 TORUS	· Owner ALARM AND TRIP SETPOINT SCHEDULE				Document No.	INS-LST-003
					Revision / Date	A · September 29, 2026
					Issue purpose	Issued for Review
INSTRUMENTATION AND CONTROLS ·ALARM AND TRIP SETPOINT SCHEDULE						
Rev.	Date	Revision description	Prepared	Reviewed	Approved	
A	2026-09-29	Issued for Review				

NOTES

This schedule lists the 88 alarms, control setpoints and trips of the station with, for each, the setpoint, its basis, the priority, the on-delay, the automatic action, the consequence of no response and the expected operator response. It is the alarm master database for configuring the RTU, the safety PLC, the flow computer, the burner management system and the SCADA displays, and it follows ISA-18.2 and API RP 1167.

The station is unmanned. The operator is the Owner’s gas controller at the SCADA host, supported by a call-out technician; a 60-minute drive time to site has been assumed (to be confirmed by the Owner). Alarm priorities were assigned from the time available to respond and the consequence, as set out in Table 1-1. Delays are on-delays in the logic solver that owns the point: debounce for switches, filtering for analyzers. Trip delays of safety instrumented functions (SIFs) form part of the SIF response time in SAF-SRS-001, Safety Requirements Specification. Analog alarm deadbands are 1 % of span unless stated. Shelved and suppressed alarms are recorded, and SIS trip alarms cannot be shelved.

Setpoints derived by calculation are explained in Table 1-2. Vendor-dependent setpoints (LSL-154, PSL-164A, PSH-164B, BMS timings and meter diagnostic limits) are typical until vendor data are received (HOLD H-15). Gas quality limits and the shut-in delay follow the tariff values of the Basis of Design pending the interconnect agreement (HOLD H-13). The overpressure shutdown demand rate depends on the upstream lateral MAOP (HOLD H-16).

PRIORITIES AND DERIVED SETPOINTS

Table 1-1: Alarm Priorities

Priority	Meaning	Required response	Examples
P1 Emergency	Trip or ESD has occurred, or a safety function has been demanded	Immediate; notify the receiving operator and call out	OPSS trip, station ESD, confirmed gas
P2 High	Will lead to a trip, off-spec delivery or loss of protection in about 15 min	Act from SCADA within 15 min; call out if unresolved	Pressure override not holding, gas quality high-high
P3 Medium	Abnormal condition needing action within about 1 h	Investigate; schedule call-out	Filter DP high-high, MOV travel timeout
P4 Low	Maintenance or information	Next routine visit	Pig arrival, element change planning

Table 1-2: Derived Setpoints

Setpoint	Value	Derivation
Trunkline overpressure limit	1,290 psig	49 CFR 192.201: the lower of MAOP + 10 % (1,320 psig) and the pressure producing 75 % SMYS in NPS 24 x 0.344 in X60 (1,290 psig)
OPSS trip PT-133A/B/C, 2oo3	1,225 psig	At 7.3 psi/s the process safety time to 1,290 psig is 8.9 s against a 5.5 s response (including a 0.5 s trip delay that filters short excursions); the peak is about 1,264 psig with the 4 s SDV-102 stroke (PRO-CAL-009, corrected for the trip delay). The trip is 45 psi above the 1,180 psig maximum PIC-134 setting
Layer separation	1,150 / 1,200 / 1,210 / 1,225 psig	Pressure override, BPCS high-high, SIS pre-alarm and trip are at least 10 psi apart, more than six times the 1.5 psi transmitter reference accuracy
TIC-135 setpoint	43.5 to 51.1 F	Pressure-compensated from PT-134: the larger of 40 F, hydrate temperature + 10 F and hydrocarbon dewpoint + 10 F (PRO-CAL-003)
TT-156 high / high-high	130 / 140 F	Heater outlet above the TIC-152 clamp; the high-high trip protects the 120 F delivery limit
H2S high-high (AT-143)	4.0 ppmv	Tariff 0.25 grain/100 scf converted at 378.6 scf/lbmol and 34.08 lb/lbmol = 3.97 ppmv
T-101 levels (LT-191, LSHH-192)	57.6 / 76.8 / 86.4 in	60 / 80 / 90 % of the 96 in shell of the 9 ft 6 in OD tank
TIC-161A (E-161 outlet)	105 F	Keeps the PCV-161 outlet at or above 40 F in the rich-gas case, which needs 102.7 F
SDV-102 travel alarm	5 s	4 s specified stroke plus 1 s

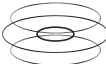
SETPOINT SCHEDULE

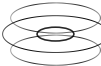
Table 1-3 is the full schedule.

