MANUAL

INSTRUCTIONS | OPERATION | MAINTENANCE

VALVE POSITIONER FOR ACTUATION AND CONTROL FY303

MAR/24 - VERSION 4

smar
Technology Company

FY303

Valve Positioner for Actuation and Control

Consult our subsidiary

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

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INTRODUCTION

The **FY303** is a Profibus PA valve positioner for Single (spring return) or Double acting Linear motion type control valves e. g. Globe, Gate, Diaphragm, Pinch or Clamp and Rotary motion type control valves e. g. Ball, Butterfly or Plug with pneumatic type actuators e. g. Diaphragm, Piston, Vane, or Bellows. It is based on a field-proven piezo flapper and non-contacting Hall-effect position sensor that provides reliable operation and high performance. The digital technology used in the **FY303** enabled the choice of several types of flow characterizations, an easy interface between the field and the control room and several interesting features that considerably reduce the installation, operating and maintenance costs.

The **FY303** is part of Smar's complete 303 line of Profibus PA devices.

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.

The system controls variable sampling, algorithm execution and communication to optimize the usage of the network, not losing time. Thus, high closed loop performance is achieved.

Using Profibus 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.

The need for implementation of Fieldbus in small as well as large systems was considered when developing the entire 303 line of Profibus-PA devices. They have common features and can be configured locally using a magnetic tool, eliminating the need for a configuration tool or console in many basic applications.

Get the best result of the **FY303** by carefully reading these instructions.

NOTE
In case of using Simatic PDM as the configuration and parameterization tool, Smar recommends that the user does not apply the option "Download to Device". This function can improperly configure the field device. Smar recommends that user make the use of the option "Download to PG / PC" and then selecting the Device Menu, use the menus of the transducer, function and display blocks acting specifically, according to each menu and method for reading and writing.

WARNING
Throughout the operation of the positioner, including self-setup, do not touch the moving parts of valve/actuator/positioner assembly as they may unexpectedly move automatically. Make sure to disconnect supply air before touching any moving parts.

NOTE
This manual is compatible with version 4.XX, where 4 denotes software version and XX software release. The indication 4.XX means that this manual is compatible with any release of software version 4.

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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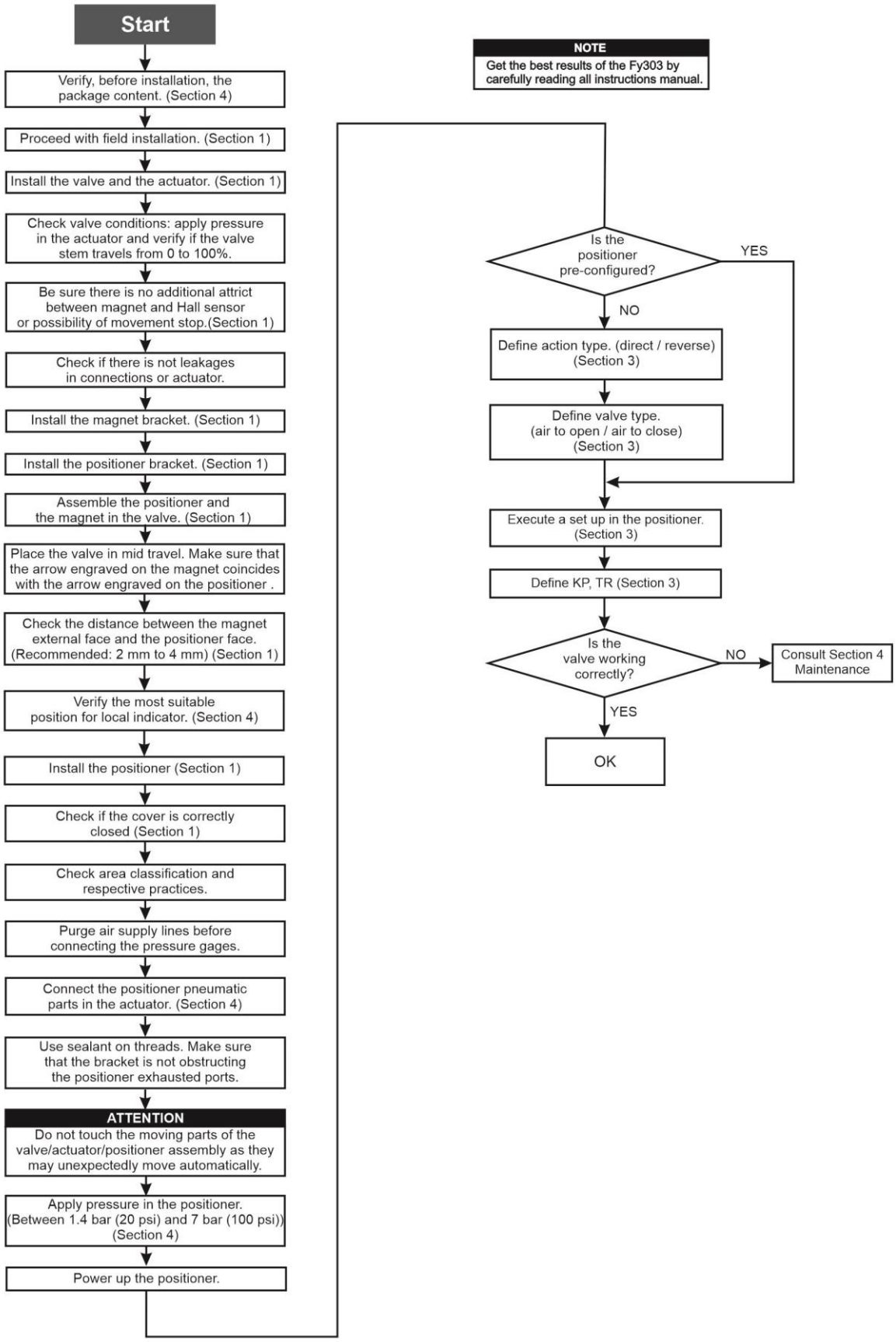
Installation Flowchart



INSTALLATION

General

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

The overall accuracy of measuring and control depends on several factors. In spite of the excellent performance, the positioner must be adequately installed so that it may work well.

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

The **FY303** has a built-in temperature sensor to compensate for temperature variations. At the field, this feature minimizes the temperature variation effect.

Installing the positioner in areas protected from extreme environmental changes can minimize temperature fluctuation effects. In warm environments, the positioner 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 thermal isolation to protect the positioner from external heat sources, if necessary.

Humidity is fatal to electronic circuits. In areas subjected to high relative humidity, the O-rings for the electronic housing covers must be correctly placed and the covers must be completely closed by tighten them by hand until you feel the O-rings being compressed. Do not use tools to tight the covers. Removal of the electronics cover in the field should be reduced to the minimum necessary, since each time it is removed; the circuits are exposed to the humidity.

The electronic circuit is protected by a humidity proof coating, but frequent exposures to humidity may affect the protection provided. It is also important to keep the covers tightened in place. Every time they are removed, the threads are exposed to corrosion, since painting cannot protect these parts. Sealing methods should be employed on conduit entering of the positioner.

IMPORTANT
Avoid to use thread sealant tapes on the air input and outputs connections, since small pieces of this type of sealant may block the air flow inside the positioner, affecting the overall equipment performance.

Although the positioner is practically vibration resistant, it is not recommended to install it near pumps, turbines or other equipment producing too much vibration. If not possible to avoid it, consider using of remote position sensor version.

Mounting

The mounting of positioner **FY303** will depend on actuator type, single (spring return) action or double action and on actuator movement, if it is linear or rotary. Two supports are required for mounting, one for the magnet and the other for the positioner itself. Smar may supply them both since they are specified in the order code.

Additionally, a great variety of customized mounting brackets is available, covering several control valves models from different manufacturers.

Check the availability and select the most adequate mounting bracket to your need, by visiting our web page on the Internet: http://www.smar.com. Select "Valve Positioner" option to access the product specific page. After enter your login and password, click on the **Bracket for FY** link and choose the most appropriate mounting bracket to your application.

See below an example showing the Positioner with rotary and linear magnets.

IMPORTANT
Smar web site (www.smar.com) has options of mounting brackets available for several actuators of several manufacturers and models and the related dimensional drawings.

Rotary Movement

Install the magnet on the valve stem using the magnet support. See the next figure.

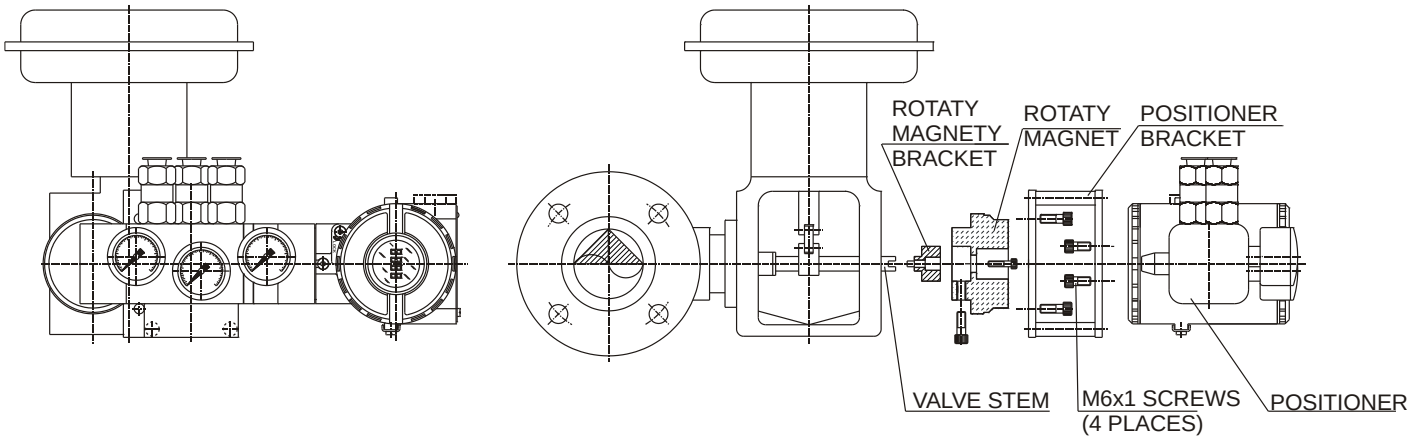


Figure 1.1 - Positioner on Rotary Actuator

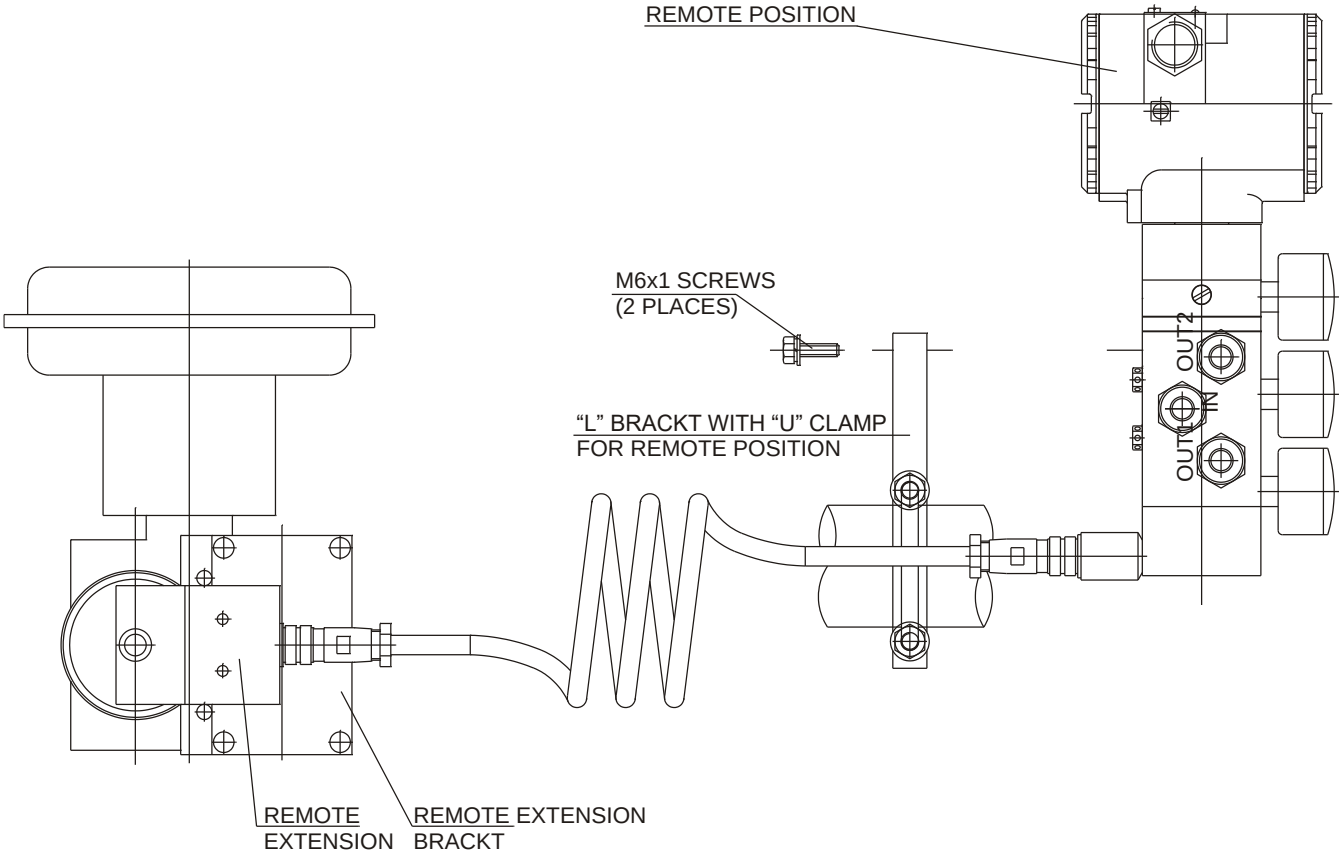


Figure 1.2 – Positioner on Rotary Actuator with Remote Position

Then, install the positioner bracket on the actuator. Usually, the actuator is designed according to the VDI/VDE 3845 standard, and, in this case, tighten the four screws with their lock washers on the proper bracket.

For special supports, refer to specify instructions. After installing the support on the actuator, it is possible to mount the positioner **FY303** on the support by means of the four screws with lock washers.

NOTE

Make sure that the arrow engraved on the magnet coincides with the arrow engraved on the positioner when the valve is in mid travel.
When mounting the magnet, be sure that:

1. There is no attrict between the internal magnet face and the position sensor salience during the travel (rotary or linear), through the magnet.
2. The magnet and the salience of position sensor must not be distant.

A minimum distance of 2 mm and a maximum distance of 4mm are recommended between the magnet external face and the positioner face.

If the installation of the positioner or magnet change, or if there should be any other modification, the positioner will require a recalibration.

As to the type of valve action, refer to paragraph "Pneumatic Connections".

Linear Movement
Install the magnet on the valve stem using its proper bracket, according to Figure 1.3.

Install the positioner bracket on the actuator. The fastening of the actuator bracket may follow the NAMUR/IEC 60534-6-1 standard or be in accordance with the user specified boring. Mount the positioner on the bracket by fastening the four screws in the holes of the pressure gauges opposite face. Use lock washers to avoid loosening the screws.

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

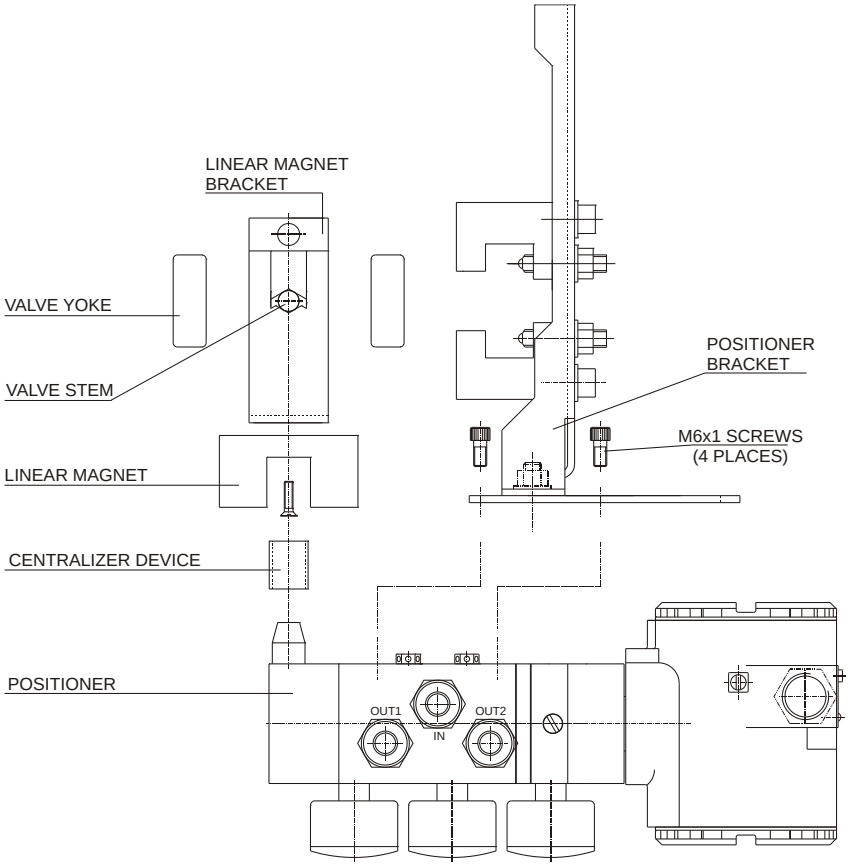


Figure 1.3 - Positioner on Linear Actuator

NOTE

Included in the package content the **centralizer device of linear magnet.** See figure 1.16.

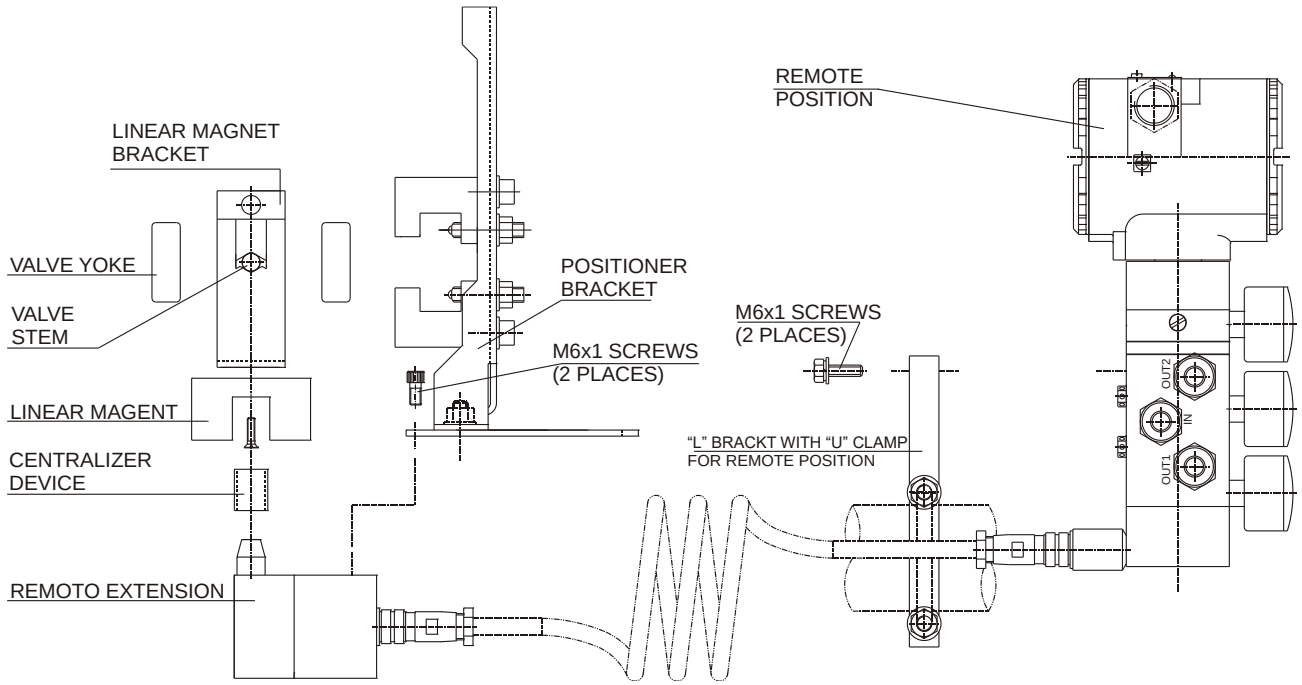


Figure 1.4 – Positioner on Linear Actuator with Remote Position

Make sure the bracket does not obstruct the exhaust outputs.

NOTE
Make sure that the arrow engraved on the magnet coincides with the arrow engraved on the positioner when the valve is in mid travel. When mounting the magnet, be sure that: 1. There is no attrict between the internal magnet face and the position sensor salience during the travel (rotary or linear), through the magnet. 2. The magnet and the salience of position sensor must not be distant. A minimum distance of 2 mm and a maximum distance of 4mm are recommended between the magnet external face and the positioner face. For that, a centralizer device (linear or rotary) must be used.

Case the positioner installation or magnet change or if any other modification is done, the positioner will require a re-calibration. See Section 3 (Setup - for Auto Setup procedure). See item "Pneumatic Connections" as recommended practice to install the positioner to the valve type.

Pneumatic Connections

Air supplied to the positioner **FY303** shall be quality instrument air, i. e., dry, clean and non-corrosive. Refer to the American National Standard. "Quality Standard for Instrument Air" (ANSI/ISA S7.0.01 - 1996).

The **FY303** is supplied with input and outputs air filters; but these filters do not substitute a preliminary instrumentation air treatment. We recommend a periodic cleaning of such filters each 6 months or less, case the air instrument quality is not good.

Air supply pressure to the **FY303** shall be between 1.4 bar (20 psi) and 7 bar (100 psi). In case such requirements cannot be fulfilled, the use of an air pressure regulator is acceptable. Pressure below this range shall affect the positioner performance. Pressure above this range may damage the positioner.

Positioner **FY303** may be supplied with pressure gages. There are taps available for IN, OUT1 and OUT2. Before connecting the pressure gages, make sure that all lines be completely purged.

Valve positioner **FY303** has two pneumatic outputs. They work on opposite directions to open or close the valve.

WARNING
The **FY303** should fail, for example, because of a power failure. The output identified as OUT1 (output 1) goes to zero; while the output identified as OUT2 (output 2) goes to the air supply pressure.

The positioner can have pressure gages (see the ordering code table) attached to the supply air input and in each output. The indications on gages are references only and does not have the same overall positioner accuracy.

Pneumatic connections are identified as IN (input) for the air supply, and OUT1 and OUT2 for Output 1 and Output 2 respectively. Use 1/4 NPT connections. Sealant may be used NPT threads. Connect the air supply tubing to the connection identified as IN. Make sure that the air supply pressure does not exceed the maximum rating accepted by the positioner or actuator.

IMPORTANT
When using tape sealant type on the thread connections, be sure not spread small residues inside, since they may clog the air flow inside the positioner and even impair the equipment efficiency.

There are five exhaust outputs in the **FY303**, all of them fitted with filters. It is very important that such outputs are neither blocked nor obstructed, because the air must circulate freely. In case of painting the Positioner block, remove the filters to avoid their clogging with paint.

All filters shall be inspected to make sure they will not obstruct the outputs.

NOTE
The exhaust hole located at the base of the piezo has a stainless-steel sintered bushing, it is a critical item for Explosion Proof Certification (Ex-d), it cannot be removed if the equipment is used in Classified Areas.

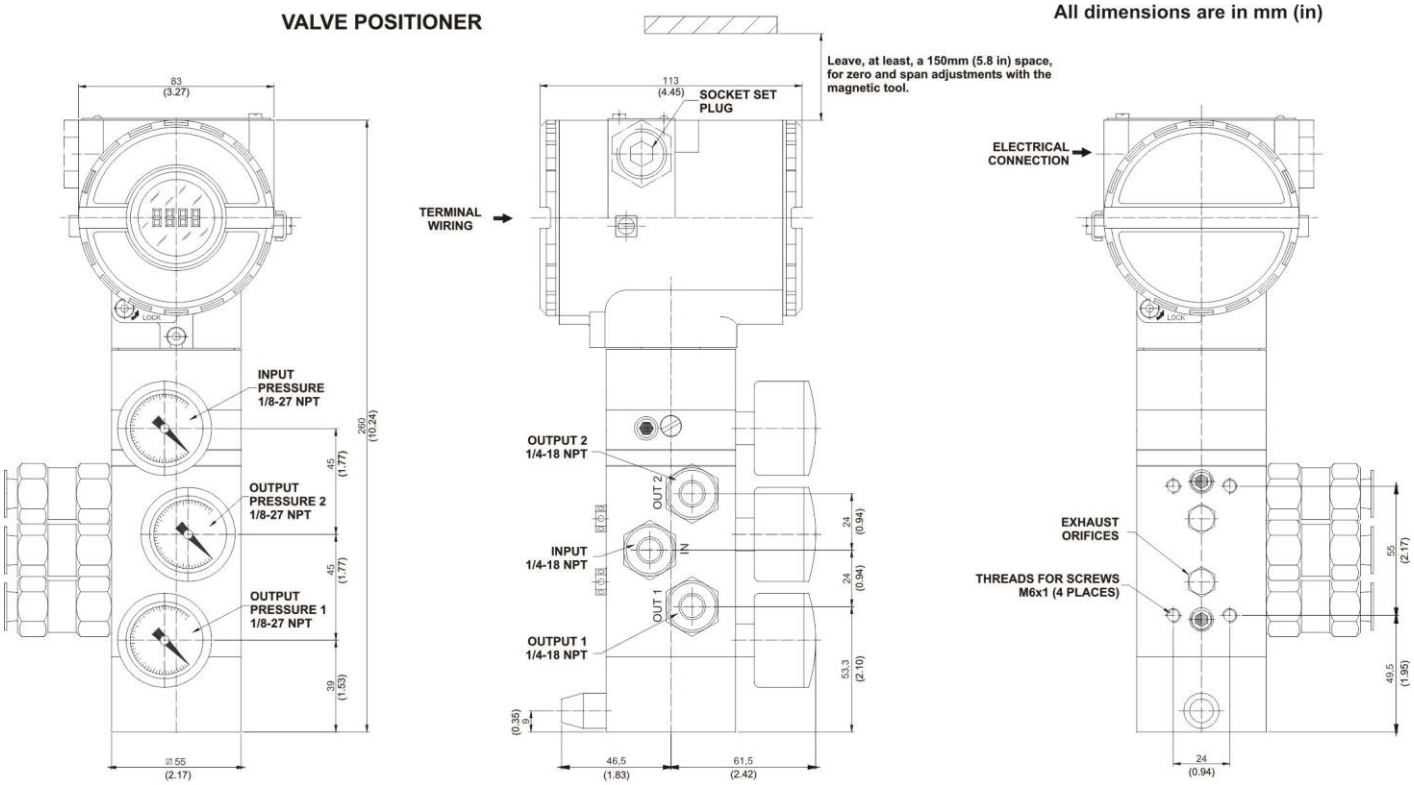
Double Action - Air to Open (Fail Close)
Connect Output 1 (OUT1) of the positioner to the input identified as OPEN in the actuator, and connect Output 2 (OUT2) of the positioner to the input CLOSE in the actuator.

Double Action - Air to Close (Fail Open)
Connect Output 2 (OUT2) of the positioner to the input identified as OPEN in the actuator, and connect Output 1 (OUT 1) of the positioner to the input CLOSE of the actuator.

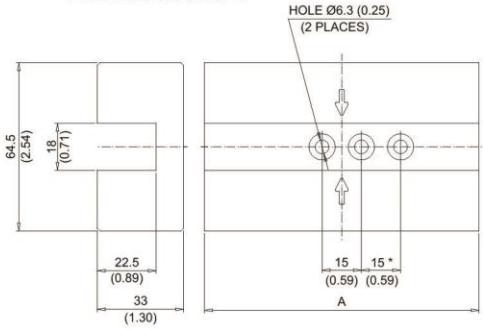
Single Action
Connect Output 1 (OUT1) of the positioner to the input of the actuator. Use a plug to block Output 2 (OUT2).

VALVE POSITIONER

All dimensions are in mm (in)



LINEAR MAGNET

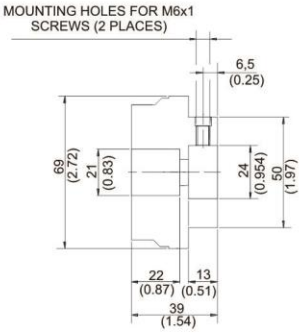


TRAVEL	DIMENSION A
UP TO 30 mm (1.18)	67 mm (2.64)
UP TO 50 mm (1.97)	105 mm (4.13)
UP TO 100 mm (3.94)	181 mm (7.12)

*ONLY FOR 50 AND 100 mm TRAVELS.

Note: Dimensions in mm (in)

ROTARY MAGNET



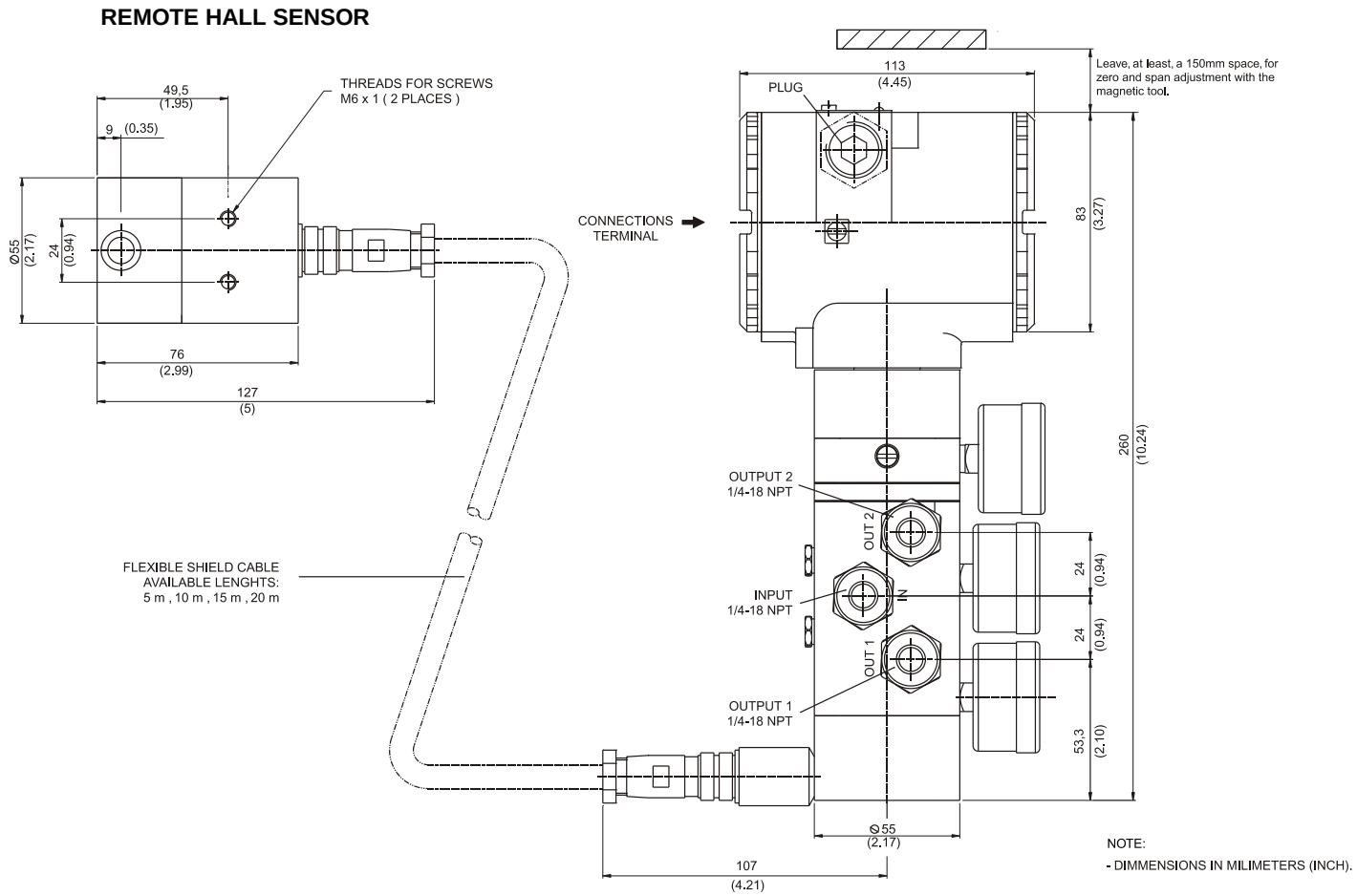


Figure 1.5 - FY303 Dimensional Drawings

Electronic Housing Rotating

The electronic housing can be rotated in order to offer a better position to the digital display and/or better access to the field connections. To rotate it, release the housing rotation set screw. See figure 1.6. The local indicator can also be rotated. See section 4, figure 4.3.

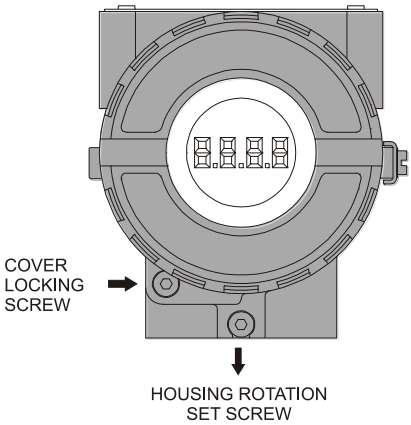


Figure 1.6 - Cover Locking and Housing Rotation Set Screw

Reach the wiring block by removing the electrical connection cover. This cover can be locked closed by the cover locking screw. To release the cover, rotate the locking screw clockwise. See figure 1.7.

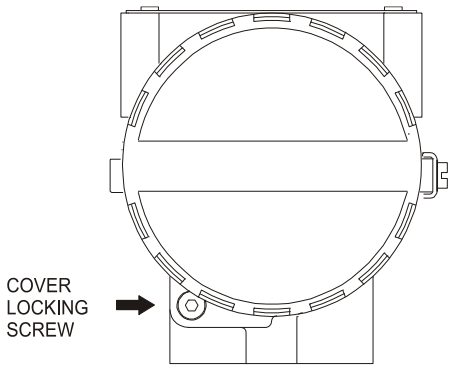


Figure 1.7 - Cover Locking Bolt

Electric Wiring

The access to the signal cables to the terminal wiring can be done through of one of the electronic housing orifices and can be connected to a conduit. The wiring block has screws on which fork or ring-type terminals can be fastened. See figure 1.8. Use a plug to block the electrical connection not used. Tight it well and use thread sealing tape.

IMPORTANT
If the user opts for protection against noise induced by atmospheric discharges, overloads, welding machines and machines in general, it will be necessary to install a transient protector. (Protector purchased separately).

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

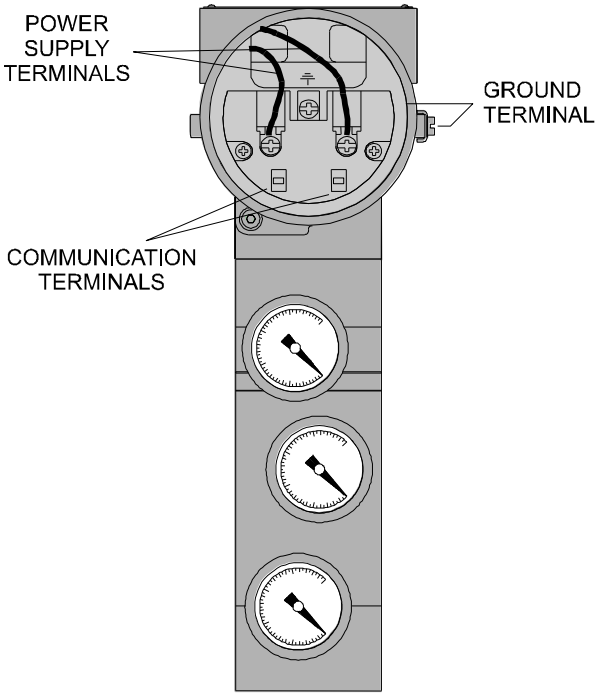


Figure 1.8 - Wiring Block

The **FY303** 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 Profibus devices may be connected on the same bus.

The **FY303** is powered via bus. The limit for such devices is according to the DP/PA coupler limitations for one bus for non-intrinsically safe requirement. In hazardous area, the number of

devices may be limited by intrinsically safe restrictions, according to the coupler DP/PA and barriers limitations.

HAZARDOUS AREAS
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 it 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-incentive 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.
Explosion-proof, non-incendive, and intrinsically safe certifications are standard for the FY303. Consult the website www.smar.com to obtain all available certifications.

The Figure 1.9 shows the correct installation of the conduit, to avoid penetration of water, or other substance, which may cause malfunctioning of the equipment.

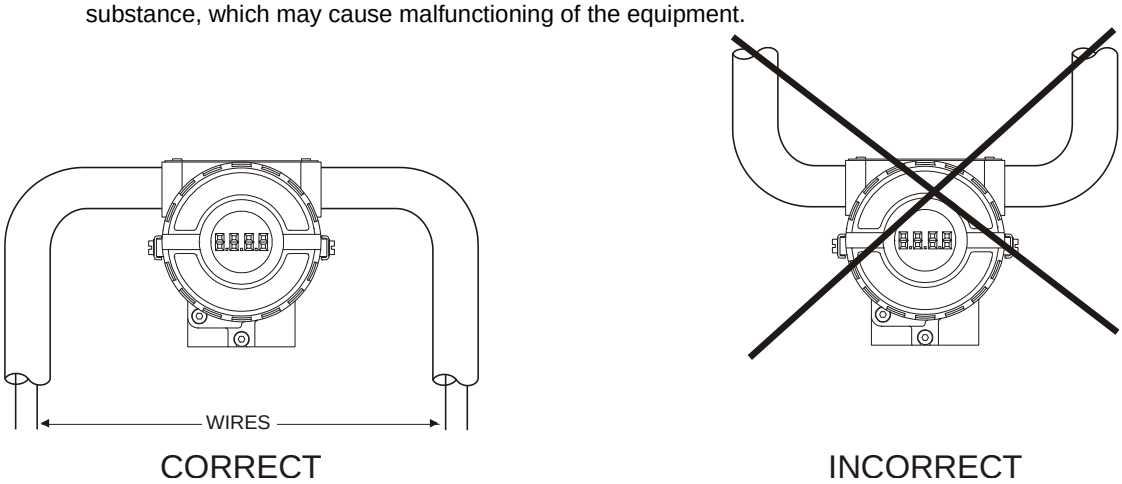


Figure 1.9 - Conduit Installation Diagram

The **FY303** is protected against reverse polarity, and can withstand ± 35 Vdc without damage, but it will not operate when in reverse polarity.

Topology and Network Configuration

Bus topology 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.

In following figures the DP/PA link depends on the application needs.

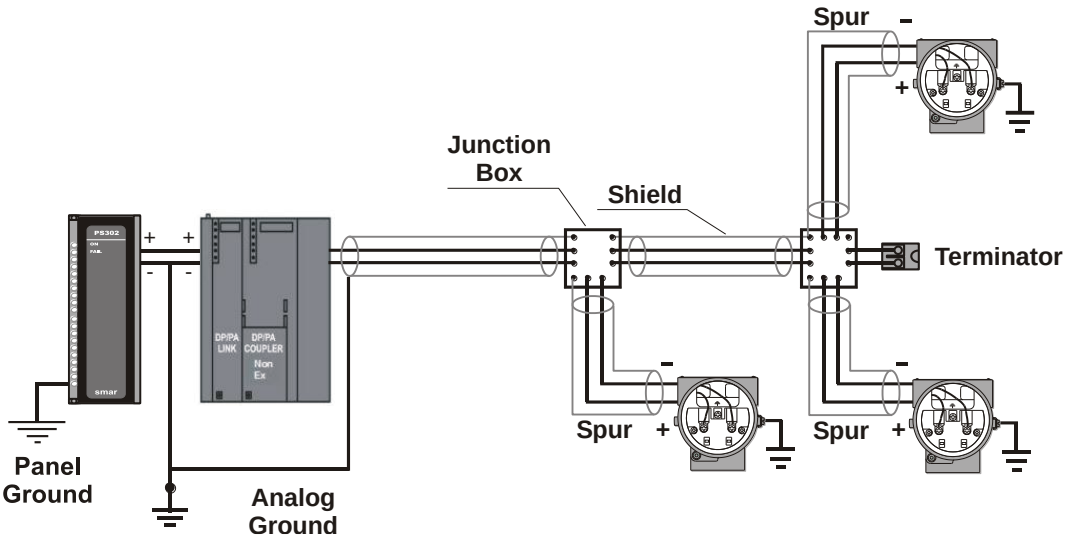


Figure 1.10 - Bus Topology

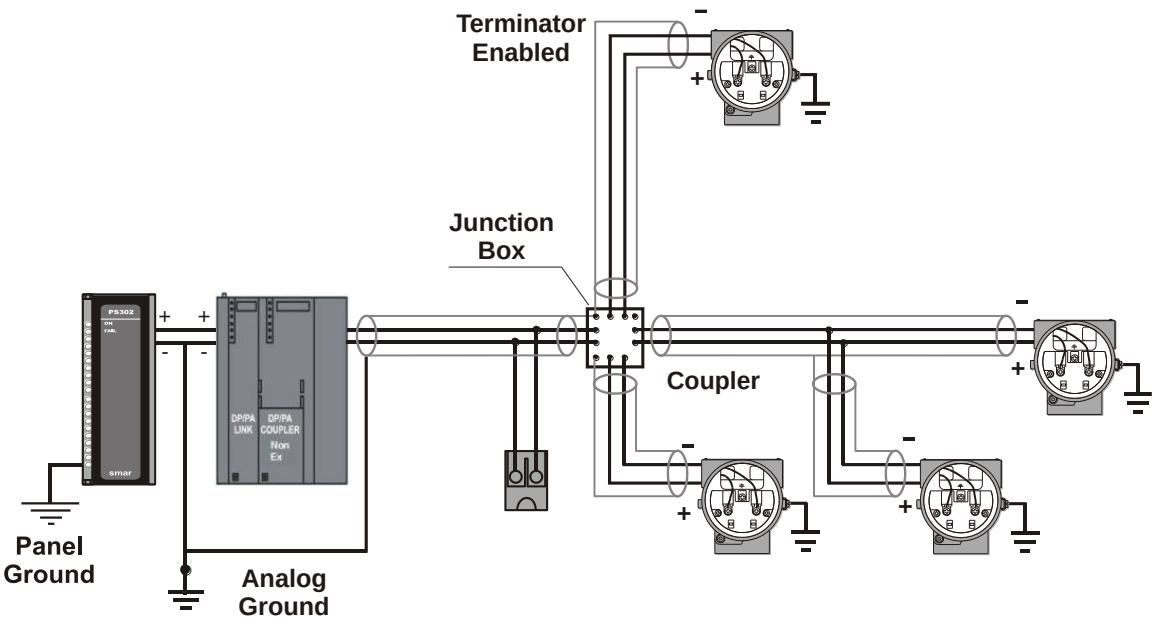


Figure 1.11 - Tree Topology

Intrinsic Safety Barrier

When the PROFIBUS PA positioner is in an area requiring intrinsic safety, a barrier must be used on the trunk between the power supply and the DP/PA coupler, when it is Non-Ex type.

Use of **DF47-17** (Intrinsic safety barrier) is recommended.

Jumper Configuration

In order to work properly, the jumpers J1 and W1 located in the **FY303** main electronic board must be correctly configured.

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

Power Supply

The **FY303** 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.

Air Supply Requirements

Before the air supply is connected to the positioner, we recommend the hose is opened freely for 2 to 3 minutes to allow any contamination to be blown out. Direct the air jet into a large paper bag to trap any water, oil, or other foreign materials. If this indicates that the air system is contaminated, it should be properly cleaned.

As soon as the positioner is connected and started, internal air leakage will provide protection against corrosion and prevent the ingress of moisture. For this reason, the air supply pressure should always be kept on.

Recommendations for an Instrument Air System

Instrument air quality shall be superior to that of industrial compressed air. Humidity, airborne particles and oil may impair the instrument operation, either temporarily or permanently in case of internal parts wearing.

As per standard *ANSI/ISA S7.0.01 – 1996 - Quality Standard for Instrument Air*, instrument air shall have the following characteristics:

Dew point	10°C below minimum instrument temperature
Size of particles (airborne)	40 µm (maximum)
Oil content	1 ppm w/w (maximum)
Contaminants	free from corrosive flammable gases

This standard recommends that the compressor intake be located in an area free from process spills and fitted with and adequate filter. It also recommends the use of non-lubricated type compressors, in order to prevent air contamination by lubricating oil. Where lubricated type compressors are adopted, there shall be used means to make the air oil free.

The figures 1.12 and 1.13 show a typical system for air supply and air quality conditioning.

