

TP302

smar
First in Fieldbus

DEC / 24
TP302
VERSION 3



OPERATION, MAINTENANCE
AND INSTRUCTIONS MANUAL

FIELDBUS POSITION TRANSMITTER





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INTRODUCTION

The **TP302** is from the first generation of Fieldbus devices. It is a transmitter for position measurements. It can measure displacement or movement of rotary or linear type. The **TP302** reads the position and makes it available to Fieldbus system. The digital technology and communication provide an easy interface between the field and control room and several interesting features that considerably reduce the installation, operation and maintenance costs.

The **TP302** is part of Smar's complete 302 line of Foundation Fieldbus devices.

Fieldbus is not only a replacement for 4-20 mA or intelligent/smart transmitter protocols. It contains much more. Fieldbus is a complete system enabling distribution of the control function to 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.

Some of the disadvantages, in comparison to 4-20 mA technology, are communication speed too low for closed loop control, poor inter-operability between devices of different type and manufacturer. Others: not possible to pass data direct from one device to another (peer-to-peer communication).

The main requirement for Fieldbus was 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 minimum communication overhead. Using scheduling so as the system controls variable sampling, algorithm execution and communication to optimize the usage of the network, not losing time. Thus achieving 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 and overview complex control strategies. Another advantage is adding flexibility, the control system may be edited without having to rewire or change the hardware.

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 applications.

The **TP302**, like the rest of the 302 family, has several Function Blocks built in, like PID controller, Input Selector and Splitter/Output selector, eliminating the need for a separate device. This takes to reduced communication and thereby less dead-time and tighter control, not to mention the reduction in cost.

NOTE

Get the best results of the **TP302** by carefully reading these instructions.

NOTE

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.

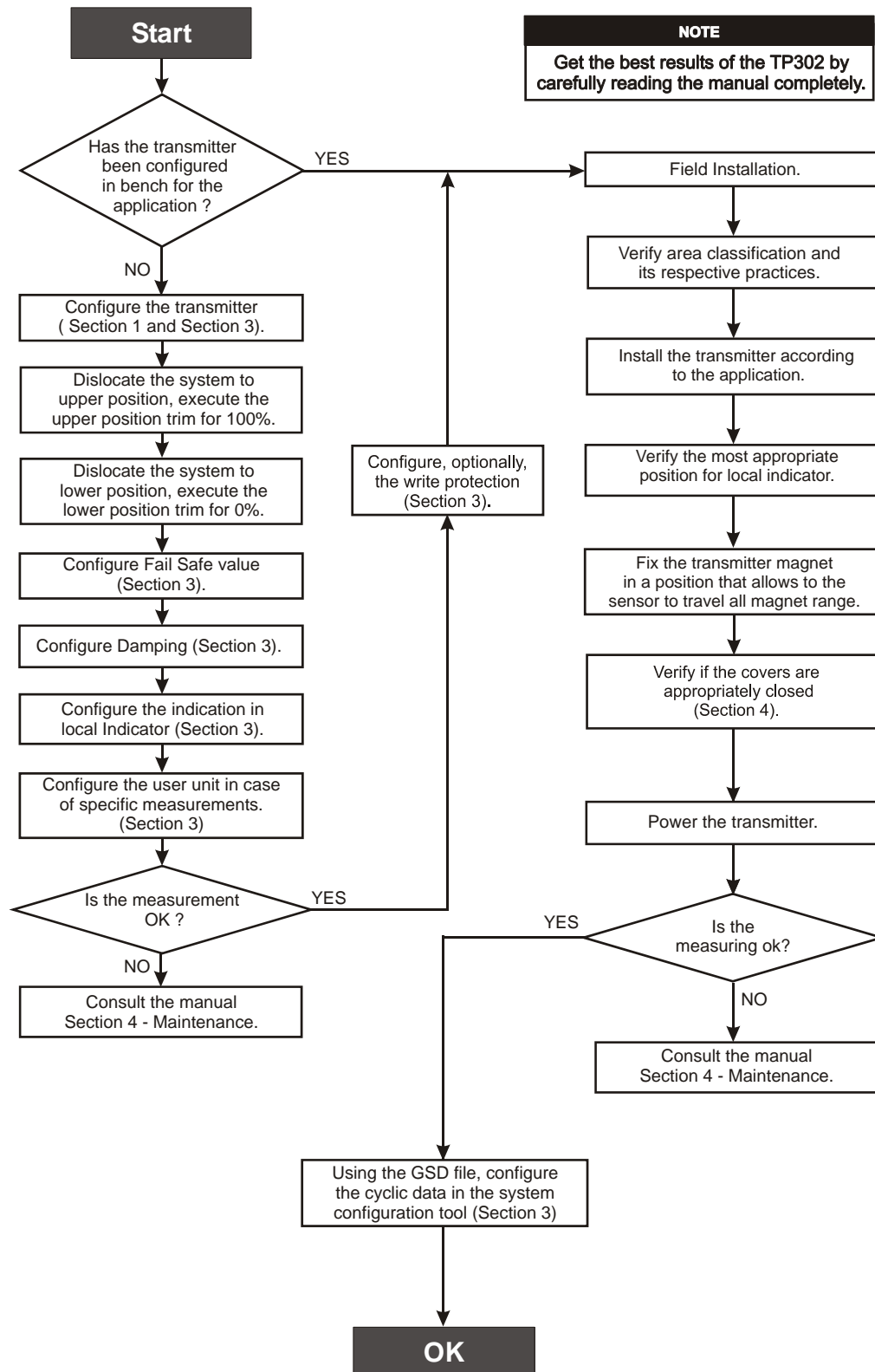
The field equipment referred to in this manual, when acquired for classified or hazardous areas, has its certification void when having its parts replaced or interchanged without functional and approval tests by Smar or any of Smar authorized dealers, which are the competent companies for certifying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



INSTALLATION

General

NOTE

The installation carried out in hazardous areas should follow the recommendations of Appendix A.

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.

In warm environments, the transmitter 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 transmitter 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 re-moved; 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 transmitter should be employed.

Although the transmitter is virtually insensitive to vibration, installation close pumps, turbines or other vibrating equipment should be avoided.

Mounting

The **TP302** mounting depends on the type of movement, linear or rotary. Two brackets are required for mounting, one for the magnet and the other for the transmitter itself.

NOTE

Make sure that arrow engraved on the magnet coincides with the arrow engraved on the Position Transmitter when the system is in mid travel. When mounting the Position Transmitter, consider that:

- 1 . There is no friction between the internal magnet face and the position sensor salience all over the travel (rotary or linear).
2. A minimum distance of 2 mm to 4 mm distance is recommended between the magnet external face and the Position Transmitter face.

Should the transmitter installation change, or magnet change, or should any other modification, the transmitter will require a re-calibration.

IMPORTANT

If the self-diagnostics detect a transmitter failure, for example the loss of the power, the analog signal will go to 3.9 mA or to 21.0 mA to alert the user (High or low alarm signal is user selectable).

The following Figures 1.1 and 1.3 show both linear and rotary typical mounting:

Rotary Movement

Install the magnet on the valve stem using the magnet mounting bracket.

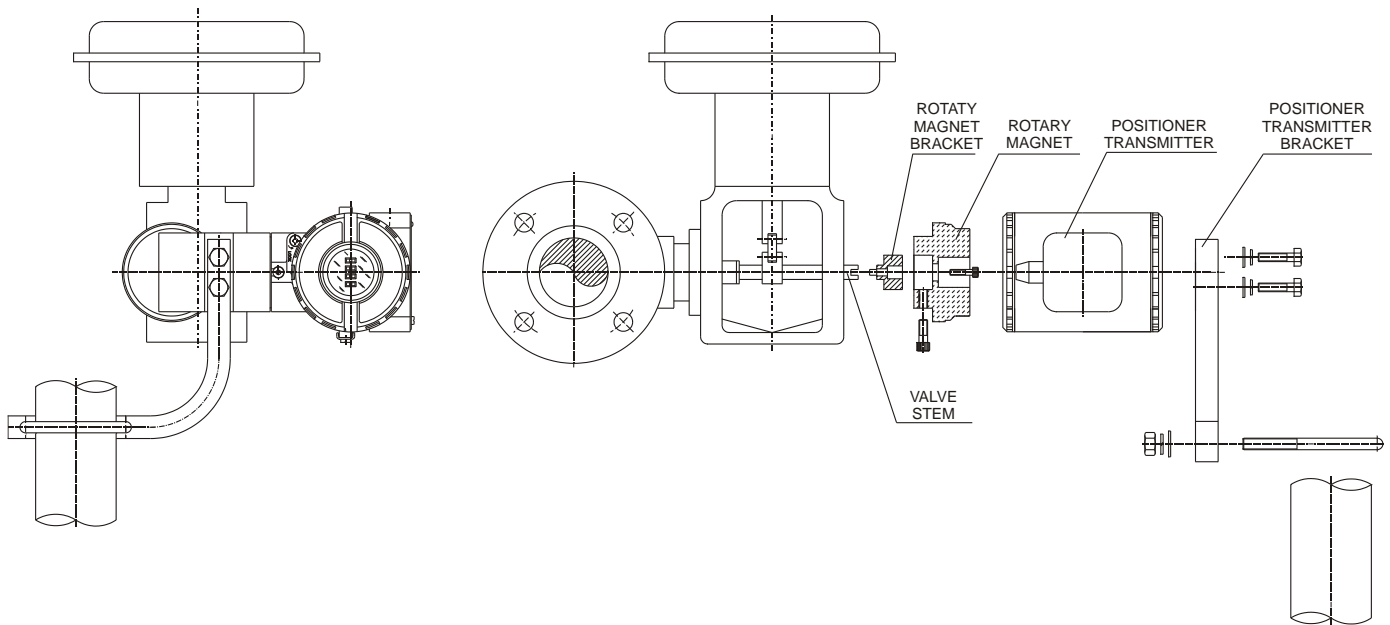


Figure 1.1 – Transmitter on a Rotary Actuator

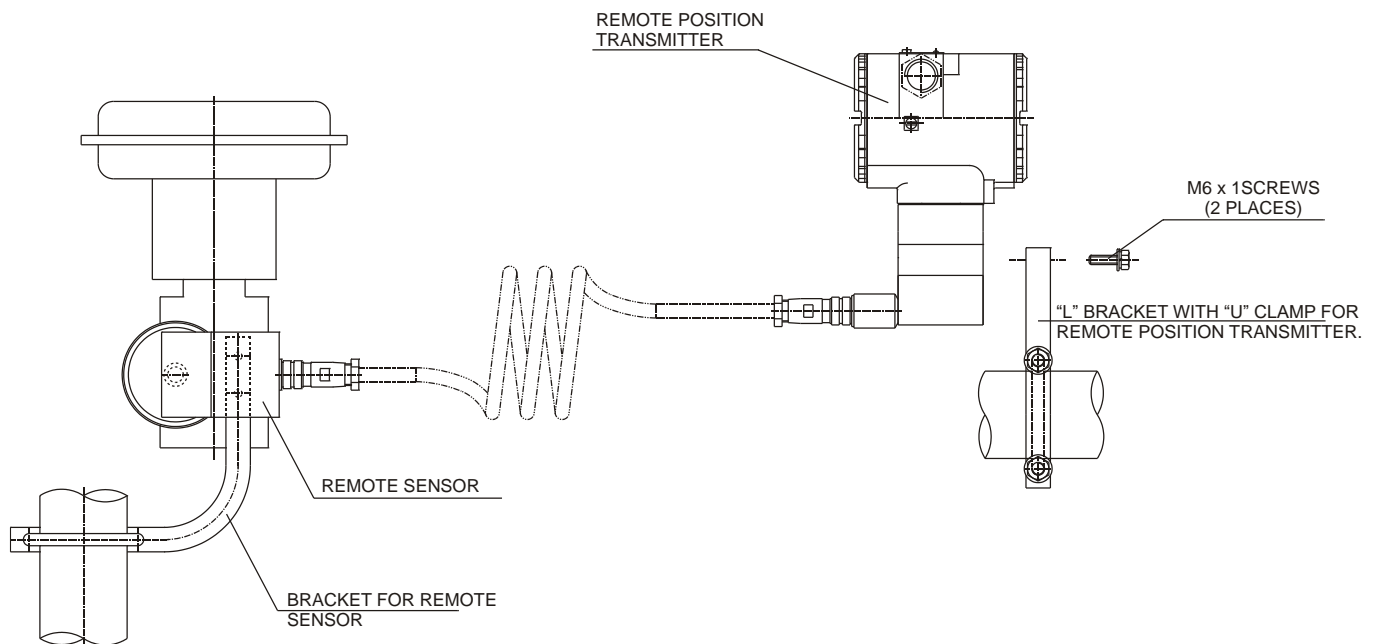


Figure 1.2 – Position Transmitter on Rotary Actuator with Remote Position Sensor

Linear Movement

Install the magnet on the valve stem using the magnet mounting bracket.

The linear magnet movement must be orthogonal in relation to the main axis of the position transmitter. For example, if the linear magnet movement is vertical, the transmitter main axis must be horizontal, as show in Figure 1.3.

