GEFRAN

2500

CONFIGURABLE CONTROLLER

CE

INSTALLATION AND OPERATION MANUAL

Software version 1.4x

Code **80291C** / Edition **06** - **09/08 ENG**

GENERAL INDEX

The contents of each section are summarized immediately following the section heading

Graphic symbols used

To distinguish between the type and importance of the information provided in these instructions for use, graphic symbols have been used as a reference to make interpreting the information clearer.

Indicates the contents of the various manual sections, the general warnings, notes, and other points to which the reader's attention should be drawn.

Indicates a particularly delicate situation that could affect the safety and correct working operation of the controller, or a rule that must be strictly observed to avoid dangerous situations

Indicates a condition of risk for the safety of the user, due to the presence of dangerous voltages at the points shown

Indicates a suggestion based on the experience of the GEFRAN Technical Staff, which could prove especially useful under given circumstances

Indicates a reference to Detailed Technical Documents available on the GEFRAN web site **www.gefran.com**

1 • PRELIMINARY INSTRUCTIONS

This section contains information and warnings of a general nature which should be read before proceeding with controller installation, configuration and use.

General Description

The instrument is appropriate for acquisition and control of systems with high variation speed. It has two main analog inputs for many applications, including differential measurements.

The inputs can be configured from the keyboard and accept standard linear signals (as well as custom linearized signals), signals from pressure probes, load cells, potentiometers, TC, RDT.

They represent an exclusive combination of performance, reliability and applicational flexibility. In particular, this new line of Gefran temperature controllers is the ideal solution for application in sectors where performance and service continuity are important, including:

- pressure controls on extrusion and injection press lines for plastics
- differential pressure control
- strength control on textile, paper, plastic film production lines
- tension control on winding stations

The controller also has 4 digital inputs for functions such as reset, calibration, man/auto, loc/rem, hold, raise/lower (motopotentiometer function), parameter set selection, setpoint selection. The outputs (up to 4) are relay type, with alarm function.

Up to 3 optional high-resolution (optically isolated) analog outputs are also available for functions such as control, analog retransmission of peak values, remote setpoints, deviation, alarm setpoints, differential value.

Basic Version Controller (mod. 2500-0-0-0-0-0-X)

- **1 universal input** for strain gauge, potentiometer, thermocouples TC, RTD 2/3 wires and linear thermocouples, supplied with current and voltage with accuracy better than 0,1% f.s.
- **2 auxiliary inputs** for linear on current and voltage, potentiometers
- **1 power supply** for transmitters
- **4** configurable **digital inputs** NPN or PNP
- **1** control **analog output**
- **1 power supply** probe selectable for strain gauge, potentiometers and transmitters
- **4 outputs**: OUT1, OUT2, OUT3, OUT4 relay

Options

- **2th** universal **input** (useful for differential measurements)
- **2th** control analog **output**
- **1** retransmission analog **output**
- **4** digital **inputs/outputs** with configurable function
- **1** serial optoisolated RS485 **interface**

Operator Interface

All the operator interface devices are concentrated on the controller faceplate with IP54 level protection.

- 6 buttons to be used for manual regulation / configuration / selection
- 1 red/green five-digit displays (process variable)
- 2 green five-digit displays (Set point and configuration parameter)
- 5 red led for configurable indication
- 2 bargraph red with programmable functionality

Electrical Interface

All connection terminals (power supply, inputs, outputs, options) are grouped together on the back of the controller. For technical specifications and performance details refer to Section 5 "Technical Specifications".

Preliminary Warnings

The following preliminary warnings should be read before installing and using the series 2500 controller. This will allow the controller to be put into service more quickly and will avoid certain problems which may mistakenly be interpreted as malfunctions or limitations of the controller.

- Immediately after unpacking the controller, make a note of the order code and the other identification data given on the label affixed to the outside of the container and copy them to the table below. These details must always be kept close at hand and referred to the personnel involved in the event of help from Gefran Customer Service Assistance.
- Check also that the controller is complete and has not been damaged at all during transit, and that the package contains not only the controller and these Instructions for Use, but also the two brackets for fixing to the panel and the dust protection seal - see:

SN:	.....	(Serial n°)
CODE:	.....	(Finished product code)
TYPE:	.....	(Order Code)
SUPPLY:	.....	(Type of electrical power supply)
VERS:	.....	(Software version)

  Installation with Panel Fixing in Section 2.
  Any inconsistencies, omissions or evident signs of damage should be reported immediately to your Gefran sales agent.
- Check that the order code corresponds with the configuration requested for the application the controller is needed for, referring to Section 7: “Technical - Commercial Information”.
  - No. and Type of Inputs/Outputs available
  - Presence of the necessary options and accessories
  - Mains voltage supply

Example: 2500 – 0 – 1 – 0 – 0 – 2 – 1
Model 2500 controller
Single main input
Digital Input/Outputs 5...8
Single continuous control output ±10V (0/4...20mA)
None retransmission output
Digital Communication: RS485
Power supply 100...240Vac/dc

- Before installing the series 2500 controller on the control panel of the machine or host system, refer to the paragraph "Dimensions and Cut-out" in Section 2 “Installation and Connection”.
- Where configuration by PC is provided for, make sure the interface RS232 cable is available and the CD-ROM containing the WINSTRUM software. For the order code refer to Section 7 “Technical - Commercial Information”.

Users and/or system integrators who wish to know more about the concepts of serial communication between standard PC and/or Gefran Industrial PC and Gefran Programmable Instruments, can access the various technical reference Documents in Adobe Acrobat format available in the Download section of the Gefran Web Site **www.gefran.com** including:

- Serial Communication
- MODBus Protocol

In the same Download section of the Gefran Web Site **www.gefran.com** the 2500 Controller reference manual is available in Adobe Acrobat format, containing a detailed description of all the adjustable parameters and procedures.
In the event of presumed instrument malfunction, before contacting Gefran Technical Service Assistance, refer to the Troubleshooting Guide given in Section 6 "Maintenance", and if necessary refer to the F.A.Q. Section (Frequently Asked Questions) on the Gefran Web Site **www.gefran.com**

2 • INSTALLATION AND CONNECTION

This section contains the instructions necessary for correct installation of the 2500 controllers into the machine control panel or the host system and for correct connection of the controller power supply, inputs, outputs and interfaces.

Before proceeding with installation read the following warnings carefully!
Remember that lack of observation of these warnings could lead to problems of electrical safety and electromagnetic compatibility, as well as invalidating the warranty.

Electrical power supply

- the controller is NOT equipped with an On/Off switch: the user must provide a two-phase disconnecting switch that conforms to the required safety standards (CE marking), to cut off the power supply upstream of the controller.
  The switch must be located in the immediate vicinity of the controller and must be within easy reach of the operator.
  One switch may control more than one controller.
- if the controller is connected to NOT isolated electrical equipment (e.g. thermocouples), the earth connection must be made with a specific conductor to prevent the connection itself from coming directly through the machine structure.
- if the controller is used in applications with risk of damage to persons, machinery or materials, it is essential to connect it up to auxiliary alarm equipment. It is advisable to make sure that alarm signals are also triggered during normal operation. The controller must NOT be installed in flammable or explosive environments; it may be connected to equipment operating in such atmospheres only by means of appropriate and adequate types of interface, conforming to the applicable safety standards.

Notes Concerning Electrical Safety and Electromagnetic Compatibility:

CE MARKING: EMC Conformity (electromagnetic compatibility)
in accordance with EEC Directive 89/336/CEE and following modifications.
Series 2500 temperature controllers are mainly designed to operate in industrial environments, installed on the switch boards or control panels of productive process machines or plants.
As regards electromagnetic compatibility, the strictest generic standards have been adopted, as indicated in the table below.
BT Conformity (low voltage) in accordance with Directive 2006/95/CE.

EMC conformity has been tested with the following connections.

Function	Cable type	Length
Power supply cable	1mm^2	1m
Relay output cables	1mm^2	3,5m
Serial connection wire	0,35mm^2	3,5m
Thermocouple input	0,8mm^2 compensated	5m
Strain gauge input, potentiometers, linears, “PT100” temperature resistance	1mm^2	3m
Control and retransmission analog outputs	1mm^2	3,5m
Digital Inputs / Outputs	1mm^2	3,5m

EMC EMISSION		
Generic standards, emission standard for residential commercial and light industrial environments	EN 61000-6-3	
Generic standards emission standard for industrial environment	EN 61000-6-4	
Emission AC mains	EN 61000-6-3	Classe B
Radiated emission	EN 61000-6-4 CISPR-16-1-4 CISPR-16-2-3 CEI R210-010	Classe A
EMC IMMUNITY		
Generic standards, immunity standard of industrial environments	EN 61000-6-2	
Electrostatic discharge immunity	EN 61000-4-2	± 4 kV contact discharge ± 8 kV air discharge
Radiated radio frequency electromagnetic field immunity test	EN 61000-4-3 +A1	10 V/m amplitude modulated 80 MHz-1 GHz 10 V/m amplitude modulated 1.4 GHz-2 GHz
Conducted disturbances immunity	EN 61000-4-6	10 V/m amplitude modulated 0.15 MHz-80 MHz
Electrical fast transient/burst immunity test	EN 61000-4-4	± 2 kV power line ± 2 kV signal line
Surge immunity test	EN 61000-4-5	Power line-line ± 1 kV Power line-earth ± 2 kV Signal line-earth ± 1 kV
Power frequency magnetic field immunity test	EN 61000-4-8	100 A/m
Voltage dips, short interruptions and voltage immunity tests	EN 61000-4-11	100%U, 70%U, 40%U,
LOW VOLTAGE DIRECTIVE SAFETY		
Safety requirements for electrical equipment for measurement, control and laboratory use	EN 61010-1	

Advice for Correct Installation for EMC

Instrument power supply

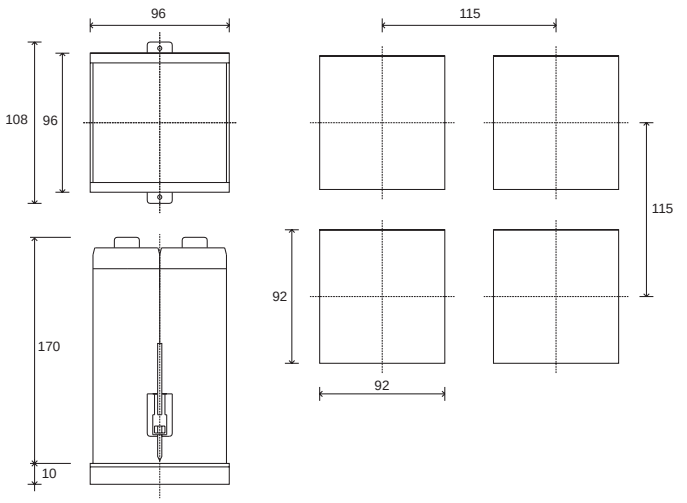
- The power supply to the electronic equipment on the switchboards must always come directly from an isolation device with a fuse for the instrument part.
- The electronic instruments and electromechanical power devices such as relays, contactors, solenoid valves, etc., must always be powered by separate lines.
- When the electronic instrument power supply is strongly disturbed by the commutation of transistor or power units or motors, an isolation transformer should be used for the controllers only, earthing the screen.
- It is essential that the plant has a good earth connection:
  - the voltage between neutral and earth must not be >1V
  - the Ohmic resistance must be < 6Ω;
- If the mains voltage fluctuates strongly, use a voltage stabilizer.
- In the proximity of high frequency generators or arc welders, use adequate mains filters.
- The power supply lines must be separate from the instrument input and output ones.

Inputs and outputs connection

- The externally connected circuits must be doubly isolated.
- To connect the analogue inputs and analog outputs the following is necessary:
  - physically separate the input cables from those of the power supply, the outputs and the power connections.
  - use woven and screened cables, with the screen earthed in one point only.
- To connect the relay outputs (contactors, solenoid valves, motors, fans, etc.), fit RC groups (resistance and condensers in series) in parallel to the inductive loads that operate in Alternating Current.
  (Note: all the condensers must conform to VDE (class X2) standards and withstand a voltage of at least 220V AC. The resistances must be at least 2W).
- Fit a 1N4007 diode in parallel with the coil of the inductive loads that operate in Direct Current.

GEFRAN S.p.A. declines all responsibility for any damage to persons or property caused by tampering, neglect, improper use or any use which does not conform to the characteristics of the controller and to the indications given in these Instructions for Use.

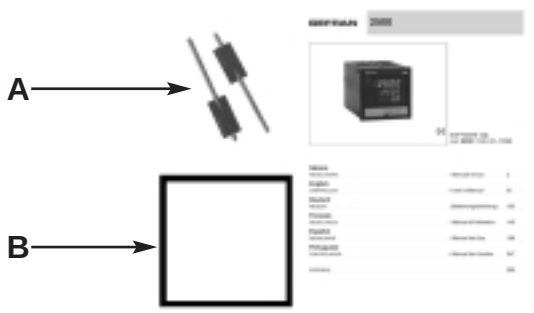
Dimensions and cut-out



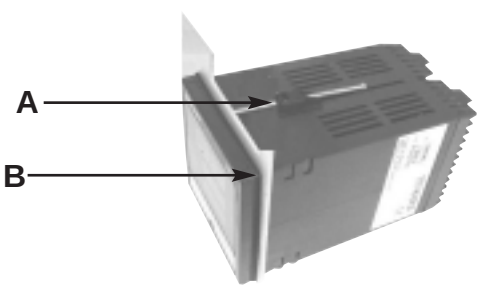
Installation with panel mounting

As well as the actual controller and these instructions for use, the controller package also contains:

- 2 panel fixing brackets (**A**)
- 1 protective seal against dust and water spray (**B**)



Fit the controller to the panel as shown in the figure.



Warnings and instructions for mounting to the panel

Instructions for installation category II, pollution level 2, double isolation.

- only for models with 20...27Vac/dc power supply: supply from Class 2 or low voltage limited energy source
- the power supply lines must be separate from the controller input and output ones
- group the instruments together keeping them separate from the powered part of the relay
- do not install high-power remote switches, contactors, relays, thyristor power units (especially the “phase angle” type), motors, etc. in the same switchboard
- avoid dust, humidity, corrosive gasses and heat sources
- do not block the ventilation holes: the working temperature must be between 0...50°C
- surrounding air: 50°C
- use 60/75°C copper (Cu) conductor only, wire size range 2x N. 22 - 14AWG, Solid/Stranded
- use terminal tightening torque 0.5Nm

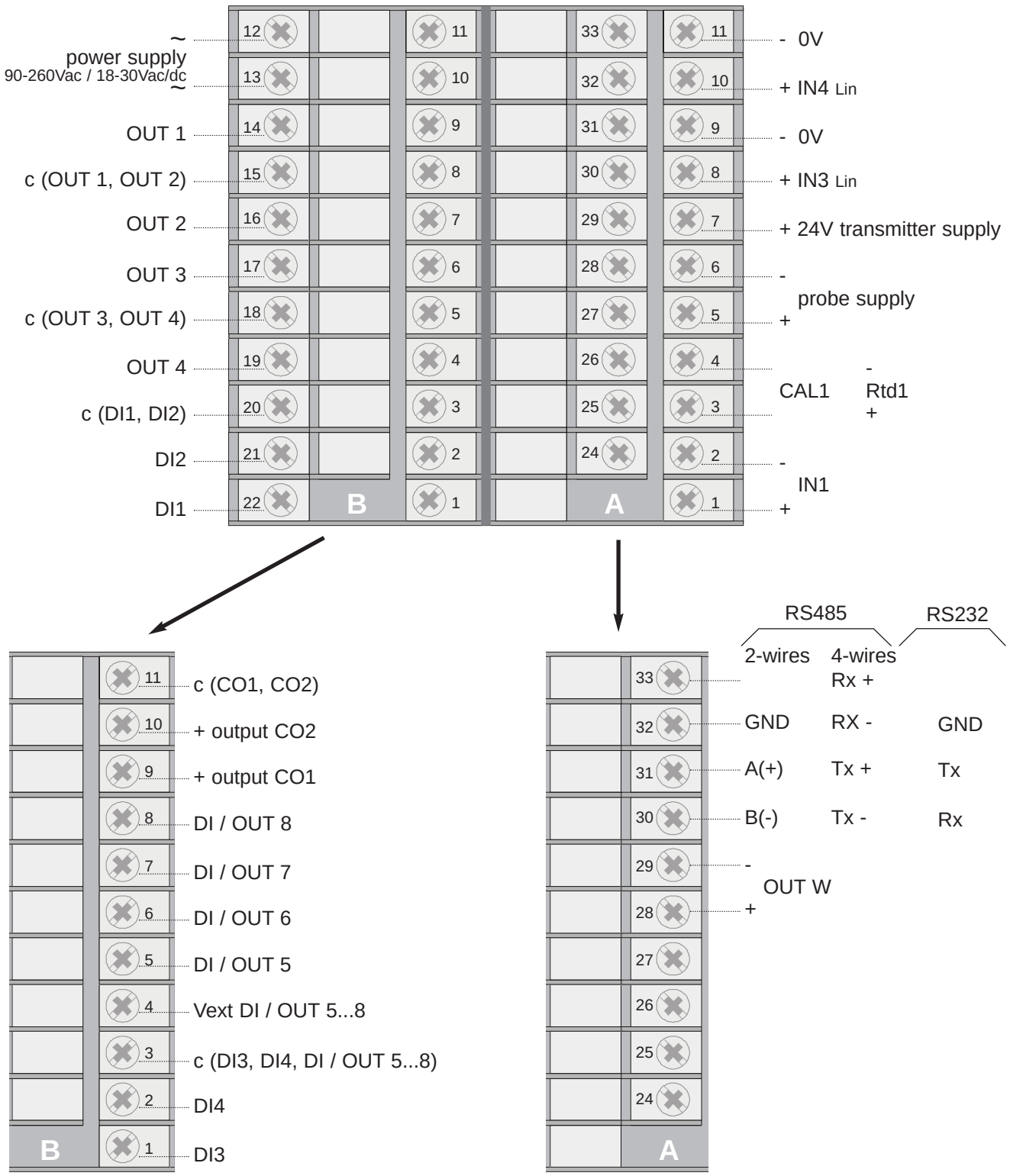
Nominal ambient conditions

Altitude	Up to 2000m
Working/storage temperature	0..50°C/-20...70°C
Non condensing relative humidity	20...85%

Before supplying the Controller with power, make sure that the mains voltage is the same as that shown in the last number of the order code.

Example:
2500 – x – x – x – x – x – 1 = 100..240Vac/dc
2500 – x – x – x – x – x – 0 = 20..27Vac/dc

Electrical Connections (Mod. 2500 - 0 - x - x - x - x)



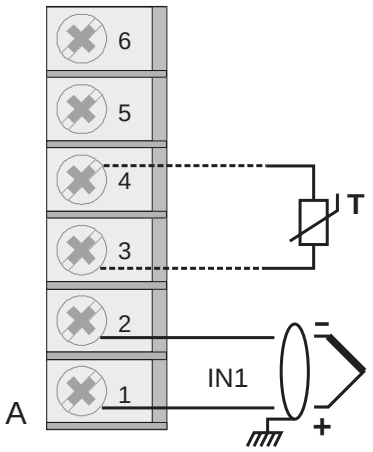
When making connections, always use wire appropriate to the voltage and current limits indicated in Section 5 – Technical Characteristics.

If the Controller has faston contacts, they must be protected and isolated.

If it has screw contacts, the wires must be attached at least in pairs

Electrical Connections (Mod. 2500 - 0 - x - x - x - x - x)

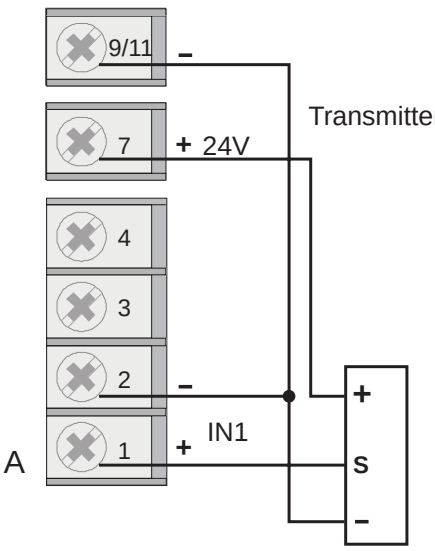
Input IN1 TC - Thermocouple



PT100 for possible compensation of external cold junction

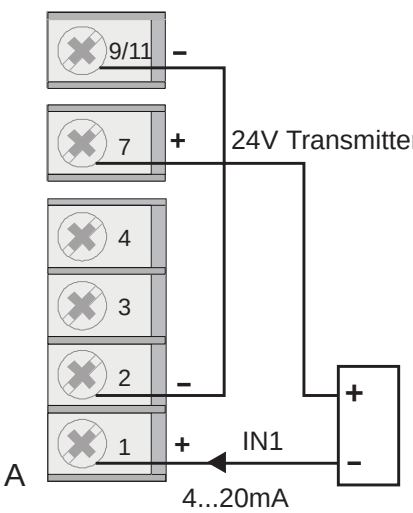
Available thermocouples:
J, K, R, S, T
(B,E, N, L, U, G, D, C possible by inserting custom linearization)
- Respect polarity
- For extensions, use compensated wire suitable to the TC utilized

IN1 linear input with three-wire transmitter powered by instrument



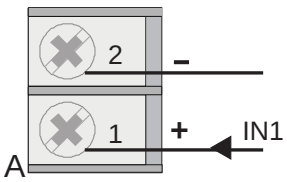
Select the probe accordiing to transmitter type

IN1 linear input with two-wire transmitter powered by instrument



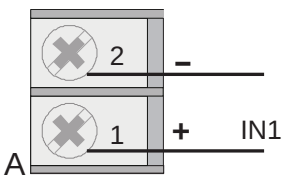
Electrical Connections (Mod. 2500 - 0 - x - x - x - x)

IN1 Linear input (I)



Linear input in DC
0/4...20mA, Ri = 50Ω

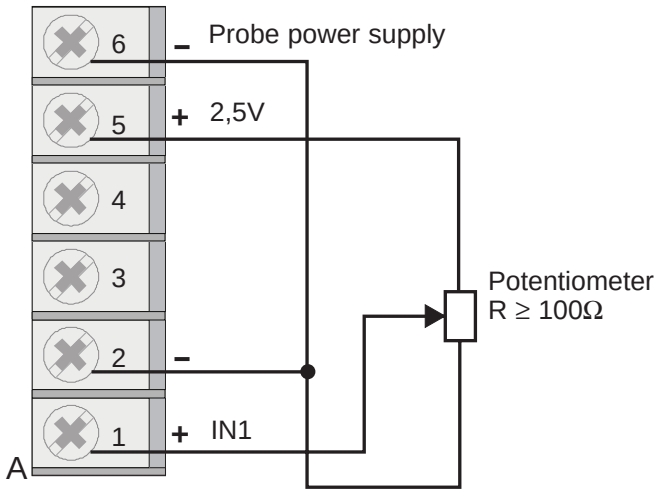
IN1 Linear input (V)



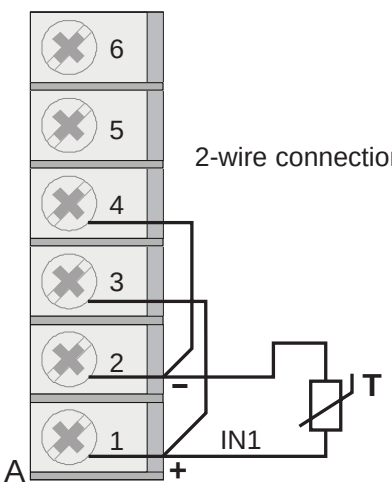
Linear input in DC

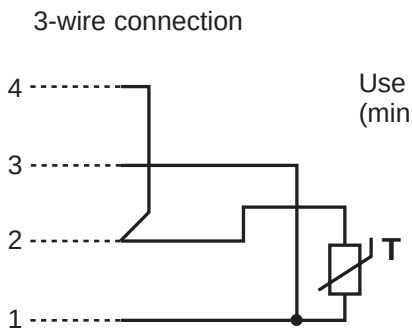
± 60mV	Ri > 10MΩ
± 100mV	Ri > 10MΩ
± 1V	Ri > 2MΩ
± 5V	Ri > 2MΩ
± 10V	Ri > 2MΩ

IN1 potentiometer input



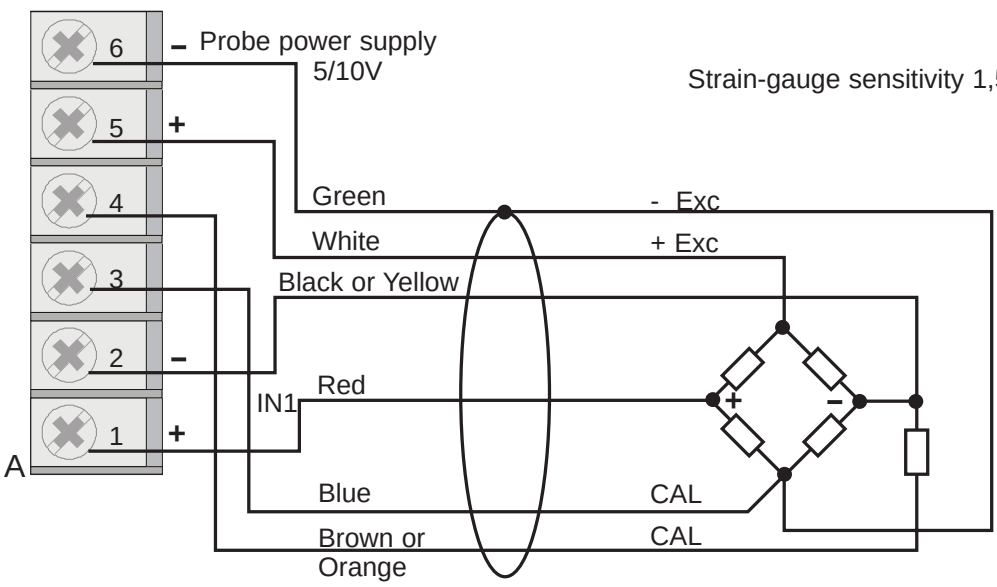
IN1 PT100 input





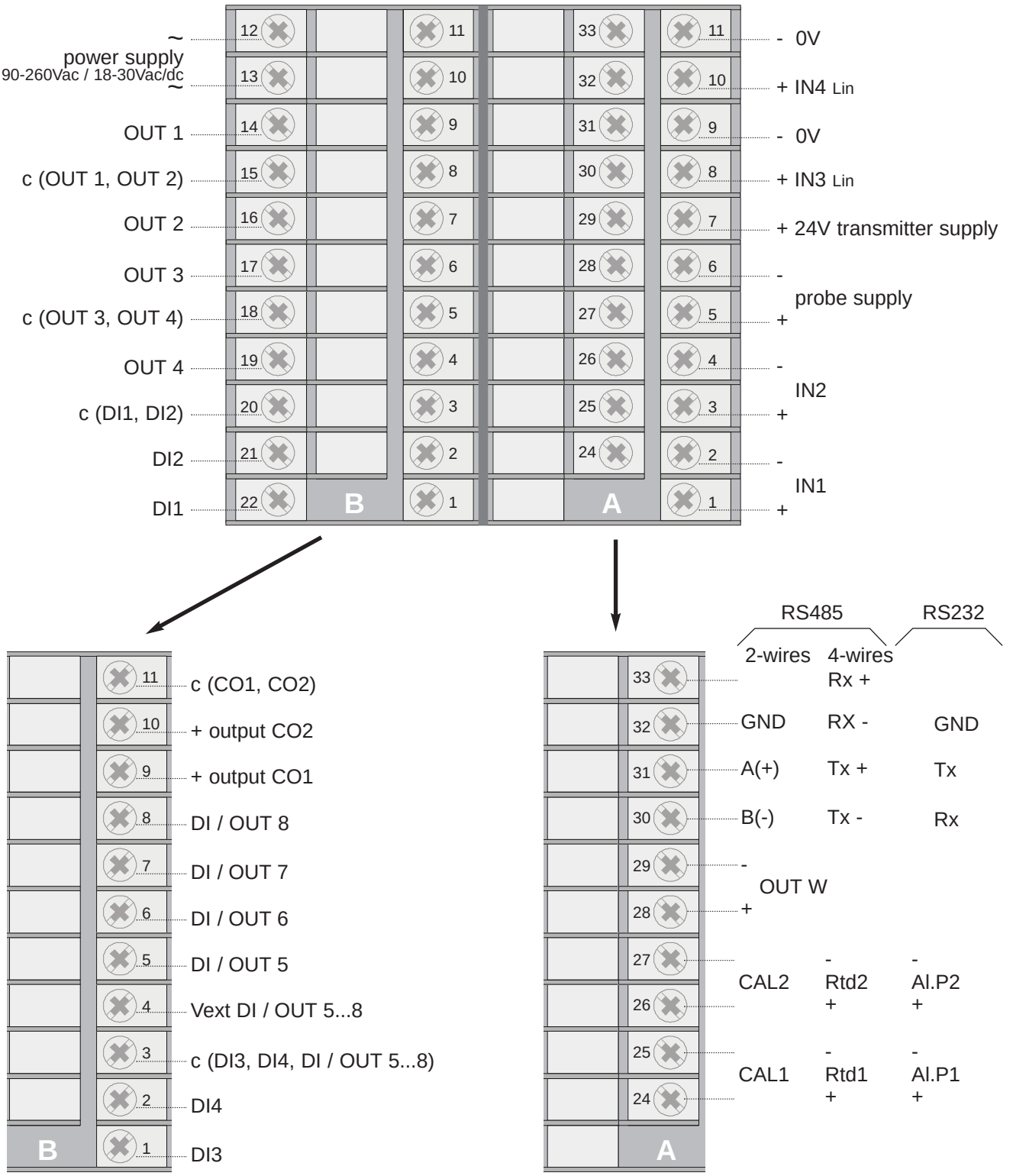
Use wires with adequate section (min 1 mm²)

IN1 Strain-gauge input 4/6 wires



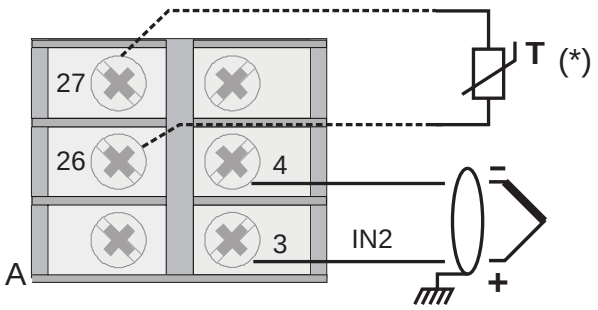
Strain-gauge sensitivity 1,5...4mV/V

Electrical Connections (Mod. 2500 - 1 - x - x - x - x - x)



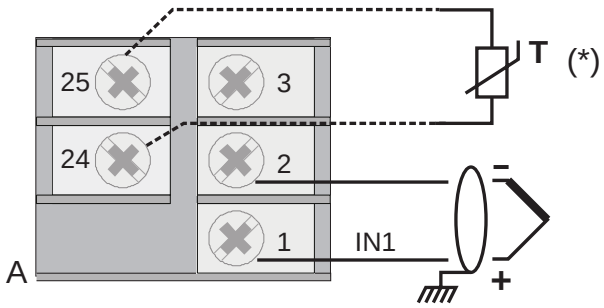
Electrical Connections (Mod. 2500 - 1 - x - x - x - x)

IN2 TC - Thermocouple input



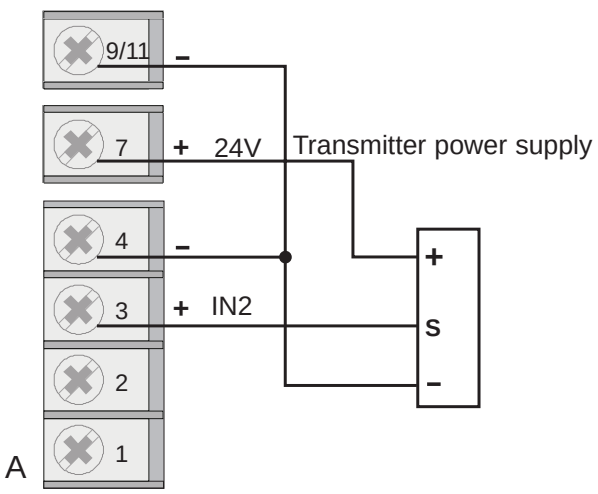
(*) PT100 for possible compensation of remote cold junction

IN1 TC - Thermocouple input



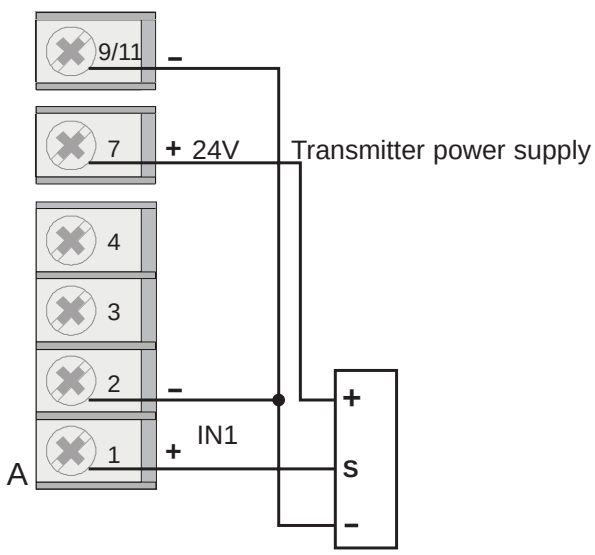
Available thermocouples:
J, K, R, S, T
(B,E, N, L, U, G, D, C possible by inserting custom linearization)
- Respect polarity
- For extensions, use compensated wire suitable to the TC utilized

