esmerMPFM ™

## Technology Overview

ESMER MPFMs measure the flow rates of individual phases in oil, condensate and wet gas production lines without the need for separation or complex sensor technologies. ESMER MPFMs are ideally suited for well testing and allocation applications in fixed or mobile configurations

ESMER MPFMs comprise a horizontal non-intrusive skid with a small footprint fitted with oil industry standard transmitters. Different transmitter selections are specially selected for each **ESMER MPFM Model** depending on process line conditions and accuracy requirements.

ESMER MPFM Software is founded on a combination of fluid dynamic and thermodynamic models and signal processing technologies. The signals are processed locally or remotely on the **ESMER Flow Computer** and the measurements are transmitted to the customer network via the SCADA interface.
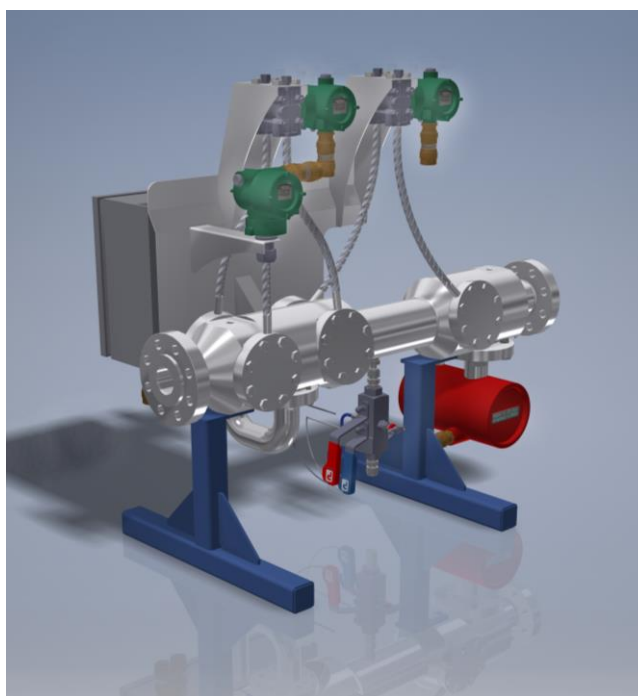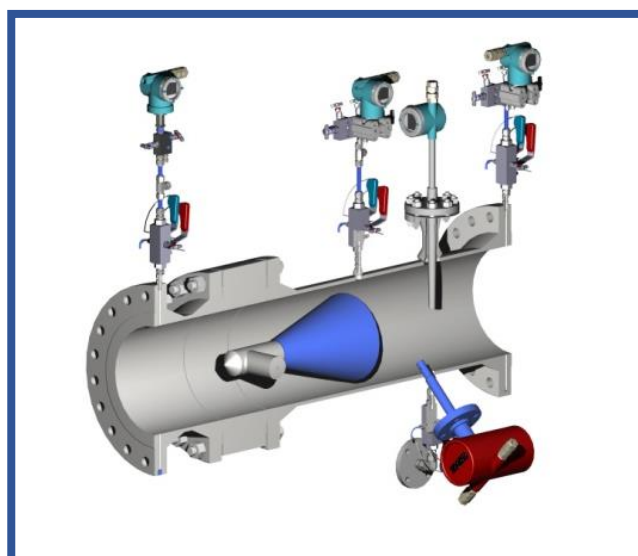

ESMER MPFM D2+

Electro - Mechanical System

ESMER MPFM's primary element is the **ESMER Cone** which provides dual functionality as a differential flow metering device and as an impedance electrode for measuring the permittivity of the fluid medium for water composition and GVF measurement. Gamma ray densitometer and Red Eye (infra red) transmitters can be added as an option.

The spool can be installed horizontally or vertically and the flow passes through the spool in a straight line with very low pressure drop. ESMER MPFM does not require flow conditioning (dead T, mixer etc)

ESMER MPFM Schematic

Application Areas

ESMER MPFMs have been in use for over ten years in on-shore and off-shore fields across the globe. ESMER MPFMs are ideally suited for well testing and allocation applications in fixed or mobile configurations. ESMER technology can be implemented for heavy or light oil multiphase flow or wet gas / condensate process conditions by the relevant combination of sensors and calibration algorithms.


