

## Thermo Scientific Sapphire Single- and Dual-Point Level Systems

Thermo Scientific Sapphire single- and dual-point level systems feature an advanced acoustical design and a continuous self-test to increase reliability and uptime. Available in gap or slot sensor configurations, these field-proven ultrasonic devices perform exceptionally well in aerated, attenuative, viscous and corrosive applications yet require minimal maintenance.



### Features & Benefits

- Gap or slot sensor configurations
- Continuous self-test for unmatched reliability
- Variable system qualification time
- Manual loop test
- Dual-compartment housing
- Lowest total installed cost
- Broad range of sensor materials
- 3A sanitary finish and fittings
- Completely independent electronics (dual-point level system only)



### Reliable Level Measurement

Designed for both low and high level alarms and spill prevention, Thermo Scientific Sapphire single- and dual-point level systems are available in gap and slot configurations to provide reliable level measurement under demanding conditions. The standard gap sensor performs exceptionally well in most applications, including aerated and attenuating liquids that can be problematic for other ultrasonic technologies. The more sensitive slot sensor is recommended for highly viscous applications or for dual-point usage when the sensing points are positioned more than 18 inches apart.

While both systems are highly reliable, the dual-point system incorporates two Sapphire single-point level systems into one enclosure, including two electronics packages. The dual-point system also offers the industry's best sensitivity with a wet to dry ratio of over 10,000.

### Rugged Design

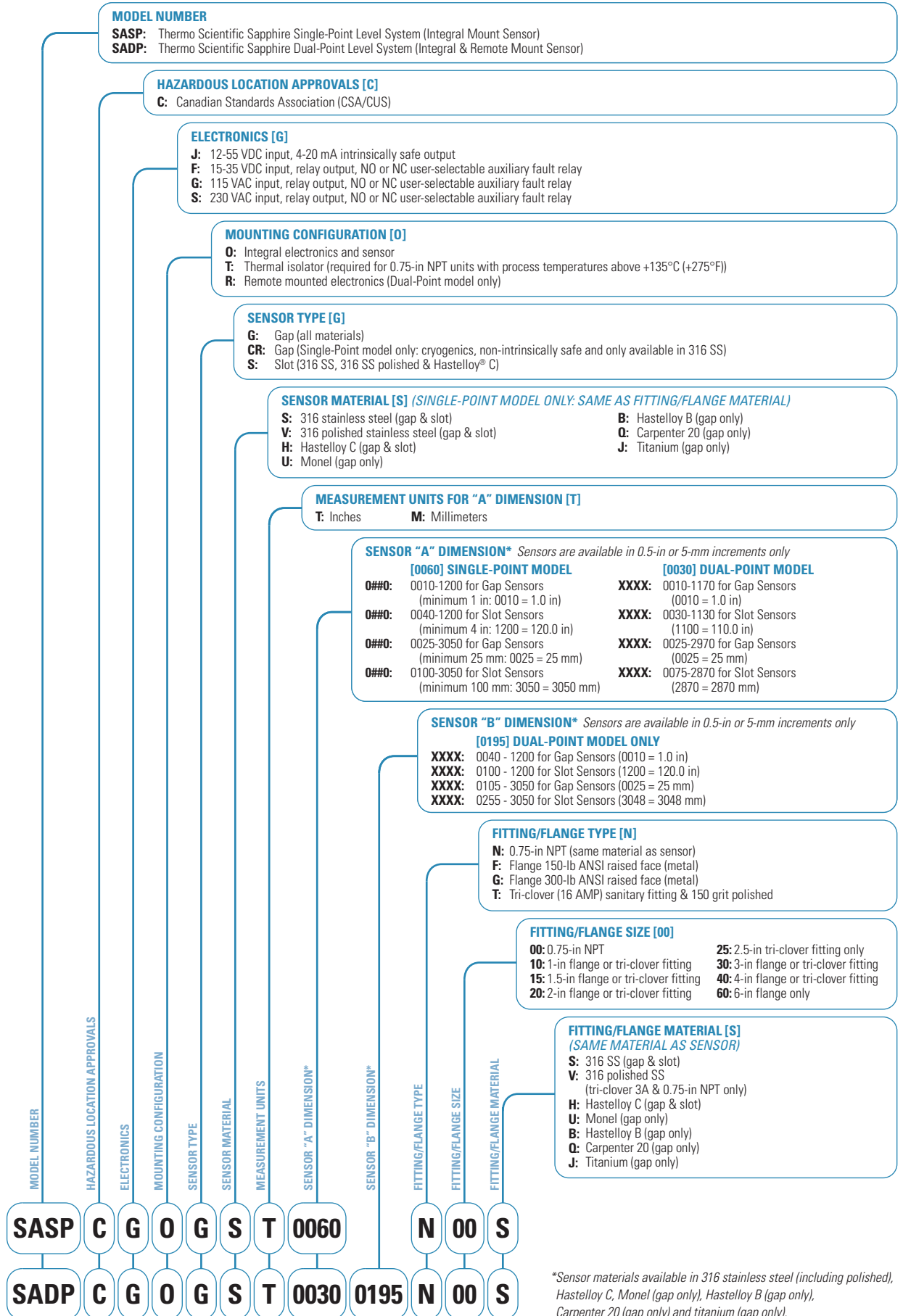
Sapphire single- and dual-point level systems are built for rugged industrial environments. The variable system qualification time

