IECEx International Conference 2014
Kuala Lumpur, Malaysia

Electrical Installations
Design, Selection, Erection
and Inspection

IECEx International Conference 2014
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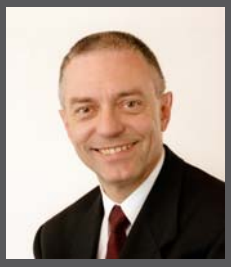
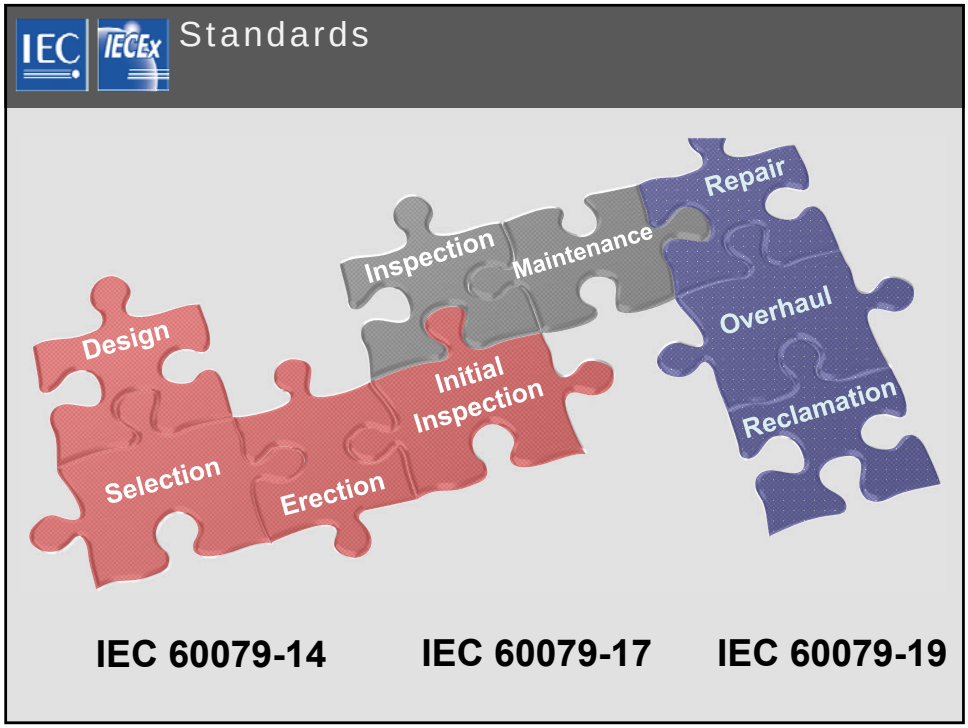


Peter Thurnherr
thuba Ltd., Switzerland
Convenor MT 60079-14


IEC
IEC 60079-14
Edition 5.0 2013-11
INTERNATIONAL STANDARD
NORME INTERNATIONALE
colour inside
Explosive atmospheres –
Part 14: Electrical installations design, selection and erection
Atmosphères explosives –
Partie 14: Conception, sélection et construction des installations électriques


IEC
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Standards
Design
Selection
Erection
Initial Inspection
Inspection
Maintenance
Repair
Overhaul
Reclamation
IEC 60079-14
IEC 60079-17
IEC 60079-19

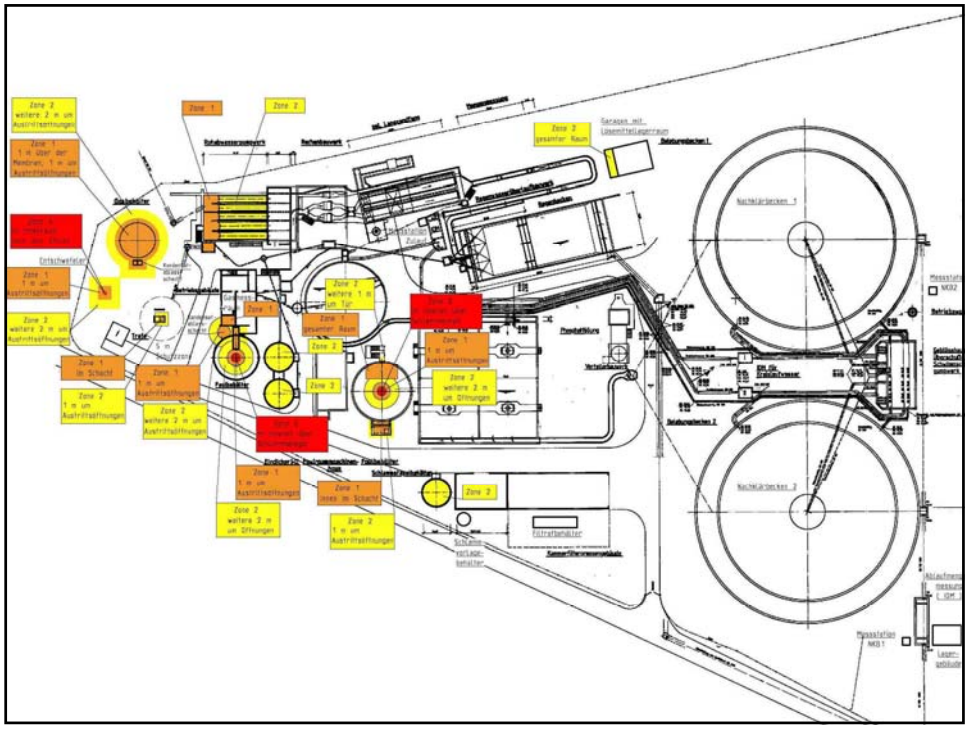
Structure of the Standard

4. General requirements
5. Selection of equipment
6. Protection from dangerous sparking
7. Electrical protection
8. Emergency switch-off and electrical isolation
9. *Wiring systems*
10. *Cable entry systems*
11. *Rotating electrical machines*
12. *Luminaires*
13. *Electric heating*

4. General requirements

4.2 Documentation – Site

- **Area classification document (see IEC 60079-10-1 and IEC 60079-10-2)**
- **Where applicable, gas, or vapour or dust classification in relation to the group or subgroup of the electrical equipment**
- **Temperature class or ignition temperature of the gas or vapour involved**
- **Where applicable, the material characteristics**
- **External influences**
- **Ambient temperature**




Ex

4.2 Documentation – Equipment

- **Certificate according to IEC standards**
- **Manufacturer's instruction manual for selection, installation and initial inspection**
- **Information with special conditions, if the certificate number has the suffix "X"**
- **Descriptive system document for the intrinsically safe system**

4.2 Equipment documentation

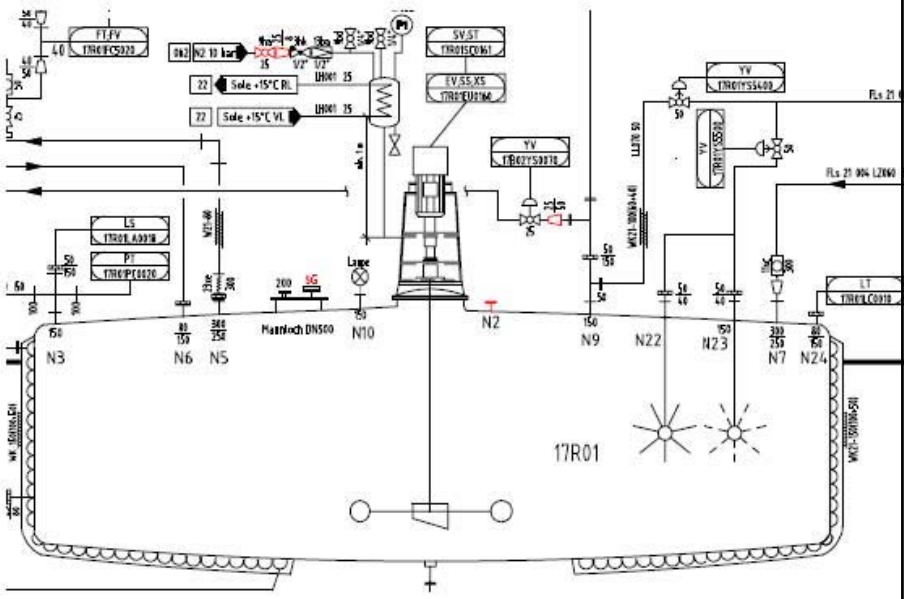
IECEx Certificate of Conformity

INTERNATIONAL ELECTROTECHNICAL COMMISSION
IEC Certification Scheme for Explosive Atmospheres

DEKRA EXAM GmbH

4.2 Documentation – Installation

- Necessary information to ensure correct installation of the equipment
- Documentation relating to the suitability of the equipment
- The plans showing details of wiring systems
- Records of selection criteria for cable entry systems
- Drawings and schedules relating to circuit identification
- Records of the initial inspection



4.2 Documentation – Personnel

- Evidence of personnel competency

4.3 Initial inspection

Equipment shall be installed in accordance with its documentation. It shall be ensured that replaceable items are of the correct type and rating.

On completion of the erection, **initial inspection** of the equipment and installation shall be carried out in accordance with IEC 60079-14.

Table 1 – Inspection schedule for Ex "d", Ex "e", Ex "n" and Ex "t/tD"

	Check that:	Ex 'd'	Ex 'e'	Ex 'n' Ex't/tD'
		Grade of inspection: Detailed		
A	**GENERAL (ALL EQUIPMENT)**			
1	Equipment is appropriate to the EPL/Zone requirements of the location	X	X	X
2	Equipment group is correct	X	X	X
3	Equipment temperature class is correct (only for gas)	X	X	n
4	Equipment maximum surface temperature is correct (only for 't/tD')			t
5	Degree of protection (IP grade) of equipment is appropriate for the level of protection/group/conductivity	X	X	t
6	Equipment circuit identification is correct	X	X	X
7	Equipment circuit identification is available	X	X	X
8	Enclosure, glass parts and glass-to-metal sealing gaskets and/or compounds are satisfactory	X	X	X
9	There are no unauthorized modifications	X	X	X
10	There are no visible unauthorized modifications			
11	Bolts, cable entry devices (direct and indirect) and blanking elements are of the correct type and are complete and tight			
	– physical check	X	X	X
	– visual check			
12	Threaded covers on enclosures are of the correct type, are tight and secured			
	– physical check	X		
	– visual check			

	Check that:	Grade of inspection: Detailed		
25	Breathing and draining devices are satisfactory	X	X	n
	EQUIPMENT SPECIFIC (LIGHTING)			
26	Fluorescent lamps are not indicating EOL effects		X	X
27	HID lamps are not indicating EOL effects	X		t
28	Lamp type, rating, pin configuration and position are correct	X	X	X
B	**INSTALLATION - GENERAL**			
1	Type of cable is appropriate	X	X	X
2	There is no obvious damage to cables	X	X	X
3	Sealing of trunking, ducts, pipes and/or conduits is satisfactory	X	X	X
4	Stopping boxes and cable boxes are correctly filled	X		
5	Integrity of conduit system and interface with mixed system maintained	X	X	X
6	Earthing connections, including any supplementary earthing bonding connections are satisfactory (for example connections are tight and conductors are of sufficient cross-section)			
	– physical check	X	X	X
7	Fault loop impedance (TN systems) or earthing resistance (IT systems) is satisfactory	X	X	X
8	Automatic electrical protective devices are set correctly (auto-reset not possible)	X	X	X
9	Automatic electrical protective devices operate within permitted limits	X	X	X
10	Specific conditions of use (if applicable) are complied with	X	X	X
11	Cables not in use are correctly terminated	X	X	X
12	Obstructions adjacent to flameproof flanged joints are in accordance with IEC 60079-14	X		

8	Automatic electrical protective devices are set correctly (auto-reset not possible)	X	X	X
9	Automatic electrical protective devices operate within permitted limits	X	X	X
10	Specific conditions of use (if applicable) are complied with	X	X	X
11	Cables not in use are correctly terminated	X	X	X
12	Obstructions adjacent to flameproof flanged joints are in accordance with IEC 60079-14	X		
13	Variable voltage/frequency installation complies with documentation	X	X	X
	INSTALLATION – HEATING SYSTEMS			
14	Temperature sensors function according to manufacturer's documents	X	X	t
15	Safety cut off devices function according to manufacturer's documents	X	X	t
16	The setting of the safety cut off is sealed	X	X	
17	Reset of a heating system safety cut off possible with tool only	X	X	
18	Auto-reset is not possible	X	X	
19	Reset of a safety cut off under fault conditions is prevented	X	X	
20	Safety cut off independent from control system	X	X	
21	Level switch is installed and correctly set, if required	X	X	
22	Flow switch is installed and correctly set, if required	X	X	
	INSTALLATION – MOTORS			
23	Test motor protection device by verification of time t_E or i_A		X	X
C	**ENVIRONMENT**			
1	Equipment is adequately protected against corrosion, weather, vibration and other adverse factors	X	X	X
2	No undue accumulation of dust and dirt	X	X	X
3	Electrical insulation is clean and dry		X	X

4.4 Assurance of conformity of equipment

Equipment with certificate according to the IEC 60079 series meets the requirements for hazardous areas, when selected and installed in accordance with this standard.