Hydrodynamic and Thermodynamic Flow Models

ESMER MPFMs can be configured for use under a variety of fluid and flow regimes by means of a combination of hydrodynamic and thermodynamic models. Flow models are fine tuned against process conditions in the field by proprietary methods. Petroleum Software Ltd has a long track record of testing and applying the tune up methods in the field.
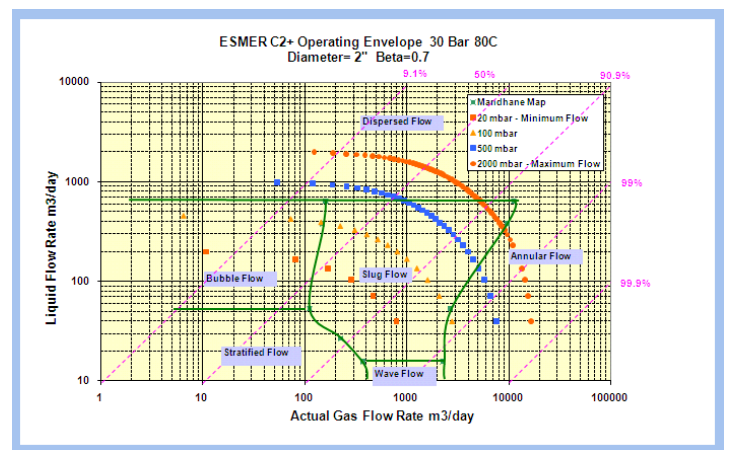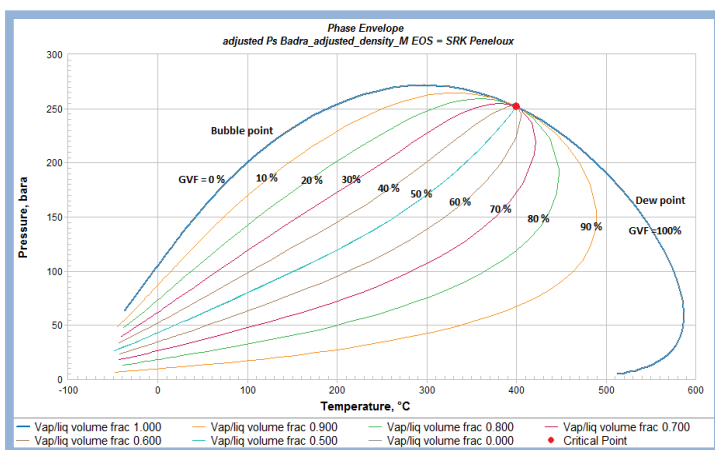
Specification

Each ESMER MPFM is built and calibrated to order to meet specific process and fluid requirements. Careful attention is paid to material selection to provide protection against corrosion. ESMER MPFMs are quality tested by third party inspectors. We collaborate closely with TUV, Bureau Veritas, Lloyds to implement industry standards for testing and inspection during FAT testing of systems.

Operating Envelope	Measurement Uncertainty
Gas & Liquid: Depends on pipe diameter and beta. Each application is sized specially based on process Conditions. **Water Cut:** 0 – 100% **GVF:** 0 – 100% **Pressure:** up to 150 bar **Temperature:** up to 120 ˚C	**Liquid flow rate:** +/- 5% (relative %FS) **Gas flow rate:** +/- 10% (relative %FS) **Water cut :** +/- 3% (abs) Quoted at 95% confidence level. Accuracy will depend on GVF, water composition and field tune-up capability. A specific accuracy target will be provided for each application.

Electro-Mechanics

Materials: Built to NACE and ASME standards. Materials selected as per customer request.
Meter sizes: 2" to 14"
Transmitters: Impedance/DP/AP/ RTD/Coriolis/Gamma/Infra Red
Certification: EEx ia IIB T4
**Power Supply:** 24 VDC / 110/220 VAC / 20 W

Typical Weights and Dimensions

| SIZE (600 ANSI)	L mm	H mm	W mm	WEIGHT kg
2"	672	1185	515	105
3"	922	1230	560	130
6"	1669	1376	706	275
10"	2683	1528	858	520