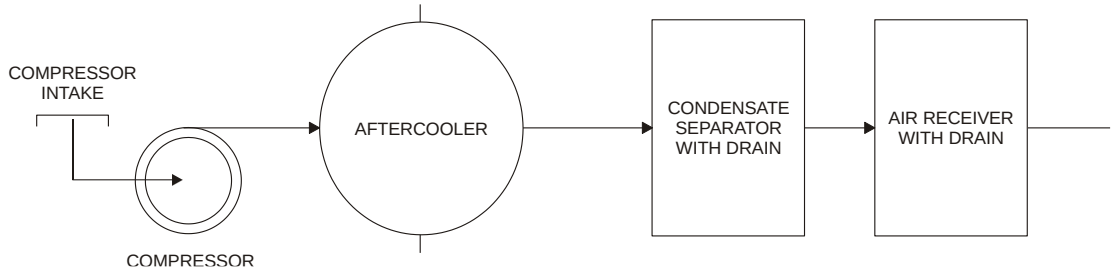


Figure 1.12 - Air Supply System

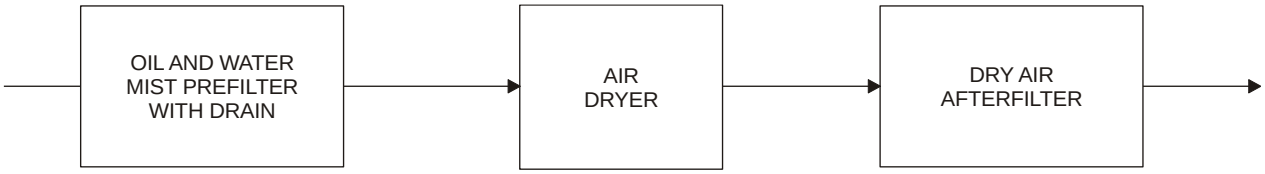


Figure 1.13 - Air Quality Conditioning System

Rotary and Linear Magnet

Magnet models are linear and rotary, for utilization on linear and rotary actuators, respectively.

Figure 1.14 – Linear and Rotary Magnet Models

Magnet Centralizer Device

NOTE
Centralizer device of linear magnet is used for all type of linear bracket.

Figure 1.15 – Centralizer device of linear magnet

NOTE
Centralizer device of linear magnet is used only for universal rotary bracket. *Supports universal rotating bracket only, not packaged with FY.

***Figure 1.16 - Centralizer* device of rotary magnet**

Remote Hall Sensor

The remote Hall magnetic sensor is an accessory recommended for high temperature and extreme vibration applications. It prevents excessive wear of the equipment and, consequently, the reduction of its useful time.

Figure 1.17 - Remote Hall Sensor

The electric signals on the remote sensor's connection to que equipment 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 for excellent protection against electromagnetic interference, but despite this protection avoid the cable sharing the same conduit with other cables.
The connector for remote Hall sensor is easy handling and simple installation.

See the installation procedure:

Figure 1.18 - Connecting the Cable to the Remote Hall Sensor

Figure 1.19 - Connecting the Cable to the Positioner

Installations in Hazardous Areas

See Appendix "A" for additional certification information.

OPERATION

Functional Description - Output Module

The main parts of the output module are the pilot, servo, Hall Effect sensor and the output control circuit.

The control circuit receives a digital setpoint signal from the CPU and a feedback signal from the Hall Effect sensor.

The pneumatic circuit is based on a well-known and widely adopted technology, which is described on item Nozzle-Flapper and Spool valve.

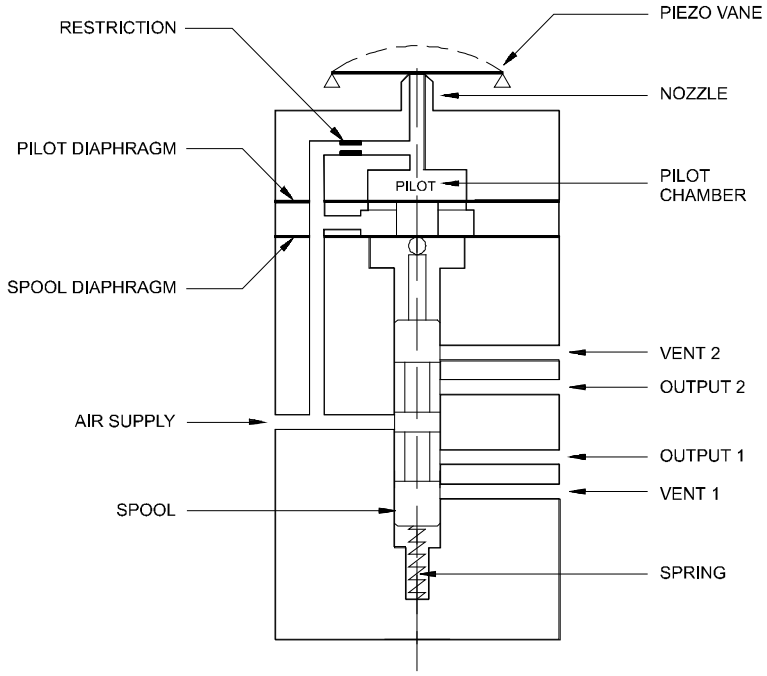


Figure 2.1 - Pneumatic Transducer Schematic

A piezoelectric disk as flapper in the pilot stage. The flapper is deflected when the control circuit applies a voltage. A small stream of air flowing through the nozzle is obstructed causing an increase in pressure in the pilot chamber; this is called the pilot pressure.

The pilot pressure is too low, with flowing capacity, and for this reason it must be amplified in the servo section. The servo section includes a diaphragm in the pilot chamber and a smaller one in the spool chamber. The pilot pressure applies a force at the pilot chamber's diaphragm which, in the equilibrium state, will be equal to the force applied by the spool valve at the smaller diaphragm which is in the spool chamber.

Therefore, upon every position change caused by the positioner, the pilot pressure increases or decreases as explained in the pilot stage section; such change in pilot pressure causes an upward or downward valve travel which alters the pressure at output 1 and output 2 until a new equilibrium is reached, which results in a new valve position.

Functional Description-Electronics

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

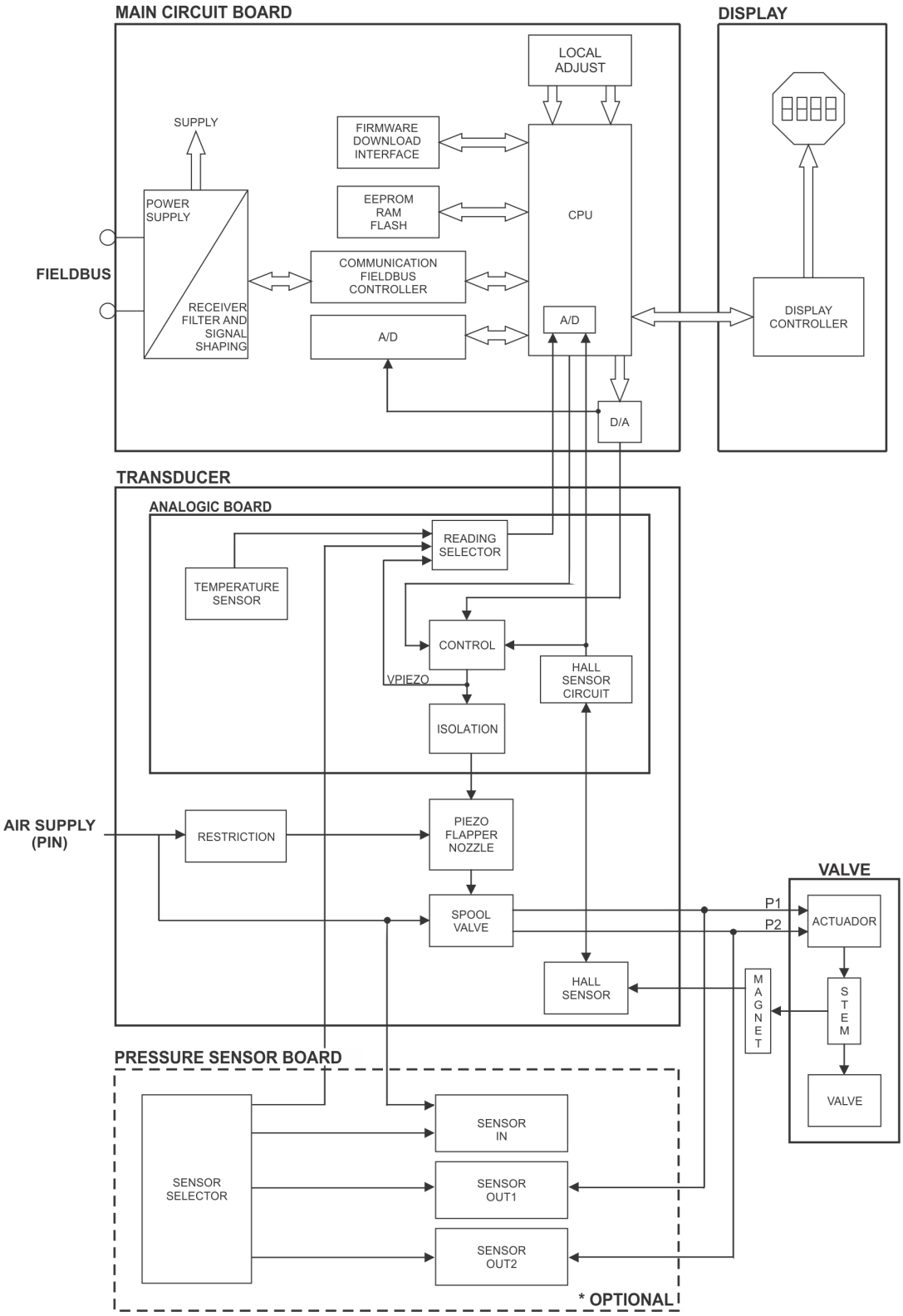


Figure 2.2 - FY303 Block Diagram

D/A
Receives the signal from the CPU and converts it to an analog voltage proportional the desired position, used by the control.

A/D
Receives the signal from the Hall Sensor and converts it to a digital value proportional to the actual valve position.

Control
Controls the valve position according to the data received from the CPU and the Hall effect sensor feedback.

Hall Effect Sensor
Measures the position actual and feedback to the control and CPU.

Temperature Sensor
Measures the temperature of the transducer assembly.

Isolation
Its function is to isolate the PROFIBUS PA signal from the piezoelectric signal.

EEPROM
A non-volatile memory which stores configuration data as a backup.

Central Processing Unit (CPU), RAM, PROM and EEPROM
The CPU is the intelligent portion of the positioner, being responsible for the management and operation of block execution, self-diagnostics and communication. The program is stored in PROM. 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 is stored. Examples of such data are: calibration and valve configuration.

Communication Controller
A monitor line activity, modulates and demodulates communication signals and inserts and deletes start and end delimiters.

Power Supply
The positioner circuit receives supply from a 9 to 32 Vdc power supply. Use of **PS302** is recommended.

Display Controller
Receives data from the CPU and drives the (LCD) Liquid Crystal Display.

Local Adjustment
There are two switches that are magnetically activated, without any external electrical or mechanical contact, through a magnetized cable screwdriver.

Piezo Flapper Nozzle
The unit flapper nozzle converts the movement of piezoelectric into a pneumatic signal to control pressure in the pilot chamber.

Restriction
The restriction and the nozzle form a pressure-divided circuit. Air is supplied to the nozzle through a restriction.

Spool
The spool ensures a quick valve positioning by providing a greater air flow than one provided by the restriction.

Pressure sensors (optional)
They read the Positioner input and output pressures for diagnostic purposes.

NOTE
Pressure sensor board is optional (in ordering code section 5 it is option K1).

Pressure Sensor Selector
Select the sensor to be read.
IN sensor: Measures the input pressure. (Air supply).
OUT1 sensor: Measures the pressure of Output 1.
OUT2 sensor: Measures the pressure of Output 2.

Introduction to Profibus Application

From a PROFIBUS point of view, the **FY303** is not an assembly of electronics, housing and sensor forming a positioner, but a network node containing function blocks.

Basically, it contains one output transducer block, one resource block, one display transducer block and Analog Output block.

These blocks are models of the functionality that the **FY303** provides for a control system. They can loosely be said to make up part of the application that is performed in the **FY303**.

Function Blocks

Models the basic user configurable functionality of the device. Typically this functionality was previously available in individual devices. For example, the analog output block provides the functionality of what is known as a positioner. It makes the Fieldbus signal available to the **FY303** output hardware. It also optionally performs output reversing.

All information regarding to Function Blocks are available on the “Function Blocks Instruction Manual”.

Transducer Blocks

These are responsible for the interface between the function blocks and the **FY303** output channel hardware.

Output transducer block
It is responsible for the processing of the output signal, such as output characterization and trim.

Display transducer block
It is responsible for the display and local adjustment.

Physical Block

It is responsible for monitoring the operation of the device. It also contains device information such as serial equipment number.

The Local Indicator

The local indicator is required for signaling and operation in local adjustment. The parameters desired by the user to be viewed on the LCD display should be configured in the display block.

During normal operation, the **FY303** remains in monitoring mode and the display indicates the valve position in percentage. There is an option to select, in the configurator, the setpoint on the display. The local programming mode is activated by the magnetic tool when inserted in the hole marked by the letter “Z”, on top of the housing.

The possible configuration and monitoring operation are shown on.

The **FY303** initializes the position indication on the display after being powered up. It shows FY303 model and software version (X.XX).

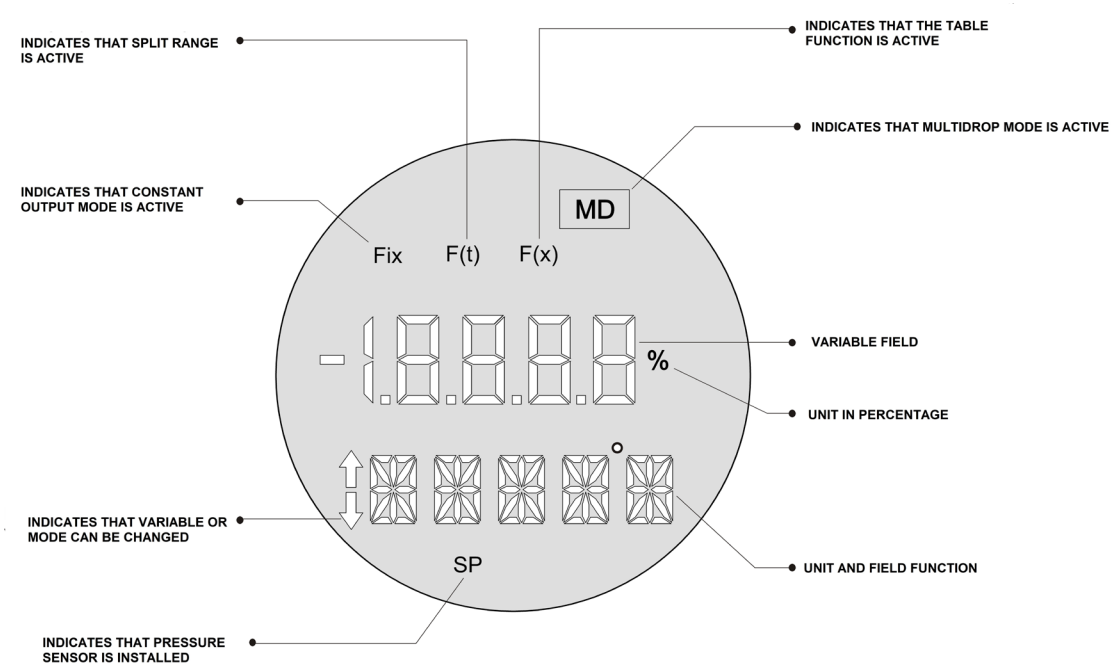


Figure 2.3 - Local Indicator

Monitoring

During normal operation, **FY303** remains in the monitoring mode. The display simultaneously shows value and some other information. Figure 2.4 shows the positioning (in percentage) of the valve.

The normal indicator is interrupted when the magnet key is inserted in the hole marked with the letter ”Z“ (Local Adjustment), entering the programming mode via local adjustment.

On the indicator can be seen the result of inserting the key in holes Z and S, which give, respectively, movement and actuation in the selected options.

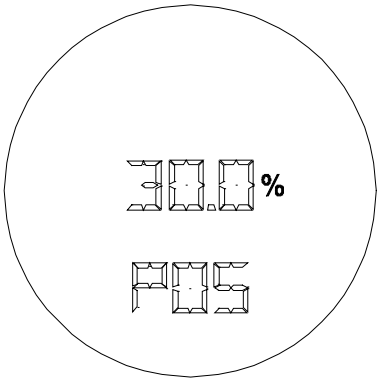


Figure 2.4 - Typical Indicator

CONFIGURATION

This section describes the characteristics of the blocks in the **FY303**. They follow the Profibus PA specifications. The transducer blocks, output transducer block and display, have some special features implemented as a “specific structure”.

The **FY303** contains one Analog Output block, one physical block, one display transducer block and one transducer block.

For explanation and details of function blocks, see the “Profibus PA Function Blocks Manual”.

The 303 Smar family is integrated in **ProfibusView**, from Smar and **Simatic PDM**, from Siemens. It is possible to integrate any 303 Smar devices into any configuration tool for Profibus PA devices. It is necessary to provide a Device Description or Drive according to the configuration tool. In this manual is taken several examples using **ProfibusView** and **Simatic PDM**. It can also be configured using the DTM that Smar provides for free on the web.

Offline Configuration

1. First run “Download to PG/PC” option to assure valid values.
2. Run after the Menu Device option to configure the required parameters using the related menus.

NOTE
It is not advisable to use the “Download to Device” option. This function can misconfigure the equipment.

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 allows the transducer block to execute its algorithm 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 a Transducer Block

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 manufacturers’ 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 configuration tool identifies each method associated to the parameters and enables the interface to it. These methods are described in the communication DTM or DD.

Functional Diagram of the Positioner Transducer Block

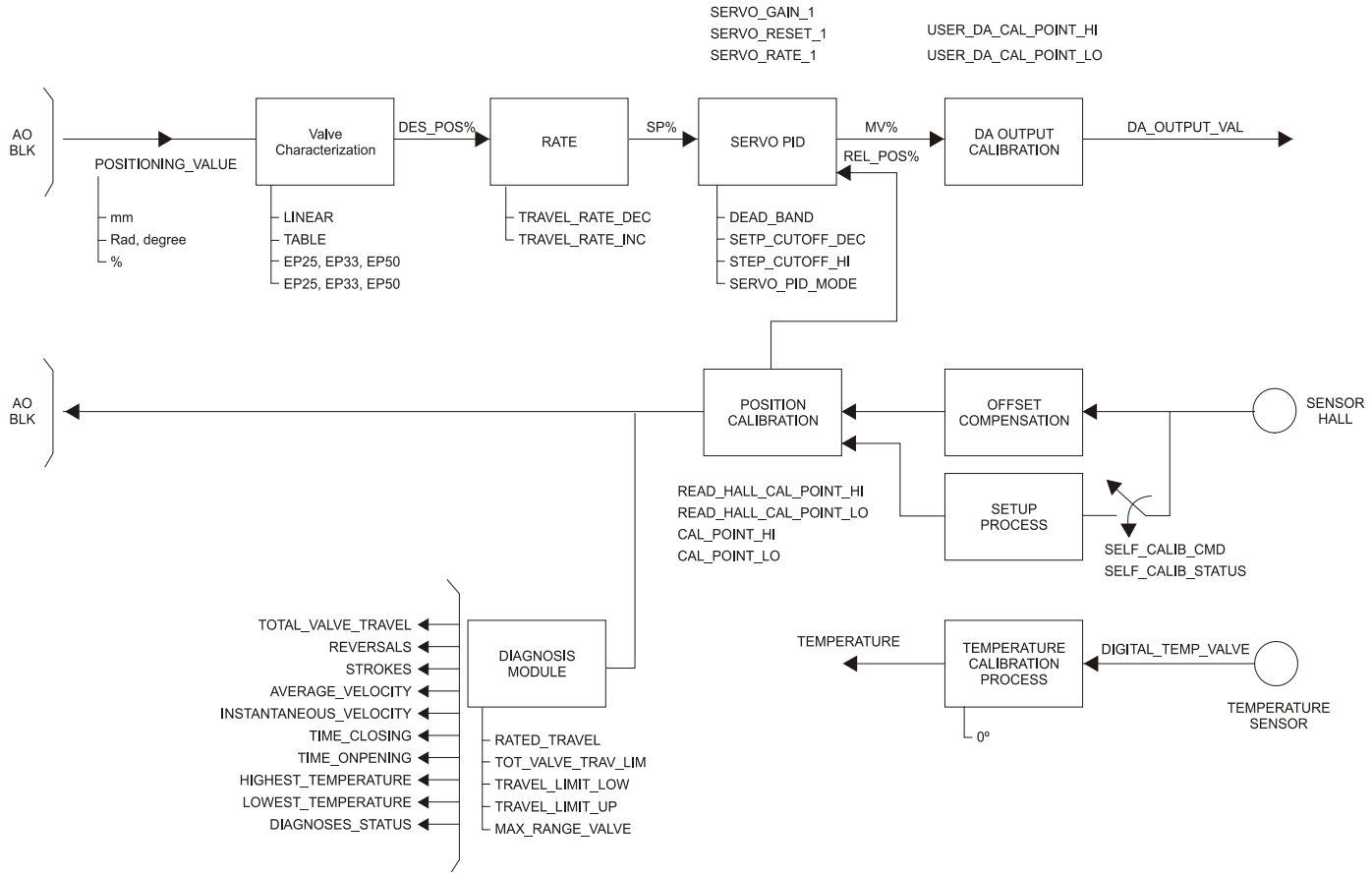


Figure 3.1 - Functional Diagram of the Positioner Transducer Block

Transducer Block Standard Parameter Descriptions

Parameter	Transducer Block Description
ACTUATOR_ SER_NUM	Serial-number of the actuator belonging to the positioner or the electronic device.
ACTUATOR_ACTION	Fail-Safe position for power-loss of the actuator, the valve: 0 = not initialized 1 = opening (100%) 2 = closing (0%) 3 = none / remains in actual position
ACTUATOR_MAN	Name of Actuator-Manufacturer.
ACTUATOR_TYPE	Type of actuator: 0 = electro-pneumatic 1 = electric 2 = electro-hydraulic 3 = others
ACT_STROKE_TIME_DEC	Minimum of time to move from OPEN to CLOSE position (in sec.) for total system (positioner, actuator and valve). Measured while commissioning.
ACT_STROKE_TIME_INC	Minimum of time to move from CLOSE to OPEN position (in sec.) for total system (positioner, actuator and valve). Measured while commissioning.
ADD_GEAR_ID	Manufacturer specific type identification of the additional component (e.g. a gearbox, booster) mounted between the actuator and valve.
ADD_GEAR_INST_DATE	Installation date of the additional component (e.g. gearbox, booster) mounted between the actuator and valve
ADD_GEAR_MAN	Manufacturer name of the additional component (e.g. gearbox, booster) mounted between the actuator and valve.
ADD_GEAR_SER_NUM	Serial number of the additional component (e.g. gearbox, booster) mounted between the actuator and valve.
DEAD BAND	Dead band in percent of travel span. Travel span correspondents to OUT_SCALE.
DEVICE_CALIB_DATE	Date of last calibration of the device.
DEVICE_CONFIG_DATE	Date of last configuration of the device.
LIN_TYPE	Type of linearization. 0 = no linearization (mandatory) 1 = linearization table (optional)
FEEDBACK_VALUE	The actual position of the final control element in units of OUT_SCALE.
POSITIONING_VALUE	The actual command variable for the final control element in units of OUT_SCALE. Status BAD will drive the actuator to the fail-safe position defined by ACTUATOR_ACTION.
RATED_TRAVEL	Nominal stroke of the valve in units of OUT_SCALE.
SELF_CALIB_CMD	0 = default value; no reaction of the field device 2 = start self-calibration / initialization 255 = abort current calibration-procedure
SELF_CALIB_STATUS	Result or status of the device-specific (manufacturer specific) calibration-procedure. Smar: 0 = Self Calibration OK. 3 = No magnet part detected. 4 = Error in mechanical system. 11 = Timeout. 12 = Pressure problem.
SERVO_GAIN_1	Proportional-action coefficient for both moving directions.
SERVO_RATE_1	Derivative-action coefficient for both moving directions.
SERVO_RESET_1	Integral-action coefficient for both moving directions.
SETP_CUTOFF_DEC	When the servo setpoint goes below the defined percent of span, the position goes to the limit position CLOSE. With electro-pneumatic actuator, this is done by totally ventilate/filling of the actuator (ref. to fail-safe position.) With electric actuator, the actuator goes motor-driven to the limit position CLOSE.
SETP_CUTOFF_INC	When the servo setpoint goes above the defined percent of span, the position goes to the limit position OPEN. With electro-pneumatic actuator, this is done by totally ventilate/filling of the actuator (ref. to fail-safe position.)
TAB_ENTRY	The index parameter identifies which element of the table is in the X_VALUE and Y_VALUE parameter currently
TAB_X_Y_VALUE	The X_Y_VALUE parameter contains one value couple of the table
TAB_MIN_NUMBER	For device internal reasons (e.g. for calculation), sometimes it is necessary to use a certain number of table values in minimum. This number is provided in the TAB_MIN_NUMBER parameter.
TAB_MAX_NUMBER	TAB_MAX_NUMBER is the maximum size (number of X_VALUE and Y_VALUE values) of the table in the device.
TAB_ACTUAL_NUMBER	Contains the actual numbers of entries in the table. It shall be calculated after the transmission of the table is finished.

Parameter	Transducer Block Description
TAB_OP_CODE	The modification of a table in a device influences the measurement or actuation algorithms of the device. Therefore an indication of a starting and an end point is necessary. The TAP_OP_CODE controls the transaction of the table. 0: not initialized 1: new operation characteristic, first value (TAB_INDEX=1), old curve cleared 2: reserved 3: last value, end of transmission, check table, swap the old curve with the new curve, and actualize ACTUAL_NUMBER. 4: delete point of table with actual index (optional), sort records with increasing Charact-Input-Value, assign new indexes, and decrement CHARACT_NUMBER. 5: insert point (Charact-Input-Value relevant) (optional), sort records with increasing Charact-Input-Value, assign new indexes. Increment CHARACT_NUMBER. 6: replace point of table with actual index (optional). It is possible to read a table or parts of the table without start and stop an interaction (TAB_OB_CODE 1 and 3). The start is indicated by set TAB_ENTRY to 1.
TAB_STATUS	It is common to provide a plausibility check in the device. The result of this check is indicated in the TAB_STATUS parameter. 0: not initialized 1: good (new table is valid) 2: not monotonous increasing (old table is valid) 3: not monotonous decreasing (old table is valid) 4: not enough values transmitted (old table is valid) 5: too many values transmitted (old table is valid) 6: gradient of edge too high (old table is valid) 7: Values not excepted (old values are valid) 8 - 127 reserved > 128 manufacturer specific
TOTAL_VALVE_TRAVEL	Accumulated valve travel in nominal duty cycles.
TOT_VALVE_TRAV_LIM	Limit for the TOTAL_VALVE_TRAVEL in nominal duty cycles.
TRAVEL_LIMIT_LOW	Lower limit of the valve position in percent of travel span. Travel span correspondents to OUT_SCALE.
TRAVEL_LIMIT_UP	Upper limit of the valve position in percent of travel span. Travel span correspondents to OUT_SCALE.
TRAVEL_RATE_DEC	Configurable seconds to full span change (closing time of the valve) in seconds.
TRAVEL_RATE_INC	Configurable seconds to full span change (opening time of the valve) in seconds.
VALVE_MAINT_DATE	Date of last valve maintenance.
VALVE_MAN	Name of Valve Manufacturer.
VALVE_SER_NUM	Serial-number of the valve belonging to the positioner or the electronic device.
VALVE_TYPE	Type of valve: 0 = linear moving valve, sliding valve 1 = rotary moving valve, part-turn 2 = rotary moving valve, multi-turn

Table 3.1 - Transducer Block Standard Parameter Description

Transducer Block Specific Parameter Descriptions

Parameter	Transducer Block Description
AIR_TO	Air to Open/Close. {0, "Open"}, {1, "Close"}
CAL_POINT_HI	The highest calibrated point.
CAL_POINT_LO	The lowest calibrated point.
CAL_MIN_SPAN	The minimum calibration span value allowed
CAL_UNIT	Engineering units code for the calibration values, %(1342).
FEEDBACK_CAL	The position value used to correct a calibration.
CAL_CONTROL	Enable and disable a calibration method.
BACKUP_RESTORE	This parameter is used to do backup or to restore configuration data. { 0, "None" }, { 1, "Factory Cal Restore" }, { 2, "Last Cal Restore" }, { 3, "Default Data Restore" }, { 5, "Sensor Data Restore" }, { 11, "Factory Cal Backup" }, { 12, "Last Cal Backup" }, { 15, "Sensor Data Backup" }
SECONDARY_VALUE	The secondary value related to the sensor.
SECONDARY_VALUE_UNIT	The engineering units to be used with the secondary value, °C (1001).
CAL_TEMPERATURE	The temperature value used to calibrate the temperature sensor.
SERVO_PID_BYPASS	Enable and disable the servo PID. {0, "Disable" }, {1, "Enable" }
SERVO_PID_ERROR_PER	The percent error value for the servo PID.
SERVO_PID_INTEGRAL_PER	The percent integral value for the servo PID.
SERVO_MV_PER	The percent measured value for the servo PID.
MODULE_SN	The module manufacturer identification number.
REVERSALS	Number of reversals.
STROKES	Number of strokes.
AVERAGE_VELOCITY	The average velocity of valve.
INSTANTANEOUS_VELOCITY	The instantaneous velocity of valve.
TIME_CLOSING	The time to go from 100.0% to 0.0%.
TIME_OPENING	The time to go from 0.0% to 100.0%.
MAX_RANGE_VALVE	The maximum range valve.
HIGHEST_TEMPERATURE	The highest measured temperature.
LOWEST_TEMPERATURE	The lowest measured temperature.
DIAGNOSES_STATUS	Indicates the status of diagnoses: { 0, "None"}, { 2, "Output Module Not Initialized"}, { 4, "No Valve Movement or Slow Valve Movement or Low Air Supply or No Magnet Detected"}, { 6, "(No Valve Movement or Slow Valve Movement or Low Air Supply or No Magnet Detected) and (Output Module Not Initialized)"}, { 8, "Travel Limit Exceeded"}, { 10, "Travel Limit Exceeded and Output Module Not Initialized"}, { 12, "Travel Limit Exceeded and (No Valve Movement or Slow Valve Movement or Low Air Supply or No Magnet Detected)"}, { 14, "(Travel Limit Exceeded) and (No Valve Movement or Slow Valve Movement or Low Air Supply or No Magnet Detected) and (Output Module Not Initialized)"}, { 16, "Temperature Out of work range"}, { 18, "Temperature Out of work range and Output Module Not Initialized"}, { 20, "Temperature Out of work range and (No Valve Movement or Slow Valve Movement or Low Air Supply or No Magnet Detected)"}, { 22, "Temperature Out of work range and (No Magnet Detected and Output Module Not Initialized)"}, { 24, "Travel Limit Exceeded and Temperature Out of work range"}, { 26, "Travel Limit Exceeded and Temperature Out of work range and Output Module Not Initialized"}, { 28, "Travel Limit Exceeded and Temperature Out of work range and (No Valve Movement or Slow Valve Movement or Low Air Supply or No Magnet Detected)"}, { 30, "Travel Limit Exceeded and Temperature Out of work range and (No Valve Movement or Slow Valve Movement or Low Air Supply or No Magnet Detected) and Output Module Not Initialized"}, { 32, "Output Module Not Detected"}
DIGITAL_HALL_VALUE	Value and Status for Hall sensor.
HALL_COMPENSATED	Value for Hall sensor after compensation of offset.

Parameter	Transducer Block Description
HALL_OFFSET_CONTROL	Enable and disable for offset compensation. {0, "Disable"}, {1, "Enable"}
READ_HALL_CAL_POINT_HI	The highest calibrated point for Hall sensor.
READ_HALL_CAL_POINT_LO	The lowest calibrated point for Hall sensor.
DA_OUTPUT_VALUE	Value and status for DA output.
USER_DA_CAL_POINT_HI	The highest calibrated point for DA output.
USER_DA_CAL_POINT_LO	The lowest calibrated point for DA output.
PIEZO_ANALOG_VOLTAGE	The analog voltage for piezo.
POT_DC	The value for POT DC.
MAIN_LATCH	Main analog switch used by hardware.
XD_ERROR	Indicates the condition of calibration process according to: { 16, "Default value set"}, {22, "Applied process out of range"}, {26, "Invalid configuration for request"}, {27, "Excess correction"}, {28, "Calibration failed"}
MAIN_BOARD_SN	The electronic main board serial number.
EEPROM_FLAG	This parameter is used to indicate EEPROM saving process. { 0, "False"}, { 1, "True"}
ORDERING_CODE	Indicates information about the sensor and control of factory production.
SETUP_PROGRESS	Indicates self-calibration progress
DEV_MODEL	Indicates the main model of the equipment
MANUFACT_ID	Indicates the code that identifies the manufacturer
ACP	Parameter for setting the setup sensitivity for ACP (pneumatic cylindrical actuators)
COEFF_PRES_POL	Coefficient of pressure polynomial (not used)
POLYNOMIAL_SENS_VERSION	Pressure polynomial version (not used)
SENSOR_PRESS_UNIT	Pressure unit of pressure sensor
SENSOR_CAL_SELECTED	Selets the pressure sensor
SENSOR_CAL_POINT_HI	Upper calibration value of selected pressure sensor
SENSOR_CAL_POINT_LO	Lower calibration value of selected pressure sensor
SENSOR_PRESS_IN	Input pressure sensor value
SENSOR_PRESS_OUT1	Output 1 pressure sensor value
SENSOR_PRESS_OUT2	Output 2 pressure sensor value
SENSOR_PRESSURE_LOWER_LIMIT	Pressure sensor lower limit
SENSOR_PRESSURE_UPPER_LIMIT	Pressure sensor upper limit
SENSOR_PRESSURE_INSTALED	Whether or not the pressure sensor is installed
SENSOR_PRESSURE_STATUS	Status of pressure sensor
DEVIATION_ENABLE	Enables the deviation diagnostic
DEVIATION_TIME	It is the time in seconds which the valve must exceed the deviation dead band before an alert is generated on CHECKBACK parameter of AO function block
DEVIATION_DEAD_BAND	It is the magnitude value of valve deviation, in percent of travel.
HALL_FILTER	Hall sensor reading filter that can be used in slow actuators. When during the setup process it stops at 60%, this value must be reduced, recommending 0.15.
TRD_ENABLE_PST	Used to enable the PST (Enable = 0xff, it only allows changes if the TRD_TEST_TYPE_PST is in MANUAL_MODE (0x00, AUTO_MODE = 0x01). When in AUTO_MODE, the method controls the writing of the TRD_ENABLE_PST.
TRD_TEST_TYPE_PST	It is used to select the type of test. If in MANUAL_MODE, the test will be executed only once and after that it will set the TRD_ENABLE_PST parameter to DISABLE (0x00). Under error conditions, this parameter will be forced to STOP_MODE(0x02). This parameter must be configured by the user.
TRD_CYCLE_TO_EXEC_PST	Time that will determine the test cycle period, when in AUTO_MODE. Maximum value of 43200 minutes (30 days). While the method waits for the time to perform the PST, a message is displayed in the TRD_ERROR_PST parameter, as described below for this parameter. Under error conditions force the TRD_TEST_TYPE_PST parameter to STOP_MODE(0x02). This parameter must be configured by the user. Writing to this parameter will trigger time.
TRD_TIMEOUT_PST	Maximum time that the test will be allowed to run in order to have the error configured in the TRD_DEADBAND_PST parameter. After this time, the TRD_ERROR_PST parameter will display a message as described below for this parameter. Maximum value of 1310.7 seconds (21.83 minutes). This parameter must be configured by the user.

Parameter	Transducer Block Description
TRD_SAFETY_CONTROL_VALVE_PST and TRD_SAFE_POSITION_PST	In the first parameter, the user must indicate whether the valve is for control or safety. The second indicates the safety position of the valve, that is, for example, 0%, 100% or even any other position and it is configured in the AO block. When the valve is a safety valve, the SP before starting the test is saved, because if a different SP comes during the test, it means that the control is possibly sending the valve to the safety position and in this condition the method is aborted. It may also happen that the valve is moving to the safety position and the test starts, in this case the same thing happens: the method aborts and enters STOP Mode and the error goes to "PST method was aborted since the valve is in safety operation ".
TRD_SP_OFFSET_PST	Value to be added to the current SP. A test is always performed to see if the limits of 0% and 100% are not exceeded, and if they are exceeded, a message will be displayed in the TRD_ERROR_PST parameter, as described below for this parameter. This parameter must be configured by the user.
TRD_SP_OFFSET_0_PST	Value used to increment when SP is 0%.
TRD_SP_OFFSET_100_PST	Value used to decrement when SP is 100%.
TRD_SUCCEED_PST	Counter that totals the number of successful executions of the PST. This counter is saved in non-volatile memory during power down.
TRD_UNSUCCEED_PST	Counter that totals the number of failed executions of the PST. This counter is saved in non-volatile memory during power down.
TRD_RESET_PST_COUNTER	Allows resetting the TRD_SUCCEED_PST and TRD_UNSUCCEED_PST counters. { 0, "No error in the PST method."}, { 1, "PST is running..."}, { 2, "Error: SP Offset is out of limits."}, { 3, "Error: PST timeout."}, { 4, "PST method succeed"}, { 5, "PST is in AUTO MODE and waiting for the test execution..."}, { 6, "PST is in STOP MODE."}, { 7, "Error: PST test is not allowed when in Setup or Position Calibration method."} { 8, "PST method was aborted since the valve is in safety operation."}
TRD_DEADBAND_PST	Error range to accept a successful PST.
TRD_TIME_TO_INITIATE_PST	Time left to start the PST.
TRD_MANUAL_SETUP	In the field, the setup process may not be completed successfully, for example, in vibration situations and in these cases with this new version, when writing TRUE in this parameter, if the setup is stopped at some stage (for example, 40% in LCD), will advance to the next step, forcing setup progress. So that ManualSetup can be reset in a new step (if it stops at any step), it must be set to FALSE (0) and then TRUE (1, to start ManualSetup). The manual setup will allow to go from: ● **10% to 20%** (At 10%, the FY opens or closes the valve depending on the initial value of the piezo voltage); ● **20% to 30%** (At 20%, the FY verifies if the flat cable is connected or if the Hall sensor is working correctly); ● **30% to 40%** (At 30%, the FY discovers how the magnet was assembled); ● **40% to 50%** (At 40%, the FY opens or closes the valve depending on its initial position); ● **50% to 60%** (At 50%, the FY checks if the magnet is attached to the valve); ● **60% to 70%** (At 60%, FY sends the valve to 50%); ● **70% to 80%** (At 70%, the FY is close to 50%, the setup may remain at this step, if the KP is high); ● **80% to 90%** (At 80%, the FY adjusts its internal references in order to position the valve at 50%. The setup can remain in this step, if the KP is high). At 90% the FY verifies that the magnet is assembled correctly (arrow with arrow).
TRD_TIME_TO_SETUP	In this case, when faced with the 40% condition, the FY will automatically minimize the noise filter to guarantee the stability of the Hall sensor reading, acting on the parameter TRD_ACP (index 114), setting it to 40.
TRD_VALVE_SIGN_X_UP	Array of SP% obtained by the user through curves from 0% to 100% – 51 signed int
TRD_VALVE_SIGN_X_DWN	Array of SP% obtained by the user through curves from 100% to 0% – 51 signed int
TRD_VALVE_SIGN_Y_UP	Array of Pos%, Press Out 1 or Press Out 2 obtained by the user through curves from 0% to 100% – 51 signed int
TRD_VALVE_SIGN_Y_DWN	Array of Pos%, Press Out 1 or Press Out 2 obtained by the user through curves from 100% to 0% – 51 signed int
TRD_REF_VALVE_SIGN_X_UP	Used to back up TRD_VALVE_SIGN_X_UP and it is used as a reference
TRD_REF_VALVE_SIGN_X_DWN	Used to back up TRD_VALVE_SIGN_X_DWN and it is used as a reference
TRD_REF_VALVE_SIGN_Y_UP	Used to back up TRD_VALVE_SIGN_Y_UP and it is used as a reference
TRD_REF_VALVE_SIGN_Y_DWN	Used to back up TRD_VALVE_SIGN_Y_DWN and it is used as a reference
TRD_VALVE_SIGN_EN	Parameter used to: -0x00: Curve Method is disabled -0x01: Curve Method is enabled -0x02: Allows to back up the curve

Parameter	Transducer Block Description
TRD_VALVE_SIGN_STATUS	0x00: Valve Signature is disabled 0x01: Valve Signature was just enabled 0x02: Valve Signature is looking for 0% 0x03: Valve Signature is at 0% to start the curve 0x04: Valve Signature is going from 0% to 100% 0x05 Valve Signature is at 100% to start the curve 0x06: Valve Signature is going from 100% to 0% 0x07: Valve Signature is finalized 0x08: It is not allowed to execute the Valve Signature procedure when Setup or calibration or PST test process is enabled.
TRD_VALVE_SIGN_TYPE	Allows selecting the curve type: 0x01: SP (%) x POS (%) 0x02: POS (%) x Press Out 1 0x03: POS (%) x Press Out 2
TRD_REF_VALVE_SIGN_TYPE	Indicates the type of curve stored as reference: 0x01: SP (%) x POS (%) 0x02: POS (%) x Press Out 1 0x03: POS (%) x Press Out 2 When the user writes in this parameter, in arrays with REF it will read the stored curve according to the stored curve type.
TRD_VALVE SIGN_TIME_OUT	Maximum time to perform the valve signature. Value configurable by the user and with a maximum of 20 minutes. When reaching the time out, it indicates the time out message in the TRD_VALVE_SIGN_STATUS.

