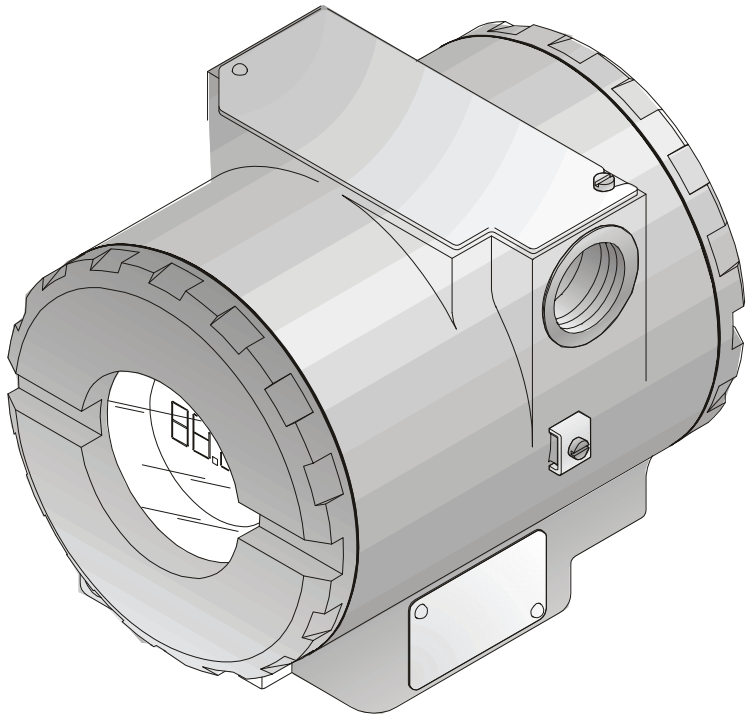
FI303

OPERATION & MAINTENANCE
INSTRUCTIONS MANUAL

TRIPLE CHANNEL PROFIBUS PA TO CURRENT CONVERTER



smar
First in Fieldbus

MAR / 10
FI303
VERSION 1

PROFIBUS

FI303ME

smar

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INTRODUCTION

The **FI303** is from the first generation of Profibus PA devices. It is a converter mainly intended for interface of a Profibus PA system to control valve or other actuators. The **FI303** produces a 4-20 mA output proportional to input received over the Profibus PA network. The digital technology used in the **FI303** enables an easy interface between the field and the control room and several interesting features that reduce considerably the installation, operation and maintenance costs.

The **FI303** is part of Smar's complete 303 line of Profibus PA devices.

Profibus PA, is not only a replacement for 4-20 mA or intelligent/smart transmitter protocols, it contains much more.

The digital technology used in the **FI303** enables the choice of several types of transfer functions, an easy interface between the field and the control room and several interesting features that considerably reduce the installation, operation and maintenance costs.

Some of the advantages of bi-directional digital communications are known from existing smart transmitter protocols: Higher accuracy, multi-variable access, remote configuration and diagnostics, and multi-dropping of several devices on a single pair of wires.

The system controls variable sampling, algorithm execution and communication so as to optimize the usage of the network, not loosing time. Thus, high closed loop performance is achieved.

Using Profibus technology, with its capability to interconnect several devices, very large control schemes can be constructed. In order too be user friendly the function block concept was introduced.
The **FI303**, like the rest of the 303 family, has some Function Blocks built in, like Analog Output and Transducer and Display Blocks.

The need for implementation of Fieldbus in small as well as large systems was considered when developing the entire 303 line of Profibus-PA devices. They have common features and can configured locally using a magnetic tool, eliminating the need for a configuration tool or console in many basic applications.

Get the best result of the FI303 by carefully reading these instructions.

WARNING
This Manual is compatible with version 1.XX, where 1 denote software version and XX software release. The indication 1.XX means that this manual is compatible with any release of software version 1.

Waiver of responsibility

The contents of this manual abides by the hardware and software used on the current equipment version. Eventually there may occur divergencies between this manual and the equipment. The information from this document are periodically reviewed and the necessary or identified corrections will be included in the following editions. Suggestions for their improvement are welcome.

Warning

For more objectivity and clarity, this manual does not contain all the detailed information on the product and, in addition, it does not cover every possible mounting, operation or maintenance cases.

Before installing and utilizing the equipment, check if the model of the acquired equipment complies with the technical requirements for the application. This checking is the user's responsibility.

If the user needs more information, or on the event of specific problems not specified or treated in this manual, the information should be sought from Smar. Furthermore, the user recognizes that the contents of this manual by no means modify past or present agreements, confirmation or judicial relationship, in whole or in part.

All of Smar's obligation result from the purchasing agreement signed between the parties, which includes the complete and sole valid warranty term. Contractual clauses related to the warranty are not limited nor extended by virtue of the technical information contained in this manual.

Only qualified personnel are allowed to participate in the activities of mounting, electrical connection, startup and maintenance of the equipment. Qualified personnel are understood to be the persons familiar with the mounting, electrical connection, startup and operation of the equipment or other similar apparatus that are technically fit for their work. Smar provides specific training to instruct and qualify such professionals. However, each country must comply with the local safety procedures, legal provisions and regulations for the mounting and operation of electrical installations, as well as with the laws and regulations on classified areas, such as intrinsic safety, explosion proof, increased safety and instrumented safety systems, among others.

The user is responsible for the incorrect or inadequate handling of equipments run with pneumatic or hydraulic pressure or, still, subject to corrosive, aggressive or combustible products, since their utilization may cause severe bodily harm and/or material damages.

The field equipment referred to in this manual, when acquired for classified or hazardous areas, has its certification void when having its parts replaced or interchanged without functional and approval tests by Smar or any of Smar authorized dealers, which are the competent companies for certifying that the equipment in its entirety meets the applicable standards and regulations. The same is true when converting the equipment of a communication protocol to another. In this case, it is necessary sending the equipment to Smar or any of its authorized dealer. Moreover, the certificates are different and the user is responsible for their correct use.

Always respect the instructions provided in the Manual. Smar is not responsible for any losses and/or damages resulting from the inadequate use of its equipments. It is the user's responsibility to know and apply the safety practices in his country.

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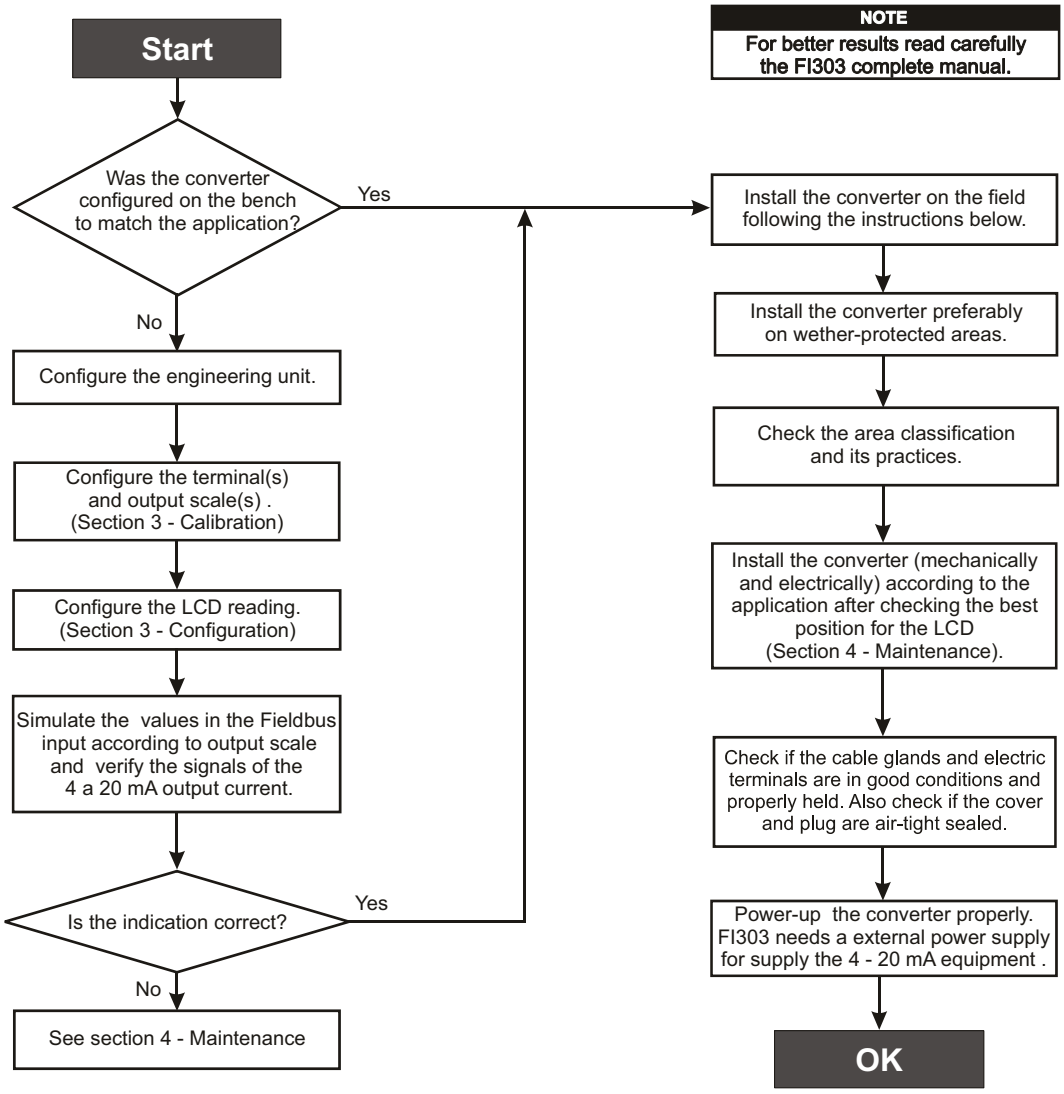
Installation Flowchart



Section 1

INSTALLATION

General

The overall accuracy of measurement and control depends on several variables. Although the converter has an outstanding performance, proper installation is essential, in order to maximize its performance.

Among all factors, which may affect converter accuracy, environmental conditions are the most difficult to control. There are, however, ways of reducing the effects of temperature, humidity and vibration.

Locating the converter in areas protected from extreme environmental changes can minimize temperature fluctuation effects.

In warm environments, the converter should be installed to avoid, as much as possible, direct exposure to the sun. Installation close to lines and vessels subjected to high temperatures should also be avoided.

Use of sunshades or heat shields to protect the converter from external heat sources should be considered, if necessary.

Humidity is fatal to electronic circuits. In areas subjected to high relative humidity, the O-rings for the electronics cover must be correctly placed. Removal of the electronics cover in the field should be reduced to the minimum necessary, since each time it is removed the circuits are exposed to the humidity. The electronic circuit is protected by a humidity proof coating, but frequent exposures to humidity may affect the protection provided. It is also important to keep the covers tightened in place. Every time they are removed, the threads are exposed to corrosion, since painting cannot protect these parts. Code-approved sealing methods on conduit entering the converter should be employed.

Mounting
Using the bracket, the mounting may be done in several positions, as shown on Figure 1.3 - Dimensional Drawing and Mounting Positions.
For better visibility, the digital indicator may be rotated in steps of 90° (See the section Maintenance Procedures).

Output Wiring
The output is in fact a current link. An external power source is therefore necessary. The **FI303** controls the current in the loop. (See Figure 1.4 - Output Connections). The three channels have a common ground for the external power supply.

The output load is limited by the voltage of the external power supply. Please refer to the load graph to determine the maximum load.

On loss of power the output will be uncertain. If power is maintained, but communication is lost, the output may be pre-configured to freeze or go to a safe value.

Electric Wiring
Access the wiring block by removing the Electrical Connection Cover. This cover can be locked closed by the cover locking screw (See Figure 1.1 - Cover Locking). To release the cover, rotate the locking screw clockwise.

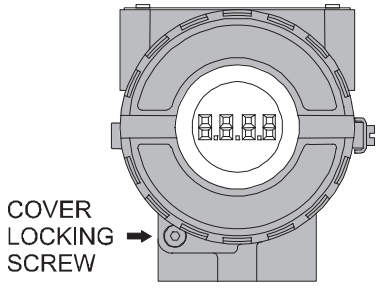


Figure 1.1 - Cover Locking

Cable access to wiring connections is obtained by one of the two conduit outlets. Conduit threads should be sealed by means of code-approved sealing methods. The unused outlet connection should be plugged accordingly.

The wiring block has screws, on which terminal type fork or ring can be fastened, see Figure 1.2 - Ground Terminals**.**

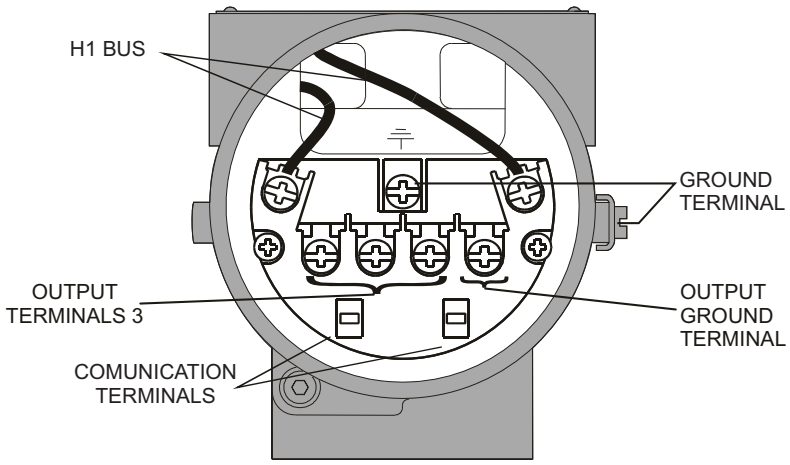


Figure 1.2 - Ground Terminals

For convenience there are three ground terminals: one inside the cover and two externals, located close to the conduit entries.

The **FI303** uses the 31.25 kbit/s voltage mode option for the physical signaling. All other devices on the same bus must use the same signaling. All devices are connected in parallel along the same pair of wires.

Various types of Fieldbus devices may be connected on the same bus.

The **FI303** is powered via the bus. The limit for such devices is according to the DP/PA coupler limitations for one bus for non-intrinsically safe requirement. In hazardous area, the number of devices may be limited by intrinsically safe restrictions, according to the DP/PA coupler and barriers limitations.

Dimensions are in mm (in).

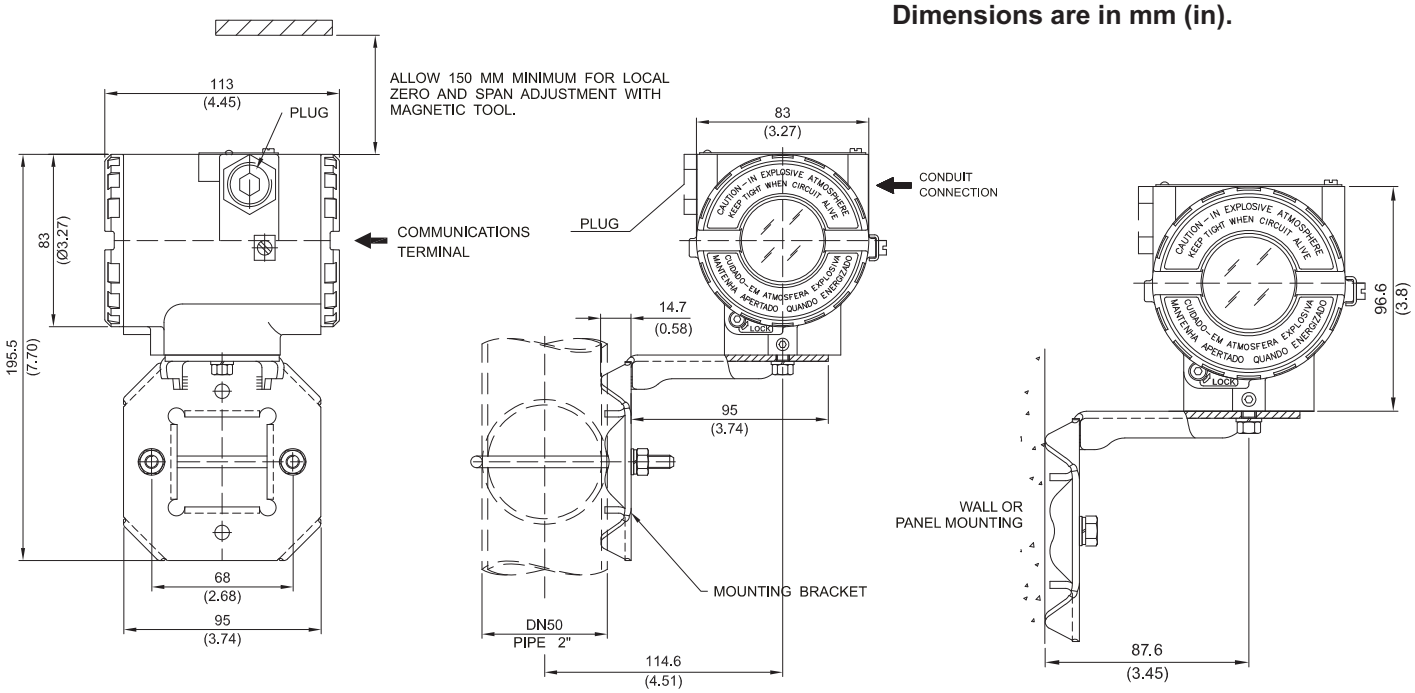


Figure 1.3 - Dimensional Drawing and Mounting Positions

WARNING

HAZARDOUS AREAS

In hazardous areas with explosion proof requirements, the covers must be tightened with at least 8 turns. In order to avoid the penetration moisture or corrosive gases, tighten the O'ring until feeling the O'ring touching the housing. Then, tighten more 1/3 turn (120°) to guarantee the sealing. Lock the covers using the locking screw.

In hazardous zones with intrinsically safe or non-incentive requirements, the circuit entity parameters and applicable installation procedures must be observed.

Cable access to wiring connections is obtained by the two conduit outlets. Conduit threads should be sealed by means of code-approved sealing methods. The unused outlet connection should be plugged and sealed accordingly.

Should other certifications be necessary, refer to the certification or specific standard for installation limitations.

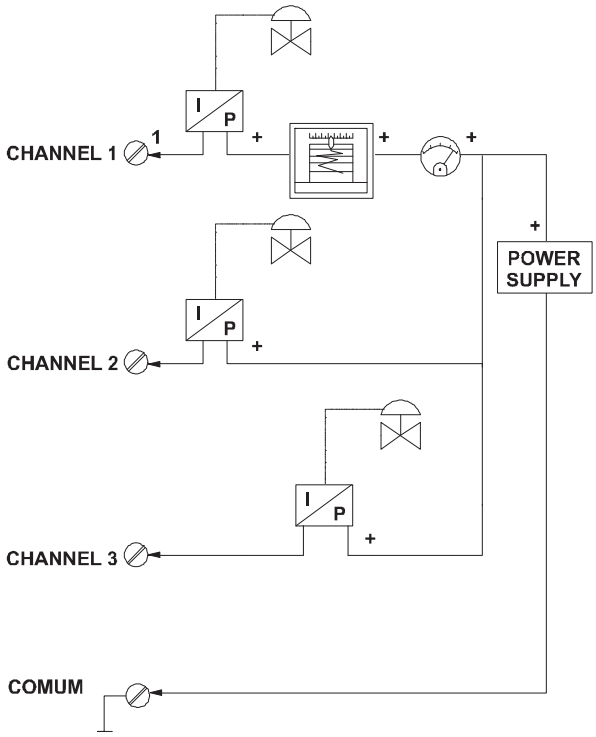


Figure 1.4 - Output Connections

Avoid routing signal wiring close to power cables or switching equipment.
The **FI303** is protected against reverse polarity, and can withstand ±35 V DC without damage, but it will not operate when in reverse polarity.