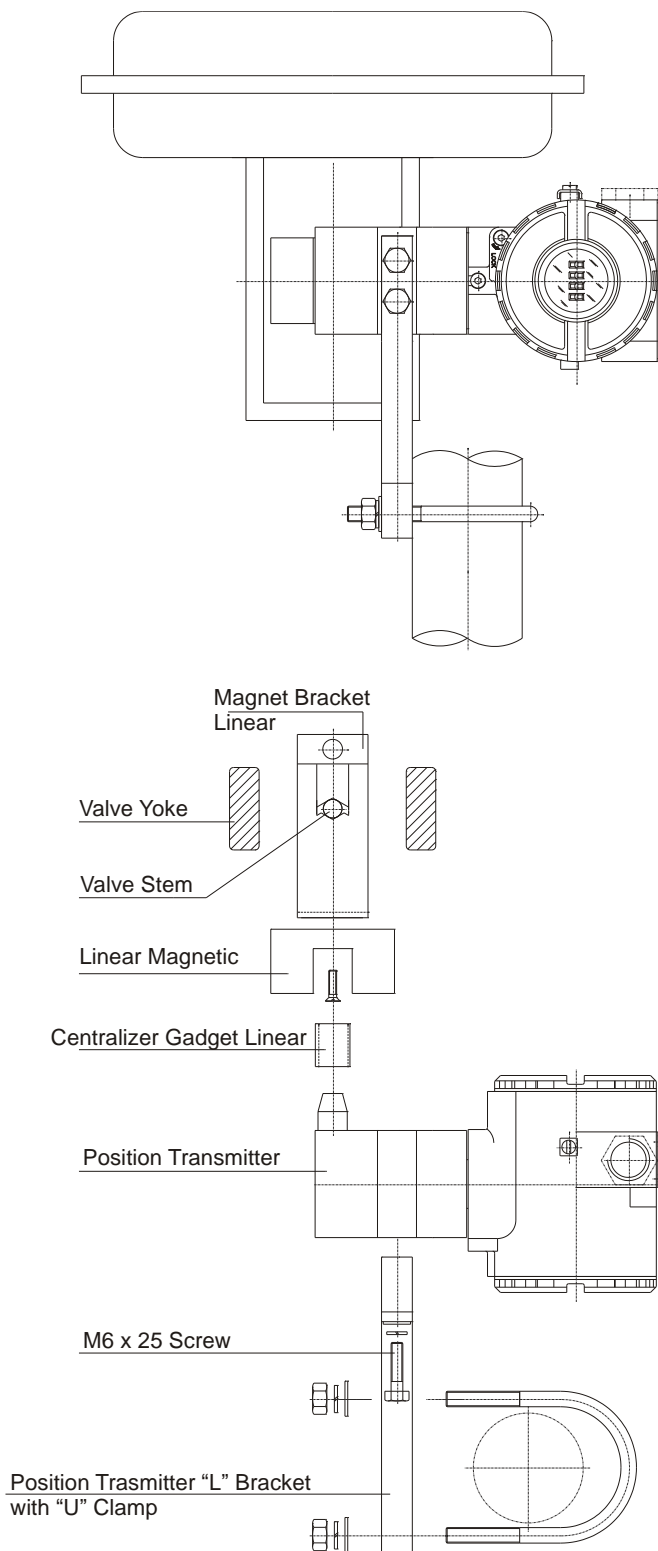


Figure 1.3 - Transmitter on a Linear Actuator

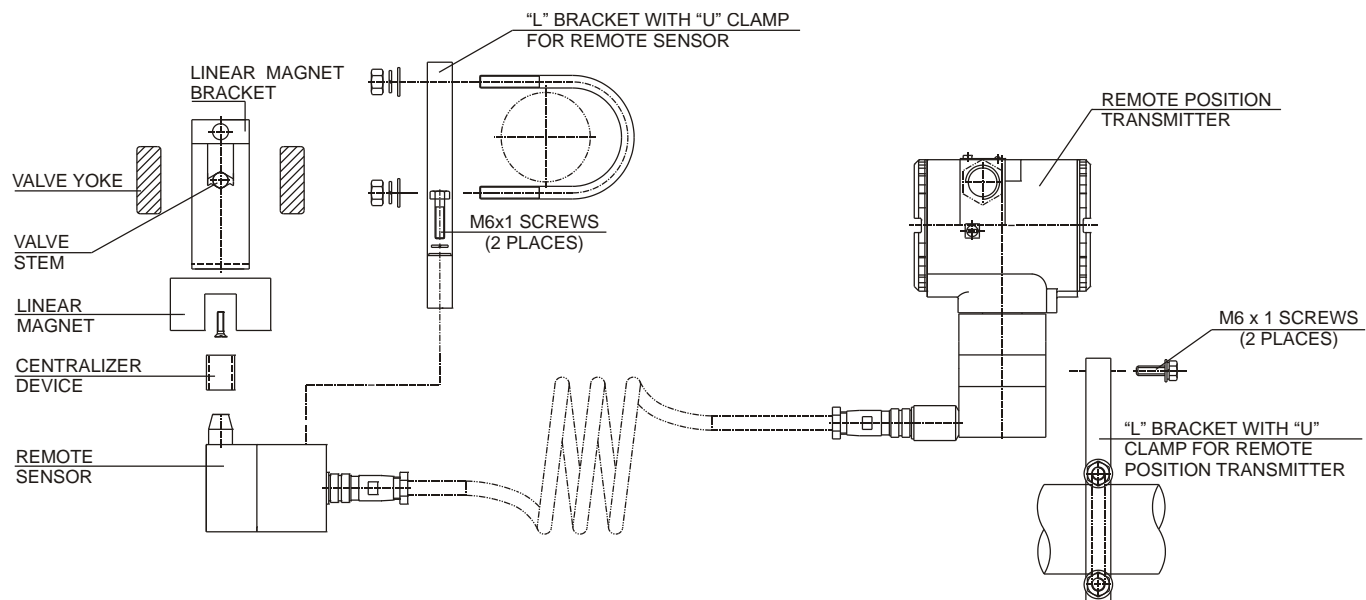
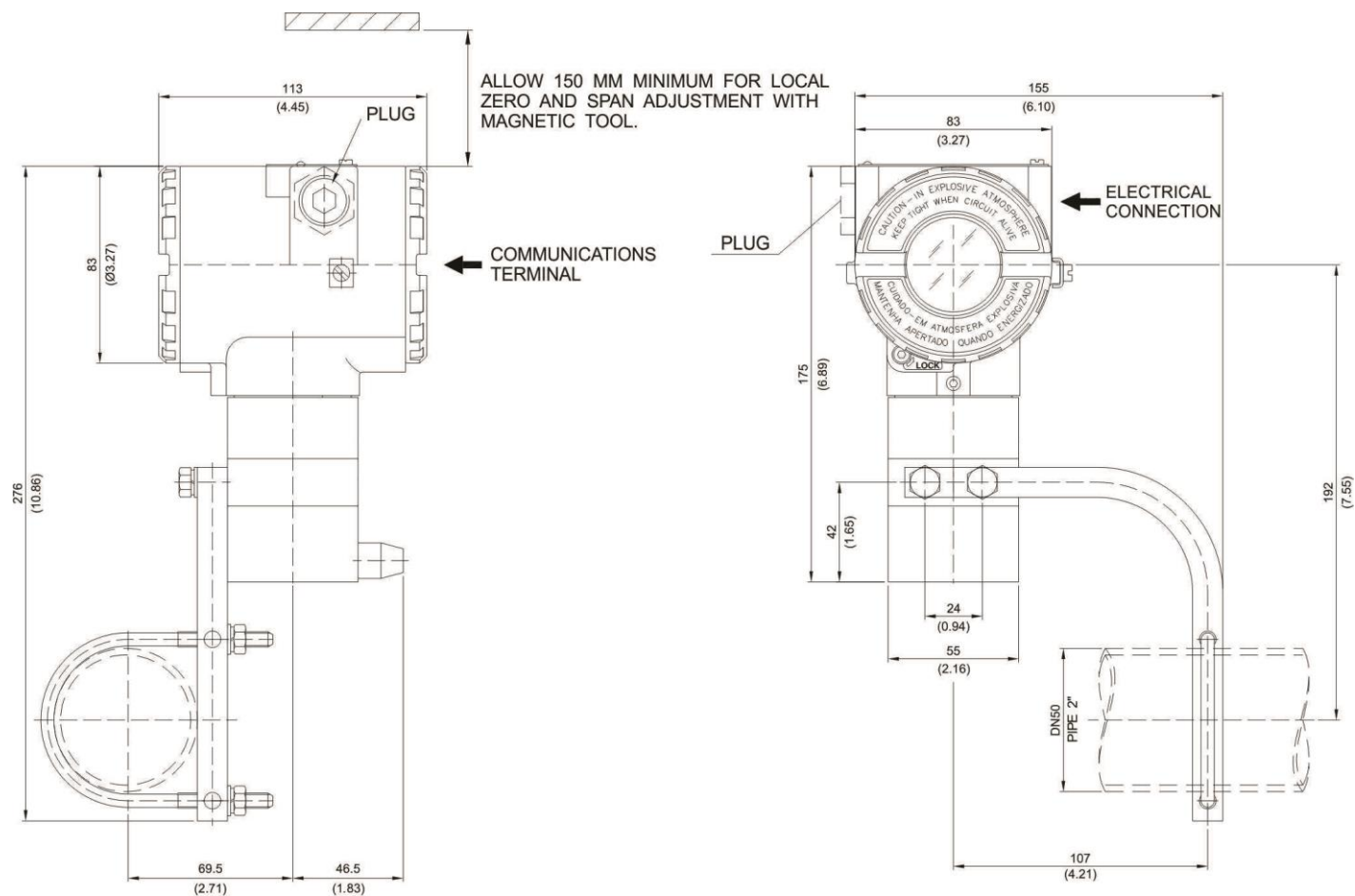
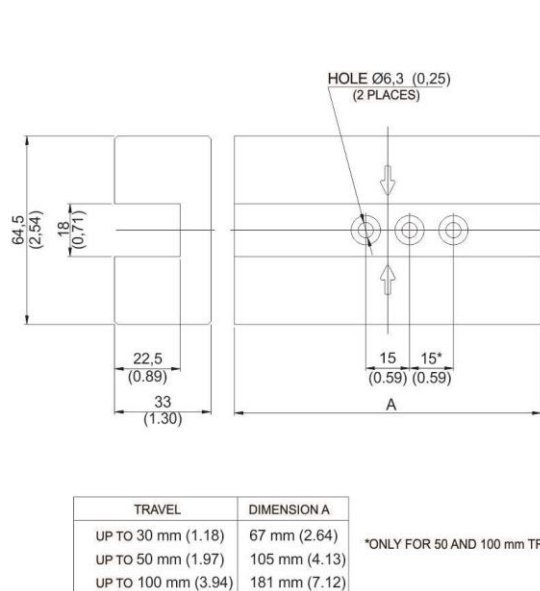


Figure 1.4 – Position Transmitter on Linear Actuator with Remote Position Sensor

See below the **TP302** and magnets dimensional drawings.



LINEAR MAGNET



ROTARY MAGNET

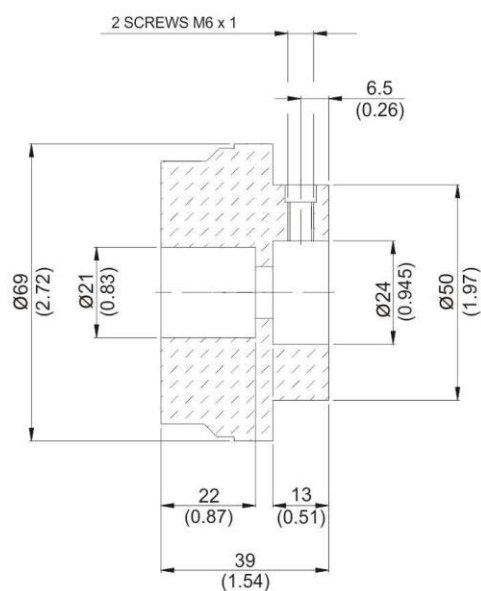


Figure 1.5 – TP302 Dimensional Drawing / Magnets Dimensional Drawing

REMOTE SENSOR

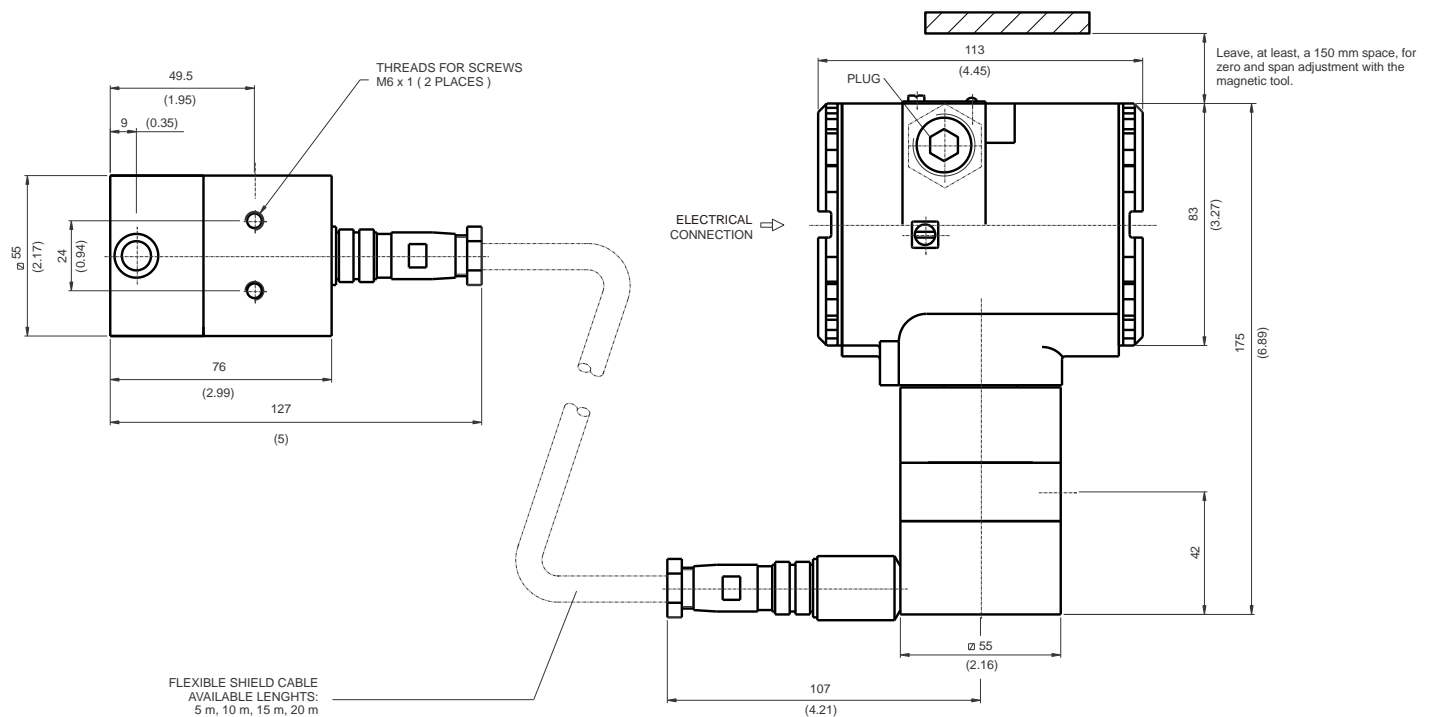
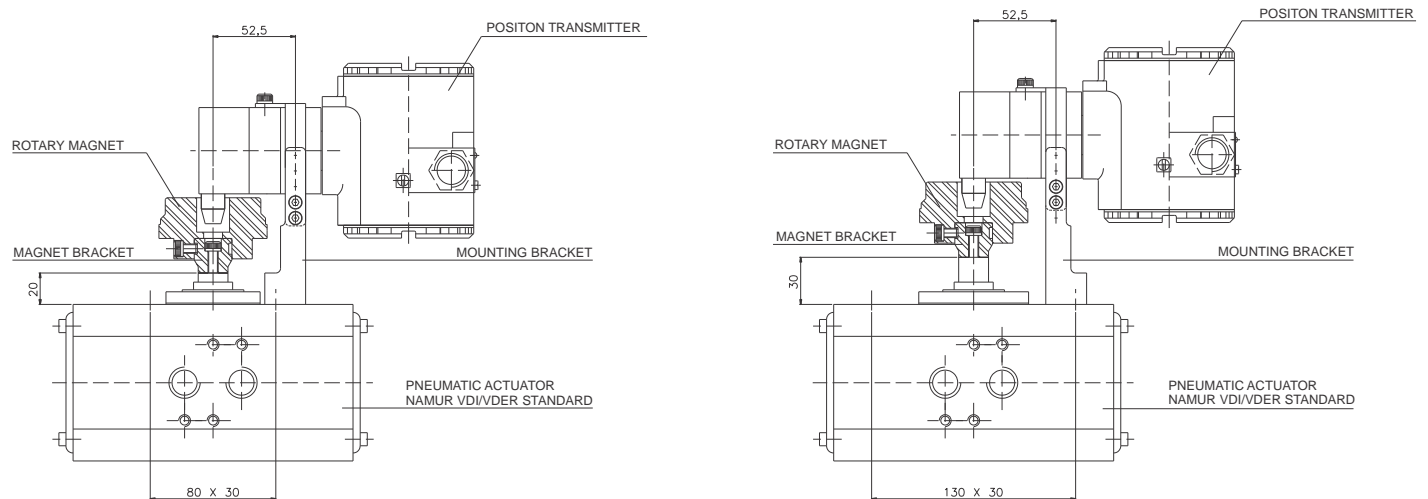


Figure 1.5.a – Remote Sensor Dimensional Drawing

SPECIAL MOUNTING BRACKET – ROTARY VDI / VDE NAMUR

Mounting bracket of the position transmitter for rotary valves actuated via type actuators rack and pinion, designed to comply with NAMUR VDI/VDE.



