MANUAL

INSTALLATION | OPERATION | MAINTENANCE

PROFIBUS PA
PNEUMATIC CONVERTER
FP303

PROFIBUS®

DEC/24 - VERSION 3

smar
Technology Company

FP303

Profibus PA Pneumatic Converter

Consult our subsidiary

Rua Dr. Antônio Furlan Junior, 1028 - Sertãozinho, SP - CEP: 14170-480
insales@smar.com.br | +55 (16) 3946-3599 | www.smar.com

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INTRODUCTION

FP303 belongs to the first generation of PROFIBUS PA equipment, as a PROFIBUS PA converter that controls valves and other actuators. The FP303 has a 3 to 15 psi output or 3 to 30 psi proportional to the output received from the PROFIBUS PA network.

The FP303 is factory calibrated, compliant with the Order Code (3 to 15 psi or 3 to 30 psi), but it allows field calibration for the 3 to 15 psi or 3 to 30 psi.

The **FP303** digital technology enables friendly interface between the field and the control room and other interesting features that reduce considerably installation, operation, and maintenance costs.

The **FP303** is part of the Smar 302 PROFIBUS PA equipment and complies with the PROFIBUS DP-V1 version.

PROFIBUS is not only a substitute for the 4 -20 mA protocols or intelligent transmitters and have many other characteristics.

The **FP303** digital technology makes possible to choose multiple types of transference functions, an easy field and control room interface, and have other interesting properties that considerably cut down installation, operation, and maintenance costs.

Some highlights of the bidirectional digital communication of the intelligent devices protocols are: high precision, multi-variable access, diagnostic, remote configuration and multidrop of several equipments on a single pair of wires.

The system controls the sampling of variables, execution of algorithms and the communication, as well as optimizes the use of the network without time loss, hence obtaining a high performance for control loops.

Large control loops can be built with the PROFIBUS technology due to its capacity for interconnecting several equipments. The functional block concept was introduced to make the equipment easily understandable to the user.

The **FP303** and the entire 303 family have some built-in function blocks such as analogical output, transducer, and display blocks.

The development of the 303 series equipments took into consideration the need for implementing PROFIBUS both in small and big systems. They can be configured locally with a magnetic tool, thus eliminating the need for a configurator in many basic applications. This allow great flexibility when control strategies are implemented.

Get the best results from the FP303 by following the instructions on this manual.

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 versions 3.XX, where 3 indicates the software version and the XX the software release. The 3.XX indication means that the manual is compatible with any version 3 software release.

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.

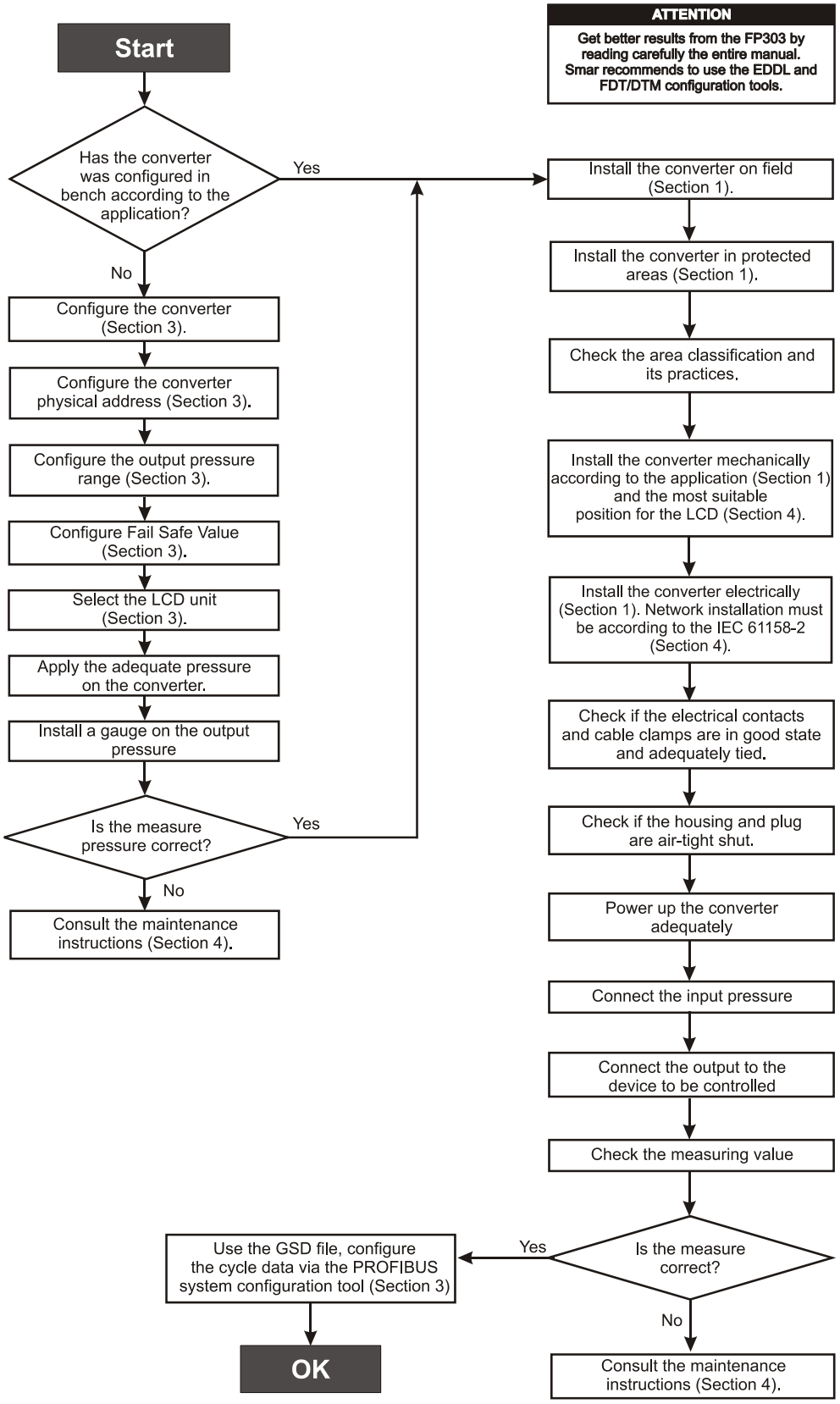
The user is responsible for the incorrect or inadequate handling of equipments run with pneumatic or hydraulic pressure or, still, subject to corrosive, aggressive or combustible products, since their utilization may cause severe bodily harm and/or material damages.

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.

TABLE OF CONTENTS

Installation Flowchart



Section 1

INSTALLATION

General

NOTE
The installation carried out in hazardous areas should follow the recommendations of the IEC60079-14 standard.

The precision of global measuring and control depends on many variables. Although the converter has high-level performance, an adequate installation is necessary for best profiting from the device benefits.

From all the factors possibly affecting the precision of converters, environmental conditions are the most difficult to cope with. However, there are ways to reduce the effects of temperature, humidity and vibration.

The FP303 circuit contains a sensor that compensates temperature variations. On the field, the effect of temperature variation is minimized due to this characteristic.

The effects from temperature variation can be reduced by installing the converter in areas protected from ambient changes.

In warm conditions, the converter must be installed in a way that avoids the maximum possible the direct exposition to solar rays. Also should be avoided the installation near high temperature lines or vases.

Thermal insulation should be used to protect the converter from external heat sources, if necessary.

Humidity is enemy to electronic circuits. The electronic housing cover o-rings must be set correctly mainly on areas with high relative humidity rates. Avoid removing the housing covers on the field, as each time they are open, more humidity penetrates in the circuits.

The electronic circuit is wetness-proof coated, but constant exposition to open air may impair this protection. By the same token, keep covers shut, since every time they are removed corrosion may deteriorate the housing threads, as this area is not painted. Use adequate sealant on the electric connections according to sealing method and the hazardous area classification to avoid the penetration of moisture.

IMPORTANT
Avoid using sealant tape on air inlets and outlets, as this type of material may release residues and block them and spoil the device performance.

The converter is practically insensitive to vibrations, although it is recommended not to install it near to pumps, turbines or equipments that produce excessive vibration.

Mounting

The converter is designed to be light and robust together. This makes its mounting easier and can be done in a 2” pipe, wall or panel. By using an adequate mounting bracket, it can be mounted in different positions.

Make sure the FP303 is mounted in a way that dust and particles do not obstruct the vents.

The FP303 has filters to protect the in-coming supply pressure and the vent, which must be kept clean. In case of impurity building, replace the filter (consult the recommended spare part),

For more visibility, the digital indicator may rotate at 90” angles, as well as the electronic housing, for better display reading and visibility.

Pneumatic Connections

The instrumentation air must be of better quality than industrial compressed air. Humidity, suspended particles and oil can temporarily harm the device performance or definitely, if the internal parts can be damaged.

In compliance with the *ANSI/ISA S7.0.01 - 1996 - Quality Standard for Instrument Air* standard, the instrumentation air must bear the following characteristics:

Dew Point	10º C below the minimum registered temperature.
Size of particles	40 µm (maximum).
Oil content	1 ppm w/w (maximum).
Contaminants	Must be free from corrosive or inflammable gases.

The standard recommends that the compressor inlet is in a place free from process spills and uses the adequate filter. Also, that non-lubricated compressors are used to prevent contamination from lubricant oil. When lubricated compressors are used, there must be means to clean the contaminated air.

It is recommended the periodical filter cleaning, and more frequent ones in case of bad instrumentation air quality.

For an **output signal from 3 psi (0,2 bar) to 15 psi (1 bar)**, it is required a minimum air supply of 18 psi (1.24 bar) and a maximum 100 psi (7 bar) supply.

For an **output signal from 3 psi (0,2 bar) to 30 psi (2 bar)**, it is required a minimum air supply of 40 psi (1.4 bar) and a maximum 100 psi (7 bar) supply.

NOTE
To get a maximum output pressure value, the converter requires the minimum necessary pressure described above

An excessive pressure supply, above 100 psi, may be harmful.

The air pressure supply for the FP303 must be a minimum of 18 psi and a maximum of 100 psi. If this condition cannot be met, an air pressure regulator is recommended.

The air supply inlet is marked with “IN” and the outlet with “OUT” (See figure 1.3 - Converter Dimensional Drawing and Mounting Position)

The air supply inlet and outlet connections are ¼ “ NPT threaded. Before connecting the piping, purge the lines completely. There must be no leaks, mainly on the outlet. Check all piping parts and connection for leaks. Use good sealing practices before operating the equipment. Thread sealants are recommended instead of PTFE (Teflon) sealant tape.

The vent is used to exhaust the air to relieve the output pressure. This vent must never be obstructed for better air flow.

In case of loss of pressure supply, the output will drop near 0 Kgf/cm³ (0 psi). If the pressure is kept, but communication is lost, the output may be pre-configured for a free value or a safe value.

Electric Connection

To access the terminal block, remove the Electric Connection cover. This cover can be locked with its locking screw. To release it, rotate the locking screw clockwise.

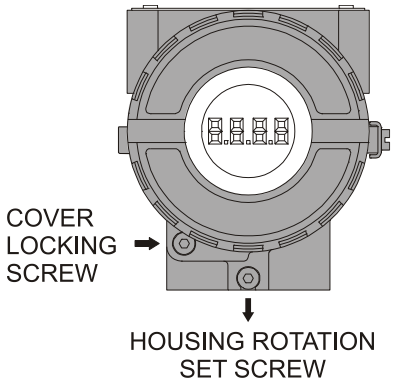


Figure 1.1 - Cover Locking Screw

The access of signal cables and their connection to the terminals are done through one of the two orifices in the electronic housing, by linking them to a electric conduit o cable clamp. The conduit threads must be sealed according to the required method. The unused orifice must be sealed with a plug or sealant.

The electrical orifices must be connected in a way that prevents humidity inside the device. After completing the connections, shut the device cover to avoid humidity.

The terminal block has screws to receive fork or eye terminals.

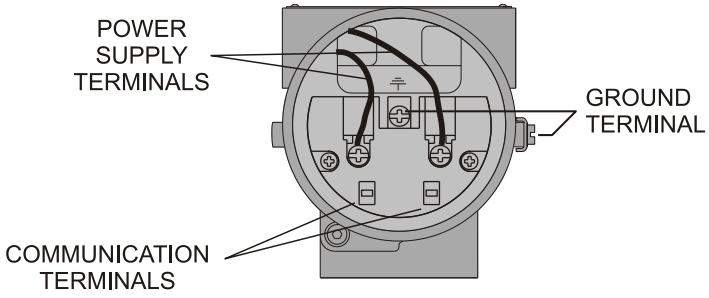


Figure 1.2 – Electric Connections

NOTE
The unused cable entries should be plugged and sealed accordingly to avoid humidity entering, which can cause the loss of the product's warranty.

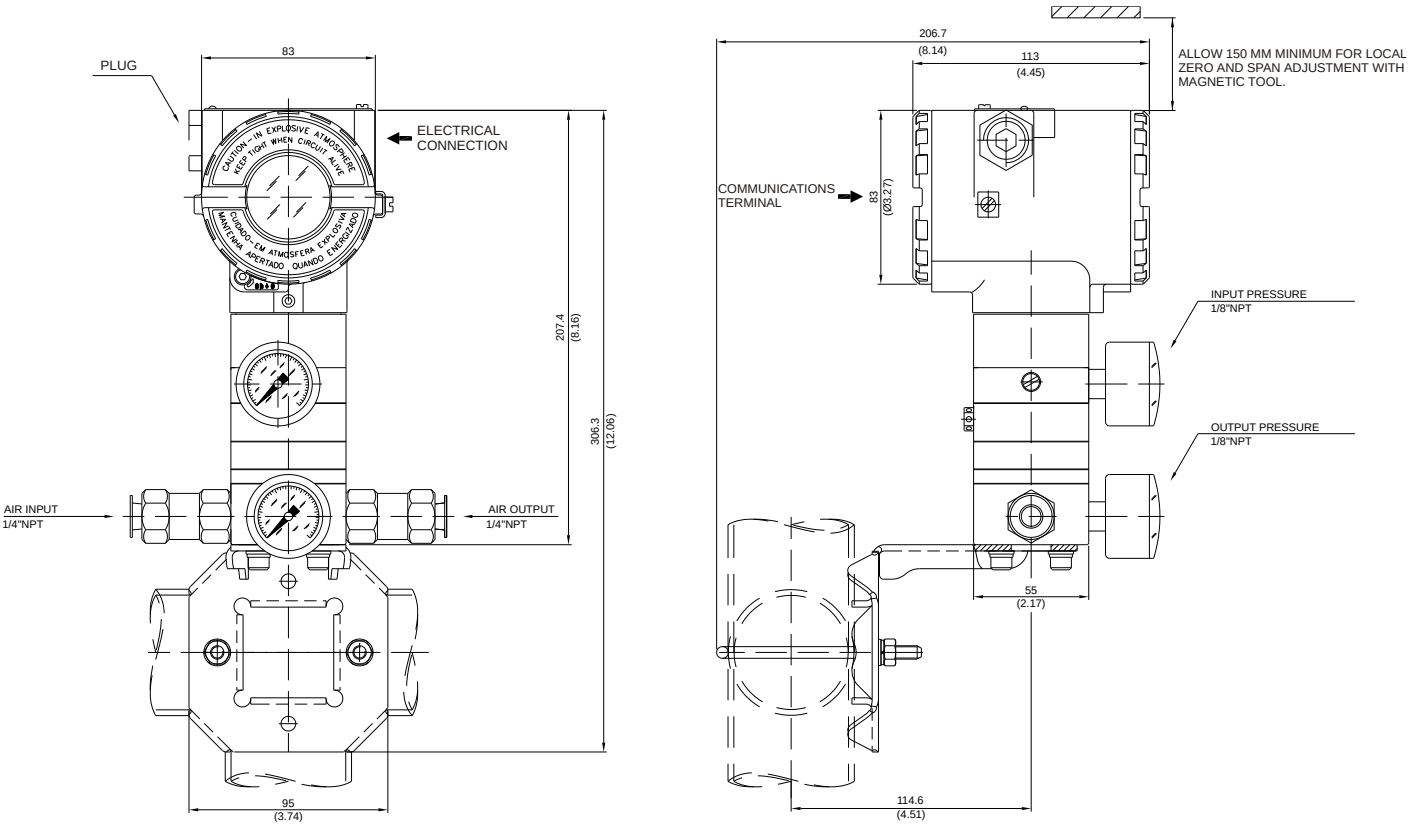


Figure 1.3 – Converter Dimensional Drawing and Mounting Position

For more convenience, there are three ground terminals: an internal one, close to the terminal block and two external ones, located near the conduit inlet.

The FP303 uses the 31,25 Kbit/s voltage mode for physical signalization, and the other devices on the same bus must use the same signals. All devices are connected in parallel on the same line. The several Fieldbus devices can be connected on the same bus.

The FP303 is powered via the bus. The number of devices to be connected on the same bus is 15 for non-intrinsically safe installations.

In classified areas, the number of devices is limited by the intrinsic safety restrictions.

Avoid passing the signal wiring through conduits with power cables or electric commuters.

The FP303 is protected against reverse polarity and can support ± 35 Vdc without being damaged. The reverse polarity does not damage the equipment; however it will not work.

Network Configuration and Topology

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 1.4) and tree topology (See Figure 1.5) 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 Profibus should not exceed 1900 m.

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

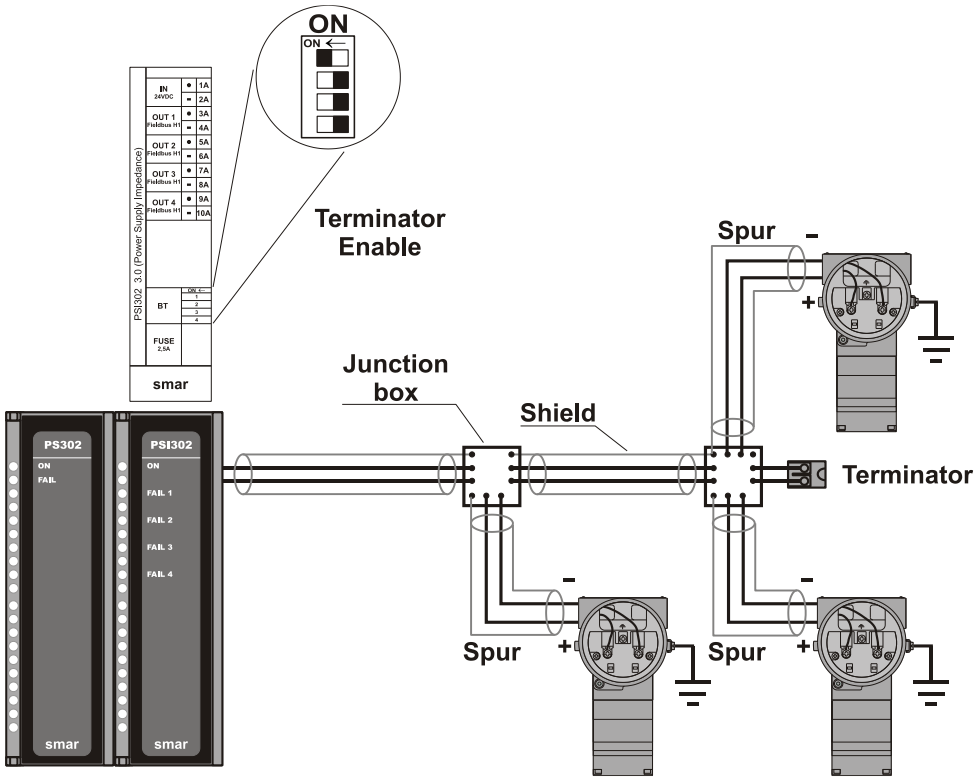


Figure 1.4 - Bus Topology

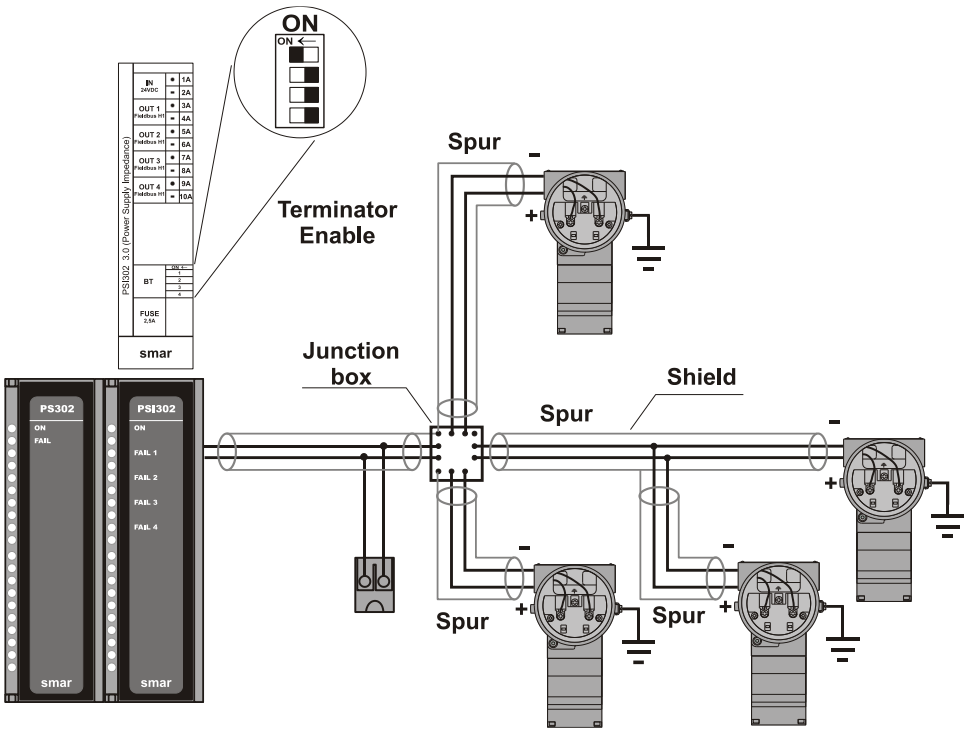


Figure 1.5 – Tree Topology

Intrinsic Safety Barrier

When the Profibus 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. See more in http://www.smar.com.

Jumper Configuration

To work properly, the jumpers J1 and W1 located in the **FP303** main board must be correctly configured.

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 **FP303** 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 (Digital Control System).

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. See more in http://www.smar.com.

Installation in Hazardous Areas

See Appendix A for further information.

OPERATION

Output Module Functional Description

The output module main parts are: pilot, servo, pressure sensor and output control circuit.

The pneumatic part is based on a well known technology: pneumatic relay and the nozzle-baffle set, according to the schematic drawing on Figure 2.1.

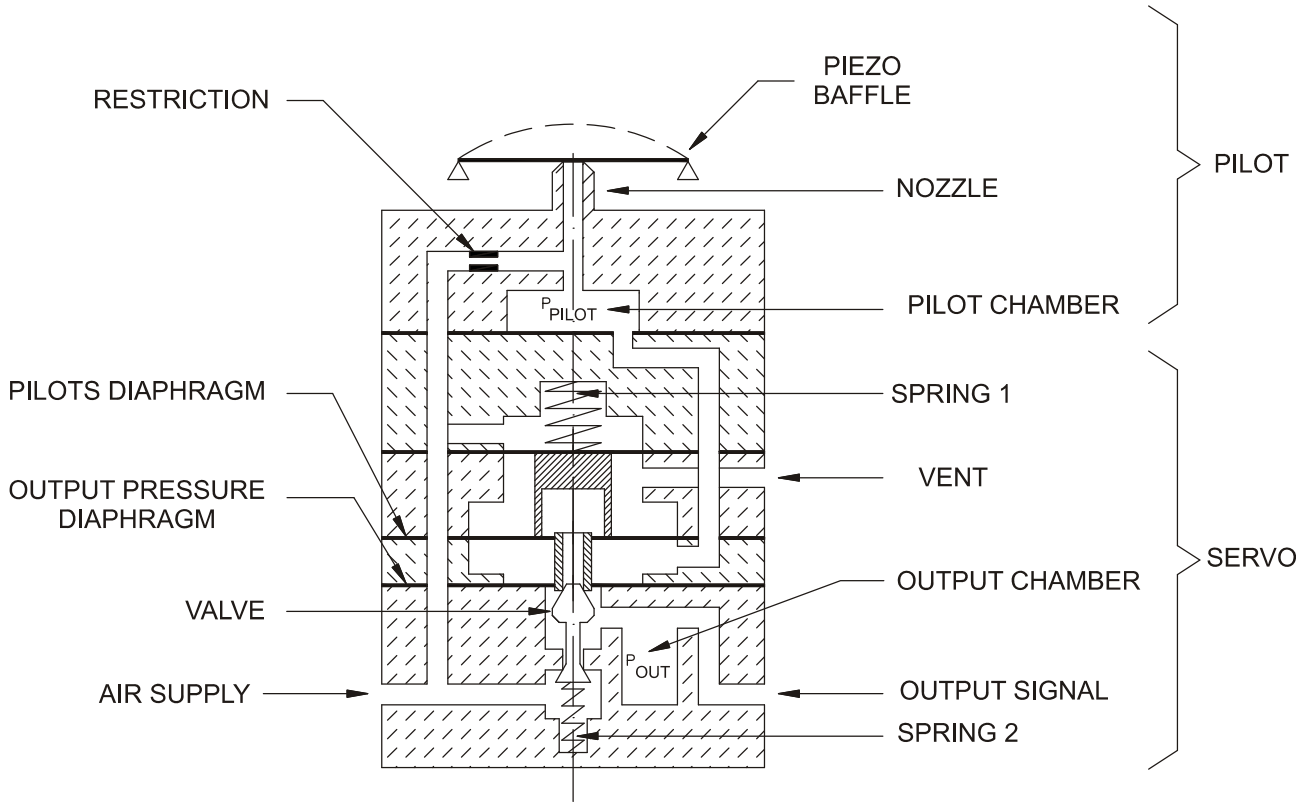


Figure 2.1 – Pneumatic Transducer

A piezoelectric disc is used as a baffle at the pilot stage. The baffle is deflected when it receives a voltage through the control circuit. Approaching or moving away from the piezoelectric disc causes a variation on the small air flow passing through the nozzle and changes the pilot chamber pressure, which is called pilot pressure.

The pilot pressure, for being too low, must be amplified. This is performed in the servo section, which works as pneumatic relay. The servo section has a diaphragm in the pilot chamber and a smaller output diaphragm in the output chamber. The pressure pilot, when applied on the pilot diaphragm results in a force equal to the pressure on the output diaphragm, when in balance.

When an increase is required in the output pressure, the baffle will move away from the nozzle according to value set, and the correction is carried out as described above. Spring 1 forces the valve downwards and increases the output pressure until it reaches a new balance.

If a decrease in pressure is required, the baffle will approach the nozzle and the pilot pressure will increase. The valve will close through the spring 2 and the diaphragms will be pushed upwards by the stronger output flow and pilot pressure.

The air in the system relieves the output pressure through the vent, decreasing the output pressure until reaching balance again.

Functional Electronic Description

The FP303 CPU receives the required output level through the Fieldbus network. The CPU supplies an electronic setpoint signal to the control circuit. The control circuit also receives a feedback from a pressure sensor on the FP303 outlet.

Each block function will be described below.

