Honeywell Enraf

Installation & Operation Manual
Fusion4 SSC-A

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CHAPTER 1 GENERAL

1.1 Product Introduction

The *Fusion4 Single Stream Controller-Additive*, further in this manual referred to as ***SSC-A***, is a hazardous area, intelligent additive injection controller, utilizing state-of-the-art microprocessor technology for high-accuracy additive injection applications.

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

One basic principle[1] of operation (see FIGURE 1-1) is achieved by the SSC-A monitoring the flow of the *wild stream*, and using this flow rate to accurately pace the flow of the *additive stream* to a pre-determined target ratio in parts per million (ppm).

The pacing of the additive stream is realized through accurate, rapid injections of very small volumes of additive into the process, at frequently and evenly spaced intervals.

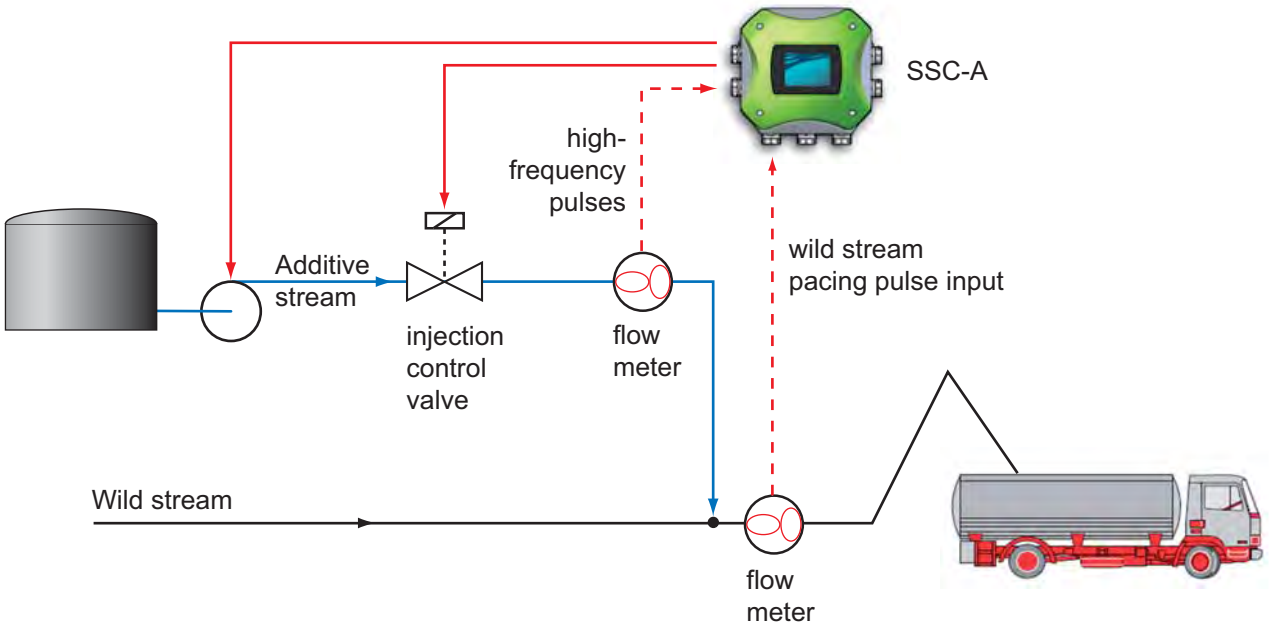

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FIGURE 1-1 Basic SSC-A principle of operation (example)

1. Additional pacing modes are available. For details, see *Chapter 3 - System Description*.

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

1.3 Target Group for this Manual

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

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

CHAPTER 2 SAFETY

2.1 Safety Conventions

2.1.1 Warnings

Following warning mark is used within this manual to urge attention in order ***to prevent personal injuries or dangerous situations***, further described within this manual.

Symbol	Description	Remark
	General warning	Will always be explained by text.

2.1.2 Cautions

Following caution mark is used within this manual to urge attention in order ***to prevent damages to the equipment*** further described within this manual.

Symbol	Description
	General caution sign
	Electrostatic Discharge (ESD) sensitive device

2.2 Safety Instructions for the SSC

2.2.1 General

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

The SSC may be located in explosion safety areas:

USA (FM) **and Canada** (CSA)		**Canada** (CSA)		**Rest of the World** (ATEX / IECEx)	
Safety level	**Remarks**	**Safety level**	**Remarks**	**Safety level**	**Remarks**
Class 1, Division 1	 *WARNING!* Do NOT open when an explosive atmosphere may be present.	Zone 1	 *WARNING!* Do NOT open when an explosive atmosphere may be present.	Zone 1	 *WARNING!* Do NOT open when an explosive atmosphere may be present.
	 *CAUTION!* Seal conduit within 18 inches.		 *CAUTION!* Seal conduit within 18 inches.		
Class 1, Division 2	 *WARNING!* Do NOT open when an explosive atmosphere may be present.	Zone 2	 *WARNING!* Do NOT open when an explosive atmosphere may be present.	Zone 2	 *WARNING!* Do NOT open when an explosive atmosphere may be present.
	 *CAUTION!* Seal conduit within 18 inches.		 *CAUTION!* Seal conduit within 18 inches.		
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 may 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 Honeywell Enraf 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).

2.2.2 Personal Safety

WARNING! In hazardous areas it is compulsory to use personal protection and safety gear.
This can be: Safety helmet, fire-resistive overall, safety shoes, safety glasses, working gloves, LEL-meter.

Pay attention to the kind of product involved. If there is any danger for your health, wear a gas mask and take all necessary precautions.

WARNING! Take appropriate precautions when chemical or toxic product vapors are present (compressed air, chemical protection suit, detection equipment).

2.2.2.1 General

2.2.2.1.1 Repairs and Maintenance

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

2.2.2.1.2 Opening of the Device

WARNING! It is forbidden to open the device within an explosive hazardous environment, unless otherwise stated on the safety label.

WARNING! Treat the flange surface of the cover and the housing with care.
Keep the flange surface free of dirt.
The O-ring must be present and undamaged.

2.2.2.1.3 Tools

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

2.2.2.1.4 Working Environment

WARNING! Avoid generation of static electricity. Make sure no explosive gas mixtures 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 FIGURE 2-1. Ensure the electrical resistance of the ground connections is below the maximum prescribed by local requirements.

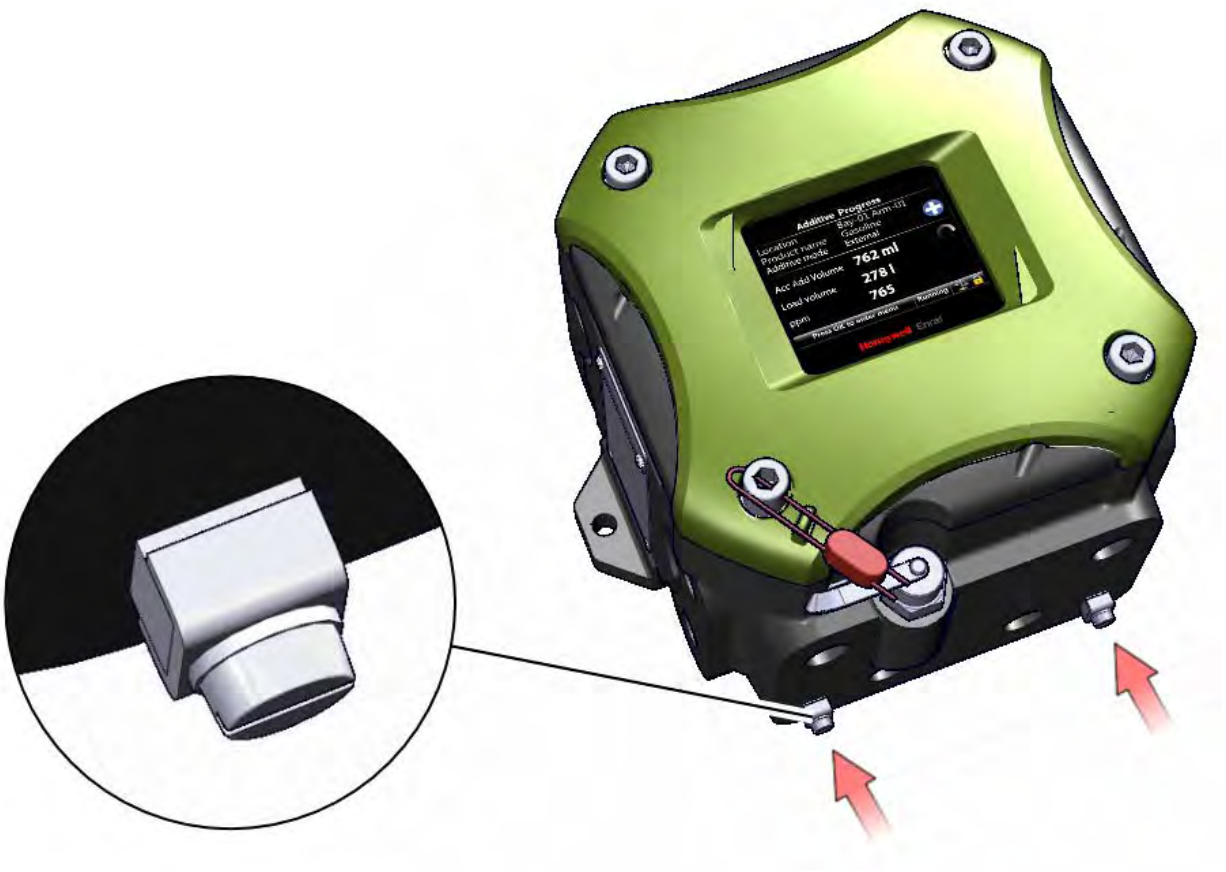

FIGURE 2-1 The grounding connections of the SSC

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2.2.4 Accordance to Regulations

2.2.4.1 Explosion Safety

Approval	Certificate no.	Type of protection identification		
ATEX	KEMA 10ATEX0095 X	Ex II 2 G	Ex d [ia] IIB T6 Gb	T_a = -40°C ... +65°C (-40°F ... +149°F)
IECEx	IECEx KEM 10.0044 X	Zone 1		
FM	3040469	Class I, Division 1	group C, D T6	
CSA	11.2370409	Class I, Division 1	group C, D T6	
		Zone 1	Ex d [ia] IIB T6	

2.2.4.2 Compliance to FCC

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

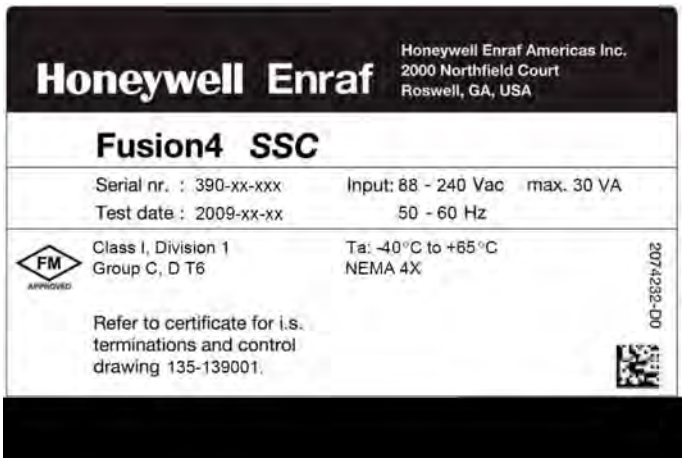
The device is suitable for:

- 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.
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



NOTE to FM label:

Ta = -40°F to +149ºF

FIGURE 2-2 Identification labels with Safety note on the SSC

2.3 Safety Instructions for the LAD

FIGURE 2-3 The Local Access Device (LAD)

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

The LAD may be located in explosion safety areas:

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

Approval	Certificate no.	Type of protection identification		
ATEX	KEMA 10ATEX0152	Ex II 2 G	Ex ia IIB T4 Gb	T_a = -20°C ... +65°C (-40°F ... +149°F)
IECEx	IECEx KEM 10.0070	Zone 1		
FM	3041202	Class I, Division 1	group C, D T4	
CSA	11.2395571	Class I, Division 1	group C, D T4	
		Zone 1	Ex ia IIB T4	

2.3.3 Installation

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

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

2.3.4 Commissioning

Commissioning the instrument and Fusion4 parent devices using this controller may be conducted by qualified engineers, trained by Honeywell Enraf 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 Honeywell Enraf and with knowledge of safety regulations for working in hazardous areas is allowed to repair the instrument.

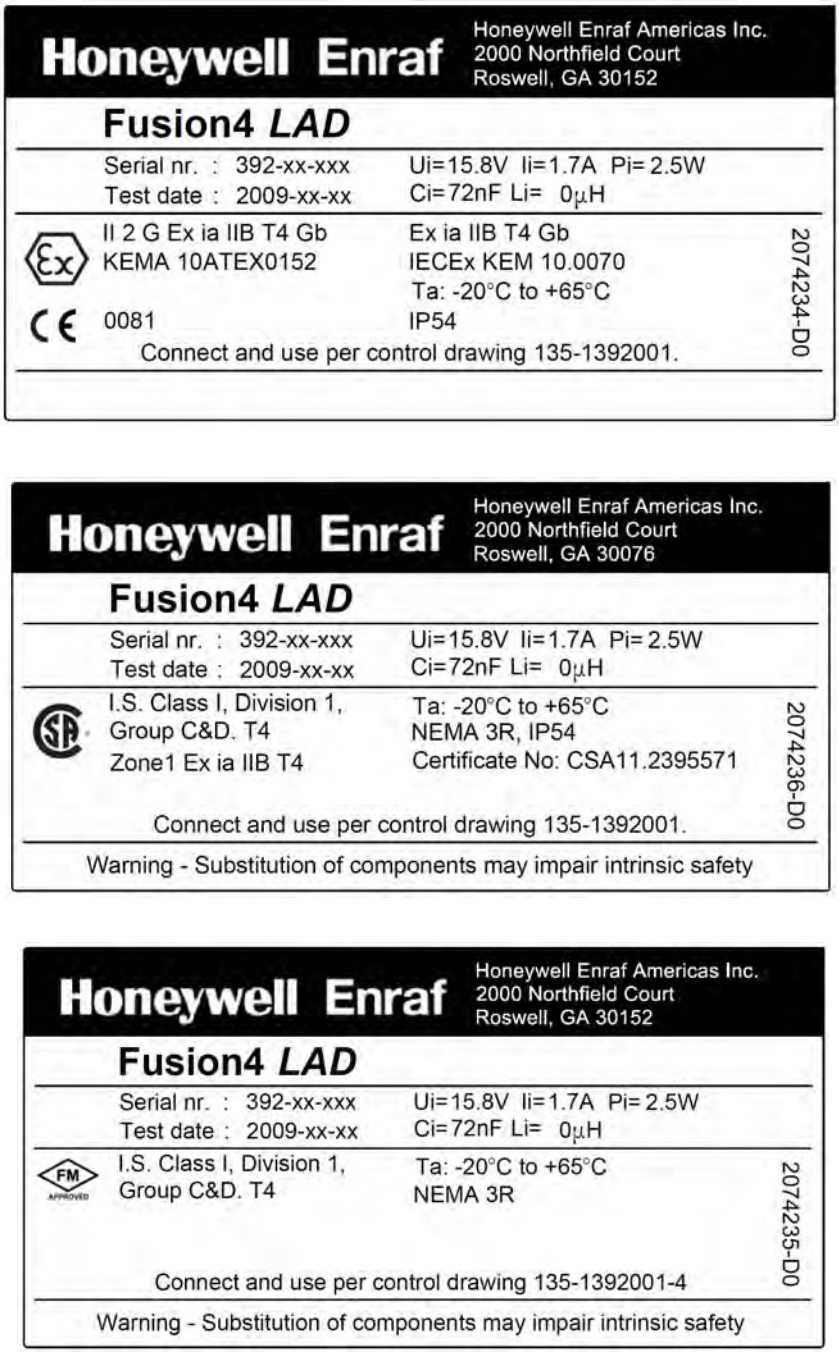
2.3.7 Additional Information

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

2.3.8 Environmental Conditions

Observe the environmental conditions regarding the allowable operating temperature (-20°C ... +65°C/ -40°F ... +149°F), relative humidity (RH 5 ... 95%, non-condensing), and operating pressure (atmospheric).

2.3.9 LAD Labels



NOTE to FM label:

Ta = -4°F to +149ºF

FIGURE 2-4 Identification labels with Safety note on the LAD

2.4 Safety Instructions for the Fusion4 IR Controller

FIGURE 2-5 Safety instructions for the Fusion4 IR Controller

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

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

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

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!* Do not open battery compartment in a hazardous area. Use only approved batteries, see label.	Class 1, Division 2	 *WARNING!* Do not open battery compartment in a hazardous area. Use only approved batteries, see label.	Zone 2	 *WARNING!* Do not open battery compartment in a hazardous area. Use only approved batteries, see label.
Safe Area	-	Safe Zone	-	Safe Zone	-

2.4.1 General

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

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

2.4.2 Precautions

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

2.4.2.1 EC declaration of conformity (for EU)

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

2.4.3 Installation

Perform the following steps to install the device.

- Remove the security screws from the compartment lid.
- Slide the battery compartment lid from the device.
- Install the 3 AAA Alkaline batteries ensuring that the plus (+) and the minus (-) polarity of the batteries is correct.

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

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

2.4.4 Commissioning

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

2.4.5 Operation

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

Perform the following steps to use the device.

- Direct the device at the IR port of the equipment to be programmed.
- Select **ATTN** on the IR Controller to turn the device and send the initial program command to the equipment (SSC).

REMARK: Refer to the specific equipment's user manual for defined programmed functions.
The device automatically stops after 30 seconds if an activity is not performed. This helps in preserving the battery life.

2.4.6 Maintenance and Troubleshooting

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

2.4.7 Additional Information

If you require additional information, contact Honeywell Enraf or its representative. For more information about Honeywell Enraf's solutions, see the back cover of this manual.

2.4.8 IR Controller Labels

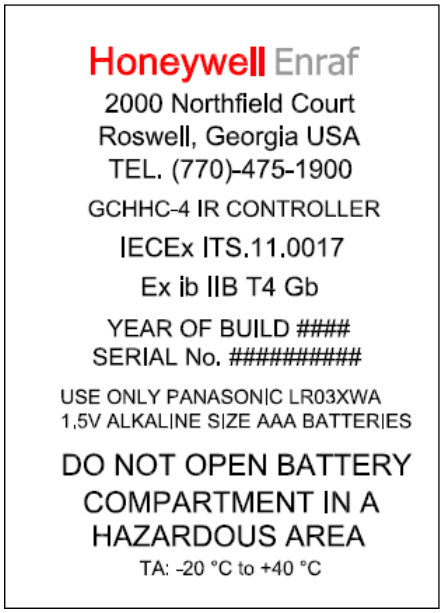


FIGURE 2-6 Identification labels with Safety note on the GCHHC-4 IR Controller

2.5 Liability

The information in this installation guide is the copyright property of Honeywell International Inc. Honeywell International Inc. 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. Honeywell International Inc. 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 Honeywell International Inc. Modifications not authorized by Honeywell International Inc. invalidates the approval certificates.

CHAPTER 3 SYSTEM DESCRIPTION

3.1 Introduction

3.1.1 General

EU version

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 multiple products need to be accurately combined.

3.1.2 Injection Principle

US version

The pacing of the additive stream is achieved through accurate, rapid injections of very small volumes of additive, at frequently and evenly spaced intervals.

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*. Many 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 (optional)
- Target additive ratio to target product (ppm)[1]

The injection control of the SSC-A can be achieved in different pacing modes (see also FIGURE 3-1):

- *Self-paced mode*: The SSC-A autonomously injects on a time and fluid volume basis (configurable).

1. Not in Slave mode.

- *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.

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*.

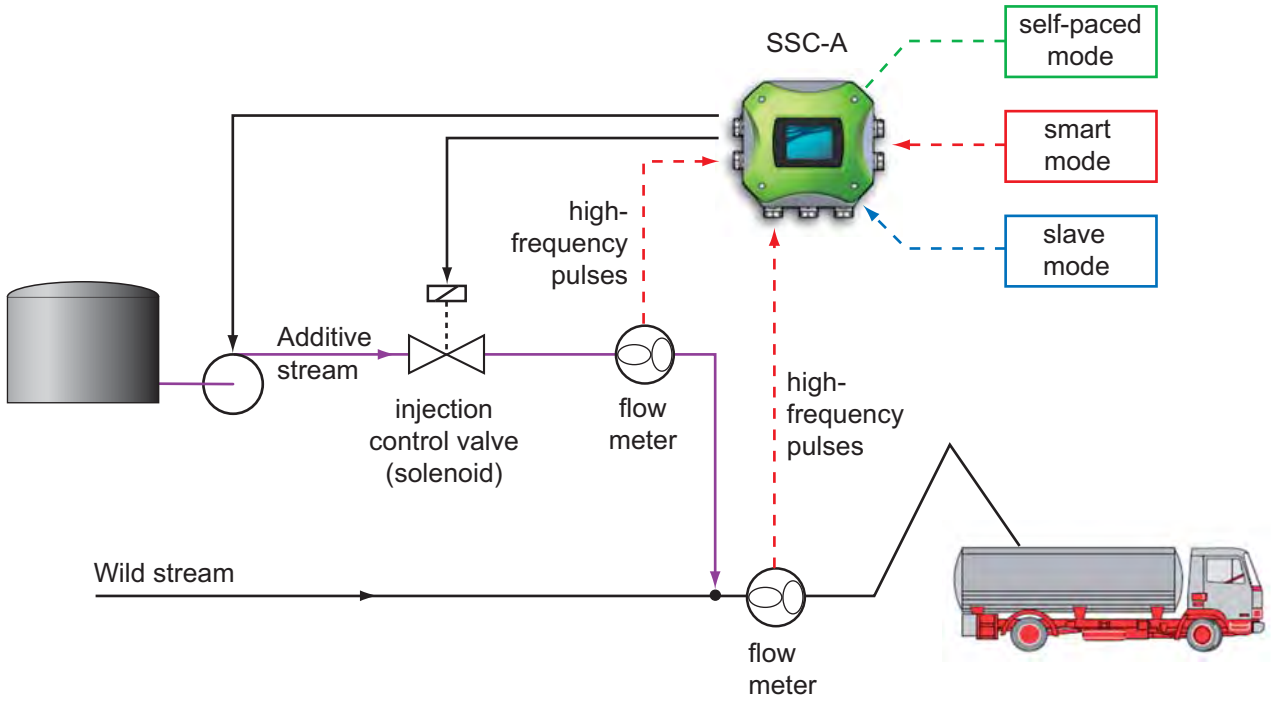


FIGURE 3-1 SSC-A pacing control modes

3.1.4 Menu-based SSC-A Control

By using 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[1] based Local Access Device (LAD).

Using one of these devices, it is possible to navigate the menus, change settings (commissioning), initiate a calibration, and diagnose problems.

1. Through an Ex d/ Ex i connector on the front of the SSC-A.

3.2 System Architecture

Founded on Honeywell Enraf's proprietary FlexConn architecture, the SSC-A is a member of the Fusion4 portfolio of Loading Automation & Control products.

The Fusion4 SSC-A system is built up 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 FIGURE 3-2.

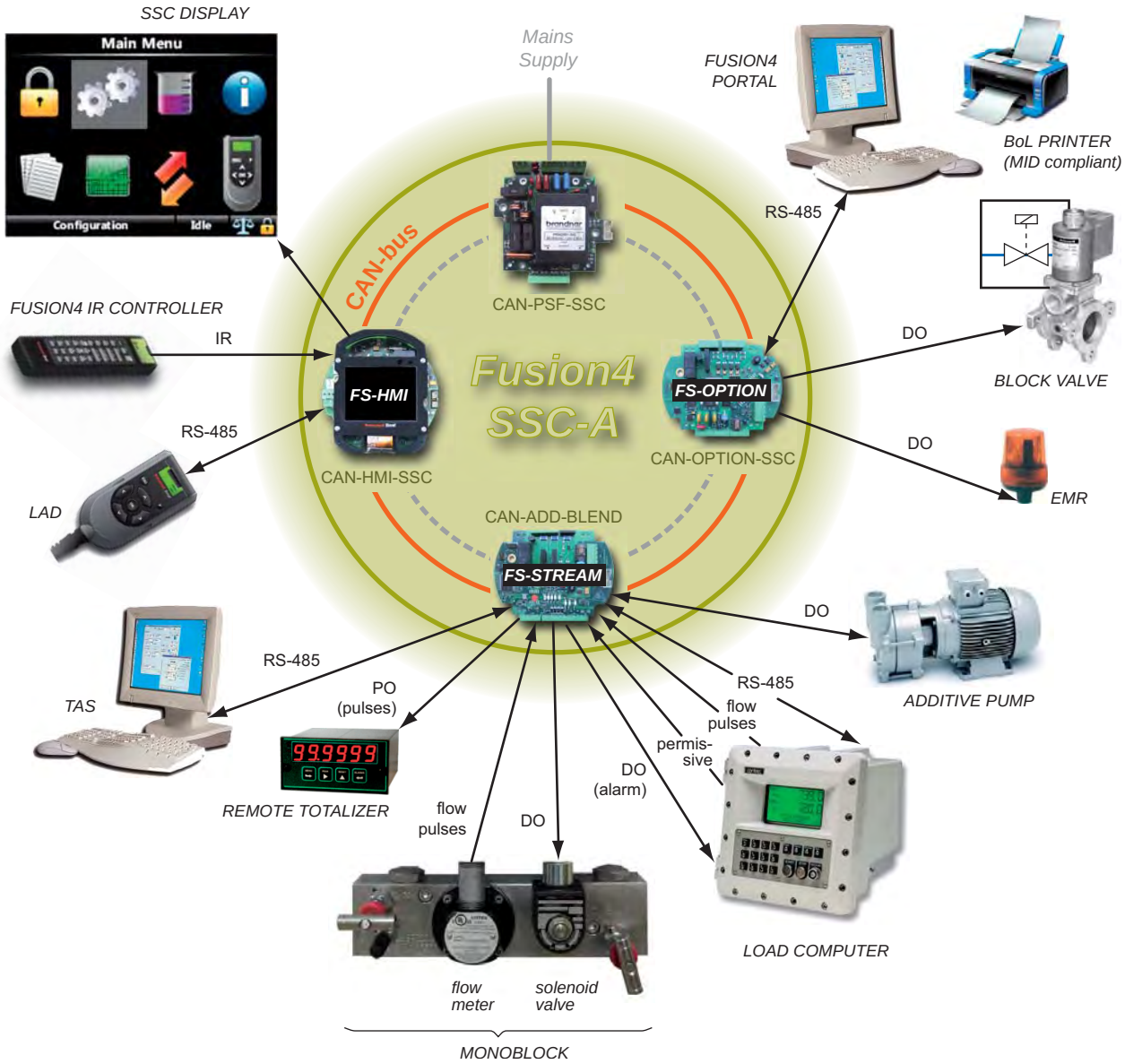
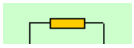


FIGURE 3-2 Fusion4 SSC-A architecture overview

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[1] bus to which each FlexConn module connects.



= terminating resistor

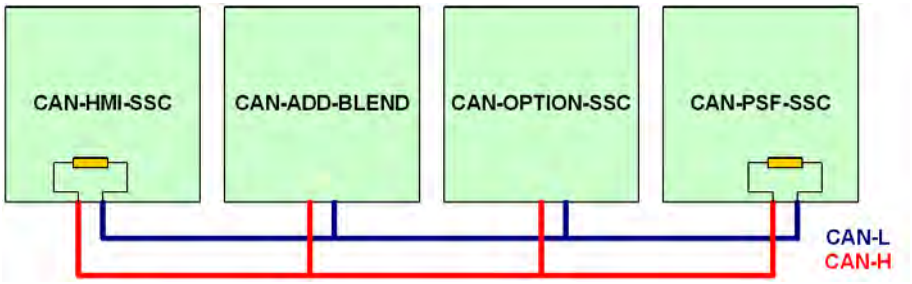


FIGURE 3-3 FlexConn CAN bus concept

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

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

1. Controller Area Network.

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 4 captive socket-head screws. See FIGURE 3-4.

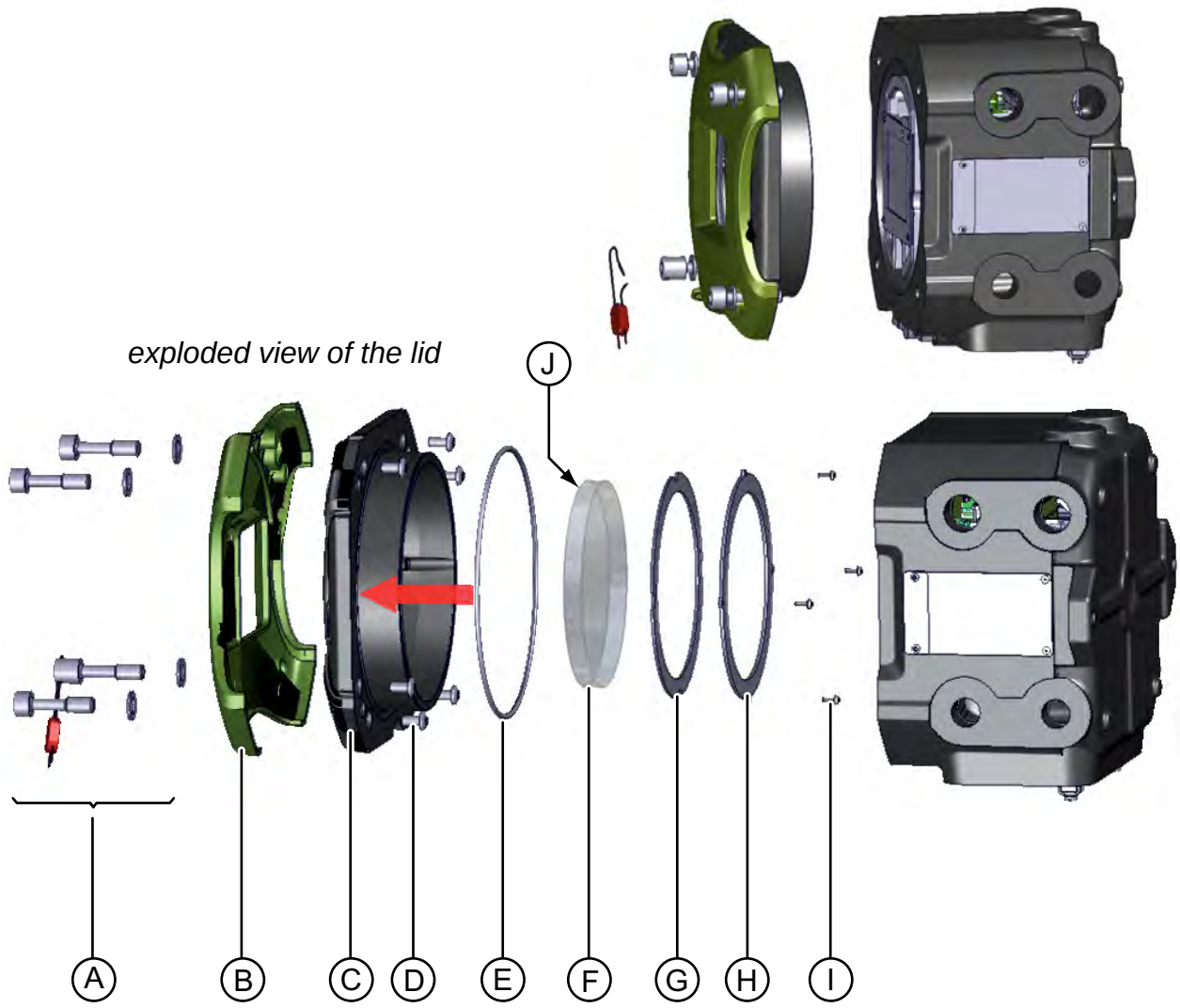


FIGURE 3-4 Housing of SSC-A

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

3.4.2 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 flatcable, 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 FIGURE 3-5.

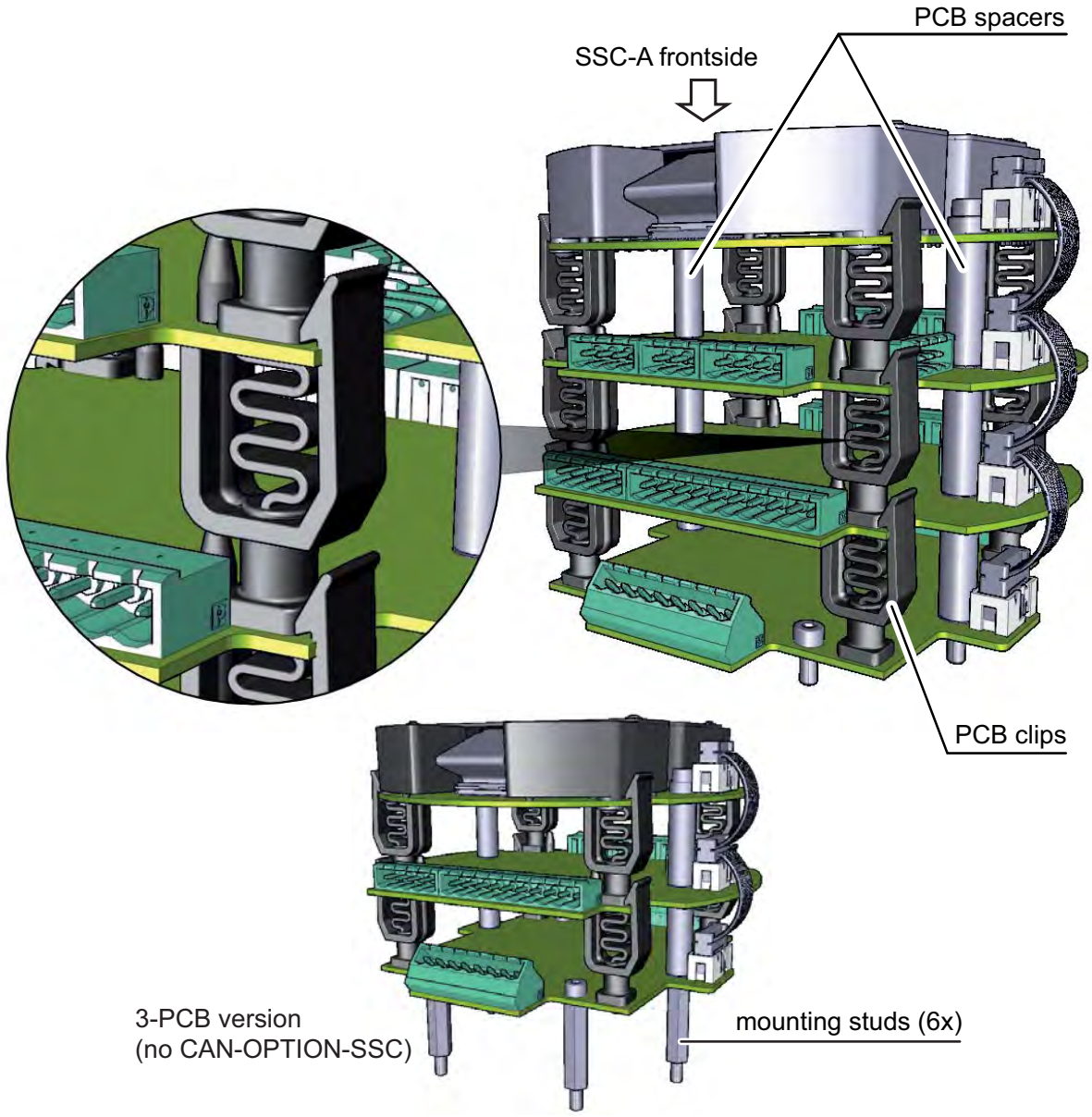


FIGURE 3-5 Stacked module construction of the SSC-A

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

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

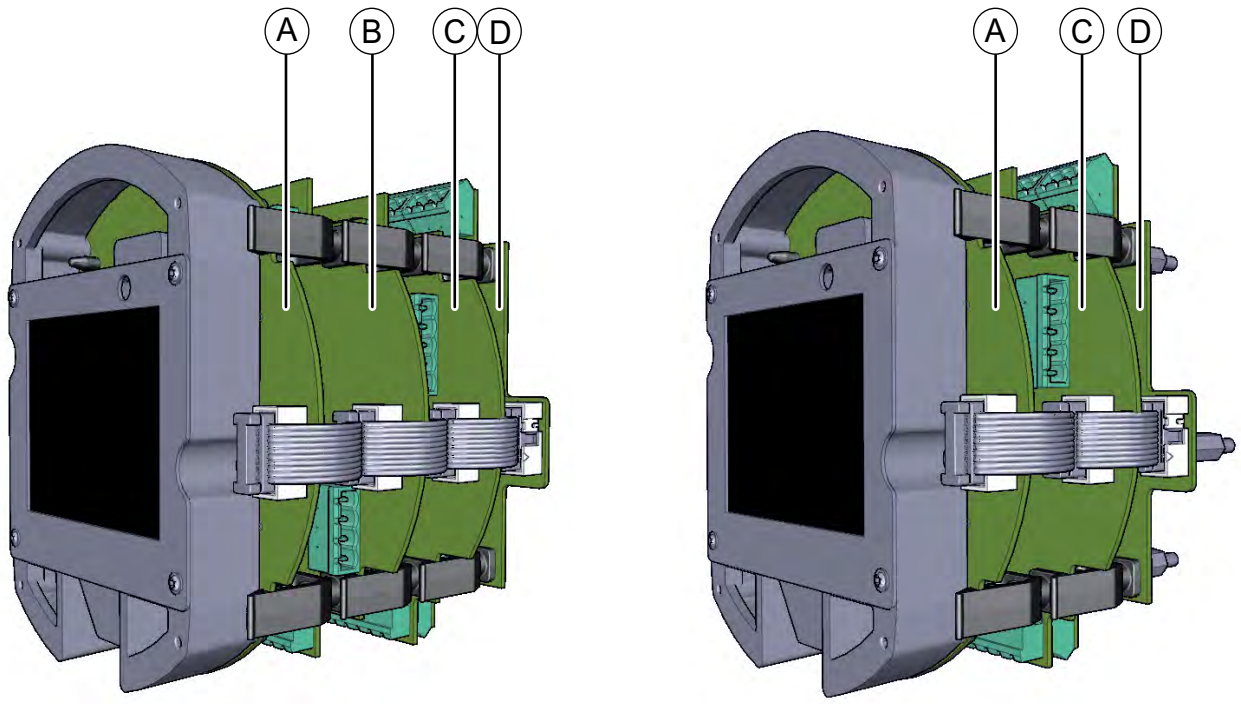


FIGURE 3-6 Full-configuration SSC-A (left) and 3-PCBs configuration (right)

F4A10-0005

Refer to FIGURE 3-6	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.

* A PCB with software installed.

3.4.3 Grounding Concept

Each printed circuit board has 2 grounding points. These grounding points are used to electrically connect every board with the metal housing. This is performed by means of metal spacers, which are pressed into the boards. See FIGURE 3-7.