Mounting 80 mm between centers, 20 mm stem height.

Mounting 130 mm between centers, 30 mm stem height.

Figure 1.5.b – Special Mounting Bracket Dimensional Drawing - Rotary VDI / VDE NAMUR

Electronic Housing Rotation

The electronic housing rotates for a better digital display reading. To rotate it, release the housing rotation screw.

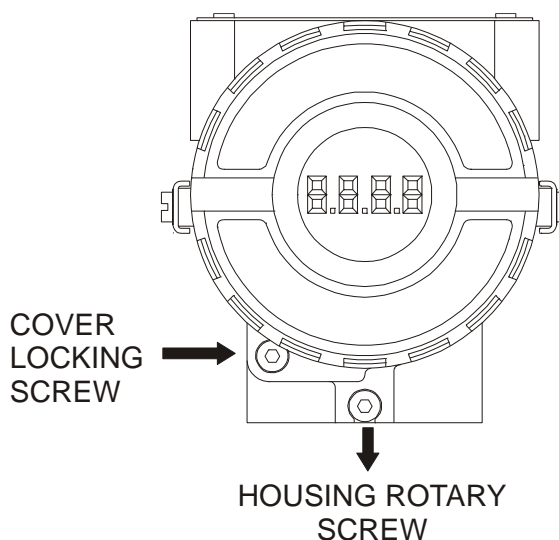


Figure 1.6 – Cover Locking and Housing Rotation Set Screw

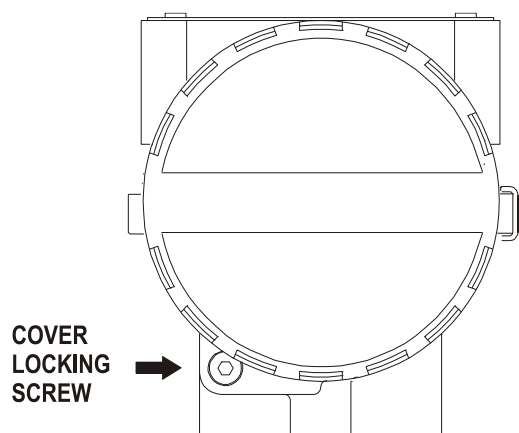


Figure 1.7 - Cover Locking Screw

Electric Wiring

Access the wiring block by removing the electrical connection cover.

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

The unused outlet connection should be plugged accordingly.

The wiring block has screws on which fork or ring-type terminals can be fastened. For convenience there are two ground terminals: one inside the cover and one external, located close to the conduit entries.

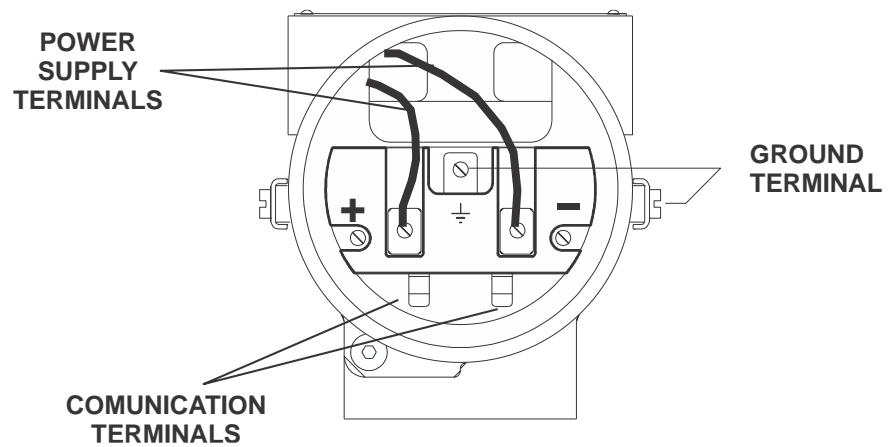


Figure 1.8 – Wiring Block

The **TP302** 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. All devices are connected in parallel along the same pair of wires.

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

The **TP302** is powered via the bus. The limit for such devices is 16 for one bus for non-intrinsically safe requirement.

In hazardous area, the number of devices may be limited to 6 by intrinsically safe restrictions.

The **TP302** is protected against reverse polarity and can withstand ± 35 Vdc without damage.

WARNING

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

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

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

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

Bus Topology and Network Configuration

Bus and 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.

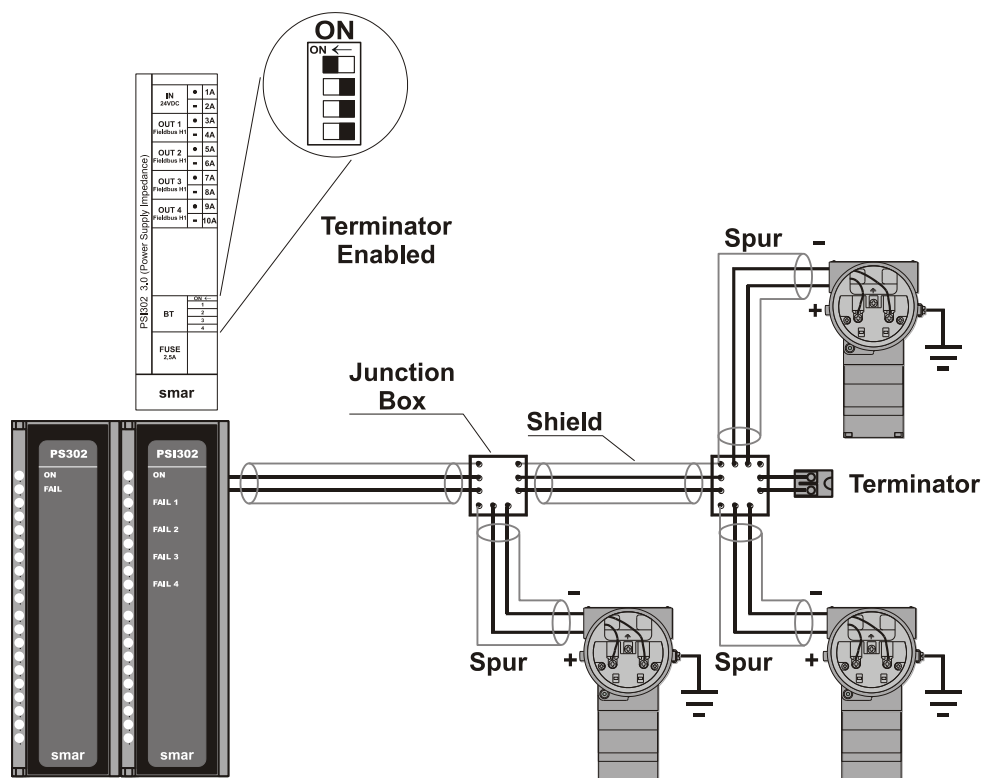


Figure 1.9 - Bus Topology

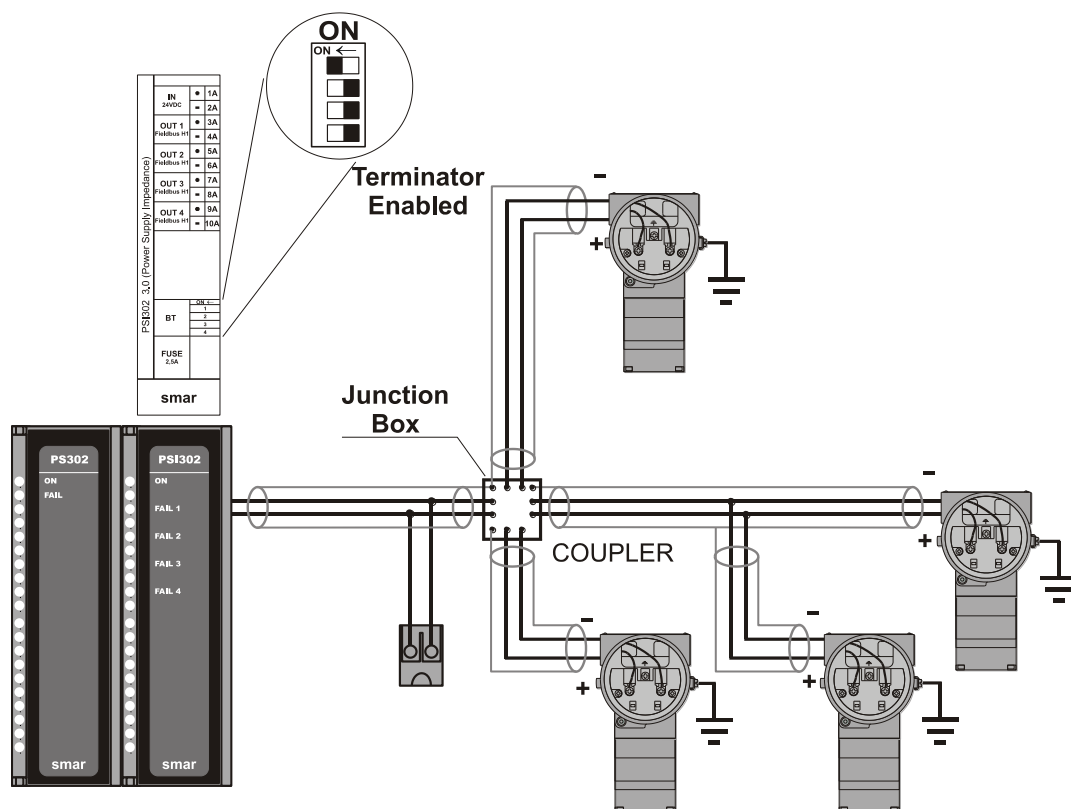


Figure 1.10 - Tree Topology

Jumper Configuration

In order to work properly, the jumpers J1 and W1 located in the **TP302** main board must be correctly configured.

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

Table 1.1 - Description of the Jumpers

Power Supply

The **TP302** receives power from the bus via the signal wiring. The power supply may come from a separate unit or from another device such as a controller or DCS.

The voltage should be between 9 to 32 Vdc for non-intrinsic safe applications.

A special requirement applies to the power supply used in an intrinsically safe bus and depends on the type of barrier used.

Use of PS302 is recommended as power supply.

Recommendations for mounting Approved Equipment with the IP66/68 W certifications ("W" indicates certification for use in saline atmospheres)

NOTE
<p>This TP302 certification is valid for stainless steel transmitter manufactured, approved with the certification IP66/68 W. All transmitter external material, such as plugs, connections etc., should be made in stainless steel.</p> <p>The electrical connection with 1/2" – 14NPT thread must use a sealant. A non-hardening silicone sealant is recommended.</p> <p>The instrument modification or replacement parts supplied by other than authorized representative of Smar is prohibited and will void the certification.</p>

Rotary and Linear Magnet

The Figure 1.12 shows typical shapes for both magnets. For better transmitter performance, the linear magnet is presented with different lengths. Consult the ordering code table for the best choice.

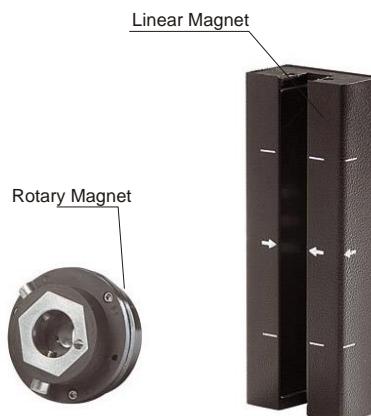


Figure 1.12 – Linear and Rotary Magnet Models

Remote Position Sensor

The remote magnetic position sensor, based on hall effect, is recommended for high temperature or extreme vibration applications. It prevents excessive wear of the equipment and, consequently, increasing the transmitter lifetime..

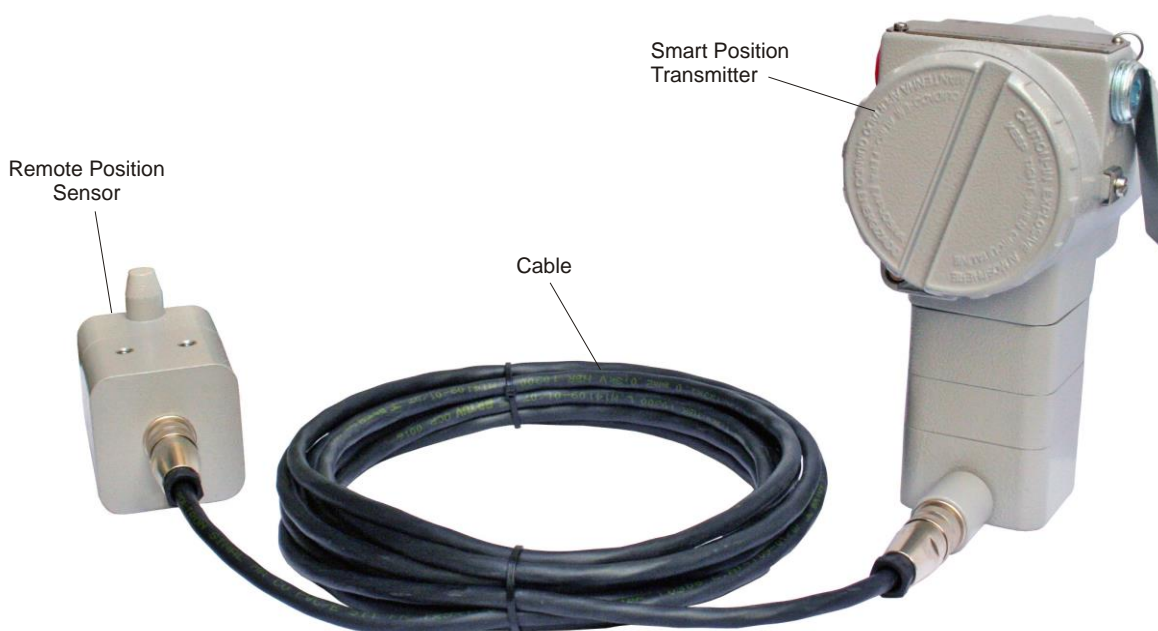


Figure 1.13 - Remote Position Sensor

The electric signals on the remote sensor's cable and connections are of low intensity. Therefore, when installing the cable inside the conduit (maximum limit 20 (meters) length), keep it away from possible sources of induction and/or magnetic interference. The cable supplied by Smar is shielded with excellent protection against electromagnetic interference, but despite of this protection, it is recommended to avoid the cable sharing the same conduit with other cables.

The connector for Remote Position Sensor is easy to handle and simple to install.

See the installation procedure:



Figure 1.14 - Connecting the Cable to the Remote Position Sensor



Figure 1.15 - Connecting the Cable to the Position Transmitter

Installation in Hazardous Areas

Consult the Appendix A for Hazardous Location Approvals.

Section 2

OPERATION

Functional Description – Hall Sensor

Sensor hall supplies an output voltage proportional to the applied magnetic field. This magnetic sensor is ideal for use in system of sensor of linear or rotary position. The mechanical vibrations do not affect sensor hall.

Functional Description – Electronics

Refer to the block diagram. The function of each block is described below.

