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Operating instructions HFisolator 9730/37-25

Explosion Proof and Intrinsically Safe Antenna Coupler
For Hazardous Area Applications

The HFisolator type 9730/37-25 explosion proof and intrinsically safe antenna coupler is an integrated protection device that facilitates non-Ex certified radio antenna installation in hazardous areas. The HFisolator features a barrier circuit which blocks power voltage in the event of a radio transmitter/receiver fault and is encapsulated and housed in an explosion proof stainless steel body. By limiting transmitted power per local regulations and ensuring the threshold power requirements for the area of installation are met, the HFisolator can easily be used with most passive antennas. When a radio must be used in a safe area, the HFisolator can still protect the output signal using a cable to connect to an antenna that is installed in a hazardous area.

Note: The information in this manual is intended to assist with equipment design and ensure proper installation.

READ THIS INSTRUCTION FIRST

To avoid serious or fatal personal injury or major property damage, read and follow all safety instruction in this manual. If you require additional assistance, please contact R. STAHL.

SAFETY INSTRUCTION TO HAZARDOUS AREA INSTALLATION

- The HFisolator type 9730/37-25 must be installed and maintained according to suitable standards for electrical application in potentially explosive atmospheres (IEC/EN 60079-14, IEC/EN60079-17 and/or other national standards).
- NEC installation must be in accordance with article 504 of the National Electrical Code, NFPA70, the Canadian electrical code and all applicable local codes.
- Suitably trained personnel shall carry out installation according with applicable code practice.
- Read this first and keep this instruction manual always available.
- For proper installation (IEC/EN), see the applicable control drawing DDCD-0006 attached.
- For proper installation (NEC), see the applicable control drawing DDCD-0007 attached.

ATEX / IECEx MARKING



I M2 (M1) Ex db mb [ia Ma] I Mb
II 2 (1) G Ex db mb [ia Ga] IIA/IIB/IIC T6...T5 Gb
II 2 (1) D Ex mb tb [ia Da] IIIC T80°C...T100°C Db

This instruction refers to certified equipment covered by following certificate:

ATEX: TÜV CY 18 ATEX 0206158 X

IECEx: IECEx MSC 19.0001X

NEC MARKING



C

Class I, Div. 1, Group A,B,C,D

Class II, Div. 1, Group E,F,G

Class I, Zone 1, AEx db mb [ia Ga] IIA/IIB/IIC T6...T5 Gb

Zone 21, AEx mb tb [ia Da] IIIC T80°C...T100°C Db

Ex db mb [ia Ga] IIA/IIB/IIC T6...T5 Gb

Ex mb tb [ia Da] IIIC T80°C...T100°C Db

This instruction refers to certified equipment covered by following certificate:

QPS File: LR1504-3

WARNINGS

1. HFisolator type 9730/37-25 must be connected to RF source with minimum internal impedance of 50Ω.
2. Connected antennas must be assessed, installed and maintained according to suitable standards for electrical application in potentially explosive atmospheres (e.g. IEC/EN60079-0, IEC/EN60079-14, IEC/EN60079-17 or other national standards).
3. HFisolator type 9730/37-25 does not provide any RF power limitation. The threshold power must be limited by the user in order to achieve the levels defined in IEC/EN60079-0 Table 4 or for NEC installations see control drawing DDCD-0007.
4. The HFisolator is designed to be used with a suitable enclosure with mechanical protection of the input side that utilizes one of the protection types listed in Clause 1 of IEC/EN60079-0 when it is installed in an Ex area. The protection type utilized shall be applicable to the specific area of use (i.e. Gas or Dust).
5. NEC: The HFisolator is designed to be used with a suitable enclosure with mechanical protection of the input side such as Class I or Class II rated enclosures. It can also be located in a "Safe Area" and wired to an antenna located in a hazardous area.
6. In case of use of an Ex tb enclosure with metric entries ensure 5 engaged threads minimum or use an appropriate gasket.
7. It is responsibility to the installer to ensure an IP6x level at the threaded joint between antenna coupler and Ex tb enclosure.
8. When installed in a safe area the input side must be protected from sun exposure. For example by using a housing or by being in an indoor area.
9. The user should not repair this equipment.
10. The user should not modify the unit.
11. The unit should not painted.
12. If the equipment is likely to come in to contact with aggressive substances, it is 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. Aggressive substances: example Acids, liquids, gases with can affected metals.

