H250 M9 Supplementary instructions

Variable area flowmeter

Equipment with electrical components
in protection type non-sparking Ex nA'

Ex
NEPSI
Ex nA

KROHNE

1.1 General notes

These additional Instructions apply to the explosion-protected versions of the variable area flowmeters with electrical components and the marking Ex nA. They complete the installation and operation instructions for the non-explosion protected versions.

The information given in these instructions contains only the data relevant to category 3 explosion protection. The technical details given in the installation and operation instructions for the non-explosion protected versions apply unchanged unless excluded or superseded by these instructions.

1.2 NEPSI conformity

The H250/../M9S... variable-area flowmeters series has been approved by NEPSI (National Supervision and Inspection Center for Explosion Protection and Safety of Intrumentation in China) under Certification No.

GYJ12.1526X

This certification together with its boundary conditions is required to be observed without fail. The Ex marking is NOT acc. to the ATEX directive 94/9/EC (see also Attachment "Certificate"). Placing the product on the market of the EU for purpose of distribution and/or use in the EU is NOT permitted.

1.3 Security information

Assembly, installation, start-up and maintenance may only be performed by personnel trained in explosion protection!

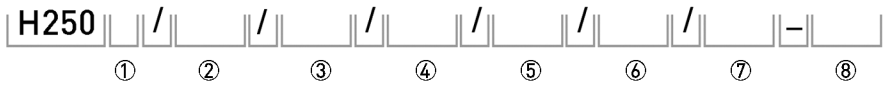
CAUTION!
The operator respectively his agent is responsible to follow further standards, directives or laws if required due to operating conditions or place of installation. This applies particularly for the use of easy detachable process connections such as SMS or Clamp when measuring flammable mediums.

2.1 Device description

Variable area flowmeters are used to measure and display volume flows of flammable and non-flammable gases and liquids. Depending on the device version, electrical limit switches and a 4-20 mA signal output or a Profibus PA interface can be built into the indicator part.

2.2 Description code

The safety description code * consists of the following elements:



① Direction of flow
H - horizontal orientation
U - vertical downwards
no identifier - standard upwards

② Materials / versions
RR - Stainless steel
C - PTFE or PTFE/ceramics
HC - Hastelloy
Ti - Titanium
F - Sterile version (food)

③ Heating jacket version
B - with heating jacket

④ Indicator part series
M9 - Indicator M9 standard indicator
M9S - Indicator with increased protection
M9R - Indicator in stainless steel housing
M9T - Indicator in stainless steel housing with increased protection

⑤ High-temperature version
HT version with HT extension

⑥ Electrical signal output
ESK - Electronic transmitter

⑦ Limit switch
K1 - One limit switch
K2 - Two limit switches

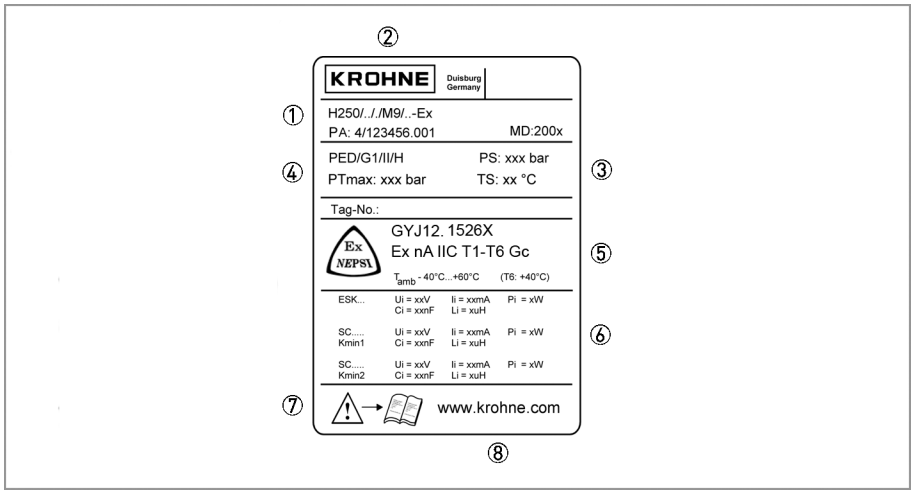
⑧ Explosion protection
Ex - Explosion-protected equipment

* positions which are not needed are omitted (no blank positions)

The indicator M9S is required for Ex nA.

2.3 Marking

Type designation of the complete unit is shown on the indicator with the nameplates reproduced below (see also description code).