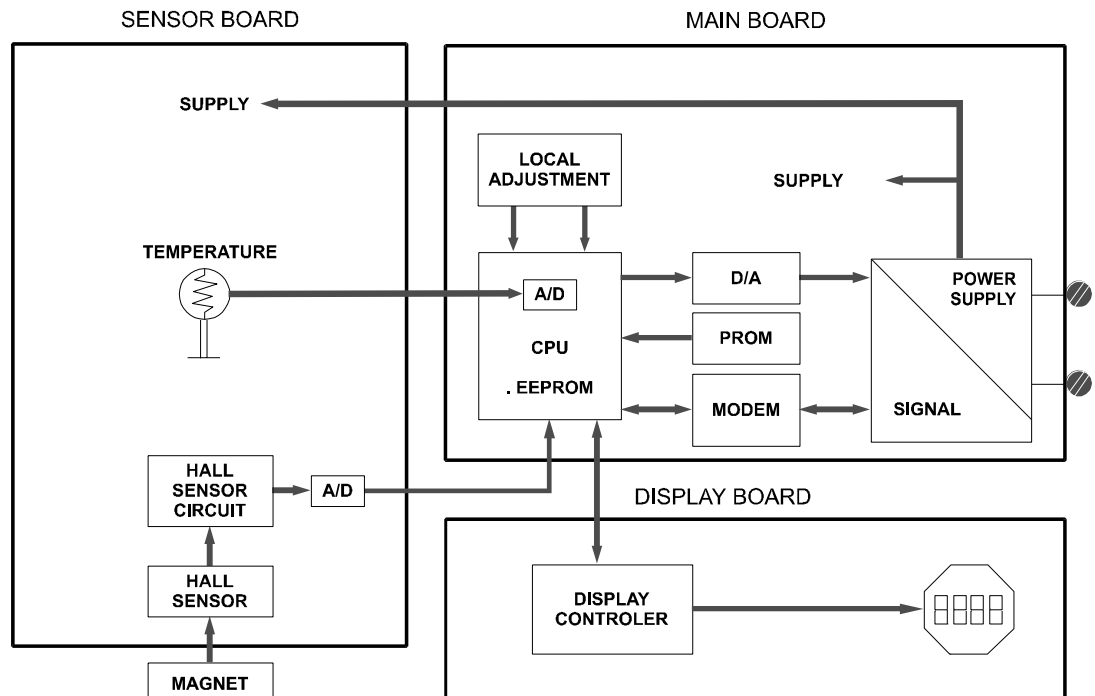


Figure 2.1 - TP302 Block Diagram

Central Processing Unit (CPU), RAM, FLASH and EEPROM

The CPU is the intelligent portion of the transmitter, being responsible for the management and operation of measurement, block execution, self-diagnostics and communication. The program is stored in a FLASH memory for easy upgrade and saving data on power-down event occurrence. For temporary storage of data there is a RAM. The data in the RAM is lost if the power is switched off, however the main board has a nonvolatile EEPROM memory where the static data configured that must be retained is stored. Examples of such data are the following: calibration, links and identification data.

Controller Communication

Monitors line activity, modulate and demodulate communication signals; inserts and deletes start and end delimiters, and check integrity of frame received.

Power Supply

Takes power of the loop-line to power the transmitter circuit.

Power Isolation

Isolates the signals to and from the input section, the power to the input section must be isolated.

A/D

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

Display Controller

Receives data from the CPU identifying which segments on the local indicator use to turn on. The controller drives the backplane and the segment control signals.

Local Adjustment

There are two switches that are magnetically activated. The magnetic tool without mechanical or electrical contact can activate them.

Local Indicator

Indicates the actual position to the CPU.

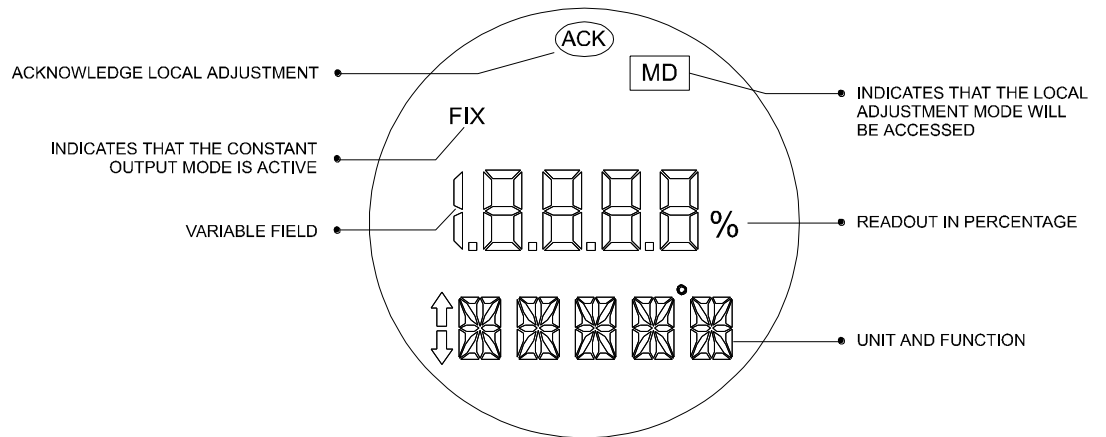


Figure 2.2 - Local Indicator

Section 3

CONFIGURATION

One of the many advantages of Fieldbus is that device configuration is independent of the configurator. The **TP302** may be configured by a third-party terminal or operator console.

The **TP302** contains one input transducer block, one resource block, one display block and function blocks.

Transducer Block

Transducer block insulates function block from the specific I/O hardware, such as sensors, 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 block 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 function block is called channel. These blocks can exchange data from its interface.

Normally, transducer blocks perform functions, such as linearization, characterization, temperature compensation, control and exchange data to hardware.

How to Configure the Transducer Block

Each time when you select a field device on Syscon by instantiating on the operation menu, automatically you instantiate one transducer block and it appears on screen.

The icon indicates that one transducer block has been created and by clicking twice on the icon, you can access it.

The transducer block has an algorithm and a set of contained parameters.

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 and publish the link via communication, 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 manufacturer's specific ones are defined only for 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 guideline to help the user to make common tasks. The Syscon identifies each method associated to the parameters and enables the interface to it.

Position Fieldbus Transducer

Description

The position Fieldbus transducer makes the position input reading PRIMARY_VALUE available to the AI block. The engineering unit and the primary value range are selected from the XD_SCALE in the AI block. The only unit allowed in this case is %. The AI block connected to this transducer has the CHANNEL the same selection as TERMINAL_NUMBER. The supported mode is OOS and AUTO. As the transducer block runs together with AI block, the transducer block goes to AUTO only if the AI mode block is already in AUTO. The sensor module temperature may be read from the SECONDARY_VALUE parameter.

Warning messages may appear in primary value status or in the block error in certain condition as explain below.

Supported Modes

OOS and AUTO.

BLOCK_ERR

The BLOCK_ERR of the transducer block will reflect the following causes:

Input Failure – When mechanic module is disconnected from main electronic board.

Out of Service – When the block is in OOS mode.

Primary_Value Status

The PRIMARY_VALUE status of the transducer block will reflect the following causes:

Bad::SensorFailure:NotLimited – When mechanic module is disconnected from main electronic board.

Parameters Table

Idx	Parameter	Data Type	Valid Range	Initial/ 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	1-255	0	None	S	Number of identification in the plant.
5	MODE_BLK	DS-69	See Table	O/S	Na	Mix	Indicates the operation mode of Transducer Block.
6	BLOCK_ERR	Bit String				D	Indicates the status associated with hardware or software in the Transducer.
7	UPDATE_EVT	DS-73			Na	D	It is the alert for any static data.
8	BLOCK_ALM	DS-72			Na	D	It is used for configuration, hardware and others failures.
9	TRANSDUCER_DIRECTORY	Array of Unsigned16			None	N	It is used to select several Transducer Blocks.
10	TRANSDUCER_TYPE	Unsigned16	See Table	65535	E	N	Indicates the type of Transducer according to its class.
11	XD_ERROR	Unsigned8	See Table	0	None	D	It is used to indicate calibration status.
12	COLLECTION_DIRECTORY	Array of Unsigned 32			None	S	Specifies the number of transducer index into Transducer Block.
13	PRIMARY_VALUE_TYPE	Unsigned16	See Table	65535	None	S	Defines the calculation type for Transducer Block.
14	PRIMARY_VALUE	DS-65	± INF	0	PVR	D	It is the value and status used by channel 1, 2 and 3.
15	PRIMARY_VALUE_RANGE	DS-68	0-100%	100	PVR	S	The High and Low range limit values, the engineering unit code and the number of digits to the right of the decimal point to be used for Primary Value.
16	CAL_POINT_HI	Float	+INF	100	CU	S	The highest calibrated value.
17	CAL_POINT_LO	Float	-INF	0	CU	S	The lowest calibrated value.
18	CAL_MIN_SPAN	Float		5.0 %	CU	S	The minimum calibration span value allowed. This minimum span information is necessary to ensure that when calibration is done, the two calibrated points (high and low) are not too close together.
19	CAL_UNIT	Unsigned16	See Table	%	E	S	The Device Description engineering units code index for the calibration values.
20	SENSOR_SN	Unsigned32	0 to 2 ³²	0		S	The sensor serial number.
21	SENSOR_CAL_METHOD	Unsigned8	See Table	Factory	None	S	The method of last sensor calibration. ISO defines several standard methods of calibration. This parameter is intended to record that method, or if some other method was used.

Idx	Parameter	Data Type	Valid Range	Initial/ Default Value	Units	Store	Description
22	SENSOR_CAL_LOC	VisibleString		NULL	None	S	The location of last sensor calibration. This describes the physical location at which the calibration was performed.
23	SENSOR_CAL_DATE	Time of Day		0	None	S	The date of the last sensor calibration.
24	SENSOR_CAL_WHO	VisibleString		NULL	None	S	The name of person who is in charge of last calibration.
25	SECONDARY_VALUE	DS-65	\pm INF	0	SUV	D	The secondary value related to the temperature sensor.
26	SECONDARY_VALUE_UNIT	Unsigned16	See Table	1001 (°C)	E	S	The engineering units to be used with the secondary value related to the sensor.
27	DIGITAL_HALL	Float	0-65536	0	Na	D	Digital Hall Value.
28	DIAGNOSTIC_STATUS	Unsigned16		Good		S	Show the device status (failures and warnings)
29	READ_HALL_CAL_POINT_HI	Float		43786.0		S	Digital Hall value for the highest calibration point.
30	READ_HALL_CAL_POINT_LOO	Float		24111.0		S	Digital Hall value for the lowest calibration point.
31	SENSOR_TEMPERATURE	DS-65		0	°C	D	The sensor temperature value
32	DIGITAL_TEMPERATURE	DS-65	\pm INF	0	None	D	The digital temperature value.
33	CAL_TEMPERATURE	Float	-40 a 85 °C	25	°C	S	The temperature value used to calibrate the temperature.
34	ACTION_TYPE	Unsigned8	Direct/Reverse	Direct	None	S	Defines if the action is direct or indirect.
35	BACKUP_RESTORE	Unsigned8	See Table	0	Na	S	This parameter is used to backup or to restore configuration data.
35	CAL_POINT_HI_BAKUP	Float	+INF	100	CU	S	Indicates the backup for high calibration point.
37	CAL_POINT_LO_BAKUP	Float	-INF	0	CU	S	Indicates the backup for low calibration point.
38	CAL_POINT_HI_FACTORY	Float	+INF	100	CU	S	Indicates the high factory calibration point.
39	CAL_POINT_LO_FACTORY	Float	-INF	0	CU	S	Indicates the low factory calibration point.
40	ORDERING_CODE	VisibleString		Null	Na	S	Indicates information about factory production.

Table 3.1 – Parameters Table

Legend:

E - Enumerated parameter

Na - Adimensional parameter

RO - Read only

D - Dynamic

N - Non-volatile

S - Static

CU - CAL_UNIT

PVR - PRIMARY_VALUE_RANGE

Sec: Seconds

SR: SENSOR_RANGE

SVU: SECONDARY_VALUE_RANGE

Gray Background Line: Default Parameters of Syscon

Calibration

There is a specific method to make the calibration operation. It is necessary to match the source of reference applied to or connected to the device with the wished value. At least four parameters should be used to configure this process: CAL_POINT_HI, CAL_POINT_LO, CAL_MIN_SPAN, and CAL_UNIT. Those parameters define the highest and lowest calibrated value for this device, the minimum allowed span value for calibration (if necessary) and the engineering unit selected for calibration purpose.

NOTE

TP302 has damping function implemented.

Position Trim

The **TP302** 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 and compare it with the device's indication. If a mismatch is detected, a trim can be done.

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

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

Take the lower value as example:

Set the lower input position 0.0% and wait until the readout of parameter PRIMARY_VALUE stabilizes. Write 0.0 or the lower value in parameter CAL_POINT_LO. For each value written a calibration is performed at the desired point.

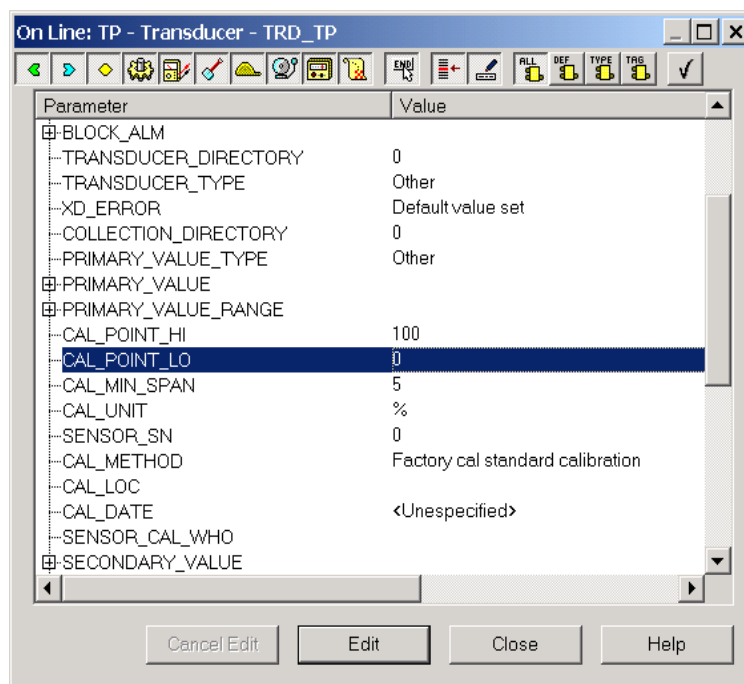


Figure 3.1 - Position Trim – Lower Value

Now, take the upper value as an example:

Set to the input position 100.0% and wait until the readout of parameter PRIMARY_VALUE stabilizes. Write 100.0 or the upper value in the parameter CAL_POINT_HI. For each value written a calibration is performed at the desired point.

