



Safety instructions

VEGADIF 85

Intrinsic safety

Two-wire 4 ... 20 mA

Two-wire 4 ... 20 mA/HART

Two-wire 4 ... 20 mA/HART with SIL qualification

Profibus PA

Foundation Fieldbus



Document ID: 1013794



VEGA

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Supplementary documentation:

- Operating Instructions VEGADIF 85
- Certificate of Conformity FM22US0052X (Document ID: 1013795)

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1 Scope

These safety instructions apply to the differential pressure transmitters VEGADIF 85 in the versions described in chapter " *Type code specifications*".

The classification as well as the respective standards are stated in the Certificate of Conformity FM22US0052X.

- IS / CL I, DIV 1, GP ABCD
- IS / CL I, ZN 0, AEx ia IIC T6...T1 Ga

2 Type code specifications

VEGADIF DF85(*).ab****hijk*m*

Position		Feature	Description
a	Scope	F	FM-us
b	Approval	C	FM (IS) CL I, II, III, DIV1, GP ABCD
		O	FM (IS) CL I, II, III, DIV1, GP ABCD + Ship approval
h	Electronics	Z	Two-wire 4 ... 20 mA
		H	Two-wire 4 ... 20 mA/HART
		A	Two-wire 4 ... 20 mA/HART with SIL qualification
		P	Two-wire Profibus PA
		F	Two-wire Foundation Fieldbus
i	Supplementary electronics	X	without
		Z	Additional current output 4 ... 20 mA
j	Housing	A	Aluminium - single chamber
		D	Aluminium - double chamber
		V	Stainless steel single chamber (precision casting)
		8	Stainless steel single chamber (electropolished)
		W	Stainless steel double chamber (precision casting)
k	Housing version / Protection	I	compact / IP66/IP67; NEMA 4X
		D	compact / IP66/IP68 (0,2 bar); NEMA 6P
		N	compact / IP66/IP68 (1 bar); NEMA 6P
		M	compact / IP69K
		A	axial cable outlet IP68 (PUR) with external housing / IP66/IP67; NEMA 4X
		S	lateral cable outlet IP68 (PUR) with external housing / IP66/IP67; NEMA 4X
		K	axial cable outlet IP68 (PE) with external housing / IP66/IP67; NEMA 4X
		L	lateral cable outlet IP68 (PE) with external housing / IP66/IP67; NEMA 4X

Position		Feature	Description
m	Display and adjustment module PLICSCOM	X	without
		A	mounted
		F	without; lid with inspection window
		B	Laterally mounted
		K	mounted; with Bluetooth, magnetic pen operation
		L	laterally mounted; with Bluetooth, magnetic pen operation

3 General information

VEGADIF 85 is a differential pressure transmitter for measurement of differential pressure, flow, level, density and interface.

It consists of a differential pressure measuring cell and an electronics housing which is optionally also executed as external housing.



The display and adjustment module PLICSCOM can be mounted optionally.

The VEGADIF 85 is suitable for applications in hazardous atmospheres of all combustible materials of explosion groups IIA, IIB and IIC.

The VEGADIF 85 is suitable for applications requiring EPL Ga, EPL Ga/Gb or EPL Gb instruments.

4 Application areas

4.1 Division and Classes

Division Designation	Class/Group Designation
	CL I (GP A, B, C, D)
DIV 2	
DIV 1	

4.2 Zones

EPL Ga instrument

The VEGADIF 85 with the mechanical fixing element are installed in hazardous areas of zone 0 requiring EPL Ga instruments.









EPL Ga/Gb or EPL Ga/Gc instrument

The VEGADIF 85 is installed in hazardous areas of zone 1 or zone 2 requiring EPL Gb or EPL Gc instruments. The process connection is installed in the separating wall, which separates areas requiring EPL Gb or EPL Gc instruments. The sensor measuring system is installed in hazardous areas of zone 0 requiring EPL Ga instruments.