① Device type
② Manufacturer
③ Sizing data: temperature & pressure rating
④ PED data
⑤ Ex data
⑥ Electrical connection data
⑦ Note on observing documentation
⑧ Manufacturer's website

Additional markings on the housing cover:

- SN - serial number
- SO - sales order / item
- PA - order
- Vxxx - product configurator code
- AC - article code

Additional plate

The association of the housing cover to the device is confirmed by an additional plate with the serial number on the interior of the indicator part.

2.4 Flammable products

Atmospheric conditions:
An explosive atmosphere is a mixture of air and flammable gases, vapours, mists or dusts under atmospheric conditions. The following values define it
T_{atm} = -20...+60°C / -4...+140°F and P_{atm} = 0.8...1.1 bar.
Outside of this range, no key data are available as to ignition behaviour for most mixtures.

Installation conditions:
Variable area flowmeters operate outside of atmospheric conditions, which means that explosion protection – regardless of the zone assignment – is fundamentally not applicable due to the lack of key safety data for the interior of the measuring section.

WARNING!
Operation with flammable products is only permitted as long as no explosive fuel/air mixture builds up on the inside of the flowmeter under operating conditions. The operator is responsible for ensuring that the flowmeter is operated safely as regards the temperature and pressure of the products used. In case of operation with flammable products the measuring units must be included in the periodic pressure tests of the system. When using the device version H250/C... (PTFE-liner, nonconductive) the min. conductivity of the medium must be 10^{-8} S/m, in order to avoid the electrostatic charge.

2.5 Device category

The flowmeters are designed according to GB 3836.1-2010 and GB 3836.8-2003.

2.6 Types of protection

The variable area flowmeter is designed in protection type "non-sparking" Ex nA. Explosion protection is ensured by the absence of sparking contacts and hot surfaces during normal operation.

The marking Ex nA IIC T1 - T6 Gc contains the following information:	
Ex nA	Non-sparking equipment
IIC	Suitable for gas groups IIC, IIB and IIA
T1 - T6	Suitable for temperature classes T6 ... T1
Gc	EPL, suitable for zone 2

2.7 Ambient temperature / temperature classes

Due to the influence of the product temperature, variable area flowmeters with built-in electrical equipment (electric variants) are not assigned to any fixed temperature class. The temperature class of these devices is rather a function of the product temperature and ambient temperature that is present and the specific device version. The classification is outlined in the following tables.

The tables take into account the following parameters:

- Installed equipment
- Ambient temperature Tamb
- Product temperature Tm
- Nominal DN
- Standard or high temperature version (HT)
- Standard or heating jacket version
- Heat resistance of the connecting cable

When there is more than type of built-in equipment, the data of the most unfavourable equipment should be used.

INFORMATION!
The maximum permissible product temperatures listed in the tables are valid under the following conditions:

- *The measuring device is installed and operated in accordance with the installation instructions in the installation and operating manual.*
- *It must be ensured that the flowmeter is not heated by the effects of additional heat radiation (sunshine, neighbouring system components) and thus operated above the permissible ambient temperature range.*
- *Insulation must be limited to the piping.*
  Unobstructed ventilation of the indicator part must be ensured
  To do this, the variant with a projecting indicator (HT version) is preferable.
- *For device versions with a heating jacket, that the temperature of the heating medium does not exceed the maximum permissible product temperature.*

For certain device version, lower values apply due to differing boundary conditions (e.g. lining materials).

Here the user should consult the technical data sheet.

Using a heat resistant connecting cable

Temperature table in °C				
Heating jacket			T_m ①	
none	with	HT-version	$T_{amb} \leq 40$	$T_{amb} \leq 60$
DN15, DN25	DN15		-	150
		x	-	236
DN50	DN25		-	127
		x	-	171
DN80, DN100	DN50, DN80		-	109
		x	-	145

Temperature table in °F				
Heating jacket			T_m ①	
none	with	HT-version	$T_{amb} \leq 104$	$T_{amb} \leq 140$
DN15, DN25	DN15		-	302
		x	-	456
DN50	DN25		-	260
		x	-	340
DN80, DN100	DN50, DN80		-	228
		x	-	293

① Maximum value of the product temperature for the use of a standard connecting cable. For higher product temperatures a connecting cable with a temperature resistance of 100°C / 212°F is required.

HT version - high-temperature version with projecting indicator

The permitted ambient temperature range is indicated on the nameplate; depending on the device version it is T_{amb} = -40...+60°C / -40...+140°F or T_{amb} = -25...+60°C / -13...+140°F.

