Usual values and safeguard settings

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1 List of usual values and safeguard settings - general

For each system of the engine the tables in the chapter that follows give the values for usual operation and the trigger values for safeguard settings.

1.1 Tables - identification

The tables give the data that follow:

- **Description**

  This list gives the description of the object or of the system.

- **Medium / physical value / location**

  This list gives the data that follow:
  - Medium that is monitored
  - Physical parameter and unit
  - Location of the measurement

- **Usual operation (value or range)**

  This list gives the setpoint or the approximate range for usual operation. During operation the current values can have small differences to the given values.

- **Signal number**

  This list gives the signal number as follows (refer also to Para 1.2):
  - First two letters (XX) - Function code
  - Four digit number of the signal (for example 10NN)
    - First two numbers - Function group
    - Second two numbers - Running number
  - -nn - If more than one signal of the same type is applicable (for example TE2501-nnA is TE2501A, TE2502A, TE2503A)
  - Last letter - Applied system

- **Function**

  This list gives one of the functions that follow:
  - ALM - Alarm
  - GTrip - Gas Trip (the ECS changes to diesel mode)
  - SLD - Slowdown
  - SHD - Shutdown

- **Level**

  This list gives one of the levels that follow:
  - D - Deviation
  - H - High
  - L - Low

- **Trigger value**

  This list gives the value at which the related safeguard function starts.

  For the analysis elements (AE) of concentration:
  - max - maximum concentration

  For the level switches (LS) and flow switches (FS):
  - min - minimum or no flow
  - max - maximum flow

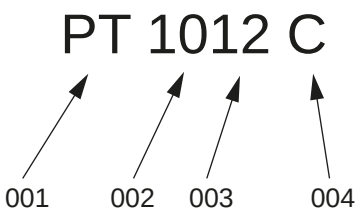
- **Delay**

  This list gives the delay of the action (in seconds) after the trigger value occurs.

1.2 Signal codes - identification

An example of a signal code is shown in Figure 1-1.

Fig 1-1 Signal codes



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Legend

001 Function code
002 Function group
003 Running number
004 Applied system

Tab 1-1 Function code

Code	First position	Second position
A	Analysis	n/a
C	Control	Control
E	n/a	Element
F	Flow	n/a
G	Gauge	n/a
H	Hand	n/a
I	n/a	Indication
J	Power	n/a
L	Level	n/a
P	Pressure	n/a
S	Speed	Switch
T	Temperature	Transmitter
V	n/a	Valve
X	Unclassified	Unclassified
Y	Vibration	Relay
Z	Position (binary)	n/a

Tab 1-2 Function group

Code	Signal type	System
10 to 19	Signals from the engine	Cooling water
20 to 29	Signals from the engine	System oil, cooling oil
31	Signals from the engine	Cylinder lubrication
33	Signals from the engine	Fuel gas
34	Signals from the engine	Fuel oil
35	Signals from the engine	Fuel gas
37	Signals from the engine	Exhaust gas
40 to 49	Signals from the engine	Air systems
50 to 59	Signals from the engine	Miscellaneous
60 to 69	Signals from the engine	Spare
70 to 79	Signals to the engine	Miscellaneous
80 to 89	Signals to the engine	Miscellaneous

Tab 1-3 Applied system

Code	Description
A	Alarm and monitoring system
C	Control system
L	Local
M	Measured indication, Local control panel
S	Safety system
W	Wrong way alarm
X	Miscellaneous

2 List of usual values and safeguard settings

On the pages that follow you find the values for usual operation and the trigger values for safeguard settings as follows:

- Table 1-4 - Cooling water systems (XX10NN to XX19NN)
- Table 1-5 - Oil systems (XX2NNN, part 1)
- Table 1-6 - Oil systems (XX2NNN, part 2)
- Table 1-7 - Oil systems (XX2NNN, part 3 (turbocharger bearing oil))
- Table 1-8 - Oil systems (XX2NNN, part 4)
- Table 1-9 - Gas system (XX33NN and XX39NN)
- Table 1-10 - Fuel system (XX34NN)
- Table 1-11 - Exhaust gas system (XX37NN)
- Table 1-12 - Air systems (XX40NN to XX44NN)
- Table 1-13 - Miscellaneous items (XX45NN to XX52NN)

