# ANF380 Magnetic Flowmeter

## Introduction

ANF380 Electromagnetic flowmeter is a high precision, high reliability flowmeter. It is used to measure the volume flow of conductive liquid and slurry in the closed pipeline, and is widely used in steel, electric power, petroleum, chemical industry, coal, metallurgy, mineral resources, paper making, water supply and drainage, food, medicine and other industries.

## Measure Principle

The measurement principle (see Figure 1) is based on Faraday's law of electromagnetic induction. That is, when the conductive liquid moves through the cutting magnetic force line in the magnetic field, the induced electromotive force is generated in the conductor, and E is:

E=KBVD

K: Instrument constant

B: Intensity of magnetization

V: Measure the average flow velocity in the pipe section
D: Measure the inner diameter of the tube

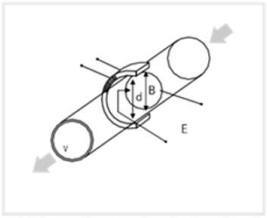



Figure 1 Measurement schematic diagram

When measuring the flow rate, the fluid flows through a magnetic field located perpendicular to the flow direction. The flow of the conductive liquid induces a voltage signal proportional to the average flow rate (i. e. volume flow). The induced voltage signal is detected through two electrodes in direct contact with the liquid, and is transmitted to the amplifier through the cable line, and then converted into a uniform current output signal.

## Features

- The measurement accuracy is not affected by changes in fluid density, viscosity, temperature, pressure, and conductivity.
- No hindered flow parts, no pressure loss, and low requirements for straight pipe section.
- The converter uses liquid crystal backlight display, which can make reading in direct sunlight or dark room easy.
- The parameters are set by the infrared touch button, and the cover plate of the converter can be set safely without opening in the harsh ring.
- The flow meter is a two-way measurement system, equipped with three integrtors: forward amount, reverse amount and total difference amount: can display positive and reverse flow, and has a variety of outputs: current, pulse, digital communication, HART.
- The converter has the functions of self-diagnosis alarm output, empty load detection, alarm output, alarm output of flow upper and lower limits, batch control and so on.
- It can not only be used for general process detection, but also for the measurement of pulp, pulp and paste liquid.
- High voltage electromagnetic flowmeter sensor adopts PFA, mesh lining technology, high pressure resistance, negative pressure resistance, specially used in petrochemical, mineral and other industries.

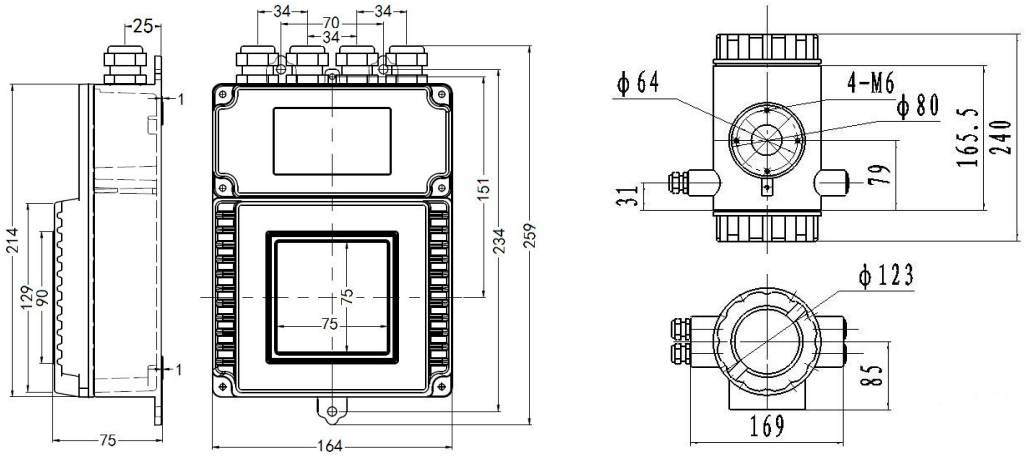
## Chinese Smart Converter (ANF380 / Z Type)

The Chinese and English display smart converter uses a 16-bit embedded microprocessor. Full digital treatment, with the function of bidirectional flow measurement, instantaneous flow and positive and reverse cumulative and, difference accumulation, used to measure the volume flow of clear water, sewage, acid, alkali, salt solution or liquid-solid phase fluid.

