FULLKON

INSTRUCTION MANUAL

Preface

●Thank you for purchasing our products.

●an instruction manual about the functions, wiring methods, setting methods, operation methods, troubleshooting methods, etc. of the product .

●Please read this manual carefully before operation and use this product correctly to avoid personal injury and unnecessary losses caused by incorrect operation.

Notice

●this manual , please refer to the newly released document .

●We strive to ensure that the contents of this manual are correct. If you find any errors, please contact us.

●The contents of this manual may not be reproduced or copied.

●Please use this product according to its explosion-proof characteristics and in compliance with national and regional laws and regulations.

●The final right of interpretation of this manual belongs to our company.

Version

U-FK-LDG-G-EN1

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Chapter 1 Introduction

1.1. Introduction

The electromagnetic flowmeter is designed based on the Faraday electromagnetic induction principle and are used to directly measure the flow rate of conductive liquids in closed pipelines. During on-site monitoring and display, standard current signals, pulse signals, and RS485 digital signals can be output for recording, adjustment, and control, achieving automatic detection and control. It can be widely used in industries such as tap water, chemical industry, coal, environmental protection, light textile, metallurgy, papermaking, etc.

1.2. Measuring Principle

The electromagnetic flowmeter adopts an advanced low-frequency square wave excitation design, and its operating principle is based on Faraday's law of electromagnetic induction.The two electromagnetic coils at the upper and lower ends as shown in Figure 3 generate a constant or alternating magnetic field. When the conductive medium flows through the electromagnetic flowmeter, the induced electromotive force can be detected between the left and right electrodes on the wall of the flowmeter tube. The magnitude of the induced electromotive force is proportional to the electrically conductive medium flow rate, the magnetic induction density of the magnetic field, and the width of the conductor (the inner diameter of the flowmeter measuring tube), and the flow rate of the medium can be obtained by calculation. The induced electromotive force equation is as follows:

$$E=K\times B\times V\times D$$

Where:

E—Induced electromotive force

K—Meter constant

B—Magnetic induction density

V—Average flow speed in cross-section of measuring tube

D—Inner diameter of measuring tube

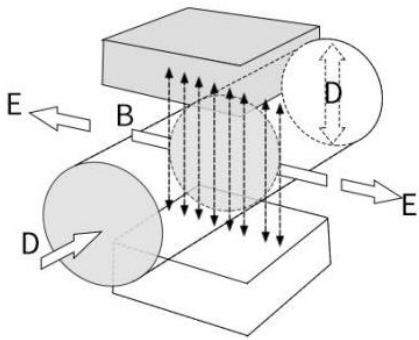


Figure 1

When measuring the flow, the fluid flows through a magnetic field which is perpendicular to the flow direction. The flow of conductive fluid induces a potential proportional to the average flow velocity, thus requiring the conductivity of the measured flowing liquid to be higher than the minimum conductivity.The induced voltage signal is detected by two electrodes and transmitted to the converter via a cable. After a series of analog and digital signal processing, the accumulated flow and real-time flow are displayed on the display of the converter.

1.3. Measurement System

The electromagnetic flowmeter primarily consists of two main components: the sensor and the transmitter.The sensor comprises the flange, liner, electrodes, measuring tube, excitation coil, and sensor housing.The transmitter includes internal circuit boards and the transmitter housing.

1.4. Features

●Reliable measurement, high accuracy, and good stability.

●Integrated structure, no moving parts, easy to install, maintenance free.

●RS485 communication interface - standard Modbus RTU protocol.

●It is not affected by the direction of the fluid and can be accurately measured in both directions.

●Adopting advanced low-frequency square wave excitation, zero point stability, strong anti-interference ability, and reliable operation.

●The orientation of the header/display interface can be adjusted for easy reading.

●Built in bilingual Chinese and English, allowing for free switching.

1.5. Product Technical Standards

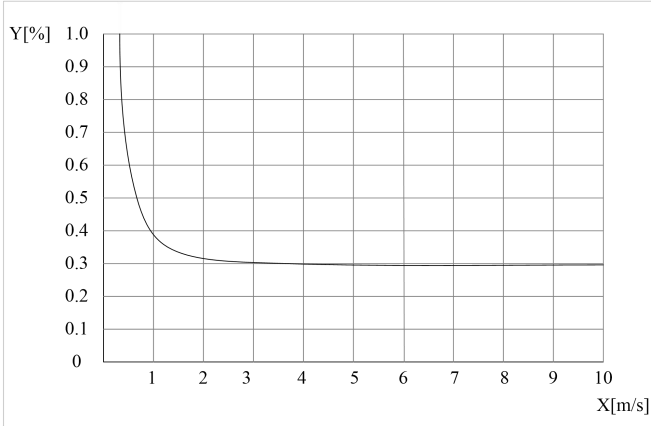
This product conforms to the following reference standards:JB/T 9248-2015 Electromagnetic Flowmeter, Q/330114 HZMY 001 Electromagnetic Flowmeter.