EPL Gb instrument

The VEGADIF 85 with the mechanical fixing element are installed in hazardous areas of zone 1

requiring EPL Gb instruments.

Zone	Device protection level			
	EPL Gc, Dc	EPL Gb, Db	EPL Ga/Gb, Da/Db	EPL Ga, Da
Ex Zone 2, 22 				
Ex Zone 1, 21 				
Ex Zone 0, 20 				

5 Specific conditions of use ("X" identification)

The following overview is listing all special properties of VEGADIF 85, which make a labelling with the symbol "X" behind the certificate number necessary.

1. For information only: The permissible ambient resp. medium temperature range depends on the variant of the apparatus and on the temperature class, for which the apparatus shall be used (see thermal data). The limits of the permissible ambient temperature range may be restricted by the used O-ring material. The used O-ring material is included in the marking. The permissible temperature ranges in dependence of the material have to be taken from the manufacturer's instructions.

2. For use as Ga/Gb-apparatus:

For functional reasons, the partition wall (membrane) to the wetted area has a wall thickness < 1 mm. In the application, it has to be ensured, that an impairment of the separation wall e. g. by aggressive media or mechanical hazards is excluded.

For variants with standard process connections:

The installation of the meter bodies shall provide as a minimum degree of protection IP67 according to ANSI/IEC 60529 for the process connections and vents.

For variants with capillary connections:

The capillary connections are designed to be connected to a capillary with diaphragm seal. The filling holes are intended to bring in a fill fluid. To prevent a zone entrainment from Zone 0, the diaphragm seal resp. the diaphragm seal and capillary have to be suitably designed. The pressure transfer system has to be technically tight. The filling hole has to be tightly sealed.

3. At the plastic parts there is a danger of ignition by electrostatic discharge. Observe manual of the manufacturer and warning label.

4. At the metallic parts made of light metal there is a danger of ignition by impact or friction. Observe manual of the manufacturer.

5. For the execution with separate housing, potential equalization has to exist in the complete course of the erection of the connecting cable between the electronics housing and the measuring sensor housing.

6 Important information for mounting and maintenance

General instructions

The following requirements must be fulfilled for mounting, electrical installation, setup and maintenance of the instrument:

- The staff must be qualified according the respective tasks
- The staff must be trained in explosion protection
- The staff must be familiar with the relevant valid regulations which are necessary for the safe installation and operation of the device.
- Make sure when working on the instrument (mounting, installation, maintenance) that there is no explosive atmosphere present, the supply circuits should be voltage-free, if possible.
- The instrument has to be mounted according to the manufacturer specifications, the Certificate of Conformity, National Electrical Code and the valid regulations and standards
- Modifications on the instrument can influence the explosion protection and hence the safety, therefore repairs are not permitted to be conducted by the end user
- Modifications must only be carried out by employees authorized by VEGA company
- Use only approved spare parts
- Components for installation and connection not included in the approval documents are only permitted if these correspond technically to the latest standard mentioned on the cover sheet. They must be suitable for the application conditions and have a separate certificate. The special conditions of the components must be noted and if necessary, the components must be integrated in the type test. This applies also to the components already mentioned in the technical description.

Cable and wire entries

- The VEGADIF 85 must be connected via suitable cable gland or conduit systems that are in conformity with the requirements of the type of protection and the IP protection and provided with a separate type approval certificate. When connecting VEGADIF 85 to conduit systems, the corresponding sealing facility must be connected directly to the housing.
- The red thread or/dust covers screwed in when the instruments are shipped (depending on the version) must be removed before setup and replaced by cable entries or closing screws suitable for the respective ignition protection type and IP protection.
- Note type and size of the thread: A label with the respective thread name is in the area of the respective thread
- Threads must have no damages
- Cable entries and closing screws should be mounted correctly and according to the safety instructions of the manufacturer to ensure the specified ignition protection type and IP protection rating. When using certified or suitable cable glands, closing screws or plug connections, it is absolutely necessary to note the corresponding certificates/documents. Supplied cable entries or closing screws meet these requirements.
- Unused openings must be closed with plugs suitable for the ignition protection type and IP protection. Supplied plugs meet these requirements.
- Cable or wire entries resp. the closing screws must be tightly screwed into the housing
- The connection cables resp. pipeline sealing facilities must be suitable for the application conditions (e.g. temperature range) of the application
- With surface temperatures $> 70\text{ }^{\circ}\text{C}$, the cables must be suitable for the higher application conditions
- The connection cable of VEGADIF 85 has to be wired fix and in such a way that damages can be excluded.