## Specifications

| | | |
|---|---|---|
| Power Supply | AC220V 50HZ/DC24V/3.6V | |
| Power Dissipation | < 15W(Power consumption with the the sensor ) | |
| Display and Buttons | Chinese and English display， Can display instantaneous flow, cumulative flow and alarm display (excitation open circuit alarm, air traffic control alarm, flow overrun alarm with 4 film touch switches for data setting. | |
| Counter | Forward total, reverse total | |
| Output Signal | Analog Output | Two ways, all separate 0~10mA/4~20mA |
| | | Load Resistance 0~10mA, 0~1.5KΩ; 4~20mA, 0~750Ω; |
| | Frequency Output | Forward and reverse flow output, the upper limit of output frequency can be set within 1~5000Hz. Transtor collector with photoelectric isolation. The external power supply is not greater than 35V, and the maximum current of the collector is 50mA. |
| | Alarm Output | Two open alarm output with photoelectric isolation. The external power supply is not greater than 35V, and the maximum current of the collector is 250 mA. Alarm status: fluid air traffic control, excitation line break, flow over the limit. |
| | Pulse Output | Forward and reverse flow output, output pulse ceiling up to 5000CP / S. The pulse equivalent of 0.0001~1.0m3/ P. The pulse width is automatically set to 20ms or a square wave. Open circuit output of the transistor collector with photoelectric isolation. The external power supply is not greater than 35V, and the maximum current of the collector is 50 mA. |
| Accuracy | Display Value ±0.5%， optional display value±0.3% or ±0.2% | |
| Damping Time Constant | Continuous variables from 0 to 100s (90%) time scale optional | |
| Communication | Optional RS232C or RS485 serial communication interface, HART communication protocol, with lightning protection | |
| Power Lossing | The instrument internal design has no power loss clock and can store 16 power loss records (10 years) | |
| Protection Class | IP65 | |

## ANF380/Z Drawing




## Flanged-type Electromagnetic Flow Sensor

### Technical Performance Parameters

| | | | |
|---|---|---|---|
| Nominal Diameter | DN6mm ~ DN3000mm | | |
| Nominal Pressure | 0.6 ~ 4.0MPa （Special pressures can be customized) | | |
| Accuracy | Display Value ±0.5%， optional display value±0.3% or ±0.2% | | |
| Lining Material | Polychloroprene, polyurethane rubber, polysilicone fluororubber rubber, polytetrafluoroethylene (PTFE), polyperfluoroethylene propylene (F46), PFA | | |
| Electrode Form | Standard type, scraper type, replaceable type | | |
| Electrode Material | SUS316, Hastelloy B, Hastelloy C, titanium, tantalum, platinum/iridium alloy, stainless steel coated with tungsten carbide | | |
| Medium Temperature | Integrated type | -20℃~ +70℃ | |
| | Separated type | Pneoprene lining / polyurethane lining | -20℃~ +60℃ |
| | | PTFE lining / PFA lining / F46 lining / PSFE lining | -40℃~ +180℃ |
| Ambient Temperature | -20℃~ +60℃ | | |
| Ambient Humidity | 5 ~ 100%RH （Relative humidity) | | |
| Media Conductivity | ≥ 20μ s/cm | | |
| Range | 1500:1 Flow rate setting < 15m/s | | |
| Structure | Integrated type、Separated type、Separated type | | |

| | |
|---|---|
| Protection Class | IP65、IP67、IP68 Optional |
| Standards | JB/T9248-1999 Electromagnetic Flowmeter |

