2600T Series
Models 262 – 264.

Pressure Transmitter

ADDENDUM for PROFIBUS® PA Version

Valid for 2600T-262/264 Revision 1

Industrial IT enabled™

ABB Instrumentation

INDEX:

ACRONYMS

- LCD - **L**iquid **C**rystal **D**isplay
- 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
- IS - **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 on Profibus 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 2600T Pressure Transmitter Series include a complete line of differential, absolute and gauge pressure transmitters used also for level, flow and volume applications.
In addition, 2600T 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.

2.2 – Profibus PA version Considerations

The 2600T-262/264 PROFIBUS 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.

The 2600T-262/264 PROFIBUS PA is a compact slave device including 1 Physical Block, 2 Analog Input function blocks and 1 Pressure Transducer Block. The 2600T-262/264 PA is suitable for the measurement of Pressure (Gauge, Absolute, Differential) in accordance with the Profile 3.0 for Pressure transmitters see the Data Sheet Transmitter section 2.2 Pressure [Ref. 2]

The 2600T-262/264 PA implements all the services defined for the Profibus DP standard plus in addition the services defined for the DPE or DPV1standard as extension of the DP in order to satisfy the PA requirements.

[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.**

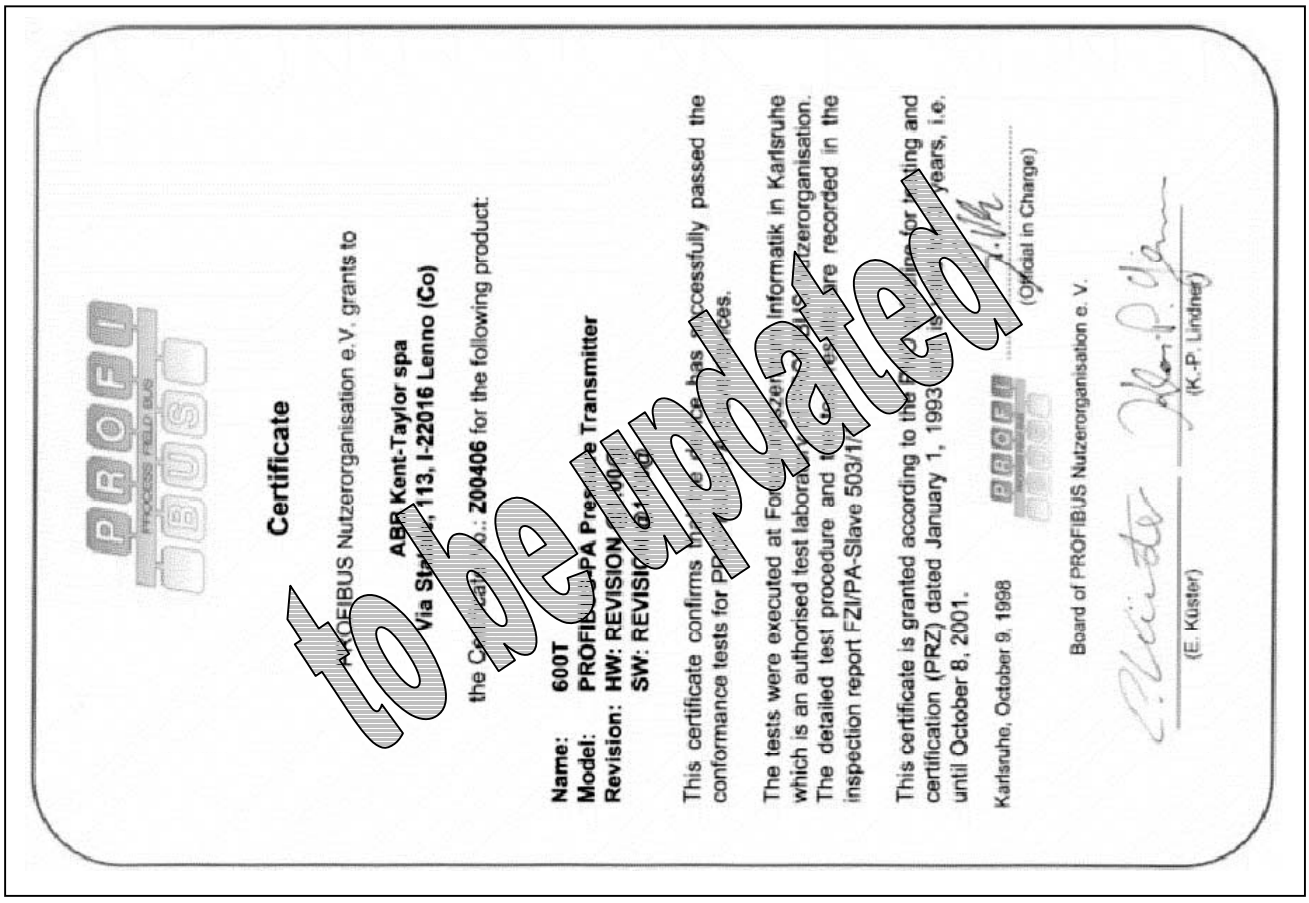
Here is a summary of the Profibus PA functionality implemented in the 2600T-262/264 PA:

- **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 Resource Block can be present in each device.
- **2 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 2600T-262/264 PA 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 (DPV1) Services supported**
  - Initiate
  - Abort
  - Read variable
  - Write Variable
  - Data Transport

  Only for factory use:
  - Physical Read
  - Physical Write

2.3 – Certification Details

PNO PROFIBUS CERTIFICATE



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 01.00
SW: REVISION 01.00

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

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

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

Karlsruhe, October 9, 1998

Board of PROFIBUS Nutzerorganisation e. V.

(E. Küster)

(K.-P. Lindner)

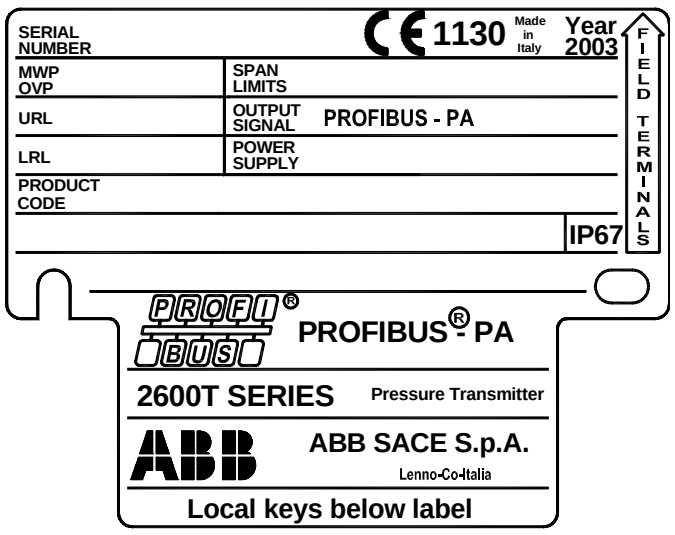
(Official in Charge)

3. – Hardware Characteristics

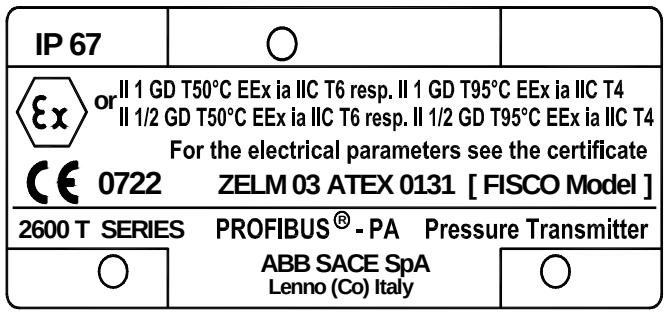
3.1 – Environmental Protection

The 2600T-262/264 PA Pressure transmitter is an integrated electronic designed for IS application. The 2600T-262/264 Series is compliant and conforms to the FISCO model. In the Table A are listed the Certifications of the 2600T-262/264 PA.

TYPE PLATE AND CERTIFICATION LABELS

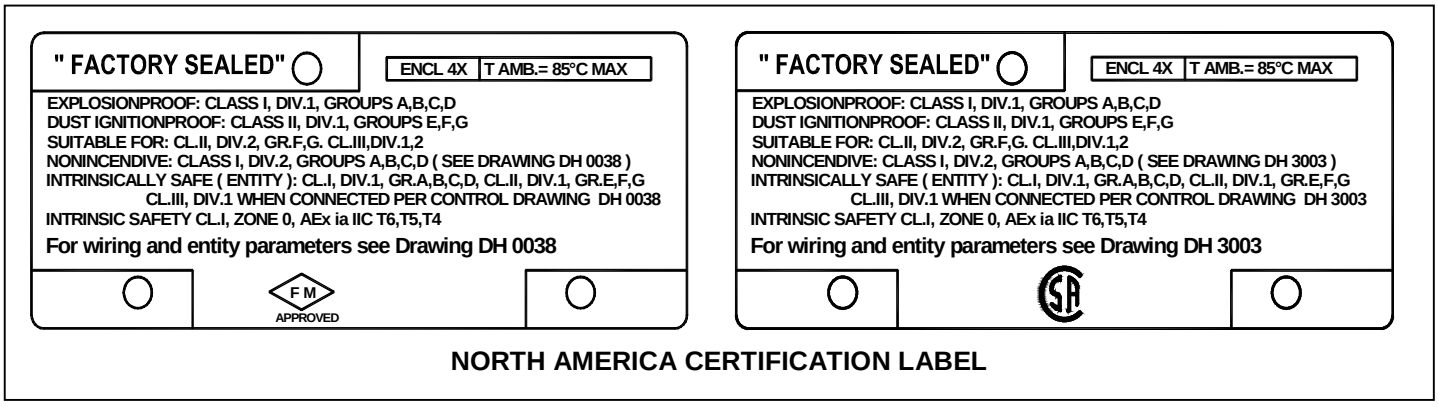


PROFIBUS® PA Type Plate



EUROPE CERTIFICATION LABEL

Agency: **ATEX / ZELM**
Certificate N°: EC-Type Examination Certificate n° ZELM 02 ATEX 0131
Protection Type: II 1GD T50°C, EEx ia IIC T6 resp. II 1GD T95°C EEx ia IIC T4
or
II 1/2GD T50° EEx ia IIC T6 resp. II 1/2GD T95°C EEx ia IIC T4



NORTH AMERICA CERTIFICATION LABEL

Agency: **FM - CSA**
Certificate N°: *Pending*
Protection Type: 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

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 20 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 unit, behind the Local Display when installed, there are available 4 DIP switches, see the Figure 1, with the following functionality:

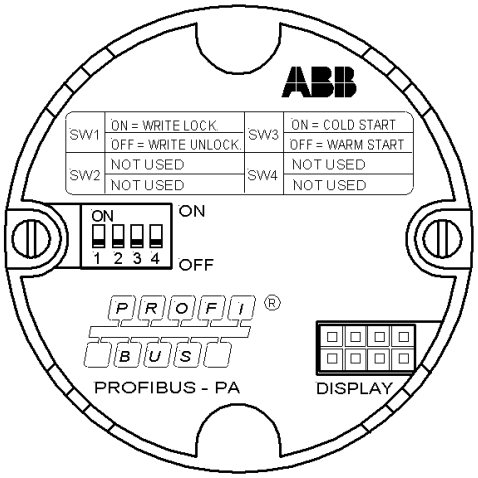


Figure 1: Electronic Front View

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 AIFBs and TB are properly set with values strictly related to the connected transducer type

SW 4 not used: (For future use)

3.4 – Local Display

The 2600T_262/264 PROFIBUS PA Pressure Transmitter is available with the LCD local common display as optionally item see the Figure 2. This display is a Dot matrix type with one 5 digit line for the value to be displayed, one 7 characters alphanumeric line for the strings and unit code, plus a 50 segments bar-graph. It can be optionally installed on the transmitter, with the capability to display variables produced in the transducer block as well as the Function Block output in Engineering Value, or its percentage, or some Diagnostic strings whenever failure or warnings are detected. In addition it acts as feedback of the local operations performed acting on the external keys.

Figure 2: Integral Local Display

The transmitter's programmability[1] through the LCD common display can be typically used in the beginning of the commissioning phase when the FF network does not work properly or the Host configuration tool is not yet available. When the Host is ready to work the local programmability can be disabled acting on PB_LOCAL_OP_ENA parameter.

The LCD common display can work in two different modes:

- Continuous Display (simple Indicator)
- Local operation monitor

[1] The Programmability of the 2600T-262/264 transmitter is allowed only for the functions regarding the Pressure Measurement.

3.4.1 - Continuous Display

When the LCD display works as Continuous Display (Default condition), it displays the variable selected in the PB_LCD_VAL_SEL. See section 8 in the Physical Block table.
The LCD assumes different behaviours depending by the Quality Status of the variable to be displayed.
- When the Quality is GOOD, the displaying of the value is continuous and updated every 1 seconds.
- When the Quality is UNCERTAIN, the display will show in alternate mode, every 1 seconds, the value of the variable, and the diagnostic string relating the reason of the Uncertainty.
- When the Quality is BAD, the value is no more displayed, and on the display blinks, every 1 seconds, the diagnostic strings relating the reason of the malfunction.

When the variable is displayed, on the LCD appear the Value with the Unit code and the bar-graph.
The bar-graph always displays the percentage of the **AIFB1_OUT_VALUE that means linked to Process Variable.**

The operating mode of the AIFB see the section 9 – Operating Mode produce the following effect on the display:

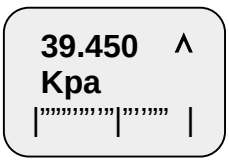
OUT OF SERVICE

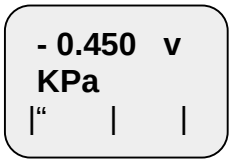
➔ When the AIFB is in Out of Service Mode, the AIFB_OUT_Status is BAD-OUT Of Service, and on the display blink this string

MANUAL MODE

➔ When the AIFB is in Manual Mode, the AIFB_OUT_Status is UNCERTAIN-Manual Mode, and on the appear this string and the AIFB_OUT Manual Value

When the AIFB is in AUTO, the process flow is normal and the display show the selected variable.
Additional indication could appear depending by the selected variable to be displayed. In case is displayed the OUT_FB1 or OUT_FB2, if the Value goes across the Limits (HI_HI, LO_LO, HI, LO) a special character is displayed together with the value.





In the **Continuous Display Mode**, the display acts also as feedback of the operation executed acting on the ‘Z’ key. For details see the section 3.5 -Local Adjustment.

3.4.2 - Local Operation Monitor

After the two external keys have been kept pressed for more than 2 seconds (ENTER operation), automatically the display mode switch from Continuous Display to Local Operation Monitor.
This condition is confirmed when on the Display appears the string REVIEW as first of the 4 main menus, see the figure 3 below.

In **Local Operation Monitor mode** the external keys 'Z' and 'S' change their functionality. When pressed they work as follow:

- Only 'Z' = NEXT.
- Only 'S' = PREVIOUS.
- Together 'Z' and 'S' for more than 2 seconds = ENTER
- Together 'Z' and 'S' for less than 2 seconds = ESCAPE

In the following figures consider the above rule where the strings ESC, ENTER, NEXT, PREV appear.