Mounting

Keep in mind for instrument mounting

- Mechanical damage on the instrument must be avoided
- Mechanical friction must be avoided
- Process connections separating two areas of different Ex-zones must comply to valid regulations and standards and the protection rating must be in conformity.
- Close the housing lid (s) up to the stop before starting operating, to ensure the IP protection rating or NEMA rating specified on the type label

Maintenance

To ensure the functionality of the device, periodic visual inspection is recommended for:

- Secure mounting
- No mechanical damages or corrosion
- Worn or otherwise damaged cables
- No loose connections of the line connections, equipotential bonding connections
- Correct and clearly marked cable connections

The parts of the VEGADIF 85 being in contact with flammable media during operation must be included in the periodic overpressure test of the plant.

Intrinsic safety "i"

- Valid regulations for connection of intrinsically safe circuits, e.g. proof of intrinsic safety according to IEC/EN 60079-14 must be observed
- The instrument is only suitable for connection to certified, intrinsically safe instruments
- When connecting a circuit with protection level Ex ib, the device, the sensor meas. system of the device must no more be used in hazardous areas of zone 0.
- When connecting an intrinsically safe instruments with classification mark Ex ia to a circuit with protection level Ex ib, then the classification mark of the instrument changes to Ex ib. After the use as instrument with Ex ib power supply, the instrument must no more be used in circuits with protection level Ex ia
- When connecting an intrinsically safe instrument to a non-intrinsically safe circuit, the instrument must be no longer used in intrinsically safe circuits
- With surface temperatures > 70 °C, the cables must be suitable for the higher application conditions

Version with exchangeable cable or rod probe

Only original VEGA cable or rod probes must be mounted to VEGADIF 85. When mounting cable or rod probes, the torques specified in the respective operating instruction manuals must be maintained. The mechanical connection must be ensured.

7 Safe operating mode

General operating conditions

- Do not operate the instrument outside the electrical, thermal and mechanical specifications of the manufacturer
- Use the instrument only in media against which the wetted parts are sufficiently resistant
- Note the relation between process temperature on the sensor/antenna and the permissible ambient temperature on the electronics housing. For permissible temperatures, see the respective temperature tables. See chapter " *Thermal data*".
- If necessary, a suitable overvoltage arrester can be connected in front of the VEGADIF 85
- For assessment and reduction of the explosion risk, valid standards such as for example ISO/EN 1127-1 must be taken into account

8 Potential equalization/Grounding

- Integrate the instruments into the local potential equalisation, e.g. via the internal or external earth terminal
- The potential equalization terminal must be secured against loosening and twisting
- If grounding of the cable screening is necessary, this must be carried out acc. to the valid standards and regulations, e.g. acc. to IEC/EN 60079-14
- The intrinsically safe input and the intrinsically safe output circuits are ground-free. The voltage resistance against ground is min. 500 Veff.

9 Electrostatic charging (ESD)

In case of instrument versions with electrostatically chargeable plastic parts, the danger of electrostatic charging and discharging must be taken into account!