INSTRUMENTATION AND CONTROLS ·ALARM AND TRIP SETPOINT SCHEDULE

Table 1-3: Alarm and Trip Setpoints

Point	Function	Setpoint	Units	Basis	Priority	Delay	Action	Consequence of inaction	Operator response
PT-101	PAH	1,180	psig	Above max supply 1,150 psig (Basis of Design Sec. 6)	P3	10 s	Alarm	Upstream overpressure trend, OPSS demand more likely	Contact Owner upstream gas control; confirm PIC-134 in control
PT-101	PAL	880	psig	Below C5 min metering pressure 900 psig	P3	30 s	Alarm	Meter velocity above design; flow limited	Check supply; reduce nomination
PT-101	PALL	600	psig	Possible upstream line rupture / supply loss	P2	10 s	Alarm; RTU ramps FIC-131 to hold	Continued depressurisation, liquids slug	Call out technician; consider remote ESD
PT-101	ROC	50	psi/min fall	Line-break detection	P2	60 s	Alarm	Undetected upstream rupture	Confirm with Owner upstream; ESD if confirmed
TT-101	TAH	125	F	Above C4 max 120 F	P4	60 s	Alarm	Delivery temperature limit risk	Notify Owner upstream cooler
TT-101	TAL	35	F	Below C1 45 F; heater demand	P4	60 s	Alarm	Hydrate margin reduced	Confirm heater mode ON
PT-102A	PAH (closure)	5	psig	Barrel must be at 0 psig before closure opening	P3	0 s	Alarm when closure-open intent	Closure opened under pressure (injury)	Do not open; vent via BDV-102
PDIT-103	PDAH	8	psid	Plan element change (Basis of Design Sec. 6: change-out 10 psid)	P4	5 min	Alarm	Approaching change-out	Schedule element change
PDIT-103	PDAHH	10	psid	Basis of Design Sec. 6 change-out DP	P3	5 min	Alarm	Element collapse / bypass if ignored	Change elements; swap to bypass only with approval
PDIT-103	PDAL	0.3	psid	Element ruptured or missing (only when flow > 20 MMSCFD)	P3	5 min	Alarm	Solids to USMs, measurement error	Inspect elements
LT-104	LIC-104 SP	12	in	Normal sump level	-	-	Control	-	-
LT-104	LAH	20	in	Above normal, dump not keeping up	P3	30 s	Alarm	Approach to LSHH-105 trip	Check LCV-104, SDV-106, T-101 level
LT-104	LAL	6	in	Below normal, dump valve passing	P3	30 s	Alarm; LIC-104 closes LCV-104	Approach to gas blow-by	Check LCV-104 seat
LSHH-105	LSHH	26	in	Liquid carryover protection (LOPA L-02)	P1	2 s	SIS closes SDV-101 (SIF-02)	Liquids to meters, heater,	Investigate slug; drain; reset SDV-101 locally
LSLL-106	LSLL	3	in	Gas blow-by protection (LOPA L-03)	P1	2 s	SIS closes SDV-106 and forces LCV-104 closed (SIF-03)	Gas blow-by overpressures T-101	Check LCV-104; reset locally
LCV-104	Open too long	120	s	Valve > 50 % open with no level fall	P3	120 s	Alarm	Possible blow-by	Check level instrument / valve
PT-111/121	PAL	894	psia	Below C5 (880 psig + 14.1)	P3	30 s	Alarm (FC)	Meter velocity above design	Reduce nomination
PT-111/121	PAH	1,214	psia	Above normal supply envelope	P4	30 s	Alarm (FC)	-	Check PT-101
TT-111/121	TAH / TAL	125 / 35	F	Outside C1-C4 envelope	P4	60 s	Alarm (FC)	-	Check heater / upstream
FT-111/121	FAH	125	MMSCFD	Above 120 MMSCFD design (velocity)	P3	60 s	Alarm	Meter above calibrated range	Reduce FIC-131 SP
FT-111/121	Low flow cutoff	1.0	MMSCFD	Below USM calibrated qmin (MEA to confirm)	P4	60 s	FC flow cutoff	-	-
FT-111/121	SOS deviation vs AGA 10	0.2	%	AGA 9 diagnostic (MEA to confirm)	P3	15 min avg	Alarm	Undetected meter drift	Run series verification
FT-111/121	Path failure	1	path	Any path invalid	P3	5 min	Alarm	Reduced accuracy	Inspect meter
FQI-110	Series deviation	0.3	%	Basis of Design Sec. 9.5 meter-to-meter agreement	P2	at end of test	Alarm; hold result	Custody error	Investigate both meters; notify
MOV-1xx	Travel timeout	90	s	NPS 10 MOV stroke (vendor ~60 s)	P3	90 s	Alarm; run-switch sequence hold	Run switching incomplete	Inspect MOV
AT-141	HHV AH / AHH	1,140 / 1,150	Btu/scf	Tariff max 1,150 (Basis of Design Sec. 5.2, H-13)	P2 / P2	0 / 15 min	Alarm / gas quality shut-in	Off-spec delivery	Contact Owner treating; confirm GC cal
AT-141	HHV AL / ALL	980 / 970	Btu/scf	Tariff min 970	P2 / P2	0 / 15 min	Alarm / shut-in	Off-spec delivery	As above
AT-141	CO2 AH / AHH	1.8 / 2.0	mol %	Tariff max 2.0	P2 / P2	0 / 15 min	Alarm / shut-in	Off-spec delivery	Contact Owner treating
AT-141	Inerts AH / AHH	3.6 / 4.0	mol %	Tariff max 4.0 (CO2 + N2)	P2 / P2	0 / 15 min	Alarm / shut-in	Off-spec delivery	Contact Owner treating

