MFM SERIES
MUD FLOW METER

FLOW IN
MFM 100

FLOW OUT
MFM + IVD

DYNAMIC DENSITY OUT
DDM

DESCRIPTION
Accurate measures of drilling fluid flow through the well are essential for drillers to monitor and control the wellbore. Advanced control to ensure safe drilling condition requires the measurement of the drilling fluid flow rates entering and coming out the well. Evaluation of the balance of flow in / flow out is a key parameter to ensure the proper drilling behavior. To have comparable measurement of fluid flow is fundamental to have measuring devices based on the same measurement principle, with a consequent better value of differential flow and highest comparison capability.
Valcom developed and patented the MFM Mud Flow Meter that provides exceptional reliability and accurate measurements at the inlet as well as at the outlet of the wellbore.
The measurement of the flow is obtained by the measurement of pressure drop through a Venturi tube and the measurement of absolute pressure and temperature of the flowing medium as well as of the flowing fluid density. Different configurations of the system layout are possible to satisfy existing piping schemes.

APPLICATIONS
- Mud flow measuring at wellheads in order to reveal flow rates of mud, mixture of liquids, solids and gas
- Suitable for fluid densities from 1 Kg/l up to 2 Kg/l with different content of gas (up to 30%) and solids (up to 15%).
- Suitable for Oil & Gas, Chemical, Petrochemical industries.

SPECIAL FEATURES
- Increased safety with redundancy of installed instruments.
- Real time measurement.
- It is not affected even when high density mud (2.00 SG) is left inside the bypass without circulation for more than 24 hrs; at the resume of circulation the readings are stable and accurate immediately.
- Available in AISI 4130 or DUPLEX materials.
- Available for flow computers interfaces.

APPROVALS
CE Ex PED TÜV SÜD CLUB ISOENCErtifications SIL IEC 61508
HART COMMUNICATION PROTOCOL
FIELDCOMM GROUP MEMBER

THE HEART OF MEASUREMENT SYSTEM

The MFM has an extended rangeability up to 10 times in order to cover a wide range of flowrates. The 5" unit gives a reliable measurement from 300 to 3500 l/min through the use of dual flow sensors.
The unit is extra compact: up to ten sensors within a length of 650 mm. The sensors have been specially developed and patented for this application and sensor-to-fluid connections protect sensor diaphragms (against abrasions or possible built up) and increase reliability and long-term accuracy. The special sensor design, utilizing traditional well proven technology, allows easy and reduced maintenance need and fast sensor installation. For inlet flow meter, the unit is rated for high pressure and can be installed on the stand pipe pressure line, extending the monitoring of Flow in even with Oil Base Mud (OBM), overcoming a limitation of Coriolis and magnetic flowmeter application respectively.
The meters have reduced pressure losses (less than 0.3 bar) compared to the equivalent diameter of Coriolis sensor; the mechanical construction reduce drastically possible mud spill upstream.

INSTALLATION OF MFM

The system installation is different following the inlet and outlet section of the circulation plant. For Flow IN application can be installed on the stand pipe or at its base either in horizontal or vertical position or if required in an inclined position. The system requires the measure of the density at the mud tank fitted with our T7S density meter and level through KRG radar transmitter. Considering Flow OUT applications different configurations are possible. In all cases the system is fitted with the DDM (Dynamic Density Meter) to ensure a simultaneous measurement of flowrate and density. U shaped configurations are possible and reduce the required space. It is possible to install it with a less intrusive, compact and lighter tailored bypass, compared to conventional Coriolis meter; in addition, the bypass will not require flushing / dumping lines and pumps associated, as usually installed in a Coriolis bypass.

Sizing based on Vmin = 0,5 m/s and Vmax = 5 m/s

SIZE	DIAMETER (mm)	THROAT DIAMETER (mm)	Qmin (l/min)	Qmax (l/min)
4" XS	97,2	58,3	200	2000
4" XXS	80,1	48,0	150	1500
5" XS	122,3	73,4	350	3500
5" XXS	103,2	61,9	250	2500
6" XS	146,3	87,8	500	5000
6" XXS	124,4	74,6	360	3600
8" XS	193,7	116,2	900	9000
8" XXS	174,6	104,8	700	7000
10" XS	247,7	148,6	1400	15000
12" XS	298,5	179,1	2000	21000

The maximum velocity is due to limit the effects of erosion on piping and Venturi meter. Instead, the minimum velocity is required to ensure the flush of the piping and avoid any problem due to settling and clogging of pipes. The expected accuracy in these ranges of velocity is within +/- 2%.