NOTE

Please refer to the General Installation, Operation and Maintenance Procedures Manual for more details.

Topology and Network Configuration

Wiring

Other types of cable may be used, other than for conformance testing. Cables with improved specifications may enable longer trunk length or superior interface immunity. Conversely, cables with inferior specifications may be used subject to length limitations for trunk and spurs plus possible nonconformance to the RFI/EMI susceptibility requirements. For intrinsically safe applications, the inductance/resistance ratio (L/R) should be less than the limit specified by the local regulatory agency for the particular implementation.

Bus topology (See Figure 1.5 – Bus Topology) and tree topology (See Figure 1.6 – Tree Topology) are supported. Both types have a trunk cable with two terminations. The devices are connected to the trunk via spurs. The spurs may be integrated in the device giving zero spur length. A spur may connect more than one device, depending on the length. Active couplers may be used to extend spur length.

The total cable length, including spurs, between any two devices in the Fieldbus should not exceed 1900m.

The connection of couplers should be kept less than 15 per 250m. In following figures the DP/PA link depends on the application needs.

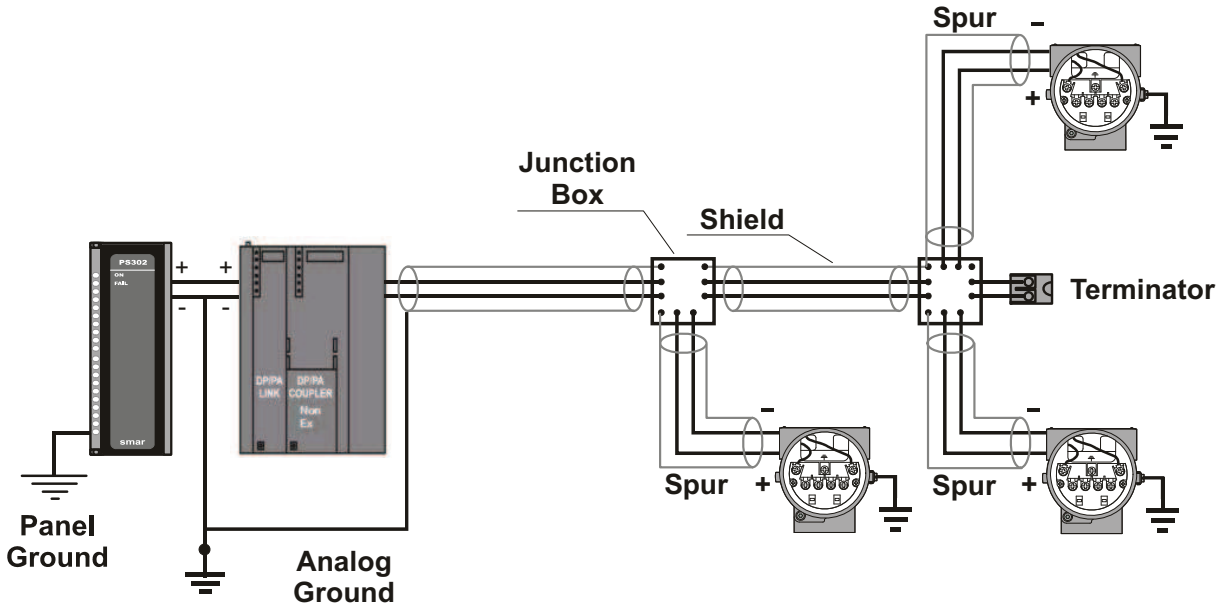


Figure 1.5 - Bus Topology

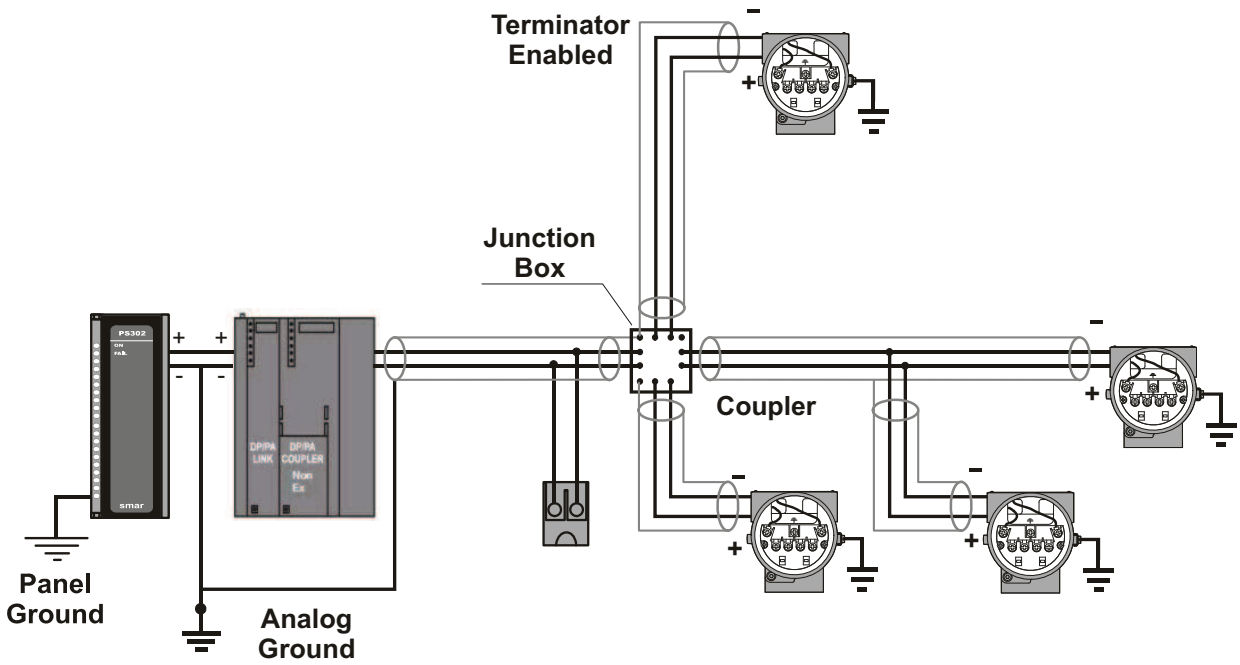


Figure 1.6 - Tree Topology

Intrinsic Safety Barrier

When the Fieldbus is in an area requiring intrinsic safety, a barrier must be inserted on the trunk between the power supply and the DP/PA coupler, when it is Non-Ex type.

Use of **DF47** is recommended.

Jumper Configuration

In order to work properly, the jumpers J1 and W1 located in the **FI303** main board must be correctly configured (See Table 1.1 - Description of the Jumpers).

J1	This jumper enables the simulation mode parameter in the AO block.
W1	This jumper enables the local adjustment programming tree.

Table 1.1 - Description of the Jumpers

Power Supply

The **FI303** receives power from the bus via the signal wiring. The power supply may come from a separate unit or from another device such as a controller or DCS.

The voltage should be between 9 to 32 Vdc for non-intrinsic safe applications.

A special requirement applies to the power supply used in an intrinsically safe bus and depends on the type of barrier used.

Use of **PS302** is recommended as power supply.

Section 2

OPERATION

Functional Description - Electronics Refer to the block diagram

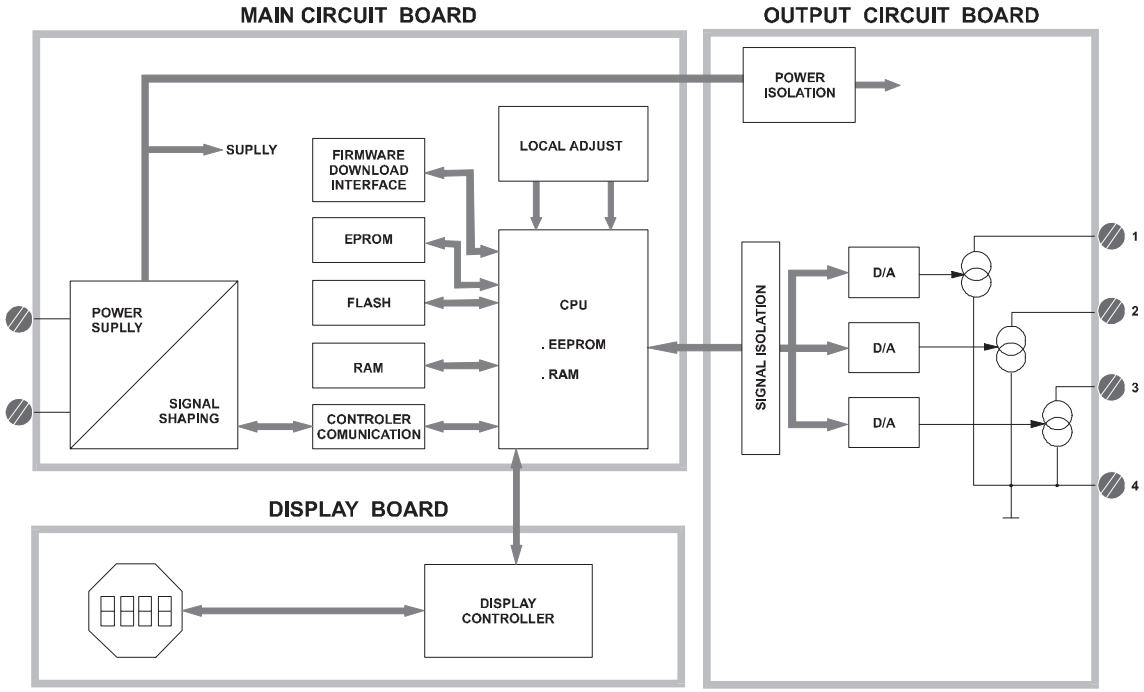


Figure 2.1 - FI303 Block Diagram

The function of each block is described below:

D/A
Receives the signal from the CPU and converts it to an analog voltage, used by the current control.

Current Control
Controls the current of the channel according the data received from the CPU.

Signal Isolator
Its function is to isolate the data signal between the output and the CPU.

(CPU) Central Processing Unit, RAM and PROM
The CPU is the intelligent portion of the converter, being responsible for the management and operation of block execution, self-diagnostics and communication. The program is stored in PROM. For temporary storage of data there is a RAM. The data in the RAM is lost if the power is switched off, however the device also has a nonvolatile EEPROM where data that must be retained is stored. Examples of such data are calibration, configuration and identification data.

Communication Controller
It monitors line activity, modulates and demodulates communication signals and inserts and deletes start and end delimiters.

Power Supply
Takes power of the loop-line to power the converter circuitry.

Power Isolation
Just like the signals to and from the output section, the power to the output section must be isolated.

Display Controller
Receives data from the CPU and drives the Liquid Crystal Display.

Local Adjustment

Two switches that are magnetically activated. They can be activated by the magnetic tool without mechanical or electrical contact.

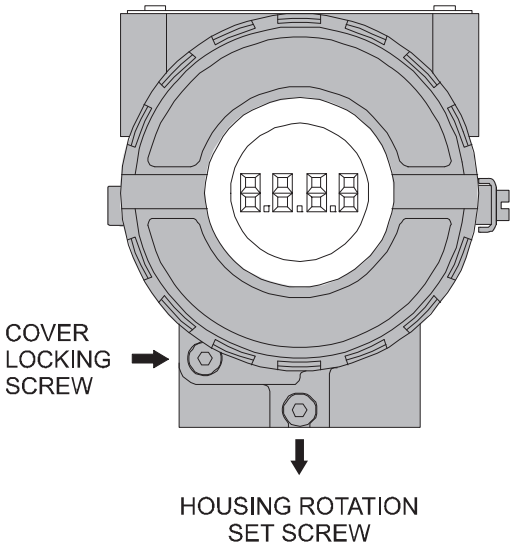


Figure 2.2 - LCD Indicator

Section 3

CONFIGURATION

One of the many advantages of Fieldbus is that device configuration is almost indepen-dent of the configurator. The **FI303** may be configured by a third party terminal or operator console.

The **FI303** contains three output transducer blocks, one physical block, one display transducer block , three analog output function blocks.

Function Blocks are not covered in this manual. For explanation and details of function blocks, see the “Function Blocks Instruction Manual”.

The transducer block isolates the function block of the specific I/O hardware, like sensors and actuators, for example. Transducer block controls access to I/O through manufacturer specific implementation. This permits the transducer block to execute the algorithm, as frequently as necessary to obtain good data from sensors without burdening the function blocks that use the data. It also insulates the function blocks from the manufacturer specific characteristics of certain hardware.

By accessing the hardware, the transducer block can get data from I/O or passing control data to it. The connection between Transducer block and Input/Output Function blocks is called channel. Normally, transducer blocks perform functions, such as linearization, characterization, temperature compensation, control and exchange data to/from hardware.

In order to assure correct values in the offline configuration, when using download function of Simatic PDM, please make sure you have done the upload firstly.

Offline Configuration

1. First run “Download to PG/PC” option to assure valid values.
2. Run after the Menu Device option to configure the required parameters using the related menus.

NOTE
It is not advisable to use the “Download to Device” option. This function can misconfigure the equipment.

How to Configure a Transducer Block

The transducer block has an algorithm, a set of contained parameters and a channel connecting it to a function block.

The algorithm describes the behavior of the transducer as a data transfer function between the I/O hardware and other function block. The set of contained parameters, it means, you are not able to link them to other blocks, defines the user interface to the transducer block. They can be divided into Standard and Manufacturer Specific.

The standard parameters will be present for such class of device, as pressure, temperature, actuator, etc., whatever is the manufacturer. Oppositely, the manufacturers specific ones are defined only by its manufacturer. As common manufacturer specific parameters, we have calibration settings, material information, linearization curve, etc.

When you perform a standard routine as a calibration, you are conducted step by step by a method. The method is generally defined as guide line to help the user to make common tasks. The **Configuration Tool** identifies each method associated to the parameters and enables the interface to it., linearization curve, etc.

When you perform a standard routine as a calibration, you are conducted step by step by a method. The method is generally defined as guide line to help the user to make common tasks. The **Configuration Tool** identifies each method associated to the parameters and enables the interface to it.

Terminal Number

The terminal number, which references a channel value, which is sent via internal, manufacturer-specific from the specified transducer, output to function block.

It starts at one channel (1) for transducer number one until channel three (3) for transducer number three.

The channel number of the AO block is related to the transducer's terminal number. Channel number 1, 2, 3 corresponds bi-univocally to the terminal block with the same number. Therefore, all the user has to do is to select combinations: (1.1), (2.2), (3.3) for (CHANNEL, BLOCK).

Functional Diagram of the Profibus PA to Current Transducer Block

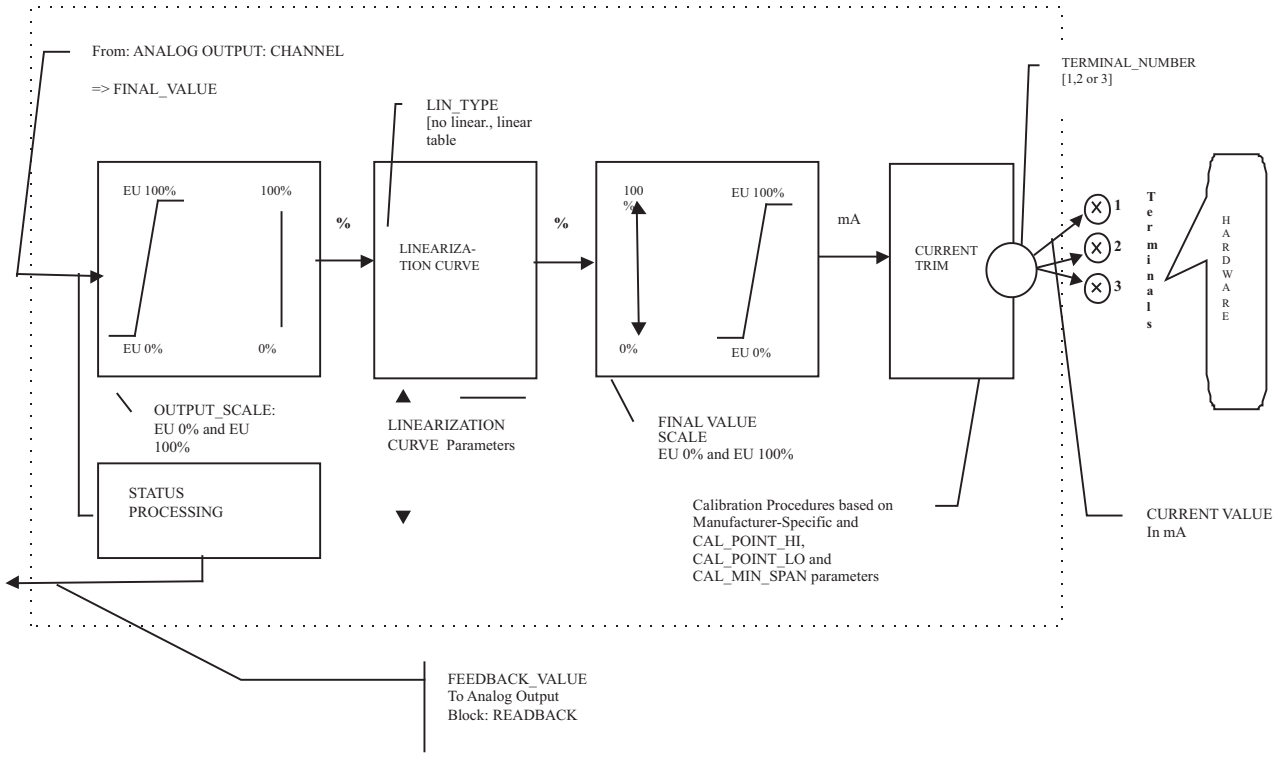


Figure 3.1 - Functional Diagram of the Profibus PA to Current Transducer Block

PROFIBUS to Current Converter Transducer Block - Parameters Description

PARAMETERS	DESCRIPTION
FINAL_VALUE	The actual value variable for the final control element in units of OUT_SCALE. Status BAD will indicate a hardware problem.
FINAL_VALUE_SCALE	This is the output conversion of the linearisated value using the high and low scale. The engineering unit is mA (1211).
CAL_POINT_HI	This parameter contains the highest calibrated value. This parameter indicates where the converter should be when the setpoint is 100%. The engineering unit used by this calibration is mA.
CAL_POINT_LO	This parameter contains the lowest calibrated value. This parameter indicates where the converter should be when the setpoint is 0%. The engineering unit used by calibration is mA.
CAL_MIN_SPAN	This parameter contains the minimum calibration span value allowed. This minimum span information is necessary to ensure that when calibration is done, the two calibrated points (high and low) are not too close together. The engineering unit used by calibration is mA.
CONVERTER_SER_NUM	This parameter contains the converter serial number.
CONVERTER_MAN	Name of converter-manufacturer
CONVERTER_MAINT_DATE	The date of last maintenance.
FEEDBACK_VALUE	The actual final value of the final control element in units of OUT_SCALE.
TERMINAL_NUMBER	The terminal number, which references a channel value, which is sent via internal, manufacturer-specific from AO function block to the specified transducer. It starts at one (1) for transducer number one until three (3) for transducer number three.