Maximum permitted product temperature in °C

				Maximum permitted product temperature T_m						
Heating jacket			TK ▸	T6	T5	T4	T3		T2, T1	
none	with	HT Version	T_{amb} ▸	≤ 40	≤ 60	≤ 60	≤ 40	≤ 60	≤ 40	≤ 60
ESK II / ESK2A and ESK3-PA										
DN15, DN25	DN15			85	100	135	200	183	200	183
		x		85	100	135	200	200	300	300
DN50	DN25			85	100	135	200	165	200	165
		x		85	100	135	200	200	300	300
DN80, DN100	DN50, DN80			85	100	135	200	150	200	150
		x		85	100	135	200	200	300	252
K1 / K2										
DN15, DN25	DN15			85	100	135	200	200	200	200
		x		85	100	135	200	200	300	300
DN50	DN25			85	100	135	200	200	200	200
		x		85	100	135	200	200	300	300
DN80, DN100	DN50, DN80			85	100	135	200	200	200	200
		x		85	100	135	200	200	300	300

Maximum permitted product temperature in °F

				Maximum permitted product temperature T_m						
Heating jacket			TK ▸	T6	T5	T4	T3		T2, T1	
none	with	HT Version	T_{amb} ▸	≤ 104	≤ 140	≤ 140	≤ 104	≤ 140	≤ 104	≤ 140
ESK II / ESK2A and ESK3-PA										
DN15, DN25	DN15			185	212	275	392	361	392	361
		x		185	212	275	392	392	572	572
DN50	DN25			185	212	275	392	329	392	329
		x		185	212	275	392	392	572	572
DN80, DN100	DN50, DN80			185	212	275	392	302	392	302
		x		185	212	275	392	392	572	485
K1 / K2										
DN15, DN25	DN15			185	212	275	392	392	392	392
		x		185	212	275	392	392	572	572
DN50	DN25			185	212	275	392	392	392	392
		x		185	212	275	392	392	572	572
DN80, DN100	DN50, DN80			185	212	275	392	392	392	392
		x		185	212	275	392	392	572	572

2.8 Electrical data

Electrical equipment	Nominal voltage	Nominal current
Limit switch K1 / K2	8 VDC	1...3 mA
Signal output ESK II and ESK2A	24 VDC ± 25%	4...20 mA with HART communication
ESK3-PA Profibus transmitter ①	9...32 VDC	12 mA

① Further information and instructions for operation of the ESK3-PA Profibus transmitter are provided in separate supplementary instructions.

3.1 Installation

Installation and setup must be carried out according to the applicable installation standards by qualified personnel trained in explosion protection. The information given in the Installation and Operation Instructions and the Supplementary Installation and Operation Instructions must always be observed.

Variable area flowmeters must be installed in such a way that

- There is no danger from mechanical impact effects.
- There are no external forces affecting the indicator part.
- The device is accessible for any visual inspections that are necessary, and can be viewed from all sides.
- The nameplate is clearly visible.
- It can be operated from a location with secure footing.

The variable area flowmeter can withstand the low risk of mechanical damage (impact energy 4/2 joules).

CAUTION!
The manufacturer is not liable for any damage resulting from improper use or use other than the intended purpose. This applies in particular to hazards due to insufficient corrosion resistance and suitability of the materials in contact with product.

4.1 General notes

Electrical connection of the signal circuits is carried out in the integrated terminal compartment of the indicator part. Separate conduit entries are provided for the signal output and limit switches.

Unused conduit entries should be closed using approved blind plugs and seals. Ensure that the seals are tight.

The connecting cables should be selected according to the applicable installation standards and the maximum operating temperature. The outer diameter of the connecting wires must be adapted to the sealing range of the cable entries (6...10 mm / 0.24...0.39"). The connecting cables must be fixed and laid in such a way as to be sufficiently protected against damage.

Before connecting or disconnecting the electric connecting cable of the device, ensure that all of the cables leading to the signal converter are de-energised relative to each other and to the reference potential of the hazardous area. This also applies to earthing conductors (FE) and equipotential bonding conductors (PA).

All cores that are not used must be securely connected to the earth potential of the hazardous area or carefully insulated against each other and against ground (test voltage ≥ 500 V_{eff}).

Cable entries / Blanking plugs

The variable area flowmeter is optionally equipped with one conduit entry and one blind plug or two conduit entries. These elements guarantee protection against foreign bodies and water (protection category) IP65 or greater. The cable entries are sealed with a plug. The plugs should be replaced with suitable connecting cables.

