is generated after 75% of injection volume has been injected.
- Last 25%—A pulse is generated after 75% of the injection volume is injected.
- Extended piston switch—The injector feedback is active for the complete period during which the additive injection solenoid is active and some additional time (the time equal to the feedback pulse duration entity).
- Inverted extended piston switch—The inverse of extended piston switch mode.
- End sensor piston emulation feedback—It describes the behaviour of a piston emulation control signal when configured for end-sensor emulation. When configured, the feedback signal changes its state whenever an injection is started. The state of the feedback signal follows the piston emulation control signal, but it changes its state only when the actual additive flow is detected after the additive injection is activated. The feedback output changes from its state when 25% of the injecton is distributed.
- Inverted end sensor piston emulation feedback—The inverse of end sensor piston emulation feedback mode.
- Mid stroke piston emulation feedback—Describes the behavior of a piston emulation control signal when configured for mid- stroke emulation. When configured, a pulse is created whenever an additive injection is started. The pulse is generated after 50% of the injection is dispatched and the length is as per the configured "Pulse duration".

Figure 5-13: Injector Feedback Signals



5.11.3.2.6 Pump Start

Additive pump start output should be driven high when the permissive becomes <True> (if the [Pump start] I/O binding is defined).

The pump is de-activated when the permissive becomes <False> and when you are not receiving wild stream pulses for a time-out period in minutes.

5.11.3.2.7 Factored Pulse 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 additive 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 additive volume dispensed
- 10 pulses for each unit of additive volume dispensed
- 100 pulses for each unit of additive volume dispensed
- 1000 pulses for each unit of additive volume dispensed

The unit of volume is defined by the device unit of volume configuration entity and not by the additive volume unit entity.

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

5.11.4 I/O Settings

5.11.4.1 Inputs

5.11.4.1.1 PI

Entity	Description	Value Range
[Add. meter integrity check]	Pulse type of the additive flow meter.	<Disable> = single pulse (default) <Enable> = dual pulse (quad)
[Add. meter cut-off frequency]	Frequency level below which the pulse integrity cannot be monitored.	50 Hz (default)

Entity	Description	Value Range
[Add. meter error threshold]	Maximum number of quad pulse errors permitted for every 1000 pulses. If more than the specified number of pulses are missing within a batch of 1000 pulses, then a pulse hardware error is generated if the pulse integrity check is configured. Missing pulses that occur when the pulse input frequency is below the meter cutoff frequency are not counted towards the pulse hardware alarm. A quad pulse phase error also increments the pulse hardware error count.	3 (default)
[Add. stream meter serial #]	Serial number of the connected additive flow meter. This is then a part of the calibration record.	
[Wild stream meter serial #]	Serial number of the wild stream flow meter.	

5.11.4.1.2 Wild Stream Flow Metering

The pulse input function can meter both the additive and wild stream flow.

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

If a single pulse input is used for the additive meter, then this must be wired to quad channel A.

The pulse input functions also support new entities for flow rate for both the wild and additive streams. These values are always in units of liters/minute.

5.11.4.1.3 DI (for both AC# and DC#)

Entity	Description	Value Range
[DI hysteresis time]	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 [DI hysteresis time].	default = <250> ms

5.11.4.1.4 OPT AI DC

Entity	Description	Value Range
[PV value @20mA]	Process value at 20 mA. If an analog input is used as the pacing source, then this entity represents the main product flow rate in (volume units per second)	default = <100.0>
[PV value @4mA]	Process value at 4 mA. If an analog input is used as the pacing source, then this entity represents main product flow rate in (volume units per second)	default = <0.0>
[AI threshold]	Analog input threshold value defining the range for 0 or 1. For example, 0 or not active from 4-12 mA and 1 or active from 12 mA to 20 mA.	default = <0.0>
[AI logic state]	How the injector controller uses the analog input signal. • <Positive>: Provides the range 0 or not active from 4-12 mA and 1 or active from 12 mA to 20 mA. • <Negative>:Provides the range 1 or active from 4-12 mA and 0 or not active from 12 mA to 20 mA.	<Positive> (default) <Negative>
[AI serial #]	With this entity you can enter the serial number of the connected analog input device or transmitter.	Alphanumeric string of maximum 8 characters.

Entity	Description	Value Range
[HH Alarm Threshold]	With this entity you can set the high high PV alarm threshold. When exceeded, a PV alarm occurs.	NOTE: The entity is blank (empty) by default.
[H Alarm Threshold]	With this entity you can set the high PV alarm threshold. When exceeded, a PV alarm occurs.	
[L Alarm Threshold]	With this entity you can set the low PV alarm threshold. When exceeded, a PV alarm occurs.	
[LL Alarm Threshold]	With this entity you can set the low low PV alarm threshold. When exceeded, a PV alarm occurs.	
[Alarm Hysteresis]	With this entity you can set the hysteresis around the alarm levels. This hysteresis is used to avoid alarm ON/OFF toggling situations at an alarm level. A high (high) alarm occurs when the value becomes higher than [HH/H Alarm Threshold]. A low (low) alarm occurs when the value becomes lower than [LL/L Alarm Threshold]. A high (high) alarm disappears when the value becomes lower than [HH/H Alarm Threshold - Hysteresis] and a low (low) alarm disappears when the value becomes higher than [L/LL Alarm Threshold + Hysteresis].	
[AI Adjustment @4mA]	With this entity you can adjust value at 4mA. Example: If the [AI Adjustment @4mA] is 0.004, the lower boundary has been adjusted to 4.004mA.	default = <0.0000000>

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.

5.11.4.1.5 OPT RTD

Entity	Description	Value Range
[RTD serial #]	Serial number of the connected PT100 temperature probe.	Alphanumeric string of maximum 8 characters.
[HH Alarm Threshold]	High high temperature alarm threshold. When exceeded, a temperature alarm occurs.	default = <0.0>
[H Alarm Threshold]	High temperature alarm threshold. When exceeded, a temperature alarm occurs.	default = <0.0>
[L Alarm Threshold]	Low temperature alarm threshold. When exceeded, a temperature alarm occurs.	default = <0.0>
[LL Alarm Threshold]	Low temperature alarm threshold. When exceeded a temperature alarm occurs.	default = <0.0>
[Alarm Hysteresis]	Hysteresis around the alarm levels. This hysteresis is used to avoid alarm ON/OFF-toggling situations at an alarm level. • A High (High) alarm occurs when the value becomes higher than[HH/H Alarm Threshold]. • A Low (Low) alarm occurs when the value becomes lower than [LL/L Alarm Threshold]. • A High (High) alarm disappears when the value becomes lower than [HH/H Alarm Threshold] - [Alarm Hysteresis], and a Low (Low) alarm disappears when the value becomes higher than [L/LL Alarm Threshold] + [Alarm Hysteresis].	default = <0.0>

5.11.4.2 Outputs

5.11.4.2.1 (OPT) DO EMR

5.11.4.2.1.1 Relay Mode

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

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.

> NOTE: Set each individual relay to the required configuration by selecting the proper entities. See also next overview.

Physically Configured	Relay Mode	Relay State	Physical Result
Normally Open (NO)	De-energized	Activated	Closed
		Deactivated	Open
	Energized	Activated	Open
		Deactivated	Closed
Normally Closed (NC)	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 the transaction additive gross observed volume entity.

In addition, the SSC-A 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.

When the transaction begins, the transaction additive gross observed volume is zero, and the analog output should be 4 mA.

The output value during the transaction should be: ((additive volume) / upper boundary value) * (16) + 4 mA.

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]	Mode for analog output.	• <Explicitly Driven> (default)—The output value is set by the application • <Follow PV>—The output reflects one of the Primary Values measured by the SSC.

Entity	Description	Value Range
[PV address]	Process variable to be mapped on the analog output (4-20 mA).	<None> (default) <Acc. additive vol.> ml <Additive volume> ml <Additive flowrate> L/min <Wild flowrate> L/min <ppm>
[Lower boundary]	PV value at 4 mA. For the actual current value, linear interpolation is used between [Lower boundary] and [Upper boundary].	default = <0.0> For units, see value range of [PV address] NOTE: The lower boundary values are set as per the units selected in the [PV address] entity.
[Upper boundary]	PV value at 20 mA. For the actual current value, linear interpolation is used between [Lower boundary] and [Upper boundary].	default = <0.0> For units, see value range of [PV address] NOTE: The upper boundary values are set as per the units selected in the [PV address] entity.

5.11.4.3 Communication

5.11.4.3.1 IR COMMS

Entity	Description	Value Range
[IR access]	Enable or disable the IR interface.	<IR enabled> (default) <IR disabled> NOTE: IR communication cannot be disabled from the 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. Enabling this entity makes the controller require the long login sequence of four buttons being pressed. Use [ATTN], [F1], [F2], [F3].	<Long IR enabled> <Long IR disabled> (default)

NOTE: For some IR 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. If this occurs, parameter values could accidentally be changed. It should be noted that this is an extremely rare possibility.

The Long IR 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-A includes several different communications protocols. These include FMC Smith, FlexConn, Brooks, Modbus RTU, and Modbus legacy.

The SSC-A 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 Injectors total on one drop
- Data rates: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, and 128000 baud
- Data bits: 8
- Parity: none, even, odd
- Stop bits: 1, 2

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 configuration data from remote network systems such as TAS between additive transactions when the device is idle, as any changes sent take immediate effect.

5.11.4.3.2.2 FlexConn Instrument Address

The entity [FlexConn instrument addr.] 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 as follows:

- FMC Smith
- FlexConn
- Brooks
- Modbus RTU
- Modbus legacy

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

5.11.4.3.2.4 Baud Rate

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

- 1200 baud
- 2400 baud
- 4800 baud
- 9600 baud
- 19200 baud
- 38400 baud

- 57600 baud
- 115200 baud
- 128000 baud

5.11.4.3.2.5 Parity

The entity [Parity] selects the parity used for serial communication.

5.11.4.3.2.6 Stop Bits

The entity [Stop bits] selects the number of stop bits used for serial communication.

5.11.4.3.2.7 Datastream Maximum Gap Time

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

5.11.4.3.2.8 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.

5.11.4.3.2.9 Broadcast Address

The entity [Broadcast address] selects the secondary communications address, recognized by the SSC-A. 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-A units on the system responds to broadcast messages. The SSC-A acts upon 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-A a Broadcast Address of 999 enter: 999
- To assign the SSC-A a Broadcast Address of 000 enter: 000

5.11.4.3.2.10 Unit Address

The entity [Unit address] selects the primary communications address of the SSC-A. 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-A an Address of 10, enter: 010
- To assign the SSC-A an Address of 252, enter: 252

5.11.4.3.2.11 Modbus Byte Order

The entity [Modbus byte order] selects byte order in serial communication when modbus protocol is used.

5.11.4.4 Protocols

5.11.4.4.1 FMC Smith

This protocol communicates with the protocol defined by Smith Meter (now part of Guidant) for the AccuLoad electronic preset.

This protocol offers two different message formats, depending on whether the message originated from the master system or from a controller.

5.11.4.4.2 FlexConn

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

The Fusion4 Portal program covers a broad range of functions as follows:

- BOL printing and viewing
- Commissioning and diagnosing of controllers
- OPC interfacing
- Monitoring of field devices for the control room

5.11.4.4.3 Brooks

The Brooks protocol is provided to allow PetroCount IMS presets to easily communicate with the controller.

Existing software communications drivers used to communicate with the PetroCount can be used to communicate with the controller. Ensure the entity code table for the controller.

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

5.11.4.4.4 Modbus RTU/Modbus legacy

The Modbus RTU/Modbus legacy protocol is a modified subset of the Modbus RTU protocol. While the protocol supports a large number of commands, only three 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.

5.11.4.5 Communication Wiring

The SSC-A 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.

An EIA-485 to EIA-232 converter can be used if your application requires it.

