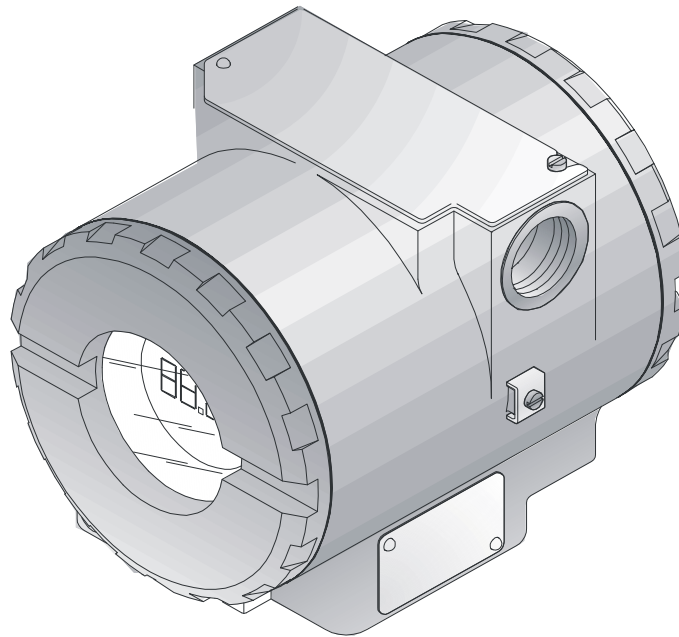


IF302

smar

**OPERATION & MAINTENANCE
INSTRUCTIONS MANUAL**

**TRIPLE CHANNEL
CURRENT TO FIELD BUS
CONVERTER**



JUL / 16
IF302
VERSION 3



I F 3 0 2 M E



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

web: www.smar.com/contactus.asp

INTRODUCTION

The **IF302** is a converter mainly intended to interface analog transmitters to a FOUNDATION™ fieldbus network. The **IF302** receives up to three current signal typically 4-20 mA or 0-20 mA, and makes them available to Fieldbus system. The digital technology used in the **IF302** enables an easy interface between the field and the control room and it has several interesting features that reduce considerably the installation, operation and maintenance costs.

The **IF302** is part of SMAR's complete 302 line of FOUNDATION™ fieldbus devices.

FOUNDATION™ fieldbus, is not only a replacement for 4-20 mA or intelligent/smart transmitter protocols, it contains much more. FOUNDATION™ fieldbus is a complete system enabling distribution of the control function on equipment in the field.

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

Those protocols were not intended to transfer control data, but maintenance information. Therefore they were slow and not efficient enough to be used as control network.

The main requirements for Fieldbus were to overcome these problems. Closed loop control with performance like a 4-20 mA system requires higher speed. Since higher speed means higher power consumption, this clashes with the need for intrinsic safety. Therefore a moderately high communication speed was selected, and the system was designed to have a minimum of communication overhead. Using scheduling, the system controls variable sampling, algorithm execution and communication to optimize the usage of the network, not losing time. Thus, high closed loop performance is achieved.

Using Fieldbus technology, with its capability to interconnect several devices, very large control schemes can be constructed. In order to be user friendly the function block concept was introduced (users of SMAR CD600 should be familiar with this, since it was implemented several years ago). The user may now easily build complex control strategies. Another advantage is added flexibility; the control strategy may be edited without having to rewire or change any hardware.

The **IF302**, like the rest of the 302 family, has several Function Blocks built in, like PID controller, Input Selector, Arithmetic, Signal Characterizer and Flow Totalization. These useful blocks eliminate the need for separate devices and reduce communication and therefore decreasing dead-time and making the control tighter, not to mention the reduction in cost. Other function blocks are also available, allowing flexibility in control strategy implementation.

The need for implementation of Fieldbus in small as well as large systems was considered when developing the entire 302 line of Fieldbus devices. They have the common features of being able to act as a master on the network and be configured locally using a magnetic tool, eliminating the need for a configurator or console in many basic applications.

Get the best result of the **IF302** by carefully reading these instructions.

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

NOTE

This Manual is compatible with version 3.XX, where 3 denote software version and XX software release. The indication 3.XX 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.

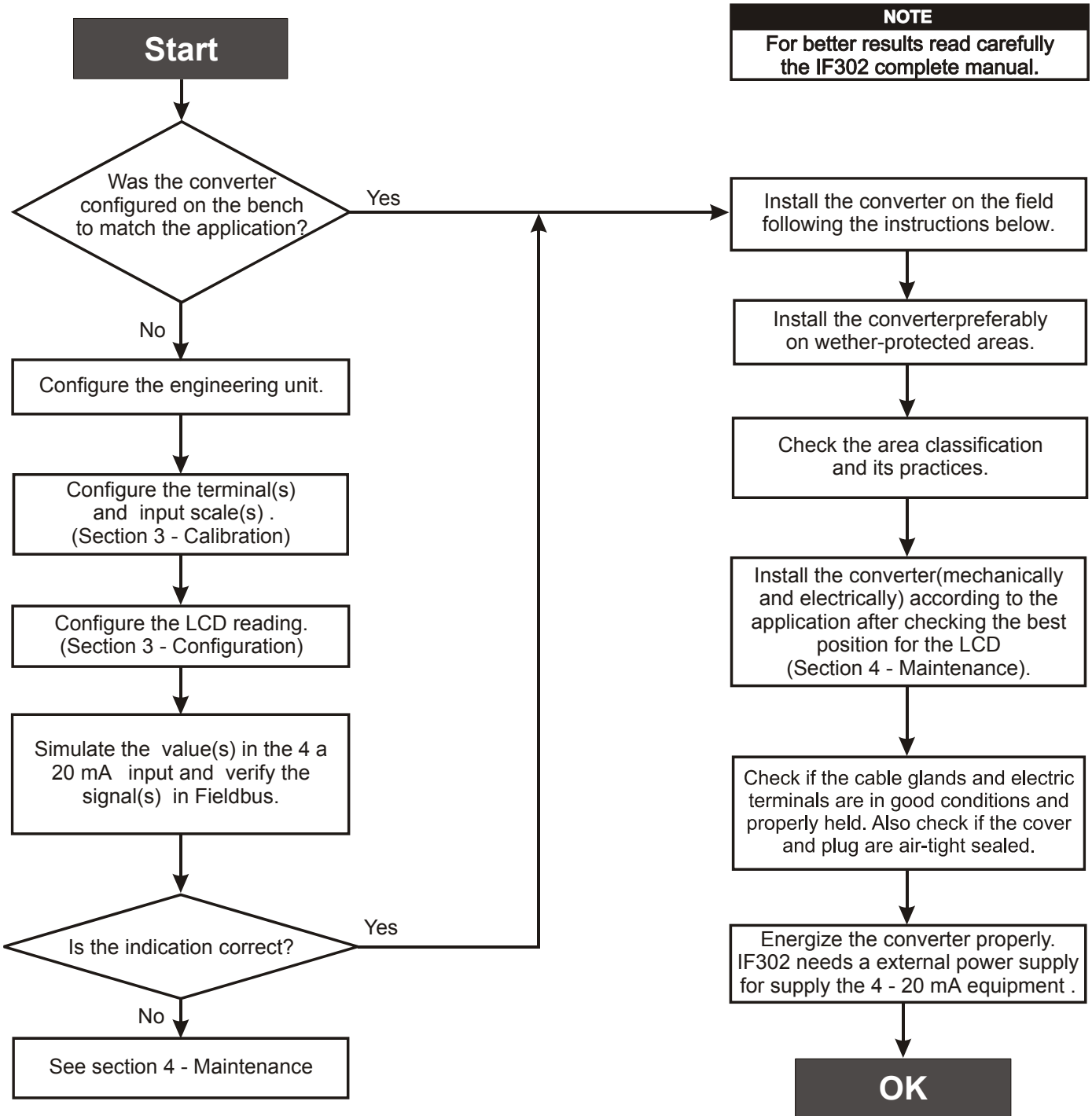
The field equipment referred to in this manual, when acquired for classified or hazardous areas, has its certification void when having its parts replaced or interchanged without functional and approval tests by Smar or any of Smar authorized dealers, which are the competent companies for certifying 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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Installation Flowchart



Section 1

INSTALLATION

General

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

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

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

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

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

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

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

Mounting

Using the bracket, the mounting may be done in several positions, as shown on Figure 1.3 - Dimensional Drawing and Mounting Positions.

For better visibility, the digital indicator may be rotated in steps of 90° (See Section 4 - Maintenance Procedures).

Electric Wiring

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

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

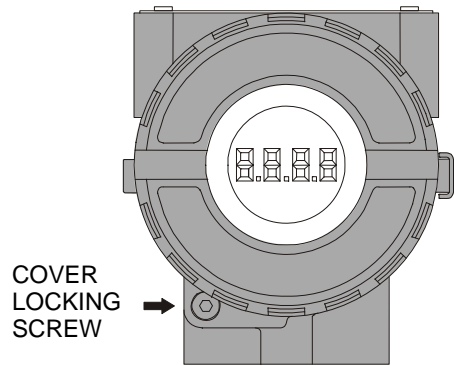


Figure 1.1 - Cover Locking

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

The wiring block has screws, on which fork or ring type terminals can be fastened, see Figure 1.2 - Terminal Block.

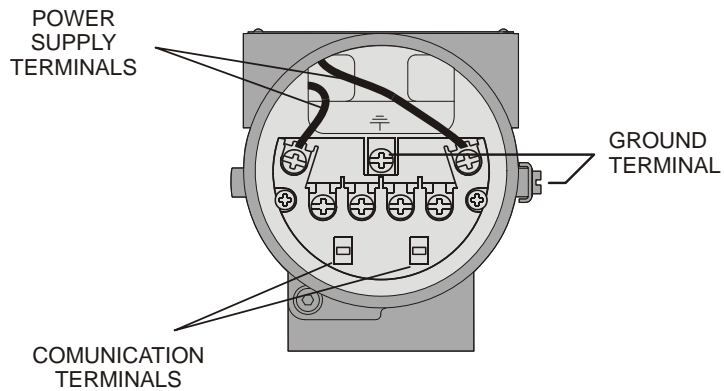


Figure 1.2 - Terminal Block

The **IF302** uses the 31.25 kbit/s voltage mode option for the physical signaling. All other devices on the same bus must use the same signaling. 12 to 16 devices can be connected in parallel along the same pair of wires.

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

The **IF302** is powered via the bus. The limit for such devices is 16 for one bus (one segment) for non-intrinsically safe requirement.

In hazardous area, the number of devices may be limited by intrinsically safe restrictions.

The **IF302** is protected against reverse polarity, and can withstand ± 35 VDC without damage.

