



上海曹欣仪器仪表有限公司

SHANGHAI CAO XIN INSTRUMENTATION CO.,LTD.



您的满意，我们的追求！

电磁流量计 Magnetic Flowmeter

一般规格说明 General Specifications

ETFM 系列电磁流量计具有优良的结构设计. 双腔结构使电子系统免于周围环境干扰.它采用低频方波励磁,有良好的输出稳定性.它的励磁方式和多种衬里,决定了它有广泛的应用范围.

ETFM is the advanced engineering designed magnetic flowmeter, it has a dual cavity housing providing ease of wiring while isolating the electronics from the environment.ETFM continues the use of low frequency excitation,which provides noise free output. EFTM excitation method and multiform lining allow this magnetic flowmeter to be applied to an even greater range of applications.

◆特点 FEATURES

▲ 快速响应,并有好的稳定性

Fast response and high stability.

▲ 高精度,特别标定可达 0.2%

High Accuracy,,0.2% for flowrate

▲ 双腔结构把电气部分于接线端隔开

Dual cavity housing to separate electronics part from wiring part.

▲ 超低 EMI 开关电源,适用电源电压范围宽.

AC power supply common use (85~265vac).

▲ 高清晰度背光,高温型 LCD 显示,便于操作

High visible backlit LCD for easy operation.

▲ 具有 RS485, RS232, HART, PROFIBUS, MODBUS 等总线数据通讯输出.

Communication:e.g.RS485,RS232C,HART,Profibus,

MODBUS etc.

▲ 能进行双向流量测量,双向总量累计

BI-direction measuring and totalizing.

◆ 性能指标 STANDARD SPECIFICATIONS

转换器 Converter

▲ 流量测量范围 Measuring Range

与传感器配套,流量测量范围上限值的流速可达 0.3m/s~15m/s 范围内选定,下限值的流速可为上限值的 1%.

The velocity range is 0.3m/s to 15m/s.The minimum measurable speed can be one percent(1%) of the full range .

▲ 电流输出 Analog Output

电流输出信号:全隔离 0~10mA/4~20mA

负载电阻:0~10mA,0~1.5k;4~20mA,0~750

基本误差:在上述测量基本误差基础上加減

10uA

Current

output:fully-isolated

0~10mA/4~20mA

Load resitance:0 to 1.5k at 0~10mA;0 to 750 at 4~20mA

Base error:add minus 10uA on top of the measurement error

▲ 频率输出 Frequency Output

输出频率上限 1~5000hz 内设定.频率输出为带光电隔离的晶体管集电极开路输出.外接电源不大于 35V,导通时集电极最大电流为 250mA.

Frequency output is proportional to the flow percentage of the full range. It Provides fully



isolated transistor open collector frequency output ranged from 1 to 5000hz,The external Dc power supply should not exceed 35V and maximum collector current is 250mA.

▲ 脉冲输出 Pulse Output

输出脉冲上限可达 5000cp/s.脉冲当量可设定.如果脉冲频率小于 30hz,脉冲输出的宽度固定为 33ms,频率高于 30hz 时则自动转化为方波.脉冲输出为带光电隔离的晶体管集电极开路输出.外接电源不大于 35V,导通时集电极最大电流为 250mA.

The converter can output up to 5000cp/s pulse series,which is dedicated to external totalization .Pulse factor is defined as pulse count per unit volume or mass.It can be set.Pulse width is selectable from 16ms,33ms,66mm,and so on.Photo-coupler isolated transistor open collectr circuit is used for pulse output. The external Dc power supply should not exceed 35V and maximum collector current is 250mA.

▲ 流向指示/量程指示输出 Showing Flow Direction

& Range

本流量计可测正反方向的流体流动流量,并可以判断出流体流动的方向.规定显示正向流量时输出 0V 低电平,反向流体流动输出+12V 的高电平。

The converter is capable of measuring both forward and reverse flow and recognizing its direction.The converter output 0V low level for forward flow,while +12V high level for reverse flow.

▲ 报警输出 Alarm Output:

两路带光电隔离的晶体管集电极开路报警输出。外接电源不大于 35V,导通时集电极最大电流为 250mA。报警状态: 流量上限报警, 下限报警。

Two channels of photo-coupler isolated open collector circuit are used for alarm signal output.There are two alarm outputs:high limit alarm and low limit alarm.The external DC power supply should not exceed 35V and maximum collector current is 250mA.

