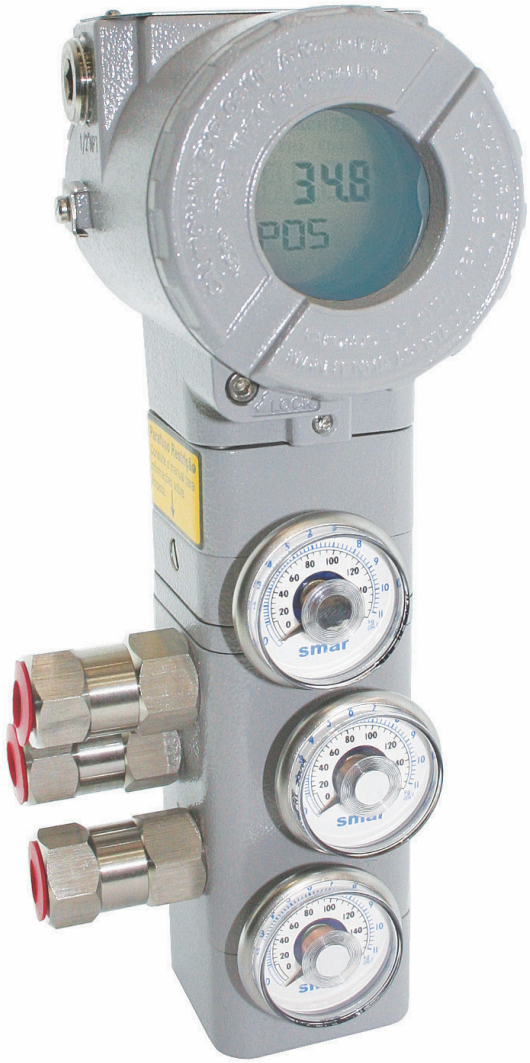
FY303

smar
First in Fieldbus

OPERATION, MAINTENANCE
AND INSTRUCTION MANUAL

Profibus PA Valve Positioner



JUL / 16
FY303
VERSION 1

PROFI BUS

FY303ME

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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 so as to optimize the usage of the network, not loosing 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 too 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 1XX, where 1 denotes software version and XX software release. The indication 1.XX means that this manual is compatible with any release of software version 1.

Waiver of responsibility

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

Warning

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

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

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

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

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

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

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

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

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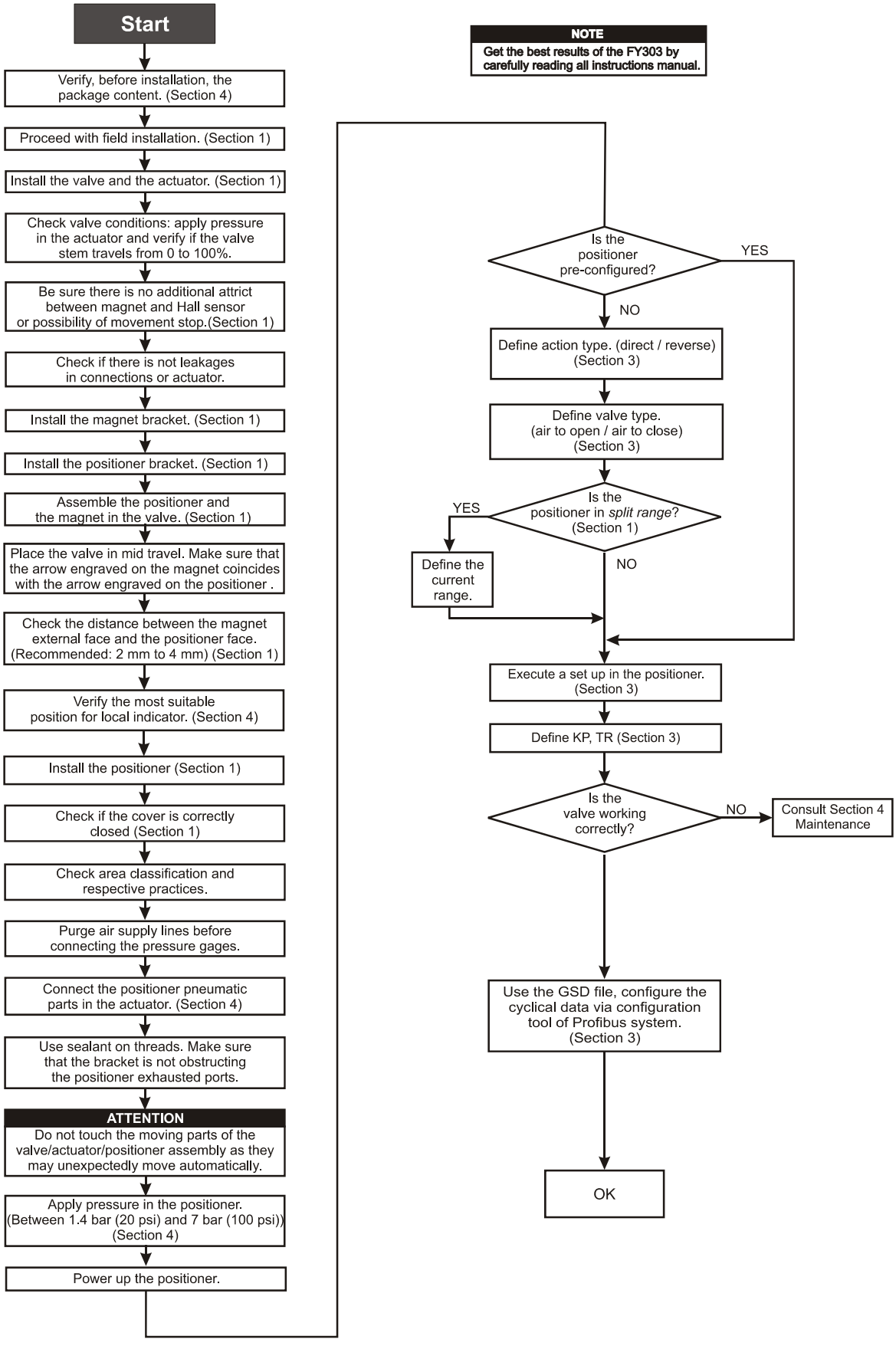
Installation Flowchart



Section 1

INSTALLATION

General

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

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

Among all factors, which may affect converter accuracy environmental conditions are the most difficult to control. There are, however, ways 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.

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

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

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

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.

Rotary Movement

Install the magnet on the valve stem using the magnet support (See Figure 1.2).

Install the positioner support on the actuator. The actuator should be in accordance with standard VDI/VDE 5845, all you have to do is tighten the four screws with the lock washers on the standard support.

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.

Make sure that the arrow engraved on the magnet coincides with the arrow engraved on the positioner when the valve is in mid travel.

If the installation of the positioner or magnet should be altered, 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 the magnet support (See Figure 1.3).
Install the positioner support on the actuator. The actuator support may be secured in place as per standard NAMUR/IEC 536-4 or in accordance with user specified boring. Install the positioner on the support and tighten the four screws in the threaded bores located on the side opposite to the pressure gages (See Figure 1.3). Use lock washers in order to prevent screw slackening.

Make sure that the support is not obstructing the exhaustion outlets.

NOTE
Make sure that arrow engraved on the magnet coincides with the arrow engraved on the positioner when the valve is in mid travel. The magnet mounting in relation to the hall sensor: 1. Must not have attrition between the internal magnet face and the hall sensor salience during the travel (rotary or linear), through the magnet. 2. The magnet and the salience of hall sensor must not be distant. A minimum distance of 2 mm and a maximum distance of 4 mm 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.

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

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 can not be fulfilled, the use of an air pressure regulator is acceptable.

Use sealant on threads. Sealants like PTFE (Teflon) tape shall be avoided because they may fragment and eventually obstruct internal parts.

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 nearly zero; while the output identified as OUT2 (output 2) goes to nearly the air supply pressure.

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. The tubing used to connect the positioner **FY303** to the actuator shall be as short as possible. The manometer supply is optional.

NOTE
When ordering the positioner in stainless steel 316, combined with the local pressure gauges, the gauge case is in SS 316. For wet parts and threads in SS 316, please, consult Smar.

ATTENTION
Make sure that sealant does not enter the positioner.

There are six 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.

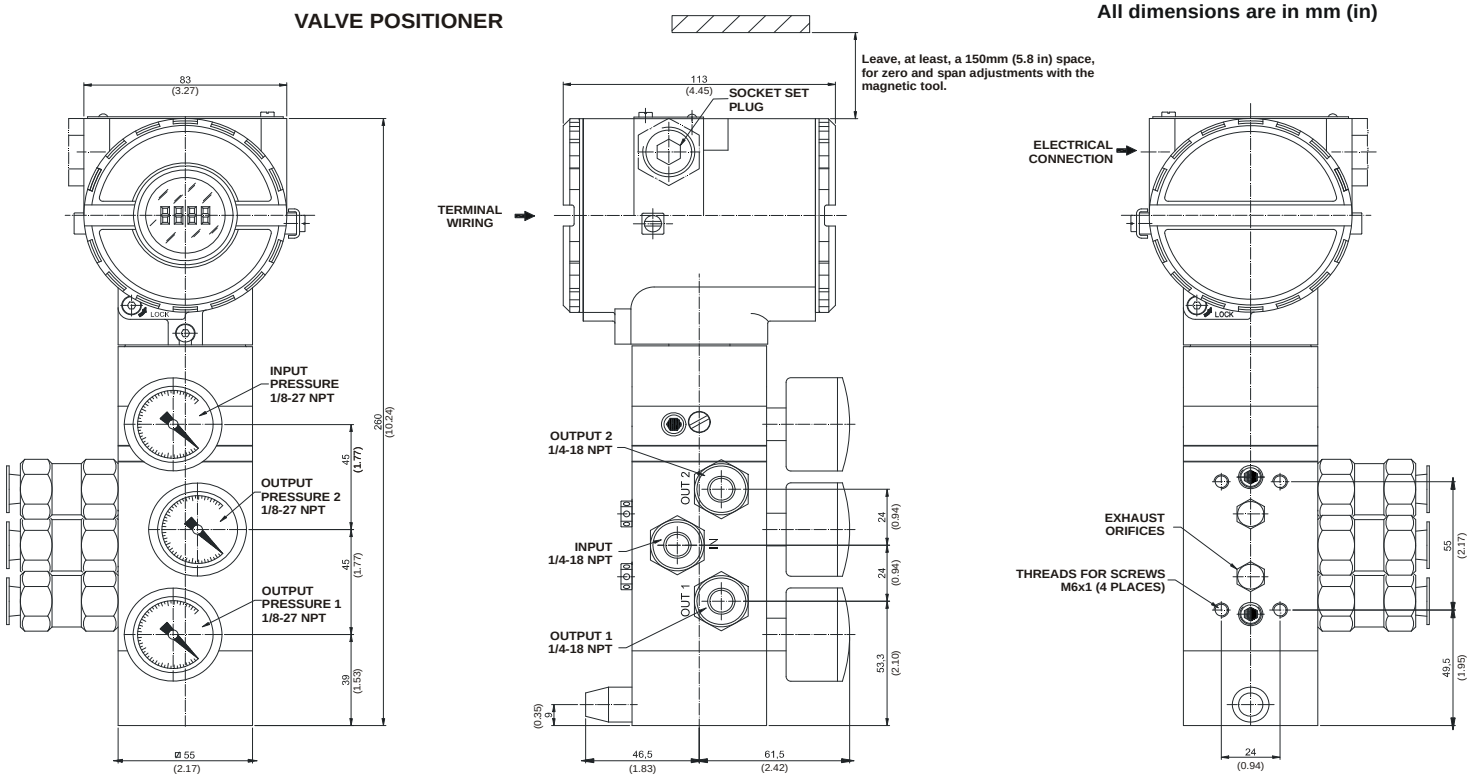
All filters shall be inspected to make sure they will not obstruct the outputs (Refer to Section 4 - Maintenance Procedures).

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.

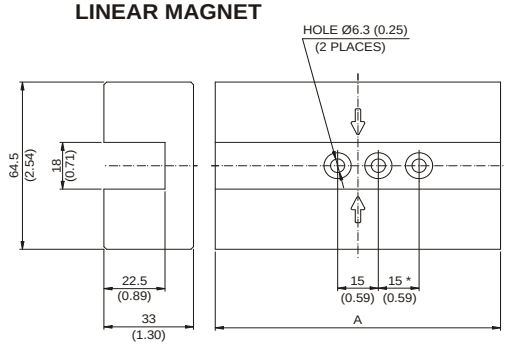
Single Action
Connect Output 1 (OUT1) of the positioner to the input of the actuator. Use a plug to block Output 2 (OUT2).

VALVE POSITIONER

All dimensions are in mm (in)



LINEAR MAGNET

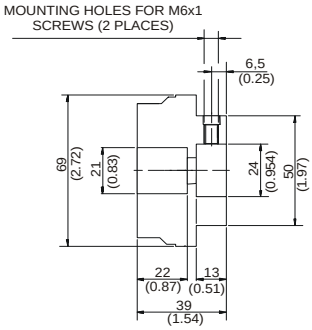


TRAVEL	DIMENSION A
UP TO 15 mm (0.59)	43 mm (1.7)
UP TO 30 mm (1.18)	67 mm (2.64)
UP TO 50 mm (1.97)	105 mm (4.13)
UP TO 100 mm (3.94)	181 mm (7.12)

*ONLY FOR 50 AND 100 mm TRAVELS.

Note: Dimensions in mm (in)

ROTARY MAGNET



REMOTE HALL SENSOR

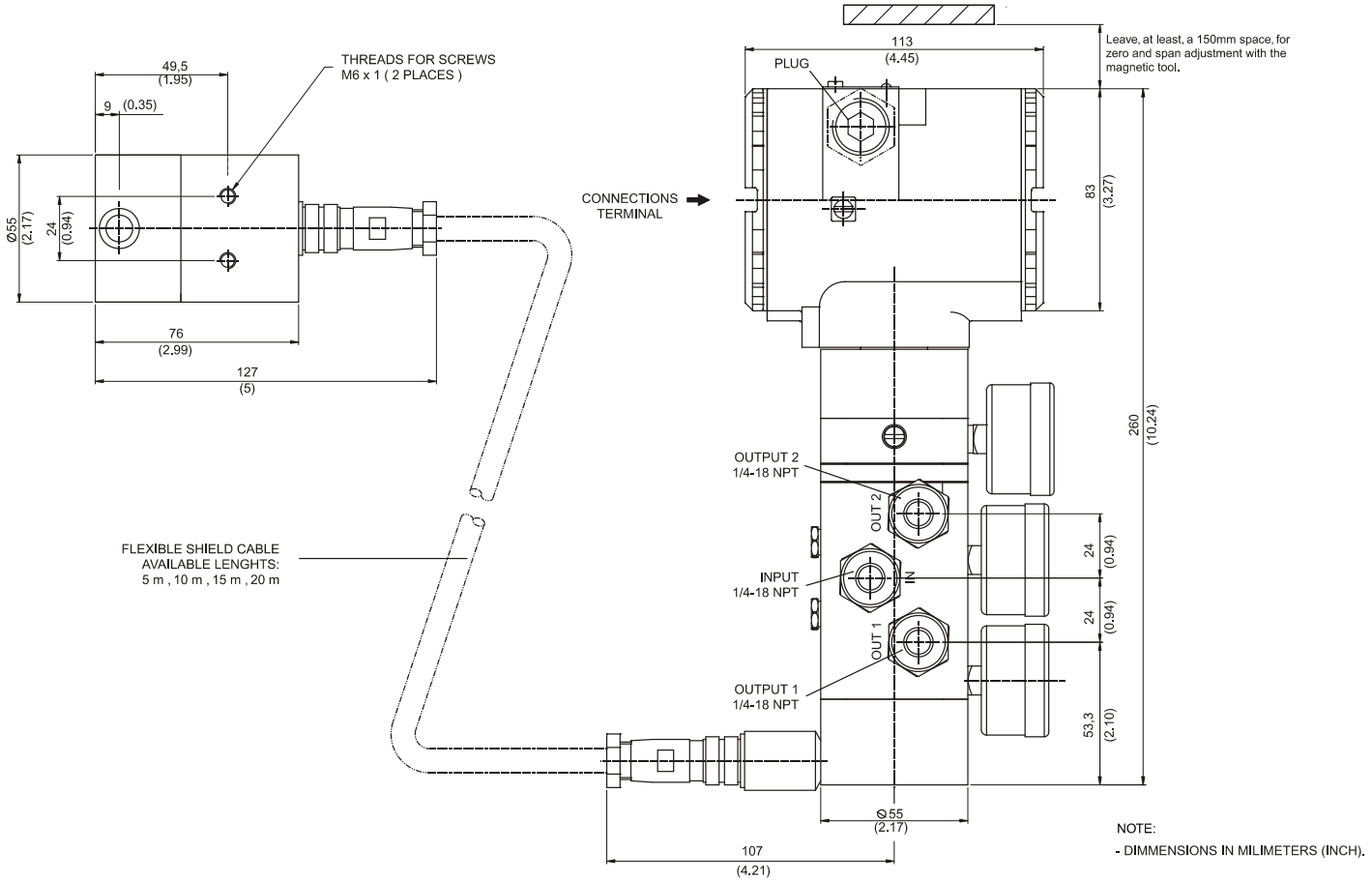


Figure 1.1 - FY303 Dimensional Drawing

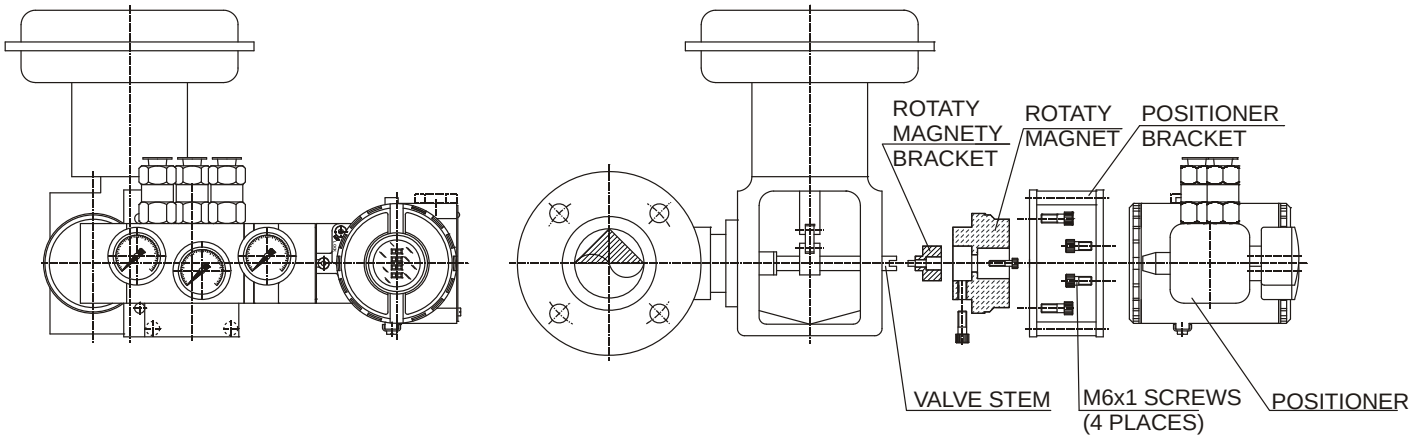


Figure 1.2 - Positioner on Rotary Actuator

NOTE
Included in the package content the **centralizer device of rotary magnet.** See figure 1.13.

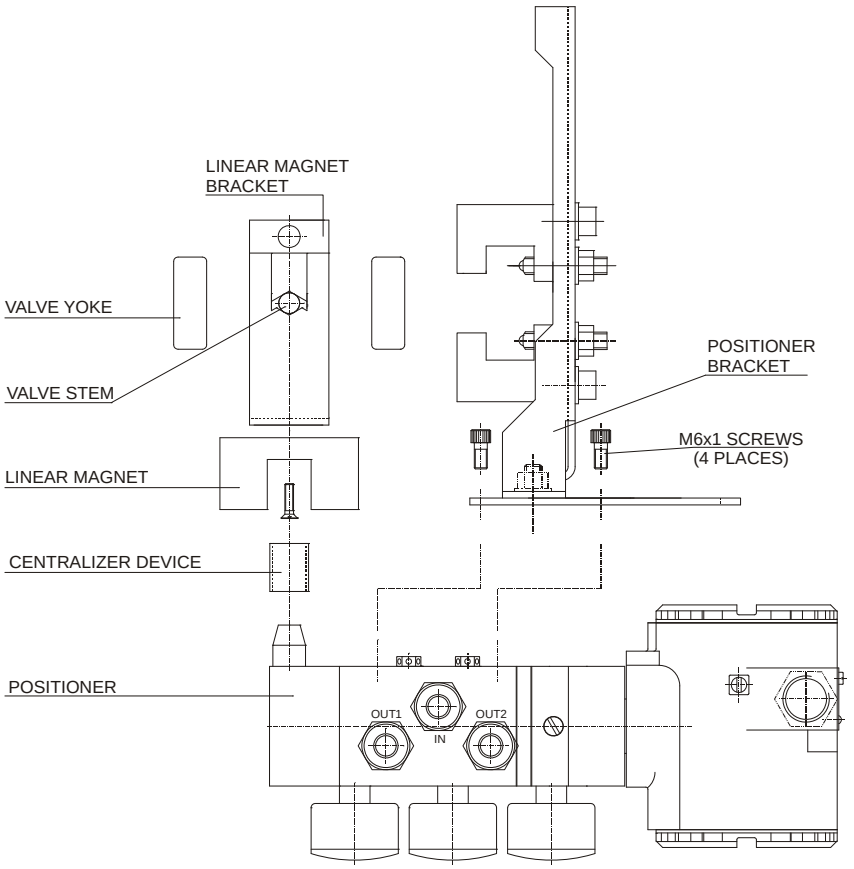


Figure 1.3 - Positioner on Linear Actuator

NOTE
Included in the package content the **centralizer device of linear magnet.** See figure 1.12.

Electronic Housing Rotating

The electronic housing can be rotated in order to have a better position of the digital display. To rotate it, use the Housing Rotation Set Screw. (See Figure 1.4).

The local indicator itself can also be rotated. (See Figure 2.4).

Electric Wiring

Reach the wiring block by removing the Electrical Connection Cover. This cover can be locked by the cover locking screw. To release the cover, rotate the locking screw clockwise.
The wiring block has screws on which fork or ring-type terminals can be fastened.

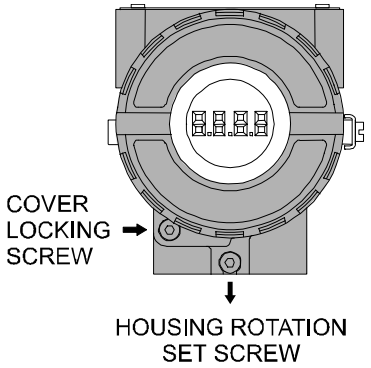


Figure 1.4 - Cover Locking and Housing Rotation Set Screw

For convenience there are two ground terminals: one inside the cover and one external, located close to the conduit entries. (See Figure 1.5).

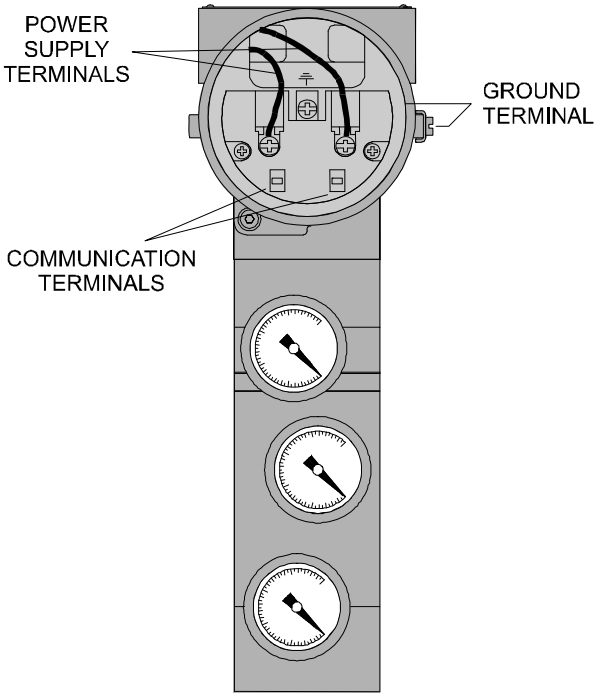


Figure 1.5 - Wiring Block

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 the 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.

WARNING
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 the O'ring touching the housing. Then, tighten more 1/3 turn (120°) to guarantee the sealing. Lock the covers using the locking screw. In hazardous zones with intrinsically safe or non-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. Should other certifications be necessary, refer to the certification or specific standard for installation limitations.

The Figure 1.6 - Conduit Installation Diagram shows the correct installation of the conduit, in order to avoid penetration of water, or other substance, which may cause malfunctioning of the equipment.

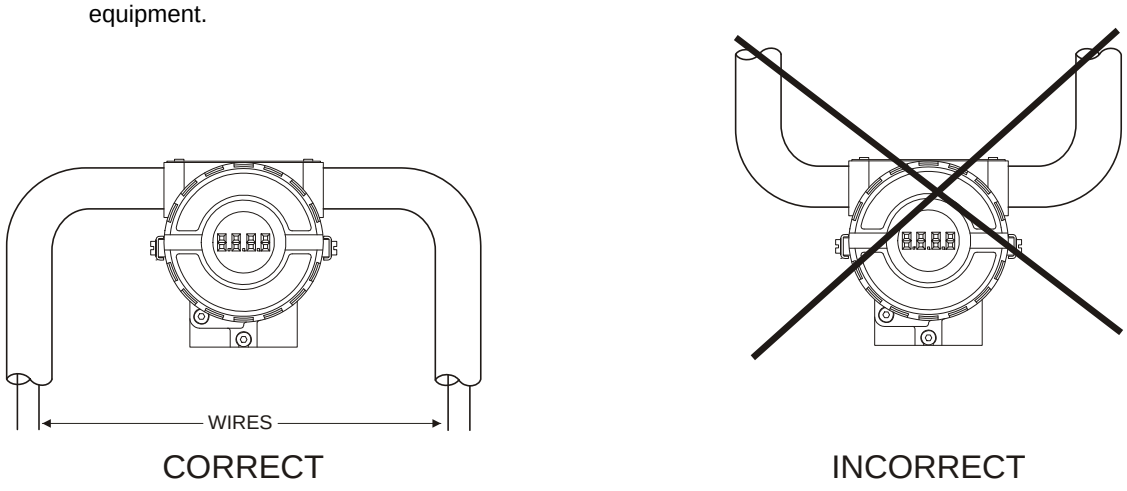


Figure 1.6 - Conduit Installation Diagram

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 (See Figure 1.7) and tree topology (See Figure 1.8) 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.

The connection of couplers should be kept less than 15 per 250m. In following figures the DP/PA link depends on the application needs.

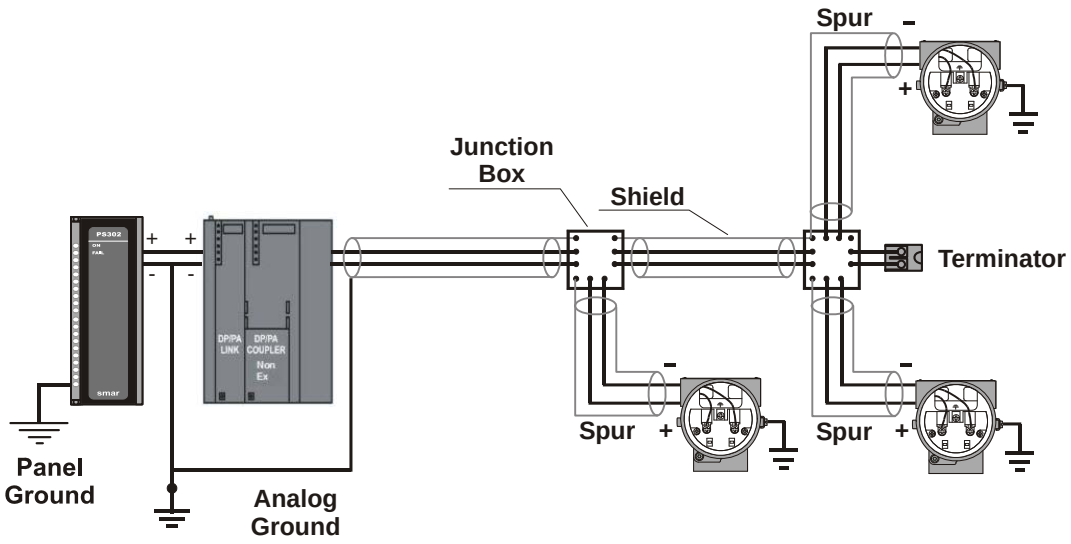


Figure 1.7 - Bus Topology

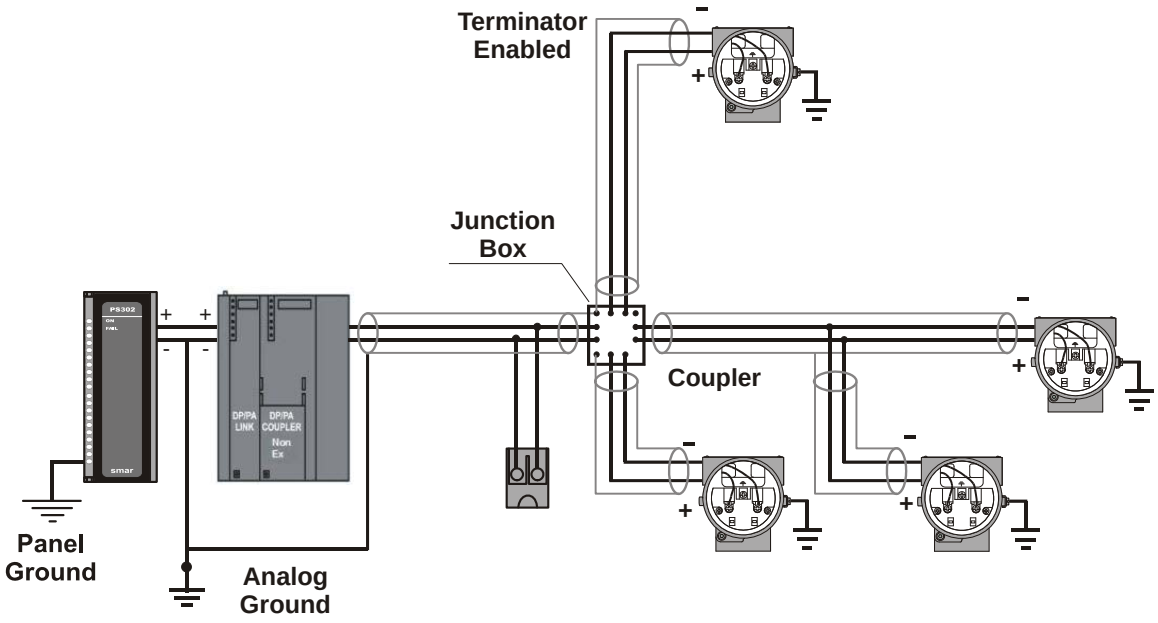


Figure 1.8 - Tree Topology

Intrinsic Safety Barrier

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

Use of **SB302** is recommended.