NOTE

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

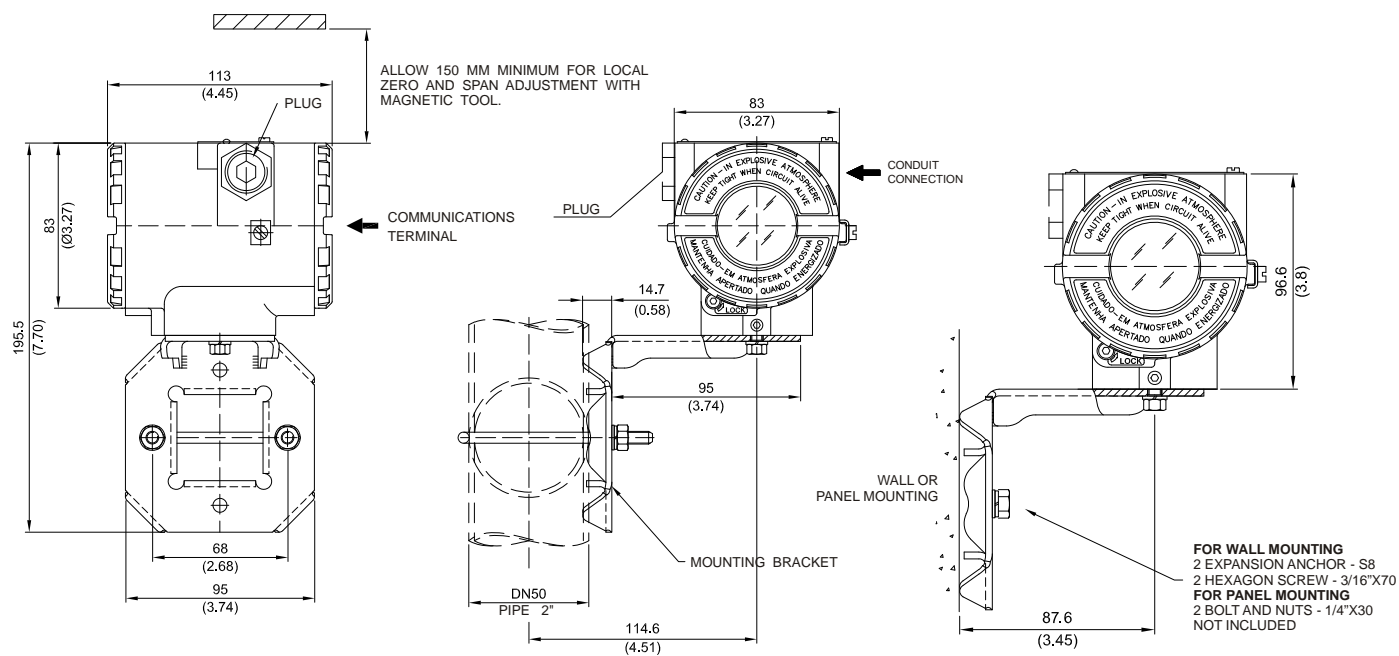


Figure 1.3 - Dimensional Drawing and Mounting Positions

Topology and Network Configuration

Bus topology (See Figure 1.4 - Bus Topology) and tree topology (See Figure 1.5 - Tree Topology Configuration) are supported. Both types have a trunk cable with two terminations. The devices are connected to the trunk via spurs. The spurs may be integrated in the device giving zero spur length. A spur may connect more than one device, depending on the length. Active couplers may be used to extend spur length.

Active repeaters may be used to extend the trunk length.

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

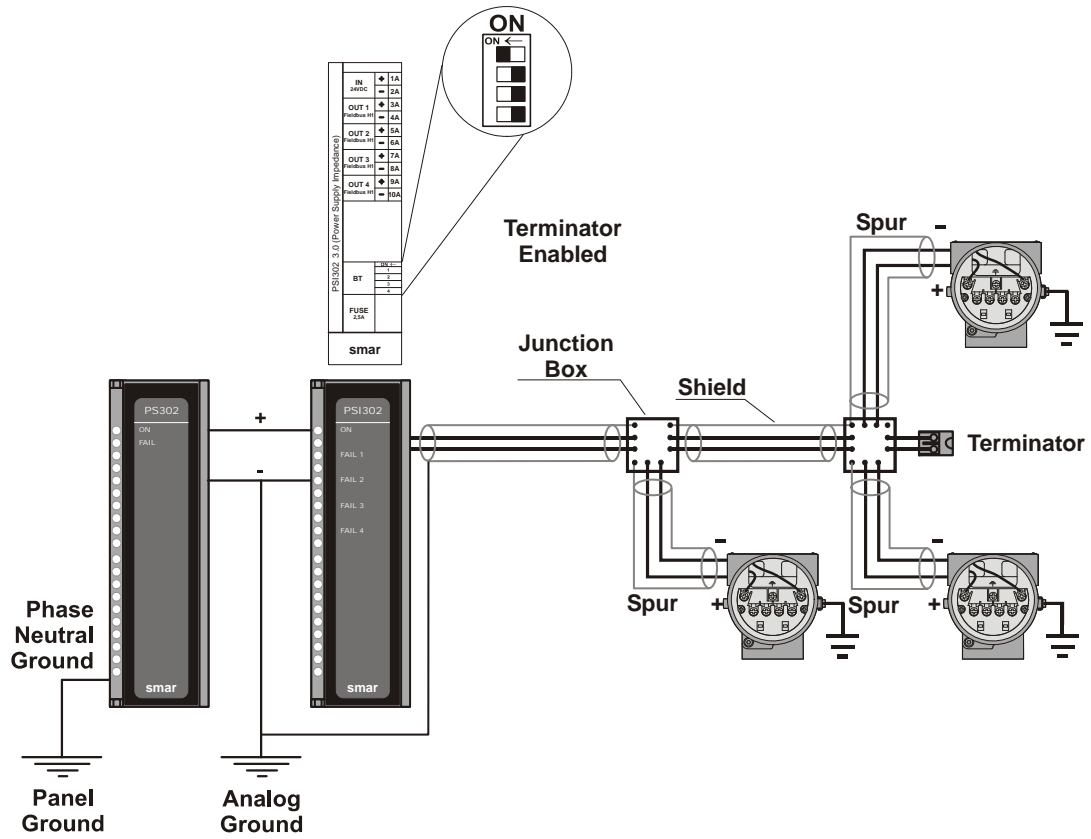


Figure 1.4 - Bus Topology

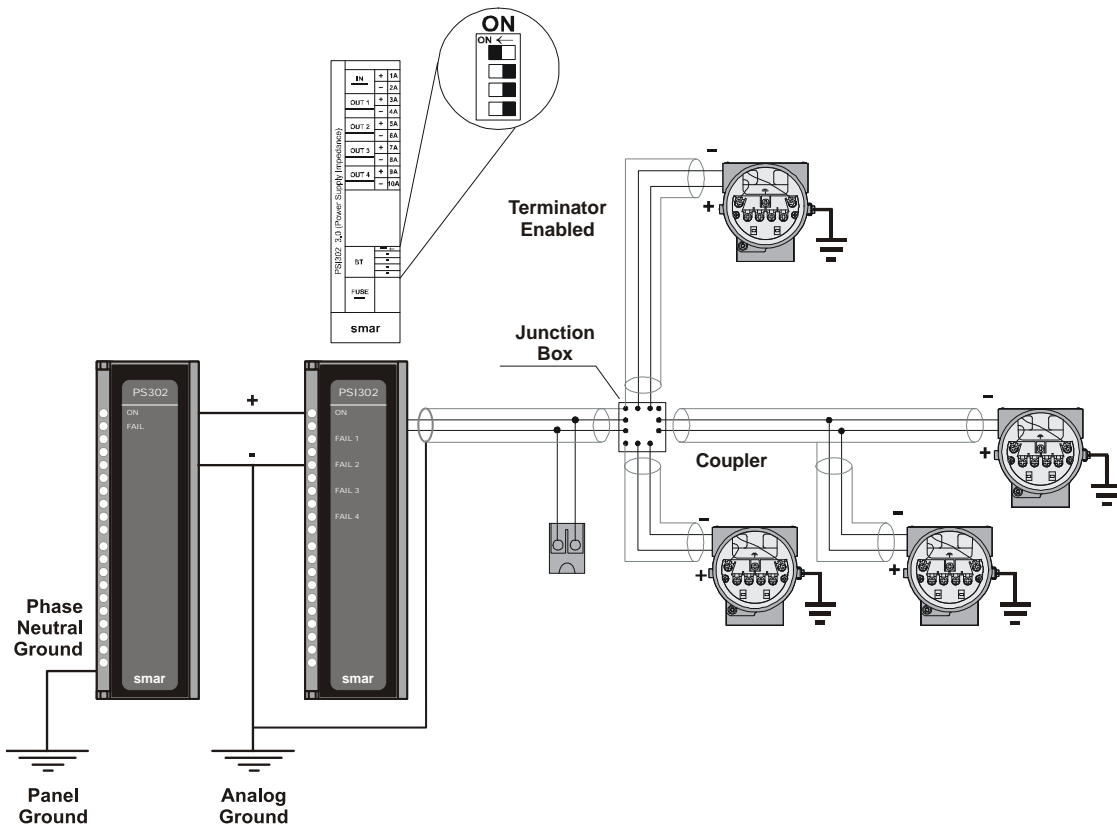


Figure 1.5 - Tree Topology Configuration

Input Wiring

The **IF302** accepts up to three current inputs in the range 0-20 mA or 4-20 mA. The three inputs have a common ground and they are protected from reverse polarity signal. The inputs should be connected as per Figure 1.6 - Input Wiring.

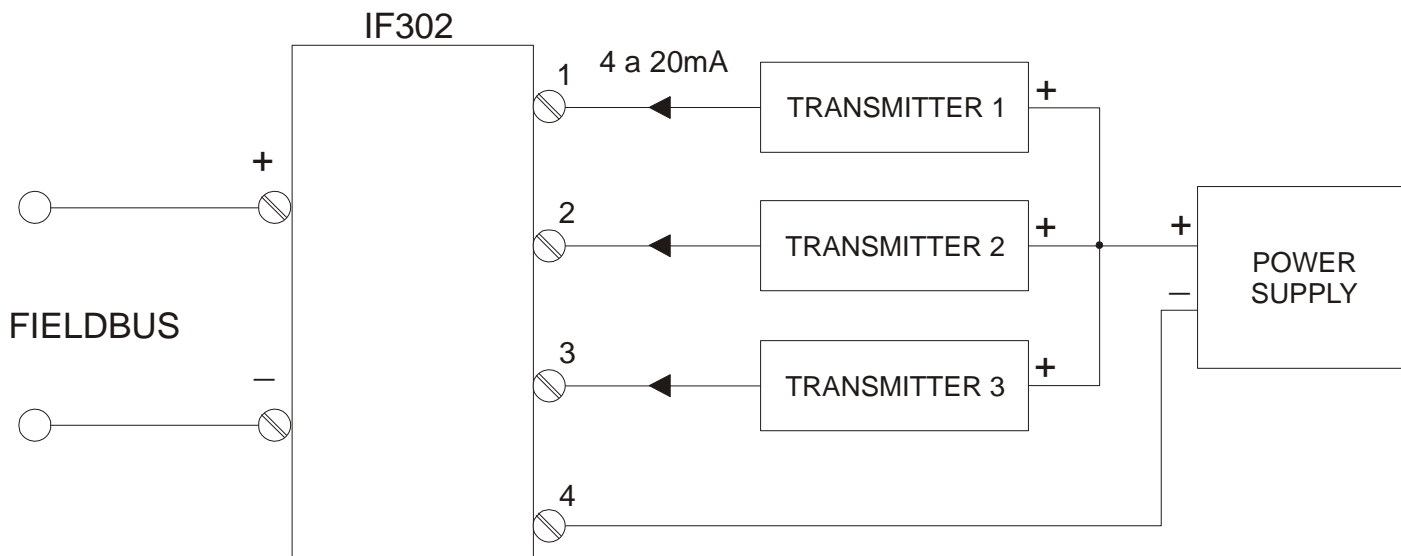


Figure 1.6 - Input Wiring

Note that **IF302** can operate with 0-20 mA or 4-20mA transmitters (See Figure 1.7 - Connection).