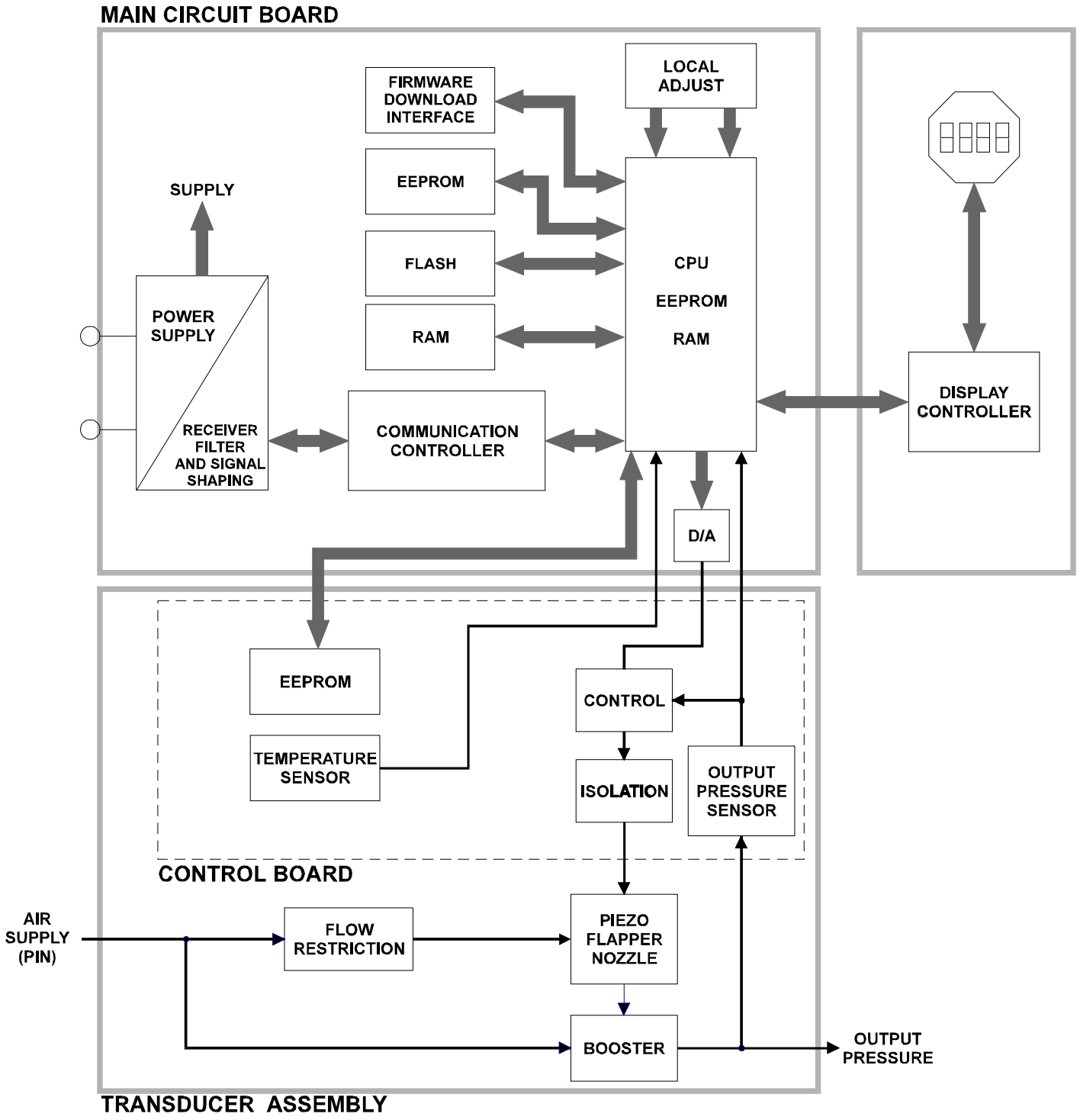


Figure 2.2 – FP303 Block Diagram

Power Supply
The FP303 converter circuit is bus powered via the transmission line (two-wire system).

Communication Controller
Controls the line activity, modulates and demodulates communication signals and inserts or erases initial or final delimitators according to the Fieldbus protocol.

Central Processing Unit (CPU), RAM and PROM
The CPU is the converter intelligent part and is responsible for the management and executing operation of the block, self-diagnosis and communication. The program is stored in the PROM. For the temporary storage of data, the CPU has an internal RAM. The CPU has a non-volatile internal memory (EEPROM) that store data that must be retained in case of power failure. Examples are data calibration, configuration and identification.

Display Controller
Receives data from the CPU and send them to liquid crystal display.

Local Adjustment
Two switches are magnetically activated via the magnetic configuration tool without any external electric or mechanic contact. There is no need for opening the housing cover to access the Local Adjustment.

D/A Block
Receives the CPU signal and convert it into an analog voltage used by the control block.

Control Block
Controls the output pressure, while supplying voltage to the piezoelectric disc, according to the data received from the CPU and the pressure sensor feedback.

Isolation
Its function is to isolate the Fieldbus signal from the piezoelectric signal.

Output Pressure Sensor
Measures the output pressure and sends a feedback to the Control Block and the CPU.

Temperature Sensor
Measures the temperature on the transducer board.

EEPROM
Non-volatile memory that stores data when the FP303 is reinitialized.

Nozzle-Baffle
This unit converts the piezoelectric movement inside a pneumatic signal to a pressure control in the pilot chamber.

Restriction
The restriction and the nozzle form a pressure divisor circuit. The restriction reduces the supply pressure to activate the nozzle-baffle system, as described above on Output Module Functional Description.

Booster
The booster amplifies the pressure changes that occur before the pressure restriction into bigger values with the bigger air volume as described on Output Module Functional Description.

CONFIGURATION

One of the PROFIBUS features is to configure the equipment regardless of the configurator used. The **FP303** can be configured on the terminal or third-parties console. The **FP303** has three output transducer blocks, one physical block, one display transducer block and one analog output function block. The function blocks are not covered in the manual. For explanations and details, see the "Functional Block Manual".

The transducer block isolates the specific I/O hardware function block, like sensors and actuators, while controlling the I/O access through the manufacturer specific action. This prompts the transducer block to execute the algorithm as many times as required for getting valid sensor data without overloading the function blocks that use them. It also isolates the function blocks from the specific characteristics of some existing hardware.

When accessing the hardware, the transducer block gets I/O data or sends control data to it. The connection between the transducer block and the input/output function blocks is called channel. Normally, the transducer blocks execute functions as: linearization, characterization, temperature compensation, control and data exchange to/from the hardware.

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 stored parameters and a channel connecting them to the function block. The algorithm describes the transducer work as a function to transfer data between the I/O circuit and the other functional block. The stored parameters define the user interface to the transducer block. These parameters cannot be connected to the other blocks. They can be divided in specific manufacturer standards.

The standard parameters will be present for each class of equipment, such as: pressure, temperature, actuator, etc. regardless of the manufacturer. On the other hand, the specific manufacturers parameters are defined by them, such as, calibration setting, materials information, linearization curve, etc.When a routine standard calibration is performed, the user is guided step by step by a method. The method is normally designed as a reference to help carry out the most common tasks. The configuration tool identifies each method associated to the parameters and enables the interface, the linearization curve, etc.

Profibus PA Transducer Block Functional Diagram for the Pressure Transducer Block

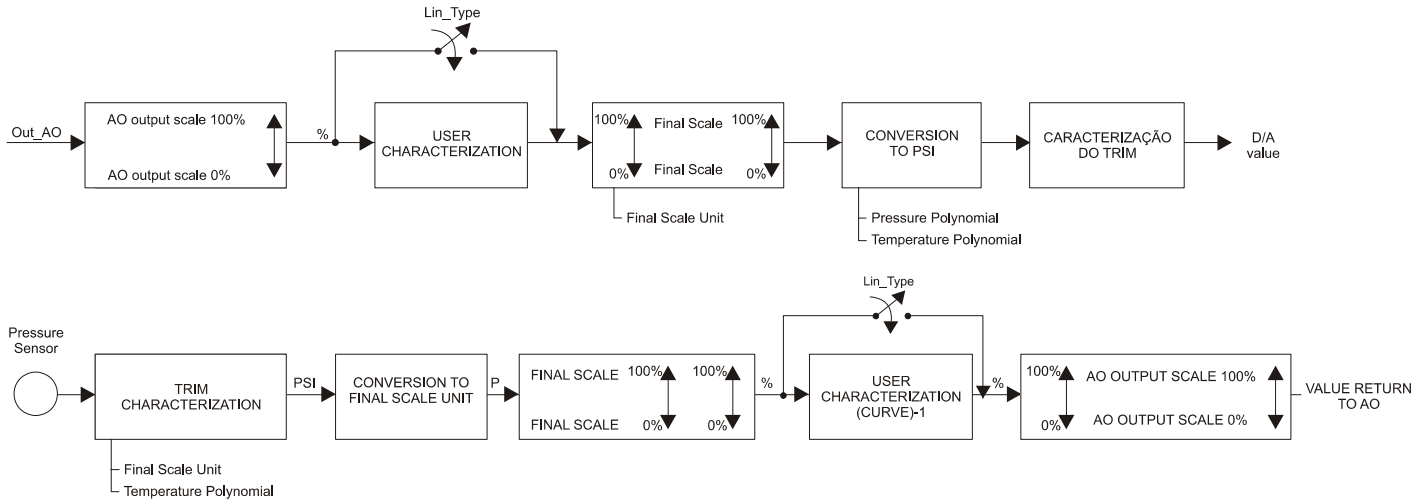


Figure 3.1 - Profibus PA Transducer Block Functional Diagram for the Pressure Transducer Block

Transducer Block Parameter Descriptions

ÍNDEX	PARAMETER MNEMONIC	DESCRIPTION
1	ST_REV	Indicates the static data level.
2	TAG_DESC	Describe the Transducer block
3	STRATEGY	This parameter is not processed by the transducer block.
4	ALERT_KEY	Plant ID number.
5	TARGET_MODE	Indicates the target block operation mode.
6	MODE_BLK	Indicates the transducer block operation mode.
7	ALARM_SUM	Shows the status of up to 16 alarm blocks. For each alarm, the current status, unknown status, non-reported status and disabled status are kept.
8	FINAL_VALUE	The command variable for the final control element in OUT_SCALE units. The status BAD will move the actuator to the fail-safe position as defined by the ACTUATOR_ACTION.
9	FINAL_VALUE_SCALING	The values for the upper and lower range limits, the engineering unit code and the number of digits after the decimal point f the final value.
10	CAL_POINT_HI	The calibration upper point.
11	CAL_POINT_LO	The calibration lower point.
12	CAL_MIN_SPAN	The minimum permitted span calibration value. This information is needed to ensure that both upper and lower points do not stay too close.
13	CAL_UNIT	The engineering unit codes for calibration values. See page 3-14 for the valid units.
14	CONV_SN	Converter serial number.
15	ACTUATOR_ACTION	Specifies the actuator work in case of failure. The fail-safe position for the lack of energy on the valve actuator: 0 = not initialized; 1 = 100% opening; 2 = 0% opening; 3 = none / stays on same position.
16	ACTUATOR_MAN	Name of actuator manufacturer.
17	ACTUATOR_TYPE	Type of actuator: 0 = electro-pneumatic; 1 = electric; 2 = electric-hydraulic; 3 = others.
18	ACTUATOR_ SER_NUM	Actuator serial number.
19	VALVE_MAN	Name of valve manufacturer.
20	VALVE_SER_NUM	Valve serial number.
21	VALVE_TYPE	Valve type: 0 = linear, sliding movement; 1 = 1-turn, rotary movement; 2 = multi rotary movement.
22	VALVE_MAINT_DATE	Date of latest valve maintenance.
23	DEVICE_CALIB_DATE	Date of latest equipment calibration.
24	DEVICE_CONFIG_DATE	Date of latest equipment configuration.
25	FEEDBACK_VALUE	Current position of the final control element in OUT_SCALE units.
26	RATE_DEC	Ramp descending inclination where the setpoint is executed on Auto mode, in units per second. If the ramp inclination is set on zero, the setpoint will be used immediately.
27	RATE_INC	Ramp ascent inclination where the setpoint is executed on Auto mode, in FV units per second. If the ramp inclination is set on zero, the setpoint will be used immediately.
28	LIN_TYPE	Type of linearization: 0 Without linearization (mandatory); 1 Linearization table (optional); 240 Manufacturer-specific; 249 Manufacturer-specific; 250 Not used; 251 None; 252 Unknown; 253 Special.
29	TAB_ENTRY	The index parameter identifies which table element is on the parameter.
30	TAB_X_Y_VALUE	The X_Y_VALUE parameter has a table pair of values.
31	TAB_MIN_NUMBER	For internal equipment reasons, such as calculations, it may be necessary to use a minimum table values. This number is shown one the TAB_MIN_NUMBER parameter.
32	TAB_MAX_NUMBER	TAB_MAX_NUMBER is the maximum size (number of X_VALUE and Y_VALUE

ÍNDEX	PARAMETER MNEMONIC	DESCRIPTION
		values) of the equipment table.
33	TAB_ACTUAL_NUMBER	Keeps the current table inputs. It can be calculated after finishing the table transmission.
34	TAB_OP_CODE	Altering an equipment table affects the equipment measuring or algorithms, being necessary the indication of the initial and end points. The TAP_OP_CODE parameter controls the table transaction. 0: Not initialized. 1: New operation characteristic, TAB_INDEX=1 first value, former curve deleted. 2: reserved. 3: last value, end of transmission, table check, replace old curve for the new or update ACTUAL_NUMBER. 4: deletes the table point with current index (optional), registers the Charact-Input-Value in raising order, indicates a new index, decreases the new. CHARACT_NUMBER. 5: inserts the (Charact-Input-Value relevant) optional point, registers the Charact-Input-Value in raising order, indicates a new index, increases the CHARACT_NUMBER. 6: replaces the table point with the optional current index. The table or parts of it can be read without combining the beginning and the end (TAB_OB_CODE 1 and 3). The beginning is indicated by setting TAB_ENTRY on 1.
35	TAB_STATUS TAB_STATUS	The equipment plausibility can be checked on the TAB_STATUS parameter. 0: Not initialized 1: Good (new table is valid). 2: Non-monotonous increase (old table is valid). 3: Non-monotonous decrease (old table is valid). 4: Insufficient transmitted values ((old table is valid). 5: Many transmitted values (old table is valid). 6: Edge gradient too high (old table is valid). 7: Unexpected values (old table is valid) 8 - 127 reserved > 128 manufacturer specific
36	SECONDARY_VALUE	Secondary value related to sensor (ºC).
37	SECONDARY_VALUE_UNIT	Engineering units to be used with the secondary value related to sensor (ºC) (1001).
38	CAL_TEMPERATURE	Temperature sensor calibration point.
39	BACKUP_RESTORE	Saves and restores data according to the factory and calibration procedures. It has the following options: 1, "Factory Cal Restore", (Reestablishes factory calibration) 2, "Last Cal Restore", (Reestablishes last calibration) 3, "Default Data Restore", (Reestablishes default data) 4, "Shut-Down Data Restore", (Reestablishes data) 5, "Sensor Data Restore", (Reestablishes sensor data) 11, "Factory Cal Backup", (Saves data as factory data) 12, "Last Cal Backup", (Saves data as last valid calibration) 14, "Shut-Down Data Backup", (Saves data before turning off) 15, "Sensor Data Backup", (Saves sensor data) 0, "None", (No data)
40	COEFF_PRESS_POL	Pressure coefficient 0 to 10.
41	POLYNOMIAL_PRESS_VERSION	Pressure polinomial version.
42	COEFF_SENS_TEMP_POL	Temperature sensor coefficient 0 to 10.
43	POLYNOMIAL_SENS_TEMP_VERSION	Temperature sensor polinomial version.
44	COEFF_SENS_PRESS_POL	Temperature sensor coefficient 0 to 7.
45	POLYNOMIAL_SENS_PRESS_VERSION	Temperature sensor polinomial version.
46	SENSOR_PRESSURE	Pressure sensor value and status.
47	CAL_POINT_HI_SENSOR_PRES	Pressure sensor upper calibration point.
48	CAL_POINT_LO_SENSOR_PRES	Pressure sensor lower calibration point.
49	FEEDBACK_ CAL	Measured value when the calibration method is being carried out.
50	CAL_CONTROL	After entering the calibration method, CAL_CONTROL is used to return to previous normal operation.
51	PIEZO_VOLTAGE	Piezo value and status.
52	XD_ERROR	Indicates the condition of the 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"
53	MAIN_BOARD_SN	Main board serial number.
54	EEPROM_FLAG	This parameter indicates the EEPROM saving process.

ÍNDEX	PARAMETER MNEMONIC	DESCRIPTION
		0, "False" 1, "True"
55	ORDERING_CODE	Indicates the information from the sensor and the factory production control.

Table 3.1 – Transducer Block Parameter Description

Table of Transducer Block Parameter Attributes

Related Index	Parameter Name	Object Type	Data Type	Storage	Size	Access	Parameter used/Type of transport	Standard	Mandatory/Optional Class
Standard parameter									
Electro-pneumatic Transducer Block Additional parameters									
8	FINAL_VALUE	Record	DS_33	D	5	r,w	C/a		M(B)
9	FINAL_VALUE_SCALING	Record	DS-36	S	4	r	C/a	-	O (B)
10	CAL_POINT_HI	Simple	Float	N	4	r,w	C/a	15.0 psi	O (B)
11	CAL_POINT_LO	Simple	Float	N	4	r	C/a	3.0 psi	O (B)
12	CAL_MIN_SPAN	Simple	Float	N	4	r	C/a	7.0 psi	O (B)
13	CAL_UNIT	Simple	Unsigned16	N	2	r	C/a		O (B)
14	CONV_SN	Simple	Unsigned32	N	4	r,w	C/a	0	O (B)
15	ACTUATOR_ACTION	Simple	Unsigned8	S	1	r,w	C/a		M(B)
16	ACTUATOR_MAN	Simple	OctetString	S	16	r,w	C/a		M(B)
17	ACTUATOR_TYPE	Simple	Unsigned8	N	1	r	C/a		M(B)
18	ACTUATOR_SER_NUM	Simple	OctetString	S	16	r,w	C/a		O (B)
19	VALVE_MAN	Simple	OctetString	S	16	r,w	C/a		M(B)
20	VALVE_SER_NUM	Simple	OctetString	S	16	r,w	C/a	0	O (B)
21	VALVE_TYPE	Simple	Unsigned8	S	1	r,w	C/a		M(B)
22	VALVE_MAINT_DATE	Simple	OctetString	S	16	r,w	C/a		M(B)
23	DEVICE_CALIB_DATE	Simple	OctetString	S	16	r,w	C/a		M(B)
24	DEVICE_CONFIG_DATE	Simple	OctetString	S	16	r,w	C/a		M(B)
25	FEEDBACK_VALUE	Record	DS_33	D	5	r	C/a	0	M(B)
26	RATE_DEC	Simple	Float	S	4	r,w	C/a	0	O (B)
27	RATE_INC	Simple	Float	S	4	r,w	C/a	0	O (B)
28	LIN_TYPE	Simple	Unsigned8	S	1	r,w	C/a	0	M (B)
29	TAB_ENTRY	Simple	Unsigned8	D	1	r,w	C/a	-	O(B)
30	TAB_X_Y_VALUE	Array	Float	S	4	r	C/a	-	O(B)
31	TAB_MIN_NUMBER	Simple	Unsigned8	S	1	r	C/a	-	O(B)
32	TAB_MAX_NUMBER	Simple	Unsigned8	S	1	r	C/a	-	O(B)
33	TAB_ACTUAL_NUMBER	Simple	Unsigned8	S	1	r	C/a	-	O (B)
34	TAB_OP_CODE	Simple	Unsigned8	D	1	r,w	C/a	-	O(B)
35	TAB_STATUS	Simple	Unsigned8	D	1	r	C/a	-	O(B)
36	SECONDARY_VALUE	Record	DS-33	D	5	r	C/a		O (B)
37	SECONDARY_VALUE_UNIT	Simple	Unsigned16	N	2	r	C/a		O (B)
38	CAL_TEMPERATURE	Simple	Float	N	4	r,w	C/a	25	O (B)
39	BACKUP_RESTORE	Simple	Unsigned8	S	1	r,w	C/a	None	O (B)
40	COEFF_PRESS_POL	array	float	S	44	r,w	C/a		O (B)
41	POLYNOMIAL_PRESS_VERSION	Simple	Unsigned8	S	1	r,w	C/a	0x11	O (B)
42	COEFF_SENS_TEMP_POL	array	float	S	20	r,w	C/a		O (B)
43	POLYNOMIAL_SENS_TEMP_ VERSION	Simple	Unsigned8	S	1	r,w	C/a	0x10	O (B)
44	COEFF_SENS_PRESS_POL	array	float	S	20	r,w	C/a		O (B)
45	POLYNOMIAL_PRESS_TEMP_ VERSION	Simple	Unsigned8	S	1	r,w	C/a	0x10	O (B)
46	SENSOR_PRESSURE	Record	DS_33	D	5	r	C/a		M(B)
47	CAL_POINT_HI_SENSOR_ PRES	Simple	Float	N	4	r	C/a	15.0 psi	O (B)
48	CAL_POINT_LO_SENSOR_ PRES	Simple	Float	N	4	r	C/a	3.0 psi	O (B)
49	FEEDBACK_CAL	Simple	Float	D	4	r,w	C/a		M(B)
50	CAL_CONTROL	Simples	Unsigned8	N	1	r,w	C/a	Disable	O (B)
51	PIEZO_VOLTAGE	Record	DS_33	D	5	r	C/a		M(B)
52	XD_ERROR	Simple	Unsigned8	S	1	r	C/a	0x10	O (B)
53	MAIN_BOARD_SN	Simple	Unsigned32	S	4	r,w	C/a		O (B)
54	EEPROM_FLAG	Simple	Unsigned8	D	1	r	C/a	False	O (B)
55	ORDERING_CODE	array	Unsigned8	S	50	r,w	C/a		O (B)

Table 3.2 – Table of Transducer Block Parameter Attributes

NOTE
On the extended range version, the standard value will be 30 psi for the parameters **10** (CAL_POINT_HI) and **47** (CAL_POINT_HI_SENSOR).

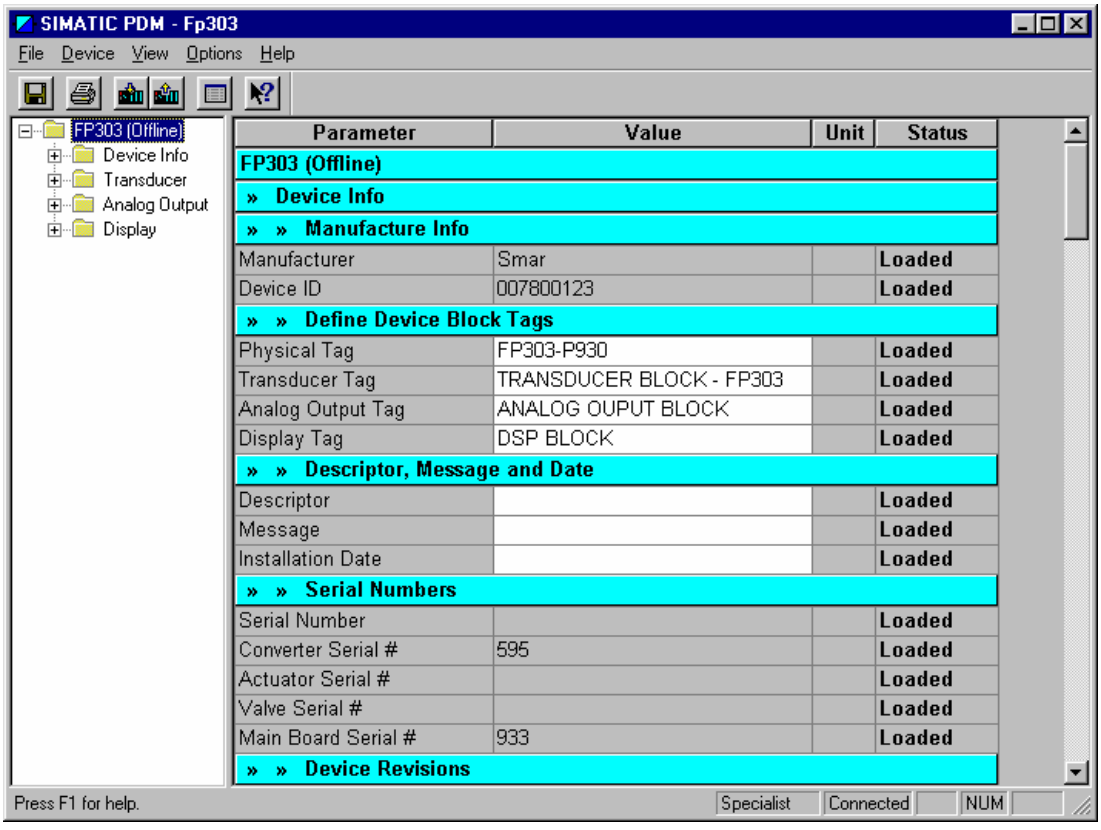
Transducer Block Visualization Table

Related Index	Mnemonic Parameter	VIEW_1 Number of bytes
1-7	Standard Parameters	13
8	FINAL_VALUE	
9	FINAL_VALUE_SCALING	
10	CAL_POINT_HI	
11	CAL_POINT_LO	
12	CAL_MIN_SPAN	
13	CAL_UNIT	
14	CONV_SN	
15	ACTUATOR_ACTION	
16	ACTUATOR_MAN	
17	ACTUATOR_TYPE	
18	ACTUATOR_SER_NUM	
19	VALVE_MAN	
20	VALVE_SER_NUM	
21	VALVE_TYPE	
22	VALVE_MAINT_DATE	
23	DEVICE_CALIB_DATE	
24	DEVICE_CONFIG_DATE	
25	FEEDBACK_VALUE	
26	RATE_DEC	
27	RATE_INC	
28	LIN_TYPE	
29	TAB_ENTRY	
30	TAB_X_Y_VALUE	
31	TAB_MIN_NUMBER	
32	TAB_MAX_NUMBER	
33	TAB_ACTUAL_NUMBER	
34	TAB_OP_CODE	
35	TAB_STATUS	
36	SECONDARY_VALUE	
37	SECONDARY_VALUE_UNIT	
38	CAL_TEMPERATURE	
39	BACKUP_RESTORE	
40	COEFF_PRESS_POL	
41	POLYNOMIAL_PRESS_VERSION	
42	COEFF_SENS_TEMP_POL	
43	POLYNOMIAL_SENS_TEMP_VERSION	
44	COEFF_SENS_PRESS_POL	
45	POLYNOMIAL_PRESS_TEMP_VERSION	
46	SENSOR_PRESSURE	
47	CAL_POINT_HI_SENSOR_PRES	
48	CAL_POINT_LO_SENSOR_PRES	
49	FEEDBACK_CAL	
50	CAL_CONTROL	
51	PIEZO_VOLTAGE	
52	XD_ERROR	
53	MAIN_BOARD_SN	
54	EEPROM_FLAG	
55	ORDERING_CODE	
	TOTAL	13 bytes

Table 3.3 – Transducer Block Visualization Table

Smar ProfibusView or Siemens Simatic PDM configuration software can configure several transducer block parameters, as shown below:

Figure 3.2 – ProfibusView Function Blocks and Transducer Blocks



Parameter	Value	Unit	Status
FP303 (Offline)			
» Device Info			
» » Manufacture Info			
Manufacturer	Smar		Loaded
Device ID	007800123		Loaded
» » Define Device Block Tags			
Physical Tag	FP303-P930		Loaded
Transducer Tag	TRANSDUCER BLOCK - FP303		Loaded
Analog Output Tag	ANALOG OUPUT BLOCK		Loaded
Display Tag	DSP BLOCK		Loaded
» » Descriptor, Message and Date			
Descriptor			Loaded
Message			Loaded
Installation Date			Loaded
» » Serial Numbers			
Serial Number			Loaded
Converter Serial #	595		Loaded
Actuator Serial #			Loaded
Valve Serial #			Loaded
Main Board Serial #	933		Loaded
» » Device Revisions			

Figure 3.3 – Simatic PDM Function Blocks and Transducer Blocks

Use the main menu for the following functions:

- Change the equipment address;
- Parameter upload/download;
- Transducer block, analog output block and display block configuration;
- Converter calibration;
- Software resetting, equipment protection against recording and simulation of transducer block value for the analog output block;
- Data calibration saving and restoring.

