# 600T EN Series

## Pressure Transmitter

# ADDENDUM for PROFIBUS® PA Version

**Valid for 600T_EN_PA Profile 2.0**

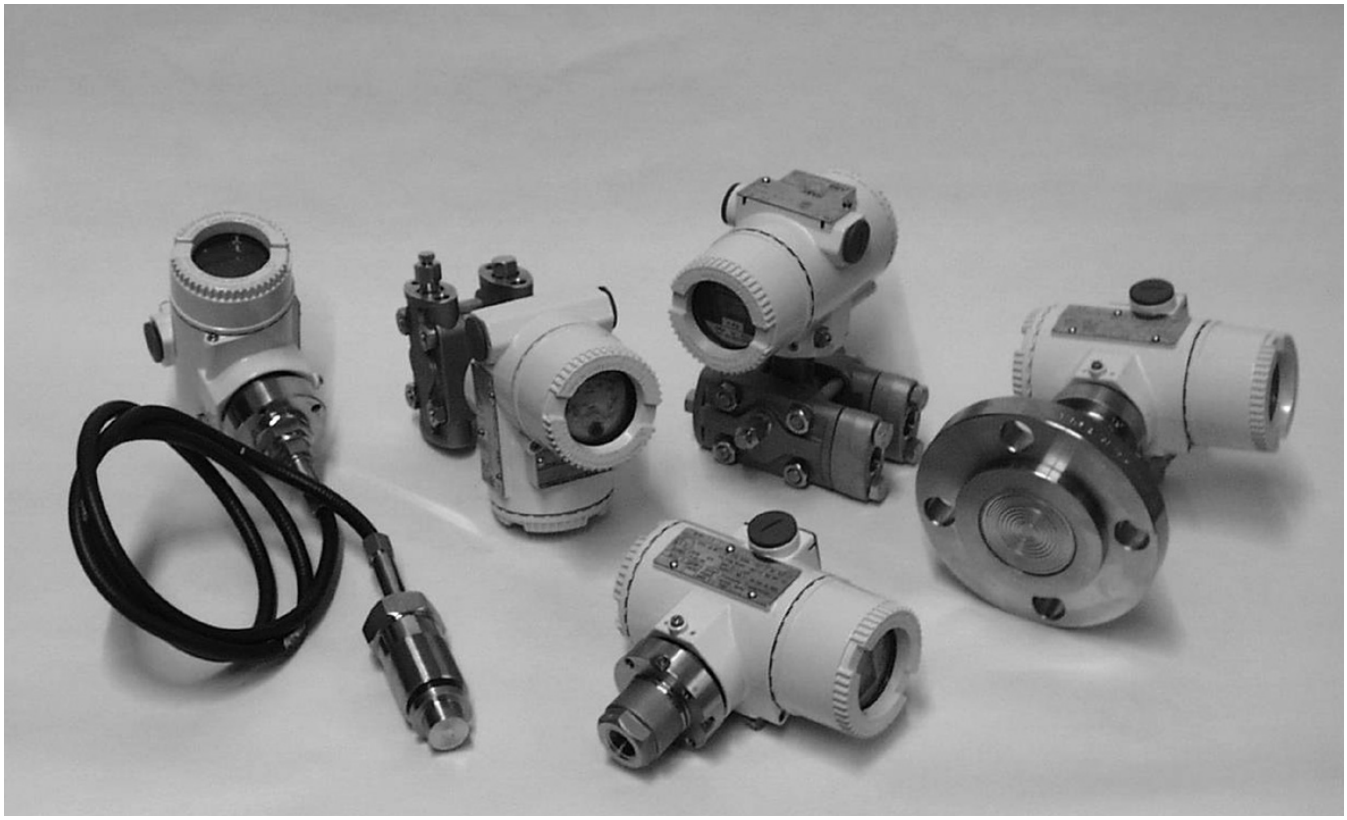


**ABB Instrumentation**

**INDEX:**

**ACRONYMS**

- LCD - **L**iquid **C**rystal **D**isplay
- CPU - **C**ontrol **P**rocess **U**nit
- DSP - **D**igital **S**ignal **P**rocessing
- DTM - **D**evice **T**ype **M**anagement
- PA - **P**rocess **A**utomation
- H1 - Low Speed Fieldbus Segment
- DP - **D**ecentralised **P**eriphery
- DPE - **D**ecentralised **P**eriphery **E**xtended
- ASIC - **A**pplication **S**pecific **I**ntegrated **C**ircuit
- PC - **P**ersonal **C**omputer
- AIFB - **A**nalog **I**nput **F**unction **B**locks
- PB - **P**hysical **B**lock
- TB - **T**ransducer **B**lock
- I.S. - **I**ntrinsically **S**afety

## Preamble

In order to make easier the description, all the variables mentioned in this document are written with the suffix PB or TB or AIFB indicating the block into where the variables are mapped.

## 1. – Profibus PA Fieldbus Definition

PROFIBUS® PA Fieldbus is an all-digital, serial, two-way communication system that serves as a Local Area Network (LAN) for factory/plant instrumentation and control devices.

PROFIBUS® Fieldbus is a CENELEC Standard EN50170-2 and include Profibus FMS, DP and PA in accordance with the DIN Standard 19245 Part 1, 2 and for the PA application 19245 part 3 as DPE.

For interoperability purposes the PROFIBUS® Organisation defined the Standard Profiles for PA devices of 'Class A' and more detailed of 'Class B'.

Detailed information of the Profibus fieldbus is available read on the WebPage of the PROFIBUS PNO (www.profibus.com) and/or from the ABB WebPage (www.abb.com)

## 2. – Device Introduction

### 2.1 – General Considerations

The 600T EN Pressure Transmitter Series include a complete line of differential, absolute and gauge pressure transmitters used also for level, flow and volume applications.
In addition, 600T EN series offers the most complete line of remote seal forms and wetted materials in the industry; different process and application matching fill fluids cover the widest process temperature range.
The series is covered by multiple agency safety approvals (including ATEX and FM) supported by intrinsically safe and explosion proof designs, for a full compliance to hazardous area requirements.

The 600T EN PA version differs by the traditional 4-20 mA version only in the secondary electronic and in the Terminal block[1]. The transducer with its own primary electronic has to be considered the common part of all the different Transmitter versions (Hart, Profibus, and FF). This feature offers the possibility to replace on the same transmitters different electronics with the plug and play capability.

[1] Anyway the standard Terminal Block, without surge protector, can be used also for the Profibus PA application connecting the PA bus cable to the +/- terminals. **The polarity has not consistency.**

## 2.2 – Profibus PA version Considerations

The 600T EN PA is a compact slave device including 1 Physical Block, 1 Analog Input function blocks and 1 Pressure Transducer Block. The 600T_EN PA is suitable for the measurement of Pressure (Gauge, Absolute, Differential) in accordance with the Profile 2.0 for Pressure transmitters [Data Sheet Transmitter section 2.2 Pressure (Ref. 2)], and for the measurement of Flow, Level and Volume as manufacturer specific implementation.

The 600T EN PA implements all the services defined for the Profibus DP standard plus in addition the services defined for the DPE standard as extension of the DP in order to satisfy the PA requirements.

**Here is a summary of the Profibus PA functionality implemented in the 600T EN PA:**

- **1 Physical Block**
  This block identifies the transmitter and includes characteristics of the instrument connected at the fieldbus like Model, Serial Number, Manufacturer and so on. Only 1 Physical Block can be present in each device.
- **1 Standard Analog Input Function Block**
  Inside the Function blocks are contained the information/parameters relating the Process Control. Each Function Block type provides specific functionality.
- **1 Pressure Transducer Block**
  In this block are contained the information relating the 600T EN sensor like Model, Calibration, Physical Limits or Construction, and setting about how to convert the measured Pressure to Flow, Level or Volume measurement.
- **DP Services supported:**
  - Set Slave Address
  - Slave Diagnosis
  - Get Configuration
  - Check Configuration
  - Set Parameters
- **DPE (PA) Services supported**
  - **Initiate**
  - **Abort**
  - Read variable
  - Write Variable
  - Data Transport

  Only for factory use:
  - Physical Read
  - Physical Write

## 2.3 – PROFIBUS® Certification Details

PROFI PROCESS FIELD BUS

**Certificate**

PROFIBUS Nutzerorganisation e.V. grants to

**ABB Kent-Taylor spa**
**Via Statale, 113, I-22016 Lenno (Co)**

the Certificate No.: **Z00406** for the following product:

**Name:** **600T**
**Model:** **PROFIBUS-PA Pressure Transmitter**
**Revision:** **HW: REVISION @1.00@**
**SW: REVISION @1.00@**

This certificate confirms that the device has successfully passed the conformance tests for PROFIBUS-PA Slave devices.

The tests were executed at Forschungszentrum Informatik in Karlsruhe which is an authorised test laboratory of PROFIBUS Nutzerorganisation. The detailed test procedure and the test results are recorded in the inspection report FZI/PA-Slave 503/1/1.

This certificate is granted according to the PNO guideline for testing and certification (PRZ) dated January 1, 1993 and is valid for 3 years, i.e. until October 8, 2001.

Karlsruhe, October 9, 1998

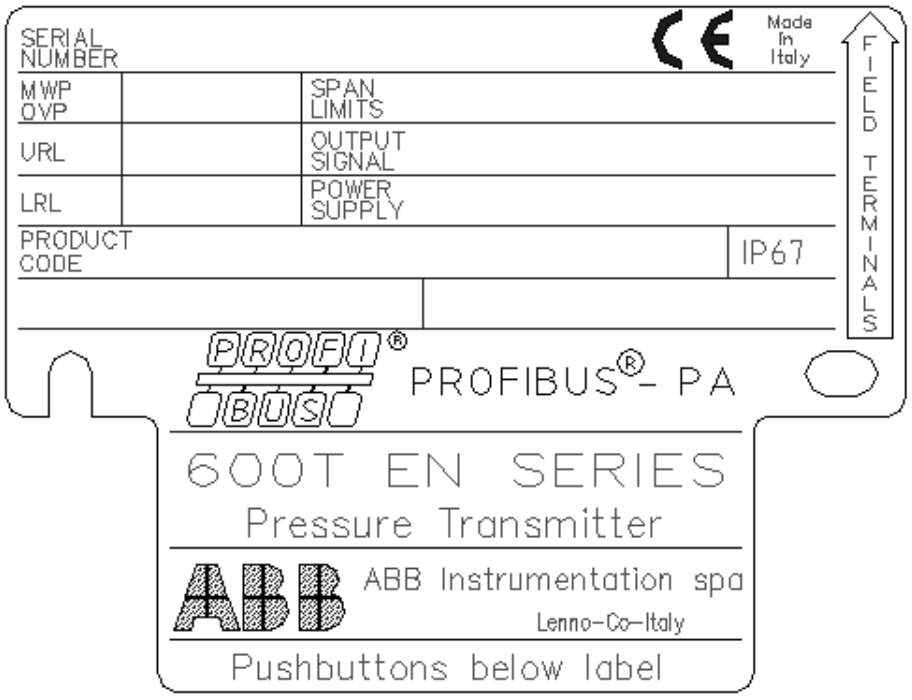
PROFI

(Official in Charge)

Board of PROFIBUS Nutzerorganisation e. V.

(E. Küster) (K.-P. Lindner)

## PROFIBUS® PA Type Plate




## 3. – Hardware Characteristics

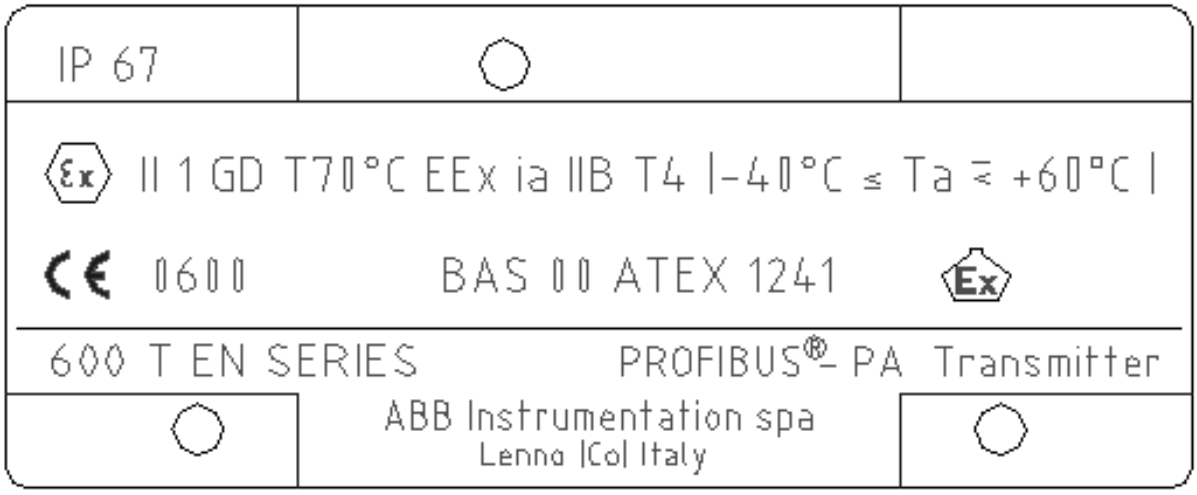
### 3.1 – Environmental Protection

The 600T EN PA Pressure transmitter is an integrated electronic designed for I.S. application. In the Table A are listed the Certifications of the 600T EN PA.

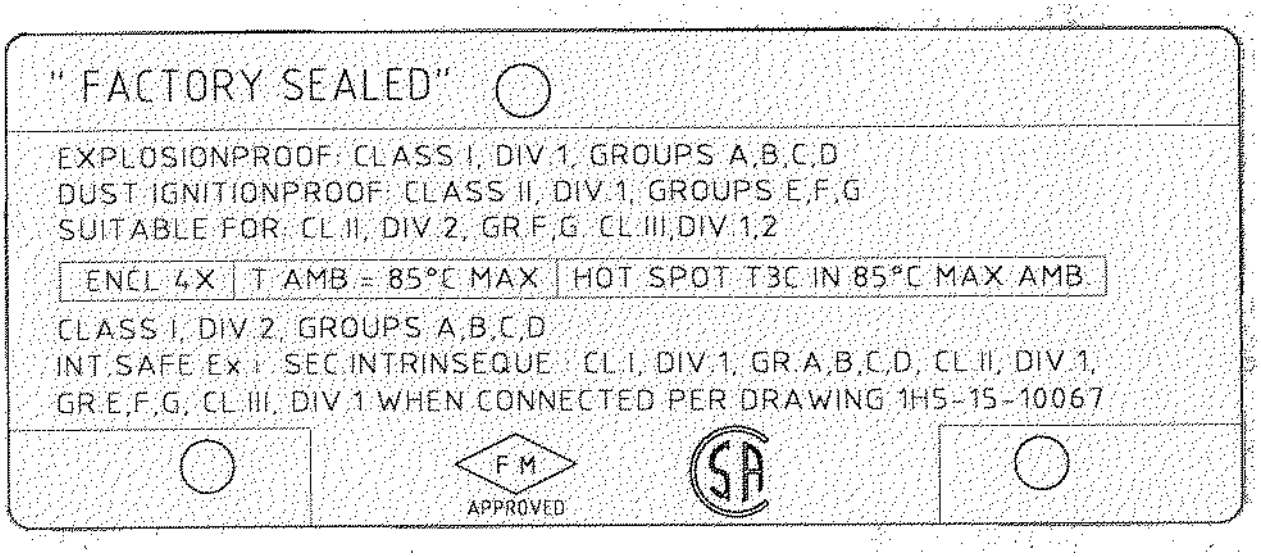
**TABLE A**

| | | | |
|---|---|---|---|
| EUROPE | ATEX/BASEEFA | EC-Type Examination Certificate n° BAS 00ATEX 1241 | II 1GD T50°C, EEx ia IIB T4 (-40°C ≤ Ta ≤ +60°C) |
| NORTH AMERICA | CSA & FM | Explosionproof: Class I, Div.1, Groups A, B, C, D | |
| | | Dust Initionproof: Class II, Div.1, Groups E, F, G | |
| | | Suitable for: Class II, Div.2, Groups F, G; Class III, Div.1, 2 | |
| | | Nonincendive: Class I Div.2, Groups A, B, C, D | |
| | | | |
| | | Intrinsically safe: Class I, II, III, Div.1, Groups A, B, C, D, E, F, G | |

**EUROPE CERTIFICATION LABEL**




**NORTH AMERICA CERTIFICATION LABEL**




## 3.2 – Fault Protection

This electronic implements also an especial circuitry for the fault current protection. Whenever a fatal failure occurs and the current consumption increase over the 16 mA, this circuitry provides to disconnect the device from the bus, in order to save the good functionality of the other connected devices that otherwise would be switched off due to the missing power available.