PARAMETERS	DESCRIPTION
TAB_ACTUAL_NUMBER	Contains the actual numbers of entries in the table. It shall be calculated after the transmission of the table is finished.
TAB_ENTRY	The index parameter identifies which element of the table is in the X_VALUE and Y_VALUE parameter currently
TAB_MAX_NUMBER	TAB_MAX_NUMBER is the maximum size (number of X_VALUE and Y_VALUE values) of the table in the device.
TAB_MIN_NUMBER	For device internal reasons (e.g. for calculation), sometimes it is necessary to use a certain number of table values in minimum. This number is provided in the TAB_MIN_NUMBER parameter.
TAB_OP_CODE	The modification of a table in a device influences the measurement or actuation algorithms of the device. Therefore an indication of a starting and an end point is necessary. The TAP_OP_CODE controls the transaction of the table. **0**: not initialised **1**: new operation characteristic, first value (TAB_INDEX=1), old curve cleared **2**: reserved **3**: last value, end of transmission, check table, swaps the old curve with the new curve, actualise ACTUAL_NUMBER. **4**: delete point of table with actual index (optional), sort records with increasing Charact-Input-Value, assign new indexes, decrement CHARACT_NUMBER. **5**: insert point (Charact-Input-Value relevant) (optional), sort records with increasing Charact-Input-Value, assign new indexes. Increment CHARACT_NUMBER. **6**: replace point of table with actual index (optional). It is possible to read a table or parts of the table without start an stop an interaction (TAB_OB_CODE 1 and 3). The start is indicated by set TAB_ENTRY to 1.
TAB_STATUS	It is common to provide a plausibility check in the device. The result of this check is indicated in the TAB_STATUS parameter. **0**: not initialised **1**: good (new table is valid) **2**: not monotonous increasing (old table is valid) **3**: not monotonous decreasing (old table is valid) **4**: not enough values transmitted (old table is valid) **5**: too many values transmitted (old table is valid) **6**: gradient of edge too high (old table is valid) **7**: Values not excepted (old values are valid) **8**: **127** reserved > **128** manufacturer specific
TAB_X_Y_VALUE	The X_Y_VALUE parameter contains one value couple of the table
LIN_TYPE	Type of linearisation. **0** = no linearisation (mandatory) **1** = linearisation table (optional) **240** = Manufacturer specific **249** = Manufacturer specific **250** = Not used **251** = None **252** = Unknown **253** = Special
FEEDBACK_CAL	This parameter should be set with the actual output current during the calibration procedure.
CAL_CONTROL	This parameter controls when the calibration procedure ends. It is necessary since the user should enter the "analog current" value that he sees at the multi-meter. The device waits for a flag that tells it when to change from trim mode to normal one.
ACTUATOR_ACTION	Fail-Safe position for power-loss of the actuator resp. the valve: **0** = not initialized **1** = opening (100%) **2** = closing (0%) **3** = none / remains in actual position
SP_RATE_INC	Ramp rate at which upward setpoint changes are acted on in Auto mode, in FV units per second. If the ramp rate is set to zero or minus infinite then the setpoint will be used immediately.
SP_RATE_DEC	Ramp rate at which downward setpoint changes are acted on in Auto mode, in FV units per second. If the ramp rate is set to zero or plus infinite then the setpoint will be used immediately.
SP_HI_LIM	The setpoint high limit is the highest setpoint operator entry that can be used for the

PARAMETERS	DESCRIPTION
	transducer block.
SP_LO_LIM	The setpoint low limit is the lowhest setpoint operator entry that can be used for the transducer block.
BACKUP_RESTORE	This parameter allows to save and to restore data according to factory and user calibration procedures. It has the following options: **1**, "Factory Cal Restore", **2**, "Last Cal Restore", **3**, "Default Data Restore", **4**, "Shut-Down Data Restore", **11**, "Factory Cal Backup", **12**, "Last Cal Backup", **14**, "Shut-Down Data Backup", **0**, "None".
XD_ERROR XD_ERROR	Indicates the condition of calibration process according to: {**16**, "Default value set"}, {**22**, "Applied process out of range"}, {**26**, "Invalid configuration for request"}, {**27**, "Excess correction"}, {**28**, "Calibration failed"}
MAIN_BOARD_SN	The electronic main board serial number.
EEPROM_FLAG	This parameter is used to indicate EEPROM saving process. {**0**, "False"} {**1**, "True"}
ORDERING_CODE	This array of Unsigned 8 bytes contains information about which kind of materials and mechanical parts have been used for the device. This is part of the Ordering Code information necessary to buy a spare unit.

Table 3.1 - Parameters Description

PROFIBUS to Current Converter Transducer Block - Parameters Table

Relative Index	Parameter Name	Object Type	Data Type	Store	Size	Access	Parameter usage/Type of Transport	Initial/Default Value	Mandatory/ Optional Class	VIEW
Standard Parameters										13
Additional Parameters for Transducer Block										
8	FINAL_VALUE	R	DS-33	D	5	R/w	C/a	0	M	
9	FINAL_VALUE_SCALE	Array	Float	S	8	R/w	C/a	4 and 20 mA	M	
10	CAL_POINT_HI	S	Float	N	4	R/w	C/a	20	M	
11	CAL_POINT_LO	S	Float	N	4	R/w	C/a	4	M	
12	CAL_MIN_SPAN	S	Float	N	4	R	C/a	1	O	
13	CONVERTER_SER_NUM	S	Unsigned32	N	4	R/w	C/a	0	O	
14	CONVERTER_MAN	S	Octet String	S	16	R/w	C/a	""	O	
15	CONVERTER_MAINT_DATE	S	Octet String	S	16	R/w	C/a	""	O	
16	FEEDBACK_VALUE	S	DS-33	D	5	R/w	C/a	0	M	
17	TERMINAL_NUMBER	S	Unsigned8	S	1	R/w	C/a	1	M	
18	TAB_ACTUAL_NUMBER	See explanation about table handling							O	
19	TAB_ENTRY	See explanation about table handling							O	
20	TAB_MAX_NUMBER	See explanation about table handling							O	
21	TAB_MIN_NUMBER	See explanation about table handling							O	
22	TAB_OP_CODE	See explanation about table handling							O	
23	TAB_STATUS	See explanation about table handling							O	

Relative Index	Parameter Name	Object Type	Data Type	Store	Size	Access	Parameter usage/Type of Transport	Initial/Default Value	Mandatory/ Optional Class	VIEW
24	TAB_X_Y_VALUE	See explanation about table handling							O	
25	LIN_TYPE	See explanation about table handling							M	
26	FEEDBACK_CAL	S	Float	D	4	R/w	C/a	0	M	
27	CAL_CONTROL	S	Unsigned8	N	1	R/w	C/a	0	O	
28-38	NOT – USED									
39	ACTUATOR_ACTION	S	Unsigned8	S	1	R/w	C/a			
40	SP_RATE_INC	S	float	S	4	R/w	C/a			
41	SP_RATE_DEC	S	float	S	4	R/w	C/a			
42	SP_HI_LIM	S	float	S	4	R/w	C/a			
43	SP_LO_LIM	S	float	S	4	R/w	C/a			
44	BACKUP_RESTORE	S	Unsigned8	S	1	R/w	C/a	0	O	
45	XD_ERROR	S	Unsigned8	D	1	R	C/a	0x10	O	
46	MAIN_BOARD_SN	S	Unsigned32	N	4	R/w	C/a	0	O	
47	EEPROM_FLAG	S	Unsigned8	D	1	R/w	C/a	0	O	
48	ORDERING_CODE	S	Array of Char	S		R/w	C/a			

Table 3.2 - Parameters Table

Cyclic Configuration

The profibus network master executes the equipment initialization process through the gsd file, which has details for hardware and software revision, equipment bus timing and information on the cyclic data exchange.

The FI303 has 3 functional blocks with analog output (AOs) that the class 1 master uses to execute the cyclic services and the user must choose what configuration best suits their application. If the slave AO master is in AUTO, it will receive the value and the status of the class 1 master setpoint. In addition, the user may alter this value via a class 2 master if the setpoint status is equal to 0x80 (“good”), and the following configurations can be chosen:

- SP;
- SP/CKECKBACK;
- SP/READBACK/POSD;
- SP/READBACK/POSD/CKECKBACK.

If the AO block is in RCAS, the equipment only receives the setpoint value and status through a class 1 master, and the status will always be equal to 0xc4 (“IA”). The following configurations may be chosen:

- SP;
- SP/CKECKBACK;
- SP/READBACK/POSD;
- SP/READBACK/POSD/ CKECKBACK;
- RCASIN/RCASOUT;
- RCASIN/RCASOUT/ CKECKBACK;
- SP/READBACK/RCASIN/RCASOUT/POSD/CHECKBACK.

The example below shows the necessary steps to integrate the FI303 to a PA system. These steps are applicable to all the equipments on Smar 303 line.

Copy the FI303 gsd file on the search directory of the PROFIBUS configurator, usually called GSD;

- Copy the FI303 bitmap file on the search directory of the PROFIBUS configurator, usually called BMP;

- After choosing the master, define the communication rate. Don´t forget that the couplers may have the following communication rates: 45.45 kbits/s (Siemens), 93.75 kbits/s (P+F) and 12Mbits/s (P+F, SK2). The IM157 link device may have up to 12Mbits/s;
- Add the FI303 and specify its bus address;

- Choose the configuration via parameterization with the gsd file, according to the application, as seen previously. Notice that this choice must match the AO blocks operating mode. Under these conditions mind the status value of the setpoint value, which should be 0x80 (Good) when in Auto mode, and 0xc4(IA) when in Rcas. Three AO blocks may be operated in the following cyclic order: AO_1, AO_2 e AO_3. If only 2 AOs are to be applied, there should be: configuration for the AO_1, configuration for the AO_2 and EMPTY MODULE.

The watchdog condition may be activated, prompting the equipment to enter a fail-safe mode when detecting a communication loss between the slave and the master equipment. Since the FI303 will be on a final element, it is recommended that a fail-safe value be configured.

The **Simatic PDM** (Process Device Manager) configuration software from Siemens, for example, can configure many parameters of the Input Transducer block.

The device was created as FI303.

Here, you can see all blocks instantiated.

As you can see the Transducer and Display are treated as special type of Function Blocks, called Transducer Blocks.

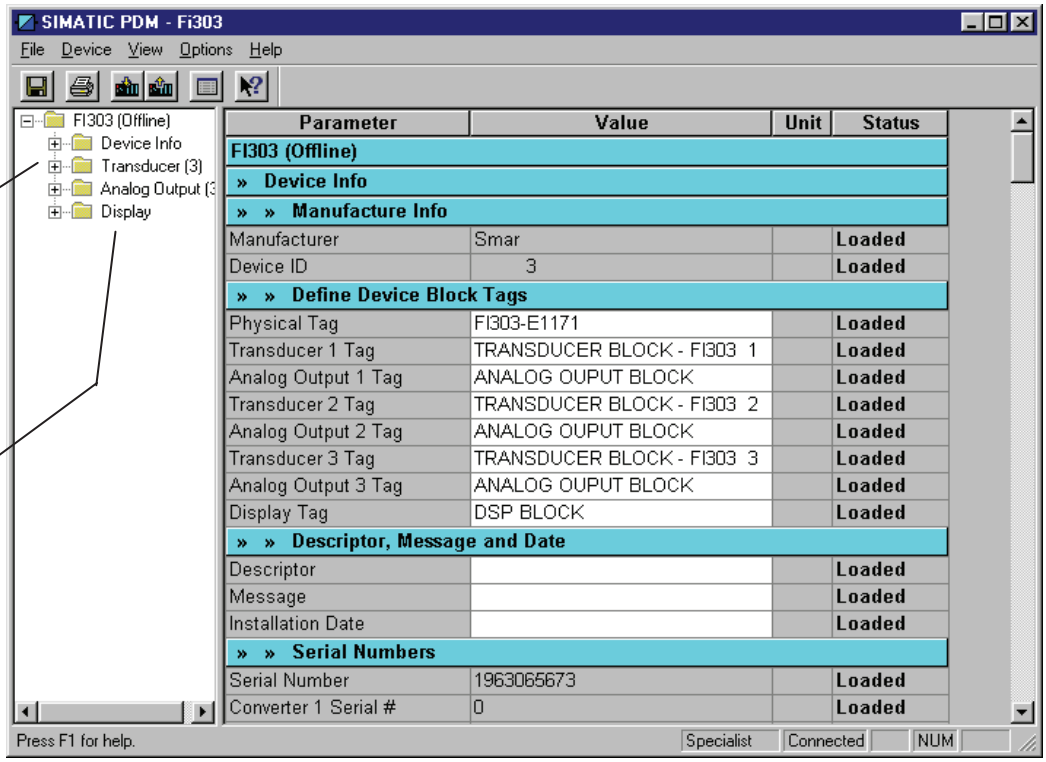


Figure 3.2 - Function and Transducer Blocks

To make the configuration of Transducer Block, we need to select the menu "Device"
Use this menu:
- To change the device address;
- To make the up/download of parameters;
- To configure the Transducer Block, Analog Output Block and Display Block;
- To calibrate the converter;
- To make the reset by software, to protect the device against writing and to simulate the value from transducer block to analog output block;
- To save and restore data calibration.

To make the configuration of Transducer Block, we need to select the menu "Device- OffLine Configuration-Transducer. We have 3 Transducer Blocks:

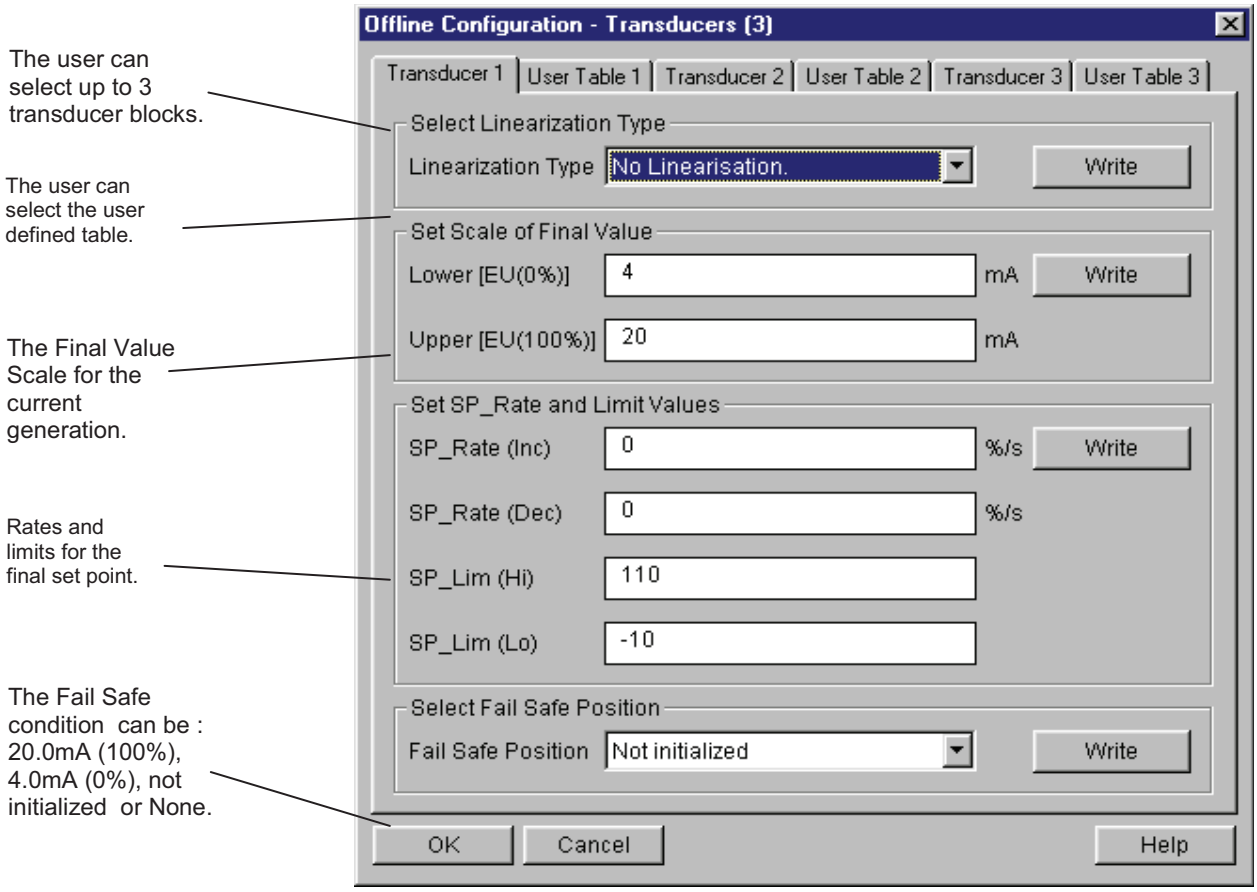


Figure 3.3 – FI303 Simatic PDM Transducer Block – Offline Configuration

Table handling

There is the possibility to load and re-load tables in the devices. This table is used for linearisation mostly. For this procedure the following parameters are necessary:

TAB_INDEX
TAB_X_Y_VALUE
TAB_MIN_NUMBER
TAB_MAX_NUMBER
TAB_OP_CODE
TAB_STATUS

The TAB_X_Y_VALUE parameter contains the value couple of the each table entries.

The TAB_INDEX parameter identifies which element of the table is in the TAB_X_ Y_VALUE parameter currently (see the following figure).

