

CRYO-DVT

HIGH ACCURACY SIMULTANEOUS DENSITY AND VISCOSITY METERING FOR CRYOGENIC FLUIDS

- Single sensor for density, viscosity and temperature measurement of cryogenic fluids
- EX-certified for use in explosive atmospheres at temperatures as low as -200°C
- Hermetically sealed for complete submersion
- Purpose built for Liquified Natural Gas (LNG) tank, terminal and transport lines

Cryogenic LNG sensor Specifications

Fluid Measurements

Density Range	0 – 1100 kg/m ³
Density Accuracy	0.1 kg/m ³
Repeatability	0.05 kg/m ³
Resolution	0.01 kg/m ³

Viscosity Range	0 – 20 mPa.s
Viscosity Resolution	0.001 mPa.s

Temperature	PT1000 (class AA)
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Calibrated to NIST traceable viscosity and density standards.

Operational Environment

Process Fluid Temperature	-200 °C and above
Ambient Temperature	-200 °C up to 125 °C
Pressure Range	up to 10,000 psi

Mechanical

Material (Wetted parts)	Titanium Grade 5
Diameter x Length	ø35 x 120 mm
Process Connection	1" NPT

Flange & custom connections available

Ingress Protection	IP69K
Electrical Connection	M12 (8-pin, A-coded)

EX-Certification	Ex ia IIC Tx Ga Class 1 Div 1
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Electronics & Communication

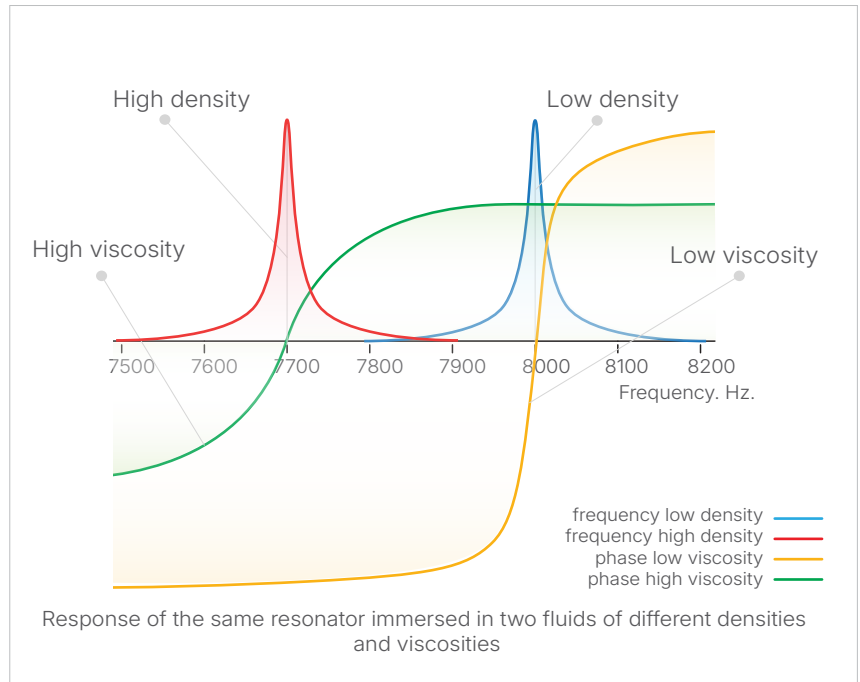
Analog output	4-20 mA (3 channel) {Viscosity, Density, Temp.}	Display	Multi-line LCD (SME-TRD)
Digital output	Modbus RTU (RS-485) Ethernet (Ethernet/IP, Modbus TCP, Profinet) USB HART	Operational temp.	max. 20° to 65° C
Wireless output	Bluetooth LE 4.0	Power supply	24 V DC IP66 IP20
		SME-TR(D) SME-DRM	
		Software	Data acquisition and service control panel iOS and Android app

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Operating principle

The rheonics CRYO-DVT measures density and viscosity by means of a balanced torsional fork resonator with flattened tine ends, which is immersed in the fluid under test. The more viscous the fluid, the higher the mechanical damping of the resonator, and the denser the fluid, the lower its resonant frequency. From the resonant frequency and damping, the density and viscosity is calculated by means of rheonics' proprietary algorithms. Thanks to rheonics' coupled torsional resonator design, the transducer is perfectly balanced, while maintaining excellent mechanical isolation from the sensor's mounting. Damping and resonant frequency are measured by the rheonics sensing and evaluation electronics. Based on rheonics' proven gated phase-locked loop technology, the electronics unit offers stable and repeatable, high-accuracy readings over the full range of specified temperatures and fluid properties.