MEASUREMENT PERFORMANCE

Flow rate: < ±2% (*****)
Density: < ±5%
Sensors accuracy: <±0,075%FS

(*****) Accuracy obtained through customer's calculation software.

ENVIRONMENTAL CONDITIONS

Ambient Temperature: -40 ÷ +85°C
Process fluid Temperature:
- Standard: -40 ÷ +85°C
- on request: up to 283°C

Handling and storage: -40 ÷ +90°C
Relative Humidity: from 0 to 100% R.H.
LCD Display reading: -20 ÷ +75°C

TRANSMITTERS

PHYSICAL SPECIFICATIONS

Housing: SS AISI316 IP67, Dust and sand tight, protected against sea wave effects as defined by IEC IP67. Suitable for tropical climate operation as defined by DIN 50015.
Covers O-ring: EPDM.
Nameplate: stainless steel AISI 316, fixed on housing.

WETTED PARTS

AISI 316L Nace MR0175 compliance.
Inconel.
Tantalum and others on request.

PHYSICAL CHARACTERISTICS

Power supply: 12.5 – 30 Vdc
Output signal:
Analog 4-20mA, 2 wires / Digital HART®
Electrical connections: intrinsically safe plug connectors

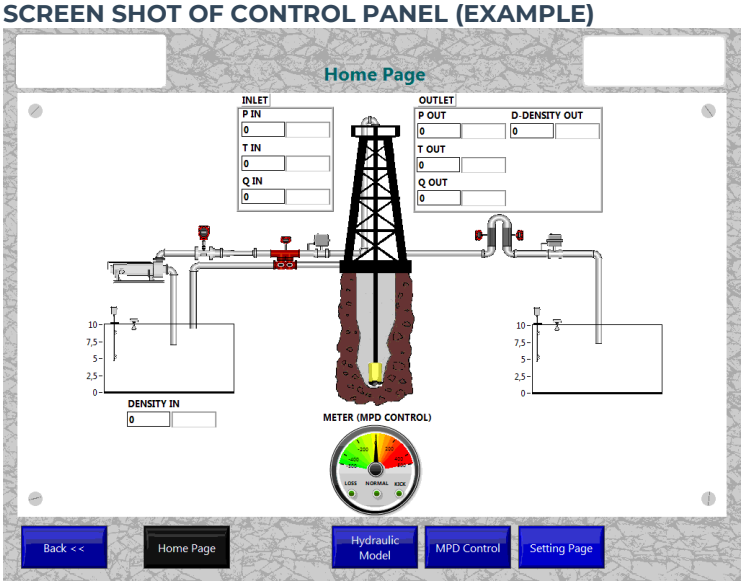
All signals (2 flows, 1 temperature, 1 pressure, 1 or 2 pit density, 1 pit level for IN and same plus dynamic density and viscosity for OUT) are available for existing or newly developed computed solution to perform specific functions and get calculated outputs to drive and / or optimize the system.

