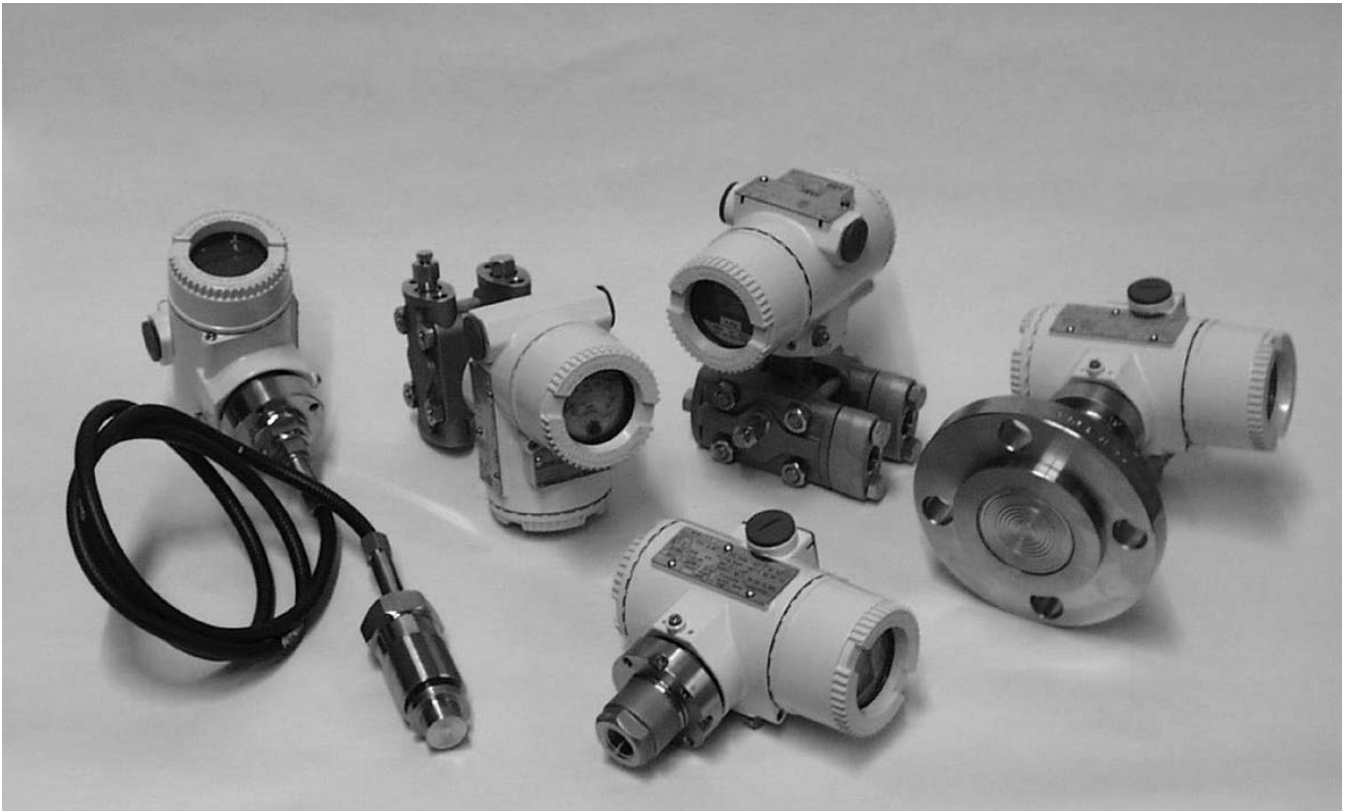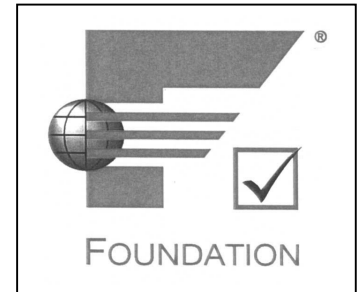# 2600T Series
Models 262 – 264.

Pressure Transmitter

ADDENDUM for
FOUNDATION™ Fieldbus

Valid for 2600T-262/264 Revision 1

Industrial IT
enabled™

ABB Instrumentation

ABB

INDEX:

ACRONYMS

- LCD   - **L**iquid **C**rystal **D**isplay
- CPU   - **C**ontrol **P**rocess **U**nit
- DSP   - **D**igital **S**ignal **P**rocessing
- H1   - Low Speed Fieldbus Segment
- FF   - **F**oundation **F**ieldbus
- LAS   - **L**ink **A**ctive **S**cheduler
- AIFB   - **A**nalog **I**nput **F**unction **B**lock
- RB   - **R**esource **B**lock
- TB   - **T**ransducer **B**lock
- AOFB   - **A**nalog **O**utput **F**unction **B**lock
- PIDFB   - **P**roportional **I**ntegral **D**erivative **F**unction **B**lock
- DD   - **D**evice **D**escription
- CFF   - **C**apability **F**ile **F**ormat
- IS   - **I**ntrinsically **S**afety
- FISCO   - **F**ieldbus **IS Co**ncept
- OOS   - **O**ut **O**f **S**ervice

Preamble

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

1. – Foundation Fieldbus Definition

FOUNDATION™ 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.

FOUNDATION™ Fieldbus is designed to be compatible with the officially sanctioned SP50 standards project of the ISA (The International Society for Measurement and Control) and the specifications of the IEC (International Electrotechnical Committee

A unique characteristic of FOUNDATION™ Fieldbus is interoperability that ensures its use of a fully specified, standard User Layer based on "Blocks" and Device Description technology.

Detailed information of the Foundation fieldbus is available read on the WebPage of the FIELDBUS FOUNDATION (www.fieldbus.org) 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 – FOUNDATION™ Fieldbus Version Considerations

The 2600T-262/264 FOUNDATION™ Fieldbus 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 Foundation Fieldbus Revision 1 implements and is compliant to the communication Protocol FOUNDATION™ Fieldbus specification version 1.4.

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

The 2600T-262/264 FF Revision 1 (see section 8 the RB_DEV_REV) is registered as a Link Master Device.
When the 2600T-262/264 FF is properly configured as back-up LAS, if the current LAS running in the controller fails, it enables its own LAS functionality with the task to maintain alive the fieldbus operations.
The 2600T-262/264 FF Revision 1 includes 1 Standard Resource Block, 2 Standard Analog Input Function Blocks 1 Standard PID Function Block and 1 Custom Pressure with Calibration Transducer Block.

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

- **Client/Server VCR.**

    This communication type is used for the operator messages like read/write of configurations or maintenance data. This is a not scheduled message but executed when the operator requires it.

- **Publisher/subscriber VCR.**

    This communication type is used for Process Control purpose. These are the scheduled and cyclic exchange of data.

- **Report/Distribution VCR.**

    This communication type is used when the slave device has to advise the operator consoles about the occurrence of alarms (Event Notification) or for Trend report.

- **LAS Functionality.**

    With this functionality the 2600T-262/264 FF can acts as backup master, keeping alive the Function block application whenever the Master/Controller fails.
    The LAS implemented in the device supports 1 sub-schedule, 25 sequences and 25 elements for sequence.

- **1 Enhanced Resource 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**
- **1 Standard Proportional Integral Derivative Function Block.**

    Inside the Function blocks (AI, PID) are contained the information/parameters relating the Process Control. Each Function Block type provides specific functionality. The combination of different Function Blocks offers the possibility to design a complete control loop.

- **1 Custom Pressure with Calibration Transducer Block**

    In this block are contained the information relating the 2600T-262/264 sensor like Model, Calibration, Physical Limits or Construction, and setting about how to convert the measured Pressure to Flow, Level or Volume measurement.

- **FMS services supported:**
    - Initiate
    - Abort
    - Status
    - Identify
    - Read Variable
    - Write Variable
    - Get Object Dictionary

    Only for factory use:
    - Physical Read
    - Physical Write

- **Link objects mechanism.**

    This allows the linking between the produced Values or Alarms or Trends in output from the AIFBs (Publisher) with other Input Blocks enabled to receive these information (Subscriber).
    i.e. Pressure in output from AIFB, linked as input for PIDFB.

- **Event Notification mechanism.**

    This provides to automatically send an alarm message to the Master whenever an alarm or event condition occurs. This message includes details about when the event occurred (date, time) and about the reason of the event or alarm (subcode).

- **Trend Objects.**

    These objects collect a defined number of sampling of a selected variable, under different conditions.

2.3 – Registration Details
DEVICE

Model:	2600T Series– Models 262/264
Type:	Pressure Transmitter
Revision:	1.0
Tested Function Blocks:	2xAI(Standard), 1xPID(Standard), 1xRB(Enhanced)
Other Blocks:	1xTB(Custom)
Comm. Profile Class:	31PS, 32L
IT Campaign Number:	IT019000

PHYSICAL LAYER

Class:	111, 113, 511

DEVICE DESCRIPTION

Manufacturer ID Num:	0x00320
Device Type:	0x0004
DD Revision:	1.0

CAPABILITY FILE

Filename:	010101.cff

FIELDBUS FOUNDATION CERTIFICATE

3. – Hardware Characteristics

3.1 – Environmental Protection

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

TYPE PLATE AND CERTIFICATION LABELS

SERIAL NUMBER		**C E 1130** Made in Italy **Year 2003**		F I E L D
MWP OVP	SPAN LIMITS			
URL	OUTPUT SIGNAL	Foundation Fieldbus - IEC 1158-2		T E R M I N A L S
LRL	POWER SUPPLY	9 - 32 VDC		
PRODUCT CODE				
			IP67	

FOUNDATION ™

2600T SERIES   Pressure Transmitter

ABB SACE S.p.A.
Lenno-Co-Italia

Local keys below label

FOUNDATION™ Fieldbus Type Plate

IP 67	◯	
⟨Ex⟩ or	II 1 GD T50°C EEx ia IIC T6 resp. II 1 GD T95°C EEx ia IIC T4 II 1/2 GD T50°C EEx ia IIC T6 resp. II 1/2 GD T95°C EEx ia IIC T4	
	For the electrical parameters see the certificate	
C E 0722	ZELM 03 ATEX 0126 [FISCO Model]	
2600 T SERIES	FOUNDATION™ Fieldbus Pressure Transmitter	
◯	**ABB SACE SpA** Lenno (Co) Italy	◯

EUROPE CERTIFICATION LABEL

Agency: **ATEX / ZELM**
Certificate N°:   EC-Type Examination Certificate n° ZELM 03 ATEX 0126
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

" FACTORY SEALED" ◯	ENCL 4X	T AMB.= 85°C MAX

EXPLOSIONPROOF: CLASS I, DIV.1, GROUPS A,B,C,D
DUST IGNITIONPROOF: CLASS II, DIV.1, GROUPS E,F,G
SUITABLE FOR: CL.II, DIV.2, GR.F,G. CL.III,DIV.1,2
NONINCENDIVE: CLASS I, DIV.2, GROUPS A,B,C,D (SEE DRAWING DH 0038)
INTRINSICALLY SAFE (ENTITY): CL.I, DIV.1, GR.A,B,C,D, CL.II, DIV.1, GR.E,F,G
       CL.III, DIV.1 WHEN CONNECTED PER CONTROL DRAWING DH 0038
INTRINSIC SAFETY CL.I, ZONE 0, AEx ia IIC T6,T5,T4

For wiring and entity parameters see Drawing DH 0038

◯   ⟨F M APPROVED⟩   ◯

" FACTORY SEALED" ◯	ENCL 4X	T AMB.= 85°C MAX

EXPLOSIONPROOF: CLASS I, DIV.1, GROUPS A,B,C,D
DUST IGNITIONPROOF: CLASS II, DIV.1, GROUPS E,F,G
SUITABLE FOR: CL.II, DIV.2, GR.F,G. CL.III,DIV.1,2
NONINCENDIVE: CLASS I, DIV.2, GROUPS A,B,C,D (SEE DRAWING DH 3003)
INTRINSICALLY SAFE (ENTITY): CL.I, DIV.1, GR.A,B,C,D, CL.II, DIV.1, GR.E,F,G
       CL.III, DIV.1 WHEN CONNECTED PER CONTROL DRAWING DH 3003
INTRINSIC SAFETY CL.I, ZONE 0, AEx ia IIC T6,T5,T4

For wiring and entity parameters see Drawing DH 3003

◯   ⟨CSA⟩   ◯

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
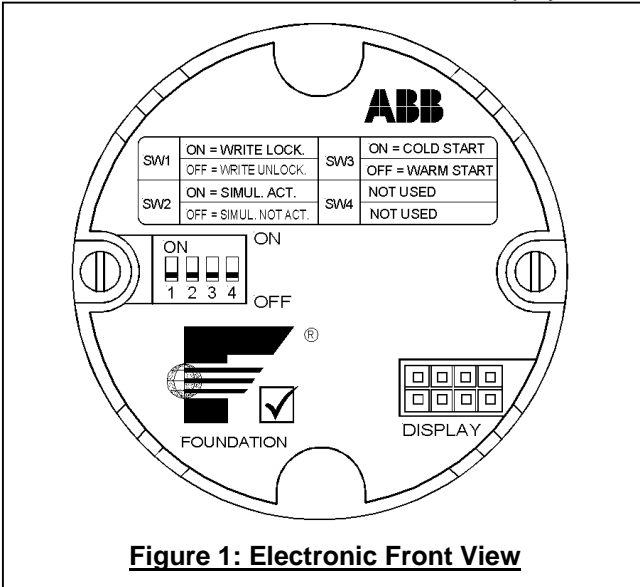
Write Locking:
- SW1 in ON position enables the Write Locking condition. The attempts to change the configuration of the device are refused.

Simulation:
- SW 2 in ON position enables the Simulation.

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 Foundation Fieldbus 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.

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 TB_KEY_ENABLE parameter.

The LCD common display can work in two different modes:

➢ Continuos Display (simple Indicator)
➢ Local operation monitor

Figure 2: Integral Local Display

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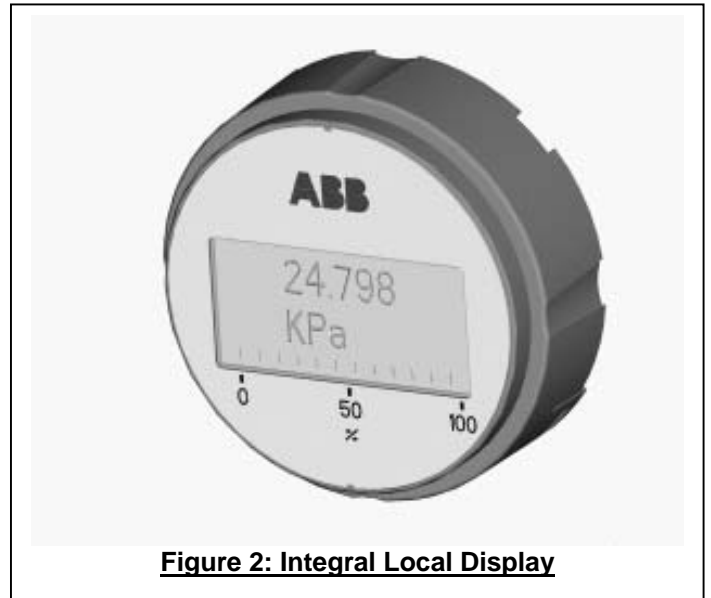
[1] The Programmability of the 262/264 transmitter is allowed only for the functions regarding the Pressure Measure.

3.4.1 - Continuous Display

When the LCD display works as Continuous Display (Default condition), it displays the variable selected in the TB_LCD_VAL_SELECTION. See section 8 in the Transducer 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 continuos and updated every 0.5 seconds.
- When the Quality is UNCERTAIN, the display will show in alternate mode, every 0.5 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 0.5 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 **AIFB_OUT_VALUE with CHANNEL = 1 that means linked to Process Variable.**

The operating mode of the AIFB, see the section 8 – 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.

```
 39.450   ^
 Kpa
|'''''''''''|''''''  |
```
```
 - 0.450   v
 KPa
|"        |       |
```

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 Continuos 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
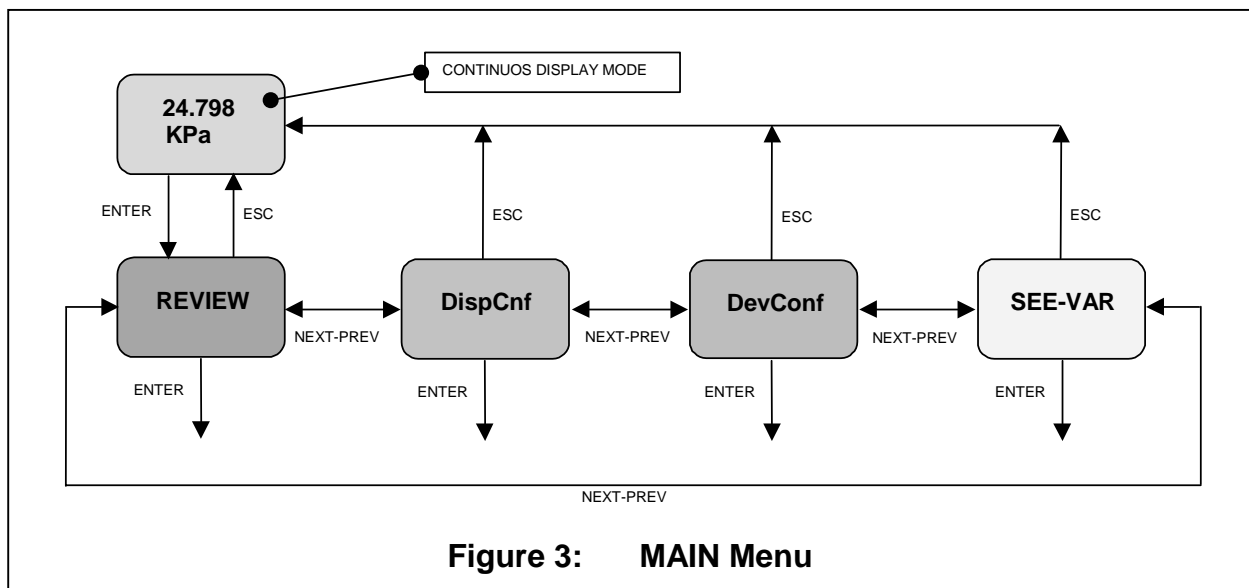
3.4.2.1 – REVIEW MENU

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 Continuos Display Programmed Variable could require more ESCAPE actions.

QUICK REFERENCE FOR REVIEW

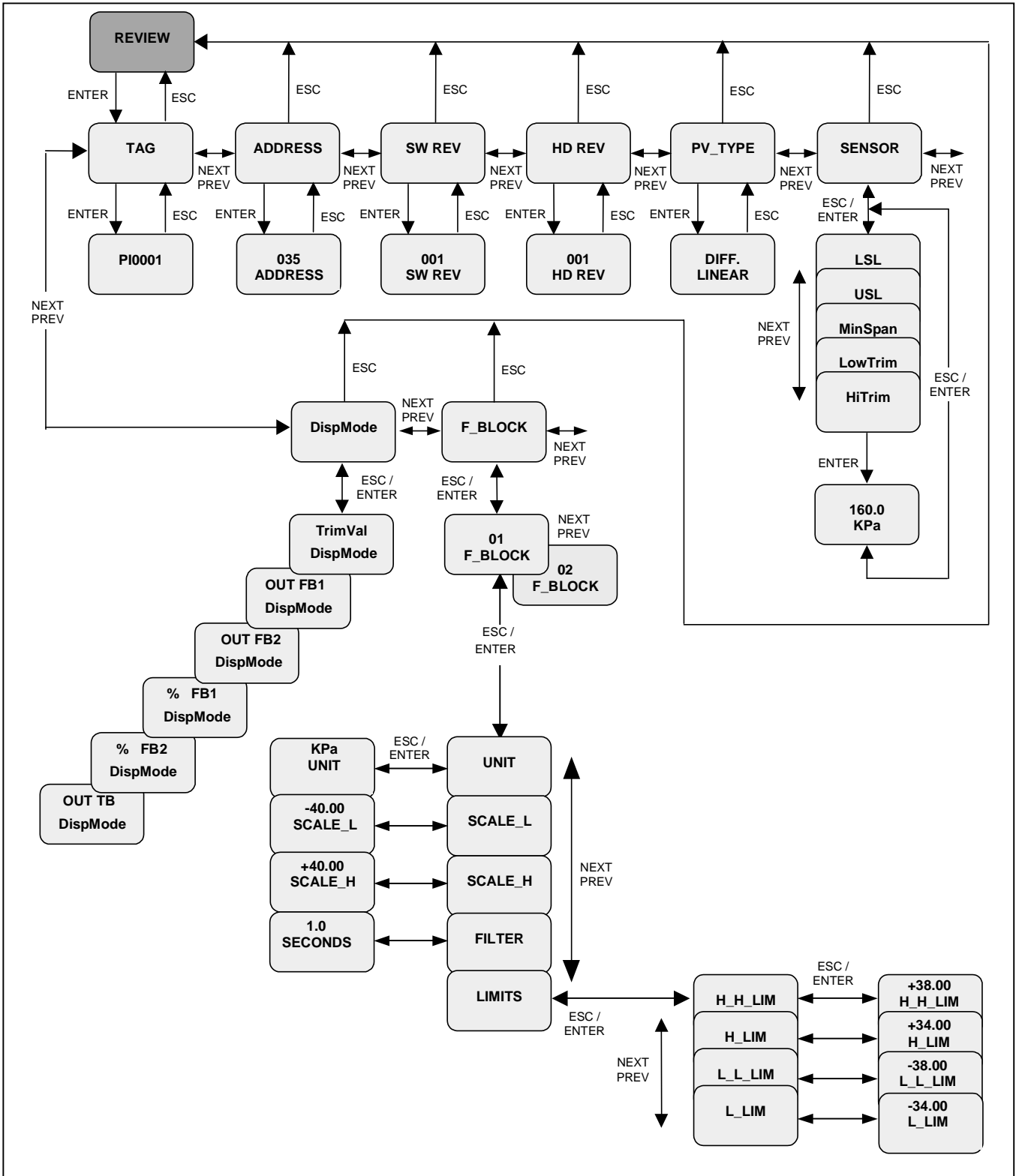| Menu	Submenu	Item	Description
TAG			Display on 3 screens the 32 characters of the "Device PD_TAG"
ADDRESS			Display the "Device Node Address"
SW REV			Display the Private Software Revision – TB_PRIV_SW_REV
HD REV			Display the Private Hardware Revision – TB_PRIV_HW_REV
PV TYPE			The first line displays 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_RANGE_Low + TB_CAL_UNIT
	USL		Display the Upper Sensor Limit + Unit TB_SENSOR_RANGE_High + TB_CAL_UNIT
	MIN_SPAN		Display the Minimum Span + Unit TB_MIN_SPAN + TB_CAL_UNIT
	CAL_POINT_HI		Display the Calibration Point High + Unit TB_CAL_POINT_HI + TB_CAL_UNIT
	CAL_POINT_LO		Display the Calibration Point Low + Unit TB_CAL_POINT_LO + TB_CAL_UNIT
F_BLOCK			Only the AIFB 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 TB_LCD_VAL_SELECTION: 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 TB_LCD_VAL_SELECTION.