Chapter 2 Technical Parameters

Table 1 Technical parameters

Input			
Measured variable	Direct measured variables ： Flow velocity Calculated measured variables ： Volume flow, mass flow.		
Velocity of flow	Typically Velocity of flow：0.5m/s~5m/s		
Flow range	See Table 2		
Nominal diameter	DN15~DN1000		
Range ratio	1:10		
Output			
Current output	Function	Flow Rate, Volumetric Flow, or Mass Flow (when the density of the measured medium remains constant)	
	Scope	Scope	(4~20)mA
		Max	20mA
		Min	4mA
	Internal Voltage	24VDC	
	Loading	≤750Ω	
Pulse output	Function	Set up Pulse and frequency output	
	Pulse output	Basis	Output Pulse Width: 0.1 ms ~ 2000 ms (below maximum duty cycle; max duty cycle: 1:1) $F_{max} \leq 5000$ cp/s
		Pulse coefficient	0.001~100000/单位
	Passive Output	External Voltage (U_{ext}): ≤ 30 VDC	

	Active Output	Internal Output Voltage (U_{int}): ≤ 24 VDC
		Output Current (I): ≤ 4.52 mA
Communication Output	Interface: RS485 Protocol: MODBUS-RTU	
Relay Output (optional for remote type)	2 SPST Outputs, rated at 250 VAC, 3 A	
Power supply		
Supply voltage	AC：100VAC~240VAC，50/60Hz； DC：20VDC~28VDC	
Power consumption	≤15W	
Wiring Terminals	Screw-type wiring terminals	
Electrical Interface	M20*1.5Cable gland	
Signal Cable	Applicable to remote type only, standard length 10 m; other lengths customizable.	
Performance characteristics		
Reference operating conditions	Medium: water Temperature: 20℃ Pressure: 0.1MPa Stallation requirements: Inlet run≥10DN, Outlet run≥5DN	
Accuracy	Measurement value±0.5%(Flow velocity 0.5m/s~5m/s)	
Repetitiveness	0.16%	

Flow Rate Characteristics Curve	 ①X[m/s]：Velocity of flow ②Y[%]：Actual measured value deviation（mV）
Process	
Medium temperature range	Chloroprene rubber (CR)：-10℃~70℃ Polyurethane rubber (UR)：-10℃~60℃ PTFE/FEP：-10℃~120℃ PFA：-10℃~120℃
Pressure rating (High pressure can be customized)	DN15~DN250：PN<1.6MPa DN300~DN1000：PN<1.0MPa Note：(If there are differences in the selection of individual specifications, the label shall prevail, and high-voltage can be customized)
Conductivity	≥50μS/cm
Burial Capability	< 5 m (applicable only to remote sensor with IP68 protection)
Depth	< 3 m (applicable only to remote sensor with IP68 protection)
Environment	

Ambient temperature	Integral Type	-10℃~55℃
	Remote Type	Transmitter：-20℃~55℃ Sensor：-10℃~55℃
Storage temperature	-20℃~55℃	
Ingress protection	Integral Type	IP65
	Remote Type	Transmitter：IP65 Sensor：IP68

Table 2 Flow Characteristic Parameters

Nominal diameter	Min value (m³/h)	Max value (m³/h)
DN10	0.14	1.4
DN15	0.32	3.2
DN20	0.56	5.6
DN25	0.88	8.8
DN32	1.4	14
DN40	2.3	23
DN50	3.5	35
DN65	6	60
DN80	9	90
DN100	14	140
DN125	22	220
DN150	32	320
DN200	56	560
DN250	88	880
DN300	127	1270
DN350	173	1730
DN400	226	2260
DN450	286	2860
DN500	353	3530
DN600	509	5090
DN700	693	6930
DN800	905	9050
DN900	1150	11500
DN1000	1410	14100

Chapter 3 Structure and Dimensions

3.1. Structure

The electromagnetic flowmeter mainly consists of two parts: the sensor and the transmitter.In an integrated electromagnetic flowmeter, the sensor and transmitter are combined into a single unit.In a remote (split-type) electromagnetic flowmeter, the sensor and transmitter are installed separately and connected via signal cables.

