

FI302

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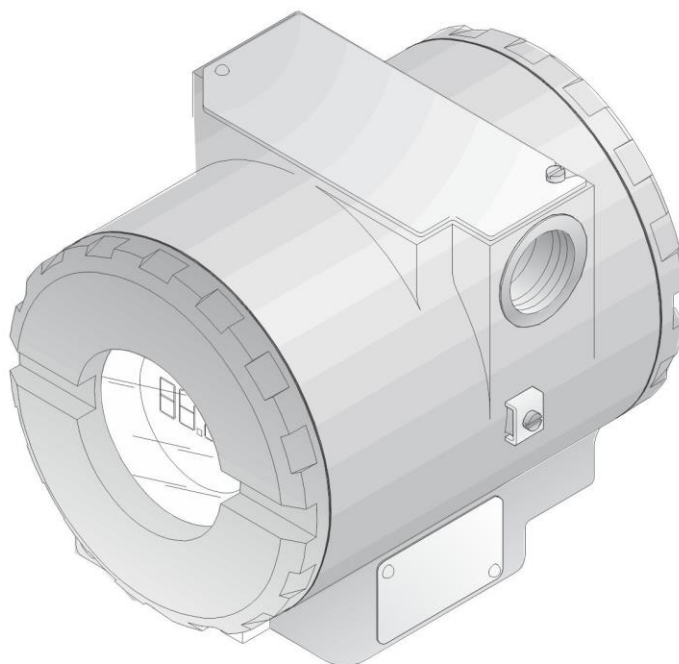
FI302

VERSION 3



OPERATION & MAINTENANCE
INSTRUCTIONS MANUAL

TRIPLE CHANNEL FIELD BUS TO CURRENT CONVERTER





Specificatinos and information are subject to change without notice.
Up-to-date address information is available on our website.

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INTRODUCTION

The FI302 is part of Smar's first generation of FOUNDATION™ fieldbus field equipment. It is a converter intended to connect Foundation Fieldbus systems with actuators and positioners for 4 -20 mA control valves. The FI302 produces a 4 -20 mA output proportional to the input received by the Fieldbus network. Its digital technology enables an easy interface between the field and the control room, while offering several types of transference functions and interesting features that reduce installation, operation and maintenance costs.

Foundation Fieldbus is a digital communication system that enables distributing control functions for field equipment and advantageously replaces conventional technology.

Other protocols only disclose maintenance data, as they were not devised for control data. The main Fieldbus goal was to overcome this situation. Closed loop control with a 4 -20 mA performance requires high speed, which means higher power consumption – a feature that is not compatible with intrinsic safety. This fact led to the use of a moderately high communication speed and to devise a system with a minimum communication capability. Using scheduling synchronization, the system controls variable sampling, algorithm execution and communication. The network treatment is optimized and high circuit loop performance is achieved.

Using Foundation Fieldbus Technology with its capability to interconnect several devices, very large projects can be constructed. The function block concept allows the user to easily construct the programming and overview complex control strategies (Smar CD600 users are familiar with this concept, since it was implemented a few years ago). Another advantage is flexibility, as the control strategy may be edited without having to rewire or change any hardware.

The FI302 and the Smar FOUNDATION™ fieldbus family have function blocks that avoid the need for separate equipment and facilitate implementing the control strategy. Among these function blocks, the following may be enhanced: PID controller, Input Selector, Arithmetic, Signal Characterizer and Integrator. These built-in blocks improve control, reduce communication, dead-time and costs.

Any FOUNDATION™ fieldbus equipment with Master Backup rapidity may work as a network master and be locally configured using a magnetic screwdriver in several situations. This tool eliminates the need for a configurator in many basic applications.

Read carefully these instructions to get the best result from the FI302.

NOTE

This manual is compatible with version 3.XX. The 3 indicates the software version and the XX indicates the release. The 3.XX sign means that this manual is compatible with any release of software version-3

Waiver of responsibility

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

Warning

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

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

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

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

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

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

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

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

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Fieldbus to Current Converter Transducer Block – Parameter Description

Description of Parameter Description

Index	Parameter	Manual Section	Valid Range	Default/ Init Value	Unit	Description
1	ST_REV		Positive	0	None	Indicates the level of static data.
2	TAG_DESC			Null	Na	Description of Transducer Block.
3	STRATEGY			0	None	This parameter is not checked and processed by Transducer Block.
4	ALERT_KEY		1 to 255	0	v	Number of identification in the plant.
5	MODE_BLK	3		AUTO	None	Indicates the operation mode of Transducer Block.
6	BLOCK_ERR	5			E	Indicates the status associated with hardware or software in the Transducer.
7	UPDATE_EVT				Na	It is the alert for any static data.
8	BLOCK_ALM				Na	It is used for configuration, hardware and other failures.
9	TRANSDUCER_DIRECTORY			0	None	It is used to select several Transducer Blocks.
10	TRANSDUCER_TYPE			65535	None	Indicates the type of Transducer according to its class.
11	XD_ERROR	5		16	None	It is used to indicate calibration status.
12	COLLECTION_DIRECTORY				None	Specifies the number of transducer index into Transducer Block.
13	FINAL_VALUE	5		0	FVR	It is the current value and status that comes from AO block.
14	FINAL_VALUE_RANGE			4.0 to 20.0 mA	FVR	The High and Low range limit values, the engineering unit code and the number of digits to the right of the decimal point to be used for Final Value.
15	CAL_POINT_HI	4	12.5 to 20.5 mA	20.0	mA	The highest calibrated value.
16	CAL_POINT_LO	4	3.99 to 11.5 mA	4.0	mA	The lowest calibrated value.
17	CAL_MIN_SPAN			1.0	mA	The minimum calibration span value allowed. This minimum span information is necessary to ensure that when calibration is done, the two calibrated points (high and low) are not too close together.
18	CAL_UNIT			mA	mA	The Device Description engineering units code index for the calibration values.
19	ACT_SN		0 to 2 ³²	0	None	Indicates the actuator serial number.
20	CAL_METHOD			Factory	None	The method of last sensor calibration. ISO defines several standard methods of calibration. This parameter is intended to record that method, or if some other method was used.
21	CAL_LOC			NULL	None	The location of last sensor calibration. This describes the physical location at which the
22	CAL_DATE				None	The date of the last sensor calibration.
23	SENSOR_CAL_WHO			NULL	None	The name of person who is in charge of last calibration.
24	RETURN	5		0	mA	This is the current value that goes to the AO Block.
25	TERMINAL_NUMBER	3	1, 2, 3	0	None	Indicates the input terminal number (1, 2 and 3).
26	BACKUP_RESTORE	5		0	None	This parameter is used to do backup or to restore configuration data.
27	CHARACTERIZATION_TYPE	6		255	None	Indicates the type of characterization curve.

Index	Parameter	Manual Section	Valid Range	Default/ Init Value	Unit	Description
28	CURVE_BYPASS	6	True/False	False	None	Enable and disable the characterization curve.
29	CURVE_LENGTH	6	2 a 8	8	None	Indicates the length of characterization curve.
30	CURVE_X	6		%	%	Input points of characterization curve.
31	CURVE_Y	6		%	%	Output points of characterization curve.
32	FEEDBACK_CAL	4		0	mA	The measured current value used by the calibration method.
33	CAL_CONTROL	4	En/Dis	Disable	None	Enable and disable for calibration process.
34	CAL_POINT_HI_BACKUP			20.0	mA	Indicates the backup for high calibration point.
35	CAL_POINT_LO_BACKUP			4.0	mA	Indicates the last high calibration point.
35	CAL_POINT_HI_FACTORY			20.0	mA	Indicates the last low calibration point.
37	CAL_POINT_LO_FACTORY			4.0	mA	Indicates the low factory calibration point.
38	ORDERING_CODE				None	Indicates information about factory production.

CAPTION

- **AUTO** - Automatic
- **FACTORY** - Standard of factory
- **NULL** - No standard value
- **NONE** - No unit or no value
- **Na** - Non-dimensional parameter
- **E** - Parameter list
- **FVR** - Final_Value_Range,
- **True/False** - Accepts true/false values
- **En/Dis** - Enables/Disables parameter

Display Block Parameters

Index	Parameter	Manual Section	Range/Options	Description
7	BLOCK_TAG_PARAM	3		This is a tag of the block to which the parameter belongs to use up to a maximum of 32 characters.
8	INDEX_RELATIVE	3	0 a 65535	This is the index related to the parameter to be actuated or viewed (1, 2...).
9	SUB_INDEX	6	1 a 255	To visualize a certain tag, opt for the index relative equal to zero, and for the sub-index equal to one.
10	MNEMONIC	6		This is the mnemonic for the parameter identification (maximum of 16 characters). Choose the mnemonic, preferably with no more than 5 characters because, this way, it will not necessary to rotate it on display.
11	INC_DEC	6		It is the increment and decrement in decimal units when the parameter is Float or Float Status time, or integer, when the parameter is in whole units.
12	DECIMAL_POINT_NUMBER	6	0 a 4	This is the number of digits after the decimal point (0 to 3 decimal digits)
13	ACCESS	6	Monit/ Action	The access allows the user to read, in the case of the "Monitoring" option, and to write when "action" option is selected, and then the display will show the increment and decrement arrows.
14	ALPHA_NUM		Mnem/ Value	These parameters include two options: value and mnemonic. In option value it is possible to display data both in the alphanumeric and in the numeric fields, this way, in the case of a data higher than 10000, it will be shown in the alphanumeric field.
63	DISPLAY_REFRESH	3	True/ False	It allows updating the local adjustment tree.

CAPTION

- Monit – Monitoring
- Mnem – Mnemonic

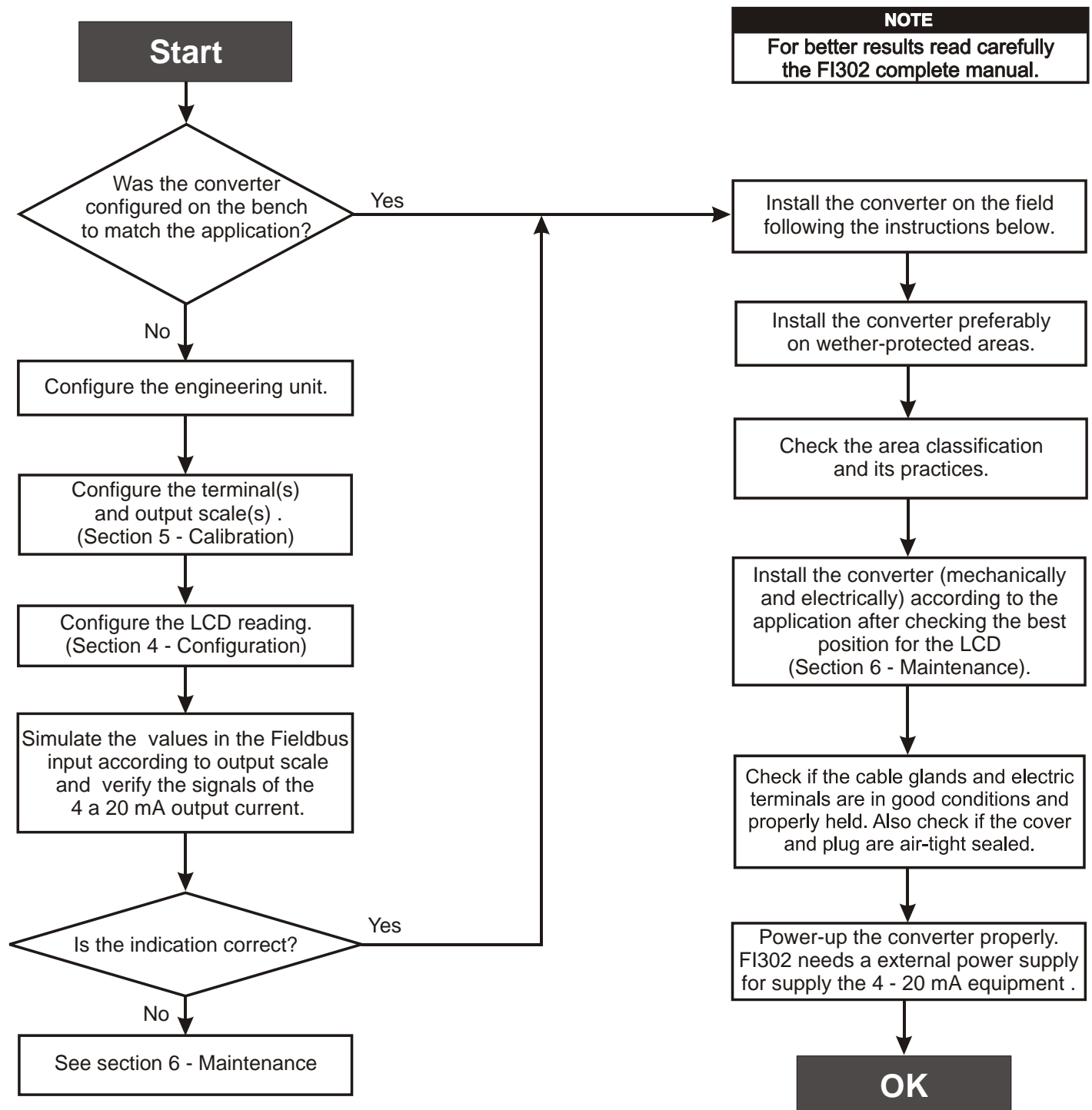
Diagnostic Block Parameters

Index	Parameter	Manual Section	Valid Range	Default/ Init Value	Unit	Description
1	ST_REV			0	Null	-
2	TAG_DESC			Spaces	Na	-
3	STRATEGY			0	Null	-
4	ALERT_KEY		1 a 255	0	Null	-
5	MODE_BLK			O/S	Na	See Mode Parameter.
6	BLOCK_ERR	5			E	
7	EXE_TIME_TAG	5		Spaces	Na	Block tag of the selected block to measure the execution time.
8	MIN_EXE_TIME	5		+INF	ms	Minimum execution time of the selected block.
9	CUR_EXE_TIME	5		0	ms	Current execution time of the selected block.
10	MAX_EXE_TIME			0	ms	Maximum execution time of the selected block.
11	HW_REV	5				Hardware revision.
12	FIRMWARE_REV	5				Firmware revision.
13	DEV_SN	5				Device serial number.
14	MAIN_BOARD_SN					Main board serial number.
15	BEHAVIOR	5	0 - Adapted 1 - Spec	0	E	Select the initial values for parameters, there are two options Adapted and Spec.
16	PUB_SUB_STATUS		0 - bom 1 - ruim		E	Indicate if all external links is good or if at least one is bad.
17	LINK_SELECTION		0 - First 1 - Next 2 - Previous	0	E	Select an external link.
18	LINK_NUMBER					Number of the external link selected.
19	LINK_STATUS					Status of the external link selected (see table below)
20	LINK_RECOVER		0 - No Action 1 - Action	No Action	E	Command a recovery process to the external link selected.
21	BLOCK_ALM				Na	The block alarm is used for all configuration, hardware, and connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.
22	SAVING_CONFIG		0 - No save 1 - save	0	E	It indicates if the device is saving the configuration in a non-volatile memory.

CAPTION

- **NULL** - Has no standard value
- **Na** - Non-dimensional parameter
- **E** - Parameter list.
- **ms** - Milisecond

Installation Flowchart



INSTALLATION

General

NOTE

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

The FI302 is a high end device and thus, in order to take advantage to its maximum, the FI302 requires an appropriate installation.

Many factors may affect the converter accuracy, among which environment conditions are the most difficult to control. In order to reduce the effects from temperature, humidity and vibration, avoid its installation in aggressive areas.

The effects from temperature variation may be minimized by assembling the converter in areas protected from weather changes. If necessary, use thermal insulation against external heat sources.

Humidity is harmful to the electric circuits. In areas with high relative humidity levels, the correct placing of the housing cover o-ring must be assured and hand-tight shut to press the o-ring. The housing cover should not be removed on the field so that its threads are not damaged, as they are not protected by painting.

A flexible sealing material should be applied on the electric connections to avoid humidity. See details on how to connect the FI302 to Fieldbus.

Mounting

The display may be rotated at 90° to 90° angles for easier visualization. See figure 6.2 on section 6 – Maintenance. To access the display, unlock the locking screw on the display cover by rotating it clockwise. See figure 1.1 to locate the locking screw.

