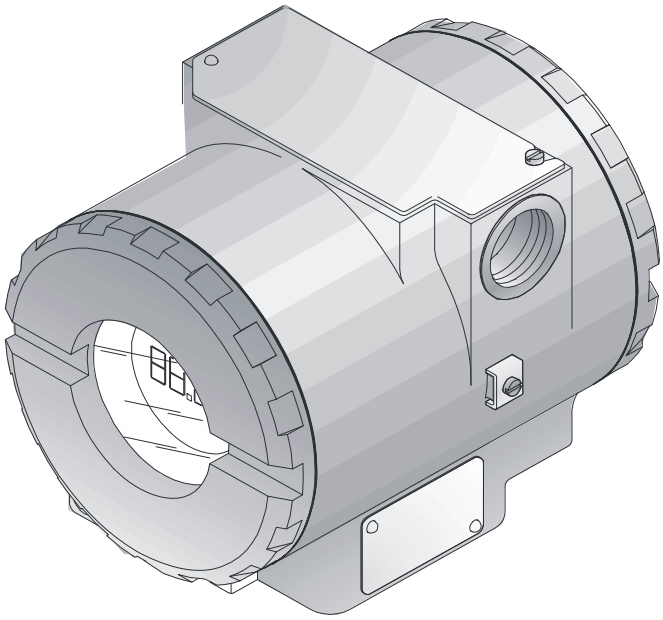
- IF303 -

smar
FIRST IN FIELDBUS

OPERATION & MAINTENANCE
INSTRUCTION MANUAL

TRIPLE CHANNEL CURRENT TO PROFIBUS PA CONVERTER



MAR / 10
IF303
VERSION 1

PROFIBUS

IF303ME

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INTRODUCTION

The **IF303** is a converter mainly intended to interface analog transmitters to a Profibus PA network. The **IF303** receives up to three current signal typically 4-20 mA or 0-20 mA, and makes them available to Profibus PA system. The digital technology used in the **IF303** enables an easy interface between the field and the control room and it has several interesting features that reduce considerably the installation, operation and maintenance costs.

The **IF303** 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 **IF303** enables the choice of several types of transfer functions, an easy interface between the field and the control room and several interesting features that considerably reduce the installation, operation and maintenance costs.

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

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

Using Profibus technology, with its capability to interconnect several devices, very large control schemes can be constructed. In order too be user friendly the function block concept was introduced

The **IF303**, like the rest of the 303 family, has some Function Blocks built in, like Analog Input and Totalizer 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 be 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 **IF303** by carefully reading these instructions.

This product is protected by US patent number **5,706,007**.

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

Waiver of responsibility

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

Warning

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

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

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

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

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

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

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

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

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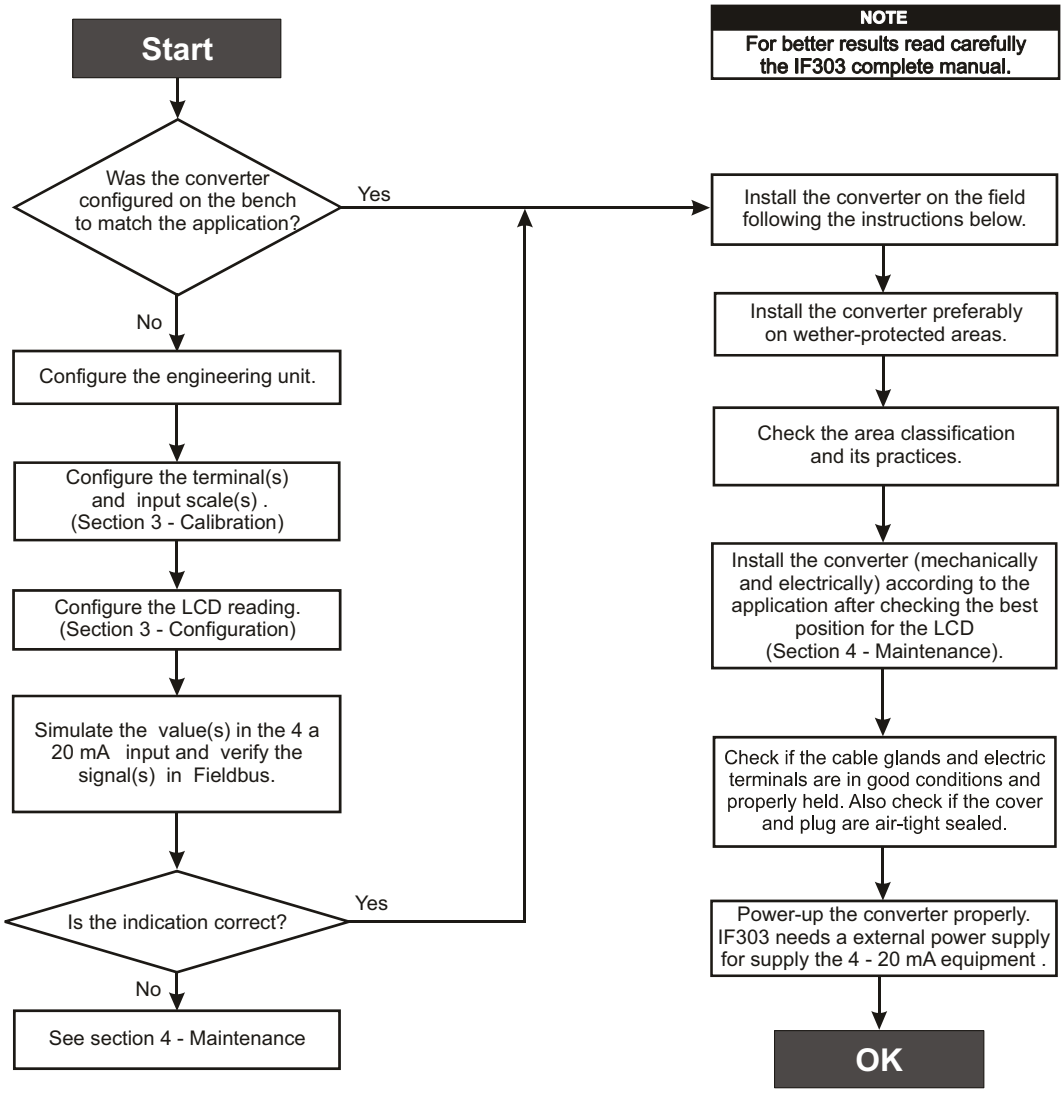
Installation Flowchart



Section 1

INSTALLATION

General

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

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

Locating the converter in areas protected from extreme environmental changes can improve the converter performance.

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 Section 4 - Maintenance Procedures).

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.

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 fork or ring type terminals can be fastened, see Figure 1.2 - Terminal Block.

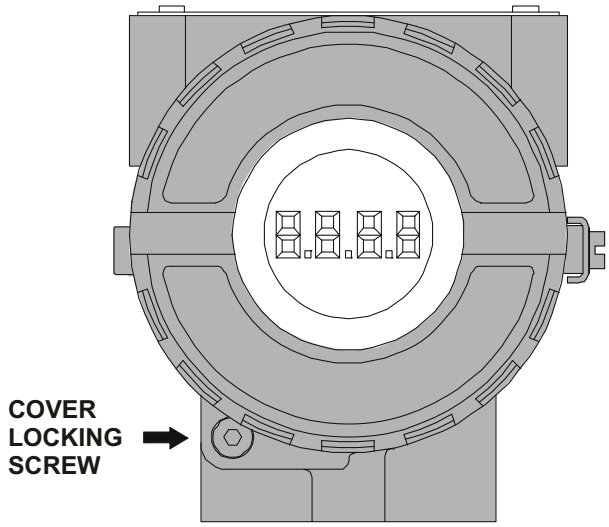


Figure 1.1 - Cover Locking

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

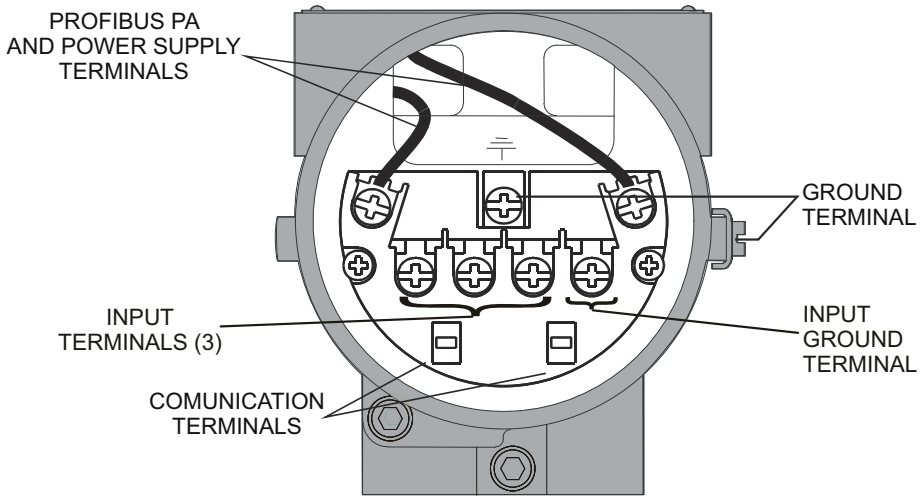


Figure 1.2 - Terminal Block

The **IF303** uses the 31.25 kbit/s voltage mode option for the physical signaling. All other devices on the same bus must use the same signaling.

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

The **IF303** is powered via the bus. The limit for such devices is according to the DP/PA coupler limitations for one bus (one segment) 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.

The **IF303** is protected against reverse polarity, and can withstand ±35 VDC 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.

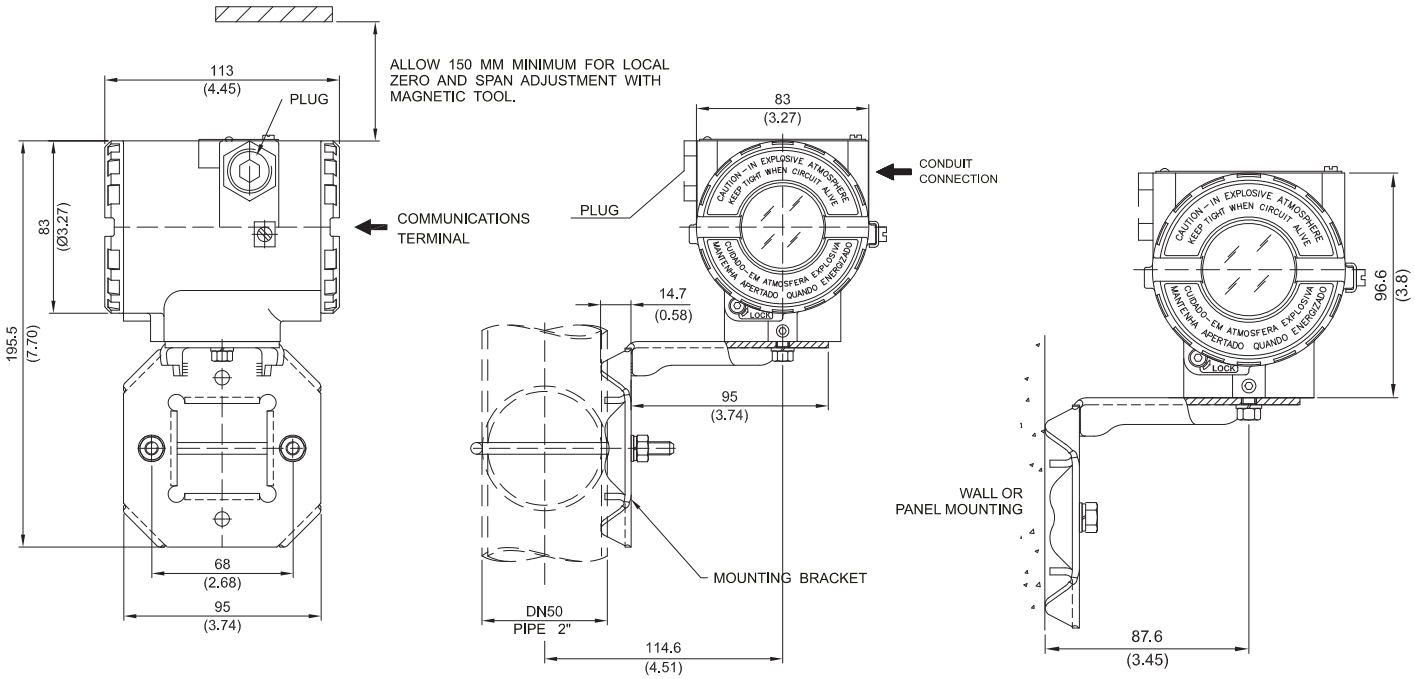


Figure 1.3 - Dimensional Drawing and Mounting Positions

WARNING

HAZARDOUS AREAS

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

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

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

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

Topology and Network Configuration

Bus topology (See Figure 1.4 - Bus Topology) and tree topology (See Figure 1.5 - 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.

Active repeaters may be used to extend the trunk length.