13. Maximum RF power input shall not exceed the value listed into control drawing DDCD-0006 (IEC/EN) or DDCD-0007 (NEC).
14. Maximum operation temperature of the HFisolator is 91°C. (use in non-hazardous area)
15. Maximum operation temperature of the equipment it is installed in shall not exceed +80°C in case of max RF power input (Pi) of 6 W (max Tamb allowed +80°C) or +85°C in case of max RF power input (Pi) of 2 W (max Tamb allowed +85°C).

INSTALLATION

For proper installation, see the applicable **control drawing DDCD-0006 (IEC/EN) or DDCD-0007 (NEC)**

1. Do not attach radio connection to radio until housing has been fully threaded into enclosure.
2. If lightning suppressor is used, connect it to output side of the coupler.
3. Antenna and cable connections should be finger tightened only. Over tightening can cause permanent damage resulting in equipment failure.
4. The HFisolator must be secured from loosening when installed in an Ex d enclosure. Use of LOCTITE® or similar sealing adhesive is acceptable and shall be applied to threaded joint prior to mounting the HFisolator to the Ex d enclosure so the joint is secured against loosening.
5. Screw 9730 into enclosure following local electrical code (UL1203 requires 5 threads minimum engagement).

PRODUCT SPECIFICATIONS

Type code R. STAHL	Type code Solexy
9730/37-25	RXNML0200RXN-04

Ambient temperature range		
Gas	Dust	Tamb
T5	100°C	-40°C to +80°C (max. RF input 6 W)
		-40°C to +85°C (max. RF input 2 W)
T6	80°C	-40°C to +65°C (max. RF input 6 W)
		-40°C to +70°C (max. RF input 2 W)

Refer to product marking for max RF Power Input (Pi) allowed and related ambient temperature

Maximum Fault Voltage (Um)	250 VDC 250 VAC 50-60 Hz
Frequency Range	500 MHz to 6 GHz
Impedance	50 Ω

Maximum RF Threshold Power (table 4 in IEC/EN/UL 60079-0)	
ATEX/IECEX Equipment Group	Threshold Power
Group I, IIA, III	6 W (37.7 dBm)
Group IIB	3.5 W (35.4 dBm)
Group IIC	2 W (33.0 dBm)

MAXIMUM RF INPUT POWER (Pi)

Refer to product marking for maximum RF Input Power (Pi) allowed (see product specification table above).

This value does not consider any cable loss between the RF transmitter and the HFisolator and may therefore be considered as the maximum allowable RF transmitter output power when the HFisolator is directly connected to a RF transmitter.

Added cable loss between the RF transmitter and the HFisolator may allow the RF transmitter output power to exceed the value above as long as the cable loss ensures the power at the input of the HFisolator is less than or equal to the above values.

$$\begin{aligned}
 &RF\ transmitter\ output\ power_{(dBm)} \\
 &\quad -\ Coax\ cable\ loss_{(dB)} \\
 &\leq\ Maximum\ RF\ Input\ Power\ (Pi)
 \end{aligned}$$

It is permissible to limit the maximum output power of the transmitter by a programmable or software setting but it must not be possible for an end-user to modify it.

MAXIMUM PERMITTED RF THRESHOLD POWER (Pth)

The RF threshold power, sometimes called the effective isotropic radiated power (EIRP), as defined in IEC/EN/UL60079-0, is the product of the effective output power of a radio transmitter multiplied by the power gain of a connected antenna. The maximum threshold powers for each equipment group as defined by Table 4 in IEC/EN/UL60079-0 are provided above.

