

# MANUAL

INSTALLATION | OPERATION | MAINTENANCE

## FIELDBUS RELAY AND DRY CONTACT INPUT FRI302



JAN/25 - VERSION 3

**smar**  
Technology Company

# FRI302

Fieldbus Relay and Dry Contact Input



Consult our  
subsidiary



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# INTRODUCTION

The **FRI302** is a fieldbus device that has two built-in relays making integration of Fieldbus to conventional devices such as solenoids, on/off valves, electrical actuators, motors, pumps, starters, etc. The **FRI302** also has two dry contact inputs. The **FRI302** Fieldbus Relay and dry contact Input can be located in the field, mounted close to the conventional devices without the need to run the conventional wiring to the control room. The **FRI302** is an integral part of SYSTEM302 but also integrates into other systems that support FOUNDATION™ Fieldbus.

The **FRI302** allows that conventional discrete outputs be available, in order to make the control strategy configuration easy. Using standard FOUNDATION™ Fieldbus Function blocks, these outputs appear as regular Fieldbus devices, thus making the system homogenous. Control loops are implemented consistently.

An extensive function block library enables the **FRI302** to perform logic control functions in the field integrating it to its discrete outputs. Instantiated function blocks provide great flexibility in the control strategy. The **FRI302** is fully configured by Syscon software in SYSTEM302 or any other FOUNDATION™ Fieldbus configuration tool. "Link master" capability allows the **FRI302** to work as a backup LAS for greater availability of network communications.

The **FRI302** may be installed close to the final elements, thereby eliminating long wire runs, associated marshalling panels and cable trays for the conventional output. With subsequent savings further reducing overall system costs. The use of **FRI302** makes it possible to distribute outputs at various locations in the field and connect them via the H1 Fieldbus.

Get the best result of the **FRI302** by carefully reading these instructions.

### **WARNING**

This Manual is compatible with version 3.XX, where 3 denotes 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.

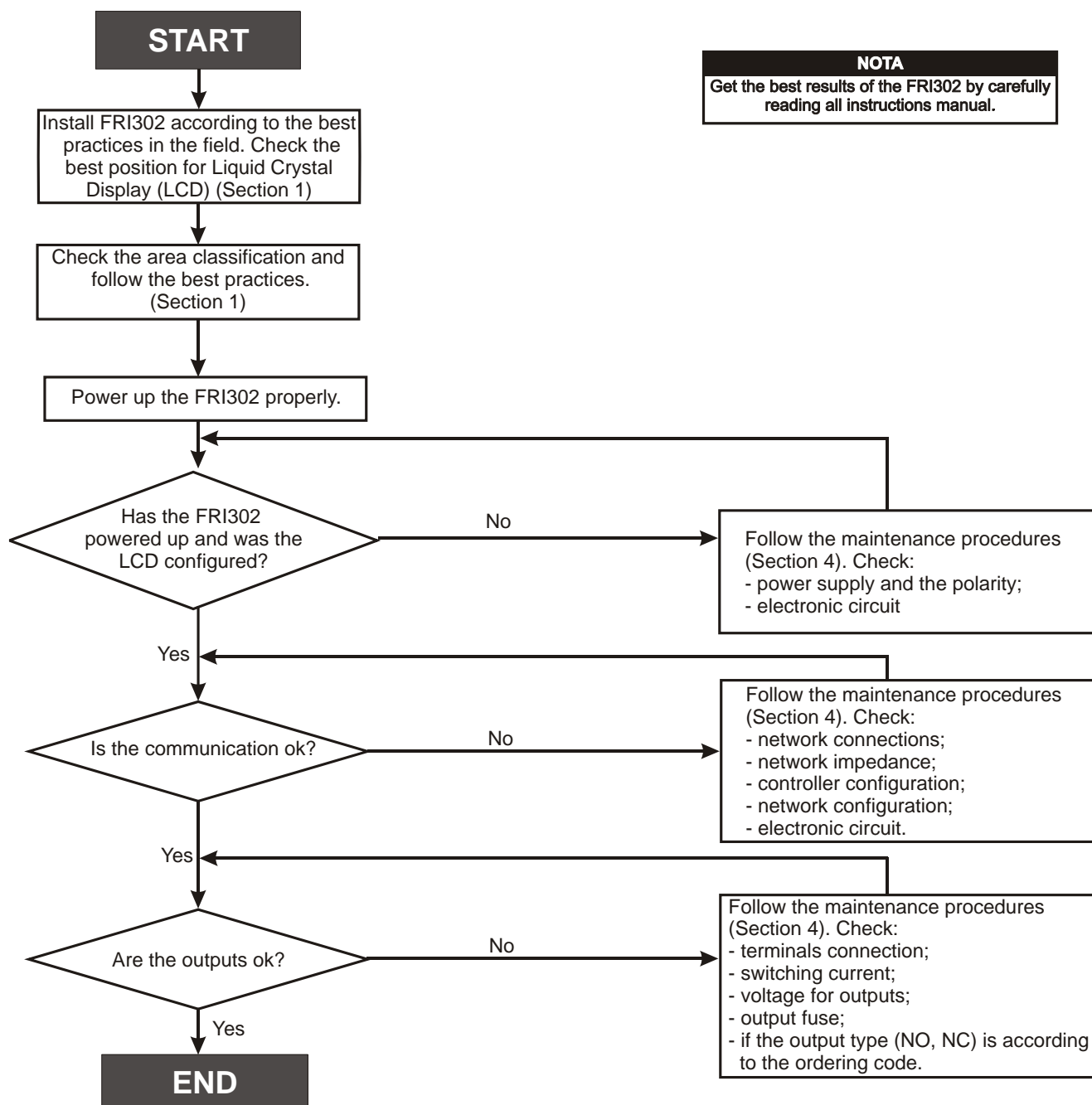
The field equipment referred to in this manual, when acquired for classified or hazardous areas, has its certification void when having its parts replaced or interchanged without functional and approval tests by Smar or any of Smar authorized dealers, which are the competent companies for certifying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

The overall reliability of actuation and control depends on several variables. Although the **Fieldbus Relay and dry contact Input** has an outstanding performance, proper installation is essential in order to maximize its performance.

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

Locating the **Fieldbus Relay and dry contact Input** in areas protected from extreme environmental changes can improve its performance.

In warm environments, the **Fieldbus Relay and dry contact Input** should be installed to avoid, as much as possible, direct exposure to the sun. Installation close to lines and vessels subjected to high temperatures also should be avoided.

The use of sunshades or heat shields to protect the **Fieldbus Relay and dry contact Input** from external heat sources should be considered, when necessary.

Humidity can be fatal to electronic circuits. A humidity proof coating protects the electronic circuit, 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.

For details of mounting, please, refer to Figure 1.1.

## Mounting

Using the bracket, the mounting may be done in several positions, as shown on Figure 1.1 - Dimensional Drawing and Mounting Positions.

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

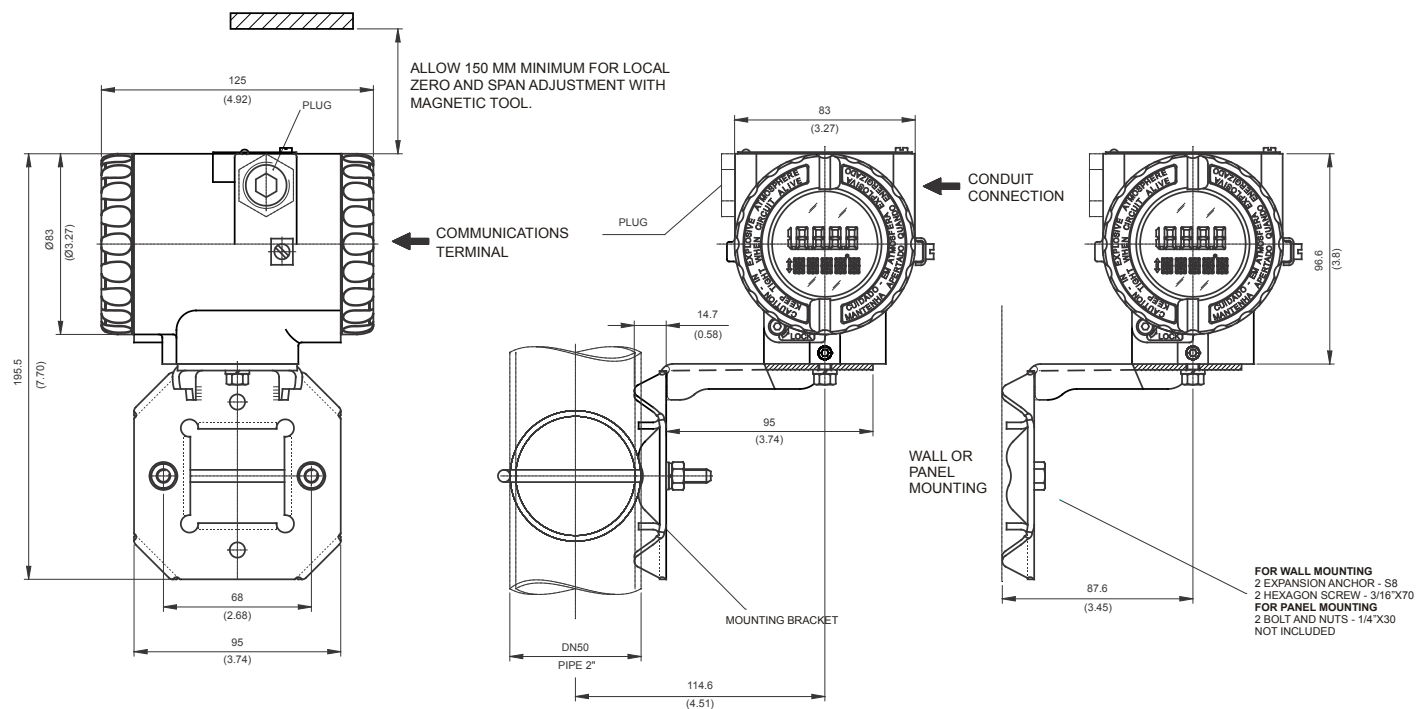
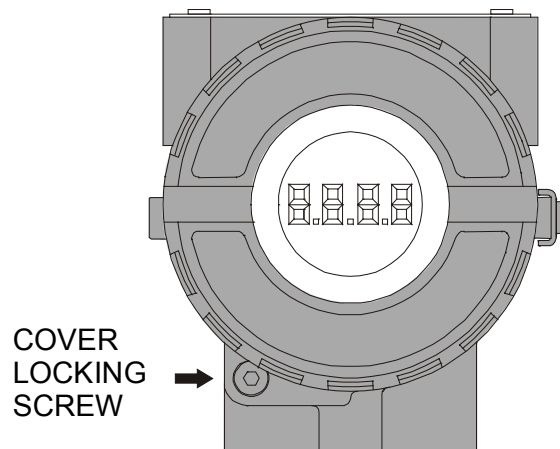