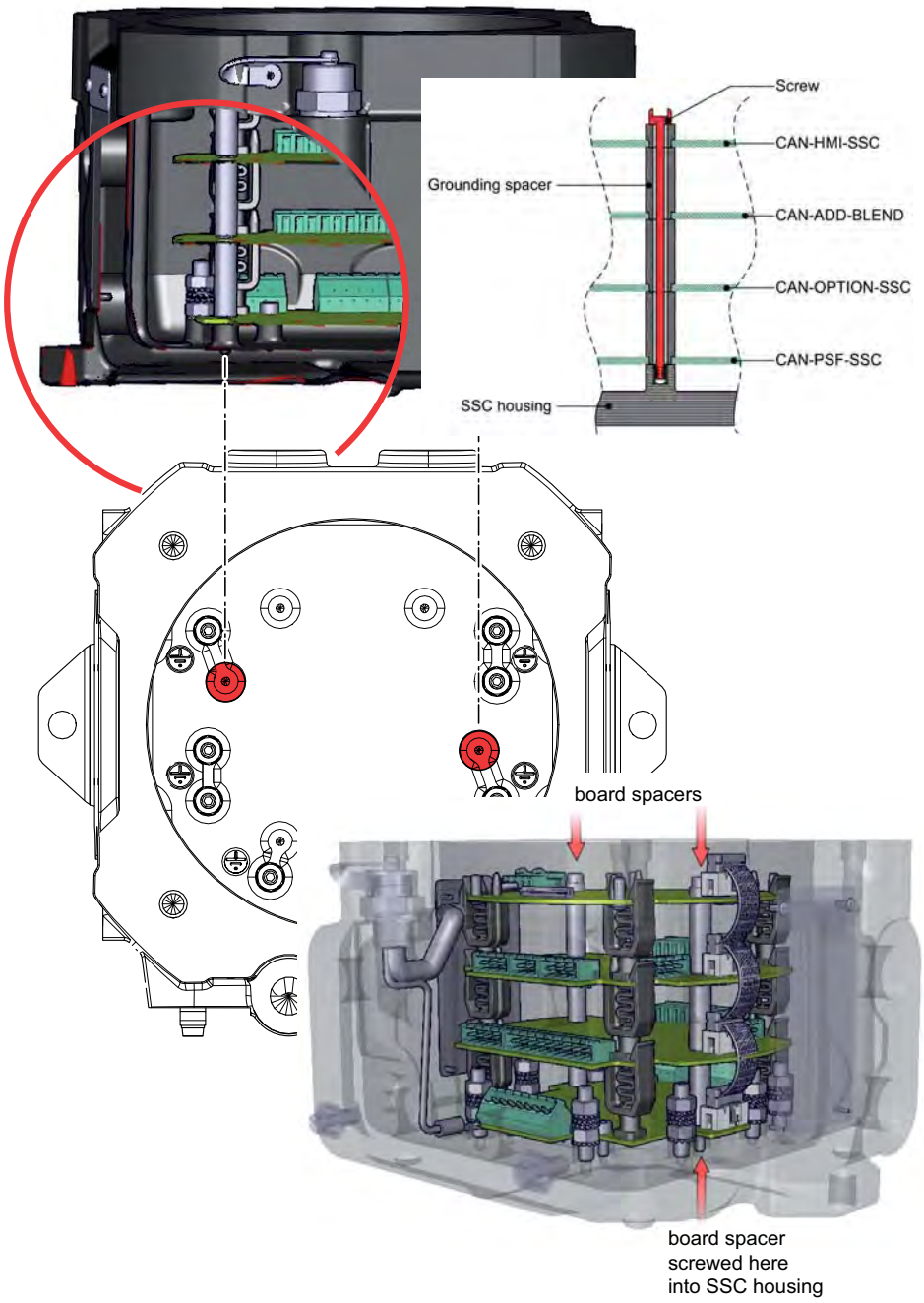


FIGURE 3-7 Grounding concept (1)

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 FIGURE 3-8 for a visualization of this concept.

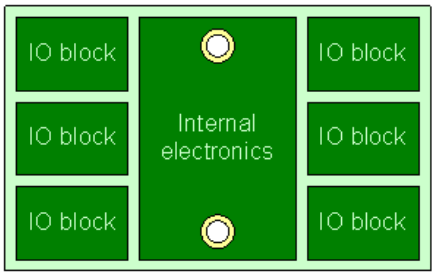


FIGURE 3-8 Grounding concept (2)

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 modules. The *specific* electronics part represents an application-specific function. On the *generic* electronics part, the following parts can be found:

- **The program memory** contains the module-specific software.
- **The microprocessor / controller** executes the module-specific software stored in the program memory.
- When the power is switched off, the commissioning parameters and the diagnostics data are stored in **the non-volatile memory**.
- With **jumpers**, specific hardware settings can be made.
- The **Health LED (blue)** indicates the general health status of the FlexConn module:

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

- The **Function LEDs** indicate module-specific activities, such as data being transmitted or received.
- **Voltage monitors and temperature sensors** are used for internal diagnostics purposes.

3.5.1 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.

The board implements the following functions.

Function	Description
Display control interface	Control and interface of the 3.5” QVGA color display
Record storage	Data storage of transactions, calibrations, and alarms
Display processor	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.

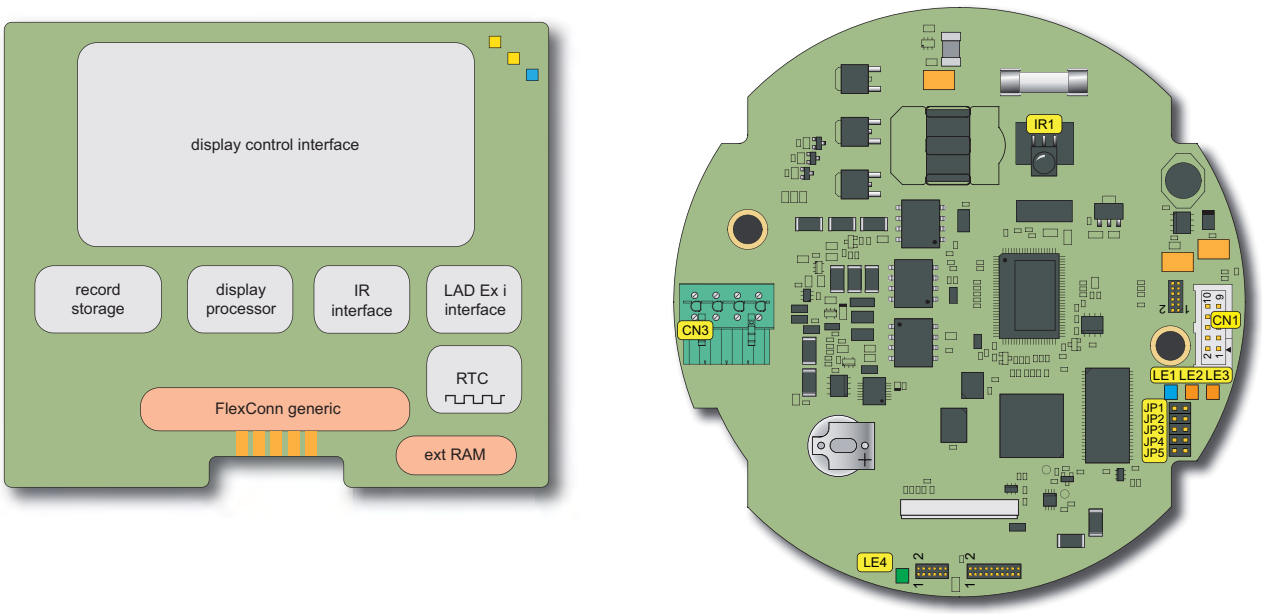


FIGURE 3-9 CAN-HMI-SSC functions (left) and physical layout (right)

3.5.1.1.2 *Component Locations*

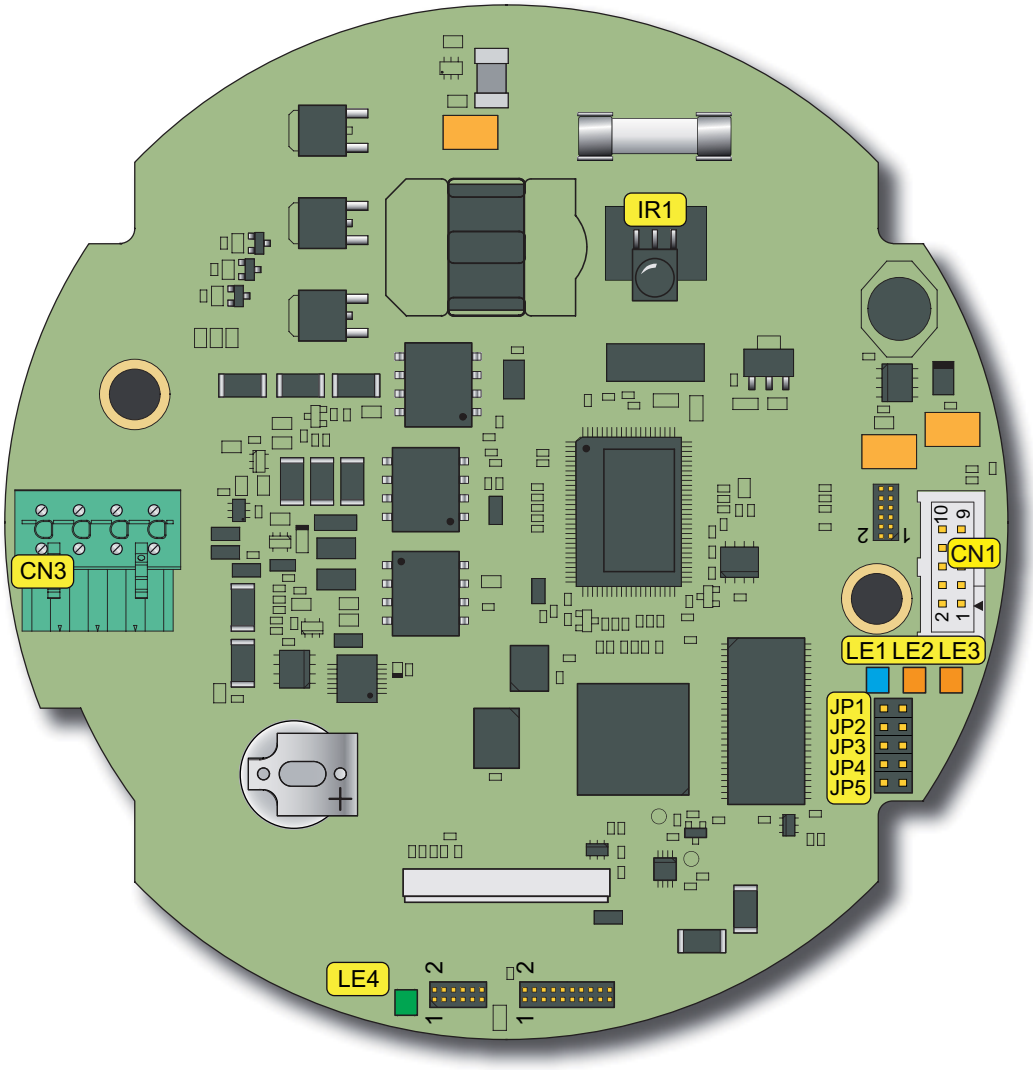
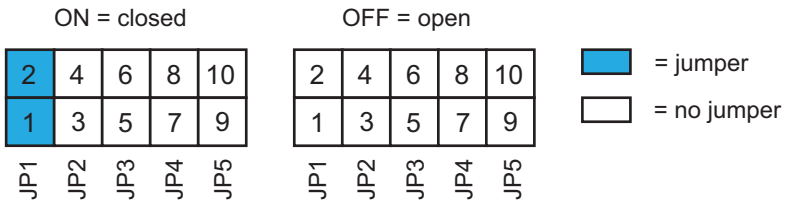


FIGURE 3-10 CAN-HMI-SSC component location

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

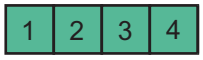
3.5.1.1.3 Terminal Descriptions

■ JP1 ... 5



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

■ CN3 - LAD connector



Pin no.	Name / signal	Description
1	GND_{safe}	Ex i safe ground
2	V_{safe}	Ex i safe power
3	A_{safe}	Ex i safe RS485 A signal
4	B_{safe}	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**) circuits	Convert the logic signals from the FlexConn generic microcontroller into isolated, high-frequency switched DC signals.
A Digital Output Electromechanical Relay (**DO EMR**) circuit	Converts the logic signals from the FlexConn generic microcontroller such that higher power AC or DC signals can be switched.
A **COMMS** circuit	This RS serial communication block, which can be configured as 2-wire or 4-wire circuit, allows the SSC to communicate with external devices through an RS-485 compliant connection.

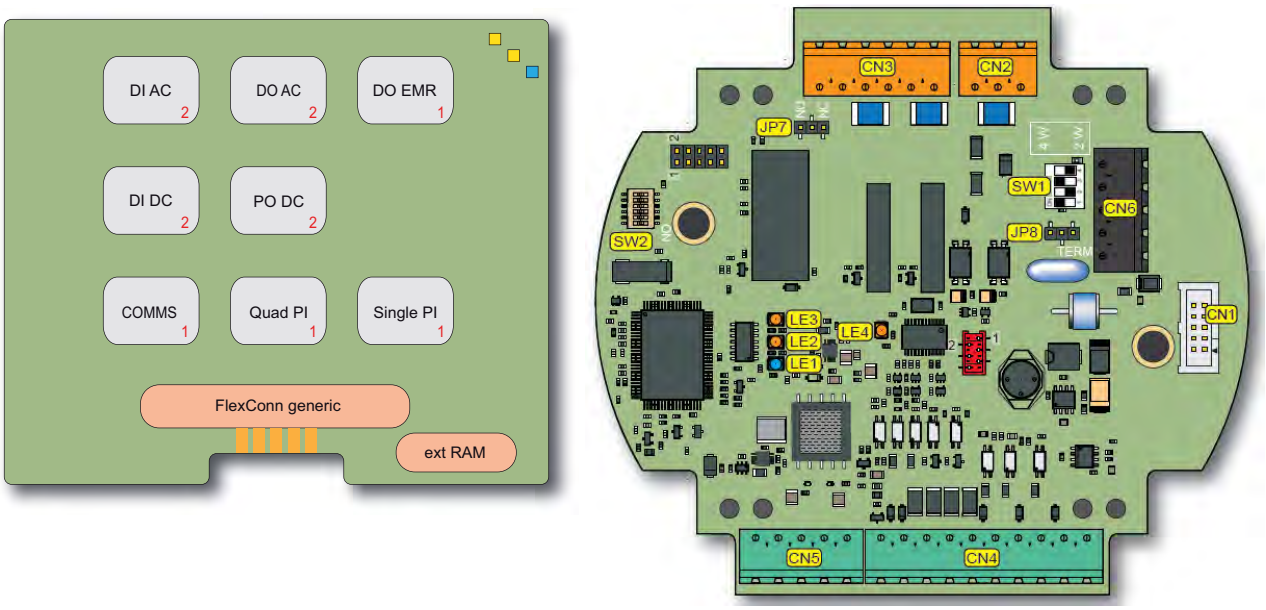


FIGURE 3-11 CAN-ADD-BLEND functions (left) and physical layout (right)

3.5.1.2.2 Component Locations

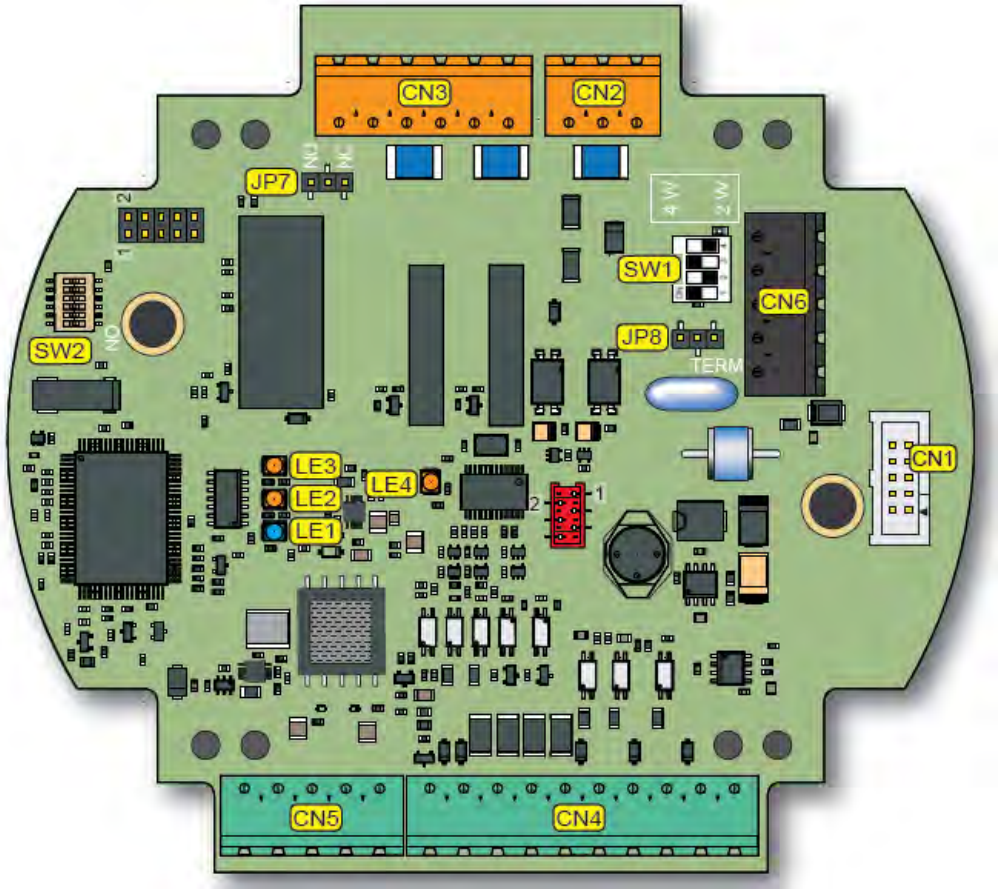
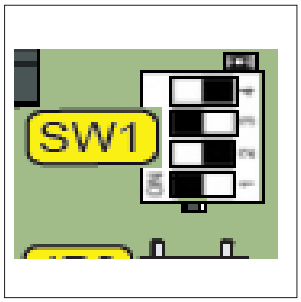


FIGURE 3-12 CAN-ADD-BLEND component locations

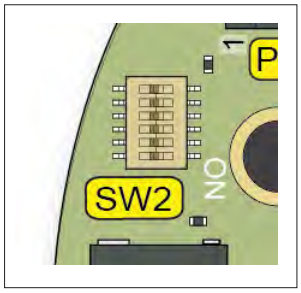
Item reference	Description
SW1	RS-COMM mode switch
SW2	FlexConn jumper function switches
JP7	Jumper for Digital Output ElectroMechanical Relay contacts setting
JP8	Jumper for RS communication termination setting
LE1	FlexConn Health LED
LE2	Function configurable
LE3	Function configurable
LE4	Pulse Input activity
For all connectors: see 4.9 - Terminal Assignment Guide.	

3.5.1.2.3 Terminal Descriptions



■ SW1 - RS-COMM mode switch

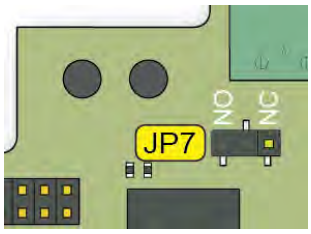
Reference	Setting	Function	Description
SW1-1	ON	2-Wire interface	2-Wire RS-485 communication
SW1-2	OFF		
SW1-3	ON		
SW1-4	OFF		
SW1-1	OFF	4-Wire interface	4-Wire RS-485 communication
SW1-2	ON		
SW1-3	OFF		
SW1-4	ON		

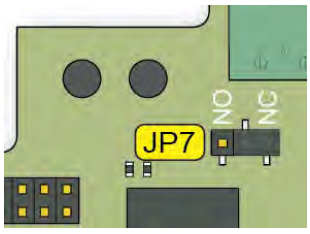


■ SW2 - FlexConn jumper function switches

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

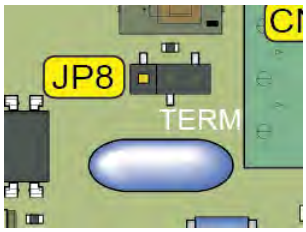
■ JP7 - Jumper for Digital Output EM Relay contacts setting

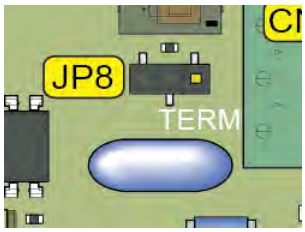




Position	Description
NO (figure left)	Relay contacts normally open
NC (figure right)	Relay contacts normally closed

- JP8 - Jumper for RS communication terminating setting





Position	Description
TERM (figure left)	RS-485 communication terminated with 120 Ω
- (figure right)	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	This 2-wire RS serial communication block 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.

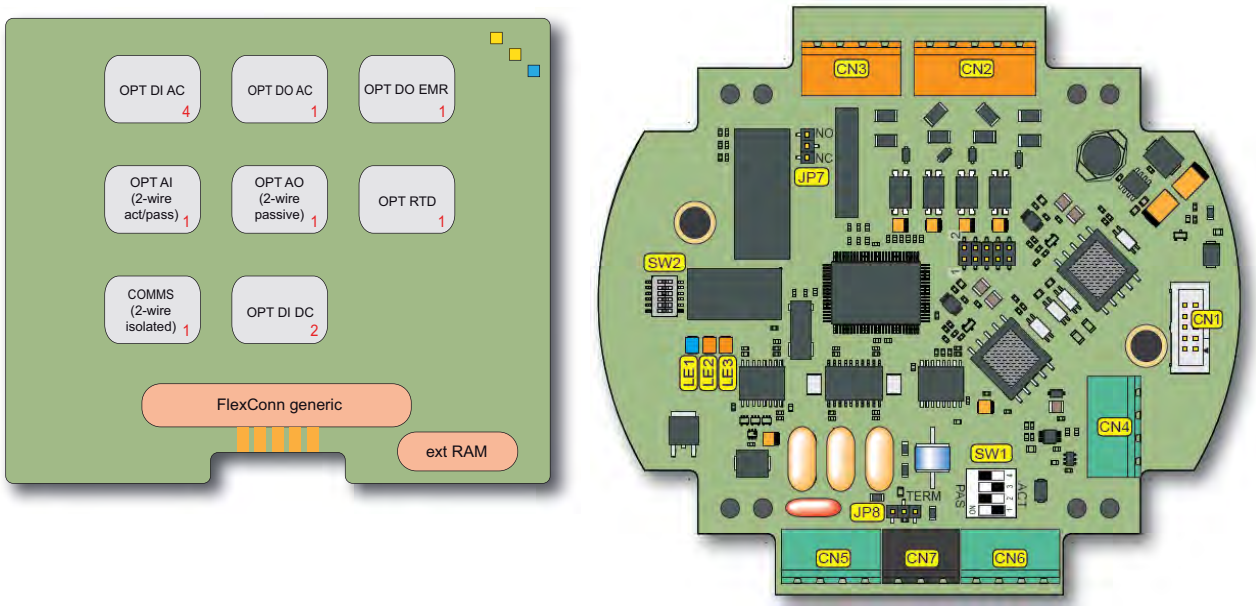


FIGURE 3-13 CAN-OPTION-SSC functions (left) and physical layout (right)

3.5.1.3.2 Component Locations

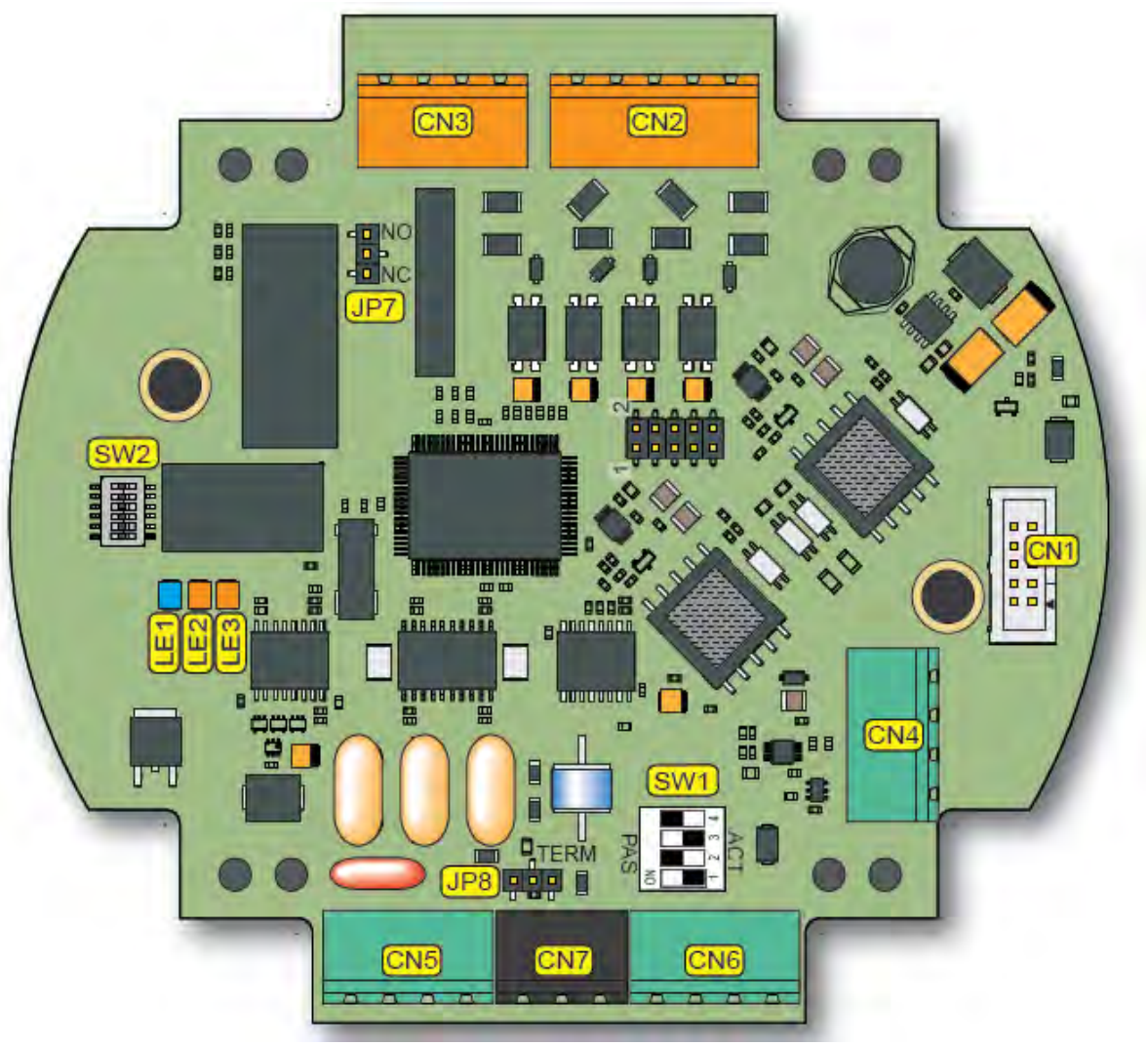
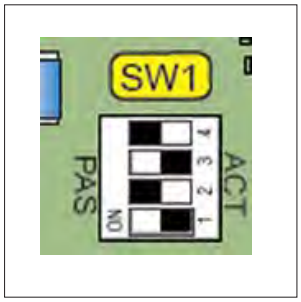


FIGURE 3-14 CAN-OPTION-SSC component locations

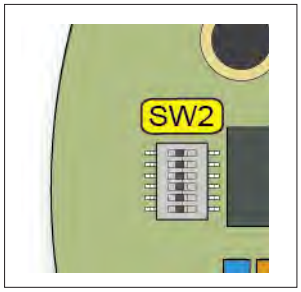
Item reference	Description
SW1	Active Input mode switch
SW2	FlexConn jumper function switches
JP7	Jumper for Digital Output ElectroMechanical Relay contacts setting
JP8	Jumper for RS communication termination setting
LE1	FlexConn Health LED
LE2	Function configurable
LE3	Function configurable
For all connectors: see 4.9 - Terminal Assignment Guide.	

3.5.1.3.3 Terminal Descriptions



■ SW1 - Analog Input mode switch

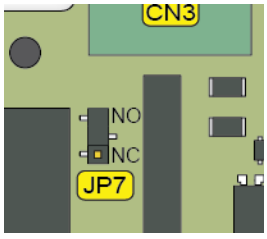
Reference	Setting	Function	Description
SW1-1	ON	Active Mode	4-20 mA input loop powered from CAD-ADD-BLEND board
SW1-2	OFF		
SW1-3	ON		
SW1-4	OFF		
SW1-1	OFF	Passive	4-20 mA input loop powered from external power supply
SW1-2	ON		
SW1-3	OFF		
SW1-4	ON		

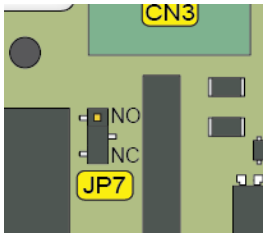


■ SW2 - FlexConn jumper function switches

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

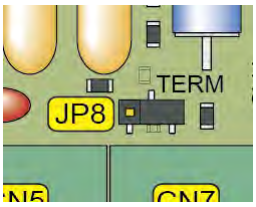
■ JP7 - Jumper for Digital Output EM Relay contacts setting

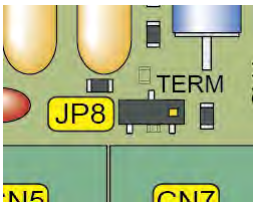




Position	Description
NO (figure left)	Relay contacts normally open
NC (figure right)	Relay contacts normally closed

■ JP8 - Jumper for RS communication terminating setting





Position	Description
TERM (figure left)	RS-485 communication terminated with 120 Ω
- (figure right)	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 a 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 FIGURE 3-15.

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

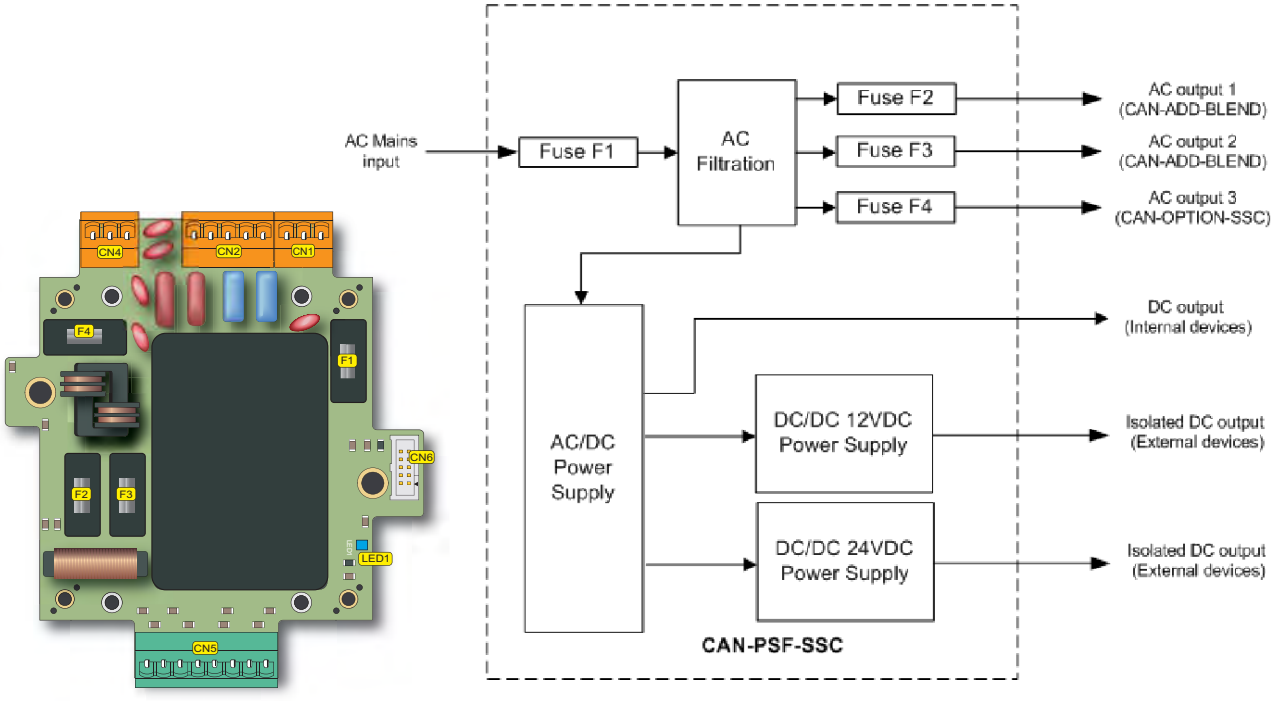


FIGURE 3-15 CAN-PSF-SSC functions (right) and physical layout (left)

The following table specifies the external DC outputs.

Item	Conditions	Minimum	Type	Maximum	Unit
Output voltage variation	V_{in} = 230 V_{AC}	23 11.5	24 12	25 12.8	V_{DC}
Continuous output current	+24 V_{DC} +12 V_{DC}	-	-	42 83	mA
Short circuit current	+24 V_{DC} +12 V_{DC}	42 83	56.3 94	80 110	mA

Item	Conditions	Minimum	Type	Maximum	Unit
Ripple and noise	pk-pk bandwidth = 20 Mhz	-	-	150	mV

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

3.5.1.4.2 Board Description

3.5.1.4.3 TComponents Locations

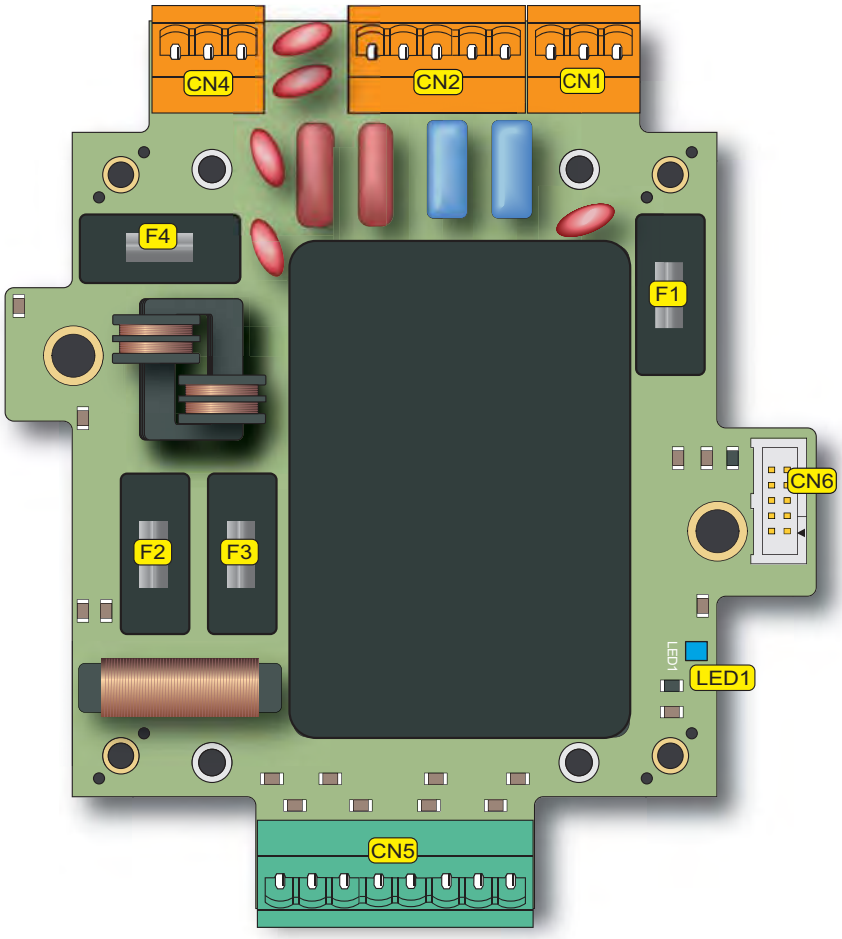


FIGURE 3-16 CAN-PSF-SSC TComponents locations

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 FIGURE 3-17).

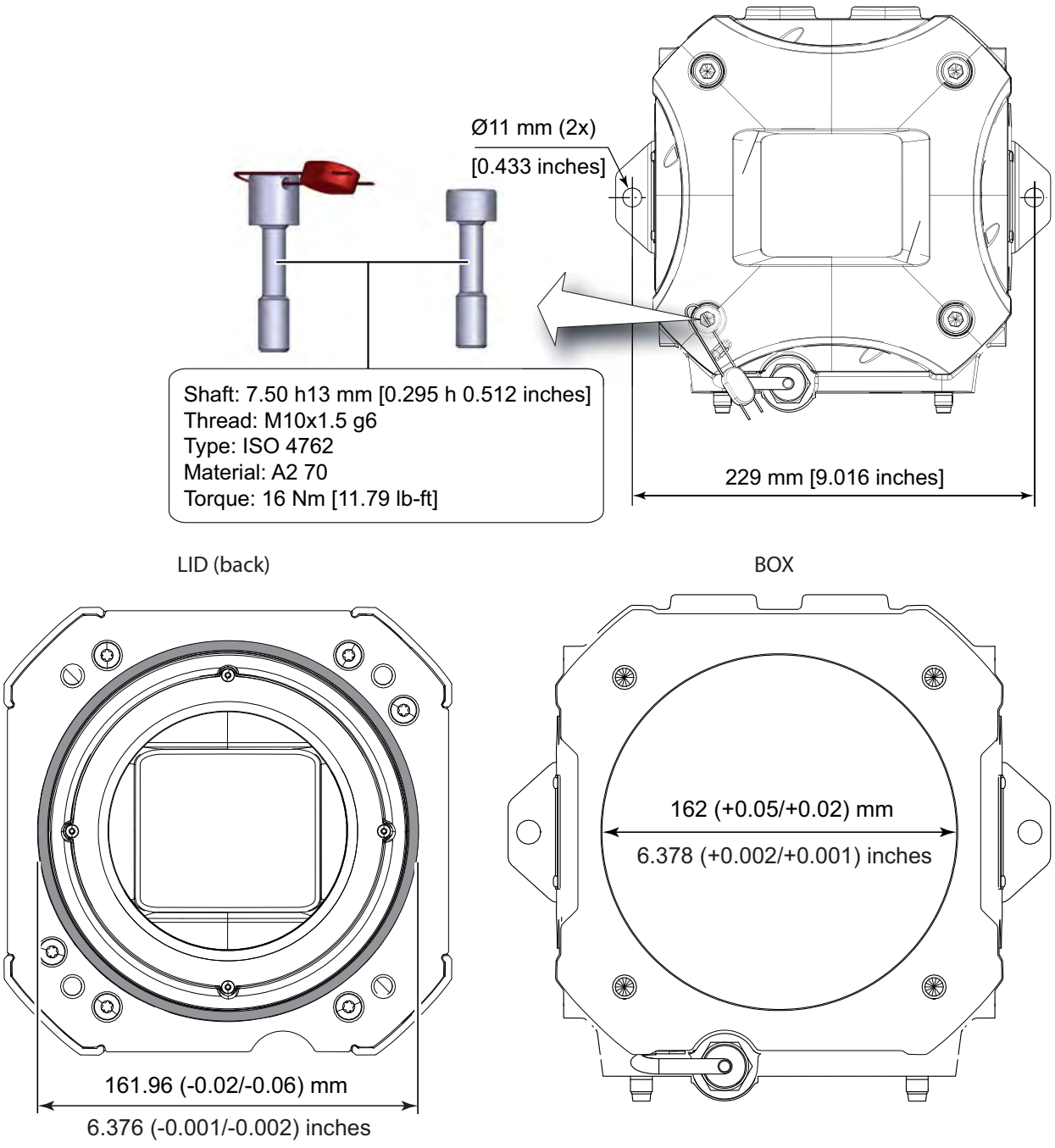


FIGURE 3-17 Mechanical facilities of SSC-A

- Captured bolts in lid
- Sealing facility on the lid (see FIGURE 3-18).

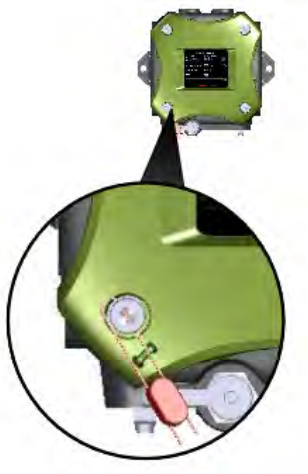


FIGURE 3-18 Sealing facility on the SSC-A lid

- 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 FIGURE 3-19).