The main menu also gives access to the transducer block configuration screen.

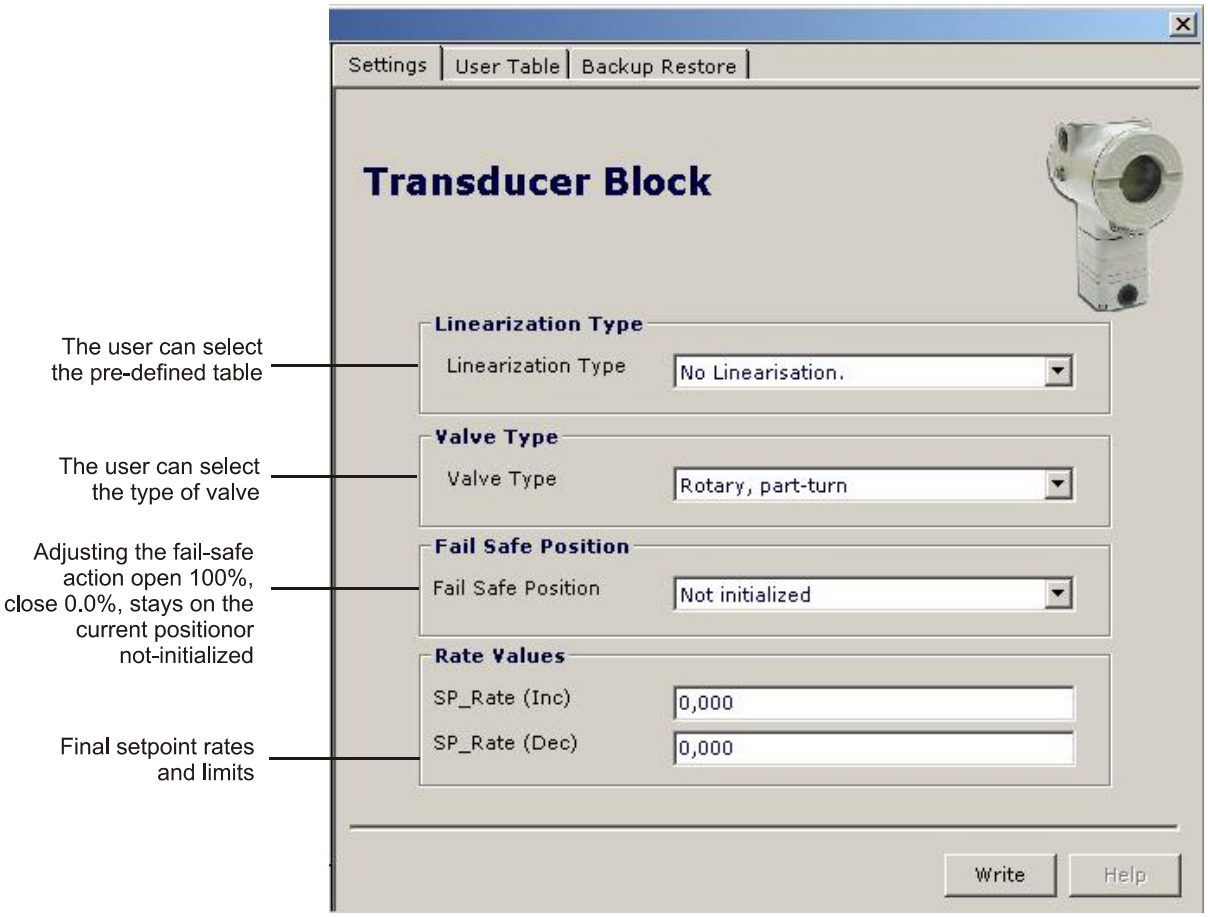


Figure 3.4 – ProfibusView Transducer Block Configuration

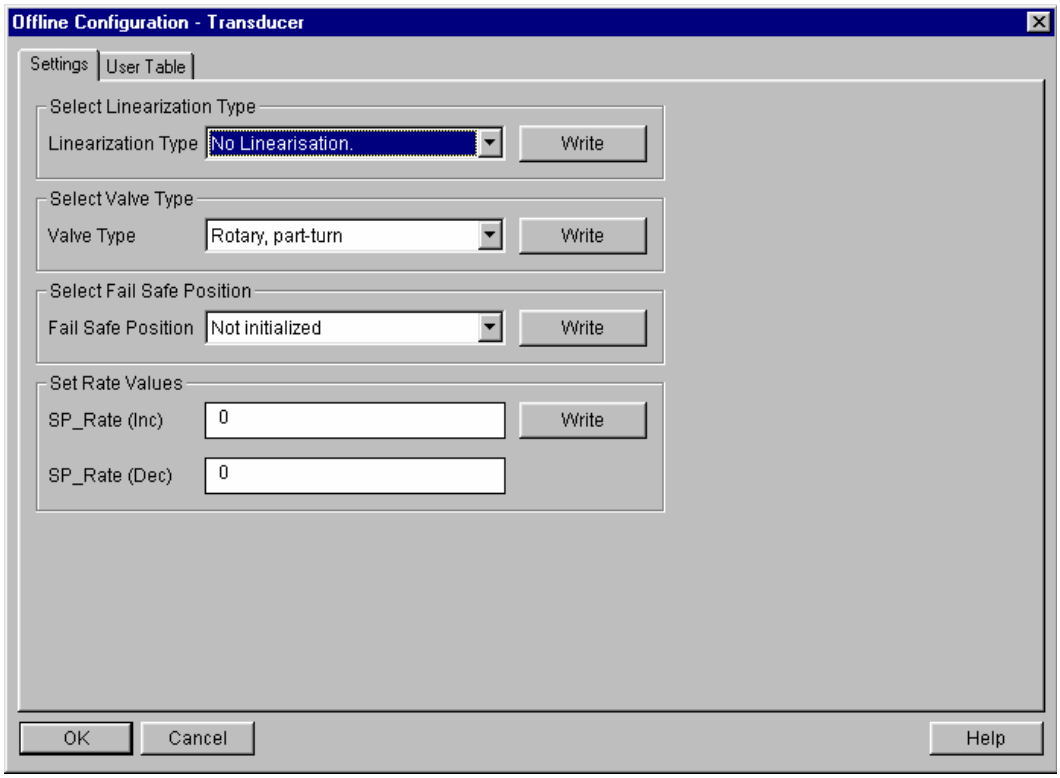


Figure 3.5 – Simatic PDM Transducer Block Configuration

Table Handling

The tables can be loaded and reloaded on the equipments. This table is used mainly for linearization. To execute this procedure, use the following parameters:

- TAB_INDEX
- TAB_X_Y_VALUE
- TAB_MIN_NUMBER
- TAB_MAX_NUMBER
- TAB_OP_CODE
- TAB_STATUS

The TAB_X_Y_VALUE parameter has the pair of values for each table value.
The TAB_INDEX parameter identifies the table element in the X_Y_VALUE parameter (see Figure 3.4).

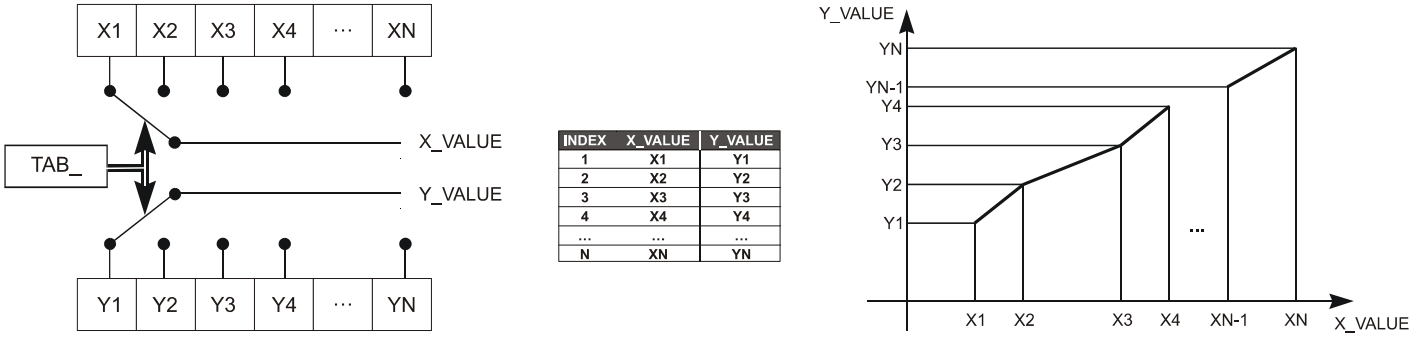


Figure 3.6 - Table Parameters

- TAB_MAX_NUMBER is the maximum table size on an equipment.
- TAB_MIN_NUMBER is the minimum table size on an equipment

Changing an equipment table affects its measuring algorithms, being necessary an indication of the initial and final points. The TAB_OP_CODE parameter controls the table transaction. The equipment provides an acceptability check. The results are indicated on the TAB_STATUS parameter.

The user table is used for current characterization in several points.

The user can configure up to 21 points in percentages. The characterization curve is used to provide a given profile to the output, for example, when the FP303 is controlling a valve with a non-linear characteristics. The characterization curve, when used, is applied to the input signal before being converted to analog current.

This eventual non-linearity can be corrected with the User Table and only the input and output values must be configured in percentages. Configure a minimum of two points to define the characterization curve. The maximum number of points is 21. Select the number evenly distributed on the desired range or on a part of it requiring more precision. The user must adjust the user-defined table for the valve linearization.

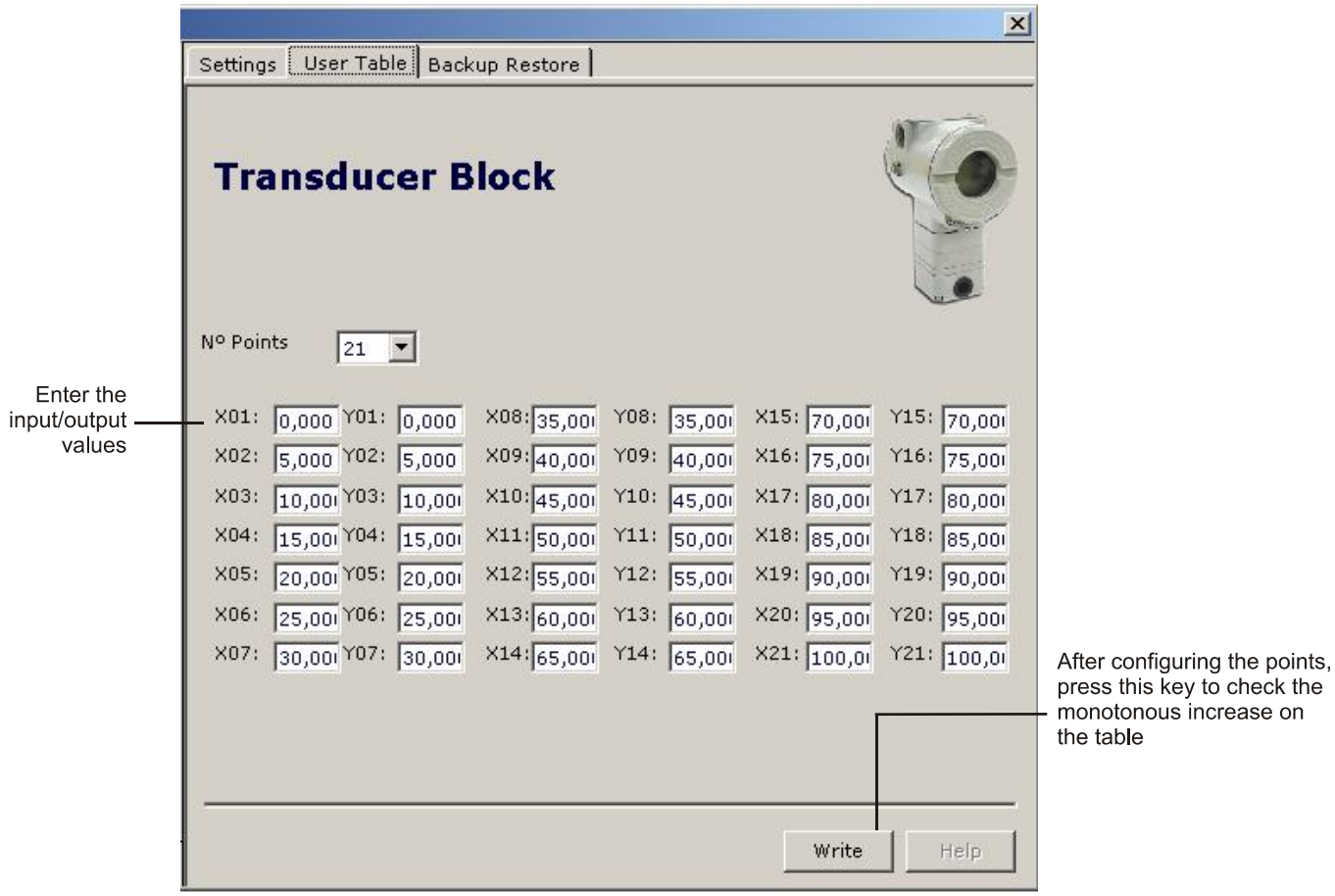


Figure 3.7 – ProfibusView User Table Screen

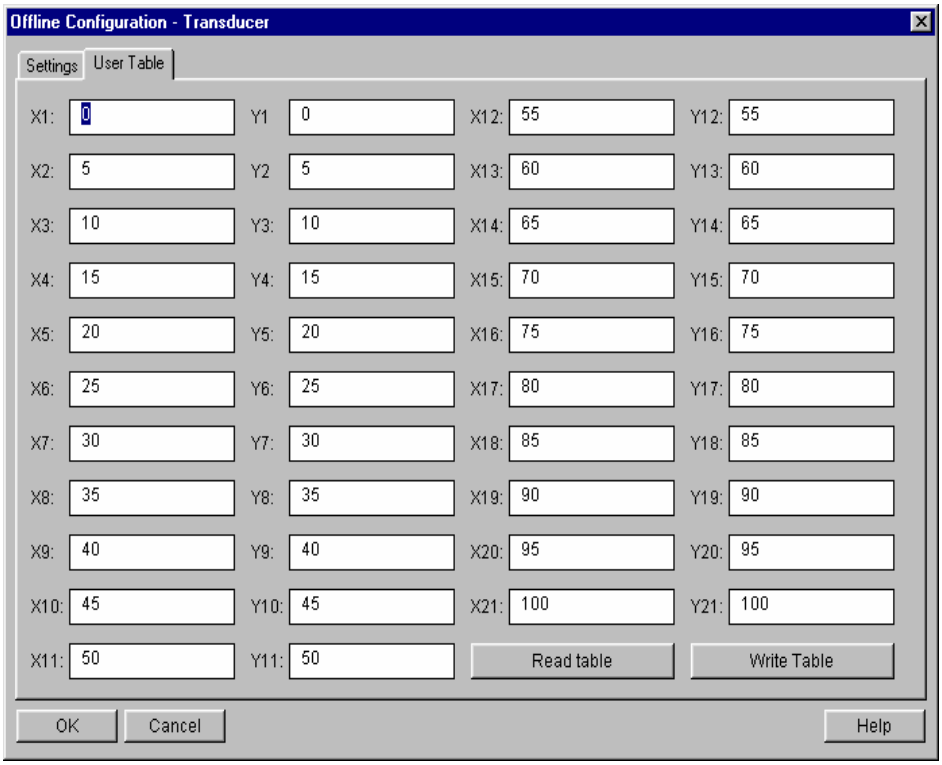


Figure 3.8 – Simatic PDM User Table Screen

The Analog Output Block (AO block) is a functional block used by an output transducer block to provide values, scale conversions, safety-fail mechanism and other resources.

The analog output block is a functional block used on equipments working as output elements in a control circuit such as valves, actuators, positioners, etc. The AO block receives a signal from another function block and transfers the results to a transducer block via an internal reference channel.

The output unit and scale will be the same for the transducer block

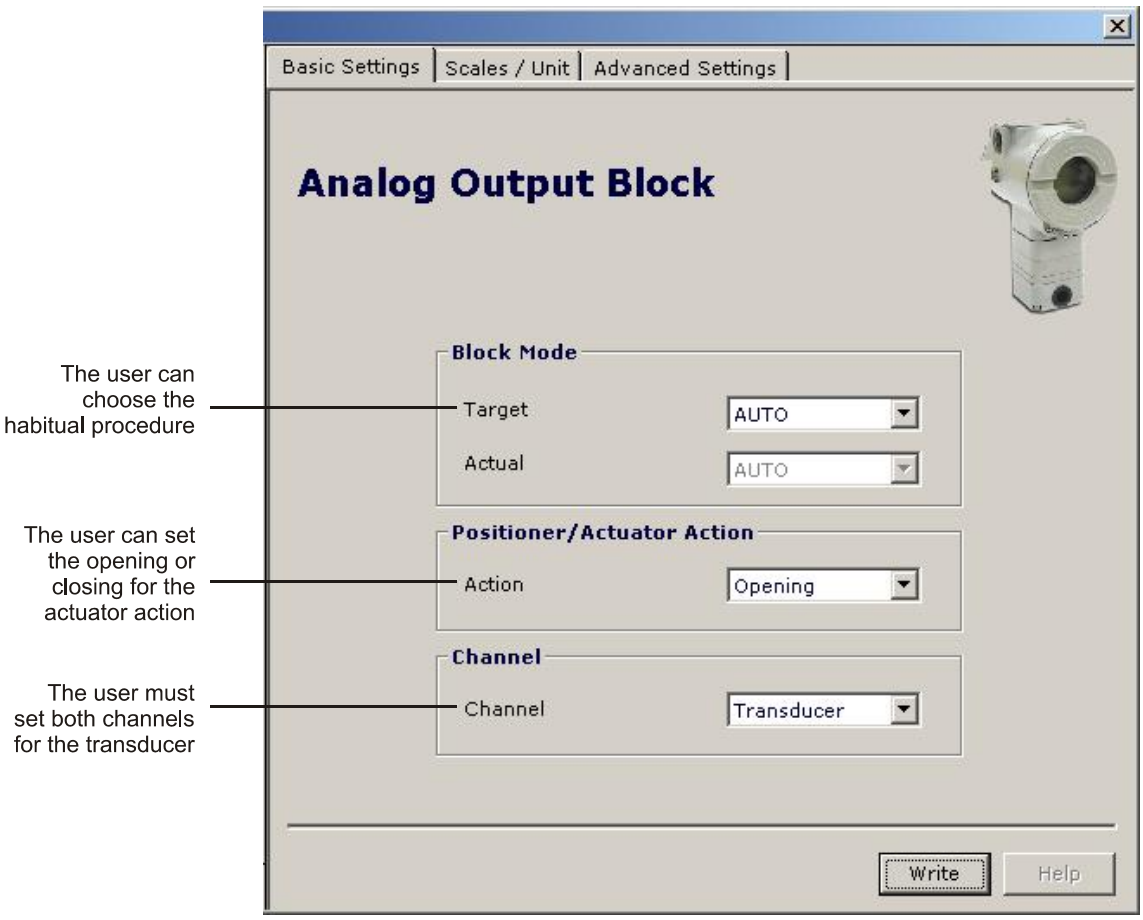


Figure 3.9 - ProfibusView Analog Output Block Basic Settings

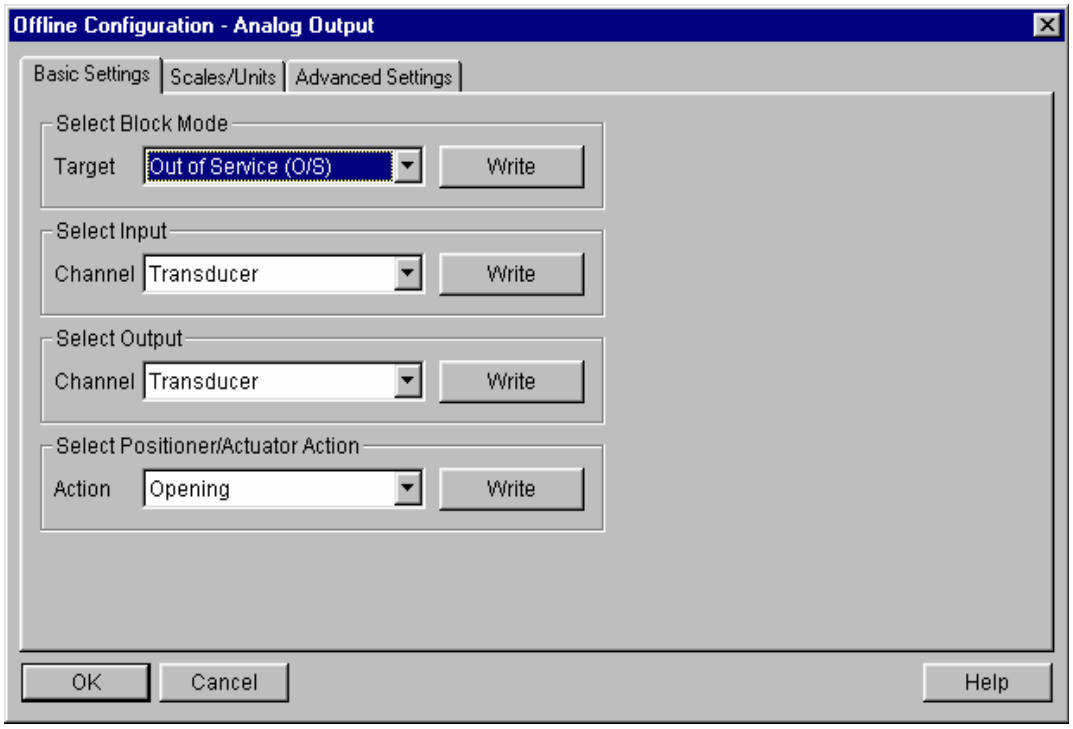


Figure 3.10 –Simatic PDM Analog Output Block Basic Settings

Configure the input and output scale and unit on the Scale/Units tab. The FP303 most recent models can also execute 3 to 30 psi calibration. The FP303 is factory calibrated from 3 to 15 psi and the examples below are based on this value.

The same calibration sequence is applied on the 3 to 30 psi extended band.

The output unit and scale will be the same for the transducer block.

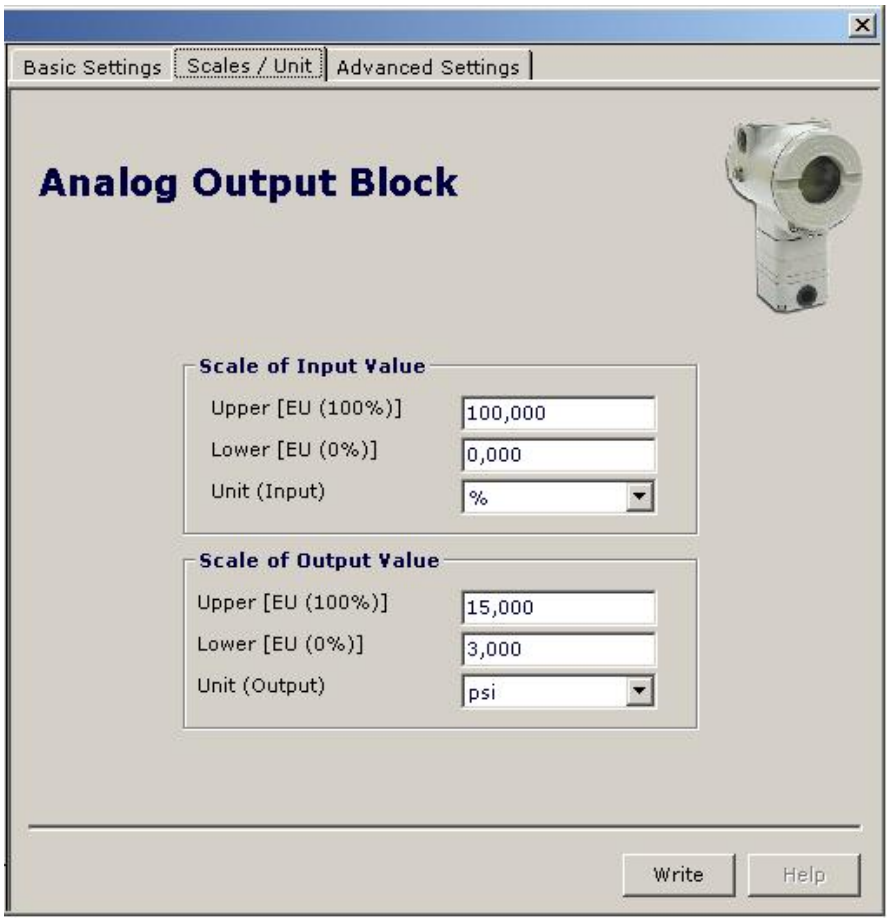


Figure 3.11 –ProfibusView Analog Output Block Scale/Units

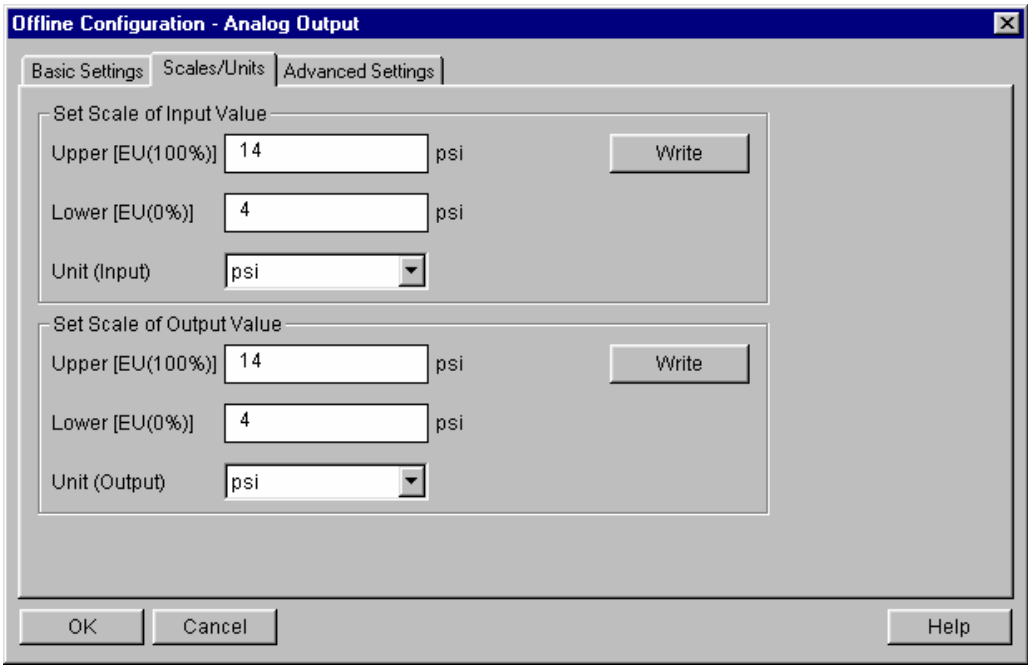


Figure 3.12 –SimaticView Analog Output Block Scale/Units

On Advance Settings tab, configure the fail-safe condition.