Figure 1.1 - Dimensional Drawing and Mounting Positions

## Electric Wiring

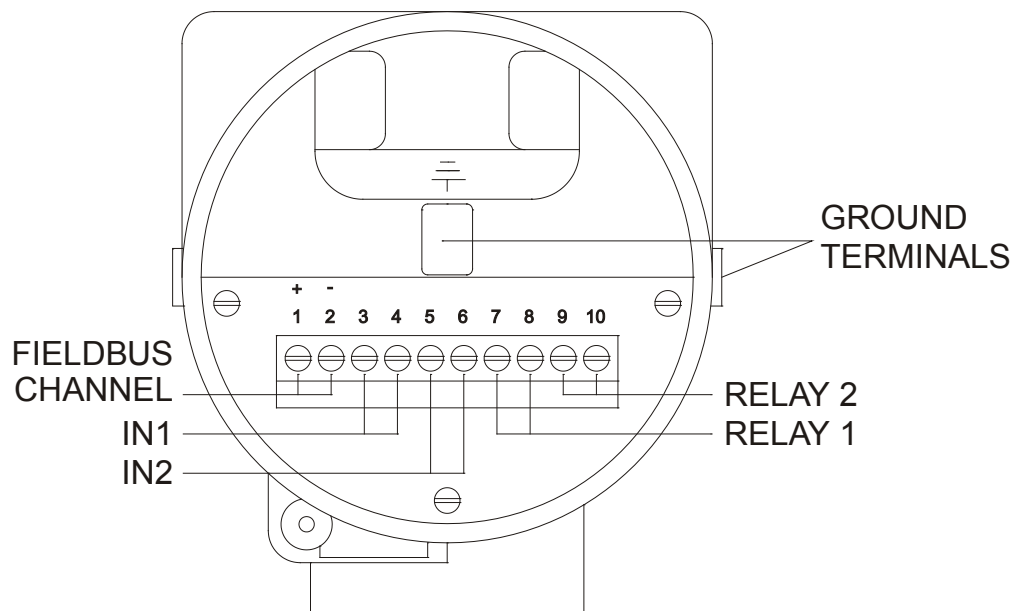
Access the wiring block by removing the Electrical Connection Cover. This cover can be locked closed by the cover locking screw (See Figure 1.2 - Cover Locking). To release the cover, rotate the locking screw clockwise.

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 port should be plugged accordingly.



**Figure 1.2 - Cover Locking**

The wiring block has screws, on which fork or ring type terminals can be fastened. See Figure 1.3 – Terminal Block.



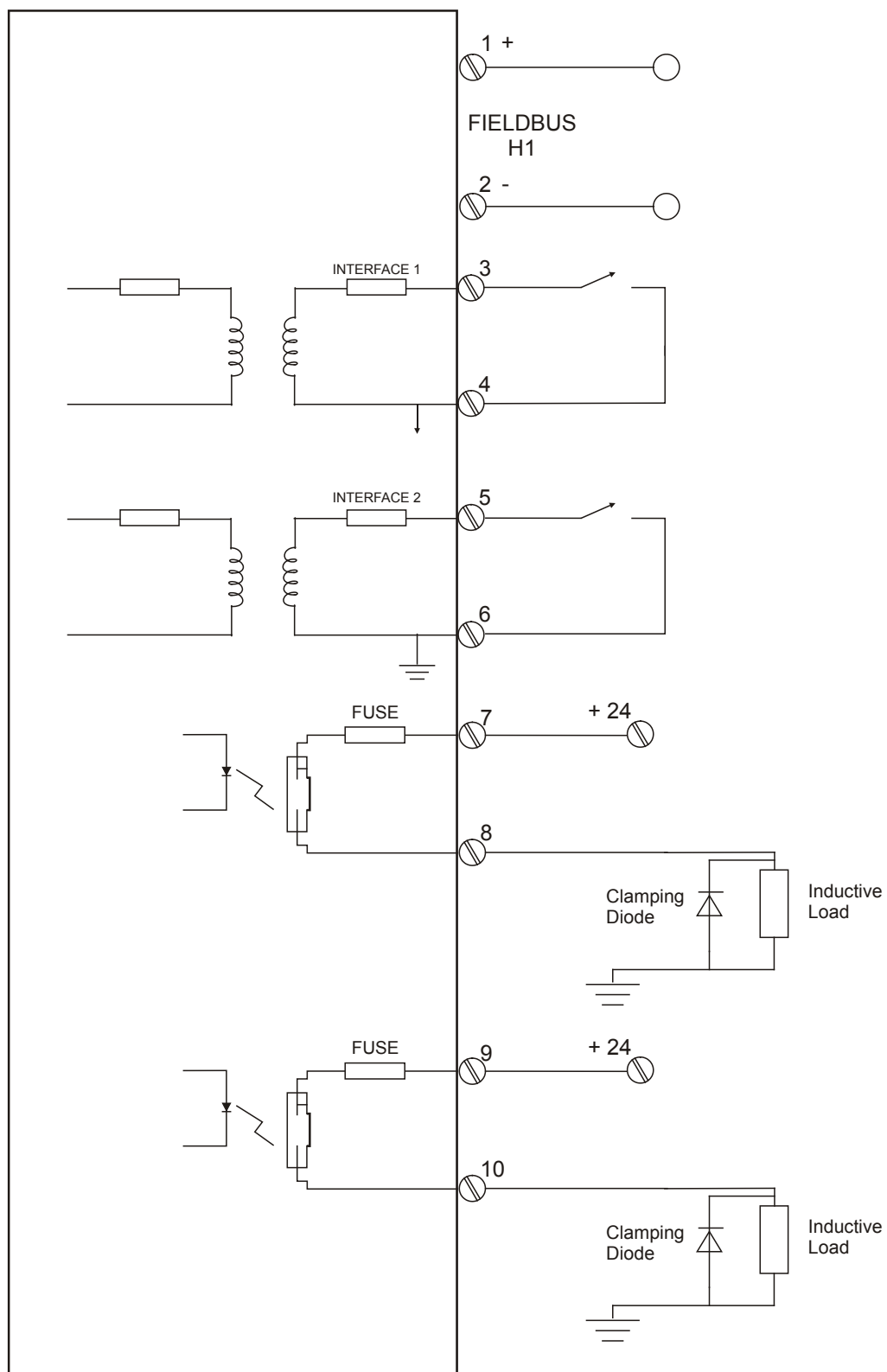
**Figure 1.3 - Terminal Block**

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

The unused port should be plugged accordingly. In Figure 1.4 you can see an example of output connections.



FRI302

**Figure 1.4 – Example of Output and Input Connections**

The **FRI302** is a bus-powered device.

The **FRI302** uses the 31.25 kbit/s voltage mode option for the physical signaling. Various types of Fieldbus devices may be connected on the same bus being bus-powered or non-bus-powered. When bus-powered, the devices must use the same signaling. Up to 16 devices can be connected in parallel along the same pair of wires.

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

The **FRI302** is protected against reverse polarity, and can withstand  $\pm 35$  VDC without damage.

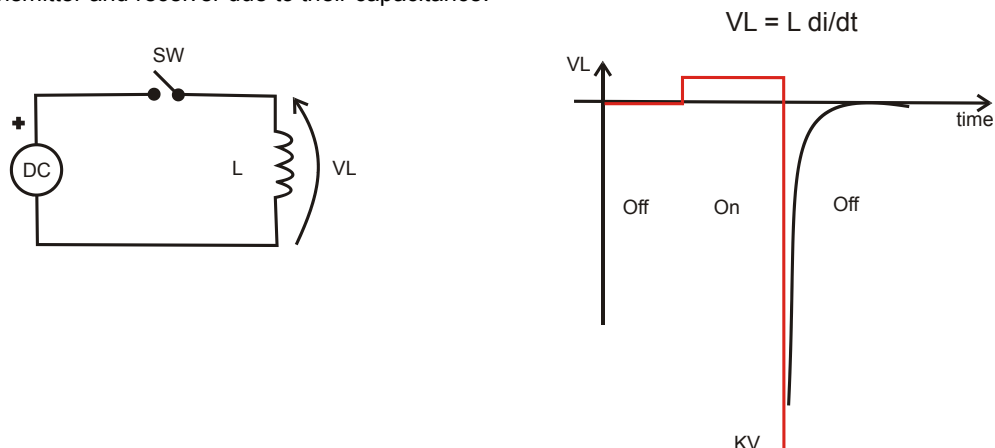


**NOTE**

For a DC connection it is recommended to use a protection diode and for an AC connection it is recommended to use a snubber, mainly for inductive loads.