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-A, 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.]	Device address for the FlexConn protocol.	<0> ... <1900> (default = <0>)

Entity	Description	Value Range
[Communication protocol]	Protocol for the communication port.	<FlexConn> <FMC Smith> <Brooks> <Modbus RTU> <Modbus legacy>
[Baudrate]	Baud rate for the communication port.	<Baudrate 1200> <Baudrate 2400> <Baudrate 4800> <Baudrate 9600> (default) <Baudrate 19200> <Baudrate 38400> <Baudrate 57600> <Baudrate 115200> <Baudrate 128000>

Entity	Description	Value Range
[Parity]	With this entity you can select the parity type.	<Odd> <Even> <None> (default)
[Stop bits]	With this entity you can select the number of stop bits to be used with each byte.	<One> (default) <Two>
[Datastream max gap time]	With this entity you can select the time-out between characters in one single record (ms).	<0> ms ... <10000> ms (default = <1000> ms)
[Turn around delay]	With this entity you can select the time between the received request from the master and the moment the answer is sent (ms).	<0> ms ... <1000> ms (default = <100> ms)
[Broadcast address]	With this entity you can select 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.	<0> ... <999> (default = <998>)
[Unit address]	With this entity you can select 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.	<0> ... <997> default = <123>

Entity	Description	Value Range
[Modbus byte order]	With this entity you can select the byte representation of the information retrieved by the modbus protocol: • Little endian: The LSB is sent first • Big endian: The MSB is sent first	<Little endian> <Big endian> default

5.11.5 Control settings

5.11.5.1 Additive Control

Entity	Description	Value Range
[Additive mode]	Additive mode of the injector	<Smart> (default) <Slave> <Self>
[K-factor]	K-factor of the additive 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]	The logical relation between the Permissive and System interlock functions. NOTE: The entity [Permissive condition] is only relevant when the System Interlock I/O binding is configured other than <None>.	• <AND> (default) (Both signals should be available to permit the device) • <OR> (One of those signals should be available to permit the device)

Entity	Description	Value Range
[Factored pulse out]	Number of pulses for each unit of additive volume dispensed	<1 Pulse/Unit> (default) <10 Pulses/Unit> <100 Pulses/Unit> <1000 Pulses/Unit>
[Feedback mode]	The type of feedback for each injection	<None> (default) <End-sensor switch> <Inv. end-sensor> <Mid-stroke switch> <Piston switch> <Inv. piston switch> <Post injection> <Double pulse> <Last 25% > <Ext. piston switch> <Inv. ext. piston switch>
[Feedback pulse duration]	Duration of the feedback pulse in ms	<0> ms ... <1000> ms (default = <500> ms)
[Piston control emulation]	With this entity you can inject the control through a digital input channel. When configured for piston emulation control, the injector injects whenever there is a change to logic level of the DI channel bound to the pacing source I/O binding. The SSC-A must also have its piston emulation configuration set to "True".	<False> (default) <True>

Entity	Description	Value Range
[Pump run timeout]	The time in minutes between the last injection and the additive pump stop	<0> min ... <255> mins (default = <10> mins)
[Reset alarm at permissive]	Alarm reset when the SSC becomes permitted	<Enable> <Disable> (default)
[Inject queue length]	Inject queue length. You can define the number of injections that can be queued if the injection progress is too slow in relation to the calculated or configured injection period time or even the measured wild stream flow.	<0> ... <10> (default = <1>)

Entity	Description	Value Range
[AccuLoad alarm mapping]	With this entity you can ensure that the SSC-A alarms which are not present in the Mini-Pak can be found in an AccuLoad preset if they are activated by the SSC-A. The new alarms have status bits associated with them in the parameter 802 alarm status value that are not recognized by the AccuLoad. When the AccuLoad alarm mapping configuration is true, then all these alarms drive the Program Failure bit in parameter 802. This is found in the AccuLoad as a General Additive (GA) alarm. The alarms affected include the following: • No activity • Flush Volume • Valve Error • No Pump • License Error • Control Error • Power Failure • Pulse Error • Tank Monitor • Service Due	<False> (default) <True>
[Block valve creation]	Block valve location in the stream.	<Upstream> (default) <Downstream>

Entity	Description	Value Range
[Comm alarm update]		<False> (default) <True> If True, alarms will be exposed to modbus; otherwise, they will not be exposed to modbus.

5.11.5.2 Additive Recipe

Entity	Description	Value Range
[Addtive name]	Name of the additive stream product	Text string of maximum 20 characters.
[Injection volume1]	Volume to be injected per injection cycle when permissive 1 is active	default = <20> ml
[Injection volume2]	Volume to be injected per injection cycle when permissive 2 is active	default = <20> ml
[Volume per inj. cycle]	Wild stream volume per injection cycle	default = <40> L

Entity	Description	Value Range
[Injection offset]	Percentage to determine at what point the SSC-A gives the first injection during a transaction. The percentage is applied to the [Volume per inj. cycle] and determines the volume of wild stream product at when the first injection occurs. Subsequent injections occur on the normal [Volume per inj. cycle] interval. This entity is only applicable for the Smart Pulse Input mode. The entity guarantees the delivery of the intended additive amount in the complete batch. Example: Volume per inj. Cycle = 100 l [26.417 gal] Injection offset = 50% First injection: 50 l[13.209 gal] Second injection: 150 l [39.626 gal] Third injection: 250 l [66.043 gal] Fourth injection: 350 l [92.460 gal]	<0> % ... <100> % (default = <0> %)
[Selfpace injection period]	Time between injection cycles. This entity is only applicable in self-paced mode. In this case, the entity [Pacing source] must be set to <Self>.	<1> s ... <32> s (default = <1> s)

5.11.5.2.1 Injection Recipe

The following entities exist for additive injection recipe configuration. Two recipes are available for additive injection, and the following configuration entities exist for them:

- Additive name
- Additive injection volume1
- Additive injection volume2
- Wild stream volume per injection
- Self-paced injection period (only used in self-paces mode)
- Injection offset

Either of the two recipes can be used for transactions. The recipe to be used depends upon the permissive. Enabling permissive 1 enables recipe 1 and enabling permissive 2 enables recipe 2 for the transaction.

The recipe definitions can be changed between transactions.

5.11.5.2.2 Definition

The recipe is the ratio of the chemical additive to the process flow (fuel). The recipe consists of two parts:

- HOW MUCH additive [Injection volume] chemical is going to be put in each injection cycle is the first part.
- HOW OFTEN the [Volume per inj. cycle] occurs determines the second part.

Effectively, SSC-A provides two recipes.

These two criteria are interrelated. Changing either of them affects the ratio, and thus the recipe. By changing both values, it is possible to adjust the operating characteristics of the injector to an optimal setting, without changing the actual recipe.

5.11.5.2.3 Recipe Sources

Recipes are defined by chemical suppliers and by decision makers in your company. They may also be determined by law. In the case of detergent additives, testing determines the optimal concentrations of the chemical in the fuel, and company policies regulate the amounts put in. Odorants, dyes, and tracers are generally regulated by government decree and the dosage rates required to meet those needs are established in advance.

Chemical suppliers, company management, and other similar facilities are all sources for determining the “typical” setup for your injection recipe.

5.11.5.2.4 Conversion of Recipe Volumes

Determine the additive concentration required by your company.

This may be specified in volume of additive per volume of product delivered, parts per million, or a percentage. Injections occur at some regularly spaced product volume interval.

In the USA, it is typical to use cc’s per 40 gallons. Outside the USA, a more typical concentration is cc’s per 100 liters.

The following table provides factors for the conversion of recipe volumes.

	lbs/Mbbls	cc’s/40 gal	gal/Mgal	ppm	cc’s/100 l
lbs/Mbbls	1	0.4312	0.002845	2.845	0.2845
cc’s/40 gal	2.32	1	0.0066	6.6	0.66
gal/Mgal	351.5	151.5	1	1000	100
ppm	0.3515	0.1515	0.001	1	0.1
cc’s/100 l	3.515	1.515	0.01	0.1	1

Example:

Assume that the recipe from the additive manufacturer is provided in parts per million (ppm). The recipe calls for 285 ppm. The injector is set up to inject every 40 gallons.

Find ppm in the left-hand column. Follow the row across to the cc’s / 40 gal column and find the factor of 0.1515.

Then multiply 285 PPM by 0.1515 and get 43.2. To meet the 285 ppm requirement, set up the injector to inject 43.2 cc’s every 40 gallons.

5.11.5.2.5 Frequency of Injection

The example above used a 40-gallon interval for injections. The frequency of injections depends upon several factors that may apply to your situation.

Pacing injectors used to be carried out exclusively with pulse transmitters placed in the mechanical meter stack. Due to gearing limitations and injection volumes at that time, it was common to send a pacing pulse that was ON for 20 gallons and OFF for 20 gallons. This is the standard pacing for injectors.

With modern pulse transmitters, electronic pulse splitters, and the capability of presets to send virtually any factored pulse output, the 40-gallon interval is less used.

One criterion for determining how often to inject is the K-factor of the pacing pulse. This K-factor represents the total number of pulses that equal one unit of flow.

For example, if 5 pulses equal 1 liter [0.264 gal], the K-factor is 5.

If one pulse represents more than one unit of flow, the K-factor is less than 1. For example, if 1 pulse equals 100 liters [26.417 gal], the K-factor is 0.010.

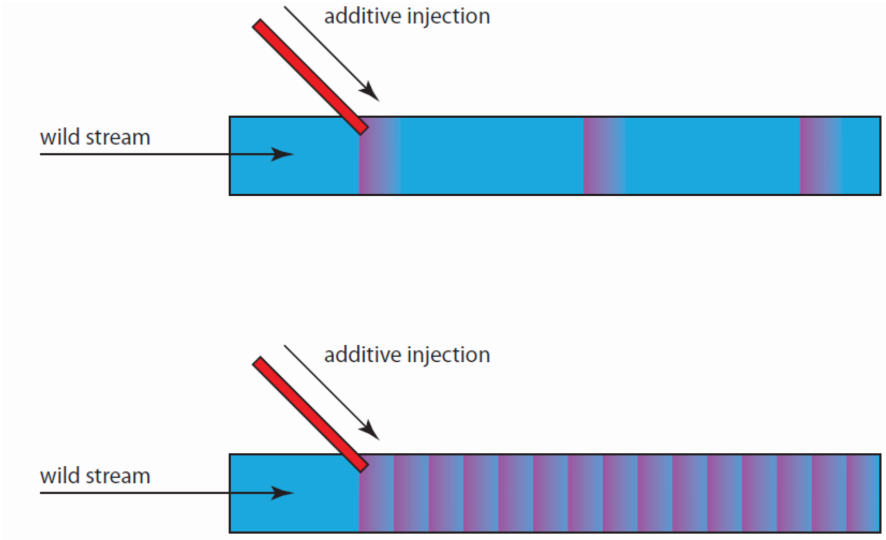
If the K-factor is less than one, the interval between injections must be set to an exact multiple of the number of units that the pulse represents. In our example of 100 liters (26.417 gal) per pulse, injections must be set to 100, 200, 300, and so on, liters (26.417, 52.834, 79.252, and so on, in gallons). Setting the injection interval to an amount that is not a multiple of the units per pulse (for example,150 litres [39.626 gal]) causes irregular injection cycles to occur, with a resultant loss of accuracy.

Similarly, if the pacing pulse is one pulse every 40 gallons, the interval between injections must be set to 40, 80,120, and so on. For example, 50 gallons does not work.

Pulse rates of 1 pulse per unit volume of fuel flow or higher allow you to configure any interval in limitation of the other factors mentioned hereafter.

One of the factors to consider is the homogeneity of the result. The longer time between injections, the less consistent the blend becomes. See the following figure.

Figure 5-14: Frequency of injection



For this reason it is desirable to inject more frequently.

The limiting factor here is the limitation of the injector hydraulics to meter and control very small volumes. The typical injector can handle injection volumes down to 1 cc. But it is much more accurate to put in several cc's.

For this reason, the volume of fuel in one cycle must be large enough to receive at least 2 or 3 cc's of additive.

The factors above must be considered, and a balance must be achieved to allow the injector to cycle in an optimum manner. The ideally tuned injection system should be set up to be injecting 50% of the time at maximum fuel flow rate.

This means that the additive-system pressure, injection interval, injection volume, and manual throttling of manifold needle valves should be adjusted until the injector solenoid is open 50% of the time when the fuel is flowing at its fastest flow rate. This ensures the most accurate injection and allows for the widest possible compensation for variations in flow.

5.11.5.3 Wild Stream

Entity	Description	Value Range
[K-factor]	K-factor of the wild stream, in pulses per [Units of volume]. Used by the SSC to determine the volume from the process (wild stream) or product flow meter. This K-factor must be the number of pulses per litre, regardless of the configured unit of volume selected.	Meter pulses per unit volume of product Example: One input pulse from product meter = 2 litres --> Enter: 0000.500 NOTE: To determine the [K-factor] for any other value, divide 1 by the flow meter pulse output. default = <100>
[Meter factor]	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.	<0.0> ... <99999.999> (default = <1.0>)
[Min. transaction vol.]	Use this entity to set the minimum amount of wild stream volume before the SSC-A is permitted to start a new injection transaction. The [Permissive I/O binding] must be configured as <None>.	<1> L ... <999> L (default = <10> L)
[End product flow timeout]	Time in seconds to indicate the end of the transaction. When no wild stream pulses are received, the transaction is finished. The [Permissive I/O binding] must be configured as <None>.	<5> s ... <255> s (default = <30> s)

5.11.5.3.1 Minimum Product Volume for Transaction Record

The [Min. transaction vol.] is the minimum volume of the product that must be loaded before the transaction begins. Setting this parameter to a value greater than 1 limits the false transaction data record that may be generated in case the SSC-A permissive-enable inputs have contact bounce. This only works when the [Permissive I/O binding] is set to <None>.

5.11.5.4 Clean Arm

Entity	Description	Value Range
[Num. of clean start cycles]	The number of injection cycles at the beginning of the transaction to be used for "over injection". The "over injection" at the start compensates the injection stop at the end of the transaction, in order to realize the clean arm or flushing of the loading arm.	<1> ... <99> (default = <10>)
[Flush volume]	The amount of wild stream volume to realize the flushing, by stopping the injections before the end of the transaction. The [Flush volume] is the amount of wild stream product that is to remain additive-free in order to realize a clean arm when the flow stops. The [Flush volume] and [Num of clean start cycles] determines the additional addtive volume to be injected at the start of the transaction (over injection). When [Flush volume] equals zero, the clean arm operation is disabled.	<0> L ... <999> L (default = <0.00> L)
[High flow threshold]	Flow rate that must be exceeded to start the injection process during clean arm operation	<0> L/min ... <30000> L/min (default = <1000.00> L/min)

Entity	Description	Value Range
[Low flow threshold]	Flow rate at which the flushing starts by stopping the additive injection process	<0> L/min ... <30000> L/min (default = <1000.00> L/min)

NOTE: Clean arm mode is applicable for all smart modes.

- Smart Product Mode
- Smart Inject Mode
- Smart Analog Mode
- Smart Inject Edge

Clean arm is also applicable for self-paced mode. Clean arm is not applicable for slave mode.