Cryogenic Applications

Density measurements in cryogenic environments

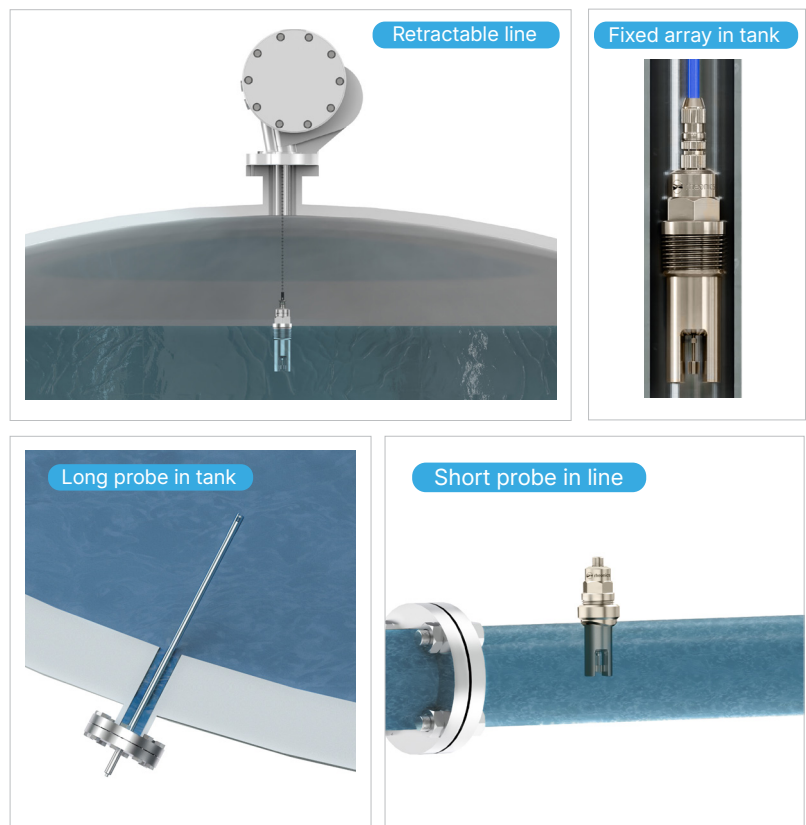
- Maintains high accuracy for density, viscosity and temperature measurement for fluids even at -200°C (33.8°F)
- Certified probe for explosion safety at LNG temperatures or in the vicinity of LNG equipment
- Mounts in LNG tank, as fixed or retractable installation, and in transfer lines.

Density stratification detection or Roll Over prediction

- CRYO-DVT sensor monitors real-time density of LNG in tank, crucial for forecasting and warning of potentially catastrophic rollover events

Density profiles with retractable system

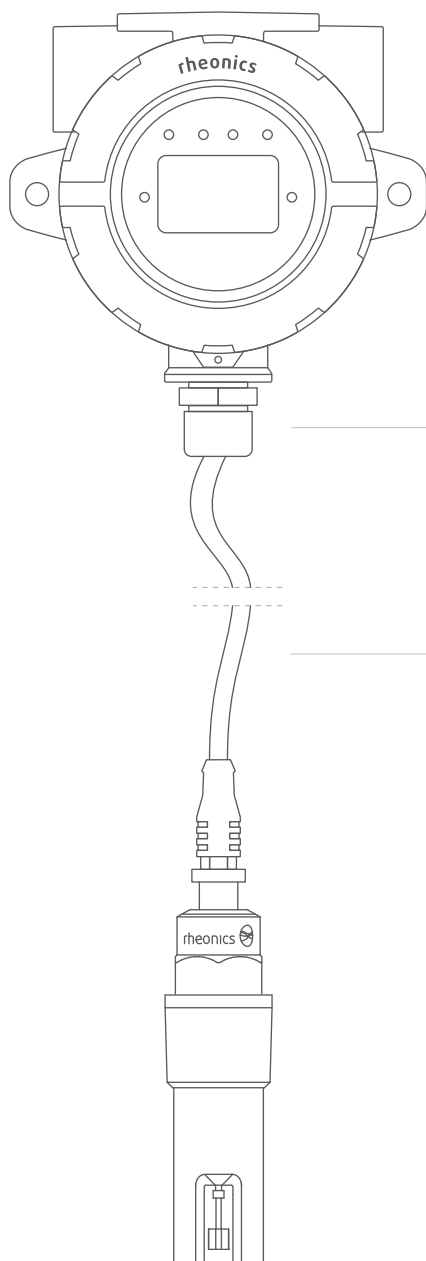
- Create a density profile with depth in a LNG tank, using retractable systems. CRYO-DVT integrates seamlessly into existing retractable system.



