ELECTROMAGNETIC FLOW MEASUREMENT

ECLIPSE EMAG 3000

Electromagnetic Flow Meter



Overview

OVERVIEW

The ECLIPSE EMAG 3000 electromagnetic flow meter consists of sensors and converters in two parts. The product is based on Faraday's law of electromagnetic induction, used to measure the conductance greater than 5 µS/cm volume of conductive liquid flow.

The measuring pipe is in a magnetic field. If an electrically conductive medium with a certain flow passes through the pipe, it passes at a right angle to the magnetic field, creating a voltage which is proportional to the average flow velocity and picked up by two electrodes.

In addition to measuring the general volume of conductive liquid flow, it can also be used to measure strong acid, alkali and other strong corrosive liquids and mud, pulp and other liquid-solid two-phase suspension of uniform volume flow.

TYPICAL APPLICATIONS

- Water / wastewater industry (except distilled)
- High viscous fluids in food & beverage industry
- Pulp and paper industry
- Pharmaceutical manufacturing
- Metal & mining industry
- Irrigation applications

FEATURES AND BENEFITS

- High accuracy of ±0.5 % of reading (±0.3 % ±0.2 % optional).
- Conductivity: normal liquid >20 µS/cm, slurry liquid >5 µS/cm.
- Measure forward and reverse direction flows.
- Built-in reference electrodes, no need to connect ground ring.
- Available in DN 3 to DN 3000 line sizes.
- Integrated diagnostic function and empty pipe detection.
- Process temperature up to 160 °C (remote type).
- Available in flange, clamp and sanitary connections.
- High protection grade, IP65, IP68.
- Dual frequency excitation and stable zero point.
- No moving parts, no pressure loss.
- Optional Modbus RS485 communication.

DN3 – DN3000	±0.5 %	IP65 / IP68	4.0 MPa
LINE SIZE RANGE	ACCURACY OF READING	PROTECTION GRADE	NOMINAL PRESSURE

SPECIFICATIONS

Major Technical Performance

PROCESS & MEASUREMENT	
Size	DN3 – DN3000 mm (1/8” ~ 120”)
Accuracy	±0.5 % of reading; ±0.3 % and ±0.2 % optional; velocity >0.3 m/s
Conductivity	Normal liquid >20 µS/cm Slurry liquid >5 µS/cm
Flow Velocity	0.1 m/s ~ 15 m/s
Nominal Pressure	4.0 MPa (DN3 – DN150) 1.6 MPa (DN200 – DN600) 1.0 MPa (DN700 – DN1000) 0.6 MPa (DN1200 – DN3000)
Process Temperature	Up to 160 °C (remote type)
Protection Grade	IP65, IP68
Explosion-proof	Exd IIB T6 Gb
Ambient Temperature	−20 °C ~ 60 °C
Relative Humidity	5 % ~ 95 %

LINERS, ELECTRODES & MATERIALS	
Liner Material	Neoprene (rubber), PTFE, PFA, F46, Polyurethane
Electrode Material	SS316L, Hastelloy C, Hastelloy B, Titanium, Tantalum, Platinoiridium
Measuring Tube	Stainless Steel 304
Flange Material	Carbon Steel (standard) Stainless Steel 304 (optional) Stainless Steel 316 (optional)

ELECTRICAL, COMMUNICATION & INSTALLATION	
Power Supply	AC 85 ~ 250 V DC 20 V ~ 36 V
Power Consumption	< 20 W
Signal Output	4 ~ 20 mA, pulse
Frequency Output	1 ~ 5000 Hz
Communication	RS485 / Modbus, HART, Profibus
Display	LC display 128 × 128 mm Three lines 4 internal push buttons
Exciting Current	125 mA, 187 mA, 250 mA
Exciting Frequency	3.12 Hz, 4.16 Hz, 6.25 Hz, 12.5 Hz, 25 Hz, 30 Hz
Straight Pipe	Inlet path ≥ 10D Outlet path ≥ 5D
Language	English, Chinese Other languages are available

FLANGE STANDARDS	
EN 1092-1	PN10, PN16, PN25, PN40
ANSI B16.5	Class 150, 300, 600
JIS 2220	10K, 20K, 40
AS 2129 / AS 4087	Table D, Table E / PN16, PN21, PN35

PERFORMANCE & SIGNAL CHARACTERISTICS

≤ 0.17 %

Repeatability of measurement under stable reference conditions.

Forward & reverse

Bi-directional flow measurement with forward and reverse indication.

0 ~ 750 Ω

Permissible load resistance on the 4–20 mA analogue output loop.

MATERIAL SELECTION

Liner & Electrode Material Selection Guide

Liner and electrode selection is governed by the chemical aggressiveness, temperature and abrasion level of the measured medium. The guidance below is general electromagnetic-flow-meter selection practice; confirm final material compatibility against the process datasheet before ordering.