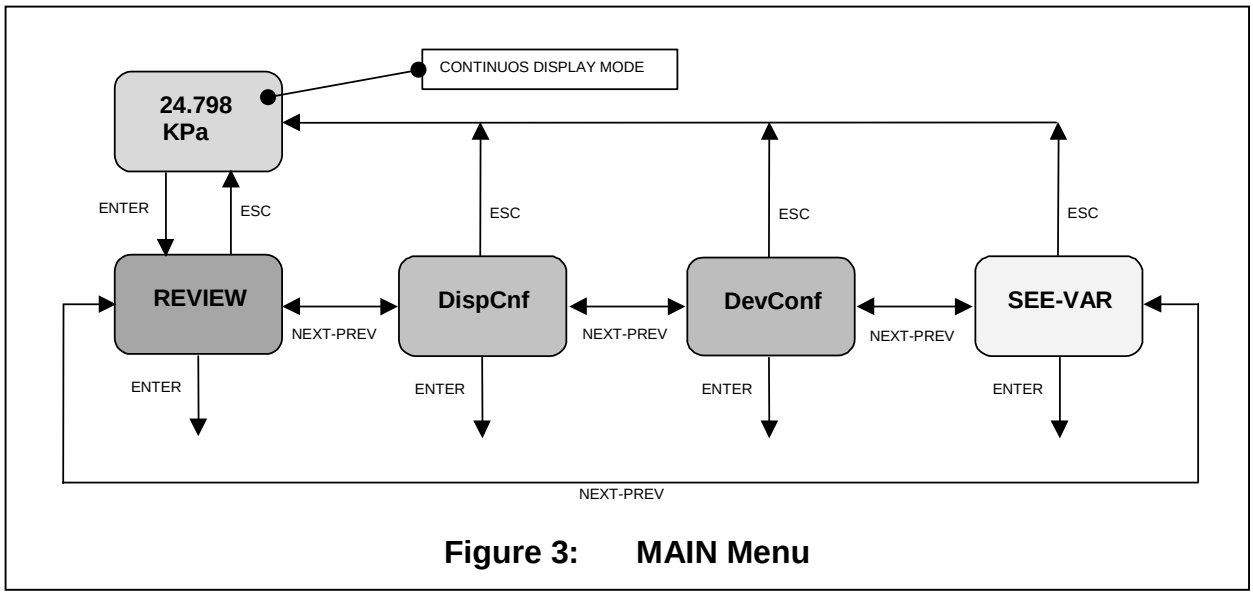


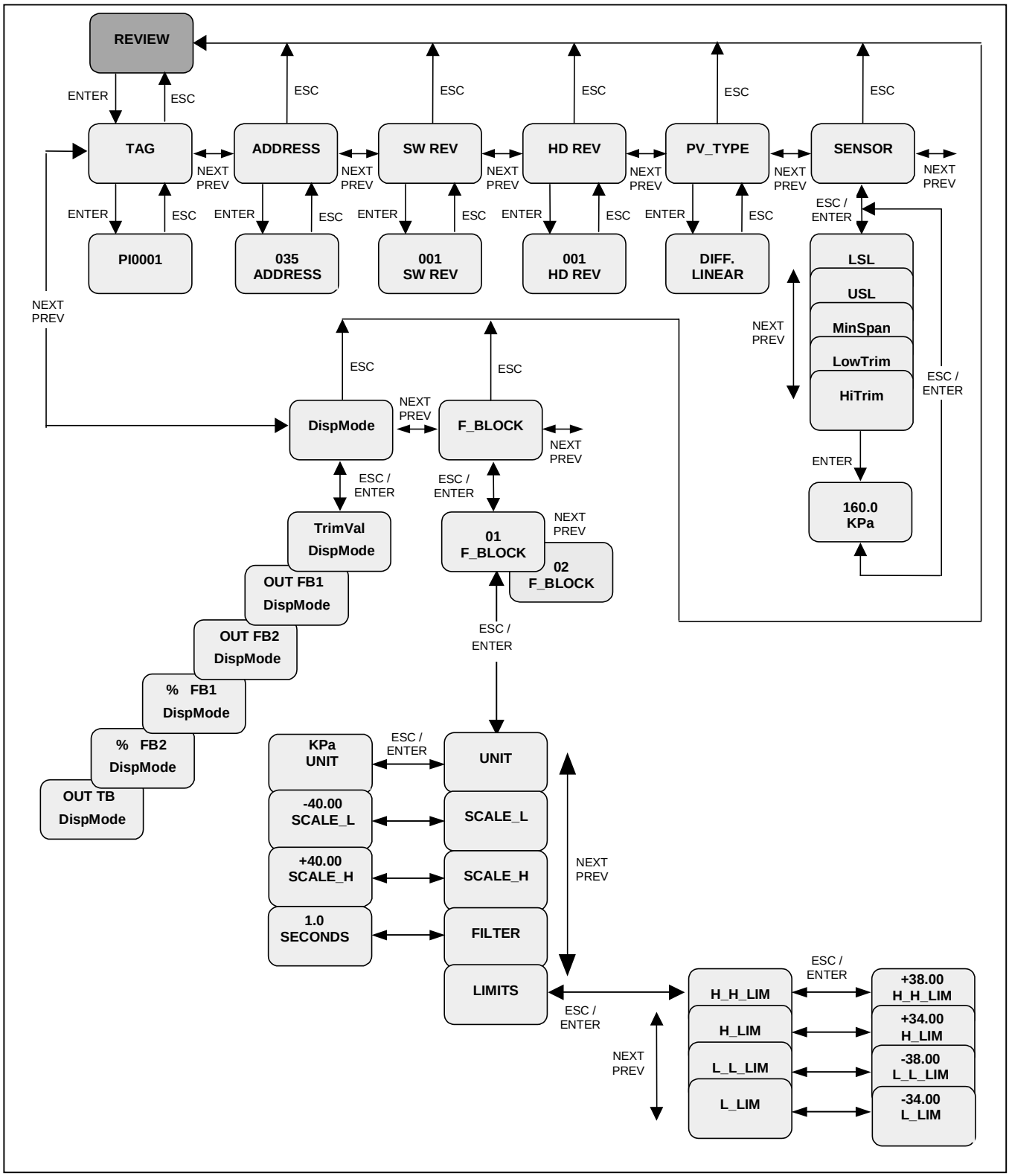
Figure 3: MAIN Menu

3.4.2.1 – REVIEW MENU

When the string 'REVIEW' is displayed, the operator can ENTER in such menu pressing the 'Z' and 'K' together for **more than 2 seconds**.

In the Review Menu are displayed variables read from the device data-base and representing the device setting.
The tree structure of the REVIEW Menu is represented in the Figure 4 below

Entering in the REVIEW menu, appear on the display the first item (TAG). Every action on 'Z' or 'S' keys scrolls to the NEXT or PREVIOUS item as in the Figure 4. Again, when from a selected item, the two keys are kept pushed together for **more than 2 seconds**, this is interpreted as an ENTER.
If submenus are available the ENTER means that the LCD goes into the submenu and then the single pushing of 'Z' or 'S' scroll to the NEXT or PREVIOUS item of the submenu too.
If no other submenus are defined, with the ENTER the variable correspondent to the item is read directly from the transmitter's memory and displayed, e.g. TAG => PI001, ADDRESS => 35, PV_TYPE => DIFF.LINEAR and so on.
When the two keys are kept pushed together for **less than 2 seconds**, this is interpreted as an ESCAPE from this level of menu and the LCD come back to the previous level of menu. A complete ESCAPE for returning to the Continuous Display Programmed Variable could require more ESCAPE actions.


REVIEW
ENTER
ESC
TAG
ADDRESS
SW REV
HD REV
PV_TYPE
SENSOR
NEXT
PREV
PI0001
035
ADDRESS
001
SW REV
001
HD REV
DIFF.
LINEAR
ESC /
ENTER
LSL
USL
MinSpan
LowTrim
HiTrim
DispMode
F_BLOCK
TrimVal
DispMode
OUT FB1
DispMode
OUT FB2
DispMode
% FB1
DispMode
% FB2
DispMode
OUT TB
DispMode
01
F_BLOCK
02
F_BLOCK
160.0
KPa
KPa
UNIT
UNIT
-40.00
SCALE_L
SCALE_L
+40.00
SCALE_H
SCALE_H
1.0
SECONDS
FILTER
LIMITS
H_H_LIM
H_LIM
L_L_LIM
L_LIM
+38.00
H_H_LIM
+34.00
H_LIM
-38.00
L_L_LIM
-34.00
L_LIM

QUICK REFERENCE FOR REVIEW

Menu	Submenu	Item	Description
TAG			Display on 3 screens the 32 characters of the "PB_TAG_DESC"
ADDRESS			Display the "Device Node Address"
SW REV			Display the Private Software Revision – TB_SW_PRIV_REV
HD REV			Display the Private Hardware Revision – TB_HW_PRIV_REV
PV TYPE			The first line displays a string for the TB_PRIMARY_VALUE_TYPE: e.g. DIFF, PRESS, FLOW, LEVEL, VOLUME; The second line displays a string for the TB_LIN_TYPE: e.g. LINEAR, SQR, TABLE…...
SENSOR	LSL		Display the Lower Sensor Limit + Unit - TB_SENSOR_LO_LIM + TB_SENSOR_UNIT
	USL		Display the Upper Sensor Limit + Unit - TB_SENSOR_HI_LIM + TB_SENSOR_UNIT
	MIN_SPAN		Display the Minimum Span + Unit - TB_CAL_MIN_SPAN + TB_SENSOR_UNIT
	CAL_POINT_HI		Display the Calibration Point High + Unit - TB_CAL_POINT_HI + TB_SENSOR_UNIT
	CAL_POINT_LO		Display the Calibration Point Low + Unit TB_CAL_POINT_LO + TB_SENSOR_UNIT
F_BLOCK			Only the AIFB1 connected to the TB_PRIMARY_VALUE (Channel = 1)
	UNIT		Display the AIFB_OUT_SCALE_Unit
	SCALE_L		Display the AIFB_OUT_SCALE_High Range
	SCALE_H		Display the AIFB_OUT_SCALE_Low Range
	FILTER		Display the AIFB_PV_FTIME + "SECONDS"
	LIMIT		
		H_H_LIM	Display the AIFB_HI_HI_LIM
		H_LIM	Display the AIFB_HI_LIM
		L_L_LIM	Display the AIFB_LO_LO_LIM
		L_LIM	Display the AIFB_LO_LIM
DspMode			Display the PB_LCD_VAL_SEL: OUT_FB1, OUT FB1%, OUT_FB2, OUT_FB2%, TrimVal, OUT_TB (see Display Config)

3.4.2.2 – DISPLAY CONFIG MENU

When the string 'DspConf' is displayed, the operator can ENTER in such menu pressing the 'Z' and 'K' together for **more than 2 seconds**.

In the DISPLAY CONFIG menu is possible to select locally the variable to be used for the continuous display mode. The selectable variables are the same available via Host in the PB_LCD_VAL_SEL.

The tree structure of the DISPLAY CONFIG Menu is represented in the Figure 5 below

When the new variable to be displayed has been selected, it became active after an ENTER operation.
In this case the ENTER performs a writing of the selection in the transmitter database.

This operation is normally allowed but can be disabled by two conditions:

1- The setting of PB_LOCAL_OP_ENA = disable from the Host.
2- The Hardware Switch 1 on the electronics is in Write Locking position (ON).

In these cases, after the ENTER, on the display will appear the string '**INVALID**'.

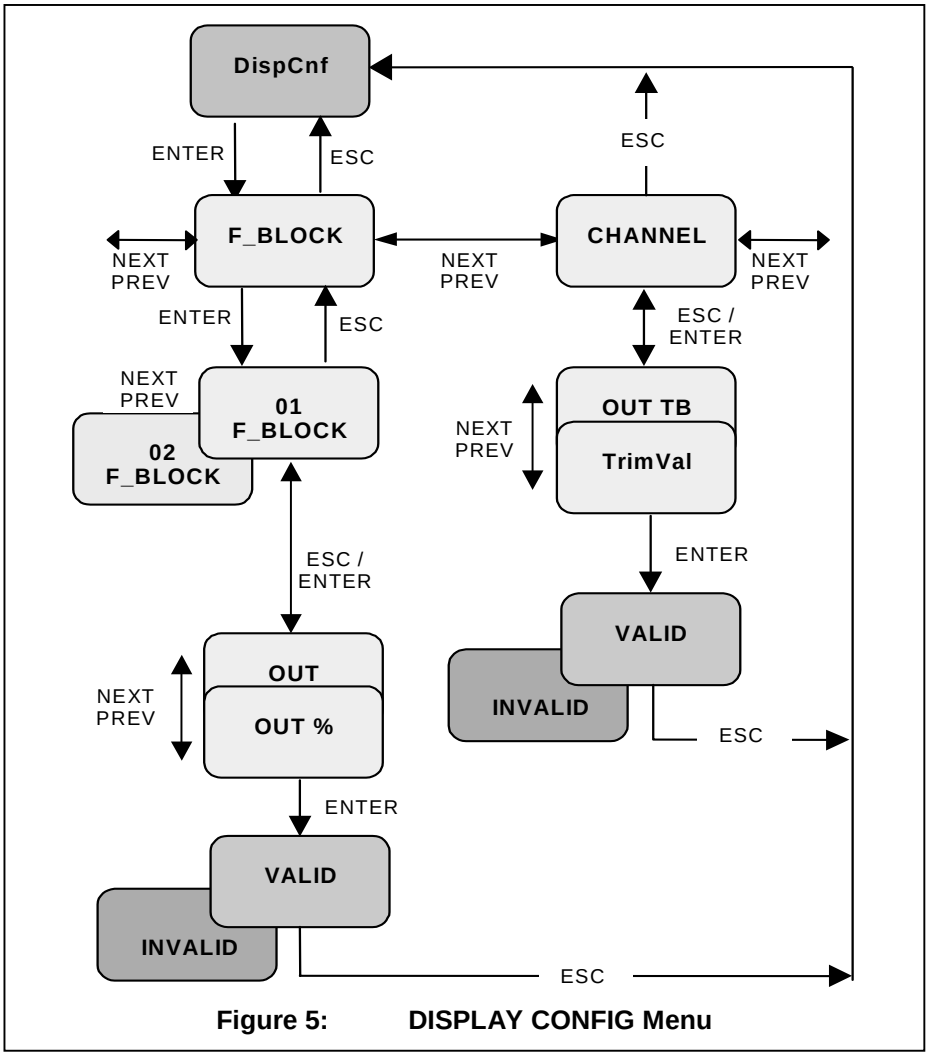


Figure 5: DISPLAY CONFIG Menu

QUICK REFERENCE FOR DISPLAY CONFIG

Menu	Submenu	Item	Description
F_BLOCK			
	01 – F_BLOCK	OUT	Display the AIFB_1_OUT_VALUE + Unit Code (AIFB_1_OUT_SCALE_Unit Code)
		OUT%	Display the AIFB_1_OUT_VALUE as percentage of the AIFB_1_OUT_SCALE
	02 – F_BLOCK	OUT	Display the AIFB_2_OUT_VALUE + Unit Code (AIFB_2_OUT_SCALE_Unit Code)
		OUT%	Display the AIFB_2_OUT_VALUE as percentage of the AIFB_2_OUT_SCALE
CHANNEL		OUT TB	Display the TB_PRIMARY_VALUE + Unit Code (TB_PRIMARY_VALUE_RANGE Unit Code)
		TrimVal	Display the TB_TRIMMED_VALUE + Unit Code (TB_CAL_UNIT)

3.4.2.3 – DEVICE CONFIG MENU

When the string 'DevConf' is displayed, the operator can ENTER in such menu pressing the 'Z' and 'K' together for **more than 2 seconds**.

In the DEVICE CONFIG menu is possible to perform locally the SENSOR TRIMMING operations.
The tree structure of the DEVICE CONFIG Menu is represented in the Figure 6 below

The values read and to be written for "LowTrim" and "HiTrim" are represented in TB_CAL_UNIT. The reference variable for these Calibrations is the TB_TRIMMED_VALUE. See also the section 12, 12.2, 12.3, 12.4.

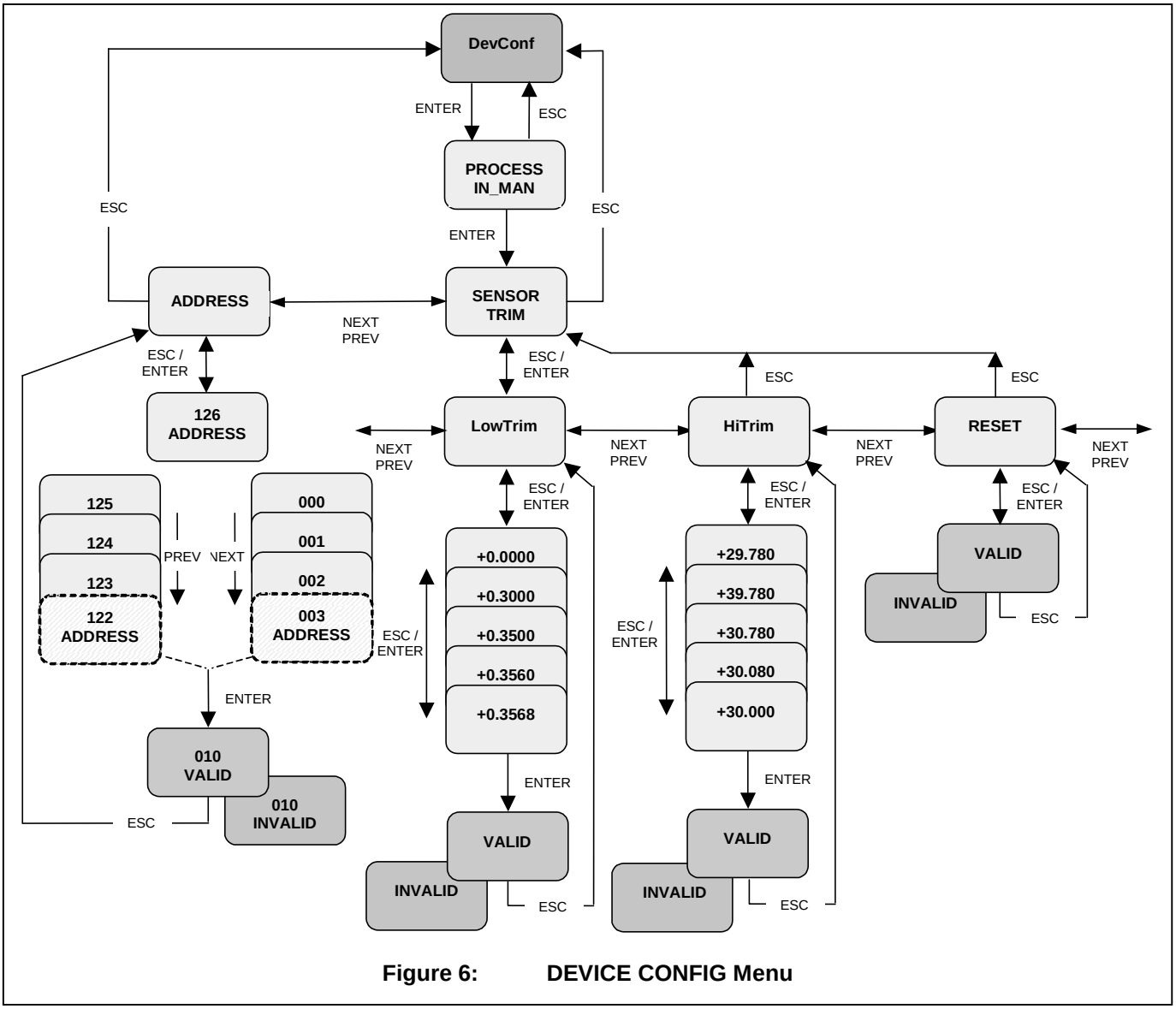


Figure 6: DEVICE CONFIG Menu

This operation is normally allowed but can be disabled by two conditions:

1- The setting of PB_LOCAL_OP_ENA = disable from the Host.
2- The Hardware Switch 1 on the electronics is in Write Locking position (ON).

In these cases, after the ENTER, on the display will appear the string '**INVALID**'.

Whenever from one of the Submenu "LowTrim" or "HiTrim" the two keys are kept pushed for more of 2 seconds, the correspondent actual value in the transmitter database is displayed. The first digit is blinking in order to distinguish the active digit.
Each NEXT action increments the digit's value, each PREVIOUS action decrements the digit's value. When the digit is at the desired value, the two keys pushed together for more than 2 seconds acts as ENTER and the next

digit is selected and it starts to blink. The same operation for less than two seconds means ESCAPE and the previous digit is selected again and it starts to blink. When the digit setting with the ENTER operations are repeated for all the digits, and the last digit (the less significant) has been set, the last ENTER provides to write the entire value in the transmitter database.

Whenever from one of the Submenu “ADDRESS” the two keys are kept pushed for more of 2 seconds, the actual Node Address of the transmitter is displayed. Each NEXT action increment the address value, each PREVIOUS action decrement the address value. When the digit is at the desired value, the two keys pushed together for more than 2 seconds acts as ENTER. The same operation for less than two seconds means ESCAPE and the menu came back to “DevConf”.
The address set in this way became active only after a power cycle of the device.

QUICK REFERENCE FOR DEVICE CONFIG

Menu	Submenu	Item	Description
SENSOR TRIM			
	LowTrim	TB_CAL_POINT_LO	See section 13.2
	HiTrim	TB_CAL_POINT_HI	See section 13.3
	Reset	PB_FAC_RESET	See section 13.4
SET ADDRESS		PB_DEV_ADD	It is locally set the device node address. Only after a power cycle of the transmitter this address became active

3.4.2.4 – SEE VARIABLES MENU

When the string 'SEE-VAR' is displayed, the operator can ENTER in such menu pressing the 'Z' and 'K' together for **more than 2 seconds**.