5.11.5.5 Solenoid

Entity	Description	Value Range
[Number of retries]	The number of retries for opening the solenoid again in case no additive pulses are received.	<0> ... <2> (default = <2>)
[Close delay]	The amount of time in ms after which the additive pulses must be stopped after the solenoid has been closed.	<500> ms ... <10000> ms (default = <500> ms)

Entity	Description	Value Range
[Dwell time]	The minimum time in ms that the solenoid opens and closes. The parameter value is normally set to zero in injectors that require the solenoid to open and stay open until the full volume per cycle is injected. The numeric value represents the ON time of the solenoid in milliseconds. The OFF time is equal to the ON time. When this value is non-zero, the controller continues to pulse the valve control output until the amount of additive called for in the 'Injection Volume' setting is dispensed. The stroke repeat rate is double the 'Solenoid Dwell Time'.	<0> ms ... <32767> ms (default = <0> ms)

5.11.6 Volume Conversion

5.11.6.1 Introduction

The SSC-A volume conversion is meant for the conversion of the measured Gross Observed Volume (GOV) to the Gross Standard Volume (GSV). The GSV is defined at reference condition for temperature and for that reason it is suitable for high accurate custody transfer of the additive stream product. The SSC-A implements volume conversions for "Refined products" only. For this, the SSC-A uses volume conversion standard "ASTM D 1250-04" table 59/60.

5.11.6.2 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 additive stream volume. The volume- converted values of these incremental additive stream observed volumes are then summed together to generate the running accumulative transactional GSV value.

5.11.6.3 Setup

Entity	Description	Value Range
[Volume conversion mode]	With this entity you can enable/disable the additive volume conversion.	<Enable> <Disable> (default)

5.11.6.4 Density Data

Entity	Description	Value Range
[Observed density]	With this entity you can enable/disable the additive volume conversion.	default = <0.0> kg/m3
[Density temperature]	The temperature of the lab sample used to determine the additive product observed density.	default = <0.0>°C
[Density pressure]	The pressure of the lab sample used to determine the additive product observed density.	default = <0> KPa

5.11.7 Alarms

5.11.7.1 Leaking Valve

Entity	Description	Value Range
[Alarm action]	Alarm behavior for when the alarm occurs. <Disabled>: The alarm is ignored. <Display>: Alarm shown on the display. Alarm-indication output set to ON. <Display shutdown>: Alarm shown on the display. Alarm-indication output set to ON. Alarm-shutdown output set to ON. Running transactions are stopped. Start-up of new transactions impossible.	<Disabled> <Display> <Display shutdown> (default)
[Leaking volume limit]	The maximum amount of additive volume in [Leaking timeout period] before a leaking valve alarm is generated. If this limit is exceeded, an alarm occurs depending on [Alarm action].	<1.0> ml ... <9999> ml (default = <100.00> ml)

Entity	Description	Value Range
[Leaking timeout period]	Time in seconds in which the [Leaking volume limit] is checked.	<1> s ... <99> s (default = <60> s)

5.11.7.2 Flush Volume

Entity	Description	Value Range
[Alarm action]	Alarm behavior for when the alarm occurs. <Disabled>: The alarm is ignored. <Display>: Alarm shown on the display. Alarm-indication output set to ON. <Display shutdown>: Alarm shown on the display. Alarm-indication output set to ON. Alarm-shutdown output set to ON. Running transactions are stopped. Start-up of new transactions impossible.	<Disabled> <Display> <Display shutdown> (default)
[Flush volume deviation]	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> % (default = <10> %)

5.11.7.3 No Activity

Entity	Description	Value Range
[Alarm action]	Alarm behavior for when the alarm occurs. <Disabled>: The alarm is ignored. <Display>: Alarm shown on the display. Alarm-indication output set to ON. <Display shutdown>: Alarm shown on the display. Alarm-indication output set to ON. Alarm-shutdown output set to ON. Running transactions are stopped. Start-up of new transactions impossible.	<Disabled> <Display> <Display shutdown> (default)
[No activity timeout]	Time in seconds in which wild stream pulses should be received when 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 (default = <60> s)

5.11.7.4 No Additive

Entity	Description	Value Range
[Alarm action]	Alarm behavior for when the alarm occurs. <Disabled>: The alarm is ignored. <Display>: Alarm shown on the display. Alarm-indication output set to ON. <Display shutdown>: Alarm shown on the display. Alarm-indication output set to ON. Alarm-shutdown output set to ON. Running transactions are stopped. Start-up of new transactions impossible.	<Disabled> <Display> <Display shutdown> (default)
[No additive timeout]	Time in seconds in which additive stream pulses should be received when the solenoid is opened. When after this time no additive stream pulses has been received after the configured [number of retries], an alarm occurs depending	<1> s ... <9> s (default = <2> s)

Entity	Description	Value Range
	on [Alarm action].	

5.11.7.5 No Pump

Entity	Description	Value Range
[Alarm action]	Alarm behavior for when the alarm occurs. <Disabled>: The alarm is ignored. <Display>: Alarm shown on the display. Alarm-indication output set to ON. <Display shutdown>: Alarm shown on the display. Alarm-indication output set to ON. Alarm-shutdown output set to ON. Running transactions are stopped. Start-up of new transactions impossible.	<Disabled> <Display> <Display shutdown> (default)
[Pump feedback timeout]	Time in seconds in which the additive 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 ... <255> s (default = <15> s)

5.11.7.6 Deviation

Entity	Description	Value Range
[Alarm action]	Alarm behavior for when the alarm occurs. <Disabled>: The alarm is ignored. <Display>: Alarm shown on the display. Alarm-indication output set to ON. <Display shutdown>: Alarm shown on the display. Alarm-indication output set to ON. Alarm-shutdown output set to ON. Running transactions are stopped. Start-up of new transactions impossible.	<Disabled> <Display> <Display shutdown> (default)

Entity	Description	Value Range
[Add. volume deviation]	Percentage of additive volume that is accepted without resulting in an alarm situation. If this percentage is exceeded, an alarm occurs depending on [Alarm action]. If a user sets the [Num. cycles for alarm] as 0, then the alarm occurs at the end of the transaction. If a user sets the [Num. cycles for alarm] as "n" (for example, n = 3 cycles), then the alarm occurs as per the calculation mentioned below: Example: Let's take an average based on the first 3 cycles. If the deviation is within the limit, no deviation alarm will be generated. Then it will calculate the average based on 2nd shot, 3rd shot and 4th shot, if the deviation is within the limit, no deviation alarm will be generated. The situation will keep moving until the deviation calculated exceeds [Add. volume deviation].	<1> % ... <100> % (default = <10> %)
[Num. cycles for alarm]	Number of additive injection cycles before the deviation alarm is evaluated.	<0... 99> (default = <0>)

5.11.7.7 Fixed

Entity	Description	Value Range
[Control fault]	Alarm behavior for when the alarm occurs. <Disabled>: The alarm is ignored. <Display>: Alarm shown on the display. Alarm-indication output set to ON. <Display shutdown>: Alarm shown on the display. Alarm-indication output set to ON. Alarm-shutdown output set to ON. Running transactions are stopped. Start-up of new transactions impossible,	<Disabled> <Display> <Display shutdown> (default)
[Solenoid fault]	Alarm behavior for when the alarm occurs. <Disabled>: The alarm is ignored. <Display>: Alarm shown on the display. Alarm-indication output set to ON. <Display shutdown>: Alarm shown on the display. Alarm-indication output set to ON. Alarm-shutdown output set to ON. Running transactions are stopped. Start-up of new transactions impossible.	<Disabled> <Display> <Display shutdown> (default)
[Block valve fault]	Alarm behavior for when the alarm occurs. <Disabled>: The alarm is ignored. <Display>: Alarm shown on the display. Alarm-indication output set to ON. <Display shutdown>: Alarm shown on the display.Alarm-indication output set to ON. Alarm-shutdown output set to ON. Running transactions are stopped. Start-up of new transactions impossible.	<Disabled> <Display> <Display shutdown> (default)

Entity	Description	Value Range
[Pulse hardware]	Alarm behavior for when the alarm occurs. <Disabled>: The alarm is ignored. <Display>: Alarm shown on the display. Alarm-indication output set to ON. <Display shutdown>: Alarm shown on the display. Alarm-indication output set to ON. Alarm-shutdown output set to ON. Running transactions are stopped. Start-up of new transactions impossible.	<Disabled> <Display> <Display shutdown> (default)
[Pulse phase]	Alarm behavior for when the alarm occurs. <Disabled>: The alarm is ignored. <Display>: Alarm shown on the display. Alarm-indication output set to ON. <Display shutdown>: Alarm shown on the display. Alarm-indication output set to ON. Alarm-shutdown output set to ON. Running transactions are stopped. Start-up of new transactions impossible.	<Disabled> <Display> <Display shutdown> (default)
[Factored pulse out]	Alarm behavior for when the alarm occurs. <Disabled>: The alarm is ignored. <Display>: Alarm shown on the display. Alarm-indication output set to ON. <Display shutdown>: Alarm shown on the display. Alarm-indication output set to ON. Alarm-shutdown output set to ON. Running transactions are stopped. Start-up of new transactions impossible.	<Disabled> <Display> <Display shutdown> (default)

Entity	Description	Value Range
[Temperature sensor]	Alarm behavior for when the alarm occurs. <Disabled>: The alarm is ignored. <Display>: Alarm shown on the display. Alarm-indication output set to ON. <Display shutdown>: Alarm shown on the display. Alarm-indication output set to ON. Alarm-shutdown output set to ON. Running transactions are stopped. Start-up of new transactions impossible.	<Disabled> <Display> <Display shutdown> (default)
[Tank low level]	Alarm behavior for when the alarm occurs. <Disabled>: The alarm is ignored. <Display>: Alarm shown on the display. Alarm-indication output set to ON. <Display shutdown>: Alarm shown on the display. Alarm-indication output set to ON. Alarm-shutdown output set to ON. Running transactions are stopped. Start-up of new transactions impossible,	<Disabled> <Display> (default) <Display shutdown>
[Tank empty]	Alarm behavior for when the alarm occurs. <Disabled>: The alarm is ignored. <Display>: Alarm shown on the display. Alarm-indication output set to ON. <Display shutdown>: Alarm shown on the display. Alarm-indication output set to ON. Alarm-shutdown output set to ON. Running transactions are stopped. Start-up of new transactions impossible,	<Disabled> <Display> <Display shutdown> (default)

Entity	Description	Value Range
[Service due expired]	Alarm behavior for when the alarm occurs. The [Next scheduled service] entity is configured with the date when the next service activities should take place for the SSC-A. <Disabled>: The alarm is ignored. <Display>: Alarm shown on the display. Alarm-indication output set to ON. <Display shutdown>: Alarm shown on the display.Alarm-indication output set to ON. Alarm-shutdown output set to ON. Running transactions are stopped. Start-up of new transactions impossible.	<Disabled> <Display> <Display shutdown> (default)
[Volume correction]	Alarm behavior for when the alarm occurs. <Disabled>: The alarm is ignored. <Display>: Alarm shown on the display. Alarm-indication output set to ON. <Display shutdown>: Alarm shown on the display. Alarm-indication output set to ON. Alarm-shutdown output set to ON. Running transactions are stopped. Start-up of new transactions impossible.	<Disabled> <Display> <Display shutdown> (default)

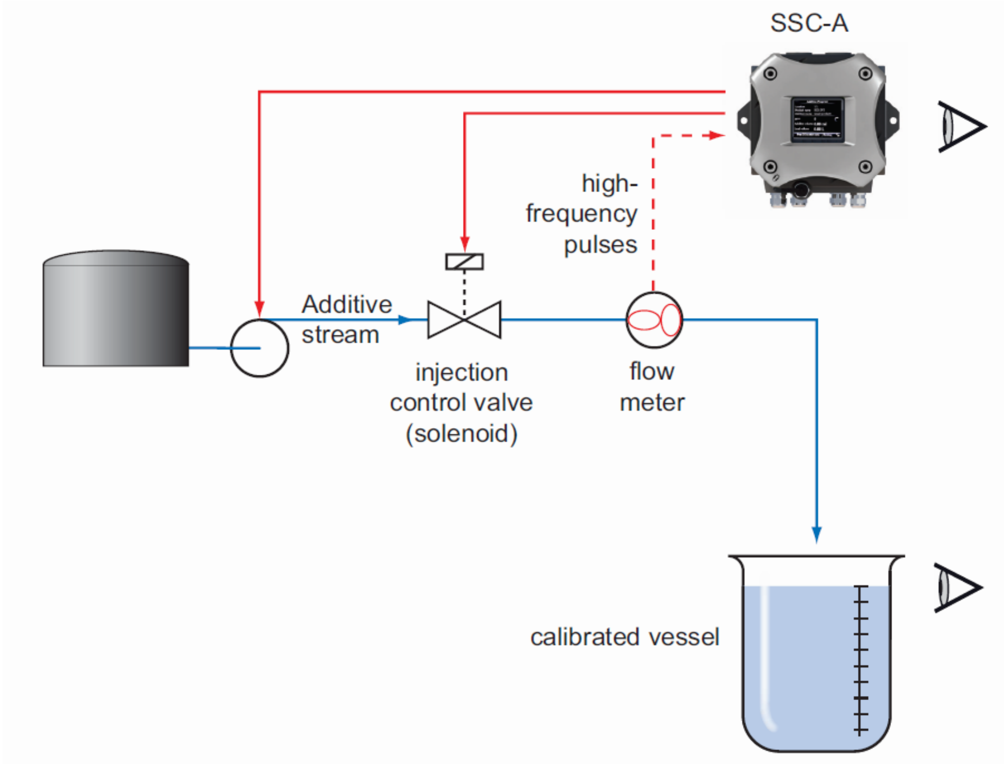
5.12 Calibration

5.12.1 Why Calibrate?

A flow meter gives a number of pulses per amount of fuel that passes the meter. The number of pulses per volume unit the meter gives is called its K-factor. This K-factor is exactly specified by the manufacturer for each delivered flow meter.

