



Exploration & Production

GENERAL SPECIFICATION

INSTRUMENTATION

GS INS 153

**Analogue Input standard function
- AI -**

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1. Scope

The purpose of this document is to define the Standard Function for an analogue input to control systems.

In order to assist in understanding, this document should be read in conjunction with **GS NS 150**, Design Methods for System Configuration Standard Functions.

This standard is only used for the measurement acquisition and may be linked to other Standard Functions, e.g. :

- PID
- RAI (Redundant analogue inputs)
- GCF (Temperature & Pressure compensated Flow), ...

2. Reference documents

The reference documents listed below form an integral part of this General Specification. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the EFFECTIVE DATE of the CONTRACT.

Standards

Reference	Title
Not applicable	

Professional Documents

Reference	Title
Not applicable	

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
Not applicable	

Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
GS INS 150	Design Method for System Configuration Standard Functions

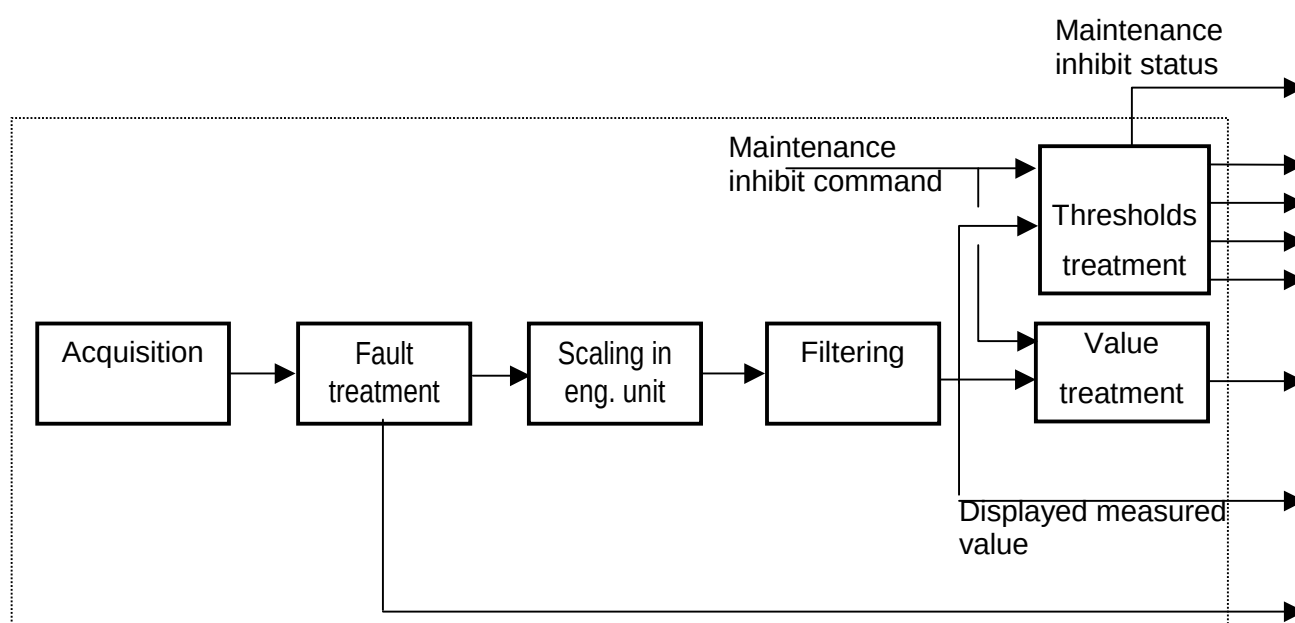
3. General description of functions

3.1 List of main functions

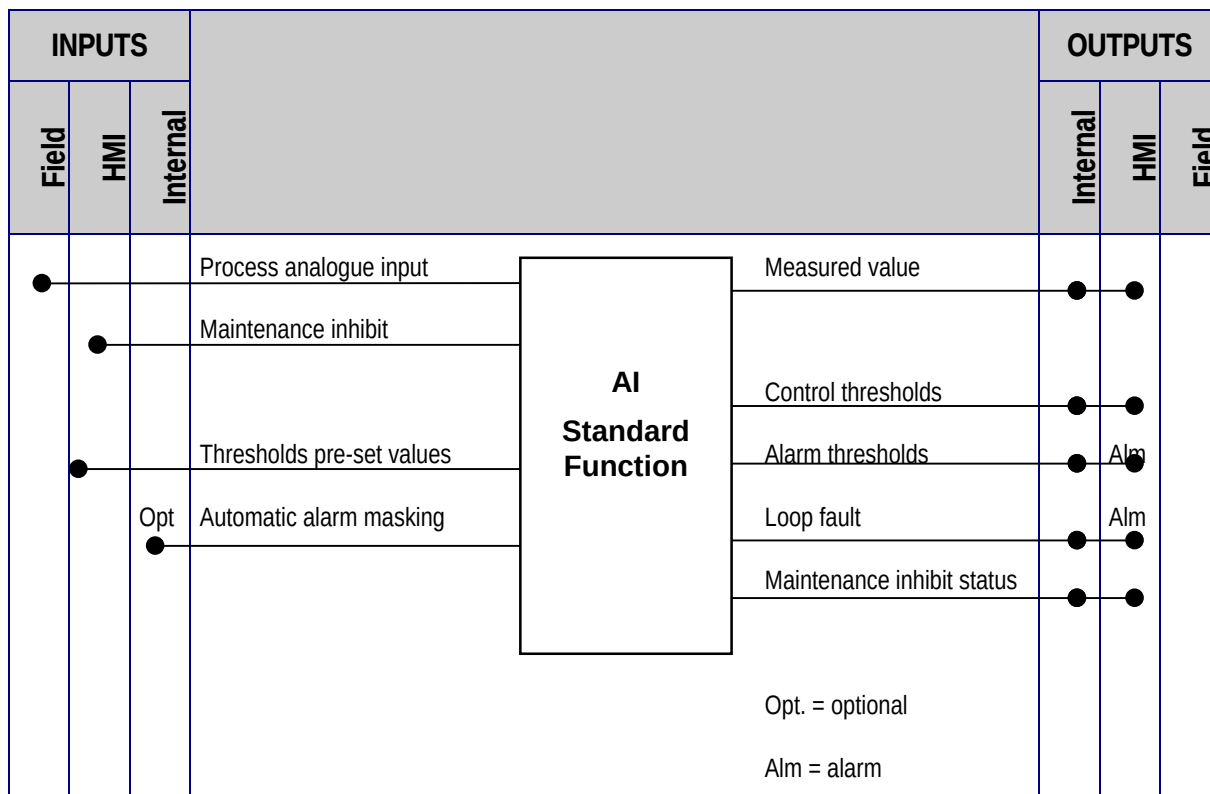
- Signal acquisition,
- Loop fault detection,
- Signal conversion to a numerical value in engineering unit,
- Engineering value filtering (first order),
- Process thresholds handling (alarm and/or control),
- Maintenance inhibit

Note that the function associated with the analogue input acquisition shall be able to provide square root extraction as necessary. a square root one to a linear one with a specific low cut-off value.

3.2 Functional scheme



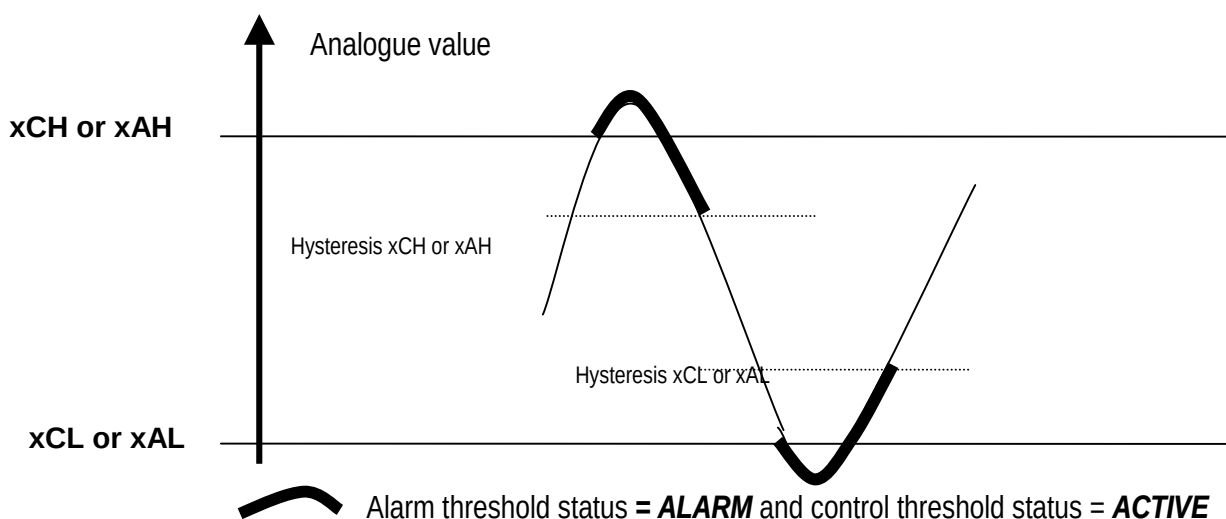
4. Interface description



5. Detailed description of functions

5.1 Thresholds activation handling

Four thresholds per analogue value shall be available for equipment automatic control or operator alarming purposes. Utilisation of the thresholds shall be as defined on the PIDs and instrument schedule.