IN2 linear input with three-wire transmitter powered by instrument

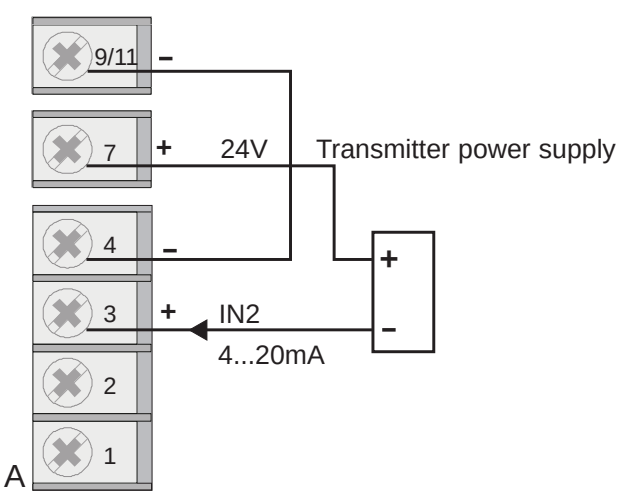


Select the probe according to transmitter type

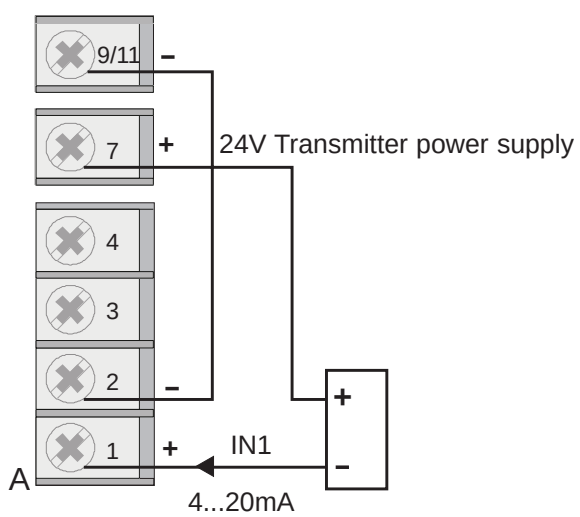
IN1 linear input with three-wire transmitter powered by instrument



IN2 linear input with two-wire transmitter powered by instrument

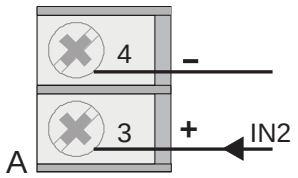


IN1 linear input with two-wire transmitter powered by instrument

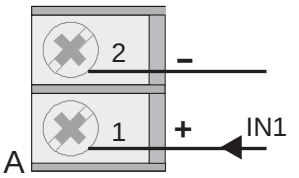


Electrical Connections (Mod. 2500 - 1 - x - x - x - x - x)

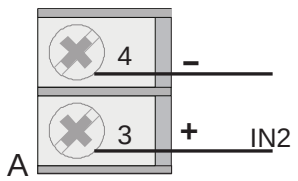
IN2 linear input (I)



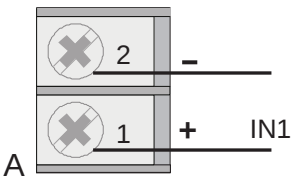
IN1 linear input (I)



IN2 linear input (V)

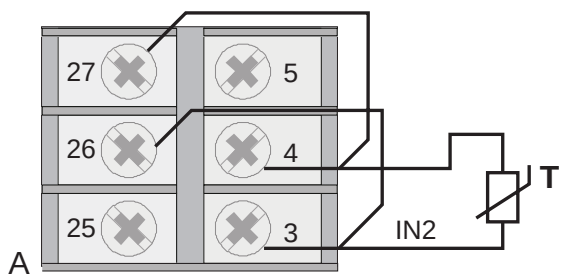


IN1 linear input (V)

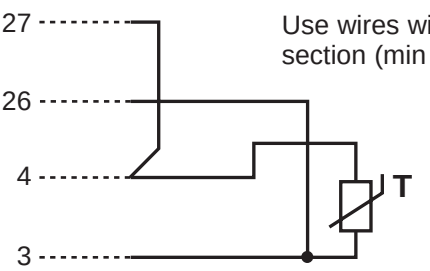


IN2 PT100 input

2-wire connection



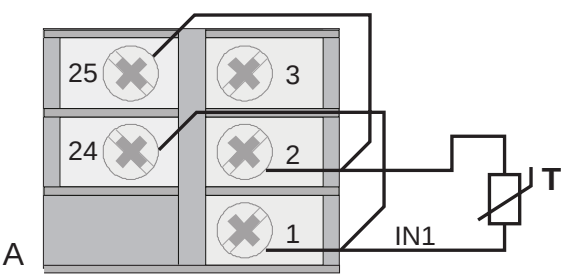
3-wire connection



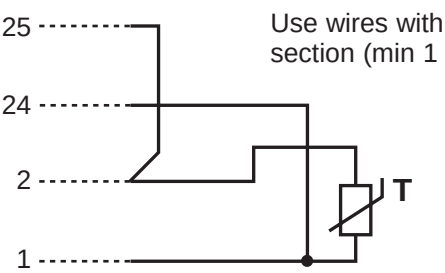
Use wires with adequate section (min 1 mm²)

IN1 PT100 input

2-wire connection

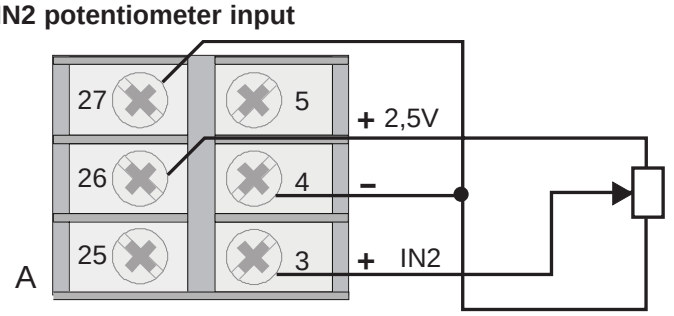


3-wire connection



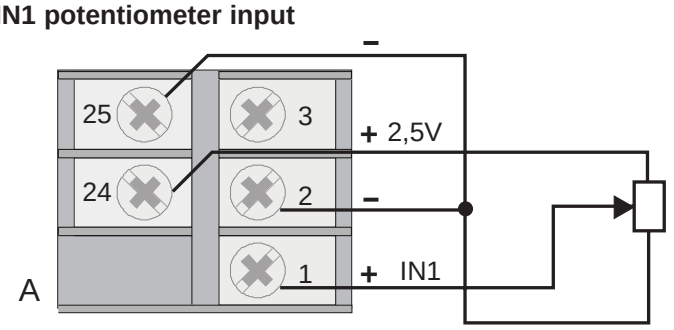
Use wires with adequate section (min 1 mm²)

IN2 potentiometer input



Potentiometer R ≥ 100Ω
Power supply 2,5V

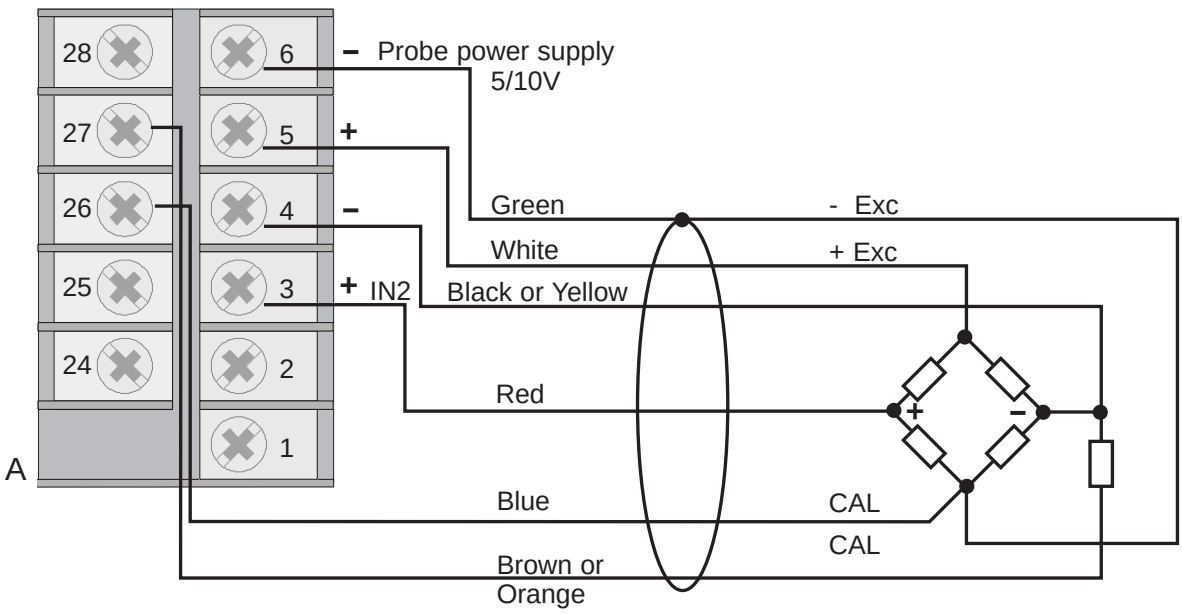
IN1 potentiometer input



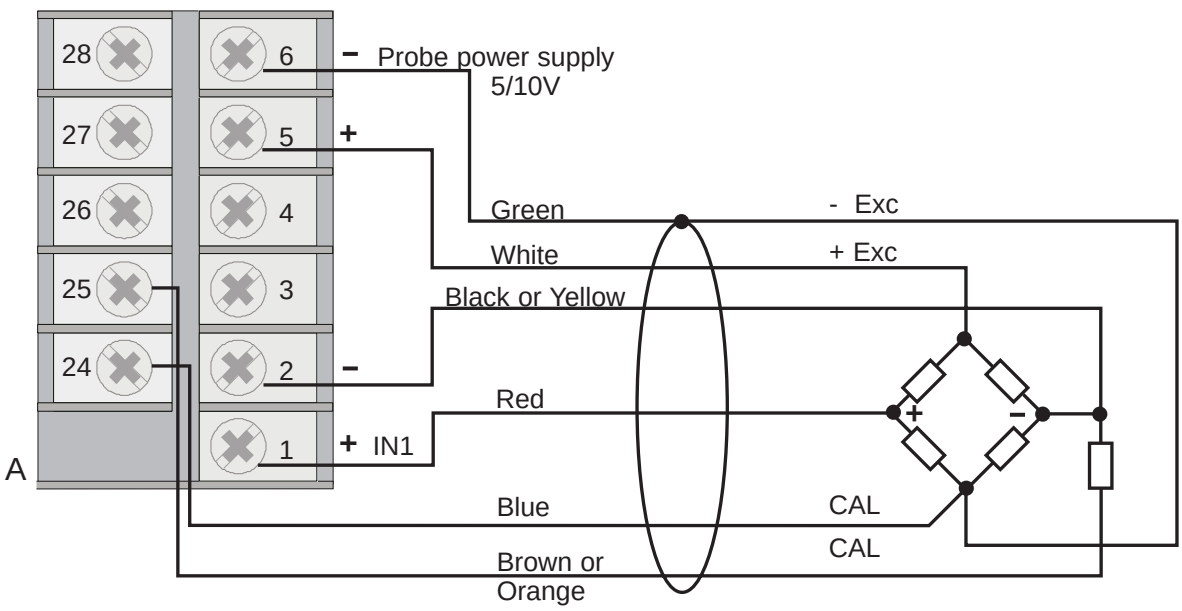
Potentiometer R ≥ 100Ω
Power supply 2,5V

Electrical Connections (Mod. 2500 - 1 - x - x - x - x - x)

IN2 Strain-gauge input 4/6 wires

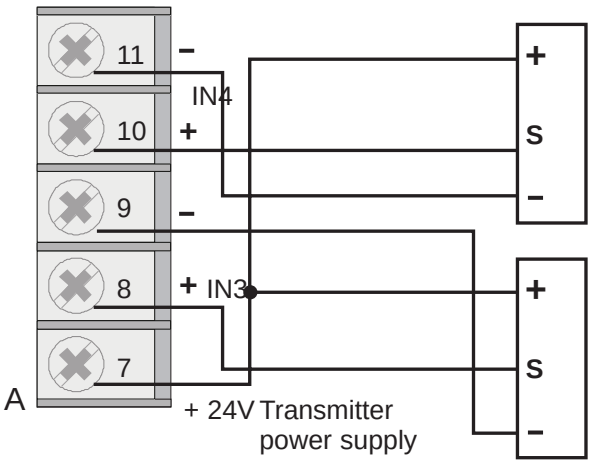


IN1 Strain-gauge input 4/6 wires

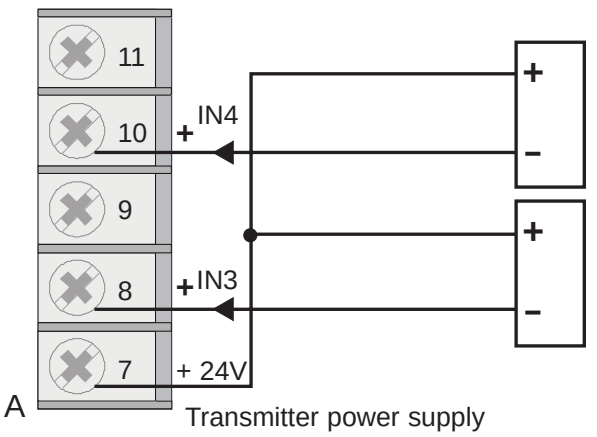


N.B.: Respect the probe connections and FASTON “CAL” connections (PROBE imbalance 80%).
FASTON 24 (26) must be connected to the probe at common pin “- EXC”.
Reversal of the “CAL” 80% imbalance leads is indicated at the end of calibration with error signal “Hi” or “Sbr”.

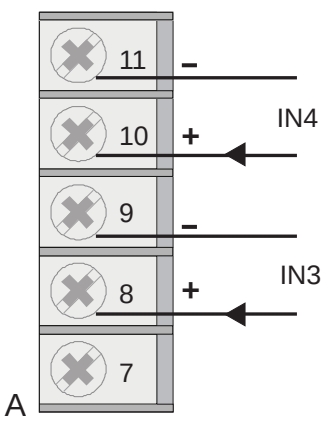
IN3, IN4 linear inputs with 3-wire transmitter powered by instrument



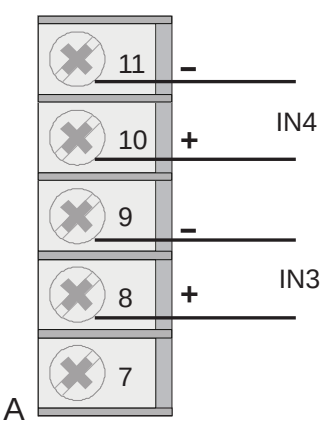
IN3, IN4 linear inputs with 2-wire transmitter powered by instrument



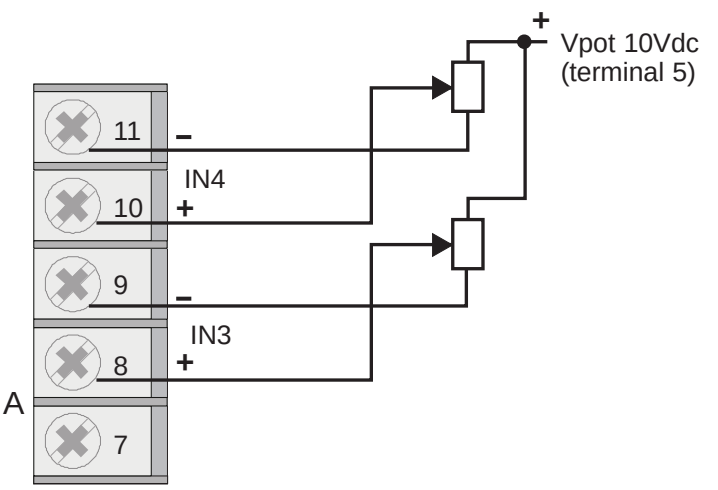
IN3, IN4 linear inputs (I)



IN3, IN4 linear inputs (V)



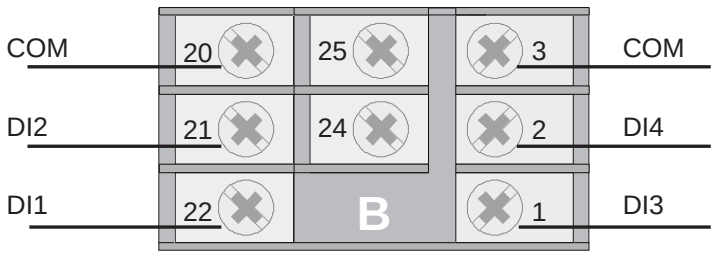
IN3, IN4 potentiometer inputs



Vpot is the potentiometer power supply voltage.
The 10Vdc probe power supply can be used if available.

Electrical Connections (for all models)

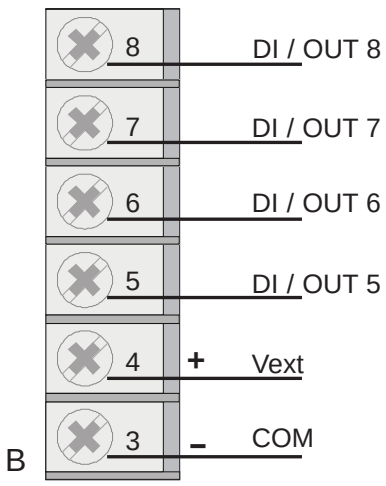
Digital inputs DI1, DI2, DI3, DI4



Digital inputs (PNP), 24V, max. 5mA or voltage-free contact (NPN) max. 5mA

Single selection PNP/NPN for DI1, DI2, DI3, DI4 by setting configuration parameter (Hd1 = +8)

Digital inputs / Digital outputs DI/OUT 5, DI/OUT 6, DI/OUT 7, DI/OUT 8

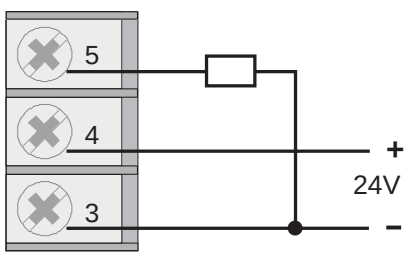


Digital inputs (PNP) 24V, max. 5mA

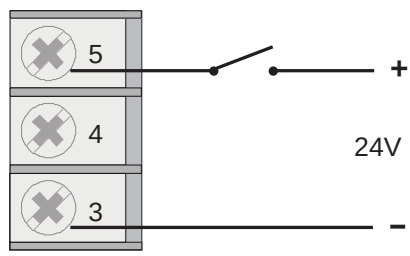
Digital output max. 100mA; Vout = Vext -25% with 4 outputs 100mA protected against short circuit

Vext is the external power supply required for OUT 5,6,7,8 - 24V ±25%

example of digital output connection (OUT 5)



example of digital input connection (DI 5)



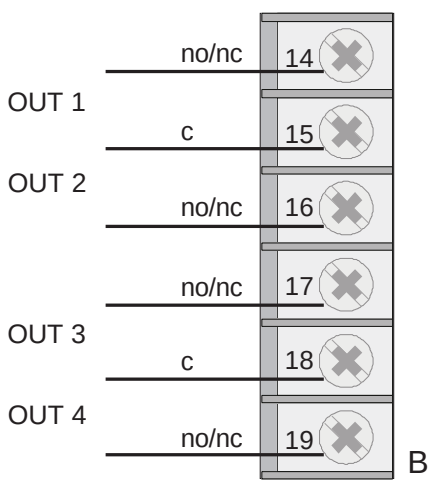
OUT 1, OUT 2, OUT 3, OUT 4 outputs

Relay 5A, 250Vac/30Vdc

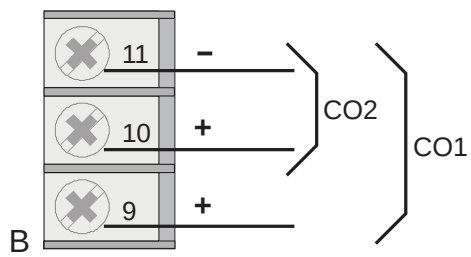
Select the no/nc contacts via jumper on power supply board (standard contact no)

To perform the alarm function in intrinsic safety (closed no connection when the alarm condition does not exist) remove S1, ..., S4 jumpers on power supply board.

(see section 6 - maintenance)



CO1, CO2 control outputs

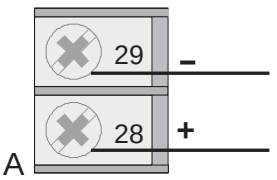


0/2...10V, ±10V, max. 25mA protected against short-circuit
0/4...20mA, on load max. 500Ω

Select type by means of configuration parameter.

Electrical Connections (for all models)

Retransmission output

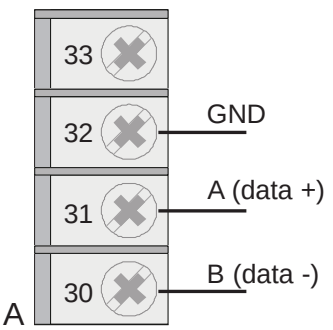


0/2...10V, ±10V, max. 25mA protection against short circuit
0/4...20mA, on load max. 500Ω

Select type by means of configuration parameter.

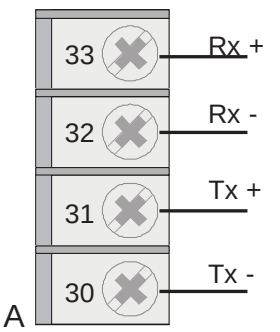
Serial line - MODBUS

RS485 2-wires (standard)



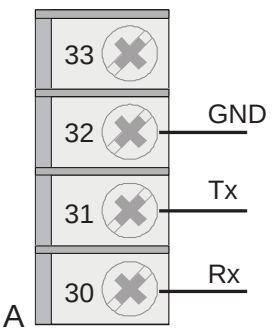
Termination strength 120Ω line can be inserted via jumper S3 closed, S2 open
Polarization can be inserted via jumpers S4, S5 closed
(S6, S7, S9 closed, S8 open)

RS485 4-wires

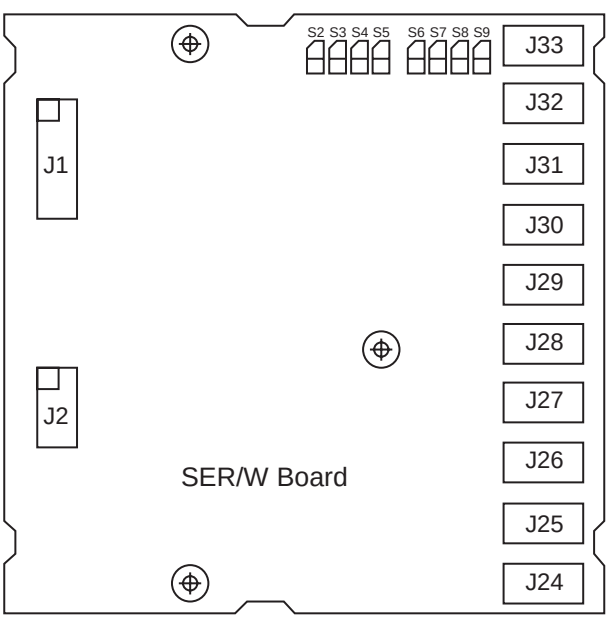


termination strength 120Ω line can be inserted via jumper S3 closed (Tx) and S2 closed (Rx)
Polarization can be inserted on Rx via jumpers S4, S5 closed
(S6, S7, S9 open, S8 closed)

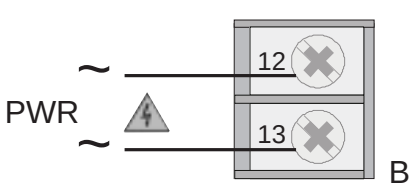
RS232



SER/W Board



Power supply



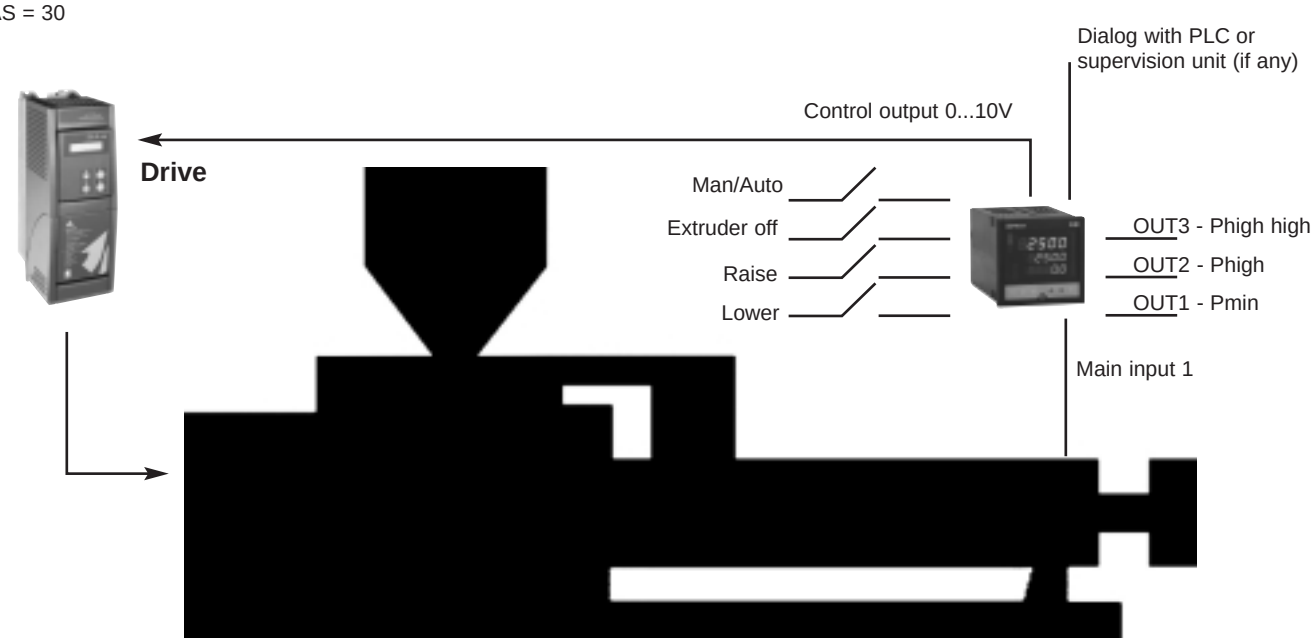
Standard: 100...240Vac/dc ±10%
Optional: 20...27Vac/dc ±10%
Power: max 20VA; 50/60 Hz

Examples

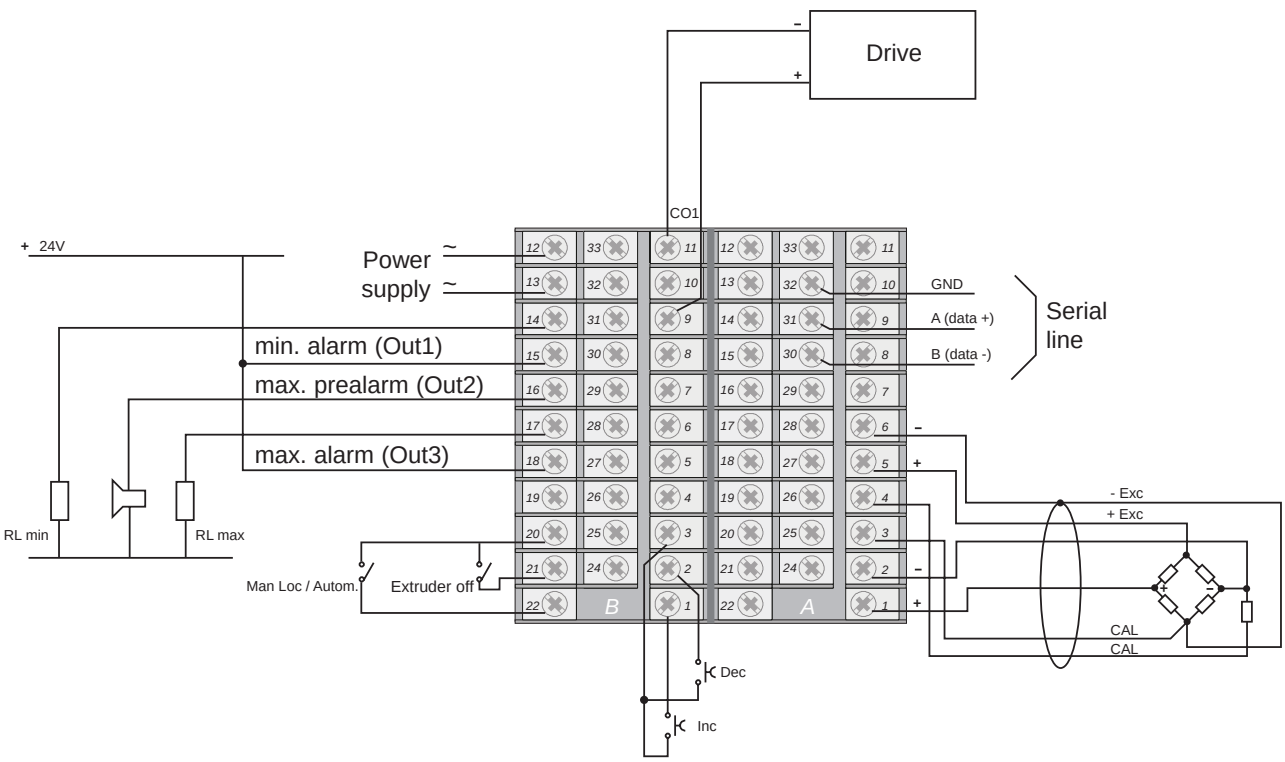
The 2500 controller has four typical configurations selectable via the “PASS” parameter, referring to four basic applications. These functions provide quick system start without precluding fine-tuning of parameters

1. SETTING MELT PRESSURE (extruder)

Model **2500-0-0-0-0-2-1**
PAS = 30

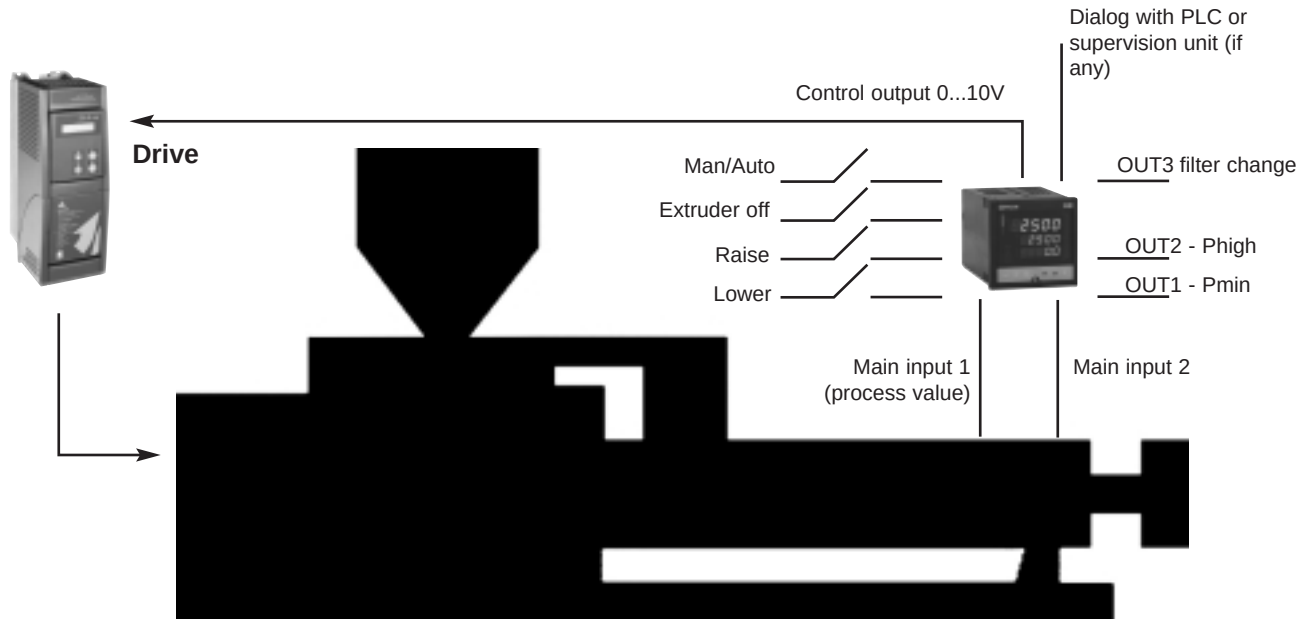


The basic instrument 2500-0-x-x-x-x-x accurately controls material pressure at the infeed of the volumetric pump.
The variable is acquired via main input 1.
The control output is sent to the extruder screw motor drive.
Digital input DI1, configured for Manual/Automatic, allows the extruder to be started in manual: by pushing the raise/lower buttons, you can increase extruder speed until approaching work pressure and then go to automatic with fast PI control.
Controller output is zero with the extruder off (input DI2).
OUT1 = minimum pressure alarm (automatically signals lack of material)
OUT2 = prealarm for maximum pressure