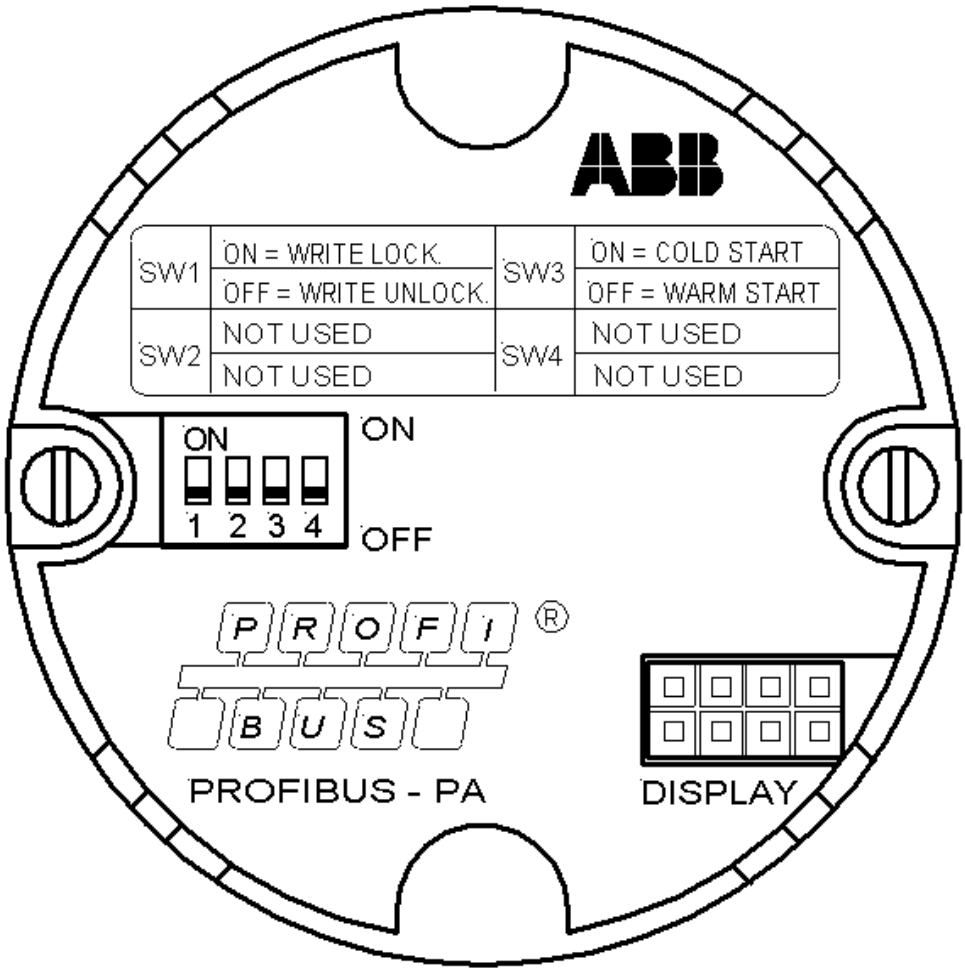
## 3.3 – Hardware Settings

On the electronic, below the Local Display when installed, there are available 4 DIP switches, see the Figure 1, with the following functionality:

- **Write Locking:**
  SW1 in ON position enables the Write Locking condition. The attempts to change the configuration of the device are refused.
- **SW 2 not used.** (For Future use)
- **Cold Start**
  SW 3 in ON position enables the Cold Start-up. A Cold Start-up feature is available in order to initialise all the parameters requiring a well-defined value, with the default values. This operation can be performed setting the Cold Start-up switch 3 in the ON position before to power on the device, Many variables of the AIFB and TB are properly set with values strictly related to the connected transducer type

- **SW 4 not used.** (For future use)

**Figure 1: Electronic Front View:**




## 3.4 – Local Display

The 600T EN PA Pressure Transmitter is available with an integral display as optionally item; see the Figure 2. This integral display offers the possibility to display the selected variable or diagnostic strings whenever failure and/or warnings are detected.
The variable to be displayed is user selectable among several variables produced in the TB as well as the Function Blocks output in Engineering Value[3], or its percentage.

The variable to be displayed is selected writing the right code in the PB_LCD_SEL. See section 7 in the Physical Block table.
-At the start-up, during the initialisation phase, the display appears with all the segments lit on.
-At the end of the initialisation appears the string 'ADDR' and after 1 second the 3 digits number representing the device address (3 digits). The same displaying sequence occurs at every change of the device address from a remote Master (Configuration Tool).
-When the transmitter works correctly, the variable selected in the PB_LCD_SEL is displayed together with the unit code, and it is updated every 0.5 seconds.
-When some malfunctions are detected on the display appears one of the following diagnostic string sequences:
'SNSR' and after 0.5 seconds 'FAIL' when a sensor fail has been detected.
'ELEC' and after 0.5 seconds 'FAIL' when an electronic fail has been detected.

[3] The today's display allows the displaying of Pressure Unit code only.

'TEMP' and after 0.5 seconds 'FAIL' when the sensor for the sensor temperature to be used as compensation variable is failed. This is a Warning indication

'STAT' and after 0.5 seconds 'FAIL' when the sensor for the static pressure to be used as compensation variable is failed. This is a Warning indication.

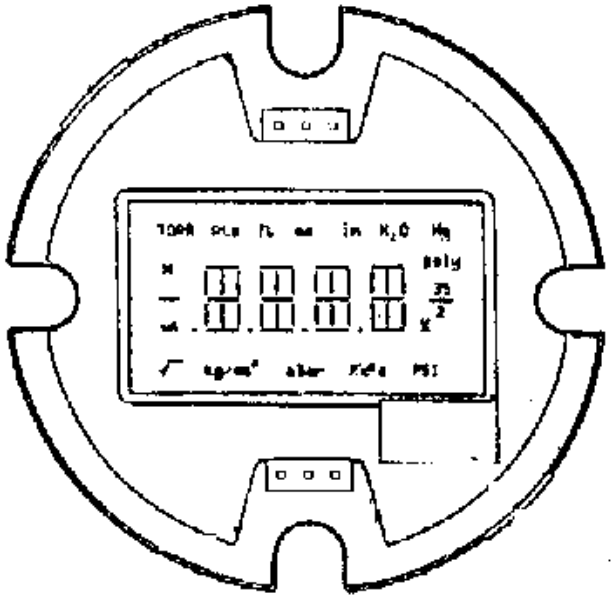
-Depending by some operating condition of the device there could be additional string sequences like:

'SIM ' and after 0.5 seconds 'MODE' when the device is set in simulation mode.

'OUT ' and after 0.5 seconds 'SERY' when the Function Block has been set in Out of Service mode.

The display acts also as feedback of the operations performed with the external push buttons, for additional display indications see the next section 3.5 Local Adjustment.

**Figure 2: Integral Local Display**



## 3.5 – Local Adjustment

The two external push buttons, see the Figure 3, have the following functions.

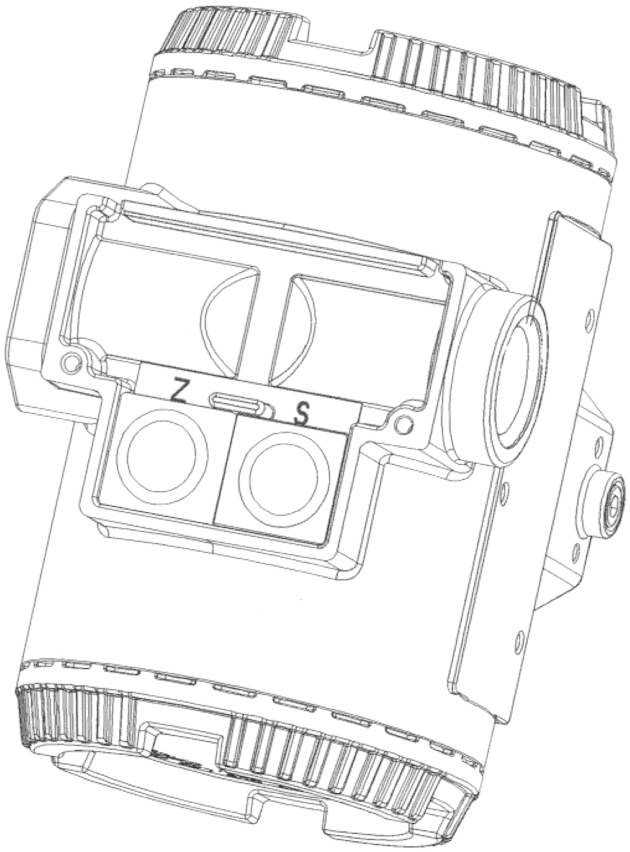
- The 'Z' key performs the 'Zero Alignment' operation. With this operation the TB_TRIMMED_VALUE indication is automatically adjusted to 'zero'. Whenever the user wants to set the measure produced by the transmitter to 'zero' (i.e. when the measure is different by 'zero' due to the installation position) the following sequence of operations are required by the user acting on the local push button:

  When the 'Z' button is kept rotated for more than 1 second, when released, the 'Zero Alignment' operation is executed adjusting to 'zero' value the TB_TRIMMED_VALUE and automatically setting to 'zero' also the TB_CAL_POINT_LO as Calibration Point Low.

  As consequence of the operation, the feedback appearing on the display is one of the following string sequences:
  - 'ZERO' and after 1 second 'PASS' when the operation was OK.
  - 'ZERO' and after 1 second 'FAIL' when the operation was not OK
  - 'ZERO' and after 1 second 'PROT' when the security-locking switch 1 is in ON position (Write Protection).
  - 'ZERO' and after 1 second 'DSBL' when the Local operations are disabled (see PB_LOCAL_OP_ENA in the Physical Block).

- The 'S' key is dedicated to the setting of the slave address. When kept rotated, on the display appears first the actual address, and every 0.5 seconds it is incremented in a range between 0 to 126. When the key is then released, the feed-back appearing on the display is one of the following string sequences:
  - 'ADDR' and after 1 second 'PASS' when the setting was accepted.
    **In this case the address selected became active only after a new Power-up of the device.**
  - 'ADDR' and after 1 second 'PROT' when the security-locking switch 1 is in ON position (Write Protection).

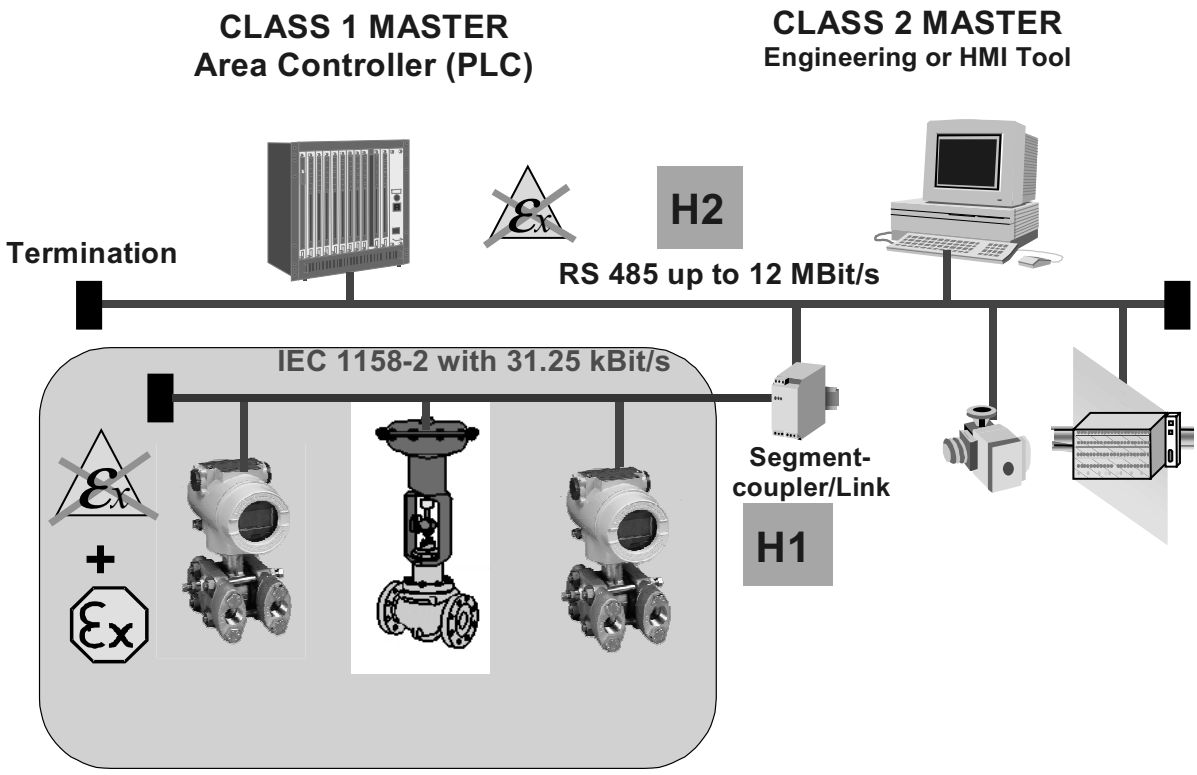
**Figure 3: Push Buttons View**



## 4. – Network Architecture

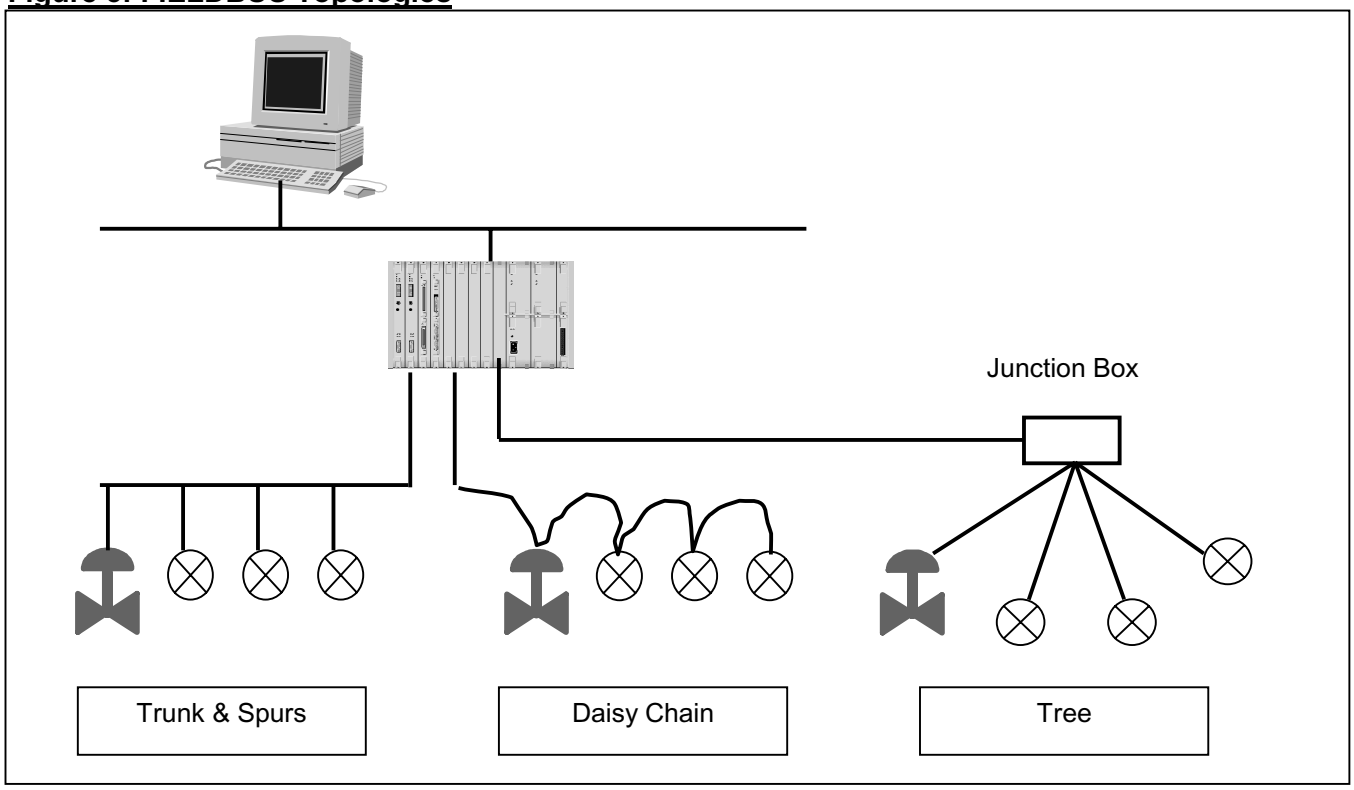
A simple and common Profibus system is here following represented in Fig.4. The H2 side is the high-speed segment in Profibus DP and applicable only in not Ex area[2]. The Segment Coupler equipment converts the Profibus DP in Profibus PA, H1 low-speed, as segment suitableble for Ex and not-Ex area. The Class 1 Master is the PLC/DCS dedicated to the Process Control. It provides to read and write the cyclic variables of the slave devices as described in the GSD file (in the keyword 'Module'). The Class 2 Master (SmartVision, PDM, other), acts as maintenance and configuration tool accessing at the acyclic variables of the slaves.
Only the H2 segment supports the redundancy.