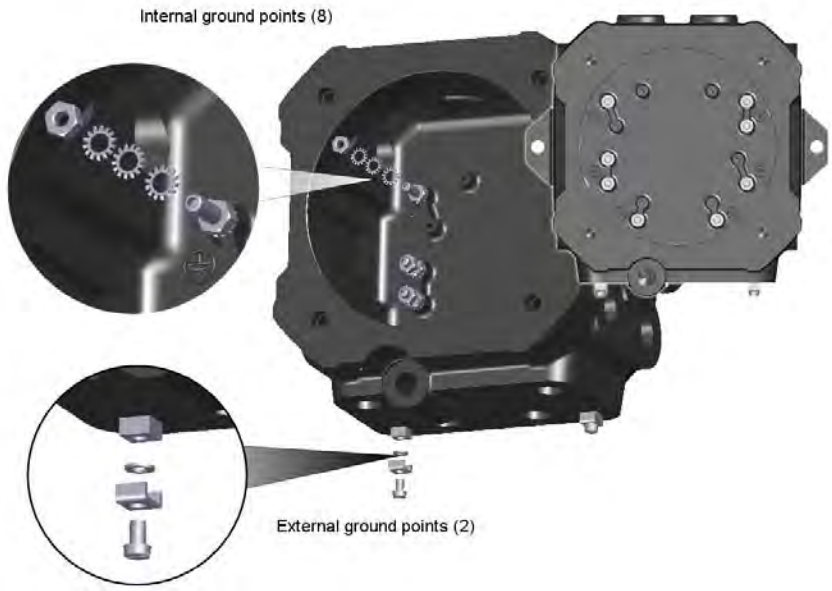


FIGURE 3-19 Internal power supply of SSC-A

- 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[1]	-40°C ... +85°C (-40ºF ... +185ºF) and RoHS[1]
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

1 Restriction of Hazardous Substances.

3.7 Available Input/Output Functions on the SSC-A

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	-
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.

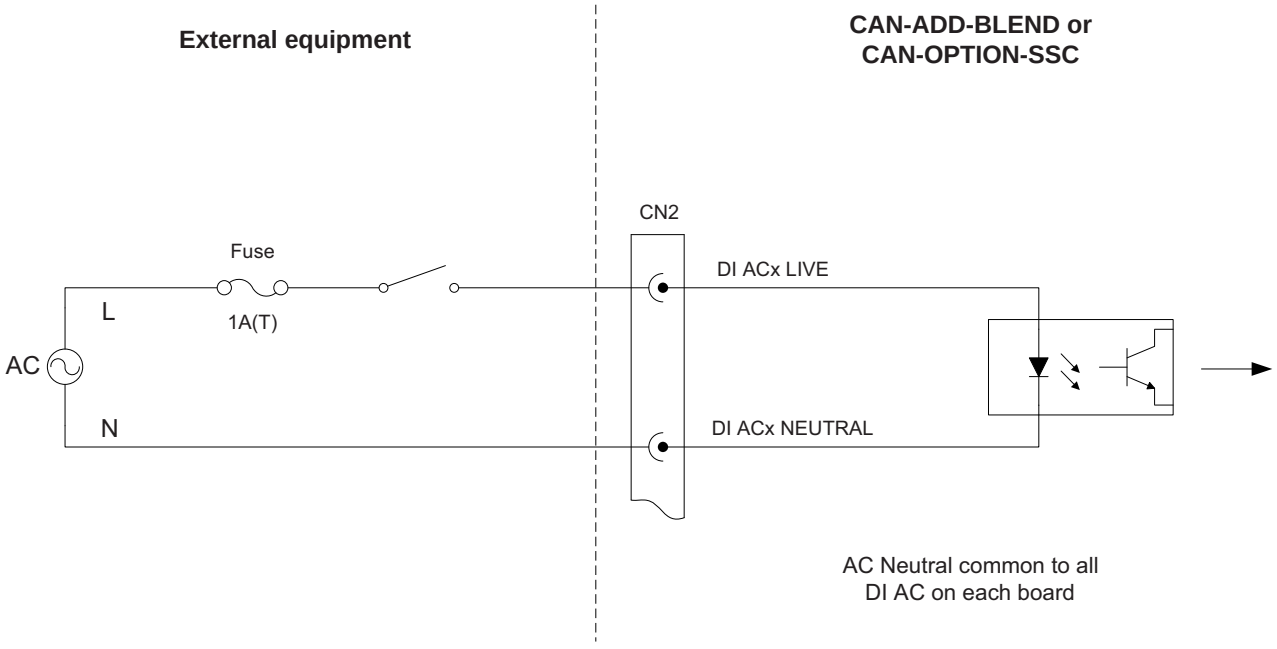


FIGURE 3-20 Digital Input AC connections

3.8.2.2 Characteristics

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

3.8.3 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.

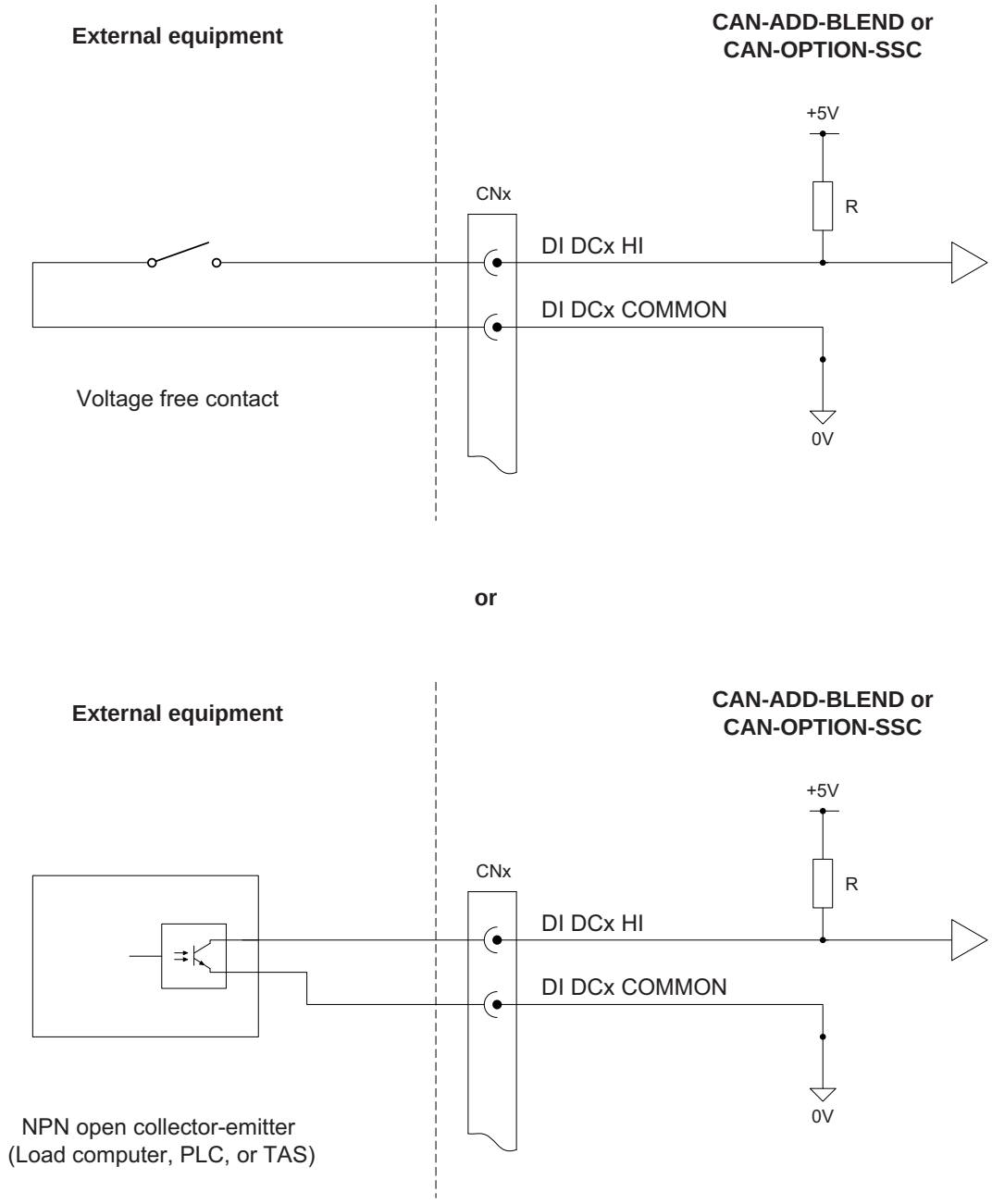


FIGURE 3-21 Digital Input DC connections

3.8.3.2 Characteristics

Item	Minimum	Type	Maximum	Unit
Switching level V_H	5	-	30	V_{DC}
Switching level V_L	-	-	0.8	V_{DC}
Switching current (I_{SW})	10	-	-	mA
Input switching frequency	-	-	1	kHz
Input on time (T_{ON})	500	-	-	µs
Input off time (T_{OFF})	500	-	-	µs

3.8.4 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.

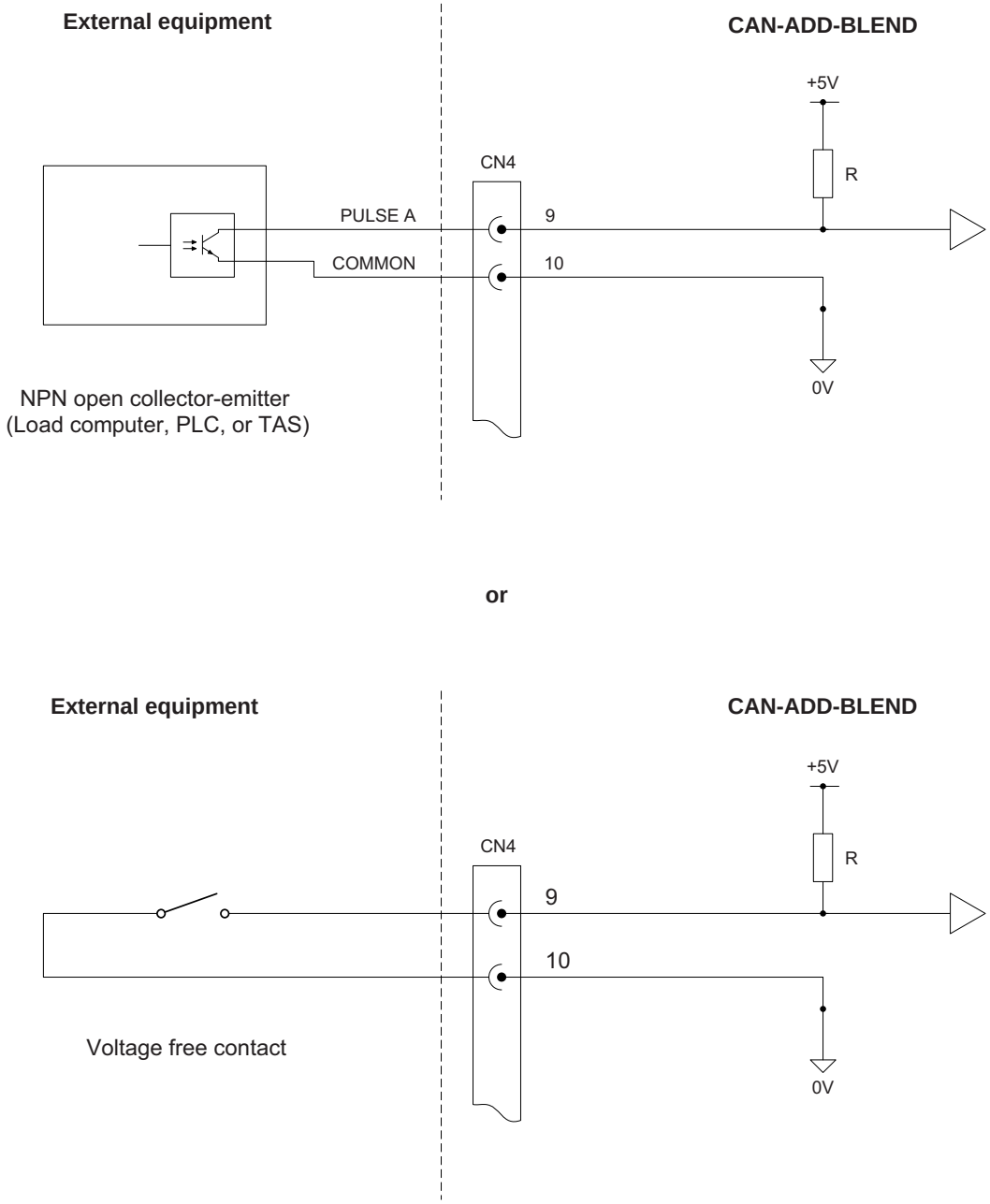


FIGURE 3-22 Single-Pulse Input connections

3.8.4.2 Characteristics

Item	Minimum	Type	Maximum	Unit
Switching level V_H	5	-	30	V_{DC}
Switching level V_L	-	-	0.8	V_{DC}
Switching current (I_{SW})	10	-	-	mA
Input switching frequency	-	-	5	kHz
Input on time (T_{ON})	100	-	-	µs
Input off time (T_{OFF})	100	-	-	µs

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. *See 5.11.4.1.1 - PI.*

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

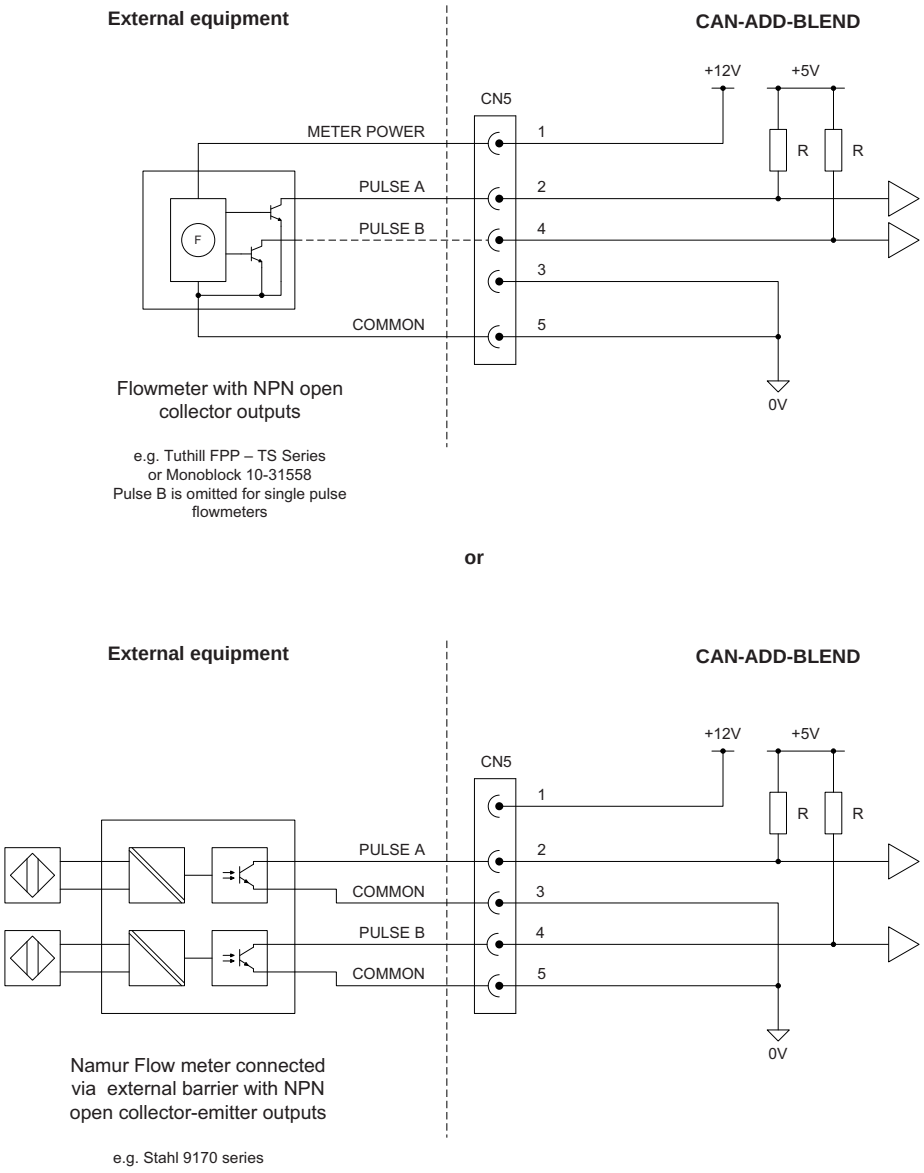


FIGURE 3-23 Dual-Pulse Input connections

3.8.5.2 Characteristics

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

3.8.6 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.

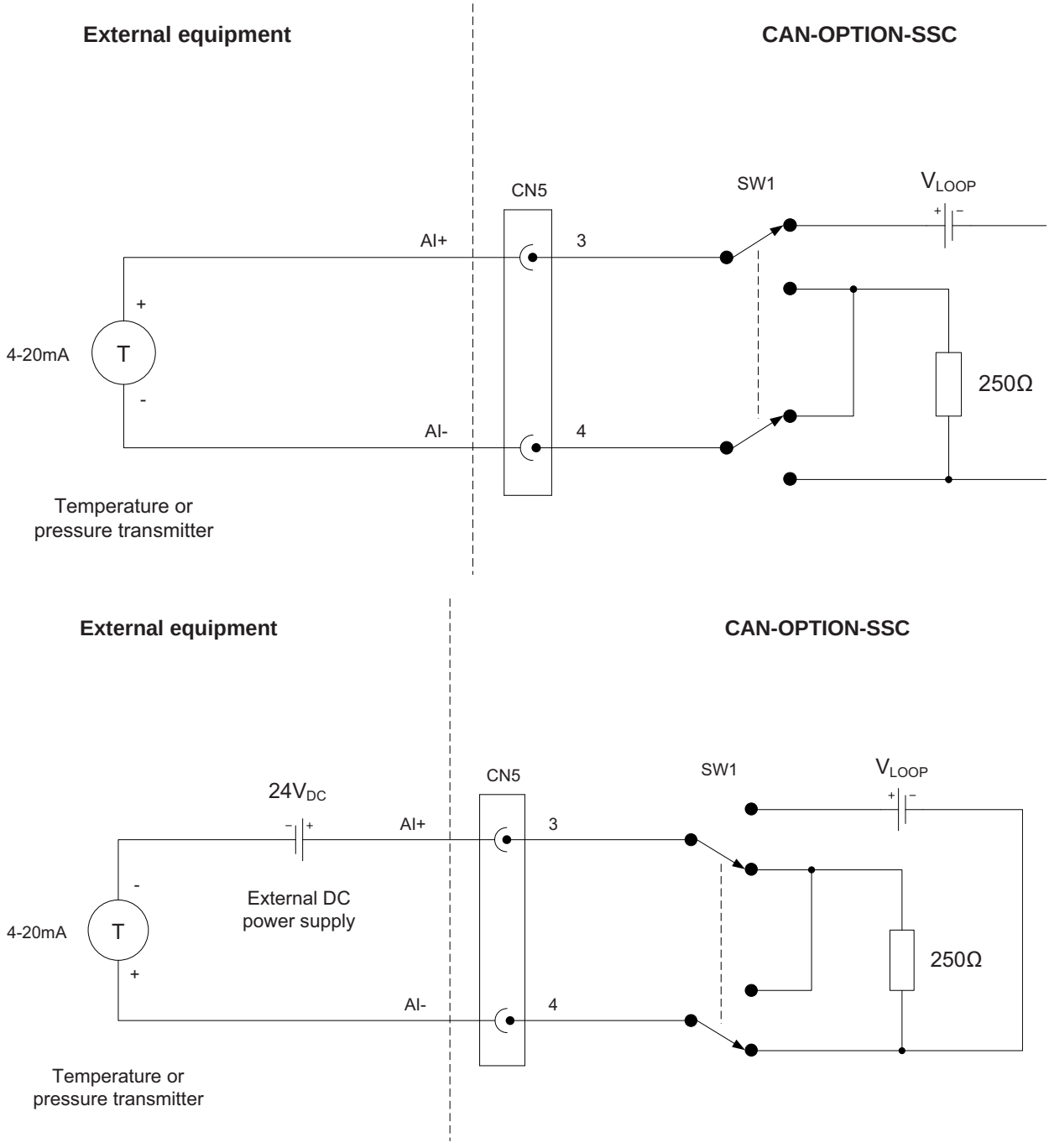


FIGURE 3-24 Analog Input connections - Active mode (top) and Passive mode (bottom)

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
V_{LOOP} (passive mode)	23.0	24.0	42.5	V_{DC}
$V_{LOOP\ (ISO)}$ (active mode)	24.0	28.0	32.0	V_{DC}
$I_{LOOP\ (ISO)}$ (active mode)	-	-	25.0	mA
Nominal loop current range	4	-	20	mA
Loop current measurement range	0	-	25	mA
Max. loop current	-	-	40	mA
Nominal input resistance (R_S)	249.75	250	250.25	Ω
External reference voltage (V_{REF})	2.49875	2.5	2.5012	V_{DC}
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.

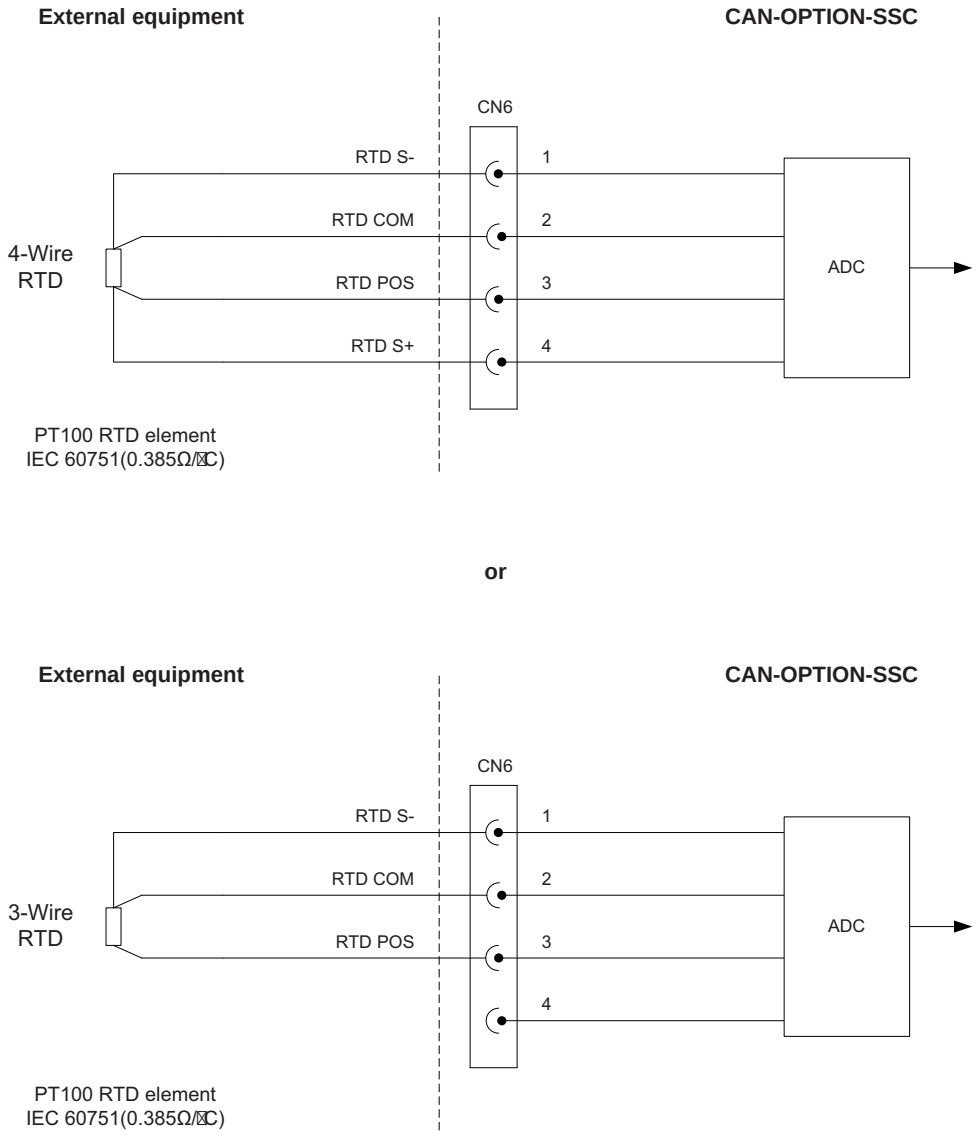


FIGURE 3-25 RTD connections

The following RTD types are accepted.

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

The selection of 3-Wire or 4-Wire RTD type is performed in software, but the RTD must be connected to the circuit as shown in the 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	mΩ
	-	-	±0.5 [±0.9]	°C [°F]
Measurement error (-20 ... +55°C/ -4 ... +131°F)	-	-	±116	mΩ
	-	-	±0.3 [±0.5]	°C [°F]
RTD current source	-	500	-	µA
RTD cable length	-	-	150	m

3.9 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, 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 image illustrates a simplified block diagram of the Digital Output Solid State Relay AC connections.

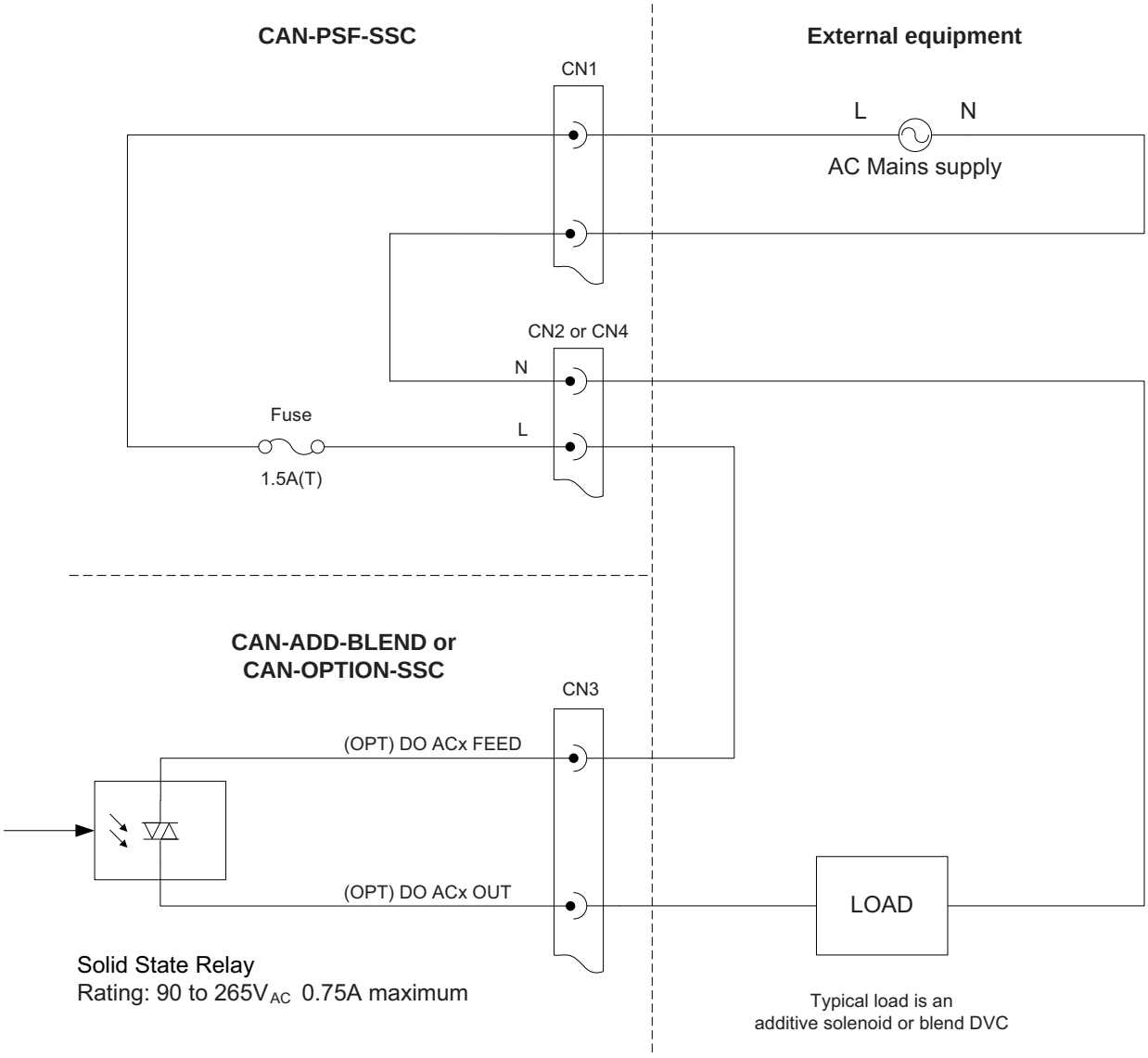


FIGURE 3-26 Solid State Relay “Self-powered” connections

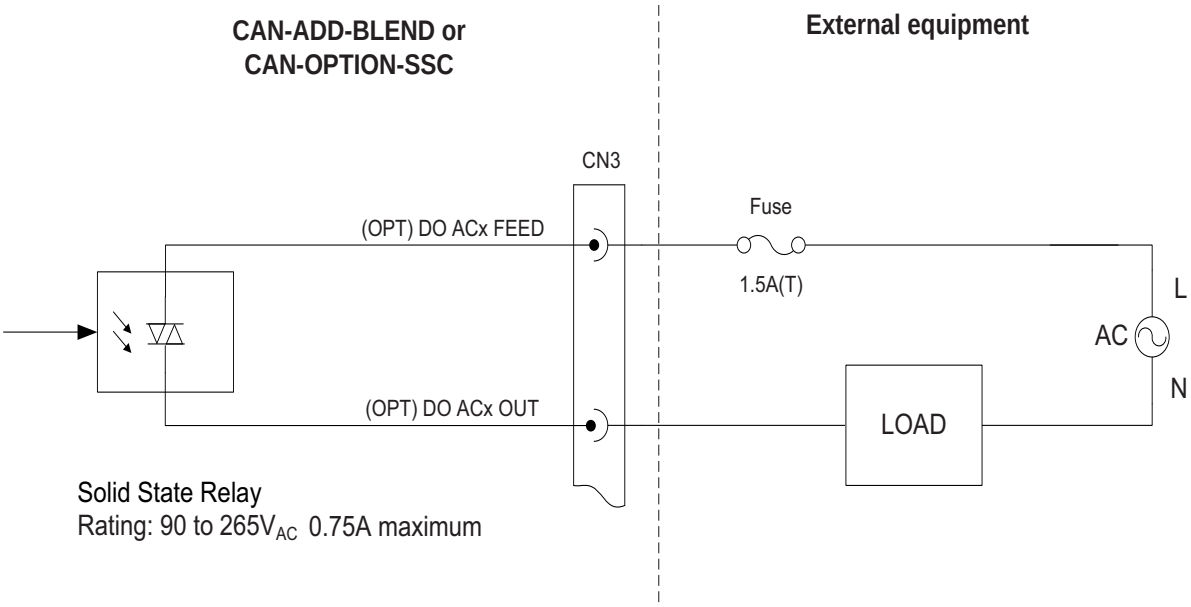


FIGURE 3-27 Solid State Relay “Externally powered” connections

3.9.2.2 Characteristics

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

3.9.2.3 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/µsec] (3)	500
Maximum Load Current [Arms]	1.5
Maximum Load Current [Arms]	0.025

Description	Unit
Maximum Surge Current (16.6ms) [Apk]	80
Maximum On-State Volatge Drop @ Rated Current [Vpk]	1.5
Maximum Power Factor (with Maximum Load)	0.5

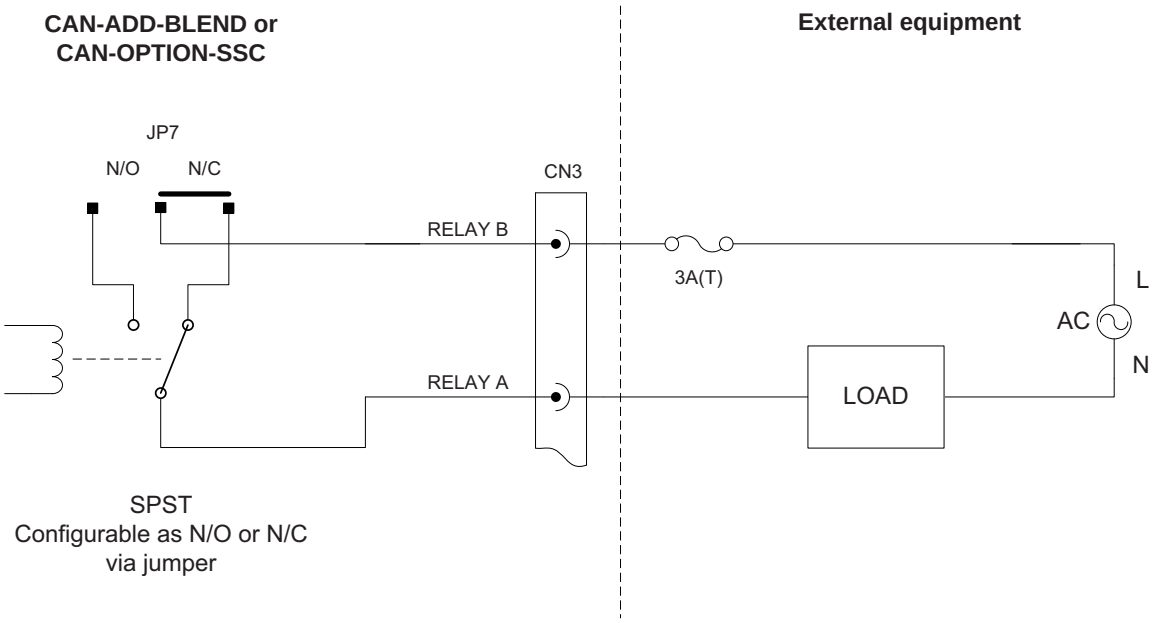
3.9.3 Digital Output Electromechanical Relay (DO EMR/OPT DO EMR)

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[1] to be either Normally Open (NO) or Normally Closed (NC). See FIGURE 3-28.



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

FIGURE 3-28 Electromechanical Relay connections

1. For physical location(s), see Chapter 4 - Installation.

3.9.3.2 Characteristics

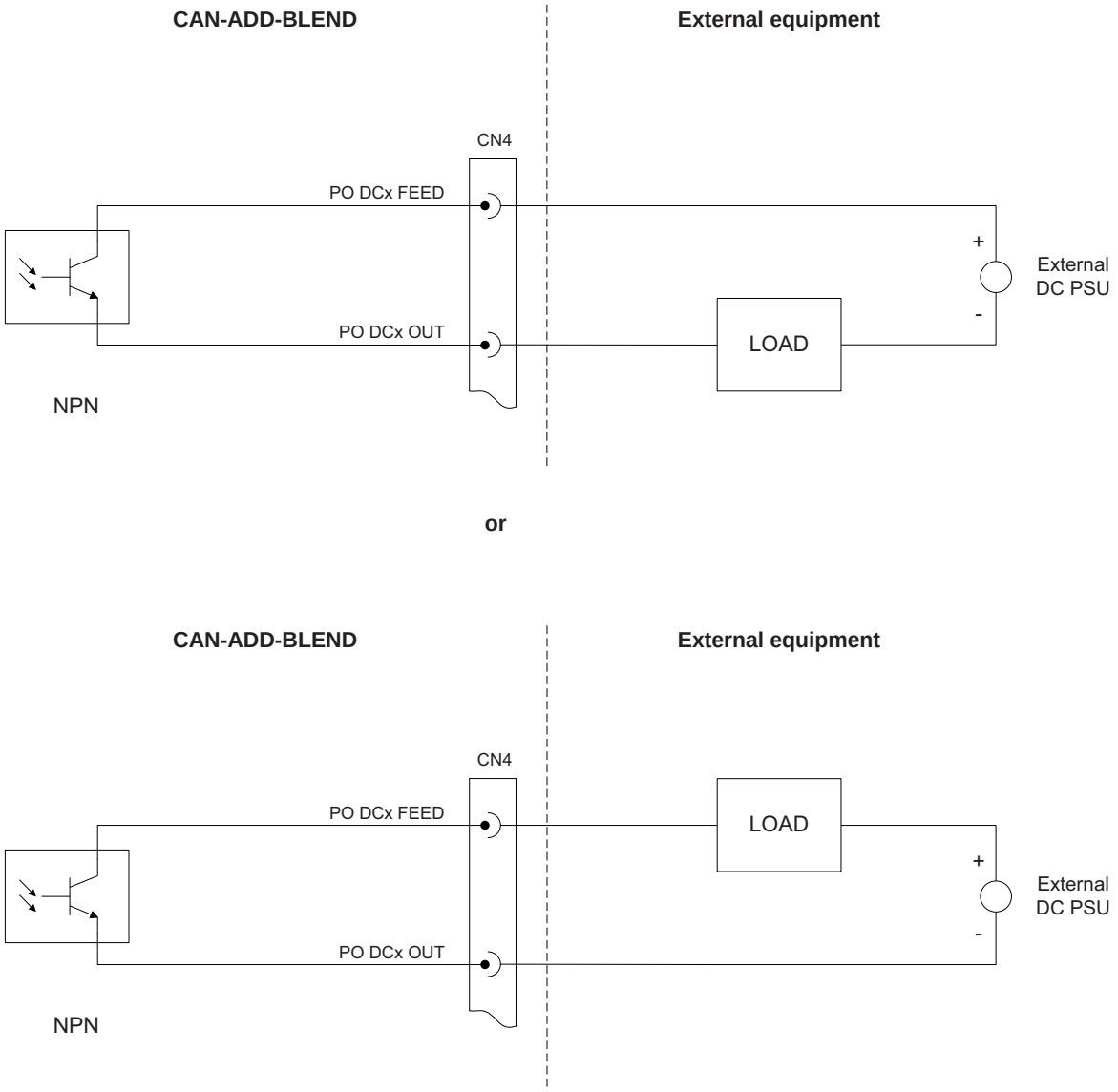
Item	Minimum	Type	Maximum	Unit
Load Voltage to be switched	-	-	265	V_{AC}
Switching current AC	-	-	3	A
Steady state current AC	-	-	3	A
Output contact type	-	SPST	-	-
Operate time	-	-	10	ms
Release time	-	-	10	ms
Setting time	-	-	50	ms

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 FIGURE 3-29.



- PO Rating: 30V_{DC} 0.05A maximum

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 $V_{CE(SAT)}$	-	-	1.0	V_{DC}
Max. Switching frequency F_{MAX}	-	-	0.3	kHz
T_{ON} and T_{OFF} pulse width	3.33	-	-	ms

3.9.5 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. See FIGURE 3-30.

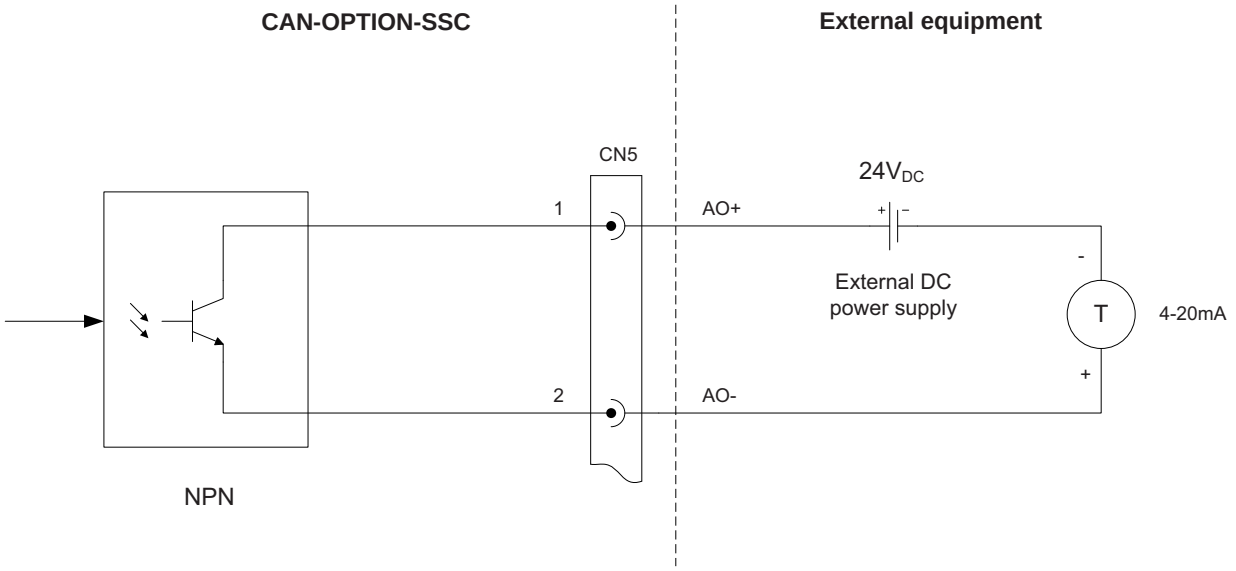


FIGURE 3-30 Analog Output connections

3.9.5.2 Characteristics

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

3.10 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 FIGURE 3-31 and FIGURE 3-32.