ESMER MPFM Models

Different transmitter selections are offered depending on process line conditions and accuracy requirements. The model name contains a letter which indicates the transmitters mounted on the MPFM. A skid frame is provided on request.
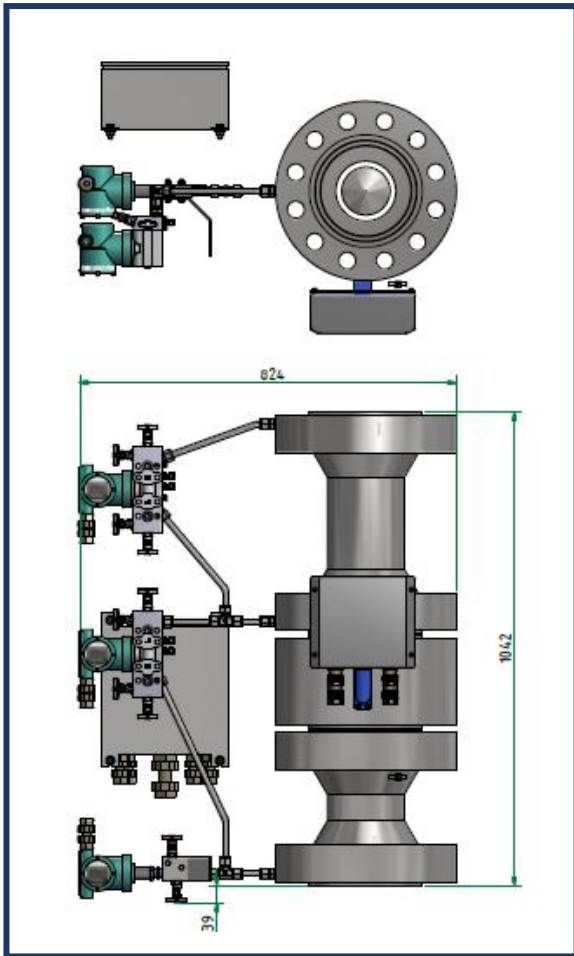
ESMER MPFM Model Designations					
C	**D**	**G**	**+**	**R**	**Number**
Conventional Pressure Transmitter	Diaphragm Pressure Transmitter	Gamma Ray Densitometer	Recovery Pressure Transmitter	Red Eye Transmitter	Nominal Diameter in Inches
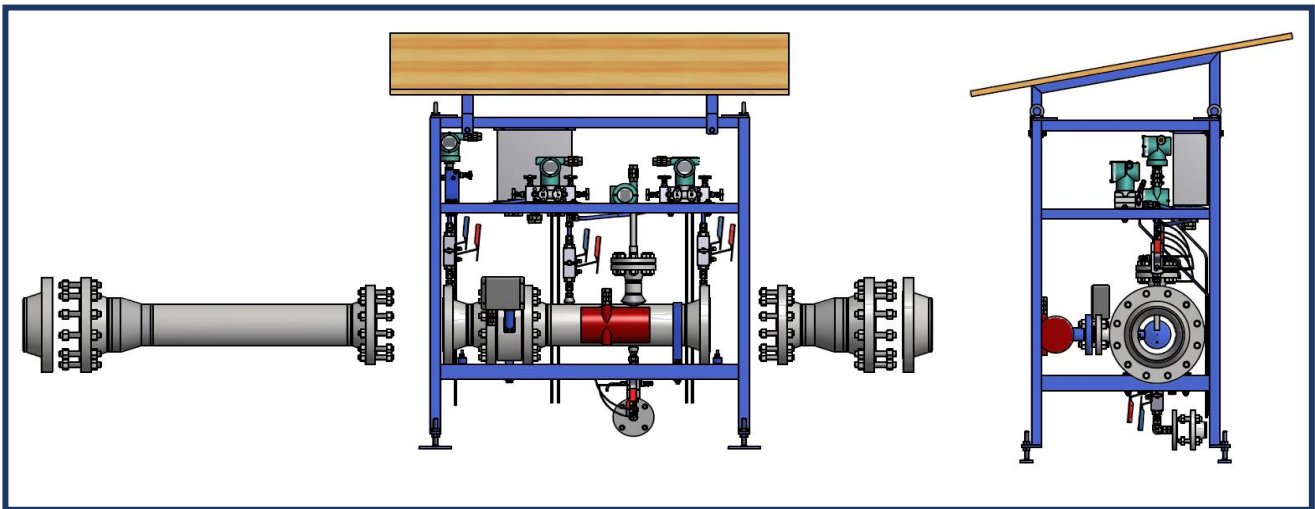
ESMER CR6+ Skidded MPFM – Red Eye Infra Red Transmitter – Non Nuclear
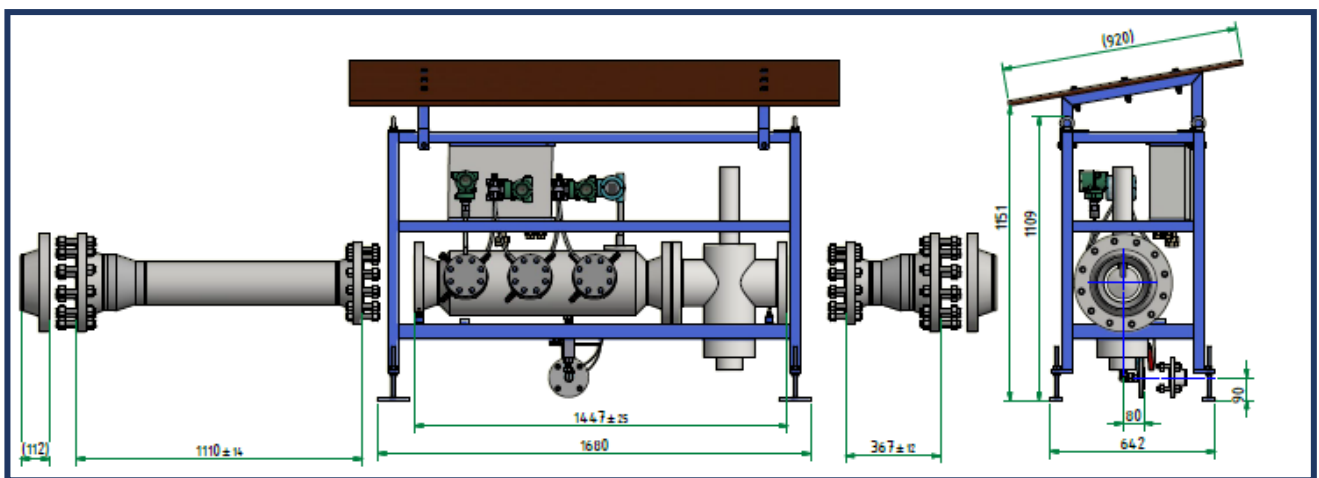
ESMER DG6+ Skidded MPFM – Diaphragm Transmitters and Gamma Ray Densitometer