**Figure 4: Simple PROFIBUS® fieldbus System**




[2] Today there are available on the Market I.S.Barriers for the DP segments extension in Ex area.

**Figure 5: FIELDBUS Topologies**




In the Table B below are summarised some fieldbus characteristics.

**TABLE B**

| Parameters | Specifications | |
|---|---|---|
| Data Rate | 31.25 Kbits/s | |
| Type | Voltage | |
| Topology | Bus/Tree | |
| Bus Power | Dc | |
| Intrinsically Safe | No | Yes |
| Max Number of Devices (1) | 32 | 6 |
| Max Cable length (2) | 1900 m | |
| Max Spurs length (3) | 120 m | |

(1) The number of devices is strictly dependent by factors like the device power consumption, Type of cable used, additionally accessory devices such as repeaters and so on.
(2) The maximum length includes the bus plus all the spurs length. The cable Type 'A' (#18 AWG 0.8 mm²) twisted pairs cable allows the maximum length of 1900 m.
(3) The maximum Spur length is 120 m when only 1 device is connected. Any additional device reduces of 30 m the maximum Spur length.

The 600T EN PA has the following power requirements:

Current consumption =10.5 mA ± 1 mA
Power Supply non Ex = 10.5 to 32 VDC
Power Supply Ex = 10.5 to 15 VDC

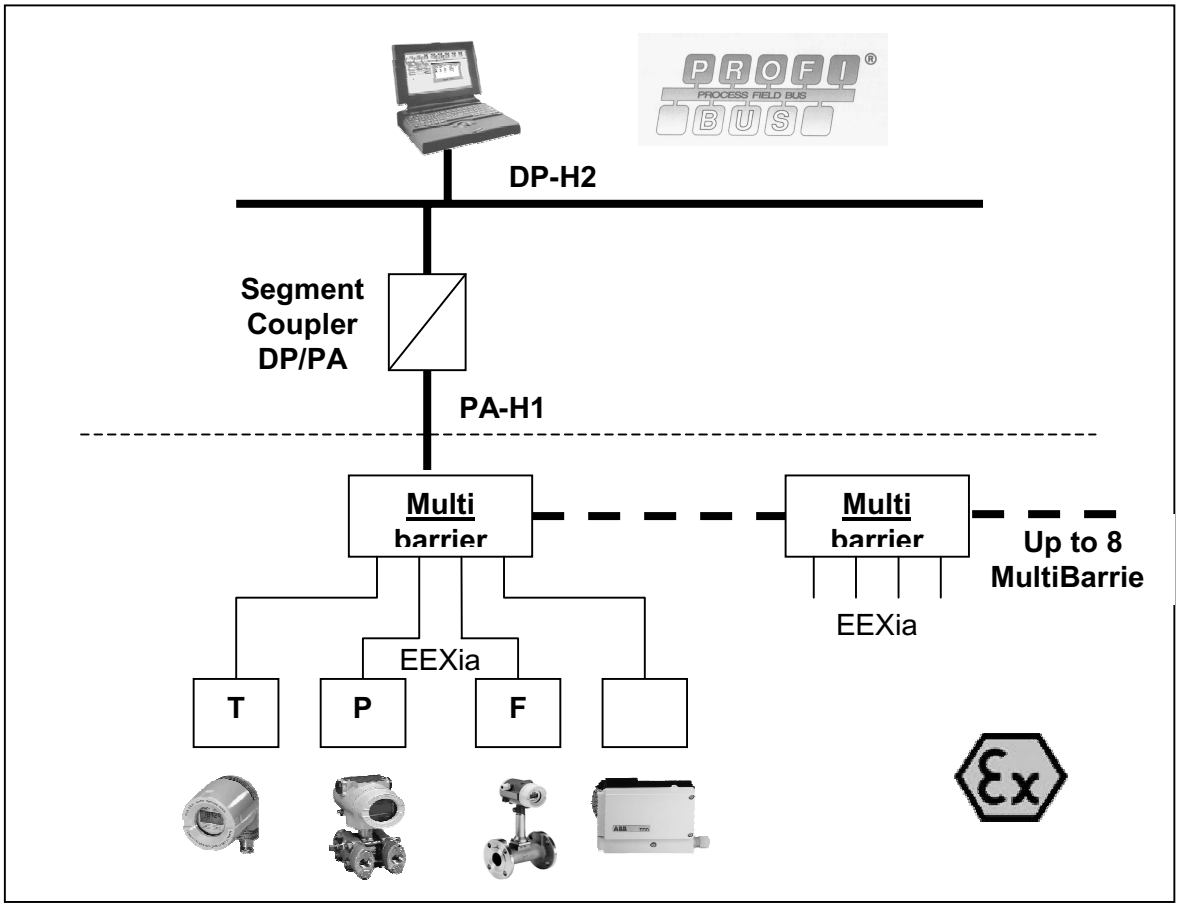
Generally for the 600T EN PA it is possible to consider:

About 10 transmitters connected on one segment for EEx ia applications **.
Max. 32 transmitters connected on one segment for non EEx applications

**** The number of 600T EN PA transmitters connected on one segment for EEx ia applications can be increased when used in conjunction with the ABB Multibarrier MB204.**

It is possible to connect up to 8 multibarrier MB204 on one EEx ia segment and on each multibarrier is possible to connect up to 4 transmitters. See an example of segment with Multibarrier in the Figure 6.

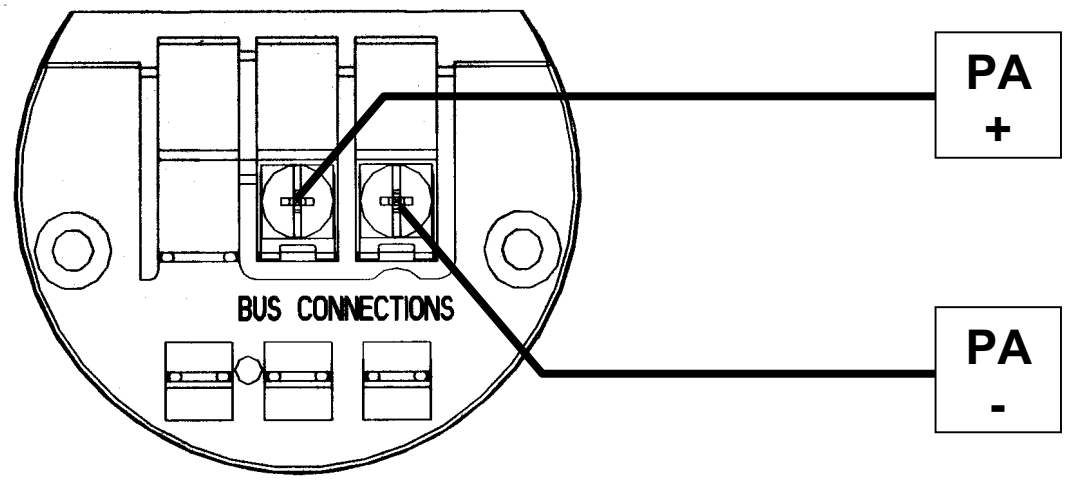
**Figure 6: Profibus PA-H1 Segment with Multibarrier**



## 4.1 – Electrical Connections

The 600T EN PA is a Bus Powered device with Profibus communication output. On the terminal block two screws for the BUS CONNECTION are available, see the Figure 7.
**The Polarity has not consistency, so the two bus cables can be connected without take care about the polarity.**

**Figure 7: Terminal Block**




The special Profibus PA bus connector is also available as optional item for the 'quick connection' of the transmitter to the bus.

If necessary the ground terminal could be also connected. For details about the connections and installation refers to Profibus website (www.Profibus.com)

## 5. – Initialisation

At the power up, the 600T EN PA executes some internal self-test. Both the Hardware and the memory contents are checked before to start the normal operations.
During this phase, on the display all the segments remain lit on for few seconds until the initial testing is complete. After that, depending by the test result, on the display appears the selected variable (PB_LCD_SEL) when all is OK or the diagnostic string when some failure has been detected.

**By default the 600T EN PA starts as PRESSURE Transmitter and the AIFB_OUT produces the Pressure Measurement**

The user can select different PB_MEAS_TYPE in order to use the 600T EN PA as FLOW, LEVEL or VOLUME measurement. Depending by the selected PB_MEAS_TYPE, The table C below gives a summary of the relation between the type of the selected measurement and the available variables produced by the TB.
The TB_PRIMARY_VALUE represents (the grey line) the variable in output from the Transducer Block and in input to the AIFB.

**Table C:**

| | TYPE OF MEASURE (PB_MEAS_TYPE) | | | |
|---|---|---|---|---|
| | **Pressure** | **Flow** | **Level** | **Volume** |
| **TB_PRIMARY_VALUE** | Pressure | Flow | Level | Volume |
| **TB_AUX_VAL_1** | Sensor Temp | Sensor Temp | Sensor temp | Sensor Temp |
| **TB_SEC_VAL1** | | Pressure | Pressure | Pressure |
| **TB_SEC_VAL2** | | | | Normalised Pressure |
| **TB_AUX_VAL_2** | Static Pressure | Static Pressure | Static Pressure | Static Pressure |

## 6. – Device Addressing

The default address for the Profibus devices is defined by the specification as 126. When the user needs to change the slave address, as required by the plant, he can do this in different ways:

- Locally, acting on the 'S' key and using the feed-back on the display.
- From remote station (Master of Class 2) with the Slave_Change_Address service.
- From remote station (Master of Class 2) writing on the dedicated location PB_DEV_ADD in the Physical Block trough the DPE Write service.

Before to perform the Remote operations it is necessary to establish a first connection with the device still having the old address. The start-up of the device with the cold start condition set, force the address to be set to 126.

## 7. – Device Configuration

The 600T EN PA Pressure Transmitter offers a set of variables available trough the Profibus communication. The variables can be accessed by the Master for configuration and maintenance purposes with Read and Write operations each addressed by two bytes as specified by the Profibus DPE Protocol (Ref. 4) so called Slot and Index mechanism. The relative index of each variable is defined by the Profile Standard but the numbers of the Slots containing up to 255 indexes are not defined but Manufacturer Specific. For our application we use a compact mapping approach with more blocks in one Slot:

- Physical Block as Slot n° 1
- Function Block as Slot n° 1
- Pressure Transducer Block as Slot n° 1

The Profile Standard defines also the Device Management Block containing, in a well defined way, the description about how the device is mapped for the communication perspective. The Device Management Block collects all these information in the Slots 0 to 7 reserved for this scope. Refer to the Mapping of the Profile to Profibus-DP document (Ref. 3) in the Profibus Profile document:

The list of the variables available on the Profibus communication are reported in the following tables with the relevant block where:
IDX = Relatve Index of the Variable
PC = Allowed type of access for the variables.
For details about the meaning of each single variable refer to the Profibus Profile of Class 'B' devices divided in the General Requirements Document (Ref. 1) and in the Data Sheet Transmitter Document section Pressure (Ref. 2).

# DEVICE MANAGEMENT

**SLOT – 1**

| IDX | Name | Description | Bytes | PC | DEF | NOTE |
|---|---|---|---|---|---|---|
| 0 | DIR_OBJ_HEAD | Directory Object Header | 12 | R | | |
| 1 | COMP_LIST_DIR_ENTRY<br>+<br>COMP_DIR_ENTRY | Composite List Directory Entries<br><br>Composite Directory Entries | 24<br>(12+12) | R | | |

**DIR_OBJ_HEAD**

| Dir_ID | Rev_number | Num_Dir_Obj | Num_Dir_Entry | First_Comp_ List_Dir_ Entry | Num_Comp_ List_Dir_ Entry | Extension for Future Use |
|---|---|---|---|---|---|---|
| 0x0000 | 0x0001 | 0x0001 | 0x0006 | 0x0001 | 0x0003 | |

**COMP_LIST_DIR_ENTRIES**

| Start_PB Index/Offset | Num_PB | Start_TB Index/Offset | Num_TB | Start_FB Index/Offset | Num_FB |
|---|---|---|---|---|---|
| 0x0104 | 0x0001 | 0x0105 | 0x0001 | 0x0106 | 0x0001 |

**COMP_DIR_ENTRIES**

| PB Slot/Index | Num_PB parameters | TB Slot/Index | Num_TB Parameters | FB Slot/Index | Num_FB Parameters |
|---|---|---|---|---|---|
| 0x010E (1/14) | 0x001E (30) | 0x0150 (1/80) | 0x003E (62) | 0x01A0 (1/160) | 0x001A (26) |
| PB_ID = 1 | | TB_ID = 1 | | FB_ID = 1 | |

# PHYSICAL BLOCK

| SLOT – 1 | | | | |
|---|---|---|---|---|
| **Idx** | **Name** | **N° byte** | **PC** | **Description** |
| **14** | **PHY_BK_OBJ** | 20 | R | In the Block Object data structure, there are different items describing the block characteristics. Execution period, Number of parameters in the block, the DD Revision, Profile Revision, View Objects characteristics and so on |
| **15** | **ST_REV** | 2 | R | The revision level of the Static data associated with the Function Block. The revision level is incremented each time a static parameter value in the block is changed. |
| **16** | **TAG_DESC** | 32 | R/W | The user description of the intended application of the block |
| **17** | **STRATEGY** | 2 | R/W | The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block. |
| **18** | **ALERT_KEY** | 1 | R/W | The identification number of the plant unit. This information may be used in the host for sorting alarms, etc. |
| **19** | **TARGET_MODE** | 1 | R/W | The selected mode from the operator. (Only AUTO Permitted) |
| **20** | **MODE_BLK** | 1 | R | Actual – The mode the block is currently in. |
| | | 1 | R | Permitted – Allowed modes that the target may take on |
| | | 1 | R | Normal – The common mode for the Actual. |
| **21** | **ALARM_SUM** | | | The alert status associated to the function block |
| | | 2 | R | Current |
| | | 2 | R | Unacknowledged |
| | | 2 | R | Unreported |
| | | 2 | R | Disabled |
| **22** | **SW_REV** | 16 | R | Software Revision. |
| **23** | **HW_REV** | 16 | R | Hardware Revision. |
| **24** | **DEV_MAN_ID** | 2 | R | Manufacturer Identification number. For ABB is the same of Hart:<br>**26 dec. or 1A Hex** |
| **25** | **DEV_ID** | 16 | R | Identification/description of the location, position where the transmitter is in the plant |
| **26** | **DEV_SER_N** | 16 | R | Serial Number of the transmitter |
| **27** | **DIAGNOSIS** | 4 | R | Diagnostic information. PNO definition |
| **28** | **DIAGNOSIS_EXT** | 6 | R | Diagnostic information extended. Manufacturer definition |
| **29** | **DIAGN_MASK** | 4 | R | Diagnosis Mask. Only the supported information are set |
| **30** | **DIAGN_MASK_EXT** | 6 | R | Diagnosis Mask extension. Only the supported information are set |
| **31** | **DEV_CERT** | 16 | R/W | Type of certifications the transmitter fulfil |
| **33** | **FAC_RESET** | 2 | R/W | Allows a manual restart to be initiated. Several degrees of restart are possible, they are:<br>**1** Load Default Parameters<br>**2** Software Reset<br>**3** Reset to the Factory Sensor Trimming |
| **34** | **VIEW_1** | 2 | R | Used for read more information with only one communication. |
| **44** | **DESCRIPTOR** | 32 | R/W | Used for user descriptions |
| **45** | **DEV_MESS** | 32 | R/W | Used for user messages |
| **46** | **DATE** | 8 | R/W | Used for user date |
| **MANUFACTURER SPECIFIC PARAMETERS** | | | | |
| **64** | **KEYS_EN** | 1 | R/W | Enable/Disable the Local key operations:<br>**0** Enable<br>**1** Disable |

| | | | | |
|---|---|---|---|---|
| **65** | **LCD_INST** | 1 | R | Indication of the installation of the local display<br>**0** Not Installed<br>**3** Integral Digital |
| **66** | **LCD_SEL** | 1 | R/W | Selection of the variable to be displayed on the local display<br>**0** Process Variable<br>**3** Percent of Range. |
| **67** | **DEV_ADD** | 1 | R/W | Profibus Node address of the transmitter. Default address = 126 |
| **68** | **PR_CODE_1** | 16 | R/W | Transmitter product code. The same printed on the type plate |
| **69** | **PR_CODE_2** | 16 | R/W | Remote seal side H code |
| **70** | **PR_CODE_3** | 16 | R/W | Remote seal side L code |
| **71** | **MEAS_TYPE** | 1 | R/W | Type of Measurement the transmitter has to produce:<br>**0** Pressure Measurement<br>**2** Level Measurement<br>**3** Flow Measurement<br>**6** Volume Measurement |
| **73** | **PRIV_REV** | 1 | R | Internal Software Revision |

# ANALOG INPUT FUNCTION BLOCK

**SLOT – 1**

| Idx | Name | N° byte | PC | Description |
|---|---|---|---|---|
| **160** | **FNC_BK_OBJ** | 20 | R | In the Block Object data structure, there are different items describing the block characteristics. Execution period, Number of parameters in the block, the DD Revision, Profile Revision, View Objects characteristics and so on |
| **161** | **ST_REV** | 2 | R | The revision level of the Static data associated with the Function Block. The revision level is incremented each time a static parameter value in the block is changed. |
| **162** | **TAG_DESC** | 32 | R/W | The user description of the intended application of the block |
| **163** | **STRATEGY** | 2 | R/W | The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block. |
| **164** | **ALERT_KEY** | 1 | R/W | The identification number of the plant unit. This information may be used in the host for sorting alarms, etc. |
| **165** | **TARGET_MODE** | 1 | R/W | The selected mode from the operator. (AUTO, MAN, O/S are permitted) |
| **166** | **MODE_BLK** | 1 | R | Actual – The mode the block is currently in. |
| | | 1 | R | Permitted – Allowed modes that the target may take on |
| | | 1 | R | Normal – The common mode for the Actual. |
| **167** | **ALARM_SUM** | The summary alarm is used for all process alarm in the block. | | |
| | | 2 | R | Current |
| | | 2 | R | Unacknowledged |
| | | 2 | R | Unreported |
| | | 2 | R | Disabled |
| **170** | **OUT** | 4 | R | The block output value calculated as a result of the block execution, expressed in OUT_SCALE unit code |
| | | 1 | R | The block output status |

| | | | | | |
|---|---|---|---|---|---|
| 171 | PV_SCALE | 4 | R/W | High Range | All the values are associated with the channel input value |
| | | 4 | R/W | Low Range | |
| | | 2 | R/W | Unit Index | |
| | | 1 | R/W | Decimal point | |

**Code for Pressure**

| | | | | | |
|---|---|---|---|---|---|
| **1** | inches H2O | (20 deg. C) | **10** | Kilograms / centimeter^2 | |
| **2** | inches Hg | (0 deg. C) | **11** | pascal | |
| **3** | feet H2O | (20 deg. C) | **12** | Kilopascal | |
| **4** | mm H2O | (20 deg. C) | **13** | Torr | (0 deg. C) |
| **5** | mm Hg (0 deg. C) | | **14** | Atmosphere | |
| **6** | pounds / in^2 | | **237** | Megapascal | |
| **7** | Bar | | **238** | inches H2O | (4 deg. C) |
| **8** | millibar | | **239** | mm H2O | (4 deg. C) |
| **9** | grams / centimeter^2 | | **57** | Percent | |

**Code for Flow**

| | | | |
|---|---|---|---|
| **15** | cubic feet per minute | **26** | cubic feet per second |
| **16** | gallons per minute | **28** | cubic meters per second |
| **17** | liters per minute | **57** | percent |
| **18** | imperial gallons per minute | **130** | cubic feet per hour |
| **19** | cubic meter per hour | **131** | cubic meters per minute |
| **22** | gallons per second | **136** | gallons per hour |
| **24** | liters per second | **235** | gallond per day |

**Code for Volume**

| | | | |
|---|---|---|---|
| **40** | gallons | **43** | cubic meters |
| **41** | liter | **112** | cubic feet |
| **42** | imperial gallons | **236** | hectoliters |

**Code for Level**

| | | | |
|---|---|---|---|
| **44** | feet | **48** | centimeters |
| **45** | meters | **49** | millimeters |
| **47** | inches | | |

| | | | | | |
|---|---|---|---|---|---|
| 172 | OUT_SCALE | 4 | R/W | High Range | All the values are associated with the OUT. All the units code are available for this Scaling. |
| | | 4 | R/W | Low Range | |
| | | 2 | R/W | Unit Index | |
| | | 1 | R/W | Decimal point | |
| 174 | CHANNEL | 2 | R/W | The CHANNEL value is used to select the measurement value from the I/O block. On this version the Channel is always set to 0. | |
| 176 | PV_FTIME | 4 | R/W | Time constant of a single exponential filter for the PV, expressed in seconds. This is the time necessary for reach the 63% of the variation in input. | |
| 179 | ALARM_HYS | 4 | R/W | Amount the PV must return within the alarm limit before the alarm condition clears. Alarm Hysteresis is expressed as percent of the OUT_SCALE span. | |
| 181 | HI_HI_LIM | 4 | R/W | The setting of the High High Limit producing the High High Alarm. This value is expressed in OUT_SCALE Unit Code | |
| 183 | HI_LIM | 4 | R/W | The setting of the High Limit producing the High Alarm. This value is expressed in OUT_SCALE Unit Code | |
| 185 | LO_LIM | 4 | R/W | The setting of the Low Limit producing the Low Alarm. This value is expressed in OUT_SCALE Unit Code | |
| 187 | LO_LO_LIM | 4 | R/W | The setting of the Low Low Limit producing the Low Low Alarm. This value is expressed in OUT_SCALE Unit Code | |
| 190 | HI_HI_ALM | The HI HI Alarm data | | | |
| | | 1 | R | Unacknowledged | |
| | | 1 | R | Alarm State | |
| | | 8 | R | Time Stamp: The date and time of when the alert was generated | |
| | | 2 | R | Subcode | |
| | | 4 | R | Value: The date and time of when the alert was generated | |

| | | | | |
|---|---|---|---|---|
| **191** | **HI_ALM** | | | The HI Alarm data |
| | | 1 | R | Unacknowledged |
| | | 1 | R | Alarm State |
| | | 8 | R | Time Stamp: The date and time of when the alert was generated |
| | | 2 | R | Subcode |
| | | 4 | R | Value: The date and time of when the alert was generated |
| **192** | **LO_ALM** | | | The LO Alarm data |
| | | 1 | R | Unacknowledged |
| | | 1 | R | Alarm State |
| | | 8 | R | Time Stamp: The date and time of when the alert was generated |
| | | 2 | R | Subcode |
| | | 4 | R | Value: The date and time of when the alert was generated |
| **193** | **LO_LO_ALM** | | | The LO LO Alarm data |
| | | 1 | R | Unacknowledged |
| | | 1 | R | Alarm State |
| | | 8 | R | Time Stamp: The date and time of when the alert was generated |
| | | 2 | R | Subcode |
| | | 4 | R | Value: The date and time of when the alert was generated |
| **194** | **SIMULATE** | 1 | R/W | Simulate Status |
| | | 4 | R/W | Simulate Value |
| | | 1 | R/W | Simulation Enable/Disable bit |
| **200** | **VIEW_1** | 5 | R | Used for read more information with only one communication. |
| **MANUFACTURER SPECIFIC PARAMETERS** | | | | |
| **204** | **MAN_VALUE** | 4 | R/W | Manual Value of the OUT when Manual Mode is selected. Expressed as Percent of the OUT_SCALE Span |
| **205** | **O_S_VALUE** | 4 | R/W | Safe Value of the OUT when Out of Service Mode is selected or set. Expressed as Percent of the OUT_SCALE Span |

# PRESSURE TRANSDUCER BLOCK

## SLOT – 1

| Idx | Name | N° byte | PC | Description |
|---|---|---|---|---|
| 80 | TR1_BK_OBJ | 20 | R | In the Block Object data structure, there are different items describing the block characteristics. Execution period, Number of parameters in the block, the DD Revision, Profile Revision, View Objects characteristics and so on |
| 81 | ST_REV | 2 | R | The revision level of the Static data associated with the Function Block. The revision level is incremented each time a static parameter value in the block is changed. |
| 82 | TAG_DESC | 32 | R/W | The user description of the intended application of the block |
| 83 | STRATEGY | 2 | R/W | The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block. |
| 84 | ALERT_KEY | 1 | R/W | The identification number of the plant unit. This information may be used in the host for sorting alarms, etc. |
| 85 | TARGET_MODE | 1 | R/W | The selected mode from the operator. (Only AUTO is Permitted) |
| 86 | MODE_BLK | 1 | R | Actual – The mode the block is currently in. |
| | | 1 | R | Permitted – Allowed modes that the target may take on |
| | | 1 | R | Normal – The common mode for the Actual. |
| 87 | ALARM_SUM | The alert status associated to the function block | | |
| | | 2 | R | Current |
| | | 2 | R | Unacknowledged |
| | | 2 | R | Unreported |
| | | 2 | R | Disabled |
| 88 | SENS_VAL | 4 | R | Raw Sensor Value |
| 89 | SENS_HI_LIM | 4 | R | Highest Sensor Limit |
| 90 | SENS_LO_LIM | 4 | R | Lowest Sensor Limit |
| 91 | CAL_POINT_HI | 4 | R/W | The Highest calibrated value |
| 92 | CAL_POINT_LO | 4 | R/W | The lowest calibrated value |
| 93 | CAL_MIN_SPAN | 4 | R/W | The minimum span to be used between the calibration points, high and low. |
| 94 | CAL_UNIT | 2 | R/W | Calibration Unit. Only Pressure unit code are usable<br>See in the Analog Input Function Block Table the PV_SCALE Unit Code the allowed **Code for Pressure** |
| 95 | TRIMMED_VALUE | 4 | R | This is the Pressure value used as reference for the Calibration operation.<br>**See also the section 11** |
| | | 1 | R | This the Trimmed Value Status |
| 96 | TRIM_VAL_DEC | 1 | R/W | Number of decimals of the Trimmed Value |
| 97 | SENSOR_TYPE | 2 | R | Type of sensor.<br>**0** Differential<br>**1** Gauge<br>**2** Level<br>**3** Flow<br>**4** Temperature<br>**5** Absolute<br>**6** Volume |
| 98 | SERIAL_NUMBER | 4 | R | Serial Number of the sensor |
| 99 | PRIMARY_ VALUE | 4 | R | This is the output value from the TB and input for the AIFB. Depending by the PB_MEAS_TYPE it can assume Pressure, Flow, Level or Volume Values |
| | | 1 | R | This is the output status from the TB |

| | | | | |
|---|---|---|---|---|
| **100** | **PRIMARY_ VALUE_TYPE** | 2 | R | Type of measurement representing the primary value. The default measurement type is Differential Pressure.<br>When writing on this parameter is performed in order to switch the device as Flow, Level or Volume measurement, the device should go in O/S mode until all the necessary TB and AIFB variables are not properly configured.<br>**0** Differential<br>**1** Gauge<br>**2** Level<br>**3** Flow<br>**4** Temperature<br>**5** Absolute<br>**6** Volume |
| **101** | **PRIM_VAL_DEC** | 1 | R/W | Number of decimals of the Trimmed Value |
| **102** | **PRIM_VAL_UNI** | 2 | R | Unit Code of the PRIMARY_VALUE in output from the TB.<br>Depending by the PB_MEAS_TYPE selected, the default unit assumed by this parameter is as follow:<br>**Pressure:** KPa<br>**Level:** meter<br>**Flow:** cubic meter per hour<br>**Volume:** cubic meter |
| **103** | **SENS_DIAPHRAG M_MTL** | 2 | R | Type of materials for sensor isolator:<br>**4** Monel 400 **25** 17-4-PH<br>**5** Tantalum **30** Hastelloy C276<br>**19** AISI 316L Stainless Steel |
| **104** | **SENSOR_FILL_ FLUID** | 2 | R | Type of Fill Fluid used in the sensor:<br>**1** Silicone Oil **50** Inert Oil (Galden)<br>**2** Inert Oil (Fluorolube) |
| **105** | **MAX_WORK_ PRESSURE** | 4 | R | Max allowed working pressure of the sensor. |
| **106** | **O_RING_MTL** | 2 | R/W | Type of materials for the O-ring:<br>**10** PTFE **12** Buna-N<br>**11** Viton **39** TFE Glass Filled |
| **107** | **PROC_CONN_TY PE** | 2 | R/W | Type of Process Connection (Flanges):<br>**12** Conventional **56** Level Sanitary<br>**14** Remote Seal **57** Level Food<br>**53** Level Flange Type Flush **58** No Flange, Direct Connection<br>**54** Level Flange Type Extended **59** All Welded for Remote Seal<br>**55** Welded Flange **60** Gasketed for Remote Seal |
| **108** | **PROC_CONN_ MATERIAL** | 2 | R/W | Type of material for the Process Connection (Flanges):<br>**0** Carbon Steel **4** Monel 400<br>**2** AISI 316 Stainless Steel **9** AISI 316L Stainless Steel<br>**3** Hastelloy C **5** 17-4-PH |
| **109** | **AUX_VAL_1** | 4 | R | This is the Sensor temperature, expressed in AUX_UNIT_1 |
| | | 1 | R | This is the Sensor temperature Status |
| **110** | **AUX_VAL_NO** | 2 | R | Number of Auxiliary variables |
| **111** | **AUX_VAL_TYP 1** | 2 | R | Types of Auxiliary variables 1 – Sensor Temperature |
| **112** | **AUX_UNIT_1** | 2 | R/W | Sensor Temperature Unit. The allowed units are:<br>**32** Celsius Degree **34** Rankine Degree<br>**33** Fahrenheit Degree **35** Kelvin |
| **120** | **AUX_VAL_2** | 4 | R | This is the Static Pressure, expressed in AUX_UNIT_2 |
| | | 1 | R | This is the Static Pressure Status |
| **121** | **AUX_VAL_TYP 2** | 2 | R | Types of Auxiliary variables 2– Static Pressure. |

| | | | | |
|---|---|---|---|---|
| 122 | **AUX_UNIT_2** | 2 | R/W | Static Pressure Unit. Only Pressure unit code are usable<br>See in the Analog Input Function Block Table the PV_SCALE Unit Code the allowed **Code for Pressure** |
| 130 | **DRAIN_VENT_ MATERIAL** | 2 | R/W | Type of material of the Drain Vent:<br>**3** Hastelloy C<br>**4** Monel 400<br>**19** AISI 316L Stainless Steel<br>**251** None |
| 131 | **MAX_WORK_ PRESS_UNIT** | 2 | R/W | Maximum working pressure Unit code. Only Pressure unit code are usable<br>See in the Analog Input Function Block Table the PV_SCALE Unit Code the allowed **Code for Pressure** |
| 132 | **REMOTE_SEAL_ TYPE** | 2 | R | Type of remote seals:<br>**51** Wafer<br>**55** Off line threated<br>**56** Chemical Tee<br>**57** Button<br>**58** Triclamp & Cherry Burrell<br>**59** Alimentary<br>**60** Union Connection<br>**61** Aseptic<br>**62** Off line flanged connection<br>**63** Sanitary Flush<br>**64** Sanitary Extended<br>**65** Flush Flanged<br>**66** Extended Flanged<br>**67** Urea Service |
| 133 | **REMOTE_SEAL_ FILL_FLUID** | 2 | R | Type of Fill fluid for the remote seals:<br>**1** Silicon Oil<br>**2** Inert Oil (Fluorolube)<br>**50** Inert Oil (Galden)<br>**51** Glyceryn + H2O<br>**54** Santotherm<br>**55** Silicone Oil food<br>**56** Neobee<br>**57** Dowtherm<br>**58** Ethyl benzene<br>**59** Ethyl Alcohol<br>**60** Propylene Glycol/Water<br>**61** Dibutyl Penthalate<br>**62** Siltherm 800<br>**63** Mercury<br>**253** Special |
| 134 | **REMOTE_SEAL_ ISOLATOR** | 2 | R | Type of remote seals isolator:<br>**4** Monel 400<br>**5** Tantalum<br>**19** AISI 316L Stainless Steel<br>**30** Hastelloy C276<br>**42** AISI 316L TFE Coated<br>**55** Hastelloy C276 TFE Coated |
| 135 | **NUMBER_ REMOTE_SEAL** | 1 | R | Number of remote seals:<br>**1** One Seal<br>**2** Two Seals<br>**251** None |
| 136 | **CALIBRATION_ TYPE** | 1 | R | Type of Calibration:<br>**0** Standard<br>**1** Special Line Pressure<br>**2** Special Temperature<br>**3** Special Line Pressure and Temp. |
| 137 | **PROCEDURE_ TYPE** | 1 | R | Type of procedure:<br>**1** None<br>**2** Oxygen Cleaning<br>**3** Chlorine Cleaning<br>**4** Hydrogen Preparation<br>**5** Special degreasing |
| 138 | **HIGH_TEMP_LIM** | 4 | R | Highest allowed temperature limit. +85°C for the 600T_EN. This is expressed in °C |
| 139 | **LOW_TEMP_LIM** | 4 | R | Lowest allowed temperature limit. –40°C for the 600T_EN. This is expressed in °C |
| 140 | **MIN_SPAN** | 4 | R | The minimum span to be used between the calibration points, high and low |
| 141 | **STATIC_PRESS_T RIM** | 4 | R/W | Value at which the Static Pressure has been adjusted to. Expressed in MAX_WORK_PRESS_UNIT |
| 142 | **VIEW_1** | 5 | R | Used for read more information with only one communication. |
| 143 | **SEC_ VAL1** | 4 | R | This is the Process Pressure Value available when the PB_MEAS_TYPE is selected as Flow, Level or Volume, **see also the Figure 14.** This Pressure Value is expressed in SEC_VAL1_UNI |
| 144 | **SEC_VAL1_UNI** | 2 | R/W | Process Pressure Unit.. Only Pressure unit code are usable<br>See in the Analog Input Function Block Table the PV_SCALE Unit Code the allowed **Code for Pressure** |

| | | | | |
|---|---|---|---|---|
| **145** | **SEC_ VAL2** | 4 | R | This is the Normalised Pressure Value. It is expressed always in percentage of the Input Scaling. **See also the Figure 14** |
| **146** | **SEC_VAL2_UNI** | 2 | R | This unit is always percentage **(%)** |
| **147** | **LIN_TYPE** | 1 | R/W | Manufacturer specific Linearisation Type available for converting the Pressure value in Flow, Level or Volume depending by the PB_MEAS_TYPE selection. The available types are:<br>**0** Linear **240** square root to the third power<br>**1** Table **241** square root to the fifth power<br>**10** square root |
| **148** | **SCALE_IN_100** | 4 | R/W | All the values represent the input scaling, **see also the Figure 14.** These values are expressed in **SEC_VAL1_UNI**. Only Pressure unit code are usable. |
| | **SCALE_IN_0** | 4 | R/W | See in the Analog Input Function Block Table the PV_SCALE Unit Code the allowed **Code for Pressure** |
| **149** | **SCALE_OUT_100** | 4 | R/W | All the values represent the Output scaling, **see also the Figure 14.** These values are expressed in **AIFB_PV_SCALE UnitCode**. Only Pressure unit code are usable. |
| | **SCALE_OUT_0** | 4 | R/W | See in the Analog Input Function Block Table the PV_SCALE Unit Code the allowed **Code for Pressure** |
| **150** | **FLW_CUT_OFF** | 4 | R/W | Limit used in square root processing. A value of zero percent of scale is used in block processing if the transducer falls below this limit, in % of input scale. The features may be used to eliminate noise near zero for a flow sensor. The FLW_CUT_OFF has to be always lower than the LIN_SQR_PNT. The accepted values are between 0 – 15% of the input scale. **See also the figure 15.** |
| **151** | **LIN_SQR_PNT** | 4 | R/W | Limit used in square root processing. Starting from the FLW_CUT_OFF value a linear part is applied before to apply the square root function. The LIN_SQR_PNT has to be always greater than the FLW_CUT_OFF. The accepted values are between 0 – 20% of the input scale. **See also the figure 15.** |
| **152** | **TAB_ACT_NUM** | 1 | R | Number of X, Y points currently defined and used, of the 21 available. |
| **153** | **TAB_INDEX** | 1 | R/W | This parameter identify which element of the table is in the X_VALUE and Y_VALUE parameter currently |
| **154** | **TAB_MAX_NUM** | 1 | R | Maximum number of X, Y elements as points of the linearisation table. The 600T EN has max.21 X, Y points available |
| **155** | **TAB_MIN_NUM** | 1 | R | Minimum number of X, Y elements as points of the linearisation table. The 600T EN has minimum 2 points at least always defined |
| **156** | **TAB_OP_CODE** | 1 | R/W | This parameter controls the transaction of the table. The type of operations to be applied for the table handling are:<br>- **0** – Not Initialzed<br>- **1** – New Operation characteristic, first value (TAB_ENTRY = 1)<br>- **2** – No Operation<br>- **3** – Last value, end transmission, check table, swap the old curve with the new curve, update TAB_ACT_NUM |
| **157** | **TAB_STATUS** | 1 | R | This is the result of a plausibility check in the device after the table setting. The possible status are:<br>- **0** not initialized<br>- **1** Good (new table is valid)<br>- **2** not monotonous increasing (old table is valid)<br>- **3** not monotonous decreasing (old table is valid)<br>- **4** not enough value transmitted (old table is valid)<br>- **5** too many values transmitted (old table is valid)<br>- **6** gradient of edge too high (old table is valid)<br>- **7** Values not excepted (old table is valid) |
| **158** | **TAB_X_Y_VALUE** | 168 | R/W | Couple of X, Y value for the linearisation table setting up to 21 elements |

## 8. - Operating Modes

As defined by the PROFIBUS® Profile, the permitted modes for the AIFB are:

- Manual (MAN)
- Automatic (AUTO)
- Out of Service (O/S)

Each represented by a proper bit, refer at the General Requirement document section 3.1.7 'Mode Parameter (Ref.1). The permitted modes are the following with their meaning.

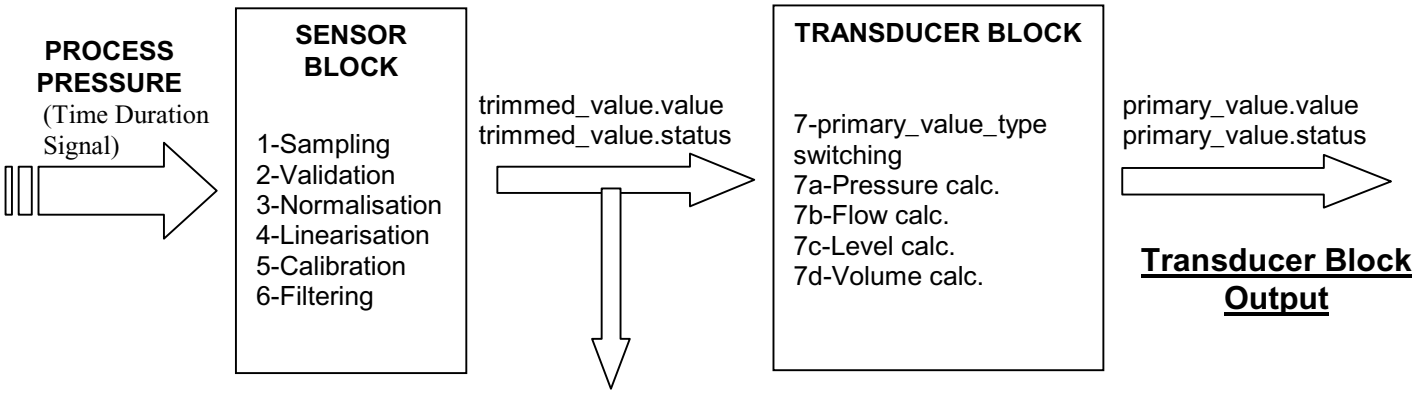
| | |
|---|---|
| O/S | The AIFB is not able to fulfil its functional calculations anymore (e.g. the parameter values in the non-volatile memory are not accessible after a reset) |
| MAN | The operator writes direct the OUT parameter of the AIFB |
| AUTO | The AIFB processes the value from the transmitter (PV) according all algorithms (scaling, filtering, status and mode calculation, limit checks) |

The PB and TB blocks are always in AUTO mode.

## 9. – Process Flow

Depending by the selected PB_MEAS_TPE the device assumes different operating modes just to produce in output from the TB one of various measurement types. The Pressure Value is the standard or default measurement, but are available also the Flow, Level and Volume measurements.
These different operating modes require the configuration of additional manufacturer specific parameters defined in the TB and then used by different algorithms in order to perform the necessary conversions.
The Figure 11 shows the main function steps executed inside the Transducer Block DSP, starting from the acquisition until the TB output producing.

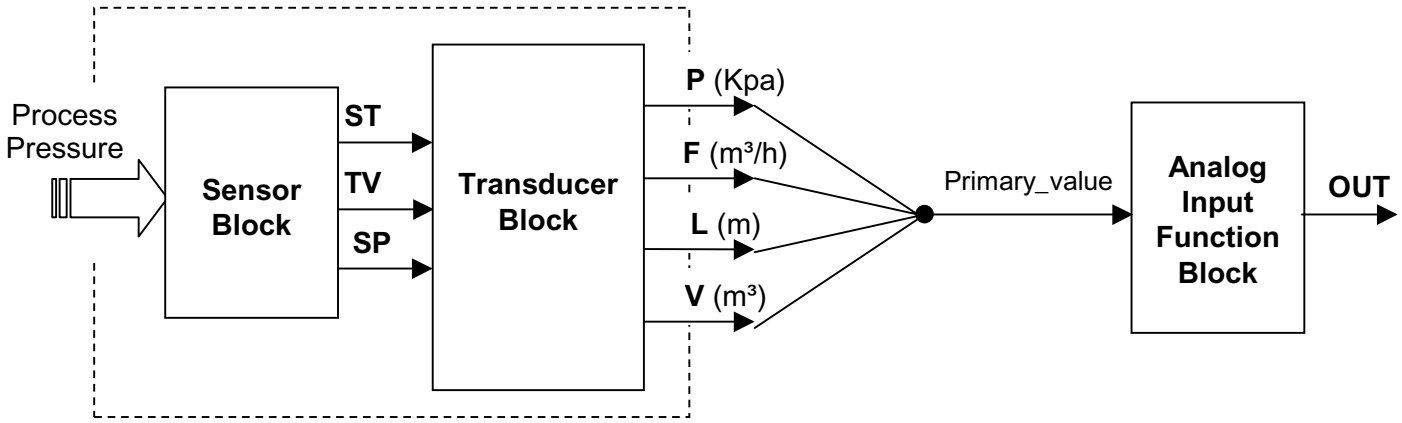
**Figure 11: Transducer Block DSP**




The Analog Input Function block implemented in the 600T EN PA receives in input the TB_PRIMARY_VALUE in output from the TB.
Whenever the transmitter, previous selected as Pressure type, is then selected for one of the other measure type (i.e. Flow, Level or Volume), the AIFB variables (i.e. Unit code, ranges and so on) have to be properly configured with consistent values for the new measure type.

The following Figure 12 shows the connections between the AIFB and the variables in output from the Transducer Block.

**Figure 12: Connection between AIFB and TB**




**TV** = Trimmed value (only Pressure units. See section 7)
**P** = Pressure
**F** = Flow
**Pn** = Normalised Pressure
**V** = Volume
**ST** = Sensor Temperature
**SP** = Static Pressure

Here is a more detailed representation of the operation performed by the DSP algorithm every loop and already described above.

**Figure 13: Sensor Block**

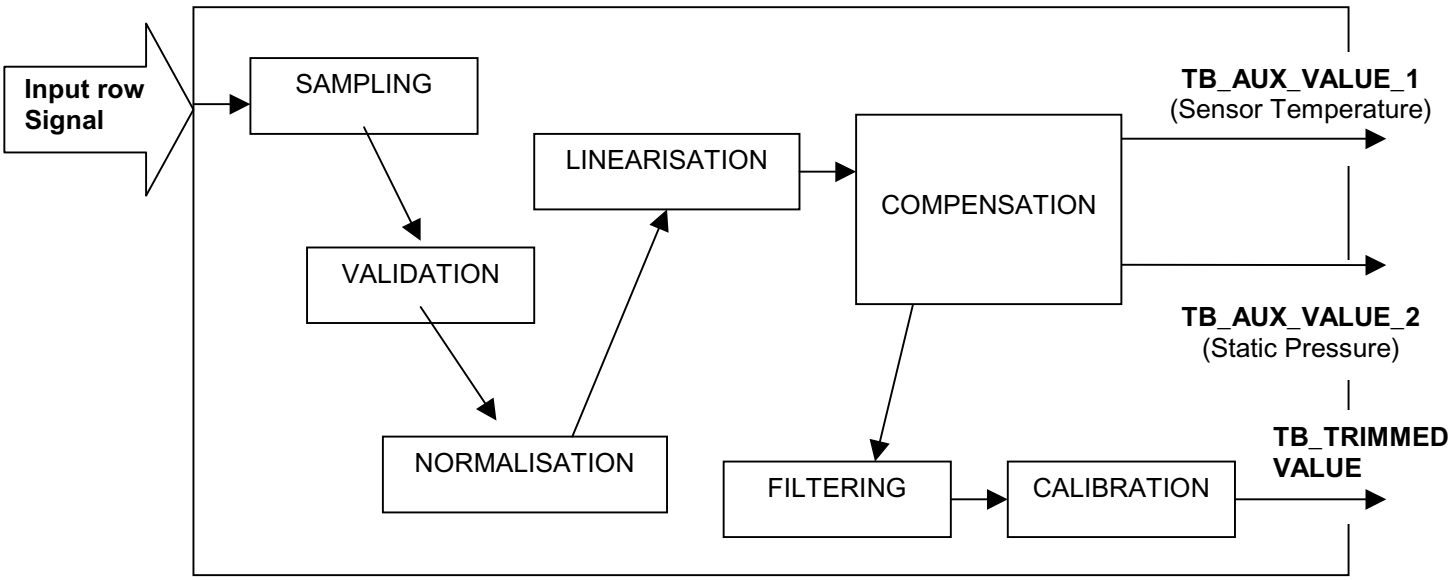


**Figure 14: Custom Pressure Transducer Block**

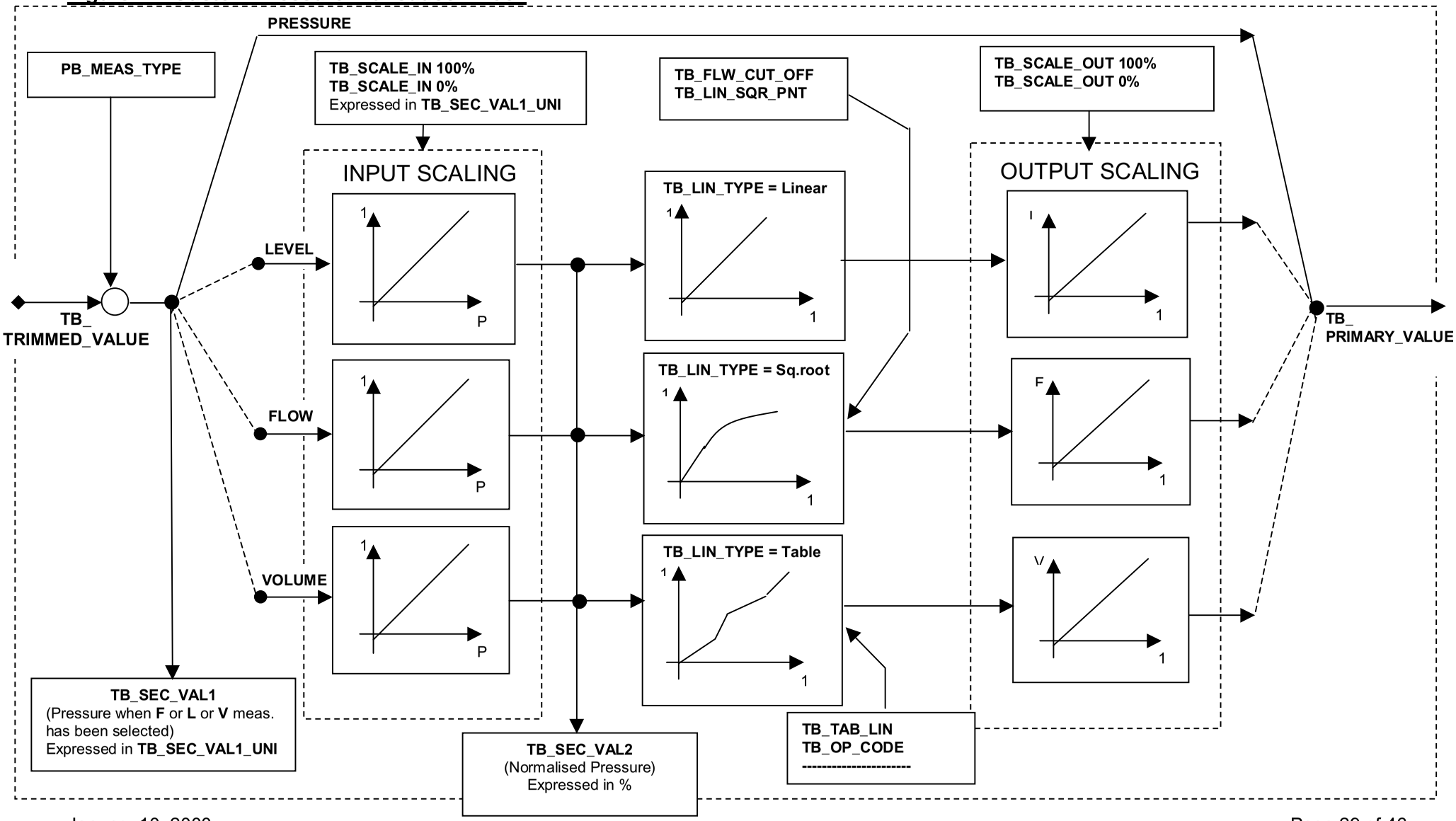
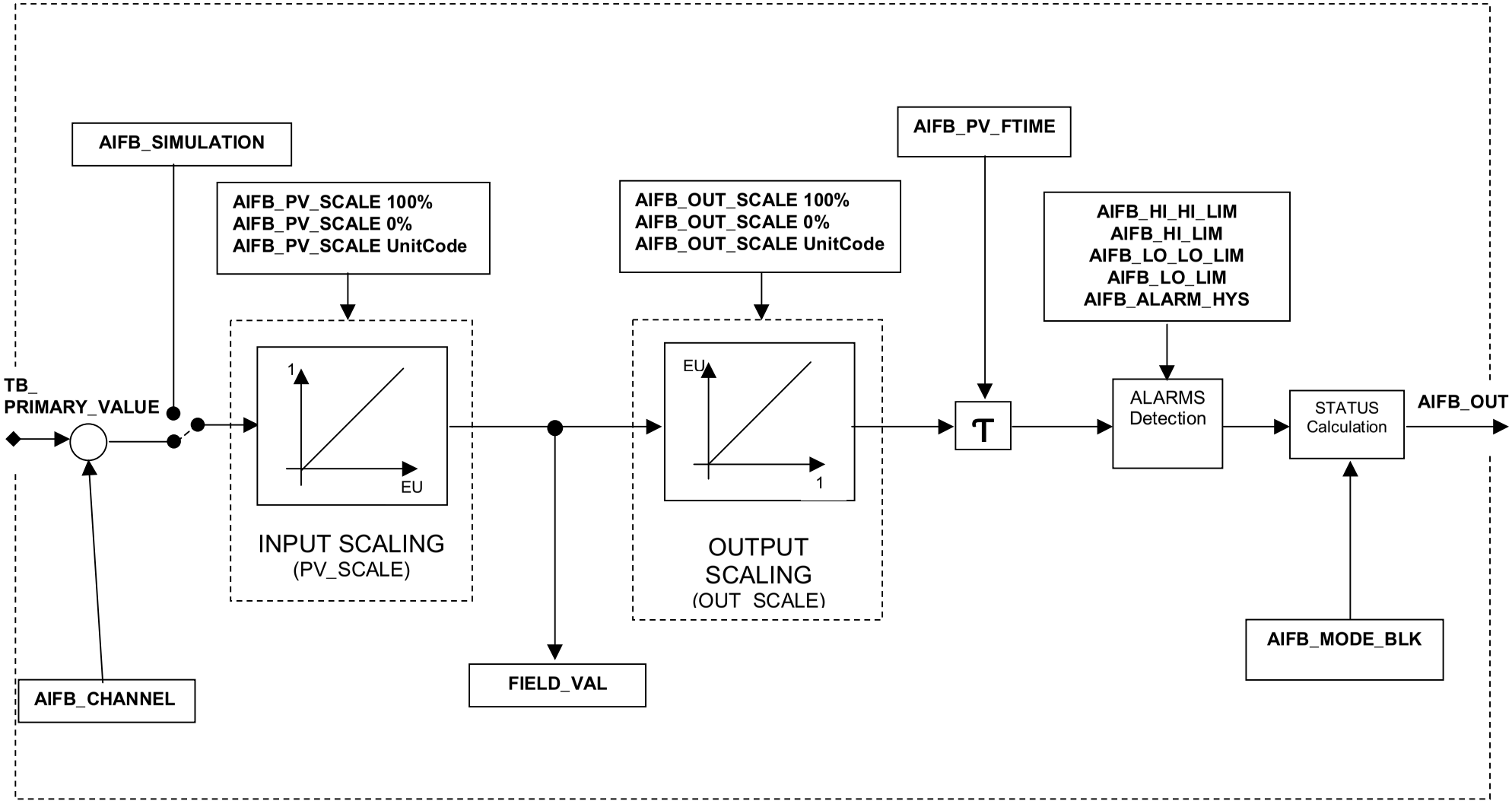


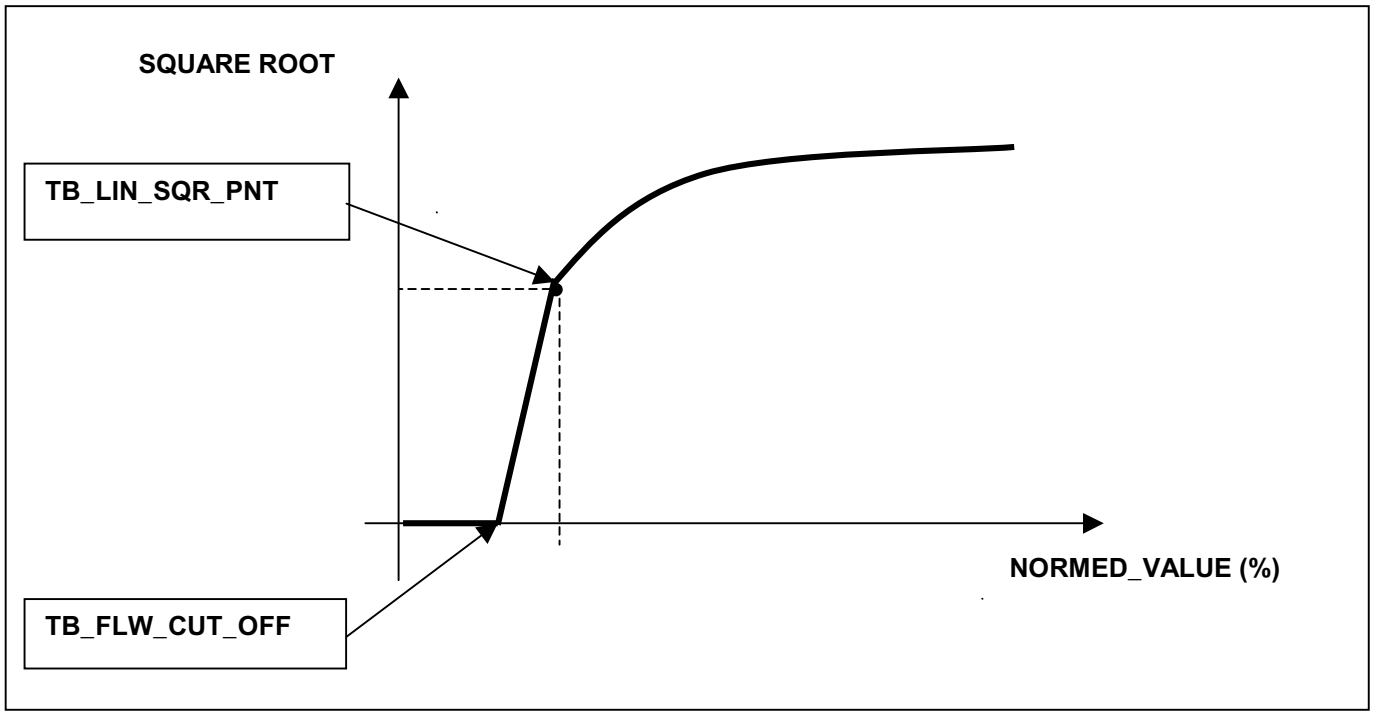
**Figure 15: Analog Input Function Block**



The Square Root function and relating setting is represented in the Figure 16.
- The TB_LIN_SQR_PNT can be set between 0 to 20% of the input
- The TB_FLW_CUT_OFF can be set between 0 to 15% of the input

The TB_LIN_SQR_PNT must to be always greater than the TB_FLW_CUT_OFF.

**Figure 16: Square Root Function**




### 9.1 - Transducer Block Algorithms

Referring to the Figure 14 these are the calculation internally executed:

TB_SEC_VAL1 = TRIMMED_VALUE (converted in TB_SEC_VAL1_UNI Unit Code for monitoring only)

TB_SEC_VAL2 = (TRIMMED_VALUE – SCALE_IN_0%) / (SCALE_IN_100% - SCALE_IN_0%)

Depending from the PB_MEAS_TYPE selection, the internal calculations proceed as follow:

**Pressure:**
PRIMARY_VALUE = TRIMMED_VALUE

**Level:**
PRIMARY_VALUE = TB_SEC_VAL2 * (TB_SCALE_OUT_100% - TB_SCALE_OUT_0%) – TB_SCALE_OUT_0%

**Flow:**
**IF TB_SEC_VAL2 < TB_FLW_LOW_OFF**
**PRIMARY_VALUE = TB_SCALE_OUT_0%**
**ELSE**
PRIMARY_VALUE = sqr(TB_SEC_VAL2) * (TB_SCALE_OUT _100% - TB_SCALE_OUT _0%) - TB_SCALE_OUT _0%

**Volume:**
PRIMARY_VALUE = ƒ table (TB_SEC_VAL2) * (TB_SCALE_OUT _100% - TB_SCALE_OUT _0%) - TB_SCALE_OUT _0%

### 9.2 - Analog Input Function Block Algorithms

Referring to the Figure 15 these are the calculation internally executed:

FIELD_VAL = 100 * (TB_PRIMARY_VALUE – AIFB_PV_SCALE_0%) / (AIFB_PV_SCALE_100% - AIFB_PV_SCALE_0%)

AIFB_OUT = FIELD_VAL / 100 * (OUT_SCALE_100% - OUT_SCALE_0%) + OUT_SCALE_0%

## 10. – Commissioning

The 600T EN PA can be configured for measure Pressure, Flow, Level or Volume.
At every PB_MEAS_TYPE selection, all the relevant variables of the TB and AIFB are automatically set with values consistent with the new selection. i.e. changing the PB_MEAS_TYPE from Pressure to Flow, all the units and range values are set to cubic meter per hour and the TB_LIN_TYPE to square root. Then the user will set the wanted configuration.

### 10.1 - Pressure Configuraton

By default the 600T EN PA is configured and works as Pressure Transmitter. The value produced by the sensor block (TRIMMED_VALUE), is the same in output from the Transducer Block (PRIMARY_VALUE), see the figure 12 and 14. This value is linked in input to the AIFB trough the Channel selection as CHANNEL_VALUE of the formula applied in the section 9.2 AIFB algorithms.

This is the default setting of the 600T EN PA:
- PB_MEAS_TYPE = PRESSURE
- TB_SCALE_IN_100% = Not used
- TB_SCALE_IN_0% = Not Used
- TB_SEC_VAL1_UNI = Not Used
- TB_LIN_TYPE = Not Used
- TB_SCALE_OUT_100% = Upper Range Limit (strictly dependent by the sensor type)
- TB_SCALE_OUT_0% = Lower Range Limit (strictly dependent by the sensor type)
- TB_PRIMARY_VALUE_UNI = Kpa

The TB_PRIMARY_VALUE, as output of the TB, is produced by default in Kpa

- AIFB_CHANNEL = 1
- AIFB_PV_SCALE_100% = Upper Range Limit
- AIFB_PV_SCALE_0% = Lower Range Limit
- AIFB_PV_SCALE_UnitCode = Kpa
- AIFB_L_TYPE = Direct
- AIFB_OUT_SCALE_100% = Upper Range Limit
- AIFB_OUT_SCALE_0% = Lower Range Limit
- AIFB_OUT_SCALE_UnitCode = Kpa

The AIFB_OUT, as output of the Analog Input function Block, produce in output the pressure value in Kpa

### 10.2 - Flow Configuraton

When the PB_MEAS_TYPE is selected as FLOW, the TB_TRIMMED_VALUE goes trough the FLOW algorithm of the Transducer Block in the section 9.1. See also the Figure 14.

- PB_MEAS_TYPE = FLOW
- TB_SCALE_IN_100% = Upper Range Limit.
- TB_SCALE_IN_0% = 0.0
- TB_SEC_VAL1_UNI = Kpa
- TB_LIN_TYPE = Square Root
  - TB_LOW_CUT_OFF = 0%
  - TB_LIN_SQR_PNT = 0%
- TB_SCALE_OUT_100% = 100.0
- TB_ SCALE_OUT _0% = 0.0
- TB_PRIMARY_VALUE_UNIT = Cubic Meter per hours

The TB_PRIMARY_VALUE, as output of the TB, is produced by default in Cubic meter per hours

The input scaling (SCALE_IN) always represents the input pressure range, and the output scaling (SCALE_OUT_RANGE) represents the output conversion range.

- AIFB_CHANNEL = 1
- AIFB_PV_SCALE_100% = 100.0
- AIFB_PV_SCALE_0% = 0.0
- AIFB_PV_SCALE_UnitCode = Cubic Meter per hours
- AIFB_L_TYPE = Direct
- AIFB_OUT_SCALE_100% = 100.0
- AIFB_OUT_SCALE_0% = 0.0
- AIFB_OUT_SCALE_UnitCode = Cubic Meter per hours

The AIFB_OUT, as output of the Analog Input function Block, produce in output the flow value in Cubic Meter per hour

The user can start from this default and working condition, and then proceed with the real setting of the variables as the application requires.

### 10.3 - Level Configuraton

When the PB_MEAS_TYPE is selected as LEVEL, the TB_TRIMMED_VALUE goes trough the LEVEL algorithm of the Transducer Block in the section 9.1. See also the Figure 14.

- PB_MEAS_TYPE = LEVEL
- TB_SCALE_IN_100% = Upper Range Limit.
- TB_SCALE_IN_05 = 0.0
- TB_SEC_VAL1_UNI = Kpa
- TB_LIN_TYPE = Linear
- TB_SCALE_OUT_100% = 100.0
- TB_ SCALE_OUT _0% = 0.0
- TB_PRIMARY_VALUE_UNIT = Meters

The TB_PRIMARY_VALUE, as output of the TB, is produced by default in meters

The input scaling (SCALE_IN) always represents the input pressure range, and the output scaling (SCALE_OUT) represents the output conversion range.

- AIFB_CHANNEL = 1
- AIFB_PV_SCALE_100% = 100.0
- AIFB_PV_SCALE_0% = 0.0
- AIFB_PV_SCALE_UnitCode = Meters
- AIFB_L_TYPE = Direct
- AIFB_OUT_SCALE_100% = 100.0
- AIFB_OUT_SCALE_0% = 0.0
- AIFB_OUT_SCALE_UnitCode = Meters

The AIFB_OUT, as output of the Analog Input function Block, produce in output the Level value in Meters

The user can start from this default and working condition, and then proceed with the real setting of the variables as the application requires.

### 10.4 - Volume Configuraton

When the PB_MEAS_TYPE is selected as VOLUME, the TB_TRIMMED_VALUE goes trough the VOLUME algorithm of the Transducer Block in the section 9.1. See also the Figure 14.

- PB_MEAS_TYPE = VOLUME
- TB_SCALE_IN_100% = Upper Range Limit.
- TB_SCALE_IN_05 = 0.0
- TB_SEC_VAL1_UNI = Kpa
- TB_LIN_TYPE = Table
  - TB_TAB_X_Y_VALUE = SEE THE TABLE SETTING PROCEDURE 11.4.1.
- TB_SCALE_OUT_100% = 100.0
- TB_ SCALE_OUT _0% = 0.0
- TB_PRIMARY_VALUE_UNIT = Cubic Meters

The TB_PRIMARY_VALUE, as output of the TB, is produced by default in Cubic Meters

The input scaling (SCALE_IN) always represents the input pressure range, and the output scaling (SCALE_OUT) represents the output conversion range.

- AIFB_CHANNEL = 1
- AIFB_PV_SCALE_100% = 100.0
- AIFB_PV_SCALE_0% = 0.0
- AIFB_PV_SCALE_UnitCode = Cubic Meters
- AIFB_L_TYPE = Direct
- AIFB_OUT_SCALE_100% = 100.0
- AIFB_OUT_SCALE_0% = 0.0
- AIFB_OUT_SCALE_UnitCode = Cubic Meters

The AIFB_OUT, as output of the Analog Input function Block, produce in output the Volume value in Cubic Meters

The user can start from this default and working condition, and then proceed with the real setting of the variables as the application requires.

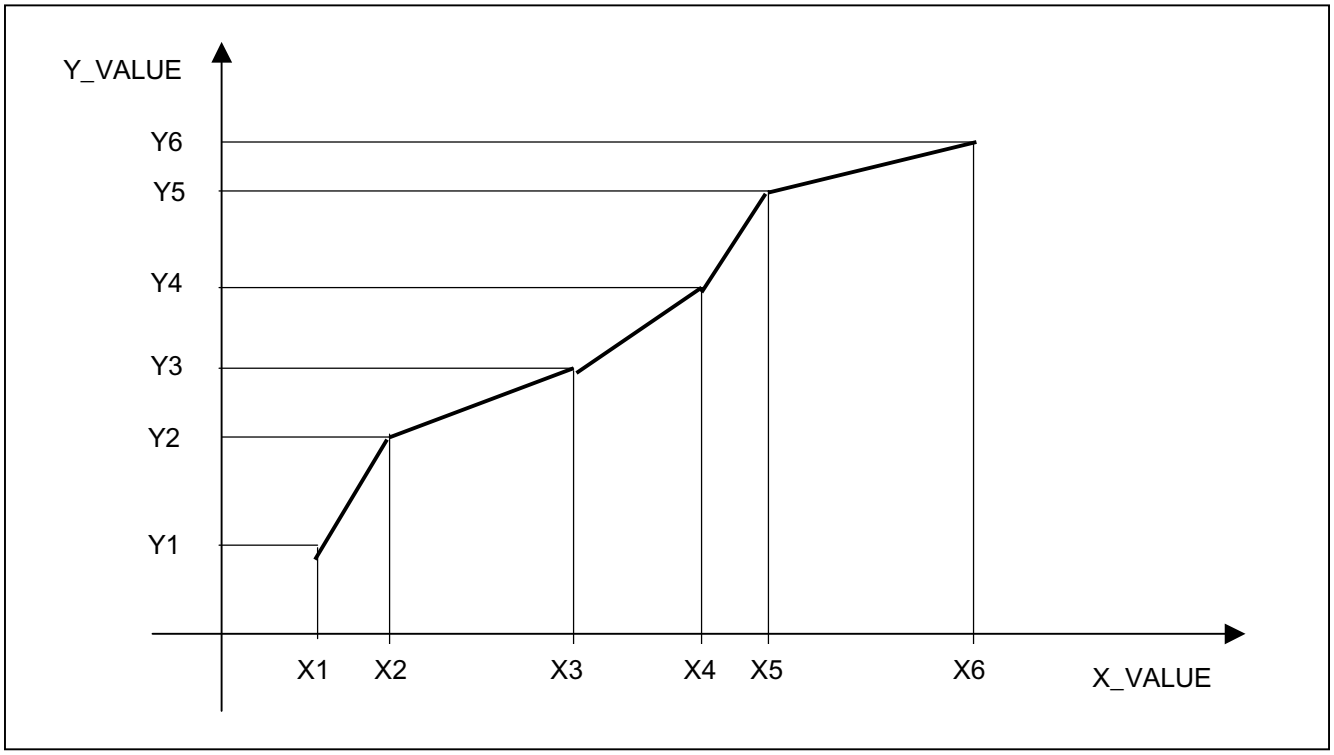
**10.4.1 – LINEARISATION TABLE SETTING PROCEDURE**

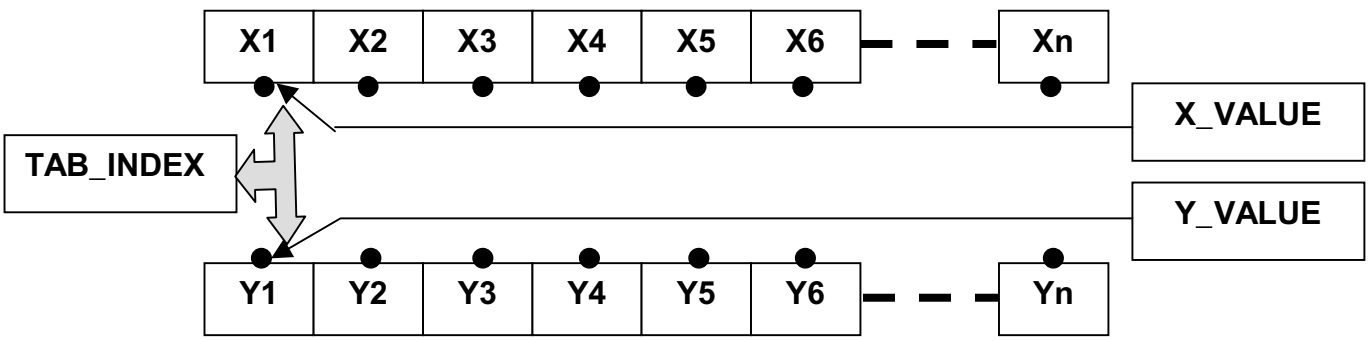
The linearisation table consist of 21 X, Y values to be set, in order to have a conversion between the input pressure value and the output volume value.

Using as example the figure 19 below, the setting procedure is done as follow:

1- The setting procedure starts writing the TAB_OP_CODE = 1. The TAB_INDEX goes to 1 as pointer to the first couple of X, Y values. See also the section 7 in the PRESSURE TRANSDUCER BLOCK TABLE.
2- Then the user can write the X1, Y1 values in the TAB_X_Y_VALUES.
3- In the TAB_INDEX the user writes 2.
4- Then the X2, Y2 values are written in the TAB_X_Y_VALUES.
5- In the TAB_INDEX the user writes 3.
6- As above until the writing of the X6 and Y6 values.
7- Then the user have to write the TAB_OP_CODE = 3. The new table is internally checked before to become valid.
8- The TAB_STATUS will reflect the result of the internal table check executed as in the point 7. See the available TAB_SATUS conditions in the section 7 (PRESSURE TRANSDUCER BLOCK TABLE)

**Figure 19: Linearisation Table setting**



## 11. – Calibration Operations

The operations provided by the transmitters and to be supported by the configuration tools are listed in the Table D below:

**TABLE D**

| Operations | Parameters involved and modified |
|---|---|
| Zero Alignment | TB_CAL_POINT_LO |
| Low Trimming | TB_CAL_POINT_LO |
| High Trimming | TB_CAL_POINT_HI |
| Reset to Factory Sensor Trimming Condition | TB_CAL_POINT_LO, TB_CAL_POINT_HI, TB_CAL_UNIT |
| Static Pressure Trimming | TB_STATIC_PRESS_TRIM |

### 11.1 - Zero alignment

This operation can be executed using the remote configuration tool or the local 'Z' push button. With this operation the TB_TRIMMED_VALUE indication is automatically adjusted to 'zero'. Whenever the user wants to set the measure produced by the transmitter to 'zero' (i.e. when the measure is different by 'zero' due to the installation position) the following sequence of operations are required when the remote configuration tool is used:

1. Select the desired unit for representing the measure produced by the transmitter (TB_TRIMMED_VALUE), writing the right code in the TB_CAL_UNIT.

**Note: Only Pressure Unit Code is allowed**

2. Read the reference value produced by the transmitter from the TB_TRIMMED_VALUE.
3. If this value is different by 'zero' the 'zero alignment' operation can be executed and it works setting automatically the TB_CAL_POINT_LO to zero and writing it into the transmitter.
4. Read again the TB_TRIMMED_VALUE and check if its value is 'zero'.

When this operation is executed using the local push button 'Z', see the section 3.5

### 11.2 - Low Trimming

This operation can be executed only using the remote configuration tool. With this operation the TB_TRIMMED_VALUE indication is automatically adjusted, in order to match the real value of the pressure applied in input, in the low part of the working range. The following sequence of operations is required:

1. Apply a reference pressure in input using a reference pressure generator.
2. Select the desired unit for representing the measure produced by the transmitter (TB_TRIMMED_VALUE), writing the right code in the TB_CAL_UNIT.

**Note: Only Pressure Unit Code is allowed**

3. Read the reference value produced by the transmitter from the TB_TRIMMED_VALUE.
4. If this value doesn't match the pressure applied in input, write the right value in the TB_CAL_POINT_LO and send it to the transmitter.
5. Read again the TB_TRIMMED_VALUE and check if its value has been adjusted for matching the applied pressure.

### 11.3 - High Trimming

This operation can be executed only using the remote configuration tool. With this operation the TB_TRIMMED_VALUE indication is automatically adjusted, in order to match the real value of the pressure applied in input, in the high part of the working range. The following sequence of operations is required:

1. Apply a reference pressure in input using a reference pressure generator.
2. Select the desired unit for representing the measure produced by the transmitter (TB_TRIMMED_VALUE), writing the right code in the TB_CAL_UNIT.

**Note: Only Pressure Unit Code is allowed**

3. Read the reference value produced by the transmitter from the TB_TRIMMED_VALUE.
4. If this value doesn't match the pressure applied in input, write the right value in the TB_CAL_POINT_LO and send it to the transmitter.

5. Read again the TB_TRIMMED_VALUE and check if its value has been adjusted for matching the applied pressure.

**11.4 - Reset to Factory Sensor Trimming:** With this operations the all the parameters involved in the trimming operations are updated with the original values recorded during the final calibration performed in the factory.

### 11.5 - Static Pressure Trimming

This operation can be executed only using the remote configuration tool. With this operation the TB_AUX_VAL_2 (Static Pressure) indication is automatically adjusted, in order to match the known value of Static Pressure applied at the transducer.. The following sequence of operations is required:

1. Read the Static Pressure value from the TB_SEC_VAL2.
2. If this value doesn't match the known Static pressure applied in input at the transducer, write the right value in the TB_ST_PRESS_TRIM and send it to the transmitter.
3. Read again the TB_AUX_VAL_2 (Static Pressure) and check if its value has been adjusted for matching the real Static Pressure value.

## 12. - Diagnostic

The Profibus Profile defines different ways to report diagnostic information. These are update dynamically every loop:

- The ALARM_SUMMARY
- The DIAGNOSIS & DIAGNOSIS EXTENSION
- The Status byte produced with the OUT value.

### 12.1 – Alarm Summary

The ALARM_SUMMARY data structure reflects the general status of the alarms handled in the 600T EN PA. The bits listed below represent the alarms supported in the 600T EN PA, and each of them is available with 4 information:

1. Current Alarms
2. Unacknowledged
3. Unreported
4. Disabled

| Octet | Bit | Mnemonic | Description |
|---|---|---|---|
| 1 | 0 | not handled | |
| | 1 | HI_HI_Alarm | Supported by AIFB.<br>Notified when the OUT value goes over the HI_HI_LIM value, and also when the OUT value came back below the HI_HI_LIM value. |
| | 2 | HI_Alarm | Supported by AIFB.<br>Notified when the OUT value goes over the HI_LIM value, and also when the OUT value came back below the HI_LIM value. |
| | 3 | LO_LO_Alarm | Supported by AIFB.<br>Notified when the OUT value goes below the LO_LO_LIM value, and also when the OUT value came back over the LO_LO_LIM value. |
| | 4 | LO_Alarm | Supported by AIFB.<br>Notified when the OUT value goes below the LO_LIM value, and also when the OUT value came back over the LO_LIM value. |
| | 5 | Reserved | |
| | 6 | Reserved | |
| | 7 | Update Event<br>(e.g. increment of ST_REV) | Supported by PB, AIFB and TB. Notify every Block Error occurrence of the relating block. . |
| 2 | 0-7 | Reserved | |

Only the **Current field** of the Alarm Summary structure is handled. Limit alarm bits will be set to 1 or 0 if the alarm reason occurs (1) or is gone (0). The update event bit will be set to 1 after ST_REV increment or other problems (see block specification) and will be set to 0 after 10 s.

## 12.2 – Diagnosis Information

The PB_DIAGNOSIS bits defined in the Physical Block and handled in the 600T EN PA are here following listed. Whenever one of the supported bits changes its status from 0 to 1 or viceversa, the Class 1 Master will be informed about the availability of new diagnosis situation, and it can provide to read and update the slave diagnosis conditions. The PB_DIAGNOSIS bits are mapped in the SLAVE_DIAGN service

| Octet | Bit | Mnemonic | Description | Indication Class |
|---|---|---|---|---|
| 1 | 0 | DIA_HW_ELECTR | Hardware failure of the electronic | R |
| | 3 | DIA_TEMP_ELECTR | Electronic temperature too high | R |
| | 4 | DIA_MEM_CHKSUM | Memory error | R |
| | 5 | DIA_MEASUREMENT | Failure in measurement | R |
| 2 | 2 | DIA_CONF_INVAL | Configuration not valid | R |
| | 3 | DIA_WARMSTART | New-start-up (warm start up) carried out. | A |
| | 4 | DIA_COLDSTART | Re-start-up (cold start up) carried out. | A |
| 3 | 0…7 | Reserved | Reserved for use within the PNO | |
| 4 | 0... 7 | Reserved | Reserved for use within the PNO | |

Values of the PB_DIAGNOSIS bit:

0 = not set
1 = set

R Indication, remains active as long as the reason for the message exists.
A Indication, will be automatically reset after 10s.

Manufactory Block error bits will be set to 1 or 0 if the error occurs (1) or is gone (0).

## 12.3 - Status Supported

The PROFIBUS® PA Profile defines different dynamic variables having the status byte to be produced together with the value. The status byte gives a detailed information about the Quality of the associated variable's value. The following table lists the different status conditions available/generated for the output dynamic variables coming out from the AIFB and TB blocks[2] implemented in the 600T EN PA Transmitter. For each status condition is available a brief explanation about the meaning and an indication about into which block it is generated.

Status byte in the Variable "OUT"

| | | Quality | | Substatus | | | | Limits | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Dec | Hex | Gr | Gr | QS | QS | QS | QS | Qu | Qu | |
| | | **$2^7$** | **$2^6$** | **$2^5$** | **$2^4$** | **$2^3$** | **$2^2$** | **$2^1$** | **$2^0$** | |
| 0 | 00 | 0 | 0 | | | | | | | **= bad** |
| 64 | 40 | 0 | 1 | | | | | | | **= uncertain** |
| 128 | 80 | 1 | 0 | | | | | | | **= good (Not Cascade)** |

[2] Other variables like the Trimmed Value and the different **Secondary Values** mapped in the TB are produced with their own status byte.

**Details for BAD**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 00 | 0 | 0 | 0 | 0 | 0 | 0 | | | **= non-specific** |
| 4 | 04 | 0 | 0 | 0 | 0 | 0 | 1 | | | **= configuration error** |
| 12 | 0C | 0 | 0 | 0 | 0 | 1 | 1 | | | **= device failure** |
| 16 | 10 | 0 | 0 | 0 | 1 | 0 | 0 | | | **= sensor failure** |
| 28 | 1C | 0 | 0 | 0 | 1 | 1 | 1 | | | **= out of service** |

**Configuration error detail:**
When the PB_MEAS_TYPE is selected for Flow and Volume measurement, some specific parameters of the Transducer block have to be well configured by the customer. If the configuration is not well done so the measure can not be produced (i.e. negative value in input at the Square Root operation), this status is set.
**Device failure detail:**
When malfunction in the device is detected this status is produced. More information about the nature of the malfunction can be available from the PB_DIAGNOSIS bytes.
**Sensor failure detail:**
When malfunction of the sensor is detected this status is produced. More information about the nature of the malfunction can be available from the PB_DIAGNOSIS bytes.
**Out of Service detail:**
This status is produced when the device is in Out Of Service mode.

**Details for UNCERTAIN**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 64 | 40 | 0 | 1 | 0 | 0 | 0 | 0 | | | **= non-specific** |
| 76 | 4C | 0 | 1 | 0 | 0 | 1 | 1 | | | **= Initial Value** |
| 80 | 50 | 0 | 1 | 0 | 1 | 0 | 0 | | | **= sensor conversion not accurate** |
| 84 | 54 | 0 | 1 | 0 | 1 | 0 | 1 | | | **= engineering unit range violation** |

**Initial Value detail:**
After the restart of the device this status is produced to indicate the values not yet updated.
**Sensor Conversion not Accurate detail:**
This status is produced when the auxiliary values for compensation are not more usable (compensation sensors failed or compensation variables outside specified operating limits). The OUT will be always produced but with the last valid compensation. This gives an indication of degraded performances of the device
**Engineering unit range violation detail:**
This status is produced when the value is outside the operating range selected for this variable.

**Details for GOOD (non-cascade)**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 128 | 80 | 1 | 0 | 0 | 0 | 0 | 0 | | | **= ok** |
| 136 | 88 | 1 | 0 | 0 | 0 | 1 | 0 | | | **= active advisory alarm** |
| 140 | 8C | 1 | 0 | 0 | 0 | 1 | 1 | | | **= active critical alarm** |

**Active advisory alarm detail:**
When the OUT values goes across the LO_LIM or HI_LIM, this status is produced with the low limited and/or high limited indication
**Active critical alarm detail:**
When the OUT values goes across the LO_LO_LIM or HI_HI_LIM, this status is produced with the low limited and/or high limited indication

**Details for bits 'LIMITS'**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| +0 | +00 | | | | | | | 0 | 0 | **= ok** |
| +1 | +01 | | | | | | | 0 | 1 | **= low limited** |
| +2 | +02 | | | | | | | 1 | 0 | **= high limited** |
| +3 | +03 | | | | | | | 1 | 1 | **= constant** |

If more than one condition is present, only the one with higher priority is reported. The priority level is in the following order:

- BAD
- UNCERTAIN
- GOOD (Not Cascade)

Into any single quality group the priority level is relating to the value. (i.e. BAD - Out of Service is the higher priority and GOOD – OK is the lower priority)

### 12.4 - Relation between OUT Status byte and Diagnosis bits

The combination of the status byte and the Diagnosis bits gives a detailed information about the reason of the indication.

**TABLE D**

| Status | Diagnosis |
|---|---|
| BAD – Configuration Error | DIA_CONF_INVAL |
| BAD- Device Fail | DIA_HW_ELECTR<br>DIA_MEM_CHKSUM |
| BAD- Sensor Fail | DIA_MEASUREMENT |
| UNCERTAIN – Sensor Conversion not Accurate | DIA_TEMP_ELECTR |

## 13. – Device Specification Data

The delivery of the 600T EN PA devices includes the GSD file with the bitmaps representing the different functionality of the transmitter and the DTM.

**The following table is a summary of the most important information of the 600T_EN FF specification data**

| | |
|---|---|
| Manufacturer | ABB Instrumentation SpA |
| Device Model | 600T EN PA |
| Measured Variable | **Direct:** Differential, Gauge, Absolute Pressure.<br>**Derived:** Flow, Level and Volume |
| Output Signal | Physical layer compliant to the standard IEC 1158-2 |
| Communication speed | 31.25 Kbit/second |
| Electrical Signal | Manchester Code II |
| Power supply | Bus Powered: 10.5 – 32 Volts limited to 15 Volts for IS |
| Interface | Profibus PA with DPV1 functionality as extension of the CENELEC EN 50170. Compliant to the Profile 2.0 for Pressure transmitter as 'Simple device of Class A and B' |
| Blocks implemented | 1 Analog Input, 1 Physical Block, 1 Pressure Transducer Blocks |
| Output Updating Rate | 25mS |
| Current consumption | 10.5 mA max |
| Fault Current limiting | 15 – 16 mA |
| PNO Certification | FZI N°:Z00406 |
| IS Certificate | See section 3.1 – Environmental protection |
| Max. Temperature | -40 / +85 °C |
| Remote Configuration tools | DTM for SmartVision 4.0, Siemens PDM or via Standard Profile |

## 14. - Reference -

1- PROFIBUS-PA Profile for Process Control Devices -- General Requirements V2.0 – March '97
2- PROFIBUS-PA Profile for Process Control Devices -- Data Sheet Transmitter V2.0 – March '97
3- PROFIBUS-PA Profile for Process Control Devices -- Mapping to DP V2.0 – March'97
4- Profibus DP /V1 Specification Version 1.13 dated 07.03.97.

# APPENDIX A

# CONFIGURATION DATA SHEET

| **CUSTOMER INFORMATION** | |
|---|---|
| **CUSTOMER** | _____ |
| **P.O Number** | _____ |
| **PRODUCT CODE** | _____ |

| **GENERAL DEVICE INFORMATION** | | | |
|---|---|---|---|
| **DEVICE ADDRESS** (1/67) | \|__\|__\|__\| | **TYPE OF MEASURE** ① (MEAS_TYPE 1/71) | ***Pressure*** *(default)* *Level* *Flow* *Volume* |
| **TAG** (TAG_DESC 1/16) | *(32 chars.max)* \|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\| | | |
| **DESCRIPTOR** (1/44) | *(32 chars.max)* \|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\| | | |
| **MESSAGE** (1/45) | *(32 chars.max)* \|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\|__\| | | |
| **DATE** (1/46) | *(8 chars.max)* \|__\|__\|__\|__\|__\|__\|__\|__\| | | |

| **DEVICE INFORMATION WHEN THE TYPE OF MEASURE = PRESSURE** | | | |
|---|---|---|---|
| **UNIT CODE** (PV_SCALE_UNIT 1/171) (OUT_SCALE_UNIT 1/172) | *Inches H2O (20 deg.C)* *mm H2O (20 deg.C)* *Bar* *Kilograms/cm^2* *Torr (0 deg.C)* *Inches H2O (4 deg.C)* | *inches Hg (0 deg.C)* *mm Hg (0 deg.C)* *millibar* *Pascal* *Atmosphere* *mm H2O (4 deg.C)* | *feet H2O (20 °C)* *pounds / in^2* *grams / cm^2* ***Kilopascal*** *(default)* *Megapascal* *OTHER ……* |
| **HIGH RANGE** ② (OUT_SCALE_EU100 1/172) (PV_SCALE_EU100 1/171) | _____ | **CRITICAL LIMIT HIGH** ② (HI_HI_LIM 1/181) | _____ |
| **LOW RANGE** ② (OUT_SCALE_EU0 1/172) (PV_SCALE_EU0 1/171) | _____ | **ADVISORY LIMIT HIGH** ② (HI_LIM 1/183) | _____ |
| **HISTERESYS** ② (ALM_HYS 1/179) | _____ | **ADVISORY LIMIT LOW** ② (LO_LIM 1/185) | _____ |
| **DAMPING TIME (Sec.)** (PV_FTIME 1/176) | *(32 sec.max)* _____ | **CRITICAL LIMIT LOW** ② (LO_LO_LIM 1/187) | _____ |

① If the MEASURE_TYPE selected is PRESSURE **only the SHEET 1** has to be filled.If the MEASURE_TYPE selected is different by PRESSURE fill only the CUSTOMER INFORMATION and the GENERAL DEVICE INFORMATION of SHEET 1 and the SHEET 2.

| DEVICE INFORMATION WHEN THE TYPE OF MEASURE = FLOW or LEVEL or VOLUME | | | |
|---|---|---|---|
| **LINEARTISATION TYPE**<br>(LIN_TYPE 1/147) | *Linear* | *Square Root* | *Table* |
| **INPUT PRESSURE HIGH RANGE** ③<br>(SCALE_IN_EU100 1/148) | _____ | **INPUT PRESSURE LOW RANGE** ③<br>(SCALE_IN_EU0 1/148) | _____ |
| **OUTPUT CONVERSION HIGH RANGE** ④<br>(SCALE_OUT_EU100 1/149)<br>(OUT_SCALE_EU100 1/172)<br>(PV_SCALE_EU100 1/171) | _____ | **OUTPUT CONVERSION LOW RANGE** ④<br>(SCALE_OUT_EU0 1/149)<br>(OUT_SCALE_EU0 1/172)<br>(PV_SCALE_EU0 1/171) | _____ |
| **INPUT PRESSURE UNIT CODE**<br>(SEC_VAL1_UNI 1/144) | *Inches H2O (20 deg.C)*<br>*feet H2O (20 deg.C)*<br>*mm Hg (0 deg.C)*<br>*Bar*<br>*grams / cm^2*<br>*Pascal*<br>*Torr (0 deg.C)*<br>*Megapascal*<br>*mm H2O (4 deg.C)* | *inches Hg (0 deg.C)*<br>*mm H2O (20 deg.C)*<br>*pounds / in^2*<br>*millibar*<br>*Kilograms/cm^2*<br>***Kilopascal** (default)*<br>*Atmosphere*<br>*inches H2O (4 deg.C)* | |
| **OUTPUT CONVERSION UNIT CODE**<br>(PV_SCALE_UNIT 1/171)<br>(OUT_SCALE_UNIT 1/172) | **FLOW**<br>*cubic feet per minute*<br>*gallons per minute*<br>*liters per minute*<br>*imperial gallons per min*<br>***cubic meter per hour** (default)*<br>*gallons per second*<br>*liters per second*<br>*cubic feet per second*<br>*cubic meters per sec.*<br>*percent*<br>*cubic feet per hour*<br>*cubic meters per min.*<br>*gallons per hour*<br>*gallond per day* | **LEVEL**<br>*feet*<br>***meters** (default)*<br>*inches*<br>*centimeters*<br>*millimeters* | **VOLUME** ⑤<br>*gallons*<br>*liter*<br>*imperial gallons*<br>***cubic meters** (default)*<br>*cubic feet*<br>*hectoliters*<br>*OTHER UNIT* ⑥<br>……. |
| **CRITICAL LIMIT HIGH** ④<br>(HI_HI_LIM 1/181) | _____ | **ADVISORY LIMIT LOW** ④<br>(LO_LIM 1/185) | _____ |
| **ADVISORY LIMIT HIGH** ④<br>(HI_LIM 1/183) | _____ | **CRITICAL LIMIT LOW** ④<br>(LO_LO_LIM 1/187) | _____ |
| **HISTERESYS** ④<br>(ALM_HYS 1/179) | _____ | **DAMPING TIME (Sec.)**<br>(PV_FTIME 1/176) | *(32 sec.max)*<br>_____ |

② These variables must be represented with unit code as selected in the field **UNIT CODE.**
③ These variables must be represented with unit code as selected in the field **INPUT PRESSURE UNIT CODE.**
④ These variables must be represented with unit code as selected in the field **OUTPUT CONVERSION UNIT CODE.**
⑤ For the complete configuration of the 600T used as Volume measurement it is necessary to set the Linearisation Table (up to 21 X, Y points)
⑥ The OTHER UNIT not part of the list selected can be written only in the **(OUT_SCALE_UNIT 1/172)**

# APPENDIX B

## GSD File of the 600T EN PA Profile 2.0

```
;=======================================================================
; GSD file for 600T Pressure Transmitter = PROFIBUS-DPV1
; Company: ABB Automation
; Version: 1.0
; Date: 01.12.1997
; Author: M.Romagnoli Tel +39 344 58248
;                     Fax +39 344 56152
;                     E-mail mauro.romagnoli@it.abb.com
;
;=======================================================================
#Profibus_DP
GSD_Revision            =2

Vendor_Name             ="ABB Automation"
Model_Name              ="600T PRESSURE FAMILY"
Revision                ="V1.0"
Ident_Number            =0x009B
Protocol_Ident          =0
Station_Type            =0
FMS_supp                =0
Hardware_Release        ="REVISION @1.00@"
Software_Release        ="REVISION @1.00@"

Implementation_Type     ="SPC4/ITEC"
Bitmap_Device           ="621_d__N"
Bitmap_Diag             ="621_d__D"
Bitmap_SF               ="621_d__S"

9.6_supp                = 0
19.2_supp               = 0
31.25_supp              = 1
45.45_supp              = 1         ; for Siemens Segment Coupler
93.75_supp              = 1         ; for Pepperl & Fuchs Segment Coupler
187.5_supp              = 0
500_supp                = 0
1.5M_supp               = 0
3M_supp                 = 0
6M_supp                 = 0
12M_supp                = 0

MaxTsdr_31.25           = 100
MaxTsdr_45.45           = 200       ; for Siemens Segment Coupler
MaxTsdr_93.75           = 1000      ; for Pepperl & Fuchs Segment Coupler

Freeze_Mode_supp        = 0
Sync_Mode_supp          = 0
Auto_Baud_supp          = 0
Set_Slave_Add_supp      = 1
Min_Slave_Intervall     = 100
Fail_Safe               = 1
Max_Diag_Data_Len       = 6
Slave_Family            = 12
Modular_Station         = 0

Max_Module              = 1
Max_Input_Len           = 5
Max_Output_len          = 0
```

```
Max_Data_Len            = 5

; UserPrmData: Length and Preset:
User_Prm_Data_Len       = 3
User_Prm_Data           = 0x00,0x00,0x00

; Module Definition List
Module="PV & status (short)" 0x94
EndModule
```

# APPENDIX C

# 600T EN PA Electronic Replacement

**The following Steps have to be followed for the Profibus PA electronic replacement:**

**1- Remove the cover with the glass**
**2- Remove the 2 screws of the electronic.**
**3- Extract the electronics from the housing, (be carefully with the sensor Flat cable connected to the unit), and disconnect the flat cable.**
**4- Remove the LCD meter, (be carefully with the plastic clips)**
**5- Take the new unit and put the switch 3 (cold Start-up) in ON position. Do not connect, for the moment, the LCD meter !!!!**
**6- Connect the sensor flat cable to the new unit and insert it into the housing (be carefully with the two in-housing jack connectors)**
**7- Power on the transmitter and keep it supplied for few seconds (about 10).**
**8- Power-Off the transmitter again, and put the switch 3 in OFF position.**
**9- Insert the LCD meter, (be carefully with the 8 pins connector). May be it is easier to remove the electronic again from the Housing for the connection of the LCD meter.**
**10-Fix the electronics with the two screws and mount the glass cover again.**

**The operation is now completed and the device should work with default configuration. This means that the node address will be set to 126. It is possible to set the address locally keeping rotate the 'S' key under the On-Top label. When the desired address appears on the Display the 'S' key have to be released.**
**In order to make active the address selected in this way it is necessary to power down and up again the device.**

*(Note: This page is intentionally blank)*

The Company's policy is one of continuous product improvement and the right is reserved to modify the specifications contained herein without notice.

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