▲ 通信 Communication:

可 选
RS232C,RS485,HART,PROFIBUS,MODBUS 通信
可选。可选防雷击保护

The
RS485,RS232C,HART,PROFIBUS,MODBUS
communication interface are embedded in the
converter.Surge absorber is optional to protect the
interface and converter.

▲ 阻尼时间 Damping Constant:

在 0.2~100s 分档可选
Damping time optional from 0.2 to 100s.

▲ 接点输入 Input Contact

外部接点 on 或 off 信号能够远程控制转换器内部计数器累计流量的开始和停止。也能够起到远程清零计数器。

External contact ON or OFF signal can be used to remotely control the start/stop or reset of internal counter.

▲ 显示功能 Display Function:

能显示瞬时流量, 流量百分比和两个方向的流量积算值

Flow rate can be displayed either in engineering units or in percent of span.Totalized volume in any engineering unit can be displayed by setting a totalizing factor.

▲ 自诊断功能 Self Diagnostics Function:

转换器故障, 测量管道故障等能知道并显示出来

Converter failure,flow tube failure,erroneous setting,etc. can be diagnosed and displayed.

▲ 断电保护数据 Data Security During Power Failure:

数据储存在 EEPROM 中, 无须备用电池
Data storage by EEPROM-no back-up battery required.

▲ 电气接口 Electrical Connection:

M20*1.5 内螺纹
ISO M20*1.5 FEMALE

▲ 转换器壳体材料 Case Material:

铝合金
Aluminum alloy.

▲ 涂层 Coating:

聚氨酯防腐涂层。
Polyurethane corrosion-resistant coating.

▲ 防护等级 Protection:

IP65,,IP67,IP68

▲ 传感器材料 Sensor Material:

Housing:Stainless steel(SUS304),Carbon
steel(SPCC)
Flange:Stainless steel(SUS304),Carbon
steel(SS400)
Pipe:Stainless steel(SUS304)

▲ 接触介质材料 Wetted Part Material:

内衬: 橡胶, PTFE,PFA
电极: 316L, 哈 C 合金, 钛, 钽
接地环/接地电极: 316L, 哈 C 合金, 钛, 钽
Lining : Rubber,PTFE or PFA
Electrode:Stainless-steel(SUS316),HastelloyC,T
itanium,Tantalum,PlatinumEarth Ring/Earth
Electrode:Stainless steel(SUS316),Hastelloy
C,Titanium,Tantalum,Platinum

▲ 正常工作条件 Normal Operating Conditions

环境温度 Ambient temperature:-20 to 60
环境湿度 Ambient Humidity: 5 to 95%RH
电源电压 Power Supply Voltage:85 to 265VAC
电源频率 Power Supply Frequency:47 to 63hz
流体电导率 Fluid Conductivity: 20uS/cm at
least.

◆ 型号系列 Model Code

型号 Model	后缀 Suffix Code			说明 Description	使用内衬 Use Lining					
					R	P	A			
ETFM-10				DN10	▲	▲	▲			
ETFM-15				DN15	▲	▲	▲			
ETFM-20				DN20	▲	▲	▲			
ETFM-25				DN25	▲	▲	▲			
ETFM-32				DN32	▲	▲	▲			
ETFM-40				DN40	▲	▲	▲			
ETFM-50				DN50	▲	▲	▲			
ETFM-65				DN65	▲	▲	▲			
ETFM-80				DN80	▲	▲	▲			
ETFM-100				DN100	▲	▲	×			
ETFM-125				DN125	▲	▲	×			
ETFM-150				DN150	▲	▲	×			
ETFM-200				DN200	▲	▲	×			
ETFM-250				DN250	▲	▲	×			
ETFM-300				DN300	▲	▲	×			
ETFM-350				DN350	▲	▲	×			
ETFM-400				DN400	▲	▲	×			
ETFM-450				DN450	▲	×	×			
ETFM-500				DN500	▲	×	×			
ETFM-600				DN600	▲	×	×			
ETFM-700				DN700	▲	×	×			
ETFM-800				DN800	▲	×	×			
ETFM-900				DN900	▲	×	×			
ETFM-1000				DN1000	▲	×	×			
ETFM-1200				DN1200	▲	×	×			
ETFM-1400				DN1400	▲	×	×			
ETFM-1600				DN1600	▲	×	×			
ETFM-1800				DN1800	▲	×	×			
ETFM-2000				DN2000	▲	×	×			
ETFM-2200				DN2200	▲	×	×			
型式 Type	-AA				一体型 Integral Type	▲	▲	▲		
	-NN				分离型 Remote Type	▲	▲	▲		
内衬 Lining	-R				Rubber	▲				
	-P				PTFE		▲			
	-A				PFA			▲		
连接 Connection	-W				夹持型 Wafer	▲	▲	▲		
	-D1				1.0Mpa 法兰 Flange	▲	▲	▲		
	-D2				1.6Mpa 法兰 Flange	▲	▲	▲		
	-D3				2.5Mpa 法兰 Flange	▲	▲	▲		
	-D4				4.0Mpa 法兰 Flange	▲	▲	▲		
电极材料 Electrode Material	-L				SUS316	▲	▲	▲		
	-P				铂 Platinum	▲	▲	▲		
	-H				哈 C Hastelloy C	▲	▲	▲		
	-T				钽 Tantalum	▲	▲	▲		
	-V				钛 Titanium	▲	▲	▲		
接地环/接地电极材料 Earth Ring/Earth Electrode Material	S				SUS316L	▲	▲	▲		
	P				铂 Platinum	▲	▲	▲		
	H				哈 C Hastelloy C	▲	▲	▲		
	T				钽 Tantalum	▲	▲	▲		
	V				钛 Titanium	▲	▲	▲		
防爆 Exproof				/EX		防爆等级 Ex d IIB T4		▲	▲	▲
特殊选项 Optional Code					/□					