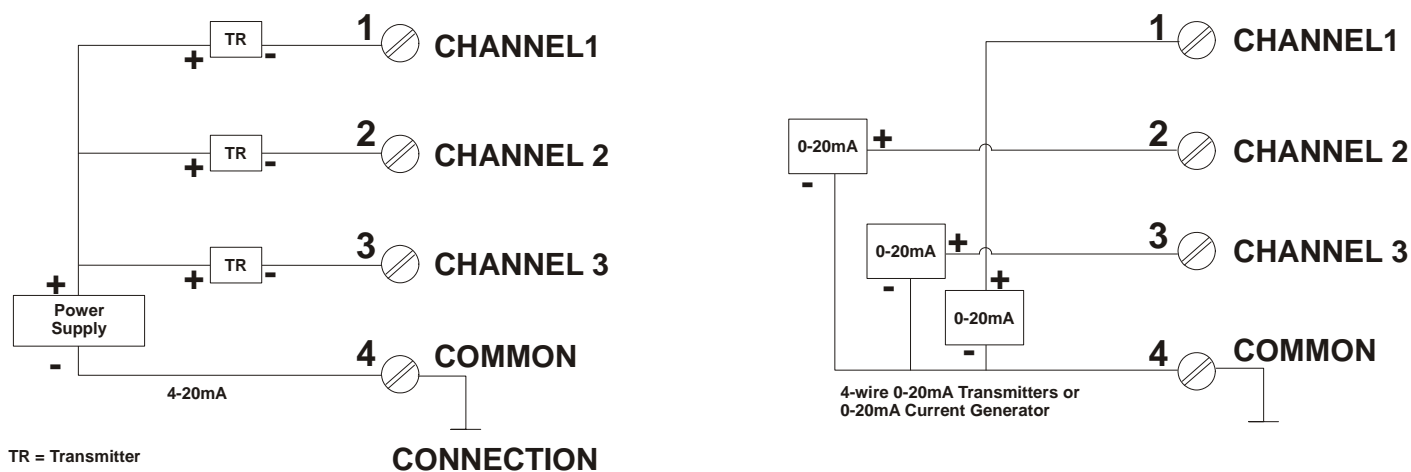


Figure 1.7 - Connection

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

WARNING

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

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 1.1).

The cover must be tightened with at least 8 turns to avoid the penetration of humidity or corrosive gases. The cover must be tightened until it touches the housing. Then, tighten more 1/3 turn (120°) to guarantee the sealing. Lock the covers using the locking screw (Figure 1.1).

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.

Section 2

OPERATION

The **IF302** accepts signals from mA generators such as most conventional transmitters. It is therefore ideal for interfacing existing equipment to a Fieldbus system.

Functional Description – Electronics

Refer to the block diagram (See Figure 2.1 - IF302 Block Diagram). The function of each block is described below.

MUX Multiplexer

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

A/D Converter

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

Signal Isolator

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

(CPU) Central Processing Unit, RAM and FLASH

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

Communication Controller

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

Power Supply

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

Power Isolation

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

Display Controller

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

Local Adjustment

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

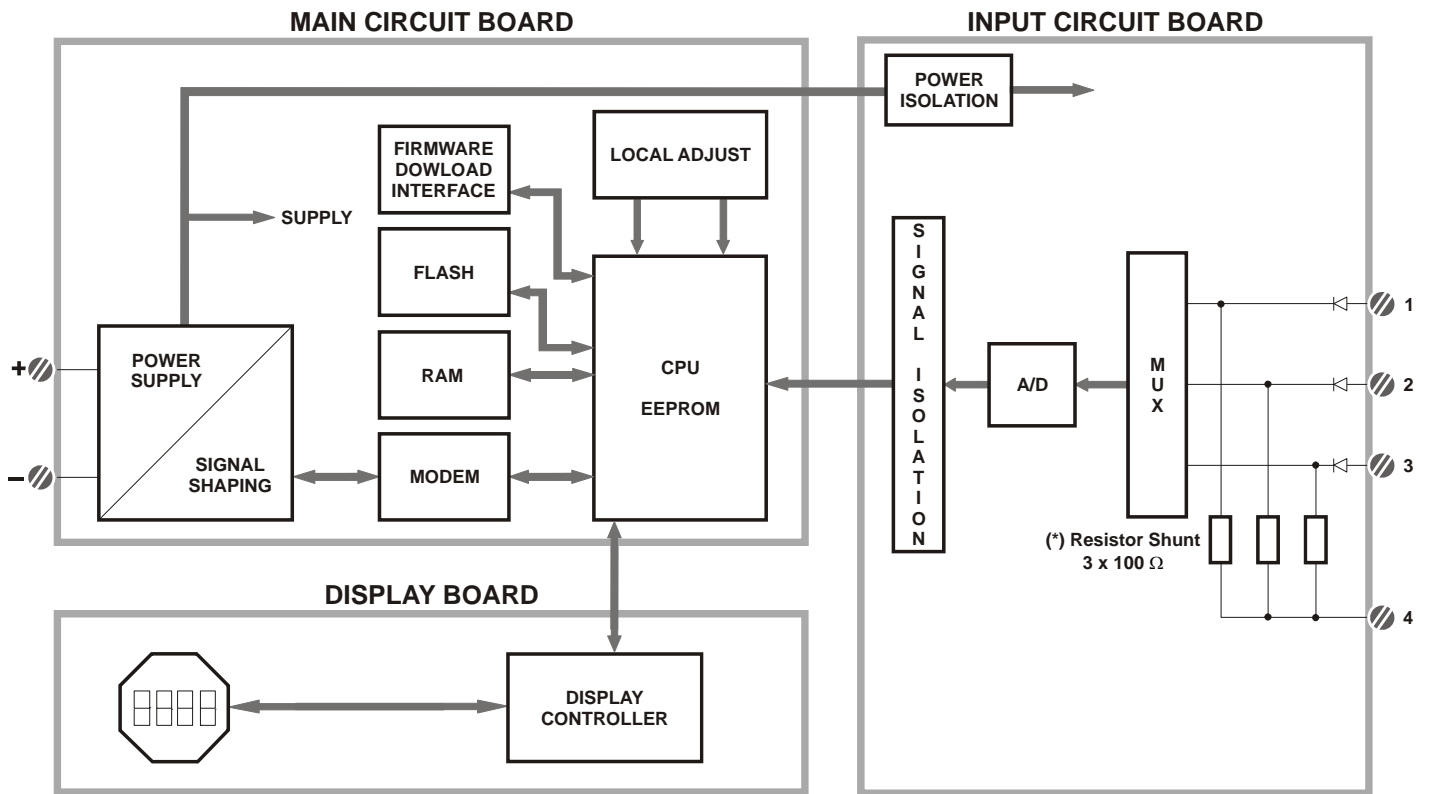


Figure 2.1 - IF302 Block Diagram

*** WARNING**

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

CONFIGURATION

One of the many advantages of Fieldbus is that device configuration is independent of the configurator. The **IF302** may be configured by a third party terminal or operator console.

The **IF302** contains three input transducer blocks, one resource block, one display transducer block and function blocks.

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

Transducer Block

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

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

How to Configure a Transducer Block

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

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

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

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

Terminal Number

The terminal number, which references a physical input, which is sent internally from the specified transducer output to function block.

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

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

Primary Value Status

The status of the Primary Value can follow the NAMUR NE 43 as showed bellow:

3.80 mA < input < 20.5 mA GOOD

input = 3.80 mA or input = 20.5 UNCERTAIN

input <= 3.6 mA or input >= 21.0 mA BAD

To disable this feature, just write a number different from 4 or 20 in the Transducer xd_scale parameter.

Current Trim

The **IF302** provides the capability of making a trim in the input channels, if necessary.

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

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

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

Trim can be done in two points:

Lower Trim: Is used to trim the output at the lower range.

Upper Trim: Is used to trim the output at the upper range.

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

There are at least two ways of doing the trim: using local adjustment or using **SYSCON** (the System Configurator from **SMAR**).

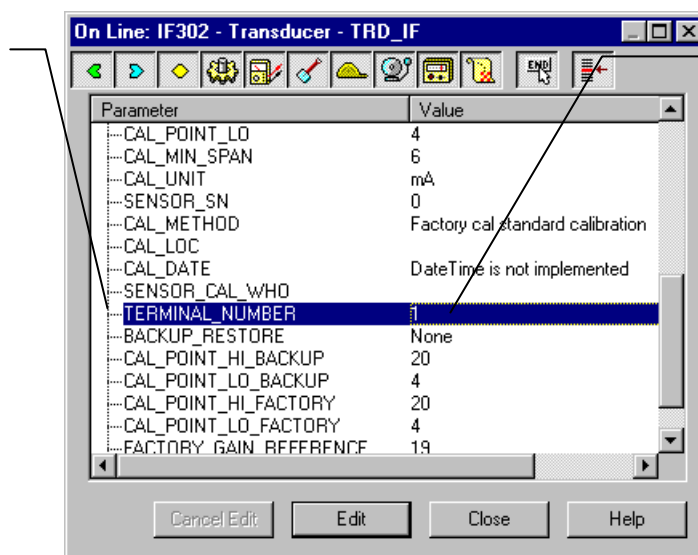
When doing the trim, make sure you are using an appropriate meter (with the necessary accuracy).



Via SYSCON

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

This parameter selects the terminal number which the input current will be generated and calibrated.



In this case the channel 1 was chosen.

Figure 3.1 - Current Trim - IF302



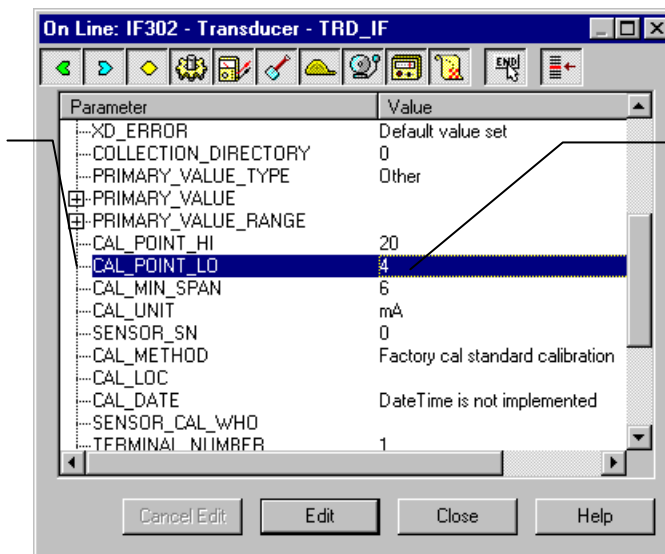
It is possible to calibrate the current inputs of the transmitter by means of parameters CAL_POINT_LO and CAL_POINT_HI.

Let's take the lower value as an example:

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

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

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



The desired value should be entered.

Figure 3.2 - Current Trim - IF302

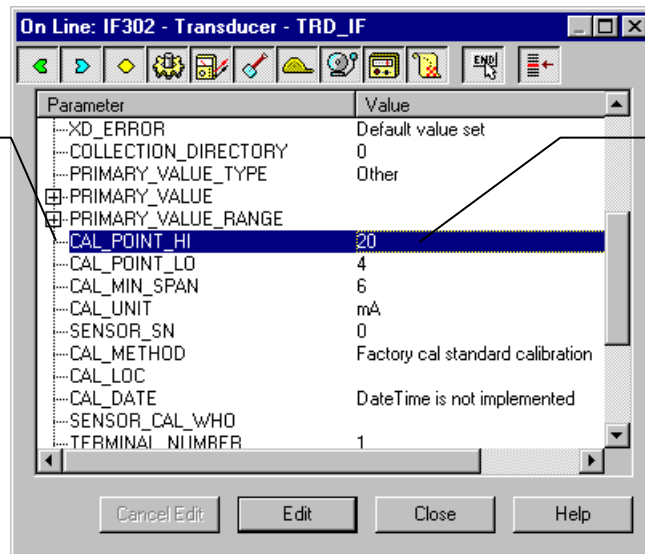


Let's take the upper value as an example:

Supply 20 mA or the upper value to the terminal block and wait until the readout of parameter PRIMARY_VALUE stabilizes.

Write 20.00 or the upper value in parameter CAL_POINT_HI. For each value written a calibration is performed at the desired point.