Table 3.2 - Transducer Block Specific Parameter Descriptions

Transducer Block Parameter Attribute Table

Relative Index	Parameter Name	Object Type	Data Type	Store	Size	Access	Parameter usage/ Type of Transport	Default	Mandatory /Optional (Class)
9	ACT_STROKE_TIME_DEC	Simple	Float	S	4	r	C/a	-	
10	ACT_STROKE_TIME_INC	Simple	Float	S	4	r	C/a	-	
17	TAB_ENTRY	(1)	(1)	(1)	(1)	(1)	(1)	-	
18	TAB_X_Y_VALUE	(1)	(1)	(1)	(1)	(1)	(1)	-	
19	TAB_MIN_NUMBER	(1)	(1)	(1)	(1)	(1)	(1)	-	
20	TAB_MAX_NUMBER	(1)	(1)	(1)	(1)	(1)	(1)	-	
21	TAB_ACTUAL_NUMBER	(1)	(1)	(1)	(1)	(1)	(1)	-	
22	DEAD BAND	Simple	Float	S	4	r,w	C/a	-	
23	DEVICE_CALIB_DATE	Simple	Octet String	S	16	r,w	C/a	-	
24	DEVICE_CONFIG_DATE	Simple	Octet String	S	16	r,w	C/a	-	
25	LIN_TYPE	(1)	(1)	(1)	(1)	(1)	(1)	0	
32	RATED_TRAVEL	Simple	Float	S	4	r,w	C/a	-	
33	SELF_CALIB_CMD	Simple	Unsigned8	S	1	r,w	C/a	0	
34	SELF_CALIB_STATUS	Simple	Unsigned8	N	1	r	C/a	0	
35	SERVO_GAIN_1	Simple	Float	S	4	r,w	C/a	-	
36	SERVO_RATE_1	Simple	Float	S	4	r,w	C/a	-	
37	SERVO_RESET_1	Simple	Float	S	4	r,w	C/a	-	
38	SETP_CUTOFF_DEC	Simple	Float	S	4	r,w	C/a	-	
39	SETP_CUTOFF_INC	Simple	Float	S	4	r,w	C/a	-	
45	TOTAL_VALVE_TRAVEL	Simple	Float	D(2)	4	r	C/a	-	
46	TOT_VALVE_TRAV_LIM	Simple	Float	S	4	r,w	C/a	-	
47	TRAVEL_LIMIT_LOW	Simple	Float	S	4	r,w	C/a	0	
48	TRAVEL_LIMIT_UP	Simple	Float	S	4	r,w	C/a	100	
49	TRAVEL_RATE_DEC	Simple	Float	S	4	r,w	C/a	-	
50	TRAVEL_RATE_INC	Simple	Float	S	4	r,w	C/a	-	
51	VALVE_MAINT_DATE	Simple	Octet String	S	16	r,w	C/a	-	
52	SERVO_GAIN_2	Simple	Float	S	4	r,w	C/a	-	
53	SERVO_RATE_2	Simple	Float	S	4	r,w	C/a	-	
54	SERVO_RESET_2	Simple	Float	S	4	r,w	C/a	-	
55	TAB_OP_CODE	(1)	(1)	(1)	(1)	(1)	(1)	-	
56	TAB_STATUS	(1)	(1)	(1)	(1)	(1)	(1)	-	
57	POSITIONING_VALUE	Record	DS_33	D	5	r	C/a	-	
58	FEEDBACK_VALUE	Record	DS_33	D	5	r	C/a	-	
59	VALVE_MAN	Simple	Octet String	S	16	r,w	C/a	-	
60	ATUADOR_MAN	Simple	Octet String	S	16	r,w	C/a	-	
61	VALVE_TYPE	Simple	Unsigned8	S	1	r,w	C/a	-	
62	ATUADOR_TYPE	Simple	Unsigned8	N	1	r	C/a	-	
63	ATUADOR_ACTION	Simple	Unsigned8	S	1	r,w	C/a	-	
64	VALVE_SER_NUM	Simple	Octet String	S	16	r,w	C/a	-	
65	ATUADOR_SER_NUM	Simple	Octet String	S	16	r,w	C/a	-	
66	ADD_GEAR_SER_NUM	Simple	Octet String	S	16	r,w	C/a	-	
67	ADD_GEAR_MAN	Simple	Octet String	S	16	r,w	C/a	-	
68	ADD_GEAR_ID	Simple	Octet String	S	16	r,w	C/a	-	
69	ADD_GEAR_INST_DATE	Simple	Octet String	S	16	r,w	C/a	-	
70	AIR_TO	Simple	Unsigned8	N	1	r,w	C/a	Open	
71	CAL_POINT_HI	Simple	Float	N	4	r,w	C/a	%	
72	CAL_POINT_LO	Simple	Float	N	4	r	C/a	%	
73	CAL_MIN_SPAN	Simple	Float	N	4	r	C/a	1	
74	CAL_UNIT	Simple	Unsigned16	N	2	r	C/a	%	
75	FEEDBACK_CAL	Simple	Float	N	4	r,w	C/a	%	
76	CAL_CONTROL	Simple	Unsigned16	N	1	r,w	C/a	Disable	
77	BACKUP_RESTORE	Simple	Unsigned16	S	1	r,w	C/a	None	
78	SECONDARY_VALUE	Simple	DS-33	D	5	r	C/a		
79	SECONDARY_VALUE_UNIT	Simple	Unsigned16	N	2	r	C/a	Celsius	
80	CAL_TEMPERATURE	Simple	Float	N	4	r,w	C/a	Celsius	
81	SERVO_PID_BYPASS	Simple	Unsigned16	S	1	r,w	C/a	Not Bypass	
82	SERVO_PID_ERROR_PER	Record	DS-33	D	5	r	C/a		
83	SERVO_PID_INTEGRAL_PER	Record	DS-33	D	5	r	C/a		
84	SERVO_MV_PER	Record	DS-33	D	5	r	C/a		
85	MODULE_SN	Simple	Unsigned16	S	4	r,w	C/a		
86	REVERSALS	Simple	float	S	4	r,w	C/a		
87	STROKES	Simple	float	S	4	r,w	C/a		
88	AVERAGE_VELOCITY	Simple	float	D	4	r	C/a		

Relative Index	Parameter Name	Object Type	Data Type	Store	Size	Access	Parameter usage/ Type of Transport	Default	Mandatory /Optional (Class)
89	INSTANTANEOUS_VELOCITY	Simple	Float	D	4	r	C/a		
90	TIME_CLOSING	Simple	Float	D	4	r	C/a		
91	TIME_OPENING	Simple	Float	D	4	r	C/a		
92	MAX_RANGE_VALVE	Simple	Float	S	4	r,w	C/a		
93	HIGHEST_TEMPERATURE	Simple	Float	S	4	r,w	C/a		
94	LOWEST_TEMPERATURE	Simple	Float	S	4	r,w	C/a		
95	DIAGNOSES_STATUS	Simple	Unsigned16	N	1	r	C/a	None	
96	DIGITAL_HALL_VALUE	Record	DS-33	D	5	r	C/a		
97	HALL_COMPENSATED	Simple	float	D	4	r	C/a		
98	HALL_OFFSET_CONTROL	Simple	Unsigned16	N	1	r,w	C/a	Disable	
99	READ_HALL_CAL_POINT_HI	Simple	Float	S	4	r	C/a		
100	READ_HALL_CAL_POINT_LO	Simple	Float	S	4	r	C/a		
101	DA_OUTPUT_VALUE	Record	DS-33	D	5	r	C/a		
102	USER_DA_CAL_POINT_HI	Simple	Float	S	4	r	C/a		
103	USER_DA_CAL_POINT_LO	Simple	Float	S	4	r	C/a		
104	PIEZO_ANALOG_VOLTAGE	Record	DS-33	D	5	r	C/a		
105	POT_DC	Simple	Unsigned16	N	1	r,w	C/a	128	
106	MAIN_LATCH	Simple	Unsigned16	S	1	r,w	C/a	12	
107	XD_ERROR	Simple	Unsigned16	S	1	r	C/a	0x10	
108	MAIN_BOARD_SN	Simple	Unsigned32	S	4	r,w	C/a		
109	EEPROM_FLAG	Simple	Unsigned8	D	1	r	C/a		
110	ORDERING_CODE	array	Unsigned8	S	50	r,w	C/a		
111	SETUP_PROGRESS	Simple	Unsigned8	D	1	r	C/a		
112	DEV_MODEL	Simple	Octet String	S	5	r,w	C/a		
113	MANUFACT_ID	Simple	Unsigned16	S	2	r,w	C/a		
114	TRD_ACP	Simple	Unsigned8	S	1	r,w	C/a		
115	COEFF_PRES_POL	Simple	Unsigned8	S	1	r,w	C/a		
116	POLYNOMIAL_SENS_VERSION	Simple	Unsigned8	S	1	r,w	C/a		
117	SENSOR_PRESS_UNIT	Simple	Unsigned16	S	2	r,w	C/a		
118	SENSOR_CAL_SELECTED	Simple	Unsigned8	S	1	r,w	C/a		
119	SENSOR_CAL_POINT_HI	Simple	Float	S	4	r,w	C/a		
120	SENSOR_CAL_POINT_LO	Simple	Float	S	4	r,w	C/a		
121	SENSOR_PRESS_IN	Record	Float and Status	D	5	r	C/a		
122	SENSOR_PRESS_OUT1	Record	Float and Status	D	5	r	C/a		
123	SENSOR_PRESS_OUT2	Record	Float and Status	D	5	r	C/a		
124	SENSOR_PRESSURE_LOWER_LIMIT	Simple	Float	S	4	r,w	C/a		
125	SENSOR_PRESSURE_UPPER_LIMIT	Simple	Float	S	4	r,w	C/a		
126	SENSOR_PRESSURE_INSTALED	Simple	Unsigned8	S	1	r,w	C/a		
127	SENSOR_PRESSURE_STATUS	Simple	Unsigned8	S	1	r,w	C/a		
128	DEVIATION_ENABLE	Simple	Unsigned Char	S	1	r,w	C/a	False	
129	DEVIATION_TIME	Simple	Float	D	4	r,w	C/a	0.5 seconds	
130	DEVIATION_DEAD_BAND	Simple	Float	S	4	r,w	C/a	2.0 %	
131	HALL_FILTER	Simple	Float	S	4	r,w	C/a	0.3	
132	TRD_CYCLE_TO_EXEC_PST	Simple	Float	D	4	r,w	C/a	1.0	
133	TRD_SP_OFFSET_PST	Simple	Float	S	4	r,w	C/a	5.0	
134	TRD_TIMEOUT_PST	Simple	Float	S	4	r,w	C/a	1.0	
135	TRD_TEST_TYPE_PST	Simple	Unsigned8	S	1	r,w	C/a	PST_IN_MANUAL_MODE	
136	TRD_ENABLE_PST	Simple	Unsigned8	D	1	r,w	C/a	Disabled	
137	TRD_ERROR_PST	Simple	Unsigned8	D	1	r	C/a	None	
138	TRD_DEADBAND_PST	Simple	Float	S	4	r,w	C/a	0.5	
139	TRD_SP_OFFSET_FOR_100_PST	Simple	Float	S	4	r,w	C/a	0.0	
140	TRD_SP_OFFSET_FOR_0_PST	Simple	Float	S	4	r,w	C/a	0.0	
141	TRD_TIME_TO_INITIATE_PST	Simple	Float	D	4	r	C/a	0 seconds	
142	TRD_SUCCEED_PST	Simple	Unsigned16	D	2	r	C/a	0	
143	TRD_RESET_PST_COUNTER	Simple	Unsigned8	D	1	r,w	C/a	FALSE	
144	TRD_SAFETY_CONTROL_VALVE_PST	Simple	Unsigned8	S	1	r,w	C/a	CONTROL_VALVE_TYPE	
145	TRD_SAFE_POSITION_PST	Simple	Float	S	4	r	C/a	0.0	
146	TRD_UNSUCCEED_PST	Simple	Unsigned16	D	2	r	C/a	0	
147	TRD_TEMPERATURE_ALARM_LIMIT	Simple	Float	S	04	r,w	C/a	131.25C	
148	TRD_SP_POWER_UP	Simple	Unsigned8	S	01	r,w	C/a	0x00	
149	TRD_ALARM_CB_SELECTOR	Simple	Unsigned8	S	01	r,w	C/a	0x00	
150	TRD_MANUAL_SETUP	Simple	unsigned	S	01	r,w	C/a	False	

Relative Index	Parameter Name	Object Type	Data Type	Store	Size	Access	Parameter usage/ Type of Transport	Default	Mandatory /Optional (Class)
			Char						
151	TRD_TIME_TO_SETUP	Simple	Float	S	04	r,w	C/a	30.0	
152	TRD_VALVE_SIGN_X_UP	Record	Signed Int	S	51	r	C/a	All 0x0000	
153	TRD_VALVE_SIGN_X_DWN	Record	Signed Int	S	51	r	C/a	All 0x0000	
154	TRD_VALVE_SIGN_Y_UP	Record	Signed Int	S	51	r	C/a	All 0x0000	
155	TRD_VALVE_SIGN_Y_DWN	Record	Signed Int	S	51	r	C/a	All 0x0000	
156	TRD_REF_VALVE_SIGN_X_UP	Record	Signed Int	S	51	r	C/a	All 0x0000	
157	TRD_REF_VALVE_SIGN_X_DWN	Record	Signed Int	S	51	r	C/a	All 0x0000	
158	TRD_REF_VALVE_SIGN_Y_UP	Record	Signed Int	S	51	r	C/a	All 0x0000	
159	TRD_REF_VALVE_SIGN_Y_DWN	Record	Signed Int	S	51	r	C/a	All 0x0000	
160	TRD_VALVE_SIGN_EN	simple	Unsigned char	S	01	r,w	C/a	0x00-Disabled	
161	TRD_VALVE_SIGN_STATUS	simple	Unsigned char	D	01	r	C/a	0x00: Valve Signature is disabled	
162	TRD_VALVE_SIGN_TYPE	simple	Unsigned char	S	01	r,w	C/a	0x01: SP(%) x POS(%) 0x02: SP(%) x Press Out1 0x03: SP(%) x Press Out2	
163	TRD_REF_VALVE_SIGN_TYPE	simple	Unsigned char	S	01	r	C/a	0x01: SP(%) x POS(%) 0x02: SP(%) x Press Out1 0x03: SP(%) x Press Out2	
164	TRD_VALVE_SIGN_TIME_OUT	simple	float	S	04	r,w	C/a	20.0	

1) See table handling
2) Should be stored nonvolatile
C/a: contained

Table 3.3 - Parameter Attributes of Transducer Block

Transducer Block View Object Table

Relative Index	Parameter Name	VIEW_1 Number of bytes
9	ACT_STROKE_TIME_DEC	
10	ACT_STROKE_TIME_INC	
17	TAB_ENTRY	
18	TAB_X_Y_VALUE	
19	TAB_MIN_NUMBER	
20	TAB_MAX_NUMBER	
21	TAB_ACTUAL_NUMBER	
22	DEADBAND	
23	DEVICE_CALIB_DATE	
24	DEVICE_CONFIG_DATE	
25	LIN_TYPE	
32	RATED_TRAVEL	
33	SELF_CALIB_CMD	
34	SELF_CALIB_STATUS	
35	SERVO_GAIN_1	
36	SERVO_RATE_1	
37	SERVO_RESET_1	
38	SETP_CUTOFF_DEC	
39	SETP_CUTOFF_INC	
45	TOTAL_VALVE_TRAVEL	

Relative Index	Parameter Name	VIEW_1 Number of bytes
46	TOT_VALVE_TRAV_LIM	
47	TRAVEL_LIMIT_LOW	
48	TRAVEL_LIMIT_UP	
49	TRAVEL_RATE_DEC	
50	TRAVEL_RATE_INC	
51	VALVE_MAINT_DATE	
52	SERVO_GAIN_2	
53	SERVO_RATE_2	
54	SERVO_RESET_2	
55	TAB_OP_CODE	
56	TAB_STATUS	
57	POSITIONING_VALUE	
58	FEEDBACK_VALUE	
59	VALVE_MAN	
60	ACTUATOR_MAN	
61	VALVE_TYPE	
62	ACTUATOR_TYPE	
63	ACTUATOR_ACTION	
64	VALVE_SER_NUM	
65	ACTUATOR_SER_NUM	
66	ADD_GEAR_SER_NUM	
67	ADD_GEAR_MAN	
68	ADD_GEAR_ID	
69	ADD_GEAR_INST_DATE	
70	AIR_TO	
71	CAL_POINT_HI	
72	CAL_POINT_LO	
73	CAL_MIN_SPAN	
74	CAL_UNIT	
75	FEEDBACK_CAL	
76	CAL_CONTROL	
77	BACKUP_RESTORE	
78	SECONDARY_VALUE	
79	SECONDARY_VALUE_UNIT	
80	CAL_TEMPERATURE	
81	SERVO_PID_BYPASS	
82	SERVO_PID_ERROR_PER	
83	SERVO_PID_INTEGRAL_PER	
84	SERVO_MV_PER	
85	MODULE_SN	
86	REVERSALS	
87	STROKES	
88	AVERAGE_VELOCITY	
89	INSTANTANEOUS_VELOCITY	

Relative Index	Parameter Name	VIEW_1 Number of bytes
90	TIME_CLOSING	
91	TIME_OPENING	
92	MAX_RANGE_VALVE	
93	HIGHEST_TEMPERATURE	
94	LOWEST_TEMPERATURE	
95	DIAGNOSES_STATUS	
96	DIGITAL_HALL_VALUE	
97	HALL_COMPESATED	
98	HALL_OFFSET_CONTROL	
99	READ_HALL_CAL_POINT_HI	
100	READ_HALL_CAL_POINT_LO	
101	DA_OUTPUT_VALUE	
102	USER_DA_CAL_POINT_HI	
103	USER_DA_CAL_POINT_LO	
104	PIEZO_ANALOG_VOLTAGE	
105	POT_DC	
106	MAIN_LATCH	
107	XD_ERROR	
108	MAIN_BOARD_SN	
109	EEPROM_FLAG	
110	ORDERING_CODE	
111	SETUP_PROGRESS	
112	DEV_MODEL	
113	MANUFACT_ID	
114	ACP	
115	COEFF_PRES_POL	
116	POLYNOMIAL_SENS_VERSION	
117	SENSOR_PRESS_UNIT	
118	SENSOR_CAL_SELECTED	
119	SENSOR_CAL_POINT_HI	
120	SENSOR_CAL_POINT_LO	
121	SENSOR_PRESS_IN	
122	SENSOR_PRESS_OUT1	
123	SENSOR_PRESS_OUT2	
124	SENSOR_PRESSURE_LOWER_LIMIT	
125	SENSOR_PRESSURE_UPPER_LIMIT	
126	SENSOR_PRESSURE_INSTALED	
127	SENSOR_PRESSURE_STATUS	
128	DEVIATION_ENABLE	
129	DEVIATION_TIME	
130	DEVIATION_DEAD_BAND	
131	HALL_FILTER	
132	TRD_CYCLE_TO_EXEC_PST	
133	TRD_SP_OFFSET_PST	
134	TRD_TIMEOUT_PST	
135	TRD_TEST_TYPE_PST	
136	TRD_ENABLE_PST	
137	TRD_ERROR_PST	

Relative Index	Parameter Name	VIEW_1 Number of bytes
138	TRD_DEADBAND_PST	
139	TRD_SP_OFFSET_FOR_100_PST	
140	TRD_SP_OFFSET_FOR_0_PST	
141	TRD_TIME_TO_INITIATE_PST	
142	TRD_ SUCCEED_PST	
143	TRD_RESET_PST_COUNTER	
144	TRD_SAFETY_CONTROL_VALVE_PST	
145	TRD_SAFE_POSITION_PST	
146	TRD_UNSUCCEED_PST	
147	TRD_TEMPERATURE_ALARM_LIMIT	
148	TRD_SP_POWER_UP	
149	TRD_ALARM_CB_SELECTOR	
150	TRD_MANUAL_SETUP	
151	TRD_TIME_TO_SETUP	
152	TRD_VALVE_SIGN_X_UP	
153	TRD_VALVE_SIGN_X_DWN	
154	TRD_VALVE_SIGN_Y_UP	
155	TRD_VALVE_SIGN_Y_DWN	
156	TRD_REF_VALVE_SIGN_X_UP	
157	TRD_REF_VALVE_SIGN_X_DWN	
158	TRD_REF_VALVE_SIGN_Y_UP	
159	TRD_REF_VALVE_SIGN_Y_DWN	
160	TRD_VALVE_SIGN_EN	
161	TRD_VALVE_SIGN_STATUS	
162	TRD_VALVE_SIGN_TYPE	
163	TRD_REF_VALVE_SIGN_TYPE	
164	TRD_VALVE_SIGN_TIME_OUT	
	Total length	**13**

Table 3.4 - View Object Table Transducer Block

FY303 Cyclical Configuration

Through the GSD file the Class 1 master executes all initialization process with the device and this file presents details of hardware revision and software, bus timing of the device and information on cyclical data exchange.

FY303 has one AO function block. It is with this block that the class 1 master will execute the cyclical services and the user should choose the configuration, according to the application.

If the AO block is in AUTO, then the device will receive the value and status of the setpoint of the class 1 master and the user will also be able to write in this value via class 2 master.

In this case, the setpoint status should always be equal to 0x80 (“good") and the following configurations can be chosen:

- SP
- SP/CKECKBACK
- SP/READBACK/POSD
- SP/READBACK/POSD/CKECKBACK

If the AO block is in RCAS, then the device will receive the value and status of the setpoint only via class 1 master. In this case, the setpoint status should always be equal to 0xc4 (“IA"). The following configurations can be chosen:

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

See below a typical example with the necessary steps to the integration of a **FY303** device in a PA system:

- Copy the GSD file of the **FY303** for the search directory of the PROFIBUS configurator, usually named GSD.

- Copy the bitmap file of the **FY303** for the search directory of the PROFIBUS configurator, usually named BMP.

- Once the master is chosen, the communication rate must be chosen, remembering that when we had the couplers, we can have the following rates: 45.45 kbits/s (Siemens), 93.75 kbits/s (P+F) and 12 Mbits/s (P+F, SK2). If we had the link device, it can be up to 12 Mbits/s.

- Add the **FY303**, specifying the address in the bus.

- Choose the cyclical configuration via parameterization with the GSD file, dependent of the application, as indicated previously. Remember that this choice must be in agreement with the operation mode of the AO block. In these conditions attempt to the status of the setpoint value that should be 0x80 (“good”), when in AUTO mode and 0xc4 (IA) for RCAS mode.

- The watchdog condition can also be activated, where after the communication loss detection for the slave device with the master, the equipment can change to a fail-safe condition. As **FY303** will be as final element is recommended the configuration of a fail-safe value.

The **ProfibusView** of Smar or **Simatic PDM** (Process Device Manager) configuration software from Siemens, for example, can configure many parameters of the Input Transducer block.

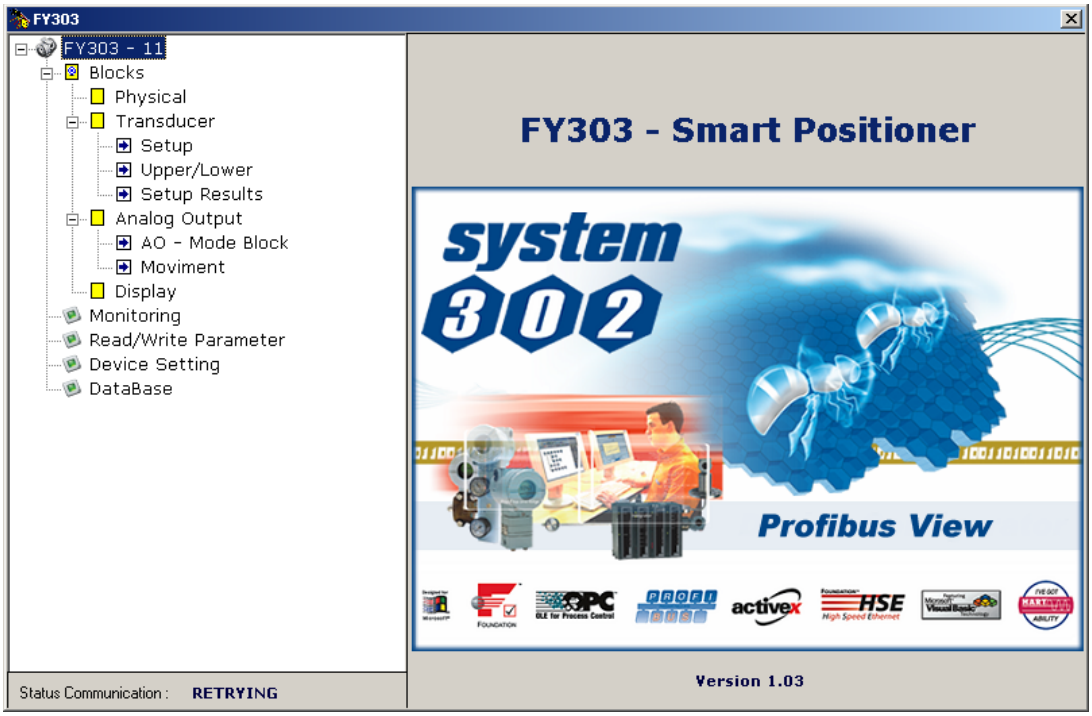


Figure 3.2 - Function and Transducer Blocks - ProfibusView

The device was created as **FY303**.

Here, you can see all blocks instantiated.

As you can see the Transducer and Display are treated as special type of Function Blocks, called Transducer Blocks.

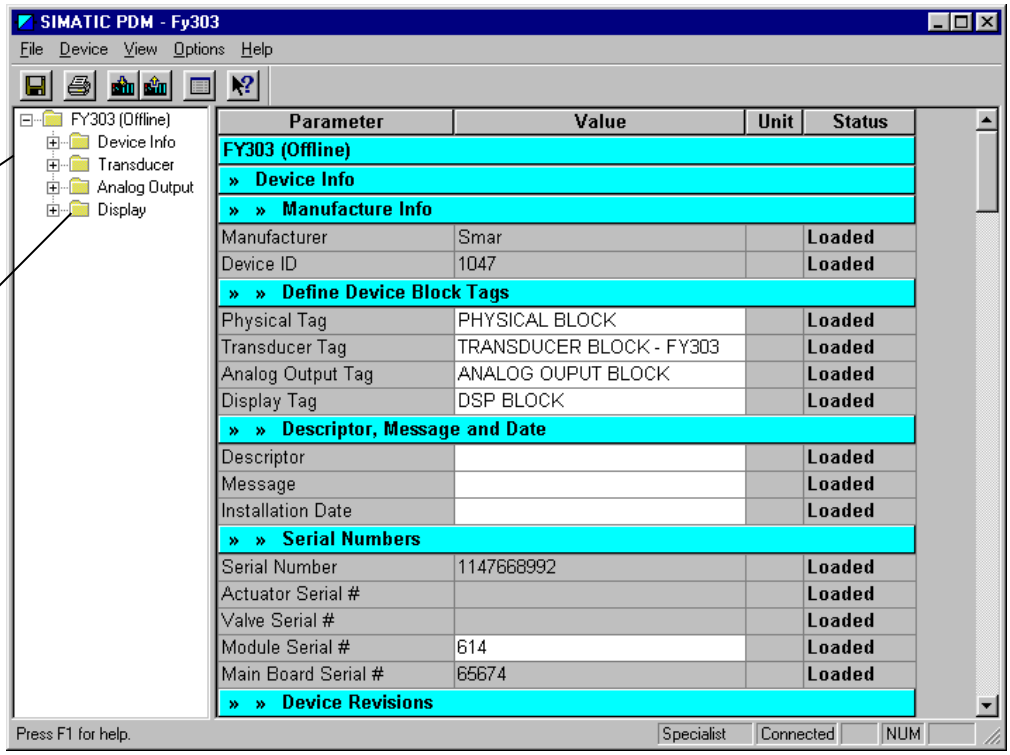


Figure 3.3 - Function and Transducer Blocks - Simatic PDM

Use the main menu to configure the following functions:
- To change the device address;
- To perform the up/download of parameters;
- To configure the Transducer Block, Analog Output Block and Display Block;

- To calibrate the positioner; perform the Auto Setup

NOTE

Auto Setup procedure for FY303 positioner in ACP.
When the positioner FY303 is working with a pneumatic cylindrical actuator or a valve with high air inertia (slow movement) and during the self-calibration process (SETUP) remains permanently at 40% on the LCD, the user must decrease the ACP_F value (relative index 114) using the local adjustment. Enter into the local adjustment and select one of LCDs (for example LCD_2) in CONF menu, then select TRD block and adjust the PRMT parameter to 114 (relative index of this parameter in the Transducer Block). Browse up to UPD parameter to update the local adjustment LCD configuration. Reenter into the local adjustment and then browse up to ACP_F parameter where you can decrease the value. For an initial step, you can decrease it to 60 and then browse up to SETUP parameter and execute the self-calibration process setting this parameter to 2 (Initialize the self-calibration process).

- To protect the device against writing and to simulate the value of transducer block and analog output block;
- Save and restore data calibration.

The main menu also give access to configuration window of Transducer Block.

The user can select the valve linearization type: linear, user defined (table), EP25, EP33, EP50, Q24, Q22, EQ50.

The user can select the valve type.

The actuator Fail action can be: Open (100%), Close (0%), not initialized or none.

Te user can set air to open or air to close according to the action.

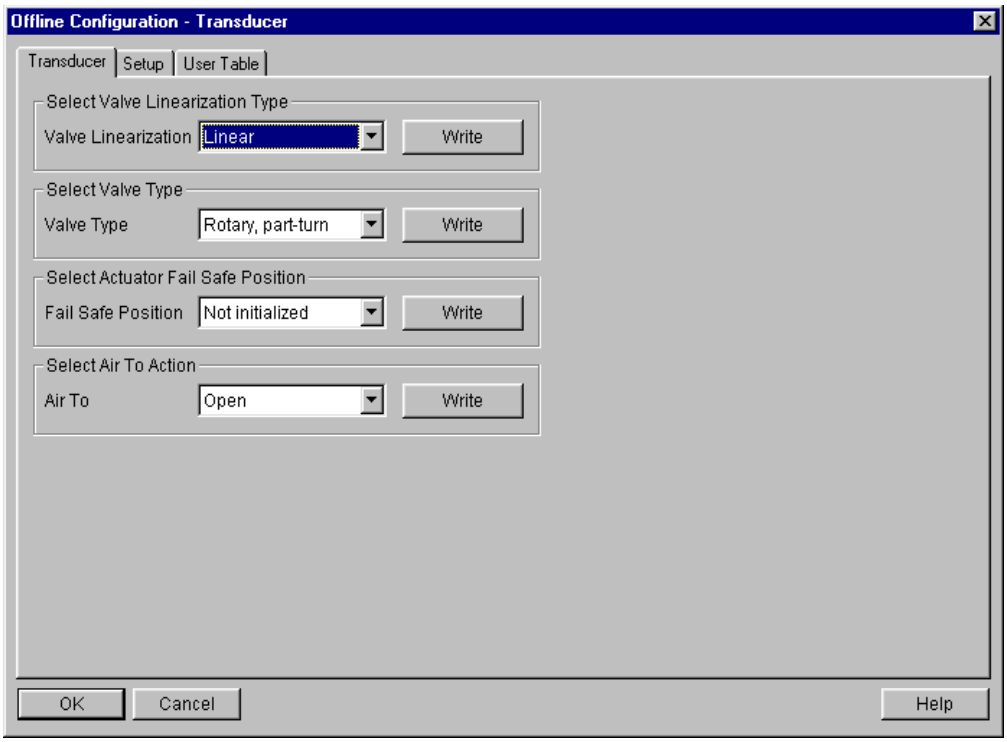


Figure 3.4 - Offline Configuration – Transducer Block

Selecting the page Setup, the user configures some data for the internal servo PID of **FY303**.

Configurable seconds to full span change (closing time of the valve) in seconds and Configurable seconds to full span change (opening time of the valve) in seconds.

Servo Control Parameters: The gain and reset depend on valve type.

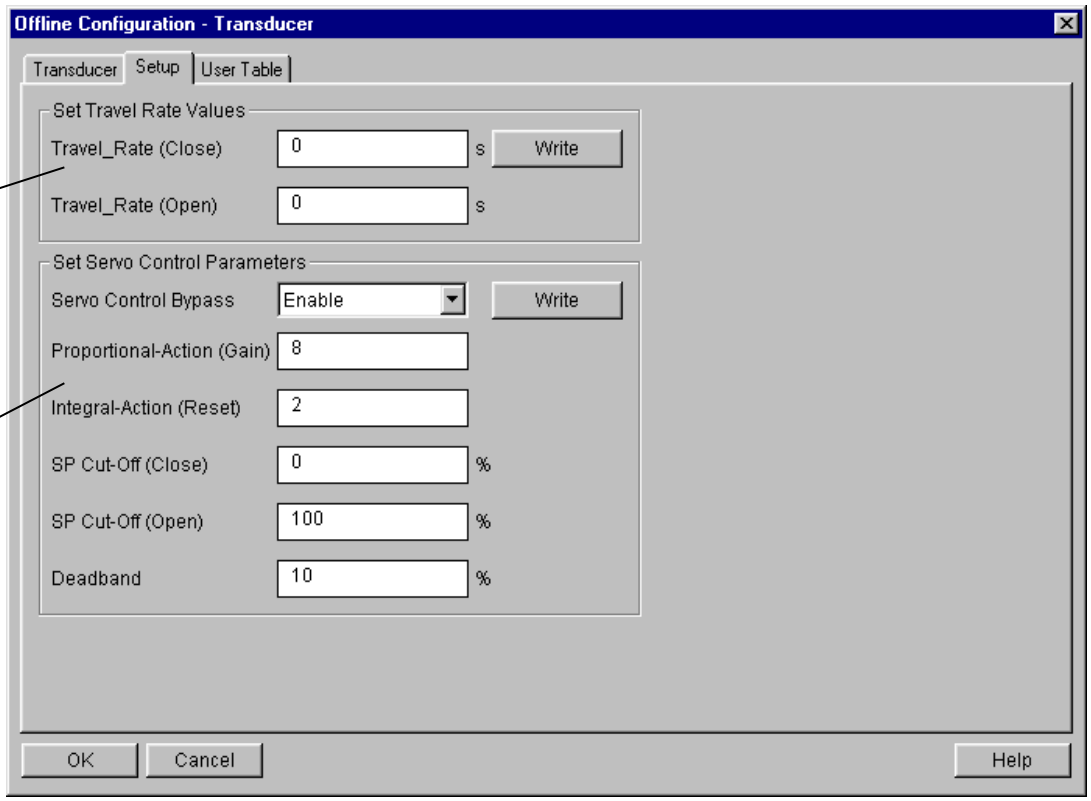


Figure 3.5 - Transducer Block Configuration Setup

Table handling

There is the possibility to load and re-load tables in the devices. This table is used for linearization mostly. For this procedure the following parameters are necessary:

TAB_INDEX
TAB_X_Y_VALUE
TAB_MIN_NUMBER
TAB_MAX_NUMBER
TAB_OP_CODE
TAB_STATUS
The TAB_X_Y_VALUE parameter contains the pair value of each input table.

To configure the Transducer Block, select the menu Device - Offline Configuration -Transducer. The TAB_INDEX parameter identifies which element of the table is in the X_Y_VALUE parameter currently (see the following figure).

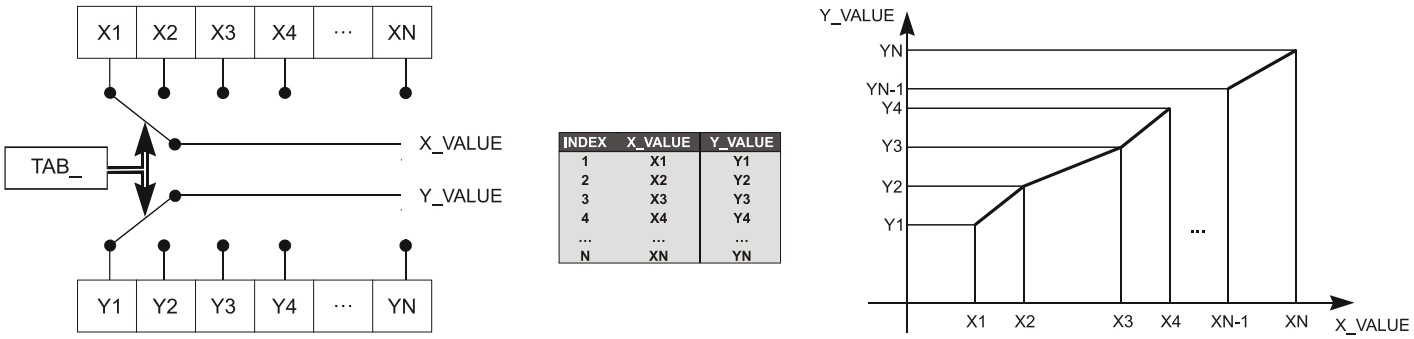


Figure 3.6 - Parameters of a Table

TAB_MAX_NUMBER is the maximum size of the table in the device. TAB_MIN_NUMBER is the minimum size of the table in the device.

The modification of a table in the device influences the measurement algorithms of the device. Therefore, an indication of a starting and an endpoint is necessary. The TAB_OP_CODE controls the transaction of the table. The device provides a plausibility check. The result of this check is indicated in the TAB_STATUS parameter.

The User Table is used to do the position characterization in several points.
The user can configure up to 21 points in percentage.
The valve characteristic curve may be slightly nonlinear.
This eventual non-linearity may be corrected through the User Table.

The user just needs to configure the input values and the correspondent output values in %. Configure a minimum of two points. These points will define the characterization curve. The maximum number of points is 21. It is recommended to select the points equally distributed over the desired range or over a part of the range where more accuracy is required. The user needs to set "user defined (table) to valve linearization type.

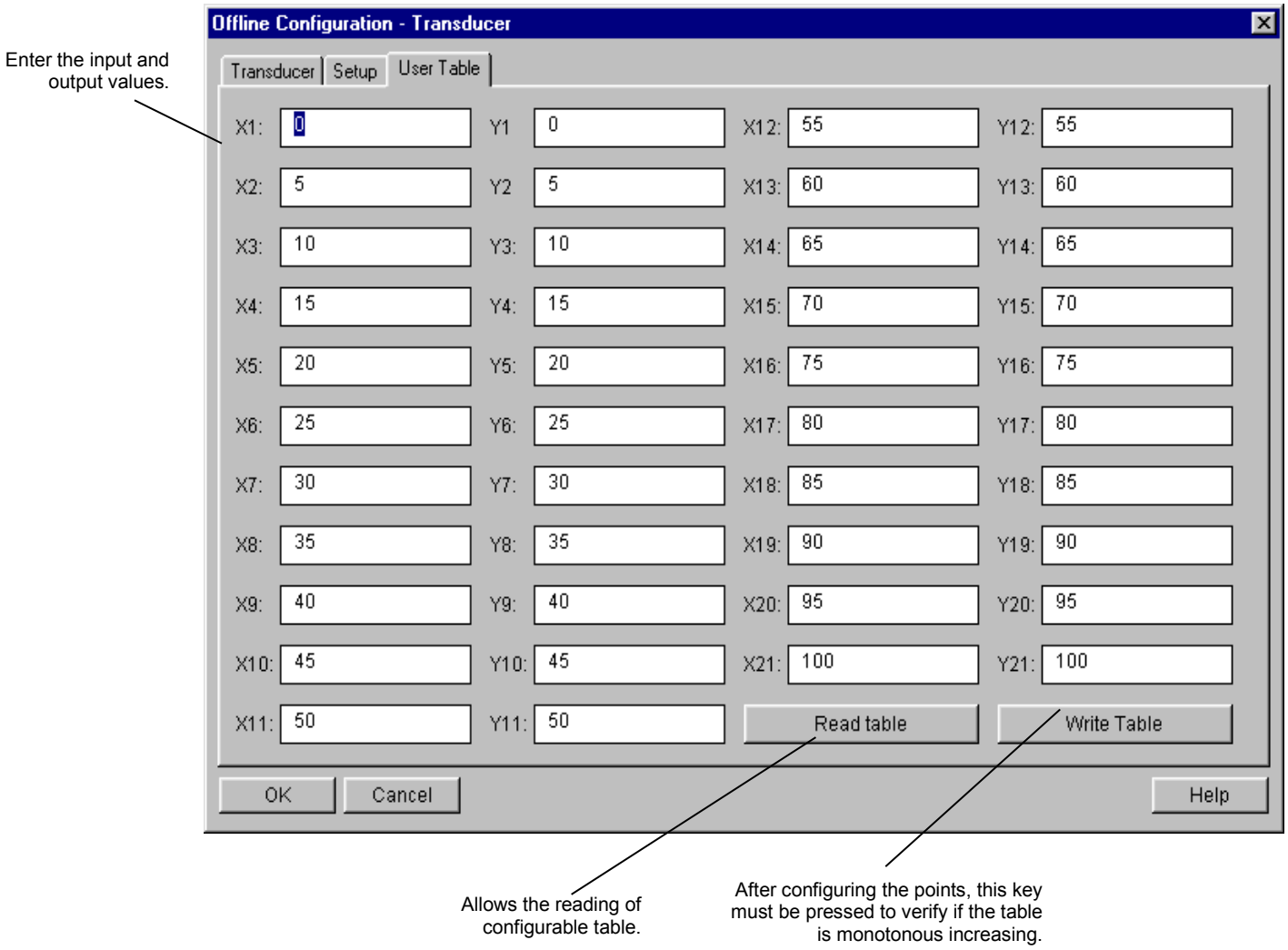


Figure 3.7 - User Table Configuration in the Transducer Block

The desired flow characteristics may be changed using this function. E.g., if a valve with linear inherent flow characteristic is used and equal percentage applied flow characteristic is selected, the valve will

be act as an equal percentage valve.

The adjacent number is the rangeability of the valve. The rangeability of the valve may be found in the manufacturer's documentation. The options for applied flow characterization are: **LINEAR, TABLE, EP25, EP33, EP50, QO25, QO33, and QO50**

The equation resulting from its curve is:

Y (%) = (X/ (((X (%). /100)*(1-L)) +L)),

Where:

Y [%] = Value after the flow characterization curve calculation and X [%] = Position value before entering in the curve calculation.

L = Characterization Factor

TYPE	L
LINEAR	1.0
EP25	3.5
EP33	4.1
EP50	5.1
QO25	0.27
QO33	0.24
QO50	0.19

See the configuration windows of the Transducer block using the ProfibusView of Smar.

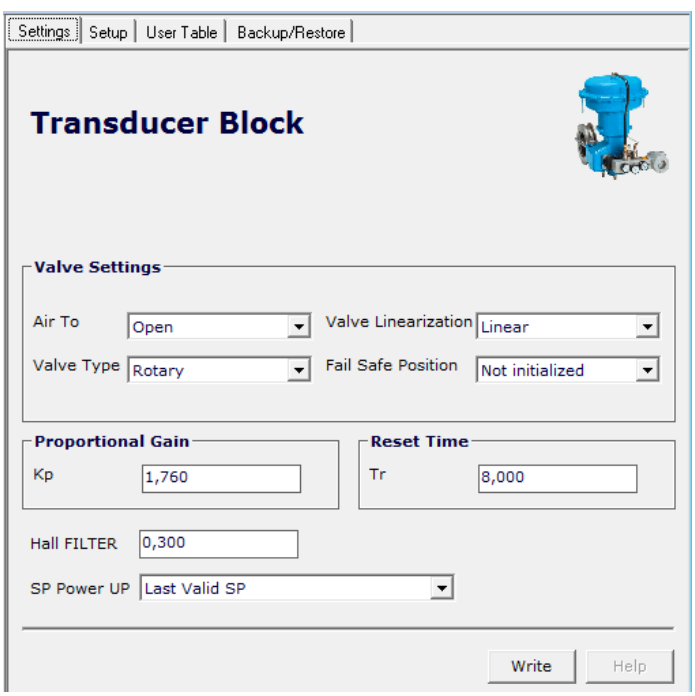


Figure 3.8 - Transducer Block Configuration

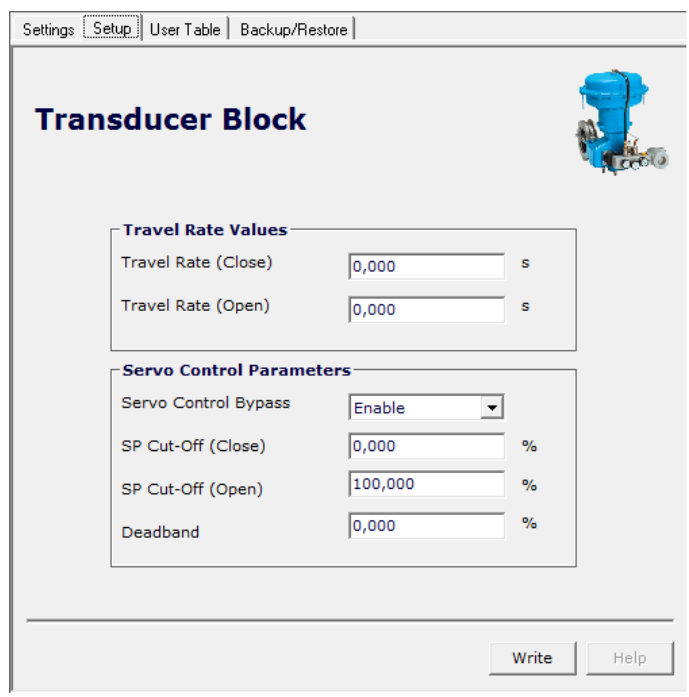


Figure 3.9 – Configuration of Transducer Block Setup

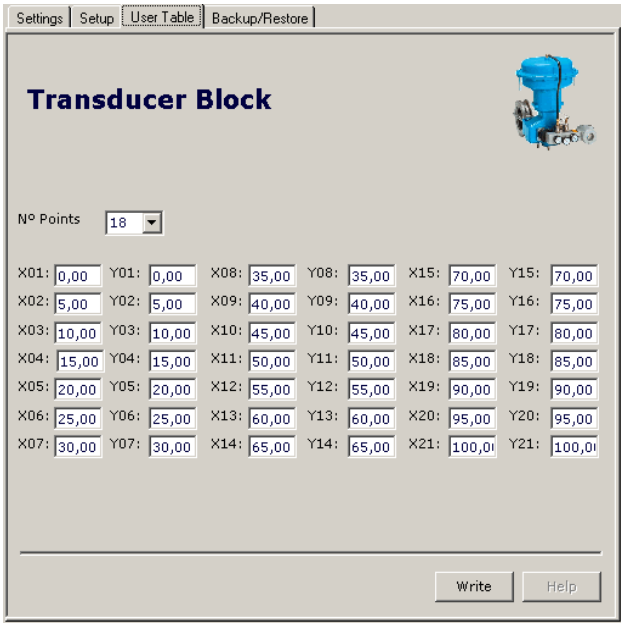


Figure 3.10 - Configuration of Transducer Block User´s Table

How to Configure the Analog Output Block

The AO block provides a value to an output transducer block. It provides value, scaling conversion, Fail safe mechanism and other features.

The Analog Output Block is a function block used by devices that work as output elements in a control loop, like valves, actuators, positioners, etc. The AO block receives a signal from another function block and passes its results to an output transducer block through an internal channel reference.

