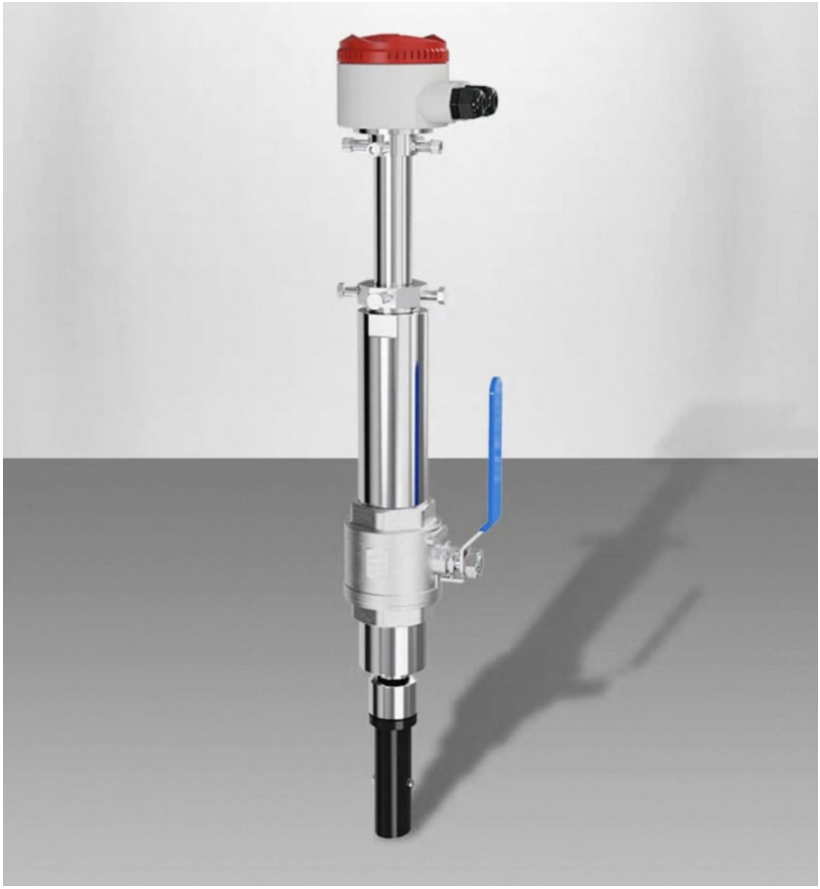
Agrinovo

AGRINOVO-EMF-200

Insertion Electromagnetic Flow Meter



1. Overview

The AGRINOVO-EMF-200 is an insertion-type electromagnetic flow meter for large-diameter pipelines. The probe mounts through a ball valve saddle and inserts into the pipe flow, allowing installation and removal without stopping flow (hot-tap). It contains no moving parts, causes virtually no pressure drop, and is unaffected by fluid temperature, pressure, density, viscosity, or conductivity (above minimum). The transmitter displays instantaneous flow, velocity, and accumulated volume on a backlit LCD and communicates over RS-485 Modbus-RTU.

Key Features

- Pipe sizes: DN100-DN3000
- Hot-tap install/removal under pressure
- Accuracy: ±1.5% (velocity ≥1 m/s)
- Bidirectional flow measurement
- RS-485 Modbus-RTU
- 4-20mA + frequency/pulse outputs
- Sensor IP68, Transmitter IP65
- 85-250VAC or 20-36VDC power

Applications

- Large-diameter supply and return mains
- Aquaculture system manifolds and headers
- Municipal water distribution
- Irrigation trunk lines and irrigation canals

2. Specifications

Measurement

Parameter	Specification
Pipe Size	DN100-DN3000
Velocity Range	0-1 to 0-10 m/s (full-scale 1-10 m/s, continuously adjustable)
Accuracy	±1.5% of reading (velocity ≥1 m/s)
Min. Fluid Conductivity	≥30 μS/cm
Max. Fluid Temperature	60°C
Max. Working Pressure	1.6 MPa

Probe and Transmitter

Parameter	Specification
Electrode Materials	Stainless 316L, Hastelloy C (HC)
Measurement Tube Material	ABS
Sensor Protection	IP68
Transmitter Protection	IP65
Max. Signal Cable Length	50 m (sensor to transmitter)

Insertion Length

Pipe Size	Probe Length
DN ≤200	630 mm
DN250-DN400	730 mm
DN401-DN1200	830 mm
DN1401-DN2000	1030 mm

Insertion depth: DN ≤400 - insert to ½ DN; DN >400 - insert to ¼ DN.

Electrical

Parameter	Specification
Supply Voltage	85-250VAC (45-63Hz) or 20-36VDC
Power Consumption	<20W
Operating Temperature	-10 to 55°C (ambient)
Storage Temperature	-40 to 65°C

3. Wiring

Integral Type (24VDC)

Terminal	Function
LN+	24V Power+
LN-	24V Power-
TRX+	RS485-A (Data+)
TRX-	RS485-B (Data-)
IOUT	4-20mA Current Output
IVIN	2-wire 24V Input
POUT	Frequency / Pulse Output (bidirectional)
COMM	Common Ground (frequency, pulse, current)
ALM1	High Alarm Output
ALM2	Low Alarm Output

Integral Type (220VAC)

Terminal	Function
L / N	220V Power Input
TXD	RS485-A (Data+)
RXD	RS485-B (Data-)
IOUT	4-20mA Current Output
POUT	Frequency / Pulse Output
COMM	Common Ground
ALMH	High Alarm Output
ALML	Low Alarm Output

> All digital outputs (frequency, pulse, alarm) are opto-isolated. Max load: 36VDC, 250mA.