guards against false alarms by accurately determining the continuous presence of liquid in the measurement gap rather than allow a wave or other disturbance caused by turbulence to trigger the alarm. The rugged surface-mount technology increases durability while the continuous self-test circuitry increases uptime by automatically confirming system integrity, including the electronics and the sensor as well as the crystal bond to the sensor body.

### Easy Installation & Maintenance

The housing for both the Sapphire single- and dual-point level systems provides easy access to field wiring connections without exposing the electronics to unnecessary handling, harsh environments or physical damage. During installation, the electronics remain in the enclosure and are safely protected as wire is pulled and field terminations are made. For ongoing maintenance, the manual loop test enables field wiring and control integrity verification without costly system removal or tank filling.

Ordering Configuration



\*Sensor materials available in 316 stainless steel (including polished), Hastelloy C, Monel (gap only), Hastelloy B (gap only), Carpenter 20 (gap only) and titanium (gap only).

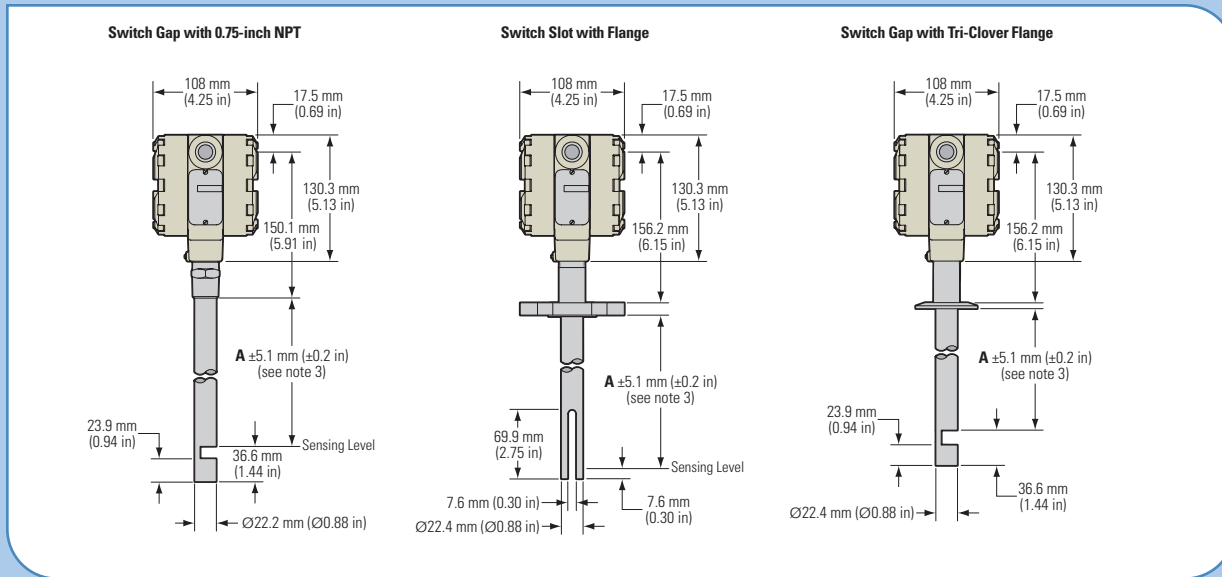
**Increased Sensitivity with Time-Gate Technology**