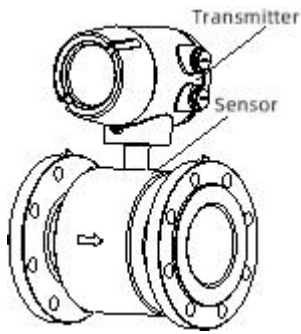


Figure 2 Structural Diagram of Integrated Electromagnetic Flowmeter

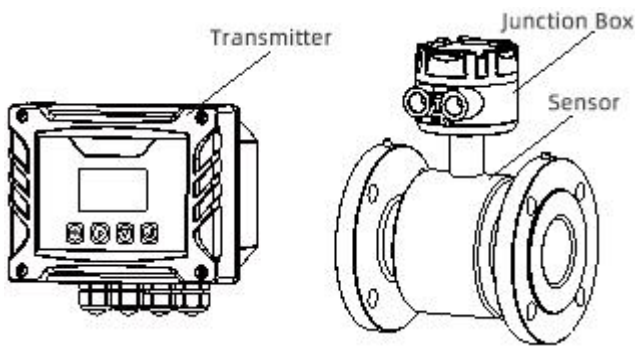
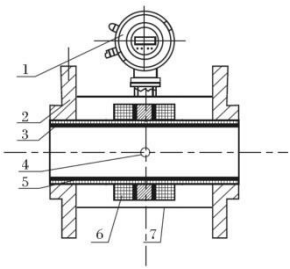


Figure 3 Structural Diagram of Remote Electromagnetic Flowmeter

The electromagnetic flowmeter is mainly consisted of the following parts, see Figure 4.



1-Converter; 2-Flange;

3-Insulation lining; 4-Electrode;

5-Measuring tube; 6-Excitation coil;

7-Casing

Figure 4

The electromagnetic flowmeter mainly consists of a sensor and a converter. The sensor includes a flange, a lining, an electrode, a measuring tube, an excitation coil, and a sensor casing, etc; the converter includes an internal circuit board and a converter casing.

(1) Converter: Provide stable excitation current for the sensor, meanwhile amplify the induced electromotive force obtained by the sensor and convert it to standard electrical signals or frequency signals; at the same time, it displays real-time flow and parameters for displaying, controlling and adjusting thereof.

(2) Flange: for connecting process piping.

(3) Lining: Refer to a complete layer of electrically insulating corrosion resistant material located at the inner side of measuring tube and flange sealing surface.

(4) Electrode: A pair of electrodes is installed on the wall of the measuring tube which is perpendicular to the magnetic line to detect the flow signal.

The material of electrode can be selected according to the corrosion performance of the measured medium. It is also equipped with 1-2 grounding electrodes for grounding and anti-interference of flow signal measurement.

(5) Measuring tube: The measured medium flows through the measuring tube. It is made by welding non-magnetic stainless steel and flange, and the inner side is equipped with insulation lining.

(6) Excitation coil: A group of coils is arranged on the upper and lower side of external side of the measuring tube respectively to generate a working magnetic field.

(7) Casing: Protect and seal the meter.

3.2. Product Dimensions

3.2.1 Dimensions of Integrated Converter

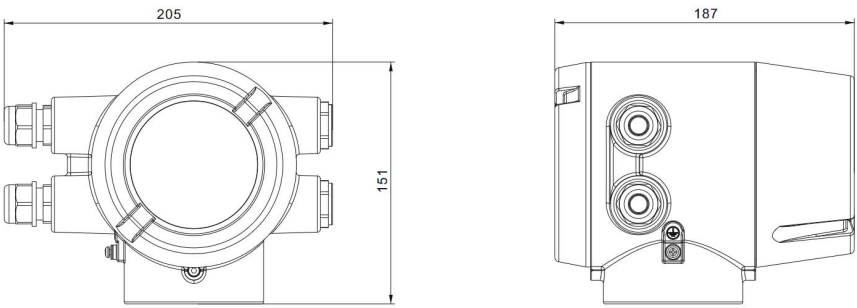


Figure 5 Converter Dimension Diagram (Unit: mm)