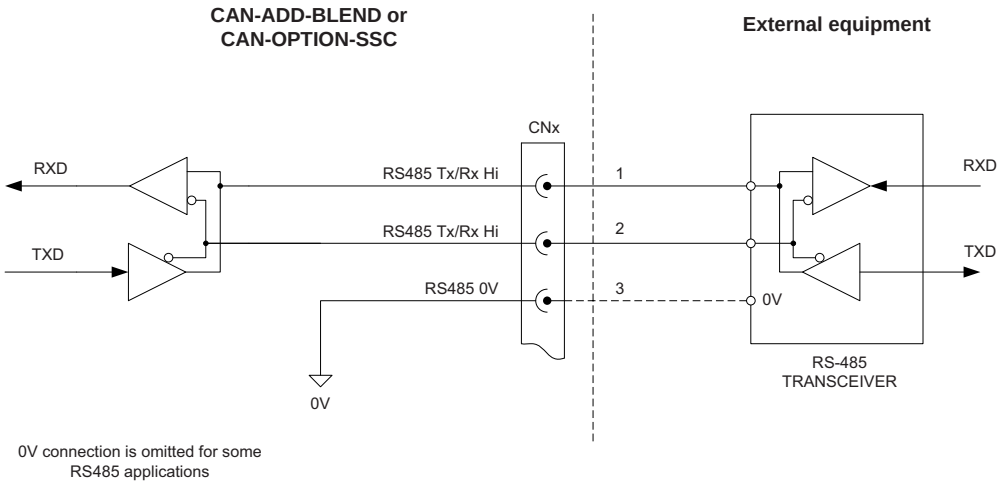


FIGURE 3-31 RS Communication 2-Wire connections

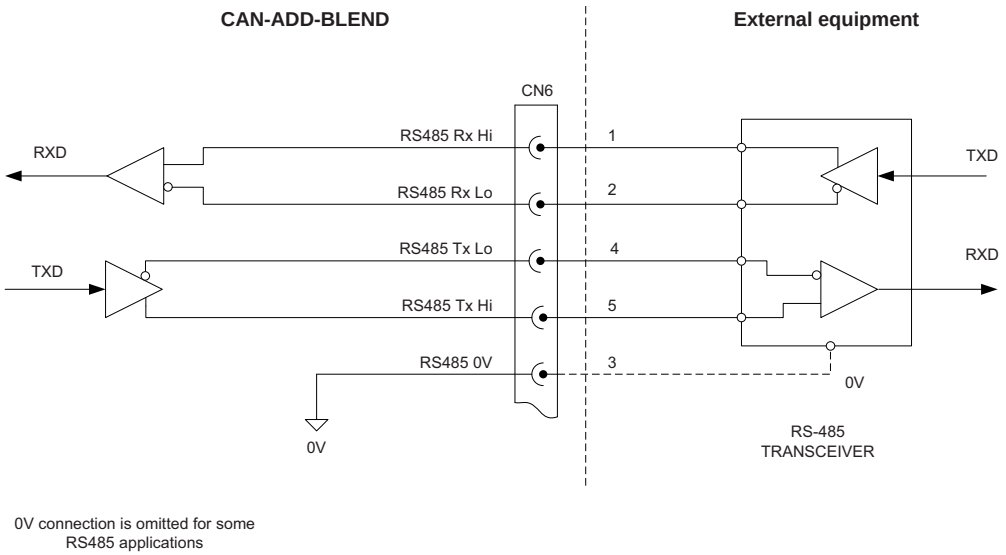


FIGURE 3-32 RS Communication 4-Wire connections (CAN-ADD-BLEND only)

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

3.10.1.2 Characteristics

Item	Minimum	Type	Maximum	Unit
Terminator resistor R_T	118	120	122	Ω
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	-	-	kΩ
Data transmission rate	-	-	500	kbps
Number of connected devices	-	-	32	-

3.10.1.3 Cable Specifications

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

CHAPTER 4 INSTALLATION

4.1 Mounting and Dimensions

The SSC-A can be mounted by means of 2 x M10 socket-head bolts.

See FIGURE 4-1.

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

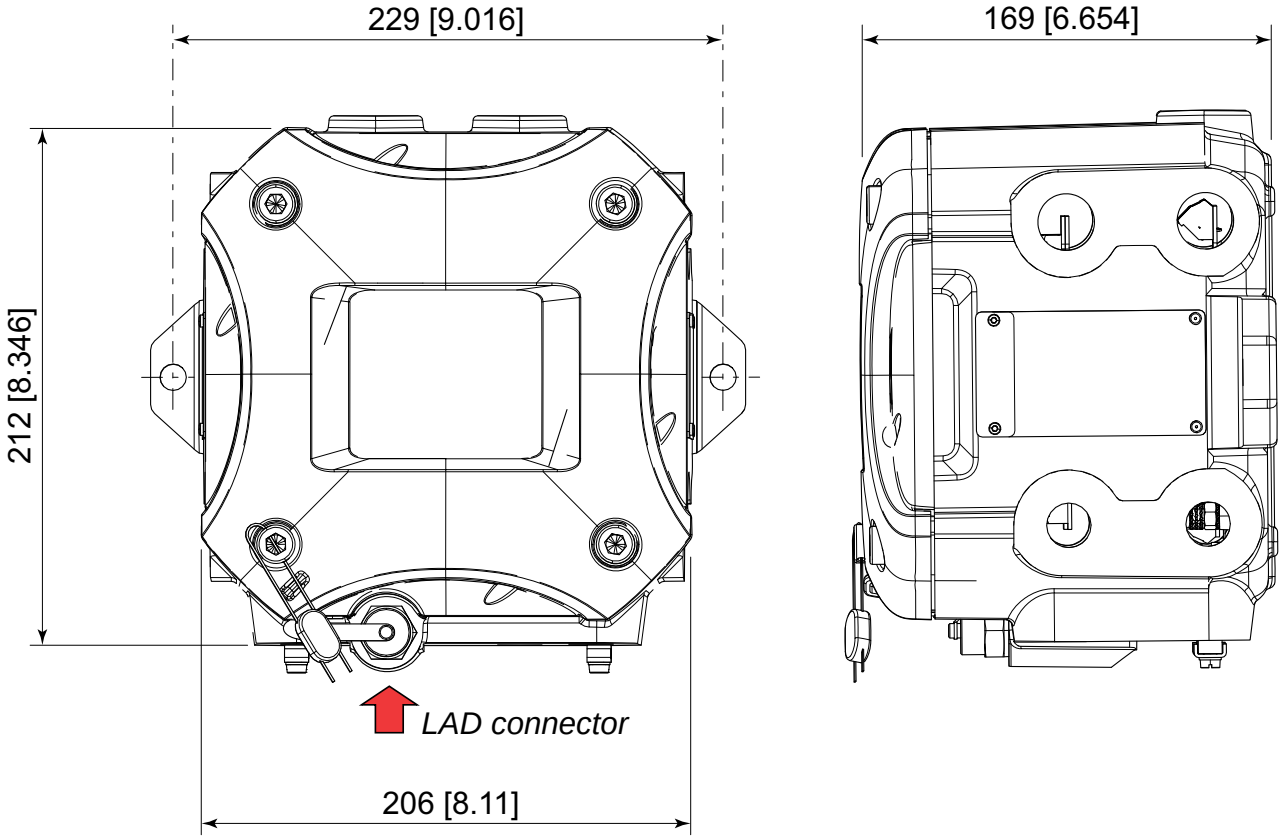


FIGURE 4-1 Main dimensions of the SSC-A in mm [inches]

F4A10-0009

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

4.2 Gland Entries

4.2.1 General

The SSC-A has *12 metric* gland entries or *8 NPT* gland entries.

FIGURE 4-2 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.

The temperature rating of the glands must be at least 20ºC [68ºF] above maximum operating temperature.

Therefore, a rating of 85°C [185ºF] is suitable for the entire temperature range.

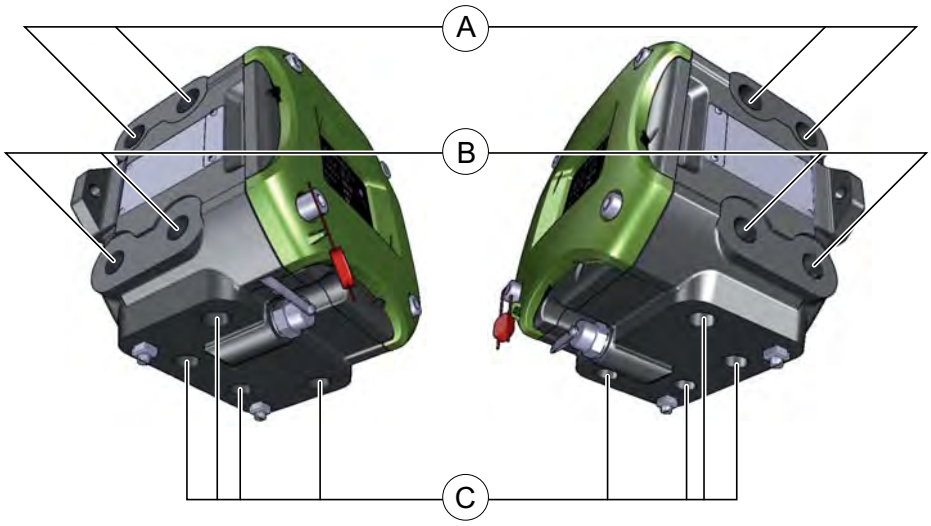


FIGURE 4-2 SSC-A metric gland entries

F4A10-0010

4.2.2 Metric Gland Entries (FIGURE 4-3)

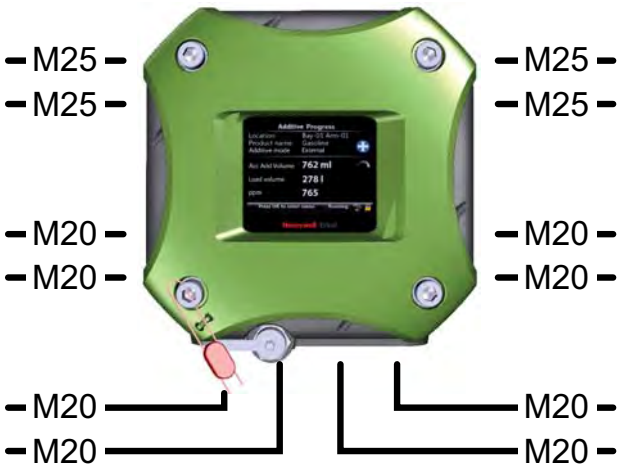


FIGURE 4-3 Metric gland entries overview

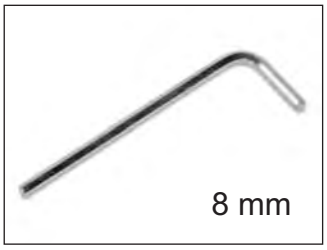
F4A10-0011

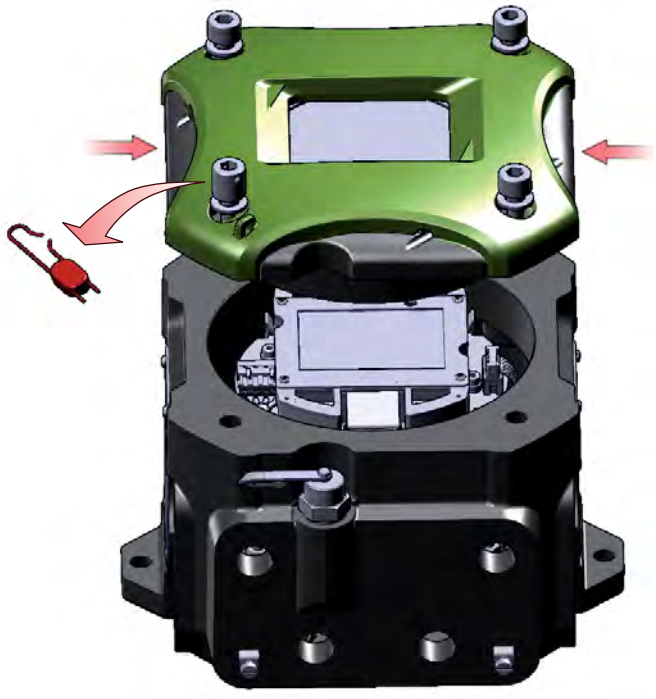
4.2.3 NPT Gland Entries (FIGURE 4-4)

FIGURE 4-4 NPT gland entries overview F4A10-0012

4.3 Removing the Lid

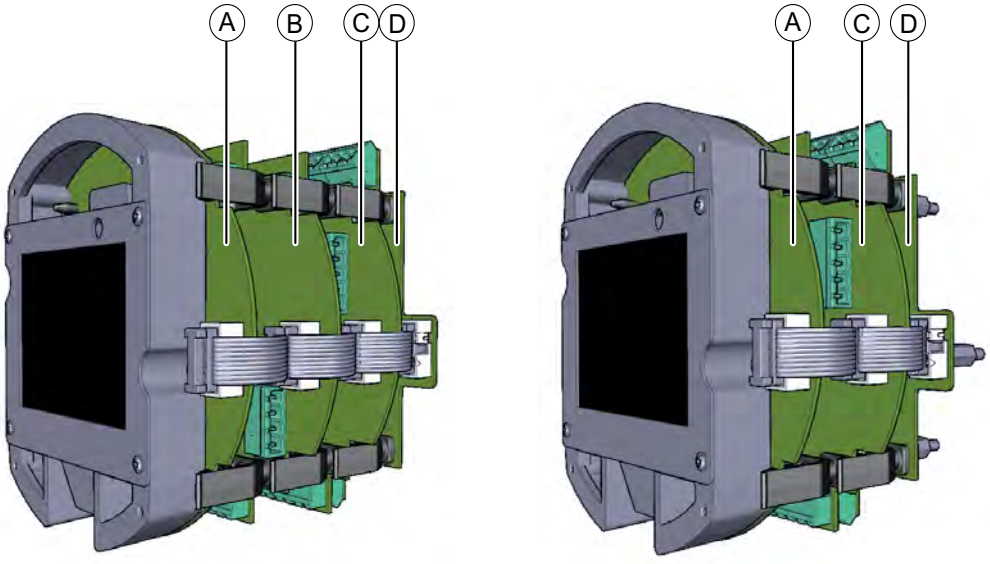
1. Remove W&M seal if applicable.
2. Loosen the 4 captive socket-head screws with an 8 mm Allen key.
3. Pull the lid at arrowed locations (figure below - right). Rotate gently to aid removal.
4. If the lid is stuck, carefully force it open with 2 screwdrivers (figure below - left).





5. Make sure the O-ring is in place (see figure below).
6. Place lid on a clean surface.

4.4 Removing the PCBs



F4A10-0005

FIGURE 4-5 Full-configuration SSC-A (left) and 3-PCBs configuration (right)

Refer to FIGURE 4-5	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.

* A PCB with software installed.

In order to be able to mount the field entries, all PCBs (except the power board) must be removed from the SSC-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 FIGURE 4-6.

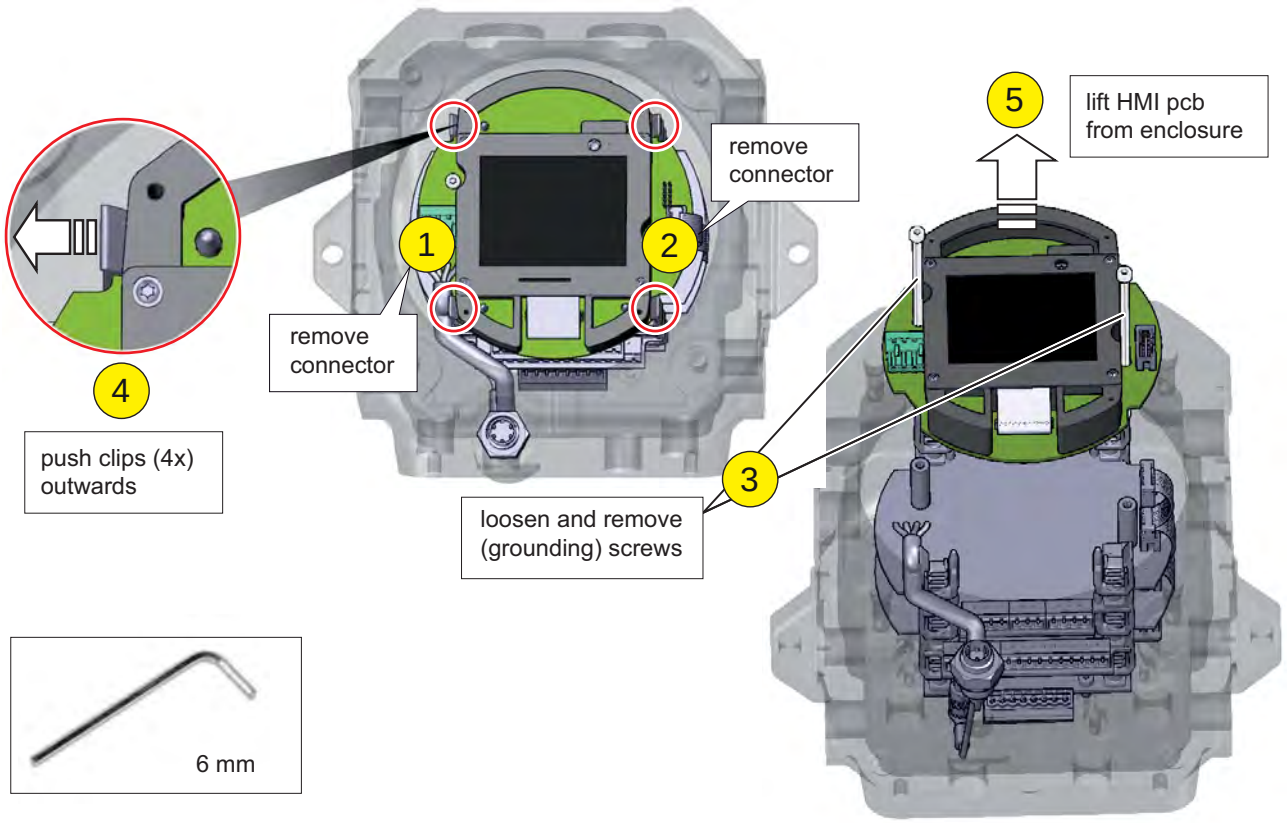


FIGURE 4-6 Removing the CAN-HMI-SSC board

2. Remove the other PCBs (except CAN-PSF-SSC) one after another according to FIGURE 4-7.

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

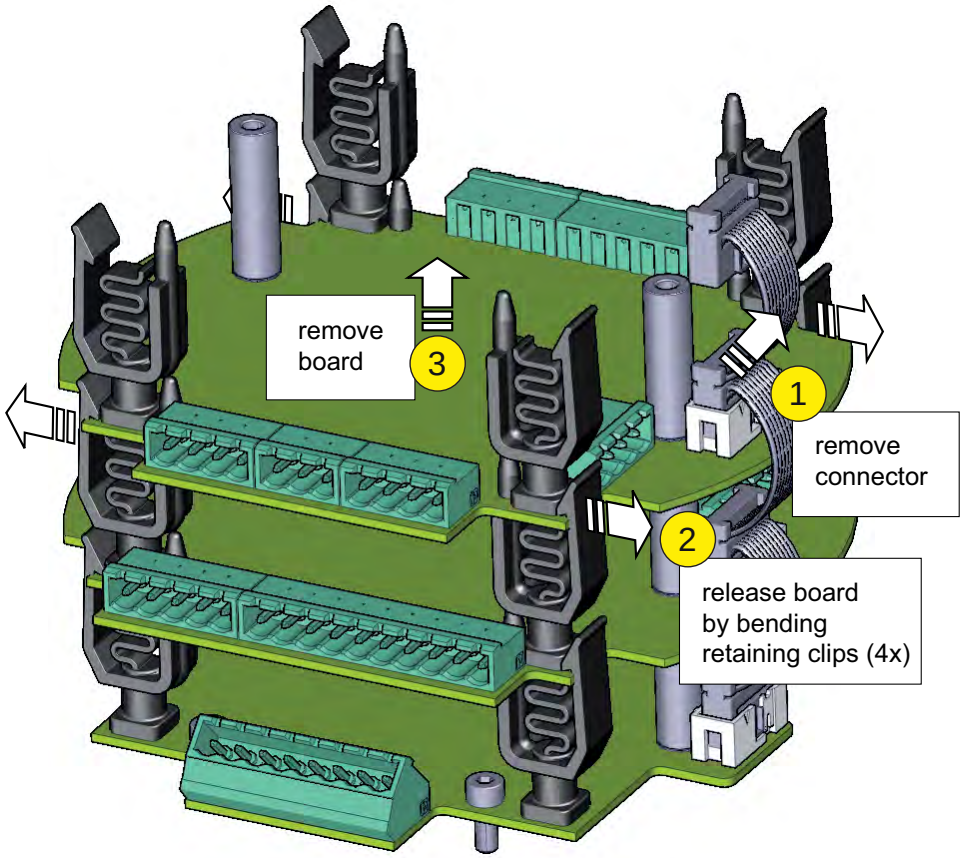


FIGURE 4-7 Removing the other PCBs

4.5 Replacing the PCBs

- Replace PCBs in reverse order of removal.

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

1. Connect appropriate terminal connectors outside the enclosure.
2. Carefully replace each PCB into enclosure whilst guiding attached wiring to the sides of the enclosure.
3. Align PCB with connectors below, and depress into place, ensuring each of the 4 clips clicks into place.
4. Replace PCB spacers.
5. Connect flatcable connector.
6. Repeat for each remaining PCB.

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

4.6 Replacing the Lid

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

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

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

4.7 Fusing and Power Consumption

4.7.1 Fusing

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

NOTE: All fusing is perfromed 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 Power consumption SSC

Maximal	Typical
15.9 W	9.9 W

4.8 Wiring Termination Guidance

4.8.1 Wiring Architecture

- Ex i wiring is separated from other wiring.
- In order to limit interference between low and high voltage signals, a logical separation between cables carrying these signals has been created. See FIGURE 4-8.

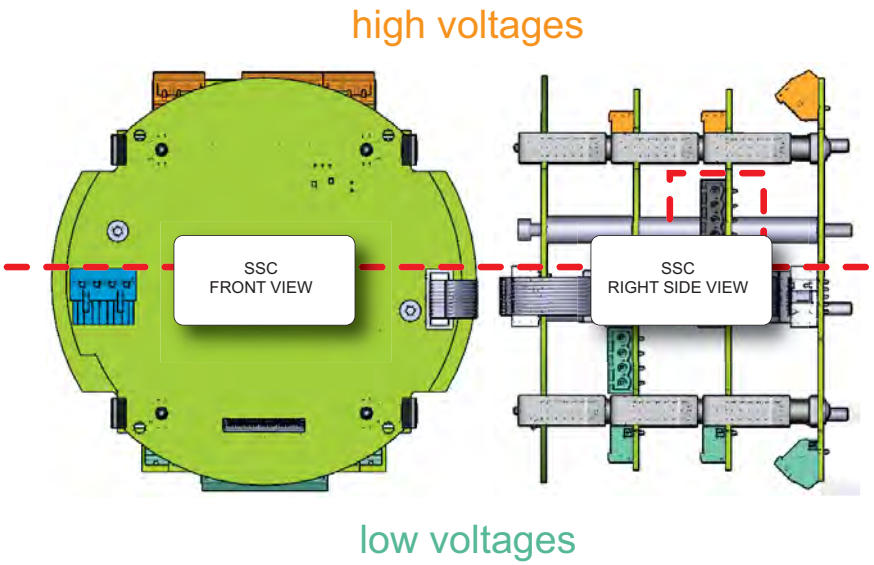


FIGURE 4-8 High/low voltages separation concept

- The following measures are taken to adequately identify connections with different functions, and to avoid connector placement confusion.
  - Use of different number of pins.
  - In case of same number of pins with different functions, a connector coding profile of insulating material is applied.
  - Color-coding of the connectors, see the following table.

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

4.8.2 General

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

4.8.3 Wire Sizes and Types

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

- All I/O terminals accepts wires with a cross section area of 0.2 to 2.5 mm^2 [AWG 24 to 14].
- For mains / high-voltage wiring, 1.5 mm^2 [AWG 16] is recommended.
- For low-voltage wiring (DI, PO, AI, AO, RTD, and so on), 0.75 mm^2 [AWG 18] or 0.5 mm^2 [AWG 20] is recommended.

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

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

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

4.8.4 Recommended Cables

Cable Type	Number of wires	Function
XLPE/SWA/PVC 4C X 1.5MM 600/1000V BS5467	3	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)
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

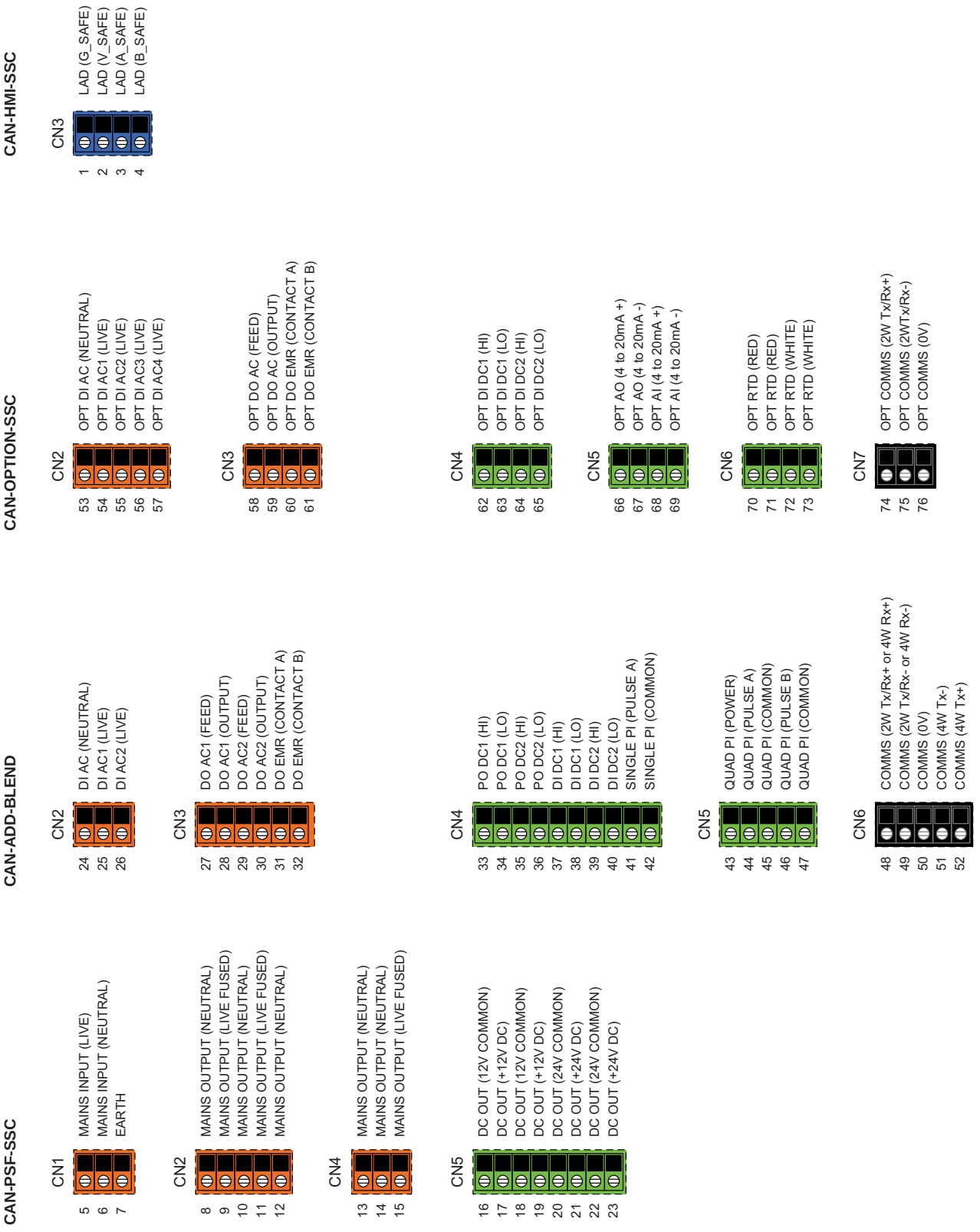
There are no strictly prescribed wire crimps.

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

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

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

4.8.6 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

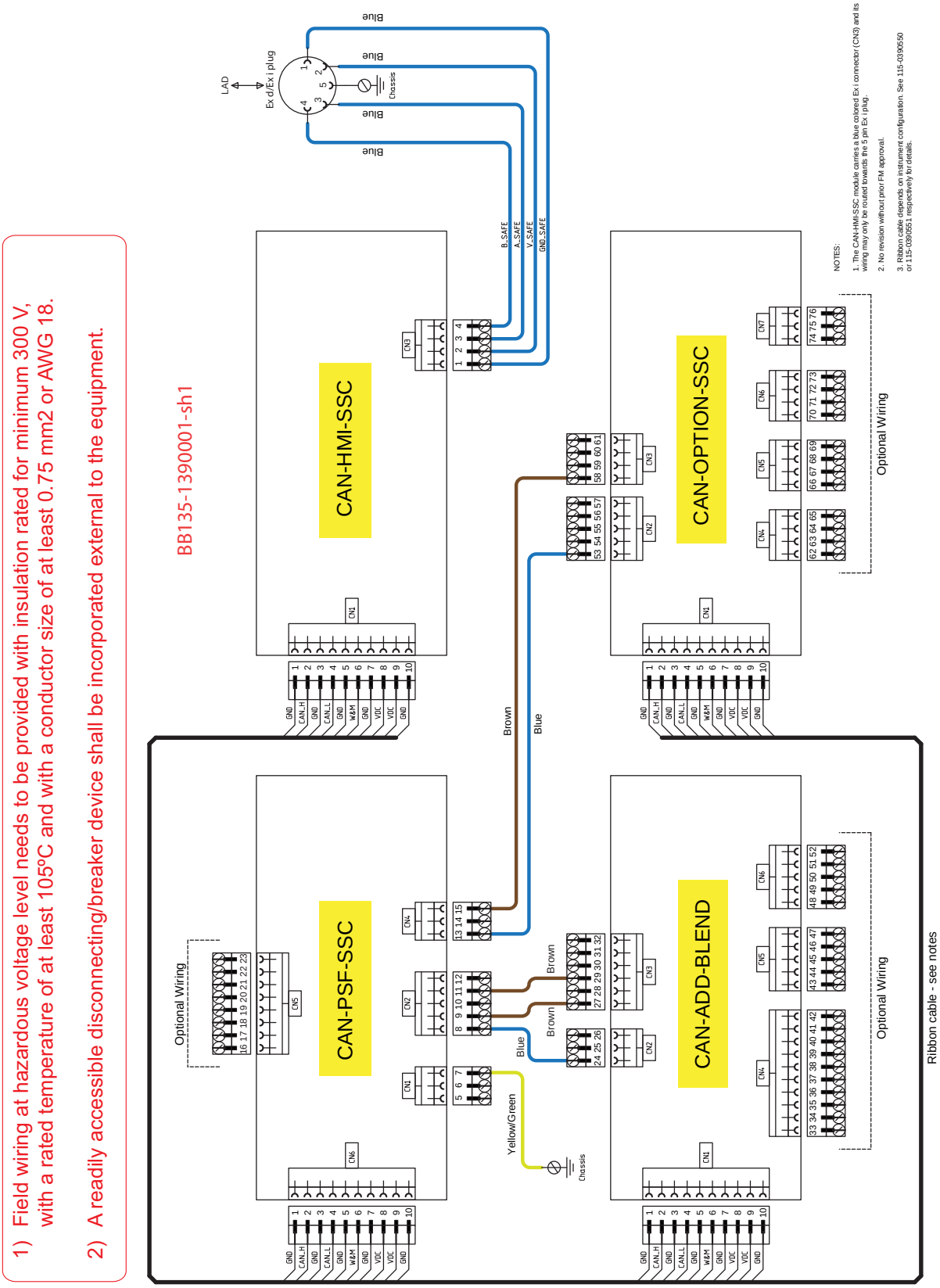
Terminal	ID	SUGGESTED	OPTIONS
CN 2			
24	DI-AC	Common Neutral	*Pre-installed for For Fusion4 MiniPak*
25	DI-AC1	**Permissive**	Alarm Reset, Slow Flow Signal, Pump Feedback, System Interlock, Tank Low Level, Tank Empty, Pacing Source, Ext. Solenoid Control
26	DI-AC2	**Alarm Reset**	Alarm Reset, Slow Flow Signal, Pump Feedback, System Interlock, Tank Low Level, Tank Empty, Pacing Source, Ext. Solenoid Control
CN 3			
27	DO-AC1	Feed	*Pre-installed for For Fusion4 MiniPak*
28	DO-AC1	**Add. Control Solenoid**	*Pre-installed for For Fusion4 MiniPak*
29	DO-AC2	Feed	*Pre-installed for For Fusion4 MiniPak*
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)		
CN 4			
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)		
CN 5			
43	Quad PI (Power)	**Additive Flow Meter (single)**	*Pre-installed for For Fusion4 MiniPak*
44	Quad PI (Pulse A)		*Pre-installed for For Fusion4 MiniPak*
45	Quad PI (Common)		*Pre-installed for For Fusion4 MiniPak*
46	Quad PI (Pulse B)	**Additive Flow Meter (dual)**	
47	Quad PI (Common)		
CN 6			
48	Comms (2W)	**RS 485 2 Wire**	
49	Comms (2W)		
50	Comms (0V)		
51	Comms (4W)	**RS 485 4 Wire**	
52	Comms (4W)		

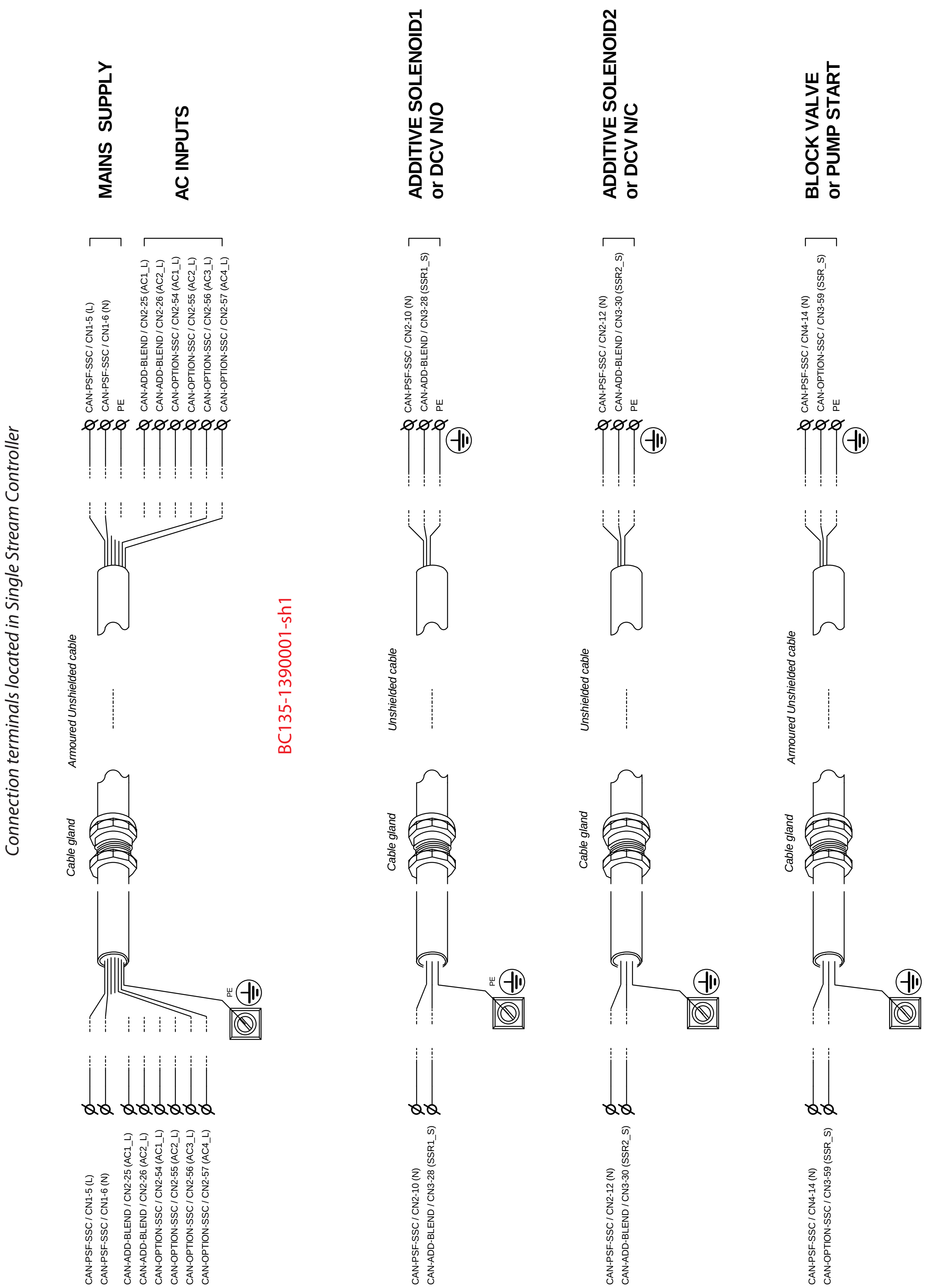
4.9.2 CAN-OPTION-SSC

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.