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Mechanical & Electrical



Cable Gland

- Standard
- Ex Rated

Sensor Cable

Up to 1500m (4921 ft.)
(IP67 | IP68 | IP69K)

Electronics (select between)



SME-TRD



SME-TR

- Transmitter housing (IP66)
- Onsite and remote installation of electronics head
- Available with and without display for field use



SME-DRM

- DIN rail mount
- Extra-small form factor for easy installation
- Ethernet connection

Mechanical

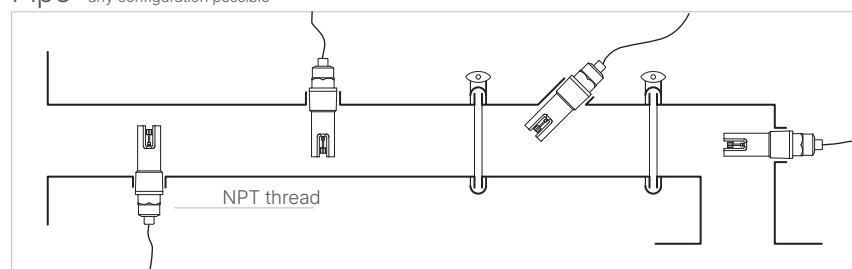
- Titanium Grade 5
- Hermetically sealed for complete immersion
- Long insertion adapters for installation in larger pipes and tanks

Process connection

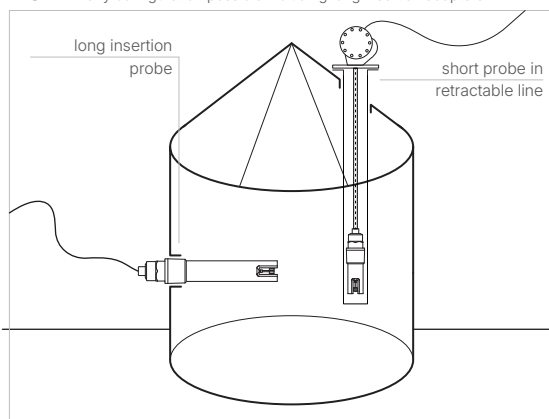
- 1" NPT (standard)
- Adapters available for Flange and Tri-clamp
- Other process connection available with MOQ

Mounting

Pipe [†]any configuration possible



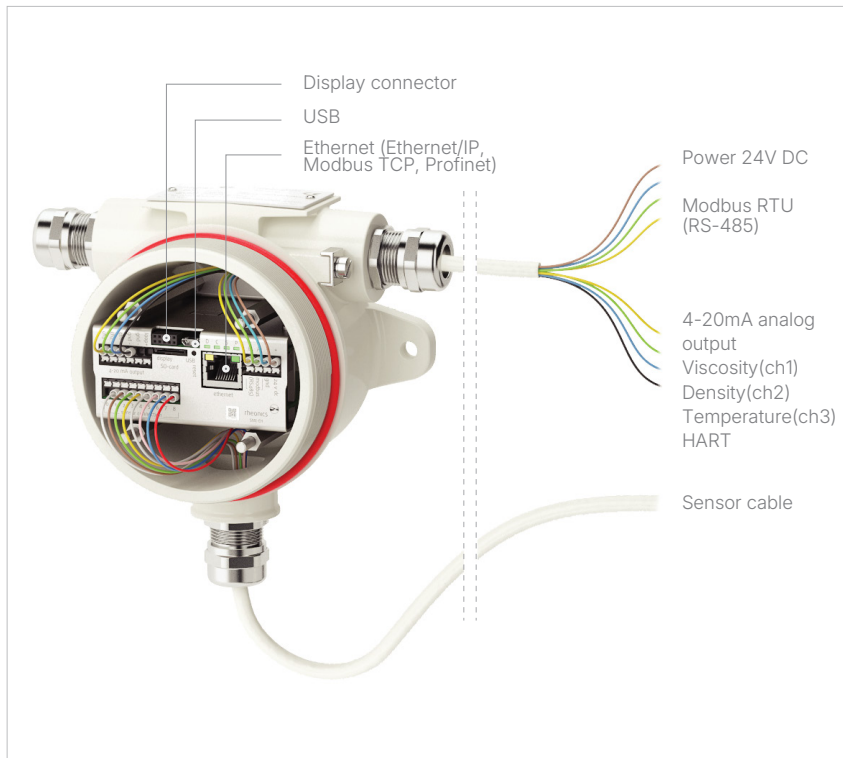
Tank [†]any configuration possible including long insertion adapters