4.4 Assurance of conformity of equipment

4.4.1.2 IEC Standards

The requirements given in IEC 60079-14 are based on *the current editions* of the IEC standards in the IEC 60079 series.

If equipment is tested and certified according to past editions, it is possible that the basis used for the certification does not comply with the requirements given in this standard.

NOTE 1 Care should be taken *to check any technical differences* to the requirements given in the current editions. It may be required that additional measures should be applied to ensure safe operation.

Simple apparatus

Exception:

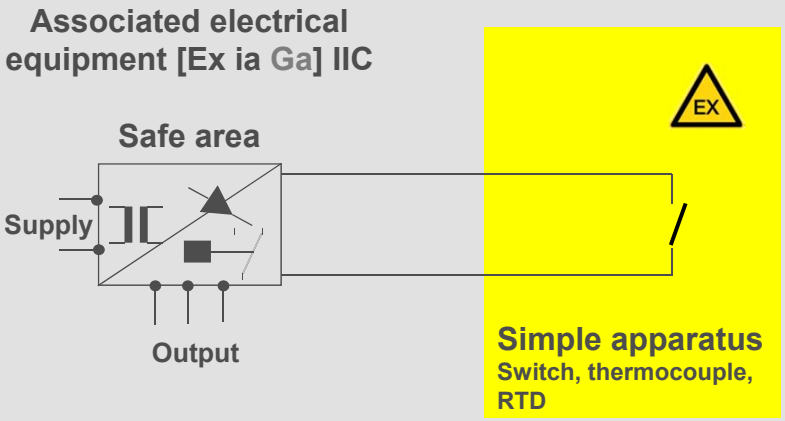
Simple electrical apparatus used within an intrinsically safe circuit.

Simple apparatus

Simple apparatus must possess the following characteristics:

- **no internal cells or batteries (exception: thermocouples, photocells, etc., limited to 1.5 V, 100 mA and 25 mW)**
- **connection to a single source only**
- **no internal voltage/current transformation**

Simple apparatus



4.5 Qualifications of personnel (Annex A)

- General understanding of relevant electrical engineering
- Practical understanding of explosion protection principles and techniques
- Understanding of and ability to read and assess engineering drawings
- Working knowledge and understanding of relevant Standards in explosion protection
- Basic knowledge of quality assurance, including the principles of auditing, documentation, traceability of measurement, and instrument calibration

5. Selection of equipment

5.3 Relationship between equipment protection level (EPLs) and zones

Zones	Equipment protection level (EPL)
0	Ga
1	Gb and Ga
2	Gc, Gb and Ga

5.4.2 Relation between EPLs and types of protection

EPL	Type of Protection	Code	Standard
Gb	Flameproof enclosures	d	IEC 60079-1
	Increased safety	e	IEC 60079-7
	Intrinsically safe	ib	IEC 60079-11
	Encapsulation	mb	IEC 60079-18
	Oil immersion	o	IEC 60079-6

5.5 Selection according to equipment grouping

Requested Group	Permissible Group
IIA	IIA, IIB or IIC
IIB	IIB or IIC
IIC	IIC

Gas group – Class I, Division 1 and 2

Group	Permissible Group
A	Acetylen
B	Hydrogen
C	
D	

Gas group

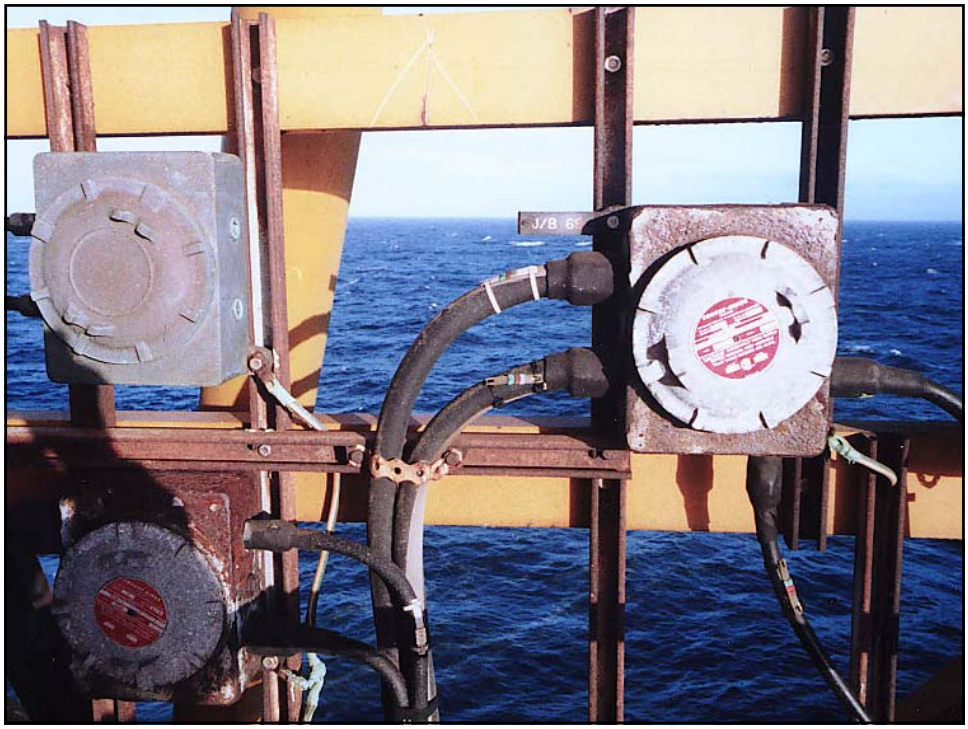
NEC 500-503			NEC 505 IEC 60079-0
Class I Gas and vapours	Acetylene	Group A	Group IIC
	Hydrogen	Group B	Group IIC
	Ethylene	Group C	Group IIB
	Propane	Group D	Group IIA

5.6.2 Temperature class

Temperature class required by the area classification	Ignition temperature of gas or vapor	Allowable temperature classes of equipment
T1	> 450°C	T1 - T6
T2	> 300°C	T2 - T6
T3	> 200°C	T3 – T6
T4	> 135°C	T4 – T6
T5	> 100°C	T5 – T6
T6	> 85°C	T6

5.9 Selection to cover external influences

- Thermal effects
- Chemical effects
- Mechanical effects
- Effects of movement and vibration
- Electrical effects
- Moisture
- Ingress of process liquids
- Corrosion



5.9 Selection to cover external influences

5.9 Ambient temperature

Equipment shall normally be designed for use in an ambient temperature range between –20 ºC and 40 ºC;
in this case, no additional ambient temperature marking is required.

Example of extended ambient temperature range T_{amb}

T_{amb} –20 ºC to 60 ºC.

6. Protection from dangerous sparking

6.1 Light metals as construction materials

Materials used in Group II installations for the identified equipment protection levels shall not contain, by mass, more than:

for EPL "Ga"

- **10 % in total of aluminum, magnesium, titanium and zirconium, and**
- **7.5 % in total of magnesium, titanium and zirconium;**

for EPL "Gb"

- **7.5 % in total of magnesium, titanium and zirconium;**

for EPL "Gc"

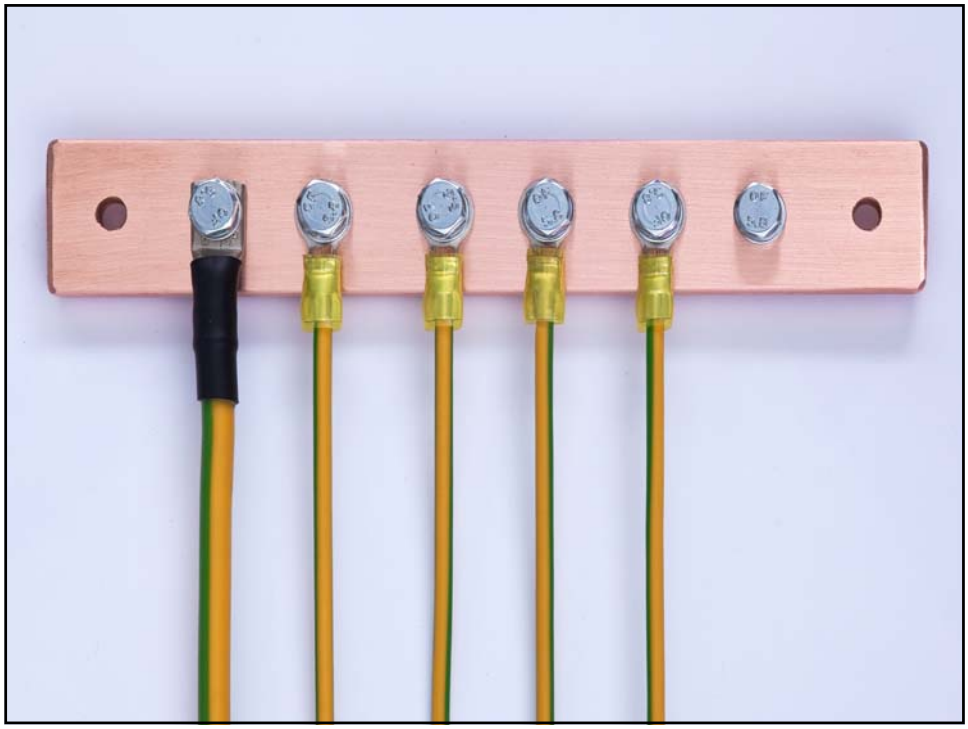
- **No requirement**

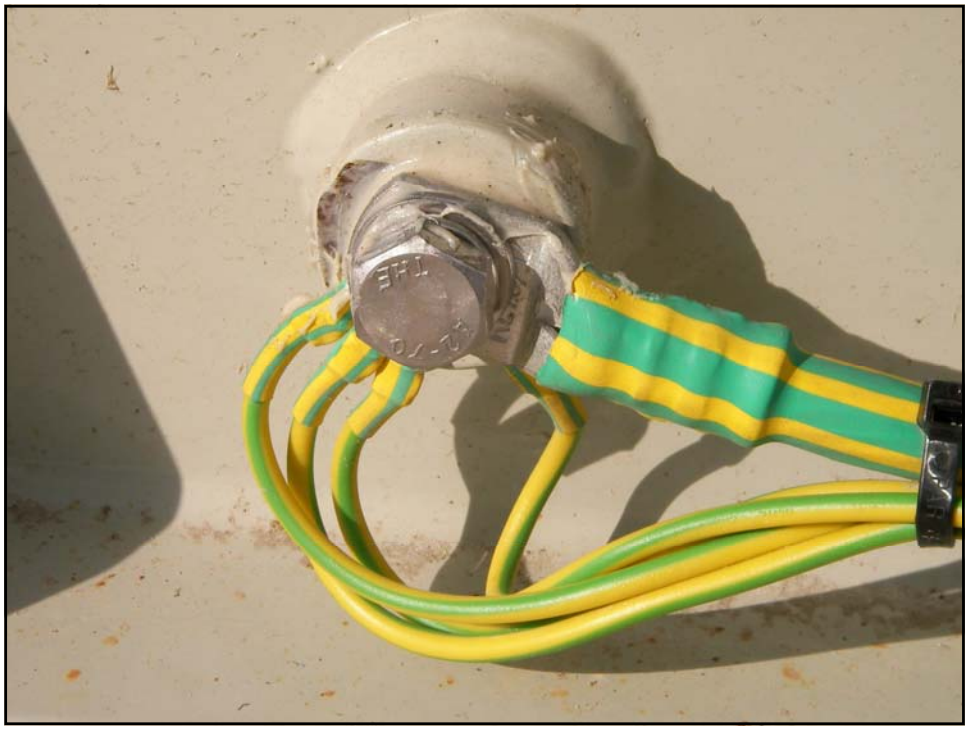
6.4 Potential equalization

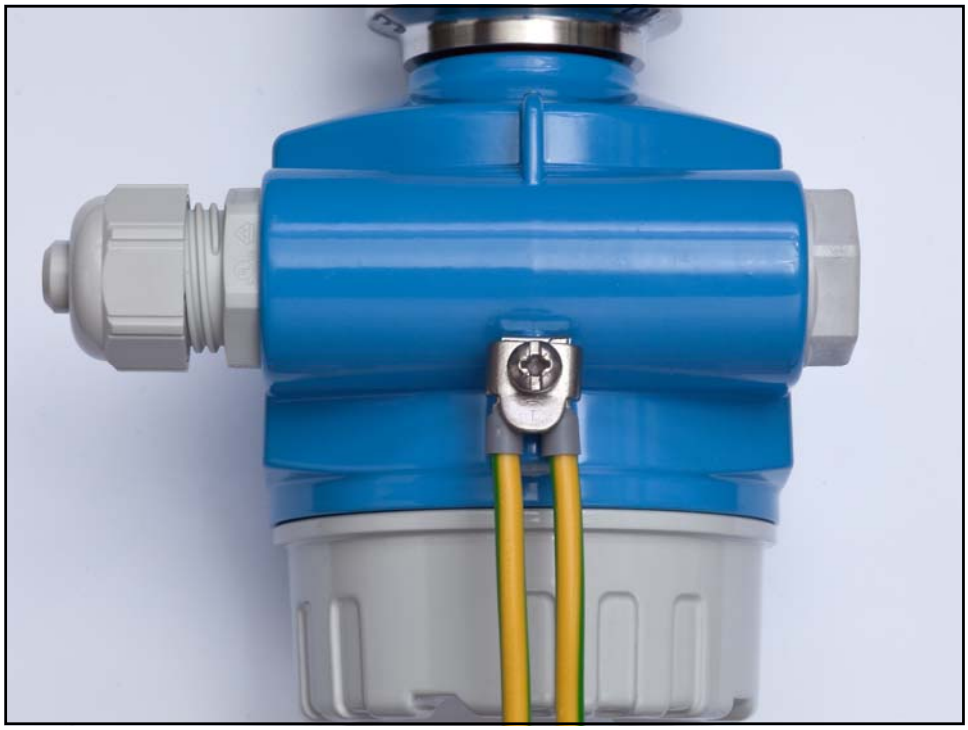
The minimum size for bonding conductors for the *main connection* to a protective rail shall be *at least 6 mm²* (based on conductivity of copper) in accordance to IEC 60364-5-54 and *supplementary connections* shall be a minimum of *4 mm²*.