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

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

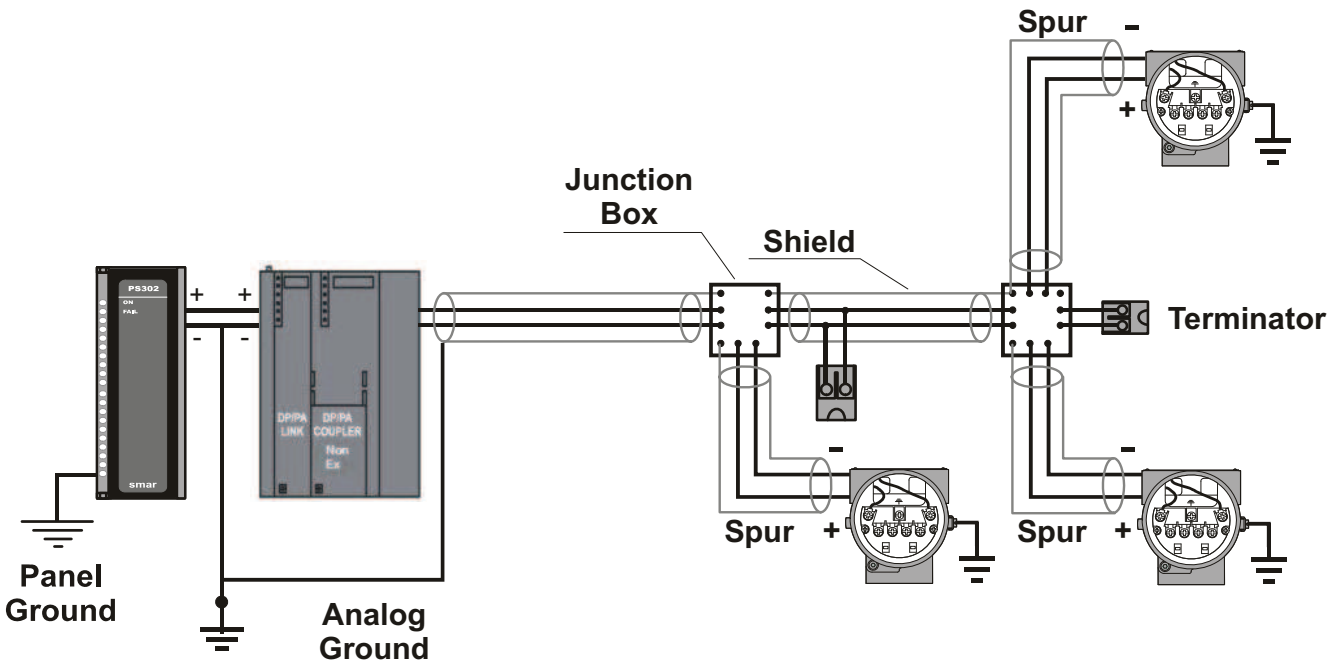


Figure 1.4 - Bus Topology

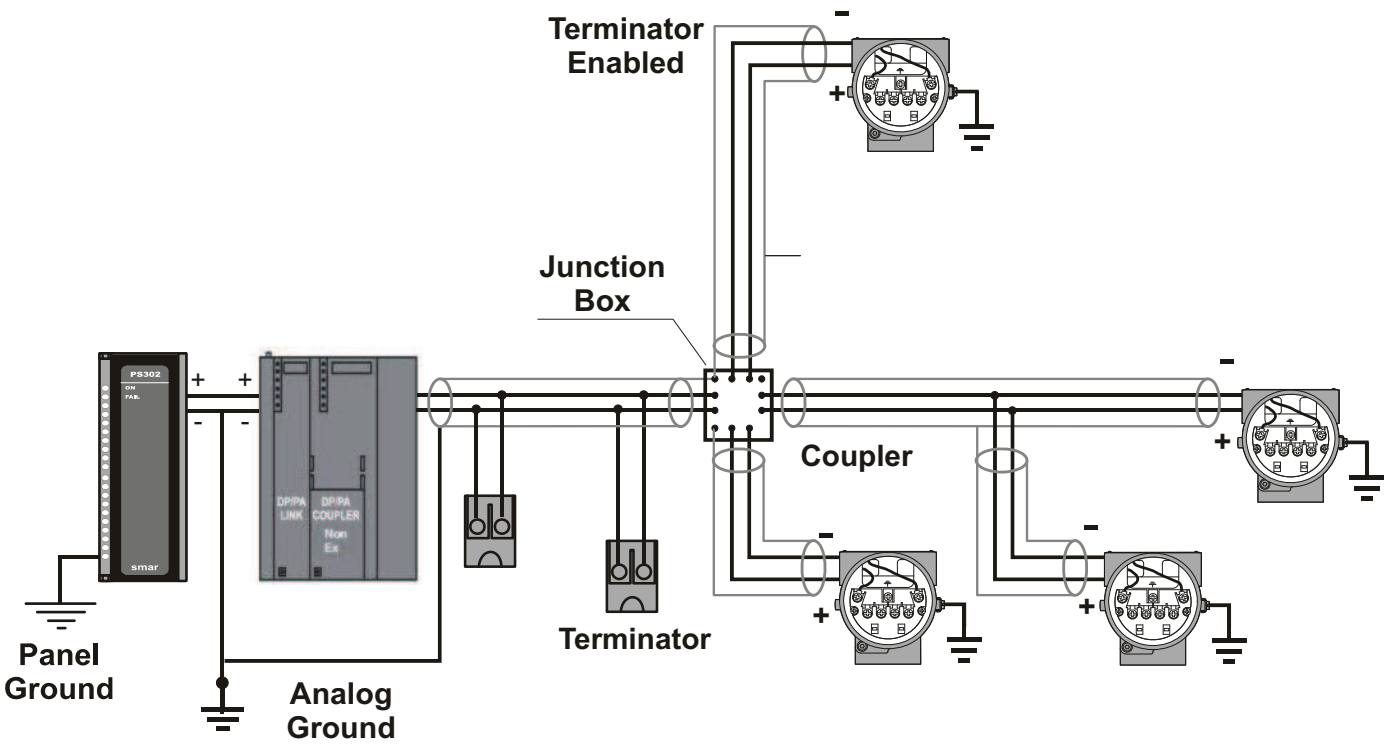


Figure 1.5 - Tree Topology

Intrinsic Safety Barrier

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

Use of **DF47** is recommended.

Jumper Configuration

In order to work properly, the jumpers J1 and W1 located in the **IF303** main board must be correctly configured (See Table 1.1 - Description of the Jumpers).

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

Table 1.1 - Description of the Jumpers

Power Supply

The **IF303** 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.

Input Wiring

The **IF303** accepts up to three current inputs in the range 0-20 mA or 4-20 mA. The three inputs have a common ground and they are protected from reverse polarity signal. The inputs should be connected as per Figure 1.6 - Input Wiring.

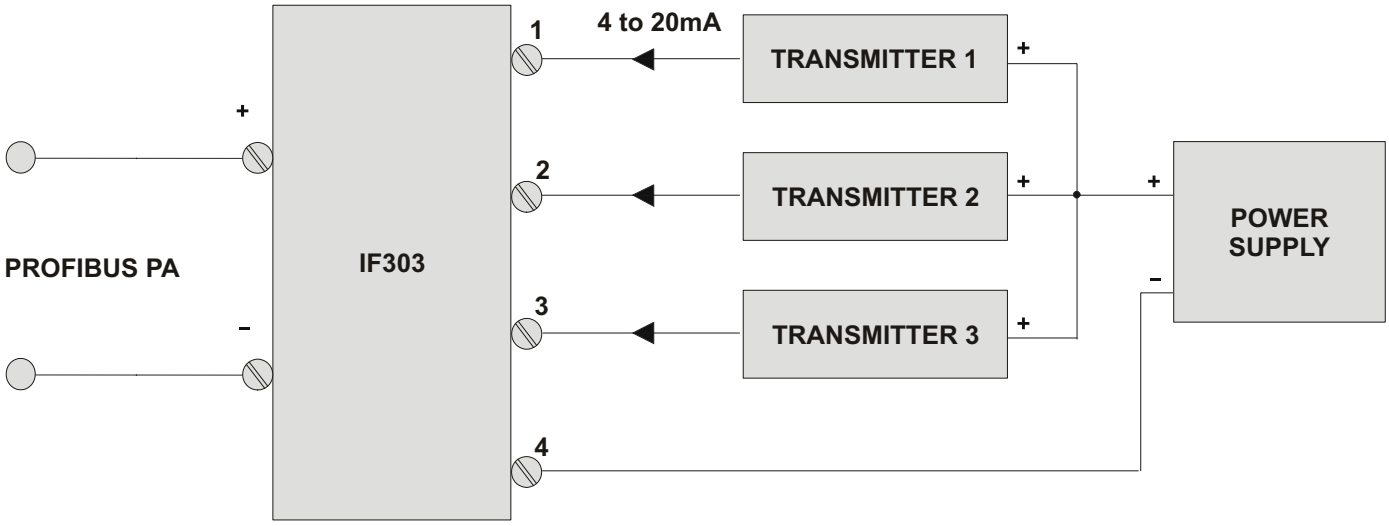


Figure 1.6 - Input Wiring

Note that **IF303** can operate with 0-20 mA or 4-20mA transmitters (See Figure 1.7 - Connection).

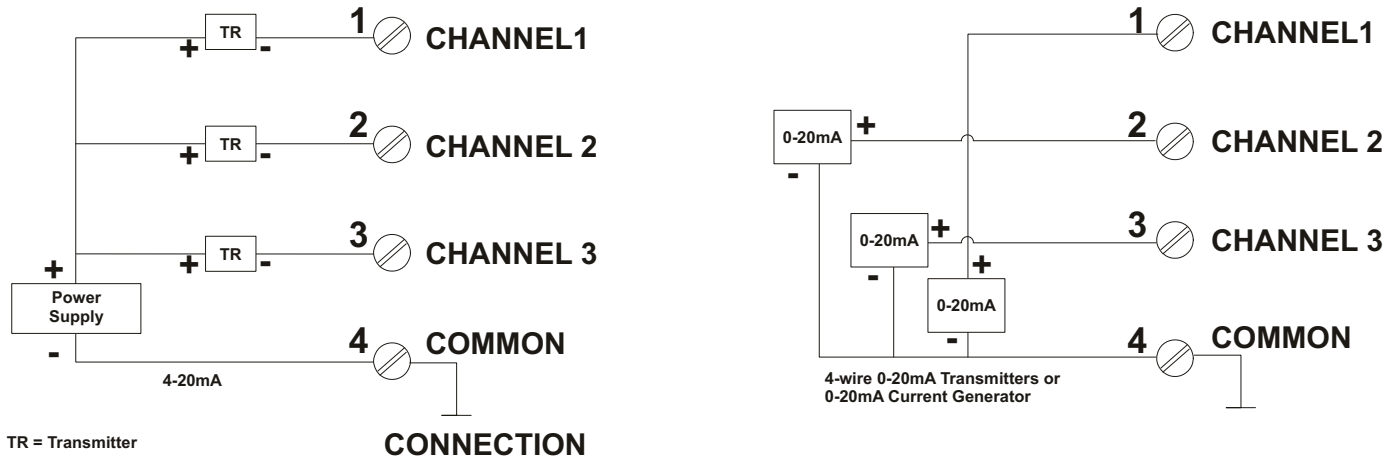


Figure 1.7 - Connection

Avoid routing input wiring close to power cables or switching equipment.

WARNING
Apply in the inputs of the conversor only current levels. **Don't apply tension levels**, because the shunt resistors are of 100R 1W and **tension above 10 Vdc it can damage them**.

Section 2

OPERATION

The **IF303** accepts signals from mA generators such as most conventional transmitters. It is therefore ideal for interfacing existing equipment to a Fieldbus system.

Functional Description – Electronics

See Figure 2.2 - IF303 Block Diagram. The function of each block is described below.

MUX Multiplexer
The MUX multiplexes the input terminals to ensure that all three channels reach the A/D converter.

A/D Converter
The A/D converts the input signals to a digital format for the CPU.

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

(CPU) Central Processing Unit, RAM and FLASH
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 Flash memory. 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 are stored. Examples of such data are: calibration, configuration and identification data.

Communication Controller
It monitors line activity, modulates and demodulates the signal from network line.

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

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

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

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

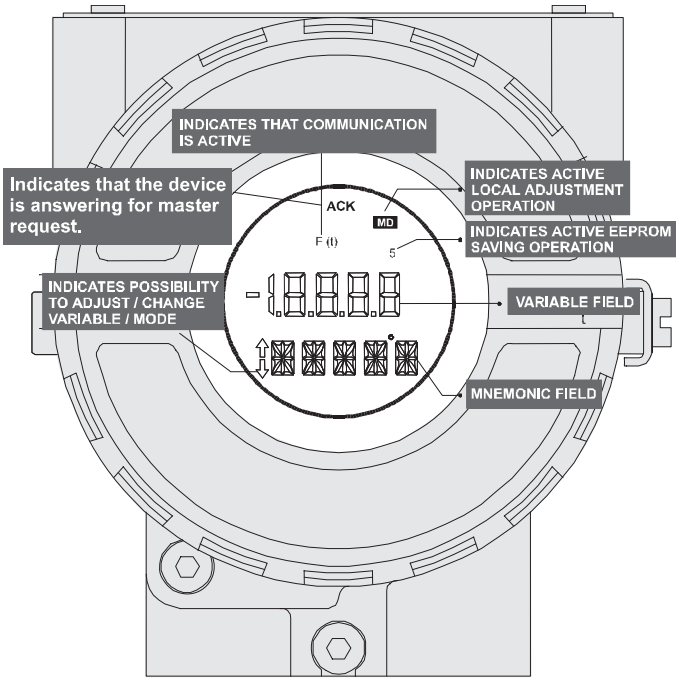


Figure 2.1 - LCD Indicator

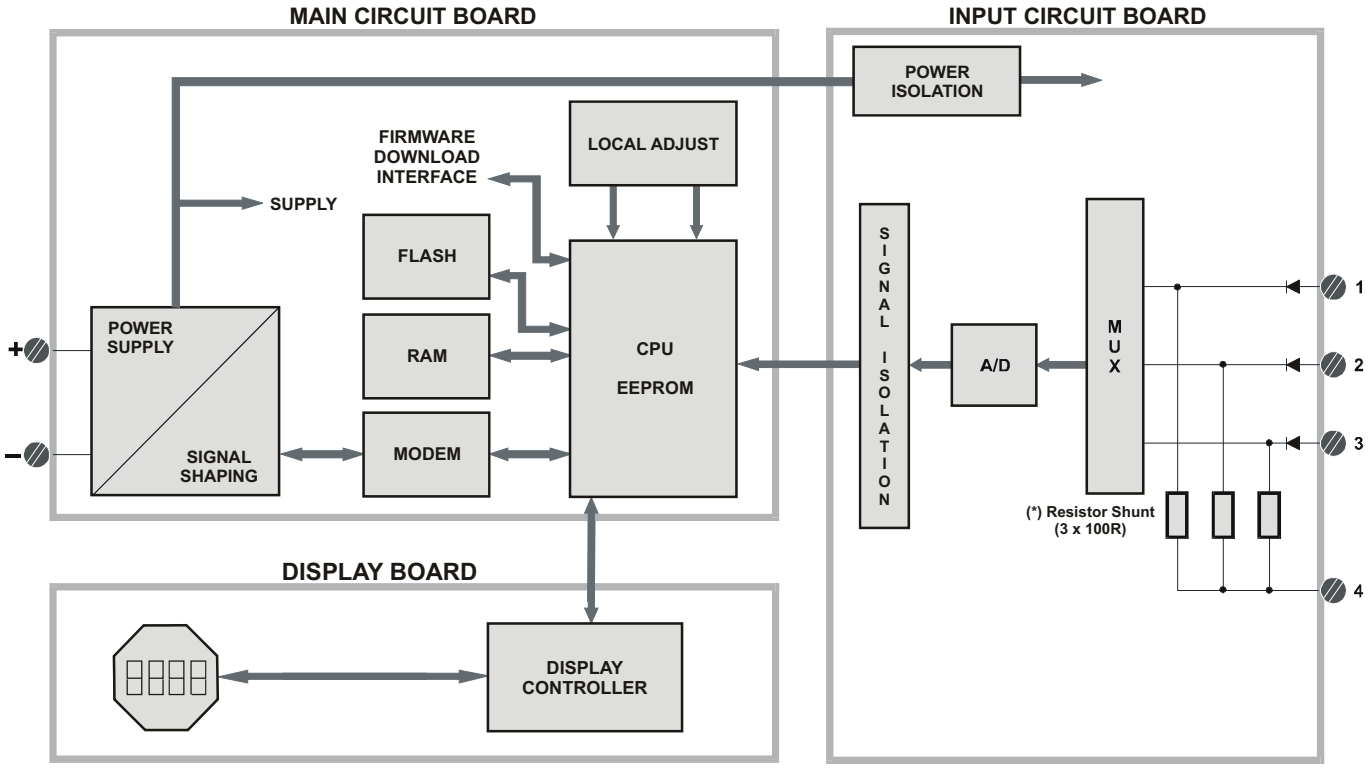


Figure 2.2 - IF303 Block Diagram

** WARNING*
Apply in the inputs of the conversor only current levels. **Don't apply tension levels**, because the shunt resistors are of 100R 1W and **tension higher than 10 Vdc can damage them**.

Section 3

CONFIGURATION

One of the many advantages of Fieldbus is that device configuration is independent of the configurator. The **IF303** may be configured by a third party terminal or operator console.

The **IF303** contains three input transducer blocks, one physical block, one display transducer block , three analog input and three totalizer function blocks.

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

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.

Transducer Block

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

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

How to Configure a Transducer Block

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

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

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

Terminal Number

The terminal number, which references a physical input, which is sent 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 AI block and TOT block is related to the transducer’s terminal number. Channel number 1, 2, 3 corresponds bi-univocally to the terminal block with the same number. Therefore, all the user has to do is to select combinations: (1.1), (2.2), (3,3) for (CHANNEL, BLOCK).