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



The desired value should be entered.

Figure 3.3 - Current Trim - IF302



WARNING

It is recommendable that a convenient engineering unit be chosen by means of parameter XD_SCALE of the Analog Input Block, considering that the range limits of the sensor must be respected, these being 100% and 0%.

It is also recommendable, for every new calibration, to save existing trim data in parameters CAL_POINT_LO_BACKUP and CAL_POINT_HI_BACKUP, by means of parameter BACKUP_RESTORE, using option LAST_TRIM_BACKUP.

Via Local Adjustment

The IF302 has 3 input transducers and its device leaves SMAR with factory settings. The factory setting establishes only the transducers #1 as default for local adjustment. In order to configure the others via local adjustment, the user should configure them in the display transducer via SYSCON, according specific instructions for this transducer block.

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

Browse to parameter P_VAL (PRIMARY_VALUE).

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

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

Let's take the upper value:

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

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



NOTE

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

Limit Conditions for Calibration:

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

Lower:

$0.0\text{mA} < \text{NEW_LOWER} < 9.0\text{mA}$
Otherwise, XD_ERROR = 22

Upper:

$15.0\text{ mA} < \text{NEW_UPPER} < 22.0\text{mA}$
Otherwise, XD_ERROR = 22.

**NOTE****Codes for XD_ERROR:**

... 16: Default Value Set
... 22: Out of range
... 26: Invalid Calibration request
... 27: Excessive Correction

Display Transducer Block

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

The interface between the user is described very detailed on the "General Installation, Operation and Maintenance Procedures Manual". Please take a detailed look at this manual in the chapter related to "Programming Using Local Adjustment". It shows significantly the resources on this transducer display. All Series 302 field devices from SMAR have the same methodology to handle with it. So, since the user has learned once, he is capable to handle all kind of field devices from SMAR.

All function blocks and transducers defined according Foundation Fieldbus™ have a description of their features written on binary files, by the Device Description Language. This feature permits that third parties configurator enabled by Device Description Service technology can interpret these features and make them accessible to configure. The Function Blocks and Transducers of Series 302 have been defined rigorously according the Foundation Fieldbus specifications in order to be interoperable to other parties.

In order to enable the local adjustment using the magnetic tool, it is necessary to previously prepare the parameters related with this operation via **SYSCON** (System Configurator). The Figure 3.8 - Parameters for Local Adjustment Configuration and the Figure 3.11 - Step 1 - IF302 show all parameters and their respective values, which shall be configured in accordance with the necessity of being locally adjusted by means of the magnetic tool. All values shown on the display are default values.

There are seven groups of parameters, which may be pre-configured by the user in order to allow a possible configuration by means of the local adjustment. As an example, let's suppose that you don't want to show some parameters; in this case, simply write an invalid Tag in the parameter, Block_Tag_Param_X. Doing this, the device will not take the parameter related (indexed) to the Tag as a valid parameter.

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.

Sub_Index

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).

Mnemonic

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

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_Number

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. If option value is selected, the display will show 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.

If option mnemonic, the display will 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).

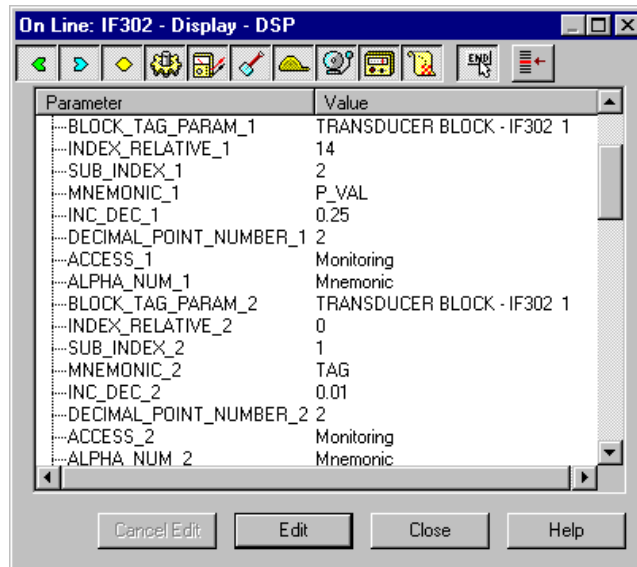


Figure 3.4 - Parameters for Local Adjustment Configuration

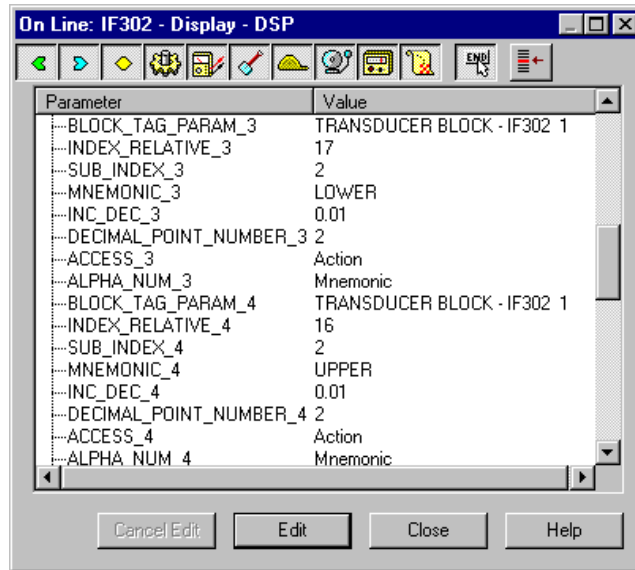


Figure 3.5 - Parameters for Local Adjustment Configuration

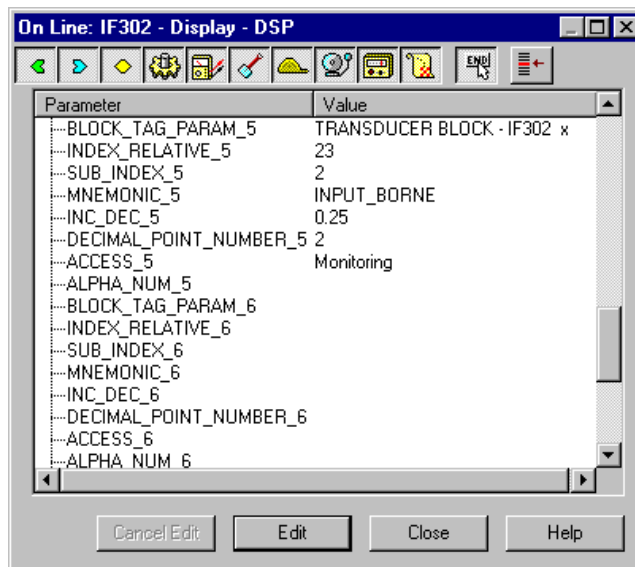


Figure 3.6 - Parameters for Local Adjustment Configuration

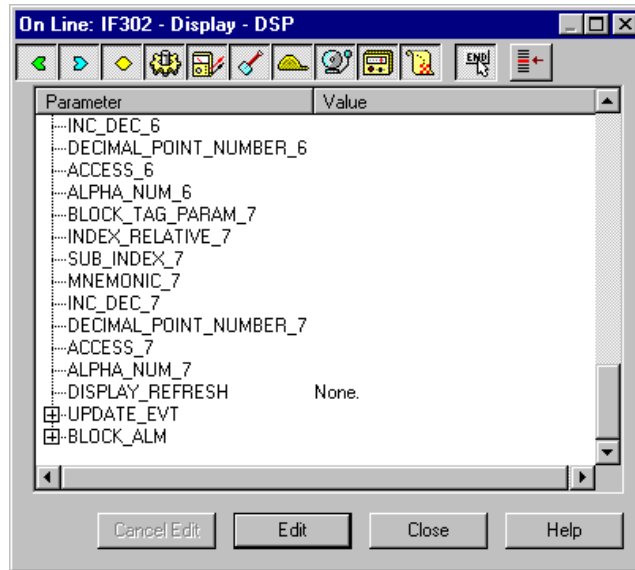
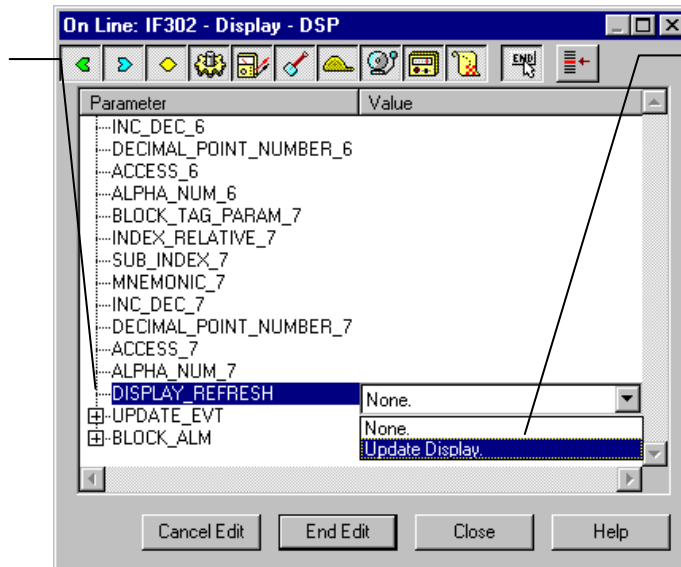


Figure 3.7 - Parameters for Local Adjustment Configuration

This parameter updates the local adjustment programming tree configured on each device.



The option "update" should be selected in order to execute the upgrade of local adjustment programming tree.

After its step all the parameters selected will show on the LCD display.

Figure 3.8 - Parameters for Local Adjustment Configuration

Programming Using Local Adjustment

The converter has two holes for magnetic switches activated by the magnetic tool located under the identification plate (See Figure 3.9). These magnetic switches are activated by one magnetic tool.

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

The jumper J1 on top of the main circuit board must be in place for this function to be enabled and the transmitter must be fitted with the digital display for access to the local adjustment. Without the display the local adjustment is not possible.

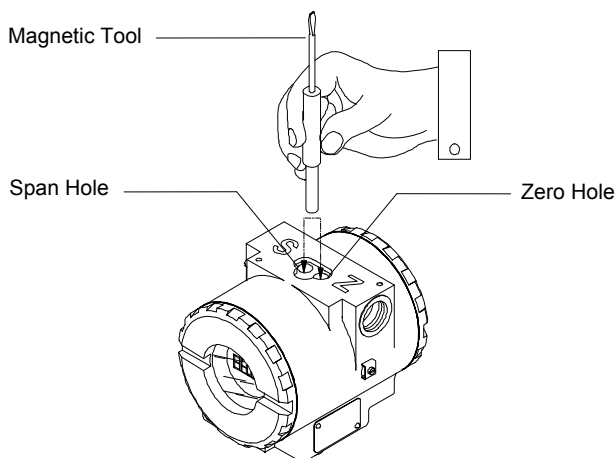


Fig. 3.9 - Local Adjustment Holes

Table 3.1 shows the actions on the Z and S holes on the LD302 when Local Adjustment is enabled.

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

Table 3.1 - Purpose of the holes on the Housing

J1 Jumper Connections

If J1 (see figure 3.10) is connected to ON, it is possible to simulate values and status through the SIMULATE parameter, from the function blocks.

W1 Jumper Connections

If W1(see figure 3.10) is connected to ON, the local adjustment programming tree is enabled, the block parameters can be adjusted and the communication can be pre-configured via local adjustment.