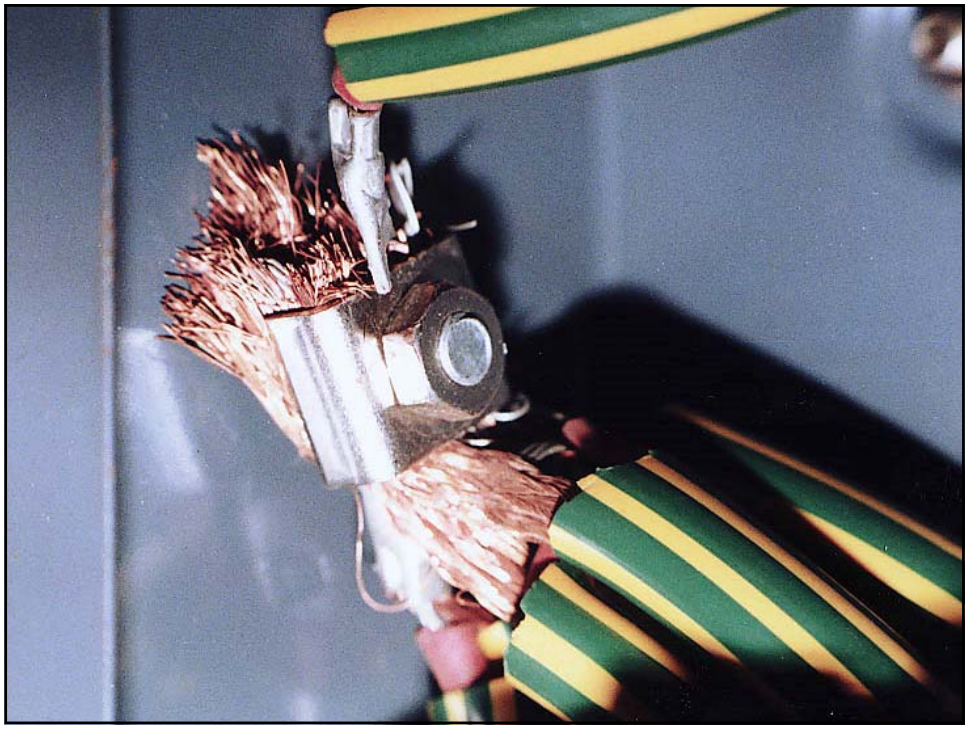
Consideration should also be given to using larger conductors for mechanical strength.

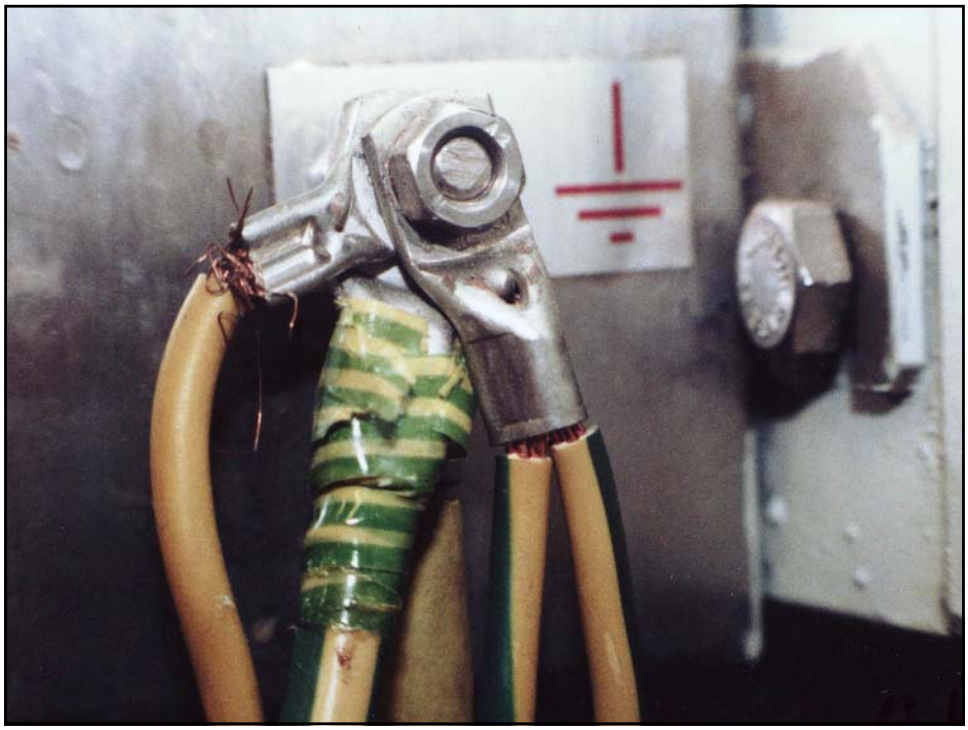
Connections shall be secure against self loosening and shall minimize the risk of corrosion which may reduce the effectiveness of connection.







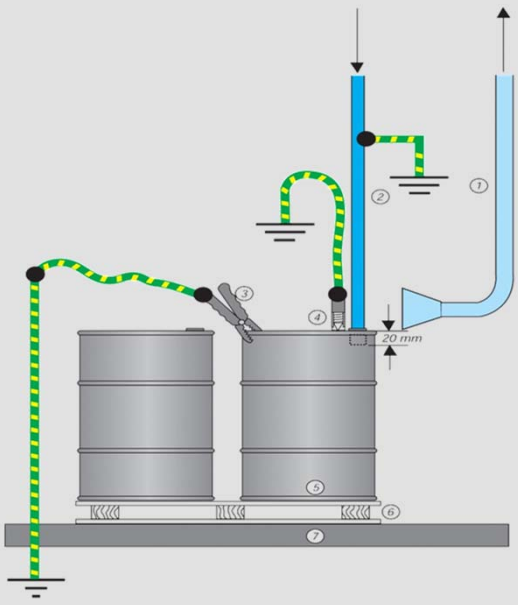




6.4.2 Temporary bonding

Mechanical strength of the conductor shall be equivalent to at least 4 mm² copper, or be part of flexible cabling system incorporating a monitoring and control system.

6.4.2 Temporary bonding



6.5 Static electricity

Limitation of the size of chargeable non-conductive surfaces

EPL	Surface [mm^2]		
	IIA	IIB	IIC
Ga	5000	2500	400
Gb	10000	10000	2000
Gc	10000	10000	2000

shall be ≤4 kV (measured across the thickness of the insulating material according to the method described in IEC 60243-1);

d) by provision of a conductive coating. Non-metallic surfaces may be covered with a bonded durable conductive coating. The resistance between coating and either the point of bond (in the case of equipment for fixed installations) or the farthest point of potential contact with the enclosure (in the case of portable equipment) shall not exceed 10^9 Ω. The resistance shall be measured in accordance with 26.13 but using a 100 mm^2 electrode at the worst case position of the surface and either the bond or the farthest point of potential contact. The equipment shall be marked "X" in accordance with item e) of 29.3 and the documentation shall provide guidance on the use of the bonding connection (for fixed equipment) and provide information to enable the user to decide on the durability of the coating material with respect to the environmental conditions;

NOTE 1 The environmental conditions that have an effect on the coating material may include influences from small particles in an air stream, solvent vapours, and the like.

e) for fixed installations where the installation is intended to minimize the risk from electrostatic discharge, by marking the equipment X" in accordance with item e) of 29.3. . The instructions shall provide guidance for the user to minimize the risk from electrostatic discharge. Where practicable, the equipment shall also be marked with the electrostatic charge warning given in item g) of 29.12.

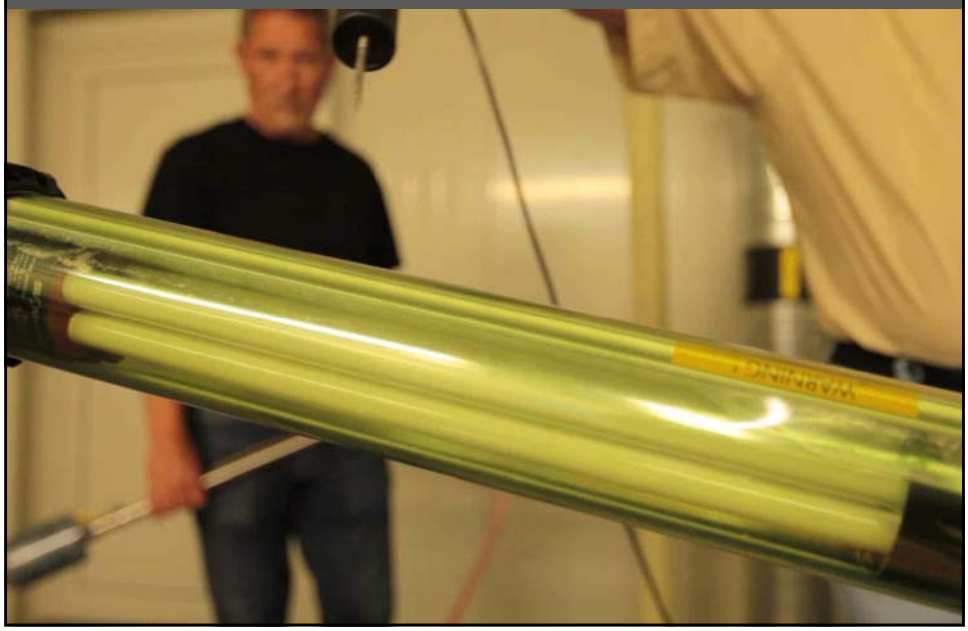
NOTE 2 Guidance on the risk of ignition from electrostatic discharge can be found in EN TR50404 and future IEC/TS 60079-32.

NOTE 3 Care should be taken when selecting the use of a warning label for static risk control. In many industrial applications, especially coal mining, it is highly likely that warning labels may become illegible through the deposition of dusts. If this is the case, it is possible that the act of cleaning the label may cause a static discharge.

NOTE 4 When selecting electrical insulating materials, attention should be paid to maintaining a minimum insulation resistance to avoid problems arising from touching exposed non-metallic parts that are in contact

Warning!

6.5 Static electricity



9. Wiring systems

9.1 General

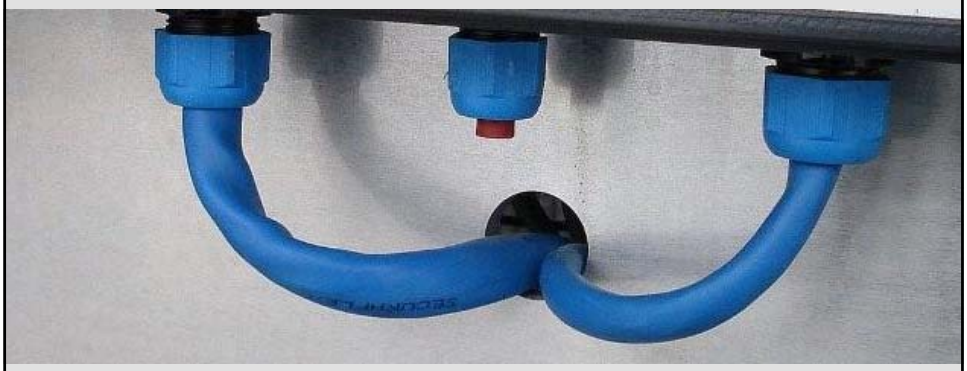
Edition 4

Wiring systems shall comply fully with the relevant requirements of this clause except that intrinsically safe and energy-limited installations need not comply with 9.3.1 to 9.3.5 inclusive.

Edition 5

Cable and wiring systems shall comply with the relevant requirements of Clause 9.