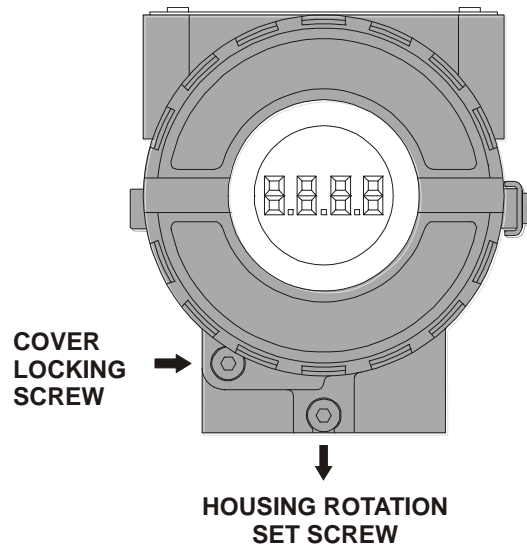


Figure 1.1 - Display lid locking screw

The mounting bracket makes it easier to adjust the converter in several positions, as shown on Figure 1.2 – Mounting Positions and Dimensional Drawing

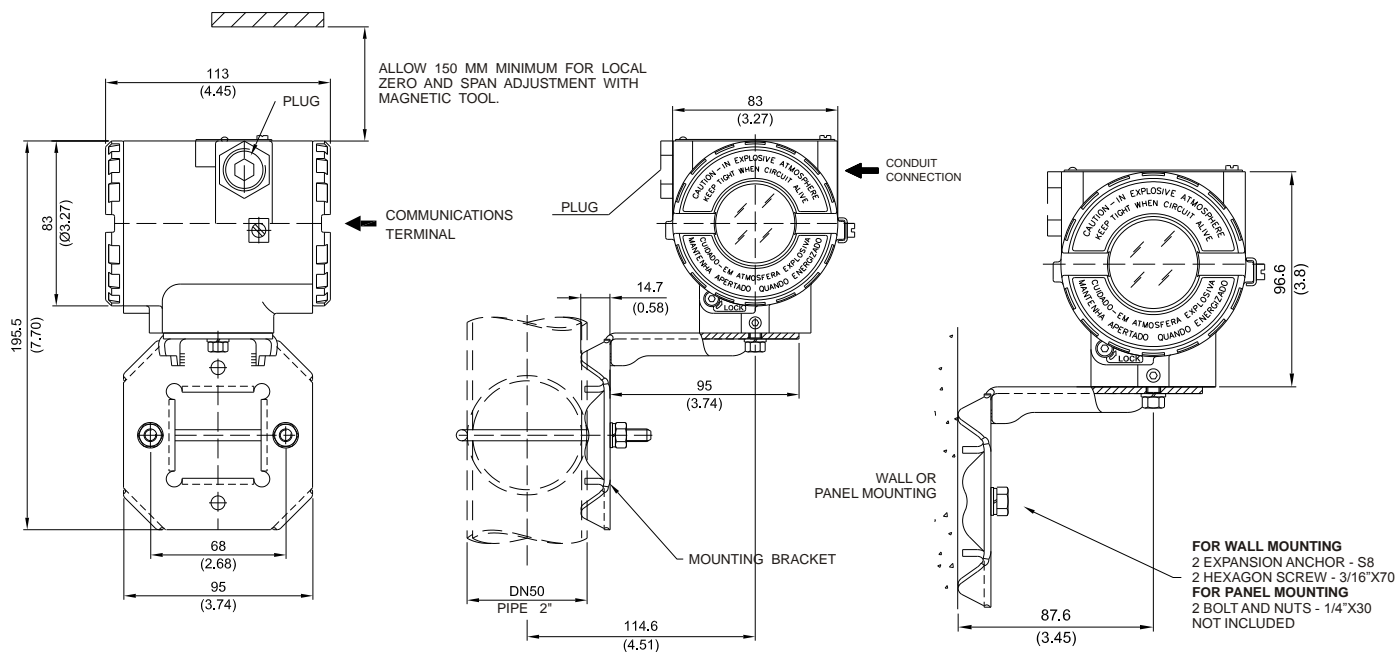


Figure 1.2 - Mounting Positions and Dimensional Drawing.

Electric Connection

Output Connection

To access the terminal block, loosen the cover locking screw to release it. Rotate the cover anti-clockwise and remove it (See Figure 1.3).

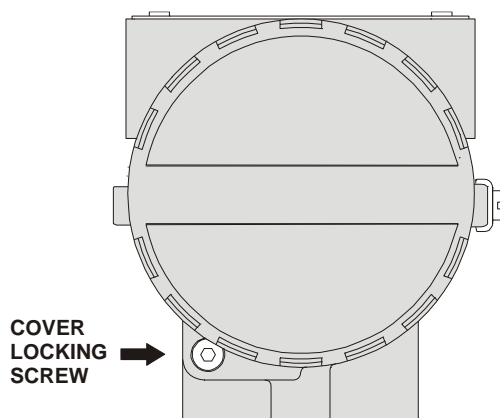


Figure 1.3 – Terminal Block Cover Locking Screw

The housing has two threaded openings where to insert the signal cables of the connection terminal block. The threads allow connecting the wiring conduit or the cable gland.

For more convenience, there are three ground terminals: one internal and two externals close to the terminal block.

Figure 1.4 shows the three terminals of the converter current output channels, which are marked with numbers 1, 2 and 3. Terminal 4 is the power supply common ground to the loop controlled by the channels. The converter H1 (IEC-61158-2) power supply must be connected to the terminals marked by (+) and (-).

The current output is limited by the power supply voltage on the current loop and by the conditions of the classified area. Refer to the load curve to determine the maximum equipment quantity allowed for the bus.

If power fails, the outputs status will be uncertain and in case of communication loss, communication

lacks, the outputs will move to fixed pre-configured values or to safety default values.

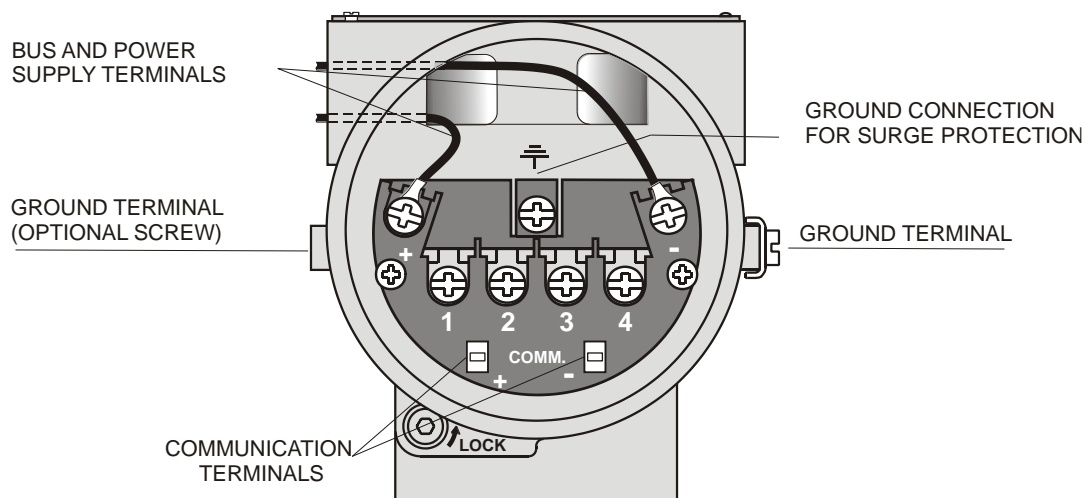


Figure 1.4 – Terminal Block

Connecting the FI302 to the FOUNDATION™ fieldbus

The FI302 may be connected to or removed from a fieldbus network in operation. Take due precaution with this operation and prevent signal cables from touching the shielding, the ground cables or one another. Insert the FI302 on the network with communication speed equal to its own (31,25 kbps), FOUNDATION™ fieldbus protocol.

Preparing the FI302 before connecting it to network

The FI302 may be configured on-line or off-line by a fieldbus configuration like the Smar SYSCON installed on a Engineering station, for instance.

- Then, use the configuration device to attribute a tag to the converter, using the “Assign Tag” option on the menu.
- Download the configuration for the equipment or for the entire network.

NOTE

The Assign Tag may be applied on-line or off-line for specific equipment connected to a fieldbus network with other equipments.

ATTENTION

To attribute a new Tag to the equipment, the system configuration must be changed. This may bring some inconveniences on the control configuration. For example, the addressees configured on the previous functional blocks and links are deactivated. Therefore, if the tags are modified, the entire configuration must be revised and when applicable, the TAG list from OPC Servers shall be updated.

The FI302 is protected against reverse polarity and may support ± 35 VDC without causing any damage, but it will not work under these conditions. Although the FI302 cannot be affected by polarity, try and keep the polarity in all connections.

In hazardous areas, the number of equipments is limited by the intrinsic safety restrictions. Consult the documents related to the use of equipment for this area.

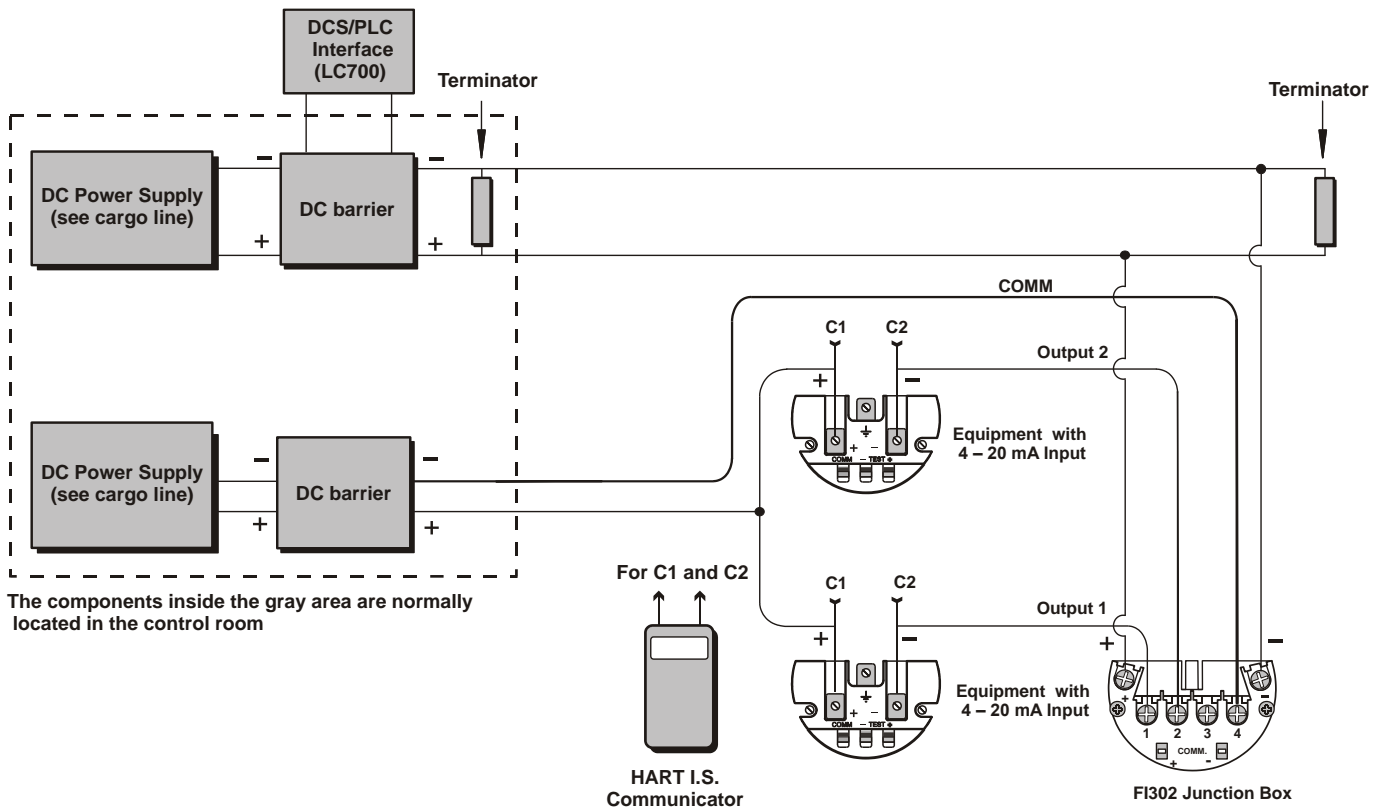


Figure 1.5 – FI302 Output connections for Classified Areas.

The FI302 connection for non-classified areas must follow the diagram on figure 1.6. The three available output channels may be used for that area.

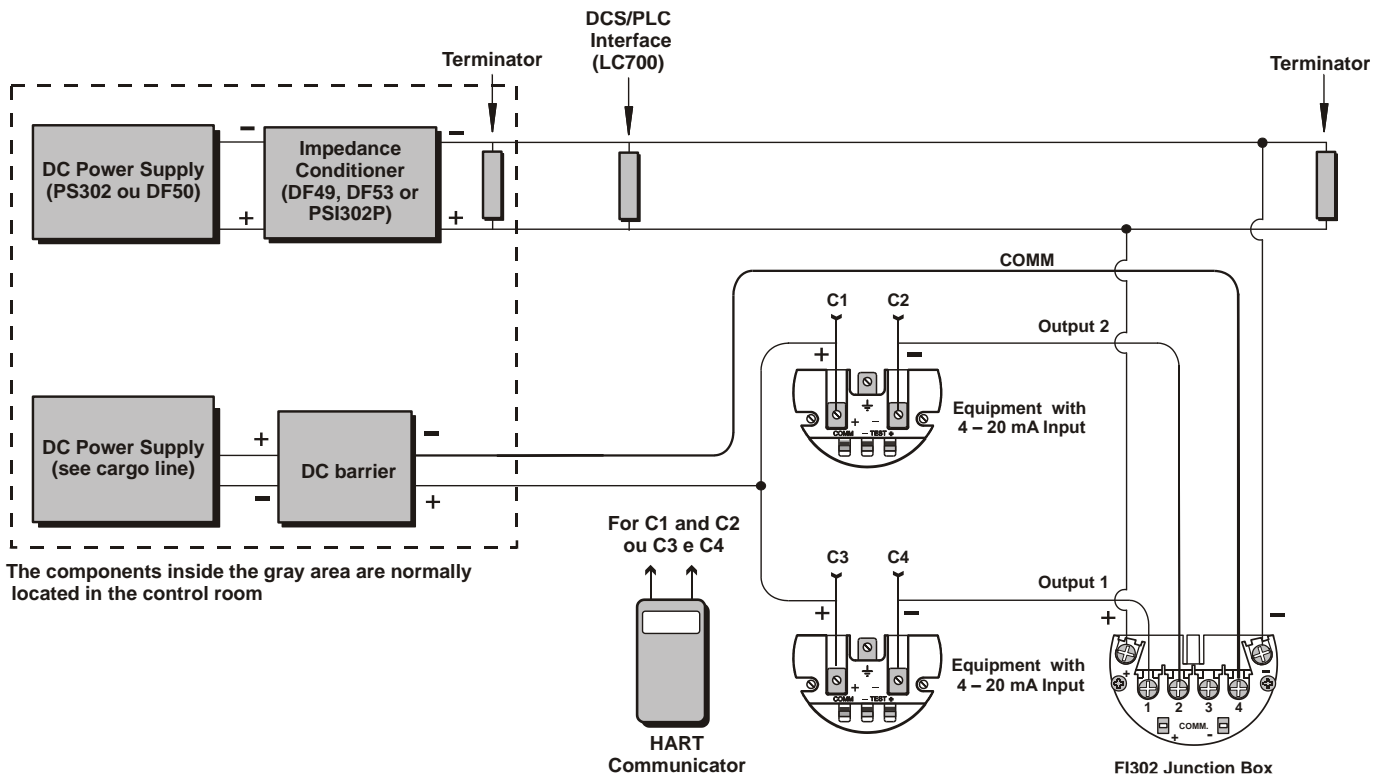


Figure 1.6 – FI302 Output Connections

Figure 1.7 shows a typical fieldbus network with equipments for different functions connected.

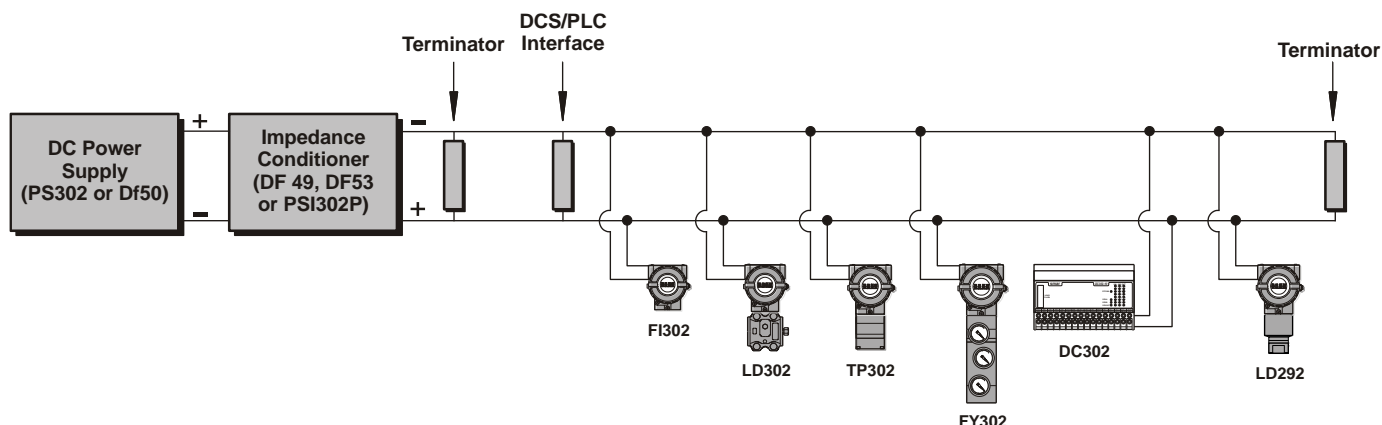


Figure 1.7 – Typical Fieldbus Equipment Network

Power Consumption

The FI302 converter must be properly powered as follows:

- * Minimum 9 V voltage;
- * 12 mA Operating Current (I_q)

The power supply must provide the minimum voltage wherever the FI302 is located in the H1 segment. An independent power supply shall be used to power the 4 – 20 mA equipments connected to the converter output.

Low current consumption equipments should be used for intrinsically safety applications. Choose low resistance cables to reduce drop in voltage on the junction box and on each equipment.

