MANUAL

INSTALLATION | OPERATION | MAINTENANCE

TRIPLE CHANNEL PROFIBUS TO CURRENT CONVERTER FI303

DEC/24 - VERSION 4

smar
Technology Company

FI303

Triple channel Profibus to Current converter

PROFIBUS®

Consult our subsidiary

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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, without losing 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.

NOTE
In case of using Simatic PDM as the configuration and parameterization tool, Smar recommends that the user does not apply the option "Download to Device". This function can improperly configure the field device. Smar recommends that user make the use of the option "Download to PG / PC" and then selecting the Device Menu, use the menus of the transducer, function and display blocks acting specifically, according to each menu and method for reading and writing.

NOTE
This Manual is compatible with version 4.XX, where 4 denote software version and XX software release. The indication 4.XX means that this manual is compatible with any release of software version 4.

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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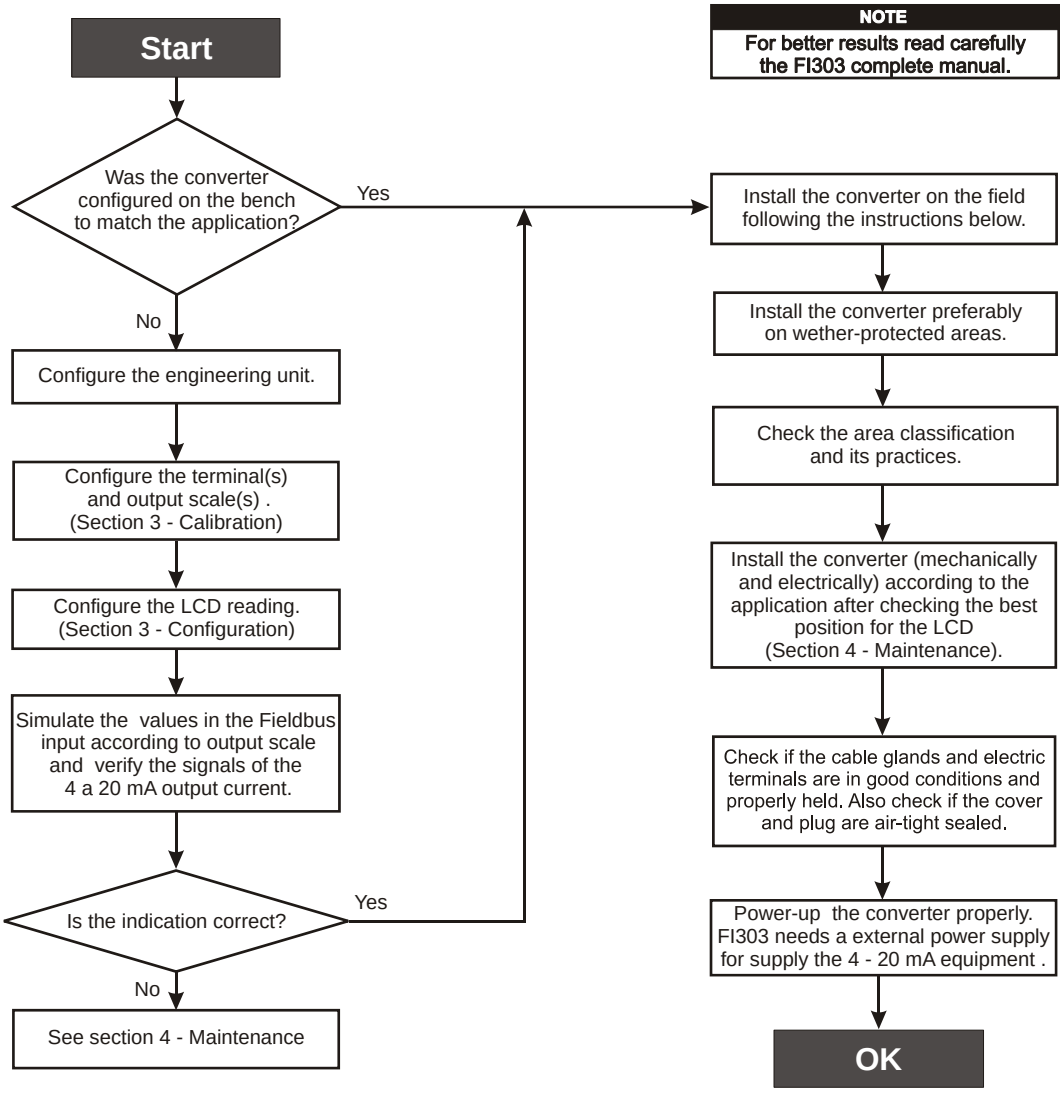
Installation Flowchart



Section 1

INSTALLATION

General

NOTE
Installations carried out in hazardous areas must follow the recommendations of the standards applicable to the area.

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

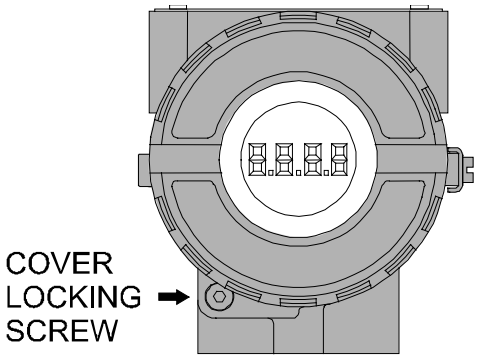


Figure 1.1 - Cover Locking

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**.**

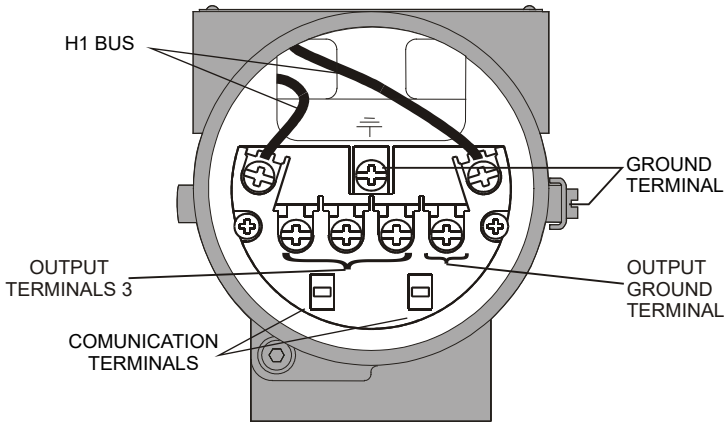


Figure 1.2 - Ground Terminals

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 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 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).

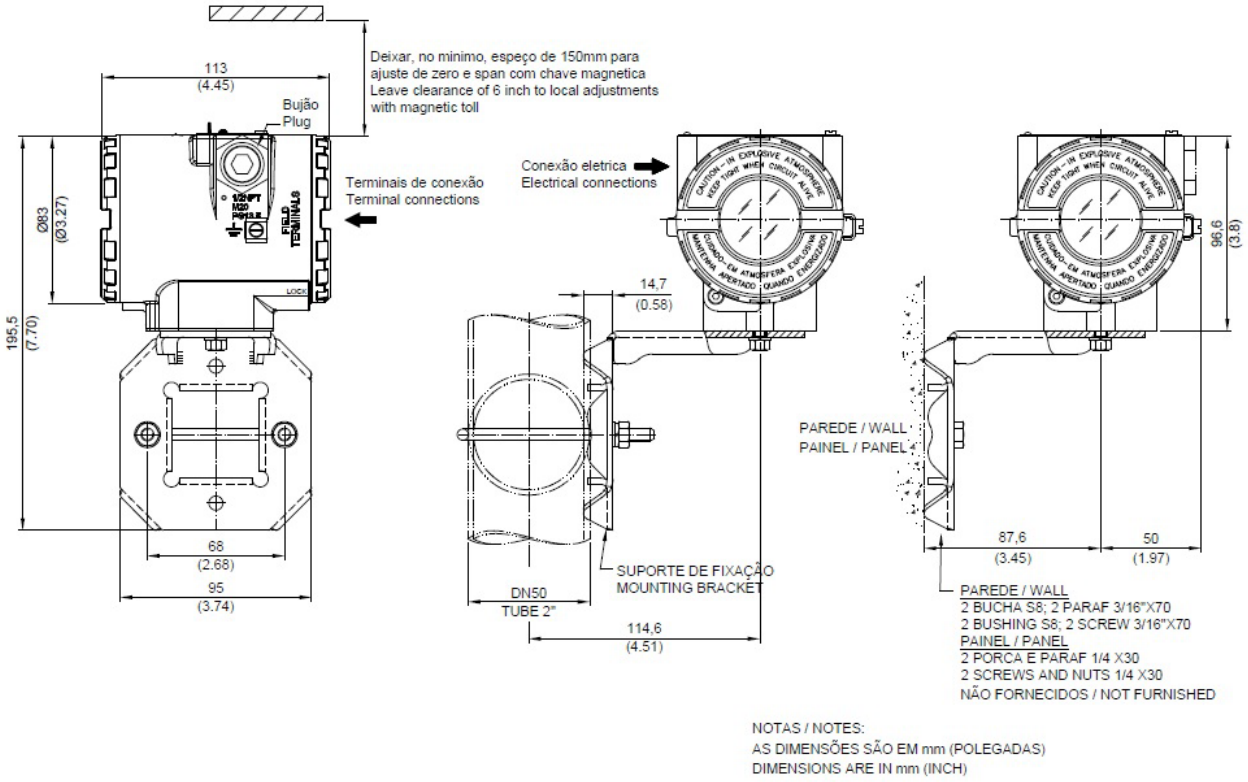


Figure 1.3 - Dimensional Drawing and Mounting Positions

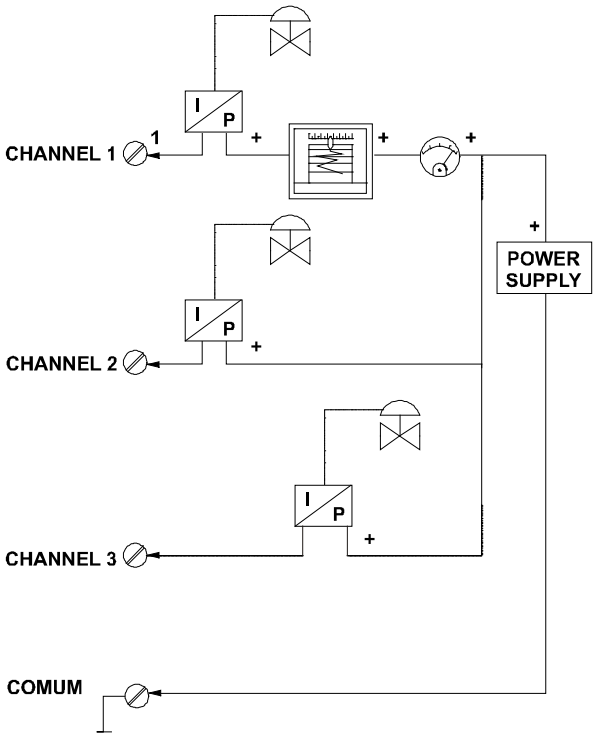


Figure 1.4 - Output Connections

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 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.

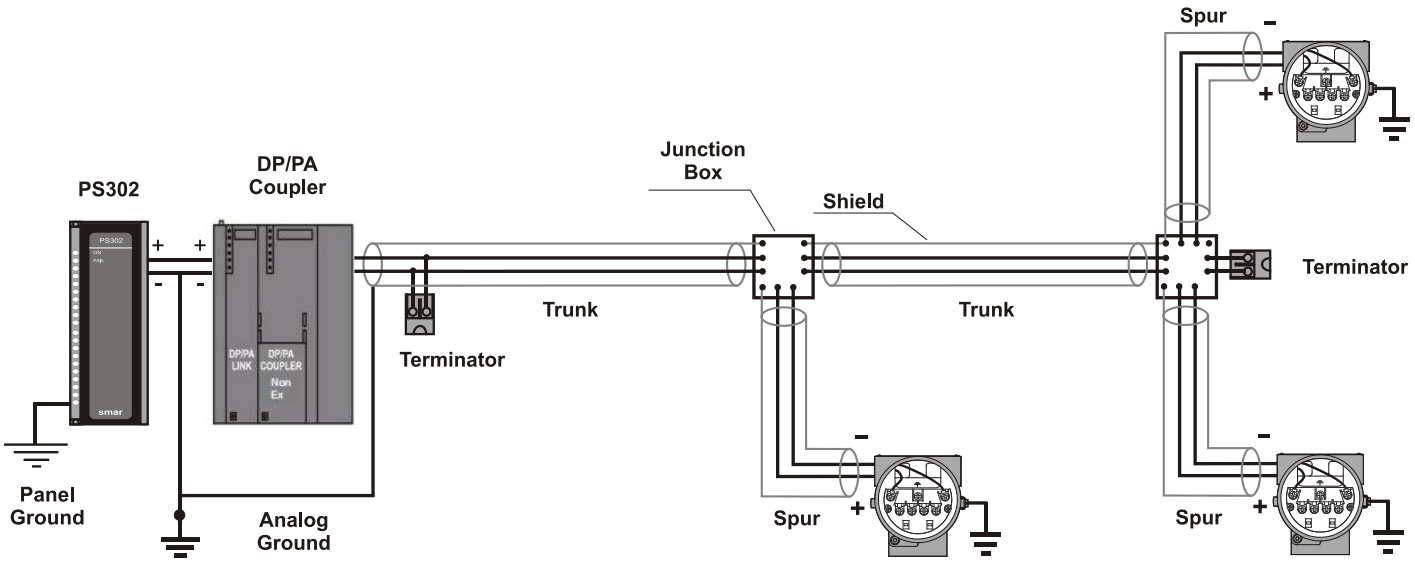


Figure 1.5 - Bus Topology

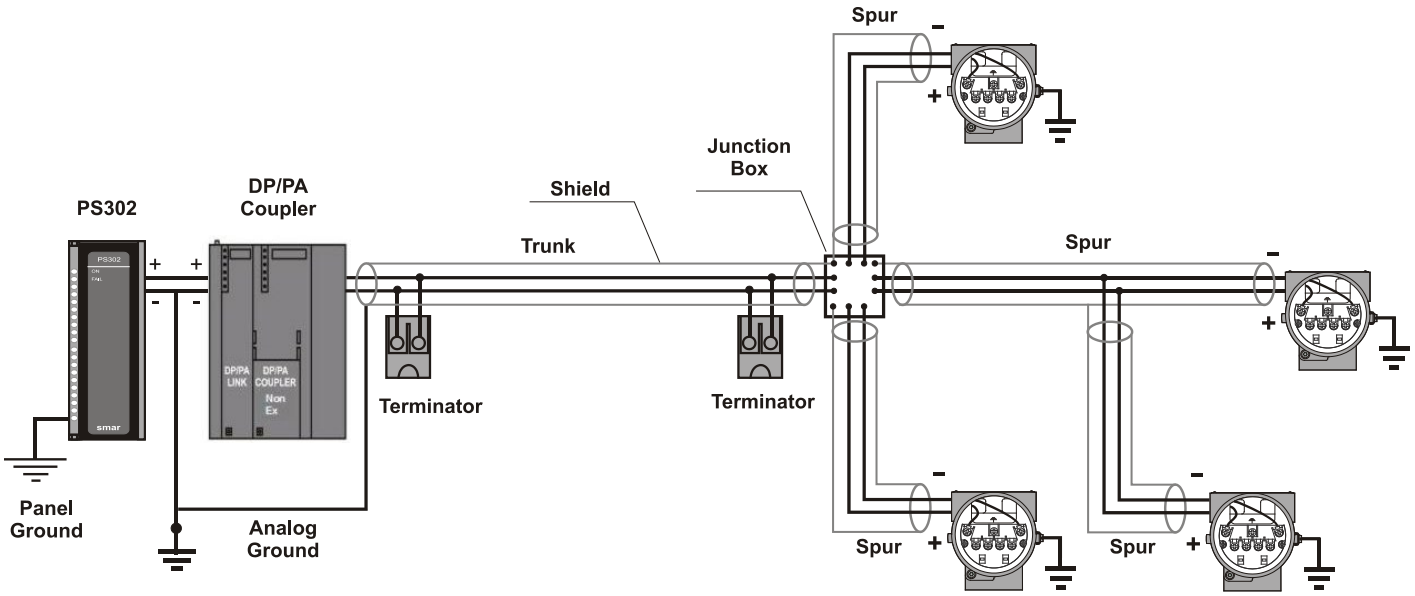


Figure 1.6 - Tree Topology

Intrinsic Safety Barrier

When the Profibus converter is in an area requiring intrinsic safety, a barrier must be inserted on the trunk. If the DP/PA coupler is already intrinsically safe, there is this necessary. Use of **DF47-17** (Smar intrinsic safety barrier) is recommended.

Jumper Configuration

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.

Installation in Hazardous Areas

See Appendix “A” for additional certification information.

OPERATION

Functional Description - Electronics Refer to the block diagram

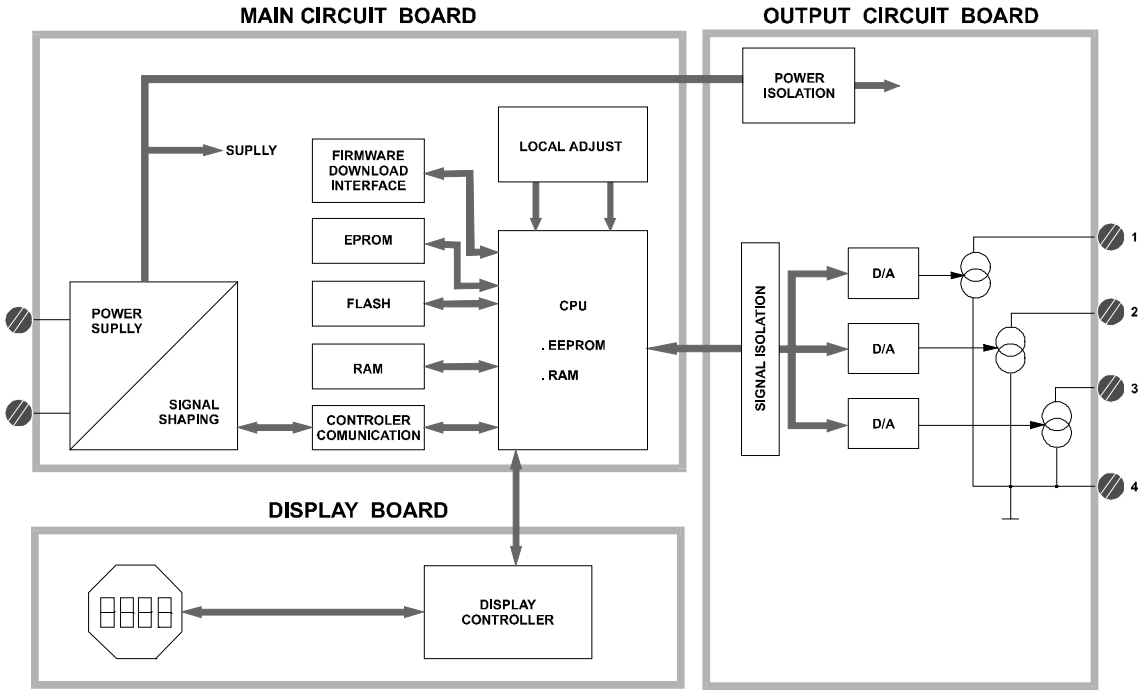


Figure 2.1 - FI303 Block Diagram

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 to 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.

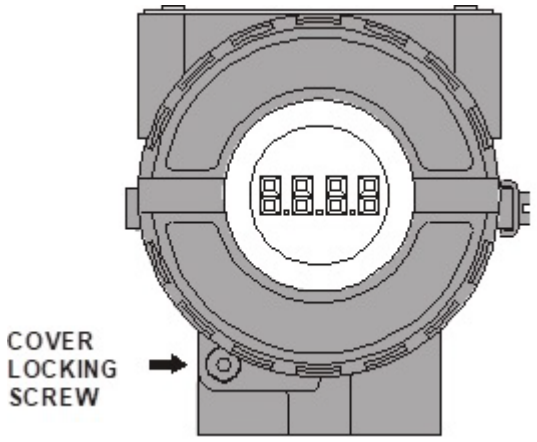


Figure 2.2 - LCD Indicator

CONFIGURATION

One of the many advantages of using Fieldbus technologies is that device configuration is independent of the configuration software. The **FI303** may be configured by a third-party terminal or operator console as Smar's configurators ProfibusView or AssetView for FDT.

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 further 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 allows 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 pass 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 first.

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 deforming a standard routine as a calibration, user is conducted step by step by a method. The method is generally defined as guideline 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 method. The method is generally defined as guideline 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

It is the parameter, which refers to a channel value, which in its turn, is sent via internally from the specified transducer output to function block.

It starts at channel one (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 user has to do is choose combinations: (1.1), (2.2), (3.3) for (CHANNEL, BLOCK) respectively.