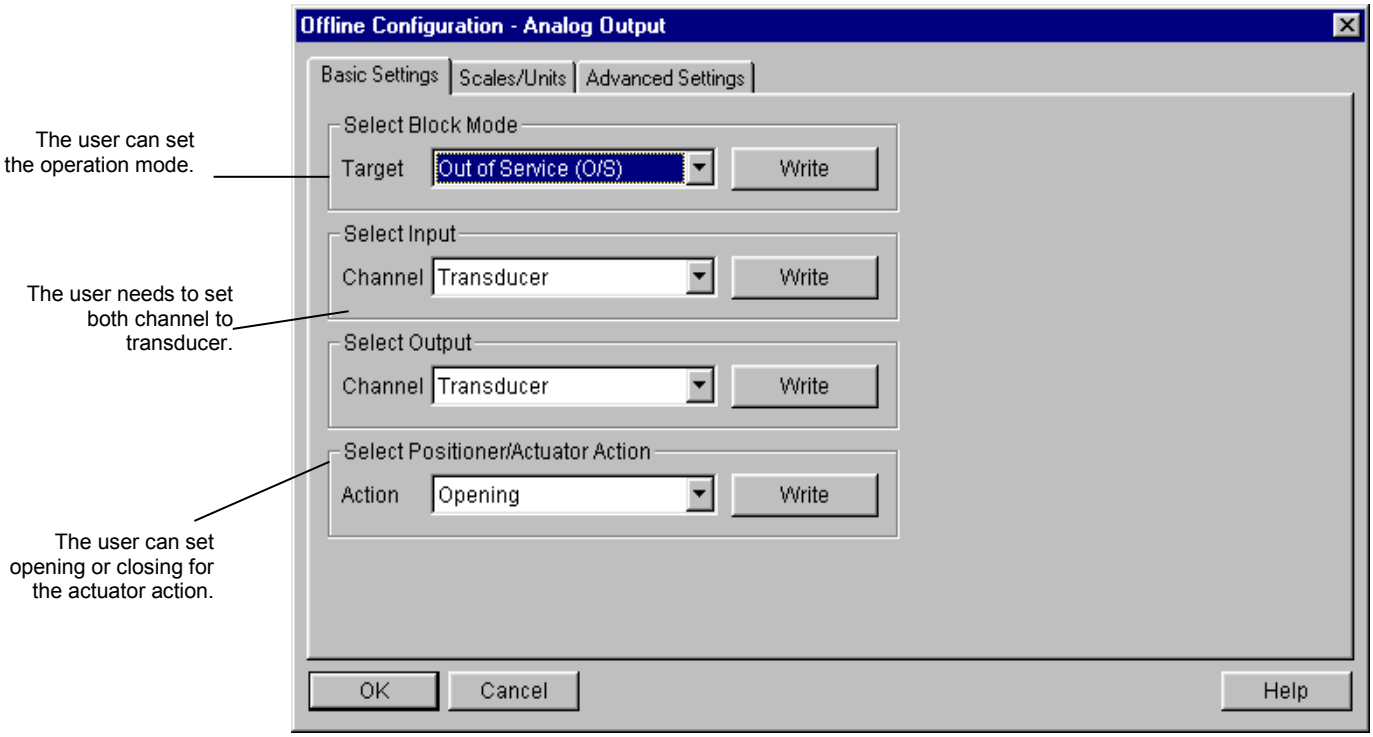


Figure 3.11 - Analog Output Block - Basic Settings - Offline Configuration

Selecting the tab **Scale/Units**, the user has the option to configure the scale and unit for the input and output:

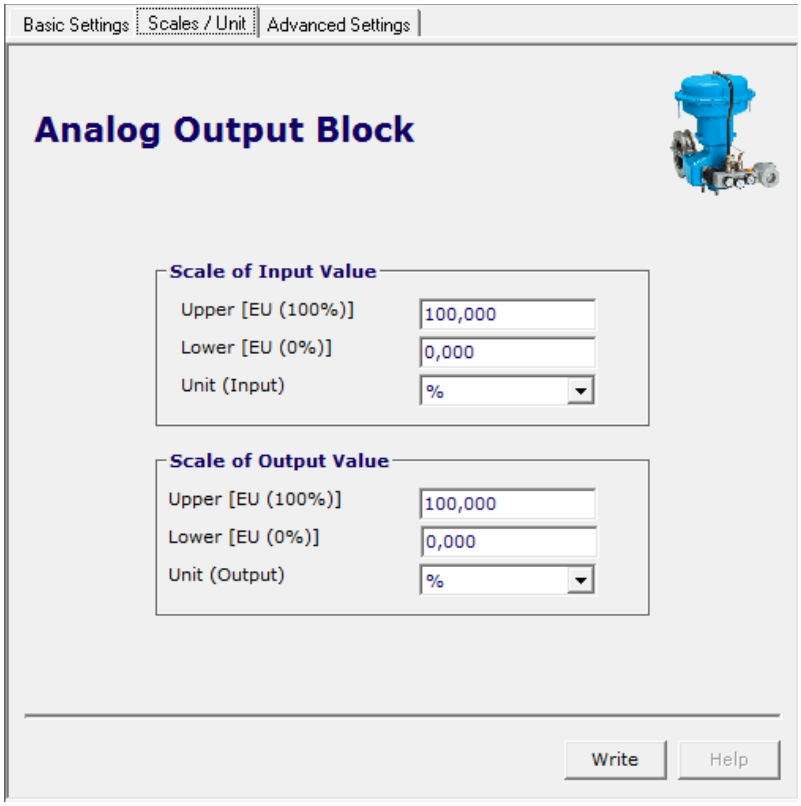


Figure 3.12 - Analog Output Block - Scale/Units - Offline Configuration

The unit and scale for the output will be the same for the transducer block. Note that the allowed units are %, rad, °, mm.

Selecting **Advanced Settings** tab, the user can set the fail-safe conditions.

For Fail Safe mode the options can be: Actuator goes to fail-safe position, storing last valid setpoint and fail safe value is used as a control regulator input.

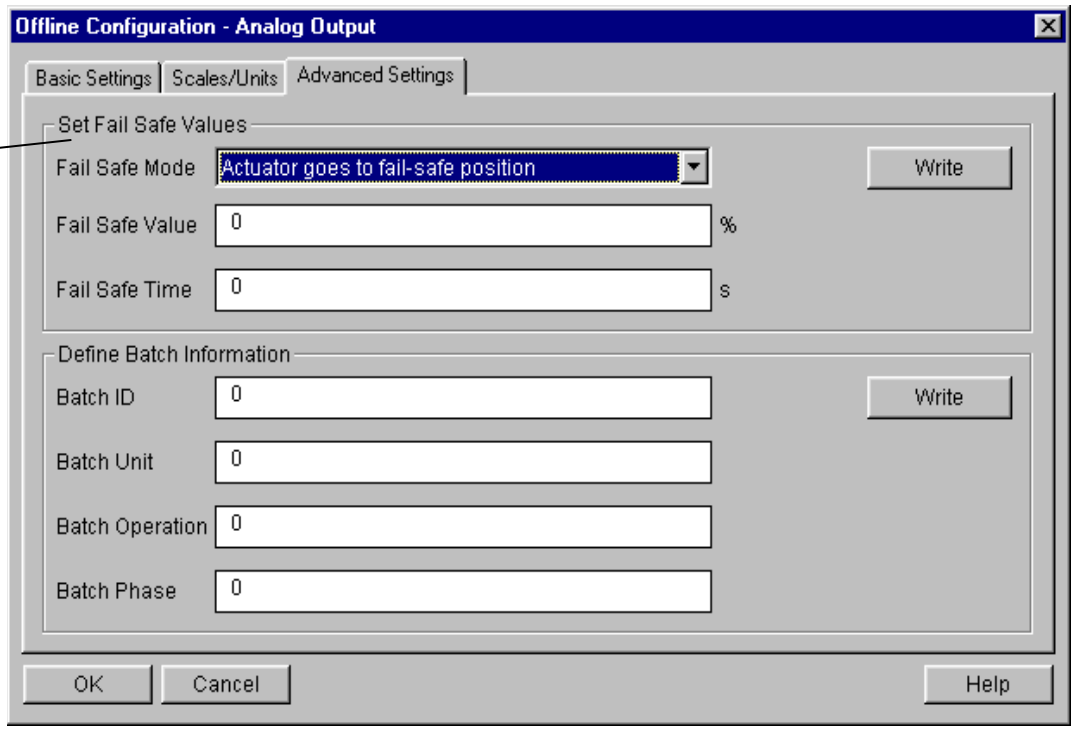


Figure 3.13 - Analog Output Block - Advanced Settings - Offline Configuration

In terms of online configuration, the user can select at the device menu the Online Configuration for Analog Output block. The user can select the mode block operation and set the setpoint.

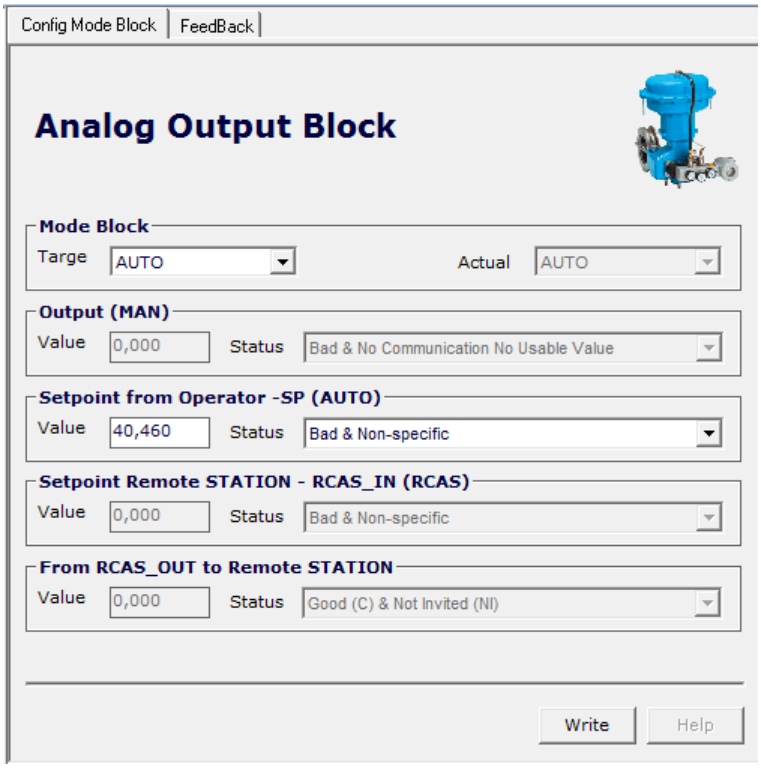


Figure 3.14 - Online Configuration Mode Block for AO

Using **Feedback** tab, the user can monitor and check all values related between the analog block and the transducer block, such as the information about the real condition of transducer and analog output block.

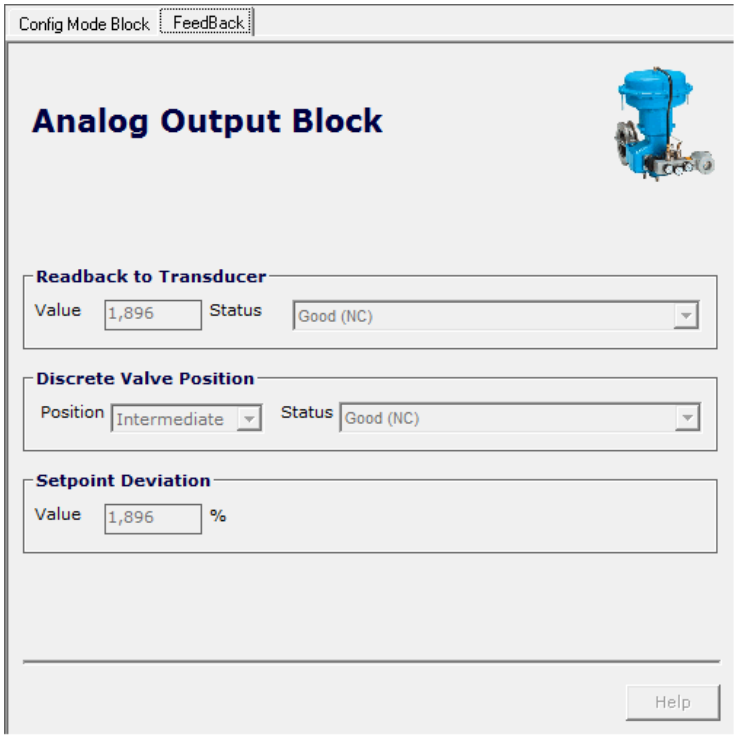


Figure 3.15 - Online Configuration Feedback for AO

Position Calibration

NOTE
The ProfibusView Position calibration setup windows are similar to Simatic PDM ones.

First of all, the user should configure the valve type, the servo gain according to the valve. Please, see transducer offline configuration. In general, when the valve is fast, is appropriate to set a gain value about 8. If the valve is slow, is appropriate to set a gain value about 43. It depends on case by case and the valve type.

Then using the Device menu, the user must select Calibration, where we have the options: "Lower/Upper", "Self-Calibration" and "Temperature".

Choosing "Lower/Upper" the user has the window:

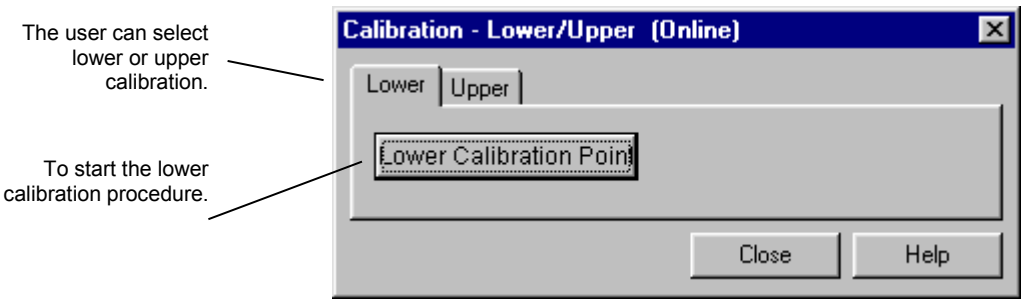
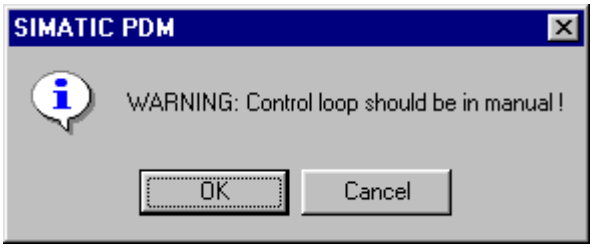
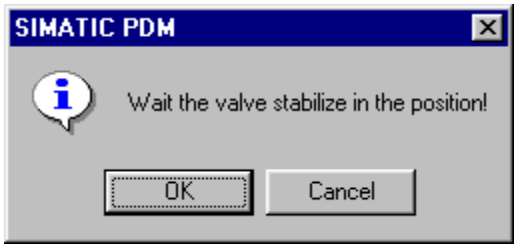


Figure 3.16 - Calibration of Lower/Upper value

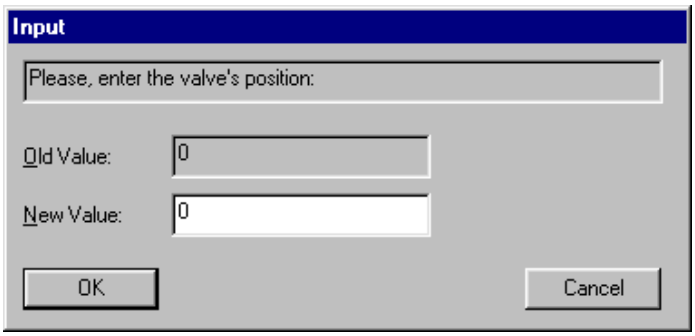
By clicking "Lower Calibration Point" button, a warning message will appear.



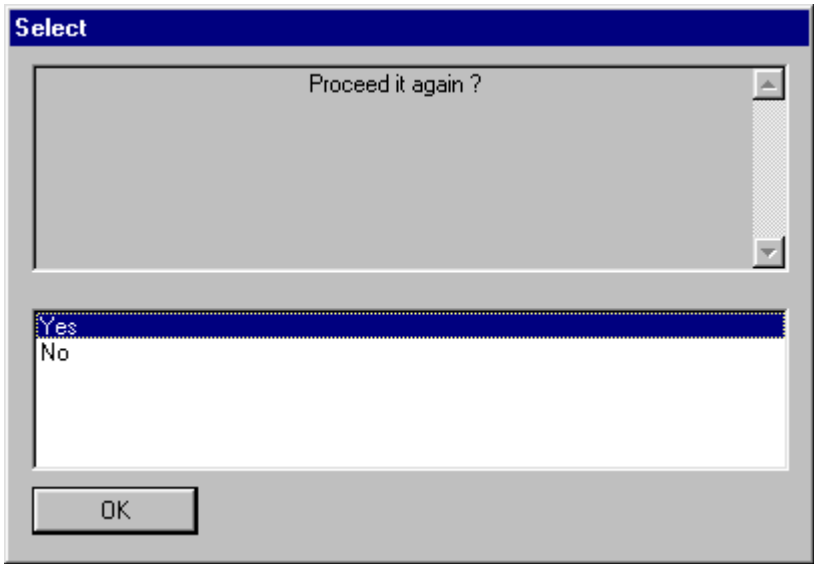
If the user proceeds, the valve position goes to the lower position and the next message will apeear:



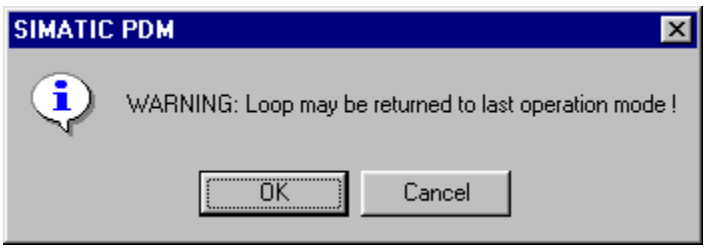
If the valve is stabilized, when the user clicks "OK", a new window appear, allowing to enter the desired value for the new calibrated point for the lower position. Write 0% in new value. For **FY303** it should be always 0%:



After entering the desired valve, the position is corrected according to the desired value and the user can do the correction until the right position is reached:

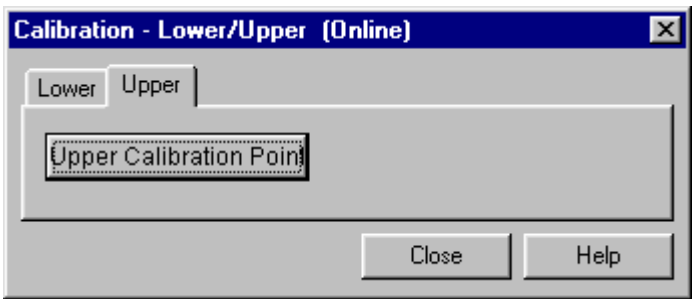


If the calibrated position is correct, select "No" and a new warning appears:

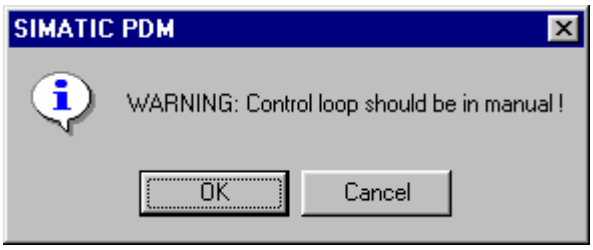


After user confirmation, the positioner comes to the normal operation.

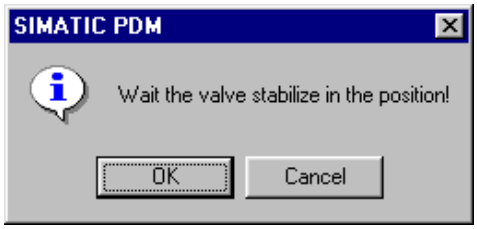
The upper calibration procedure is like the lower:



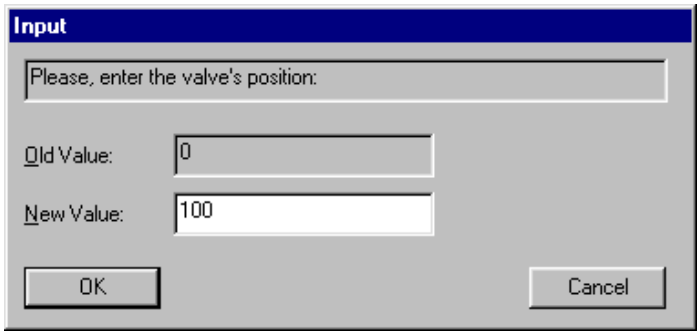
By clicking " Upper Calibration Point" button, a warning message will appear.



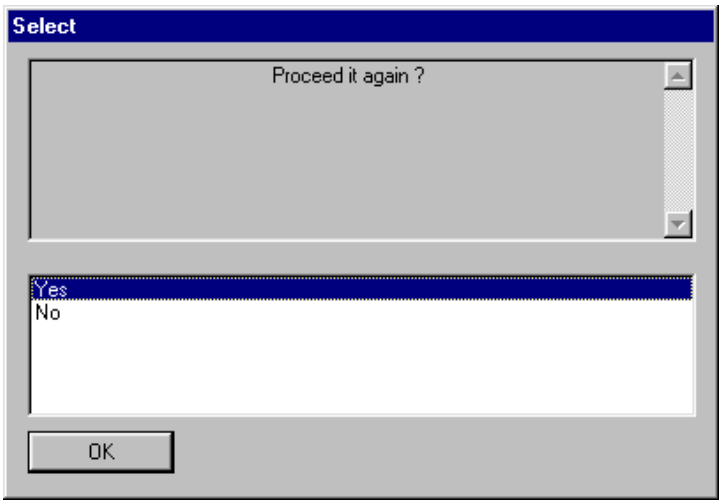
If the user proceeds, the valve position goes to the upper position and the next message appears:



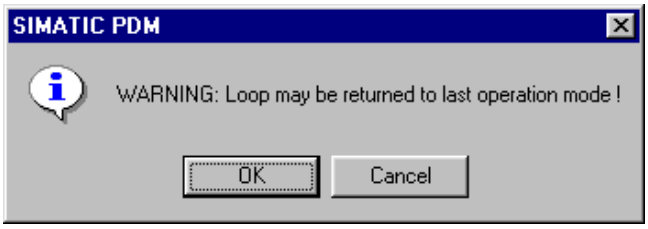
If the valve is stabilized, when the user clicks "OK", a new window appear, allowing to enter the desired value for the new calibrated point for the upper position. Write 100% in new value. For **FY303** it should be always 100%:



After entering the desired valve, the position is corrected according to the desired value and the user can do the correction until the right position is reached:



If the calibrated position is correct, select "No" and a new warning appears:



After user confirmation, the positioner comes to the normal operation.

NOTE
The calibration unit is always percentage (%). It is also recommendable, before a new calibration, to save the existing trim data by means of parameter BACKUP_RESTORE, using the option "Last Cal Backup" “Sensor Data Backup”.

Temperature Calibration

The parameter CAL_TEMPERATURE can be used to trim the temperature sensor located at the body of positioner to improve the accuracy of temperature measurement done by its sensor.

The range accepts from - 40°C to + 85 °C. The parameter SECONDARY_VALUE indicates the value of such measurement.

Using the configuration software, go to the Device menu and select the "Calibration" menu and then "Temperature.

Set the desired calibration temperature point. The user can verify the status and operation result. To calibrate click the **Write** button.

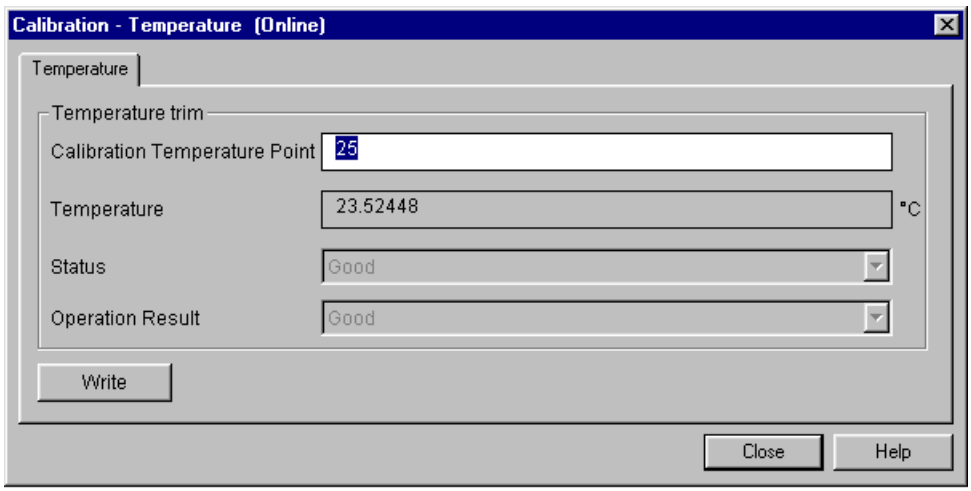
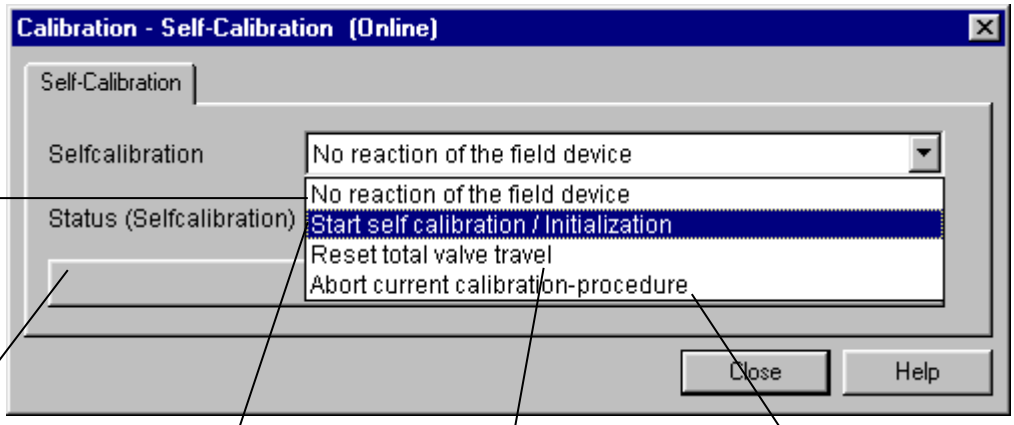


Figure 3.17 - FY303 Temperature Calibration

Self-Calibration

Using the "Self-Calibration" procedure, the user starts a method of self-calibration for the positioner. For this reason, the option "Start self-calibration/Initialization" should be selected at the window below. The self-calibration can take some minutes according to the valve:



In normal operation, we have this option indicating no reaction of the field device according to the self-calibration procedure.

After selecting the self-calibration procedure, please, press the "Write" key to begin the procedure.

This marked option allows the start of self-calibration procedure.

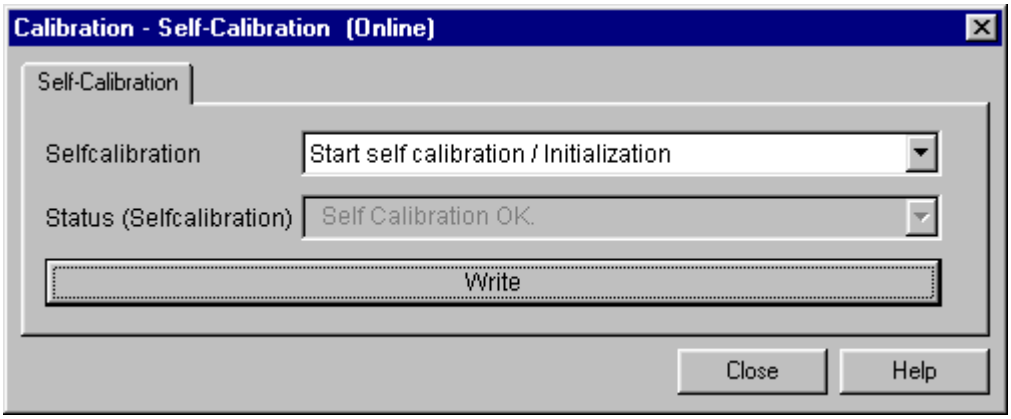
To reset the total valve travel, select this option.

To abort the self-calibration procedure, select this option.

Figure 3.18 - Self-Calibration option

After selecting the self-calibration procedure, the positioner will move the valve during some time to setup the lower and upper position automatically. At LCD interface, the user can see the steps of this procedure in %.

If the procedure gets success, we got the following status of "Self Calibration OK”.



We can have the following options for the status calibration:

- Self Calibration OK
- Aborted
- No magnet part detected
- Error in mechanical system
- Timeout
- Pressure Problem

To verify the self-calibration results the user should select at the main menu the option "Maintenance Self-Calibration Report":

This value describes the set value for hardware compensation. It is an automatic calculated value. It is suitable that the user does not change this value.

The Hall sensor value and the calibrated points for it.

The value for the DA converter and the calibrated points for it.

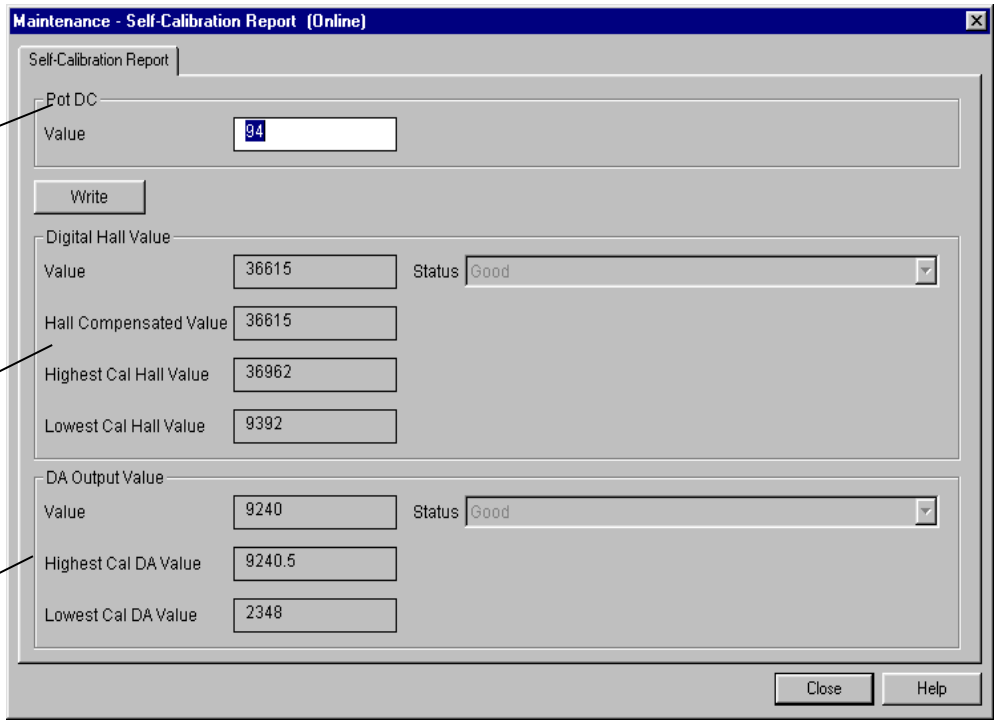


Figure 3.19 - FY303 Maintenance Self-Calibration Report

Diagnosis

NOTE
The ProfibusView Diagnosis setup windows are similar to Simatic PDM ones.

Using the "View" menu and selecting "Diagnosis", the user has accessing to the diagnosis windows, according to the next window:

The user can see: the setpoint value from AO; the total valve travel according to the maximum range value for the valve; and a general status for **FY303**.

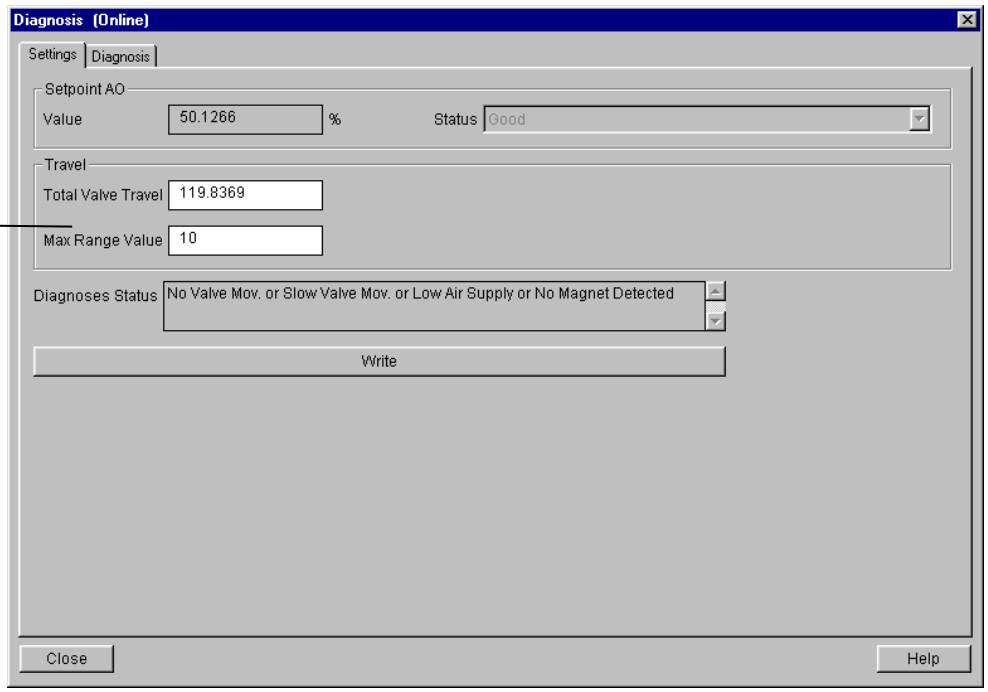


Figure 3.20 - FY303 Settings

Selecting the "Diagnosis" tab, the next window will appear:

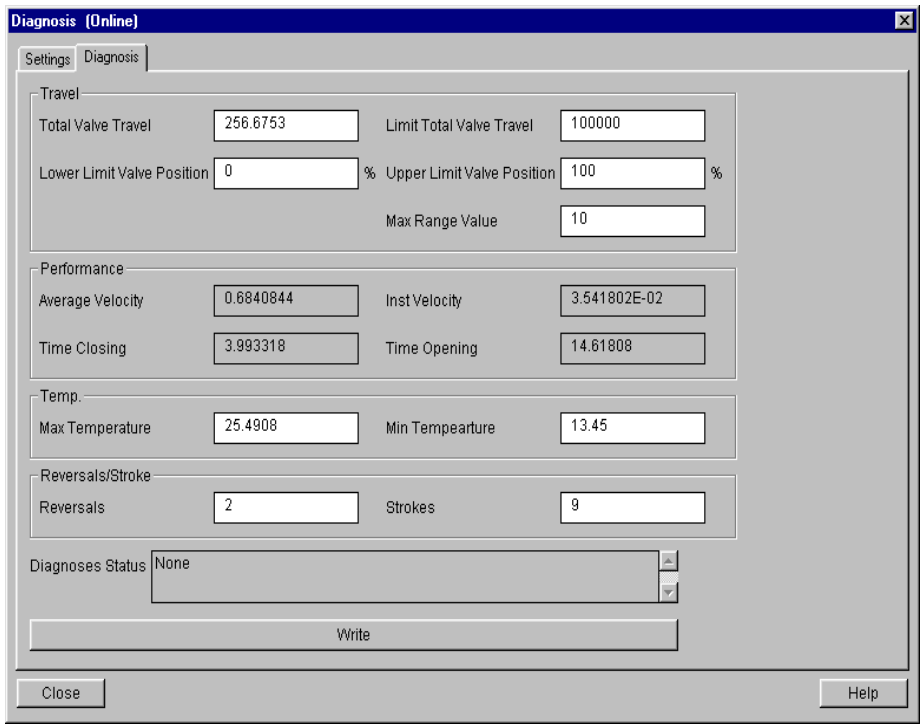


Figure 3.21 - FY303 Diagnosis

Using this window, the user can have some items for diagnosing:

- Travel: Depending on the maximum value of the valve stroke, the total stroke of the valve can be generated, and a stroke limit exceeded when this value is greater than the total stroke limit of the configured valve.
- Performance: the user can verify the average velocity, the instantaneous velocity, the time closing (when the direction is from 100.0% to 0.0%) and the time opening (when the direction is from 0.0% to 100.0%). These times are according to the configured rate for closing and opening.

- Temp: The user can verify the maximum and minimum temperature;
- Reversals/stroke: we have the possibility to verify both values according to the movement of valve.

Some factors are important to the performance of movement:

- the air pressure;
- the proportional action (servo gain);
- the integral action (reset);
- the travel rate for closing and opening.

Transducer Display - Configuration

NOTES
- ProfibusView Transducer Block configuration windows are like Simatic PDM ones. - Every function block and transducer defined according to PROFIBUS PA have a description of their characteristics written in the Equipment Description Language (DD).

The Transducer Display is treated as a normal block by any configuration tool. It means, this block has some parameters which can be configured according to customer's needs. The LCD indicator can be used to monitor, act on function block parameters, or calibrate and tune parameters.

Using ProfibusView, Simatic PDM or a magnetic tool, it is possible to configure the Display Transducer block. As described in the name, this block is a transducer due to its interfacing with the LCD circuit.

The Profibus PA positioner display has two main views: normal operation (process view) and local adjustment. The user can choose up to six parameters to be shown in the indicator (views). They can be parameters for monitoring purposes or for setting via local adjustment using a magnetic tool. If the user does not want to use the six views, in the **Select Block Type** option, “None” must select in those that does not want to view.

On the **Local Address Change** tab, it is possible to access the physical address of the equipment. The user can change this address according to the application. See next figure.

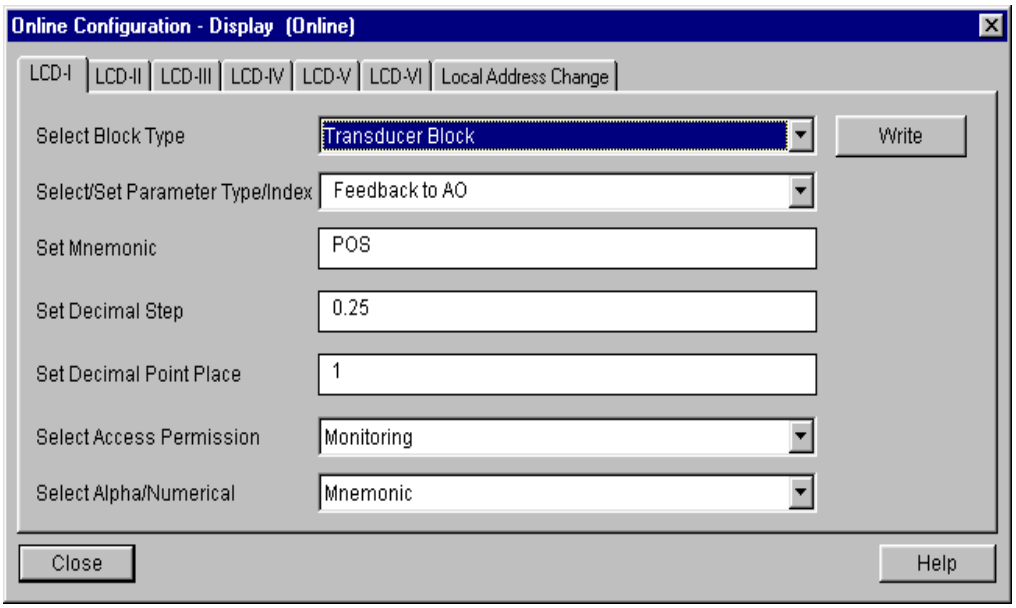


Figure 3.22 – Display Block

Display Transducer Block

The local adjustment is a reflection of the configuration done in the LDCs (1..6). Therefore, the user can select the best options to configure the application. The positioner leaves the factory configured with the default options: POS, KP, TR, SP, MODE, and SETUP.

To enable local adjustment using the magnetic tool, it is necessary to first prepare the parameters related to this operation via system configuration.

Definition of Parameters and Values

The following are definitions of the display transducer block configuration options. Refer to figure 3.27 to locate them.

Select Block Type
This is the type of the block where the parameter is located. The user can choose: Transducer Block, Analog Output Block, Physical Block or None.

Select / Set Parameter Type / Index
This is the index related to the parameter to be actuated or viewed (0, 1, 2…). For each block there are some pre-defined indexes. Refer to the Profibus PA Function Blocks Manual to know the desired indexes and then just enter the desired index.

Set 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.

Set Decimal Step
It is the increment and decrement in decimal units when the parameter is Float or Float Status value, or Integer, when the parameter is in integer units.

Set Decimal Point Place
This is the number of digits after the decimal point (0 to 3 decimal digits).

Set Access Permission
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.

Set Alpha Numerical
These parameters include two options: Value and Mnemonic. In option Value, it is possible to display data both in the alphanumeric and in the numeric fields; this way, in the case of a data higher than 10000, it will be shown in the alphanumeric field. This is useful when displaying totals on the LCD interface.

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

In case you wish to visualize a certain tag, opt for the index relative equal to "TAG". To configure other parameters just select "LCD-II" up to "LCD-VI" windows:

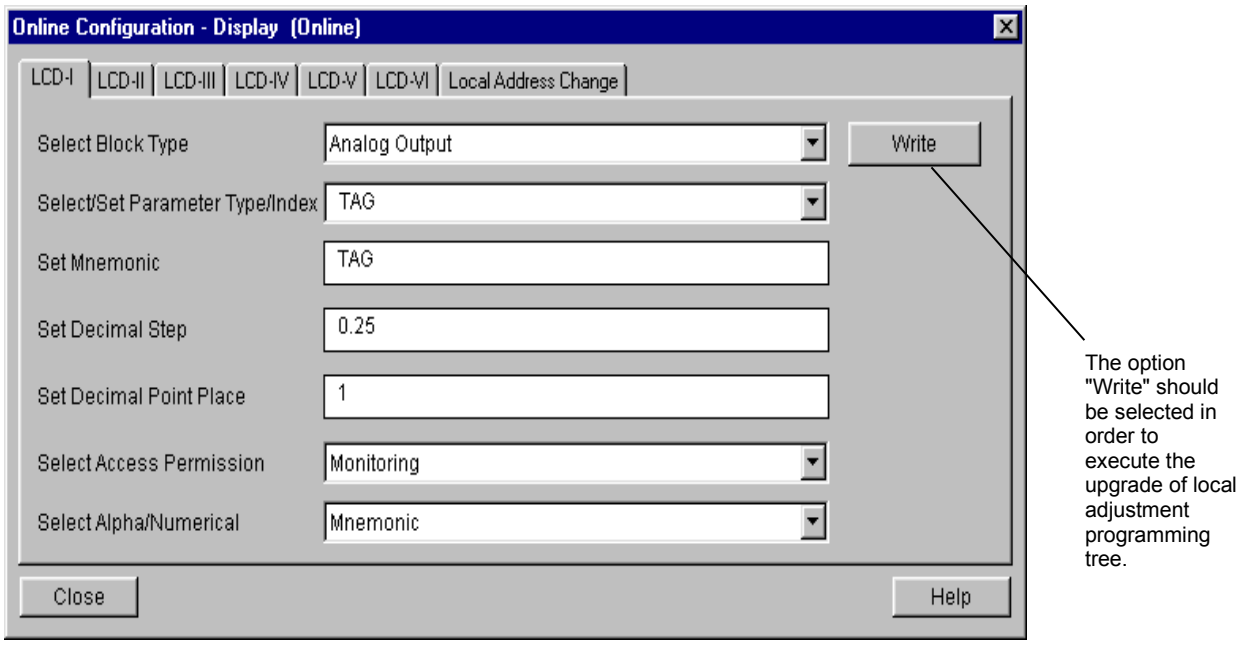


Figure 3.23 - Parameters for Local Adjustment Configuration

The window "Local Address Change" allows the user "enable/disable” access to changing the physical device address.

When the option "enable" is selected, the user can change the physical device address.

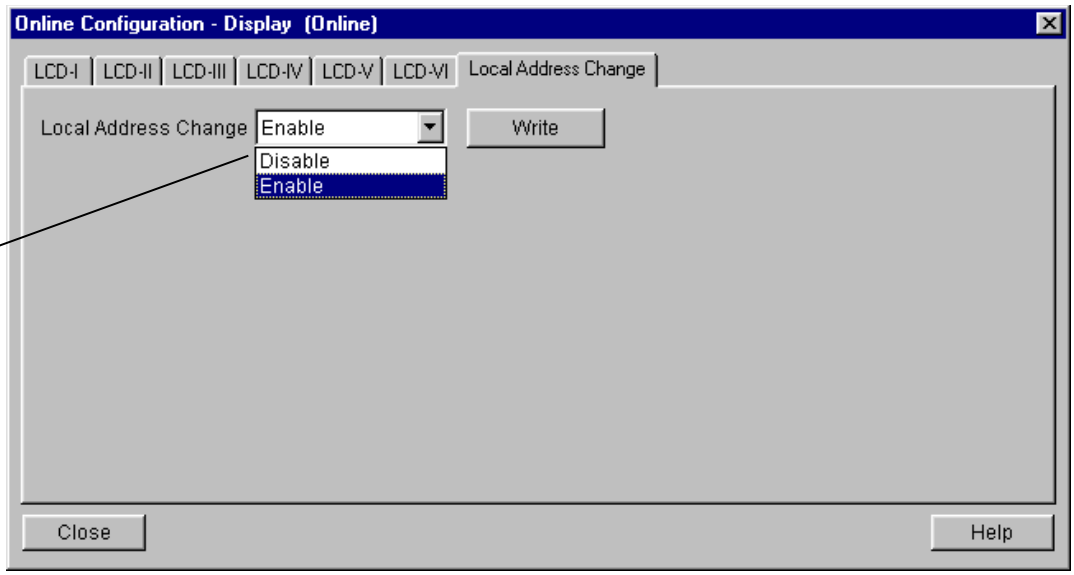


Figure 3.24 - Parameters for Local Address Configuration

When the user enters in the local adjustment and rotate the parameters using the magnetic tool, after escaping to normal operation, e.g., the monitoring, if the parameter when the magnetic tool is removed has "Access Permission equal to "Monitoring", then this last parameter will be shown at the LCD.

The LCD interface always shows the number of parameters defined in the TOGGLE option, alternating between the parameters configured on the LCDs. If the user does not want to show any parameter, just choose "None" when configuring the LCD:

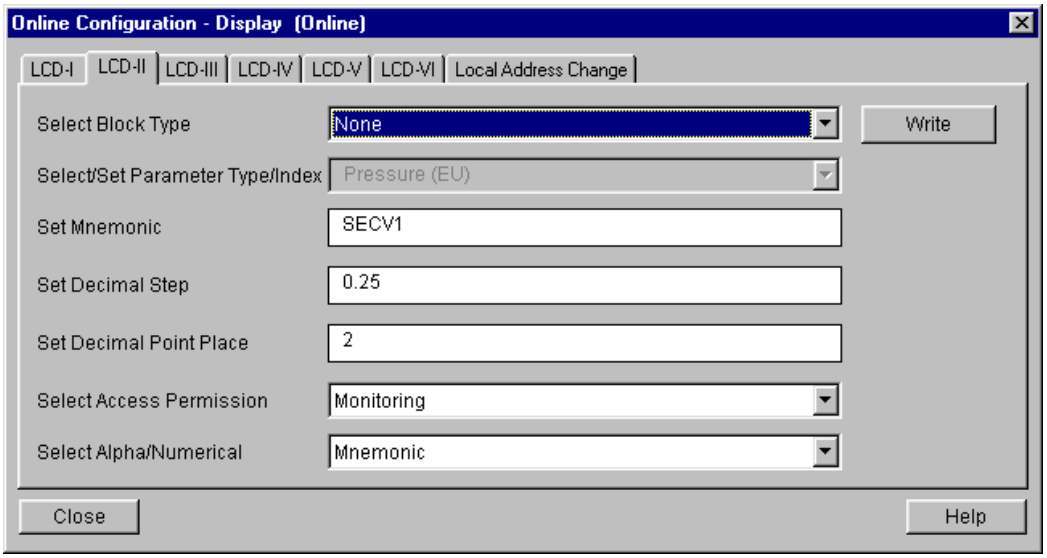


Figure 3.25 - Parameters for Local Adjustment Configuration

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

With this option, the Mode Block parameter is shown at the LCD.