3.2.2 Dimensions of Remote Converter

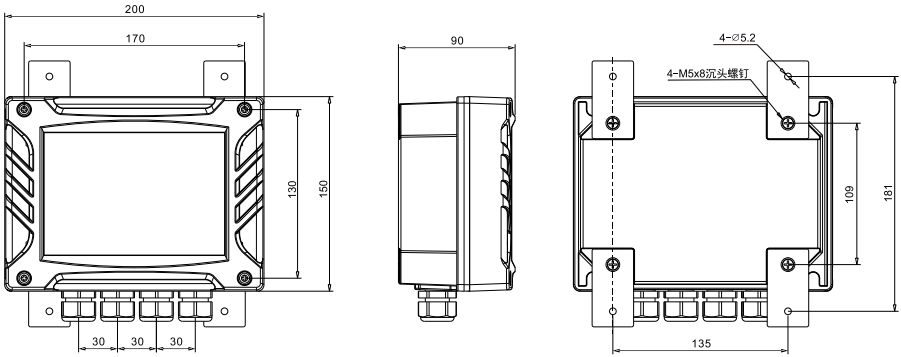


Figure 6 Remote Converter Outline Dimensions (Unit: mm)

3.2.3 Sensor Dimensions

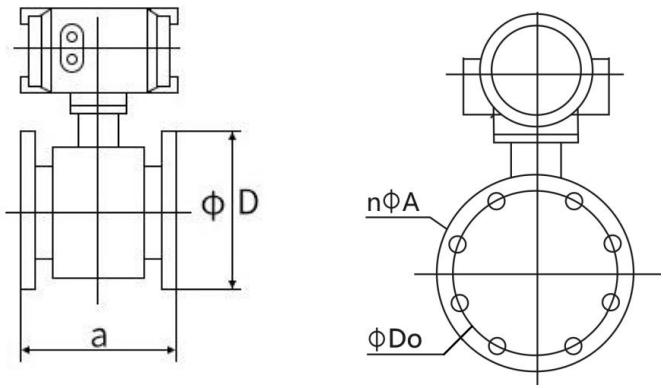


Figure 7 Sensor Structural Diagram

Table 3 Sensor Dimensions

DN	a	D	Do	n*A	Pressure resistance
10	200	90	60	4*14	1.6MPa
15	200	95	65	4*14	1.6MPa
20	200	105	75	4*14	1.6MPa
25	200	115	85	4*14	1.6MPa
32	200	135	100	4*18	1.6MPa
40	200	145	110	4*18	1.6MPa
50	200	160	125	4*18	1.6MPa
65	200	180	145	4*18	1.6MPa
80	200	195	160	8*18	1.6MPa
100	250	215	180	8*18	1.6MPa
125	250	245	210	8*18	1.6MPa
150	300	280	240	8*23	1.6MPa
200	350	335	295	12*23	1.6MPa
250	450	405	355	12*25	1.6MPa
300	500	440	400	12*23	1.0MPa
350	550	500	460	16*23	1.0MPa
400	600	565	515	16*25	1.0MPa
450	600	615	565	20*25	1.0MPa
500	600	670	620	20*25	1.0MPa
600	600	780	725	20*30	1.0MPa
700	700	895	840	24*30	1.0MPa
800	800	1015	950	24*33	1.0MPa
900	900	1115	1050	28*33	1.0MPa
1000	1000	1230	1160	28*36	1.0MPa

3.2.4 Process Connection

Flange: In line with JB/T 81-2015 standard carbon steel (Optional stainless steel flanges), other standard flange can be customized.

Clamp: In line with ISO 2852 clamp standard, DN50 and above need to be customized through negotiation.

3.3. Materials

Integrated converter housing: standard die-cast aluminum

Remote converter housing:ABS+standard die-cast aluminum

Sensor housing: Carbon steel (optional stainless steel)

Lining: CR, UR, PTFE (F4), FEP (F46), and PTFE (PFA)

Sensor: Optional stainless steel 316L, Hastelloy (HB and HC), titanium, tantalum, platinum iridium alloy.

Chapter 4 Electrical Connection

4.1. Integrated Wiring Terminals

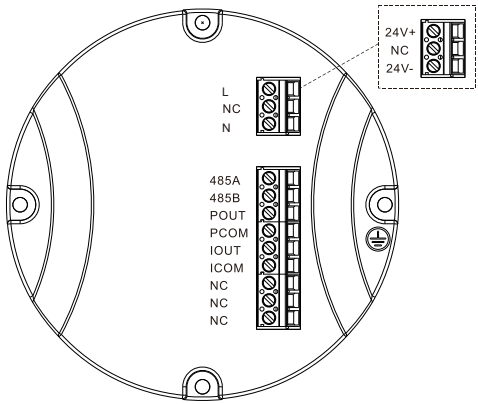


Figure 8 Integrated Terminal Block Diagram

Table 4 Terminal Definitions for Integrated Type

Terminal	Description
L, N	220V AC power supply
24V+, 24V-	24V DC power supply
TX+, TX-	RS485 serial communication
IOUT, ICOM	(4~20)mA output
POUT, PCOM	Pulse output
⏚	Converter instrument protection grounding