5.2 Maintenance inhibit handling

One maintenance inhibit command is required for this type of analogue value.

NUMERICAL VALUE	CONTROL THRESHOLDS	ALARM THRESHOLDS
HMI shows actual measured value of the sensor (in engineering unit) Memorised value is the last valid value measured value (before inhibit). Associated PID controller calculation is stopped with last calculated output. Automatic control sequences still run (with the memorised value).	xCL and xCH are deactivated and forced to their <i>NORMAL</i> state	xAL and xAH are deactivated and forced to their <i>NORMAL</i> state

The loop fault shall not be alarmed when the maintenance inhibit is active.

5.3 Loop Fault handling

SIGNAL VALUE	SIGNAL STATUS	DISPLAYED VALUE
Signal < 0,8 mA	INVALID	- 20% (a)
0,8 mA ≤ signal ≤ 23,2 mA	VALID	Current value
Signal > 23,2 mA	INVALID	120 % (a)
Card fault	INVALID	Last value

(a) : The predefined values –20% and 120% can be replaced by specific characters when the DCS has a loop fault status standard display.

HMI consoles shall always display the current measured value while within valid signal limits.

When the loop is *INVALID*, the thresholds treatment is no longer performed.

When associated with the RAI Standard Function, the loop fault will not affect process control functions and the measured value will only be used for display purpose. Loop fault will be replaced by the “total invalidity”, coming from the RAI Standard Function (e.g. set in MAN the associated controller).

5.4 Automatic masking

Each threshold can be masked by an external event (as per [GS INS 150](#))

6. Tuning parameters and variables

PARAMETER	ACCESS LEVEL
Min. scale pre-set value	Engineer
Max. scale pre-set value	Engineer
Filtering pre-set value	Engineer
Alarm thresholds (xAH / xAL) pre-set values	Method
Control thresholds (xCH / xCL) pre-set values	Method
Thresholds hysteresis pre-set values	Engineer

7. Representation and animation description (HMI)

7.1 Events and Values to be recorded

7.1.1 Events

- Loop fault
- Alarm thresholds,
- Maintenance inhibit command,

7.1.2 Analogue value

Analogue value (in engineering units)

7.2 Alarm handling

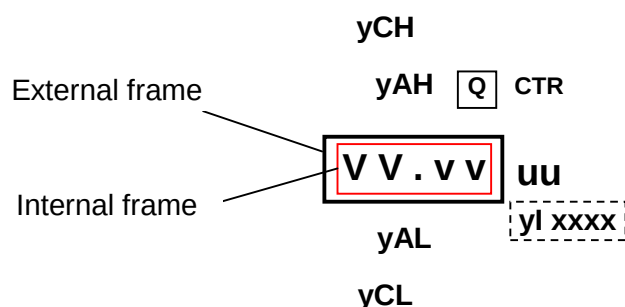
Alarm description	Priority
Alarm thresholds (xAH, xAL)	Level 1
Loop fault alarm	Level 1

7.3 Control display

This description gives examples of representation. However, they may be amended dependant on the DCS features.

7.3.1 Displayed data representation

The measurement representation shall be as below :



V V . v v = Measured value (in engineering unit),

Target area for the loop faceplate display (alarm thresholds tuning),

uu = Engineering unit,

CTR = Process control (only appears on operator request),

Target area for the loop faceplate display (control thresholds tuning),

yI xxxx = Sensor tag name (only appears on operator request),

Target area for the maintenance inhibit command,

yCH = High control threshold activated,

(can also be displayed near the associated equipment),

yAH = High alarm threshold activated,

yAL = Low alarm threshold activated,

yCL = Low control threshold activated,

(can also be displayed near the associated equipment),

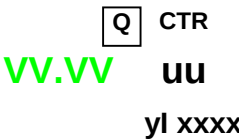
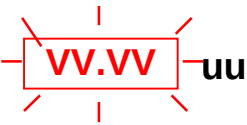
Control thresholds shall not be displayed on process mimics.