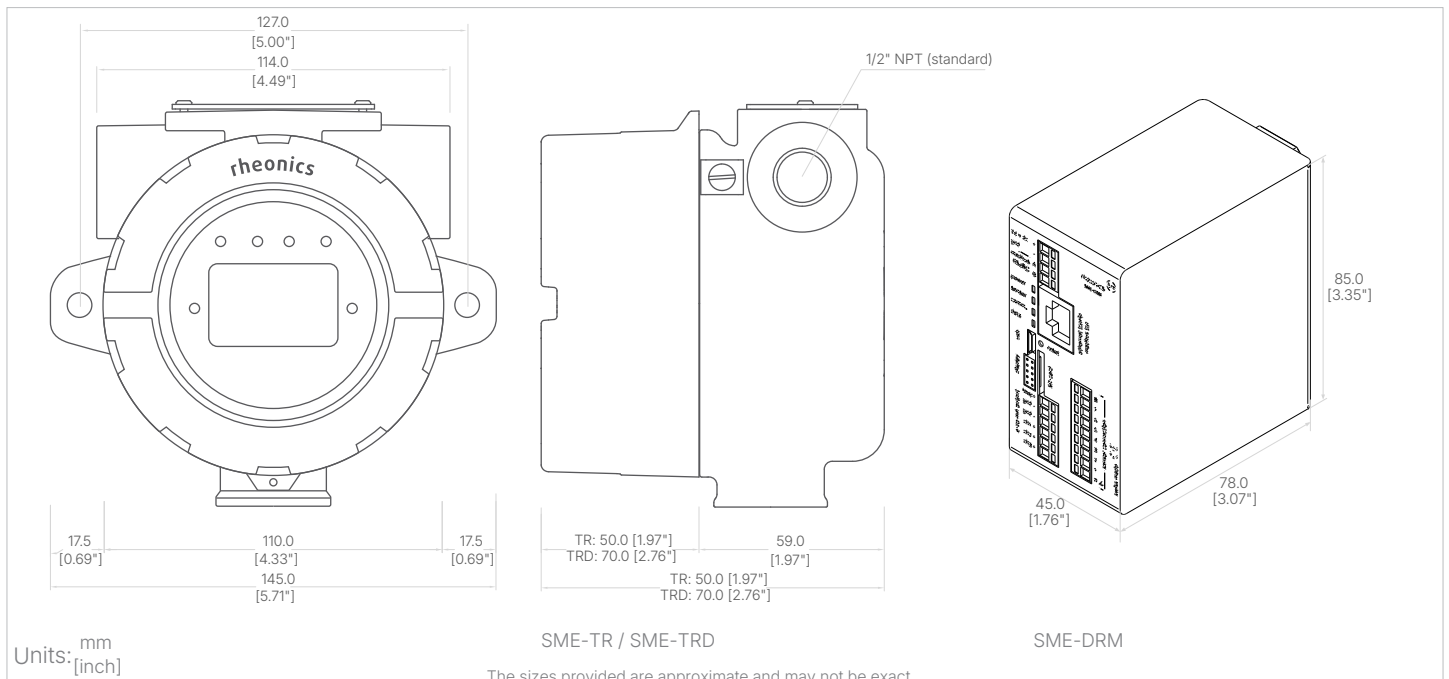
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Electronics installation