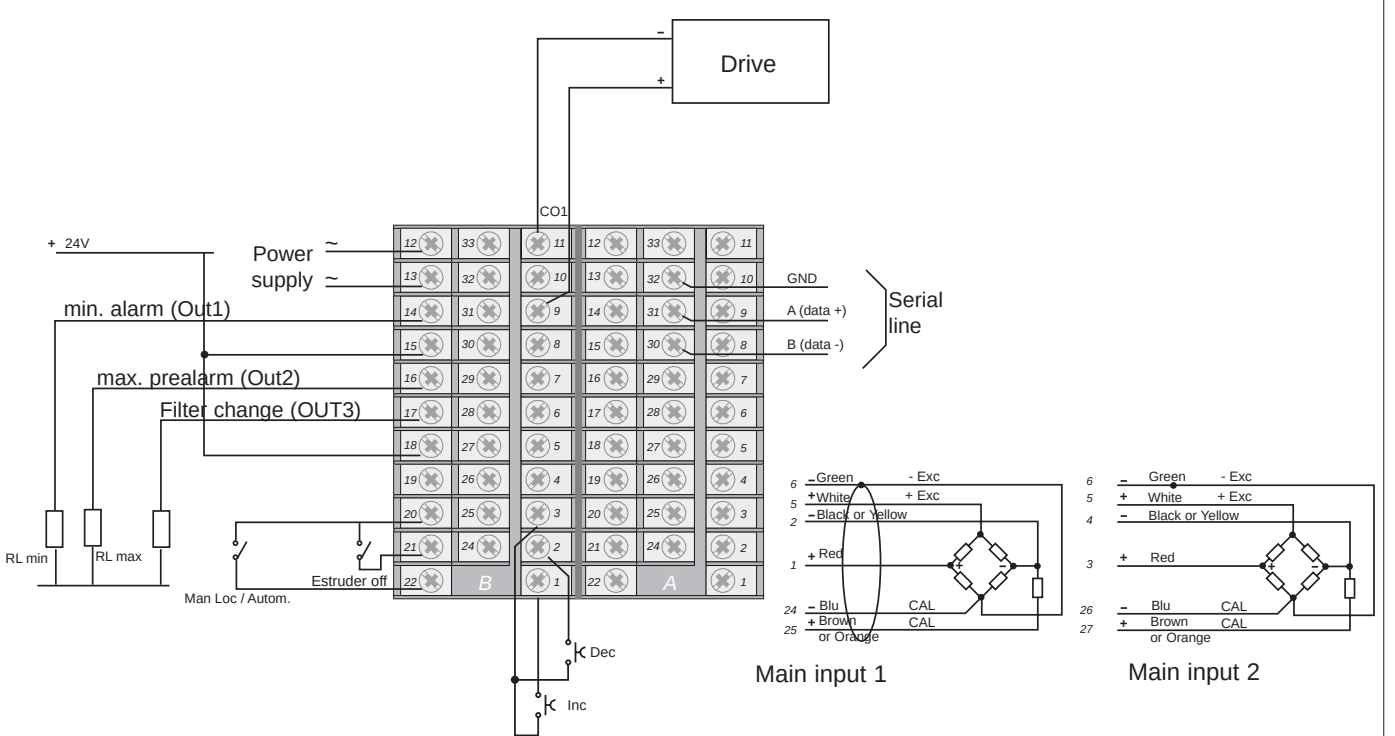


2. MELT PRESSURE CONTROL AND FILTER CHANGE SIGNAL

Model **2500-1-0-0-0-2-1**
PAS = 31

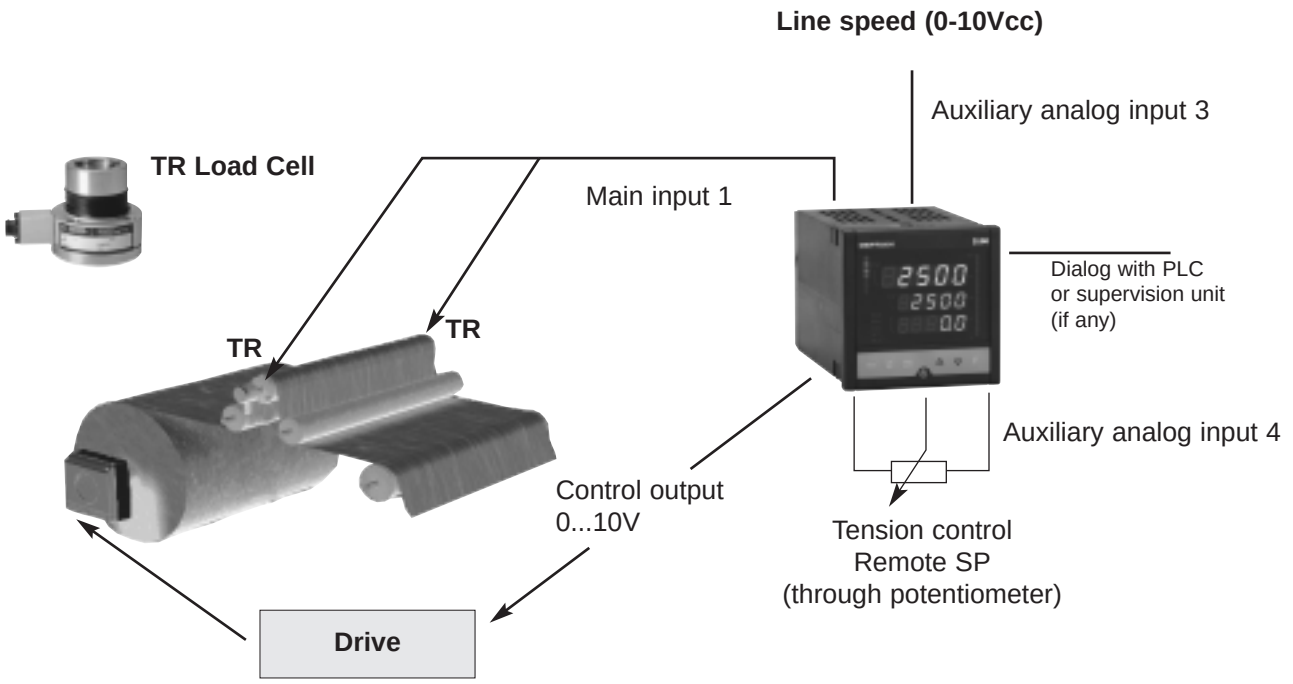


The basic instrument 2500-1-0-x-x-x-x checks the efficiency of the filter upline of the volumetric pump, seen as the difference in input-output pressure.
The 2500 instrument acquires the variables via the two main inputs, one of which is also used to control pressure (see application 1).
The OUT3 alarm (configurable) signals the need to change the filter (manual or automatic).

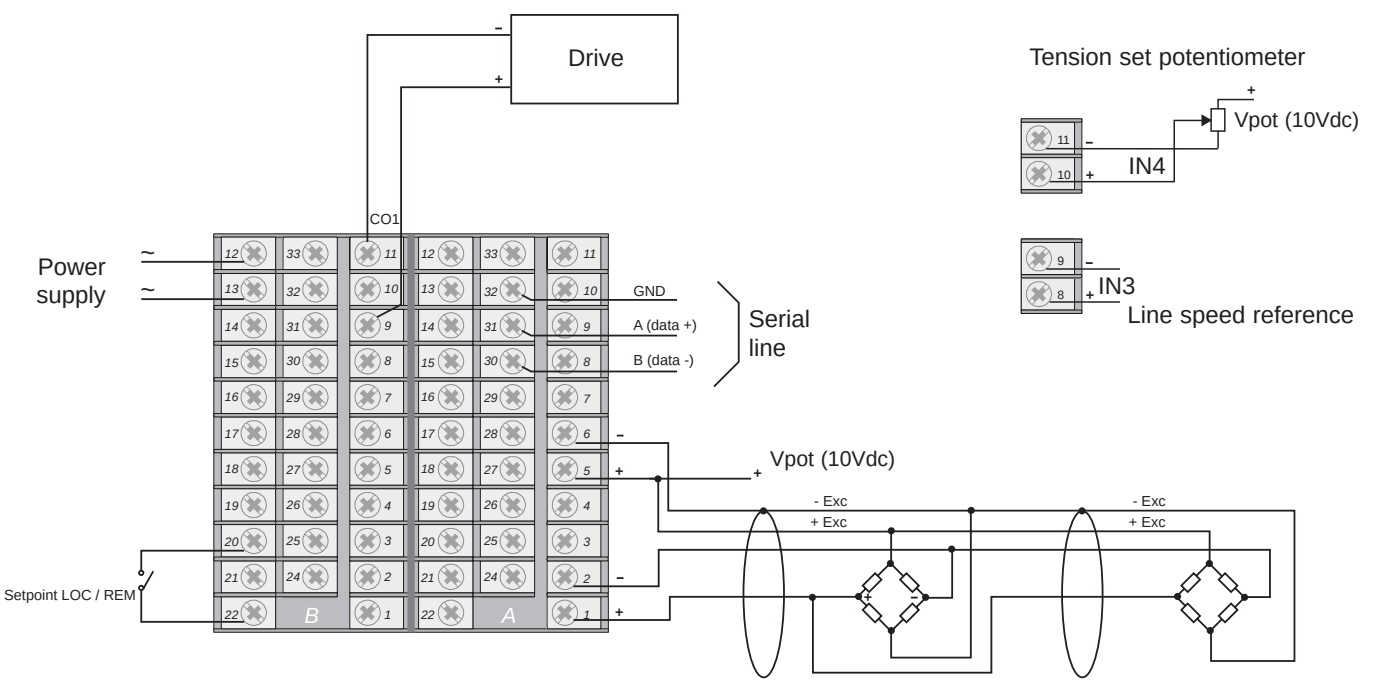


3. ROLLER TENSION CONTROL

Model **2500-0-0-0-0-2-1**
PAS = 32



The basic model 2500-0-x-x-x-x-x with one main input accurately controls roller tension on a winding line.
Tension is measured by 2 load cells with 2mV/V sensitivity connected in parallel, powered at 10Vdc by the instrument's auxiliary power supply.
Given a setpoint, the instrument keeps roller winding constant.
The 2500 control output controls the drive that controls winder motor speed.
Tension control can be adjusted via a digital input configured to select Local/Remote SP and an external potentiometer powered by the instrument.
A second remote input, configured to receive line speed, lets the instrument start in Automatic with a percentage of power on the control output, thereby preventing strong jerks on the winding material.



3 • FUNCTIONS

This section describes the use and functions of the displays, lighted indicators and buttons making up the 2500 controller operator interface.
It therefore contains essential information for correct programming and configuration of the controllers.

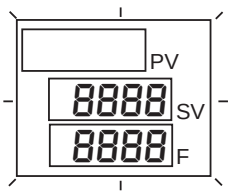
Operator interface

ID	Symbol	Function
1	2500	PV : Shows the process variable and error codes
2	2500 SV 0.0 F	SV : Shows the setpoint value (default) or the value of the parameter indicated in F F : Shows the control output value (default), menus and parameters identification, the symbol of the parameter whose value is displayed in SV
3	△ ▽	Raises/Lowers the value of the parameter displayed in SV until the max/min value is reached. When kept pushed: progressively increases the raise/lower speed of the value displayed in SV.
	F	Lets you navigate the controller menus and parameters. Confirms the value of the current (or modified by △ ▽) parameter and selects the next parameter.
	PEAK CAL RST MAN AUTO	Buttons with configurable function: with standard configuration, switches controller function PEAK activation maximum peak input IN1 CAL RST check calibration strain-gauge input IN1 MAN AUTO MANUAL/AUTOMATIC Active only when the display 1 shows the process variable. (for configuration, see parameter but 1, but2, but3 on Hrd menu)
	F + MAN AUTO	Confirms the value of the current (or modified by △ ▽) parameter and selects the preceding parameter.
4	brg 1 brg 2	bargraph 1: indicates deviation DEV with scale ±10% bargraph 2: indicates % value of control output (for configuration, see parameter brG)
5	L1 L2 L3 L4 L5	Function indicators: with standard configuration, signal the operating state of the controller For configuration, see parameter LEd.1, LEd.2, LEd.3, LEd.4, LEd.5 on Hrd menu L1 MAN/AUTO = ON blinking (manual control) OFF (automatic control) L2 REMOTE SETPOINT = ON (IN1 = ON remote Setpoint) OFF (IN1 = OFF local Setpoint) L3 IN1 CALIBRATION CHECK L4/L5 ALARM 1/2/3 = ON OFF

General Notes on Operation

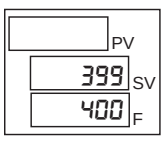
Switching on and operating the controller

Self-diagnostics



- When switched on, the controller runs a self-diagnostics test.
  During the test, all segments of the display and the 7 lighted indicators flash.
- If self-diagnostics detects no errors, the controller enters normal operating state (Level 1)
- Any errors detected by self-diagnostics are stored in a register and can be displayed with the Err function on the InF menu.

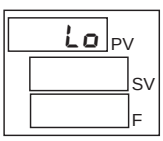
Normal operation Level 1

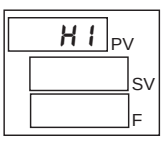


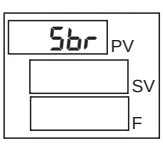
PV displays the Process Variable value.
SV displays the Setpoint value (if parameter dSSP = 0).
F displays the control output 1 value (if parameter dSF = 5)

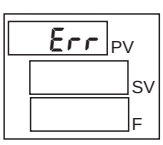
- Push briefly F to see, in sequence, on the PV display (and change if necessary) the significant values that influence operation of the controller at Level 1 (Setpoint, Alarm Setpoint, Control Output, etc.)
- When the button F remains pushed for 3 seconds, you enter the Programming/Configuration menu – see Navigating the Controller Menus for details.
- Push to ▲ ▼ the Setpoint value until reaching the required value.

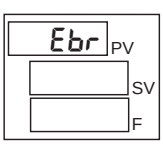
Errors during operation

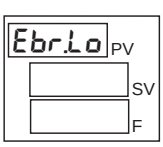


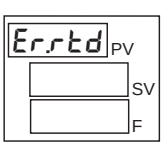


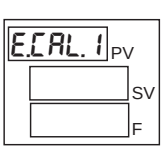












In case of errors during normal operation:

PV Displays error code.

SV Continues to display Setpoint value or Control Output value.

Lo Process Variable < min. scale limit (parameter LoS on InP menu of selected Process Variable)

HI Process Variable < max. scale limit (parameter HiS on InP menu of selected Process Variable)

Sbr probe broken or input values exceed maximum limits

Err PT100 in short circuit and input values below minimum limits (ex. for CT with wrong connection)
4...20mA transmitter broken or not powered

Ebr absence of probe power supply (strain-gauge) due to broken or unconnected probe

Ebr.Lo no voltage in probe power supply

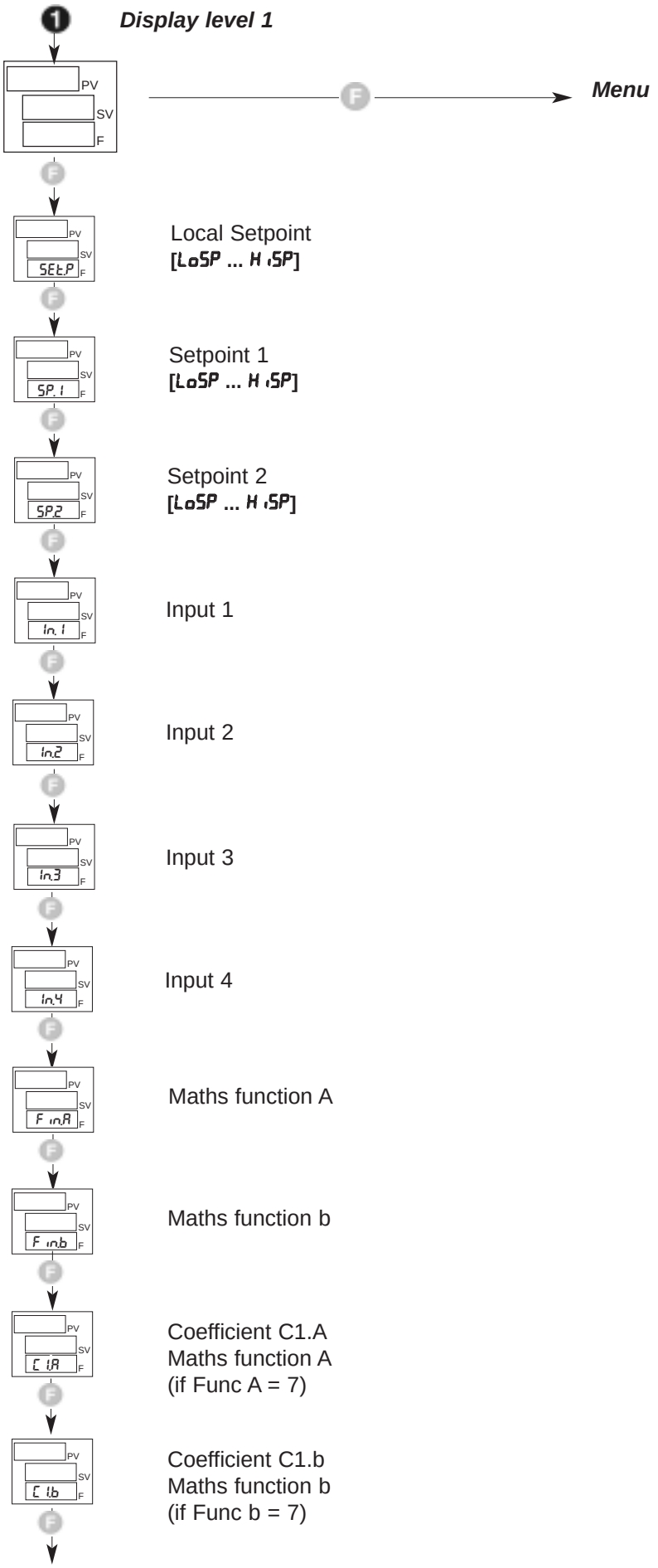
Er.rtd third wire for PT100 broken or not connected

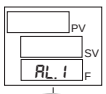
E.CAL.1 calibration error on input x (x = 1...4)

To solve the problem, see: Guide to the Solution of Problems in Section 6 Maintenance.

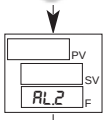
Navigating the Controller Menus

Keep this button F pushed to scroll the menus in succession; release when the required menu appears.
Push F to access the parameters of the selected menu.
Keep + pushed F to return immediately to level 1.

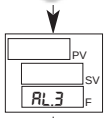




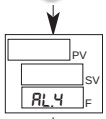
Alarm setpoint 1
[LoAL ... H AL] if absolute
[-9999 ... +9999] if relative



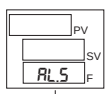
Alarm setpoint 2
[LoAL ... H AL] if absolute
[-9999 ... +9999] if relative



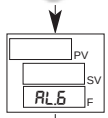
Alarm setpoint 3
[LoAL ... H AL] if absolute
[-9999 ... +9999] if relative



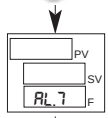
Alarm setpoint 4
[LoAL ... H AL] if absolute
[-9999 ... +9999] if relative



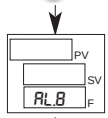
Alarm setpoint 5
[LoAL ... H AL] if absolute
[-9999 ... +9999] if relative



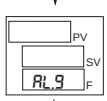
Alarm setpoint 6
[LoAL ... H AL] if absolute
[-9999 ... +9999] if relative



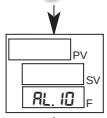
Alarm setpoint 7
[LoAL ... H AL] if absolute
[-9999 ... +9999] if relative



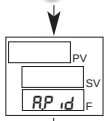
Alarm setpoint 8
[LoAL ... H AL] if absolute
[-9999 ... +9999] if relative



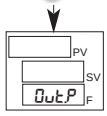
Alarm setpoint 9
[LoAL ... H AL] if absolute
[-9999 ... +9999] if relative



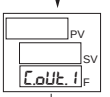
Alarm setpoint 10
[LoAL ... H AL] if absolute
[-9999 ... +9999] if relative



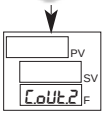
Number identifying active PID parameters group
(only if n.Pid > 1)



Control outputs value
[- 100.0 ... 100.0] %



Control 1 output value (*)



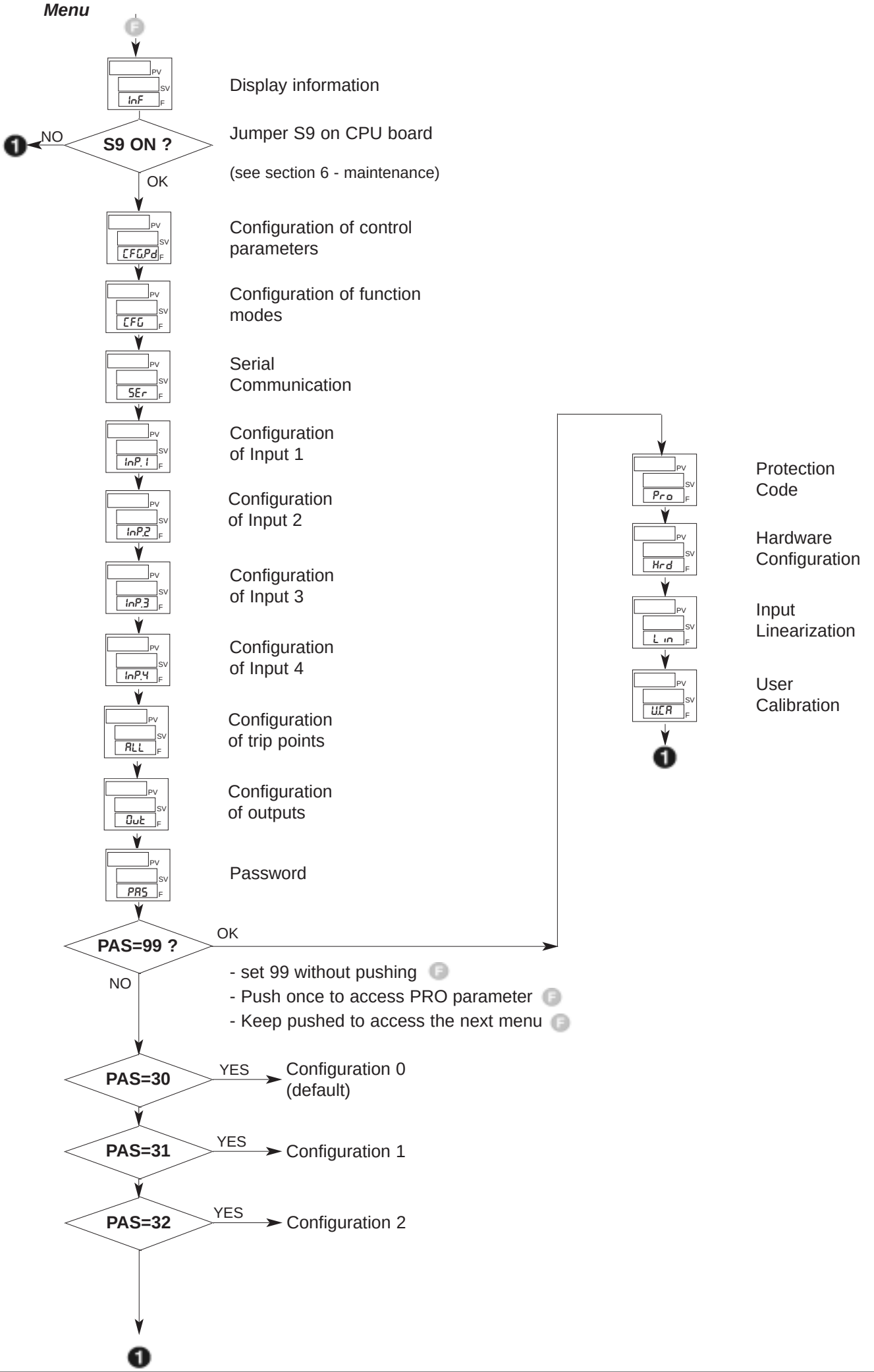
Control 2 output value (*)

(*) the automatic return to level 1 is disabled

Insignificant configuration parameters and menus are NOT displayed.

The display returns to level 1 if the keys ▲ ▼ F are not pressed within about 15 seconds

Menu


Display information
S9 ON ?
NO
OK
Jumper S9 on CPU board
(see section 6 - maintenance)
Configuration of control parameters
Configuration of function modes
Serial Communication
Configuration of Input 1
Configuration of Input 2
Configuration of Input 3
Configuration of Input 4
Configuration of trip points
Configuration of outputs
Password
PAS=99 ?
OK
NO
- set 99 without pushing
- Push once to access PRO parameter
- Keep pushed to access the next menu
PAS=30
YES
Configuration 0 (default)
PAS=31
YES
Configuration 1
PAS=32
YES
Configuration 2
Protection Code
Hardware Configuration
Input Linearization
User Calibration

4 • CONFIGURATION / PROGRAMMING

This section contains the instructions needed to configure the 2500 Controller as required.

To provide optimum functioning in its intended application, the 2500 Controller's control parameters have to be correctly configured and programmed. The flexibility and high performance of these instruments is based on numerous parameters that the user can program directly via the control panel buttons, or transfer from PC in the form of configuration file via the optional digital communication interface.

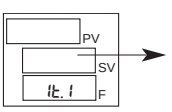
Configuration
Access to all configuration / programming menus and to all parameters available for the 2500 Controllers means that the Controller can be configured extremely precisely to satisfy any applicative requirement.

The correct setting of configuration parameters assumes expertise in control problems and techniques. Therefore, do not change these parameters if you are not fully aware of the consequences that may derive from improper setting.

To prevent harm to persons or property, the user is responsible for checking that all parameters are correctly set before the Controller is put into operation.

*If you have any doubts or need any explanation, consult the website **www.gefran.com** or call Gefran Customer Care.*

The following pages describe each of the Controller's menus and, for each parameter, provide a concise description of its function, its default value (if any), and its range of settable values.
Example: Parameter it.1 on CFG menu



(default value)

Integral time of Pid 1 group
[**0.0 ... 99.99**] min

Supplemental Notes for Consultation of Configuration/Programming Pages
When setting a few highly complex parameters, you need to consult certain tables or detailed notes.
These tables or notes are found on the right side of the page for the parameter in question.

Applicative Notes
Detailed explanations of certain operating modes or special techniques developed by Gefran in its years of experience in the control field are provided at the end of the Configuration/Programming Section, and are a valuable consulting tool for the user.
References are made to these Applicative Notes, where necessary, in the configuration / programming flows.

Password: PAS
The message PAS appears when scrolling the menus (button F kept pusched), after the Out menu.
Subsequent menus can be accessed only by setting the parameter PAS = 99, then pushing
After setting the value 99, push and keep pushed F to access subsequent menus.

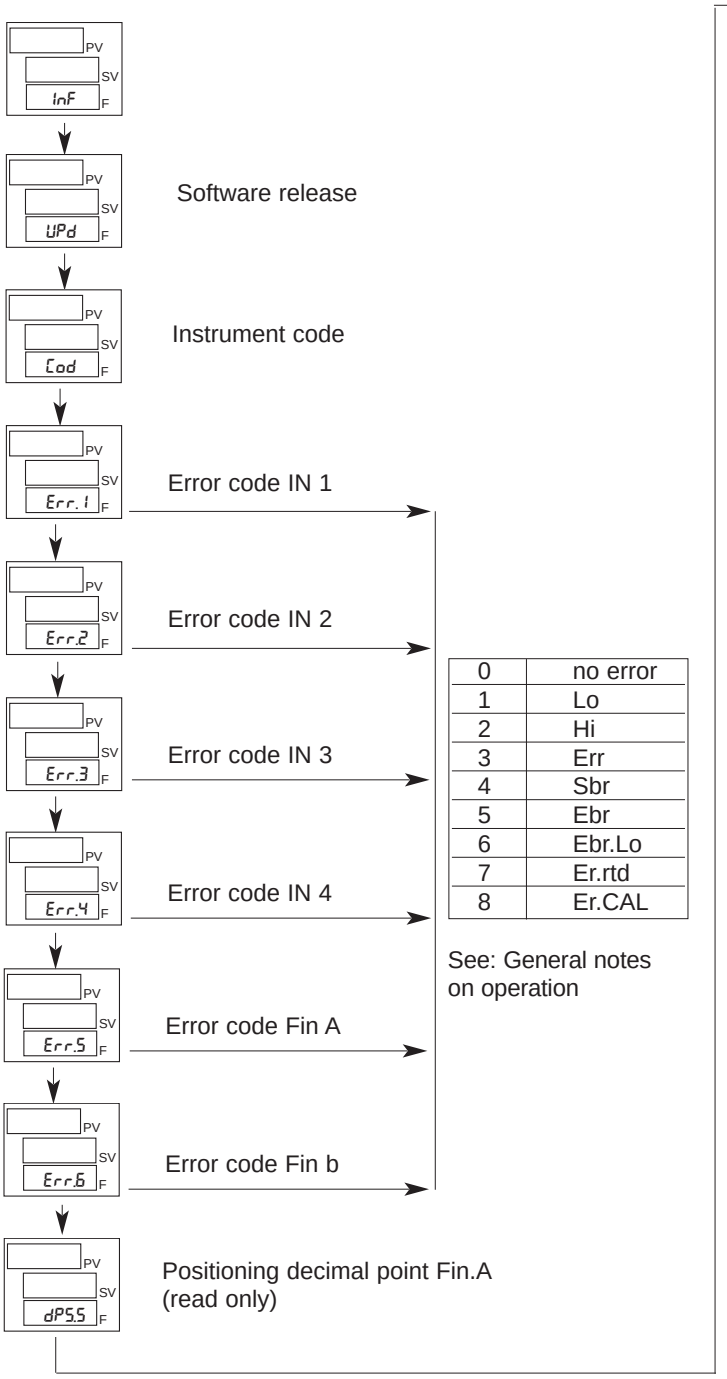
Protection Code: Pro
The Pro parameter lets you enable or disable the display and/or change of certain parameters.
For details, see the description of the Pro parameter in the configuration flows.

Jumper S9 on CPU Board
The absence of jumper S9 on the Controller's CPU board blocks access to all menus when the instrument's hardware configuration does not required any change of preset parameters.
This jumper is inserted or removed in the factory, and normally does not need to be changed by the final user.

For more information, see section 6 - Maintenance.

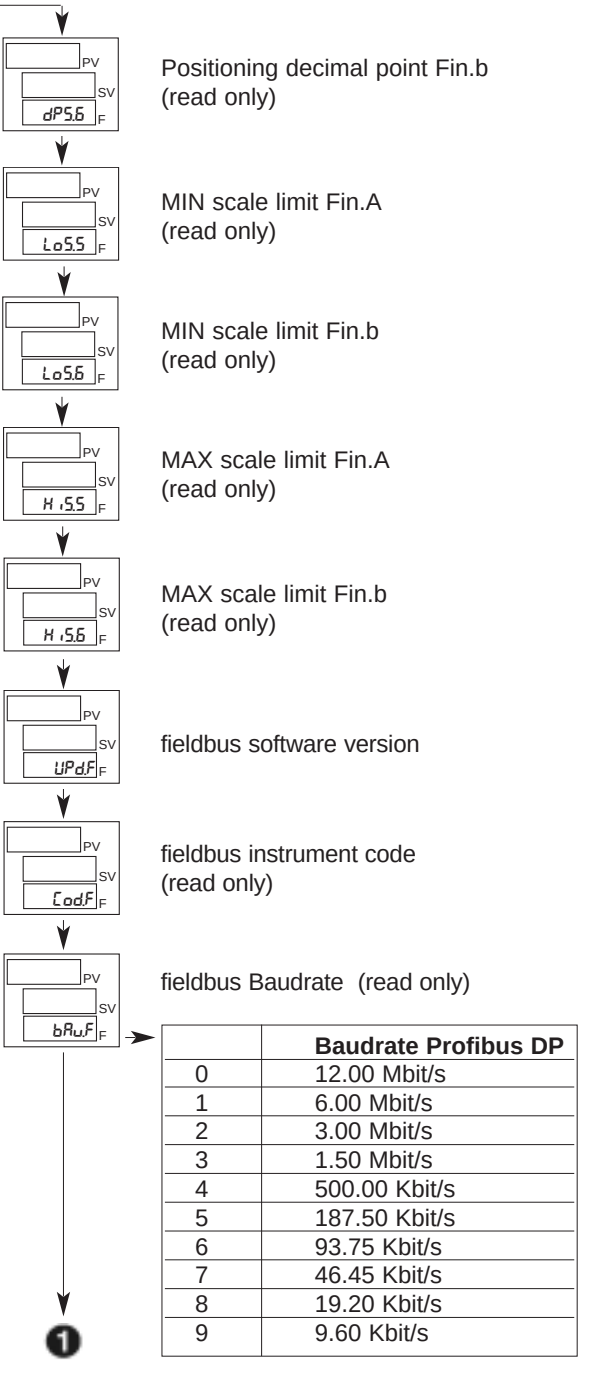
InF Informations

This menu lets you display the state of the controller



0	no error
1	Lo
2	Hi
3	Err
4	Sbr
5	Ebr
6	Ebr.Lo
7	Er.rtd
8	Er.CAL

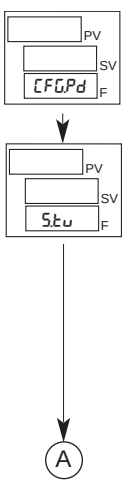
See: General notes on operation



	Baudrate Profibus DP
0	12.00 Mbit/s
1	6.00 Mbit/s
2	3.00 Mbit/s
3	1.50 Mbit/s
4	500.00 Kbit/s
5	187.50 Kbit/s
6	93.75 Kbit/s
7	46.45 Kbit/s
8	19.20 Kbit/s
9	9.60 Kbit/s

CFG PID Configuration

This menu lets you configure the various control parameters.