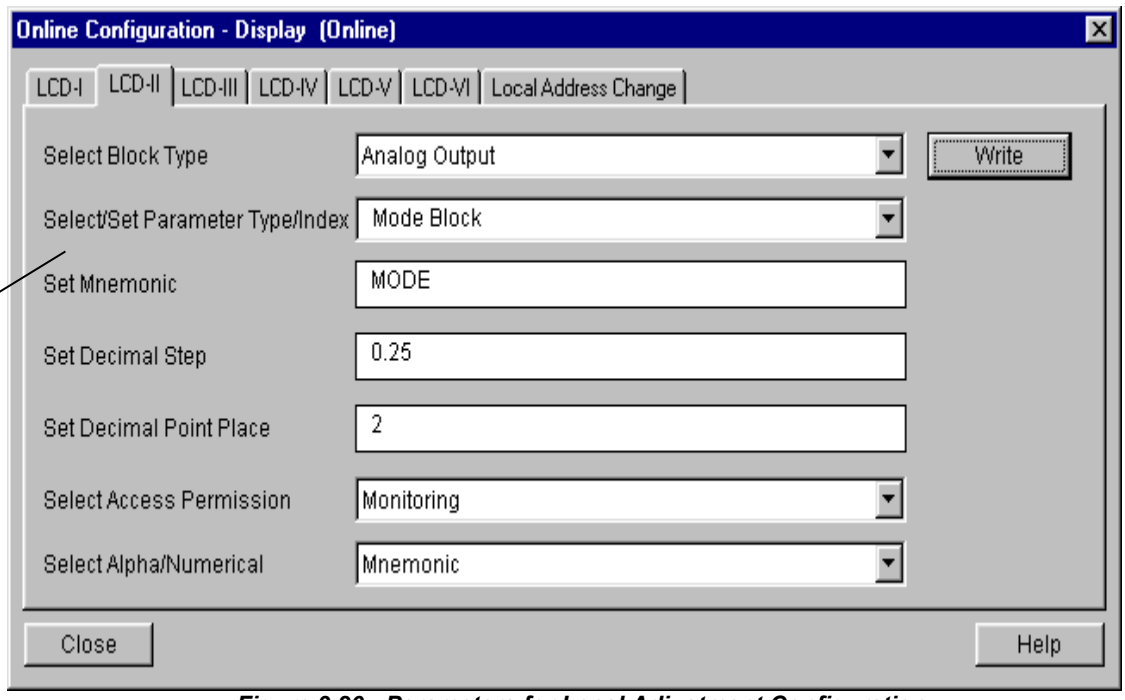
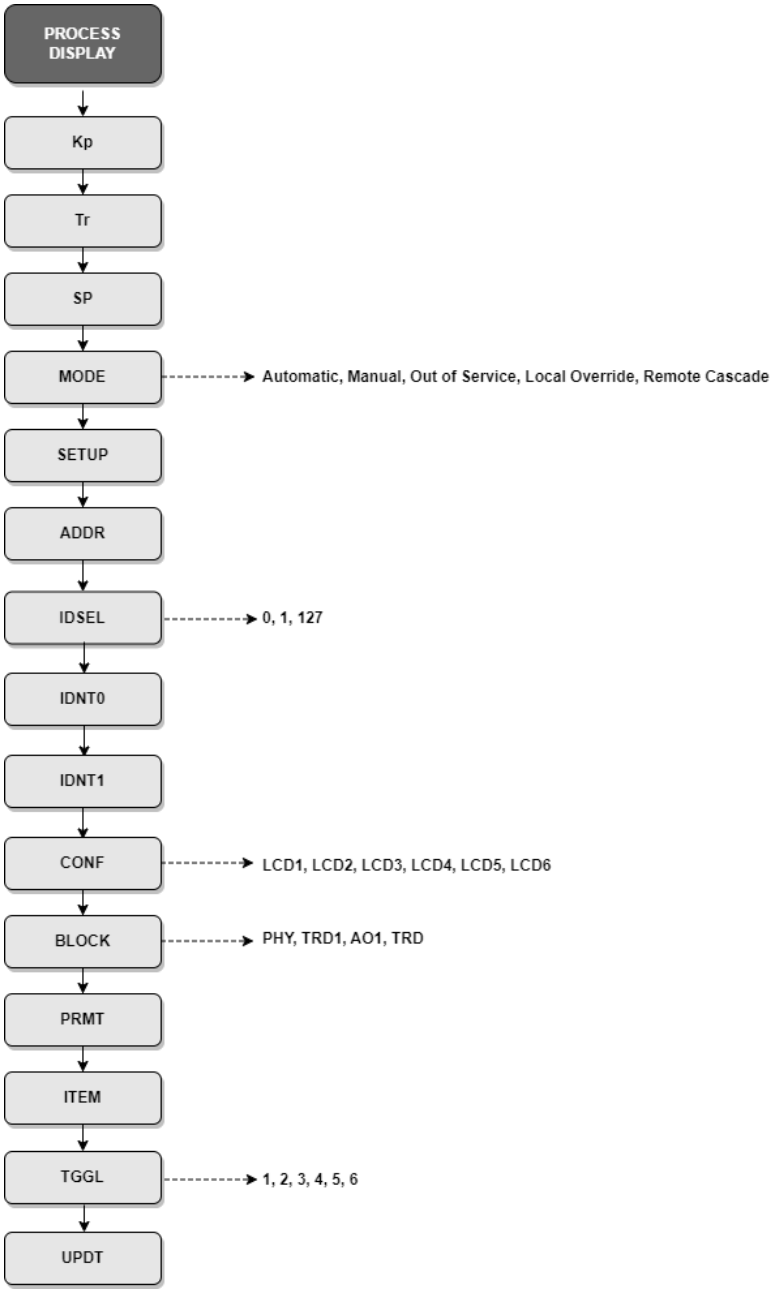


Figure 3.26 - Parameters for Local Adjustment Configuration

Local Adjustment Tree



How to access the local adjustment tree

- Place the magnetic tool in hole Z, wait for the MD icon to appear on the display;
- Place the magnetic tool in hole S, wait 2 seconds, remove it from S, wait 2 seconds, place it in S again and wait for LOC ADJ to appear on the display.

How to search and select menu options

- Hold the magnetic tool in Z to move through the local adjustment tree.
- Enter in S to select the desired option.

How to configure a block parameter in one of the local adjustment tree options

- Navigate to the CONF option and select the desired LCD;
- Return the switch to hole Z, navigate to the next option, BLOCK, and select the block to be configured, placing the magnetic tool in hole S;

- Return the switch to hole Z, navigate to the next option, PRMT, and select the parameter to be configured, placing the magnetic tool in hole S;
- Then, in the ITEM option, configure the subindex, if applicable;
- Navigate to the UPDT option and insert the magnetic tool in S;
- Enter local adjustment again and look for the configured parameter in the chosen LCD. After all these steps the parameter can be changed;
- Repeat the above steps for all parameters that will be configured. Use views 2 to 6 (LCD-II to LCD_VI) to avoid corrupting the main view of normal equipment operation (LCD-I).

Configuring using Local Adjustment

The FY303 is completely configured by ProfibusView, by Simatic PDM, or via FDT/DTM. Choose the best usage options to fit your application. Normally, the equipment is configured through the configuration tool, but an LCD functionality allows action on certain parameters, without the need to install communication network connections.

All Smar 303 series field devices use the same methodology to handle the display transducer resources. Soon, if the user learns it once, can handle all types of Smar field equipment. This local adjustment setting is just a suggestion. The user can choose the preferred configuration via configuration tool by simply configuring the display block.

The positioner has two holes for magnetic switches, located under the identification plate, marked with letters S and Z. 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. Without the display the local adjustment is not possible.

To enter the local adjustment mode, place the magnetic tool in hole **Z** until flag **MD** lights up in the display. Removes magnetic tool from **Z** and place it in hole **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**. By placing the magnetic tool in **Z** the user will be able to access the local adjustment tree.

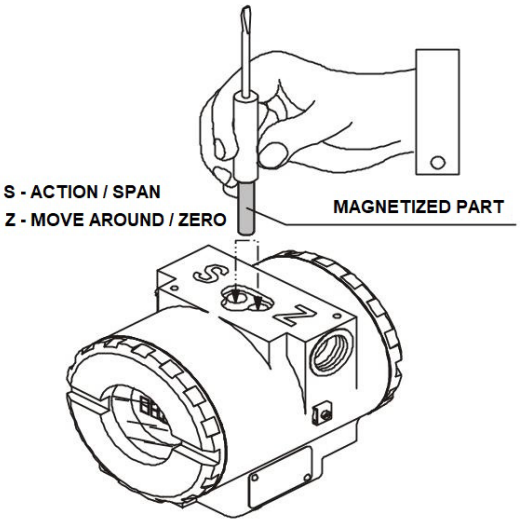


Figure 3.27 - Local Adjustment Holes

The table shows what the actions on the **Z** and **S** holes do in the FY303 when the local adjustment is enabled.

HOLE	ACTION
Z	Initializes and moves between available options.
S	Select the option shown on the indicator.

Connection of J1 Jumper

If J1 Jumper is connected in ON, the simulation mode will be enabled on AO block.

Connection of W1 Jumper

If W1 Jumper is connected in ON, the local adjustment is enabled.

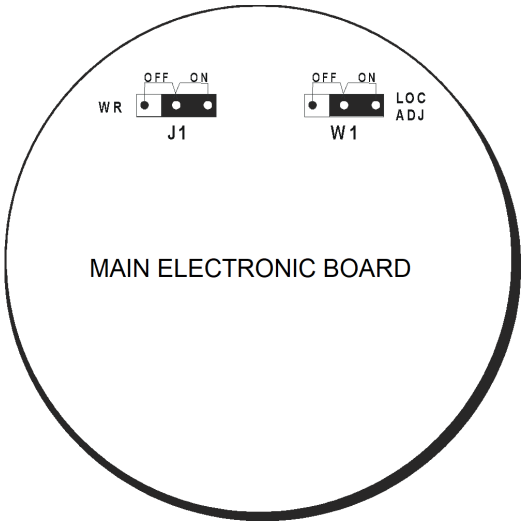


Figure 3.28 - Jumpers J1 and W1

The local adjustment tree allows the configuration of FY303 parameters, such as KP, TR, SP, MODE and SETUP parameters, which is the factory default configuration for the Display transducer block.

POS – Valve Position
When starting the local adjustment, the last valve position read is shown on the display.

KP – Proportional Gain
This parameter allows adjusting the servo control proportional gain.

TR – Integral Time
This parameter allows adjusting the servo control integral time.

SP – Set Point
This parameter represents the desired position value. While in "Manual" mode, it is possible to actuate this parameter remotely. While in automatic, it is calculated from the input current level.

MODE – Operation Mode
This parameter allows the user to choose operation mode. During operation there are the following options:

- **Out of Service (O/S):**
  The block is not being evaluated. The output remains at the last value or, in case of power failure, can be programmed to hold a value.
- **Local Override (LO):**
  The output block is not being calculated, although it may be limited. Applies to control block that supports traced input parameter. When the block is in LO, the output follows the value established by the user locally (through actuations of magnetic switches). The user cannot change remote host outputs.
- **Manual (Man):**
  Block output is not being calculated, although it may be limited. In this mode, the operator can directly adjust the block outputs.
- **Automatic (Auto):**
  The algorithm normally calculates the block output. If the block has a setpoint, it will be used with a local value, which can be recorded by the operator through a local interface device.
  The block output is calculated using the transducer block input, in the case of a function block, and using a setpoint value provided by a server or an operator via an interface in the case of an output function block.

- **Remote Cascade (Rcas):**
  The block setpoint is being adjusted by a control application through the RCAS_IN remote cascade parameter. The normal algorithm calculates the block output based on that setpoint.
  The “automatic” modes are Auto and Rcas, which calculate the primary output using the normal algorithm. The “manual” modes are LO and Man.

Mode	SP Source	Output Source
O/S	User	User
LO	User	User
Man	User	User
Auto	User	Block Algorithm
Rcas	Control application running on interface equipment	Block Algorithm

SETUP
This option implements the valve autoconfiguration, that is, the lower and upper values of the physical position of the valve. When the configuration shows the value 0 (zero) on the LCD Display, it indicates that configuration is disabled.

Insert the magnetic tool in orifice **S** and select value 2. After that, the autoconfiguration will start and a quick message with the word **SETUP** will be shown on the positioner's LCD Display. After finishing this process, the local adjustment will return to normal operation.

ADDR
This option configures the FY303 address on the PROFIBUS PA network. Acceptable values range from 3 to 126.

See below an example of configuration via Local Adjustment:

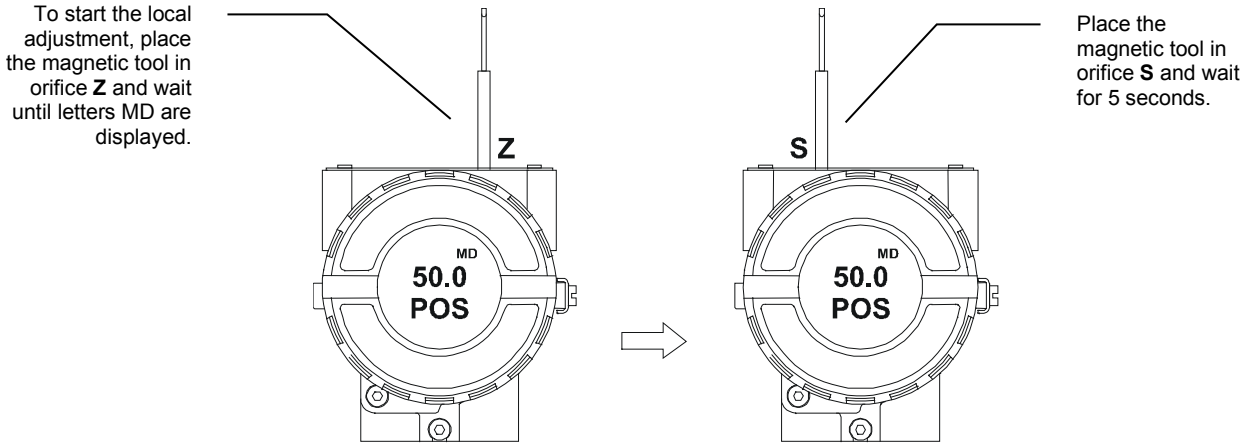


Figure 3.29 - Step 1 - FY303

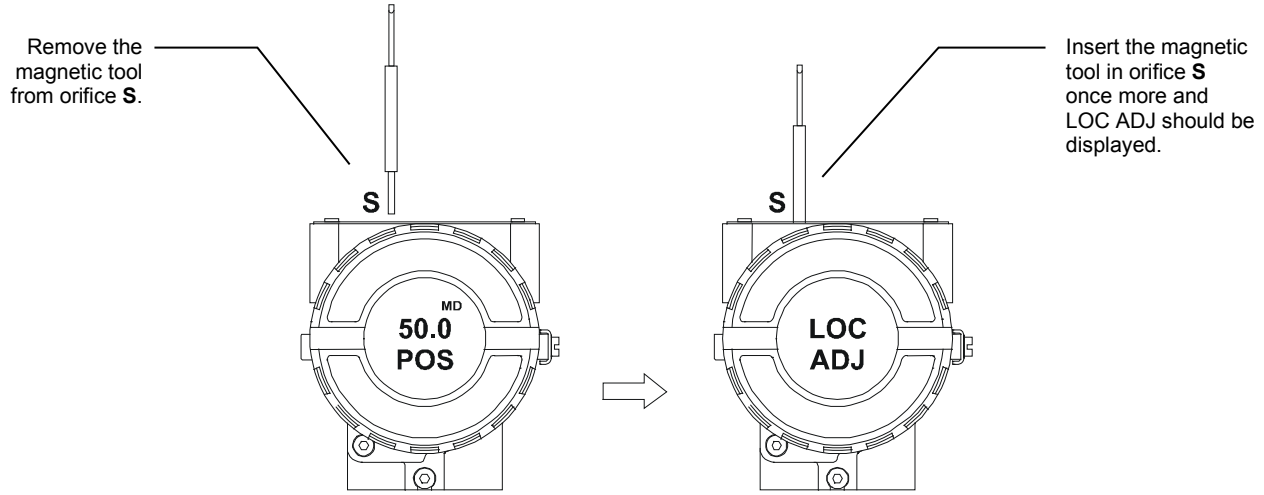


Figure 3.30 - Step 2 – FY303

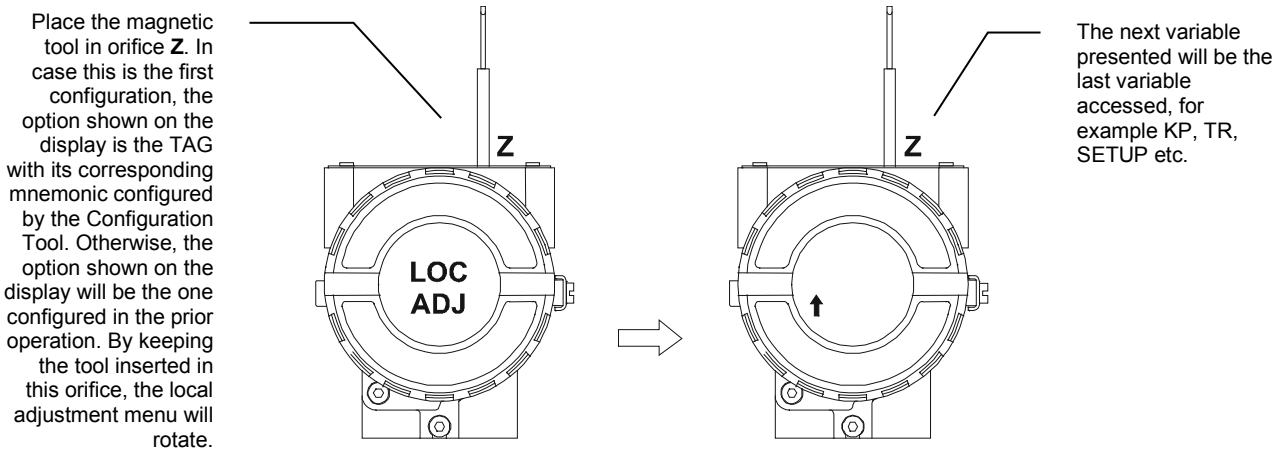


Figure 3.31 - Step 3 - FY303

Adjust the **KP** and **TR** value according to the actuator characteristics.

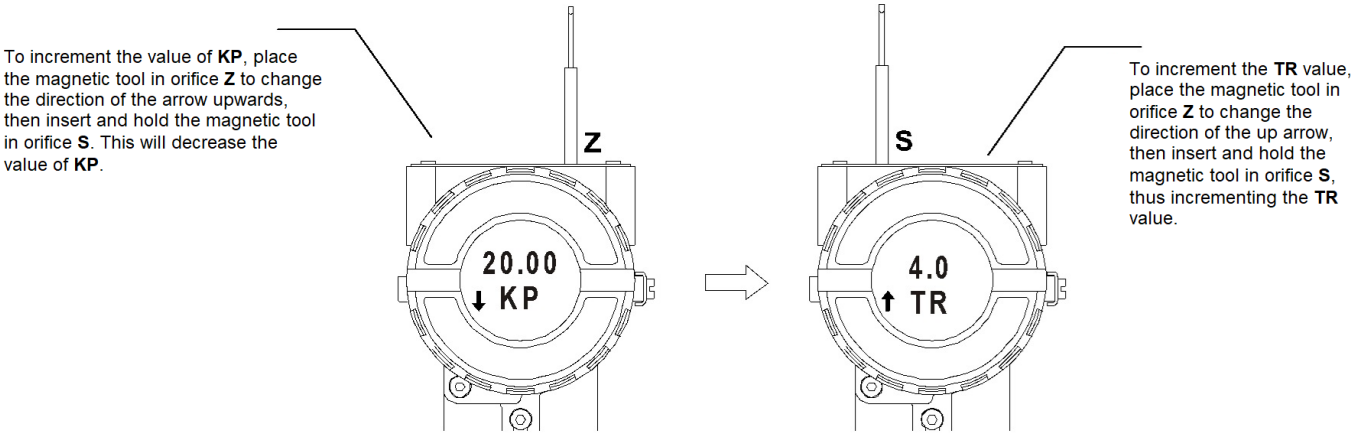


Figure 3.32 - Step 4 – FY303

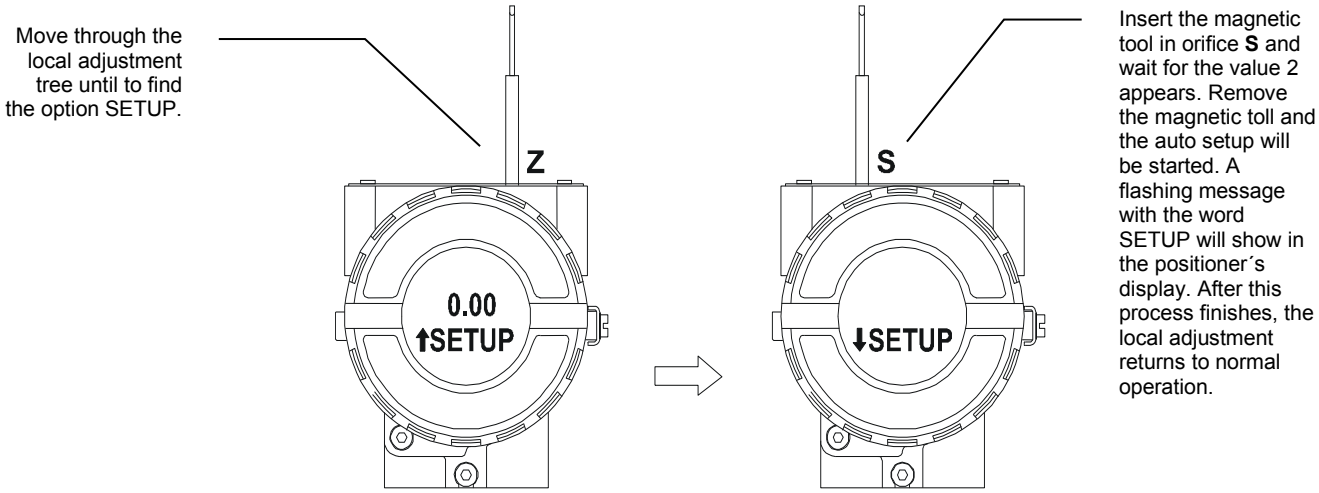


Figure 3.33 - Step 5 – FY303

NOTE
Manual SETUP – location with high vibration During the SETUP process, if the positioner is installed in a place with high vibration, the SETUP stops at 10%. At this moment, it is recommended to run the Manual Setup: 1. Insert the magnetic tool in hole "S", the display will indicate 20% of SETUP; 2. Remove the magnetic tool from hole "S" for the positioner to continue the setup process.

NOTE
If SETUP stops at 40%, the positioner may have a mechanical defect or lack of supply air. If the positioner is intact, the procedure ends successfully, SETUP up to 100%.

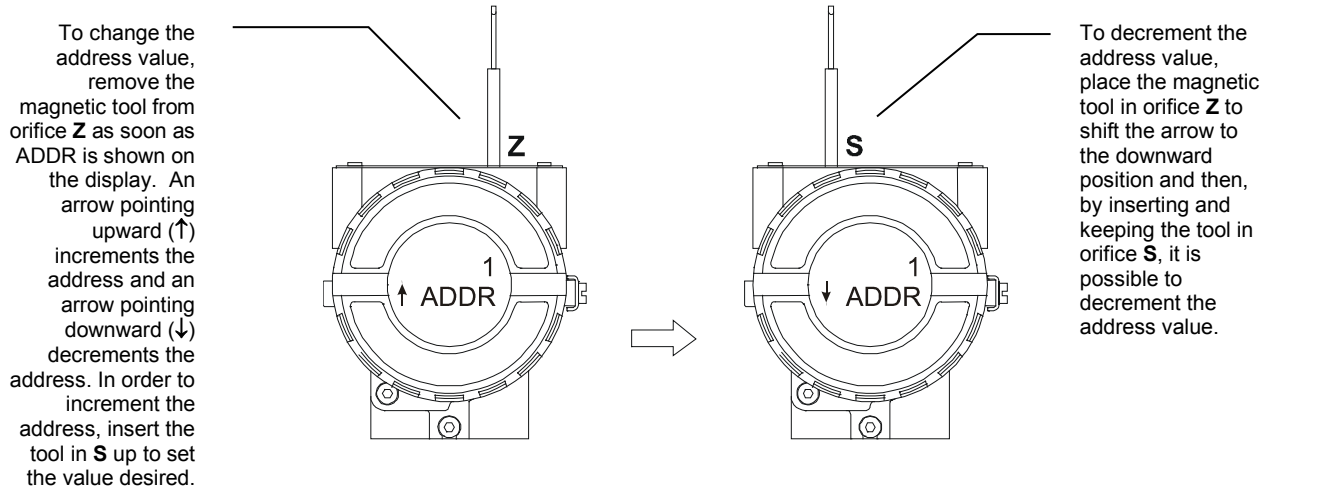


Figure 3.34 - Step 6 - FY303

NOTE
Every time the Auto Calibration is used it is suitable to save it via configuration tool, and to write in the Backup-Restore parameter of the transducer block the sensor Data Backup option. For further details about local adjustment, refer to PROFIBUS PA General Manual.

IDSEL

There are three possible values for this parameter, resulting in three operating modes:

(0) PROFILE SPECIFIC – Equipment complies with a generic GSD, and this must be used when there is a perspective of exchanging equipment between manufacturers.

(1) MANUFACTURER SPECIFIC – (DEFAULT) Equipment complies with the manufacturer's GSD with its characteristics.

(127) AUTOMATIC_IDENT_NUMBER – Equipment will respond with the IDENT_NUMBER configured in the IDNT0 and IDNT1 parameters. For more details see note.

IDENT0
After changing the IDSEL parameter to 127, the equipment's IDENT_NUMBER value must be converted from hexadecimal to decimal, found inside the GSD file used to include it in the configuration, and the first part of the converted number must be written in IDNT0.

IDENT1
In IDENT1 write the second part of the equipment's IDENT_NUMBER value in decimal.

Examples:
0X06CA => IDNT0 = 6 and IDNT1 = 202
0X8079 => IDNT0 =128 and IDNT1 = 121

CONF
This option allows selecting the LCD to configure it, that is, which item will be shown on the FY303 display and the local adjustment tree. Six options are available – from LCD1 to LCD6.

BLOCK
In this option, the user can select the function block to be configured.

PRMT
It is the number corresponding to the relative index of the parameter to be configured within the function block chosen in the BLOCK option.

ITEM
This option must be configured if the parameter selected in PRMT has sub-items. For example, the OUT_SCALE parameter is composed of EU at 100%, EU at 0%, Unit Index and Decimal Point.

TGGL
This option allows choosing how many configured parameters will be alternately shown on the display during normal operation. For example, if TGGL equals two, the display will alternate between LCD1 and LCD2.

UPDT
The configuration is finished by activating UPDT after choosing the options for the local adjustment.

NOTE

AUTOMATIC_IDENT_NUMBER is a feature available from FY303 firmware version 4.11 onwards. This procedure can be used to replace a device from another manufacturer with a SMAR device without changing the configuration of the PROFIBUS master in operation.

This action is recommended when there is an urgent need to replace the equipment or there is no possibility of maintaining the configuration.

In this case, the IDENT_NUMBER of the SMAR equipment must be changed to reflect the same code as the equipment it will replace. This can only be done by comparing the GSD files of both and ensuring module compatibility.

For example, if there is a PROFIBUS PA device from another manufacturer in your network and that, according to its GSD file, has IDENT_NUMBER = 0x0639 and it is necessary to replace it with a Smar device, without downloading the configuration in the PROFIBUS master, the user must proceed as follows:

1) Change the address of the SMAR device to the same address as the device to be replaced.

2) Check in the configuration in operation on the client, which is the model and IDENT_NUMBER of the equipment via GSD file. Take a note of this number, for example 0x0639 is the IDENT_NUMBER used by one of the equipment models from another manufacturer.

3) On the Smar equipment, using the magnetic tool, go to the IDENT parameter and set the value to 127. This value means that the equipment will work in AUTOMATIC_IDENT_NUMBER.

4) After changing the IDENT parameter to 127, convert the GSD value to decimal and write the values in items IDNT0 and IDNT1:

   0x0639 => IDNT0 = 6 | IDNT1 = 57

5) Restart the equipment.

This Smar equipment can be added in place of another manufacturer's equipment without changing the configuration. Parameterizations (SETUP, Kp, Tr, scales) must be performed locally or with ProfibusView and PBI.

In case of FACT_INIT on the instrument, it will return to the default mode (1) MANUFACTURER SPECIFIC with the original IDENT_NUMBER Smar.

Function Block Configuration Via Local Adjustment

In this topic, an example of how to configure a function block, via local adjustment, will be shown.

Air to Open and Air to Close:
The user must configure the following parameters using the local adjustment procedure:
CONF: Select a LCD, for example, **LCD2**;
BLOCK: Select **TRD**;
PRMT: Select **70** (AIR_TO), in accordance with the Transducer Block Parameter Descriptions, Transducer Block Specific Parameters, and Transducer Block Parameter Table in this manual;
ITEM: The **AIR_TO** is a simple parameter and does not have elements, so it is not necessary to configure a specific value**.**

After these settings, go to the “UPDT” option and insert the magnetic tool in the Span orifice to update the local adjustment tree. Enter local adjustment and go to the AIR_TO option, and then set the value as shown below:
0 = Open
1 = Closed

For details and more examples on how to configure a function block via local adjustment, refer to the Profibus PA Installation, Operation and Maintenance Procedures Manual (General Profibus PA), section 3, topic “Example of Configuration of the Same Equipment Using the Adjustment Location”, FY303.

Self-Calibration using Local Adjustment

This process is necessary to find the position values at which the valve is considered fully open or closed. This operation can be done using the **Configuration Tool** or the Local Adjustment. The **FY303** automatically finds the fully open and closed positions of a valve, but the user may also set an operation range. Before making the Auto-Setup, select the type of valve through the parameter VALVE_TYPE choosing between "Linear or Rotary" options.

The configuration operation is started after removing the magnetic tool when the increment in the SETUP parameter is 2 (Enabled self-calibration by local adjustment), thus the positioner will immediately perform the self-calibration operation for approximately 2 to 5 minutes depending on the type of valve, the other configured parameters and the function blocks used in the positioner.

The process will be finished when the SETUP parameter will indicate "Disable" (0) automatically during the operation of reading.

NOTE

This operation should be performed off-line or with the process stopped to be sure that the plant operation is not disturbed, due the valve will be moved between the fully open and closed points to reach the better adjustment.

NOTE
In case of oscillation, decrease the gain of valve, acting on the SERVO GAIN parameter. If the valve could be out-of-control after its operation, please, repeat the Self-Calibration operation again.

Pressure Sensors Version (K1 Option)

The K1 option of the **FY303** is available with 3 pressure sensors: one for input and two for the outputs.

How to check the pressure sensors installation
In terms of configuration, after identifying the presence of the sensors on the hardware, their installation may be checked via ProfibusView or Simatic PDM. Open the Pressure Sensor window, Status tab, as shown below:

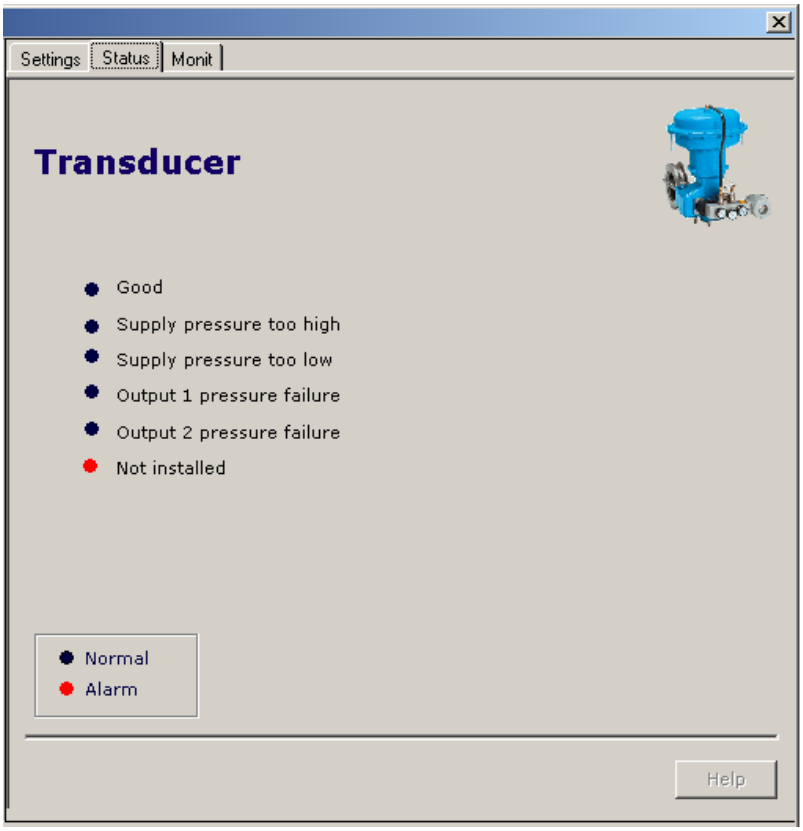


Figure 3.35 – Checking the FY303 Pressure Sensors Installation - ProfibusView

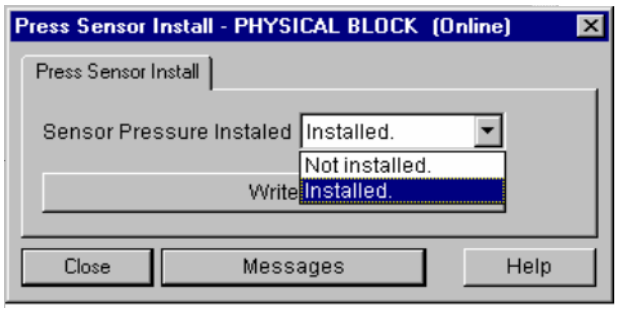


Figure 3.36 – Checking the FY303 Pressure Sensors Installation – Simatic PDM

Pressure sensor calibration

To check or calibrate the pressure sensor with the ProfibusView or Simatic PDM, open the Pressure Sensor window, Settings tab, as shown below:

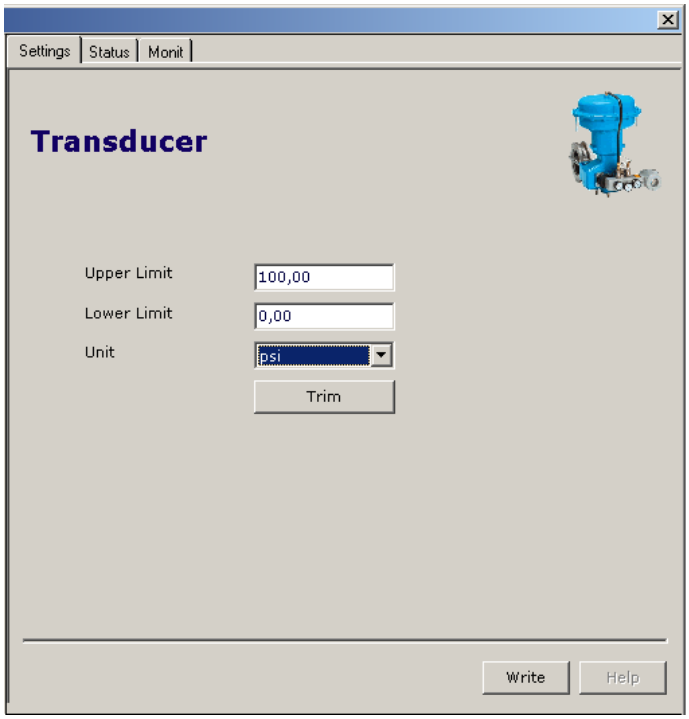


Figure 3.37 – Pressure Sensors Calibration

Next step is selecting which sensor is to be calibrated: if the Input, or the output 1 (Out 1), or the output 2 (Out 2). Choose the reference point with the options Upper and Lower. See next figure.

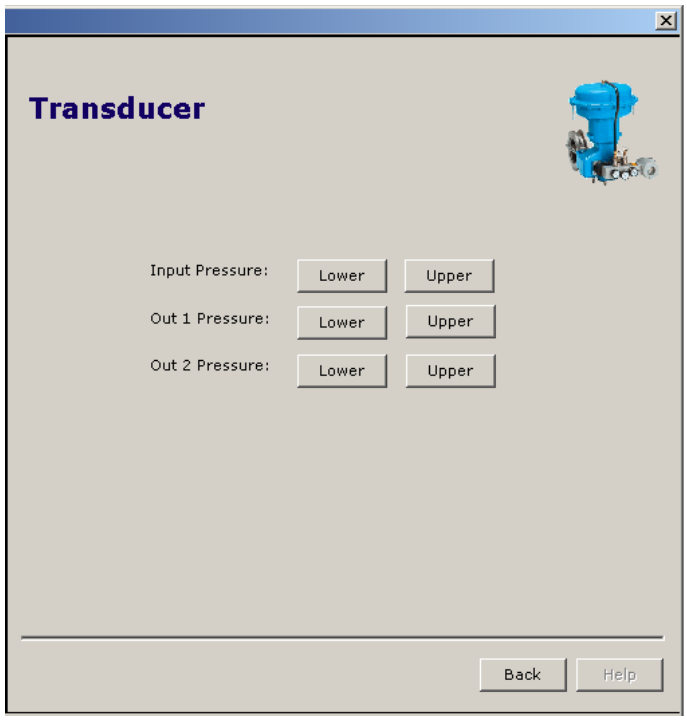


Figure 3.38 – Sensor Type and Reference Point Calibration - ProfibusView

The user must inform the reference pressure observing the values in the FY303:

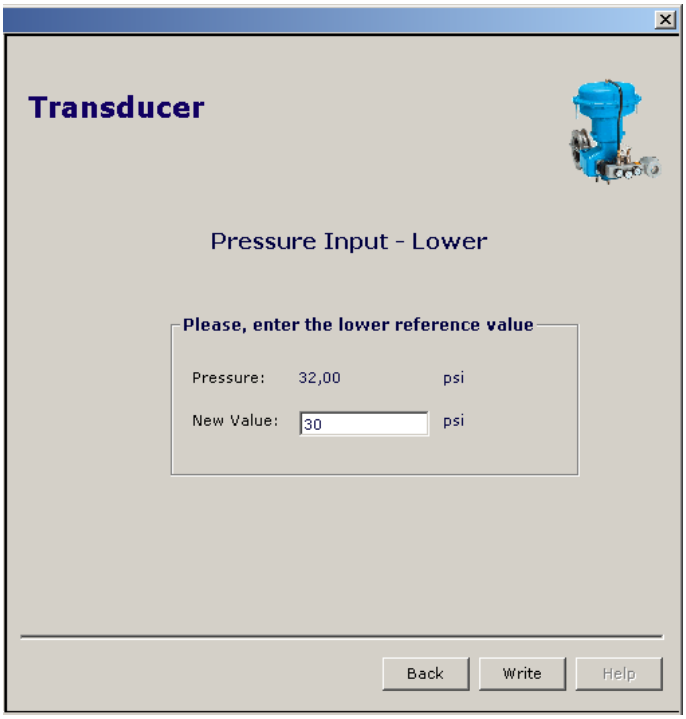


Figure 3.39 – Lower Pressure Point Calibration - ProfibusView

See below the Pressure Sensor Setup and Calibration windows using Simatic PDM software:

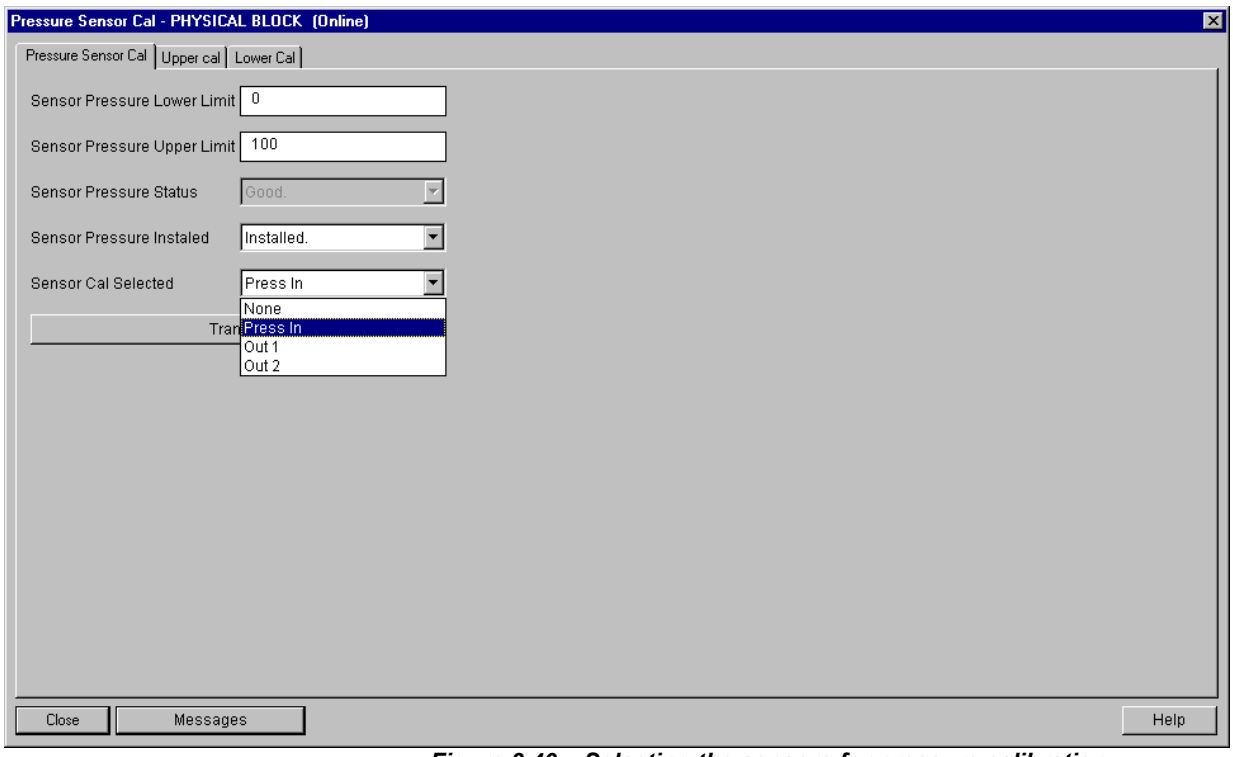


Figure 3.40 – Selecting the sensors for pressure calibration

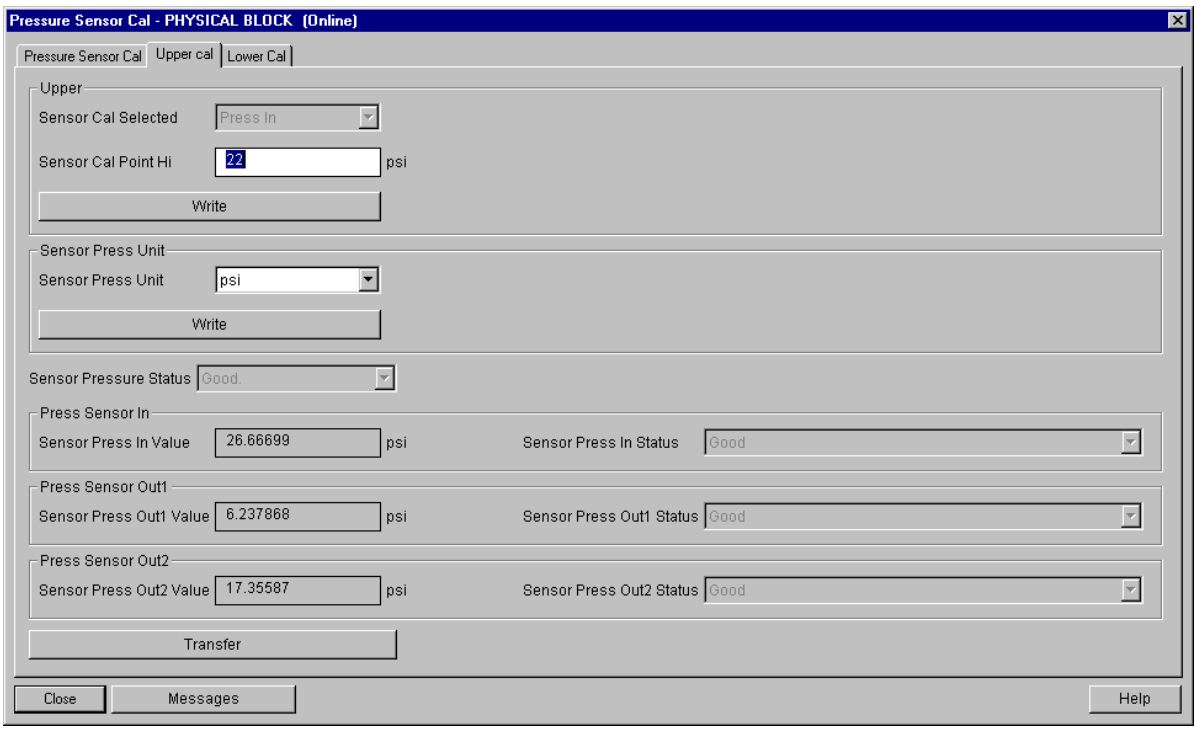


Figure 3.41 - Calibration at the Upper Pressure Point

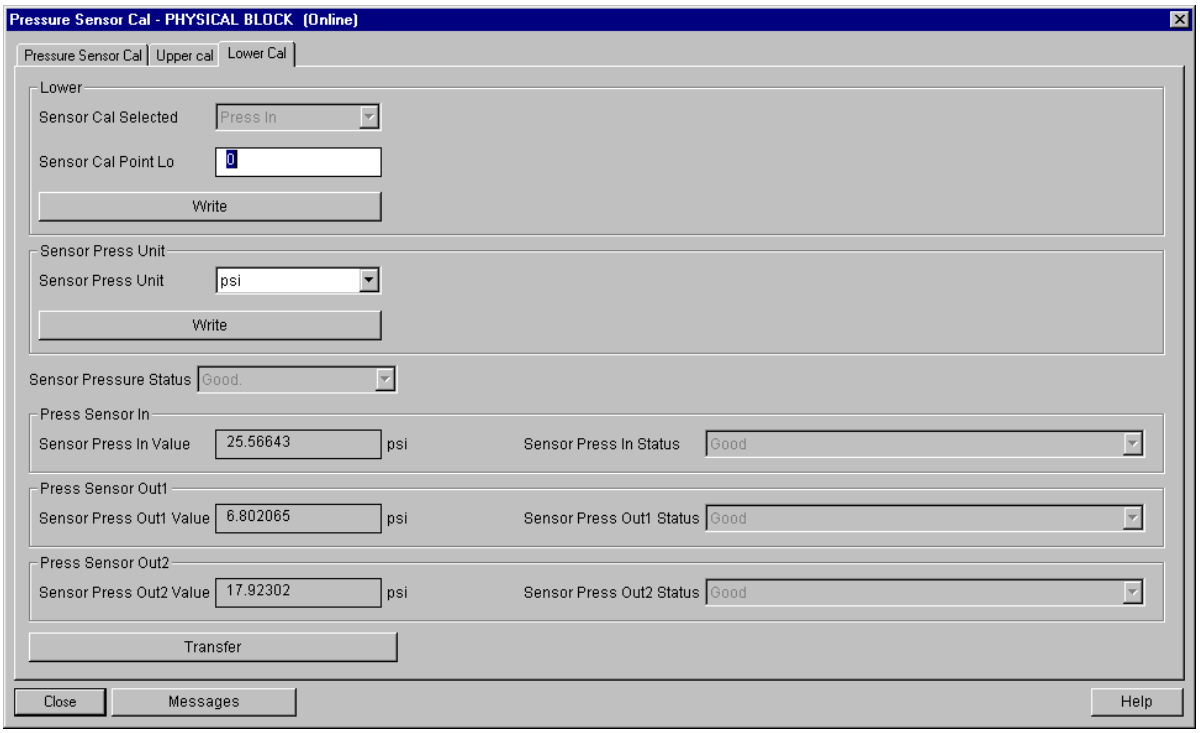


Figure 3.42 – Lower Pressure Point Calibration

NOTE
When having an input pressure alarm, the ReadBack status for the AO function block will be “uncertain”.