To increase the accuracy of the flow meter, a calibration can be performed. This is performed by comparing the actual resulting fuel volume received in a calibrated vessel (see the following figure) with the displayed value on the SSC-A screen, being the result of the value returned from the flow meter.

Figure 5-15: Calibrating the Flow Meter



With these two 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 injection volume (V) is then:

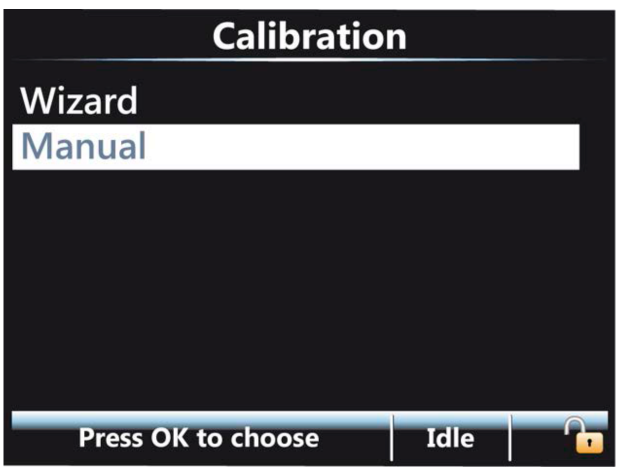
V = number of pulses / (K-factor * meter factor).

5.12.2 Calibration Menu Choice

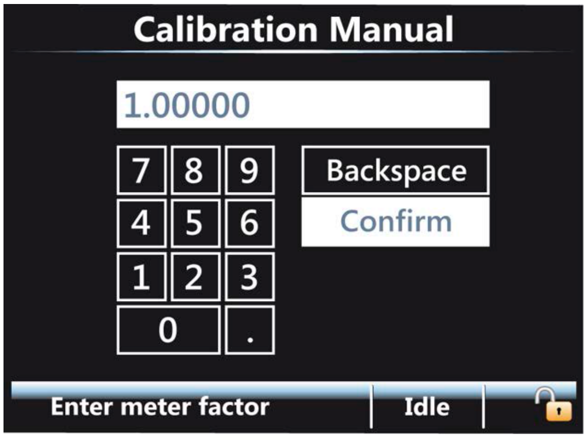
1. On the Main Menu screen, select Calibration menu. The Calibration screen appears.
2. Select the calibration method, either Wizard or Manual.

5.12.3 Manual Calibration

1. From the Calibration menu, select Manual and then select <OK>.



2. Enter the meter factor and select Confirm.



3. Select <OK> to accept the meter factor.

5.12.4 Calibrating Using the Wizard

The built-in calibration wizard makes it easy to (re-)calibrate the flow meter.

Follow these steps through the SSC-A menu to re-calibrate the flow meter:

1. Enter the volume to be injected.
2. Measure the actual volume result (calibrated vessel).
3. Enter the result.

   New meter factor appears.
4. Accept new meter factor

   Flow meter is (re-)calibrated.

The (re-)calibration process is explained in detail below.

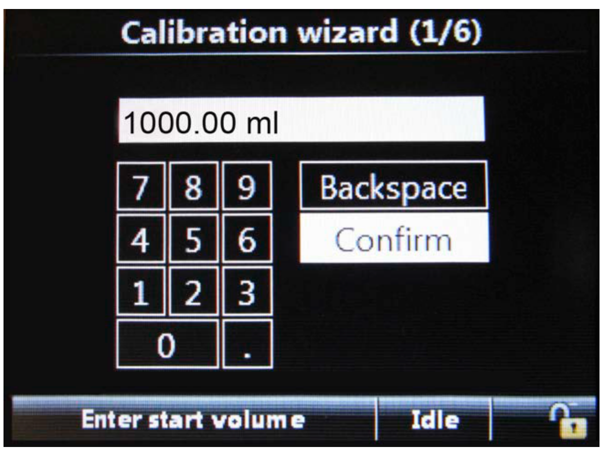
> WARNING: Do all necessary preparations (calibrated vessel in place, and so on) before starting the actual calibration.

A sequence of input screens is used to calibrate the additive meter factor.

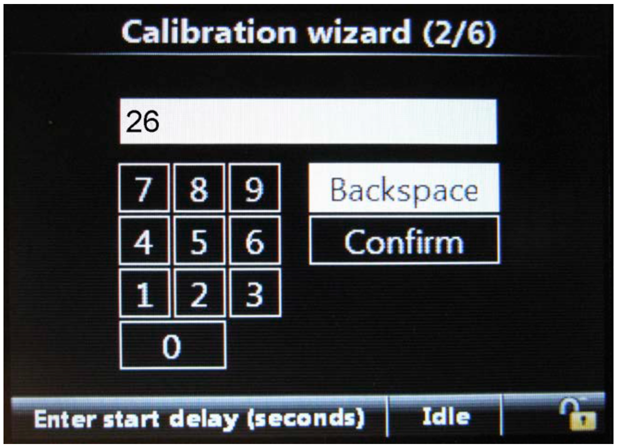
1. Enter the amount to dispense.
2. Enter the time delay (seconds) before calibration starts.
3. Press Start and wait for additive to be dispensed (progress bar appears).
4. Enter the measured volume.
5. Confirm the new additive meter factor

   Each calibration is saved in non-volatile memory with date, time, old, and new values.

6. Enter the start volume, the volume the SSC-A must inject for the calibration process.

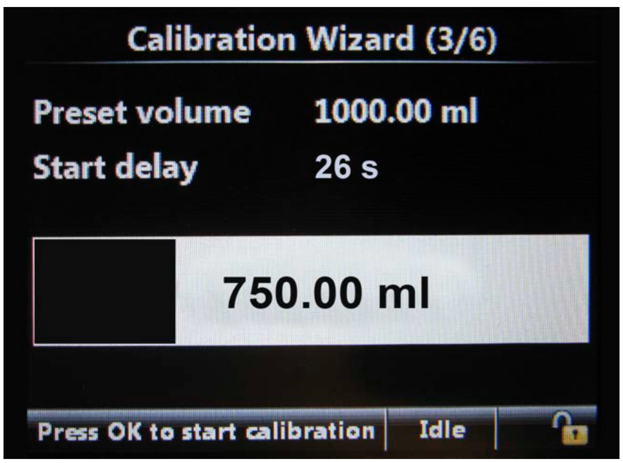
7. Enter the start delay (seconds), for situations in which the user has to move to another place (for example, to watch the result).



8. After you select <OK>, the countdown of the delay time starts.

   After expiration of the delay time, the injection process starts.

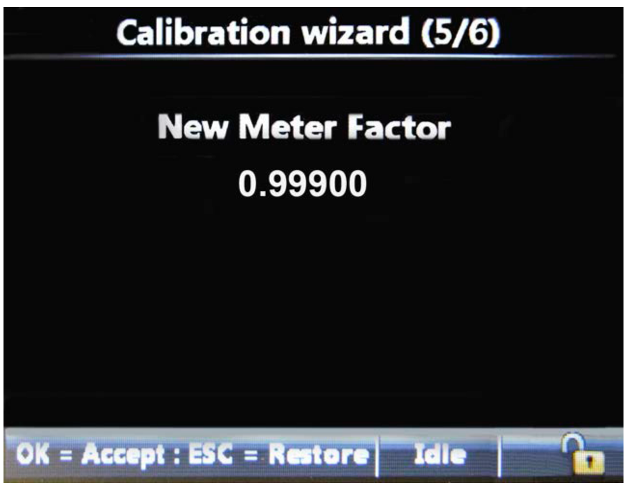
   A progress bar displays the progress of the injection process.



9. Enter the actual measured volume (calibrated vessel).

   With the actual value and the value the SSC-A measured, a new meter factor is calculated.

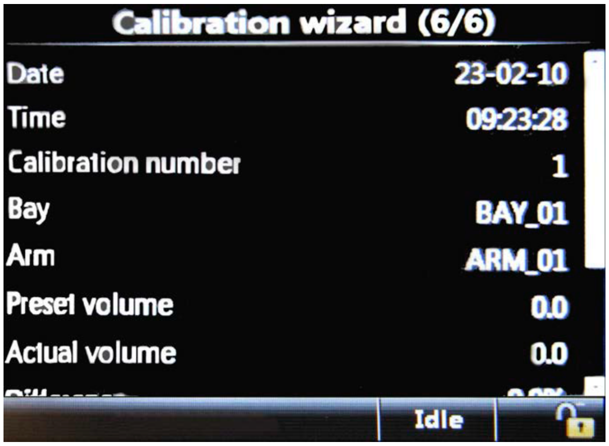
10. After the new meter factor appears, select <OK> to accept the new meter factor, or select <ESC> to reject the new meter factor.



> NOTE: When <ESC> is selected, the old meter factor is restored.

11. When <OK> is selected, a new calibration record is created and stored into the system. An overview of the calibration process is displayed.

    Select <OK> to exit to the Main Menu.



5.13 Device Information

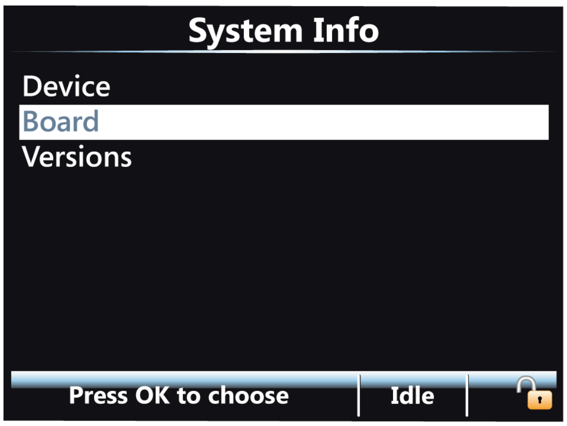
5.13.1 Information Menu Choice

The SSC "About" screen displays important information about the following:

- FlexConn protocol
- FlexConn build
- Application firmware build
- Device serial number
- Board serial number
- Bootloader firmware version

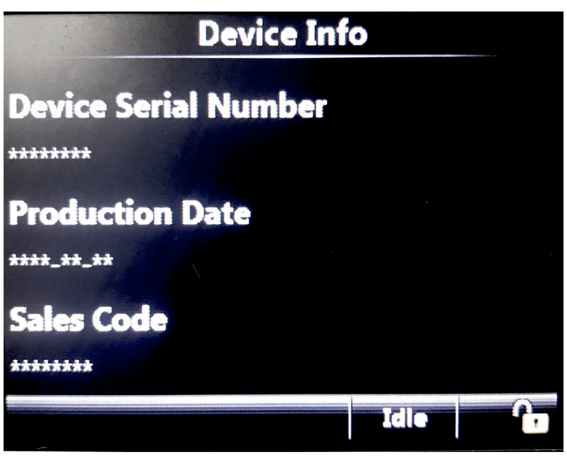
Identification information for the following device components also appears:

- 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.



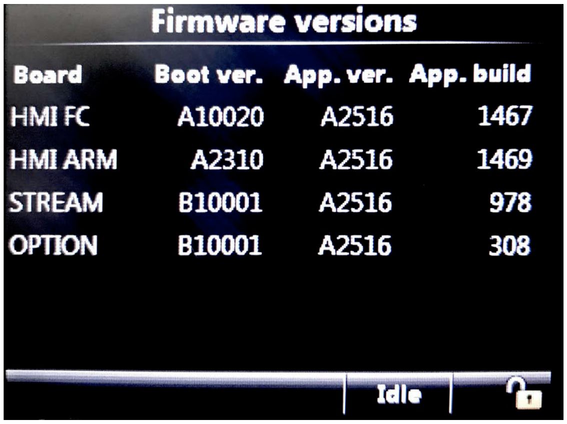
5.13.1.1 Device Info

To see device info, select <Device> on the System Info screen and then select <OK>. The Device Info screen appears.



5.13.1.2 Firmware Versions

For information about firmware versions, select <Versions> on the System Info screen and then select <OK>. The Firmware versions screen appears.



5.13.1.3 Board Info

For board information, select <Board> on the System Info screen and then select <OK>. The Board Info screen appears.

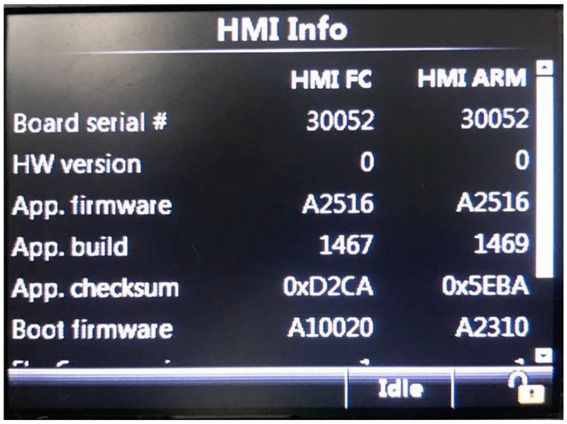
Select the relevant board, which provides an overview of the particular board, such as serial number, hardware version, and software-related version numbers.

