제12-538호

안 전 인 증 서

Krohne Ltd.

Rutheford Drive, Park Farm Industrial Estate, Wellingborough, Northants NN8 6AE, United Kingdom

위 사업장에서 제조하는 아래의 품목이 「산업안전보건법」 제34조 및 같은 법 시행규칙 제58조의4제4항에 따른 안전인증 심사 결과 안전·보건기준에 적합하므로 안전인증표시의 사용을 인증합니다.

품 목

Mass Flow Meter

형식 · 모델 / 용량 · 등급 / 인증번호

형식·모델	용량 · 등급	인증번호
Type OPTIMASS x300xC and OPTIGAS 5300C	첨부 인증조건(12-0538) 참조	12-GA4BO-0538X
	Ex d e [ia/ib] IIC T6/T4...T1 Ex tD [ia] IIIC T***℃	

인 증 기 준

방호장치 의무안전인증 고시(고용노동부고시 제2010-36호)

인 증 조 건

첨부 인증조건 (12-0538) 참조

2012 년 9 월 5 일

한국가스안전공사 사장

인 증 조 건

1. 제조공장:

Rutheford Drive, Park Farm industrial Estate, Wellingborough, Northants NN8 6AE, United Kingdom에 위치한 Krohne Ltd. 공장에서 생산한 제품 중 아래 인증범위의 제품에 한함.

2. 제품개요

The flow meters of type series OPTIMASS 1300C, 1300C T6, 2300C, 3300C, 7300C, 8300C, 8300kC and OPTIGAS 5300C are used for the direct determination and display of the mass flow rate of flammable and non-flammable liquids and gases. They consist of the separately certified components, sensor unit and measuring transducer, which are mounted to each other to form a compact device. All connections between the sensor unit and the measuring transducer are internal connections and comply with type of protection Intrinsic Safety. The enclosure for the measuring transducer complies with type of protection Flameproof Enclosure. The flow meters are designed as associated apparatus and may be installed in the hazardous area.

3. 인증범위: 본 인증서는 아래의 형식번호에 한하여 유효함

품목 명 Mass Flow Meter, 모델 명 Type OPTIMASS x300xC and OPTIGAS 5300C에 한하여 인증함. 첨부 인증조건(12-0538) 참조.

4. 안전한 사용을 위한 조건

1) The measuring sensors of type series OPTIMASS 1300C, 1300C T6, 2300C, 3300C, 7300C, 8300C, 8300kC and OPTIGAS 5300C shall be included in the equipotential bonding system of the hazardous area.
2) Opening the enclosure inside the hazardous area is only permissible in a de-energized state and with keeping a subsequent waiting time (warning label !)
   This waiting time is :
   35 minutes for temperature class T6 and 10 minutes for temperature class T5
   The waiting time may be omitted for temperature classes T4 ... T1.
3) Only certified cable glands may be applied as cable entries. Non-used openings shall be sealed by means of certified blind plugs.
4) The connecting cables shall be installed as fixed wiring and in such a way that they are sufficiently protected against damage.
5) For relationship between maximum permissible ambient temperature, maximum medium temperature, maximum surface temperature and temperature class for the individual type series and enclosure materials, reference is made to the tables given in the operating instruction manual or the tables given above respectively.

5. 인증(변경)사항

6. 그 밖의 사항

안전인증품의 품질관리, 확인심사 수검, 변경사항 신고 등 인증 받은 자의 의무 준수

[첨 부]

인 증 조 건(12-0538)

OPTIMASS 1300C with transducer enclosure made of aluminium

Non-insulated / heated variants

ambient temperature, up to Tamb	temperature class	max. medium temperature, up to T_M	max. surface temperature
50 ℃	T4	70 ℃	T130℃
	T3 - T1	130 ℃	T185℃
60 ℃	T4 - T1	60 ℃	T125℃
65 ℃ (*)	T4 - T1	65 ℃	T130℃