The following parts can charge and discharge:

- Lacquered housing version or alternative special lacquering
- Plastic housing, plastic housing parts
- Metal housing with inspection window
- Plastic process fittings
- Plastic-coated process fittings and/or plastic-coated sensors
- Connection cable for separate versions
- Type label
- Isolated metallic labels (measuring point identification plate)

Take note in case of danger of electrostatic charges:

- Avoid friction on the surfaces
- Do not dry clean the surfaces

The instruments must be mounted/installed in such a way that the following can be ruled out:

- electrostatic charges during operation, maintenance and cleaning.
- process-related electrostatic charges, e.g. by measuring media flowing past

The warning label indicates danger:

WARNING - POTENTIAL ELECTROSTATIC
CHARGING HAZARD - SEE INSTRUCTIONS

10 Instructions for zone 0, zone 0/1 applications

The usual atmospheric conditions (in accordance with IEC 60079-0 related to the properties of the explosive atmosphere) under which it is assumed that the measuring probe is operated in zone 0, are:

- Temperature: -20 ... +60 °C.
- Pressure: 80 ... 110 kPa (0.8 ... 1.1 bar)
- Air with normal oxygen content, normally 21 % (V/V)

The chapter " *Thermal Data*" contains concrete notes on the use outside of this usual temperature range.

If there are no explosive mixtures or supplementary measures, e.g. according to IEC 1127-1, then the instruments can be also operated according to the manufacturer specification outside atmospheric conditions.

The intrinsically safe supply/signal circuit must correspond to protective level Ex ia (EPL Ga).

Preferred are associated instrument with galvanic separation between intrinsically safe and non-intrinsically safe circuits.

If there is a risk of dangerous potential differences inside zone 0, then suitable measures for intrinsically safe circuits in zone 0 must be taken, e.g. according to the requirements of IEC 60079-14 section 16.3 (edition November 2014).

Instruments/sensors in the version where light metal, aluminium, magnesium, Titanium or zirconium is used, must be installed in such a way that the generation of sparks due to strokes or frictions can be excluded.

On the process fitting, a tightness acc. to protection IP67 following IEC 60529 must be ensured.

11 Electrical data

Supply and signal circuit

Intrinsically safe power supply and signal In type of protection intrinsic safety Ex ia IIC circuit: (terminals 1, 2)

Electronics Z/H/A:

Maximum values

$$U_i = 30 \text{ V}$$

$$I_i = 131 \text{ mA}$$

$$P_i = 983 \text{ mW}$$

$$L_i = 5 \text{ } \mu\text{H}$$

$$L_i = 10 \text{ } \mu\text{H (double chamber housing)}$$

$$C_i = \text{negligibly small}$$

In the version with fix connected connection cable the following values must be also taken into consideration:

$$L_i = 0.62 \text{ } \mu\text{H/m}$$

$$C_{i \text{ wire/wire}} = 150 \text{ pF/m}$$

$$C_{i \text{ wire/screen}} = 270 \text{ pF/m}$$

Electronics P/F:

Maximum values

$$U_i = 17.5 \text{ V}$$

$$I_i = 500 \text{ mA}$$

$$P_i = 5.5 \text{ W}$$

L_i = negligibly small (single chamber housing)

L_i = 5 μH (double chamber housing)

C_i = negligibly small

The instrument is suitable for connection to a Fieldbus system according to the FISCO model (IEC 60079-11), e.g. Profibus PA.

$$U_i = 24 \text{ V}$$

$$I_i = 250 \text{ mA}$$

$$P_i = 1.2 \text{ W}$$

In the version with fix connected connection cable the following values must be also taken into consideration:

$$L_i = 0.62 \mu\text{H/m}$$

$$C_{i \text{ wire/wire}} = 150 \text{ pF/m}$$

$$C_{i \text{ wire/screen}} = 270 \text{ pF/m}$$

Supply and signal current circuit when installing in a double chamber housing and the supplementary electronics PLICSZEZSA (2. current output)

Intrinsically safe power supply and signal circuit I: (terminals 1[+], 2[-]) In type of protection intrinsic safety Ex ia IIC

Electronics H/A:

Maximum values

$$U_i = 30 \text{ V}$$

$$I_i = 131 \text{ mA}$$

$$P_i = 983 \text{ mW}$$

$$L_i = 5 \mu\text{H}$$

C_i = negligibly small

In the version with fix connected connection cable the following values must be also taken into consideration:

$$L_i = 0.62 \mu\text{H/m}$$

$$C_{i \text{ wire/wire}} = 150 \text{ pF/m}$$

$$C_{i \text{ wire/screen}} = 270 \text{ pF/m}$$

Intrinsically safe power supply and signal circuit II: (terminals 7[+], 8[-]) In type of protection intrinsic safety Ex ia IIC

Electronics H/A:

Maximum values

$$U_i = 30 \text{ V}$$

$$I_i = 131 \text{ mA}$$

$$P_i = 983 \text{ mW}$$

$$L_i = 5 \text{ }\mu\text{H}$$

C_i = negligibly small

In the version with fix connected connection cable the following values must be also taken into consideration:

$$L_i = 0.62 \text{ }\mu\text{H/m}$$

$$C_{i \text{ wire/wire}} = 150 \text{ pF/m}$$

$$C_{i \text{ wire/screen}} = 270 \text{ pF/m}$$

Intrinsically safe display and adjustment circuit

Intrinsically safe display and adjustment circuit: (terminals 5, 6, 7, 8)

In type of protection intrinsic safety Ex ia IIC

For connection to the intrinsically safe circuit of the associated external indicating instrument VEGADIS 61/81 with corresponding approval.

The rules for connecting intrinsically safe circuits between VEGADIF 85 and the external display unit VEGADIS 61/81 are maintained if the following characteristic values are taken into consideration:

Electronics Z/H/A:

$$L_o = 330 \text{ }\mu\text{H}$$

$$C_o = 1.98 \text{ }\mu\text{F}$$

Electronics P/F:

$$L_o = 212 \text{ }\mu\text{H}$$

$$C_o = 1.98 \text{ }\mu\text{F}$$

L_i and C_i of the external display unit VEGADIS 61/81 are negligibly small.

When using the connection cable supplied by VEGA, the following values must be taken into consideration:

$$L_i = 0.62 \text{ }\mu\text{H/m}$$

$$C_{i \text{ wire/wire}} = 150 \text{ pF/m}$$

$$C_{i \text{ wire/screen}} = 270 \text{ pF/m}$$

Intrinsically safe circuit of the display and adjustment module

Circuit of the display and adjustment module: (spring contacts in the electronics compartment or connection compartment)

In type of protection intrinsic safety Ex ia IIC

For connection to the display and adjustment module PLICSCOM or VEGACONNECT.

The metallic parts of VEGADIF 85 are electrically connected with the earth terminals.

The intrinsically safe supply and signal circuits are galvanically separated from parts that can be grounded.

For applications requiring instruments of EPL Gb, the intrinsically safe power supply and signal circuit can correspond to protection class ia or ib. For connection to a circuit with protection class ib, the ignition protection type identification is Ex ib IIC T6 Gb.

For applications requiring instruments of type EPL Ga or EPL Ga/Gb, the intrinsically safe power supply and signal circuit must correspond to protection class ia.

For applications requiring EPL Ga resp. EPL Ga/Gb instruments the VEGADIF 85 is preferably connected to appropriate instruments with electrically isolated, intrinsically safe circuits.

12 Thermal data

The following temperature table applies to all housing and electronic versions and when using the instruments acc. to instrument category EPL Ga, EPL Ga/Gb, EPL Gb.

Temperature class	Product temperature (Tp) on the sensor	Ambient temperature (Ta)
T6 (+85 °C)	-40 ... +46 °C	-40 ... +46 °C
T5 (+100 °C)		
T4 (+135 °C)	-40 ... +85 °C	-40 ... +80 °C
T3 (+200 °C)		
T2 (+300 °C)		
T1 (+450 °C)		

The limits of the permissible temperature range can be limited due to the O-ring material used. The O-ring material used is specified on the type label. The limits for the temperature range depending on the materials are specified in the below table:

Name: Seal ring	Temperature range: Measuring cell	Temperature range: Seal ring
FKM	-40 ... +85 °C	-40 ... +220 °C
NBR	-20 ... +85 °C	-20 ... +120 °C
EPDM	-40 ... +85 °C	-50 ... +140 °C
PTFE	-40 ... +85 °C	-200 ... +260 °C
FFKM	-40 ... +85 °C	-46 ... +240 °C
Copper	-40 ... +85 °C	-200 ... +300 °C

In explosive steam-air mixtures, the instrument should only operated under atmospheric conditions:

- Temperature: -20 ... +60 °C.
- Pressure: 80 ... 110 kPa (0.8 ... 1.1 bar)
- Air with normal oxygen content, normally 21 %

If there is no explosive atmosphere, the permissible operating temperatures and pressures must be taken from the manufacturer specifications (operating instructions).

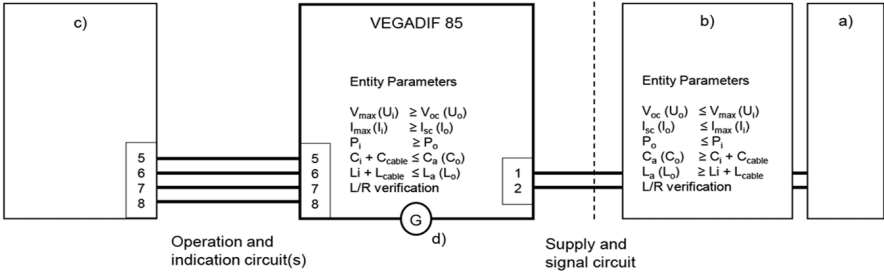
13 Control Drawing

Hazardous (classified) Location

Class I, Division 1, Groups A, B, C, D
or
Class I, Zone 0, Group IIC
Class I, Zone 1, Group IIC

Unclassified / Ordinary Location

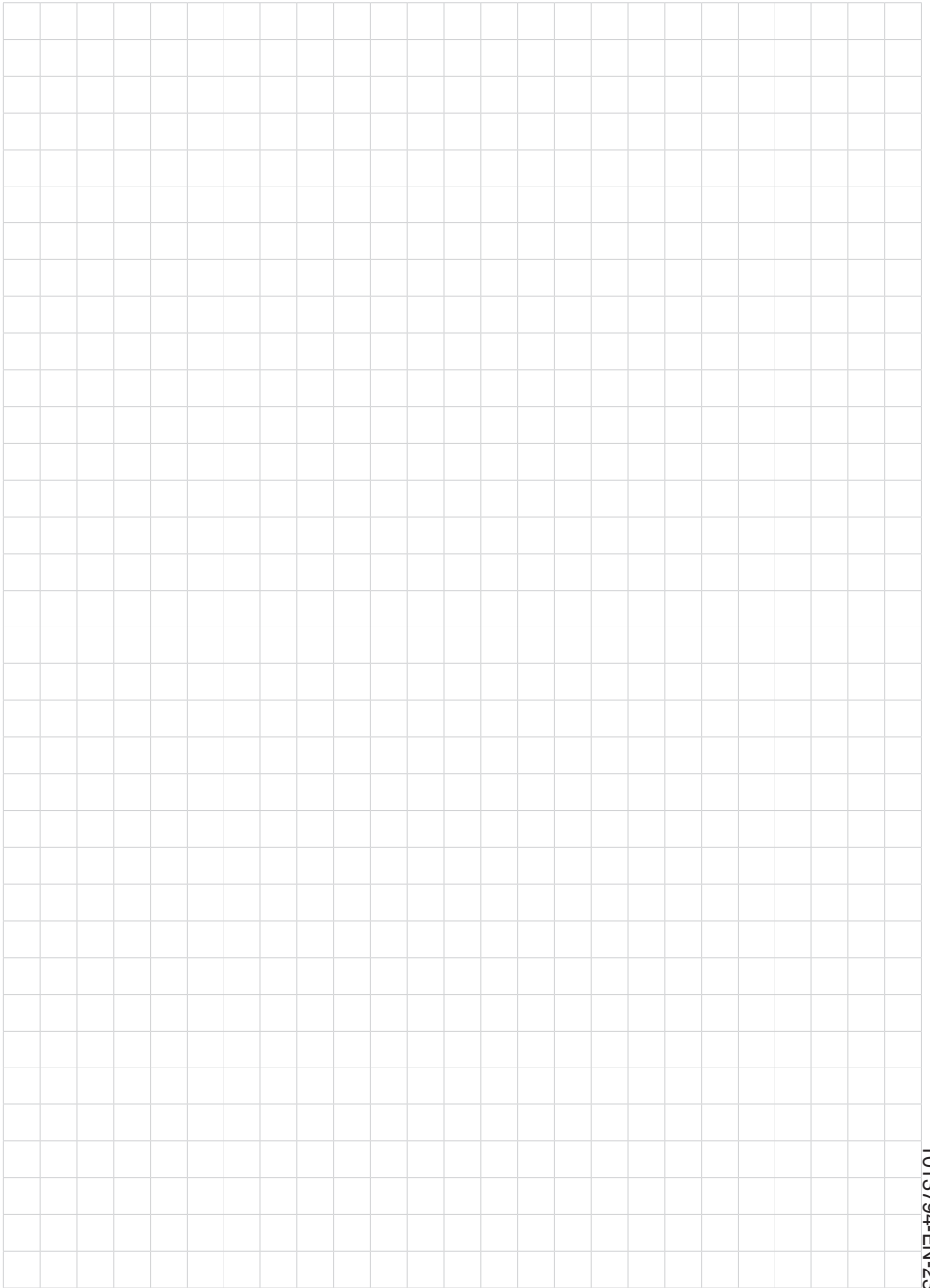
Class I, Division 2, Groups A, B, C, D
or
Class I, Zone 2, Group IIC



