



Exploration & Production

GENERAL SPECIFICATION

INSTRUMENTATION

GS INS 154

**Analogue Input Safety
standard function
- AIS -**

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1. Scope

The purpose of this document is to define the Standard Function for an Analogue Input specific to safety systems.

In order to assist in understanding, this document should be read in conjunction with **GS INS 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. :

- RAI (Redundant analogue inputs)
- Safety Bar
- Voting logic 2ooN...

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

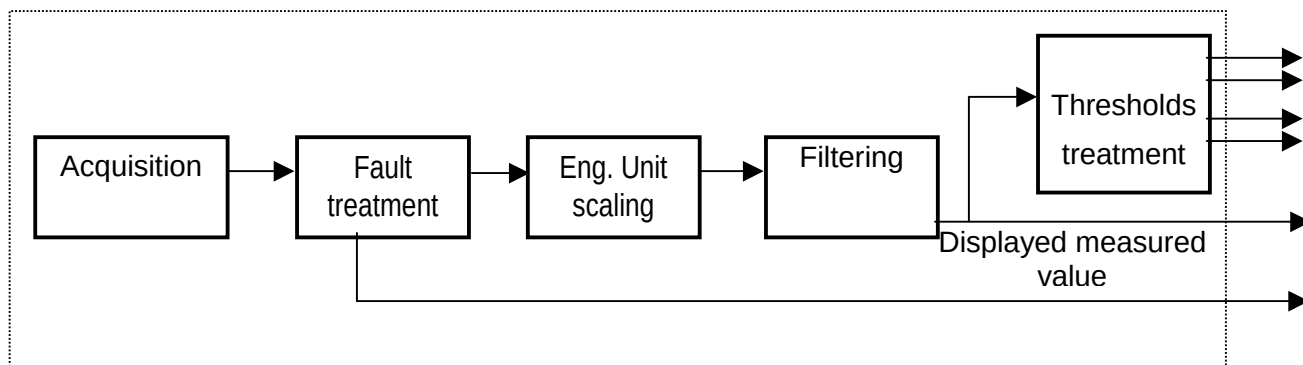
Reference	Title
GS INS 150	Design Method for System Configuration Standard Functions