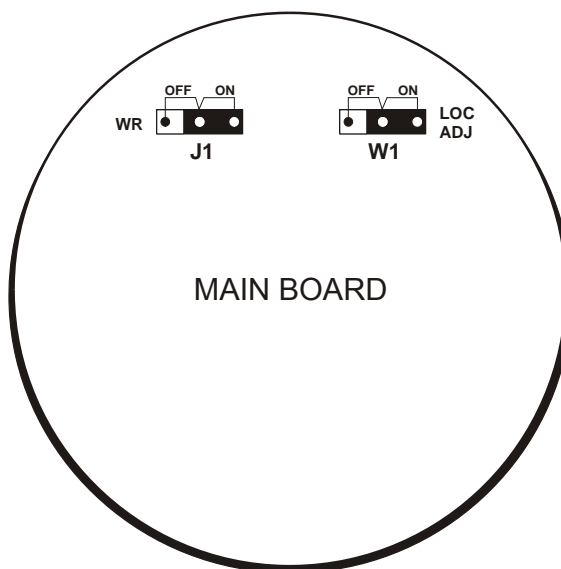
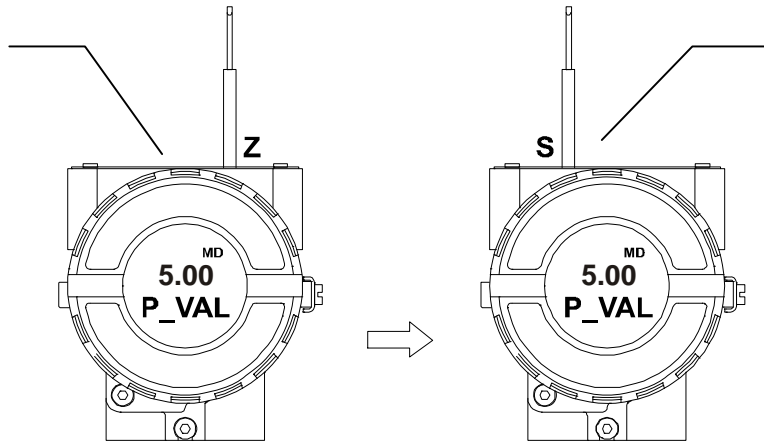


Fig. 3.10 - J1 and W1 Jumpers

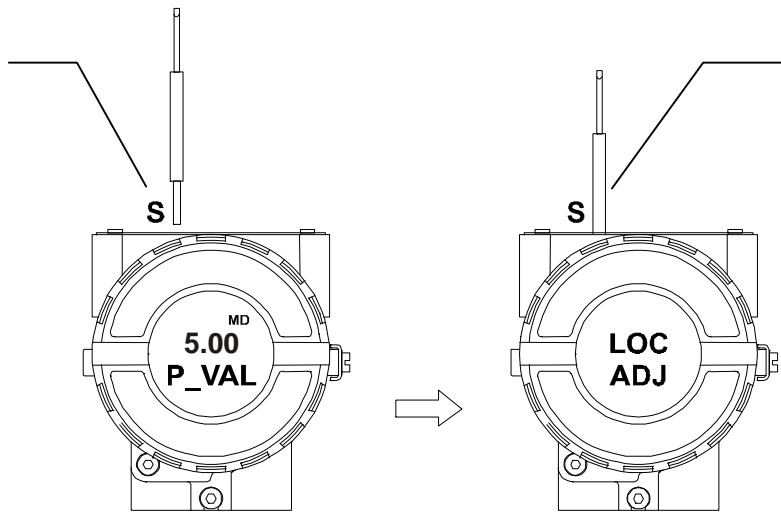
In order to start the local adjustment, place the magnetic tool in orifice **Z** and wait until letters **MD** are displayed.



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

Figure 3.11 - Step 1 - IF302

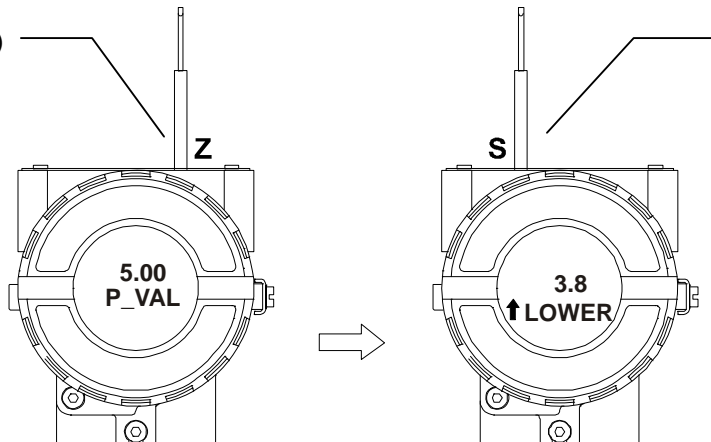
Remove the magnetic tool from orifice **S**.



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

Figure 3.12 - Step 2 - IF302

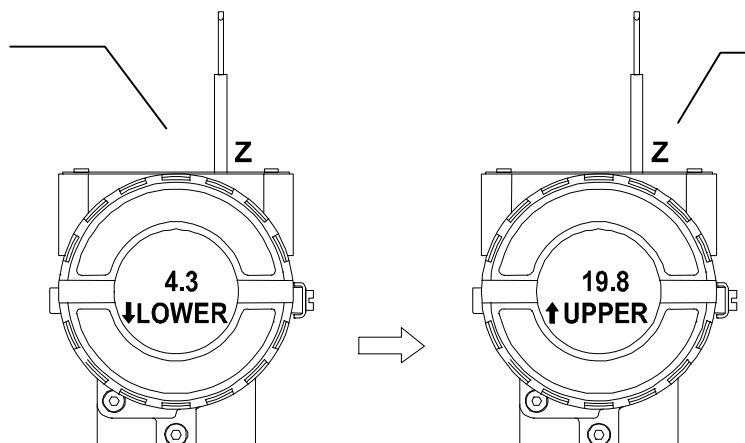
In this option (**P_VAL**) is showed with its respective value (if you to want that it keeps static, put the tool in **S** orifice and stay there.



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

Figure 3.13 - Step 3 - IF302

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



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

Figure 3.14 - Step 4 - IF302

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

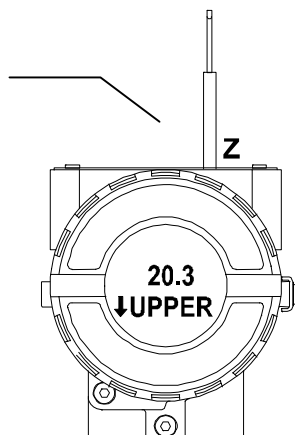


Figure 3.15 - Step 5 - IF303

NOTE

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

MAINTENANCE

General

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

SMAR **IF302** Current to Fieldbus Converters are extensively tested and inspected before delivery to the end user. Nevertheless, during their design and development, consideration was given to the possibility of repairs by the end user, if necessary.

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

Troubleshooting

Symptom: No Quiescent Current

Probable Sources of Trouble:

Converter Fieldbus Connections

Check wiring polarity and continuity.

Power Supply

Check power supply output. The voltage at the **IF302** Fieldbus terminals must be between 9 and 32 VDC.

Electronic Circuit Failure

Check the boards for defect by replacing them with spare ones.

Symptom: No Communication

Probable Source of Trouble

Network Connections

Check the network connections: devices, power supply, and terminators.

Network Impedance

Check the network impedance (power supply impedance and terminators).

Transmitter Configuration

Check configuration of communication parameters of converter.

Network Configuration

Check communication configuration of the network.

Electronic Circuit Failure

Try to replace the converter circuit with spare parts.

Symptom: Incorrect Inputs

Probable Source of Trouble:

Input Terminals Connection

Check wiring polarity and continuity.

Conventional Transmitter

Verify if the conventional transmitter is working properly or if it has the necessary voltage. Remember that **IF302** has a 100 ohms plus 0.8 V input impedance.

Calibration

Check calibration of **IF302** and the conventional transmitters.

If the problem is not presented in the table above follow the Note below:

NOTE
<p>The Factory Init should be tried as a last option to recover the equipment control when the equipment presents some problem related to the function blocks or the communication. This operation must only be carried out by authorized technical personnel and with the process offline, since the equipment will be configured with standard and factory data.</p> <p>This procedure resets all the configurations run on the equipment, after which a partial download should be performed.</p> <p>Two magnetic tools should be used to this effect,. On the equipment, withdraw the nut that fixes the identification tag on the top of the housing, so that access is gained to the "S" and "Z" holes.</p> <p>The operations to follow are:</p> <ol style="list-style-type: none">1) Switch off the equipment, insert the magnetic tools and keep them in the holes (the magnetic end in the holes);2) Feed the equipment;3) As soon as Factory Init is shown on the display, take off the tools and wait for the "5" symbol on the right upper corner of the display to unlit, thus indicating the end of the operation. <p>This procedure makes effective all the factory configuration and will eliminate eventual problems with the function blocks or with the equipment communication.</p>

Disassembly Procedure

Refer to Figure 4.1 - IF302 Exploded View Make sure to disconnect power supply before disassembling the converter.

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



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

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

Reassemble Procedure

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

Boards Interchangeability

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



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

Exploded View

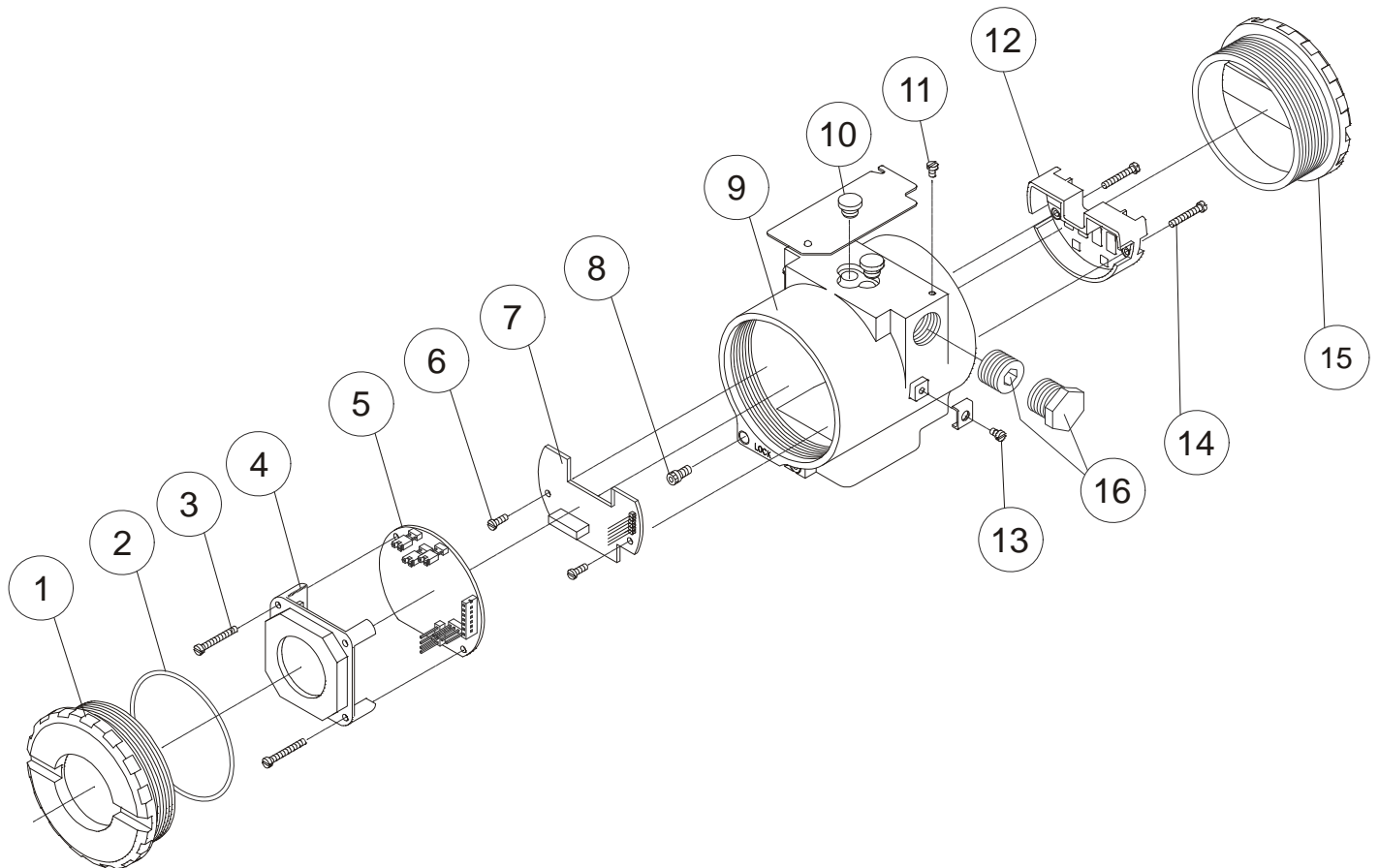


Figure 4.1 - IF302 Exploded View

Accessories

ACCESSORIES	
ORDERING CODE	DESCRIPTION
SD1	Magnetic Tool for Local Adjustment
BC302	Fieldbus/RS232 Interface
SYSCON	System Configurator
PS302	Power Supply
PSI302	Power Supply Impedance
BT302	Terminator
PCI	Process Control Interface

