



## H250 M40 Supplementary Instructions

Equipment protection level Gb and Db  
in protection type intrinsic safety "i"



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## 1.1 General notes

This additional instruction applies to explosion-protected versions of variable area flowmeter with electrical built-ins with protection type intrinsic safety "i", equipment protection level (EPL) Gb and Db.

It completes the standard manual for the non explosion-protected versions.

The information given in this instruction contains only the data relevant to explosion protection. The technical details given in the manual for the non explosion-protected versions remain unchanged unless they will be excluded or replaced by this supplementary instruction.

## 1.2 EU conformity

The manufacturer declares with the EU declaration of conformity, in which the applied standard (EN IEC 60079-0:2018 and EN 60079-11:2012) is also specified, on his own responsibility conformity with the protection goals of directive 2014/34/EU for use in hazardous areas with gas and dust.

The EU declaration of conformity for the equipment category II 2 G and II 2 D is based on the EC type examination certificate of the Physikalisch Technische Bundesanstalt (PTB):

**PTB 11 ATEX 2012 X**

The "X" after the certificate number refers to special conditions for safe use of the device, which have been listed in these instructions.

If needed the EC type examination certificate can be downloaded from the manufacturer's website.

## 1.3 Approval according to the IECEx scheme

Conformity of the variable area flowmeter for use in hazardous areas was tested in accordance with the "IECEx Certification Scheme for Explosive Atmospheres" according to IEC 60079-0:2017 and IEC 60079-11:2011.

The number of the IEC certificate is:

**IECEx PTB 11.0069 X**

The "X" after the certificate number refers to special conditions for safe use of the device, which have been listed in these instructions.

If needed, the IEC certificate can be downloaded from the manufacturer's website.

## 1.4 Safety instructions

If these instructions are not followed, there is a risk of explosion.

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



**CAUTION!**

*The operator or his agent is responsible for observing any additional standards, directives or laws if required due to operating conditions or place of installation.*

*This applies in particular to the use of easily detachable process connections when measuring flammable media.*



**CAUTION!**

*When an equipment fault is detected the device shall be de-energised and send back to the manufacturer for repair.*

## 2.1 Device description

Variable area flowmeters measure and display the volume flow of flammable and non-flammable gases and liquids. Depending on the device version, electrical limit switch contacts and a 4...20 mA signal output with HART® communication, a Foundation Fieldbus interface or a Profibus PA interface can be installed in the indication unit.

## 2.2 Description code

The safety description code consists of the following elements \*:

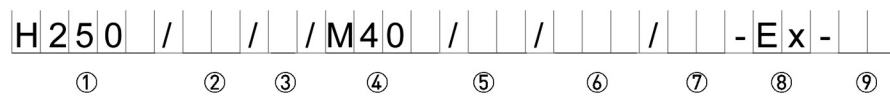


Figure 2-1: Safety description code

- ① **Type series of measuring unit H250**  
 H250 - standard version, vertical upwards  
 H250H - horizontal orientation  
 H250U - vertical downwards
- ② **Measuring unit materials / versions**  
 RR - stainless steel  
 C - PTFE or PTFE/ceramics  
 HC - Hastelloy C  
 Ti - Titanium  
 F - Food
- ③ **Heating jacket version**  
 blank - without heating jacket  
 B - with heating jacket
- ④ **Signal converter version**  
 M40 - aluminium housing, painted (standard)  
 M40S - aluminium housing with increased corrosion protection  
 M40R - stainless steel housing
- ⑤ **High-temperature version**  
 blank - without HT extension  
 HT - with HT extension
- ⑥ **Electrical signal output**  
 blank - without transmitter  
 ESK - electrical signal output 4...20 mA (ESK4)  
 ... - optionally available with counter, I/O module and display (ESK4-T) or  
 ... - Foundation Fieldbus (ESK4-FF) or  
 ... - Profibus PA (ESK4-PA)
- ⑦ **Limit switch**  
 blank - without limit switches  
 K1 - one limit switch  
 K2 - two limit switches  
 R1 - 1 Reed switch  
 R2 - 2 Reed switches
- ⑧ **Version**  
 Ex - explosion-protected version
- ⑨ **SIL version**  
 SE - SIL compliant electronic signal output  
 SK - SIL compliant limit switch

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

## 2.3 Marking

The marking of the entire device is clearly visible on the indication unit, in accordance with the description code.