Terminator

The terminators are impedances with the same values as the specific bus impedance to avoid signal reflection and, consequently their distortion or loss. Each bus segment must have only two terminators positioned on its ends. Some equipments, especially for power source, output/input, fieldbus test or PC simulation card, etc, include the option for an internal terminator connection. Before connecting a terminator to the bus, check if the equipment already has an internal terminator on one end, and install the other terminator.

Each terminator has a 100 Ohm impedance and the equivalent impedance of both will be 50 Ohm.

The terminator causes a 250- to-500 mV amplitude tension drop on the bus.

Smar has the terminator model BT302.

Cabling

The FOUNDATION™ fieldbus protocol works with several types of cable and the best they are, the longer the lengths and the greater the number of equipments to be connected to it. Table 1.1 shows the regular cable types used when installing FOUNDATION™ fieldbus equipments and their characteristics.

Pair	Shielding	Twisted	Size	Maximum Length	Type
Single	Yes	Yes	0,75 mm ²	1900 m	A
Multicables	yes	yes	0,32 mm ²	1200 m	B
Multicables	no	yes	0,13 mm ²	400 m	C
Multicables	yes	no	1,25 mm ²	200 m	D

Table 1.1 – Types of Cables.

NOTE

The length of **non-twisted** cables decreases regardless of their diameter and shielding (see D type data). It is recommended not to use these cables, but if you do, do not leave them too close to power cables or noisy equipments.

The Fieldbus Foundation recommends the “A” type cable. Table 1.2 shows its main characteristics for a bus project.

“A” TYPE CABLE	
Characteristic impedance on the 31,25 kHz frequency	100 Ohm ± 20%
Maximum attenuation on the 39 kHz frequency	3 dB/km
Maximum capacitance outbalance for shielding	2 nF/km
Maximum DC resistance per conductor lenght	22 Ohm/km
Maximum propagation delay change	1,7 us/km
Conductor transversal area	0,75 mm²

Table 1.2 – “A Type” Cable Characteristics

Total Cable Length

The cable(s) total length vary (ries) according to its/their quality. The total length is the sum of the trunk and the spur lengths. For instance, use the diagram on figure 1.8 and the table 1.3 to determine the total length of a hypothetical bus.

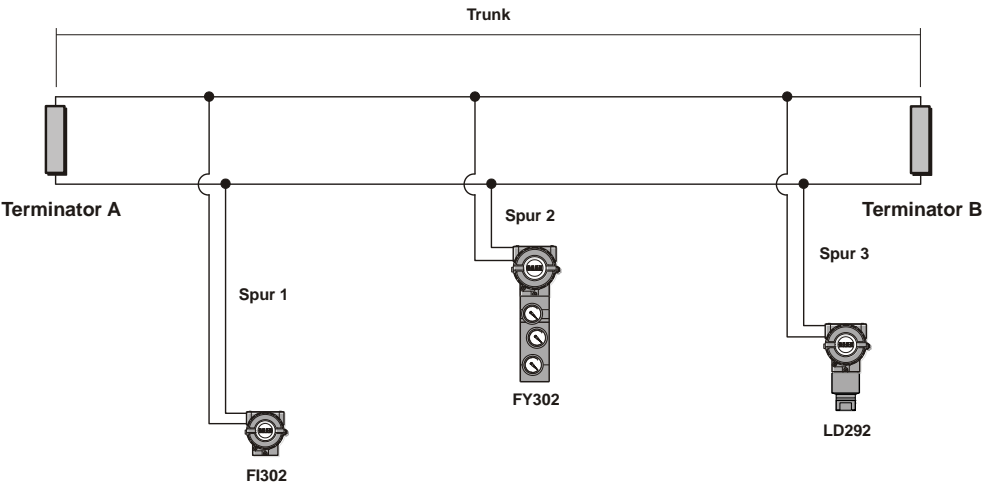


Figure 1.8 – Total Cable Length

Segment A, B	Length
Trunk	240 m
Spur 1	120 m
Spur 2	40 m
Spur 3	80 m
Total	480 m

Table 1.3 – Examples of Total Cable Lengths

The cable types should combine according to the equation below:

L1 / L1max + L2 / L2max + ... < 1

Example: the network has the following cables:

- L1: is the type 1 cable length
- L2: is the type 2 cable length
- L1max: is the type 1 maximum cable length (see table 1.1).
- L2max: is the type 2 maximum cable length (see table 1.1).

$L1 = 1000 \text{ m of A type cable}$
 $L2 = 100 \text{ m of B type cable}$
 $1000 / 1900 + 100 / 1200 = 0,61$

The hypothetical combination on last example satisfies the above equation: $0,61 < 1$

Cable shielding

Shielding must be used, especially at noisy sites with high EMI/RFI near to the bus. Connect the spur shielding with the trunk shielding. The shielding should cover a minimum 90% cable length to guarantee good protection.

Grounding

The shielding is grounded only at the power supply negative terminal. Do not ground it at the other terminal, in order to avoid a secondary current circulation that could induce noise onto the bus. If the cable is not shielded install it on a tray and ground it only at one end. Do not use shielding as power conductor. Signal cables should NOT be grounded.

Commissioning

This item will explain the commissioning related to the configuration of the converter in the network.

Before receiving or installing the converter and after the plant's detailing project conclusion, it is suggested to initiate the offline configuration. Once accomplished those steps proceed with the device configuration download.

In FOUNDATION™ fieldbus the database configuration is made on user-defined tags with no association with the physical devices. Therefore, the devices must be associated to their respective configurations.

Each device has a unique Device ID with 32 characters as hardware address, and meant to distinguish a device from another. This address is engraved on the circuit board by the manufacturer and cannot be changed. A field device is associated to its configuring system when correlates its configuration tag to the device ID. If the factory tag is identical to the configured tag on the configuring systems they will be automatically associated by the configurator system. Once it is connected to the network, the factory tag may be named, if not done yet.

When all the devices are associated to their respective tags, the configuration may be completely or partially unloaded on the network equipments.

If possible, use the configuring system to simulate the control and the operation. Then, you may start, stop and go through the control strategies and check if the plant is operating normally before the start-up.

Commissioning stages

- Connect the electrically converter to the segment, so that the fieldbus will recognize it as an equipment with a non-commissioned tag;
- Use the configuration software to instantiate the newly-connected equipment. This creates ties between the physical equipment in the plant and the database configuration;
- Upload the equipment internal data on the configuration system and its strategy control on the equipment.

NOTE

The Fieldbus requires that the measuring unit be the same, both on the equipment transducer block and the function blocks, in order to avoid commissioning error.

Use of non-preconfigured to devices

Devices with non-configured tags are configured during commissioning. To do it, follow the procedure:

- Connect each adequate equipment to a fieldbus segment. The system will recognize them as non-commissioned equipments;
- Instantiate each equipment on the adequate segment in the configuration software;
- Name a TAG to the specific device according to the plant process flowchart (P&ID);
- Download the configuration to the equipment.

Use of preconfigured equipments

The devices with preconfigured tags identify themselves automatically with the configuration and save commissioning time. The user must simply install them and check when they appear on the system configurator screen.

Each preconfigured device must be installed on the specific plant site where it was configured for.

Linking Device

The linking device, for instance, the Smar DFI302 or other interface, addresses all the devices on each network automatically. For practical purpose, the node address may be hidden, once it is not of interest to most users, whose interaction is based on tags. However, the node address is typically shown on the live list for the use of specialists. As a result, the Foundation Fieldbus devices may be commissioned directly from the control room. Once the device is connected to the network it will be detected in seconds. The devices may be connected or disconnected at any time without disturbing the network.

Error monitoring and detection with Live List

If the device does not appear on the configuration system live list, it most probably was connected to the wrong network or was not commissioned. In this case, it may be located in the live list of the others networks. Another possibility is that the device cable is not connected or the device is not operating properly. The live list, thus, is an excellent commissioning tool, as it facilitates checking the cable connection to the field devices. To make sure that a device was not mistaken for another on the same network or that it was installed at the wrong place, the device may be disconnected temporarily from the network, so that the user check if the right tag disappears from the live list.

For more safety, use the configuration system to obtain detailed ID information from any device connected to the network. This information helps checking the tag, the description, the manufacturer, the type, the version and instrument general condition in order to confirm if it is the right device and if it is working properly.

Installation in Hazardous Areas

WARNING

Explosions could result in death or serious injury, besides financial damage. Installation of this converter in explosive areas must be carried out in accordance with the local standards and the protection type adopted. Before continuing the installation make sure the certificate parameters are in accordance with the classified area where the equipment will be installed.

The instrument modification or parts replacement supplied by other than authorized representative of Smar is prohibited and will void the certification.

The converters are marked with options of the protection type. The certification is valid only when the protection type is indicated by the user. Once a particular type of protection is selected, any other type of protection can not be used.

The electronic housing and the sensor installed in hazardous areas must have a minimum of 6 fully engaged threads. Lock the housing using the locking screw (Figure 1.3).

The cover must be tighten with at least 8 turns to avoid the penetration of humidity or corrosive gases. The cover must be tighten until it touches the housing. Then, tighten more 1/3 turn (120°) to guarantee the sealing. Lock the covers using the locking screw (Figure 1.3).

Consult the Appendix A for further information about certification.

Explosion/Flame Proof

WARNING

In Explosion-Proof installations the cable entries must be connected or closed using metal cable gland and metal blanking plug, both with at least IP66 and Ex-d certification.

The standard plugs provided by Smar are certified according to CEPEL certificate. If the plug needs to be replaced, a certified plug must be used.

The electrical connection with NPT thread must use waterproofing sealant. A non-hardening silicone sealant is recommended.

For NEMKO ATEX certificate please to follow the installation guidelines in hazardous locations below: Group II Category 2G, Ex d, Group IIC, Temperature Class T6, EPL Gb U = 28VDC

Ambient Temperature: -20 to 60°C for T6

Environmental Protection: IP66/687 or IP66W/687W

The electrical connection available are ½ - 14NPT and M20x1,5.

Cable entries must be connected or closed using metal cable gland and metal blanking plug, both with at least IP66 and Ex-d certification or any appropriate ATEX approved metal cable gland and metal blanking plug. Do not remove the transmitter covers when power is ON.

Intrinsically Safe

WARNING

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

To protect the application the transmitter must be connected to a barrier. Match the parameters between barrier and the equipment (Consider the cable parameters). Associated apparatus ground bus shall be insulated from panels and mounting enclosures. Shield is optional. If used, be sure to insulate the end not grounded. Cable capacitance and inductance plus C_i and L_i must be smaller than C_o and L_o of the associated Apparatus.

It is not recommended to remove the transmitter cover when the power is ON.

FUNCTIONAL DESCRIPTION

Functional Description

See Figure 2.1.

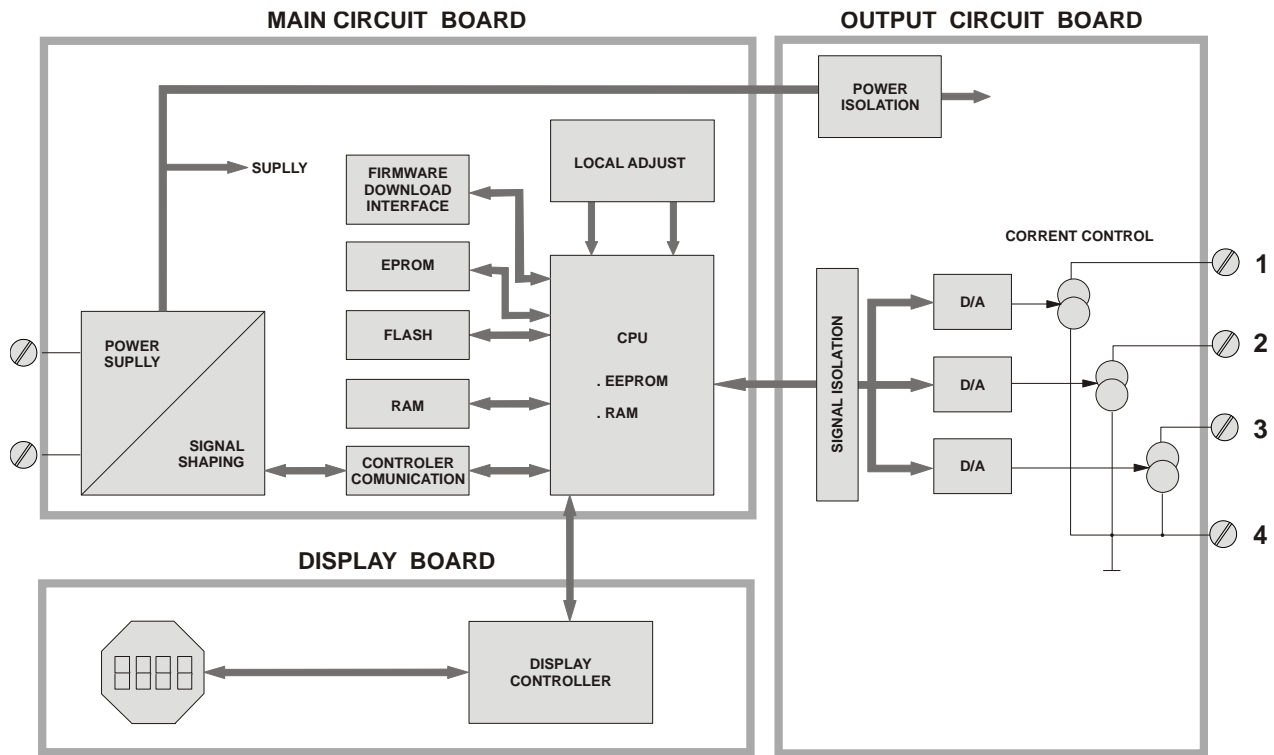


Figure 2.1 – FI302 Block Diagram

D/A

Receives signal from the CPU and converts it to an analog signal to be used by the current control

Current Control

Controls the channel current according to the data received from the CPU.

Signal Isolator

Isolates the data signal between the output and the CPU.

Central Processing Unit (CPU), RAM and FLASH

The CPU is the converter intelligent part, and is responsible for the management and operation of the blocks, auto-diagnosis and communication. The program is stored in FLASH memory. For the temporary storing of data there is a RAM. The RAM data will be lost if energy fails, although the device has a non-volatile EEPROM where the valid data are stored, as for calibration, configuration and identification.

Communication Controller

It controls the line activity, modulates and demodulates communication signals and inserts or delete initial and final delimiters.

Power Supply

Uses energy from the control loop to power the converter circuit.

Power Insulation

The power must be insulated as the output signals sent or received by the output

Signal Conditioner

Prepares the signals from the network or from the communication controller at acceptable levels by the communication controller or the fieldbus network, respectively.

Display Controller

Receives CPU data and controls the Liquid Crystal Display.

Local Adjustment

The power must be insulated once signals are sent and received by the output.

Section 3

OPERATION

Liquid Crystal Display

The liquid crystal display shows up to three variables that may be selected by the user. When two or three variables are chosen, the display will alternate the sampling from both with an interval of approximately 3 seconds.

The LCD is made of a field with 4½ numerical digits, a field with 5 alphanumeric digits and an information field, as shown on Figure 3.1.

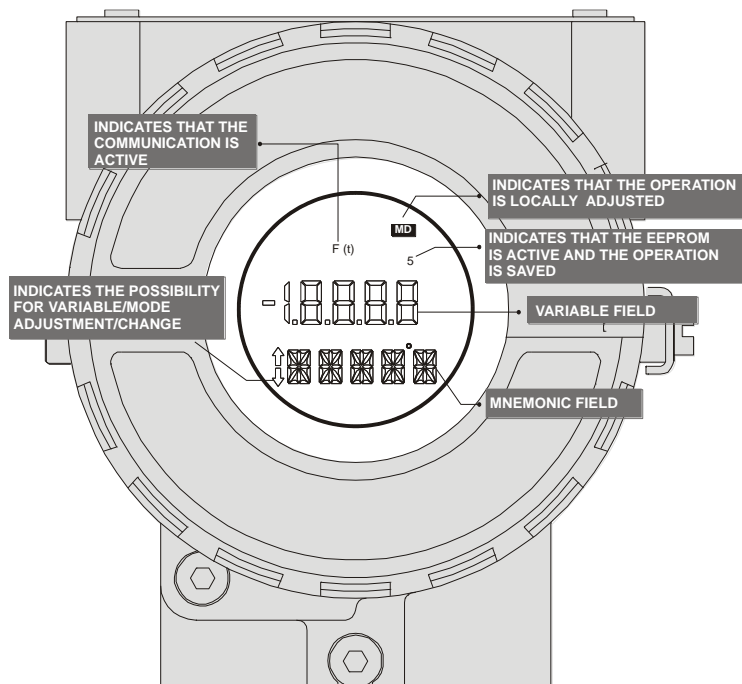


Figure 3.1 - Display

Monitoring

During normal operation, the FI302 is in monitoring mode and the indication alternates between the variables, as configured by the user. See Figure 3.2. The display shows the engineering units, values and parameters simultaneously with the majority of status indicators, depending on the local adjustment configuration.

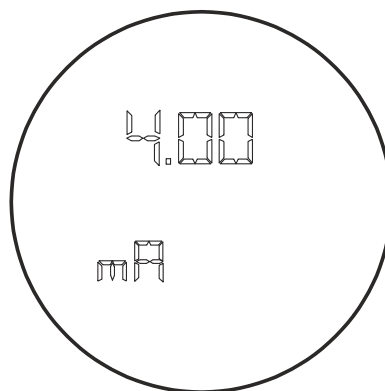


Figure 3.2 – Typical Monitoring Mode displaying the current inferior value, namely 4.0 mA.