ESMER C6+ MPFM Vertical Mount

ESMER C6 Basic Configuration

Flow Loop Calibration & Performance Benchmark

ESMER MPFMs are calibrated / tested in a multiphase flow loop.   NEL UK flow loop is commonly used. NEL provides an independent performance report on request. Some examples of recent ESMER MPFM NEL reports :

Evaluation of a 6 inch ESMER C6 MPFM NEL Report 2013/386 August 2013

Evaluation of a 2-inch ESMER C2 MPFM NEL Report 2012/580 16 November 2012
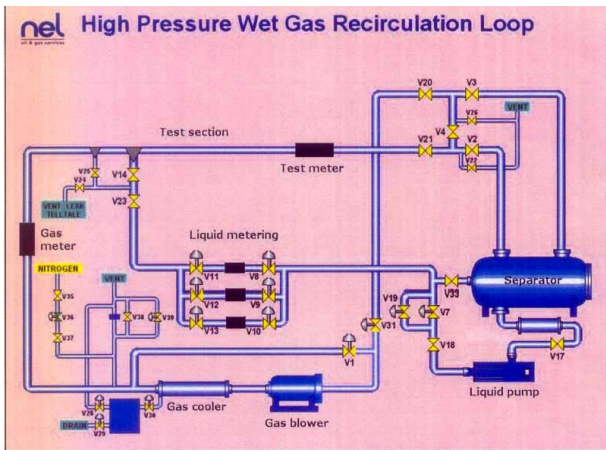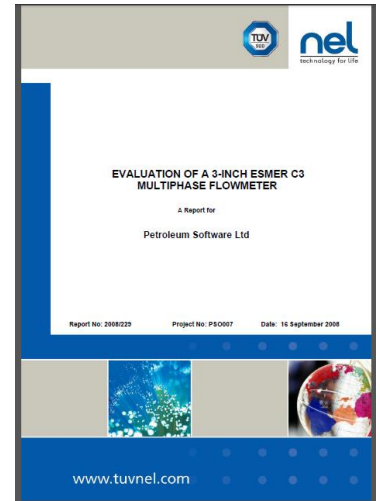
ESMER calibrations are carried out under conditions which provide the best match against particular process conditions. Particular laboratories and calibration matrices will be recommended after a careful study of the process conditions and the operating envelope.