Tab 1-4 Cooling water systems (XX10NN to XX19NN)

Description	Usual operation (value or range)	Safeguard setting				
Medium / physical value / location		Signal number	Function	Level	Trigger value	Delay
Cylinder liner, cylinder cover						
HT cylinder cooling water / pressure [bar] / engine inlet	3.2 to 5	PT1101A	ALM	L	≤ 3.0	0
			SLD	L	≤ 2.8	60
	-	PS1101S	SHD	L	≤ 2.5	60
HT cylinder cooling water / temperature [°C] / engine inlet	72 to 90	TE1111A	ALM	L	≤ 70	0
HT cylinder cooling water / temperature [°C] / outlet each cylinder (engine outlet)	90 +/-2 [1] 90 +/-4 [2]	TE1121-nnA	ALM	H	≥ 95	0
			SLD	H	≥ 97	60
Scavenge air cooler (SAC)						
SAC LT cooling water / pressure [bar] / engine inlet	2.5 to 4	PT1361A	ALM	L	≤ 2.0	0
SAC LT cooling water / temperature [°C] / engine inlet	25 to 36 [3]	TE1371A	ALM	L	≤ 21	0
SAC LT cooling water / temperature [°C] / outlet each SAC	25 to 75	TE1381-nnA	ALM	H	≥ 80	0

1 This value is applicable for stable operation condition.

2 This value is applicable for transient operation condition.

3 WinGD recommends a setpoint value of 25°C. 36°C is only permitted if the seawater temperature is 32°C.

Tab 1-5 Oil systems (XX2NNN, part 1)

Description	Usual operation (value or range)	Safeguard setting				
Medium / physical value / location		Signal number	Function	Level	Trigger value	Delay
Lubricating oil supply - system side						
Main lubricating oil / pressure [bar] / engine inlet	4.2 to 5	PT2001A	ALM	L	≤ 4.0	0
			SLD	L	≤ 3.8	60
	-	PS2002S	SHD	L	≤ 3.3	10
Main lubricating oil / temperature [°C] / engine inlet	45 +/-2 [1] 45 +/-4 [2]	TE2011A	ALM	H	≥ 50	0
			SLD	H	≥ 55	60
External crosshead bearing oil / pressure [bar] / engine inlet	10.2 to 13	PT2021A	ALM	L	≤ 10.0 [3]	10
			SLD	L	≤ 9.0 [3]	60
Injector lubricating oil						
Injector lubricating oil / pressure [bar] / inlet injectors	4.2 to 5	PT2003A	ALM	L	≤ 2.6 [4]	120
Bearing oil						
Main bearing oil / temperature [°C] / outlet each main bearing (optional)	45 to 60	TE2101-nnA	ALM	H	≥ 65	0
			SLD	H	≥ 70	60
Crank bearing oil / temperature [°C] / outlet each crank bearing (optional)	45 to 60	TE2201-nnA	ALM	H	≥ 65	0
			SLD	H	≥ 70	60
Crosshead bearing oil / temperature [°C] / outlet each crosshead bearing (optional)	45 to 60	TE2301-nnA	ALM	H	≥ 65	0
			SLD	H	≥ 70	60

1 This value is applicable for stable operation condition.

2 This value is applicable for transient operation condition.

3 The trigger value is only applicable above 40% engine load.

4 The trigger value is not applicable when the engine has stopped.

Tab 1-6 Oil systems (XX2NNN, part 2)