For the fail-safe mode, the options are: the actuator moves to the fail-safe position and stores the last fail-safe values and setpoint, being used as regulating control input

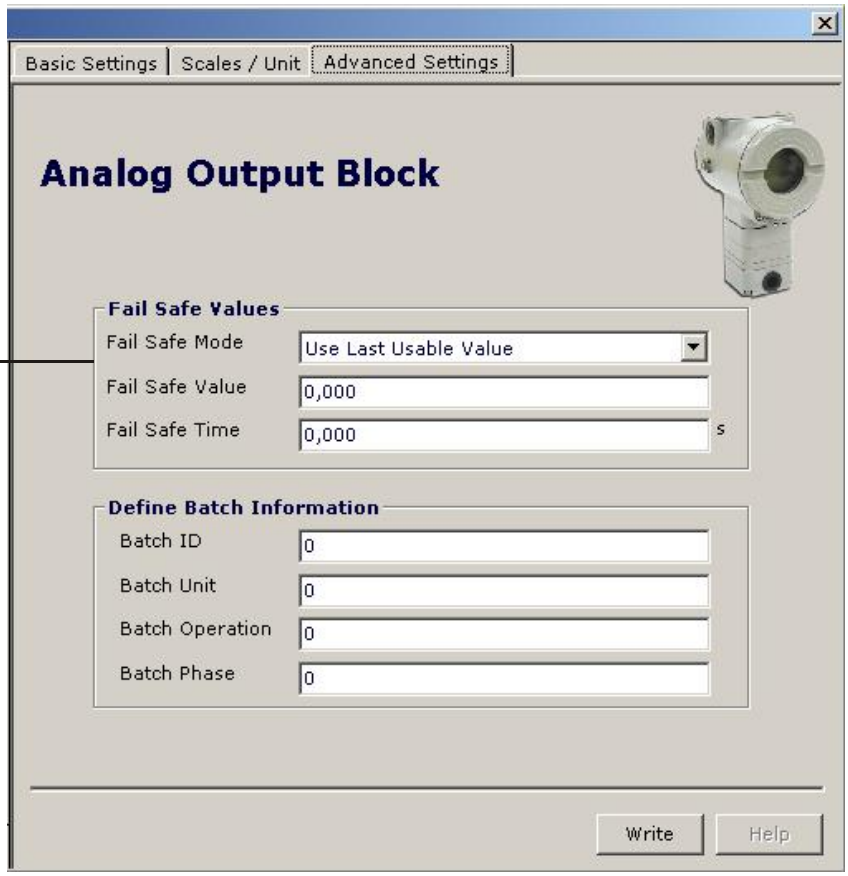


Figure 3.13 –ProfibusView Analog Output Block Advanced Settings

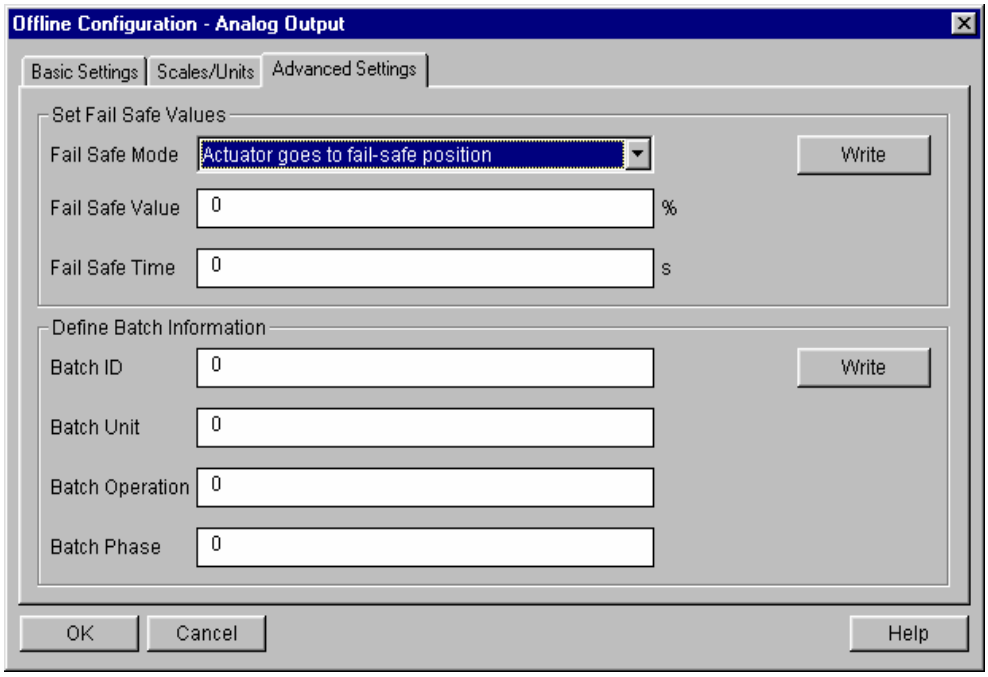


Figure 3.14 –Simatic PDM Analog Output Block Advanced Settings

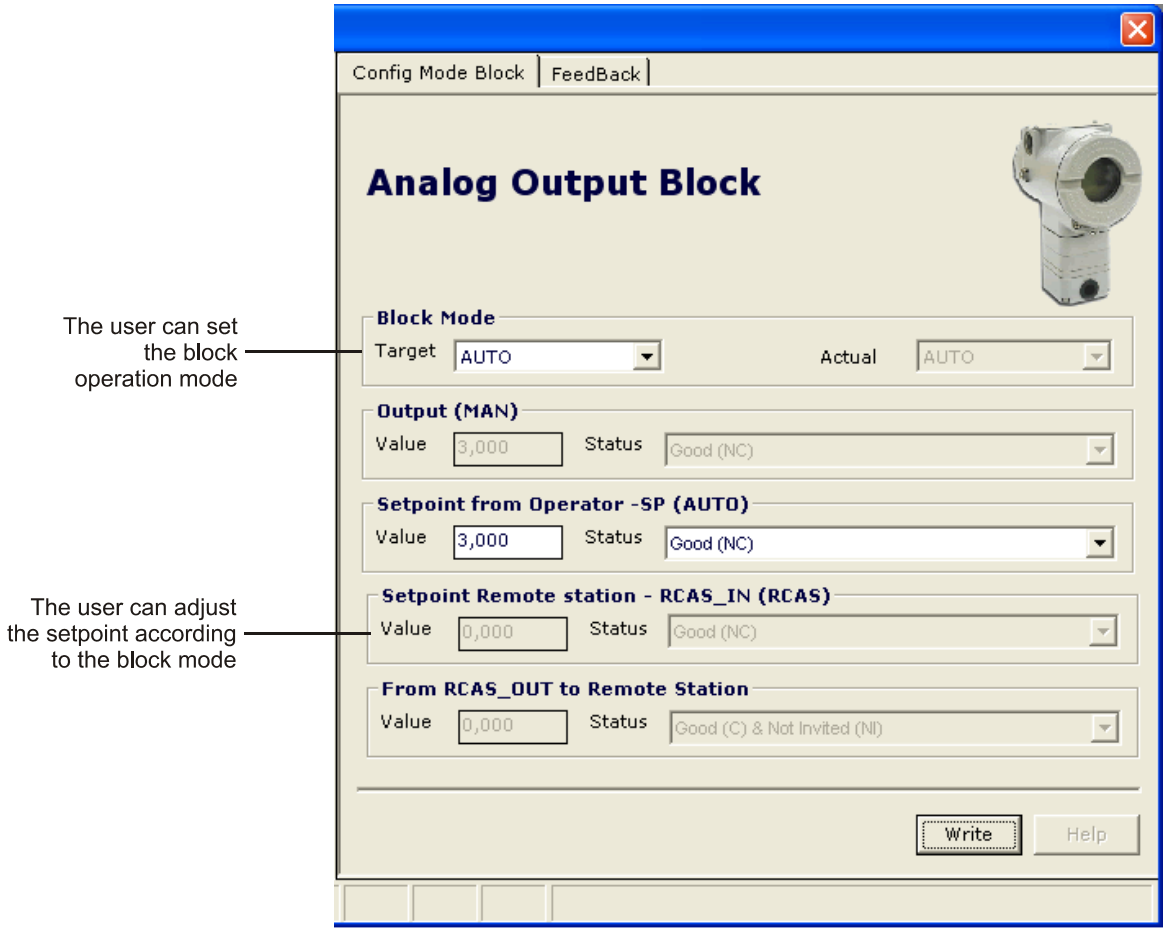


Figure 3.15 – ProfibusView AO Configuration Block Mode

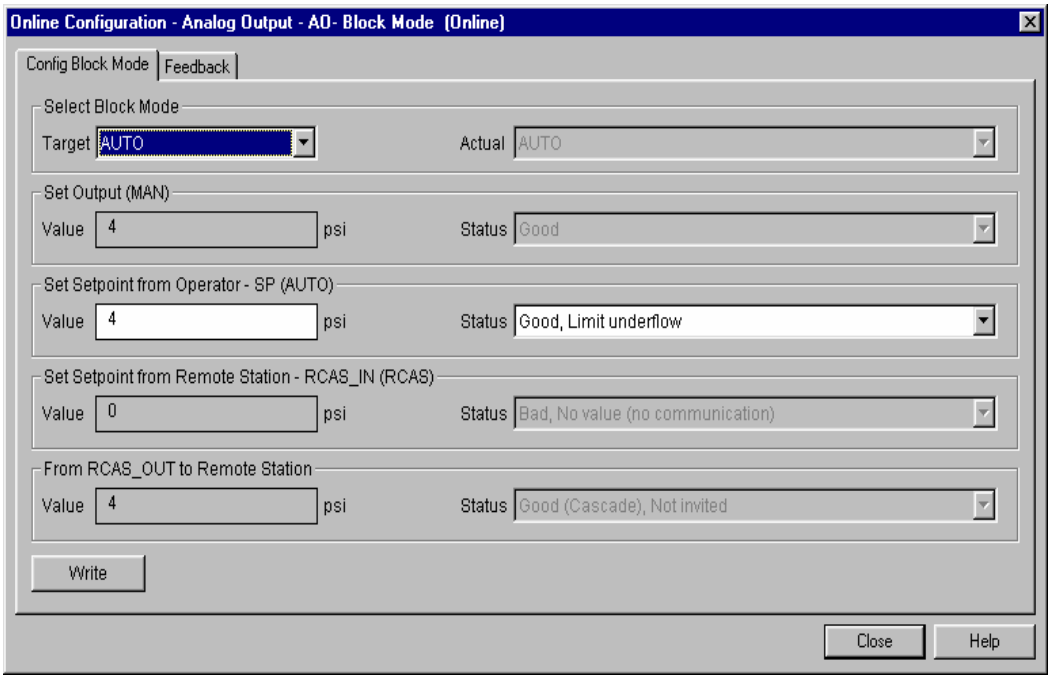


Figure 3.16– Simatic PDM AO Configuration Block Mode

The values listed between the analog block and the transducer block can be monitored and checked on the Feedback tab.

Information on the transducer real conditions and the analog output block

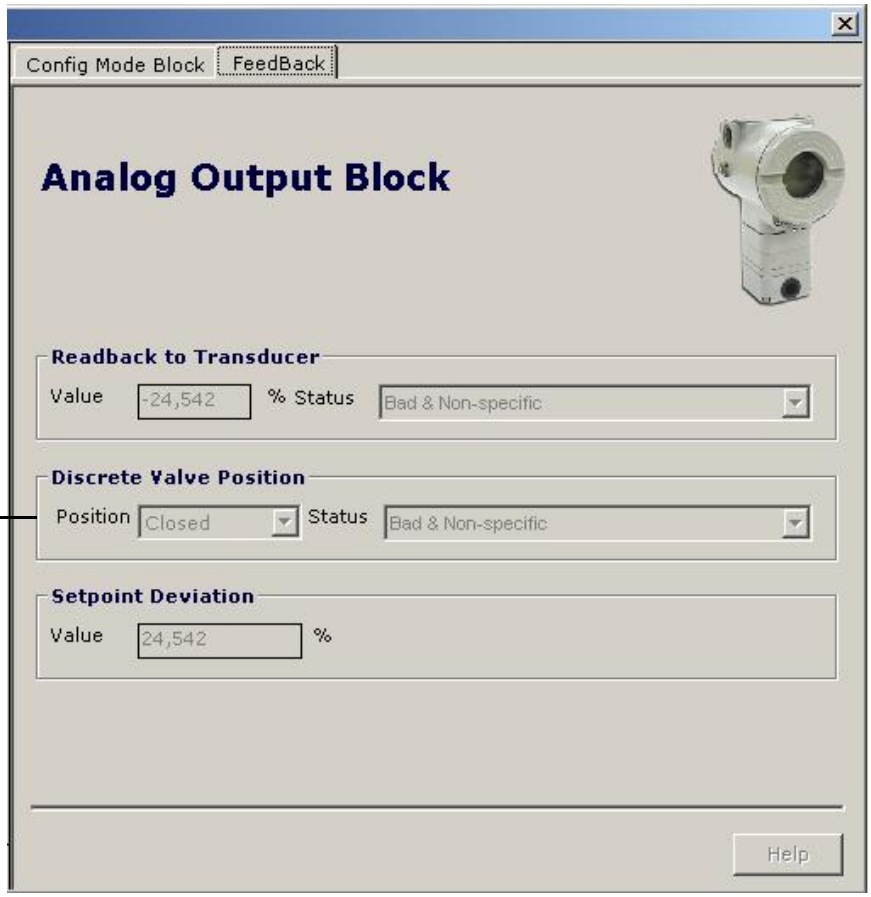


Figure 3.17 – ProfibusView Return to the AO Block Configuration

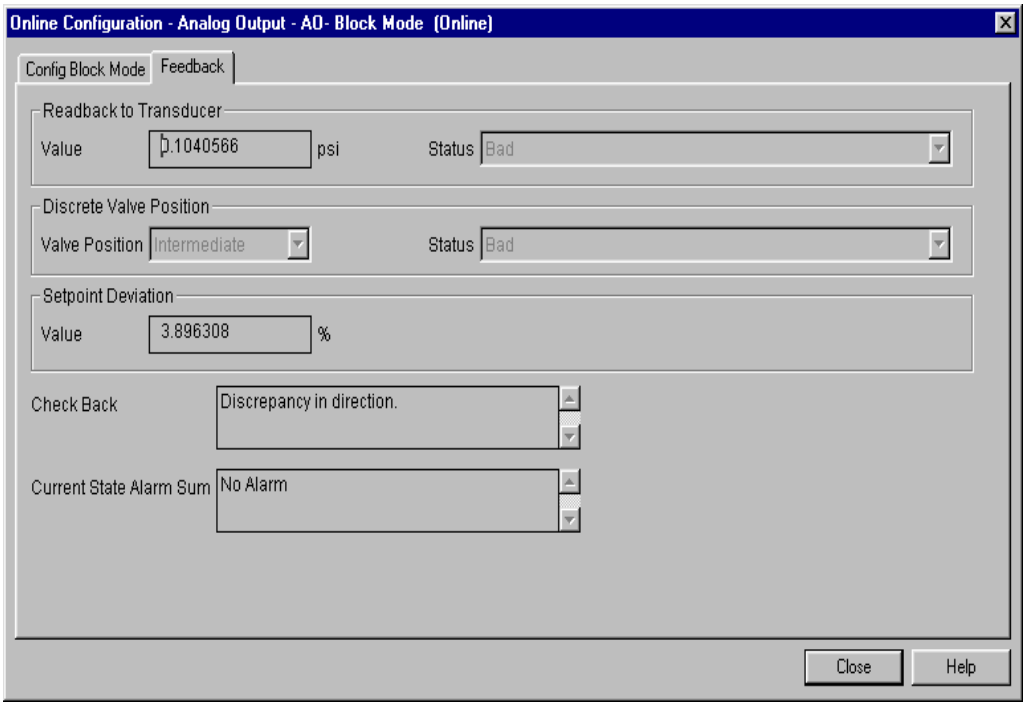


Figure 3.18 – Simatic PDM Return to the AO Block Configuration

How to Configure the FP303 Cyclically

The master executes the entire initialization process via the General Station Description (GSD) and this file provides detailed information on the hardware and software version, equipment bus timing and cyclic data exchange.

NOTE
For more information on the master and slave devices see page www.profibus.org.br.

The **FP303** has one AO functional block. This block enables the class 1 master to execute the cyclic services and the user must choose the configuration according to its application. If the AO block is in AUTO, the equipment will receive the class 1 master setpoint and status enabling the user to write this value via a class 2 master. In this case, the setpoint status must always be 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 (Remote Cascade) the equipment will only receive the setpoint value and status via the class 1 master and the status will always be equal to 0xc4 (“IA”).The following configurations can be chosen:

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

See next a typical example with the necessary steps to integrate a **FP303** equipment to a PA system.

- Copy a **FP303** GSD file on the PROFIBUS configurator research directory known as GSD.

- Copy a **FP303** bitmap file on the PROFIBUS configurator research directory, known as BMP.

- Once the master is chosen, select the communication rate, bearing in mind that when having the couplers, the following rates can be achieved: 45.45 kbits/s(Siemens), 93.75 kbits/s(P+F) and 12Mbits/s(P+F, SK2). With the link device, up to 12Mbits/s may be reached. Add the **FP303** and specify its address on the bus.

- Choose the cyclic configuration via parameterization with the GSD file that depends on the application.(Remember that this choice must comply with the AO block operating mode. In this situation pay attention to the status value of the setpoint value, which should be 0x80 (Good) on AUTO mode and 0xc4 (IA) on RCAS.

- The watchdog condition can also be activated to detect any loss of communication between the master and the slave devices. In such case, the equipment enter into a fail-safe condition. Since the FP303 will be on a control final element, it is recommended to configure a fail-safe value.

Calibration

The calibration can be performed by a specific method that compares the reference source connected to the equipment with the desired value. At least five parameters must be used to configure this method: CAL_POINT_HI, CAL_POINT_LO, FEEDBACK_CAL, CAL_MIN_SPAN e CAL_UNIT. These parameters define the upper and the lower values for this equipment, the minimum permissible span value for calibration and the engineering unit selected for the calibration.

Pressure Trim

Using ProfibusView or Simatic PDM

The converter can be calibrated through the CAL_POINT_LO e CAL_POINT_HI parameters.

To start with, a convenient engineering unit must be selected before beginning the calibration. This engineering unit is configured by the CAL_UNIT parameter. After its configuration, the parameter related to the calibration will be converted to this unit.

The CAL_UNIT parameter requires that the engineering unit used for the calibration be chosen from the ones listed below:

UNIT	CODE
inH_2O @ 68 ºF	1148
inHg @ 0 ºC	1156
ftH_2O @ 68 ºF	1154
mmH_2O @ 68 ºF	1151
mmHg @ 0 ºC	1158
psi	1141
bar	1137
mbar	1138
g/cm^2	1144
k/cm^2	1145
Pa	1130
kPa	1133
torr	1139
atm	1140
MPa	1132
inH_2O @ 4 ºC	1147
mmH_2O @ 4 ºC	1150

Go to the Device menu and select the Calibration option.

Next select the “Lower/Upper” options:

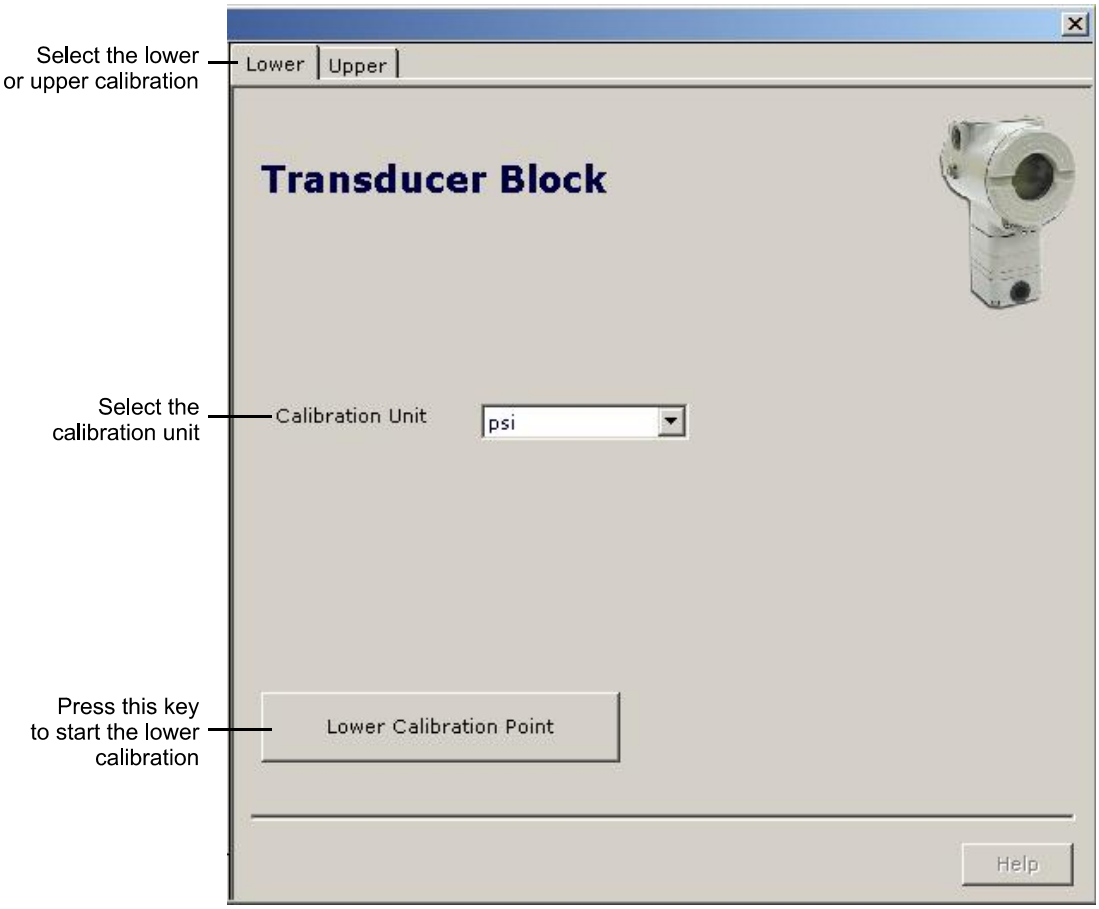


Figure 3.19 - ProfibusView

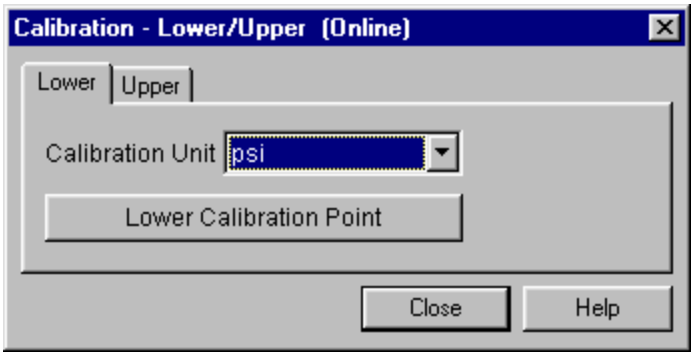


Figure 3.20 – Simatic PDM

After clicking on Lower Calibration Point, the message below is shown:

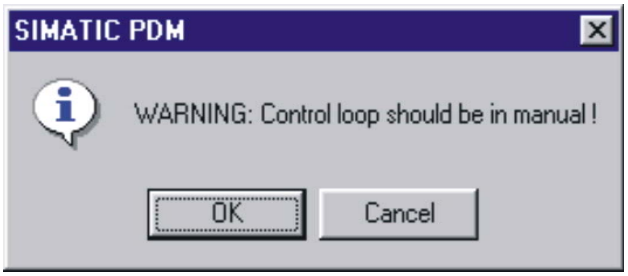


Figure 3.21 – Simatic PDM

Click on OK and enter the new calibration lower value.

Suppose it is 3.0 psi:

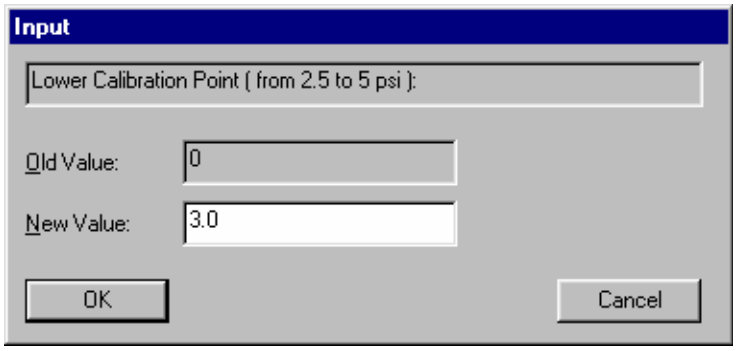


Figure 3.22 – Simatic PDM

Enter the new value, check the pressure meter and write this value:

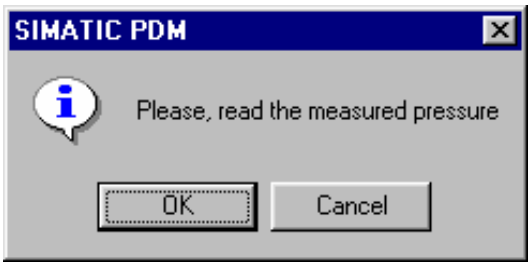


Figure 3.23 – Simatic PDM

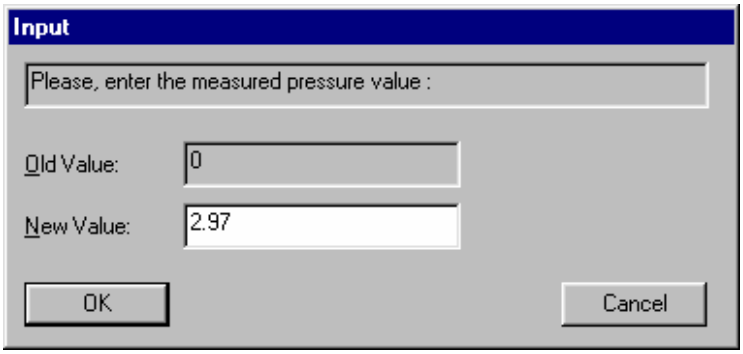


Figure 3.24 – Simatic PDM

Repeat the procedure until the pressure equals the desired value:

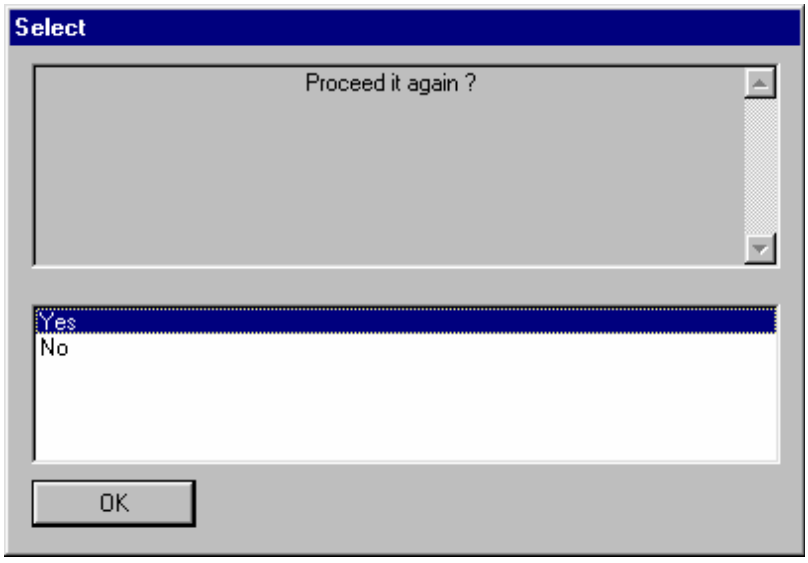


Figure 3.25 – Simatic PDM

If the calibrated current value is correct, click on “No” and a new warning appears:

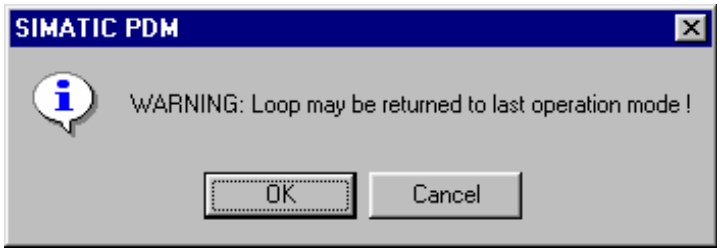


Figure 3.26 – Simatic PDM

After confirmation, the converter will return to normal operation.

The upper calibration procedure is the same as for the lower calibration.