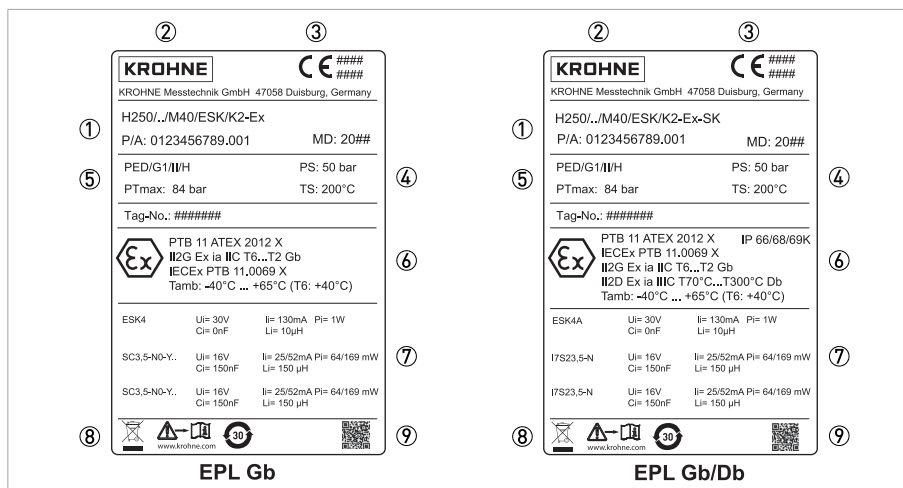


Figure 2-2: Example of a nameplate

- ① Device version
- ② Manufacturer
- ③ Identification number of the notified body ATEX & PED
- ④ Rating data: temperature & pressure rating
- ⑤ Data according to the pressure equipment directive
- ⑥ Marking according to the notified body
- ⑦ Electrical connection data
- ⑧ Note to observe the documentation and for disposal
- ⑨ Data matrix

### 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:

The standard atmospheric conditions under which it may be assumed that Ex equipment can be operated are:

- Temperature: -20...+60°C / -4...+140°F
- Pressure: 80...110 kPa (0.8...1.1 bar) / 11.6...15.9 psi
- Air with normal oxygen content, typically 21%v/v

Ex equipment operating outside the standard temperature range must be tested and certified (e.g. for ambient temperature range -40...+65°C / -40...+149°F).

Ex equipment operating outside the standard atmospheric pressure range and standard oxygen content is not permitted.

### Operating conditions:

The measuring unit of variable area flowmeters operate outside the standard atmospheric pressure range, which means that explosion protection, regardless of the zone assignment, is fundamentally not applicable for the measuring unit (piping).



#### **WARNING!**

*Operation with flammable products is only permitted as long as no explosive fuel/air mixture builds up inside of the piping at the same time the atmospheric conditions are exceeded.*

*The operator is responsible to ensure that the flowmeter is operated safely in terms of 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 piping.*

*When using the device version H250/C... (PTFE version, non-conductive) the minimum conductivity of the media must be  $10^{-8}$  S/m, in order to avoid danger from electrostatic charge.*

## 2.5 Equipment protection level

Variable area flowmeters are designed according to IEC 60079-0 and IEC 60079-11 in equipment protection level (EPL) Gb for use in zone 1 and zone 2.

Depending on the device version, variable area flowmeters are also designed in equipment protection level (EPL) Db for use in zone 21 and zone 22.

The inside of the measuring unit is also approved for zone 1.



### **INFORMATION!**

*Definition of zone 1:*

*An area in which an explosive atmosphere, as a result of the mixture of flammable substances in the form of gas, steam or mist with air, under normal operation may occasionally occur.*

*Definition of zone 21:*

*An area in which an explosive atmosphere may occasionally occur in the form of a cloud of flammable dust in the air under normal operation.*



## 2.6 Types of protection

The variable area flowmeter is designed with protection type intrinsic safety "i" according to IEC 60079-11.

The identification for equipment category II 2 G or the equipment protection level (EPL) Gb is:

**II 2G** (ATEX only)  
**Ex ia IIC T6...T2 Gb**

The marking contains the following information:

<b>II</b>	Explosion protection, group II
<b>2</b>	Equipment category 2
<b>G</b>	Gas explosion protection
<b>Ex ia</b>	Explosion protection through intrinsic safety, protection level "ia"
<b>IIC</b>	Gas group, suitable for gas groups IIC, IIB and IIA
<b>T6...T2</b>	Temperature class range, suitable for temperature classes T6...T1
<b>Gb</b>	EPL, suitable for zone 1 and zone 2

Table 2-1: Description of the marking



**INFORMATION!**

*The temperature class of the device depends on the product temperature.*



**INFORMATION!**

*For the equipment category II 2 G or EPL Gb, connection to an intrinsically safe circuit with protection level "ib" is required.*

*When connecting the variable area flowmeter to an intrinsically safe circuit with protection level "ia", a higher protection level is given.*

The additional identification of the version for the equipment category II 2 D or the equipment protection level (EPL) Db is:

