



Exploration & Production

GENERAL SPECIFICATION

INSTRUMENTATION

GS INS 178

Safety Bar standard function

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1. Scope

The purpose of this document is to define the Standard Function for a safety bar logic.

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

Some inputs of this Standard Function are the result of treatments processed by higher level Standards Functions e.g. digital inputs, analogue safety inputs or FGS voting logic (DI_AL, AIS, 2ooN, ...).

This Standard Function is split into three parts :

- the Safety bar inputs
- the Safety bar
- the Safety bar outputs

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 Systems Configuration Standard Functions

3. General Description of Functions

3.1 List of main functions

For the bar inputs:

- Maintenance inhibit handling
- Start-up inhibit handling (optional)
- Trip Initiator latch handling
- First up alarm handling

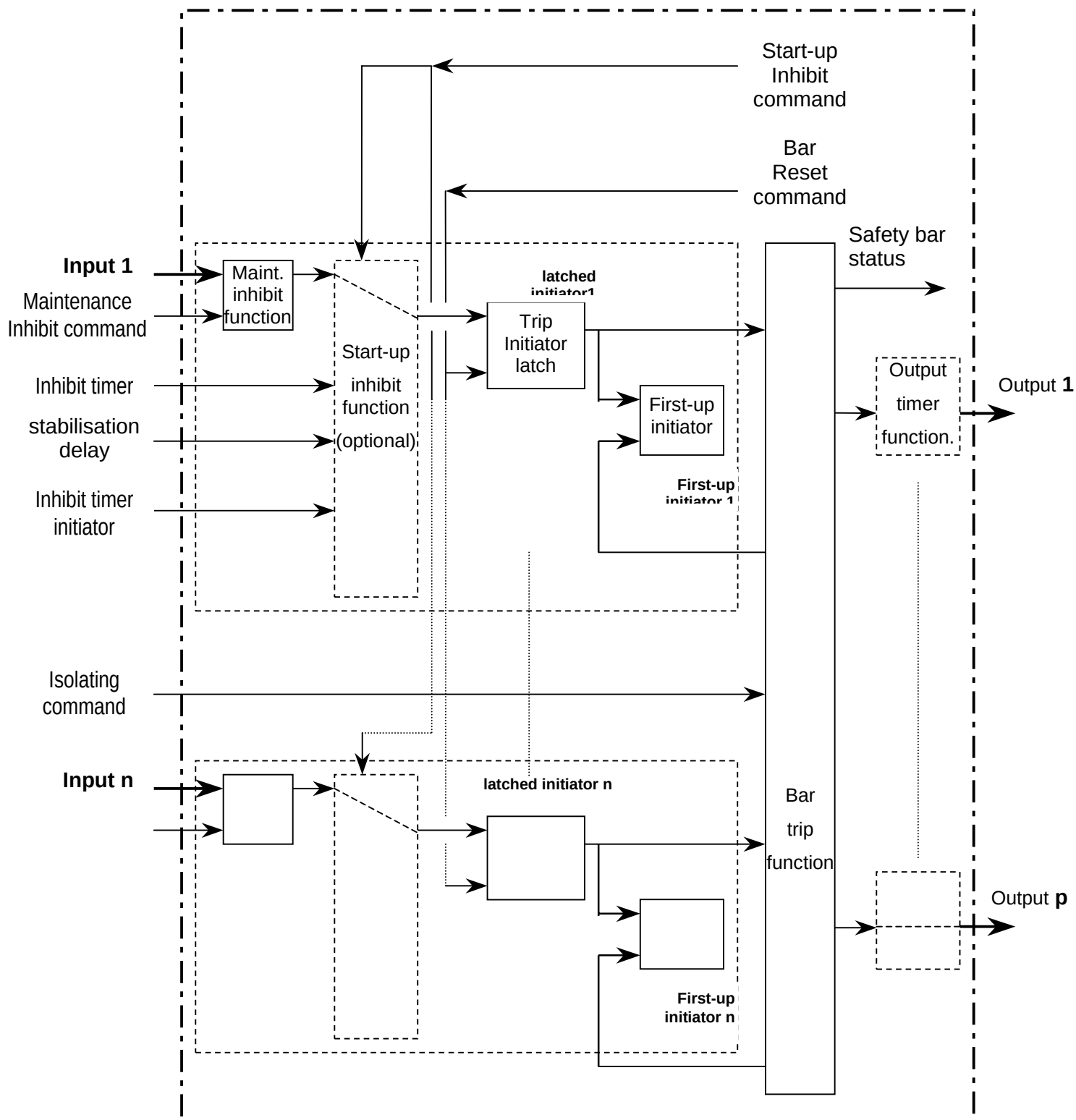
For the bar itself:

- Bar trigger handling
- Isolating facility

For the bar outputs:

- Output timer handling (optional)

3.2 Functional scheme



4. Description of Interfaces

INPUTS				OUTPUTS		
Field	HMI	Internal		Internal	HMI	Field
	Opt		Bar reset & start-up inhibit commands	Safety bar status		
				Ready to reset status		
				Start-up inhibit status	Opt	
			Bar input 1 (specific trip initiator)	Latched trip initiator1		
				First-up initiator 1	Alm	
				Individual start-up inhibit status	Opt	
				Inhibit timer countdown value	Opt	
				Maintenance. Inhibit status		
			Bar input n (higher Safety bar trip)	First-up initiator n	Alm	
			Bar outputs 1 to p	Individual safety trip 1		
				Individual safety trip p		
			Safety bar Standard Function			

Alm : alarm
Opt : option

5. Detailed Description of Functions

5.1 Definition of status

5.1.1 Bar input

Each bar input is a trip initiator. Two types are used in the Safety bar logic :

- related to a safety threshold or to the corresponding loop fault (as per project requirement)
- related to a higher Safety bar

Each bar input can take the two following status : **TRIP** or **NORMAL**

5.1.2 Latched initiator

After the start-up inhibit function (optional), each specific trip initiator is individually latched :

- **LATCHED** : when the specific initiator comes up in TRIP condition (and is not Maintenance or process inhibited)
- **UNLATCHED** : after a bar reset command, if the specific initiator is NORMAL (or Maintenance or process inhibited)

5.1.3 First-up Initiator

A specific treatment is required to trap the first-up trip initiator of each Safety bar. This treatment shall be performed individually, for each bar input.

The first-up initiator is alarmed, but the corresponding acknowledgement is automatically performed to avoid any operator action on the safety mimics.

5.1.4 Safety bar status

A Safety bar can take the following status :

- **TRIPPED** : when, at least, one specific initiator is LATCHED or one higher Safety bar trip initiator is in TRIP
- **NOT TRIPPED** : when all initiators are UNLATCHED and all higher Safety bar trip initiators are NORMAL
- **ISOLATED** : when isolating command is active

5.1.5 Safety bar in isolated status

Isolating command is available to the operator in method access level. Such facility shall HAVE to be removed after commissioning activity, including also extensions/modifications commissioning.

A safety bar may be (**TRIPPED** or **NOT TRIPPED**) and **ISOLATED**

When a safety bar is set to isolated status, its handling will be quite the same (including reset function), but its outputs will no longer interlock motors, valves,... which will remain in their previous status (before the activation of the isolating command), as well as initiators for the lower level safety bars.

5.1.6 Ready to reset status

This status is active when the bar is TRIPPED and can be reset.

The bar can be reset when all specific trip initiators have disappeared (after acknowledgement) or have been inhibited.

5.2 Maintenance inhibit function

Each trip initiator can be inhibited by maintenance operators from the HMI consoles. This function prohibits the Safety Bar from triggering if the corresponding trip initiator is in the TRIP condition. The status of the safety bar input shall always be displayed. The maintenance inhibit command is available from the corresponding latched initiator display.

It is possible to set the maintenance inhibit on a safety bar input even when the corresponding trip initiator alarm is not acknowledged, thus permitting the reset of the bar.

The maintenance inhibit function is not implemented for the specific faults issued from HMI command.

A maintenance inhibit function will also to be implemented for the higher Safety bar initiators, which are transmitted by a DI or by the confirmed detection of a 2oo3 voting logic.

5.3 Bar reset command

All Safety bars need one dedicated reset command. This shall be available to the operator from the HMI consoles if the "Ready to reset status" is active. This will allow the unlatching of all latched initiators, and consequently the reset of the Safety bar.

The confirmation that the Safety bar is available for reset is shown by the "Ready to reset status" animation.

When a higher Safety bar initiator returns to NORMAL, the associated Safety bar automatically returns to the NOT TRIPPED condition, without the need for any operator intervention (assuming there are no other latched trip initiators).

5.4 Start-up inhibit function (optional)

5.4.1 Start-up inhibit command

The aim of this command is to allow the temporary inhibit of some specific bar inputs which are in the TRIP condition in order to be able to perform the reset of the associated Safety bar (e.g.: low pressure safety threshold initiators, ...).

There is only a maximum of one start-up inhibit command per bar.