Functional Diagram of the Current To Profibus PA Transducer Block

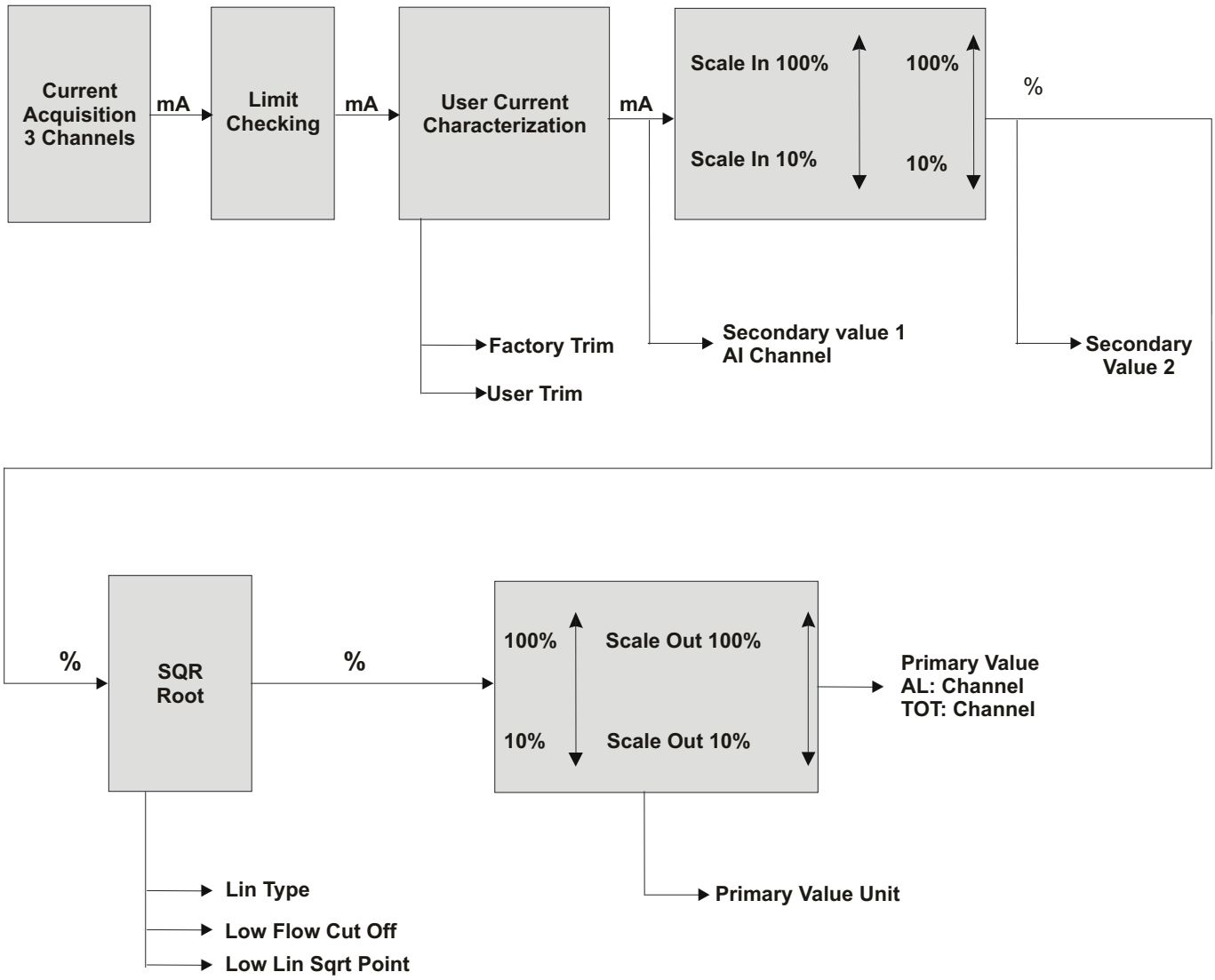


Figure 3.1 - Functional Diagram of the Current To Profibus PA Transducer Block

Current To Profibus PA Transducer Block General Parameter Description

Parameter	Description
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".
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. Unit derives from SENSOR_UNIT.
CAL_POINT_HI	This parameter contains the highest calibrated value. For calibration of the high limit point you give the high measurement value (pressure) to the sensor and transfer this point as HIGH to the transmitter. Unit derives from SENSOR_UNIT.
CAL_POINT_LO	This parameter contains the lowest calibrated value. For calibration of the low limit point you give the low measurement value (pressure) to the sensor and transfer this point as LOW to the transmitter. Unit derives from SENSOR_UNIT.
LIN_TYPE	Linearization Type: **0** – No Linearization **10** – Square Root
LOW_FLOW_CUT_OFF	This is the point in percent of flow till that the output of the flow function is set to zero. It is used for suppressing low flow values.
FLOW_LIN_SQRT_POINT	This is the point of the flow function where the curve changes from linear to square root function. The input has to be done in percent of flow.
MAINT_DATE	The date of last maintenance.
EEPROM_FLAG	This parameter is used to indicate EEPROM saving process.
FACTORY_GAIN_REFERENCE	Factory calibration reference value.
MAIN_BOARD_SN	This is the main board serial number.
MAX_SENSOR_VALUE	Holds the maximum process SENSOR_VALUE. A write access to this parameter resets to the momentous value. The unit is defined in SENSOR_UNIT.
MIN_SENSOR_VALUE	Holds the minimum process SENSOR_VALUE. A write access to this parameter resets to the momentous value. The unit is defined in SENSOR_UNIT.
ORDERING_CODE	Indicates information about the sensor and control from production factory.
PRIMARY_VALUE	This parameter contains the measured value and status available to the Function Block. The unit of PRIMARY_VALUE is the PRIMARY_VALUE_UNIT.
PRIMARY_VALUE_TYPE	This parameter contains the application of the device. **> 128**: manufacturer specific
PRIMARY_VALUE_UNIT	This parameter contains the engineering units index code for the primary value. In this case the unit code is mA (1211).
SECONDARY_VALUE_1	This parameter contains the current value and status available to the Function Block.
SECONDARY_VALUE_1_UNIT	This parameter contains the current units of the SECONDARY_VALUE_1. In this case the unit code is mA (1211).
SECONDARY_VALUE_2	This parameter contains the measured value after input scaling and status available to the Function Block. The related unit is the SECONDARY_VALUE_UNIT_2. In this case the unit code is % (1342).
SECONDARY_VALUE_2_UNIT	This parameter contains the units of the SECONDARY_VALUE_2 defined by the manufacturer. In the this case the unit code mA (1211).

Parameter	Description
SCALE_IN	This is the input conversion of the current into PRIMARY_VALUE using the high and low scale. The related unit is the PRIMARY_VALUE_UNIT.
SCALE_OUT	This is the output conversion value using the high and low scale. The related unit is the PRIMARY_VALUE_UNIT.
SENSOR_HI_LIM	This parameter contains the sensor upper limit value. Unit derives from SENSOR_UNIT.
SENSOR_LO_LIM	This parameter contains the sensor lower limit value. Unit derives from SENSOR_UNIT.
SENSOR_UNIT	This parameter contains the engineering units index code for the calibration values. In this case the unit code is mA (1211).
SENSOR_SN	The serial number of sensor.
SENSOR_VALUE	This parameter contains the raw sensor value. The uncalibrated measurement value from the sensor. Unit derives from SENSOR_UNIT.
TERMINAL_NUMBER	The terminal number, which references a channel value, which is sent via internal, manufacturer-specific from AI function block to the specified transducer. It starts at one (1) for transducer number one until three (3) for transducer number three.
TRIMMED_VALUE	This parameter contains the sensor value after the trim processing. Unit derives from SENSOR_UNIT.
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"}

Table 3.1 - Parameter Description

Transducer Block Parameter Attributes

Relative Index	Parameter Mnemonic	Object Type	Data Type	Store	Size	Access	Parameter usage/ Type of transport	Default value	Down-load Order	Mandatory / Optional (Class)	View
... Standard Parameter											1
Additional Parameter for Transducer Block											
8	SENSOR_VALUE	Simple	Float	D	4	r	C/a	0	-	M (B)	
9	SENSOR_HI_LIM	Simple	Float	N	4	r	C/a	0	-	M (B)	
10	SENSOR_LO_LIM	Simple	Float	N	4	r	C/a	0	-	M (B)	
11	CAL_POINT_HI	Simple	Float	N	4	r,w	C/a	20.0	-	M (B)	
12	CAL_POINT_LO	Simple	Float	N	4	r,w	C/a	4.0	-	M (B)	
13	CAL_MIN_SPAN	Simple	Float	N	4	r	C/a	0	-	M (B)	
14	MAINT_DATE	Simple	Octet String	S	16	w,w	C/a			O(B)	
15	SENSOR_UNIT	Simple	Unsigned 16	N	2	r,w	C/a	1211	-	M (B)	
16	SENSOR_SN	Simple	Unsigned 32	N	4	r,w	C/a		-	M (B)	
17	TRIMMED_VALUE	Record	DS-33	D	5	r	C/a	0.0	-	M (B)	
18	PRIMARY_VALUE	Record	DS-33	D	5	r	C/a	0.0	-	M (B)	1
19	PRIMARY_VALUE_UNIT	Simple	Unsigned 16	N	2	r,w	C/a	-	-	M (B)	
20	PRIMARY_VALUE_TYPE	Simple	Unsigned 16	N	2	r,w	C/a	255	-	M (B)	
21	SECONDARY_VALUE	Record	DS-33	D	5	r	C/a	0.0	-	O (B)	

Relative Index	Parameter Mnemonic	Object Type	Data Type	Store	Size	Access	Parameter usage/ Type of transport	Default value	Down-load Order	Mandatory / Optional (Class)	View
	_1										
22	SECONDARY_VALUE _1_UNIT	Simple	Unsigned 16	N	2	r,w	C/a	mA	-	O (B)	
23	SECONDARY_VALUE _2	Record	DS-33	D	5	r	C/a	0	-	O (B)	
24	SECONDARY_VALUE _2_UNIT	Simple	Unsigned 16	N	2	r,w	C/a	%	-	O (B)	
25	SCALE_IN	Array	Float	S	8	r,w	C/a	20.0 4.0	-	O(B)	
26	SCALE_OUT	Array	Float	S	8	r,w	C/a	20.0 4.0	-	O(B)	
27	MAX_SENSOR_VALU E	Simple	Float	N	4	r,w	C/a	0.0	-	O (B)	
28	MIN_SENSOR_VALUE	Simple	Float	N	4	r,w	C/a	0.0	-	O (B)	
29	TERMINAL_NUMBER	Simple	Unsigned 8	S	1	r,w	C/a	0	-	O (B)	
30	LIN_TYPE	Simple	Unsigned 8	S	1	r,w	C/a	0	-	O (B)	
31	LOW_FLOW_CUT_OF F	Simple	Float	S	4	r,w	C/a	0	-	O (B)	
32	FLOW_LIN_SQRT_POI NT	Simple	Float	S	4	r,w	C/a	0		O (B)	
33-40	RESERVED										
41	BACKUP_RESTORE	Simple	Unsigned 8	S	1	r,w	C/a	0	-	O (B)	
42	XD_ERROR	Simple	Unsigned 8	D	1	r	C/a	0x10	-	O (B)	
43	MAIN_BOARD_SN	Simple	Unsigned 32	S	4	r,w	C/a	0	-	O (B)	
44	EEPROM_FLAG	Simple	Unsigned 8	D	1	r	C/a	FALSE	-	O (B)	
45	FACTORY_GAIN_REF ERENCE	Simple	Float	S	4	r,w	C/a	0	-	O (B)	
46	ORDERING_CODE	Array	Unsigned 8	S	50	r,w	C/a	-	-	O (B)	

Table 3.2 - Parameter Attribute

IF303 - CYCLIC CONFIGURATION

The PROFIBUS-DP and PROFIBUS-PA protocols have mechanisms against communication failures between the slave device and the network master. For example, during initialization, these mechanisms are used to check these possible errors. After powering up the field device (slave), it can cyclically exchange information with the class 1 master, if the parameterization for the slave is correct. This information is obtained using the GSD files (supplied by the device manufacturer, it contains their descriptions). Through the commands below, the master executes all initialization process with the PROFIBUS-PA device:

- Get_Cfg: uploads the slave configuration on the master and checks network configuration;
- Set_Prm: writes to the slave parameters and executes the parameterization network;
- Set_Cfg: configures the slaves according to its outputs and inputs;
- Get_Cfg: another command, where the master checks the slave configuration.

All these services are based on the information obtained from slave gsd files. The GSD file from IF303 shows details such as, hardware and software revision, device bus timing and information about cyclic data exchange.

IF303 has 6 function blocks: 3 AIs (Analog Input) and 3 TOTs (Totalizer). It also has the empty module for applications where not all function blocks are necessary. The following cyclic order of the blocks should be respected: AI_1, AI_2, AI_3 and TOT_1, TOT_2, TOT_3. Suppose, only the AIs blocks are necessary, then configure this way: AI_1, AI_2, AI_3, EMPTY_MODULE, EMPTY_MODULE, EMPTY_MODULE.

Nevertheless, if you want to work only 1 AI and 1 TOT, configure them this way: AI_1, EMPTY_MODULE, EMPTY_MODULE and TOT_1, EMPTY_MODULE, EMPTY_MODULE.

Most PROFIBUS configuration tools use two directories where the different manufacturers' GSD's and BITMAPS files are stored. The GSD's and BITMAPS for Smar devices can be obtained through the website: (https://www.smar.com), on the 'download' link.

The following example shows the necessary steps to integrate the IF303 on a Profibus system. These steps are valid for the entire 303 line of Smar devices:

- Copy the IF303 gsd file to the research directory of the PROFIBUS configuration tool, usually called GSD;
- Copy the IF303 bitmap file to the research directory of the PROFIBUS configuration tool usually called BMP;
- After choosing the master, define the baud rate for the network. Do not forget that couplers may work with the following baud rate: 45.45 kbits/s (Siemens model), 93.75 kbits/s (P+F model) and 12 Mbits/s (P+F, SK2 model). The IM157 device link (Siemens model) may work up to 12 Mbits/s;
- Add the IF303 and specify its physical bus address;
- Choose the cyclic configuration via parameterization using the gsd file that depends on the application, as detailed previously. For every AI (Analog Input) block, the IF303 provides the process variable to the master in 5 bytes value, being the first four according to float point data type and the fifth byte is the status that brings the measure quality of this information.

  In the TOT (Totalizer) block, the user can choose the totalization value (Total) and the integration is made considering the operation mode (Mode_Tot). It allows defining of how the totalization will be, with the following options: only positive value of the flow, only negative values of the flow, or both. In this block, the user can reset the totalization and configure the preset value through the Set_Tot parameter. The reset option is very used in batch processes;
- It allows activating the condition of watchdog, which the device goes to a fail safe condition, when a loss of communication is detected with the master.

The **Simatic PDM** (Process Device Manager) configuration software from Siemens, for example, can configure many parameters of the Input Transducer block. Figure x.xx - Function and Transducers Blocks.

The device was created as IF303.

Here, you can see all blocks instantiated.

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

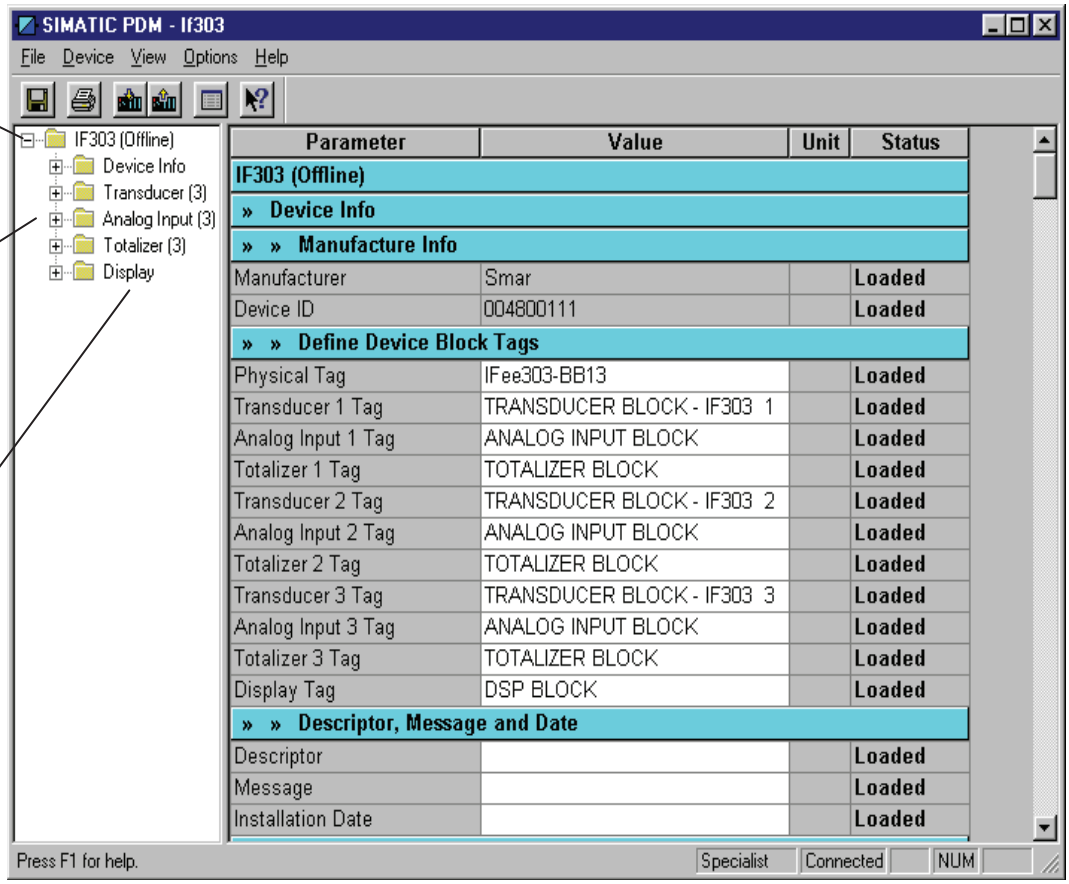


Figure 3.2 – Function and Transducers Blocks

To make the configuration of Transducer Block, we need to select "Device-OffLine Configuration-Transducer" on the main menu:

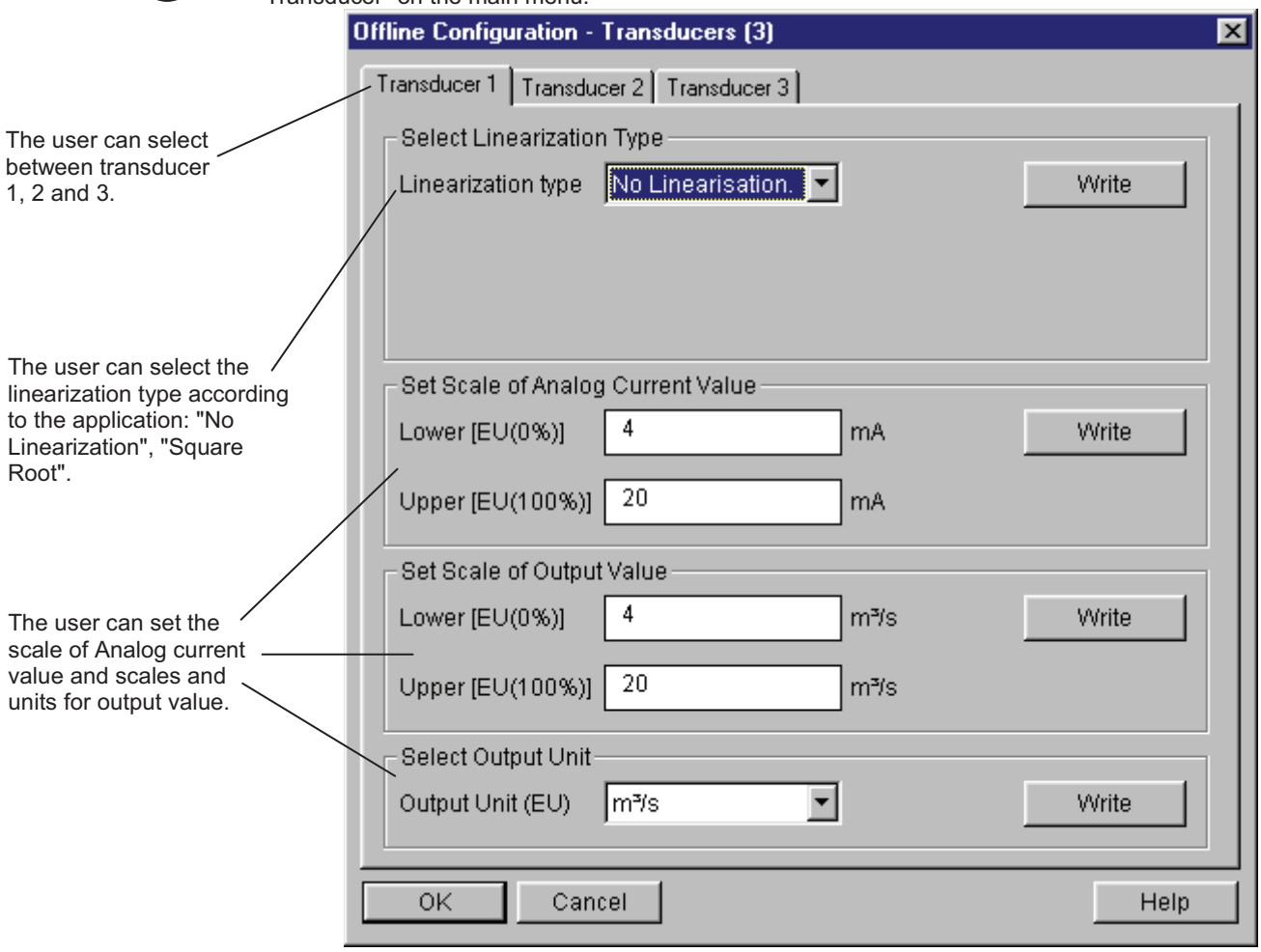


Figure 3.3 - IF303 Simatic PDM Transducer Block - Offline Configurarion

In terms of Square Root, we have the following feature:

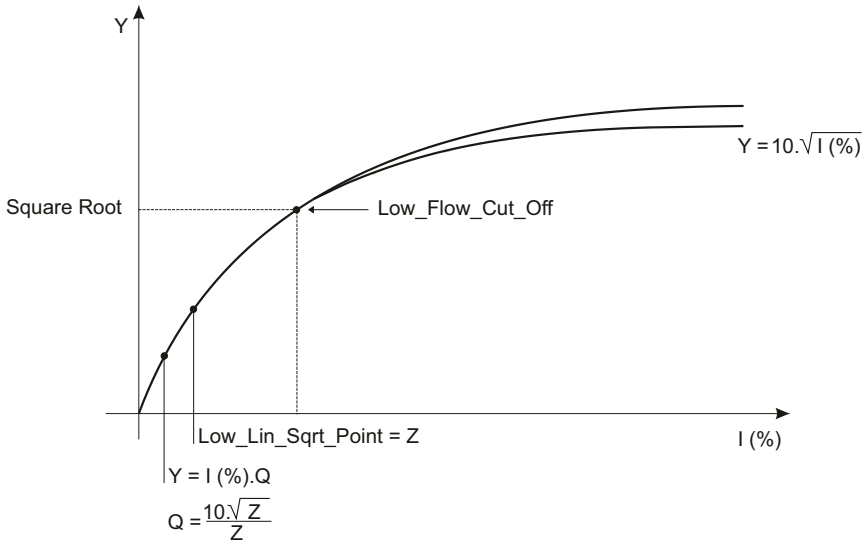


Figure 3.4 – Square Root Calculation.

When the user chooses "Square Root", he needs to configure more two parameters: Low Flow Cutoff" and "Flow Lin Sqr Point". For details, please see last figure and the diagram of Transducer Block.

How to Configure the Analog Input Block

The Analog Input block takes the input data from the Transducer block, selected by channel number, and makes it available to other function blocks at its output. The transducer block provides the input unit of the Analog Input, and when the unit is changed in the transducer, the PV_SCALE unit is changed too. Optionally, a filter may be applied in the process value signal, whose time constant is PV_FTIME. Considering a step change to the input, this is the time in seconds to the PV reaches 63,2% of the final value. If the PV_FTIME value is zero, the filter is disabled. For more details, please, see the Function Blocks Specifications.

To configure the Analog Input Block in offline mode, please, go to the main menu and select "Device Offline Configuration - Analog Input Block. Using this window, the user can configure the block mode operation, selects the channel, scales and unit for input and output value and the damping.

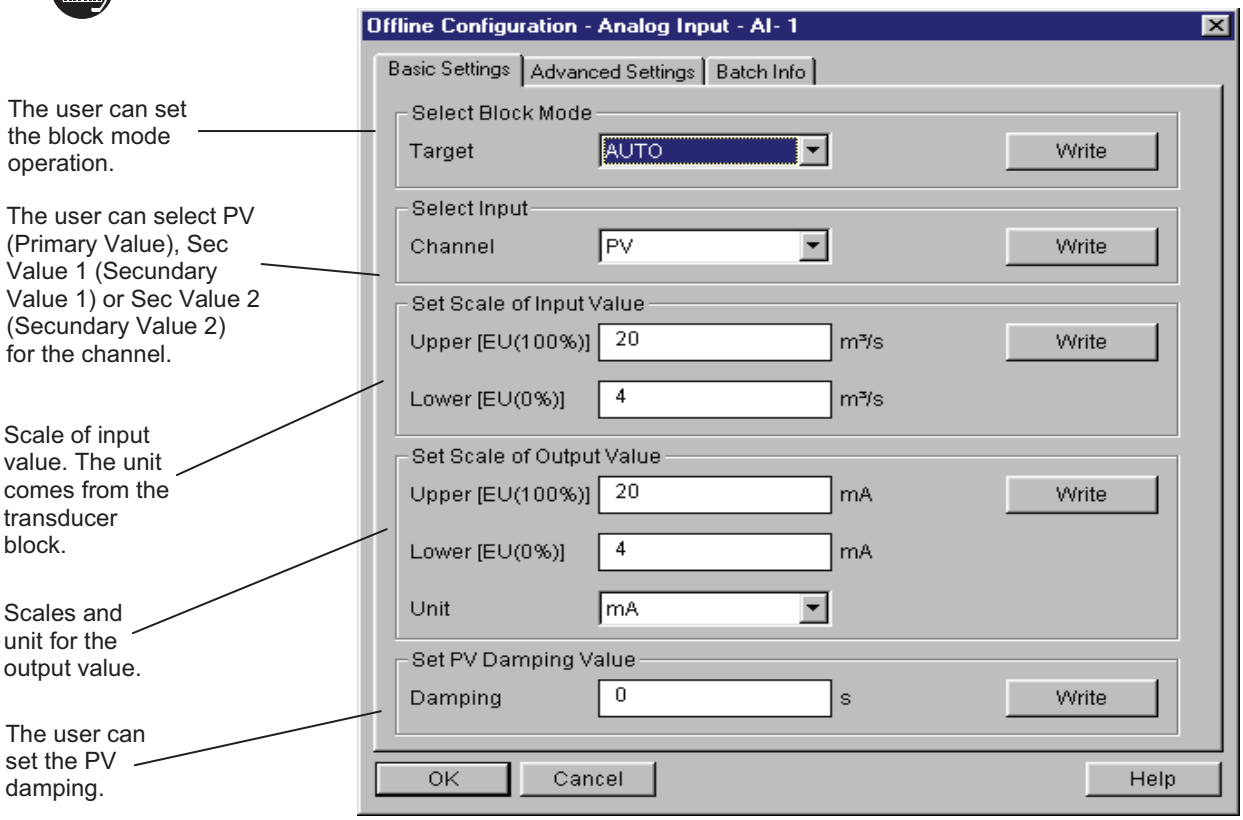


Figure 3.5 – Simatic PDM – Basic Settings for Analog Input Block.

Selecting the page "Advanced Settings", the user can configure the conditions for alarms and warnings, as well the fail safe condition. Please, see the next window:

The user can set Alarm/Warning limits.

The fail safe conditions.

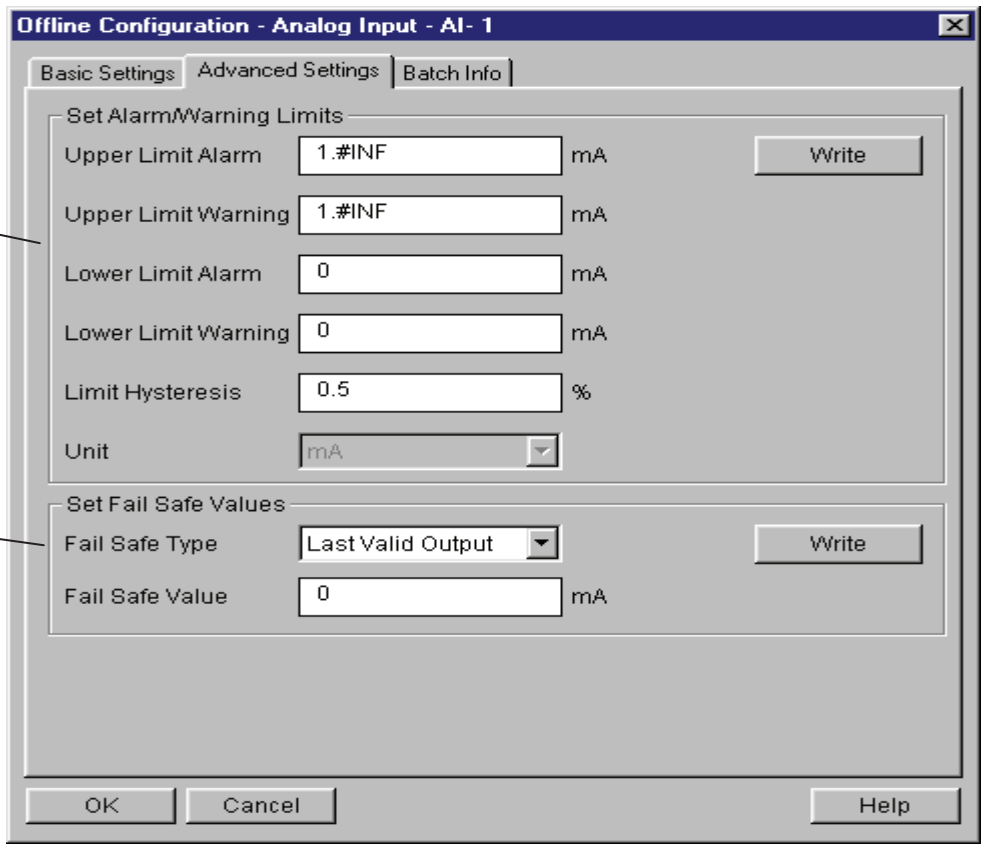


Figure 3.6 - Simatic PDM - Advanced Settings for Analog Input Block.

In terms of online configuration for the Analog Input Block, please, go to the main menu and select "Device - Online Configuration - Analog Input - Block Mode". The user can choose between 3 Analog Input Blocks:

The user can set the mode block.

The user can monitor the output parameter and verify the current state alarm.

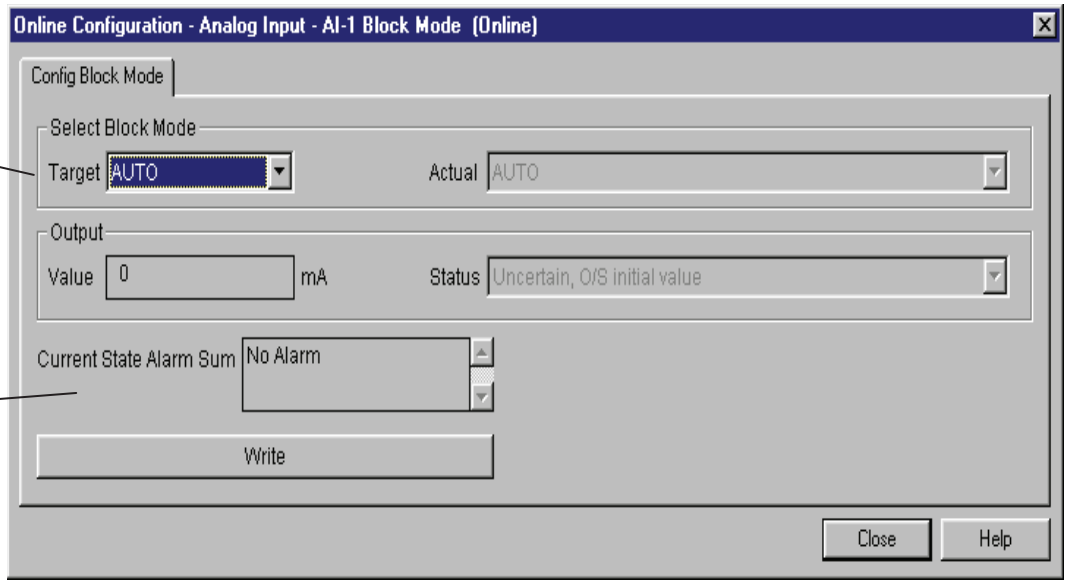


Figure 3.7 - Simatic PDM - Online Configuration for Analog Input Block.

How to configure the Totalizer Block

The Totalizer function block obtain the input data from the Transducer block, selected by channel number, and integrates over the time. This block is normally used to totalize flow, giving total mass or volume over a certain time, or totalize power, giving the total energy.

The Totalizer Function Block integrates a variable (e.g flow rate or power) in function of the time to the corresponding quantity (e.g., volume, mass or distance). The rate unit of the Totalizer is providing by the transducer block. Internally, the time units are converted in rate units per second. Each rate, multiplied by the block execution time, gives the mass, volume or energy increment per block execution.

The TOTAL is the totalized quantity. The engineering unit used in the output is the UNIT_TOT. The unit of the output must be compatible with the unit of the input provided by the transducer by the channel. Then, if the input the rate is mass flow (like Kg/s, g/min, ton/h) the unit of the output must be mass (like kg, g, ton, lb, etc.).