**Surge Suppression**

Transient EMI (electric noise) can be generated during the commutation of every inductive electric load. In many cases, the noise interferes directly on the origin of the commutation command and until may damage electronic components. Those transient peaks have a time of ascent very fast, generating a high induced tension where the automation wiring system works as the signal transmitter and receiver due to their capacitance.



**Figure1.5 – Reverse Voltage Peak**

Some alternatives may avoid this interference, like optical couplers, Zero Crossing Switching, indirect startups that prevent the arrival of the noise to the command, but the noise generated by the commuted device continues existing and many times it is induced in the wiring system, reaching other automation electronic points, causing intermittent defects in the system. Therefore, those ways of treating the noise are not effective. It should be eliminated exactly in the noise source, in other words, in order to obtain a filter with better performance, it should be mounted the closest possible to the commuted load.

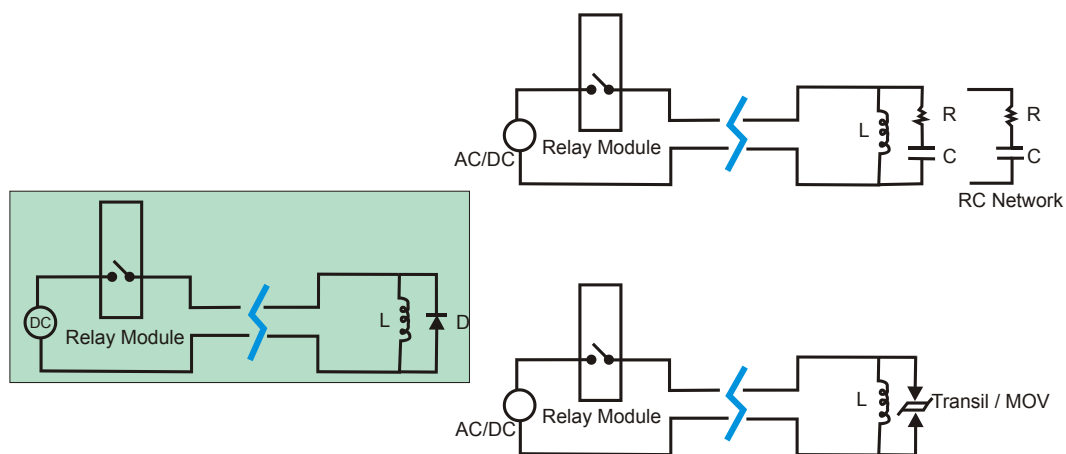


Figure 1.6 – Filters for AC and DC loads

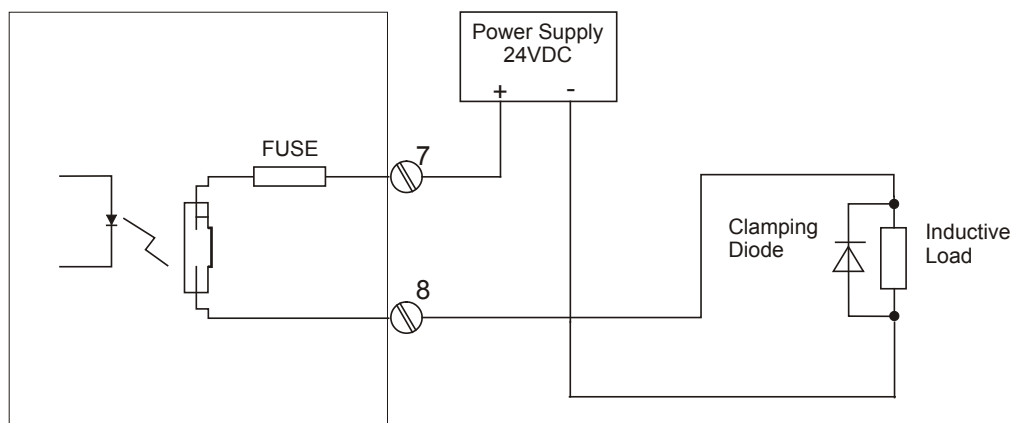


Figure 1.7 – Protection Diode in Parallel to DC Load

- **Inductive AC Load:** In FRI302 it is recommended to insert snubber circuit in parallel to the load and close to them. This will avoid the noise coupling in other cables that are in the same conduit.

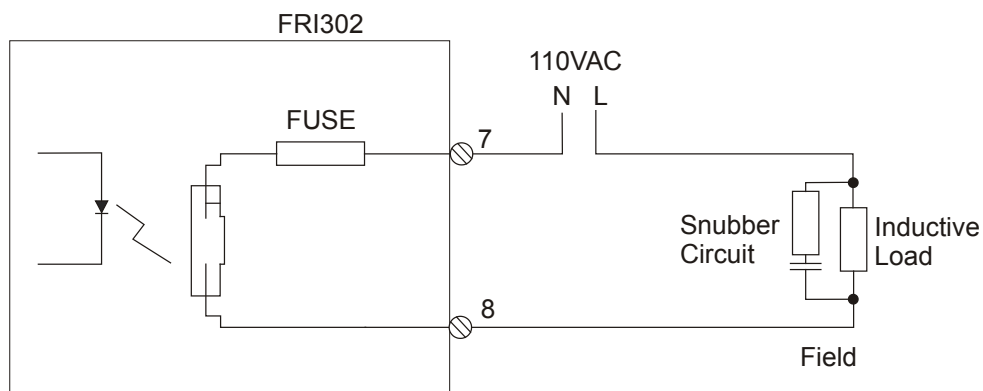


Figure 1.8 – Snubber Circuit in parallel to the AC Load

**Suggestion for the RC network components and the clamping diode**

The maximum current of the clamping diode should be greater or equal to the load maximum current, and the maximum tension should be 3-4 times greater than the circuit source in 24VDC and 8-10 times greater than the circuit source in 110VDC.

The RC circuit (AC) capacitor should have a tension 2-3 times greater than the power supply voltage. Recommended values:

Load Inductance	Capacitor
25-70mH	0.50µF
70-180mH	0.250µF
180mH - 10H	0.10µF

For loads up to 100 Ω, the RC circuit resistor should be 1 - 3 Ω, 2 Watts.  
For loads that exceed 100 Ω, the resistor value should be increased until 47 Ω, ½ Watt.

Several manufacturers supply RC filters ready to be mounted in contactors, valves and other inductive loads. One of them is Murr Elektronik ([www.murrelektronik.com](http://www.murrelektronik.com)) or ICOS ([www.icos.com.br](http://www.icos.com.br)).

**Ferrite Beads**

Ferrite beads can supply additional suppression for EMI transients. The Ferrite of Fair-Rite Products Corporation (ordering code 2643626502) can be used in category 2 and 3 conductors. We can install them using fastening belts. With a ferrite located close to the cable termination, EMI transients induced on the cable can be suppressed by the ferrite, before entering in the equipment.

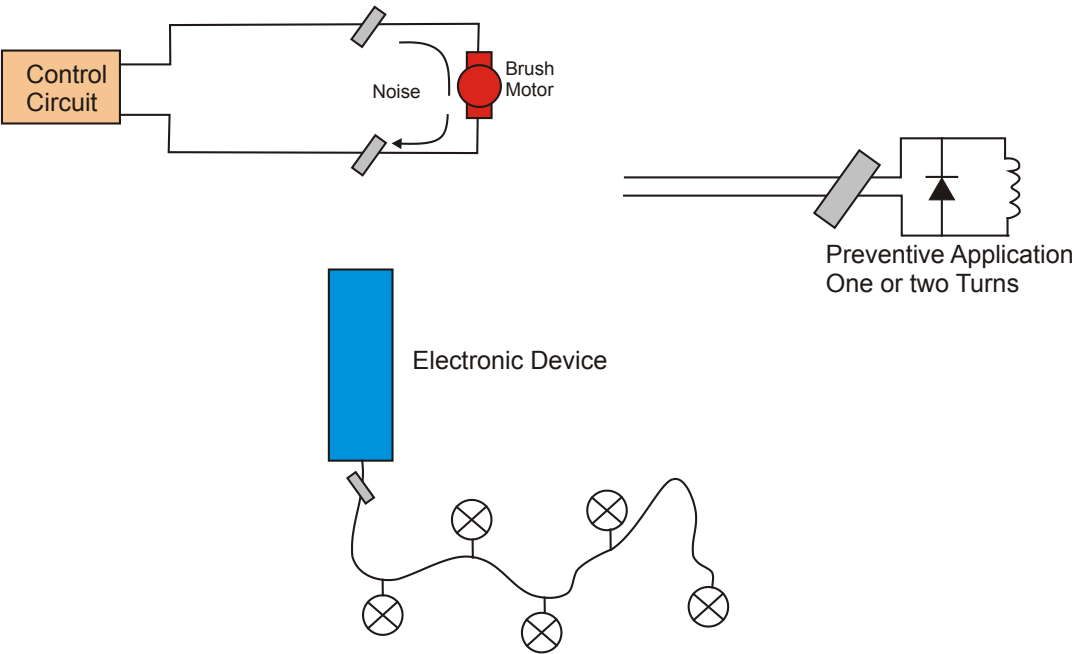


Figure 1.9 – Ferrite Application on Control Lines



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

**WARNING**

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

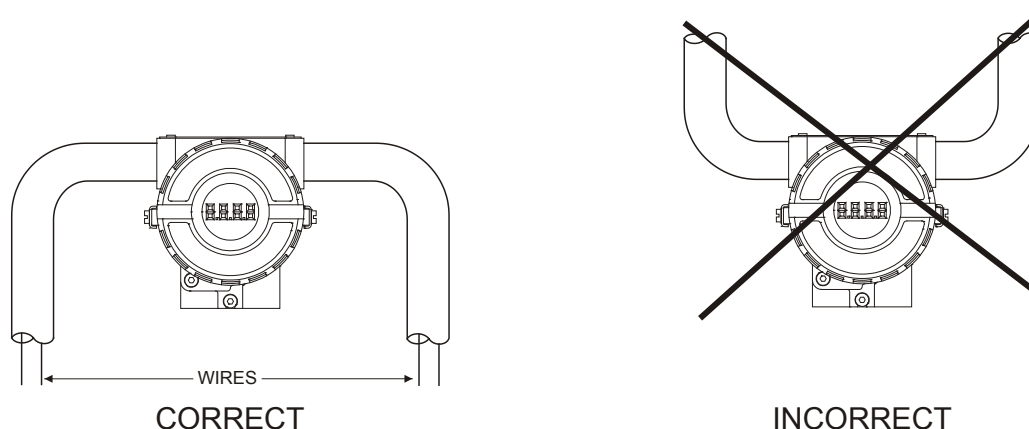
In hazardous zones with intrinsically safe or nonincendive requirements, the circuit entity parameters and applicable installation procedures must be observed.