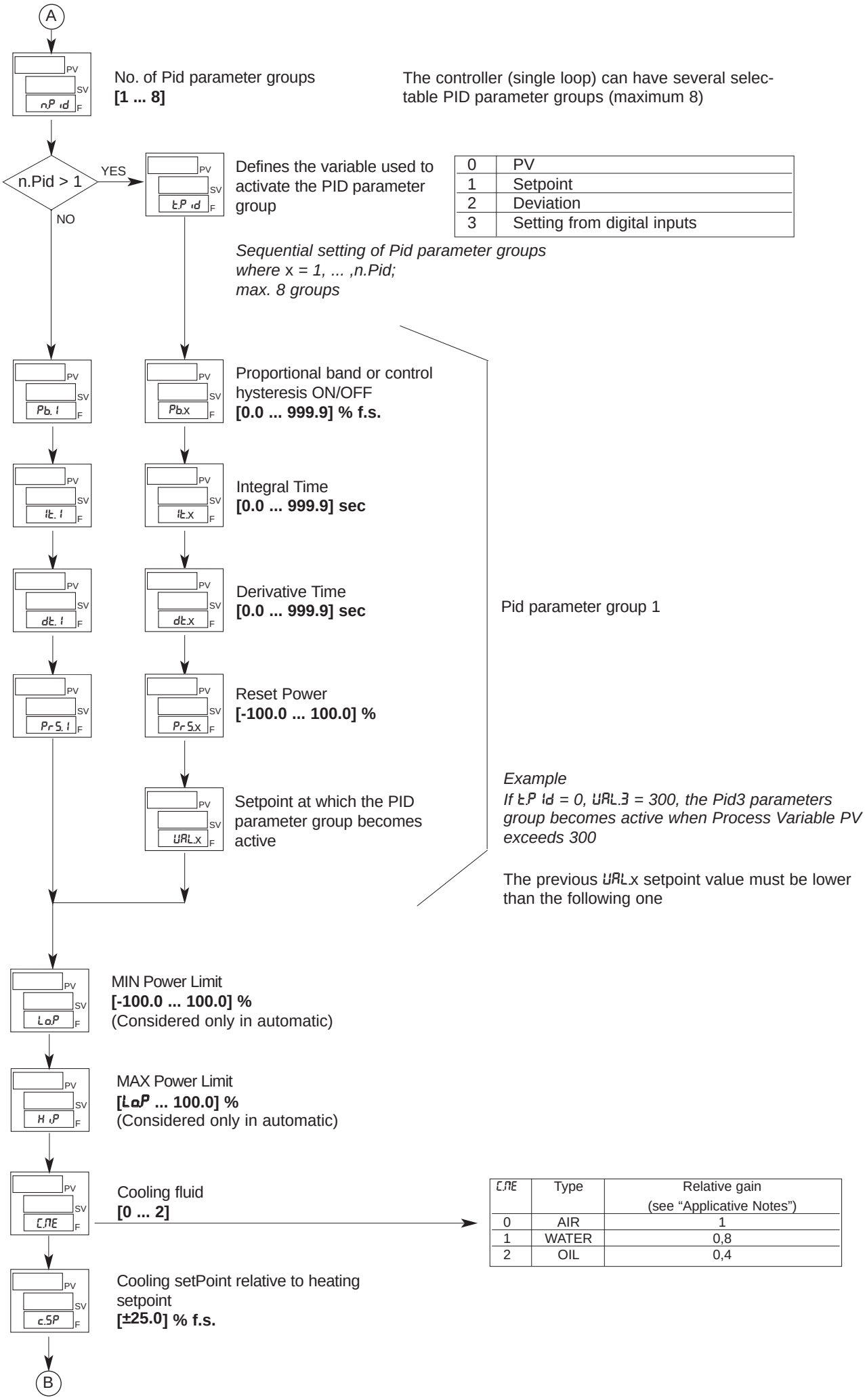


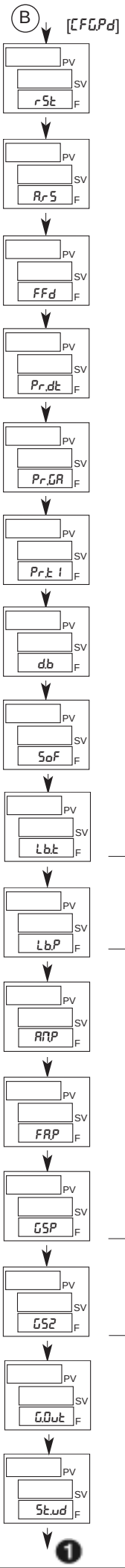
Enable Self Tuning, Auto Tuning, Soft Start (**)

*) by adding the following numbers to the value shown in the table, you can enable a series of supplemental functions:
+16 with automatic switching to GO if IPV-SPI > 0,5%
+32 with automatic switching to GO if IPV-SPI > 1%
+64 with automatic switching to GO if IPV-SPI > 2%
+128 with automatic switching to GO if IPV-SPI > 4%

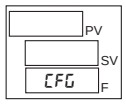
**) For more information on the Self Tuning, Auto Tuning, Soft Start functions, see paragraph Notes on Operation.

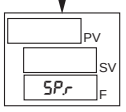
S.tun	Continuous Autotuning	Selftuning	Softstart
0	NO	NO	NO
1	YES	NO	NO
2	NO	YES	NO
3	YES	YES	NO
4	NO	NO	YES
5	YES	NO	YES
6	-	-	-
7	-	-	-
S.tun	One-shot Autotuning	Selftuning	Softstart
8*	WAIT	NO	NO
9	GO	NO	NO
10*	WAIT	YES	NO
11	GO	YES	NO
12*	WAIT	NO	YES
13	GO	NO	YES


A
PV
SV
nP id
F
No. of Pid parameter groups
[1 ... 8]
The controller (single loop) can have several selectable PID parameter groups (maximum 8)
n.Pid > 1
YES
NO
tP id
Defines the variable used to activate the PID parameter group
0 PV
1 Setpoint
2 Deviation
3 Setting from digital inputs
Sequential setting of Pid parameter groups
where x = 1, ... ,n.Pid;
max. 8 groups
Pb. 1
Pbx
Proportional band or control hysteresis ON/OFF
[0.0 ... 999.9] % f.s.
It. 1
Itx
Integral Time
[0.0 ... 999.9] sec
dt. 1
dtx
Derivative Time
[0.0 ... 999.9] sec
Pr5. 1
Pr5x
Reset Power
[-100.0 ... 100.0] %
UAL.x
Setpoint at which the PID parameter group becomes active
Pid parameter group 1
Example
If tP id = 0, UAL.3 = 300, the Pid3 parameters group becomes active when Process Variable PV exceeds 300
The previous UAL.x setpoint value must be lower than the following one
LoP
MIN Power Limit
[-100.0 ... 100.0] %
(Considered only in automatic)
H.P
MAX Power Limit
[LoP ... 100.0] %
(Considered only in automatic)
C.tE
Cooling fluid
[0 ... 2]
C.tE | Type | Relative gain (see “Applicative Notes”)
0 | AIR | 1
1 | WATER | 0,8
2 | OIL | 0,4
c.SP
Cooling setPoint relative to heating setpoint
[±25.0] % f.s.
B


B
[CFG,Pd]
PV
SV
rSt
F
Manual Reset
[-999 ... +999] scale points
Manual Reset is added to the setpoint value to compensate the error at full speed.
It is applied in case of P or PD control, and lets the setpoint be reached.
PV
SV
ArS
F
Antireset
[0 ... 9999] scale points
It defines the band around the setpoint within which integral action is active.
If set to zero, antireset is disabled.
PV
SV
FFd
F
Feed forward
[-100.0 ... +100.0] %
If other than zero, the set value corresponds to the contribution to the control output when the setpoint is equal to full scale. For lower setpoint values, this contribution takes on a proportional value.
PV
SV
Pr.dt
F
Dead time
[0.0 ... 9999.9] sec.
available from future version
This is the time the process needs to respond to a change in the control output.
PV
SV
Pr.GA
F
Process again
[0.1 ... 10.0]
available from future version
Corresponds to the ratio between the value of the Process Variable (as a percentage of f.s.) and the corresponding percentage value of the control output.
PV
SV
Pr.t 1
F
Process time constant
[0.0 ... 9999.9] sec.
available from future version
Corresponds to the time the system needs to reach 70% of the final value due to a step change in the control output.
PV
SV
db
F
Dead band
(symmetrical tol Setpoint)
[0 ... 999] scale points
If set to other than zero, the control output does not change with respect to the setpoint within such symmetrical band.
PV
SV
SoF
F
Soft Start Time
[0.0 ... 500.0] min
PV
SV
Lbt
F
LBA alarm trip delay time
[0.0 ... 500.0] min
If set to “0”, the LBA alarm is disabled.
If the LBA alarm is active, it can be cancelled by pressing the + keys when the value of the control output (OutP), or by switching to Manual mode.
N.B.: the active LBA alarm condition is indicated by the flashing of the variable display
PV
SV
LbP
F
Limit of power supplied under LBA alarm condition
[-100.0 ... +100.0] %
If the LBA alarm is active, it can be cancelled by pressing the + keys when the value of the control output (OutP), or by switching to Manual mode.
PV
SV
AMP
F
Manual power assumed at power ON or when switching Auto/Man
[-100.0 ... +100.0] % ON/OFF
PV
SV
FAP
F
Fault Action Power
(supplied under open circuit condition)
[-100.0 ... +100.0] % ON/OFF
PV
SV
GSP
F
Set Gradient / Gradient for setpoint 1 with Multiset enabled
(see “Applicative Notes”)
[0.0 ... 999.9] digit/min
PV
SV
GS2
F
Set Point 2 Gradient
(considered only if Multiset is enabled)
[0.0 ... 999.9] digit/min
Unit of measurement digit/sec: adding + 16 to value of parameter Lrt on CFG menu.
PV
SV
G.Out
F
Gradient for control output
(see “Applicative Notes”)
[0.0 ... 100.0] %/sec
PV
SV
Stud
F
Delta of manual power value raise/lower in impulse mode
(from keys or digital inputs if enabled)
[0.1 ... 100.0] %/impulse
1

CFG Configuration of Operating Modes

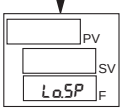




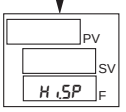
Definition of remote set

0	OFF
1	Digital (from serial line)
2	IN3 absolute
3	IN4 absolute
4	Fin.A (Math function A)
5	Fin.b (Math function b)

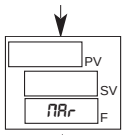
+8 = relative to local setpoint



Settable lower limit SP
[Scale range of controlled variable]

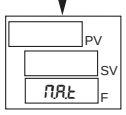


Settable upper limit SP
[Scale range of controlled variable]



Definition of manual remote

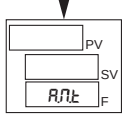
0	OFF
1	Digital (from serial line)
2	IN3
3	IN4
4	Fin.A (Math function A)
5	Fin.b (Math function b)



Switching mode from Manual to Automatic

0	The setpoint is set to the same value as the variable and does not cause any disturbance or variation in switching power with SPU parameter = 4 or 5 (if Func.A and/or Func.B have value 7, the ratio IN1/IN3 stored in C1A and/or C1b is calculated at MAN/AUTO switching)
1	The setpoint is unchanged, the instrument adjusts to reach the setpoint (local or remote).

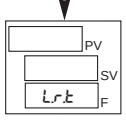
+8 = saves manual power in AM.P.



Switching modes from Automatic to Manual local or remote

0	Power value is set to AM.P value. (does not change with ▲ ▼ keys)
1	Power value is set to AM.P value. **Manual local**: power can be increased or decreased via the ▲ ▼ keys or digital inputs. **Manual remote**: power assumes the percentage value of the manual remote when it is brought to values less than or equal to AM.P.
2	The power value is unchanged and keeps the value it had in automatic **Manual local**: power can be increased or decreased via the ▲ ▼ keys or digital inputs. **Manual remote**: power can be increased or decreased to the percentage variation of manual remote.
3	**Manual local**: The power value is unchanged and keeps the value it had in automatic. It can be increased or decreased via the keys ▲ ▼ or digital inputs. **Manual remote**: power assumes the percentage value of the manual remote.

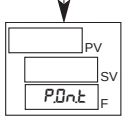
Switching to remote manual, when power assumes the % value of the remote input, the power scale limits are defined by the remote input scale limits.



Switching modes between local setpoint and remote setpoint

0	Immediate switching between local and remote setpoint
1	Switching with set gradient G.SP [digit/minute]
2	At switching from remote to local setpoint, the local setpoint value assumes remote setpoint value.
3	At switching from local to remote setpoint, the variation takes place with set gradient G.SP, at switching from remote to local setpoint the local setpoint value assumes remote setpoint value.

+16 = setpoint gradient in [digit/sec].



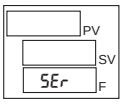
Power On modes
(conditions set at power-up)

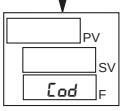
0	Operation at last memorized state (states of any digital inputs have priority)
1	Automatic with local setpoint
2	Automatic with remote setpoint
3	Manual local; power value is set in parameter AM.P
4	Manual remote, the power value is the one of the remote input
5	Manual local with switching to automatic after first deactivation of alarm 1 (AL1)
6	Manual remote with switching to automatic after first deactivation of alarm 1 (AL1)

+16: for codes 1 .. 6 Digital input states override power-on mode

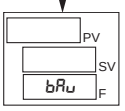
SEr Serial Communication

This menu lets you configure the various parameters that control serial communication between controller and supervisor.



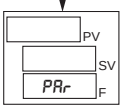


Instrument Identification Code
[0 ... 247]



Select Baudrate

	Baudrate
0	1200 bit/s
1	2400 bit/s
2	4800 bit/s
3	9600 bit/s
4	19200 bit/s
5	38400 bit/s
6	57600 bit/s
7	115200 bit/s

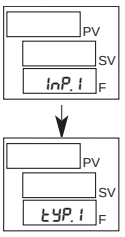


Select Parity

	Parity
0	No Parity
1	Odd
2	Even

InP.1 Setting Input 1

This menu lets you configure parameters for the input 1 signals



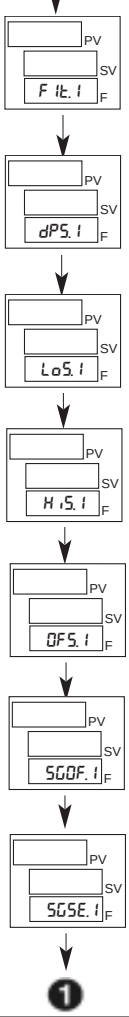
Probe type, signal, enable custom linearization, and main input scale.

	Probe type	Scale limits
0	Input disabled	
1	TC J °C	0/1000
2	TC J °F	32/1832
3	TC K °C	0/1300
4	TC K °F	32/2372
5	TC R °C	0/1750
6	TC R °F	32/3182
7	TC S °C	0/1750
8	TC S °F	32/3182
9	TC T °C	-200/400
10	TC T °F	-328/752
11	PT100 °C	-200/850
12	PT100 °F	-328/1562

	Probe type	Scale limits
13	Potentiometer ≥100Ω with 2.5V power supply	-19999/99999
14	Strain gauge positive polarization sensitivity: 1.5 ... 4mV/V	-19999/99999
15	Strain gauge symmetrical polarization sensitivity: 1.5 ... 4mV/V	-19999/99999
16	60mV	-19999/99999
17	±60mV	-19999/99999
18	100mV	-19999/99999
19	±100mV	-19999/99999
20	1V	-19999/99999
21	±1V	-19999/99999
22	5V	-19999/99999
23	±5V	-19999/99999
24	10V	-19999/99999
25	±10V	-19999/99999
26	0...20 mA	-19999/99999
27	4...20 mA	-19999/99999
28	Strain-gauge positive polarization calibrated 40mV	-19999/99999
29	Strain-gauge symmetrical polarization calibrated 40mV	-19999/99999
30	Strain-gauge positive polarization calibrated 60mV	-19999/99999
31	Strain-gauge symmetrical polarization calibrated 60mV	-19999/99999

+32 with custom linearization
+64 only for cold junction compensation thermocouples

Note
- For input type 27 (4...20mA), a current below 2mA causes the Err and activates the assigned relay state specified with parameter -rEL.
- The type 28, 29, 30, 31 input can be used without having to calibrate the probe. Simply enter the Offset and Sensitivity data requested in configuration (ex.: 0.193mV; 1.985mV/V).
- For types 28, 29 Maximum sensitivity is 4mV/V with 10V power supply.
- For types 30, 31 Maximum sensitivity is 6mV/V with 10V power supply.



Input 1 Digital Filter
[0.00 ... 20.00] sec

If set to "0" the average filter is excluded on the sampled value

Decimal Point Position for Scale Input 1

	Size
0	xxxxx
1	xxxx.x
2	xxx.xx (*)
3	xx.xxx (*)
4	x.xxxx (*)

(*) **Not** available for TC, RTD probes

MIN Scale Limit Input 1

+8 disables the Lo and Hi messages for linear inputs only
+16 disables the Ebr message
+32 for differential linear inputs probe type 16...25

MAX Scale Limit Input 1

Min...Max value assigned to input selected with parameter tyP1
[LoS.1 must be always < than HiS.1]

Offset Correction Input 1
[-999 ... +999] scale points

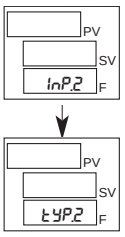
Offset Input 1
[-9.999 ... +9.999] mV

Sensitivity Input 1
[-0.000 ... +9.999] mV/V

Only for probe type 28, 29, 30, 31

InP.2 Setting Input 2

This menu lets you configure parameters for the input 2 signals



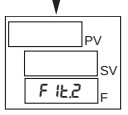
Probe type, signal, enable custom linearization, and main input scale.

	Probe type	Scale limits
0	Input disabled	
1	TC J °C	0/1000
2	TC J °F	32/1832
3	TC K °C	0/1300
4	TC K °F	32/2372
5	TC R °C	0/1750
6	TC R °F	32/3182
7	TC S °C	0/1750
8	TC S °F	32/3182
9	TC T °C	-200/400
10	TC T °F	-328/752
11	PT100 °C	-200/850
12	PT100 °F	-328/1562

	Probe type	Scale limits
13	Potentiometer ≥100Ω with 2.5V power supply	-19999/99999
14	Strain gauge positive polarization sensitivity: 1.5 ... 4mV/V	-19999/99999
15	Strain gauge symmetrical polarization sensitivity: 1.5 ... 4mV/V	-19999/99999
16	60mV	-19999/99999
17	±60mV	-19999/99999
18	100mV	-19999/99999
19	±100mV	-19999/99999
20	1V	-19999/99999
21	±1V	-19999/99999
22	5V	-19999/99999
23	±5V	-19999/99999
24	10V	-19999/99999
25	±10V	-19999/99999
26	0...20 mA	-19999/99999
27	4...20 mA	-19999/99999
28	Strain-gauge positive polarization calibrated 40mV	-19999/99999
29	Strain-gauge symmetrical polarization calibrated 40mV	-19999/99999
30	Strain-gauge positive polarization calibrated 60mV	-19999/99999
31	Strain-gauge symmetrical polarization calibrated 60mV	-19999/99999

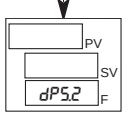
+32 with custom linearization
+64 only for cold junction compensation thermocouples

Note
- For input type 27 (4...20mA), a current below 2mA causes the Err and activates the assigned relay state specified with parameter -rEL.
- The type 28, 29, 30, 31 input can be used without having to calibrate the probe. Simply enter the Offset and Sensitivity data requested in configuration (ex.: 0.193mV; 1.985mV/V).
- For types 28, 29 Maximum sensitivity is 4mV/V with 10V power supply.
- For types 30, 31 Maximum sensitivity is 6mV/V with 10V power supply.



Input 2 Digital Filter
[0.00 ... 20.00] sec

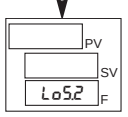
If set to "0" the average filter is excluded on the sampled value



Decimal Point Position for Scale Input 2

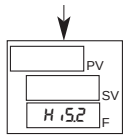
	Size
0	xxxxx
1	xxxx.x
2	xxx.xx (*)
3	xx.xxx (*)
4	x.xxxx (*)

(*) **Not** available for TC, RTD probes



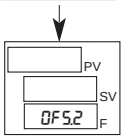
MIN Scale Limit Input 2

+8 disables the Lo and Hi messages for linear inputs only
+16 disables the Ebr message
+32 for differential linear inputs probe type 16...25

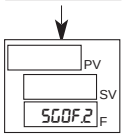


MAX Scale Limit Input 2

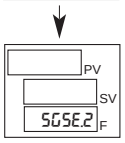
Min...Max value assigned to input selected with parameter tYP2
[LoS.2 must be always < than HiS.2]



Offset Correction Input 2
[-999 ... +999] scale points

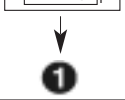


Offset Input 2
[-9.999 ... +9.999] mV



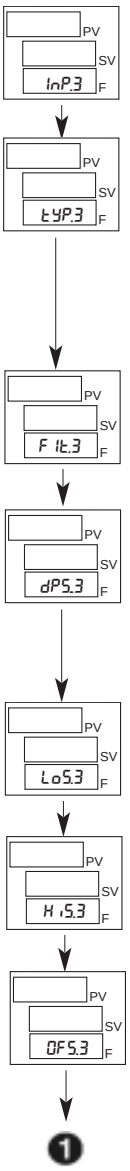
Sensitivity Input 2
[-0.000 ... +9.999] mV/V

Only for probe type 28, 29, 30, 31



InP.3 Setting Input 3

This menu lets you configure parameters for the input 3 signals.



Probe type, signal, enable custom linearization, and main input scale

	Probe type	Scale limits
0	Input disabled	
1	0...10V	-19999/99999
2	0...20mA	-19999/99999
3	4...20mA	-19999/99999
4	potentiometer	-19999/99999

+32 enable custom linearization

Input 3 Digital Filter
[0.00 ... 20.00] sec

If set to “0” the average filter is excluded on the sampled value

Decimal Point Position for Scale Input 3

	Size
0	xxxxx
1	xxxx.x
2	xxx.xx
3	xx.xxx
4	x.xxxx

+8 disables the Lo and Hi messages

MIN Scale Limit Input 3

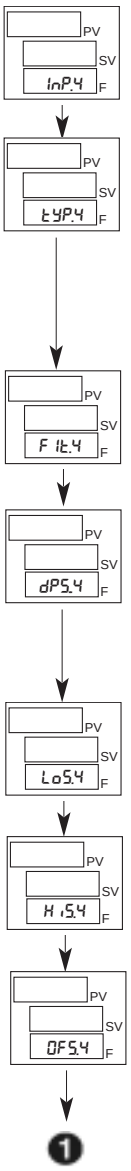
MAX Scale Limit Input 3

Min...Max value assigned to the input selected with parameter tYP3
[Lo5.3 must be always < than Hi5.3]

Offset Correction Input 3
[-999 ... +999] scale points

InP.4 Setting Input 4

This menu lets you configure parameters for the input 4 signals.



Probe type, signal, enable custom linearization, and main input scale

	Probe type	Scale limits
0	Input disabled	
1	0...10V	-19999/99999
2	0...20mA	-19999/99999
3	4...20mA	-19999/99999
4	potentiometer	-19999/99999

+32 enable custom linearization

Input 4 Digital Filter
[0.00 ... 20.00] sec

If set to “0” the average filter is excluded on the sampled value

Decimal Point Position for Scale Input 4

	Size
0	xxxxx
1	xxxx.x
2	xxx.xx
3	xx.xxx
4	x.xxxx

+8 disables the Lo and Hi messages

MIN Scale Limit Input 4

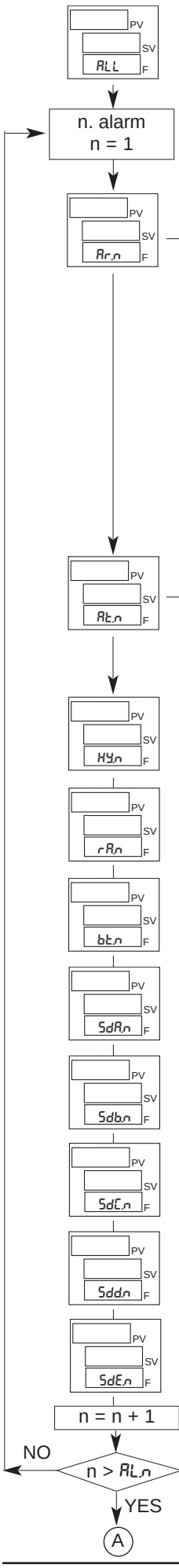
MAX Scale Limit Input 4

Min...Max value assigned to the input selected with parameter tYP4
[Lo5.4 must be always < than Hi.5.4]

Offset Correction Input 4
[-999 ... +999] scale points

AL L Setting Alarms

This menu lets you configure parameters for the alarm functions.



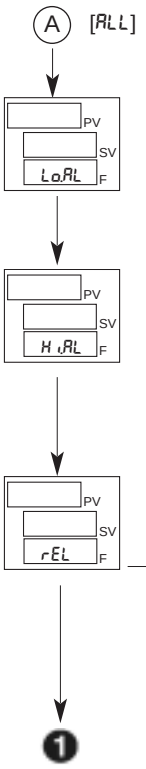
	Reference quantity
0	IN1
1	IN2
2	IN3
3	IN4
4	Fin.A (math function A)
5	Fin.b (math function b)
6	PV - Process Variable (input selected in SPU)
7	SSP - Active Setpoint
8	SP - Local Setpoint
9	DEV - Deviation (PV - SSP) (only for absolute type)
10	CO1 (control output 1) (scale range like the power 0 ÷ 100.0 % and 0 ÷ -100.0 %)
11	CO2 (control output 2) (scale range like the power 0 ÷ 100.0 % and 0 ÷ -100.0 %)
12	Value acquired from serial line
13	Max peak input 1
14	Min peak input 1
15	Input 1 peak - peak
16	Max peak input 2
17	Min peak input 2
18	Input 2 peak - peak

	Direct (maximum) Inverse (minimum)	Absolute/Relative to active Setpoint	Normal Symmetrical (window)
0	Direct	Absolute	Normal
1	Inverse	Absolute	Normal
2	Direct	Relative	Normal
3	Inverse	Relative	Normal
4	Direct	Absolute	Symmetrical
5	Inverse	Absolute	Symmetrical
6	Direct	Relative	Symmetrical
7	Inverse	Relative	Symmetrical

By adding the following numbers to the value shown in the table, you can enable a series of supplemental functions:
+8: disable power-on until first trip point.
+16: enable memory latch.
+32: change color of PV display in case of active alarm
+256: change color of PV display if limit is exceeded (only for alarms with timed delay)
+512: enable string if alarm is active
+1024: enable string if limit is exceeded (only for alarms with timed delay)

0	msec
1	sec
2	min

N.B.:
For deviation alarms, reference quantities must have the same decimal resolution



MIN limit alarm setpoint
[-19999 ... 99999]

MAX limit alarm setpoint
[-19999 ... 99999]

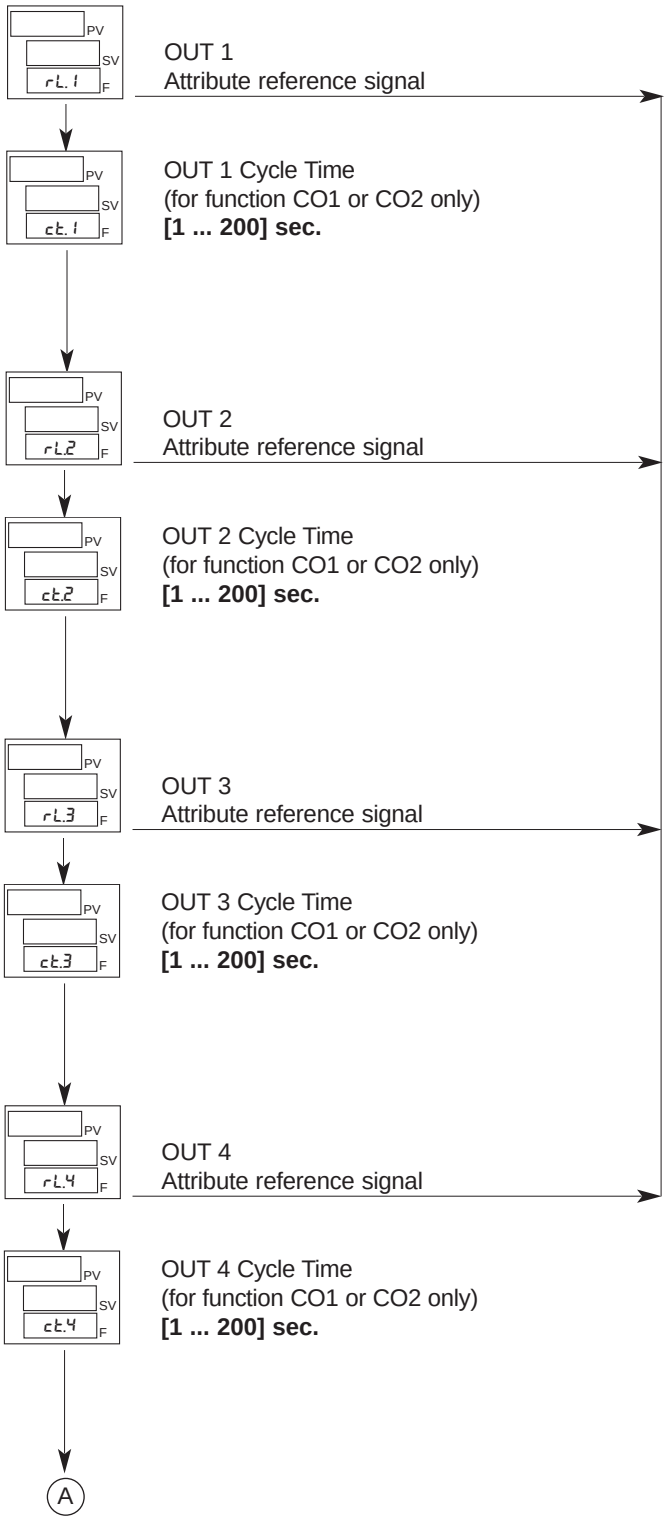
Fault Action (definition of alarm state in case of broken probe Err, Sbr, Ebr)

	Alarm 1	Alarm 2	Alarm 3
0	OFF	OFF	OFF
1	ON	OFF	OFF
2	OFF	ON	OFF
3	ON	ON	OFF
4	OFF	OFF	ON
5	ON	OFF	ON
6	OFF	ON	ON
7	ON	ON	ON

State of alarms 4...10 = OFF
+16 for state of alarms 4...10 = ON

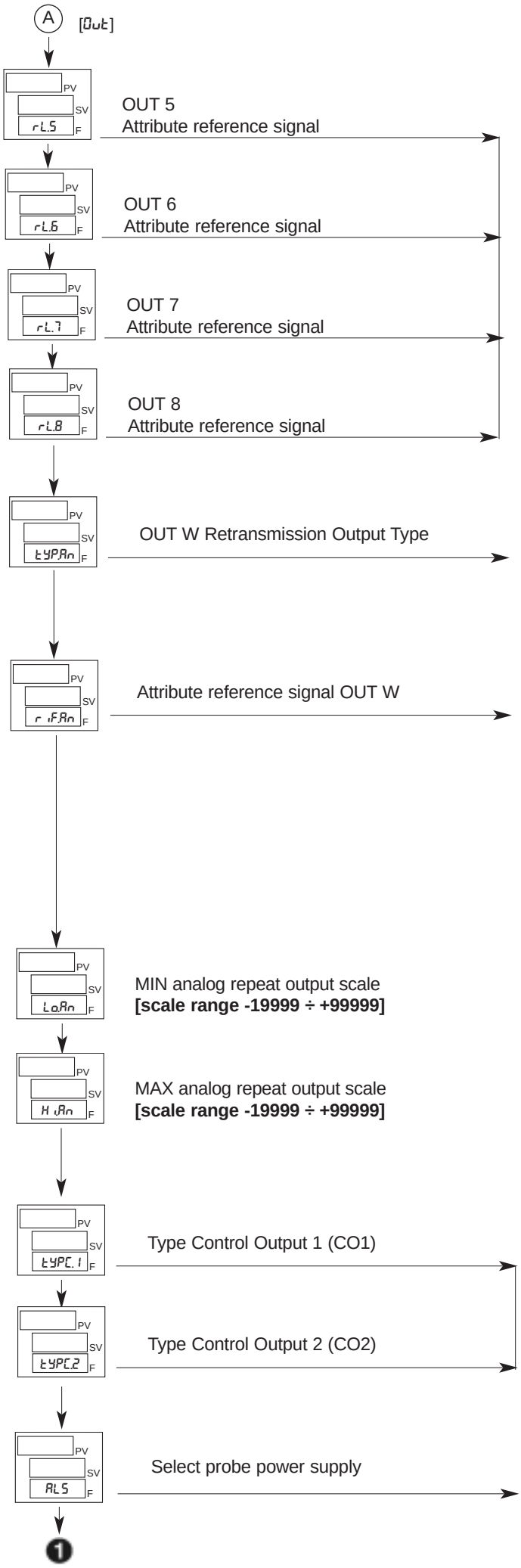
Out Setting Outputs

This menu lets you configure the output parameters.



