

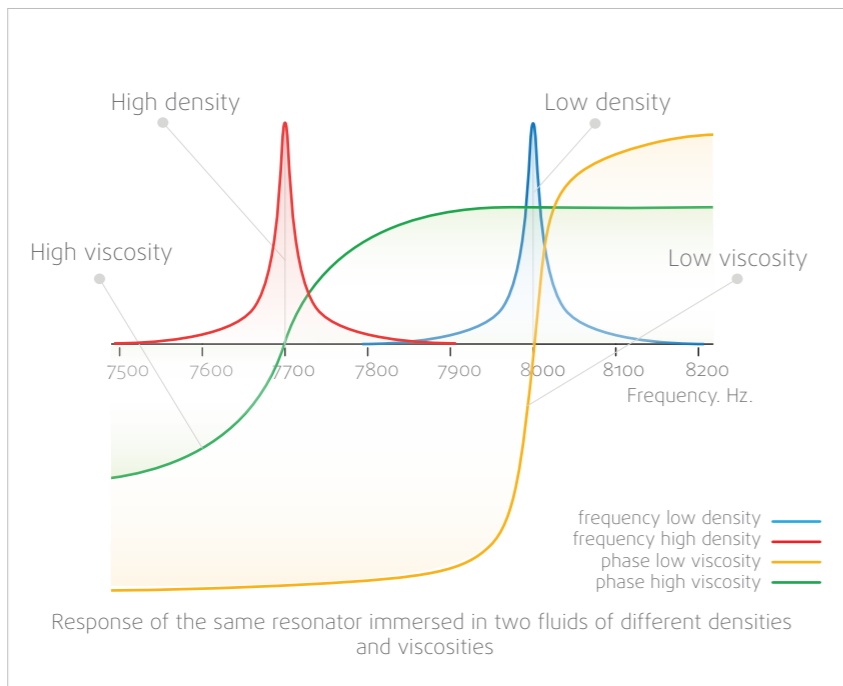
# SRD

INLINE PROCESS DENSITY METER AND VISCOMETER



## Operating principle

The rheonics SRD measures viscosity and density by means of a balanced torsional resonator, the finned end of 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 damping and resonant frequency, the density and viscosity may be calculated by means of rheonics' proprietary algorithms. Thanks to rheonics' symmetric resonator design (US patent number 9267872), the transducer is isolated from the fluid in a hermetically sealed capsule, while maintaining excellent mechanical isolation from the sensor's mounting. Damping and resonant frequency are measured by the rheonics sensing and evaluation electronics (US patent number 8291750). 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.



## Application

### Battery electrode slurry mixing and coating

- Real-time monitoring of battery electrode slurry solid content
- Continuous monitoring of viscosity to ensure tight coating thickness control

### Metering and Interface detection

- Highly accurate and reliable density measurement
- Interface detection to recognize product change

### Blending and Batching

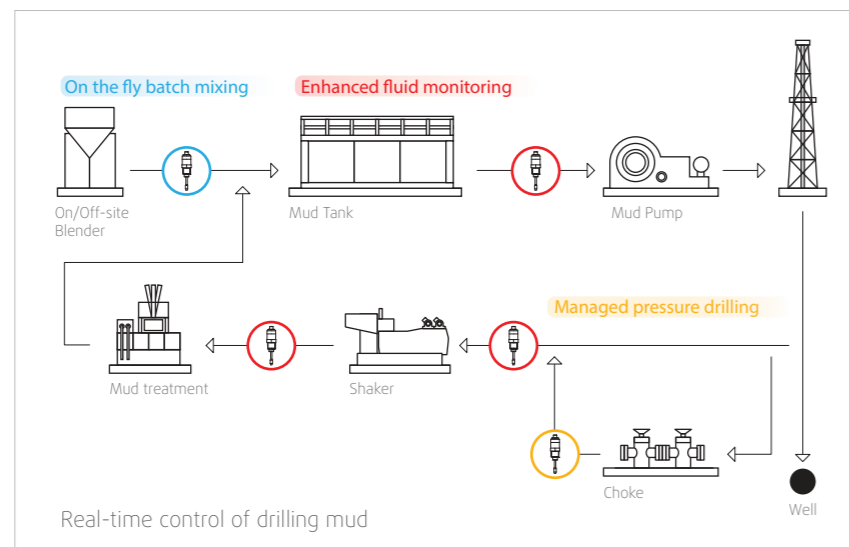
- Real-time molar ratio control in chemical reactions through continuous concentration measurement