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 and sealed accordingly.

Explosion proof, nonincendive and intrinsic safety Factory Mutual certification are standard for **FRI302**.

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

The Figure 1.10 - Conduit Installation Diagram, shows the correct installation of the conduit, in order to avoid penetration of water, or other substance, which may cause malfunctioning of the equipment.



**Figure 1.10 - Conduit Installation Diagram.**

## Topology and Network Configuration

Bus topology (See Figure 1.11 - Bus Topology) and tree topology (See Figure 1.12 - Tree Topology) are supported. Both types have a trunk cable with two terminations. The devices are connected to the trunk via spurs. The spurs may be integrated in the device giving zero spur length. A spur may connect more than one device, depending on the length. Active couplers may be used to extend spur length.

Active repeaters may be used to extend the trunk length.

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

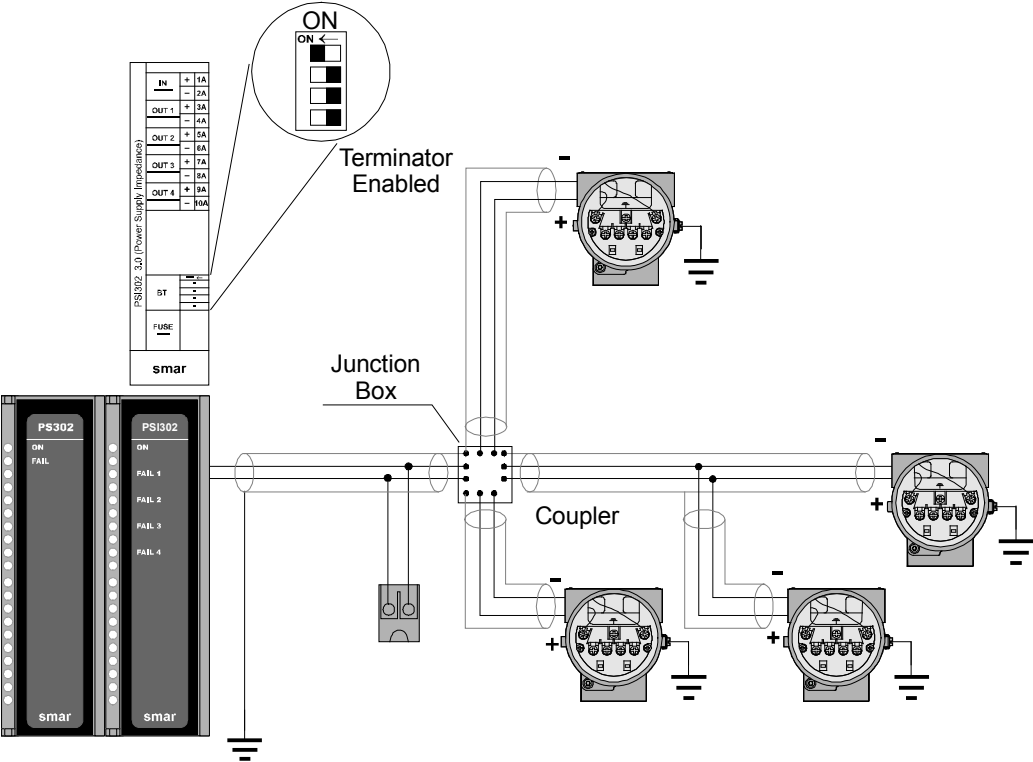


Figure 1.11 - Bus Topology

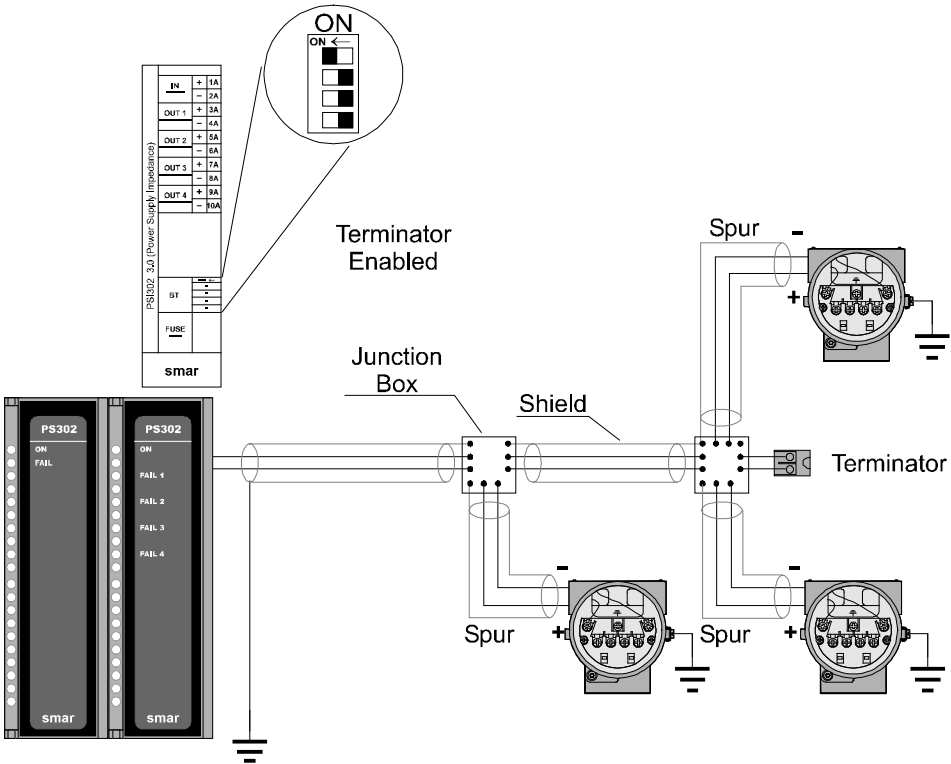
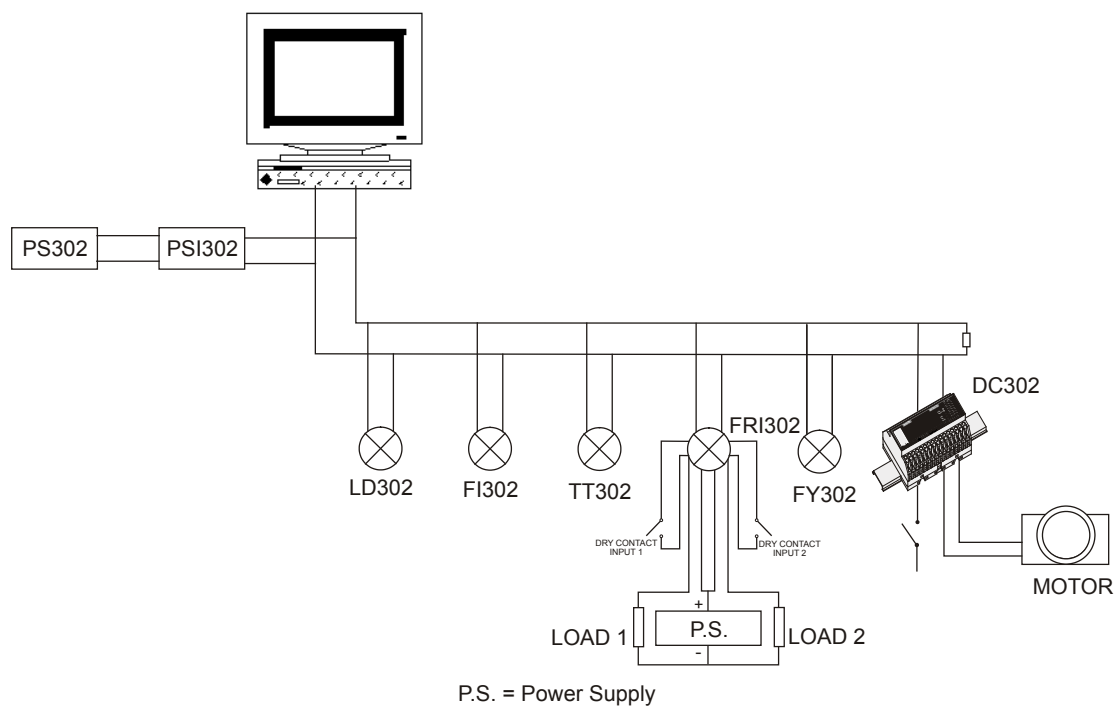


Figure 1.12 - Tree Topology

## General System

According to the figure below, a general network topology can be seen where the FRI302 is integrated into a simple Fieldbus network.



