



TRICOR[®]

Control drawing for hazardous areas





Manual-Version

TCMQ_E90_PRO_Plus_E_EN_200311_E003

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1. Validity of the Manual

This manual contains the information for installing and operating the TRICOR PRO Plus Mass Flow Meters in hazardous areas.

The knowledge of the standard TRICOR PRO Plus manual is required.

The manual is valid for the following mass flow meters (remote and compact versions):

TCMQ 6400, TCMQ 018K, TCMQ 070K

As well as for the following remote transmitters:

TCD 9010, TCD 9100, TCD 9200

2. Hazardous Area Installation Instructions

Instructions specific to hazardous area installations.

The following instructions apply to the transmitters and sensors.

1. The equipment may be used in a hazardous area with flammable gases and vapors, groups and temperature classes as specified in the equipment specification.
2. The equipment is certified for use in ambient temperature (T_a) as specified in the equipment specification and should not be used outside of the specified temperature range.
3. Installation shall be carried out in accordance with the applicable code of practice by suitably trained personnel.
4. The equipment is not intended to be repaired by the user. Repair of this equipment shall be carried out by the manufacturer in accordance with the applicable code of practice.
5. If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised.
6. Aggressive substances - e.g. acidic liquids or gases that may attack metals or solvents that may affect polymeric materials.
7. Suitable precautions - e.g. regular checks as part of routine inspections or establishing from the material's data sheet that it is resistant to specific chemicals.



3. Special Conditions for use

WARNING!

ATEX/IECEx: Potential risk of sparking from aluminum alloy enclosure.

WARNING!

US/Canada: Potential risk of sparking from aluminum alloy enclosure. In Division 1 or Zone 0 installations, equipment shall be installed in such manner as to prevent the possibility of sparks resulting from friction or impact against the enclosure.

WARNING!

Risk of electrostatic sparking. Clean only with a damp cloth.

3.1. Standards

IEC 60079-0: 2011+C1+C2, IEC 60079-1:2014, IEC 60079-7:2015, IEC 60079-11: 2011, IEC 60079-26:2006 , IEC 60079-31:2013

EN 60079-0:2012/A11:2013, EN 60079-1:2014, EN 60079-7:2015, EN 60079-11:2012, EN 60079-26:2007 , EN 60079-31:2014

CAN/CSA-C22.2 No. 0-10, CAN/CSA-C22.2 No. 60079-1:16, CAN/CSA-C22.2 No. 60079-0:19, CAN/CSA-C22.2 No. 60079-7:16, CAN/CSA-C22.2 No. 60079-11:14, CAN/CSA-C22.2 No. 60079-31:15

ANSI/UL 61010-1-2016, ANSI/UL 60079-0-2019, ANSI/UL 60079-1-2015, ANSI/UL 60079-7:2017, ANSI/UL 60079-11-2014, ANSI/ISA-60079-31:2013, FM 3615:2006, FM 3600:1998, FM 3810:2005

3.2. Warning

WARNING!

Explosion Hazard – Can cause death or serious injury.

Danger of explosion in hazardous areas.

Use only cable glands/plugs that comply with the requirements for the relevant type of protection.

Tighten the cable glands in accordance with the torques specified in technical specifications.

Close unused cable inlets for the electrical connections.

When replacing cable glands use only cable glands of the same type.

After installation check the cables are seated firmly.

WARNING!

The equipment shall not be opened when energized.

Substitution of components may impair Intrinsic Safety.

To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

4. TCMQ with TCD 9010 Transmitter

1. The apparatus housing shall be connected to the potential equalising conductor in the hazardous area.
2. The maximum allowable process fluid temperatures with respect to temperature class for the device when used with potentially explosive gases in the following maximum ambient temperatures are:

Max. ambient temperature	Maximum process temperature per temperature class			
	T6	T5	T4	T3
60 °C [140 °F]	70 °C [158 °F]	70 °C [158 °F]	70 °C [158 °F]	70 °C [158 °F]
55 °C [131 °F]	85 °C [185 °F]	100 °C [212 °F]	100 °C [212 °F]	100 °C [212 °F]
50 °C [122 °F]	85 °C [185 °F]	100 °C [212 °F]	130 °C [266 °F]	130 °C [266 °F]
45 °C [113 °F]	85 °C [185 °F]	100 °C [212 °F]	135 °C [275 °F]	160 °C [320 °F]
40 °C [104 °F]	85 °C [185 °F]	100 °C [212 °F]	135 °C [275 °F]	190 °C [374 °F]
35 °C [95 °F]	85 °C [185 °F]	100 °C [212 °F]	135 °C [275 °F]	200 °C [392 °F]
30 °C [86 °F]	85 °C [185 °F]	100 °C [212 °F]	135 °C [275 °F]	200 °C [392 °F]

3. The maximum allowable process fluid temperatures with respect to maximum surface temperatures for hazardous dusts for the device when used with hazardous dusts in the following maximum ambient temperatures are:

“Da” application and 500 mm dust.		“tb” application and “Da” 5 mm dust	
Max. ambient temperature	Max. process temperature	Max. ambient temperature	Max. process temperature
60 °C [140 °F]	-40 °C [-40 °F]	60 °C [140 °F]	70 °C [158 °F]
55 °C [131 °F]	-10 °C [14 °F]	55 °C [131 °F]	100 °C [212 °F]
50 °C [122 °F]	20 °C [68 °F]	50 °C [122 °F]	130 °C [266 °F]
45 °C [113 °F]	50 °C [122 °F]	45 °C [113 °F]	160 °C [320 °F]
40 °C [104 °F]	80 °C [176 °F]	40 °C [104 °F]	190 °C [374 °F]
35 °C [95 °F]	110 °C [230 °F]	35 °C [95 °F]	200 °C [392 °F]
30 °C [86 °F]	140 °C [284 °F]	30 °C [86 °F]	200 °C [392 °F]

If $T_{process} \leq 85 \text{ °C [185 °F]}$, maximum surface temperature = 80 °C [176 °F]

If $T_{process} > 85 \text{ °C [185 °F]}$, maximum surface temperature = process temperature.

4. The equipment internal circuits at the 4-Pin Connection – A, B, 0 and 15 V or Connector X700 (Pin 1 = 15 V, Pin 2 = 0 V, Pin 3 = A and Pin 4 = B) are not capable of withstanding a 500 V r.m.s. a.c. test to earth as required by clause 6.3.13 of IEC 60079-11:2011/EN 60079-11:2012. This shall be taken into account in any equipment installation.
5. When the equipment is installed as ‘Ex d’, the connector (½” NPT or M20) shall be replaced with a suitably certified Ex d cable gland or Ex d Conduit Sealing Device and the voltage of the equipment shall not exceed 60 V DC.



6. If the equipment is installed as flameproof only, it shall not subsequently be installed as intrinsically safe unless it can be verified that there has been no damage to the safety components within the intrinsically safe circuit on which safety depends by, for example, an over-voltage at the supply terminals. The safety components on which intrinsic safety depends have been assessed up to an input voltage of 60 V DC.
7. Intrinsically safe installations only: A temporary connection of the TRICOR device to an uncertified programming or data download device is permitted, when the TRICOR device ANS is located in the nonhazardous area (typically prior to installation). Alternatively, such a connection may be made when the TRICOR device remains in the hazardous area, but the area is declared 'gas-free'. The uncertified programming or data download device shall be suitably-approved as a SELV supply to IEC 60950-1, IEC 61010-1 or an equivalent standard, with a maximum output voltage of 60 V. The input terminals of the TRICOR device have a maximum voltage $U_M = 60$ V.
8. The maximum pressure associated with the process medium in the internal pipes shall be limited to 160 bar.
9. The following table details the various approval parameters:

Marking IECEx: Ex db ia IIC T6-T3 Ga/Gb and Ex ia IIIC T6-T3Da

Entity parameters for TCD 9010 (or DSL), $U_M = 60$ V, rated voltage: 12 - 24V, rated current: 100 mA

	U_i (V)	I_i (mA)	P_i (W)	C_i (nF)	L_i (μ H)
Intr. Safety supply	20	485	2.3	1.9	0.6