4. Communication Settings

Parameter	Value
Protocol	Modbus-RTU
Physical Interface	RS-485
Baud Rate	1200 / 2400 / 4800 / **9600** / 19200 bps
Data Bits	8
Parity	None (Odd or Even selectable)
Stop Bits	1
Default Address	0x01
Max Devices per Bus	99
Bus Termination	120Ω at each end of the RS-485 bus
Isolation	1000V electrical + ESD protection

Data Format

All 32-bit values span two consecutive registers. Values are big-endian IEEE-754 float32 or big-endian int32: the lower register address holds the high 16-bit word, the next register holds the low 16-bit word.

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5. Register Map

All registers are read with **Function Code 0x04** (Read Input Registers).

Address (Dec)	Address (Hex)	Type	Description
4112-4113	0x1010-0x1011	Float32 BE	Instantaneous flow rate
4114-4115	0x1012-0x1013	Float32 BE	Instantaneous velocity (m/s)
4116-4117	0x1014-0x1015	Float32 BE	Flow percentage (%)
4118-4119	0x1016-0x1017	Float32 BE	Fluid conductivity ratio
4120-4121	0x1018-0x1019	Int32 BE	Forward totalizer (integer part)
4122-4123	0x101A-0x101B	Float32 BE	Forward totalizer (decimal part)
4124-4125	0x101C-0x101D	Int32 BE	Reverse totalizer (integer part)
4126-4127	0x101E-0x101F	Float32 BE	Reverse totalizer (decimal part)
4128	0x1020	Uint16	Flow rate unit code
4129	0x1021	Uint16	Totalizer unit code
4130	0x1022	Uint16	High alarm status (0=none, 1=active)
4131	0x1023	Uint16	Low alarm status (0=none, 1=active)
4132	0x1024	Uint16	Empty pipe alarm (0=none, 1=active)
4133	0x1025	Uint16	System alarm (0=none, 1=active)

Flow Rate Unit Codes

Code	Unit	Code	Unit	Code	Unit	Code	Unit
0	L/s	3	m³/s	6	T/s	9	GPS
1	L/min	4	m³/min	7	T/min	10	GPM
2	L/h	5	m³/h	8	T/h	11	GPH

Totalizer Unit Codes

Code	0	1	2	3
Unit	L	m³	T	USG

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6. Reading Data

Read Instantaneous Flow

Read 2 registers from 0x1010 (device address 0x01):

```
Request:  01 04 10 10 00 02 74 CE
Response: 01 04 04 [4 bytes float] [CRC]
```

Assemble bytes as big-endian IEEE-754 float32: bytes[0-1] = high word (register 0x1010), bytes[2-3] = low word (register 0x1011).

Read Instantaneous Velocity

```
Request:  01 04 10 12 00 02 D5 0E
Response: 01 04 04 [4 bytes float] [CRC]
```

Read Forward Totalizer

Integer part (from 0x1018) + decimal part (from 0x101A). Combine for full 9-digit totalizer value.

```
Request (integer):  01 04 10 18 00 02 F5 0C
Request (decimal):  01 04 10 1A 00 02 54 CC
```

7. Address Configuration

Address and baud rate are set via the transmitter front-panel menu. The address range is 1-99. The default address is 1.

8. Outputs

4-20mA Current Output

- Range: 4mA (zero flow) to 20mA (full scale)
- Max load: 750Ω
- Also supports 2-wire (loop-powered) mode

Frequency / Pulse Output

- Frequency range: 1-5000Hz (proportional to flow percentage)
- Pulse equivalent: 0.001-1.000 m^3/pulse or L/pulse
- Opto-isolated: max 36VDC, 250mA

Alarm Outputs

- ALMH / ALM1: activates when flow exceeds high setpoint
- ALML / ALM2: activates when flow drops below low setpoint
- Opto-isolated: max 36VDC, 250mA

9. Installation Notes

Placement

- Upstream straight run: 15D minimum
- Downstream straight run: 10D minimum

Hot-Tap Procedure

- Weld the saddle and ball valve to the pipe before insertion
- Close ball valve; drill and deburr the tapping hole

- Mount at 3 or 9 o’clock position (horizontal pipes) to keep electrodes away from sediment and air
- Pipe must remain completely filled during measurement
- Avoid installation near motors, transformers, or variable-frequency drives
- Insert probe to the correct depth (DN/2 for DN ≤400; DN/4 for DN >400)
- Open ball valve slowly; tighten the compression seal
- No flow interruption required during installation or removal

Grounding

The transmitter housing must be earthed with a minimum 1.6mm² copper conductor. Earth resistance to ground must be below 10Ω. Use the sensor flange and grounding ring for earth continuity.