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.

NOTE A:
This operation is normally allowed but can be disabled by two conditions:
1- The setting of TB_KEY_ENABLE = 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**'.
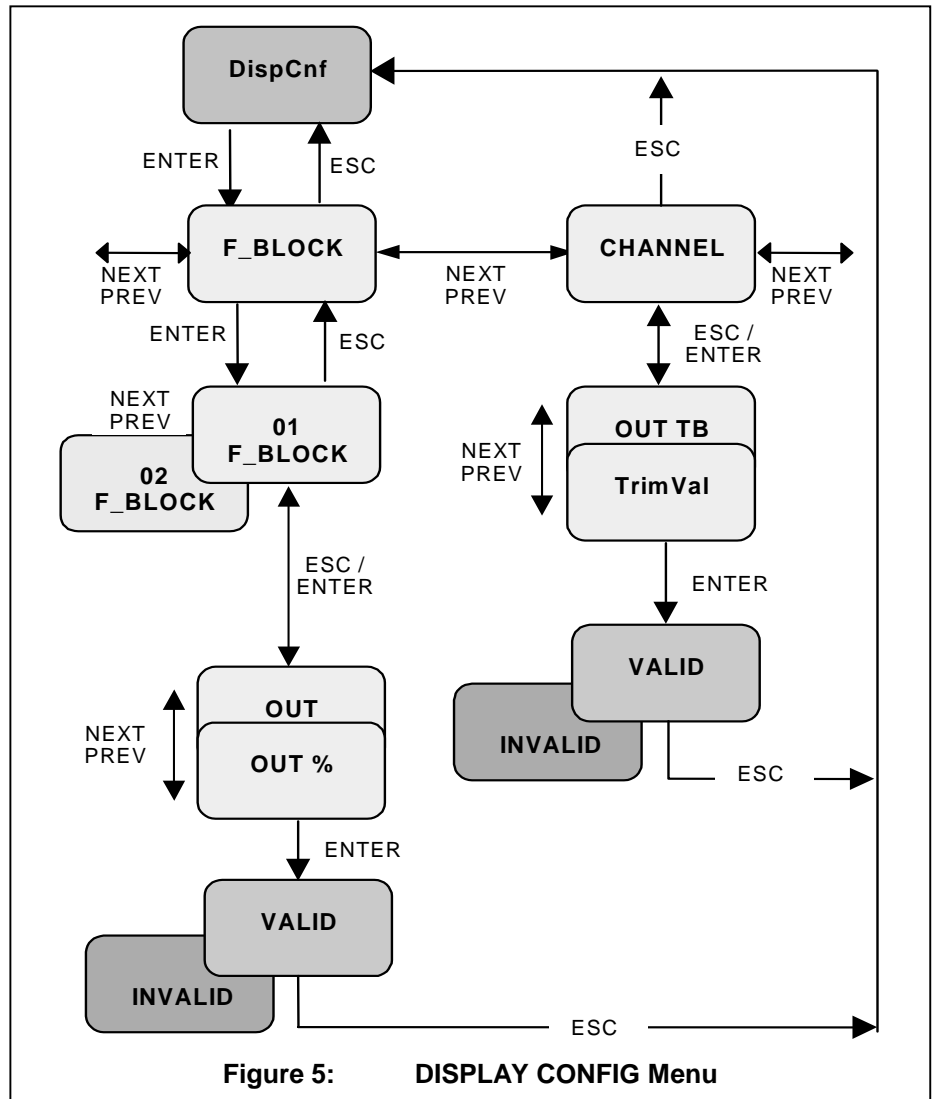
Figure 5:   DISPLAY CONFIG Menu

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.

NOTE A:
This operation is normally allowed but can be disabled by two conditions:
1. The setting of TB_KEY_ENABLE = 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

Figure 6:   DEVICE CONFIG Menu

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.
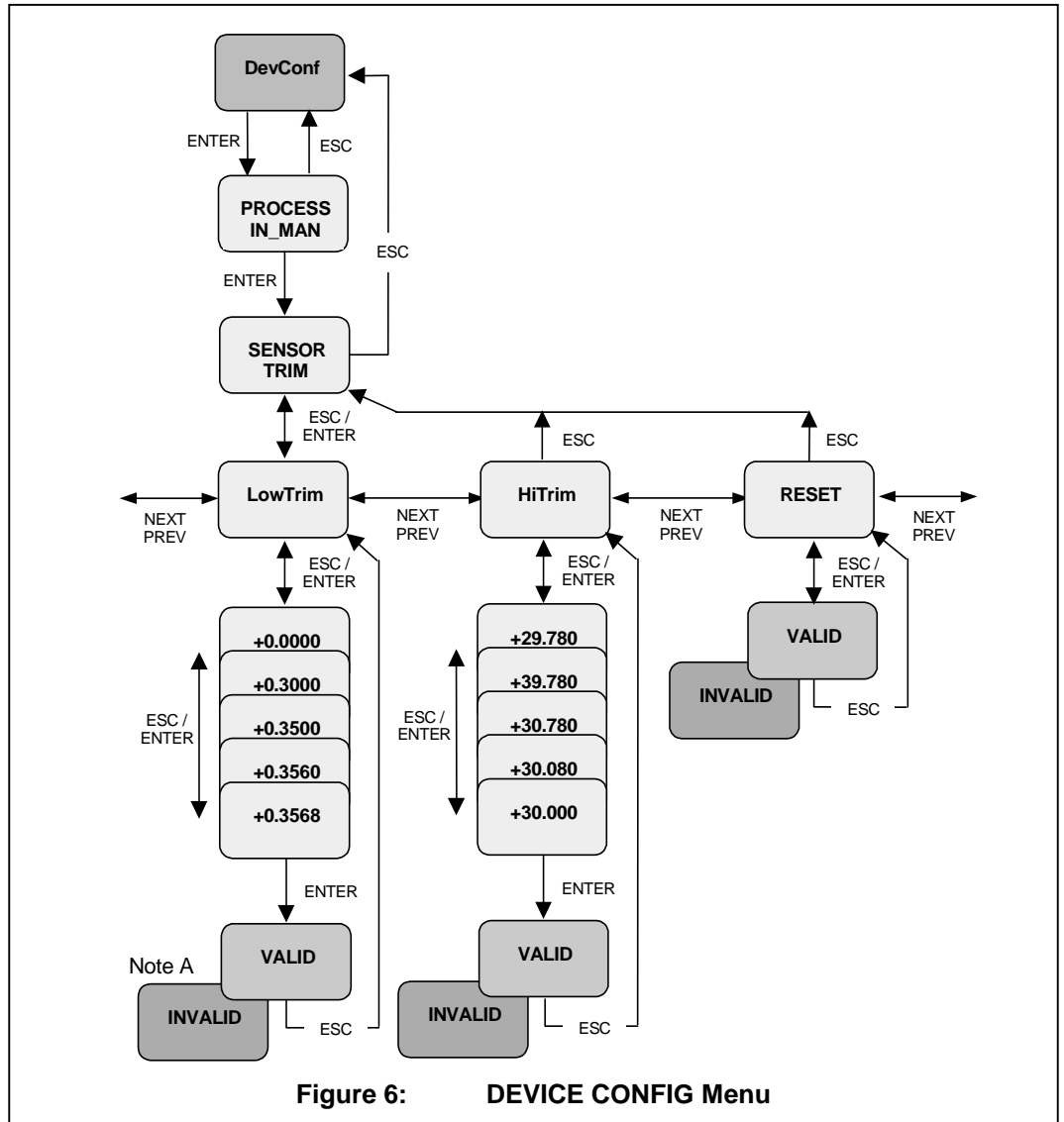
QUICK REFERENCE FOR DEVICE CONFIG

Menu	Submenu	Item	Description
SENSOR TRIM	LowTrim	TB_CAL_POINT_LO	See section 12.2
	HiTrim	TB_CAL_POINT_HI	See section 12.3
	Reset	RB_RESTART	See section 12.4

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 TB_LCD_VAL_SELECTION.
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 TB_LCD_VAL_SELECTION became active again on the display when the operator came-back into the Continuous Display Mode.
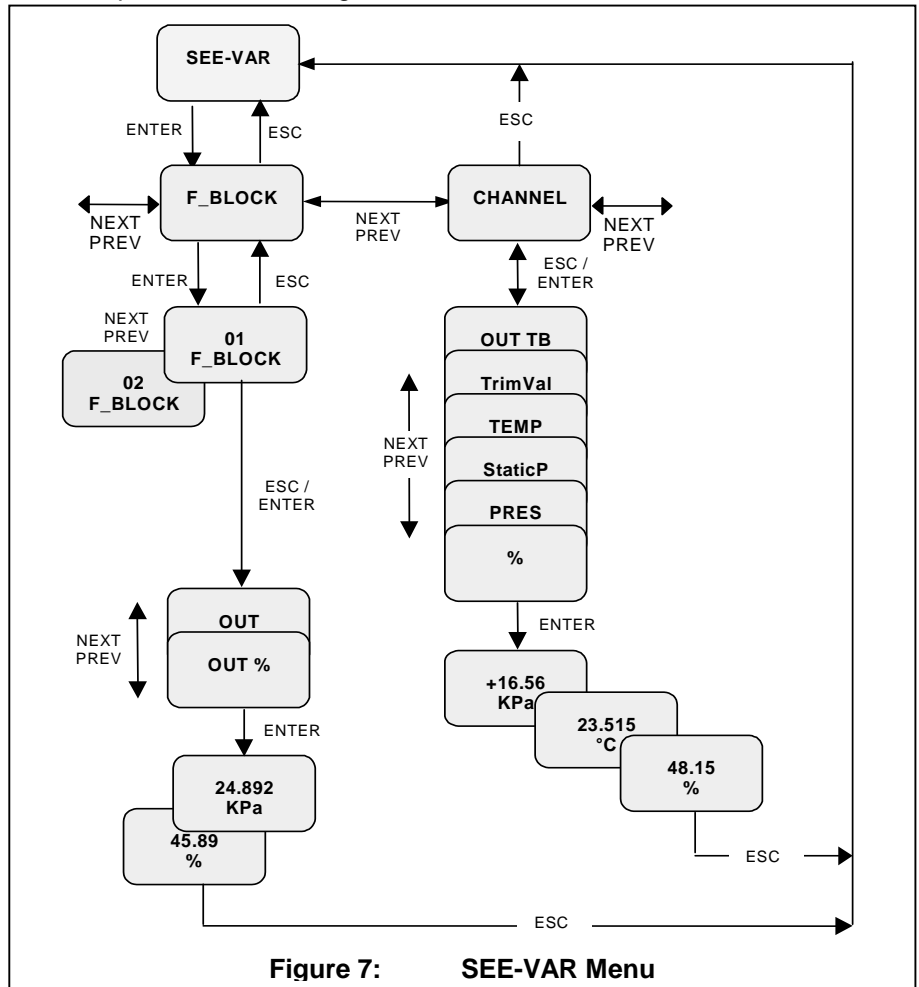
Figure 7:   SEE-VAR Menu

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_RANGE Unit Code)
		TrimVal	Display the TB_TRIMMED_VALUE + Unit Code (TB_CAL_UNIT)
		TEMP	Display the Sensor Temperature + unit code. TB_SECONDARY_VALUE_1 & TB_SECONDARY_VALUE_UNIT_1
		StaticP	Display the Static Pressure + unit code. TB_SECONDARY_VALUE_2 & TB_SECONDARY_VALUE_UNIT_2
		PRES	Display the Pressure Value + unit code when the transmitter produces Flow or Level or Volume. TB_SECONDARY_VALUE_3 & TB_SECONDARY_VALUE_UNIT_3
		%	Display the Normalized Pressure as percentage of TB_SCALE_IN

3.5 – Local Adjustment

Of the two external push buttons only the 'Z' key is active, see the Figure 8

➢ 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 12.1.

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 PROTECT | ➔ When the security-locking switch 1 is in ON position (Write Protection). |

| ZERO DISABLE | ➔ When the Local operations are disabled (see TB_KEY_ENABLE in the Transducer Block). |

INSTRUMENTATION

4. – Network Architecture

A simple generic FOUNDATION™ fieldbus system is represented in Figure 9. The H1 segment is applicable in Ex and non Ex area. The network can be designed following 3 different topologies as shown in the Figure 10 below or can be applied as a mix of the three.

Figure 9:   Simple FOUNDATION™ fieldbus System

Figure 10:   FIELDBUS Topologies
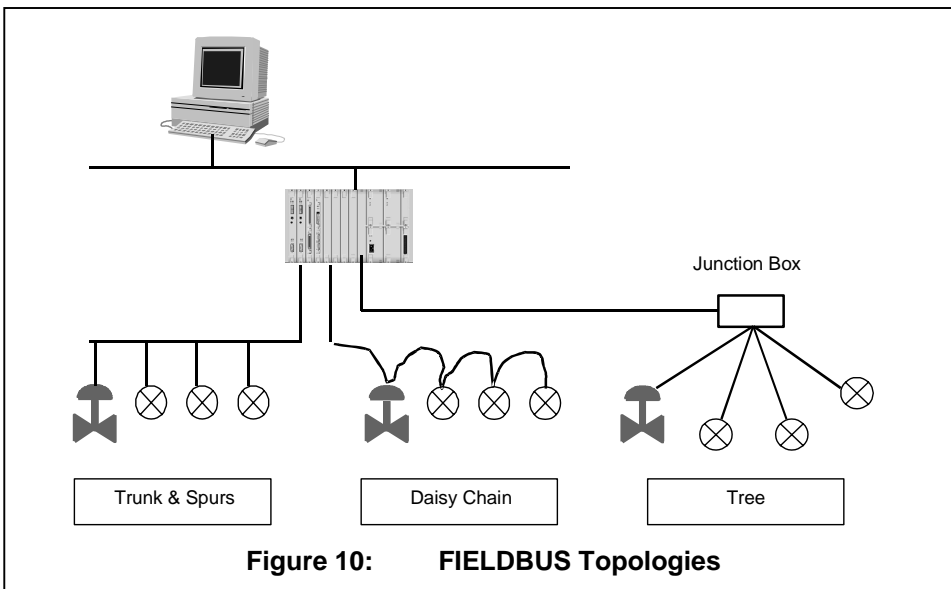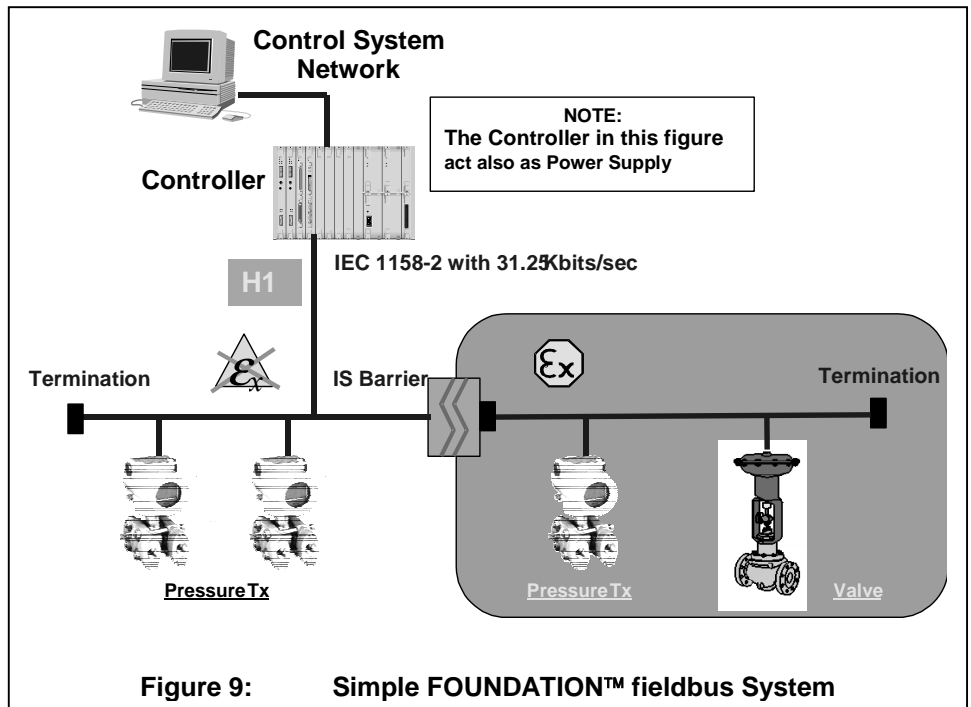
TABLE B

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	

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.

The 2600T-262/264 FF has the following power requirements:
- Current consumption = **10.5 mA ± 1 mA**
- Power Supply non Ex = **9 to 32 VDC**
- Power Supply Ex for **Entity** certification
  = **9 to 24 VDC**
- Power Supply Ex for **FISCO** certification
  = **9 to 17.5 VDC**

A typical ABB Solution for FOUNDATION Fieldbus is represented in the Figure 11.
The number of 2600T-262/264 FF 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 11.

Figure 11:   ABB Solution for FOUNDATION Fieldbus
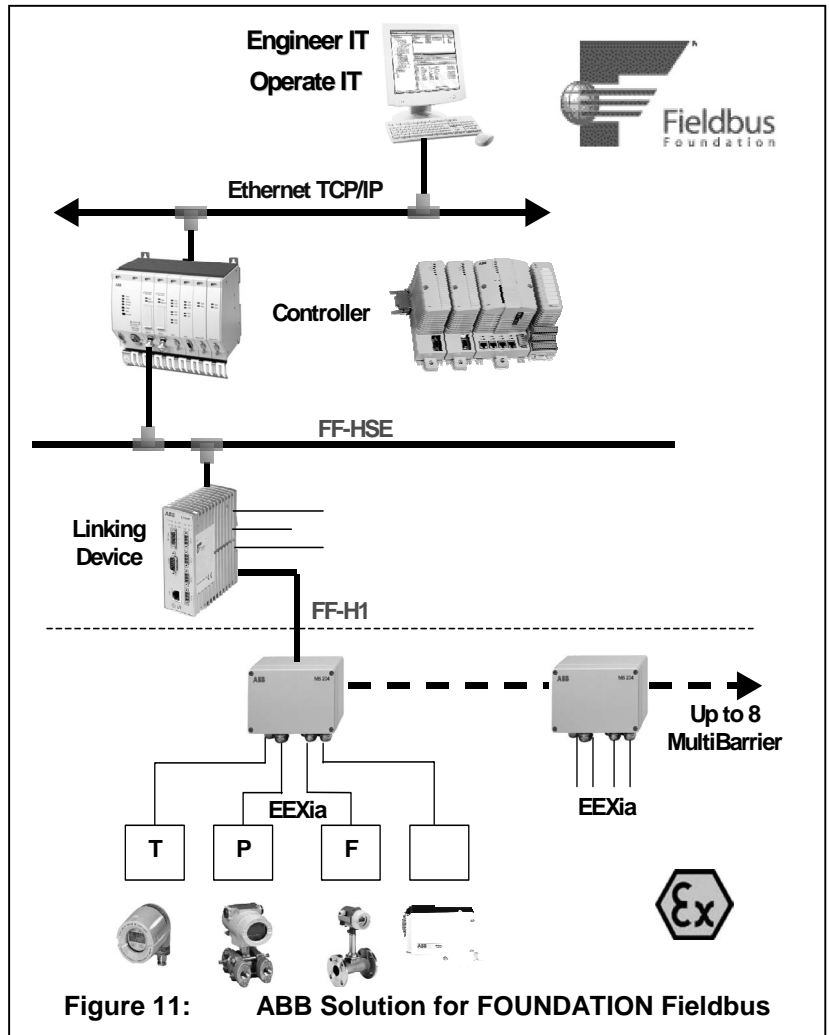
4.1 – Electrical Connections

The 2600T-262/264 FF is a Bus Powered device with Foundation Fieldbus output. On the terminal block there are two screws for the BUS CONNECTION, see the Figure 12.
The Polarity has not consistency, so the two bus cables can be connected without take care about the polarity.