	Function
0	OFF
1	AL1 – alarm 1
2	AL2 – alarm 2
3	AL3 – alarm 3
4	LBA – alarm LBA
5	Repeat logic input 1
6	Repeat logic input 2
7	Repeat but 1 key (if but 1 = 7)
8	AL1 or AL2
9	AL1 or AL2 or AL3
10	AL1 and AL2
11	AL1 and AL2 and AL3
12	CO1 (control output 1, 0.0...100.0%)
13	CO2 (control output 2, 0.0...100.0%)
14	CO1 (control output 1, 0.0...-100.0%)
15	CO2 (control output 2, 0.0...-100.0%)
18	AL4 – alarm 4
19	AL4 or AL5
20	AL4 or AL5 or AL6
21	AL4 or AL5 or AL6 or AL7
22	AL4 and AL5
23	AL4 and AL5 and AL6
24	AL4 and AL5 and AL6 and AL7
25	AL8 or AL9
26	AL8 or AL9 or AL10
27	AL8 and AL9
28	AL8 and AL9 and AL10

Add +32 to the values indicated in the table to obtain the denied logic level in output (except codes 12 ...15)



	Function
0	OFF
1	AL1 – alarm 1
2	AL2 – alarm 2
3	AL3 – alarm 3
4	LBA – alarm LBA
5	Repeat logic input 1
6	Repeat logic input 2
7	Repeat but 1 key
8	AL1 or AL2
9	AL1 or AL2 or AL3
10	AL1 and AL2
11	AL1 and AL2 and AL3
18	AL4 – alarm 4
19	AL4 or AL5
20	AL4 or AL5 or AL6
21	AL4 or AL5 or AL6 or AL7
22	AL4 and AL5
23	AL4 and AL5 and AL6
24	AL4 and AL5 and AL6 and AL7
25	AL8 or AL9
26	AL8 or AL9 or AL10
27	AL8 and AL9
28	AL8 and AL9 and AL10

Add +32 to the values indicated in the table to obtain the denied logic level in output

0	Output disabled
1	0...10V
2	2...10V
3	0...20mA
4	4...20mA
5	±10V

+8 reverse output

	Reference quantity
0	IN1
1	IN2
2	IN3
3	IN4
4	Fin.A (math function A)
5	Fin.b (math function b)
6	PV - Process Variable (input 1)
7	SSP - Active Setpoint
8	SP - Local Setpoint
9	DEV - Deviation (PV - SSP)
10	CO1 (control output 1)
11	CO2 (control output 2)
12	Value acquired from serial line
13	Input 1 maximum peak
14	Input 1 minimum peak
15	Input 1 peak-peak
16	Input 2 maximum peak
17	Input 2 minimum peak
18	Input 2 peak-peak
19	AL1 (limit)
20	AL2 (limit)
21	AL3 (limit)

+32 only for riF.An = 0,1,2,3,4,5: output at max/min hardware (beyond calibration limits) for input at Hi/Lo
+64 only for riF.An = 0,1,2,3,4,5: output at minimum if input is in Err, Sbr, Ebr condition

0	Output disabled
1	0...10V (0.0 ... 100.0%)
2	2...10V (0.0 ... 100.0%)
3	0...20mA (0.0 ... 100.0%)
4	4...20mA (0.0 ... 100.0%)
5	0...10V (0.0 ... -100.0%)
6	2...10V (0.0 ... -100.0%)
7	0...20mA (0.0 ... -100.0%)
8	4...20mA (0.0 ... -100.0%)
9	-10...+10V (-100.0 ... +100.0%)
10	-10...+10V (+100.0 ... -100.0%)

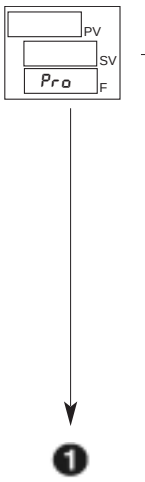
+16 reverse output

0	2,5V for potentiometers
1	5V for strain gauge
2	10V for strain gauge

max. 200mA

Pro Protection Code

This menu lets you enable/disable the display and/or change of certain parameters.
(To access this menu, see the section “Using the controller menus”)

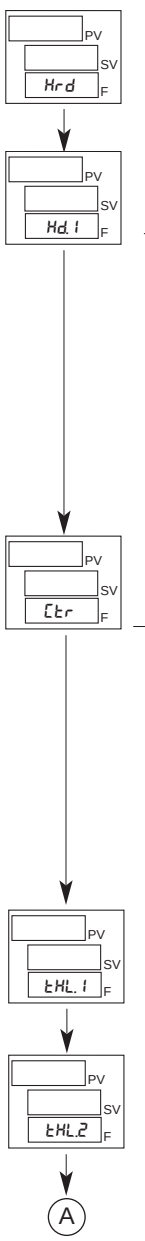


	Display	Change
0	SEtP, SP.1, SP.2, In.1, In.2 In.3, In.4, F InA, F InB, AL.1, ...AL.10, Cout.1, OutP Cout.2	SEtP, SP.1, SP.2, AL.1, ...AL.10
1	SEtP, SP.1, SP.2, In.1, In.2 In.3, In.4, F InA, F InB, AL.1, ...AL.10, Cout.1, OutP Cout.2	SEtP, SP.1, SP.2
2	SEtP, SP.1, SP.2, In.1, In.2 In.3, In.4, F InA, F InB, Cout.1, OutP, Cout.2	
3	SEtP, SP.1, SP.2, F InA, F InB, OutP	SEtP, SP.1, SP.2,

by adding the following numbers to the value shown in the table, you can enable a series of supplemental functions:
+4: disable menus InP.1, InP.2, InP.3, InP.4, ALL, Out
+8: disable menus CFGPd, CFG, SEr
+16: disable software “on – off” from keyboard
+32: disable save tare

Hrd Hardware Configuration

This menu lets you configure the hardware parameters.
(To access this menu, see the section “Using the controller menus”).



Enable MultiSet, process type line frequency and digital inputs

	MultiSet (2SP)	Process type Fast to check pressure, flow rate. Slow to check temperature	Line frequency
0		Fast	50Hz
1	X	Fast	50Hz
2		Slow	50Hz
3	X	Slow	50Hz
4		Fast	60Hz
5	X	Fast	60Hz
6		Slow	60Hz
7	X	Slow	60Hz

+8: digital inputs DIG1, DIG2, DIG3, DIG4 type NPN
NB: digital input NPN is active with contact open, if you want reverse logic, set +64 in parameter diG.x
+32: disable parameter rEL

Control type

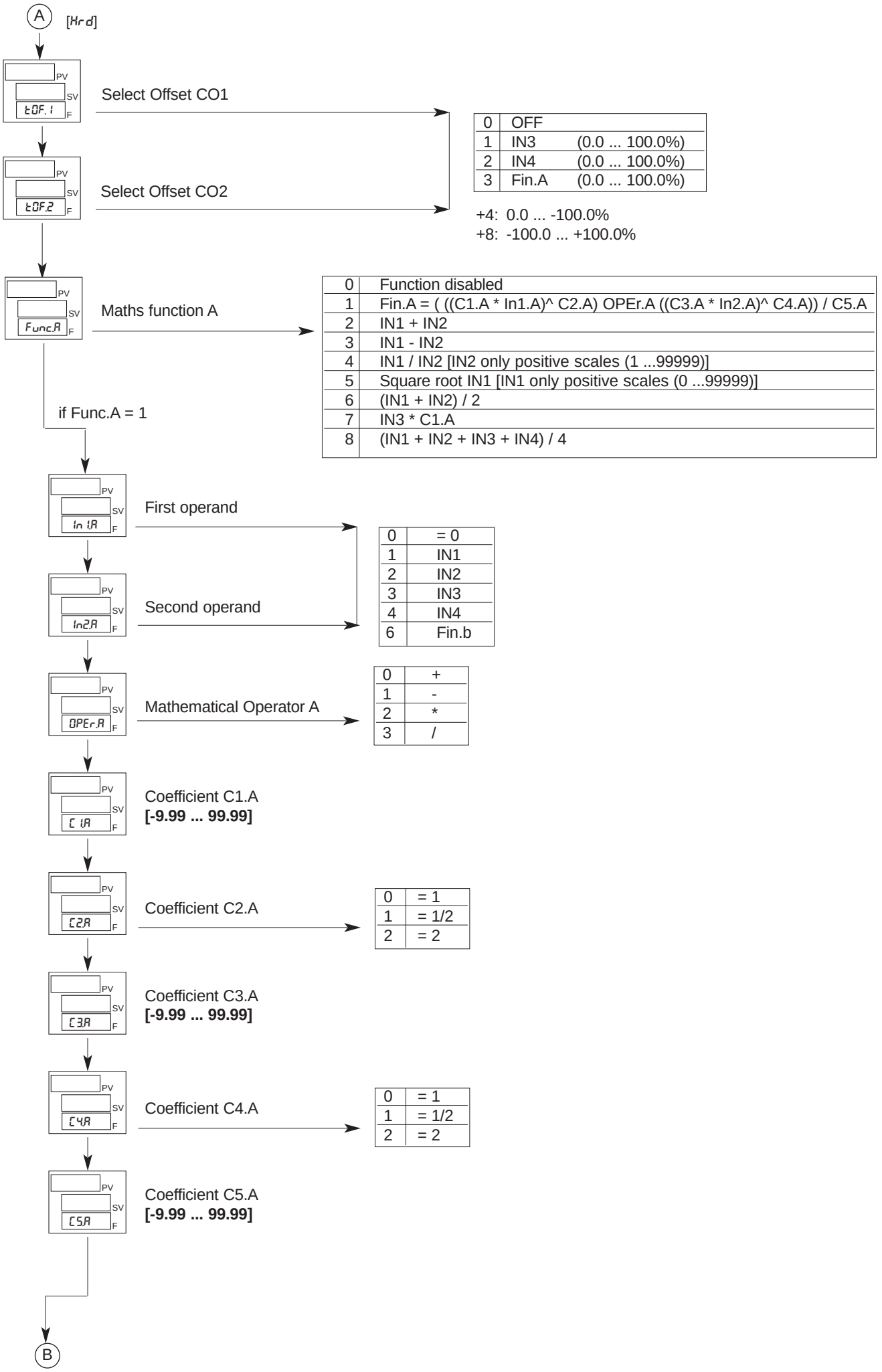
	Control type
0	PID heat / cool
1	ON – OFF heat
2	ON – OFF cool
3	ON – OFF heat / cool
4	PID heat + ON – OFF cool
5	ON – OFF heat + PID cool
6	PID heat + cool with Relative Gain (see “Notes on Operation”)

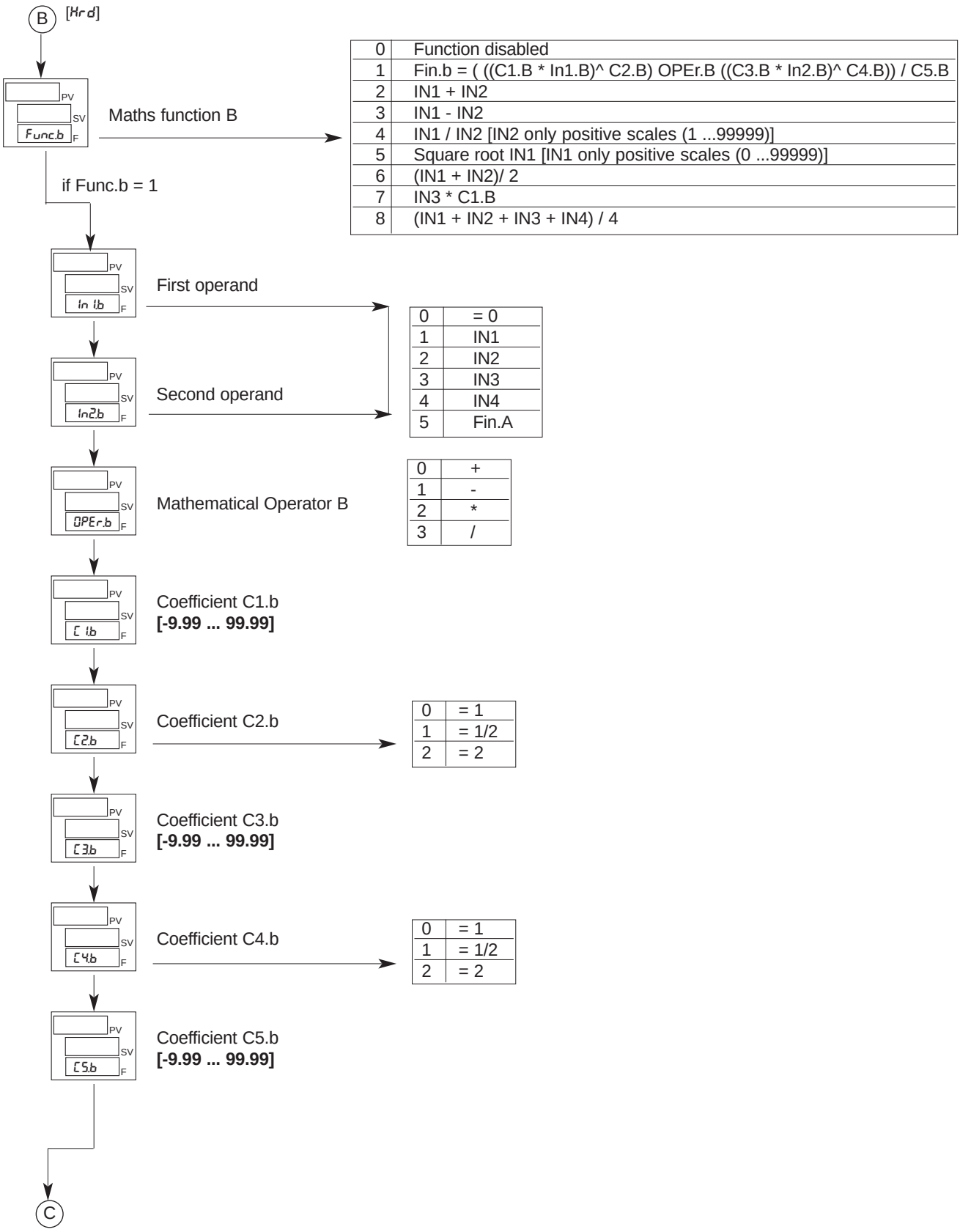
+16: to enable LBA alarm
+32: high-resolution control calculation
+64: local manual power within limits Lo.P/Hi.P
+128: to avoid the integral power reset after setpoint variations (from version 1.44)

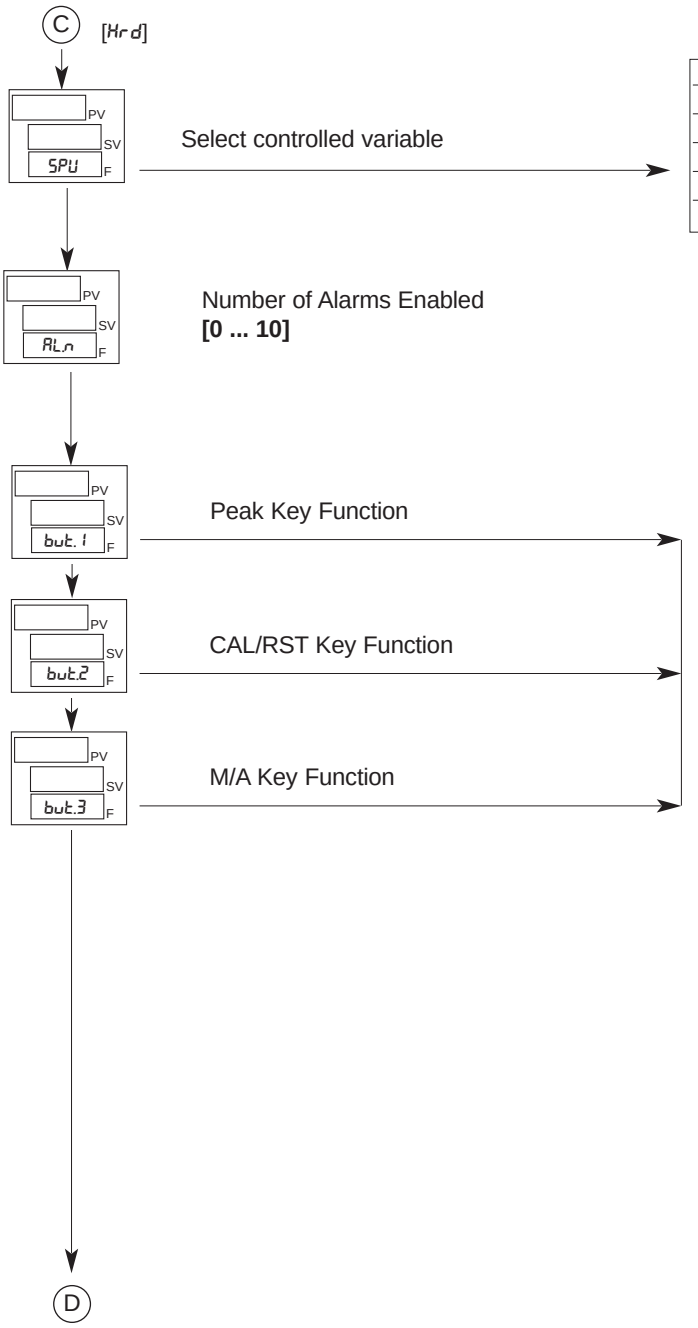
Power limit type 1 (CO1)

Power limit type 2 (CO2)

0	max Hi.P, min Lo.P
1	max Hi.P, min Lo.P proportional to IN3
2	max Hi.P, min Lo.P proportional to IN4
3	max Hi.P, min = 0
4	max = 0, min Lo.P
5	max Hi.P proportional to IN3, min = 0
6	max = 0, min Lo.P proportional to IN4


A
[Hrd]
PV
SV
tOF.1
F
Select Offset CO1
tOF.2
Select Offset CO2
0 OFF
1 IN3 (0.0 ... 100.0%)
2 IN4 (0.0 ... 100.0%)
3 Fin.A (0.0 ... 100.0%)
+4: 0.0 ... -100.0%
+8: -100.0 ... +100.0%
Func.A
Maths function A
0 Function disabled
1 Fin.A = (((C1.A * In1.A)^ C2.A) OPEr.A ((C3.A * In2.A)^ C4.A)) / C5.A
2 IN1 + IN2
3 IN1 - IN2
4 IN1 / IN2 [IN2 only positive scales (1 ...99999)]
5 Square root IN1 [IN1 only positive scales (0 ...99999)]
6 (IN1 + IN2) / 2
7 IN3 * C1.A
8 (IN1 + IN2 + IN3 + IN4) / 4
if Func.A = 1
In1A
First operand
In2A
Second operand
0 = 0
1 IN1
2 IN2
3 IN3
4 IN4
6 Fin.b
OPErA
Mathematical Operator A
0 +
1 -
2 *
3 /
C1A
Coefficient C1.A
[-9.99 ... 99.99]
C2A
Coefficient C2.A
0 = 1
1 = 1/2
2 = 2
C3A
Coefficient C3.A
[-9.99 ... 99.99]
C4A
Coefficient C4.A
0 = 1
1 = 1/2
2 = 2
C5A
Coefficient C5.A
[-9.99 ... 99.99]
B

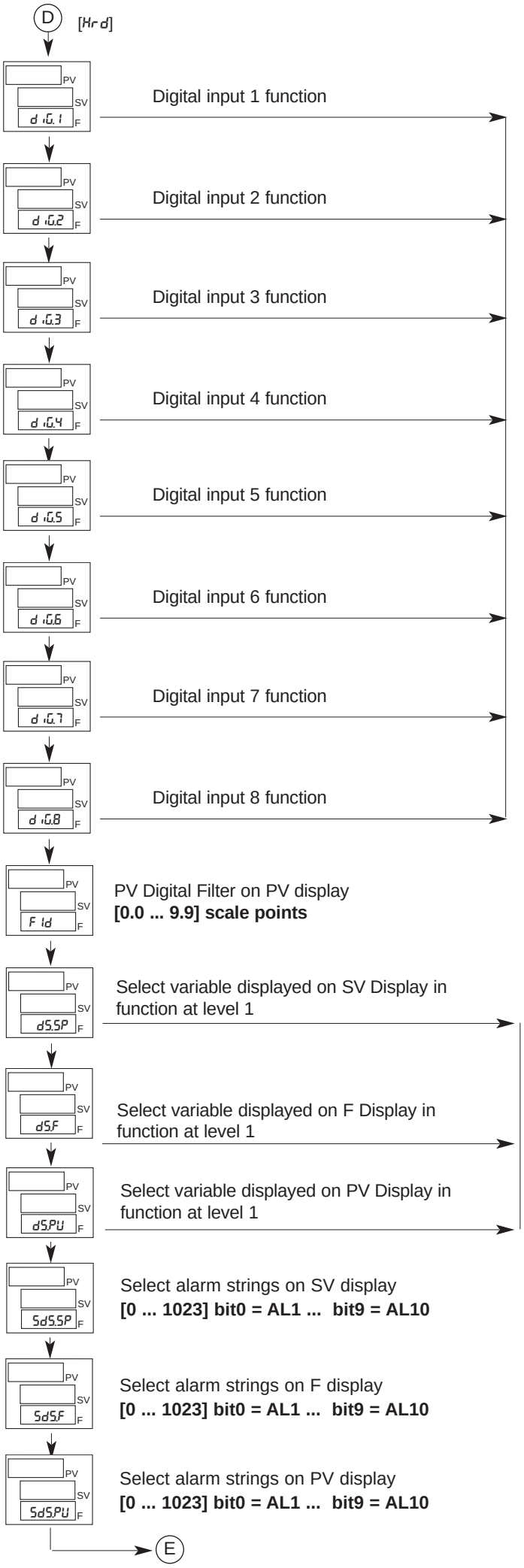

B
[Hrd]
PV
SV
Func.b
F
Maths function B
0 Function disabled
1 Fin.b = (((C1.B * In1.B)^ C2.B) OPEr.B ((C3.B * In2.B)^ C4.B)) / C5.B
2 IN1 + IN2
3 IN1 - IN2
4 IN1 / IN2 [IN2 only positive scales (1 ...99999)]
5 Square root IN1 [IN1 only positive scales (0 ...99999)]
6 (IN1 + IN2)/ 2
7 IN3 * C1.B
8 (IN1 + IN2 + IN3 + IN4) / 4
if Func.b = 1
In1.b
First operand
In2.b
Second operand
0 = 0
1 IN1
2 IN2
3 IN3
4 IN4
5 Fin.A
OPEr.b
Mathematical Operator B
0 +
1 -
2 *
3 /
C1.b
Coefficient C1.b
[-9.99 ... 99.99]
C2.b
Coefficient C2.b
0 = 1
1 = 1/2
2 = 2
C3.b
Coefficient C3.b
[-9.99 ... 99.99]
C4.b
Coefficient C4.b
0 = 1
1 = 1/2
2 = 2
C5.b
Coefficient C5.b
[-9.99 ... 99.99]
C



0	IN1
1	IN2
2	IN3
3	IN4
4	Fin.A
5	Fin.b

	Function
0	Disabled (no function)
1	Setpoint LOC / REM
2	HOLD IN1
3	Reset memory latch
4	Selection SP1 / SP2
5	Start / Stop Self Tuning
6	Start / Stop Auto Tuning
7	Set / Reset outputs OUT 1 ... OUT 8 (for but.1 only)
8	Peak ON + (maximum) IN1
9	Peak ON - (minimum) IN1
10	Peak ON - peak (maximum peak - minimum peak) IN1
11	Reset memory peak IN1
12	Reset alarms / peak IN1
13	Select manual local / automatic
14	Select manual remote / automatic
15	Check calibration strain-gauge IN1 (6-wire probe)
16	Calibrate strain-gauge IN1
17	U.CAL calibration (from version 1.44)
23	RESET TARE IN1 (only in manual mode and only from 0 ... 4,2% of input scale)
34	HOLD IN2
40	Peak ON + (maximum) IN2
41	Peak ON - (minimum) IN2
42	Peak ON - peak (maximum peak - minimum peak) IN2
43	Reset memory peak IN2
44	Reset alarms / peak IN2
47	Check calibration strain-gaugeIN2 (6-wire probe)
48	Calibrate strain-gauge IN2
55	RESET TARE IN2 (only in manual mode and only from 0 ... 4,2% of input scale)

for but3 only, adding +64 to value shown in table, disable “back menu” function (immediate exit from configuration menus with key combination MAN AUTO + F).



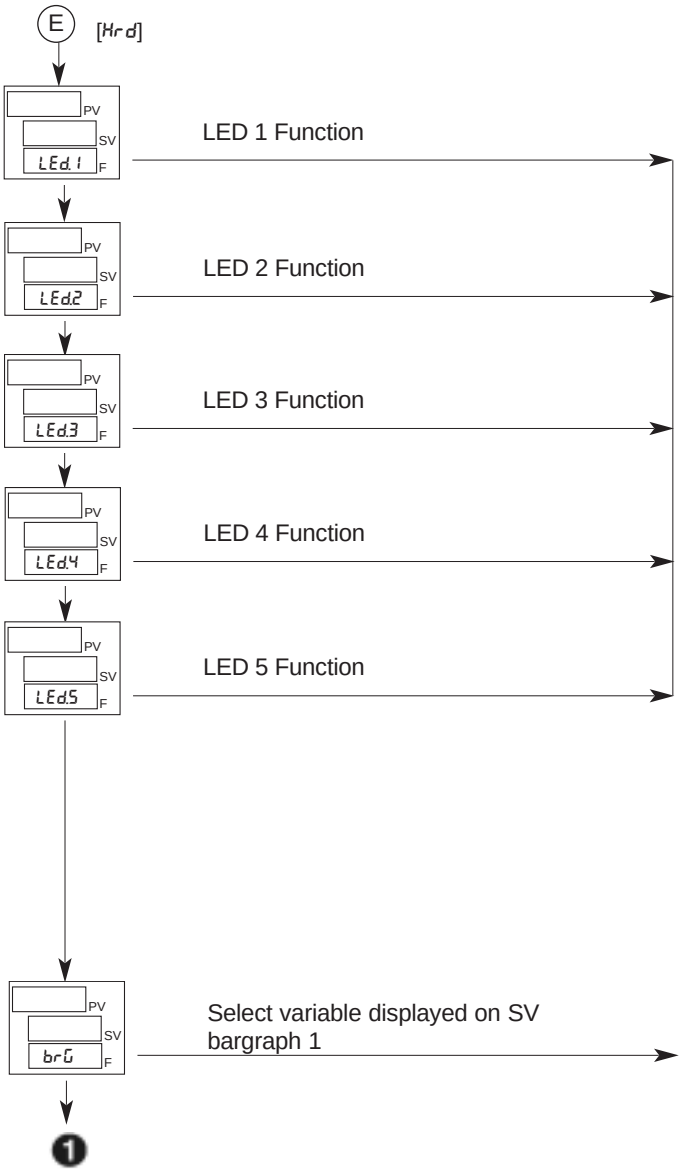
	Function
0	Disabled (no function)
1	Setpoint LOC / REM
2	HOLD IN1
3	Reset alarm latch
4	Selection SP1 / SP2
5	Start / Stop Self Tuning
6	Start / Stop Auto Tuning
7	Set / Reset outputs OUT 1 ... OUT 4 (for d iG. 1, d iG.2 only)
8	Peak ON + (maximum) IN1
9	Peak ON - (minimum) IN1
10	Peak ON - peak (maximum peak - minimum peak) IN1
11	Reset memory peak IN1
12	Reset memory alarms / peak IN1
13	Selection manual local / automatic
14	Selection manual remote / automatic
15	Check calibration strain-gauge IN1 (6-wire probe)
16	Calibration strain-gauge IN1
17	Software off/on
18	Block key
19	Raise manual local power value
20	Lower manual local power value
21	Raise value of active setpoint
22	Lower value of active setpoint
23	PID group selection - bit0 of (RP id- 1)
24	PID group selection - bit1 of (RP id- 1)
25	PID group selection - bit2 of (RP id- 1)
26	Remoting key F
27	Remoting key INC
28	Remoting key DEC
29	RESET TARE IN1 (only in manual mode and only from 0 ... 4,2% of input scale)
30	Change color of PV display
31	Power-OFF
33	Reset memory latch + reset disable alarms until first intercept
34	HOLD IN2
35	Reset memory latch + software on/off
40	Peak ON + (maximum) IN2
41	Peak ON - (minimum) IN2
42	Peak ON - peak (maximum peak - minimum peak) IN2
43	Reset memory peak IN2
44	Reset alarms / peak IN2
47	Check calibration strain-gaugeIN2 (6-wire probe)
48	Calibrate strain-gauge IN2
61	RESET TARE IN2 (only in manual mode and only from 0 ... 4,2% of input scale)

By adding the following numbers to the value shown in the table, you can enable a series of supplemental functions:
+64: input in denied logic
+128: force logic state 1 (ON)

	Function
0	SSP - active setpoint
1	IN1
2	IN2
3	IN3
4	IN4
5	CO1 - Control output 1
6	CO2 - Control output 2
7	OUTP - Controller output
8	Retransmission output
9	Fin.A
10	Fin.b
11	PV (*)

for dSSP only, +16 red PV display

(*)The PV visualization never goes over the range limit, even if +8 in dPS.x is setted.



0	No function
1	MAN / AUTO controller
2	LOC / REM
3	HOLD IN1
4	HOLD IN2
5	Self Tuning on
6	Auto Tuning on
7	Repeat logic input 1
8	Repeat logic input 2
9	Error (broken probe)
10	Softstart running
11	Indicate SP1 / SP2
12	setpoint gradient running
13	AL1
14	AL2
15	AL3
16	AL1 or AL2
17	AL1 or AL2 or AL3
18	AL1 and AL2
19	AL1 and AL2 and AL3
20	Check calibration IN1
21	Check calibration IN2
28	Relay state OUT 1
29	Relay state OUT 2
30	Relay state OUT 3
31	Relay state OUT 4

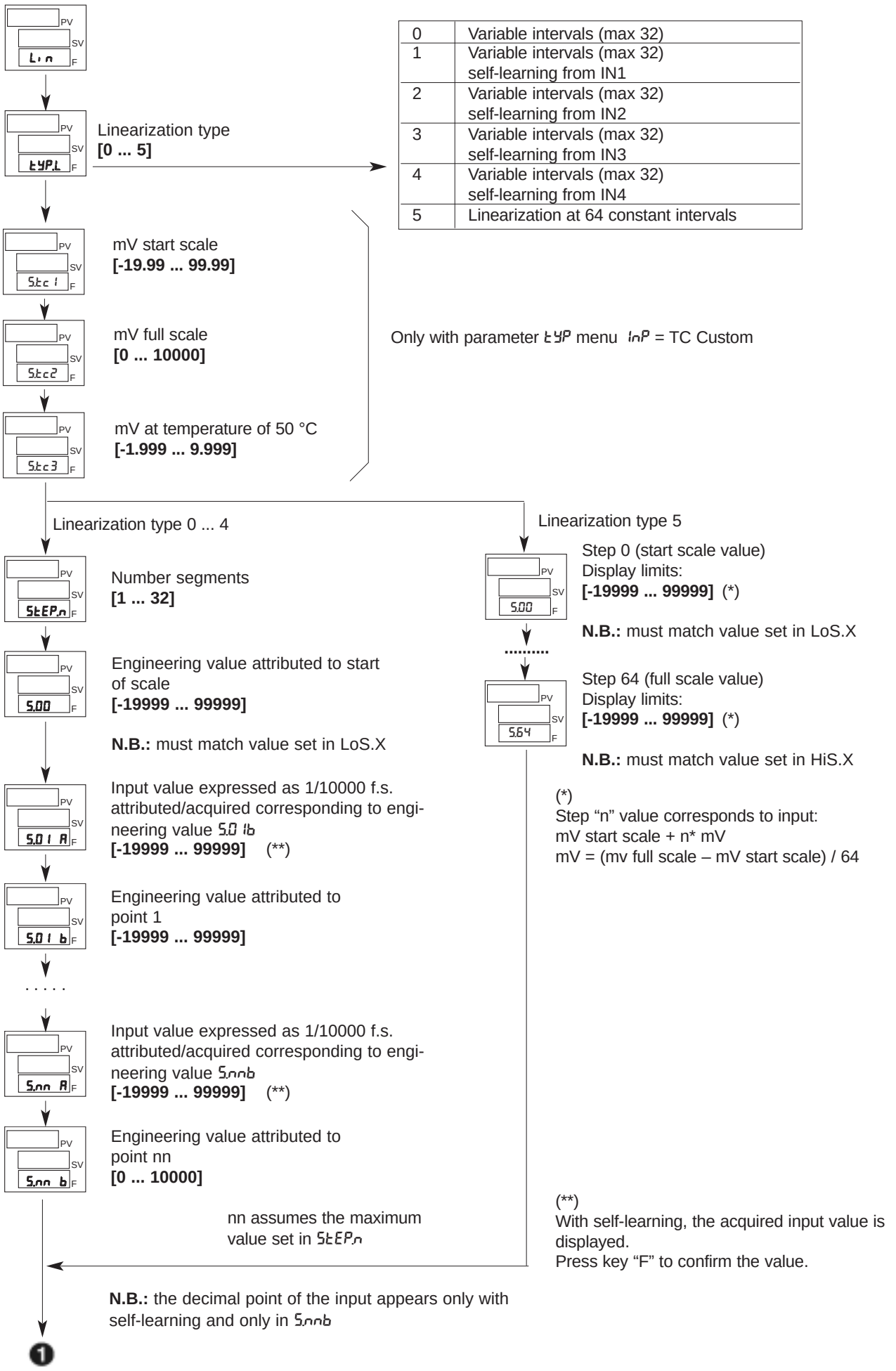
+32 LED flashes if on

+64 LED state reversed

0	CO1 - Control output 1
1	CO2 - Control output 2
2	OUTP - Controller output

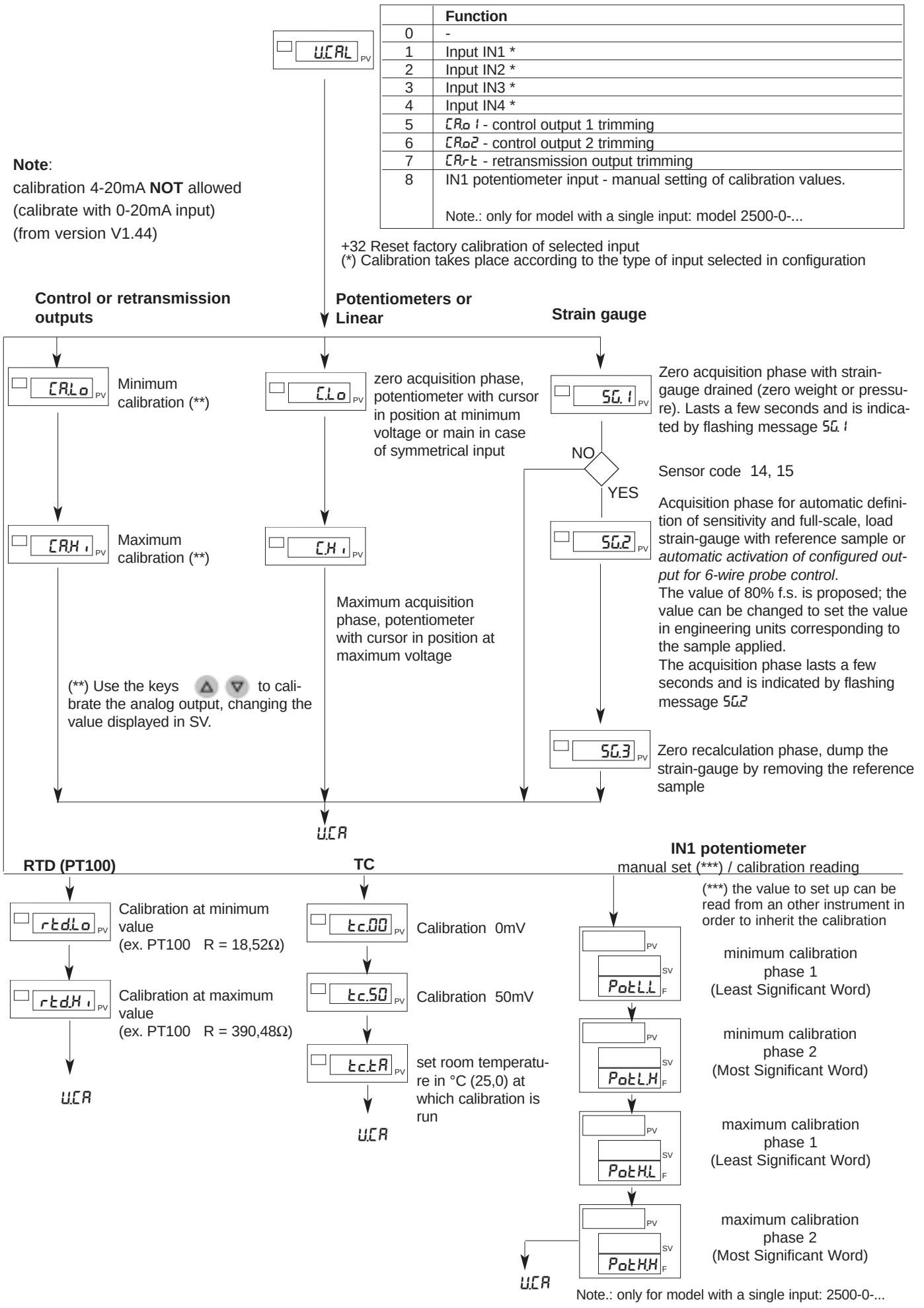
LIn Input Linearization

This menu lets you run custom linearization.