Because most antennas list the gain relative to an isotropic radiator (dBi) instead of the raw power gain, it is often easier to simply add the antenna gain in dBi to the radio output power in decibel-milliwatts (dBm). Any added cable loss between the RF transmitter output and the RX input, or the RX output and the antenna may also be considered.

$$\begin{aligned}
 &P_{th_{(dBm)}} \\
 &= RF\ Transmitter\ output_{(dBm)} + Antenna\ Gain_{(dBi)} \\
 &\quad -\ Cable\ loss\ between\ radio\ and\ 9730_{(dB)} \\
 &\quad -\ Cable\ loss\ between\ 9730\ and\ antenna_{(dB)}
 \end{aligned}$$

- The resulting threshold power calculated by the above formula MUST be below the threshold power for the operating area group rating given above.

- Consideration of fault conditions in the radio transmitter is not necessary. The max radio transmitter's RF power output should be taken from manufacturer's datasheet in normal operation.
- A radio output power lower than those provided above may be used to allow for an antenna with a higher gain.
- In case of device with multiple outputs and multiple antennas, each threshold power is calculated separately for each output/antenna.
- Gain of multiband antennas should be evaluated separately at each individual frequency.
- High gain directional antennas on the same device should not be directed in the same direction.

ANTENNA CONNECTION

IEC/EN: The antenna connected to the HFisolator must be installed in accordance with the earthing requirements of IEC/EN 60079-14.

NEC: The antenna connected to the RX coupler must be installed in accordance with the earthing requirements of suitable standards for electrical application in potentially explosive atmospheres. Installation must be in accordance with article 504 of the National Electrical Code, NFPA70, the Canadian electrical code and all applicable local codes.

IEC/EN/NEC: In case of antenna direct mounting on HFisolator (without coax cable) the antenna is earthed through the enclosure earth connection via the 9730 body. In case of remote antenna installation using a coax cable the antenna need to be installed on an isolate earth support in order to grant a single earth connection through the enclosure earth connection.

MAXIMUM ENERGY CALCULATION IN CASE OF COAX CABLE INSTALLATION

In case of coax cable installation (radio/HFisolator and HFisolator/antenna) the added cable need to be evaluated to ensure that the maximum energy stored in the cable is not exceeding the value permitted per IEC/EN 60079-11:

Max energy (Joules) allowed per IEC/EN/UL 60079-11	
Group I	1500 μJ
Group IIA	950 μJ
Group IIB	250 μJ
Group IIC	50 μJ

The calculation can be done according to following equation:

$$E = \frac{1}{2} * \left\{ C * \left[(1.5 * (\sqrt{R * P})) \right]^2 \right\}$$

Where:

E = Energy

C = HFisolator capacitance + Coax cable capacitance
(see below HFisolator reference value)

R = Impedance (50Ω)

P = Radio power output

1.5 = Safety Factor

Capacitance HFisolator 9730/37-25: 18 pF

Example

RF Radio Power Output = 2 W

Antenna cable capacitance = 1195 pF

HFisolator capacitance = 18 pF

Input cable capacitance = 73 pF

Total Capacitance *C* = 1286 pF

$$E = \frac{1}{2} * \left\{ 1213 \text{ pF} * \left[(1,286 * (\sqrt{50 * 2})) \right]^2 \right\} = 0.145 \mu\text{J}$$

Result = 0.145 μJ is acceptable for any Explosion Group

MAINTENANCE

- The verification and maintenance of the electrical equipment must be performed according to IEC/EN 60079-17.
- The user should guarantee to keep the safety characteristic of the device after maintenance.
- The maintenance related the components used for wiring must be performed according to manufacturer instruction.