9.1 General



9.3.2 Cables for fixed installations

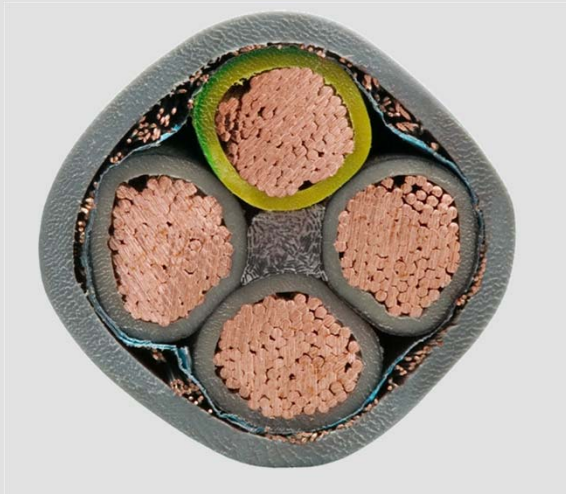
Cables used for fixed installations wiring in hazardous areas shall be appropriate for the ambient conditions in service.

9.3.2 Cables for fixed installations

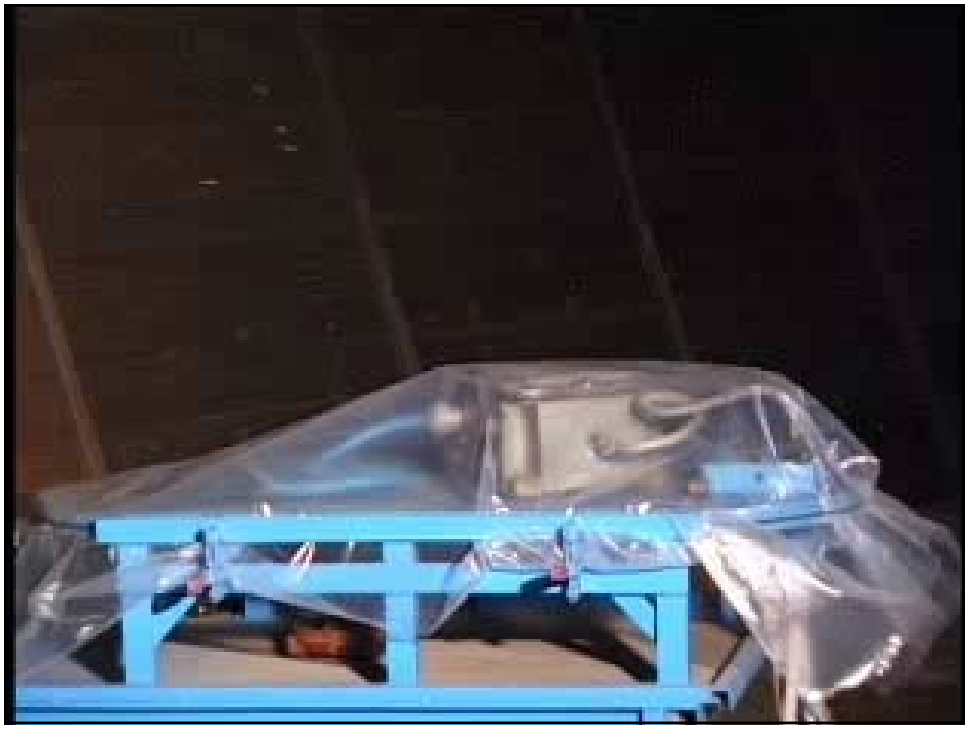
Cables shall be:

- **Sheathed with thermoplastic, thermosetting, or elastomeric material.**
  They shall be circular and compact.
  Any bedding or sheath shall be extruded.
  Fillers, if any, shall be non hygroscopic.
- **Mineral insulated metal sheathed, or**
- **Special, e.g. flat cables with appropriate cable glands.**

9.3.2 Cable for fixed installations



9.3.2 Cable for fixed installations



9.6.3 Unused cores

Each unused core in multi-core cables shall either be connected to earth or be adequately insulated by means of terminations suitable for the type of protection.

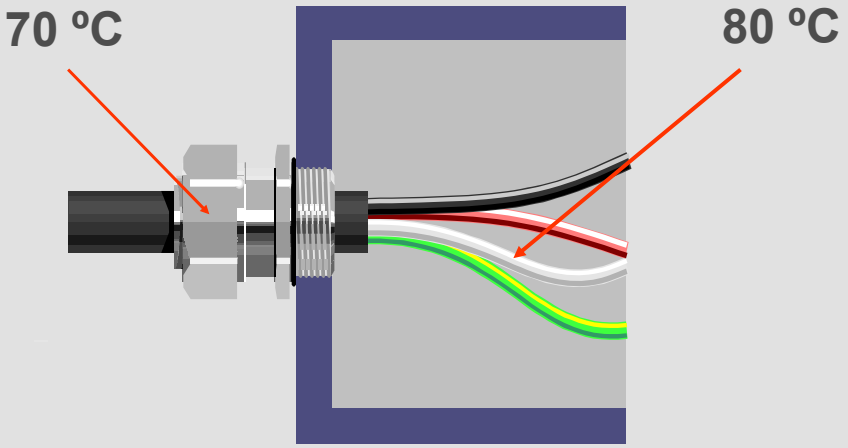
***Insulation by tape alone is not permitted*!**

10. Cable entry systems and blanking elements

10.1 General

If a cable gland is to be used at an ambient temperature range different from –20 °C to 40 °C and/or a operation temperature higher than 80 °C this must be covered by certification documentation.

10.1 Cable entries

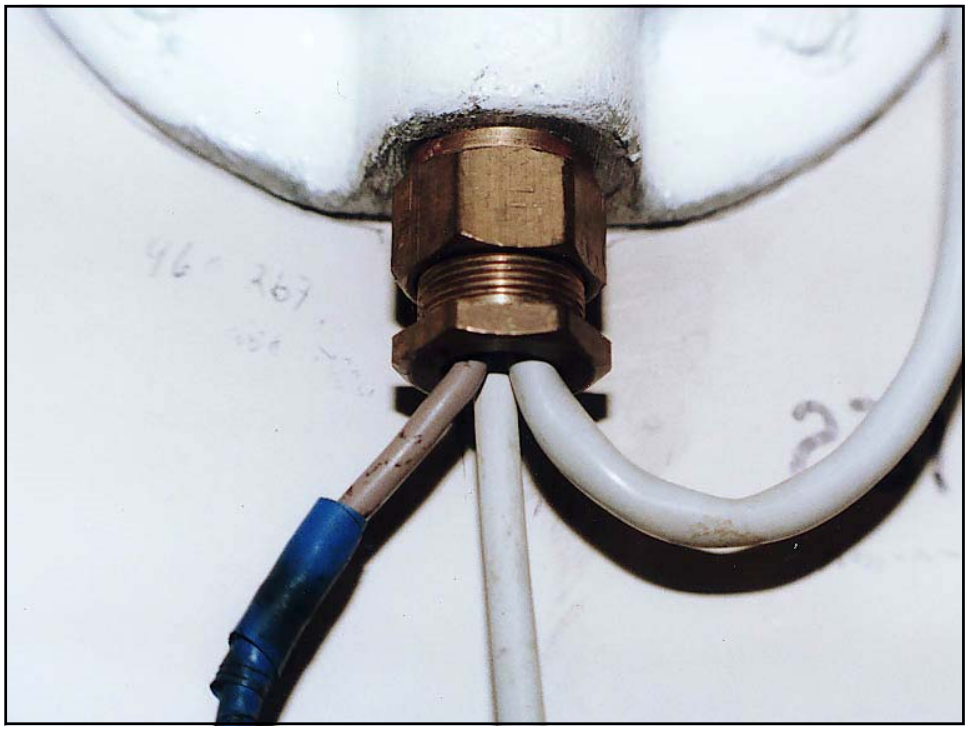


10.2 Selection of cable glands

The cable gland shall be selected to match the cable diameter.

The use of **sealing tape, heat shrink tube** or other materials is **not permitted** to make the cable fit to the cable gland.

Cable glands shall be in accordance with IEC 60079-0 and shall be selected to maintain the requirements of the protection technique according to Table 10.



10.2 Selection of cable glands

Protection technique for the equipment	Glands, adapters and blanking element protection technique			
	Ex “d” see 10.6	Ex “e” see 10.4	Ex “n” see 10.4	Ex “t” see 10.7
Ex “d”	X			
Ex “e”	X	X		
Group II Ex “i” / Ex “nL”	X	X	X see 16.5	
Group III Ex “i”				X See 16.5

10.2 Selection of cable glands

Protection technique for the equipment	Glands, adapters and blanking element protection technique			
	Ex “d” see 10.6	Ex “e” see 10.4	Ex “n” see 10.4	Ex “t” see 10.7
Ex “n” ausgenommen Ex “nL” Ex “nR” Siehe 10.8	X	X	X	
Ex “pxb”, Ex “pyb” or Ex “pzc”	X	X		

10.2 Selection of cable glands

Protection technique for the equipment	Glands, adapters and blanking element protection technique			
	Ex “d” see 10.6	Ex “e” see 10.4	Ex “n” see 10.4	Ex “t” see 10.7
Ex “pD”	X	X		X
Ex “t”				X

10.2 Selection of cable glands

Protection technique for the equipment	Glands, adapters and blanking element protection technique			
	Ex “d” see 10.6	Ex “e” see 10.4	Ex “n” see 10.4	Ex “t” see 10.7
Ex “m” Ex “o” Ex “q”	Ex “m”, Ex “o” and Ex “q” would not normally be applied to wiring connections. The protection technique for connections shall suit the wiring system used.			

10.3 Connections of cables to equipment

Cable glands shall be installed in a manner that after installation they are only capable of being released or dismantled by means of a tool.

10.3 Connections of cables to equipment

Certificate with the suffix “X”

If an additional clamping is required to prevent pulling and twisting of the cable transmitting the forces to the conductor terminations inside the enclosure, a clamp shall be provided, as close as practicable to the gland along the cable.

NOTE 1
Cable clamps within 300 mm of the end of the cable gland are preferred.

10.3 Connections of cables to equipment

10.3 Connections of cables to equipment

	evoprene:	-50 °C to +70 °C
Suitable for equipment of group II with a degree of mechanical hazard:	low	
Installation in equipment with wall thicknesses of:	at least 1,5 mm	
Protection against contact, foreign matter and water:	at least IP 54 acc. to EN 60 529:1991	

(16) Report PTB Ex 99-30113

(17) Special conditions for safe use

Only permanently laid cables and conduits may be entered. The user must guarantee suitable clamping.

The maximu[illegible]al load of the cables and conduits entered is to be taken into account.

The cable ent[illegible]ay be used only in places where they are protected against the influence of mechanical da[illegible].

(18) Essential health and safety requirements

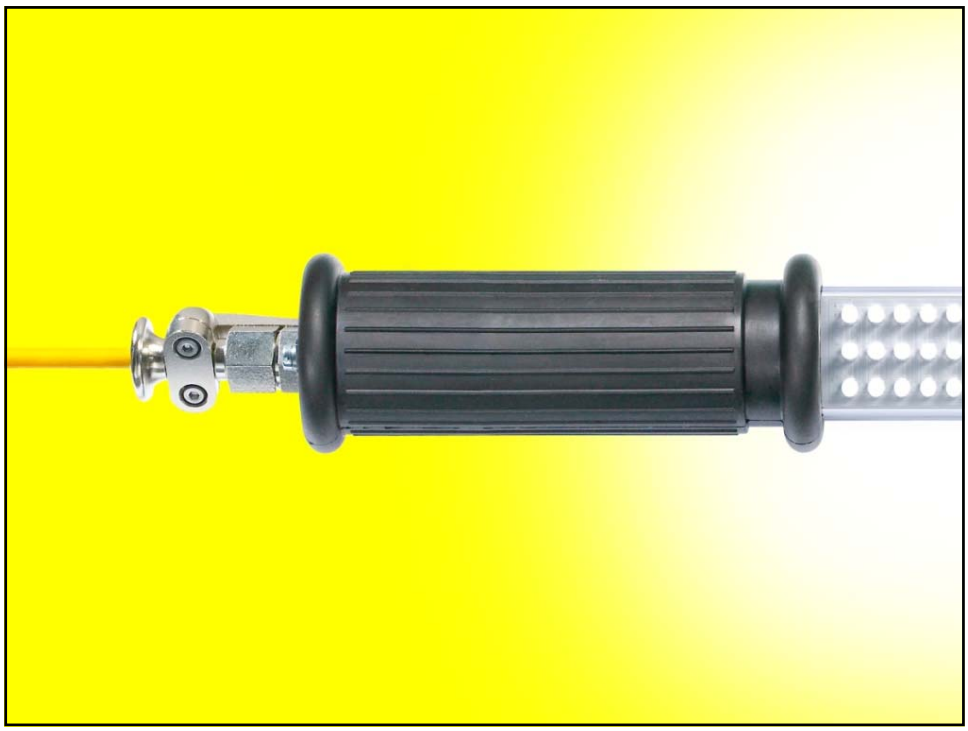
The degree of protection - at least IP 54 according to EN 60529:1991 - will be guaranteed only by adequate selection od cable and conduit entries, of the sealings tested and by proper installation of the cable and conduit entries into the electrical apparatus.