In this menu it is possible select a variable to be temporarily displayed independently from what selected in the PB_LCD_VAL_SEL.
The tree structure of the SEE-VAR Menu is represented in the Figure 7 below:

In the available list appear some secondary variables like the Static Pressure or Sensor Temperature not selectable from the Host, unless they are Output of AI Function Blocks.
The variable selected into the PB_LCD_VAL_SEL became active again on the display when the operator came-back into the Continuous Display Mode.

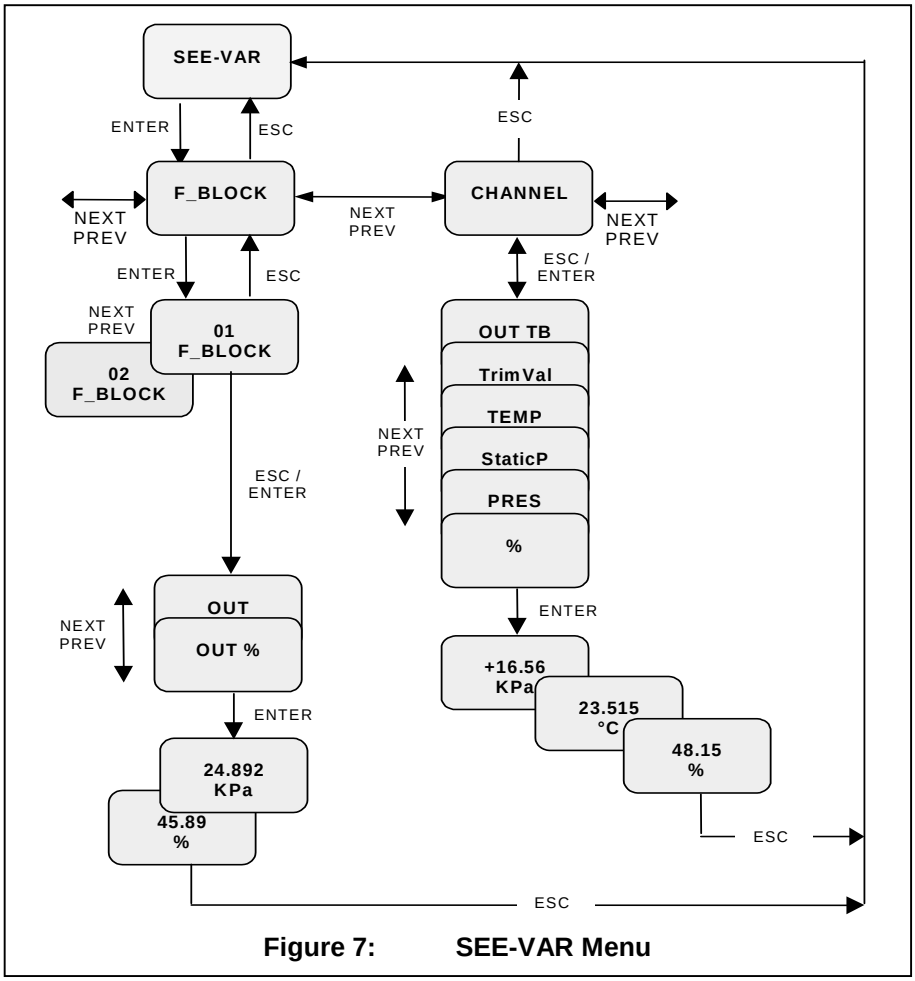


Figure 7: SEE-VAR Menu

QUICK REFERENCE FOR SEE VARIABLE

Menu	Submenu	Item	Description
F_BLOCK	01 – F_BLOCK	OUT	Display the AIFB_1_OUT_VALUE + Unit Code (AIFB_1_OUT_SCALE_Unit Code)
		OUT%	Display the AIFB_1_OUT_VALUE as percentage of the AIFB_1_OUT_SCALE
	02 – F_BLOCK	OUT	Display the AIFB_2_OUT_VALUE + Unit Code (AIFB_2_OUT_SCALE_Unit Code)
		OUT%	Display the AIFB_2_OUT_VALUE as percentage of the AIFB_2_OUT_SCALE
CHANNEL		OUT TB	Display the TB_PRIMARY_VALUE + Unit Code (TB_PRIMARY_VALUE & TB_PRIMARY_VALUE_UNIT)
		TrimVal	Display the TB_TRIMMED_VALUE + Unit Code (TB_CAL_UNIT)
		TEMP	Display the Sensor Temperature + unit code. TB_TEMPERATURE & TB_TEMPERATURE_UNIT
		StaticP	Display the Static Pressure + unit code. TB_STATIC_PRESS_VALUE & TB_STATIC_PRESS_UNIT
		PRES	Display the Pressure Value + unit code when the transmitter produces Flow or Level or Volume. TB_SECONDARY_VALUE_1 & TB_SECONDARY_VALUE_UNIT_1
		%	Display the Normalized Pressure as percentage of TB_SCALE_IN – TB_SEC_VAL2

3.5 – Local Adjustment

The two external push buttons, see the Figure 8, 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 when the user acts with the local push button:

  After the 'Z' button is kept pushed 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, see the also section 13.1.
  As consequence of the operation, the feedback appearing on the display is one of the following string sequences:

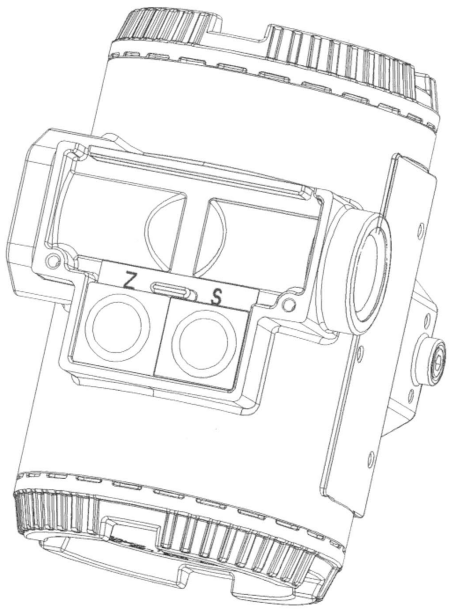


Figure 8: Push Buttons View

ZERO PASS	➔ When the operation was OK.
ZERO FAIL	➔ When the operation was NOT OK.
WRITE PROT	➔ When the security-locking switch 1 is in ON position (Write Protection).
KEY DSBL	➔ When the Local operations are disabled (see PB_LOCAL_OP_ENA in the Physical Block).

1. When the Local Display is not installed

- The 'S' key set the device address to the fixed value 32 in order to remove the device from the condition of default address 126.
  After it has been kept pressed for more than 1 second, whenever it is released the address is set to 32

The two key pressed together have not effect

2. When the display is installed, the two external keys offer also the possibility to perform local operations.

- The 'S' key when kept pressed show on the local display the actual address of the device.
- For a correct setting of the Device Address follow the 'DevConf' menu see the section 3.4.2.3 – Device Config Menu

When the Device address is set with the above methods, it became active only after a new Power-up of the device.

4. – Network Architecture

A simple and generic Profibus system is here following represented in Figure 9. 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 suitable 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 ('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.

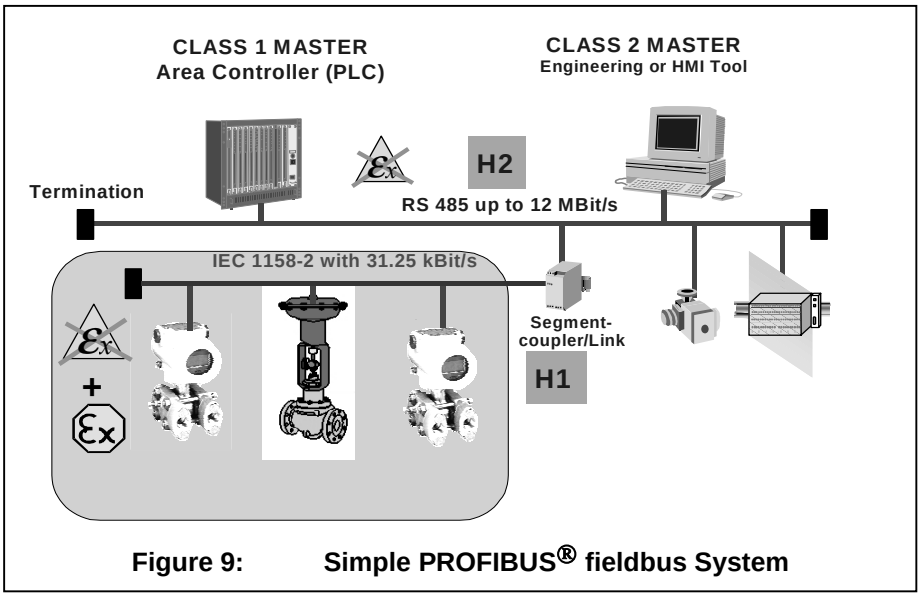


Figure 9: Simple PROFIBUS® fieldbus System

The 2600T-262/264 PA is delivered with its GSD file in a floppy disk: **ABB_052B.GSD**.

It is available also from the www.abb.com website. This file has to be imported in the network configuration tool in order to support and configure the device for the Process Control purpose.

In the figure 10 below each Profibus device connected on the bus has its own GSD file to be imported in the system before the device can became active and establish the cyclic communications.

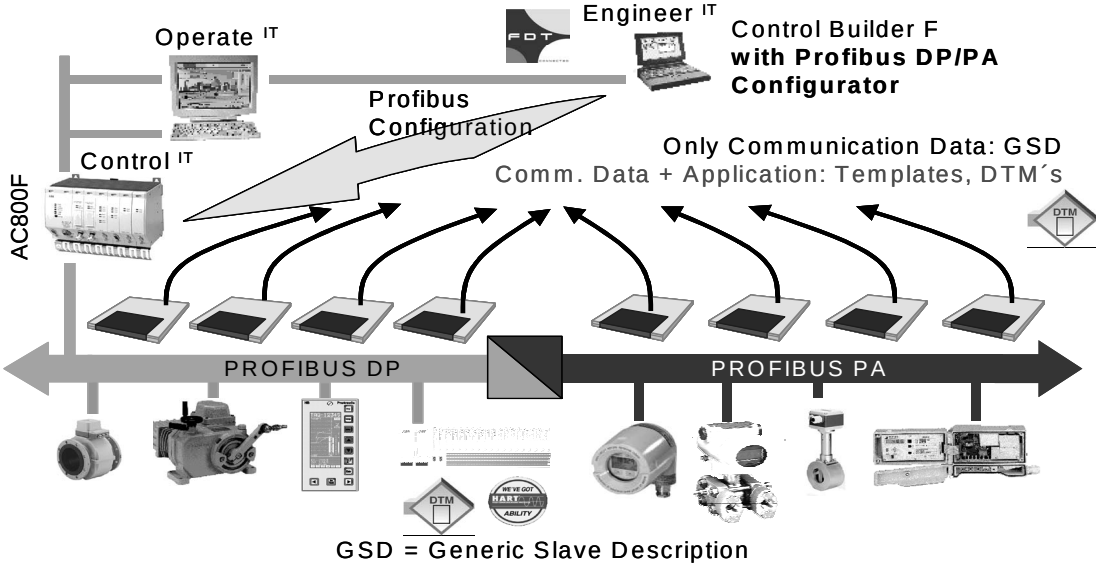


Figure 10: GSD/DTM for Configuration

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

The network can be designed following 3 different topologies as shown in the Figure 11 below or can be applied as a mix of the three

In the Table B are summarised some fieldbus characteristics.

(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

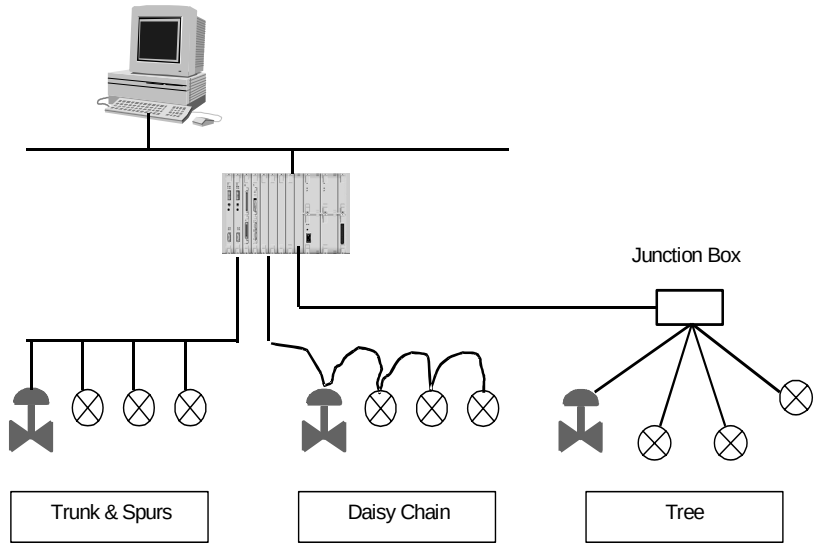


Figure 11: FIELDBUS Topologies

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	

The 2600T-262/264 PA has the following power requirements:
- Current consumption = **10.5 mA ± 1 mA**

- Power Supply non Ex = **9 to 32 Vdc**

- Power Supply Ex **(FISCO)** = **9 to 17.5Vdc**

A typical ABB Solution for PROFIBUS is represented in the Figure 12.
The number of 2600T-262/264 PA transmitters connected on one segment for EEx-ia applications can be increased when used in conjunction with the ABB Multibarrier MB204-EX.

It is possible to connect up to 8 multibarrier MB204-Ex 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 12.

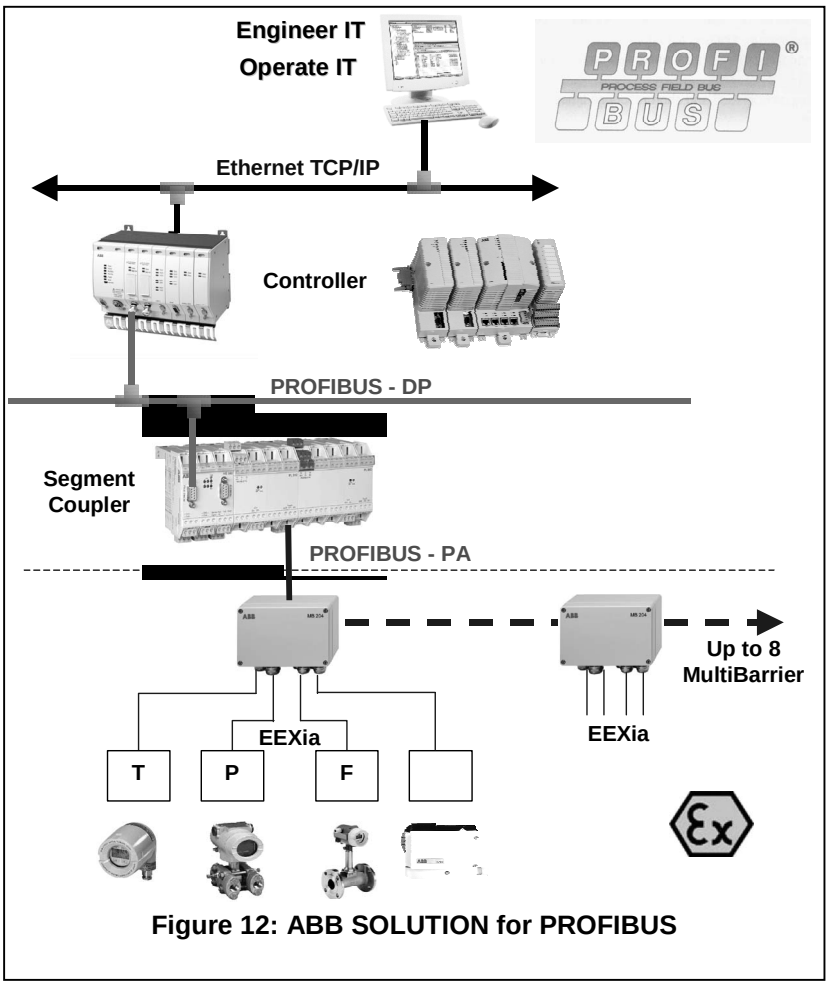
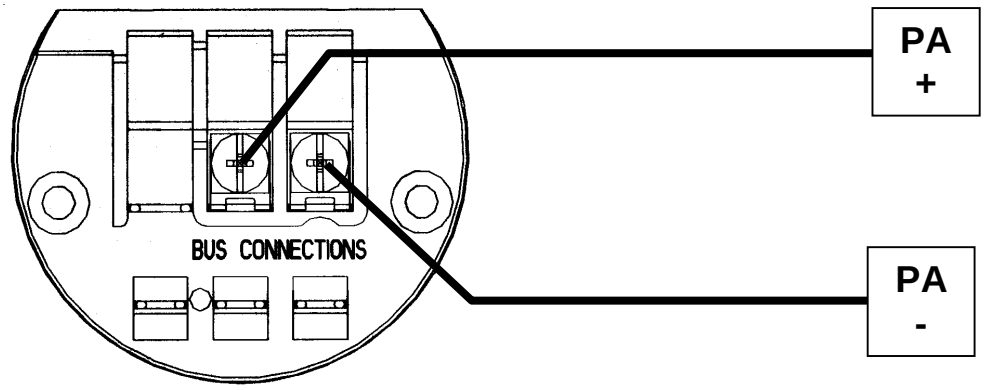


Figure 12: ABB SOLUTION for PROFIBUS

4.1 – Electrical Connections

The 2600T-262/264 PA is a Bus Powered device with Profibus PA output. On the terminal block there are two screws for the BUS CONNECTION, see the Figure 13.
The Polarity has not consistency, so the two bus cables can be connected without take care about the polarity.

Figure 13: 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 2600T-262/264 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_VAL_SEL) when all is OK or the diagnostic string when some failure has been detected.

By default the 2600T-262/264 PA starts as PRESSURE Transmitter with the two AIFBs set and selected for measure:

- **AIFB_1 produce the Pressure Measurement** (AIFB_CHANNEL = 1)
- **AIFB_2 produce the Sensor Temperature** (AIFB_CHANNEL = 2)

The user can select different TB_PRIM_VALUE_TYPE in order to use the 2600T-262/264 PA as FLOW, LEVEL or VOLUME measurement. Depending by the TB_PRIM_VALUE_TYPE selected, the AIFB_CHANNEL can be linked to different variables produced by the TB as input for the AIFB. See the TABLE C.

