MagneW 3000 FLEX

Questions and Answers
(Q & A)
Transmitter MGG10 Model
Detector MGG 11/12 Model

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1. Q & A ABOUT PRINCIPLES

Question
1-1: On what principles does an electromagnetic flowmeter operate?

Answer

- The electromagnetic flowmeter operates on Faraday's law of electromagnetic induction.

Description

The law of electromagnetic induction discovered in 1831 by British scientist Michael Faraday states that electromotive force is induced in an object when it moves in a magnetic field. The electromagnetic flowmeter applies a magnetic field to the fluid to be measured by an excitation coil and picks up induced electromotive force by a pair of electrodes.

The electromotive force (E) is proportional to magnetic flux density (B), average flow velocity ($\bar{V}$) of fluid under measurement and detector diameter (d) and can be expressed by the following equation. This equation holds theoretically and is not an empirical equation.

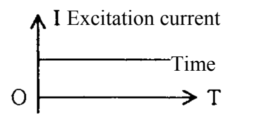
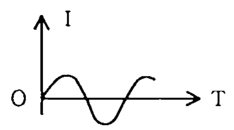
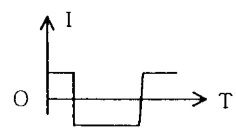
$$E = B \cdot d \cdot \bar{V}$$

Question
1-2: What types of excitation systems are available?

Answer

- There are (1) DC excitation, (2) AC excitation, (3) square wave excitation and other excitation systems. This flowmeter adopts the square wave excitation system.

Description

Type / Item	(1) DC excitation system	(2) AC excitation system	(3) Square wave excitation system
Excitation current and field	Intensity and direction of magnetic field are constant.	Intensity and direction of magnetic field change.	Intensity of magnetic field does not change but its direction changes cyclically.
			
Advantages	• Can respond to sharp flow velocity changes. • Can detect flow even in reverse direction.	• No affected by electrochemical noise. • Easy signal amplification. • Resistant against bubble noise as excitation frequency is high.	• Not affected by electromagnetic induction noise. • Easy signal amplification. • Zero point does not shift.
Disadvantages	• Signal amplification is difficult. • Influenced by electrochemical noise. • Zero-point shift is large.	• Affected by electromagnetic induction noise. • Zero-point shift is large.	• Susceptible to bubble noise in extreme cases.

Question
1-3: What is electrochemical noise?

Answer
- Electrochemical noise is an unwanted electrical signal that is induced due o nonuniform ion density distribution in fluid.

Description

When two electrodes made of the same metal are immersed in still water, a slight potential difference is induced between the two electrodes. This phenomenon is observed regardless of the material forming the electrodes or quality of water. However, the potential difference is not constant and varies from several tens of microvolts to several tens of millivolts. This potential difference, or asymmetric potentials, are said to be caused as ion density distributions of double electrical layers near the electrodes are not truly symmetrical between the pair of electrodes. In addition, these ion density distributions vary by time.

The AC excitation system or square wave excitation system is less affected by electrochemical noise since these systems adopt differential amplification and the direction of magnetic fields they induce constantly change.

Question
1-4: What is electromagnetic induction noise?

Answer
- When a conductor is placed in a magnetic field and its intensity is changed, a voltage is induced in the conductor. This voltage caused by electromagnetic induction is called “electromagnetic induction noise” when it interferes with the signal of interest.

Description

The AC excitation system uses commercial line power and hence excitation current changes constantly and so does the magnetic field. As a result, electromagnetic induction noise is induced in the loop formed by the electrodes, lead wires, and fluid. This noise is proportional to magnetic flux change (dB/dt) and is consequently 90 degrees out of phase from the flow rate signal that is proportional to magnetic flux intensity (B). Hence, this noise is called “quadrature phase noise.” With the AC excitation system, another electromagnetic induction noise is induced by eddy current produced in the measuring pipe or fluid by the changing magnetic field.

Question

1-5: What is the detector constant?

Answer

- The detector constant is a non-unit constant which depends on the detector of each electromagnetic flowmeter. Setting the constant in the transmitter allows the flow measurement to be correct.

Description

Each of the electromagnetic flowmeter detectors is calibrated at the factory before shipment.

This calibration is conducted by using actual fluid in order to find the detector constant of each electromagnetic flowmeter by eliminating the influence of parts machining inaccuracies and assembly errors.

The excitation current (mA) that is to be supplied from the transmitter to the coil of the detector is always 160 mA.

Question

1-6: Whey is this flowmeter free from zero shift?

Answer

- Zero shift is caused by stained electrodes and eddy current. The MagneW is not affected by eddy current and, even if its electrodes are stained, zero shift does not occur. Unlike this, other electromagnetic flowmeters that employ AC excitation are intrinsically affected by eddy current and have zero shift if their electrodes are stained.

Instrumentation Data IBI-5610-0030

Description

Eddy current..... Current in eddy form induced by electromagnetic induction in a conductor placed in a magnetic field that changes with time.

Zero-point instability of AC-excitation flowmeters

The zero point of the conventional AC-excitation electromagnetic flowmeter shifts primarily due to the following three causes:

1. If the electrodes are stained asymmetrically, the phases of the eddy currents change and components in phase with the flow signal are produced, thereby causing zero-point shift.
2. If conductive solids are contained in the flow, the phases of the eddy currents change, thereby causing zero-point shift.
3. If the electrodes are stained, the resistance between the electrodes and the ground changes, thereby causing zero-point shift (of a level of several percent to several tens percent).

Zero-point stability of MagneW

The AC-excitation system produces constantly changing magnetic flux. It is theoretically difficult to eliminate the zero-point shift described above.

MagneW units achieve high zero-point stability by employing the square wave excitation system as follows:

1. No zero-point shift caused by eddy current:

   Sampling is made when no eddy currents are produced and thus the zero point is not affected by eddy currents.

2. Very little zero-point shift caused by change in resistance between electrodes and ground:

   Flow signals are sampled to synchronize with even-number fraction of the line frequency so that common mode 50/60 Hz voltage has no influence. Common mode voltage due to leakage from the excitation circuit is small while the converter input impedance is large. Zero point shift due to stained electrodes is this negligibly small.

   For example, assuming a full scale signal voltage of 1 mV rms. and 1% contamination (α=0.01), the zero point shift for the two different types of excitation systems are as follows:

   ⇒ **AC excitation system**

   Approximately 1.4% F.S.

   ⇒ **Square wave excitation system**

   Approximately 0.01% F.S.

2. Q & A ABOUT CONSTRUCTION AND MATERIAL OF DETECTOR

Question

2-1: What types of Teflon are available?

Answer

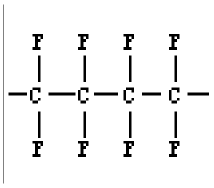
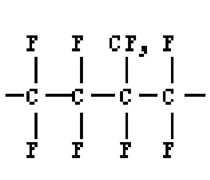
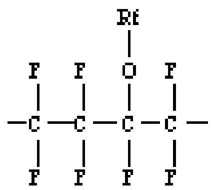
- For lining of electromagnetic flowmeters, TFE, FEP, PFA, etc. are generally used. This flowmeter adopts PFA.

Description

Teflon™ is a trademarked DuPont fluororesin. It is also used widely as a generic term for these resins, as in ICI's term "Fluon".

Fluororesins are synthetic resins containing fluorine and are very resistant to chemicals. They have excellent electrical and heat resistant characteristics, low surface friction and are highly nonadhesive.

The fluororesins used as lining materials are listed below.

	TFE (ethylene tetrafluoride resin)	FEP	PFA
Formal name	Tetra Fluoro Ethylene	Fluorinated Ethylene Propylene	Per Fluoro Alkoxy Resin
Molecular structure			 Rf: Fluoroalkyl radical
Features	Highest in heat resistance but less workable. Not available for fusion molding due to high melt viscosity.	Rather inferior to TFE in heat resistance but superior in workability. Low melt viscosity allows molding.	Workability equivalent to FEP and also suitable for mold lining. More heat resistant than FEP or nearly equal to TFE.
Remarks	Formally called polytetrafluoroethylene and sometimes called PTFE.		

Question

2-2: What is polyurethane rubber?

Answer

- It is a synthetic rubber with high wear resistance.

  It is not chemically resistant, however.

Description

Urethane rubber:

One of the synthetic rubbers. Formed by bridging raw material polymer having urethane bond -NHCOO- (namely polyurethane) by dissoamine acid or aromatic diamine. Longer glycol chain results in coarser network structure and hence in rubber elastomer that has a high degree of freedom, low hardness and small modulus of elasticity. Urethane rubber excels in wear resistance, oxidation resistance, aging resistance, oil resistance, but is rather inferior in heat resistance and is sensitive to hydrolysis by acid, alkaline, hot water, steam. Use as material for shoe soles, tires, belts and packing material.

Question

2-3: Why does an electromagnetic flowmeter require lining?

Answer

- When the flowmeter detects electromotive force induced in the detector by its electrodes, it must hold the electromotive force in. For this purpose, the inside wall of the detector must be insulated.

Question

2-4: How thick are the linings?

Answer

- Thickness

Nominal diameter	PFA	Polyurethane rubber	Chloroprene rubber
2.5	2.5	-	-
5	5	-	-
10	10	-	-
15	15	-	-
25	24	24	-
40	38.5	38.5	-
50	50	50	-
65	63	63	-
80	75	75	-
100	100	100	-
125	123	123	-
150	147	147	-
200	195	195	-
250	245	-	245
300	295	-	295
350	345	-	345
400	395	-	395
500	495	-	495
600	595	-	595

Question

2-4: *Continued*

Answer

- Thickness

Nominal diameter	PFA	Polyurethane rubber	Chloroprene rubber
2.5	1.75	-	-
5 - 15	3.00	-	-
25	3.00	3.00	-
40	3.15	3.15	-
50	3.25	3.25	-
65	3.15	3.15	-
80	3.05	3.05	-
100	3.15	3.15	
125	3.40	3.40	-
150	4.10	4.10	-
200	4.15	4.15	-
250	4.7	-	4.7
300	5.25	-	5.25
350	5	-	5
400	5	-	5
500	5	-	5
600	5	-	5

Question
2-5: What are the protruding type electrodes?

Answer

- Theses electrodes are longer and protrude more into the measured fluid than the regular ones do, for measurements of heavily adhesive or contaminated fluids. Refer to the electrode materials shown in the prior list.

Description

These flowmeters are in principle highly resistant contamination and free from zero-point shift. If the electrode surface is completely covered with insulating material, however, measurement cannot be made. It has been confirmed that one effective measure against this is to make the electrodes longer than normal so that they may protrude into the electromagnetic flowmeter tube and be cleaned by flowing fluid.

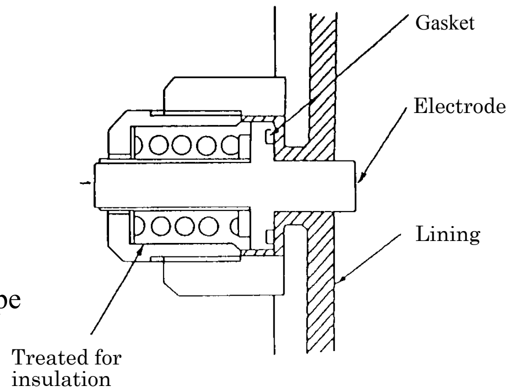
Competing products have problems of electrode sealing performance and detector compatibility. In this respect, the protruding electrodes may be claimed as an important feature of this flowmeter. If users experience unstable zero point and frequent maintenance requirements with competitors' products, this flowmeter, with its protruding electrodes, will effectively solve such problems.

⇒ Applicable fluids

- Sewage
- Solutions rich in oil and water
- Liquids containing latex
- Lime slurries

⇒ Electrode specifications

- SUS316L cylindrical protruding type



Question
2-6: What is a ground ring?

Answer

- It is a kind of electrode to ground fluid for stable flow rate measurements.

Description

For an electromagnetic flowmeter to provide stable flow rate measurements, fluids must be grounded. As the measuring pipe inside the wall is insulated by lining, this ground ring is provided at the tube inlet to ground fluid. The ground ring also serves to protect the lining at the tube inlet. The appropriate material to for the ground ring is selected according to fluid to be handled.

Ground rings may be installed in both upstream and downstream position in order to create the same fluid potentials in both positions and improve measuring stability.

Question

2-7: Are there any differences in the structures of the bodies of JIS 10K, JIS 20K, and JIS 30K, whose line mounting follows the wafer tie-in specifications?

Answer

- Under the wafer tie-in specifications, the body structures are all the same. However, the sizes and numbers of the attached center adjustment metal fittings and optional bolts and nuts are different.

Description

Since this flowmeter adopts the flange snap-in method (wafer tie-in) for line mounting, the form of the body does not change even if the remote flange constant changes.

However, the length, width, and number of through bolts depends on the standard of the remote flange, so the sizes and numbers of the center adjustment metal fittings and nuts inevitably change.

Question

2-8: How has stress analysis been made on detectors?

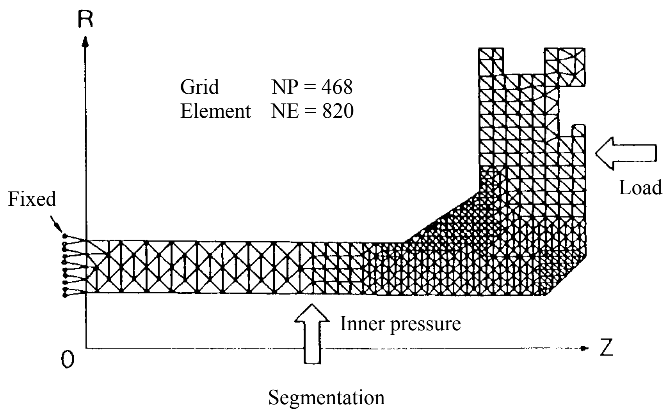
Answer

- Stress analysis has been made using the finite element method (FEM).

Finite element method: a method to make analysis by dividing a continuous object into a finite number of elements, working out mathematical models to represent the characteristics of individual elements and combining them to find a formula which will represent the overall characteristics of the object.

Description

This analysis has been made to adopt pincered installation between flanges and accomplish minimized size and weight and shorter face-to-face. The figure below illustrates the measuring pipe as divided into a finite number of elements.



Question
2-9: How are electrode and ground ring materials selected?

Answer

- The ground ring and electrodes should ideally be of the same material, since the ground ring also is in contact with the liquid under measurement. However, since the objective of the ground ring is to ground the liquid to the earth, the requirement of the corrosion resistance of the ground ring may not be so stringent as that of the electrodes. If you are to select different materials for the electrodes and the ground ring, select for the electrodes on which is more resistant against electrolytic corrosion.

  Instrumentation Data ID1-5610-0170 "Selecting Corrosion-resistant Materials for Electromagnetic Flowmeters."

Description

The tolerance limit of electrode corrosion is set at 0.05 mm/year. For applicability of various materials to various fluids, see the above document.

Question
2-10: Does the piping connection of the sanitary detector meet IDF standards?

Answer

- Yes

  IDF: INTERNATIONAL DAIRY FEDERATION

Question
2-11: What are the specifications for the dedicated cable for this flowmeter?

Answer

- MGA12W cables are dedicated to the MagneW 3000.

Description

Note that termination of MGA12W dedicated cables differ by model, detector diameter, fluid conductivity and cable length. You may use other cables (two-core single shield cable, CVVS, CEEV, etc.) which are equivalent to MGA12W cables and are available commercially.

Question
2-12: What is the proportion of platinum an iridium in the electrode material?

Answer

- 90% platinum and 10% iridium.

Question
2-13: Are detector bodies made of stainless steel available?

Answer

- Bodies with 2.5 to 200 mm detector diameters are all made of stainless steel.

Question

2-14: Can the converter direction of the detector terminal box or integral type be specified?

Answer

- Direction can be specified using the selection specifications in the model No.

Question

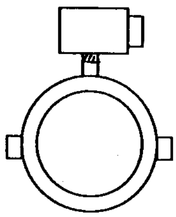
2-15: What are the structural differences between a water-tight model and a submersible model?

Answer

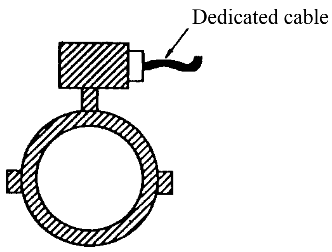
Description

The inside of a water-tight model is not potting-processed (except for the neck). The structure of the body is all-welded. The submersible model is potting-processed with silicone resin, as shown below.

Since humidity may leak in from the conduit port operated by the user, the inside of the terminal box might be subject to condensation under high humidity. Make sure to choose the water-tight model. The submersible model is potting-processed with silicone resin, as shown below.



Water-tight model:
All-welded body



Submersible model:
With potting for overall detector
All-welded body

Question

2-16: Do you assert that measured fluids will not leak from the wafer detectors?

Answer

- No, we don't. Be sure to install the detectors correctly by observing the instructions given in the "Notes for Installation." Otherwise we recommend selection of a flanged detector.

Question

2-17: What are the JPI standards, standards for flanges?

Answer

- These are standards of the Petroleum Institute. JPI is an abbreviation for Japan Petroleum Institute.

Question

2-18: Are there any abrasion resistant and noise resistant electrode materials?

Answer

- Yes. Tungsten carbide.

3. Q & A ABOUT APPLICATIONS

Question
3-1: Is there an explosion-proof type transmitter?

Answer

- No. Make sure to install the transmitter in a safe place. An integral explosion-proof type is available in the SMT3000 series.

Question
3-2: What is an arrester?

Answer

- An arrester protects the electronic parts of converter signals and power inlet/output circuits from damage due to lightning in areas suffering frequent lightning storms. The arrester built in the converter has been designed to prevent equipment damage against lightning induction of max. 12 kV (1.2 × 50 μs), 1 kA (8 × 20 μs) at output terminals to case ground (excluding detector signal input terminal).

  The KIX converter has an arrester as a standard feature.

Question
3-3: Is actual flow rate indication available?

Answer

- It is available as a standard feature.

Question
3-4: Is it possible to produce a unit with the mercury relay contact pulse feature?

Answer

- No. (Because mercury is harmful to the body, units with a mercury relay contact pulse feature cannot be produced.)

Question
3-5: What is the damping adjustment for?

Answer

- It is to adjust the damping level to suppress the response time constant of the instrument. When the output changes too rapidly and can hardly be read, you may increase the damping to smooth it so that you can read it more easily; when you need a rapid response, you may decrease the damping.

Description

The damping time constant is defined as the time required for the output to change from 0 to 63.2% against positive stepwise input of 0 to 100%.

Question
3-6: How does liquid containing ferrous materials affect measurement?

Answer

- Magnetic materials, if present in the liquid under measurement, cause the indication to shift toward higher values in proportion to their concentration. No error is caused, however, if their concentration is in ppm.

  Instrumentation Data ID1-5610-0160 “Effects of Liquid Containing Magnetic Materials on Electromagnetic Flowmeters.”

Description

If the fluid under measurement contains ferromagnetic materials, its apparent permeability increases and hence a larger signal is obtained. Experiments indicated that a fluid containing 20 wt% magnetite gave a 10% larger signal and that the rate increased linearly up to the concentration of about 50 wt%. The measured signals are stable. In the case of nonmagnetic materials (such as Fe_2O_3), concentration of up to approximately 4 wt% will not affect accuracy.

Question
3-7: Are measurements of high temperature fluids possible?

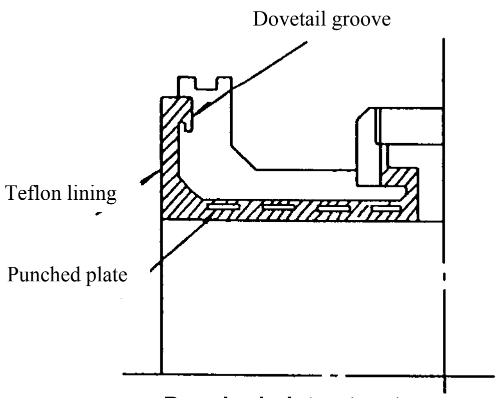
Answer

- There is a limit on temperatures which depends on the lining material used, unit model and fluid pressure. PFA is available for continuous duty for fluid of max. 160_C.

  Refer to the relative Specification Sheets.

Description

This flowmeter employs a dovetail groove and punched plate structure, with externally inserted electrodes, which makes it by far stronger and tougher than conventional flowmeters at higher temperatures.



Punched plate structure

Question

3-8: Are there any problems when measuring low-electrical-conductivity fluids (1μs/cm)?

Answer

- We recommend use of a type with integrated detector and transmitter or a dedicated cable of less than one meter. By using either of these, measurement is possible at a maximum of 3% drift in output signal and 1% drift in accuracy. (This is based on actual data.)

Description

As the electrical conductivity of the fluid to be measured lowers, the resistance (R) between the electrodes inversely rises.

In addition, the longer the cable between the detector and transmitter, the larger the capacitance (C) between the signal cables becomes. When R and C reach certain values, the electromotive force induced in the electromagnetic flowmeter declines, and the flow signal may indicate a value smaller than the actual value.

Therefore, when the electrical conductivity of the fluid is low, shorten the signal cable so that the increase in inter-electrode resistance (R) is offset by a decrease in inter-cable capacitance (C).

Question

3-9: Do the electromagnetic flowmeters measure ethylene oxide?

Answer

- No, they do not, because the electrical conductivity of pure ethylene oxide is 0 μS/cm.

Description

Theoretically, the electrical conductivities of pure hydrocarbon compounds (including organic compounds) are 0 μS/cm and cannot be measured with the electromagnetic flowmeters. In practice, however, water-soluble compounds often contain approximately 2% city water and in such cases the electrical conductivities are of a level of 5 μS/cm or more and can be successfully measured with the electromagnetic flowmeter. Check the electrical conductivity of the compounds you want to measure.

Question

3-10: What should we do when a separable detector has been installed in a reverse direction (the detector arrow is in the reverse of the actual process flow direction)?

Answer

- Interchange the wires between terminals X and Y.

Question

3-11: What will happen if the detector pipe is not completely filled with fluid?

Answer

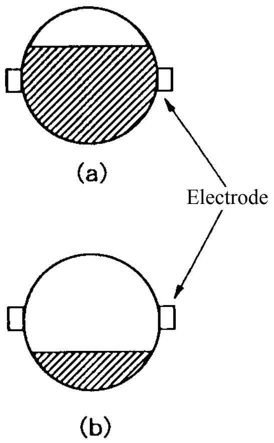
- When the pipe is not completely filled with fluid, the flowmeter may give a flowrate that is larger than the actual flow or may scale out due to noise. Design piping so that the detector pipe is always filled with fluid.

  Refer to the related instruction manuals for the detectors.

Description

An electromagnetic flowmeter assumes that the pipe is filled with fluid. If the pipe is partially filled as shown in (a) below, the signal obtained will be larger than it should be.

If the fluid is below the electrode level as shown in (b), the resistance between the electrodes becomes infinite, making flowrate measurement impossible. In addition, unstable or scaled out indications may result due to noise. Lay the piping so that the detector pipe is always filled with fluid.



Question

3-12: Do the electromagnetic flowmeter successfully measure fluids which contain bubbles or solids?

Answer

- To measure such fluids, use Model KIX40B Noise-resistant Converters that can suppress output signal fluctuations that could be caused by such bubbles or solids.

  Refer to Specification Sheet No. SS1-5661-3040 "Noise Resistant Converter," Field Eye Vol. 16 (1992), and Instrumentation Data ID1-5610-0320.

Description

If the measured fluid contains bubbles or solids, the meter will indicate the flow rate which include such bubbles or solids.

Question

3-13: What cautions are needed when measuring slurries?

Answer

- Care must be used in setting a normal flow velocity, selecting a lining, an considering the effects of slurry on the electrodes.

Description

When handling slurries, a regular flow velocity lower than 2 m/s may cause abrasion of the lining and electrodes. If the slurry is likely to precipitate or adhere, the regular flow velocity must be 2 m/s or more. If the lining is worn by slurry or the slurry deposit reduces the inside diameter of the detector pipe, corresponding measurement errors will result.

Question

3-14: What cautions are needed when a reducer is used with the electromagnetic flowmeter?

Answer

- Care must be paid to the length of the straight pipe upstream of the flowmeter. When pumps or valves are installed upstream 10D is required as straight pipe upstream. When no pumps and values are installed 5D is required.

  Refer to the related manuals for detectors.

Description

- The length of the straight pipe upstream means the length of the straight pipe upstream of the electrode of the electromagnetic flowmeter.
- An electromagnetic flowmeter requires straight piping of 2 times the pipe diameter on the downstream side and a straight length of 5 times the pipe diameter on the upstream side.

  A reducing pipe is regarded as a straight pipe since the flow at its outlet is known to be axially symmetrical.

  If a flare pipe with a cone angle of less than 15_ is used upstream of the flowmeter, a straight pipe of longer than 5 times the pipe diameter is required on the upstream side of the flare pipe. If 15_ or larger flare pipe is used, provide a straight pipe of longer than 5 times the nominal diameter of the flowmeter on the downstream side of the flare pipe and install the flowmeter downstream of the straight pipe.

Question

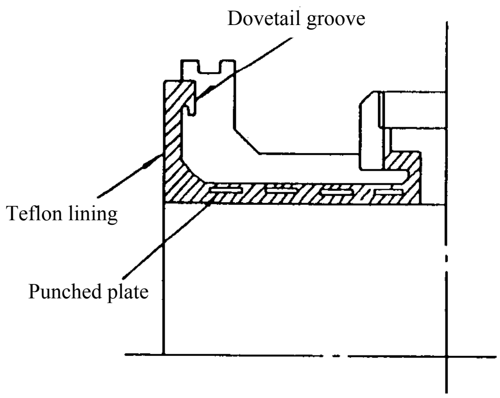
3-15: Can the flowmeter be used on a line that could develop negative pressure?

Answer

- The lining of this flowmeter is mechanically fixed by groove and punched plate so that it is far more resistant to negative pressures than similar products.

Description

Teflon lined units should not be used on lines that could develop negative pressure. However, this flowmeter has lining fixed mechanically by groove and punched plate (unlike competing products that relay on adhesives) and hence are far more resistant to negative pressures. It has been verified that exposure of 50 mm diameter MagneW 3000 flowmeters to a vacuum at 110_C for a week causes no problem.



Punched plate structure

Question

3-16: Is it possible to combine this device with the conventional devices? Which model should we select when making a replacement?

Answer

- It is possible to combine this flowmeter with the conventional type as long as it is the basic separable type. However, appropriate adjustment or actual fluid calibration is required in order to connect devices. For details, see the description starting on the next page.

Detector / Transmitter	MGG11 Water-tight model	MGG12 Submerged model	KID10A Water-proof model	KID10B Water-proof model	KID11/12B	KID20A Sanitary
MGG10C Integrated model	±0.5% of rate					
MGG10C Separable model	±0.5% of rate	±0.5% of rate		±1.0% of rate	±1.0% of rate	
KIX20A	Connection adaptor (*3) Connection cable Replacing of ROM ±1.0 of rate		±0.5% of rate			±0.5% of rate
KIX20B	Replacing of ROM (*3) ±1.0 of rate	Replacing of ROM (*3) ±1.0 of rate		±0.5% of rate	±0.5% of rate	
KIC20A	R8 short circuit (EX) × $\frac{160}{300}$ Connection adopter Connection cable ±1.0% of rate		±0.5% of rate			±0.5% of rate
KIC20B	R8 short circuit (EX) × $\frac{160}{300}$ ±1.0% of rate	R8 short circuit (EX) × $\frac{160}{300}$ ±1.0% of rate		±0.5% of rate	±0.5% of rate	
KIC33B	R8 short circuit (EX) × $\frac{160}{300}$ ±1.0% of rate	R8 short circuit (EX) × $\frac{160}{300}$ ±1.0% of rate		±0.5% of rate	±0.5% of rate	
KIX40B High noise resistance	Please contact us for advice.	Please contact us for advice.		40-300A ±0.5% of rate Other combinations not possible (25A is available as a special item.)	40-300A ±0.5% of rate Other combinations not possible (25A is available as a special item.)	
NNA	R4 Input 10KW in parallel R5 Short circuit (EX) × $\frac{160}{300}$ ±1.5% FS	R4 Input 10KW in parallel R5 Short circuit (EX) × $\frac{160}{300}$ ±1.5% FS		R4 Input 10KW in parallel R5 Short circuit ±1.5% FS	R4 Input 10KW in parallel R5 Short circuit ±1.5% FS	
NNB	R81 Short circuit (EX) × $\frac{160}{300}$ ±1.0% of rate	R81 Short circuit (EX) × $\frac{160}{300}$ ±1.0% of rate		R81 Short circuit ±1.0% of rate	R81 Short circuit ±1.0% of rate	
NNX	Combination not possible	Combination not possible		±1.0% of rate	±1.0% of rate	

Notes: *1. Accuracy indicates 1m/s or greater span flow velocity.

*2. Combination with KIX60B is not possible except with detectors of the SMT3000 series. KID50 and KIX50 (80 to 200A, ±5% FS) cannot be combined with any other units.

*3. Please contact ISD P-MKT Section for advice.

Detector / Transmitter	KID20B Sanitary	KID30A Ceramic	KID30/KID31B Ceramic	NNK140 Underwater model	NNM
MGG10C Integrated model					
MGG10C Separable model	±1.0% of rate		±1.0% of rate	±1.0% FS	25-600A...±1.5% FS 6-15A...Combination not possible
KIX20A		±0.5% of rate			
KIX20B	±0.5% of rate		±0.5% of rate	(EX) × 0.5 ±1.0% FS	40-200A...(EX) × 0.4 25, 250-600A...(EX) × 0.5 100A...(EX)...× 0.4 ±1.5% FS 6-15A...Combination not possible
KIC20A		±0.5 of rate			
KIC20B	±0.5% of rate		±0.5% of rate	(EX) × 0.5 ±1.0% FS	40-200A...(EX) × 0.4 25, 250-600A...(EX) × 0.5 100A...(EX) × 0.42 ±1.5% FS 6-15A...Combination not possible
KIC33B	±0.5% of rate		±0.5% of rate	(EX) × 0.5 ±1.0% FS	40-200A...(EX) × 0.4 25, 250-600A...(EX) × 0.5 100A...(EX)...×0.42 ±1.5% FS 6-15A...Combination not possible
KIX40B High noise resistant	40-125A ±0.5% of rate 15, 25A Other combinations not possible (25A is available as a special item.)		40-125A ±0.5% of rate 15, 25A Other combinations not possible (25A is available as a special item.)	Combination not possible	Combination not possible
NNA	R4 Input 10KW in parallel R5 Short circuit ±1.5% FS		R4 Input 10KW in parallel R5 Short circuit ±1.5% FS	±2.5% FS	±1.0% FS
NNB	R81 Short circuit ±1.0% of rate		R81 Short circuit ±1.0% of rate	±0.5% FS	±0.5% FS
NNX	±1.0% of rate		±1.0% of rate	±0.2% FS	40-200A...±0.2% FS 25, 250-600A...±0.2% FS 6-15A... ±0.3% FS

Notes: *1. Accuracy indicates 1m/s or greater span flow velocity.

*2. Combination with KIX60B is not possible except with detectors of the SMT3000 series. KID50 and KIX50 (80 to 200A, ±5% FS) cannot be combined with any other units.

*3. Please contact ISD P-MKT Section for advice.

Combinations between traditional detectors and FLEX (MGG) transmitters

Setting EX value

		Transmitter before replacement	
		NNA/NNB/NNX	KIC/KIX
Detector	KID	Input EX value of the detector	Input EX value of the detector
	NNK	Input EX value of the detector	Input EX value of the detector × 2 (*1)
	NNM Bore diameter 25A, 250-600A	Input EX value of the detector	Input EX value of the detector × 2 (*1)
	NNM Bore diameter 40-200A	Input EX value of the detector	Input EX value of the detector × 2.5 (*1)

Remark: Replacing KIX60 with MGG is not possible.

*1 Input the EX value as it is when the EX value of the detector is set from 500 to 700.

Check by dummy input

Detector type to be selected according to engineer mode of the transmitter	TYPE	EX value to be set	Input flow velocity
MGG	130	300	Flow velocity
KID	130	320	Flow velocity × 1/2
NNK	130	320	Flow velocity
NNM Bore diameter 25A, 250-600A	130	320	Flow velocity
NNM Bore diameter 40-200A	130	400	Flow velocity

Gain adjustment value

When adjusting gain with the calibrator (KIZ006), specify the following values.

Type with KIZ006: 130

Setting input: Value of flow velocity

Combination between KIC/KIX and MGG detectors

To combine a traditional-type detector and an MGG detector, the H/W on the transmitter side may need to be remodeled. The KIX-type needs a P-ROM replacement.

Transmitter	Ver.	Detector type	EX value to be set
KIC			Set 8/15 of the marking on the detector.
KIX	3.42	Set KID.	Set 8/15 of the marking on the detector.
KIX*	3.50	Set MGG.	Set the marking on the detector.

* For Ver. 3.50, EX current is 8/15 of the set value.

Question

3-17: What is the engineering unit of measure for viscosity? Please mention some of viscous liquids and their viscosities.

Answer

- The unit of measure for viscosity is centipoise (cp). Viscosities of some viscous substances are shown below.

  ⇒ City water: 1 cp (basis of unit)

  ⇒ Salad oil: Approx. 700 cp

  ⇒ Miso (fermented soybean paste): Approx. 10000 cp

Question

3-18: After installing an electromagnetic flowmeter for liquor tax inspection, is reexamination necessary?

Answer

- No. However, an instrumental error test should be performed at the beginning of use and every five years.

  Liquor Container Test Device User's Manual

Description

The MagneW3000 FLEX for liquor tax inspection is a flowmeter which complies with the notification from the National Tax Administration Agency of the Ministry of Finance for liquor tax inspection.

An instrumental error test is a test of the flowmeter by checking three or more points of flow within the flow range which is actually used. This test is executed three or more times for each point.

Question

3-19: Does the zero point shift?

Answer

- For fluids to be measured, the zero point does not substantially shift unless one of the following is done.

  ✐✉ The length of the cable between a remote-type detector and a converter is changed.

  ✍✉ The types of measured fluids are changed (especially when their conductivities greatly differ).

Question

3-20: When we used the data set device, it didn't allow us to set the damping time constant at less than 1 second. What is the cause of this?

Answer

- If the damping time constant is less than 1 second, the output can fluctuate. As a precaution for inadvertent selection, such short time constants are not set immediately as you press the key.

Question

3-21: What electrodes do you recommend to measure soy sauce and vinegar?

Answer

- We recommend titanium electrode.

[Remarks]

Actual applications have proved that the titanium electrodes are appropriate:

Measurement of soy sauce by Yamasa Shoyu Co., Ltd.

Measurement of vinegar by Mitsukan Vinegar Co., Ltd.

Question

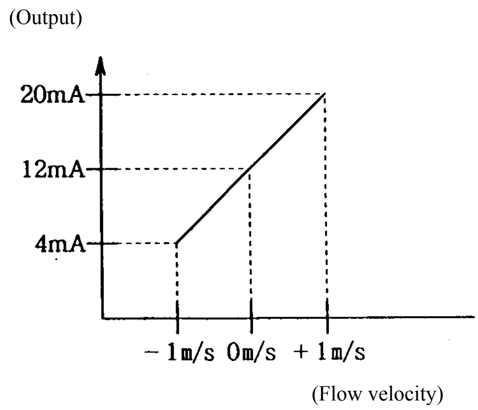
3-22: May we measure a flow whose direction changes, by assigning the 4 to 12 mA range for the reverse direction and the 12 to 20 mA range for the direct direction?

Answer

- Yes, you may. To do it, calibrate the converter's 0% flow output (which normally is set at 4 mA) at 12 mA.

Description

For example, assuming that flow velocity ranges are ±1 m/s, assign the ranges as shown below.



When a flow velocity range is 1m/s

4. Q & A ABOUT PULSE OUTPUT

Question
4-1: What is “drop out”?

Answer

- This function is used to cut off pulse output such as when there are pulsations in the vicinity of zero output. (The analog output is not affected.)

  Adjustable for 0 to 10% (continuously)

  Refer to the related manuals for the converters.

Question
4-2: What is pulse weight?

Answer

Flow per pulse, determined for output of a pulse signal

The pulse weight, for example, of a pulse with a 100cc flow is 100cc/p.

Question
4-3: What will the pulse output be when the meter scales over?

Answer

- Correctly counted up to 115% (analog output alike).

Question
4-4: Does changing the damping time constant affect the pulse output?

Answer

- Like the analog output, the pulse output is also damped.

Question
4-5: What are the available pulse widths?

Answer

- Any value between 0.3 and 999.9 msec, or fixed at 50% compared to the duty.

  Refer to the related manuals and specification sheets for the converters.

Question

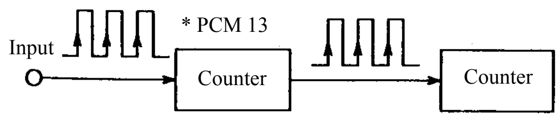
4-6: Can the KIC converter provide two channels of pulse output?

Answer

- The converter can provide only one channel of pulse output. Make adequate measures on the receiver side.

Description

Refer to Specification Sheet No. SS1-PCM100-0100.



We recommend the PCM13 type.

Two channels of pulse output can be set up by adding a * PCM13 type to the primary counter.

Question

4-7: We attempted to drive an auxiliary relay with the open-collector output but failed. What would be the likely cause of that?

Answer

- The most probable cause is that the pulse width of the output signal is too short. Check the specifications of the auxiliary relay and set an appropriate pulse width.

Description

When using a Relay MY4 manufactured by Omron Co., a 20 msec or higher pulse width is required for normal use of the relay.

5. Other Q & A

Question

5-1: Why are Model NNK submersible electromagnetic flowmeters calibrated at only three points with actual flow?

Answer

- These flowmeters are highly accurate (± 1.0% FS) and their output signal linearity is excellent. It is sufficient to calibrate them at the zero point and two range points. Moreover, theses open-channel flowmeters are not subject to the requirements prescribed by JIS Standard JIS B 7554 "Electromagnetic Flowmeters."

Question

5-2: To use the electromagnetic flowmeter in the various areas of Japan, is it necessary to change the power frequency depending on whether it is used in eastern part or western Japan?

Answer

- When using AC power, there is no way for the user to change the power frequency of KIC and KIX transmitters. For DC24V power, use the frequency switch plug on the rear side of the power unit to change the power frequency.

Description

When using the flowmeter with a power frequency which is other than the one set at the factory before shipping, an error of about 0.3% will occur.

50Hz → 60Hz: +0.3%

60Hz → 50Hz: –0.3%

Question

5-3: Why are the ground rings provided on both the upstream and downstream sides?

Answer

- They are provided to create the same the fluid potentials on both sides, by grounding the fluid in both positions.

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