电磁流量计的选型最好由熟悉现场工艺条件的技术人员进行按选型资料中可测流量范围表选择合适的口径材料选择最好由熟悉现场工艺条件的最终用户确定

The selection of the electromagnetic flowmeter is preferably performed by a technician who is familiar with on-site technological conditions, the technician shall select proper aperture material according to the measurable range table in the type selection material, and the selection is preferably confirmed by an end user who is familiar with the on-site technological conditions.

◆ 选择流量计类型 Selecting flowmeter type

▲ 一体型和分离型 Integral type and split type

一体型和分离型各有优点，选择的基本原则如下：分离型一般用于现场维护及调试时读数不方便或经常浸泡在水中和其它功能的场合。它也用于较恶劣的应用场合，如：高温流体、有震动源处及易爆环境中。大多数场合一体型和分离型都能满足使用要求。

Both integral type and split type have their own advantages, and basic principals for selection are as follows: the split type is usually used in situations inconvenient for one-site maintenance and numerical reading when debugging is difficult or the flowmeter is often immersed in water and with other functions, It is also used in poor application situations, such as high temperature fluid, a position with vibration source and explosive environment. In most cases, both the integral type and the split type can meet use requirements.

▲ 一般型和防爆型 General type and explosion-proof type

用户应根据流量计使用环境确定选择一般型还是防爆型。

Users shall confirm to select a general type or an explosion-proof type according to application environment of the flowmeter.

▲ 传感器的口径与连接的工艺管道口径 The diameter of the sensor and that of technological pipeline.

一般情况，考虑安装方便，不要选择异径管。但前提是流量计管内的使用流速应在 0.3m/s~10m/s 范围内。这种选择常适用于新设计的工程，在选择流速时既要考虑现在的工作情况，又要考虑将来设备满负荷运转时的情况。流量、流速与口径三者关系可查阅曲线图。但有时也选择传感器的口径与连接的工艺管道口径不相同。如：

1、管道内的流速偏低，工艺流量又能较稳定，为满足仪表对流量范围的要求，在流量计处局部提高流速，选择传感器小于工艺管道口径，在传感器前后加接异径管。

2、对于大口径电磁流量计，口径越大，价格越高，对管道内流速偏低，工艺参数稳定的情况，可选用口径较小的流量计，这不仅使流量计运行在较好的工作状态下，同时降低投资成本。

Generally, It is suggested not to select reducing pipe for the sake of convenient installation, provided that the use flow in the flowmeter pipe shall be within the range of 0.3m/s~10m/s. This kind of selection is usually applicable to a newly-designed project for which current work situation is not only considered when choosing a flow speed, but also a situation of running at full load of the device in the future shall also be considered. For the relationships among the flux, velocity and diameter, see curve graph. However, sometimes we also choose a sensor with a different diameter with the connected technological pipeline diameter, for example:

1. The flow speed in the pipeline is low and the process flow is stable, in order to meet the demand of instrument to flow range, to improve flow speed at local of the flowmeter, select a sensor with smaller diameter than the diameter of the technological pipeline, and additionally connect a reducing pipe at front and rear part of the sensor.
2. In terms of large diameter electromagnetic flowmeter, the diameter is larger, the price is higher, as for the

situations with low flow speed in the pipeline and stable technological parameter, small diameter flowmeter maybe chosen, this not only runs the flowmeter under good working state, but also reduces investment cost at the same time.

