HMA INSTRUMENTATION

MPFM-50 SERIES

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The AGAR MPFM-50 is a low-cost multiphase meter that continues the long tradition of excellent multiphase meters provided by Agar for over 15 years.

ADVANTAGES OF THE AGAR MPFM-50 SERIES:

- Gas void fraction 0-100%
- Water-cut 0-100%
- Not affected by flow regimes
- High accuracy, real-time flow measurement High and low viscosities
- No nuclear (radioactive) sources
- Compact, portable, and easy to transport and install
- Wet gas application

FEATURES

The AGAR MPFM-50 combines advanced coriolis technology with traditional flow-measurement devices to achieve superior accuracy in the entire GVF range; 0-100%, including the wet gas regime from 95-100%. The AGAR MPFM-50 is a low-cost, compact multiphase flow meter that can accurately measure oil, water, and gas flow rates without separation. The AGAR oil/water monitor is capable of measuring water cuts from 0-100% and is not affected by changing salinities.

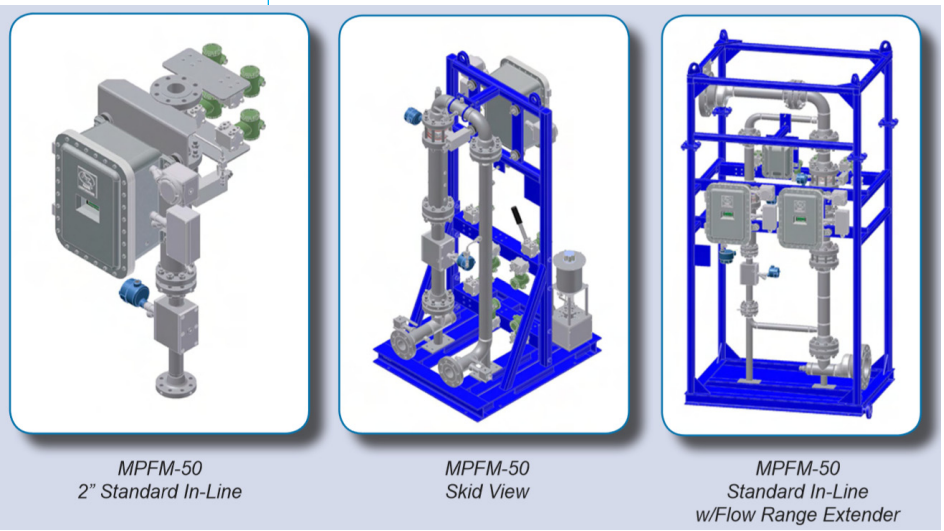
The AGAR MPFM-50 eliminates the need for expensive, secondary equipment such as phase separators, valves, and pumps for flow measurement. It is fully self-contained and compact for use in rugged field conditions and can easily be trailer-mounted for portable service.

The AGAR MPFM-50 is a multiphase flow metering tool for field and well optimization, capable of handling all flow regimes.

World-Class Process Measurement & Control Solutions

MPFM-50 COMPRISES FIVE PRIMARY SUBSYSTEMS:

- **The mass flow and density measurement** is based on coriolis and other ancillary sensors. Engineering advances allow Agar to utilize these sensors at extended operating multiphase flow ranges. The mass flow momentum and density data are fed into the AGAR Data Analysis System (DAS), which determines the net gas flow rate and net liquid flow rate.density. Water-cut data is fed into the DAS and used to determine the individual oil and water flow rates from the net liquid flow rate.
- The AGAR Water-cut meter (OW-201 or OW-301) is used to measure water content accurately over the full range of 0-100% in both oil and water-continuous phases. Accuracy is not affected by changes in velocity, salinity, pH, viscosity, temperature, or density. Water-cut data is fed into the DAS and used to determine the individual oil and water flow rates from the net liquid flow rate.
- The AGAR Data Analysis System (DAS) performs on-line analysis of data acquired from the above subsystems to determine the oil, water, gas, and total fluid flow rates. It supports a variety of PVT calculations that convert the flow from process conditions to standard conditions. It also has the ability to accept userdefined PVT relations.
- High Flow Rate Capability: In applications where the flow line is larger than 4" and the flow rate is high, Agar's unique flow range extender (F.R.E.) MPFM-50 design is used. In this design a 2" MPFM-50 is installed on the split stream and flow nozzle and GVF is installed on the main stream. This design has the ability to manage any flow rate and pipe size at a low cost and high accuracy.
- The Agar Dual Venturi Meter is used to measure flow rates of the multiphase in extreme conditions where the flow is not homogeneous.