The monitoring mode is interrupted when the user makes the local adjustment. The display also shows messages and errors (See Table 3.1).

DISPLAY	DESCRIPTION
Init , FI302 & Version	The FI302 is powered and initiated
Blk OOS	OOS block not configured and link ineffective
bad	Communication or signal failure or bad signal

Table 3.1 – Display Messages and Errors.

CONFIGURATION

The **FI302** may be configured by any Foundation Fieldbus configuration tool or by an operational console.

The FI302 has **three output transducer blocks, one resource block, one display block, one diagnostic block and other instant able function blocks.**

This manual deals with the parameters of transducer blocks, display block and diagnostic block. The function blocks are described in the specific function block manual.

Transducer Block

The transducer block insulates the hardware input/output function block like sensors and actuators. The transducer blocks controls the input and output access through the specific manufacturer implementation.

Usually, transducer block execute linearization function, characterization.

The connection between the transducer block and function blocks is called channel.

How to Configure a Transducer Block

When instantiating the FI302 on the configuration tool, the transducer block is automatically instantiated.

The Transducer block has an algorithm, an internal parameter group and a channel that connects it to the analog output function block.

The algorithm describes how the transducer transfers information from the hardware input/output to other function blocks. The internal parameters, which cannot be linked to other blocks and published on the link via communication, define the user interface for the transducer block. They are divided in Standards that comply with the Foundation Fieldbus standard and those specified by manufacturers and made according to their needs.

Every standard routine (e.g. calibration) follows a step by step method, which defines generally the rules that will help the user.

The transducer, display and diagnostic blocks have several parameters that could be configured. Here will treat of the most usual. The others are similar.

NOTE

The parameters ending with an "n" mean that they are the same for the other groups, and are distinguished by their group number instead of the letter "n".

For the FI302 basic configuration, use the Transducer and Display blocks parameters.

The Transducer Block parameters are configured as follows:

MODE_BLOCK

The **MODE-BLOCK** parameter configures the transducer block mode of operation. There are two options: **Out of Service** or **AUTO** (automatic).

TERMINAL_NUMBER

The **TERMINAL_NUMBER** parameter relates a value for the channel. It starts with 1 to the transducer number 1 and goes up to 3 to the transducer number 3. The FI302 has 3 current channels and the current value will be sent internally to a specific transducer output from the analog output function block. The number of the analog output block (AO) is related to the transducer terminal number (**TERMINAL_NUMBER**). The channels with numbers 1, 2, 3 correspond to the terminal block numbers 1, 2, 3. Select the combinations (1 - 1), (2 - 2), (3 - 3) for the channel and the terminal block number where the output will occur (channel number – terminal block number).

The **TERMINAL_NUMBER** parameter chooses which of the three terminals of the terminal block will supply the output. At least one of them must be chosen or otherwise the FI302 will issue the error message "Bik_error".

Display Block

The FI302 display block shows the variable chosen on monitoring mode or the option menu on the local adjustment mode.

The display block is default-configured to make it possible to adjust the Upper Trim (UPPER) and the Lower Trim (LOWER), to monitor the input transducer output and check the Tag.

The options of the FI302 local adjustment tree may be entirely configured by any fieldbus configuration tool. Use them for the configuration, but for certain operations the local adjustment is easier and faster, because it does not depend on network and communication connections. The parameter options to work with the local adjustment are: Mode Block, Output Monitoring, Tag Visualization and Tuning Parameter Adjustments.

Before using the magnetic tool for local adjustment, use the fieldbus configuration tool to prepare the parameters that enable this operation.

How to Configure a Display Block

There are seven parameter groups indexed to the **Block_Tag_Param_n** parameter that may be preconfigured by the user to enable a configuration by local adjustment. If it is not necessary to display this group of tag-indexed parameters, write an invalid tag for the **Block_Tag_Param_n** parameter. With this procedure the equipment does not recognize it as a valid parameter nor the parameters indexed to it.

The Display Block parameters are configured as follows:

MODE_BLOCK

The configuration is identical to the previous transducer block.

BLOCK_TAG_PARAM_n

This is the block tag where the parameter belongs. The FI302 enables inserting up to 7 block tags. Use a maximum of 32 characters.

INDEX_RELATIVE_n

This is the index related to the parameter that will be activated or visualized (0, 1, 2...6). See the Function Block manual to know the required indices, or visualize them on the configuration tool by opening the desired block. The FI302 accepts up to 7 parameter indices, configuring up to 7 parameter in the LCD.

DISPLAY_REFRESH

This parameter updates the new configuration.

CALIBRATION

If necessary, it is possible to adjust the FI302 output channel current. The trim adjustment is used if the indication on the transducer block output is different from the reference standard adopted. Possible causes are:

- The user Amperemeter is different from the plant standard.
- The converter had its default characterization altered by overload or by the time of use.

To analyze the transducer output calibration, measure the channel output current with an accurate Amperemeter and compare it with the indication on the FI302. Adjust the trim in case of difference.

The trim may be adjusted in two levels:

Lower Trim: At the range lower level.

Upper Trim: At the range upper level.

These points define the linear output characteristics. The trim adjustments are independent.

The Transducer Block parameters used for the FI302 calibration or current Trim are:

CAL_POINT_HI, CAL_POINT_LO, FEEDBACK_CAL e CAL_CONTROL.

Parameter description:

CAL_POINT_HI

This parameter configures the calibration range upper value.

CAL_POINT_LO

This parameter configures the calibration range lower value.

FEEDBACK_CAL

This is the current measured value used by the calibration method. It is used to apply the current trim. To apply the lower or upper values, write the value read by the amperemeter in the parameter during the calibration of the values. Repeat this operation until the measure is the same as the value read. See figure 5.1.

CAL_CONTROL

It enables and disables the calibration process with options Enable and Disable. After initiating the calibration method, the CAL_CONTROL parameter is used to return to the previous normal operation.

The calibration will be enabled if the AO block output has a valid value and the status is different from "Bad". If "Bad" appears, the message "Calibration Failed" will appear on the XD_ERROR parameter.

Figure 5.1 shows how to connect the converter to calibrate its lower value on 4 mA and its upper value on 20mA.

FI302

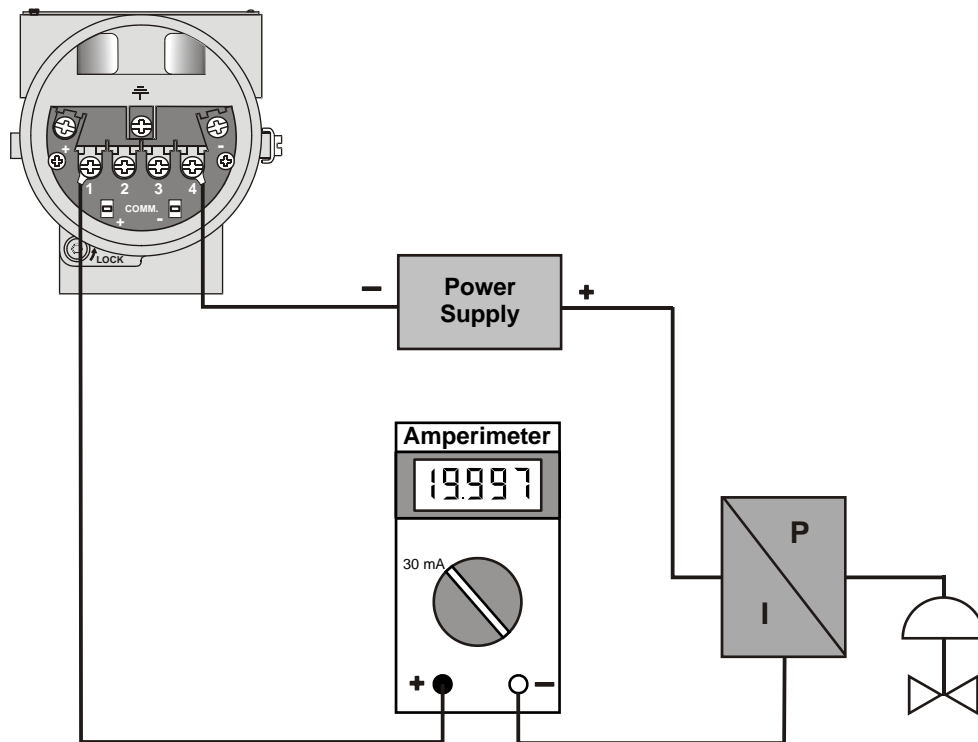


Figure 5.1 – Current Measuring Connection Diagram

There are two ways to apply the trim: use a magnetic tool for one of them and a fieldbus configuration tool, like the Smar Syscon for the other.

It is possible to calibrate the converter by means of parameters CAL_POINT_LO and CAL-POINT-HI.

Let's take the lower value as an example: write 4 mA or the lower value in parameter CAL_POINT_LO.

This parameter indicates where the converter should be when the setpoint lower value is 0%.

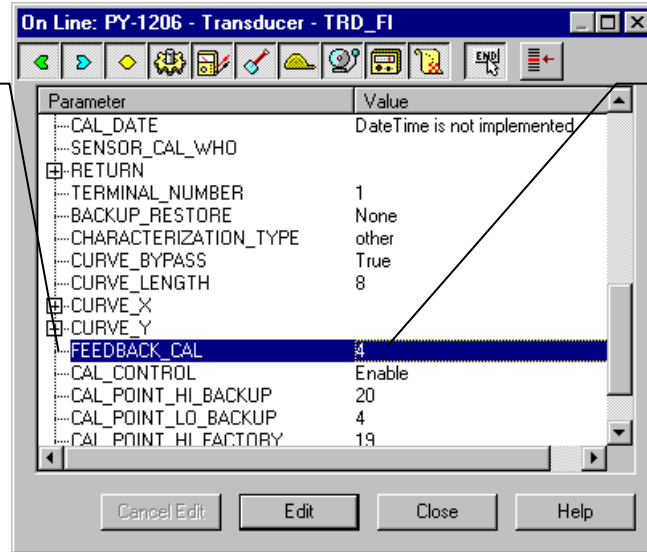
Parameter	Value
...BLOCK_ALM	0
...TRANSDUCER_DIRECTORY	0
...TRANSDUCER_TYPE	Other
...XD_ERROR	Default value set
...COLLECTION_DIRECTORY	0
...FINAL_VALUE	
...FINAL_VALUE_RANGE	
...CAL_POINT_HI	19
CAL_POINT_LO	4
...CAL_MIN_SPAN	1
...CAL_UNIT	mA
...ACT_SN	0
...CAL_METHOD	Factory cal standard calibration
...CAL_LOC	
...CAL_DATE	DateTime is not implemented

The desired value should be entered.

Figure 5.2 - Calibrating the CAL_POINT_LO – FI302

Always keep in mind that, simply by writing in this parameter, the trim procedure is initialized. Read the current in the multimeter and write that value in parameter FEEDBACK_CAL. Write in this parameter until it reads 4.0 mA or the lower value readout of the multimeter.

This parameter should be set with the actual output current during the calibration procedure.

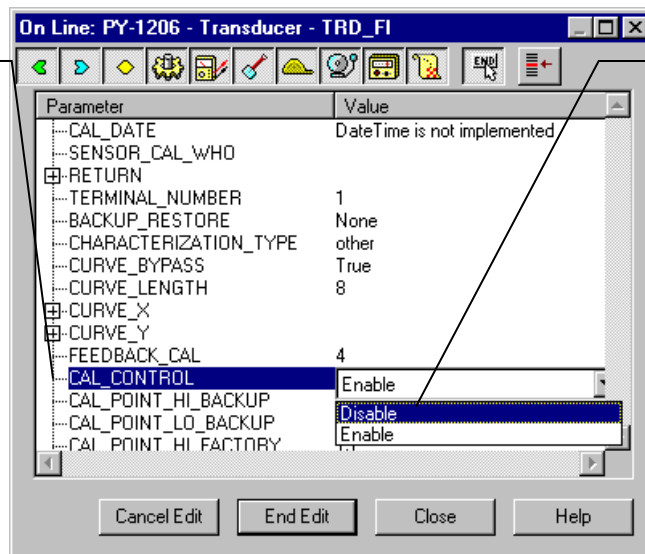


The value should be entered here.

Figure 5.3 - Feedback of Current Lo Value

In order to end the trim procedure, choice DISABLE in the parameter CAL_CONTROL.

This parameter ends the calibration procedure.



The enable option indicates that the calibration process is being done. In order to finalize its procedure, the user should set it to disable.

Figure 5.4 - Closing the Calibration Lo Procedure

Let's take the upper value as an example:

Write 20 mA in parameter CAL_POINT_HI. Always keep in mind that, simply by writing in this parameter, the trim procedure is initialized.

This parameter indicates where the converter should be when the setpoint is 100%.

Parameter	Value
FINAL_VALUE	
FINAL_VALUE_RANGE	
CAL_POINT_HI	20
CAL_POINT_LO	4
CAL_MIN_SPAN	1
CAL_UNIT	mA
ACT_SN	0
CAL_METHOD	User cal standard calibration
CAL_LOC	
CAL_DATE	DateTime is not implemented
SENSOR_CAL_WHO	
RETURN	
TERMINAL_NUMBER	1
BACKUP_RESTORE	None
CHARACTERIZATION_TYPE	other

The desired value should be entered.

Figure 5.5 - Calibrating the Cal Point Hi – FI302

Read the current in the multimeter and write that value in parameter FEEDBACK_CAL. Write in this parameter until it reads 20.00 mA or the upper value readout of the multimeter.

This parameter should be set with the actual output current during the calibration procedure.

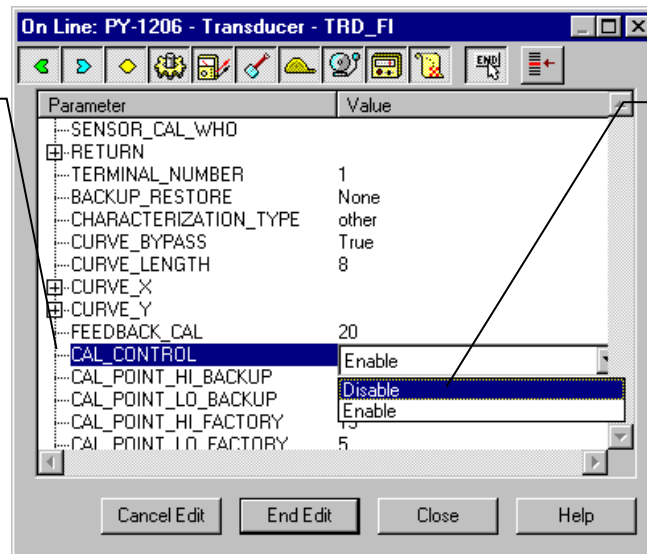
Parameter	Value
SENSOR_CAL_WHO	
RETURN	
TERMINAL_NUMBER	1
BACKUP_RESTORE	None
CHARACTERIZATION_TYPE	other
CURVE_BYPASS	True
CURVE_LENGTH	8
CURVE_X	
CURVE_Y	
FEEDBACK_CAL	20
CAL_CONTROL	Enable
CAL_POINT_HI_BACKUP	20
CAL_POINT_LO_BACKUP	4
CAL_POINT_HI_FACTORY	19
CAL_POINT_LO_FACTORY	5

The value should be entered here.

Figure 5.6 - Feedback of CAL_POINT_HI – FI302

In order to end the trim procedure, choice DISABLE in the parameter CAL_CONTROL.

This parameter ends the calibration procedure.

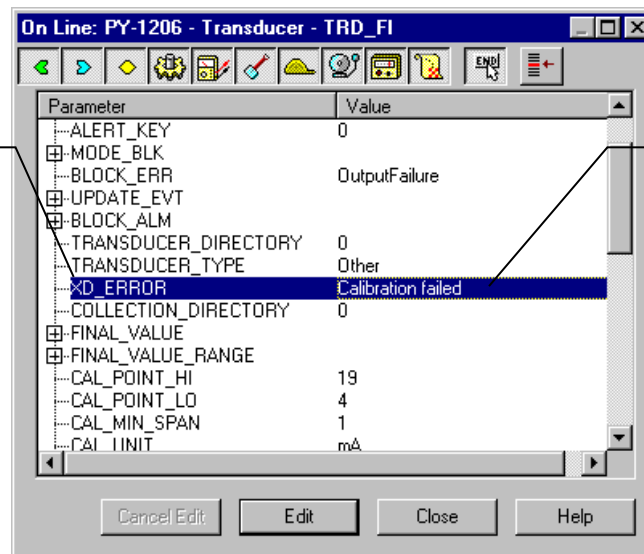


The enable option indicates that the calibration process is being done. In order to finalize its procedure, the user should set it to disable.

Figure 5.7 - Closing the Calibration High Procedure

The calibration will be enabled only if the output of AO block has a valid value and status different of "Bad". In this case, the following message can be seen in the parameter XD_ERROR.

This parameter indicates the Error Code Operation associated to calibration procedure.



It indicates that the calibration procedure was not successful.

Figure 5.8- Calibration Error Message – FI302

MAINTENANCE

NOTE

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

Diagnostic Block – DIAG

This transducer block provides the following characteristics:

- Online measuring time for the functional blocks execution;
- Hardware revision
- Firmware revision
- Equipment serial number
- Main board serial number

The BEHAVIOR parameter defines the initial parameter values that will be used after block instantiation. The Adapted option selects a group of initial values more proper for the parameters, thus avoiding invalid values. The Spec option also allows defining initial values.