Figure 12: Terminal Block
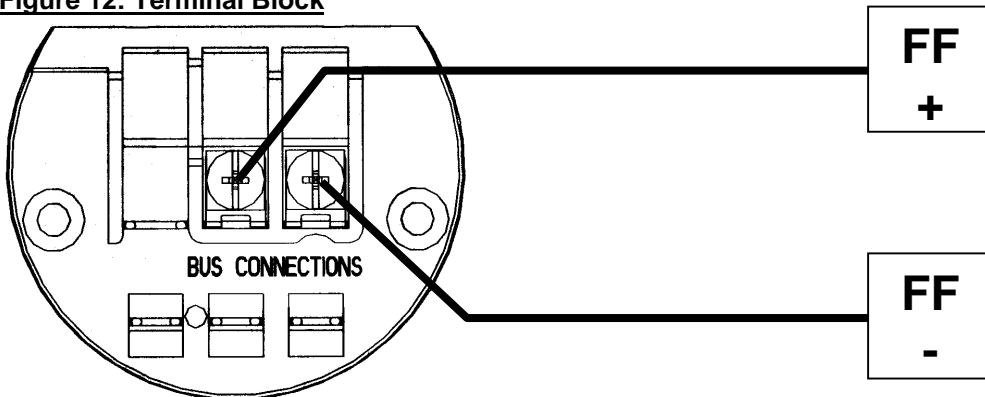
The special FF connector (gland receptacles) is also available as optional item for the 'quick connection' of the transmitter to the bus.
If necessary the ground terminal could be also connected. For details about the connections refer to the 'Fieldbus Installation & Planning Guide' document AG-165 available on the Fieldbus Foundation website (www.fieldbus.org)

5. – FOUNDATION Fieldbus Overview

In the Figure 13, is represented how the Function Blocks inside the FF devices connected on the bus, can be linked together in order to achieve a simple control loop. After the loop has been designed, the LAS Master device located in the Controller or, as back-up, in the slave device itself, starts the scheduling of the Function Block executions and of the publisher/subscriber communications in a deterministic way.

In the example of Figure 13, the Pressure Transmitter implementing the AIFB publish the pressure value, then the PID FB implemented in the valve, subscribe this value from the bus in order to be used as input for the PIDFB. In the same way the exchange of values between the PIDFB and the AOFB occurs but without communications on the bus, because the two Blocks are inside the same device.
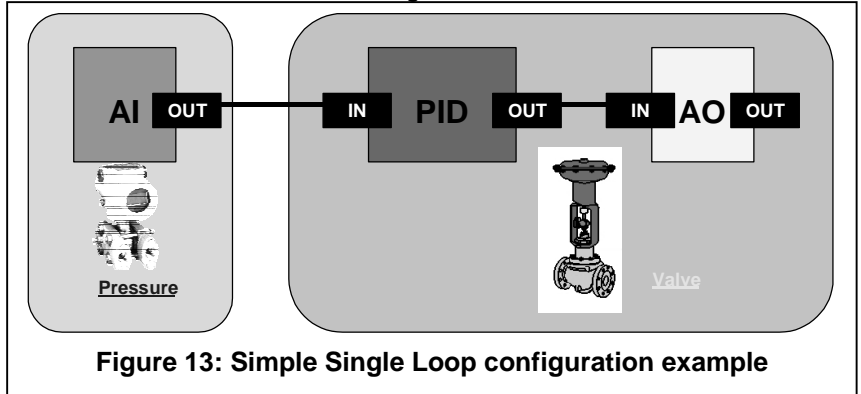
Figure 13: Simple Single Loop configuration example

In the Figure 14 is represented the macrocycle of the above loop. The LAS functionality inside the controller provides to handle the loop, and the macro-cycle is the temporary representation of how, function blocks and communications, are scheduled. From the instant 0 to 20 the AIFB is executed, in the period from 20 to 30 the LAS provide to schedule the AIFB output. The Pressure Transmitter provides to publisch the pressure value, the PIDFB subscribes this value. Then the PIDFB is executed from the instant 30 to 40 and at the end the PIDFB output is scheduled and goes in input to the AOFB without communications because the two Function blocks reside inside the same device.

The unscheduled communications are always active unless during the period between 20-30 when the pressure value is published on the bus.

Figure 14: Macro-cycle Example

The LAS functionality handling the control loops, is also available inside the 2600T-262/264 FF Revision 1. Referring to the Figure 15, whenever failure of the Controller occurs and the Primary LAS stops its execution, the 2600T-262/264 previously set as Back-up LAS take over the loop maintaining alive the fieldbus activity/communication executing the same macrocycle that was active before of the controller failure.

☞ When more than 1 field device is configured as LAS Backup, the one with lower Node Address has high priority for assuming the control when the Primary LAS fails.

Figure 15: LAS Backup Capability
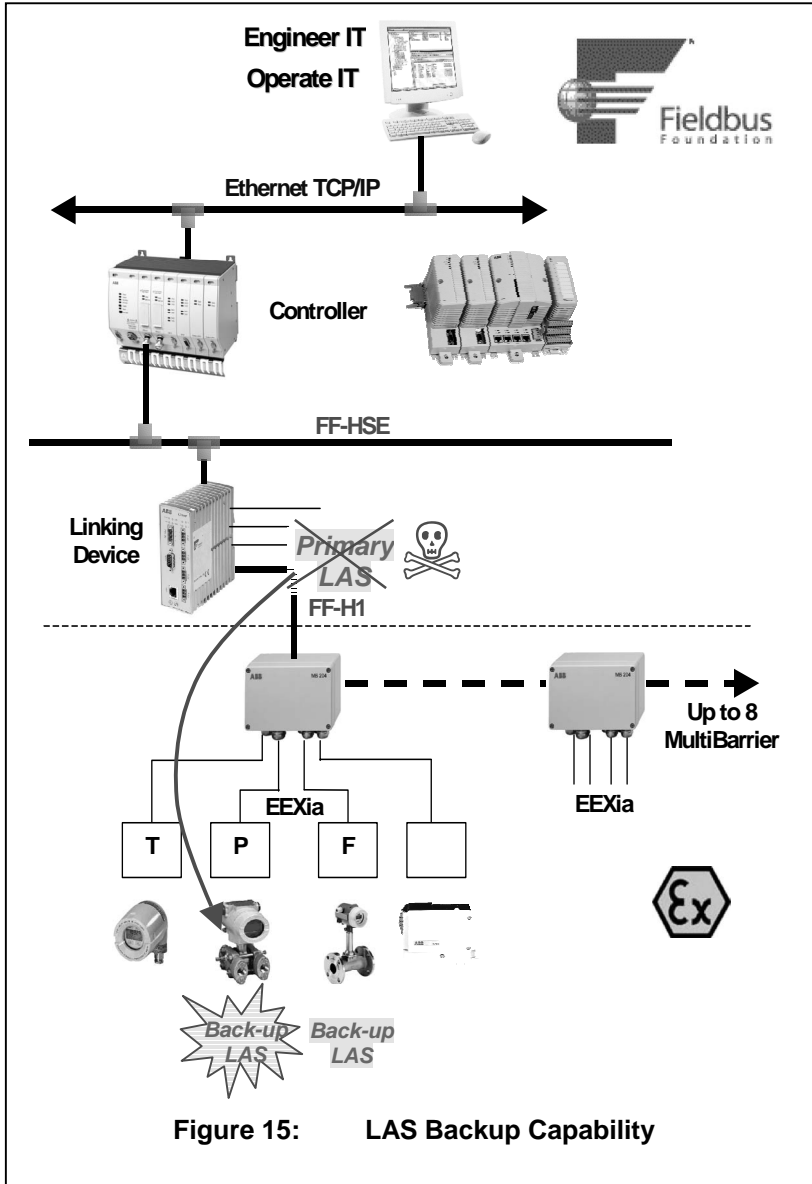
Further and detailed descriptions about the FOUNDATION Fieldbus concepts refers to the 'Technical Overview' document FD-043 available on the Fieldbus Foundation website (www.fieldbus.org)

6. – Initialisation

At the power up, the 2600T-262/264 FF 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 (TB_LCD_VAL_SELECTION) when all is OK or the diagnostic string when some failure has been detected.

By default, the Function Blocks of the 2600T-262/264 FF are not running, until a FB application is not downloaded into the transmitter. For this reason the selected default variable to be displayed is the TB_TRIMMED_VALUE because it is always produced independently by the creation of the FB application.

After the Function Block has been successfully downloaded into the transmitter, the FBs start to be scheduled producing in output the value to be used for the Process Control. After this condition is established, the user can select on the TB_LCD_VAL_SELECTION the preferred variable to be displayed.

By default the 2600T-262/264 FF 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_PRIMARY_VALUE_TYPE in order to use the 2600T-262/264 FF as FLOW, LEVEL or VOLUME measurement. Depending by the TB_PRIMARY_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_PRIMARY_VALUE_TYPE)			
	Pressure	**Flow**	**Level**	**Volume**
Channel 1 (TB_PRIMARY_VALUE)	Pressure	Flow	Level	Volume
Channel 2 (TB_SECONDARY_VALUE_1)	Sensor Temp	Sensor Temp	Sensor temp	Sensor Temp
Channel 3 (TB_SECONDARY_VALUE_3)		Pressure	Pressure	Pressure
Channel 4 (TB_SECONDARY_VALUE_4)				Normalised Pressure
Channel 5 (TB_SECONDARY_VALUE_2)	Static Pressure	Static Pressure	Static Pressure	Static Pressure

Note: The Channel selection of the two AIFB must to be always different.

7. – Device Addressing

When the 2600T-262/264 FF Transmitter is connected on a FF bus, the Master has to recognize it with a unique address in the world. For this reason the FF specifications define three different addressing levels that characterize the FF devices:
- The DEV_ID is the unique device identifier
- The PD_TAG is the physical name of the device
- The Node Address is the real node at which the device is connected on the bus. It is automatically set by the Master (Primary LAS) and its default value is **35**.

The most important one with the higher priority is the DEV_ID. This is a string of 32 characters and must identify in a unique way each FF device in the world.

In order to fulfill this requirement the 2600T-262/264 FF applies the following mechanism:
- The first part of the string is of 10 characters; the Manufacturer Code "000320" and Device Type code "0004".
- The second part of the string is of 12 characters and represent the device type identification; "_2600T_HI___".
- The third part of the string is of 10 characters and is filled with the TB_SENSOR_SERIAL_NUMBER read from the transducer database. This number is written at factory configuration stage and it is assigned in a well-defined way just to be sure to have always different numbers.

Finally the DEV_ID appears of 32 characters in this way '0003200004_2600T_HI___xxxxxxxxxx', where the entire 'x' represents the Serial number.

Whenever an electronics replacement after an electronics failure is necessary, appear clear that the device will be recognized on the network as before of the replacement. This is possible because the transducer, which includes the serial number, remains unchanged and the DEV_ID will be maintained the same as before of the failure.

8. – Device Configuration

The 2600T-262/264 FF Pressure Transmitter offers a set of variables available trough the FF communication. The Master for configuration and maintenance purposes can access the variables with Read and Write operations each addressed by an Index number. The FF Profile Standard defines the relative index of each variable, but the Start Index of each block is Manufacturer Specific.
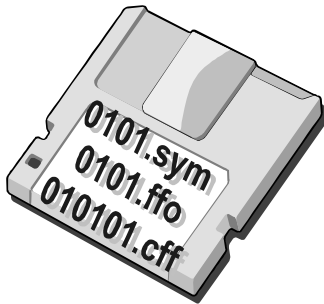
In order to allow a full visibility and support of the variables mapped inside the 2600T-262/264 FF transmitter, it is necessary to import in the Master configuration system the DD files (.sym, and .ffo)

These files together with the Capability file (.cff) are available from the ABB Instrumentation SpA or directly from the website www.abb.com.

These registered files have the following names:
- **0101.sym   as DD symbol file**
- **0101.ffo**
- **010101.cff as Capability file.**

The list of the variables available on the FF communication are reported in the following tables with the relevant block where:

IDX ➔ Relative Index of the Variable
PC ➔ Access Type for the variables.
        Note: Some variables can be changed only if the relevant block is in Out of Service.
The RB the AIFB and the PIDFB are implemented in accordance with the Function Block Part 2 specification Document, the TB is a manufacturer specific implementation.

For details about the meaning of each single variable refer at the FF Function Block Part 2 (Ref. 1), and at the Transducer Block Application Process Part 2 (Ref. 2).

RESOURCE BLOCK

Idx	Name	Byte	PC	Description
0	BLOCK_OBJ	62	mix.	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	MODE_BLK	1	R/W	Target – The selected mode from the operator.
		1	R	Actual – The mode the block is currently in.
		1	R/W	Permitted – Allowed modes that the target may take on
		1	R/W	Normal – The common mode for the Actual.
6	BLOCK_ERR	2	R	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
7	RS_STATE	1	R	State machine of the function block application.
8	TEST_RW	112	R/W	Read/Write test parameter – used only for conformance testing.
9	DD_RESOURCE	32	R	String identifying the tag of the resource, which contains the Device Description for this resource.
10	MANUFAC_ID	4	R	Manufacturer Identification number – used by an interface device to locate the DD file for the resource. **000320 hex for ABB**

11	DEV_TYPE	2	R	Manufacturer's model number associated with the resource – used by interface devices to locate the DD file for the resource.
12	DEV_REV	1	R	Manufacturer's revision number associated with the resource – used by interface devices to locate the DD file for the resource.
13	DD_REV	1	R	Revision of the DD associated with the resource – used by interface devices to locate the DD file for the resource.
14	GRANT_DENY	1	R/W	Grant
		1	R/W	Deny
15	HARD_TYPES	2	R	The type of Hardware available as channel numbers. For the 2600T-262/264 this is limited to Scalar Inputs (i.e. Analog Input)
16	RESTART	1	R/W	Allows a manual restart to be initiated. More restart are possible, they are: **1: Run** – Normal state when running **2: Restart Resource** **3: Restart with Default** – Set the parameters to INITIAL VALUES. **4: Restart Processor** – perform a warm start-up **5: Reset to Factory Sensor Trimming –** Re-load the original Factory Calibration
17	FEATURES	2	R	Used to show supported resource block options
18	FEATURES_SEL	2	R/W	Used to select resource block options
19	CYCLE_TYPE	2	R	Identifies the block execution methods for this resource
20	CYCLE_SEL	2	R/W	Used to select the block execution methods for this resource. The 2600T-262/264 supports the following: - **Scheduled**: Blocks are executed depending by the function block schedule. - **Block execution**: A block may be executed by linking to another block completion.
21	MIN_CYCLE_T	4	R	Time duration of the shorted cycle interval of which the resource is capable.
22	MEMORY_SIZE	2	R	Available configuration memory in the empty resource. To be checked before attempting a download
23	NV_CYCLE_TIME	4	R	Minimum time interval for writing copies of NV parameters to non-volatile memory. Zero means it will be never automatically copied.
24	FREE_SPACE	4	R	Percent of memory available for further configuration. Zero in a preconfigured device
25	FREE_TIME	4	R	Percent of the block processing time that is free to process additional blocks.
26	SHED_RCAS	4	R/W	Time duration at which to give up on computer writes to function block Rcas locations. Shed from Rcas shall never happen when Shed_Rcas = 0
27	SHED_ROUT	4	R/W	Time duration at which to give up on computer writes to function block Rout locations. Shed from Rout shall never happen when Shed_Rout = 0
28	FAULT_STATE	1	R	Fault State
29	SET_FSTATE	1	R/W	Set Fault State
30	CLR_FSTATE	1	R/W	Clear Fault State
31	MAX_NOTIFY	1	R	Maximum number of unconfirmed alert notify messages possible
32	LIM_NOTIFY	1	R/W	Maximum number of unconfirmed alert notify messages allowed
33	CONFIRM_TIME	4	R/W	The minimum time between retries of alert report. Retries shall not happen when Confirm_Time = 0
34	WRITE_LOCK	1	R/W	If set, no writes from anywhere are allowed except to clear Write_Lock. Block inputs will continue to be updated.
35	UPDATE_EVT			This alert is generated by any change to the static data.
		1	R/W	Unacknowledged:
		1	R	Update State:
		8	R	Time Stamp: The date and time of when the alert was generated
		2	R	Static Revision: The number of the last increment generating the alert
		2	R	Relative Index: The index of the changed variable generating the alert
36	BLOCK_ALM			The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active Status in the status parameter. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active Status, if the subcode has changed
		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: Cause of the alert
		1	R	Value: The value generating the alert

37	ALARM_SUM			The alert status associated to the function block
		2	R	Current
		2	R	Unacknowledged
		2	R	Unreported
		2	R/W	Disabled
38	ACK_OPTION	2	R/W	Selection of whether alarms associated the function block will be automatically acknowledged.
39	WRITE_PRI	1	R/W	Priority of the alarm generated by clearing the write_lock
40	WRITE_ALM			This alert is generated if the write_lock parameter is cleared
		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
		1	R	Value
41	ITK_VER	2	R	Major revision number of the Interoperability test case used in certifying this device as interoperable
42	TX_SERIAL_NUM	16	R	Serial Number of the Transmitter (FAN – Finally Assembly Number)

ANALOG INPUT FUNCTION BLOCK

Idx	Name	byte	PC	Description		
0	BLOCK_OBJ	62	mix.	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	MODE_BLK	1	R/W	Target – The selected mode from the operator.		
		1	R	Actual – The mode the block is currently in.		
		1	R/W	Permitted – Allowed modes that the target may take on		
		1	R/W	Normal – The common mode for the Actual.		
6	BLOCK_ERR	2	R	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.		
7	PV	4	R	The process variable used in block execution, expressed in XD_SCALE unit Code		
		1	R	The process variable status		
8	OUT	4	R	The block output value calculated as a result of the block execution, expressed in OUT_SCALE unit code **Only when the function block is in Manual MODE this variable can be written**		
		1	R	The block output status		
9	SIMULATE	1	R/W	Simulate Transducer Status		
		4	R/W	Simulate Transducer Value		
		1	R	Current Transducer Status		
		4	R	Current Transducer Value		
		1	R/W	Simulation Enable/Disable bit		
10	XD_SCALE	4	R/W	High Range	All the values are associated with the channel input value	
		4	R/W	Low Range		
		2	R/W	Unit Index		
		1	R/W	Decimal point		

Code for Pressure

Code	Unit	Code	Unit
		1144	grams / centimeter^2
1130	pascal	1145	Kilograms / centimeter^2
1131	gigapascal	1146	inches H2O (20 deg. C)
1132	Megapascal	1147	inches H2O (4 deg. C)
1133	Kilopascal	1148	inches H2O (68 deg. F)
1134	Millipascal	1149	mm H2O (20 deg. C)
1135	Micropascal	1150	mm H2O (4 deg. C)
1136	Hectopascal	1151	mm H2O (68 deg. F)
1137	bar	1152	feet H2O (20 deg. C)
1138	millibar	1153	feet H2O (4 deg. C)
1139	Torr (0 deg. C)	1154	feet H2O (68 deg. F)
1140	Atmosphere	1155	inches Hg
1141	Psi	1156	inches Hg (0 deg. C)
1142	Psia	1157	mm Hg
1143	Psig	1158	mm Hg 0 deg. C)

Code for Level

Code	Unit	Code	Unit
1010	meters	1016	pm
1011	Km	1017	angstrom
1012	cm	1018	feet
1013	mm	1019	inches
1014	micron	1020	yard
1015	nm	1021	mile
		1022	naut.mile