Zertifizierungsstelle Explosionsschutz — Braunschweig, November 16, 1999

By order:

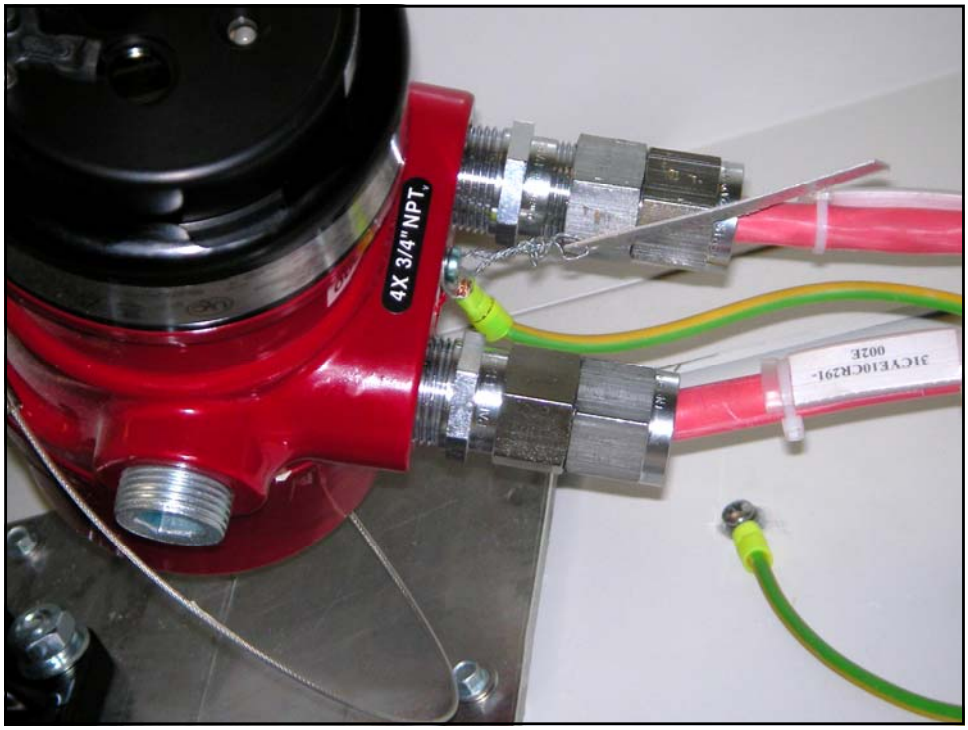
Dr.-Ing. U. Engel

10.3 Trumpet cable gland



10.3 Connections of cables to equipment

Cables shall be routed straight from the cable gland to avoid lateral tension that may compromise the seal around the cable.



10.4 Additional requirements for entries

Additional requirements for entries
other than Ex “d”, Ex “t” or Ex “nR”

If additional cable entry holes for other than Ex “d”, Ex “t” or Ex “nR” are required they may be made under following conditions:

- **permitted by the manufacturer’s documentation with area, size of holes and quantity of holes**
- **entry holes either plain or threaded shall meet the tolerances given by the manufacturer**

10.5 Unused openings

With the exception of enclosures containing only one intrinsically safe circuit unused entries in the enclosure shall be sealed by blanking elements in accordance with table 10 and that maintain the *degree of ingress protection IP 54* or that required by the location, whichever is the higher.

Blanking elements shall *comply with IEC 60079-0*, and be of a type that can only be removed with the aid of tools.

10.5 Unused openings


ROSEMOUNT

10.5 Unused openings

10.5 Unused openings

Flameproof enclosures

Adapters shall not be used together with blanking elements.

10.6 Additional requirements for type of protection “d”

The cable entry system shall comply with one of the following:

- **barrier cable glands in compliance with IEC 60079-1 and certified as equipment;**
- **cable glands in compliance with IEC 60079-1, certified as an equipment and combined with the cables complying with 9.3.1(a) and with a minimum length of the connected cable of 3 m**

NOTE 1

The minimum length is required to minimize the negative effects of gas migration through the cable (see also Annex E).

10.6 Additional requirements for type of protection “d”

Table 3 – Cylindrical threaded joints

Pitch	≥0,7 mm[a]
Thread form and quality of fit	Medium or fine tolerance quality according to ISO 965-1 and ISO 965-3[b]
Threads engaged	≥5
Depth of engagement	
Volume <100 cm³	≥5 mm
Volume >100 cm³	≥8 mm

[a] Where the pitch exceeds 2 mm, special manufacturing precautions may be necessary (for example, more threads engaged) to ensure that the electrical apparatus can pass the test for non-transmission of an internal ignition which is prescribed in 15.2.

[b] Cylindrical threaded joints which do not conform with ISO 965-3 in respect of thread form or quality of fit, are permitted if the test for non-transmission of an internal ignition, prescribed in 15.2, is passed, when the width of the threaded joint specified by the manufacturer is reduced by the amount specified in Table 6.

10.8 Additional requirements for type of protection “nR”

The sealing of restricted-breathing “nR” enclosures shall be such as to maintain the restricted-breathing properties of the enclosure.

12. Luminaires

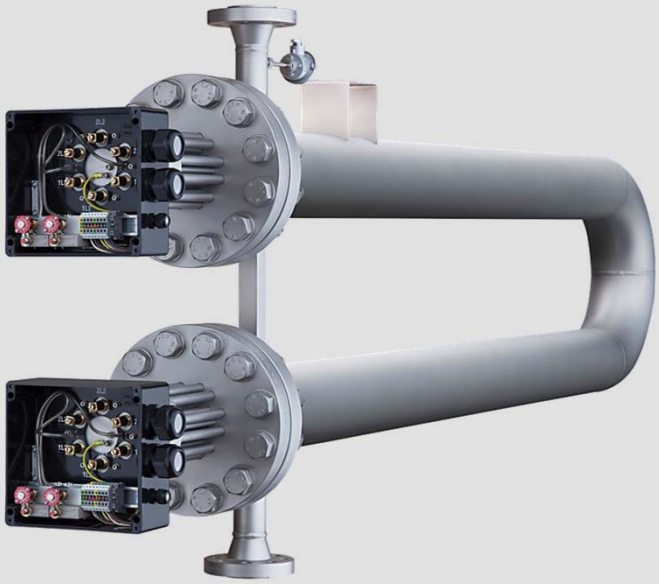
12. Luminaires

12. Luminaires (“e” and “nA”)

Luminaires with fluorescent lamps and electronic ballasts shall not be used where *temperature class T5 or T6 is required* or where the *ambient temperature exceeds 60 °C*.

13. Electric heating system

13. Electric heating system



13.1 General

Heaters shall have the following protection in addition to overcurrent protection:

- **in a TT or TN type system, a residual current device (RCD) with a rated residual operating current not exceeding 100 mA shall be used. insulation monitors are employed in IT systems.**

NOTE
Preference should be given to RCDs with a rated residual operating current of 30 mA.

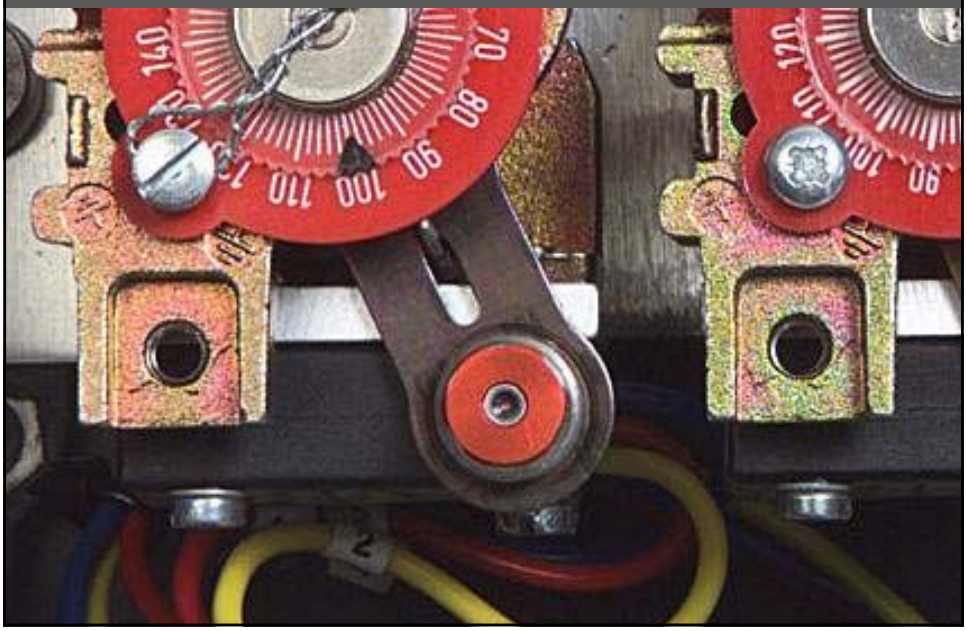
13.1 General

13.1 General

13.2 Temperature monitoring

- Resetting only with tool
- Manual resetting
- Resetting only under normal operating conditions
- Secured setting
- Independent of the controller
- Sensor fail-safe function (e.g. if capillary tube fractures)

13.2 Temperature monitoring



13.4 Safety device

The protection offered by a safety device shall be achieved by sensing:

- **the temperature of the resistance heating device or, if appropriate, of its immediate surroundings;**
- **the temperature of the resistance heating device or the surrounding temperature; and one or more other parameters.**

13.4 Safety device

Examples of such parameters include:

- in the case of liquids, a covering of the heating device of at least 50 mm can be ensured by means of a level monitor; or
- in the case of flowing media such as gas and air, the minimum throughput can be ensured by means of a flow monitor.

13.4 Safety device

Temperature class required by the area classification	Ignition temperature of gas or vapour	Max. surface temperature (worst case)
T1	> 450 °C	440 °C
T2	> 300 °C	290 °C
T3	> 200 °C	195 °C
T4	> 135 °C	130 °C
T5	> 100 °C	95 °c
T6	> 85 °C	80 °C

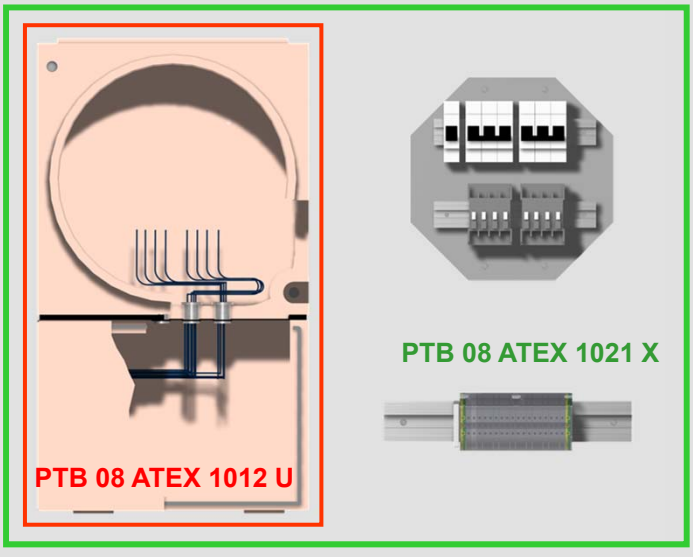
13.4 Safety device

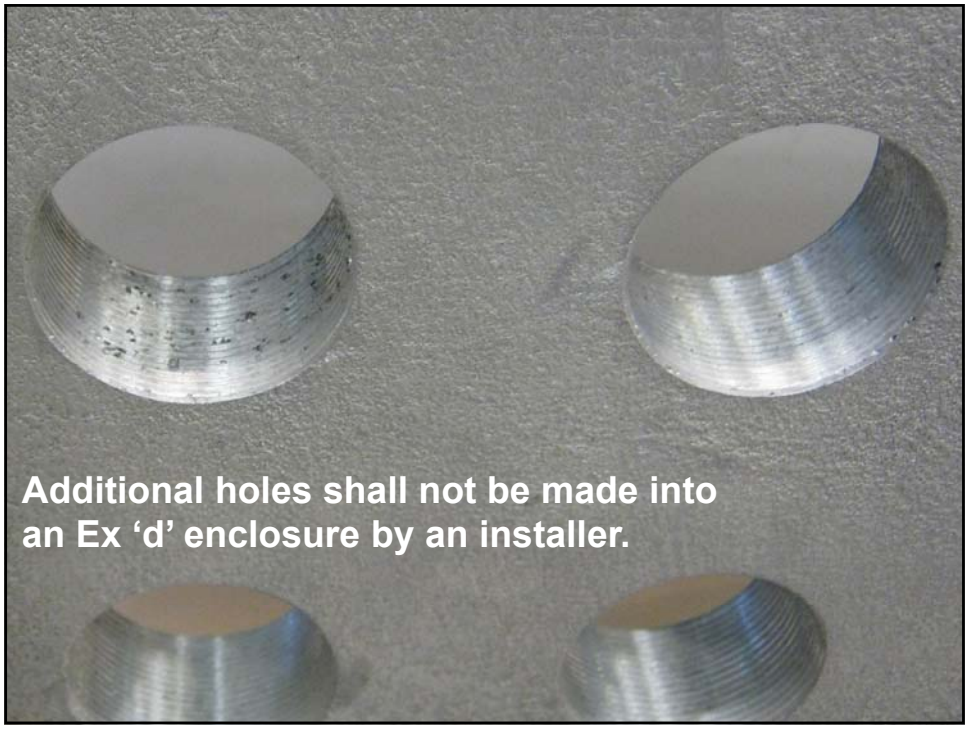
14. Additional requirements for type of protection ‘d’ Flameproof enclosures

14. General

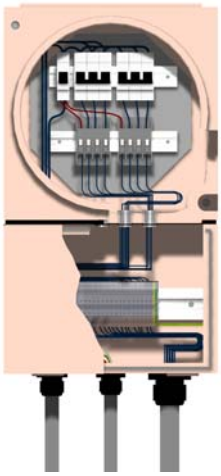
Flameproof enclosures, with only an Ex component enclosure certificate (marked with a 'U'), shall not be installed. They shall always have an equipment certificate for the complete assembly.