Field Calibration & Validation

ESMER MPM is connected in series with   a conventional gravity separator for in-field periodic validation and calibration tune up as per API 2566 guidelines. Petroleum Software can supply the separator also within project scope and take full responsibility for validation and recalibration of the inline MPFM.
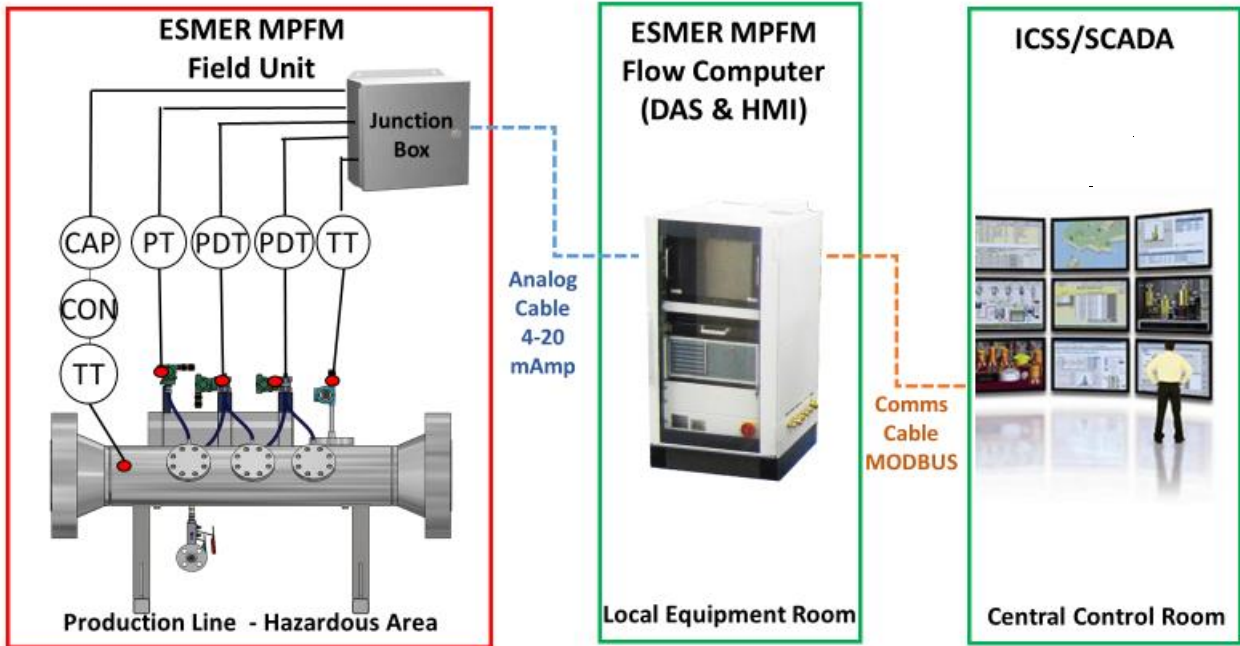

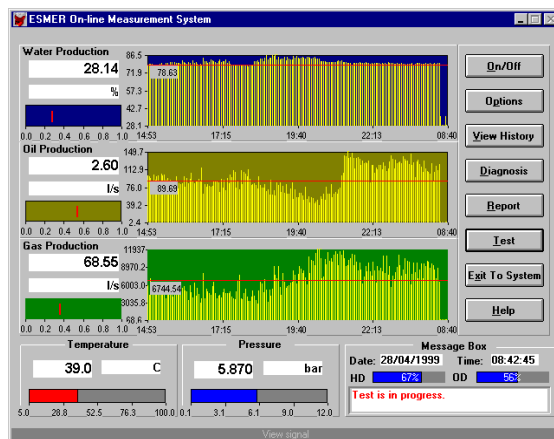esmer Separator at Badra Gazprom

esmerMPFM C6+ Validation vsTest Separator at Badra Gazprom

Flow Computer and Software

- **Hazardous Area:** Beckoff Microprocessor in Class II 2G EEx d IIB T6 Exd Enclosure
- **Safe Area:** Beckoff Industrial PC in IP55 Rack Mount Enclosure
- **Software:** ESMER / Windows
- **Communication:** RS232/RS485/Ethernet/MODBUS

ESMER MPFM BLOCK DIAGRAM

ESMER MPFM OPERATOR'S CONSOLE

Petroleum Software Ltd
http://www.petroleumsoftware.co.uk