Functional Diagram of the Profibus PA to Current Transducer Block

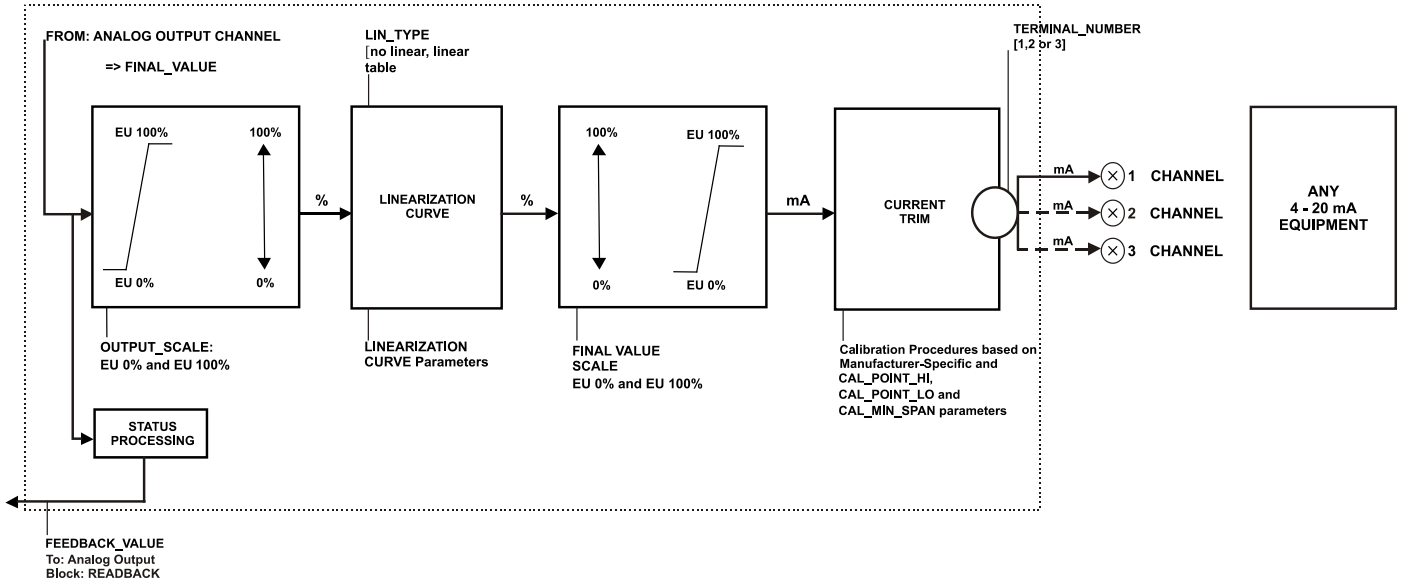


Figure 3.1 - Functional Diagram of the Profibus PA to Current Transducer Block

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, 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.
TAB_ACTUAL_NUMBER	Contains the actual numbers of entries in the table. It shall be calculated after the transmission of the table is finished.

PARAMETERS	DESCRIPTION
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 a stop an interaction (TAB_OP_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 transducer block.
SP_LO_LIM	The setpoint low limit is the lowhest setpoint operator entry that can be used for the

PARAMETERS	DESCRIPTION
	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	
24	TAB_X_Y_VALUE	See explanation about table handling							O	
25	LIN_TYPE	See explanation about table handling							M	

Relative Index	Parameter Name	Object Type	Data Type	Store	Size	Access	Parameter usage/Type of Transport	Initial/Default Value	Mandatory/ Optional Class	VIEW
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

See FUNCTION BLOCKS PROFIBUS PA manual for more parameter information, by visiting our web page on the Internet: http://www.smar.com.br

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 function blocks with analog output (AOs) that the class 1 master uses to execute the cyclic services. Users must choose what configuration best suits their application. If the AO Block Mode 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 into 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. Do not forget that the couplers may have the following fixed communication rates 45,45 kbits/s (Siemens) or 93,75 kbits/s (P+F) and variable comm rates up to 12 Mbit/s as instance: SK2 and SK3 from P+F, link IM157 from Siemns and Smar's controllers with embedded couplers (DF95 or DF97);
- 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. As FI303 will be on a final element, it is recommended that a fail-safe value be configured.

Using **ProfibusView, AssetView FDT** from Smar or **Simatic PDM** from Siemens, for instance, user may configure parameters of the Transducer block. See Figure 3.2 - Function and Transducer Blocks.

The device was created as FI303.

Here it is possible to see all instantiated function blocks.

Transducer and Display are treated as special type of Function Blocks, called Transducer Blocks.

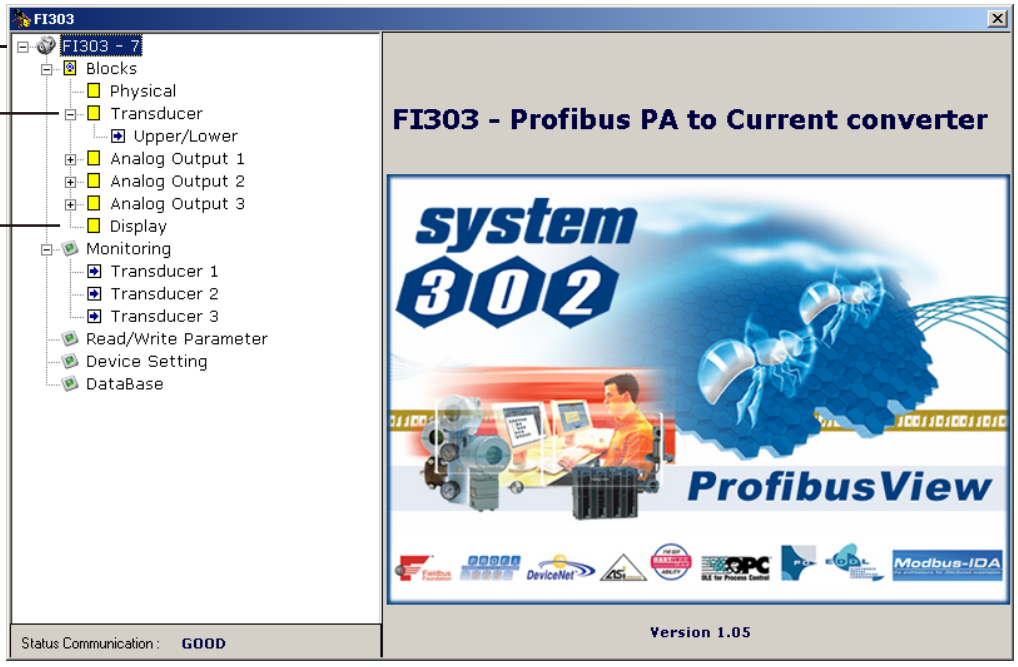


Figure 3.2 - Function and Transducer Blocks – ProfibusView.

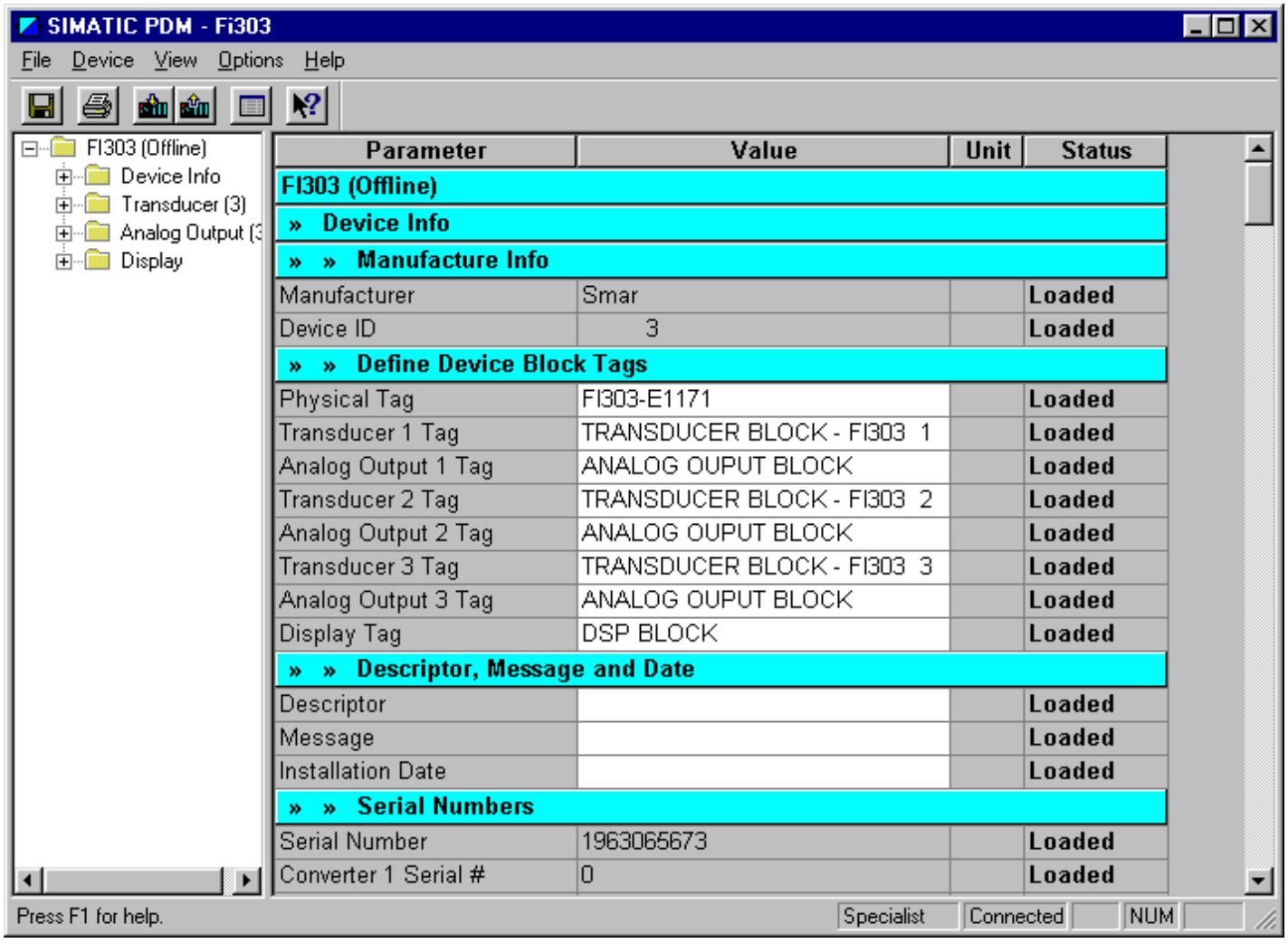


Figure 3.3 - Function and Transducer Blocks – Simatic PDM.

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

Select main menu make the configuration of Transducer Block:

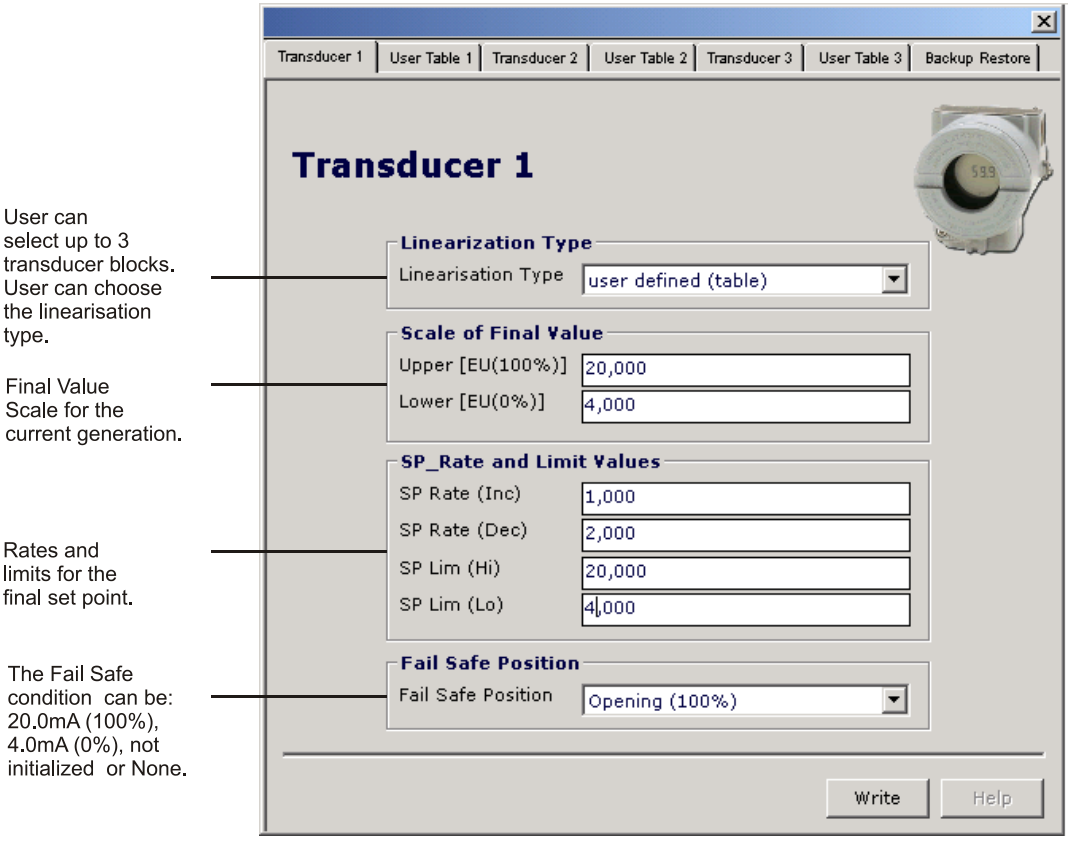


Figure 3.4 – Transducer Block – ProfibusView.

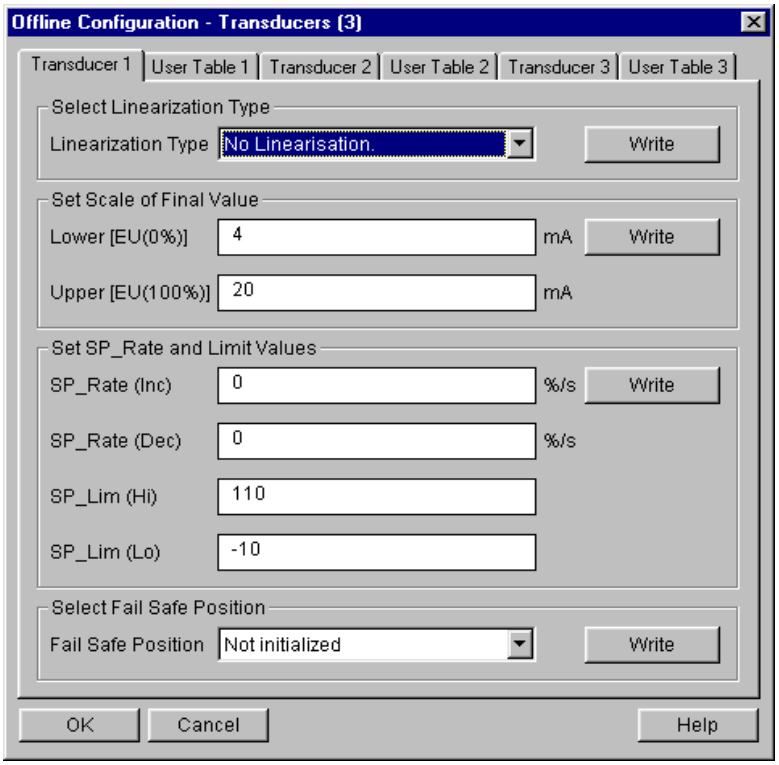


Figure 3.5 – Transducer Block - Simatic PDM.

Table handling

It is possible to load and re-load tables into 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 each table entries.

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

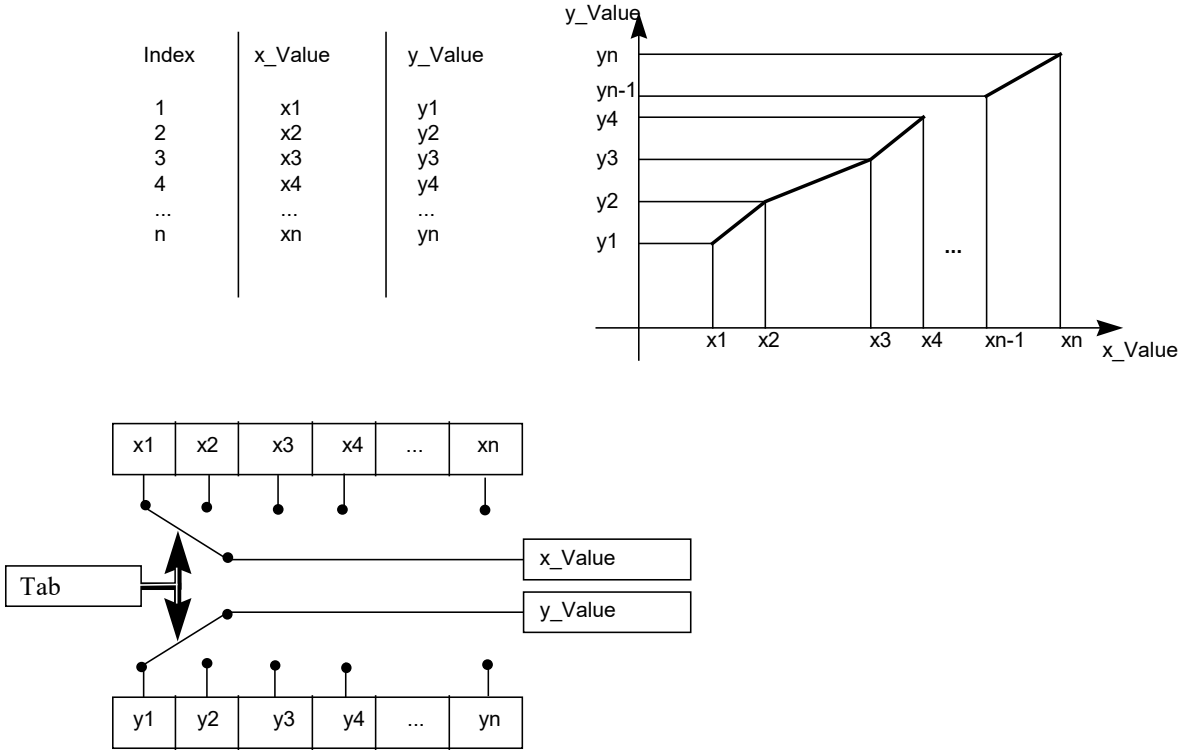


Figure 3.6 - Parameters of a table

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.

Modifing device's table 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 configure the current signal characterization in up to 8 points in percentage.

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

For instance, 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. User needs to set "user defined (table) in the linearization type field.

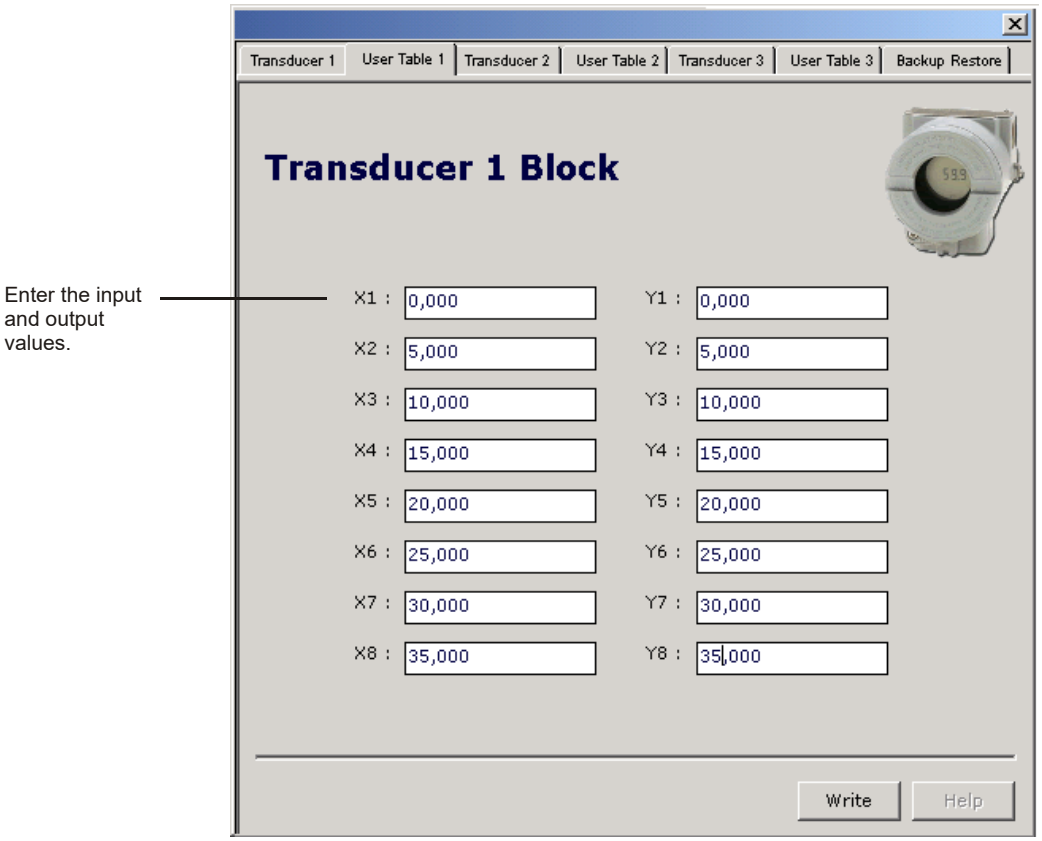


Figure 3.7 - User Table Configuration – ProfibusView.