4.2. Remote Wiring Terminals

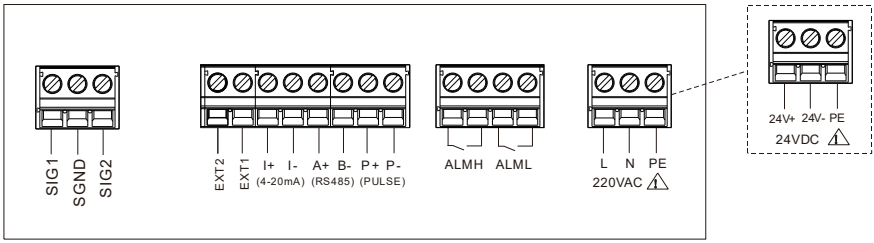


Figure 9 Remote Terminal Block Diagram

Table 5 Wiring Terminal Definitions for Remote Type

Terminal	Description
SIG1、SIG2、SGND	Electrode Signal
EXT1、EXT2	Excitation Signal
I+、I-	(4~20)mA output
A+、B-	RS485 serial communication
P+、P-	Pulse output
ALMH、ALML	Relay Output (Optional Function)
L，N	220V AC power supply
24V+、24V-	24V DC power supply
PE	Power Grounding

4.3. Output Description

Current Output

①IOUT, ICOM: (4~20) mA output （IOUT connects to the positive terminal of the current input; ICOM connects to the negative terminal.）

②Active mode: Load RL ≤ 750 Ω; I_{max} ≤ 24.5 mA.

③The output current is proportional to the flow percentage.

Communication Output

①485A, 485B: RS485 serial communication output.

②Protocol: Modbus RTU.

Pulse Output

①Corresponding terminals: POUT, PCOM.

②Active mode: High level 24 V, drive current 5 mA.

③Electrical isolation: Opto-isolated; isolation voltage > 1000 VDC.

④Scaling: Each output pulse corresponds to a configurable volume of flow.

– Pulse width: 0.1 ms ~ 2000 ms (must be lower than the max duty cycle, max duty cycle 1:1);

– Max frequency: F_{max} ≤ 5000 cps.

⑤Wiring Diagram:

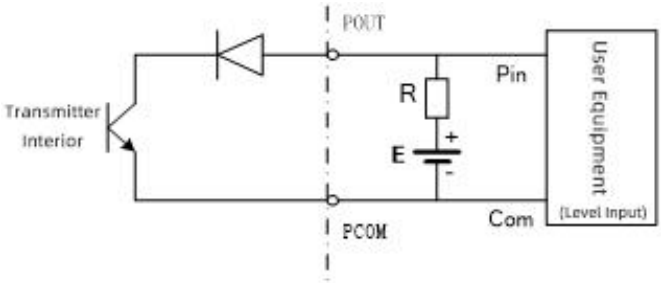


Figure 10

Note: Pulse output is an open-collector (OC) output and requires external power supply.Most counters come with a pull-up resistor and can be directly connected.

– Recommended pull-up resistor R: 2kΩ, 0.5 W.

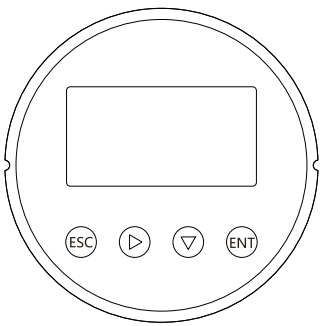
– Recommended power supply E: 24 VDC.

Chapter 5 Operation Modes

5.1. Display and Operation Unit

The integrated electromagnetic flowmeter features a display and operation unit (four mechanical buttons) located beneath the front cover of the transmitter. The measured values can be read through the transparent housing cover. To operate the instrument, open the front cover of the transmitter.The remote electromagnetic flowmeter has its display and operation unit (four touch keys) located on the front panel of the transmitter and can be operated directly.