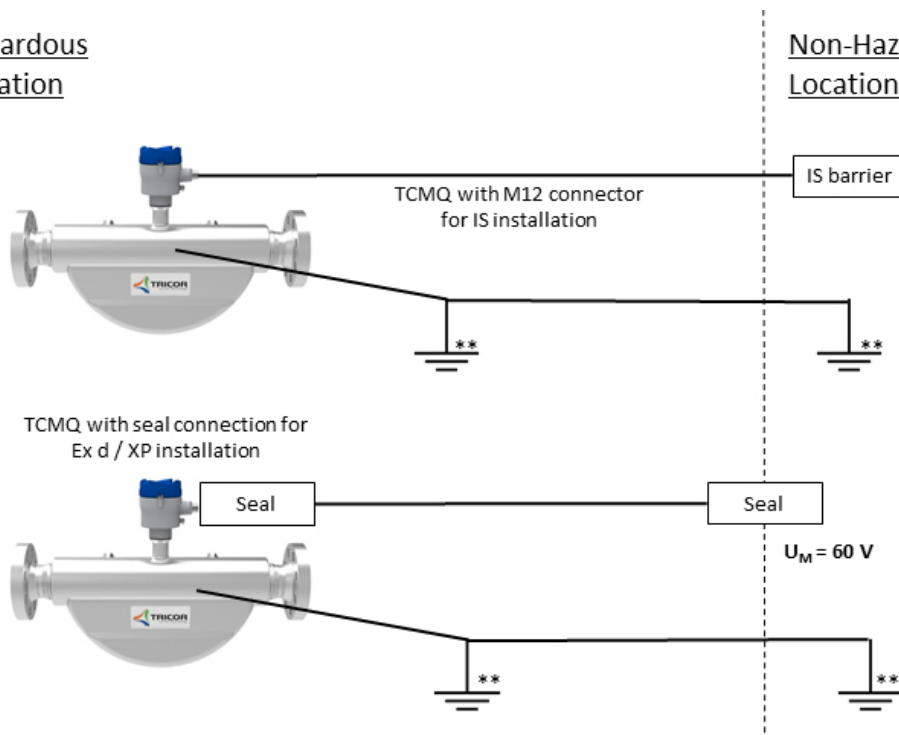
Marking IECEx: Ex db IIC T6-T3 Ga/Gb and Ex tb IIIC T6-T3 Db

Entity parameters for TCD 9010 (or DSL), $U_M = 60$ V, rated voltage: 12 - 24 V, rated current: 100 mA

4.1. Installation

Hazardous Location

Non-Hazardous Location



5. TCMQ with TCD 9100/TCD 9200 Transmitter

1. Maximum safe area voltage must not exceed 250V
2. The TRICOR TCMQ abcd-****-****-**-efghij-****-**** shall only be electrically powered / connected to an overvoltage category II or better circuit as defined in IEC 60664-1 and required by Annex F of CAN/CSA-C22.2 No. 60079-11/ UL 60079-11.
3. The quoted entity parameters of Co and Lo are applicable for the distributed capacitance and inductance in cables. Where there is circuit capacitance or inductance in the connected equipment (represented by Ci and Li) that both total more than 1% of quoted Co and Lo then the Co and Lo of the connected equipment shall not exceed 50% of the quoted Co and Lo values.
4. The maximum dust layer shall be no greater than 5mm (T5 85°C).
5. The apparatus housing shall be connected to the potential equalising conductor in the hazardous area.
6. The maximum allowable process fluid temperatures with respect to the marked temperature class and maximum surface temperature for the device in the following maximum ambient temperatures are:

Max. ambient temperature	Maximum Process Temperature per Temperature Class (°C)			
	T6	T5	T4	T3
60 °C [140 °F]	80 °C [176 °F]	80 °C [176 °F]	80 °C [176 °F]	80 °C [176 °F]
55 °C [131 °F]	85 °C [185 °F]	100 °C [212 °F]	110 °C [230 °F]	110 °C [230 °F]
50 °C [122 °F]	85 °C [185 °F]	100 °C [212 °F]	135 °C [275 °F]	140°C [284 °F]
45 °C [113 °F]	85 °C [185 °F]	100 °C [212 °F]	135 °C [275 °F]	170°C [338 °F]
40 °C [104 °F]	85 °C [185 °F]	100 °C [212 °F]	135 °C [275 °F]	200 °C [392 °F]
35 °C [95 °F]	85 °C [185 °F]	100 °C [212 °F]	135 °C [275 °F]	200 °C [392 °F]
30 °C [86 °F]	85 °C [185 °F]	100 °C [212 °F]	135 °C [275 °F]	200 °C [392 °F]