Jumper Configuration

In order to work properly, the jumpers J1 and W1 located in the **FY303** main 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 1.9 and 1.10 show a typical system for air supply and air quality conditioning.

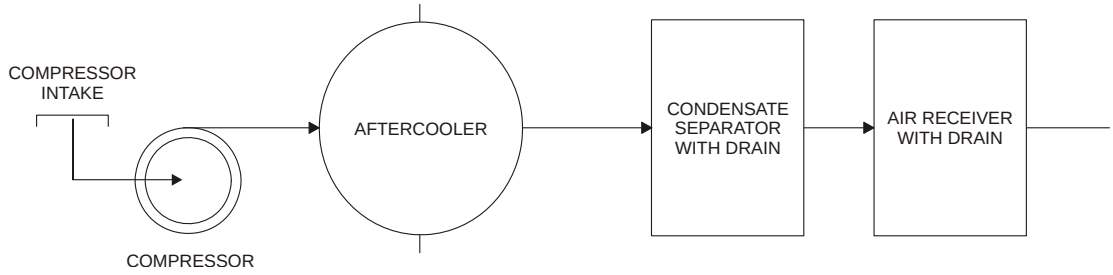


Figure 1.9 - Air Supply System

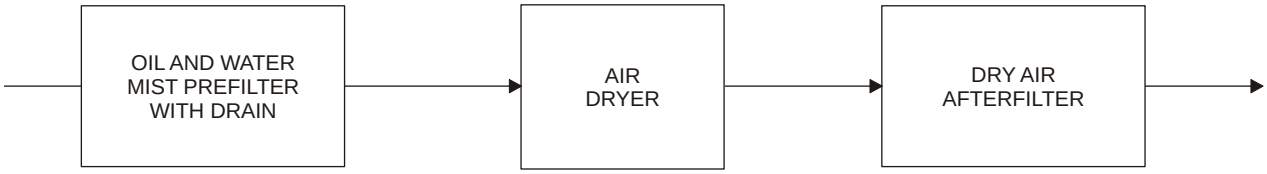


Figure 1.10 - Air Quality Conditioning System

Rotary and Linear Magnet

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

Figure 1.11 – Linear and Rotary Magnet Models

Magnet Centralizer Device

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

Figure 1.12 – Centralizer device of linear magnet

NOTE
Centralizer device of linear magnet is used only for universal rotary bracket.

***Figure 1.13 - 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 1.14 - 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 1.15 - Connecting the Cable to the Remote Hall Sensor

Figure 1.16 - Connecting the Cable to the Positioner

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-and-Vane and Spool.

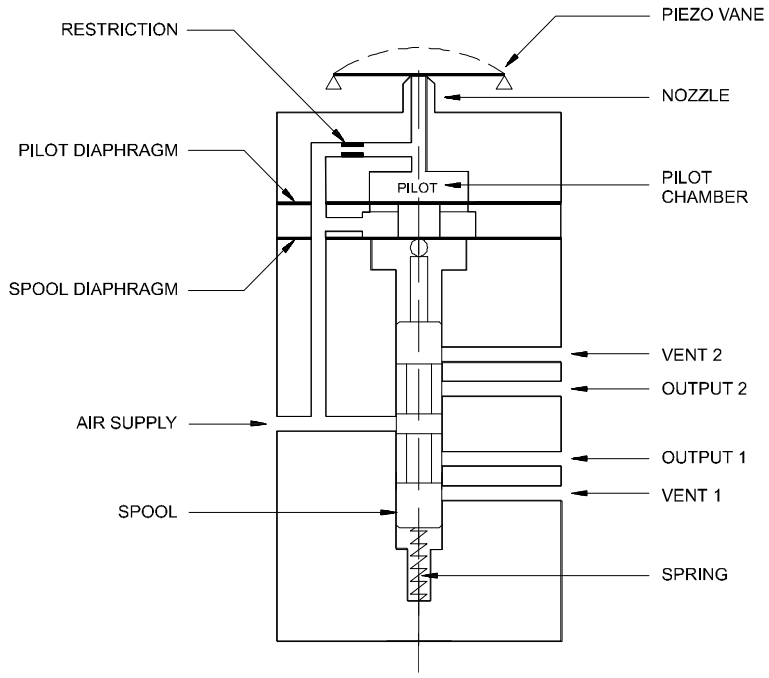


Figure 2.1 - Pneumatic Transducer Schematic

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.

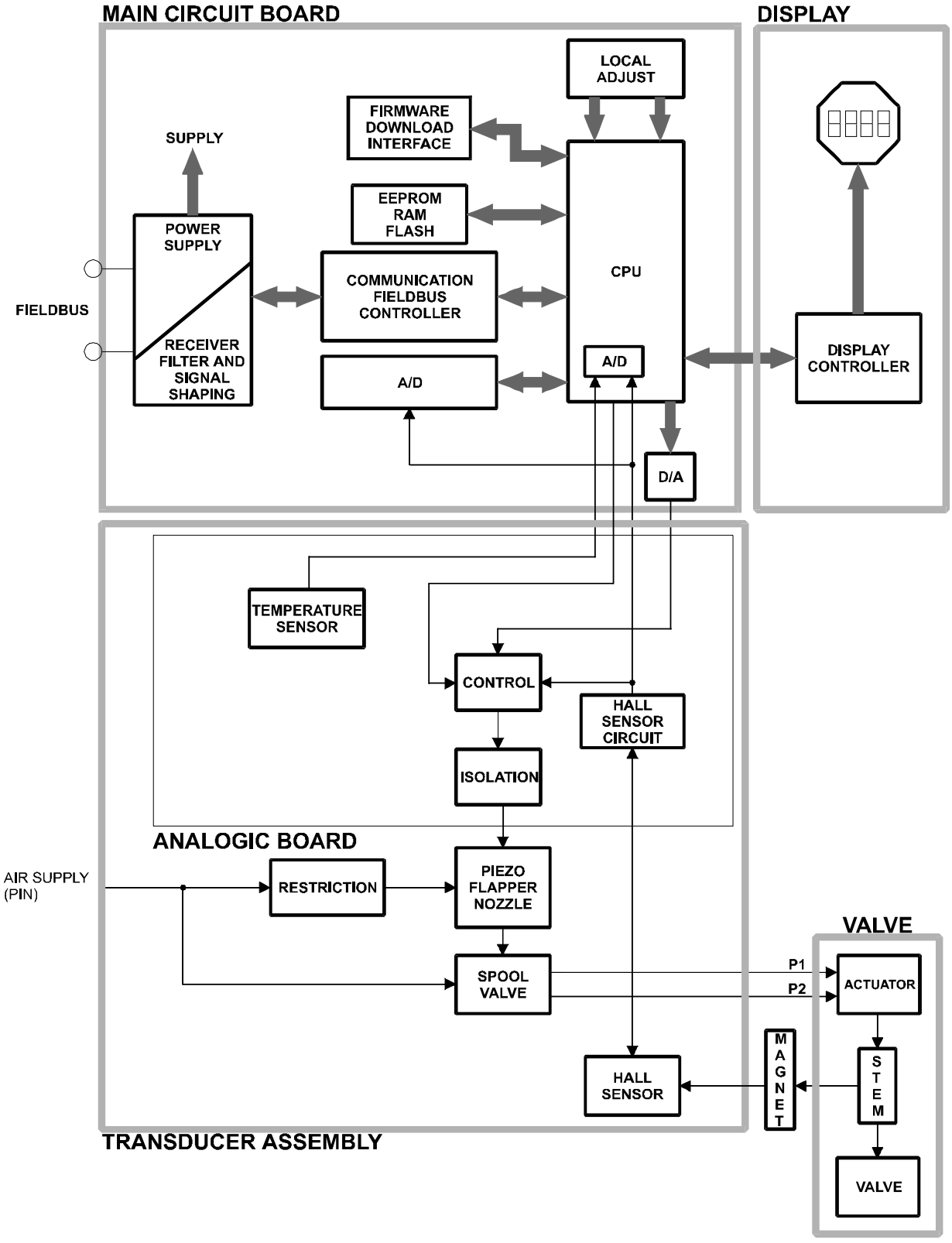


Figure 2.2 - FY303 Block Diagram

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

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

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

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 fieldbus signal from the piezoelectric.

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
Local adjustment is provided by means of two magnetic naturally actuated switches with no external electric or mechanical contact, by using a magnetic 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.

Introduction to Fieldbus Application

From a Fieldbus 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.

Normal Indicator
During normal operation, the **FY303** remains in the monitoring mode and the display will always indicate the variable of monitoring configured in the display block. The user can configure up to six parameters and chooses up to two to switching on the LCD. For details, please see the general manual. It is recommended configuring the position of the valve in % (percentage).

The possible configuration and monitoring operation are shown on.

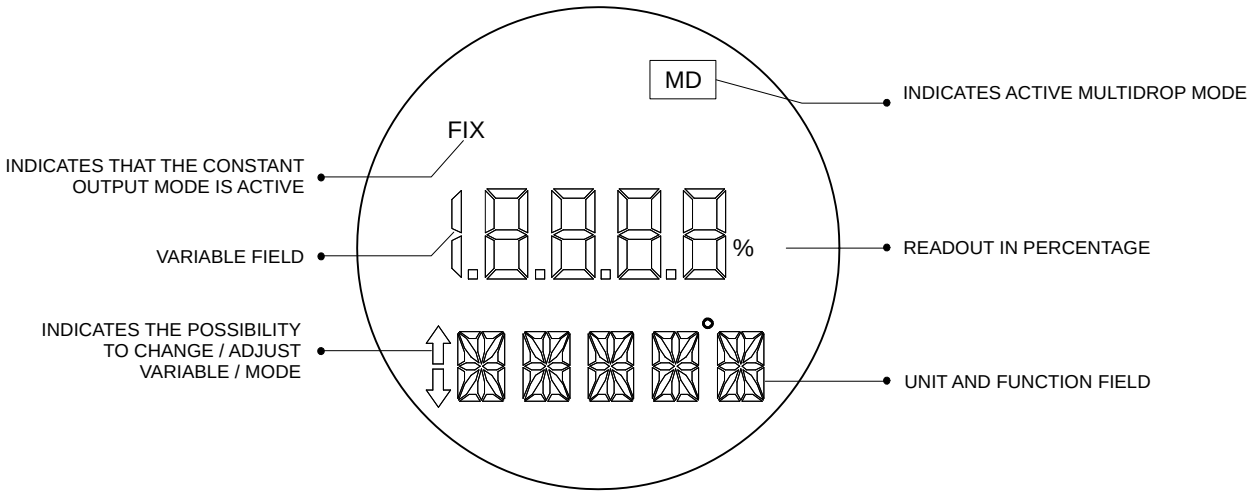


Figure 2.3 - Local Indicator

Upon receiving power, the **FY303** initializes the position indication on the display, by showing model **FY303** and its software version (X.XX).

Monitoring

During normal operation, **FY303** remains in the monitoring mode. The display simultaneously shows readout and some other information.

Normal displaying is interrupted when the magnetic tool is placed in orifice marked as “Zero” and the indicator “MD” is showed on the display. After this, withdraw the magnetic tool off the Z orifice and put it in the orifice marked with the “S” letter.

With the tool in the orifice, wait for 3 seconds. Withdraw again the magnet tool and wait for 3 seconds. Put it now in the S orifice and it will appear the message of “LOC ADJ“ (Local Adjust). Withdraw the tool and put it in the Z orifice. After this, you can browse to all the parameters configured in the display block.

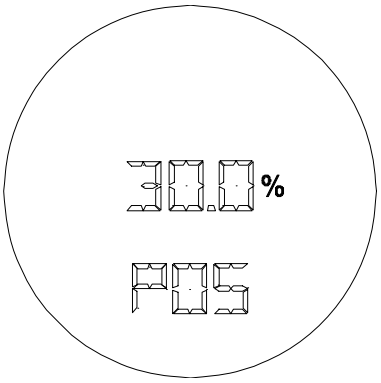


Figure 2.4 - Typical Indicator

Section 3

CONFIGURATION

This section describes the characteristics of the blocks in the **FY303**. They follow the Profibus PA specifications, but in terms of transducer blocks, the output transducer block and display, they have some special features on top of this.

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

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

The 303 Smar family is integrated in **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 **Simatic PDM**.

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 permits the transducer block to execute as frequently as necessary to obtain good data from sensors without burdening the function blocks that use the data. It also insulates the function block from the manufacturer specific characteristics of certain hardware. By accessing the hardware, the transducer block can get data from I/O or passing control data to it. The connection between Transducer block and Function block is called channel. These blocks can exchange data from its interface.

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

How to Configure 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 guide line to help the user to make common tasks. The configuration tool identifies each method associated to the parameters and enables the interface to it.

Functional Diagram of the Positioner Transducer Block

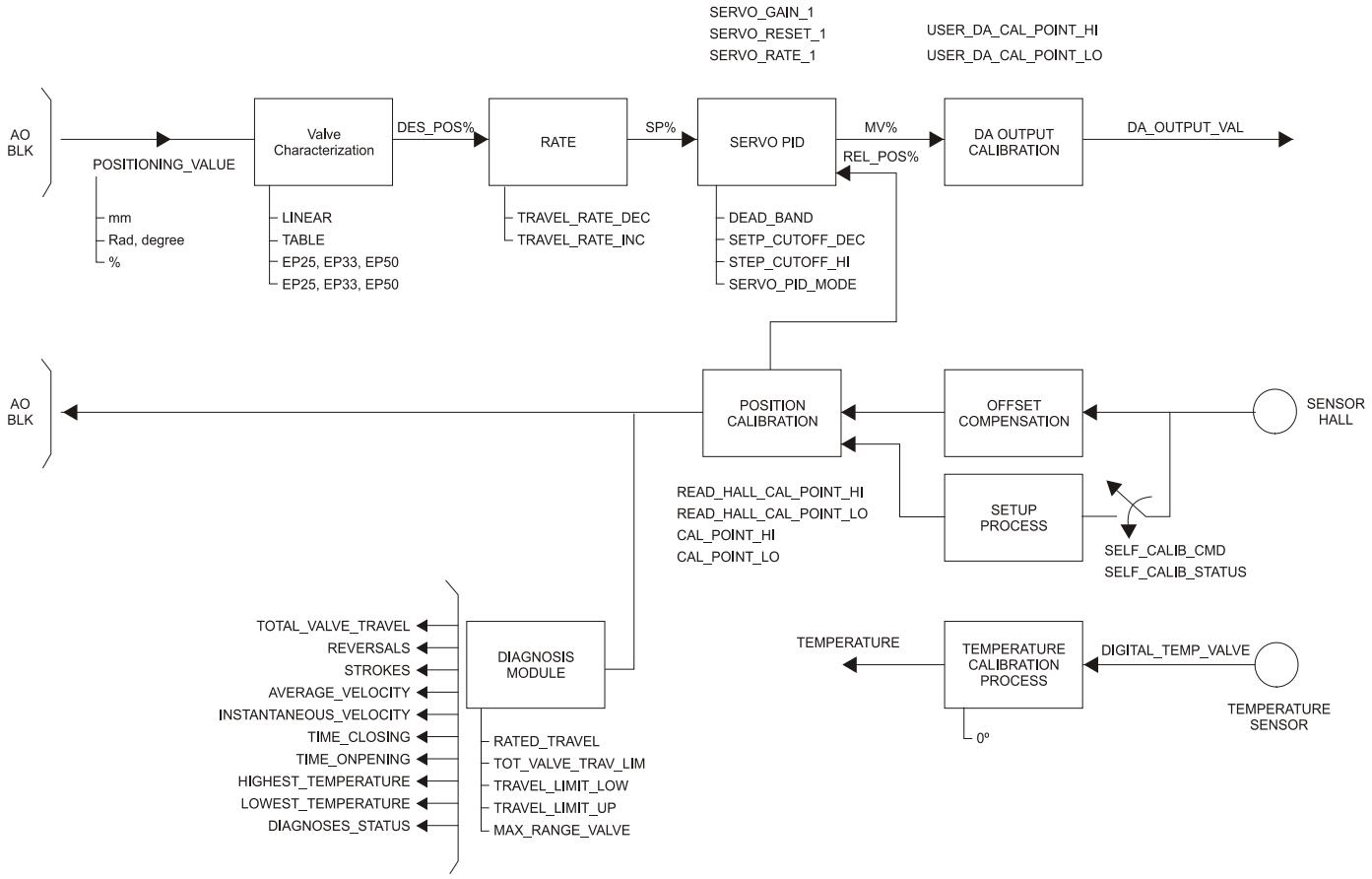


Figure 3.1 - Functional Diagram of the Positioner Transducer Block

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.
DEADBAND	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) 240 Manufacturer specific 249 Manufacturer specific 250 Not used 251 None 252 Unknown 253 Special
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	Initiation of a device-specific (manufacturer specific) calibration-procedure. 0 = default value; no reaction of the field device (mandatory) 1 = start zero point adjustment (optional) 2 = start self calibration / initialization (optional) 7 = reset total valve travel limit exceeded“ CB_TOT_VALVE_TRAV (optional) and reset Accumulated valve travel“ TOTAL_VALVE_TRAVEL (optional) 10 = reset internal control loop disturbed“ CB_CONTR_ERR (optional) 255 = abort current calibration-procedure (optional) Smar: 0 = default value; no reaction of the field device 2 = start self calibration / initialization 7 = reset total valve travel 255 = abort current calibration-procedure
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

Parameter	Transducer Block Description
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.
SELF_CALIB_STATUS	Result or status of the device-specific (manufacturer specific) calibration-procedure. 0 = undetermined (mandatory) 2 = aborted (optional) 4 = error in mechanical system (optional) 11 = timeout (optional) 20 = aborted by means of "Emergency override active" CB_OVERRIDE (optional) 30 = zero point error (optional) 254 = erfolgreich (optional) 255 = no valid data (optional) Smar: 0 = Self Calibration OK. 3 = No magnet part detected. 4 = Error in mechanical system. 11 = Timeout. 12 = Pressure problem.
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.

Parameter	Transducer Block Description
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.
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.*

Parameter	Transducer Block Description
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.

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	DEADBAND	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		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	-	

Relative Index	Parameter Name	Object Type	Data Type	Store	Size	Access	Parameter usage/ Type of Transport	Default	Mandatory/ Optional (Class)
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	OctetString	S	16	r,w	C/a	-	
60	ACTUATOR_MAN	Simple	OctetString	S	16	r,w	C/a	-	
61	VALVE_TYPE	Simple	Unsigned8	S	1	r,w	C/a	-	
62	ACTUATOR_TYPE	Simple	Unsigned8	N	1	r	C/a	-	
63	ACTUATOR_ACTION	Simple	Unsigned8	S	1	r,w	C/a	-	
64	VALVE_SER_NUM	Simple	OctetString	S	16	r,w	C/a	-	
65	ACTUATOR_SER_NUM	Simple	OctetString	S	16	r,w	C/a	-	
66	ADD_GEAR_SER_NUM	Simple	OctetString	S	16	r,w	C/a	-	
67	ADD_GEAR_MAN	Simple	OctetString	S	16	r,w	C/a	-	
68	ADD_GEAR_ID	Simple	OctetString	S	16	r,w	C/a	-	
69	ADD_GEAR_INST_DATE	Simple	OctetString	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	Unsigned8	N	1	r,w	C/a	Disable	
77	BACKUP_RESTORE	Simple	Unsigned8	S	1	r,w	C/a	None	
78	SECONDARY_VALUE	Record	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	Unsigned8	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	Unsigned32	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		
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		

Relative Index	Parameter Name	Object Type	Data Type	Store	Size	Access	Parameter usage/ Type of Transport	Default	Mandatory/ Optional (Class)
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	Unsigned8	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	Unsigned8	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	Unsigned8	N	1	r,w	C/a	128	
106	MAIN_LATCH	simple	Unsigned8	S	1	r,w	C/a	12	
107	XD_ERROR	simple	Unsigned8	S	1	r	C/a	0x10	
108	MAIN_BOARD_SN	simple	Unsigned32	S	4	r,w	C/a		
109	EEPROM_FLAG	simple	Uunsigned8	D	1	r	C/a		
110	ORDERING_CODE	array	Unsigned8	S	50	r,w	C/a		

1) See table handling
2) Should be stored non volatile

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	
46	TOT_VALVE_TRAV_LIM	

Relative Index	Parameter Name	VIEW_1 Number of bytes
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	
90	TIME_CLOSING	

Relative Index	Parameter Name	VIEW_1 Number of bytes
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	
	Total length of View Object	13

Table 3.4 - View Object Table Transducer Block

FY303 Cyclical Configuration

Through the GSD file the 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 activate, 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 **Simatic PDM** (Process Device Manager) configuration software from Siemens, for example, can configure many parameters of the Input Transducer block.

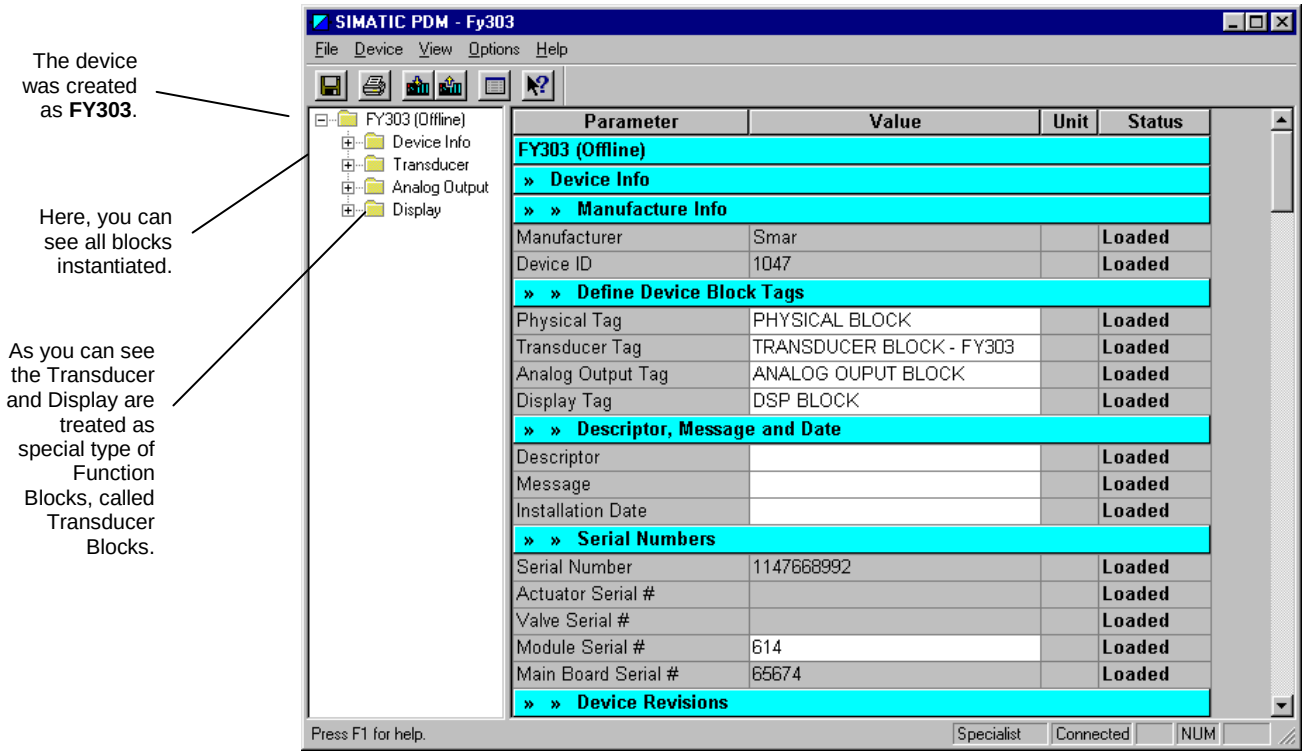


Figure 3.1 - Function and Transducer Blocks

To make the configuration of Transducer Block, we need to select the menu "Device"
Use this menu:
- To change the device address;
- To make the up/download of parameters;
- To configure the Transducer Block, Analog Output Block and Display Block;
- To calibrate the positioner; made 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) is gotten 40% permanently on the LCD, please decrease the ACP_F value using the local adjustment. For this proposal, you need to configure the ACP_F parameter on the LCD display, using the local adjustment. Enter into the local adjustment and select one of LCDs (for example LCD_2), 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 make the reset by software, to protect the device against writing and to simulate the value from transducer block to analog output block;

Save and restore data calibration.

To make the configuration of Transducer Block, we need to select the menu: Device - Offline Configuration - Transducer.

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: Opening (100%), Closing (0%), not initialized or none.

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

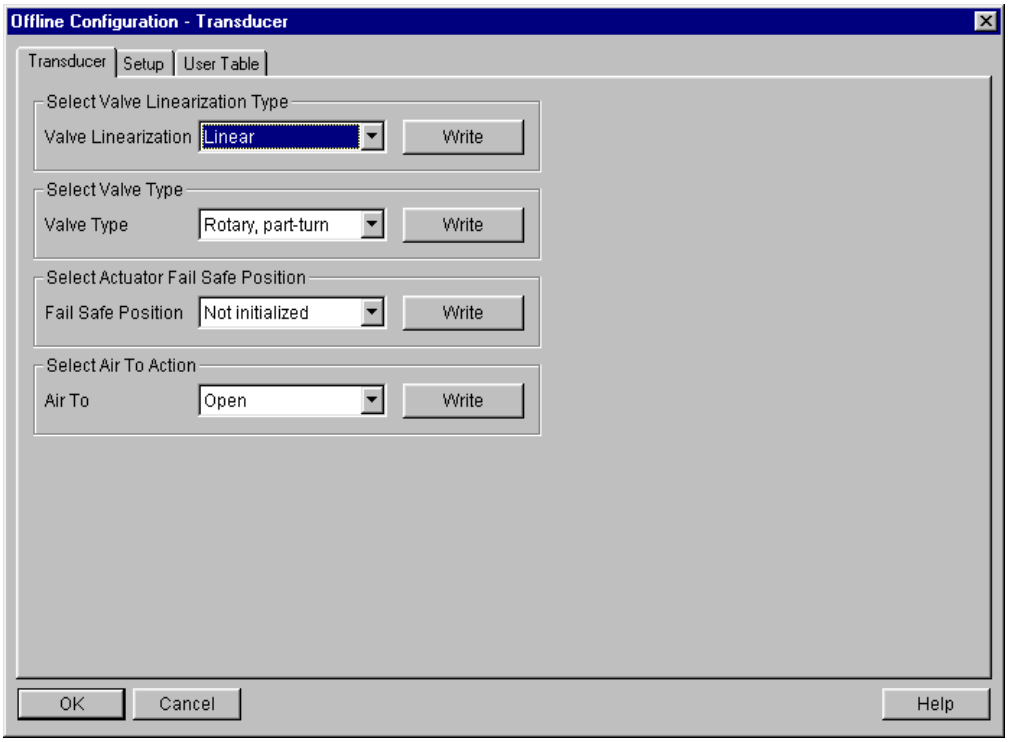


Figure 3.2 - Offline Configuration - Transducer

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.

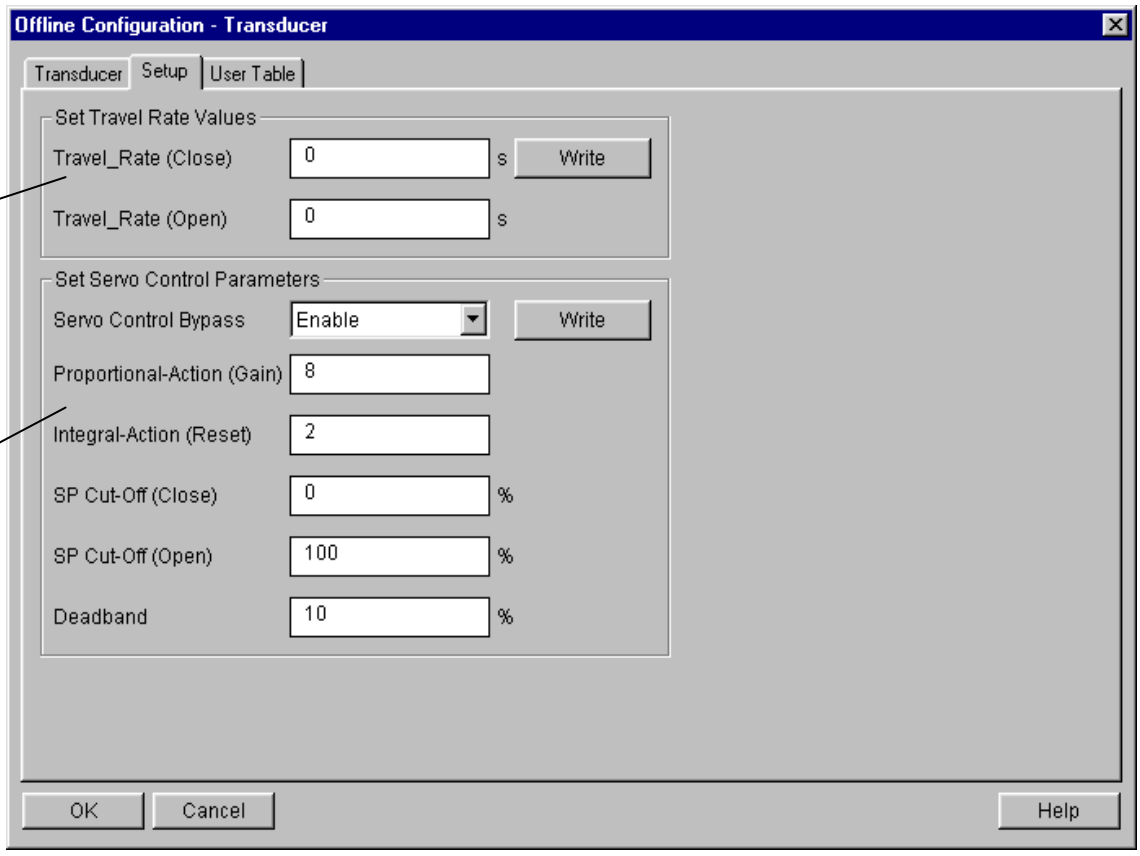


Figure 3.3 - Simatic PDM - Transducer Configuration Setup

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 value couple of the each table entries.