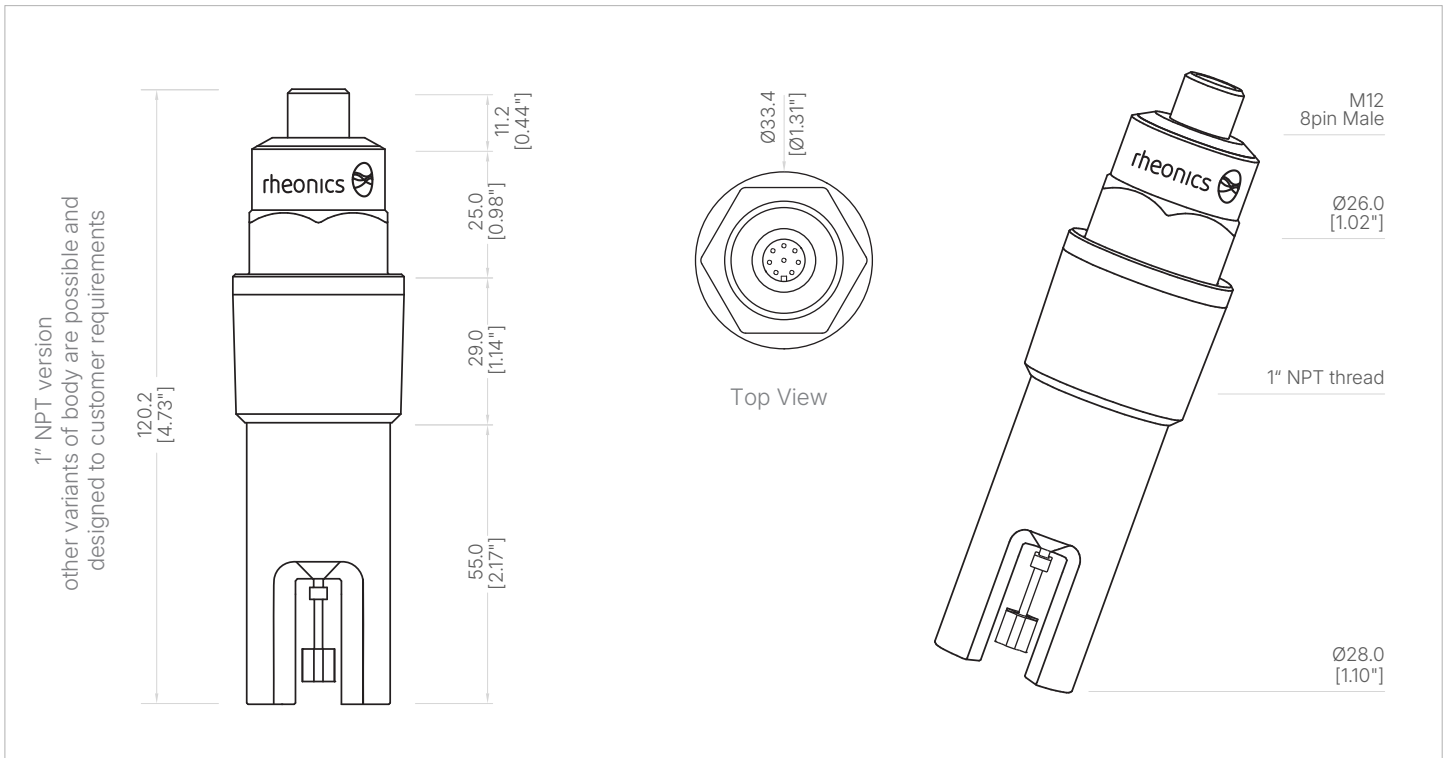
Dimensions



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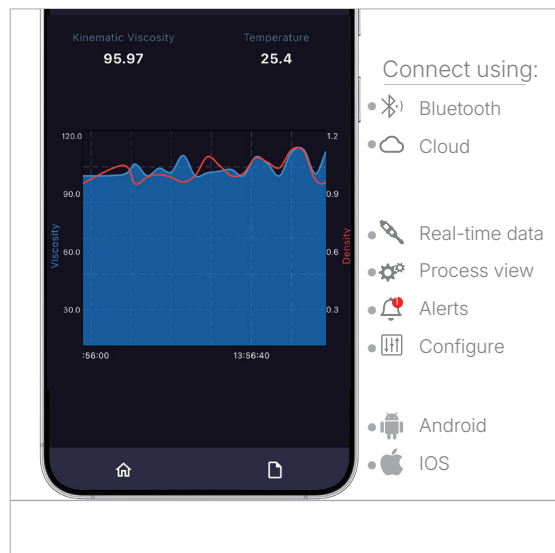
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Probe dimensions