**II 2D (ATEX only)**  
**Ex ia IIIC T70°C...T300°C Db**

The marking contains the following information:

<b>II</b>	Explosion protection, group II
<b>2</b>	Equipment category 2
<b>D</b>	Dust ignition protection
<b>Ex ia</b>	Explosion protection through intrinsic safety, protection level "ia"
<b>IIIC</b>	Dust group, suitable for groups IIIC, IIIB and IIIA
<b>T70°C...T300°C</b>	Surface temperature range at 65°C ambient temperature
<b>Db</b>	EPL, suitable for zone 21 and zone 22

Table 2-2: Description of the marking



**INFORMATION!**

*The highest surface temperature of the device depends on the product temperature.*



**INFORMATION!**

*For the equipment category II 2 D or EPL Db, connection to an intrinsically safe circuit with protection level "ib" is required.*

*When connecting the variable area flowmeter to an intrinsically safe circuit with protection level "ia", a higher protection level is given.*

## 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:**

- Built-in equipment
- Maximum values  $I_i$  and  $P_i$  for K1, K2
- Ambient temperature  $T_{amb}$
- Product temperature  $T_m$
- Nominal size DN
- Standard or high temperature version (HT)
- Standard or heating jacket version
- Heat resistance of the connecting cable

When using more than one 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 manufacturer's installation instructions.*
- *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.  
For this purpose, the variant with a projecting indicator (HT version) is preferable.*
- *For device versions with a heating jacket the temperature of the heating medium does not exceed the maximum permissible product temperature.*

For certain device versions, lower values apply due to differing boundary conditions (e.g. liner materials). In this regard, pay special attention to the pressure and temperature indications on the device nameplate.

## Using a heat-resistant connecting cable

Heating jacket			$T_m$ ①		
without	with	HT version	$T_{amb} \leq 40$	$T_{amb} \leq 60$	$T_{amb} \leq 65$
DN15, DN25, DN50	DN15, DN25		220	105	75
		x	-	175	95
DN80, DN100	DN50, DN80		165	90	75
		x	-	155	90

Table 2-3: Temperature table in °C

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 90°C is required.

Heating jacket			$T_m$ ①		
without	with	HT version	$T_{amb} \leq 104$	$T_{amb} \leq 140$	$T_{amb} \leq 149$
DN15, DN25, DN50	DN15, DN25		428	221	167
		x	-	347	203
DN80, DN100	DN50, DN80		329	194	167
		x	-	311	194

Table 2-4: Temperature table in °F

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 194°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  
 $T_{amb} = -40...+65^{\circ}\text{C} / -40...+149^{\circ}\text{F}$  or  $T_{amb} = -25...+65^{\circ}\text{C} / -13...+149^{\circ}\text{F}$ .
- The minimum product temperature is  $-40^{\circ}\text{C} / -40^{\circ}\text{F}$ .  
Lower product temperatures are possible, provided they do not fall below the permitted temperature of the indicator (see reference point observation).

				Maximum permissible product temperature T <sub>m</sub> [°C]										
Heating jacket			TK ▶	T6	T5		T4		T3			T2, T1		
without	with	HT version	T <sub>amb</sub> [°C] ▶	≤ 40	≤ 60	≤ 65	≤ 60	≤ 65	≤ 40	≤ 60	≤ 65	≤ 40	≤ 60	≤ 65
ESK4														
DN15 DN25 DN50	DN15 DN25	x		85	100	90	135	135	200	160	140	235	160	140
				85	100	100	135	135	200	200	200	300	300	270
DN80 DN100	DN50 DN80	x		85	100	85	135	130	200	150	130	220	150	130
				85	100	100	135	135	200	200	200	300	300	255
ESK4-T														
DN15 DN25 DN50	DN15 DN25	x		85	90	70	135	120	200	140	120	220	140	120
				85	100	85	135	135	200	200	200	300	290	225
DN80 DN100	DN50 DN80	x		85	85	70	130	115	200	130	115	200	130	115
				85	100	80	135	135	200	200	200	300	270	215
ESK4-FF / ESK4-PA														
DN15 DN25 DN50	DN15 DN25	x		70	60	not adm.	135	125	200	150	125	235	150	125
				85	60		135	135	200	200	200	300	300	240
DN80 DN100	DN50 DN80	x	65	60	135		120	200	140	120	220	140	120	
			85	60	135	135	200	200	200	300	300	225		
K1/K2 - 64 mW														
DN15 DN25 DN50	DN15 DN25	x		85	100	100	135	135	200	200	180	290	205	180
				85	100	100	135	135	200	200	200	300	300	300
DN80 DN100	DN50 DN80	x		85	100	100	135	135	200	185	170	260	185	170
				85	100	100	135	135	200	200	200	300	300	300
K1/K2 (I7S23,5-N / SC3,5-N0-Y) - 169 mW														
DN15 DN25 DN50	DN15 DN25	x		not adm.			105	80	200	105	80	210	105	80
							135	115	200	200	115	300	200	115
DN80 DN100	DN50 DN80	x	105				80	195	105	80	195	105	80	
			135	110	200	190	110	300	190	110				
K1/K2 (SJ3,5-SN or SJ3,5-S1N) - 169 mW														
DN15 DN25 DN50	DN15 DN25	x		not adm.			135	135	200	195	170	295	195	170
							135	135	200	200	200	300	300	300
DN80 DN100	DN50 DN80	x	135				135	200	180	160	275	180	160	
			135	135	200	200	200	300	300	300				
R1/R2 (Reed SPST)														
DN15 DN25 DN50	DN15 DN25	x		85	100	100	135	135	200	200	150	300	235	150
DN80 DN100	DN50 DN80	x		85	100	100	135	135	200	200	145	300	220	145