The inhibit is normally performed automatically on bar inputs in the TRIP condition, at the time where the start-up inhibit command is activated.

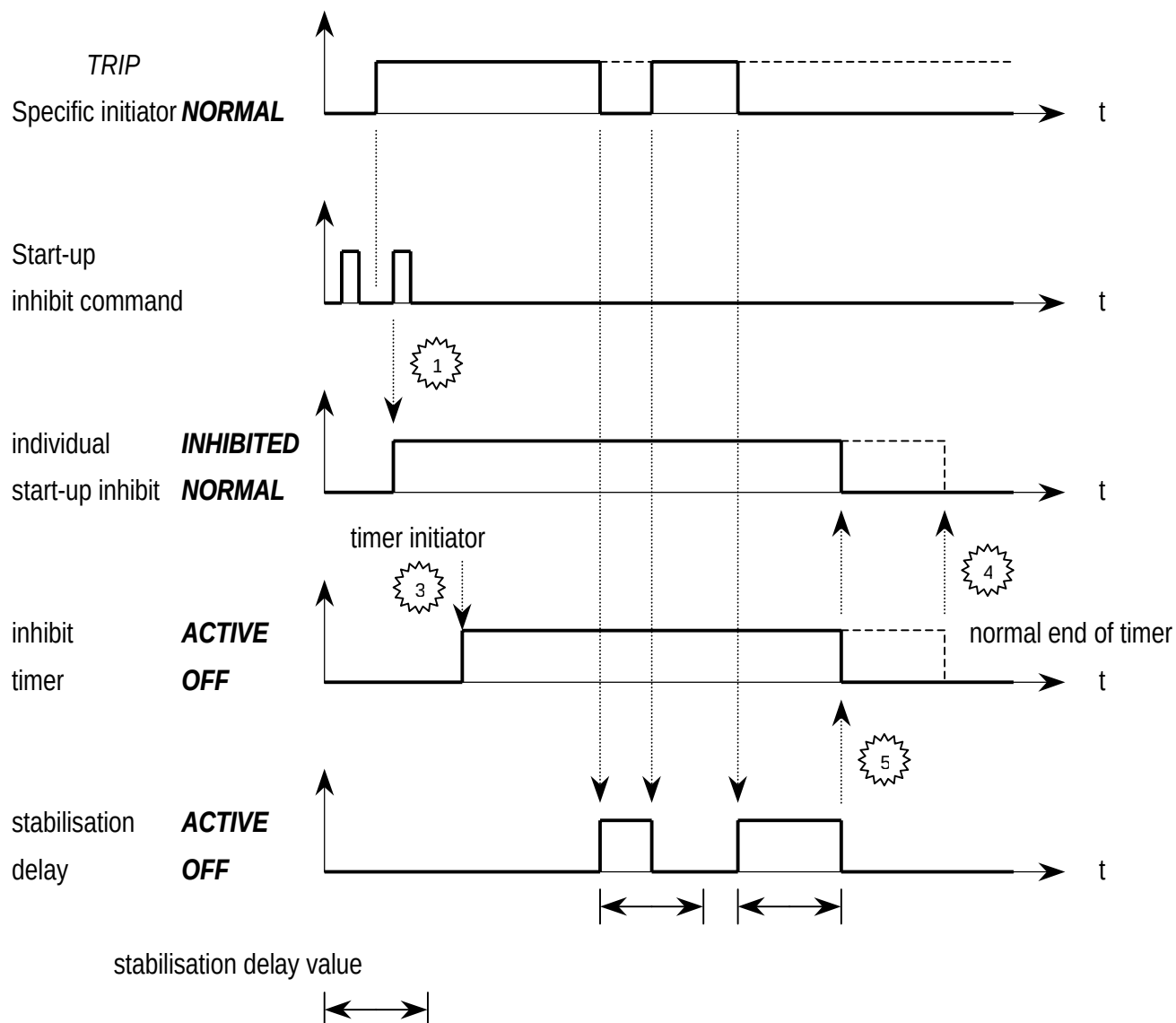
The activated start-up inhibit of a bar input will be deactivated if the corresponding loop fault occurs or when the corresponding Safety bar is reset to its NOT TRIPPED state.

The start-up inhibit of a bar input is not activated if the corresponding alarm for that input has not been acknowledged.

For some bar inputs, such as a PSL associated with a pump stop, after the alarm is masked, the individual start-up inhibit shall be set automatically by an external event (e.g. pump stopped,...)