(*) for the variants listed in the operating instructions

Insulated / heated variants

ambient temperature, up to Tamb	temperature class	max. medium temperature, up to T_M	max. surface temperature
40 ℃	T4	65 ℃	T130℃
	T3 - T1	130 ℃	T195℃
50 ℃	T4	65 ℃	T130℃
	T3 - T1	100 ℃	T165℃
60 ℃	T4 - T1	60 ℃	T125℃
65 ℃ (*)	T3 - T1	65 ℃	T130℃

(*) for the variants listed in the operating instructions

OPTIMASS 1300C with transducer enclosure made of stainless steel

Non-insulated / heated variants

ambient temperature, up to Tamb	temperature class	max. medium temperature, up to T_M	max. surface temperature
50 ℃	T4	70 ℃	T130℃
	T3 - T1	130 ℃	T185℃
55 ℃	T4 - T1	55 ℃	T120℃

Insulated / heated variants

ambient temperature, up to Tamb	temperature class	max. medium temperature, up to T_M	max. surface temperature
40 ℃	T4	65 ℃	T130℃
	T3 - T1	120 ℃	T185℃
50 ℃	T4	65 ℃	T130℃
	T3 - T1	75 ℃	T140℃
55 ℃	T4 - T1	55 ℃	T120℃

인 증 조 건(12-0538)

OPTIMASS 1300C T6 with transducer enclosure made of aluminium

Non-insulated / heated variants

ambient temperature, up to Tamb	temperature class	max. medium temperature, up to TM	max. surface temperature
40 ℃	T6	45 ℃	T80℃
	T5	60 ℃	T95℃
	T4	100 ℃	T130℃
	T3 - T1	130 ℃	T155℃
50 ℃	T5	60 ℃	T95℃
	T4	100 ℃	T130℃
	T3 - T1	130 ℃	T160℃
60 ℃	T4 - T1	60 ℃	T95℃
65 ℃ (*)	T4 - T1	65 ℃	T100℃

(*) for the variants listed in the operating instructions

Insulated / heated variants

ambient temperature, up to Tamb	temperature class	max. medium temperature, up to TM	max. surface temperature
40 ℃	T6	45 ℃	T80℃
	T5	60 ℃	T95℃
	T4	100 ℃	T130℃
	T3 - T1	130 ℃	T155℃
50 ℃	T5	60 ℃	T95℃
	T4	100 ℃	T130℃
	T3 - T1	130 ℃	T160℃
60 ℃	T4 - T1	60 ℃	T95℃
65 ℃ (*)	T4 - T1	65 ℃	T100℃

(*) for the variants listed in the operating instructions

OPTIMASS 1300C T6 with transducer enclosure made of stainless steel

Non-insulated / heated variants

ambient temperature, up to Tamb	temperature class	max. medium temperature, up to TM	max. surface temperature
40 ℃	T6	45 ℃	T80℃
	T5	60 ℃	T95℃
	T4	100 ℃	T130℃
	T3 - T1	130 ℃	T155℃
50 ℃	T5	60 ℃	T95℃
	T4	100 ℃	T130℃
	T3 - T1	130 ℃	T160℃
55 ℃	T4 - T1	55 ℃	T95℃

인 증 조 건(12-0538)

Insulated / heated variants

ambient temperature, up to Tamb	temperature class	max. medium temperature, up to T_M	max. surface temperature
40 ℃	T6	45 ℃	T80℃
	T5	60 ℃	T95℃
	T4	95 ℃	T130℃
	T3 - T1	120 ℃	T155℃
50 ℃	T5	60 ℃	T95℃
	T4 - T1	75 ℃	T110℃
55 ℃	T4 - T1	55 ℃	T130℃

OPTIMASS 2300C with transducer enclosure made of aluminium

all variants

ambient temperature, up to Tamb	temperature class	max. medium temperature, up to T_M	max. surface temperature
40 ℃	T6	50 ℃	T80℃
	T5	65 ℃	T95℃
	T4	100 ℃	T130℃
	T3 - T1	130 ℃	T160℃
50 ℃	T5	65 ℃	T95℃
	T4 - T1	100 ℃	T130℃
60 ℃	T4 - T1	60 ℃	T90℃
65 ℃ (*)	T4 - T1	65 ℃	T95℃