Sapphire single- and dual-point level systems detect liquid within a defined measurement gap by using unique, patented Time-Gate technology. This advanced form of ultrasonic measurement uses ultrasonic sound waves and a transmit crystal positioned opposite from a receive crystal

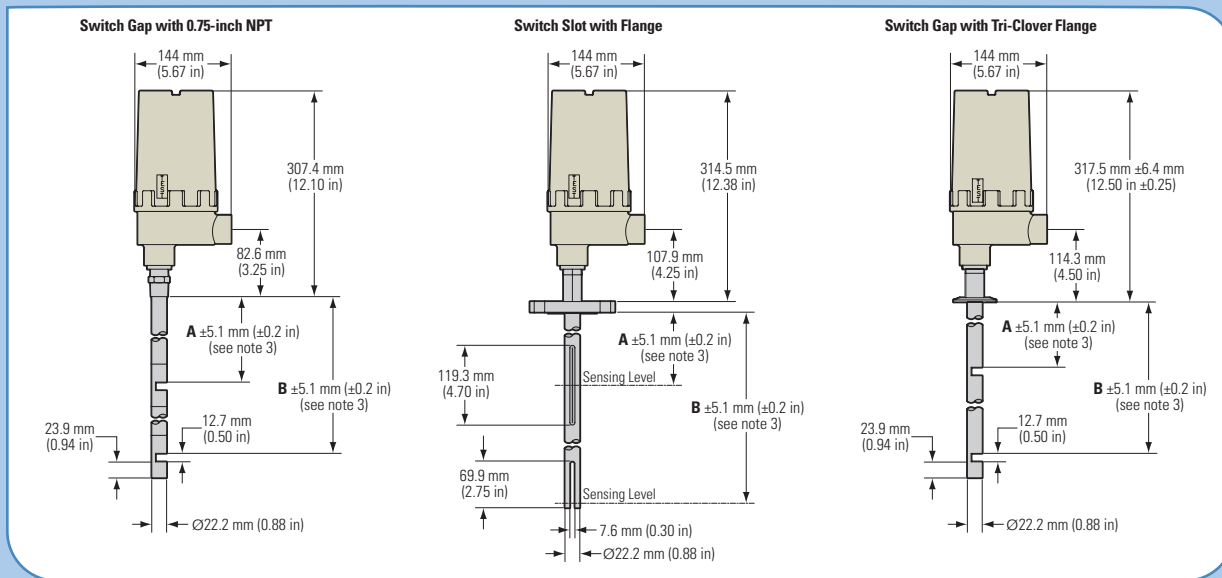
in the measurement gap to measure specific time intervals. The ultrasonic sound wave reaches the receive crystal much faster if the gap is dry. When liquid is present within the gap, the transmitted ultrasonic sound wave is detected by the receive crystal and a much higher amplitude output results. The system analyzes the signals from the receive crystal in predictable, narrow time

windows or time gates. By differentiating and separating the ultrasonic signals, this technology increases sensitivity as well as the reliability of the measurement. A self-test is also performed continuously and automatically by the Time-Gate technology to further ensure reliability and maximize uptime.

**Single-Point Dimensional Drawings (enclosure and sensor)**



**Dual-Point Dimensional Drawings (enclosure and sensor)**



**Reference Notes for Dimensional Drawings**

1. Minimum distance between A & B dimension on gap sensors is 2.5 inches
2. Minimum distance between A & B dimension on slot sensors is 7 inches
3. Order in 10 mm (0.5 in) increments to allow for manufacturing tolerances of ±5 mm (±0.2 in) for metal sensors
4. When specifying sensor lengths, the total installed sensor length is equal to the B dimension plus the remaining sensor length
5. Metal flanges have a raised face
6. Fitting/flange materials must be the same as the sensor material for all but tri-clover fittings; Tri-clover fittings are available in 316 L only and must be used with 316 SS sensors only
7. Tri-clover fittings are available with integral or remote mounted Sapphire systems; 20-mm and 25-mm (1-in and 1.5-in) tri-clover fittings are the same size; Tri-clover Dual Point Sapphire fittings do not carry 3A approvals