3. General description of functions

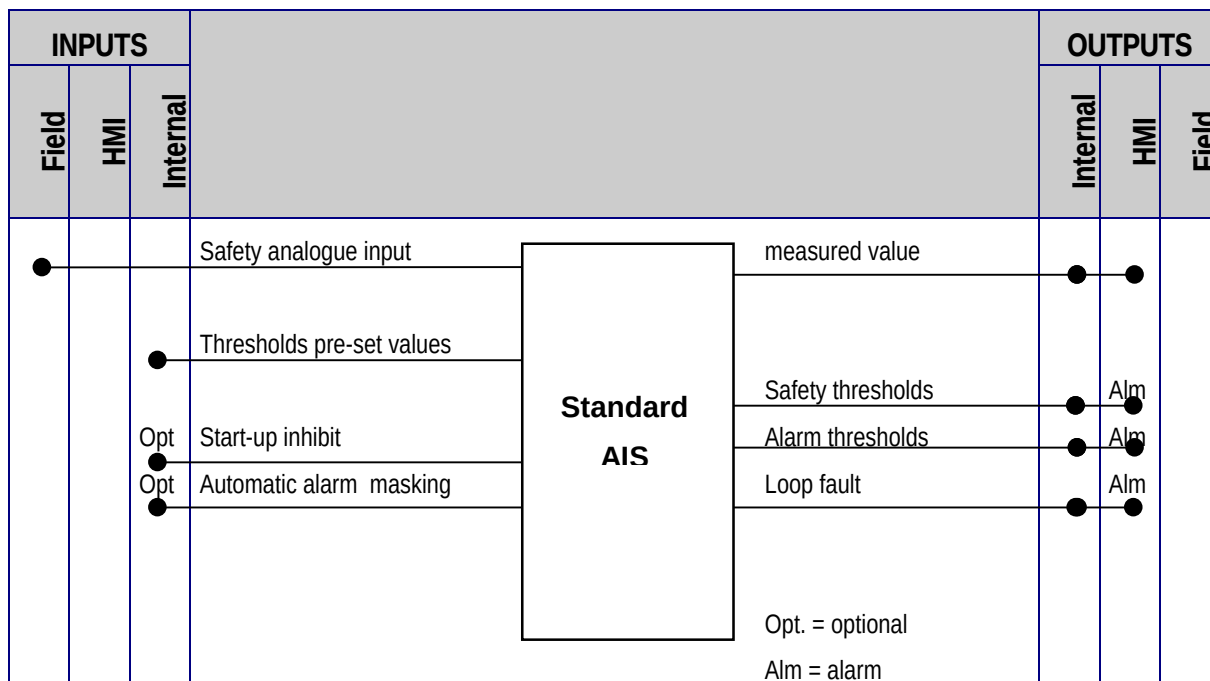
3.1 List of main functions

- Signal acquisition,
- Loop fault detection,
- Signal conversion to a numerical value in engineering unit,
- Engineering value filtering (first order),
- Thresholds handling (alarm and safety),

3.2 Functional scheme



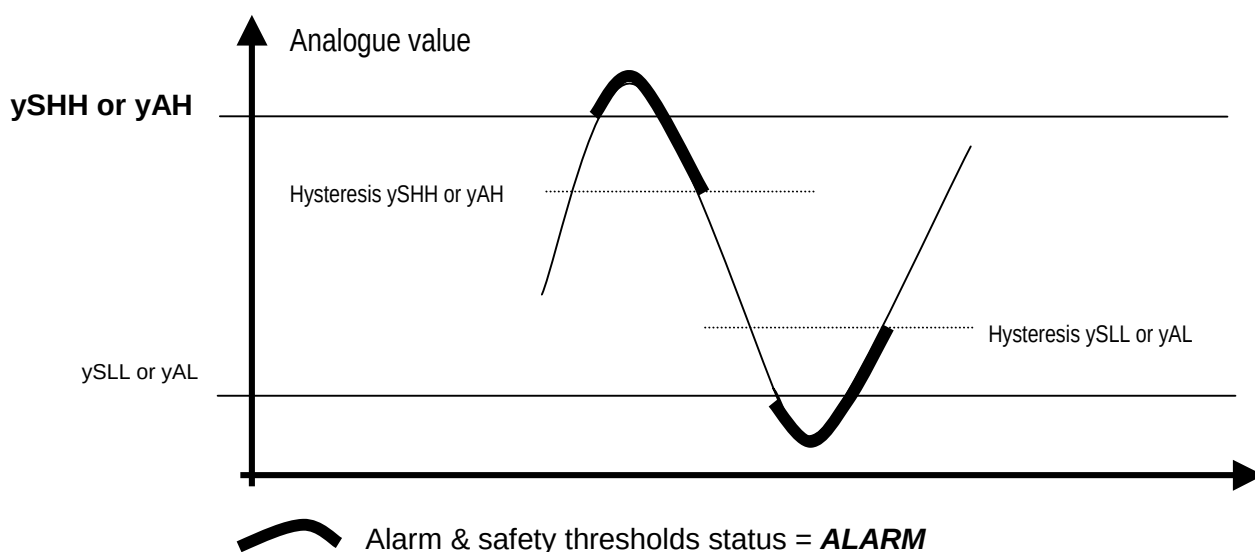
4. Interfaces description



5. Detailed description

5.1 Thresholds activation handling

Four thresholds per analogue value shall be available for safety trip initiations or operator alarming purposes. Utilisation of the thresholds shall be as defined on the PIDs, instruments schedule and ESD functional diagrams.



5.2 Maintenance inhibit handling

One maintenance inhibit command is required for each safety threshold performing a safety trip to a Safety bar.

This maintenance inhibit function shall be clearly detailed within the SAFETY BAR standard, for each bar input.

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.

Note that upon a loop fault being detected on a safety analogue input, the safety trip shall be initiated i.e. fail to the safe state. This point needs to be confirmed as per project safety philosophy.

When associated with the RAI Standard Function, the loop fault will not trip any safety function, only display functions will be performed. Loop fault will then be replaced by the “total invalidity”, coming from the RAI Standard Function.