Troubleshooting

Physical Inspection

After connecting the FI302 to the network, if it loses communication or slows down. e.g., due to multiple tentative communication, the error may be caused by poor installation procedure, by the configuration or by poor equipment performance.

Causes for communication errors

- Badly fit connections
- Installation problems, repeated equipment addresses, bad configuration, etc.
- Terminator located at the wrong place, with or without terminator
- Power supply with too low or unstable voltage value
- Too long or too many Spurs
- Wrong ground or no ground
- Water infiltration in the equipment due to connections with wrong sealing and/or loose clamps
- Low isolation

After carrying out the procedures for detecting network defects, act as follows:

- Insulate the segment or equipment that causes the problem
- Check if the polarity is correct
- Check if the address is correct
- Check the Network integrity
- Check if the tension on the converter terminals is at least 9.5 V during communication

Remove the equipment to a bench and test it. If it presents malfunctioning, contact Smar.

Parameters used for Troubleshooting

The FI302Transducer Block parameters used for troubleshooting are:

BLOCK_ERR, XD_ERROR, FINAL_VALUE, RETURN e BACKUP_RESTORE

Caution messages may appear on the status of the Return parameter or Block Error parameter, in given circumstances such as presented below, in two modes, OOS and AUTO.

BLOCK_ERR

This transducer BLOCK_ERR parameter shows the following errors:

- **Block Configuration** – When XD_SCALE has an improper range or unit;

- **Output Failures** – When the loop current open;
- **Out of Service** – When the block is on out of service mode (OOS)

Limit Conditions for Calibration	
Lower	3.99 < NEW_LOWER < 11.5 mA, otherwise XD_ERROR = 22
Upper	12.5 < NEW_UPPER < 20.01 mA, otherwise XD_ERROR = 22

FINAL_VALUE

The desired current value and the status written by the AO block;

RETURN

Current output value coming from the AO block;

RETURN STATUS

The transducer block **Return Status** indicates the following errors:

- **Bad::NonSpecific:NotLimited** – When the loop current is interrupted (open loop);
- **XD_ERROR** – This parameter is used to indicate the calibration status;

BACKUP_RESTORE

This parameter is used as backup or to recover configuration data.

Table 6.1 has the information to determine the converter or network failures.

NOTE
It is recommended not to repair printed circuit boards. Keep spare parts or buy them from Smar, if necessary.

PROBABLE SOURCE OF ERROR	
Symptom	Diagnostic
No turn on	<p>Converter Fieldbus Connections Check power supply polarity and continuity</p> <p>Power Supply Check power supply output. The voltage at the FI302 terminal block must be between 9 and 32 Vdc</p> <p>Electronic circuit failure Check circuit boards for defects and replace them for spare ones.</p>
No communication	<p>Network Connection Check equipment, power supply and terminator connections.</p> <p>Network equipment impedance Check power supply and terminator impedance.</p> <p>Converter configuration Check the converter communication parameters setting</p> <p>Network Configuration Check the network communications settings</p> <p>Electronic Circuit Failure Replace the main board and the input board matched pairs.</p>
Incorrect Outputs (the power supply indicated aside is for 4-20 mA equipments)	<p>Output Terminal Connection Check power supply, channels, terminal box polarity and continuity</p> <p>Power Supply Check power supply output. The FI 302 output voltage must be between 3 and 45 Vdc.</p> <p>Load Resistance Must be between 0 and 2000 Ohm. The higher value depends on the output power supply voltage.</p> <p>Calibration Check the converter calibration</p>

Table 6.1 – Failure Diagnostic.

If the failure is not on table 6.1 use the Factory Init. The note below shows how to do it.

NOTE

Use **factory init** as the last option to recover control over the device when it presents problems related to function blocks or the communication. **Only authorized personnel should do it and the converter must be offline. This procedure will enable the standard configuration values of the plant and disable the previous equipment configuration.**

To access the letters **S** and **Z** use two magnetic screwdrivers and loosen the screw that holds the identification plate.

Proceed as follows:

1) Turn off the equipment and insert the magnetic screw drive handles in the openings S and Z and leave them there;

2) Power the equipment;

When the display shows **factory init**, remove them and wait for the “**S**” symbol on the right upper corner to unlit, indicating the end of the operation.

After running the **factory init**, download partially the configuration, which characterizes the equipment functional behavior on the fieldbus.

Disassemble Procedure

See Figure 6.1 for guidance on this procedure. Turn off the power supply before disassembling the converter.

Exploded View

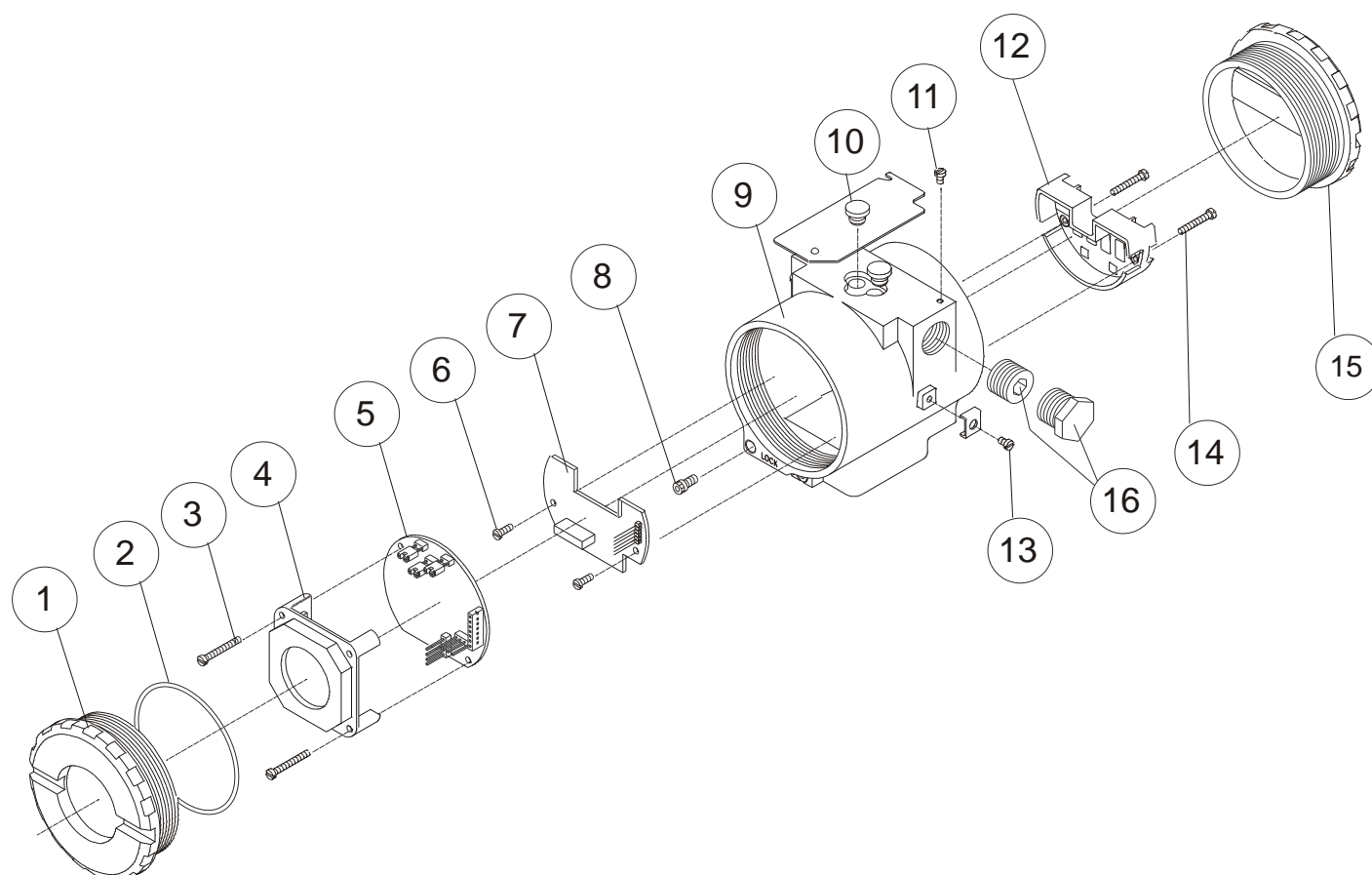


Figure 6.1 – FI302 Exploded View

Electronic Circuit

The main board (5) and output board (7) are matched pairs and must be replaced together should it be needed.

Tighten the locking screw cap (8) located on the opposite side of the enclosure housing marked by "Field Terminals" and unscrew the cap (1) to access the display and circuit boards. To remove the motherboard (5) and the display, release the two screws (3) that hold them. Disconnect the display of the motherboard (5) and that the board's output signal. To remove the entry (7), loosen the screws (6) that hold the housing (9).

CAUTION

The boards have CMOS components that may be damaged by electrostatic discharges. Follow the right procedure for handling the CMOS components. Store the circuit boards in electrostatic-proof packaging.

Assembly Procedure

See Figure 6.1 for guidance on this procedure.

- Insert the output signal board (7) into the housing (9) and fasten it with its screws.
- Insert the main board (5) in the housing, making sure that all the pins are connected.
- The display may be mounted in any of the 4 possible positions (see Figure 6.2). The "▲" sign indicates the display upper position.
- Hold firmly the main board and the display with their screws (3).
- Fit the cover (1) according to the area classification and lock it with the locking screw (8).

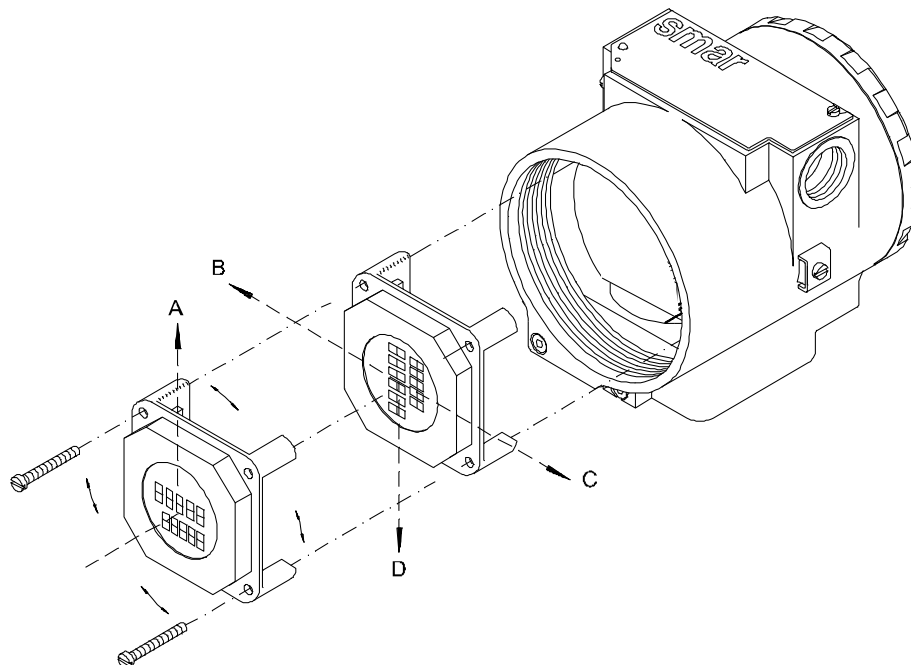


Figure 6.2 – Four Possible Indicator Positions

Interchangeability

The output and the main boards are matched pairs, once the calibration data for the output board is stored in the EEPROM of the main board. If for any reason, boards must be mixed to form a functional pair, a new calibration procedure must be done in order to guarantee the outputs accuracy.

Spares

SPARES	
ORDER CODE	DESCRIPTION
SD1	Magnetic Screwdriver for local adjustment
FDI302	Field device interface

Spare Part List

SPARE PART LIST				
DESCRIPTION OF PARTS		POSITION	CODE	CATEGORY (NOTE 4)
Cover Without Window (Included O-ring)	Aluminum	1 e 15	204-0102	
	316 Stainless Steel	1 e 15	204-0105	
Cover With Window (Included O-ring)	Aluminum	1	204-0103	
	316 Stainless Steel	1	204-0106	
Sealing ring (Note 2)	Cover, Buna-N	2	204-0122	B
Aluminum Housing Main Board Screw	Units with indicator	3	304-0118	
	Units without indicator	3	304-0117	
316 Stainless Steel Housing Main Board Screw	Units with indicator	3	204-0118	
	Units without indicator	3	204-0117	
Digital Indicator		4	214-0108	
Main and Output Board		5 e 7	324-0140	A
Output Board Screw	Aluminum Housing	6	314-0125	
	316 Stainless Steel Housing	6	214-0125	
Cover Locking Screw		8	204-0120	
Housing, Aluminum (Note 1)	1/2 - 14 NPT	9	324-0130	
	M20 x 1.5	9	324-0131	
	PG 13.5 DIN	9	324-0132	
Housing, 316 Stainless Steel (Note 1)	1/2 - 14 NPT	9	324-0133	
	M20 x 1.5	9	324-0134	
	PG 13.5 DIN	9	324-0135	
Local Adjustment Protection Cap		10	204-0114	
Identification Plate Screw		11	204-0116	
Terminal Block Insulator		12	314-0123	
External Ground Screw		13	204-0124	
Terminal Block Insulator Screw	Aluminum Housing	14	304-0119	
	316 Stainless Steel Housing	14	204-0119	
Six-Sided Plug 1/2" NPT Internal BR Ex	Bichromated Carbon Steel	16	400-0808	
	Bichromated 304 Stainless Steel	16	400-0809	
Six-Sided Plug 1/2" NPT Internal	Bichromated Carbon Steel	16	400-0583-11	
	Bichromated 304 Stainless Steel	16	400-0583-12	
Six-Sided Plug M20 X 1.5 External BR Ex d	316 Stainless Steel	16	400-0810	
Six-Sided Plug PG13.5 External BR Ex d	316 Stainless Steel	16	400-0811	
Mounting Bracket for 2" Pipe (Note 3)	Carbon Steel	-	214-0801	
	316 Stainless Steel	-	214-0802	
	Carbon Steel Bolts, Nuts, Washers and U-clamp in Stainless Steel	-	214-0803	

NOTE

1. Includes terminal insulator, bolts (cover lock, grounding and terminal insulator), and I.D. plate without certification.
2. Sealing orings are packed in dozens.
3. Includes U-clamp, nuts, bolts and washers. Spare part list.
4. For category "A" it is recommended to keep in stock 1 set for each 25 installed pairs, and for category "B", 1 set/50 pairs.

ADVANCED CONFIGURATION

The transducer block allows some configurations through the parameters below that alter the current output curve.

Parameter description

CHARACTERIZATION_TYPE

Indicates the characterization curve type;

CURVE_BYPASS

Enables and disables the characterization curve;

CURVE_LENGTH

Indicates the number of points the characterization curve;

CURVE_X

Characterization curve input points;

CURVE_Y

Characterization curve output points;

Characterization Curve

The transducer block also has a characterization curve, used to give a determined profile to the output. This is useful, for example, when the FI302 controls a valve with a non-linear feature. The characterization curve is applied to the input signal before being converted and sent to the analog output by the transducer.

The CURVE_BYPASS parameter determines if the curve will be used or not. If the parameter is a true Bypass, the curve is not used and the input value is transmitted directly to the output current conversion routine.

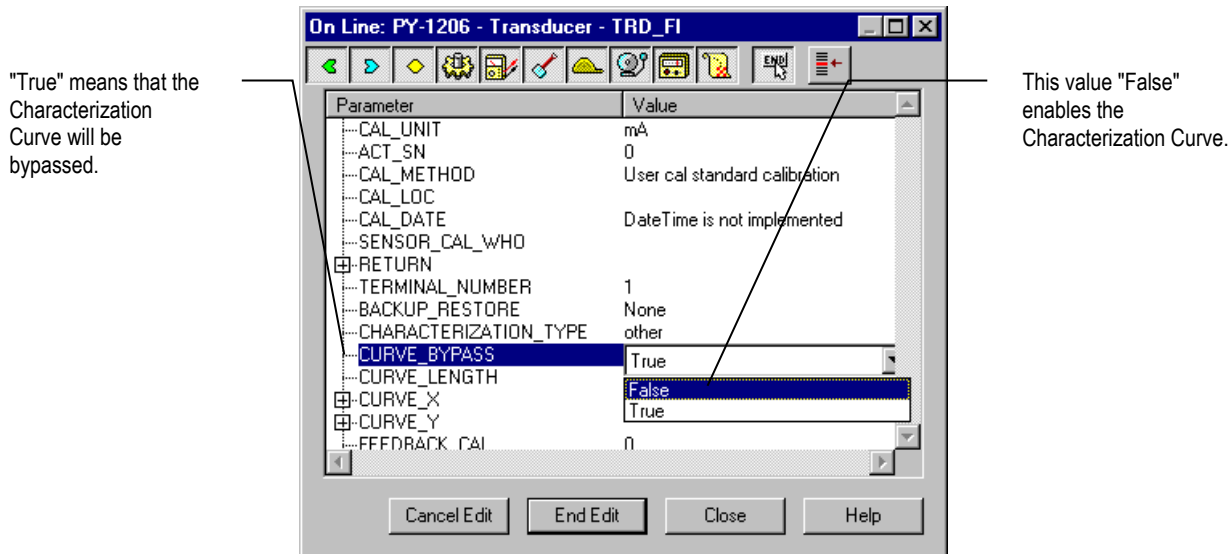


Figure 7.1 - Enabling the Characterization Curve

The characterization curve has 8 points. Each point has two coordinates (**X** and **Y**). These two coordinates define the point location in the **X – Y** space, and the connection of adjacent points with a linear segment forms the characterization curve. Extreme points are extrapolated.