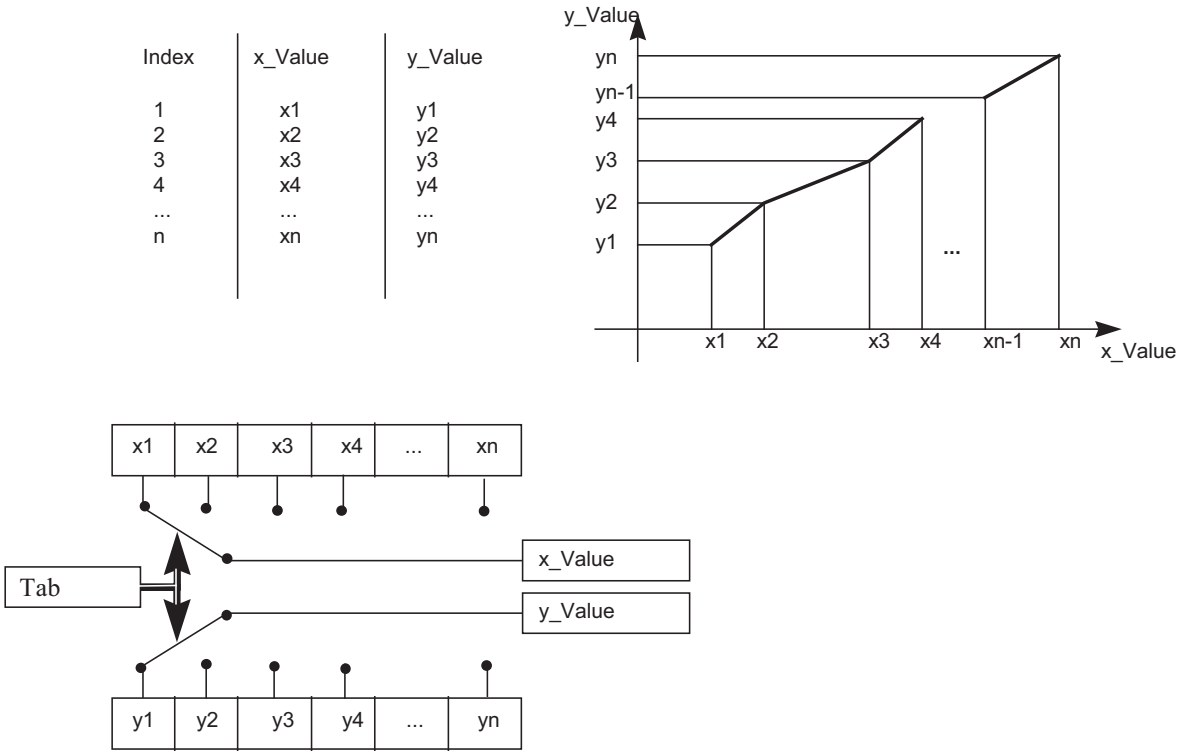


Figure 3.4 - Parameters of a table

TAB_MAX_NUMBER is the maximum size of the table in the device. TAB_MIN_NUMBER is the minimum size of the table in the device.

The modification of a table in the device influences the measurement algorithms of the device. Therefore an indication of a starting and an endpoint is necessary. The TAB_OP_CODE controls the transaction of the table. The device provides a plausibility check. The result of this check is indicated in the TAB_STATUS parameter.

The User Table is used to make the current characterization in several points.

The user can configure up to 8 points in percentage.

The characterization curve is used to give a determined profile to the output. This is useful, for example, when the **FI303** is controlling a valve with a non-linear characteristic. Characterization curve, when used, is applied to the input signal, before it is converted by the transducer to analog current.

For example, the valve characteristic curve may be slightly nonlinear.

This eventual non-linearity may be corrected through the User Table.

The user just needs to configure the input values and the correspondent output values in %. Configure a minimum of two points. These points will define the characterization curve. The maximum number of points is 8. It is recommended to select the points equally distributed over the desired range or over a part of the range where more accuracy is required. The user needs to set "user defined(table) to valve linearization type.

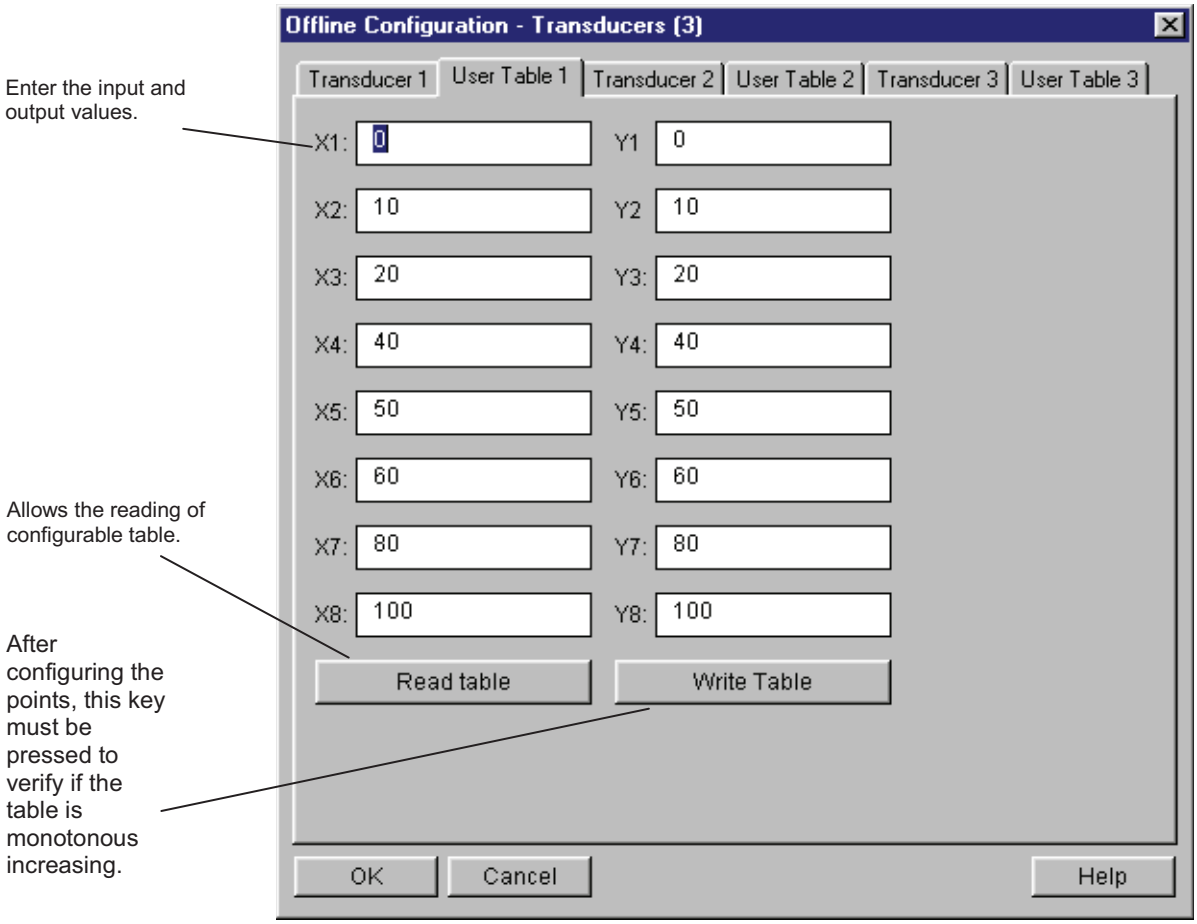


Figure 3.5 - FI303 Simatic PDM - Transducer OffLineConfiguration - User Table Screen

How to configure the Analog Output Block

The AO block provides a value to an output transducer block. It provides value, scaling conversion, fail safe mechanism and other features.
The Analog Output Block is a function block used by devices that work as output elements in a control loop, like valves, actuators, positioners, etc. The AO block receives a signal from another function block and passes its results to an output transducer block through an internal channel reference.

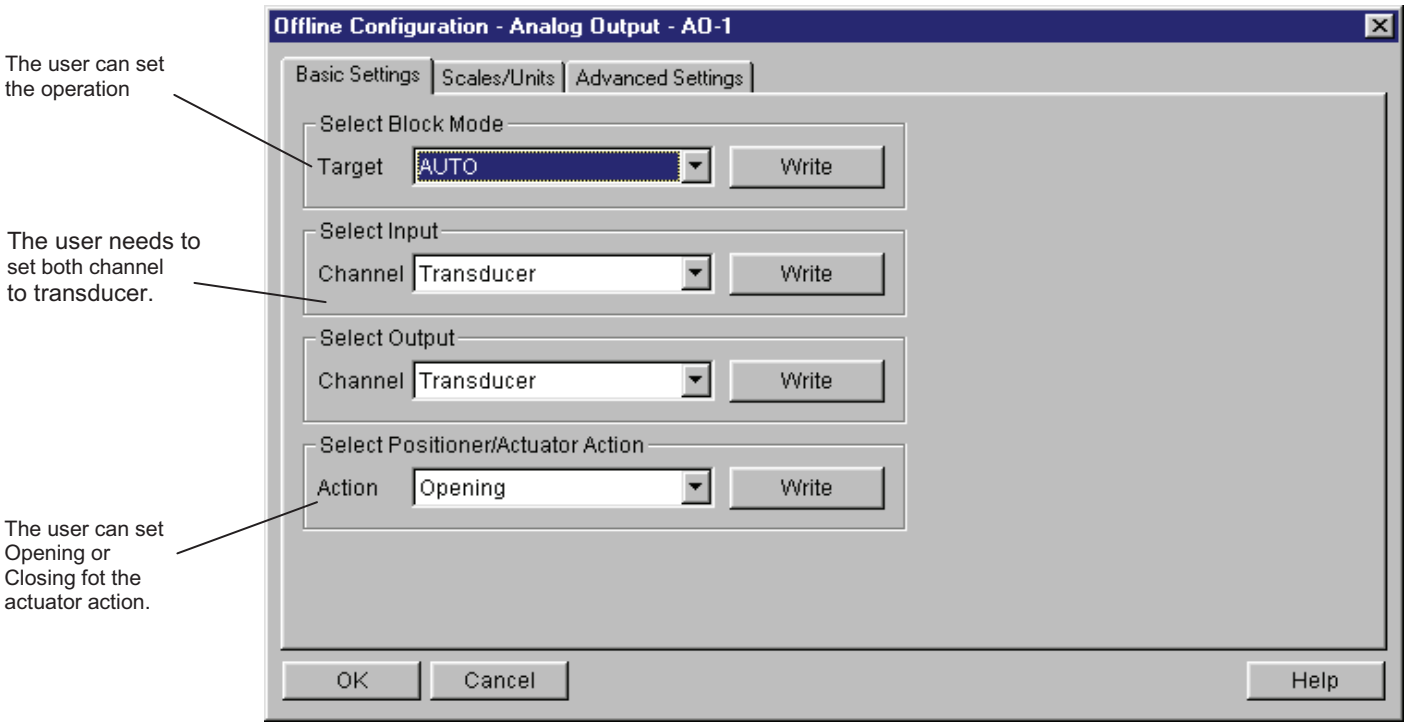


Figure 3.6 - FI303 Simatic PDM - Analog Output Block - Basic Settings - Offline Configuration

Selecting the page Scale/Units, the user has the option to configure the scale and unit for the input and output:

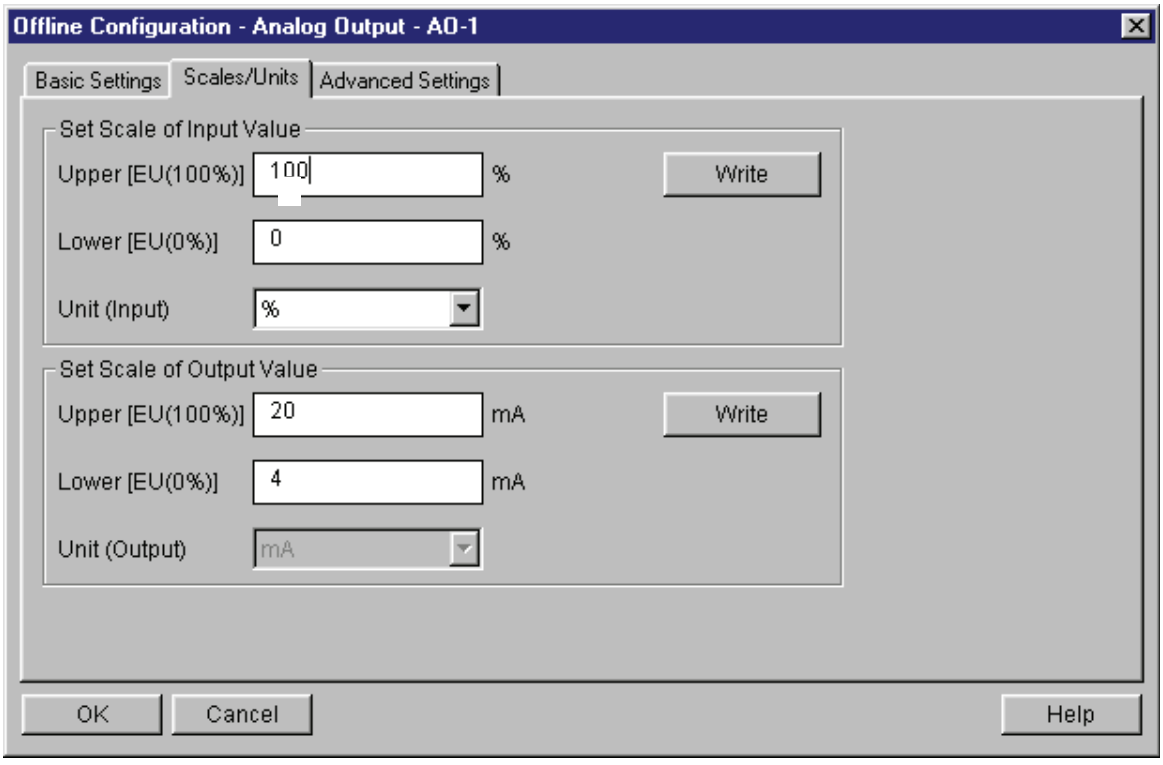


Figure 3.7 - FI303 Simatic PDM - Analog Output Block - Scale/Units - Offline Configuration

The unit and scale for the output will be the same for the transducer block. Note that the allowed unit is mA.

Selecting Advanced Settings page, the user can set the fail safe conditions.

For Fail Safe mode the options can be: Actuator goes to fail-safe position, storing last valid setpoint and fail safe value is used as a control regulator input.

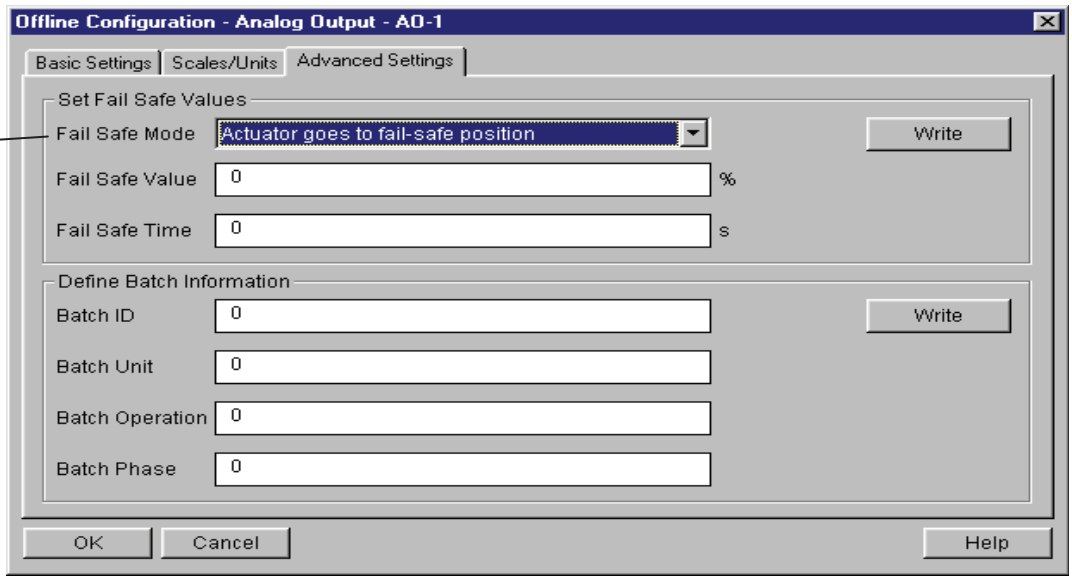


Figure 3.8 - FI303 Simatic PDM - Analog Output Block - Advanced Settings - Offline Configuration

In terms of Online configuration, the user can select at the device menu the Online Configuration for each Analog Output block:

The user can set block mode operation.

According to the block mode, the user can set the setpoint.

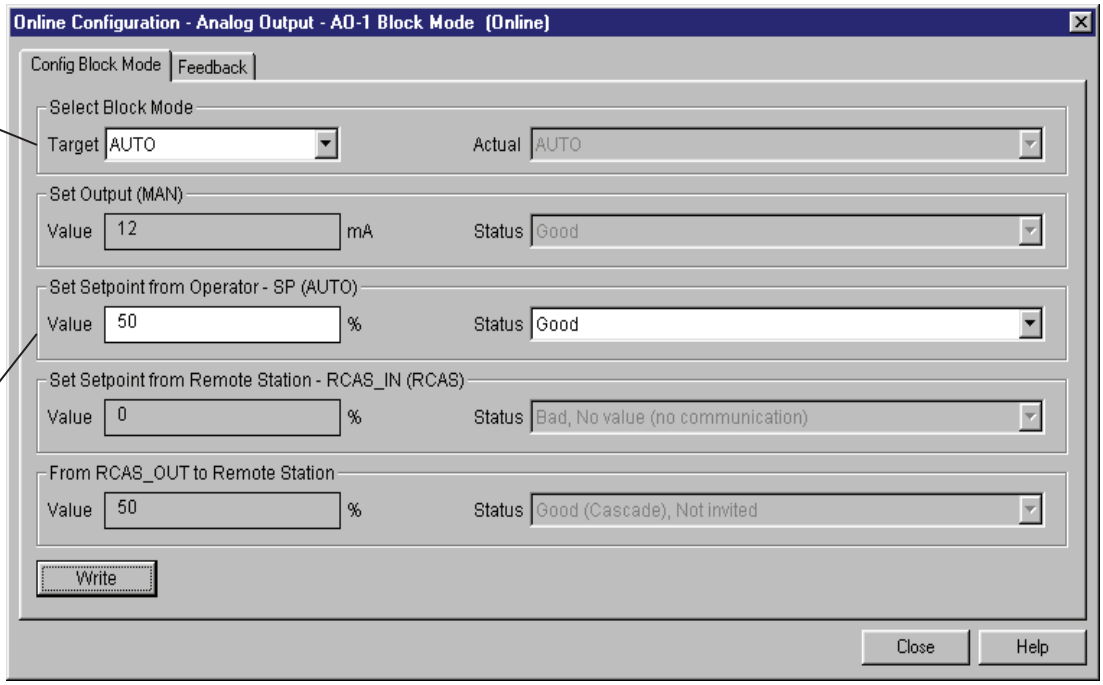


Figure 3.9 – FI303 Simatic PDM – Online Configuration mode block for AO

Using Feedback page, the user can monitore and check all values related between the analog block and the transducer block:

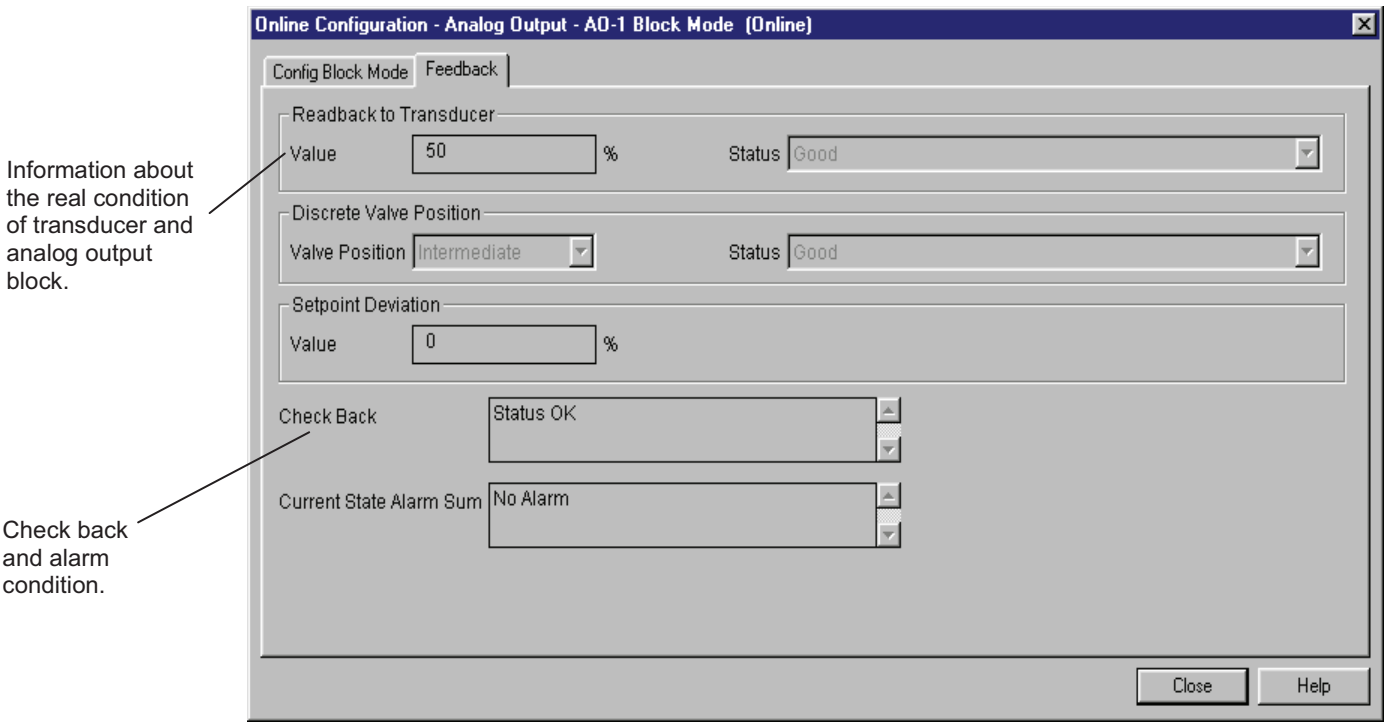


Figure 3.10 - FI303 Simatic PDM - OnLine Configuration feedback for AO.