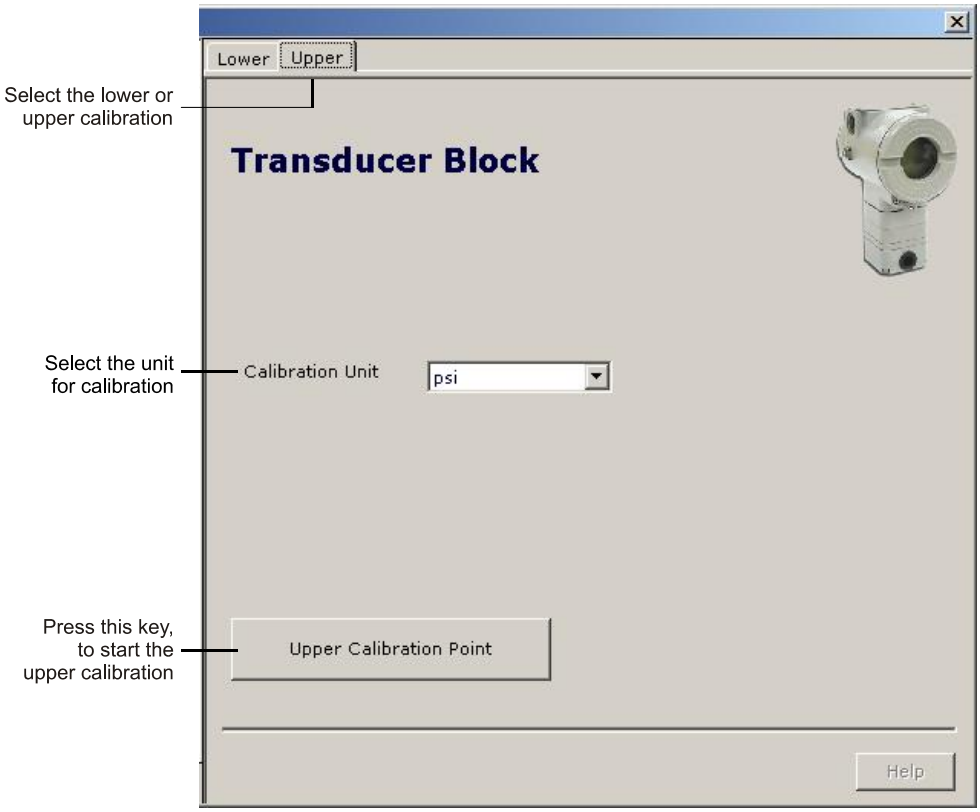


Figure 3.27 – ProfibusView

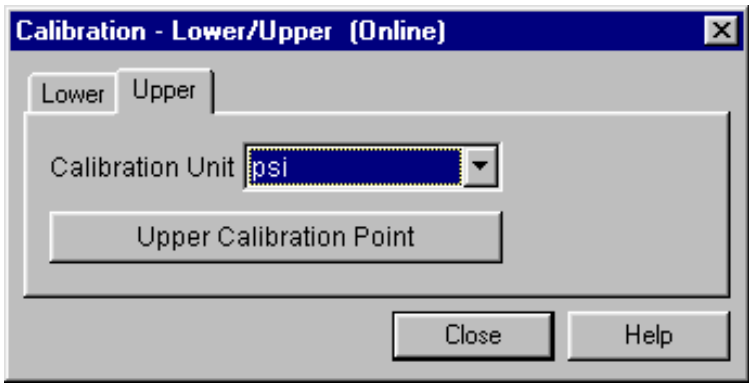
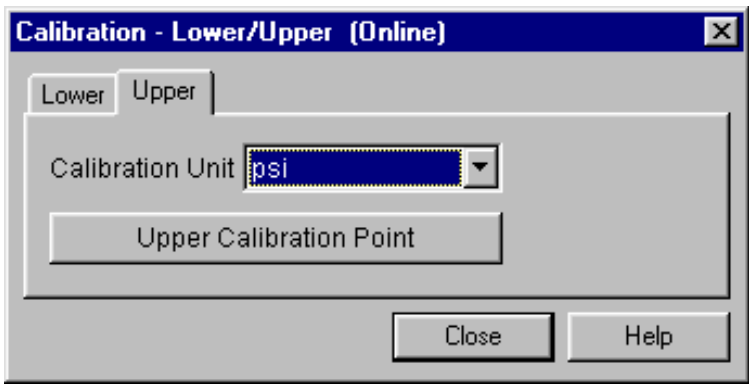


Figure 3.28 – Simatic PDM



After clicking on “Upper Calibration Point”, the following warning will be displayed:

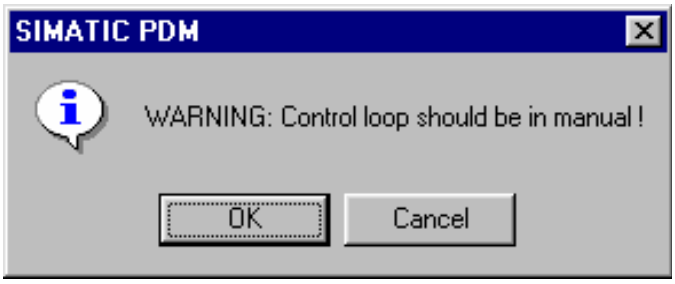


Figure 3.29 – Simatic PDM

Click on OK and enter the upper calibration value desired.

Suppose it is 15.0 psi:

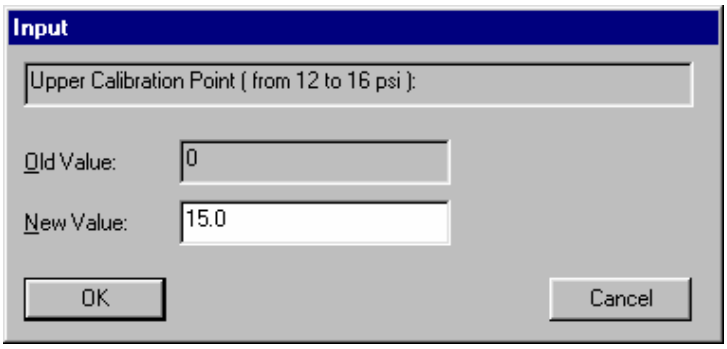


Figure 3.30 – Simatic PDM

NOTE
When calibrated for up to 30 psi the FP303 upper values will be 13 to 34 psi.

After entering the new value, check the pressure meter reading and write this value:

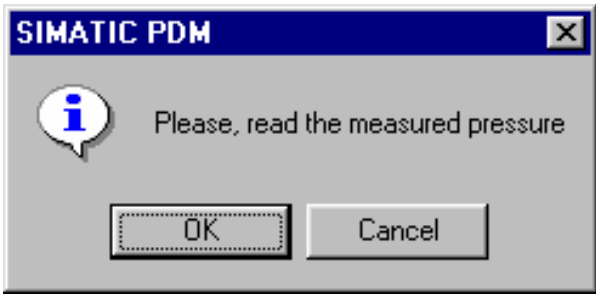


Figure 3.31 – Simatic PDM

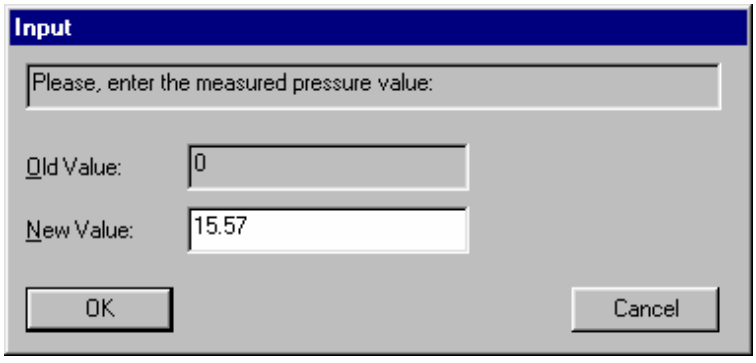


Figure 3.32 – Simatic PDM

Repeat the procedure until the pressure equals the desired value:

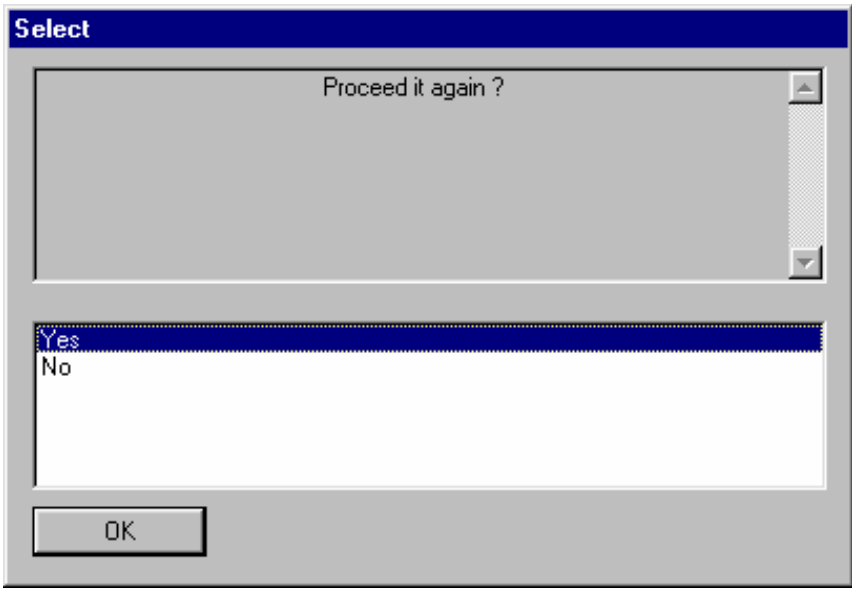


Figure 3.33 – Simatic PDM

If the calibrated value is correct, click on “No” and a new warning appears:

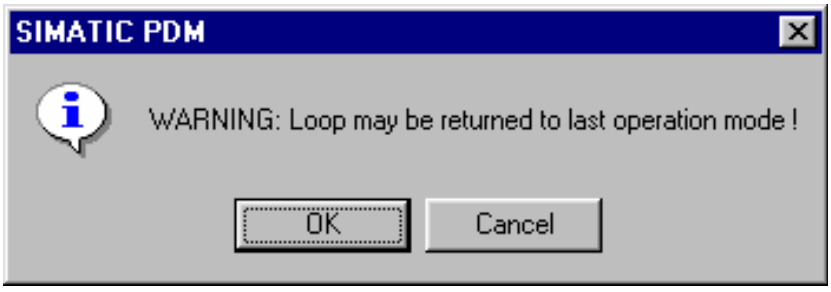


Figure 3.34 – Simatic PDM

After confirmation by the user, the converter will return to normal operation.

NOTE
The same Pressure TRIM procedure applies to the FP303 with a extended band from 3 to 30 psi.

NOTE
At each new calibration, save the existing TRIM data through the BACKUP_RESTORE parameter, by using the “Last Cal Backup”.

Temperature Calibration

The CAL_TEMPERATURE parameter is used to adjust the temperature sensor located on the converter body to improve the precision of the sensor temperature measurement. The range accepts -40 °C a +85 °C. The SECONDARY_VALUE parameter indicates the measurement value.

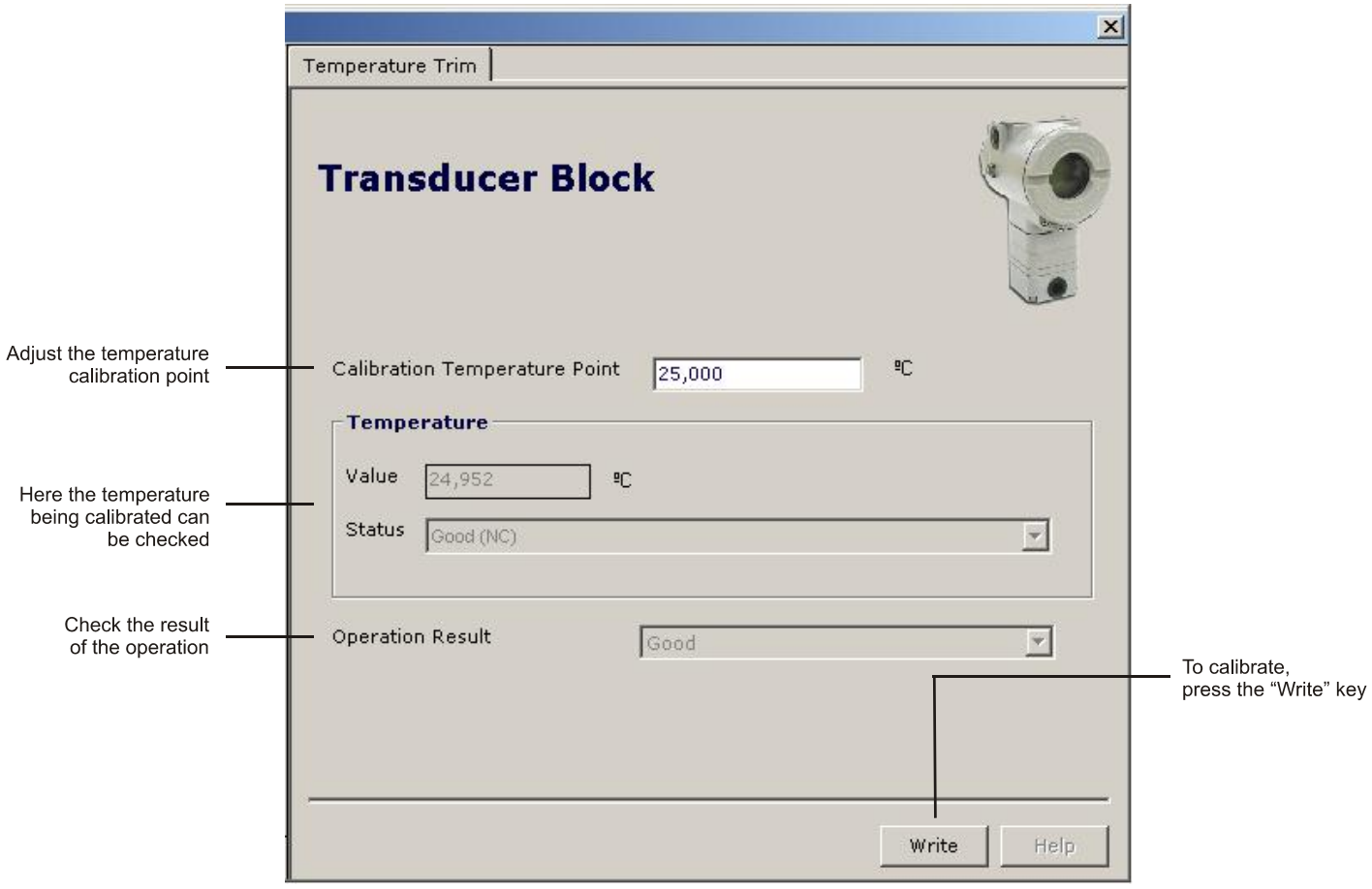


Figure 3.35 – ProfibusView Temperature Calibration

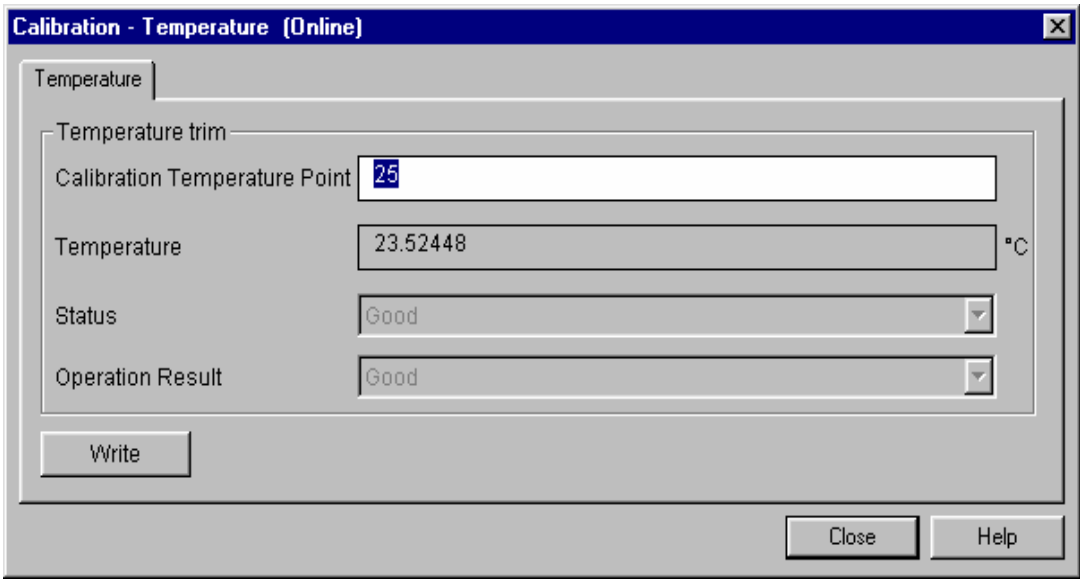


Figure 3.36 – Simatic PDM Temperature Calibration

Local Adjustment

To enter the local adjustment mode, insert the magnetic key in the “Z” orifice until the display shows “MD”. Remove the magnetic key from “Z” and place it in “S”. Remove and reinsert the magnetic tool in “S” until the “Loc Adj” message appears. The message is displayed for about 5 seconds. By placing the magnetic key in “Z”, the local adjustment or the monitoring tree can be accessed here.

Move to the “LOWER” parameter. To start the calibration, configure the “LOWER” parameter with the magnetic key placed in “S”. You may enter with 3.0 psi or a lower value. When the magnetic key is removed from “S”, the output will be adjusted on a value near the desired value. Then navigate on the tree until the “FEEDBACK_CAL” FEED parameter and work on it by positioning the magnetic key in ”S” until reaching the pressure reference value received.

Continue working on this parameter until reading 3.0 psi or the lower pressure value.

Navigate to the ‘“UPPER” parameter and position the magnetic key in “S” to start the calibration.

It is possible to enter 15.0 psi or 30 psi, for example. When the magnetic key is removed from “S”, the output will be adjusted to a value close to the desired value. This will enable to navigate on the tree until FEED (FEEDBACK_CAL) and work on it by positioning the magnetic key on “S” until reaching the desired value received from the reference pressure.

The user must continue to work on this parameter until the reading reaches 15.0 psi or 30 psi.

NOTE
The trim mode output via the local adjustment occurs automatically if the magnetic key is not used for a few seconds.

Limit conditions for calibration are:

Lower:
2.50 psi < NEW_LOWER < 5.0 psi. Otherwise, XD_ERROR=22

Upper:
12.0 psi < NEW_UPPER 16.0 psi. Otherwise, XD_ERROR=22

NOTE
If the FP303 supports the calibration of 3 to 30, the calibration condition will be from 12 psi to 34 psi.

NOTE
Codes for XD_ERROR: … 16: Default Value Set: … 22: Out of Range: … 26: Invalid Calibration Request: … 27: Excessive Correction:

Transducer Display Configuration

The display transducer block can be configured using the **ProfibusView** or the **Simatic PDM**. As the name describes, it is a transducer because its block has an interface with the display circuit.

The display transducer is treated as a normal block by any configuration tool. In other words, this block has some parameters that can be configured according to requirements.

Six parameters can be chosen to be displayed and used for monitoring or local adjustment parameters with the magnetic tool. The seventh parameter is used to access the equipment address. This address can be changed to suit the user application.

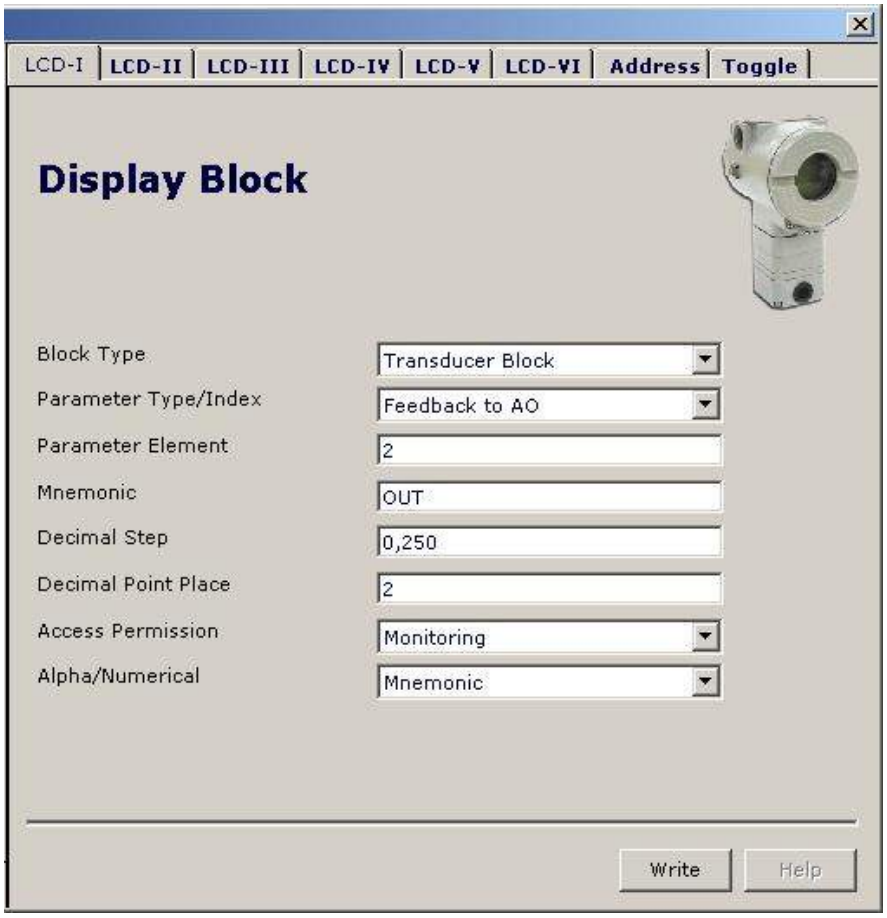


Figure 3.37 – ProfibusView Display Block

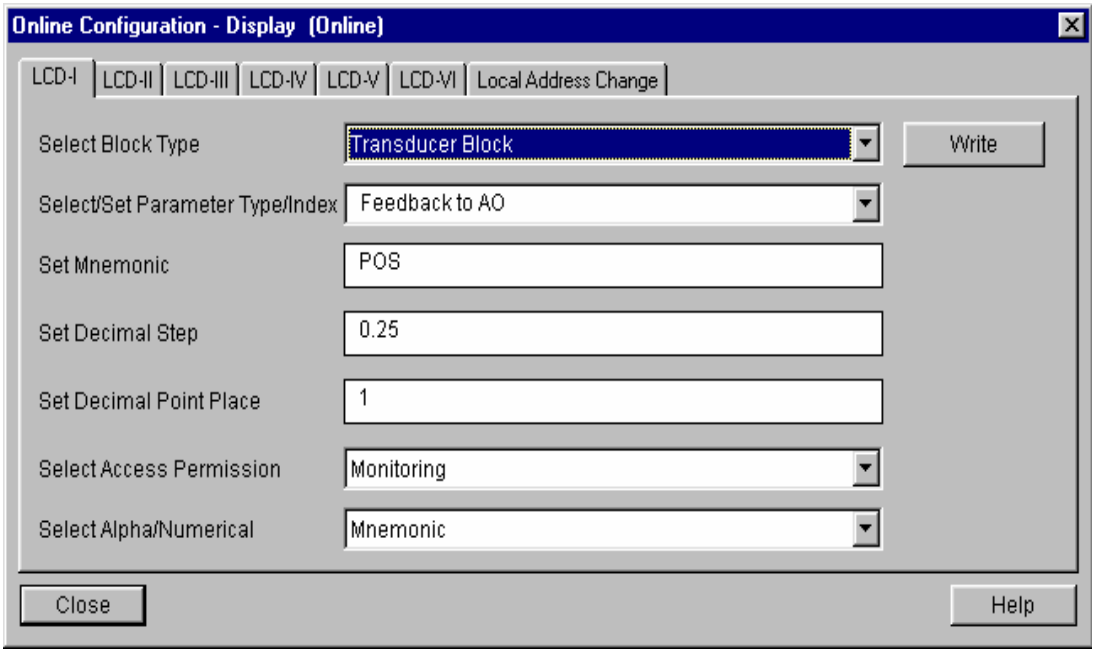


Figure 3.38 – Simatic PDM Display Block

Display Transducer Block

The local adjustment is totally configured by the ProfibusView or the Simatica PDM, namely, this block has some parameters and these can be configured according to the applications.
They are factory-configured with options to adjust the upper and lower trim, to monitor the input transducer, the output and to check the tag. Among the local adjustment possibilities, the following options can be chosen**:** block mode, output monitoring, tag visualization and adjustment of calibration parameters.

The resources on the display transducer and on all of field equipments from the Smar 303 series have the same handling methodology. As long as learned it can be used on any Smar Profibus PA field equipment.

All function blocks and transducers defined according to the Profibus PA have a description of their resources carried out by the DDL – Device Description Language.

This feature allows the configuration tools enabled by the technology of the equipment description service to interpret the equipment resources and render them capable of being configured. The 302 series function blocks and transducers were strictly defined to comply with the Profibus PA specifications in order to be interoperable with other manufacturers.

NOTE
To enable the local adjustment using the magnetic tool, the parameters must be prepared via the System Configurator.

There are six groups of parameters that can be pre-configured to enable local adjustment configuration. As an example, suppose that some parameters should not be displayed and the *None* option is selected on the *Select Block Type* parameter. In this case, the equipment won´t have the parameters indexed to its block as a valid parameter.

Parameters and Values Definition

Block Type Selection
Block where the parameter is located. User may choose: Transducer Block, Analog Input Block, Totalizing Block, Physical Block or None.

Selection / Adjustment of Parameter / Index Type
This is the index related to the parameter to be executed or only visualized
(0, 1, 2…). For each block there are pre-defined indexes. See the “Function Blocks” Manual to learn about the desired indexes and then enter the index.

Mnemonic Adjustment
This mnemonic identifies the parameter and accepts a maximum of 16 characters on the display alphanumerical field. Preferably, select the mnemonic with up to 5 characters, so that it you won´t have to rotate it in the display.

Decimal Step Adjustment
This setting increments or decrements decimal units when the parameter is defined by a Float, Float Status Value or by an Integer, when the parameter is in whole units.

Decimal Point Adjustment
The number of digits following the decimal figure (0 to 3 decimal digits).

Access Permission Adjustment
This setting allows the user to read in the “Monitoring” option and record when the “action” option is selected. So, the display will show the increment and decrement arrows.

Alphanumerical Adjustment
These parameters include two options: value and mnemonic. On the Value option it is possible to show data in the numerical and alphanumerical fields. Hence, a data higher than 10000 will be shown in the alphanumerical field, being useful when displaying the total on the LCD.

On the Mnemonic option, the display can show the data on the Numeric field and the Mnemonic on the alphanumerical field.

NOTE
For equipment with a software version bigger than or equal to 1.10, check the Programming section using Local Adjustment.

To visualize a given tag, choose the relative index equal to the tag. To configure other parameters, select the "LCD-II" a "LCD-VI" tab.