For more details, please, see the Function Blocks Specifications.
To configure the Totalizer Block in offline mode, please, go to the main menu and select "Device Offline Configuration - Totalizer Block. Using this window, the user can configure the block mode operation, selects the channel, totalizer mode and unit for the total. The user can choose up to 3 Totalizer Blocks:

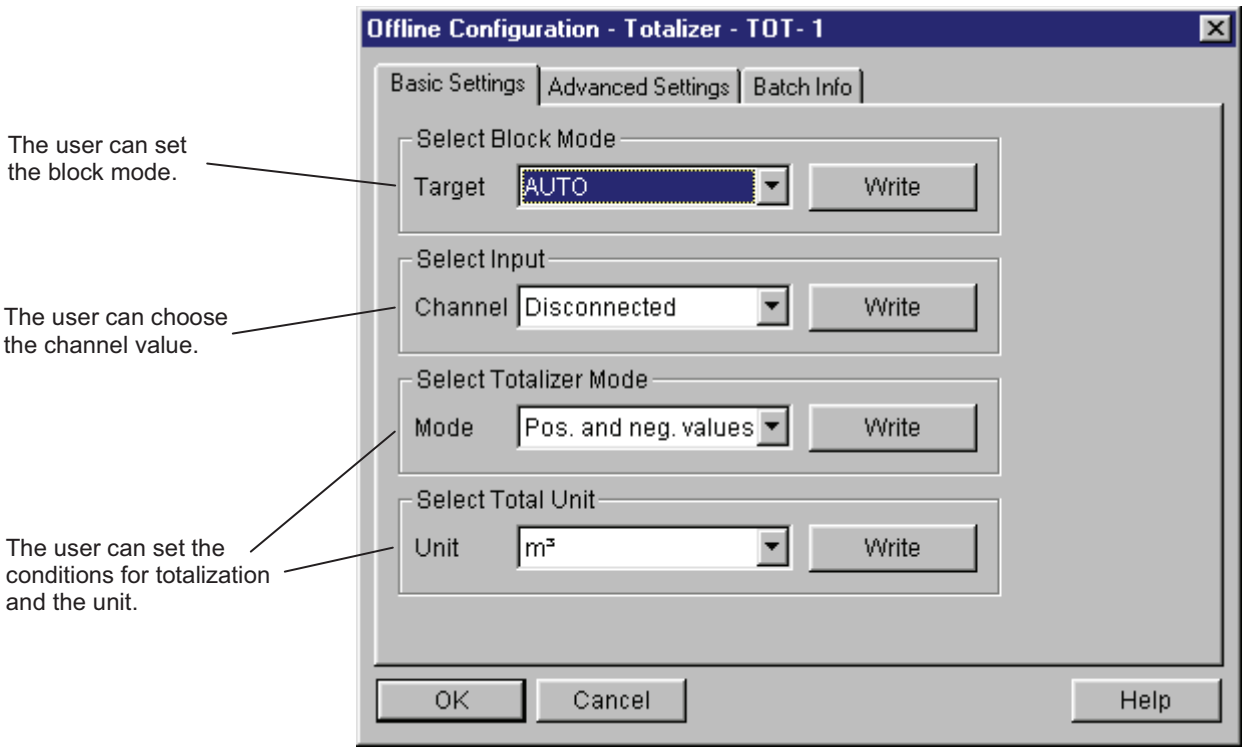


Figure 3.8 - Simatic PDM - Onffline Configuration - Basic Settings for Totalizer Block

Choosing the "Advanced Settings" window, the user can set alarm and warning limits, as well the fail safe condition:

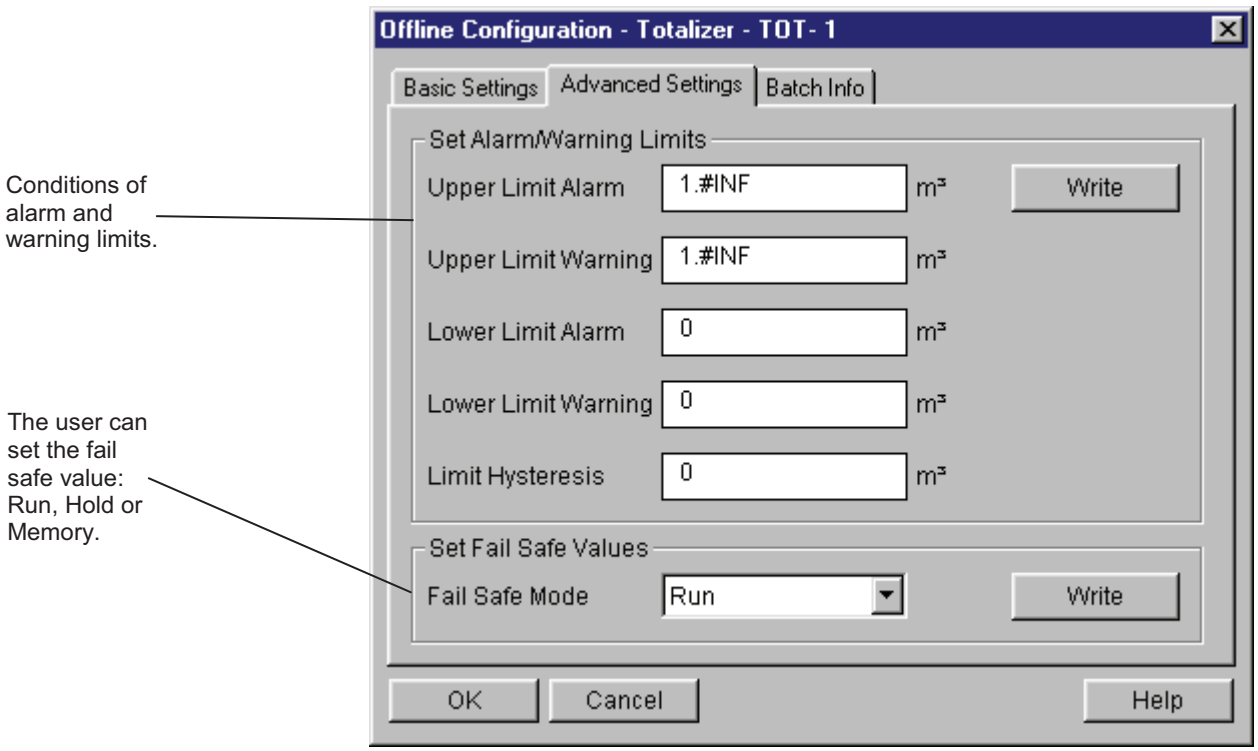


Figure 3.9 - Simatic PDM - Offline Configuration - Advanced Settings for Totalizer Block.

In terms of online configuration for the Totalizer Block, please, go to the main menu and select "Device - Online Configuration - Totalizer ", we have the following windows:

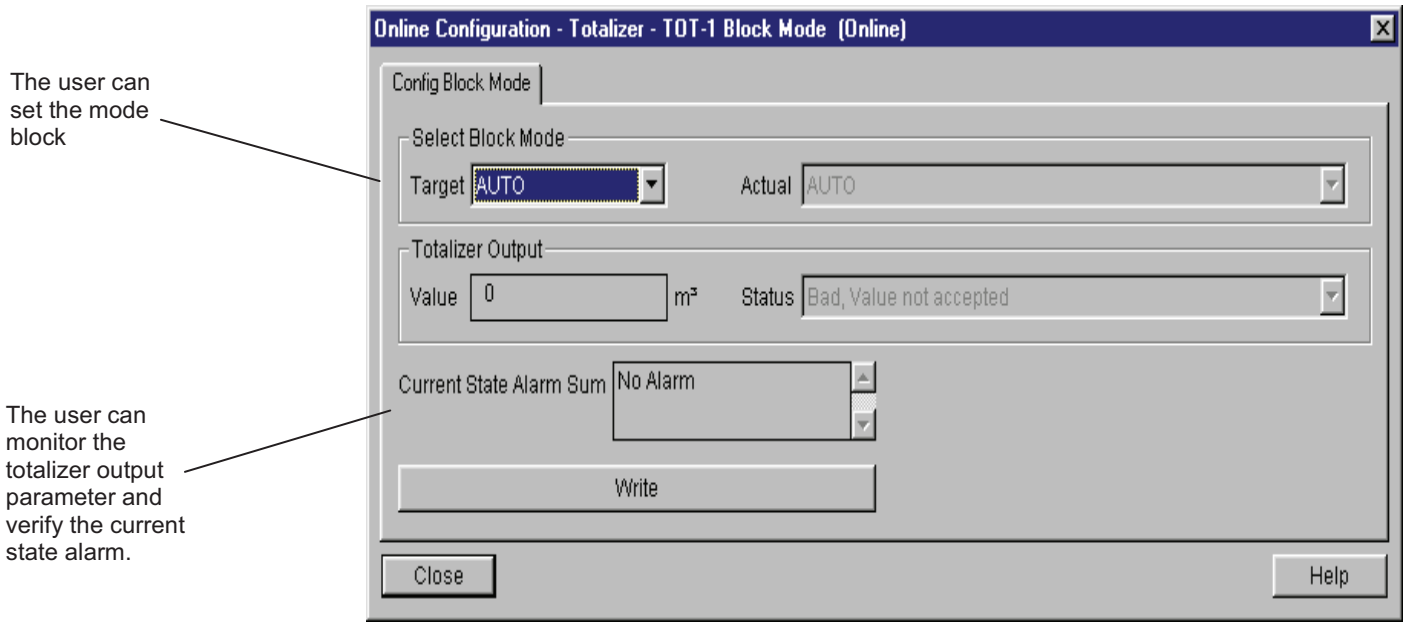


Figure 3.10 - Simatic PDM - Online Configuration - Block Mode for Totalizer Block.

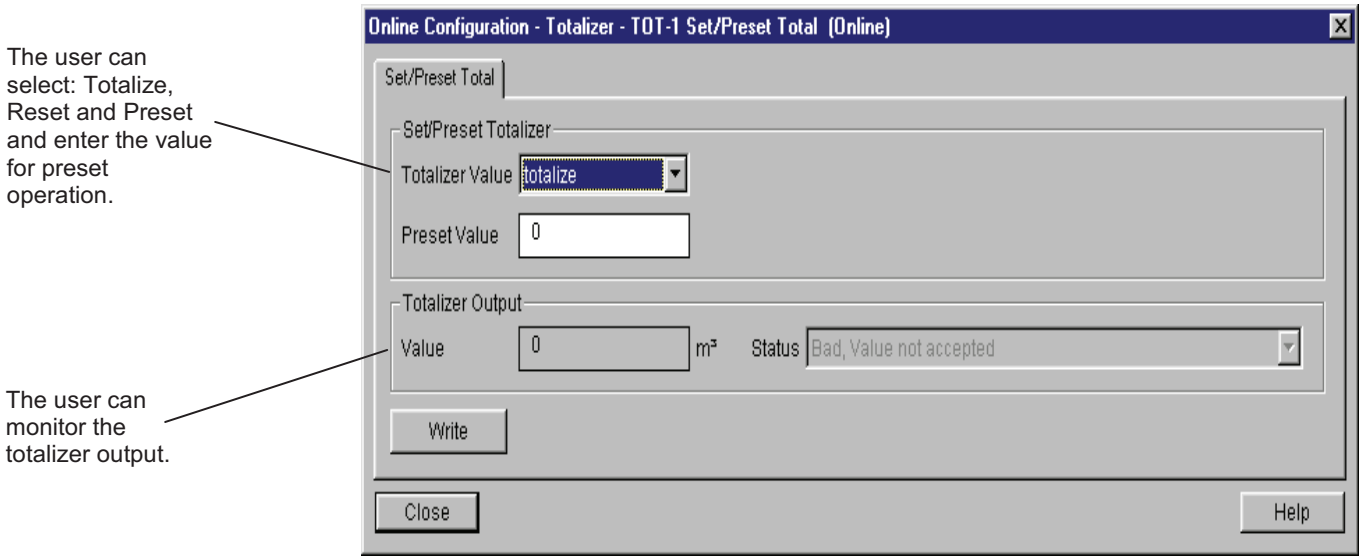


Figure 3.11 - Simatic PDM - Online Configuration - Set/Preset for Totalizer Block

Current Trim

The **IF303** provides the capability of making a trim in the input channels, if necessary.
A trim is necessary if the indicator reading of the transducer block output differs from the actual physical output. The reason may be:

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

The user can check the calibration of the transducer output by measuring the actual current in the input and compare it with the device's indication (of course an appropriate meter shall 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 lower value of the input range.
Upper Trim: Is used to trim the upper value of the input value.

These two points define the linear characteristic of the output. Trim in one point is independent from the other.
There are at least two ways of doing the trim: using local adjustment or using **a Configuration Tool** (see below examples using **Simatic PDM** from **Siemens**).
When doing the trim, make sure you are using an appropriate meter (with the necessary accuracy).

Via Simatic PDM

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

It is possible to calibrate the current inputs of the transmitter by means of parameters CAL_POINT_LO and CAL_POINT_HI.

Let's take the lower value as an example:

Supply 4 mA or the lower value to the terminal block and wait until the readout of parameter PRIMARY_VALUE stabilizes.

Write 4.00 or the lower value in parameter CAL_POINT_LO. For each value written a calibration is performed at the desired point.

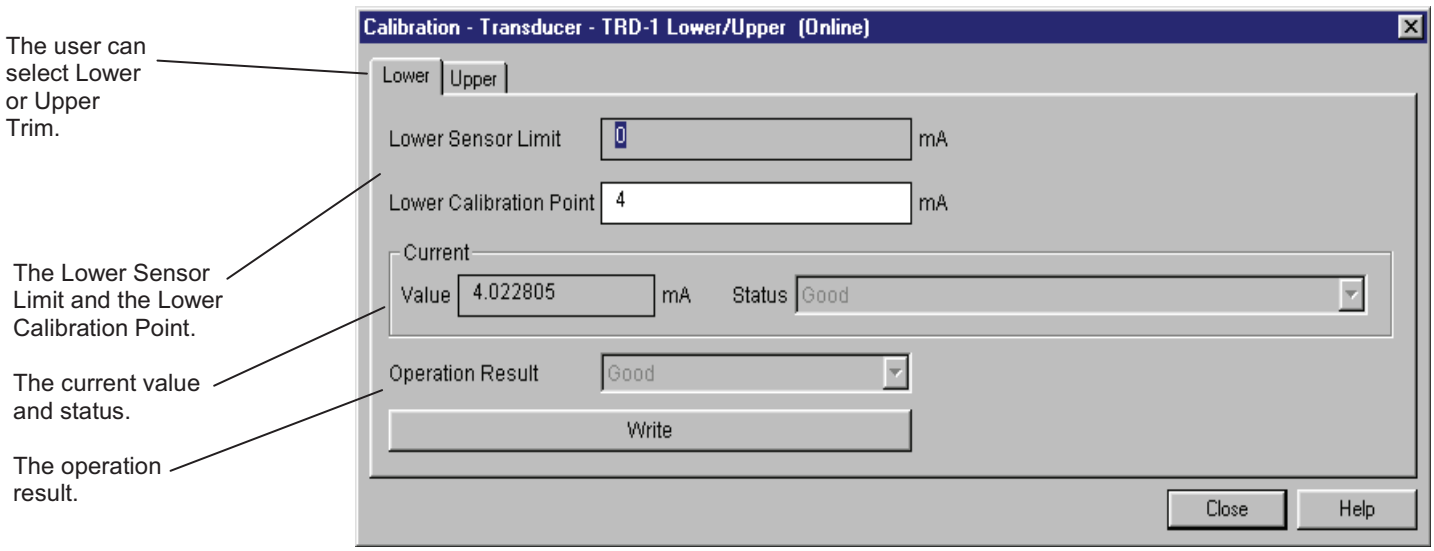


Figure 3.12 – IF303 Simatic PDM Lower Current Calibration.

Let's take the upper value as an example:
Supply 20 mA or the upper value to the terminal block and wait until the readout of parameter PRIMARY_VALUE stabilizes.
Write 20.00 or the upper value in parameter CAL_POINT_HI. For each value written a calibration is performed at the desired point.