LINER MATERIAL SELECTION

LINER	SERVICE CHARACTERISTICS	TEMPERATURE
PTFE	Best chemical resistance; withstands boiling hydrochloric, sulfuric and nitric acids, alkalis and organic solvents. Poor wear resistance.	**−20 ~ 140 °C**
PFA	Highly resistant to chemicals and performs well under vacuum conditions; smooth bore with good release characteristics.	**−20 ~ 160 °C**
F46 (FEP)	Excellent chemical resistance; suited to corrosive fluids and clean chemical processing duties.	**−20 ~ 120 °C**
Neoprene	Good elasticity and abrasion resistance; for low-concentration acids, alkalis and salt solutions. Not for oxidizing media.	**−10 ~ 80 °C**
Polyurethane	Strong abrasion resistance; ideal for slurries, muds, mineral pulp and solids-bearing suspensions.	**−10 ~ 60 °C**
Ceramic	Exceptional wear, corrosion and temperature resistance; smooth bore, fully vacuum resistant.	**High temp.**

ELECTRODE MATERIAL SELECTION

ELECTRODE	TYPICAL SERVICE MEDIA
SS316L	Industrial and municipal water, wastewater, sewage and low-corrosive media; widely used in general process plants.
Hastelloy B	Hydrochloric acid below boiling point; resistant to vitriol, phosphoric, hydrofluoric and organic acids.
Hastelloy C	Exceptional resistance to strong oxidizing salts and acids — Fe^{3+}, Cu^{2+}, nitric and mixed acids.
Titanium	Seawater, chloride solutions, hypochlorites, oxidizable acids including fuming nitric acid, and alkalis.
Tantalum	Almost all chemicals except hydrofluoric acid, oleum and strong alkalis.
Platinum-Iridium	Universal resistance across virtually all corrosive media except ammonium salts and fortis.

> Liner and electrode combinations must be reviewed together with the process fluid, concentration, temperature and presence of solids. The EMAG 3000 ordering matrix on page 6 lists the material codes available for this model.

DIMENSIONS

Dimensions of Sensor and Converter

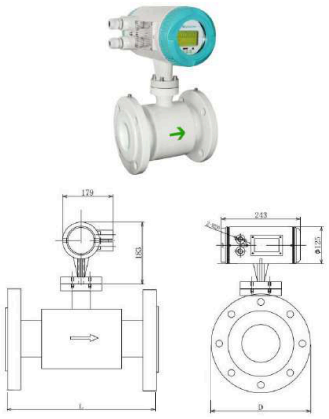
DN	L	D	KG
3	200	90	4
6	200	90	5
10	200	90	6
15	200	95	8
20	200	105	10
25	200	115	12
32	200	140	13
40	200	150	14
50	200	165	15
65	200	185	18
80	200	200	20
100	250	235	25
125	250	270	28
150	300	300	30
200	350	340	50

DN	L	D	KG
250	450	405	70
300	500	460	95
350	550	520	120
400	600	580	140
450	600	640	160
500	600	715	200
600	600	840	280
700	700	895	350
800	800	1015	400
900	900	1115	480
1000	1000	1230	550
1200	1200	1405	660
1400	1400	1630	750
1600	1600	1830	850
1800	1800	2045	980
2000	2000	2265	1200
2200	2200	2475	1600
2400	2400	2685	2000
2600	2600	2905	2400
2800	2800	2905	2700
3000	3000	3315	2900

Table 1 — Dimensions of sensor and converter. DN in millimetres; *L* and *D* external dimensions in millimetres; weight in kilograms.

INTEGRAL TYPE

Integral Type



Sensor and converter assembled as a single unit. Outline and mounting-face dimensions per source drawing.

REMOTE TYPE

Remote Type



Separate converter connected to the sensor by cable. Outline and mounting-face dimensions per source drawing.

ENGINEERING GUIDANCE

Installation & Pipeline Engineering Guidelines

The guidance on this page reflects general good practice for electromagnetic flow meters. It supports installation planning for the EMAG 3000 but does not override the model-specific specifications on page 2.

STRAIGHT RUN & ORIENTATION

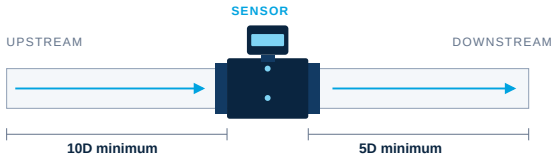
An electromagnetic flow meter measures the average velocity of a fully developed flow profile. Accuracy therefore depends on adequate undisturbed straight pipe on both sides of the sensor.

- Provide a minimum **10D upstream** straight run and **5D downstream** (D = nominal bore), measured from the electrode plane.
- Increase the upstream length where the disturbance is severe — two elbows in different planes, partly open valves, pumps or reducers.
- Install downstream of pumps, never at the suction side, to avoid negative pressure and cavitation at the liner.
- Horizontal mounting: keep the electrode axis horizontal to prevent air pockets or sediment bridging the electrodes.
- Vertical mounting: preferred direction is upward flow, which guarantees a full pipe at low flow rates. Avoid downward vertical flow.
- The pipe must remain completely full at all times; do not install at the highest point of a line or where the pipe can drain empty.