U.CA User Calibration

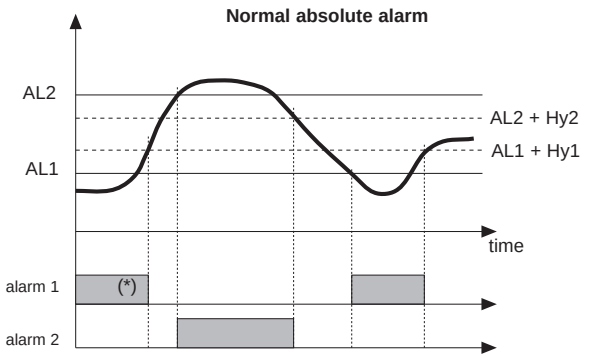
This menu lets you run user calibration



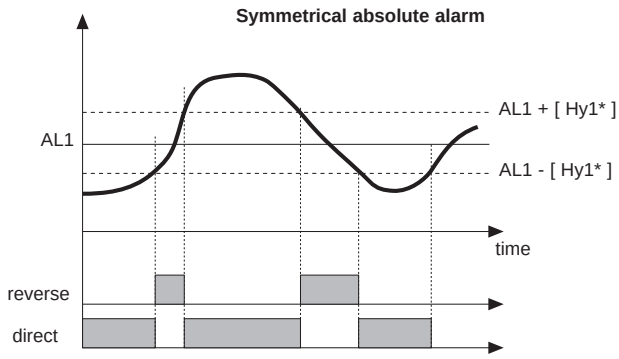
HOLD Function

The input value and alarms are frozen while the logic input is closed.
With logic input closed, a reset turns OFF both the relay outputs and the alarms latch.

Alarms

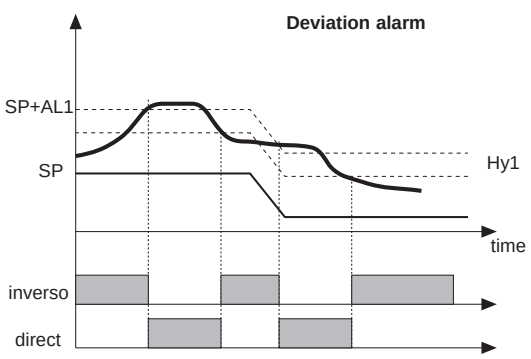


For AL1 = reverse absolute alarm (low) with positive Hyst1, AL1 t = 1
(*) = OFF if disabled on power-up
For AL2 = direct absolute alarm (high) with negative Hyst2, AL2 t = 0

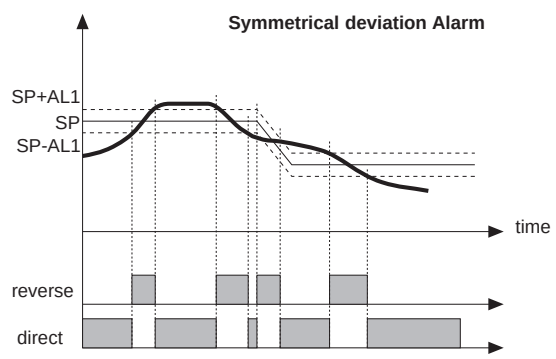


For AL1 = symmetrical Lo absolute alarm with Hyst1, AL1 t = 5
For AL1 = symmetrical Hi absolute alarm with Hyst1, AL1 t = 4

* Minimum hysteresis = 2 scale points



For AL1 = Lo deviation alarm with negative Hyst 1, AL1 t = 3
For AL1 = Hi deviation alarm with negative Hyst 1, AL1 t = 2



For AL1 = Symmetrical Lo deviation alarm with Hyst 1, AL1 t = 7
For AL1 = Symmetrical Hi deviation alarm with Hyst 1, AL1 t = 6

N.B.: For deviation alarms (At.n = deviation) with different reference quantities (Ar.n), which are set with different decimal points, the switch setpoint always refers to scale points without considering decimal point.
ex.: if Ar.n = 0 (referred to IN1) and At.n = 6 (deviation referred to IN3) and IN1 with dP = 1, IN3 with dP = 2 AL1 = 200.0 IN3 = 10.00 dS.SP = 1, the alarm setpoint is 300.0

Control actions

Proportional Action:
action in which contribution to output is proportional to deviation at input (deviation = difference between controlled variable and setpoint).
Derivative Action:
action in which contribution to output is proportional to rate of variation input deviation.
Integral Action:
action in which contribution to output is proportional to integral of time of input deviation.

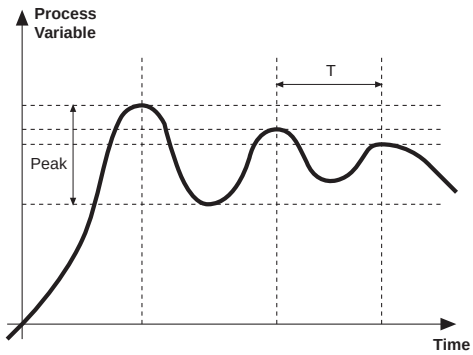
Influence of Proportional, Derivative and Integral actions on response of process under control

* An increase in P.B. reduces oscillations but increases deviation.
* A reduction in P.B. reduces the deviation but provokes oscillations of the controlled variable (the system tends to be unstable if P.B. value is too low).
* An increase in Derivative Action corresponds to an increase in Derivative Time, reduces deviation and prevents oscillation up to a critical value of Derivative Time, beyond which deviation increases and prolonged oscillations occur.
* An increase in Integral Action corresponds to a reduction in Integral Time, and tends to eliminate deviation between the controlled variable and the setpoint when the system is running at rated speed.

If the Integral Time value is too long (Weak integral action), deviation between the controlled variable and the set-point may persist.
Contact GEFRAN for more information on control actions.

Manual Tuning

A) Enter the setpoint at its working value.
B) Set the proportional band at 0.1% (with on-off type setting).
C) Switch to automatic and observe the behavior of the variable. It will be similar to that in the figure:
D) The PID parameters are calculated s follows: Proportional band

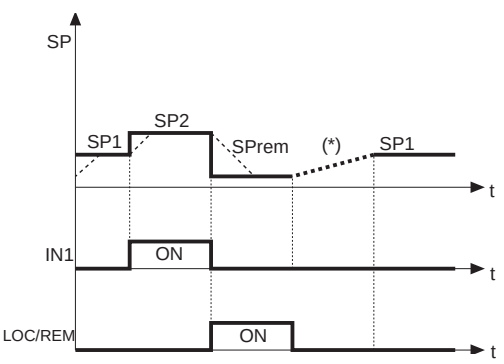


$$P.B.= \frac{Peak}{V\ max - V\ min} \times 100$$

(V max - V min) is the scale range.
Integral time: It = 1.5 x T
Derivative time: dt = It/4

E) Switch the unit to manual, set the calculated parameters. Return to PID action by setting the appropriate relay output cycle time, and switch back to Automatic.
F) If possible, to optimize parameters, change the setpoint and check temporary response. If an oscillation persists, increase the proportional band. If the response is too slow, reduce it.

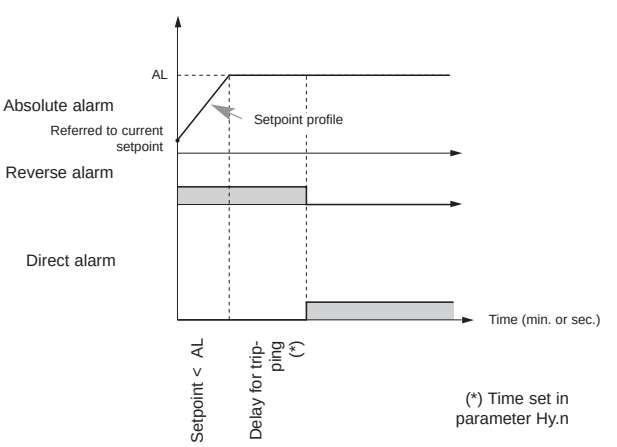
Multiset function, Set gradient



(*) if the set gradient is set

The multiset function is enabled in hd.1.
The gradient function is always enabled.
You can select between setpoint 1 and setpoint 2 with the faceplate key or with digital input.
You can display the setpoint 1-2 selection by means of LED.
SET GRADIENT: if set to ≠0, the setpoint is assumed equal to PV at power-on and auto/man switchover. With gradient set, it reaches the local setpoint or the one selected.
Every variation in setpoint is subject to a gradient.
The set gradient is inhibited at power-on when self-tuning is engaged.
If the set gradient is set to ≠0, it is active even with variations of the local setpoint, settable only on the relative SP menu.
The control setpoint reaches the set value at the speed defined by the gradient.

Twin setpoint application
(ramp + hold + time expiration alarm)



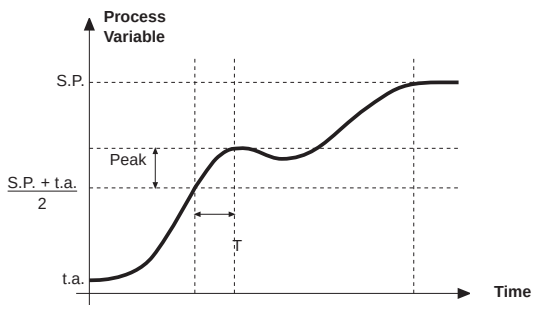
(*) Time set in parameter Hy.n

Software ON/OFF switching function

How to switch the unit OFF: hold down the “F” and “Raise” keys simultaneously for 5 seconds to deactivate the unit, which will go to the OFF state while keeping the line supply connected and keeping the process value displayed. The SV display is OFF and “OFF” appears in the F display.
All outputs (alarms and controls) are OFF (logic level 0, relays de-energized) and all unit functions are disabled except the switch-on function and digital communication.
How to switch the unit ON: hold down the “F” key for 5 seconds and the unit will switch OFF to ON. If there is a power failure during the OFF state, the unit will remain in OFF state at the next power-up (ON/OFF state is memorized).
The function is normally enabled, but can be disabled by setting the parameter Prot = Prot +16. This function can be assigned to a digital input (d.i.G), not é subject to the disabilitazione from parameter “Prot” and excludes deactivation from the keyboard.

Self-Tuning
The function works for single output systems (heating or cooling) and double action (heating/cooling).
The self-tuning action calculates optimum control parameter values during process startup.
The variable (for example, temperature) must be that assumed at zero power (room temperature).
The controller supplies maximum power until an intermediate value between starting value and setpoint is reached, after which it zeros power.
PID parameters are calculated by measuring overshoot and the time needed to reach peak. When calculations are finished, the system disables automatically and the control proceeds until the setpoint is reached.

How to activate self-tuning:
A. Activation at power-on
1. Set the setpoint to the required value
2. Enable selftuning by setting the **Stu** parameter to 2 (CFG menu)
3. Turn off the instrument
4. Make sure the temperature is near room temperature
5. Turn on the instrument again



B. Activation from keyboard
1. Make sure that key M/A is enabled for Start/Stop selftuning (code but = 6 Hrd menu)
2. Bring the temperature near room temperature
3. Set the setpoint to the required value
4. Press key M/A to activate selftuning (Attention: selftuning interrupts if the key is pressed again)

The procedure runs automatically until finished, when the new PID parameters are stored: proportional band, integral and derivative times calculated for the active action (heating or cooling). In case of double action (heating or cooling), parameters for the opposite action are calculated by maintaining the initial ratio between parameters (ex.: CPb = HPb * K; where K = CPb / HPb when self-tuning starts). When finished, the **Stu** code is automatically cancelled.

Notes:
-The procedure does not start if the temperature is higher than the setpoint (heating control mode) or if the temperature is lower than the setpoint (cooling control mode).
In this case , the Stu code is not cancelled.
-It is advisable to eneable one of the configurable LEDs to signal selftuning status.By setting one of parameters LED1, LED2, LED3=4 or 20 on the Hrd menu, the respective LED will be on or flashing when selftuning is active.

Notes.: Action not considered in the type of control ON/OFF

Auto-Tuning

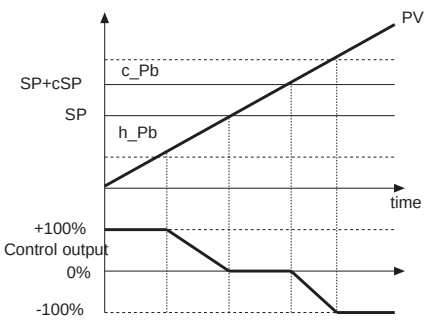
Enabling the auto-tuning function blocks the PID parameter settings.
It can be one of two types: permanent (continuous) or single-action (one-shot).

* Continuous auto-tuning is activated via the Stu parameter (values 1, 3, 5). It continuously reads system oscillations, immediately seeking the PID parameter values that reduce the current oscillation. It does not engage if the oscillations drop below 1.0% of the proportional band.
  It is interrupted if the set-point is changed, and automatically resumes with a constant set-point. The calculated parameters are not saved if the instrument is switched off, if the instrument is switched to manual, or if the configuration code is disabled. The controller resumes with the parameters programmed before auto-tuning was enabled.
  The calculated parameters are saved when the function is enabled from the digital input or from the A/M (start/stop) key if the procedure is interrupted.

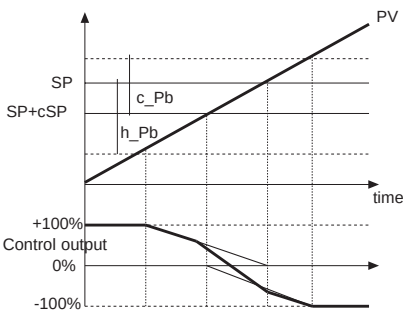
* One-shot auto-tuning can be enabled manually or automatically. It is activated via the Stu parameter (as can be seen on the table, the values to be set depend on whether Self-tuning or Soft-start is enabled.).
  It is useful for calculation of PID parameters when the system is around the set-point. It produces a variation on the control output at a maximum of ± 100% of the current control power limited by h.PH - h.PL (hot), c.PH - c.PL (cold), and assesses the effects in timed overshoot. The calculated parameters are saved.
  Manual activation (Stu code = 8, 10, 12) via direct setting of the parameter or via digital input or via key.
  Automatic activation (Stu code = 24, 26, 28 with error band of 0.5%) when the PV-SP error exceeds the preset band (programmable to 0.5%, 1%, 2%, 4% of full scale).

NB: at power-up, or after a change of set-point, automatic activation is inhibited for a time equal to five times the integral time, with a minimum of 5 minutes.
The same time has to run after one-shot.
One-shot auto-tuning is not active for PVs lower than 5% and higher than 95% of scale.

Controls



Control output with proportional action only if proportional heating band overlaps proportional cooling band.



Control output with proportional action only if proportional heating band overlaps proportional cooling band.

PV = process value
SP = heating setpoint
SP+cSP = cooling setpoint

h_Pb = proportional heating band
c_Pb = proportional cooling band

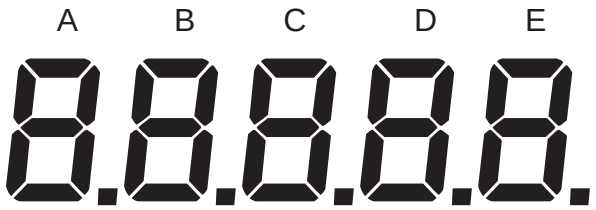
Heating/Cooling control with relative gain

In this control mode (enabled with Ctr = 14 parameter) the type of cooling has to be specified.
Cooling PID parameters are therefore calculated based on heating parameters according to the specified ratio.
(for example: C.ME = 1 (oil), H_Pb = 10, H_dt = 1, H_It = 4 implies: C_Pb = 12,5, C_dt = 1, C_It = 4)
We advise you to apply the following values when setting output cycle times:
Air T Cool Cycle = 10 sec.
Oil T Cool Cycle = 4 sec.
Water T Cool Cycle = 2 sec.

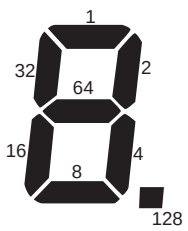
String assigned to an alarm
Each enabled alarm can be assigned an alphanumeric string composed of 5 characters, to be displayed on the PV, SV or F in level 1.

The string of alarm n (with n from 1 to 10) is enabled by means of parameter At.n = +512 (to display the string when the alarm trips) or At.n = +1024 (to display the string when the alarm limit is exceeded in case of alarm with time delay).

The string is composed of parameters SdA.n, Sdb.n, SdC.n, Sdd.n and SdE.n, which define characters A, B, C, D and E of the PV/SV/F display.



The 8 parameter set bits identify the 7 display segments and the decimal point; they are shown below in decimal values to be added, corresponding to the segments to be switched on.



Example: to compose character “3” you have to set the parameter corresponding to the value 1+2+4+8+64 = 79

The table with the settings corresponding to the most-used characters appears below.

Character to be displayed	Parameter setting
0	63
1	6
2	91
3	79
4	102
5	109
6	125
7	7
8	125
9	111
-	128

Character to be displayed	Parameter setting
a	95
A	119
b	124
c	88
C	57
d	94
e	123
E	121
F	113
G	61
h	116
H	118

Character to be displayed	Parameter setting
i	4
I	6
L	56
M	55
n	84
o	92
O	63
P	115
r	115
S	109
t	120
U	62

The alarm string and the display on which it appears are set by means of parameters SdS.SP, SdS.F and SdS.PV on the Hrd menu: they are enabled with bit weight according to the number of alarm strings to be shown on each display.

Alarm	AL.10	AL.9	AL.8	AL.7	AL.6	AL.5	AL.4	AL.3	AL.2	AL.1
Parameter setting	512	256	128	64	32	16	8	4	2	1

In case of simultaneous strings on the PV display, the string corresponding to the lower alarm number has priority.

Example: to display the strings corresponding to alarms 1, 2, 4 on display SV and 3, 5 on display F, you have to set:

SdSS.P = 1 + 2 + 8 = 11
SdS.F = 4 + 16 = 20
SdS.PU = 0

Maths functions

The maths functions configurable by means of parameters Func.A and Func.b define two additional inputs Fin.A and Fin.b, each starting with one or two operands.
The operands can be the main physical inputs (In.1/In.2), the auxiliary physical inputs (In.3/In.4) or the added inputs themselves (Fin.A/Fin.b); the last case lets you put the two functions in cascade to create a more complex added input.
Refresh time is 20ms.

The scale of the maths function derives from the scale of its operands; it cannot be changed, and is displayed on the Inf menu (LoS.5/HiS.5 for Fin.A, LoS.6/HiS.6 for Fin.b).
The decimal point position on the math function scale derives from the decimal point positions of the operands (min. dPS value of operands); it cannot be changed, and is displayed on the Inf menu (dPS.5 for Fin.A, dPS.6 for Fin.b).
The maths function error code derives from the error code of the operands (first Err value other than zero of operands); it cannot be changed, and is displayed on the Inf menu (Err.5 for FIn.A, Err.6 for Fin.b).

Definition is by fixed formulas or by generic polynomial:

$$Fin.A = \frac{(C1.A * In1.A)^{C2.A} \; OPEr.A \; (C3.A * In2.A)^{C4.A}}{C5.A}$$

with

In1.A / In2.A:	In.1, In.2, In.3, In.4, Fin.b
C1.A / C3.A=C5.A:	range [-9.99 ... 99.99]
OPEr.A:	+,-,*,/
C2.A / C4.A:	0 -> 1, 1 -> 1/2, 2 -> 2

Maths inputs Fin.A and Fin.b can be used as normal inputs in defining the process variable PV, remote setpoint, remote manual, alarms or quantities to be retransmitted.

RATIO CONTROLLER

Settings

Level 1 display of ratio calculation starting with vers. 1.14

Set the following parameters:

“CFG” menu	parameter	SP.r = 4 (5)	math function A (B)
“CFG” menu	parameter	M.A.t = 0	mandatory function mode
“Hrd” menu	parameter	Func.A = 7	(IN3 * C1.A)
“InP.3” menu	parameter	tYP.3 = x	select remote input type
“Hrd” menu	parameter	C1.A = xx	value of coefficient (can be changed manually)

You have to enable remote condition “REM” of input IN3 (from key, from configured digital input or from serial).

N.B.: the ratio is also calculated automatically at Man/Auto switching and the value is written in C1.A

INSTALLATION PROCEDURE FOR LOAD CELL WITHOUT SAMPLE WEIGHT

There is a procedure that lets you calibrate the instrument without having to use a sample weight, but only with the characteristic sensitivity parameter of the load cell.
The procedure is activated by means of Parameter tyP.x on the InP.x menu, set to 28 (or 30) in case of a unidirectional load cell, or to 29 (or 31) in case of a bidirectional cell and TR load cell (“Roller Tension”).

Procedure

1. Go to the **InP.x** menu
2. Set **tyP.x** to 28 (or 29), 30 (or 31)
3. Set minimum scale in **LoS.x**
   (for example,: “0” for unidirectional load cell, or **-FS** (Full Scale) for bidirectional load cell and TR load cell).
4. Set maximum scale in **HiS.x**
   (with only one load cell = FS of cell; with more than one equal load cell set the sum of the FSs).
5. In parameter **SGSE.x**, set the value of “**F.R.OUT**” (sensitivity) printed on the plate of the load cell (in case of more than one equal load cell in parallel, set the arithmetic average of the sensitivity).
6. The value shown on the “**PV**” display is the system tare.
   Use parameter **OFS.x** (on the **InP.x** menu) to reset the value
   (for example: for value 10.00 read on the PV, set **OFS.x** = -10.00).

   As an alternative, you can reset the tare by using the “**Reset tara Inx**” function assigned to a digital input (parameters **dig.1** or **dig.2**) or to the front panel key  (parameter **but.3**) on the “**Hrd**” menu.

“POWER OFF” FUNCTION

Typical application: protection of extruders in case of alarm.
The “power OFF” function is obtained by setting digital input code diG.x (1÷8) = 31.
Configure a second digital input (or front panel key) as MAN/AUTO.
Set the manual power value you want in parameter “AMP”.
When the digital input configured as “power OFF” becomes active, i.e., is put into ON state, it forces the control output to zero in automatic and in manual.

Starting from automatic:
When the digital input configured as “power OFF” becomes active, i.e., is put into ON state, it forces the control output to zero.
By putting the digital input configured as “power OFF” into OFF state, the instrument stays locked in “power OFF,” i.e., with the output forced to zero.
To resume control, the instrument has to be switched manually to MAN, after which it resumes control of manual power starting from zero.
The switch to automatic is restricted to the conditions set in parameter “M.A.t” (with regard to the value assumed by the set point).

Starting from manual:
When the digital input configured as “power OFF” becomes active, i.e., is put into ON state, it forces the control output to zero.
By putting the digital input configured as “power OFF” into OFF state, the instrument, already in manual, resumes from manual condition starting from zero.

5 • TECHNICAL SPECIFICATIONS

This section contains a list of the Technical Specifications for the 2500 Controller.

Display	1 x 5 red/green bicolor digits, height 13mm 2 x 5 red digits, height 10mm 2 x red bargraph, 10/20 led 5 x led red
Keys	6 mechanical keys (Peak, Cal/Rst, Man/Auto, INC, DEC, F)
Accuracy	0.1% f.s. ±1 at 25°C room temperature
Thermal drift	< 150ppm/°C on f.s. for current/voltage and strain-gauge inputs
IN1, IN2 main input/s	Strain-gauge: 350Ω, sensibility 1,5...4mV/V, with probe power supply 5/10Vdc ±5% Potentiometer: ≥ 100Ω, Ri > 10MΩ @ 2,5Vdc Linear DC: ± 60mV, ± 100mV, ± 1V, ± 5V, ± 10V, Ri > 10M Ω 0/4...20mA, Ri = 50Ω TC, RTD Sampling time 2msec
TC type (Thermocouples) (ITS90)	J, K, R, S, T (IEC 584-1, CEI EN 60584-1,60584-2) a 64/32 segment custom linearization can be inserted
Cold junction error	0,1°C/ °C
RTD type (Temperature resistance) (ITS90) Max. line resistance for RTD	Pt100 (DIN 43760), 20Ω
Safety	Detection of short-circuit or opening of probes, no probe power; LBA alarm
IN3, IN4 auxiliary inputs	Potentiometer: 1...10KΩ, @ 10Vdc Linear DC: 10V, Ri > 2MΩ 0/4...20mA, Ri = 50Ω Sampling time 10ms
Linear scale ranges	-19999...99999, with configurable decimal point position
Controls	Double action (heat/cool) Pid, ON/OFF, calculation every 20ms
Control outputs	Continuous, resolution improved by 0,03%: isolation 1500V 0/2...10V, ± 10V max 25mA, short-circuit protection, 0/4...20mA, max load 500Ω
Type of relay contact OUT 1, OUT 2, OUT 3, OUT 4 outputs	NO (NC) 5A, 250V/30Vdc cosφ = 1
Digital inputs DI1, DI2, DI3, DI4	Isolation 1500V, sampling time 60ms 24Vdc, 5mA (PNP) or by voltage-free contact (NPN) max 5mA select PNP/NPN via configuration parameter
Expansion of digital outputs / inputs OUT 5, OUT 6, OUT 7, OUT 8	Isolation 1500V Inputs: PNP type 24Vdc, max 5mA Outputs: PNP with ext. power supply (Vext) 24Vdc ±25% max 100mA, short-circuit with PTC
OUT W analog retransmission	Continuous, resolution improved by 0,03%, isolation 1500V refresh every 2msec in sync with sampling of variables IN1 and IN2 0/2...10V, ± 10V max 25mA, short-circuit protection 0/4...20mA, max load 500Ω
Max. power limit	-100.0 ... 100.0%
Cycle time (for relay or logic outputs)	1...200sec
Softstart	0.0 ... 500.0min
Fault power setting	-100.0 ... 100.0%
Automatic blanking	Maintains PV value display
Configurable alarms	Up to 3 alarm functions assignable to an output and configurable of type: maximum, minimum, symmetrical, absolute, relative, LBA for AL1, AL2 calculation every 2ms in sync with sampling of variables IN1 and IN2
Alarm masking	Exclusion during warm up, memory, reset from faceplate and/or contact
Probe power supply	5Vdc, 10Vdc, for strain-gauge probes, max 200mA 2,5Vdc for potentiometers ≥ 100Ω
Transmitter power supply	24Vdc ±5%, max 100mA
Serial interface	RS485 isolation 1500V
Baudrate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bit/s
Protocol	MODBUS RTU
Power supply (switching type)	(standard) 100...240Vac/dc ±10% (optional) 20...27Vac/dc ±10% 50/60Hz, max 20VA protection via internal fuse, not replaceable by operator
Faceplate protection	IP54 (optional IP65)
Working / Storage temperature range	0...50°C/-20...70°C
Relative humidity	20...85% Ur non-condensing
Environmental working conditions	For indoor use, altitudes up to 2000m
Installation	Panel, removable faceplate
Installation specifications	Installation category II, pollution level 2, double isolation
Weight	700g

6 • MAINTENANCE

This section gives the information and the necessary warnings for routine maintenance of the 2500 controllers and contains a Troubleshooting Guide which should be read before seeking help from the Gefran Customer Service Assistance, in the event of instrument malfunction.

If installed and configured correctly according to the instructions and the recommendations provided in Sections 2 and 4 of these Instructions for use, the 2500 Controller will work normally without any need for maintenance, apart from the usual operations of cleaning the faceplate, and if necessary the internal parts of the instrument.

To gain access to the inside of the instrument (for example for cleaning or to check the jumpers) just undo the screw at the bottom of the faceplate and take out the instrument without having to disconnect the cables.
Make sure that the power is turned off upstream of the instrument however.
Remember that the 2500 Controller is not equipped with an ON/OFF switch.

Cleaning the Controller

To clean the faceplate and the case use only a cloth dampened in water or ethyl alcohol.
Do not use hydrocarbon-based solvents (trichiorethylene, petrol, etc.).
Do not use compressed air to remove dust from the electronic circuit boards, if necessary use a clean brush with soft bristles.

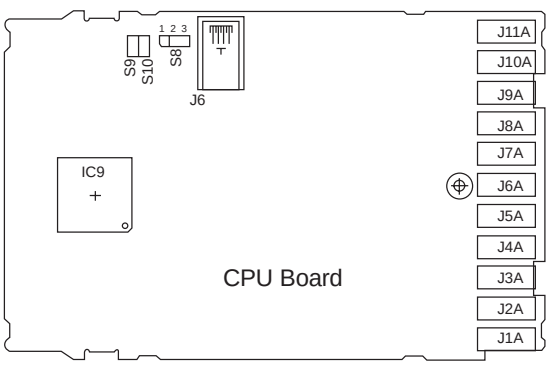
Repairs

Repairs to the Controller must only be carried out by qualified technicians, properly trained and authorized by Gefran.
Any attempts at repair or modification of the Controller hardware characteristics by unauthorized personnel will invalidate the warrantya.

Checking the jumpers

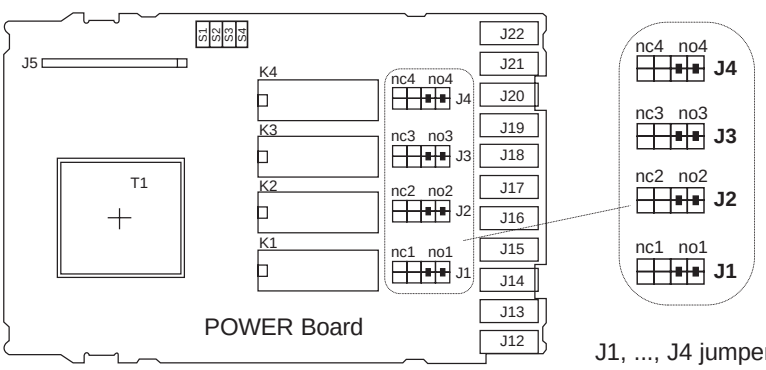
CPU Board

The component side of the CPU board contains the jumper S9 which enables (if on) access to the controller menus.



POWER Board

Jumpers J1, J2, J3, J4 for selection of contact type no/nc for the relay outputs are present on the component side of the POWER board, accessibility on welding side (LS).
Remove S1, ..., S4 jumpers to reverse OUT1, ..., OUT4 output status.



J1, ..., J4 jumpers are made with double jumper; move both jumpers in the requested position to change type of contact.

The controller contains components which are sensitive to electrostatic discharge, so the relevant precautions must be taken when handling the electronic circuit boards contained in it, in order to avoid permanent damage to components themselves.

Troubleshooting Guide

Symptom	Cause and Recommended remedy
The Controller display and Led do not come on	Controller power supply problem. Check that power is being supplied to terminals 10-11. make sure the power supply corresponds with the one stated in the order code: 2500 – x – x – x – x – x – 1 = 100..240Vac/dc 2500 – x – x – x – x – x – 0 = 20..27Vac/dc
The characters shown on the display are incomplete or illegible	Possible fault with one of the display segments. Check that all the segments are working properly by switching the controller off and then on again. When it is switched on again a self-diagnostic test is performed that checks intermittent start up of all the segments (displays the value 88888). If one or more segments do not light up contact your Gefran dealer.
When pressing down F none of the configuration menus can be accessed	If the problem occurs in the initial installation phase, it probably means that the Controller hardware configuration does not give the option of editing the preset parameters, apart from the setpoint value or the alarm point, at level 1 to display. (For modified of parameters jumper S9 on the CPU board).
When pressing down F not all of the parameters and/or configuration menus can be accessed	Access to some menus and/or parameters is controlled by a password (PAS) and by a protection code (Pro) which disables the configuration mode. To set the password and the protection code correctly refer to Section 4 “Configuration/Programming”.
Instead of the process variable the PV display shows one of the following: Lo - Hi - Sbr - Err - Ebr EbrLo - Errtd	In the first four cases it means that an input error has been found (for details refer to Section 3 - Functions). Err, means that in case of Pt100 probe, the input is in short circuit. In case of TC in short circuit, the PV display shows room temperature instead of the process variable. In case of input 4...20mA, it indicates that the transmitter is broken or not powered. Ebr means strain-gauge probe broken or not powered. EbrLo no power to probe Errtd third wire of PT100 probe broken or not connected

7 • TECHNICAL/COMMERCIAL INFORMATION

This section contains information regarding the Controller order codes and the main accessories available.

As stated in the Preliminary Warnings of these Instructions for Use, correct interpretation of the Controller order code allows the hardware configuration for the controller to be identified immediately and so it is essential to quote the order code each time the Gefran Customer Care Service is contacted for assistance with any problems.

Order code – Controller 2500

MODEL	
	2500

SECOND MAIN INPUT	
None	0
Strain-gauge / TC / RTD / Pot / Lin	1

AUXILIARY DIGITAL I/O	
None	0
In/Out 5...8	1

SECOND CONTROL OUTPUT	
None	0
Continuous ±10V (0/4...20mA)	1

POWER SUPPLY	
0	20...27Vac/dc
1	100...240Vac/dc

DIGITAL COMMUNICATION	
0	None
2	RS485
3	RS232
P	PROFIBUS DP (not available if option “W” is present)

RETRANSMISSION OUTPUT	
0	None
W	Analog 0/4...20mA (0...10V) (not available with Profibus DP configuration)

For information on the availability of codes please contact your Gefran dealer.

ACCESSORIES

• RS232 / TTL interface for GEFRAN instrument configuration

N.B. RS232 interface for PC configuration is supplied with the WINSTRUM programming software. Make connection with instrument powered but with inputs and outputs disconnected.

• ORDER CODE

WSK-0-0-0	Cable interface + CD Winstrum

APPENDIX

Display	Default	CONF	Description
Menu MAIN			
PU / SU / F	-		
SEt.P	0		Local Setpoint
SP. 1	100		Setpoint 1
SP.2	200		Setpoint 2
In. 1	-		Input IN1 main
In.2	-		Input IN2 main
In.3	-		Input IN3 auxiliary
In.4	-		Input IN4 auxiliary
F inA	-		Result math function A
F inb	-		Result math function b
C 1A			Coefficient math function A
C 1b			Coefficient math function B
AL. 1	100		Alarm 1 setpoint
AL.2	200		Alarm 2 setpoint
AL.3	300		Alarm 3 setpoint
AL.4	400		Alarm 4 setpoint
AL.5	500		Alarm 5 setpoint
AL.6	600		Alarm 6 setpoint
AL.7	700		Alarm 7 setpoint
AL.8	800		Alarm 8 setpoint
AL.S	900		Alarm 9 setpoint
AL. 10	1000		Alarm 10 setpoint
AP Id	-		PID group active
OutP	-		PID power
CO. 1	-		Control output 1
CO.2	-		Control output 2
Menu InF			
UPd	-		Software release
Cod	-		Instrument code
Err. 1	-		Error code for IN1
Err.2	-		Error code for IN2
Err.3	-		Error code for IN3
Err.4	-		Error code for IN4
Err.5	-		Error code for Fin. A
Err.6	-		Error code for Fin. b
dP5.5	-		Decimal point position Fin. A
dP5.6	-		Decimal point position Fin. b
Lo5.5	-		MIN scale limit Fin. A (read only)
Lo5.6	-		MIN scale limit Fin. b (read only)
H 15.5	-		MAX scale limit Fin. A (read only)
H 15.6	-		MAX scale limit Fin. b (read only)
UPdF	-		Fieldbus software version
CodF	-		Fieldbus instrument code (read only)
bAuF	-		Fieldbus Set Baudrate (read only)
Menu CFGPd			
StU	0		Type of Tuning
nP Id	1		Number of PID groups
tP Id	0		Type of variable for activation of PID parameter groups
Pb. 1	100.0		Proportional band, group 1
It. 1	4.0		Integral time, group 1
dt. 1	0.0		Derivative time, group 1
Pr5. 1	0.0		Reset power, group 1
UAL. 1	100		Activation setpoint group 1
Pb.2	100.0		Proportional band, group 2
It.2	4.0		Integral time, group 2
dt.2	0.0		Derivative time, group 2
Pr5.2	0.0		Reset power, group 2
UAL.2	200		Activation setpoint group 2
Pb.3	100.0		Proportional band, group 3
It.3	4.0		Integral time, group 3
dt.3	0.0		Derivative time, group 3
Pr5.3	0.0		Reset power, group 3
UAL.3	300		Activation setpoint group 3

Display	Default	CONF	Description
Pb.4	100.0		Proportional band, group 4
It.4	4.0		Integral time, group 4
dt.4	0.0		Derivative time, group 4
Pr5.4	0.0		Reset power, group 4
UAL.4	400		Activation setpoint group 4
Pb.5	100.0		Proportional band, group 5
It.5	4.0		Integral time, group 5
dt.5	0.0		Derivative time, group 5
Pr5.5	0.0		Reset power, group 5
UAL.5	500		Activation setpoint group 5
Pb.6	100.0		Proportional band, group 6
It.6	4.0		Integral time, group 6
dt.6	0.0		Derivative time, group 6
Pr5.6	0.0		Reset power, group 6
UAL.6	600		Activation setpoint group 6
Pb.7	100.0		Proportional band, group 7
It.7	4.0		Integral time, group 7
dt.7	0.0		Derivative time, group 7
Pr5.7	0.0		Reset power, group 7
UAL.7	700		Activation setpoint group 7
Pb.8	100.0		Proportional band, group 8
It.8	4.0		Integral time, group 8
dt.8	0.0		Derivative time, group 8
Pr5.8	0.0		Reset power, group 8
UAL.8	800		Activation setpoint group 8
LoP	0.0		MIN power limit
H IP	100.0		MAX power limit
C.tE	0		Type of cooling
c.SP	0.0		Deviation cooling setpoint
rSt	0		Manual Reset
ArS	0		Antireset
FFd	0.0		Feed Forward
Pr.dt	0		Process dead time
Pr.GA	0.0		Process gain
Pr.t 1	0.0		Main process time constant
db	0		Dead band
SoF	0.0		Softstart time
LbI.t	30.0		LBA alarm trip time
LbP	25.0		Power limit in LBA alarm state
AOP	0.0		Manual power at power-on or Auto/Man
FAP	0.0		Fault Action Power
G.SP	0.0		Setpoint gradient
G.S2	0.0		Setpoint 2 gradient
G.Out	0.0		Control output gradient
St.ud	0.1		Delta of power inc/dec from keys or digital inputs
Menu CFG			
SP.r	2		Remote setpoint type
LoSP	0		Lower setpoint limit
H ISP	3500		Upper setpoint limit
OAr	0		Definition manual remote
OAt	0		Switching mode Man/Auto control
AOt	0		Switching mode Auto/Man control
Lrt	0		Switching mode local/remote setpoint
P.Ont	0		Power-on mode
Menu SEr			
Cod	1		Instrument code
bAu	4		Serial communication baudrate
PAr	0		Serial communication parity
Menu InP 1			
tYP.1	14		Type of probe or signal for input IN1
F It.1	0.1		Digital filter input IN1
dPS.1	0		Decimal point position for IN1
LoS.1	0		Min. scale limit input IN1
H IS.1	3500		Max. scale limit input IN1
OFS.1	0.0		Offset input IN1
SGOF.1	0.000		Offset input IN1 calibrated 40mV
SGSE.1	4.000		Sensitivity input IN1 calibrated 40mV
Menu InP2			
tYP.2	0		Type of probe or signal for input IN2

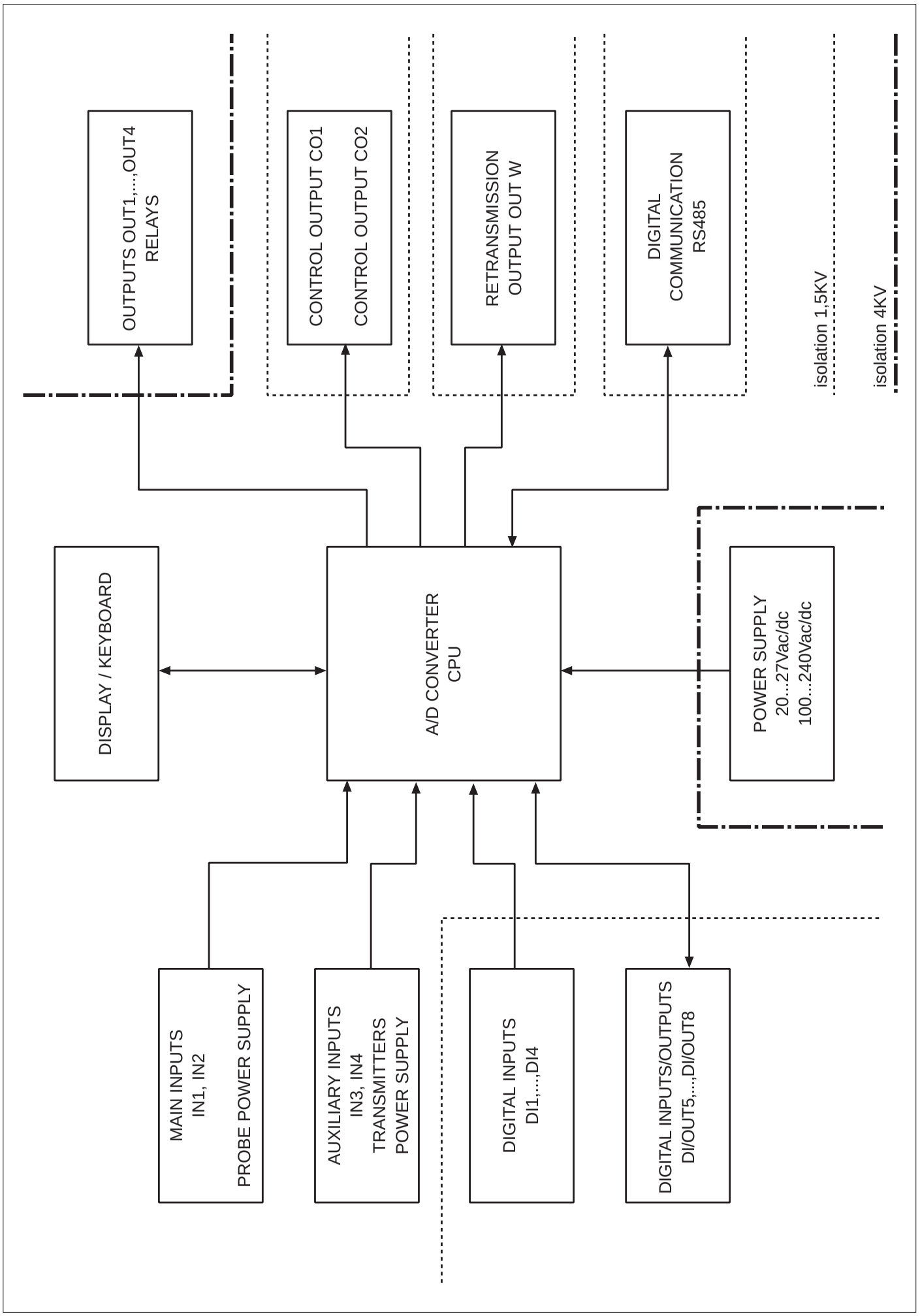
Display	Default	CONF	Description
F it.2	0.1		Digital filter input IN2
dPS.2	0		Decimal point position for IN2
Lo5.2	0		Min. scale limit input IN2
H i5.2	1000		Max. scale limit input IN2
OFS.2	0		Offset input IN2
SCOF.2	0.000		Offset input IN2 calibrated 40mV
SCSE.2	4.000		Sensitivity input IN2 calibrated 40mV
Menu InP3			
tYP.3	1		Type of probe or signal for input IN3
F it.3	0.1		Digital filter input IN3
dPS.3	0		Decimal point position for IN3
Lo5.3	0		Min. scale limit input IN3
H i5.3	1000		Max. scale limit input IN3
OFS.3	0		Offset input IN3
Menu InP4			
tYP.4	1		Type of probe or signal for input IN4
F it.4	0.1		Digital filter input IN4
dPS.4	0		Decimal point position for IN4
Lo5.4	0		Min. scale limit input IN4
H i5.4	1000		Max. scale limit input IN4
OFS.4	0		Offset input IN4
Menu ALL			
Ar. 1	0		Alarm reference 1
At. 1	0		Type alarm 1
HY. 1	-1		Alarm hysteresis 1
rA. 1	0		Activation time alarm 1
bt. 1	0		Time base for activation time alarm 1
SdA. 1	0		Character A alarm string 1
Sdb. 1	0		Character B alarm string 1
SdC. 1	0		Character C alarm string 1
Sdd. 1	0		Character D alarm string 1
SdE. 1	0		Character E alarm string 1
Ar.2	0		Alarm reference 2
At.2	0		Type alarm 2
HY.2	-1		Alarm hysteresis 2
rA.2	0		Activation time alarm 2
bt.2	0		Time base for activation time alarm 2
SdA.2	0		Character A alarm string 2
Sdb.2	0		Character B alarm string 2
SdC.2	0		Character C alarm string 2
Sdd.2	0		Character D alarm string 2
SdE.2	0		Character E alarm string 2
Ar.3	0		Alarm reference 3
At.3	0		Type alarm 3
HY.3	-1		Alarm hysteresis 3
rA.3	0		Activation time alarm 3
bt.3	0		Time base for activation time alarm 3
SdA.3	0		Character A alarm string 3
Sdb.3	0		Character B alarm string 3
SdC.3	0		Character C alarm string 3
Sdd.3	0		Character D alarm string 3
SdE.3	0		Character E alarm string 3
Ar.4	0		Alarm reference 4
At.4	0		Type alarm 4
HY.4	-1		Alarm hysteresis 4
rA.4	0		Activation time alarm 4
bt.4	0		Time base for activation time alarm 4
SdA.4	0		Character A alarm string 4
Sdb.4	0		Character B alarm string 4
SdC.4	0		Character C alarm string 4
Sdd.4	0		Character D alarm string 4
SdE.4	0		Character E alarm string 4
Ar.5	0		Alarm reference 5
At.5	0		Type alarm 5
HY.5	-1		Alarm hysteresis 5

Display	Default	CONF	Description
rA.5	0		Activation time alarm 5
bt.5	0		Time base for activation time alarm 5
SdA.5	0		Character A alarm string 5
Sdb.5	0		Character B alarm string 5
SdC.5	0		Character C alarm string 5
Sdd.5	0		Character D alarm string 5
SdE.5	0		Character E alarm string 5
Ar.6	0		Alarm reference 6
At.6	0		Type alarm 6
HY.6	-1		Alarm hysteresis 6
rA.6	0		Activation time alarm 6
bt.6	0		Time base for activation time alarm 6
SdA.6	0		Character A alarm string 6
Sdb.6	0		Character B alarm string 6
SdC.6	0		Character C alarm string 6
Sdd.6	0		Character D alarm string 6
SdE.6	0		Character E alarm string 6
Ar.7	0		Alarm reference 7
At.7	0		Type alarm 7
HY.7	-1		Alarm hysteresis 7
rA.7	0		Activation time alarm 7
bt.7	0		Time base for activation time alarm 7
SdA.7	0		Character A alarm string 7
Sdb.7	0		Character B alarm string 7
SdC.7	0		Character C alarm string 7
Sdd.7	0		Character D alarm string 7
SdE.7	0		Character E alarm string 7
Ar.8	0		Alarm reference 8
At.8	0		Type alarm 8
HY.8	-1		Alarm hysteresis 8
rA.8	0		Activation time alarm 8
bt.8	0		Time base for activation time alarm 8
SdA.8	0		Character A alarm string 8
Sdb.8	0		Character B alarm string 8
SdC.8	0		Character C alarm string 8
Sdd.8	0		Character D alarm string 8
SdE.8	0		Character E alarm string 8
Ar.9	0		Alarm reference 9
At.9	0		Type alarm 9
HY.9	-1		Alarm hysteresis 9
rA.9	0		Activation time alarm 9
bt.9	0		Time base for activation time alarm 9
SdA.9	0		Character A alarm string 9
Sdb.9	0		Character B alarm string 9
SdC.9	0		Character C alarm string 9
Sdd.9	0		Character D alarm string 9
SdE.9	0		Character E alarm string 9
Ar.10	0		Alarm reference 10
At.10	0		Type alarm 10
HY.10	-1		Alarm hysteresis 10
rA.10	0		Activation time alarm 10
bt.10	0		Time base for activation time alarm 10
SdA.10	0		Character A alarm string 10
Sdb.10	0		Character B alarm string 10
SdC.10	0		Character C alarm string 10
Sdd.10	0		Character D alarm string 10
SdE.10	0		Character E alarm string 10
Lo.AL	0		Lower limit alarm setpoint
H.AL	3500		Upper limit alarm setpoint
rEL	0		Alarm state in Fault Action condition
Menu Out			
rL.1	1		Output reference OUT1
Ct.1	20		Cycle time for output OUT1
rL.2	2		Output reference OUT2
Ct.2	20		Cycle time for output OUT2

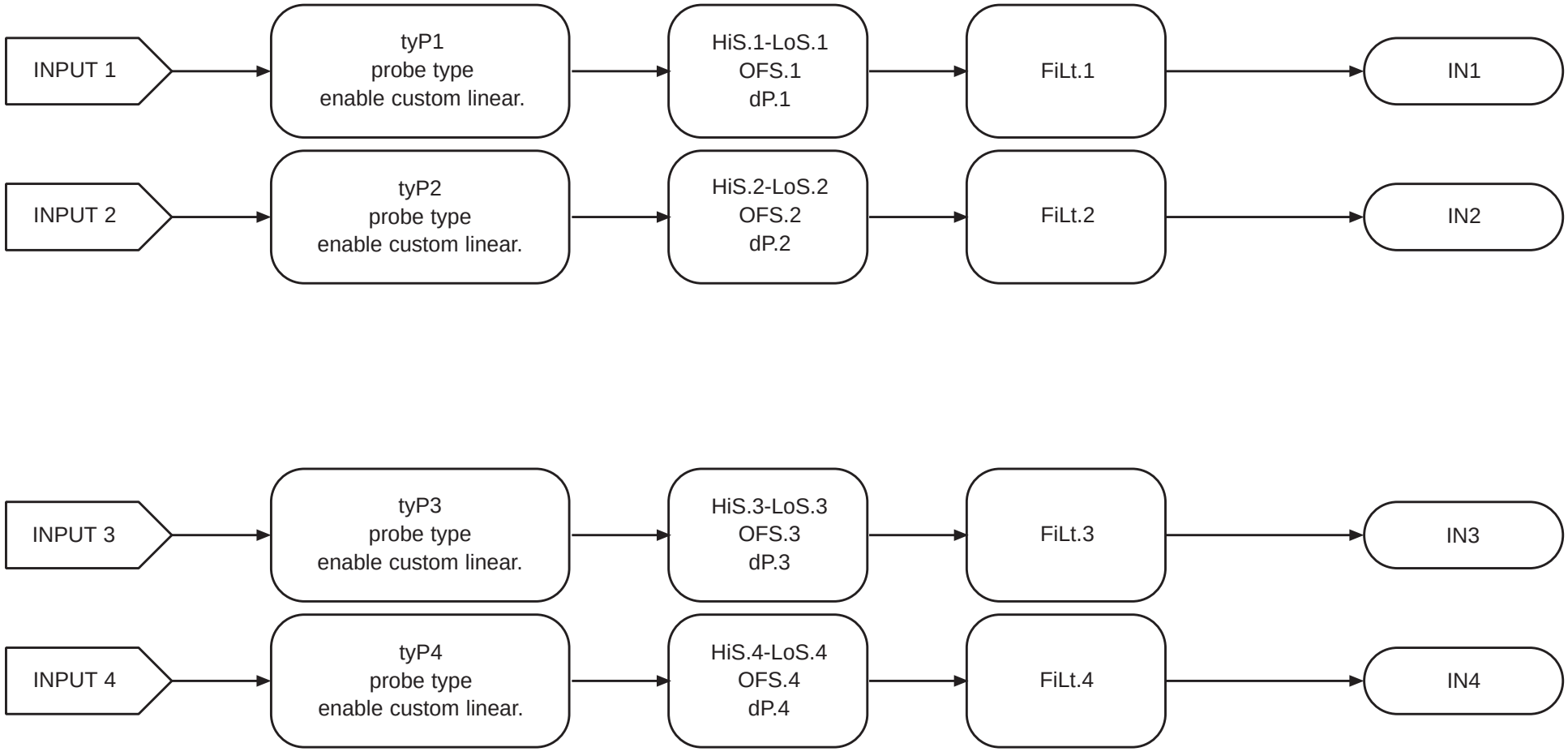
Display	Default	CONF	Description
rL.3	3		Output reference OUT3
Ct.3	20		Cycle time for output OUT3
rL.4	4		Output reference OUT4
Ct.4	20		Cycle time for output OUT4
rL.5	0		Output reference OUT5
rL.6	0		Output reference OUT6
rL.7	0		Output reference OUT7
rL.8	0		Output reference OUT8
tYP.Rn	0		Type of retransmission output W
r inF.Rn	0		Output reference W
Lo.Rn	0		Minimum scale output W
H inRn	3500		Maximum scale output W
tYPC.1	1		Type control output CO.1
tYPC.2	0		Type control output CO.2
AL5	2		Select probe power supply
Menu PAS			
PAS	0		Pass-word
Pro	0		Protection code
Menu Hrd			
hd.1	8		Enable multiset/type process/line freq.
Ctr	128		Control type
tHL.1	3		Type limit control output 1
tHL.2	4		Type limit control output 2
tOF.1	0		Offset for output control 1
tOF.2	0		Offset for output control 2
Func.A	0		Math function A
In 1.A	0		First operand of Func.A
In2.A	0		Second operand of Func.A
OPEr.A	0		Operator of Func.A
C 1.A	0		Coefficient C 1.A
C2.A	0		Coefficient C2.A
C3.A	0		Coefficient C3.A
C4.A	0		Coefficient C4.A
C5.A	0		Coefficient C5.A
Func.b	0		Math function b
In 1.b	0		First operand of Func.b
In2.b	0		Second operand of Func.b
OPEr.b	0		Operator of Func.b
C 1.b	0		Coefficient C 1.b
C2.b	0		Coefficient C2.b
C3.b	0		Coefficient C3.b
C4.b	0		Coefficient C4.b
C5.b	0		Coefficient C5.b
SPU	0		Select controlled variable
AL.n	3		Number of alarms enabled
but.1	8		Function key (Peak)
but.2	15		Function key (Cal/Rst)
but.3	13		Function key (M/A)
d inG.1	0		Digital function input DI1
d inG.2	0		Digital function input DI2
d inG.3	0		Digital function input DI3
d inG.4	0		Digital function input DI4
d inG.5	0		Digital function input DI5
d inG.6	0		Digital function input DI6
d inG.7	0		Digital function input DI7
d inG.8	0		Digital function input DI8
FLd	0.5		Digital filter on PV display
dS.SP	0		Select variable displayed on SV display
dS.F	7		Select variable displayed on F display
dS.PU	11		Select variable displayed on PV display
SdS.SP	17		Select alarm strings on SV display
SdS.F	18		Select alarm strings on F display
SdS.PU	19		Select alarm strings on PV display

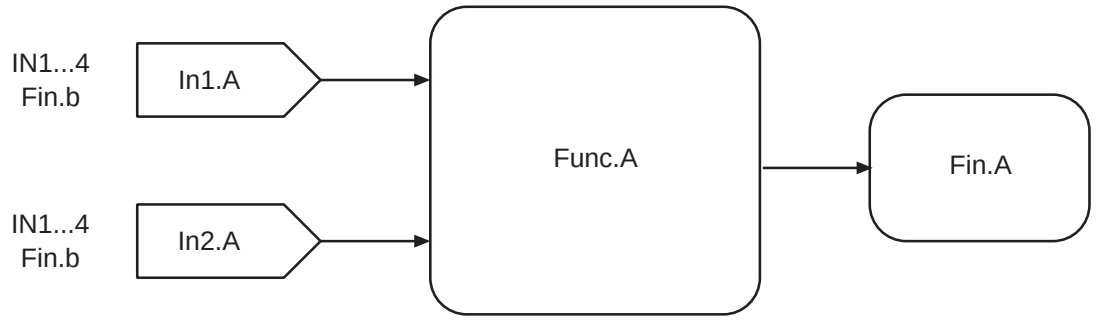
Display	Default	CONF	Description	
LEd.1	33		Function Led 1	
LEd.2	2		Function Led 2	
LEd.3	20		Function Led 3	
LEd.4	13		Function Led 4	
LEd.5	14		Function Led 5	
brG	2		Select variable displayed on bargraph 1	
Menu L In				
tYP.L	0		Type linearization	
StEP.n	32		Number segments	
5.00 (5.00)	0		Segment 0 low scale linearized value	(Step 0)
5.01 A (5.01)	313		Segment 1 input value [1/10.000] f.s.	(Step 1)
5.01 b (5.02)	31		Segment 1 linearized value	(Step 2)
5.02 A (5.03)	625		Segment 2 input value [1/10.000] f.s.	(Step 3)
5.02 b (5.04)	63		Segment 2 linearized value	(Step 4)
5.03 A (5.05)	938		Segment 3 input value [1/10.000] f.s.	(Step 5)
5.03 b (5.06)	94		Segment 3 linearized value	(Step 6)
5.04 A (5.07)	1250		Segment 4 input value [1/10.000] f.s.	(Step 7)
5.04 b (5.08)	125		Segment 4 linearized value	(Step 8)
5.05 A (5.09)	1563		Segment 5 input value [1/10.000] f.s.	(Step 9)
5.05 b (5.10)	156		Segment 5 linearized value	(Step 10)
5.06 A (5.11)	1875		Segment 6 input value [1/10.000] f.s.	(Step 11)
5.06 b (5.12)	188		Segment 6 linearized value	(Step 12)
5.07 A (5.13)	2188		Segment 7 input value [1/10.000] f.s.	(Step 13)
5.07 b (5.14)	219		Segment 7 linearized value	(Step 14)
5.08 A (5.15)	2500		Segment 8 input value [1/10.000] f.s.	(Step 15)
5.08 b (5.16)	250		Segment 8 linearized value	(Step 16)
5.09 A (5.17)	2813		Segment 9 input value [1/10.000] f.s.	(Step 17)
5.09 b (5.18)	281		Segment 9 linearized value	(Step 18)
5.10 A (5.19)	3125		Segment 10 input value [1/10.000] f.s.	(Step 19)
5.10 b (5.20)	313		Segment 10 linearized value	(Step 20)
5.11 A (5.21)	3438		Segment 11 input value [1/10.000] f.s.	(Step 21)
5.11 b (5.22)	344		Segment 11 linearized value	(Step 22)
5.12 A (5.23)	3750		Segment 12 input value [1/10.000] f.s.	(Step 23)
5.12 b (5.24)	375		Segment 12 linearized value	(Step 24)
5.13 A (5.25)	4063		Segment 13 input value [1/10.000] f.s.	(Step 25)
5.13 b (5.26)	406		Segment 13 linearized value	(Step 26)
5.14 A (5.27)	4375		Segment 14 input value [1/10.000] f.s.	(Step 27)
5.14 b (5.28)	438		Segment 14 linearized value	(Step 28)
5.15 A (5.29)	4688		Segment 15 input value [1/10.000] f.s.	(Step 29)
5.15 b (5.30)	469		Segment 15 linearized value	(Step 30)
5.16 A (5.31)	5000		Segment 16 input value [1/10.000] f.s.	(Step 31)
5.16 b (5.32)	500		Segment 16 linearized value	(Step 32)
5.17 A (5.33)	5313		Segment 17 input value [1/10.000] f.s.	(Step 33)
5.17 b (5.34)	531		Segment 17 linearized value	(Step 34)
5.18 A (5.35)	5625		Segment 18 input value [1/10.000] f.s.	(Step 35)
5.18 b (5.36)	563		Segment 18 linearized value	(Step 36)
5.19 A (5.37)	5938		Segment 19 input value [1/10.000] f.s.	(Step 37)
5.19 b (5.38)	594		Segment 19 linearized value	(Step 38)
5.20 A (5.39)	6250		Segment 20 input value [1/10.000] f.s.	(Step 39)
5.20 b (5.40)	625		Segment 20 linearized value	(Step 40)
5.21 A (5.41)	6563		Segment 21 input value [1/10.000] f.s.	(Step 41)
5.21 b (5.42)	656		Segment 21 linearized value	(Step 42)
5.22 A (5.43)	6875		Segment 22 input value [1/10.000] f.s.	(Step 43)
5.22 b (5.44)	688		Segment 22 linearized value	(Step 44)
5.23 A (5.45)	7188		Segment 23 input value [1/10.000] f.s.	(Step 45)
5.23 b (5.46)	719		Segment 23 linearized value	(Step 46)
5.24 A (5.47)	7500		Segment 24 input value [1/10.000] f.s.	(Step 47)
5.24 b (5.48)	750		Segment 24 linearized value	(Step 48)
5.25 A (5.49)	7813		Segment 25 input value [1/10.000] f.s.	(Step 49)
5.25 b (5.50)	781		Segment 25 linearized value	(Step 50)
5.26 A (5.51)	8125		Segment 26 input value [1/10.000] f.s.	(Step 51)
5.26 b (5.52)	813		Segment 26 linearized value	(Step 52)
5.27 A (5.53)	8438		Segment 27 input value [1/10.000] f.s.	(Step 53)
5.27 b (5.54)	844		Segment 27 linearized value	(Step 54)
5.28 A (5.55)	8750		Segment 28 input value [1/10.000] f.s.	(Step 55)

5.28 b (5.56)	875		Segment 28 linearized value	(Step 56)
5.29 A (5.57)	9063		Segment 29 input value [1/10.000] f.s.	(Step 57)
5.29 b (5.58)	906		Segment 29 linearized value	(Step 58)
5.30 A (5.59)	9375		Segment 30 input value [1/10.000] f.s.	(Step 59)
5.30 b (5.60)	938		Segment 30 linearized value	(Step 60)
5.31 A (5.61)	9688		Segment 31 input value [1/10.000] f.s.	(Step 61)
5.31 b (5.62)	969		Segment 31 linearized value	(Step 62)
5.32 A (5.63)	10000		Segment 32 input value [1/10.000] f.s.	(Step 63)
5.32 b (5.64)	1000		Segment 32 linearized value	(Step 64)
5.tc1	0.00		Step mV start scale - for custom Tc only	
5.tc2	0.00		Step mv full scale - for custom Tc only	
5.tc3	0.000		Step mV at 50°C - for custom Tc only	

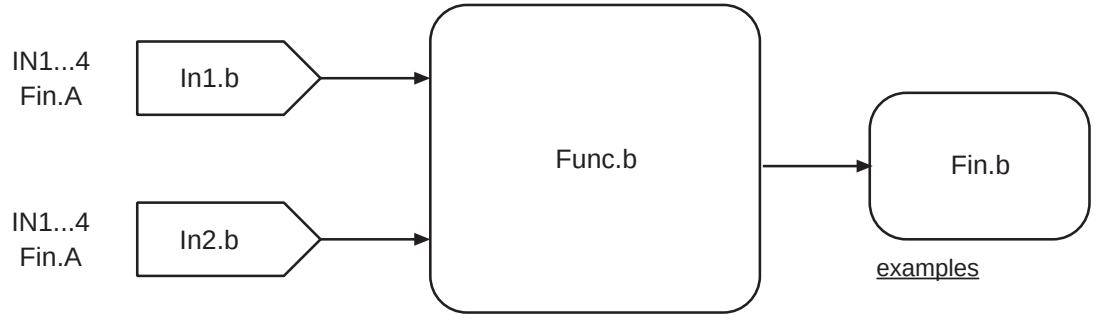

OUTPUTS OUT1,...,OUT4
RELAYS
CONTROL OUTPUT CO1
CONTROL OUTPUT CO2
RETRANSMISSION
OUTPUT OUT W
DIGITAL
COMMUNICATION
RS485
isolation 1,5KV
isolation 4KV
DISPLAY / KEYBOARD
A/D CONVERTER
CPU
POWER SUPPLY
20...27Vac/dc
100...240Vac/dc
MAIN INPUTS
IN1, IN2
PROBE POWER SUPPLY
AUXILIARY INPUTS
IN3, IN4
TRANSMITTERS
POWER SUPPLY
DIGITAL INPUTS
DI1,...,DI4
DIGITAL INPUTS/OUTPUTS
DI/OUT5,...,DI/OUT8

FUNCTIONAL DIAGRAM





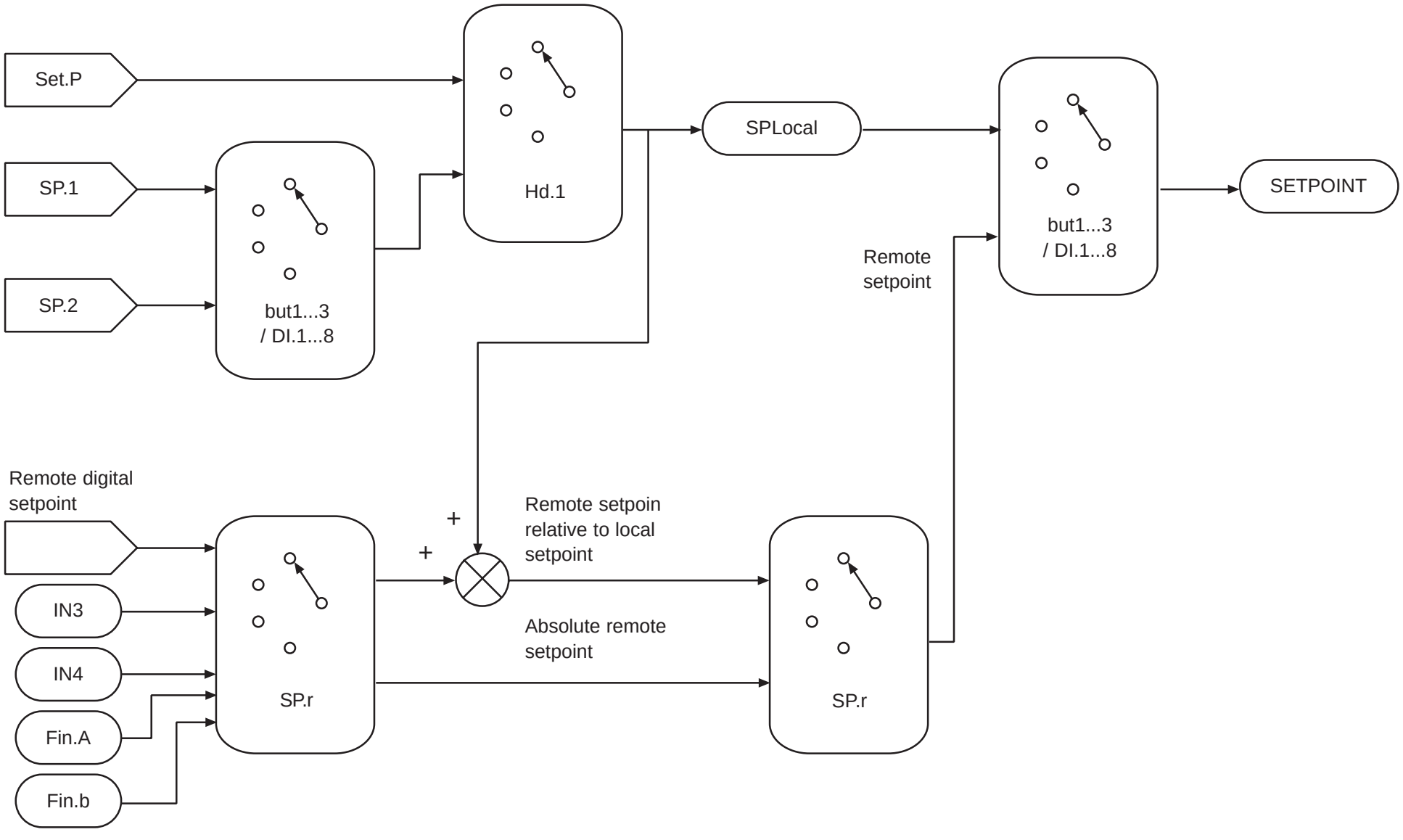
Fin.A = (((C1.A * **In1.A**)^ C2.A) OPEr.A ((C3.A * **In2.A**)^ C4.A)) / C5.A
where OPEr.A = +,-,*,/

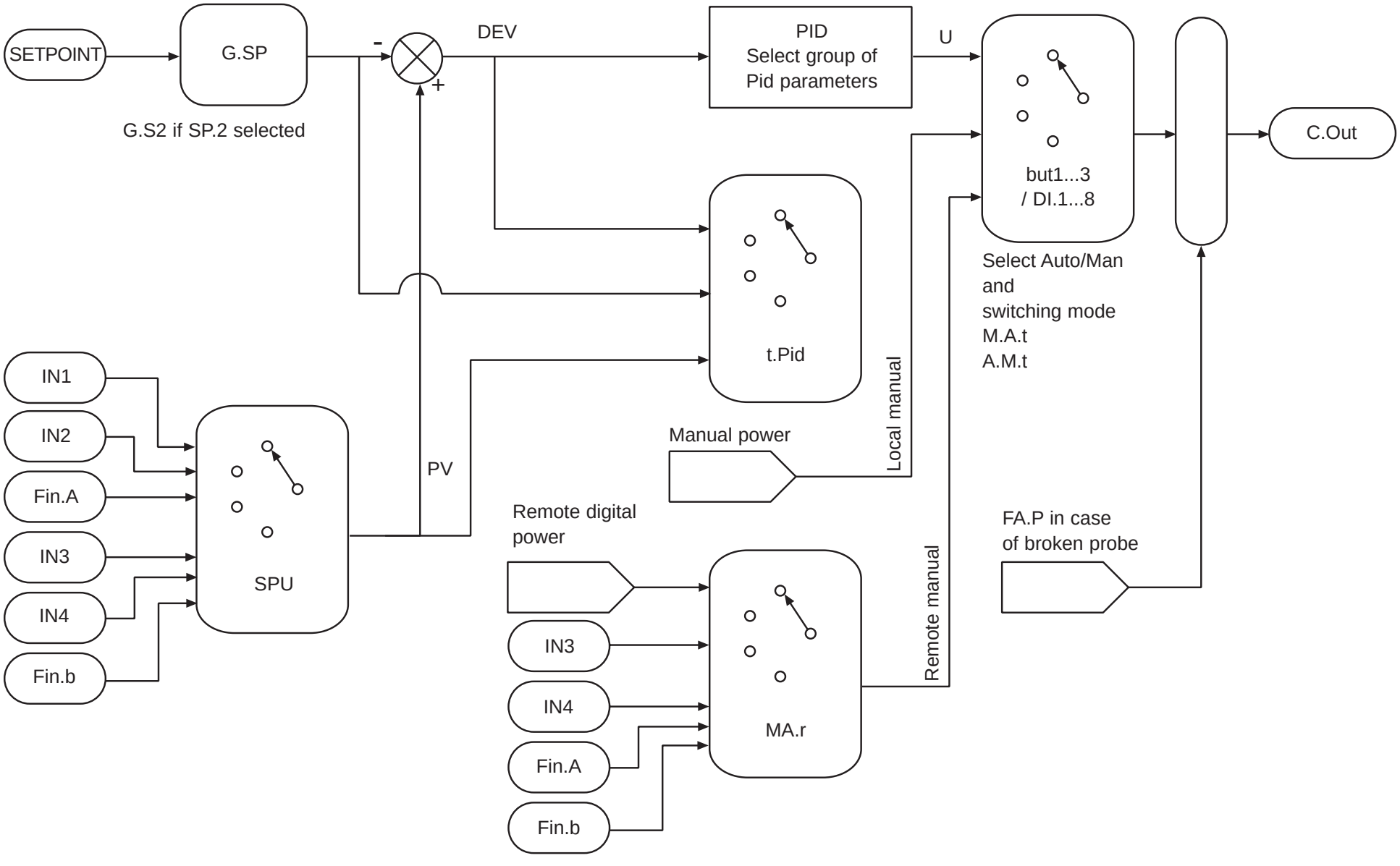


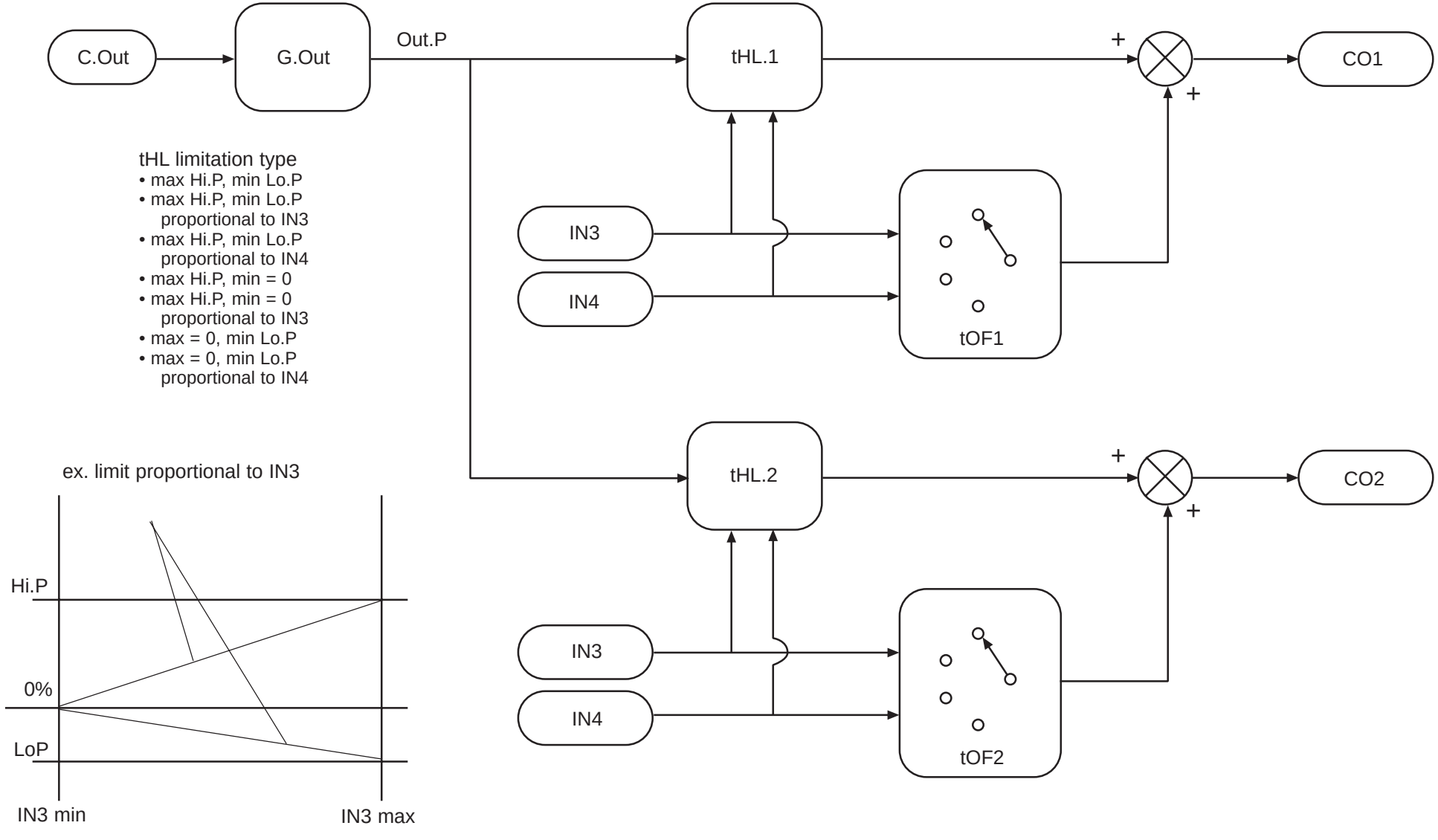
Fin.b = (((C1.b * **In1.b**)^ C2.b) OPEr.b ((C3.b * **In2.b**)^ C4.b)) / C5.b
where OPEr.b = +,-,*,/

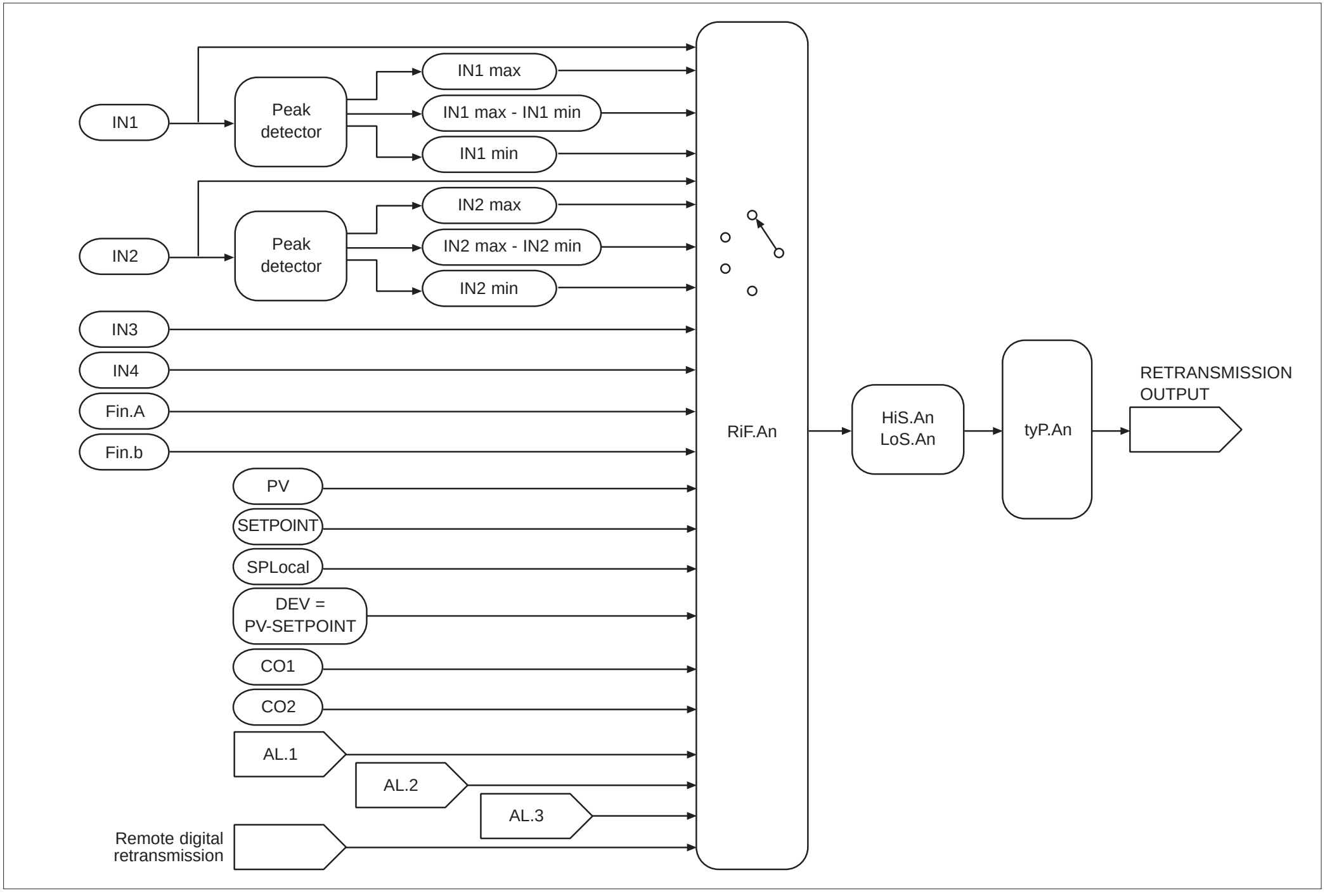
examples

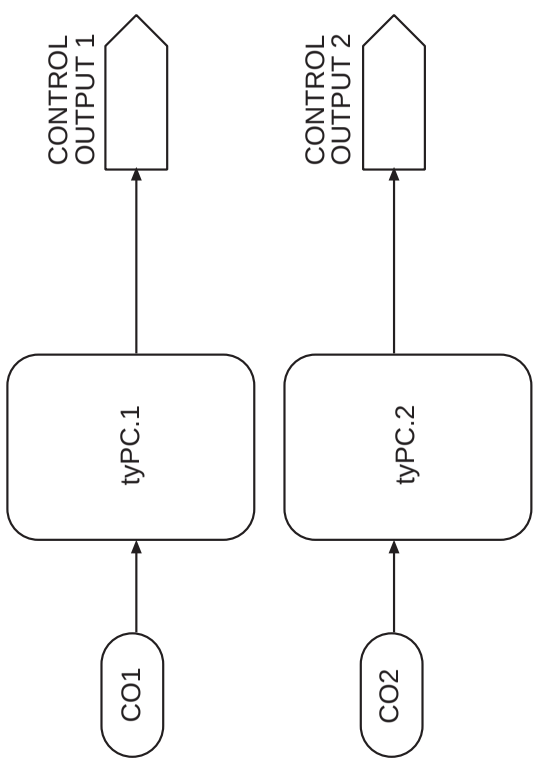
	In.1	**In.b**	**OPEr**	**C1**	**C2**	**C3**	**C4**	**C5**
IN1+IN2	IN1	IN2	+	1	1	1	1	1
IN1-IN2	IN1	IN2	-	1	1	1	1	1
IN1/IN2	IN1	IN2	/	1	1	1	1	1
square root IN1	IN1	0	+	1	0.5	0	1	1
(IN1+IN2) / 2	IN1	IN2	+	1	1	1	1	2
IN3 * C1	IN1	0	+	C1	1	0	1	1

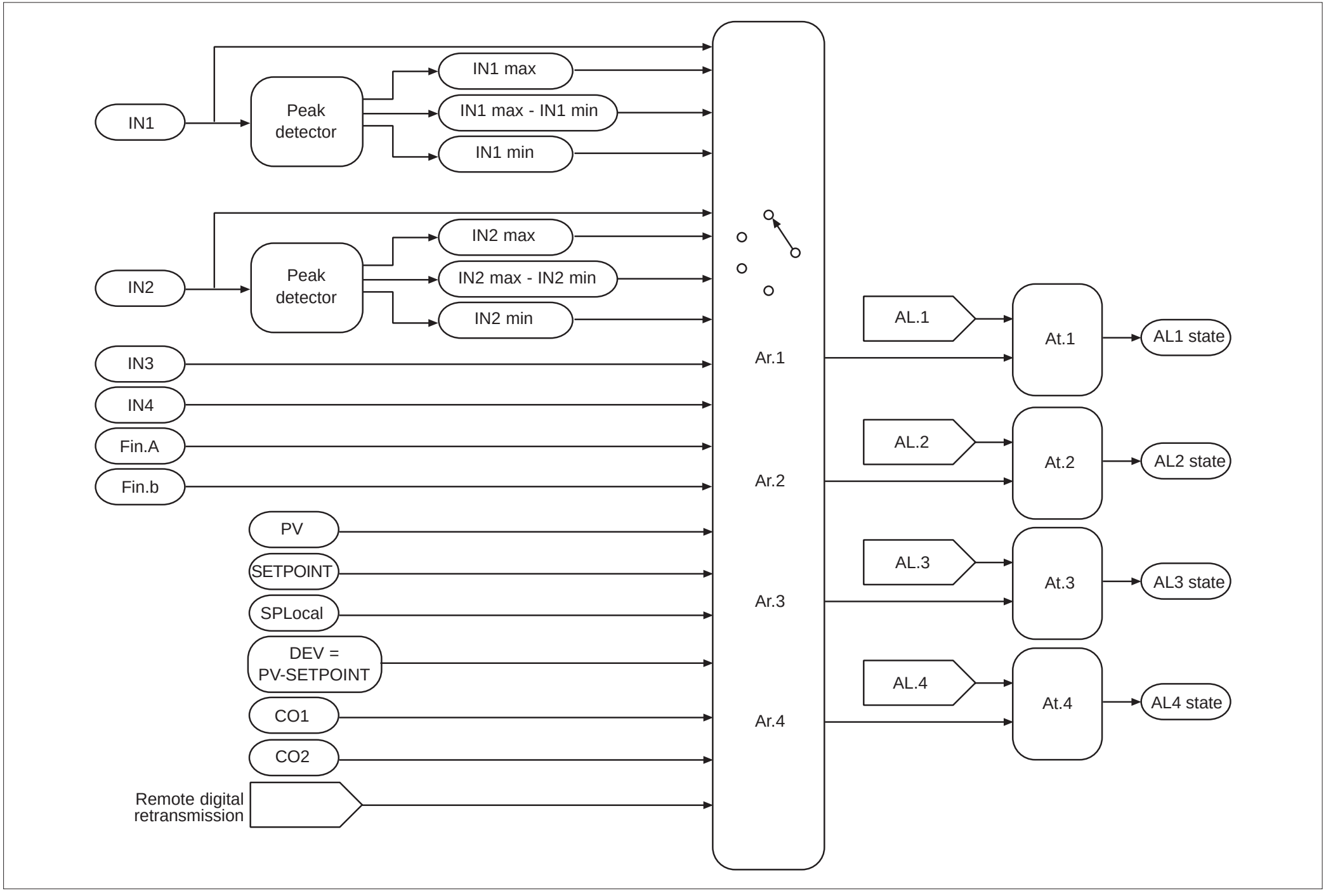

Set.P
SP.1
SP.2
but1...3
/ DI.1...8
Hd.1
SPLocal
but1...3
/ DI.1...8
SETPOINT
Remote
setpoint
Remote digital
setpoint
IN3
IN4
Fin.A
Fin.b
SP.r
+
+
Remote setpoin
relative to local
setpoint
Absolute remote
setpoint
SP.r

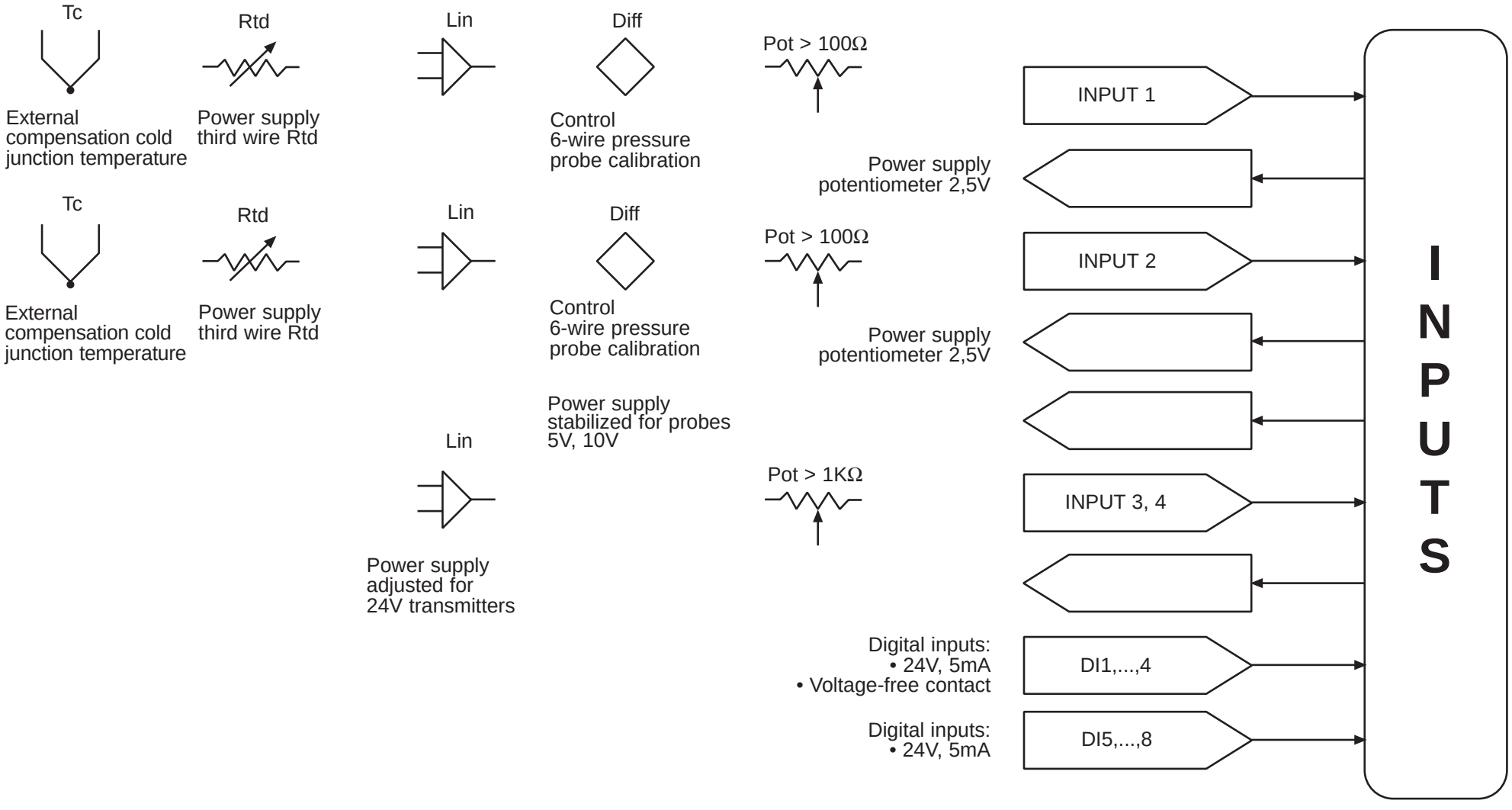

SETPOINT
G.SP
G.S2 if SP.2 selected
-
+
DEV
PID
Select group of
Pid parameters
U
but1...3
/ DI.1...8
Select Auto/Man
and
switching mode
M.A.t
A.M.t
C.Out
t.Pid
IN1
IN2
Fin.A
IN3
IN4
Fin.b
SPU
PV
Manual power
Local manual
Remote digital
power
IN3
IN4
Fin.A
Fin.b
MA.r
Remote manual
FA.P in case
of broken probe

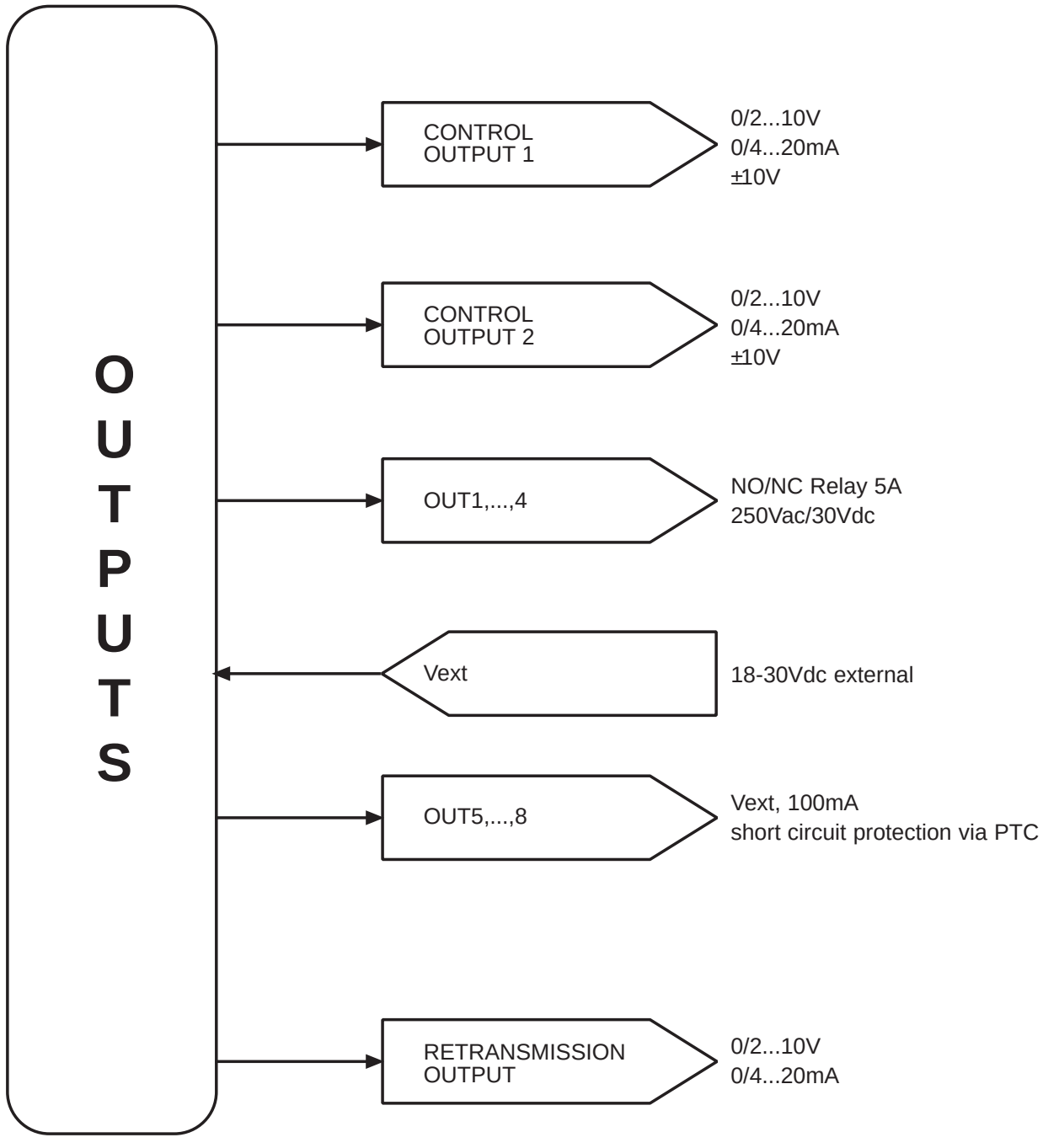

C.Out
G.Out
Out.P
tHL.1
+
+
CO1
tHL limitation type
• max Hi.P, min Lo.P
• max Hi.P, min Lo.P
proportional to IN3
• max Hi.P, min Lo.P
proportional to IN4
• max Hi.P, min = 0
• max Hi.P, min = 0
proportional to IN3
• max = 0, min Lo.P
• max = 0, min Lo.P
proportional to IN4
IN3
IN4
tOF1
ex. limit proportional to IN3
Hi.P
0%
LoP
IN3 min
IN3 max
tHL.2
+
+
CO2
IN3
IN4
tOF2


IN1
Peak detector
IN1 max
IN1 max - IN1 min
IN1 min
IN2
Peak detector
IN2 max
IN2 max - IN2 min
IN2 min
IN3
IN4
Fin.A
Fin.b
PV
SETPOINT
SPLocal
DEV = PV-SETPOINT
CO1
CO2
AL.1
AL.2
AL.3
Remote digital retransmission
RiF.An
HiS.An
LoS.An
tyP.An
RETRANSMISSION OUTPUT


CONTROL
OUTPUT 1
CONTROL
OUTPUT 2
tyPC.1
tyPC.2
CO1
CO2


IN1
Peak detector
IN1 max
IN1 max - IN1 min
IN1 min
IN2
Peak detector
IN2 max
IN2 max - IN2 min
IN2 min
IN3
IN4
Fin.A
Fin.b
PV
SETPOINT
SPLocal
DEV = PV-SETPOINT
CO1
CO2
Remote digital retransmission
Ar.1
Ar.2
Ar.3
Ar.4
AL.1
AL.2
AL.3
AL.4
At.1
At.2
At.3
At.4
AL1 state
AL2 state
AL3 state
AL4 state


Tc
External compensation cold junction temperature
Rtd
Power supply third wire Rtd
Lin
Diff
Control 6-wire pressure probe calibration
Pot > 100Ω
Power supply potentiometer 2,5V
Tc
External compensation cold junction temperature
Rtd
Power supply third wire Rtd
Lin
Diff
Control 6-wire pressure probe calibration
Pot > 100Ω
Power supply potentiometer 2,5V
Power supply stabilized for probes 5V, 10V
Lin
Power supply adjusted for 24V transmitters
Pot > 1KΩ
INPUT 1
INPUT 2
INPUT 3, 4
INPUTS
Digital inputs:
• 24V, 5mA
• Voltage-free contact
DI1,...,4
Digital inputs:
• 24V, 5mA
DI5,...,8


OUTPUTS
CONTROL OUTPUT 1
0/2...10V
0/4...20mA
±10V
CONTROL OUTPUT 2
0/2...10V
0/4...20mA
±10V
OUT1,...,4
NO/NC Relay 5A
250Vac/30Vdc
Vext
18-30Vdc external
OUT5,...,8
Vext, 100mA
short circuit protection via PTC
RETRANSMISSION OUTPUT
0/2...10V
0/4...20mA

EXAMPLES OF CUSTOM LINEARIZATION

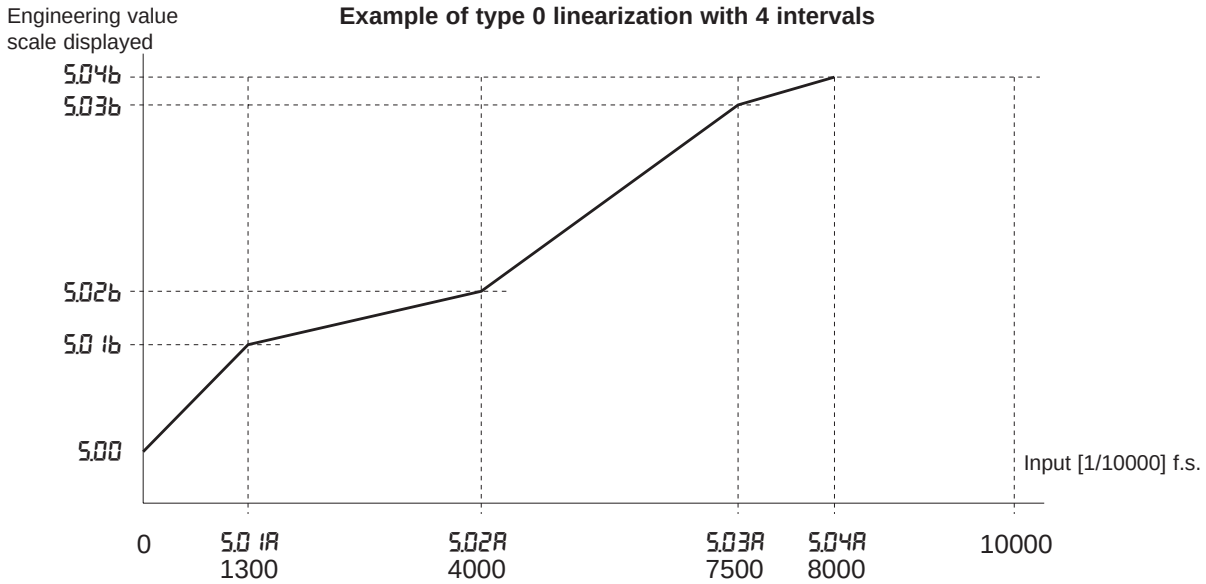
Example of custom linearization: type 0
(at variable amplitude intervals, max. 32)

For positive polarization signals (ex. 0...50mV) 5.00 is the value displayed for minimum input (ex. 0mV);
if 32 intervals are set, 5.326 is the value displayed for input = 5.32A * (f.s. / 10000)
(ex. if 5.32A = 10000, 5.326 is the value displayed with input = 50mV)

For symmetrical polarization signals (ex. -25mV...+25mV) 5.00 is the value displayed for minimum input (ex. -25mV);
if 32 intervals are set, 5.326 is the value displayed for input = 5.32A * (f.s. / 10000)
(ex. if 5.32A = 10000, 5.326 is the value displayed with input = +25mV)

In case of linearization type 1, ... ,4 5.nnA values are acquired directly by its input IN1, ... ,IN4

Example of type 0 linearization with 4 intervals



Example of custom linearization: type 5
(at 64 constant amplitude intervals = f.s. / 64)

For positive polarization signals (ex. 0...50mV) 5.00 is the value displayed for minimum input (ex. 0mV);
5.64 is the value displayed for maximum input (es 50mV)

For positive polarization signals (ex. -25mV...+25mV) 5.00 is the value displayed for minimum input (ex. -25mV);
5.64 is the value displayed for maximum input (ex. +25mV)

Example of type 5 linearization