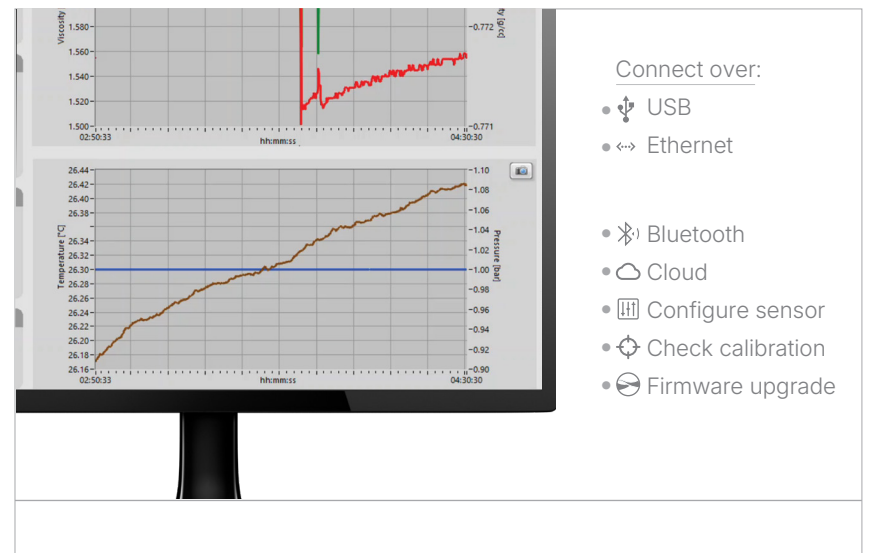


Software

Rheonics Application



PC Data Acquisition & Analysis



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Ordering

CLNG Sensor Configuration: Probe + Electronics + Cable

[CLNG probe configuration code](#)

CLNG-[MA]-[DEN RAN]-[DEN CAL]-[VIS RAN]-[VIS CAL]-[T]-[P]-[X]

Order code	Name
Material [MA]	
TG5	Titanium Grade 5
Density Range [DEN RAN] (select one)	
D1	0 to 1.5 g/cc
Density Calibration [DEN CAL] (select one)	
DCAL1	Standard density accuracy: $\pm 0.001 \text{ g/cc}$ (1 kg/m^3 0.0083 lb/gal)
DCALG	Gas calibration
Viscosity Range [DEN CAL] (select one)	
V1	0-30 mPa.s
Viscosity calibration [VIS CAL] (select one)	
VCAL1	Standard: $\pm 5\%$ of reading or $\pm 0.1 \text{ mPa.s}$, whichever is greater

Temperature Rating [T] (select one) Optional

ULT	Ultra-low temperature (up to -200°C)
LT7	-70°C (-94°F)
LT4	-40°C (-40°F)
-20°C (-40°F) to max value by code	
T1	125°C (250°F)
T2	150°C (300°F)
T3	175°C (350°F)

Pressure rating [P] (select one)

P2	70 bar (1000 psi)
P4	350 bar (5000 psi)
P6	750 bar (10000 psi)
P7	1000 bar (15000 psi)

Process Connection (select one)

X1	Threaded connection
X5	Long insertion probe
X9	Custom configuration for OEM

Variants [X] (select one)

-X1-1N0	1" NPT
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Electronics Configuration

[SME Electronics Configuration Code](#)

[EVAR]-[EMAT]-[COM]-[ADD]

Order code	Name
Electronics [EVAR] (select one)	
E1	SME-TRD (Transmitter housing with display)
E2	SME-TR (Transmitter housing with solid cover)
E3	SME-DRM (DIN-rail mount housing)
E4	SME-BOX (Desktop version with 10.4" touchscreen)
Material [EMAT]	
-	Aluminum housing (only for E1 and E2)
SS	316L stainless steel housing (only for E1 and E2)
Communication [COM] (multiple selection)	
C1	4-20 mA
C2	Modbus RTU (RS-485)
C3	USB
C4	RJ45
C5	Bluetooth LE 4.0
C6	Modbus TCP
C7	Ethernet/IP
C8	HART
C9	Profinet
C10	WirelessHART
C11	CAN
C12	IO-LINK

Cable Configuration

[Cable configuration code](#)

CAB-[CVAR]-[LXX]

Order code	Name
Cable Type [CVAR]	
STD	Standard cable
90	Cable with 90° connector
EX	EX-rated cable (explosion-proof)
HT	High-temperature cable
IP69K	Cable with IP69K protection rating
Cable Length [LXX]	
Lxx	Length: 5, 10, 30 meters (15, 30, 90 ft) or custom, limited for certain cable types

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*subject to change without notice

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