Table C:

	TYPE OF MEASURE (TB_PRIM_VALUE_TYPE)			
	Pressure	**Flow**	**Level**	**Volume**
Channel 0	Not Active	Not Active	Not Active	Not Active
****Channel 1 (TB_PRIMARY_VALUE)**	Pressure	Flow	Level	Volume
Channel 2 (TB_TEMPERATURE)	Sensor Temp	Sensor Temp	Sensor temp	Sensor Temp
Channel 3 (TB_SEC_VAL1)		Pressure	Pressure	Pressure
Channel 4 (TB_SEC_VAL2)				Normalised Pressure
Channel 5 (TB_ST_PRESS_VAL)	Static Pressure	Static Pressure	Static Pressure	Static Pressure

**** The Channel 1 is reserved only for the Analog Input Function Block 1 for the Process Value**

6. – Device Addressing

When the 2600T-262/264 PA Transmitter is connected on a Profibus PA bus, it is recognized by the Master trough its node address.
The default address for the Profibus devices is defined by the specification as 126. If the customer doesn't require specific setting, the Profibus PA devices are delivered with the default address.

When the user needs to change the slave address, in accordance with the plant requirements, he can perform this setting in 3 different ways:

1. Locally, when the display is installed/available, following the "DevConf" menu. See the section '3.4.2.3 - Device Config Menu'.
2. Locally, when the display is not installed/available acting on the 'S' Local key. With this operation the operator force the device address to the fixed value **32**. This operation is important when the device is set with the default address 126, that not scheduled/visible by the Class 1 Master, and there is not Class 2 Master available (Configuration Tool) for changing the address. In this way the operator can switch the device address from the default 126 into a valid and scheduled address 32, and then when it appears in the live list as 32 he can provide to change again the address as required by the project. See the section 3.5 Local Adjustment
3. From remote station (Master of Class 2) writing on the dedicated location PB_DEV_ADD in the Physical Block trough the DPE Write service.
4. From remote station (Master of Class 2) with the Slave_Change_Address service.

When the address changing is executed with the methods 1, 2 or 3 the new address became active only after a power cycle of the transmitter.

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 (switch 3 in ON position, see the section 3.3), force the address to be set to 126.

7. Measurement of Profibus PA devices

According to the Profibus specifications, the communications are of two categories:

1. **Cyclic Communications:**
   With this communication type the Class 1 master read or write cyclically the variables necessary for the **Process Control**. The 2600T-262/264 PA produces at every DSP algorithm the output of the two AI Function blocks to be read by the Class 1 Master with the cyclic communication. For the meaning of the output refer to the Table C where the TB_PRIMARY_VALUE_TYPE and the AI_CHANNEL concur to define the variable.
   The keyword "Module" in the GSD file defines exactly if one or two outputs will be produced and the format of the variables.
   The output from the AI blocks is of 5 bytes, the Variable expressed in Floating Point format (4 bytes) plus a Status Byte (1 Byte).
   The Floating Point format of each variable read by the Class 1 master is as follow:

FLOAT FORMAT

Byte n								Byte n+1								Byte n+2								Byte n+3							
Bit 7	Bit 6							Bit 7	Bit 6							Bit 7								Bit 7							
S	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}	2^{-8}	2^{-9}	2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}	2^{-15}	2^{-16}	2^{-17}	2^{-18}	2^{-19}	2^{-20}	2^{-21}	2^{-22}	2^{-23}
	EXPONENT								MANTISSA								MANTISSA								MANTISSA							

Example: 40 F0 00 00 (hex) = 0100 0000 1111 0000 0000 0000 0000 0000 (binary)
Calculation: Value = $(-1)^{S} * 2^{(Exponent - 127)} * (1 + Mantissa)$
Value = $(-1)^{0} * 2^{(129 - 127)} * (1 + 2^{-1} + 2^{-2} + 2^{-3})$
Value = $1 * 4 * (1 + 0.5 + 0.25 + 0.125)$ **= 7.5**

The Status byte is the fifth byte and can be one of the values represented in the section **13.4.-Status Supported** of this document.

2. **Acyclic Communications:**
   The acyclic communications have this name because are operator driven. See the following section **8.-Device Mapping** for details about such communication type.

8. – Device Mapping

The 2600T-262/264 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 Profile Standard defines the relative index of each variable 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° 0
- Analog Input Function Block 1 as Slot n° 1
- Pressure Transducer Block as Slot n° 1
- Analog Input Function Block 2 as Slot n° 2

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

In order to allow a full visibility and support of the variables mapped inside the 2600T-262/264 PA transmitter, it is necessary to import in the Master configuration system the DTM driver. The ABB Configuration tool is a product called SMARTVISION.
The DTM for the 2600T-262/264 PA is available with its license and has to be requested as option of the 2600T-262/264 PA directly to ABB.

The list of the variables available on the Profibus communication are reported in the following tables with the relevant block where:
IDX ➔ Relative Index of the Variable
PC ➔ Access Type for the variables.

The grey variables, when changed, increment the ST_REV.

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 + COMP_DIR_ENTRY	Composite List Directory Entries Composite Directory Entries	28 (12+16)	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	0x0007	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	0x0002

COMP_DIR_ENTRIES

PB Slot/Index	Num_PB parameters	TB Slot/Index	Num_TB Parameters	FB Slot/Index	Num_FB Parameters	FB Slot/Index	Num_FB Parameters
0x0000 (0/0)	0x0037 (55)	0x0150 (1/80)	0x0078 (120)	0x0110 (1/16)	0x003F (63)	0x0210 (2/16)	0x003F (63)
PB_ID = 1		TB_ID = 1		FB_ID = 1		FB_ID = 2	

PHYSICAL BLOCK

SLOT – 0				
Idx	**Name**	**Byte**	**PC**	**Description**
0	BLK_DATA	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
1	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.
2	TAG_DESC	32	R/W	The user description of the intended application of the block.
3	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.
4	ALERT_KEY	1	R/W	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
5	TARGET_MODE	1	R/W	The selected mode from the operator. (Only AUTO Permitted)
6	MODE_BLK	1	R	Actual – The mode the block is currently in.
		1	R	Permitted – Allowed modes that the target may take on- **AUTO**
		1	R	Normal – The common mode for the Actual.
7	ALARM_SUM	The alert status associated to the function block		
		2	R	Current
		2	R	Unacknowledged
		2	R	Unreported
		2	R	Disabled
8	SW_REV	16	R	Software Revision of the device as reported in the GSD file
9	HW_REV	16	R	Hardware Revision of the device as reported in the GSD file
10	DEV_MAN_ID	2	R	Manufacturer Identification number. For ABB is **26 dec. or 1A Hex**
11	DEV_ID	16	R	Manufacturer Specific Identification of the device. – **2600T-262/264 PA**
12	DEV_SER_N	16	R	Serial Number of the transmitter
13	DIAGNOSIS	4	R	Diagnostic information. PNO definition
14	DIAGNOSIS_EXT	6	R	Diagnostic information extended. Manufacturer definition
15	DIAGN_MASK	4	R	Diagnosis Mask. Only the supported information are set
16	DIAGN_MASK_EXT	6	R	Diagnosis Mask extension. Only the supported information are set
17	DEVICE_CERTIFIC.	32	R	Type of certifications the transmitter fulfil
18	WRITE_LOCKING	2	R/W	Software write protection **0** Write Locked. All the parameter, except this WRITE_LOCKING and TAB_ENTRY, are refused, i.e. access is denied **2457** Write Unlocked. This is the default value and all writeable parameters of a device can be written
19	FAC_RESET	2	R/W	Allows a manual restart to be initiated. Several degrees of restart are possible, they are: **1** Load Default Parameters (No address) **2506** Warm Start **2712** Reset the address to Default (126) **32768** Load Factory Sensor Trimming
20	DESCRIPTOR	32	R/W	Used for user descriptions
21	DEV_MESS	32	R/W	Used for user messages
22	DATE	16	R/W	Used for user date
23	LOCAL_OP_ENA	1	R/W	Local operations enable **1** Disabled **2** Enabled
24	IDENT_NUMBER	1	R/W	Ident. Number selector **0** Profile Specific Ident_Number 1 AI Block (9700) **1** Manufacturer Specific Ident_Number (052B) **2** 600T EN Profile 2.0 Ident_Number (009B) **128** Transmitter with 2 AI blocks (9701) **129** MV2010TC Ident_Number (062D)
25	HW_WRITE_PROT	1	R	Reflect the Switch 1 setting - HW Write locking
35	LCD_INST	1	R	Indication about the installation of the Display on the transmitter: **255** Not Installed **xxx** = Installed (xxx = lcd SW revision)
36	LCD_VAL_SEL	1	R/W	Type of variable to be displayed on the local display: **0** Primary Value **1** FB_1 output value **2** FB_1 output percent **3** FB_2 output value **4** FB_2 output percent **5** Trimmed value
37	DEV_ADD	1	R/W	Profibus Node address of the transmitter. Default address = 126

38	SW_PRIV_REV	1	R	Private SW revision
39	HW_PRIV_REV	1	R	Private HW revision
50	VIEW_1	2	R	ST_REV (Idx 1)
		3	R	MODE_BLK (Idx. 6)
		8	R	ALARM_SUM (Idx 7)
		4	R	DIAGNOSIS (Idx 13)
51	VIEW_2	2	R	ST_REV (idx 1)
		3	R	MODE_BLK (Idx. 6)
		8	R	ALARM_SUM (Idx 7)
		4	R	DIAGNOSIS (Idx 13)
		6	R	DIAGNOSIS_EXT (Idx 14)
52	VIEW_3	2	R	ST_REV (idx 1)
		2	R	WRITE_LOCKING (idx 18)
		1	R	LOCAL_OP_ENA (idx 23)
		1	R	HW_WRITE_PROT (idx 25)
		1	R	LCD_VAL_SEL (idx 36)
53	VIEW_4	2	R	ST_REV (idx 1)
		1	R	LCD_INST (idx 36)
		1	R	SW_PRIV_REV (idx 38)
		1	R	HW_PRIV_REV (idx 39)

ANALOG INPUT FUNCTION BLOCK

SLOT – 1 for analog Input 1 **/ SLOT – 2** for analog Input 2				
Idx	**Name**	**Byte**	**PC**	**Description**
16	BLK_DATA	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
17	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.
18	TAG_DESC	32	R/W	The user description of the intended application of the block.
19	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.
20	ALERT_KEY	1	R/W	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
21	TARGET_MODE	1	R/W	The selected mode from the operator. (AUTO, MAN, O/S are permitted)
22	MODE_BLK	1	R	Actual – The mode the block is currently in.
		1	R	Permitted – Allowed modes that the target may take on. **AUTO-MAN-OOS**
		1	R	Normal – The common mode for the Actual.
23	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
24	BATCH			This parameter is intended to be used in Batch applications in line with IEC 61512 Part1.
		4	R/W	**Batch_ID.** Identifies a certain batch to allow assignment of equipment-related information (e.g. faults, alarms ...) to the batch.
		2	R/W	**Rup.** Identifies the active Control Recipe Unit Procedure or the related Unit (e.g. reactor, centrifuge, drier).
		2	R/W	**Operation.** Identifies the active Control Recipe Operation.
		2	R/W	**Phase.** Identifies the active Control Recipe Phase.
26	OUT	4	R	The block output value calculated as a result of the block execution, expressed in OUT_SCALE unit code – Only when the MODE in MANUAL this variable is R/W
		1	R	The block output status - Only when the MODE in MANUAL this variable is R/W
27	PV_SCALE	4	R/W	**High Range** — All the values are associated with the channel input value
		4	R/W	**Low Range** — These values are expressed in TB_PRIM_VALUE_UNIT
28	OUT_SCALE	4	R/W	**High Range** — All the values are associated with the OUT.
		4	R/W	**Low Range** — All the units code specified by the PNO are available for
		2	R/W	**Unit Code** — this Scaling. Refer to the PROFIBUS Profile specs
		1	R/W	**Num.of Decimal digit** — [Ref. 2] for the full set of the available units code
29	LIN_TYPE	1	R/W	Linearisation Type available in the Analog Input Block: **0** Linear **10** Square root
30	CHANNEL	2	R/W	The CHANNEL value is used to select the measurement value from the I/O block. Refer to the TABLE C of this Manual for understand how the CHANNEL can be selected.
32	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.
33	FSAFE_TYPE	1	R/W	Defines reaction of device, if a fault is detected. The calculated ACTUAL MODE remains in AUTO. **0** value FSAVE_VALUE is used as OUT and Status - Uncertain_Substitute Value, **1** use of stored last valid OUT value Status - Uncertain_LastUsableValue. If there is no valid value available, then UNCERTAIN-Inital_Value, OUT value is = Initial value **2** OUT has the wrong calculated value and Status- BAD_* (* as calculated)
34	FSAFE_VALUE	4	R/W	Default value for the OUT parameter, if sensor or sensor electronic fault is detected. The unit of this parameter is the same like the OUT one.
35	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.
37	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
39	HI_LIM	4	R/W	The setting of the High Limit producing the High Alarm. This value is expressed in OUT_SCALE Unit Code

41	LO_LIM	4	R/W	The setting of the Low Limit producing the Low Alarm. This value is expressed in OUT_SCALE Unit Code
43	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
46	HI_HI_ALM			The HI HI Alarm data
		1	R/W	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
47	HI_ALM			The HI Alarm data
		1	R/W	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
48	LO_ALM			The LO Alarm data
		1	R/W	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
49	LO_LO_ALM			The LO LO Alarm data
		1	R/W	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
50	SIMULATE	1	R/W	Simulate Status
		4	R/W	Simulate Value
		1	R/W	Simulation Enable/Disable bit
51	OUT_UNIT_TEXT	16	R/W	If a specific unit of OUT parameter is not in the code list (see General Requirement) the user has the possibility to write the specific text in this parameter. The unit code is then equal “textual unit definition”.
64	VIEW_1	2	R	ST_REV (Idx 17)
		3	R	MODE_BLK (Idx. 22)
		8	R	ALARM_SUM (Idx 23)
		4	R	OUT_Value (Idx 26)
		1	R	OUT_Status (Idx 26)
65	VIEW_2	2	R	ST_REV (Idx 17)
		2	R	CHANNEL (idx 30)
		8	R	PV_SCALE (idx 27)
		1	R	LIN_TYPE (idx 29)
		11	R	OUT_SCALE (idx 28)
66	VIEW_3	2	R	ST_REV (Idx 17)
		4	R	PV_FTIME (idx 32)
		4	R	ALARM_HYS (idx 35)
		4	R	HI_HI_LIM (idx 37)
		4	R	HI_LIM (idx 39)
		4	R	LO_LIM (idx 41)
		4	R	LO_LO_LIM (idx 43)
67	VIEW_4	2	R	ST_REV (Idx 17)
		3	R	MODE_BLK (Idx. 22)
		8	R	ALARM_SUM (Idx 23)
		1	R	FSAFE_TYPE (idx 33)
		4	R	FSAFE_VALUE (idx 34)

PRESSURE TRANSDUCER BLOCK

SLOT – 1				
Idx	**Name**	**Byte**	**PC**	**Description**
80	BLK_DATA	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. **AUTO**
		1	R	Normal – The common mode for the Actual.
87	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
88	SENSOR_VAL	4	R	Raw Sensor Value
89	SENSOR_HI_LIM	4	R	Highest Physical Sensor Limit expressed in Sensor Unit. **Only Pressure Units**.
90	SENSOR_LO_LIM	4	R	Lowest Physical Sensor Limit expressed in Sensor Unit. **Only Pressure Units**
91	CAL_POINT_HI	4	R/W	The Highest calibrated value expressed in SENSOR_UNIT
92	CAL_POINT_LO	4	R/W	The lowest calibrated value expressed in SENSOR_UNIT
93	CAL_MIN_SPAN	4	R	The minimum span to be used between the calibrations points, high and low, expressed in SENSOR_UNIT.
94	SENSOR_UNIT	2	R/W	Sensor Unit. Only Pressure Units are allowed. See in the PRIM_VALUE_UNIT table the **Code for Pressure**
95	TRIMMED_VALUE	4	R	This is the Pressure value used as reference for the Calibration operation. **See also the section 12**.
		1	R	This the Trimmed Value Status
96	SENSOR_TYPE	2	R	Type of sensor module: **42** Differential Piezo Minden **43** Diff. Absolute Piezo Minden **50** Pressure Capacitive Minden **51** Press.Abs.Capacitive Minden **52** Pressure Piezo Minden **53** Pressure Abs.Piezo Minden **60** Differential Inductive Lenno **61** Diff. Inductive Abs.Lenno **62** Diff. Inductive Gauge Lenno **63** Pressure Inductive Lenno **64** Press.Inductive Abs.Lenno **65** Pressure Capacitive Lenno **66** Press.Capacitive Abs.Lenno
97	SERIAL_NUM	4	R	Serial Number of the sensor
98	PRIMARY_VALUE	4	R	This is the output value from the TB and input for the AIFB when CHANNEL = 1. It is always represented in the PRIM_VALUE_UNIT
		1	R	This is the output status from the TB
99	PRIM_VALUE_UNIT	2	R/W	Primary Value Unit. Depending by the PRIMARY_VALUE_TYPE selection: **Code for Pressure** **1130** pascal **1131** gigapascal **1132** Megapascal **1133** Kilopascal **1134** Millipascal **1135** Micropascal **1136** Hectopascal **1137** bar **1138** millibar **1139** Torr (0 deg. C) **1140** Atmosphere **1141** Psi **1142** Psia **1143** Psig **1144** grams / centimeter^2 **1145** Kilograms / centimeter^2 **1146** inches H2O (20 deg. C) **1147** inches H2O (4 deg. C) **1148** inches H2O (68 deg. F) **1149** mm H2O (20 deg. C) **1150** mm H2O (4 deg. C) **1151** mm H2O (68 deg. F) **1152** feet H2O (20 deg. C) **1153** feet H2O (4 deg. C) **1154** feet H2O (68 deg. F) **1155** inches Hg **1156** inches Hg (0 deg. C) **1157** mm Hg **1158** mm Hg 0 deg. C)