DISPOSAL / RECYCLING

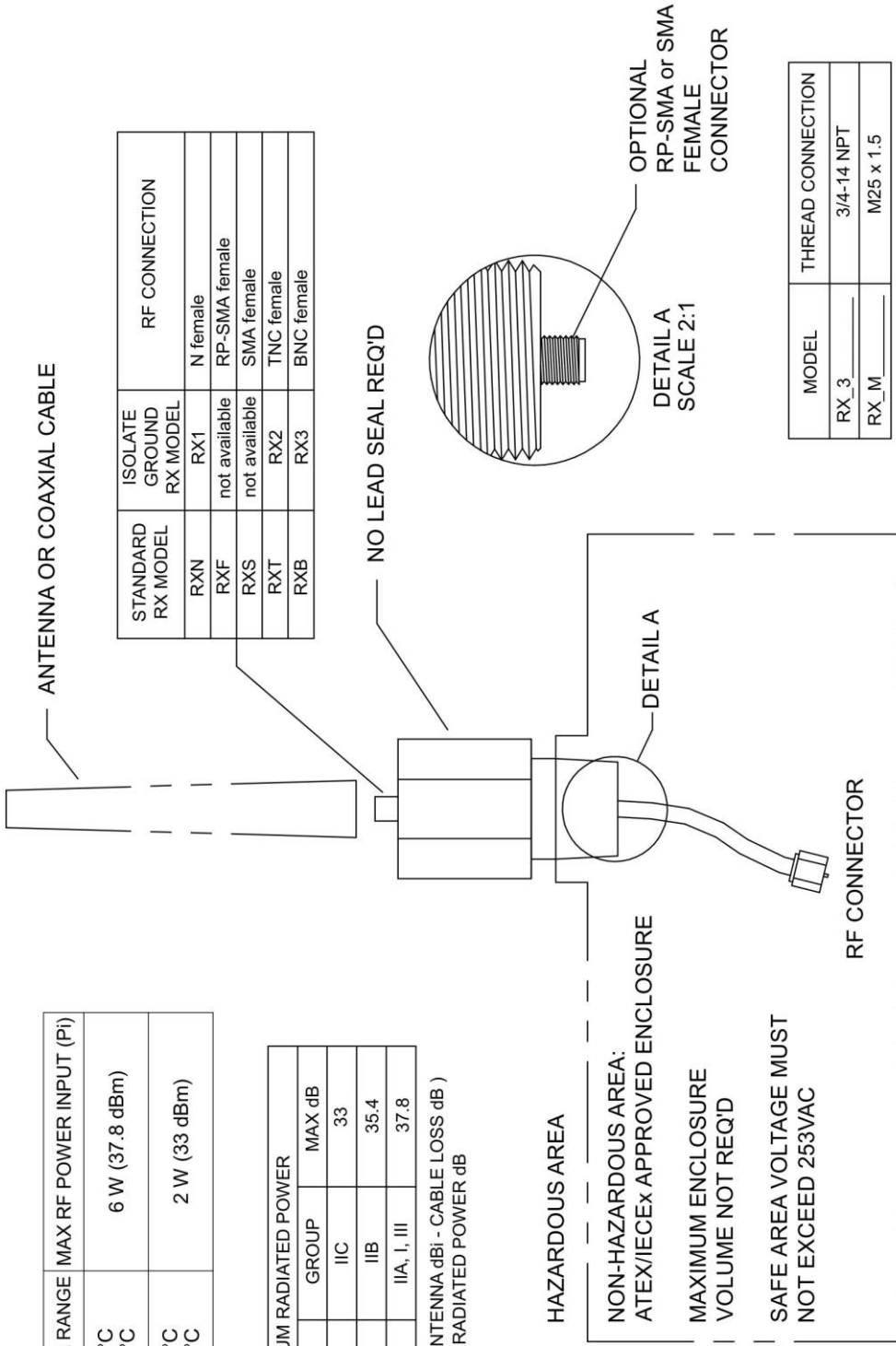
Disposal and recycling of the product according to national regulation for waste disposal and recycling.

WARNING: Do not dispose the product and the components in the environment.

AMBIENT TEMPERATURE RANGE	MAX RF POWER INPUT (Pi)
T5: -40°C ≤ Ta ≤ 80°C T6: -40°C ≤ Ta ≤ 65°C	6 W (37.8 dBm)
T5: -40°C ≤ Ta ≤ 85°C T6: -40°C ≤ Ta ≤ 70°C	2 W (33 dBm)