Current Trim

The **FI303** provides the capability of making a trim in the output channels, if necessary.

A trim is necessary if the indicator reading of the transducer block output differs from the actual physical output. The reason may be:

- The user's current meter differs from the factory standard.
- The converter had its original characterization shifted by over-load or by long term drift.

The user can check the calibration of the transducer output by measuring the actual current in the output and compare it with the device's indication (of course an appropriate meter should be used). If a mismatch is detected, a trim can be done.

Trim can be done in two points:

LOWER TRIM: Is used to trim the output at the lower range.
UPPER TRIM: Is used to trim the output at the upper range.

These two points define the linear characteristic of the output. Trim in one point is independent from the other.

There are two ways of doing the trim: using local adjustment or using **a Configuration Tool** (For example, Simatic PDM from Siemens). When doing the trim, make sure you are using an appropriate meter (with the necessary accuracy).

Via Simatic PDM

Using the Device menu, please, choose the "Calibration" option an then, select the correspondent transducer block. For example, choosing the transducer block 1:

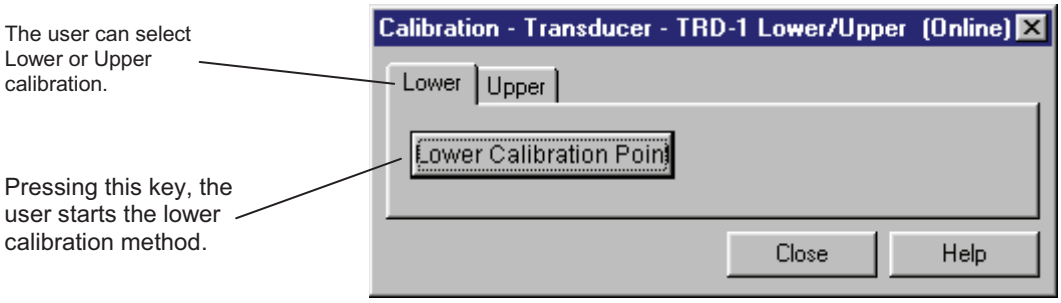
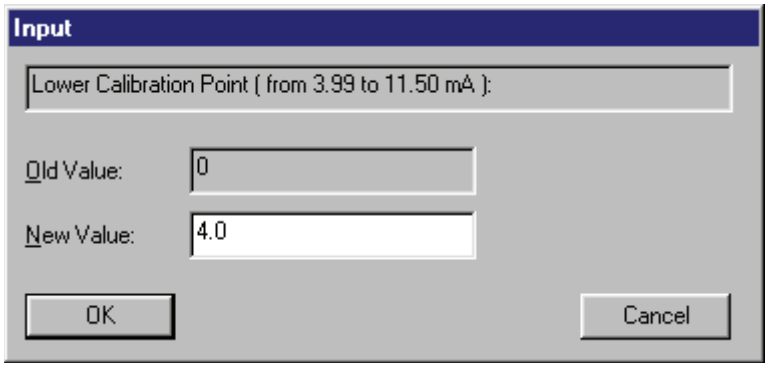


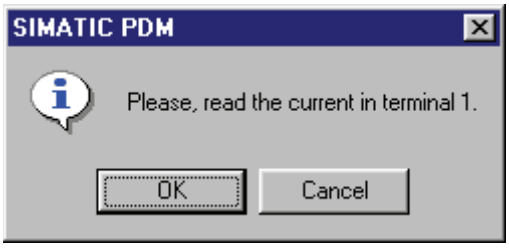
Figure 3.11 - FI303 - Simatic PDM Calibration Lower/Upper

After pressing " Lower Calibration", we get a warning.

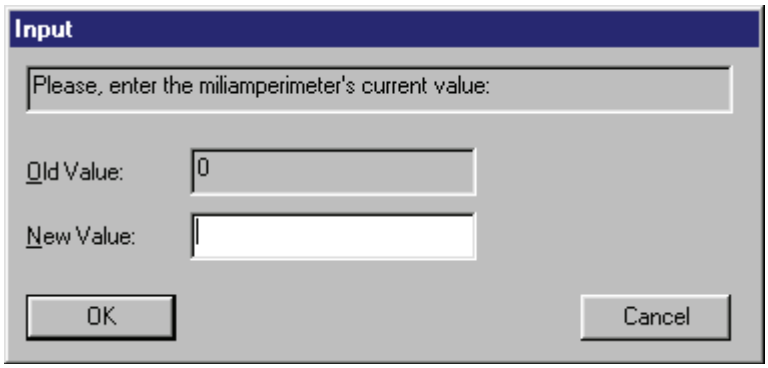
When the user press "OK", we have a new window that allows him to enter the desired value for the new calibrated point for the lower current. Write for example 4.0mA in new value:



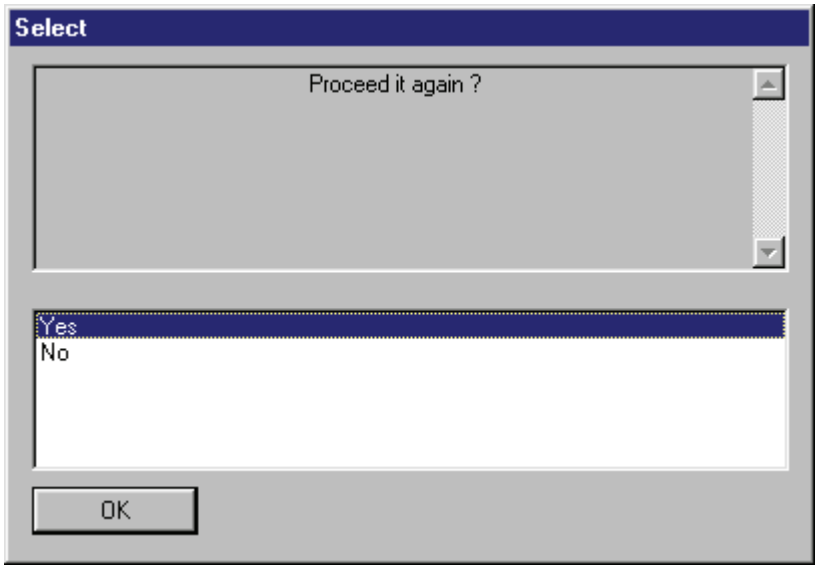
After entering the desired valve, the generated current is corrected according to the desired value and the user can make the correction until the right current is reached. For this purposal, the user needs to inform the generated current:



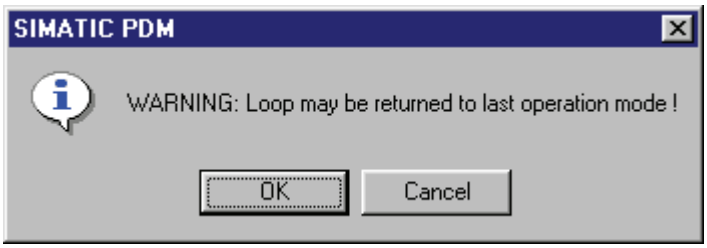
Pressing OK, we have:



The user can proceeds unitl the generated current is equal to the desired value:



If the calibrated current is correct, press "No" and a new warning appears:



After user confirmation, the converter comes to the normal operation.

The upper calibration procedure is similar than the lower:

The user can select Lower or Upper calibration.

Pressing this key, the user starts the upper calibration method.

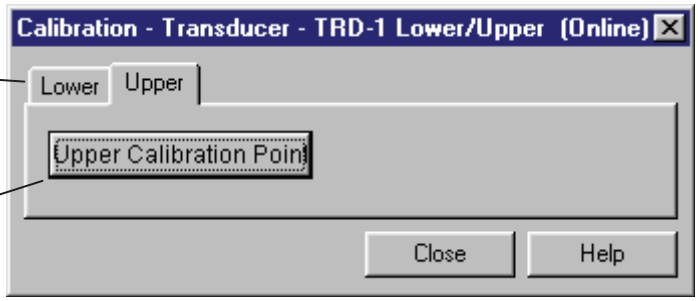
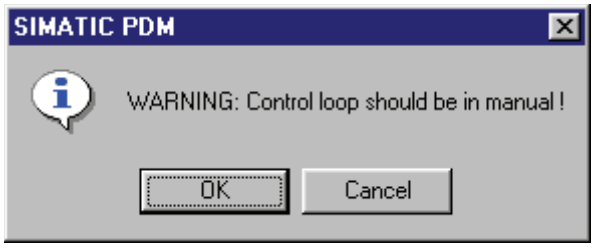
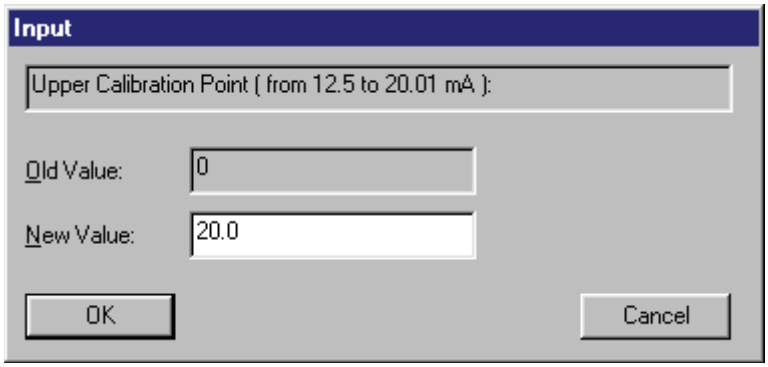


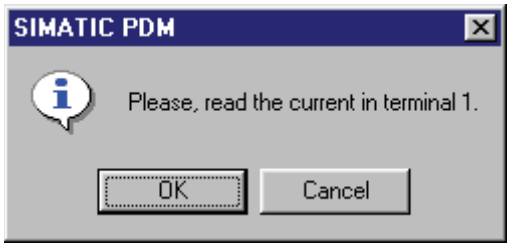
Figure 3.12 - FI303 - Simatic PDM Calibration Lower/Upper



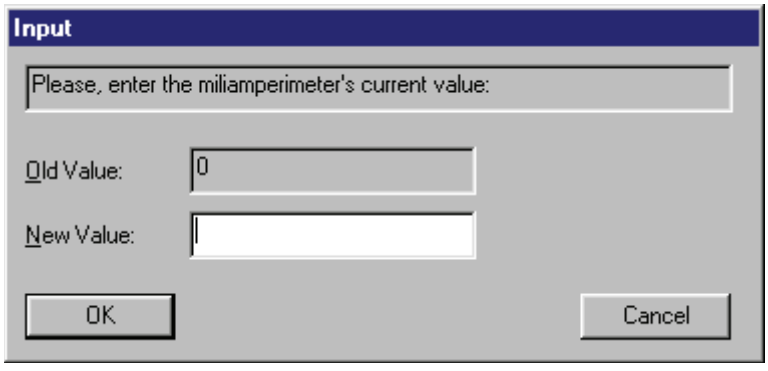
When the user press "OK", we have a new window that allows him to enter the desired value for the new calibrated point for the upper current. Write for example 20.0mA in new value:



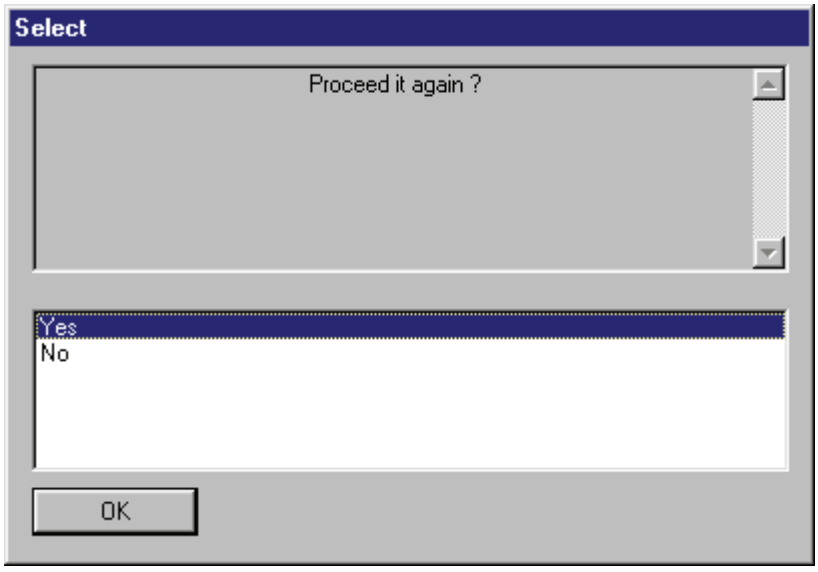
After entering the desired valve, the generated current is corrected according to the desired value and the user can make the correction until the right current is reached. For this purposal, the user needs to inform the generated current:



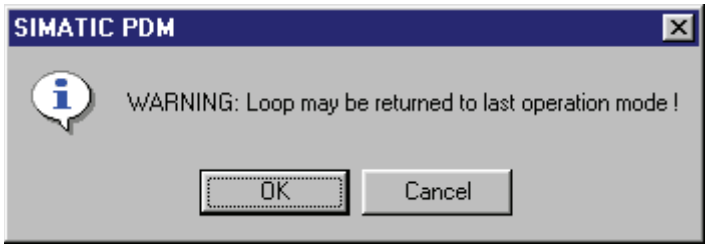
Pressing OK, we have:



The user can proceeds unitl the generated current is equal to the desired value:



If the calibrated current is correct, press "No" and a new warning appears:



After user confirmation, the converter comes to the normal operation.

NOTE
It is recommendable, for every new calibration, save the existing trim data by means of parameter BACKUP_RESTORE, using option "Last Cal Backup"

Via Local Adjustment

The **FI303** has 3 output transducers and its device leaves SMAR with factory settings. The factory setting establishes only the transducer #1 as default for local adjustment. In order to configure the others via local adjustment, the user should configure them in the display transducer via Configuration Tool, according specific instructions for this transducer block.

In order to enter the local adjustment mode, place the magnetic tool in orifice “Z” until flag “MD” lights up in the display. Remove the magnetic tool from “Z” and place it in orifice “S”. Remove and reinsert the magnetic tool in “S” until the message “**Loc-Adj**” is displayed. The message will be displayed during approximately 5 sec. after the user removes the magnetic tool from “S”. By placing the magnetic tool in “Z” the user will be able to access the local adjustment/monitoring tree. Browse to parameter “LOWER”. After that, in order to start the calibration, the user should actuate parameter “LOWER” with the help of the magnetic tool placed in “S”.

For example, it is possible to enter 4.0 mA or the lower value. When the magnetic tool is removed from “S”, the output will be adjusted to a value close to the desired value. The user should then browse the tree up to parameter FEED (FEEDBACK_CAL), and actuate this parameter by placing the magnetic tool in “S” until reaching the value shown by the multimeter.

The user should write in this parameter the multimeter readout value until 4.0 mA or the desired lower values are displayed.

Browse up to parameter “UPPER”. Then, in order to start the calibration, the user should actuate parameter UPPER by planing the magnetic tool in “S”.

For example, it is possible to enter 20.0 mA or the upper value. When the magnetic tool is removed from “S”, the output will be adjusted to a value close to the desired value. The user should then browse the tree up to parameter FEED (FEEDBACK_CAL) and actuate this parameter by placing the magnetic tool in “S” until reaching the value shown by the multimeter.

The user should write in this parameter the multimeter readout value until 20.0 mA or the desired upper values are displayed.

NOTE
Trim mode exit via local adjustment occurs automatically. Should the magnetic tool not be used during some seconds.

LIMIT CONDITIONS FOR CALIBRATION	
Lower	3.99 < NEW_LOWER < 11.5 mA, otherwise XD_ERROR = 22
Upper	12.50 < NEW_UPPER < 20.01 mA, otherwise XD_ERROR = 22

NOTE
Codes for XD_ERROR: **16**: Default Value Set **22**: Out of range **26**: Invalid Calibration request **27**: Excessive Correction

Transducer Display – Configuration

Using the **Simatic PDM or any other configuration tool** is possible to configure the Display Transducer block. As the name described it is a transducer due the interfacing of its block with the LCD hardware.

The Transducer Display is treated as a normal block by **any configuration tool**. It means, this block has some parameters and those ones can be configured according to customer's needs.