Code for Flow			**1360**	Std.Cubic feet per hour
1347	cubic meters per sec		**1361**	Std.Cubic feet per day
1348	cubic meters per min		**1362**	Gallons per sec
1349	cubic meters per hour		**1363**	Gallons per min
1350	cubic meters per day		**1364**	Gallons per hour
1351	liters per sec		**1365**	Gallons per day
1352	liters per min		**1366**	Megagallons per day
1353	liters per hour		**1367**	Imperial gallons per sec
1354	liters per day		**1368**	Imperial gallons per min
1355	Megaliters per day		**1369**	Imperial gallons per hour
1356	Cubic feet per sec		**1370**	Imperial gallons per day
1357	Cubic feet per min		**1371**	barrel per sec
1358	Cubic feet per hour		**1372**	barrel per min
1359	Cubic feet per day		**1373**	barrel per hour
			1374	barrel per day

Code for Volume			**1044**	cubic yard
1034	cubic meters		**1045**	cubic mile
1035	cubic decimeters		**1046**	pint
1036	cubic centimeters		**1047**	quart
1037	cubic millimeters		**1048**	gallons
1038	liters		**1049**	imp.gallons
1039	centiliters		**1050**	bushel
1040	milliliters		**1051**	barrel
1041	hectoliters		**1052**	barrel liq.
1042	cubic inch		**1053**	Standard cubic foot
1043	cubic feet			

11	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 FF are available for this
		2	R/W	Unit Index	Scaling. Refer to the FF specs (Ref. 2) for the complete set
		1	R/W	Decimal point	Of available unit code
12	GRANT_DENY	1	R/W	Grant	
		1	R/W	Deny	
13	IO_OPTS	2	R/W	Option which the user can select to alter Input and Output block processing Only the Low cutoff can be enabled/disabled	
14	STATUS_OPTS	2	R/W	Option which the user can select block processing of status. The available selections are: – **Propagate Fault Forward** – **Uncertain if Limited** – **BAD if Limited** – **Uncertain if MAN Mode**	
15	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.	
16	L_TYPE	1	R/W	Linearisation Type. The selectable types are: - **Direct** - **Indirect** - **Indirect Square Root**	
17	LOW_CUT	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 scale. The features may be used to eliminate noise near zero for a flow sensor.	
18	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.	
19	FIELD_VAL	4	R	The percent of the value from the Transducer block or from the simulation value, when enabled, before the characterisation (L_TYPE) and Filtering (PV_FTIME).	
		1	R	Field Value Status	
20	UPDATE_EVT			This alert is generated by any change to the static data	
		1	R/W	Unacknowledged	
		1	R	Update State	
		8	R	Time Stamp: The date and time of when the alert was generated	
		2	R	Static Revision	
		2	R	Relative Index	

21	BLOCK_ALM			The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active Status in the status parameter. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Actve Status, if the subcode has changed
		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
		1	R	Value
22	ALARM_SUM			The summary alarm is used for all process alarm in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active Status in the status parameter. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Actve Status, if the subcode has changed
		2	R	Current
		2	R	Unacknowledged
		2	R	Unreported
		2	R/W	Disabled
23	ACK_OPTION	2	R/W	Used to set auto acknowledgment of the alarms
24	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.
25	HI_HI_PRI	1	R/W	Priority of the High High Alarm
26	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
27	HI_PRI	1	R/W	Priority of the High Alarm
28	HI_LIM	4	R/W	The setting of the High Limit producing the High Alarm. This value is expressed in OUT_SCALE Unit Code
29	LO_PRI	1	R/W	Priority of the Low Alarm
30	LO_LIM	4	R/W	The setting of the Low Limit producing the Low Alarm. This value is expressed in OUT_SCALE Unit Code
31	LO_LO_PRI	1	R/W	Priority of the Low Low Alarm
32	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
33	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
34	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
35	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
36	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

PID FUNCTION BLOCK

Idx	Name	Byte	PC	Description	
0	BLOCK_OBJ	62	mix.	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	MODE_BLK	1	R/W	Target – The selected mode from the operator.	
		1	R	Actual – The mode the block is currently in.	
		1	R/W	Permitted – Allowed modes that the target may take on	
		1	R/W	Normal – The common mode for the Actual.	
6	BLOCK_ERR	2	R	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.	
7	PV	4	R	The process variable used in block execution, expressed in PV_SCALE Unit Code	
		1	R	The process variable status	
8	SP	4	R/W	The analog Set Point value of this block, expressed in PV_SCALE Unit Code	
		1	R/W	The analog Set Point status of this block	
9	OUT	4	R	The block output value calculated as a result of the block execution, expressed in OUT_SCALE unit code Only when the function block is in Manual MODE this variable can be written	
		1	R	The block output status	
10	PV_SCALE	4	R/W	High Range	All the values are associated with the PV
		4	R/W	Low Range	
		2	R/W	Unit Index	
		1	R/W	Decimal point	
11	OUT_SCALE	4	R/W	High Range	All the values are associated with the OUT
		4	R/W	Low Range	
		2	R/W	Unit Index	
		1	R/W	Decimal point	
12	GRANT_DENY	1	R/W	Grant	
		1	R/W	Deny	
13	CONTROL_OPTS	2	R/W	Options the user may select to alter the calculation done in a control loop. The supported actions in the 2600T-262/264 are: - Bypass enabled - Direct acting - SP-PV track in MAN - Track enable - SP-PV track in Rout - Track in Manual - SP-PV track in LO or IMAN - Use PV for BKCAL_OUT - SP track retained target - No out limits in Manual	
14	STATUS_OPTS	2	R/W	Options the user can select for block processing of status. They are: - Initiate Fault Sate if BAD IN - Target to Manual if BAD IN - Initiate Fault Sate if BAD CAS_IN - Target AUTO if BAD CAS_IN - Use Uncertain as Good	
15	IN	4	R/W	The Primary Input Value for the block coming from another block, Expressed in PV_SCALE Unit Code	
		1	R/W	The Primary Input Status	
16	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 of IN value.	
17	BYPASS	1	R/W	The normal control algorithm may be bypassed trough this parameter. When bypass is set, the set point value (in percent) will be directly transferred to the output.	
18	CAS_IN	4	R/W	Remote set point value from another block. Expressed in PV_SCALE Unit Code	
		1	R/W	Remote set point status from another block	
19	SP_RATE_DN	4	R/W	Ramp rate for downward SP changes. When the ramp rate is set to zero the SP is used immediately. Expressed in PV_SCALE Unit Code per seconds	
20	SP_RATE_UP	4	R/W	Ramp rate for upward SP changes. When the ramp rate is set to zero the SP is used immediately. Expressed in PV_SCALE Unit Code per seconds	

21	SP_HI_LIM	4	R/W	The Highest Set Point value allowed. Expressed in PV_SCALE Unit Code	
22	SP_LO_LIM	4	R/W	The Lowest Set Point value allowed. Expressed in PV_SCALE Unit Code	
23	GAIN	4	R/W	The proportional gain value.	
24	RESET	4	R/W	The integral time constant, in seconds per repeat.	
25	BAL_TIME	4	R/W	The specified time for the internal working value of bias to return to operator set bias. Also used to specify the time constant at which the integral term will move to obtain balance when the output is limited and the mode is AUTO, CAS, or RCAS. Expressed in seconds	
26	RATE	4	R/W	The derivative action time constant expressed in seconds	
27	BKCAL_IN	4	R/W	The analog input value from another block's BKCAL_OUT output that is used to prevent reset windup and to initialize the control loop. Expressed in OUT_SCALE Unit Code	
		1	R/W	Back Calculation Input Status	
28	OUT_HI_LIM	4	R/W	The max. Output value allowed. Expressed in OUT_SCALE Unit Code	
29	OUT_LO_LIM	4	R/W	The min. Output value allowed. Expressed in OUT_SCALE Unit Code	
30	BKCAL_HYS	4	R	The amount that the output must change away from its output limit before the limit status is turned off. Expressed as percent of the OUT_SCALE span	
31	BKCAL_OUT	4	R	The value required by an upper block's BKCAL_IN so that the upper block may prevent reset windup and provide bumpless transfer to closed control loop. Expressed in PV_SCALE Unit Code	
		1	R	Back Calculation Status	
32	RCAS_IN	4	R/W	Target setpoint value provided by a supervisory host. Used when mode is RCAS. Expressed in PV_SCALE Unit Code.	
		1	R/W	RCAS_IN Status	
33	ROUT_IN	4	R/W	Target output value provided by a supervisory host. Used when the mode is ROUT. Expressed in OUT_SCALE Unit Code	
		1	R/W	ROUT_IN Status	
34	SHED_OPT	1	R/W	Define actions to be taken on remote control device timeout	
35	RCAS_OUT	4	R	Block setpoint Value after ramping – provided by a supervisory host for back calculations and to allow action to be taken under limiting conditions or mode change. Used when mode is RCAS. Expressed in PV_SCALE Unit Code	
		1	R	RCAS_OUT Status	
36	ROUT_OUT	4	R	Block output Value provided to a supervisory host for a back calculation to allow action to be taken under limiting conditions or mode change. Used when mode is ROUT. Expressed in OUT_SCALE Unit Code	
		1	R	ROUT_OUT Status	
37	TRK_SCALE	4	R/W	High Range	All the values are associated with the external tracking value (TRK_VAL)
		4	R/W	Low Range	
		2	R/W	Unit Index	
		1	R/W	Decimal point	
38	TRK_IN_D	2	R/W	Discrete input used to initiate external tracking of the block output to the value specified by the TRK_VAL	
39	TRK_VAL	4	R/W	This input is used as tack value when external tracking is enabled by TRK_IN_D. Expressed in TRK_SCALE Unit Code.	
		1	R/W	Tracking Status	
40	FF_VAL	4	R/W	The Feed-Forward Control Value. Expressed in FF_SCALE Unit Code	
		1	R/W	The Feed-Forward Control Status	
41	FF_SCALE	4	R/W	High Range	All the values are associated with the feed forward value (FF_VAL)
		4	R/W	Low Range	
		2	R/W	Unit Index	
		1	R/W	Decimal point	
42	FF_GAIN	4	R/W	The gain that the feed forward input is multiplied by before it is added to the calculated control loop.	
43	UPDATE_EVT			This alert is generated by any change to the static data	
		1	R/W	Unacknowledged	
		1	R	Update State	
		8	R	Time Stamp: The date and time of when the alert was generated	
		2	R	Static Revision	
		2	R	Relative Index	

44	BLOCK_ALM			The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active Status in the status parameter. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Actve Status, if the subcode has changed
		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
		1	R	Value
45	ALARM_SUM			The summary alarm is used for all process alarm in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active Status in the status parameter. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Actve Status, if the subcode has changed
		2	R	Current
		2	R	Unacknowledged
		2	R	Unreported
		2	R/W	Disabled
46	ACK_OPTION	2	R/W	Used to set auto acknowledgment of the alarms
47	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.
48	HI_HI_PRI	1	R/W	Priority of HI_HI_ALM
49	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
50	HI_PRI	1	R/W	Priority of HI_ALM
51	HI_LIM	4	R/W	The setting of the High Limit producing the High Alarm. This value is expressed in OUT_SCALE Unit Code
52	LO_PRI	1	R/W	Priority of LO_ALM
53	LO_LIM	4	R/W	The setting of the Low Limit producing the Low Alarm. This value is expressed in OUT_SCALE Unit Code
54	LO_LO_PRI	1	R/W	Priority of LO_LO_ALM
55	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
56	DV_HI_PRI	1	R/W	The Priority of DV_HI_ALM
57	DV_HI_LIM	4	R/W	The setting of the Deviation High Limit producing the Deviation High Alarm. This value is expressed in OUT_SCALE Unit Code
58	DV_LO_PRI	1	R/W	The Priority of DV_LO_ALM
59	DV_LO_LIM	4	R/W	The setting of the Deviation Low Limit producing the Deviation Low Alarm. This value is expressed in OUT_SCALE Unit Code
60	HI_HI_ALM			High High 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
61	HI_ALM			High 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
62	LO_ALM			Low 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

63	LO_LO_ALM			Low Low 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
64	DV_HI_ALM			Deviation High 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
65	DV_LO_ALM			Deviation Low 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

PRESSURE TRANSDUCER BLOCK

Idx	Name	Byte	PC	Description
0	BLOCK_OBJ	62	mix.	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	MODE_BLK	1	R/W	Target – The selected mode from the operator.
		1	R	Actual – The mode the block is currently in.
		1	R/W	Permitted – Allowed modes that the target may take on
		1	R/W	Normal – The common mode for the Actual.
6	BLOCK_ERR	2	R	This parameter reflects the error status associated with the HW or SW components associated with a block. It is a bit string, so that multiple errors may be shown.
7	UPDATE_EVT			This alert is generated by any change to the static data
		1	R/W	Unacknowledged
		1	R	Update State
		8	R	Time Stamp: The date and time of when the alert was generated
		2	R	Static Revision
		2	R	Relative Index
8	BLOCK_ALM			The block alarm is used for all configuration, hardware, and connection failure or system problems in the block. The cause of the alert is entered in the sub-code field. The first alert to become active will set the Active Status in the status parameter. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active Status, if the sub-code has changed
		1	R/W	Unacknowledged
		1	R	Alarm State
		8	R	Time Stamp: The date and time of when the alert was generated
		2	R	Sub-code
		1	R	Value
9	TRANSDUCER_ DIRECTORY	4	R	Directory that specifies the number and starting indices of the transducers in the transducer block
10	TRANSDUCER_ TYPE	2	R	Identifies the transducer type **For the 2600T FF it is 100 = Standard Pressure with calibration**
11	XD_ERROR	1	R	Transducer block error sub-code
12	COLLECTION_ DIRECTORY	36	R	Directory that specifies the number, starting indices, and the DD items IDs of the data collections in each transducer within a transducer block
13	PRIMARY_VALUE_ TYPE	2	R/W	Type of measurement representing the primary value. The default measurement type is Differential Pressure. Writing on this parameter changes the measurement type of the transmitter and the internal algorithm. **See the figure 19 and section 10.1** **101** Volumetric Flow **109** Absolute Pressure **107** Differential Pressure **110** Level **108** Gauge Pressure **200** Volume
14	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 PRIMARY_VALUE_RANGE Unit-Index
		1	R	This is the output status from the TB
15	PRIMARY_VALUE_ RANGE	4	R	High Range	All the values are associated with the PRIMARY_VALUE. This record is read only and it is always a copy of the XD_SCALE of
		4	R	Low Range	the AIFB having the Channel = 1. Whenever writing on XD_SCALE
		2	R	Unit Index	of the AIFB with CHANNEL = 1 are performed, the PRIMARY_VALUE_RANGE is updated in the same way.
		1	R	Decimal point	The usable units code are the same of the XD_SCALE in the Analog Input Function Block
16	CAL_POINT_HI	4	R/W	The Highest calibrated value
17	CAL_POINT_LO	4	R/W	The lowest calibrated value
18	CAL_MIN_SPAN	4	R	The minimum span to be used between the calibrations points, high and low.

19	CAL_UNIT	2	R/W	Calibration Unit. Only Pressure Units are allowed. See in the Analog Input Function Block Table the XD_SCALE Unit Code the allowed **Code for Pressure**		
20	SENSOR_TYPE	2	R/W	Type of sensor. **The 2600T is –121 - Pressure sensor unknown**		
21	SENSOR_RANGE	4 4 2 1	R R R R	High Range Low Range Unit Index Decimal point	All the values represent the physical sensor limits. See in the Analog Input Function Block Table the XD_SCALE Unit Code the allowed **Code for Pressure**	
22	SENSOR_SN	32	R	Serial Number of the sensor		
23	SENSOR_CAL_ METHOD	1	R/W	Calibration Method		
24	SENS_CAL_LOC	32	R/W	The last location of the sensor Calibration		
25	SENS_CAL_DATE	7	R/W	The last date on which the calibration was performed		
26	SENS_CAL_WHO	32	R/W	The name of the person responsible of the last sensor calibration		
27	SENS_ISOL_MTL	2	R	**Type of materials for sensor isolator:** **104** Monel **105** Tantalum **119** AISI 316L Stainless Steel	**130** Hastelloy C276 **236** Monel Gold Plated **339** Monel 400	
28	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	
29	SECONDARY_ VALUE_1	4	R	This is the Sensor temperature value to be linked in input to the AIFB when the CHANNEL = 2 is selected. It is expressed in SECONDARY_VALUE_UNIT_1		
		1	R	This is the Sensor temperature Status		
30	SECONDARY_ VALUE_UNIT_1	2	R/W	Sensor Temperature Unit. The allowed units are: **1000** Kelvin **1001** Celsius Degree	**1002** Fahrenheit Degree **1003** Rankine Degree	
31	SECONDARY_ VALUE_2	4	R	This is the Static Pressure value to be linked in input to the AIFB when the CHANNEL = 5 is selected. It is expressed in SECONDARY_VALUE_UNIT_2		
		1	R	This is the Static Pressure Status		
32	SECONDARY_ VALUE_UNIT_2	2	R/W	Static Pressure Unit. Only Pressure unit code are usable See in the Analog Input Function Block Table the XD_SCALE Unit Code the allowed **Code for Pressure**		
33	SECONDARY_ VALUE_3	4	R	This is the Process Pressure Value available when the PRIMARY_VALUE_TYPE is selected for Flow, Level, or Volume, **see also the Figure 19.** This Pressure Value can be linked in input to the AIFB when the CHANNEL = 3 is selected. It is expressed in SECONDARY_VALUE_UNIT_3		
		1	R	This is the Process Pressure Status when the PRIMARY_VALUE_TYPE is different by pressure		
34	SECONDARY_ VALUE_UNIT_3	2	R/W	Process Pressure Unit. Only Pressure unit code are usable See in the Analog Input Function Block Table the XD_SCALE Unit Code the allowed **Code for Pressure**		
35	SECONDARY_ VALUE_4	4	R	This is the Normalised Pressure Value. It is expressed always in percentage of the Input Scaling. **See also the Figure 19**		
		1	R	This is the Normalised Pressure Status		
36	SECONDARY_ VALUE_UNIT_4	2	R	This unit is always percentage **(%)**		
37	CHANNEL_MAP	5	R/W	An optional parameter that aids in the correlation of channels in a device to channels as defined for a plant or process area.		
38	LIN_TYPE	1	R/W	Manufacturer specific Linearisation Type available for converting the Pressure value in Flow, Level or Volume in accordance with the PRIMARY_VALUE_TYPE selection. **0** Undefined **1** Linear with input **2** Linear with output **3** Square root	**4** Square root to the third power **5** Square root to the fifth power **200** Table	
39	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		
40	O_RING_MTL	2	R/W	**Type of materials for the O-ring:** **110** PTFE **111** Viton **112** Buna-N	**121** Nitrile Rubber (Perbunan NBR) **136** TFE Glass Filled **233** Perfluoro elastomer **238** EPDM	