14. General

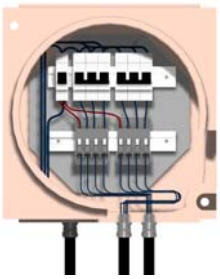




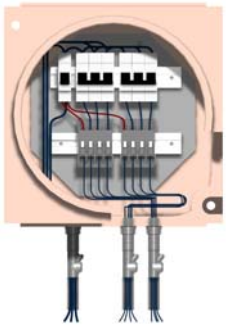
14. Installation



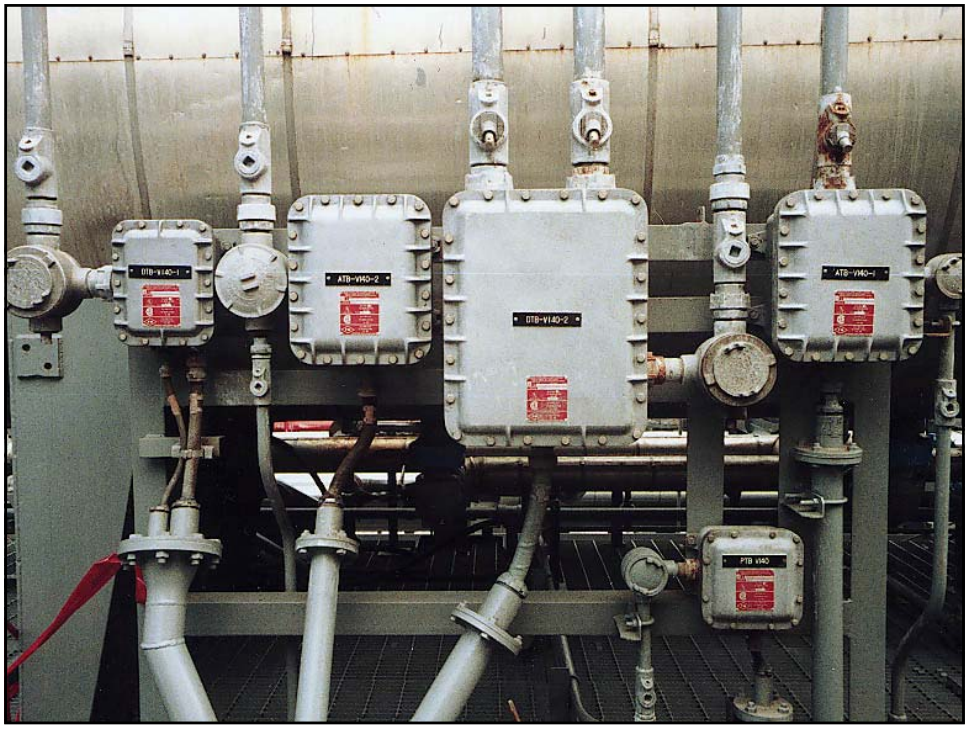
Indirect



Direct

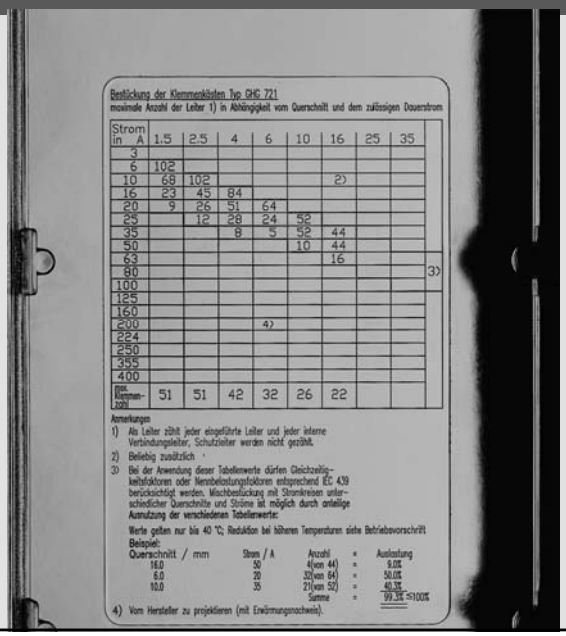


Conduit entries



15. Additional requirements for type of protection ‘e’ – Increased safety

15.2 Maximum dissipated power



Bestückung der Klemmenkästen Typ GHG 721
maximale Anzahl der Leiter 1) in Abhängigkeit vom Querschnitt und dem zulässigen Dauerstrom

Strom in A	1.5	2.5	4	6	10	16	25	35
3								
6	102							
10	68	102				2)		
16	23	45	84					
20	9	26	51	64				
25		12	28	24	52			
35			8	5	52	44		
50					10	44		
63						16		
80								3)
100								
125								
160								
200				4)				
224								
250								
355								
400								
max. Klemmenzahl	51	51	42	32	26	22		

Anmerkungen
1) Als Leiter zählt jeder eingeführte Leiter und jeder interne Verbindungsleiter, Schutzleiter werden nicht gezählt.
2) Beliebig zusätzlich
3) Bei der Anwendung dieser Tabellenwerte dürfen Gleichzeitigkeitsfaktoren oder Nennbelastungsfaktoren entsprechend IEC 439 berücksichtigt werden. Mischbestückung mit Stromkreisen unterschiedlicher Querschnitte und Ströme ist möglich durch anteilige Ausnutzung der verschiedenen Tabellenwerte:
Werte gelten nur bis 40 °C; Reduktion bei höheren Temperaturen siehe Betriebsvorschrift
Beispiel:

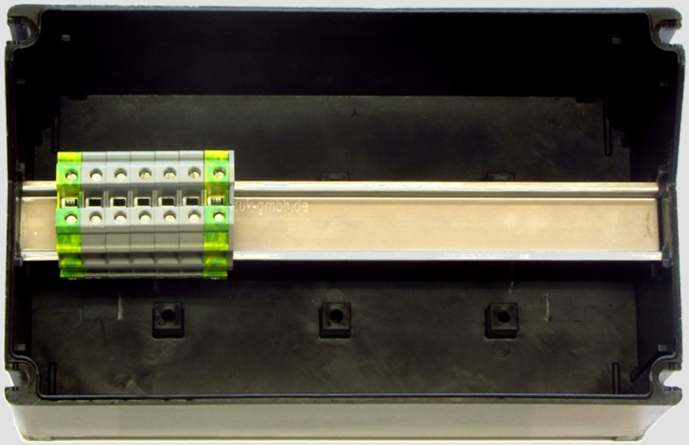
Querschnitt / mm	Strom / A	Anzahl		Auslastung
16.0	50	4(von 44)	=	9.0%
6.0	20	32(von 64)	=	50.0%
10.0	35	21(von 52)	=	40.3%
		Summe	=	99.3% ≤100%

4) Vom Hersteller zu projektieren (mit Erwärmungsnachweis).

15.2 Maximum dissipated power

Current	Cross-section in [mm²]							
[A]	1,5	2,5	4	6	10	16	*25*	35
6	102							
10	68	102						
16	23	45	84					
20	9	26	51	64				
25		12	28	24	52			
35			8	5	52	44		
50					10	44		
63						16		
80								
100								
max. number of terminals	51	51	42	32	26	22		

15.2 Maximum dissipated power



16. Additional requirements for type of protection ‘i’ – Intrinsic safety

16.5.1 Terminal boxes – General

The terminal box used shall be suitable for the environment in which it is installed e.g. usually an enclosure of at least IP54 is desirable. Cable entry devices shall maintain the degree of protection of the enclosure.

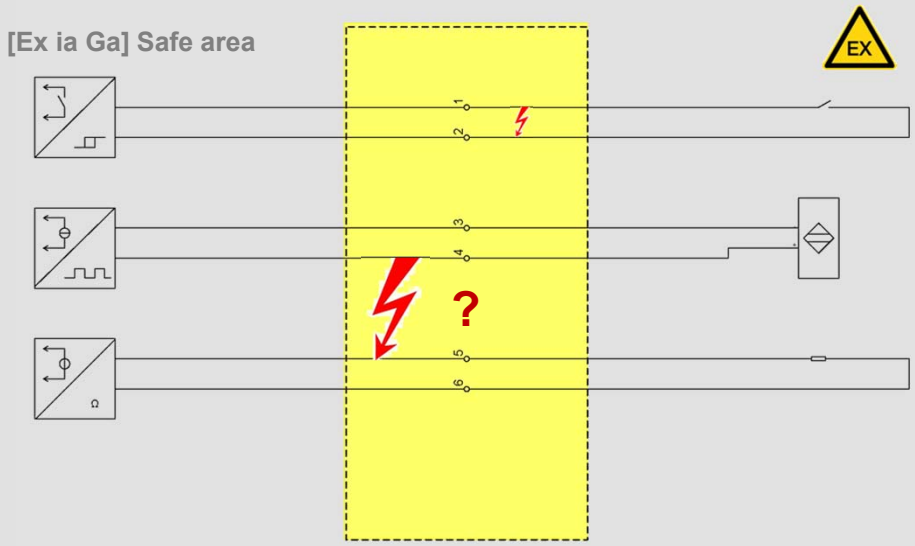
Where a terminal box is used within a hazardous area it shall additionally comply with the electrostatic requirements of IEC 60079-0.

16.5.2 Terminal boxes with only one intrinsically safe circuit

There are no additional requirements for one intrinsically safe circuit.

In accordance to IEC 60079-11: IP 20

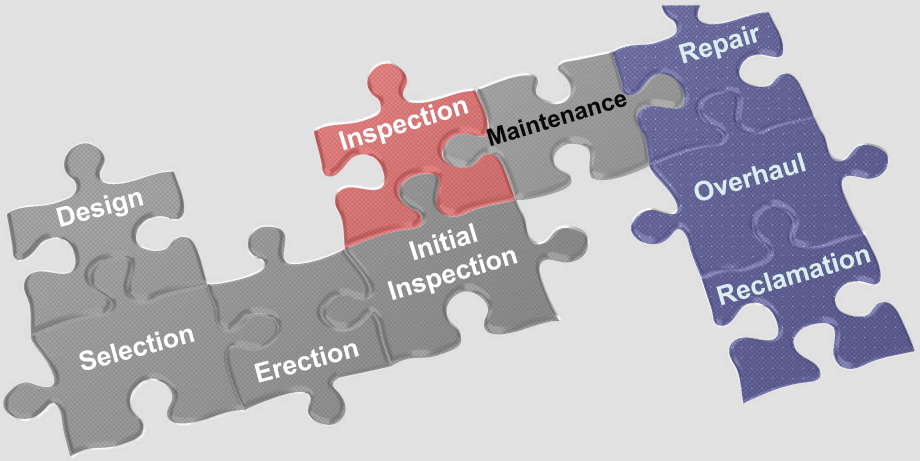
16.5.3 Terminal boxes with more than one intrinsically safe circuit



IECEx International Conference 2014
Kuala Lumpur, Malaysia

Electrical Installations
Design, Selection, Erection
and Inspection

Standards



IEC 60079-14 **IEC 60079-17** **IEC 60079-19**

IEC 60079-17

Edition 5.0 2013-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Explosive atmospheres –
Part 17: Electrical installations inspection and maintenance

Atmosphères explosives –
Partie 17: Inspection et entretien des installations électriques

Inspection and maintenance

- Electrical equipment in hazardous areas require more inspection and maintenance than equipment in non hazardous areas.
- Lack of inspection and maintenance introduce the risk of explosion.
- Where maintenance is subcontracted, they should be made aware of the rules.
- Competency control should be in place.