### Biofuels and Petroleum

- In Biofuel production monitor density to distinguish between raw materials and separated products
- In refinery distillation column, differentiate fractions based on density and viscosity - between gasoline, diesel, lubricant and marine fuel
- Continuous measurement - eliminate manual sampling and laboratory time

### Drilling Mud

- Drilling fluid's density and viscosity inline readings
- Measure fluid's carrying capacity and gel development
- Keep drilling rate constant with density monitoring



### Other applications:

- Continuous electrolyte density check in battery
- Adapt process to variable raw material quality (eg. due to stratification in tanks) by monitoring density and viscosity of the raw material in real-time
- Measure concentration of lime slurry (calcium hydroxide)
- Ink and coating density and viscosity monitoring for equipment control and QA
- Lubricant density and viscosity monitoring
- Fuel consumption (density) and quality (density, viscosity) monitoring
- Beverage and dairy (sugar concentration in fermentation, wort beer brewing, etc.)

# Order

We recommend using the online RFQ form: <https://rheonics.com/request-for-quotation/>  
For sensor accessories, visit: <https://rheonics.com/product-accessories/>

## SRD Sensor Configuration: Probe + Electronics + Cable

SRD probe configuration code

SRD-[MA]-[COA]-[CERT]-[DEN RAN]-[DEN CAL]-[VIS RAN]-[VIS CAL]-[T]-[P]-[X]-[OPT]

| Order code  | Name  |
|---|---|
| <b>Material [MA]</b>                                |   |
| SS  | 316L Stainless Steel  |
| C22   | Hastelloy C22   |
| <b>Coating[COA] (optional)</b>                      |   |
| TF  | Teflon coating for SS only  |
| <b>Certifications[CERT] (optional)</b>              |   |
| EXIA  | ATEX/IECEX  |
| HSEG  | EHEDG Certification   |
| HS3A  | 3-A Certification   |
| HSNC  | Rheonics hygienic design without certification (all wetted surfaces below Ra 0.8) |
| <b>Density Range [DEN RAN] (select one)</b>         |   |
| D1  | 0.00 - 1.5 g/cc (12.5 lb/gal)   |
| D2  | Order-specific, up to 4 g/cc (33.33 lb/gal)                                       |
| <b>Density Calibration [DEN CAL] (select one)</b>   |   |
| DCAL1   | 0.01 g/cc (10kg/m <sup>3</sup>   0.083lb/gal)                                     |
| DCAL2   | up to 0.001 g/cc (1kg/m <sup>3</sup>   0.0083lb/gal)                              |
| <b>Viscosity Range [VIS RAN] (select one)</b>       |   |
| V1  | 1 - 3,000 mPa.s   |
| V2  | 1 - 10,000 mPa.s  |
| <b>Viscosity Calibration [VIS CAL] (select one)</b> |   |
| VCAL1   | ±5% of reading or ±0.1 mPa.s, whichever is greater                                |
| VCAL2   | ±1% of reading or ±0.1 mPa.s, whichever is greater                                |
| <b>Temperature [T] (select one)</b>                 |   |
| To  | 75 °C (165 °F)  |
| T1  | 125 °C (250 °F)   |
| T2  | 150 °C (300 °F)   |
| T3  | 175 °C (350 °F)   |
| T4  | 250 °C (480 °F)   |
| T5  | 285 °C (545 °F)   |

## Electronics Configuration

SME Electronics Configuration Code

SME-[VAR]-[EMAT]-[COM]-[ADD]

| Order code                                      | Name  |
|---|---|
| <b>Electronics [VAR] (select one)</b>           |   |
| 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)  |
| <b>Material [EMAT]</b>                          |   |
| -   | Aluminum housing (only for E1 and E2)             |
| SS  | 316L stainless steel housing (only for E1 and E2) |
| <b>Communication [COM] (multiple selection)</b> |   |
| C1  | 4-20 mA   |
| C2  | Modbus RTU (RS-485)                               |
| C3  | USB   |
| C4  | Ethernet  |
| C5  | Bluetooth LE 4.0                                  |
| C6  | Modbus TCP  |
| C7  | Ethernet/IP                                       |
| C8  | HART  |
| C9  | Profinet  |
| <b>Add-ons [ADD]</b>                            |   |
| AP-SD0  | Sand detection for SDP                            |