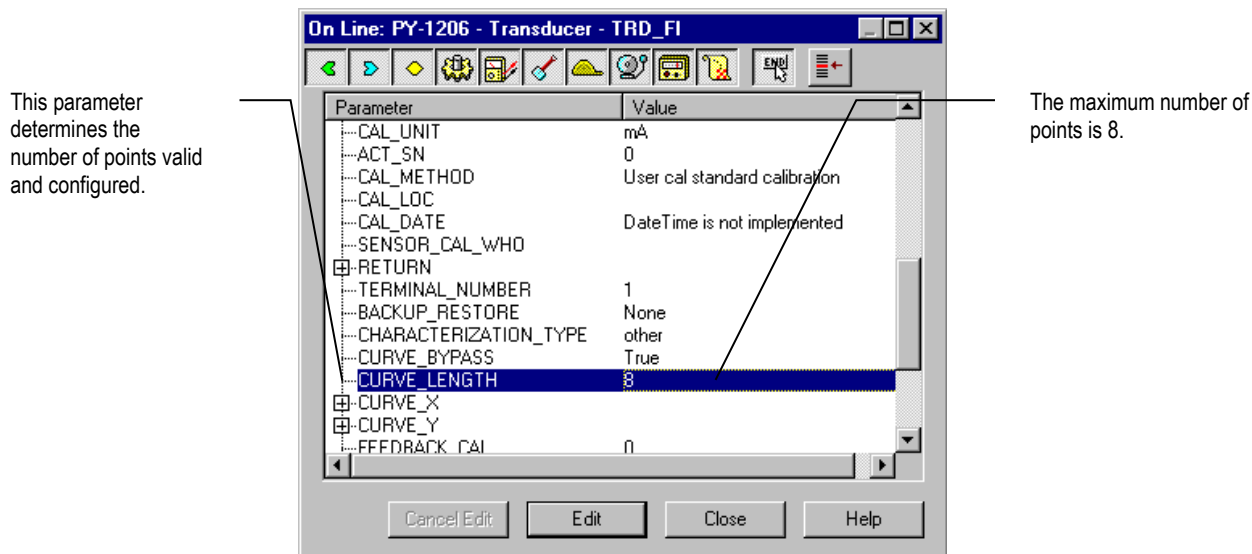


Figure 7.2 - Setting the Characterization Curve Length

These points are numbered from 1 to 8 and are contained in the CURVE_X (abscissas) and CURVE_Y (ordinates) parameters. CURVE_X parameter requires points in crescent order, meaning that the subsequent points must be greater than the preceding ones, or the parameter will not be accepted. CURVE_Y parameter does not require this, and a non-monotonic curve is allowed.

NOTE
When writing on CURVE parameters remember to place the point coordinates in the correct order.

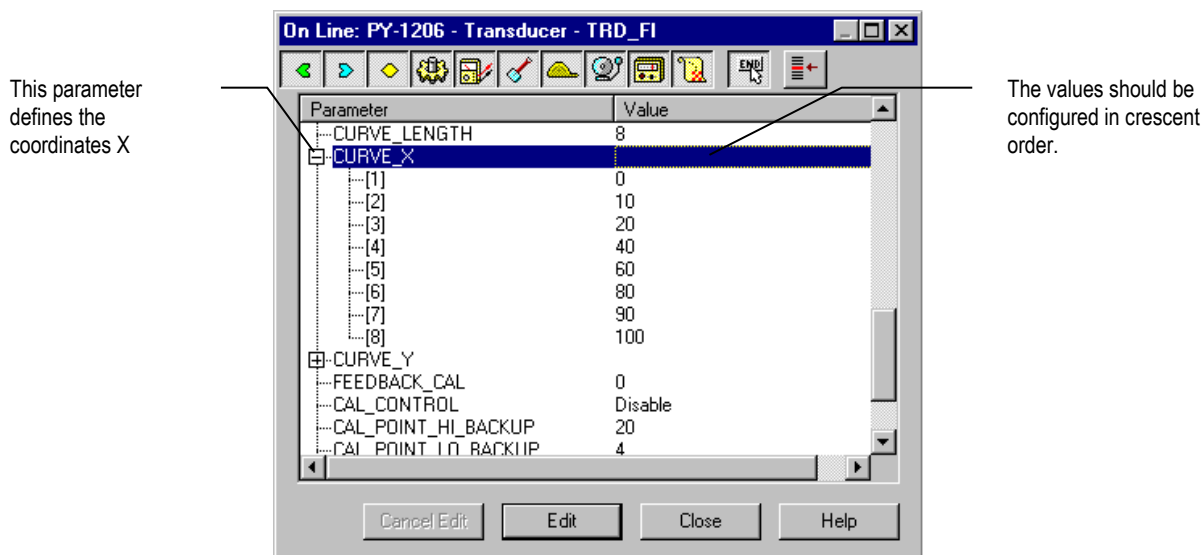
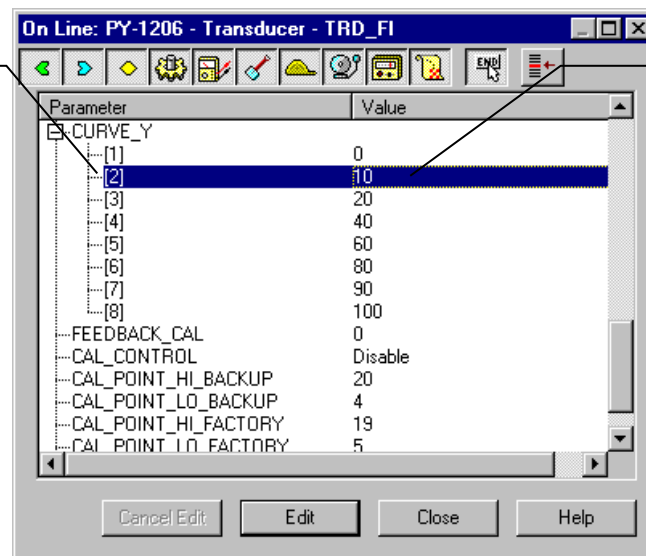


Figure 7.3 - Configuring the Characterization Curve X points

This parameter defines the coordinates Y



It is not necessary to follow any order. A monotone curve is allowed.

Figure 7.4 - Configuring the Characterization Curve - Y points

The Display Block allows configure up to three variables here they be shown in the digital indicator, or a tree with parameters that can be altered via local adjustment. This configuration is possible through procedures below:

NOTE

The parameters with "n" at its end mean that they are the same for other groups and are differentiated by their group number instead of the letter.

The Display Block parameters are:

SUB_INDEX_n, **MNEMONIC_n**, **INC_DEC_n**, **DECIMAL_POINT_NUMBER_n** e **ACCESS_n**

SUB_INDEX_n

To visualize a tag choose the relative index equal to zero and the sub index equal to 1

MNEMONIC_n

This mnemonic identifies the parameter (16 characters maximum). Preferably, choose the mnemonic with up to 5 characters because it will be not necessary to rotate it on the display.

INC_DEC_n

It is the increase and the decrease in decimal units when the parameter is Float, Float Status, or Integer when the parameter is expressed in total units;

DECIMAL_POINT_NUMBER_n

Number of digits after the decimal point (0 to 3 decimal digits);

ACCESS_n

On **Monitoring**, the parameter enables only this option and on **Action** the function shows on the display the increment and decrement values.

Definition of Parameters and Values

Block_Tag_Param

This is tag of the block to which the parameter belongs. Use up to a maximum of 32 characters.

Index_Relative

This is the index related to the parameter to be actuated or viewed (0, 1, 2...). Refer to the Function Blocks Manual to know the desired indexes, or visualize them on the SYSCON by opening the desired block.

In case you wish to visualize a certain tag, opt for the index relative equal to zero, and for the sub-index equal to one (refer to paragraph Structure Block in the Function Blocks Manual).

Sub_Index

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

Inc_Dec

It is the increment and decrement in decimal units when the parameter is Float or Float Status time, or integer, when the parameter is in whole units.

Decimal_Point_Numb.

This is the number of digits after the decimal point (0 to 3 decimal digits).

Access

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

Alpha_Num

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

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

In case you wish to visualize a certain tag, opt for the index relative equal to zero, and for the sub-index equal to one (refer to paragraph Structure Block in the Function Blocks Manual).

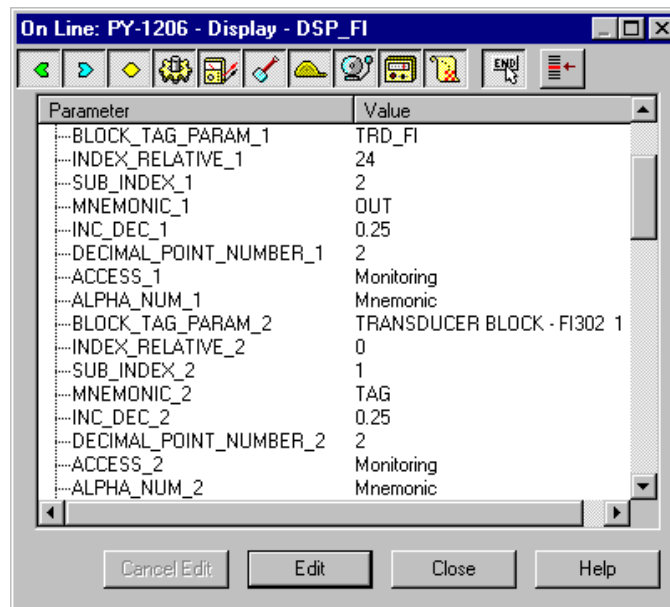


Figure 7.5- Parameters for Local Adjustment Configuration

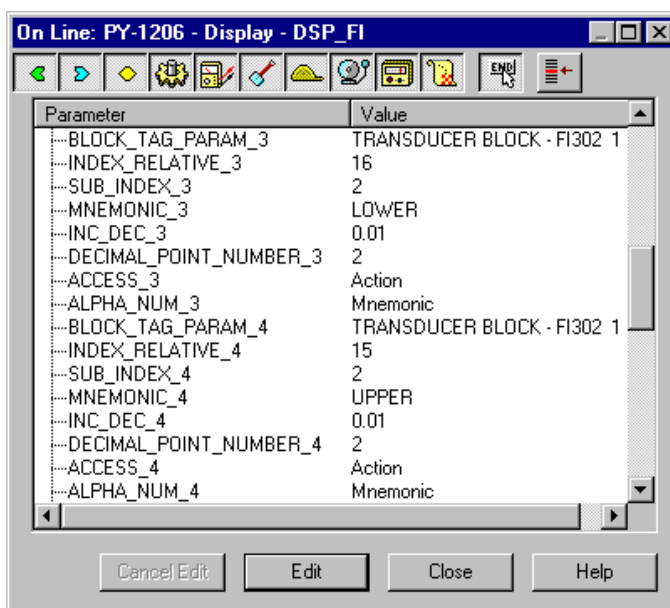


Figure 7.6 - Parameters for Local Adjustment Configuration

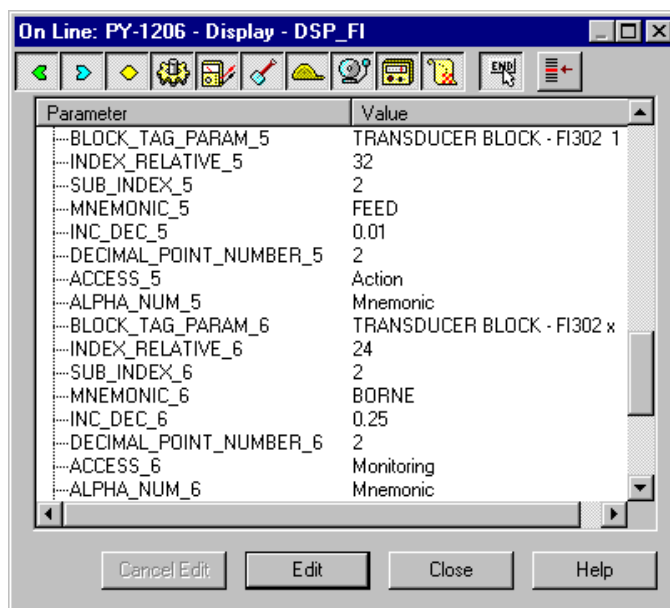


Figure 7.7 - Parameters for Local Adjustment Configuration

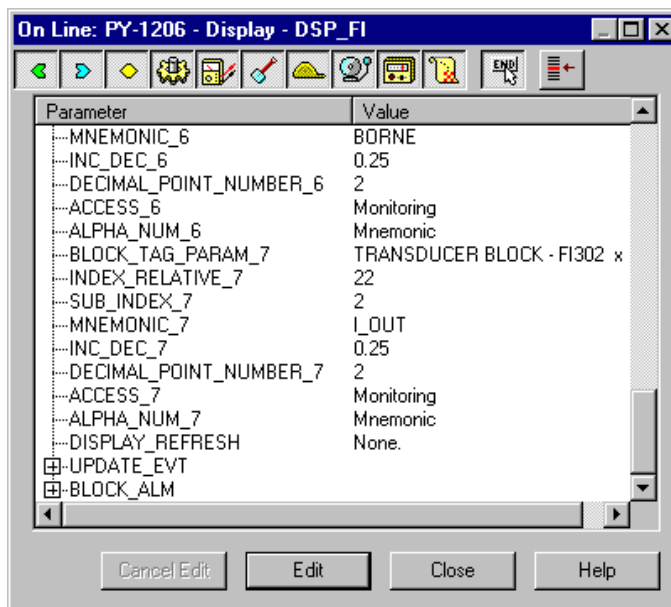


Figure 7.8 - Parameters for Local Adjustment Configuration

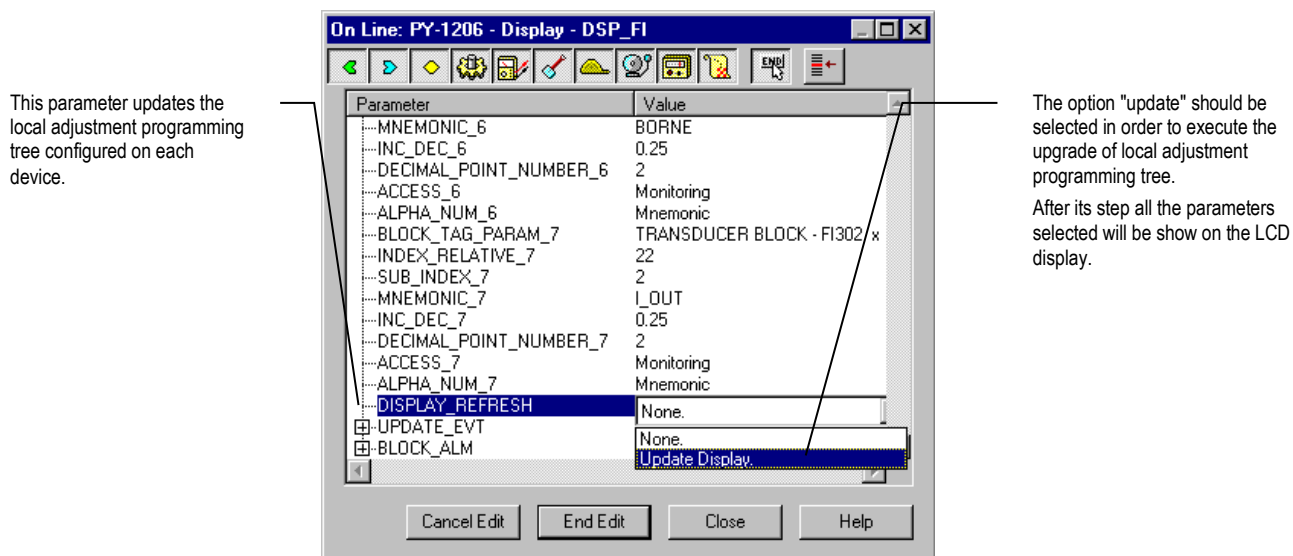


Figure 7.9 - Parameters for Local Adjustment Configuration

LOCAL ADJUSTMENT

When using the local adjustment for calibration, configure the display block to show the following parameters: CAL_POINT_HI (UPPER mnemonic), CAL_POINT_LO (LOWER mnemonic) and TAG (TAG mnemonic).

The FI302 has three output transducers, although only the number 1 leaves Smar with factory configuration. To configure the other transducers to work with local adjustment use the configuration tool.

NOTE

The Trim mode is removed from local adjustment automatically if the magnetic tool is not used during approximately 16 seconds.

Under its identification plate, the FI302 has two openings marked with S and Z at their side, giving access to two Reed Switch magnetic tools. They are activated when the magnetic tool is inserted in the orifices by its handle (See Figure 8.1).

The magnetic tool permits adjusting most block parameters.

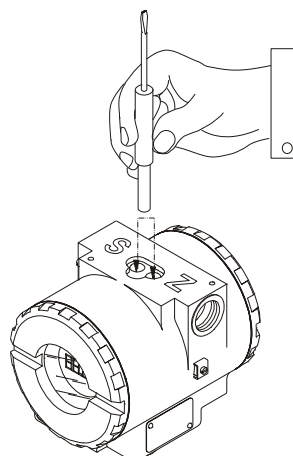


Figure 8.1 – Local Adjustment Orifices.