Spare Parts List

SPARE PARTS LIST				
DESCRIPTION OF PARTS		POSITION	CODE	CATEGORY (NOTE 4)
Cover Without Window (Includes O-Ring)	Aluminium	1 and 15	204-0102	
	316 Stainless Steel	1 and 15	204-0105	
Cover With Window for Indication (Includes O-Ring)	Aluminium	1	204-0103	
	316 Stainless Steel	1	204-0106	
O-Rings (Note 2)	Cover, Buna-N	2	204-0122	B
Aluminium Housing Main Board Screw	Units With Indicator	3	304-0118	
	Units Without Indicator	3	304-0117	
316 Stainless Steel Housing Main Board Screw	Units With Indicator	3	204-0118	
	Units Without Indicator	3	204-0117	
Digital Indicator		4	214-0108	
Main and Input Circuit Board Assembly		5 and 7	334-0150	A
Input Board Screw	Aluminium Housing	6	314-0125	
	316 Stainless Steel Housing	6	214-0125	
Cover Locking Screw		8	204-0120	
Housing, Aluminium (Note 1)	½ - 14 NPT	9	324-0150	
	M20 x 1.5	9	324-0151	
	PG 13.5 DIN	9	324-0152	
Housing, 316 Stainless Steel (Note 1)	½ - 14 NPT	9	324-0153	
	M20 x 1.5	9	324-0154	
	PG 13.5 DIN	9	324-0155	
Local Adjustment Protection Cap		10	204-0114	
Identification Plate Fixing Screw		11	204-0116	
Terminal Insulator		12	314-0123	
External Ground Screw		13	204-0124	
Terminal Holding Screw	Housing in Aluminium	14	304-0119	
	Housing in 316 Stainless Steel	14	204-0119	
Six-Sided Plug 1/2" NPT Internal BR Ex	Bichromated Carbon Steel	16	400-0808	
	Bichromated 304 Stainless Steel	16	400-0809	
Six-Sided Plug 1/2" NPT Internal	Bichromated Carbon Steel	16	400-0583-11	
	Bichromated 304 Stainless Steel	16	400-0583-12	
Six-Sided Plug M20 X 1.5 External BR Ex d	316 Stainless Steel	16	400-0810	
Six-Sided Plug PG13.5 External BR Ex d	316 Stainless Steel	16	400-0811	
Mounting Bracket for 2" Pipe Mounting (Note 3)	Carbon Steel	-	214-0801	
	316 Stainless Steel	-	214-0802	
	Carbon Steel Bolts, Nuts, Washers and U-clamp in Stainless Steel	-	214-0803	

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

Section 5

TECHNICAL CHARACTERISTICS

Functional Specifications	
Input Signal (Field Values)	0-20 mA, 4-20 mA or any within 0 and 20 mA. Reverse polarity protected (*).
Output Signal (Communication)	Digital only, Foundation™ Fieldbus, 31.25 kbits/s voltage mode with bus power.
Input Impedance	Resistive 100 Ohms , plus a 0.8 V drop over diode in forward direction.
Power Supply	Bus power 9 - 32 Vdc. Current consumption quiescent 12 mA.
Output impedance	Non-intrinsic safety from 7.8 KHz - 39 KHz should be greater or equal to 3 KΩ. Intrinsic safety output impedance (assuming an IS barrier in the power supply) from 7.8 KHz - 39 KHz should be greater or equal to 400 Ω.
Indication	Optional 4 1/2-digit numerical and 5-character alphanumeric LCD indicator.
Hazardous Location 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 to 100% RH.
Turn-on Time	Approximately 10 seconds.
Update Time	Approximately 0.3 second.
Performance Specifications	
Accuracy	0.03% of span for 4 - 20 mA, 5 µA for others spans.
Ambient Temperature Effect	For a 10°C variation: ± 0.05%.
Vibration Effect	Complies with SAMA PMC 31.1 standard.
Electromagnetic Interference Effect	Designed to comply with European Directive EMC 2004/108/EC.
Physical Specifications	
Electrical Connection	1/2 - 14 NPT, PG 13.5 or M20 x 1.5.
Material of Construction	Injected low copper aluminium with polyester painting or 316 Stainless Steel housing, with Buna N O-rings on cover.
Mounting	With an optional bracket can be installed on a 2" pipe or fixed on a wall or panel.
Weight	Without display and mounting bracket: 0.80 kg. Add for digital display: 0.13 kg. Add for mounting bracket: 0.60 kg.

* WARNING

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

Ordering Code

MODEL										
IF302 TRIPLE CHANNEL CURRENT TO FOUNDATION FIELDBUS CONVERTER										
COD.		Local Indicator								
0		Without indicator								
1		With indicator								
COD.		Mounting Bracket								
0		Without Bracket								
1		Carbon Steel Accessories: Carbon Steel								
2		316 Stainless Steel. Accessories: AI316								
7		Carbon Steel. Accessories: AI316								
COD.		Electrical Connections								
0		1/2" - 14 NPT								
1		1/2" - 14 NPT X 3/4 NPT (AI 316) - with adapter								
2		1/2" - 14 NPT X 3/4 BSP (AI 316) - with adapter								
3		1/2" - 14 NPT X 1/2 BSP (AI 316) - with adapter								
A		M20 X 1.5								
B		PG 13.5 DIN								
SPECIAL OPTIONS										
COD.		Housing								
H0		Aluminum (IP/TYPE)								
H1		316 Stainless Steel (IP/TYPE)								
H2		Aluminum for saline atmosphere (IPW/TYPE X)								
H3		316 Stainless Steel for saline atmosphere (IPW/TYPE X)								
COD.		Identification Plate								
I1		FM: XP, IS, NI, DI								
I3		CSA: XP, IS, NI, DI								
I4		EXAM (DMT): Ex-ia; NEMKO: Ex-d								
I5		CEPEL: Ex-d, Ex-ia								
I6		Without Certification								
IE		NEPSI: Ex-ia								
IJ		NEMKO - Ex-d								
COD.		Painting								
P0		Gray Munsell N 6,5 Polyester								
P3		Black Polyester								
P4		White Epoxi								
P5		Yellow Polyester								
P8		Without Painting								
P9		Safety Blue Epoxy - Electrostatic Painting								
PC		Safety Blue Polyester - Electrostatic Painting								
PG		Safety Orange Epoxi Paint - Electrostatic Painting								
COD.		Input Signal								
T0		3 output, 4 to 20 mA								
COD.		Tag Plate								
J0		With tag								
J1		Blank								
J2		According to user's notes								
COD.		Special								
ZZ		See Notes								
IF302	1	1	0	*	*	*	*	*	*	← TYPICAL MODEL

* Leave it blank for no optional items.

CERTIFICATIONS INFORMATION

European Directive Information

Consult www.smar.com for the EC declarations of conformity for all applicable European directives and certificates.

ATEX Directive (94/9/EC) – “Electrical equipment and protective system intended for use in potential explosive atmospheres”

The EC-Type Examination Certificate had been released by Nemko AS (CE0470) and/or DEKRA EXAM GmbH (CE0158), according to European Standards.

The certification body for Production Quality Assurance Notification (QAN) and IECEx Quality Assessment Report (QAR) is Nemko AS (CE0470).

LVD Directive 2006/95/EC – “Electrical Equipment designed for use within certain voltage limits”

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

According to IEC standard: IEC 61010-1:2010 - Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements.

EMC Directive 2004/108/EC - “Electromagnetic Compatibility”

The equipment is in compliance with the directive and EMC test was performed according to IEC standards: IEC61326-1:2005 and IEC61326-2-3:2006.

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 60079-11 Intrinsic Safety “i”

IEC 60079-26 Equipment with equipment protection level (EPL) Ga

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

Customer responsibility:

IEC 60079-10 Classification of Hazardous Areas

IEC 60079-14 Electrical installation design, selection and erection

IEC 60079-17 Electrical Installations, Inspections and Maintenance

Warning:

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

Installation of this instrument in an explosive environment must be in accordance with the national standards and according to the local environmental protection method. Before proceeding with the installation match the certificate parameters according to the environmental classification.

General Notes:

Maintenance and Repair

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

Marking Label

Once a device labeled with multiple approval types is installed, do not reinstall it using any other approval types. Scratch off or mark unused approval types on the approval label.

For Ex-i protection application

- Connect the instrument to a proper intrinsically safe barrier.

- Check the intrinsically safe parameters involving the barrier, equipment including the cable and connections.
- Associated apparatus ground bus shall be insulated from panels and mounting enclosures.
- When using shielded cable, isolate the not grounded cable end.
- Cable capacitance and inductance plus C_i and L_i must be smaller than C_o and L_o of the Associated Apparatus.

For Ex-d protection application

- Only use Explosion Proof/Flameproof certified Plugs, Adapters and Cable glands.
- In an Explosion-Proof/Flame-Proof installation, do not remove the instrument housing covers when powered on.

- Electrical Connection

In Explosion-Proof installations the cable entries must be connected through conduit with sealed unit or closed using metal cable gland or closed using metal blanking plug, all with at least IP66 and Ex-d certification. For enclosure with saline environment protection (W) and ingress protection (IP) applications, all NPT thread parts must apply a proper water-proof sealant (a non-hardening silicone group sealant is recommended).

For Ex-d and Ex-i protection application

- The transmitter has a double protection. In this case the transmitter shall be fitted with appropriate certified cable entries Ex-d and the electric circuit supplied by a certified diode safety barrier as specified for the protection Ex-ia.

Environmental Protection

- Enclosure Types (Type X): Supplementary letter X meaning special condition defined as default by Smar the following: Saline Environment approved - salt spray exposed for 200 hours at 35°C. (Ref: NEMA 250).
- Ingress protection (IP W): Supplementary letter W meaning special condition defined as default by Smar the following: Saline Environment approved - salt spray exposed for 200 hours at 35°C. (Ref: IEC60529).
- Ingress protection (IP x8): Second numeral meaning continuous immersion in water under special condition defined as default by Smar the following: 1 Bar pressure during 24hours. (Ref: IEC60529).