| Order code                                | Name  |
|---|---|
| <b>Pressure [P] (select one)</b>          |   |
| P1  | 15 bar (200 psi)  |
| P2  | 70 bar (1000 psi)   |
| P3  | 200 bar (3000 psi)  |
| P4  | 350 bar (5000 psi)  |
| P5  | 500 bar (7500 psi)  |
| P6  | 750 bar (10000 psi)   |
| P7  | 1000 bar (15000 psi)  |
| P8  | 1500 bar (20000 psi)  |
| <b>Variants [X] (select one)</b>          |   |
| X1  | Short probe, threaded connection  |
| X2  | Short probe, connection of choice (standard insertion)                                    |
| X3  | Short probe, Tri-Clamp flange (standard insertion length)                                 |
| X4  | Short probe, connection of choice (flush or minimal insertion length)                     |
| X5  | Long probe, connection "B" as selected (custom insertion length "A")                      |
| X6  | Slim probe, connection "B" as selected (custom insertion length "A")                      |
| X7  | Slim probe, selected by total length "L", snap connector                                  |
| X8  | Teletube (back-threaded probe) connection of choice "B", adaptable for teletube extension |
| X9  | Special probe variants  |
| <b>Optional Features [OPT] (optional)</b> |   |
| FT  | Rear thread for electronics mounting  |

## Cable Configuration

Cable configuration code

CAB-[CVAR]-[LXX]

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

# SRD

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- Online, real-time, simultaneous density, viscosity and temperature monitoring
- Repeatable measurements in both Newtonian and non-Newtonian fluids
- Hermetically sealed, available in 316L stainless steel and Hastelloy C22 wetted parts
- Available with EX certifications, Hygienic certified designs and with wide range of process connections

## Specifications

### Fluid Measurements

|                           |   |
|---------------------------|---|
| Viscosity Range           | 1 to 3,000 cP   |
|                           | wider range available   |
| Viscosity Accuracy        | 5% of reading (standard)                                      |
|                           | 1% & higher accuracy available                                |
| Density Range             | 0.0 - 4.0 g/cc  |
|                           | 0.0 - 33.4 lb/gal   |
| Density Accuracy          | 0.001 g/cc  |
|                           | 0.008 lb/gal  |
| Reproducibility           | Better than 0.1% of reading                                   |
| Temperature               | Pt1000 (DIN EN 60751 class B)                                 |
|                           | Calibrated to NIST traceable viscosity and density standards. |
| Process Fluid Temperature | -40 up to 285 °C  |
|                           | -40 up to 545 °F  |
| Pressure Range            | up to 10,000 psi  |
|                           | up to 690 bar   |

### Mechanical

|                         |  |
|-------------------------|--|
| Material (Wetted parts) | Stainless steel 316L                       |
|                         | Hastelloy C22                              |
| Variant                 | Flush, Short, Long, Slim, Reactor          |
| Process Connection      | Threaded, Flange, Sanitary                 |
|                         | EHEDG and 3-A certified hygienic available |
| Ingress Protection      | IP69K                                      |
|                         | Limited by the M12 connector IP rating     |
| Electrical Connection   | M12 (8-pin, A-coded)                       |

## Electronics & Communication

|                 |  |                   |   |
|-----------------|--|-------------------|---|
| Analog output   | 4-20 mA (3 channel)<br>(Viscosity, Density, Temp.) | Display           | Multi-line LCD<br>(SME-TRD)                                       |
| Digital output  | Modbus RTU (RS-485)                                | Operational temp. | 20 to 65 °C   |
|                 | Ethernet (Ethernet/IP,<br>Modbus TCP, Profinet)    | Power supply      | 24 V DC   |
|                 | USB  | SME-TR(D)         | IP65/66   |
|                 | HART   | SME-DRM           | IP40/50   |
| Wireless output | Bluetooth LE 4.0                                   | Software          | Data acquisition and service control panel<br>iOS and Android app |

Protected by US and International patents granted and pending

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SRD-DS-2601



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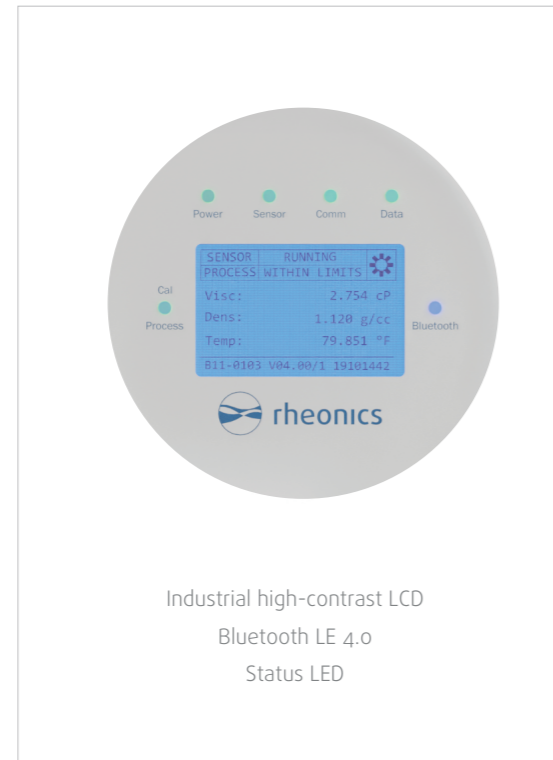
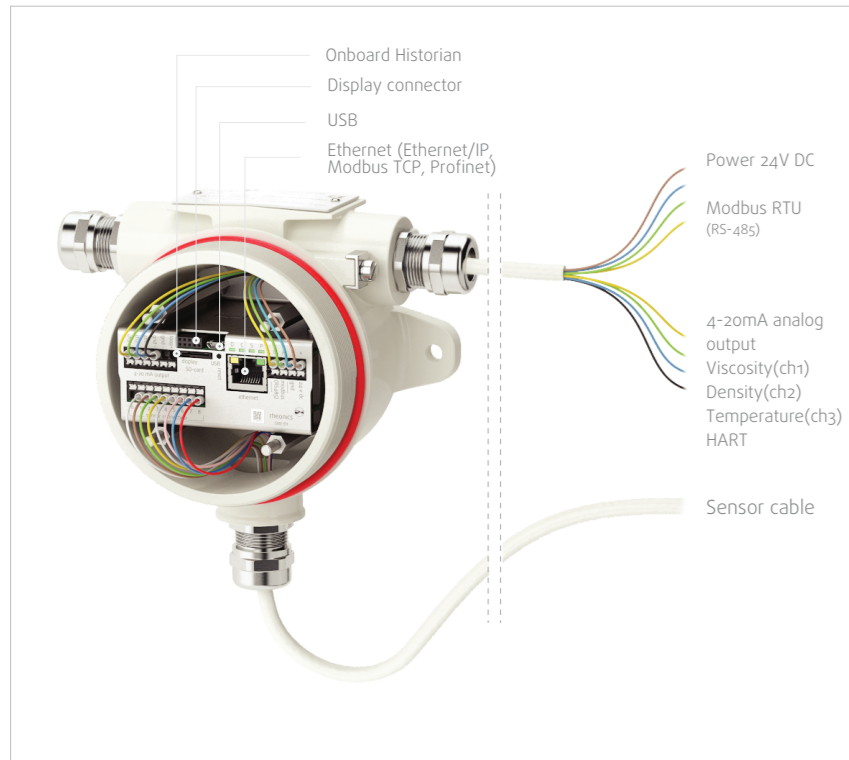


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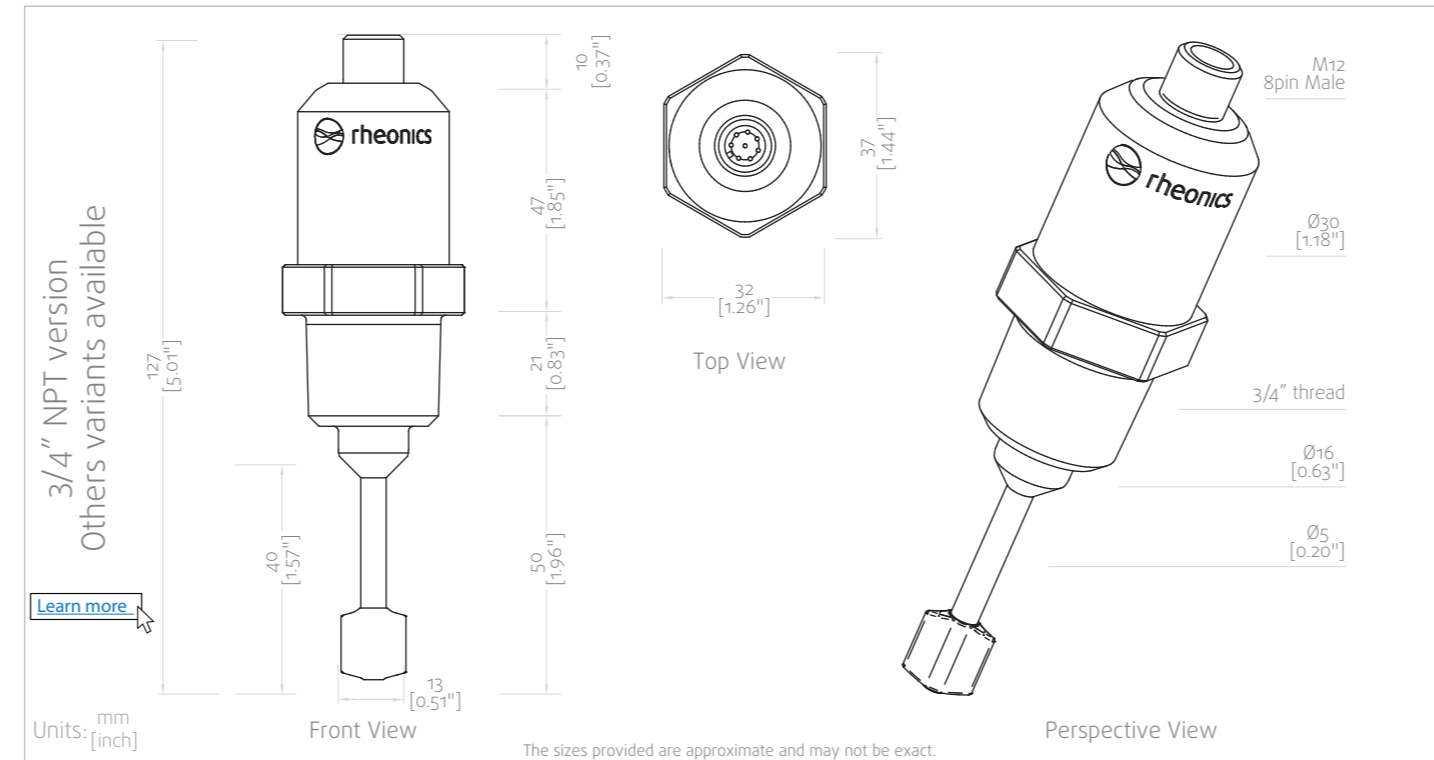
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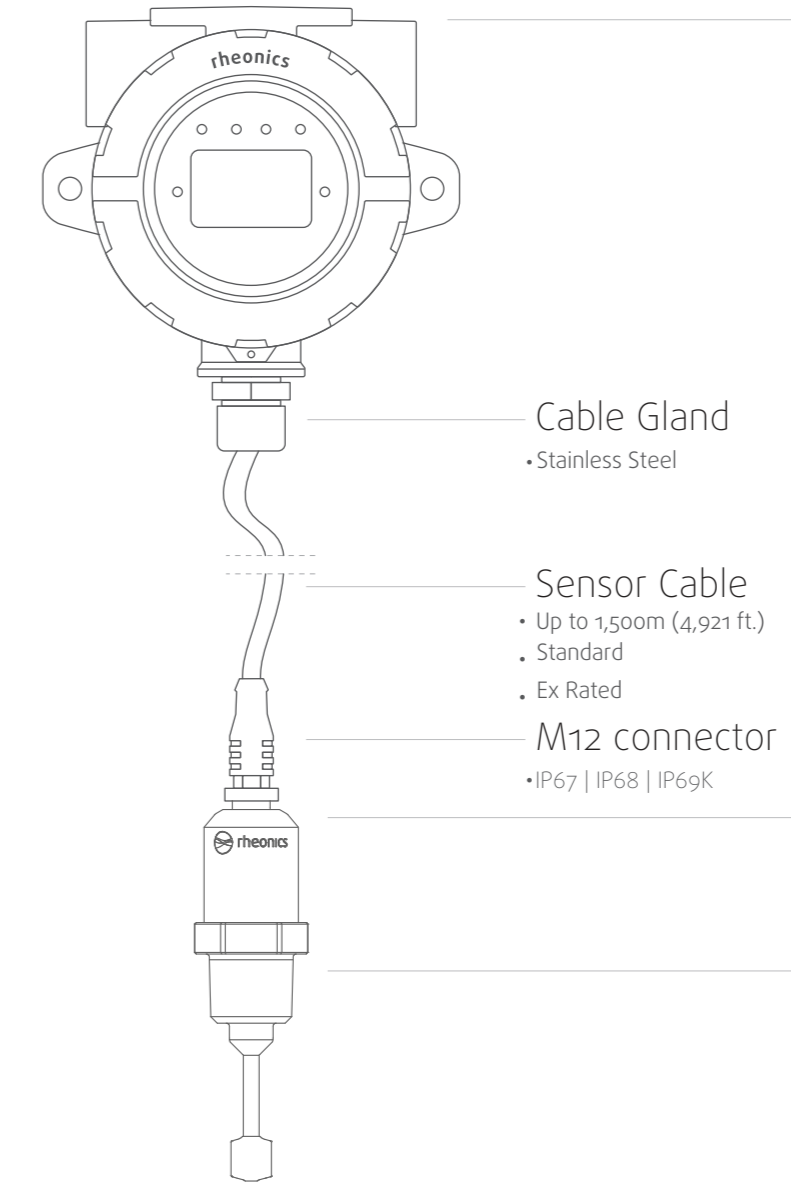
## Electronics installation



## SRD dimensions



## Mechanical & Electrical



## Electronics (select between)



## Process fluid wetted materials

- 316L stainless steel (standard)
- Available with Hastelloy C22
- Available with custom coatings

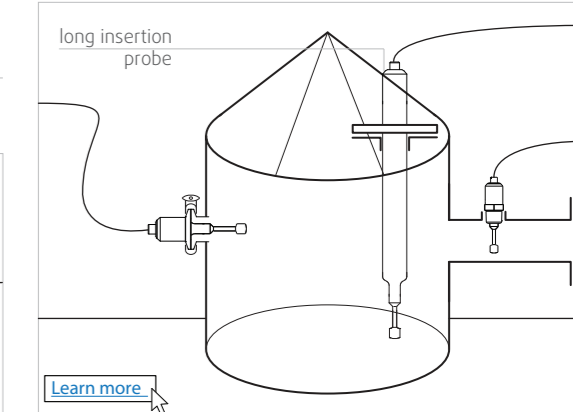
## Process connection

- Flush, Short and Long insertion, slimline, reactor probes
- Threaded, Flange, Tri-clamp, Varinline, Ingold, API, 6A
- EHEDG and 3-A certified hygienic version

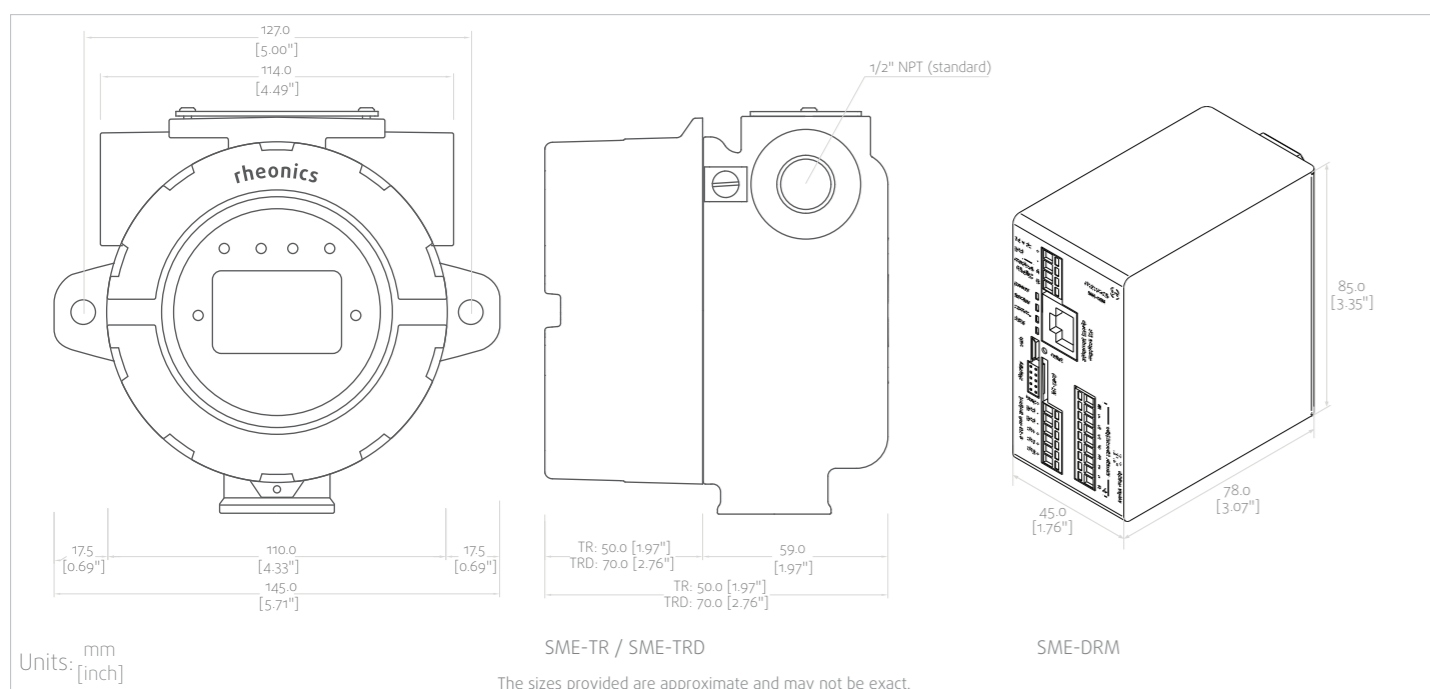
## Ex Certified sensors

- Intrinsically safe
- Covers full Ex temperature range
- IECEx, ATEX, JPEX, others

## Tank

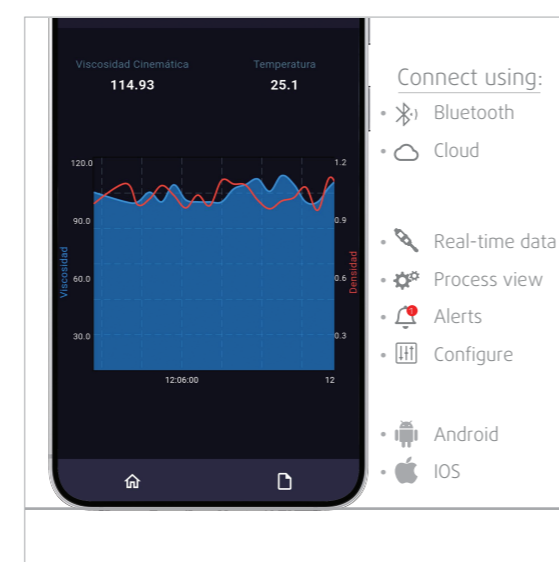


## Dimensions

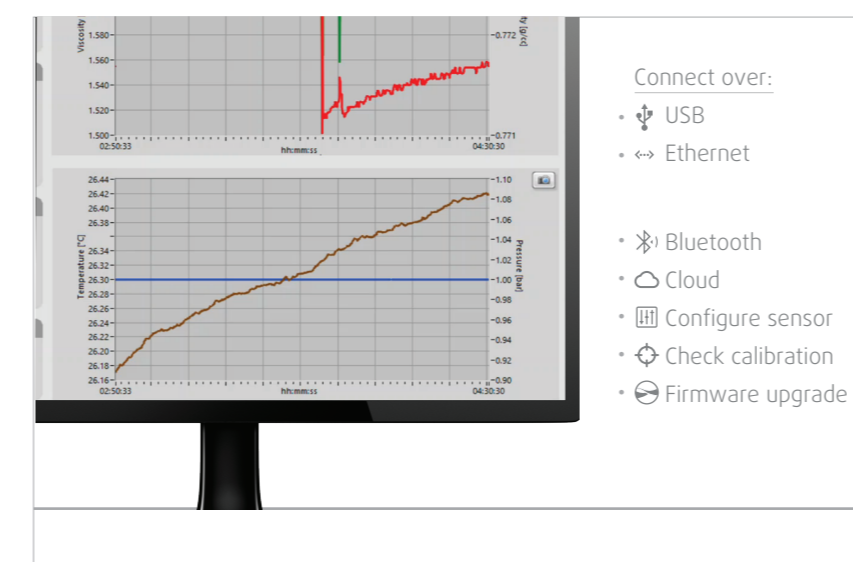


## Software

### rheonics Application



### PC Data Acquisition & Analysis



## Mounting