Description	Usual operation (value or range)	Safeguard setting				
Medium / physical value / location		Signal number	Function	Level	Trigger value	Delay
Servo oil						
Servo oil / pressure [bar] / distributor pipe (mini rail) [1]	60	PT2041A	ALM	L	≤ 40.0	3
			ALM	H	≥ 75.0	3
Servo oil / flow / inlet each servo oil pump [2]	-	FS2061-nnA	ALM	L	min	0
Servo oil leakage / flow / servo oil supply unit	-	LS2055A	ALM	H	max	10
Oil mist						
Oil mist / concentration / crankcase (each cylinder) [3]	-	AE2401-nnA	ALM	H	max	0
		AS2401A	ALM	H	max	0
	-	AS2401S	SLD	H	max	60
Oil mist / concentration / gearcase	-	AE2415A	ALM	H	max	0
Oil mist / concentration / fuel supply unit	-	AE2421A	ALM	H	max	0
Piston cooling oil						
Piston cooling oil / temperature [°C] / outlet each cylinder	45 to 75	TE2501-nnA	ALM	H	≥ 80	0
			SLD	H	≥ 85	60
Piston cooling oil / flow [l/min] / outlet each cylinder	-	FS2521-nnS	SHD	H	max	15
			SHD	L	min	15

1 The trigger values are not applicable when the engine has stopped.

2 The trigger values are only applicable above 30% engine load.

3 The concentration is related to the lower explosive level (LEL).

Tab 1-7 Oil systems (XX2NNN, part 3 (turbocharger bearing oil))

Description	Usual operation (value or range)	Safeguard setting				
Medium / physical value / location		Signal number	Function	Level	Trigger value	Delay
Bearing oil turbocharger Accelleron A100/200-L with internal oil						
TC bearing oil / pressure [bar] / inlet each turbocharger	1.3 to 2.5	PT2611-nnA	ALM	L	≤ 1.0	5
			SLD	L	≤ 0.8	60
	-	PS2611-nnS	SHD	L	≤ 0.6	5
TC bearing oil / temperature [°C] / outlet each turbocharger	45 to 100	TE2601-nnA	ALM	H	≥ 110	0
			SLD	H	≥ 120	60
Bearing oil turbocharger Accelleron A100/200-L with external oil						
TC bearing oil / pressure [bar] / inlet each turbocharger	1.5 to 2.5	PT2611-nnA	ALM	L	≤ 1.3	5
			SLD	L	≤ 1.1	60
	-	PS2611-nnS	SHD	L	≤ 0.9	5
TC bearing oil / temperature [°C] / inlet turbocharger	30 to 80	TE2621A	ALM	H	≥ 85	0
			SLD	H	≥ 90	60
TC bearing oil / temperature [°C] / outlet each turbocharger	45 to 120	TE2601-nnA	ALM	H	≥ 130	0
			SLD	H	≥ 140	60
Bearing oil turbocharger MHI MET with internal oil						
TC bearing oil / pressure [bar] / inlet each turbocharger	1.0 to 1.5	PT2611-nnA	ALM	L	≤ 0.7	5
			SLD	L	≤ 0.6	60
	-	PS2611-nnS	SHD	L	≤ 0.4	5
TC bearing oil / temperature [°C] / outlet each turbocharger	45 to 80	TE2601-nnA	ALM	H	≥ 90	0
			SLD	H	≥ 95	60
Bearing oil turbocharger MHI MET with external oil						
TC bearing oil / pressure [bar] / inlet each turbocharger	1.0 to 1.5	PT2611-nnA	ALM	L	≤ 0.7	5
			SLD	L	≤ 0.6	60
	-	PS2611-nnS	SHD	L	≤ 0.4	5
TC bearing oil / temperature [°C] / inlet turbocharger	35 to 50	TE2621A	ALM	H	≥ 60	0
			SLD	H	≥ 65	60
TC bearing oil / temperature [°C] / outlet each turbocharger	45 to 80	TE2601-nnA	ALM	H	≥ 90	0
			SLD	H	≥ 95	60

Tab 1-8 Oil systems (XX2NNN, part 4)

Description	Usual operation (value or range)	Safeguard setting				
Medium / physical value / location		Signal number	Function	Level	Trigger value	Delay
Damper oil						
Damper oil / pressure [bar] / inlet torsional vibration damper [1]	2.8 to 5.0	PT2711A	ALM	L	≤ 2.2	0
Damper oil / pressure [bar] / axial vibration damper space aft side	1.8 to 5.0	PT2721A	ALM	L	≤ 1.7	60
Damper oil / pressure [bar] / axial vibration damper space fore side	1.8 to 5.0	PT2722A	ALM	L	≤ 1.7	60
Cylinder oil						
Cylinder oil / pressure [bar] / cylinder oil rail [2]	≥ 0.47	PT3124A	ALM	L	≤ 0.1	30
Cylinder oil / temperature [°C] / engine inlet	35 to 50	-	-	-	-	-

1 The setpoint and trigger values can be different. For the applicable values refer to the specification of the damper manufacturer.