Table 2-5: Maximum permissible product temperature in °C

				Maximum permissible product temperature T <sub>m</sub> [°F]										
Heating jacket			TK ▶	T6	T5		T4		T3			T2, T1		
without	with	HT version	T <sub>amb</sub> [°F] ▶	≤ 104	≤ 140	≤ 149	≤ 140	≤ 149	≤ 104	≤ 140	≤ 149	≤ 104	≤ 140	≤ 149
ESK4														
DN15 DN25 DN50	DN15 DN25	x		185	212	194	275	275	392	320	284	455	320	284
				185	212	212	275	275	392	392	392	572	572	518
DN80 DN100	DN50 DN80	x		185	212	185	275	266	392	302	266	428	302	266
				185	212	212	275	275	392	392	392	572	572	491
ESK4-T														
DN15 DN25 DN50	DN15 DN25	x		185	194	158	275	248	392	284	248	428	284	248
				185	212	185	275	275	392	392	392	572	554	437
DN80 DN100	DN50 DN80	x		185	185	158	266	239	392	266	239	392	266	239
				185	212	176	275	275	392	392	392	572	518	419
ESK4-FF / ESK4-PA														
DN15 DN25 DN50	DN15 DN25	x		158	140	not adm.	275	257	392	302	257	455	302	257
				185	140		275	275	392	392	392	572	572	464
DN80 DN100	DN50 DN80	x		149	140		275	248	392	284	248	428	284	248
				185	140		275	275	392	392	392	572	572	437
K1/K2 - 64 mW														
DN15 DN25 DN50	DN15 DN25	x		185	212	212	275	275	392	392	356	554	401	356
				185	212	212	275	275	392	392	392	572	572	572
DN80 DN100	DN50 DN80	x		185	212	212	275	275	392	365	338	500	365	338
				185	212	212	275	275	392	392	392	572	572	572
K1/K2 (I7S23,5-N / SC3,5-N0-Y) - 169 mW														
DN15 DN25 DN50	DN15 DN25	x		not adm.			221	176	392	221	176	410	221	176
							275	239	392	392	239	572	392	239
DN80 DN100	DN50 DN80	x					221	176	383	221	176	383	221	176
							275	230	392	374	230	572	374	230
K1/K2 (SJ3,5-SN or SJ3,5-S1N) - 169 mW														
DN15 DN25 DN50	DN15 DN25	x		not adm.			275	275	392	383	338	563	383	338
							275	275	392	392	392	572	572	572
DN80 DN100	DN50 DN80	x					275	275	392	356	320	527	356	320
							275	275	392	392	392	572	572	572
R1/R2 (Reed SPST)														
DN15 DN25 DN50	DN15 DN25	x		185	212	212	275	275	392	392	305	572	460	305
DN80 DN100	DN50 DN80	x		185	212	212	275	275	392	392	295	572	435	295

Table 2-6: Maximum permissible product temperature in °F

				Maximum permissible product temperature T <sub>m</sub> [°C]				
Heating jacket			TK ▶	T6	T5		T4...T1	
without	with	HT version	T <sub>amb</sub> [°C] ▶	≤ 40	≤ 60	≤ 65	≤ 60	≤ 65
DN15...DN100	DN15...DN80	with / without						
ESK4 / ESK4-T				40	65	65	65	65
ESK4-FF / ESK4-PA				40	60	not adm.	65	65
K1/K2 - 64 mW / R1/R2				40	65	65	65	65
K1/K2 (I7S23,5-N / SC3,5-N0-Y) - 169 mW				not adm.	not adm.		65	65
K1/K2 (SJ3,5-SN bzw. SJ3,5-S1N) - 169 mW				not adm.	not adm.		65	65

Table 2-7: Maximum permissible product temperatures for painted measuring units in °C