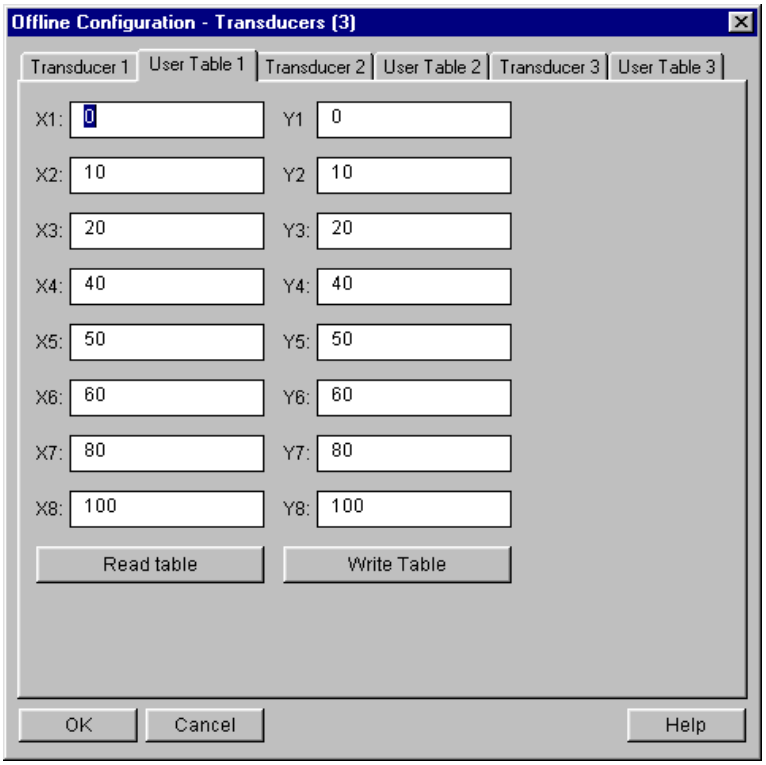


Figure 3.8 - User Table Configuration - Simatic PDM.

How to configure the Analog Output Block

The AO block provides information to an output transducer block such as 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.

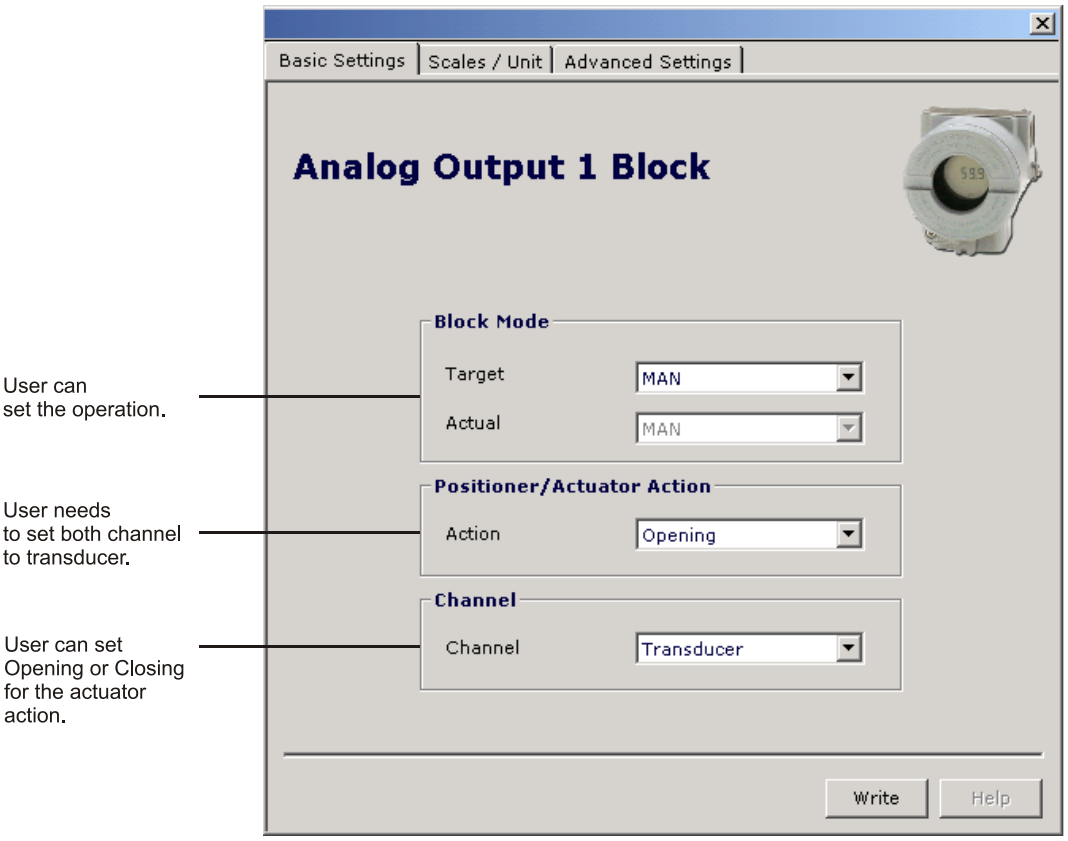


Figure 3.9 - Analog Output Block - Basic Settings – ProfibusView.

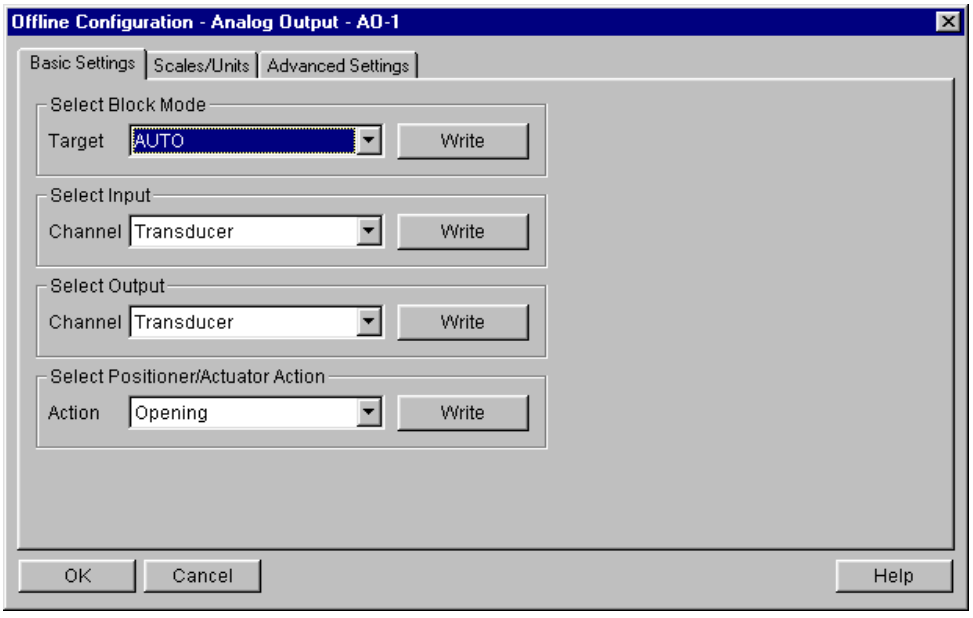


Figure 3.10 - Analog Output Block - Basic Settings - Simatic PDM.

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

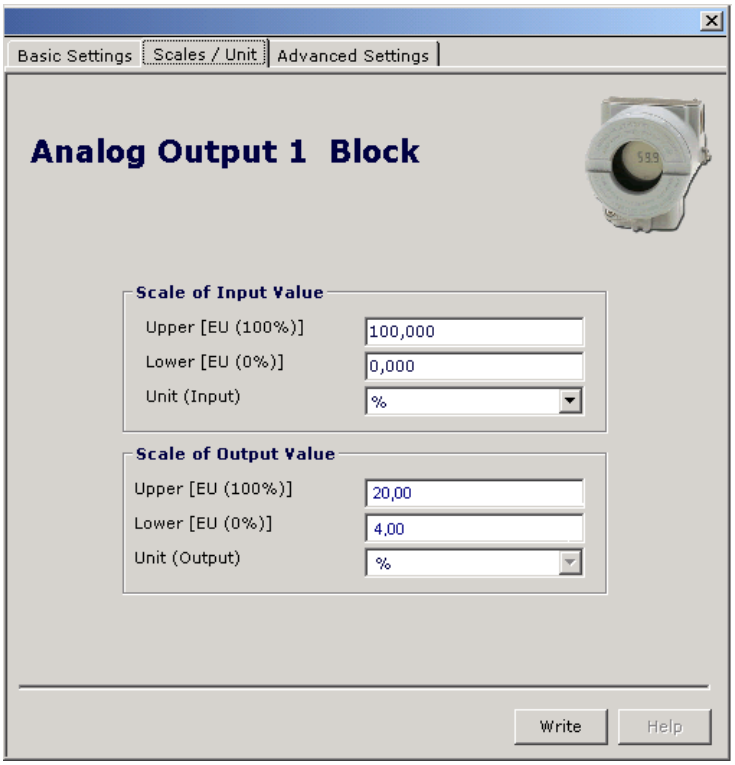


Figure 3.11 - Analog Output Block - Scale/Units - ProfibusView.

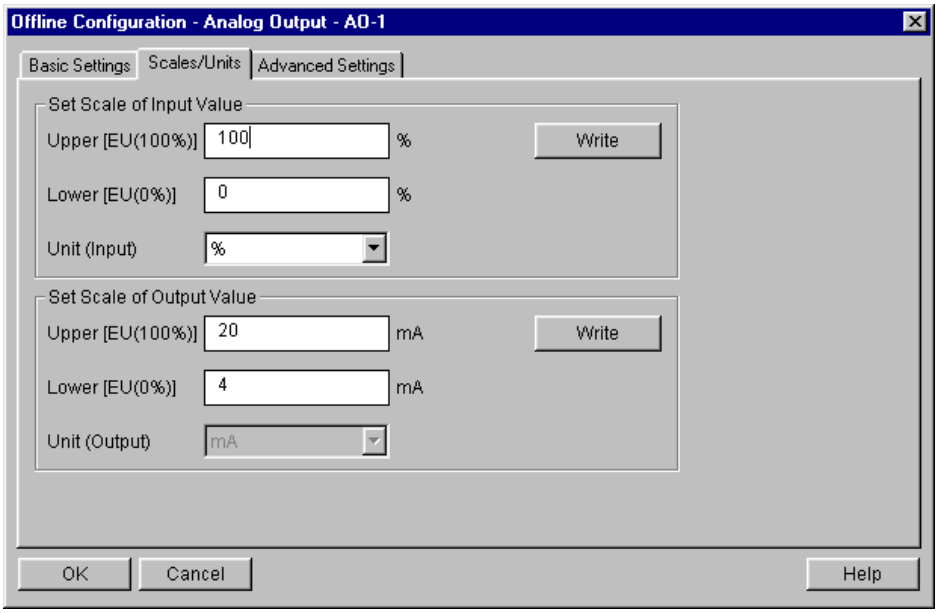
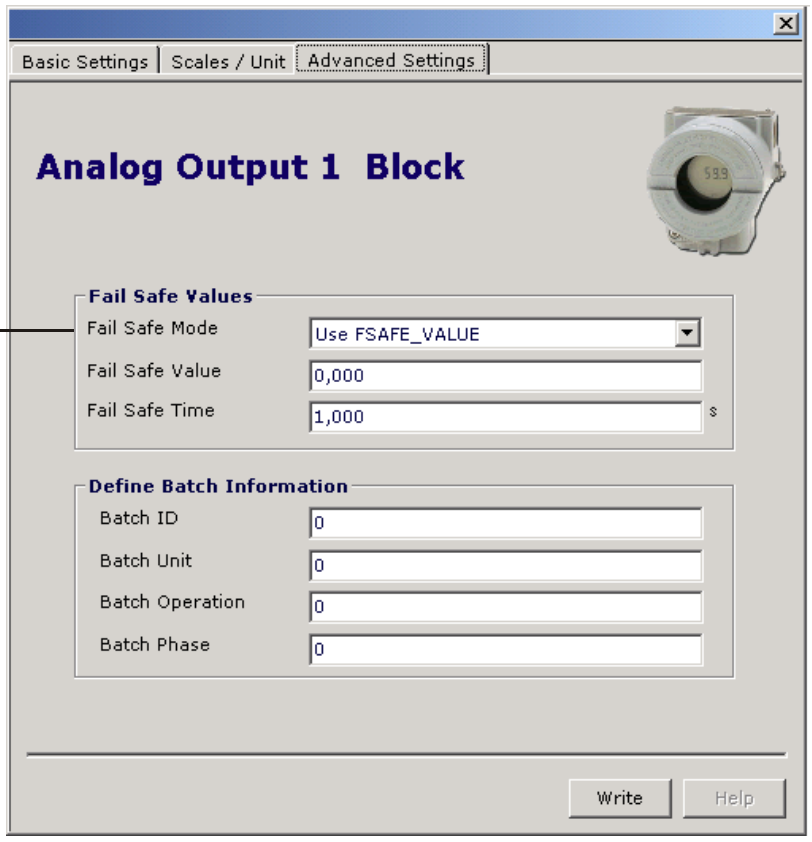


Figure 3.12 - Analog Output Block - Scale/Units - Simatic PDM.

Output engeneering Unit and Scale will be the same for the transducer block. Note that the allowed unit is mA.

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



For fail-safe mode, 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 3.13 - Analog Output Block - Advanced Settings - ProfibusView.

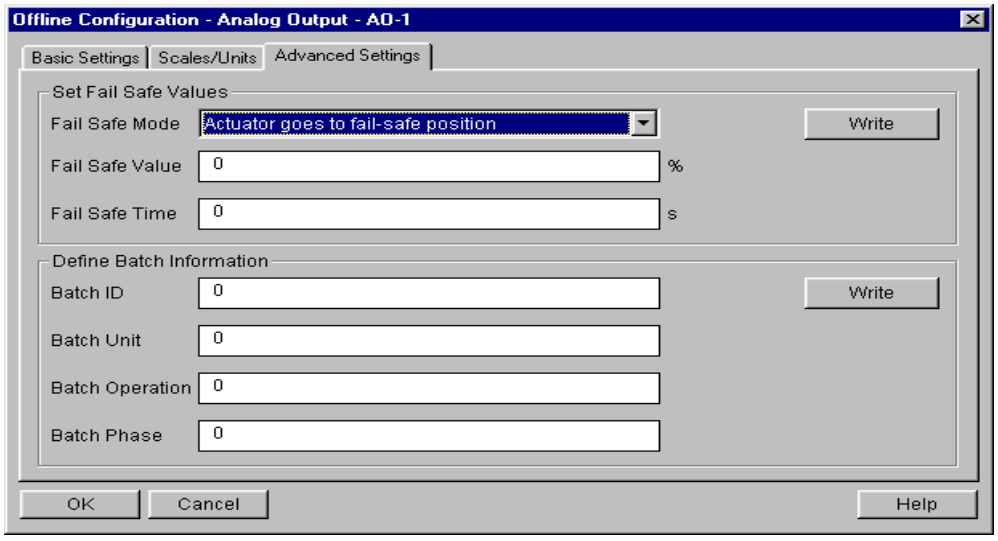


Figure 3.14 - Analog Output Block - Advanced Settings - Simatic PDM.

In the screen Config Mode Block the user can adjust the operation of the block.

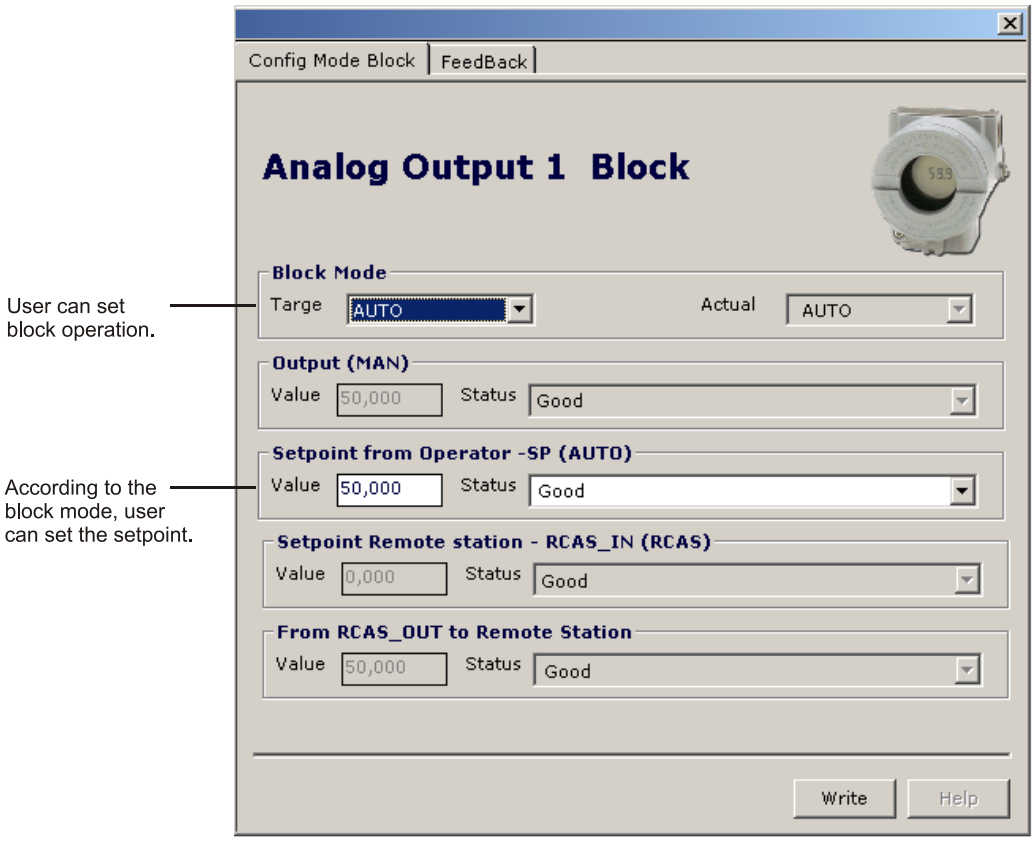


Figure 3.15 – Configuration mode block for AO – ProfibusView.

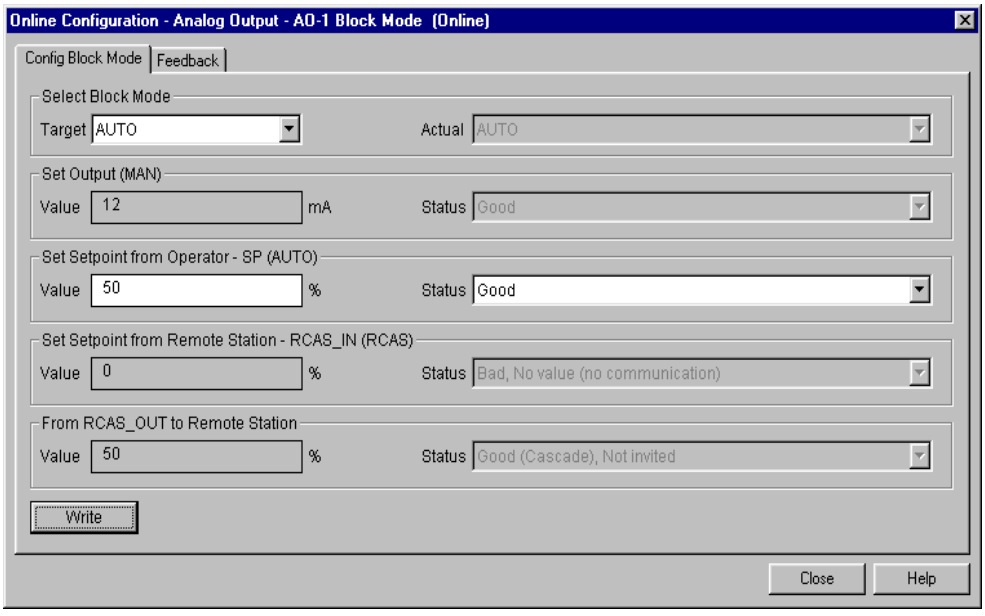


Figure 3.16 – Configuration mode block for AO – Simatic PDM.

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

Information about the real condition of transducer and analog output block.

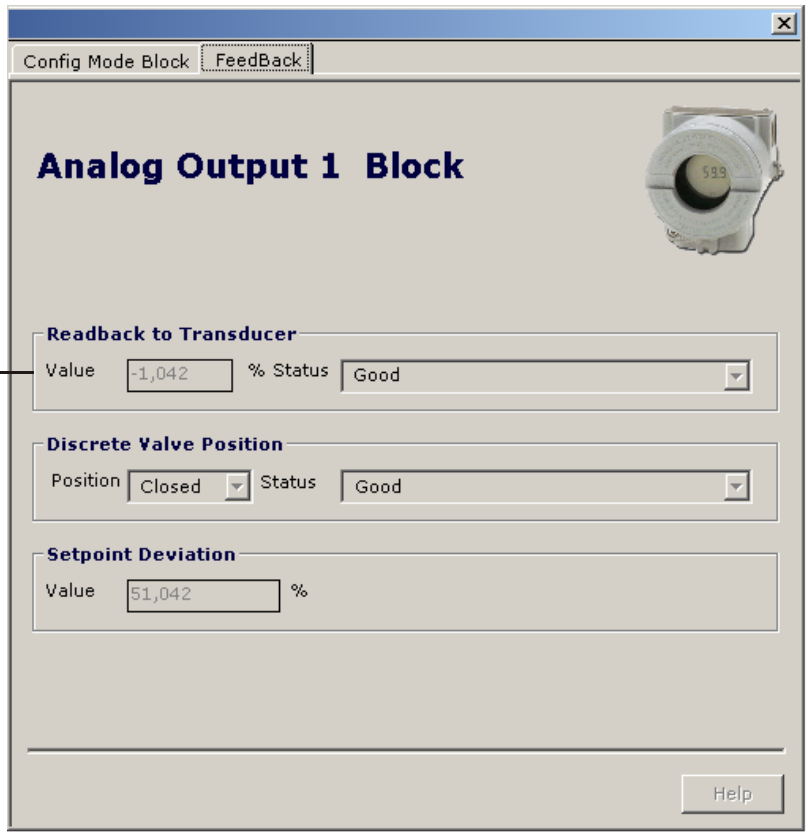


Figure 3.17 - Configuration feedback for AO – ProfibusView.

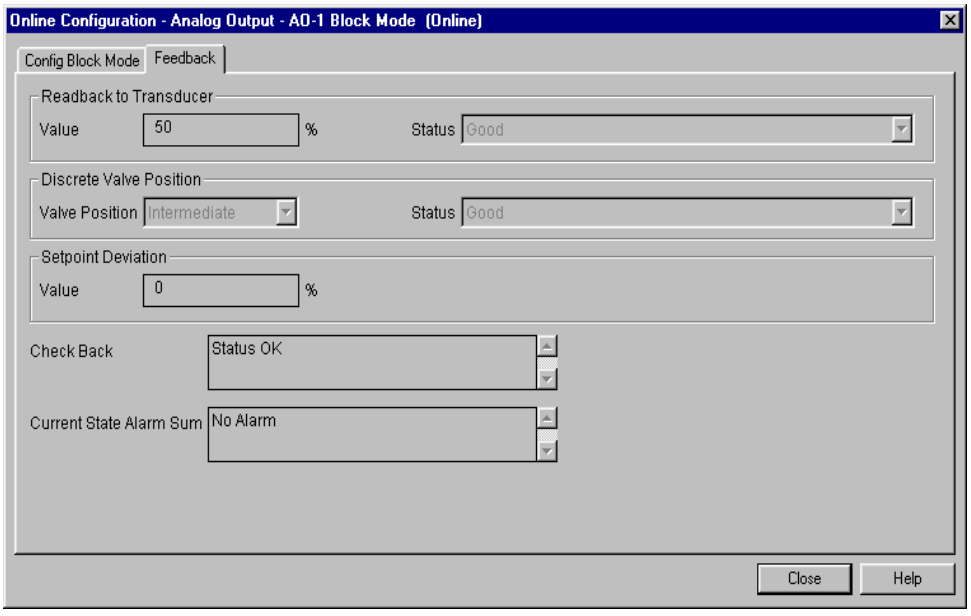


Figure 3.18 - Configuration feedback for AO - Simatic PDM.

Current Trim

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

TRIM procedure is necessary if the indication of the transducer block output differs from the actual physical output. The reason may be:

- User's current meter differs from the factory standard.
- Converter had its original characterization signal shifted by over-load or by long term drift.

User can check the calibration of the transducer output by measuring the actual current in the output and compare it with the indication of the device (an appropriate meter must 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, ProfibusView). When doing the TRIM, make sure you are using an appropriate meter (with the necessary accuracy).

Via ProfibusView, AssetView FDT or Simatic PDM

In the main menu selects the Calibration option:

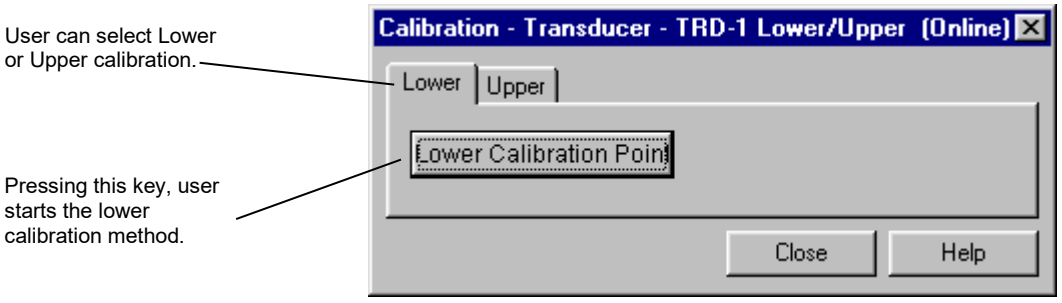
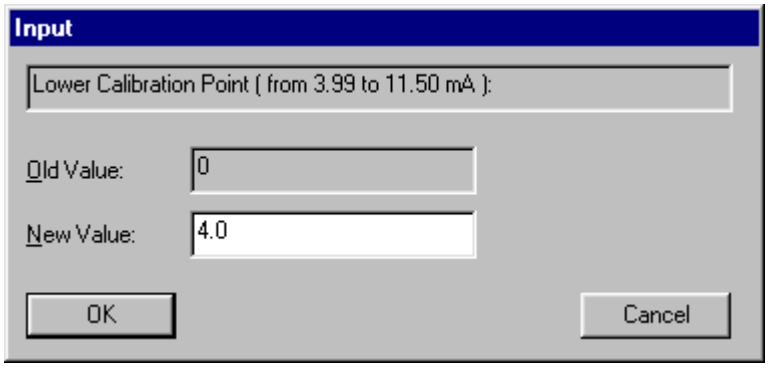


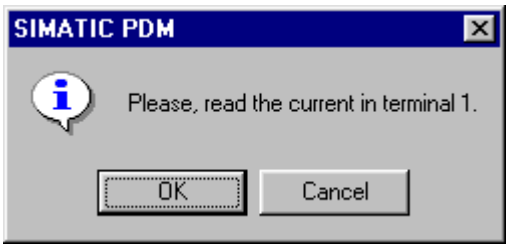
Figure 3.19 - Calibration Lower/Upper - Simatic PDM.

After pressing “Lower Calibration” a warning comes next.

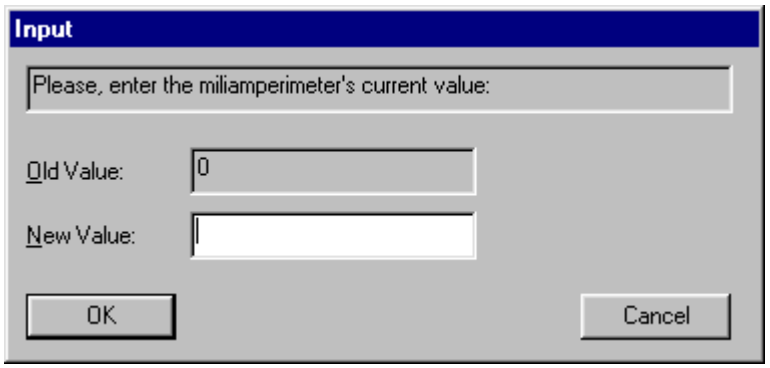
When the user clicks "OK", a new window appears allowing to enter the desired value of the new calibrated point and the lower current. Write for instance 4.0 mA in new value:



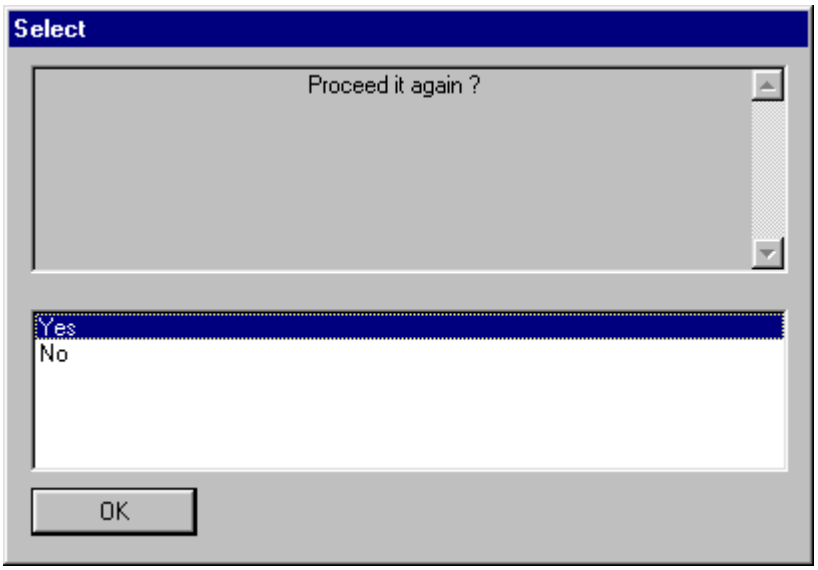
After entering the desired value, the generated current is corrected according to the desired value and the user can make the correction until the right current value is reached. For this purpose, the user needs to inform the generated current:



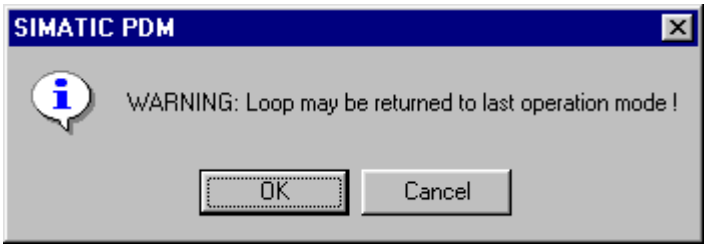
By clicking OK, the following window appears:



The user can proceed until the generated current is equal to the desired value:



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



After user confirmation, the converter returns to its normal operation.

The upper calibration procedure is similar to the lower:

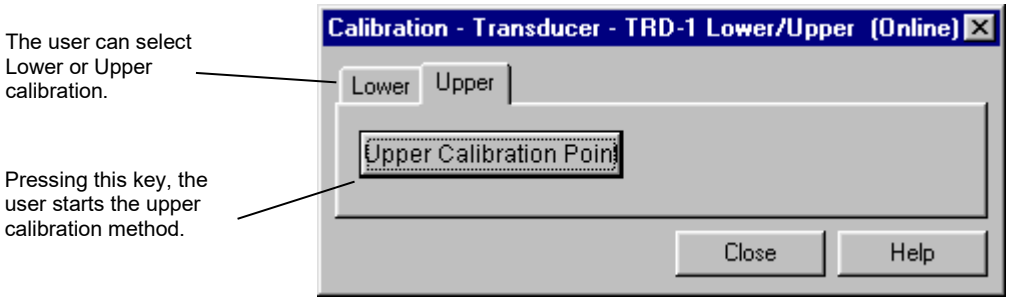
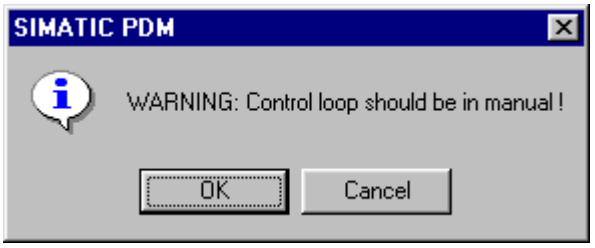
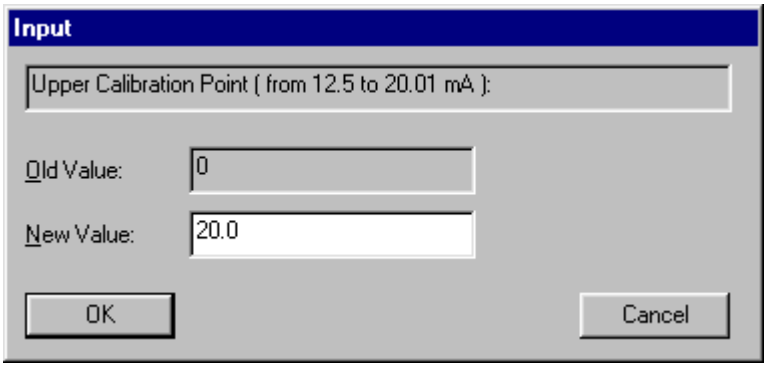


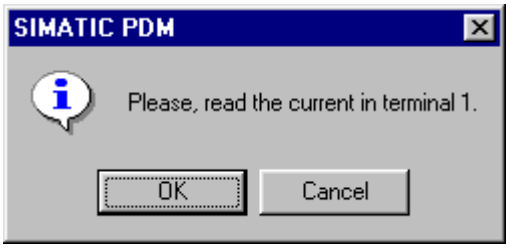
Figure 3.20 - Calibration Lower/Upper - Simatic PDM.



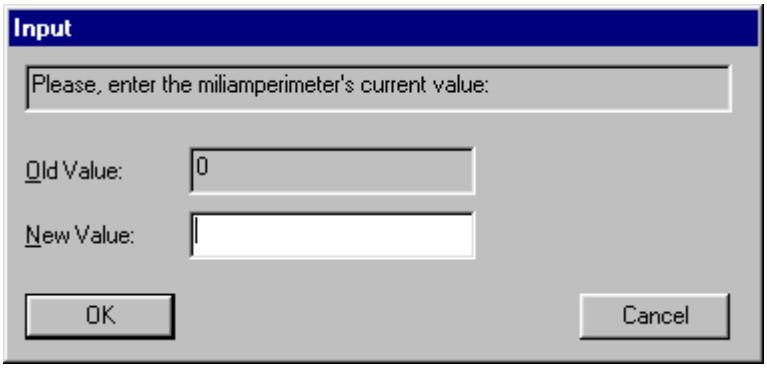
When the user clicks "OK", a new window appears allowing to enter the desired value of the new calibrated point and of the upper current. Write for instance 20.0 mA in new value:



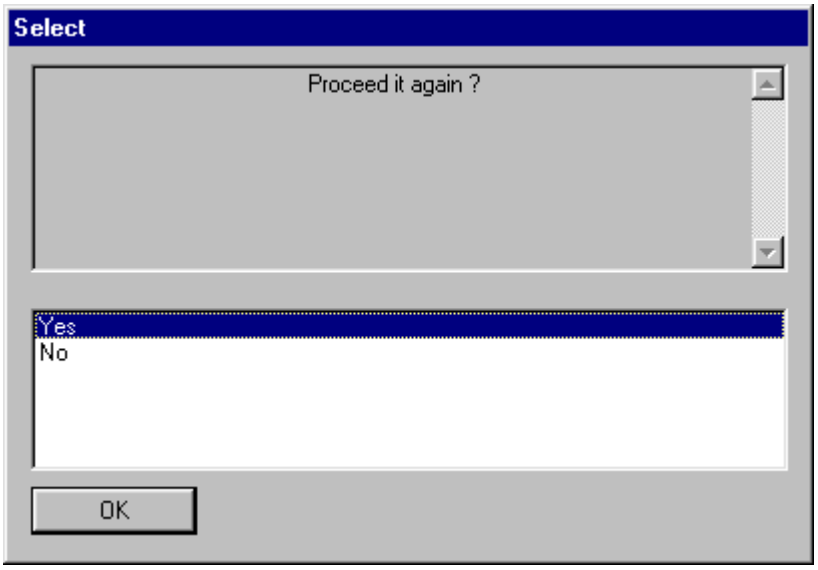
After entering the desired value, the generated current is corrected according to this value and user can make the correction until the right current is reached. For this purpose, the user needs to inform the generated current:



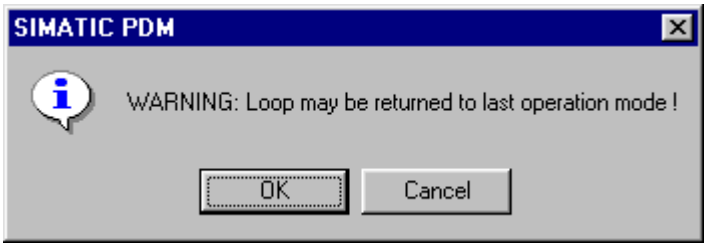
By clicking OK, it follows:



The user can proceed until the generated current is equal to the desired value:



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



After user confirmation, the converter comes to normal operation.

NOTE
It is recommended, for every new calibration, saving the existent TRIM data by means of parameter BACKUP_RESTORE, using option "Last Cal Backup".

Local Adjustment

The **FI303** has 3 output transducers, and it is provided by Smar with default 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 shall configure them in the display transducer via Configuration Tool, according specific instructions for this transducer block.

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 for approximately 5 seconds after the user has removed 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, to start the calibration, the user shall actuate in the “LOWER parameter” inserting the magnetic tool in “S”.

For instance, 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. Then the user shall browse the tree up to parameter FEED (FEEDBACK_CAL), and modify this parameter by placing the magnetic tool in “S” until reaching the value shown by the multimeter.

Write in this parameter the value of the multimeter reading up to 4.0 mA or the lower values that are shown.

Browse up to parameter “UPPER”. Then, to start the calibration, the user shall set the parameter UPPER by holding the magnetic tool in “S”.

For instance, 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. Shall 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 **ProfibusView, AssetView FDT,** the **Simatic PDM or any other configuration tool** is possible to configure the Display Transducer block. As described above it is a transducer that interfaces with LCD hardware.

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.

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, and select “Device OnLine Configuration”:

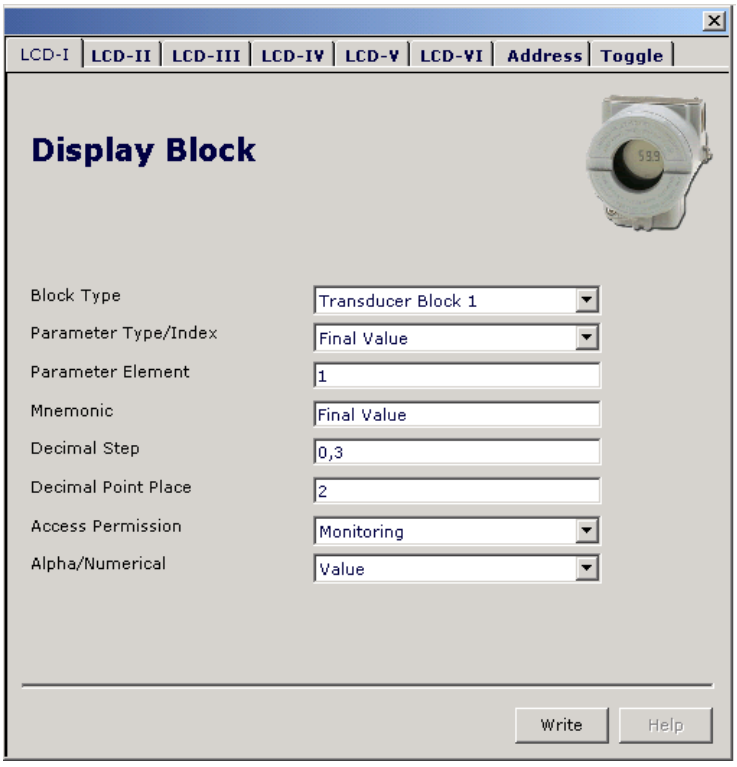


Figure 3.21 - Display Block - ProfibusView.

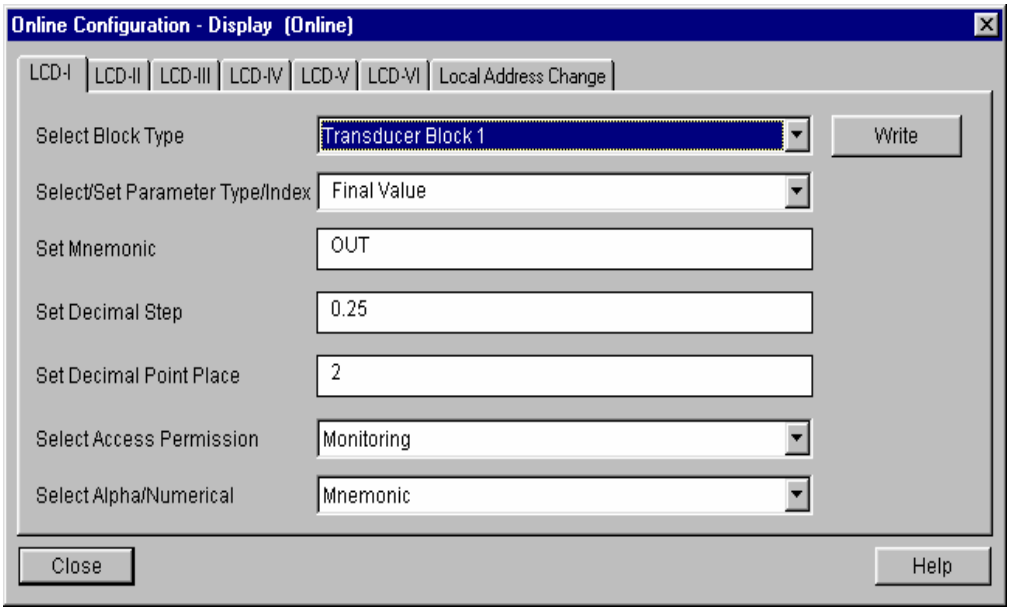


Figure 3.22 - Display Block - Simatic PDM.

Display Transducer Block

Local adjustment is completely configured by **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 checking the Tag. Normally, the converter is much better configured by **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.

User interface is described in details 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". The same handling methodology used for this transducer display can also be used for the 303 Series field devices from Smar. So, since the user has learned once, the user is capable to handle all kind of field devices from SMAR.

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

This feature allows other configuration tools to easily configure field devices. The function blocks and transducers of the 303 series have been strictly defined according to PROFIBUS PA specifications so that they are interoperable with other manufacturers.

To enable local adjustment using the magnetic tool, it is necessary a previous setup of parameters related with this operation via system configuration.

There are six groups of parameters, which one may be pre-configured by user to enable the local adjustment. Use “NONE” option in the "Select Block Type" parameter to hide unnecessary items to be displayed. Doing this, the device will not take parameters related (indexed) to its Block as a valid parameter.

Definition of Parameters and Values

Select Block Type
Type of block where the parameter is located. User can choose: Transducer Block, Physical Block, Analog Output Block or None.

Select/Set Parameter Type/Index
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 available indexes to be used.

Set Mnemonic
Mnemonic for parameter identification (it is allowed a maximum of 16 characters into the alphanumeric field of the display). Choose the mnemonic, preferably with no more than 5 characters to avoid the display rotation.

Set Decimal Step
It is the increment and decrement in decimal units when the parameter is Float or Float Status value; 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
Allows 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 both data in the alphanumeric and in the numeric fields; this way, in case of a data higher than 10000, it will be shown in the alphanumeric field.