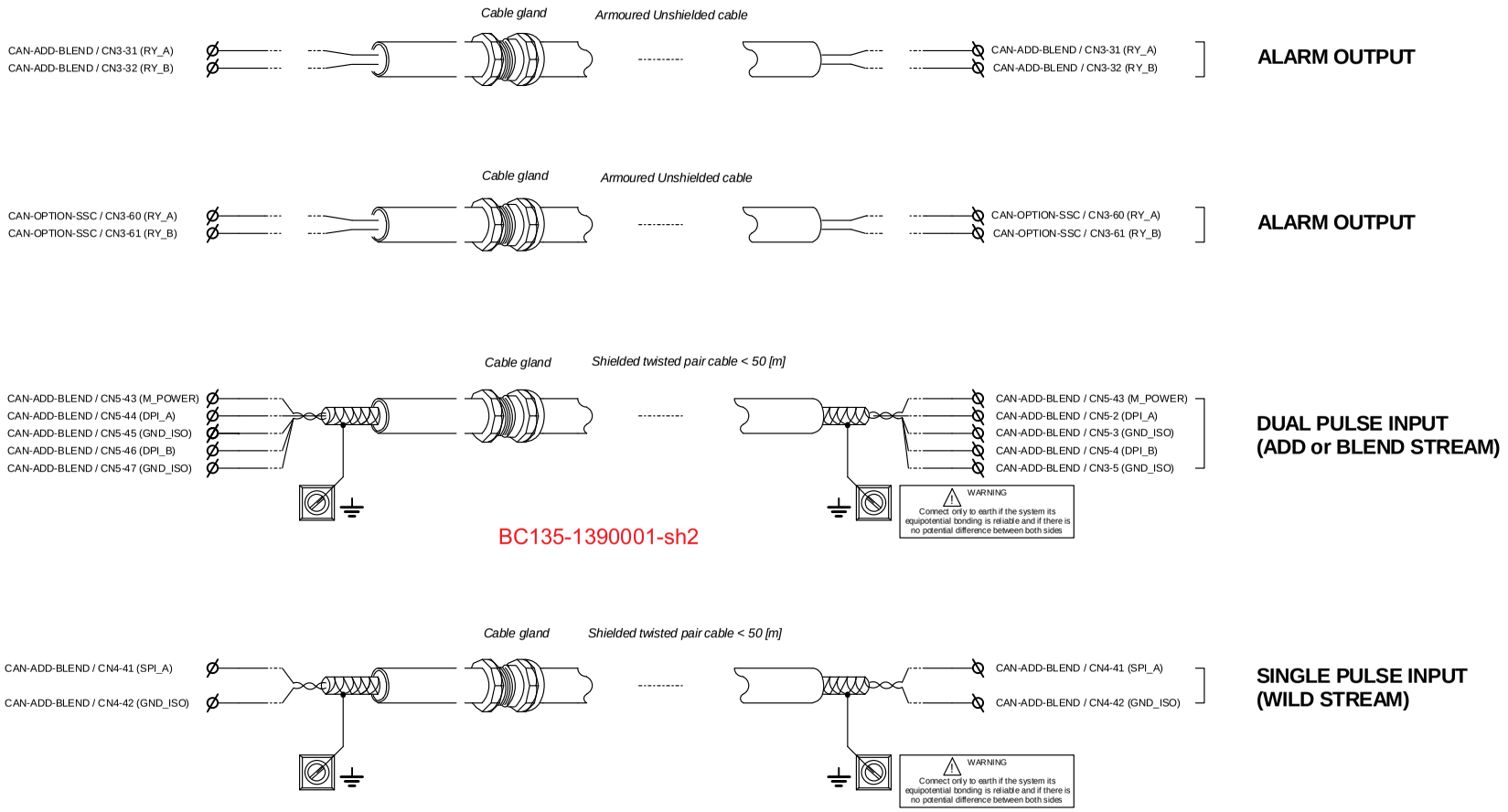
Terminal	ID	SUGGESTED	OPTIONS
CN2			
53	OPT DI-AC	Common Neutral	*Pre-installed for For Fusion4 MiniPak*
54	OPT DI-AC 1		Alarm Reset, Slow Flow Signal, Pump Feedback, System Interlock, Tank Low Level, Tank Empty, Pacing Source, Ext. Solenoid Control
55	OPT DI-AC 2		Alarm Reset, Slow Flow Signal, Pump Feedback, System Interlock, Tank Low Level, Tank Empty, Pacing Source, Ext. Solenoid Control
56	OPT DI-AC 3		Alarm Reset, Slow Flow Signal, Pump Feedback, System Interlock, Tank Low Level, Tank Empty, Pacing Source, Ext. Solenoid Control
57	OPT DI-AC 4		Alarm Reset, Slow Flow Signal, Pump Feedback, System Interlock, Tank Low Level, Tank Empty, Pacing Source, Ext. Solenoid Control
CN3			
58	OPT DO-AC1	Feed	*Pre-installed for For Fusion4 MiniPak Neutral - PSF, CN4, Terminal 14*
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 DC 1 (Hi)		Permissive, Alarm Reset, Slow Flow Signal, Pump Feedback, System Interlock, Tank Low Level, Tank Empty, Pacing Source, Ext. Solenoid
63	OPT DI DC 1 (Lo)		
64	OPT DI DC 2 (Hi)		Permissive, Alarm Reset, Slow Flow Signal, Pump Feedback, System Interlock, Tank Low Level, Tank Empty, Pacing Source, Ext. Solenoid
54	OPT DI DC 2 (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+)		Analyser control, 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

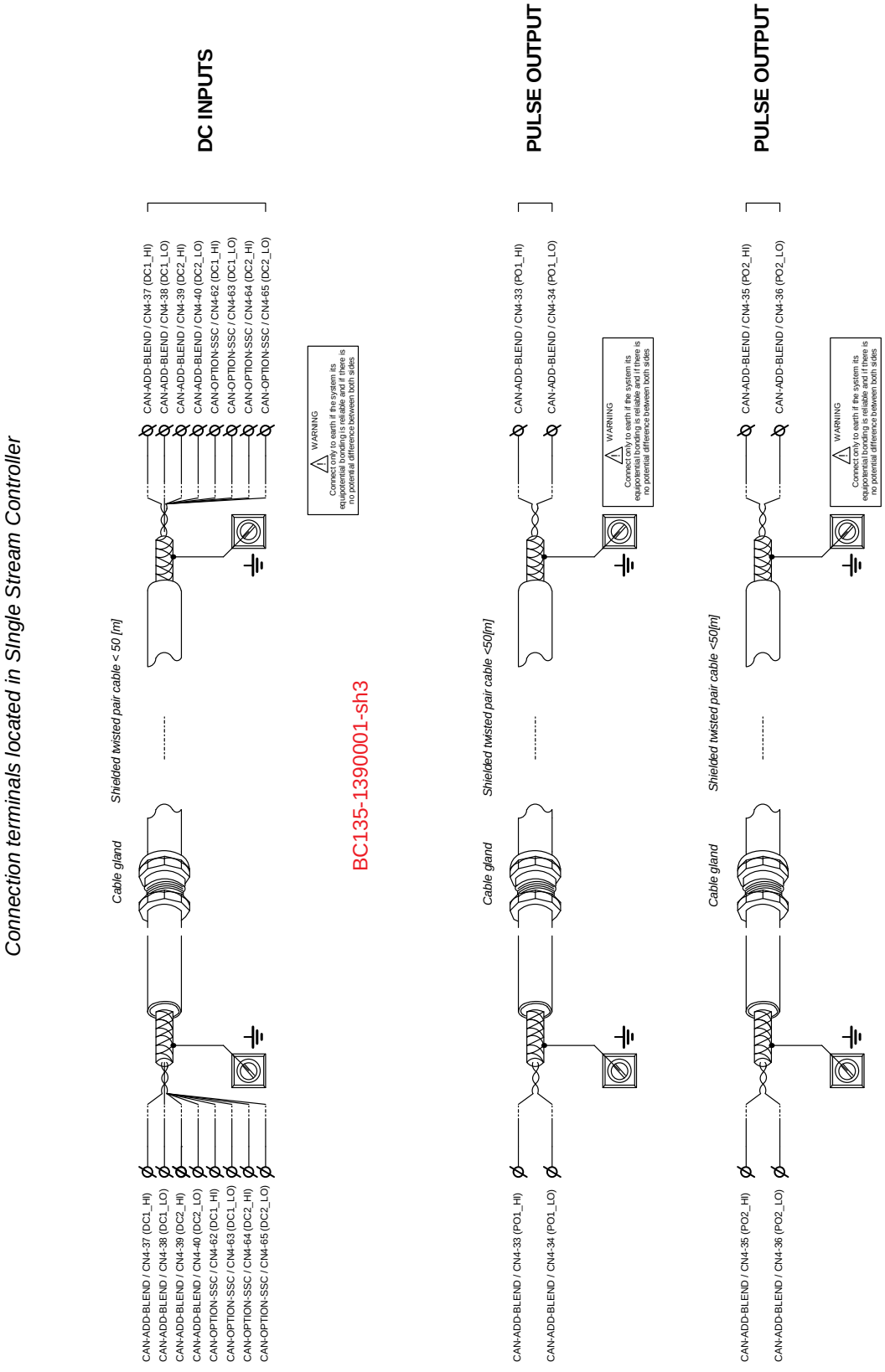



Connection terminals located in Single Stream Controller
MAINS SUPPLY
AC INPUTS
ADDITIVE SOLENOID1 or DCV N/O
ADDITIVE SOLENOID2 or DCV N/C
BLOCK VALVE or PUMP START
CAN-PSF-SSC / CN1-5 (L)
CAN-PSF-SSC / CN1-6 (N)
PE
CAN-ADD-BLEND / CN2-25 (AC1_L)
CAN-ADD-BLEND / CN2-26 (AC2_L)
CAN-OPTION-SSC / CN2-54 (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)
Armoured Unshielded cable
Unshielded cable
Cable gland
BC135-1390001-sh1

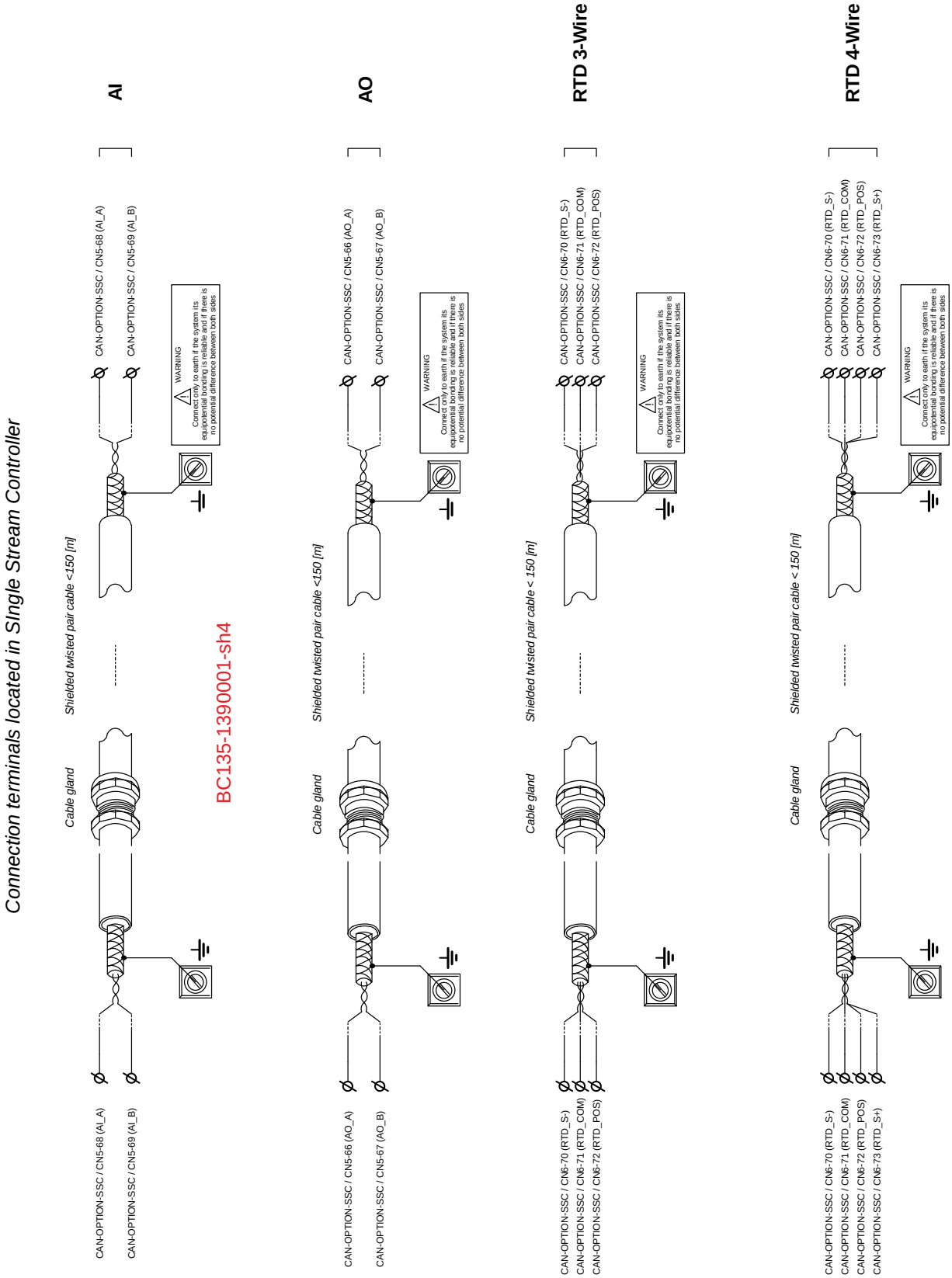
Connection terminals located in Single Stream Controller

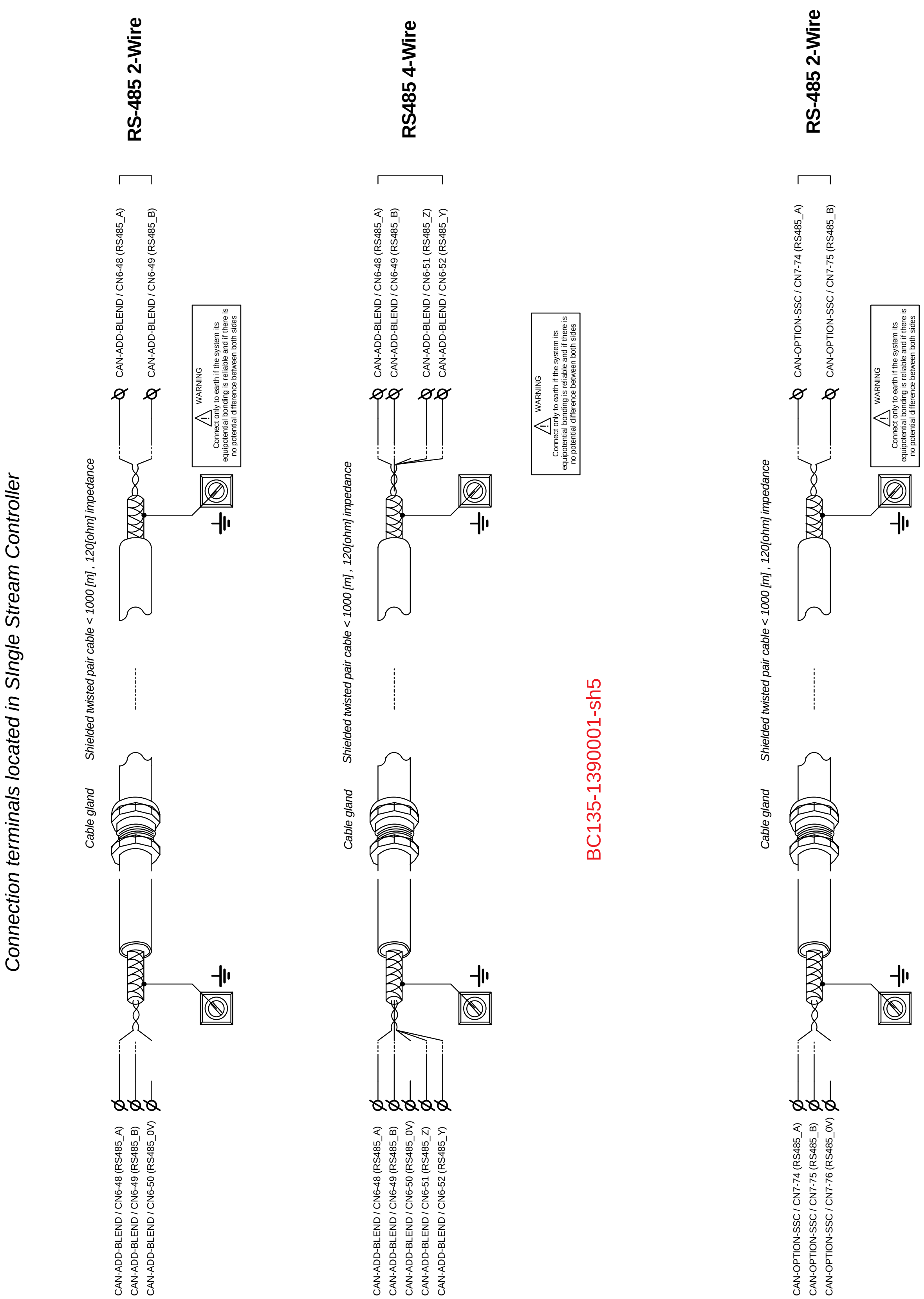


Connection terminals located in SIngle Stream Controller



Connection terminals located in SIngle Stream Controller




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
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 / CN6-51 (RS485_Z)
CAN-ADD-BLEND / CN6-52 (RS485_Y)
CAN-OPTION-SSC / CN7-74 (RS485_A)
CAN-OPTION-SSC / CN7-75 (RS485_B)
CAN-OPTION-SSC / CN7-76 (RS485_0V)
BC135-1390001-sh5

CHAPTER 5 OPERATION

5.1 General

5.1.1 Introduction

This chapter gives 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).

5.1.2 Text Conventions

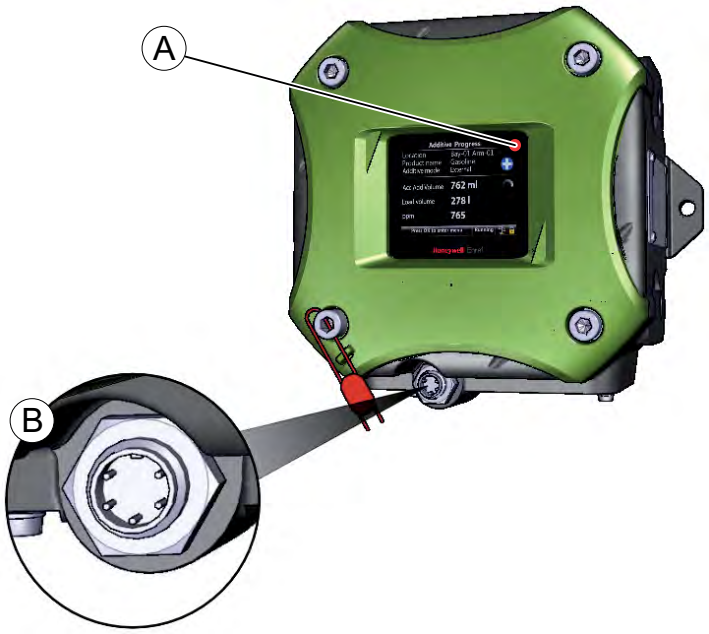
In contrast with explanatory text, all instruction text is preceded by a ➔.

All [Entity] and <entity-related> text is recognizably formatted.

5.2 Service Interfaces

The SSC-A can be configured through three interfaces as follows:

- The infrared interface (see A, FIGURE 5-1) by using the IR Controller.
- The wired Ex i interface (see B, FIGURE 5-1) with a LAD.
- The RS-485 communication.



F4A10-0008

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 “wake-up” the Fusion4 IR Controller. Then the [SEND] light blinks, indicating that the Fusion4 IR Controller is ready for operation.

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

The SSC-A uses 7 of the Fusion4 IR Controller buttons. These buttons, that is, **∧**, **v**, **<**, **>**, **OK**, **ESC** are provided in bold text in FIGURE 5-2.

FIGURE 5-2 The key functions of the Fusion4 IR Controller

NOTE:

- 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 also upgrading the firmware in the field.

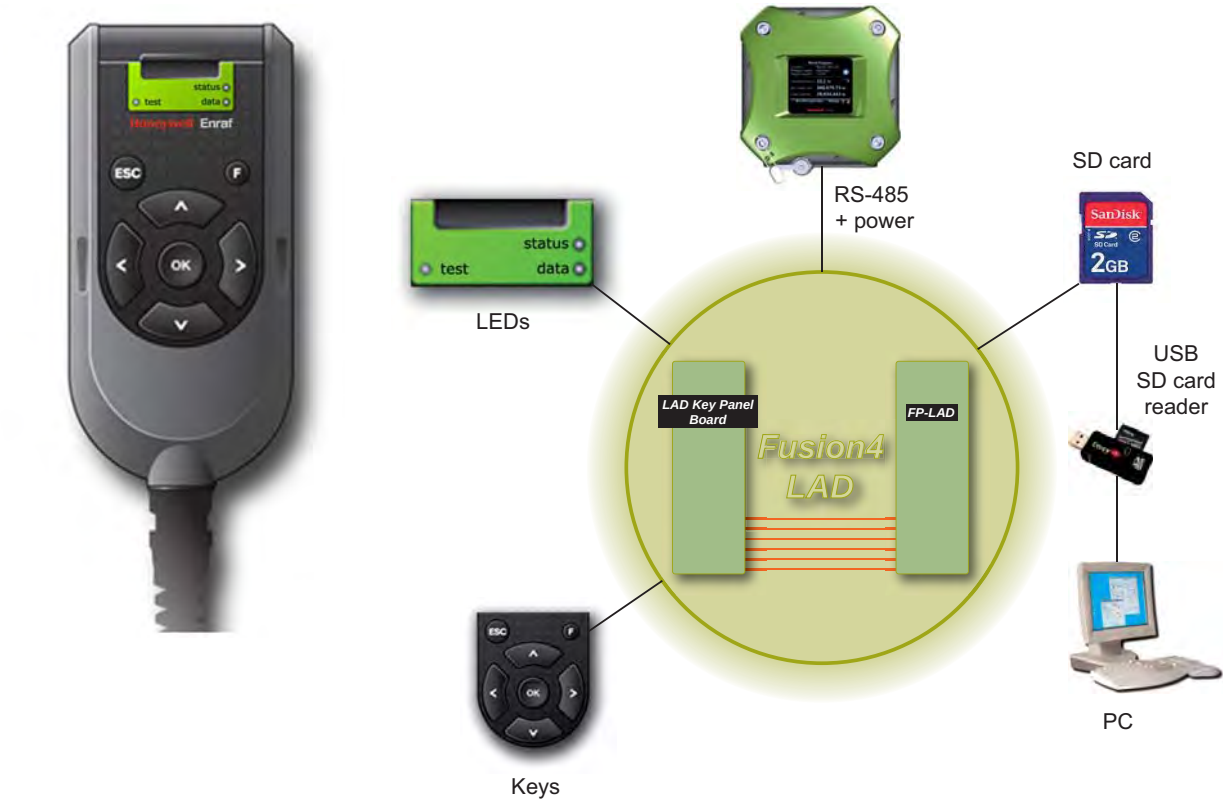


FIGURE 5-3 LAD and its system overview

5.3.2.2 LAD Application 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 FIGURE 5-5.

Fusion4 IR Controller	LAD
	
^ = Up	
V = Down	
< = Left	
> = Right	
OK = Select	
ESC = Back	

FIGURE 5-5 Basic navigation (Fusion4 IR Controller + LAD)

5.3.3.2 LEDs (Fusion4 IR Controller + LAD)

<table>
<tr><th colspan="2">Fusion4 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="5">send (blinking)</td><td rowspan="5">Fusion4 IR Controller is ready for operation.

NOTE: When LED is OFF, press 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 rowspan="3">test (dual-color)</td><td>• green = mapped I/O function has good health and is active</td></tr>
<tr><td>• red = mapped I/O is inactive</td></tr>
<tr><td>• 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: Transfer transaction to LAD, brings up diagnostics screen, and starts 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 for all the Fusion4 devices.

5.3.3.4 SD Card

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

The LAD has an SD card slot located at the top, front face (see FIGURE 5-6).

FIGURE 5-6 SD card location in the LAD (lid opened)

- The SD card uses a FAT file system to allow for interoperability with MS Windows platforms.
- The SD card is used for 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 cards that are recommended by Honeywell Enraf.

Manufacturer	Series	Type	Capacity	Part Number
SanDisk	Industrial	SD	2GB	SDSDAA-002G
Swissbit	S-200	SD	1GB	SFSD1024L4BN2SA-E-D1-131-STD
Pretec	Industrial	SD	1GB	SDS001GSBHP
Transcend	Industrial	SDHC	2GB	TS2GSD80I
STEC	Industrial	SD	1GB	SLSD1GBBSIU

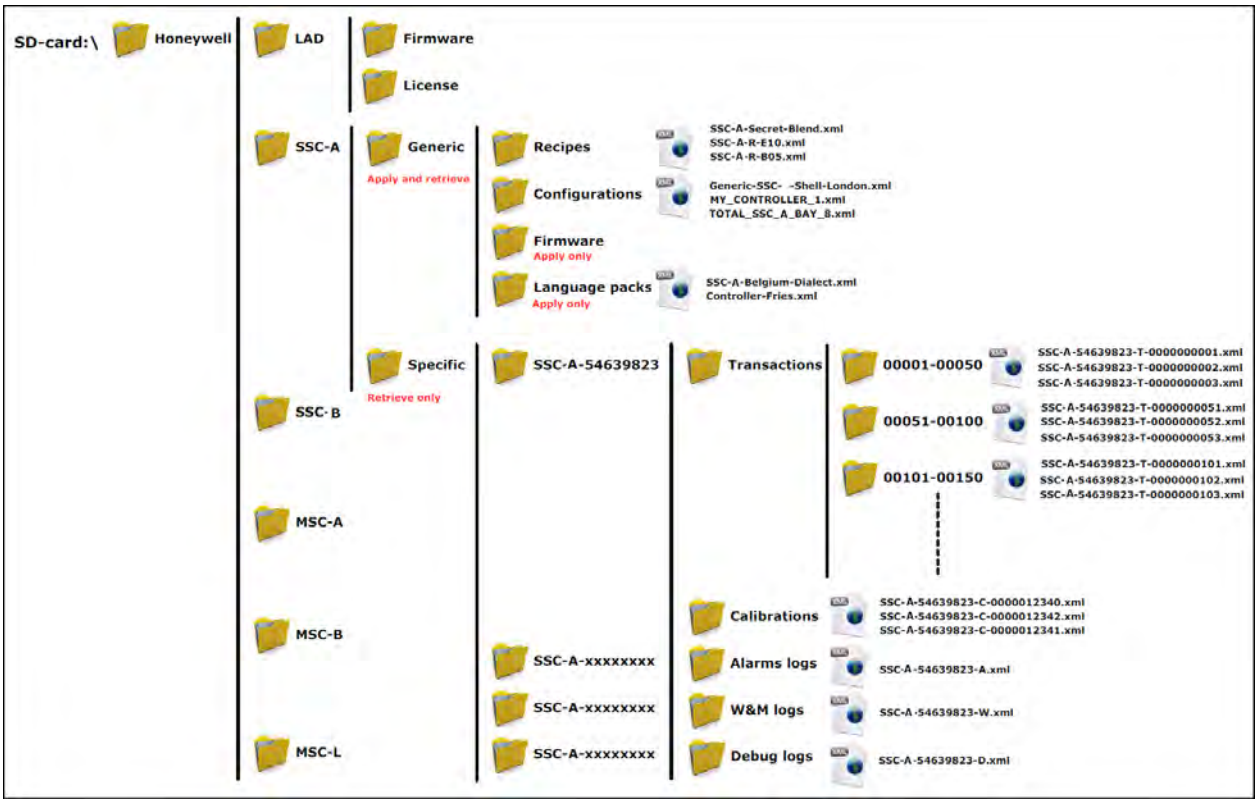
It is possible to use SD cards which are not included in the list above, but they must conform to the following specification.

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

NOTE: The Honeywell Enraf does NOT provide support for any cards not listed in the table above. Contact factory for more information.

NOTE: The 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 -extention (except *Firmware* and *License*).
- File name identification (file-id):
  - T = Transactions
  - C = Calibrations
  - A = Alarm logs
  - W = W&M logs
  - D = Debug logs
  - R = Recipes
- File name format **Transactions:**
  - <device-type>-<serial number>-<file-id>-<transaction-id>.xml
  - Example: `SSC-A-54639823-T-0123456789.xml`
- File name format **Calibrations:**
  - <device-type>-<serial number>-<file-id>-<calibration-id>.xml
  - Example: `SSC-A-54639823-C-0123456789.xml`
- File name format **Alarm logs:**
  - <device-type>-<serial number>-<file-id>.xml

  - Example: `SSC-A-54639823-A.xml`
- File name format **Debug logs:**
  - <device-type>-<serial number>-<file-id>.xml
  - Example: `SSC-A-54639823-D.xml`
- File name format **Recipes:**
  - <device-type>-<file-id>-<recipe-name>.xml
  - Example: `SSC-A-R-E20.xml`
- File name format **Configurations:**
  - <user defined string>.xml
  - Example: `MY_CONTROLLER_1.xml`

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

\Honeywell\SSC-A\Generic\Recipes	100
\Honeywell\SSC-A\Generic\Configurations	100
\Honeywell\SSC-A\Generic\Firmware	25
\Honeywell\SSC-A\Generic\Language packs	25
\Honeywell\SSC-A\Specific\SSC-A-54639823\Transactions	20,000
\Honeywell\SSC-A\Specific\SSC-A-54639823\Calibrations	100
\Honeywell\SSC-A\Specific\SSC-A-54639823\Alarm logs	1
\Honeywell\SSC-A\Specific\SSC-A-54639823\W&M logs	1
\Honeywell\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 text items are listed that are displayed according to the language that is set with the relevant Language Pack.

LAST TRANSACTION SCREEN
Last Transaction
Location
Product name
Blend %
Blend volume
Load volume
Start time
End time
Status
No transaction on controller
DAILY TOTAL SCREEN
DailyTotals
Location
No. of trans.
Total volume
BLEND PROGRESS SCREEN
Blend Progress
Location
Product name
Target blend %
Current blend %
Blend volume
Load volume
ADDITIVE PROGRESS SCREEN
Additive Progress
Location
Product name
Additive mode
ppm
Additive volume
Load volume
STATUS BAR MESSAGES
Stopped
Running
Idle
Paused
Error

ALARM MESSAGES
General fail alarm
Power failure
Communication failure
HMI fatal error
Stream board missing
Option board missing
License key failure
Batch permissive failure
Service due reminder
Control failure alarm
VCF error alarm
Pulse phase alarm
Pulse hardware alarm
Temperature error alarm
Pressure error alarm
Blend percentage alarm
Leaking valve alarm
Wild stream closing alarm
Blend stream closing alarm
No activity alarm
Flush volume alarm
Stream failed alarm
No pump alarm
Factored pulse out alarm
No hydr. pump alarm
Tank low level alarm
Tank empty alarm
Block valve alarm
Solenoid failing alarm
No additive alarm
Low vol. dev. alarm
High vol. dev. alarm
ALARM STATUS
Disabled
Inactive
Active
Acknowledged

5.3.3.4.6 *Building a Local Language Pack for SSC*

To create a custom language pack for the SSC, perform the following steps.

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

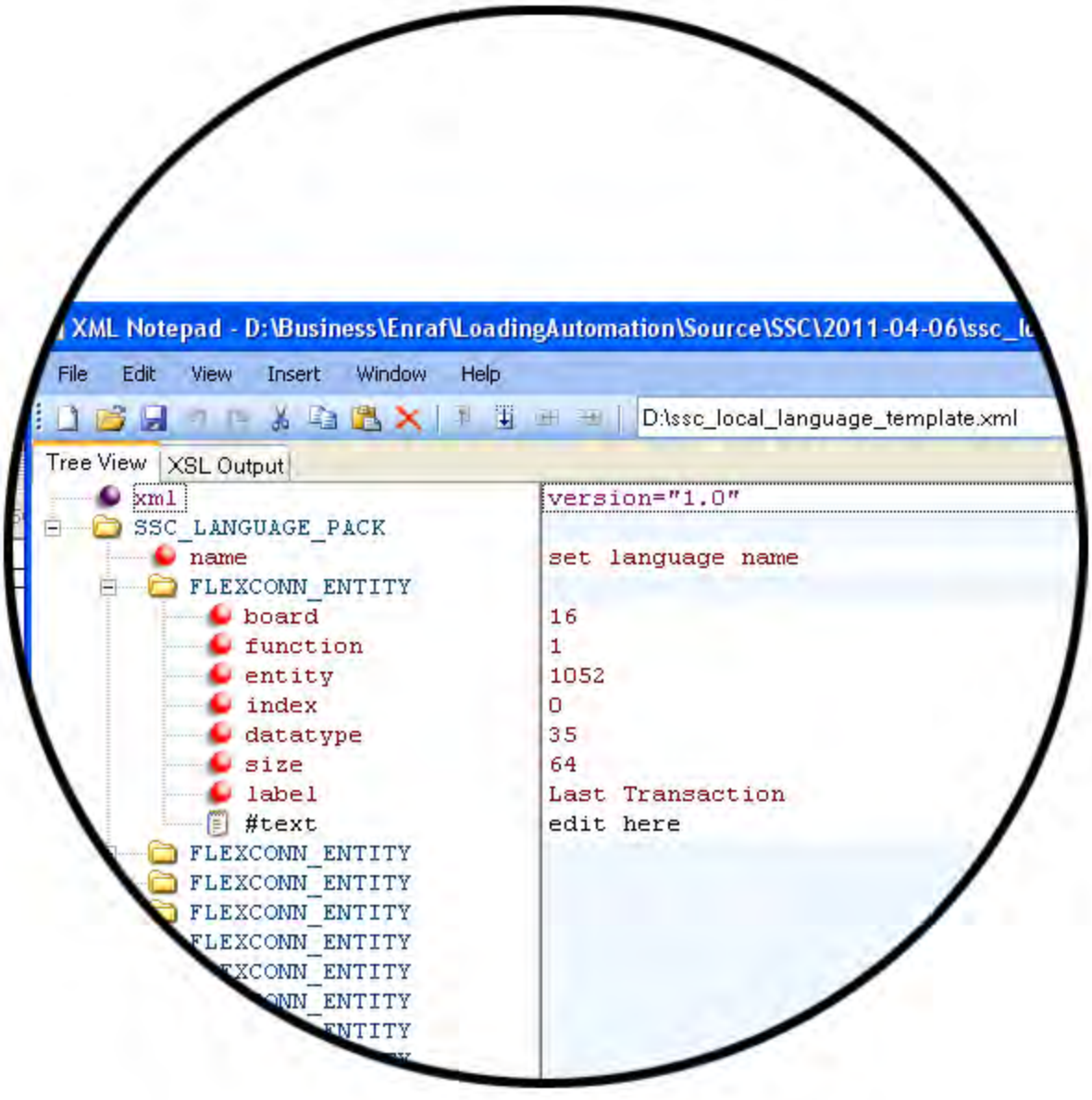
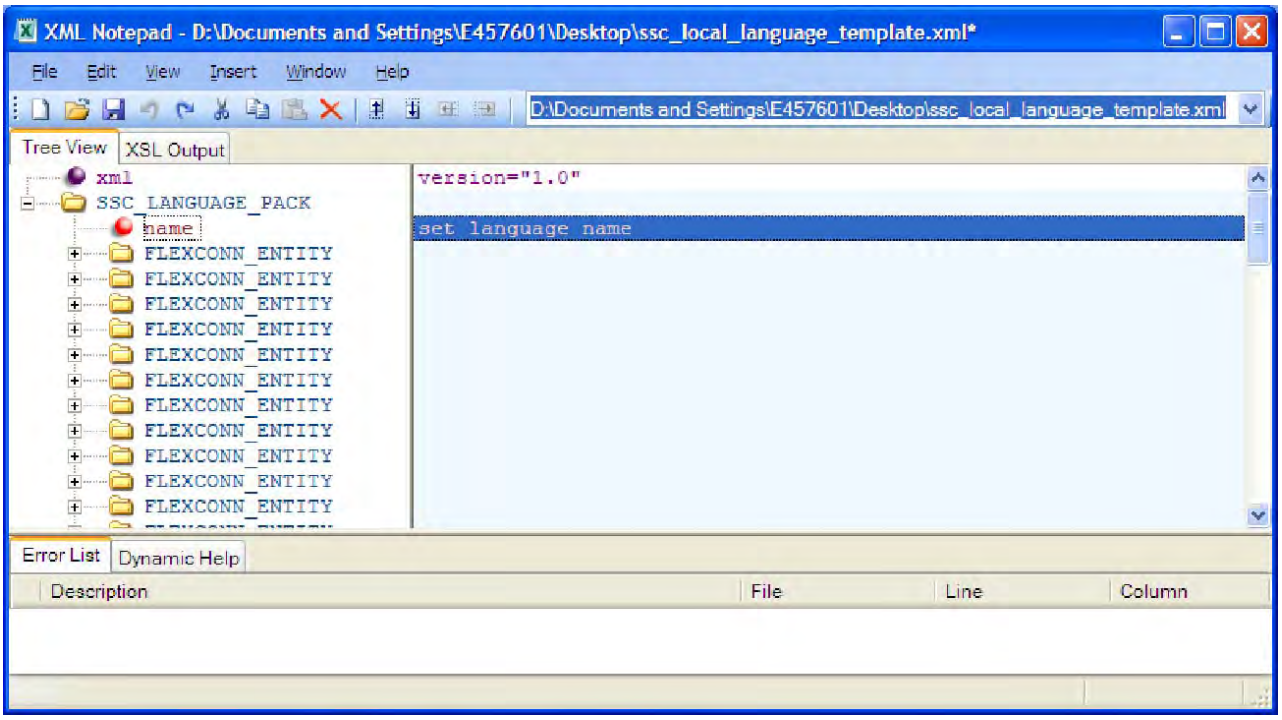


FIGURE 5-7 Screenshot detail of the XML template

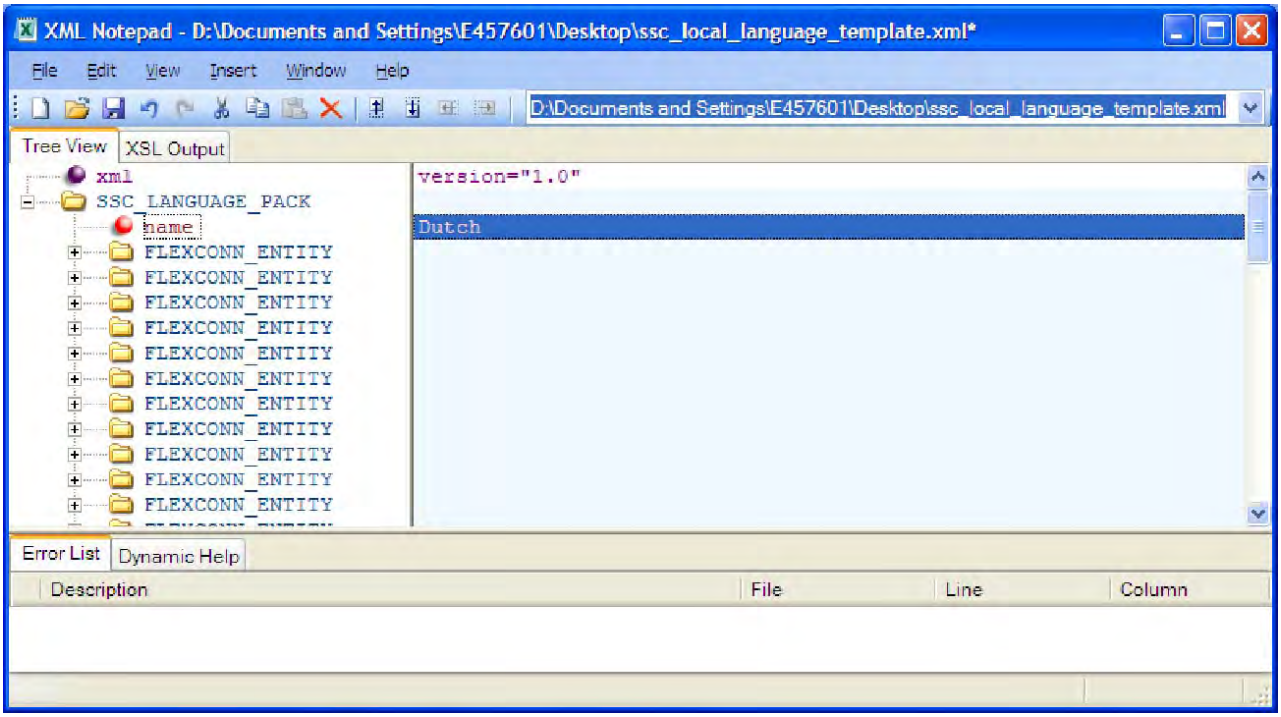
NOTE: This manual displays screenshots from XML Notepad 2007, but any text editor can be used.