				Code for Flow **1347** cubic meters per sec **1348** cubic meters per min **1349** cubic meters per hour **1350** cubic meters per day **1351** liters per sec **1352** liters per min **1353** liters per hour **1354** liters per day **1355** Megaliters per day **1356** Cubic feet per sec **1357** Cubic feet per min **1358** Cubic feet per hour **1359** Cubic feet per day **1360** Std.Cubic feet per hour **1361** Std.Cubic feet per day **1362** Gallons per sec **1363** Gallons per min **1364** Gallons per hour **1365** Gallons per day **1366** Megagallons per day **1367** Imperial gallons per sec **1368** Imperial gallons per min **1369** Imperial gallons per hour **1370** Imperial gallons per day **1371** barrel per sec **1372** barrel per min **1373** barrel per hour **1374** barrel per day
				Code for Level **1010** meters **1011** Km **1012** cm **1013** mm **1014** micron **1015** nm (nanometers) **1016** pm (picometers) **1017** angstrom **1018** feet **1019** inches **1020** yard **1021** mile **1022** naut.mile
				Code for Volume **1034** cubic meters **1035** cubic decimeters **1036** cubic centimeters **1037** cubic millimeters **1038** liters **1039** centiliters **1040** milliliters **1041** hectoliters **1042** cubic inch **1043** cubic feet **1044** cubic yard **1045** cubic mile **1046** pint **1047** quart **1048** gallons **1049** imp.gallons **1050** bushel **1051** barrel **1052** barrel liq. **1053** Standard cubic foot
100	PRIM_VALUE_TYPE	2	R/W	Type of measurement representing the Primary Value in output from the TB. The default measurement type is Pressure. Writing on this parameter changes the measurement type of the transmitter and the internal algorithm. **See the figure 17 and section 10.1** 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. **0** Pressure **2** Level **1** Flow **3** Volume
101	SNS_DIAPHRAGMMTL	2	R	**Type of materials for sensor diaphragm:** **4** Monel **30** Hastelloy C276 **5** Tantalum **136** Monel Gold Plated **19** AISI 316L Stainless Steel **239** Monel 400
102	SENSOR_FILL_FLUID	2	R	**Type of Fill Fluid used in the sensor:** **1** Silicone Oil **2** Fluorcarbon **7** With Oil (FDA) **50** Inert Oil (Galden) **61** Dibutyl Penthalate
103	MAX_STAT_PRESS	4	R	Max allowed working pressure of the sensor expressed in SENSOR_UNIT
104	O_RING_MTL	2	R/W	**Type of materials for the O-ring:** **10** PTFE **11** Viton **12** Buna-N **21** Nitrile Rubber (Perbunan NBR) **36** TFE Glass Filled **133** Perfluoro elastomer **138** EPDM
105	PROC_CONN_TYPE	2	R/W	**Process Connection Type (flanges):** **12** Conventional **14** Remote Seal **53** Level Flange Type Flush **54** Level Flange Type Extended **55** Welded Flange **56** Level Sanitary **57** Level Food **58** No Flange, Direct Connection **59** All Welded for Remote Seal **60** Gasketed for Remote Seal **62** Direct Mount Seal (level)

106	PROC_CONN_MTL	2	R/W	**Type of material for the process connection:**		**4**	Monel
						19	AISI 316L Stainless Steel
				0	Carbon Steel	**24**	Kynar
				2	AISI 316 Stainless Steel	**30**	Hastelloy C276
				3	Hastelloy C	**239**	Monel 400
107	TEMPERATURE	4	R	This is the Sensor temperature value to be linked in input to the AIFB_2 when the CHANNEL = 2 is selected. It is expressed in TEMP_UNIT			
		1	R	This is the Sensor temperature Status			
108	TEMP_UNIT	2	R/W	Sensor Temperature Unit. The allowed units are:			
				1000	Kelvin	**1002**	Fahrenheit Degree
				1001	Celsius Degree	**1003**	Rankine Degree
109	SEC_VAL1	4	R	This is the Process Pressure Value available when the PRIM_VALUE_TYPE is selected for Flow, Level, or Volume, **see also the Figure 17.** This Pressure Value can be linked in input to the AIFB when the CHANNEL = 3 is selected. It is expressed in SEC_VAL1_UNI			
		1	R	This is the Process Pressure Status when the PRIM_VALUE_TYPE is different by pressure			
110	SEC_VAL1_UNI	2	R/W	Process Pressure Unit. Only Pressure unit code are usable See in the PRIM_VALUE_UNIT Table the Unit Code the allowed **Code for Pressure**			
111	SEC_VAL2	4	R	This is the normalized Pressure Value when the PRIM_VALUE_TYPE is selected for Volume measurement. It will be expressed always as percentage			
		1	R	This is the normalized Pressure Status			
112	SEC_VAL2_UNI	2	R/W	This unit is always percentage **(%)**			
113	LIN_TYPE	1	R/W	Linearisation Type available for converting the Pressure value in Flow, Level or Volume in accordance with the PRIM_VALUE_TYPE selection.			
				0	Linear	**240**	Square root to the third power
				1	Table	**241**	Square root to the fifth power
				10	Square root		
114	SCALE_IN_100	4	R/W	High Range (100%) of the input scaling, **see also the Figure 17.** This value is expressed in SEC_VAL1_UNI. Only Pressure unit code is allowed.			
	SCALE_IN_0	4	R/W	Low Range (0%) of the input scaling, **see also the Figure 17.** This value is expressed in SEC_VAL1_UNI. Only Pressure unit code is allowed.			
115	SCALE_OUT_100	4	R/W	High Range (100%) of the output scaling, **see also the Figure 17.** This value is expressed in PRIM_VALUE_UNIT. Only Pressure unit code is allowed			
	SCALE_OUT_0	4	R/W	Low Range (0%) of the output scaling, **see also the Figure 17.** This value is expressed in PRIM_VALUE_UNIT. Only Pressure unit code is allowed			
116	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 17**			
117	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 17**			
118	TAB_ACT_NUM	1	R	Contains the actual numbers of entries in the table. It shall be calculated after the transmission of the table is finished.			
119	TAB_ENTRY	1	R/W	The TAB_ENTRY parameter identifies which element of the table is in the X_VALUE and Y_VALUE parameter currently			
120	TAB_MAX_NUM	1	R	TAB_MAX_NUMBER is the maximum size (number of X_VALUE and Y_VALUE values) of the table in the device.			
121	TAB_MIN_NUM	1	R	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.			
122	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: - **0** – Not Initialzed - **1** – New Operation characteristic, first value (TAB_ENTRY = 1) - **2** – No Operation - **3** – Last value, end transmission, check table, swap the old curve with the new curve, update TAB_ACT_NUM			

123	TAB_STATUS	1	R	This is the result of a plausibility check in the device after the table setting. The possible status are: - **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 value 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 table is valid)
124	TAB_X_Y_VAL	8	R/W	The X_Y_VALUE parameter contains one value couple of the table
125	MAX_SENS_VAL	4	R/W	Holds the maximum process SENSOR_VALUE. The unit is defined in SENSOR_UNIT.
126	MIN_SENS_VAL	4	R/W	Holds the minimum process SENSOR_VALUE. The unit is defined in SENSOR_UNIT.
127	MAX_TEMP	4	R/W	Holds the maximum Sensor Temperature. The unit is defined in TEMP_UNIT
128	MIN_TEMP	4	R/W	Holds the minimum Sensor Temperature. The unit is defined in TEMP_UNIT
139	DRAIN_VENT_MTL	2	R/W	**Type of material of the Drain Vent:** **3** Hastelloy C **4** Monel **19** AISI 316L Stainless Steel **239** Monel 400 **251** None
140	REM_SEAL_TYPE	2	R	**Type of remote seals:** **51** Wafer **55** Off line threated **56** Chemical Tee **57** Button **58** Triclamp & Cherry Burrell **59** Alimentary (Union Nut) **60** Union Connection **61** Aseptic **61** Off line flanged connection **62** Sanitary Flush **63** Sanitary Extended **64** Flush Flanged **65** Extended Flanged **66** Urea Service **69** Pulp & Paper **70** Beverage
141	REMOTE_SEAL_ FILL_FLUID	2	R	**Type of Fill fluid for the remote seals:** **1** Silicon Oil **2** Inert Oil (Fluorolube) **50** Inert Oil (Galden) **51** Glyceryn + H2O **54** Santotherm **55** Silicone Oil food **56** Neobee **57** Dowtherm **58** Ethyl benzene **59** Ethyl Alcohol **60** Propylene Glycol/Water **61** Dibutyl Penthalate **62** Siltherm 800 **63** Mercury **65** DC97 9120 Pharma B-Grade **66** Marcol 82 (Mineral Oil) **67** AN140 (Silicon oil Hi Temp) **68** Siltherm XLT **253** Special
142	REMOTE_SEAL_ ISOLATOR	2	R	**Type of remote seals isolator:** **4** Monel **5** Tantalum **19** AISI 316L Stainless Steel **30** Hastelloy C276 **34** AISI 316L TFE Coated **136** Monel Gold Plated **234** Hastelloy C276 TFE Coated
143	NUMBER_ REMOTE_SEAL	1	R	**Number of remote seals:** **1** One Seal **2** Two Seals **251** None
144	CALIBRATION_TYPE	1	R	**Type of Calibration:** **0** Standard **1** Special Line Pressure **2** Special Temperature **3** Special Line Pressure and Temp.
145	PROCEDURE_TYPE	1	R	**Type of procedure:** **1** None **2** Oxygen Cleaning **3** Chlorine Cleaning **4** Hydrogen Preparation **5** Special degreasing
146	HIGH_TEMP_LIM	4	R	Highest allowed temperature limit. +85°C for the 2600T-262/264. This is expressed in TEMP_UNIT
147	LOW_TEMP_LIM	4	R	Lowest allowed temperature limit. –40°C for the 2600T-262/264. This is expressed in TEMP_UNIT
148	STATIC_PRESS_TRIM	4	R/W	Value at which the Static Pressure has been adjusted to. Expressed in ST_PRESS_UNIT
149	ST_PRESS_VAL	4 1	R R	This is the Static Pressure value to be linked in input to the AIFB_2 when the CHANNEL = 5 is selected. It is expressed in ST_PRESS_UNIT This is the Static Pressure Status
150	MAX_STATIC_VAL	4	R/W	Holds the maximum ST_PRESS_VAL. The unit is defined ST_PRESS_UNIT
151	ST_PRESS_UNI	2	R/W	Static Pressure Unit code. Only Pressure Units are allowed. See in the PRIM_VALUE_UNIT table the **Code for Pressure**

152	PWR_ON_CNT	2	R	Power On Counter. This counter represents the number of power on of the device
		8	R	Last event. When the last power on event occurred.
153	OVER_RNG_CNT	2	R/W	Over-range Counter. For diagnostic purpose each over-range occurrence is counted. An operator writing command can clear this counter
		8	R	Last event. When the last over-range occurred
154	OVER_TEMP_CNT	2	R/W	Over Sensor Temp. Counter For diagnostic purpose each time the sensor temperature goes outside the HIGH_TEMP_LIMIT and/or LOW_TEMP_LIMIT the occurrence is counted. An operator writing command can clear this counter
		8	R	Last event. When the last over-temp occurred
155	OVER_STAT_CNT	2	R/W	Over Static Press. Counter. For diagnostic purpose each time the static pressure goes outside the MAX_STATIC_VAL the occurrence is counted. An operator writing command can clear this counter
		8	R	Last event. When the last over-static occurred
156	TOT_WORK_HOUR	8	R	Total Working hours. Total amount of time the transmitter has been switched on
157	PAR_WORK_HOUR	8	R/W	Partial Working hours. Partial amount of time the transmitter has been switched on. An operator writing command can clear this counter.
195	VIEW_1	2	R	ST_REV (Idx 81)
		3	R	MODE_BLK (Idx. 86)
		8	R	ALARM_SUM (Idx 87)
		4	R	PRIMARY_VALUE_Value (Idx 98)
		1	R	PRIMARY_VALUE_Status (Idx 98)
196	VIEW_2	2	R	ST_REV (Idx 81)
		2	R	PRIM_VALUE_TYPE (idx 100)
		8	R	SCALE_IN (idx 114)
		2	R	SEC_VAL1_UNI (idx 110)
		1	R	LIN_TYPE (idx 113)
		8	R	SCALE_OUT (idx 115)
		2	R	PRIM_VALUE_UNIT (idx 99)
		4	R	PRIMARY_VALUE_Value (Idx 98)
		1	R	PRIMARY_VALUE_Status (Idx 98)
197	VIEW_3	2	R	ST_REV (Idx 81)
		4	R	SENSOR_HI_LIM (idx 89)
		4	R	SENSOR_LO_LIM (idx 90)
		2	R	SENSOR UNIT (idx 94)
		4	R	CAL_POINT_HI (idx 91)
		4	R	CAL_POINT_LO (idx 92)
		4	R	CAL_MIN_SPAN (idx 93)
		4	R	TRIMMED_VALUE_Value (Idx 95)
		1	R	TRIMMED_VALUE_Status (Idx 95)
198	VIEW_4	2	R	ST_REV (Idx 81)
		4	R	TEMPERATURE_Value (idx 107)
		1	R	TEMPERATURE_Status (idx 107)
		2	R	TEMPERATURE_UNIT (idx 108)
		4	R	ST_PRESS_VAL_Value (idx 149)
		1	R	ST_PRESS_VAL_Status (idx 149)
		2	R	ST_PRESS_UNI (idx 151)
		4	R	MAX_SENS_VAL (idx 125)
		4	R	MIN_SENS_VAL (idx 126)
		4	R	MAX_TEMP (idx 127)
		4	R	MIN_TEMP (idx 128)
		4	R	MAX_STATIC_VAL)idx 150)

9. - Operating Modes

As defined by the PROFIBUS PA Profile specifications, the Analog Input Function Blocks have to satisfy defined operating modes each represented by a proper bit in the AIFB_MODE_BLK_PERMITTED data structure. See the section 8 – Device Mapping

- 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'. The permitted modes are the following with their meaning.

O/S The AIFB is not able to fulfil its functional calculations anymore.
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)

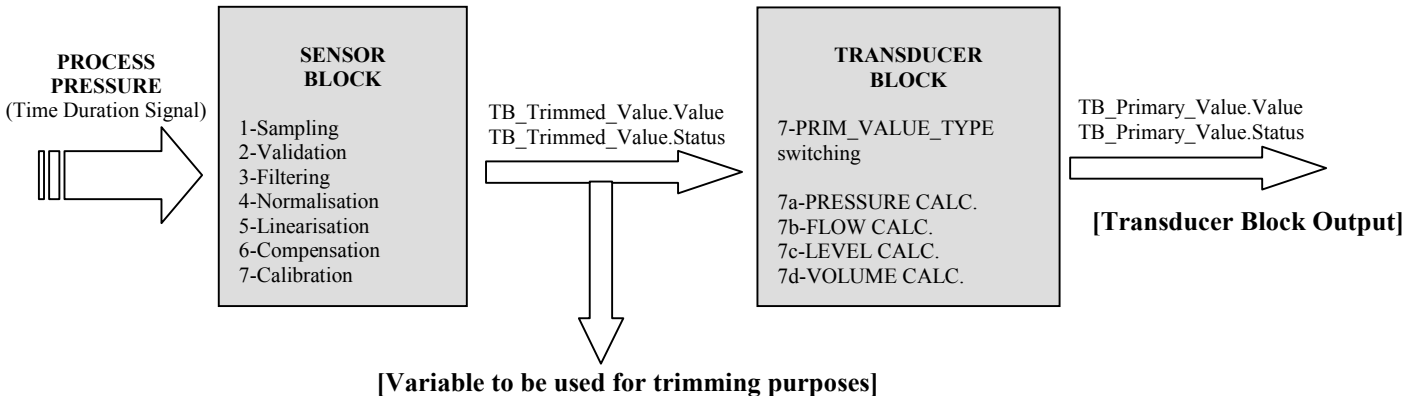
The PB and TB blocks are always in AUTO mode

10. - Process Flow

Depending by the selected TB_PRIM_VALUE_TYPE 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. For this purpose and other functionality the 262/264 PA transmitter implements what defined in the standard Profile Version 3.0. See the Transmitter Specific document [Ref. 2] in the section 2.2 Pressure Transmitters.

The Figure 14 shows the main function steps executed inside the Transducer Block DSP, starting from the acquisition until the TB output producing.

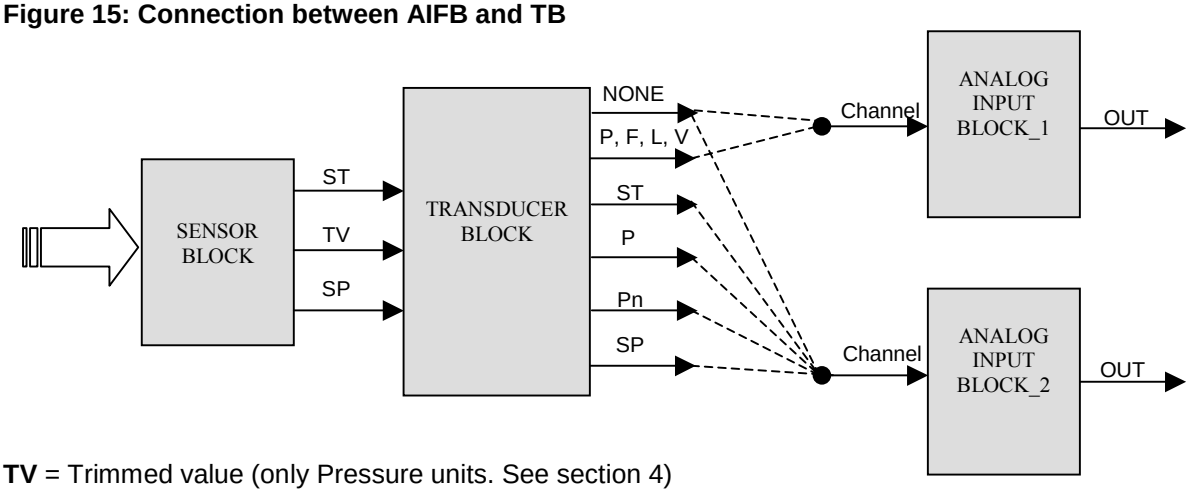
Figure 14: Transducer Block DSP



The Analog Input Function blocks receive in input one of the values produced by the Transducer Block selected through the AIFB_CHANNEL number. The AIFB 1 can be linked only for the cyclically production of the measure (P, F, L, V), the AIFB 2 can be linked to the transducer block in order to produce one of several dynamic variables. Whenever the transmitter, previous selected as Pressure type, is then selected for one of the other measurement type (i.e. Flow, Level or Volume), the relevant AIFB variables (i.e. Unit code, ranges and so on) have to be properly configured with consistent values for the new measurement type.

The following Figure 15 shows the possible connections between the 2 AIFBs and the variables in output from the Transducer Block.

Figure 15: Connection between AIFB and TB



TV = Trimmed value (only Pressure units. See section 4)
P = Pressure **F** = Flow
Pn = Normalised Pressure **V** = Volume
ST = Sensor Temperature **SP** = Static Pressure
Here in the figure 16 is a more detailed representation of the operation performed by the DSP algorithm every loop and already described above.