- a) Control Room ($U_m \leq 250$ V)
b) Associated Apparatus
c) VEGA DISPLAY e.g. VEGADIS 81 (optional)
d) Grounding Connection

NOTES:

- The Entity Concept allows the interconnection of suitable approved intrinsically safe devices with entity parameters not specifically examined in combination as a system when:
 - U_o or V_{oc} or $V_i \leq U_i$ or V_{max}
 - I_o or I_{sc} or $I_t \leq I_i$ or I_{max}
 - $P_o \leq P_i$
 - C_a or $C_o \geq C_i + C_{cable}$
 - L_a or $L_o \geq L_i + L_{cable}$
- Control equipment connected to the Associated Apparatus shall not use or generate more than $250 V_{rms}$ or V_{dc} .
- Installation should be in accordance with ANSI/ISA-RP12.06.01 "Intrinsic Safety Wiring Methods for Hazardous (Classified) Locations Instrumentation" and the National Electrical Code (ANSI/NFPA 70 (NEC®). Articles 504 and 505).
- The configuration of associated Apparatus shall be suitable approved under Entity Concept.
- Associated Apparatus manufacturer's installation control drawing shall be followed when installing this equipment.
- The VEGADIF 85 is approved for Class I, Zone 0 and Division 1 applications.
If connecting [Ex ib]/[Aex ib] associated apparatus to the VEGADIF 85, the above system is only suitable for Class I, Zone 1, or Division 2 hazardous (classified locations), and is not suitable for Class I, Zone 0, or Division 1 hazardous (classified) applications.
- When cable parameters are unknown, the following may be used: Capacitance = 200 pF/m (60 pF/ft); Inductance = 0.66 μ H/m (0.20 μ H/ft)
- Resistance between intrinsically safe ground and earth ground must be less than 1(one) Ohm.
- No revision to drawing without prior agency approval
- Warning: Substitution of components may impair suitability for intrinsic safety and hazardous locations.





Printing date:

VEGA

All statements concerning scope of delivery, application, practical use and operating conditions of the sensors and processing systems correspond to the information available at the time of printing.

Subject to change without prior notice

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