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Pressure/Flow Impulse Test Stand

General Description

The Pressure / Flow Impulse Test Stand is a fully integrated system designed to perform pressure impulse and flow impulse testing on oil-filled components. The freestanding unit incorporates a dedicated test area positioned over a shallow stainless steel sink fitted with a screen. The sink drains manually to a removable waste container, while process connections to the unit under test are located on the rear panel within the enclosed viewing area.

An adjacent compartment houses the day tank and pumping equipment. The upper section contains the control and computer enclosure, including a 22-inch touchscreen computer and keyboard mounted on a rotating arm to provide convenient operator access.

A key feature of the proposed system is its ability to impose pulsating pressure and flow conditions on the test specimen while isolating the remainder of the hydraulic circuit from the damaging effects of these transients. The method used to achieve this is described below.

Process Description

A stainless steel reservoir stores the test fluid, and a positive displacement pump delivers fluid to a pressure level established by a manual back-pressure regulator. Pump speed is controlled to maintain the required pressure, allowing the system to operate efficiently at reduced flow rates when fewer test channels are in service or when testing is conducted at lower flow conditions.

Discharge from the pump is routed to a 3-inch diameter header. The increased pressurized volume of this header, together with a pulsation dampener, minimizes water-hammer effects and protects the system as a whole from excessive transient loading.

The circulating fluid then passes through a forced-fan cooler before returning to the reservoir. The cooling fan is controlled as required to maintain the desired fluid temperature. Heating is achieved by the hydraulic energy input of the pump.

The system includes four test channels supplied from the main 3-inch header. Within each channel, fluid first passes through an isolating ball valve and then through a manual flow control valve used to set the flow rate through the unit under test. An indicating pressure transmitter with a 1.5 ms response time and 0.1% repeatability sends the measured pressure signal to the controller for monitoring and recording.

Downstream of the test specimen, a flowmeter with local display provides flow measurement with 1% repeatability and a response time of 10 ms. A sight glass is included in the line to verify that the test article is free of entrained air. A fast-acting solenoid valve may be installed either upstream or downstream of the unit under test, depending on the specific test mode.

For pressure impulse testing, the solenoid valve is positioned on the outlet side of the test specimen. Closing the solenoid valve rapidly pressurizes the test article to the header pressure, while opening the valve relieves pressure and permits flow of temperature-controlled fluid through the component.

For flow impulse testing, the solenoid valve may remain downstream with the test part subjected to system pressure, or it may be relocated upstream of the test specimen to eliminate applied pressure on the part while still creating the required flow transient.

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Control System

The control system includes dedicated Pump Start/Stop, Master Power, and Emergency Stop pushbuttons, while all other operating parameters are entered and managed through the HMI. The HMI is a full-color 17-inch display with graphical trending and data-recording capability.

Control is based on an Allen-Bradley Micro 870 PLC equipped with analog input cards providing an 8 ms response time and 16-bit resolution. Test data may be transferred from the system to a USB flash drive for further analysis and record retention.

Performance Summary

Parameter	Specification
Power Supply	208-240 VAC, 3 Phase, 60 Hz
Temperature Range	Ambient to 100°C ± 3°C
Test Pressure Range	0-150 PSIG
Pressure Transducer	0-150 PSIG range, 0.1% FS accuracy, 1 ms response
Valve Response Time	<100 milliseconds

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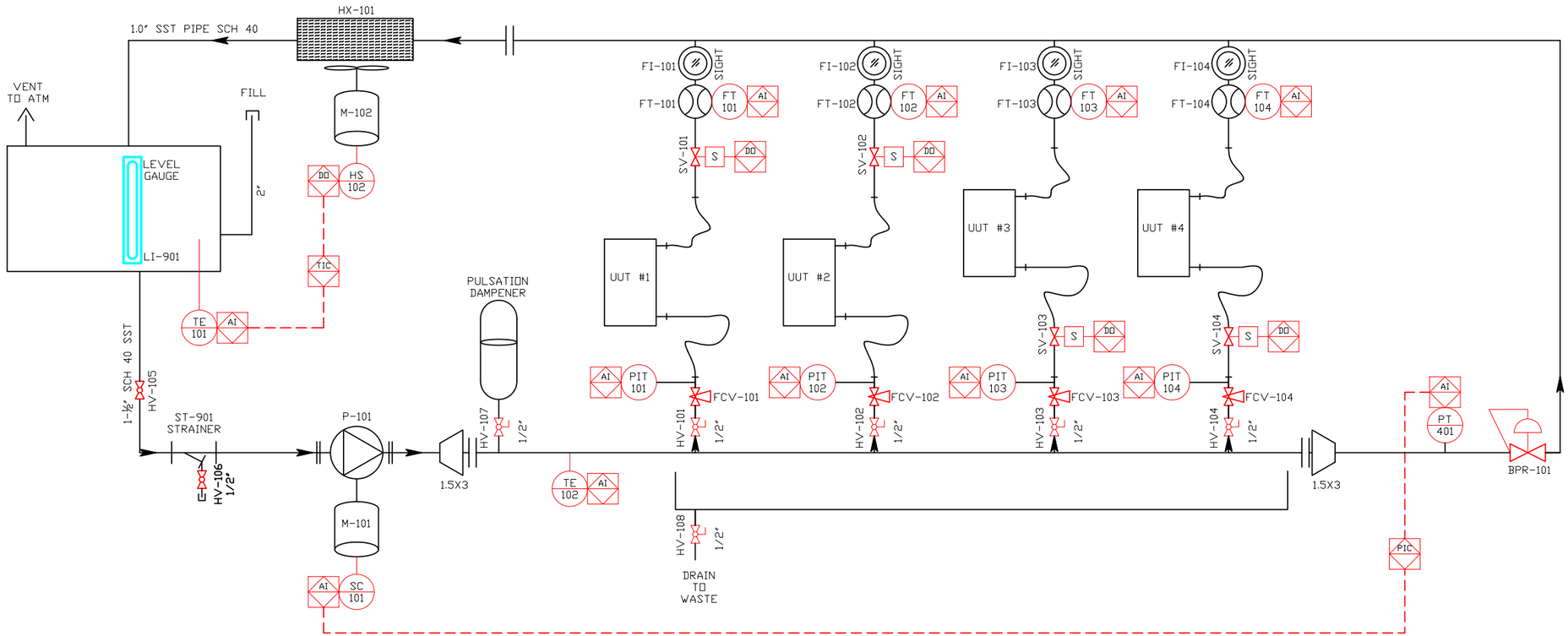

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LTR	DATE	BY	DESCRIPTION

REVISIONS

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ENGINEER APPROVAL BY:		DATE	
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CLIENT	
PROJECT TITLE	PRESSURE / FLOW TEST STAND
LOCATION	
SHEET TITLE	PROCESS & INSTRUMENTATION DIAGRAM

SIZE	SHEET	NUMBER
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