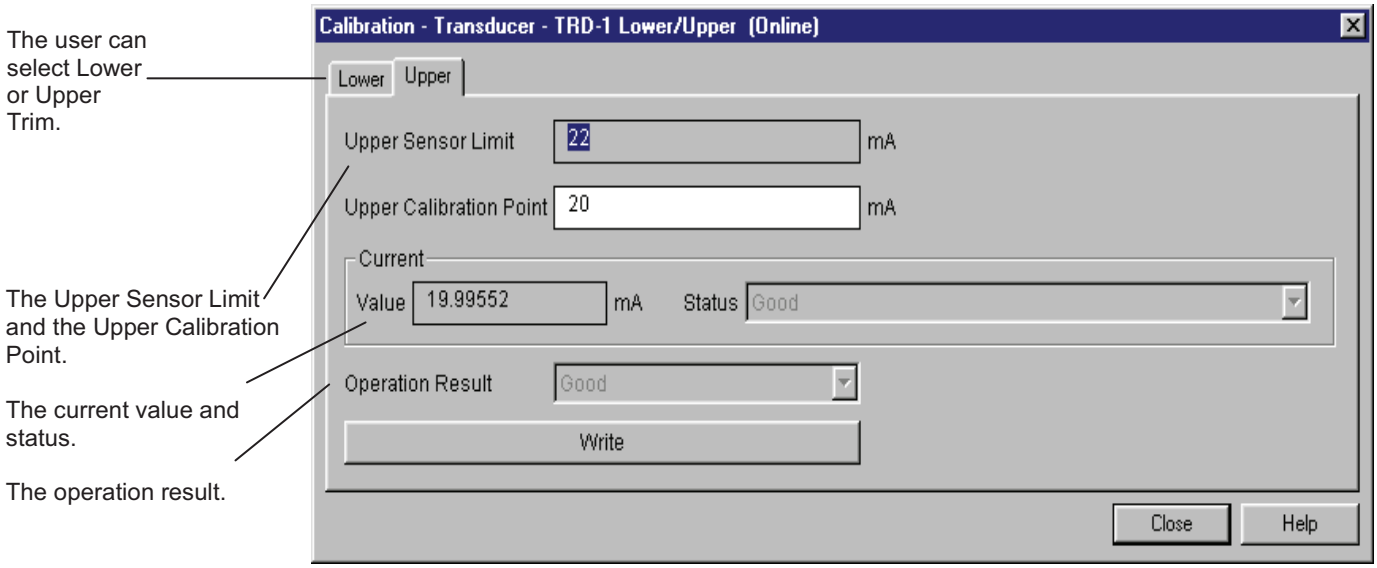


Figure 3.13 - IF303 Simatic PDM Upper Current Calibration

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

Via Local Adjustment

The **IF303** has 3 input transducers and its device leaves SMAR with factory settings. The factory setting establishes only the transducers #1 as default for local adjustment. In order to configure the others via local adjustment, the user should configure them in the display transducer via Configuration Tool, according specific instructions for this transducer block.

In order to enter the local adjustment mode, place the magnetic tool in orifice **"Z"** until flag **"MD"** lights up in the display. Remove the magnetic tool from **"Z"** and place it in orifice "S" until the message **"LOC ADJ"** is displayed. The message will be displayed during approximately 5 seconds after the user removes the magnetic tool from **"S"**. By placing the magnetic tool the user will be able to access the local adjustment tree in the monitoring mode.

Browse to parameter P_VAL (PRIMARY_VALUE).

Supply 4.0mA or the lower value to the terminal block and wait until the read of the parameter stabilizes in the display.

Browse to parameter "LOWER". After that, in order to start calibration, the user will act on the parameter "LOWER" by placing the magnetic tool in "S" down to 4.0 mA.

Let's take the upper value:
Supply 20.0mA or the upper value to the terminal block and wait until the readout of parameter P_VAL stabilizes, and then actuate parameter UPPER up to 20.0.

Trim mode exits via local adjustment automatically when the magnetic tool is not used during approximately 16 seconds.

NOTE
Keep in mind that even when parameters LOWER or UPPER present the desired value, they must be actuated so that calibration is performed.

Limit Conditions for Calibration:

For every writing operation in the transducer blocks there is a code indication for the operation associated with the writing method. These codes appear in parameter XD_ERROR every time a calibration is performed. Code 16, for example, indicates a successfully performed operation.

Lower:
0.0mA < NEW_ LOWER < 9.0mA
Otherwise, XD_ERROR = 22

Upper:
15.0 mA < NEW_UPPER < 22.0mA
Otherwise, XD_ERROR = 22.

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

Transducer Display – Configuration

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

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

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

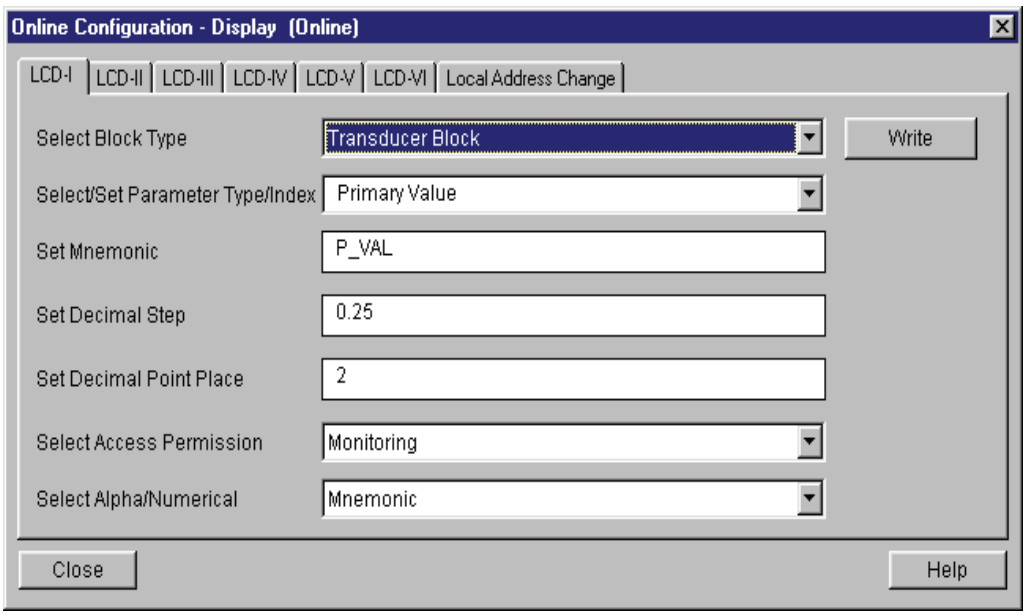


Figure 3.14 - Display Block and Simatic PDM.

Display Transducer Block

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

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

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

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

In order to able the local adjustment using the magnetic tool, it is necessary to previously prepare the parameters related with this operation via System Configuration.

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

Definition of Parameters and Values

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

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

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

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

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

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

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

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

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

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

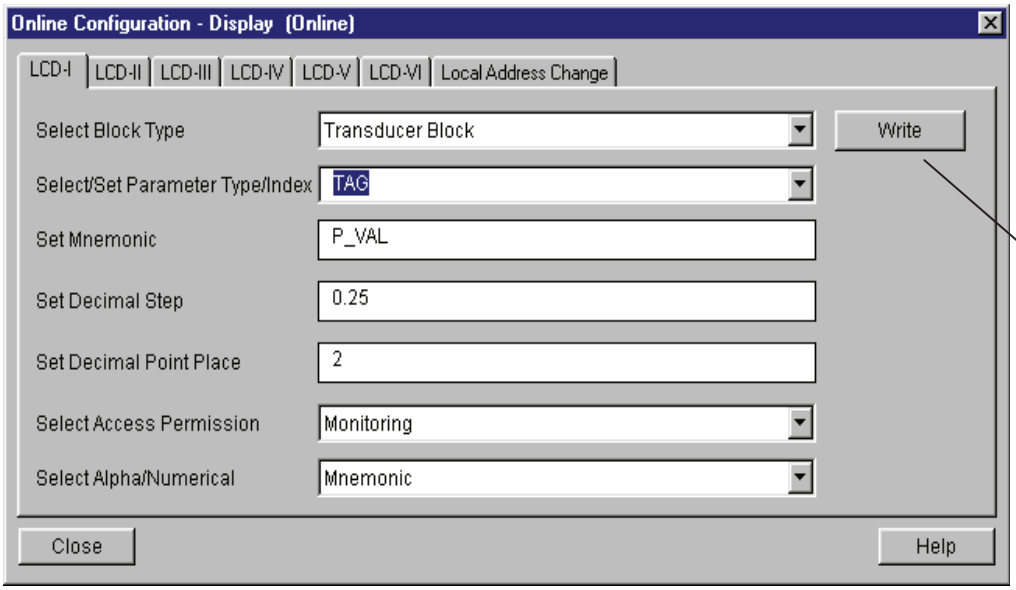


Figure 3.15 - Parameters for Local Adjustment Configuration

The window "Local Address Change" allows the user "enable/disable" the access to changing the physical device address.

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

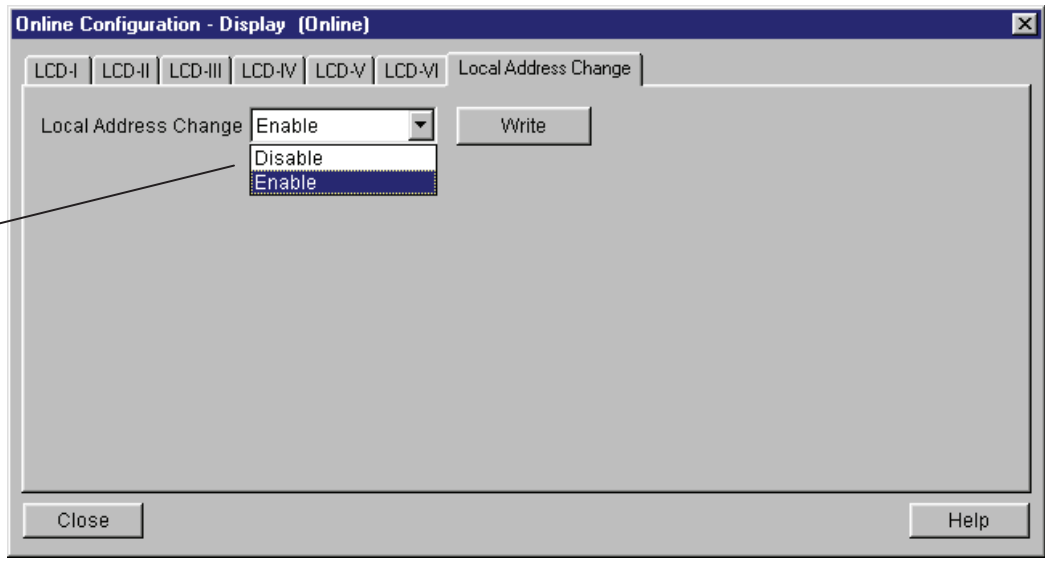


Figure 3.16 - Parameters for Local Adjustment Configuration

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

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

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

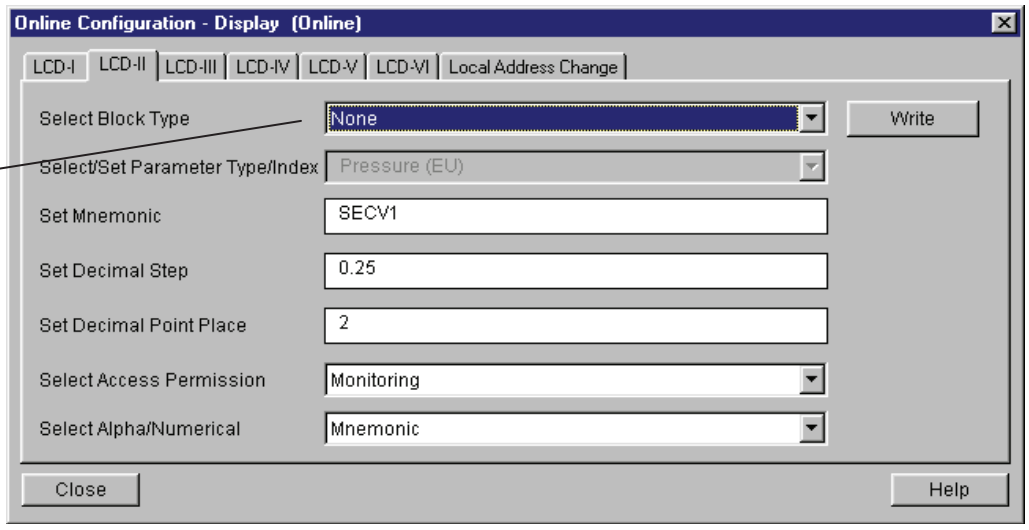


Figure 3.17 - Parameters for Local Adjustment Configuration

The user can select the "Mode Block" parameter at the LCD. In this case is necessary to select the index equal to "Mode Block":

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

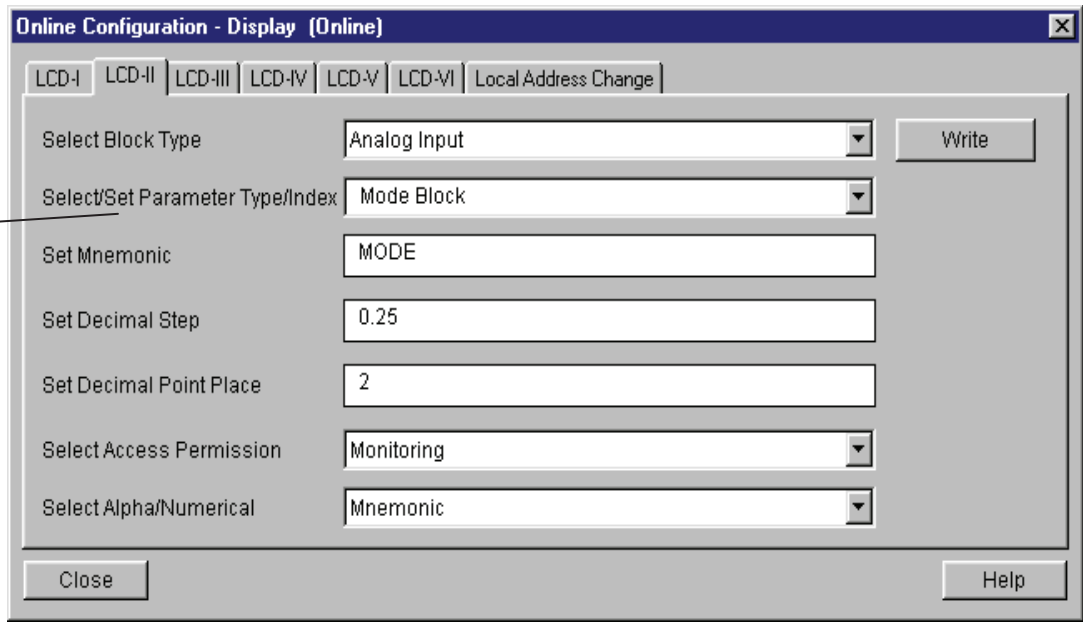


Figure 3.18 - Parameters for Local Adjustment Configuration

Programming Using Local Adjustment

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

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

The converter has two holes for magnetic switches activated by the magnetic tool located under the identification plate. These magnetic switches are activated by one magnetic tool (see figure 3.19).

This magnetic tool enables adjustment of the most important parameters of the blocks. It also enables pre-configuration of the communication.

The jumper W1 on top of the main circuit board must be in place for this function to be enabled and the transmitter must be fitted with the digital display for access to the local adjustment. Without the display the local adjustment is not possible.