41	FLANGE_TYPE	2	R/W	**Type of Flanges:**		**56**	Level Sanitary
				12	Conventional	**57**	Level Food
				14	Remote Seal	**58**	No Flange, Direct Connection
				53	Level Flange Type Flush	**59**	All Welded for Remote Seal
				54	Level Flange Type Extended	**60**	Gasketed for Remote Seal
				55	Welded Flange	**62**	Direct Mount Seal (level)
42	FLANGE_MTL	2	R/W	**Type of material for the Flange:**			
				100	Carbon Steel	**119**	AISI 316L Stainless Steel
				102	AISI 316 Stainless Steel	**124**	Kynar
				103	Hastelloy C	**130**	Hastelloy C276
				104	Monel	**339**	Monel 400
43	DRAIN_VENT_MTL	2	R/W	**Type of material of the Drain Vent:**		**119**	AISI 316L Stainless Steel
				103	Hastelloy C	**339**	Monel 400
				104	Monel	**251**	None
44	REM_SEAL_TYPE	2	R	**Type of remote seals:**			
				51	Wafer	**62**	Off line flanged connection
				55	Off line threated	**63**	Sanitary Flush
				56	Chemical Tee	**64**	Sanitary Extended
				57	Button	**65**	Flush Flanged
				58	Triclamp & Cherry Burrell	**66**	Extended Flanged
				59	Alimentary (Union Nut)	**67**	Urea Service
				60	Union Connection	**69**	Pulp & Paper
				61	Aseptic	**70**	Beverage
45	REMOTE_SEAL_ FILL_FLUID	2	R	**Type of Fill fluid for the remote seals:**		**59**	Ethyl Alcohol
				1	Silicon Oil	**60**	Propylene Glycol/Water
				2	Inert Oil (Fluorolube)	**61**	Dibutyl Penthalate
				50	Inert Oil (Galden)	**62**	Siltherm 800
				51	Glyceryn + H2O	**63**	Mercury
				54	Santotherm	**65**	DC97 9120 Pharma B-Grade
				55	Silicone Oil food	**66**	Marcol 82 (Mineral Oil)
				56	Neobee	**67**	AN140 (Silicon oil Hi Temp)
				57	Dowtherm	**68**	Siltherm XLT
				58	Ethyl benzene	**253**	Special
46	REMOTE_SEAL_ ISOLATOR	2	R	**Type of remote seals isolator:**		**130**	Hastelloy C276
				104	Monel	**134**	AISI 316L TFE Coated
				105	Tantalum	**236**	Monel Gold Plated
				119	AISI 316L Stainless Steel	**334**	Hastelloy C276 TFE Coated
47	NUMBER_ REMOTE_SEAL	1	R	**Number of remote seals:**			
				1 One Seal	**2** Two Seals	**251**	None
48	CALIBRATION_ TYPE	1	R	**Type of Calibration:**			
				100 Standard		**102**	Special Temperature
				101 Special Line Pressure		**103**	Special Line Pressure and Temp.
49	PROCEDURE_ TYPE	1	R	**Type of procedure:**		**3**	Chlorine Cleaning
				1 None		**4**	Hydrogen Preparation
				2 Oxygen Cleaning		**5**	Special degreasing
50	HIGH_TEMP_LIM	4	R	Highest allowed temperature limit. +85°C for the 2600T-262/264. This is expressed in SECONDARY_VALUE_UNIT_2			
51	LOW_TEMP_LIM	4	R	Lowest allowed temperature limit. –40°C for the 2600T-262/264. This is expressed in SECONDARY_VALUE_UNIT_2			
52	MAX_WORK_ PRESS_UNIT	2	R/W	Maximum working pressure Unit code. Only Pressure unit code are usable. See in the Analog Input Function Block Table the XD_SCALE Unit Code the allowed **Code for Pressure**			
53	MAX_WORK_PRESS	4	R/W	Max allowed working pressure of the sensor.			
54	STATIC_PRESS_ TRIM	4	R/W	Value at which the Static Pressure has been adjusted to. Expressed in MAX_WORK_PRESS_UNIT			
55	SCALE_IN	4 4 2 1	R/W R/W R/W R/W	High Range Low Range Unit Index Decimal point	All the values represent the input scaling. **See also the Figure 19.** Only Pressure unit code are usable. See in the Analog Input Function Block Table the XD_SCALE Unit Code the allowed **Code for Pressure**		

56	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 19.**
57	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 19.**
58	LIN_TABLE_X	21*4	R/W	Percentage of Input Pressure as X linearisation term of the table up to 21 elements
59	LIN_TABLE_Y	21*4	R/W	Percentage of Output Volume as Y linearisation term of the table up to 21 elements
60	LCD_VAL_SEL	1	R/W	Type of variable to be displayed on the local display: **100** Primary Value **103** FB_2 output value **101** FB_1 output value **104** FB_2 output percent **102** FB_1 output percent **105** Trimmed value
61	LCD_INST	1	R	Indication about the installation of the Display on the transmitter: **255** Not Installed xxx = Installed (xxx = lcd SW revision)
62	KEY_ENABLE	1	R/W	Local operations enabled/disabled. The Push buttons can be selected as: **100** Push Buttons Enabled **101** Push Buttons Disabled
63	MODULE_TYPE	2	R	Type of sensor module: **60** Differential Inductive Lenno **42** Differential Piezo Minden **61** Diff. Inductive Abs.Lenno **43** Diff. Absolute Piezo Minden **62** Diff. Inductive Gauge Lenno **50** Pressure Capacitive Minden **63** Pressure Inductive Lenno **51** Press.Abs.Capacitive Minden **64** Press.Inductive Abs.Lenno **52** Pressure Piezo Minden **65** Pressure Capacitive Lenno **53** Pressure Abs.Piezo Minden **66** Press.Capacitive Abs.Lenno
64	AUTO_CONFIG	1	R/W	Auto_Config Enable / Disable. When this variable is set to TRUE, at every AIFB_CHANNEL writing/changing or at every PRIMARY_VALUE_TYPE selection, all the AIFB and TB variables are automatically set with default values consistent for the kind of selected measure/channel linked in input at the AIFB.
65	MAX_SENS_VAL	4	R/W	Maximum Value reached by the Sensor
66	MIN_SENS_VAL	4	R/W	Minimum Value reached by the Sensor
67	MAX_TEMP_VAL	4	R/W	Maximum Temperature Value reached by the Sensor
68	MIN_TEMP_VAL	4	R/W	Minimum Temperature Value reached by the Sensor
69	MAX_WORK_PR	4	R/W	Maximum Static Pressure Value reached by the Sensor
70	PRIV_HW_REV	1	R	Private HW revision
71	PRIV_SW_REV	1	R	Private SW revision
72	PWR_ON_CNT	2	R	Power On Counter. This counter represents the number of power on of the device. After a defined number of power-on cycles an alert notification is sent to the Master.
73	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
74	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
75	OVER_STAT_CNT	2	R/W	Over Static Press. Counter. For diagnostic purpose each time the static pressure goes outside the MAX_WORK_PRESS the occurrence is counted. An operator writing command can clear this counter
76	TOT_WORK_HR	6	R	Total Working hours. Total amount of time the transmitter has been switched on
77	PAR_WORK_HR	6	R/W	Partial Working hours. Partial amount of time the transmitter has been switched on. An operator writing command can clear this counter.
78	MANUFACTURER_ BLOCK_ERR_1	2	R	Manufacturer block error 1. In this variable are included additional block errors bit. **See details in the section 13.4**
79	MANUFACTURER_ BLOCK_ERR_2	2	R	Manufacturer block error 2. In this variable are included additional block errors bit. **See details in the section 13.4**
80	PRIVATE_INDEX	48	R/W	Manufacturer Read/write command. Only for Factory usage specific maintenance/setting.

9. - Operating Modes

As defined by the FOUNDATION™ fieldbus specifications, the Resource and Function Blocks have to satisfy defined operating modes each represented by a proper bit in the MODE_BLK_PERMITTED data structure. (See section 8)

The AIFB supports	The PID FB supports	The RB supports	The TB supports
- Manual (MAN)	- Manual (MAN)	- IMAN	- AUTO
- Automatic (AUTO)	- Automatic (AUTO)	- AUTO	- O/S
- Out of Service (O/S)	- Out of Service (O/S)	- O/S	
	- IMAN (Initialisation Manual)		
	- CAS (Cascade)		
	- RCAS (Remote Cascade)		
	- ROUT (Remote Output)		
	- LO (Local Override)		

When the RB is Out of Service, all the other blocks are forced in Out of Service too.

10. - Process Flow

Depending by the selected TB_PRIMARY_VALUE_TPE the device assumes different operating modes just to produce in output from the TB one of various measurement types. The Pressure Value is the standard or default measurement, but are available also the Flow, Level and Volume measurements.

These different operating modes require the configuration of additional manufacturer specific parameters defined in the TB and then used by different algorithms in order to perform the necessary conversions.

The Figure 16 shows the main function steps executed inside the Transducer Block DSP, starting from the acquisition until the TB output producing.

Figure 16: Transducer Block DSP
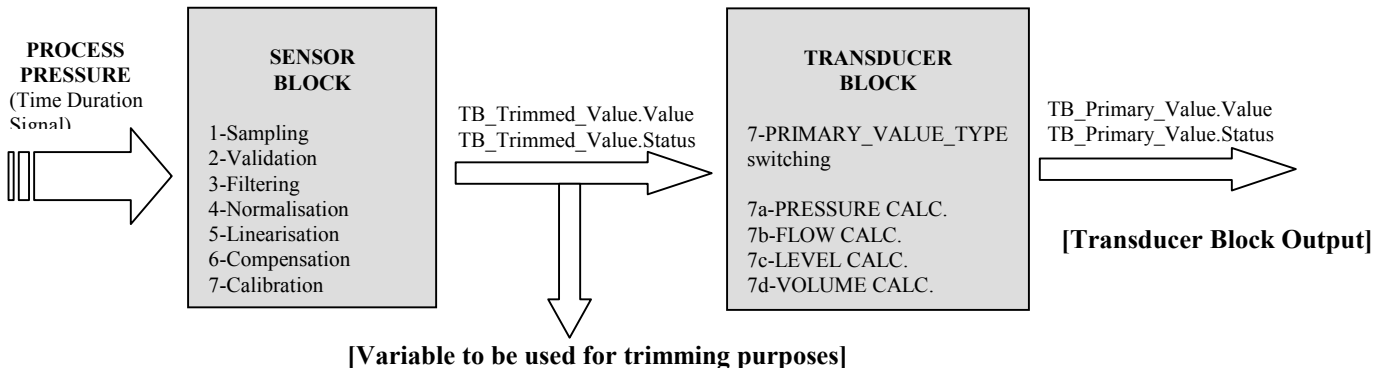
The Analog Input Function blocks receive in input one of the values produced by the Transducer Block selected through the AIFB_CHANNEL number. The default selection for the AIFB_1 is the process variable (Channel 1), the default for the AIFB_2 is the Sensor Temperature (Channel 2).

Whenever the transmitter, previous selected as Pressure type, is then selected for one of the other measure type (i.e. Flow, Level or Volume), the connected AIFB variables (i.e. Unit code, ranges and so on) have to be properly configured with consistent values for the new measure type.

The following Figure 17 shows the possible connections between the 2 AIFBs and the variables in output from the Transducer Block.
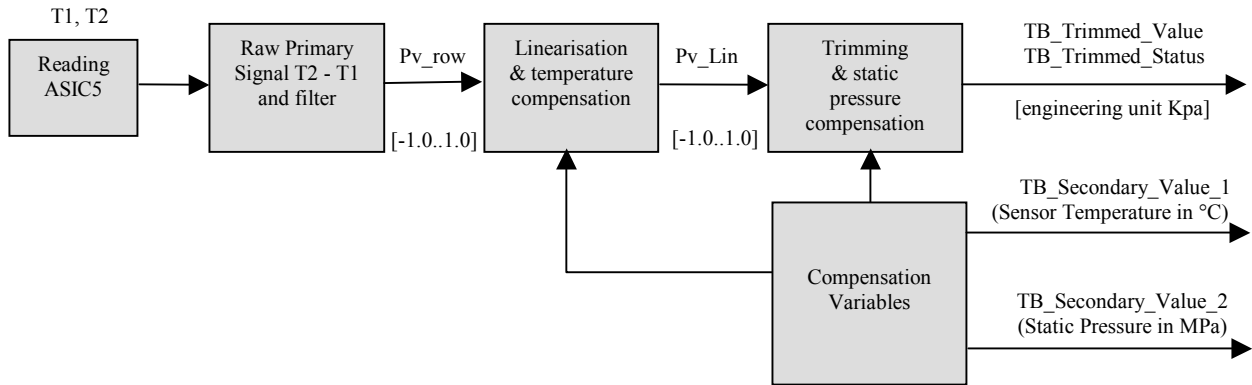
Figure 17: Connection between AIFB and TB
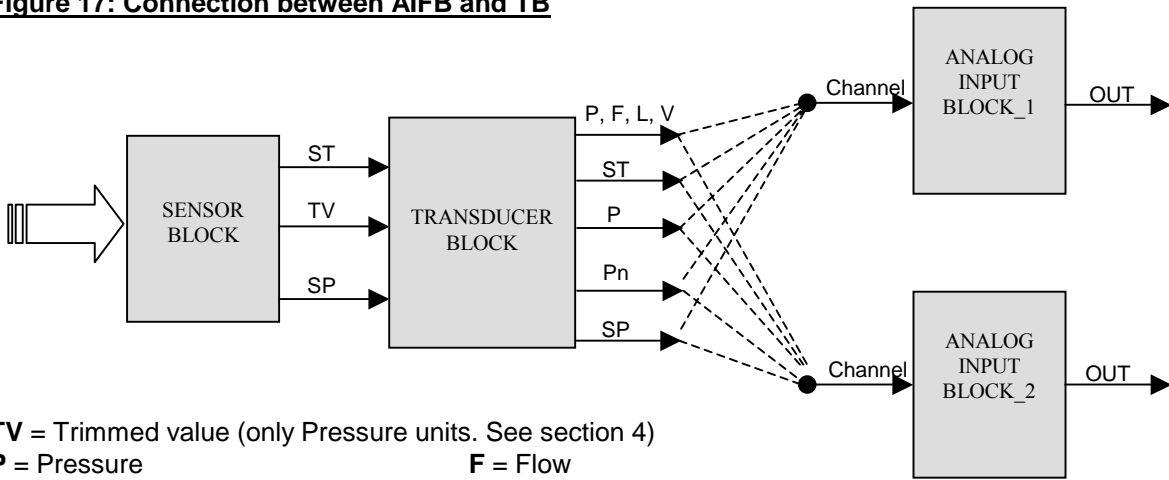
TV = Trimmed value (only Pressure units. See section 4)
P = Pressure   **F** = Flow
Pn = Normalised Pressure   **V** = Volume
ST = Sensor Temperature   **SP** = Static Pressure

Here in the figure 18 is a more detailed representation of the operation performed by the DSP algorithm every loop and already described above.

Figure 18: Sensor Block

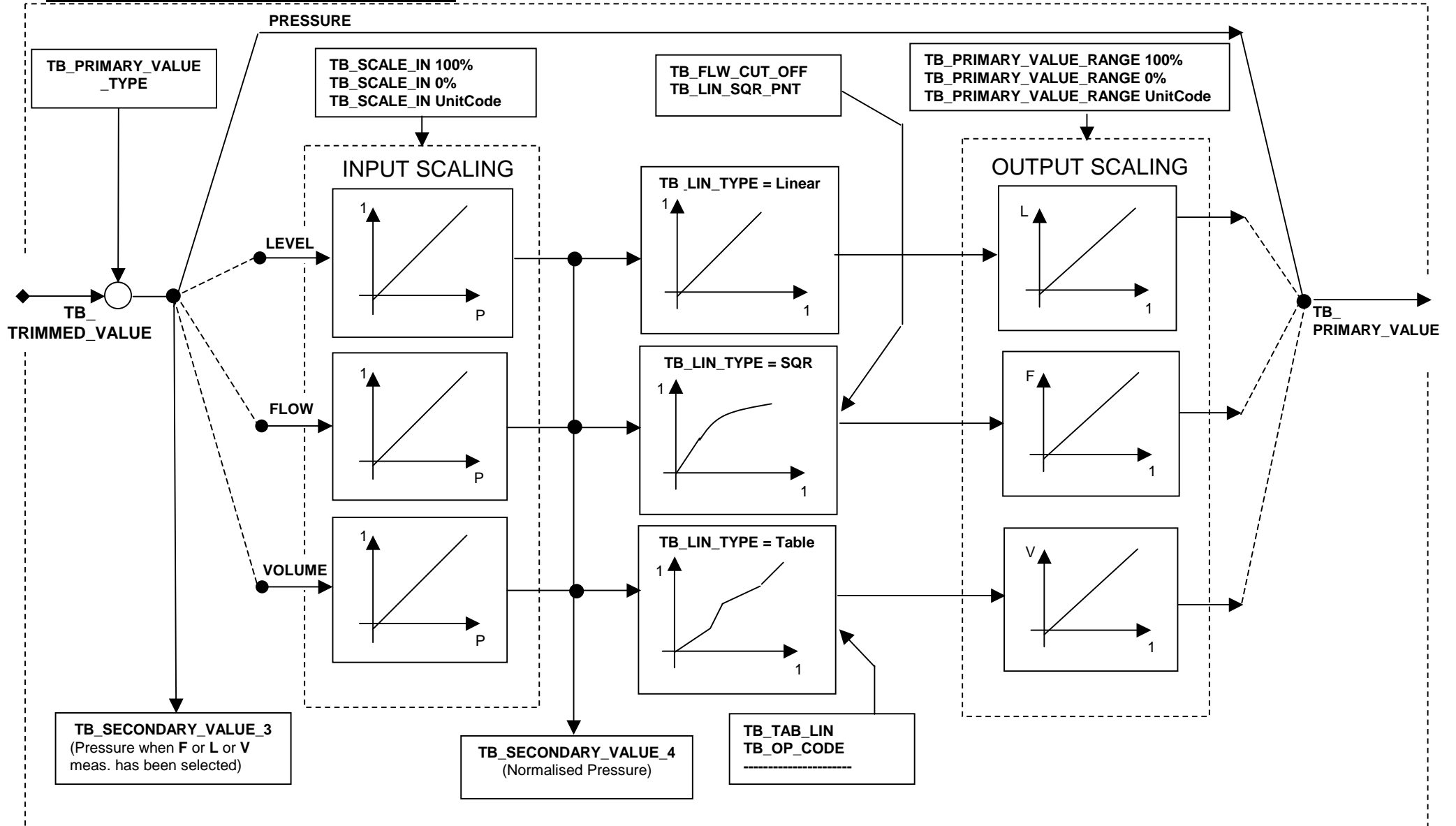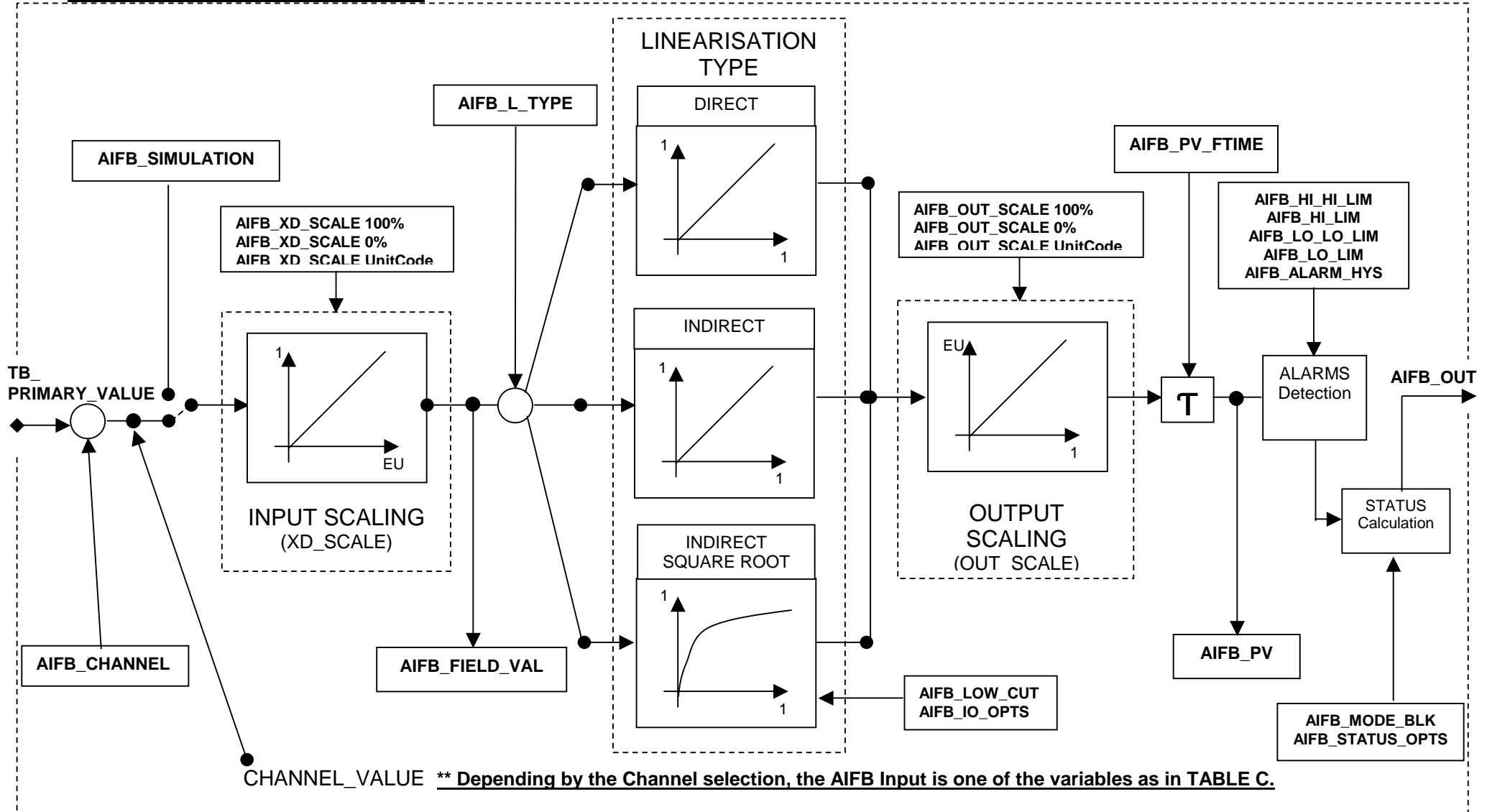**Figure 19: Custom Pressure Transducer Block**

Figure 20: Analog Input Function Block

LINEARISATION
TYPE

AIFB_L_TYPE

DIRECT

AIFB_SIMULATION

AIFB_XD_SCALE 100%
AIFB_XD_SCALE 0%
AIFB_XD_SCALE UnitCode

AIFB_OUT_SCALE 100%
AIFB_OUT_SCALE 0%
AIFB_OUT_SCALE UnitCode

AIFB_PV_FTIME

AIFB_HI_HI_LIM
AIFB_HI_LIM
AIFB_LO_LO_LIM
AIFB_LO_LIM
AIFB_ALARM_HYS

INDIRECT

TB_
PRIMARY_VALUE

INPUT SCALING
(XD_SCALE)

EU

AIFB_OUT

ALARMS
Detection

OUTPUT
SCALING
(OUT SCALE)

STATUS
Calculation

AIFB_CHANNEL

INDIRECT
SQUARE ROOT

AIFB_FIELD_VAL

AIFB_PV

AIFB_LOW_CUT
AIFB_IO_OPTS

AIFB_MODE_BLK
AIFB_STATUS_OPTS

CHANNEL_VALUE **** 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 21.