MAXIMUM RADIATED POWER		
MAX WATTAGE	GROUP	MAX dB
2 W	IIC	33
3.5 W	IIB	35.4
6 W	IIA, I, III	37.8

(RADIO dB + ANTENNA dBi - CABLE LOSS dB)
≤ MAX RADIATED POWER dB



STANDARD RX MODEL	ISOLATE GROUND RX MODEL	RF CONNECTION
RXN	RX1	N female
RXF	not available	RP-SMA female
RXS	not available	SMA female
RXT	RX2	TNC female
RXB	RX3	BNC female

MODEL	THREAD CONNECTION
RX_3	3/4-14 NPT
RX_M	M25 x 1.5

SCHEDULE DRAWING
No modifications permitted
without reference to the
Notified Body

- NOTES:
- REFER TO PRODUCT MARKING FOR MAX OPERATING TEMPERATURE ALLOWED
 - IN CASE OF USE OF A Ex tb ENCLOSURE WITH METRIC ENTRIES ENSURE 5 ENGAGED THREADS MINIMUM OR USE AN APPROPRIATE GASKET
 - IN CASE OF USE OF A Ex tb ENCLOSURE WITH NPT ENTRIES ENSURE 3,5 ENGAGED THREADS MINIMUM
 - IT IS RESPONSABILITY TO THE INSTALLER TO ENSURE AN IP6x LEVEL AT THE THREADED JOINT BETWEEN ANTENNA COUPLER AND Ex tb ENCLOSURE

REV	DATE	ECN	DESCRIPTION	DRAWN BY	CHECK BY	APPRD BY

UNITS	SCALE	MATERIAL	FINISH	PROJECTION	DRAWN BY	DATE	TITLE
N/A	N/A	N/A	N/A	N/A	SS	07/09/2018	CONTROL DRAWING RX SERIES ATEX / IECEx
UNLESS OTHERWISE SPECIFIED							
GENERAL TOLERANCES							
X	mm						
XX	±0.05						
XXX	±0.13						
CONCENTRICITY ±0.05 ±0.13							
ANGLES ±0°30'							

SHEET NO.	SOLEXY WATERLESS	SIZE	DRAWING NUMBER	REV
1 OF 1		A	DDCD-0006-S	00

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AMBIENT TEMPERATURE RANGE	MAX RF POWER INPUT (Pi)
T5:-40°C ≤Tas 80°C T6:-40°C ≤Tas 65°C	6 W (37.8 dBm)
T5:-40°C ≤Tas 85°C T6:-40°C ≤Tas 70°C	2 W (33 dBm)