Hazardous Locations Approvals

CSA (Canadian Standards Association)

Class 2258 02 – Process Control Equipment – For Hazardous Locations (CSA1002882)

Class I, Division 1, Groups B, C and D
Class II, Division 1, Groups E, F and G
Class III, Division 1
Class I, Division 2, Groups A, B, C and D
Class II, Division 2, Groups E, F and G
Class III

CLASS 2258 03 - PROCESS CONTROL EQUIPMENT – Intrinsically Safe and Non-Incendive Systems - For Hazardous Locations (CSA 1002882)

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

Model IF302 Converter; supply 12-42V dc, 4-20mA; Enclosure Type 4/4X; non-incendive with Fieldbus/FNICO Entity parameters

@ Terminals + and - :

$V_{max} = 24V$, $I_{max} = 570\text{ mA}$, $P_{max} = 9.98\text{ W}$, $C_i = 5\text{ nF}$, $L_i = 12\mu\text{H}$;

@ Terminals 1 - 4:

$V_{max} = 30V$, $I_{max} = 110\text{ mA}$, $C_i = 5\text{ nF}$, $L_i = 12\mu\text{H}$;

when connected through CSA Certified Safety Barriers as per SMAR Installation drawing 102A0558; Temp. Code T3C.

Class 2258 04 – Process Control Equipment – Intrinsically Safe Entity – For Hazardous Locations (CSA 1002882)

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

FISCO Field Device

Model IF302 Converter; supply 12-42V dc, 4-20mA; Enclosure Type 4/4X; Intrinsically safe with Fieldbus/FISCO Entity parameters

@ Terminals + and -:

$V_{max} = 24 \text{ V}$, $I_{max} = 380 \text{ mA}$, $P_i = 5.32 \text{ W}$, $C_i = 5 \text{ nF}$, $L_i = 12 \text{ uH}$;

@ Terminals 1 – 4: $V_{max} = 30 \text{ V}$, $I_{max} = 110 \text{ mA}$, $C_i = 5 \text{ nF}$, $L_i = 12 \text{ uH}$;

when connected through CSA Certified Safety Barriers as per Smar Installation Drawing 102A0558; Code T3C.

Note: Only models with stainless steel external fittings are Certified as Type 4X.

Special conditions for safe use:

Temperature Class T3C

Maximum Ambient Temperature: 40°C (-20 to 40 °C)

FM Approvals (Factory Mutual)

Intrinsic Safety (FM 0D7A9.AX)

IS Class I, Division 1, Groups A, B, C and D

IS Class II, Division 1, Groups E, F and G

IS Class III, Division 1

Explosion Proof (FM 0D7A9.AX)

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

Dust Ignition Proof (FM 0D7A9.AX)

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

DIP Class III, Division 1

Non Incendive (FM 0D7A9.AX)

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

Environmental Protection (FM 0D7A9.AX)

Option: Type 4X/6/6P or Type 4/6/6P

Special conditions for safe use:

Entity Parameters Fieldbus Power Supply Input (report 3015629):

$V_{max} = 24 \text{ Vdc}$, $I_{max} = 250 \text{ mA}$, $P_i = 1.2 \text{ W}$, $C_i = 5 \text{ nF}$, $L_i = 12 \text{ uH}$

$V_{max} = 16 \text{ Vdc}$, $I_{max} = 250 \text{ mA}$, $P_i = 2 \text{ W}$, $C_i = 5 \text{ nF}$, $L_i = 12 \text{ uH}$

4-20 mA Current Loop:

$V_{max} = 30 \text{ Vdc}$, $I_{max} = 110 \text{ mA}$, $P_i = 0,825 \text{ W}$, $C_i = 5 \text{ nF}$, $L_i = 12 \text{ uH}$

Temperature Class T4

Maximum Ambient Temperature: 60°C (-20 to 60 °C)

NEMKO (Norges Elektriske MaterielKontroll)

Explosion Proof (NEMKO 13 ATEX 1570X)

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

Ambient Temperature: -20 °C to +60 °C

Environmental Protection (NEMKO 03ATEX1570X)

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:

EN 60079-0:2012 General Requirements

EN 60079-1:2007 Flameproof Enclosures “d”

EXAM (BBG Prüf - und Zertifizier GmbH)

Intrinsic Safety (DMT 00 ATEX E 064)

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:

$U_i = 24V_{dc}$, $I_i = 380\text{ mA}$, $P_i = 5.32\text{ W}$, $C_i \leq 5\text{ nF}$, $L_i = \text{neg}$

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

Input-signal-circuits:

three 0-20 mA or 4-20 mA signal inputs with common ground

Input impedance (load impedance) $R_i = 100\ \Omega$

Effective internal capacitance C_i negligible

Effective internal inductance L_i negligible

Safety relevant maximum values for certified intrinsically safe 0-20 mA or 4-20 mA signal 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 inputs 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 60079-0:2012 + A11:2013 General Requirements

EN 60079-11:2012 Intrinsic Safety "i"

CEPEL (Centro de Pesquisa de Energia Elétrica)

Intrinsic Safety (CEPEL 97.0020X)

Ex ia, Group IIC, Temperature Class T4/T5, EPL Ga

FISCO Field Device

Entity Parameters:

$P_i = 5.32\text{ W}$, $U_i = 30V$, $I_i = 380\text{mA}$, $C_i = 5.0\text{nF}$, $L_i = \text{Neg}$

Ambient Temperature:

-20 to 65°C T4

-20 to 50°C T5

Explosion Proof (CEPEL 97.0090)

Ex d, Group IIC, Temperature Class T6, EPL Gb

Maximum Ambient Temperature: 40°C (-20 to 40 °C)

Environmental Protection (CEPEL 97.0020X AND CEPEL 97.0090)

Options: IP66/68W or IP66/68

Special conditions for safe use:

The certificate number ends with the letter "X" to indicate that for the version of Current to FIELDBUS Converter model IF302 equipped with housing made of aluminum alloy, only can be installed in "Zone 0" if is excluded the risk of occurs impact or friction between the housing and iron/steel itens.

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

ABNT NBR IEC 60079-0:2008 General Requirements

ABNT NBR IEC 60079-1:2009 Flameproof Enclosures "d"

ABNT NBR IEC 60079-11:2009 Intrinsic Safety "i"

ABNT NBR IEC 60079-26:2008 Equipment with equipment protection level (EPL) Ga

IEC 60079-27:2008 Fieldbus intrinsically safe concept (FISCO)

ABNT NBR IEC 60529:2009 Classification of degrees of protection provided by enclosures (IP Code)

Identification Plate

CSA (Canadian Standards Association)

smar IF302 4-20 mA to FB Converter
BR - 14160
FISCO Field Device
FNICO Field Device

XP - CL I DIV 1 GR BCD, CL II DIV 1 GR EFG, CL III DIV 1
NI - CL I DIV 2 GR ABCD
IS - Exia - CL I DIV 1 GR ABCD, CL II DIV 1 GR EFG, CL III DIV 1
Vmax=24V Imax=380mA Ci=5nF Li=12uH
T3C Ta=40°Cmax Inst. Dwg. 102A0558

Type 4
Seal not required (conduit)

0044333 - 2007

CE 142601

smar IF302 4-20 mA to FB Converter
BR - 14160
FISCO Field Device
FNICO Field Device

XP - CL I DIV 1 GR BCD, CL II DIV 1 GR EFG, CL III DIV 1
NI - CL I DIV 2 GR ABCD
IS - Exia - CL I DIV 1 GR ABCD, CL II DIV 1 GR EFG, CL III DIV 1
Vmax=24V Imax=380mA Ci=5nF Li=12uH
T3C Ta=40°Cmax Inst. Dwg. 102A0558

Type 4X
Seal not required (conduit)

0044333 - 2007

CE 139501

FM Approvals (Factory Mutual)

smar IF302 4-20mA to FB Converter
BR - 14160
Made in Brazil

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 102A0081.

Type 4X/6/6P

0044333 - 2007

CE 133300

smar IF302 4-20mA to FB Converter
BR - 14160
Made in Brazil

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 102A0081.

Type 4X/6/6P

0044333 - 2007

CE 121000

smar IF302 4-20mA to FB Converter
TX - 77040
Made in USA

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 102A0081.

Type 4X/6/6P

0000000 - 0000

CE 162702

smar IF302 4-20mA to FB Converter
TX - 77040
Made in USA

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 102A0081.

Type 4X/6/6P

0000000 - 0000

CE 162602

NEMKO (Norges Elektriske MaterielKontroll) / EXAM (BBG Prüf - und Zertifizier GmbH)

smar IF302 4-20mA to FB Converter
BR - 14160
Sertãozinho
Brazil

Ex II 2G Ex ia IIC T4/T5/T6 Gb DMT 00 ATEX E 064 ()
-40°C ≤ Ta ≤ +60°C
Pi = 5,32 W Ui = 24 VDC li = 380 mA Li = neg Ci ≤ 5 nF
IP66W

Ex II 2G Ex d IIC T6 Gb Nemko 13 ATEX 1570X ()
Tamb = -20°C to 60°C U = 28 VDC
IP68W
10m/24h

0000000 - 0000

CE 0470 149704

smar IF302 4-20mA to FB Converter
BR - 14160
Sertãozinho
Brazil

Ex II 2G Ex ia IIC T4/T5/T6 Gb DMT 00 ATEX E 064 ()
-40°C ≤ Ta ≤ +60°C
Pi = 5,32 W Ui = 24 VDC li = 380 mA Li = neg Ci ≤ 5 nF
IP66

Ex II 2G Ex d IIC T6 Gb Nemko 13 ATEX 1570X ()
Tamb = -20°C to 60°C U = 28 VDC
IP68
10m/24h

0000000 - 0000

CE 0470 141504

smar IF302 4-20mA to FB Converter
BR - 14160
Sertãozinho
Brazil

Ex I M2 Ex ia I Mb DMT 00 ATEX E 064
-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

CE 0470 149801

smar IF302 4-20mA to FB Converter
BR - 14160
Sertãozinho
Brazil

Ex I M2 Ex ia I Mb DMT 00 ATEX E 064
-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

CE 0470 141601

CEPEL (Centro de Pesquisa de Energia Elétrica)

smar IF302 Conversor 4-20mA FB
BR - 14160

Segurança
INMETRO OCP 0007



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

Ex d IIC T6 Gb CEPEL 97.0090 ()
Ex ia IIC T4/T5 Ga CEPEL 97.0020 X ()

Tamb = -20° a 65°C (T4) -20° a 50°C (T5)
Ui = 30 V li = 380 mA Pi = 5,32 W Ci = 5 nF Li = desp

IP 66 68

0044333 - 2007

136802

smar IF302 Conversor 4-20mA FB
BR - 14160

Segurança
INMETRO OCP 0007



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

Ex d IIC T6 Gb CEPEL 97.0090 ()
Ex ia IIC T4/T5 Ga CEPEL 97.0020 X ()

Tamb = -20° a 65°C (T4) -20° a 50°C (T5)
Ui = 30 V li = 380 mA Pi = 5,32 W Ci = 5 nF Li = desp