## Thermo Scientific Sapphire — Single- and Dual-Point Level Systems

### Electronics—Relay Operation (integral and remote)

Supply Voltage	Model F: 15-35 VDC Model G: 115 VAC, ±10%, 50/60 Hz Model S: 230 VAC, ±10%, 50/60 Hz
Power Consumption	4W max (2W typical)
Outputs	2 relay outputs; Process relay is field-selectable for Hi/Lo operation; Auxiliary relay is field-selectable for Fault/Mimic operation and NC/NO operation.
Process (SPDT <sup>1</sup> ) Relay	Maximum contact rating: 5 amps at 115/250 VAC or 5 amps at 30 VDC Minimum contact rating: 100 mA at 5 VDC or 15 mA at 24 VDC
Auxiliary (SPST <sup>1</sup> ) Relay	Maximum contact rating: 5 amps at 115/250 VAC or 5 amps at 30 VDC Minimum contact rating: 100 mA at 5 VDC or 15 mA at 24 VDC

### Electronics—Two-Wire Operation (integral and remote)

Supply Voltage	Model J: 12-55 VDC
Power Consumption	1.1W maximum
Current Loop Loads	Rload, max = (Vsupply-12) x 50 ohms
Analog Output (±1 mA)	19 mA/5 mA self-test fault (field-selectable) 8 mA dry/16 mA wet (field-selectable) 16 mA dry/8 mA wet (field-selectable)

### Operating Specifications—Relay and Two-Wire

Self-Test	Continuous for electronics and sensor, including crystal bond to sensor body
Manual Loop Test	All output conditions momentarily change to the opposite state (except when in a fault condition) when supplied magnet is placed over the housing cover at the location marked "Loop Test"
Sensor Qualification Time	0.3 or 12 seconds, field-selectable
Repeatability	±0.1 in
Enclosure	Single-Point: dual-compartment NEMA 4X (ANSI 250 Type 4X) enclosure housing; Materials include low copper aluminum, polyurethane paint, Buna-N O-rings Dual-Point: single-compartment NEMA 4 (ANSI 250 Type 4) enclosure housing; Materials include low copper aluminum, polyurethane paint, Buna-N O-rings
Connections	Single 0.5-in NPT conduit connections; Wire range is 22 AWG to 12 AWG
Temperature Range	Electronics: -40°C to +70°C (-40°F to +158°F) Sensors: -40°C to +160°C (-40°F to +320°F); -190°C to +100°C (-310°F to +212°F)
Humidity	10% to 95% RH, non-condensing
Operating Pressure (max)	-10 to +1000 PSIG (-69 to +6895 KPa)
Proof Pressure	1500 PSIG (10342 KPa)

### Physical Specifications

Materials	Gap: 316 SS, Hastelloy C, Monel, Hastelloy B, Carpenter 20, titanium; Slot: 316 SS, Hastelloy C
Weight (incl 3/4-in NPT)	Single-Point model: 1.8 kg (4 lbs); Dual-Point model: 2.7 kg (6 lbs)

### Certifications

CSA/C-US	Single-Point (when installed per drawing 952-000099): Class I, Groups B, C & D; Class II; Class III; Class I, Div 2, Groups A, B, C & D; Enclosure Type 4 Single-Point and Remote Relay Level Switches (when installed per drawing 952-000066): Class I, Groups A, B, C & D; Class II, Groups E, F & G; Class III; Enclosure Type 4 Dual-Point/Remote Dual-Point (when installed per drawing 952-000118): Class I, Groups B, C & D; Class II, Groups E, F & G; Class III; Class I, Div 2, Groups A, B, C & D; Enclosure Type 4
ATEX	Pending
3A Sanitary Standards	Remote sensor and field wiring are approved as NI field wiring when installed in accordance with Class I, Div 2 wiring diagram

<sup>1</sup>Both SPDT and SPST relays have gold-plated contacts and de-energize on process alarm, self-test or power loss

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