2 This value is only applicable if the engine has no iCAT.

Tab 1-9 Gas system (XX33NN and XX39NN)

Description	Usual operation (value or range)	Safeguard setting				
Medium / physical value / location		Signal number	Function	Level	Trigger value	Delay
Gas leakage detection						
Gas leakage / concentration [% LEL] / piston underside (engine outlet) [1]	-	AE3315C	ALM	H	≥ 20	0
			GTrip	H	≥ 40	0
Gas supply - iGPR						
Gas / pressure [bar] / inlet iGPR (engine inlet)	10 to 15 [2]	PT3941C	-	-	-	-
			-	-	-	-
Gas / flow [kg/h] / inlet iGPR (engine inlet)	1000 to 1800 [3]	FT3942C	-	-	-	-
Gas / pressure [bar] / outlet flowmeter	10 to 15	PT3942C	-	-	-	-
		PS3901S	GTrip	H	≥ 18.0	3
		PS3902S	GTrip	L	≤ 2.0	3
Gas / temperature [°C] / outlet flowmeter	20 to 50 [4]	TS3901S	GTrip	H	≥ 60	3
		TS3902S	GTrip	L	≤ 0 [4]	3
Gas / underpressure [mbar] / iGPR enclosure	-	PT3903C	GTrip	H	≥ -15	-
Gas / pressure [bar] / inlet pressure regulation valve	10 to 15	PT3906C	-	-	-	-
Air / flow [l/min] / inlet double wall pipe	41 to 45	FS3904S	GTrip	L	≤ 40	0
Gas supply - gas rail						
Gas / pressure [bar] / gas rail	- [5]	PT3595C	GTrip	H	≥ 16	-
		PT3597C	GTrip	L	≤ 2.0	

1 LEL - Lower explosive level

2 Related to the GTD requirement for the selected rating and to the LHV of the gas quality

3 Related to the engine load

4 For a mixture of volatile organic compounds (VOC) and liquefied natural gas (LNG) the usual operation range is 45 to 55°C. The related trigger value is ≤ 40°C.

5 Related to the engine load

Tab 1-10 Fuel system (XX34NN)

Description	Usual operation (value or range)	Safeguard setting				
Medium / physical value / location		Signal number	Function	Level	Trigger value	Delay
Fuel supply - system side						
High viscosity fuel which requires heating (HFO, excluding RMA10) / viscosity [cSt] / engine inlet	13 to 17	- [1]	ALM	H	≥ 20	0
			ALM	L	≤ 10	0
Low viscosity fuel which requires no heating (distillates, RMA10, most ULSFO) / viscosity [cSt] / engine inlet	3 to 14	- [1]	ALM	H	≥ 17	0
			ALM	L	≤ 2	0
Fuel supply unit						
Fuel / pressure [bar] / inlet fuel supply unit	7.5 to 10 [2]	PT3421A	ALM	L	≤ 7	0
Fuel / temperature [°C] / inlet fuel supply unit [3]	20 to 150	TE3411A	ALM	H	≥ 50 to 160	0
			ALM	L	≤ 20 to 130	0
Fuel leakage / flow / outlet fuel supply unit	-	LS3426A	ALM	H	max	10
Fuel leakage / flow / outlet fuel rail items	-	LS3446A	ALM	H	max	10
Rail unit						
Leakage / flow / outlet rail unit	-	LS3444A	ALM	H	max	10
Pilot fuel filter						
Fuel / differential pressure [bar] / pilot fuel filter	-	PS3464A	ALM	H	≥ 1.5	0

1 This measurement is not included in the standard engine supply (the viscometer is a yard supply item).

2 When the engine has stopped, the setpoint is 10 bar. The value decreases when the engine load increases.

3 The values are related to the fuel viscosity. Alarm can be omitted if available in AMS.

Tab 1-11 Exhaust gas system (XX37NN)