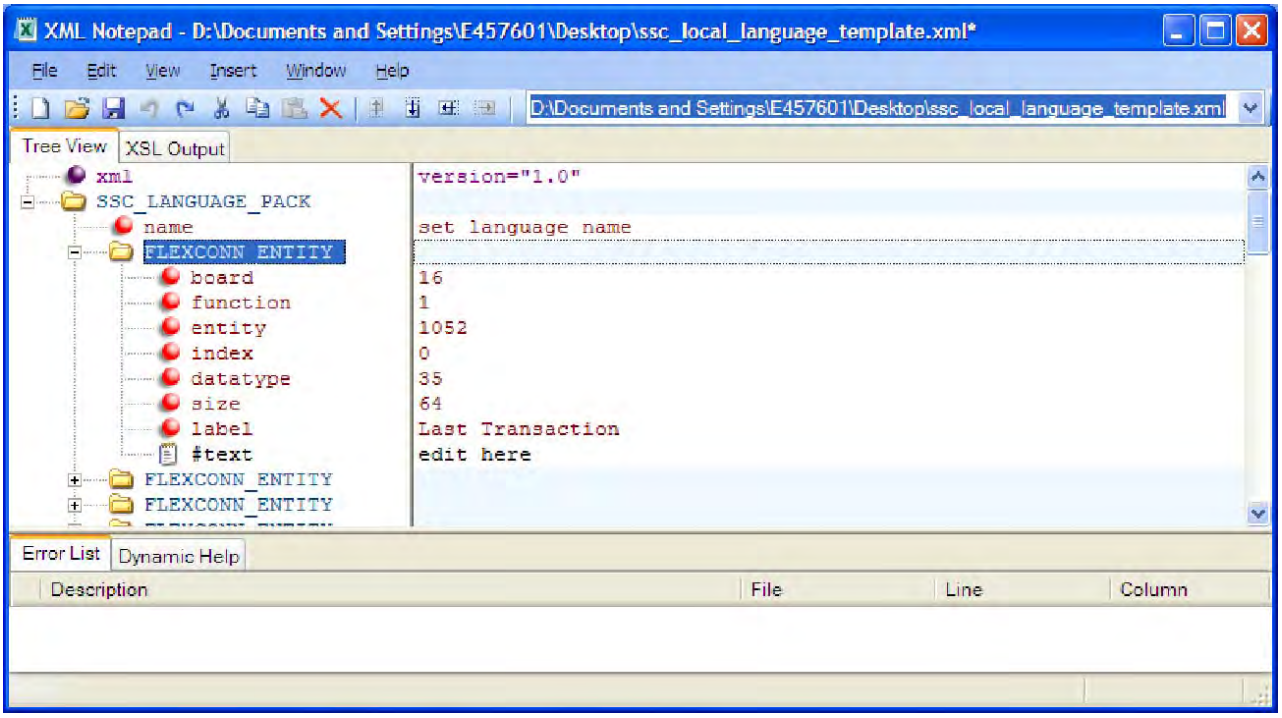
2. Replace the text **set language name** with the name of the language.

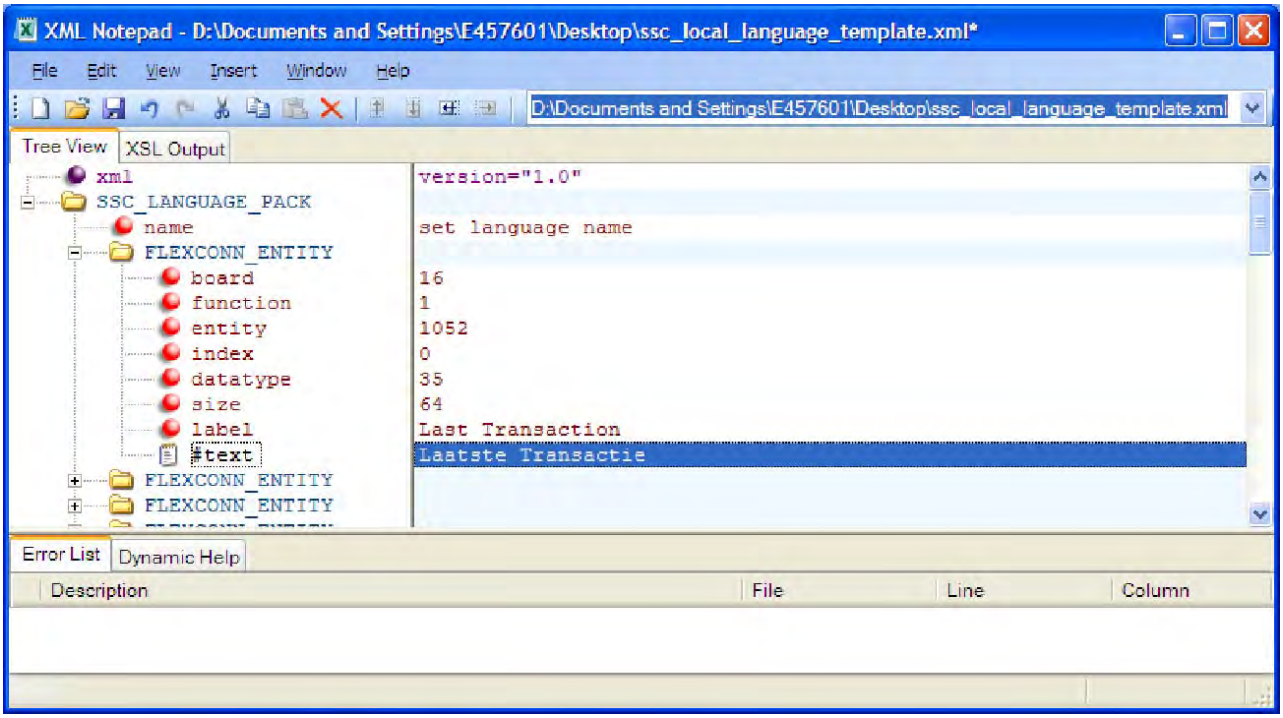


3. Provide a translation for every FLEXCONN_ENTITY instance, by replacing the “edit here” text with the local language.

NOTE: Do not edit other fields.


XML Notepad - D:\Documents and Settings\E457601\Desktop\ssc_local_language_template.xml*
File Edit View Insert Window Help
D:\Documents and Settings\E457601\Desktop\ssc_local_language_template.xml
Tree View
XSL Output
xml
SSC_LANGUAGE_PACK
name
FLEXCONN_ENTITY
version="1.0"
Dutch
Error List
Dynamic Help
Description
File
Line
Column





4. Save the file and place it on the SD card in the following link: `Honeywell\SSC-A\Generic\Language packs`.
5. Upload the file to the device.
6. Change **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 value
- Wizard-based configuration for additive meter calibration
- Flexible I/O configuration
- Diagnostic screens
- Record-based approach to transactions, recipes, and calibrations make re-use possible
- Interoperable with both the Fusion4 IR Controller and the LAD
- A graphical user interface to the LAD

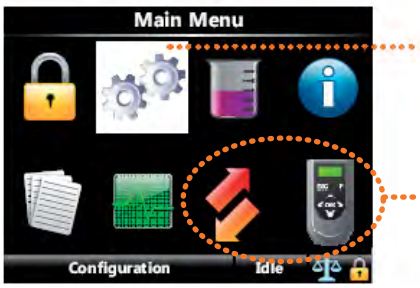
The following sections briefly explain all the Main Menu items/aspects.

5.4.3 Main Menu

Title

Main Menu icon

Name of selected item



Selected item
(focus rectangle)

Only available
if LAD is connected

5.4.4 Text Input Screen

Title bar

Single line edit field

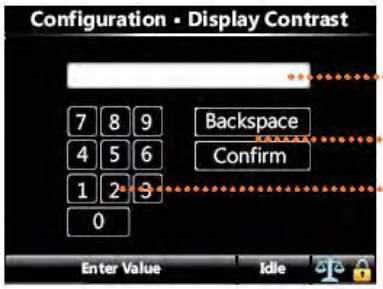
Selected letter

Action message

Numbers grouped

Letters grouped

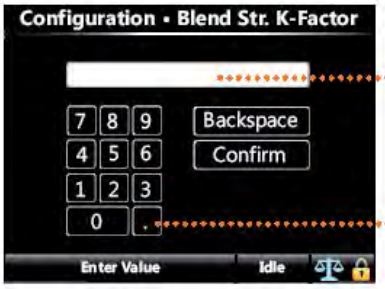
5.4.5 Numeric Input Screen



Single line edit field

Confirm & Backspace buttons

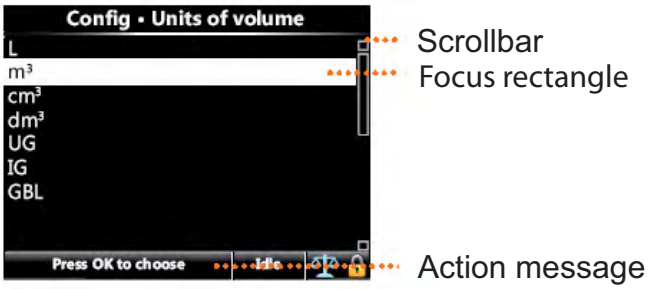
Number buttons



Single line edit field

Point button

5.4.6 Enumeration Input Screen



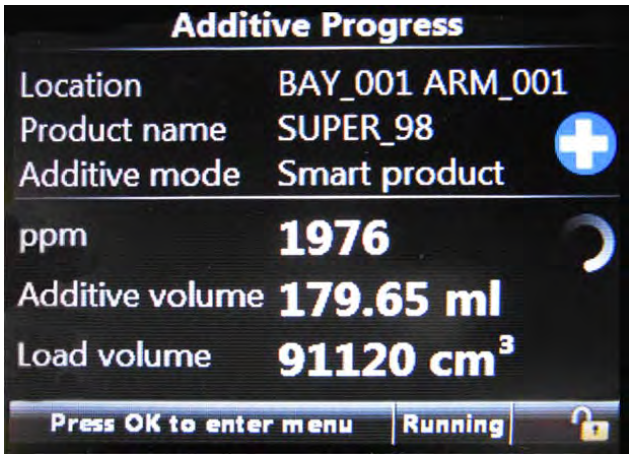
5.4.7 Status Bar

- 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.



See screen above	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 screens below.
- The "<" and ">" navigation buttons on the Fusion4 IR Controller or LAD can be used to explicitly toggle between these screens.

5.6 Transfer

NOTE: Only when the LAD is connected!

- Through this user's interface, the following type of records can be transferred between the SSC and the LAD.
  - Transaction records
  - Configurations
  - Events / Logs
  - Calibration records
  - Recipes
  - Language packs

5.7 LAD Functions

NOTE: Only when the LAD is connected!

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

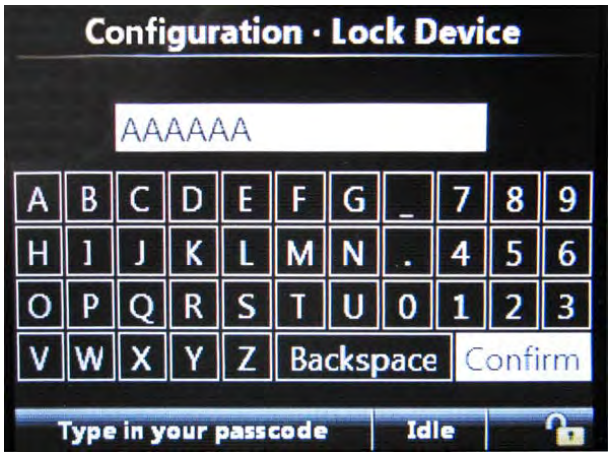
- A single password is used to lock the device from further configuration through HMI.
- Password consists of all characters and the size of the password must be between 1 and 6 characters.
- Device remains unlocked until explicitly locked again.
- Reading the password used for locking the device can be disabled by the jumper JP2.

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

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

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

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



To unlock the device, ensure to 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 forgotton, then the jumper should be removed or replaced in order to be able to read the password again (see FIGURE 5-8).

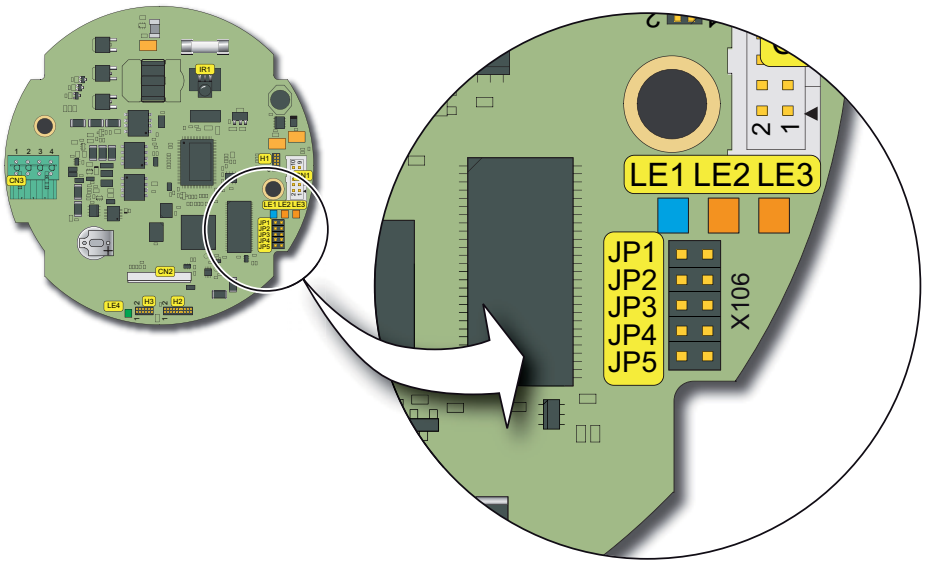


FIGURE 5-8 Lock the device password read protection by jumper JP2

5.9 Device Commissioning

5.9.1 Using the Menu

Commissioning of the SSC-A is performed by its menu-based interface.

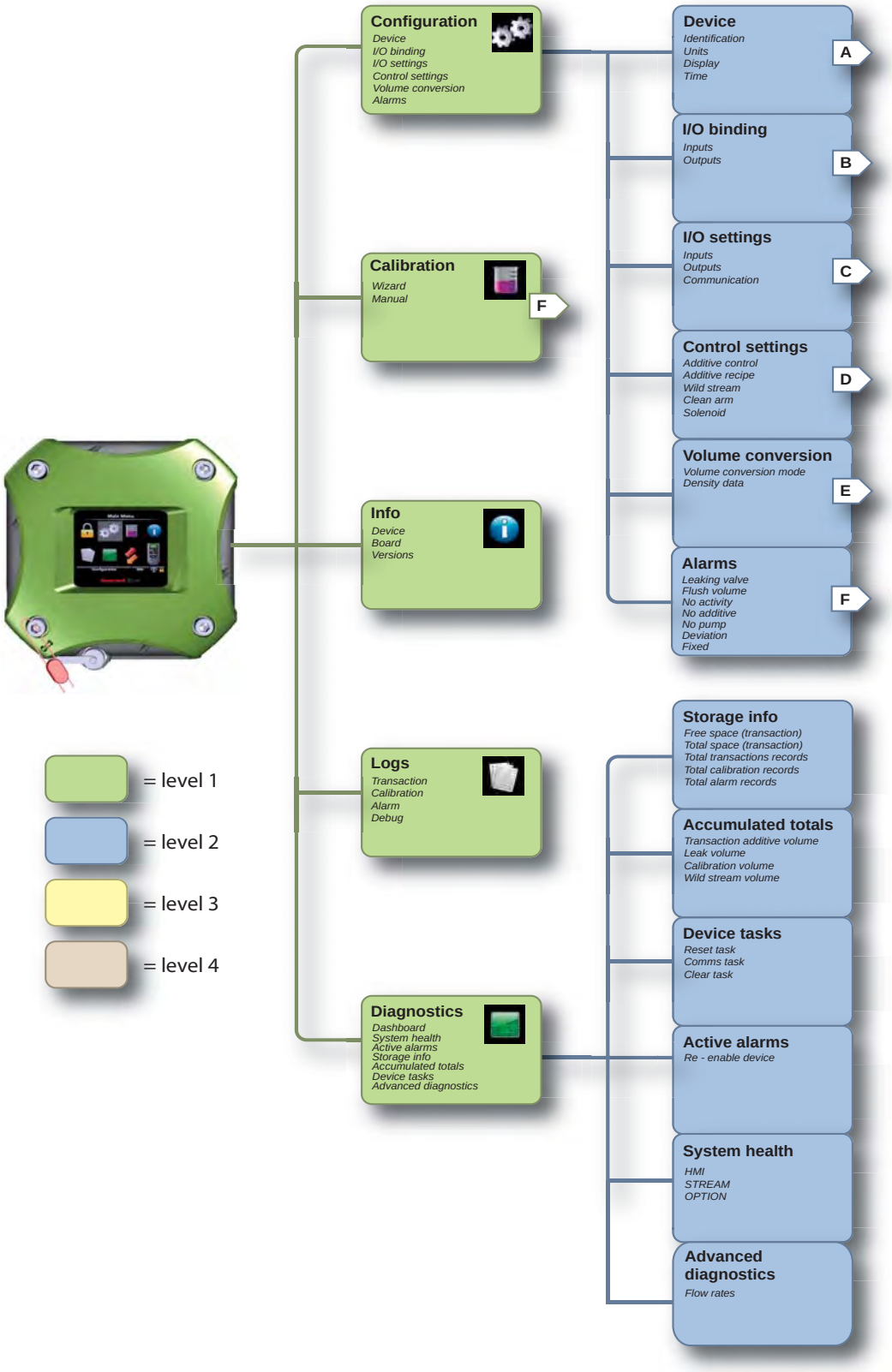
By using the Fusion4 IR Controller or the LAD, and starting from the Main Menu, the various sub-menus can be selected.

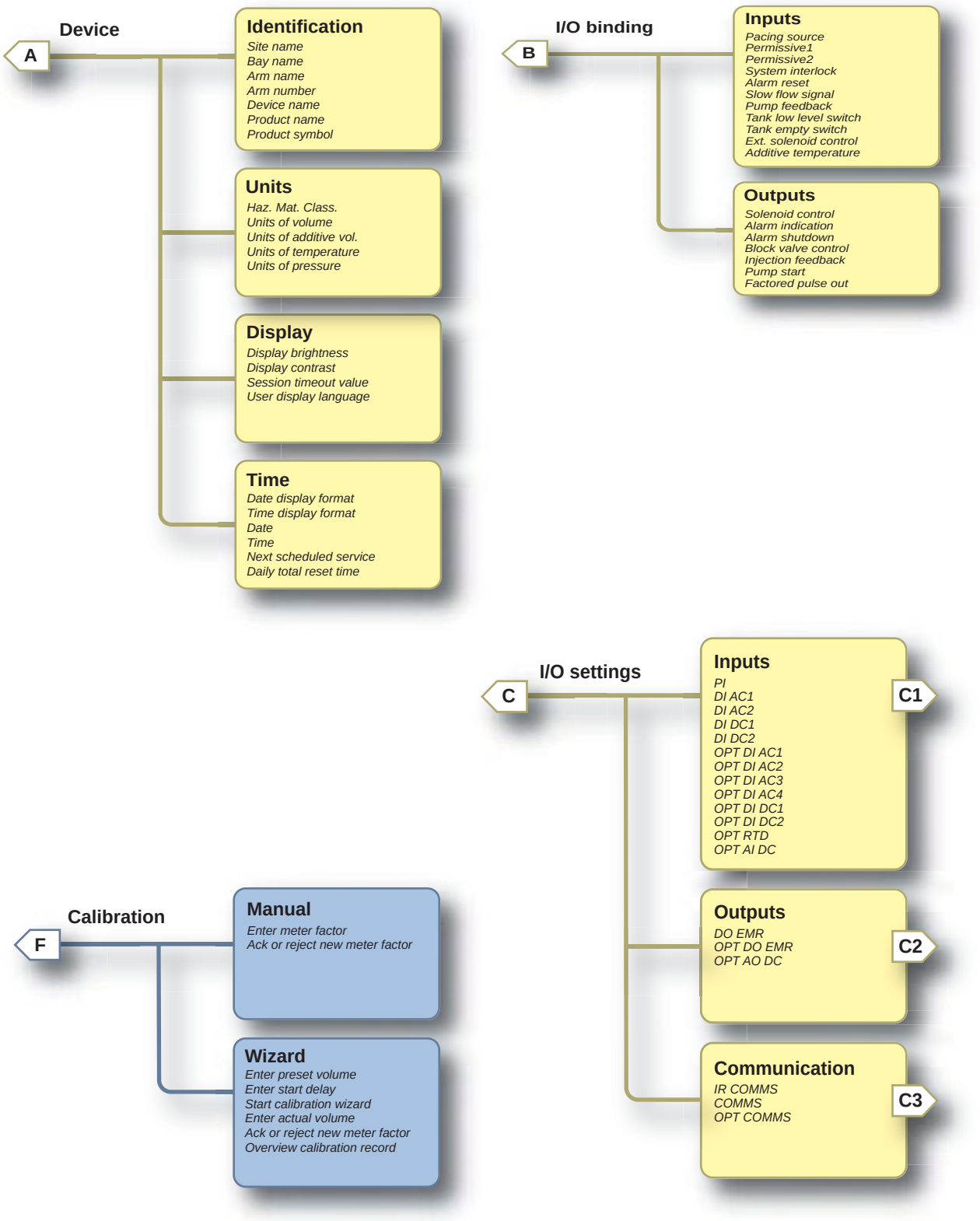
In this way all entities can be reached and set.

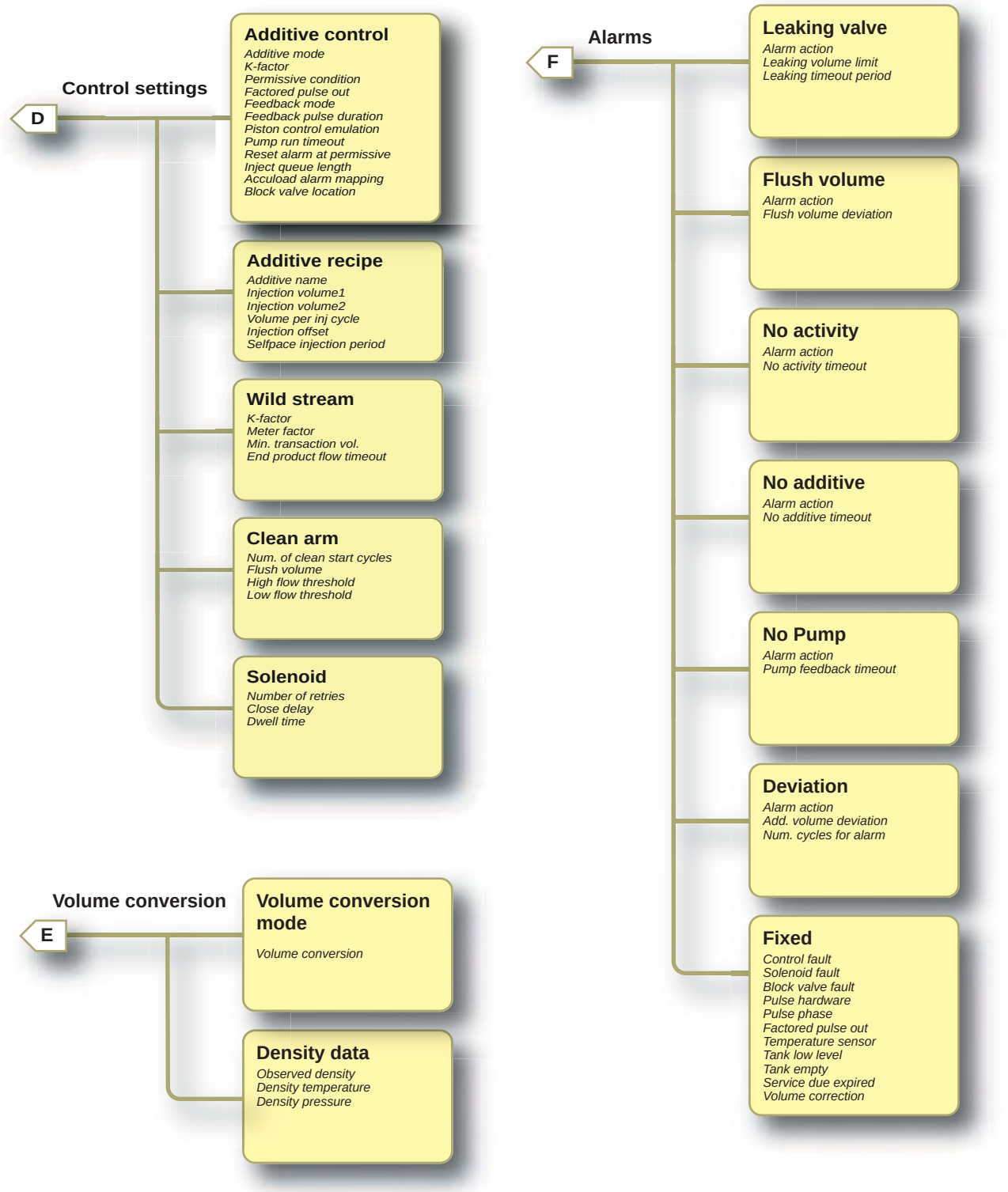
5.9.2 Menu Structure

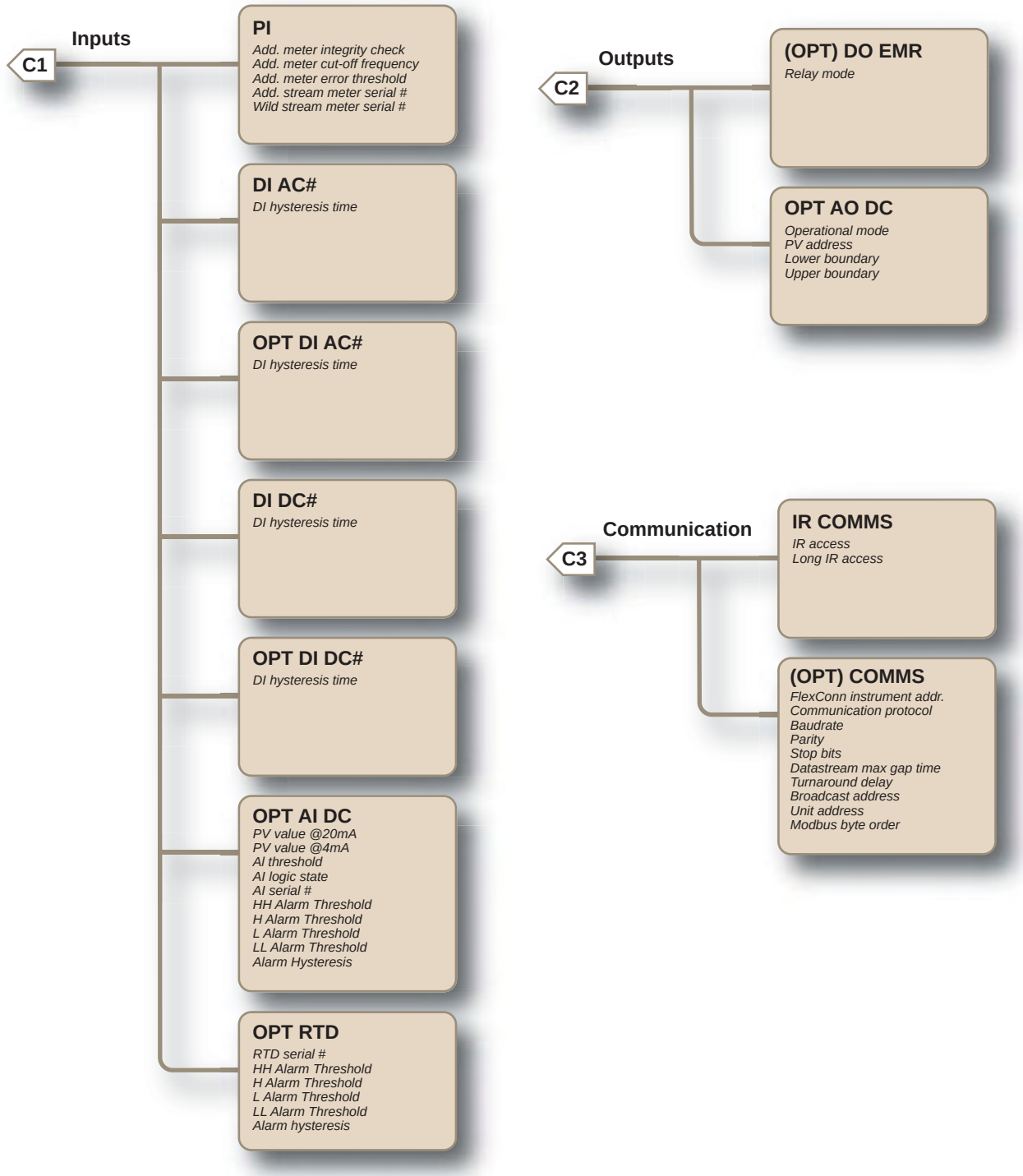
For an overview of all the entities and the parameters, see the following diagrams.

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


Device
A
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
I/O binding
B
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
I/O settings
C
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
Calibration
F
Manual
Enter meter factor
Ack or reject new meter factor
Wizard
Enter preset volume
Enter start delay
Start calibration wizard
Enter actual volume
Ack or reject new meter factor
Overview calibration record


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
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



1. The entity [Add. meter cut-off frequency] in the PI parameter is displayed as [Add. meter cut-off frequen] in the SSC-A device.

5.10 Additive Injection Application Overview

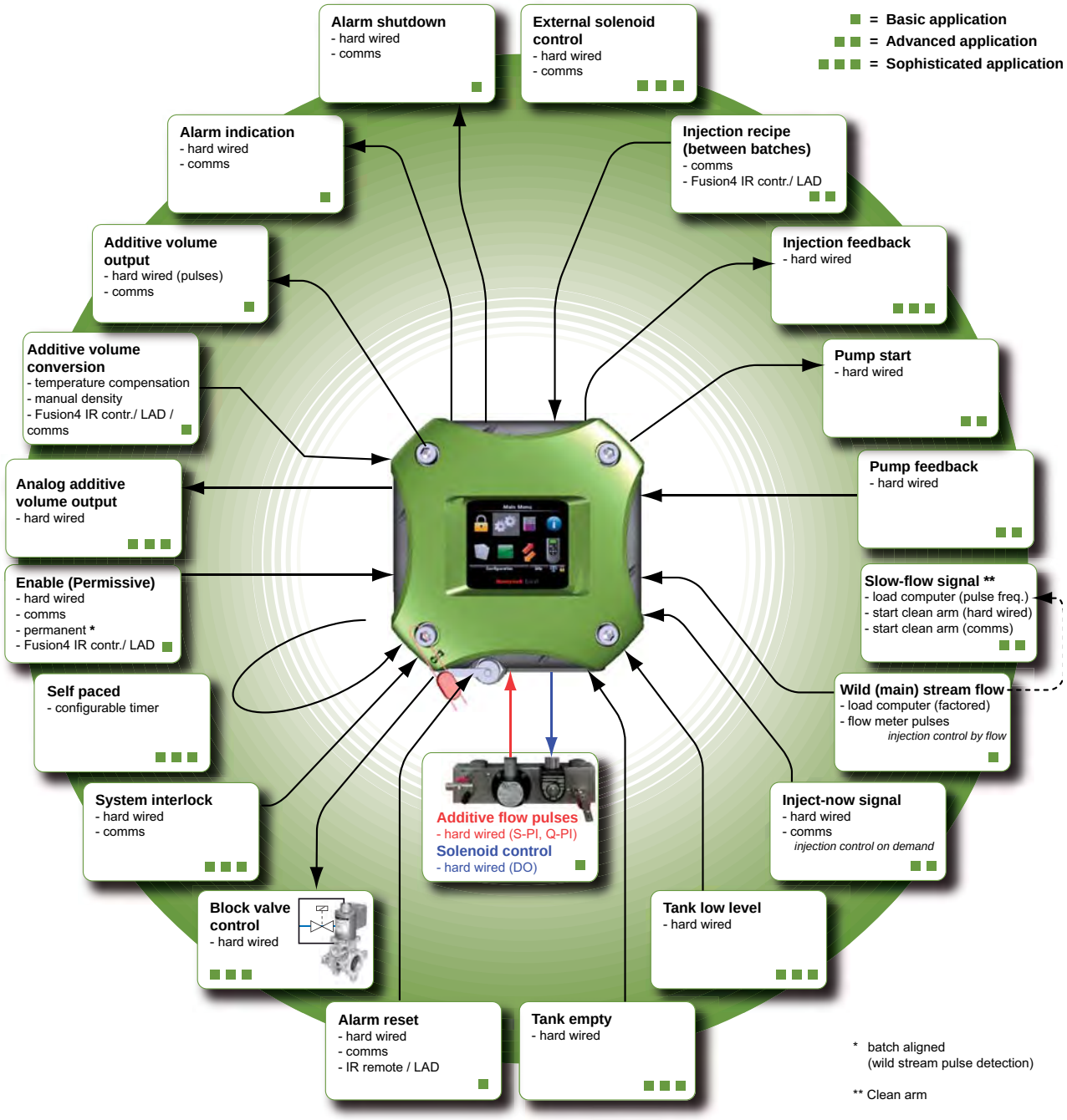


FIGURE 5-9 Additive injection application overview

5.11 Configuration

5.11.1 Using the Configuration Menu

- You can access the device configuration parameters, except the additive meter calibration entities.
- The structured menu system with device configuration are grouped in a logical order.
- The current device configuration values appear.
- All configuration values are edited one at a time in 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 maximum 7 characters in order to see the complete name on the SSC screen.
[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 maximum 7 characters in order to see the complete name on the SSC screen.
[Arm number]	The number of the loading arm at which the SSC is located at site.	A value which is less than 32.
[Device name]	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 maximum 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 U.S.-related market, you can select from a list of API symbols. For the EU-related market, you can select from a list of EI symbols. 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 entities [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	

Description	Menu text displayed	Symbol
Low grade unleaded gasoline	LGU gasoline	
Ultra low sulfer diesel	ULS diesel	
Low sulfer diesel	LS diesel	
High sulfer diesel	HS diesel	
Low sulfer no. 1 fuel oil	LS no. 1 fuel oil	
High sulfer no. 1 fuel oil	HS no. 1 fuel oil	
Low sulfer no. 2 fuel oil	LS no. 2 fuel oil	
High sulfer no. 2 fuel oil	HS no. 2 fuel oil	
Ultra low sulfer kerosene	ULS kerosene	
Low sulfer kerosene	LS kerosene	
High sulfer kerosene	HS kerosene	
E5 (5% Alcohol based fuel)	API E5	
E10 (10% Alcohol based fuel)	API E10	
E20 (20% Alcohol based fuel)	API E20	
B5 (5% Bio blended diesel)	API B5	
B10 (10% Bio blended diesel)	API B10	

Description	Menu text displayed	Symbol
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	
Premium unleaded Petrol (95 octane)	PU petrol	
Super unleaded petrol (97 octane)	SU petrol	
E5 (5% ethanol, 95% petrol)	EU E5	
E10 (10% ethanol, 90% petrol)	EU E10	
E20 (20% ethanol, 80% petrol)	EU E20	
DERV		
B5 (5% FAME, 95% diesel)	EU B5	
B10 (10% FAME, 90% diesel)	EU B10	

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

5.11.2.2 Units

Entity	Description	Value range
[Haz. mat. class]	With this configuration entity, you can specify the 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]	With this entity you can select the engineering units for volume.	<L> (default) <m^3> <cm^3> <dm^3> <US Gal> <UK Gal> <bbls>
[Units of additive vol.]	With this entity you can select the engineering units for additive volume.	<ml> (default) <cc>
[Units of temperature]	With this entity you can select the engineering units for temperature.	<^{0}C> (default) <^{0}F>
[Units of pressure]	With this entity you can select the engineering units for pressure.	<Pa> (default) <KPa> <PSI Small> <PSI Large> <bar>

Description	Name	Unit	Range min	Range max	Format
Transaction volume	Litre Cubic meter Cubic centimeter Cubic decimeter US gallons UK gallons Barrel	L m^3 cm^3 dm^3 US gal UK gal bbls	0 0 0 0 0 0 0	999999.99 999.99999 999999990 999999.99 99999.999 99999.999 9999.9999	6 [ds] 2 3 [ds] 5 9 6 [ds] 2 5 [ds] 3 5 [ds] 3 4 [ds] 4
Accumulated total volume	Litre Cubic meter Cubic centimeter Cubic decimeter US gallons UK gallons Barrel	L m^3 cm^3 dm^3 US gal UK gal bbls	0 0 0 0 0 0 0	99999999 99999.999 99999999000 99999999 9999999.9 9999999.9 999999.99	8 5[ds]3 11 8 7[ds]1 7[ds]1 6[ds]2

Description	Name	Unit	Range min	Range max	Format
Transaction additive volume	Millilitre Cubic centimeter	ml cc	0 0	999999.99 999999.99	6[ds]2 6[ds]2
Accumulated total additive volume	Liter Cubic meter Cubic centimeter Cubic decimeter US Gallons UK Gallons Barrel	L m^3 cm^3 dm^3 US gal UK gal bbl	0 0 0 0 0 0 0	99999.999 99.999999 99999999 99999.999 99999.999 99999.999 999.99999	5[ds]3 2[ds]6 8 5[ds]3 5[ds]3 5[ds]3 3[ds]5
Mass	Kilogram Metric ton Pound Long ton (UK) Short ton (US)	kg ton lb long ton US ton	0 0 0 0 0	999999.99 999.99999 999999.99 999.99999 999.99999	6[ds]2 3[ds]5 6[ds]2 3[ds]5 3[ds]5
Temperature	Celsius Fahrenheit	°C °F	-300.00 -400.0	300.00 572.0	3[ds]2 3[ds]1
Density	Kilogram cubic meter Degrees API Pounds cubic feet Relative density @ 60°F	kg/m3 °API lb/ft3 RD60	0 -50.0 0 0	9999.9 600.0 999.99 9.9999	4[ds]1 3[ds]1 3[ds]2 1[ds]4
Pressure	Bar Pascal Kilo Pascal PSI RANGE 100 PSI RANGE 1000	bar Pa kPa psi_r100 psi_r1000	0 0 0 0 0	999.99 99999000 99999 999.9999 999.999	3[ds]2 8 5[ds]0 3[ds]4 3[ds]3
Ratio	Percentage Parts per million	% ppm	0.00 0	99.99 999999	2 [ds] 2 6
Expansion coefficient	Inverse Fahrenheit Inverse Celsius	10-7/°F 10-7/°C	00000 00000	99999 99999	5 5
Flow rate	Liter per minute Cubic meter per minute Cubic centimeter per minute Cubic decimeter per minute US Gallons per minute UK Gallons per minute Barrel per minute	L/min m3/min cm3/min dm3/min US gal/min UK gal/min bbl/min	0 0 0 0 0 0 0	999999.99 999.99999 999999990 999999.99 99999.999 99999.999 9999.9999	6 [ds] 2 3 [ds] 5 9 6[ds]2 5[ds]3 5[ds]3 4[ds]4
Additive Flow rate	Milliliter per minute Cubic centimeter per minute	ml/min cc/min	0 0	999999.99 999999.99	6[ds]2 6[ds]2

5.11.2.3 Display

Entity	Description	Value range
[Display brightness]	With this entity you can enter the brightness of the display. The brightness is controlled by the backlight of the display.	<0> % (low) ... <100> % (high) (default = <75> %)
[Display contrast]	With this entity you can enter the contrast of the display.	<0> % (low) ... <100> % (high) (default = <75> %)
[Session timeout value]	With this entity you can enter the time in seconds between last key pressed on Fusion4 IR Controller and the moment the display switches back to one of the running screens.	<10> s ... <600> s (default = <300> s)
[User display language]	With this entity you can select the display language for the running screens.	<English UK> <English US> (default) <French> <German> <Dutch> <Spanish> <Chinese> <Japanese> <Polish> <Portuguese> <Italian> <Local language>

5.11.2.4 Time

Entity	Description	Value range
[Date display format]	With this entity you can select the format of the date.	<DD_MM_YY> (default) <MM_DD_YY> <YY_MM_DD> <DD_MM_YYYY> <MM_DD_YYYY> *Note: Only the first 3 selections are completely visible on the SSC screen.*
[Time display format]	With this entity you can select the format of the time.	<12-hour> <24-hour> (default) *Note: Only the 24-hour selection is completely visible on the SSC screen.*
[Date]	With this entity you can select the actual date that is used for time stamping of transactions, calibrations, and alarms.	Year Month Day *Note: By default, the current date appears. However, to change the default date, enter the year, month, and day.*
[Time]	With this entity you can select the actual time that is used for time stamping of transactions, calibrations, and alarms.	Hour Minute Second Millisecond *Note: By default, the current time appears. However, to change the default time, enter the hour, minute, second, and millisecond.*
[Next scheduled service]	With this entity you can select the date when the next service activities should take place for the SSC-A. It is handled like an alarm and it can be configured to desired alarm behaviour (Disable, Display, or Shutdown).	Year Month Day *Note: By default, 01-01-10 appears. However, to change the default date enter the year, month, and day.*
[Daily total reset time]	With this entity you can select the time at which the daily totals is cleared.	Hour Minute Second Millisecond *Note: By default, 00:00:00 appears. However, to change the daily totals reset time, enter the hour, minute, second, and millisecond.*

5.11.3 I/O binding

The new 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 FIGURE 5-10).