- **The TB_LIN_SQR_PNT can be set between 0 to 20% of the output range**
  (TB_PRIMARY_VALUE_RANGE_100 – TB_PRIMARY_VALUE_RANGE_0)
- **The TB_FLW_CUT_OFF can be set between 0 to 15% of the output range**
  (TB_PRIMARY_VALUE_RANGE_100 – TB_PRIMARY_VALUE_RANGE_0)

The TB_LIN_SQR_PNT must to be always greater than the TB_FLW_CUT_OFF.
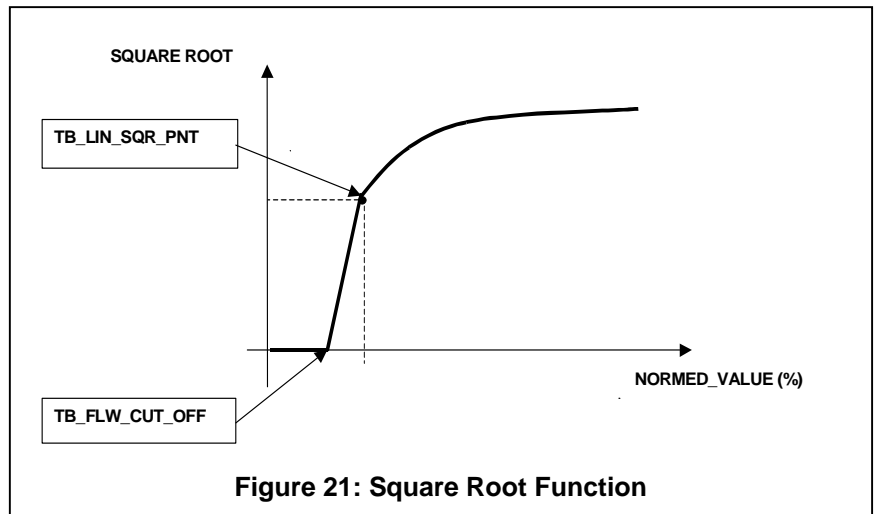
Figure 21: Square Root Function

10.1 - Transducer Block Algorithms

Referring to the Figure 19 these are the calculation internally executed:

TB_SECONDARY_VALUE_3 = TB_TRIMMED_VALUE ➔ (converted in TB_SCALE_IN_UnitCode for monitoring only)
TB_SECONDARY_VALUE_4 = (TB_TRIMMED_VALUE – TB_SCALE_IN_0%) / (TB_SCALE_IN_100% - TB_SCALE_IN_0%)

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

Pressure:
TB_PRIMARY_VALUE = TB_TRIMMED_VALUE * (TB_PRIMARY_VALUE_RANGE_100% - TB_PRIMARY_VALUE_RANGE_0%) + TB_PRIMARY_VALUE_RANGE_0%

Level:
TB_PRIMARY_VALUE = TB_SECONDARY_VALUE_4 * (TB_PRIMARY_VALUE_RANGE_100% - TB_PRIMARY_VALUE_RANGE_0%) + TB_PRIMARY_VALUE_RANGE_0%

Flow:
    IF (TB_LIN_TYPE = LINEAR)
    TB_PRIMARY_VALUE = TB_SECONDARY_VALUE_4 * (TB_PRIMARY_VALUE_RANGE_100% - TB_PRIMARY_VALUE_RANGE_0%) + TB_PRIMARY_VALUE_RANGE_0%

    IF (TB_LIN_TYPE = SQRT3)
        IF (TB_SECONDARY_VALUE_4 > 0.0)
    TB_PRIMARY_VALUE = $\sqrt{\text{(TB\_SECONDARY\_VALUE\_4)}^3}$ * (TB_PRIMARY_VALUE_RANGE_100% - TB_PRIMARY_VALUE_RANGE_0%) + TB_PRIMARY_VALUE_RANGE_0%
        ELSE
    TB_PRIMARY_VALUE = TB_PRIMARY_VALUE_RANGE_0%

    IF (TB_LIN_TYPE = SQRT5)
        IF (TB_SECONDARY_VALUE_4 > 0.0)
    TB_PRIMARY_VALUE = $\sqrt{\text{(TB\_SECONDARY\_VALUE\_4)}^5}$ * (TB_PRIMARY_VALUE_RANGE_100% - TB_PRIMARY_VALUE_RANGE_0%) + TB_PRIMARY_VALUE_RANGE_0%
        ELSE
    TB_PRIMARY_VALUE = TB_PRIMARY_VALUE_RANGE_0%

    IF (TB_LIN_TYPE = SQRT)
        IF $\left(\text{TB\_SECONDARY\_VALUE\_4} \leq \left(\dfrac{\text{TB\_FLW\_CUT\_OFF}}{100} \right)^2 \right)$

    TB_PRIMARY_VALUE = TB_SCALE_OUT_0%

ELSE IF $\left(\text{TB\_SECONDARY\_VALUE\_4} \le \left(\frac{\text{TB\_LIN\_SQR\_PNT}}{100} \right)^2 \right)$

$\text{TB\_PRIMARY\_VALUE} = m * \left(\text{TB\_SECONDARY\_VALUE\_4} - \left(\frac{\text{TB\_FLW\_CUT\_OFF}}{100} \right)^2 \right) * (\text{TB\_SCALE\_OUT\_100\%} -$
$\text{TB\_SCALE\_OUT\_0\%}) + \text{TB\_SCALE\_OUT\_0\%}$

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

ELSE

$\text{TB\_PRIMARY\_VALUE} = \sqrt{(\text{TB\_SECONDARY\_VALUE\_4})} * (\text{TB\_PRIMARY\_VALUE\_RANGE\_100\%} -$
$\text{TB\_PRIMARY\_VALUE\_RANGE\_0\%}) + \text{TB\_PRIMARY\_VALUE\_RANGE\_0\%}$

Volume:

$\text{TB\_PRIMARY\_VALUE} = \mathcal{F} \text{table (TB\_SECONDARY\_VALUE\_4)} * (\text{TB\_PRIMARY\_VALUE\_RANGE\_100\%} -$
$\text{TB\_PRIMARY\_VALUE\_RANGE\_0\%}) + \text{TB\_PRIMARY\_VALUE\_RANGE\_0\%}$

10.2 - Analog Input Function Block Algorithms

Referring to the Figure 20 these are the calculation internally executed:

$\text{AIFB\_FIELD\_VAL} = 100 * \dfrac{\text{CHANNEL\_VALUE} - \text{AIFB\_XD\_SCALE\_0\%}}{\text{AIFB\_XD\_SCALE\_100\%} - \text{AIFB\_XD\_SCALE\_0\%}}$

Depending by the L_TYPE parameters selection there are applied the following signal conversions:

Direct:
$\text{AIFB\_PV} = \text{CHANNEL\_VALUE}$

Indirect:
$\text{AIFB\_PV} = \dfrac{\text{AIFB\_FIELD\_VAL}}{100} * (\text{AIFB\_OUT\_SCALE\_100\%} - \text{AIFB\_OUT\_SCALE\_0\%}) + \text{AIFB\_OUT\_SCALE\_0\%}$

This conversion is applied when the XD_SCALE values are different from the OUT_SCALE values.

Indirect Square Root:
IF AIFB_FIELD_VAL < AIFB_LOW_CUT
$\text{AIFB\_PV} = \text{AIFB\_OUT\_SCALE 0\%}$

ELSE

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

10.3 – PID Algorithm

The PID is available inside the 2600T-262/264 models as additional network functionality. The PID here contained is not part of the basic functionality of the Pressure Transmitters as well as the AIFB, but it has to be seen as additional functionality to be used, when required, to satisfy the process requirements.

Detail about the implemented PID is represented in the Figure 22.
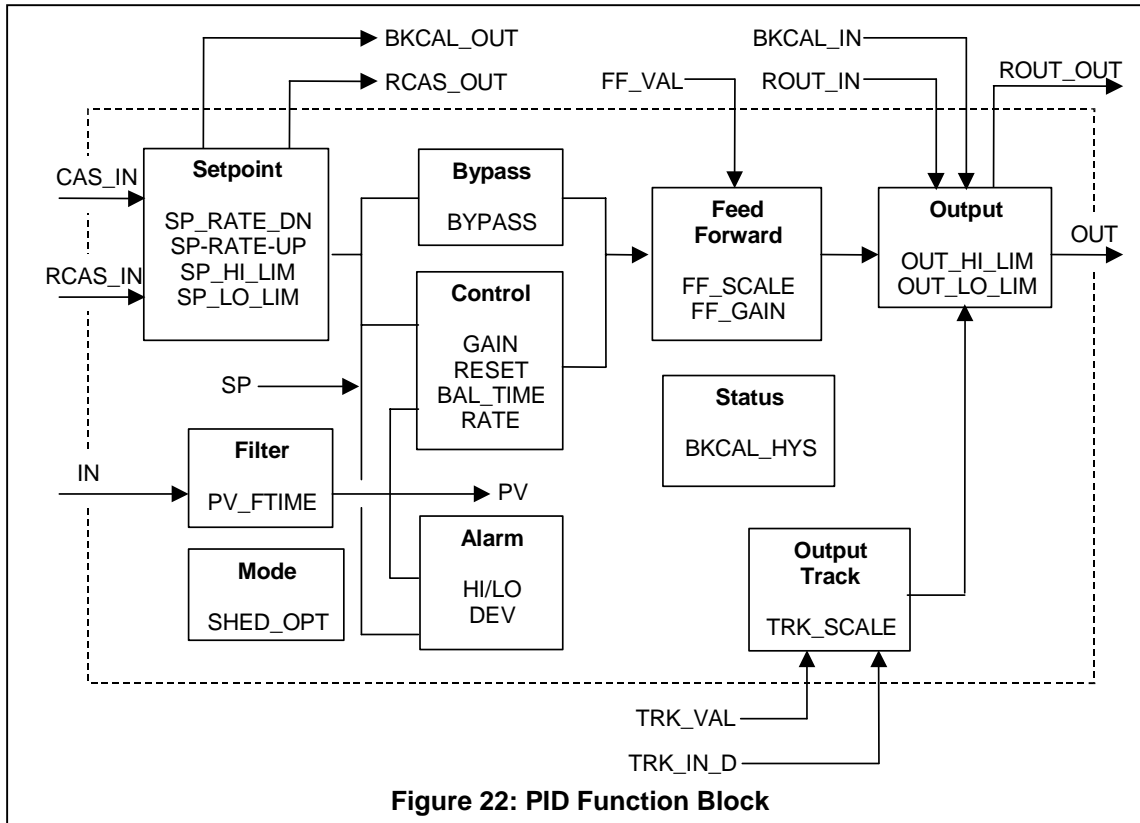
Figure 22: PID Function Block

The PID receives in input the value produced in output from another block like Analog Input, and provides to apply the algorithm with the Proportional, Integral, Derivative contribute as previously set.
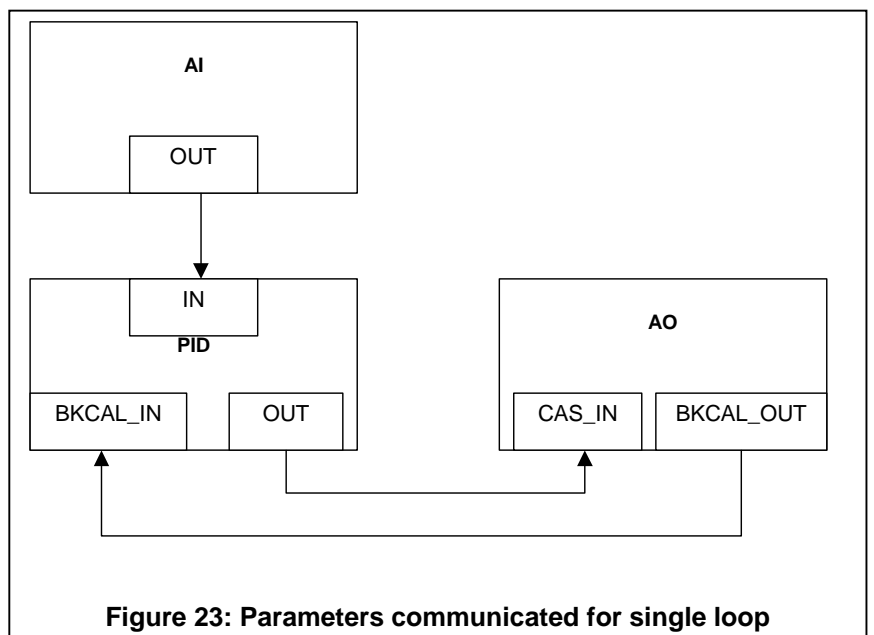
Figure 23: Parameters communicated for single loop

INSTRUMENTATION

The algorithm applied is as in the following formula ➔ $\mathbf{StandardOut = GAIN} \cdot E \cdot \left(1 + \dfrac{1}{T_r s} + \dfrac{T_d s}{\alpha \cdot T_d s + 1} \right) + \mathbf{F}$

Where:

GAIN: Proportional Gain Value
T_r: Integral action Time constant (RESET Parameter) in seconds
s: Laplace operator
T_d: Derivative action time constant (RATE parameter)
α: Fixed smoothing factor of 0.1 applied to RATE
F: Feed-forward control contribution from the feed-forward input (FF_VAL parameter)
E: Error between set-point and process variable

In more detail the PID formula implemented is:

$$OUT(s) = Gain \cdot Error + \frac{Gain \cdot Error}{\operatorname{Re} set \cdot s} + \frac{Gain \cdot Rate \cdot Measure \cdot s}{\alpha \cdot Rate \cdot s + 1} + FeedForward$$

The Tustin's approximation is used to calculate the integral and derivative part of the formula.

The integral part is:

$$I(k) = I(k-1) + \frac{Gain \cdot T_c \cdot (Error(k) + Error(k-1))}{2 \cdot \operatorname{Re} set} + AW(k) + FeedForward\_Deviation(k)$$

The AW is the anti-windup term, the formula is:

$$AW(k) = \frac{T_c \cdot (Lim\_Out(k-1) - Out(k-1))}{Balance\_Time}$$

The *FeedForward_Deviation* is the difference between the last two values of the FeedForward value:

$$FeedForward\_Deviation(k) = FeedForward(k-1) - FeedForward(k-2)$$

The derivative part is:

$$D(k) = \frac{2 \cdot Gain \cdot Rate \cdot (Measure(k) - Measure(k-1))}{(T_c + 2 \cdot \alpha \cdot Rate)} - \frac{(T_c - 2 \cdot \alpha \cdot Rate) \cdot D(k-1)}{(T_c + 2 \cdot \alpha \cdot Rate)}$$

The α term is set to 0.13.

The Reverse Acting the error and the measure are set to:

$$Error(k) = SP(k) - PV(k)$$

$$Measure(k) = -PV(k)$$

Otherwise in Direct Acting are set to:

$$Error(k) = PV(k) - SP(k)$$

$$Measure(k) = PV(k)$$

11. – Commissioning

The 2600T-262/264 FF can be configured for measure Pressure, Flow, Level or Volume.

When the TB_AUTO_CONFIG is set to TRUE, at every AIFB_CHANNEL or PRIMARY_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 Channel from Pressure to Temperature, all the units and range values are set to °C and temperature range values, changing the PRIMARY_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 FF 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 17 and 20. This value is linked in input to the AIFB_1 trough the Channel selection representing the CHANNEL_VALUE of the formula applied in the section 10.2 AIFB algorithms.

The AIFB_1 is linked with the Primary_Value (Channel = 1) and the AIFB_2 is linked with the Sensor_Temperature (Channel = 2).

This is the default setting of the 2600T-262/264 FF:
- TB_PRIMARY_VALUE_TYPE = PRESSURE
- TB_SCALE_IN_100% = **Not used**
- TB_SCALE_IN_0% = **Not Used**
- TB_SCALE_IN_UnitCode = **Not Used**
- TB_LIN_TYPE = **Not Used**
- TB_PRIMARY_VALUE_RANGE_100% = Upper Range Limit (TB_SENSOR_RANGE_100% strictly dependent by the sensor type)
- TB_PRIMARY_VALUE_RANGE_0% = Lower Range Limit (TB_SENSOR_RANGE_0% strictly dependent by the sensor type)
- TB_PRIMARY_VALUE_RANGE_UnitCode = Kpa (TB_SENSOR_RANGE_UnitIndex)

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_XD_SCALE_100% = Upper Range Limit   AIFB_2_XD_SCALE_100% = 90.0
- AIFB_1_XD_SCALE_0% = Lower Range Limit   AIFB_2_XD_SCALE_0% = -40.0
- AIFB_1_XD_SCALE_UnitCode = Kpa   AIFB_2_XD_SCALE_UnitCode = °C
- 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 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 Configuration

When the TB_PRIMARY_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 19.
The user has to switch the TB_MODE_BLOCK in OOS Mode and then select the following:
-    TB_PRIMARY_VALUE_TYPE = FLOW

If the TB_AUTO_CONFIG is set to TRUE, automatically the 2600T-262/264 FF became set as follows:
-    TB_SCALE_IN_100% = Upper Range Limit.
-    TB_SCALE_IN_0% = 0.0
-    TB_SCALE_IN_UnitCode = Kpa
-    TB_LIN_TYPE = Square Root
     -    TB_LOW_CUT_OFF = 0%
     -    TB_LIN_SQR_PNT = 10%
-    TB_PRIMARY_VALUE_RANGE_100% = 100.0
-    TB_PRIMARY_VALUE_RANGE_0% = 0.0
-    TB_PRIMARY_VALUE_RANGE_UnitCode = 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_PRIMARY_VALUE_RANGE) represents the output conversion range.

-    AIFB_1_CHANNEL = 1   AIFB_2_CHANNEL = 2
-    AIFB_1_XD_SCALE_100% = 100.0   AIFB_2_XD_SCALE_100% = 90.0
-    AIFB_1_XD_SCALE_0% = 0.0   AIFB_2_XD_SCALE_0% = -40.0
-    AIFB_1_XD_SCALE_UnitCode = Cubic Meter per hours   AIFB_2_XD_SCALE_UnitCode = °C
-    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 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 6-Initialisation about the allowed Channel selections depending by the TB_PRIMARY_VALUE_TYPE.

11.3 - Level Configuration

When the TB_PRIMARY_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 19.
The user has to switch the TB_MODE_BLOCK in OOS Mode and then select the following:
- TB_PRIMARY_VALUE_TYPE = LEVEL

If the TB_AUTO_CONFIG is set to TRUE, automatically the 2600T-262/264 FF became set as follows:
- TB_SCALE_IN_100% = Upper Range Limit.
- TB_SCALE_IN_0% = 0.0
- TB_SCALE_IN_UnitCode = Kpa
- TB_LIN_TYPE = Linear
- TB_PRIMARY_VALUE_RANGE_100% = 100.0
- TB_PRIMARY_VALUE_RANGE_0% = 0.0
- TB_PRIMARY_VALUE_RANGE_UnitCode = 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_PRIMARY_VALUE_RANGE) represents the output conversion range.

- AIFB_1_CHANNEL = 1	AIFB_2_CHANNEL = 2
- AIFB_1_XD_SCALE_100% = 100.0	AIFB_2_XD_SCALE_100% = 90.0
- AIFB_1_XD_SCALE_0% = 0.0	AIFB_2_XD_SCALE_0% = -40.0
- AIFB_1_XD_SCALE_UnitCode = Meters	AIFB_2_XD_SCALE_UnitCode = °C
- 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 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 6-Initialisation about the allowed Channel selections depending by the TB_PRIMARY_VALUE_TYPE.