◆ 电极材料性能(仅供参考) Properties of electrode material(for reference only)

电极材料 Electrode material	测量材料性能(仅供参考) Properties of measured material(for reference only)	耐腐蚀性能 Corrosion resistance
不锈钢 SUS316L Stainless steel SUS316L	生活及工业用水和污水 Domestic and industrial water and sewage	不能用于无机酸,有机酸,氯化物 Not for use in inorganic acid, organic acid, chloride
哈氏合金 C Hastelloy alloy C	海水,硫酸钠 Seawater, sodium sulfate	不适用于氯化物,硫酸,适用于摩擦性流体 Not suitable for chloride, sulfuric acid, suitable for frictional fluid
钽 Tantalum	盐酸,王水 Hydrochloric acid, aqua regia	几乎适用于所有的化学物质,但对氢氟酸,发烟硝酸尚有些问题 Almost suitable for all chemicals, but there are also some problems for hydrofluoric acid and fuming nitric acid
钛 Titanium	乙酸,氯化钠 Acetic acid, sodium chloride	适用于氯化物,硫化物,碱液,但不能用于盐酸,硫酸和硝酸 Suitable for sodium chloride, sulfide, alkali liquor, but not suitable for hydrochloric acid, sulfuric acid and nitric acid

■ 接地环材料的选择 Selection of grounding ring material

▲ 接地环材料可以于电极材料相同,一般可选与管道材料耐腐蚀性相同的材料。

Grounding ring material can be the same as the electrode material, generally material with the same corrosion resistance as the pipeline material is selectable.

■ 衬里材料的选择 Selection of lining material

▲ 衬里材料应根据被测液体种类和工作温度来选择。PFA 是一种氟化塑料,具有良好的耐强酸,强碱的腐蚀性,同时具有良好的耐高温性,高温下不变形,不降低绝缘阻抗。99.9%高纯度氧化铝用于制作陶瓷衬里,它使得仪表能够高精度测量流量,因为与传统的高分子材料相比,陶瓷不会产生高温,高压变形,并且具有良好的耐磨性。

Lining material should be selected according to the type and working temperature of measured fluid. PFA is a fluorinated plastic, has good corrosion resistance to strong acid, strong alkali, at the same time has good high temperature resistance, does not deform at high temperature. Insulation resistance is not reduced. 99.9% high purity alumina is used for making ceramic lining so that the instrument can measure the flow with high precision. In comparison with traditional high polymer material, ceramics can not create high temperature, high pressure deformation, and have good wear resistance.