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

For devices where 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, select the relative index equal to "tag". To configure other parameters just select "LCD-II" up to "LCD-VI" windows:

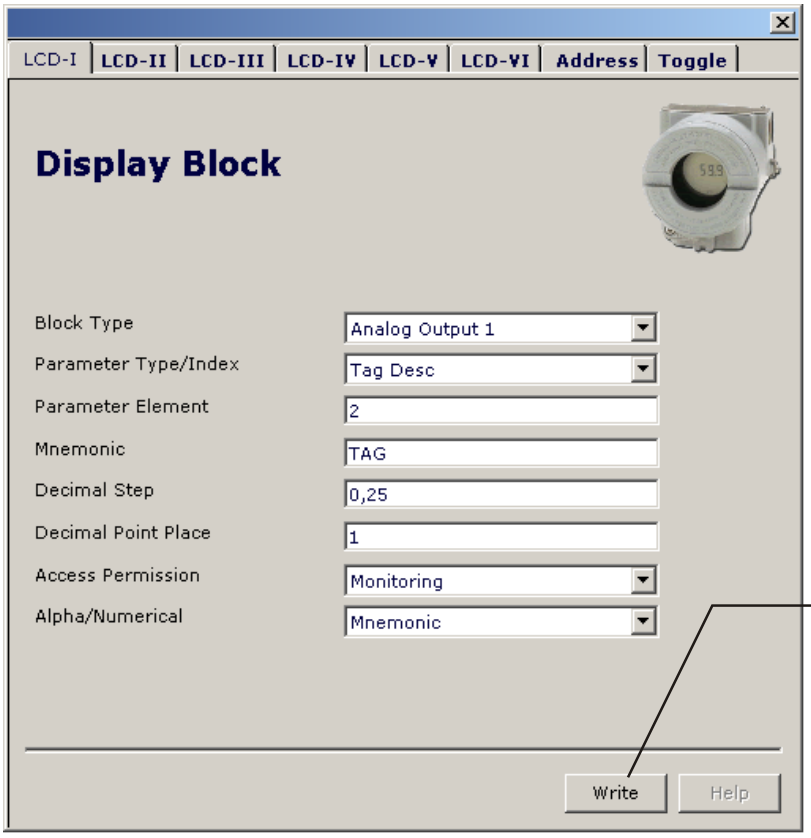


Figure 3.23 – Parameters for Local Adjustment Configuration - ProfibusView.

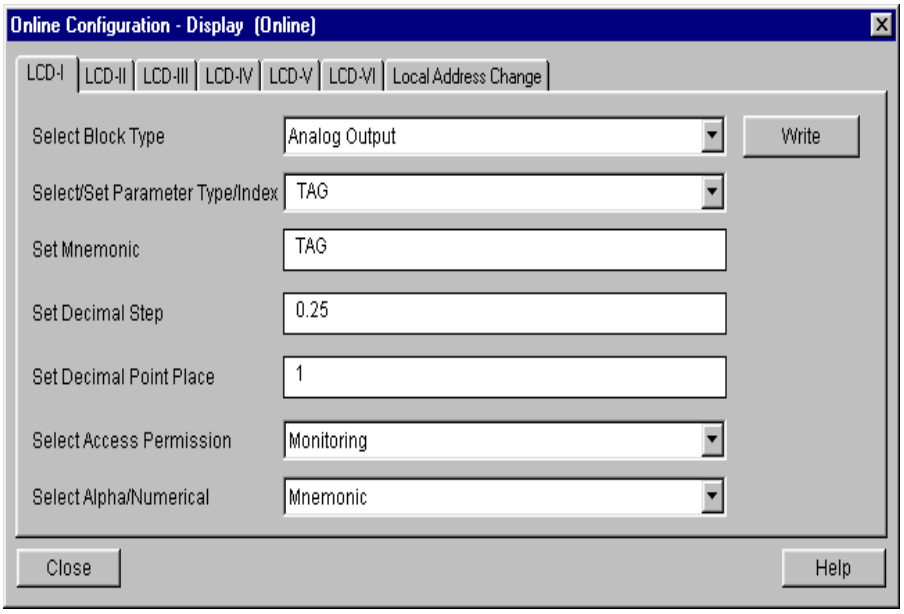


Figure 3.24 – Parameters for Local Adjustment Configuration – Simatic PDM.

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

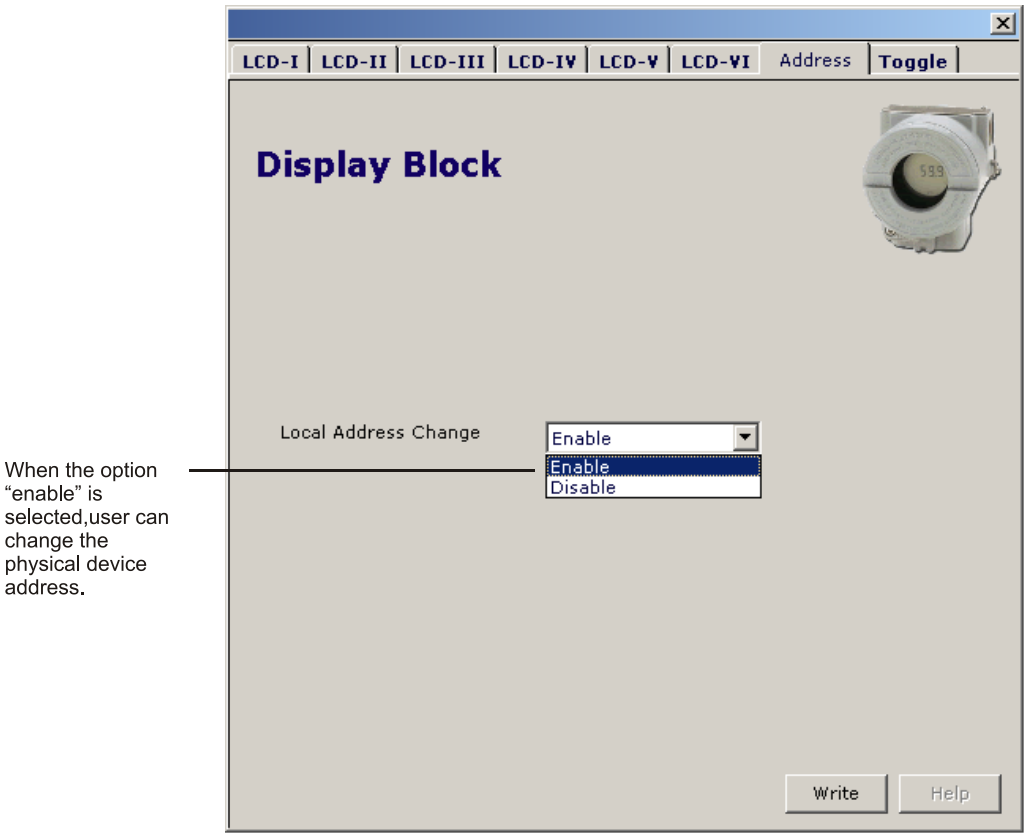


Figure 3.25 – Parameters for Local Address Configuration - ProfibusView.

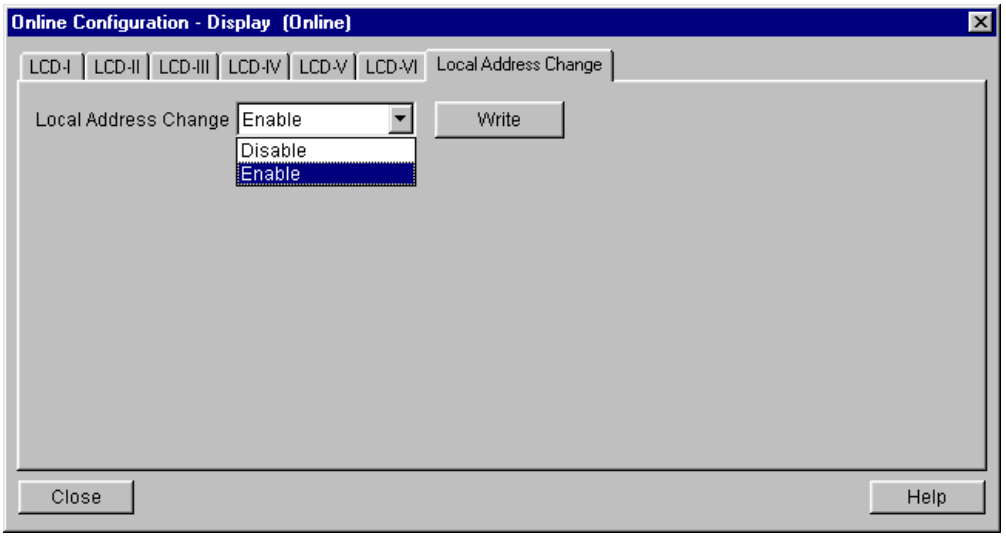


Figure 3.26 – Parameters for Local Address Configuration – Simatic PDM.

In the local adjustment, the user can rotate parameters using the magnet screwdrive. Normally; primary value (P_VAL) is the standard parameter to be shown. In case of setting another parameter to be displayed, user shall changue “Access Permission” to “Monitoring”. Thus, the last parameter set to “Monitoring” will be displayed after removing the magnet tool.

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 user does not want to show two parameters at the same time, it is only needed to set "none" when configure the LCD-II:

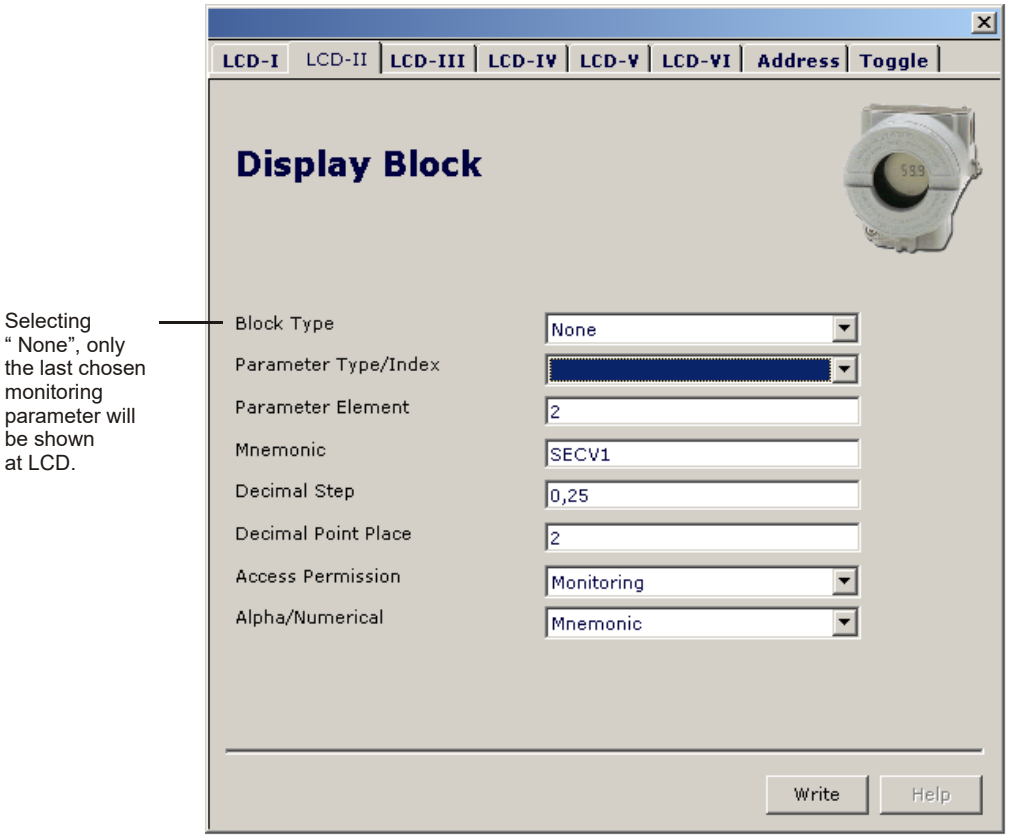


Figure 3.27 – Parameters for Local Adjustment Configuration - ProfibusView.

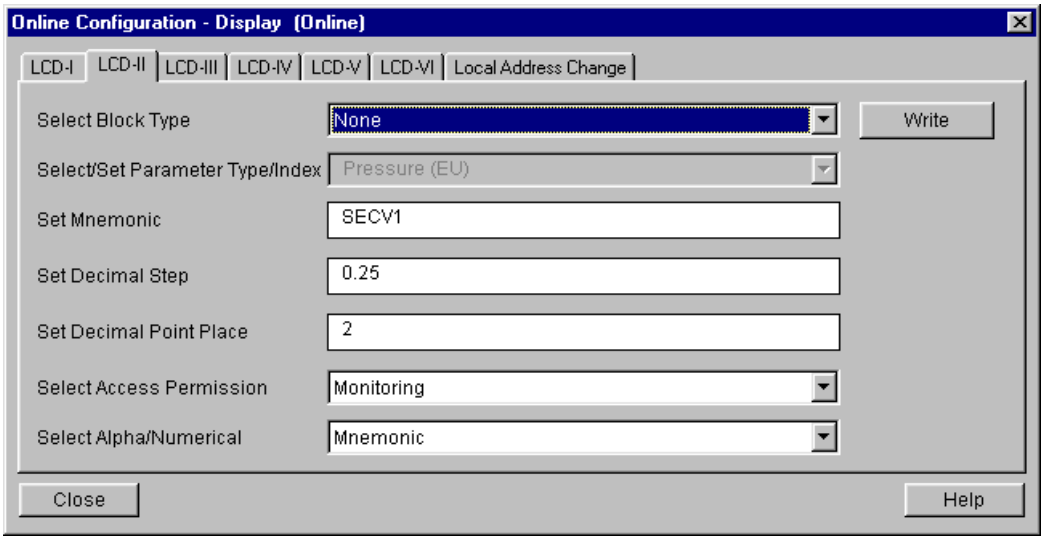


Figure 3.28 – Parameters for Local Adjustment Configuration - Simatic PDM.

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.

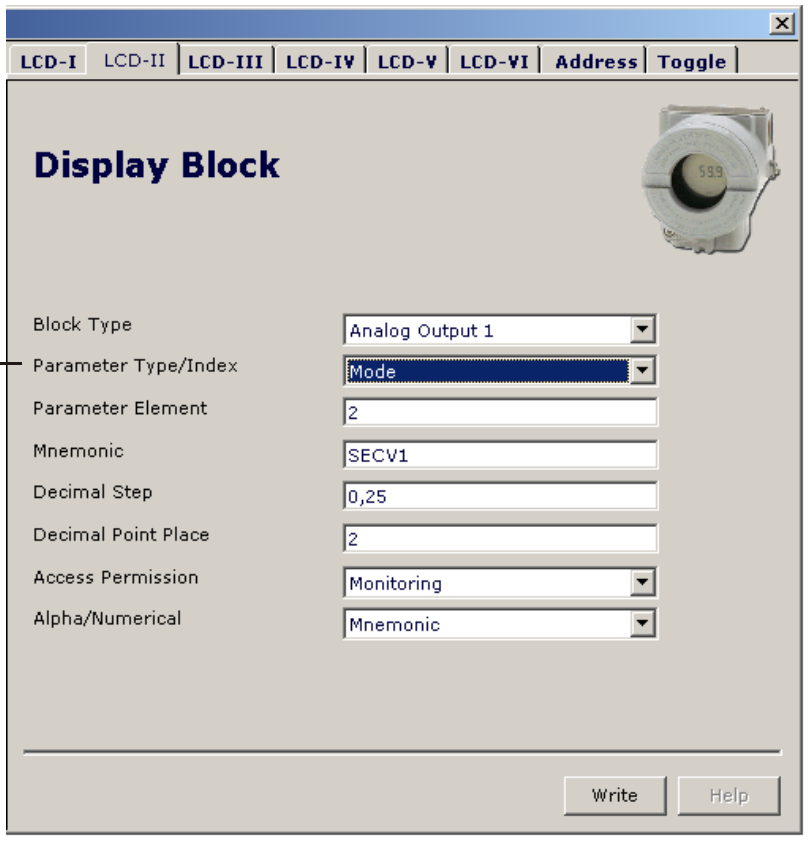


Figure 3.29 - Parameters for Local Adjustment Configuration – ProfibusView.

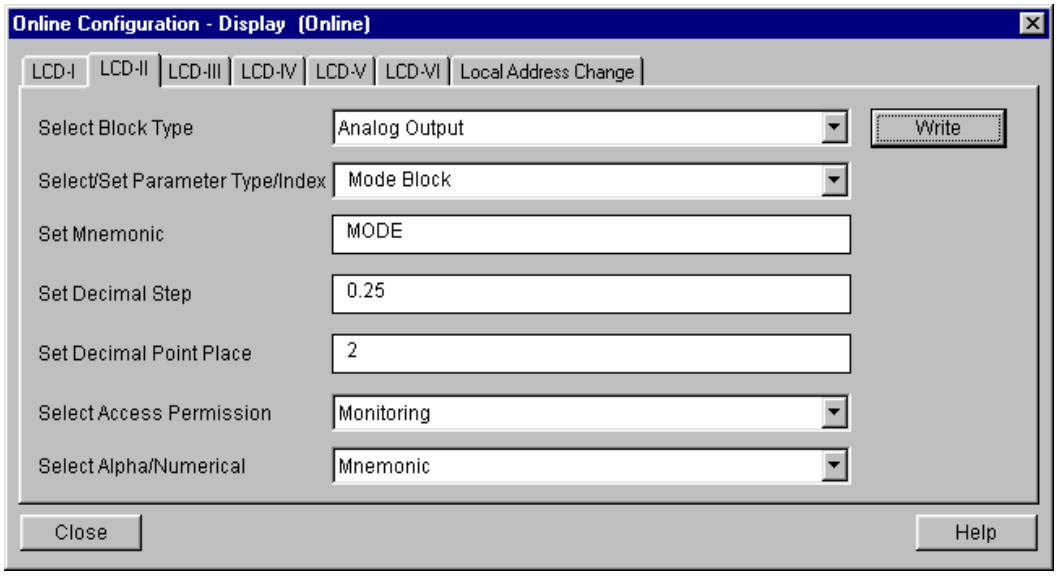
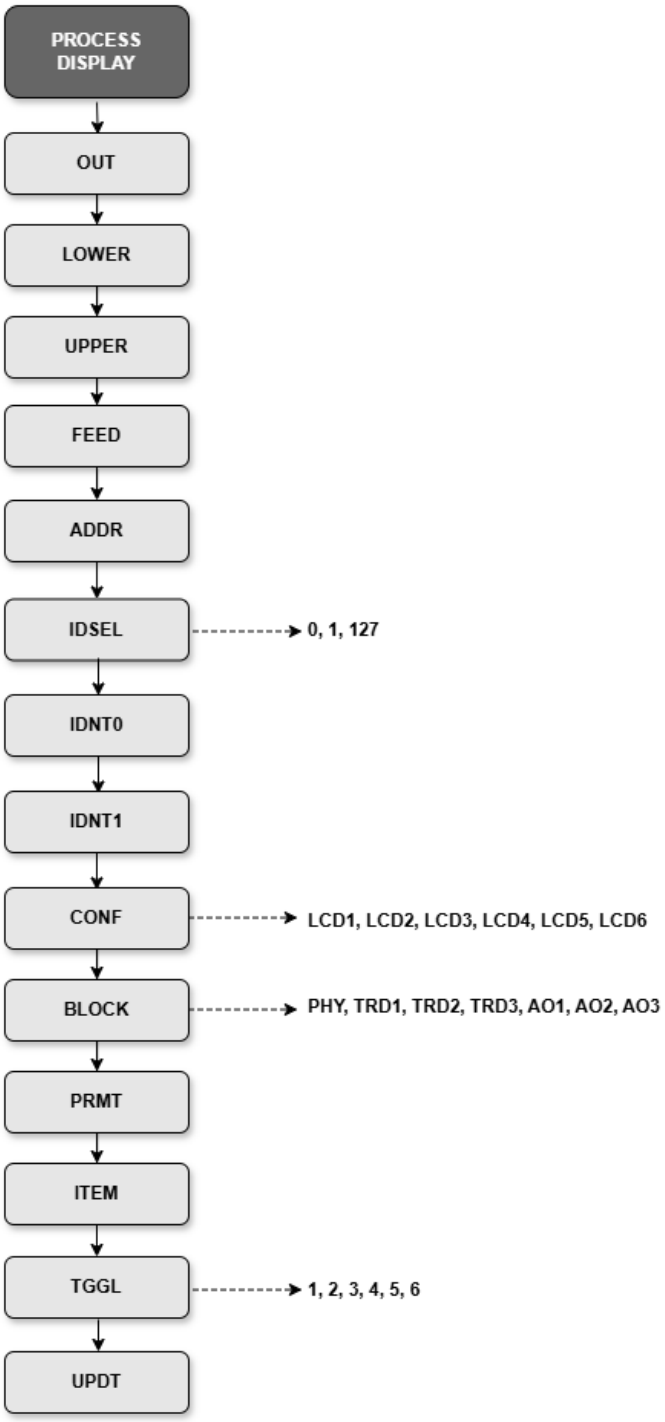


Figure 3.30 - Parameters for Local Adjustment Configuration - Simatic PDM.

Local Adjustment Tree



How to access the local adjustment tree

- Place the magnetic tool in hole Z, wait for the MD icon to appear on the display;
- Place the magnetic tool in hole S, wait 2 seconds, remove it from S, wait 2 seconds, place it in S again and wait for LOC ADJ to appear on the display.

How to search and select menu options

- Hold the magnetic tool in Z to move through the local adjustment tree.
- Enter in S to select the desired option.

How to configure a block parameter in one of the local adjustment tree options

- Navigate to the CONF option and select the desired LCD;
- Return the switch to hole Z, navigate to the next option, BLOCK, and select the block to be configured, placing the magnetic tool in hole S;
- Return the switch to hole Z, navigate to the next option, PRMT, and select the parameter to be configured, placing the magnetic tool in hole S;
- Then, in the ITEM option, configure the subindex, if applicable;
- Navigate to the UPDT option and insert the magnetic tool in S;
- Enter local adjustment again and look for the configured parameter in the chosen LCD. After all these steps the parameter can be changed;
- Repeat the above steps for all parameters that will be configured.