				Maximum permissible product temperature T <sub>m</sub> [°F]				
Heating jacket			TK ▶	T6	T5		T4...T1	
without	with	HT version	T <sub>amb</sub> [°F] ▶	≤ 104	≤ 140	≤ 149	≤ 140	≤ 149
DN15...DN100	DN15...DN80	with / without						
ESK4 / ESK4-T				104	149	149	149	149
ESK4-FF / ESK4-PA				104	140	not adm.	149	149
K1/K2 - 64 mW / R1/R2				104	149	149	149	149
K1/K2 (I7S23,5-N / SC3,5-N0-Y) - 169 mW				not adm.	not adm.		149	149
K1/K2 (SJ3,5-SN bzw. SJ3,5-S1N) - 169 mW				not adm.	not adm.		149	149

Table 2-8: Maximum permissible product temperatures for painted measuring units in °F

### Reference point observation

The permissible product and ambient temperatures may be exceeded or undershot as long as the permissible temperature range of the reference point of the display is not exceeded. The following table contains the permissible maximum values at the reference point.

Note:

- Reference point is the connection of the equipotential bonding conductor of the M40 indicator.
- The temperatures at the reference point are to be determined in the most unfavourable operating situation.
- The required measuring uncertainty is max. 2 K.
- Measuring conditions and results are to be permanently recorded in a suitable format.
- The measuring unit should be insulated properly.
- At temperatures above 70°C / 158°F, a heat-resistant cable must be used.

Design of indicator	Component	Limit switch P <sub>i</sub> [mW]	Permissible temperatures at reference point T <sub>Ref</sub> [°C] according to temperature class			
			TK ▶	T6	T5	T4...T1
M40./../K.	SC3,5-NO-Y	64		-20...+65	-20...+80	-20...+90
		169		-20...+37	-20...+52	-20...+72
	SJ3,5-SN	64		-40...+66	-40...+81	-40...+90
		169		-40...+42	-40...+57	-40...+86
	SJ3,5-S1N	64		-20...+66	-20...+81	-20...+90
		169		-20...+42	-20...+57	-20...+86
	I7S23,5-N	64		-40...+70	-40...+85	-40...+90
		169		-40...+52	-40...+67	-40...+90
M40./../R.	Reed SPST	1000		-40...+65	-40...+65	-40...+65
M40./../ESK/K.	SC3,5-NO-Y	64		-20...+55	-20...+70	-20...+80
		169		-20...+33	-20...+48	-20...+68
	SJ3,5-SN	64		-40...+55	-40...+70	-40...+80
		169		-40...+38	-40...+53	-40...+80
	SJ3,5-S1N	64		-20...+55	-20...+70	-20...+80
		169		-20...+38	-20...+53	-20...+80
	I7S23,5-N	64		-40...+55	-40...+70	-40...+80
		169		-40...+48	-40...+63	-40...+80
M40./../ESK/R.	Reed SPST	1000		-40...+55	-40...+65	-40...+65
M40./../ESK/...	ESK4A			-40...+55	-40...+70	-40...+80
	ESK4-T			-40...+52	-40...+67	-40...+77
	ESK4-FF			-40...+36	-40...+51	-40...+76
	ESK4-PA					

Table 2-9: Permissible temperatures at reference point of indicator in °C



Design of indicator	Component	Limit switch P <sub>i</sub> [mW]	Permissible temperatures at reference point T <sub>Ref</sub> [°F] according to temperature class			
			TK ▶	T6	T5	T4...T1
M40./../K.	SC3,5-NO-Y	64		-4...+149	-4...+176	-4...+194
		169		-4...+99	-4...+126	-4...+162
	SJ3,5-SN	64		-40...+151	-40...+178	-40...+194
		169		-40...+108	-40...+135	-40...+187
	SJ3,5-S1N	64		-4...+151	-4...+178	-4...+194
		169		-4...+108	-4...+135	-4...+187
	I7S23,5-N	64		-40...+158	-40...+185	-40...+194
		169		-40...+126	-40...+153	-40...+194
M40./../R.	Reed SPST	1000		-40...+149	-40...+149	-40...+149
M40./../ESK/K.	SC3,5-NO-Y	64		-4...+131	-4...+158	-4...+176
		169		-4...+91	-4...+118	-4...+154
	SJ3,5-SN	64		-40...+131	-40...+158	-40...+176
		169		-40...+100	-40...+127	-40...+176
	SJ3,5-S1N	64		-4...+131	-4...+158	-4...+176
		169		-4...+100	-4...+127	-4...+176
	I7S23,5-N	64		-40...+131	-40...+158	-40...+176
		169		-40...+118	-40...+145	-40...+176
M40./../ESK/R.	Reed SPST	1000		-40...+131	-40...+149	-40...+149
M40./../ESK/...	ESK4A			-40...+131	-40...+158	-40...+176
	ESK4-T			-40...+126	-40...+153	-40...+171
	ESK4-FF			-40...+97	-40...+124	-40...+169
	ESK4-PA					

Table 2-10: Permissible temperatures at reference point of indicator in °F

## 2.8 Surface temperature for equipment protection level Db

For use in areas with combustible dust it should be noted that the indicated maximum surface temperature of T70°C at an ambient temperature of 65°C / 149°F and a product temperature of 70°C / 158°F is valid without a dust layer.