**Figure 1.13 – FRI302 and a general Fieldbus System**





### OPERATION

The **FRI302** has 2 isolated built-in relay outputs. It is therefore ideal for interfacing existing discrete devices to a Fieldbus system.

Output function blocks include standard FOUNDATION™ safety mechanisms in case of failures. Outputs are isolated from each other.



#### NOTE

For each output there is a 250mA protection fuse. To access them, please, remove the main electronic board and in the Relay board see the reference FU1 and FU2. The code for them is LIT 251.250 – 0.250A – from Littelfuse.

### **Functional Description – Electronics**

Refer to the block diagram (See Figure 2.1 – *FRI302 Block Diagram*). The function of each block is described below.

#### **(CPU) Central Processing Unit, RAM and FLASH**

The CPU is the intelligent portion of the Fieldbus Relay and dry contact Input, 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 configuration and identification data.

##### **Communication Controller**

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

##### **Power Supply**

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

##### **Display Controller**

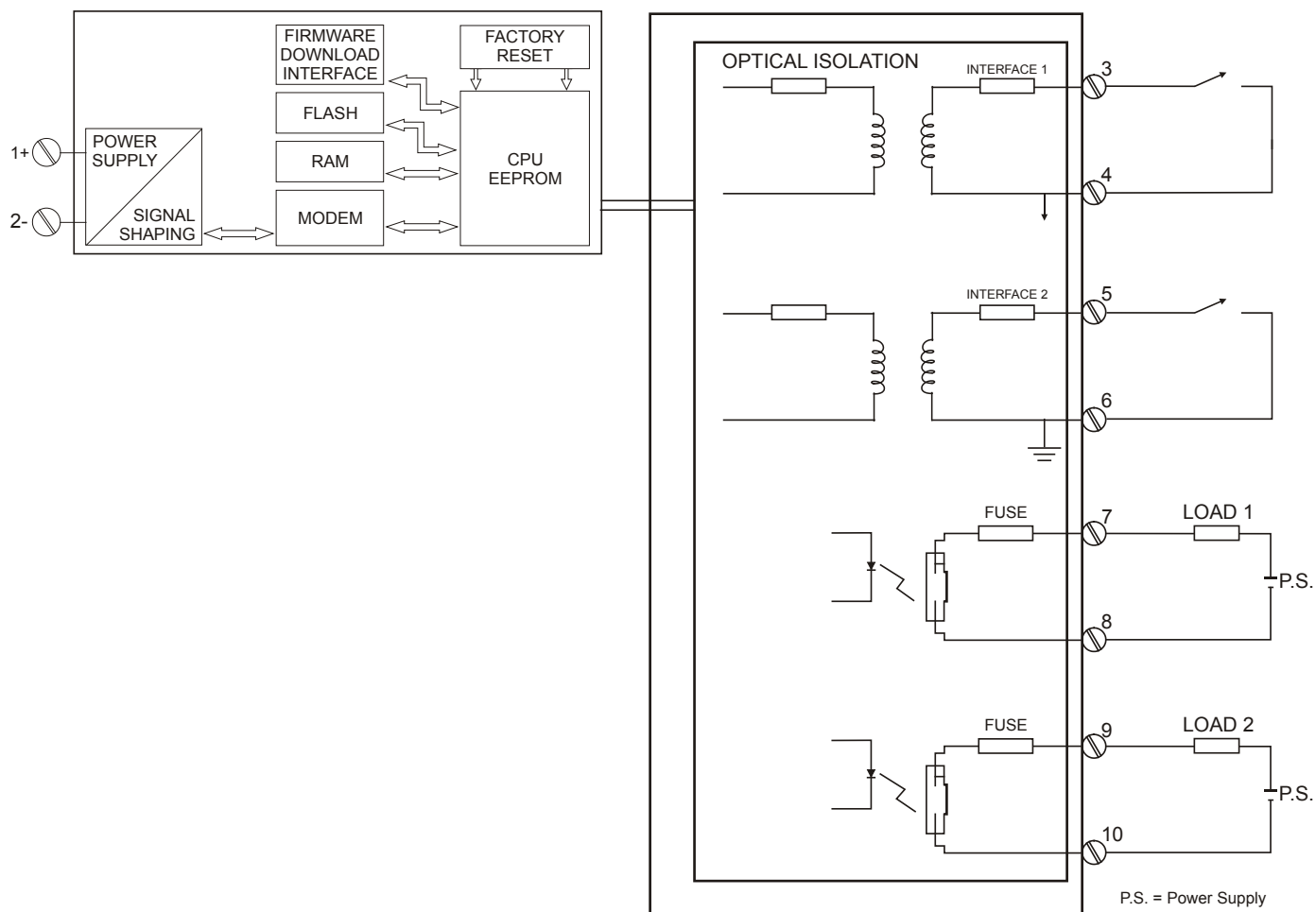
Receives data from the CPU and drives the Liquid Crystal Display.

##### **Local Adjustment**

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

##### **Optical Isolation**

Optical isolation is for outputs and inputs.



**Figure 2.1 – FRI302 Block Diagram**

**NOTE**

When the FRI302 has a N.O. relay and a N.C. relay, the N.O. relay is connected to terminals 7-8 and the N.C. relay is connected to the terminals 9-10.

# CONFIGURATION

One of the many advantages of Fieldbus is that device configuration is independent of the configuration tool. The **FRI302** may be configured by a third party host computer using the DD (Device Description) and CFF (Capability File).

The **FRI302** has several Function Blocks built in, such as Analog Alarm, Arithmetic, Discrete Output, Flip-Flop and Edge Trigger, Input Selector, PID, Step Output PID and Timer. See “*Function Block type availability and initial block set*” at the end of this section.

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

The FRI302 Function Blocks can link with blocks located in other devices using SYSCON or other Fieldbus configuration tools. The relay outputs are chosen via CHANNEL parameter in the DO and PID Step blocks.

For explanation and details for using SYSCON, please see the *SYSCON Manual*.

## Functional Diagram

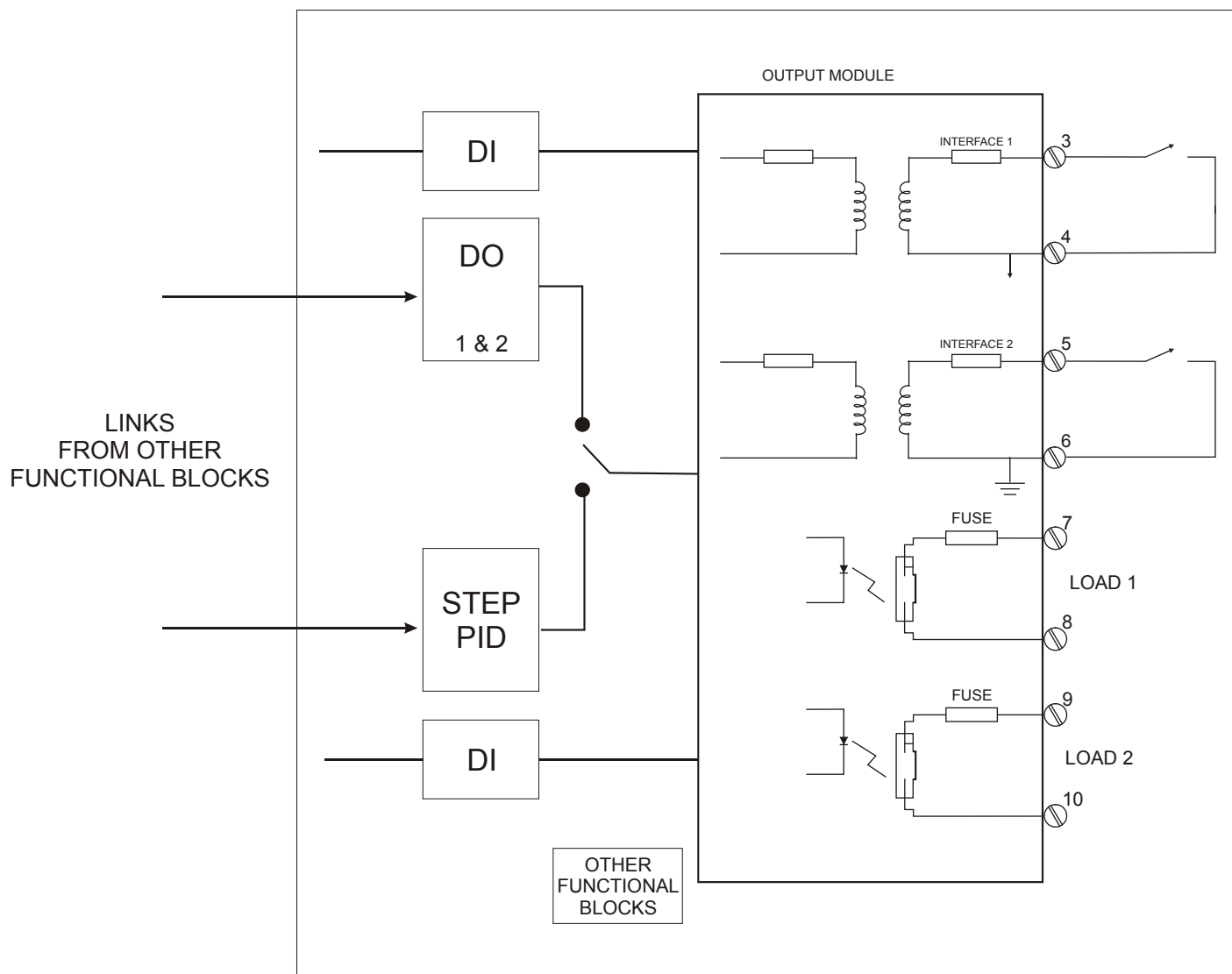


Figure 3.1 – Functional Diagram

## Output Transducer Blocks

### Description

Using the transducer block the user can see the output relay type definition.