MPFM-50 2" Standard In-Line

MPFM-50 Skid View

MPFM-50 Standard In-Line w/Flow Range Extender

MPFM-50 SERIES

TYPICAL APPLICATIONS

- **The AGAR Water-cut meter (OW-201 or OW-301)** is used to measure water content accurately over the full range of 0-100% in both oil and water-continuous phases. Accuracy is not affected by changes in velocity, salinity, pH, viscosity, temperature, or density. Water-cut data is fed into the DAS and used to determine the individual oil and water flow rates from the net liquid flow rate.
- **The AGAR Data Analysis System (DAS)** performs on-line analysis of data acquired from the above subsystems to determine the oil, water, gas, and total fluid flow rates. It supports a variety of PVT calculations that convert the flow from process conditions to standard conditions. It also has the ability to accept userdefined PVT relations.
- **High Flow Rate Capability:** In applications where the flow line is larger than 4" and the flow rate is high, Agar's unique flow range extender (F.R.E.) MPFM-50 design is used. In this design a 2" MPFM-50 is installed on the split stream and flow nozzle and GVF is installed on the main stream. This design has the ability to manage any flow rate and pipe size at a low cost and high accuracy.
- **The Agar Dual Venturi Meter** is used to measure flow rates of the multiphase in extreme conditions where the flow is not homogeneous.

MPFM-50 GENERAL SPECIFICATIONS

PREFERRED INSTALLATION: Vertical upward flow

ELECTRICAL: Power Supply: 24 VDC, 110 & 220 VAC Power Requirements: 50 Watts for the basic option (lower power options available upon request) **SAFETY CERTIFICATIONS:** ATEX: Sensor - II 1G Ex ia IIB T4 (-20ºC<Ta<60ºC) DAS Enclosure - II 2 G Ex d[ia] IIB T6 (-20ºC<Ta<60ºC) Barrier Enclosure - II 2 G Ex d[ia] IIB + H2 T6 (-20ºC<Ta<50ºC) UL/C-UL - Class 1, Division 1, Group C&D, T6 (Pending) ROSTECHNADZOR (Russia, CIS), GOST-R, Metrology Pattern Approval

DATA COMMUNICATION: (STANDARD AND OPTIONAL) STANDARD: 5 x 4-20 mA (oil flow rate, water flow rate, gas flow rate, temperature, pressure) Standard: 3 x Pulses 0-5V square shape (oil flow rate, water flow rate, gas flow rate) Standard: RS485 or RS232 with MODBUS Protocol Standard: RS232 communication with laptop, or industrial PC, using Agar WINDOWS application, optional ethernet connection Optional: HART Protocol Optional: Modem or wireless communication

TYPICAL DIMENSIONS: Approximate Weight for 2" meter(Refer to Note 1): 440 lb (200 kg) Approximate Dimensions(Refer to Note 1) (F/FXWXH): 30 in X 20 in X 50 in (76 cm X 51 cm X 127 cm)

PERFORMANCE:	
Gas Void Fraction	0 to 100%
Water cut	0 to 100%
Flow Regimes	All: (e.g. Bubbly, Wavy, Slug, Annular, etc.)
Pressure	Up to 10,000 PSI
Ambient Temperature	-4°F to 160°F (-20°C to 70°C) Optional Low Temp -40°F to 160°F (-40°C to 70°C)
Process Temperature	Standard Model 32°F to 212°F (0°C to 100°C) High Temperature Model 32°F to 450°F (0°C to 232°C)
Liquid Viscosity	Low Viscosity Model: 0.1-30 cP High Viscosity Model: 0.1-2000 cP
Salinity	0 to 30% NaCl by weight (up to saturation)
Sand/Particulate	Up to 5% by volume and less than 1mm particle size
Max. Pressure Drop	Less than 15 psi (1 bar)
Wetted Parts	Standard: 316 Stainless Steel; Hastelloy, and other materials available on special order; According to ASME B31.1 and B31.3. PEEK; Ceramics Isolators