Figure 16: Sensor Block

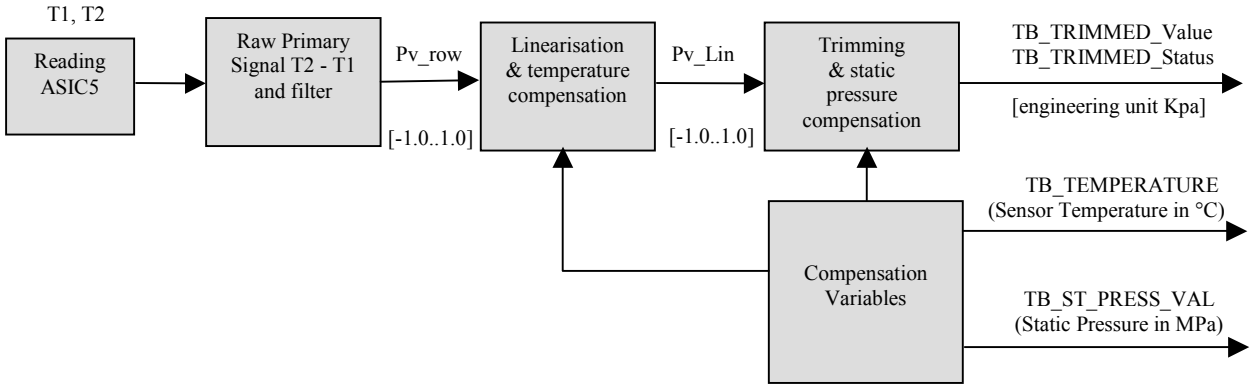


Figure 17: Pressure Transducer Block

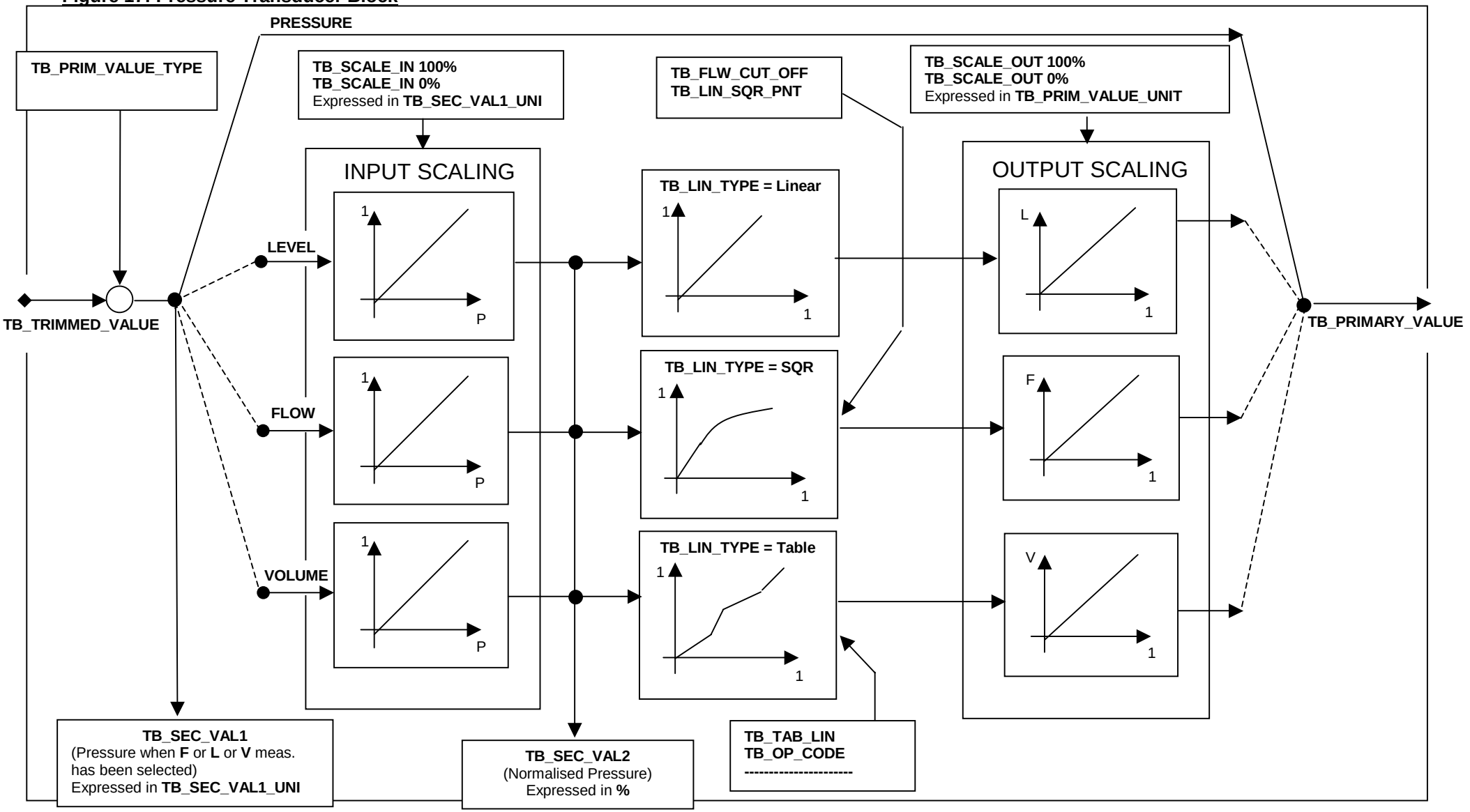
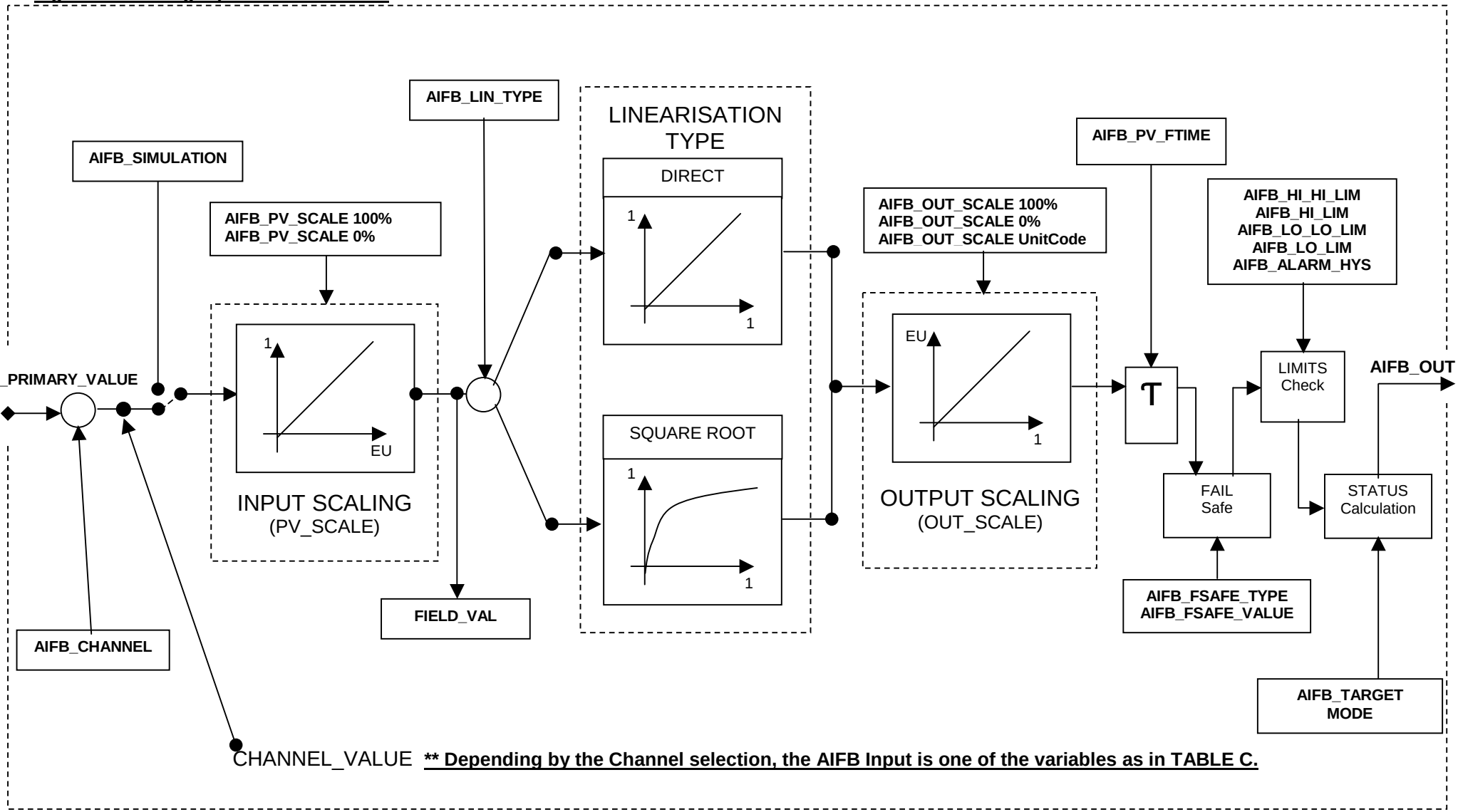


Figure 18: Analog Input Function Block



**** Depending by the Channel selection, the AIFB Input is one of the variables as in TABLE C.**

The Square Root function and relating setting is represented in the Figure 19.

- **The TB_LIN_SQR_PNT can be set between 0 to 20% of the output range**

(TB_SCALE_OUT_100 – TB_SCALE_OUT_0)

- **The TB_FLW_CUT_OFF can be set between 0 to 15% of the output range**

(TB_SCALE_OUT_100 – TB_SCALE_OUT_0)

The TB_LIN_SQR_PNT must to be always greater than the TB_FLW_CUT_OFF.

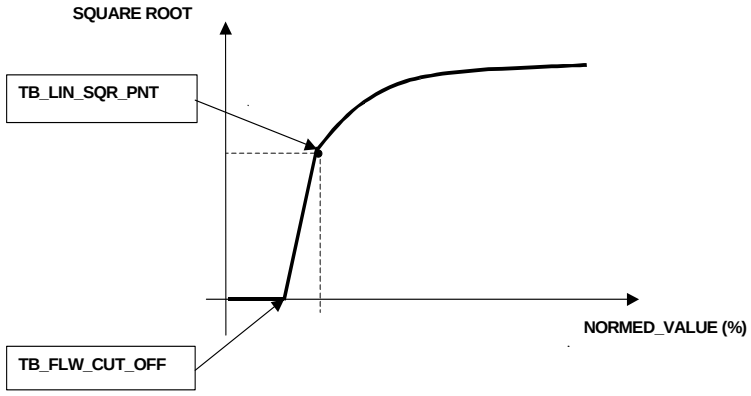


Figure 19: Square Root Function

10.1 - Transducer Block Algorithms

Referring to the Figure 17 these are the calculation internally executed:

TB_SEC_VAL1 = TB_TRIMMED_VALUE ➔ (converted in TB_SEC_VAL1_UNI for monitoring only)
TB_SEC_VAL2 = (TB_TRIMMED_VALUE – TB_SCALE_IN_0%) / (TB_SCALE_IN_100% - TB_SCALE_IN_0%)

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

Pressure:
TB_PRIMARY_VALUE = TB_TRIMMED_VALUE ➔ (converted in TB_PRIM_VALUE_UNIT in order to be directly usable by the AIFB_PV_SCALE)

Level:
TB_PRIMARY_VALUE = TB_SEC_VAL2 * (TB_SCALE_OUT_100% – TB_SCALE_OUT_0%) + TB_SCALE_OUT_0%

Flow:

IF (TB_LIN_TYPE = LINEAR)
TB_PRIMARY_VALUE = TB_SEC_VAL2 * (TB_SCALE_OUT_100% – TB_SCALE_OUT_0%) + TB_SCALE_OUT_0%

IF (TB_LIN_TYPE = SQRT3)
IF (TB_SEC_VAL2 > 0.0)
TB_PRIMARY_VALUE = $\sqrt{(TB\_SEC\_VAL2)^3}$ * (TB_SCALE_OUT_100% – TB_SCALE_OUT_0%) + TB_SCALE_OUT_0%

ELSE
TB_PRIMARY_VALUE = TB_SCALE_OUT_0%

IF (TB_LIN_TYPE = SQRT5)
IF (TB_SEC_VAL2 > 0.0)
TB_PRIMARY_VALUE = $\sqrt{(TB\_SEC\_VAL2)^5}$ * (TB_SCALE_OUT_100% – TB_SCALE_OUT_0%) + TB_SCALE_OUT_0%

ELSE
TB_PRIMARY_VALUE = TB_SCALE_OUT_0%

IF (TB_LIN_TYPE = SQRT)

$$\textbf{IF}\left(\textbf{TB\_SEC\_VAL2} \le \left(\frac{\textbf{TB\_FLW\_CUT\_OFF}}{\textbf{100}}\right)^{\textbf{2}}\right)$$

TB_PRIMARY_VALUE = TB_SCALE_OUT_0%

$$\textbf{ELSE IF } \left(\textbf{TB\_SEC\_VAL2} \leq \left(\frac{\textbf{TB\_LIN\_SQR\_PNT}}{\textbf{100}} \right)^{\textbf{2}} \right)$$

$$\text{TB\_PRIMARY\_VALUE} = \text{m} * \left(\text{TB\_SEC\_VAL2} - \left(\frac{\text{TB\_FLW\_CUT\_OFF}}{100} \right)^2 \right) * (\text{TB\_SCALE\_OUT\_100\%} - \text{TB\_SCALE\_OUT\_0\%}) + \text{TB\_SCALE\_OUT\_0\%}$$

$$\textbf{Where: } \text{m} = 100 * \frac{\text{TB\_LIN\_SQR\_PNT}}{\text{TB\_LIN\_SQR\_PNT}^2 - \text{TB\_FLW\_CUT\_OFF}^2}$$

ELSE

$$\text{TB\_PRIMARY\_VALUE} = \sqrt{\text{TB\_SEC\_VAL2}} * (\text{TB\_SCALE\_OUT\_100\%} - \text{TB\_SCALE\_OUT\_0\%}) + \text{TB\_SCALE\_OUT\_0\%}$$

Volume:

TB_PRIMARY_VALUE = ***F*** table (TB_SEC_VAL2) * (TB_SCALE_OUT_100% – TB_SCALE_OUT_0%) + TB_SCALE_OUT_0%

10.2 - Analog Input Function Block Algorithms

Referring to the Figure 18 these are the calculation internally executed:

$$FIELD\_VAL = 100 * \frac{CHANNEL\_VALUE - AIFB\_PV\_SCALE\_0\%}{AIFB\_PV\_SCALE\_100\% - AIFB\_PV\_SCALE\_0\%}$$

Depending by the LIN_TYPE parameter selection there are applied the following signal conversions:

Linear:

AIFB_OUT_VALUE = FIELD_VALUE * (AIFB_SCALE_OUT_100% – TB_SCALE_OUT_0%) + TB_SCALE_OUT_0%

Square Root:

IF FIELD_VAL < 0.0
AIFB_OUT_VALUE = AIFB_OUT_SCALE 0%

ELSE

$$AIFB\_OUT\_VALUE = \sqrt{\frac{FIELD\_VAL}{100}} * (AIFB\_OUT\_SCALE\_100\% - AIFB\_OUT\_SCALE\_0\%) + AIFB\_OUT\_SCALE\_0\%$$

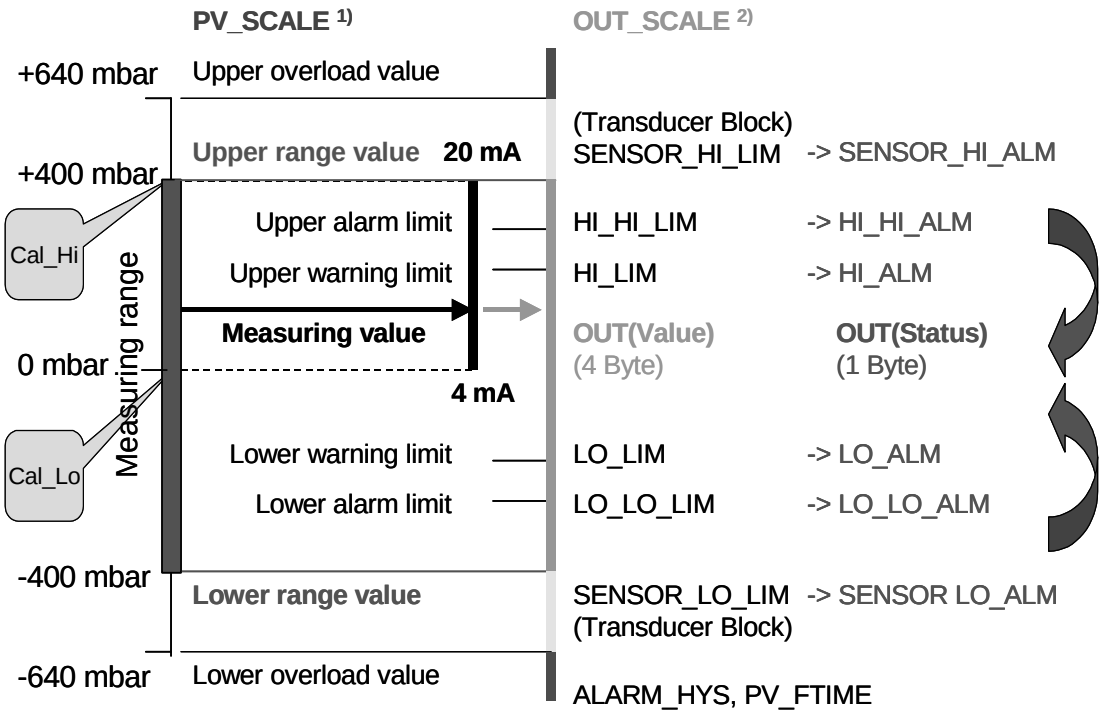


Figure 20: **Measuring value, parameter and status information of a PROFIBUS PA device - e.g. Transmitter for Diff. Pressure**

11. – Commissioning

The 2600T-262/264 PA can be configured for measure Pressure, Flow, Level or Volume.
At every TB_PRIM_VALUE_TYPE selection, all the relevant variables of the TB and AIFB are automatically set with values consistent with the new selection. i.e. switching the AIFB_2 Channel from Pressure to Temperature, all the units and range values are set to °C and temperature range values changing the TB_PRIM_VALUE_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.