Configuring the Fail Safe

The configuration of the safety value must be done in a combination of parameterization in the transducer block and the AO block, where the user must initially select in the Actuator_Action(index 63) parameter:

- Opening(100%),
- Closing (0%),
- None/remains in actual position or not initialized.

Still in the transducer block, the parameter TRD_SP_POWER_UP (index = 148) will indicate during the equipment power-up process (for example, after a power failure) which Setpoint (SP) must be used; if the last SP received by the Profibus DP master or the value configured in the AO block parameter, the Fail_Safe_Value:

TRD_SP_POWER_UP:

- 0x00: Last Valid SP
- 0x01: Use FailSafeValue from AO Block

After a factory init this parameter is configured as “Last Valid SP”.

On the AO block configure the Actuator Position parameter, the options are “Opening” or “Closing”.

Using “Advanced Settings for AO block”, user can select fail safe mode:

“Actuator goes to fail safe position, Storing last valid setpoint or Fail safe value is used as a control regulator input.”

Remember that the watchdog must be activated in the FY303 configuration in the Profibus DP master

Monitoring
Via ProfibusView or Simatic PDM it is possible to monitor the positioner process variables.

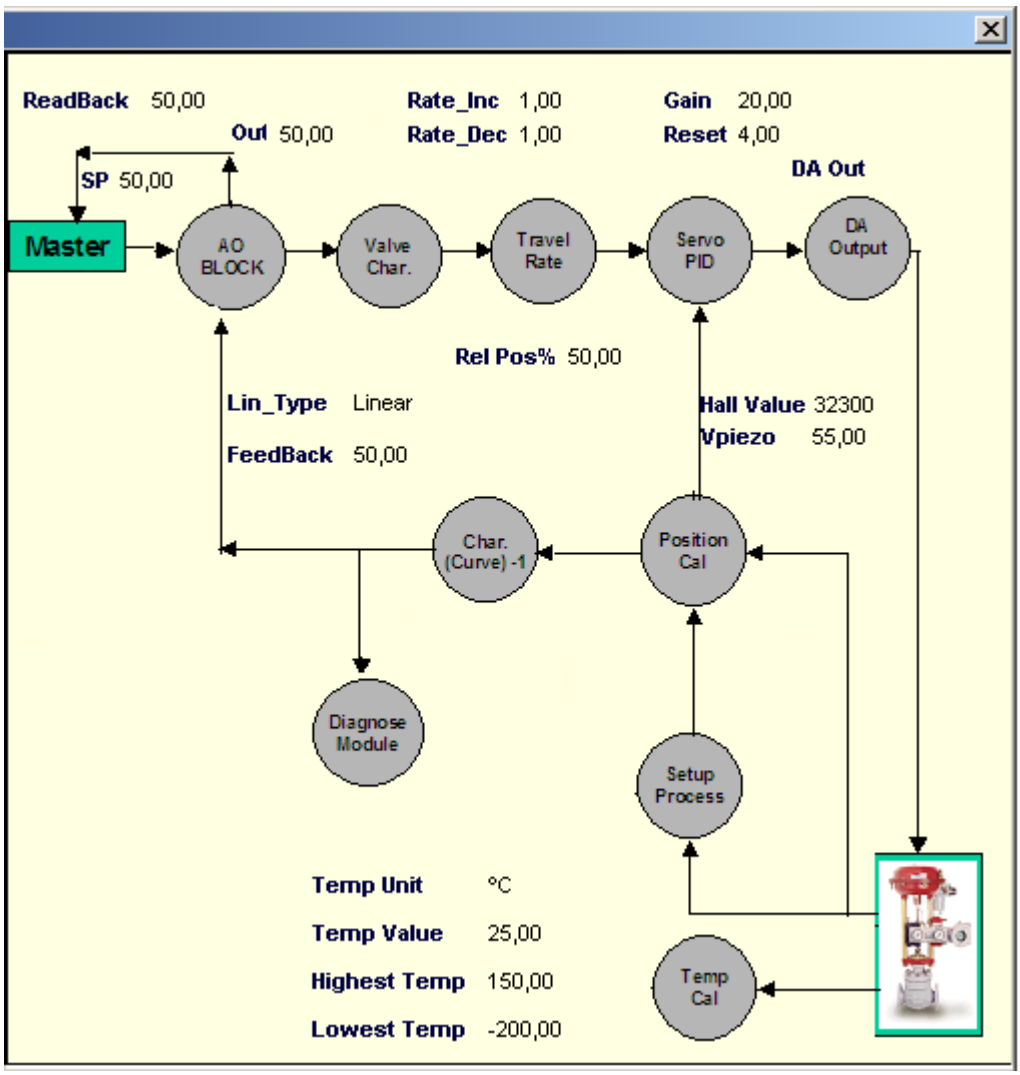


Figure 3.43 – Monitoring window - ProfibusView

When choosing the “Position Performance Diagram” option, the PDM will show the graph according to figure 3.50, where the user will be able to observe the behavior of the real position of the valve in the SetPoint over time.

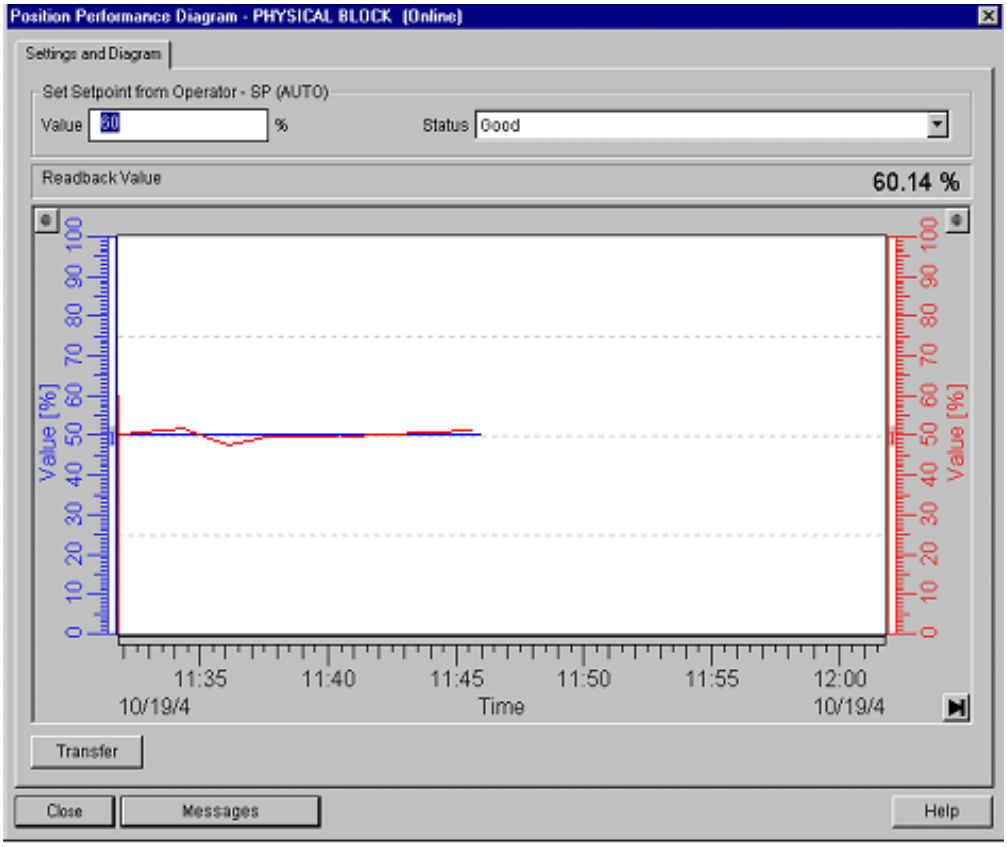


Figure 3.44 – Real Position x SP

Clicking on the scales, the user may adjust them according to the application and, in addition, zoom in the curve to locate a specific area.

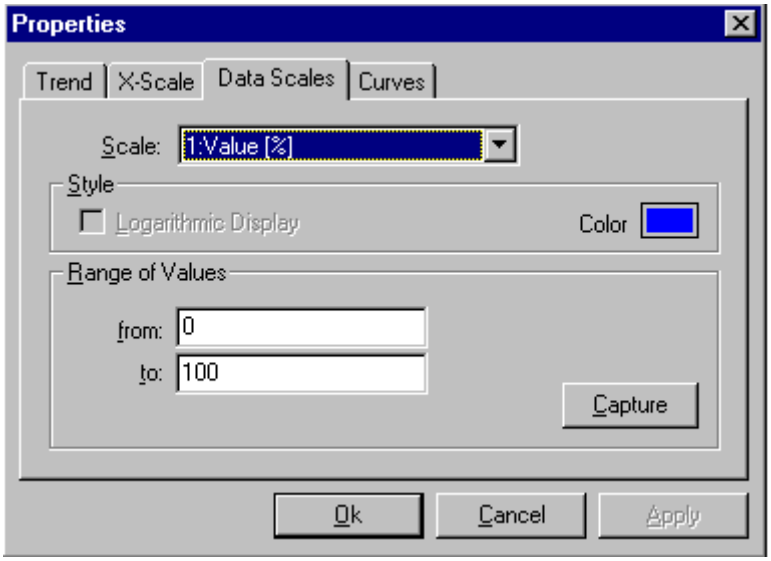


Figure 3.45 – Scale adjustment

By choosing “Pressure Diagram”, the real position may be drawn by the sensor selected on figure 3.52, as shown on next figure. If no sensor was selected, the “Pressure Diagram” option will not be seen on the “View” menu.

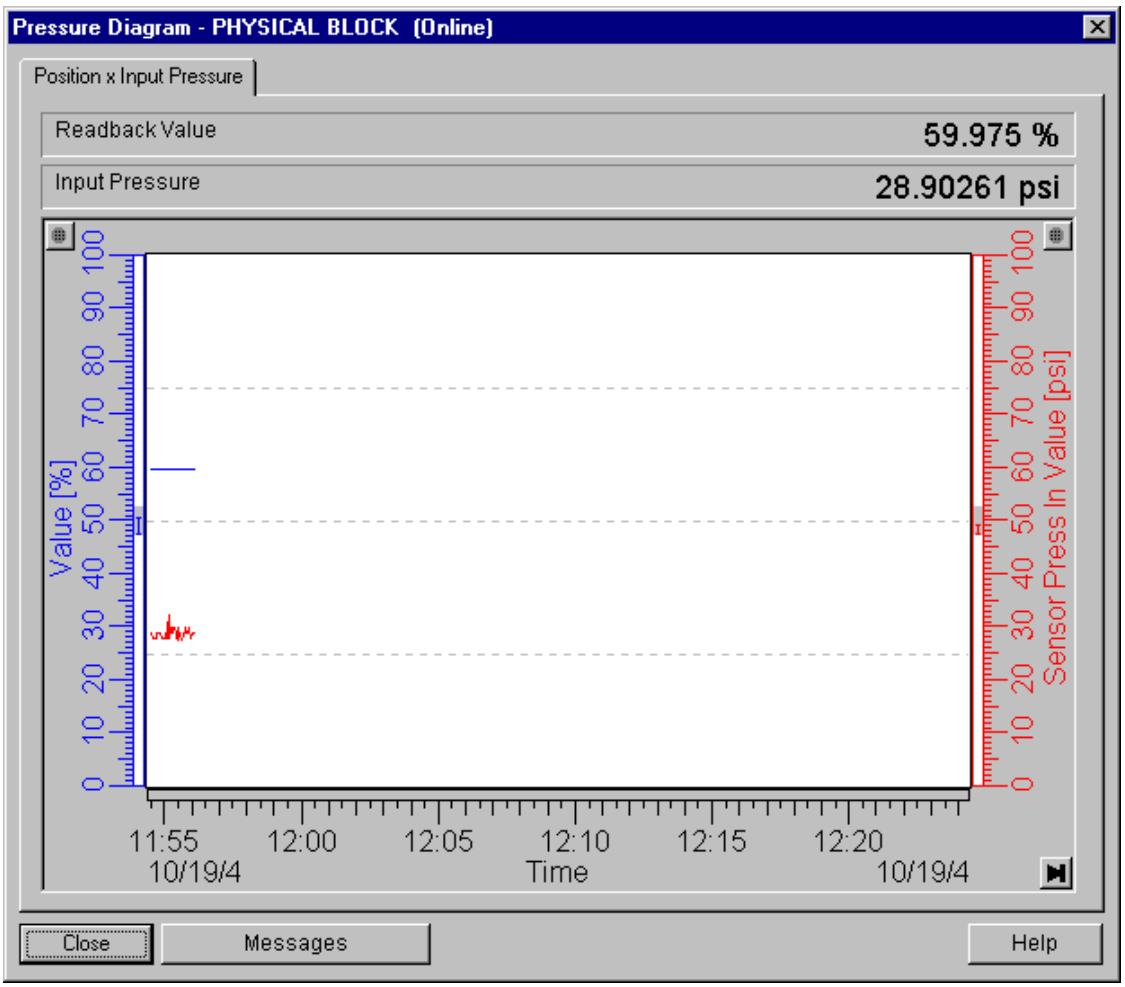


Figure 3.46 – Real Position x Pressure

Pressure sensors configuration data on the Transducer block

The pressure sensors are characterized on factory procedure, so, if the configuration data must be checked, go the “Pressure Sensors” window of the transducer block, as shown on figure 3.53.

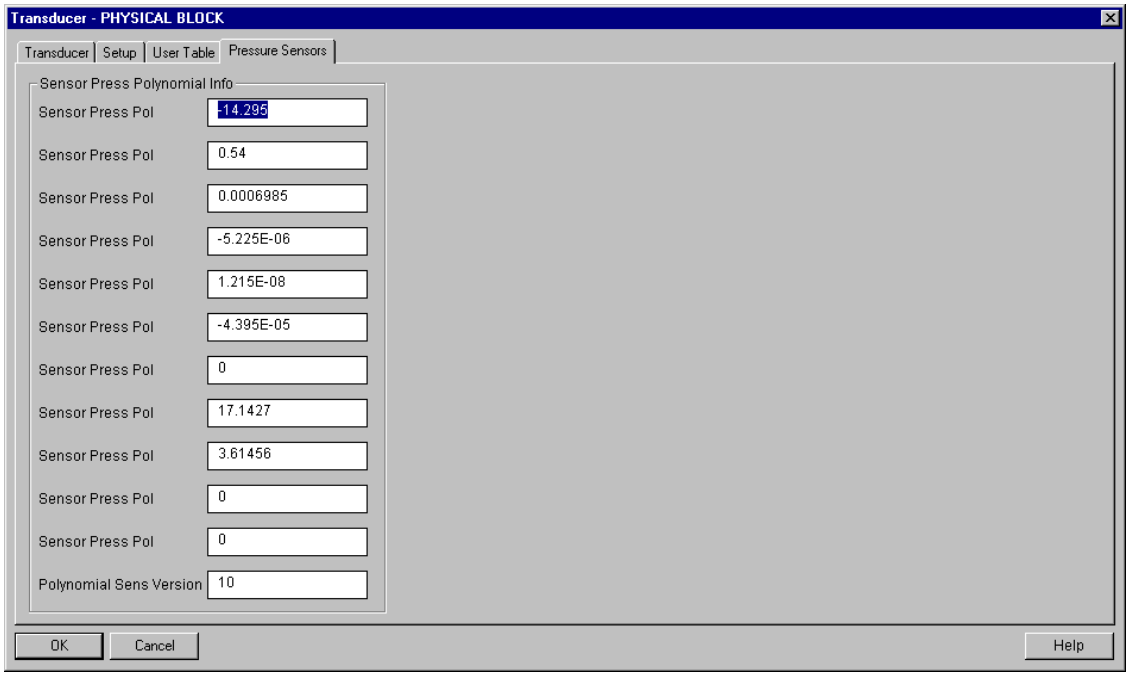
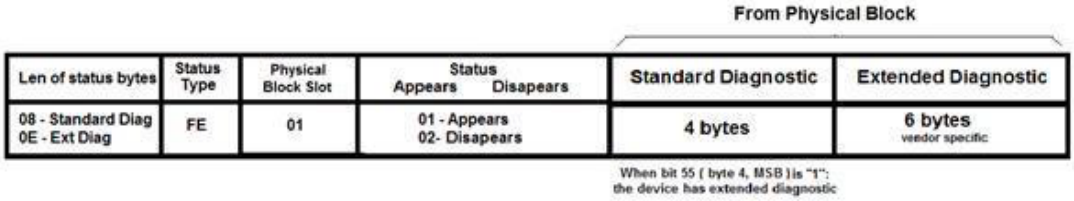


Figure 3.47 – Sensor Pressure Configuration Data

Cyclic Diagnostics

The diagnostics can be checked cyclically through readings via the Profibus DP class 1 master, as well as acyclically via the class 2 master. The Profibus PA devices provide 04 standard bytes via the Physical Block (see figure 3.54 and figure 3.55) and when the bit more significant than the 4th. Byte to “1”, will extend the diagnostic by 6 more bytes. These diagnostic bytes can also be monitored using acyclic tools.

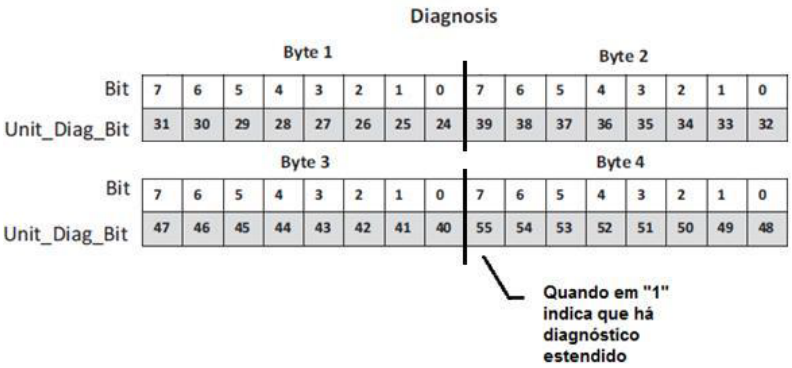


From Physical Block

Len of status bytes	Status Type	Physical Block Slot	Status Appears Disapears	Standard Diagnostic	Extended Diagnostic
08 - Standard Diag 0E - Ext Diag	FE	01	01 - Appears 02- Disapears	4 bytes	6 bytes vendor specific

When bit 55 (byte 4, MSB) is "1":
the device has extended diagnostic

Figure 3.48 – Cyclic Diagnostics



Diagnosis

	Byte 1								Byte 2							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Unit_Diag_Bit	31	30	29	28	27	26	25	24	39	38	37	36	35	34	33	32
	Byte 3								Byte 4							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Unit_Diag_Bit	47	46	45	44	43	42	41	40	55	54	53	52	51	50	49	48

Quando em "1" indica que há diagnóstico estendido

Figure 3.49 – Mapping of Cyclic Diagnostics in the 4 bytes of the Physical Block

Unit_Diag_bit is described on GSD file of the Profibus PA equipment.

Next comes part of the description of a GSD file where the 4 bytes are detailed:

```
;----------- Description of device related diagnosis: ----------------------
;

Unit_Diag_Bit(16)   = "Error appears"
Unit_Diag_Bit(17)   = "Error disappears"
;
;Byte 01
Unit_Diag_Bit(24)   = "Hardware failure electronics"
Unit_Diag_Bit(25)   = "Hardware failure mechanics"
Unit_Diag_Bit(26)   = "Not used 26"
Unit_Diag_Bit(27)   = "Electronic temperature alarm"
Unit_Diag_Bit(28)   = "Memory error"
Unit_Diag_Bit(29)   = "Measurement failure"
Unit_Diag_Bit(30)   = "Device not initialized"
Unit_Diag_Bit(31)   = "Device initialization failed"

;Byte 02
Unit_Diag_Bit(32)   = "Not used 32"
Unit_Diag_Bit(33)   = "Air supply failed"
Unit_Diag_Bit(34)   = "Configuration invalid"
Unit_Diag_Bit(35)   = "Restart"
Unit_Diag_Bit(36)   = "Coldstart"
Unit_Diag_Bit(37)   = "Maintenance required"
Unit_Diag_Bit(38)   = "Characteristics invalid"
Unit_Diag_Bit(39)   = "Ident_Number violation"

;Byte 03
Unit_Diag_Bit(40)   = "Not used 40"
Unit_Diag_Bit(41)   = "Not used 41"
Unit_Diag_Bit(42)   = "Not used 42"
Unit_Diag_Bit(43)   = "Not used 43"
Unit_Diag_Bit(44)   = "Not used 44"
Unit_Diag_Bit(45)   = "Not used 45"
Unit_Diag_Bit(46)   = "Not used 46"
Unit_Diag_Bit(47)   = "Not used 47"

;byte 04
Unit_Diag_Bit(48)   = "Not used 48"
Unit_Diag_Bit(49)   = "Not used 49"
Unit_Diag_Bit(50)   = "Not used 50"
Unit_Diag_Bit(51)   = "Not used 51"
Unit_Diag_Bit(52)   = "Not used 52"
Unit_Diag_Bit(53)   = "Not used 53"
Unit_Diag_Bit(54)   = "Not used 54"
Unit_Diag_Bit(55)   = "Extension Available"


; Extended_Diag = Check_Back from Ao Block
Unit_Diag_Bit(56)   = "CB_FAIL_SAFE"
Unit_Diag_Bit(57)   = "Not used 57"
Unit_Diag_Bit(58)   = "Not used 58"
Unit_Diag_Bit(59)   = "Not used 59"
Unit_Diag_Bit(60)   = "CB_DISC_DIR"
Unit_Diag_Bit(61)   = "Not used 61"
Unit_Diag_Bit(62)   = "Not used 62"
Unit_Diag_Bit(63)   = "Not used 63"

Unit_Diag_Bit(64)   = "CB_ACT_OPEN"
Unit_Diag_Bit(65)   = "CB_ACT_CLOSE"
Unit_Diag_Bit(66)   = "CB_UPDATE_EVT"
Unit_Diag_Bit(67)   = "CB_SIMULATE"
Unit_Diag_Bit(68)   = "Not used"
Unit_Diag_Bit(69)   = "Not used 69"
Unit_Diag_Bit(70)   = "Not used 70"
Unit_Diag_Bit(71)   = "CB_SELFTEST"
```

Unit_Diag_Bit(72) = "CB_TOT_VALVE_TRAV"
Unit_Diag_Bit(73) = "CB_ADD_INPUT"
Unit_Diag_Bit(74) = "Supply pressure too high"
Unit_Diag_Bit(75) = "Supply pressure too low"
Unit_Diag_Bit(76) = "Output 1 pressure failure"
Unit_Diag_Bit(77) = "Output 2 pressure failure"
Unit_Diag_Bit(78) = "AO Block in Out of Service"
Unit_Diag_Bit(79) = "Calibration Error - Check XD_ERROR parameter"

Unit_Diag_Bit(80) = "PST in execution"
Unit_Diag_Bit(81) = "SP Offset is out of limit"
Unit_Diag_Bit(82) = "PST time out occurred"
Unit_Diag_Bit(83) = "PST in Auto mode and waiting for execution"
Unit_Diag_Bit(84) = "PST in Stop Mode"
Unit_Diag_Bit(85) = "PST in Setup or Trim"
Unit_Diag_Bit(86) = "PST Valve is in Safe Operation"
Unit_Diag_Bit(87) = "PST in Auto mode forced waiting for execution"

Unit_Diag_Bit(88) = "Temperature Sensor Fail"
Unit_Diag_Bit(89) = "Output Module Not Initialized"
Unit_Diag_Bit(90) = "No or Slow Valve Movement or Low Air Supply or No Magnet Detected"
Unit_Diag_Bit(91) = "Travel Limit Excedeed"
Unit_Diag_Bit(92) = "Temperature Out of work range"
Unit_Diag_Bit(93) = "Output Module Not Detected"
Unit_Diag_Bit(94) = "Piezo Sensor out of work range(25V to 80V)"
Unit_Diag_Bit(95) = "Device is Writing Lock"

Unit_Diag_Bit(96) = "Not used 96"
Unit_Diag_Bit(97) = "Not used 97"
Unit_Diag_Bit(98) = "Not used 98"
Unit_Diag_Bit(99) = "Not used 99"
Unit_Diag_Bit(100) = "Not used 100"
Unit_Diag_Bit(101) = "Not used 101"
Unit_Diag_Bit(102) = "Not used 102"
Unit_Diag_Bit(103) = "Not used 103"

NOTE

If the FIX flag is active on the LCD, the FY303 is configured for “Profile Specific” mode.
When in “Manufacturer Specific” mode, the Identifier Number is 0x0897. Once changed from “Profile Specific” to “Manufacturer Specific”, wait 5 seconds and turn the equipment off and on so that the Identifier Number is updated at the communication level. If the equipment is in “Profile Specific” and with the GSD file using Identifier Number equal to 0x0897, there will be acyclical communication, this with tools based on EDDL, FDT/DTM, but there will be no cyclical communication with the Profibus DP master.

Cyclic Diagnostics via Physical Block (Diagnosis parameter)

1. If the temperature is higher than 131.25 ºC and lower than -42 ºC: activates (1) the bit DIA_TEMP_ELECTR
2. If there is a problem in the setup with the reading of the HALL (> 63500): activates (1) the bit DIA_NOT_INIT;
3. If there was a problem initializing the transducer or it is not connected: activates (1) the bit DIA_INIT_ERR;
4. If a table has been configured and it does not have the increasing points (that is, if it is NOT_MONOTONOUS_INC): activates (1) the bit DIA_CHARACT;
5. If too high pressure or too low pressure alarm happens: activates (1) the bit DIA_SUPPLY.

Diagnosis of the balanced piezo voltage: if the Setpoint (SP) is different from 0.0% and 100.0% and the position (ReadBack for the AO block) is greater than or equal to 10.0% and less than or equal to 90.0%, and even if the error is less than 1.0%, the piezo voltage is diagnosed and if it is outside the control voltage range, a diagnosis is generated in the second byte of the Diagnosis parameter of the Physical Block, activating (1) the Maintenance Required bit (0x20) and yet, the status of the Piezo Voltage parameter is set to bad (0x00).

Cyclic Diagnostics via AO Block (Check_Back parameter)

1. If there is air to open in TRD block and in AO block there is “Increaseclose to open”: activates (1) the bit CB_ACT_OPEN;
2. If there is air to close in TRD block and in AO block there is “Increaseclose to lose”: activates (1) the bit CB_ACT_CLOSE;
3. 3. If the travel limit is exceeded in the TRD block: activates (1) the bit CB_TOT_VALVE_TRAV;
4. If in SETUP: activates (1) the bit CB_SELFTEST;
5. If in Fail Safe: activates (1) the bit CB_FAIL_SAFE;
6. If there is a deviation from SP after exceeding Deviation_Time when Deviation method is enabled: activates (1) the bit CB_DISC_DIR.
7. If the positioner is inactive (BAD status in the Output of AO block): activates (1) the bit CB_CONTR_INACT.
8. If any static variable is changed (eg Kp, Tr, Mode Block) - variable saved even when transmitter is turned off: activates (1) the bit CB_UPDATE_EVT.

Pressure and temperature diagnosis in the CheckBack of the AO block, when there is an input pressure alarm, (1) is activated in the second bit of the third byte of the CheckBack. The same can happen when there is a high temperature alarm (configured in the Temperature_Alarm_Limit parameter of the Transducer (index 147). Through the Trd_Alarm_CB_Selector parameter in the Transducer, you can have:

{ 0x00, "No action"},
{ 0x01, "Pressure Alarm"},
{ 0x02, "Pressure Temperature"},
{ 0x03, "Pressure or Temperature Alarm"}

The Temperature Alarm will happen when the temperature is higher than the limit configured in TemperatureAlarmLimit. The Input Pressure Alarm will occur when it is lower and higher than the limits configured in the SensorPressureLowerLimit and SensorPressureUpperLimit parameters, respectively.

PST - Partial Stroke Test

The main purpose of a PST is to discover in advance a part of dangerous undetected failures.

The PST is a procedure used to perform a partial valve stroke test.
It is a method that can be manually or automatically programmed to move the valve stem, partially, and measure the efforts required for this movement. What's more, you can measure the response speed of the valve. Or even check if the valve is not stuck or if the pneumatic actuator is being properly pressurized, without the need to go to the place where it is installed. The adoption of the Partial Stroke Test or PST is a simpler, cheaper and very reliable solution that can significantly increase operational safety.

How was it done before?
In the not-too-distant past, what was done was to test all valves during process stops. Those stops scheduled by industries for equipment maintenance, new installations, and process improvements. During these stops, the opportunity was used to activate the valve, opening, and closing it completely, allowing verification, for example, of possible stem jamming, actuator supply air leaks, sealing when fully closed, integrity of the assembly valve/actuator and signaling on control panels, etc.
As the industry cannot stop frequently for reasons of productivity and profitability, such tests could take months or years to be carried out.

Will such valves operate when required?
When talking about blocking valves or security system valves, the ideal is to test them from time to time to see if they are working properly. These valves, in general, go a long time, sometimes years, without being actuated. Because they are installed in the weather, or in aggressive and corrosive environments, they normally suffer a degradation inherent to their construction materials and design concepts.

How long should the partial course be?
It will depend on the process, that is, the course that does not cause disturbances in the plant or that, alternatively, causes “acceptable” oscillations for the process.

To know if the valve is sealing correctly when fully closed, you will have to do the Full Stroke Test.

CONFIGURATION

The PST (Partial Stroke Test) method is implemented in FY303 Version 2.03

The description of the PST configuration, below, was carried out using ProfibusView (Profibus parameterization software from Smar). The PST can also be configured through Simatic PDM or through FDT/DTM based tools.

NOTE
The PST can only be executed if the FY303 positioner is not in Self-calibration (SETUP) or even executing the position TRIM. If you try to run the PST under these conditions, on the Status tab, an Alarm will be indicated: **PST in Setup Or Trim**, SETUP or TRIM is running.

The PST method was implemented to act on the SP (SetPoint), increasing or decreasing the current position of the valve, in predefined values and intervals.

When opening the PST configuration screen, the disabled fields are displayed on the Method tab. To start the configuration, click the Start PST button and follow the configuration sequence defined by the PST.

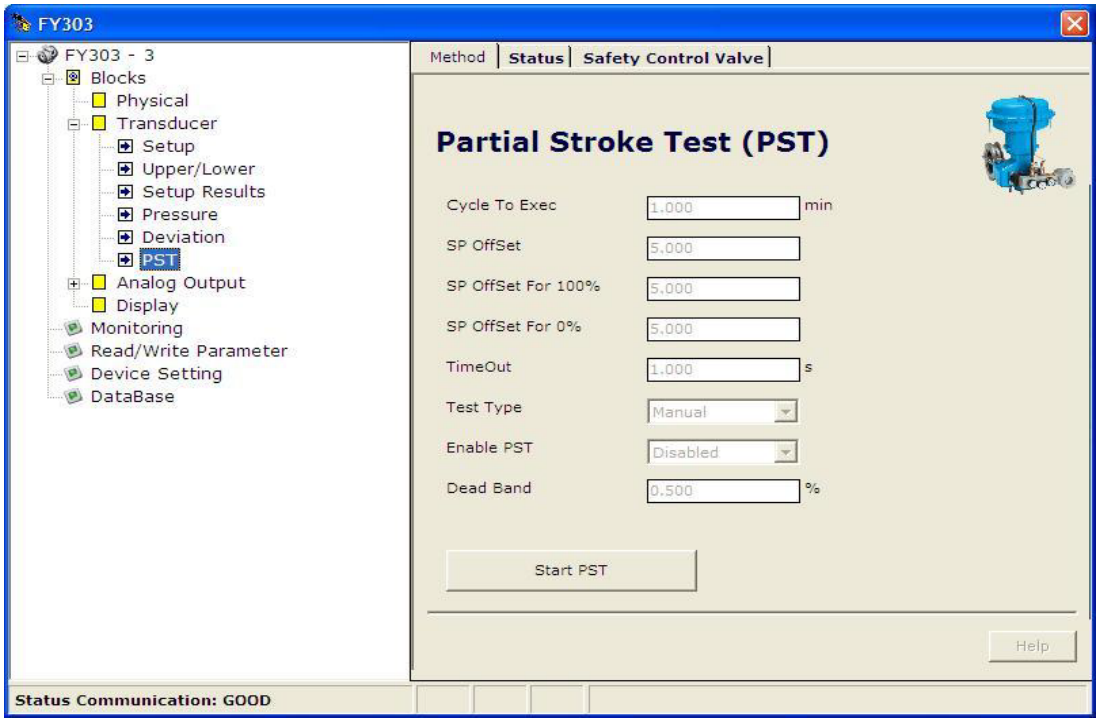


Figure 3.50 – Main window of PST on ProfibusView

In the Test Type item, select the option Manual, Auto (Automatic) or Stop mode, see Table 3.5 and Figure 3.57:

Parameter	Description
Manual	Enables the test to run only once, under user command.
Auto (Automático)	Enables the test to run according to the configuration of the Cycle To Exec and Enable PST parameters. When writing in Cycle To Exec and enabling Enable PST, the test will run according to its timing, that is, time defined by the user.
Stop	Used for the user to end (stop) the PST test, when necessary. In error conditions it goes to that state automatically.

Table 3.5 – Selection of PST operation mode

METHOD

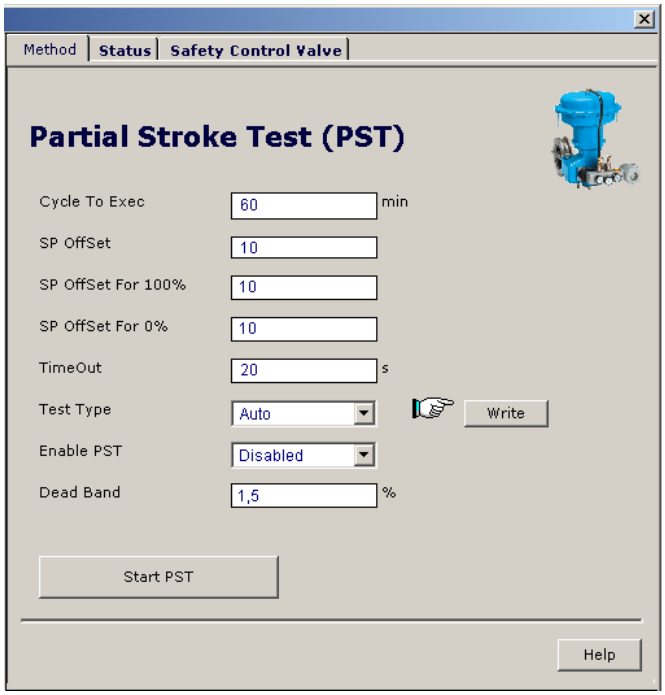


Figure 3.51 – Main screen for PST method setting - ProfibusView

Parameter	Description
Cycle To Exec	Time that determines how often the PST test will run. The test will only run when the Test Type parameter is set to Auto. Configured value from 1 to 43200 minutes (30 days).
SP Offset	Value to be incremented in the SP during the execution of the PST test. A test is always performed to verify that the limits of 0% and 100% have not been exceeded. The PST method will only decrease the SP value of the current valve position if the SP Offset value indicated in the SP OffSet parameter is negative.
SP Offset for 0%	Allows incrementing when SP is 0%.
SP Offset for 100%	Allows decreasing when SP is 100%.
TimeOut	Sets the maximum waiting time for the test to run and SP-PV is less than the Dead Band value. It depends on the error value defined in the Dead Band parameter. If the test is not run before the Time Out time expires, it generates a PST Time Out status. This parameter is used according to the nature of inertia and movement of the valves because there are slower or faster valves, and it must be configured by the user. Maximum value of 1310.7 seconds (21.83 minutes).
Test Type	It allows selecting the desired test type: Manual and Auto (Automatic), or interrupting the test being executed with the Stop option. Stop: Every time which is necessary to change the type of test it must be selected to stop the test.
Enable PST	It allows starting the test when the Test Type parameter is in Manual mode, click the Enable button. See figure 3.58.
Dead Band	This value is user-defined. It is the error allowed according to the defined maximum time (TimeOut) for the test to be executed.

Table 3.6 – PST Configuration

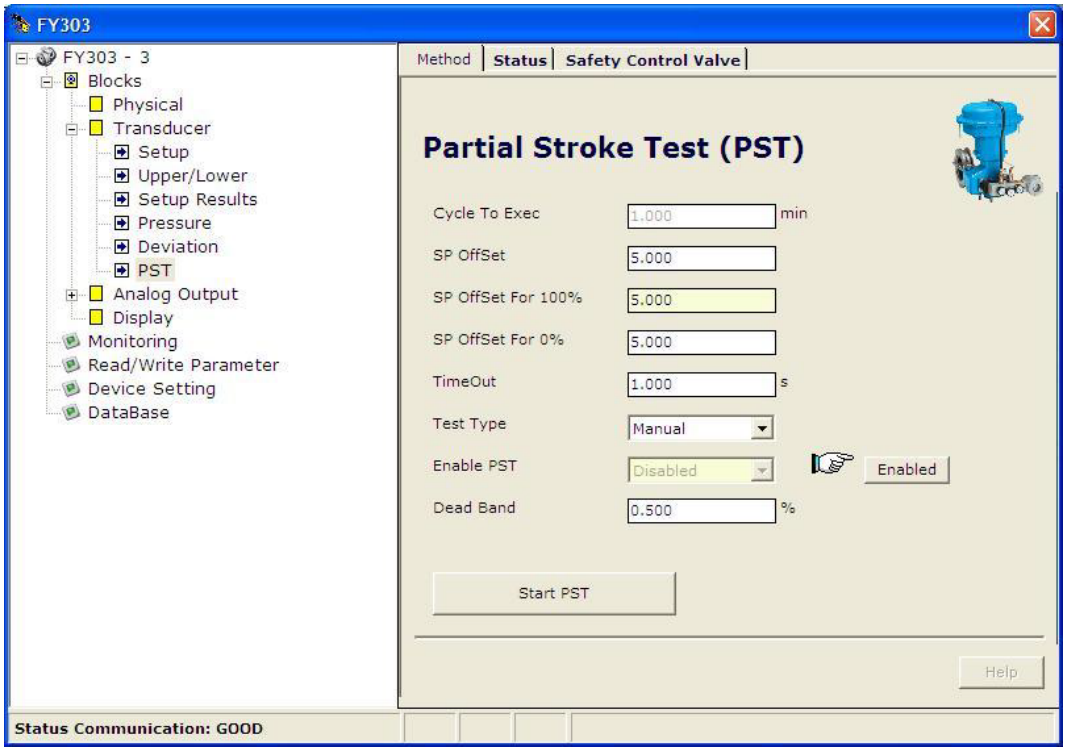


Figure 3.52 – Enable PST - ProfibusView

SAFETY CONTROL VALVE

Safety Valve - When the valve is safety, before starting the test, the SP is saved, because if during the test a different SP comes, it means that the control is possibly sending the valve to the safety position and in this condition, it is aborted the test. It could also happen that the valve is moving to the safety position and the test starts. According to these requirements, it is configured indicating to the PST whether the valve is a control or safety valve, and which is the safety position, according to figure 3.59.

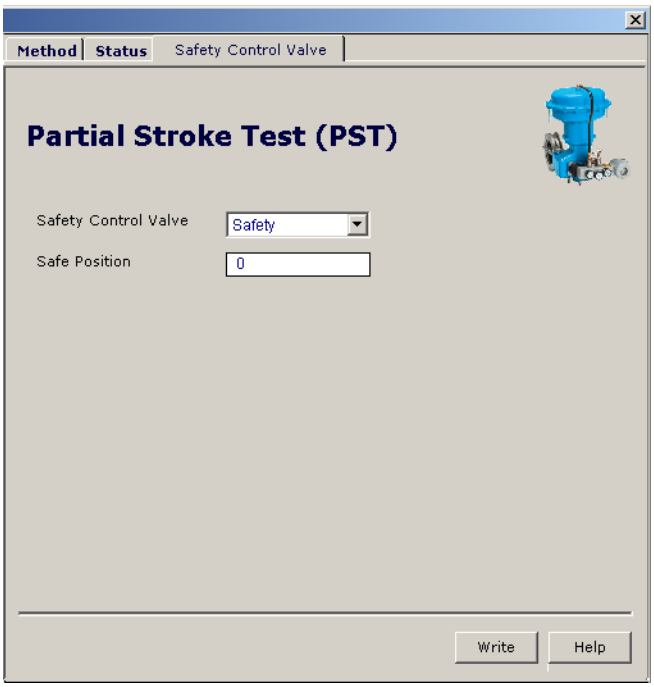


Figure 3.53 – Safety Control Valve - ProfibusView

Parameter	Description
Safety Control Valve	It allows selecting whether the valve is control or safety.
Safe Position	Allows configuration to indicate the safety position of the valve, for example, 0%, 100% or any other position (configured in the AO block).

Table 3.7 – Configuration for safety valves

PST Diagnostic Conditions

During the execution of the PST method, the FY303 monitors several conditions, generating status information according to figure 3.60 and table 3.8.