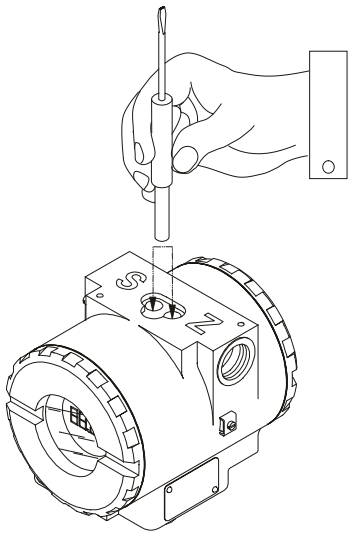


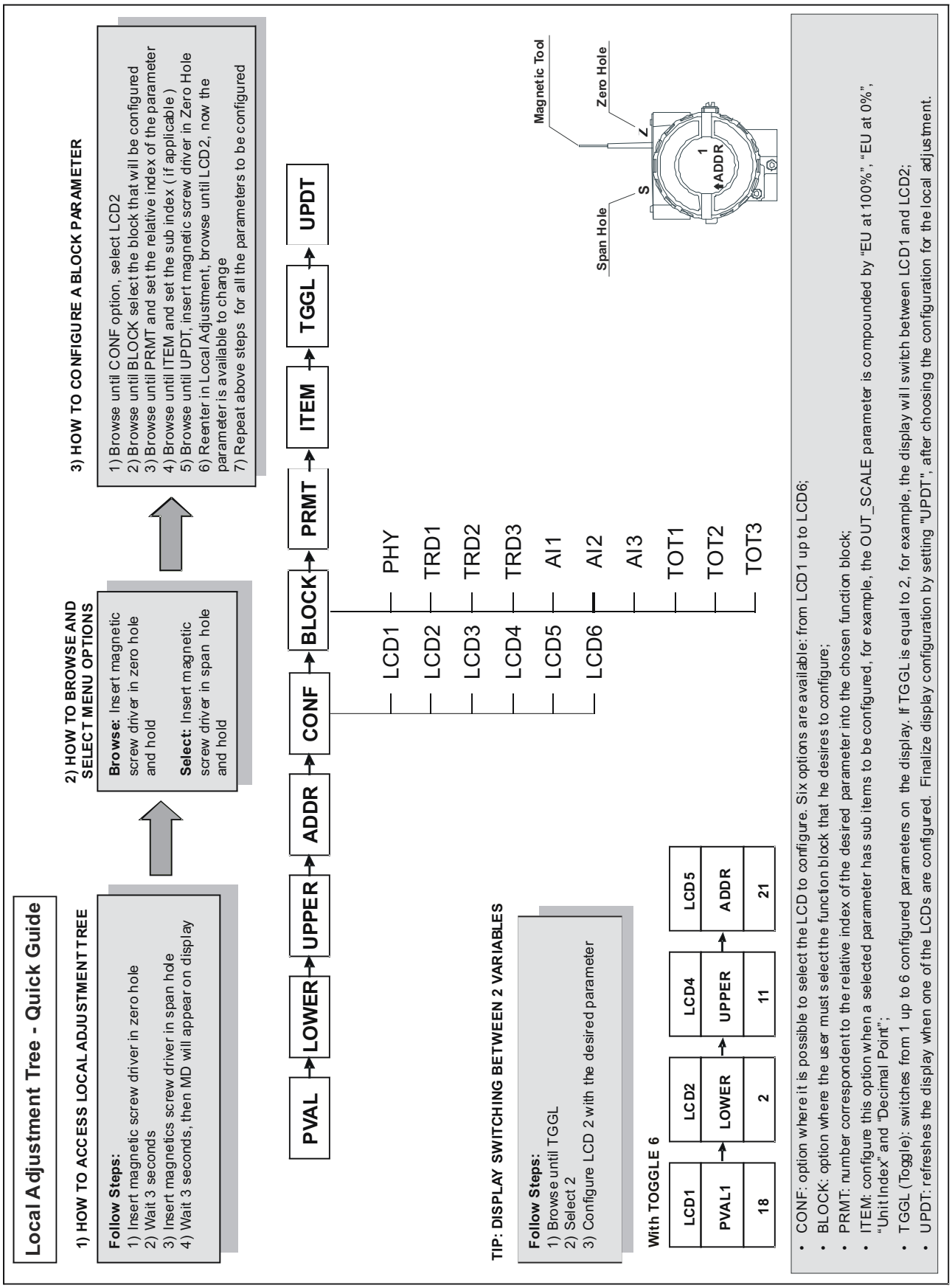
Fig. 3.19 - Local Adjustment Holes

Table 3.4 shows the actions on the **Z** and **S** holes on the FY303 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

Quick Guide – Local adjustment Tree



J1 Jumper Connections

If J1 (see figure 3.20) is connected to ON, then simulation mode in the AO block is enabled.

W1 Jumper Connections

If W1 (see figure 3.20) is connected to ON, the local adjustment programming tree is enabled and then important block parameters can be adjusted and communication can be pre-configured via local adjustment.

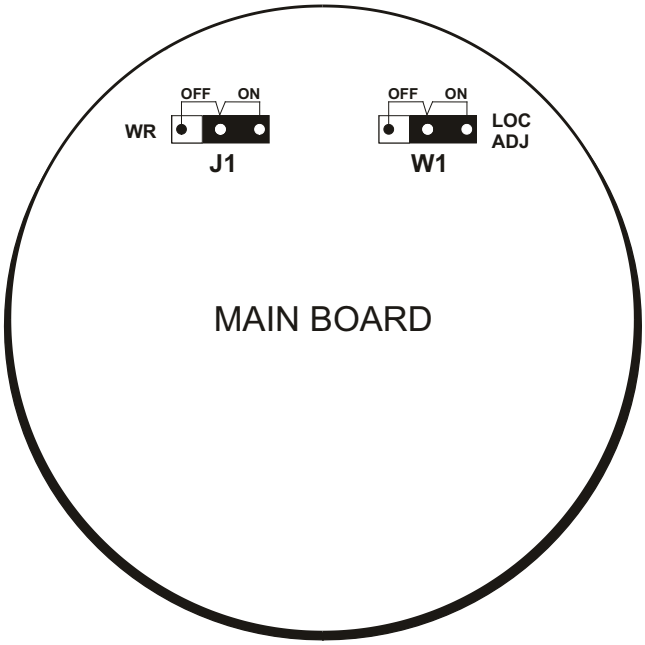
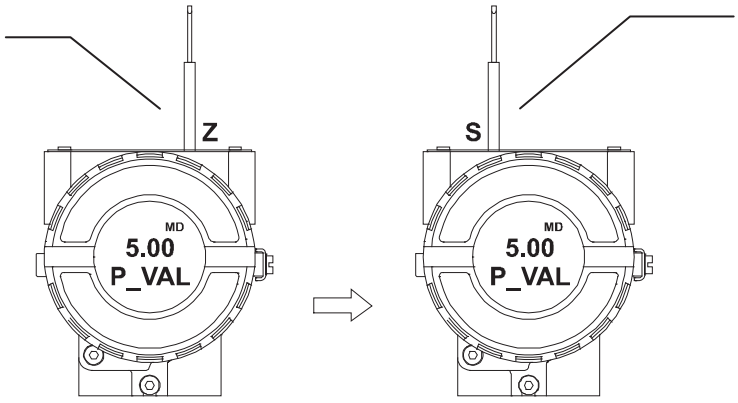


Fig. 3.20 - J1 and W1 Jumpers

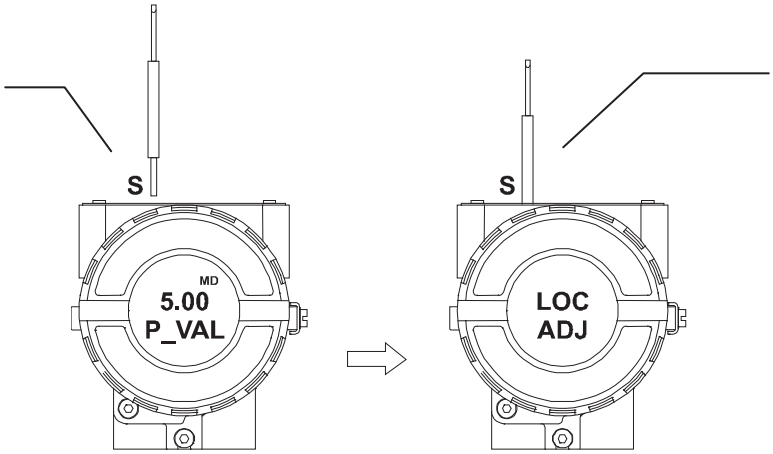
In order to start the local adjustment, place the magnetic tool in orifice **Z** and wait until letters **MD** are displayed.



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

Figure 3.21 - Step 1 - IF303

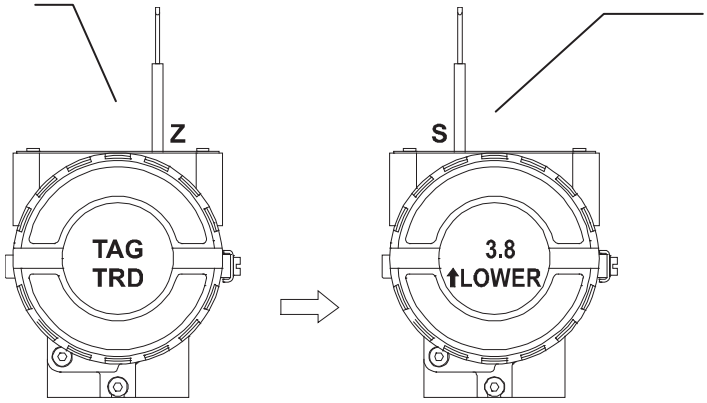
Remove the magnetic tool from orifice **S**.



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

Figure 3.22 - Step 2 - IF303

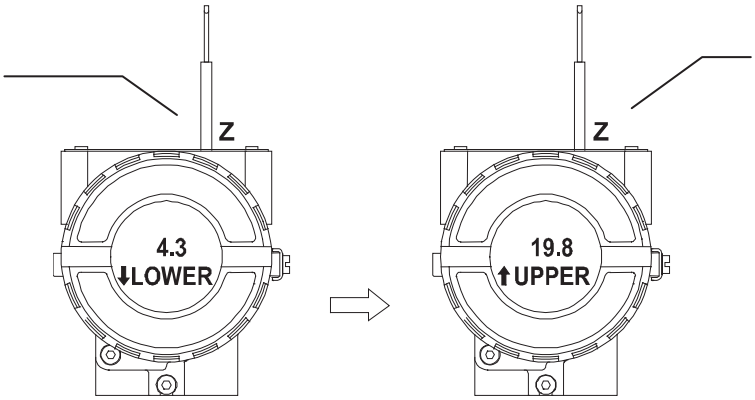
Place the magnetic tool in orifice **Z**. In case this is the first configuration, the option shown on the display is the **TAG** with its corresponding mnemonic configured by the Configuration Tool. Otherwise, the option shown on the display will be the one configured in the prior operation. By keeping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



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

Figure 3.23 - Step 3 - IF303

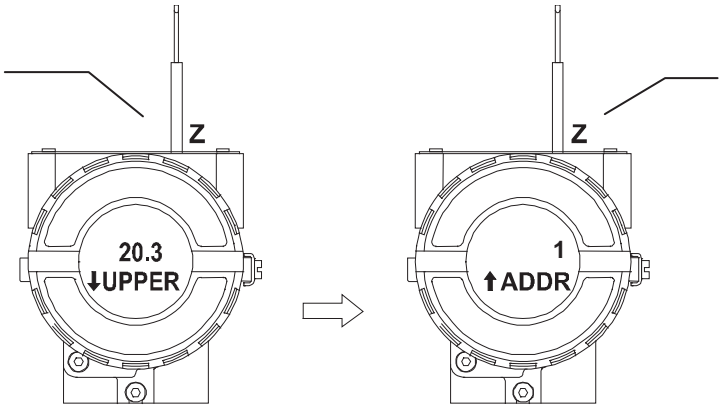
In order to decrement the lower value, place the magnetic tool in orifice **Z** to shift the arrow to the downward position and then, by inserting and keeping the tool in orifice **S**, it is possible to decrement the lower value.



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. Adjust the current showed on the display to 20.0 mA.

Figure 3.24 - Step 4 - IF303

In order to decrement the address 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 address value.



In order to change the address value, simply take off the magnetic tool from orifice **Z** as soon as ADDR is shown on the display. An arrow pointing upward ( ) increments the address and an arrow pointing downward ( ) decrements the address. In order to increment the address, insert the tool in **S** up to set the value desired.

Figure 3.25 - Step 5 - IF303

In order to decrement the address 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 address value.

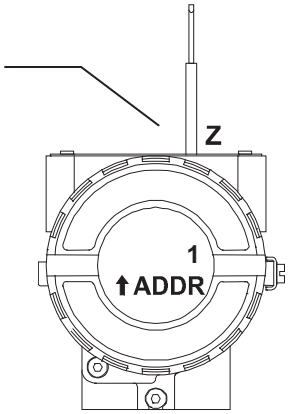


Figure 3.26 - Step 6 - IF303

NOTE
This Local adjustment configuration is a suggestion only. The user may choose his preferred configuration via Configuration Tool, simply configuring the display.

Section 4

MAINTENANCE PROCEDURES

General

SMAR **IF303** Current to Profibus PA Converters are extensively tested and inspected before delivery to the end user. Nevertheless, during their design and development, consideration was given to the possibility of repairs by the end user, if necessary.

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

Troubleshooting

SYMPTOM	PROBABLE SOURCE OF PROBLEM
No Quiescent Current	**Converter Fieldbus Connections** Check wiring polarity and continuity. **Power Supply** Check power supply output. The voltage at the IF303 Fieldbus terminals must be between 9 and 32 VDC. **Electronic Circuit Failure** Check the boards for defect by replacing them with spare ones.
No Communications	**Network Connections** Check the network connections: devices, power supply, couplers, links, and terminators. **Transmitter Configuration** Check configuration of communication parameters of converter. **Network Configuration** Check communication configuration of the network. **Electronic Circuit Failure** Try to replace the converter circuit with spare parts.
Incorrect Input	**Input Terminals Connection** Check wiring polarity and continuity. **Conventional Transmitter** Verify if the conventional transmitter is working properly or if it has the necessary voltage. Remember that IF303 has a 100 ohms plus 0.8 V input impedance. **Calibration** Check calibration of IF303 and the conventional transmitters.

If the problem is not presented in the table above follow 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.

Disassembly Procedure

Refer to Figure 4.1 - IF303 Exploded View Make sure to disconnect power supply before disassembling the converter.

To remove the circuit boards (**5** and **7**) and display (**4**), first loose the cover locking (**8**) on the side not marked “Field Terminals”, then unscrew the cover (**1**).

WARNING

The boards have CMOS components, which may be damaged by electrostatic discharges. Observe correct procedures for handling CMOS components. It is also recommended to store the circuit boards in electrostatic-proof cases.

Loose the two screws (**3**) that anchor the display and the main circuit board. Gently pull out the display, and then the main board (**5**). To remove the input board (**7**), first unscrew the two screws (**6**) that anchors it to the housing (**9**), and gently pull out the board.

Reassembly Procedure

- Put input board (**7**) into housing (**9**).
- Anchors input board with their screws (**6**).
- Put main board (**5**) into the housing, ensuring all inter connecting pins are connected.
- Put display (**4**) into the housing, observing the four mounting positions. "▲" should point in the direction desired as UP.
- Anchors main board and display with their screws (**3**).
- Fit the cover (1) and lock it using the locking screw (**8**).

Boards Interchangeability

Main and input boards are supposed to stay together, because calibration data from input board circuit is stored in EEPROM of the main board.

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.