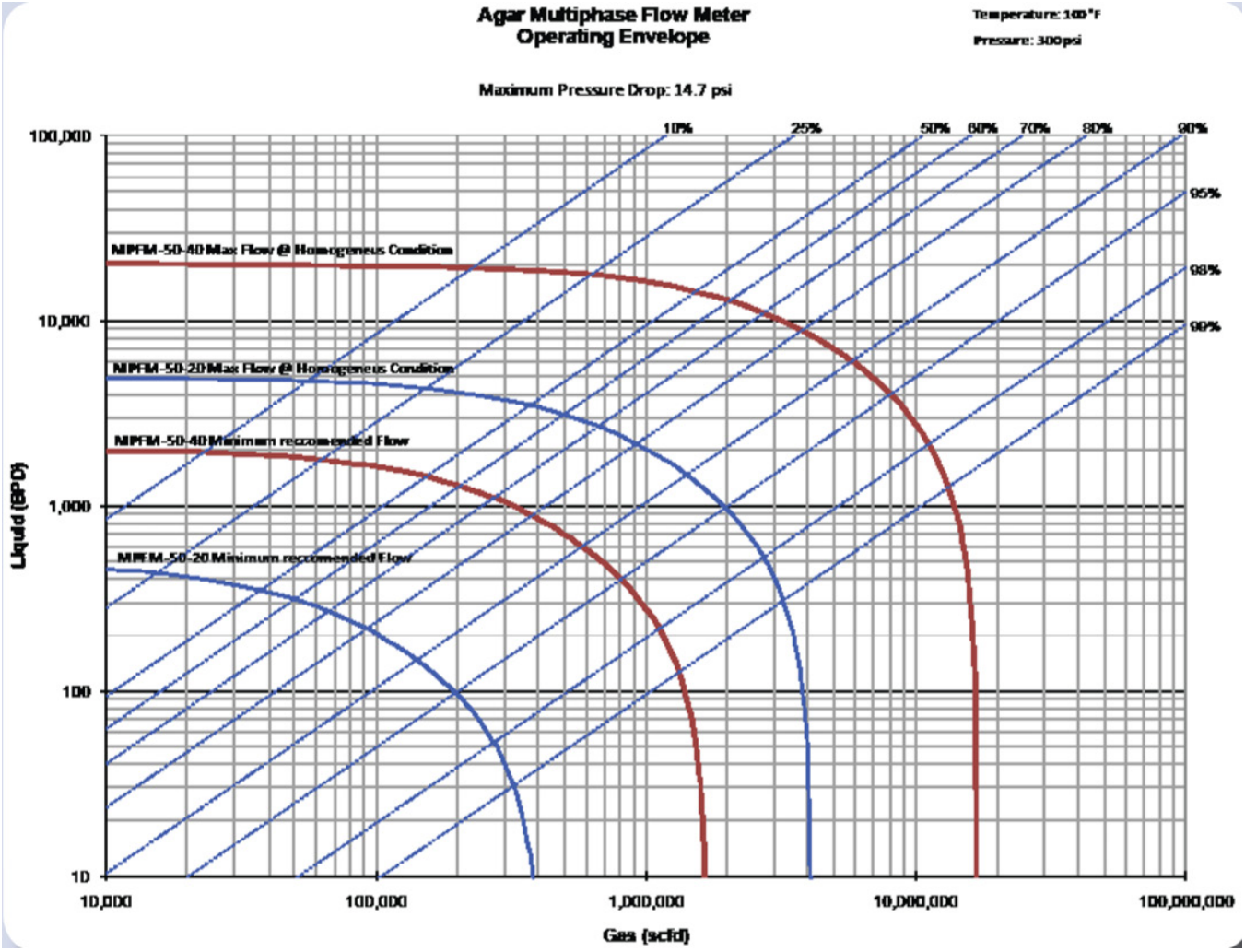
ACCURACY

The accuracies shown below take into account changes in salinity, viscosity, density, temperature, pressure, and pH.

Worst case instantaneous results for a **2"** meter (quoted to 2 sigma):
(FS_L[2] = Liquid Full Scale, R = Reading)

Water Flow Rate Error:	± 2% FS_L ± 5% R	
Oil Flow Rate Error:	± 2% FS_L ± 5% R	**Refer to operating envelope below.**
Gas Flow Rate Error:	GVF 0 - 100%: ±(2% FS_{gas} + 5%R)	

1	Weights and Dimensions will vary according to options chosen. Example shown is for a 2" meter.
2	FS_L is the maximum liquid flow rate at zero gas volume fraction. FS_L depends on the size of the meter. The errors quoted are for a 2" meter for which FS_L = 5000 bbl/day (800 m^3/day).



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