5.13.1.3.1 HMI Info

Select <HMI> on 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

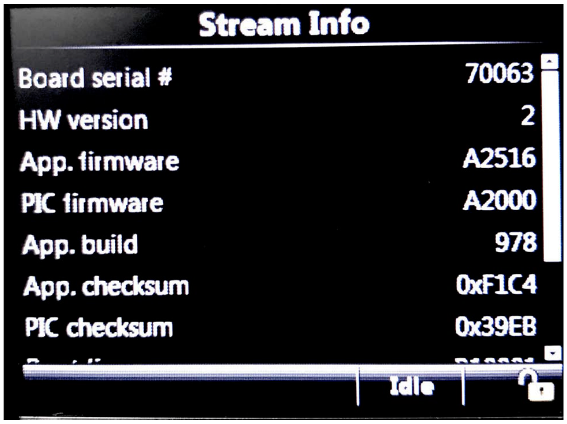
- App. checksum
- Boot firmware
- FlexConn version
- FlexConn build



5.13.1.3.2 Stream Info

Select <Stream> on the Board Info screen and then select <OK>. The Stream Info screen appears with the following details:

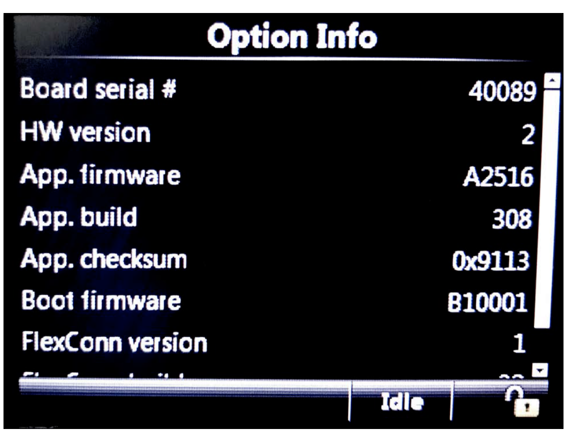
- Board serial #
- HW version
- App. firmware
- PIC firmware
- App. checksum
- PIC checksum
- App. build
- Boot firmware
- FlexConn version
- FlexConn build



5.13.1.3.3 Option Info

Select <Option> on the Board Info screen and then select <OK>. The Option Info screen appears with the following details:

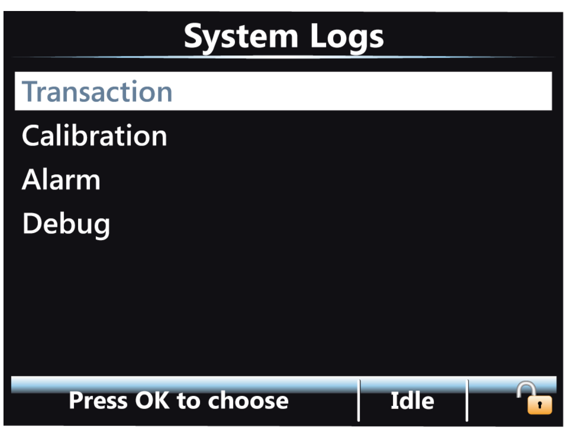
- Board serial #
- HW version
- App. firmware
- App. build
- App. checksum
- Boot firmware
- FlexConn version
- FlexConn build



5.14 Logs

The Logs menu is the user interface which provides various logs maintained in non-volatile memory including the following:

- Transaction logs: Complete information for each transaction.
- Calibration log: Displays the sequence of additive meter factor calibrations over time
- Alarm log: A chronological list of the occurrence of the alarms and the type of alarms they were
- Debug log: A list of device events that can be retrieved for fault-finding purposes.

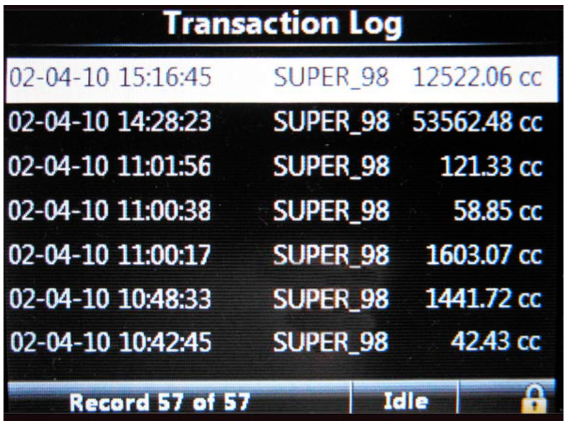


On the System Logs screen, the following data logs can be viewed:

- All available transaction records
- All available calibration records
- All available alarm records

5.14.1 Transaction Log

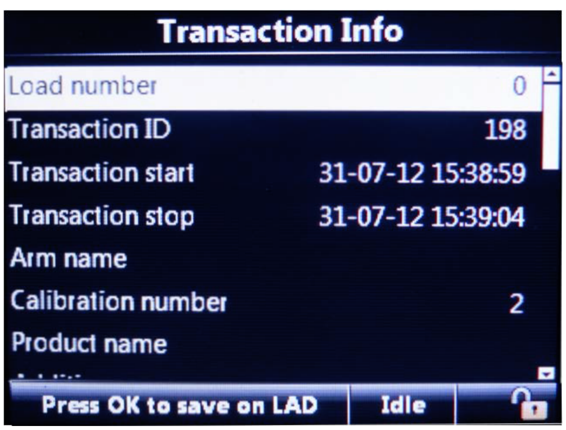
To view a transaction, select <Transaction> and then select <OK>. The Transaction Logs screen appears.



Select <OK> for any specific transaction from the Transaction Log list. The following transaction info appears:

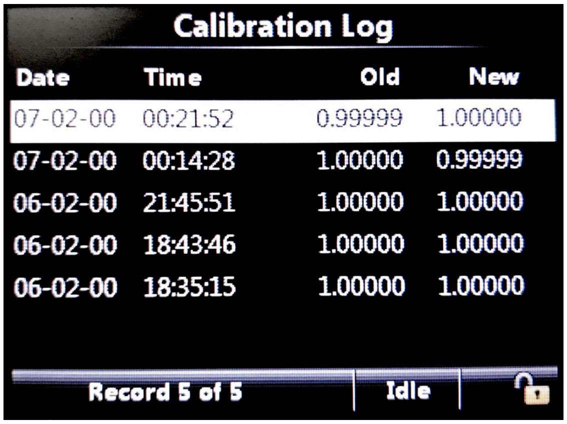
- Load number
- Transaction ID
- Transaction start
- Transaction stop
- Arm name
- Calibration number
- Product name
- Additive name
- ppm
- Load volume

- 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



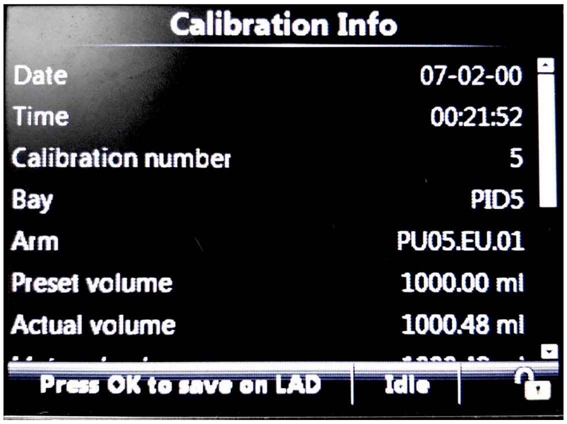
5.14.2 Calibration Log

For the Calibration log, select <Calibration> on the System Logs screen and then select <OK>. The Calibration Log screen appears.



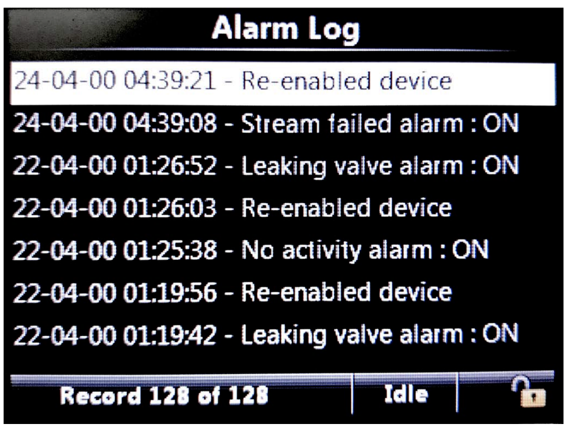
Select <OK> for any specific calibration log from the Calibration Log list. The following calibration info appears:

- 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

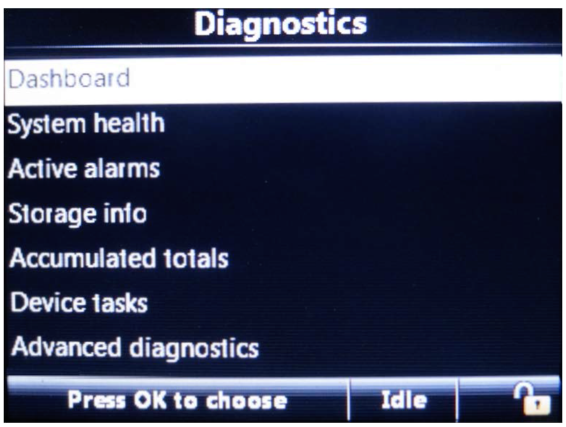
For alarms, select <Alarm> on the System Logs screen and then select <OK>. The Alarm Log screen appears.



5.15 Diagnostics

The Diagnostics menu provides the following features:

- High-level view of the current state of all device I/O functions
- Digital inputs/outputs show the state as “High”/ “Low”
- Ability to set the values of all output channels (digital and analog). 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



From the Diagnostics screen, you can view diagnostics about the following subjects:

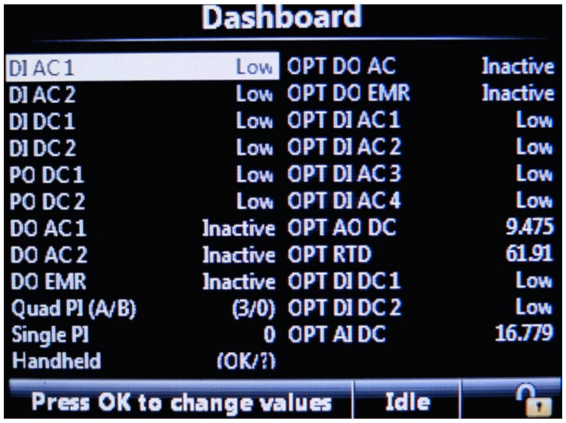
- Dashboard - Overview of all I/O (Dashboard).
- System health
- Active alarms
- Storage info - Overview of the available memory space for data logs and total number of available logs
- Accumulated totals - Total volume of the blend stream and wild stream since last Clear totals command
- Device tasks

- Reset task
  - Reset the complete device
  - Reset to the factory default settings
- Comms task - simulate the following actions by Comms.
  - Disable permissive
  - Enable permissive 1
  - Enable permissive 2
  - Slow flow enable
  - Inject now
  - Open solenoid
  - Close solenoid
- Clear task
  - Clear all alarms
  - Clear all totals
  - Clear wild stream totals only
  - Clear blend stream totals only
- Advanced diagnostics
  - Flow rates
    - Additive stream
    - Product stream
    - Instant additive

5.15.1 Dashboard

The Dashboard displays the state or value of all available I/O blocks in the SSC-A.

Select each output function to test and activate it.



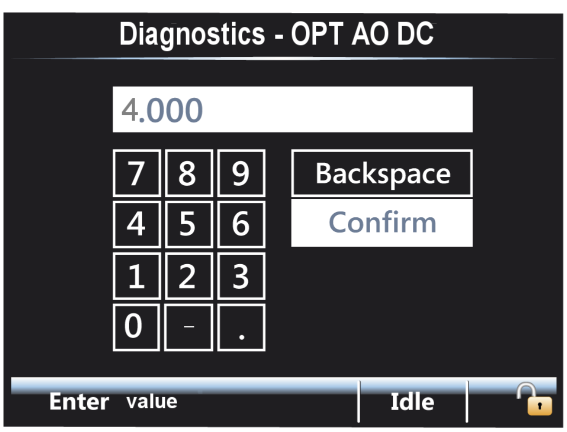
To change the value from Inactive to Active or vice versa for an output function (DO, DO-EMR, AO, or PO), select the function and then select <OK>.

To change the value from Low to High for an input function (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, do the following steps:

1. Select <Diagnostics> from the Main Menu.
2. Select Dashboard.
3. Select the OPT AO DC function in the Dashboard. The Diagnostics - OPT AO DC screen appears.

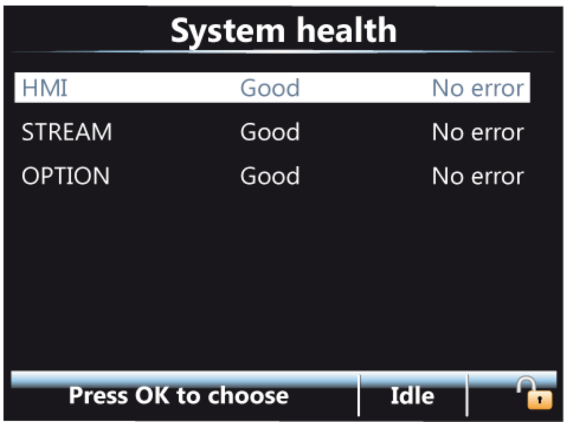


4. Enter the value for AO and then select Backspace or Confirm. The default value is 4.000.

> NOTE: Be sure to unbind the I/O when forcing the outputs to avoid unpredictable control errors.