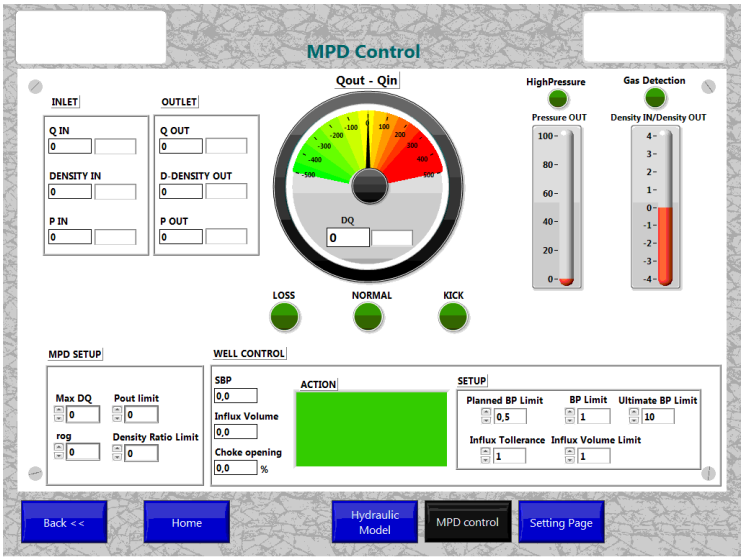
VENTURI

BODY MATERIAL

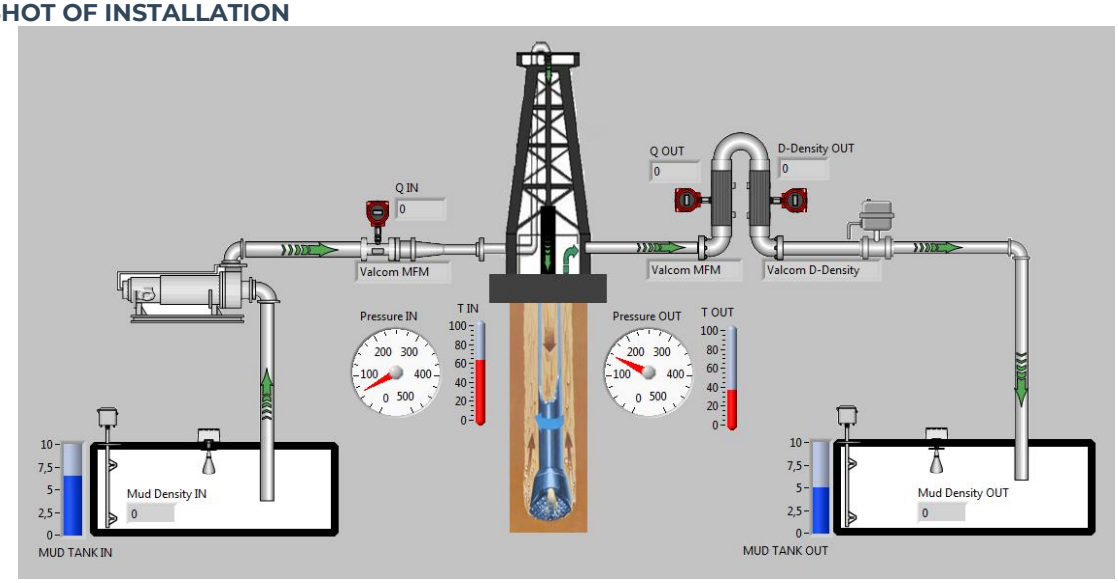
Standard: AISI 4130
Options: Duplex, Hard insert, etc.

SCREEN SHOT OF CONTROL PANEL (EXAMPLE)



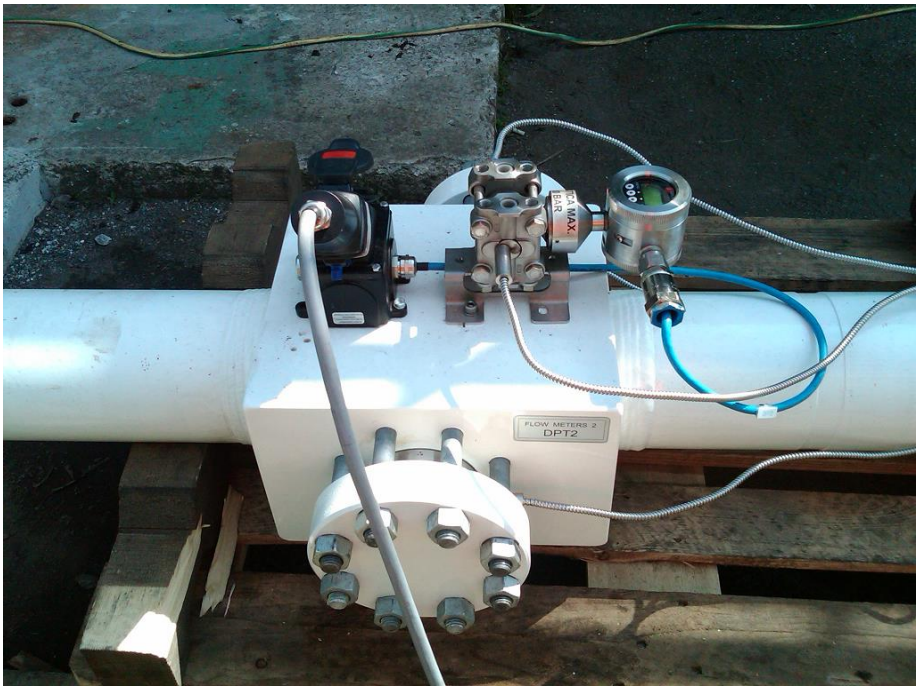


SCREEN SHOT OF INSTALLATION



FLOW-IN
Any direction from horizontal to vertical position.