To make the configuration of Transducer Block, we need to 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).

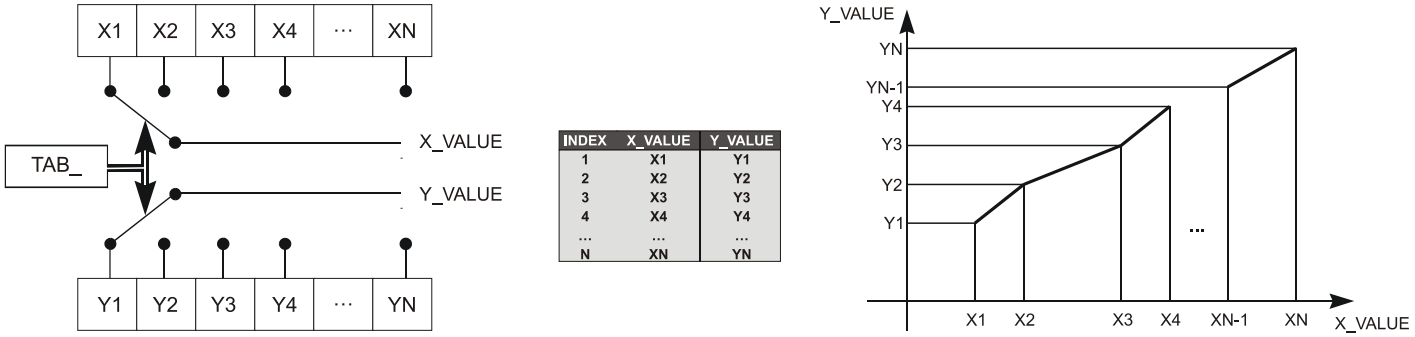


Figure 3.4 - Parameters of a Table

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 make 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.

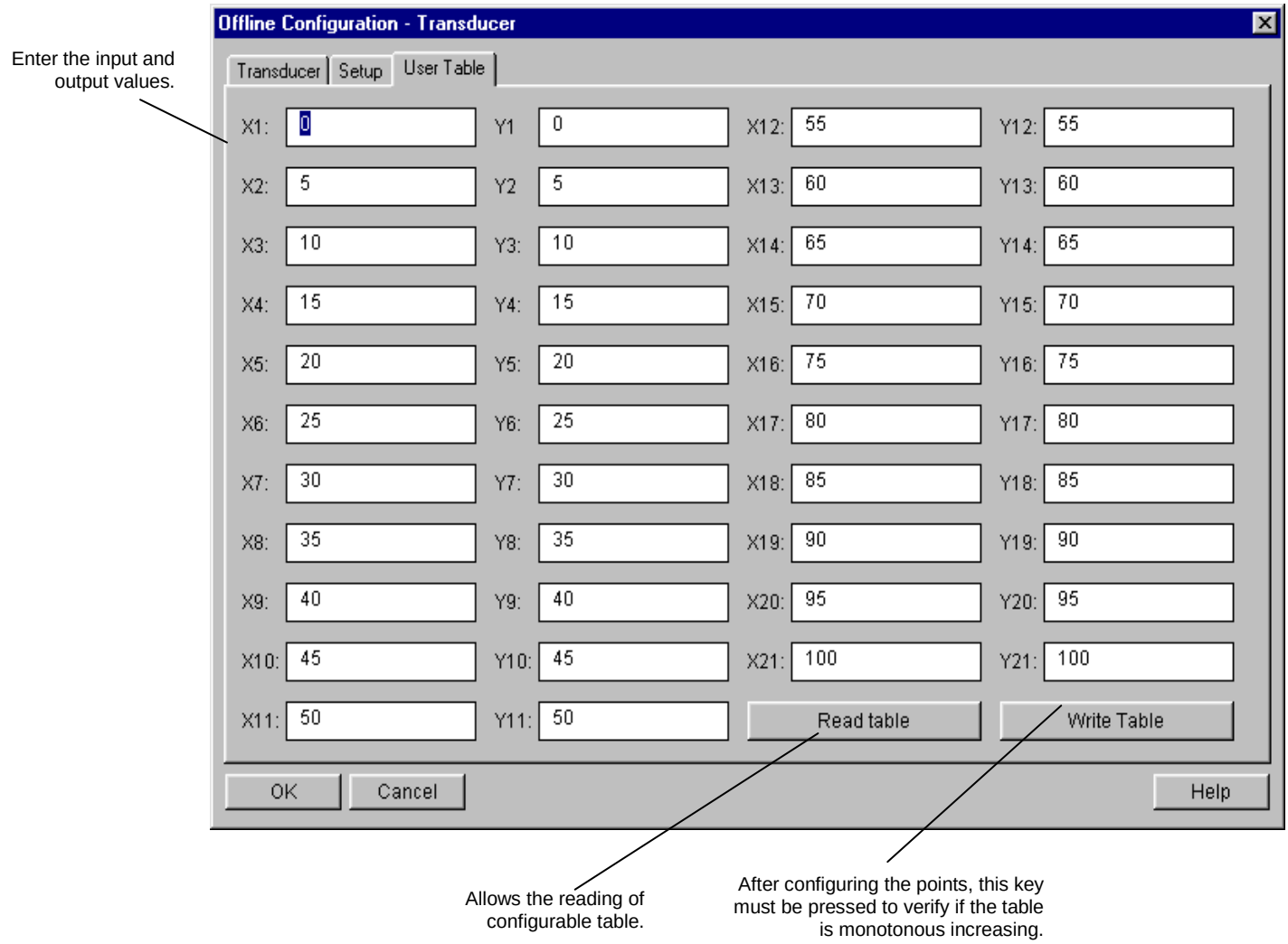


Figure 3.5 - FY303 Simatic PDM - Transducer Offline Configuration - User Table Screen

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

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

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.

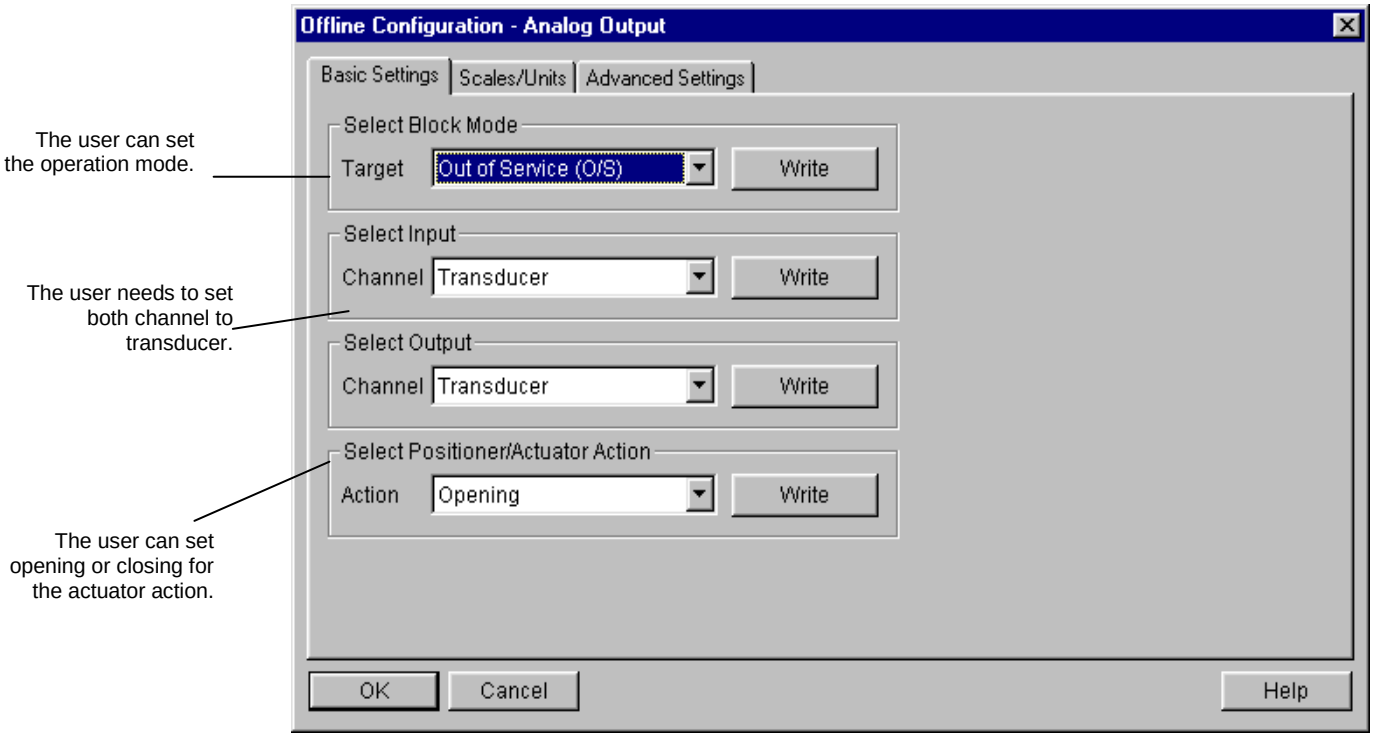


Figure 3.6 - FY303 Simatic PDM - Analog Output Block - Basic Settings - Offline Configuration

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

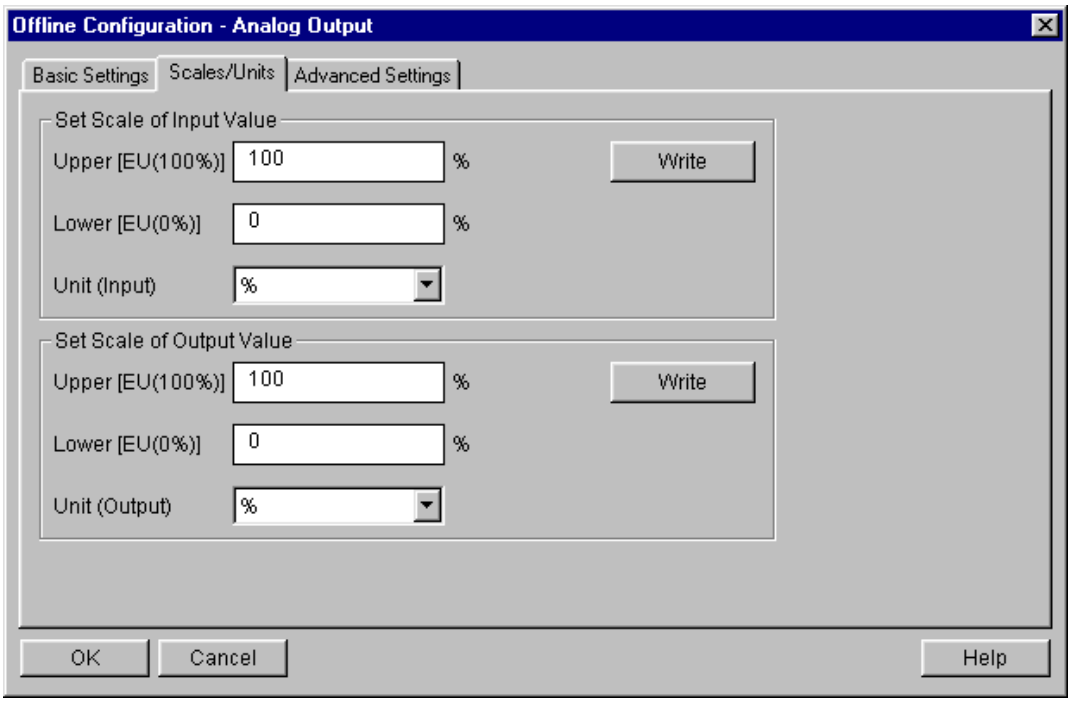


Figure 3.7 - FY303 Simatic PDM - Analog Output Block - Scale/Units - Offline Configuration

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 page, 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.

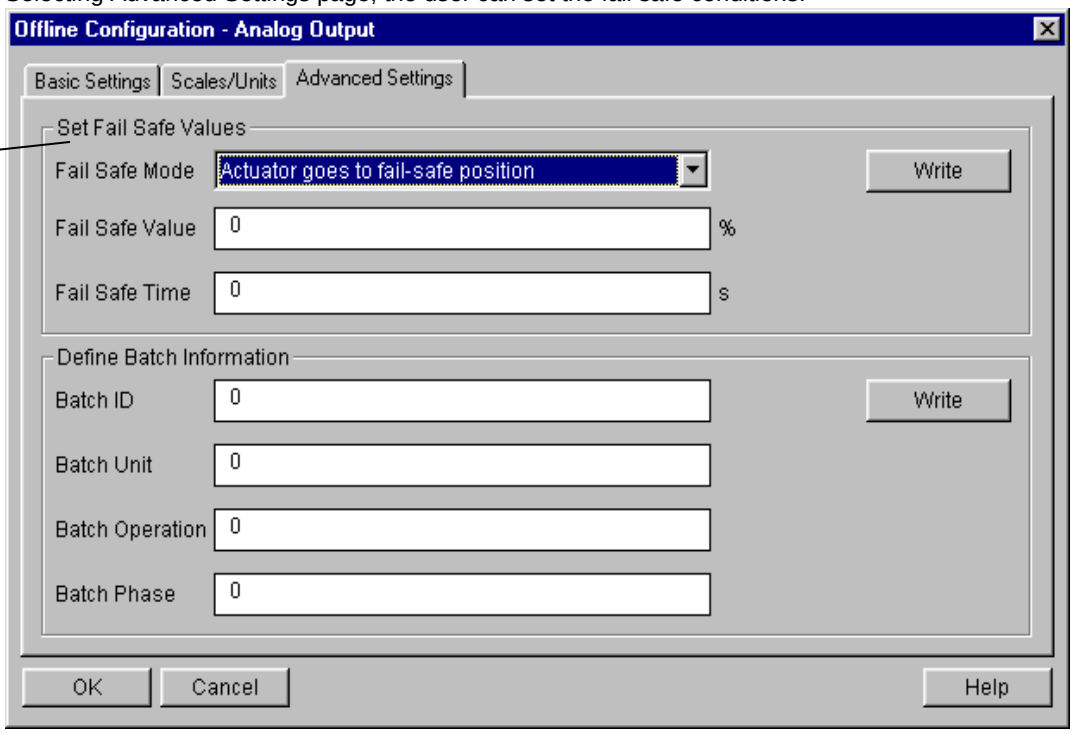


Figure 3.8 - FY303 Simatic PDM - Analog Output Block - Advanced Settings - Offline Configuration

In terms of online configuration, the user can select at the device menu the Online Configuration for Analog Output block:

The user can set the block mode operation.

According to the block mode, the user can set the setpoint.

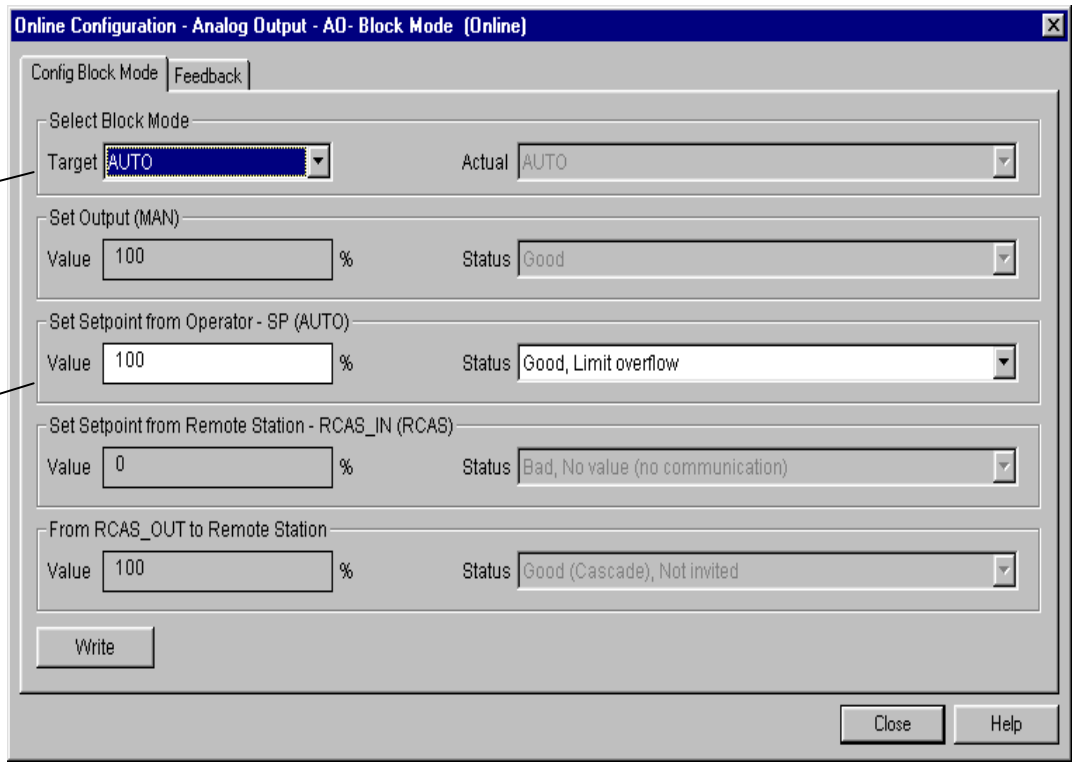


Figure 3.9 - FY303 Simatic PDM - Online Configuration Mode Block for AO

Using Feedback page, the user can monitor and check all values related between the analog block and the transducer block:

Information about the real condition of transducer and analog output block.

Check back and alarm condition.

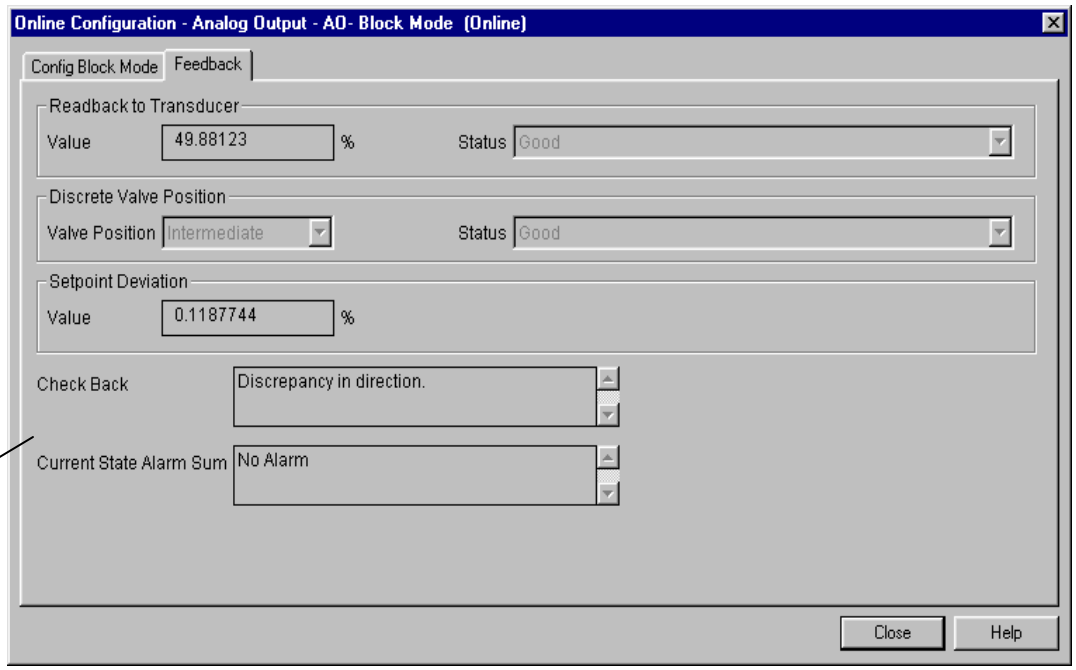


Figure 3.10 - FY303 Simatic PDM - Online Configuration Feedback for AO

Position Calibration

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:

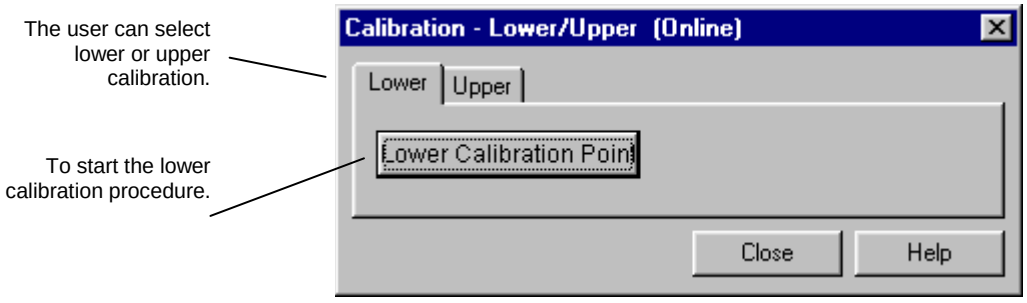
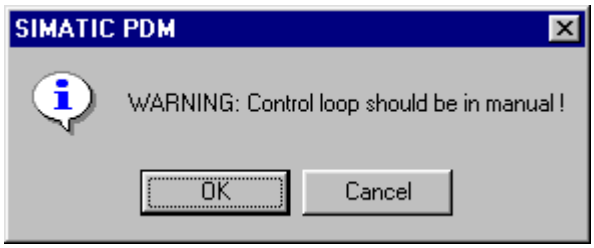
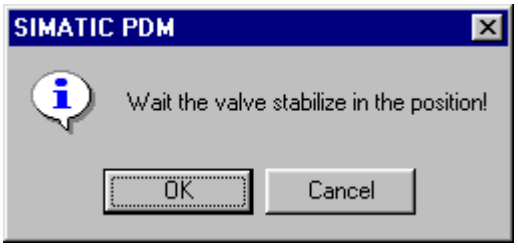


Figure 3.11 - FY303 - Simatic PDM Calibration Lower/Upper

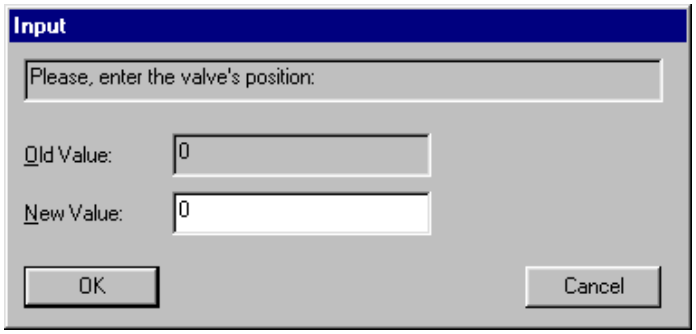
After pressing "Lower Calibration Point", we get a warning:



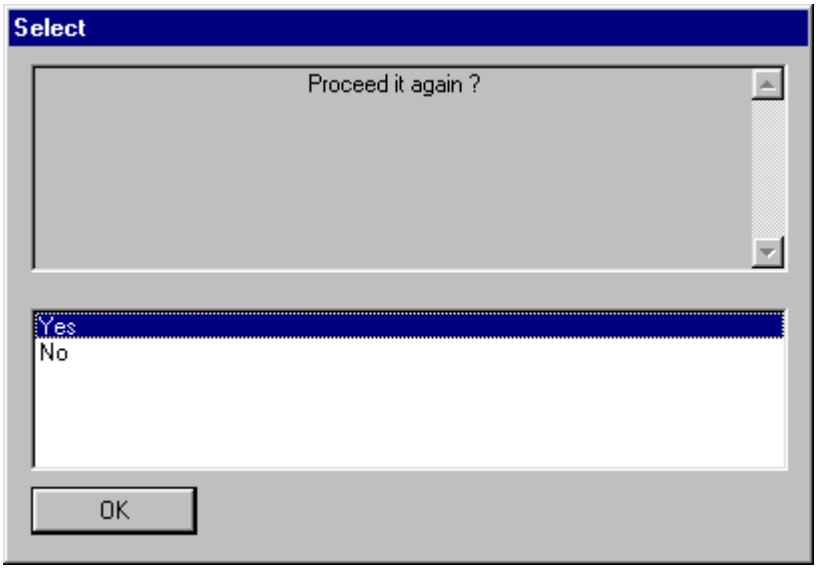
If the user proceeds, the valve position goes to the lower position and we have the message:



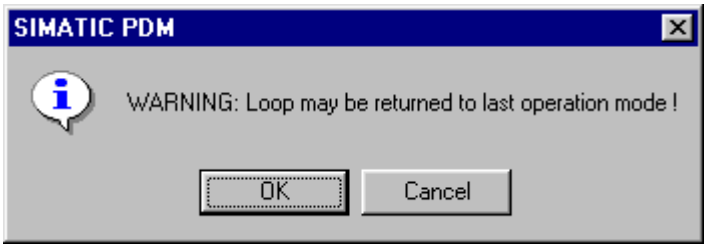
If the valve is stabilized, when the user press "OK", we have a new window that allows him to enter the desired value for the new calibrated point for the lower position. Write 0% in new value. For **FY303** it should be always 0%:



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

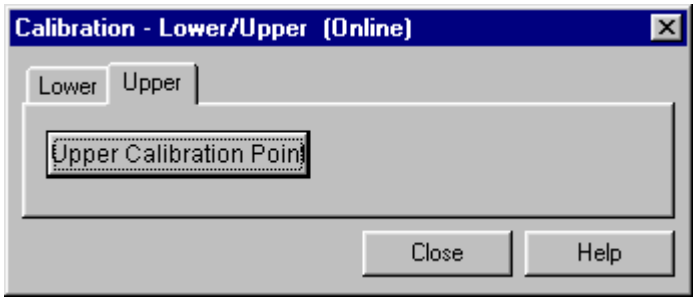


If the calibrated position is correct, press "No" and a new warning appears:

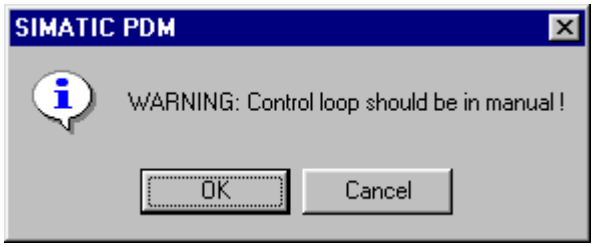


After user confirmation, the positioner comes to the normal operation.

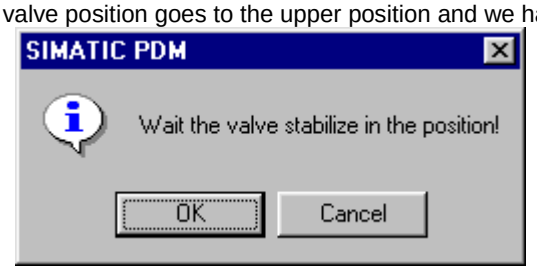
The upper calibration procedure is similar than the lower:



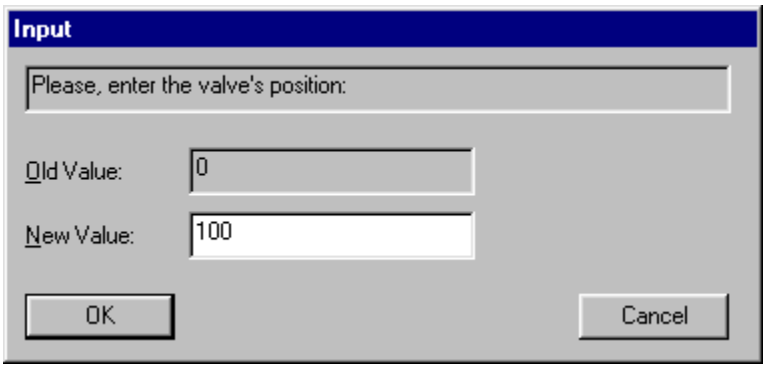
After pressing "Upper Calibration Point", we get a warning:



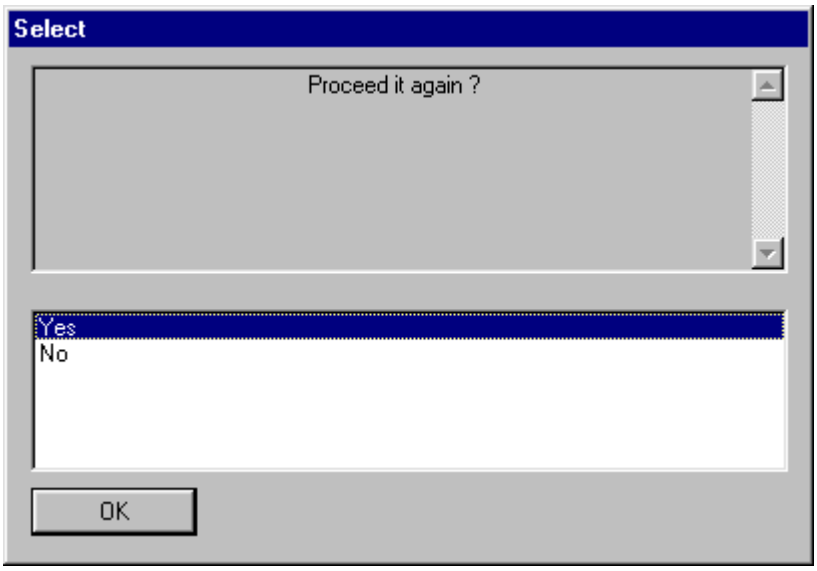
If the user proceeds, the valve position goes to the upper position and we have the message:



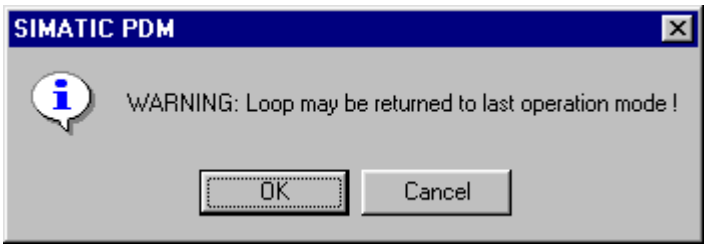
If the valve is stabilized, when the user press "OK", we have a new window that allows him to enter the desired value for the new calibrated point for the upper position. Write 100% in new value. For **FY303** it should be always 100%:



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



If the calibrated position is correct, press "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".