The TGGL option allows you to switch from one to six configured parameters on the display. For example, if TGGL is equal to two, the display will alternate between LCD1 and LCD2.

Programming Using Local Adjustment

The local adjustment is completely configured by **configuration tool**. It means, the user can select the best options to the application. From factory, it is configured with the options to set the Upper and Lower TRIM, for monitoring the input transducer output and checking the Tag.

Normally, the converter 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.

It is significantly the resources on this transducer display, also all the 303 Series field devices from **SMAR** has the same methodology to handle with it. So, since the user has learned once, is capable to handle all kind of field devices from **SMAR**. This Local adjustment configuration is a suggestion only. The user may choose the 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 figure. 3.31).

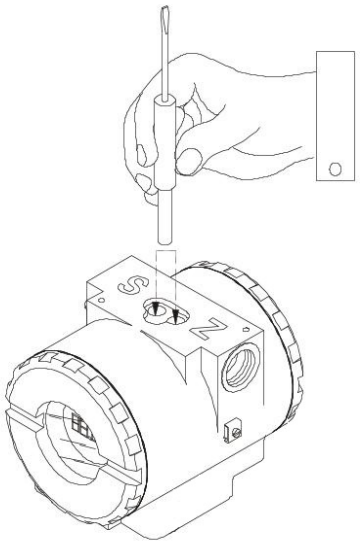


Figure. 3.31 – Local Adjustment Holes

Table 3.4 shows the actions on the **Z** and **S** holes on the FI303 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 3.32) 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.

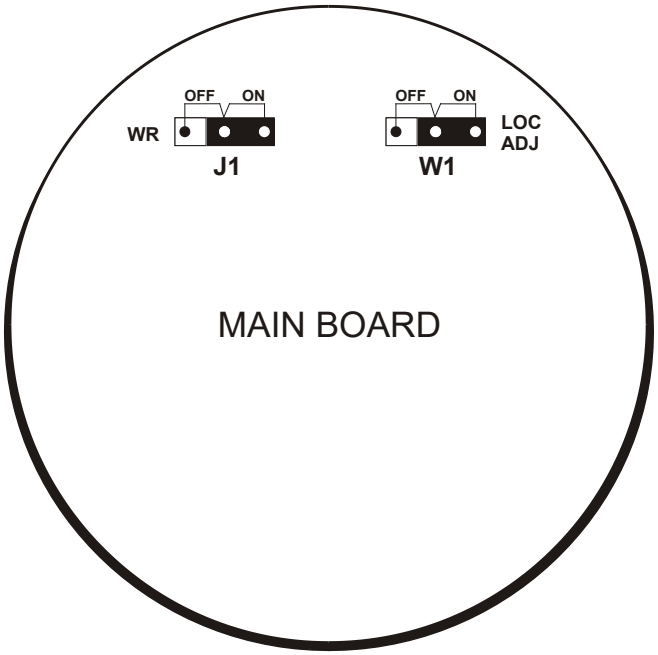


Figure 3.32 - J1 and W1 Jumpers

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

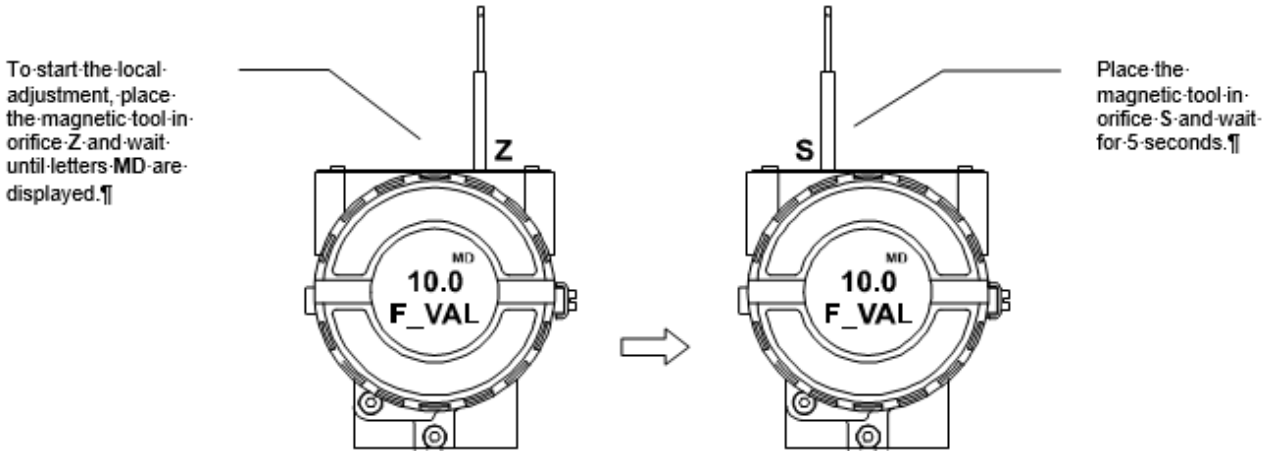


Figure 3.33 - Step 1 - FI303

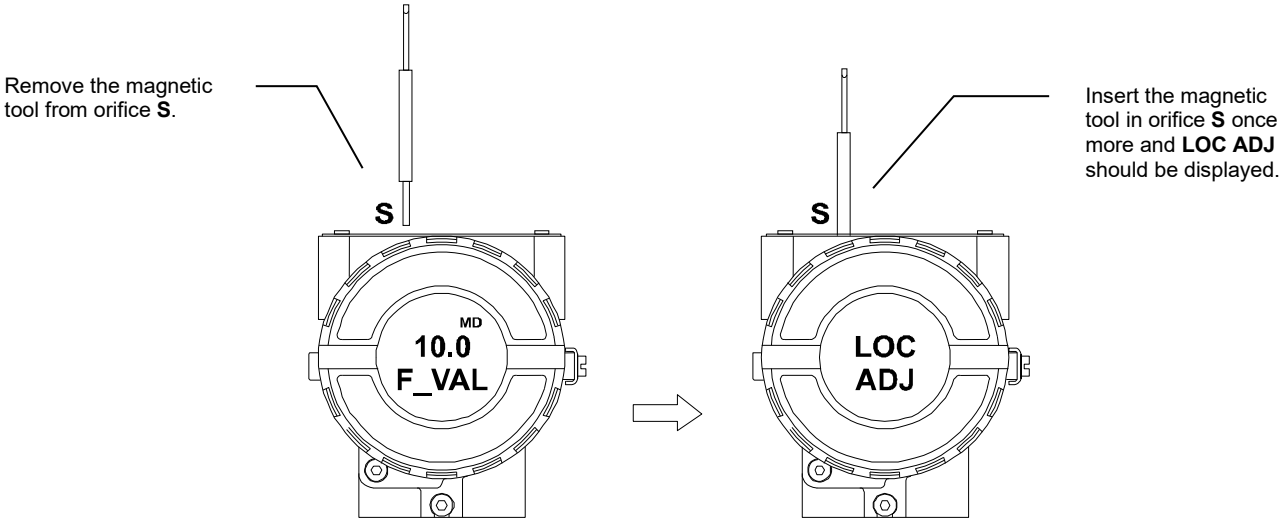


Figure 3.34 - Step 2 - FI303

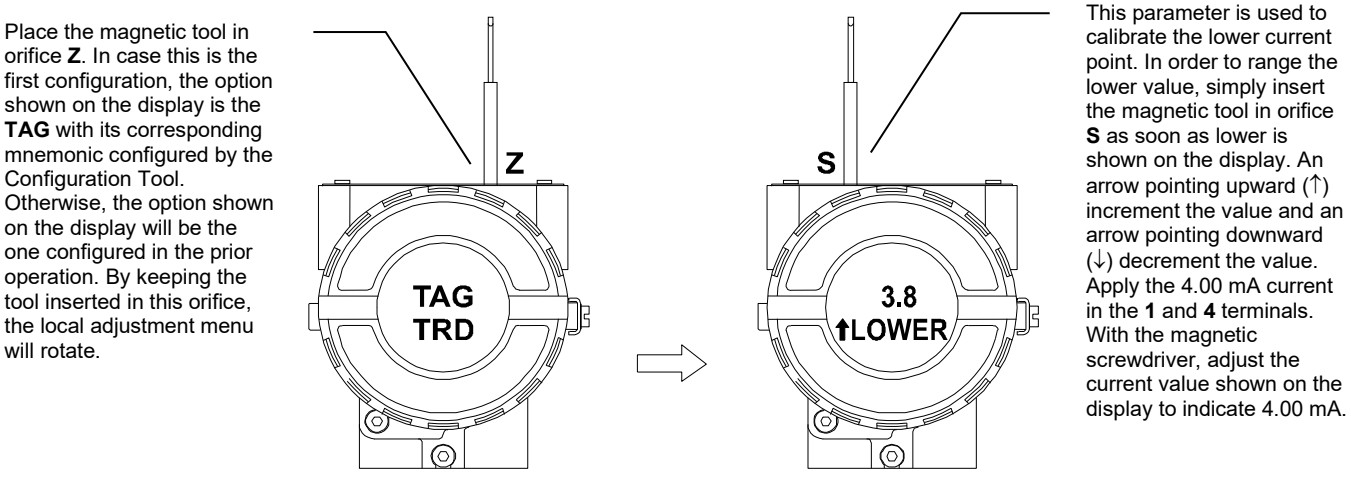
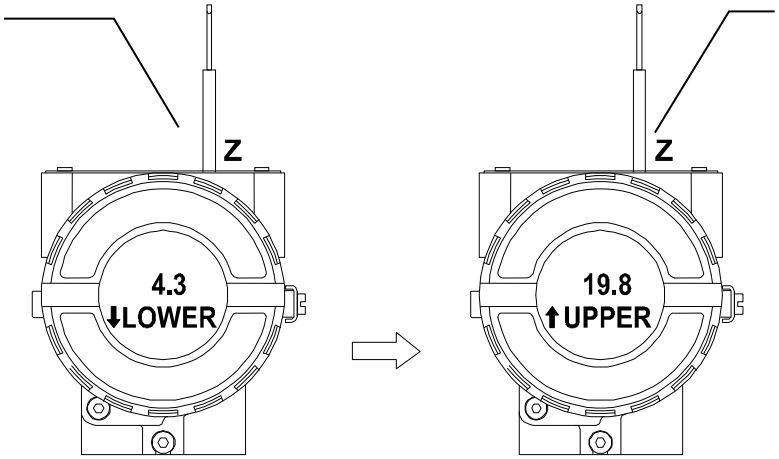


Figure 3.35 - Step 3 - FI303

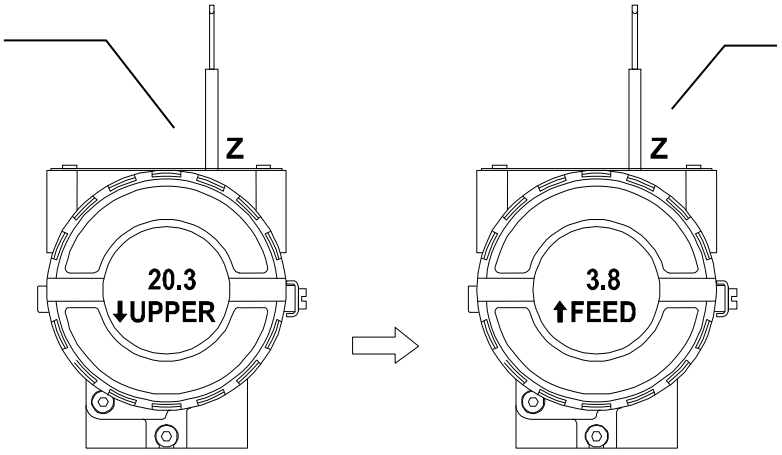
In order to decrement the lower value, place the magnetic tool in orifice **Z** to shift the arrow to the downward position and then, by inserting and keeping the tool in orifice **S**, it is possible to decrement the lower value.



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 3.36 - 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 3.37 - Step 5 - FI303

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

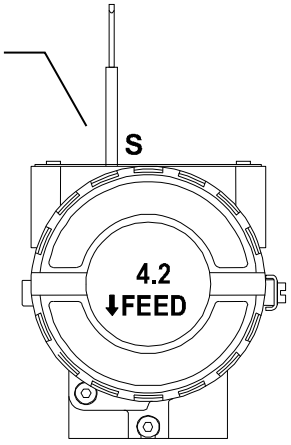
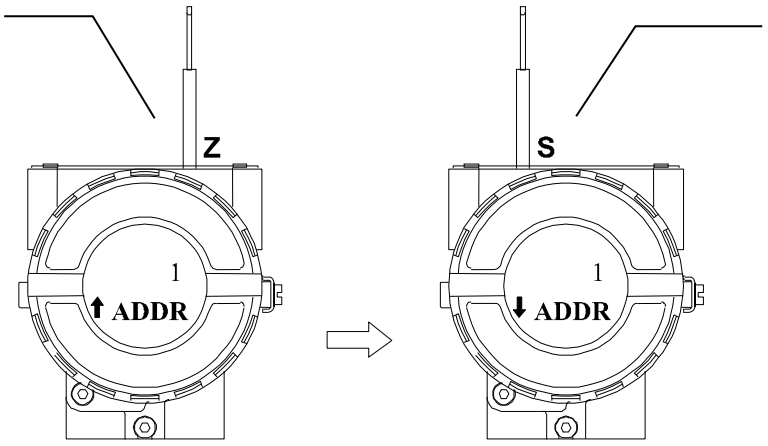


figure 3.38 - Step 6 - FI303

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 3.39 - 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).

IDSEL
There are three possible values for this parameter, resulting in three operating modes:
(0) PROFILE SPECIFIC – Equipment complies with a generic GSD, and this must be used when there is a perspective of exchanging equipment between manufacturers.
(1) MANUFACTURER SPECIFIC – (DEFAULT) Equipment complies with the manufacturer's GSD with its characteristics.
(127) AUTOMATIC_IDENT_NUMBER – Equipment will respond with the IDENT_NUMBER configured in the IDNT0 and IDNT1 parameters. For more details see note.

IDENT0
After changing the IDSEL parameter to 127, the equipment's IDENT_NUMBER value must be converted from hexadecimal to decimal, found inside the GSD file used to include it in the configuration, and the first part of the converted number must be written in IDNT0.

IDENT1
In IDENT1 write the second part of the equipment's IDENT_NUMBER value in decimal.

Examples:
0X06CA => IDNT0 = 6 and IDNT1 = 202
0X8079 => IDNT0 =128 and IDNT1 = 121

CONF
This option allows selecting the LCD to configure it, that is, which item will be shown on the FY303 display and the local adjustment tree. Six options are available – from LCD1 to LCD6.

BLOCK
In this option, the user can select the function block to be configured.

PRMT
It is the number corresponding to the relative index of the parameter to be configured within the function block chosen in the BLOCK option.

ITEM
This option must be configured if the parameter selected in PRMT has sub-items. For example, the OUT_SCALE parameter is composed of EU at 100%, EU at 0%, Unit Index and Decimal Point.

TGGL
This option allows choosing how many configured parameters will be alternately shown on the display during normal operation. For example, if TGGL equals two, the display will alternate between LCD1 and LCD2.

UPDT
The configuration is finished by activating UPDT after choosing the options for the local adjustment.

NOTE

AUTOMATIC_IDENT_NUMBER is a feature available from FI303 firmware version 4.11 onwards. This procedure can be used to replace a device from another manufacturer with a SMAR device without changing the configuration of the PROFIBUS master in operation.

This action is recommended when there is an urgent need to replace the equipment or there is no possibility of maintaining the configuration.

In this case, the IDENT_NUMBER of the SMAR equipment must be changed to reflect the same code as the equipment it will replace. This can only be done by comparing the GSD files of both and ensuring module compatibility.

For example, if there is a PROFIBUS PA device from another manufacturer in your network and that, according to its GSD file, has IDENT_NUMBER = 0x0639 and it is necessary to replace it with a Smar device, without downloading the configuration in the PROFIBUS master, the user must proceed as follows:

1) Change the address of the SMAR device to the same address as the device to be replaced.

2) Check in the configuration in operation on the client, which is the model and IDENT_NUMBER of the equipment via GSD file. Take a note of this number, for example 0x0639 is the IDENT_NUMBER used by one of the equipment models from another manufacturer.

3) On the Smar equipment, using the magnetic tool, go to the IDENT parameter and set the value to 127. This value means that the equipment will work in AUTOMATIC_IDENT_NUMBER.

4) After changing the IDENT parameter to 127, convert the GSD value to decimal and write the values in items IDNT0 and IDNT1:

   0x0639 => IDNT0 = 6 | IDNT1 = 57

5) Restart the equipment.

This Smar equipment can be added in place of another manufacturer's equipment without changing the configuration. Parameterizations (SETUP, Kp, Tr, scales) must be performed locally or with ProfibusView and PBI.

In case of FACT_INIT on the instrument, it will return to the default mode (1) MANUFACTURER SPECIFIC with the original IDENT_NUMBER Smar.

Cyclical Diagnosis

Via cyclic communication is possible to verify diagnostics from the **FI303** using the Profibus Master Class 1 or even via acyclic communication via Master Class 2. The Profibus-PA devices provide up to 4 standard diagnoses bytes via Physcial Block (See figure 3.40 and 3.41) and when the most significant bit of the fourth Byte is "1", the diagnose will extend the information in more 6 bytes. These Diagnosis bytes can also be monitored via cyclic tools.

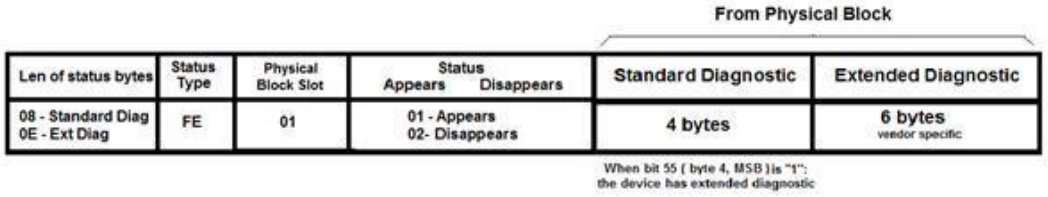


Figure 3.40 – Cyclical Diagnosis

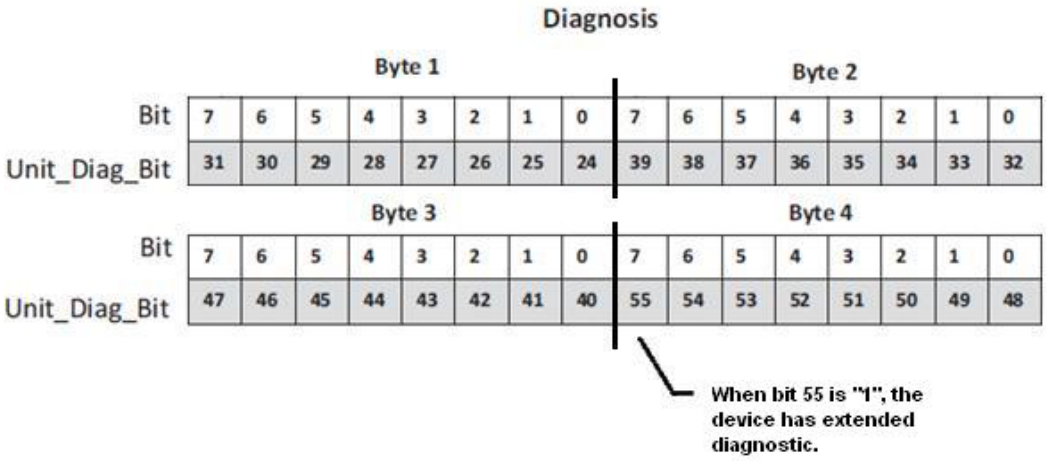


Figure 3.41 – Cyclic Diagnosis mapping for 4 bytes of Physical Block.

Unit_Diag_bit is described in the GSD file Profibus-PA device.