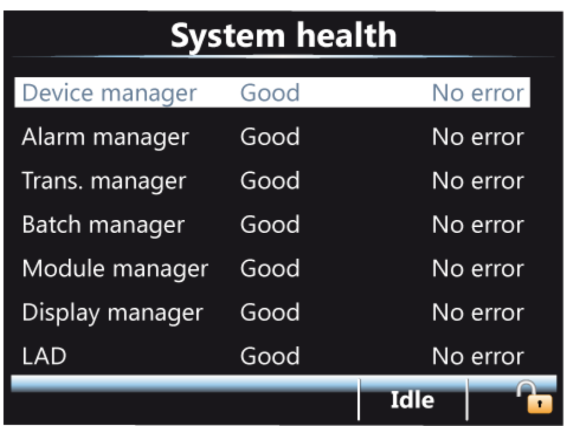
5.15.2 System Health

Select <System health> to display the health of the system. The System health screen appears.



5.15.2.1 HMI

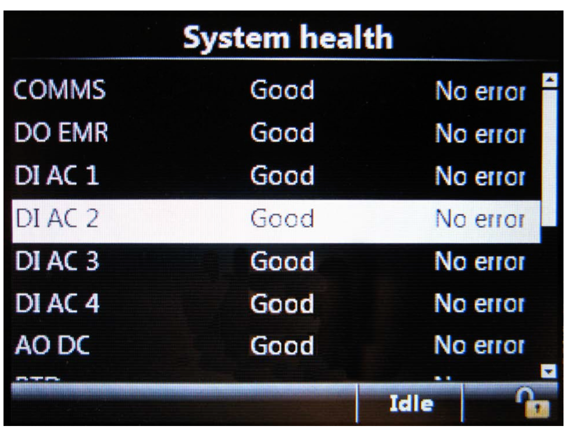
Select <HMI> to view the details of the HMI board.



5.15.2.2 Stream

Select <STREAM> to view the 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

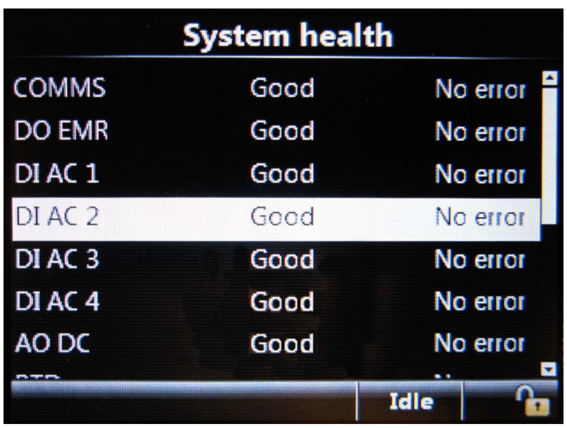


5.15.2.3 Option

Select <OPTION> to view the 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

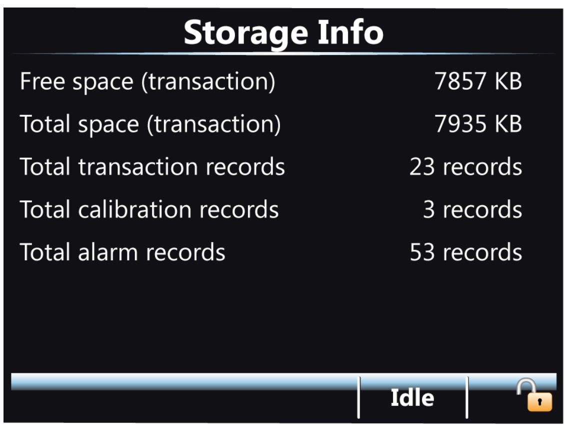


5.15.3 Active Alarms

Select <Active alarms> on the Diagnostics screen for an overview of all active alarms.

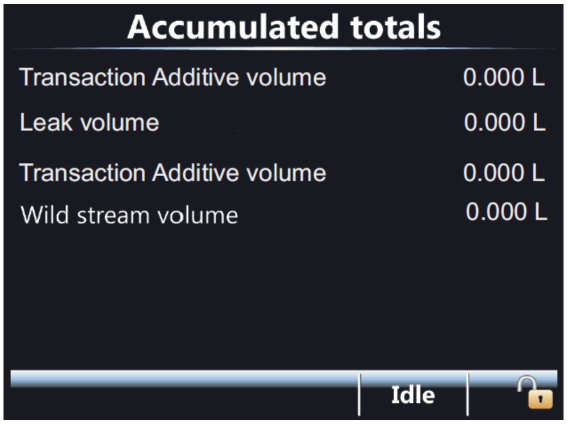
5.15.4 Storage Info

Select <Storage info> on the Diagnostics screen for an overview of actual stored logs.



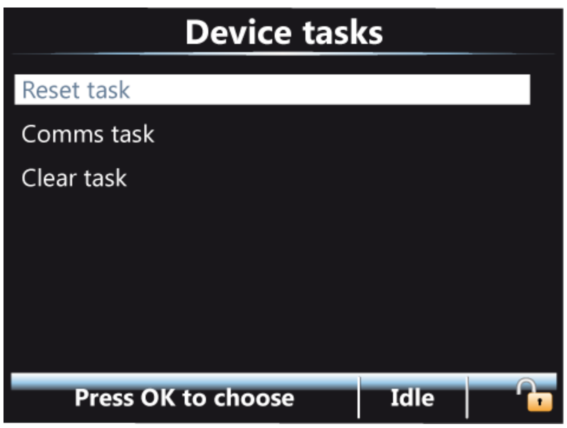
5.15.5 Accumulated Totals

Select <Accumulated totals> on the Diagnostics screen for an overview of accumulated totals.



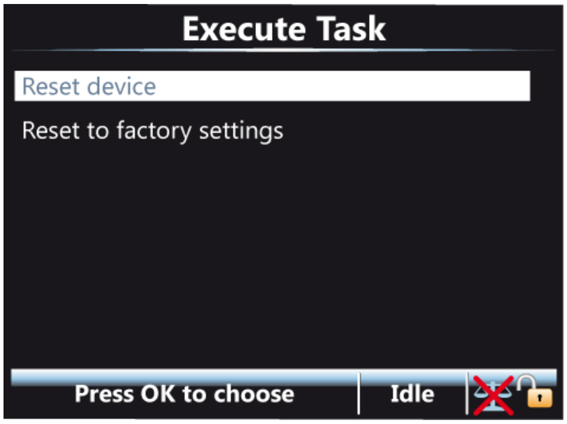
5.15.6 Device Tasks

Select <Device tasks> on the Diagnostics screen to view the <Device tasks> submenus.



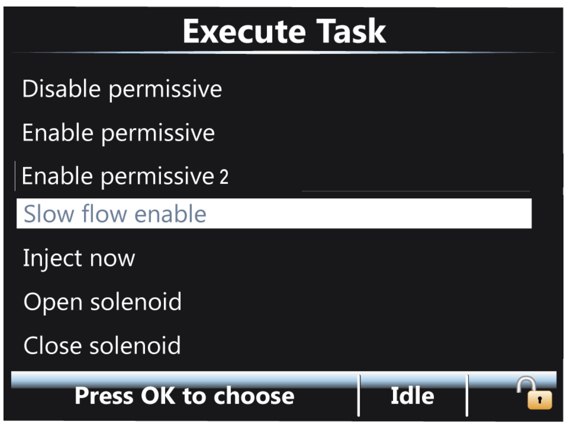
5.15.6.1 Reset Task

Select <Reset task> on the Device Tasks screen to view the options available to reset the device.



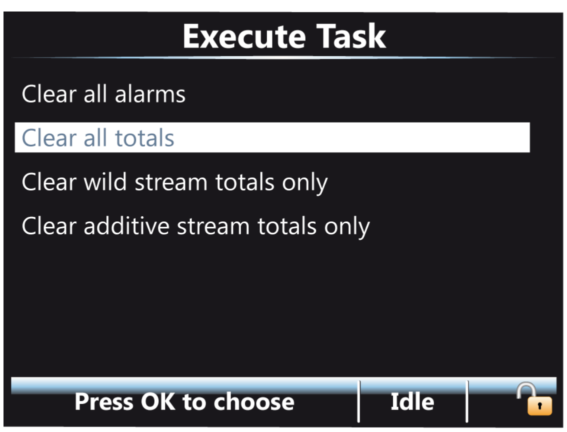
5.15.6.2 Comms Task

Select <Comms task> on the Device Tasks screen to view the options for communication tasks.



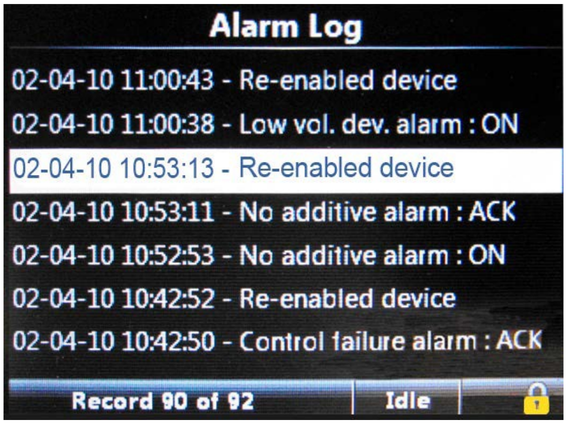
5.15.6.3 Clear Task

Select <Clear task> on the Device Tasks screen to view the options to clear the task.



5.15.6.4 Alarm Logs

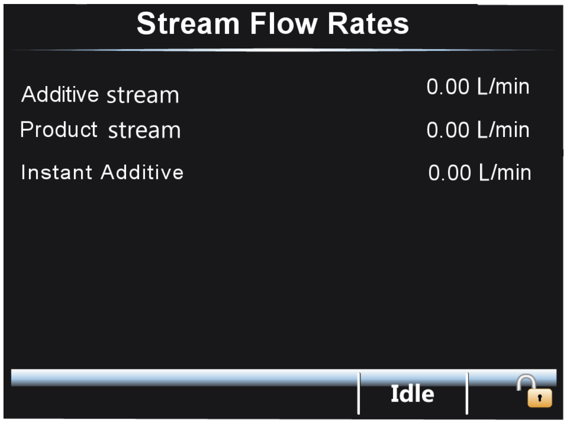
Select <Alarm> on the System Logs screen and then select <OK>. The Alarm Log screen appears.



5.15.7 Advanced Diagnostics

Select <Advanced diagnostics> on the Diagnostics screen. The <Advanced diagnostics> submenu appears.

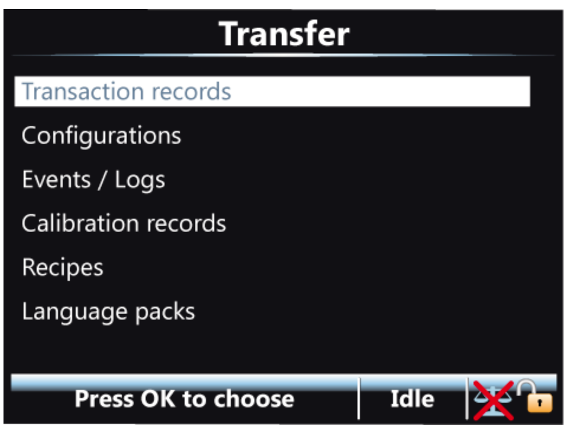
Select <Flow rates> on the Advanced diagnostics screen to view the available options.



5.16 Transfer

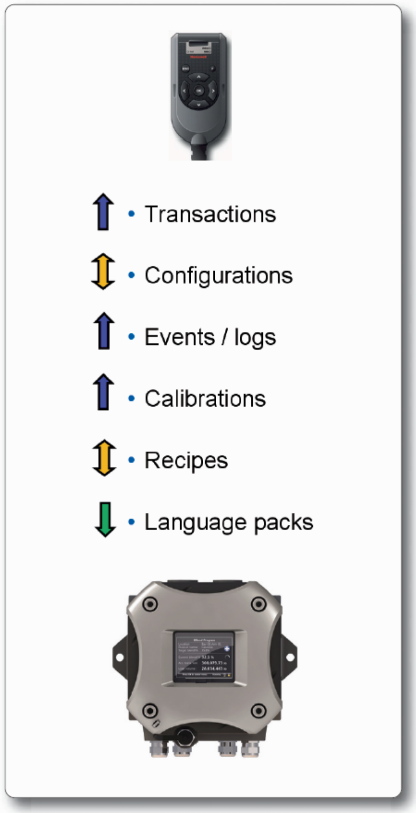
5.16.1 General

In the Transfer menu, various data sets can be transferred between the SSC-A and the LAD; see the following screen shot.



The data-transfer directions are defined in the following figure.

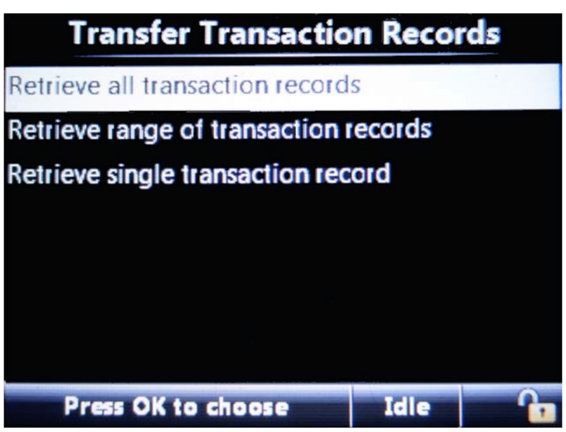
Figure 5-16: Data-Transfer Directions



5.16.2 Retrieving Transaction Records

The SSC-A 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.

To retrieve transaction records, select <Transaction records> from the Transfer Main Menu. The Transfer Transaction Records screen appears.