For higher product temperatures the maximum surface temperature is defined by the product.

## 2.9 Electrical data

Electrical equipment	Nominal voltage	Nominal current
Limit switch K1 / K2	8 VDC	$\leq 1 / \geq 3$ mA per switch
Reed switches R1 / R2	3...24 VDC	0.1 ... 100 mA
Signal output ESK4	14...30 VDC	4...20 mA with HART® communication
Switching output ESK4-T, OC output	<30 VDC	1...100 mA per circuit
Switching output ESK4-T, NAMUR output	8 VDC	$\leq 1 / \geq 3$ mA per circuit
Signal input ESK4-T, input	<30 VDC	$\leq 2$ mA
ESK4-FF Foundation Fieldbus transmitter ①	9...24 VDC	16 mA
ESK4-PA Profibus transmitter ②	9...24 VDC	16 mA

Table 2-11: Electrical data

① Further information and instructions for operation of the ESK4-FF transmitter are provided in separate supplementary instructions.

② Further information and instructions for operation of the ESK4-PA Profibus transmitter are provided in separate supplementary instructions.

Built-in equipment for the variable area flowmeter may only be connected to separate intrinsically safe circuits with the following maximum values:

Built-in equipment	Maximum values				
	$U_i$ [V]	$I_i$ [mA]	$P_i$ [mW]	$C_i$ [nF]	$L_i$ [ $\mu$ H]
ESK4	30	130	1000	~ 0	10
ESK4-T (I/O module)	30	130	1000	10	~ 0
ESK4-PA / ESK4 FF ①	24	380	5320	~ 0	~ 0
I7S23,5-N / SC3,5-N0	16	25	64	150	150
	16	52	169	150	150
SJ3,5-SN / SJ3,5-S1N	16	25	64	30	100
	16	52	169	30	100
Reed SPST	30	100	1000	~ 0	~ 0

Table 2-12: Maximum intrinsic safety values for built-in equipment

① FISCO field device



### **WARNING!**

*Also, when operating the variable area flowmeter outside of the hazardous area, the connection must be made to intrinsically safe circuits.*

*When connecting to non-intrinsically safe circuits, there is a risk of damage to the safety-defining components.*

### 3.1 Mounting

Mounting and setup must be carried out according to the applicable installation standards by qualified personnel trained in explosion protection. The information given in the manual and the supplementary 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 necessary visual inspections and can be viewed from all sides.
- the nameplate is clearly visible.
- it can be operated from a location with secure footing.

**Take special note of the installation position for the H250/H/... with horizontal flow direction:**

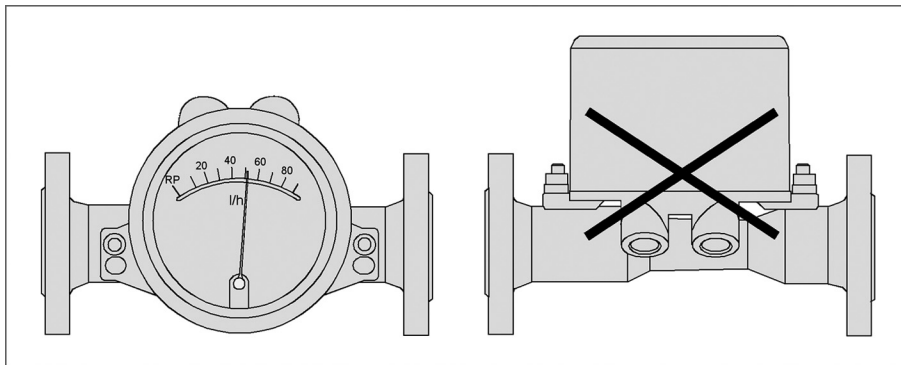


Figure 3-1: Installation position for the H250/H/... with horizontal flow direction

In order to comply with thermal parameters and measuring accuracy, flowmeters for horizontal installation are to be installed in the pipeline so that the indicator is located on the side of the measuring tube. The maximum product and ambient temperatures indicated as well as the measuring accuracy are based on lateral installation of the indicator.