11.4 - Volume Configuration

When the TB_PRIMARY_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 19.
The user has to switch the TB_MODE_BLOCK in OOS Mode and then select the following:
- TB_PRIMARY_VALUE_TYPE = VOLUME

If the TB_AUTO_CONFIG is set to TRUE, automatically the 2600T-262/264 FF became set as follows:
- TB_SCALE_IN_100% = Upper Range Limit.
- TB_SCALE_IN_0% = 0.0
- TB_SCALE_IN_UnitCode = Kpa
- TB_LIN_TYPE = Table
    - TB_TABLE_X = SEE THE TABLE SETTING PROCEDURE 11.4.1.
    - TB_TABLE_Y = SEE THE TABLE SETTING PROCEDURE 11.4.1.
- TB_PRIMARY_VALUE_RANGE_100% = 100.0
- TB_PRIMARY_VALUE_RANGE_0% = 0.0
- TB_PRIMARY_VALUE_RANGE_UnitCode = 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_PRIMARY_VALUE_RANGE) represents the output conversion range.

- AIFB_1_CHANNEL = 1   AIFB_2_CHANNEL = 2
- AIFB_1_XD_SCALE_100% = 100.0   AIFB_2_XD_SCALE_100% = 90.0
- AIFB_1_XD_SCALE_0% = 0.0   AIFB_2_XD_SCALE_0% = -40.0
- AIFB_1_XD_SCALE_UnitCode = Cubic Meters   AIFB_2_XD_SCALE_UnitCode = °C
- 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 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 6-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 user has not restriction of when the linearisation table can be set. The Table can be set in any time and not necessarily with the TB_PRIMARY_VALUE_TYPE = VOLUME.

Typically the user has to switch the TB in OOS Mode and then proceed in the following setting:

- TB_PRIMARY_VALUE_TYPE = VOLUME
- TB_LIN_TYPE = Table
- TB_TABLE_X and TB_TABLE Y set with the characterisation values.

  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_PRIMARY_VALUE_RANGE.

  Some rules have to be respected in order to properly set the table:

  - The X points and Y points must be of equal numbers
  - The minimum number of X, Y points must be 2
  - The maximum number of X, Y points must be 21
  - The X points and Y points must be set following a monotonic sequence
  - The X points and Y points must not be set creating a Gradient too high and consequently not a good conversion accuracy.

After the above minimum setting the TB_MODE_BLOCK can be switched in AUTO, and if the table has not been properly set the block cannot change its mode in AUTO and the TB_BLOCK_ERR will show a Configuration error set. See the 13.4-Manufacturer Block Error in the Table I - Manufacturer Bloch Error 2 (Byte 2-bit 3,4,5,6,7) for more details about the 5 reasons relating the linearisation table configuration error

Figure 24: Linearisation Table setting
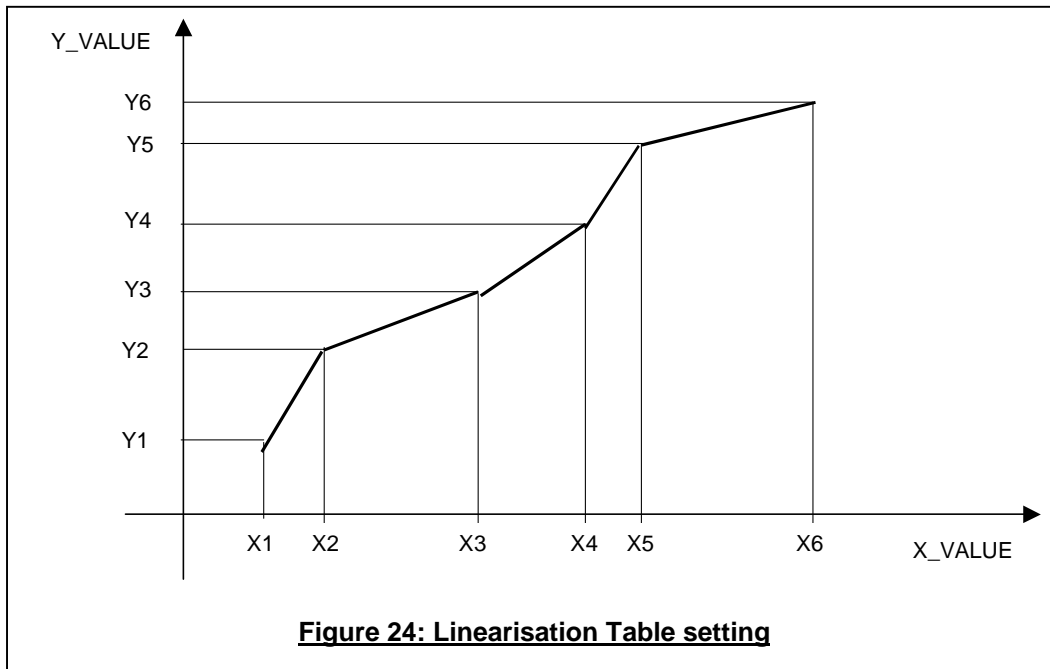
12. Calibration Operations

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

TABLE E

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

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 matching the current pressure applied in input. These values are expressed in TB_CAL_UNIT engineering unit code.

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 are required when the remote configuration tool is used:
1. Select the desired unit for representing the measure produced by the transmitter (TB_TRIMMED_VALUE), writing the right code in the TB_CAL_UNIT.
   Note: Only Pressure Unit Code is allowed
2. Read the reference value produced by the transmitter from the TB_TRIMMED_VALUE.
3. If this value is different by 'zero' the 'zero alignment' operation can be executed and it works setting automatically the TB_CAL_POINT_LO to zero and writing it into the transmitter.
4. Read again the TB_TRIMMED_VALUE and check if its value is 'zero'.
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_CAL_UNIT.
   Note: Only Pressure Unit Code is allowed
3. Read the reference value produced by the transmitter from the TB_TRIMMED_VALUE.
4. If this value doesn't match the pressure applied in input, write the right value in the TB_CAL_POINT_LO and send it to the transmitter.
5. Read again the TB_TRIMMED_VALUE and check if its value has been adjusted for matching the applied pressure.

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

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 "Reset to Factory Sensor Trimming Value" in the RB_RESTART, see section 8 in the Resource Block.

12.5 - Static Pressure Trimming

This operation can be executed only using the remote configuration tool. With this operation the TB_SECONDARY_VALUE_2 (Static Pressure) indication is automatically adjusted, in order to match the known value of Static Pressure applied at the transducer.. The following sequence of operations is required:

1. Read the Static Pressure value from the TB_SECONDARY_VALUE_2.
2. If this value doesn't match the known Static pressure applied in input at the transducer, write the right value in the TB_STATIC_PRESS_TRIM and send it to the transmitter.
3. Read again the TB_SECONDARY_VALUE_2 and check if its value has been adjusted for matching the real Static Pressure value.

13. - Diagnostic

The FOUNDATION™ Fieldbus defines different ways to report diagnostics information. Standard and Manufacturer specific variables include and represent diagnostic Flags/Codes updated dynamically every DSP loop.

First of all it is necessary to distinguish between the flags available only when accessed from the user with a read operation, and the other which in addition, enable the Alert Notification mechanism if allowed by the ALARM_SUMMARY disabled variable. The notification provides to automatically inform the Master about the occurred event with the information defined in the Alert_Discrete data structure. These events could be then acknowledged or not depending by the operator at the Master side. These events are notified only when the error appears and there are not notifications when the error conditions disappear.

Furthermore the Alert Notification mechanism is used to notify to the Master not only error conditions, but also some process conditions.

For example whenever the OUT value of the AIFB goes outside the Advisory and/or Critical limits, the notification mechanism get starts only if enabled in the ALARM_SUMMARY disabled variable. The notification provides to inform the Master about the OUT value which enabled the event, the time and date of the occurred event (Time_Stamp), and other information defined in the Alert_Float data structure. The alarm could be then acknowledged or not depending by the operator at the Master side. Respect the errors handling, the same mechanism is enabled also when the OUT value came back inside the Advisory and/or Critical limits.

The FOUNDATION™ Fieldbus defines also others events which have to be automatically notified to the Master. Each changing of the HW and/or SW security locking condition is notified trough an Alert_Discrete data structure, and every changing of the variable's value, which consequently requires the increment the Static Revision value, is notified with the information of the Alert_Update data structure.

Only for the notifications of Alert_Update type is not contemplated the acknowledgement form the Master.

The error flags supported by the 262/264 models of the 2600T Series FOUNDATION™ Fieldbus are a subset of the standard errors defined in the BLOCK_ERR variable, and the additionally errors flags defined in the MANUFATORER_BLOCK_ERR_1 and MANUFATORER_BLOCK_ERR_2. Each Block implemented in the 2600T FF includes the BLOCK_ERR bit-string variable, and each bit represents an error condition. Some of these bits can also be source of the Alert Notification mechanism. See the sections 13.3, 13.4, 13.5.

Whenever an error or alarm condition enables an Alert Notification mechanism, it can assume different state machine conditions like acknowledged, unacknowledged, reported, unreported and so on. The complete status of each supported alarm is summarised by the ALARM_SUMMARY variable. 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 13.6.

13.1 – Alarm Summary

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

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

Whenever the alarm is enabled in the Disabled field, and the alarm condition occurs, it is notified at the Master trough the Alert Notification state machine and the relevant bit is set in the Current Alarms field. The Unacknowledged field reflects if the alarm has been recognised at the Master side. The Unreported field reflects if the alarm was linked to a system at which each alarm event has to be reported.

Octet	Bit	Mnemonic	Description
1	0	Discrete Alarm	Supported only by the Resource Block. When the HW (Switch 1) and/or SW write locking change its status.
	1	HI_HI_Alarm	Supported by AIFB and PIDFB. 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 and PIDFB. 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 and PIDFB. 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 and PIDFB. 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	DEV_HI_Alarm	Supported only by PIDFB
	6	DEV_LO_Alarm	Supported only by PIDFB
	7	Block Alarm	Supported by RB, AIFB and PIDFB. Notify every Block Error occurrence of the relating block. See 13.3 – Block Error.
2	0-7	Reserved	

Limit alarm bits will be set to 1 or 0 if the alarm reason occurs (1) or is gone (0) in the Current Alarms field.

13.2 – Alarm Priority

For each alarm there is the possibility to select the correspondent priority level between 0 - 15. The Table F below defines what the different priority means.

TABLE F:

Alarm Priority	Description
0	Alarm is Suppressed
1	Recognised by the system but not reported
2	Report to the operator, but doesn't require his attention
3 – 7	Advisory alarm of increasing priority
8 – 15	Critical alarm of increasing priority

13.3 – Block Error

Each Block implemented in the device contains a Standard BLOCK ERROR variable defined as bit string of 16 errors see below. Not all the errors condition are supported by all the different blocks

STANDARD BLOCK ERROR TABLE		
Byte	**Bit**	**Mnemonic**
1	0	Other
	1	Block Configuration error
	2	Link Configuration error
	3	Simulate active
	4	Local Override
	5	Device Fault State Set
	6	Device needs maintenance soon
	7	Input Failure/process variable has BAD status
2	0	Output Failure
	1	Memory failure
	2	Lost Static Data
	3	Lost NV Data
	4	Read-back check failed
	5	Device needs maintenance now
	6	Power up
	7	Out-of-Service

The following tables represent the BLOCK ERROR of each implemented block of the 2600T-262/264 FF, with only the description of the supported error conditions and indication of which errors enable the Alert Notification mechanism depending by the correspondent "Alarm Priority" selection.

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 H: TRANDUCER - BLOCK ERROR TABLE

Byte	Bit	Mnemonic	Alert Event	Description	Checking	Propagation on TB_PRIMARY_VALUE Status	LCD When selected the TB_PRIMARY_VALUE
1	0	Other	YES	The error is one or more in the list MANUFACTURY BLOCK ERROR and XD_ERROR Table. See 11.5	SEE MANUFACTURY BLOCK ERROR TABLE	SEE MANUFACTURY BLOCK ERROR TABLE	SEE MANUFACTURY BLOCK ERROR TABLE
	1	Block Configuration error	YES	The TB is not properly configured for the measurement and production of the process value.	1- TB_Primary_Value_Range outside TB_Sensor_Range values or smaller than TB_Cal_Min_Span 2- Scale_In range outside Sensor_Range values or smaller than Cal_Min_Span 3- LinTable not properly configured	BAD + Out Of Service	*ERROR HANDLING Type* 'CONFIG' ----- 'ERROR'
	6	Device needs maintenance soon	YES	An not fatal error decreasing the transmitter performance/accuracy has been detected	The compensation variables not more available or usable due to specific sensors failure	UNCERTAIN + Sensor Conversion Not Accurate	*WARNING HANDLING Type* 'SENSOR' ----- 'FAIL S'
2	1	Memory failure	YES	A memory failure has been detected in the Sensor EEPROM or Electronics EEPROM	At every the EEPROM(s) writing there is a checking that the values have been effectively burned in.	*NO EFFECT*	SEE MANUFACTURER BLOCK ERROR TABLE
	2	Lost Static Data	YES	The Sensor Memory EE1 has data corrupted (CRC fail)	During the start-up phase has been detected a CRC error in the sensor memory	SEE MANUFACTURER BLOCK ERROR TABLE	SEE MANUFACTURER BLOCK ERROR TABLE
	5	Device needs maintenance now	YES	A fatal error has been detected in the Sensor or Electronics	1- The Sensor Primary signal is no more available or correctly updated due to electronics failure. 2- The sensor signal reflects wrong condition due to probably mechanical failure	BAD + Sensor Fail	*ERROR HANDLING Type* 'SENSOR' ----- 'FAIL S'
	7	Out-of-Service	YES	The TARGET MODE of the TB has been set to Out Of Service by the operator	The Actual_Mode of the TB is set to OUT OF SERVICE	BAD + Out Of Service	*ERROR HANDLING Type* 'OUT OF' ----- 'SERVICE'

13.4 – Manufacturer Block Error

There are 2 additional TB_MANUFACTURER_BLOCK_ERR variables mapped in the Transducer Block including more detailed indication respect the above standard Block Error. All these error flags enable the Alert Notification mechanism.
Manufacturer Block error bits will be set to 1 if the error occurs or 0 if the error disappears.

Table I - MANUFATORER_BLOCK_ERR_1:

Byte	Bit	Mnemonic	Reference to Standard Block Error	Description	Propagation on TB_PRIMARY_VALUE Status	LCD
1	0	Sensor type incompatible with the electronics	OTHER	The Sensor type is an old model or its database is not compatible with the installed electronics.	BAD + Sensor Fail	*ERROR HANDLING Type* 'SENSOR' ----- 'INVALID'
	1	Sensor database incompatible with the electronics	OTHER	The Sensor database is of an old type for the actual electronic	BAD + Sensor Fail	*ERROR HANDLING Type* 'DBASE' ----- 'INVALID'
	2	CRC Error for <u>Critical data</u> of Sensor EEPROM	LOST STATIC DATA	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 <u>Not Critical data</u> of Sensor EEPROM	LOST STATIC DATA	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	LOST STATIC DATA	This error bit is always in logical OR with one of the above bit 2-3. 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 (2 or 3)	The LCD is the one of the associated bit (2 or 3)
	5	Sensor EEPROM burn failure	MEMORY FAILURE	A writing in the Sensor EEPROM was not executed with success	NO EFFECT	*WARNING HANDLING Type* 'SENSOR' ----- 'FAIL E'
	6	Electronic EEPROM burn failure	MEMORY FAILURE	A writing in the Electronics EEPROM was not executed with success	NO EFFECT	*WARNING HANDLING Type* 'ELECTR.' ----- 'FAIL E'
	7	Pressure sensor not updating	DEVICE NEEDS MAINTENANCE NOW	The sensor signal is no more updated correctly due to electronics failure	SEE BLOCK ERROR TABLE	SEE BLOCK ERROR TABLE
2	0	Mechanical Error	DEVICE NEEDS MAINTENANCE NOW	The sensor signal reflects wrong condition due to probably mechanical failure.	SEE BLOCK ERROR TABLE	SEE BLOCK ERROR TABLE
	1	Static Pressure Sensor Failed	DEVICE NEEDS MAINTENANCE SOON	The circuitry for the sampling of the Static Pressure is failed/broken	SEE BLOCK ERROR TABLE	*WARNING HANDLING Type* 'SENSOR' ----- 'FAIL S'
	2	Temperature Sensor Failed	DEVICE NEEDS MAINTENANCE SOON	The circuitry for the sampling of the Temperature of the Sensor is failed/broken	SEE BLOCK ERROR TABLE	*WARNING HANDLING Type* 'SENSOR' ----- 'FAIL S'
	3	Pressure sensor out of High limit	OTHER	The TB_PRIMARY_VALUE exceed the TB_SENSOR_RANGE_high_range	UNCERTAIN + Engineering unit range Violations + limit High	*WARNING HANDLING Type* 'PV OUT' ----- 'LIMIT H'

	4	Pressure sensor out of Low limit	OTHER	The TB_PRIMARY_VALUE exceed the TB_SENSOR_RANGE_low_range	UNCERTAIN + Engineering unit range Violations + limit Low	*WARNING HANDLING Type* 'PV OUT' ----- 'LIMIT L'
	5	Overpressure Plus	OTHER	An Overrange of pressure on the side + has been detected. Each occurrence is counted by a dedicated counter TB_OVER_RNG_CNT	UNCERTAIN + Engineering unit range Violations + limit High	*WARNING HANDLING Type* 'OVER P' ----- 'SIDE +'
	6	Overpressure Minus	OTHER	An Overrange of pressure on the side - has been detected. Each occurrence is counted by a dedicated counter TB_OVER_RNG_CNT	UNCERTAIN + Engineering unit range Violations + limit Low	*WARNING HANDLING Type* 'OVER P' ----- 'SIDE -'
	7	Primary Value Type Not Recognised	OTHER	The TB_PRIMARY_VALUE_TYPE is not one of the supported types	BAD + Out Of Service	*ERROR HANDLING Type* 'CONFIG' ----- 'ERROR'

Table J - MANUFATORER_BLOCK_ERR_2:

Byte	Bit	Mnemonic	Reference to standard block error	Description	Propagation on TB_PRIMARY_VALUE Status	LCD
1	0	Pressure value Out Of the PRIMARY_VALUE Hi range	OTHER	The TB_PRIMARY_VALUE is outside the TB_PRIMARY_VALUE_RANGE 100% value.	UNCERTAIN + Engineering unit range Violations + limit High	*WARNING HANDLING Type* 'PV OUT' ----- 'H RANGE'
	1	Pressure value Out Of the PRIMARY_VALUE Lo range	OTHER	The TB_PRIMARY_VALUE is outside the TB_PRIMARY_VALUE_RANGE 0% value.	UNCERTAIN + Engineering unit range Violations + limit Low	*WARNING HANDLING Type* 'PV OUT' ----- 'L RANGE'
	2	Over Static	OTHER	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'
	3	Over Temperature Plus	OTHER	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'
	4	Over Temperature Minus	OTHER	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'
	5	Primary Value Range EU100% > Sensor Range EU100%	BLOCK CONFIGURATION ERROR	The TB_PRIMARY_VALUE_RANGE 100% has been set greater than the TB_SENSOR_RANGE 100%	SEE BLOCK ERROR TABLE	SEE BLOCK ERROR TABLE
	6	Primary Value Range EU0% < Sensor Range EU0%	BLOCK CONFIGURATION ERROR	The TB_PRIMARY_VALUE_RANGE 0% has been set lower than the TB_SENSOR_RANGE 0%	SEE BLOCK ERROR TABLE	SEE BLOCK ERROR TABLE
	7	Primary Value Range lower than Minimum Span	BLOCK CONFIGURATION ERROR	The (TB_PRIMARY_VALUE_RANGE 100% - TB_PRIMARY_VALUE_RANGE 0%) < TB_CAL_MIN_SPAN	SEE BLOCK ERROR TABLE	SEE BLOCK ERROR TABLE

Byte	Bit	Mnemonic	Reference to standard block error	Description	Propagation on TB_PRIMARY_VALUE Status	LCD
2	0	Scale In EU100% > Sensor Range EU100%	BLOCK CONFIGURATION ERROR	The TB_SCALE_IN 100% has been set greater than the TB_SENSOR_RANGE 100%	SEE BLOCK ERROR TABLE	SEE BLOCK ERROR TABLE
	1	Scale In EU0% < Sensor Range EU0%	BLOCK CONFIGURATION ERROR	The TB_SCALE_IN 0% has been set lower than the TB_SENSOR_RANGE 0%	SEE BLOCK ERROR TABLE	SEE BLOCK ERROR TABLE
	2	Scale In < Cal Minimum Span	BLOCK CONFIGURATION ERROR	The (TB_SCALE_IN 100% - TB_SCALE_IN 0%) < TB_CAL_MIN_SPAN	SEE BLOCK ERROR TABLE	SEE BLOCK ERROR TABLE
	3	Table num. X points different Table num. Y points	BLOCK CONFIGURATION ERROR	In the Linearisation Table setting the number of X points are not equal to the numbers of Y points	SEE BLOCK ERROR TABLE	SEE BLOCK ERROR TABLE
	4	Table num.points < 2	BLOCK CONFIGURATION ERROR	In the Linearisation Table setting the number of X and Y points are less than 2	SEE BLOCK ERROR TABLE	SEE BLOCK ERROR TABLE
	5	X not monotonic	BLOCK CONFIGURATION ERROR	In the Linearisation Table setting the X points are not following a monotonic sequence	SEE BLOCK ERROR TABLE	SEE BLOCK ERROR TABLE
	6	Y not monotonic	BLOCK CONFIGURATION ERROR	In the Linearisation Table setting the Y points are not following a monotonic sequence	SEE BLOCK ERROR TABLE	SEE BLOCK ERROR TABLE
	7	Gradient too High	BLOCK CONFIGURATION ERROR	In the Linearisation Table setting, between two contiguous X points (input pressure) and the correspondent two contiguous Y points (output volume) the calculation doesn't guarantee a good accuracy e.g. small gap for the Xs correspond a big gap for the Ys (big slope) or big gap for the Xs correspond a small gap for the Ys (small slope)	SEE BLOCK ERROR TABLE	SEE BLOCK ERROR TABLE