5.4 Automatic masking

Each individual alarm can be masked by an external event (as per **GS INS 150**). During this automatic masking, the alarm is not generated and the fault status treatment is no longer active.

5.5 Start-up inhibition

Each individual alarm can be masked by a corresponding active start-up inhibit on the Safety bar. During this masking, the alarm is not generated, but the fault status treatment and trip condition monitoring are still active. When the start-up inhibit is removed (inhibit timer elapsed), the corresponding threshold alarm is not re-alarmed again (klaxon and flashing) if the trip condition is still active (the Safety bar will tripped again). First fault detection will help to identify the trip condition.

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 (yAH / yAL) pre-set values	Engineer
Safety thresholds (ySHH / ySLL) pre-set values	Engineer
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,
- Safety thresholds,

7.1.2 Analogue value

- Analogue value (in engineering unit),

7.2 Alarm handling

Alarm description	Priority
Safety thresholds (ySHH, ySLL)	Level 2 for PSS Level 3 for SSS & FGS
Alarms thresholds (yAH, yAL)	Level 1 for PSS Level 2 for SSS & FGS
Loop fault alarm	Level 2 for PSS Level 3 for SSS & FGS

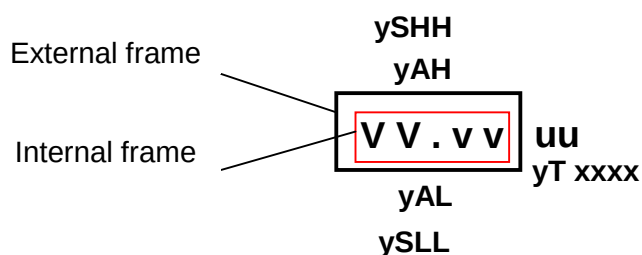
7.3 Control display

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

7.3.1 Displayed data representation

When displayed, the analogue value standard representation shall be:

(Note: in majority of cases, safety analogue values shall not be displayed on process mimics)



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

Target area for the face plate display (alarm & safety thresholds tuning),

uu = engineering unit,

yT xxxx = sensor tag name (only appears on operator request),

ySHH = high high safety threshold activated

yAH = high alarm threshold activated,

yAL = low alarm threshold activated,

ySLL = low low safety threshold activated,

7.3.2 Analogue value display

When the analogue value display is required, please refer to AI standard (without animation associated with the face plate target area nor the maintenance inhibit command).

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 yellow (PSS) Flashing red (SSS)	NA
Alarm threshold = <i>ALARM</i> Alarm acknowledged		Yellow steady (PSS) Red steady (SSS)	NA

7.3.4 Safety thresholds display (for process mimics)

Internal data	Display	Text	Frame
Safety threshold = <i>NORMAL</i>		Hidden	NA
Safety threshold = <i>ALARM</i> Alarm unacknowledged		Flashing red	NA
Safety threshold = <i>ALARM</i> Alarm acknowledged		Red steady	NA

When the analogue value is not displayed on a process mimic, then the frame animation shall be performed on each safety threshold, according to the animation used for safety mimics (refer to section 5.3.5). In this case, safety thresholds shall also be used as target areas for calling the associated loop face plate.

Note that, in case of RAI association, an internal frame (fault) is managed on a safety threshold display in the same way as a safety mimic.

7.3.5 Safety thresholds display (for safety mimics)

When RAI switching is active, the text is displayed with an Orange background **ySHH xxxx**

Internal data	Display	Text	Frame
Safety threshold = <i>NORMAL</i>	ySHH xxxx	Blue	NA
Safety threshold = <i>ALARM</i> Alarm unacknowledged		Flashing red	NA
Safety threshold = <i>ALARM</i> Alarm acknowledged	ySHH xxxx	Red steady	NA
Corresponding bar input maintenance inhibit active		as above	Yellow steady (external frame)
Corresponding bar input start- up inhibit active		Red steady or blue	Yellow steady (external frame)
Threshold invalidity = <i>INVALID</i> Alarm unacknowledged		Flashing red or blue	Flashing red (internal frame)
Threshold invalidity = <i>INVALID</i> Alarm acknowledged		Blue	Red steady (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

7.4 Short time trend curves display

As per AI standard