Jumper Configuration

J1 and **W1** Jumpers located on top of the main board must be coupled with the main board and the converter must have a display to show the local adjustment options.

Table 8.1 shows the possible actions applied on openings **S** and **Z** when the local adjustment is enabled.

OPENING	ACTION
S	Selects the function shown on the display
Z	Initializes the local adjustment and moves through the available options.

Table 8.1 – Function of the Openings on the Housing

J1 Jumper Connection

If **J1** (see figure 8.2) is connected to the **ON** pins, it will be possible to simulate values and status using the SIMULATE parameter on the functional blocks.

W1 Jumper Connection

If **W1** (see figure 8.2) is connected to **ON**, the display may perform configurations through local adjustment.

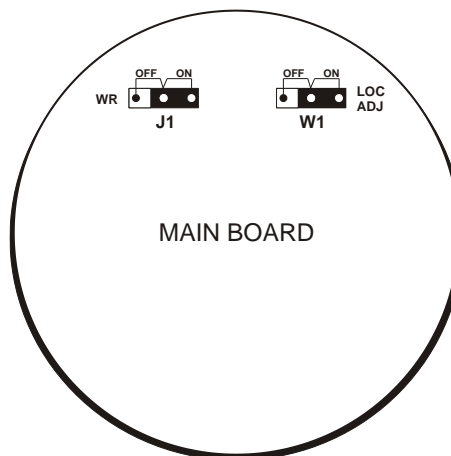
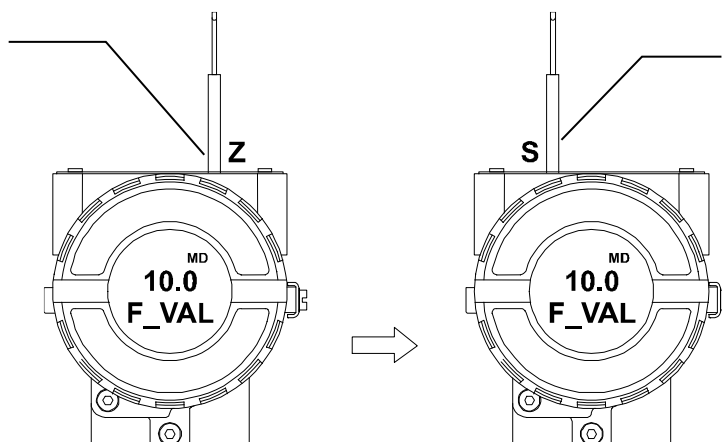


Figure. 8.2 – J1 and W1 Jumpers

To calibrate the upper and lower current values by local adjustment follow the step-by-step example below:

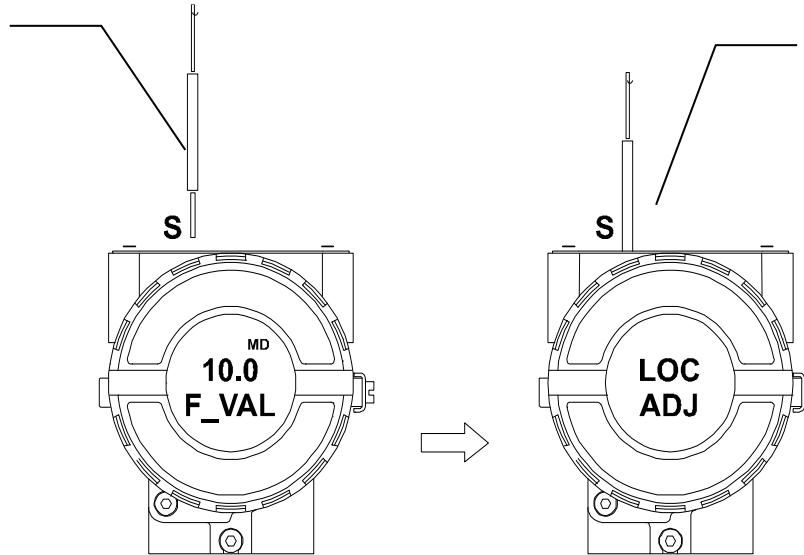
In order to initialize the local adjustment, insert the magnetic screwdriver. Insert it in orifice **Z** and wait for the letters **MD** to appear.



Insert it again in orifice **S** and wait for 5 secs.

Figure 8.3 – FI302 Step 1

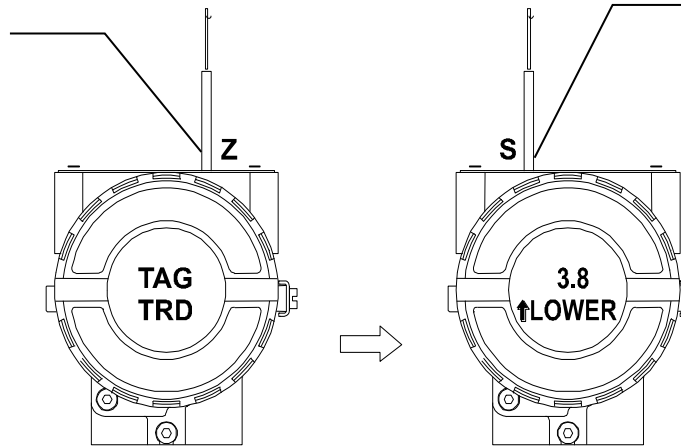
Remove it from opening **S**



Insert it again on opening **S**. The abbreviations **LOC ADJ** will be displayed

Figure 8.4 – FI302 Step 2

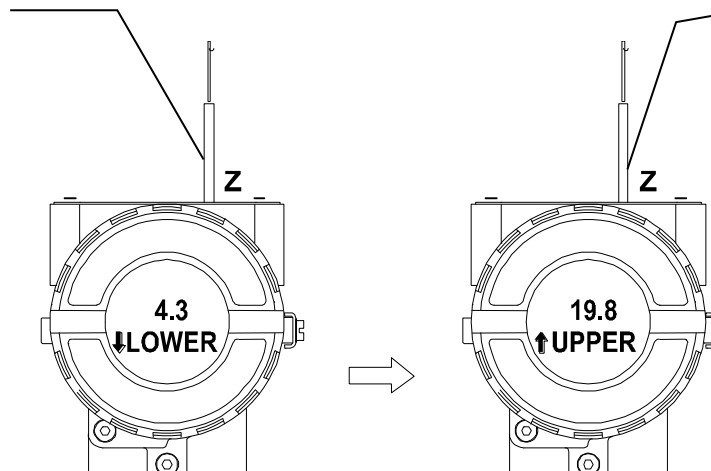
Insert the magnetic tool in the orifice **Z**. If it is the first option to be configured, the option **TAG** and its equivalent mnemonic will be displayed. Otherwise, the last option configured will be displayed. By keeping the tool in the opening, the local adjustment menu will rotate through the options on the local adjustment tree.



The first option on the tree is **LOWER**, with an arrow pointing upwards. An arrow pointing upwards (↑) increments the value and an arrow pointing downwards (↓) decrements the value. This parameter is used to calibrate the lower current value. In order to adjust the lower current value insert the tool in orifice **S**. Leave it there until the display shows 4,00 mA. If the values are different, move to **FEED** parameter and insert the milli-ampere current value to correct it.

Figure 8.5 – FI302 step 3

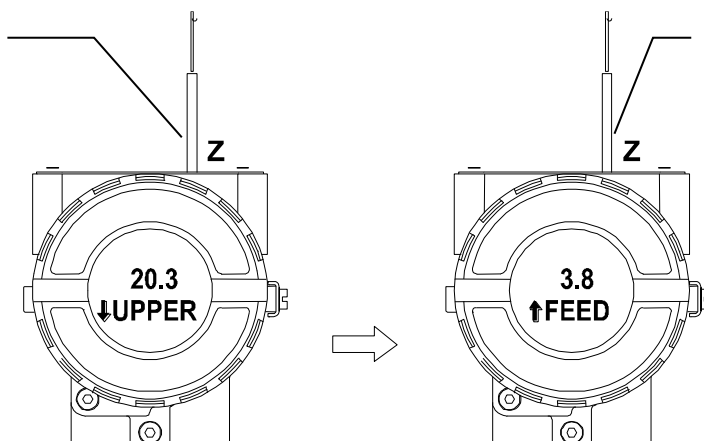
In order to decrement the lower value, insert the magnetic tool in the orifice **Z** to shift the arrow to the downward position. Insert the tool in opening **S** and wait for the lower value to decrement to 4,99 mA. Insert the milliamperimeter in the terminal block output and measure the current. If the values are different, move to the **FEED** parameter and insert the milliamperimeter current value to correct it.



The **UPPER** option is used to calibrate the upper current value. Insert the magnetic tool in the **S** and leave it there until the display indicates 20,00 mA. Insert the milliamperimeter in the output terminal of the terminal block and measure the current. If the values are different, move to the **FEED** parameter and insert the current value read on the meter to correct it.

Figure 8.6 – F302 Step 4

In order to decrement the upper value, insert the magnetic tool in the **Z** to shift the arrow to the downward position. Insert the tool in the **S** and wait for the lower value to decrease to 20,00 mA. Insert the miliamperimeter in the output terminal of the terminal block and measure the current. If the values are different, go to the **FEED** parameter and insert the miliamperimeter current value to correct it.



The FEED option allows the user to correct the current shown on the display, when the current is different from the standard value measured at the output. To implement the correction, read the current shown on the meter and apply this value. This option makes it possible to correct the calibration points on both Upper and Lower currents. An arrow pointing upwards (↑) increments the current.

Figure 8.7 – FI302 Step 5

Insert the magnetic tool in the **S** to shift the arrow downwards and decrement the calibration current according to the measured value. An arrow pointing downwards (↓) will decrement the current value.

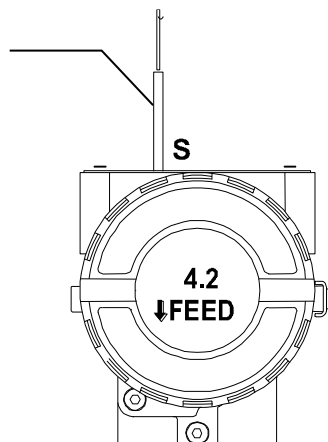


Figure 8.8 – FI302 Step 6

Section 9

TECHNICAL CHARACTERISTICS

Functional Specification	
Output Signal	Three 4 - 20 mA current output, external supply, common ground.
Input Signal	FOUNDATION™ fieldbus, digital, voltage mode 31.25 Kbit/s with bus power.
Output Load Limitation	External 3 - 45 Vdc output supply.
Power Supply	Bus power 9 a 32 Vdc. Quiescent current consumption 12 mA.
Output Impedance	Non-intrinsic safety: 7.8 KHz to 39 KHz impedance must greater or equal to 3 KΩ. With an intrinsic safety, the output impedance should be greater or equal to 400 Ω, on the assumption that exists a power supply barrier of 7.8 KHz to 39KHz.
Display	4½ digit LCD display.
Hazardous Area Certification	Explosion-proof and intrinsically safe (ATEX (NEMKO and DEKRA EXAM), FM, CEPEL, CSA and NEPSI). Designed to comply with European Regulations (ATEX 94/9/EC and LVD 2006/95/EC).
Temperature Limits	Operation: -40 to 85 °C (-40 to 185 °F); Storage: -40 to 120 °C (-40 to 250 °F); Display: -10 to 60 °C (14 to 140 °F) Operation; -40 to 85 °C (-40 to 185 °F) without damage.
Humidity Limits	0 a 100% RH.
Operation starting time	Approximately 10 seconds.
Update time	Approximately 0.2 seconds.
Performance Specification	
Accuracy	0.1%.
Ambient Temperature Effect	For a 10° C variation: ± 0.05% .
Output Power Supply Effect	± 0.005% V.
Vibration Effect	Complies with SAMA PMC 31.1.
Electromagnetic interference Effect	Designed to comply with European Directive EMC 2004/108/EC.
Physical Specification	
Electrical connection	1/2 -14 NPT, PG 13.5 or M20 x 1.5.
Material of Construction	Injected low copper aluminum and finishing with polyester painting or 316 stainless steel, with Buna N O-rings on cover.
Mounting	With an optional bracket, may be installed on a 2" pipe or on a wall or panel.
Weight	Without display and mounting brackets: 0.80 Kg. Add 0.13 Kg for digital display. Add 0.60 Kg for mounting bracket.

Ordering Code

MODEL									
FI302 TRIPLE CHANNEL FOUNDATION FIELDBUS TO CURRENT CONVERTER									

FI302	1	1	0	*	*	*	*	*	*
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TYPICAL MODEL

* Leave it blank if not applicable

CERTIFICATIONS INFORMATION

European Directive Information

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

Authorized representative/importer located within the Community:

Smar Europe BV De Oude Wereld 116 2408 TM Alphen aan den Rijn Netherlands

ATEX Directive 2014/34/EU - "Equipment for explosive atmospheres" (applicable from 20 April 2016)

The EC-Type Examination Certificate is released by DNV Product Assurance AS (NB 2460) and DEKRA Testing and Certification GmbH (NB 0158).

Designated certification body that monitors manufacturing and released QAN (Quality Assurance Notification) is Nemko AS (NB 0470) and UL International Demko AS (NB 0539).

LVD Directive 2014/35/EU – "Low Voltage" (applicable from 20 April 2016)

According to the LVD directive Annex II, electrical equipment for use in an explosive atmosphere is outside the scope of this directive.

According to IEC standard: IEC 61010-1 - Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements.

ROHS Directive 2011/65/EU - "Restriction of the use of certain hazardous substances in electrical and electronic equipment"

For the evaluation of the products the following standards were consulted: EN IEC 63000.

EMC Directive 2014/30/EU - "Electromagnetic Compatibility" (applicable from 20 April 2016)

For products evaluation the standard IEC 61326-1 were consulted and to comply with the EMC directive the installation must follow these special conditions:

Use shielded, twisted-pair cable for powering the instrument and signal wiring.

Keep the shield insulated at the instrument side, connecting the other one to the ground.

Hazardous locations general information

Ex Standards:

IEC 60079-0 General Requirements

IEC 60079-1 Flameproof Enclosures "d"

IEC 60079-7 Increased Safe "e"

IEC 60079-11 Intrinsic Safety "i"

IEC 60079-18 Encapsulation "m"

IEC 60079-26 Equipment with Separation Elements or combined Levels of Protection

IEC 60079-31 Equipment dust ignition protection by enclosure "t"

IEC 60529 Classification of degrees of protection provided by enclosures (IP Code)

IEC 60079-10 Classification of Hazardous Areas

IEC 60079-14 Electrical installation design, selection and erection

IEC 60079-17 Electrical Installations, Inspections and Maintenance

IEC 60079-19 Equipment repair, overhaul and reclamation

ISO/IEC 80079-34 Application of quality systems for equipment manufacture

Warning:

Explosions could result in death or serious injury, besides financial damage.

Installation of this instrument in hazardous areas must be in accordance with the local standards and type of protection. Before proceedings with installation make sure that the certificate parameters are in accordance with the classified hazardous area.

Maintenance and Repair

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

Marking Label

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

Intrinsic Safety / Non Incendive application

In hazardous areas with intrinsic safety or non-incendive requirements, the circuit entity parameters and applicable installation procedures must be observed.

The instrument must be connected to a proper intrinsic safety barrier. Check the intrinsically safe parameters involving the barrier and equipment including the cable and connections. Associated apparatus ground bus shall be insulated from panels and mounting enclosures. Shield is optional, when using shielded cable, be sure to insulate the end not grounded.

Cable capacitance and inductance plus Ci and Li must be smaller than Co and Lo of the Associated Apparatus.

It is recommended do not remove the housing covers when powered on.

Explosionproof / Flameproof application

Only use Explosionproof/Flameproof certified Plugs, Adapters and Cable glands.

The electrical connections entries must be connected using a conduit with sealed unit or closed using metal cable gland or metal blanking plug with at least IP66.

Do not remove the housing covers when powered on.

Enclosure

The electronic housing and sensor threads installed in hazardous areas must have a minimum of 6 fully engaged threads. The covers must be tightening with at least 8 turns, to avoid the penetration of humidity or corrosive gases, and until it touches the housing. Then, tighten more 1/3 turn (120°) 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 35°C for a period of 200 hours (Ref: NEMA 250/ IEC60529).

For enclosure with IP/IPW/TypeX applications, all NPT threads must apply a proper water-proof sealant (a non-hardening silicone group sealant is recommended).

Hazardous Locations Approvals

FM Approvals

FM 0D7A9.AX

XP Class I, Division 1, Groups A, B, C, D

DIP Class II, III Division 1, Groups E, F, G

IS Class I, II, III Division 1, Groups A, B, C, D, E, F, G

NI Class I, Division 2, Groups A, B, C, D

T4; Ta = -20 °C < Ta < 60 °C; Type 4, 4X, 6, 6P

Entity Parameters Fieldbus Power Supply Input (report 3015629):

Vmax = 24 Vdc, Imax = 250 mA, Pi = 1.2 W, Ci = 5 nF, Li = 12 uH

Vmax = 16 Vdc, Imax = 250 mA, Pi = 2 W, Ci = 5 nF, Li = 12 uH

4-20 mA Current Loop:

Vmax = 30 Vdc, Imax = 110 mA, Pi = 0,825 W, Ci = 5 nF, Li = 12 uH

Drawing 102A-0080, 102A-1203, 102A-1326, 102A-1622, 102A-1623

ATEX DNV

Explosion Proof (PRESAFE 20 75160X)

Group II, Category 2 G, Ex db, Group IIC, Temperature Class T6, EPL Gb

Ambient Temperature: -20 °C to +60 °C

Options: IP66W/68W or IP66/68

Special conditions for safe use:

Repairs of the flameproof joints must be made in compliance with the structural specifications provided by the manufacturer.