See below a description part of a GSD file for the 4 bytes and more detail:

```
;---------- Description of device related diagnosis: ----------------------
;

Unit_Diag_Bit(16)   = "Error appears"
Unit_Diag_Bit(17)   = "Error disappears"
;
;Byte 01
Unit_Diag_Bit(24)   = "Hardware failure electronics"
Unit_Diag_Bit(25)   = "Not used 25"
Unit_Diag_Bit(26)   = "Not used 26"
Unit_Diag_Bit(27)   = "Not used 27"
Unit_Diag_Bit(28)   = "Memory error"
Unit_Diag_Bit(29)   = "Measurement failure"
Unit_Diag_Bit(30)   = "Device not initialized"
Unit_Diag_Bit(31)   = "Device initialization failed"

;Byte 02
Unit_Diag_Bit(32)   = "Not used 32"
Unit_Diag_Bit(33)   = "Not used 33"
Unit_Diag_Bit(34)   = "Configuration invalid"
Unit_Diag_Bit(35)   = "Restart"
```

```
Unit_Diag_Bit(36)   = "Coldstart"
Unit_Diag_Bit(37)   = "Maintenance required"
Unit_Diag_Bit(38)   = "Characteristics invalid"
Unit_Diag_Bit(39)   = "Ident_Number violation"


;Byte TRD Block & PHY Block
Unit_Diag_Bit(40)   = "Not used 40"
Unit_Diag_Bit(41)   = "Not used 41"
Unit_Diag_Bit(42)   = "Not used 42"
Unit_Diag_Bit(43)   = "Not used 43"
Unit_Diag_Bit(44)   = "Not used 44"
Unit_Diag_Bit(45)   = "Not used 45"
Unit_Diag_Bit(46)   = "Not used 46"
Unit_Diag_Bit(47)   = "Not used 47"


;byte 04
Unit_Diag_Bit(48)   = "Not used 48"
Unit_Diag_Bit(49)   = "Not used 49"
Unit_Diag_Bit(50)   = "Not used 50"
Unit_Diag_Bit(51)   = "Not used 51"
Unit_Diag_Bit(52)   = "Not used 52"
Unit_Diag_Bit(53)   = "Not used 53"
Unit_Diag_Bit(54)   = "Not used 54"
Unit_Diag_Bit(55)   = "Extension Available"


; Extended_Diag


Unit_Diag_Bit(56)   = "Channel 01: current loop is open"
Unit_Diag_Bit(57)   = "Channel 02: current loop is open"
Unit_Diag_Bit(58)   = "Channel 03: current loop is open"
Unit_Diag_Bit(59)   = "TRD Block 1 - Work Range violation"
Unit_Diag_Bit(60)   = "TRD Block 2 - Work Range violation"
Unit_Diag_Bit(61)   = "TRD Block 3 - Work Range violation"
Unit_Diag_Bit(62)   = "Calibration Error - Check XD_ERROR parameter"
Unit_Diag_Bit(63)   = "Device is in Writing Lock"

Unit_Diag_Bit(64)   = "AO Block 1 in Out of Service"
Unit_Diag_Bit(65)   = "AO Block 1 in Fail Safe"
Unit_Diag_Bit(66)   = "Not used 66"
Unit_Diag_Bit(67)   = "Not used 67"
Unit_Diag_Bit(68)   = "Not used 68"
Unit_Diag_Bit(69)   = "Not used 69"
Unit_Diag_Bit(70)   = "Not used 70"
Unit_Diag_Bit(71)   = "Not used 71"

Unit_Diag_Bit(72)   = "AO Block 2 in Out of Service"
Unit_Diag_Bit(73)   = "AO Block 2 in Fail Safe"
Unit_Diag_Bit(74)   = "Not used 74"
Unit_Diag_Bit(75)   = "Not used 75"
Unit_Diag_Bit(76)   = "Not used 76"
Unit_Diag_Bit(77)   = "Not used 77"
Unit_Diag_Bit(78)   = "Not used 78"
Unit_Diag_Bit(79)   = "Not used 79"


Unit_Diag_Bit(80)   = "AO Block 3 in Out of Service"
Unit_Diag_Bit(81)   = "AO Block 3 in Fail Safe"
Unit_Diag_Bit(82)   = "Not used 82"
Unit_Diag_Bit(83)   = "Not used 83
Unit_Diag_Bit(84)   = "Not used 84
Unit_Diag_Bit(85)   = "Not used 85"
Unit_Diag_Bit(86)   = "Not used 86"
```

Unit_Diag_Bit(87) = "Not used 87"

Unit_Diag_Bit(88) = "Not used 88"
Unit_Diag_Bit(89) = "Not used 89"
Unit_Diag_Bit(90) = "Not used 90"
Unit_Diag_Bit(91) = "Not used 91"
Unit_Diag_Bit(92) = "Not used 92"
Unit_Diag_Bit(93) = "Not used 93"
Unit_Diag_Bit(94) = "Not used 94"
Unit_Diag_Bit(95) = "Not used 95"

Unit_Diag_Bit(96) = "Not used 96"
Unit_Diag_Bit(97) = "Not used 97"
Unit_Diag_Bit(98) = "Not used 98"
Unit_Diag_Bit(99) = "Not used 99"
Unit_Diag_Bit(100) = "Not used 100"
Unit_Diag_Bit(101) = "Not used 101"
Unit_Diag_Bit(102) = "Not used 102"
Unit_Diag_Bit(103) = "Not used 103"

NOTE

If the FIX flag is active on LCD, the **FI303** is configured to "Profile Specific". When in "Manufacturer Specific", the Identifier Number is 0x0899. Once the Identifier_Number_Selector is changed from "Profile Specific" to "Manufacturer Specific" or vice-versa, you must wait 5 seconds while it is saved and the turn off the **FI303** and then the identifier is updated in the level of communication. If the equipment is in "Profile Specific" and using the GSD file Identifier Number equals 0x0899, the acyclic communication will work well with tools based on EDDL, FDT/DTM, but no cyclic communication with the Profibus-DP master will get success.

Section 4

MAINTENANCE PROCEDURES

General

NOTE
Equipment installed in hazardous areas must be inspected in accordance with standards applicable to the area. See Appendix A for further information.

SMAR **FI303** PROFIBUS PA 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, the user should have spare circuit boards, which may be ordered from SMAR whenever necessary.

TROUBLESHOOTING	
SYMPTOM	**PROBABLE SOURCES OF TROUBLE**
NO QUIESCENT URRENT	Converter PROFIBUS Connections Check wiring polarity and continuity. Power Supply Check power supply output. The voltage at the **FI303** 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 be 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.

Exploded View

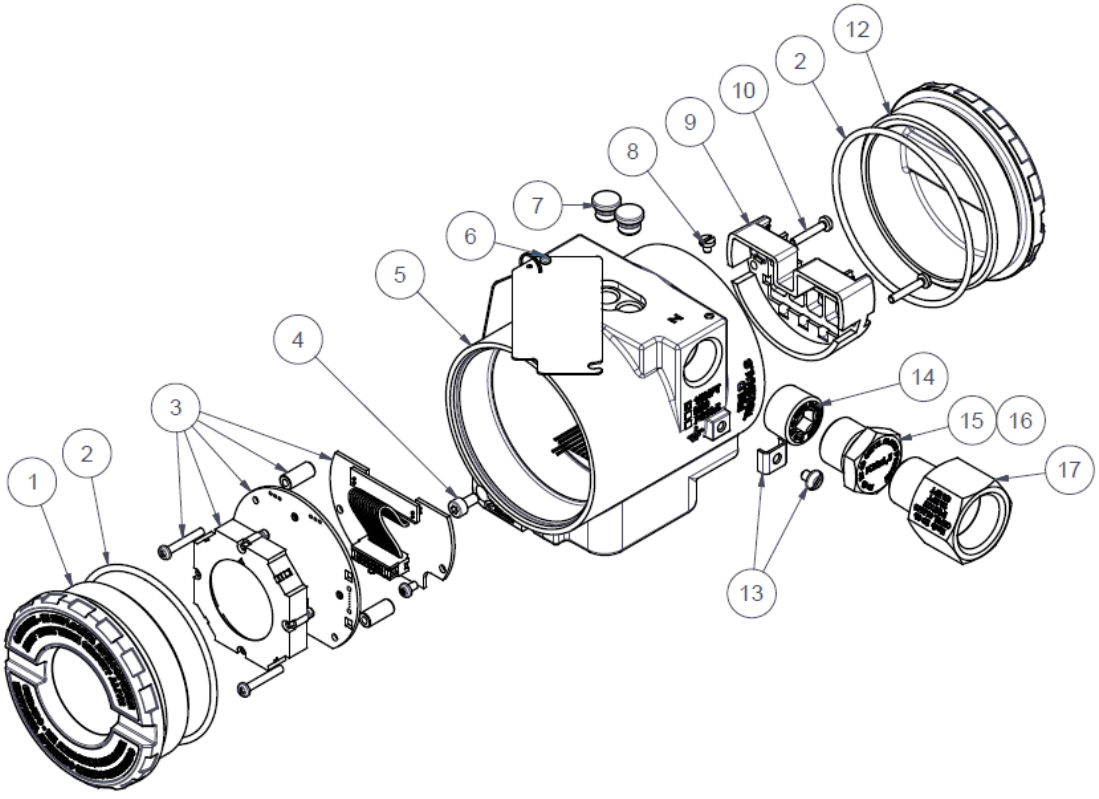


Figure 4.1 - FI303 Exploded View

ITEM	QUANT	DESCRIPTION	CODE
17	01	¾ NPT REDUCING BUSHING	400-0812
16	01	PG13,5 PLUG	400-0811
15	01	M20 PLUG EXD	400-0810
14	01	½ NPT PLUG EXD	400-1484
13	02	EXTERNAL GROUND SET	204-0124
12	01	COVER WITHOUT WINDOW (300 LINE)	400-1307-0X
10	01	TERMINAL BLOCK FIXATION SCREW	204-0119
09	01	TERMINAL BLOCK INSULATOR	214-0220
08	01	IDENTIFICATION PLATE SCREW	204-0116
07	02	LOCAL ADJUSTMENT PROTECTION COVER (Z AND S)	204-0114
06	01	RIVET U 3/16”	400-0834
05	01	ELECTRONIC HOUSING	400-1315-4X
04	02	COVER LOCKING SCREW	204-0120
03	01	GLL1462 AND GLL1464: (DISPLAY+MOUNTING SET)	400-1354
02	02	COVER O-RINGS	204-0122
01	01	COVER WITH WINDOW (300 LINE)	400-1307-1X

Electronic Circuit

The output and the main board are matched pairs on factory and must be replaced together, as one should not be changed separately.

To remove the electronic boards and the display (3), release the cover lock (8) on the housing side not marked with the words “Field Terminals” and unscrew the cover (1).

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

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

Reassembly Procedure

- Position the output board inside the housing (5).
- Secure it with the screws.
- Position the main board (3) on the housing, ensuring that the pins are connected.
- Position the display on the housing observing the four mounting positions. The "▲" symbol should point upwards. See figure 4.2.
- Secure the main board and display with their screws (3).
- Screw on the cover (1) and secure it using the locking screw (4).

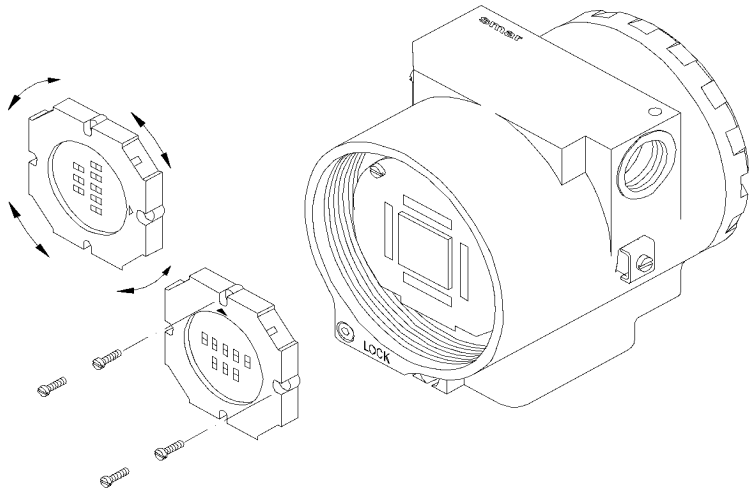


Figure 4.2 – Four Possible Indicator Positions

Interchangeability

The Input board's calibration data is stored in the Main board's EEPROM, which is why they are said to be matched pair.

WARNING
If, for some reason, you separate the input and the main boards, you must do a trim to guarantee precision of the inputs. With mismatched boards, the factory trim will not be as good as it was.

Accessories and Related Products

ACCESSORIES AND RELATED PRODUCTS	
ORDERING CODE	**DESCRIPTION**
AssetView FDT	Asset Management With FDT
BT302	Terminator
DF47-17	Intrinsic Safety Barrier
DF73	HSE/PROFIBUS-DP Controller
DF95/DF97	PROFIBUS DP/PA Controller
FDI302 Plus	Field Device interface
PBI Plus	USB Profibus Interface
ProfibusView	Profibus PA Device Parameterization Software
PS302/DF52	Power Supply
PSI302/DF53	Power Supply Impedance
SD1	Magnetic Tool for Local Adjustment

Spare Parts List

SPARE PART LIST		
DESCRIPTION OF PARTS		**CODE**
Mounting Bracket for 2” Pipe **(Note 3)**	Carbon Steel (Accessories in carbon steel)	214-0801
	316 Stainless Steel (Accessories in 316 SST)	214-0802
	Carbon Steel (Accessories in 316 SST)	214-0803

NOTES
1. Item 5: Includes terminal insulator, bolts (cover lock, grounding and terminal insulator), and I.D. plate without certification.
2. Item 2: Sealing orings are packed in dozens. It is recommended to keep one set in stock for every 50 parts installed.
3. Includes U-clamp, nuts, bolts and washers.
4. Item 3 - Access https://www.smar.com/en/support. In general support, look for compatibility note and consult the document.
5. Item 14 - The spare part 400-1484, Internal Hex Plug 1/2" NPT Stainless Steel 316 BR-Ex-d, was standardized in 316 SST material and will be used in the entire line of housings (aluminum, Copper free aluminum or 316 SST). With or without CEPEL certificate.

Detailed Code for Ordering Spare Parts

400-1315-4 HOUSING FI303

COD.	Communication Protocol
P	Profibus

COD.	Electrical Connection
0	½ NPT
A	M20x1,5
B	PG13,5 DIN

COD.	Material
H0	Aluminum
H1	316 SST
H2	Aluminum for Saline Atmosphere
H4	Cooper Free Aluminum

COD.	Painting
P0	Gray Munsell N6.5
P1	Safety Blue Epoxy – Immersion Condition – Petrobras N1021
P2	Safety Blue Epoxy – Atmospheric Zone - Petrobras N1021
P3	Black Polyester
P8	Without Painting
P9	Blue Safety Epoxy

COD.	Manufacturing Standard
S0	Smar

COD.	Applicable Certification
I0	All except CSA

400-1315-4	P	0	H0	P0	S0	I0

400-1307 COVER FOR ALL LINE 300

COD.	Type
0	Without Window
1	With Window

COD.	Material
H0	Aluminum (IP/TYPE)
H1	316 SST (IP/TYPE)

COD.	Painting
P0	Gray Munsell N6.5
P1	Safety Blue Epoxy – Immersion Condition – Petrobras N1021
P2	Safety Blue Epoxy – Atmospheric Zone - Petrobras N1021
P3	Black Polyester
P8	Without Painting
P9	Blue Safety Epoxy

400-1307	1	H0	P0

Isolation Test on Equipment Housings

1. Power off the equipment in the field, remove its back cover and disconnect all field cables from the transmitter terminal block, isolating them safely.

2. It is not necessary to remove the main board and display.

3. Jumper (connect) the power terminals (positive and negative) with the cable coming from the Megohmmeter (megger). In the case of FI303 converters, also jumper all the connectors with the same cable. In these instruments, in addition to the power terminals, there are sensor terminals. All these terminals must be connected to apply voltage in relation to the housing.

4. Configure the megohmmeter for 500 Vdc scale and check the isolation between the housing and the cable that short-circuits all the terminals.

ATTENTION
 Never test with a voltage greater than 500 Vdc.

5. The value obtained must be greater than or equal to 2GΩ and the voltage application time must be at least 1 second and at most 5 seconds.

6. If the value obtained by the megohmmeter is below 2GΩ, the possibility of moisture entering the electrical connection compartment must be analyzed.

7. It is possible to loosen the two screws that secure the terminal block to the housing and carry out a superficial cleaning and dry the surface well. Afterwards, the isolation can be tested again.

8. If the isolation test still shows that the isolation has been compromised, the housing must be replaced and sent to Nova Smar S.A. for analysis and retrieval.

IMPORTANT
a) For equipment certified Exd and Exi (Explosion Proof and Intrinsically Safe) the standards advise not to carry out repairs in the field of the housing electronic components, only at Nova Smar S.A.
b) In normal use, the housing components must not cause failures that affect its isolation. For this reason, it is important to verify whether there are traces of water entering the housing and, if so, an assessment of the electrical installations and the sealing rings of the covers must be carried out. Nova Smar S.A. has a team ready to support the assessment of facilities, if necessary.

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	Output impedance: non-intrinsic safety from 7.8 KHz - 39 KHz should be greater or equal to 3 kΩ. 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 Ω.
Indication	Optional 4½ digit LCD indicator.
Hazardous Area Certification	See Appendix A
Temperature Limits	Operation: -40 to 85 ºC (-40 to 185 ºF) Storage: -40 to 85 ºC (-40 to 185 ºF) Display: -20 to 80 ºC (-4 to 176 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 can be done using local adjustment magnetic tool if device has display. Complete configuration is possible using remote configurator (Ex.: ProfibusView, AssetView for FDT or 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	Complies with SAMA PMC 31.1 standard.
Electromagnetic Interference Effect	See Appendix A.
Physical Specifications	
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.
Mounting	With an optional bracket it 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

MODEL	
FI303	TRIPLE CHANNEL PROFIBUS TO CURRENT CONVERTER

COD.	Local Indicator
0	Without Indicator
1	With Digital Indicator

COD.	Mounting Bracket
0	Without Bracket
1	Carbon Steel. Accessories: Carbon Steel
2	316 Stainless Steel. Accessories: 316 SST
7	Carbon Steel. Accessories: 316 SST

COD.	Electrical Connections
0	1/2 - 14 NPT
1	1/2"- 14 NPT X 3/4 NPT (316 SST) - with adapter
2	1/2" - 14 NPT X 3/4 BSP (316 SST) - with adapter
3	1/2" - 14 NPT X 1/2 BSP (316 SST) - with adapter
A	M20 X 1.5
B	PG 13.5 DIN

SPECIAL OPTIONS

COD.	Housing
H0	Aluminum (IP/TYPE)
H1	316 Stainless Steel (IP/TYPE)
H2	Aluminum for saline atmosphere (IPW/TYPE X)
H3	316 Stainless Steel for saline atmosphere (IPW/TYPE X)
H4	Aluminum copper free (IPW/TYPE X)

COD.	Identification Plate
I4	ATEX (EX I, EX D) GAS
I5	INMETRO (EX D, EX I) GAS
I6	WITHOUT CERTIFICATION
I7	ATEX (EX I) MINING
IL	IECEX
IO	INMETRO (EX T) DUST

COD.	Painting
P0	Gray Munsell N 6,5 Polyester
P2	Safety Blue Epoxy – Atmospheric Zone - Petrobras N1021
P3	Black Polyester
P7	Beige Epoxy
P8	Without Painting
P9	Safety Blue Epoxy - Electrostatic Painting
PE	Pastel Green Munsell 5G 8/4 Smooth Semi-Gloss Epoxy
PG	Safety Orange Epoxy Paint - Electrostatic Painting

COD.	Manufacturing Standard
S0	Smar

COD.	Output Signal
T0	3 outputs - 4 to 20 mA

COD.	Tag Plate
J0	With tag
J1	Blank
J2	According to user's notes

COD.	Special
ZZ	See Notes

FI303	1	1	0	*	*	*	*	*	*	*	**TYPICAL MODEL**

* Leave it blank if not applicable

Appendix A

CERTIFICATIONS INFORMATION

European Directive Information

Consult www.Smar.com for the EC declarations of conformity and certificates.

Authorized representative/importer located within the Community:
Smar Europe BV De Oude Wereld 116 2408 TM Alphen aan den Rijn Netherlands

ATEX Directive 2014/34//EU - "Equipment for explosive atmospheres" (applicable from 20 April 2016)
The EC-Type Examination Certificate is released by DNV Product Assurance AS (NB 2460) and DEKRA Testing and Certification GmbH (NB 0158).
Designated certification body that monitors manufacturing and released QAN (Quality Assurance Notification) is UL International Demko AS (NB 0539).

LVD Directive 2014/35/EU – "Low Voltage" (applicable from 20 April 2016)
According the LVD directive Annex II, electrical equipment for use in an explosive atmosphere is outside the scope of this directive.
According to IEC standard: IEC 61010-1 - Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements.

ROHS Directive 2011/65/EU - "Restriction of the use of certain hazardous substances in electrical and electronic equipment"
For the evaluation of the products the following standards were consulted: EN IEC 63000.

EMC Directive 2014/30/EU - "Electromagnetic Compatibility" (applicable from 20 April 2016)
For products evaluation the standard IEC 61326-1 were consulted and to comply with the EMC directive the installation must follow these special conditions:
Use shielded, twisted-pair cable for powering the instrument and signal wiring.
Keep the shield insulated at the instrument side, connecting the other one to the ground.

Hazardous locations general information

Ex Standards:
IEC 60079-0 General Requirements
IEC 60079-1 Flameproof Enclosures "d"
IEC 60079-7 Increased Safe "e"
IEC 60079-11 Intrinsic Safety "i"
IEC 60079-18 Encapsulation "m"
IEC 60079-26 Equipment with Separation Elements or combined Levels of Protection
IEC 60079-31 Equipment dust ignition protection by enclosure "t"
IEC 60529 Classification of degrees of protection provided by enclosures (IP Code)
IEC 60079-10 Classification of Hazardous Areas
IEC 60079-14 Electrical installation design, selection and erection
IEC 60079-17 Electrical Installations, Inspections and Maintenance
IEC 60079-19 Equipment repair, overhaul and reclamation
ISO/IEC 80079-34 Application of quality systems for equipment manufacture

Warning:
Explosions could result in death or serious injury, besides financial damage.
Installation of this instrument in hazardous areas must be in accordance with the local standards and type of protection. Before proceedings with installation make sure that the certificate parameters are in accordance with the classified hazardous area.

Maintenance and Repair
The instrument modification or replaced parts supplied by any other supplier than authorized representative of Smar is prohibited and will void the Certification.

Marking Label
The instrument is marked with type of protection options. The certification is valid only when the type of protection is indicated by the user. Once a particular type of protection is installed, do not reinstall it using any other type of protection.

Intrinsic Safety / Non Incendive application
In hazardous areas with intrinsic safety or non-incendive requirements, the circuit entity parameters and applicable installation procedures must be observed.
The instrument must be connected to a proper intrinsic safety barrier. Check the intrinsically safe parameters involving the barrier and equipment including the cable and connections. Associated apparatus ground bus shall be insulated from panels and mounting enclosures. Shield is optional, when using shielded cable, be sure to insulate the end not grounded.
Cable capacitance and inductance plus Ci and Li must be smaller than Co and Lo of the Associated Apparatus.
It is recommended do not remove the housing covers when powered on.