11.1 - Pressure Configuration

By default the 2600T-262/264 PA is configured and works as Pressure Transmitter. The value produced by the sensor block (TB_TRIMMED_VALUE), is the same in output from the Transducer Block (TB_PRIMARY_VALUE), see the figure 15 and 18. This value is linked in input to the AIFB_1 trough the Channel selection as CHANNEL_VALUE of the formula applied in the section 10.2 AIFB algorithms.

This is the default setting of the 2600T-262/264 PA:
- TB_PRIM_VALUE_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 (TB_SENSOR_HI_LIM strictly dependent by the sensor type)
- TB_SCALE_OUT_0% = Lower Range Limit (TB_SENSOR_LO_LIM strictly dependent by the sensor type)
- TB_PRIM_VALUE_UNIT = Kpa (TB_SENSOR_UNIT)

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

- AIFB_1_CHANNEL = 1	AIFB_2_CHANNEL = 2
- AIFB_1_PV_SCALE_100% = Upper Range Limit**	AIFB_2_XD_SCALE_100% = 90.0**
- AIFB_1_PV_SCALE_0% = Lower Range Limit**	AIFB_2_XD_SCALE_0% = -40.0**
- AIFB_1_L_TYPE = Direct	AIFB_2_L_TYPE = Direct
- AIFB_1_OUT_SCALE_100% = Upper Range Limit	AIFB_2_OUT_SCALE_100% = 90.0
- AIFB_1_OUT_SCALE_0% = Lower Range Limit	AIFB_2_OUT_SCALE_0% = -40.0
- AIFB_1_OUT_SCALE_UnitCode = Kpa	AIFB_2_OUT_SCALE_UnitCode = °C
** The PV_SCALE is expressed in TB_PRIM_VALUE_UNIT	** The PV_SCALE is expressed in °C

The AIFB_1_OUT, as output of the Analog Input 1 function Block, produce in output the pressure value in Kpa
The AIFB_2_OUT, as output of the Analog Input 2 function Block, produce in output the Sensor Temperature value in °C
Unless of specific requirements, the AIFB receiving in input the TB_PRIMARY_VALUE works without additional conversions; AIFB_L_TYPE = direct.

11.2 - Flow Configuraton

When the TB_PRIM_VALUE_TYPE is selected as FLOW, the TB_TRIMMED_VALUE goes trough the FLOW algorithm of the Transducer Block in the section 10.1. See also the Figure 17.
The user has to select the following:

- TB_PRIM_VALUE_TYPE = FLOW

Automatically the 2600T-262/264 PA became set as follows:

- 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 = 10%
- TB_SCALE_OUT_100% = 100.0
- TB_ SCALE_OUT _0% = 0.0
- TB_PRIM_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 (TB_SCALE_IN) always represents the input pressure range, and the output scaling (TB_SCALE_OUT) represents the output conversion range.

- AIFB_1_CHANNEL = 1	AIFB_2_CHANNEL = 2
- AIFB_1_PV_SCALE_100% = 100.0**	AIFB_2_PV_SCALE_100% = 90.0**
- AIFB_1_PV_SCALE_0% = 0.0**	AIFB_2_PV_SCALE_0% = -40.0**
- AIFB_1_L_TYPE = Direct	AIFB_2_L_TYPE = Direct
- AIFB_1_OUT_SCALE_100% = 100.0	AIFB_2_OUT_SCALE_100% = 90.0
- AIFB_1_OUT_SCALE_0% = 0.0	AIFB_2_OUT_SCALE_0% = -40.0
- AIFB_1_OUT_SCALE_UnitCode = Cubic Meter per hours	AIFB_2_OUT_SCALE_UnitCode = °C
** The PV_SCALE is expressed in TB_PRIM_VALUE_UNIT	** The PV_SCALE is expressed in °C

The AIFB_1_OUT, as output of the Analog Input 1 function Block, produce in output the flow value in Cubic Meter per hour
The AIFB_2_OUT, as output of the Analog Input 2 function Block, produce in output the Sensor Temperature value in °C

The user can start from this default and working condition, and then proceed with the real setting of the variables, as the application requires.
Unless of specific requirements, the AIFB receiving in input the TB_PRIMARY_VALUE works without additional conversions; AIFB_L_TYPE = direct.

Note: See also the Table C in the section 5-Initialisation about the allowed Channel selections depending by the TB_PRIM_VALUE_TYPE.

11.3 - Level Configuraton

When the TB_PRIM_VALUE_TYPE is selected as LEVEL, the TB_TRIMMED_VALUE goes trough the LEVEL algorithm of the Transducer Block in the section 10.1. See also the Figure 17.
The user has to select the following:

- TB_PRIM_VALUE_TYPE = LEVEL

Automatically the 2600T-262/264 PA became set as follows:

- 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_PRIM_VALUE_UNIT = Meters

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

The input scaling (TB_SCALE_IN) always represents the input pressure range, and the output scaling (TB_SCALE_OUT) represents the output conversion range.

- AIFB_1_CHANNEL = 1	AIFB_2_CHANNEL = 2
- AIFB_1_PV_SCALE_100% = 100.0**	AIFB_2_PV_SCALE_100% = 90.0**
- AIFB_1_PV_SCALE_0% = 0.0**	AIFB_2_PV_SCALE_0% = -40.0**
- AIFB_1_L_TYPE = Direct	AIFB_2_L_TYPE = Direct
- AIFB_1_OUT_SCALE_100% = 100.0	AIFB_2_OUT_SCALE_100% = 90.0
- AIFB_1_OUT_SCALE_0% = 0.0	AIFB_2_OUT_SCALE_0% = -40.0
- AIFB_1_OUT_SCALE_UnitCode = Meters	AIFB_2_OUT_SCALE_UnitCode = °C
** The PV_SCALE is expressed in TB_PRIM_VALUE_UNIT	** The PV_SCALE is expressed in °C

The AIFB_1_OUT, as output of the Analog Input 1 function Block, produce in output the Level value in Meters
The AIFB_2_OUT, as output of the Analog Input 2 function Block, produce in output the Sensor Temperature value in °C

The user can start from this default and working condition, and then proceed with the real setting of the variables, as the application requires.
Unless of specific requirements, the AIFB receiving in input the TB_PRIMARY_VALUE works without additional conversions; AIFB_L_TYPE = direct.

Note: See also the Table C in the section 5-Initialisation about the allowed Channel selections depending by the TB_PRIMARY_VALUE_TYPE.

11.4 - Volume Configuraton

When the TB_PRIM_VALUE_TYPE is selected as VOLUME, the TB_TRIMMED_VALUE goes trough the VOLUME algorithm of the Transducer Block in the section 10.1. See also the Figure 17.
The user has to select the following:

- TB_PRIM_VALUE_TYPE = VOLUME

Automatically the 2600T-262/264 PA became set as follows:

- TB_SCALE_IN_100% = Upper Range Limit.
- TB_SCALE_IN_0% = 0.0
- TB_SEC_VAL1_UNI = Kpa
- TB_LIN_TYPE = Table
  - TB_TAB_X_Y_VALUE = SEE THE TABLE SETTING PROCEDURE 10.4.1.
- TB_SCALE_OUT_100% = 100.0
- TB_ SCALE_OUT _0% = 0.0
- TB_PRIMY_VALUE_UNIT = Cubic Meters

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

The input scaling (TB_SCALE_IN) always represents the input pressure range, and the output scaling (TB_SCALE_OUT) represents the output conversion range.

- AIFB_1_CHANNEL = 1	AIFB_2_CHANNEL = 2
- AIFB_1_PV_SCALE_100% = 100.0**	AIFB_2_PV_SCALE_100% = 90.0**
- AIFB_1_PV_SCALE_0% = 0.0**	AIFB_2_PV_SCALE_0% = -40.0**
- AIFB_1_L_TYPE = Direct	AIFB_2_L_TYPE = Direct
- AIFB_1_OUT_SCALE_100% = 100.0	AIFB_2_OUT_SCALE_100% = 90.0
- AIFB_1_OUT_SCALE_0% = 0.0	AIFB_2_OUT_SCALE_0% = -40.0
- AIFB_1_OUT_SCALE_UnitCode = Cubic Meters	AIFB_2_OUT_SCALE_UnitCode = °C
** The PV_SCALE is expressed in TB_PRIM_VALUE_UNIT	** The PV_SCALE is expressed in °C

The AIFB_1_OUT, as output of the Analog Input 1 function Block, produce in output the Volume value in Cubic Meters
The AIFB_2_OUT, as output of the Analog Input 2 function Block, produce in output the Sensor Temperature value in °C

The user can start from this default and working condition, and then proceed with the real setting of the variables, as the application requires.
Unless of specific requirements, the AIFB receiving in input the TB_PRIMARY_VALUE works without additional conversions; AIFB_L_TYPE = direct.

Note: See also the Table C in the section 5-Initialisation about the allowed Channel selections depending by the TB_PRIMARY_VALUE_TYPE.

11.4.1 – 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.
The X values are representing the percentage of the input pressure with reference to the TB_SCALE_IN range.
The Y values are representing the percentage of the output volume with reference to the TB_SCALE_OUT range

Using as example the figure 21 below, the setting procedure is done as follow:

1. The setting procedure starts writing the TAB_OP_CODE = 1 (New Operation characteristic). The TAB_ENTRY goes to 1 as pointer to the first couple of X, Y values. See also the section 8 in the PRESSURE TRANSDUCER BLOCK TABLE.

1- Then the user can write the X1, Y1 values in the TAB_X_Y_VALUES.
2- In the TAB_ENTRY the user writes 2.
3- Then the X2, Y2 values are written in the TAB_X_Y_VALUES.
4- In the TAB_ENTRY the user writes 3.
5- As above until the writing of the X6 and Y6 values.
6- Then the user have to write the TAB_OP_CODE = 3 (Last value, end transmission, check table, swap the old curve with the new curve, update TAB_ACT_NUM). The new table is internally checked before to become valid.
7- The TAB_STATUS will reflect the result of the internal table check executed as in the point 6. See the available TAB_SATUS conditions in the section 8 PRESSURE TRANSDUCER BLOCK TABLE

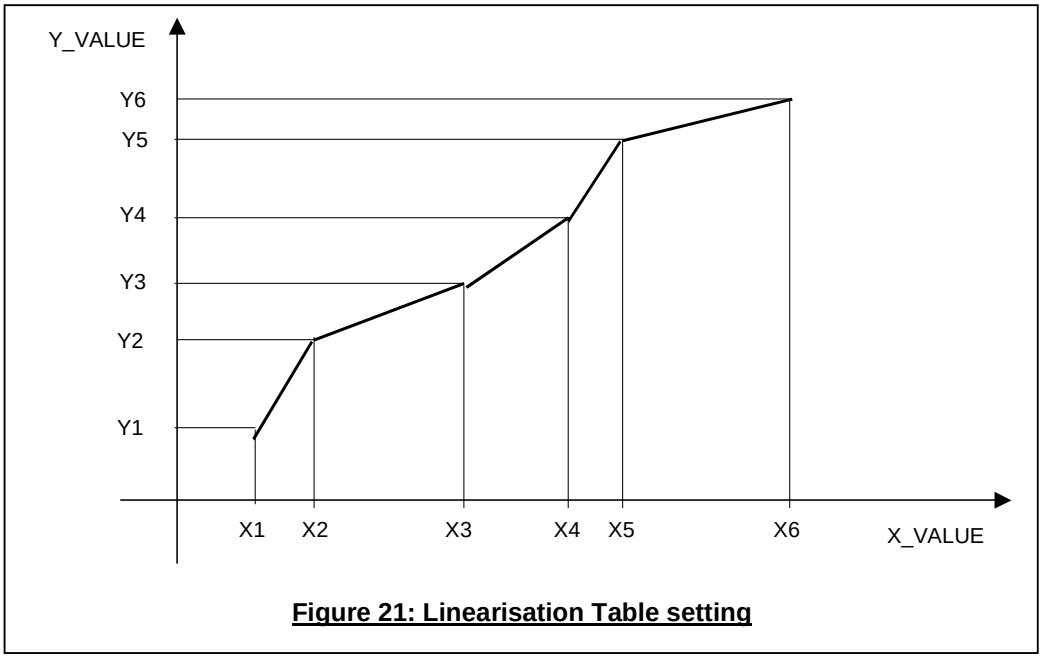
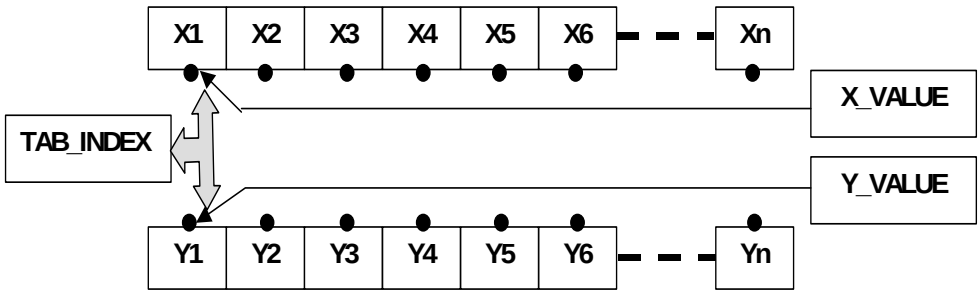


Figure 21: Linearisation Table setting



12. - Calibration Operations

The operations provided by the transmitters and to be supported by the Class 2 Master are listed in the Table D

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_SENSOR_UNIT
Static Pressure Trimming	TB_ST_PRESS_TRIM

Two points are necessary to perform a sensor trimming, Low sensor trimming point (Zero) and high sensor trimming point (Span). The minimum distance from the two points must be greater than minimum span.
The user makes a trimming procedure writing in the TB_CAL_POINT_HI and TB_CAL_POINT_LO the values that the transmitter has to produce as TB_TRIMMED_VALUE with the current pressure applied in input. These values are expressed in TB_SENSOR_UNIT engineering unit.

12.1 - 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 is 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_SENSOR _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'.

For details about this operation executed using the local push button 'Z', see the section 3.5

12.2 - 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_ SENSOR _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.

12.3 - 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_ SENSOR _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.

12.4 - Reset to Factory Sensor Trimming

This operation can be executed only using the remote configuration tool. With this operation the all the parameters involved in the trimming operations are updated with the original values recorded during the final calibration performed in the factory.
This operation is executed selecting the dedicated item “Load Factory Sensor Trimming” in the PB_FAC_RESET, see section 8 in the Physical Block.

12.5 - Static Pressure Trimming

This operation can be executed only using the remote configuration tool. With this operation the TB_ST_PRESS_VAL (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_ST_PRESS_VAL.
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_ST_PRESS_VAL and check if its value has been adjusted for matching the real Static Pressure value.

13. - Diagnostic

The PROFIBUS PA® Profile 3.0 specification pre-defines a set of diagnostic information. Additional Manufacturer specific diagnostic information are allowed in order to identify device malfunctions or working conditions that could decrease the device performance or that could require device maintenance. All these diagnostic Flags/Codes are updated dynamically every DSP loop.

The diagnostic flags supported by the 2600T-262/264 PROFIBUS PA® are a subset of the standard errors defined in the PB_DIAGNOSIS variable, and the additionally errors flags are defined in the PB_DIAGNOSIS_EXT as manufacturer specific. See the section 13.2
All the diagnostic flags supported in the PB_DIAGNOSIS and PB_DIAGNOSIS_EXT have a correspondent bit set in the PB_DIAGNOSIS_MASK and PB_DIAGNOSIS_EXT_MASK.

The AIFB_ALARM_SUMMARY variable gives indication of the current/actual condition of the AIFB_OUT value respect the Critical and Advisory limits high and low. See the section 13.1

Another information to be considered for possible diagnostic usage is the Status byte that is produced every loop together with some dynamic variables like the OUT value of the Function Blocks. It represents the Quality of the associated variable. See the section 13.3.

The Alert Notification service is not implemented and for this reason all the diagnostic flags will be accessed from the user with a read operation.

13.1 – Alarm Summary

The ALARM_SUMMARY data structure reflects the general status of the alarms handled in the 2600T-262/264 PA. The bits listed below represent the alarms supported in the 2600T-262/264 PA, and each of them is available with 4 information:

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

Table E:

Octet	Bit	Mnemonic	Description
1	0	Discrete Alarm	Not Handled
	1	HI_HI_Alarm	Supported by AIFB 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 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 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 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	For all the Blocks implemented PB, AIFB, TB (e.g. increment of ST_REV)
2	0-7	Reserved	

Only the **Current** byte 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.

13.2 – DIAGNOSIS INFORMATION

The PB_DIAGNOSIS bits defined in the Physical Block and handled in the 2600T-262/264 PA are here following listed. These bits are also mapped in the reply of the SLAVE_DIAG service for the Class 1 Master as defined in the standard Profile Version 3.0. See the Mapping to DP document [Ref.3] in the section 3.3.9.
The mapping of the PB_DIAGNOSIS bits in the SLAVE_DIAG service is in accordance with the Profile 3.0 specifications. Whenever one of the supported bits changes its status from 0 to 1 or vice-versa, 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

The Standard define a set of bits as in the table F below

TABLE F – Standard DIAGNOSIS Bits

Byte	Bit	Mnemonic	Description
1	0	DIA_HW_ELECTR	Hardware failure of the electronic
	1	DIA_HW_MECH	Hardware failure of the mechanics
	2	DIA_TEMP_MOTOR	Motor – Temperature too High
	3	DIA_TEMP_ELECTRIC	Electronic Temperature too High
	4	DIA_MEM_CHKSUM	Memory error
	5	DIA_MEASUREMENT	Failure in measurement
	6	DIA_NOT_INIT	Device not Initialized – (No Selfcalibration)
	7	DIA_INIT_ERR	Selfcalibration Failed
2	0	DIA_ZERO_ERR	Zero point error (limit position)
	1	DIA_SUPPLY	Power supply failed (electrical, pneumatic)
	2	DIA_CONF_INVAL	Configuration not valid
	3	DIA_WARMSTART	New-start-up (warm start up) carried out.
	4	DIA_COLDSTART	Re-start-up (cold start up) carried out.
	5	DIA_MAINTENANCE	Maintenance Required
	6	DIA_CHARACT	Characterization Invalid
	7	IDENTNUMBER Violation	Set to 1 if the Ident Number of the running cyclic data transfer and the value of Physical Block IDENT_NUMBER_SELECTOR parameter are different.
3	0 - 7	Reserved	Reserved for use within the PNO
	0 - 6	Reserved	Reserved for use within the PNO
4	7	EXTENSION_AVAILABLE	More diagnosis information is available

The following tables represent the PB_DIAGNOSIS and PB_DIAGNOSIS_EXTENSION of the 2600T-262/264 PA, with only the description of the supported error conditions.
Additionally is reported the Display indication and the kind of Status associated with the Output from the specific block e.g. PRIMARY_VALUE from the Transducer Block, the OUT_VALUE from the Analog Input Block and so on.

