 TORUS		· Owner LEVEL, PRESSURE, TEMPERATURE AND FLOW SWITCHES		Document No.	INS-DS-005
				Revision / Date	A · September 29, 2026
				Issue purpose	Issued for Review
INSTRUMENTATION AND CONTROLS · LEVEL, PRESSURE, TEMPERATURE AND FLOW SWITCHES					
Rev.	Date	Revision description	Prepared	Reviewed	Approved
A	2026-09-29	Issued for Review			

NOTES

1. This datasheet covers the discrete process switches: the vibrating fork level switches for the safety trips, the burner management trip switches supplied with line heater H-101, and the B-101 ventilation airflow switch.
2. Controlling documents: GEN-DB-001, Basis of Design; INS-LST-001, Instrument Index; INS-LST-002, I/O List; INS-LST-003, Alarm and Trip Setpoints; SAF-SRS-001, Safety Requirements Specification (SIF-02, SIF-03, SIF-04); INS-DWG-004, Instrument Installation Hook-up Typical (HU-LS).
3. Values marked typical are budgetary. The vendor shall confirm them with its proposal and final data (HOLD H-15).
4. Units are US customary. Pressures are gauge unless stated as absolute. Operating cases C1 to C7 are defined in GEN-DB-001, Section 6; normal conditions are case C2, maximum operating conditions the envelope of C1 to C7, and design conditions those of GEN-DB-001, Section 7.
5. LSHH-105 is the sensor of SIF-02, LSL-106 of SIF-03 and LSHH-192 of SIF-04. Each has its own nozzle, independent of LT-104 and LT-191.
6. The heater switches (LSL-154, TSHH-155, PSL-164A and PSH-164B) wire to the burner management panel CP-150 and are supplied with H-101. This datasheet sets the minimum requirements for the heater vendor.
7. TSHH-155 is set at 200 °F to agree with the bath high-high temperature used in PRO-CAL-007, Pressure Relief Devices and Tank Venting.

GENERAL

Table 1-1: General Data

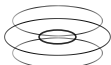
Item	Value	Item	Value
Project	County,	Service	120 MMSCFD gas receipt into the receiving pipeline operator's
Form content	ISA-20; tag numbers to ISA-5.1	Electrical codes	NFPA 70 (2023) Articles 500 and 501; API RP 500
Safety instrumented tags	IEC 61511 and IEC 61508	Sour service	Not required; sweet gas, H2S 4 ppmv maximum (NACE MR0175 not applied)

SITE CONDITIONS

Table 1-2: Site and Environmental Conditions

Item	Value	Item	Value
Ambient design temperature	-5 °F to 110 °F	Electronics rating	-40 °F to 158 °F (-40 °C to 70 °C)
Solar radiation	1,000 W/m ² ; sunshades where exposed	Elevation and atmosphere	1,150 ft MSL; 14.10 psia
Wind and ice	108 mph (ASCE 7-22, Exposure C); 0.5 in radial ice (HOLD H-06)	Area classification	Class I, Division 2, Group D in process areas; Division 1 within 5 ft of vents and relief outlets (Volume 6 area classification drawing)



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Item	Value	Item	Value
Temperature class	T3 minimum (natural gas autoignition about 900 °F)	Enclosure	NEMA 4X (IP66) minimum; 316 SS or copper-free aluminum (below 0.4 % Cu), epoxy coated
Instrument power	24 VDC from the station UPS (GEN-DB-001, Section 9.8) unless noted		

TAG SCHEDULE

Table 1-3 lists every tag in  INS-LST-001 that references this datasheet, and Table 1-4 gives the process conditions at each tag.

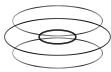
Table 1-3: Tag Schedule

Tag	Service	P&ID	Range or set	System	JB	Area classification
LSHH-105	V-101 high-high level (trips SDV-101)	 PRO-DWG-102	Set 26 in	Safety PLC	JB-101S	Class I, Division 2, Group D
LSLL-106	V-101 low-low level (closes LCV-104 and SDV-106, blow-by protection)	 PRO-DWG-102	Set 3 in	Safety PLC	JB-101S	Class I, Division 2, Group D
LSL-154	H-101 low bath level (burner trip)	 PRO-DWG-105	Set by vendor (min 2 in above firetube)	Burner management BMS-150	CP-150	Class I, Division 2, Group D (fired-equipment area)
LSH-154B	H-101 bath / expansion tank high level, coil leak detection, BMS trip (proposed, HZ-05)	 PRO-DWG-105	Set by vendor	Burner management BMS-150	CP-150	Class I, Division 2, Group D (fired-equipment area)
TSHH-155	H-101 high-high bath temperature (burner trip)	 PRO-DWG-105	Set 200 °F	Burner management BMS-150	CP-150	Class I, Division 2, Group D (fired-equipment area)
PSL-164A	Burner fuel low pressure (BMS trip)	 PRO-DWG-112	Set 5 psig (HOLD H-15)	Burner management BMS-150	CP-150	Class I, Division 2, Group D (fired-equipment area)
PSH-164B	Burner fuel high pressure (BMS trip)	 PRO-DWG-112	Set 20 psig (HOLD H-15)	Burner management BMS-150	CP-150	Class I, Division 2, Group D (fired-equipment area)
LSHH-192	T-101 high-high level (closes LCV-104 and SDV-106)	 PRO-DWG-110	Set 86.4 in	Safety PLC	JB-101S	Class I, Division 1, Group D (within 5 ft of the T-101 vent)
FSL-208	B-101 ventilation fan failure (SIS, drives B-101 power isolation)	 PRO-DWG-111	None	Safety PLC	JB-140S	Class I, Division 2, Group D (B-101 interior)