STATUS

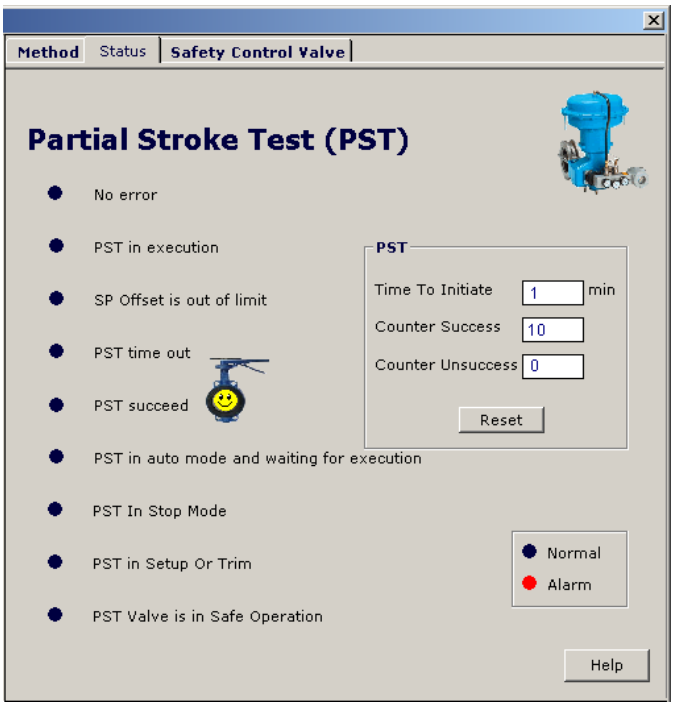


Figure 3.54 – Diagnostic and Status of PST - ProfibusView

Parameter	Description
Time to Initiate	Informs how much time is left to start the test.
Counter Success	Counter that totals the number of successful executions of the PST. When turning the FY303 off, this counter is saved in flash memory.
Counter Unsuccess	Counter that totals the number of failed executions of the PST. When turning the FY303 off, this counter is saved in flash memory.
Reset	Allows resetting the Counter Success and Counter Unsuccess counters. Clears the old history, it's useful when starting a new diagnosis.
Status	Indicates the error or diagnostic condition of the PST. Check the PST status through Normal or Alarm legend, see Figure 3.60. ● *No error* When turning on the equipment it will present this status. ● *PST in execution* The method is running. ● *SP Offset is out of limit* Indicates that the SP Offset parameter is out of range. ● *PST time out* Indicates that it was not possible to run the test as configured

Parameter	Description
Status	in the TimeOut parameter. ● *PST succed* Indicates that the test performed successfully. ● *PST in auto mode and waiting for execution* The Test Type is in automatic mode and waiting for the moment to be executed, as defined in Cycle To Exec. ● *PST In Stop Mode* Indicates that the test was finished by user or that an error occurred during the test. ● *PST in Setup Or Trim* Indicates that is running the SETUP or the TRIM. ● *PST Valve is in Safe Operation.* Indicates that the valve is in safety position.

Table 3.8 – PST Diagnostic Conditions

Valves Signature

To obtain the OUT 1 and OUT 2 pressure curves, the user must use the FY303 with the k1 option (which has pressure sensors). It is not allowed if the FY303 is in the SETUP procedure, position trim or PST test.

The user must select the type of curve in the TRD_VALVE_SIGN_TYPE parameter. Then trigger the method on TRD_VALVE_SIGN_EN. As soon as you enable the process of the selected curve, the FY303 will set the TRD_VALVE_SIGN_STATUS parameter to “Valve Signature was just enabled”.

At this moment, the FY303 will search for the 0% position, setting the TRD_VALVE_SIGN_STATUS parameter to “Valve Signature is looking for 0%”.

As soon as the position reaches 0.0% within an error of ± 0.5%, the FY303 will start to store the points in the ascending arrays(X,Y) until it reaches 100% within an error of ± 0.5%, setting the TRD_VALVE_SIGN_STATUS for “Valve Signature is going from 0% to 100%“. Before going to 100%, a backup of the RateInc and RateDec parameters is done, and these are configured for 120s, so that the test will run in four minutes. When it reaches 100% within the error, it sets the TRD_VALVE_SIGN_STATUS to “Valve Signature is at 100% to start the curve” and sends it to 0% and starts storing the descent in the descent arrays(X,Y) and triggers the “Valve Signature is going from 100% to 0%“.

When reaching 0% within the ± 0.5% error, FY303 setting the TRD_VALVE_SIGN_STATUS to “Valve Signature was finalized“ and TRD_VALVE_SIGN_EN is disabled. At this moment, the RateInc and RateDec parameters that the user had before the test are restored.

If the user wants to store the generated curve as a reference, must enter the TRD_VALVE_SIGN_EN parameter and write “Allows to backup the curve”, and the generated curve will be copied to the arrays with REF in the parameter names.

Arrays that have REF in their names are read according to what the user selects via the TRD_REF_VALVE_SIGN_TYPE parameter. The arrays are formed by integers (2 bytes) and in the configuration tools the treatment for float is done (divided by 10).

To make easier to the user, see the procedure using the communication DTM.

Figure 3.55 - Valve Signature Home screen

Figure 3.56 - Curve Type Selection and Enabling to Start the Process

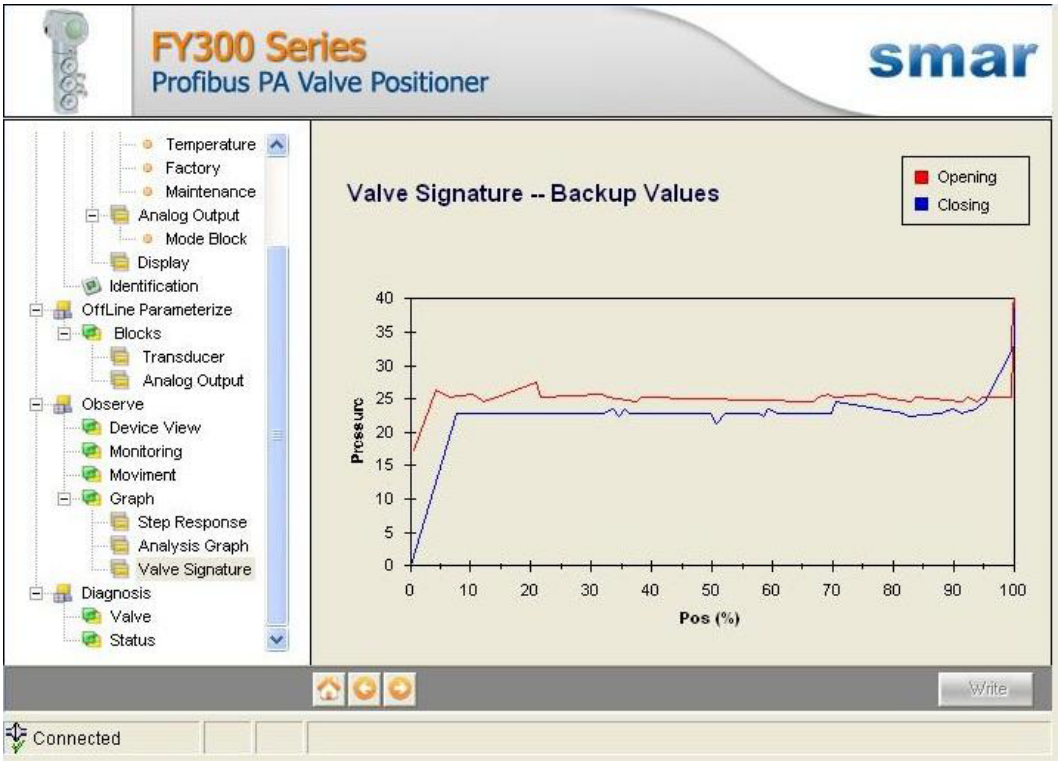


Figure 3.57 - Valve Signature Graph (Current Values - Plot Graph)

Section 4

MAINTENANCE PROCEDURES

General

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

FY303 Profibus to Valve Positioners are extensively tested and inspected before delivery to the end user. Nevertheless, during their design and development, consideration was given to the possibility of repairs by the end user, if necessary.

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

The maintenance procedure is a set of techniques with the purpose to keep the positioners with higher time of use (useful life), to operate in safe conditions and to promote costs reduction. The different maintenance types are described during this section.

Recommendations for mounting Approved Equipment with the IP66 W certifications (use in saline atmospheres)

NOTE
This certification is valid for positioners manufactured in stainless steel or cooper free aluminum, approved with the certification IP66 W. All positioner external material, such as gauge (except wetted parts), plugs, connections etc., must 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.

Corrective Maintenance for the Positioner

Maintenance not planned, with the purpose to locate and to repair problems in the positioners operating in continuous work, or either, specifically to suppress defects already presented by the equipment.

The diagnostic is a set of methods to detect, to locate and eventually to correct errors and problems or even verify fail effects in the positioner.

Diagnostics without Configurator

To carry out the diagnostics, refer to table 4.1.

DIAGNOSTICS	
SYMPTOM	**PROBABLE ERROR SOURCE**
POSITION SHOWN ON DISPLAY	***Positioner Connections*** Check wiring polarity and continuity. ***Power Supply*** Check the minimum voltage signal equal 9 Volts. ***Electronics Failure*** Check circuit boards for bad connections and replace them for spare boards.
NO COMMUNICATION	***Network Connection*** Check network connections: equipment, power supply, couplers, links, and terminators. ***Network Impedance*** Check network impedance (power supply and terminators impedance).

DIAGNOSTICS	
SYMPTOM	**PROBABLE ERROR SOURCE**
NO COMMUNICATION	***Positioner Configuration*** Check the configuration of the positioner communication parameters. ***Network Configuration*** Check the network communication configuration. ***Electronics Failure*** Try spare parts in the positioner circuits.
NO RESPONSE TO INPUT SIGNAL	***Pressure Output Connections*** Check up on air leaks. ***Air Supply Pressure*** Check the air supply pressure. The input pressure to **FY303** shall be between 20 psi and 100 psi. ***Calibration*** Check the positioner calibration points. ***Obstructed Restriction and/or Blocked Output*** Observe the following procedures described in this Manual: OUTPUT CONNECTIONS and RESTRICTION CLEANING.
OSCILLATING ACTUATOR	***Calibration*** Adjust parameter Kp. Adjust parameter Tr.
SLOW ACTUATOR RESPONSE	Adjustment Parameters are Too Low Adjust parameter Kp.
TOO FAST ACTUATOR RESPONSE	Adjustment Parameters are Too High Adjust parameter Kp.

Table 4.1 - FY303 Diagnostics without configurator

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

NOTE

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 procedure resets all the configurations run on the equipment, after which a partial download should be performed. With exception to the equipment physical address and the GSD identifier number selector parameter. After doing this, all configurations must be performed again according to their applications.

For this operation, two magnet screwdrivers are used. On the equipment, remove the screw that fixes the identification tag on the top of its housing to access to the holes marked by the letters “S“ and “Z”.
The operations to be carried out are:

1) Switch off the equipment, insert the magnetic tools and keep them in the holes (the magnetic end in the holes);

2) Power on the equipment;

3) As soon as Factory Init is shown on the display, take off the tools and wait for the "5" symbol on the right upper corner of the display to unlit, thus indicating the end of the operation.

This procedure makes effective the entire factory configuration and will eliminate eventual problems with the function blocks or with the equipment communication.

This procedure must be performed by authorized personal only and with the process offline, since the equipment will be configured with standard and factory data.

Diagnostic of BAD and UNCERTAIN messages on display

The display can be configured to show virtually any parameter. When the parameter type is DS-33 (value + status), for example: AO output, Readback, pressure, then the display will refer to the status of that variable.

Therefore, if the display shows BAD and UNCERTAIN messages, one of the following problems or situations may be occurring.

UNCERTAIN

- Pressure sensor installed (or configured as installed) and status different from 128: it will assign UNCERTAIN to the POSITIONING_VALUE.
- Position value smaller than the lower closing limit (POS < SETP_CUTOFF_DEC): it will assign UNCERTAIN to the POSITIONING_VALUE.
- Upper position value greater than the upper opening limit (POS > SETP_CUTOFF_INC): will assign UNCERTAIN to the POSITIONING_VALUE.
- Positioner in "fail safe" with specific safety value. It goes to configured security position, but it will assign UNCERTAIN to AO output.
- Positioner in "fail safe" with safety value set to last valid value. It will keep the position, but will assign UNCERTAIN for AO output.
- AO block configured in MANUAL mode. Output value can be changed in configurator, but will assign UNCERTAIN to AO output.

BAD

- AO block in OUT OF SERVICE: it will assign BAD for AO output.
- TRD block in OUT OF SERVICE: it will assign BAD to output in POSITIONING_VALUE.
- The data exchange with the Profibus master does not happen (master turned off or there are some failure in the control configuration): it will assign BAD to the SP of the AO.
- If the CHANNEL parameter is not configured (set to null): it will assign BAD to the AO READBACK.
- Positioner in "fail safe" with security value set to the last valid value. It will keep the position, but will assign BAD to the AO output, if the last value received from the master was also BAD.

For more information about the status of the parameters, their composition, conversion of enumerations to status, consult the Profibus PA Function Blocks Instruction Manual.

Disassembly Procedure for Maintenance

1. Apply air pressure in the positioner input, without applying power supply. Verify if there is any air leakage in output 1 (OUT1). In case of air leakage in output 1, it is necessary to check the mechanical parts.
2. Remove the restriction. Verify if the restriction is not obstructed. (See restriction cleaning procedure).
3. Disassemble the equipment as shown:

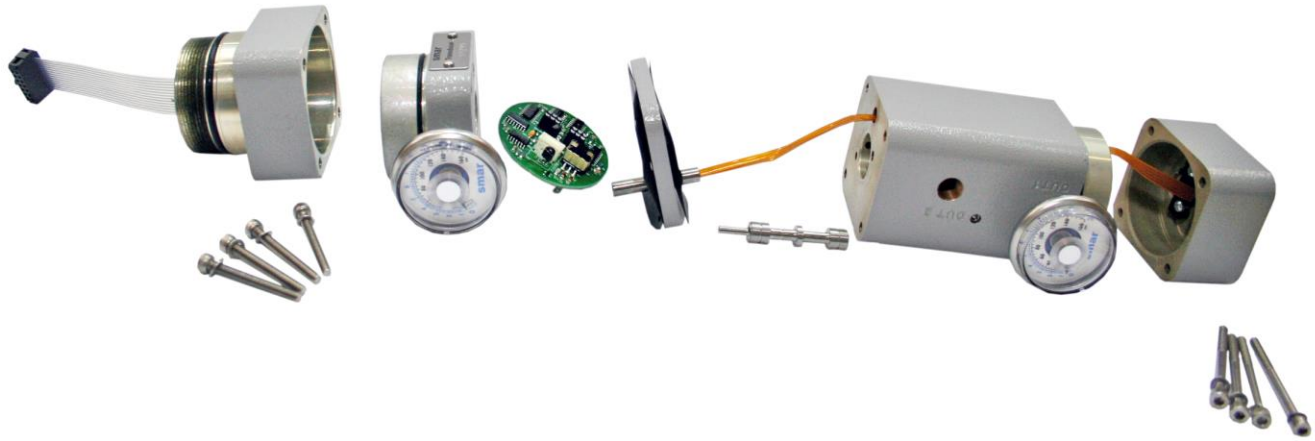


Figure 4.1 – FY303 Disassembled

Maintenance – Mechanical Parts

1. Verify if the spool valve is moving freely.
2. Verify if the spool valve is not obstructed with dirty.
3. Verify if there is any obstruction inside the FY pneumatic block and at the exhausts.
4. Verify if the diaphragm integrity.
5. Verify if the nozzle is dirty.

Maintenance – Electronic Parts

ELECTRONIC CIRCUIT

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

To remove the circuit board (5) and the indicator (4), first release the cover locking bolt (6) from the side not marked “Field Terminals”, and after that, release 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 anti-static proof cases.

Release the two screws (3) that fix the main circuit board and the indicator. Pull out the indicator, then the main board (5).

If the equipment does not initialize and the display does not light on, proceed to the following steps:
1. Disconnect the analog board from the digital board (17);
2. Re-energize the positioner and check for signal on the display (4). If the display lights up, the problem is in the Transducer, it can be the Analog Board (18) or excessive humidity in the Piezo Base (24), causing low insulation.

If there is no signal on the display even after disconnecting the flat cable, the problem is on the Digital Board, or even on the terminal block transient suppressor (11), which may be burnt.
To check the Hall value and piezo voltage do the following: Mount the positioner on the bench test valve. Apply supply pressure respecting the actuator limit, energize the equipment and perform SETUP.
1. Place the valve at 50% of the opening or closing stroke;
2. Hall values should be as close as possible to 32768 to ±2000;
3. With the configurator, enter “monitoring” mode and choose two parameters: hall values and piezo voltage

If values are outside this range, realign the magnet. If the setup is not completed and the Hall value is around 65000, it is not being read, the defect may be in the Hall position sensor or in the Analog Board.
4. The piezo voltage values should be between 30 and 70 Volts. If the voltage is not between these values, the setup may not finish, proceed with the piezo calibration. (Use the FYCAL device).

Preventive Maintenance for the Positioner

Planned maintenance, consists of the set of procedures and anticipated actions that aim to keep the device in operation, that is, it is carried out with the special objective of preventing the occurrence of failures through adjustments, tests, and measures according to specified values, determined before the appearance of the defect. It is recommended that preventive maintenance be carried out within a maximum period of one (1) year, or when the process stops.

Disassembly Procedure

Make sure to disconnect power supply and supply pressure before disassembling the positioner.

TRANSDUCER
To remove the transducer from the electronic housing, the electrical connections (in the field terminal side) and the main board connector must be disconnected.

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

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

Figure 4.1 - Transducer Rotation

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

1. Remove the flat cable cover (**17**) by releasing the Allen screws (**15**). When removing this cover (**17**), take care to do not damage the internal board: disassembly it with care. (This part can not be washed);

2. Remove the analog board (**18**);

3. Remove the electric piezo base (**24**) (This part cannot be washed);

4. Remove the restriction (**20**) for cleaning;

5. Remove the diaphragm (**27**) and check its integrity; if necessary, clean the diaphragms with water and neutral detergent; after that, wash them with alcohol, dry before mounting;

6. Remove the spool valve (**29**); the cleaning is made with water and neutral detergent; after that, wash it with alcohol, dry before mounting. Do not use lubricant of any kind in this part;

7. The pneumatic block (**31**) can be completely washed with water and neutral detergent, after that, wash it with alcohol and verify if it is completely clean, without dust or any kind of impurity. For that, apply dry compressed air in all block holes;

8. Verify if the position sensor cover (**33**) does not have indication of water or humidity. (This part cannot be washed);

9. Verify if the position sensor flat cable is damaged, twisted, cut, or oxidate.

Piezo Electric Calibration - FYCAL

NOTE
To perform the calibration of the electric piezo of the Positioner, refer to the manual of the FYCAL - Calibration Device for Pressure Transducer, available at HTTP://www.smar.com

Restriction Cleaning Procedure

The air flows to the nozzle through a restriction. Verify from time to time the restriction cleaning to assure a positioner good performance.

1. Be sure that the air supply of the equipment is blocked.

2. With an appropriate tool, remove the transducer serial number plate. (New models have the plate placed on the opposite side of the transducer).

3. Remove the restriction screw using an appropriate tool;

4. Remove the o-rings with an appropriate tool;
5. Dive the part in petroleum base solvent and dry it with compressed air (apply the compressed air directly in the smaller orifice for the air to get out through the bigger orifice).
6. Introduce the appropriate tool (PN 400-0726) into the restriction orifice to prevent any possible obstruction;

RESTRICTION - Old model, with hole in the tip

RESTRICTION - New model, with hole on the side (replaced the old model)

Restriction and Needle for Restriction Cleaning

Showing Cleaning Procedure

7. Mount the o-rings again and screw the restriction in the positioner.
8. The equipment can be supplied with air again.

Change of the Filter Elements

The replacement of the filtering elements of the positioner (see exploded view drawing - position (28)) must be carried out within a minimum period of one year.

The instrumentation air supply must be clean, dry and non-corrosive, following standards indicated for the American National Standard *"Quality Standard for Instrument Air"* ANSI / ISA S7.0.01 - 1996.

If the instrumentation air does not comply with the above-mentioned standards, the user has to consider changing the positioner filter elements more frequently.

Exhaust Ports

Air is released to atmosphere through an exhaust port located behind the transducer nameplate and 4 outputs on the side opposite the pressure gauge. An object interfering with or blocking the exhaust connection can interfere with the equipment's performance. Clean it by spraying with a solvent.

NOTE
Never use oil or grease in the spool; otherwise, the positioner performance will be impaired.

Electronic Circuit

Plug the transducer connector and the power supply connector to main board (**5**). Attach the display to the main board. Observe the four possible mounting positions (Figure 4.2). The ▲ mark indicates up position.

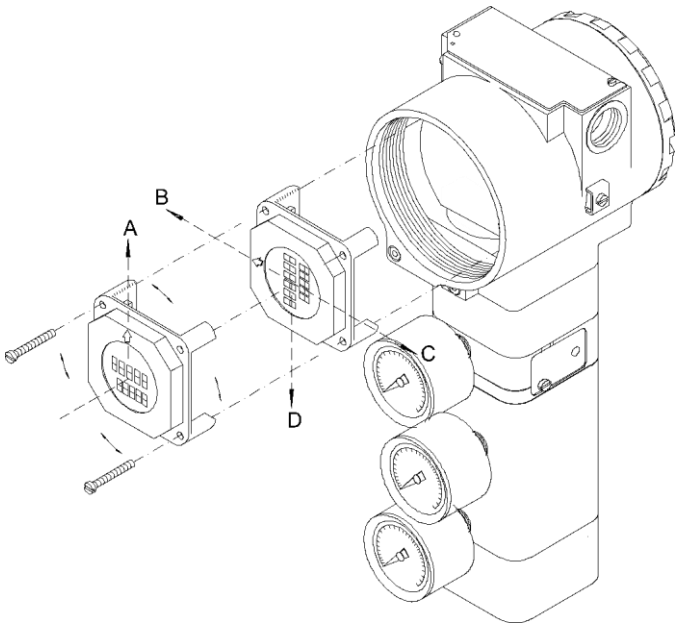


Figure 4.2 - Four Possible Positions of the Local Indicator

Anchor the main board and indicator with their screws (**3**). After tightening the protective cover (**1**), the mounting procedure is complete. The positioner is ready to be powered and tested.

Electrical Connections
The plug must be installed in the electrical connection that is not used, thus preventing the accumulation of moisture. We suggest its use together with a sealant on the thread followed by a firm tightening. Also make sure the two large housing covers are securely tightened.

Package Content

When receiving the equipment, verify the package content.

- Positioner (1)
- Positioner mounting screws
- Magnet
- Magnetic tool for local adjustment (2)
- Centralizer device for magnet (2)
- Cleaning device for the restriction (2)
- Operation, maintenance, and instructions manual (2)

NOTES
1) When choosing the Remote Sensor version, an additional "L" form support for a 2" tube will be included for fixing the FYRemote. To fix the Remote Sensor to the actuator, it is necessary to specify the BFY according to the ordering code in this manual. **2)** The quantity supplied must be in accordance with the number of positioners.

Accessories and Related Products

ACCESSORIES AND RELATED PRODUCTS	
ORDERING CODE	**DESCRIPTION**
400-0726	Needle cleaning device for the restriction
400-1176	Teflon guide for linear magnet
400-1177	Teflon guide for rotary magnet
AssetView FDT	Field device asset management
BC1	Fieldbus/RS232 Interface
BT302	Terminator
DF47-17	Intrinsic safety barrier
DF73	HSE/PROFIBUS DP Controller
DF95/DF97	PROFIBUS DP/PA Controller
FDI302	Field device interface
FYCAL	Calibration device for pressure transducer
PBI	Profibus/USB Interface
ProfibusView	Software for PROFIBUS PA device configuration
PS302/DF52	Power supply
DF53/DF98	Power supply impedance
SD1	Magnetic tool for local adjustment

Exploded View

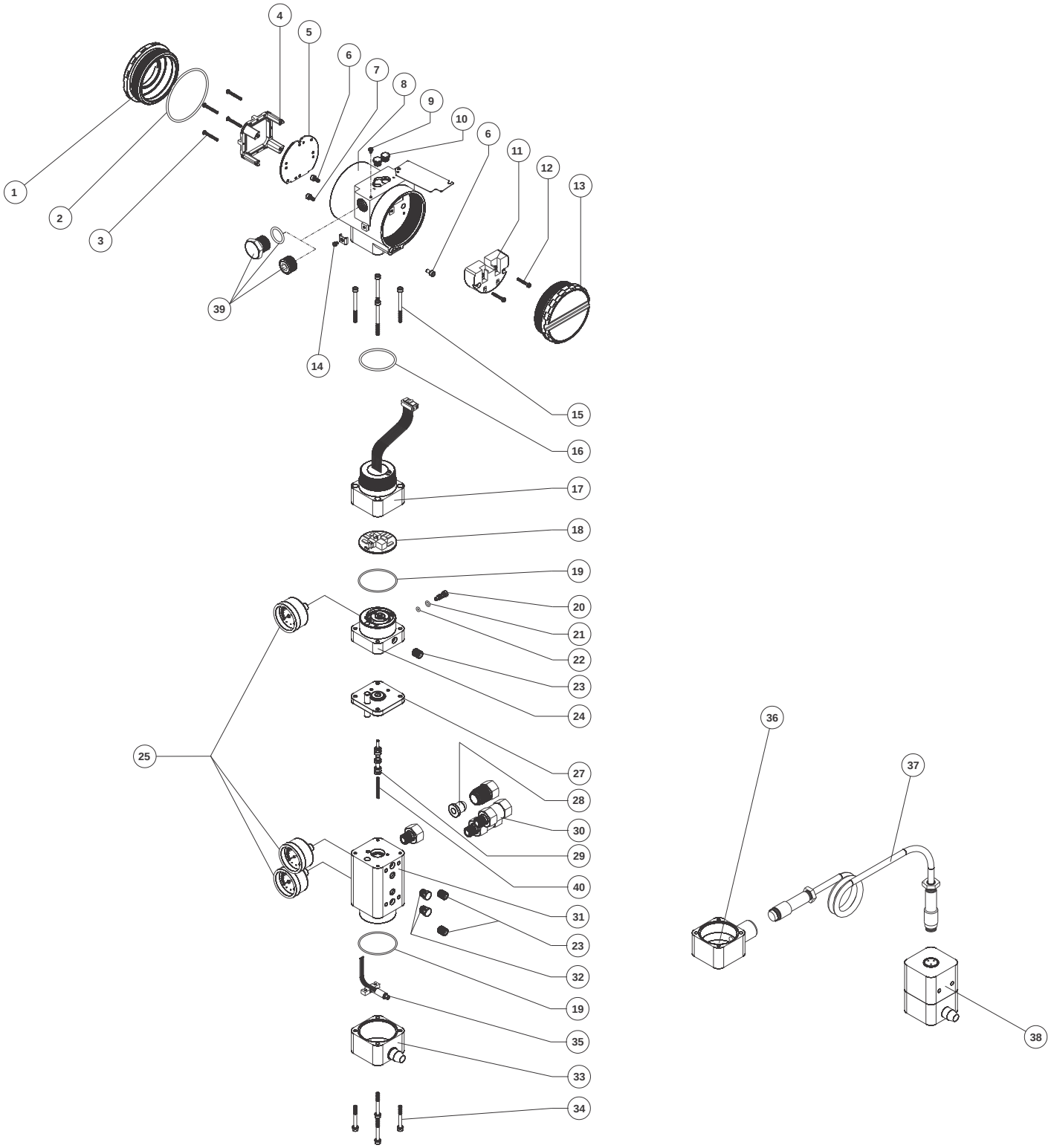


Figure 4.3 - Exploded View

Spare Parts List

SPARE PARTS LIST			
DESCRIPTION	**POSITION**	**CODE**	**CATEGORY (NOTE 4)**
HOUSING (**NOTE 1**)	8	400-1314-3P (**NOTE 6**)	-
COVER (INCLUDES O-RING)	1 and 13	400-1307 (NOTE 6)	-
Cover Locking Bolt	6	204-0120	-
Sensor Locking Bolt (M6 Without Head Screw)	7	400-1121	-
External Ground Bolt	14	204-0124	-
Identification Plate Fixing Bolt	9	204-0116	-
Orings Cover (**NOTE 2**)	2	204-0122	B
Local Adjustment Protection Cover	10	204-0114	-
DIGITAL INDICATOR GLL1438 (for old electronic main board GLL1034) DIGITAL INDICATOR (for new main boards GLL1461)	4	(NOTE 7)	A
TERMINAL INSULATOR	11	400-0058	A
MAIN ELECTRONIC CIRCUIT BOARD (include digital indicator and mounting kit)	5	(NOTE 7)	A
TERMINAL HOLDING BOLT HOUSING	12	204-0119	B
MOUNTING KIT FOR MAIN ELECTRONIC BOARD (new board GLL1461), (2 bolts with spacers and retention washers)	3	400-0560	B
CONNECTION COVER	15,16 and 17	400-1320 (**NOTE 6**)	A
. Connection Cover Bolt	15	400-0073	-
. Buna-N Neck O-ring **(NOTE 2)**	16	204-0113	B
ANALOG BOARD without Pressure Sensor GLL1012 (version K0)	18	400-0060	-
ANALOG BOARD for Pressure Sensor GLL1204 (version K1)	18	400-0840	-
PIEZO BASE SET	19,20,21,22, 23,24 and 25	400-1318 (**NOTE 6**)	A
. Base and Block O-ring **(NOTE 2)**	19	400-0085	B
. Restriction	20	344-0165	B
. Restriction External O-ring **(NOTE 2)**	21	344-0155	B
. Restriction Internal O-ring **(NOTE 2)**	22	344-0150	B
. Syntherized Bushing	23	400-0033	B
. Analog indicator (Gage - Stainless Steel and Brass) **(NOTE 5)**	25	400-1120	B
ASSEMBLED DIAPHRAGM (include hall tube, mechanical part and O-rings)	27	400-1321 (**NOTE 6**)	B
PNEUMATIC BLOCK SET	19,23,25,28,29,30,31 and 32	400-1317 (**NOTE 6**)	A
. Base & Block O-ring **(NOTE 2)**	19	400-0085	-
. Syntherized Bushing	23	400-0033	-
. Analog indicator (Gage - Stainless Steel and Brass) **(NOTE 5)**	25	400-1120	-
. Filtering Element	28	400-0655	-
. Spool valve	29	400-0653	A
. Spool valve Spring	40	400-0787	-
. Stainless steel Filter- 1/4" NPT - includes filtering element	30	400-1383	-
. Vent Plug - Stainless Steel	32	400-0654	-
HALL COVER SET	33 (or 36), 34 and 35	400-1319 (**NOTE 6**)	-
. Hall Cover Bolt	34	400-0092	-
. Hall Support + Hall Sensor + Flat cable	35	400-0090	-
REMOTE EXTENSION SET	38	400-1322 (**NOTE 6**)	-
CABLE SET + CONNECTOR	37	400-1325 (**NOTE 6**)	-

SPARE PARTS LIST			
DESCRIPTION	**POSITION**	**CODE**	**CATEGORY (NOTE 4)**
			-
			-
1/2" NPT BR-Ex-d INTERNAL SOCKET SET PLUG IN 316 SST	39	400-1484 (NOTE 8)	
			-
M20 X 1.5 (Ex d) EXTERNAL SOCKET SET PLUG IN 316 SST	39	400-0810	
PG13.5 (Ex d) EXTERNAL SOCKET SET PLUG IN 316 SST	39	400-0811	-
3/4" NPT (Ex d) ADAPTER IN 316 SST	39	400-0812	-
			-
			-
TRANSDUCER SET	**NOTE 3**	400-1316 (**NOTE 6**)	A
MAGNETS			
. Linear magnet 30mm	-	400-0748	-
. Linear magnet 50mm	-	400-0035	-
. Linear magnet 100mm	-	400-0036	-
. Rotary magnet	-	400-0037	-
MOUNTING BRACKET SCREW FOR POSITIONER ASSEMBLY (packaged with 12 units)	-	400-1190	-

Table 4.2 - Spare Parts List

NOTES
1) Includes terminal isolator, bolts (cover locking, ground and terminal isolator) and identification plate without certification.
2) O-rings are packaged with 12 units.
3) Includes all transducer's spare parts.
4) For category **A** it is recommended to keep in stock 25 parts installed for each set and 50 for category **B**.
5) The pressure gauges for supply pressure, output 1 or output 2, will be supplied with the wet parts in brass.
6) For code detailed, use the tables below.
7) Access https://www.smar.com/en/support, in General Support, look for Compatibility Note and consult the document
8) The spare part 400-1484, Internal Hexagonal Plug 1/2" NPT 316SST BR-Ex-d, was standardized in 316SST material and will be used in all line of housings (aluminum, copper free aluminum or 316SST). With or without CEPEL certificate.

Detailed Code When Ordering Spare Parts

DETAILED CODE WHEN ORDERING SPARE PARTS			
CODE	**DESCRIPTION**		
400-1314-3P	**HOUSING; FY303**		
	Option	**Electrical Connection**	
	0	½ NPT	
	A	M20 X 1,5	
	B	PG13,5	
		Option	**Material**
		H0	Aluminum (IP/Type)
		H1	Stainless Steel (IP/Type)
		H2	Aluminum - for saline atmospheres (IPW/Type X)
		H4	Aluminum Copper Free (IPW/Type X)
			Option / **Painting**
			P0 / Gray Munsell N 6,5
			P8 / Without Painting
			P9 / Safety Blue Epoxy - Electrostatic Painting

400-1314-3F	*	*	*	**TYPICAL ORDERING CODE**

***** Choose the desired option

DETAILED CODE WHEN ORDERING SPARE PARTS			
CODE	**DESCRIPTION**		
400-1307	**Cover**		
	Option	**Type**	
	0	Without window for display	
	1	With window for display	
		Option	**Material**
		H0	Aluminum (IP/TYPE)
		H1	Stainless Steel (IP/TYPE)
			Option / **Painting**
			P0 / Gray Munsell N 6,5
			P8 / Without Painting
			P9 / Safety Blue Epoxy - Electrostatic Painting

400-1307	*	*	*	**TYPICAL ORDERING CODE**

***** Choose the desired option.

DETAILED CODE WHEN ORDERING SPARE PARTS							
CODE	**DESCRIPTION**						
400-1316	**Transducer Set; FY30X**						
	Option	**Indication Gauge**					
	0	Without Gage					
	6	01 Gauge - Input					
	7	01 Gauge – Output 1					
	8	02 Gauges – Input and Output 1					
	9	02 Gauges – Output 1 and 2					
	A	03 Gauges					
		Option	**Action of Positioner**				
		C	Single Action				
		D	Double Action				
			Option	**Material**			
			H0	Aluminum (IP/TYPE)			
			H1	Stainless Steel (IP/TYPE)			
				Option	**Painting**		
				P0	Gray Munsell N 6,5		
				P8	Without Painting		
				P9	Safety Blue Epoxy - Electrostatic Painting		
					Option	**Manufacturing Standard**	
					S0	Smar	
						Option	**Hall Remote Sensor**
						R0	Standard Mounting (Without Hall Remote Sensor)
						R9	Remote Mounting (adapted for Remote Sensor)
							Option / **Special Sensor**
							K0 / Without Special Sensor
							K1 / With Pressure Sensors for Diagnostic
400-1316	*	*	*	*	*	*	*

TYPICAL ORDERING CODE

***** Choose the desired option.

DETAILED CODE WHEN ORDERING SPARE PARTS						
CODE	**DESCRIPTION**					
400-1317	**Pneumatic Block Set; FY30X**					
	Option	**Indication Gauge**				
	0	Without Gauge				
	7	01 Gauge – Output 1				
	9	02 Gauges – Output 1 and 2				
		Option	**Action of Positioner**			
		C	Single Action			
		D	Double Action			
			Option	**Material**		
			H0	Aluminum (IP/TYPE)		
			H1	Stainless Steel (IP/TYPE)		
				Option	**Painting**	
				P0	Gray Munsell N 6,5	
				P8	Without Painting	
				P9	Safety Blue Epoxy - Electrostatic Painting	
					Option	**Manufacturing Standard**
					S0	Smar
						Option / **Special Sensor**
						K0 / Without Special Sensor
						K1 / With Pressure Sensor for Diagnostic
400-1317	*	*	*	*	*	

TYPICAL ORDERING CODE

***** Choose the desired option.

DETAILED CODE WHEN ORDERING SPARE PARTS					
CODE	**DESCRIPTION**				
400-1318	**Piezo Base Set; FY30X**				
	Option	**Indication Gauge**			
	0	Without Gauge			
	6	01 Gauge – Input			
		Option	**Material**		
		H0	Aluminum (IP/TYPE)		
		H1	Stainless Steel (IP/TYPE)		
			Option	**Painting**	
			P0	Gray Munsell N 6,5	
			P8	Without Painting	
			P9	Safety Blue Epoxy - Electrostatic Painting	
				Option	**Manufacturing Standard**
				S0	Smar
400-1318	*	*	*	*	**TYPICAL ORDERING CODE**

***** Choose the desired option.

DETAILED CODE WHEN ORDERING SPARE PARTS					
CODE	**DESCRIPTION**				
400-1319	**Hall Cover Set; FY30X**				
	Option	**Material**			
	H0	Aluminum (IP/TYPE)			
	H1	Stainless Steel (IP/TYPE)			
		Option	**Painting**		
		P0	Gray Munsell N 6,5		
		P8	Without Painting		
		P9	Safety Blue Epoxy - Electrostatic Painting		
			Option	**Manufacturing Standard**	
			S0	Smar	
				Option	**Hall Remote Sensor**
				R0	Standard Mounting (Without Hall Remote Sensor)
				R9	Remote Mounting (adapted for Remote Sensor)
					Option / **Special Sensor**
					KA / For Pneumatic Block without Pressure Sensors
					KB / For Pneumatic Block with Pressure Sensors
400-1319	*	*	*	*	* / **TYPICAL ORDERING CODE**

***** Choose the desired option.

DETAILED CODE WHEN ORDERING SPARE PARTS				
CODE	**DESCRIPTION**			
400-1320	**Connection Cover; FY30X**			
	Option	Material		
	H0	Aluminum (IP/TYPE)		
	H1	Stainless Steel (IP/TYPE)		
		Option	**Painting**	
		P0	Gray Munsell N 6,5	
		P8	Without Painting	
		P9	Safety Blue Epoxy - Electrostatic Painting	
			Option	**Manufacturing Standard**
			S0	Smar
400-1320	*	*	*	**TYPICAL ORDERING CODE**

***** Choose the desired option.

DETAILED CODE WHEN ORDERING SPARE PARTS				
CODE	**DESCRIPTION**			
400-1321	**Assembled Diaphragm; FY30X**			
	Option	**Material**		
	H0	Aluminum (IP/TYPE)		
	H1	Stainless Steel (IP/TYPE)		
		Option	**Painting**	
		P0	Gray Munsell N 6,5	
		P8	Without Painting	
		P9	Safety Blue Epoxy - Electrostatic Painting	
			Option	**Manufacturing Standard**
			S0	Smar
400-1321	*	*	*	**TYPICAL ORDERING CODE**

***** Choose the desired option.

DETAILED CODE WHEN ORDERING SPARE PARTS				
CODE	**DESCRIPTION**			
400-1322	**Remote Extension Set; FY30X**			
	Option	**Material**		
	H0	Aluminum (IP/TYPE)		
	H1	Stainless Steel (IP/TYPE)		
		Option	**Painting**	
		P0	Gray Munsell N 6,5	
		P8	Without Painting	
		P9	Safety Blue Epoxy - Electrostatic Painting	
			Option	**Manufacturing Standard**
			S0	Smar
400-1322	*	*	*	**TYPICAL ORDERING CODE**

***** Choose the desired option.

DETAILED CODE WHEN ORDERING SPARE PARTS		
CODE	**DESCRIPTION**	
400-1325	**Cable Set and Connectors for Hall Remote Sensor; FY30X**	
	Option	**Cable Length**
	1	5 m
	2	10 m
	3	15 m
	4	20 m
	Z	Special
400-1325	*	**TYPICAL ORDERING CODE**

***** Choose the desired option.

Isolation Test on Equipment Housing

1. Power off the equipment in the field, remove its back cover and disconnect all field cables from the transmitter terminal block, isolating them safely.

2. It is not necessary to remove the main board and display.

3. Jumper (connect) the power terminals (positive and negative) with the cable coming from the Megohmmeter (megger).

4. Configure the megohmmeter for 500 Vdc scale and check the isolation between the housing and the cable that short-circuits all the terminals.

ATTENTION
Never test with a voltage greater than 500 Vdc.

5. The value obtained must be greater than or equal to 2GΩ and the voltage application time must be at least 1 second and at most 5 seconds.

6. If the value obtained by the megohmmeter is below 2GΩ, the possibility of moisture entering the electrical connection compartment must be analyzed.

7. It is possible to loosen the two screws that secure the terminal block to the housing and carry out a superficial cleaning and dry the surface well. Afterwards, the isolation can be tested again.

8. If the isolation test still shows that the isolation has been compromised, the housing must be replaced and sent to Nova Smar S.A. for analysis and retrieval.

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

TECHNICAL CHARACTERISTICS

Functional Specifications

Travel	Linear Motion: 3 - 100 mm. Rotary Motion: 30 - 120°
Input Signal and communication protocol	PROFIBUS, only digital, according to IEC 61158-2 (H1) 31,25 Kbit/s, bus powered.
Power Supply / Quiescent Current	Bus powered: 9-32 Vdc. Quiescent current: 12 mA.
Digital Indicator	4 ½ numerical digits and 5 alphanumerical digits (Liquid Cristal Display). Indication of Function and Status (optional).
Hazardous Location Certification	Explosion proof and intrinsically safe. Designed to meet European Directives. See Appendix "A" for detailed information.
Gauge	Only for monitoring supply pressure and outputs. Scale from 0 to 160 psi. Acrylic display, 304 stainless steel connections and flexible brass parts.
Flow Characterization	Linear, equal percentage, quick opening, and curve with 16 freely selectable points.
Temperature Limits	Ambient: -40 to 85ºC (-40 to 185 ºF). Storage: -40 to 90ºC (-40 to 194 ºF). Indicator: -10 to 75ºC (14 to 167 ºF) operation; -40 to 85ºC (-40 to 185 ºF) without damage Operation with Remote Sensor: -40 to 105ºC (-40 to 221 ºF).
Load Voltage	11 Vdc max / 20 mA (corresponding to an impedance of 550Ω).
Configuration	Basic configuration can be done using local adjustment magnetic tool if device has display. Complete configuration is possible using remote configurator (Ex.: ProfibusView - Smar or Simatic PDM- Siemens).
Humidity Limits	0 to 100% RH (non-condensable).
Current	Bus powered: 9-32 Vdc. Quiescent current: 12 mA.
Position Sensor	Magnet (Non-contact) via Hall Effect. Available in remote mounting version (Optional; consult Smar about certification).
Pressure Supply	1.4 - 7 bar (20-100 psi) free of oil, dust and water according to ANSI/ISA S7.0.01-1996 standard.
Output	Output to actuator 0 -100% supply air pressure. Single or double action.
Power Supply	Bus powered: 9-32 Vdc. Quiescent current: 12 mA Output impedance (7.8 kHz - 39 kHz); Non-intrinsic safety: ≥ 3 KΩ; Intrinsic safety: ≥ 400Ω (with an intrinsic safety barrier on power supply).
Turn-on Time	Approximately 10 seconds.
Update Time	Approximately 0.5 second.
Gain	Via communication or locally adjustable.
Travel Time	Via software or locally adjustable.

Performance Specifications

Resolution	≤ 0.1% F.S.
Supply Pressure Effect	Negligible.
Repeatability	≤ 0.1% F.S.
Consumption	0.35 Nm³/h (0.20 SCFM) at 1.4 bar (20 psi) supply. 1.10 Nm³/h (0.65 SCFM) at 5.6 bar (80 psi) supply.
Ambient Temperature Effect	0.8%/20 °C of span.
Output Capacity	13.6 Nm³/h (8 SCFM) at 5.6 bar (80 psi) supply.
Vibration Effect	±0.3%/g of span during the following conditions: 5-15 Hz at 4 mm constant displacement. 15-150 Hz at 2g. 150-2000 HZ at 1g. According to IEC60770-1.
Electromagnetic Interference Effect	Designed to meet European Directive EMC 2014/30/EU. See Appendix “A” for detailed information
Hysteresis	≤ 0.1% F.S.

Physical Specifications

Electrical Connection	**1/2 - 14 NPT** **M20 X 1.5** **PG 13.5 DIN**	3/4 - 14 NPT (with 316SST adapter for 1/2 - 14 NPT). 3/4 - 14 BSP (with 316SST adapter for 1/2 - 14 NPT). 1/2 - 14 BSP (with 316SST adapter for 1/2 - 14 NPT).
	Consult Smar for details on application in hazardous areas.	
Pneumatic Connections	Power supply and output: 1/4 -18 NPT. Gauge: 1/8 - 27 NPT.	
Material of Construction	Injected low copper aluminum with polyester painting or 316 Stainless Steel housing, with Buna-N O-rings on cover. Identification plate in 316 Stainless Steel	
Mounting	Universal brackets for rotary and linear motion (See BFY in Ordering Code). Customized brackets for most market valves and final elements (See www.smar.com for availability and bracket choice). Additional “L” bracket for the remote sensor version, in Carbon Steel and 316 Stainless Steel for mounting on a 2“ tube.	
Weight	**• FY:** 2.7 kg in Aluminum, without mounting bracket; 5.8 kg in Stainless Steel, without mounting bracket. **• Remote Sensor:** 0.58 kg (Aluminum); 1.5 kg (Stainless Steel). **• Cable and remote sensor connectors:** 0.045 kg/m of cable; 0.05 kg per each connector.	
Pressure Sensor	For measuring the air supply, output 1 and output 2. (Optional, consult Smar about applicable certifications).	