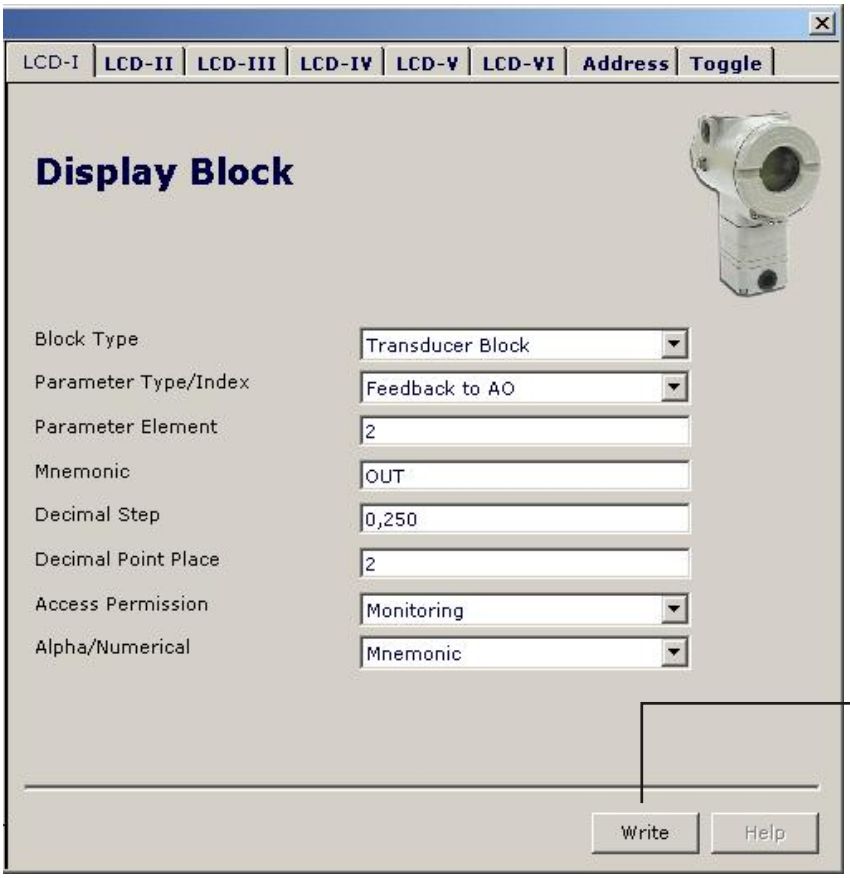


Figure 3.39 – ProfibusView Parameters for Local Adjustment Configuration

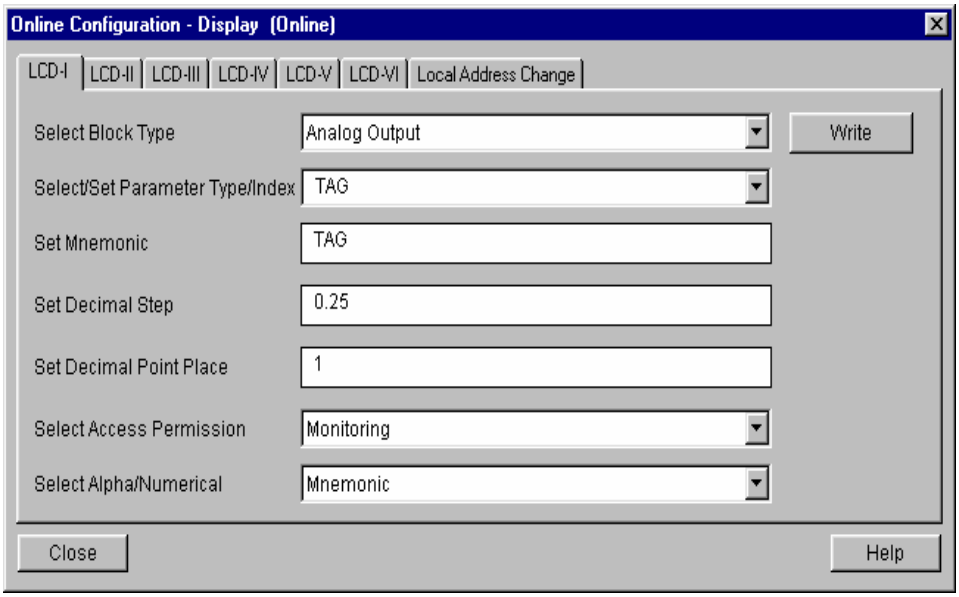
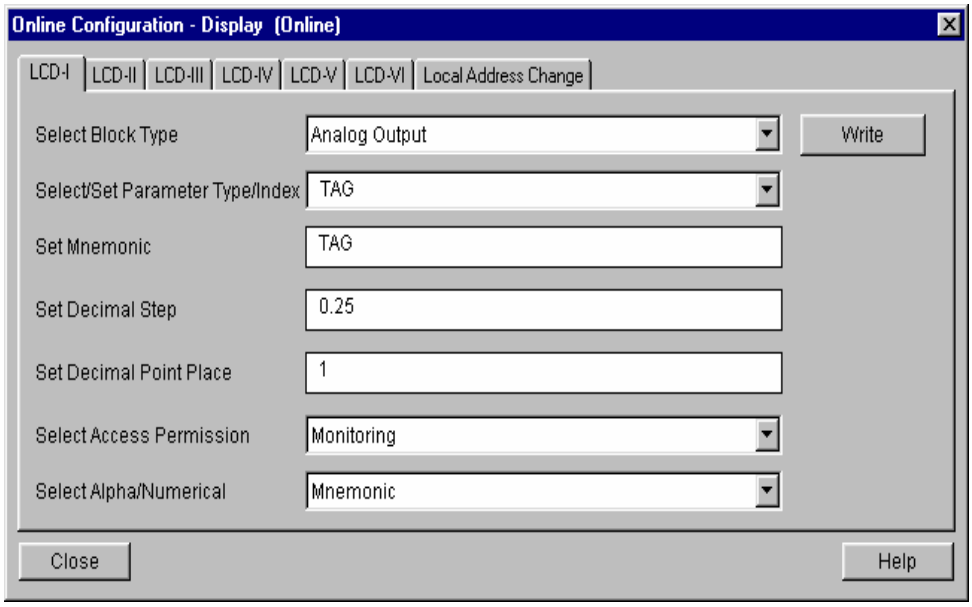


Figure 3.40 - Simatic PDM Parameters for Local Adjustment Configuration



The Local Address Change tab below allows changing the local address and also Enable/Disable the access to the equipment physical address change.

When the “Enable” option is selected, the user can change the equipment physical address

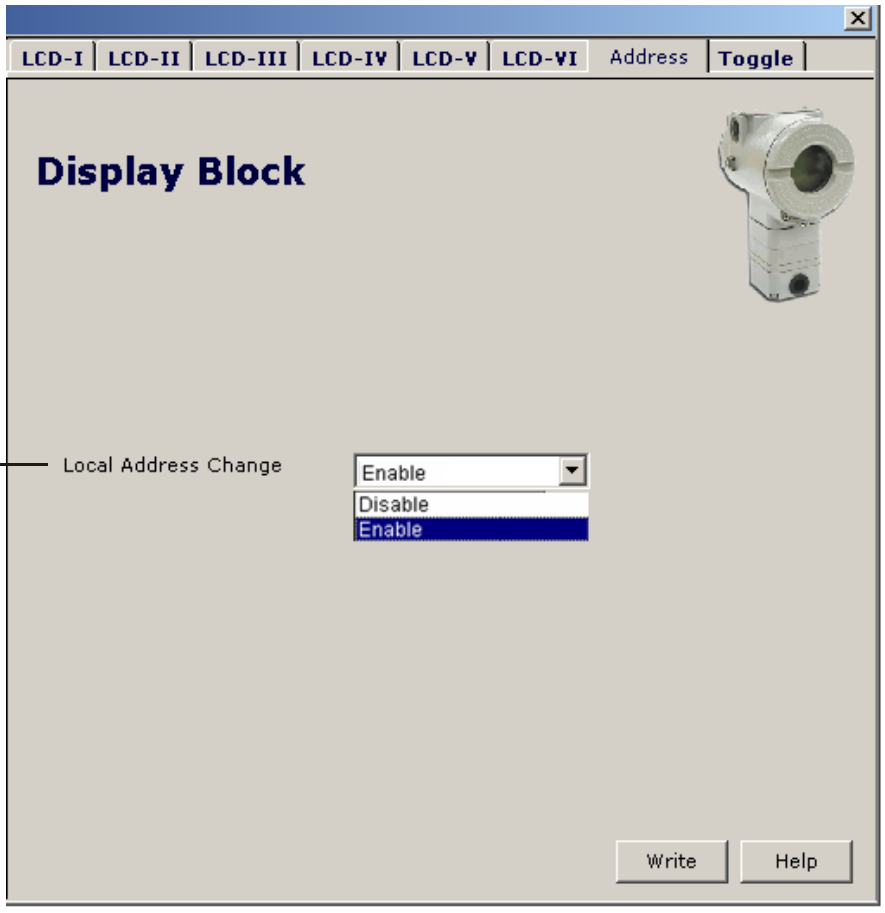


Figure 3.41 – ProfibusView Parameters for Local Adjustment Configuration

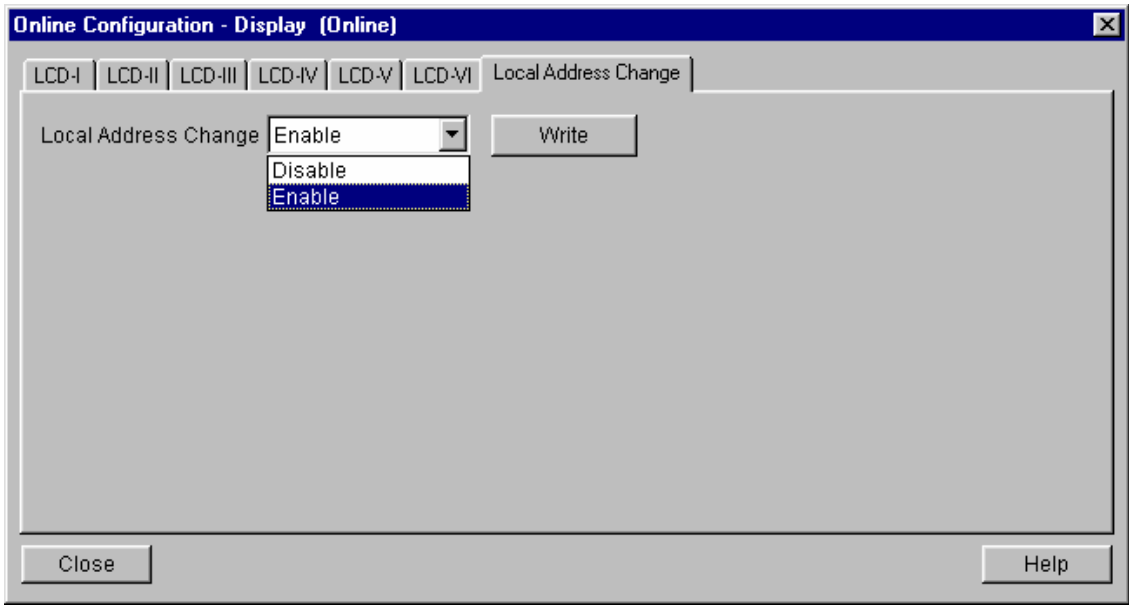


Figure 3.42 – Simatic PDM Parameters for Local Adjustment Configuration

When the user leaves the normal operation (monitoring, for example), enters the local adjustment and rotate the magnetic tool to visualize the parameters, the last parameter will be displayed if the parameter has Permission Access equal to Monitoring.

Two parameters will always be displayed at the same time, alternating between the parameters configured on the LCD-II and the last monitoring parameter. If you don´t want two simultaneous parameters, choose “None” when configuring the LCD-I. This is valid for versions lower than 1.10. For higher versions, switch between up to six displayed parameters, according to the local adjustment “toggle” parameter.

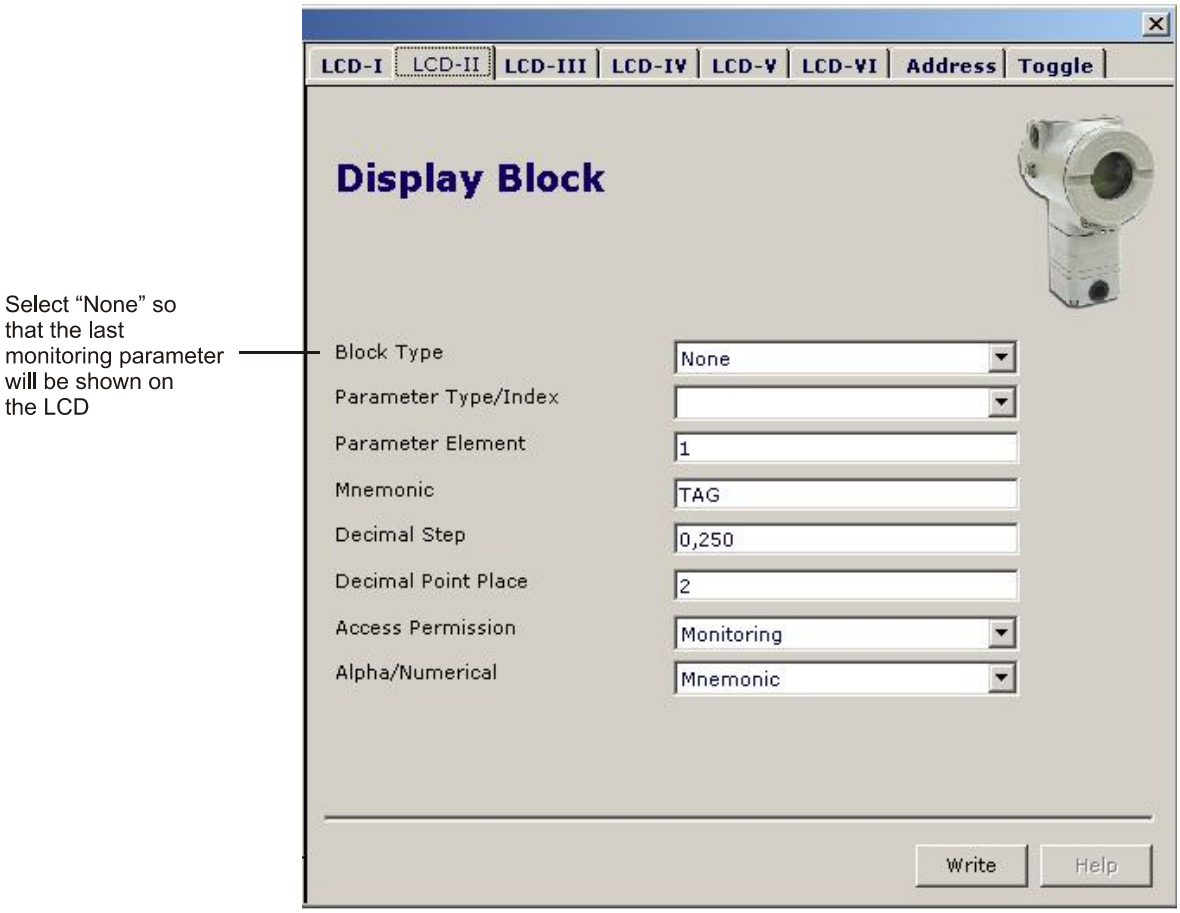


Figure 3.43 – ProfibusView Parameters for Local Adjustment Configuration

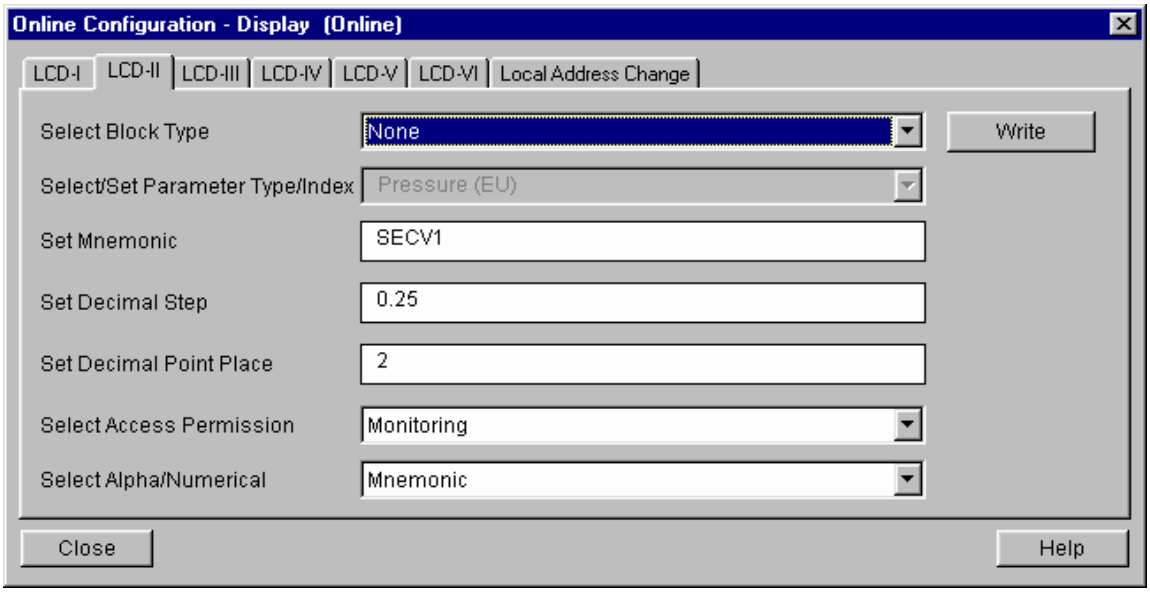


Figure 3.44 – Simatic PDM Parameters for Local Adjustment Configuration

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

This option will display the Mode Block parameter on the LCD

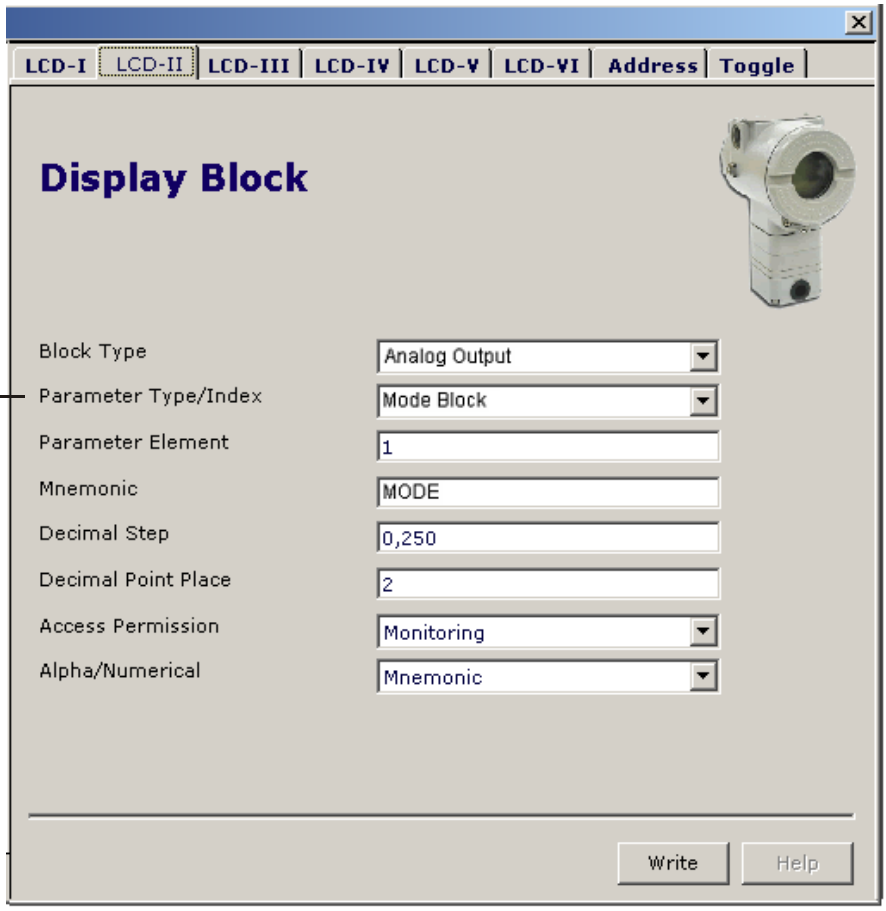


Figure 3.45 – ProfibusView Parameters for Local Adjustment Configuration

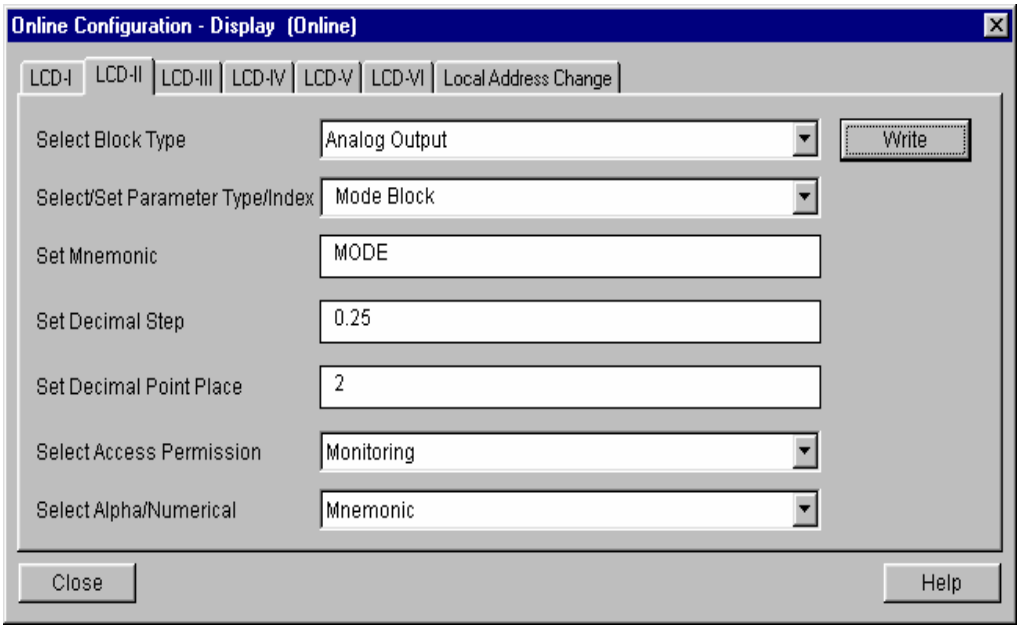


Figure 3.46 – Simatic PDM Parameters for Local Adjustment Configuration

Local Adjustment Configuration

The local adjustment is entirely configured by the ProfibusView or Simatic PDM. Therefore, the user chooses the option that best suits his application. The converter is factory-configured with options for lower and upper trim adjustment, input monitoring, transducer output and tag configuration.

Normally, the converter is configured with the configuration tool, but the display functionality works faster on certain parameters, since it does not require connections on the communication electric network. The local adjustment emphasizes the following options: mode block, output monitoring, tag visualization and tuning parameter configuration.

All of Smar Series 303 field equipment present the same methodology for handling the resources of the display transducer. Hence, the user learns one time and can handle all of the Smar field equipments.

NOTE
This local configuration is merely a suggestion. The user can choose the most viable configuration, by simply configuring the display block (see Display Transducer Block).

The converter has two identification orifices marked with the letters “S” e “Z”, which are accessed by two Reed Switches activated by inserting the magnetic tool handle in those orifices.

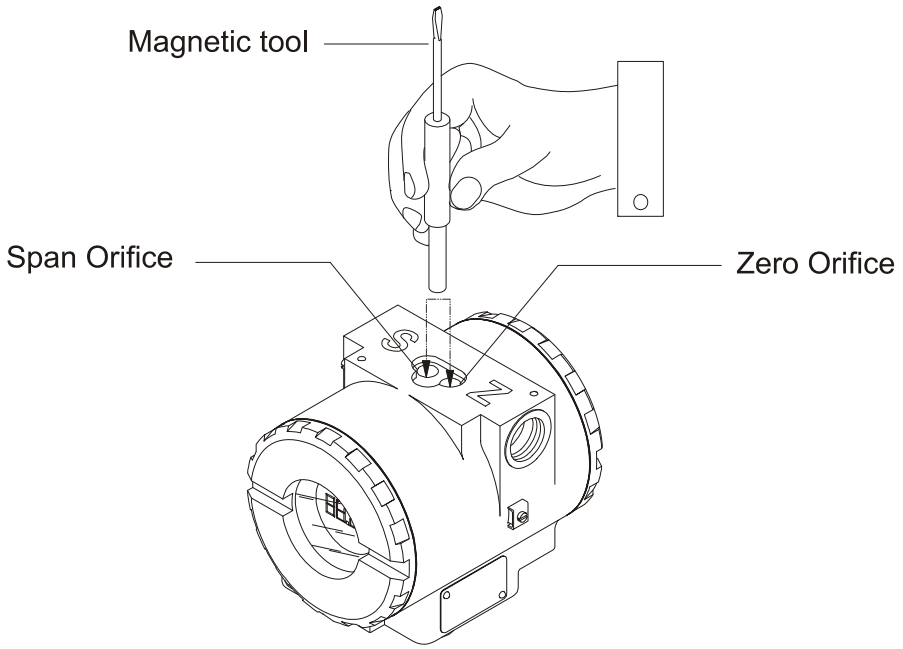


Figure 3.47 – Local Adjustment Orifices

The table 3.4 shows the action accomplished by the magnetic tool when inserted in (Z) and (S) according to the adjustment selected.

ORIFICE	ACTION
Z	Initializes and moves among the available function.
S	Selects the function shown on the display.

Table 3.4 –Function of Housing Top Orifices

Jumper J1 Connection

If Jumper J1 is connected to the pins under the word ON, the simulation mode will be enabled on the AO block.

Jumper W1 Connection

If Jumper J1 is connected to ON and enabled to execute configurations, the most important block parameters and the pre-configured communication can be adjusted to it.