Explosionproof / Flameproof application
Only use Explosionproof/Flameproof certified Plugs, Adapters and Cable glands.
The electrical connections entries must be connected using a conduit with sealed unit or closed using metal cable gland or metal blanking plug with at least IP66.
Do not remove the housing covers when powered on.

Enclosure
The electronic housing and sensor threads installed in hazardous areas must have a minimum of 6 fully engaged threads. The covers must be tightening with at least 8 turns, to avoid the penetration of humidity or corrosive gases, and until it touches the housing. Then, tighten more 1/3 turn (120º) to guarantee the sealing.
Lock the housing and covers using the locking screw.
The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction.
Care must be taken during installation and use to prevent impact or friction.

Degree of Protection of enclosure (IP)
IPx8: Second numeral meaning continuous immersion in water under special condition defined as 10m for a period of 24 hours (Ref: IEC60529).
IPW/ TypeX: Supplementary letter W or X meaning special condition defined as saline environment tested in saturated solution of NaCl 5% w/w at 35ºC for a period of 200 hours (Ref: NEMA 250/ IEC60529).
For enclosure with IP/IPW/TypeX applications, all NPT threads must apply a proper water-proof sealant (a non-hardening silicone group sealant is recommended).

Hazardous Locations Approvals

FM Approvals
FM 0D7A9.AX
XP Class I, Division 1, Groups A, B, C, D
DIP Class II, III Division 1, Groups E, F, G
IS Class I, II, III Division 1, Groups A, B, C, D, E, F G
NI Class I, Division 2, Groups A, B, C, D
T4; Ta = -20 ºC < Ta < 60 ºC; Type 4, 4X, 6, 6P

Entity Parameters Fieldbus Power Supply Input (report 3015629):
Vmax = 24 Vdc, Imax = 250 mA, Pi = 1.2 W, Ci = 5 nF, Li = 12 uH
Vmax = 16 Vdc, Imax = 250 mA, Pi = 2 W, Ci = 5 nF, Li = 12 uH

4-20 mA Current Loop:
Vmax = 30 Vdc, Imax = 110 mA, Pi = 0,825 W, Ci = 5 nF, Li = 12 uH

Drawing 102A-0080, 102A-1204, 102A-1327, 102A-1624, 102A-1625

ATEX DNV
Explosion Proof (PRESAFE 20 75160X)
II 2G Ex db IIC T6 Gb
Ambient Temperature: -20 ºC to +60 ºC
Options: IP66W/68W or IP66/68

Special conditions for safe use:
Repairs of the flameproof joints must be made in compliance with the structural specifications provided by the manufacturer. Repairs must not be made on the basis of values specified in tables 1 and 2 of EN/IEC 60079-1.

The Essential Health and Safety Requirements are assured by compliance with:
EN IEC 60079-0:2018 General Requirements
EN 60079-1:2014 Flameproof Enclosures “d”

Drawing 102A-1271, 102A-1486

IECEx DNV
Explosion Proof (IECEx DNV 21.0090X)
Ex db IIC T6 Gb
Ambient Temperature: -20 ºC to +60 ºC
Options: IP66/68W or IP66/68

Special Conditions for Safe Use
Repairs of the flameproof joints must be made in compliance with the structural specifications provided by the manufacturer. Repairs must not be made on the basis of values specified in tables 1 and 2 of EN/IEC 60079-1.

The Essential Health and Safety Requirements are assured by compliance with:
IEC 60079-0:2017 General Requirements
IEC 60079-1:2014-06 Equipment protection by flameproof enclosures “d”

Drawing 102A-2200, 102A-2201

DEKRA
Intrinsic Safety (DMT 00 ATEX E 065)
I M2 Ex ia I Mb
II 2G Ex ia IIC T4/T5/T6 Gb

Supply circuit for the connection to an intrinsically safe FISCO fieldbus-circuit:
Ui = 24Vdc, Ii = 380 mA, Pi = 5.32 W, Ci ≤ 5 nF, Li = neg
Parameters of the supply circuit comply with FISCO model according to Annex G EN 60079-11:2012, replacing EN 60079-27: 2008.

Output-signal-circuits:
three 4-20 mA current sinks with common ground for external intrinsically safe supply
Effective internal capacitance Ci ≤ 15 nF
Effective internal inductance Li negligible

Safety-relevant maximum values for certified intrinsically safe 4-20 mA current loop circuits as a function of ambient temperature and temperature class

Max. Ambient temperature Ta	Temperature Class	Voltage DC Ui	Current Ii	Power Pi
60ºC	T4	28 V	93 mA	750 mW
50ºC	T5	28 V	93 mA	750 mW
40ºC	T6	28 V	93 mA	570 mW

The signal outputs are safely galvanically separated from the fieldbus circuit.
Ambient Temperature: -40ºC ≤ Ta ≤ +60ºC

The Essential Health and Safety Requirements are assured by compliance with:
EN 60079-0:2009 + A11:2013 General Requirements
EN 60079-11:2012 Intrinsic Safety “i”

Drawing 102A-1271, 102A-1486, 102A-1272, 102A-1487

INMETRO NCC
Segurança Intrínseca (NCC 24.0168X)
Ex ia IIC T* Ga
Ex ia IIIC T* Da
Ui = 30 V Ii = 380 mA Pi = 5,32 W Ci = 5,0 nF Li = desp
Tamb: -20 °C a +50 °C para T5 ou T_{200}100 ºC
Tamb: -20 °C a +65 °C para T4 ou T_{200}135 ºC
IP66/68 ou IP66/68W

Prova de Explosão (NCC 24.0171)
Ex db IIC T6 Gb
Ex tb IIIC T85 ºC Db
Tamb: -20 °C a +40 °C
IP66/68 ou IP66/68W

Observações:
O número do certificado é finalizado pela letra "X" para indicar que para a versão do Conversor FIELDBUS/PROFIBUS PA para Corrente, modelos FI302 e FI303 equipado com invólucro fabricado em liga de alumínio, somente pode ser instalado em localização que exigem o “EPL Ga”, se durante a instalação for excluído o risco de ocorrer impacto ou fricção entre o invólucro e peças de ferro/aço.
O produto adicionalmente marcado com a letra suplementar "W" indica que o equipamento foi ensaiado em uma solução saturada a 5% de NaCl p/p, à 35 °C, pelo tempo de 200 h e foi aprovado para uso em atmosferas salinas, condicionado à utilização de acessórios de instalação no mesmo material do equipamento e de bujões de aço inoxidável ASTM-A240, para fechamento das entradas roscadas não utilizadas.
Os planos de pintura P1 são permitidos apenas para equipamento fornecido com plaqueta de identificação com marcação para grupo de gás IIB.
O grau de proteção IP68 só é garantido se nas entradas roscadas de ½” NPT for utilizado vedante não endurecível à base de silicone.
O segundo numeral oito indica que o equipamento foi ensaiado para uma condição de submersão de dez metros por vinte e quatro horas. O acessório deve ser instalado em equipamentos com grau de proteção equivalente.
É responsabilidade do fabricante assegurar que todos os transformadores da placa analógica tenham sido submetidos com sucesso aos ensaios de rotina de 1500 V durante um minuto.
Este certificado é válido apenas para os produtos dos modelos avaliados. Qualquer modificação nos projetos, bem como a utilização de componentes ou materiais diferentes daqueles definidos pela documentação descritiva dos produtos, sem a prévia autorização, invalidará este certificado.
As atividades de instalação, inspeção, manutenção, reparo, revisão e recuperação dos equipamentos são de responsabilidade dos usuários e devem ser executadas de acordo com os requisitos das normas técnicas vigentes e com as recomendações do fabricante.

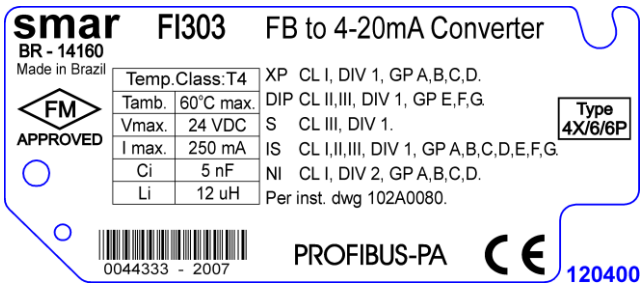
Normas Aplicáveis:
ABNT NBR IEC 60079-0:2020 Atmosferas explosivas - Parte 0: Equipamentos – Requisitos gerais
ABNT NBR IEC 60079-1:2016 Atmosferas explosivas - Parte 1: Proteção de equipamento por invólucro à prova de explosão “d”
ABNT NBR IEC 60079-11:2013 Atmosferas explosivas - Parte 11: Proteção de equipamento por segurança intrínseca "i"
ABNT NBR IEC 60079-26:2022 Atmosferas explosivas - Parte 26: Equipamentos com elementos de separação ou níveis de proteção combinados

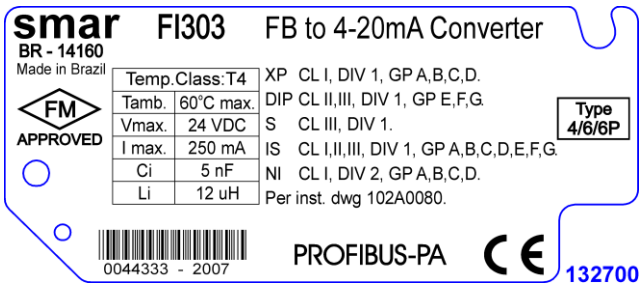
ABNT NBR IEC 60079-31:2022 Atmosferas explosivas - Parte 31: Proteção de equipamentos contra ignição de poeira por invólucros “t”
ABNT NBR IEC 60529:2017 Graus de proteção providos por invólucros (Código IP)

Desenhos 102A1362, 102A1229, 102A2002, 102A2001, 102A2081

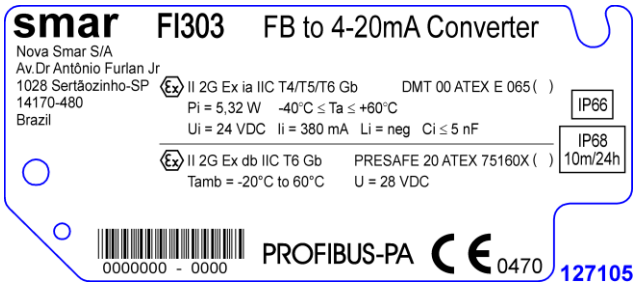
Identification Plate

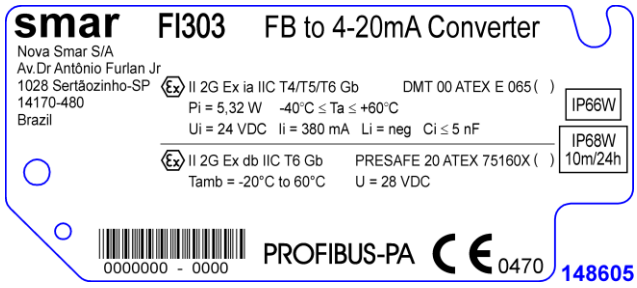
FM Approvals

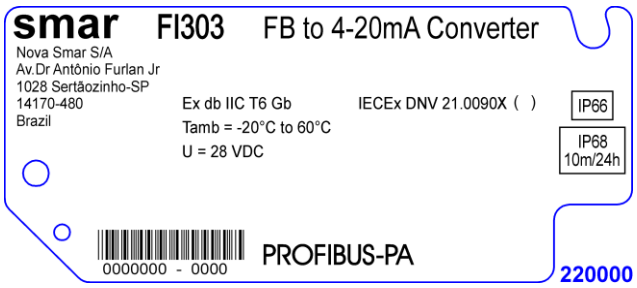


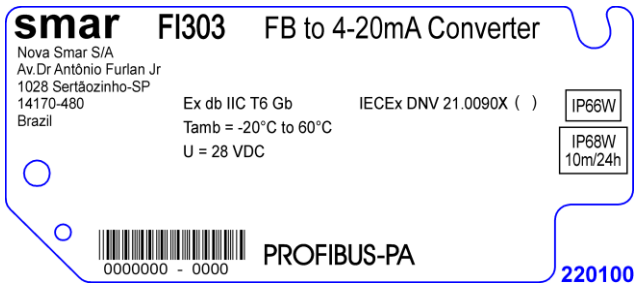


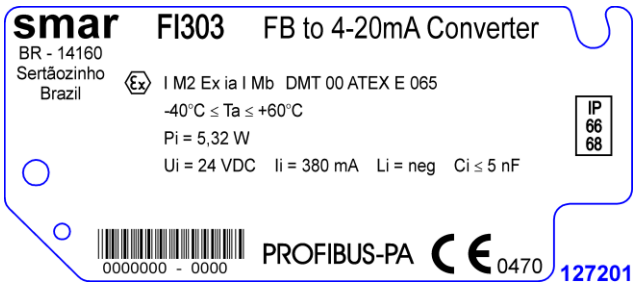
ATEX / IECEx

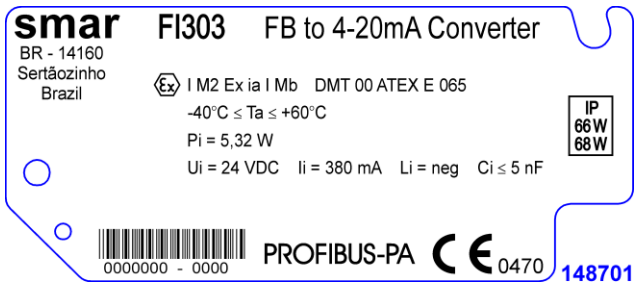




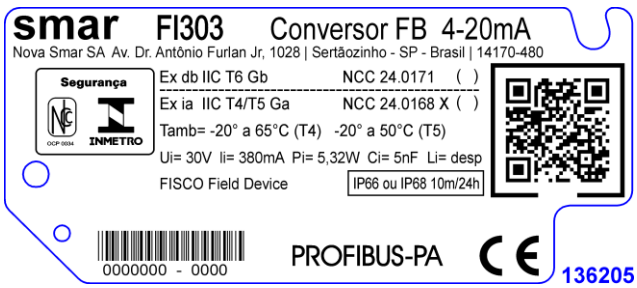


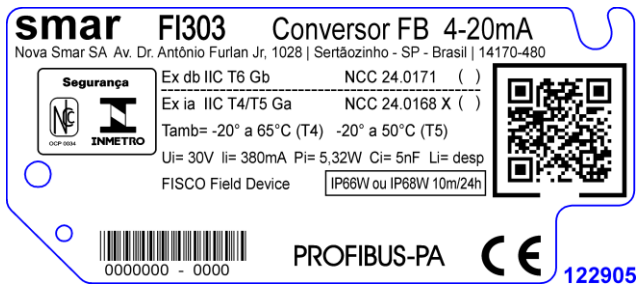


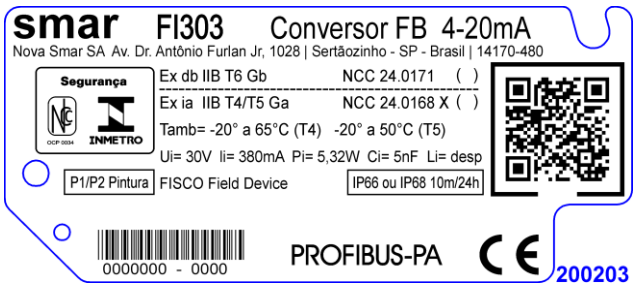


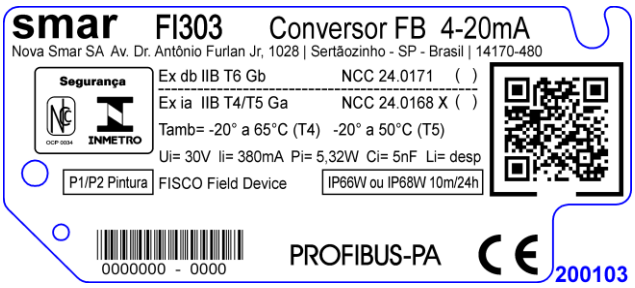


INMETRO NCC



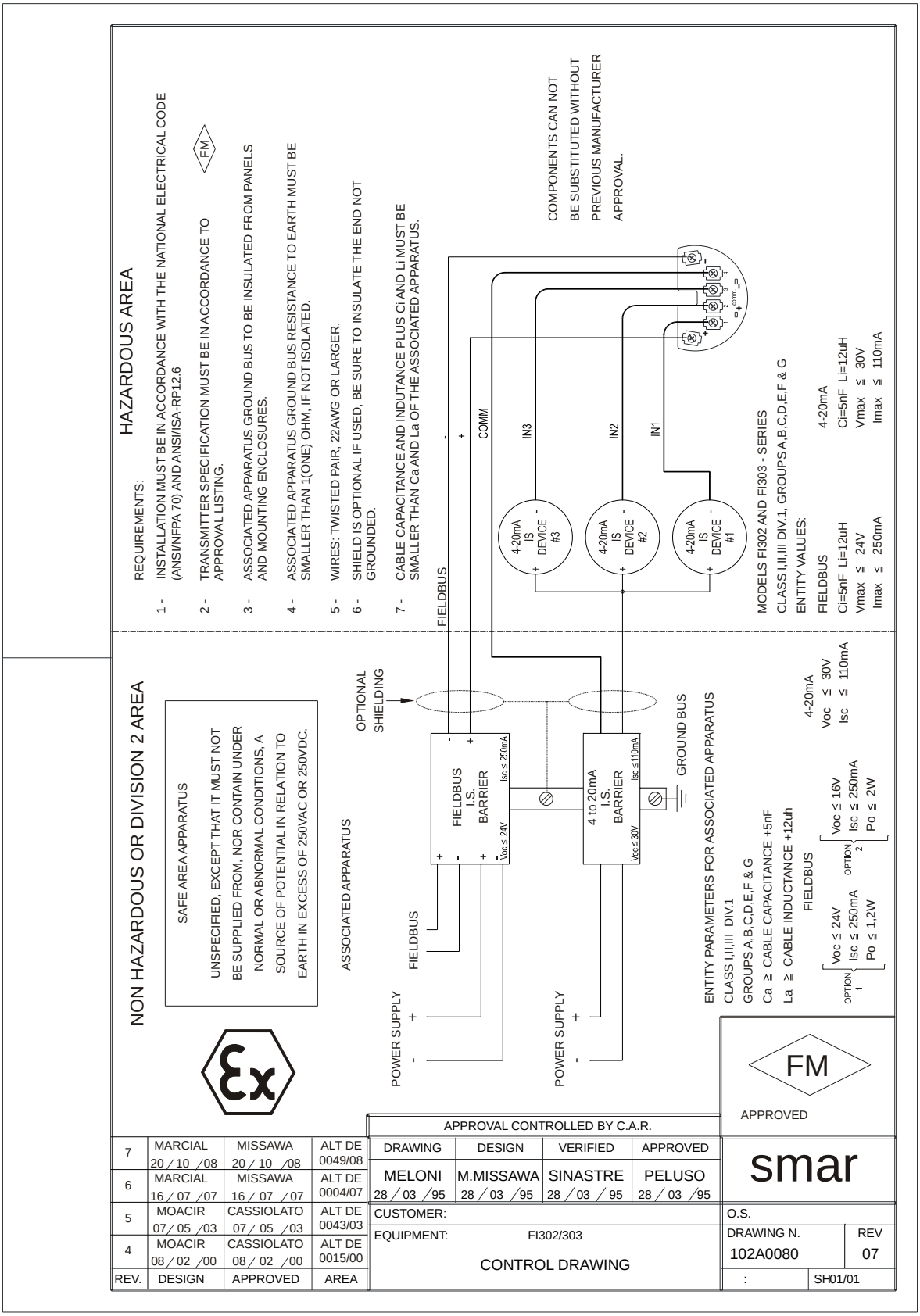



smar FI303 Conversor FB 4-20mA
Nova Smar SA Av. Dr. Antônio Furlan Jr, 1028 | Sertãozinho - SP - Brasil | 14170-480
Segurança
Ex db IIB T6 Gb NCC 24.0171 ( )
Ex ia IIB T4/T5 Ga NCC 24.0168 X ( )
Tamb= -20° a 65°C (T4) -20° a 50°C (T5)
Ui= 30V Ii= 380mA Pi= 5,32W Ci= 5nF Li= desp
P1/P2 Pintura
FISCO Field Device
IP66 ou IP68 10m/24h
0000000 - 0000
PROFIBUS-PA
200203


smar FI303 Conversor FB 4-20mA
Nova Smar SA Av. Dr. Antônio Furlan Jr, 1028 | Sertãozinho - SP - Brasil | 14170-480
Segurança
Ex db IIB T6 Gb NCC 24.0171 ( )
Ex ia IIB T4/T5 Ga NCC 24.0168 X ( )
Tamb= -20° a 65°C (T4) -20° a 50°C (T5)
Ui= 30V Ii= 380mA Pi= 5,32W Ci= 5nF Li= desp
P1/P2 Pintura
FISCO Field Device
IP66W ou IP68W 10m/24h
0000000 - 0000
PROFIBUS-PA
200103


smar FI303 Conversor FB 4-20mA
Nova Smar SA Av. Dr. Antônio Furlan Jr, 1028 | Sertãozinho - SP - Brasil | 14170-480
Segurança
Ex tb IIIC T85°C Db NCC 24.0171 ( )
Ex ia IIIC T200135°C/T200100°C Da NCC 24.0168 X ( )
Tamb= -20° a 65°C (T200135°C) -20° a 50°C (T200100°C)
Ui= 30V Ii= 380mA Pi= 5,32W Ci= 5nF Li= desp
IP66 ou IP68 10m/24h
0000000 - 0000
PROFIBUS-PA
208104

FM Approvals



Appendix B

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 FI? 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.br/en/contact-us.

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.