> NOTE: The <Retrieve single transaction record> command cannot be used through the Fusion4 portal. This screen is only used by copying a transaction record to the LAD.

5.16.2.1 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 the following parameters:

- Start date
- Start time
- Product volume
- Blend volume
- Alarms
- Percent deviation
- End time

These parameters are "read only"; that is, they cannot be changed by the user.

For an explanation of all transaction record parameters, see 5.16.3 - Additive Transaction Record Explained.

> 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. A maximum of 10,000 unsettled transactions can reside in the transaction memory of the SSC-A.

5.16.3 Additive Transaction Record Descriptions

Transaction Record Parameter	Description
[transaction_record_version]	The version of this transaction record.

Transaction Record Parameter	Description
[device_type]	The description of the type of Fusion4 device the transaction record comes from.
[transaction_unique_identifier]	A string that uniquely identifies the transaction from all other transactions for all Fusion4 devices.
[device_id]	A user specified identifier for the unit.
[calibration_number]	A counter incremented each time flow meter calibration is performed.
[units_of_volume]	The engineering units associated with all volume measurements in this record.
[units_of_additive_volume]	The engineering units associated with all additive volume measurements in this record.
[site_name]	The name of the site where the transaction happened.
[transaction_start_time]	The time in which the transaction begins (sampled form RTC entity).
[transaction_start_date]	The date when the transaction begins (sampled from RTC entity).
[transaction_stop_time]	The time when the transaction ended (sampled from RTC entity).
[transaction_stop_date]	The date when the transaction ended (sampled from RTC entity).
[load_number]	An optional number supplied by TAS when the blender is used with loader.
[critical_transaction_alarm]	An error condition associated with the transaction that breaks W&M compliance.
[non_critical_transaction_alarm]	An error condition associated with the transaction that does not break W&M compliance.
[hazardous_material_classification]	A string that describes the hazardous material classification of the resulting product.
[bay_name]	The name of the bay at which the transaction occurred.

Transaction Record Parameter	Description
[arm_name]	The name of the arm used to dispense the blended product.
[product_name]	The name of the final product.
[product_symbol]	The API symbol associated with the wild stream product.
[additive_name]	The name of the additive product.
[transaction_load_volume]	The total wild stream volume moved during the transaction.`
[batch_additive_gross_ observed_volume]	The total observed volume of additive product dispensed during the batch.
[batch_start_accumulated_ gross_observed_volume]	The gross accumulated volume at the start of the batch.
[batch_stop_accumulated_ gross_observed_volume]	The gross accumulated volume at the end of the batch.
[batch_ppm]	The actual calculated parts per million of the additive in the final product.
[secondary_stream_volume_ per_injection_cycle]	The amount of main stream product between injections.
[additive_volume_per_ injection]	The amount of injection volume dispensed per injection cycle.
[additive_percent_deviation]	The percentage deviation from the accumulative target additive injection volume.

5.16.3.1 Transaction Alarm Codes

On the Bill of Lading (BOL) document, an alarm message is denoted as an alarm code. In the following table, these alarm codes are explained.

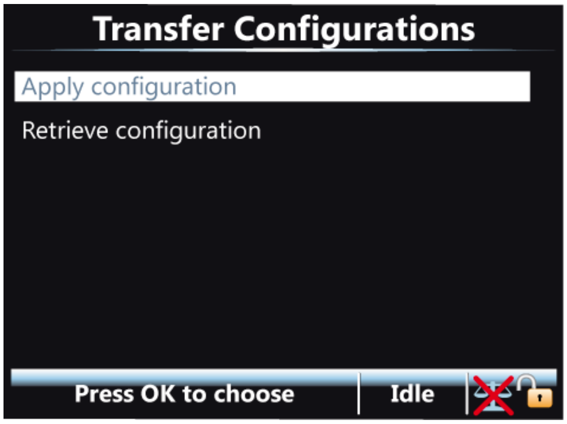
For an overview of all critical and non-critical alarms, see also CHAPTER 6 - Alarm Handling.

Alarm Code	Description
0	ALARM_NO_ALARM
1	ALARM_GENERAL_FAIL

Alarm Code	Description
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
56	HMI_ALARM_SERVICE_DUE_REMINDER
100	STREAM_ALARM_CONTROL_FAILURE
101	STREAM_ALARM_NO_ACTIVITY_TIMEOUT
102	STREAM_ALARM_SOLENOID_FAILING
103	STREAM_ALARM_STREAM_START_ERROR
104	STREAM_ALARM_PULSE_PHASE
105	STREAM_ALARM_PULSE_GENERAL
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
150	STREAM_ALARM_LOW_VOLUME_DEVIATION
151	STREAM_ALARM_HIGH_VOLUME_DEVIATION
152	STREAM_ALARM_NO_ADDITIVE
200	STREAM_ALARM_VCF_ERROR
201	STREAM_ALARM_TEMPERATURE_ERROR

5.16.4 Configurations

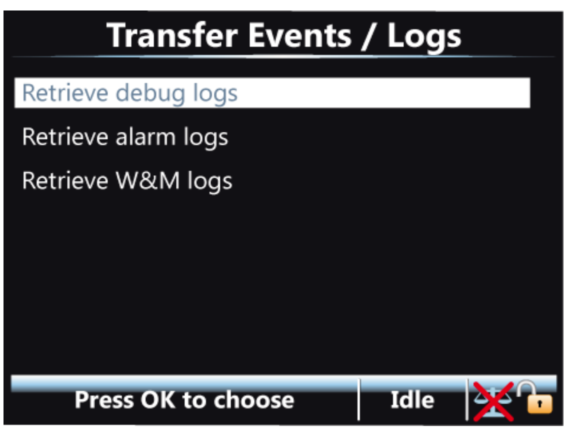
Select <Configurations> from the Transfer Main Menu. The Transfer Configurations screen appears.



- <Apply configuration> - Select this option to install a configuration present on the SD card.
- <Retrieve configuration> - Select this option to save the current configuration to the SD card.

5.16.5 Events/Logs

Select <Events/Logs> from the Transfer Main Menu. The Transfer Events/Logs screen appears.

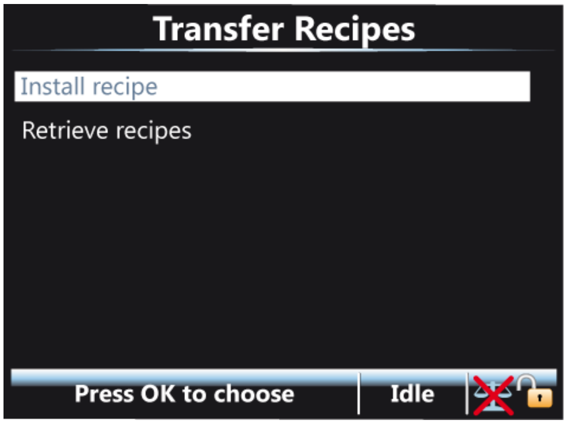


In the <Events/Logs> submenu, two types of logs can be retrieved from the SSC-A:

- Debug logs - advanced technology diagnostics
- Alarm logs - history of enabled device alarms

5.16.6 Recipes

Select <Recipes> from the Transfer Main Menu. The Transfer Recipes screen appears.



- <Install recipe> - Select this option to install a recipe present on the SD card.
- <Retrieve recipes> - Select this option to save the current recipes to the SD card.

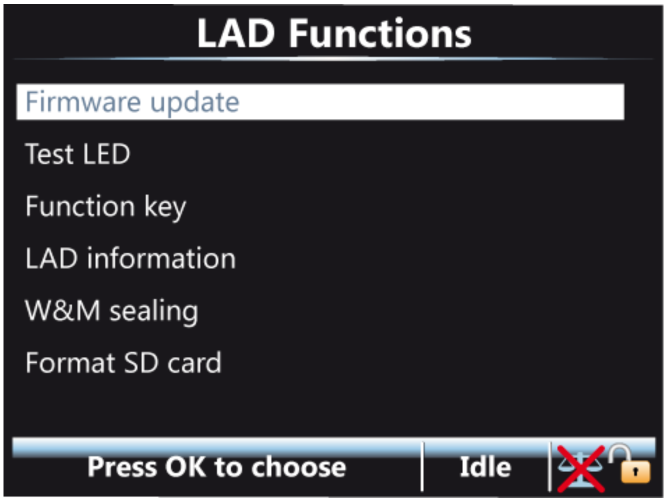
5.16.7 Language Packs

Select <Language packs> from the Transfer Main Menu. The Transfer Language Packs screen appears.

5.17 LAD Functions

5.17.1 General

In the LAD Functions menu, various LAD functions and activities can be accessed.



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-A\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 is only required if the Option card is installed in the device.

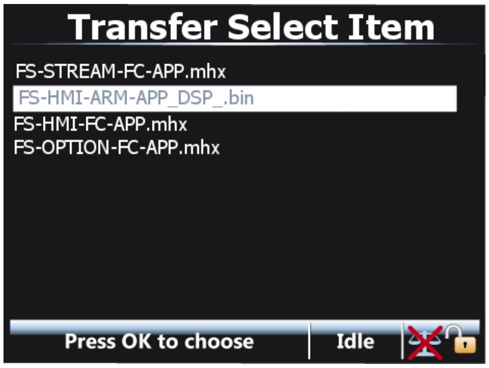
2. Plug in the LAD to the SSC and make sure the SD card is in the LAD before plugging in the LAD.

   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.

a. FS-HMI-ARM-APP_DSP_.bin

- The total time for the firmware update is approximately 6 minutes.
- After the file is updated, remove and plug in the LAD again to reinitialize it. If you do not plug in the LAD again, then the device may not recognize the SD card when the next file is downloaded.

b. FS-HMI-FC-APP.mhx

- The total time for the firmware update is approximately 3 minutes.
- After the file is updated, remove and plug in the LAD again to reinitialize it. If you do not plug in the LAD again, then the device may not recognize the SD card when the next file is downloaded.

c. FS-STREAM-FC-APP.mhx

- The total time for the firmware update is approximately 9 minutes.
- 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.

d. FS-OPTION-FC-APP.mhx (if required)

- The total time for the firmware update is approximately 6 minutes.
- Update the file only if it is available.

When the firmware update is successful, a message is displayed confirming so.

If one of the following alarms appears, ignore the alarm and re-enable the device once:

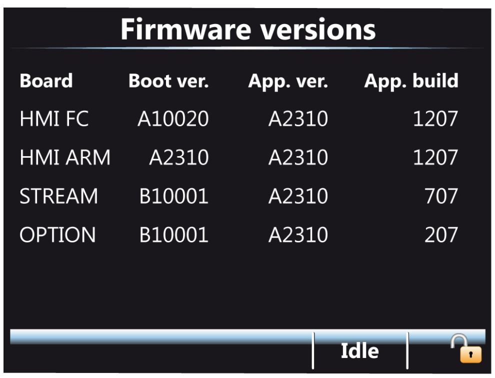
- "Stream board missing" when updating the stream board firmware.
- "Option board missing" when updating the option board firmware.

> NOTE: If the Fusion4 portal is interfaced with the SSC-A 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 App. Ver. column.



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”.

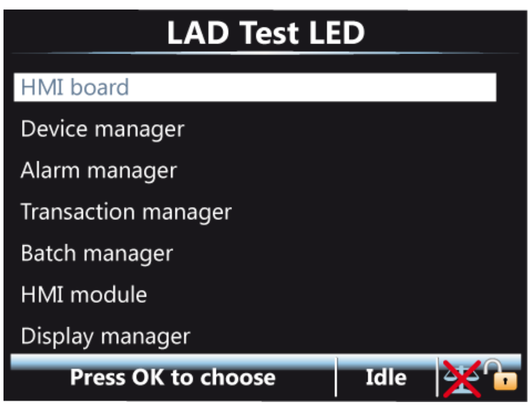
5.17.3 Test LED, Function Key, and LAD Information Submenus

5.17.3.1 LAD Test LED

In the <Test LED> submenu, 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

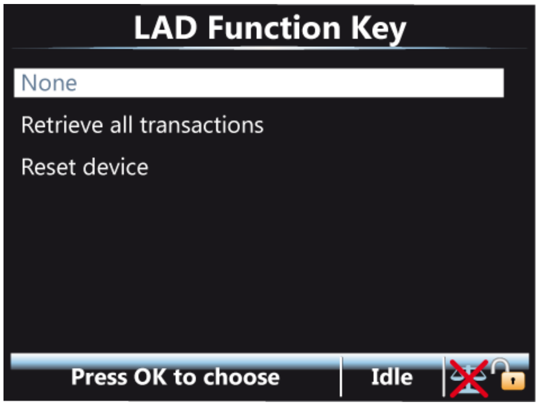
- OPT Comms
- OPT DO EMR
- OPT DI AC 1
- OPT DI AC 2
- OPT DI AC 3
- OPT DI AC 4
- OPT AO DC
- OPT RTD
- OPT DO AC
- OPT DI DC 1
- OPT DI DC 2
- OPTION module
- OPT AI DC



> NOTE: Test LED functions are inactive while retrieving other records from the LAD.

5.17.3.2 LAD Function Key

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.

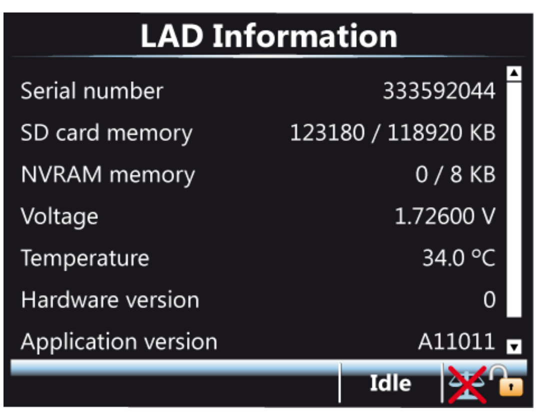


This configuration is saved on the LAD, so changes made to the function key work with other devices as well.