Ordering Code

MODEL	SMART VALVE POSITIONER
FY303	PROFIBUS PA

COD. Local Indicator

COD.	
0	Without Indicator
1	With Digital Indicator

COD. Mounting Bracket

COD.	
0	Without Bracket
1	With Bracket

COD. Electrical Connections

COD.		COD.	
0	1/2" - 14 NPT **(4)**	3	1/2" - 14 NPT X 1/2 BSP (316 SS) - with adapter **(3)**
1	1/2" - 14 NPT X 3/4 NPT (316 SS) - with adapter **(5)**	A	M20 X 1.5 **(6)**
2	1/2" - 14 NPT X 3/4 BSP (316 SS) - with adapter **(3)**	B	PG 13.5 DIN **(7)**

COD. Type of Actuator

COD.		COD.	
1	Rotary - Single Action	A	Linear Stroke Up to 30 mm. - Single Action
2	Rotary - Double Action	B	Linear Stroke Up to 30 mm. - Double Action
5	Linear Stroke Up to 50 mm. - Single Action	C	Without magnet (for linear actuator) - Single Action
6	Linear Stroke Up to 50 mm. - Double Action	D	Without magnet (for linear actuator) - Double Action
7	Linear Stroke Up to 100 mm. - Single Action	Z	Others Specify
8	Linear Stroke Up to 100 mm. - Double Action		

COD. Indication Gage

COD.		COD.	
0	Without Gauge	9	Whit 2 Gauge (Acrylic, Stainless steel and wetted parts in brass) - Output 1 and 2
6	With 1 Gauge (Acrylic, SST and wetted parts in brass) - Input	A	With 3 Gauge (Acrylic, SST and wetted parts in brass)
7	With 1 Gauge (Acrylic, Stainless steel and wetted parts in brass) - Output 1	Z	Others Specify
8	With 2 Gauge (Acrylic, Stainless steel and wetted parts in brass) - Input and Output 1		

SPECIAL OPTIONS

COD. Housing

COD.		COD.	
H0	Aluminum (IP/Type)	H3	316 Stainless Steel for saline atmosphere (IPW/Type X) **(2)**
H1	316 Stainless Steel (IP/Type)	H4	Copper Free Aluminum (IPW/Type X) **(2)**
H2	Aluminum for saline atmosphere (IPW/Type X) **(2)**		

COD. Identification Plate

COD.		COD.	
I1	FM: XP, IS, NI, DI (USA)	IO	CEPEL (INMETRO – DUST)
I3	CSA: XP, IS, NI, DI (CANADIAN)		
I4	EXAM: EX-IA, NEMKO: EX-D (ATEX – GAS)		
I5	CEPEL: EX-D, EX-IA (INMETRO – GAS)		
I6	Without certification		

COD. Painting

COD.	
P0	Gray Munsell N 6.5 Polyester
P8	Without Painting
P9	Blue Safety Epoxy – Electrostatic Painting
PD	Blue smooth diamond RAL5010 - Epoxy

COD. TAG Plate

COD.		COD.		COD.	
J0	With TAG	J1	Blank	J2	According to user's notes

COD. Sensor Mounting (1)

COD.	
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
R9	Remote Mounting (adapted for Remote Sensor, without cable and remote extension set)
RZ	Specify (*)

COD. Special Sensor

COD.	
K0	Without special sensor
K1	With pressure sensors for diagnostic

COD. Special

COD.	
ZZ	Specify (*)

FY303	1	0	0	1	0	*	*	*	*	*	*	*

TYPICAL MODEL NUMBER

* Leave it blank for no optional items.

NOTES

(1) Consult Smar for applications in classified areas.
(2) IPW/TYPEX tested for 200 hours according to NBR 8094 / ASTM B 117 standard.
(3) Options not certified for hazardous locations.
(4) Certificate Ex-d FM, ATEX, IECEX and INMETRO.
(5) Certificate Ex-d for INMETRO.
(6) When choosing the Remote Sensor version, an additional "L" shaped support will be included, for 2" pipe, for fixing the FYRemoto. To fix the Remote Sensor on the actuator, it is necessary to specify the BFY according to the order code, on this manual.

BFY	BRACKET (1)

CODE	Positioner Mounting Bracket
0	Without Bracket
1	Universal Rotary
2	Universal Linear - Yoke and Pillar Type
3	Linear - Yoke Type
4	Linear - Pillar Type
Z	Others - Specify

CODE	Magnet Mounting Bracket
0	Without Bracket
1	Rotary
2	Linear up to 30 mm.
3	Linear up to 50 mm.
4	Linear up to 100 mm.
Z	Others - Specify

COD.	Positioner Mounting Bracket Material
7	Carbon Steel Bracket and Accessories in SST
C	Carbon Steel Bracket
I	Stainless Steel Bracket
N	Not applicable
Z	Others - Specify

COD.	Magnet Bracket Material
C	Carbon Steel Bracket
I	Stainless Steel Bracket
N	Not applicable
Z	Others - Specify

COD.	Optional Items
ZZ	Leave it blank for no optional item.

BFY	-	1	0	7	C	.	*

TYPICAL MODEL NUMBER

(1) For customized mounting bracket, for different brands and models, please, consult www.smar.com.

Appendix A

CERTIFICATIONS INFORMATION

European Directive Information

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

Authorized representative/importer located within the Community:
Smar Europe BV De Oude Wereld 116 2408 TM Alphen aan den Rijn Netherlands

ATEX Directive 2014/34//EU - "Equipment for explosive atmospheres"
The EC-Type Examination Certificate is released by DNV Product Assurance AS (NB 2460) and DEKRA Testing and Certification GmbH (NB 0158).
Designated certification body that monitors manufacturing and released QAN (Quality Assurance Notification) is Nemko AS (NB 0470) and UL International Demko AS (NB 0539).

LVD Directive 2014/35/EU – "Low Voltage"
According the LVD directive Annex II, electrical equipment for use in an explosive atmosphere is outside the scope of this directive.
According to IEC standard: IEC 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements.

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

ROHS Directive 2011/65/EU - "Restriction of the use of certain hazardous substances in electrical and electronic equipment"
For the evaluation of the products the following standards were consulted: EN IEC 63000.

EMC Directive 2014/30/EU - "Electromagnetic Compatibility"
For products evaluation, the standard IEC 61326-1 were consulted and to comply with the EMC directive the installation must follow these special conditions:
Use shielded, twisted-pair cable for powering the instrument and signal wiring.
Keep the shield insulated at the instrument side, connecting the other one to the ground.

Hazardous locations general information

Ex Standards:
IEC 60079-0 General Requirements
IEC 60079-1 Flameproof Enclosures "d"
IEC 60079-7 Increased Safe "e"
IEC 60079-11 Intrinsic Safety "i"
IEC 60079-18 Encapsulation "m"
IEC 60079-26 Equipment with Separation Elements or combined Levels of Protection
IEC 60079-31 Equipment dust ignition protection by enclosure "t"
IEC 60529 Classification of degrees of protection provided by enclosures (IP Code)
IEC 60079-10 Classification of Hazardous Areas
IEC 60079-14 Electrical installation design, selection and erection
IEC 60079-17 Electrical Installations, Inspections and Maintenance
IEC 60079-19 Equipment repair, overhaul and reclamation
ISO/IEC 80079-34 Application of quality systems for equipment manufacture

Warning:
Explosions could result in death or serious injury, besides financial damage.
Installation of this instrument in hazardous areas must be in accordance with the local standards and type of protection. Before proceedings with installation make sure that the certificate parameters are in accordance with the classified hazardous area.

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

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

Intrinsic Safety / Non Incendive application
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 (120º) to guarantee the sealing.
Lock the housing and covers using the locking screw.
The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction.
Care must be taken during installation and use to prevent impact or friction.

Degree of Protection of enclosure (IP)
IPx8: Second numeral meaning continuous immersion in water under special condition defined as 10m for a period of 24 hours (Ref: IEC60529).
IPW/ TypeX: Supplementary letter W or X meaning special condition defined as saline environment tested in saturated solution of NaCl 5% w/w at 35ºC for a period of 200 hours (Ref: NEMA 250/ IEC60529).
For enclosure with IP/IPW/TypeX applications, all NPT threads must apply a proper water-proof sealant (a non-hardening silicone group sealant is recommended).

Hazardous Locations Approvals

FM Approvals
FM 3D9A2.AX
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; Ta = -25°C < Ta < 60°C; Type 4 or 4X

Entity Parameters Fieldbus Power Supply Input (report 3015629):
Vmax = 24 Vdc, Imax = 250 mA, Pi = 1.2 W, Ci = 5 nF, Li = 12 uH
Vmax = 16 Vdc, Imax = 250 mA, Pi = 2 W, Ci = 5 nF, Li = 12 uH

Drawing 102A-0040, 102A-1209, 102A-1332, 102A-1777, 102A-1778

DNV
Explosion Proof (Nemko 00ATEX305X)
Group II, Category 2 G, Ex d, Group IIC, Temperature Class T6, EPL Gb
Ambient Temperature: -20ºC ≤ Ta ≤ +60ºC
Working Pressure: 20-100 psi
Options: IP66W or IP66

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

The Essential Health and Safety Requirements are assured by compliance with:
EN 60079-0:2012 General Requirements
EN 60079-1:2007 Flameproof Enclosures “d”

Drawing 102A-1414, 102A-1496

DEKRA
Intrinsic Safety (DMT 01 ATEX E 011)
Group II, Category 2 G, Ex d [ia], Group IIC, Temperature Class T6, EPL Gb

FISCO Field Device
Supply circuit for the connection to an intrinsically safe FISCO fieldbus-circuit
Ui = 24Vdc, Ii = 380 mA, Pi = 5.32 W, Ci ≤ 5 nF, Li = neg
Parameters of the supply circuit comply with FISCO model according to Annex G EN 60079-11:2012, replacing EN 60079-27: 2008.
Ambient Temperature: -20ºC ≤ Ta ≤ +60ºC

The Essential Health and Safety Requirements are assured by compliance with:
EN 60079-0:2009 + A11:2013 General Requirements
EN 60079-1:2007 Flameproof Enclosures “d”
EN 60079-11:2012 Intrinsic Safety “i”

Drawing 102A-1414, 102A-1496

CEPEL

Segurança Intrínseca (CEPEL 00.0017)

CEPEL 00.0017 Equipamento de campo FISCO Ex db ia IIC T* Gb IP66W/IP66 Ui = 24 V Ii = 380 mA Pi = 5,32 W Ci = 5 nF Li = desp T_{amb}: -20 °C a +65 °C para T4 T_{amb}: -20 °C a +50 °C para T5 T_{amb}: -20 °C a +40 °C para T6	CEPEL 00.0017 Equipamento de campo FISCO Ex tb IIIC T* Db IP66W/IP66 Tamb: -20 °C a +65 °C para T4 Tamb: -20 °C a +50 °C para T5 Tamb: -20 °C a +40 °C para T6

Prova de Explosão (CEPEL 98.0008)

CEPEL 98.0008
Ex db IIC T6 Gb
Ex tb IIIC T85 ºC Db
IP66W/IP66

Observações:

1) A validade deste Certificado de Conformidade está atrelada à realização das avaliações de manutenção e tratamento de possíveis não conformidades, de acordo com as orientações do Cepel, previstas no Regulamento de Avaliação da Conformidade. Para verificação da condição atualizada de regularidade deste Certificado de Conformidade deve ser consultado o banco de dados de produtos e serviços certificados do Inmetro.
2) A tampa do invólucro possui uma plaqueta de advertência com a seguinte inscrição: "ATENÇÃO - NÃO ABRA ENQUANTO ENERGIZADO", ou similar tecnicamente equivalente.
3) O produto adicionalmente marcado com a letra suplementar "W" indica que o equipamento foi ensaiado em uma solução saturada a 5% de NaCl p/p, à 35 °C, pelo tempo de 200 h e foi aprovado para uso em atmosferas salinas, condicionado à utilização de acessórios de instalação no mesmo material do equipamento e de bujões de aço inoxidável ASTM-A240, para fechamento das entradas roscadas não utilizadas. Os materiais de fabricação dos equipamentos aprovados para letra "W" são: aço inoxidável AISI 316 e alumínio Copper Free SAE 336 pintados (Procedimento P-CQ-FAB764-11) com tinta Resina Poliéster ou Resina Epóxi com espessura da camada de tinta de 70 a 150 µm e 120 a 200 µm, respectivamente, ou pintados com o plano de pintura P1 e P2 (Procedimento P-CQ-FAB-765-07) com tinta Resina Epóxi ou Poliuretano Acrílico Alifático com espessura de camada de tinta de 290 µm a 405 µm e 90 µm a 200 µm, respectivamente.
4) Os planos de pintura P1 são permitidos apenas para equipamento fornecido com plaqueta de identificação com marcação para grupo de gás IIB.
5) Este certificado é válido apenas para os produtos dos modelos avaliados. Qualquer modificação nos projetos, bem como a utilização de componentes ou materiais diferentes daqueles definidos pela documentação descritiva dos produtos, sem a prévia autorização do Cepel, invalidará este certificado.
6) É responsabilidade do fabricante assegurar que os produtos fornecidos ao mercado nacional estejam de acordo com as especificações e documentação descritiva avaliada, relacionadas neste certificado.
7) 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.

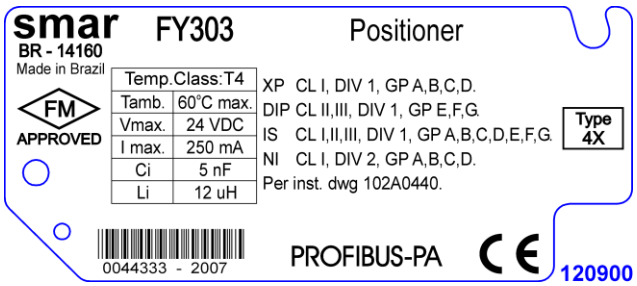
8) A marcação é executada conforme a Norma ABNT NBR IEC 60079-0:2020 e o Requisito de Avaliação da Conformidade de Equipamentos Elétricos para Atmosferas Explosivas nas Condições de Gases e Vapores Inflamáveis (RAC), e é fixada na superfície externa do equipamento, em local visível. Esta marcação é legível e durável, levando-se em conta possível corrosão química.

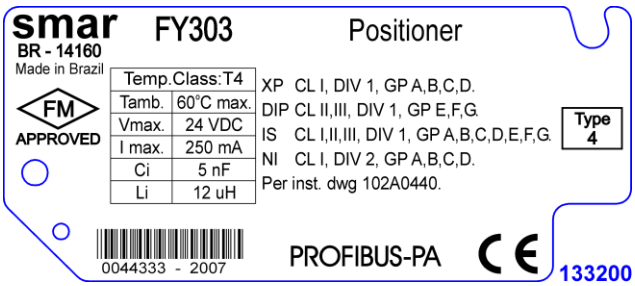
Normas Aplicáveis:
ABNT NBR IEC 60079-0:2020 Atmosferas explosivas - Parte 0: Equipamentos – Requisitos gerais
ABNT NBR IEC 60079-1:2016 Atmosferas explosivas - Parte 1: Proteção de equipamento por invólucro à prova de explosão “d”
ABNT NBR IEC 60079-11:2013 Atmosferas explosivas - Parte 11: Proteção de equipamento por segurança intrínseca "i"
ABNT NBR IEC 60079-31:2022 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 102A1246, 102A1367, 102A1789, 102A2011, 102A2012

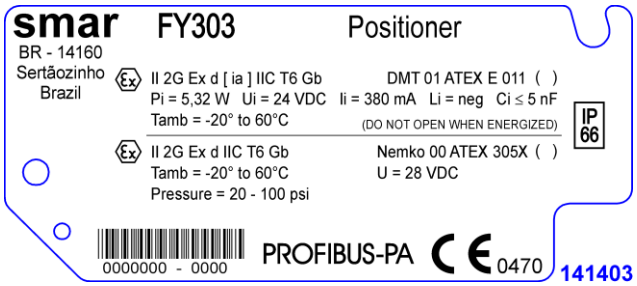
Identification Plate

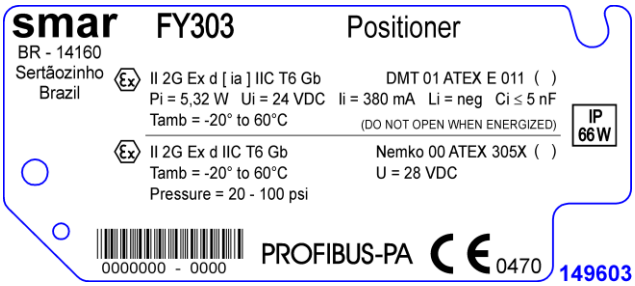
FM Approvals



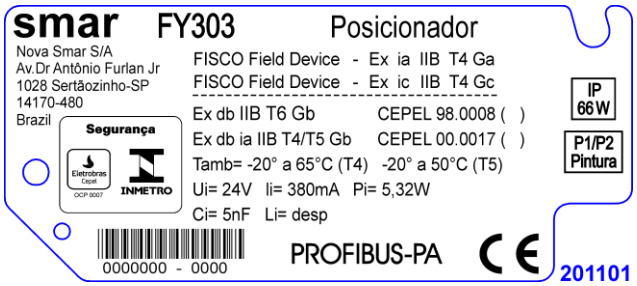


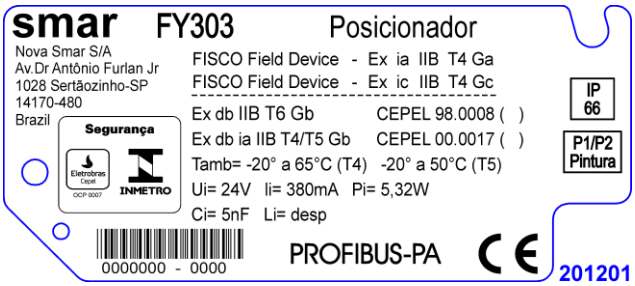
DNV / DEKRA



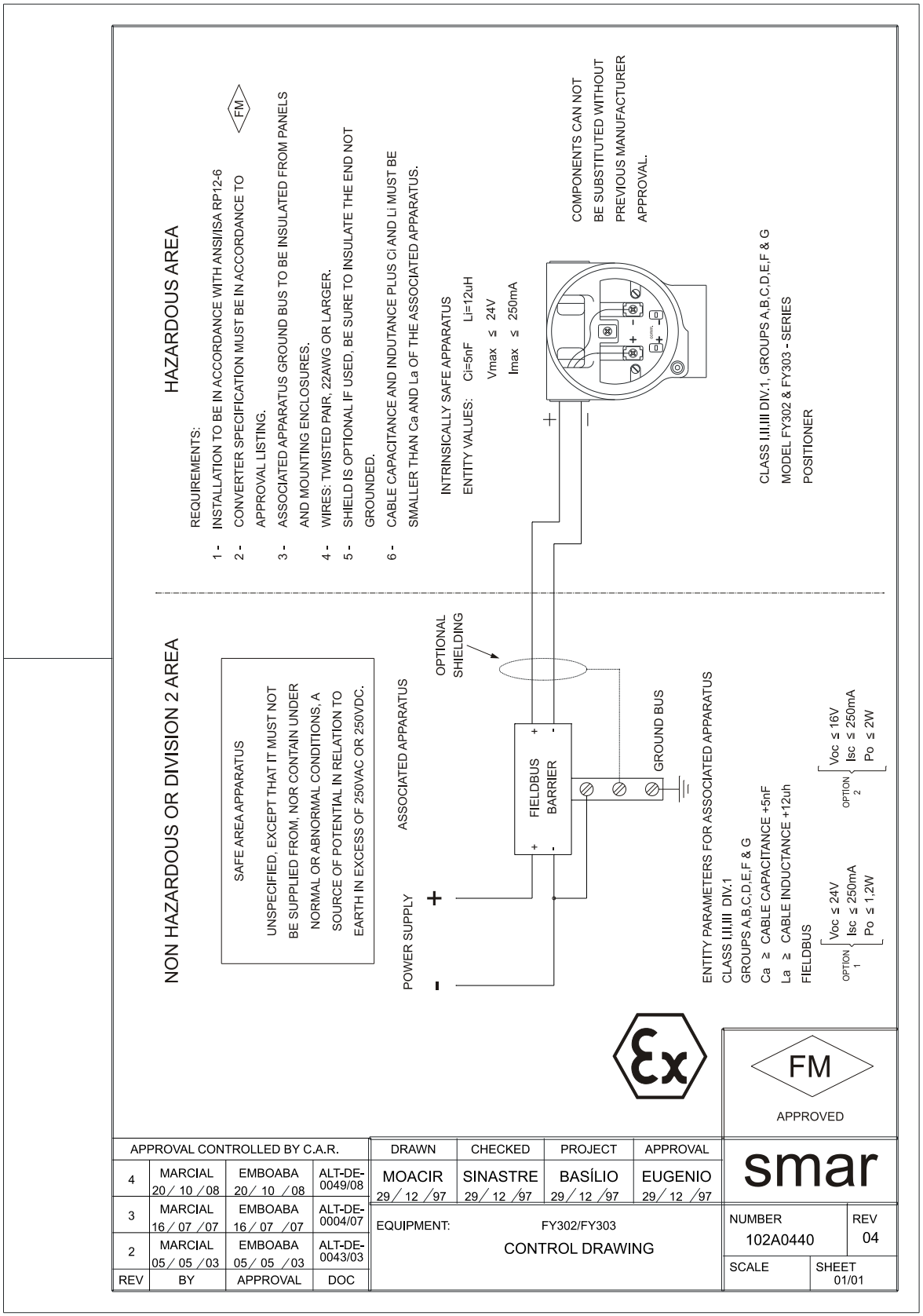


CEPEL





FM Approvals



smar

SRF – Service Request Form

FY Positioner

GENERAL DATA

Model: FY290 ( ) Firmware Version: _____ FY301 ( ) Firmware Version: _____
FY302 ( ) Firmware Version: _____ FY303 ( ) Firmware Version: _____
FY400 ( ) Firmware Version: _____

Serial Number: _____ **Sensor Number:** _____

TAG: _____

Remote Position Sensor? Yes ( ) No ( )

Pressure Sensor? Yes ( ) No ( )

Action: Rotary ( ) Linear ( )

Travel: 15 mm ( ) 30 mm ( ) 50 mm ( ) 100 mm ( ) Other: _____ mm

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

FINAL CONTROL ELEMENT DATA

Type: Valve + Actuator ( ) Pneumatic Cylinder (ACP) ( ) Other:_____

Size: _____

Travel: _____

Manufacturer: _____

Model: _____

AIR SUPPLY

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

Work Pressure: 20 PSI ( ) 60 PSI ( ) 100 PSI ( ) Other: _____ PSI

PROCESS DATA

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

Interference Types Vibration ( ) Temperature ( ) Electromagnetic ( ) Others: _____

SITUATION DESCRIPTION

_____
_____
_____
_____

SERVICE SUGGESTION

Adjustment ( ) Cleaning ( ) Preventive Maintenance ( ) Update / Up-grade ( )

Other: _____ Other:

USER INFORMATION

Company: _____

Contact: _____

Title: _____

Section: _____

Phone: _____ _____ _____ _____ **Extension:**_____

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

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

Returning Materials

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

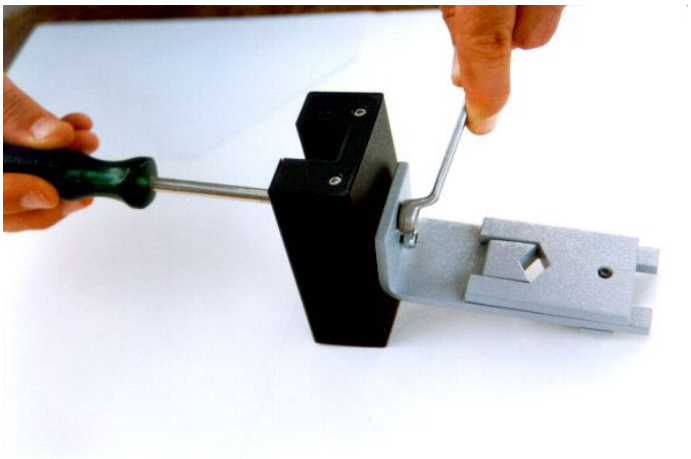
To speed up analysis and solution of the problem, the defective item should be returned with a description of the failure observed, with as much details as possible. Other information concerning the instrument operation, such as service and process conditions, is also helpful.

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

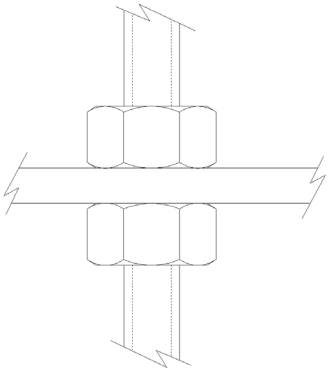
APPENDIX

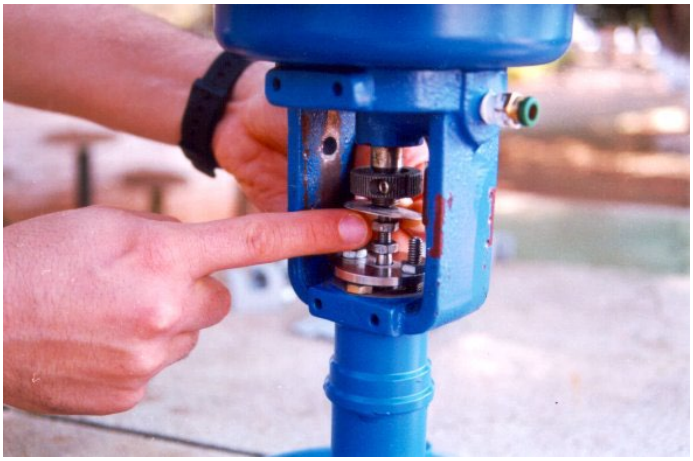
MOUNTING BRACKET FOR POSITIONER – LINEAR STROKE VALVE MOUNTING INSTRUCTIONS

1 –Attach the magnet to the magnet bracket support before connect them to the valve stem.



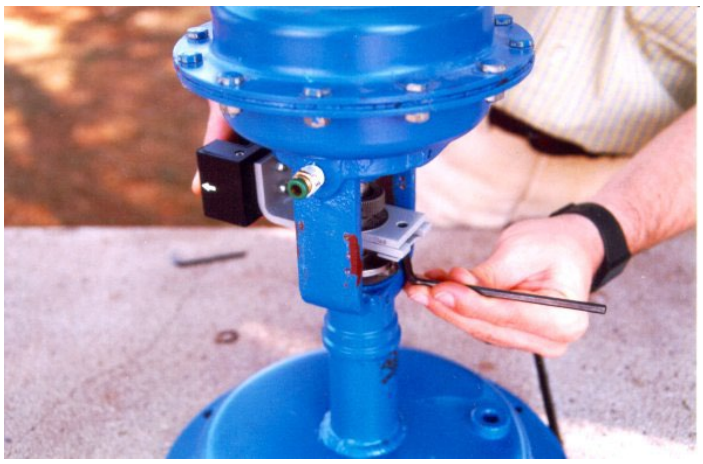
2 - The stem nuts should be used to fasten the magnet bracket.





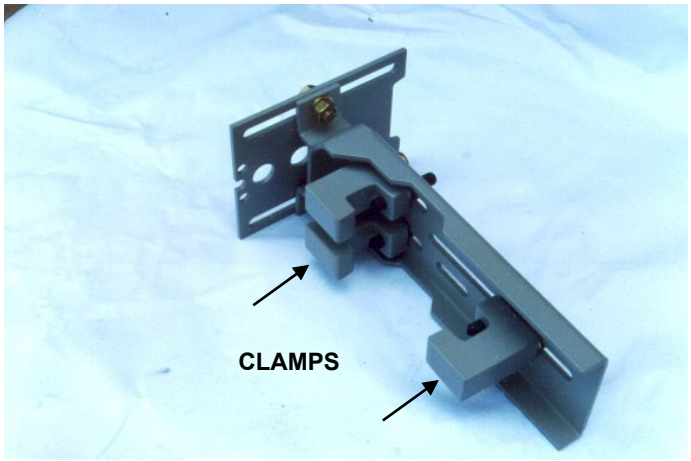
3 – Mount the magnet assembly using the nuts of the valve stem. The mounting bracket has two parts that should be mounted to the stem.

4 – Tighten the hex screw that join the two parts of the magnet bracket. It will avoid sliding of the two parts of the bracket during the fastening of the stem nuts.



5 – Tighten the stem nuts.

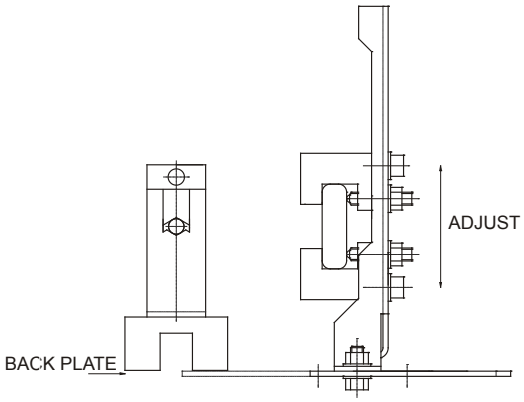
6 – Attach the “clamps” to the positioner bracket.
If your actuator is pillar type, go to step 15 to see the instructions.

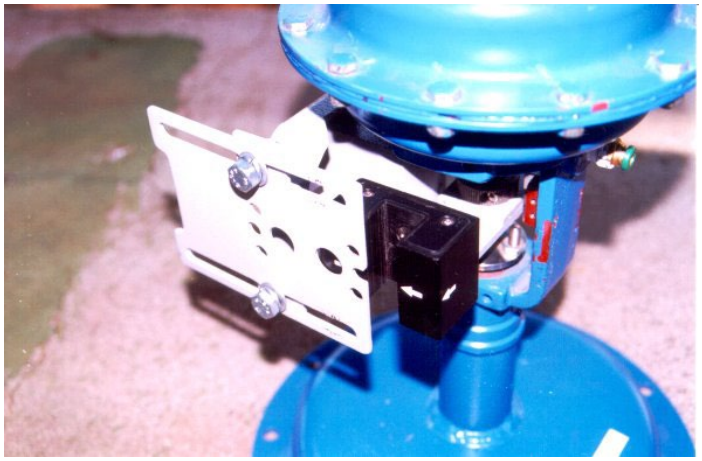


7 – Adjust the clamps according to the width of the yoke and tighten the bolts finger tight.

8 – Mount the positioner back plate. Tighten the nuts finger tight.

9 – Use the plate as a guidance to adjust the position of the positioner so that the back plate is about 1 mm apart from the magnet.

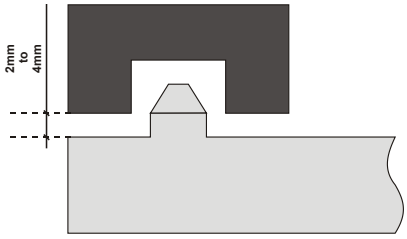


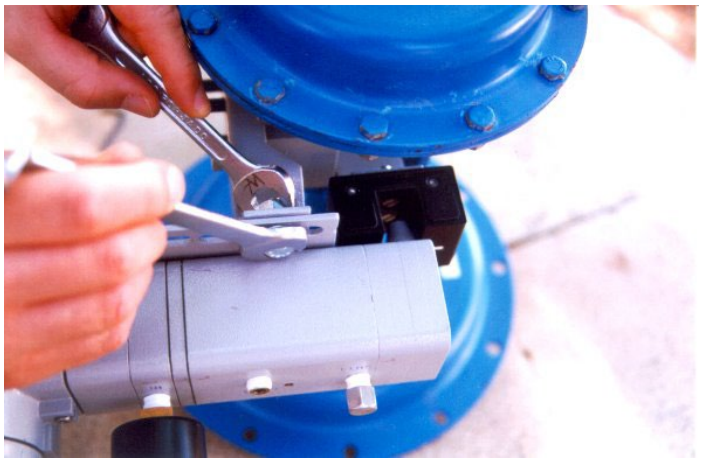


10 – Fasten the nuts to fix the positioner bracket to the yoke.
If the actuator is pillar type, fasten the U-clamp nuts.

11 – Mount the positioner to the plate and tighten the hex screws. You can take the back plate apart to facilitate the assembling.

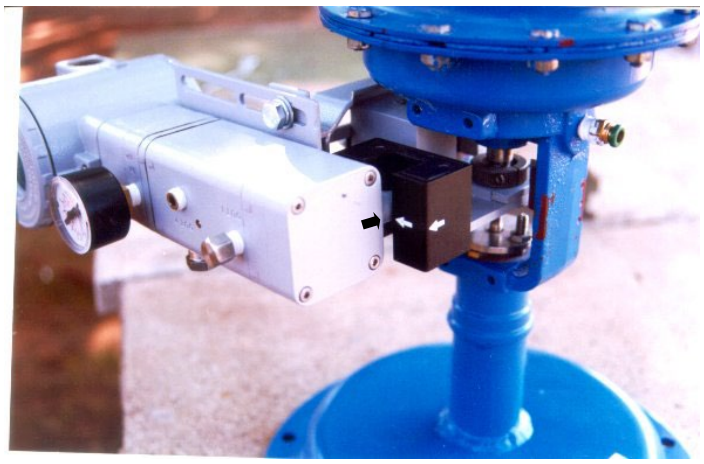
12 – Move the positioner as to adjust the Hall sensor tip in the center of the magnet. Tighten the nuts after the adjustment.





ATTENTION:
A minimum distance of 2mm and a maximum distance of 4mm is recommended between the magnet external face and the positioner face. For that, a centralizer device (linear or rotary) must be used. The centralizer device is in the positioner packing.

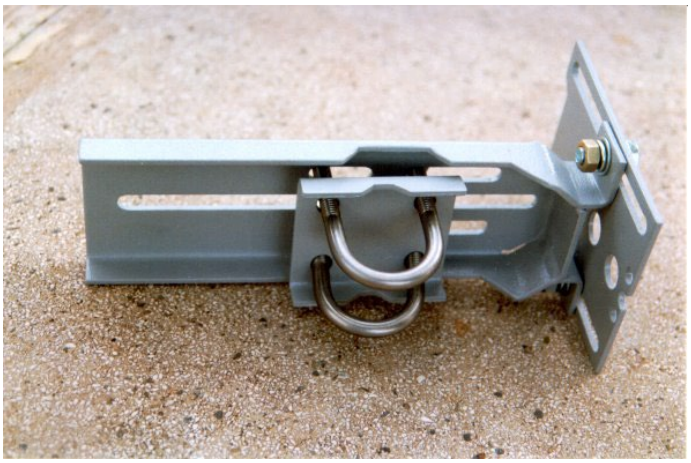
13 – Put the pressure equivalent to the half of the stem travel and adjust the height of the bracket assembly to have the arrows matching.



14 - Tighten the bolts to fasten the clamps to the yoke.

If the actuator is pillar type, fasten the U-clamp nuts.

MOUNTING DETAILS FOR THE PILLAR TYPE ACTUATOR



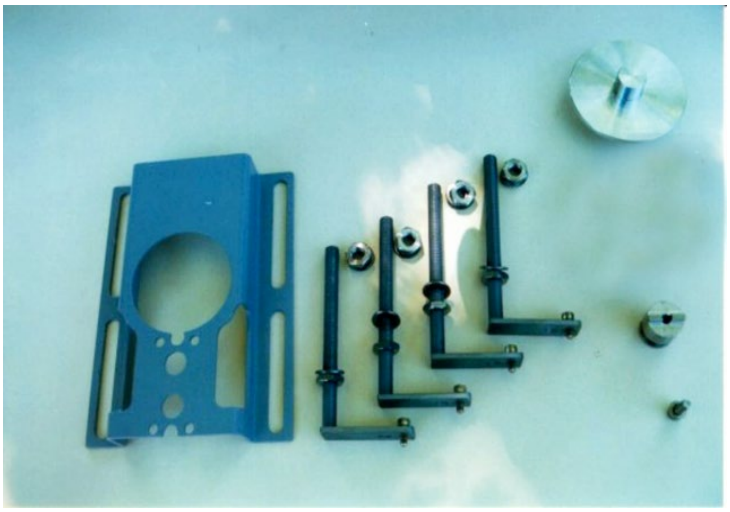
15 - This is the mounting bracket using U-clamps to be mounted on pillar type actuators.

16 – After assembling the U-clamps, follow the steps 8 to 13.

ROTARY VALVE POSITIONER BRACKET

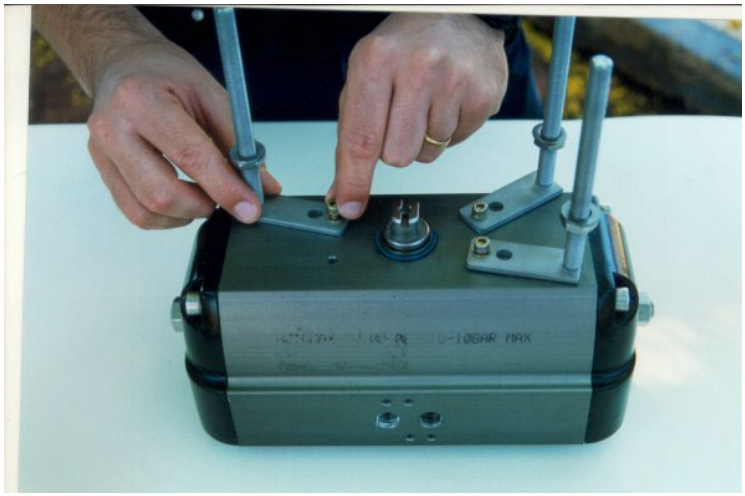
MOUNTING INSTRUCTIONS

Rotary Valve Positioner Bracket Parts.



1- Attach the clamps to the threaded orifices existent on the actuator.
Do not tight them completely.

The bolts are not supplied with the mounting bracket and they must be in accordance with size and thread of the actuator holes.



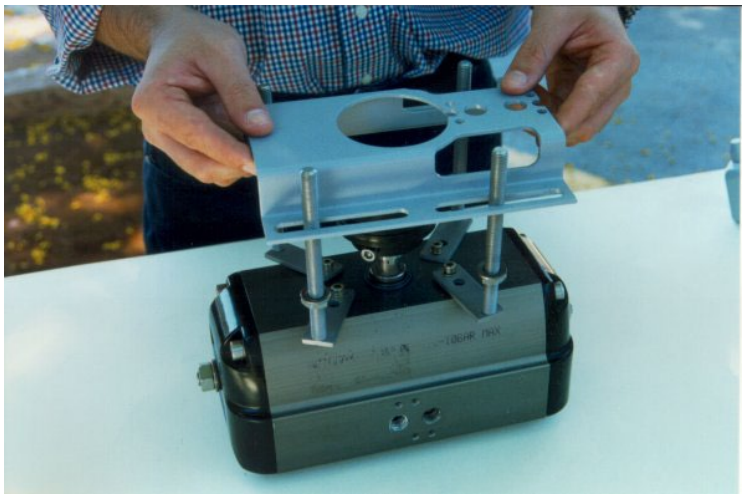
2- Attach the magnet bracket to the Actuator extremity (NAMUR).

The end the valve shaft must comply with Namur Standard.

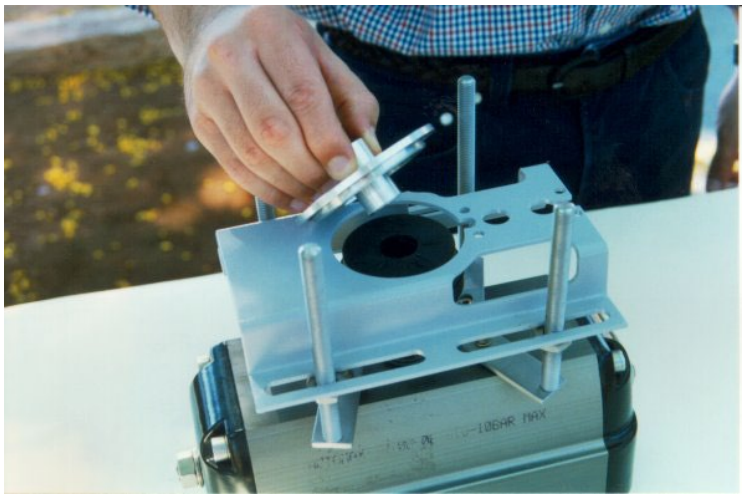
3 – Fasten the hex screw.

4 – Attach the magnet to the NAMUR adapter.
Do not fasten the bolts completely, allowing the magnet rotation.

5 – Mounting the positioner bracket through the threaded rods.



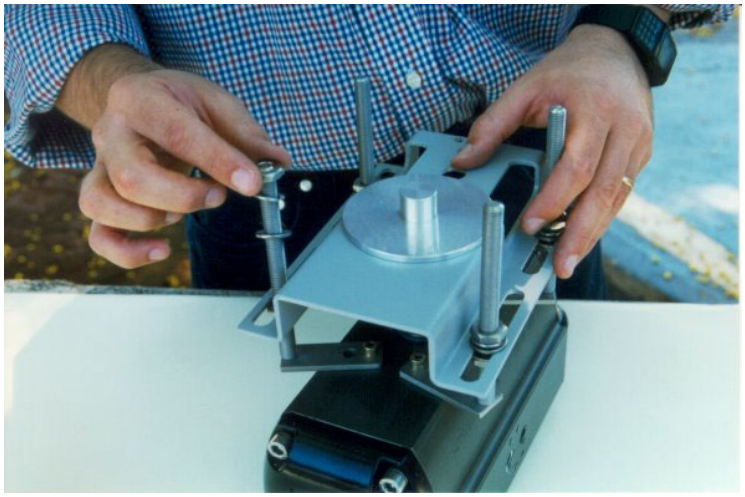
6 – Use the centralizer gadget to get the bracket centralized with the magnet.



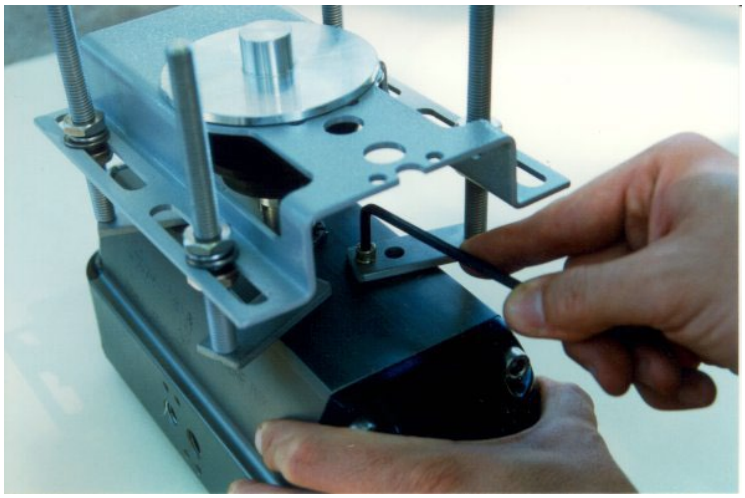
7 – Adjust the positioner bracket using the centralizer gadget and the nuts to get the height.

8 – Place the nut and washers.

Do not fasten the nuts completely.

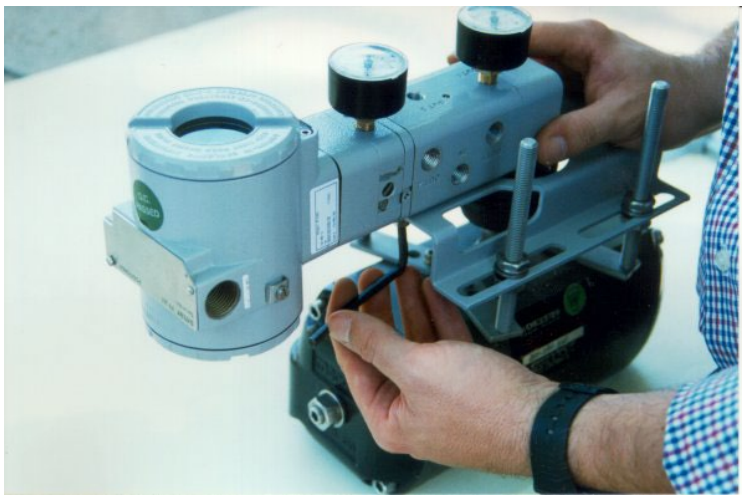


9 – Tighten the clamp bolts to fasten them to the actuator.

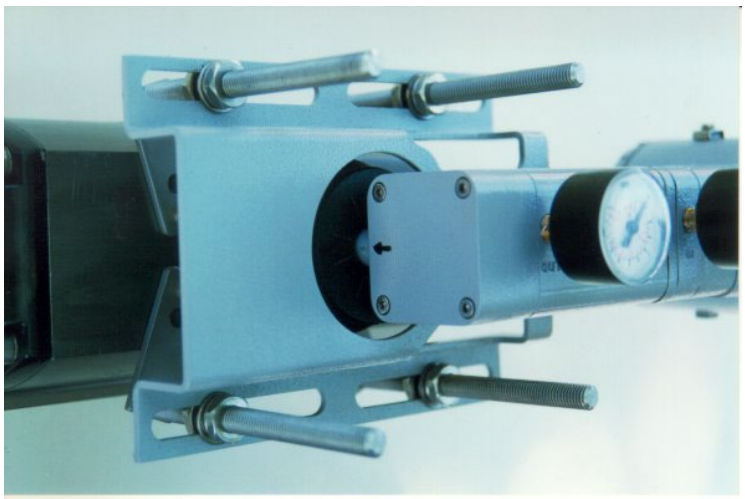


10 – Fasten the positioner bracket bolts to the clamps fastening.

11 – Remove the centralizer gadget and fasten the positioner to the positioner bracket.



12 – Put the pressure equivalent to the half of the stem and adjust the magnet position to have the arrows matching.



13 – Tighten the bolts to fasten the magnet to the magnet bracket.