MAXIMUM RADIATED POWER			
MAX WATTAGE	GROUP	GROUP	MAX dB
2 W	IIC	A & B	33
3.5 W	IIB	C	35.4
6 W	IIA, I, III	D, F & G	37.8

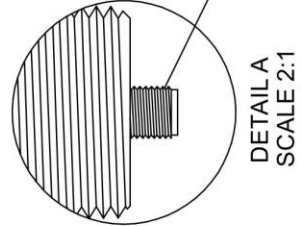
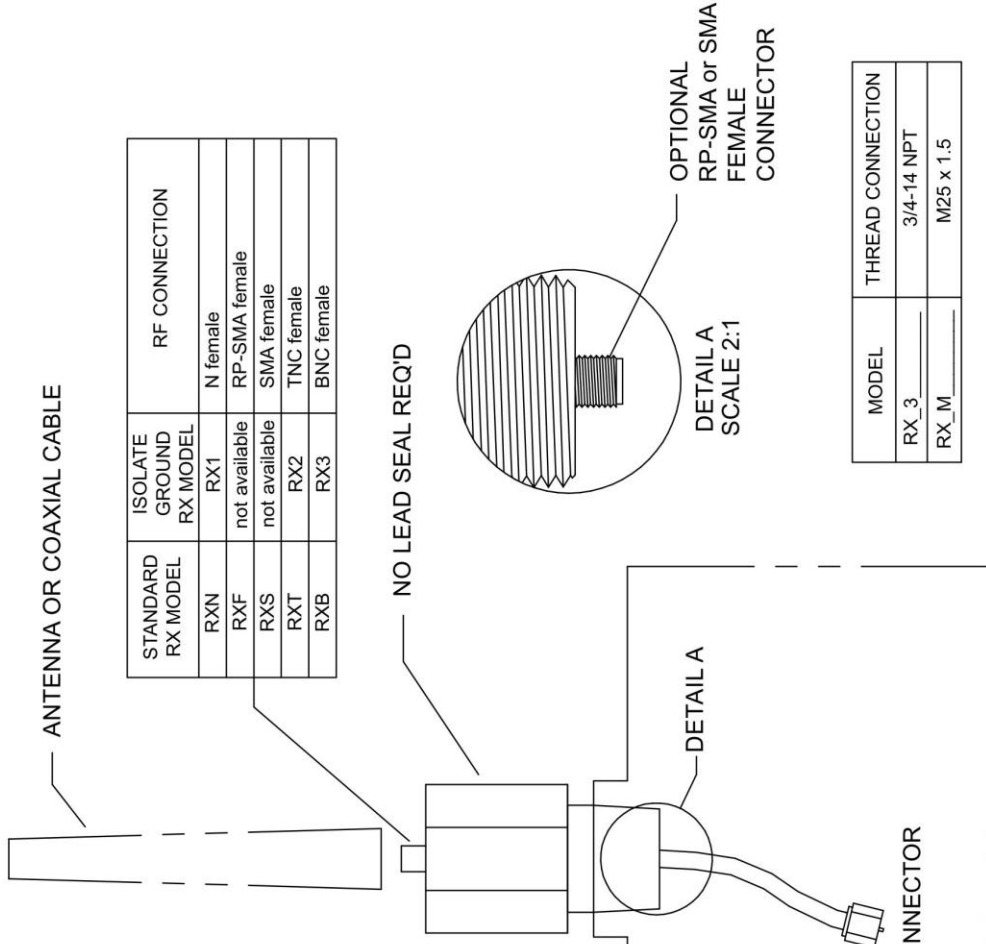
(RADIO dB + ANTENNA dBi - CABLE LOSS dB)
≤ MAX RADIATED POWER dB

HAZARDOUS AREA

NON-HAZARDOUS AREA:
APPROVED EXPLOSION PROOF
ENCLOSURE

MAXIMUM ENCLOSURE
VOLUME NOT REQ'D

SAFE AREA VOLTAGE MUST
NOT EXCEED 253VAC



MODEL	THREAD CONNECTION
RX_3	3/4-14 NPT
RX_M	M25 x 1.5

SCHEDULE DRAWING
No modifications permitted
without reference to the
Notified Body

- NOTES:**
- INSTALLATION MUST BE IN ACCORDANCE WITH ARTICLE 504 OF THE NATIONAL ELECTRICAL CODE, NFPA70, THE CANADIAN ELECTRICAL CODE AND ALL APPLICABLE LOCAL CODES
 - IN CASE OF USE OF A Ex tb ENCLOSURE WITH METRIC ENTRIES ENSURE 5 ENGAGED THREADS MINIMUM OR USE AN APPROPRIATE GASKET
 - IN CASE OF USE OF A Ex tb ENCLOSURE WITH NPT ENTRIES ENSURE 3.5 ENGAGED THREADS MINIMUM
 - IT IS RESPONSIBILITY TO THE INSTALLER TO ENSURE AN IP6x LEVEL AT THE THREADED JOINT BETWEEN ANTENNA COUPLER AND Ex tb ENCLOSURE

REV	DATE	ECN	DESCRIPTION	DRAWN BY	CHECK BY	APPR'D BY

UNITS	SCALE	MATERIAL	SHEET NO.
N/A	N/A	N/A	1 OF 1
	ANGLE OF PROJECTION	FINISH	
UNLESS OTHERWISE SPECIFIED	SS	N/A	
GENERAL TOLERANCES	DATE	DATE	
.X	mm	DATE	TITLE
.XX	+0.20 ±0.51	DATE	CONTROL DRAWING
.XXX	+0.10 ±0.25	DATE	RX SERIES QPS
CONCENTRICITY	±.005 ±0.13	APPR'D BY	SIZE
ANGLES	±0°30'	DATE	DRAWING NUMBER
		DATE	A DDCD-0007-S
			REV
			.00

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