4.2 Power supply

The variable area flowmeter does not require any separate power supply. The necessary power for the built-in electrical equipment is supplied via the signal circuits.

4.3 Inputs/outputs

The signal circuits of the variable area flowmeter may only be connected to downstream devices or circuits that satisfy the requirements of protective extra-low voltage (PELV). The terminal assignment of the built-in electrical equipment is described in the Standard Installation and Operation Instructions.

Only circuits that are suitable for operation in Zone 2 hazardous areas may be connected. Outside of the flowmeter, measures must be taken to prevent the rated voltage from being exceeded by more than 40% due to temporary faults.

Use a 50 mA microfuse when connecting the signal output (ESK II / ESK2A) to voltage sources with a possible short-circuit current of more than 100 mA.

4.4 Earthing and equipotential bonding

The variable area flowmeter must be included in the equipotential bonding of the hazardous area. This is done using the earth connection on the rear of the indicator part.

Shields should be securely connected to the earth potential of the hazardous area, and connected to the terminal located in the indicator part via the shortest route. In the case of shield earthing at both ends (e.g. for reasons of electromagnetic compatibility), adequate equipotential bonding that reliably prevents potential differences is necessary between the two earthed ends of the shield in order to avoid excessive equalising current.

5.1 Start-up

Start-up is only permitted when the variable area flowmeter:

- is correctly installed in the system and connected.
- has been checked for the proper state with regard to its installation and connection requirements.

The user of the system must have it checked before start-up in compliance with the national regulations for checks before startup.

5.2 Operation

Variable area flowmeters must be operated in such a way that they remain within the maximum and minimum permissible temperatures and pressures and the electrical limit values.

Variable area flowmeters may only be operated if the equipment parts necessary for safety are effective in the long run, and are not rendered inoperable during operation.

During operation it is only permitted to open the indicator if no explosive atmosphere is present.

5.3 Electrostatic charge

In order to avoid ignition hazards due to electrostatic charge, variable area flowmeters may not be used in areas where the following appear:

- processes that generate large charges,
- machines with friction and cutting processes,
- spraying of electrons (e.g. in the vicinity of electrostatic painting systems),
- dust carried by compressed air.

6.1 Maintenance

Maintenance work of a safety-relevant nature within the meaning of explosion protection may only be carried out by the manufacturer, his authorised representative or under the supervision of authorised inspectors.

For systems in hazardous areas, regular tests are required in order to maintain the proper condition.

The following checks are recommended:

- Checking the housing, the cable entries and the feed lines for corrosion and/or damage.
- Checking the measuring unit and the piping connections for leakage.
- Checking the measuring unit and the indicator for dust deposits.

CAUTION!
Avoid electrostatic charges when cleaning the sight window!

6.2 Dismantling

Exchanging the built-in equipment

Due to the modular structure of the variable area flowmeters, from a safety point of view it is possible to exchange the electrical equipment built into the indicator for identical spare parts.

To do this, remove the housing cover. The housing cover must be closed immediately after the spare parts are exchanged. Make sure that the cover seal is properly seated. The fastening screws of the housing cover should be tightened with a torque of 1.2 Nm.

CAUTION!
There may be a loss of measuring accuracy!

Exchanging the entire device

Removal and installation is the user's responsibility.

Before disconnecting the electric connecting cable of the device, it must be ensured that all of the cables leading to the indicator part are de-energised relative to each other and to the reference potential of the hazardous area. This also applies to functional earthing conductors (FE) and equipotential bonding conductors (PA).

CAUTION!

- *Pressurized pipes must be depressurized before removing the measuring section.*
- *In the case of environmentally critical or hazardous products, appropriate safety precautions must be taken with regard to residual liquids in the measuring section.*
- *New seals must be used when re-installing the device in the piping.*

Ex NEPSI

EXPLOSION PROTECTION
CERTIFICATE OF CONFORMITY

Cert NO.GYJ12.1526X

This is to certify that the product

Variable Areas Flowmeter

manufactured by **KROHNE Messtechnik GmbH**

(Address:Ludwig - Krohne Strasse 5, Duisburg, Germany)

which model is **H250 *a*/*b*/*c*/M9S/*d*/*e*/*f*-Ex**

Ex marking **Ex nA ⅡB/ⅡC T1~T6 Gc**

product standard **/**

drawing number **ZZ 1016320100, ZZ 1016340100**

has been inspected and certified by NEPSI, and that it conforms to **GB 3836.1-2010,GB 3836.8-2003**

This Approval shall remain in force until **2017.12.19**

Remarks
1.Conditions for safe use are specified in the attachment to this certificate.
2.Symbol "X" placed after the certification number denotes specific conditions of use, which are specified in the attachment to this certificate.
3.Model designation is specified in the attachment to this certificate.