## The main properties of lining materials are shown in Table 1

| Lining Material | Main Performance | Applications |
|---|---|---|
| Polyneoprene Rubber | 1、Excellent elasticity, high pulling force, good wear resistance | Water, sewage, weak wear of mud, slurry, temperature resistance range: -20℃ ~ + 60℃ |
| | 2、Resistance to the general low concentration of acid, alkali, salt medium corrosion, not resistant to oxidation medium corrosion | |
| Polyurethane Rubber | 1、Excellent wear resistance (10 times that of natural rubber) | Neutral strong wear slurry, coal, mud, etc., temperature resistance range: -20℃ ~ + 60℃ |
| | 2、Acid resistance, alkali resistance energy is poor | |
| | 3、Water must not be mixed with organic solvents | |
| Silicone Fluorine Rubber | 1、Excellent elasticity, high breaking force, high temperature resistance | Temperature resistance range of water: -20℃ ~ + 180℃ |
| | 2、Not resistant to any concentration of acid, alkali, salt medium corrosion | |
| PTFE | 1. Plastic in the most stable chemical performance of a material, can resist boiling hydrochloric acid, sulfuric acid and water, can also resist concentrated alkali and various organic solvents, not resistant to chloride trifluoride, high flow rate liquid fluorine, liquid oxygen, ozone corrosion. | Temperature resistance range of strong corrosion medium such as strong acid and alkali: -40℃ ~ + 170℃ |
| | 2、Poor wear resistance | |
| F46 | 1、Corrosion resistance is as that in PTFE | Same as PTFE, can be used for low wear medium temperature resistance range: -40℃ ~ + 160℃ |
| | 2、Can withstand low wear | |
| | 3、Strong ability to resist negative pressure | |
| PFA | Corrosion resistance as PTFE, strong negative pressure resistance | Can be used for the negative pressure state Temperature resistance range: -40℃ ~ + 160℃ |

Table 1

The corrosion resistance of the electrode materials is shown in Table 2

| Electrode Material | Corrosion resistance |
|---|---|
| SUS316 | Used for industrial water, domestic water, sewage, weakly corrosive media, widely used in petroleum, chemical, steel and other industrial departments and municipal, environmental protection and other fields. |
| Hastelloy B (HB) | It has good corrosion resistance to all the concentrations of hydrochloric acid below the boiling point, and is also resistant to the corrosion of sulfuric acid, phosphoric acid, hydrofluoric acid, organic acid, alkali and so on. |
| Hastelloy C (HC) | Resistant to non-oxidizing acids, such as nitric acid, mixed acid or chromic acid and sulfuric acid mixed medium corrosion, but also resistant to oxidizing salts such as Fe+++, Cu++ or containing other oxidant corrosion. Such as hypochlorite solution higher than normal temperature, seawater corrosion. |
| Titanium | Resistant to seawater, various chlorides and hypochlorites, oxidizing acids (including fuming sulfuric acid), organic acids, alkalis, etc., and is not resistant to the corrosion of purer reducing acids (such as sulfuric acid, hydrochloric acid). However, if the acid contains oxidants (such as nitric acid, Fe+++, Cu++), the corrosion is greatly reduced. |
| Tantalum | Has excellent corrosion resistance, and glass is very similar, in addition to hydrofluoric acid, fuming sulfuric acid, alkali, almost all chemical media (including boiling point of hydrochloric acid, nitric acid and sulfuric acid and aqua regia below 150℃) corrosion. Note: Not resistant to rot in alkali. |
| Platinum / Iridium alloy | Suitable for almost all chemicals, but not for aqua regia and ammonium salts. |
| Stainless steel coated with tungsten carbide | For non-corrosive, strong wear media. |

Table 2

Note: Due to the wide variety of media and their corrosive influence by complex factors such as temperature, concentration and flow rate, this table is for reference only. Users should make their own choices according to the actual situation, and if necessary, do the corrosion resistance test of the selected materials, such as hanging test.

## Outline Overall and Installing Dimensions

External dimension of instrument

The dimensions and pressure series of the flange type sensor are shown in Figure 4 and Table 3 and Table 4