5.4.2 Start-up inhibit utilisation

- 1 - When the start-up inhibit command is activated, all specific initiators in *TRIP* (and related to the start-up inhibition function) are *INHIBITED*.
 - 2 - Operator can then use the Safety bar reset command.
 - 3 - After the reset of the Safety bar, inhibition timers are initiated individually by the Safety bar reset or by specific actions (e.g. valve open, pump started, process threshold, ...).
- Two cases are then possible :
- 4 - the specific initiator is still in *TRIP* at the end of its inhibition timer,
the initiator is no longer *INHIBITED*, the initiator is then *LATCHED* again and the Safety bar is re-triggered and is *TRIPPED* again,
 - 5 - the specific initiator returns to *NORMAL* during the timer countdown
the inhibition timer is reset only if the specific initiator remains *NORMAL* (threshold status) during a stabilisation period, which avoids spurious Safety bar *TRIPS* during transient process conditions. After the reset of the inhibition timer, the specific initiator is no longer *INHIBITED* (please refer to following diagrams),



5.5 Bar output

5.5.1 Output timer handling (optional)

Each bar output corresponds to an individual safety trip command which can be used by internal safety logic or sent directly to the equipment.

When the output timer function is not used, the individual safety trip command directly follows the associated Safety bar status (TRIPPED → TRIP and NOT TRIPPED → NORMAL).

However, when the timer is used, the individual safety trip command is only performed after a specific individual time delay.

6. Tuning parameters and variables

Parameters	Access level
Inhibit timer pre-set value	Method
Stabilisation delay pre-set value	Method
Bar output time delay pre-set value	Method