Temperature Calibration

The parameter CAL_TEMPERATURE can be used to trim the temperature sensor located at the body of positioner in order 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 Simatic PDM, go to the Device menu and select the "Calibration" menu and then "Temperature:

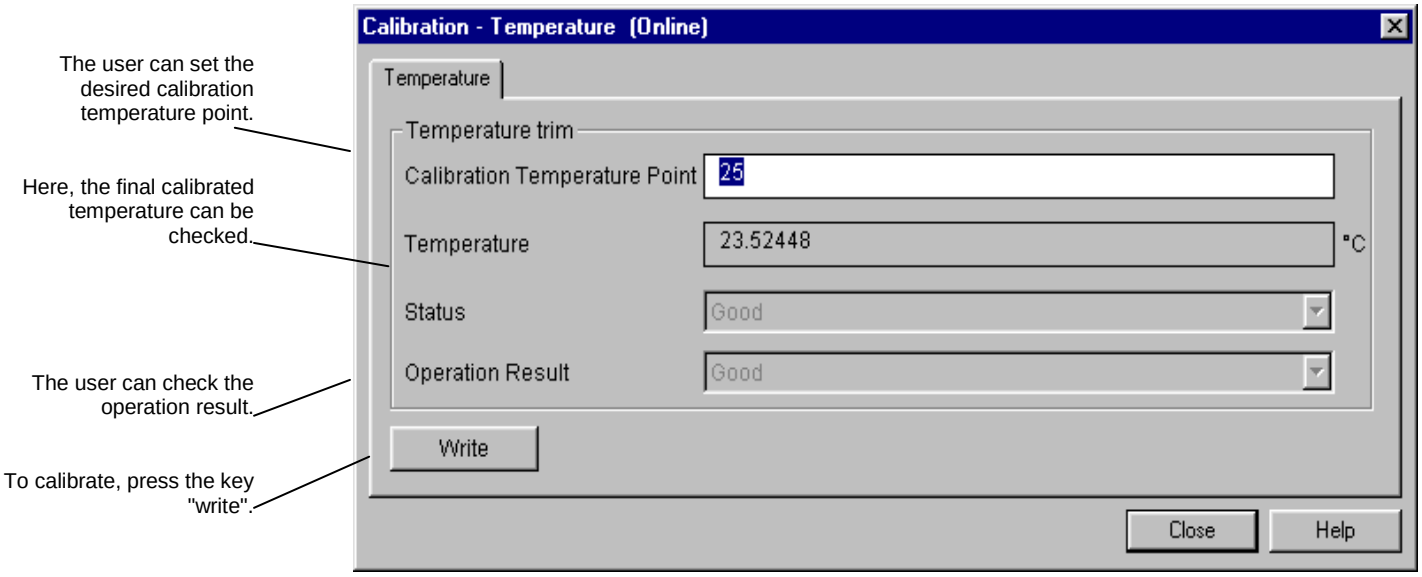
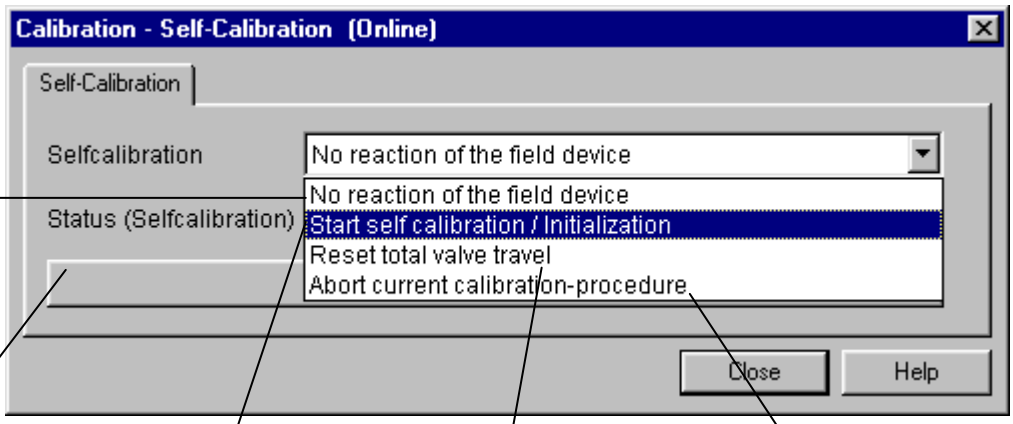


Figure 3.12 - FY303 Temperature Calibration

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.

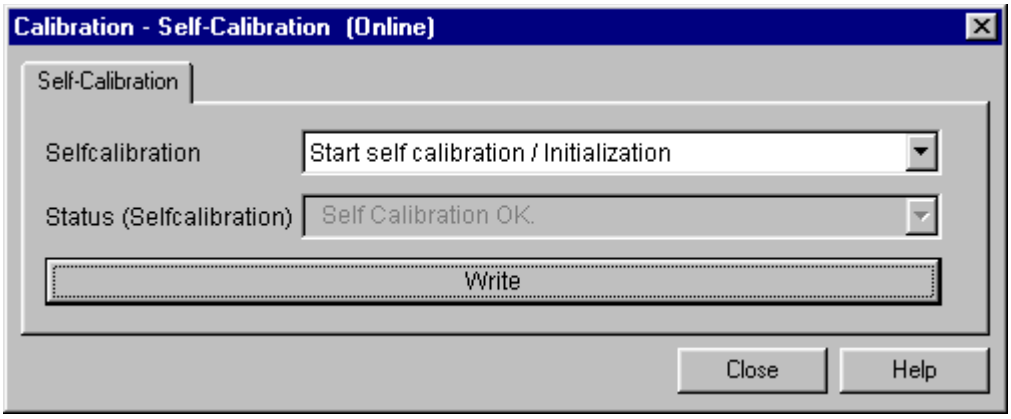
This marked option allows the start of self-calibration procedure.

To reset the total valve travel, select this option.

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

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 and check 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.

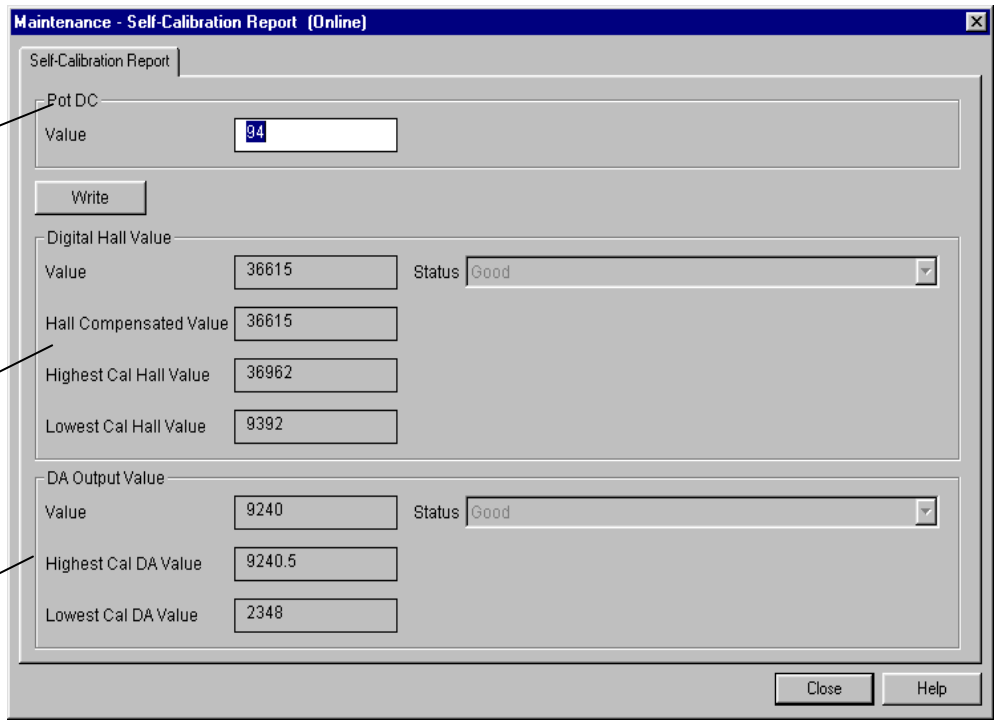


Figure 3.13 - FY303 Maintenance Self-Calibration Report

Diagnosis

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

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**.

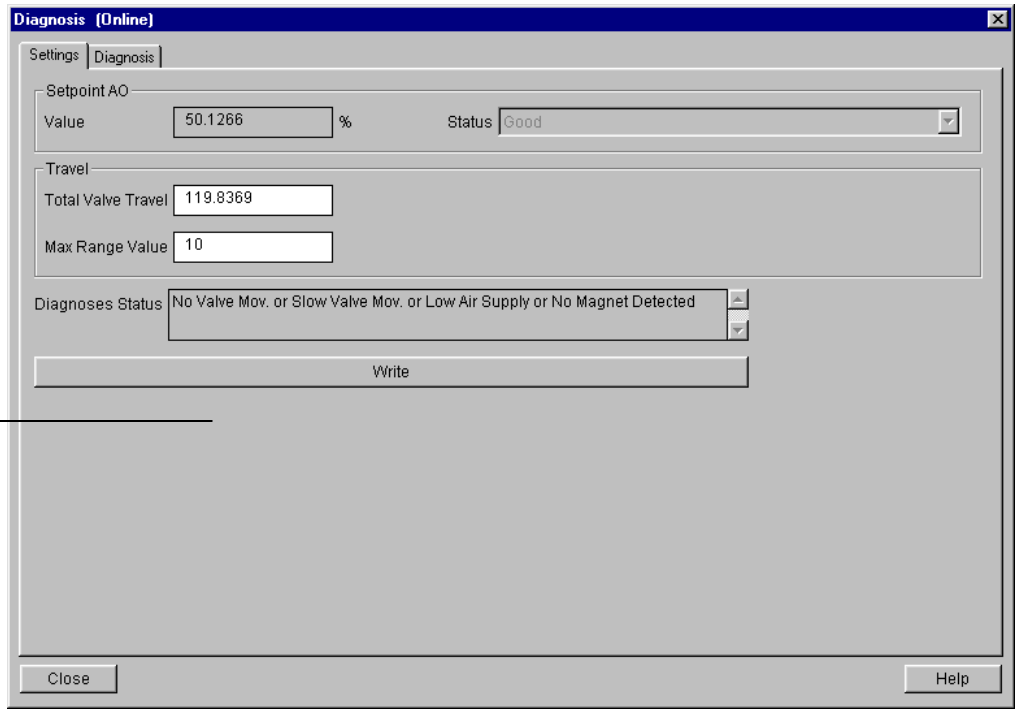


Figure 3.14 - FY303 Settings

Selecting the "Diagnosis" page, we have:

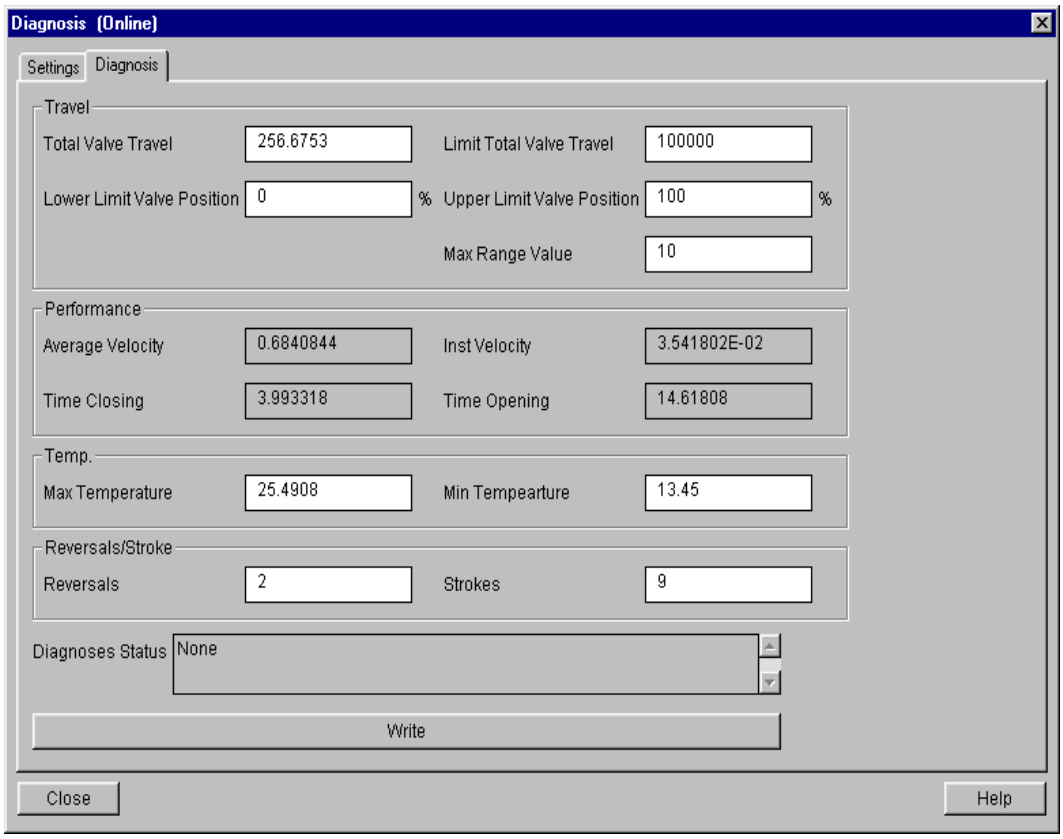


Figure 3.15 - FY303 Diagnosis

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

- Travel: according to the maximum range valve value, we have the total valve travel and a generation of traveling Limit Exceeded when this value is higher than limit total valve travel parameter;
- 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

Using the **Simatic PDM or any other configuration tool** is possible to configure the Display Transducer block. As the name described it is a transducer due the interfacing of its block with the LCD hardware.

The Transducer Display is treated as a normal block by **any configuration tool**. It means, this block has some parameters and those ones can be configured according to customer's needs.

The customer can choose up to six parameters to be shown at LCD display; they can be parameters just for monitoring purpose or for acting locally in the field devices by using a magnetic tool. The seventh parameter is used to access the physical device address. The user can change this address according to his application. To access and configure the Display Block, please, go to the main menu, select "Device Online Configuration - Display Block":

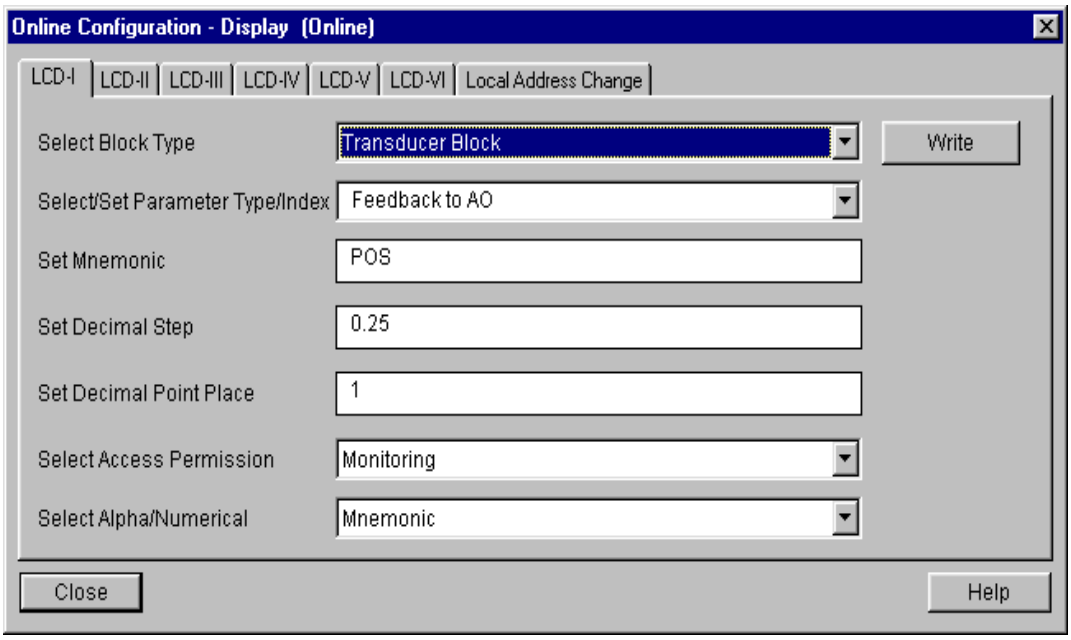


Figure 3.16 – Display Block and Simatic PDM

Display Transducer Block

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

The interface between the users is described very detailed on "Programming Using Local Adjustment". It is significantly the resources on this transducer display, also all the Series 303 field devices from Smar has the same methodology to handle with it. So, since the user has learned once, he is capable to handle all kind of field devices from Smar.

All function blocks and transducers defined according Profibus PA have a description of their features written by the Device Description Language.

This feature permits that third party configuration tools enabled by Device Description Service technology can interpret these features and make them accessible to configure. The Function Blocks and Transducers of Series 303 have been defined rigorously according the Profibus PA specifications in order to be interoperable to other parties.

In order to able the local adjustment using the magnetic tool, it is necessary to previously prepare the parameters related with this operation via System Configuration.
There are six groups of parameters, which may be pre-configured by the user in order to able, a possible configuration by means of the local adjustment. As an example, let’s suppose that you don’t want to show some parameters; in this case, simply select "None" in the parameter, "Select Block Type". Doing this, the device will not take the parameters related (indexed) to its Block as a valid parameter.

Definition of Parameters and Values

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 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 whole 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.

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

For devices where the software version is higher or equal to 1.10, please see the “Programming Using Local Adjustment”, in the Installation, Operation and Maintenance Procedures Manual.

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:

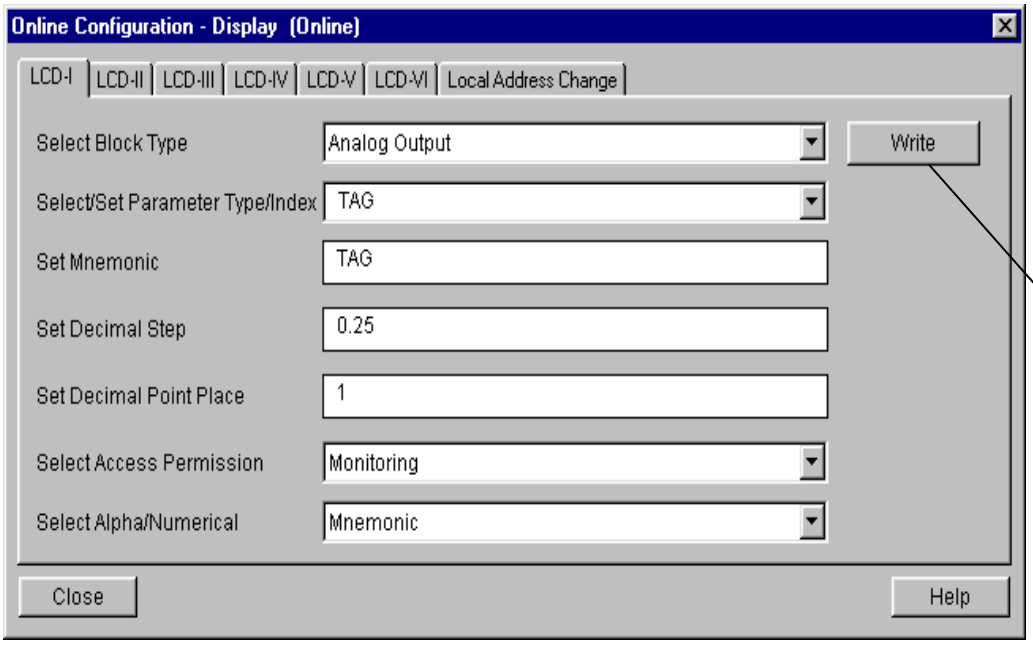


Figure 3.17 - Parameters for Local Adjustment Configuration

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.

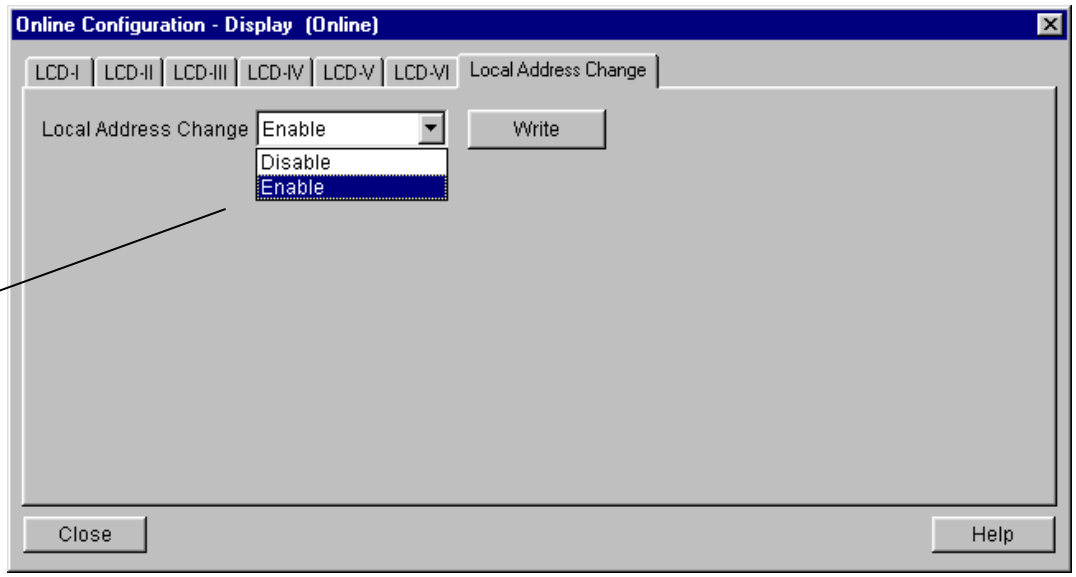


Figure 3.18 - Parameters for Local Address Configuration

When the user enter into 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.

Selecting "None", only the last chosen monitoring parameter will be shown at LCD.

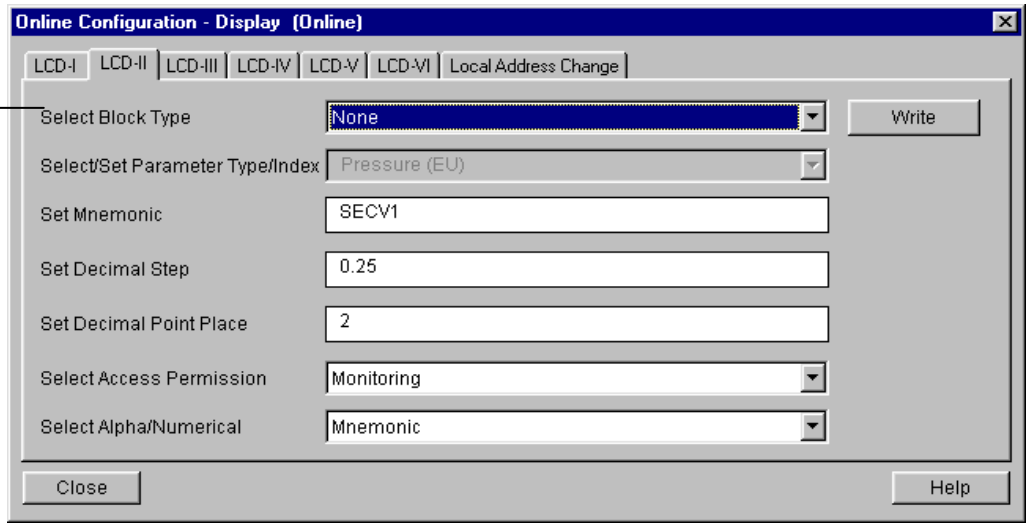


Figure 3.19 - Parameters for Local Adjustment Configuration

Always on the LCD interface will be shown two parameters at the same time, switching between the configured parameter at the LCD-II and the last monitoring parameter. If the user does not want to show two parameters at the same time, it is only necessary to opt for "none" when configure the LCD-II:

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

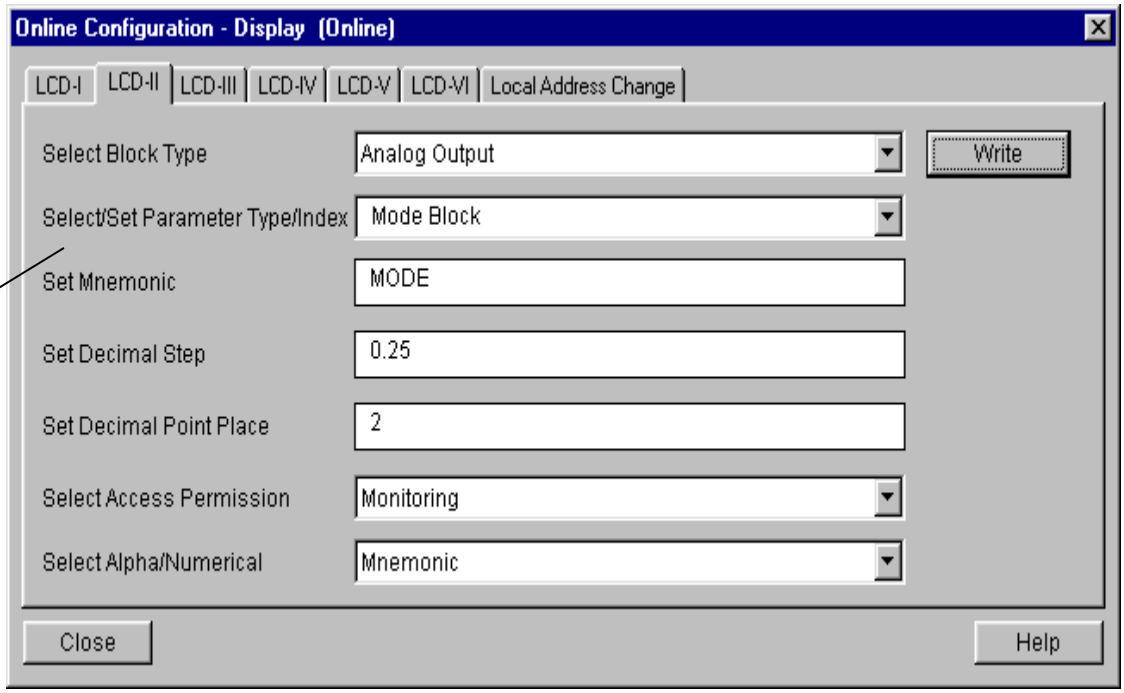


Figure 3.20 - Parameters for Local Adjustment Configuration

Calibrating using Local Adjustment

The positioner has two holes for magnetic switches, located under the identification plate (See the section "Programming Using Local Adjustment"). These magnetic switches are activated by one magnetic tool.

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

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

In order to enter the local adjustment mode, place the magnetic tool in orifice “Z” until flag “MD” lights up in the display. Removes magnetic tool from “Z” and place it in orifice “S”. Remove and reinsert the magnetic tool in “S” until the message “LOC ADJ” is displayed.

The message will be displayed during approximately 5 seconds after the user removes the magnetic tool from “S”. By placing the magnetic tool in “Z” the user will be able to access the local adjustment/monitoring tree.

Browse to parameter “LOPOS”. After that in order to start the calibration, the user shall activate parameter “LOPOS” with the help of the magnetic tool placed in “S”. For example, it is possible to enter 0%. When the magnetic tool is removed from “S”, the output will be set to a value close to the desired value. The user shall then browse the tree up to parameter FEED (FEEDBACK_CAL), and actuate this parameter by placing the magnetic tool in “S” until reaching the value obtained from the position reference.

The user shall continue to write in this parameter until it reads 0% or the desired lower position value. Browse to parameter “UPPOS”. After that, in order to start the calibration, the user shall actuate parameter “UPPOS” by placing the magnetic tool in “S”. For example, it is possible to enter 100%. When the magnetic tool is removed from “S”, the output will be set to a value close to the desired value. The user shall them browse the tree up to parameter FEED (FEEDBACK_CAL), and actuate this parameter by placing the magnetic tool in “S” until reaching the desired value.

The user shall write in this parameter until it reads 100% or the desired upper position value.

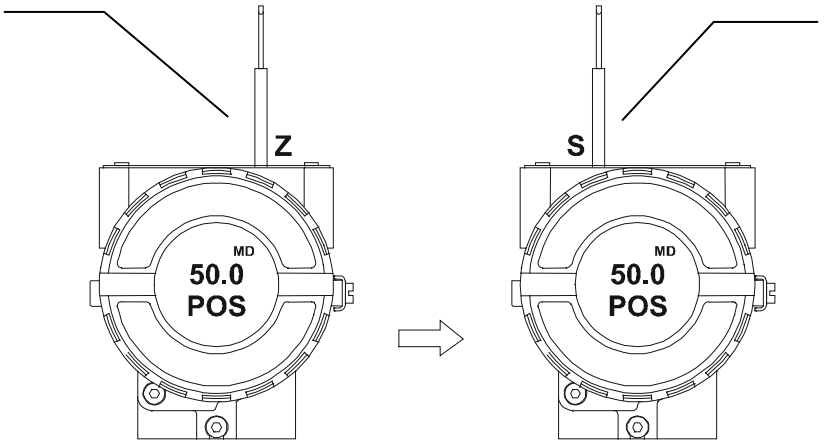
The LOWER and UPPER should be different.

LIMIT CONDITIONS OF CALIBRATION	
LOPOS (Lower Position)	Always equal 0%
UPPOS (Upper Position)	Always equal 100%
FEED	- 10% =< FEED =< 110%, otherwise XD_ERROR = 22

NOTE
Codes for XD_ERROR: 16: Default Value Set 22: Out of Range 26: Invalid Calibration Request 27: Excessive Correction

Programming using Local Adjustment

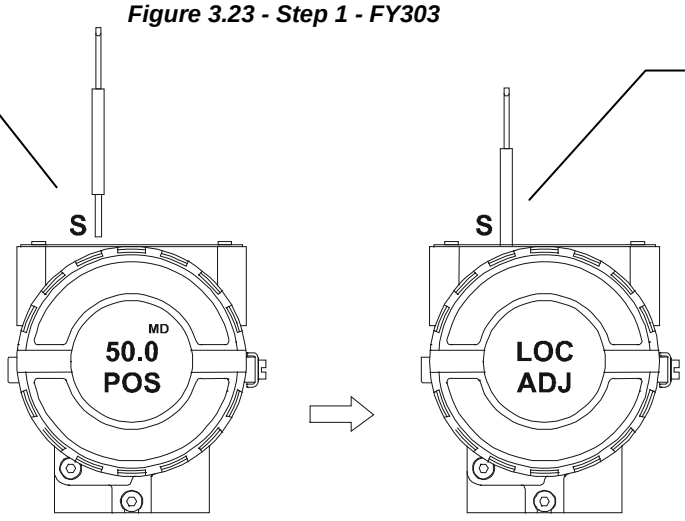
In order to start the local adjustment, place the magnetic tool in orifice **Z** and wait until letters MD are displayed.