FIGURE 5-10 I/O allocation using the Fusion4 IR Controller or the LAD F4A10-1008

➔ Select **Configuration** in the Main Menu (see screen right)

➔ Select [I/O binding] + <OK>

➔ Select [Inputs] or [Outputs] + <OK>

A specific entity can be selected.

For example, [Pacing source], [Pump feedback], and so on, and link it to a specific I/O function.

For example, <DI AC 1> (Digital Input AC[1], number 1), <DO EMR> (Digital Output Electromechanical Relay), and so on.

The possible entities and the I/O functions to which a specific entity can be linked is provided in the following table (as in TestPack 6).

Input/Output	Entity	Link is possible to ...
Inputs *NOTE: The default value for the Input entities are 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
	[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 are None, except for 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

1. For I/O functions description, see 3.8 - Input Functions ... 3.10.1.3 - Cable Specifications.

5.11.3.1 Inputs

Entity	Description	Value range
[Pacing source]	With this entity you can select the physical source for the additive pacing.	See section 5.11.3
[Permissive1]	With this entity you can select the physical source for the permissive function.	
[Permissive2]	With this entity you can select the physical source for the permissive function.	
[System interlock]	With this entity you can select the physical source for a system interlock or secondary permissive function. Secondary permissive acts as an additional check on the existing permissive1 or permissive2 whichever is enabled at that time.	
[Alarm reset]	With this entity you can select the physical source for the alarm reset function.	
[Slow flow signal]	With this entity you can select the physical source for the slow flow signal.	
[Pump feedback]	With this entity you can select physical source for the pump feedback function.	
[Tank low level switch]	With this entity you can select the 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]	With this entity you can select the 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
[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

The Honeywell Enraf family of injectors utilize 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 configuration of the following three entities.

1. Pacing source
2. [Pacing source] I/O binding
3. [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.*

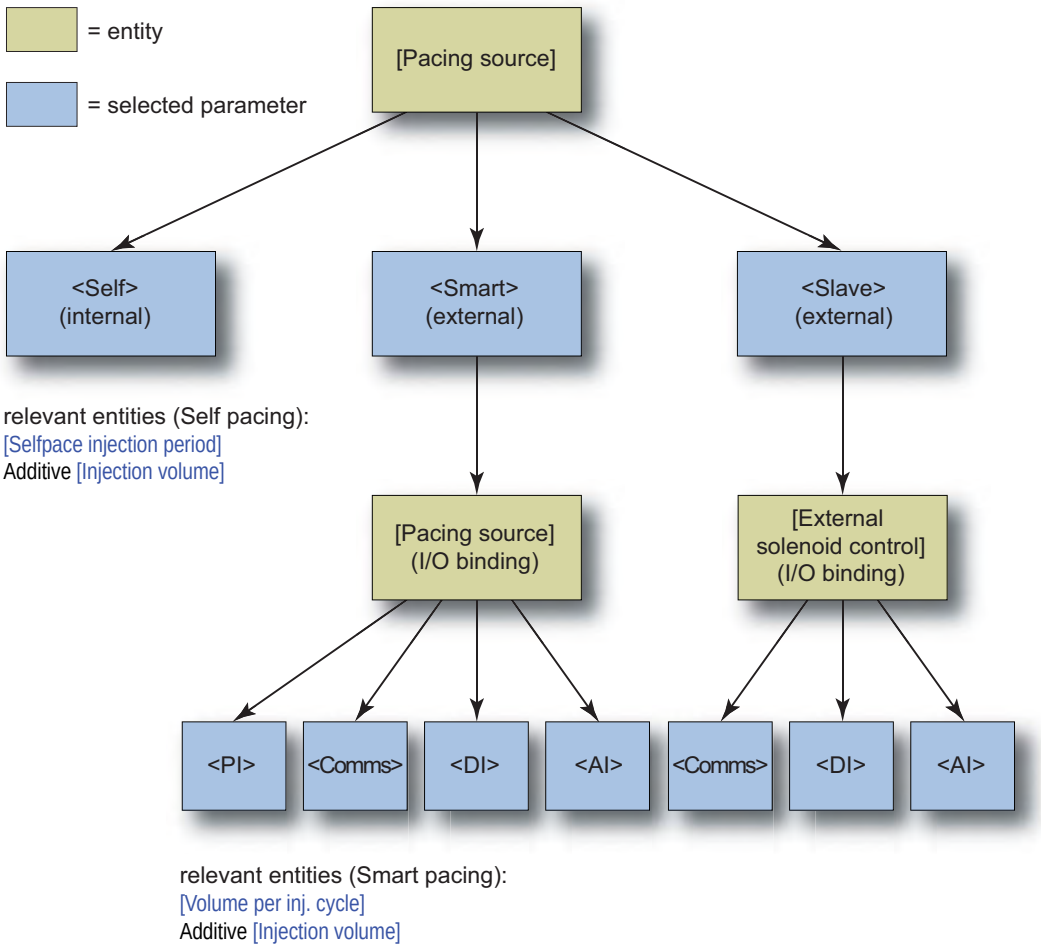


FIGURE 5-11 Additive pacing mode selection

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5.11.3.1.1.1 Smart

The Smart mode offers 4 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 an 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.

REMARK: 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

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 the digital input is active.

  • 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 resetable 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 = flush volume / 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 > 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 < 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 condition. To clear the tank low-level signal, the tank must be refilled to a point that closes the level switch. At that time, the alarm disappears. There is no need to reset the condition as with normal alarms.

5.11.3.1.9 Tank empty switch

If the *tank-empty condition* exists, the SSC-A *cannot operat*e under normal condition. To clear the tank-empty signal, the tank must be refilled to a point that closes the level switch. At that time, the alarm disappears and the SSC-A can then resume normal use. It is not required to reset the condition 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 α = 0.00385 Ω/Ω/ºC [0.00214 Ω/Ω/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 100Ω +/- 0.06Ω at ºC [32ºF]
- Class B is 100Ω +/- 0.12Ω at ºC [32ºF]

Not explicitly defined in IEC 60751 but compatible:

- Class 1/3 DIN is 100Ω +/- 0.04Ω at 0ºC [32ºF] (0.12Ω / 3 = 0.04Ω)
- Class 1/5 DIN is 100Ω +/- 0.024Ω at 0ºC [32ºF] (0.12Ω / 5 = 0.024Ω)
- Class 1/10 DIN is100Ω +/- 0.012Ω at 0ºC [32ºF] (0.12Ω / 10 = 0.012Ω)

Entity	Description	Value range
[Temperature input]	With this entity you can select the 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]	With this entity you can select the physical source for the additive solenoid control function.	See section 5.11.3
[Alarm indication]	With this entity you can select the physical source for the alarm indication function.	
[Alarm shutdown]	With this entity you can select the physical source for the alarm shutdown function.	
[Block valve control]	With this entity you can select the physical source for the block valve control function.	
[Injection feedback]	With this entity you can select the physical source for the injection feedback function.	
[Pump start]	With this entity you can select the physical source for the additive pump start function.	
[Factored pulse out]	With this entity you can select the 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 modes in which this setting is applicable are marked as *underscored italic*.
- 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* - It describes the behaviour 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".

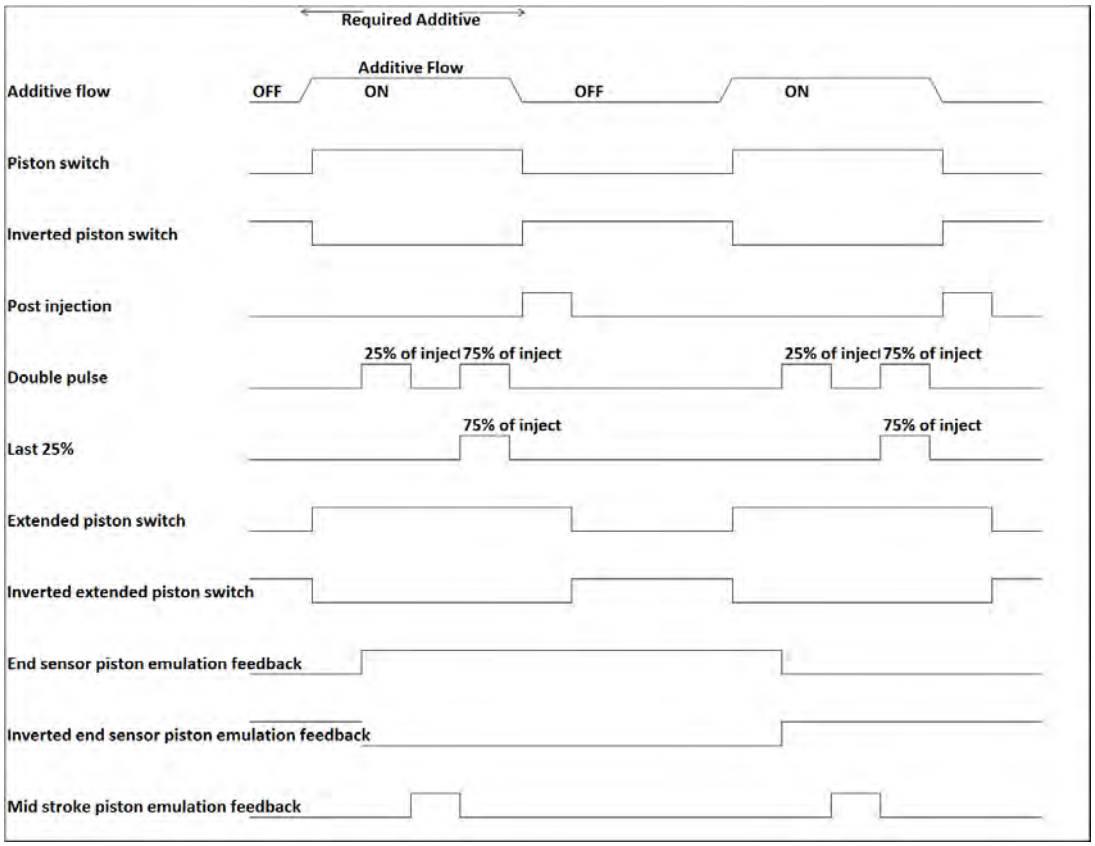


FIGURE 5-12 Injector feedback signals

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 intergity check]	With this entity you can select the pulse type of the additive flow meter.	<Disable> = single pulse (default) <Enable> = dual pulse (quad)
[Add. meter cut-off frequency]	With this entity you can enter the frequency level below which the pulse integrity cannot be monitored.	50 Hz (default)
[Add. meter error threshold]	With this entity you can enter the 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 #]	With this entity you can enter the serial number of the connected additive flow meter. This is then a part of the calibration record.	
[Wild stream meter serial #]	With this entity you can enter the serial number of the wild stream flow meter.	

5.11.4.1.1.1 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 litres/minute.

5.11.4.1.2 DI (for both AC# and DC#)

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

5.11.4.1.3 OPT AI DC

Entity	Description	Value range
[PV value @20mA]	With this entity the process value at 20 mA can be configured.	default = <100.0>
[PV value @4mA]	With this entity the process value at 4 mA can be configured.	default = <0.0>
[AI threshold]	With this entity the analog input threshold value defines 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]	With this entity you can determine how the injector controller uses the analog input signal. • <Positive>: It provides the range 0 or not active from 4 - 12 mA and 1 or active from 12 mA to 20 mA. • <Negative>: It 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].	

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.

5.11.4.1.3.1 OPT RTD

Entity	Description	Value range
[RTD serial #]	With this entity you can enter the serial number of the connected PT100 temperature probe.	Alphanumeric string of maximum 8 characters.
[HH Alarm Threshold]	With this entity you can set the high high temperature alarm threshold. When exceeded a temperature alarm occurs.	default = <0.0>
[H Alarm Threshold]	With this entity you can set the high temperature alarm threshold. When exceeded a temperature alarm occurs.	default = <0.0>
[L Alarm Threshold]	With this entity you can set the low temperature alarm threshold. When exceeded a temperature alarm occurs.	default = <0.0>

Entity	Description	Value range
[LL Alarm Threshold]	With this entity you can set the low low temperature alarm threshold. When exceeded a temperature alarm occurs.	default = <0.0>
[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] - [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 to be *energized* or *de-energized* during operation, by setting the [Relay mode] entity to <Energized> (default setting) or <De-energized> respectively.

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

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

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

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

Physically Configured	Relay Mode	Relay State	Physical Result
Normally Open (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

5.11.4.2.1.2 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 setting must be set in the I/O setting menu for the Analog Output function:
  - The [Upper boundary] entity should be set to the maximum process variable value (in default units) to be associated with a 20 mA output.
  - The [Lower boundary] entity should be set to the process variable value (in default units) to be associated with a 4 mA output.
  - The operational mode should be set to <Follow PV>.

Entity	Description	Value range
[Operational mode]	With this entity you can select between 2 modes for the anolog output.	• <Explicitly Driven> (default) - The output value is set by the application (for example, valve control). • <Follow PV> - The output reflects one of the Primary Values measured by the SSC.
[PV address]	With this entity you can select the process variable to be mapped on the analog output (4-20 mA).	<None> (default) <Acc. additive vol.> ml <Additive volume> ml <Additive flowrate> L/min <Wild flowrate> L/min <ppm>
[Lower boundary]	With this entity you can select the PV value at 4 mA. For the actual current value lineair 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]	With this entity you can select the PV value at 20 mA. For the actual current value lineair 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]	With this entity you can enable the IR interface if it was turned off.	<IR enabled> (default) <IR disabled> *Note: IR communication cannot be disabled from IR remote control device when LAD is not attached to the device.*
[Long IR access] *	Disabling this entity (default) uses the short login sequence of pressing only the [ATTN] key. 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)

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

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

5.11.4.3.2 (OPT) COMMS

5.11.4.3.2.1 Introduction

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

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

The SSC-A includes several different communications protocols. These include FlexConn, FMC Smith, 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 has 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:

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

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

5.11.4.3.2.4 Baudrate

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

- 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 Protocol FMC Smith

The FMC Smith protocol is closely related to the protocol defined by Smith Meter Inc. for use with their AccuLoad™ Electronic Preset.

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

5.11.4.4.2 Protocol Brooks

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

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

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

5.11.4.4.3 Protocol Modbus RTU/Modbus legacy

The Modbus RTU/Modbus legacy protocol is a modified subset of Modicon Inc.'s 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.

5.11.4.4.4 FlexConn Protocol

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

The Fusion4 Portal 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

5.11.4.5 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.

Honeywell Enraf can provide an EIA-485 to EIA-232 converter 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.]	With this entity you can select the device address for the FlexConn protocol.	<0> ... <1900> (default = <0>)
[Communication protocol]	With this entity you can select the protocol for the communication port.	<FlexConn> <FMC Smith> <Brooks> <Modbus RTU> <Modbus legacy>
[Baudrate]	With this entity you can select baudrate for the communication port.	<Baudrate 1200> <Baudrate 2400> <Baudrate 4800> <Baudrate 9600> (default) <Baudrate 19200> <Baudrate 38400> <Baudrate 57600> <Baudrate 115200> <Baudrate 128000>
[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)

Entity	Description	Value range
[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>
[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]	With this entity you can select the additive mode of the injector.	<Smart> (default) <Slave> <Self>
[K-factor]	With this entity you can set the 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]	With this entity you can select 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)
[Factored pulse out]	With this entity you can select the amount of pulses for each unit of additive volume dispensed.	<1 Pulse / Unit> (default) <10 Pulses / Unit> <100 Pulses / Unit> <1000 Pulses / Unit>
[Feedback mode]	With this entity you can select 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]	With this entity you can enter the 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>
[Pump run timeout]	With this entity you can enter the time in minutes between the last injection and the additive pump stop.	<1> min ... <255> mins (default = <10> mins)

Entity	Description	Value range
[Reset alarm at permissive]	With this entity you can set the alarm reset, when the SSC becomes permitted.	<Enable> <Disable> (default)
[Inject queue length]	With this entity the inject queue length can be configured. You can define the number of injections that can be queued up (that is, postponed) 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>)
[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 location]	With this entity you can select the block valve location in the stream.	<UPSTREAM> (default) <DOWNSTREAM>

5.11.5.2 Additive recipe

Entity	Description	Value range
[Addtive name]	With this entity you can enter the name of the additive stream product.	Text string of maximum 20 characters.
[Injection volume1]	With this entity you can enter the amount of volume to be injected per injection cycle when permissive 1 is active.	default = <20> ml
[Injection volume2]	With this entity you can enter the amount of volume to be injected per injection cycle when permissive 2 is active.	default = <20> ml
[Volume per inj. cycle]	With this entity the amount of wild stream volume per injection cycle can be set.	default = <40> L
[Injection offset]	With this entity a percentage to determine at what point the SSC-A gives the first injection during a transaction is entered. 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]	With this entity the time between injection cycles can be set. 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. There are two recipes 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 pace mode)
- Injection offset

■ Any of the two recipes can be used for transaction. The recipe to be used is dependent upon the permissive. Enabling permissive 1 enables the recipe 1 and enabling permissive 2 enables the 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 2 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 criterias are interrelated. Changing either one 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 optimum setting, without changing the actual recipe.

5.11.5.2.3 Where do I get my recipe?

Recipes are defined by the 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 optimum concentrations of the chemical in the fuel, and company policies are set which 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. In areas outside of the USA, a more typical concentration is cc's per 100 litres.

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

This↓ X Factor = This →	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 a common place to send a pacing pulse that was ON for 20 gallons and OFF for 20 gallons. This is the standard pacing injectors.

With today's 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 in determining how often to inject is the *k-factor* of the pacing pulse. This k-factor represents the *total number of pulses* that equals *one unit* of flow.

For example, if 5 pulses equals 1 litre [0.264 gal], the k-factor is 5.

If one pulse represents more than one unit of flow, the k-factor is less than one. For example, if 1 pulse equals 100 litres [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 litres [26.417 gal] per pulse, we are limited to injecting every 100, 200, 300, and so on, litres [26.417, 52.834, 79.252, and so on, 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 allows 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 FIGURE 5-13.

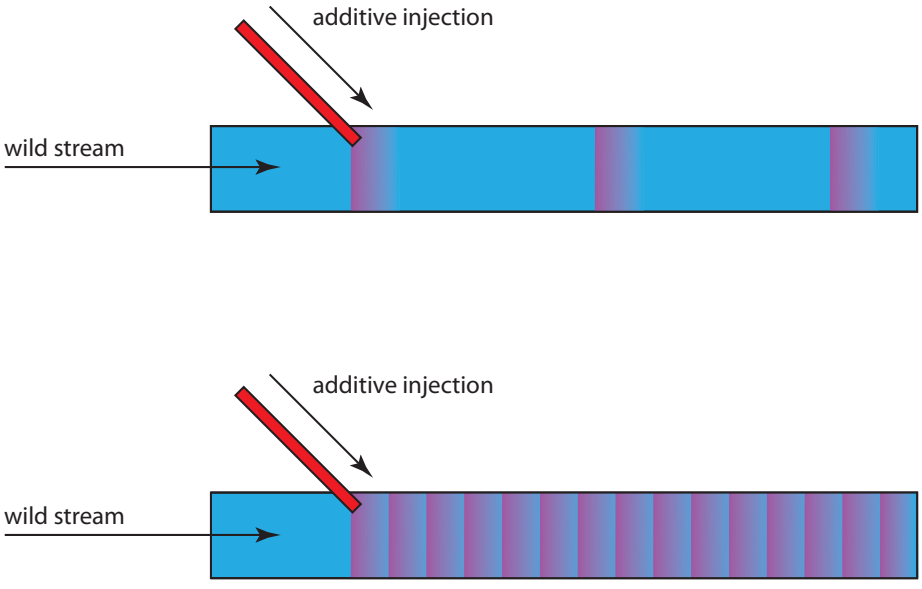


FIGURE 5-13 Frequency of injection

For this reason it is desirable to inject more frequently.

The limiting factor here is the *limitation of the injector hydraulics* to meter and to control very small volumes. The typical Honeywell Enraf 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]	With this entity you can set the 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]	With this entity you can set the K-factor *correction* of the wild stream in case the wild stream flow is measured by a real flow meter. The meter factor is determined during the *calibration* of the wild stream flow meter.	<0.0> ... <99999.999> (default = <1.0>)
[Min. transaction vol.]	With this entity 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]	With this entity the time in seconds can be configured to indicate the end of the transaction. When [End product flow timeout] 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 have been loaded before 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 in case the [Permissive I/O binding] is set to <None>.

5.11.5.4 Clean arm

Entity	Description	Value range
[Num. of clean start cycles]	With this entity you can set 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]	With this entity you can set 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]	With this entity you can set the flow rate which must be exceeded to start the injection process during clean arm operation.	<0> L/min ... <30000> L/min (default = <1000.00> L/min)
[Low flow threshold]	With this entity you can set the flow rate at which the flushing starts by stopping the additive injection process.	<0> L/min ... <30000> L/min (default = <1000.00> L/min)

5.11.5.5 Solenoid

Entity	Description	Value range
[Number of retries]	With this entity you can set the number of retries for opening the solenoid again in case no additive pulses are received.	<0> ... <2> (default = <2>)
[Close delay]	With this entity you can set the time in ms, the additive pulses must be stopped after the solenoid has been closed.	<500> ms ... <10000> ms (default = <500> ms)
[Dwell time]	With this entity you can set 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 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]	With this entity you can enter the temperature of the lab sample used to determine the additive product observed density.	default = <0.0>°C
[Density pressure]	With this entity you can enter the pressure of the lab sample used to determine the additive product observed density.	default = <0> KPa

5.11.7 Alarms

5.11.7.1 Leaking valve

Entity	Description	Value range
[Alarm action]	With this entity you can configure the alarm behaviour in case this particular 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]	With this entity you can set 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)
[Leaking timeout period]	With this entity you can set the 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]	With this entity you can configure the alarm behaviour in case this particular 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]	With this entity you can set the maximum percentage of the [Flush volume] that is allowed to be lower than the [Flush volume] without resulting in an alarm situation (Slow flow alarm).	<0> % ... <100> % (default = <10> %)

5.11.7.3 No activity

Entity	Description	Value range
[Alarm action]	With this entity you can configure the alarm behaviour in case this particular 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]	With this entity you can set the 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]	With this entity you can configure the alarm behaviour in case this particular 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]	With this entity you can set the 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 on [Alarm action].	<1> s ... <9> s (default = <2> s)

5.11.7.5 No pump

Entity	Description	Value range
[Alarm action]	With this entity you can configure the alarm behaviour in case this particular 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]	With this entity you can set the 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]	With this entity you can configure the alarm behaviour in case this particular 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)
[Add. volume deviation]	With this entity you can set the 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]. The alarm occurs at the end of the transaction.	<1> % ... <100> % (default = <10> %)
[Num. cycles for alarm]	With this entity you can set the number of additive injection cycles before the deviation alarm is evaluated.	<1 ... 99> (default = <5>)

5.11.7.7 Fixed

Entity	Description	Value range
[Control fault]	With this entity you can configure the [Control fault] alarm behavior in case this particular 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
[Solenoid fault]	With this entity you can configure the [Solenoid fault] alarm behavior in case this particular 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]	With this entity you can configure the [Block valve fault] alarm behavior in case this particular 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 hardware]	With this entity you can configure the [Pulse hardware] alarm behavior in case this particular 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 phase]	With this entity you can configure the [Pulse phase] alarm behavior in case this particular 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]	With this entity you can configure the [Factored pulse out] alarm behaviour in case this particular 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)
[Temperature sensor]	With this entity you can configure the [Temperature sensor] alarm behaviour in case this particular 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
[Tank low level]	With this entity you can configure the [Tank low level] alarm behaviour in case this particular 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]	With this entity you can configure the [Tank empty] alarm behaviour in case this particular 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)
[Service due expired]	With this entity you can configure the [Service due expired] alarm behaviour in case this particular 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)

Entity	Description	Value range
[Volume correction]	With this entity you can configure the [Volume correction] alarm behaviour in case this particular 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*. By the manufacturer, this K-factor is exactly specified per delivered flow meter.

To increase the accuracy of the flow meter, a calibration can be performed. This is performed by comparing the actual resulting fuel volume received in a calibrated vessel (see FIGURE 5-14) with the displayed value on the SSC-A screen, being the result of the value returned from the flow meter.

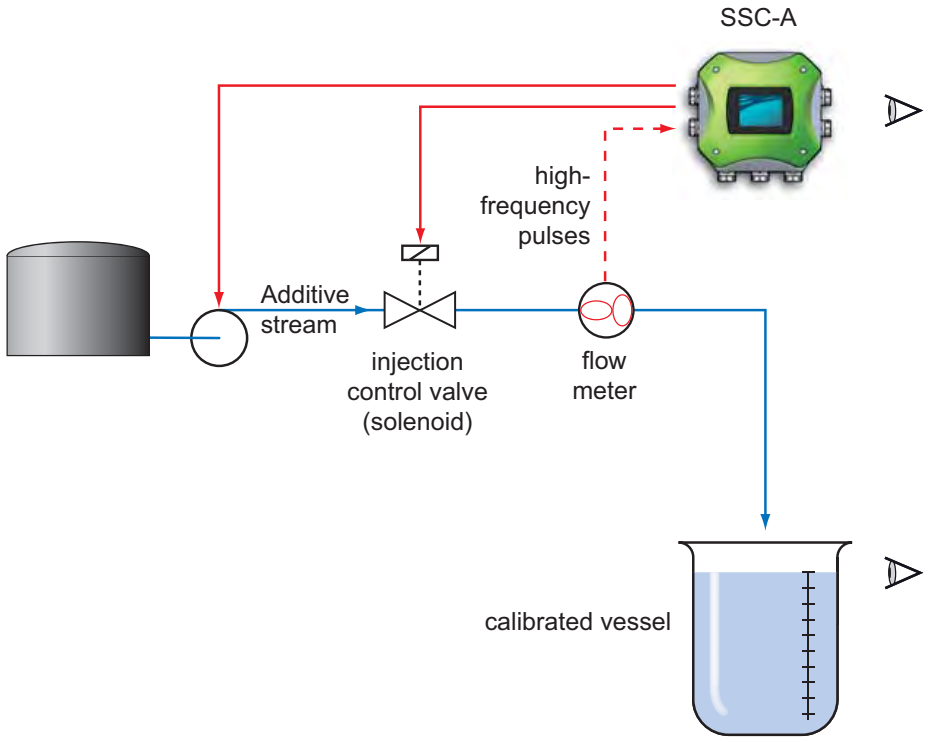


FIGURE 5-14 Calibrating the flow meter F4A10-0029

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:

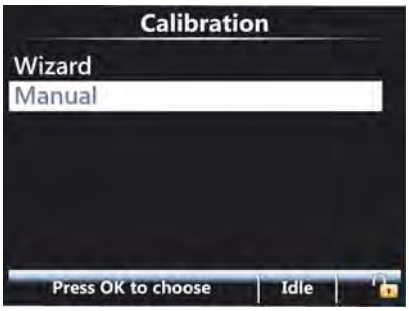
V = number of pulses / (K-factor * meter factor).

5.12.2 Calibration Menu Choice

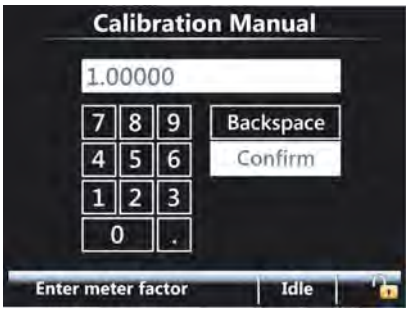
➔ On the Main Menu screen, select Calibration menu.
The **Calibration** screen appears.

➔ Select either **Wizard** or the **Manual** calibration method (see second screen).

5.12.3 Manual Calibration



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



➔ Enter meter factor and select **Confirm**.

➔ 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.

Perform the following steps through the SSC-A menu to re-calibrate the flow meter:

➔ Enter the volume to be injected.

➔ Measure the actual volume result (calibrated vessel).

➔ Enter the result.

- New meter factor appears.

➔ 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.

➔ Enter the amount to dispense.

➔ Enter time delay (seconds) before calibration starts.

➔ Press start and wait for additive to be dispensed (progress bar appears).

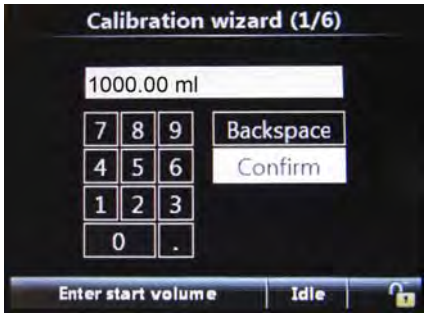
➔ Enter the measured volume.

➔ Confirm the new additive meter factor

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

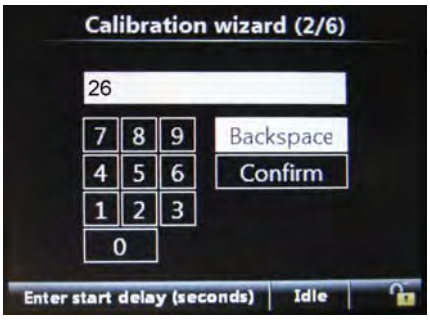
➔ Enter start volume

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



➔ Enter start delay (seconds)

In situations where the user has to move to another place (for example, to watch the result), a suitable start delay can be set.



■ Calibration starting...

After you select <OK>, count down of the delay time starts.

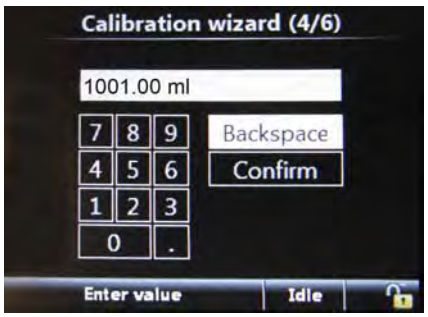
After expiration of the delay time, the injection process starts.

The screen displays the progress of the injection process, (a progress bar appears).

➔ Enter volume

Enter the actual measured volume (calibrated vessel).

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



■ The new meter factor appears.

➔ Select <Ok> to accept the new meter factor.

or

➔ Select <ESC> to reject the new meter factor.

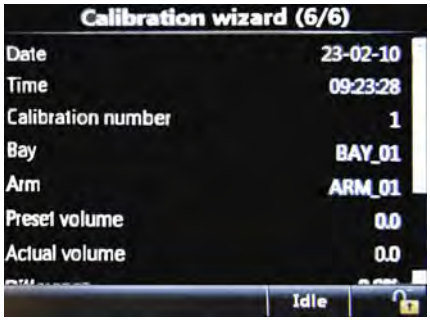
NOTE: In case <ESC> is selected, the old meter factor is restored.

- Calibration process overview

A new calibration record is created and stored into the system.

An overview of the calibration process is illustrated in the image.

➔ Select <OK> to exit to the Main Menu



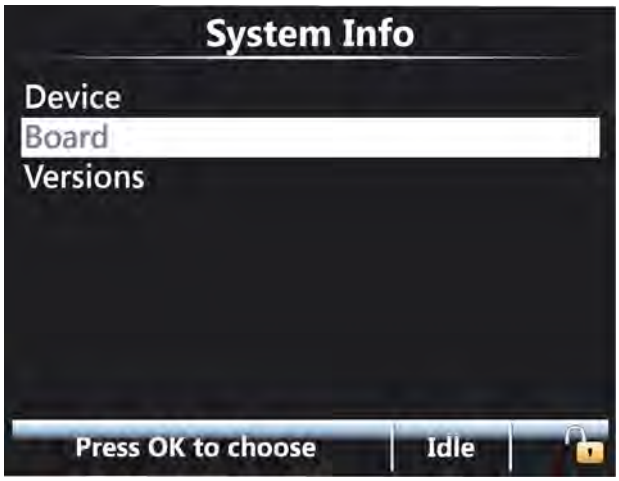
5.13 Info (Information of the device)

- 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

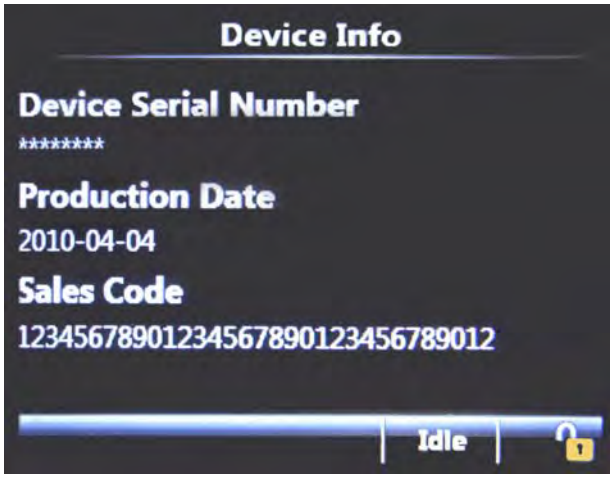
In the “About” screen, identification information of the following device components appear.

- Serial number of each FlexConn board.
- Hardware version of each FlexConn board.
- Application firmware version of each FlexConn board.
- Build information of the firmware of each FlexConn board.
- FlexConn stack firmware version of each FlexConn board.

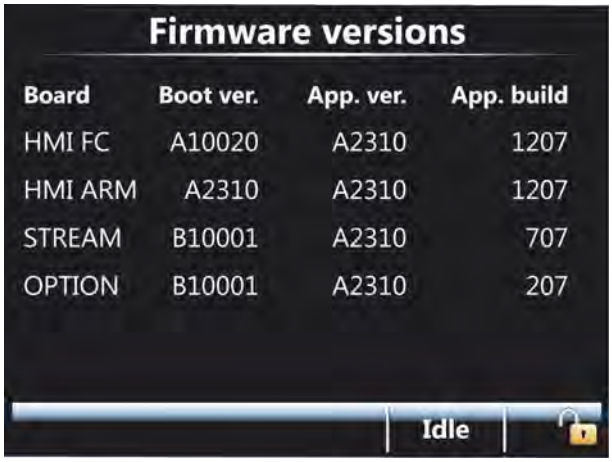
- Build information of the FlexConn stack firmware of each FlexConn board.



- Select <Device> in the System Info screen and then select <OK>. The Device Info screen appears.



- Select <Versions> in the System Info screen and then select <OK>. The Firmware versions screen appears.

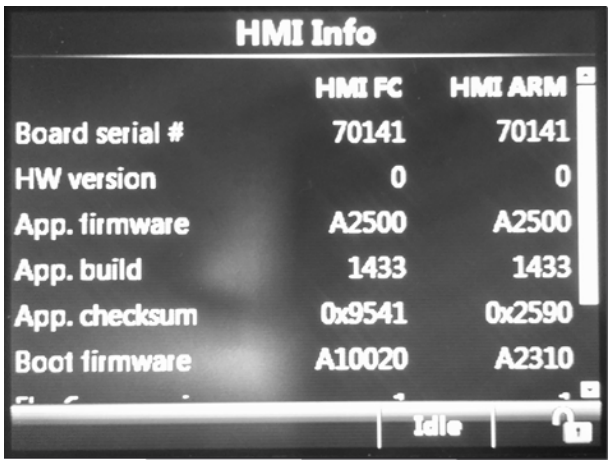


- Select <Board> in the System Info screen and then select <OK>. The Board Info screen appears.

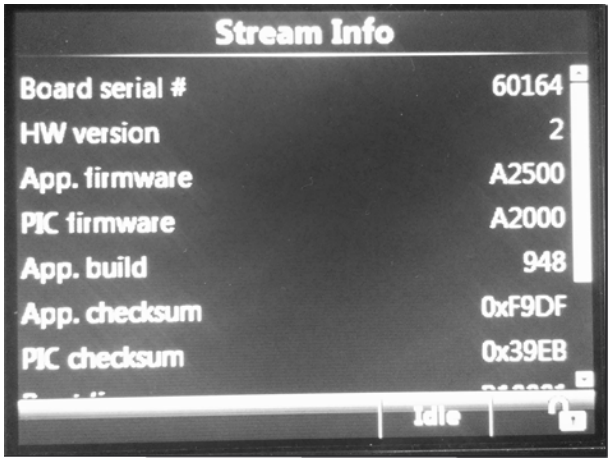
  Select the relevant board, which provides an overview of the particular board, such as serial number, hardware version, and software-related version numbers

  - Select <HMI> in the Board Info screen and then select <OK>. The HMI Info screen appears with the following details.
    - Board serial #
    - HW version
    - App. firmware
    - App. build
    - App. checksum
    - Boot firmware

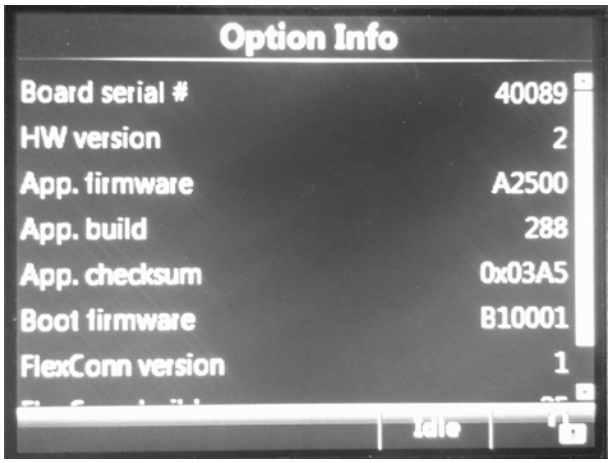
- FlexConn version
- FlexConn build



- Select <Stream> in the Board Info screen and then select <OK>. The Stream Info screen appears with the following details.
  - Board serial #
  - HW version
  - App. firmware
  - PIC firmware
  - App. checksum
  - PIC checksum
  - App. build
  - Boot firmware
  - FlexConn version
  - FlexConn build



- Select <Option> in the Board Info screen and then select <OK>. The Option Info screen appears with the following details.
  - Board serial #
  - HW version
  - App. firmware
  - App. build
  - App. checksum
  - Boot firmware
  - FlexConn version
  - FlexConn build

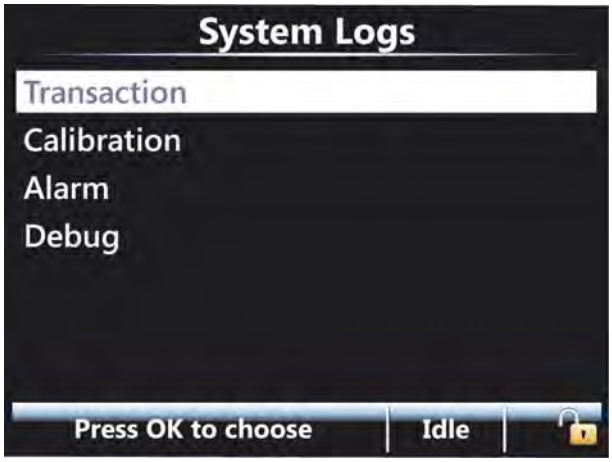


5.14 Logs

- 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 on the occurence of the alarms and the type of alarms they were.