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AT-141	HCDP calc AH	12	F	Tariff 15 F; GC C6+ estimate only (alarm, not shut-in)	P3	15 min	Alarm	Liquid dropout in trunkline	Request extended analysis
AT-141	GC fail / cal fail	-	-	FC substitutes last good composition (Basis of Design Sec. 12)	P2	0	Alarm	Energy error	Repair within agreement window
AT-142	AH / AHH	5.0 / 7.0	lb/MMscf	Tariff max 7 lb/MMscf	P2 / P2	0 / 15 min	Alarm / shut-in	Corrosion, hydrates in trunkline	Contact Owner dehydration
AT-143	AH / AHH	3.2 / 4.0	ppmv	Tariff 0.25 gr/100 scf = 4.0 ppmv (calc)	P2 / P2	0 / 15 min	Alarm / shut-in	Off-spec, corrosion	Contact Owner treating
AT-144	AH / AHH	8 / 10	ppmv	Tariff max 10 ppmv	P2 / P2	0 / 15 min	Alarm / shut-in	Corrosion	Check for air ingress
TT-173	TAL / TALL	42 / 40	F	Tariff min delivery 40 F	P2 / P2	0 / 15 min	Alarm / shut-in	Hydrates, brittle risk downstream	Check heater
TT-173	TAH / TAHH	118 / 120	F	Tariff max delivery 120 F	P3 / P2	0 / 15 min	Alarm / shut-in	Coating damage downstream	Heater to bypass; check upstream
TT-135	TIC-135 SP	42.3-51.6	F	Pressure-compensated from PT-134: 11-point characterizer of PRO-CAL-003 Table 7.8a, 700 to 1,180 psig (43.5 F @ 750, 51.1 F @ 1,150 psig design gas; rich-gas column while the off-spec HHV alarm is active)	-	-	Control (cascade master)	-	-
TT-135	TAL	SP-2	F	Below compensated SP	P3	60 s	Alarm	Hydrate / liquid dropout	Check heater firing
TT-135	TALL	SP-3.5, min 40	F	Hydrate / dewpoint margin eroding	P2	60 s	Alarm	Hydrate in FCV / outlet	Reduce pressure cut or rate; call-out
TT-151	TIC-151 high limit override	190	F	Bath high limit (low-select on TCV-152)	-	-	Override	-	-
TT-151	TAH	195	F	Approach to TSHH-155	P3	30 s	Alarm	Bath boil-off	Check TIC-152 / TCV-152
TT-151	TAL (heater ON)	100	F	Heater firing but bath cold	P3	10 min	Alarm	Hydrate margin lost	Check burner
LSH-154B	LSH	Vendor	in	Bath level rise = coil leak (HZ-05)	P1	5 s	BMS trip; RTU alarm to isolate heater (HV-158A/B)	Bath overpressure, firetube / shell rupture	Isolate coil, depressure
ZSO-103C	Bypass not closed	-	-	Unfiltered gas to meters (Basis of Design Sec. 12)	P2	5 s	Alarm	Solids to USMs, measurement error	Confirm approval; close