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

Figure 3.23 - Step 1 - FY303

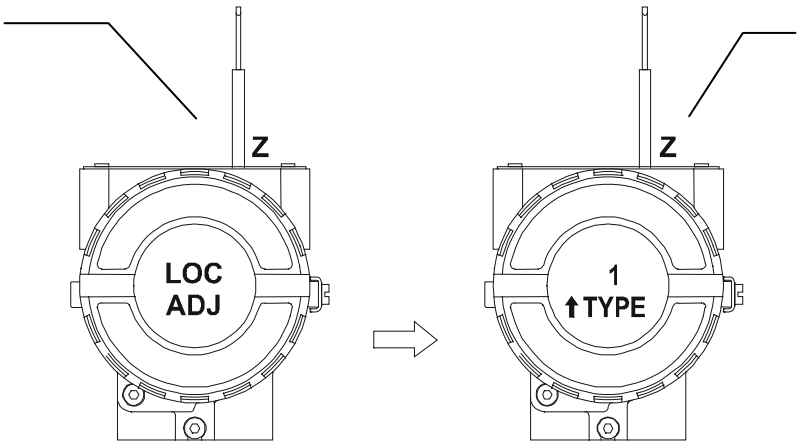
Remove the magnetic tool from orifice **S**.



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

Figure 3.24 - Step 2 – FY303

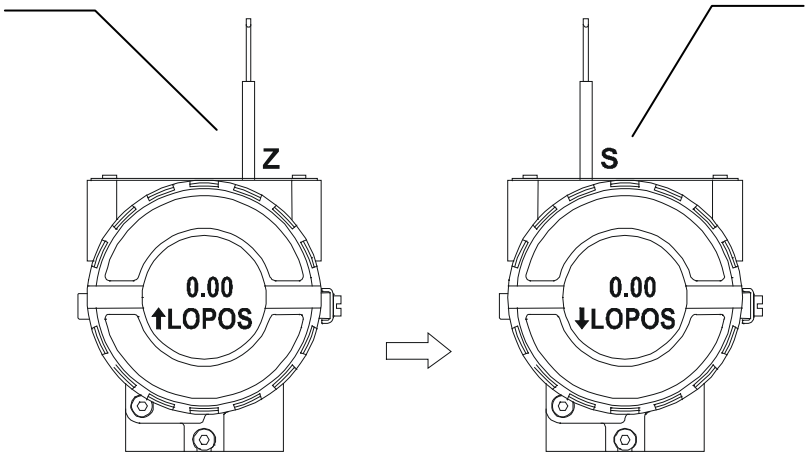
Place the magnetic tool in orifice **Z**. In case this is the first configuration, the option shown on the display is the TAG with its corresponding mnemonic configured by the Configuration Tool. Otherwise, the option shown on the display will be the one configured in the prior operation. By keeping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



In this option TYPE, is indicated by the numbers 1 or 2, which respectively represent Linear or Rotary valves.

Figure 3.25 - Step 3 - FY303

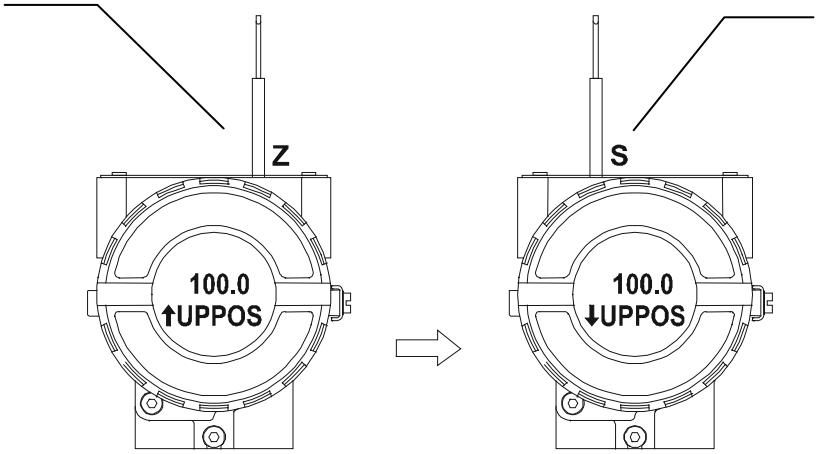
In order to start the LOPOS, simply insert the magnetic tool in orifice **S** as soon as LOPOS is shown on the display. An arrow pointing upward (-) increments the valve and an arrow pointing downward (¯) decrements the valve. In order to increment the lower position valve, keep the tool inserted in **S**.



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

Figure 3.26 - Step 4 – FY303

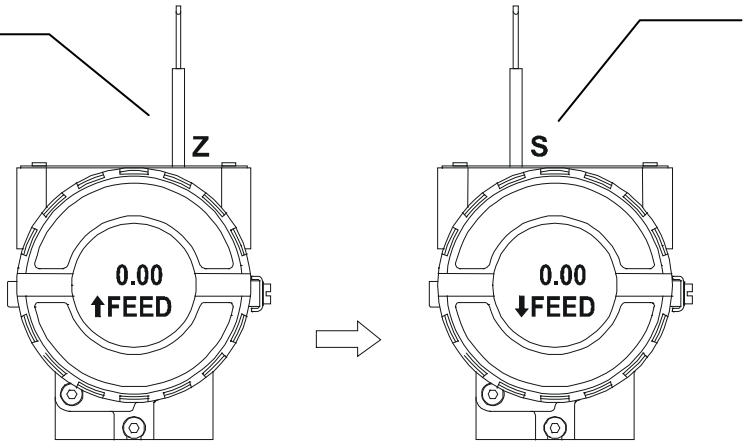
In order to start the UPPOS, simply insert the magnetic tool in orifice **S** as soon as UPPOS is shown on the display. An arrow pointing upward (-) increments the valve and an arrow pointing downward (¯) decrements the valve. In order to increment the upper position valve, keep the tool inserted in **S**.



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

Figure 3.27 - Step 5 – FY303

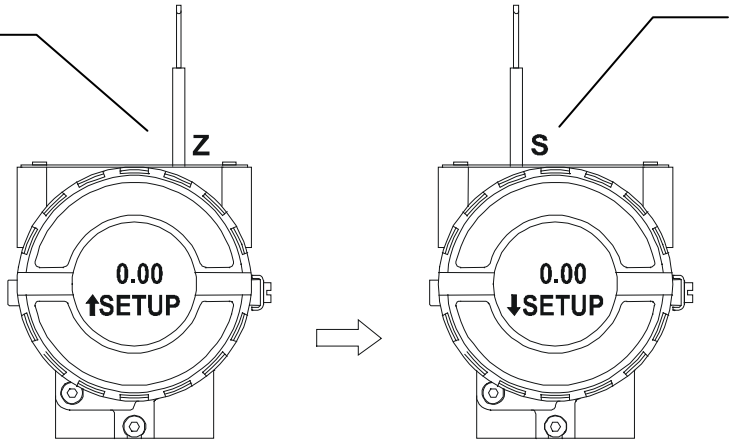
Option FEED allows the user to correct the valve calibration. In order to implement the correction, read the valve indicated by the valve and enter it in this option. This option makes it possible to correct LOPOS as well as UPPOS. An arrow pointing upward increments the position valve.



Place the magnetic tool in orifice **S** to shift the arrow to the downward position and decrement the calibration valve in accordance with the valve readout valve. An arrow pointing downward decrements the position valve.

Figure 3.28 - Step 6 - FY303

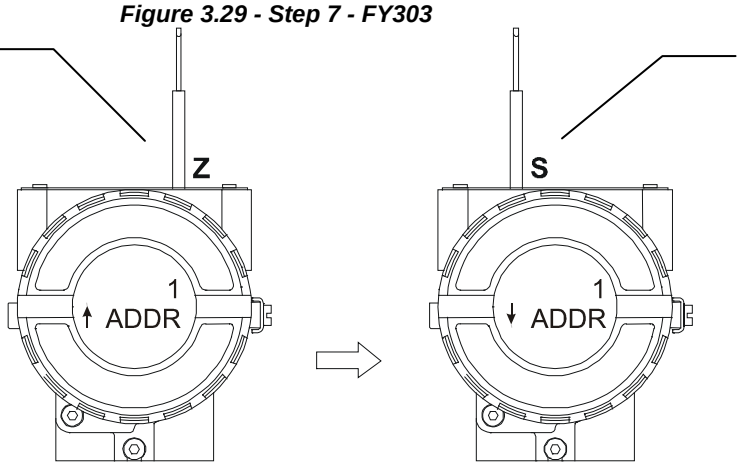
This option implements the auto setup of the valve, that is, the lower and upper position points of the valve. When setup displays 0 (zero), it indicates that the setup is disabled.



Insert the magnetic tool in orifice **S** and enter the value 2. After this, the auto setup will be started and a flashing message with the word SETUP will show in the display of the positioner. After this process finishes, the local adjustment returns to normal operation.

Figure 3.29 - Step 7 - FY303

a) In order to change the address value, simply take off the magnetic tool from orifice **Z** as soon as ADDR is shown on the display. An arrow pointing upward (↑) increments the address and an arrow pointing downward (↓) decrements the address. In order to increment the address, insert the tool in **S** up to set the value desired.



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

Figure 3.30 - Step 8 - FY303

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

Self-Calibration using Local Adjustment

This process is necessary to find the position values at which the valve is considered fully open or close. 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 a narrower range of operation should he like to. Before making the Auto-Setup, select the type of valve through the parameter VALVE_TYPE choosing between "Linear or Rotary" options.

The setup operation can be started writing "Enable" (2) on the parameter SETUP, so the positioner will execute immediately the operation of auto-setup for approximately 2 to 5 minutes depending on the type of valve, other configured parameters and 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 shut down to be sure that the plant operation is not disturbed, due the valve will be moved between the fully open and close points in order 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.

Hall's Offset Compensation without Magnet Part

Before installing the magnet to the positioner, write "Enable" on the menu Factory Hall Offset at Device menu and wait until the configuration tool set it back to "Disable" indicating end of its process of Hall's Offset compensation.

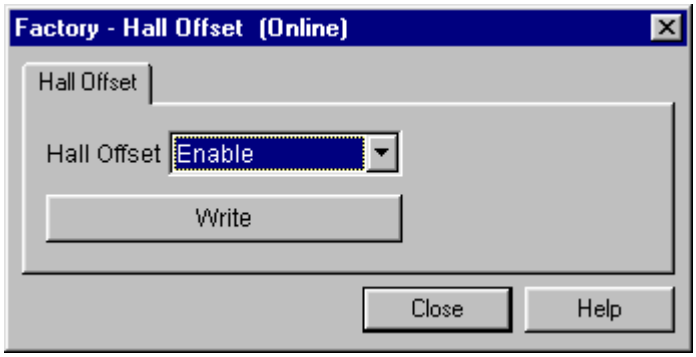


Figure 3.31 - Enabling the Hall's Offset Compensation

Figure 3.32 - Disabling the Hall's Offset Compensation

Temperature Compensation

Using the Calibration Temperature Menu at the Device, the user can trim the temperature sensor located at the body of positioner in order to improve the accuracy of temperature measurement done by its sensor. The range accepts from -40°C to +85 °C. The temperature parameter indicates the value of such measurement.

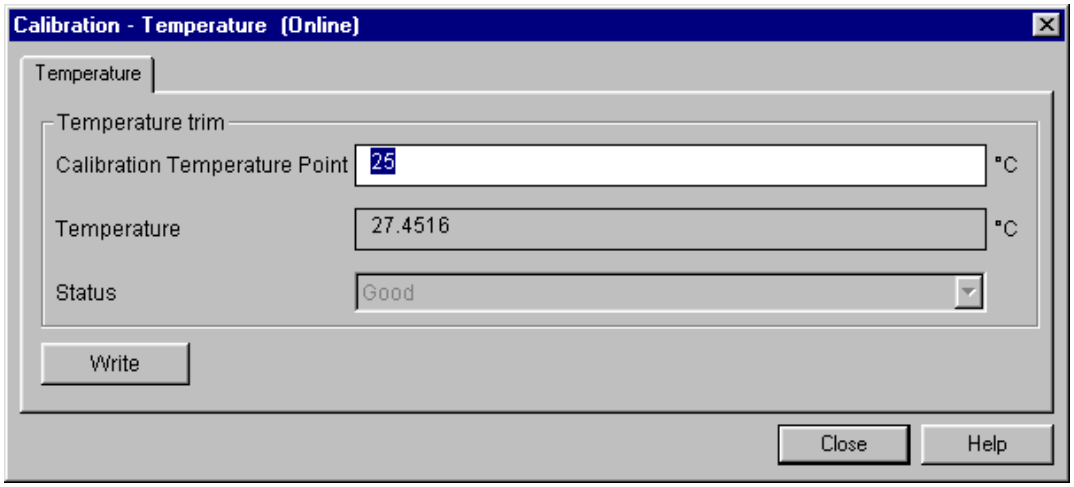


Figure 3.33 - Calibrating the Temperature Sensor

Pressure Sensors Version (K1 Option)

The K1 option of the **FY303** is available with 3 pressure sensors, namely one for input and two for both 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 Simatic PDM. To this effect, choose “Factory” on the “Device” menu and select “Press Sensor Install”, as shown below:

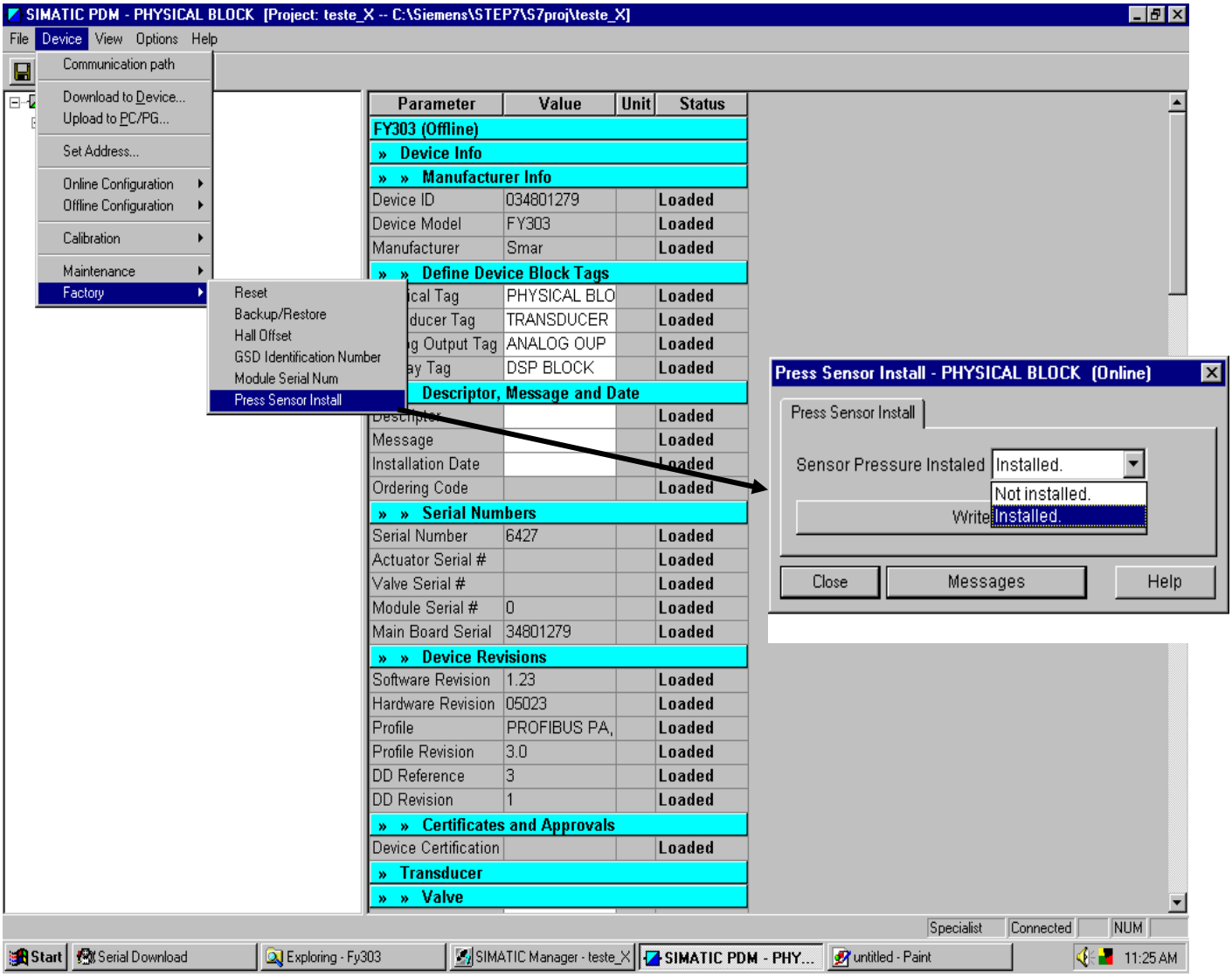


Figure 1 – Checking the FY303 Pressure Sensors Installation

Pressure sensor calibration
To check or calibrate the pressure sensor with the Simatic PDM, refer to the “Device” menu and choose “Calibration” and then “Pressure Sensor Cal”, as shown on figure 2.

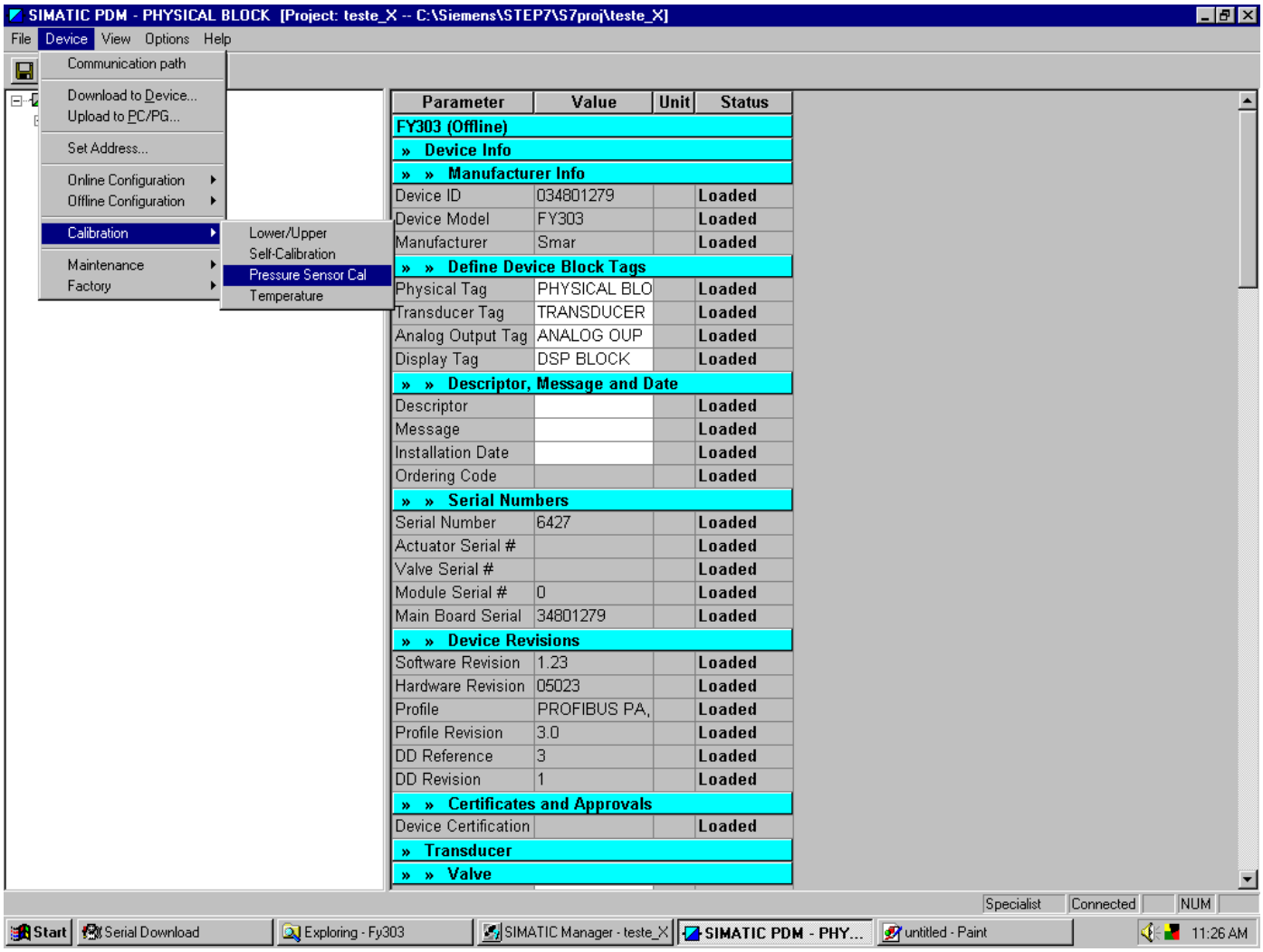


Figure 2 – Pressure Sensors Calibration

Next step is selecting which sensor is to be calibrated: if the input (Press In), or the output 1 (Out 1), or the output 2 (Out 2). See figure 3.

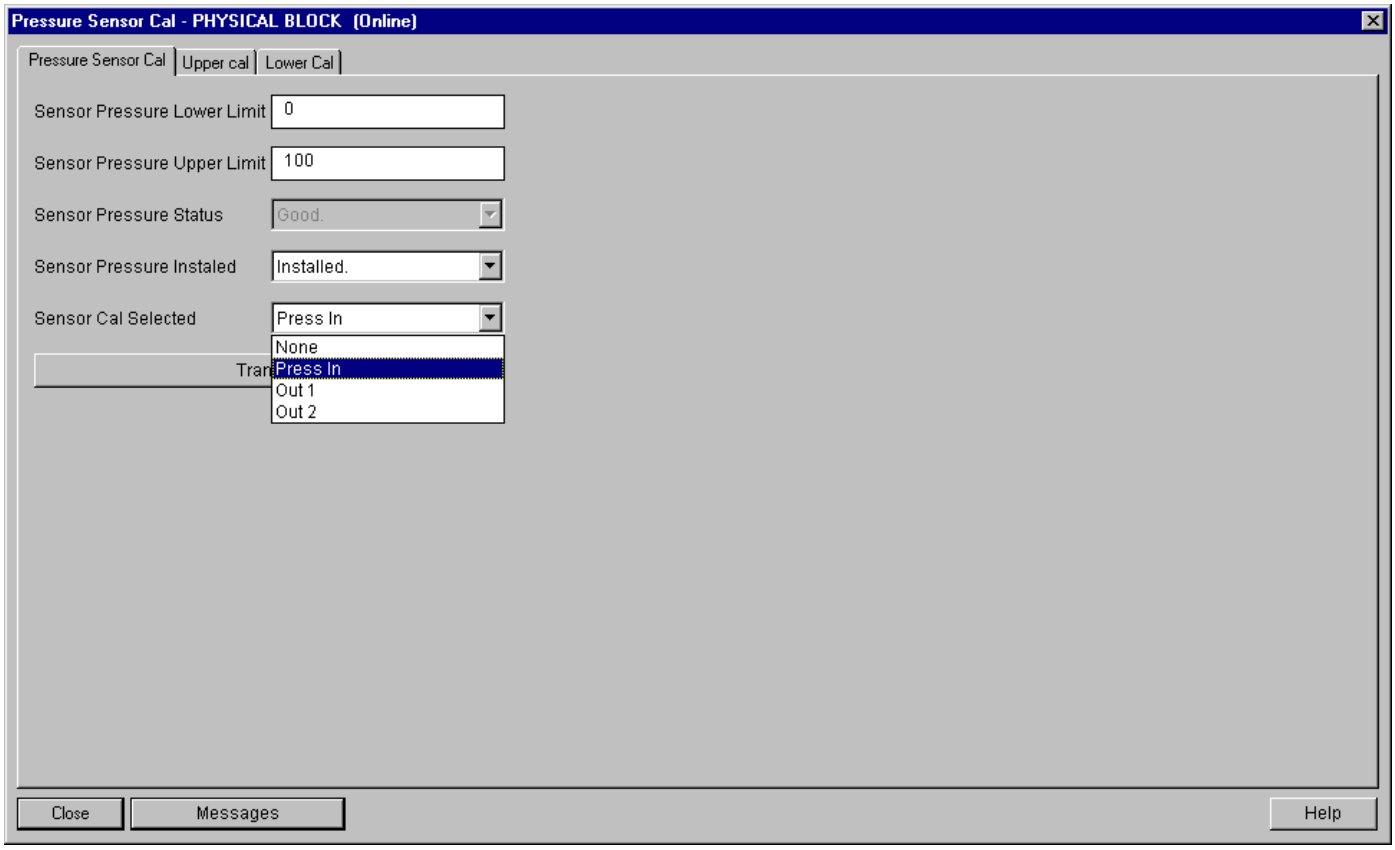


Figure 3 – Selecting the Sensors for Pressure Calibration

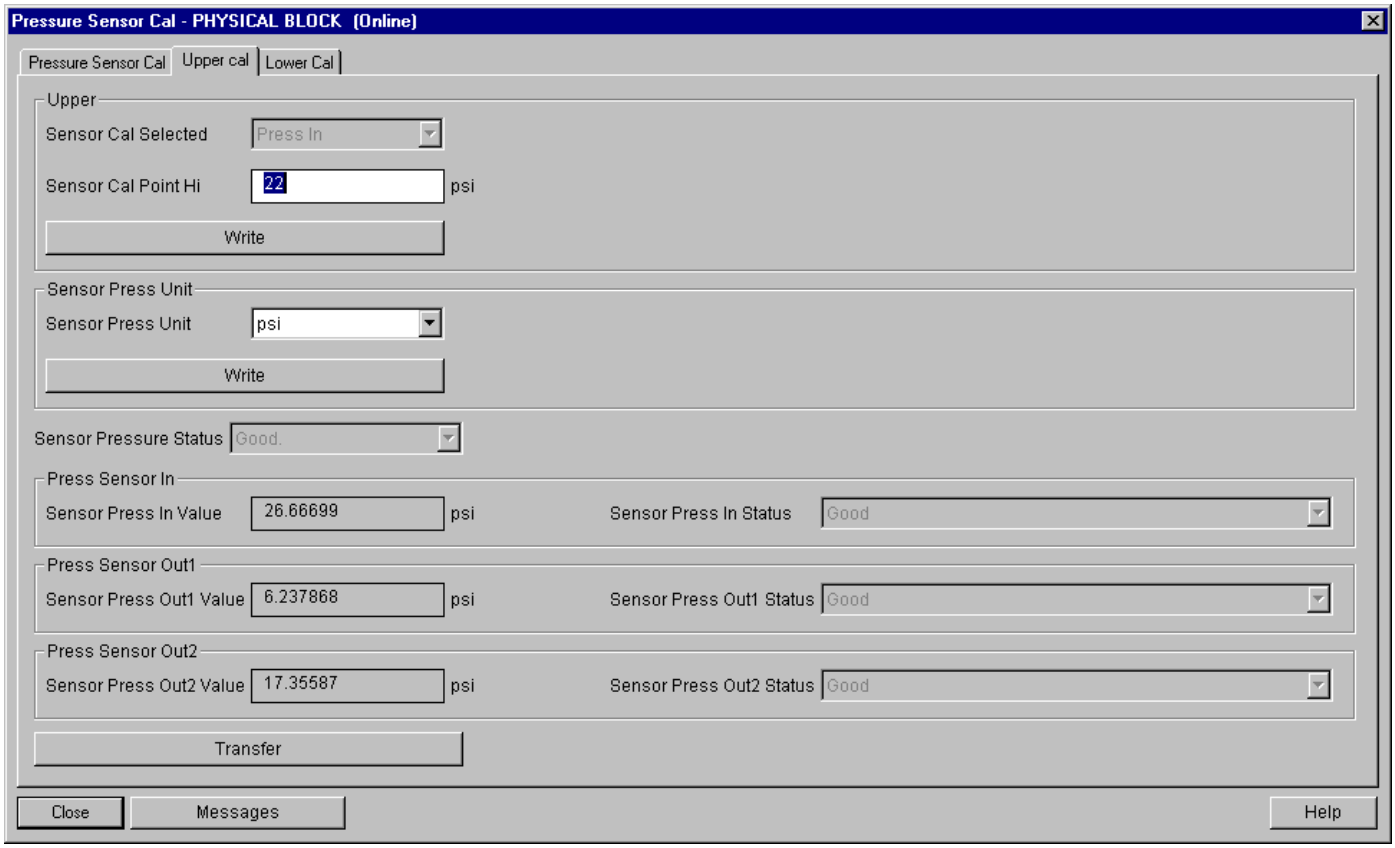


Figure 4 – Upper Pressure Point Calibration

After choosing the sensor, click on “Upper” or “Lower” for either point, as shown on figures 4 and 5, where the user must select the calibration unit and report the reference pressure on Sensor Cal Point Hi and Sensor Cal Point Lo, watching on the window bottom the values read by the **FY303**.