### Supported Modes

Out Of Service (OOS) and Auto

### Parameters

Idx	Parameter	DataType	Valid Range	Default Value	Units	Store	Description
1	ST_REV	Unsigned16		0	None	S	Indicates the level of static data.
2	TAG_DESC	VisibleString		Null	Na	S	Description of Transducer Block.
3	STRATEGY	Unsigned16		0	None	S	This parameter is not checked and processed by Transducer Block.
4	ALERT_KEY	Unsigned8	1 to 255	0	None	S	Number of identification in the plant.
5	MODE_BLK	DS-69		O/S	Na	S	Indicates the operation mode of Transducer Block.
6	BLOCK_ERR	Bit String			E	D	Indicates the status associated with hardware or software in the Transducer.
7	UPDATE_EVT	DS-73	0: Serial 1: TCP/IP		Na	D	It is the alert for any static data.
8	BLOCK_ALM	DS-72	0: Master 1: Slave		Na	D	It is used for configuration, hardware and others fails.
9	TRANSDUCER_DIRECTORY	Unsigned16			None	S	A directory that specifies the number and the starting indices of the transducers in the transducer block.
10	TRANSDUCER_TYPE	Unsigned16	Other (0xffff)	Other (0xffff)	None	S	Identifies the transducer that follows.
11	XD_ERROR	Unsigned8	Default Value Set (0x10) General Error (0x11) Calibration Error (0x12) Configuration Error (0x13) Electronics Failure (0x14) Mechanical Failure (0x15) I/O Failure (0x16) Data Integrity Error (0x17) Software Error (0x18) Algorithm Error (0x19)	Default Value Set (0x10)	None	D	Define an error code.
12	COLLECTION_DIRECTORY	Unsigned	0	0	None	S	A directory that specifies the number, the starting indices, and DD Item IDs of data collections in each transducers in the transducer block.
13	OUTPUT_RELAY_TYPE	Unsigned8	Not Initialized. (0x0) Both Normally Open. (0x1) Both Normally Closed. (0x2) One Normally Open and another Normally Closed. (0x3)	Not Initialized (0x0)	None	S	The type of each output relay.
14	SERIAL_NUMBER	Unsigned32	0 to 4294967296	0	None	S	The device serial number
15	ORDERING_CODE	Visible String[50]	-	Null	None	S	Indicates informations about the sensor and control from production factory.

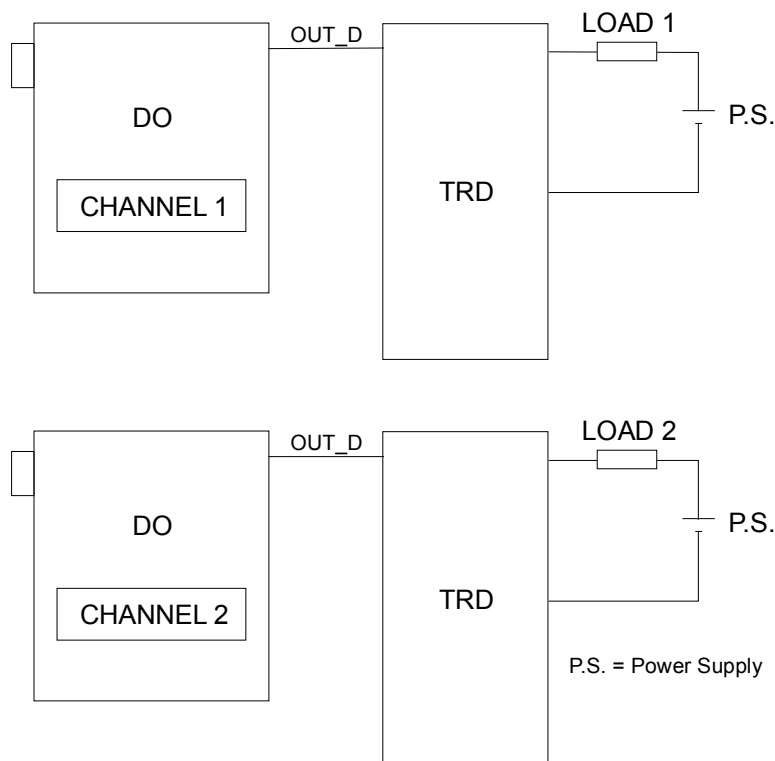
**Legend:**

E – Enumerated parameter  
 Null – Blank  
 Na – Adimensional parameter  
 RO – Read only  
 D – Dynamic  
 N – Non-volatile

S – Static  
 Sec – Seconds  
 CU – CAL\_UNIT  
 PVR – PRIMARY\_VALUE\_RANGE  
 SR – SENSOR\_RANGE  
 SVU – SECONDARY\_VALUE\_RANGE

## Connecting physical signals to Digital Output Block

The DO block converts the value in SP\_D to an on/off signal for the hardware found at the CHANNEL selection. The FRI302 can have up two DO blocks. For details, please see the *Function Blocks Manual*.



**Figure 3.2 - FRI302 and DO Block connections**

## Connecting physical signals to PID Step

A Step Control Output block is used most commonly, when the final control element has an actuator driven by an electric motor without actual position feedback. The final control element is positioned by rotating the motor clockwise or counter clockwise, which is accomplished by activating a discrete signal for each direction. A control valve, for example, needs a signal to open and another to close. If none of the signals are present, the valve stem would stay at the same position. The FRI302 has one Step Control Block. For details, please see the Function Block Manual.

Please, note the limits for switching current and voltage according to FRI302 technical specifications. The FRI302 outputs may not be able to drive the actuator motor, but can be used as control signals.

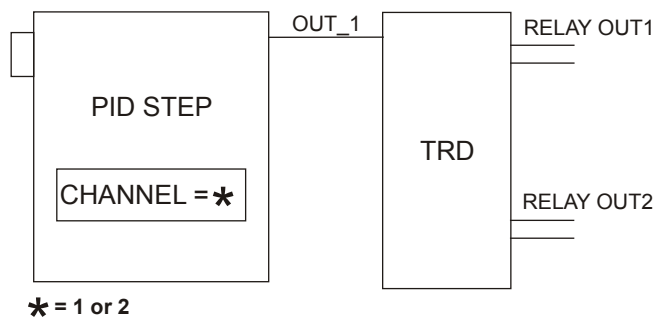


Figure 3.3 – FRI302 and PID Step Block

## Examples of Applications

**Application 1:** from the computer the outputs can be manipulated.

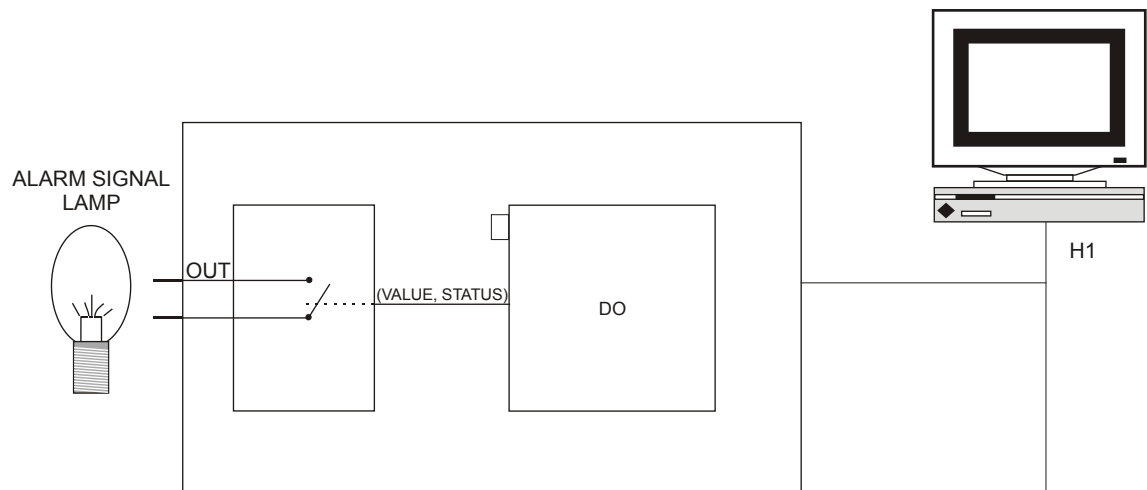


Figure 3.4 - FRI302 – Application 1

**Application 2:** Alarm control (Level limit will turn on alarm signal lamp or a buzzer).

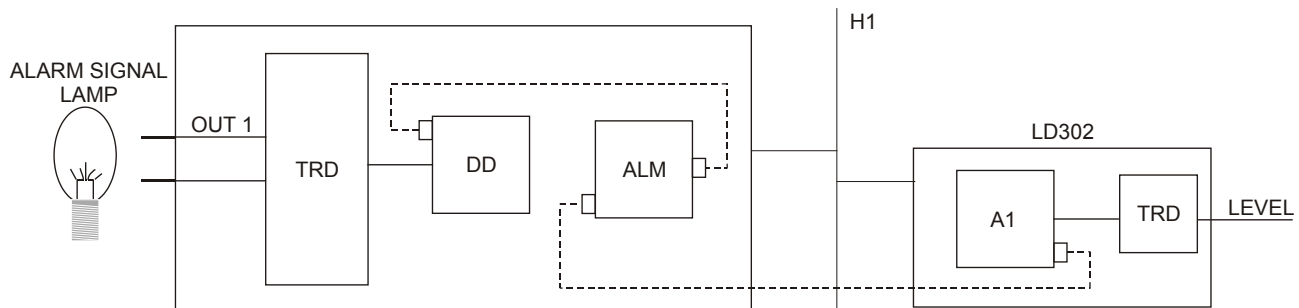


Figure 3.5 - FRI302 – Application 2

### NOTE



One very interesting application for **FRI302** is as an interface for electrical actuators.