Director

National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation

Issued Date 2012.12.20

This Certificate is valid for products compatible with the documents and samples approved by NEPSI.

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Edition 05

国家级仪器仪表防爆安全监督检验站
National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation

(GYJ12.1526X) (Attachment Ⅰ)

Attachment Ⅰto GYJ12.1526X

Variable areas flowmeter typed H250/□/□/□/M9S/□/□/□-Ex, manufactured by Krohne Messtechnik GmbH has been certified National Supervision and Inspection Center for Explosion Protection and Safety of Instrumentation (NEPSI).
Variable areas flowmeter accords with following standards:
GB 3836.1-2010 "Explosive atmospheres Part 1: Equipment-General requirements"
GB 3836.8-2003 "Electrical apparatus for explosive gas atmospheres Part 8: Type of protection 'n'"
Variable areas flowmeter has the Ex-marking Ex nA ⅡB/ⅡC T1~T6 Gc.

Following products are covered by this certificate.

H250/*a*/*b*/*c*/M9S/*d*/*e*/*f*-Ex

a: H, U, blank
b: RR, HC, C, Ti, F
c: B, blank
d: HT, blank
e: ESKII, blank
f: K1, K2, blank

1. Specific condition for safe use

The suffix "X" denotes that external provision should be made to protect the power supply exceeding 40% of the rated voltage of the apparatus and the display window only pass 2J impact test.

2. Condition for safe use

2.1 Lacquering variable areas flowmeter has Ex marking Ex nA ⅡB T1~T6 Gc. Others have Ex marking Ex nA ⅡC T1~T6 Gc.

2.2 The relation between the ambient temperature and minimum process media temperature is listed as following.

Type	Ambient termp.	Minimum process media temp.
Flowmeter with transmitter typed SJ3.5—S1N	(—25~+60) ℃	—25℃
Others	(—40~+60) ℃	—40℃

2.3 The relation among temperature class, ambient temperature and maximum temperature of process medium is as following.

(GYJ12.1526X) **(Attachment Ⅰ)**

When variable area flowmeter has 4~20mA HART signal output

Temperature class		Maximum process media temp. (℃)							Cable temp. (℃)	
		T6	T5	T4	T3		T2, T1			
Ambient temp.		≤40℃	≤60℃	≤60℃	≤40℃	≤60℃	≤40℃	≤60℃	≤40℃	≤60℃
Type	DN									
H250/a/b/c/M9S/e-Ex	15	85	100	135	200	183	200	183	—	150
H250/a/b/c/M9S/HT/e/f-Ex	25	85	100	135	200	200	300	300	—	236
H250/a/b/c/M9S/e -Ex	50	85	100	135	200	165	200	165	—	127
H250/a/b/c/M9S/HT/e -Ex		85	100	135	200	200	300	300	—	171
H250/a/b/c/M9S/e/f-Ex	80	85	100	135	200	150	200	150	—	109
H250/a/b/c/M9S/HT/e-Ex	100	85	100	135	200	200	300	252	—	145

When variable area flowmeter has PA bus output

Temperature class		Maximum process media temp. (℃)							Cable temp. (℃)	
		T6	T5	T4	T3		T2, T1			
Ambient temp.		≤40℃	≤60℃	≤60℃	≤40℃	≤60℃	≤40℃	≤60℃	≤40℃	≤60℃
Type	DN									
H250/a/b/c/M9S/e-Ex	15	83	76	135	200	183	200	183	—	150
H250/a/b/c/M9S/HT/e-Ex	25	85	100	135	200	200	300	300	—	236
H250/a/b/c/M9S/e-Ex	50	77	74	135	200	165	200	165	—	127
H250/a/b/c/M9S/HT/e-Ex		85	91	135	200	200	300	300	—	171
H250/a/b/c/M9S/e-Ex	80	71	72	135	200	150	200	150	—	109
H250/a/b/c/M9S/HT/e-Ex	100	85	85	135	200	200	300	252	—	145

When variable area flowmeter havs transmitter typed SC3.5-NO-Y or SJ3.5—SN or SJ3.5-S1N (Pi≤64mW)