Integrated Type:



Remote Type:

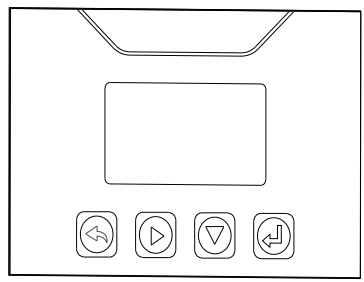


Figure 11 Electromagnetic Flowmeter Display and Operation Unit

5.2. Display Screen

Table 6 Display Screen

Display Type	Monochrome LCD, 128 × 64 pixels
Display Functions	Multiple measurement value interfaces (including measurement, status, alarm status, etc.)
Languages	Chinese and English
Units	Selectable via configuration menu

5.3. Operation Unit

The operation unit consists of four mechanical buttons, with their functions defined as shown in the table below:

Table 7 Button Definitions

Symbol	Measurement Mode	Menu Mode	Edit Mode
ESC	View system alarms	Return to previous level	Return to previous level
▷	/	Scroll through menu	Scroll through digits
▽	View cumulative data	Modify menu item	Modify data
ENT	Enter menu mode	Enter next level	Confirm modification

5.4. Interface Description

In the main interface, the following information is displayed in fixed positions:Current flow rate, Flow percentage of full scale, Alarm messages, Status bar.

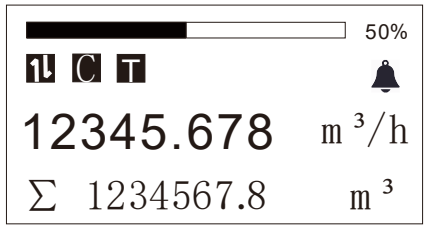


Figure 12 Main Interface of Flowmeter

In the main interface, press the designated button (ENT) to enter the user password screen.

Figure 13 User Password Screen

Different passwords grant different menu access permissions.

The Quick Configuration Password is used to modify quick-level parameters:

Flow direction, flow range, flow unit, totalizer reset, communication address, and language.

The User Configuration Password is used to modify user-level parameters:

Flow settings, output settings (pulse output, communication output, and analog output), alarm settings, fault current, empty pipe detection, sensor settings, measurement mode, and system settings.

Chapter 6 Warranty and After-sales Service

Our company promises to customers that if there are any product quality problems during the warranty period, we will provide unconditional three guarantee services for products with quality problems, namely free repair, replacement or return. All non customized products are guaranteed to be returned or exchanged within 7 days (excluding damaged products), while customized products are subject to the warranty agreed upon in the contract.
Disclaimer

During the warranty period, product malfunctions caused by the following reasons are not within the scope of the three guarantee service:

(1) Improper use by the customer resulted in product malfunction.

(2) The customer's self disassembly, repair, and modification of the product resulted in product malfunction.

Appendix A Electrode Selection and Specification

Table 8 Corrosion Resistance of Electrode Material (Only for Reference)

Material	Corrosion Resistance
Molybdenum-containing stainless steel (316L)	Applicable: domestic water, industrial water, sewage, weak acid-base salt solutions, normal temperature concentrated nitric acid. Not applicable: hydrofluoric acid, hydrochloric acid, chlorine, bromine, iodine and other media.
Hastelloy B	Applicable: non-oxidizing acids, such as hydrochloric acid and hydrofluoric acid of certain concentration, alkaline solutions with a concentration of no less than 70% sodium hydroxide. Not applicable: nitric acid and other oxidizing acids.
Hastelloy C	Applicable: oxidizing acids, such as nitric acid, mixed acid, or sulfuric acid mixed corrosive media, corrosive environments with oxidizing salts or other oxidizing agents such as hypochlorite solution above room temperature, seawater. Not applicable: reducing acids such as hydrochloric acid and chlorides.
Ti	Applicable: chloride, hypochlorite, seawater, oxidizing acid. Not applicable: reducing acids such as hydrochloric acid, sulfuric acid, etc.
Ta	Applicable: most acids, such as concentrated hydrochloric acid, nitric acid and sulfuric acid, including hydrochloric acid with boiling point, nitric acid and sulfuric acid below 175℃. Not applicable: alkalis, hydrofluoric acid, sulfur trioxide.
Pt	Applicable: various acids (excluding aqua regia), alkalis and salts.

Notes: Due to a wide variety of media, their corrosive substance is affected by complex factors such as temperature, concentration and velocity.

So this table is only for reference. Users may make their own choices based on actual situation. You may refer to corrosion prevention manual for general media. But for media with complex compositions like mixed acid, you may need to conduct corrosion tests for materials to be selected.