Description	Usual operation (value or range)	Safeguard setting				
Medium / physical value / location		Signal number	Function	Level	Trigger value	Delay
Exhaust pipe / manifold						
Exhaust gas / temperature [°C] / outlet each cylinder	-	TE3701-nnA	ALM	H	≥ 515	0
			ALM	D	≥ 50	0
			SLD	H	≥ 530	60
			SLD	D	≥ 70	60
Exhaust gas / temperature [°C] / inlet each turbocharger	-	TE3721-nnA	ALM	H	≥ 515	0
			SLD	H	≥ 530	60
Exhaust gas / temperature [°C] / outlet each turbocharger	-	TE3731-nnA	ALM	H	≥ 340	0
			SLD	H	≥ 380	60

Tab 1-12 Air systems (XX40NN to XX44NN)

Description	Usual operation (value or range)	Safeguard setting				
Medium / physical value / location		Signal number	Function	Level	Trigger value	Delay
Scavenge air receiver						
Scavenge air / temperature [°C] / outlet each air cooler	28 to 55	TE4031-nnA	ALM	L	≤ 25	0
			ALM	H	≥ 60	0
			SLD	H	≥ 70	60
Scavenge air / temperature [°C] / piston underside each cylinder	28 to 55	TE4081-nnA	ALM	H	≥ 80	0
			SLD	H	≥ 120	60
Condensation water / flow / at each water separator	-	LS4071-nnA	ALM	H	max	10
			SLD	H	max	60
Condensation water / flow / upstream each water separator	-	LS4075-nnA	ALM	H	max	10
			SLD	H	max	60
Starting air supply						
Starting air supply / pressure [bar] / engine inlet	25 or 30	-	-	-	-	-
Control air supply unit						
Control air supply / pressure [bar] / engine inlet	7 to 9	-	-	-	-	-
Control air / pressure [bar] / outlet usual supply	6.5	PT4401A	ALM	L	≤ 6.0	0
Control air / pressure [bar] / outlet stand-by supply	6.0	PT4411A	ALM	L	≤ 5.5	0
Control air / pressure [bar] / air tank for safety supply	6.5 or 6.0	PT4421A	ALM	L	≤ 5.0	15
Air spring						
Air spring air / pressure [bar] / supply to air spring	6.5 or 6.0	PT4341A	ALM	H	≥ 7.5	0
			ALM	L	≤ 5.5	0
			SLD	L	≤ 5.0	60
	-	PS4341S	SHD	L	≤ 4.5	0
Oil leakage / flow / air spring at driving end	-	LS4351A	ALM	H	max	5
Oil leakage / flow / air spring at free end	-	LS4352A	ALM	H	max	5

Tab 1-13 Miscellaneous items (XX45NN to XX52NN)

Description	Usual operation (value or range)	Safeguard setting				
Medium / physical value / location		Signal number	Function	Level	Trigger value	Delay
Thrust bearing						
Pad / temperature [°C] / thrust bearing (AHEAD)	45 to 75	TE4521A	ALM	H	≥ 80	0
			SLD	H	≥ 85	60
	-	TS4521S	SHD	H	≥ 90	60
Cylinder liner						
Wall / temperature [°C] / each cylinder liner aft side	≤ 230	TE4801-nnC	ALM	H	≥ 250	0
			SLD	H	≥ 270	60
Wall / temperature [°C] / each cylinder liner fore side	≤ 230	TE4841-nnC	ALM	H	≥ 250	0
			SLD	H	≥ 270	60
Powertrain						
Crankshaft / speed [% of CMCR] / crankshaft	-	ST5111-12S	SHD	H	≥ 110	0
Tachometer turbocharger						
Impeller shaft / overspeed [rpm] / each Accelleron turbocharger	-	ST5201-nnA	ALM	H	refer to note [1]	0
Impeller shaft / overspeed [rpm] / each MHI turbocharger	-	ST5201-nnA	ALM	H	refer to note [2]	0

1 Acceleron TC the alarm value is 0.97 x nMax on rating plate (nMax usually referred to as nMmax in 1/s).

2 For MHI TC the alarm value is 0.95 x nMax on rating plate (nMax usually referred to as overspeed in rpm).

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