TT-156	TAH	130	F	Coil outlet above TIC-152 clamp	P3	60 s	Alarm	Approach to HH trip	Check TIC-152
TT-156	TAHH trip	140	F	Heater gas outlet high-high; protects the 120 F delivery limit	P1	5 s	RTU TY-156 trips BMS-150 (I-06): close XV-150A/B/C and SDV-165	Delivery above 120 F, coating damage	Investigate TIC-152 / TCV-152; BMS reset
TSHH-155	TSHH	200	F	Bath high-high, per PRO-CAL-007 (below boiling of 50/50 glycol, API 12K)	P1	0	BMS trip, close XV-150A/B/C	Bath boil-off, firetube damage	Investigate; manual reset at CP-150
LSL-154	LSL	Vendor	in	Min 2 in above firetube top (vendor)	P1	5 s	BMS trip	Firetube overheating / rupture	Refill bath; check for coil leak
BE-153A/B	Flame failure (1oo2)	4	s FFRT	Flame failure response time 4 s max (API 556 guidance)	P1	4 s	BMS trip	Fuel accumulation, firebox explosion	Investigate; re-purge before relight
PSL-164A	PSL	5	psig	Burner train low (HOLD H-15)	P1	2 s	BMS trip	Unstable flame, flameout	Check fuel supply
PSH-164B	PSH	20	psig	Burner train high (HOLD H-15)	P1	2 s	BMS trip	Over-firing, flame lift	Check regulator
TIC-161A	SP	105	F	PCV-161 outlet >= 40 F needs 102.7 F (rich-gas case governs), plus margin	-	-	Control (integral)	-	-
TSH-161B	Cutout	Vendor	F	E-161 element over-temperature (HOLD H-15)	P3	0	E-161 de-energized (integral); alarm	Loss of preheat, PCV-161 freezing	Call out; reset at E-161
XA-161	Common alarm	-	-	E-161 low outlet temperature / fault	P3	60 s	Alarm	Fuel below MDMT downstream PCV-161; hydrate in regulator	Check E-161; heater BMS may trip on low fuel pressure
PSL-141L	PSL	MEA	psig	GC carrier gas low	P3	60 s	Alarm	GC stops analyzing; energy on last good composition	Change carrier cylinder
XS-150	BMS trip to SIS	-	-	P&ID I-06	P2	0	SIS closes SDV-165	Fuel held at burner train	Investigate BMS first-out
PT-164	PAH / PAL	35 / 15	psig	PCV-162 set 25 psig	P3	30 s	Alarm	Regulator failure	Check PCV-162, PSV-161
FT-163	FAH	7.0	Mscf/h	Above heater + G-101 max (calc)	P4	5 min	Alarm	Leak / over-firing	Inspect fuel system
PT-134	PIC-134 SP	1,150	psig	Basis of Design Sec. 9.1 (adjustable, clamp 1,180)	-	-	Control override	-	-
PT-134	PAH	1,170	psig	Override not holding	P2	10 s	Alarm	Approach to OPSS trip	Reduce FIC SP; check FCV