Table 1-4: Process Conditions

Tag	Normal P and T	Maximum operating P and T	Design P and T
LSHH-105	1,050 psig / 70 °F	1,150 psig / 45 to 120 °F	1,440 psig / -20 to 150 °F
LSLL-106	1,050 psig / 70 °F	1,150 psig / 45 to 120 °F	1,440 psig / -20 to 150 °F
LSL-154	Atmospheric bath / 150 to 190 °F	Atmospheric / 200 °F	Vendor bath design / 250 °F
LSH-154B	1,030 psig / 68 to 130 °F (coil)	1,150 psig / 140 °F (TAH)	1,440 psig / 250 °F (coil design)
TSHH-155	Atmospheric bath / 150 to 190 °F	Atmospheric / 200 °F	Vendor bath design / 250 °F
PSL-164A	10 psig fuel / ambient	25 psig / 110 °F	Class 150 / -20 to 150 °F
PSH-164B	10 psig fuel / ambient	25 psig / 110 °F	Class 150 / -20 to 150 °F
LSHH-192	Atmospheric / ambient	Atmospheric / -5 to 110 °F	Atmospheric / -5 to 110 °F



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Tag	Normal P and T	Maximum operating P and T	Design P and T
FSL-208	Atmospheric / ambient	Atmospheric / -5 to 110 °F	Atmospheric / -5 to 110 °F

SPECIFICATION

Table 1-5: Specification

Item	Requirement
Fork switches LSHH-105, LSLL-106, LSHH-192	Vibrating fork point level switch, compact, 316L SS fork, for liquid relative density 0.5 to 1.1
Fork process connection	LSHH-105 and LSLL-106: NPS 2 Class 600 RF, horizontal insertion into the V-101 sump nozzles at 26 in and 3 in above the sump bottom (vendor elevations). LSHH-192: NPS 2 Class 150 RF, top mounted with extension to trip at 86.4 in (90 % of the 96 in shell), leaving 9.6 in (about 10 bbl) of freeboard
Fork pressure rating	LSHH-105 and LSLL-106: 1,440 psig at 150 °F. LSHH-192: atmospheric tank, 150 psig minimum
Output, safety switches	Electronic insert with DPDT relay or NAMUR (IEC 60947-5-6) output to a line-monitored safety PLC input; contacts open on trip, on loss of power and on detected fault (normally closed wiring,  INS-LST-002)
Output, heater switches	SPDT or DPDT dry contact opening on trip; manual reset on TSHH-155, PSL-164A and PSH-164B
Time delay	0.5 s in the switch; 2 s in the safety PLC ( INS-LST-003)
Diagnostics	Continuous fork self-monitoring for corrosion, damage, build-up and cable break; proof test by test magnet or button without removal
SIL capability	LSHH-105, LSLL-106 and LSHH-192: IEC 61508 certified SIL 2 capable, with safety manual and FMEDA (HOLD H-15)
TSHH-155	Heater vendor supply: bulb and capillary, or RTD with trip amplifier; set 200 °F rising; manual reset; 316 SS well
LSL-154	Heater vendor supply: float or vibrating fork on the bath, set at least 2 in above the firetube top, trips on low level and on failure
PSL-164A and PSH-164B	Heater vendor supply on the burner train: diaphragm pressure switches set 5 psig falling (PSL) and 20 psig rising (PSH), adjustable, manual reset, with gauge valve (HOLD H-15 for burner pressures)
FSL-208	Duct airflow switch, differential pressure or thermal dispersion, on the B-101 exhaust fan; set at 50 % of design airflow; SPDT
Housing and rating	Explosion-proof, Class I, Division 1, Group D in the field; NEMA 4X; LSHH-192 is in the Division 1 zone
Power	24 VDC from the safety PLC, burner management system or RTU as listed
Tagging	Safety instrumented tags (PT-133A/B/C and all safety final elements): yellow stainless plate engraved with the tag and SIF number, and yellow cable markers. Other tags: 316 SS plate, 1/8 in engraved characters, wired to the instrument
Inspection and testing	Functional test certificate at set point; fork switches tested wet and dry with density check
Documentation	Dimensional drawing, wiring diagram, hazardous location certificate, calibration certificate, IEC 61508 certificate and safety manual for safety instrumented tags, installation and maintenance manual and spare parts list, all as searchable PDF

OPEN ITEMS

Table 1-6: Open Items

HOLD	Item	Responsible party
H-15	V-101 switch nozzle elevations, burner train pressures and bath level set point	Vendors
TBV	T-101 roof nozzle for LSHH-192	Volume 4 tank datasheet