Repairs must not be made on the basis of values specified in tables 1 and 2 of EN/IEC 60079-1.

The Essential Health and Safety Requirements are assured by compliance with:

EN IEC 60079-0:2018 General Requirements

EN 60079-1:2014 Flameproof Enclosures "d"

Drawing 102A-1266, 102A-1479

IECEx DNV

Explosion Proof (IECEx DNV 21.0090X)

Ex db IIC T6 Gb

Ta -20 °C to +60 °C

Options: IP66/68W or IP66/68

Special Conditions for Safe Use

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

The Essential Health and Safety Requirements are assured by compliance with:

IEC 60079-0:2017 General Requirements

IEC 60079-1:2014-06 Equipment protection by flameproof enclosures "d"

Drawing 102A-2198, 102A-2199

DEKRA

Intrinsic Safety (DMT 00 ATEX E 065)

Group I, Category M2, Ex ia, Group I, EPL Mb

Group II, Category 2 G, Ex ia, Group IIC, Temperature Class T4/T5/T6, EPL Gb

FISCO Field Device

Supply circuit for the connection to an intrinsically safe FISCO fieldbus-circuit:

Ui = 24Vdc, Ii = 380 mA, Pi = 5.32 W, Ci ≤ 5 nF, Li = neg

Parameters of the supply circuit comply with FISCO model according to Annex G EN 60079-11:2012, replacing EN 60079-27: 2008.

Output-signal-circuits:

three 4-20 mA current sinks with common ground for external intrinsically safe supply

Effective internal capacitance $C_i \leq 15 \text{ nF}$
 Effective internal inductance L_i negligible

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

Max. Ambient temperature T_a	Temperature Class	Voltage DC U_i	Current I_i	Power P_i
60°C	T4	28 V	93 mA	750 mW
50°C	T5	28 V	93 mA	750 mW
40°C	T6	28 V	93 mA	570 mW



The signal outputs are safely galvanically separated from the fieldbus circuit.
 Ambient Temperature: $-40^\circ\text{C} \leq T_a \leq +60^\circ\text{C}$

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


Drawing 102A-1266, 102A-1479, 102A-1270, 102A-1485

CEPEL

Segurança Intrínseca (CEPEL 97.0019X)

 <p>CEPEL 97.0019X</p> <p>Equipamento de campo FISCO</p> <p>Ex ia IIC T* Ga</p> <p>IP66W/IP68W</p> <p>$U_i = 30 \text{ V}$ $I_i = 380 \text{ mA}$ $P_i = 5,32 \text{ W}$ $C_i = 5,0 \text{ nF}$ $L_i = \text{desp}$</p> <p>Tamb: -20°C a $+50^\circ\text{C}$ para T5</p> <p>Tamb: -20°C a $+65^\circ\text{C}$ para T4</p>	 <p>CEPEL 97.0019X</p> <p>Equipamento de campo FISCO</p> <p>Ex ia IIIC T* Da</p> <p>IP66W/IP68W</p> <p>Tamb: -20°C a $+50^\circ\text{C}$ para T₂₀₀ 100°C</p> <p>Tamb: -20°C a $+65^\circ\text{C}$ para T₂₀₀ 135°C</p>
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Prova de Explosão (CEPEL 97.0091)

 <p>CEPEL 97.0091</p> <p>Ex db IIC T6 Gb</p> <p>Ex tb IIIC T85 °C Db</p> <p>IP66W/IP68W</p> <p>Tamb: -20°C a $+40^\circ\text{C}$</p>

Observações:

- 1) A validade deste Certificado de Conformidade está atrelada à realização das avaliações de manutenção e tratamento de possíveis não conformidades, de acordo com as orientações do Cepel, previstas no Regulamento de Avaliação da Conformidade. Para verificação da condição atualizada de regularidade deste Certificado de Conformidade deve ser consultado o banco de dados de produtos e serviços certificados do Inmetro.
- 2) O número do certificado é finalizado pela letra "X":

- Para indicar que para a versão do Conversor FIELD BUS para Corrente, modelos FI302 e FI303 equipado com invólucro fabricado em liga de alumínio, somente pode ser instalado em "Zona 0", se durante a instalação for excluído o risco de ocorrer impacto ou fricção entre o invólucro e peças de ferro/aço.
- 3) A tampa do invólucro possui uma plaqueta de advertência com a seguinte inscrição: "ATENÇÃO - NÃO ABRA ENQUANTO ENERGIZADO", ou similar tecnicamente equivalente.
- 4) 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 materiais de fabricação dos equipamentos aprovados para letra "W" são: aço inoxidável AISI 316 e alumínio Copper Free SAE 336 pintados (Procedimento P-CQ-FAB764-11) com tinta Resina Poliéster ou Resina Epoxy com espessura da camada de tinta de 70 a 150 µm e 120 a 200 µm, respectivamente, ou pintados com o plano de pintura P1 e P2 (Procedimento P-CQ-FAB-765-07) com tinta Resina Epoxy ou Poliuretano Acrílico Alifático com espessura de camada de tinta de 290 µm a 405 µm e 90 µm a 200 µm, respectivamente.
- 5) Os planos de pintura P1 são permitidos apenas para equipamento fornecido com plaqueta de identificação com marcação para grupo de gás IIB.
- 6) O grau de proteção IP68 só é garantido se nas entradas roscadas de ½" NPT for utilizado vedante não endurecível à base de silicone conforme Procedimento P-DM-FAB277-08.
- 7) O segundo numeral oito indica que o equipamento foi ensaiado para uma condição de submersão de dez metros por vinte e quatro horas. O acessório deve ser instalado em equipamentos com grau de proteção equivalente.
- 8) É responsabilidade do fabricante assegurar que todos os transformadores da placa analógica tenham sido submetidos com sucesso aos ensaios de rotina de 1500 V durante um minuto.
- 9) 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 do Cepel, invalidará este certificado.
- 10) É responsabilidade do fabricante assegurar que os produtos fornecidos ao mercado nacional estejam de acordo com as especificações e documentação descritiva avaliada, relacionadas neste certificado.
- 11) 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.
- 12) A marcação é executada conforme a Norma ABNT NBR IEC 60079-0:2020 e o Requisito de Avaliação da Conformidade de Equipamentos Elétricos para Atmosferas Explosivas nas Condições de Gases e Vapores Inflamáveis (RAC), e é fixada na superfície externa do equipamento, em local visível. Esta marcação é legível e durável, levando-se em conta possível corrosão química.

Normas Aplicáveis:

ABNT NBR IEC 60079-0:2020 Atmosferas explosivas - Parte 0: Equipamentos – Requisitos gerais

ABNT NBR IEC 60079-1:2016 Atmosferas explosivas - Parte 1: Proteção de equipamento por invólucro à prova de explosão "d"

ABNT NBR IEC 60079-11:2013 Atmosferas explosivas - Parte 11: Proteção de equipamento por segurança intrínseca "i"

ABNT NBR IEC 60079-26:2022 Atmosferas explosivas - Parte 26: Equipamentos com elementos de separação ou níveis de proteção combinados

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

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

Desenhos 102A1361, 102A1228, 102A2000, 102A1999, 102A2080

Identification Plate

FM Approvals



smar FI302 FB to 4-20mA Converter
BR - 14160
Made in Brazil

FM APPROVED

Temp. Class: T4	XP CL I, DIV 1, GP A,B,C,D.
Tamb. 60°C max.	DIP CL II,III, DIV 1, GP E,F,G.
Vmax. 24 VDC	S CL III, DIV 1.
I max. 250 mA	IS CL I,II,III, DIV 1, GP A,B,C,D,E,F,G.
Ci 5 nF	NI CL I, DIV 2, GP A,B,C,D.
Li 12 uH	Per inst. dwg 102A0080.

Type 4X/6/6P

0044333 - 2007

  120300



smar FI302 FB to 4-20mA Converter
BR - 14160
Made in Brazil

FM APPROVED

Temp. Class: T4	XP CL I, DIV 1, GP A,B,C,D.
Tamb. 60°C max.	DIP CL II,III, DIV 1, GP E,F,G.
Vmax. 24 VDC	S CL III, DIV 1.
I max. 250 mA	IS CL I,II,III, DIV 1, GP A,B,C,D,E,F,G.
Ci 5 nF	NI CL I, DIV 2, GP A,B,C,D.
Li 12 uH	Per inst. dwg 102A0080.

Type 4X/6/6P

0044333 - 2007

  132600



smar FI302 FB to 4-20mA Converter
TX - 77040
Made in USA

FM APPROVED

Temp. Class: T4	XP CL I, DIV 1, GP A,B,C,D.
Tamb. 60°C max.	DIP CL II,III, DIV 1, GP E,F,G.
Vmax. 24 VDC	S CL III, DIV 1.
I max. 250 mA	IS CL I,II,III, DIV 1, GP A,B,C,D,E,F,G.
Ci 5 nF	NI CL I, DIV 2, GP A,B,C,D.
Li 12 uH	Per inst. dwg 102A0080.

Type 4X/6/6P

0000000 - 0000

  162202



smar FI302 FB to 4-20mA Converter
TX - 77040
Made in USA

FM APPROVED

Temp. Class: T4	XP CL I, DIV 1, GP A,B,C,D.
Tamb. 60°C max.	DIP CL II,III, DIV 1, GP E,F,G.
Vmax. 24 VDC	S CL III, DIV 1.
I max. 250 mA	IS CL I,II,III, DIV 1, GP A,B,C,D,E,F,G.
Ci 5 nF	NI CL I, DIV 2, GP A,B,C,D.
Li 12 uH	Per inst. dwg 102A0080.

Type 4X/6/6P

0000000 - 0000

  162302

DNV / DEKRA



smar FI302 FB to 4-20mA Converter
Nova Smar S/A
Av. Dr. Antônio Furlan Jr
1028 Sertãozinho-SP
14170-480
Brazil

Ex II 2G Ex ia IIC T4/T5/T6 Gb DMT 00 ATEX E 065 ()
Pi = 5,32 W -40°C ≤ Ta ≤ +60°C
Ui = 24 VDC li = 380 mA Li = neg Ci ≤ 5 nF

IP66
IP68 10m/24h

Tamb = -20°C to 60°C U = 28 VDC

0000000 - 0000

  0470 126605



smar FI302 FB to 4-20mA Converter
Nova Smar S/A
Av. Dr. Antônio Furlan Jr
1028 Sertãozinho-SP
14170-480
Brazil

Ex II 2G Ex ia IIC T4/T5/T6 Gb DMT 00 ATEX E 065 ()
Pi = 5,32 W -40°C ≤ Ta ≤ +60°C
Ui = 24 VDC li = 380 mA Li = neg Ci ≤ 5 nF

IP66W
IP68W 10m/24h

Tamb = -20°C to 60°C U = 28 VDC

0000000 - 0000



  0470 147905

smar FI302 FB to 4-20mA Converter
Nova Smar S/A
Av. Dr. Antônio Furlan Jr
1028 Sertãozinho-SP
14170-480
Brazil

Ex db IIC T6 Gb IECEX DNV 21.0090X ()
Tamb = -20°C to 60°C
U = 28 VDC

IP66
IP68 10m/24h

0000000 - 0000



  219800

smar FI302 FB to 4-20mA Converter
Nova Smar S/A
Av. Dr. Antônio Furlan Jr
1028 Sertãozinho-SP
14170-480
Brazil

Ex db IIC T6 Gb IECEX DNV 21.0090X ()
Tamb = -20°C to 60°C
U = 28 VDC

IP66W
IP68W 10m/24h

0000000 - 0000



  219900

smar FI302 FB to 4-20mA Converter
BR - 14160
Sertãozinho
Brazil

Ex I M2 Ex ia I Mb DMT 00 ATEX E 065
-40°C ≤ Ta ≤ +60°C
Pi = 5,32 W
Ui = 24 VDC li = 380 mA Li = neg Ci ≤ 5 nF

IP 66 68

0000000 - 0000



  0470 127001

smar FI302 FB to 4-20mA Converter
BR - 14160
Sertãozinho
Brazil

Ex I M2 Ex ia I Mb DMT 00 ATEX E 065
-40°C ≤ Ta ≤ +60°C
Pi = 5,32 W
Ui = 24 VDC li = 380 mA Li = neg Ci ≤ 5 nF

IP 66W 68W

0000000 - 0000

  0470 148501

CEPEL

smar FI302 Conversor FB 4-20mA

Nova Smar S/A
Av. Dr. Antônio Furlan Jr
1028 Sertãozinho-SP
14170-480
Brazil

FISCO Field Device - Ex ia IIC T4 Ga
FISCO Field Device - Ex ic IIC T4 Gc

Ex db IIC T6 Gb CEPEL 97.0091 ()
Ex ia IIC T4/T5 Ga CEPEL 97.0019 X ()

Tamb= -20° a 65°C (T4) -20° a 50°C (T5)

Ui= 30V li= 380mA Pi= 5,32W
Ci= 5nF Li= desp

Segurança
Eletrôbras
INMETRO

IP66
IP68
10m/24h

0000000 - 0000

CE

136104

smar FI302 Conversor FB 4-20mA

Nova Smar S/A
Av. Dr. Antônio Furlan Jr
1028 Sertãozinho-SP
14170-480
Brazil

FISCO Field Device - Ex ia IIC T4 Ga
FISCO Field Device - Ex ic IIC T4 Gc

Ex db IIC T6 Gb CEPEL 97.0091 ()
Ex ia IIC T4/T5 Ga CEPEL 97.0019 X ()

Tamb= -20° a 65°C (T4) -20° a 50°C (T5)

Ui= 30V li= 380mA Pi= 5,32W
Ci= 5nF Li= desp

Segurança
Eletrôbras
INMETRO

IP66W
IP68W
10m/24h

0000000 - 0000

CE

122804

smar FI302 Conversor FB 4-20mA

Nova Smar S/A
Av. Dr. Antônio Furlan Jr
1028 Sertãozinho-SP
14170-480
Brazil

FISCO Field Device - Ex ia IIB T4 Ga
FISCO Field Device - Ex ic IIB T4 Gc

Ex db IIB T6 Gb CEPEL 97.0091 ()
Ex ia IIB T4/T5 Ga CEPEL 97.0019 X ()

Tamb= -20° a 65°C (T4) -20° a 50°C (T5)

Ui= 30V li= 380mA Pi= 5,32W
Ci= 5nF Li= desp

Segurança
Eletrôbras
INMETRO

IP66
IP68
10m/24h
P1/P2
Pintura

0000000 - 0000

CE

200001

smar FI302 Conversor FB 4-20mA

Nova Smar S/A
Av. Dr. Antônio Furlan Jr
1028 Sertãozinho-SP
14170-480
Brazil

FISCO Field Device - Ex ia IIB T4 Ga
FISCO Field Device - Ex ic IIB T4 Gc

Ex db IIB T6 Gb CEPEL 97.0091 ()
Ex ia IIB T4/T5 Ga CEPEL 97.0019 X ()

Tamb= -20° a 65°C (T4) -20° a 50°C (T5)

Ui= 30V li= 380mA Pi= 5,32W
Ci= 5nF Li= desp

Segurança
Eletrôbras
INMETRO

IP66W
IP68W
10m/24h
P1/P2
Pintura

0000000 - 0000

CE

199902

smar FI302 Conversor FB 4-20mA

Nova Smar S/A
Av. Dr. Antônio Furlan Jr
1028 Sertãozinho-SP
14170-480
Brazil

Ex tb IIIC T85°C Db CEPEL 97.0091 ()
Ex ia IIIC T₂₀₀135°C/T₂₀₀100°C Da CEPEL 97.0019 X ()

Tamb= -20° a 65°C (T₂₀₀135°C)
-20° a 50°C (T₂₀₀100°C)

Ui= 30V li= 380mA Pi= 5,32W
Ci= 5nF Li= desp

Segurança
Eletrôbras
INMETRO

IP66
IP68
10m/24h


0000000 - 0000

CE

208003



Appendix B

	SRF – Service Request Form			
	Converter from Fieldbus to 4-20mA			
GENERAL DATA				
Model:	FI302 ()	FI303 ()		
Serial Number:				
TAG:				
How many channels are used in FI?	1 ()	2 ()	3 ()	
Configuration:	Magnetic Tool ()	PC ()	Software: _____	Version: _____ Other: _____
INSTALLATION DATA				
Type/Model/Manufacturer of device connected to the channel 1: _____				
Type/Model/Manufacturer of device connected to the channel 2: _____				
Type/Model/Manufacturer of device connected to the channel 3: _____				
PROCESS DATA				
Hazardous Area Classification:	() Yes, please specify: _____			
	() No			
	More details: _____			
Types of Interference presents in the area:	Without interference ()	Temperature ()	Vibration ()	Others: _____
Ambient Temperature:	From _____°C up to _____°C			
OCCURRENCE DESCRIPTION				

SERVICE SUGGESTION				
Adjustment ()	Cleaning ()	Preventive Maintenance ()	Update / Up-grade ()	
Other: _____				
USER INFORMATION				
Company: _____				
Contact: _____				
Title: _____				
Section: _____				
Phone: _____			Extension: _____	
E-mail: _____			Date: ____/____/____	
<p>For warranty or non-warranty repair, please contact your representative.</p> <p>Further information about address and contacts can be found on https://www.smar.com.br/en/support.</p>				

Returning Materials

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

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