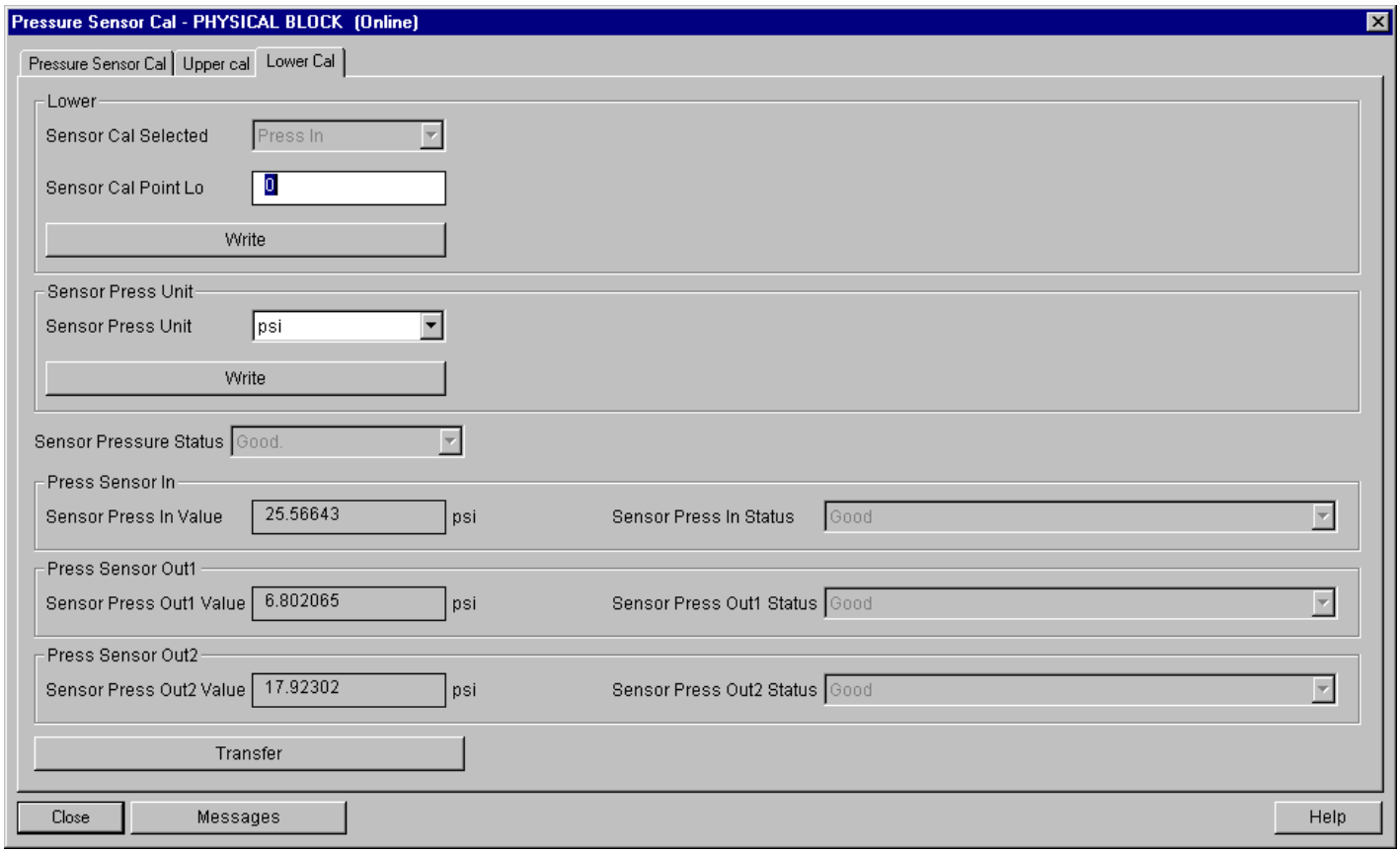


Figure 5 – Lower Pressure Point Calibration

FY303 Performance Graph

Go the “View” menu via Simatic PDM and choose one of the options: “Position Performance Diagram” or “Pressure Diagram”, according to figure 6.

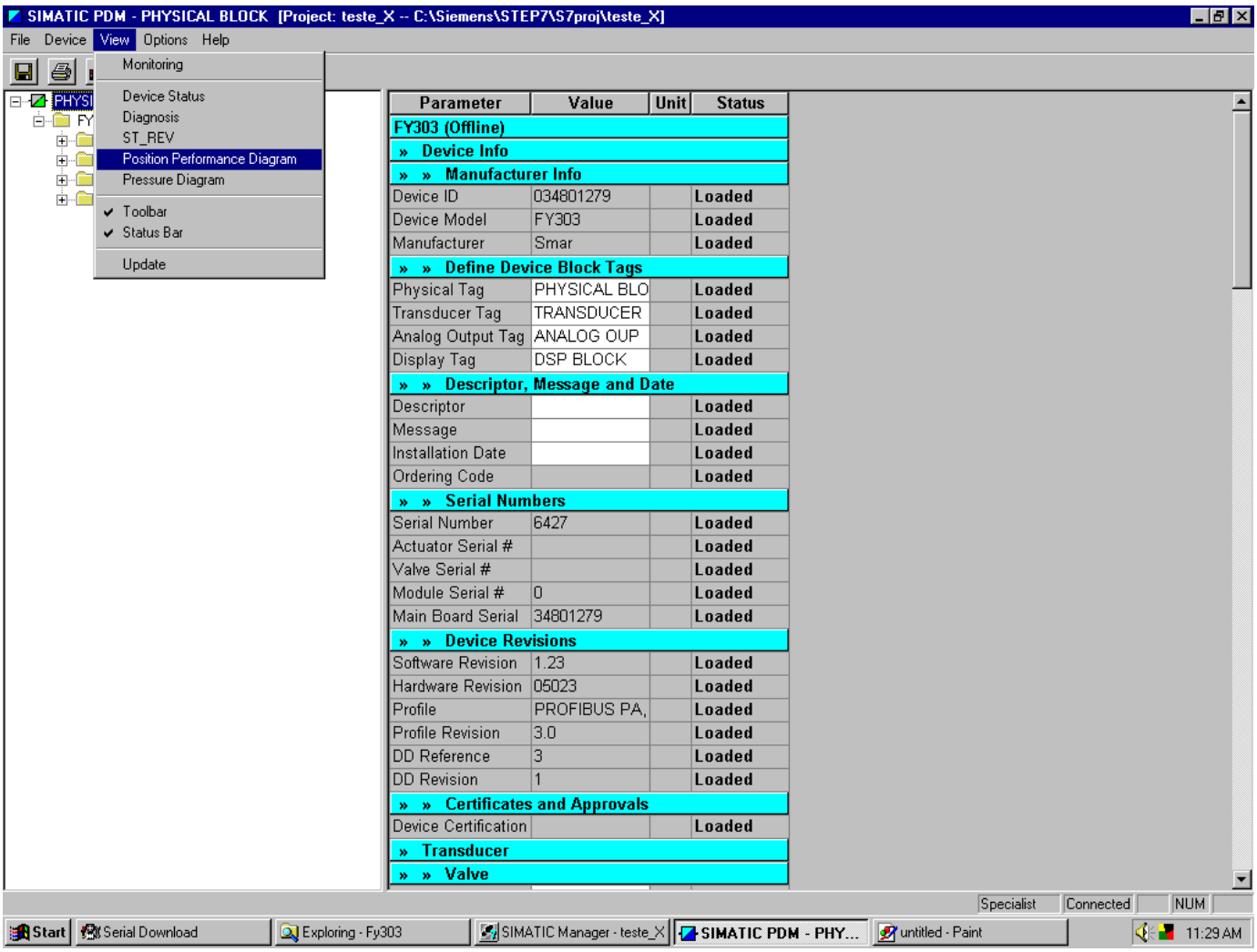


Figure 6 – FY303 Graph Selection

When choosing “Position Performance Diagram”, the PDM will show the respective graph, as on figure 7, where the user may watch the behavior of the real valve position on the SetPoint throughout the action.

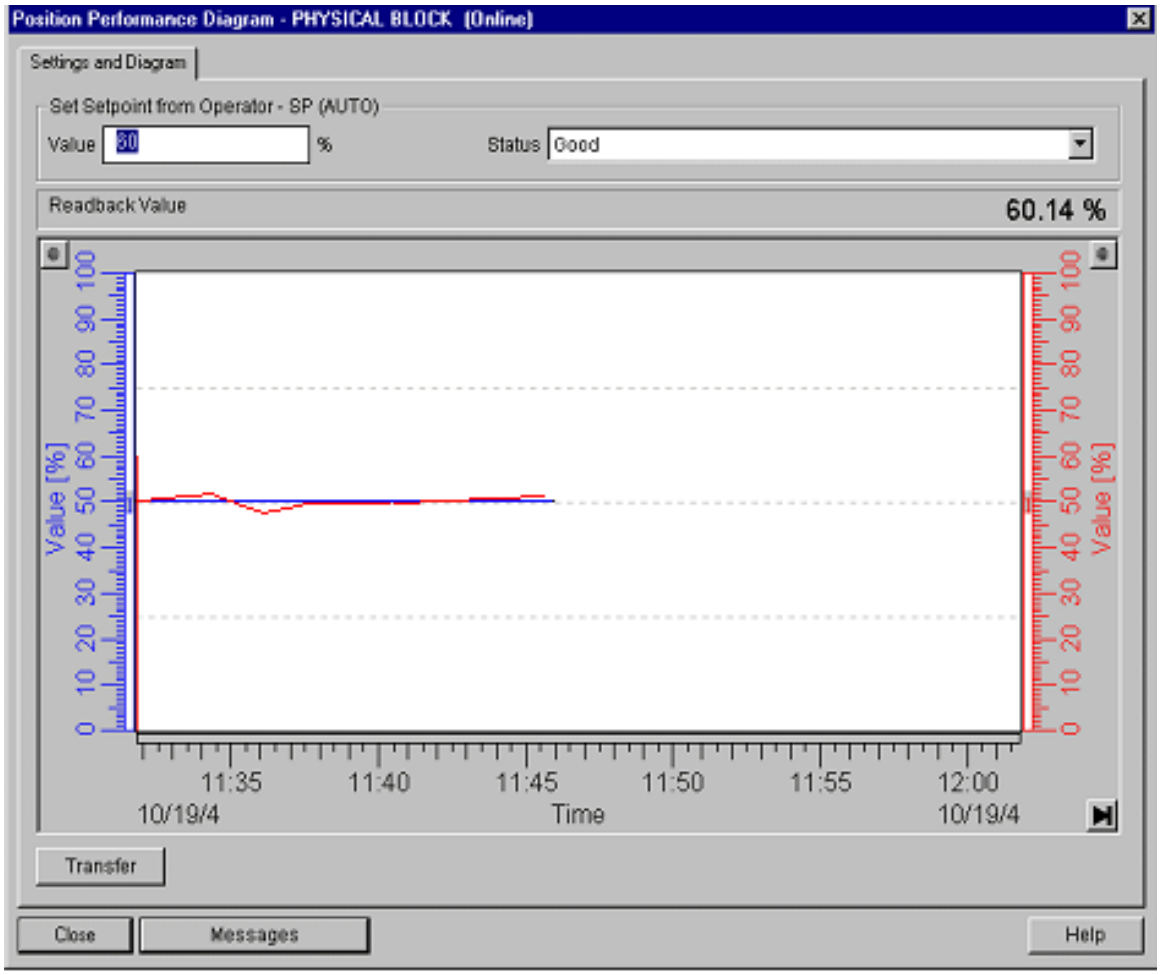


Figure 7 – Real Position x SP

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

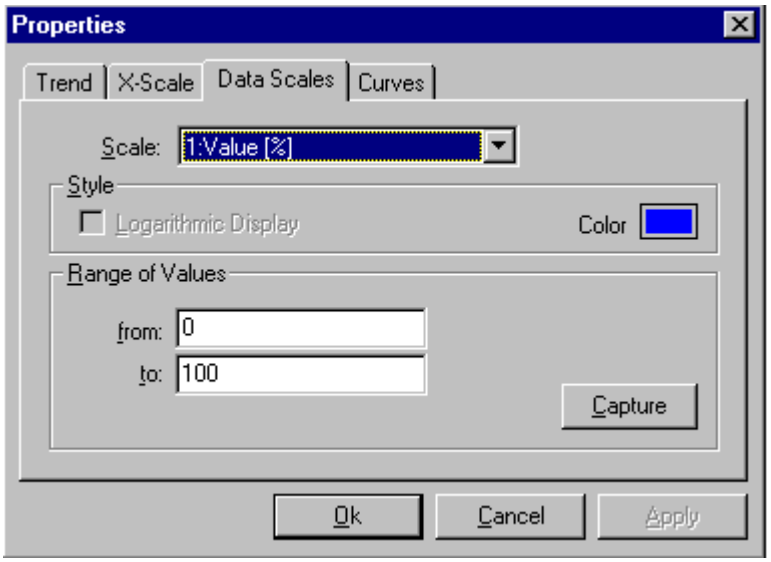


Figure 8 – Scale adjustment

By choosing “Pressure Diagram”, the real position may be drawn by the sensor selected on figure 3, as shown on figure 9. If no sensor was selected, the “Pressure Diagram” option will not be seen on the “View” menu.

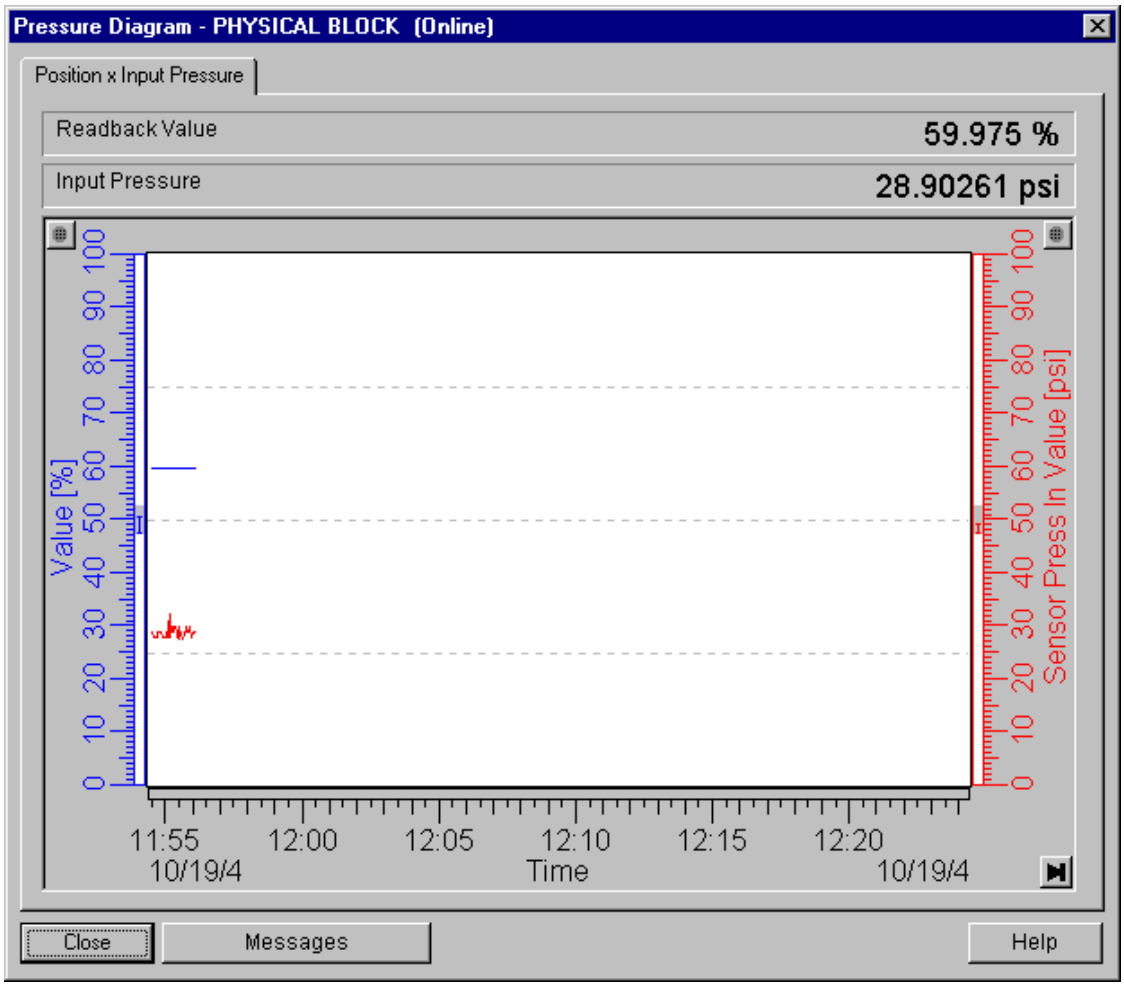


Figure 9 – Real Position x Pressure

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 “Device” menu, choose “Transducer Offline” and click on the “Pressure Sensors” tab, as shown on figure 10.

.

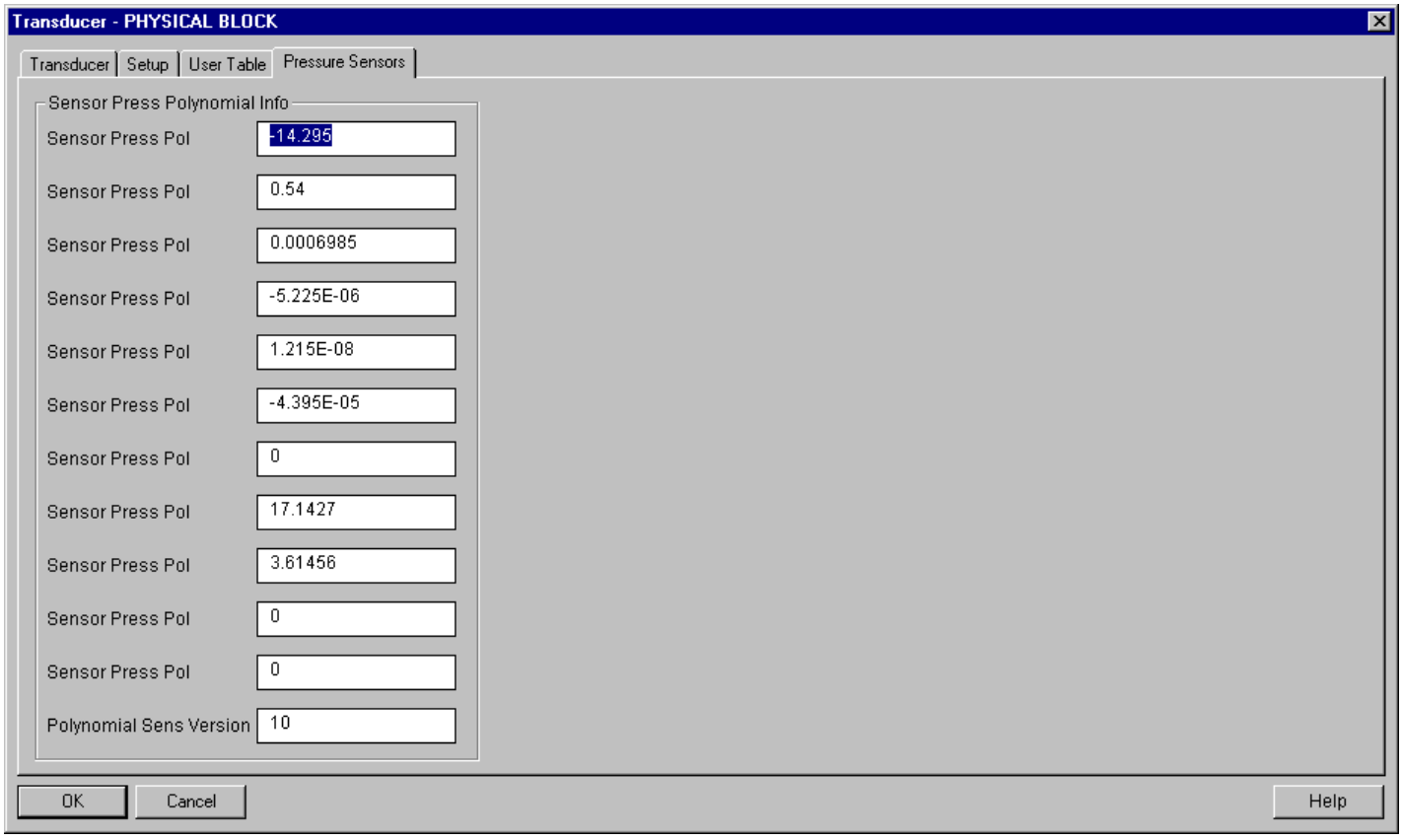


Figure 10 – Sensor Pressure Configuration Data

Section 4

MAINTENANCE PROCEDURES

General

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, he should have spare circuit boards, which may be ordered from Smar whenever necessary.

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). ***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

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 operation must only be carried out by authorized technical personnel and with the process offline, since the equipment will be configured with standard and factory data.**

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 remade according to their applications.

Two magnetic tools should be used to this effect. On the equipment, withdraw the nut that fixes the identification tag on the top of the housing, so that access is gained to the "S" and "Z" holes.

The operations to follow are:

1) Switch off the equipment, insert the magnetic tools and keep them in the holes (the magnetic end in the holes);
2) Feed the equipment;
3) As soon as Factory Init is shown on the display, take off the tools and wait for the "5" symbol on the right upper corner of the display to unlit, thus indicating the end of the operation.

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

Note that this procedure must be performed by authorized personal only and with the process switched off, since the equipment will be configured with standard and factory data.

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 5.4 – Exploded View.

ELECTRONIC CIRCUIT
To remove the circuit board (5) and indicator (4), first loose the cover locking (13) on the side not marked “Field Terminals”, then unscrew the cover (1).

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

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

Reassembly Procedure

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

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 adequate tool;

4. Remove the o-ring's 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;

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

Change the positioner filter elements with a minimum stated period of 1 (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 PORT
Air is vented to the atmosphere through the two exhausts ports located behind the transducer nameplate. A foreign object interfering or blocked exhaust port provides a way to increase the output. Cleaning by spraying it with a solvent.

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

Electronic Circuit

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

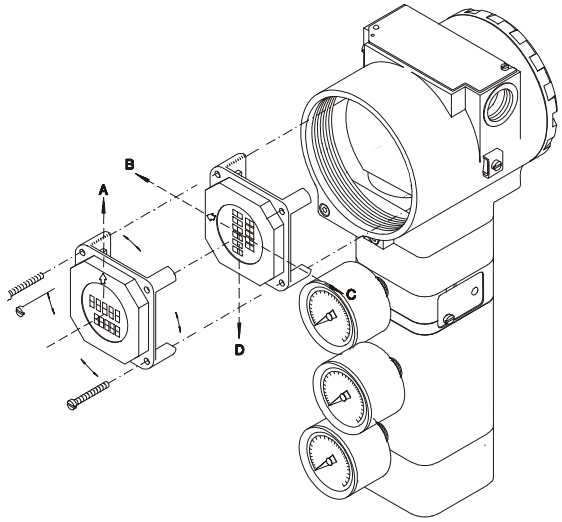


Figure 4.2 - Four Possible Positions of the Local Indicator

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

Electrical Connections
The plug must obligatorily be installed in the electric connection not used, preventing the humidity entrance.

WARNING
The standard plug provided with Smar positioner do not have an EExd certification.

Interchangeability

Main board can be changed and operate with the transducer. There is an EEPROM in the transducer part that keeps the trim.

Package Content

When receiving the equipment, verify the package content. The number for items marked with (*) must be in accordance with the number of positioners.

- Positioner
- Adequate Mounting Brackets
  - For the positioner
  - For the magnet
- Magnetic Tool for Local Adjustment (*)
- Centralizer Transmitter Device (*)
- Cleaning Device for the Restriction (*)
- Operation, Maintenance and Instructions Manual (*)

ACCESSORIES	
ORDERING CODE	**DESCRIPTION**
SD1	Magnetic Tool for Local Adjustment
BC1	Fieldbus/RS232 Interface
PS302	Power Supply
FDI302	Field Device Interface
BT302	Terminator
SB302	Intrinsic
DF48	Fieldbus Repeater
400-0726	Needle cleaning Device for the restriction

Exploded View

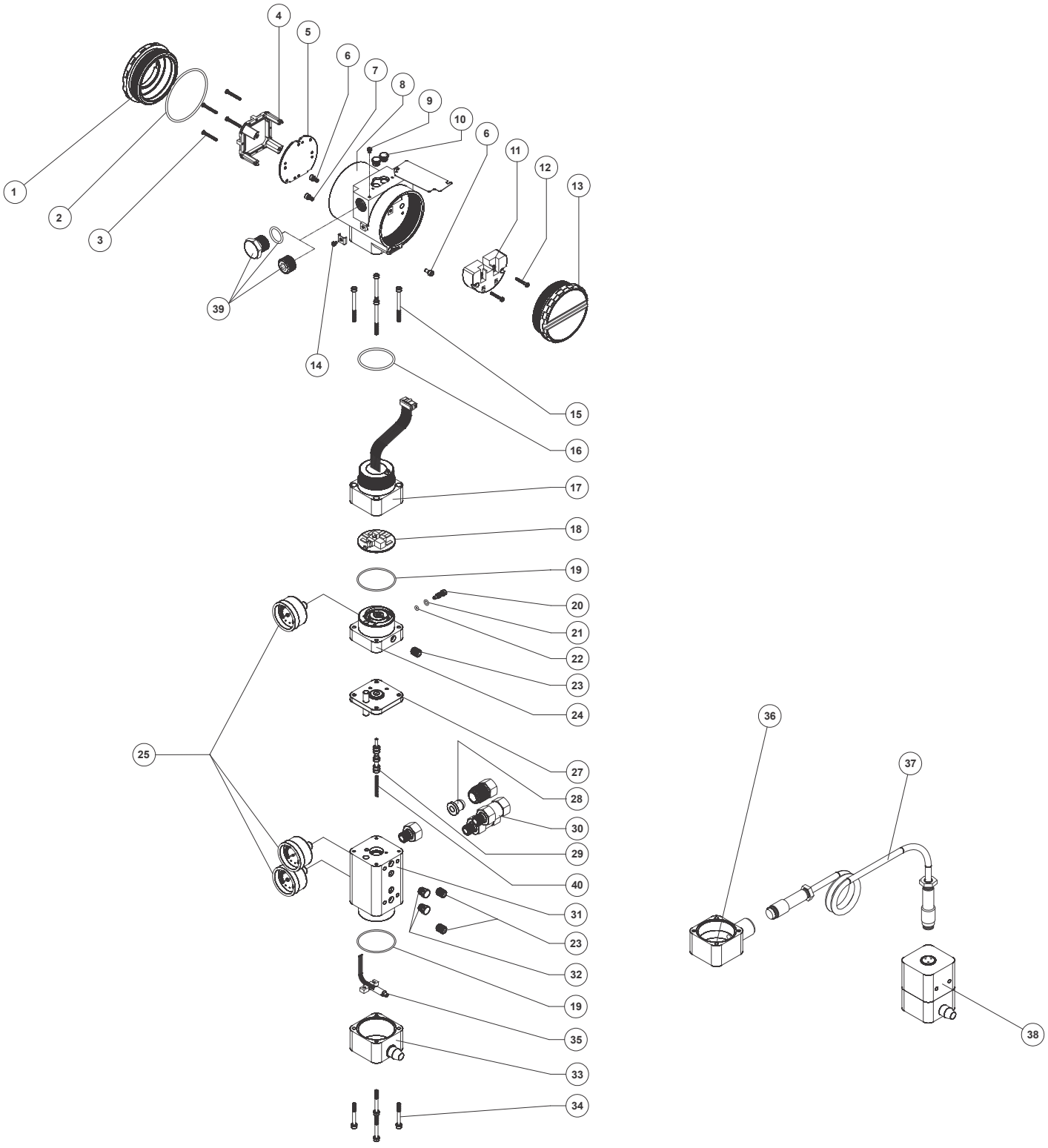


Figure 4.3 - Exploded View

Spare Parts List

SPARE PARTS LIST			
PARTS DESCRIPTION	**POSITION**	**CÓDE**	**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	400-1305 400-1310	A
TERMINAL INSULATOR	11	400-0058	A
MAIN ELECTRONIC CIRCUIT BOARD (include digital indicator and mounting kit)	5	400-1346	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			
PARTS DESCRIPTION	**POSITION**	**CÓDE**	**CATEGORY (NOTE 4)**
1/2" NPT (Ex d) INTERNAL SOCKET SET PLUG IN BICHROMATIZED CARBON STEEL	39	400-0808	-
1/2" NPT (Ex d) INTERNAL SOCKET SET PLUG IN 304 SST	39	400-0809	-
1/2" NPT INTERNAL SOCKET SET PLUG IN BICHROMATIZED CARBON STEEL	39	400-0583-11	-
1/2" NPT INTERNAL SOCKET SET PLUG IN 304 SST	39	400-0583-12	-
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

Note:
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.

Detailed Code When Ordering of Spare Parts

DETAILED CODE WHEN ORDERING OF SPARE PARTS				
CÓDE	**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 OF SPARE PARTS				
CÓDE	**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 OF SPARE PARTS

CÓDE	DESCRIPTION
400-1316	**Transducer Set; FY30X**

Option	Indication Gage
0	Without Gage
6	01 Gage - Input
7	01 Gage – Output 1
8	02 Gage – Input and Output 1
9	02 Gage – Output 1 and 2
A	03 Gage

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	Standard of Manufacture
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 OF SPARE PARTS

CÓDE	DESCRIPTION
400-1317	**Pneumatic Block Set; FY30X**

Option	Indication Gage
0	Without Gage
7	01 Gage – Output 1
9	02 Gage – 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	Standard of Manufacture
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 OF SPARE PARTS	
CÓDE	**DESCRIPTION**
400-1318	**Piezo Base Set; FY30X**
Option	**Indication Gage**
0	Without Gage
6	01 Gage – 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	**Standard of Manufacture**
S0	Smar

400-1318	*	*	*	*	**TYPICAL ORDERING CODE**

***** Choose the desired option.

DETAILED CODE WHEN ORDERING OF SPARE PARTS	
CÓDE	**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	**Standard of Manufacture**
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 OF SPARE PARTS	
CÓDE	**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	**Standard of Manufacture**
S0	Smar

400-1320	*	*	*	**TYPICAL ORDERING CODE**	

***** Choose the desired option.

DETAILED CODE WHEN ORDERING OF SPARE PARTS	
CÓDE	**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	Standard of Manufacture
S0	Smar

400-1321	*	*	*	**TYPICAL ORDERING CODE**

***** Choose the desired option.

DETAILED CODE WHEN ORDERING OF SPARE PARTS	
CÓDE	**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	Standard of Manufacture
S0	Smar

400-1322	*	*	*	**TYPICAL ORDERING CODE**

***** Choose the desired option.

DETAILED CODE WHEN ORDERING OF SPARE PARTS	
CÓDE	**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.

Section 5

TECHNICAL CHARACTERISTICS

Functional Specifications

Travel
Linear Motion: 3 - 100 mm.
Rotary Motion: 30 - 120°

Input Signal
Digital only. Fieldbus, 31.25 kbits/s voltage mode with bus power.

Output
Output to actuator 0 -100% supply air pressure. Single or double-action.