Process control function and associated control thresholds are optional.

All existing threshold (s) on process mimics are displayed in white colour on operator request (hidden if not active).

Symbol  is used as target area for the display of the totalized flow summary mimic (optional : only in case of associated totalized flow).

7.3.2 Measurement display

Internal data	Display	Text	Frame
Measured value = <i>NORMAL</i> Label + CTR + Q Units		Green White / hidden White	NA
Measured value = <i>ALARM</i>		Colour steady (only depending on alarm priority level)	NA
Maintenance inhibit = <i>INHIBITED</i>		As above	Yellow steady (external frame)
Loop fault= <i>ALARM</i> Alarm unacknowledged		Red steady	Flashing red (internal frame)
Loop fault= <i>ALARM</i> Alarm acknowledged		Red steady	Red steady (internal frame)
Loop fault occurred after Maintenance inhibition activation		Red steady	Yellow (external frame) Red Alarm (internal frame)
Communication fault = <i>ACTIVATED</i>		White	Magenta steady (external frame)

The events which drive these frame displays may not be mutually exclusive. Therefore, the precedence on the display, from most to least important, shall be : magenta, white, blue, yellow

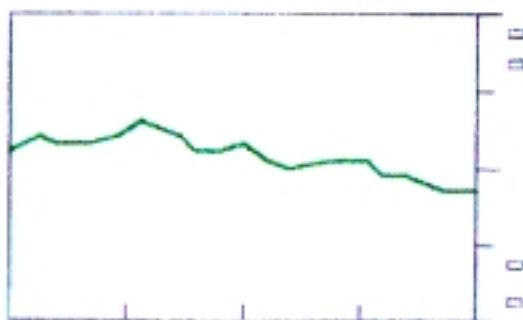
7.3.3 Alarm thresholds display

Internal data	Display	Text	Frame
Alarm threshold = <i>NORMAL</i>		Hidden	NA
Alarm threshold = <i>ALARM</i> Alarm unacknowledged		Flashing colour (colour depends on alarm priority level)	NA
Alarm threshold = <i>ALARM</i> Alarm acknowledged		Colour steady (Colour depends on alarm priority level)	NA

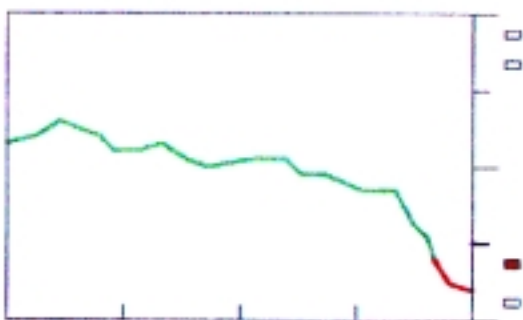
7.3.4 Control thresholds display

Internal data	Display	Text	Frame
Control threshold = <i>NORMAL</i>		Hidden	NA
Control threshold = <i>ACTIVE</i>		Green	NA

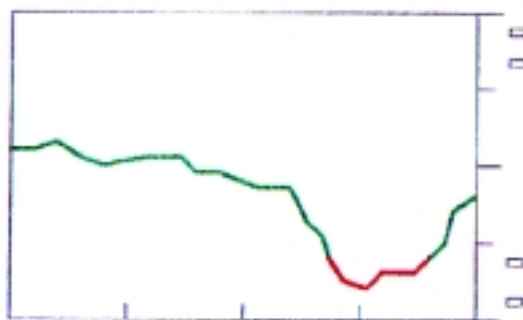
7.4 Trend curves display



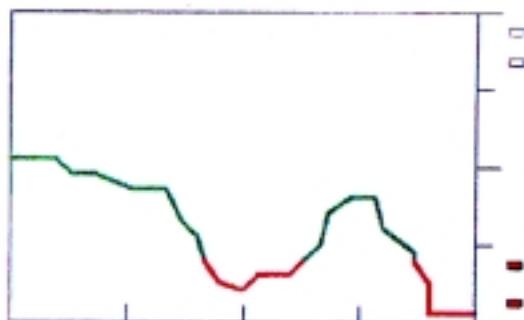
Curve within alarm thresholds limits
Curve is green



Lower alarm threshold overshooting
Curve is green in normal zone
Curve is red in alarm zone



Threshold overshooting
storage
Curve is green in normal zone
Curve is red in alarm zone



Lower safety threshold
overshooting
Curve is green in normal zone
Curve is red in alarm zone

7.5 Bar graph graphic symbol display