Exploded View

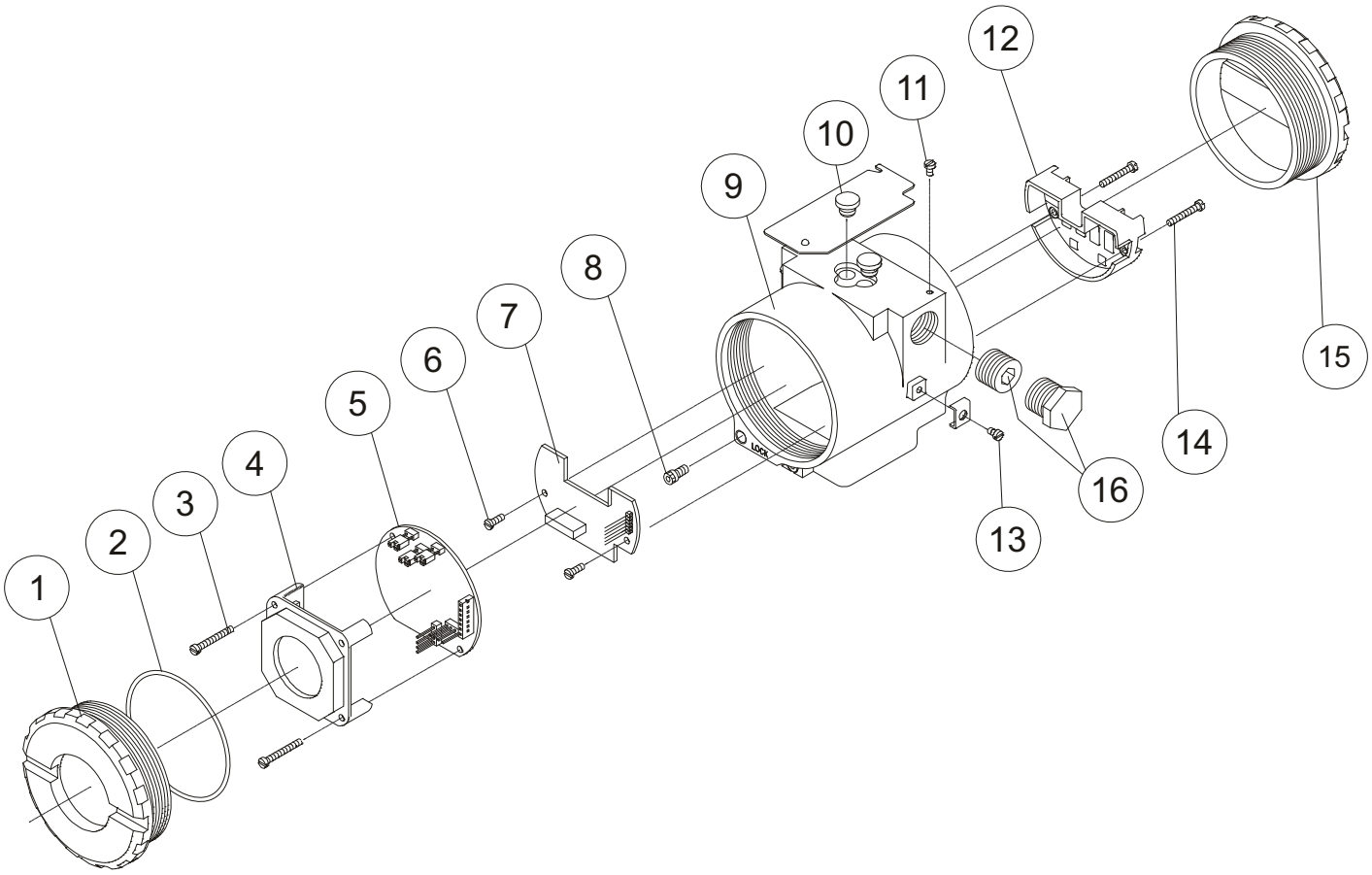


Figure 4.1 - IF303 Exploded View

Accessories

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

Spare Parts List

SPARE PARTS LIST				
	DESCRIPTION OF PARTS	**POSITION**	**CODE**	**CATEGORY (NOTE 4)**
Cover Without Window (Includes O-Ring)	Aluminum	1 and 15	204-0102	
	316 SS	1 and 15	204-0105	
Cover With Window For Indication (Includes O-Ring)	Aluminum	1	204-0103	
	316 SS	1	204-0106	
O-rings **(Note 2)**	Cover, Buna-N	2	204-0122	**B**
Aluminum Housing Main Board Screw	Units With Indicator	3	304-0118	
	Units Without Indicator	3	304-0117	
316 Stainless Steel Housing Main Board Screw	Units With Indicator	3	204-0118	
	Units Without Indicator	3	204-0117	
Digital Indicator		4	214-0108	
Main and Input Circuit Board Assembly		5 and 7	400-0311	**A**
Input Board Screw	Housing in Aluminum	6	314-0125	
	Housing in 316 Stainless Steel	6	214-0125	
Cover Locking Screw		8	204-0120	
Housing, Aluminum **(Note 1)**	½ - 14 NPT	9	400-0305	
	M20 x 1.5	9	400-0306	
	PG 13.5 DIN	9	400-0307	
Housing, 316 SS **(Note 1)**	½ - 14 NPT	9	400-0308	
	M20 x 1.5	9	400-0309	
	PG 13.5 DIN	9	400-0310	
Local Adjustment Protection Cap		10	204-0114	
Identification Plate Fixing Screw		11	204-0116	
Terminal Insulator		12	314-0123	
External Ground Screw		13	204-0124	
Terminal Holding Screw	Housing in Aluminium	14	304-0119	
	Housing in 316 Stainless Steel	14	204-0119	
Six-Sided Plug 1/2" NPT Internal BR Ex	Bichromated Carbon Steel	16	400-0808	
	Bichromated 304 Stainless Steel	16	400-0809	
Six-Sided Plug 1/2" NPT Internal	Bichromated Carbon Steel	16	400-0583-11	
	Bichromated 304 Stainless Steel	16	400-0583-12	
Six-Sided Plug M20 X 1.5 External BR Ex d	316 Stainless Steel	16	400-0810	
Six-Sided Plug PG13.5 External BR Ex d	316 Stainless Steel	16	400-0811	
Mounting Bracket for 2” Pipe **(Note 3)**	Carbon Steel	-	214-0801	
	316 Stainless Steel	-	214-0802	
	Carbon Steel Bolts, Nuts, Washers and U-clamp in Stainless Steel	-	214-0803	

NOTE

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

Section 5

TECHNICAL CHARACTERISTICS

Functional Specifications	
Input Signal (Field Values)	0-20 mA, 4-20 mA or any within 0 and 20 mA. Reverse polarity protected (*).
Output Signal (Communication)	PROFIBUS PA, Digital only, complies with IEC 61158-2 (H1): 31.25 Kbit/s and voltage mode with bus power.
Input Impedance	Resistive 100, plus a 0.8 V drop over diode in forward direction.
Power Supply	Bus power 9-32 Vdc. Current consumption quiescent 12 mA.
Indication	Optional 4½ digit LCD indicator.
Hazardous Location Certification	Explosion proof, weather proof and intrinsically safe NEMKO, DMT, FM CSA and FM standard.
Temperature Limits	Operation: -40 to 85 °C (-40 to 185 °F) Storage: -40 to 120 °C (-40 to 250 °F) Display: -10 to 60 °C (14 to 140 °F) operation -40 to 85 °C (-40 to 185 °F) without damage.
Humidity Limits	0 to 100% RH.
Turn-on Time	Approximately 10 seconds.
Update Time	Approximately 0.5 second.
Configuration	Basic configuration may be done using local adjustment magnetic tool if device is fitted with display. Complete configuration is possible using PC software interface, by using a configurator.
Performance Specifications	
Accuracy	0.03%. of span for 4-20 mA, 5 µA for others spans.
Ambient Temperature Effect	For a 10° C variation: ± 0.05%.
Vibration Effect	Meets SAMA PMC 31.1.
Electro-Magnetic Interference Effect	Designed to comply with IEC 801 and Europeans Standards EN50081 and EN50082.
Physical Specifications	
Hardware	Physical: according to IEC 61158-2 and conformity with the FISCO model.
Electrical Connection	1/2-14 NPT, Pg 13.5 or M20 x 1.5.
Material of Construction	Injected low copper aluminum with polyester painting or 316 Stainless Steel housing, with Buna N O-rings on cover (NEMA 4X, IP67).
Mounting	With an optional bracket can be installed on a 2" pipe or fixed on a wall or panel.
Weight	Without display and mounting bracket: 0.80 kg. Add for digital display: 0.13 kg. Add for mounting bracket: 0.60 kg.

* WARNING
Apply in the inputs of the conversor only current levels. **Don't apply tension levels**, because the shunt resistors are of 100R 1W and **tension above 10 Vdc it can damage them**.

Ordering Code

MODELO	CURRENT TO FIELDBUS CONVERTER

CÓD.	Local Indicator
0	Without Digital Indicator
1	With Digital Indicator

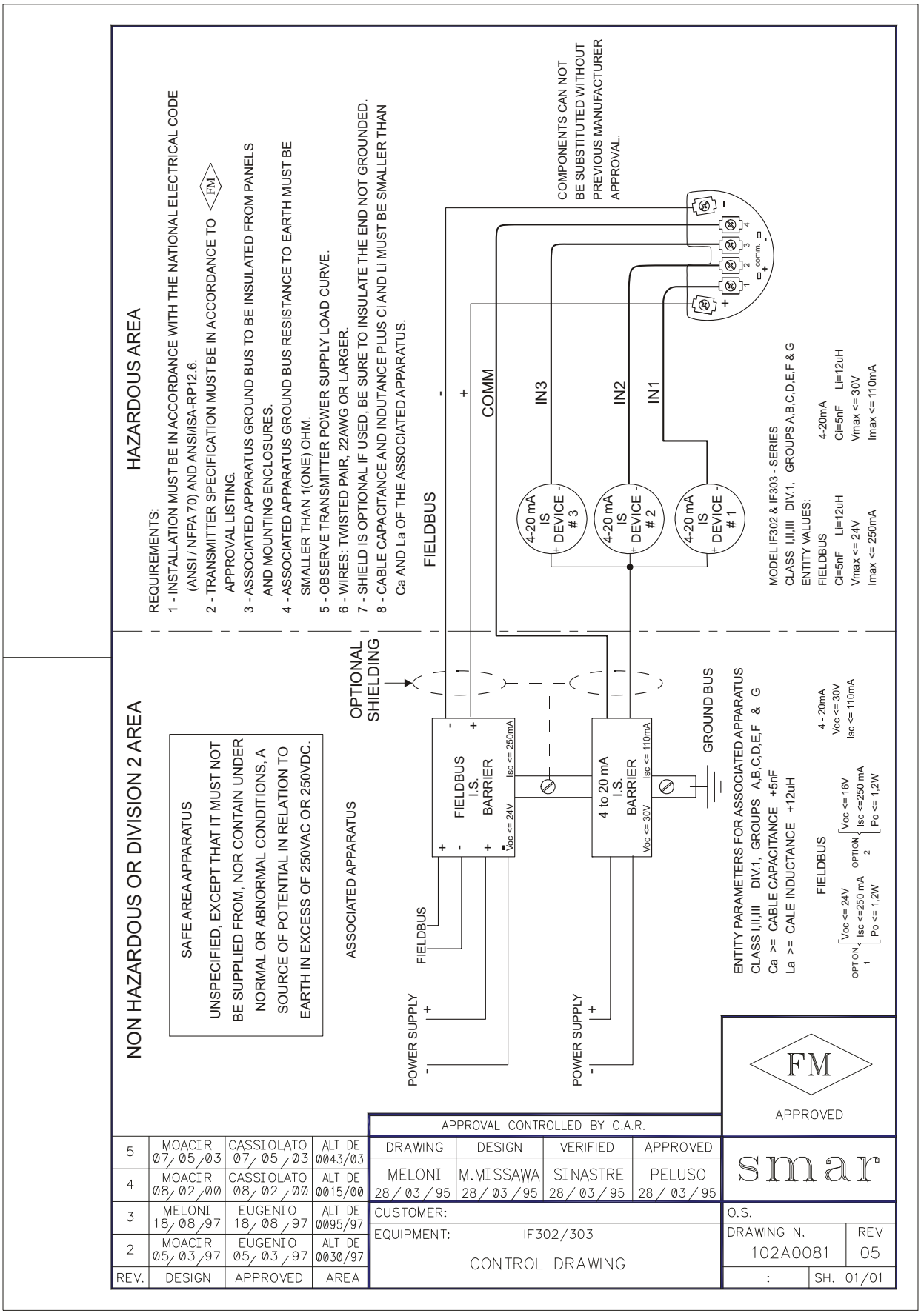
CÓD.	Mounting Bracket for 2" Pipe Mounting
0	Without Bracket
1	Carbon Steel Bracket
2	316 SST Bracket

CÓD.	Electrical Connections
0	1/2-14 NPT
A	M20 x 1.5
B	Pg 13.5 DIN

CÓD.	Options
H1	316 SST Housing
A1	316 SST Bolts
ZZ	Special Options – Specify

IF303	1	1	0	*

* Leave it blank for no optional items.


HAZARDOUS AREA
NON HAZARDOUS OR DIVISION 2 AREA
REQUIREMENTS:
1 - INSTALLATION MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (ANSI / NFPA 70) AND ANSI/ISA-RP12.6.
2 - TRANSMITTER SPECIFICATION MUST BE IN ACCORDANCE TO FM APPROVAL LISTING.
3 - ASSOCIATED APPARATUS GROUND BUS TO BE INSULATED FROM PANELS AND MOUNTING ENCLOSURES.
4 - ASSOCIATED APPARATUS GROUND BUS RESISTANCE TO EARTH MUST BE SMALLER THAN 1(ONE) OHM.
5 - OBSERVE TRANSMITTER POWER SUPPLY LOAD CURVE.
6 - WIRES: TWISTED PAIR, 22AWG OR LARGER.
7 - SHIELD IS OPTIONAL IF USED, BE SURE TO INSULATE THE END NOT GROUNDED.
8 - CABLE CAPACITANCE AND INDUTANCE PLUS Ci AND Li MUST BE SMALLER THAN Ca AND La OF THE ASSOCIATED APPARATUS.
SAFE AREA APPARATUS
UNSPECIFIED, EXCEPT THAT IT MUST NOT BE SUPPLIED FROM, NOR CONTAIN UNDER NORMAL OR ABNORMAL CONDITIONS, A SOURCE OF POTENTIAL IN RELATION TO EARTH IN EXCESS OF 250VAC OR 250VDC.
ASSOCIATED APPARATUS
OPTIONAL SHIELDING
FIELDBUS
COMM
IN3
IN2
IN1
COMPONENTS CAN NOT BE SUBSTITUTED WITHOUT PREVIOUS MANUFACTURER APPROVAL.
4-20 mA IS DEVICE # 3
4-20 mA IS DEVICE # 2
4-20 mA IS DEVICE # 1
MODEL IF302 & IF303 - SERIES
CLASS I,II,III DIV.1, GROUPS A,B,C,D,E,F & G
ENTITY VALUES:
FIELDBUS 4-20mA
Ci=5nF Li=12uH Ci=5nF Li=12uH
Vmax <= 24V Vmax <= 30V
Imax <= 250mA Imax <= 110mA
FIELDBUS I.S. BARRIER
Isc <= 250mA
Voc <= 24V
4 to 20 mA I.S. BARRIER
Isc <= 110mA
Voc <= 30V
GROUND BUS
POWER SUPPLY
FIELDBUS
ENTITY PARAMETERS FOR ASSOCIATED APPARATUS
CLASS I,II,III DIV.1, GROUPS A,B,C,D,E,F & G
Ca >= CABLE CAPACITANCE +5nF
La >= CALE INDUCTANCE +12uH
FIELDBUS 4 - 20mA
OPTION 1: Voc <= 24V, Isc <=250 mA, Po <= 1,2W
OPTION 2: Voc <= 16V, Isc <=250 mA, Po <= 1,2W
Voc <= 30V
Isc <= 110mA
FM
APPROVED
smar
APPROVAL CONTROLLED BY C.A.R.
DRAWING: MELONI 28/03/95
DESIGN: M.MISSAWA 28/03/95
VERIFIED: SINASTRE 28/03/95
APPROVED: PELUSO 28/03/95
CUSTOMER:
EQUIPMENT: IF302/303
CONTROL DRAWING
O.S.
DRAWING N. 102A0081
REV 05
SH. 01/01
REV. | DESIGN | APPROVED | AREA
5 | MOACIR 07/05/03 | CASSIOLATO 07/05/03 | ALT DE 0043/03
4 | MOACIR 08/02/00 | CASSIOLATO 08/02/00 | ALT DE 0015/00
3 | MELONI 18/08/97 | EUGENIO 18/08/97 | ALT DE 0095/97
2 | MOACIR 05/03/97 | EUGENIO 05/03/97 | ALT DE 0030/97

Appendix A

smar

SRF – Service Request Form

Converter from 4-20mA to Fieldbus

GENERAL DATA

Model: IF302 ( ) IF303 ( )

Serial Number: _____

TAG: _____

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

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

INSTALLATION DATA

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

_____

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

_____

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

_____

PROCESS DATA

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

( ) No

More details: _____

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

Ambient Temperature: From _____ºC up to _____ºC

OCCURRENCE DESCRIPTION

_____

_____

_____

_____

SERVICE SUGGESTION

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

Other: _____

USER INFORMATION

Company: _____

Contact: _____

Title: _____

Section: _____

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

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

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

Returning Materials

Should it become necessary to return the converter to SMAR, simply contact your local agent or SMAR office, informing the defective instrument's serial number, and return it to our factory.

In order to expedite analysis and solution of the problem, the defective item should be returned with a description of the failure observed, with as many details as possible. Other information concerning to the instrument operation, such as service and process conditions, is also helpful.

Appendix B

SMAR WARRANTY CERTIFICATE

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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