◆电磁流量计衬里主要性能和适用范围

衬里材料		主要性能	衬里适用范围	可测介质举例	注意事项
特氟隆	PTFE	1. 化学稳定性能优良,但氯元素和熔融状态的金属钠对其制品有一定腐蚀性. 2. 能耐盐酸,硫酸,和王水,并且有机溶剂对它几乎不起作用 3. 耐磨性和粘接性能差 4. 电绝缘性能优异,但耐电晕性较差.	1. 流量计长期使用温度-10~+120. 2. 能用于测量大多数强酸,强碱,强氧化剂等强腐蚀性介质;但不适合用于KOH,硝酸,氢氟酸等. 3. 卫生类介质	1. 盐酸,硫酸,王水. 2. 其它多数强酸,强碱和氧化剂.	1. 不适用于KOH,硝酸,氢氟酸. 2. 一般不用于测量电解液,如:从电解槽流出的NaCl溶液. 3. 不适于带固体颗粒的介质
	FEP	1. 其化学稳定性,点绝缘性,润滑性,不粘性和不燃性于PTFE(F4)相仿,但FEP材料强度,耐老化性,耐温性能和低温柔性优于PTFE. 2. 与金属粘接性好,耐磨性好于PTFE. 3. 具有较好的抗撕裂性能.	1. 流量计长期使用温度-40~+80. 2. 能用于测量大多数强酸,强碱,强氧化剂等强腐蚀性介质;但不适合用于KOH,硝酸,氢氟酸等. 3. 卫生类介质.	1. 盐酸,硫酸,王水. 2. 其它多数强酸,强碱和氧化剂 3. 带少量细小颗粒的介质.	1. 不适用于KOH,硝酸,氢氟酸. 2. 一般不用于测量电解液,如:从电解槽流出的NaCl溶液.
	PFA	1. 其化学稳定性,点绝缘性,润滑性,不粘性和不燃性于FEP(F46)相仿,但PFA材料强度,耐老化性,耐温性能优于PTFE,FEP. 2. 与金属粘接性好,耐磨性好于PTFE,FEP. 3. 低烟,难燃,耐高温,高温机械强度比PTFE高2倍	1. 流量计长期使用温度-40~+160 2. 能用于测量大多数强酸,强碱,强氧化剂等强腐蚀性介质;但不适合用于KOH,硝酸,氢氟酸等. 3. 卫生类介质.	1. 盐酸,硫酸,王水. 2. 其它多数强酸,强碱和氧化剂. 3. 带少量细小颗粒的介质. 4. 啤酒,皂化液化气等.	1. 不适用于KOH,硝酸,氢氟酸. 2. 一般不用于测量泥浆,煤浆,矿浆.
聚氨酯橡胶		1. 有极好的耐磨性能,良好的耐油性能. 2. 强度高,耐撕裂性好,但耐酸,耐碱性能较差. 3. 耐热性不好,一般为60	1. 一般长期使用温度-10~+60. 2. 耐磨性好,适用于含固体颗粒的液体. 3. 不能用于测量含有机溶剂的水.	1. 中性强磨损的矿浆,煤浆,泥浆. 2. 生活用水,工业用水,污水,海水.	1. 液体温度范围0~40. 2. 一般不用于测量混有有机溶剂的介质.
氯丁橡胶		1. 有良好的弹性和抗撕裂性,具有一定耐油性. 2. 抗老化性较差,其脆性温度为-28. 3. 耐磨性能不如聚氨酯橡胶. 4. 耐一般性低浓度酸,碱,盐介质的腐蚀,不耐氧化性介质的腐蚀.	1. 长期使用温度-10~+80 2. 由于其中含有防老剂D,略有污染性. 3. 适用于一般低浓度酸,碱,盐介质及污水测量.	1. 一般水,污水, 2. 泥浆,矿浆.	1. 不能用于测量食品. 2. 不适用于测量强酸,强碱,强氧化性介质.

■ 防护等级的选择 selection of protection grade

▲ 按 GB4208-84,国际电工委员会 IEC 标准(IEC529-76)关于外壳防护等级为:

Degrees of protection provided by enclosure are as follows according to GB4208-84,International Electrotechnical Commission(IEC) standards(IEC529-76);

▲ IP65 为防喷水型,即可允许水龙头从任何方向对仪表喷水,喷水压力为 30KPa(0.3bar).出水量为 12.5 升/分,喷水离仪表距离 3 米.IP67 为防浸水型,即仪表可短时间全部浸入水中,试验时最高点应在水下至少 150cm,持续时间至少为 30 分钟.IP68 为潜水型,应能长期在水中工作,其浸入的最大深度由制造厂于用户协商.

IP65 is an anti-spray type,i.e.a water faucet is allowed to spray water to the instrument in any directio.The pressure of spray water is 30KPa(0.3bar).Water yield is 12.5 liters/minute.The distance between spray water and the instrument is 3m,IP67 is an anti-immersing type,i.e.theinstrument can be totally immersed in the water in a short time.The highest point is 150cm below the water during test.The duration time is 30minIP68 is a submerged type, which can work in the water for a long period. The maximum depth immersed is negotiated by manufacturers and users.

▲ 防护等级选用原则应根据以上要求和仪表实际工作条件选定.若仪表在地面以下的,经常受水淹的,宜选 IP68;若仪表安装在地面上,并且环境不潮湿,则选用 IP65.

The selection principles of protection grade are determined by the abovementioned requirements and actual working conditions of the instrument.If the instrument is installed underground and often immersed under water,it"s suggested to select IP68. If the instrument is installedabove the ground and the environment is not wet,choose IP65.

▲ 由于电磁流量计的感应信号电压很小,容易受噪声的影响.其准电位必须于被测液体相同.因此,传感器的基准电位(端电位),转换器和放大器的基准电位都与被测液体相同,而液体电位又应于地电位相同电磁流量计配有接地环,其作用是通过与液体接触,建立液体接地,同时保护内衬.仪表接地如下图所示:

Because the voltage of sensing signals of the electromagnetic flowmeter is small,it is easily affected by the noise.The reference potential must be the same as the measured fluid.So the reference potential(terminal potential)of the sensor,the reference potentials of coverter and amplifer are the same as the measured fluid.And the fluid potential should be the same as the ground potential.The electromagnetic flowmeter is equipped with a grounding ring ,which plays a role in establishment of fluid ground by contacting the fluid,at the same time, protecting the lining. The instrument ground is as shown below: