

# esmerGL™

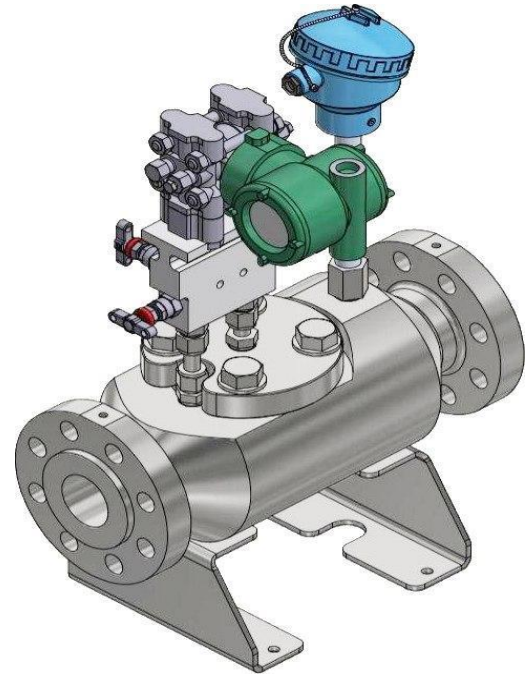
## TECHNOLOGY OVERVIEW

esmerGL is an innovative low cost flow meter for measuring the flow rates of **liquid and gas** phases in oil, condensate and wet gas production lines across the entire GVF range without the need for separation or complex sensor technologies. esmerGL can be used as a mobile or fixed metering system.

Water composition can be measured by the esmerCAP capacitance technology in the range water in oil <35% v/v (oil continuous flow regime) and where GVF<95%.

esmerGL comprises a field unit fitted with oil industry standard transmitters and a flow computer designed for use in the hazardous area mounted next to the field unit.

esmerGL Runtime Software runs on the esmerGL Flow Computer and performs the conversion of the basic transmitter signals to liquid – gas flow rates. The software is founded on a combination of fluid dynamic and thermodynamic models and signal processing technologies. It is configured (field calibrated) by means of the esmerGL Configurator running on the Windows PC platform.



esmerGL Field Unit

## ELECTRO-MECHANICAL SYSTEM

esmerGL can be installed horizontally or vertically and does not require flow conditioning. esmerGL's primary element is the cone configured with the usual set of P,T,DP multivariable transmitter (Yokogawa). Cone element is interchangeable providing a beta in the range 0.5 to 0.75

esmerGL Flow Computer (Beckhoff) mounted in an Exd enclosure on the field unit executes the I/O and processing tasks in real time and outputs measurements to the SCADA via MODBUS. A four line local digital display shows liquid and gas rates and primary measurements (P,T,DP).

A desktop PC / notebook PC / tablet is required to run the esmer Configurator software. The PC can be connected to the Flow Computer via Bluetooth, Wifi or ethernet.

| Electro-Mechanical System Summary |   |         |         |              |
|-----------------------------------|---|---------|---------|--------------|
| <b>Materials:</b>                 | NACE and ASME standards.  |         |         |              |
| <b>Meter sizes:</b>               | 2" to 10"   |         |         |              |
| <b>Transmitters:</b>              | Yokogawa MVT EJX 910A - DP/AP/ RTD  |         |         |              |
| <b>Certification:</b>             | ATEX Zone 1 Gas Group IIB   |         |         |              |
| <b>Power Supply:</b>              | 220VAC / 20 W   |         |         |              |
| <b>Communication:</b>             | RS485 MODBUS  |         |         |              |
| <b>Flow Computer Enclosure:</b>   | ATEX/IECEx II 2 G Ex db IIB+H2 T3-T6 II 2D Ex tb IIIC T85°C - T150°C IP66. Cast from copper free aluminium alloy. |         |         |              |
| Typical Weights and Dimensions    |   |         |         |              |
| SIZE                              | L<br>mm   | H<br>mm | W<br>mm | WEIGHT<br>kg |
| 2" Field Unit                     | 400   | 800     | 500     | 40           |
| 6" Field Unit                     | 600   | 900     | 700     | 100          |
| Flow Computer Enclosure           | 315   | 415     | 250     | 20           |

## SOFTWARE

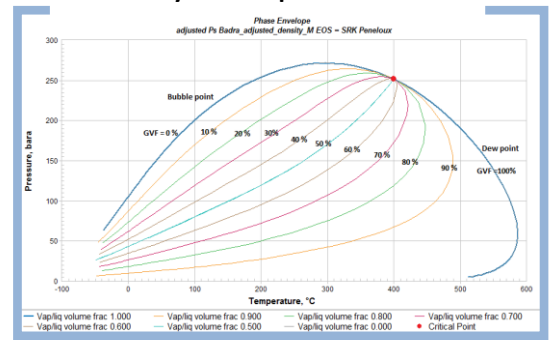
**esmerGL Runtime Software** hosted on the Flow Computer performs all the required signal processing, calculation and I/O tasks. Industry standard fluid dynamic and thermodynamic *Flow Models* are executed in real time to measure the flow rates of phases.

The user can *tune-up* the Flow Models to match particular process conditions by means of the **esmerGL Configurator** (that runs off-line on the PC – Windows platform). By *tune-up* we mean that the Configurator will create an EOS model matching the phase behavior of the process fluid and a correlation to predict the coefficient of discharge (Cd) of the cone under changing fluid and process conditions.

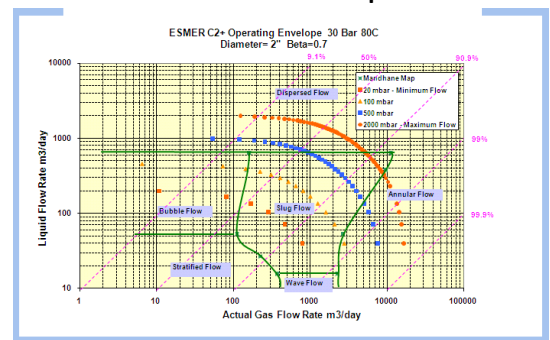
EOS model creation is based on PVT data provided by the user (from PVT fluid lab analysis and/or test separator). Cd model creation is based on historical data collected by the instrument (trending).

EOS and Cd correlations are uploaded to esmerGL Flow Computer by the user. From then on (until next tune up), the correlations are used for predicting flow rates at actual and standard conditions in real time.

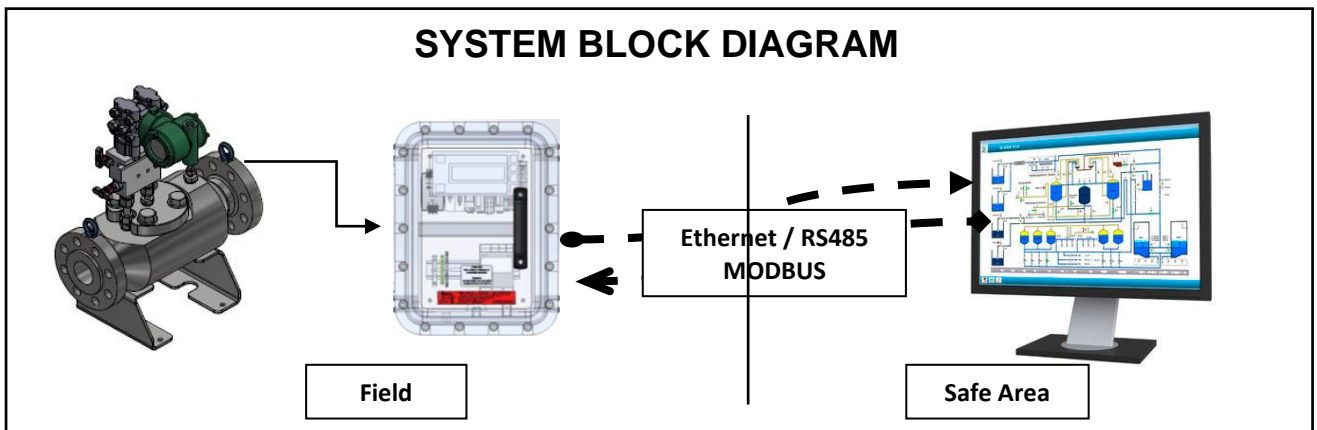
Thermodynamic Equilibrium Model



Flow Model – Bernoulli Equation



The procedure and the tools provided for configuration of **esmerGL** are in compliance with **API 2566** guidelines. Petroleum Software Ltd has a long track record of testing and applying the tune up methods in the field.



## RANGE & UNCERTAINTY

| esmer GL Operating Envelope  | esmerGL Measurement Accuracy  |
|--|---|
| <p><b>Gas &amp; Liquid Flow Range:</b> Each application is sized specially based on process conditions.</p> <p><b>Water Cut:</b> 0 – 35% and GVF &lt;95%</p> <p><b>GVF:</b> 0 – 100%</p> <p><b>Pressure:</b> up to 150 bar</p> <p><b>Temperature:</b> up to 120 °C</p> | <p>Accuracy will depend on GVF, water composition, extent of PVT data available and field tune-up capability. A specific accuracy target will be provided for each application.</p> |