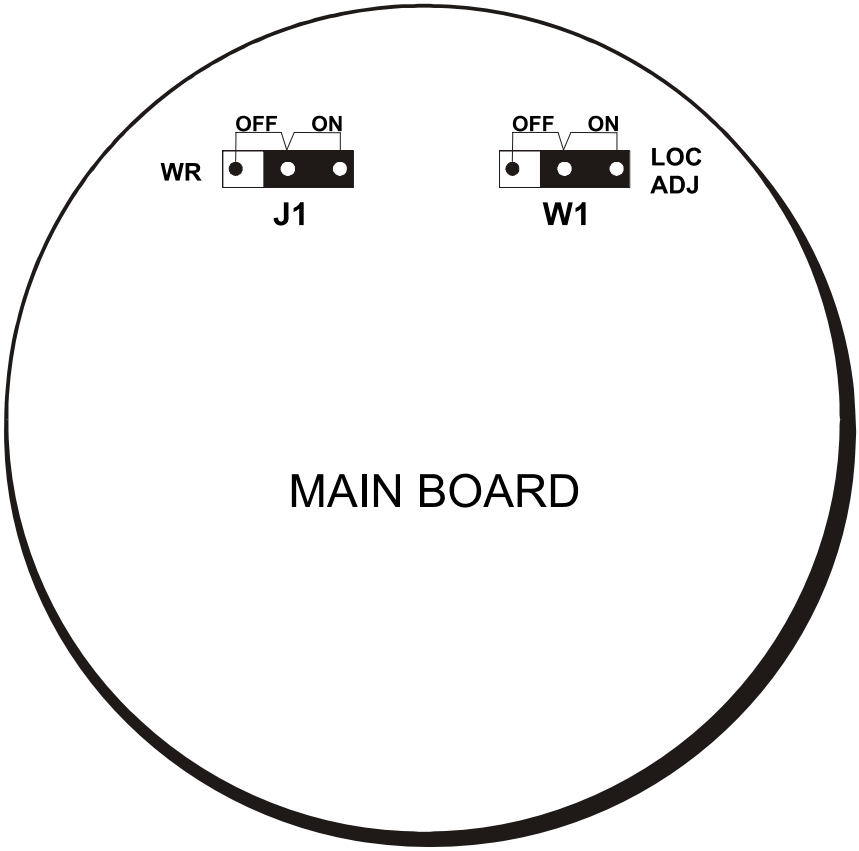
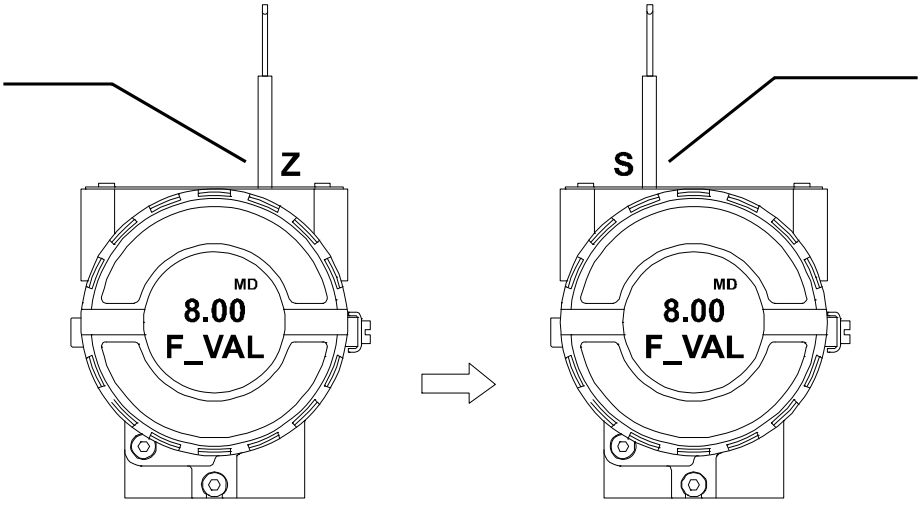


Figure 3.48 – Jumpers J1 and W1

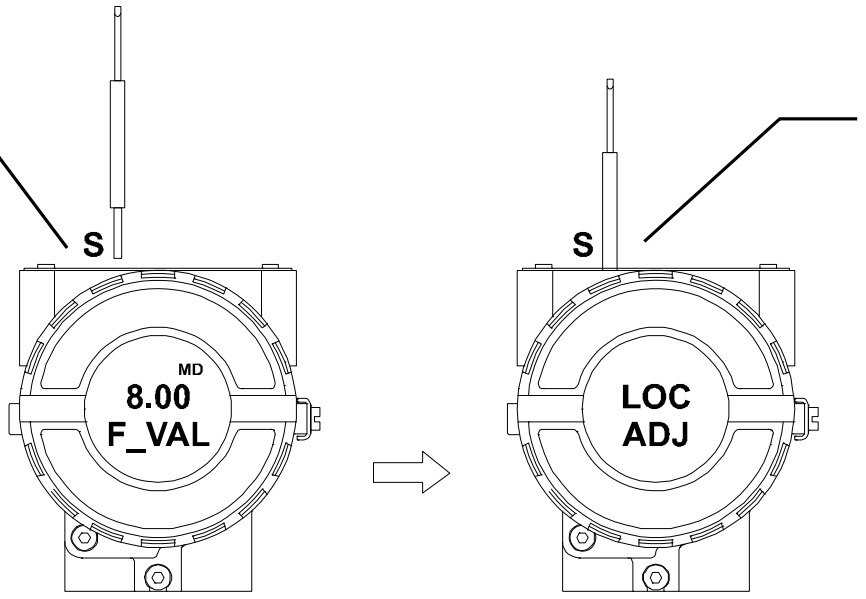
To begin the Local Adjustment, insert the magnetic tool in the "Z" orifice and wait for the "MD" letters to appear



Insert the magnetic tool in the "S" orifice and wait 5 seconds

Figure 3.49 –FP303 Step 1

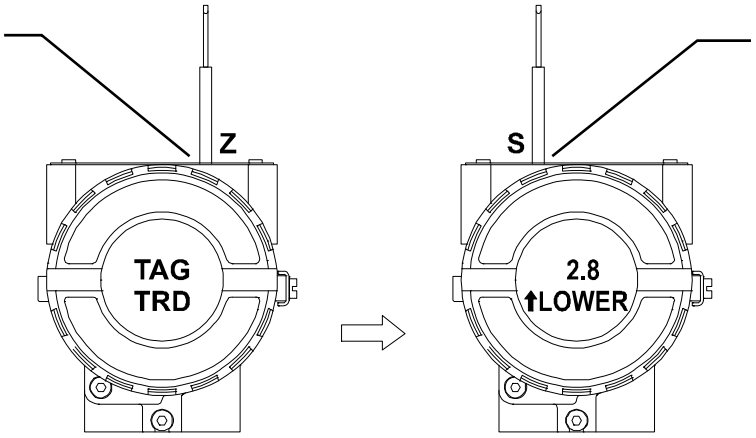
Remove the magnetic key from the “S” orifice



Remove the magnetic key from the “S” orifice one more time and wait for “LOC ADJ” to appear.

Figure 3.50 – FP303 Step 2

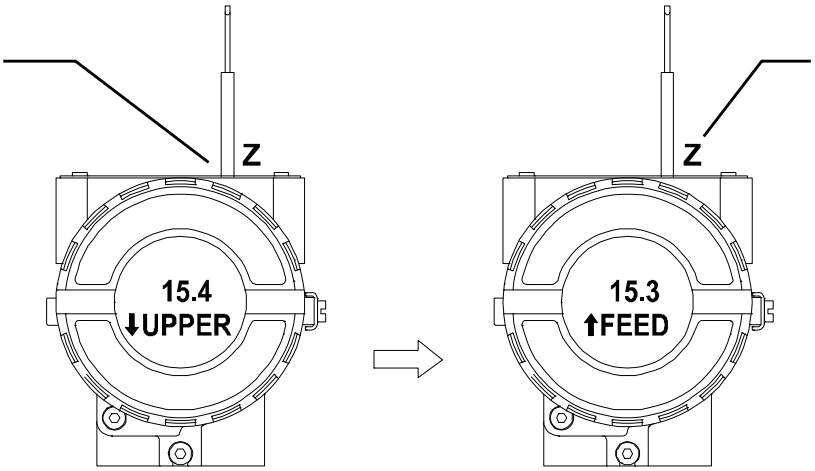
Insert the magnetic key in the “Z” orifice. In the first configuration, the option displayed will be AG with its mnemonics configured by Syscon. Otherwise, the option shown on the display will the one configured before. With the key inserted in the orifice, the local adjustment menu can be rotated



This parameter is used to calibrate the lower pressure point. To calibrate the lower value, insert the magnetic key in the “S” orifice until LOWER appears on the display. An upward pointing arrow (↑) will increment the value and a downward pointing arrow (↓) will decrement the value. Write 3 ps, e.g., for the lower parameter. Connect a gauge meter to the FP303 and read the value of the measured pressure. Enter the FEED parameter and correct the desired pressure

Figure 3.51 – FP303 Step 3

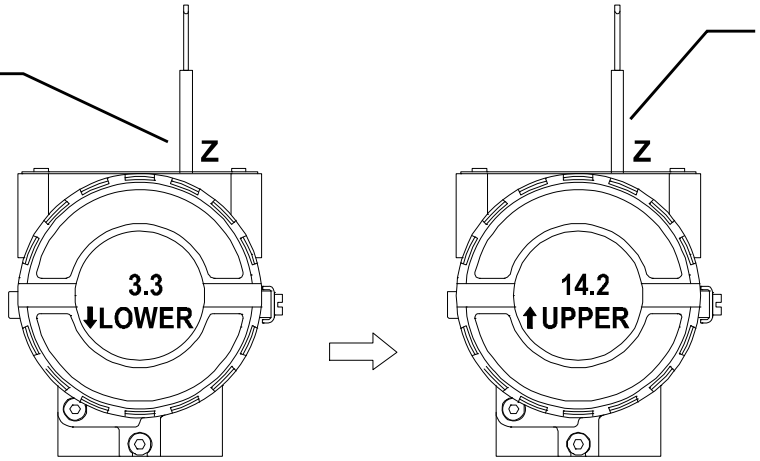
Insert the magnetic key in the “Z” orifice to change the arrow downwards and keep it inserted to decrement the upper value



The FEED option allows the pressure calibration to be corrected. To implement the correction, read the pressure measured in the gauge meter and enter this value. This option may correct the upper and lower calibration points. An arrow pointing upwards increments the current value

Figure 3.52 – FP303 Step 4

Insert the magnetic key in the “Z” orifice to change the arrow downwards and insert and keep the tool in “S” to decrement the lower value



The parameter calibrates the upper current point. To do it, insert the magnetic tool in the “S” orifice until UPPER appears on the display. An upward arrow (↑) will increment the value and downward arrow (↓) will decrement it. For example, write 15 psi as upper value. Connect a gauge meter to the FP303 and read the measured pressure value. Enter the FEED parameter and correct the desired pressure

Figure 3.53 – FP303 Step 5

Insert the magnetic key in the “S” orifice to change the arrow downwards and decrement the calibration pressure according to the value measured on the gauge meter. A downward pointing arrow (↓) will decrement the value

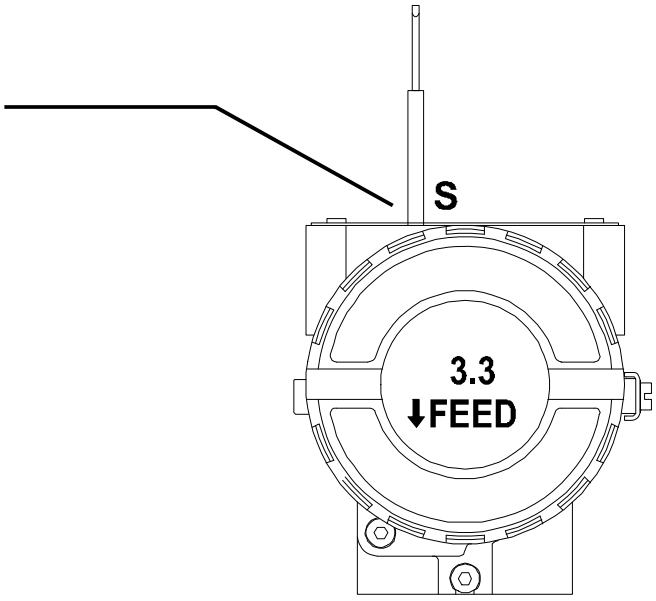
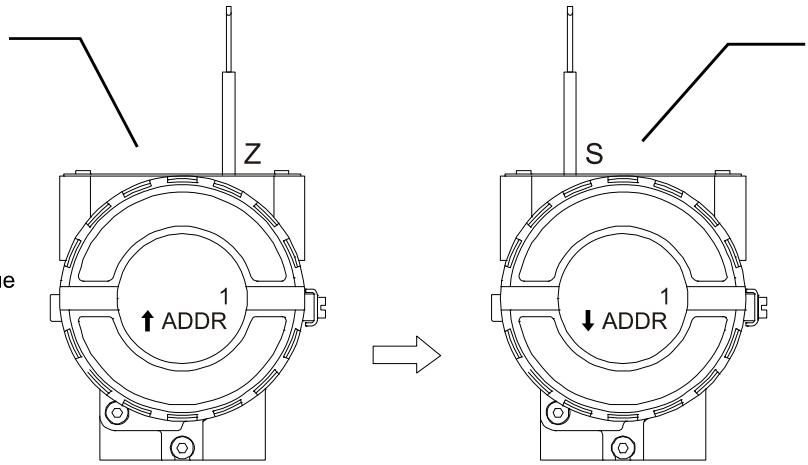


Figure 3.54 – FP303 Step 6

To change the address value, remove the magnetic tool from orifice “Z” when ADDR appears on the display. An upward arrow (↑) increments the address and a downward arrow (↓) decrements the address. To increment the address, insert the key in “S” to adjust the desired value



To decrement the address value, insert the magnetic key in “Z” to point the arrow downwards. Insert and keep it in “S” to adjust the desired value

Figure 3.55 – FP303 Step 7

Cyclical Diagnosis

Via cyclic communication is possible to verify diagnostics from the **FP303** 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 3.56 and 3.57) 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.

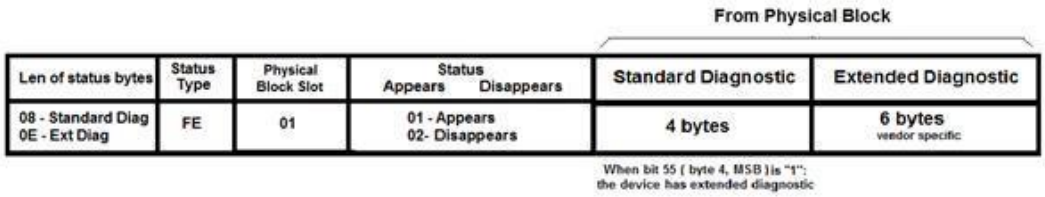


Figure 3.56 – Cyclical Diagnosis

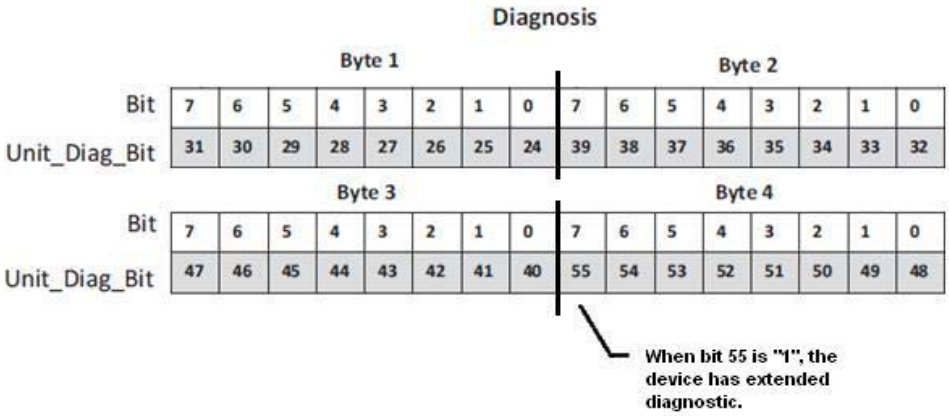


Figure 3.57 – Cyclic Diagnosis mapping for 4 bytes of Physical Block.

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)   = "Electronic temperature alarm"
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 03
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)   = "SP range violation"
Unit_Diag_Bit(57)   = "Digital Analog Convertion range violation"
Unit_Diag_Bit(58)   = "Sensor pressure failure"
Unit_Diag_Bit(59)   = "Device is in calibration procedure"
Unit_Diag_Bit(60)   = "Calibration Error - Check XD_ERROR parameter"
Unit_Diag_Bit(61)   = "Not used 61"
Unit_Diag_Bit(62)   = "Not used 62"
Unit_Diag_Bit(63)   = "Device is in Writing Lock"


Unit_Diag_Bit(64)   = "AO Block in Out of Service"
Unit_Diag_Bit(65)   = "AO Block 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)   = "Not used 72"
Unit_Diag_Bit(73)   = "Not used 73"
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 72"

Unit_Diag_Bit(80)   = "Not used 80"
Unit_Diag_Bit(81)   = "Not used 81"
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 **FP303** is configured to "Profile Specific" mode. When in "Manufacturer Specific" mode, the Identifier Number is 0x0898. Once the Identifier_Number_Selector is changed from "Profile Specific" to "Manufacturer Specific" or vice-versa, one must wait 5 seconds while the datais saved. Then, turn the **FP303** off and turn it on again. So, the Identifier Number is updated to the communication level. If the equipment is in "Profile Specific" and using the GSD file Identifier Number equals 0x0898, the acyclic communication will work with the tools based on EDDL, FDT/DTM, but no cyclic communication with the Profibus-DP master.

Section 4

MAINTENANCE PROCEDURE

General

NOTE
Equipment installed in hazardous atmospheres must be inspected in compliance with the IEC60079-17 standard.

The PROFIBUS **FP303** pressure converters are intensely tested and inspected before reaching the user. However, they were designed for the possibility to be repaired by the user if necessary.

In general, the user is recommended not to repair the printed circuit boards. Instead, he should keep extra repair parts or acquire them from Smar.

DIAGNOSTICS	
SYMPTOM	**PROBABLE CAUSE**
WITHOUT QUIESCENT CURRENT	**PROFIBUS Converter Connections** Check the wiring polarity, ground and wiring integrity **Power Source** Check the power source output. The voltage at the FP303 terminals must be between 9 and 32 Vdc. **Electronic Circuit Failure** Check the boards for defects and replace them with spare ones.
NO RESPONSE	**Network Connection** Check the network connections: equipment, power source and terminals. **Network Impedance** Check the network power source and terminators impedance. **Converter Configuration** Check the communication parameters configuration. **Network Configuration** Check the network communication configuration. **Electronic Circuit Failure** Try to replace the converter circuit with spare parts.
INCORRECT PRESSURE OUTPUT	**Output Terminal Connections** Check for possible pressure leaks. **Pressure Supply** Check the air supply. The FP303 input pressure must be between 18 and 100 psi. **Calibration** Check the converter calibration. Use the FYCAL. **Blocked restriction or vent** Use the procedures on the following section about Cleaning the Restriction and the vents

If the current problem is not described on the above table, follow the instructions below.

NOTE
The “Factory Init” must be performed as the last option to recover the control of the equipment when presenting any problem related to functional blocks or the communication. This operation should only be carried out by authorized personnel and with the process disconnected, since the equipment will be configured with factory default data. This procedure erases all the configurations applied on the equipment; after this procedure, it will be necessary to partially download the user configuration via SYSCON. Two magnetic tools are used for this operation. On the equipment, remove the screw that fixes the ID tag on the top of the housing to reach the holes marked with the letters “S” and “Z”. The operations to be performed are: 1) Turn off the equipment, insert the tools in the magnetic part of holes; 2) Power the equipment; 3) When the display shows “Factory Init”, remove the tools; a “S” symbol will appear on the display upper right corner; when it turns off, the equipment reaches indicating the end of the operation. This procedure will recover the entire factory default configuration and eliminate possible problems occurred with the converter communication.

Disassembly Procedure

Refer to the exploded view. Turn off the power and cut the supply air before dismounting the converter.

Transducer

To remove the electronic housing transducer, disconnect the electric connections and the main board connector on the Field Terminals side.

Loosen the housing locking screw (7) and carefully release the transducer from the electronic housing, without twisting the flat cable.

ATTENTION
Do not rotate the electronic housing more than 270” without disconnecting the electronic circuit from the power source.

Figure 4.1 – Transducer Rotation

Electronic Circuit

To remove the circuit (5) and the display (4) boards, first loosen the locking screw from the cover (6) on the side opposite to the “Field terminal”, and release the cover (1).

ATTENTION
The boards have CMOS components that could be damaged by electrostatic discharges. Observe the correct procedure to handle the CMOS components. Also store the circuit boards in electrostatic-proof bags.

Restriction Cleaning Procedures

The instrumentation air is applied to the converter through a restriction. Check periodically the restriction and remove all impurities to ensure the converter high performance.

1. Turn off the converter and remove the air pressure.

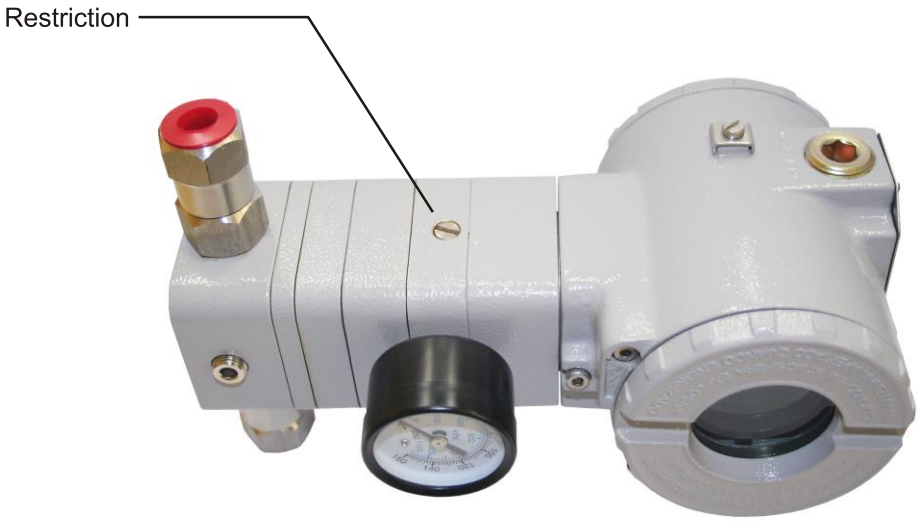


Figure 4.2 – Location of the Restriction on the converter

1. Remove the restriction screw with a screwdriver.

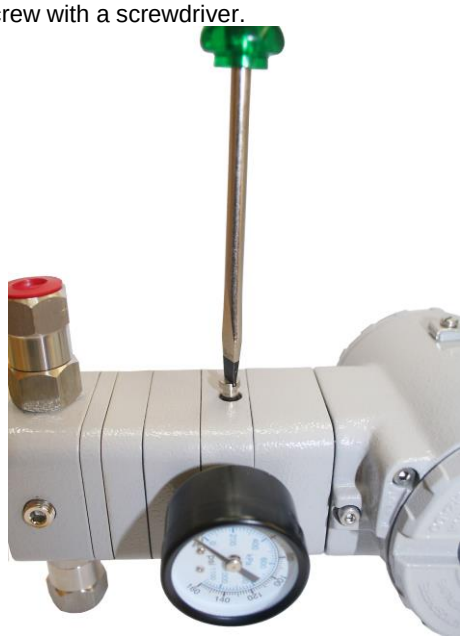


Figure 4.3 – Removing the restriction from the converter

3. Remove carefully the o-rings;

4. Dip the part in oil thinner and dry it with compressed air directly in the smaller hole so that the outlet is on the larger hole.

5. Insert the PNE 400-0726 cleaning tool in the smaller hole to clean and avoid obstructions.

Figure 4.4 – Restriction and cleaning needle

Figure 4.5 – Cleaning Procedure Scheme

6. Reassemble the O-rings and screw the restriction on the converter.
7. The equipment pressurized again.

Assembly Procedure

Transducer

Assemble the transducer on the housing by rotating it clockwise until it stops. Then rotate it anticlockwise until setting the housing front with the transducer front. Tighten the transducer locking screw (7) to lock the housing cover.

Exhausting outputs

The pressure is released into the atmosphere through a vent located on the oposite side of the transducer identification plate. Any interference or blocking the vents will compromise the equipment performance. Clean the vents by spraying proper solvents.

Filtering Elements Replacement

The replacement of the converter filters must be carried out within a minimum of 1 (one) year (see exploded view scheme – position 34). A periodical cleaning is recommended at each 6 (six) months. The converter air supply must be clean, dry and non-corrosive, compliant with "Quality Standard for Instrument Air" - (ANSI / ISA S7.0.01 – 1996).

If the air pressure is not in adequate conditions, the user must consider replacing the filtering element more frequently.

Electronic Circuit

Attach the transducer connector and the power source connector to the main board. Attach the display (4) to the main board (5). Verify the four viable mounting positions. The arrow indicates the upward position.

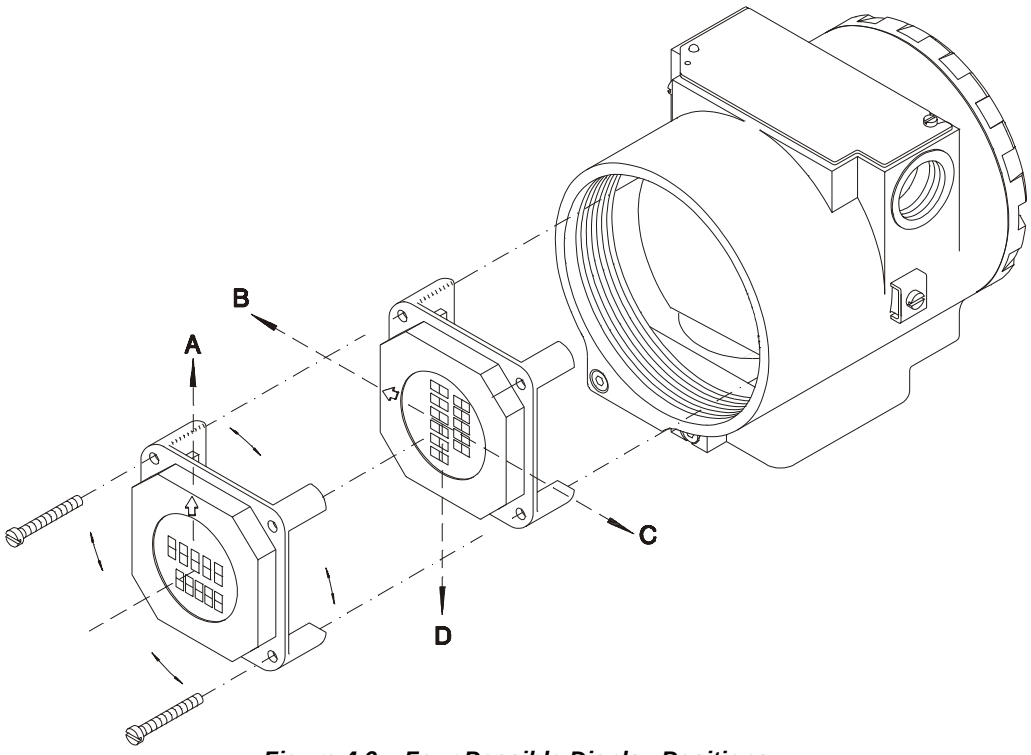


Figure 4.6 – Four Possible Display Positions

Screw the display on the main board (3).

Then tighten the display cover (1) to complete the assembly procedure. The converter is ready for mounting and testing.

Electric Connections

A plug must be installed on the non-used electric connection to avoid humidity. The plug must comply with the equipment area.

Interchangeability

The main board can be replaced by a similar one for the converter to work normally. There is an EEPROM on the transducer that stores the trim value, hence avoiding the need for a re-calibration.

Packaging Contents

Check the packaging content. The supplied quantity marked with a (*)comply with the number of converters.

- PROFIBUS PA Converter
- Mounting Bracket
- Magnetic tools for local configuration (*)
- Restriction Cleaning Needle (*)
- Instructions Manual (*)
- CD with Smar device library.