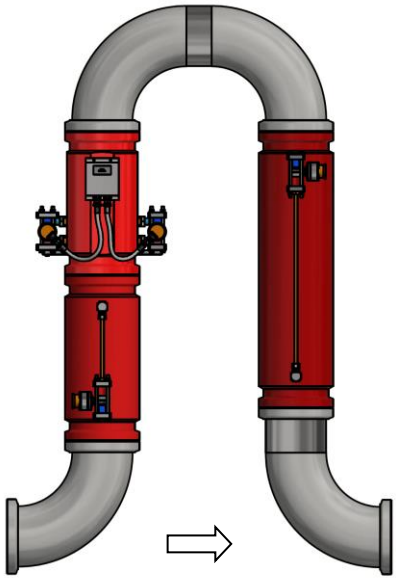
Installation in
Vertical position



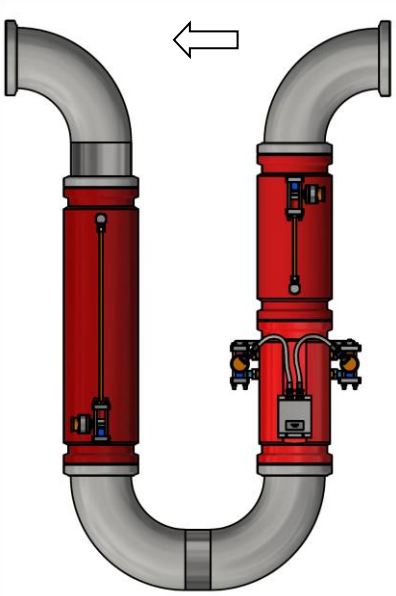
Installation in
Horizontal position

FLOW-OUT

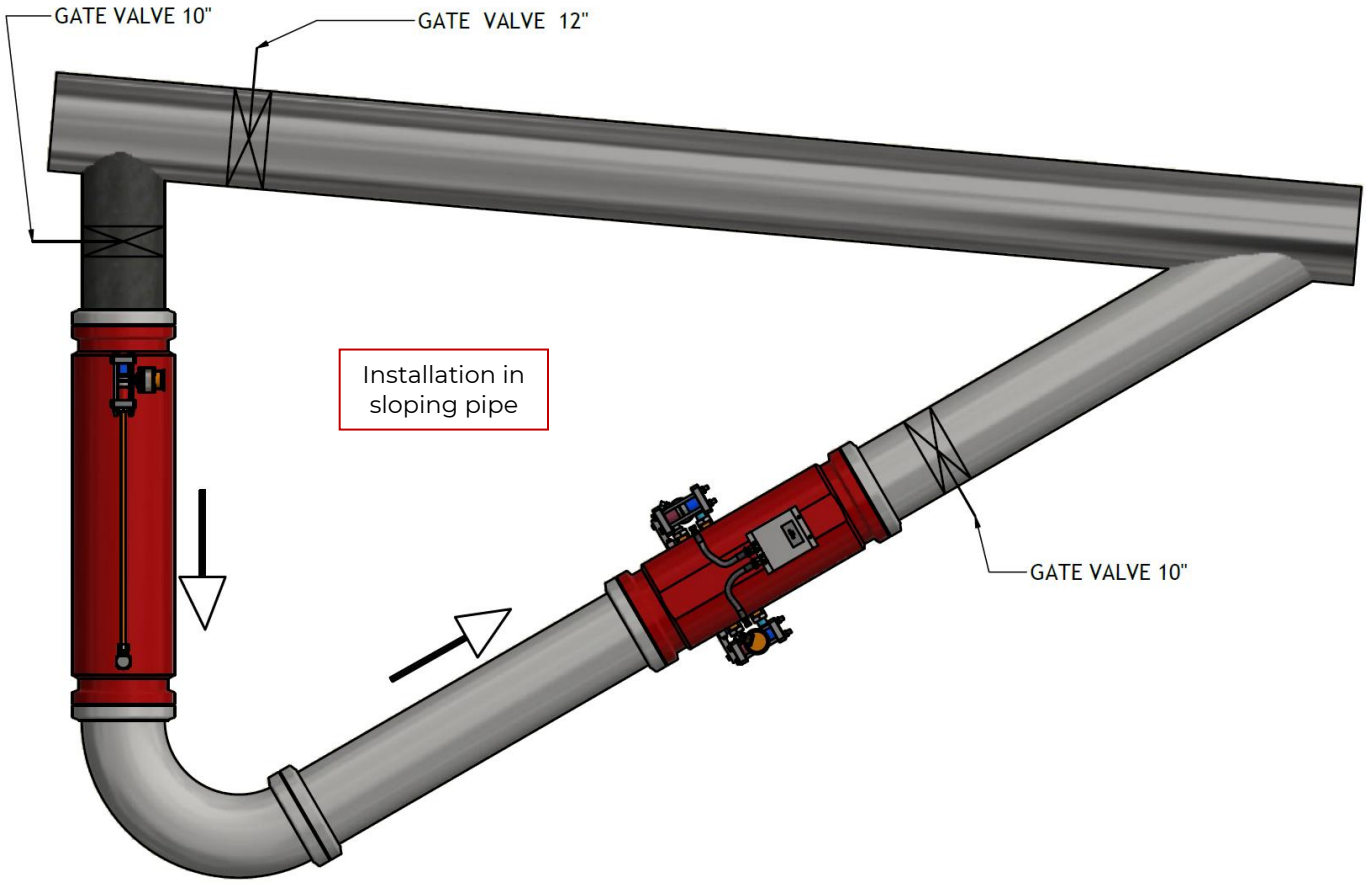
The MFM flow meter is fitted with the DDM (Dynamic Density Meter) and can be installed on flow line in different configurations.