**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.*



**DANGER!**

**Components made of titanium in oxygen applications**

*Variable area flowmeters with titanium components are **NOT** suitable for use in explosion-protected areas in conjunction with oxygen applications (products with an oxygen content which is significantly above the oxygen content in the earth's atmosphere)!*

## 3.2 Special conditions

### Equipotential bonding

Connect the connection parts for the equipotential bonding of the H250 measuring unit and the M40 indicator to the equipotential bonding system of the hazardous area.



#### **INFORMATION!**

*The ground terminal on the gate of the cable entry of the display guarantees an electrostatic connection of the device and complies with the requirements of an equipotential bonding connection.*

### Wetted parts made of titanium

When dealing with device versions with wetted parts made of titanium (TI option), use the protected installation to prevent sparking due to external impact and friction between titanium and other materials.

### Flammable products

In case of operation with flammable products the measuring units must be included in the periodic tests of the pipelines and fittings.

### IP protection

Use the cable entries and blind plugs supplied or similar types to guarantee an adequate IP protection class. Unused cable entries are to be closed.

### Electrostatics

To minimise danger due to electrostatic discharge, the variable area flowmeters type H250/M40...-Ex and indicators type M40...-Ex may not be used in areas in which there are processes that generate strong charges.

Observe additional information regarding electrostatics.

For further information refer to *Electrostatic charge* on page 23.

### Thermal data

Observe the maximum ambient and product temperatures. For further information refer to *Ambient temperature / temperature classes* on page 11.

## 4.1 General notes

The built-in equipment is connected electrically in the indication unit. The circuits are designed in protection type "intrinsically safe" and galvanically isolated from ground (test voltage  $\geq 500 V_{\text{eff}}$ ).

The connecting cables should be selected according to the applicable installation standards and the maximum operating temperature. Ensure that no residual current can form between separate intrinsically safe signal circuits.

- The connecting cables must be fixed and laid so they are sufficiently protected against damage.
- Not used cores must be securely connected to the earth potential of the hazardous area or carefully insulated against each other and against earth (test voltage  $\geq 500 V_{\text{eff}}$ ).
- Lay cables so as to ensure that there is sufficient distance between surfaces of the measuring unit and the connecting cable.
- Supplied blind plugs / cable entries guarantee protection against foreign objects and water (ingress protection) IP66/68.
- The outer diameter of the connecting cable must be within the sealing range of the cable entry (8...13 mm / 0.31...0.51").
- Unused cable entries are to be closed in accordance with IEC 60079-1 and/or IEC 60079-31 (>IP66/68).

Ensure that the gaskets and incised gasket ring are tight.

## 4.2 Power supply

The variable area flowmeter does not require a separate power supply.

The required supply for the built-in electronics is provided via the 4...20 mA current output or the bus connection.

## 4.3 Inputs / outputs

The terminal assignment of the built-in electrical equipment is described in the manual.

The signal circuits of the variable area flowmeters may only be connected to certified intrinsically safe slave units or circuits.

For more information refer to chapter "Electrical data".

## 4.4 Grounding and equipotential bonding

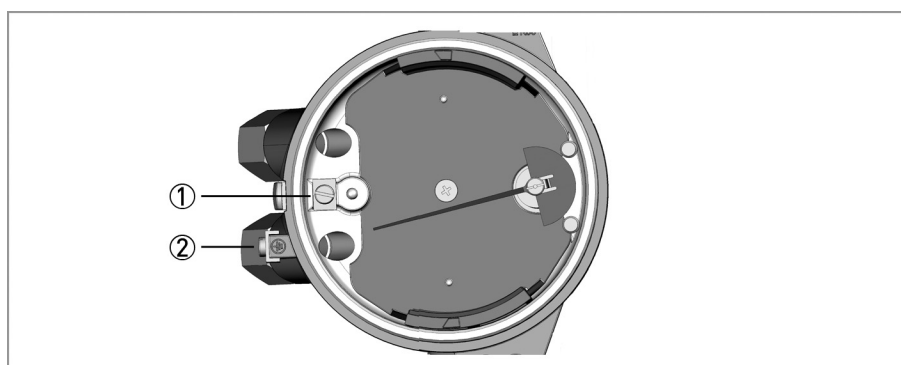
The signal converter shall be connected to the equipotential bonding system of the hazardous area via the internal or external grounding connection on the signal converter housing.

The measuring unit and the signal converter are electrically connected via an equipotential bonding connection.

Any existing cable shields should be connected to ground according to applicable installation regulations. A terminal in the terminal compartment permits a short way grounding of the cable shields.

Alternatively, the equipotential bonding of the signal converter can also take place by way of the measuring tube incorporated into the equipotential bonding of the hazardous area.