IP 66W 68W

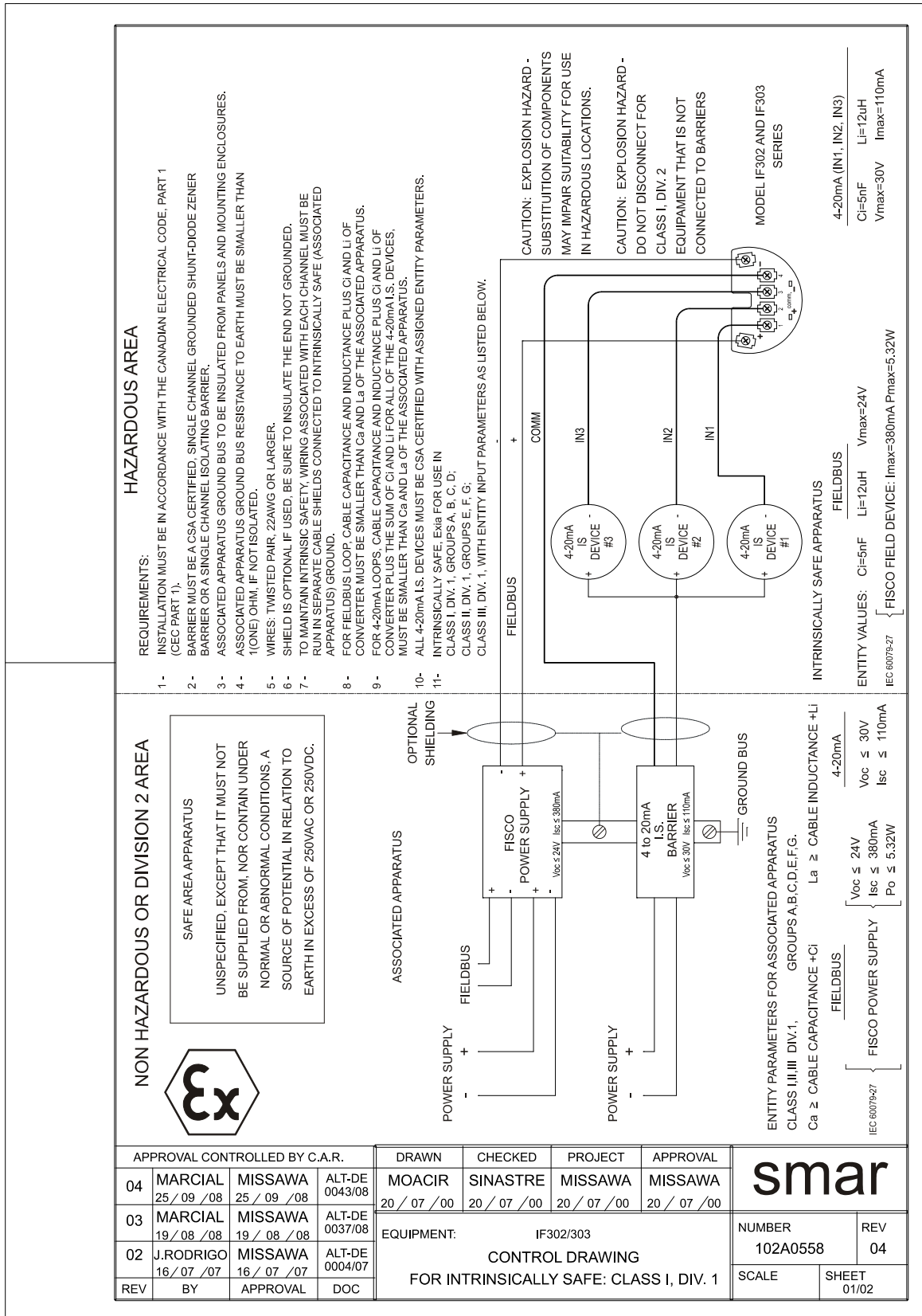
0044333 - 2007

124802

Control Drawing

Canadian Standards Association (CSA)



NON HAZARDOUS OR DIVISION 2 AREA

SAFE AREA APPARATUS

UNSPECIFIED, EXCEPT THAT IT MUST NOT BE SUPPLIED FROM, NOR CONTAIN UNDER NORMAL OR ABNORMAL CONDITIONS, A SOURCE OF POTENTIAL IN RELATION TO EARTH IN EXCESS OF 250VAC OR 250VDC.

OPTIONAL SHIELDING

ASSOCIATED APPARATUS

HAZARDOUS AREA

REQUIREMENTS:

- 1- INSTALLATION MUST BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE, PART 1 (CEC PART 1).
- 2- BARRIER MUST BE A CSA CERTIFIED, SINGLE CHANNEL GROUND SHUNT-DIODE ZENER BARRIER OR A SINGLE CHANNEL ISOLATING BARRIER.
- 3- ASSOCIATED APPARATUS GROUND BUS TO BE INSULATED FROM PANELS AND MOUNTING ENCLOSURES.
- 4- ASSOCIATED APPARATUS GROUND BUS RESISTANCE TO EARTH MUST BE SMALLER THAN 1(ONE) OHM, IF NOT ISOLATED.
- 5- WIRES: TWISTED PAIR, 22AWG OR LARGER.
- 6- SHIELD IS OPTIONAL IF USED, BE SURE TO INSULATE THE END NOT GROUNDED.
- 7- TO MAINTAIN INTRINSIC SAFETY, WIRING ASSOCIATED WITH EACH CHANNEL MUST BE RUN IN SEPARATE CABLE SHIELDS CONNECTED TO INTRINSICALLY SAFE (ASSOCIATED APPARATUS) GROUND.
- 8- FOR FIELDBUS LOOP, CABLE CAPACITANCE AND INDUCTANCE PLUS CI AND LI OF CONVERTER MUST BE SMALLER THAN Ca AND La OF THE ASSOCIATED APPARATUS.
- 9- FOR 4-20mA LOOPS, CABLE CAPACITANCE AND INDUCTANCE PLUS CI AND LI OF CONVERTER PLUS THE SUM OF CI AND LI FOR ALL OF THE 4-20mA I.S. DEVICES, MUST BE SMALLER THAN Ca AND La OF THE ASSOCIATED APPARATUS.
- 10- ALL 4-20mA I.S. DEVICES MUST BE CSA CERTIFIED WITH ASSIGNED ENTITY PARAMETERS.
- 11- NON-INCENDIVE FOR CLASS I, DIV. 2, GROUPS A, B, C, D, WITH NON-INCENDIVE FIELD WIRING INPUT PARAMETERS AS LISTED BELOW.

NON-INCENDIVE APPARATUS

MODEL IF302 AND IF303 SERIES

4-20mA (IN1, IN2, IN3)
Ci=5nF Li=12uH
Vmax=30V Imax=110mA

ENTITY VALUES: Ci=5nF Li=12uH Vmax=24V

ENTITY PARAMETERS FOR ASSOCIATED APPARATUS CLASS I, DIV. 2, GROUPS A,B,C,D.
Ca ≥ CABLE CAPACITANCE +Ci La ≥ CABLE INDUCTANCE +Li

FNICO POWER SUPPLY { Voc ≤ 24V Voc ≤ 30V
Isc ≤ 570mA Isc ≤ 110mA
Po ≤ 9.98W

FNICO FIELD DEVICE: Imax=570mA Pmax=9.98W

APPROVAL CONTROLLED BY C.A.R.			
04	MARCIAL 25 / 09 / 08	MISSAWA 25 / 09 / 08	ALT-DE 0043/08
03	MARCIAL 19 / 08 / 08	MISSAWA 19 / 08 / 08	ALT-DE 0037/08
02	J.RODRIGO 16 / 07 / 07	MISSAWA 16 / 07 / 07	ALT-DE 0004/07
REV	BY	APPROVAL	DOC

DRAWN	CHECKED	PROJECT	APPROVAL
MOACIR	SINASTRE	MISSAWA	MISSAWA
20 / 07 / 00	20 / 07 / 00	20 / 07 / 00	20 / 07 / 00

smar

EQUIPMENT: IF302/303

CONTROL DRAWING

FOR NON-INCENDIVE: CLASS I, DIV. 2

NUMBER		REV
102A0558		04
SCALE	SHEET	
	02/02	

Factory Mutual (FM)

NON HAZARDOUS OR DIVISION 2 AREA

SAFE AREA APPARATUS

UNSPECIFIED, EXCEPT THAT IT MUST NOT BE SUPPLIED FROM, NOR CONTAIN UNDER NORMAL OR ABNORMAL CONDITIONS, A SOURCE OF POTENTIAL IN RELATION TO EARTH IN EXCESS OF 250VAC OR 250VDC.

ASSOCIATED APPARATUS

OPTIONAL SHIELDING

FIELDBUS

POWER SUPPLY

GROUND BUS

HAZARDOUS AREA

REQUIREMENTS:

- 1- INSTALLATION MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (ANSI/NFPA 70) AND ANSI/ISA-RP12.6
- 2- TRANSMITTER SPECIFICATION MUST BE IN ACCORDANCE TO APPROVAL LISTING. FM
- 3- ASSOCIATED APPARATUS GROUND BUS TO BE INSULATED FROM PANELS AND MOUNTING ENCLOSURES.
- 4- ASSOCIATED APPARATUS GROUND BUS RESISTANCE TO EARTH MUST BE SMALLER THAN 1(ONE) OHM.
- 5- OBSERVE TRANSMITTER POWER SUPPLY LOAD CURVE.
- 6- WIRES: TWISTED PAIR, 22AWG OR LARGER.
- 7- SHIELD IS OPTIONAL IF USED, BE SURE TO INSULATE THE END NOT GROUNDED.
- 8- CABLE CAPACITANCE AND INDUCTANCE PLUS C_i AND L_i MUST BE SMALLER THAN C_a AND L_a OF THE ASSOCIATED APPARATUS.

FIELDBUS

COMM

IN3

IN2

IN1

4-20mA IS DEVICE #3

4-20mA IS DEVICE #2

4-20mA IS DEVICE #1

COMPONENTS CAN NOT BE SUBSTITUTED WITHOUT PREVIOUS MANUFACTURER APPROVAL.

ENTITY PARAMETERS FOR ASSOCIATED APPARATUS

CLASS I,II,III DIV:1
GROUPS A,B,C,D,E,F & G

C_a ≥ CABLE CAPACITANCE +5nF
L_a ≥ CABLE INDUCTANCE +12uH

FIELDBUS

Voc ≤ 24V I _{sc} ≤ 250mA Po ≤ 1,2W	Voc ≤ 18V I _{sc} ≤ 250mA Po ≤ 2W
Voc ≤ 30V I _{sc} ≤ 110mA	Voc ≤ 30V I _{sc} ≤ 110mA

4-20mA

C_i=5nF L_i=12uH
V_{max} ≤ 24V
I_{max} ≤ 250mA

MODELS IF302 AND IF303 - SERIES
CLASS I,II,III DIV:1, GROUPS A,B,C,D,E,F & G

ENTITY VALUES:

FIELDBUS

C_i=5nF L_i=12uH
V_{max} ≤ 24V
I_{max} ≤ 250mA

APPROVAL CONTROLLED BY C.A.R.			
DRAWING	DESIGN	VERIFIED	APPROVED
MARCIAL 20/10/08	MISSAWA 20/10/08	ALT DE 0049/08	
MARCIAL 16/07/07	MISSAWA 16/07/07	ALT DE 0004/07	
MOACIR 07/05/03	CASSIOLATO 07/05/03	ALT DE 0043/03	
MOACIR 08/02/00	CASSIOLATO 08/02/00	ALT DE 0015/00	
REV.	DESIGN	APPROVED	AREA

APPROVED

smar


O.S.

DRAWING N. 102A0081	REV 07
SH01/01	

EQUIPMENT: IF302/303

CONTROL DRAWING

Appendix B

	SRF – Service Request Form			
	Converter from 4-20mA to Fieldbus			
GENERAL DATA				
Model:	IF302 ()	IF303 ()		
Serial Number:	_____			
TAG:	_____			
How many channels are used in IF?	1 ()	2 ()	3 ()	
Configuration:	Magnetic Tool ()	PC ()	Software: _____	Version: _____
INSTALLATION DATA				
Type/Model/Manufacturer of device connected to the channel 1:	_____			
Type/Model/Manufacturer of device connected to the channel 2:	_____			
Type/Model/Manufacturer of device connected to the channel 3:	_____			
PROCESS DATA				
Hazardous Area Classification:	() Yes, please specify: _____			
	() No			
	More details: _____			
Types of Interference presents in the area:	Without interference ()	Temperature ()	Vibration ()	Others: _____
Ambient Temperature:	From _____ °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: ____/____/____	
For warranty or non-warranty repair, please contact your representative. Further information about address and contacts can be found on www.smar.com/contactus.asp .				

Returning Materials

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

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