Temperature class		Maximum process media temp. (℃)							Cable temp. (℃)	
		T6	T5	T4	T3		T2, T1			
Ambient temp.		≤40℃	≤60℃	≤60℃	≤40℃	≤60℃	≤40℃	≤60℃	≤40℃	≤60℃
Type	DN									
H250/a/b/c/M9S/e/f-Ex	15	85	100	135	200	200	200	200	—	150
H250/a/b/c/M9S/HT/e/f-Ex	25	85	100	135	200	200	300	300	—	236
H250/a/b/c/M9S/e/f-Ex	50	85	100	135	200	200	200	200	—	127
H250/a/b/c/M9S/HT/e/f-Ex		85	100	135	200	200	300	300	—	171
H250/a/b/c/M9S/e/f-Ex	80	85	100	135	200	200	200	200	—	109
H250/a/b/c/M9S/HT/e/f-Ex	100	85	100	135	200	200	300	300	—	145

When variable area flowmeter havs transmitter typed SC3.5-NO-Y（Pi≤169mW）

Temperature class		Maximum process media temp. (℃)							Cable temp. (℃)	
		T6	T5	T4	T3		T2, T1			
Ambient temp.		≤40℃	≤60℃	≤60℃	≤40℃	≤60℃	≤40℃	≤60℃	≤40℃	≤60℃
Type	DN									
H250/a/b/c/M9S/e/f-Ex	15	Not available		135	200	156	200	156	—	150
H250/a/b/c/M9S/HT/e/f-Ex	25			135	200	200	300	300	—	236
H250/a/b/c/M9S/e/f-Ex	50			135	200	141	200	141	—	127
H250/a/b/c/M9S/HT/e/f-Ex				135	200	200	300	239	—	171
H250/a/b/c/M9S/e/f-Ex	80			125	200	125	200	125	—	109
H250/a/b/c/M9S/HT/e/f-Ex	100			135	200	192	300	192	—	145

(GYJ12.1526X) (Attachment Ⅰ)

When variable area flowmeter havs transmitter typed SJ3.5－SN or SJ3.5-S1N（Pi≤169mW）

Temperature class		Maximum process media temp. (℃)							Cable temp. (℃)	
		T6	T5	T4	T3		T2, T1			
Ambient temp.		≤40℃	≤60℃	≤60℃	≤40℃	≤60℃	≤40℃	≤60℃	≤40℃	≤60℃
Type	DN									
H250/a/b/c/M9S//e/f-Ex	15	62	100	135	200	200	200	200	—	150
H250/a/b/c/M9S/HT/e/f-Ex	25	85	100	135	200	200	300	300	—	236
H250/a/b/c/M9S/e/f-Ex	50	59	100	135	200	200	200	200	—	127
H250/a/b/c/M9S/HT/e/f-Ex		81	100	135	200	200	300	300	—	171
H250/a/b/c/M9S/e/f-Ex	80	55	100	135	200	195	200	195	—	109
H250/a/b/c/M9S/HT/e/f-Ex	100	70	100	135	200	200	300	300	—	145

2.4 End user is not permitted to change any components insides.

2.5 When installation, use and maintenance of Variable areas flowmeter, observe following standards.

GB3836.13-1997"Electrical apparatus for explosive gas atmospheres Part 13:Repair and overhaul for apparatus used in explosive gas atmospheres"

GB3836.15-2000"Electrical apparatus for explosive gas atmospheres Part 15:Electrical installations in hazardous area (other than mines)"

GB 3836.16-2006 "Electrical apparatus for explosive gas atmospheres – Part 16: Inspection and maintenance of electrical installation in hazardous areas (other than mines)

GB 50257:1996 "Code for construction and acceptance of electric device for explosion atmospheres and fire hazard electrical equipment installation engineering"

3. Manufacturer's Responsibility

2.1 Special condition for safe use specified above should be included in the instruction manual.

2.2 Manufacturing should be done according to the documentation approved by NEPSI.

2.3 Any modification with influence on the type of protection should be submitted to NEPSI before application.

2.4 Following items should be added to the nameplate

a) NEPSI log
b) Ex marking
c) Number of certificate
d) Ambient temperature range

National Supervision and Inspection Center
for Explosion Protection and Safety of Instrumentation
Dec. 20th, 2012

KROHNE product overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Ultrasonic flowmeters
- Mass flowmeters
- Vortex flowmeters
- Flow controllers
- Level meters
- Temperature meters
- Pressure meters
- Analysis products
- Products and systems for the oil & gas industry
- Measuring systems for the marine industry

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