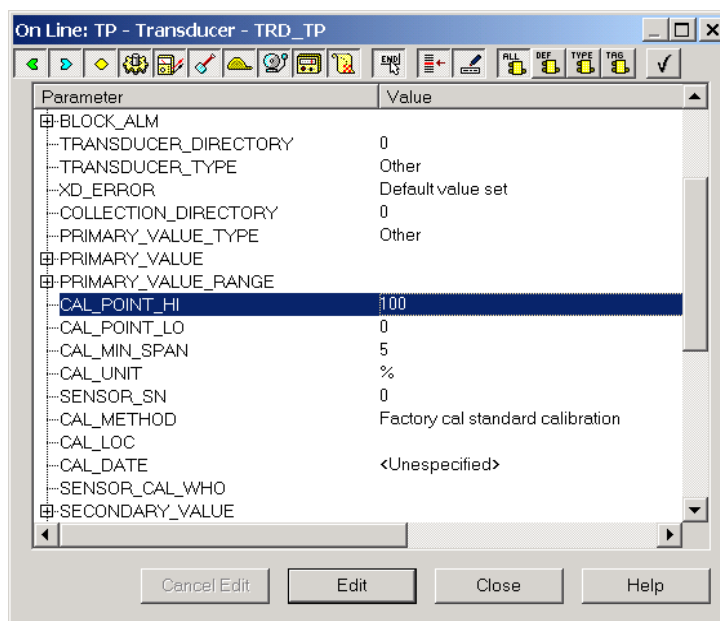


Figure 3.2 - Position Trim – Upper Value

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

In order to enter the local adjustment mode; place the magnetic tool in office “Z” until flag “MD” lights up in the display. Remove the magnetic tool from “Z” and place it in orifice “S”. Remove and reinsert the magnetic tool in “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”. Let’s take the upper value as an example:

Let’s take the upper value as an example:

Set to the input a position of 100.0%

Wait until the current of readout of parameter P_VAL (PRIMARY_VALUE) stabilizes and then actuates parameter UPPER until it reads 100.0%.

Let’s take the lower value as an example:

Set to the input a position of 0.0%.

Wait until the current of readout of parameter P_VAL (PRIMARY_VALUE) stabilizes and then actuates parameter LOWER until it reads 0.0%.

Limit Conditions for Calibration

Upper:

$-10.0\% \leq \text{CAL_POINT_HI} \leq 110.0\%$

$\text{CAL_POINT_HI} \neq \text{CAL_POINT_LO}$

$\text{CAL_MIN_SPAN} = 1.0\%$.

Otherwise, Invalid calibration request.

Lower:

$-10.0\% \leq \text{CAL_POINT_HI} \leq 110.0\%$

$\text{CAL_POINT_HI} \neq \text{CAL_POINT_LO}$

$\text{CAL_MIN_SPAN} = 1.0\%$.

Otherwise, Invalid calibration request.

If all limit conditions are according to these rules, we will get successful in the performed operation.

NOTE

Trim mode exit via local adjustment occurs automatically should the magnetic tool not be used during some seconds. Keep in that even when parameters LOWER or UPPER already present the desired value, they must be actuated so that calibration is performed.

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, the equipment 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 local indicator 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 at this manual in the section 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. Therefore, since the user has learned once, he is capable to handle all kind of field devices from Smar.

All functions 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 302 series 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 prepare previously the parameters related with this operation via Syscon (System Configurator). The figure 3.7 shows 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).

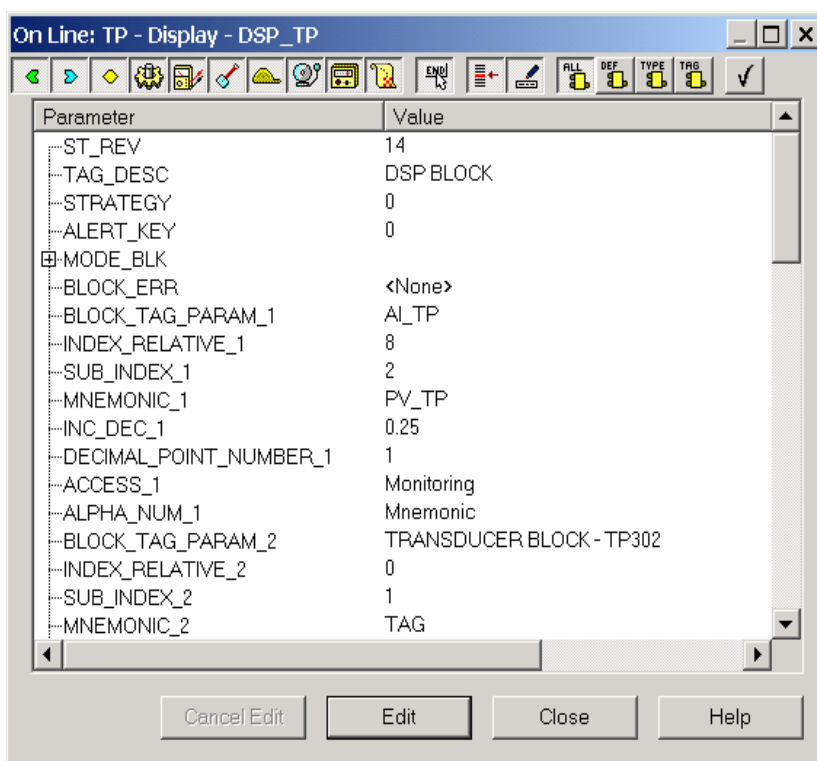


Figure 3.3 - Parameters for Local Adjustment Configuration

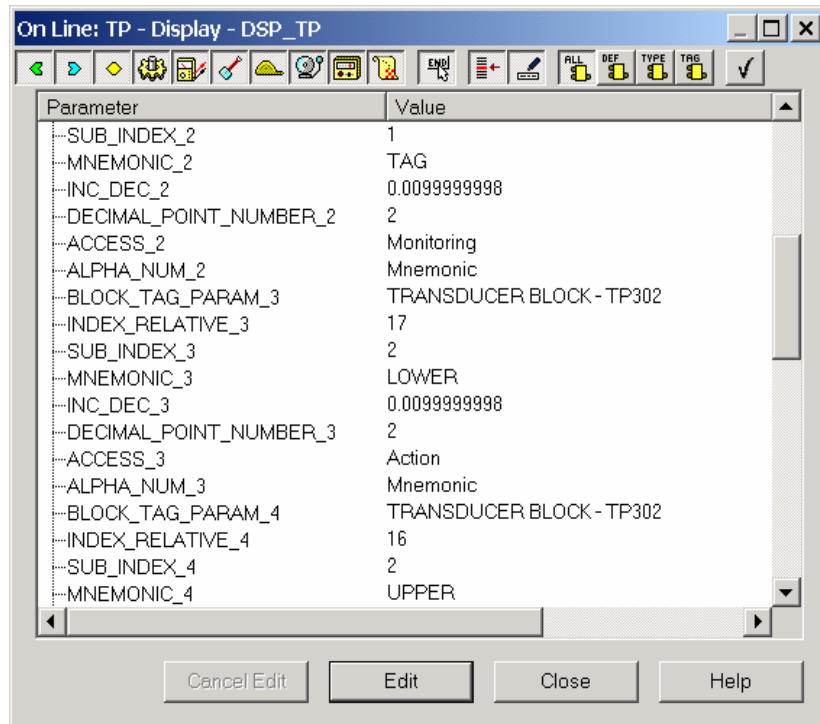


Figure 3.4 - Parameters for Local Adjustment Configuration

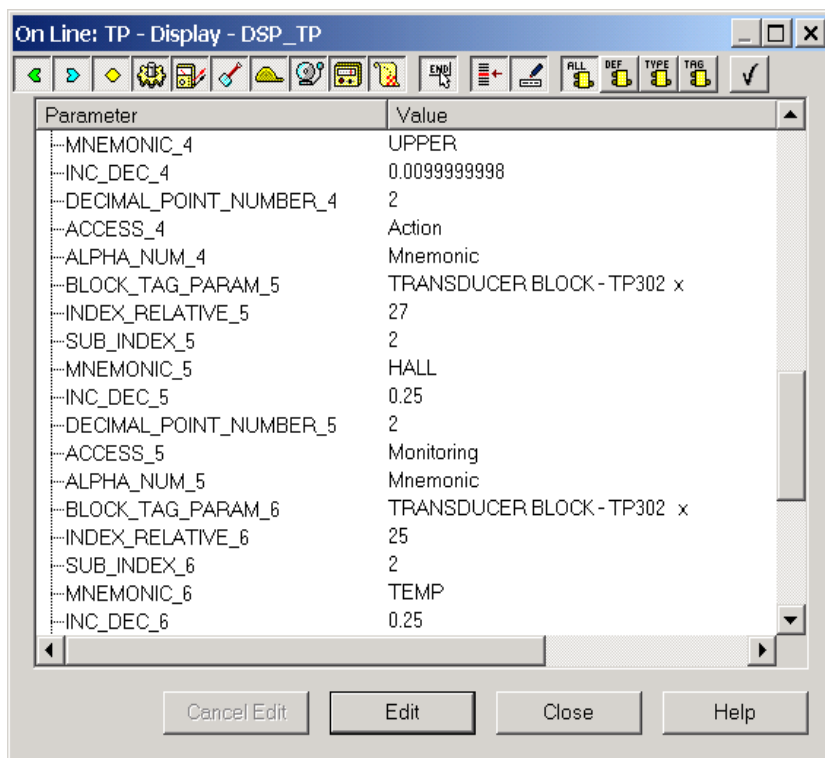


Figure 3.5 - Parameters for Local Adjustment Configuration

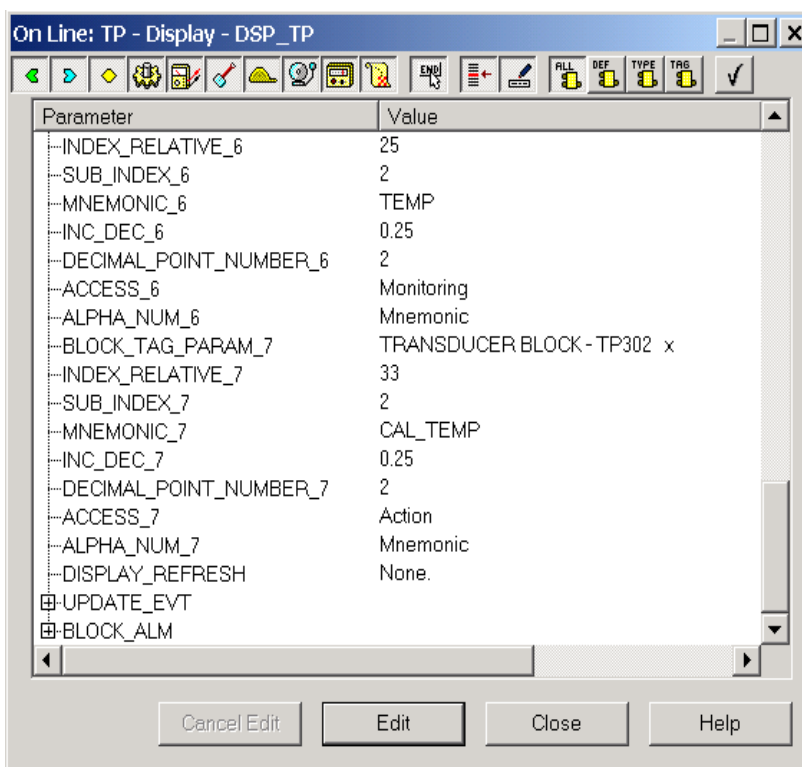


Figure 3.6 - Parameters for Local Adjustment Configuration

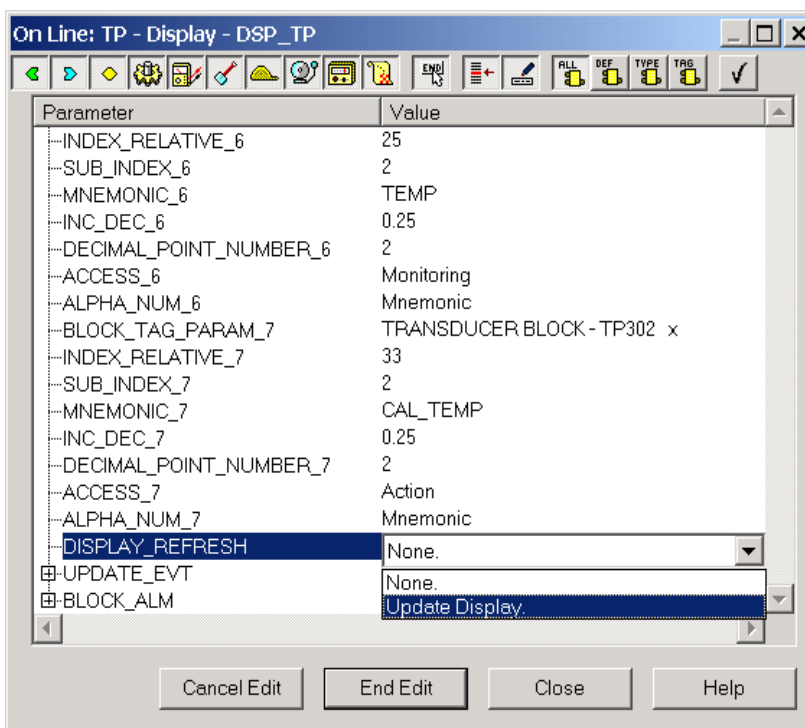


Figure 3.7 - Parameters for Local Adjustment Configuration

Programming using Local Adjustment

The **TP302** has two holes for magnetic switches activated by the magnetic tool located under the identification plate. These magnetic switches are activated by one magnetic tool.

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.

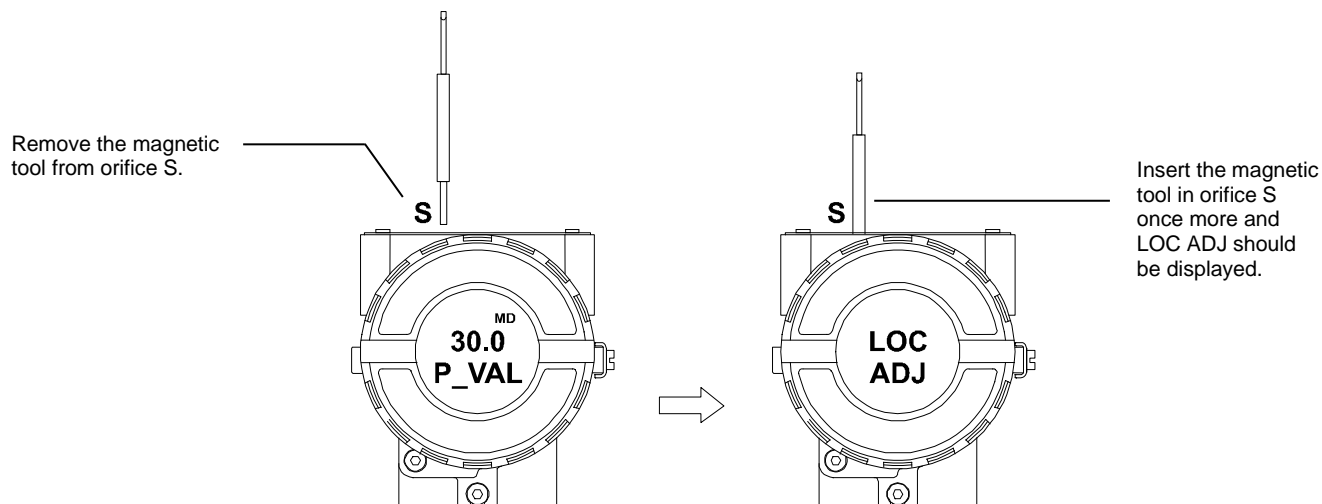


Figure 3.8 – Step 1 – TP302

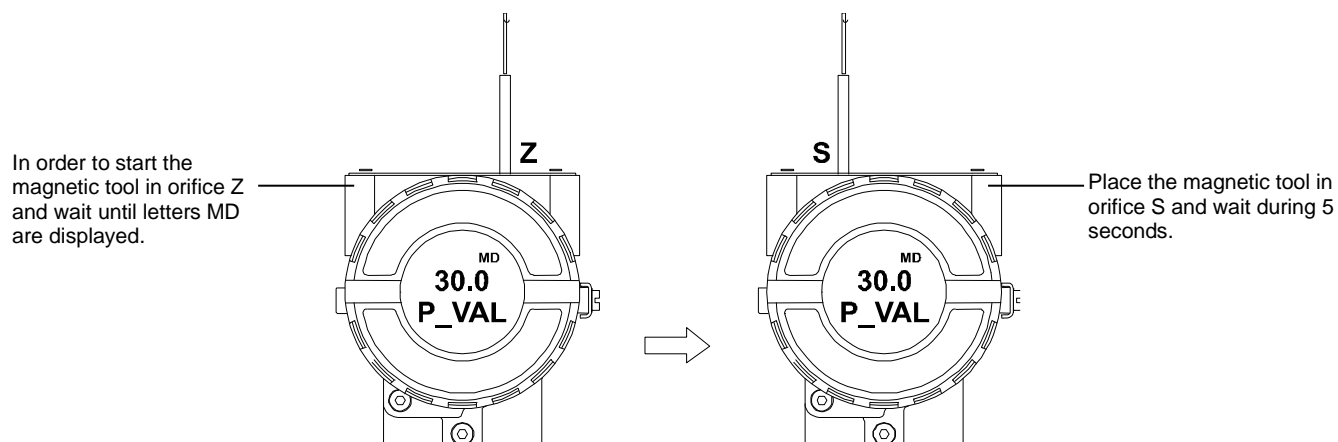
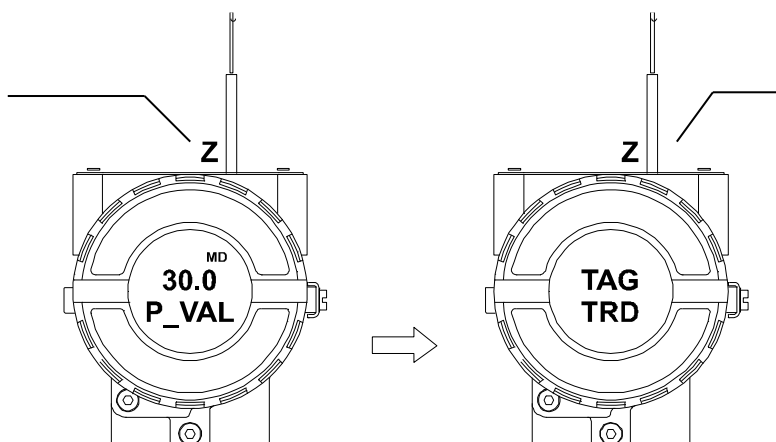


Figure 3.9 – Step 2 – TP302

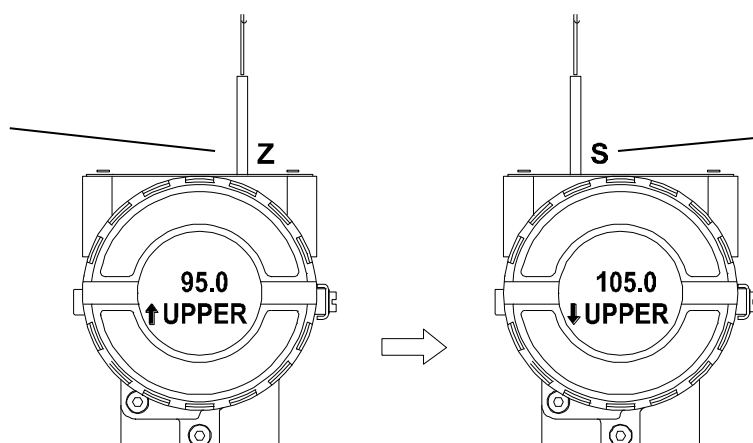
Place the magnetic tool in orifice Z. In case this is the first configuration, the option shown on the display does the configuration tool configure that the tag with its corresponding mnemonic. Otherwise, the option shown on the display will be the one configured in the prior operation. By keeping the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



In this option the first variable (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.

Figure 3.10 – Step 3 – TP302

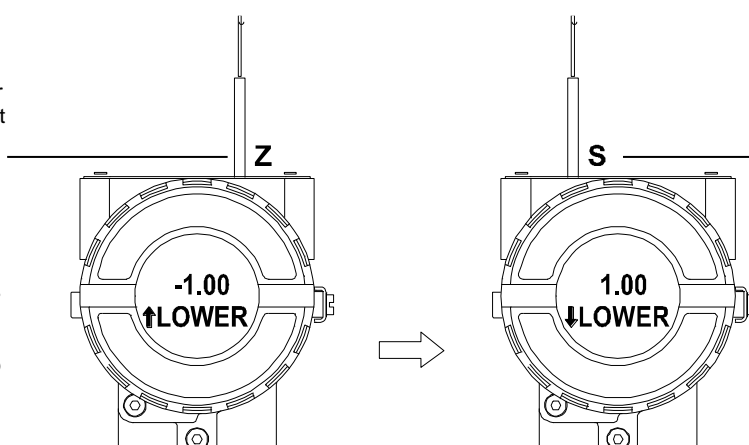
In order to range the upper value (lower); simply insert the magnetic tool in orifice S as soon as UPPER is shown on display. An arrow pointing upward (↑) increments the value and an arrow pointing downward (↓) decrements the value. In order to increment the value, keep the tool inserted in S up to set the value desired.



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

Figure 3.11 – Step 4 – TP302

In order to range the lower value (lower); simply insert the magnetic tool in orifice S as soon as LOWER is shown on display. An arrow pointing upward (↑) increments the value and an arrow pointing downward (↓) decrements the value. In order to increment the value, keep the tool inserted in S up to set the value desired.



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

Figure 3.12 – Step 5 – TP302

NOTE

local adjustment configuration is only a suggestion. The user may choose his preferred configuration via Syscon, simply configuring the display block (Refer to paragraph Display Transducer Block).

Block Type Availability and Initial Block Set

The table below shows how powerful and flexible the Smar devices are. For example, the user may instantiate up to 20 blocks selected from 17 block types (algorithms) in a field device as TP302. Indeed it means that almost all control strategy may be implemented using only the Smar field devices.

Read carefully the notes in order to fully understand the information in this table.

Block Class	Block Type	TP302	Execution time (ms)
Resource	RS (1)	1	3
Transducer Blocks	DIAG (1)	1	
	DSP (1)	1	
Input Transducer Blocks	TRD-TP (1)	1	
Input Function Blocks	AI (*)	1	34
Control and Calculation Function Blocks	PID	1	67
	EPID	0	67
	ARTH	1	59
	SPLT	0	52
	CHAR	1	47
	INTG	1	57
	AALM	1	42
	ISEL	0	25
	SPG	1	51
	TIME	0	37
	LLAG	0	34
	OSDL	0	54
	CT	0	165

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

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

Note 4 – Field devices and FB700 have a capability of 20 blocks, including resource, transducers and function blocks.

Note 6 – 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.

Table of Points - Linearization

The output signal follows a curve determined by 16 points freely configurable.

TABLE OF POINTS - LINEARIZATION			
Points %	Actual Value (process Out) X(%)	Desired position value (of the process) Y(%)	
1	0	0	5 Points (See figure: Position graphic of the magnet)
2	26.4	25	
3	48.6	50	
4	74.2	75	
5	100	100	
6	-	-	Not used
.	.	.	
.	.	.	
.	.	.	
16	-	-	

Table function (Linearization)

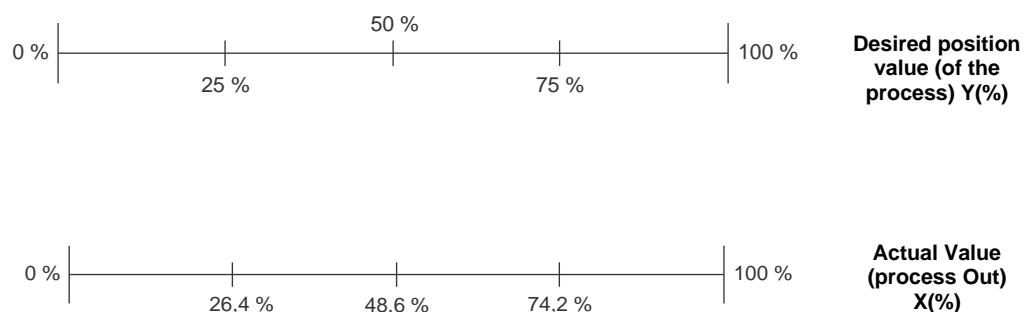
Depending on the application and according with the process, the transmitter output or PV is shown in one linear characteristic curve (position, level, opening etc.). TP also has the option for adjust this curve of linear output, to that the value in percentage can be linearized, you have to uses a table 16 points at maximum and minimum points 2. The output is calculated by interpolating these points. The user can set the total of points desired.

To configure the feature table:

- The user must choose the item "function" to "table" option.
- Select the number of points, according to you need, 2-16 points.
- Create the table and indicate the current position value in the "X" (%) column and the desired position value in the "Y" (%) column. Once created the table, send the points for the position transmitter.
- Done, this configured.

Position Graphic of the Magnet

Exemple:



NOTE: If the table is enabled there will be an indication on the Display LCD with the F(X) icon.

Figure 3.13 - Position Graphic of the Magnet

Section 4

MAINTENANCE PROCEDURES

General

Smar **TP302** Position Transmitters 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 being made by the end user, if necessary.

In general, it is recommended that end users do not try to repair printed circuit boards. Spare circuit boards may be ordered from Smar whenever necessary. Refer to the item "Returning Materials" at the end of this section.

Recommendations for mounting Approved Equipment with the IP66/68 W certifications ("W" indicates certification for use in saline atmospheres)

NOTE

The certification is valid for stainless steel transmitter manufactured, approved with the certification IP66/68 W. All transmitter external material, such as plugs, connections etc., should be made in stainless steel. The electrical connection with 1/2" – 14NPT thread must use a sealant. A non-hardening silicone sealant is recommended. The instrument modification or replacement parts supplied by other than authorized representative of Smar is prohibited and will void the certification.

The table shows the messages of errors and potential cause.

SYMPTOM	PROBABLE SOURCE OF PROBLEM
NO COMMUNICATION	Transmitter Connections Check wiring polarity and continuity. Check for shorts or ground loops. Check if the power supply connector is connected to main board. Check if the shield is not used as a conductor. It should be grounded at one end only.
	Power Supply Check power supply output. The voltage must be between 9 - 32 VDC at the TP302 terminals. Noise and ripple should be within the following limits: a) 16 mV peak to peak from 7.8 to 39 KHz. b) 2 V peak to peak from 47 to 63 Hz for non-intrinsic safety applications and 0.2 V for intrinsic safety applications. c) 1.6 V peak to peak from 3.9 MHz to 125 MHz.
	Network Connection Check network connections: devices, power supply and terminators.
	Network Impedance Check network impedance (power supply impedance and terminators).
	Converter Configuration Check configuration of communication parameters of converter.
	Network Configuration Make sure that device address is configured correctly.
	Electronic Circuit Failure Check the main board for defect by replacing it with a spare one.
	Transmitter Connections Check for intermittent short circuits, open circuits and grounding problems. Check if the sensor is correctly connected to the TP302 terminal block.
INCORRECT READING	

SYMPTOM	PROBABLE SOURCE OF PROBLEM
	Noise, Oscillation Adjust damping. Check grounding of the transmitters housing. Check that the shielding of the wires between transmitter / panel is grounded only in one end.
	Sensor Check the sensor operation; it shall be within its characteristics. Check sensor type; it shall be the type and standard that the TP302 has been configured to. Check if process is within the range of the sensor and the TP302 .

Table 4.1 - Messages of Errors and Potential Cause

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 "S" symbol on the right upper corner of the display to unlit, thus indicating the end of the operation. <p>This procedure makes effective all factory configuration and will eliminate eventual problems with the function blocks or with the equipment communication.</p>

Disassembly Procedure

Refer to the **TP302** Exploded View figure. Make sure to disconnect power supply before disassembling the position transmitter.

NOTE
The numbers indicated between parentheses refer to Figure 4.3 – Exploded View.

Transducer

To remove the transducer from the electronic housing, disconnect before the electrical connections (in the field terminal side) and the main board.

Loosen the hex screw **(6)** and carefully unscrew the electronic housing from the transducer, observing that the flat cable is not excessively twisted.

Electronic Circuit

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

WARNING
The board has 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.

CAUTION
Do not rotate the electronic housing more than 270° without disconnecting the electronic circuit from the power supply.



Figure 4.1 - Transducer Rotation

Loosen the two screws (3) that anchor the indicator and the main circuit board. Gently pull out the indicator, and then the main board (5).

Reassembly Procedure

WARNING

Do not assemble the main board with power on.

Transducer

Mount the transducer to the housing turning clockwise until it stops. Then turn it counterclockwise until it faces the square of electronic housing to the square of transducer. Tighten the hex screw (6) to lock the housing to the transducer.

Electronic Circuit

Plug transducer connector and power supply connector to main board (5). Attach the display to the main board. Observe the four possible mounting positions. The ↑ mark indicates up position.

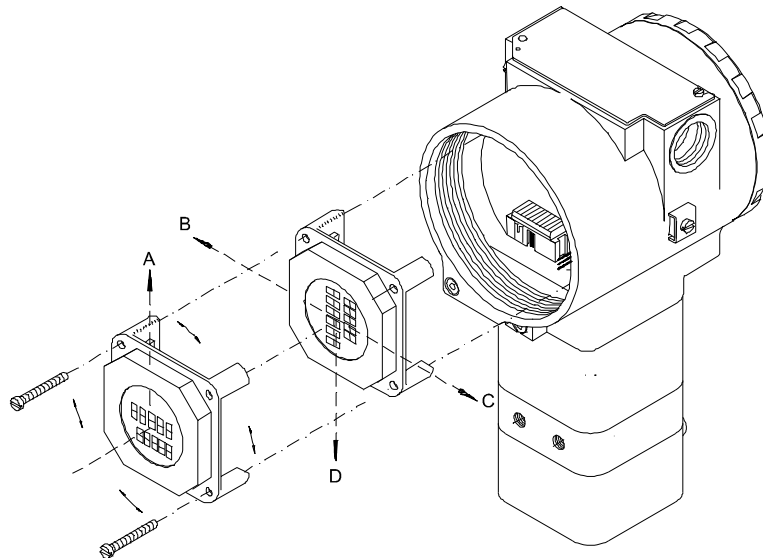


Figure 4.2 - Display - Four Possible Positions

Anchor the main board (5) in the housing (8) with their screws (3). After tightening the protective cover (1), mounting procedure is complete. The transmitter is ready to be energized and tested.

Upgrading TP301 to TP302

The sensor and casing of the TP301 is the same as the **TP302**. By changing the circuit board of the TP301 it becomes a **TP302**. The display on TP301 version 1.XX, is the same as on **TP302** and can therefore be used with the **TP302** upgrade circuit board.

Upgrading the TP301 to a **TP302** is therefore very much the same as the procedure for replacing the main board described above.

To remove the circuit board **(5)**, loosen the two screws **(3)** that anchor the board.

Caution with the circuit boards must be taken as mentioned above.

Pull the TP301 main board out of the housing and disconnect the power supply and the sensor connectors.

Put in the **TP302** main board reversing the procedure for removing the TP301 circuit.

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
400-1176	Teflon guide for linear magnet.
400-1177	Teflon guide for rotary magnet.

Exploded View

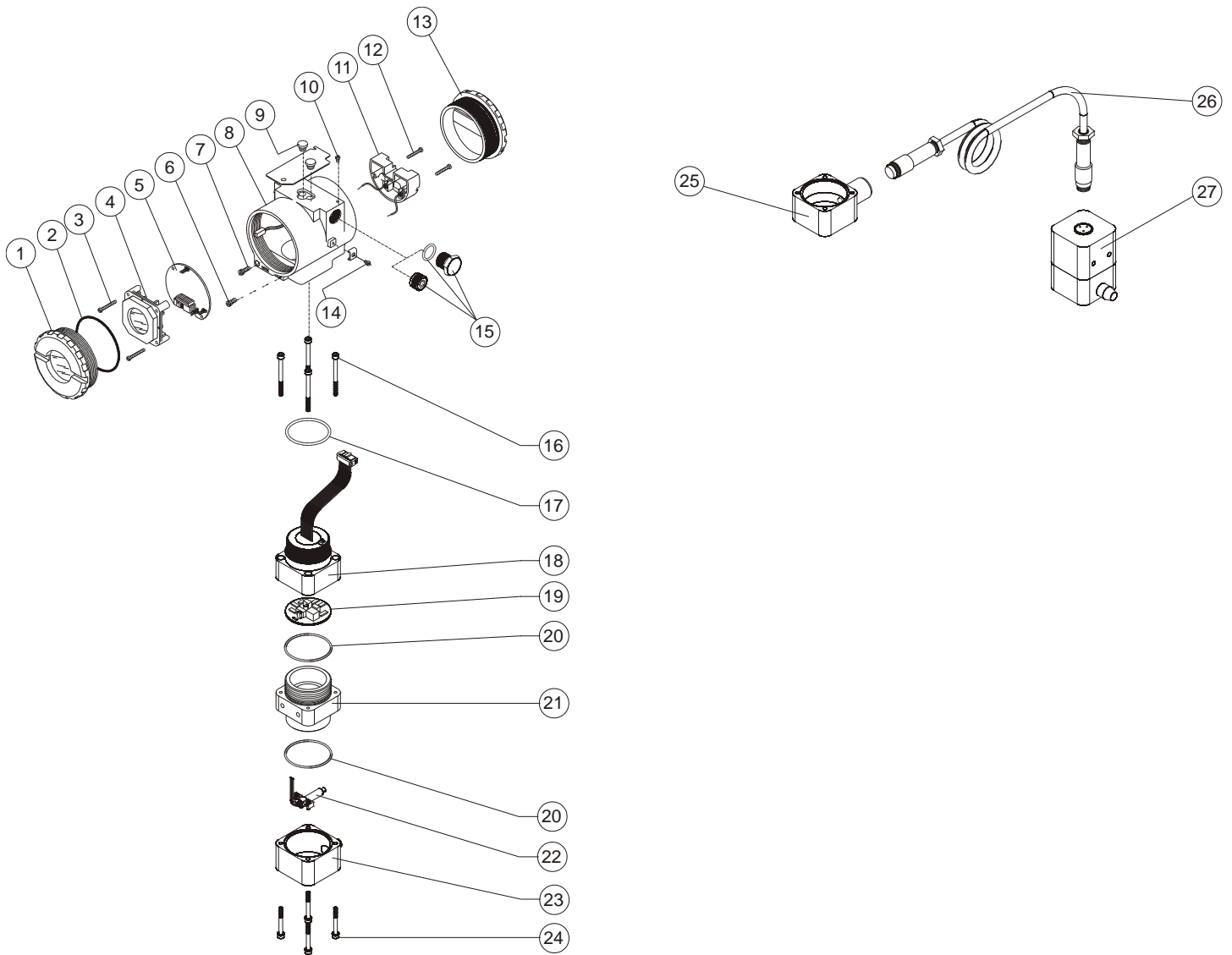


Figure 4.3 – TP302 Exploded View

Spare Parts List

SPARE PARTS LIST				
DESCRIPTION OF PARTS		POSITION	CODE	CATEGORY (NOTE 1)
COVER WITH WINDOW	. Aluminum	1	204-0103	
	. 316 SS	1	204-0106	
COVER O-RING (NOTE 3)	. Buna-N	2	204-0122	B
ALUMINUM HOUSING MAIN BOARD SCREW	. Units with indicator	3	304-0118	
	. Units without indicator	3	304-0117	
STAINLESS STEEL HOUSING MAIN BOARD SCREW	. Units with indicator	3	204-0118	
	. Units without indicator	3	204-0117	
DIGITAL INDICATOR		4	214-0108	
MAIN ELECTRONIC CIRCUIT BOARD		5	400-0580	A
HOUSING LOCKING SCREW	. M4 Screw	6	204-0121	
	. M6 Without Head Screw	6	400-1121	
COVER LOCKING SCREW		7	204-0120	
HOUSING (NOTE 2)		8	(NOTE 5)	
LOCAL ADJUSTMENT PROTECTION CAP		9	204-0114	
IDENTIFICATION PLATE SCREW		10	204-0116	
TERMINAL BLOCK ISOLATOR		11	400-0058	
TERMINAL BLOCK HOLDING BOLT	. Cover Aluminum	12	304-0119	
	. Cover 316 SS	12	204-0119	
COVER WITHOUT WINDOW	. Aluminum	13	204-0102	
	. 316 SS	13	204-0105	
EXTERNAL GROUND BOLT		14	204-0124	
SIX-SIDED INTERNAL PLUG	. 1/2" NPT Bichromatized Carbon Steel BR-EX D	15	400-0808	
	. 1/2" NPT 304 SST BR-EX D	15	400-0809	
SIX-SIDED INTERNAL PLUG	. 1/2" NPT Bichromatized Carbon Steel	15	400-0583-11	
	. 1/2" NPT 304 SST	15	400-0583-12	
SIX-SIDED EXTERNAL PLUG	. M20 X 1.5 316 SST	15	400-0810	
	. PG13.5 316 SST	15	400-0811	
RETAINING BUSHING	. 3/4" NPT 316 SST	15	400-0812	
CONNECTION COVER SCREW		16	400-0883	
CONNECTION COVER SET	. Aluminum	16, 17, 18, 19	400-0884	
	. 316 SS	16, 17, 18, 19	400-0885	
O-RING, Neck (NOTE 3)	. Buna-N	17	204-0113	B
CONNECTION COVER	. Aluminum	18	400-0074	
	. 316 SS	18	400-0391	
ANALOG BOARD		19	400-0637	
UNION BLOCK O-RING		20	400-0085	B
UNION BLOCK	. Aluminum	21	400-0386	
	. 316 SS	21	400-0387	
POSITION SENSOR COVER SET	. Aluminum	22, 23, 24	400-0656	
	. 316 SS	22, 23, 24	400-0657	
POSITION SENSOR BRACKET + POSITION SENSOR SENSOR + FLAT CABLE		22	400-0090	
POSITION SENSOR COVER	. Aluminum	23	400-0089	
	. 316 SS	23	400-0396	
POSITION SENSOR COVER BOLT		24	400-0092	
REMOTE POSITION SENSOR COVER SET(NOTE 4)	. Aluminum	25	400-0853	
	. 316 SS	25	400-0854	

SPARE PARTS LIST				
DESCRIPTION OF PARTS		POSITION	CODE	CATEGORY (NOTE 1)
CABLE SET + CONNECTOR	. 5 M	26	400-0857	
	. 10 M	26	400-0858	
	. 15 M	26	400-0859	
	. 20 M	26	400-0860	
REMOTE EXTENSION SET	. Aluminum	27	400-0855	
	. 316 SS	27	400-0856	
TRANSDUCER SET	. Aluminum	16 a 24	400-0038	
	. 316 SS	16 a 24	400-0400	
MOUNTING BRACKET, "L" + CLAMP "U" TO PIPE 2"	. Carbon Steel	-	400-0339	
	. 316 SS	-	400-0340	
MAGNETS	. Linear up to 50 mm	-	400-0035	
	. Linear up to 100 mm	-	400-0036	
	. Linear up to 30 mm	-	400-0748	
	. Rotary	-	400-0037	

NOTA

Note 1: For category **A** it is recommended to keep in stock 25 parts installed for each set and 50 for category **B**.

Note 2: Includes terminal block isolator, bolts (cover locking, ground and terminal block isolator) and identification plate without certification.

Note 3: O-rings are packaged with 12 units.

Note 4: Includes cover, position sensor flat cable, and extension cable connector.

Note 5: To specify the housing, use HOUSING ORDER CODE table.

HOUSING ORDER CODE						
400-1314	HOUSING					
	COD.	Product				
	5	TP302				
		COD.	Communications Protocol			
		F	FOUNDATION™ fieldbus			
			COD.	Electrical Connection		
			0	½ NPT		
			A	M20 X 1.5		
			B	PG13.5		
				COD.	Housing Material	
				H0	Aluminum Housing (IP/Type)	
				H1	316 SST Housing (IP/Type)	
				H2	Aluminum for saline atmosphere (IPW/TYPE X)	
				H4	Copper Free Aluminium (IPW/TYPEX)	
					COD.	Painting
					P0	Gray Munsell N 6.5 Polyester
					P3	Black Polyester
					P8	Without Painting
					P9	Safety Blue Epoxy – Electrostatic Painting
						COD. Manufacturing Standard
						S0 Smar
400-1314	5	F	*	*	*	*



TYPICAL MODEL NUMBER

* Select item.

Isolation Test on Equipment Housings

1. Power off the equipment in the field, remove its back cover and disconnect all field cables from the transmitter terminal block, isolating them safely.
2. It is not necessary to remove the main board and display.
3. Jumper (connect) the power terminals (positive and negative) with the cable coming from the Megohmmeter (megger).
4. Configure the megohmmeter for 500 Vdc scale and check the isolation between the housing and the cable that short-circuits all the terminals.

ATTENTION



Never test with a voltage greater than 500 Vdc.

5. The value obtained must be greater than or equal to $2G\Omega$ and the voltage application time must be at least 1 second and at most 5 seconds.
6. If the value obtained by the megohmmeter is below $2G\Omega$, the possibility of moisture entering the electrical connection compartment must be analyzed.
7. It is possible to loosen the two screws that secure the terminal block to the housing and carry out a superficial cleaning and dry the surface well. Afterwards, the isolation can be tested again.
8. If the isolation test still shows that the isolation has been compromised, the housing must be replaced and sent to Nova Smar S.A. for analysis and retrieval.

IMPORTANT

- a) For equipment certified Exd and Exi (Explosion Proof and Intrinsically Safe) the standards advise not to carry out repairs in the field of the housing electronic components, only at Nova Smar S.A.
- b) In normal use, the housing components must not cause failures that affect its isolation. For this reason, it is important to verify whether there are traces of water entering the housing and, if so, an assessment of the electrical installations and the sealing rings of the covers must be carried out. Nova Smar S.A. has a team ready to support the assessment of facilities, if necessary.

Section 5

TECHNICAL CHARACTERISTICS

Functional Specifications

Travel	Linear Motion: 3 -100 mm; Rotary Motion: 30 - 120° rotation angle.
Output Signal	Digital only. Fieldbus, 31.25 kbit/s voltage mode with bus power.
Power Supply	Bus power: 9 - 32 Vdc. Current consumption quiescent: 12 mA. Output impedance (from 7.8 KHz – 39 KHz Non – intrinsic safety: $\geq 3k\Omega$ Intrinsic safety: $\geq 400\Omega$ (assuming an is barrier in the power supply).
Indicator	Optional 4½-digit numerical and 5-character alphanumeric LCD indicator.
Hazardous Certifications	Area See Appendix A.
Temperature Limits	Ambient: - 40 to 85 °C (- 40 to 185 °F) Storage: - 40 to 90 °C (- 40 to 194 °F) Digital Display: - 10 to 75 °C (- 14 to 167 °F) operation; - 40 to 85 °C (- 40 to 185 °F) without damage. Remote Sensor: - 40 to 105°C (- 40 to 221°F)
Turn-on Time	Performs within specifications of less than 5.0 seconds after power is applied to the transmitter.
Humidity Limits	0 to 100% RH.

Performance Specifications

Reference conditions: range starting at zero, temperature 25°C (77°F), power supply of 24 Vdc.

Accuracy	$\leq 0.2\%$ F. S. the effects of linearity, hysteresis and repeatability are included. (NOTE: Valid value only when used with the table of points. See configuration section in this manual).
Resolution	$\leq 0.1\%$ F.S.
Repeatability	$\leq 0.5\%$ F.S.
Hysteresis of Full Scale	$\leq 0.2\%$ F.S.
Stability	$\pm 0.1\%$ F.S.
Temperature Effect	$\pm 0.8\%/20^{\circ}\text{C}$ F.S.
Power Supply Effect	$\pm 0.005\%$ F.S. Calibration.
Electromagnetic Interface Effect	Designed to comply with European Directive EMC 2004/108/EC.

Physical Specifications

Hardware	Physical: according to IEC 61158-2 and conformity with the FISCO model.
Electrical Connection	½ - 14 NPT, PG 13.5, or M20 x 1.5 metric.
Material of Construction	Injected low copper aluminum with polyester painting or 316 Stainless Steel housing, with Buna N O-rings on cover.
Mounting Bracket	Plated carbon steel with polyester painting or 316 SST.
Identification Plate	316 SST.
Approximate Weights	<ul style="list-style-type: none">• TP 1.5 kg in Aluminum (without mounting bracket); 3.3 kg in Stainless Steel (without mounting bracket).• Remote sensor: 0.58 kg in Aluminum; 1.5 kg in Stainless Steel.• Cable and remote sensor connectors: Cable 0.045 kg/m; 0.05 kg for each connector.

Ordering Code

MODEL	POSITION TRANSMITTER														
TP302	FOUNDATION™ fieldbus														
	COD.	Local Display													
	0	Without Local Display													
	1	With Local Display													
	COD.	Mounting Bracket													
	0	Without Bracket													
	1	Carbon Steel, "L" + clamp "U" pipe 2". (3)													
	2	Stainless Steel, "L" + clamp "U" pipe 2". (3)													
	3	Carbon Steel, rotary - VDI / VDE NAMUR													
	4	Stainless Steel, rotary - VDI / VDE NAMUR													
	7	Carbon Steel, "L" + clamp "U" pipe 2" - (316 SST) accessories. (3)													
	COD.	Electrical Connection													
	0	1/2" - 14 NPT				3	1/2" - 14 NPT X 1/2 BSP (316 SST) - with adapter								
	1	1/2" - 14 NPT X 3/4 NPT (316 SST) - with adapter				A	M20 X 1.5								
	2	1/2" - 14 NPT X 3/4 BSP (316 SST) - with adapter				B	PG 13.5 DIN								
	COD.	Type of Actuator													
	1	Rotary													
	5	Linear Stroke up to 50 mm													
	7	Linear Stroke up to 100 mm													
	A	Linear Stroke up to 30 mm													
	SPECIAL OPTIONS (1)														
	COD.	Housing													
	H0	Aluminum (IP/TYPE)				H2	Aluminum for saline atmosphere (IPW/TYPE X)								
	H1	316 Stainless Steel (IP/TYPE)				H4	Copper Free Aluminum (IPW/TYPE X)								
	COD.	Identification Plate													
	I1	FM: XP, IS, NI, DI				I5	CEPEL: Ex-d, Ex-ia, IP								
	I2	NEMKO: EX-D, Ex-ia, IP				I6	Without certification								
	I3	CSA: XP, IS, NI, DI				IJ	NEMKO - Ex-d								
	I4	EXAM (DMT): Ex-ia, IP													
	COD.	Painting													
	P0	Gray Munsell N 6.5 Polyester													
	P3	Black Polyester													
	P8	Without Painting													
	P9	Safety Blue Epoxy – Electrostatic Painting													
	COD.	TAG Plate													
	J0	With TAG													
	J1	Blank													
	J2	According to user's notes													
	COD.	Sensor Mounting (2)													
	R0	Full Mounting													
	R1	Remote sensor - 5 m cable													
	R2	Remote sensor - 10 m cable													
	R3	Remote sensor - 15 m cable													
	R4	Remote sensor - 20 m cable													
	COD.	Special													
	ZZ	See notes													
TP302	-	1	0	-	0	1	*	.	*	*	*	*	*	*	
														←	TYPICAL MODEL NUMBER

TP302 - 1 0 - 0 1 * . * * * *



TYPICAL MODEL NUMBER

NOTE

- 1) Leave it blank when there are not optional items.
- 2) Consult us for classified areas applications.
- 3) Magnet mounting bracket not supplied with the TP.

CERTIFICATIONS INFORMATION

European Directive Information

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

Authorized representative/importer located within the Community:

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

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

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

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

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

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

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

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

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

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

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

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

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

Hazardous locations general information

Ex Standards:

IEC 60079-0 General Requirements

IEC 60079-1 Flameproof Enclosures "d"

IEC 60079-7 Increased Safe "e"

IEC 60079-11 Intrinsic Safety "i"

IEC 60079-18 Encapsulation "m"

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

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

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

IEC 60079-10 Classification of Hazardous Areas

IEC 60079-14 Electrical installation design, selection and erection

IEC 60079-17 Electrical Installations, Inspections and Maintenance

IEC 60079-19 Equipment repair, overhaul and reclamation

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

Warning:

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

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

Maintenance and Repair

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

Marking Label

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

Intrinsic Safety / Non Incendive application

Only connect the equipment with the "Intrinsic safety" protection type to a circuit intrinsically safe. If the equipment has already been used in circuits not intrinsically safe or if the electrical specifications have not been respected, the safety of the equipment is no longer guaranteed for "Intrinsic Safety" installations.

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

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

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

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

Explosionproof / Flameproof application

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

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

Do not remove the housing covers when powered on.

Enclosure

The electronic housing and sensor threads installed in hazardous areas must have a minimum of 6 fully engaged threads. The covers must be tightening with at least 8 turns, to avoid the penetration of humidity or corrosive gases, and until it touches the housing. Then, tighten more 1/3 turn (120°) to guarantee the sealing.

Lock the housing and covers using the locking screw.

The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction.

Care must be taken during installation and use to prevent impact or friction.

Degree of Protection of enclosure (IP)

IPx8: Second numeral meaning continuous immersion in water under special condition defined as 10m for a period of 24 hours (Ref: IEC60529).

IPW/ TypeX: Supplementary letter W or X meaning special condition defined as saline environment tested in saturated solution of NaCl 5% w/w at 35°C for a period of 200 hours (Ref: NEMA 250/ IEC60529).

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

Hazardous Locations Approvals

FM Approvals

FM 3010145 / FM 3007267

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

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

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

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

T4; $T_a = -25^{\circ}\text{C} < T_a < 60^{\circ}\text{C}$; Type 4, 4X

Entity Parameters Fieldbus Power Supply Input (report 3015629):

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

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

Drawings 102A-0605, 102A-1237, 102A-1350, 102A-1960, 102A-1961

ATEX DNV

Explosion Proof (PRESAFE 21 ATEX 17657X)

II 2G Ex db IIC T6 Gb

$T_a -20^{\circ}\text{C}$ to $+60^{\circ}\text{C}$

Options: IP66/68W or IP66/68

Special Conditions for Safe Use

ATEX and IECEx certified cable gland to be used.

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 3 of EN/IEC 60079-1.

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

EN 60079-0:2018 General Requirements

EN 60079-1:2014 Flameproof Enclosures "d"

Drawings 102A-1451, 102A-1507

IECEx DNV

Explosion Proof (IECEx PRE 21.0015X)

Ex db IIC T6 Gb

$T_a -20^{\circ}\text{C}$ to $+60^{\circ}\text{C}$

Options: IP66/68W or IP66/68

Special Conditions for Safe Use

ATEX and IECEx certified cable gland to be used.

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 3 of EN/IEC 60079-1.

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

IEC 60079-0:2017 General Requirements

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

Drawings 102A2167, 102A2168

ATEX DEKRA

Intrinsic Safety (DMT 00 ATEX E 086)

I M2 Ex ia I Mb

II 2G Ex ia IIC T4/T5/T6 Gb

FISCO Field Device

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

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

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

Ambient Temperature:

$-40^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$ (T4)

$-40^{\circ}\text{C} \leq T_a \leq +50^{\circ}\text{C}$ (T5)

$-40^{\circ}\text{C} \leq T_a \leq +40^{\circ}\text{C}$ (T6)

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"

Drawing 102A-1451, 102A-1507, 102A-1582, 102A-1583

INMETRO NCC

Segurança Intrínseca (NCC 24.0156X)

Ex ia IIC T* Ga

Ex ia IIIC T* Da

Ui = 30 V li = 380 mA Pi = 5,32 W Ci = 5,0 nF Li = desp

Tamb: -20 °C a +65 °C para T4 ou T₂₀₀135°C

Tamb: -20 °C a +50 °C para T5 ou T₂₀₀100°C

IP66W/IP68W

Prova de Explosão (NCC 24.0146)

Ex db IIC T6 Gb

Ex tb IIIC T85 °C Db

Tamb: -20 °C a +40 °C

IP66W/IP68W

Observações:

O número do certificado é finalizado pela letra "X": Indicar que para a versão do Transmissor de Posição, Intrinsecamente Seguro, modelos TP290, TP301, TP302 e TP303 equipado com invólucro fabricado em liga de alumínio, somente pode ser instalado em "Zona 0", se durante a instalação for excluído o risco de ocorrer impacto ou fricção entre o invólucro e peças de ferro/aço.

O produto adicionalmente marcado com a letra suplementar "W" indica que o equipamento foi ensaiado em uma solução saturada a 5% de NaCl p/p, à 35 °C, pelo tempo de 200 h e foi aprovado para uso em atmosferas salinas, condicionado à utilização de acessórios de instalação no mesmo material do equipamento e de bujões de aço inoxidável ASTM-A240, para fechamento das entradas roscadas não utilizadas.

Os planos de pintura P1 são permitidos apenas para equipamento fornecido com plaqueta de identificação com marcação para grupo de gás IIB.

O grau de proteção IP68 só é garantido se nas entradas roscadas de ½" NPT for utilizado vedante não endurecível à base de silicone.

O segundo numeral oito indica que o equipamento foi ensaiado para uma condição de submersão de dez metros por vinte e quatro horas. O acessório deve ser instalado em equipamentos com grau de proteção equivalente.

É responsabilidade do fabricante assegurar que todos os transformadores da placa analógica tenham sido submetidos com sucesso aos ensaios de rotina de 1500 V durante um minuto.

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

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

Normas Aplicáveis:

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

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

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

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

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

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

Desenhos 102A1380, 102A1306, 102A2066, 102A2065, 102A2098

Identification Plate

FM Approvals

smar TP302 Position Transmitter
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	IS CL I,II,III, DIV 1, GP A,B,C,D,E,F,G.
I max. 250 mA	NI CL I, DIV 2, GP A,B,C,D.
Ci 5 nF	Per inst. dwg 102A0605.
Li 12 uH	

FM APPROVED

0044333 - 2007

123700

smar TP302 Position Transmitter
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	IS CL I,II,III, DIV 1, GP A,B,C,D,E,F,G.
I max. 250 mA	NI CL I, DIV 2, GP A,B,C,D.
Ci 5 nF	Per inst. dwg 102A0605.
Li 12 uH	

FM APPROVED

0044333 - 2007

135000

ATEX / IECEx

smar TP302 Position Transmitter
Nova Smar S/A
Av. Dr. Antônio Furlan Jr.
1028 Sertãozinho-SP
14170-480
Brazil

Ex II 2G Ex ia IIC T4/T5/T6 Gb DMT 00 ATEX E 086 ()
Pi = 5,32 W -40°C ≤ Ta ≤ +60°C
Ui = 24 VDC li = 380 mA Li = neg Ci ≤ 5 nF

IP66
IP68 10m/24h

0000000 - 0000

0470 145105

smar TP302 Position Transmitter
Nova Smar S/A
Av. Dr. Antônio Furlan Jr.
1028 Sertãozinho-SP
14170-480
Brazil

Ex II 2G Ex ia IIC T4/T5/T6 Gb DMT 00 ATEX E 086 ()
Pi = 5,32 W -40°C ≤ Ta ≤ +60°C
Ui = 24 VDC li = 380 mA Li = neg Ci ≤ 5 nF

IP66W
IP68W 10m/24h

0000000 - 0000

0470 150705

smar TP302 Position Transmitter
Nova Smar S/A
Av. Dr. Antônio Furlan Jr.
1028 Sertãozinho-SP
14170-480
Brazil

Ex db IIC T6 Gb IECEx PRE 21.0015X ()
Tamb = -20°C to 60°C
U = 28 VDC

IP66
IP68 10m/24h

0000000 - 0000

216701

smar TP302 Position Transmitter
Nova Smar S/A
Av. Dr. Antônio Furlan Jr.
1028 Sertãozinho-SP
14170-480
Brazil

Ex db IIC T6 Gb IECEx PRE 21.0015X ()
Tamb = -20°C to 60°C
U = 28 VDC

IP66W
IP68W 10m/24h

0000000 - 0000

216801

smar TP302 Position Transmitter
BR - 14160
Sertãozinho
Brazil

Ex I M2 Ex ia I Mb DMT 00 ATEX E 086
-40°C ≤ Ta ≤ +60°C
Pi = 5,32 W
Ui = 24 VDC li = 380 mA Li = neg Ci ≤ 5 nF

IP 66 68

0000000 - 0000

0470 158201

smar TP302 Position Transmitter
BR - 14160
Sertãozinho
Brazil

Ex I M2 Ex ia I Mb DMT 00 ATEX E 086
-40°C ≤ Ta ≤ +60°C
Pi = 5,32 W
Ui = 24 VDC li = 380 mA Li = neg Ci ≤ 5 nF

IP 66W 68W

0000000 - 0000

0470 158301

INMETRO NCC

smar TP302 Transmissor de Posição
Nova Smar SA Av. Dr. Antônio Furlan Jr, 1028 | Sertãozinho - SP - Brasil | 14170-480

Segurança

Ex db IIC T6 Gb NCC 24.0146 ()
Ex ia IIC T4/T5 Ga NCC 24.0156 X ()
Tamb = -20° a 65°C (T4) -20° a 50°C (T5)
Ui = 30V li = 380mA Pi = 5,32W Ci = 5nF Li = desp
FISCO Field Device

IP66 ou IP68 10m/24h

0000000 - 0000

138005

smar TP302 Transmissor de Posição
Nova Smar SA Av. Dr. Antônio Furlan Jr, 1028 | Sertãozinho - SP - Brasil | 14170-480

Segurança

Ex db IIC T6 Gb NCC 24.0146 ()
Ex ia IIC T4/T5 Ga NCC 24.0156 X ()
Tamb = -20° a 65°C (T4) -20° a 50°C (T5)
Ui = 30V li = 380mA Pi = 5,32W Ci = 5nF Li = desp
FISCO Field Device


IP66W ou IP68W 10m/24h




0000000 - 0000

130605


TP302 – Certifications Information




smar TP302 Transmissor de Posição
Nova Smar SA Av. Dr. Antônio Furlan Jr, 1028 | Sertãozinho - SP - Brasil | 14170-480

Segurança

 Ex db IIB T6 Gb NCC 24.0146 ()
 Ex ia IIB T4/T5 Ga NCC 24.0156 X ()
 Tamb= -20° a 65°C (T4) -20° a 50°C (T5)
 Ui= 30V li= 380mA Pi= 5,32W Ci= 5nF Li= desp
 P1/P2 Pintura FISCO Field Device IP66 ou IP68 10m/24h


 0000000 - 0000   **206603**




smar TP302 Transmissor de Posição
Nova Smar SA Av. Dr. Antônio Furlan Jr, 1028 | Sertãozinho - SP - Brasil | 14170-480

Segurança

 Ex db IIB T6 Gb NCC 24.0146 ()
 Ex ia IIB T4/T5 Ga NCC 24.0156 X ()
 Tamb= -20° a 65°C (T4) -20° a 50°C (T5)
 Ui= 30V li= 380mA Pi= 5,32W Ci= 5nF Li= desp
 P1/P2 Pintura FISCO Field Device IP66W ou IP68W 10m/24h

 0000000 - 0000   **206503**


smar TP302 Transmissor de Posição
Nova Smar SA Av. Dr. Antônio Furlan Jr, 1028 | Sertãozinho - SP - Brasil | 14170-480

Segurança

 Ex tb IIIC T85°C Db NCC 24.0146 ()
 Ex ia IIIC T₂₀₀135°C/T₂₀₀100°C Da NCC 24.0156 X ()
 Tamb= -20° a 65°C (T₂₀₀135°C) -20° a 50°C (T₂₀₀100°C)
 Ui= 30V li= 380mA Pi= 5,32W Ci= 5nF Li= desp
 IP66 ou IP68 10m/24h

 0000000 - 0000   **209804**



Appendix B

	<h2>SRF – Service Request Form</h2>			
	TP Position Transmitter			
GENERAL DATA				
Model:	TP290 () Firmware Version: _____		TP301 () Firmware Version: _____	
	TP302 () Firmware Version: _____		TP303 () Firmware Version: _____	
Serial Number:	Sensor Number: _____			
TAG:	_____			
Remote Position Sensor?	Yes () No ()			
Action:	Rotary () Linear ()			
Travel:	30 mm () 50 mm () 100 mm () Other: _____ mm			
Configuration:	Magnetic Tool () Palm () Psion () PC () Software: _____ Version: _____			
INSTALLATION DATA				
Type:	Valve + Atuador () Other: _____			
Size:	_____			
Travel:	_____			
Manufacturer:	_____			
Model:	_____			
PROCESS DATA				
Hazardous Area Classification	Non-Classified () Chemical () Explosive () Other: _____			
Interference Types	Vibration () Temperature () Electromagnetic () Others: _____			
SITUATION DESCRIPTION				
SERVICE SUGGESTION				
Adjustment () Cleaning () Preventive Maintenance () Update / Up-grade ()				
Other: _____				
USER INFORMATION				
Company: _____				
Contact: _____				
Title: _____				
Section: _____				
Phone: _____				Extension: _____
E-mail: _____				Date: ____/____/____
<p>For warranty or non-warranty repair, please contact your representative.</p> <p>Further information about address and contacts can be found on www.smar.com.br/en/contact-us.</p>				

Returning Materials

Should it become necessary to return the transmitter and/or configurator to **SMAR**, simply contact our office, informing the defective instrument serial number, and return it to our factory.

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

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