The measuring tube can be incorporated into the equipotential bonding system of the hazardous area using the U-clamp mounted on the flange if present, or suitable conductive connections (gaskets, etc.).



**Figure 4-1: Grounding connections**

- ① Grounding connection on the indicator
- ② Outer grounding connection

## 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 operator of the system has to check prior to start-up, if the start-up was in compliance with the national regulations for checks.

## 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.

Adjusting the limit switch and operating the indicator during operation is permitted. To do so, remove the housing cover. Close the housing cover immediately after adjusting the limit switches or the operation of the indicator.

For more information refer to chapter "Dismantling".



**WARNING!**

*Ignition risks caused by pressure surges, impact or friction must particularly be avoided when titanium measuring units are used.*

## 5.3 Electrostatic charge

**In order to avoid ignition hazards due to electrostatic charge, variable area flowmeters may not be used in areas with:**

- processes that generate strong charges,
- mechanical friction and cutting processes,
- spraying of electrons (e.g. in the vicinity of electrostatic painting systems) or
- pneumatically conveyed dust is exposed.



**WARNING!**

*Electrostatic charging of the housing surface by friction must be avoided. The devices must not be dry cleaned.*

## 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:

- Check the housing, the cable entries and the feed lines for corrosion or damage.
- Check the measuring unit and the piping connections for leakage.
- Check the measuring unit and the indicator for dust deposits.
- Include the flowmeter in the periodic pressure test of the process line.

## 6.2 Dismantling

### Exchanging the built-in equipment

Due to the modular design of the variable area flowmeters, from a safety perspective, the electrical equipment built into the indicator can be replaced with identical spare parts.

To do so, remove the housing cover. Close the housing cover immediately after the spare parts are exchanged. Ensure that the cover seal is tight.



#### **CAUTION!**

*There may be a risk of losing measuring accuracy!*

### Exchanging the entire device

The dismantling and installation is within the responsibility of the operator.

Before disconnecting the electric connecting cable of the device, make sure that all cables leading to the indication unit are isolated from the ground of the hazardous area. This also applies to functional earth conductors (FE) and equipotential bonding conductors (PA).



#### **WARNING!**

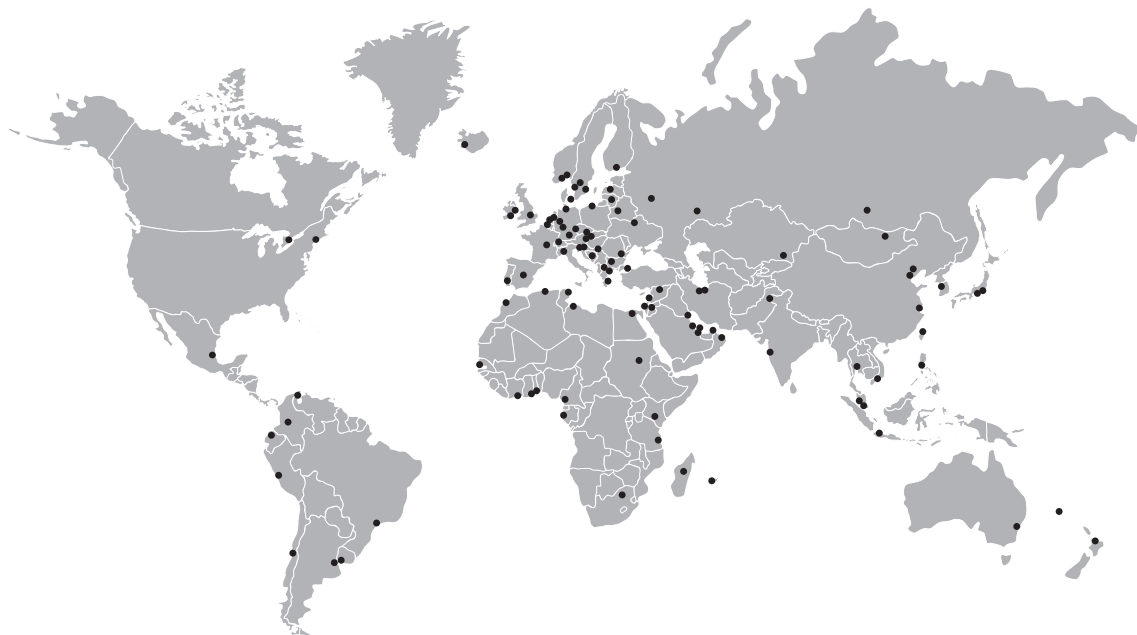
- *Pressurised pipes have to be depressurised before removing the measuring unit.*
- *In the case of environmentally critical or hazardous products, appropriate safety precautions must be taken with regard to residual liquids in the measuring unit.*
- *New gaskets have to be used when re-installing the device in the pipeline.*











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