Table G: DIAGNOSIS TABLE

Byte	Bit	Mnemonic	Description	Checking	Propagation on TB_PRIMARY_VALUE Status	LCD When selected the TB_PRIMARY_VALUE
1	0	DIA_HW_ELECTR	Hardware failure of the electronic	The sensor signal is no more updated correctly due to electronics failure	BAD + Sensor Fail	*ERROR HANDLING Type* 'SENSOR' ----- 'FAIL S'
	1	DIA_HW_MECH	Hardware failure of the mechanics	The sensor signal reflects wrong condition due to probably mechanical failure.	BAD + Sensor Fail	*ERROR HANDLING Type* 'SENSOR' ----- 'FAIL S'
	4	DIA_MEM_CHKSUM	Memory error	1- During the start-up phase has been detected a CRC error in the sensor memory EE1 2- The EEPROM(s) writing has been not executed successfully	SEE DIAGNOSIS EXTENSION TABLE	SEE DIAGNOSIS EXTENSION TABLE
	5	DIA_MEASUREMENT	Failure in measurement	Compensation variables not more available due to specific sensors failure.	UNCERTAIN + Sensor Conversion Not Accurate	*WARNING HANDLING Type* 'SENSOR' ----- 'FAIL S'
2	2	DIA_CONF_INVAL	Configuration not valid	Transducer Block not properly configured e.g. Negative Value in input for the Square Root	BAD + Configuration error	*ERROR HANDLING Type* 'CONFIG' ----- 'ERROR'
	3	DIA_WARMSTART	New-start-up (warm start up) carried out.	Indication will be automatically reset after 10s.		
	4	DIA_COLDSTART	Re-start-up (cold start up) carried out.	Indication will be automatically reset after 10s.		
	5	DIA_MAINTENANCE	Maintenance Required	This flag must be set together with: 1- DIA_HW_ELECTR and DIA_HW_MECH for the meaning of "Maintenance Required NOW" 2- DIA_MEASUREMENT for the meaning of "Maintenance Required SOON"	1- see DIA_HW_ELECTR and DIA_HW_MECH 2- see DIA_MEASUREMENT	1- see DIA_HW_ELECTR and DIA_HW_MECH 2- see DIA_MEASUREMENT
	7	IDENTNUMBER Violation	Set to 1 if the Ident Number of the running cyclic data transfer and the value of Physical Block IDENT_NUMBER_SELECTOR parameter are different.			
3	0 - 7	Reserved	Reserved for use within the PNO			
	0 - 6	Reserved	Reserved for use within the PNO			
4	7	EXTENSION_ AVAILABLE	More diagnosis information is available			

13.3 – DIAGNOSIS EXTENSION

The following PB_DIAGNOSIS_EXTENSION bits are manufacturer specific added in the Physical Block and handled in the 2600T-262/264 PA:

Table H:

Byte	Bit	Mnemonic	Reference to PB_DIAGNOSIS Flags	Description	Propagation on TB_PRIMARY_VALUE Status	LCD
1	0	Sensor incompatible with the electronics	EXTENSION_AVAILABLE	The Sensor type is an old model not compatible with the installed electronics.	BAD + Sensor Fail	*ERROR HANDLING Type* 'SENSOR' ----- 'INVALID'
	1	Sensor database incompatible with the electronics	EXTENSION_AVAILABLE	The Sensor database is of an old type for the installed electronic	BAD + Sensor Fail	*ERROR HANDLING Type* 'DBASE' ----- 'INVALID'
	2	CRC Error for Critical data of Sensor EEPROM	DIA_MEM_CHKSUM	A Sensor memory CRC error has been detected during the start-up for data that can impact critically on the correct production of the Process Variable.	BAD + Device Fail	*ERROR HANDLING Type* 'SENSOR' ----- 'FAIL E'
	3	CRC Error for Not Critical data of Sensor EEPROM	DIA_MEM_CHKSUM	A Sensor memory CRC error has been detected during the start-up for data that have not a critical impact on the correct production of the Process Variable.	NO EFFECT	*WARNING HANDLING Type* 'SENSOR' ----- 'FAIL E'
	4	Read Only block fail	DIA_MEM_CHKSUM	This error bit is always in OR with one of the above bit 2 or 3. The CRC error has been detected on a Read Only block of data. No way to correct it with re-writing attempts.	The Status is the one of the associated bit above (2 or 3)	The LCD is the one of the associated bit above (2 or 3)
	5	Sensor EEPROM burn failure	DIA_MEM_CHKSUM	A writing in the Sensor EEPROM was not executed with success	NO EFFECT	*WARNING HANDLING Type* 'SENSOR' ----- 'FAIL E'
	6	Electronic EEPROM burn failure	DIA_MEM_CHKSUM	A writing in the Electronics EEPROM was not executed with success	NO EFFECT	*WARNING HANDLING Type* 'ELECTR.' ----- 'FAIL E'
	7	NOT USED				

2	0	Pressure sensor out of High limit	EXTENSION_AVAILABLE	The TB_PRIMARY_VALUE exceed the (TB_SENSOR_HI_LIM + 10%)	BAD + Sensor Failure + limit High	*WARNING HANDLING Type* 'PV OUT' ----- 'LIMIT H'
	1	Pressure sensor out of Low limit	EXTENSION_AVAILABLE	The TB_PRIMARY_VALUE exceed the (TB_SENSOR_LO_LIM - 10%)	BAD + Sensor Failure + limit Low	*WARNING HANDLING Type* 'PV OUT' ----- 'LIMIT L'
	2	Overpressure Plus	EXTENSION_AVAILABLE	An Overrange of pressure on the side + has been detected. Each occurrence is counted by a dedicated counter TB_OVER_RNG_CNT	BAD + Sensor Failure + limit High	*WARNING HANDLING Type* 'OVER P' ----- 'SIDE +'
	3	Overpressure Minus	EXTENSION_AVAILABLE	An Overrange of pressure on the side - has been detected. Each occurrence is counted by a dedicated counter TB_OVER_RNG_CNT	BAD + Sensor Failure + limit Low	*WARNING HANDLING Type* 'OVER P' ----- 'SIDE -'
	4	Over Temperature Plus	EXTENSION_AVAILABLE	A Sensor Temperature Out of the operational limits High has been detected. Each occurrence is counted by a dedicated counter TB_OVER_TMP_CNT	UNCERTAIN + Sensor Conversion Not Accurate	*WARNING HANDLING Type* 'ST.OUT' ----- 'LIMIT H'
	5	Over Temperature Minus	EXTENSION_AVAILABLE	A Sensor Temperature Out of the operational limits Low has been detected. Each occurrence is counted by a dedicated counter TB_OVER_TMP_CNT	UNCERTAIN + Sensor Conversion Not Accurate	*WARNING HANDLING Type* 'ST.OUT' ----- 'LIMIT L'
	6	Over Static	EXTENSION_AVAILABLE	A Static Pressure Out of the acceptable Working limit has been detected. Each occurrence is counted by a dedicated counter TB_OVER_STAT_CNT	UNCERTAIN + Sensor Conversion Not Accurate	*WARNING HANDLING Type* 'SP.OUT' ----- 'LIMIT'
	7	NOT USED				
3	0	Static Pressure Sensor Failed	DIA_MEASUREMENT DIA_MAINTENANCE EXTENSION_AVAILABLE	The circuitry for the sampling of the Static Pressure is failed/broken	SEE DIA_MEASUREMENT IN DIAGNOSIS TABLE	SEE DIA_MEASUREMENT IN DIAGNOSIS TABLE
	1	Temperature Sensor Failed	DIA_MEASUREMENT DIA_MAINTENANCE EXTENSION_AVAILABLE	The circuitry for the sampling of the Temperature of the Sensor is failed/broken	SEE DIA_MEASUREMENT IN DIAGNOSIS TABLE	SEE DIA_MEASUREMENT IN DIAGNOSIS TABLE
	2	Simulation Active	EXTENSION_AVAILABLE	The AIFB_1 has the simulation enabled	NO EFFECT	*WARNING HANDLING Type* 'SIMUL..' ----- 'ACTIVE'
	3-7	NOT USED				
4	0-7	NOT USED				
5	0-7	NOT USED				
6	0-7	NOT USED				

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

13.4 - 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 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 262/264 models of the 2600T Series. For each status condition is available a brief explanation about the meaning and an indication about into which block it is generated.

Status byte conditions supported in the Variables **"AIFB_OUT, TB_PRIMARY_VALUE"**

		Quality		**Substatus**				**Limits**			**Producer Block**
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**	**TB, AI**
64	40	0	1							**= uncertain**	**TB, AI**
128	80	1	0							**= good (Not Cascade)**	**TB, AI**

Details for BAD

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

Configuration error detail:
When the TB_PRIM_VALUE_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**	
68	44	0	1	0	0	0	1			**= Last Usable Value**	**AI**
72	48	0	1	0	0	1	0			**= substitute set**	**AI**
76	4C	0	1	0	0	1	1			**= Initial Value**	**TB**
80	50	0	1	0	1	0	0			**= sensor conversion not accurate**	**TB**
84	54	0	1	0	1	0	1			**= engineering unit range violation**	**TB, AI**
96	60	0	1	1	0	0	0			**= Simulate value**	**AI**

Last Usable Value detail:
When due to malfunction conditions the value can not be updated, this status is produced. Used for fail safe handling
Substitute Set detail:
This status is produced when the OUT value is not the one calculated but is the one wanted in accordance with the fail safe handling.
Initial Value detail:
After the restart of the device this status is produced to indicate the values not yet updated.

[2] Other variables like the Trimmed Value, Temperature Value, Static Pressure Value and the different SEC_VALx mapped in the TB are produced with their own status byte.

Sensor Conversion not Accurate detail:
This status is produced when the auxiliary values for compensation are not more usable (compensation sensors failed). 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.
Simulate Value detail:
This status is produced when the AIFB is in Manual Mode and the OUT value is not the calculated one but the predefined one.

Details for GOOD (non-cascade)

128	80	1	0	0	0	0	0			**= ok**	**TB, AI**
132	84	1	0	0	0	0	1			**= event update**	**TB, AI**
136	88	1	0	0	0	1	0			**= active advisory alarm**	**AI**
140	8C	1	0	0	0	1	1			**= active critical alarm**	**AI**

Event update detail:
When the parameters with attribute S (ST_REV to be incremented) are changed this status is produced. This indication will be reset after 10 seconds.
Active advisory alarm detail:
When the OUT value 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 value 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)

13.5 – Asset Features

The 262/264 PA models implement same additional information respects what defined by the standard to be used for Asset Features purposes. These information offer to the user an increased monitoring capability of the process conditions, an historical view for analysis and a better evaluation for the device status.

Here is a list of these Asset Features information:

1. Some Event Counters provide information about the number of occurred conditions outside the operational limits of the device, and the time of when the last event occurred expressed in seconds and milliseconds:

- Event /Counter for Sensor Temperature out of operational limits condition - TB_OVER_TEMP_CNT.
- Event /Counter for Static Pressure out of operational limits condition - TB_OVER_STAT_CNT.
- Event/Counter for over range or over load condition - TB_OVER_RNG_CNT.

Each Event Counter can be independently reset.

2. The following information is to be used for maintenance purposes:

- Number of device Power On counter with the time of the latest power up occurrence expressed in seconds and milliseconds - TB_PWR_ON_CNT.
- Total Working Time counter (not allowed to be reset by the user) - TB_TOT_WORK_HOUR
- Partial Working Time counter (allowed to be reset by the user) - TB_PAR_WORK_HOUR.

3. One trend object for each Function Block has been implemented. The user can select the recording conditions. The Trend object allows up to 16 values plus Status byte registration and the time of the last sampling expressed in seconds and milliseconds. The user can select:
- The variable to be registered (The OUT from FB is the Default)
- The timing interval between two registrations (expressed as number of 25 mS)
- Other trigger conditions (not yet supported)

4- These functions also described in the section 12 are to be considered as specific functionality of the 262/264 PA models for performances improvement.
- Static Pressure value Trimming - TB_STAT_PRESS_TRIM.
- Reset the Sensor to Factory trimming values – TB_ST_PRESS_TRIM

14. - Device Specification Data

The delivery of the 2600T-262/264 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 2600T-262/264 PA specification data

TABLE H

Manufacturer	ABB
Device Model	2600T Series Pressure Transmitter – Models 262-264 PROFIBUS PA
Measured Variable	**Direct:** Differential, Gauge, Absolute Pressure. **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: 9 – 32 Volts limited to 17.5 Volts for IS
Interface	Profibus PA with DPV1 functionality as extension of the CENELEC EN 50170. Compliant to the Profile 3.0 for Pressure transmitter as 'Simple device of Class A and B'
Blocks implemented	2 Analog Input, 1 Physical Block, 1 Pressure Transducer Blocks
Output Updating Rate	25mS
Current consumption	10.5 mA max
Fault Current limiting	20 mA
PNO Certification	Pending
IS Certificate	ATEX, FM, FISCO 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

15. - References

1- PROFIBUS-PA Profile for Process Control Devices -- General Requirements V3.0 – October '99
2- PROFIBUS-PA Profile for Process Control Devices -- Data Sheet Transmitter V3.0 – October '99
3- PROFIBUS-PA Profile for Process Control Devices -- Mapping to DP V3.0 – October '99
4- Profibus-DP Extension to EN50170 (DPV1) Version 2.0 dated April 1998.

APPENDIX A

GSD File of the 2600T-262/264 PA Profile 3.0

```
;=====================================================================
; GSD file for 2600T Pressure Series Transmitter - Mod.262/264 - PROFIBUS-DPV1
; Company: ABB SACE SpA
; Version: 1.0
; Date: 20.01.2003
; Author: M.Romagnoli Tel +39 344 58248
;                 Fax +39 344 56152
;                 E-mail mauro.romagnoli@it.abb.com
;=====================================================================
; GSD File  (Simple compact Slave)
;
; Version:  V0.1
;=================================================
#Profibus_DP
GSD_Revision            =2

;General parameters
Vendor_Name             = "ABB"
Model_Name              = "2600T Press. Transm. 262/264"
Revision                = "V1.0"
Ident_Number            = 0x052B
Protocol_Ident          = 0
Station_Type            = 0
FMS_supp                = 0
Hardware_Release        = "V 1.00"
Software_Release        = "V 1.00"

Implementation_Type     ="SPC42/ITEC"
Bitmap_Device           ="262_264N"
Bitmap_Diag             ="262_264D"
Bitmap_SF               ="262_264S"

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
MaxTsdr_93.75           = 1000

Redundancy              = 0
Repeater_Ctrl_Sig       = 2
24V_Pins                = 0

; Slave-Specification:
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       = 20
Slave_Family            = 12
Modular_Station         = 1

Max_Module              = 4
Max_Input_Len           = 10
Max_Output_len          = 0
Max_Data_Len            = 10

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

;---------- Description of device related diagnosis: ---------------------
;
Unit_Diag_Bit(16)       = "Error appears"
Unit_Diag_Bit(17)       = "Error disappears"
Unit_Diag_Bit(24)       = "Hardware failure electronics"
Unit_Diag_Bit(25)       = "Hardware failure mechanics"
Unit_Diag_Bit(28)       = "Memory error"
Unit_Diag_Bit(29)       = "Measurement failure"
Unit_Diag_Bit(34)       = "Configuration invalid"
Unit_Diag_Bit(35)       = "Restart"
Unit_Diag_Bit(36)       = "Coldstart"
Unit_Diag_Bit(37)       = "Maintenance required"
Unit_Diag_Bit(39)       = "Ident_Number violation"
Unit_Diag_Bit(55)       = "Extension Available"

;-- diagnosisExtension[0]
Unit_Diag_Bit(56)       = "Sensor incompatible"
Unit_Diag_Bit(57)       = "Sensor data-base incompatible"
Unit_Diag_Bit(58)       = "Memory CRC critical error"
Unit_Diag_Bit(59)       = "Memory CRC not-critical error"
Unit_Diag_Bit(60)       = "Read Only Memory failed"
Unit_Diag_Bit(61)       = "Sensor EEPROM burn failed"
Unit_Diag_Bit(62)       = "Electronic EEPROM burn failed"
Unit_Diag_Bit(64)       = "Pressure Sens.Out of High limit"
Unit_Diag_Bit(65)       = "Pressure Sensor out of Low limit"
Unit_Diag_Bit(66)       = "Overrange High side"
Unit_Diag_Bit(67)       = "Overrange low side"
Unit_Diag_Bit(68)       = "Sensor Temp.Out of High limit"
Unit_Diag_Bit(69)       = "Sensor Temp.Out of Low limit"
Unit_Diag_Bit(70)       = "Static Pressure Out of limit"
Unit_Diag_Bit(72)       = "Static Pressure sensor failed"
Unit_Diag_Bit(73)       = "Sensor Temperature sensor failed"
Unit_Diag_Bit(74)       = "Simulation Active"
;---------------------------------------------------------------------------

; Module Definition List
Module                  ="PV status (short)" 0x94
EndModule
Module                  ="PV status" 0x42,0x84,0x08,0x05
EndModule
Module                  ="PV & Auxiliary (short)" 0x94,0x94
EndModule
Module                  ="PV & Auxiliary" 0x42,0x84,0x08,0x05,0x42,0x84,0x08,0x05
EndModule
```

APPENDIX B

2600T-262/264 PA Electronic Replacement

The following Steps have to be followed for the 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 powered-on 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 to a valid value with a local or remote operation, see the section 6 - Device Addressing.

ABB has Sales & Customer Support
expertise in over 100 countries worldwide

www.abb.com/instrumentation

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

Printed in Italy (05.05)

IIM/ADD_262-264_PA_P3

ABB Ltd
Howard Road, St. Neots
Cambridgeshire, PE19 3EU
UK
Tel: +44(0)1480 475321
Fax: +44(0)1480 217948

ABB Inc.
125 E. County Line Road
Warminster, PA 18974
USA
Tel: +1 215 674 6000
Fax: +1 215 674 7183

ABB S.p.A.
Via Statale 113
22016 Lenno (CO)
Italy
Tel: +39 0344 58111
Fax: +39 0344 56278

ABB Automation Products GmbH
Schillerstrasse 72
D-32425 Minden
Germany
Tel: +49 551 905 534
Fax: +49 551 905 555