The customer can choose up to six parameters to be shown at LCD display, they can be parameters just for monitoring purpose or for acting locally in the field devices by using a magnetic tool. The seventh parameter is used to access the physical device address. The user can change this address according to his application. To access and configure the Display Block, please, go to the main menu, select "Device OnLine Configuration - Display Block":

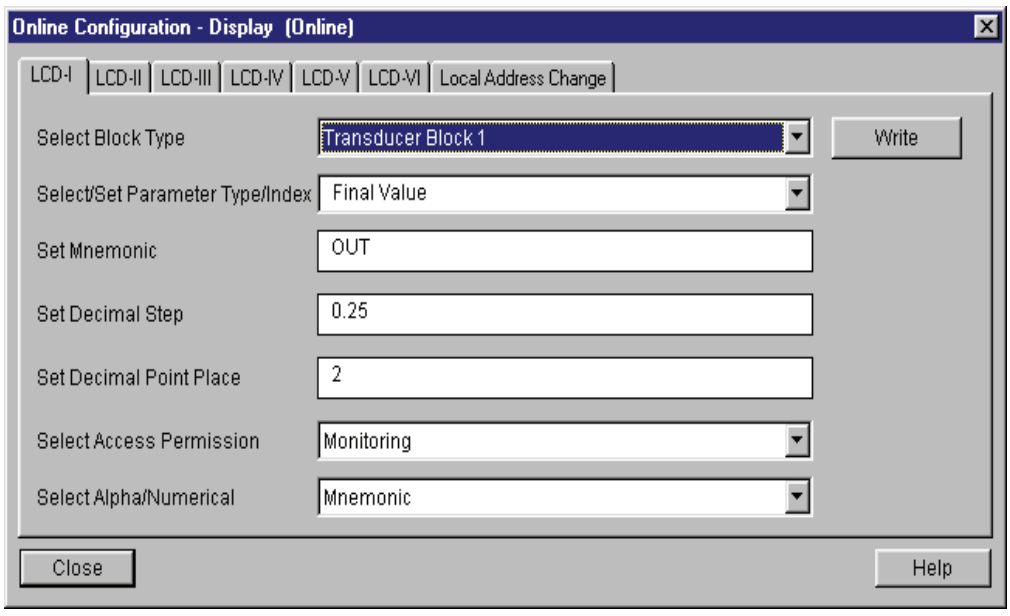


Figure 3.13 - Display Block and Simatic PDM.

Display Transducer Block

The local adjustment is completely configured by **Simatic PDM or any configuration tool**. It means, the user can select the best options to fit his application. From factory, it is configured with the options to set the Upper and Lower trim, for monitoring the input transducer output and check the Tag. Normally, the transmitter is much better configured by **Simatic PDM or configuration tool**, but the local functionality of the LCD permits an easy and fast action on certain parameters, since it does not rely on communication and network wiring connections. Among the possibilities by Local Adjustment, the following options can be emphasized: Mode block, Outputs monitoring, Tag visualization and Tuning Parameters setting.

The user interface is described very detailed on the "General Installation, Operation and Maintenance Procedures Manual". Please take a detailed look at this manual in the chapter related to "Programming Using Local Adjustment". It is significantly the resources on this transducer display, also all the **Series 303** field devices from SMAR has the same methodology to handle with it. So, since the user has learned once, he is capable to handle all kind of field devices from SMAR.

All function block and transducers defined according Profibus PA have a description of their features written by the Device Description Language.

This feature permits that third parties configuration tools enabled by Device Description Service technology can interpret these features and make them accessible to configure. The Function Blocks and Transducers of Series 303 have been defined rigorously according the Profibus PA specifications in order to be interoperable to other parties.

In order to able the local adjustment using the magnetic tool, it is necessary to previously prepare the parameters related with this operation via System Configuration.
There are six groups of parameters, which may be pre-configured by the user in order to able, a possible configuration by means of the local adjustment. As an example, let’s suppose that you don’t want to show some parameters; in this case, simply select "None" in the parameter, "Select Block Type". Doing this, the device will not take the parameters related (indexed) to its Block as a valid parameter.

Definition of Parameters and Values

Select Block Type
This is the type of the block where the parameter is located. The user can choose: Transducer Block, Analog Input Block, Totalizer Block , Physical Block or None.

Select/Set Parameter Type/Index
This is the index related to the parameter to be actuated or viewed (0, 1, 2…). For each block there are some pre-defined indexes. Refer to the Function Blocks Manual to know the desired indexes and then just enter the desired index.

Set Mnemonic
This is the mnemonic for the parameter identification (it accepts a maximum of 16 characters in the alphanumeric field of the display). Choose the mnemonic, preferably with no more than 5 characters because, this way, it will not be necessary to rotate it on the display.

Set Decimal Step
It is the increment and decrement in decimal units when the parameter is Float or Float Status value, or integer, when the parameter is in whole units.

Set Decimal Point Place.
This is the number of digits after the decimal point (0 to 3 decimal digits).

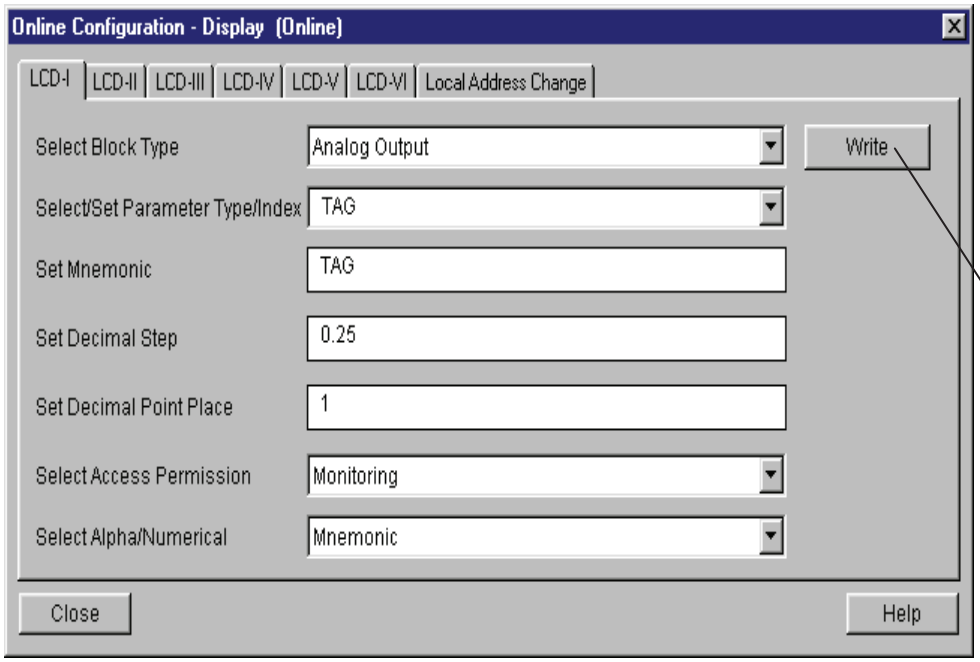
Set Access Permission
The access allows the user to read, in the case of the “Monitoring” option, and to write when "action" option is selected, then the display will show the increment and decrement arrows.

Set Alpha Numerical
These parameters include two options: value and mnemonic. In option value, it is possible to display data both in the alphanumeric and in the numeric fields; this way, in the case of a data higher than 10000, it will be shown in the alphanumeric field.

In option mnemonic, the display may show the data in the numeric field and the mnemonic in the alphanumeric field.

For devices where the software version is higher or equal to 1.10, please see the configuration of local adjustment using the local adjustment, in the Installation, operation and maintenance procedures manual.

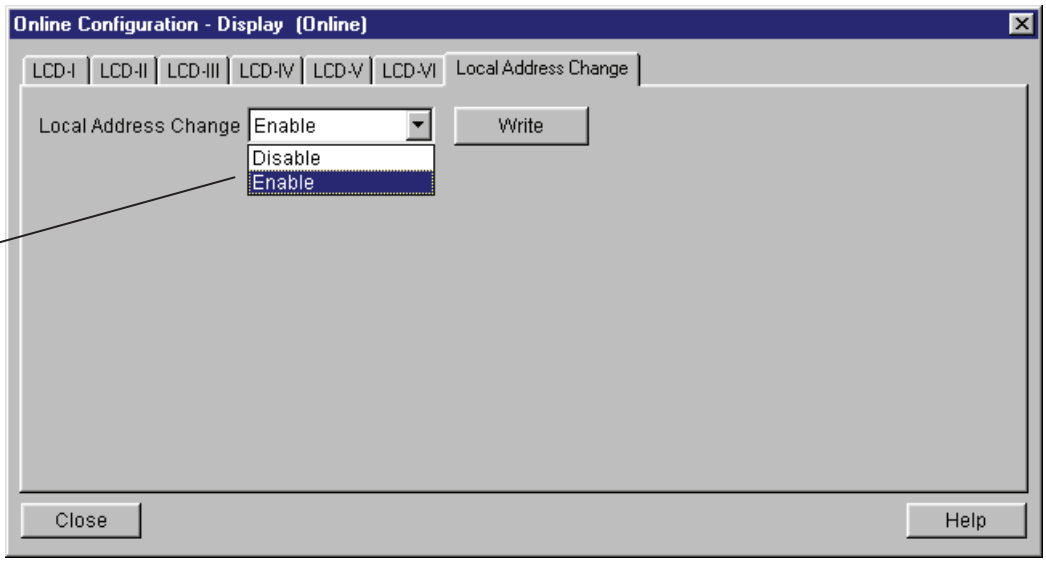
In case you wish to visualize a certain tag, opt for the index relative equal to "tag". To configure other parameters just select "LCD-II" up to "LCD-VI" windows:



The option " Write" should be selected in order to execute the upgrade of local adjustment programming tree. After its step all the parameters selected will be shonw on the LCD display.

Figure 3.14 – Parameters for Local Adjustment Configuration

The "Local Address Change" window allows the user to enable/disable the access to change the equipment address.



When the option " enable" is selected, the user can change the physical device address.

Figure 3.15 – Parameters for Local Address Configuration

When the user enter into the local adjustment and rotate the parameters using the magnetic tool, after escaping to normal operation, e.g, the monitoring, if the parameter when the magnetic tool is removed has "Access Permission equal to "monitoring", then this last parameter will be shown at the LCD.

Always on the LCD interface will be shown two parameters at the same time, switching between the configured parameter at the LCD-II and the last monitoring parameter. If the user does not want to show two parameters at the same time, it is only necessary to opt for "none" when configure the LCD-II:

Selecting “ None”, only the last chosen monitoring parameter will be shown at LCD.

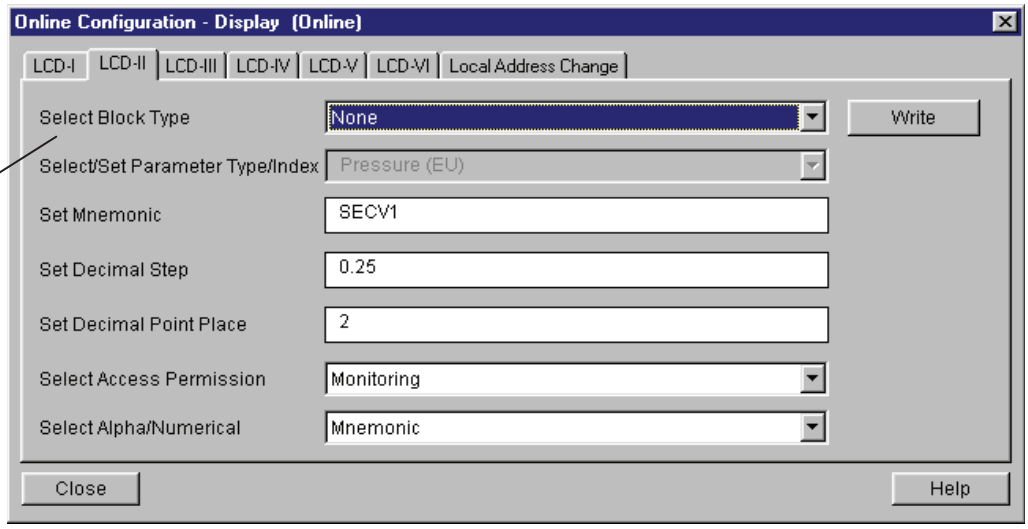


Figure 3.16 – Parameters for Local Adjustment Configuration

The user may select the “Mode Block” parameter on the display, when an index equal to this mode should be selected.

With this option, the Mode Block parameter is shown at the LCD.

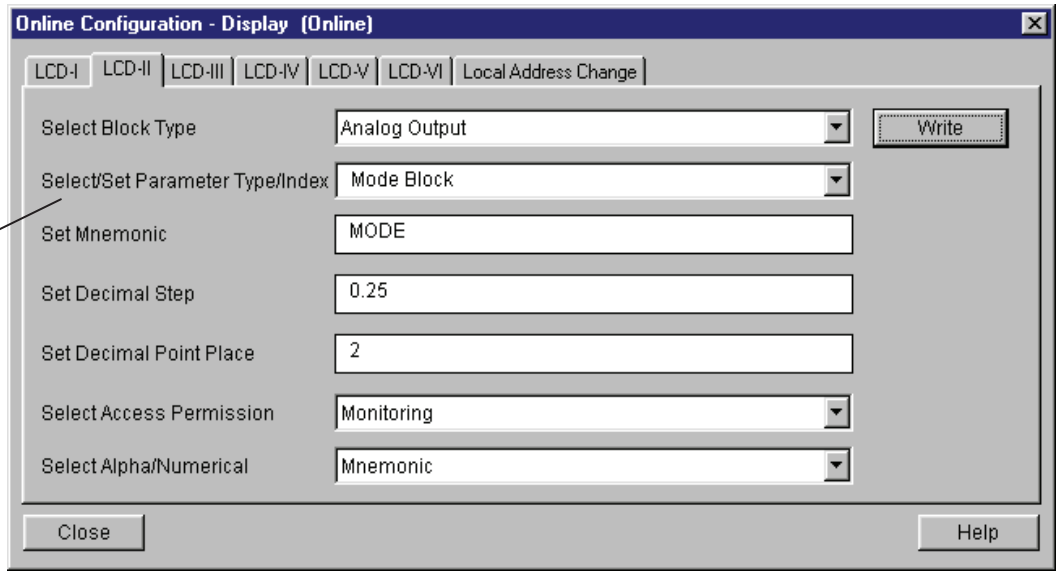


Figure 3.17 – Parameters for Local Adjustment Configuration

Local Adjustment Tree - Quick Guide

1) HOW TO ACCESS LOCAL ADJUSTMENT TREE

Follow Steps:
1) Insert magnetic screw driver in zero hole
2) Wait 3 seconds
3) Insert magnetics screw driver in span hole
4) Wait 3 seconds, then MD will appear on display

2) HOW TO BROWSE AND SELECT MENU OPTIONS

Browse: Insert magnetic screw driver in zero hole and hold

Select: Insert magnetic screw driver in span hole and hold

3) HOW TO CONFIGURE A BLOCK PARAMETER

1) Browse until CONF option, select LCD2
2) Browse until BLOCK select the block that will be configured
3) Browse until PRMT and set the relative index of the parameter
4) Browse until ITEM and set the sub index (if applicable)
5) Browse until UPDT, insert magnetic screw driver in Zero Hole
6) Reenter in Local Adjustment, browse until LCD2, now the parameter is available to change
7) Repeat above steps for all the parameters to be configured

OUT → LOWER → UPPER → FEED → ADDR → CONF → BLOCK → PRMT → ITEM → TGGL → UPDT

CONF: LCD1, LCD2, LCD3, LCD4, LCD5, LCD6

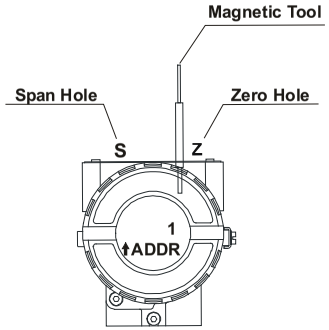
BLOCK: PHY, TRD1, TRD2, TRD3, AO1, AO2, AO3

TIP: DISPLAY SWITCHING BETWEEN 2 VARIABLES

Follow Steps:
1) Browse until TGGL
2) Select 2
3) Configure LCD 2 with the desired parameter

With TOGGLE 6

LCD1	LCD2	LCD4	LCD5	LCD6
OUT_1 →	LOWER →	UPPER →	FEED →	ADDR
8	2	10	26	24



- CONF: option where it is possible to select the LCD to configure. Six options are available: from LCD1 up to LCD6;
- BLOCK: option where the user must select the function block that he desires to configure;
- PRMT: number correspondent to the relative index of the desired parameter into the chosen function block;
- ITEM: configure this option when a selected parameter has sub items to be configured, for example, the OUT_SCALE parameter is compounded by “EU at 100%”, “EU at 0%”, “Unit Index” and “Decimal Point”;
- TGGL (Toggle): switches from 1 up to 6 configured parameters on the display. If TGGL is equal to 2, for example, the display wil l switch between LCD1 and LCD2;
- UPDT: refreshes the display when one of the LCDs are configured. Finalize display configuration by setting "UPDT", after choosing the configuration for the local adjustment.

Programming Using Local Adjustment

The local adjustment is completely configured by **Simatic PDM or any other configuration tool**. It means, the user can select the best options to fit his application. From factory, it is configured with the options to set the Upper and Lower trim, for monitoring the input transducer output and check the Tag. Normally, the transmitter is much better configured by **configuratinon tool**, but the local functionality of the LCD permits an easy and fast action on certain parameters, since it does not rely on communication and network wiring connections. Among the possibilities by Local Adjustment, the following options can be emphasized: Mode block, Outputs monitoring, Tag visualization and Tuning Parameters setting.

The interface between the user is also described very detailed on the "General Installation, Operation and Maintenance Procedures Manual" Please take a detailed look at this manual in the chapter related to "Programming Using Local Adjustment". It is significantly the resources on this transducer display, also all the Series 303 field devices from **SMAR** has the same methodology to handle with it. So, since the user has learned once, he is capable to handle all kind of field devices from **SMAR**. This Local adjustment configuration is a suggestion only. The user may choose his preferred configuration via configuration toll, simply configuring the display block).

The converter has two holes marked S and Z under the identification plate, which represent two internal Reed switches that can be activated by inserting the magnetic tool. (See fig. 3.18).

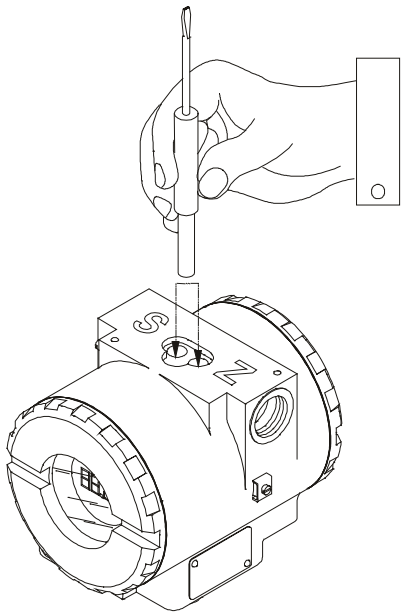


Fig. 3.18 – Local Adjustment Holes

Table 3.4 shows the actions on the **Z** and **S** holes on the IF303 when Local Adjustment is enabled.

HOLE	ACTION
Z	Inicializes and rotates through the available functions.
S	Selects the function shown in the display.

Table 3.4– Purpose of the holes on the Housing

J1 Jumper Connections

If J1 (see figure 3.19) is connected to ON, then simulation mode in the AO block is enabled.