Exploded View

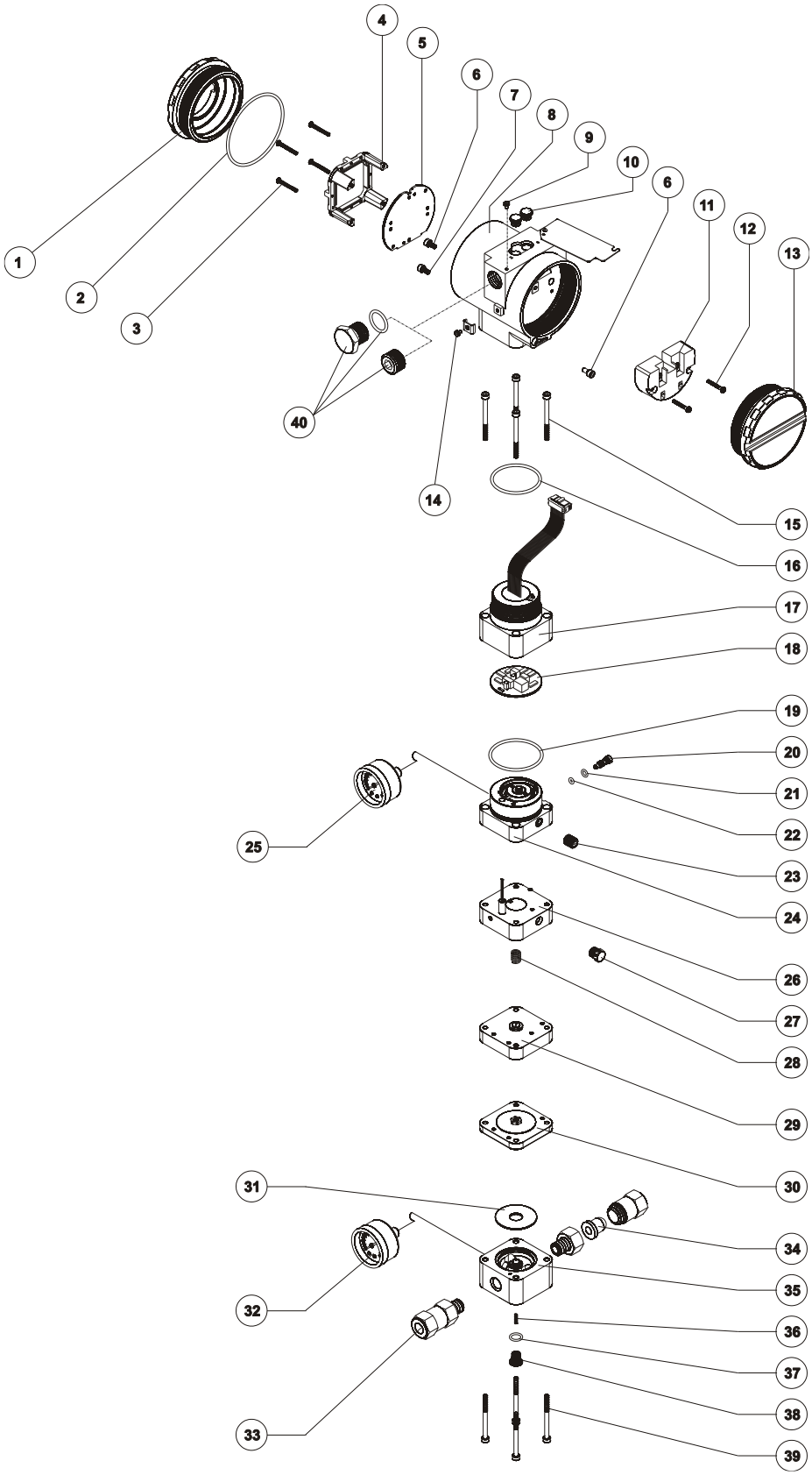


Figure 4.7 – Exploded View

Accessories and Related Products

ACCESSORIES AND RELATED PRODUCTS	
ORDERING CODE	**DESCRIPTION**
400-0726	Restriction Cleaning needle
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	Field Device interface
FYCAL	Calibration Device for Pressure Transducer
PBI	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 PARTS LIST			
PARTS DESCRIPTION	**POSITION**	**CODE**	**CATEGORY (NOTE 4)**
HOUSING - Aluminum **(NOTE 1)**			
- 1/2 - 14 NPT	8	304-0190	-
- M20 x 1.5	8	304-0191	-
- PG 13.5 DIN	8	304-0192	-
HOUSING - 316 Stainless Steel **(NOTE 1)**			
- 1/2 - 14 NPT	8	304-0193	-
- M20 x 1.5	8	304-0194	-
- PG 13.5 DIN	8	304-0195	-
Cover without display (included O-ring)			
- Aluminum	1 e 13	204-0102	-
- 316 Stainless Steel	1 e 13	204-0105	-
Cover with Display (O-ring included)			
- Aluminum	1	204-0103	-
- 316 Stainless Steel	1	204-0106	-
COVER LOCKING BOLT	6	204-0120	-
SENSOR LOCKING BOLT			
- M6 Without Head Screw	7	400-1121	-
EXTERNAL GROUND BOLT	14	204-0124	-
IDENTIFICATION PLATE FIXING BOLT	9	204-0116	-
LOCAL ADJUSTMENT PROTECTION COVER	10	204-0114	-
DIGITAL INDICATOR	4	214-0108	A
TERMINAL INSULATOR	11	400-0059	A
GLL 1007 MAIN BOARD	5	400-0325	A
O-RINGS COVER **(NOTE 2)**			
- Buna-N	2	204-0122	B
TERMINAL HOLDING BOLT HOUSING			
- Housing in 316 Aluminum	12	304-0119	B
- Housing in 316 Stainless Steel	12	204-0119	B
MAIN BOARD BOLT HOUSING IN ALUMINUM			
- Units with indicator	3	304-0118	B
- Units without indicator	3	304-0117	B
MAIN BOARD BOLT HOUSING IN 316 STAINLESS STEEL			
- Units with indicator	3	204-0118	B
- Units without indicator	3	204-0117	B

SPARE PARTS LIST			
PARTS DESCRIPTION	**POSITION**	**CODE**	**CATEGORY (NOTE 4)**
CONNECTION COVER - ALUMINUM	15,16,17,18	400-1090	A
CONNECTION COVER - 316 STAINLESS STEEL	15,16,17,18	400-1091	A
- Connection Cover Bolt	15	400-1092	-
- Buna-N Neck O-ring **(NOTE 2)**	16	204-0113	B
- Assembled Connection Cover - Aluminum	17	400-0074	-
- Assembled Connection Cover - 316 Stainless Steel	17	400-0391	-
- GLL 1143 Analog Board	18	400-1093	-
PIEZO BASE SET – ALUMINUM	19,20,21,22,23,24,25	400-0645	A
PIEZO BASE SET – 316 STAINLESS STEEL	19,20,21,22,23,24,25	400-0646	A
- Base and Block O-ring **(NOTE 2)**	19	400-0085	B
- Restriction	20	344-0165	B
- Restriction External O-ring **(NOTE 2)**	21	344-0155	B
- Restriction Internal O-ring **(NOTE 2)**	22	344-0150	B
- Syntherized Bushing	23	400-0033	B
- Assembled Base – Aluminum	24	400-0075	A
- Assembled Base – 316 Stainless Steel	24	400-0392	A
- Analog indicator (Gage – Carbon Steel)	25	209-0400	B
- Analog indicator (Gage - 316 Stainless Steel)	25	400-0395	B
SENSOR BLOCK SET - ALUMINUM	26,27,28	400-1094	-
SENSOR BLOCK SET - 316 STAINLESS STEEL	26,27,28	400-1095	-
- Aluminum Set Sensor Block	26	400-1096	-
- 316 Stainless Steel Set Sensor Block	26	400-1097	-
- Vent Plug - 304 Stainless Steel	27	400-0654	-
- Sensor Spring	28	400-1098	-
ASSEMBLED UPPER DIAPHRAGM – ALUMINUM	29	400-1099	-
ASSEMBLED UPPER DIAPHRAGM – 316 STAINLESS STEEL	29	400-1100	-
ASSEMBLED LOWER DIAPHRAGM – ALUMINUM	30	400-1101	-
ASSEMBLED LOWER DIAPHRAGM – 316 STAINLESS STEEL	30	400-1102	-
BOOSTER HOUSING SET - ALUMINUM	31,32,33,34,35,36,37,38,39	400-1103	-
BOOSTER HOUSING SET - 316 STAINLESS STEEL	31,32,33,34,35,36,37,38,39	400-1104	-
-O-ring Restriction - Aluminum	31	400-1105	-
-O-ring Restriction - 316 Stainless Steel	31	400-1106	-
- Output Analog Indicator (Gage - Carbon Steel)	32	400-1107	-
- Output Analog Indicator (Gage - 316 Stainless Steel) **(NOTES)**	32	400-1108	-
- 304 Stainless Steel Filter- 1/4" NPT	33	101B3403	-
- Filtering Element	34	400-0655	-
- Assembled Boster Housing - Aluminum	31,35,36,37,38	400-1109	-
- Assembled Boster Housing - 316 Stainless Steel	31,35,36,37,38	400-1110	-
- Pin Spring	36	400-1113	-
- Booster O-ring **(NOTE 2)**	37	400-1114	-
- Spring Bolt	38	400-1115	-
- Booster Cover Bolt	39	400-1116	-
1/2" NPT (Ex d) INTERNAL SOCKET SET PLUG IN BICHROMATIZED CARBON STEEL	40	400-0808	-
1/2" NPT (Ex d) INTERNAL SOCKET SET PLUG IN 304 SST	40	400-0809	-
1/2" NPT INTERNAL SOCKET SET PLUG IN BICHROMATIZED CARBON STEEL	40	400-0583-11	-
1/2" NPT INTERNAL SOCKET SET PLUG IN 304 SST	40	400-0583-12	-
M20 X 1.5 (Ex d) EXTERNAL SOCKET SET PLUG IN 316 SST	40	400-0810	-
PG13.5 (Ex d) EXTERNAL SOCKET SET PLUG IN 316 SST	40	400-0811	-
3/4" NPT (Ex d) ADAPTER IN 316 SST	40	400-0812	-

SPARE PARTS LIST			
PARTS DESCRIPTION	**POSITION**	**CODE**	**CATEGORY (NOTE 4)**
MOUNTING BRACKET FOR 2" PIPE **(NOTE 3)**			
- Carbon Steel	-	344-0140	-
- 316 Stainless Steel	-	344-0141	-
- Carbon Steel Bolts, Nuts, Washers and U-clamp in Stainless Steel	-	344-0142	-
TRANSDUCER SET - ALUMINUM	15 to 39	400-1111	A
TRANSDUCER SET - 316 STAINLESS STEEL		400-1112	A

NOTES
1 - Includes terminal isolator, screws (cover lock, ground and terminal isolator) and identification plate without certification. **2** - O-rings are packaged with 12 units. **3** - Including U-Clamp, nuts, bolts and washers. **4** - For category **A** it is recommended to keep in stock a set for each **25** parts installed and a set for each **20** for category **B**.

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).

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
Standard: 3 – 15 psi (0.2 – 1.0 Kgf/cm²);
Extended: 3 – 30 psi (0.2 – 2.0 Kgf/cm²).

Input Signal
Digital, according to the IEC 1158-2 (H1) standard, voltage mode 31.25 Kbit/s, bus powered.

Power Source
Bus powered: 9-32 Vdc;
Quiescent Consumption Current: 12 mA;
Output Impedance @7.8 KHz to 39 KHz:
- Without Intrinsic Safety: > 3 kΩ;
- With Intrinsic Safety: > 400 kΩ; (in the assumption of a S.I. intrinsic bus on the power source).

Air Supply
18 -100 psi (1.24 – 7 Kgf/cm²) – free from oil, dirt and water.

Indication
Digital indicator (LCD) with 4½ numerical digits.

Classified Area Certification
According to ordering code.

Temperature Limits

Ambiente:	-40	to	85 °C	-40	to	185 °F	
Storage:	-40	to	90 °C	-40	to	194 °F	
Process:	-10	to	60 °C	-14	to	140 °F	
Digital Display:	-40	to	85 °C	-40	to	185 °F	Without damage.

Humidity Limits
0 to 100% Relative Humidity.

Connecting Time
Approximately 10 sec.

Update Time
Approximately 0.5 sec.

Configuration
Local basic configuration via magnetic tool for converters with local display.
Complete configuration with remote configurator (Ex.: **ProfibusView**, by Smar or **Simatic PDM**, by Siemens).

Performance Specifications

Precision
0.4% of Spam; includes hysterisis and stability effects.

Air Consumption
0.30 Nm³/h (0.18 scfm) for 1.24 bar (18 psi) supply;
0.45 Nm³/h (0.26 scfm) for 2.8 bar (40 psi) supply;
0.80 Nm³/h (0.47 scfm) for 7 bar (100 psi) supply.

Maximum Air Flow Capacity
3.40 Nm³/h (2 scfm) for 1.24 bar (18 psi) supply;
6.80 Nm³/h (4 scfm) for 2.8 bar (40 psi) supply;
15.30 Nm³/h (9 scfm) for 7 bar (100 psi) supply.

Ambient Temperature Effect

$$\text{Error\_Sp (pressure sensor)} = \frac{\text{Temperature Range (ºC) x K (0.07) x Pressure Range psi}}{100}$$

$$\text{Error\_Ps (output pressure)} = \frac{\text{Temperature Range (ºC) x K (0.06) x Pressure Range psi}}{100}$$

Air Supply Effect
Negligible.

Vibration Effect
± 0.3 %/g of span during the following conditions:
5-15 Hz for 4 mm constant displacement;
15-150 Hz for 2g;
150 - 2000 Hz for 1g;
According to IEC60770-1 standard.

Electromagnetic Interference Effect
Designed according to the IEC 801, European EN50081 and EN50082 standards.

Physical Specifications

Electric Connections
1/2 - 14 NPT, PG 13.5 DIN; M20 x 1.5 or ½ -14 NPT x ¾ NPT (AI316) with adapter.

Pneumatic Connections
Power supply and output: 1/4 - 18 NPT.
Gauge: 1/8 – 27 NPT.

Construction Materials
Injected aluminum with low copper content and finishing in polyester paint or stainless steel 316, with Buna N gaskets on the cover.

Mounting
With additional bracket; may be installed in a 2” pipe or attached to walls or panels.

Equipment Weight

Without display and no mounting bracket:	2.0 Kg (aluminum); 4.3 Kg (stainless steel).
Add for the display:	0.1 Kg.
Add for mounting bracket:	0.6 Kg (carbon steel); 1.3 Kg (stainless steel).

Ordering Code

MODEL	PROFIBUS PA PNEUMATIC CONVERTER
FP303	PROFIBUS PA

COD.	Digital Indicatior
0	Without indicator
1	With indicator

COD.	Mounting Bracket
0	Without bracket
1	Carbon Stell bracket and accessories
2	SS316 bracket and accessories

COD.	Electrical Connection
0	1/2" - 14 NPT **(3)**
1	1/2" - 14 NPT X 3/4 NPT (AI316) - with adapter **(3)**
2	1/2" - 14 NPT X 3/4 BSP (AI316) - with adapter **(2)**
3	1/2" - 14 NPT X 1/2 BSP (AI316) - with adapter **(2)**
A	M20 X 1.5 **(5)**
B	PG 13.5 DIN **(4)**

SPECIAL OPTIONS

COD.	Housing Material
H0	Aluminum (Default) (IP/TYPE)
H1	SS 316 (IP/TYPE)
H2	Aluminium for saline atmospheres (IPW/TYPE X) **(1)**
H3	316 SST for saline atmospheres (IPW/TYPE X) **(1)**
H4	Aluminium Copper Free for saline atmospheres (IPW/Type X) **(1)**

COD.	Identification Plate	COD.	
I1	FM: XP, IS, NI, DI	I7	EXAM (DMT): Ex-ia; NEMKO: Ex-d
I3	CSA: XP, IS, NI, DI	ID	NEPSI: Ex-ia, Ex-d
I4	EXAM (DMT): EX-IA, NEMKO: Ex-d	IE	NEPSI: Ex-ia
I5	CEPEL: Ex-D, Ex-ia	IM	BDSR – GOST: Ex-d, Ex-ia
I6	Without certification		

COD.	Painting
P0	Gray Munsell N 6,5
P3	Black Polyester
P8	Without Painting
P9	Safety Blue Epoxy - Electrostatic Painting

COD.	TAG Plate
J0	With tag
J1	Blank
J2	According to the user´s note

COD.	Special
ZZ	See notes

COD.	Range
G0	3 (min) to 15 (max) psi.
G1	3 (min) to 30 (max) psi.

FP303	1	1	0	H2	I2	P0	J0	*	G1

TYPICAL ORDERING CODE

* Leave blank for no Special Option

NOTE

(1) IPW/TYPEX tested for 200 hours according to NBR 8094 / ASTM B 117 standard.
(2) Options not certified for Hazardous Locations.
(3) Certificate for use in Hazardous Locations (CEPEL, CSA e FM).
(4) Certificate for use in Hazardous Locations (CEPEL).
(5) Certificate for use in Hazardous Locations (CEPEL e FM).

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"
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"
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.

PED Directive 2014/68/EU - "Pressure Equipment"
This product is in compliance with Article 4 paragraph 3 of the Pressure Equipment Directive 2014/68/EU and was designed and manufactured in accordance with the sound engineering practice. This equipment cannot bear the CE marking related to PED compliance. However, the product bears the CE marking to indicate compliance with other applicable European Community Directives.

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"
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 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 3D9A2.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

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

Drawing 102A-0119, 102A-1206, 102A-1329

DNV
Explosion Proof (Nemko 00ATEX308X)
II 2G Ex d IIC T6 Gb
Ambient Temperature: -20 ºC to +60 ºC
Working Pressure: 18-100 psi
Options: IP66W or IP66

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 60079-0:2012 General Requirements
EN 60079-1:2007 Flameproof Enclosures “d”

Drawing 102A-1274, 102A-1489

DEKRA
Intrinsic Safety (DMT 01 ATEX E 013)
II 2G Ex d [ia] IIC 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
Ambient Temperature: -20ºC ≤ Ta ≤ +60ºC

The Essential Health and Safety Requirements are assured by compliance with:
EN 60079-0:2009 General Requirements
EN 60079-1:2007 Flameproof Enclosures “d”
EN 60079-11:2007 Intrinsic Safety “i”
EN 60079-27:2008 Fieldbus intrinsically safe concept (FISCO)

Drawing 102A-1274, 102A-1489

INMETRO NCC
Segurança Intrínseca (NCC 24.0149)
Ex db ia IIC T* Gb
Ex tb IIIC T* Db
Ui = 30 V Ii = 380 mA Pi = 5,32 W Ci = 5 nF Li = desp
Tamb: -20 °C a +65 °C para T4 ou T135 °C
Tamb: -20 °C a +50 °C para T5 ou T100 °C
Tamb: -20 °C a +40 °C para T6 ou T85 °C
IP66 ou IP66W

Prova de Explosão (NCC 24.0143)
Ex db IIC T6 Gb
Ex tb IIIC T85 ºC Db
Tamb: -20 °C a +40 °C
IP66 ou IP66W

Observações:

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.

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"

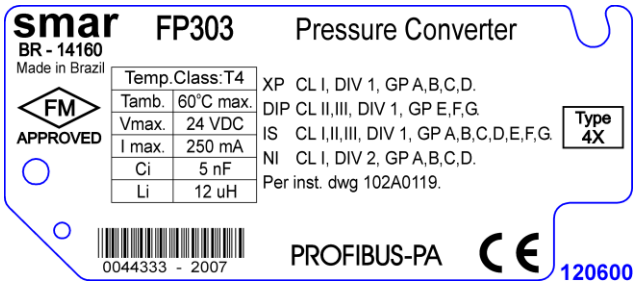
ABNT NBR IEC 60079-31:2022 Atmosferas explosivas - Parte 31: Proteção de equipamentos contra ignição de poeira por invólucros “t”

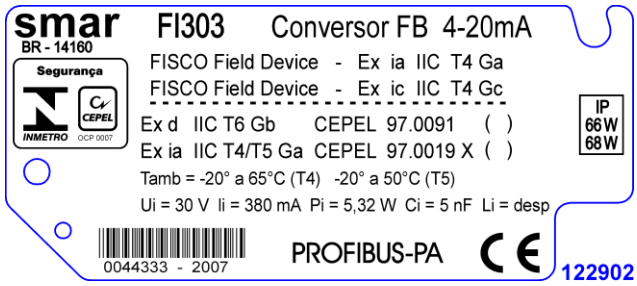
ABNT NBR IEC 60529:2017 Graus de proteção providos por invólucros (Código IP)

Desenhos 102A1364, 102A1240, 102A2006, 102A2005, 102A2095

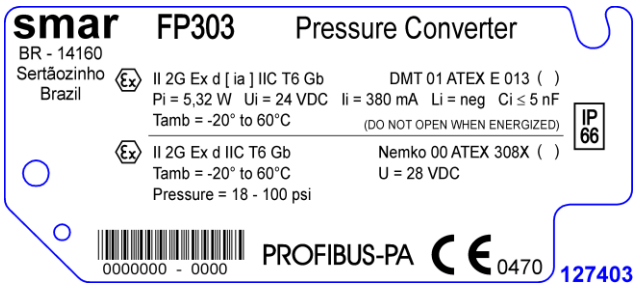
Identification Plates

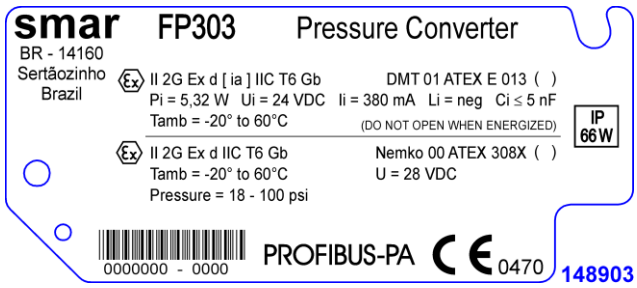
FM Approvals



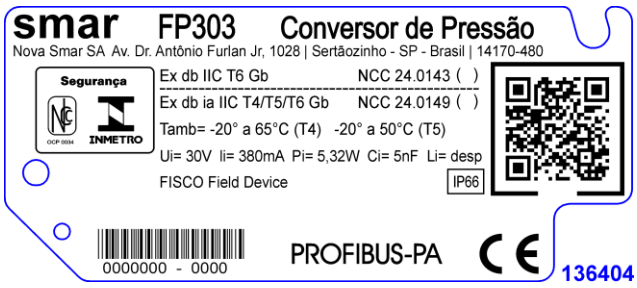


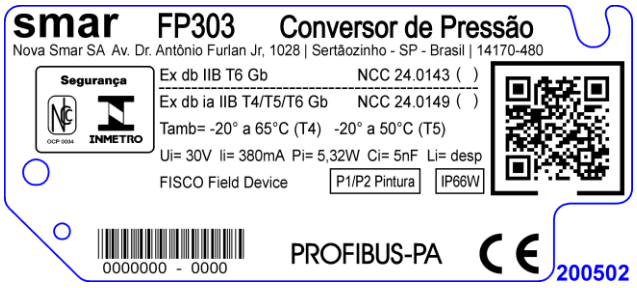
ATEX / IECEx

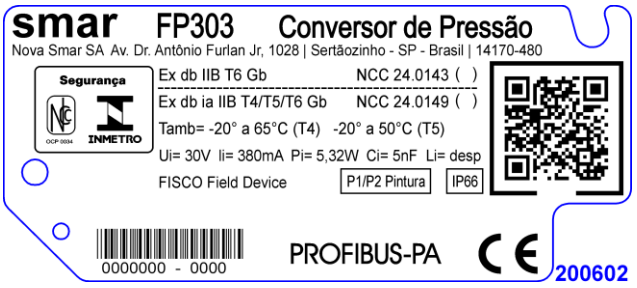


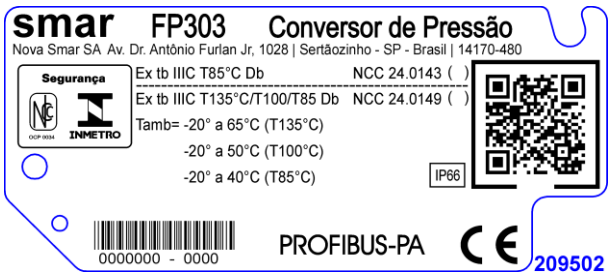


INMETRO NCC

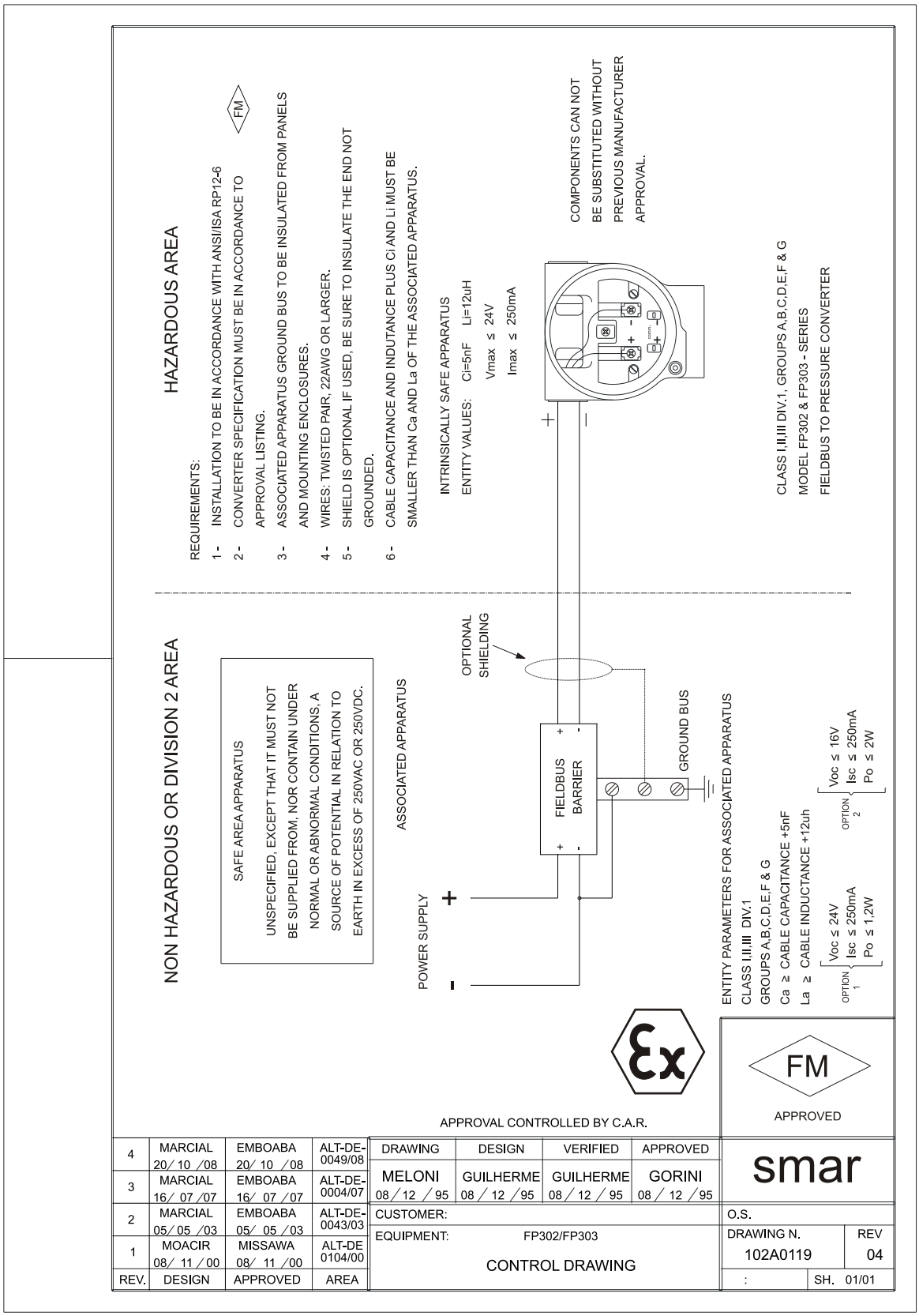








FM Approvals



Appendix B

smar

SRF – Service Request Form

Fieldbus Pressure Converter - FP

GENERAL DATA

Model: FP302 ( ) FP303 ( ) Firmware Version: _____

Serial Number: _____

Sensor Number: _____

TAG: _____

Output Pressure: 3 to 15 psi ( ) 3 to 30 psi ( )

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

APPLICATION DATA

Type/Model/Manufacturer: _____

_____

_____

Host System/Model/Manufacturer:_____

_____

AIR SUPLLY

Conditions: Dry and Clean ( ) Oil ( ) Water ( ) Others: _____

Work Pressure: 18 psi ( ) 40 psi ( ) 100 psi ( ) Others : _____ psi

PROCESS DATA

Hazardous Area Classification: Non-Classified ( ) Chemical ( ) Explosive ( ) Other: _____

Interference Types: None ( ) Vibration ( ) Temperature ( ) Electromagnetic ( ) Others: _____

Ambient Temperature: From _____ ºC to _____ ºC.

SITUATION DESCRIPTION

_____

_____

_____

_____

SERVICE SUGGESTION

Adjustment ( ) Cleaning ( ) Preventive Maintenance ( ) Update / Upgrade ( )

Other: _____

USER INFORMATION

Company: _____

Contact: _____

Title: _____

Sector: _____

Telephone: _____ _____ _____ _____ **Extension:** _____

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

For warranty or non-warranty repair, please contact your representative.
Further information about address and contacts can be found on https://www.smar.com.br/en/contact-us

Returning Materials

If necessary to return the converter and/or configurator to SMAR, simply contact our office, informing the defective instrument serial number, and return it to our factory.

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

Instruments returned or to be revised outside the warranty term should be accompanied by a purchase order or a quote request.