Documentation

For the purposes of inspection and maintenance, up-to-date documentation of the following items shall be available:

- the classification of hazardous areas;
- apparatus group and temperature class;
- records sufficient to enable the explosion-protected equipment to be maintained in accordance with its type of protection

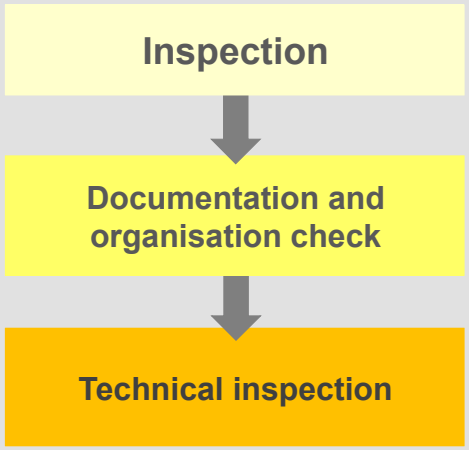
For example list and location of apparatus, spares, technical information, manufacturer's instructions.

Major factors effecting the deterioration

Major factors

- susceptibility to **corrosion**,
- likelihood of **water ingress**,
- exposure to **excessive ambient temperature**,
- risk of **mechanical damage**,
- training and experience of **personnel**,
- likelihood of **unauthorized modifications** or adjustments,

Inspection



Inspection

Following any replacement, repair, modification or adjustment, the items concerned shall be inspected in accordance with the relevant items of the detailed column of tables 1, 2 and 3 of IEC 60079-17.

Table 1 – Inspection schedule for Ex "d", Ex "e" and Ex "n" installations
(D = Detailed, C = Close, V = Visual)

	Check that:	Ex "d"			Ex "e"			Ex "n"		
		Grade of inspection								
		D	C	V	D	C	V	D	C	V
A	**APPARATUS**									
1	Apparatus is appropriate to area classification	X	X	X	X	X	X	X	X	X
2	Apparatus group is correct	X	X		X	X		X	X	
3	Apparatus temperature class is correct	X	X		X	X		X	X	
4	Apparatus circuit identification is correct	X			X			X		
5	Apparatus circuit identification is available	X	X	X	X	X	X	X	X	X
6	Enclosure, glass parts and glass-to-metal sealing gaskets and/or compounds are satisfactory	X	X	X	X	X	X	X	X	X
7	There are no unauthorized modifications	X			X			X		
8	There are no visible unauthorized modifications		X	X		X	X		X	X
9	Bolts, cable entry devices (direct and indirect) and blanking elements are of the correct type and are complete and tight									
	– physical check	X	X		X	X		X	X	
	– visual check			X			X			X
10	Flange faces are clean and undamaged and gaskets, if any, are satisfactory	X								
11	Flange gap dimensions are within maximal values permitted	X	X							
12	Lamp rating, type and position are correct	X			X			X		
13	Electrical connections are tight				X			X		
14	Condition of enclosure gaskets is satisfactory				X			X		
15	Enclosed-break and hermetically sealed devices are undamaged							X		
16	Restricted breathing enclosure is satisfactory							X		
17	Motor fans have sufficient clearance to enclosure and/or covers	X			X			X		
18	Breathing and draining devices are satisfactory	X	X		X	X		X	X	
B	**INSTALLATION**									
1	Type of cable is appropriate	X			X			X		
2	There is no obvious damage to cables	X	X	X	X	X	X	X	X	X
3	Sealing of trunking, ducts, pipes and/or conduits is satisfactory	X	X	X	X	X	X	X	X	X
4	Stopping boxes and cable boxes are correctly filled	X								
5	Integrity of conduit system and interface with mixed system is maintained	X			X			X		
6	Earthing connections, including any supplementary earthing bonding									

Inspection

The grade of inspection and the interval between periodic inspections shall take into account the type of equipment and instruction manual.

Periodic Inspection

Inspection of all electrical apparatus, systems and installations carried out on routine basis.

For examples every 3 years!

A visual or close periodic inspection may lead to the need for a further detailed inspection.

Visual Inspection

Inspection which identifies, without the use of access equipment or tools, those defects, such as missing bolts, which will be apparent to the eye.

Closed Inspection

Inspection which encompasses those aspects covered by a visual inspection and, in addition, identifies those defects, such as loose bolts, which will be apparent only by the use of access equipment, for example steps, (where necessary), and tools.

NOTE

Close inspections do not normally require the enclosure to be opened, or the equipment to be de-energized.

Detailed Inspection

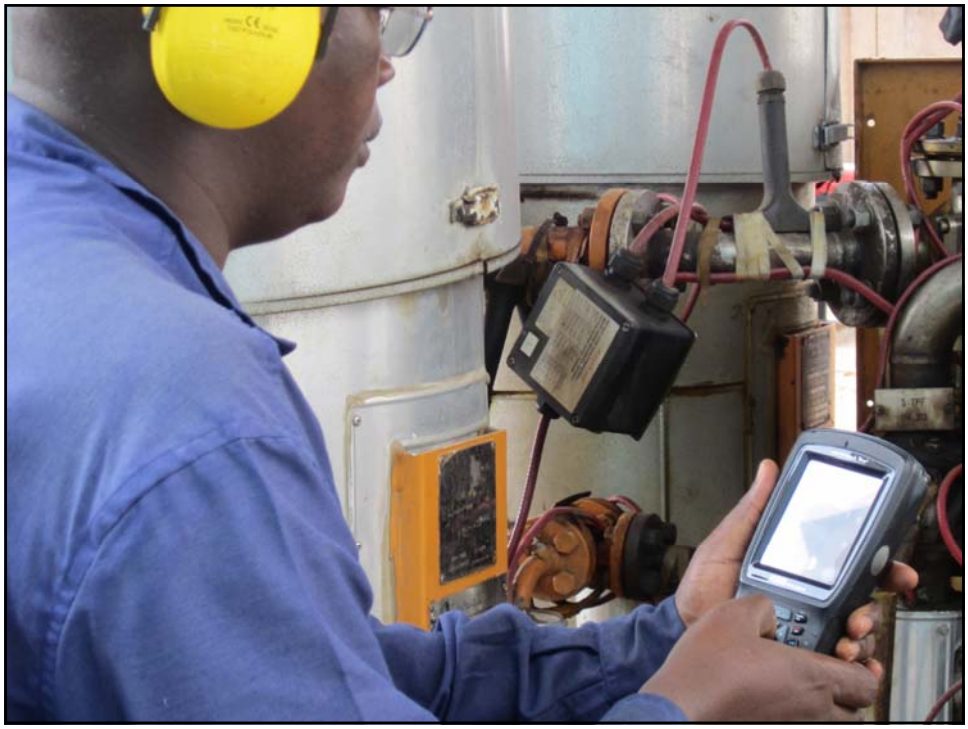
Inspection which encompasses those aspects covered by a close inspection and, in addition, identifies those defects, such as loose terminations, which will only be apparent by opening the enclosure, and/or using, where necessary, tools and test equipment.

Inspection of portable equipment

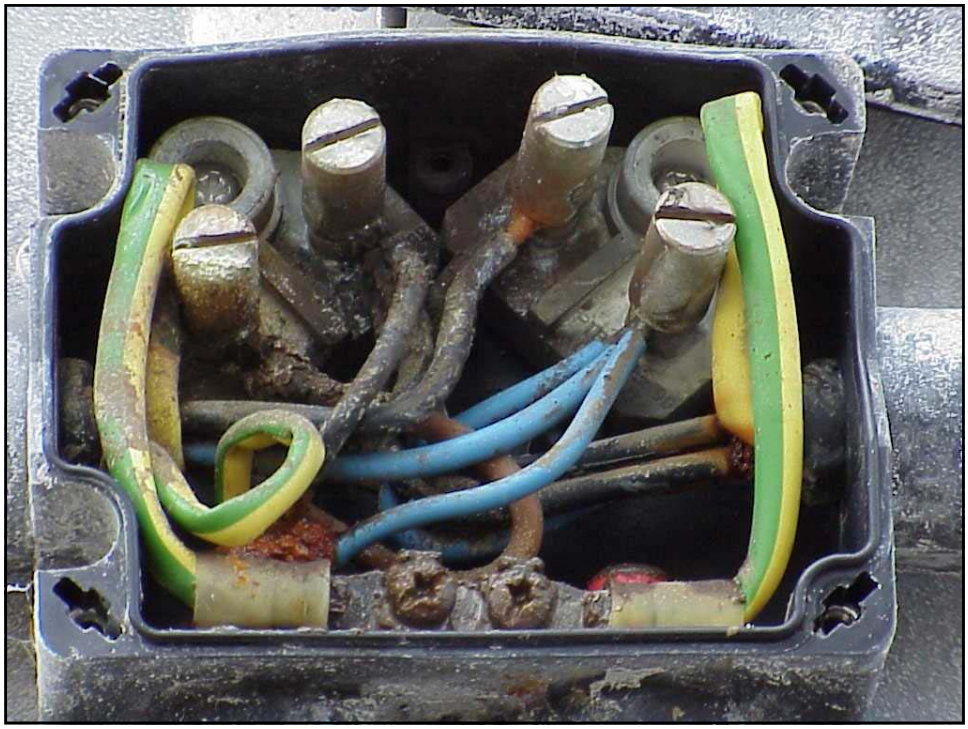
Potable electrical equipment (hand-held, portable and transportable) is particularly prone to damage or misuse and therefore the interval between periodic inspections may need to be reduced.

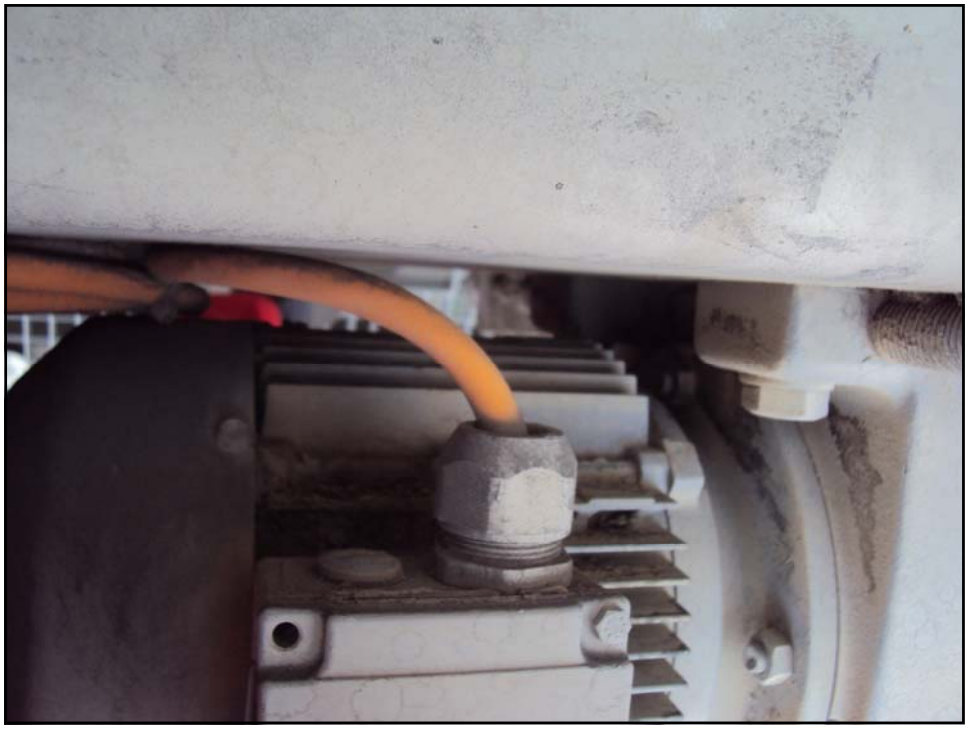
Inspection of portable equipment

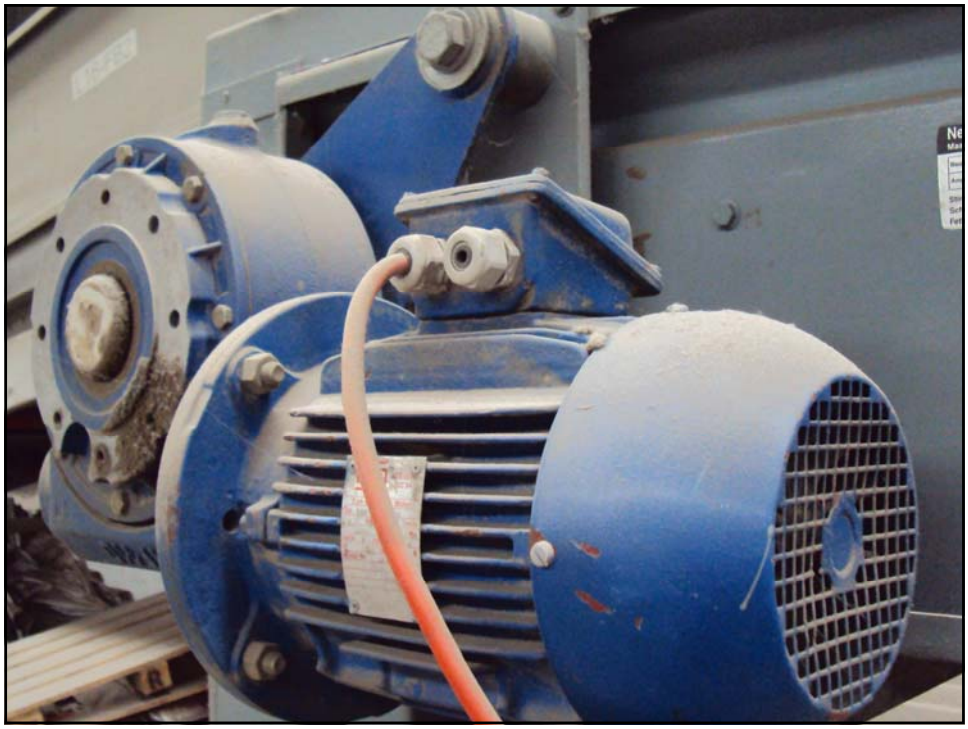
Portable electrical equipment shall be submitted to a close inspection at least every 12 months.
Enclosures which are frequently opened (such as battery housings) shall be given a detailed inspection.
In addition, the apparatus shall be visually checked by the user, before use, to ensure that the apparatus is not obviously damaged.