Any electrical actuator, including the Smar series AD/AR/AL becomes a Fieldbus actuator, making the **FRI302** ideal in upgrades and plant re-instrumentations. The PID Step block is ideal in these cases since it can modulate the valve without the need for actual position feedback.

## Function Block type availability and initial block set

The table below shows the function blocks supported by this device and the initial block set. Read carefully the notes in order to fully understand the information in this table.

Block type	Instantiable block in Factory init
RS (1)	1
TRD (1)	1
DIAG (1)	1
DSP (1)	1
DI (2)	2
DO (2)	2
PID	1
ARTH	1
AALM	1
ISEL	1
TIME	1
FFET	1
STEP	1

**Note 1** – The column “Block type” indicates which block type is available for the device.

**Note 2** – The number associated to the block type is the number of instantiated blocks during the factory initialization.

**Note 3** – the FRI302 have a capability of 20 blocks, including resource, transducers and function blocks.

**Note 4** – The column Block type shows the mnemonics, if it is followed by a number between parentheses, it indicates the maximum number of block instances. If it is followed by “\*”, it indicates the maximum number depends on the device type.





## Section 4

# MAINTENANCE PROCEDURES

### General

SMAR **FRI302** Fieldbus Relay and dry contact Input devices are extensively tested and inspected before delivery to the end user. Nevertheless, during their design and development, consideration has been given to the possibility of repairs by the end user, when necessary.

In general, it is recommended for the end user not to try to repair printed circuit boards. Instead, spare circuit boards should be available, which may be ordered from SMAR when necessary.

Troubleshooting	
Symptom	Probable Sources of Trouble
No Quiescent Current	<b>Fieldbus Relay and dry contact Input Connections:</b> Check wiring polarity and continuity. <b>Power Supply:</b> Check power supply output. The voltage at the FRI302 Fieldbus terminals must be between 9 and 32 VDC. <b>Electronic Circuit Failure:</b> Check the boards for defects by replacing them with spare ones.
No Communication	<b>Network Connections</b> Check the network connections: devices, power supply, and terminators. <b>Network Impedance</b> Check the network impedance (power supply impedance and terminators). <b>Controller Configuration</b> Check configuration of communication parameters of the controller. <b>Network Configuration</b> Check communication configuration of the network. <b>Electronic Circuit Failure</b> Check the boards for defects by replacing them with spare ones.
Incorrect Outputs	<b>Output Terminals Connection</b> Check wiring and continuity. <b>Switching Current and voltage for Outputs</b> Check limits for the connected load according to the model for relay connections. <b>Output Fuse</b> Check the condition Of the output Fuses by removing the main electronic board.

### Disassembly Procedure

See Figure 4.1 – **FRI302** Exploded View. Make sure to disconnect the power supply before disassembling the converter.

To remove the circuit boards (3 and 4) and display (3), first loosen the cover locking (5) on the side not marked “Field Terminals”, then unscrew the cover (1).

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

Loosen the two screws that anchor the display and the main circuit board. Gently pull out the display, and then the main board. To remove the input board, first unscrew the two screws that anchor it to the housing, and gently pull out the board.

## **Assembly Procedure**

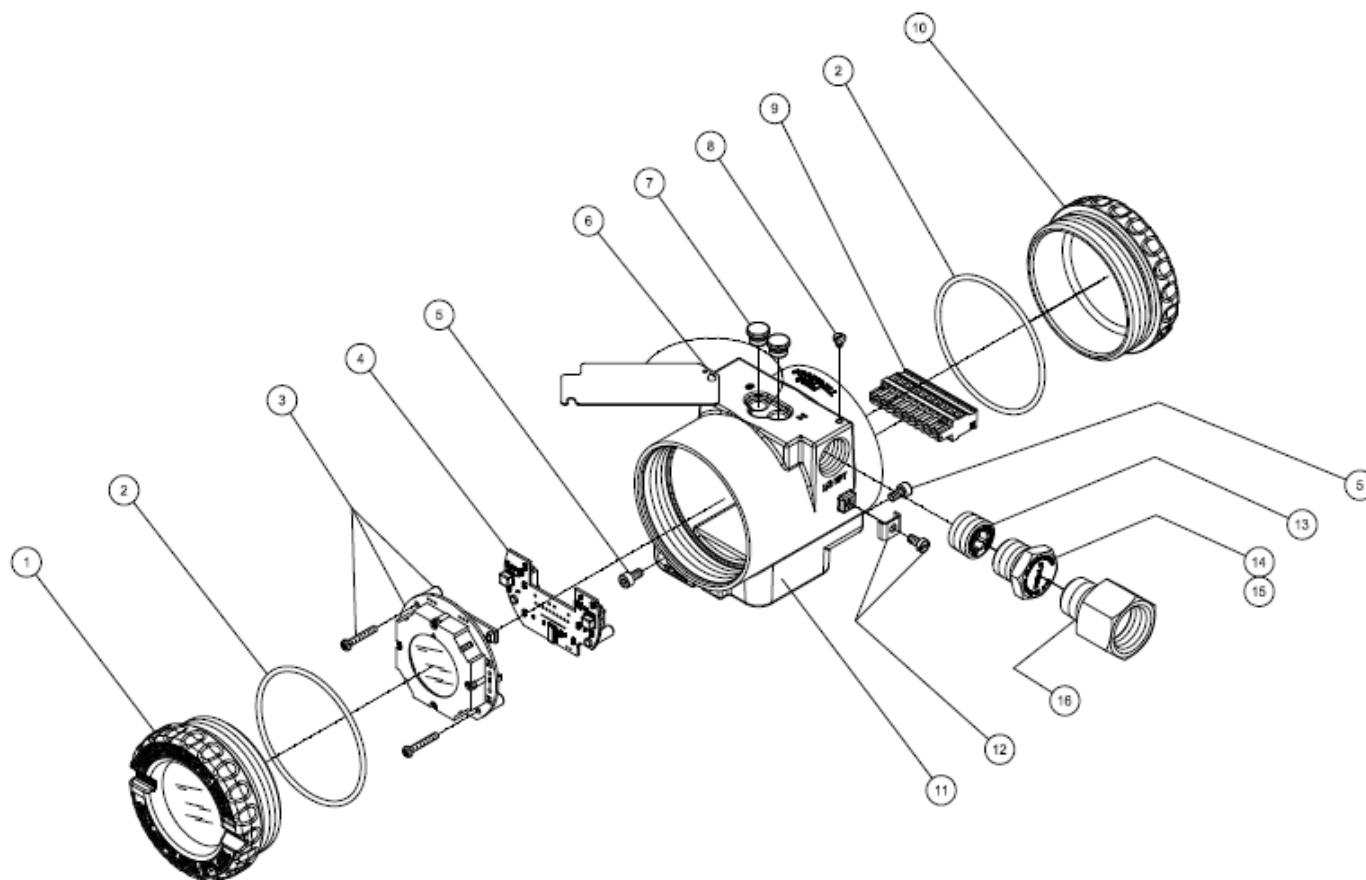
Refer to figure 4.1 – **FRI302** Exploded View.

- Place the input boards into housing (**11**), ensuring all interconnecting pins are connected;
- Place the display (**3**) into the housing, mounting it properly according to the desired viewing position;
- Tighten the fixing screws;
- Fit the cover (**1** and **10**) and lock it using the locking screws.

## **Accessories**

<b>ACCESSORIES</b>	
<b>ORDER CODE</b>	<b>DESCRIPTION</b>
<b>SYSCON</b>	Configuration software
<b>PS302</b>	Power Supply
<b>BT302</b>	Terminator
<b>FDI302-1</b>	Fieldbus/PROFIBUS-PA communication interface for firmware updating
<b>DF47</b>	Intrinsic Safety Barrier

## Exploded View and Spare Parts List



**Figure 4.1 – FRI302 Exploded View**

16	01	¾ NPT ADAPTER	400-0812
15	01	PG13,5 EXD PLUG	400-0811
14	01	M20 EXD PLUG	400-0810
13	01	½ NPT NON-EXD PLUG	400-0583-1X
12	02	EXTERNAL GROUND SET (SCREW+TERMINAL)	204-0124
11	01	ELECTRONIC HOUSING	400-1315
10	01	COVER WITHOUT WINDOW (400 LINE)	400-1257
09	01	TERMINAL BLOCK CONECTOR	400-1440
08	01	IDENTIFICATION PLATE SCREW	204-0116
07	02	LOCAL ADJUSTMENT (Z AND S) COVER	204-0114
06	01	U 3/16" RIVET	400-0834
05	02	COVER LOCK SCREW	204-0120
04	01	ELECTRONIC BOARD GLL1471	400-1438
03	01	ELECTRONIC BOARDS: GLL1470 AND GLL1404 (DISPLAY+ASSEMBLY SET)	400-1436
02	02	COVER ORINGS	204-0122
01	01	COVER WITH WINDOW (400 LINE)	400-0822
ITEM	QTY	DESCRIPTION	CODE

## Detailed Code for Ordering Spare Parts

CODE	DESCRIPTION				
400-1315	HOUSING				
	Option	Product			
	6	FRI30X			
	Option	Communication Protocol			
	F	FOUNDATION FIELDBUS			
	Option	Electrical Connection			
	0	½ NPT			
	A	M20 X 1,5			
	B	PG13,5			
400-1315	6	F	*	*	TYPICAL MODEL