GROUNDING & EARTHING

The flow signal is a low-level voltage developed across the electrodes, referenced to the process fluid. A stable, low-impedance earth reference is essential for a stable zero point.

- The EMAG 3000 uses **built-in reference electrodes**, so a separate grounding ring is not required on conductive, unlined metal pipe.
- Bond the sensor flanges to the adjacent pipe flanges with the supplied earth straps so the pipework itself carries the reference potential.
- For plastic, coated or internally lined pipe, fit **grounding rings** on both sides of the sensor to establish contact with the fluid.
- Where stray currents or cathodic protection are present, use an isolated earth connection dedicated to the instrument.
- Earth the converter housing separately and route signal cable screens back to the converter earth only — do not earth the screen at both ends.
- Keep signal cable separated from power and VFD cabling, and connect the cable screen in accordance with the converter wiring diagram.



Indicative arrangement only: minimum straight pipe lengths are measured from the electrode plane, with the pipe running full and the electrode axis horizontal in horizontal installations.

REFERENCE FLOW RANGE BY LINE SIZE

DN	SIZE	0.5 M/S	1 M/S	3 M/S	5 M/S	10 M/S
DN15	1/2”	0.32	0.64	1.91	3.18	6.36
DN25	1”	0.88	1.77	5.30	8.84	17.67
DN50	2”	3.53	7.07	21.21	35.34	70.69
DN80	3”	9.05	18.10	54.29	90.48	180.96
DN100	4”	14.14	28.27	84.82	141.37	282.74
DN150	6”	31.81	63.62	190.85	318.09	636.17
DN200	8”	56.55	113.10	339.29	565.49	1,130.97
DN300	12”	127.23	254.47	763.41	1,272.35	2,544.69

Volumetric flow q_v in m³/h calculated from $q_v = A \cdot v$ for the nominal bore shown. Values are reference figures for sizing; the EMAG 3000 measuring range is 0.1 m/s to 15 m/s.

ORDERING INFORMATION

Model Selection Matrix & Ordering Guide

EMAG 3000 model code structure: **EM · XXXX · XX · XX · X · X · X · X · XX · XX**. Select one code per field to build a complete model reference.

EM	XXXX	XX	XX	X
SERIES	LINE SIZE	CONVERTER	ACCURACY	POWER
X	**XX**	**X**	**X**	**X**
PRESSURE	CONNECTION	LINER	ELECTRODE	OUTPUT

FIELD	CODE	DESCRIPTION
Series	`EM`	EMAG 3000
Line Size	`0006 · 0010 · 0015 · 0020 · 0025 · 0032 · 0040 · 0050 · 0065 · 0080 · 0100 · 0125 · 0150 · 0200 · 0250 · 0350 · 0400 · 0500 · 0600 · xxxx`	DN6, DN10, DN15, DN20, DN25, DN32, DN40, DN50, DN65, DN80, DN100, DN125, DN150, DN200, DN250, DN350, DN400, DN500, DN600. Other sizes up to DN3000 — contact sales.
Converter	`IT · RT · RI · IE · RE`	IT — integral type · RT — remote type · RI — remote type immersion · IE — integral type Ex-proof · RE — remote type Ex-proof
Accuracy	`05 · 03 · 02`	05 — 0.5 % of rate · 03 — 0.3 % of rate · 02 — 0.2 % of rate
Power	`A · D`	A — 220 VAC 50 Hz · D — 24 VDC
Pressure Rating	`P1 · P2 · P3`	P1 — 0.6 MPa · P2 — 1.0 MPa · P3 — 1.6 MPa · 4.0 MPa option
Process Connection	`S1 · J1 · J2 · J3 · A1 · A3 · A6 · D06 · D10 · D16 · D25`	S1 sanitary type (Tri Clamp) · J1 / J2 / J3 JIS 10K / 20K / 40K flange · A1 / A3 / A6 ANSI 150# / 300# / 600# flange · D06 / D10 / D16 / D25 EN 1092-1 DIN PN10 / PN16 / PN25 / PN40 flange
Liner Material	`A · B · C · D`	A — PTFE · B — PFA · C — Neoprene · D — Polyurethane · Ceramic also listed
Electrode Material	`K · L · M · N · O · P`	K — 316L · L — Hastelloy B · M — Hastelloy C · N — Titanium · O — Platinum-Iridium · P — Tantalum
Output / Communication	`A · B · C · D`	A — flow volume 4-20 mA / pulse · B — flow volume 4-20 mA / RS232C · C — flow volume 4-20 mA / RS485 · D — flow volume 4-20 mA / HART

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