| Nominal Diameter (mm) | Nominal Pressure (MPa) | Dimensions | | | Weight (Kg) |
|---|---|---|---|---|---|
| | | Meter length (including lining) | D | H | |
| 6 | 4.0 | 160* | 90 | 220 | 6 |
| 10 | | 200/160* | 90 | 220 | 6 |
| 15 | | 200 | 95 | 220 | 8 |
| 20 | | 200 | 105 | 220 | 10 |
| 25 | | 200 | 115 | 223 | 12 |
| 32 | | 200 | 140 | 240 | 13 |
| 40 | | 200 | 150 | 250 | 14 |
| 50 | | 200 | 165 | 263 | 15 |
| 65 | 1.6 | 200/250 | 185 | 283 | 18 |
| 80 | | 200/250 | 200 | 290 | 20 |
| 100 | | 250 | 220 | 318 | 25 |
| 125 | | 250 | 250 | 350 | 28 |
| 150 | | 300 | 285 | 380 | 35 |
| 200 | | 350 | 340 | 430 | 46 |
| 250 | | 450 | 405 | 495 | 68 |
| 300 | 1.0 | 500 | 445 | 547 | 73 |
| 350 | | 550 | 505 | 602 | 87 |
| 400 | | 600 | 565 | 665 | 110 |
| 450 | | 600 | 615 | 720 | 120 |
| 500 | | 600 | 670 | 783 | 146 |
| 600 | | 600 | 780 | 897 | 175 |
| 700 | | 700 | 895 | 982 | 350 |
| 800 | | 800 | 1015 | 1092 | 400 |
| 900 | | 900 | 1115 | 1192 | 480 |
| 1000 | | 1000 | 1230 | 1299 | 550 |
| 1200 | 0.6 | 1200 | 1405 | 1488 | 660 |
| 1400 | | 1400 | 1630 | 1700 | 750 |
| 1600 | | 1600 | 1830 | 1924 | 850 |
| 1800 | | 1800 | 2045 | 2134 | 980 |
| 2000 | | 2000 | 2265 | 2344 | 1200 |
| 2200 | | 2200 | 2475 | 2549 | 1600 |
| 2400 | | 2400 | 2685 | 2754 | 2000 |
| 2600 | | 2600 | 2905 | 2964 | 2400 |
| 2800 | | 2800 | 2905 | 3169 | 2700 |
| 3000 | | 3000 | 3315 | 3369 | 2900 |

Table 3

Note: Our company can be customized and processed according to user requirements. 160* size for F46 lining length. DN65 and DN80 have two sizes of 200 and 250 length, which should be explained when ordering.

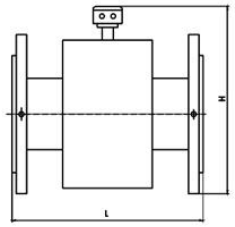



Figure 4 Appearance of DN6-DN3000 flange sensor

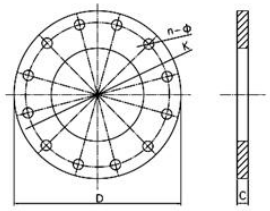



Figure 5 Connecting flange diagram

## Flange Dimension

Connection flanges and installation dimensions are shown in Figure 5 and Table 5

Connection flange implementation standard:

4.0MPa(DN10 ~ DN50) GB/T9119-2000

2.5MPa(DN300 ~ DN500) JB/T81-94

1.6MPa(DN65 ~ DN250) JB/T81-94

1.0MPa(DN300 ~ DN1000) JB/T81-94

0.6MPa(DN1200 ~ DN3000) JB/T81-94

Flange type electromagnetic flow sensor

## Flange Size Table

| Nominal Pressure (MPa) | Nominal Diameter (mm) | D | K | ∅ | n | C |
|---|---|---|---|---|---|---|
| 4.0 | 6 | 90 | 60 | 14 | 4 | 14 |
| | 10 | 90 | 60 | 14 | 4 | 14 |
| | 15 | 95 | 65 | 14 | 4 | 16 |
| | 20 | 105 | 75 | 14 | 4 | 16 |
| | 25 | 115 | 85 | 14 | 4 | 16 |
| | 32 | 135 | 100 | 18 | 4 | 18 |
| | 40 | 145 | 110 | 18 | 4 | 18 |
| | 50 | 160 | 125 | 18 | 4 | 20 |
| 1.6 | 65 | 180 | 145 | 18 | 4 | 24 |
| | 80 | 195 | 160 | 18 | 8 | 24 |
| | 100 | 215 | 180 | 18 | 8 | 26 |
| | 125 | 245 | 210 | 18 | 8 | 28 |
| | 150 | 280 | 240 | 23 | 8 | 28 |
| | 200 | 335 | 295 | 23 | 12 | 30 |
| | 250 | 405 | 355 | 25 | 12 | 32 |
| 1.0 | 300 | 440 | 400 | 23 | 12 | 28 |
| | 350 | 500 | 460 | 23 | 16 | 28 |
| | 400 | 565 | 515 | 25 | 16 | 30 |
| | 450 | 615 | 565 | 25 | 20 | 30 |
| | 500 | 670 | 620 | 25 | 20 | 32 |
| | 600 | 780 | 725 | 30 | 20 | 36 |
| | 700 | 895 | 840 | 30 | 24 | 36 |
| | 800 | 1010 | 950 | 34 | 24 | 38 |
| | 900 | 1110 | 1050 | 34 | 28 | 42 |
| | 1000 | 1220 | 1160 | 34 | 28 | 44 |
| 0.6 | 1200 | 1400 | 1340 | 33 | 32 | 32 |
| | 1400 | 1630 | 1560 | 36 | 36 | 32 |
| | 1600 | 1830 | 1760 | 36 | 40 | 34 |
| | 1800 | 2045 | 1970 | 39 | 44 | 36 |
| | 2000 | 2265 | 2180 | 42 | 48 | 38 |
| | 2200 | 2475 | 2390 | 42 | 52 | 42 |
| | 2400 | 2685 | 2600 | 42 | 56 | 44 |
| | 2600 | 2905 | 2810 | 48 | 60 | 46 |
| | 2800 | 3115 | 3020 | 48 | 64 | 48 |
| | 3000 | 3315 | 3220 | 48 | 68 | 50 |