7. The following table details the entity parameters:

- for DSL transmitter (TCD 9200 only), $U_M = 60$ V, rated voltage: 12- 24V, rated current: 100 mA

	U_o (V)	I_o (mA)	P_o (W)	C_i / C_o (nF)	L_i / L_o (μH)	L_o / R_o (μH/Ω)
SSL Interface (IS circuit)	17.42	459	2.0	0.84 / 338	4 / 134	17.8

- field connections of the TRICOR TCD 9100/9200 transmitter to the safe area :

IO Connections	Terminals	U_i (V)	I_i (mA)	P_i (W)	U_o (V)	I_o (mA)	P_o (W)	C_i (nF)	L_i (μH)	C_o IIC (μF)	L_o IIC (mH)
HART Active	4, 5	NA	NA	NA	28	85	0.6	NA	NA	0.07	1.6
HART Passive	5, 6	30	100	1	NA	NA	NA	15.8	36	NA	NA
Profibus PA	4, 5	17.5	380	5.32	NA	NA	NA	0.26	2.3	NA	NA
Modbus RTU	4, 5	4.2	149	0.14	4.2	118	0.12	<0.5	<50	420	2.56
IO 2 Active	8, 9	NA	NA	NA	28	87	0.6	NA	NA	0.08	1.46
IO 2 Passive	9, 10	30	100	1	NA	NA	NA	7.3	36	0.06	3.6
IO 3 Active	11, 12	NA	NA	NA	28	87	0.6	4.2	34	78	1.46
IO 3 Passive	12, 13	30	100	1	NA	NA	NA	7.3	36	61	3.6
IO 3 Relay	11, 12,13	30	100	1	NA	NA	NA	7.3	36	59	3.4
IO 4 Active	14, 15	NA	NA	NA	28	87	0.6	NA	NA	0.07	1.46
IO 4 Passive	15, 16	30	100	1	NA	NA	NA	7.3	36	NA	NA
IO 4 Relay	14, 15, 16	30	100	1	NA	NA	NA	7.3	36	NA	NA



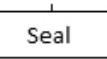
5.1. Compact mount installation

Hazardous
Location

TCMQ with seal connection for
Ex d / XP installation



Seal



Non-Hazardous
Location

$U_M = 30 \text{ V}$

$U_M = 250 \text{ V AC}$
or 90 V DC



5.2. Wall mount installation

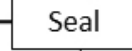
Hazardous
Location

TCMQ with seal connection for
Ex d / XP installation



M12
connector

Seal



Non-Hazardous
Location

$U_M = 30 \text{ V}$

$U_M = 250 \text{ V AC}$
or 90 V DC





N & S AMERICA

AW Lake Company
2440 W. Corporate Preserve Dr. #600
Oak Creek WI 53154 | USA
+1 414 574 4300
sales@aw-lake.com
www.aw-lake.com

ASIA PACIFIC & MIDDLE EAST

KEM Küppers Elektromechanik GmbH
Liebigstraße 5
85757 Karlsfeld | Germany
+49 8131 59391-0
info@kem-kueppers.com
www.kem-kueppers.com

REST OF WORLD

KEM Küppers Elektromechanik GmbH
Liebigstraße 5
85757 Karlsfeld | Germany
+49 8131 59391-100
sales@kem-kueppers.com
www.kem-kueppers.com

CHINA

KEM flow technology (Beijing) Co., Ltd.
Rm. 906, Block C, Ruipu Office Bldg, No. 15
HongJunYingNan Road
Chaoyang District, Beijing 100012 | China
+86 10 84929567
sales@kem-kueppers.com
www.kem-kueppers.cn