\*Select the desired option

Special Options	
COD.	Material
H0	Aluminum (IP/TYPER)
H1	SST (IP/TYTE)
H2	Aluminum for saline atmosphere (IPW/Type X)
H4	Aluminum Copper Free
COD.	Painting
P0	Gray Munsell N6.5
P1	Safety Blue Epoxy – Immersion Condition-Petrobras N1021
P2	Safety Blue Epoxy – Atmospheric Zone - Petrobras N1021
P3	Black Polyester
P7	Beige Epoxy
P8	Without painting
P9	Blue Safety Epoxy

CODE	DESCRIPTION
400-0822	Cover with window

Special Options	
COD.	Material
H0	Aluminum (IP/TYPER)
H1	SST (IP/TYTE)
COD.	Painting
P0	Gray Munsell N6.5
PJ	White Polyester

CODE	DESCRIPTION
400-1257	Cover without window

Special Options	
COD.	Material
H0	Aluminum (IP/TYPER)
H1	SST (IP/TYTE)
COD.	Painting
P0	Gray Munsell N6.5
P8	Without painting
PJ	White Polyester

## Section 5

# TECHNICAL SPECIFICATIONS

### General

<b>Communication</b>	Digital only. Fieldbus, 31.25 Kbits/s voltage mode
<b>Current consumption quiescent</b>	17.5 mA from Fieldbus network
<b>Turn-on Time</b>	Approximately 10 seconds.
<b>Update Time</b>	Approximately 0.5 second.
<b>Humidity Limits</b>	0 to 100% RH.
<b>Indication</b>	Optional 4½ digit LCD indicator.
<b>Temperature Limits</b>	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.
<b>Vibration Effect</b>	Meets SAMA PMC 31.1.
<b>Electro-Magnetic Interference Effect</b>	Designed to comply with IEC 801.
<b>Hardware</b>	Physical: according to IEC 61158-2 and conformity with the FISCO model.
<b>Electrical Connection</b>	1/2-14 NPT, PG 13.5 or M20 x 1.5.
<b>Material of Construction</b>	Injected low copper aluminum with polyester painting or 316 Stainless Steel housing, with Buna N O-rings on cover (NEMA 4X, IP67).
<b>Mounting</b>	With an optional bracket that can be installed on a 2" pipe or fixed on a wall or panel.
<b>Weight</b>	Without display and mounting bracket: 0.80 kg. Add for digital display: 0.13 kg. Add for mounting bracket: 0.60 kg.

### FRI302 Output Relays

#### Description - Outputs

The outputs are designed with Solid State relays that are able to drive incandescence lamps, solenoids and other DC and AC loads.

When the output relays are N.C., if via function block is assigned a state on to the outputs, it means that the loads will be switched off.

When the output relays are N.O., if via function block is assigned a state on to the outputs, it means that the loads will be switched on.

## Technical specifications for Normally Closed relays

Architecture	Number of Outputs: 2
Switching Voltage	350 V <sub>peak</sub>
Switching Current: AC mode	100 mA
Switching Current: DC mode	165 mA
On Resistance AC mode	18 $\Omega$
On Resistance DC mode	4.5 $\Omega$
Off State Resistance	Min: 0.1 G $\Omega$ Typ: 1.4 G $\Omega$
Off State Leakage	Typ: 1.0 $\mu$ A
Turn On Time	5ms
Turn Off Time	1ms
Capacitance - Across Output	20 to 200 pF
Thermal Offset Voltage	0.20mV
Output Status (load) with no power supply connected to the H1 bus	ON
Output Status (load) During: Firmware Download	ON
Output Status (load) During: Turn-on Time	ON
Output Status (load) During: Configuration Download	OFF

## Technical specifications for Normally Opened relays

Architecture	Number of Outputs: 2
Switching Voltage	400 V <sub>peak</sub>
Switching Current: AC mode	150 mA
Switching Current: DC mode	250 mA
On Resistance AC mode	18 $\Omega$
On Resistance DC mode	4.5 $\Omega$
Off State Resistance	Min: 0.5 G $\Omega$ Typ: 5000 G $\Omega$
Off State Leakage	Typ: 0.5 $\mu$ A
Turn On Time	5ms
Turn Off Time	1ms
Capacitance - Across Output	10 to 95 pF
Thermal Offset Voltage	0.20mV
Output Status (load) with no power supply connected on the H1 bus	OFF
Output Status (load) During: Firmware Download	OFF
Output Status (load) During: Turn-on Time	OFF
Output Status (load) During: Configuration Download	ON

## Technical Specifications for Dry Contact Input

Digital Input	<p>2 (two) dry contact inputs, galvanically isolated between other:</p> <ul style="list-style-type: none"> <li>Resistance below 2 KΩ, closed contact;</li> <li>Resistance above 3.5 KΩ, open contact.</li> </ul>
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## Ordering Code

MODEL										
FRI302	FIELDBUS RELAY AND DRY CONTACT INPUT									
	COD.	Local Indicator								
	0	Without Indicator								
	1	With Digital Indicator								
		COD.	Relay Output Conditions							
		1	Both Normally Open (N.O.)							
		2	Both Normally Closed (N.C.)							
		3	One N.O. and other N.C.							
			COD.	Mounting Bracket for 2" Pipe Mounting						
			0	Without Bracket						
			1	Bracket and accessories in Carbon Steel						
			2	Bracket and accessories in 316 SST						
				COD.	Electrical Connections					
				0	1/2-14 NPT					
				A	M20 x 1.5					
				B	PG 13.5 DIN					
					COD.	Housing				
					H0	Aluminum (IP/TYPE)				
					H1	316 SST (IP/TYPE)				
						COD.	Identification Plate			
						I6	Without certification			
							COD.	Painting		
							P0	Gray Munsell N6.5		
							P1	Safety Blue Epoxy – Immersion Condition-Petrobras N1021		
							P2	Safety Blue Epoxy – Atmospheric Zone - Petrobras N1021		
							P8	Without painting		
							P9	Blue Safety Epoxy		
								COD.	Manufacturing Standard	
								S0	SMAR	
									COD.	Tag Plate
									J0	With tag
									J1	Blank
									J2	According notes
FRI302	-	1	1	1	0	H0	I6	P0	S0	J0

← TYPICAL MODEL





## CERTIFICATIONS INFORMATION

### *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.

#### **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 tightened 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.

#### **Enclosure Entries**

2 threaded entries for cover with or without display M76x1.27 thread (20 threads)

2 threaded entries for electrical connection M20x1.5 (8 wires engaged) or ½-14NPT (>5 wires engaged)

#### **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**

### **INMETRO NCC**

Prova de Explosão (NCC 25.0004 X)

Ex db IIC T6 Gb

Tamb: -20 °C a +40 °C

IP66

**ATENÇÃO – NÃO ABRA QUANDO HOUVER ATMOSFERA EXPLOSIVA PRESENTE.**

**ATENÇÃO – MANTENHA A TAMPA BEM FECHADA QUANDO ESTIVER ENERGIZADO**

Condições de utilização segura:

Todos os prensa-cabos, bujões e adaptadores roscados a serem utilizados no equipamento devem atender o mesmo tipo e grau de proteção do invólucro e serem certificados separadamente.

Observações:

Este certificado é válido apenas para os produtos dos modelos avaliados. Qualquer modificação nos projetos, bem como a utilização de componentes ou materiais diferentes daqueles definidos pela documentação descritiva dos produtos, sem a prévia autorização, invalidará este certificado.

As atividades de instalação, inspeção, manutenção, reparo, revisão e recuperação dos equipamentos são de responsabilidade dos usuários e devem ser executadas de acordo com os requisitos das normas técnicas vigentes e com as recomendações do fabricante.

Normas Aplicáveis:

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

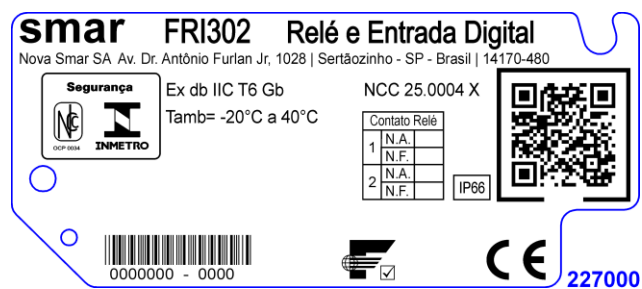
ABNT NBR IEC 60079-1:2016 Atmosferas explosivas - Parte 1: Proteção de equipamento por invólucro à prova de explosão “d”

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

Desenhos 102A2270


## Identification Plate

INMETRO NCC





# Appendix B

	<h2>SRF – Service Request Form</h2>			
	<b>Fieldbus Relay and dry contact Input</b>			
<b>GENERAL DATA</b>				
Model:	FRI302 ( )			
Serial Number:				
TAG:				
How many channels are used?	INPUT	1 ( ) 2 ( )		
	OUTPUT	1 ( ) 2 ( )		
Configuration:	PC ( )	Software: _____	Version: _____	
<b>INSTALLATION DATA</b>				
Type/Model/Manufacturer of device connected to FRI: _____ _____				
<b>PROCESS DATA</b>				
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			
<b>OCCURRENCE DESCRIPTION</b>				
_____ _____ _____ _____				
<b>SERVICE SUGGESTION</b>				
Adjustment ( )	Cleaning ( )	Preventive Maintenance ( )	Update / Up-grade ( )	
Other: _____				
<b>USER INFORMATION</b>				
Company: _____				
Contact: _____				
Title: _____				
Section: _____				
Phone: _____			Extension: _____	
E-mail: _____			Date: ____/____/____	
<p>For warranty or non-warranty repair, please contact your representative.          Further information about address and contacts can be found on <a href="https://www.smar.com.br/en/contact-us">https://www.smar.com.br/en/contact-us</a></p>				

## ***Returning Materials***

If necessary to return the **FRI302** to SMAR, simply contact our office, informing the defective instrument serial number, and return it to our factory.

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

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