Table 5

## Selection Guide

| Specifications | Code | Description |
|---|---|---|
| Model | ANF380 | Electromagnetic Flowmeter |
| Delimiter | - | |
| Nominal Diameter (mm) | Code | DN6-DN3000 Three digit numbers, see nominal diameter code Table 6 |
| Delimiter | - | |
| Nominal Pressure | 1 | 0.6MPa |
| | 2 | 1.0MPa |
| | 3 | 1.6MPa |
| | 4 | 4.0MPa |
| | 5 | Other |
| Delimiter | - | |
| Connection Type | a | Flange Type |
| Delimiter | - | |
| Lining Material | 1 | Polyneoprene rubber |
| | 2 | Polyurethane rubber |
| | 3 | Polyurethane rubber |
| | 4 | Polytetrafluoroethylene (PTFE) |
| | 5 | Polyperfluorinated ethylene-propylene (F46) |
| | 6 | PFA |
| Delimiter | - | |
| Electrode Material | 1 | Aluminum stainless steel (SUS316) |
| | 2 | Hastelloy B (HB) |
| | 3 | Hastelloy C (HC) |
| | 4 | Titanium (Ti) |
| | 5 | Tantalum (Ta) |
| | 6 | Platinum/iridium alloy |
| | 7 | Stainless steel coated with tungsten carbide |
| Delimiter | - | |
| Structure | 1 | Integrated type |
| | 2 | Separated type |
| | 3 | Separated immersion type |
| Delimiter | - | |
| Power Supply | A | 220VAC 50Hz |
| | D | 24VDC |
| | V | 3.6V |
| Delimiter | - | |
| Output communication | A | Volume flow 4-20 MADC/pulse |
| | B | Volume flow 4-20mADC/RS232C serial communication interface |
| | C | Volume flow 4-20mADC/RS485C serial communication interface |
| | D | Volume traffic HART protocol output/tape communication |
| Delimiter | - | |
| Converter Form | F0 | Square, no LCD display |
| | F1 | Square with LCD display |
| | Y | Round with LCD display |
| Delimiter | - | |
| Optional | 1 | Ground electrode |
| | 2 | Matching flange |
| | 3 | Inlet protection flange |
| | 4 | Electrode scraper mechanism |
| | 5 | Ground ring |
| | 6 | other |

Nominal diameter code table (Table 6)

| Nominal Diameter | Code |
|---|---|
| 6 | 600 |
| 10 | 100 |
| 15 | 150 |
| 20 | 200 |
| 25 | 250 |
| 32 | 320 |
| 40 | 400 |
| 50 | 500 |
| 65 | 650 |
| 80 | 800 |
| 100 | 101 |
| 125 | 125 |
| 150 | 151 |
| 200 | 201 |
| 250 | 251 |
| 300 | 301 |
| 350 | 351 |
| 400 | 401 |
| 450 | 451 |
| 500 | 501 |
| 600 | 601 |
| 700 | 701 |
| 800 | 801 |
| 900 | 901 |
| 1000 | 102 |
| 1200 | 122 |
| 1400 | 142 |
| 1600 | 162 |
| 1800 | 182 |
| 2000 | 202 |
| 2200 | 222 |
| 2400 | 242 |
| 2600 | 262 |
| 2800 | 282 |
| 3000 | 302 |

Note: If there is negative pressure in the pipeline, it is recommended not to use polytetrafluoroethylene (PTFE) lining, please use screened polyperfluorinated ethylene propylene (F46) or PFA lining.