W1 Jumper Connections

If W1 is connected to ON, the local adjustment programming tree is enabled and then important block parameters can be adjusted and communication can be pre-configured via local adjustment.

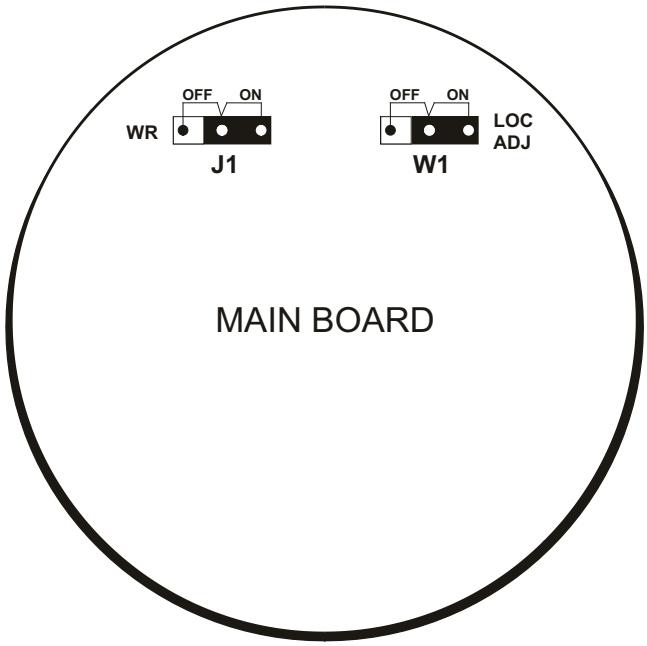
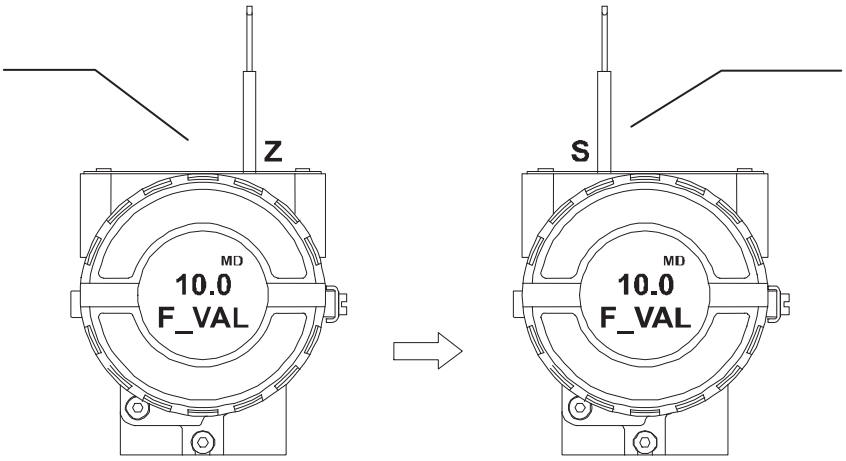


Fig. 3.19 - J1 and W1 Jumpers

Example: let's say we want to calibrate the lower and upper current value. From normal display, enter local adjustment. The display will show:

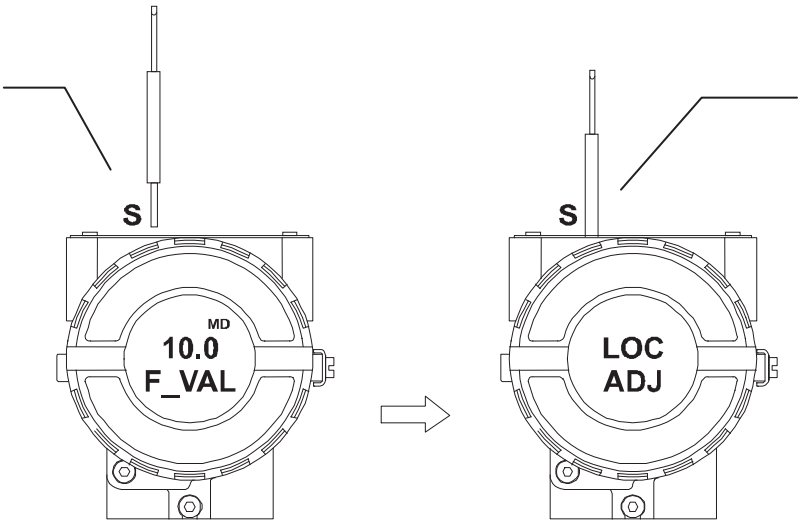
In order to start the local adjustment, place the magnetic tool in orifice **Z** and wait until letters **MD** are displayed.



Place the magnetic tool in orifice **S** and wait during 5 seconds.

Figure 3.20 - Step 1 - FI303

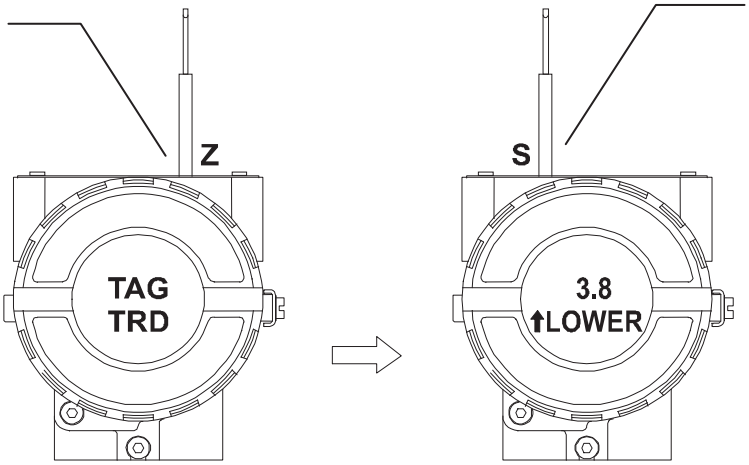
Remove the magnetic tool from orifice **S**.



Insert the magnetic tool in orifice **S** once more and **LOC ADJ** should be displayed.

Figure 3.21 - Step 2 - FI303

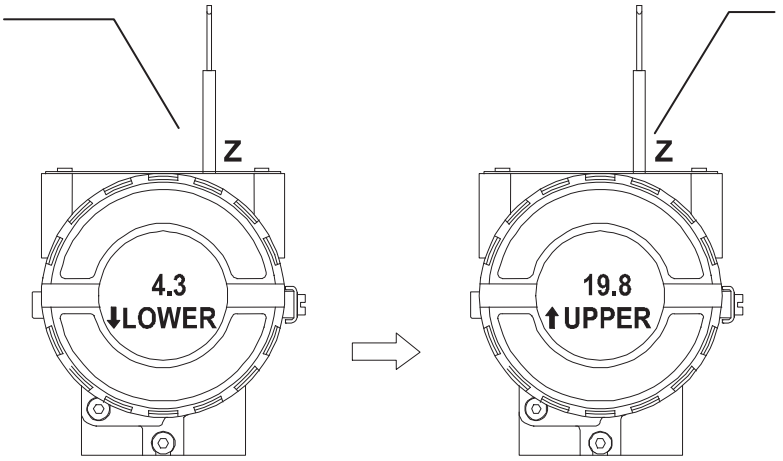
Place the magnetic tool in orifice **Z**. In case this is the first configuration, the option shown on the display is the **TAG** with its corresponding mnemonic configured by the Configuration Tool. Otherwise, the option shown on the display will be the one configured in the prior operation. By keeping the tool inserted in this orifice, the local adjustment menu will rotate.



This parameter is used to calibrate the lower current point. In order to range the lower value, simply insert the magnetic tool in orifice **S** as soon as lower is shown on the display. An arrow pointing upward (↑) increment the value and an arrow pointing downward (↓) decrement the value. Apply the 4.00 mA current in the **1** and **4** terminals. With the magnetic screwdriver, adjust the current value shown on the display to indicate 4.00 mA.

Figure 3.22 - Step 3 - FI303

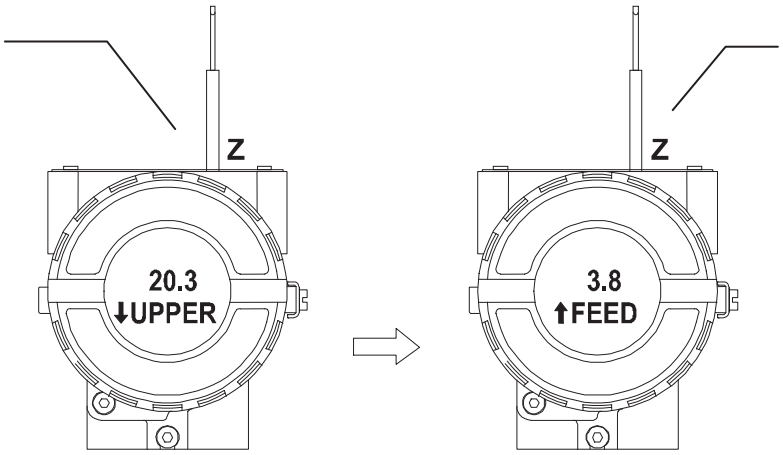
In order to decrement the lower value, place the magnetic tool in orifice **Z** to shift the arrow to the downward position and then, by inserting and keeping the tool in orifice **S**, it is possible to decrement the lower value.



This parameter is used to calibrate the upper current point. In order to range the upper value, simply insert the magnetic tool in orifice **S** as soon as upper is shown on the display. An arrow pointing upward (↑) increment the value and an arrow pointing downward (↓) decrement the value. Apply the 20.0 mA current in the **1** and **4** terminals. With the magnetic tool, adjust the current value shown on the display to indicate 20.00 mA.

Figure 3.23 - Step 4 - FI303

To decrease the upper value, insert the magnetic tool in orifice Z to change the arrow position downward (↓). Remove it and insert it in the orifice S to decrease the upper value.



The FEED option allows the user to correct the current calibration. To implement the correction, read the current measured on the Miliamperimeter and use the screwdriver to adjust the figure on the display to this value. This option corrects the value of a lower calibration. An arrow pointed upward increases the current value.

Figure 3.24 - Step 5 - FI303

Place the magnetic tool on orifice S to change the arrow position downward and decrease the calibration current.

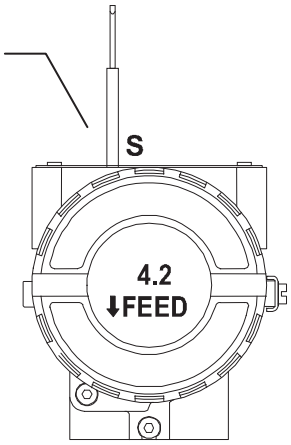
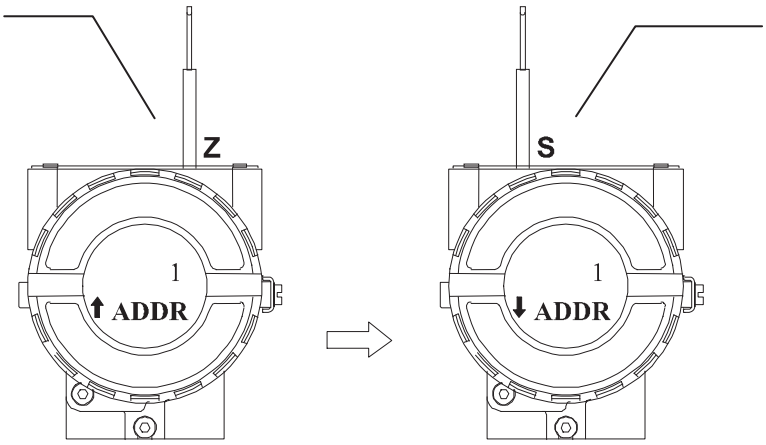


figure 3.25 - Step 6 - FI303

To change the address value, withdraw the magnetic tool from orifice Z when the ADDR is shown on the display. An arrow pointing upward (↑) increases the address, and an arrow pointing downward sets the desired value.



To decrease the address value, place the magnetic tool on orifice S to change the arrow position downward. Insert and keep the tool to decrease the address value

figure 3.26 - Step 7 - FI303

NOTE
This Local adjustment configuration is a suggestion only. The user may choose his preferred configuration via Configuration Tool, simply configuring the display block (refer to paragraph display Transducer Block).

Section 4

MAINTENANCE PROCEDURES

General

SMAR **FI303** Fieldbus to Current Converters are extensively tested and inspected before delivery to the end user. Nevertheless, during their design and development, consideration was given to the possibility of repairs by the end user, if necessary.

In general, it is recommended that the end-user do not try to repair printed circuit boards. Instead, he should have spare circuit boards, which may be ordered from SMAR whenever necessary.

TROUBLESHOOTING	
SYMPTOM	**PROBABLE SOURCES OF TROUBLE**
NO QUIESCENT URRENT	Converter Fieldbus Connections Check wiring polarity and continuity. Power Supply Check power supply output. The voltage at the **FI303** Fieldbus terminals must be between 9 and 32 VDC. Electronics Circuit Failure Check circuit boards for defect by replacing them with spare ones.
NO COMMUNICATION	Network Connection Check network connections: devices, power supply, couplers, links and terminators. Converter Configuration Check configuration of communication parameters of converter. Network Configuration Check communication configuration of the network. Electronics Circuit Failure Try to replace the converter circuit with spare parts.
INCORRECT OUTPUTS	Output Terminals Connection Check wiring polarity and continuity. Power Supply Check power supply output. The voltage at the output terminals of **FI303** must be between 3 and 45 VDC. Load Resistance Load resistance must be between 0 and 2000Ω. Note that the maximum value depends on output power supply voltage. Calibration Check calibration of converter.

If the problem cannot by solved with the diagnostic table above, run the factory init according to the note below.

NOTE

The Factory Init should be tried as a last option to recover the equipment control when the equipment presents some problem related to the function blocks or the communication. This operation must only be carried out by authorized technical personnel and with the process offline, since the equipment will be configured with standard and factory data.

This procedure resets all the configurations run on the equipment, after which a partial download should be performed. With exception to the equipment physical address and the gsd identifier number selector parameter. After doing this, all configurations must be remade according to their applications.

To run the factory Init, use two magnetic screwdrivers. Remove the screw on the equipment that fixes the identification tag on the carcass top to access the orifices bearing the letters “S” and “Z”.

The operations to follow are:

1) Turn off the equipment, insert the magnetic tools in each orifice (S and Z). Leave them in the orifices;

2) Power the equipment;

3) As soon as Factory Init is shown on the display, take off the tools and wait for the "5" symbol on the right upper corner of the display to unlit, thus indicating the end of the operation.

This operation has factory configuration that eliminates possible problems with the functional blocks or the transmitter communication.

Caution: this operation must be carried out by an authorized technician, with the process offline, as the process will be configured with factory standard data.

Disassembly Procedure

Refer to Figure 4.1 - FI303 Exploded View Make sure to disconnect power supply before disassembling the converter.

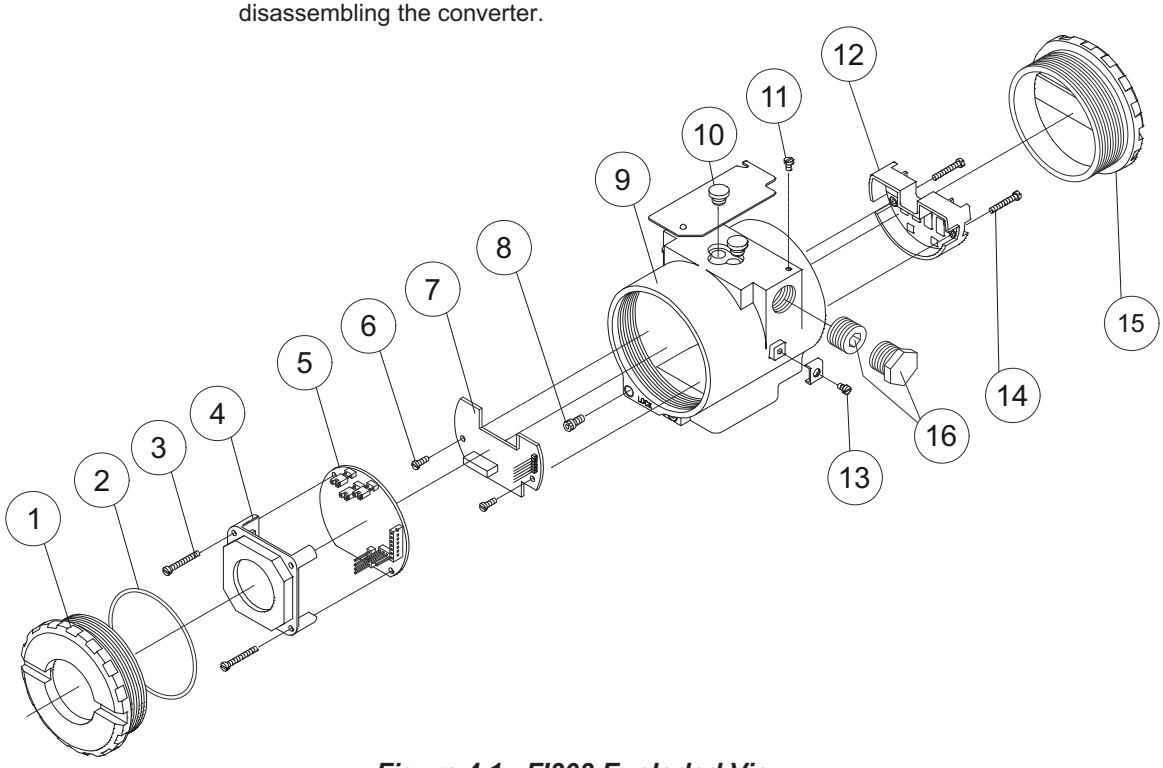


Figure 4.1 - FI303 Exploded View

Electronic Circuit
The main plate (5) and the outlet plate (7) are factory match pairs and must be replaced together, as one should not be changed separately.

To remove the electronic plates (5 and 7) and the display (4), release the lid lock (8) on the carcass side not bearing the words “Field Terminals” and unscrew the lid (1).

WARNING
The plates have CMOS components that may be damaged by electrostatic discharges. Follow the right procedure for handling the CMOS components. The plate should be stored in an electrostatic-proof case.

Loosen both screws (3) that anchors the display and the main circuit board. Gently pull out the display, and then the main board (5). To remove the output board (7), first unscrew both screws (6) that anchors it to the housing (9), and gently pull out the board.

Reassembly Procedure

Put output board (7) into housing (9).
Anchor output board with its screws (6).
Place the main plate (5) on the carcass and make sure the pins are connected.

Put display (4) into the housing, observing the four mounting positions. The "▲" symbol must point upward.

Anchor the main board and display with their screws (3).
Fit the cover (1) and lock it using the locking screw (8).

Interchangeability

The calibration data on the Inlet plate are stored on the Principal plate EEPROM, reason why they are said to be “match pairs”.

ADVERTÊNCIA
Se, por alguma razão, as placas de Entrada e Principal forem separadas é necessário fazer um Trim para garantir a precisão das entradas. Com placas incompatíveis, o trim de fábrica não será tão bom quanto aquele com as placas casadas.