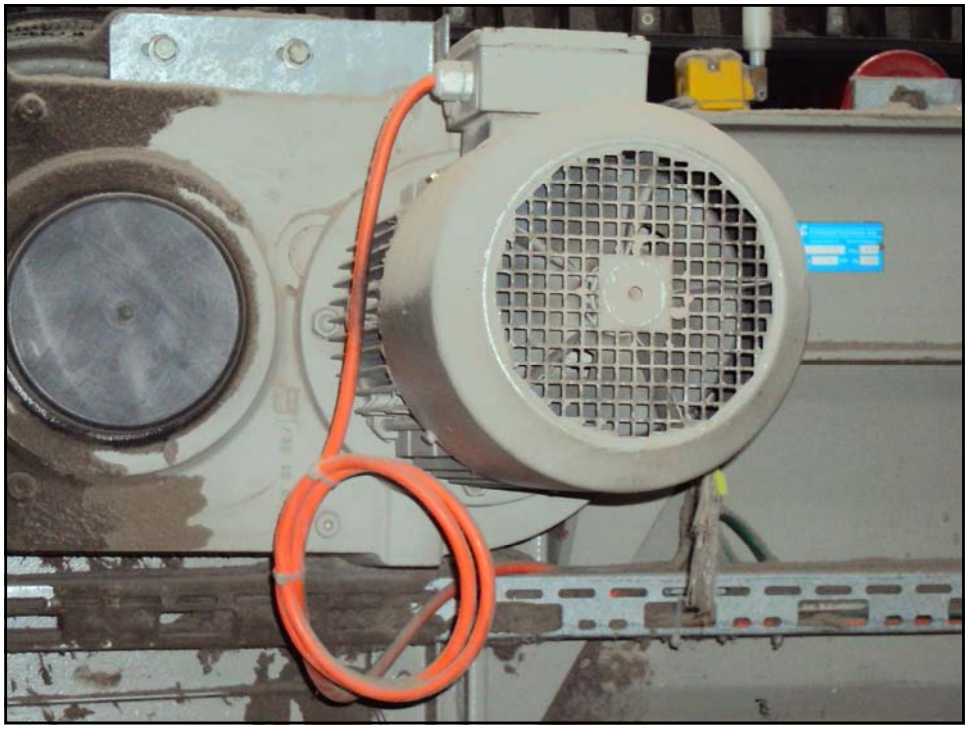


Integrity of enclosures
Cable entries
Blanking elements

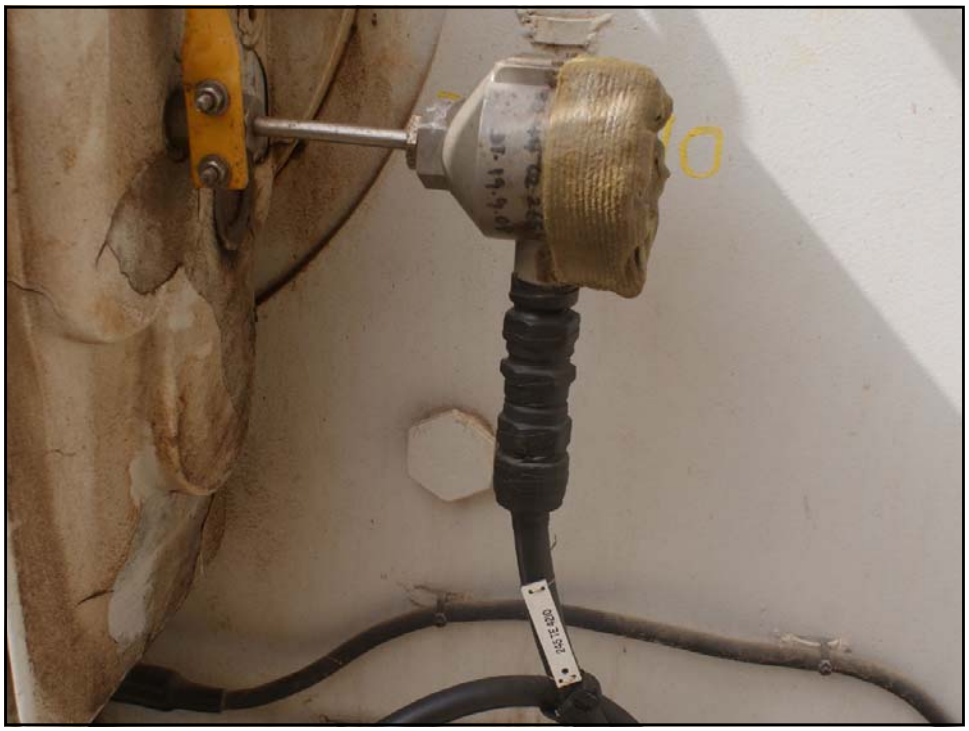






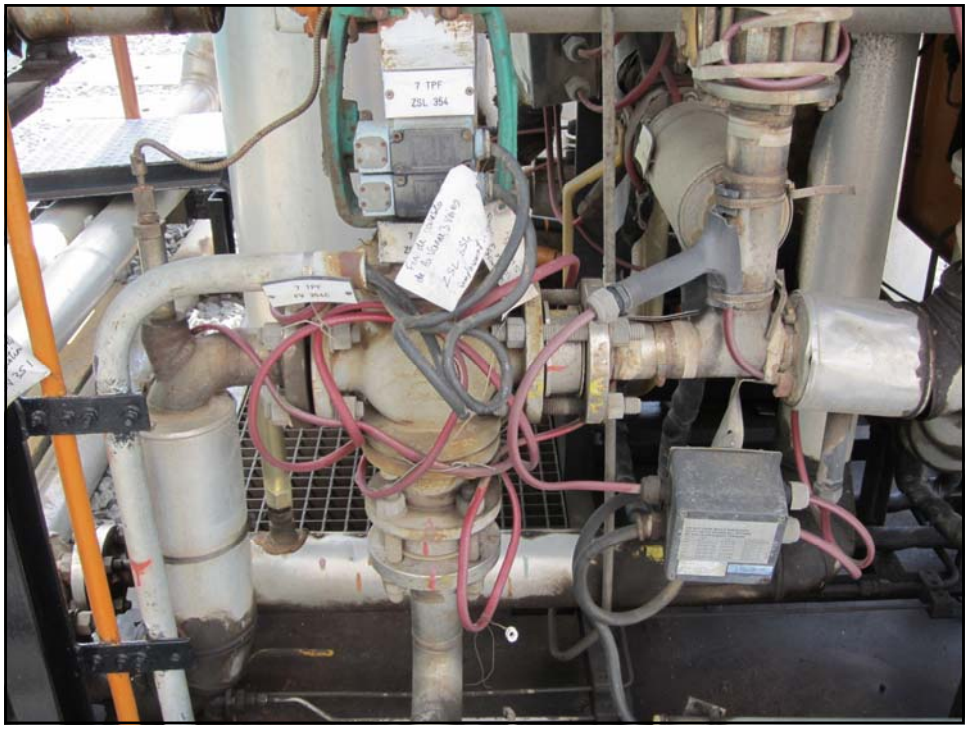


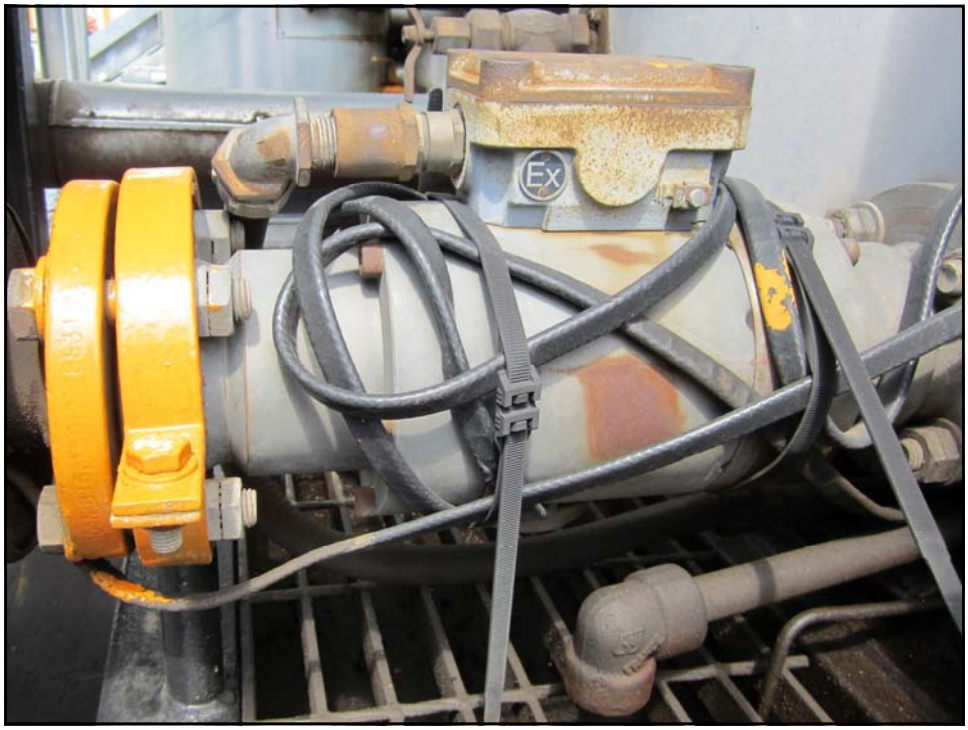
Flameproof enclosures



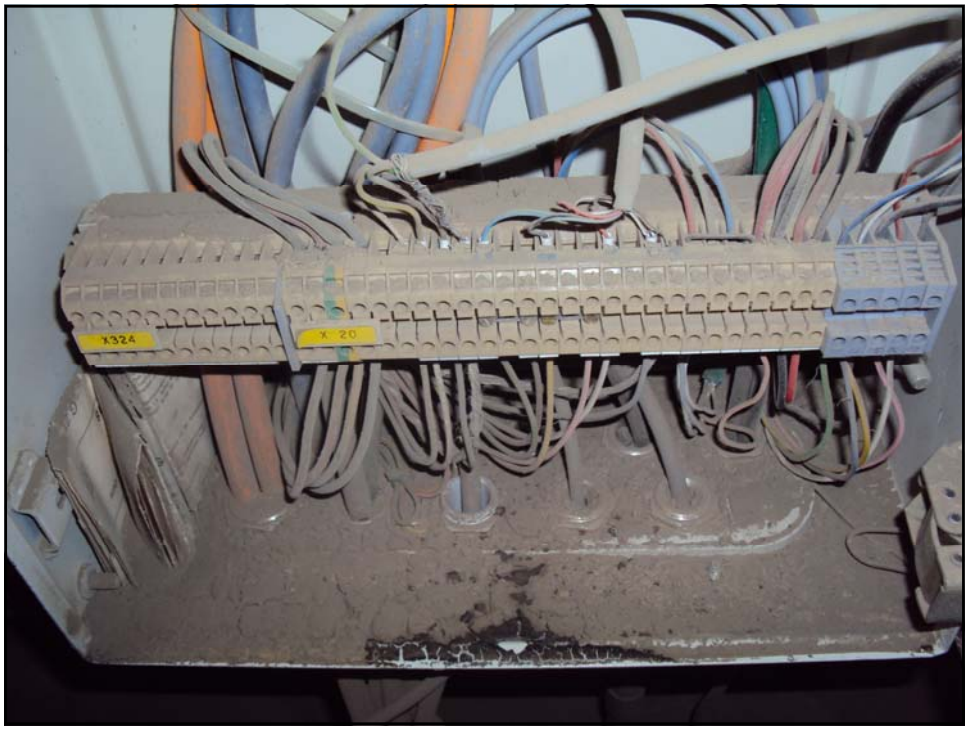
Potential equalization

Heat tracing


7 TPF
ZSL 354


Ex

Dust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