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Point	Function	Setpoint	Units	Basis	Priority	Delay	Action	Consequence of inaction	Operator response	
PT-134	PAHH (BPCS)	1,200	psig	Trunkline MAOP (H-04)	P2	3 s	RTU forces both FCVs to 0 %	OPSS demand	Investigate; restart per INS-RPT-001	
PT-134	PAL	700	psig	Below trunkline min 750	P3	60 s	Alarm	line pressure loss	Contact	
PT-133A/B/C	PAH (pre-alarm)	1,210	psig	Pre-trip warning	P2	2 s	Alarm (SIS)	OPSS trip imminent	Reduce flow	
PT-133A/B/C	PAHH trip 2oo3	1,225	psig	Basis of Design Sec. 9.2; process safety time 8.9 s to the 1,290 psig 192.201 limit (PRO-CAL-009)	P1	0.5 s	SIS closes SDV-102 (SIF-01); RTU ramps FCVs to 0	trunkline overpressure	Local key reset at HS-102 after cause found	
PT-133A/B/C	Deviation	25	psi	Any transmitter vs median	P2	10 s	Alarm	Latent transmitter fault	Calibrate / repair within MTTR 72 h	
PT-133A/B/C	Out of range	< 3.6 or > 21.0	mA	NAMUR NE43	P2	2 s	Faulted channel voted as trip (2oo3 degrades to 1oo2)	Reduced protection	Repair within 72 h	
FCV-131/132	Position deviation	5	% of stroke	/ZT -demand/ (Basis of Design Sec. 9.1 switchover)	P2	30 s	Auto switchover to standby	Loss of flow / pressure control	Inspect duty actuator	
SDV-102	Travel (close)	5	s	4 s stroke + 1 s; proof-test acceptance 4.0 s	P2	5 s	Alarm	OPSS response degraded	Inspect actuator; proof test	
SDV-101/103	Travel (close)	25	s	Stroke <= 20 s (spec) + 5 s	P2	25 s	Alarm	ESD response degraded	Inspect actuator	
SDV-106/165	Travel (close)	7	s	Stroke <= 5 s + 2 s	P2	7 s	Alarm	Trip response degraded	Inspect actuator	
PT-172	PAH	1,180	psig	Near trunkline MAOP	P3	10 s	Alarm	-	Contact	
PT-172	PAL	700	psig	Below trunkline min	P3	60 s	Alarm	Possible downstream rupture	Contact	
LT-191	LAH	57.6	in	Schedule truck (60 % of 96 in shell)	P4	5 min	Alarm	-	Schedule truck	
LT-191	LAHH (BPCS)	76.8	in	80 % of shell; ahead of LSHH-192	P3	60 s	Alarm; LIC-104 hold closed	Approach to overfill	Dispatch truck	
LSHH-192	LSHH	86.4	in	90 % of shell height (LOPA L-04)	P1	2 s	SIS closes SDV-106, forces LCV-104 closed	Tank overfill to containment	Truck out; reset locally	
GD-205/206	High	20	% LEL	Basis F&G philosophy	P2	5 s	Alarm, B-101 beacon XY-214A	Escalation	Do not enter; call-out	
GD-205/206	High-high (confirmed)	40	% LEL	1 at 40 % AND other at >= 20 %	P1	5 s	Close SDV-141, isolate non-rated power, station ESD	Explosion in B-101	Emergency response per ERP	
GD-205/206	Single HH, not confirmed	40	% LEL	One detector only	P2	5 s	Close SDV-141, isolate B-101 power	-	Investigate	
GD-207	High	20	% LEL	B-102 HVAC intake	P2	5 s	Alarm, B-102 HVAC shutdown + damper close	Gas drawn into B-102	Investigate	
GD-207	High-high	40	% LEL	Basis of Design Sec. 9.3	P1	5 s	Station ESD	Ignition in B-102	ERP	
GD-2xx	Detector fault	< 3.0	mA	Detector fault / beam block	P2	10 s	Alarm	Loss of detection	Repair; portable monitor coverage	
BE-213	Fire	20	mA	Basis of Design Sec. 9.3 fire at H-101	P1	3 s	Station ESD	Escalating fire	ERP	
XS-212	Smoke	-	-	B-102 fire	P1	0	Alarm, B-102 HVAC off	Loss of control building	ERP	
FSL-208	Airflow low	-	-	B-101 ventilation lost	P2	30 s	Alarm; SIS isolates B-101 non-rated power (XY-214D) after 5 min	Gas accumulation	Repair fan	
TT-208A	TAH / TAL	104 / 50	F	GC environment limits (vendor)	P3	10 min	Alarm	GC drift	Check HVAC	
EI-210A	EAL / EALL	22.8 / 21.6	VDC	24 VDC bus	P3 / P2	30 s	Alarm	Loss of control power (SIS trips fail-safe)	Check UPS / charger	
HS-201..204	ESD pushbutton	-	-	Basis of Design Sec. 9.3	P1	0	Station ESD	-	Follow ERP; local reset	
HS-215	remote shutdown	-	-	Basis of Design Sec. 9.3	P1	0	Station ESD	-	Contact gas control	