Accessories

ACCESSORIES	
ORDERING CODE	**DESCRIPTION**
SD1	Magnetic Tool for Local Adjustment
FDI302	Field Device interface
PS302	Power Supply
BT302	Terminator
BC1	Fieldbus/RS232 Interface
DF47	Intrinsic Safety Barrier
DF48	Fieldbus Repeater

Spare Parts List

SPARE PARTS LIST				
	DESCRIPTION OF PARTS	**POSITION**	**CODE**	**CATEGORY (NOTE 1)**
Cover Without Window (Includes O-Ring)	Aluminum	1 and 15	204-0102	
	316 SS	1 and 15	204-0105	
Cover With Window for Indicator (Includes O-Ring)	Aluminum	1	204-0103	
	316 SS	1	204-0106	
0-Rings **(Note 3)**	Cover, Buna-N	2	204-0122	**B**
Aluminum Housing Main Board Screw	Units with indicator	3	304-0118	
	Units without indicator	3	304-0117	
316 Stainless Steel Housing Main Board Screw	Units With Indicator	3	204-0118	
	Units Without Indicator	3	204-0117	
Digital Indicator		4	214-0108	
Main and Output Circuit Board Assembly		5 and 7	400-0318	**A**
Input Board Screw	Housing in Aluminum	6	314- 0125	
	Housing in 316 Stainless Steel	6	214-0125	
Cover Locking Screw		8	204-0120	
Housing, Aluminum **(Note 2)**	½ - 14 NPT	9	400-0312	
	M20 x 1.5	9	400-0313	
	PG 13.5 DIN	9	400-0314	
Housing, 316 SS **(Note 2)**	½ - 14 NPT	9	400-0315	
	M20 x 1.5	9	400-0316	
	PG 13.5 DIN	9	400-0317	
Local Adjustment Protection Cap		10	204-0114	
Identification Plate Fixing Screw		11	204-0116	
Terminal Insulator		12	314-0123	
External Ground Screw		13	204-0124	
Terminal Holding Screw	Housing in Aluminum	14	304-0119	
	Housing in 316 Stainless Steel	14	204-0119	
Six-Sided Plug 1/2" NPT Internal BR Ex	Bichromated Carbon Steel	16	400-0808	
	Bichromated 304 Stainless Steel	16	400-0809	
Six-Sided Plug 1/2" NPT Internal	Bichromated Carbon Steel	16	400-0583-11	
	Bichromated 304 Stainless Steel	16	400-0583-12	
Six-Sided Plug M20 X 1.5 External BR Ex d	316 Stainless Steel	16	400-0810	
Six-Sided Plug PG13.5 External BR Ex d	316 Stainless Steel	16	400-0811	
Mounting Bracket for 2" Pipe **(Note 4)**	Carbon Steel	-	214-0801	
	Stainless Steel 316	-	214-0802	
	Carbon Steel bolts, nuts, washers and U-clamp in Stainless Steel	-	214-0803	

NOTE
1 - For category A, it is recommended to keep, in stock, 25 parts installed for each set, and for category B, 50.
2 - It includes terminal holder insulator, bolts (cover lock, grounding and terminal holder insulator) and identification plate without certification.
3 - O-Rings are packaged in packs of 12 units.
4 - Including U-clamp, nuts, bolts and washers. Spare Parts List.

Section 5

TECHNICAL CHARACTERISTICS

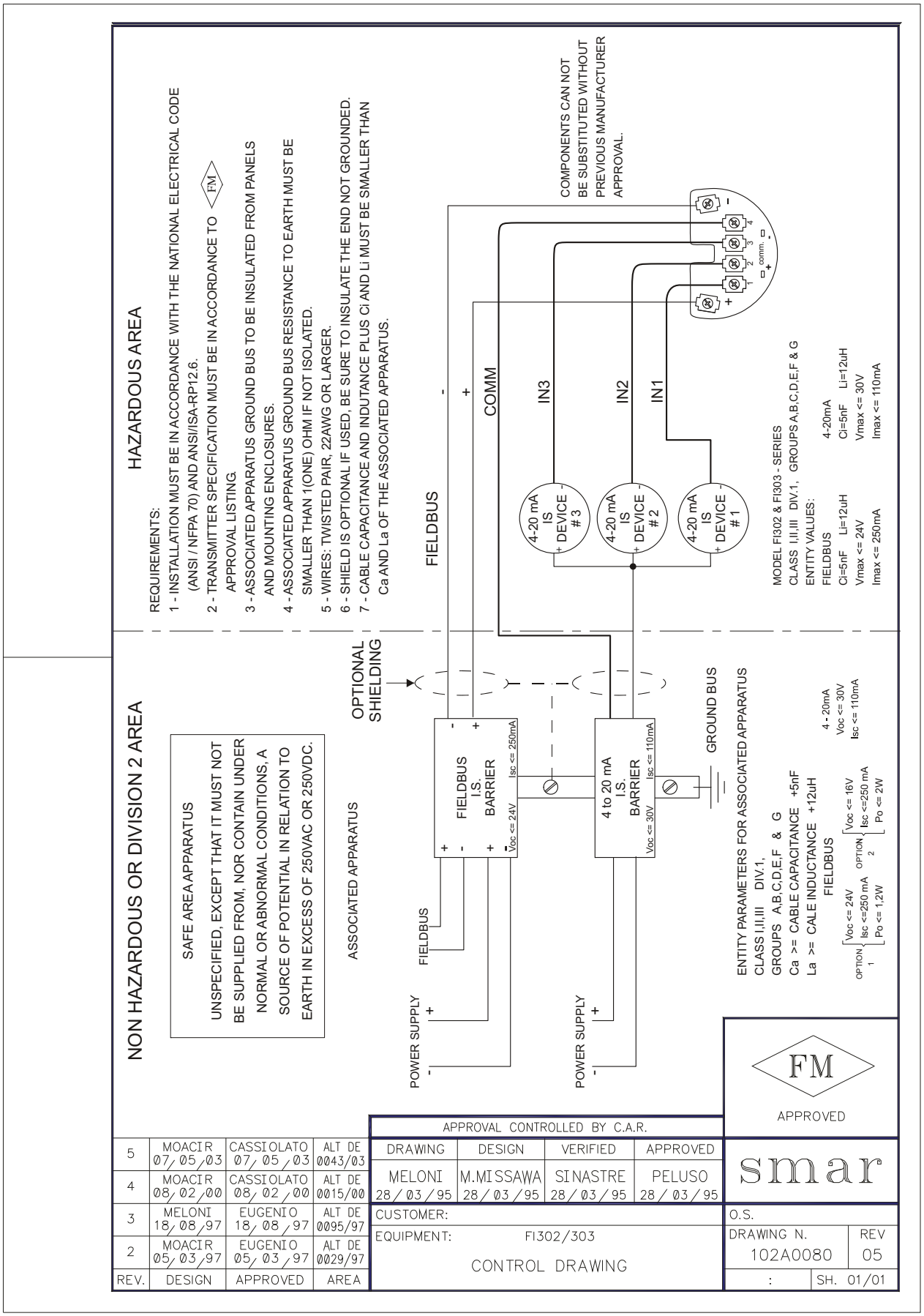
Functional Specifications	
Output Signal	Three 4-20 mA current links, external supply, common ground.
Input Signal	Digital only, Fieldbus, 31.25 Kbit/s voltage mode with bus power.
Output Load Limitation	External Output Supply Voltage 3-45 Vdc.
Power Supply	Bus power 9-32 Vdc. Current consumption quiescent 12 mA. Output impedance: non-intrinsic safety from 7.8 KHz - 39 KHz should be greater or equal to 3 KOhm. Intrinsic safety output impedance (assuming an IS barrier in the power supply) from 7.8 KHz - 39 KHz should be greater or equal to 400 Ohm.
Indication	Optional 4½ digit LCD indicator.
Hazardous Location Certification	Explosion proof, weather proof and intrinsically safe CENELEC and FM standards (pending).
Temperature Limits	Operation: -40 to 85 ºC (-40 to 185 ºF) Storage: -40 to 120 ºC (-40 to 250 ºF) Display: -10 to 60 ºC (14 to 140 ºF) operation -40 to 85 ºC (-40 to 185 ºF) without damage.
Humidity Limits	0 to 100% RH.
Turn-on Time	Approximately 10 seconds.
Update Time	Approximately 0.5 second.
Configuration	Basic configuration may be done using local adjustment magnetic tool if device is fitted with display. Complete configuration is possible using remote configurator (Ex.:Simatic PDM).
Performance Specifications	
Accuracy	0.1%.
Ambient Temperature Effect	For a 10 C variation: ± 0.05%.
Output Power Supply Effect	± 0.005%/V
Vibration Effect	Meets SAMA PMC 31.1.
Electro-Magnetic Interference Effect	Designed to comply with IEC 801.
Physical Specifications	
Hardware	Physical: according to IEC 61158-2 and conformity with the FISCO model.
Electrical Connection	1/2-14 NPT, Pg 13.5 or M20 x 1.5.
Material of Construction	Injected low copper aluminum with polyester painting or 316 Stainless Steel housing, with Buna N O-rings on covers (NEMA 4X, IP67).
Mounting	With an optional bracket can be installed on a 2" pipe or fixed on a wall or panel.
Weight	Without display and mounting bracket: 0.80 kg. Add for digital display: 0.13 kg. Add for mounting bracket: 0.60 kg.

Ordering Code

MODELO	FIELDBUS TO CURRENT CONVERTER			
	CÓD.	Local Indicator		
	0	Without Indicator		
	1	With Digital Indicator		
		CÓD.	Mounting Bracket for 2" Pipe Mounting	
		0	Without Bracket	
		1	Carbon Steel Bracket	
		2	316 SST Bracket	
			CÓD.	Electrical Connections
			0	1/2-14 NPT
			A	M20 x 1.5
			B	Pg 13.5 DIN
				CÓD. Options
				H1 316 SST Housing
				A1 316 SST Bolts
				ZZ Special Options – Specify

FI303	1	1	0	*

* Deixar em branco senão houver itens opcionais.


HAZARDOUS AREA
REQUIREMENTS:
1 - INSTALLATION MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (ANSI / NFPA 70) AND ANSI/ISA-RP12.6.
2 - TRANSMITTER SPECIFICATION MUST BE IN ACCORDANCE TO FM APPROVAL LISTING.
3 - ASSOCIATED APPARATUS GROUND BUS TO BE INSULATED FROM PANELS AND MOUNTING ENCLOSURES.
4 - ASSOCIATED APPARATUS GROUND BUS RESISTANCE TO EARTH MUST BE SMALLER THAN 1(ONE) OHM IF NOT ISOLATED.
5 - WIRES: TWISTED PAIR, 22AWG OR LARGER.
6 - SHIELD IS OPTIONAL IF USED, BE SURE TO INSULATE THE END NOT GROUNDED.
7 - CABLE CAPACITANCE AND INDUTANCE PLUS Ci AND Li MUST BE SMALLER THAN Ca AND La OF THE ASSOCIATED APPARATUS.
COMPONENTS CAN NOT BE SUBSTITUTED WITHOUT PREVIOUS MANUFACTURER APPROVAL.
FIELDBUS
COMM
IN3
IN2
IN1
4-20 mA IS DEVICE #3
4-20 mA IS DEVICE #2
4-20 mA IS DEVICE #1
MODEL FI302 & FI303 - SERIES
CLASS I,II,III DIV.1, GROUPS A,B,C,D,E,F & G
ENTITY VALUES:
FIELDBUS 4-20mA
Ci=5nF Li=12uH Ci=5nF Li=12uH
Vmax <= 24V Vmax <= 30V
Imax <= 250mA Imax <= 110mA
NON HAZARDOUS OR DIVISION 2 AREA
SAFE AREA APPARATUS
UNSPECIFIED, EXCEPT THAT IT MUST NOT BE SUPPLIED FROM, NOR CONTAIN UNDER NORMAL OR ABNORMAL CONDITIONS, A SOURCE OF POTENTIAL IN RELATION TO EARTH IN EXCESS OF 250VAC OR 250VDC.
ASSOCIATED APPARATUS
OPTIONAL SHIELDING
FIELDBUS I.S. BARRIER
Isc <= 250mA
Voc <= 24V
4 to 20 mA I.S. BARRIER
Isc <= 110mA
Voc <= 30V
GROUND BUS
FIELDBUS
POWER SUPPLY
ENTITY PARAMETERS FOR ASSOCIATED APPARATUS
CLASS I,II,III DIV.1,
GROUPS A,B,C,D,E,F & G
Ca >= CABLE CAPACITANCE +5nF
La >= CALE INDUCTANCE +12uH
FIELDBUS
OPTION 1: Voc <= 24V, Isc <=250 mA, Po <= 1,2W
OPTION 2: Voc <= 16V, Isc <=250 mA, Po <= 2W
4 - 20mA Voc <= 30V Isc <= 110mA
FM
APPROVED
APPROVAL CONTROLLED BY C.A.R.
DRAWING: MELONI 28/03/95
DESIGN: M.MISSAWA 28/03/95
VERIFIED: SINASTRE 28/03/95
APPROVED: PELUSO 28/03/95
CUSTOMER:
EQUIPMENT: FI302/303
CONTROL DRAWING
smar
O.S.
DRAWING N. 102A0080
REV 05
: SH. 01/01
REV. | DESIGN | APPROVED | AREA
5 | MOACIR 07/05/03 | CASSIOLATO 07/05/03 | ALT DE 0043/03
4 | MOACIR 08/02/00 | CASSIOLATO 08/02/00 | ALT DE 0015/00
3 | MELONI 18/08/97 | EUGENIO 18/08/97 | ALT DE 0095/97
2 | MOACIR 05/03/97 | EUGENIO 05/03/97 | ALT DE 0029/97

Appendix A

smar

SRF – Service Request Form

Converter from Fieldbus to 4-20mA

GENERAL DATA

Model: FI302 ( ) FI303 ( )

Serial Number: _____

TAG: _____

How many channels are used in IF? 1 ( ) 2 ( ) 3 ( )

Configuration: Magnetic Tool ( ) PC ( ) Software: _____ Version: _____ Other: _____

INSTALLATION DATA

Type/Model/Manufacturer of device connected to the channel 1: _____

_____

Type/Model/Manufacturer of device connected to the channel 2: _____

_____

Type/Model/Manufacturer of device connected to the channel 3: _____

_____

PROCESS DATA

Hazardous Area Classification: ( ) Yes, please specify: _____

( ) No

More details: _____

Types of Interference presents in the area: Without interference ( ) Temperature ( ) Vibration ( ) Others: _____

Ambient Temperature: From _____ºC up to _____ºC

OCCURRENCE DESCRIPTION

_____

_____

_____

_____

SERVICE SUGGESTION

Adjustment ( ) Cleaning ( ) Preventive Maintenance ( ) Update / Up-grade ( )

Other: _____

USER INFORMATION

Company: _____

Contact: _____

Title: _____

Section: _____

Phone: _____ _____ _____ _____ **Extension:** _____

E-mail: _____ **Date:** _____/ _____/ _____

For warranty or non-warranty repair, please contact your representative.
Further information about address and contacts can be found on www.smar.com/contactus.asp.

Returning Materials

Should it be necessary to return the converter to Smar, simply contact your local Smar office informing the defective equipment serial number and dispatch it to our factory.

For easier analysis and faster solution of the problem, the returned material should include the documentation with a description of the failure observed in the field and the circumstances that caused it. Other information, such as the installation site, type of measure taken and the process conditions are also important for a prompt evaluation.

Appendix B

SMAR WARRANTY CERTIFICATE

1. SMAR guarantees its products for a period of 24 (twenty four) months, starting on the day of issuance of the invoice. The guarantee is valid regardless of the day that the product was installed.

2. SMAR products are guaranteed against any defect originating from manufacturing, mounting, whether of a material or manpower nature, provided that the technical analysis reveals the existence of a quality failure liable to be classified under the meaning of the word, duly verified by the technical team within the warranty terms.

3. Exceptions are proven cases of inappropriate use, wrong handling or lack of basic maintenance compliant to the equipment manual provisions. SMAR does not guarantee any defect or damage caused by an uncontrolled situation, including but not limited to negligence, user imprudence or negligence, natural forces, wars or civil unrest, accidents, inadequate transportation or packaging due to the user's responsibility, defects caused by fire, theft or stray shipment, improper electric voltage or power source connection, electric surges, violations, modifications not described on the instructions manual, and/or if the serial number was altered or removed, substitution of parts, adjustments or repairs carried out by non-authorized personnel; inappropriate product use and/or application that cause corrosion, risks or deformation on the product, damages on parts or components, inadequate cleaning with incompatible chemical products, solvent and abrasive products incompatible with construction materials, chemical or electrolytic influences, parts and components susceptible to decay from regular use, use of equipment beyond operational limits (temperature, humidity, etc.) according to the instructions manual. In addition, this Warranty Certificate excludes expenses with transportation, freight, insurance, all of which are the customer's responsibility.

4. For warranty or non-warranty repair, please contact your representative.

   Further information about address and contacts can be found on www.smar.com/contactus.asp

5. In cases needing technical assistance at the customer's facilities during the warranty period, the hours effectively worked will not be billed, although SMAR shall be reimbursed from the service technician's transportation, meals and lodging expenses, as well dismounting/mounting costs, if any.

6. The repair and/or substitution of defective parts do not extend, under any circumstance, the original warranty term, unless this extension is granted and communicated in writing by SMAR.

7. No Collaborator, Representative or any third party has the right, on SMAR's behalf, to grant warranty or assume some responsibility for SMAR products. If any warranty would be granted or assumed without SMAR's written consent, it will be declared void beforehand.

8. Cases of Extended Warranty acquisition must be negotiated with and documented by SMAR.

9. If necessary to return the equipment or product for repair or analysis, contact us.
   See item 4.

10. In cases of repair or analysis, the customer must fill out the Revision Requisition Form (FSR) included in the instructions manual, which contains details on the failure observed on the field, the circumstances it occurred, in addition to information on the installation site and process conditions. Equipments and products excluded from the warranty clauses must be approved by the client prior to the service execution.

11. In cases of repairs, the client shall be responsible for the proper product packaging and SMAR will not cover any damage occurred in shipment.

12. In cases of repairs under warranty, recall or outside warranty, the client is responsible for the correct packaging and packing and SMAR shall not cover any damage caused during transportation. Service expenses or any costs related to installing and uninstalling the product are the client´s sole responsibility and SMAR does not assume any accountability before the buyer.

13. It is the customer's responsibility to clean and decontaminate products and accessories prior to shipping them for repair, and SMAR and its dealer reserve themselves the right to refuse the service in cases not compliant to those conditions. It is the customer's responsibility to tell SMAR and its dealer when the product was utilized in applications that contaminate the equipment with harmful products during its handling and repair. Any other damages, consequences, indemnity claims, expenses and other costs caused by the lack of decontamination will be attributed to the client. Kindly, fill out the Declaration of Decontamination prior to shipping products to SMAR or its dealers, which can be accessed at www.smar.com/doc/declarationofcontamination.pdf and include in the packaging.

14. This warranty certificate is valid only when accompanying the purchase invoice.