Vertical installation (Upward)



Vertical installation (Downward)



EUROPEAN LEGISLATION APPROVALS

T7S$_{IN/OUT}$	Smart specific gravity transmitter for IN / OUT mud pit		Ex	PED	SIL
KRG$_{IN/OUT}$	Smart radar level transmitter for level measurement of IN and OUT mud pit.		Ex IEC IECEx		
MFM$_{IN}$	Venturi Inlet dual Mud Flow Meter		Ex IEC IECEx	PED	SIL
MFM$_{OUT}$	Venturi Outlet dual Mud Flow Meter				
DDM	Dynamic Density Meter on mud flow out				
IVD	Inline Viscosity Detector on Mud Flow Out				
SIGNAL CABINET	Ex-d Box (OPTIONAL)		Ex		

COMPLIANT WITH DIRECTIVE 2004/108/EC (EMC).

ORDERING CODE

00 SERIES

MFM	Mud Flow Meter

01 CONFIGURATION TYPE

A	MFM_{IN} (2 flows, 1 temperature, 1 pressure) 4 outputs - 4÷20 mA + HART
B	MFM_{OUT} + DDM (2 flows, 1 temperature, 1 pressure, 1 dynamic density) 5 outputs - 4÷20 mA + HART
C	MFM_{OUT} + IVD + DDM (2 flows, 1 temperature, 1 pressure, 1 dynamic density, 1 viscosity) 6 outputs - 4÷20 mA + HART

02 PIPE NOMINAL DIAMETER

1	4” ASME
2	5” ASME
3	6” ASME
4	8” ASME
5	10” ASME
6	4" XS API HUB
7	4" XXS API HUB
8	5" XS API HUB
9	5" XXS API HUB
10	6" XS API HUB
11	6" XXS API HUB
12	8" XS API HUB
13	8" XXS API HUB
14	10" XS API HUB
15	12" XS API HUB
99	Others

03 PIPE RATING

A	ASME Class 300
B	ASME Class 600
C	ASME Class 900
D	ASME Class 1500
E	API 3000
F	API 5000
G	API 10000
Z	Other

04 BODY MATERIAL

A	AISI 4130
B	Duplex
Z	Other

05 HOUSING MATERIAL (SENSORS)

1	SS AISI 316

06 Ex PROTECTION

0	Ex ia Intrinsic Safety
1	Ex d Explosion Proof
2	IECEx Intrinsic Safety

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