13.5 – XD_Error

The XD_ERROR codes are relating to the Transducer Block diagnostic. The XD_ERROR codes in the Table L below are the same defined in the TB_BLOCK_ERR and TB_MANUFACTURER_BLOCK_ERR 1 & 2 but identified with a numeric value, the column 'Reference' reports the correspondent error bit. When an error occurs, the XD_ERROR code is communicated inside the Alert Notification telegram to the Master, but it reflects only the last error occurrence. If more errors conditions are simultaneously present in the transmitter, they can be detected reading the TB_BLOCK_ERR, TB_MANUFACTURER_BLOCK_ERR 1 and 2 as bit-string, because a dedicated flag identifies each error. The indications handled in the 262/264 FF are the following in the grey boxes:

Table L:

Value	Mnemonic	Reference	Description
0	Other	Table H - Byte 1 bit 0	Standard BLOCK_ERR
1	Block Configuration error	Table H - Byte 1 bit 1	Standard BLOCK_ERR
2	Link Configuration error		Standard BLOCK_ERR
3	Simulate active		Standard BLOCK_ERR
4	Local Override		Standard BLOCK_ERR
5	Device Fault State Set		Standard BLOCK_ERR
6	Device needs maintenance soon	Table H - Byte 1 bit 6	Standard BLOCK_ERR
7	Input Failure/process variable has BAD status		Standard BLOCK_ERR
8	Output Failure		Standard BLOCK_ERR
9	Memory failure	Table H - Byte 2 bit 1	Standard BLOCK_ERR
10	Lost Static Data	Table H - Byte 2 bit 2	Standard BLOCK_ERR
11	Lost NV Data		Standard BLOCK_ERR
12	Read-back check failed		Standard BLOCK_ERR
13	Device needs maintenance now	Table H - Byte 2 bit 5	Standard BLOCK_ERR
14	Power up		Standard BLOCK_ERR
15	Out-of-Service	Table H - Byte 2 bit 7	Standard BLOCK_ERR
16	Unspecified Error		An error has occurred that was not identified
17	General Error		An error has occurred that could not be classified as one of the errors below
18	Calibration Error		An error occurred during the calibration of the device or a calibration error has been detected during operation of the device
19	Configuration Error		An error occurred during the configuration of the device or a configuration error has been detected during operation of the device
20	Electronics Failure	Table I - Byte 1 bit 7	The sensor signal is no more updated correctly due to electronics failure
21	Mechanical Failure	Table I - Byte 2 bit 0	The sensor signal reflects wrong condition due to probably mechanical failure
22	I/O Failure		An I/O failure has occurred
23	Data Integrity Error		Indicated that data stored within the system may no longer be valid due to NVM checksum failure, Data verify after write failure, etc.
24	Software Error		The Software has detected an error. This could be caused by an improper interrupt service routine, an arithmetic overflow, a watchdog timer, etc.
25	Algorithm Error		The algorithm used in the transducer block produced an error. This could be due to an overflow, data reasonableness failure, etc.
26	Over Pressure Plus	Table I - Byte 2 bit 5	An Overrange of pressure on the side + has been detected. Each occurrence is counted by a dedicated counter TB_OVER_RNG_CNT

Value	Mnemonic	Reference	Description
27	Over Pressure Minus	Table I - Byte 2 bit 6	An Overrange of pressure on the side - has been detected. Each occurrence is counted by a dedicated counter TB_OVER_RNG_CNT
28	Over Temperature Plus	Table J - Byte 1 bit 3	A Sensor Temperature Out of the operational limits High has been detected. Each occurrence is counted by a dedicated counter TB_OVER_TMP_CNT
29	Over Temperature Minus	Table J - Byte 1 bit 4	A Sensor Temperature Out of the operational limits Low has been detected. Each occurrence is counted by a dedicated counter TB_OVER_TMP_CNT
30	Over Static	Table J - Byte 1 bit 2	A Static Pressure Out of the acceptable working limit has been detected. Each occurrence is counted by a dedicated counter TB_OVER_STAT_CNT
31	Temperature Sensor Failed	Table I - Byte 2 bit 2	The circuitry for the sampling of the Temperature of the Sensor is failed/broken
32	Static Pressure Sensor Failed	Table I - Byte 2 bit 1	The circuitry for the sampling of the Static Pressure is failed/broken
33	Sensor incompatible with the electronics	Table I - Byte 1 bit 0	The Sensor type is an old model or its data-base is not compatible with the installed electronics.
34	Sensor database invalid for the electronics	Table I - Byte 1 bit 1	
35	Pressure value Out Of the Primary Value range100%	Table J - Byte 1 bit 0	The TB_PRIMARY_VALUE is outside the TB_PRIMARY_VALUE_RANGE values.
36	Pressure value Out Of the Primary Value range 0%	Table J - Byte 1 bit 1	The TB_PRIMARY_VALUE is outside the TB_PRIMARY_VALUE_RANGE values.
37	Pressure sensor out of High limit	Table I - Byte 2 bit 3	The TB_PRIMARY_VALUE exceed the TB_SENSOR_RANGE_high_range
38	Pressure sensor out of Low limit	Table I - Byte 2 bit 4	The TB_PRIMARY_VALUE exceed the TB_SENSOR_RANGE_low_range
39	Primary Value Range 100% > Sensor Range 100%	Table J - Byte 1 bit 5	The TB_PRIMARY_VALUE_RANGE EU100% has been set greater than the TB_SENSOR_RANGE EU100%
40	Primary Value Range 0% < Sensor Range 0%	Table J - Byte 1 bit 6	The TB_PRIMARY_VALUE_RANGE EU0% has been set lower than the TB_SENSOR_RANGE EU0%
41	Primary Value Range lower than Minimum Span	Table J - Byte 1 bit 7	The (TB_PRIMARY_VALUE_RANGE 100% - TB_PRIMARY_VALUE_RANGE 0%) < TB_CAL_MIN_SPAN
42	Scale In EU100% > Sensor Range EU100%	Table J - Byte 2 bit 0	The TB_SCALE_IN 100% has been set greater than the TB_SENSOR_RANGE 100%
43	Scale In EU0% < Sensor Range EU0%	Table J - Byte 2 bit 1	The TB_SCALE_IN 0% has been set lower than the TB_SENSOR_RANGE 0%
44	Scale In < Cal Minimum Span	Table J - Byte 2 bit 2	The (TB_SCALE_IN 100% - TB_SCALE_IN 0%) < TB_CAL_MIN_SPAN
45	Table num. X points different Table num. Y points	Table J - Byte 2 bit 3	In the Linearisation Table setting the number of X points are not equal to the numbers of Y points
46	Table num.points < 2	Table J - Byte 2 bit 4	In the Linearisation Table setting the number of X and Y points are less than 2
47	X not monotonic	Table J - Byte 2 bit 5	In the Linearisation Table setting the X points are not following a monotonic sequence

Value	Mnemonic	Reference	Description
48	Y not monotonic	Table J - Byte 2 bit 6	In the Linearisation Table setting the Y points are not following a monotonic sequence
49	Gradient too High	Table J - Byte 2 bit 7	In the Linearisation Table setting, between two contiguous X points (input pressure) and the correspondent two contiguous Y points (output volume) the calculation doesn't guarantee a good accuracy e.g. small gap for the Xs correspond a big gap for the Ys (big slope) or big gap for the Xs correspond a small gap for the Ys (small slope)
50	Primary Value Type Not Recognised	Table I - Byte 2 bit 7	The TB_PRIMARY_VALUE_TYPE Is not one of the supported codes
255	All OK		

Table M: ANALOG INPUT - BLOCK ERROR TABLE

Byte	Bit	Mnemonic	Alert Event	Description	Checking	Propagation on AIFB_OUT_VALUE Status	LCD When selected the AIFB_OUT_VALUE
1	1	Block Configuration error	NO	The AIFB is not properly configured, or a Function Block Application has been not downloaded.	1. The AIFB has set to 0 parameters requiring a value different by 0 (Initial Value). E.g. CHANNEL, L_TYPE…… 2. The AIFB has the XD_SCALE values different by OUT_SCALE values and the LIN_TYPE is set to Linear 3. The AIFB has not been created in the Function Block Application or has not been downloaded in the transmitter.	BAD + Out Of Service	*ERROR HANDLING Type* 'CONFIG.' ----- 'ERROR'
	3	Simulate active	YES	The AIFB has been enabled for a Simulation value in the execution.	As consequence of a writing in the AIFB_SIMULATE_EN/DIS = Active (2)	As calculated starting from the Simulation Status	*WARNING HANDLING Type* 'SIMUL..' ----- 'ACTIVE'
	7	Input Failure/process variable has BAD status	YES	The Process Variable linked in input at the AIFB trough the CHANNEL has the Status byte set to BAD.	The variable in input to the AIFB has one of these conditions: - BAD-Sensor Failure - BAD-Device Failure And the variable AIFB_STATUS_OPTS is set to Propagate_Fault_Forward	BAD + Sensor Failure Or BAD + Device Failure	*ERROR HANDLING Type* 'SENSOR' ----- 'FAIL S' or 'SENSOR.' ----- 'FAIL E'
2	7	Out-of-Service	YES	The TARGET MODE of the AIFB has been switched in Out Of Service by the operator	The Actual_Mode of the AIFB is set to OUT OF SERVICE	BAD + Out Of Service	*ERROR HANDLING Type* 'OUT OF' ----- 'SERVICE'

Table N: RESOURCE - BLOCK ERROR TABLE

Byte	Bit	Mnemonic	Alert Event	Description	Checking	Propagation on AIFB_OUT_VALUE Status	LCD When selected the AIFB_OUT_VALUE
1	3	Simulate active	NO	The HW link of the device enables the Simulation. *This doesn't mean that the AIFB is using a simulation value in the execution.*	The Switch 2 of the electronics has been set in ON position (see the figure 3), in order to enable the Simulation.	*NOT APPLICABLE*	*NO EFFECT*
2	2	Lost Static Data	NO	The FB application configuration data have been lost. I.e. Link Objects, FB start List, Macrocycle, LAS data and so on.	At the start up, if the Device_ID read from the Sensor memory is different respect the Device_ID in the electronic memory, the RAM is cleared and a CRC error is detected. *This typical situation occurs when the electronics replacement is performed without the Cold Start-up procedure.*	BAD + Out of Service	ERROR HANDLING Type 'LOST NV' ----- 'MEMORY'
	6	Power up	YES	The transmitter has just been powered on.	Each occurrence is counted by a dedicated counter TB_POWER_ON_CNT	*AS CALCULATED*	*NO EFFECT*
	7	Out-of-Service	YES	The TARGET MODE of the RB has been switched in Out Of Service by the operator	The Actual_Mode of the RB is set to OUT OF SERVICE. *All the Actual Mode of the other blocks is forced to Out of Service too.*	BAD + Out of Service	ERROR HANDLING Type 'OUT OF' ----- 'SERVICE'

Table O: PID - BLOCK ERROR TABLE

Byte	Bit	Mnemonic	Alert Event	Description	Checking	Propagation on PID_OUT_VALUE Status	LCD
1	1	Block Configuration error	NO	The PID has set to 0 parameters requiring a value different by 0 (Initial Value).		BAD + Configuration Error	*NOT APPLICABLE*
	4	Local Override	NO	The actual mode is LO			*NOT APPLICABLE*
	7	Input Failure/process variable has BAD status	YES	The Process Variable linked in input at the IN variable of the PID has the Status byte set to BAD			*NOT APPLICABLE*
2	7	Out-of-Service	YES	The TARGET MODE of the PID has been switched in Out Of Service by the operator	The Actual_Mode of the PID is set to OUT OF SERVICE	BAD + Out Of Service	*NOT APPLICABLE*

13.6 – TROUBLESHOOTING:
Few considerations about the most common wrong conditions that make the device not properly working.

The AIFB or TB cannot be switched in AUTO mode
- Check that the RB must be in AUTO mode

The AI Function Block has a BAD-Configuration Error in output and/or the LCD displays 'CONFIG' --- 'ERROR'
- Did you download the FB Application correctly?
- Check if the XD_SCALE setting is different by the OUT_SCALE setting. In this case check that the L_TYPE is INDIRECT.
- Check if the CHANNEL, L_TYPE, are still set with the initial value that is not valid for the normal operations.

The PID Function Block cannot be switched in AUTO mode.
- Did you design and download the FB Application correctly?
- Set properly the SP value and status.
- Set with usable values the RATE, RESET, SHED_OPT, BY_PASS parameters.
- Check the status of the IN and BKCAL_IN, if BAD check the setting of the other blocks (AI, AO…..)

The PID Function Block cannot be switched in CASCADE mode.
- In addition at the above checking, check also the status of the CAS_IN, if BAD check the setting of the CAS_IN source.

13.7 - Status Supported

The FOUNDATION™ Fieldbus 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, PIDFB 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, PID_OUT, TB_PRIMARY_VALUE"**

Dec	Hex	Quality		Substatus				Limits			Producer Block
		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, PID**
64	40	0	1							= uncertain	**TB, AI**
128	80	1	0							= good (Not Cascade)	**TB, AI, PID**
192	C0	1	1							= good (Cascade)	**PID**

Details for BAD

0	00	0	0	0	0	0	0			= non-specific	**AI, PID**
4	04	0	0	0	0	0	1			= configuration error	**AI**
8	08	0	0	0	0	1	0			= not connected	**PID**
12	0C	0	0	0	0	1	1			= device failure	**TB**
16	10	0	0	0	1	0	0			= sensor failure	**TB**
20	14	0	0	0	1	0	1			= no communication with LUV	**PID****
24	18	0	0	0	1	1	0			= no communication no LUV	**PID****
28	1C	0	0	0	1	1	1			= out of service	**TB, AI, PID**

Configuration error detail:
Set if the AIFB Channel is different by 0 but set to a not valid/supported value. See the Table C in this document for the supported Channel values

Not Connected detail:
Set if this input is not referenced by a link object within the resource.

Device failure detail:
When malfunction in the device is detected this status is produced.

Sensor failure detail:
When malfunction of the sensor is detected this status is produced.

No communication with last usable value detail:
Set if this value had been set by communication, which has now failed. **Typically the Input variables of the PID are set to this status when the variable linked in input and coming from another block fails.

No communication, with no usable value detail:
Set if there has never been any communication with this value since it was last Out of Service. **Typically the Input variables of the PID are set to this status when the variable linked in input and coming from another block fails.

Out of Service detail:
This status is produced when the device is in Out Of Service mode.
When the TB_PRIMARY_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 cannot be produced (i.e. negative value in input at the Square Root operation), this status is set.
When the XD_SCALE is set different to the OUT_SCALE and the L_TYPE is not set to indirect, this status is set.

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[2] Other variables like the Trimmed Value and the different SECONDARY_VALUE_x mapped in the TB, and several variables of the PIDFB are produced with their own status byte.

Details for UNCERTAIN

68	44	0	1	0	0	0	1			= Last Usable Value	**TB**
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**

Last Usable Value detail:
Whatever was writing this value has stopped doing so. (This happens when an input is disconnected by a configuration tool).
Substitute Set detail:
Set when the value is written when the block is not Out of Service.
Initial Value detail:
Set when the value of an input parameter is written when the block is Out of Service.
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.

Details for GOOD (non-cascade)

128	80	1	0	0	0	0	0			= ok	**TB, AI, PID**
132	84	1	0	0	0	0	1			= active block alarm	**TB, AI, PID**
136	88	1	0	0	0	1	0			= active advisory alarm	**AI, PID**
140	8C	1	0	0	0	1	1			= active critical alarm	**AI, PID**
144	90	1	0	0	1	0	0			= unacknowledged block alarm	**AI, PID**
148	94	1	0	0	1	0	1			= unacknowledged advisory alarm	**AI, PID**
152	98	1	0	0	1	1	0			= unacknowledged critical alarm	**AI, PID**

Active Block alarm detail:
Set when the value is Good and the block has an Active Block alarm.
Active advisory alarm detail:
Set when the value is Good and the block has an Active alarm with priority less than 8.
Active critical alarm detail:
Set when the value is Good and the block has an Active alarm with priority greater than or equal to 8.
Unacknowledged Block alarm detail:
Set when the value is Good and the block has an unacknowledged Block alarm.
Unacknowledged advisory alarm detail:
Set when the value is Good and the block has an unacknowledged alarm with priority less than 8.
Unacknowledged critical alarm detail:
Set when the value is Good and the block has an unacknowledged alarm with priority greater than or equal to 8.

Details for GOOD (cascade)

192	C0	1	1	0	0	0	0			= ok	PID
196	C4	1	1	0	0	0	1			= initialisation acknowledge	PID
200	C8	1	1	0	0	1	0			= initialisation request	PID
204	CC	1	1	0	0	1	1			= not invited	PID
224	E0	1	1	1	0	0	0			= initiate fault state	PID

Initialisation Acknowledge detail:
The value is an initialised value from a source (cascade input, remote-cascade in, and remote-output in parameters).

Initialisation Request detail:
The value is an initialised value for a source (back calculation input parameters), because the lower loop is broken or the mode is wrong.

Not Invited detail:
The value is from a block which does not have a target mode that would use this input. This covers all cases other than Fault State Active, Local Override, and Not Selected. The target mode can be the next permitted mode of higher priority in case of shedding a supervisory computer.

Initiate Fault State detail:
The value is from a block that wants its downstream output blocks (e.g. AO) to go to Fault State. This is determined by a block option to initiate Fault State is the status of the primary input and/or cascade input goes Bad. See the status option table in Part 2 and 3.

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
- GOOD (Cascade)
- 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)

13.8 – Asset Features
The 2600T-262/264 FF implements 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 Counters of events provide information about the number of occurred conditions outside the operational limits of the device. Each event is also notified to the Master with Time Stamp information (date and time):
-   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. Each Power On is also notified to the Master with Time Stamp information- TB_PWR_ON_CNT.
-   Total Working Time counter (not allowed to be reset by the user) - TB_TOT_WORK_HR.
-   Partial Working Time counter (allowed to be reset by the user) - TB_PAR_WORK_HR.
3. These functions already described in the section 12 are to be considered as specific functionality of the 2600T-262/264 FF for performances improvement.
-   Static Pressure value Trimming - TB_STAT_PRESS_TRIM
-   Reset to the Factory Sensor trimming conditions.

14. – Device Specification Data

The delivery of the 2600T-262/264 FF includes the DD file (*.sym, *.ffo files) and the Capability file (.CFF file).

The following table is a summary of the most important 2600T-262/264 FF specification data

Manufacturer	ABB
Device Model	2600T Series Pressure Transmitter – Models 262-264 FOUNDATION Fieldbus
Device Type	Link Master Device
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 24 Volts for IS
Interface	FOUNDATION™ Fieldbus H1 Compliant with specification V 1.4
Blocks implemented	2 Standard Analog Input, 1 Standard PID, 1 Enhanced Resource, 1 Custom Pressure with Calibration Transducer Blocks
FB Execution period	25mS for the AIFBs 70mS for the PIDFB
LAS functionality	1 sub-schedule, 96 sequences, 25 elements for sequence
Number of link objects	25
Number of VCRs	24
Current consumption	10.5 mA max
Fault Current limiting	20 mA
FF Registration	IT019000
IS Certificate	ATEX, FM, FISCO See section 3.1 – Environmental protection
Max. Temperature	-40 / +85 °C
Remote Configuration tools	Via tools using DD & CFF Files

15. - Reference -

1- Function Block Application Process – Part 2.   n° FF-891- Revision 1.4 dated June 29, 1999
2- Transducer Block Application Process PART 2 n° FF-903 Revision PS 3.0 dated April 21,1998
3- Function Block Application Process – Part 1.   n° FF-890- Revision 1.4 dated June 29, 1999

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APPENDIX A

2600T-262/264 FF Electronic Replacement

The following Steps have to be followed for the FF 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.
The Target Mode for the RB, AIFB, PID and TB is Out Of Service. The user has to set the AUTO Mode for the RB first, and then for the other blocks.

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