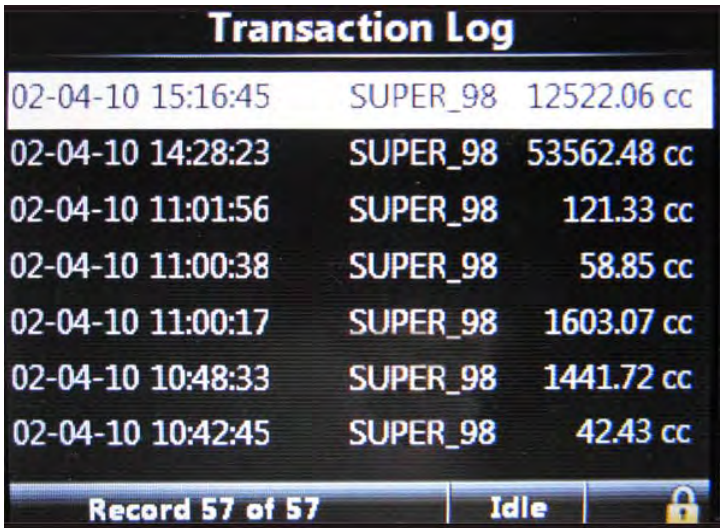
- Debug log: A list of device events that can be retrieved for fault finding purposes.

■ In the System Logs screen, the following data logs can be viewed.
- All available transaction records.
- All available calibration records.
- All available alarm records.

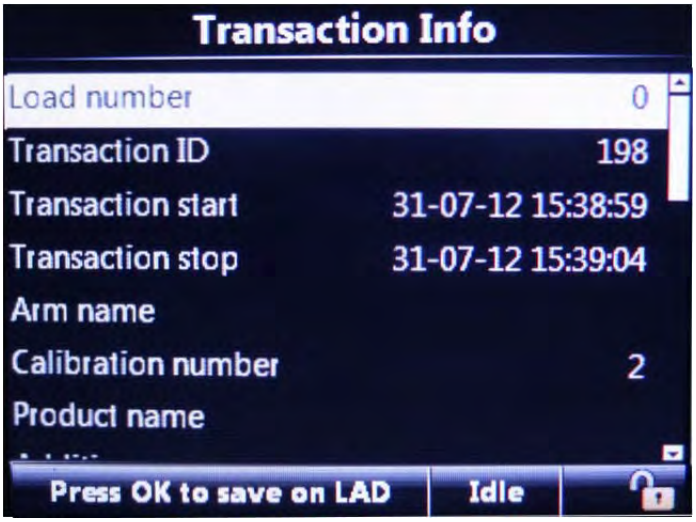


5.14.1 Transaction Logs

■ Select <Transaction> and then select <OK>. The Transaction Log screen appears.



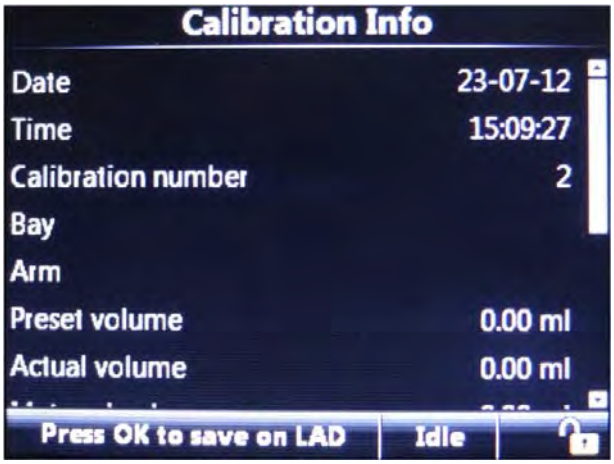
- Select <OK> for any specific transaction from the Transaction Log list. The following Transaction Info appears.
  - Load number
  - Transaction ID
  - Transaction start
  - Transaction stop
  - Arm name
  - Calibration number
  - Product name
  - Additive name
  - ppm
  - Load volume
  - Critical error
  - 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

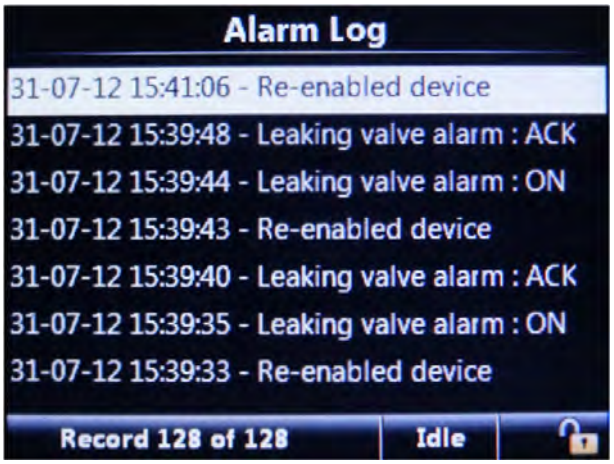
- Select <Calibration> in the System Logs screen and then select <OK>. The Calibration Log screen appears.

- Select <OK> on any one 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

- Select <Alarm> in 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”.
- The values of all output channels (digital and analog) can be set explicitly. Outputs can be operated manually to activate, control, and test field equipment. This is extremely useful for commissioning tests.
- Internal memory usage overview.
- System health overview.
- Active alarms overview.

In this screen, the user can view the diagnostics about the following subjects:

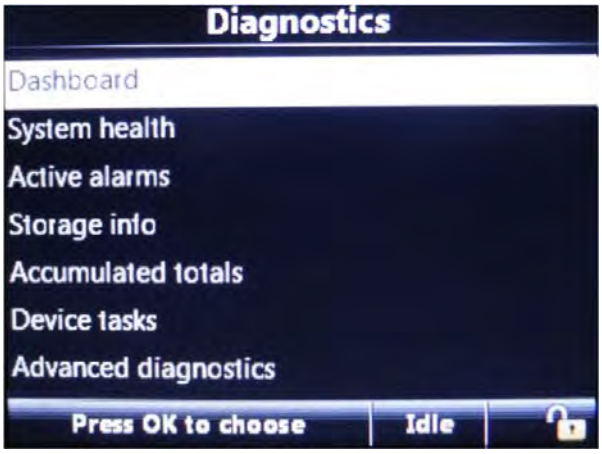
- Dashboard - Overview of all I/O (Dashboard).
- System health - Overview of the system health.
- Active alarms - Overview of all the active alarms.
- Storage info - Overview of the available memory space for data logs and total number of available logs.
- Accumulated totals - Total volume of the blend stream and wild stream since last *Clear totals* command.
- Device tasks
  - Reset task - Possibility to reset:
    - the complete device
    - to the factory default settings
  - Comms task - Possibility to 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

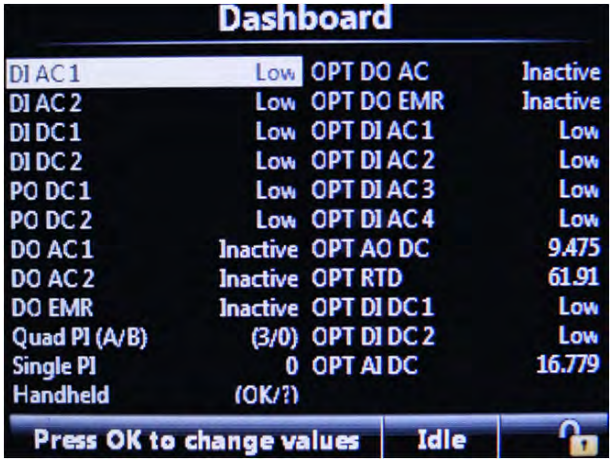
- Additive stream
- Product stream
- Instant additive



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>.

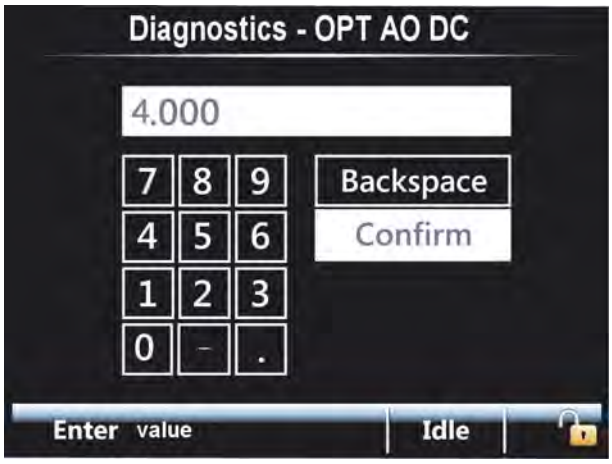
To change the value from **Low** to **High** for an input function (DI or PI), wire a DO to a DI in order to change the DI value from **Low** to **High** or vice versa.

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, perform the following steps.

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

   The Diagnostics - OPT AO DC screen appears.



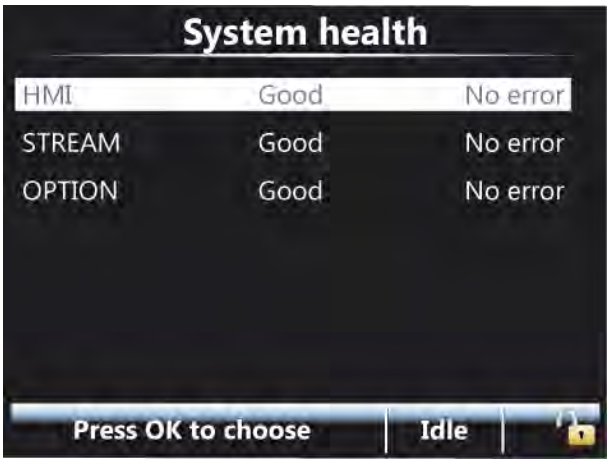
4. Enter the value for AO and then select Backspace or Confirm.

   The default value is 4.000.

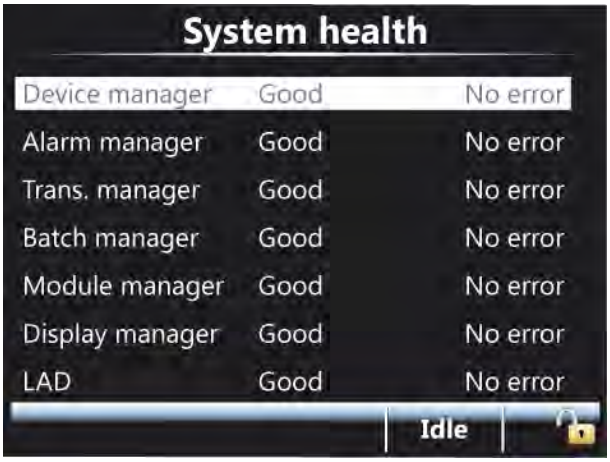
NOTE: Ensure that you unbind the I/O when forcing the outputs to avoid unpredictable control errors.

5.15.2 System Health

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

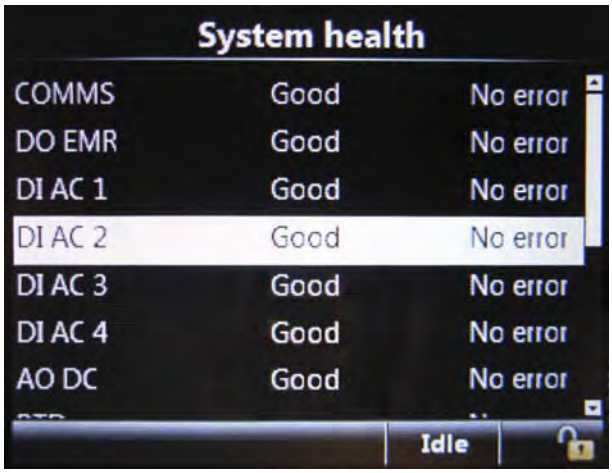


- Select <HMI> to view the details of HMI board.



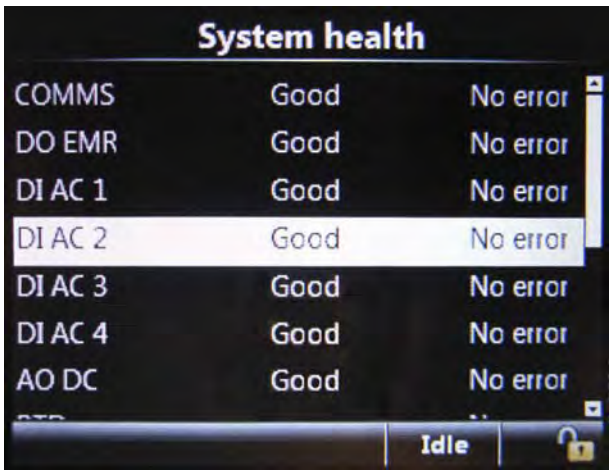
- Select <STREAM> to view following details of the STREAM board.
  - COMMS
  - DI AC 2
  - DI DC 1
  - DI DC 2
  - DO AC 1
  - DO AC 2
  - PO DC 1
  - PO DC 2
  - Pulse input
  - DI AC 1
  - DO EMR
  - Blend manager

- Additive manager
- Module manager



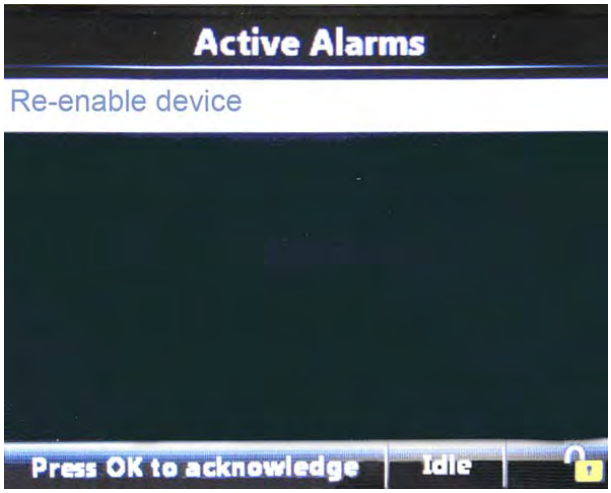
■ Select <OPTION> to view following details of the OPTION board.

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



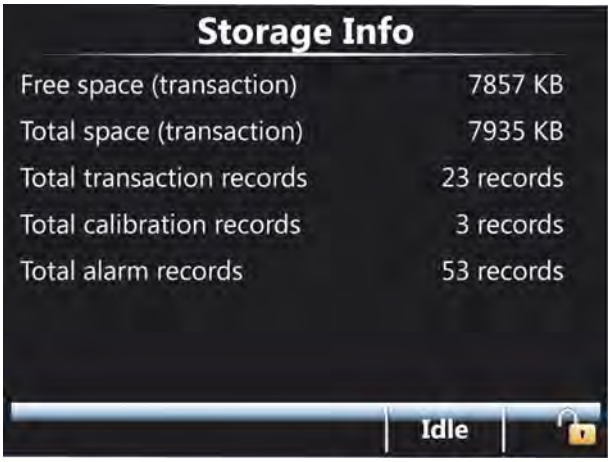
5.15.3 Active Alarms

- Select <Active alarms> in the Diagnostics screen to view an overview of all active alarms.



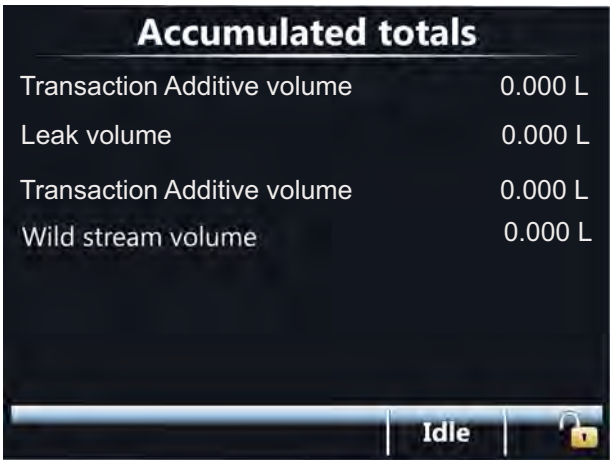
5.15.4 Storage Info

- Select <Storage info> in the Diagnostics screen to view an overview of actual stored logs.



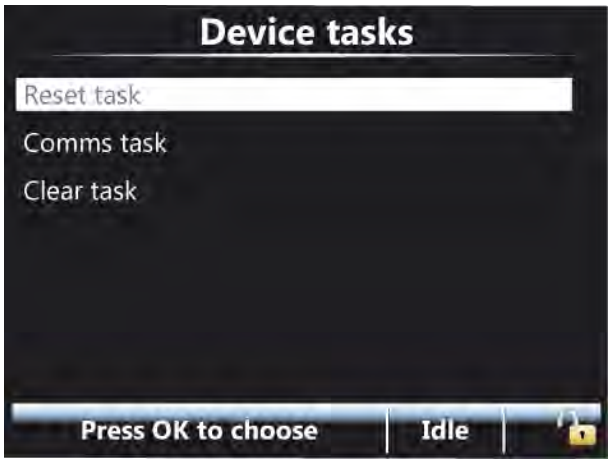
5.15.5 Accumulated Totals

- Select <Accumulated totals> in the Diagnostics screen to view an overview of accumulated totals.



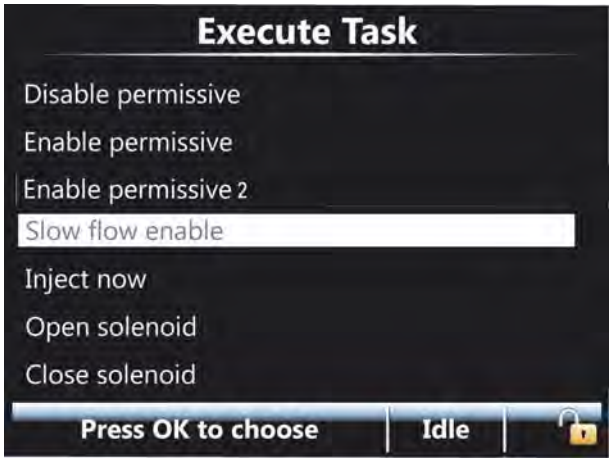
5.15.6 Device Tasks

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

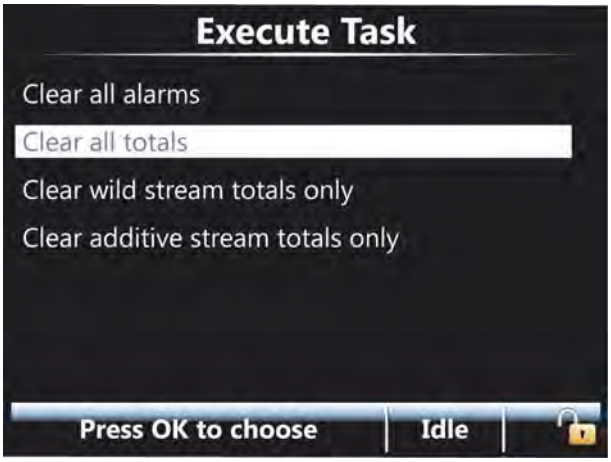


- Select <Reset task> in the Device tasks screen to view the options available to reset the device.

- Select <Comms task> in the Device tasks screen to view the options for communication tasks.

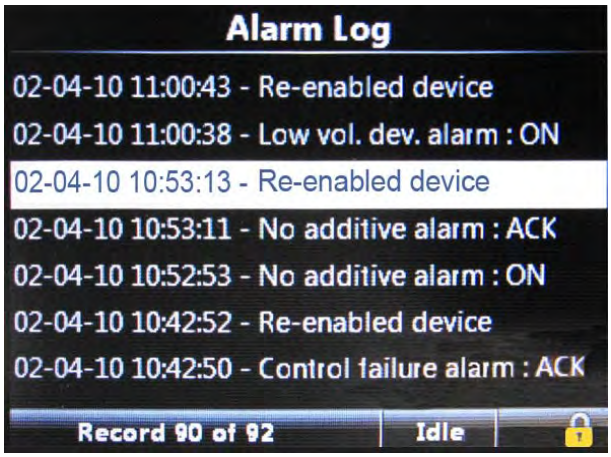


- Select <Clear task> in the Device tasks screen to view the options to clear the task.



5.15.6.1 Alarm Logs

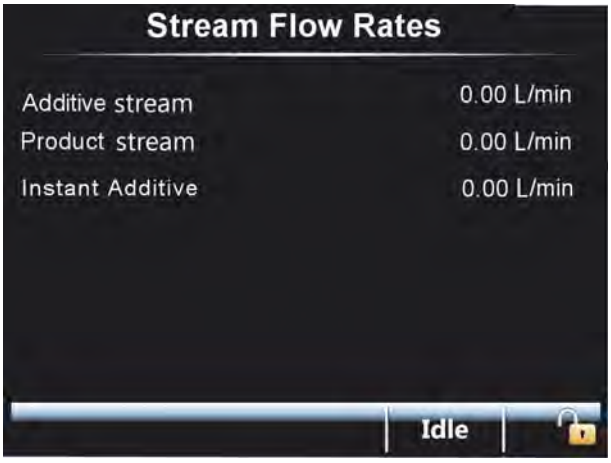
Select <Alarm> in the System Logs screen and then select <OK>. The Alarm Log screen appears..



5.15.7 Advanced Diagnostics

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

- Select <Flow rates> in the Advanced diagnostics screen to view the options available in it.

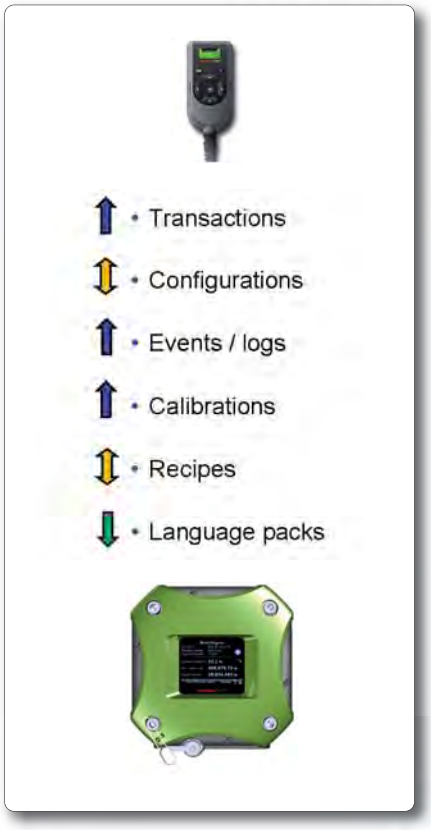


5.16 Transfer

5.16.1 General

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

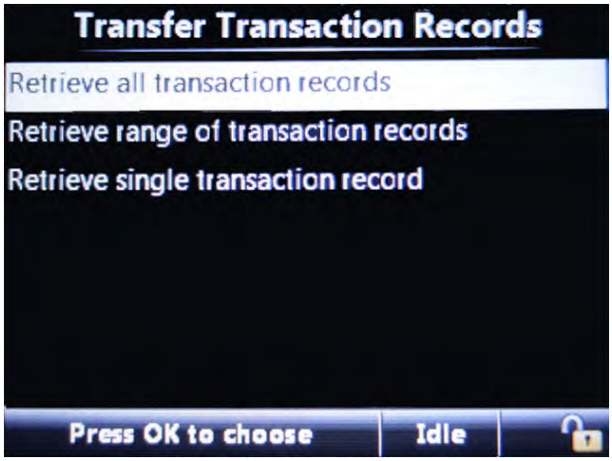
The data-transfer directions are defined below.



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.

- Select <Transaction records> from the Transfer Main Menu. The Transfer Transaction Records screen appears.



- Retrieving All Transaction Records

Using the LAD or Fusion4 Portal, all archived transaction records can be retrieved. The definition of these records extends the definition used by communication.

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

NOTE: All transactions are overwritten and the transaction cannot be retrieved through the Fusion4 Portal or the LAD. The user must have settled all transactions

before the oldest one is automatically deleted and overwritten. Maximum 10.000 un-settled transactions can reside in the transaction memory of the SSC-A.

5.16.3 Additive Transaction Record Explained

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

Transaction record parameter	Description
[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.

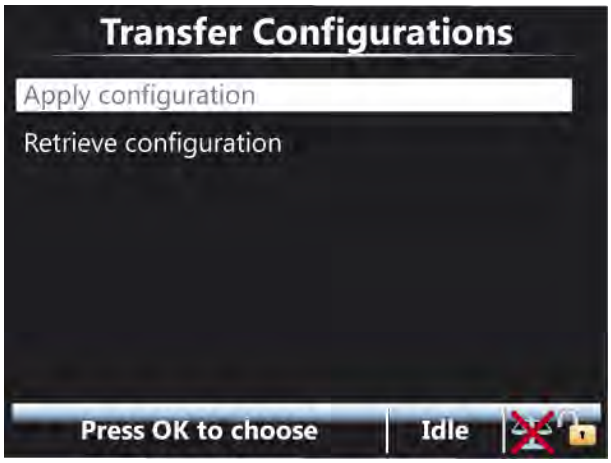
REMARK: For an overview of all critical and non-critical alarms, see also CHAPTER 6 - Alarm Handling.

Alarm code	Description
0	ALARM_NO_ALARM
1	ALARM_GENERAL_FAIL
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

Alarm code	Description
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

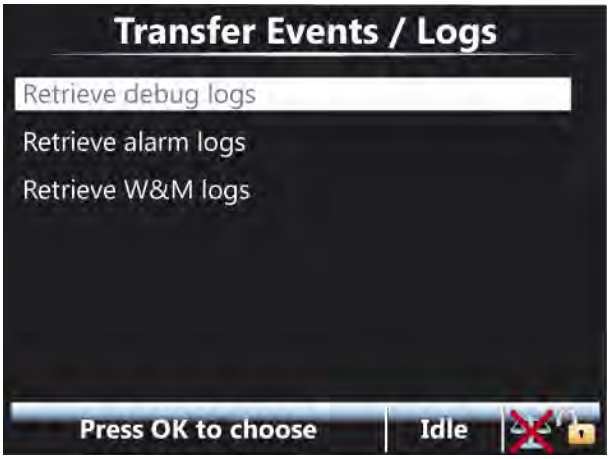
- Select <Configurations> from the Transfer Main Menu. The Transfer Configurations screen appears.



- <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 - historian 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.

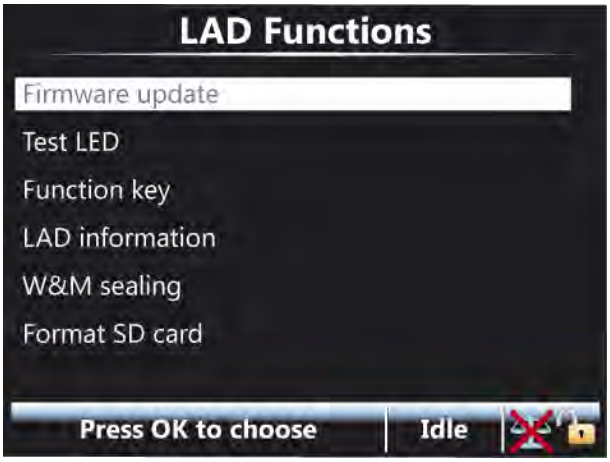
5.16.7 Language Packs

- 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 typical LAD functions and activities can be invoked.



5.17.2 Firmware Upgrade

NOTE: Remove the old files that are available in this folder from previous upgrades before updating the files.

Perform the following steps to upgrade the device using the LAD.

1. Replace the following updated firmware files received in the `\Honeywell\SSC-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 file is only required if the Option card is installed in the device.

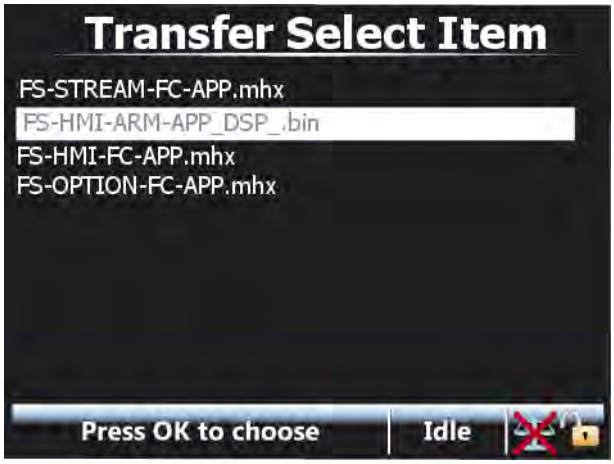
2. Plug-in the LAD to the SSC and make sure the SD card is in the LAD before plugging the LAD.

   A green status light on the LAD indicates that the SD card is inserted correctly and a red status light indicates that the SD card is missing.

NOTE: Update the firmware only when the device is not being used.
Do not insert or remove the SD card when the LAD is connected to the device and do not remove the LAD when an upgrade file is downloading.
Do not perform the update procedure when there is a chance of a power outage as this can cause problems and/or make the device unusable.

3. Select <Firmware update> to either update the firmware of the SSC boards or the LAD firmware itself.

4. Select <Fusion4 device>. The Transfer Select Item screen appears.



Select the firmware files in the following order to update the files.

1.FS-HMI-ARM-APP_DSP_.bin

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

2.FS-HMI-FC-APP.mhx

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

3.FS-STREAM-FC-APP.mhx

- The total time for the firmware update file is 9 minutes approximately.
- After the file is updated, acknowledge and reset the alarm by performing the following steps.

  1.Select <Active alarms> from the Diagnostics main menu.

  2.Select <Reset Device> to reset the device.

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

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

Once the firmware updation is successful, a message is displayed confirming the same.

If one of the following alarms appear, ignore the alarm and re-enable the device once.

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

  OR

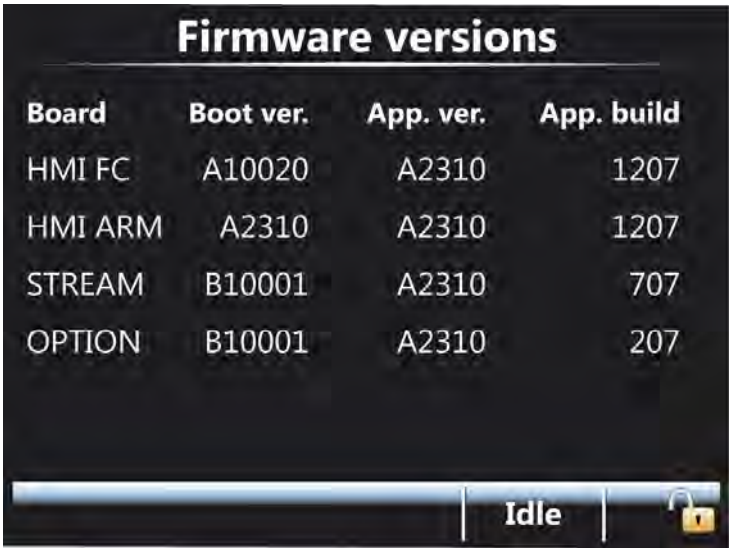
- "Option board missing" when updating the option board firmware.

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 column App. ver.



2. Verify the parameter settings to check if they are the same as they were previously in the old firmware.
3. Select <System health> from the Diagnostic main menu. Select one of the boards and then select <Ok>. The test should display, “Good/No Error”.

5.17.3 Test LED, Function Key, and LAD Information Submenus

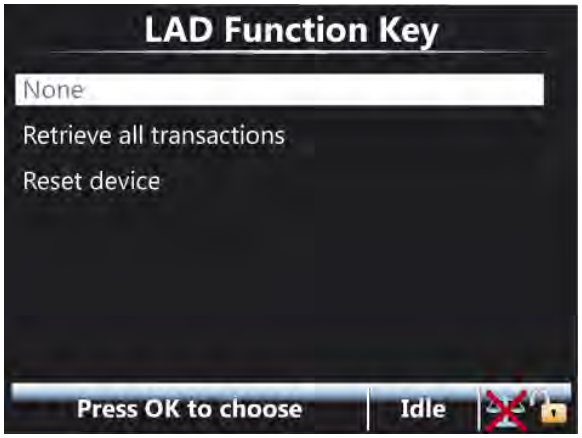
- In the <Test LED> submenu (see screen below), the following diagnostics or I/O tests can be visualized on the “Test” LED of the LAD.
  - HMI board
  - Device manager
  - Alarm manager
  - Transaction manager
  - Batch manager
  - HMI module

- Display manager
- LAD
- STREAM board
- Comms
- D1 AC 2
- DI DC 1
- DI DC 2
- DO AC 1
- DO AC 2
- PO DC 1
- PO DC 2
- PI
- DI AC1
- DO EMR
- Blend manager
- Additive manager
- STREAM module
- OPTION board
- OPT Comms
- OPT DO EMR
- OPT DI AC 1
- OPT DI AC 2
- OPT DI AC 3
- OPT DI AC 4
- OPT AO DC
- OPT RTD
- OPT DO AC
- OPT DI DC 1
- OPT DI DC 2
- OPTION module

- OPT AI DC

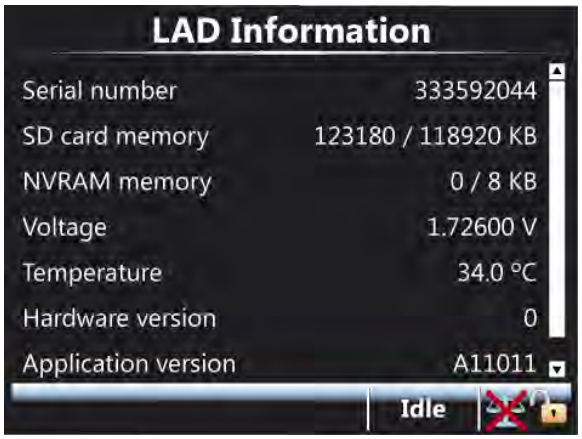
NOTE: Test LED functions are inactive while retrieving other records from the LAD.

- In the <Function key> submenu, specific functions can be programmed to the “F key” of the LAD, in order to achieve a much quicker operation of the SSC.
- This configuration is saved on the LAD, so changes made to the function key works with other devices as well.



- Select the <LAD information> submenu which 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.

CAUTION

CAUTION! All content is erased!

CHAPTER 6 ALARM HANDLING

6.1 General

Through the SSC menu, various alarm configurations can be set. Also, the active alarms, transactions alarms, and alarm logs can be displayed.

6.2 Alarm Output Configuration

- The alarm-indication output can be set with [Alarm indication] I/O binding.
- The alarm-permissive output can be set with [Alarm shutdown] I/O binding.

6.3 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

Alarm	Cause
Leaking valve	Device was idle, but within the [leaking timeout period] more than the [leaking volume limit] was measured.
Flush volume	The SSC was in the slow-flow state (clean-arm function), and [Flush volume] (wild stream) minus the [Flush volume deviation] was not measured.
Control failure	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.*
No activity	The SSC started a new transaction, but after the [no activity timeout] still no wild stream was detected.
No additive	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.*
No pump	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.*
Low deviation	This alarm is generated after a transaction, when the difference between requested and actual received additive is too large. With the entity [Additive volume deviation] the acceptable deviation can be set.
High deviation	This alarm is generated after a transaction, the difference between requested and actual received additive is too large. With the entity [Number of cycles before deviation alarm evalution] the number of additive injection cycles that are used to calculate the average of the injection volume for the deviation calculations can be set.
Pulse phase	Dual pulse input were out of phase. *Only possible if device is configured for quad pulse.*
Stream start error	Error during new transaction start-up.
Solenoid fault	When the system is not able to activate or deactivate the solenoid.
Block valve fault	When the system is not able to activate or deactivate the block valve.
Pulse hardware fault	This alarm is generated when the pulse input module detectes the following error conditions. • Error reading information from the PIC controller • Pulse overflow errors • BAD health of pulse input function

Alarm	Cause
Tank empty alarm	This alarm is generated when the SSC-A receives 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	This alarm is generated when the SSC-A receives 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	This alarm is generated when the SSC-A (or SSC-B) is not able to perform the configured output on time.
VCF error	The volume correction calculations detected an error.
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.
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 creating 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.

In 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 alarm 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.

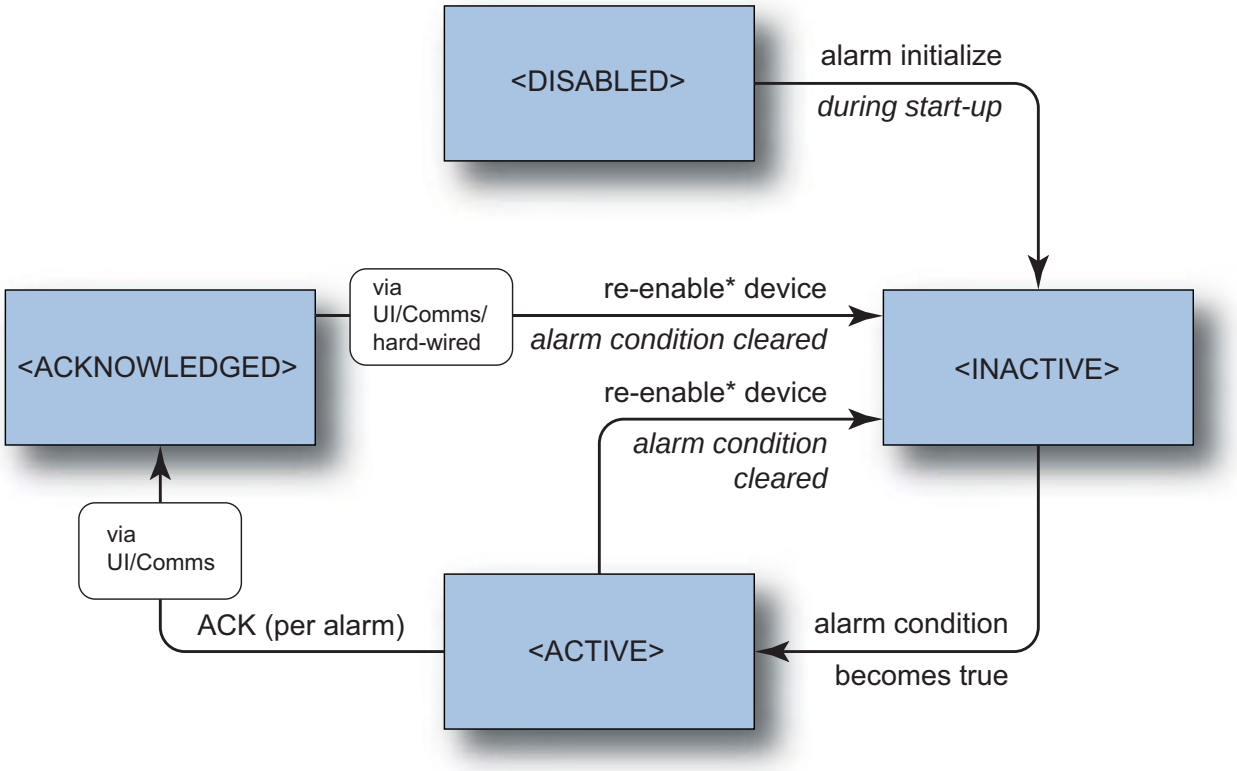
6.7.1 Alarm Manager Entities

- 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

ID	Alarm message
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.



* re-enable = clear all alarms

FIGURE 6-1 Operational alarm states F4A10-0030

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] defines if the particular alarm is handled as a “Critical transaction alarm” or a “Non-critical transaction alarm”.

When configured as “Shutdown”, the particular entity is handled as a “Critical transaction alarm”.

See the following table.

ID	Alarm message
0x0001	ALARM_ADDITIVE_CYCLE_VOLUME

ID	Alarm message
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

For More Information
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