Power Supply
Bus powered: 9-32 Vdc.
Output impedance (from 7.8 kHz - 39 kHz):
Non-intrinsic safety: 3 kΩ .
Intrinsic safety: 400 Ω (assuming an IS barrier in the power supply).

Pressure Supply
1.4 - 7 bar (20-100 psi) free of oil, dust and water.

Indication
Optional 4 ½ - digit numerical and 5-character alphanumerical LCD indicator.

Hazardous Location Certification
Explosion proof, weather proof and intrinsically safe CEPEL, FM, CSA, NEMKO and DMT standards (pending).

Temperature Limits

Operation:	-40	to	85ºC	(-40	to	185ºF).
Storage:	-40	to	90ºC	(-40	to	194ºF).
Display:	-10	to	75ºC	(14	to	167ºF) operation.
	-40	to	85ºC	(-40	to	185ºF) without damage.
Remote Hall							
Operation:	-40	to	105ºC	(-40	to	221ºF).

Humidity Limits
0 to 100% RH.

Turn-on Time
Approximately 10 seconds.

Update Time
Approximately 0.5 second.

Flow Characterization
Linear, equal percentage, quick opening and customer configuration through Fieldbus communication from e.g., a PC or by the local adjustment switches.

Gain
Through software. Locally adjustable.

Travel Time
Through software. Locally adjustable.

Actual Position Sensing
Magnet (Non-contact) via Hall Effect.

Configuration
Basic configuration may be done using local adjustment magnetic tool if device is fitted with display. Complete configuration is possible using remote configurator (Ex.: **Simatic PDM, from Siemens).**

Performance Specifications

Resolution
≤ 0.1% F.S.

Repeatability
≤ 0.1% F.S.

Hysteresis
≤ 0.1% F.S.

Consumption
0.35 Nm/h (0.20 SCFM) at 1.4 bar (20 psi) supply.
1.10 Nm/h (1.65 SCFM) at 5.6 bar (80 psi) supply.

Output Capacity
13.6 Nm^3/h (8 SCFM) at 5.6 (80 psi) supply.

Ambient Temperature Effect
0.8% / 20 ºC of span.

Supply Pressure Effect
Negligible.

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.
Reference SAMA PMC 31.1 - 1980, Sec. 5.3, Condition 3, Steady State.

Electro-Magnetic Interference Effect
Designed to comply with IEC 801 and European Standards EN50081 and EN50082.

Physical Specifications

Hardware
Physical: according to IEC 61158-2 and conformity with the FISCO model.

Electrical Connection
1/2 -14 NPT, Pg 13.5 or M20 x 1.5.

Pneumatic Connections
Supply and output: 1/4 - 18 NPT
Gage: 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 (NEMA 4X, IP66).

Weight
Without display and mounting bracket: 2.7 kg. (Aluminum)
5.8 Kg. (Stainless Steel)
Add for digital display: 0.1 kg.
Remote Sensor: 550g.
Cable: 100g. (plus 45g/m for each connector)

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	8	Linear Stroke Up to 100 mm. - Double Action
2	Rotary - Double Action	A	Linear Stroke Up to 30 mm. - Single Action
3	Linear Stroke Up to 15 mm. - Single Action	B	Linear Stroke Up to 30 mm. - Double Action
4	Linear Stroke Up to 15 mm. - Double Action	C	Without magnet (for linear actuator) - Single Action
5	Linear Stroke Up to 50 mm. - Single Action	D	Without magnet (for linear actuator) - Double Action
6	Linear Stroke Up to 50 mm. - Double Action	Z	Others Specify
7	Linear Stroke Up to 100 mm. - Single Action		

COD. Indication Gage

COD.		COD.	
0	Without Gage	9	Whit 2 Gage (Acrylic, Stainless steel and wetted parts in brass) - Output 1 and 2
6	With 1 Gage (Acrylic, Stainless steel and wetted parts in brass) - Input	A	With 3 Gage (Acrylic, Stainless steel and wetted parts in brass)
7	With 1 Gage (Acrylic, Stainless steel and wetted parts in brass) - Output 1	Z	Others Specify
8	With 2 Gage (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	ID	NEPSI: Ex-ia, Ex-d
I3	CSA: XP, IS, NI, DI	IO	CEPEL: Ex-tb (explosive dust - Zone 21)
I4	EXAM (DMT): EX-IA, NEMKO: EX-D		
I5	CEPEL: EX-D, EX-IA		
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 for use in Hazardous Locations (CEPEL, NEMKO, NEPSI, EXAM, FM, CSA).
(5) Certificate for use in Hazardous Locations (CEPEL, FM, CSA).
(6) Certificate for use in Hazardous Locations (CEPEL, NEPSI, NEMKO, EXAM, FM).
(7) Certificate for use in Hazardous Locations (CEPEL, NEPSI, NEMKO, EXAM).

BFY	BRACKET (**)

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 15 mm / 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

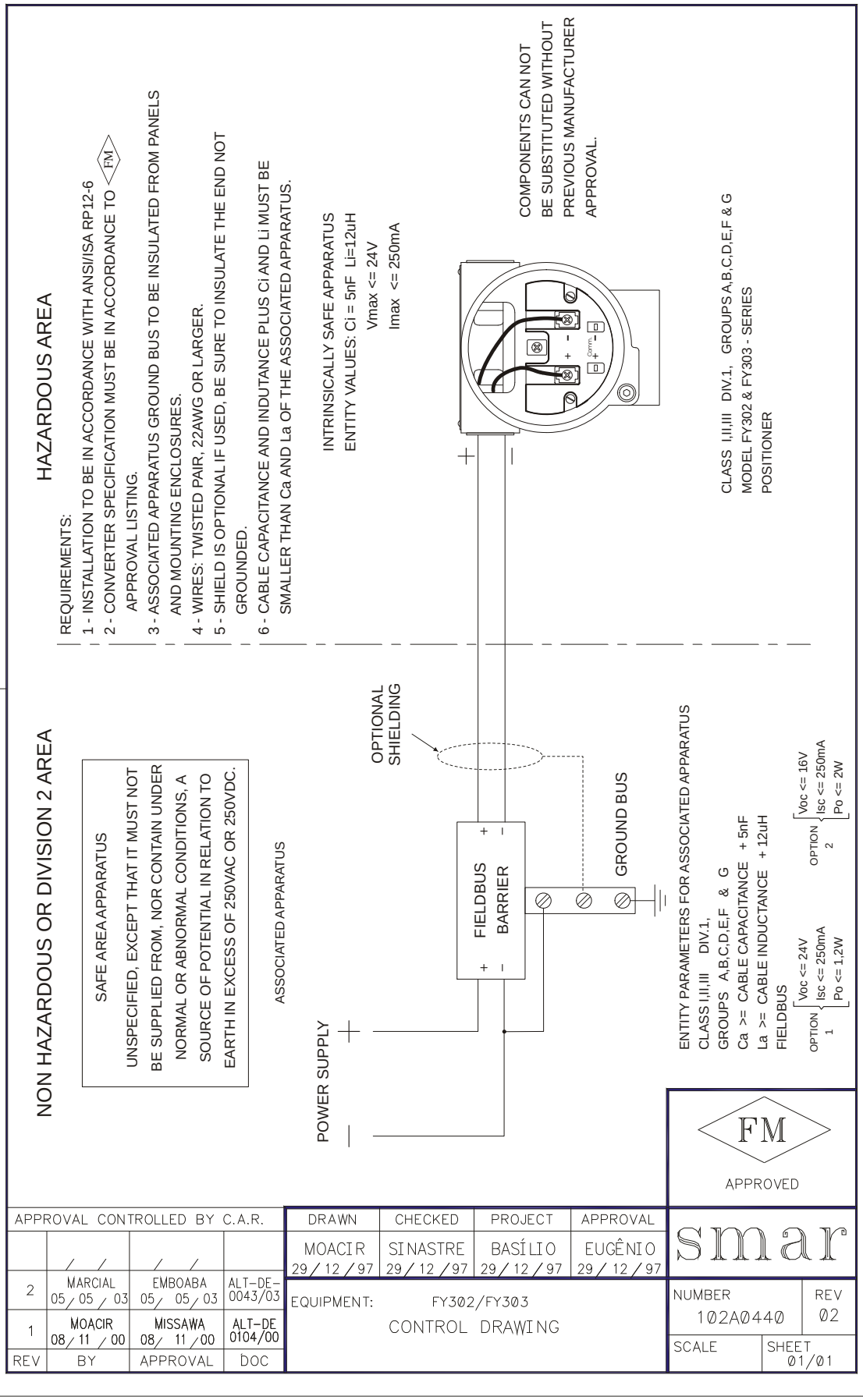
COD.	Magnet Bracket Material
C	Carbon Steel Bracket
I	Stainless Steel Bracket
N	Not applicable
Z	Others - Specify

COD.	Optional Items (*)
ZZ	Specify Actuator Model / Manufacturer

BFY	-	1	0	7	C	.	*

TYPICAL MODEL NUMBER

* Leave it blank for no optional item.
** For customized mounting bracket, for different brands and models, please, consult www.smar.com .
When choosing the remote sensor version, an additional “L” shape bracket is included, for 2” tube mounting.


HAZARDOUS AREA
REQUIREMENTS:
1 - INSTALLATION TO BE IN ACCORDANCE WITH ANSI/ISA RP12-6
2 - CONVERTER SPECIFICATION MUST BE IN ACCORDANCE TO FM APPROVAL LISTING.
3 - ASSOCIATED APPARATUS GROUND BUS TO BE INSULATED FROM PANELS AND MOUNTING ENCLOSURES.
4 - WIRES: TWISTED PAIR, 22AWG OR LARGER.
5 - SHIELD IS OPTIONAL IF USED, BE SURE TO INSULATE THE END NOT GROUNDED.
6 - CABLE CAPACITANCE AND INDUTANCE PLUS Ci AND Li MUST BE SMALLER THAN Ca AND La OF THE ASSOCIATED APPARATUS.
INTRINSICALLY SAFE APPARATUS
ENTITY VALUES: Ci = 5nF Li=12uH
Vmax <= 24V
Imax <= 250mA
COMPONENTS CAN NOT BE SUBSTITUTED WITHOUT PREVIOUS MANUFACTURER APPROVAL.
CLASS I,II,III DIV.1, GROUPS A,B,C,D,E,F & G
MODEL FY302 & FY303 - SERIES
POSITIONER
NON HAZARDOUS OR DIVISION 2 AREA
SAFE AREA APPARATUS
UNSPECIFIED, EXCEPT THAT IT MUST NOT BE SUPPLIED FROM, NOR CONTAIN UNDER NORMAL OR ABNORMAL CONDITIONS, A SOURCE OF POTENTIAL IN RELATION TO EARTH IN EXCESS OF 250VAC OR 250VDC.
ASSOCIATED APPARATUS
OPTIONAL SHIELDING
FIELDBUS BARRIER
GROUND BUS
POWER SUPPLY
ENTITY PARAMETERS FOR ASSOCIATED APPARATUS
CLASS I,II,III DIV.1,
GROUPS A,B,C,D,E,F & G
Ca >= CABLE CAPACITANCE + 5nF
La >= CABLE INDUCTANCE + 12uH
FIELDBUS
OPTION 1: Voc <= 24V, Isc <= 250mA, Po <= 1.2W
OPTION 2: Voc <= 16V, Isc <= 250mA, Po <= 2W
FM
APPROVED
APPROVAL CONTROLLED BY C.A.R.
REV | BY | APPROVAL | DOC
2 | MARCIAL 05/05/03 | EMBOABA 05/05/03 | ALT-DE-0043/03
1 | MOACIR 08/11/00 | MISSAWA 08/11/00 | ALT-DE 0104/00
DRAWN: MOACIR 29/12/97
CHECKED: SINASTRE 29/12/97
PROJECT: BASÍLIO 29/12/97
APPROVAL: EUGÊNIO 29/12/97
EQUIPMENT: FY302/FY303
CONTROL DRAWING
smar
NUMBER 102A0440
REV 02
SCALE
SHEET 01/01

Appendix A

CERTIFICATIONS INFORMATION

European Directive Information

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

ATEX Directive (94/9/EC) – "Electrical equipment and protective system intended for use in potential explosive atmospheres"
The EC-Type Examination Certificate had been released by Nemko AS (CE0470) and/or DEKRA EXAM GmbH (CE0158), according to European Standards.
The certification body for Production Quality Assurance Notification (QAN) and IECEx Quality Assessment Report (QAR) is Nemko AS (CE0470).

Hazardous Locations General Information

Ex Standards:
IEC 60079-0 General Requirements
IEC 60079-1 Flameproof Enclosures "d"
IEC 60079-11 Intrinsic Safety "i"
IEC 60079-26 Equipment with equipment protection level (EPL) Ga
IEC 60529 Classification of degrees of protection provided by enclosures (IP Code)

Customer responsibility:
IEC 60079-10 Classification of Hazardous Areas
IEC 60079-14 Electrical installation design, selection and erection
IEC 60079-17 Electrical Installations, Inspections and Maintenance

Warning:
Explosions could result in death or serious injury, besides financial damage.
Installation of this instrument in an explosive environment must be in accordance with the national standards and according to the local environmental protection method. Before proceeding with the installation match the certificate parameters according to the environmental classification.

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

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

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

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

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

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

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

Hazardous Locations Approvals

CSA (Canadian Standards Association)

Class 2258 02 – Process Control Equipment – For Hazardous Locations (CSA1078546)
Class I, Division 1, Groups B, C and D
Class II, Division 1, Groups E, F and G
Class III, Division 1
Class I, Division 2, Groups A, B, C and D

Class 2258 03 – Process Control Equipment – Intrinsically Safe and Non-Incendive Systems - For Hazardous Locations (CSA 1078546)
Ex n Class I, Division 2, Groups A, B, C and D

Model FY302 Valve Positioners; input supply 12-42V dc, 4-20mA; Enclosure Type 4/4X; non-incendive with Fieldbus/FNICO
Entity parameters at terminals "+" and "-" of :
Vmax = 24 V, Imax = 570mA, Pmax = 9,98 W, Ci = 5 nF, Li = 12 µH,
when connected as per SMAR Installation Drawing 102A0836; T Code T3C @ Max Ambient 40 Deg C; MWP 100 psi.

Class 2258 04 – Process Control Equipment – Intrinsically Safe Entity – For Hazardous Locations (CSA 1078546)
Class I, Division 1, Groups A, B, C and D
Class II, Division 1, Groups E, F and G
Class III, Division 1
FISCO Field Device

Model FY302 Valve Positioners; input supply 12-42V dc, 4-20mA; Enclosure Type 4/4X; intrinsically safe with Fieldbus/FISCO
Entity parameters at terminals "+" and "-":
Vmax = 24 V, Imax = 250 mA, Pmax = 5.32 W, Ci = 5 nF, Li = 12 uH, when connected as per Smar Installation Drawing 102A0836; T Code T3C @ Max Ambient 40 Deg C; MWP 100 psi.
Note: Only models with stainless steel external fittings are Certified as Type 4X.

Special conditions for safe use:
Temperature Class T3C
Maximum Ambient Temperature: 40ºC (-20 to 40 ºC)
Maximum Working Pressure: 100 psi

FM Approvals (Factory Mutual)

Intrinsic Safety (FM 3D9A2.AX)
IS Class I, Division 1, Groups A, B, C and D
IS Class II, Division 1, Groups E, F and G
IS Class III, Division 1

Explosion Proof (FM 3007267)
XP Class I, Division 1, Groups A, B, C and D

Dust Ignition Proof (FM 3D9A2.AX)
DIP Class II, Division 1, Groups E, F and G
DIP Class III, Division 1

Non Incendive (FM 3D9A2.AX and 3015629)
NI Class I, Division 2, Groups A, B, C and D

Environmental Protection (FM 3007267, 3D9A2.AX and 3015629)
Option: Type 4X or Type 4

Special conditions for safe use:
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
Temperature Class T4
Maximum Ambient Temperature: 60ºC (-20 to 60 ºC)

NEMKO (Norges Elektriske MaterielKontroll)

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

Environmental Protection (NEMKO 00ATEX305X)
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”

EXAM (BBG Prüf - und Zertifizier GmbH)

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”

CEPEL (Centro de Pesquisa de Energia Elétrica)

Intrinsic Safety (CEPEL 00.0017)
Ex d ia, Group IIC, Temperature Class T4/T5/T6, EPL Gb

FISCO Field Device
Entity Parameters:
Pi = 5.32 W, Ui = 24V, Ii = 380 mA, Ci = 5 nF, Li = Neg

Ambient Temperature:
-20 to 65 ºC for T4
-20 to 50 ºC for T5
-20 to 40 ºC for T6

Protection by enclosure (CEPEL 00.0017)
Ex tb, Group IIIC, Temperature Class T135ºC/T100ºC/T85ºC, EPL Db

Ambient Temperature:
-20 to 65 ºC for T135ºC
-20 to 50 ºC for T100ºC
-20 to 40 ºC for T85ºC

Explosion Proof (CEPEL 98.0008)
Ex d, Group IIC, Temperature Class T6, EPL Gb

Maximum Ambient Temperature: 40ºC (-20 to 40 ºC)

Protection by enclosure (CEPEL 98.0008)
Ex tb, Group IIIC, Temperature Class T85ºC, EPL Db

Maximum Ambient Temperature: 40ºC (-20 to 40 ºC)

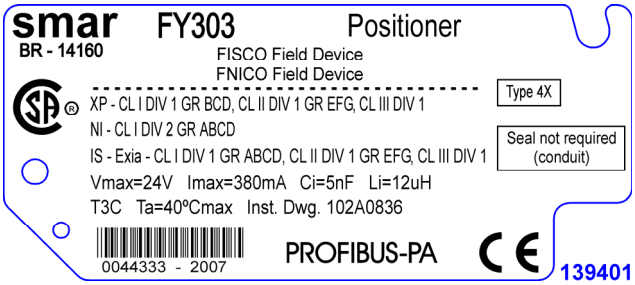
Environmental Protection (CEPEL 00.0017 AND CEPEL 98.0008)
Options: IP66W or IP66

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

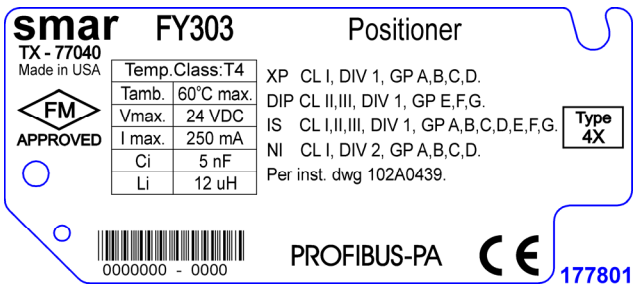
ABNT NBR IEC 60079-0:2008 General Requirements
ABNT NBR IEC 60079-1:2009 Flameproof Enclosures “d”
ABNT NBR IEC 60079-11:2009 Intrinsic Safety “i”
IEC 60079-27:2008 Fieldbus intrinsically safe concept (FISCO)
ABNT NBR IEC 60529:2009 Classification of degrees of protection provided by enclosures (IP Code)
ABNT NBR IEC 60079-31:2011 Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosure "t"

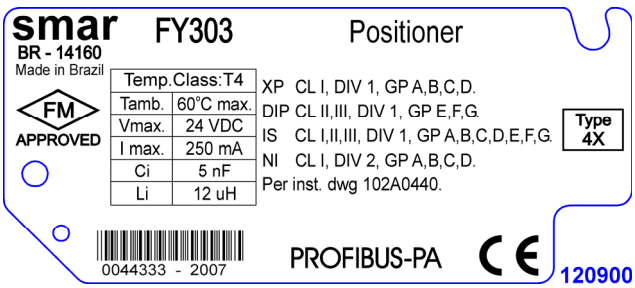
Identification Plate

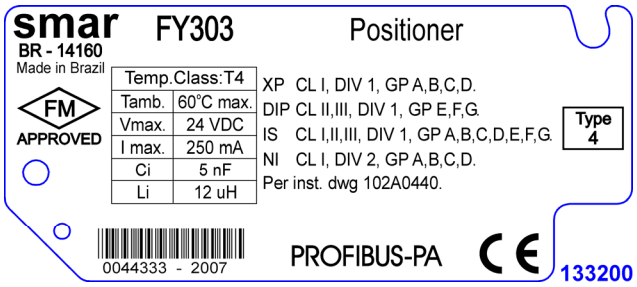
CSA (Canadian Standards Association)

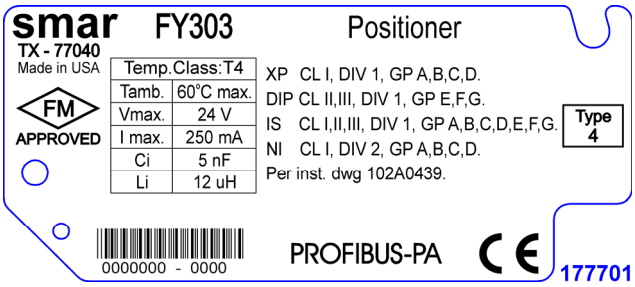


FM Approvals (Factory Mutual)

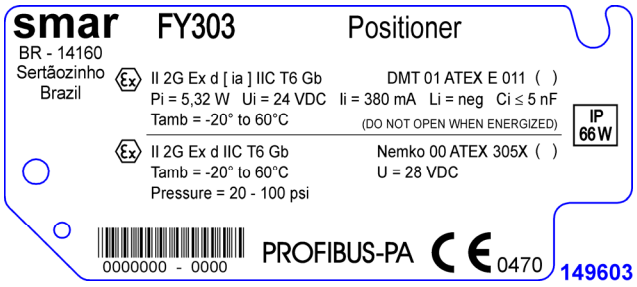


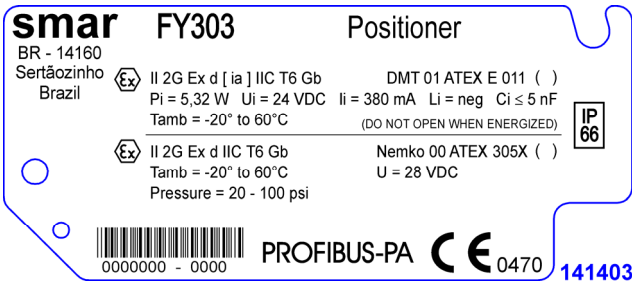




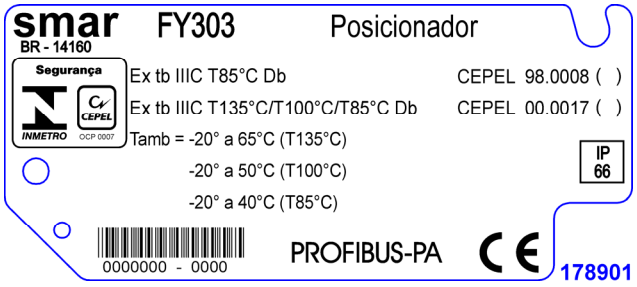


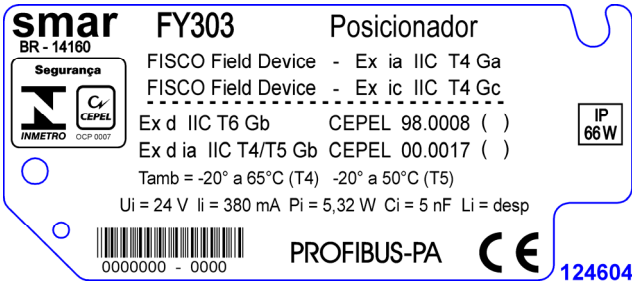
NEMKO (Norges Elektriske MaterielKontroll) / EXAM (BBG Prüf - und Zertifizier GmbH)





CEPEL (Centro de Pesquisa de Energia Elétrica)

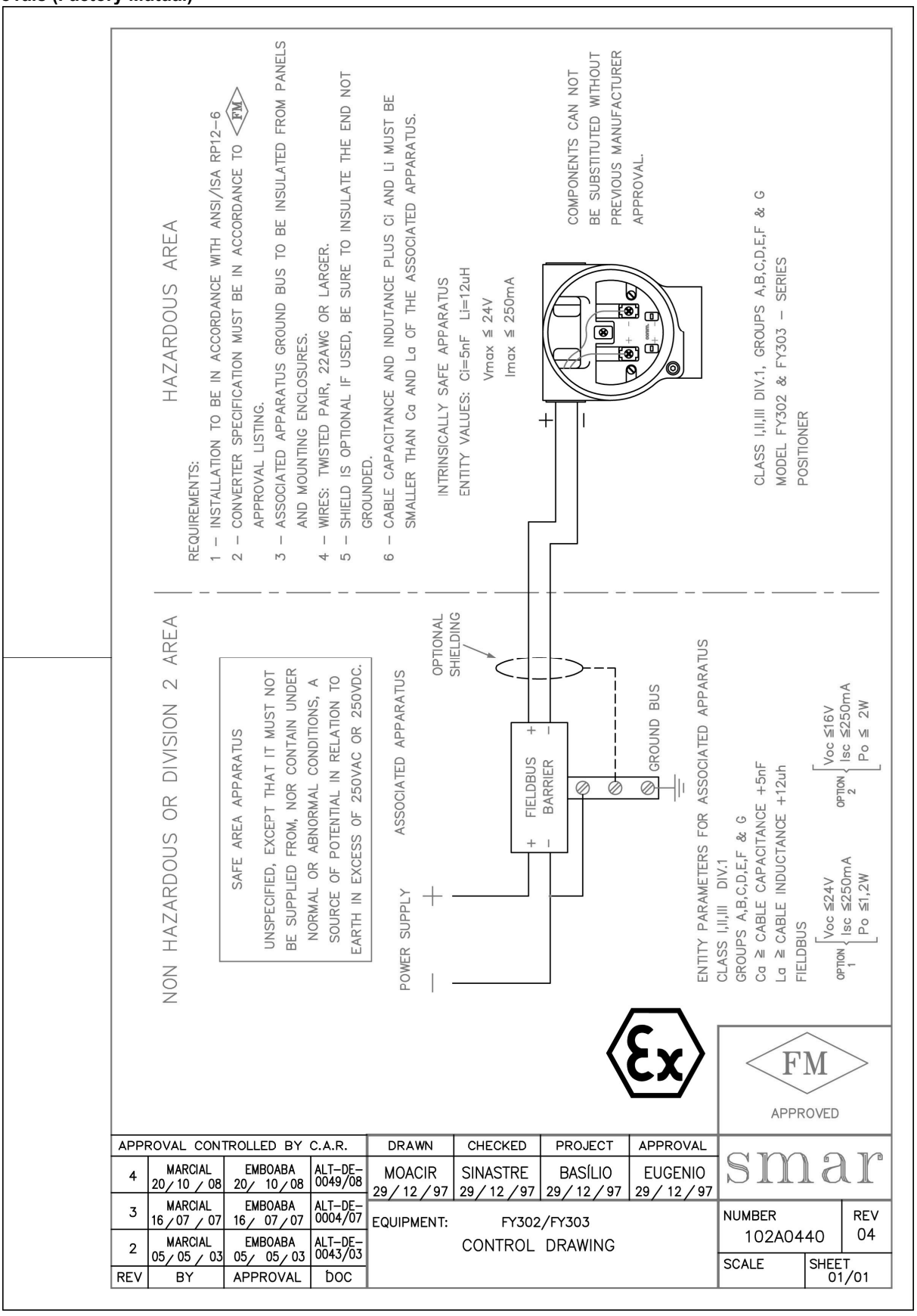




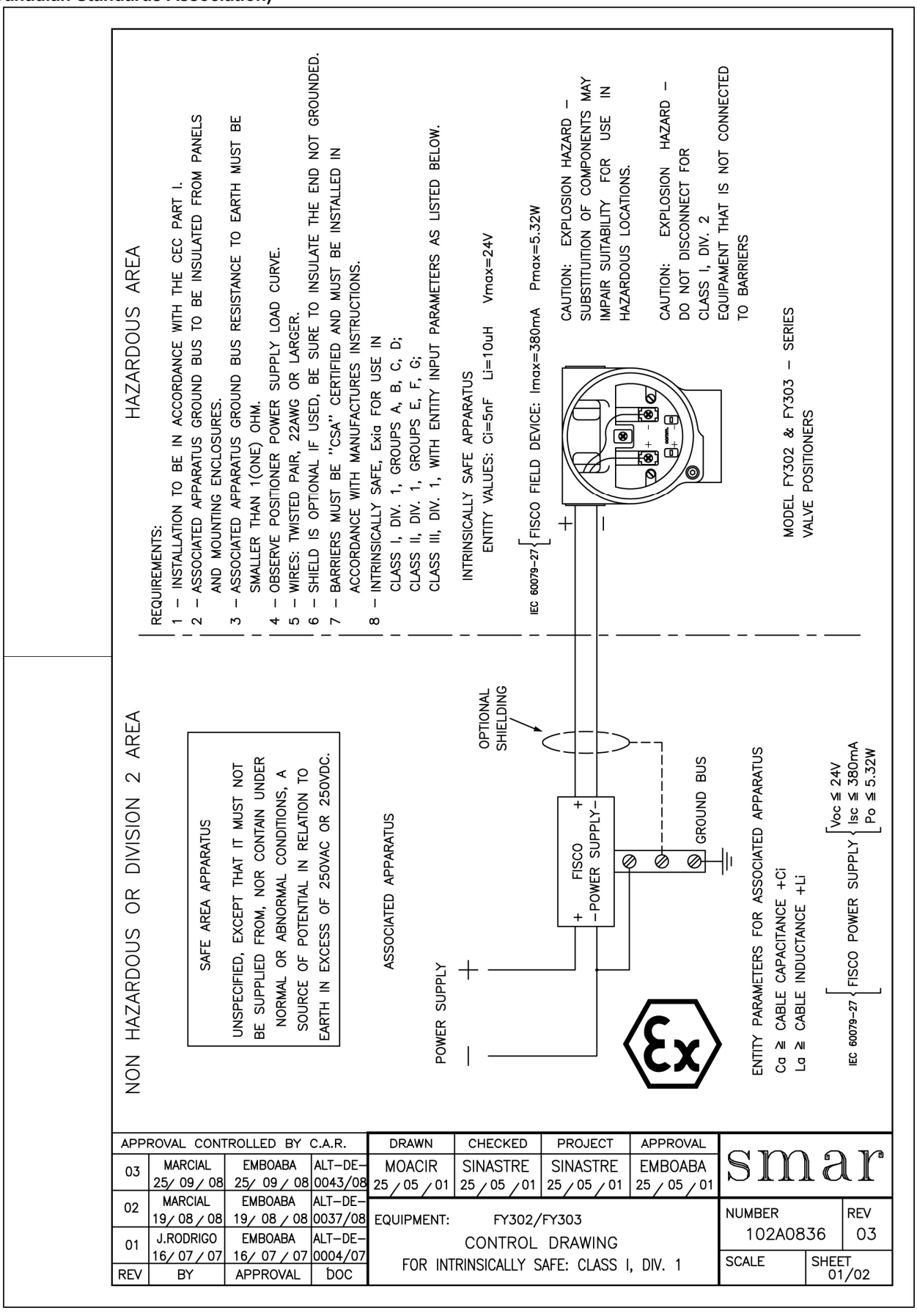

smar
BR - 14160
FY303
Posicionador
Segurança
INMETRO
OCP 0007
CEPEL
FISCO Field Device - Ex ia IIC T4 Ga
FISCO Field Device - Ex ic IIC T4 Gc
Ex d IIC T6 Gb CEPEL 98.0008 ( )
Ex d ia IIC T4/T5 Gb CEPEL 00.0017 ( )
IP 66
Tamb = -20° a 65°C (T4) -20° a 50°C (T5)
Ui = 24 V Ii = 380 mA Pi = 5,32 W Ci = 5 nF Li = desp
0000000 - 0000
PROFIBUS-PA
CE
136704

Control Drawing

FM Approvals (Factory Mutual)



CSA (Canadian Standards Association)



NON HAZARDOUS OR DIVISION 2 AREA

SAFE AREA APPARATUS

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

ASSOCIATED APPARATUS

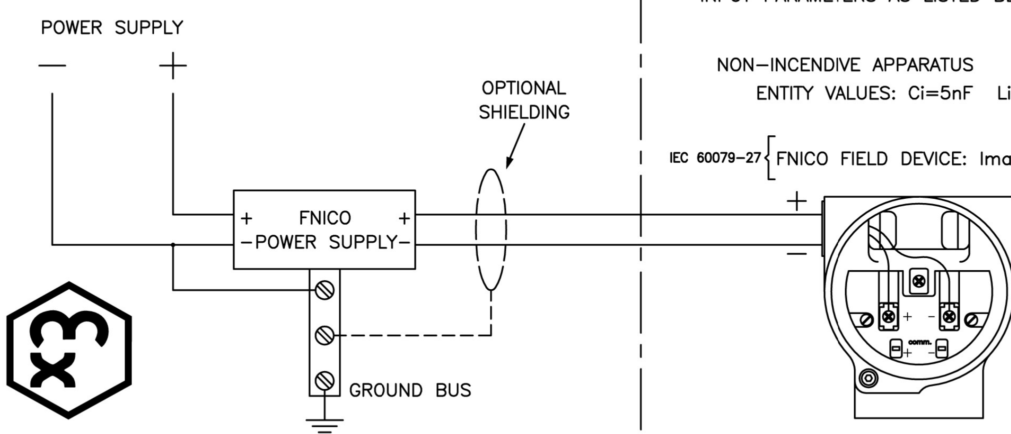
HAZARDOUS AREA

REQUIREMENTS:

1 – INSTALLATION TO BE IN ACCORDANCE WITH THE CEC PART I.
2 – ASSOCIATED APPARATUS GROUND BUS TO BE INSULATED FROM PANELS AND MOUNTING ENCLOSURES.
3 – ASSOCIATED APPARATUS GROUND BUS RESISTANCE TO EARTH MUST BE SMALLER THAN 1(ONE) OHM.
4 – OBSERVE POSITIONER POWER SUPPLY LOAD CURVE.
5 – WIRES: TWISTED PAIR, 22AWG OR LARGER.
6 – SHIELD IS OPTIONAL IF USED, BE SURE TO INSULATE THE END NOT GROUNDED.
7 – BARRIERS MUST BE "CSA" CERTIFIED AND MUST BE INSTALLED IN ACCORDANCE WITH MANUFACTURES INSTRUCTIONS.
8 – NON–INCENDIVE FOR CLASS I, DIV. 2, GROUPS A, B, C, D, WITH NON–INCENDIVE FIELD WIRING INPUT PARAMETERS AS LISTED BELOW.