(*) for the variants listed in the operating instructions

OPTIMASS 2300C with transducer enclosure made of stainless steel

all variants

ambient temperature, up to Tamb	temperature class	max. medium temperature, up to T_M	max. surface temperature
40 ℃	T6	50 ℃	T80℃
	T5	65 ℃	T95℃
	T4	100 ℃	T130℃
	T3 - T1	120 ℃	T150℃
50 ℃	T5	65 ℃	T95℃
	T4 - T1	75 ℃	T105℃
55 ℃	T5 - T1	55 ℃	T85℃

인 증 조 건(12-0538)

OPTIMASS 3300C and 7300C with transducer enclosure made of aluminium

Non-insulated / heated variants

ambient temperature, up to Tamb	temperature class	max. medium temperature, up to T_M	max. surface temperature
40 ℃	T6	55 ℃	T80℃
	T5	75 ℃	T95℃
	T4	120 ℃	T130℃
	T3 - T1	150 ℃	T160℃
50 ℃	T5	75 ℃	T95℃
	T4	115 ℃	T130℃
	T3 - T1	150 ℃	T160℃
60 ℃	T4 - T1	60 ℃	T85℃
65 ℃ (*)	T4 - T1	65 ℃	T90℃

(*) for the variants listed in the operating instructions

Insulated / heated variants

ambient temperature, up to Tamb	temperature class	max. medium temperature, up to T_M	max. surface temperature
40 ℃	T6	55 ℃	T80℃
	T5	70 ℃	T95℃
	T4	100 ℃	T125℃
	T3 - T1	145 ℃	T170℃
50 ℃	T5	70 ℃	T95℃
	T4 - T1	100 ℃	T125℃
60 ℃	T4 - T1	60 ℃	T85℃
65 ℃ (*)	T4 - T1	65 ℃	T90℃

(*) for the variants listed in the operating instructions

OPTIMASS 3300C and 7300C with transducer enclosure made of stainless steel

Non-insulated / heated variants

ambient temperature, up to Tamb	temperature class	max. medium temperature, up to T_M	max. surface temperature
40 ℃	T6	55 ℃	T80℃
	T5	75 ℃	T95℃
	T4	120 ℃	T130℃
	T3 - T1	150 ℃	T160℃
50 ℃	T5	75 ℃	T95℃
	T4	115 ℃	T130℃
	T3 - T1	135 ℃	T145℃
55 ℃	T4 - T1	55 ℃	T80℃

인 증 조 건(12-0538)

Insulated / heated variants

ambient temperature, up to Tamb	temperature class	max. medium temperature, up to T_M	max. surface temperature
40 ℃	T6	55 ℃	T80℃
	T5	70 ℃	T95℃
	T4	100 ℃	T125℃
	T3 - T1	145 ℃	T170℃
50 ℃	T5	70 ℃	T95℃
	T4 - T1	75 ℃	T100℃
55 ℃	T4 - T1	55 ℃	T80℃

OPTIMASS 8300C with transducer enclosure made of aluminium

All variants

ambient temperature, up to Tamb	temperature class	max. medium temperature, up to T_M	max. surface temperature
40 ℃	T4	45 ℃	T130℃
	T3	110 ℃	T195℃
	T2 - T1	190 ℃	T275℃
50 ℃	T3	110 ℃	T195℃
	T2 - T1	190 ℃	T275℃
60 ℃	T3 - T1	60 ℃	T145℃
65 ℃ (*)	T4 - T1	65 ℃	T150℃

(*) for the variants listed in the operating instructions

OPTIMASS 8300C with transducer enclosure made of stainless steel

All variants

ambient temperature, up to Tamb	temperature class	max. medium temperature, up to T_M	max. surface temperature
40 ℃	T4	45 ℃	T130℃
	T3	110 ℃	T195℃
	T2 - T1	190 ℃	T275℃
50 ℃	T3	110 ℃	T195℃
	T2 - T1	190 ℃	T275℃
55 ℃	T3 - T1	55 ℃	T140℃

인 증 조 건(12-0538)