7. Representation and Animation Description (HMI)

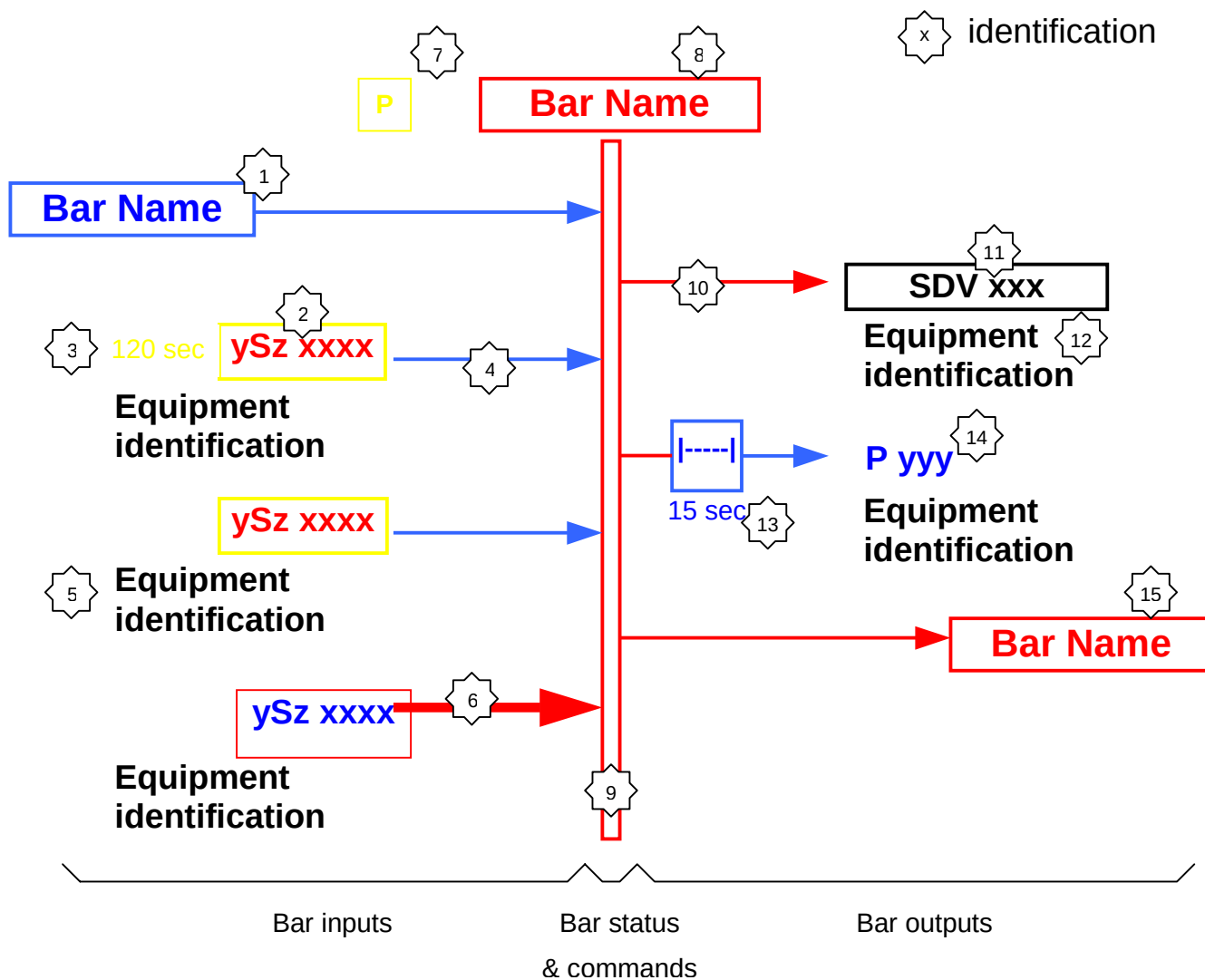
7.1 Events to be recorded

- Maintenance inhibit command
- Start-up inhibit command
- Bar reset command
- First-up initiator status
- Safety bar status

7.2 Alarm level handling

Data	Alarm
First-up initiator (automatic acknowledgement)	Level 3

7.3 General organisation of Safety bar graphic symbols



7.4 Specific animations description

7.4.1 Bar inputs animations

N°	Display description	Display	Colour
1	Higher Safety bar initiator= TRIP (higher Safety bar status = <i>TRIPPED</i>) Higher Safety bar initiator = NORMAL (higher Safety bar status = <i>NOT TRIPPED</i>)	Bar name → Bar name →	Red Blue
2	Specific initiator: The animation associated to each bar input (ySz xxxx) is fully detailed within the AIS standard (section "safety threshold display"). This animation is used as target area for calling a process display.		
3	Individual start-up inhibit status = INHIBITED (The inhibit timer countdown shall be displayed, otherwise the timer pre-set value is displayed on operator request. Timer value display is used as target area to access the pre-set value tuning window.	120 sec	Yellow Hidden
4	Latched trip initiator= LATCHED Latched trip initiator = UNLATCHED (used as target area for the maintenance inhibit command)	→ →	Red Blue
5	Text = DISPLAYED (only displayed on operator request) Text = HIDDEN	Equipment identification e.g. name of vessel	White Hidden
6	First –up initiator= FIRST Else	→	Red Hidden

7.4.2 Safety Bar status & command animations

N°	Display description	Display	Colour
7	Start-up inhibit command status (used as a target area for the start-up inhibit command)		Yellow
8	Safety bar status = TRIPPED (used as target area for the bar reset command) Safety bar status = READY TO RESET Safety bar status = NOT TRIPPED Safety bar status = ISOLATED (dedicated target for the isolating command will be located near by the bar name, in method access level; function access will be removed and de-activated after commissioning activity).	   	Red Bar name is blue Blue Bar name animation as above plus external frame
9	Safety bar status = TRIPPED Safety bar status = NOT TRIPPED	 	Red Blue

7.4.3 Bar outputs animations

N°	Displayed data	Animation	Colour
10	Safety bar status = TRIPPED Safety bar status = NOT TRIPPED	 	Red Blue
11	Individual safety trip command Test mode status Inhibit status In fault status	for frame animations, refer to individual Standard Functions (e.g. SDV,MOT)	
12	Text = DISPLAYED (only displayed on operator request) Text = HIDDEN	Equipment identification e.g. name of vessel	White Hidden
13	Time delay for output = ACHIEVED Time delay for output = NOT USED or ACTING The countdown timer must be displayed, otherwise the timer pre-set value is permanently displayed. (The timer display is used as a target area to access the pre-set value tuning window)	 	Red Blue
14	Valve, Motor,... status	for tag animation, refer to individual Standard Functions (e.g. SDV, MOT)	
15	Lower level Safety bar status = TRIPPED Lower level Safety bar status = NOT TRIPPED	 	Red Blue

When the safety bar is set to isolated status, its outputs will no longer interlock motors, valves,... which will remain in their previous status (before the activation of the isolating command), as well as initiators for the lower level safety bars, shown by animations 11, 14 and 15. Animations 10 and 13 will be as described above.



7.4.4 Animations upon communication or system faults

Bar inputs (initiators) and outputs (except links between Safety bars) are displayed in white colour (concerned animations : 2,14).

Safety bar status, input arrows and complete output arrows are displayed in blue colour (concerned animations :1, 4, 8, 9, 10, 13, 15).