NON–INCENDIVE APPARATUS
ENTITY VALUES: Ci=5nF Li=10uH Vmax=24V

IEC 60079–27 { FNICO FIELD DEVICE: Imax=570mA Pmax=9.98W



CAUTION: EXPLOSION HAZARD – SUBSTITUITION OF COMPONENTS MAY IMPAIR SUITABILITY FOR USE IN HAZARDOUS LOCATIONS.

CAUTION: EXPLOSION HAZARD – DO NOT DISCONNECT FOR CLASS I, DIV. 2 EQUIPAMENT THAT IS NOT CONNECTED TO BARRIERS

ENTITY PARAMETERS FOR ASSOCIATED APPARATUS
Ca ≧ CABLE CAPACITANCE +Ci
La ≧ CABLE INDUCTANCE +Li

IEC 60079–27 { FNICO POWER SUPPLY { Voc ≦ 24V, Isc ≦ 570mA, Po ≦ 9.98W }

MODEL FY302 & FY303 – SERIES VALVE POSITIONERS

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

DRAWN	CHECKED	PROJECT	APPROVAL
MOACIR 25 / 05 / 01	SINASTRE 25 / 05 / 01	SINASTRE 25 / 05 / 01	EMBOABA 25 / 05 / 01

EQUIPMENT: FY302/FY303
CONTROL DRAWING
FOR NON INCENDIVE: CLASS I, DIV. 2

smar

NUMBER	REV
102A0836	03
SCALE	SHEET 02/02

Appendix B

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 ( ) Eletromagnetic ( ) 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 www.smar.com/contactus.asp.

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.

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

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

Appendix C

SMAR WARRANTY CERTIFICATE

1. SMAR guarantees its products for a period of 24 (twenty four) months, starting on the day of issuance of the invoice. The guarantee is valid regardless of the day that the product was installed.

2. SMAR products are guaranteed against any defect originating from manufacturing, mounting, whether of a material or manpower nature, provided that the technical analysis reveals the existence of a quality failure liable to be classified under the meaning of the word, duly verified by the technical team within the warranty terms.

3. Exceptions are proven cases of inappropriate use, wrong handling or lack of basic maintenance compliant to the equipment manual provisions. SMAR does not guarantee any defect or damage caused by an uncontrolled situation, including but not limited to negligence, user imprudence or negligence, natural forces, wars or civil unrest, accidents, inadequate transportation or packaging due to the user's responsibility, defects caused by fire, theft or stray shipment, improper electric voltage or power source connection, electric surges, violations, modifications not described on the instructions manual, and/or if the serial number was altered or removed, substitution of parts, adjustments or repairs carried out by non-authorized personnel; inappropriate product use and/or application that cause corrosion, risks or deformation on the product, damages on parts or components, inadequate cleaning with incompatible chemical products, solvent and abrasive products incompatible with construction materials, chemical or electrolytic influences, parts and components susceptible to decay from regular use, use of equipment beyond operational limits (temperature, humidity, etc.) according to the instructions manual. In addition, this Warranty Certificate excludes expenses with transportation, freight, insurance, all of which are the customer's responsibility.

4. For warranty or non-warranty repair, please contact your representative.

   Further information about address and contacts can be found on www.smar.com/contactus.asp

5. In cases needing technical assistance at the customer's facilities during the warranty period, the hours effectively worked will not be billed, although SMAR shall be reimbursed from the service technician's transportation, meals and lodging expenses, as well dismounting/mounting costs, if any.

6. The repair and/or substitution of defective parts do not extend, under any circumstance, the original warranty term, unless this extension is granted and communicated in writing by SMAR.

7. No Collaborator, Representative or any third party has the right, on SMAR's behalf, to grant warranty or assume some responsibility for SMAR products. If any warranty would be granted or assumed without SMAR's written consent, it will be declared void beforehand.

8. Cases of Extended Warranty acquisition must be negotiated with and documented by SMAR.

9. If necessary to return the equipment or product for repair or analysis, contact us.
   See item 4.

10. In cases of repair or analysis, the customer must fill out the Revision Requisition Form (FSR) included in the instructions manual, which contains details on the failure observed on the field, the circumstances it occurred, in addition to information on the installation site and process conditions. Equipments and products excluded from the warranty clauses must be approved by the client prior to the service execution.

11. In cases of repairs, the client shall be responsible for the proper product packaging and SMAR will not cover any damage occurred in shipment.

12. In cases of repairs under warranty, recall or outside warranty, the client is responsible for the correct packaging and packing and SMAR shall not cover any damage caused during transportation. Service expenses or any costs related to installing and uninstalling the product are the client´s sole responsibility and SMAR does not assume any accountability before the buyer.

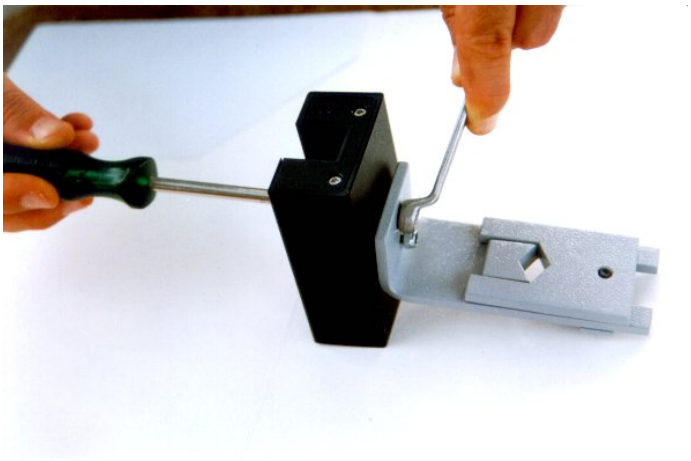
13. It is the customer's responsibility to clean and decontaminate products and accessories prior to shipping them for repair, and SMAR and its dealer reserve themselves the right to refuse the service in cases not compliant to those conditions. It is the customer's responsibility to tell SMAR and its dealer when the product was utilized in applications that contaminate the equipment with harmful products during its handling and repair. Any other damages, consequences, indemnity claims, expenses and other costs caused by the lack of decontamination will be attributed to the client. Kindly, fill out the Declaration of Decontamination prior to shipping products to SMAR or its dealers, which can be accessed at www.smar.com/doc/declarationofcontamination.pdf and include in the packaging.

14. This warranty certificate is valid only when accompanying the purchase invoice.

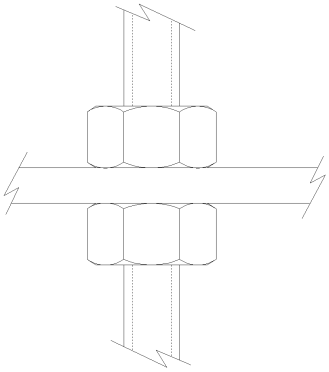
APPENDIX

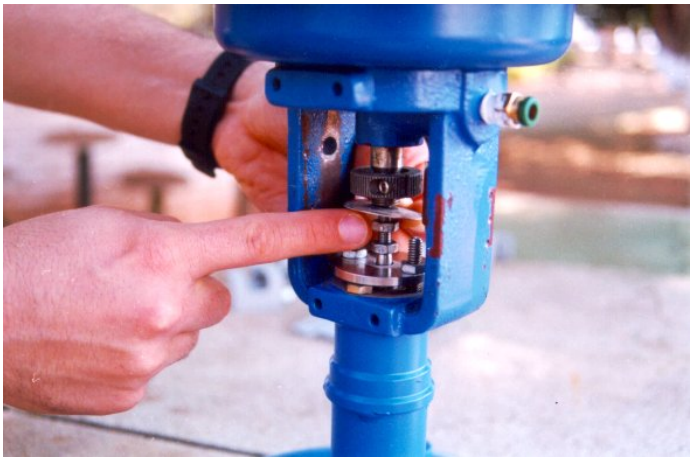
MOUNTING BRACKET FOR POSITIONER – LINEAR STROKE VALVE MOUNTING INSTRUCTIONS

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.



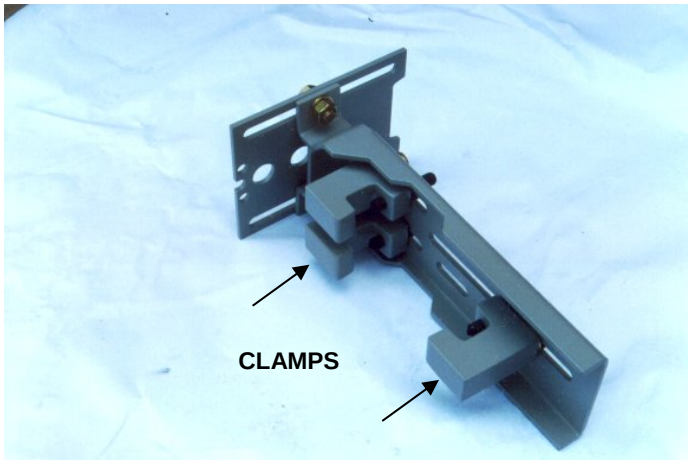


3 – Mount the magnet assembly using the nuts of the valve stem. The mounting bracket has two parts that should be mounted to the stem.

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.

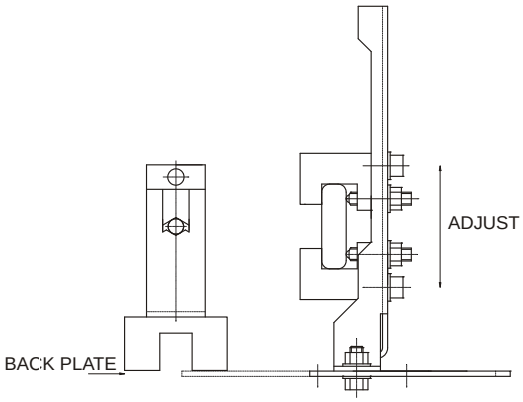
6 – Attach the “clamps” to the positioner bracket.
If your actuator is pillar type, go to step 15 to see the instructions.

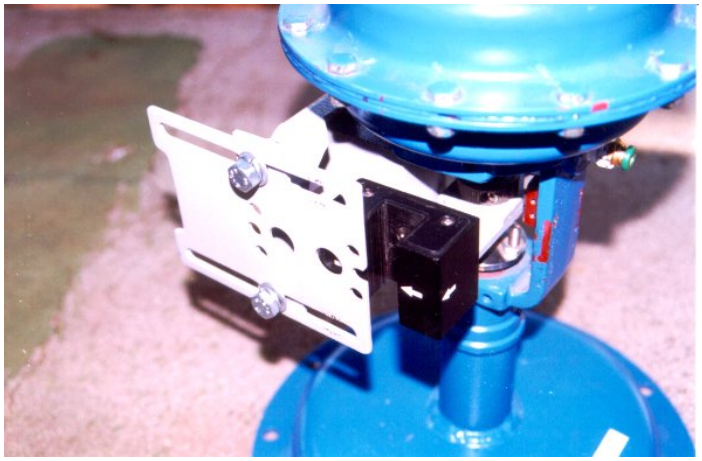


7 – Adjust the clamps according to the width of the yoke and tighten the bolts finger tight.

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.

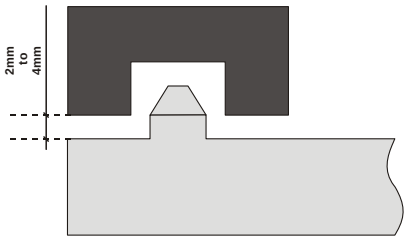


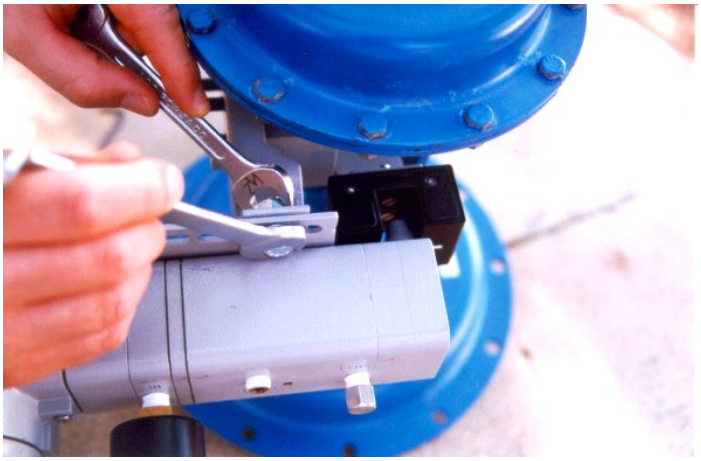


10 – Fasten the nuts to fix the positioner bracket to the yoke.
If the actuator is pillar type, fasten the U-clamp nuts.

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

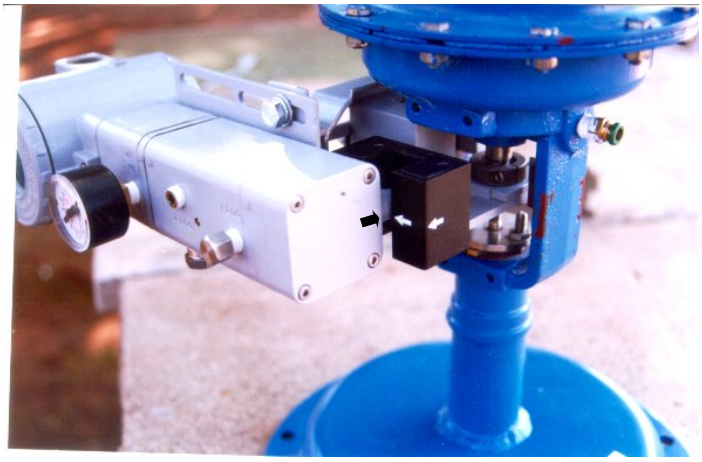
12 – Move the positioner as to adjust the Hall sensor tip in the center of the magnet. Tighten the nuts after the adjustment.





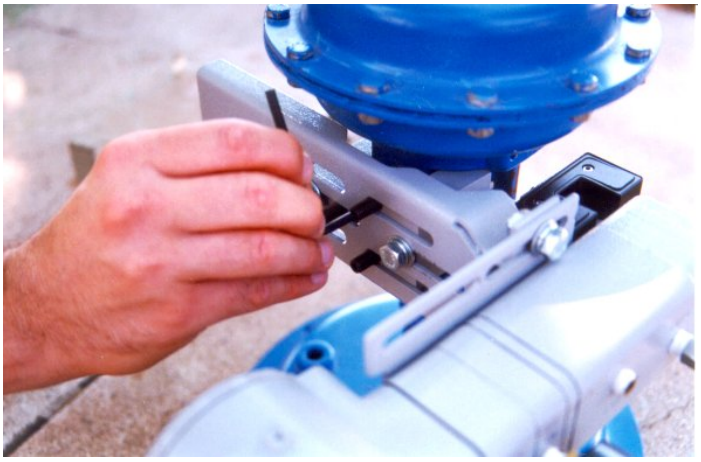
ATTENTION:
A minimum distance of 2mm and a maximum distance of 4mm is recommended between the magnet external face and the positioner face. For that, a centralizer device (linear or rotary) must be used. The centralizer device is in the positioner packing.

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.



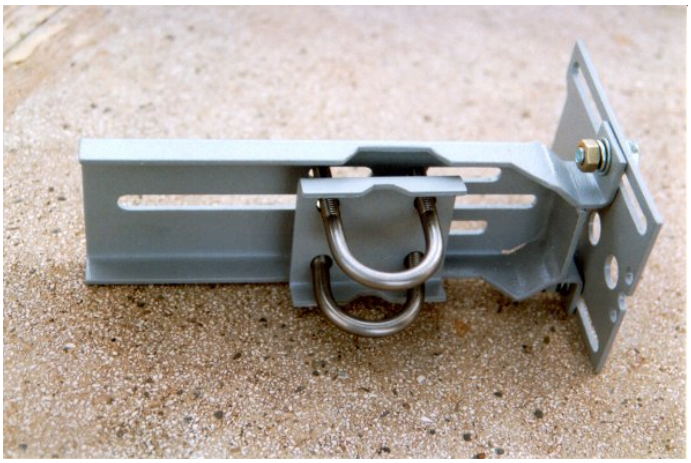
14 - Tighten the bolts to fasten the clamps to the yoke.

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.

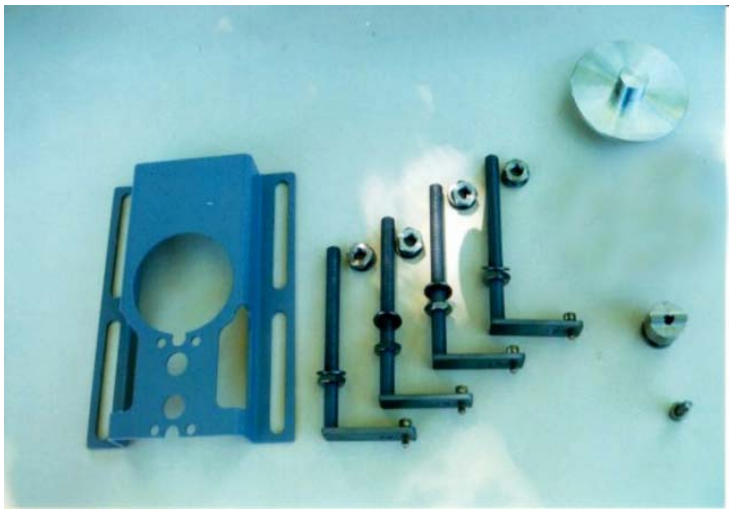


16 – After assembling the U-clamps, follow the steps 8 to 13.

ROTARY VALVE POSITIONER BRACKET

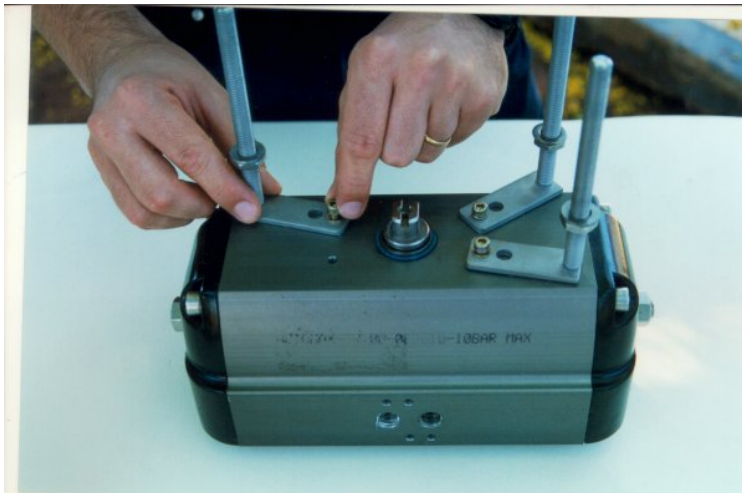
MOUNTING INSTRUCTIONS

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.



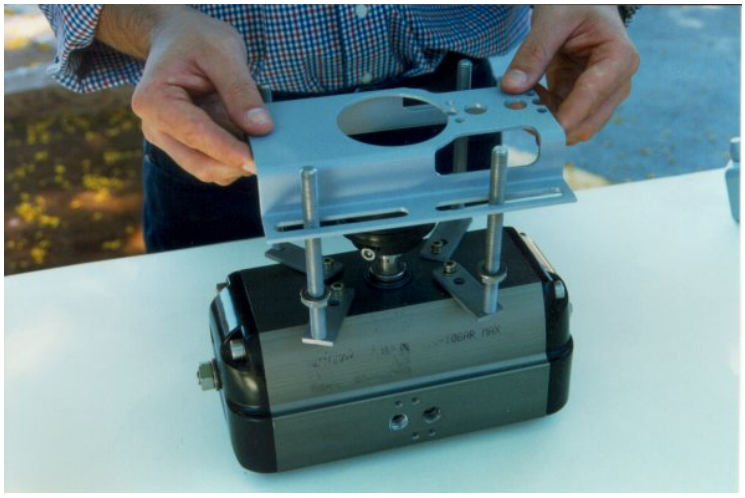
2- Attach the magnet bracket to the Actuator extremity (NAMUR).

The end the valve shaft must comply with Namur Standard.

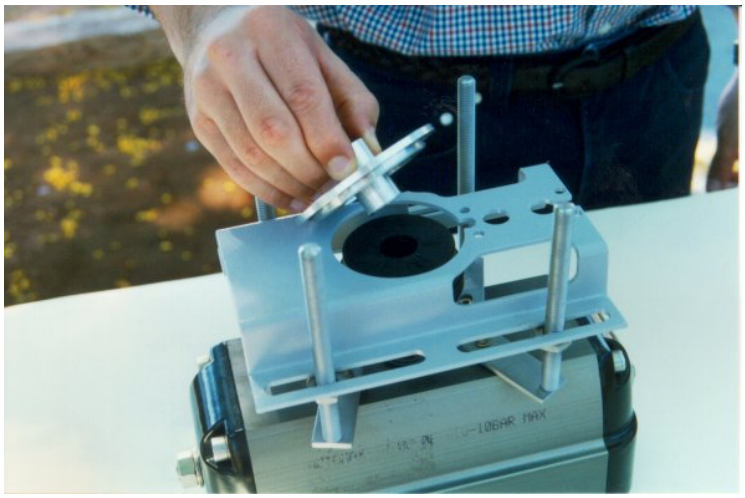
3 – Fasten the hex screw.

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.



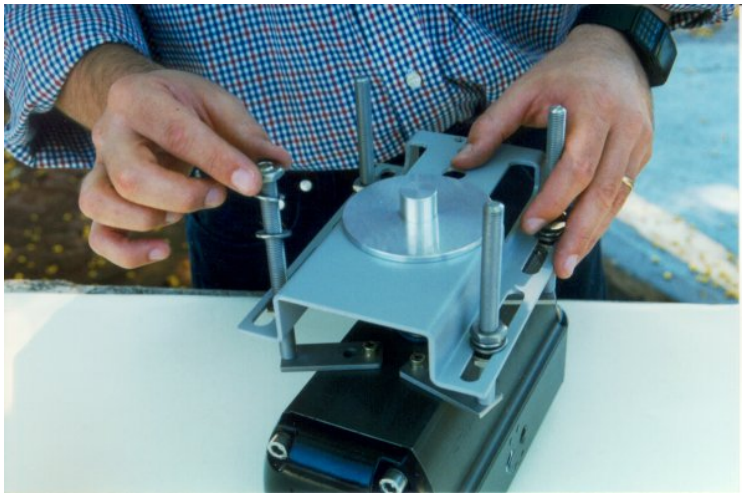
6 – Use the centralizer gadget to get the bracket centralized with the magnet.



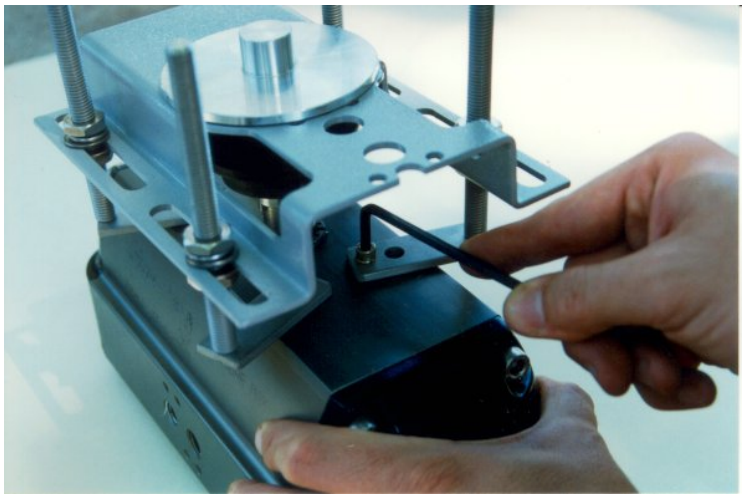
7 – Adjust the positioner bracket using the centralizer gadget and the nuts to get the height.

8 – Place the nut and washers.

Do not fasten the nuts completely.

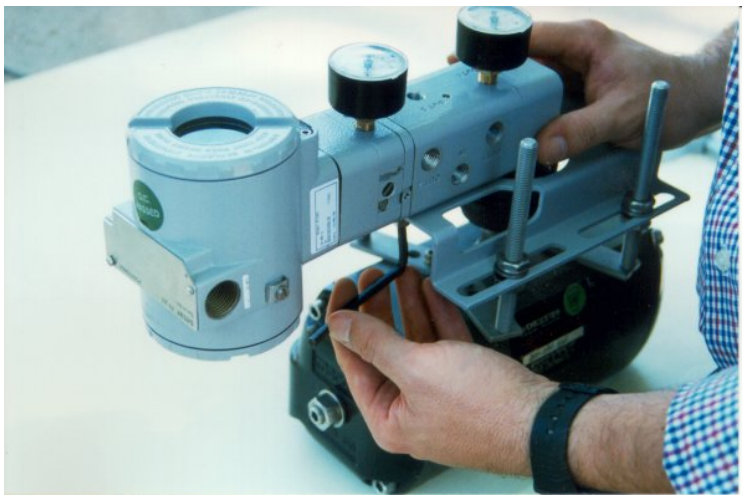


9 – Tighten the clamp bolts to fasten them to the actuator.

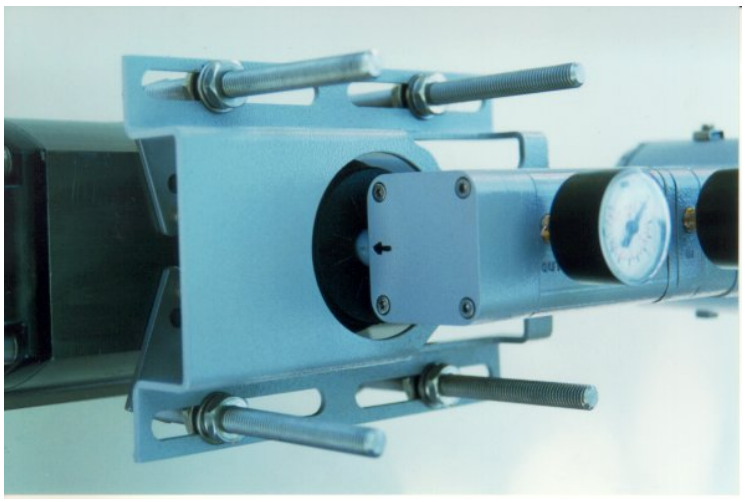


10 – Fasten the positioner bracket bolts to the clamps fastening.

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.