OPTIMASS 8300kC with converter housing made of aluminium

with or without heating jacket / insulation

permissible range of the ambient temperature Tamb	temperature class	max. medium temperature, up to T_M	max. surface temperature
-40 ℃ ... +40 ℃	T4	60 ℃	T125℃
	T3	120 ℃	T190℃
	T2 - T1	190 ℃	T265℃
-40 ℃ ... +50 ℃	T3	120 ℃	T190℃
	T2 - T1	190 ℃	T260℃
-40 ℃ ... +55 ℃	T4 - T1	55 ℃	T125℃
-40 ℃ ... +60 ℃ (*)	T4 - T1	60 ℃	T130℃

(*) for the variants listed in the operating instructions

OPTIMASS 8300kC with converter housing made of stainless steel

with or without heating jacket / insulation

permissible range of the ambient temperature Tamb	temperature class	max. medium temperature, up to T_M	max. surface temperature
-40 ℃ ... +40 ℃	T4	60 ℃	T125℃
	T3	120 ℃	T190℃
	T2 - T1	190 ℃	T265℃
-40 ℃ ... +45 ℃	T4	55 ℃	T125℃
	T2 - T1	190 ℃	T260℃
-40 ℃ ... +50 ℃	T4 - T1	50 ℃	T120℃

(*) for the variants listed in the operating instructions

OPTIGAS 8300kC with converter housing made of aluminium or stainless steel
with or without heating jacket / insulation
Cyrogenic applications

permissible range of the ambient temperature Tamb	temperature class	permissible range of the medium temperature T_M	max. surface temperature
-25 ℃ ... +40 ℃	T4 - T1	-195 ℃ ... +60 ℃	T125℃

인 증 조 건(12-0538)

OPTIGAS 5300C with transducer enclosure made of aluminium

ambient temperature, up to Tamb	temperature class	max. medium temperature, up to T_M	max. surface temperature
40 ℃	T4	40 ℃	T130℃
	T3 - T1	93 ℃	T175℃
50 ℃	T3 - T1	93 ℃	T175℃
60 ℃	T3 - T1	60 ℃	T155℃
65 ℃ (*)	T4 - T1	65 ℃	T160℃

(*) for the variants listed in the operating instructions

OPTIGAS 5300C with transducer enclosure made of stainless steel

ambient temperature, up to Tamb	temperature class	max. medium temperature, up to T_M	max. surface temperature
40 ℃	T4	40 ℃	T130℃
	T3 - T1	93 ℃	T175℃
50 ℃	T3 - T1	70 ℃	T160℃
55 ℃	T3 - T1	55 ℃	T150℃

The maximum permissible ambient and medium temperatures for type series OPTIMASS 1300C, 1300C T6, 2300C, 3300C, 7300C, 8300kC of lacquered designs are:

T_{amb} = 40 ℃ T_{medium} = 110 ℃

인 증 조 건(12-0538)

Electrical data

Auxiliary power (non-intricsically safe)

depending on variant (terminals L (L+), N (L-))	U_N = 12 ... 24 V DC, +30 % / -10 %(short-time-25 %), approx. 12 W internal fusing $I_N \leq$ 2 A U_m = 253 V for connection to protective extra low voltage with safe isolation (PELV) or U_N = 24 V AC/DC, +10 % / -15 %, 50/60 Hz, approx. 22 VA/ 12W 24 V DC, +30 % / -25 % internal fusing $I_N \leq$ 2 A U_m = 253 V for connection to protective extra low voltage with safe isolation (PELV) or U_N = 100 ... 230 V AC, +10 % / -15 %, 50/60 Hz, approx. 22 VA 24 V DC, +30 % / -25 % internal fusing $I_N \leq$ 1.6 A

In/Output circuits (non-intrinsically safe)

	Nominal voltage:	$U_N \leq$ 32 V DC U_m = 253 V

Printed circuit board:

Basic IO		
(terminals C, C-	status output, passive	I_{max} = 100 mA
B, B-	status output, passive	I_{max} = 100 mA
	or control input	U_{max} = 32 V
D, D-	pulse output, passive	I_{max} = 100 mA
A, A-, A+)	current output, active/passive	HART
Modular IO		
(terminals C, C-	current output, active/passive	HART
D, D-	status/pulse output, active	I_{max} = 20 mA
	status/pulse output, passive	I_{max} = 100 mA
Modular Carrier + IO Module	(depending on module)	
(terminals B, B-, A, A-)	current output, active/passive	0(4) - 20 mA
	status/puls output, active	I_{max} = 20 mA
	status/pulse output, passive	I_{max} = 100 mA
	control input, active/passive	U_{max} = 32 V
	current input, active/passive	0(4) - 20 mA U_{max} = 32 V