5.17.3.3 LAD Information

The <LAD information> submenu provides the following relevant LAD information and diagnostics.

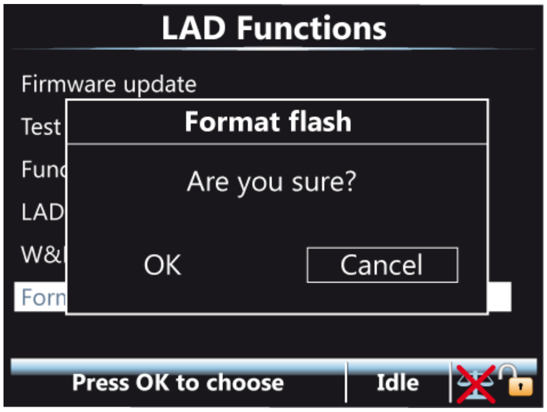
- Serial number
- SD card memory
- NVRAM memory
- Voltage
- Temperature
- Hardware version
- Application version
- Bootloader version



5.17.4 Format SD Card

With this option, the SD card of the LAD can be formatted.

> WARNING: All content is erased.



6 Alarm Handling

6.1 General

Through the SSC menu, various alarm configurations can be set. Also, the active alarms, transaction 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.

6.3 Alarm Configuration

Each alarm initiates an action, which can be configured.

The following table describes the alarm settings and the effects.

Alarm Setting	Effect
Disabled	The alarm is ignored.
Display	• Alarm shown on the display • Alarm-indication output set to ON
Shutdown (default)	• Alarm shown on the display • Alarm-indication output set to ON • Alarm-shutdown output set to ON • Running transactions are stopped • Start-up of new transactions impossible

NOTE: Per alarm, more options can be configured.

6.4 Stream Alarms

<table>
<tr><th>Alarm</th><th>Cause</th></tr>
<tr><td>Leaking valve</td><td>Device was idle, but within the [leaking timeout period] more than the [leaking volume limit] was measured.</td></tr>
<tr><td>Flush volume</td><td>The SSC was in the slow-flow state (clean-arm function), and [Flush volume] (wild stream) minus the [Flush volume deviation] was not measured.</td></tr>
<tr><td>Control failure</td><td>This alarm is raised when more than 10 triggers are available. Also, if the SSC was not correctly configured and because of this does not have enough time to handle all inject triggers.

The maximum number of triggers that can be stored into the buffer is 10.

NOTE: This alarm takes precedence over the low/high deviation alarm. This means if control failure occurs, the device will close the transaction and so the deviation alarm will also be triggered even if [Number of cycles before deviation alarm evaluation] are not complete</td></tr>
<tr><td>No activity</td><td>The SSC started a new transaction, but after the [no activity timeout] still no wild stream was detected.</td></tr>
<tr><td>No additive</td><td>No additive flow was detected on expiration of the [no additive timeout] timer.

As soon as the additive solenoid opens, the timer [no additive timeout] is started.

NOTE: The No activity alarm must be enabled for the No additive alarm to function correctly.</td></tr>
<tr><td>No pump</td><td>The pump did not receive a feedback signal within the [pump feedback timeout].

Only possible if the I/O binding for pump ON/OFF and pump indication are configured.</td></tr>
</table>

Alarm	Cause
Low deviation	This alarm is generated if the average of the additive injection volume calculated over the configured number of cycles is lower than the additive deviation percentage. With the entity [Additive volume deviation], the acceptable deviation can be set. With the entity [Number of cycles before deviation alarm evaluation], the number of additive injection cycles that are used for calculating the average of the injection volume for the deviation calculations can be set. If a user sets the [Num. cycles for alarm] as 0, then the alarm occurs at the end of the transaction. If a user sets the [Num. cycles for alarm] as "n" (for example, n = 3 cycles), then the alarm occurs as per the calculation mentioned below: In an average based on the first 3 cycles, if the deviation is within the limit, no deviation alarm will be generated. Then it will calculate the average based on 2nd shot, 3rd shot and 4th shot; if the deviation is within the limit, no deviation alarm will be generated. The situation will keep moving until the deviation calculated exceeds [Add. volume deviation].

Alarm	Cause
High deviation	This alarm is generated if the average of the additive injection volume calculated over the configured number of cycles is higher than the additive deviation percentage. With the entity [Additive volume deviation], the acceptable deviation can be set. With the entity [Number of cycles before deviation alarm evaluation], the number of additive injection cycles that are used for calculating the average of the injection volume for the deviation calculations can be set. If a user sets the [Num. cycles for alarm] as 0, then the alarm occurs at the end of the transaction. If a user sets the [Num. cycles for alarm] as "n" (for example, n= 3 cycles), then the alarm occurs as per the calculation mentioned below: In an average based on the first 3 cycles, if the deviation is within the limit, no deviation alarm will be generated. Then it will calculate the average based on 2nd shot, 3rd shot and 4th shot, if the deviation is within the limit, no deviation alarm will be generated. The situation will keep moving until the deviation calculated exceeds [Add. volume deviation].
Pulse phase	Dual pulse inputs were out of phase. Only possible if device is configured for quad pulse.
Stream start error	Error during new transaction start-up.
Solenoid fault	System is not able to activate or deactivate the solenoid.
Block valve fault	System is not able to activate or deactivate the block valve.

Alarm	Cause
Pulse hardware fault	Pulse input module detects the following error conditions: • Error reading information from the PIC controller • Pulse overflow errors • BAD health of pulse input function
Tank empty alarm	SSC-A has received an active Tank empty input. However, when the I/O binding is a DI input, an alarm is generated when the DI is NOT active.
Tank low level	SSC-A has received an active Tank low level input. However, when the I/O binding is a DI input, an alarm is generated when the DI is NOT active.
Factored pulse output alarm	SSC-A (or SSC-B) is not able to perform the configured output on time.
VCF error	The volume correction calculations detected an error.
Pulse phase	Dual pulse inputs were out of phase. Only possible if device is configured for quad pulse.
Temperature error	The temperature sensor returned an invalid value or the value exceeds the configured alarm threshold value.

6.5 HMI Alarms

Alarm	Cause
No option board	Option board disappeared. Only if an option board was detected during start-up. 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. NOTE: If this alarm appears just after the firmware upgrade of the option board, ignore the alarm and re-enable the device.
License key	No license key set. Determines additive or blending mode.
Batch permissive	SSC was about to start transaction, but during creation of a transaction record, some error occurred.
Interboard connection	Communication between ARM processor and the HMI processor failed.
HMI fatal error	Unknown fatal error

6.6 Alarm Logs

Any alarm-state change that occurs is logged with a time stamp.

On the Alarm log screen, all alarm states that have been changed can be examined.

6.7 Active Alarms

The Active Alarms screen displays all active and acknowledged alarms.

An active alarm can be acknowledged in the Active Alarms screen by selecting this alarm and then select <OK>. The state of the alarm changes to <ACKNOWLEDGED>, and a new alarm log item is created.

This can also be performed 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 <ALARM_INACTIVE>.

This can also be performed through Comms through [reset all alarms], or hard-wired. For the latter, the entity [I/O binding alarm reset input] must be configured accordingly.

6.7.1 Alarm Manager Entities

By reading the [active alarm bitmask] using the Fusion4 Portal, the active alarm ID is shown. Each alarm has a unique ID. Combined alarms are possible as well.

ID	Alarm Message
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_SOLENOID_FAILING
0x0400	STREAM_ALARM_STREAM_START_ERROR
0x0800	STREAM_ALARM_PULSE_PHASE
0x1000	STREAM_ALARM_PULSE_GENERAL
0x2000	STREAM_ALARM_NO_ACTIVITY_TIMEOUT
0x4000	STREAM_ALARM_CONTROL_FAILURE
0x8000	STREAM_ALARM_LEAKING_STREAM_VALVE
0x10000	STREAM_ALARM_NO_PUMP_SENSE
0x20000	STREAM_ALARM_BLOCK_VALVE_FAILING
0x20000	STREAM_ALARM_NO_ADDITIVE
0x40000	STREAM_ALARM_SLOW_FLOW_VOLUME
0x80000	STREAM_ALARM_LOW_VOLUME_DEVIATION
0x100000	STREAM_ALARM_HIGH_VOLUME_DEVIATION
0x400000	STREAM_ALARM_FACTORED_PULSE_OUT
0x800000	STREAM_ALARM_TANK_LOW_LEVEL
0x1000000	STREAM_ALARM_TANK_EMPTY
0x2000000	STREAM_ALARM_TEMPERATURE_ERROR

By reading the [Total numbers of implemented alarms] using the Fusion4 Portal, the number of alarms available are displayed.

By reading the [Alarm state] using the Fusion4 Portal, the state of all alarms in the device are displayed.

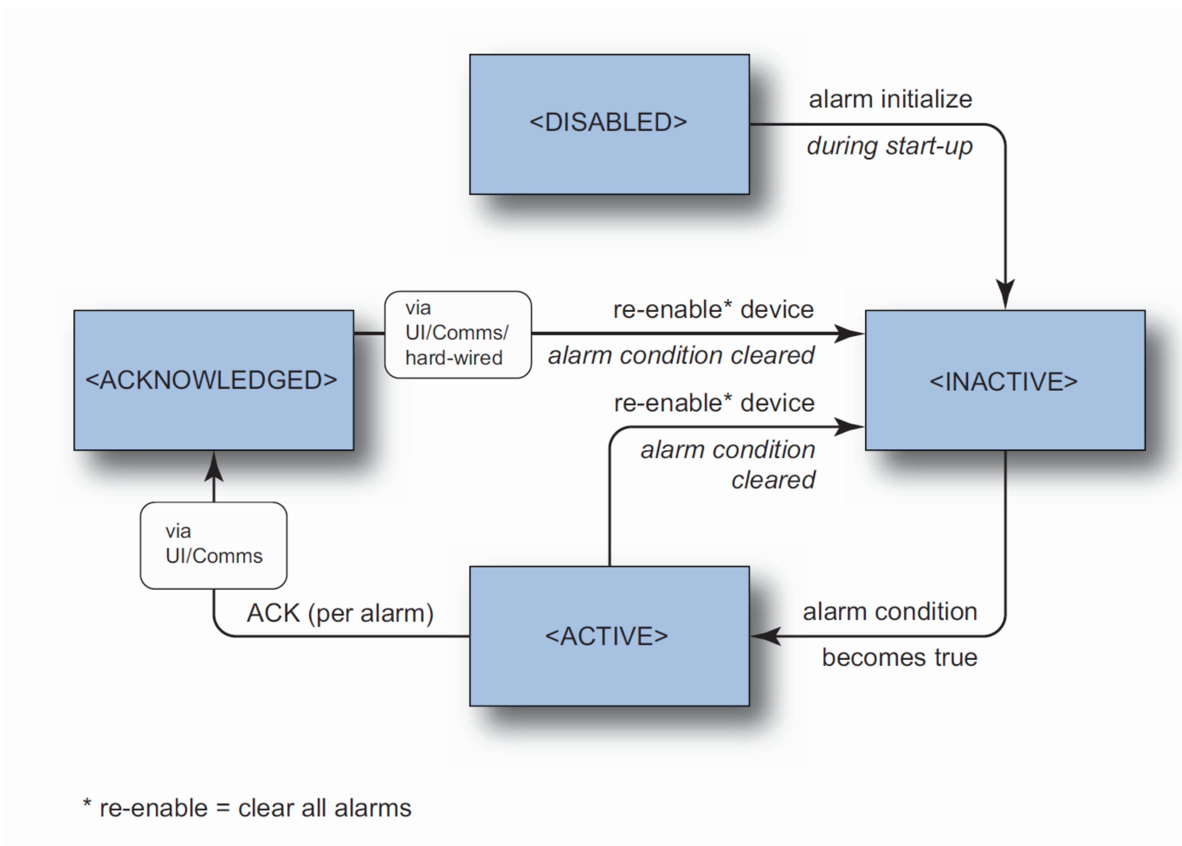
There are four possibilities:

- <DISABLED>
- <INACTIVE>
- <ACTIVE>
- <ACKNOWLEDGED>

[Critical] - If an alarm is critical, this field is set. It is 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 non-critical. Used in transaction record.

Figure 6-1: Operational Alarm States



6.8 Alarms Through Communication

SSC-A alarms—as listed in the table from section 6.7.1—are used within 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] defineswhether 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
0x0001	ALARM_ADDITIVE_CYCLE_VOLUME
0x0002	ALARM_NO_ADDITIVE
0x0004	ALARM_LEAKING_SOLENOID
0x0008	ALARM_FIRMWARE_FAILURE
0x0010	ALARM_PROGRAM_FAILURE
0x0020	ALARM_NO_ACTIVITY
0x0040	ALARM_FLUSH_VOLUME_ERROR
0x0080	ALARM_VALVE_ERROR
0x0100	ALARM_NO_PUMP
0x0200	ALARM_LICENSE_ERROR
0x0400	ALARM_CONTROL_FAILURE
0x0800	ALARM_POWER_FAILURE
0x1000	ALARM_PULSE_ERROR
0x2000	ALARM_TANK_MONITOR_ERROR
0x4000	ALARM_SERVICE_DUE_REM
0x8000	ALARM_VCF_ERROR

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