인 증 조 건(12-0538)

Fieldbus IO
(terminals D, D-, C, C-) depending on function
Profibus-PA, passive
Foundation Fieldbus, passive

Profibus DP IO
(terminals D, D-, C, C-,B, B-) depending on function
Profibus RS 485, active, up to 12 Mbit/s

Modbus IO
(terminals D, D-, C, C-) RS 485 Modbus, active

In/Output circuits (Intrinsically safe)
(depending on p.c.b. and I/O-function)

Printed circuit board:

Exi-IO
Current output, passive
HART communication
(terminals C, C-)

type of protection Intrinsic Safety Ex ia IIC
or Ex ib IIC

only for connection to a certified intrinsically safe circuit

Maximum values:

U_i = 30 V
I_i = 100 mA
P_i = 1.0 W
C_i = 10 nF
L_i negligibly low

or

Currnent output, active
HART communication
(terminals C, C-)

type of protection Intrinsic Safety Ex ia IIC
or Ex ib IIC

Maximum values:

U_o = 21 V
I_o = 90 mA
P_o = 0.5 W
linear characteristic

C_o	90 nF	110 nF
L_o	2.0 mH	0.5 mH

and

인 증 조 건(12-0538)

Puls/Status output, passive (terminals D, D-)

type of protection Intrinsic Safety Ex ia IIC or Ex ib IIC

only for connection to a certified intrinsically safe circuit

Maximum values:

U_i = 30 V

I_i = 100 mA

P_i = 1.0 W

C_i = 10 nF

L_i negligibly low

Exi-Option
Exi-Option 2

Current output, passive (terminals A, A-)

type of protection Intrinsic Safety Ex ia IIC or Ex ib IIC

only for connection to a certified intrinsically safe circuit

Maximum values:

U_i = 30 V

I_i = 100 mA

P_i = 1.0 W

C_i = 10 nF

L_i negligibly low

or

Currnent input, active (terminals A, A-)

type of protection Intrinsic Safety Ex ia IIC or Ex ib IIC

Maximum values:

U_o = 24.1 V

I_o = 99 mA

P_o = 0.6 W

linear characteristic

C_o = 75 nF

L_o = 0.5 mH

or

Currnent output, active (terminals A, A-)

type of protection Intrinsic Safety Ex ia IIC or Ex ib IIC

Maximum values:

U_o = 21 V

I_o = 90 mA

P_o = 0.5 W

linear characteristic

C_o	90 nF	110 nF
L_o	2.0 mH	0.5 mH

and

인 증 조 건(12-0538)

Puls/Status output Control input, passive (terminals B, B-)	type of protection Intrinsic Safety	Ex ia IIC or Ex ib IIC
	only for connection to a certified intrinsically safe circuit	
	Maximum values:	
	U_i =	30 V
	I_i =	100 mA
	P_i =	1.0 W
	C_i =	10 nF
	L_i	negligibly low
Fieldbus IO Profibus-PA Foundation Fieldbus passive (terminals D, D-, C, C-)	type of protection Intrinsic Safety	Ex ia IIC or Ex ib IIC/IIB
	only for connection to a certified intrinsically safe circuit	
	Maximum values:	
	U_i =	24 V
	I_i =	380 mA
	P_i =	5.32 W
	C_i =	5 nF
	L_i =	10 µH
	suitable for connection to an intrinsically safe fieldbus in accordance with the FISCO-model	

Internal circuits of type of protection Intrinsic Safety Ex ib IIC

Supply circuit
Data circuit
Driver circuit
Sensor circuit
RTD / DMS circuit

The intrinsically safe circuit are safety electrically isolated from all non-intrinsically safe circuits up to a peak value of the nominal voltage of 375 V.