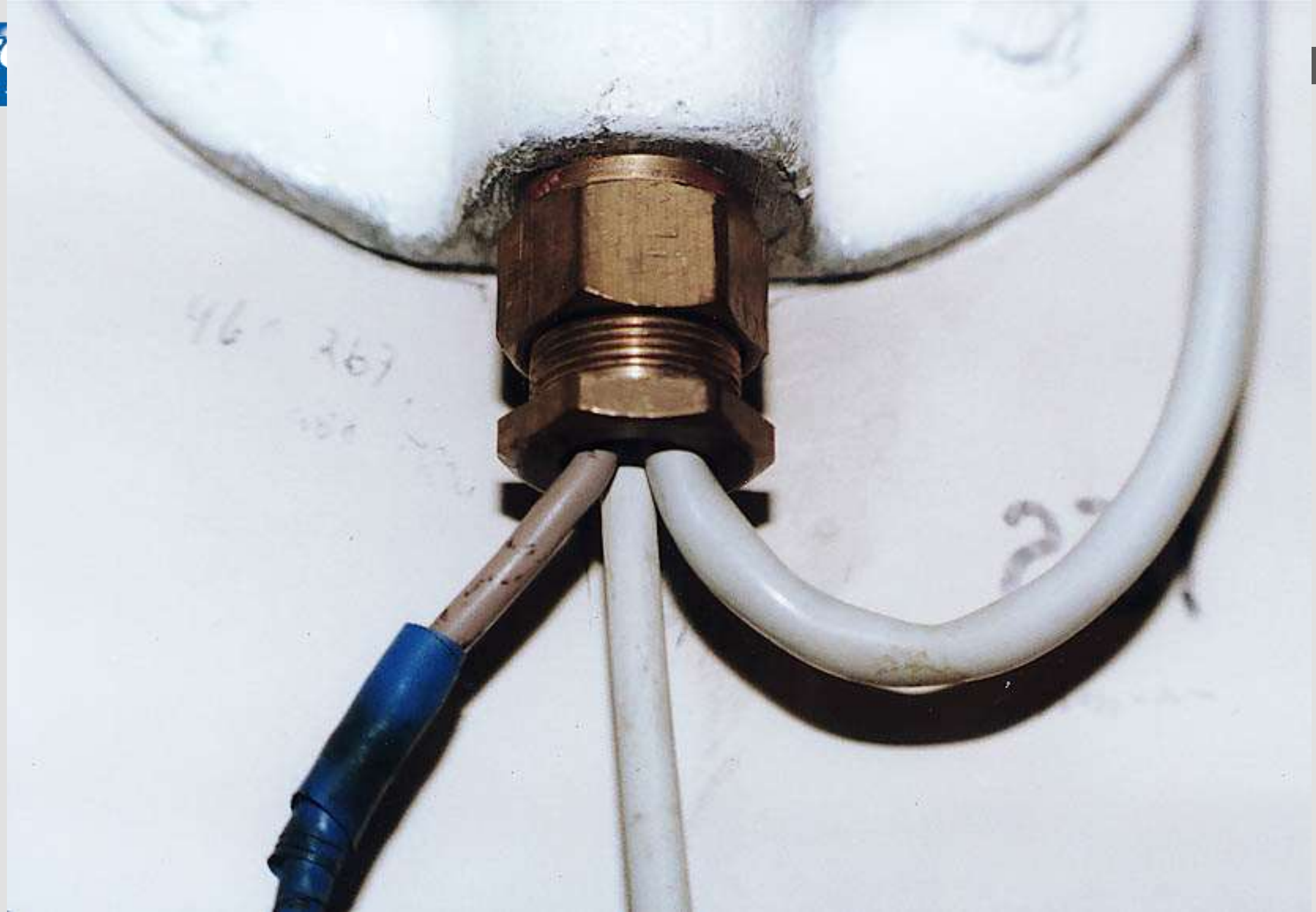
IECEx International Conference 2017
Shanghai, China

Electrical Installations Design, Selection, Erection and Inspection
Part 2 of 2

10. Cable entry systems and blanking elements



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” Excluding 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 “pxb”, Ex “pyb” or Ex “pzc”	X	X		X
Ex “t”				X


71-TA1.N1
CE 1180 Ex II 2G
Vmax=32V Wmax=5W
Ex d ia IIC T4 Gb (-40°C ≤ Ta≤ +75°C)
71–TA1.N1
MICROWCON


71-TA1.N1
CE 1180 Ex II 2G
Baseefa09ATEX0220X IECEx BAS 09.0104X
Vmax=32V Wmax=5W
Ex d ia IIC T4 Gb (-40°C ≤ Ta≤ +75°C)
WARNING: DO NOT OPEN WHEN EXPLOSIVE ATMOSPHERE MAY BE PRESENT.
71-TA1.N1
Abingdon, United Kingdom, OX14 4SD

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

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]nay 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
By order:

Braunschweig, November 16, 1999

Dr.-Ing. U. Engel

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
Rosemount


II 2G/D Ex e II PTB 02
M40X1.5
ATEX1126X
II 2G/D

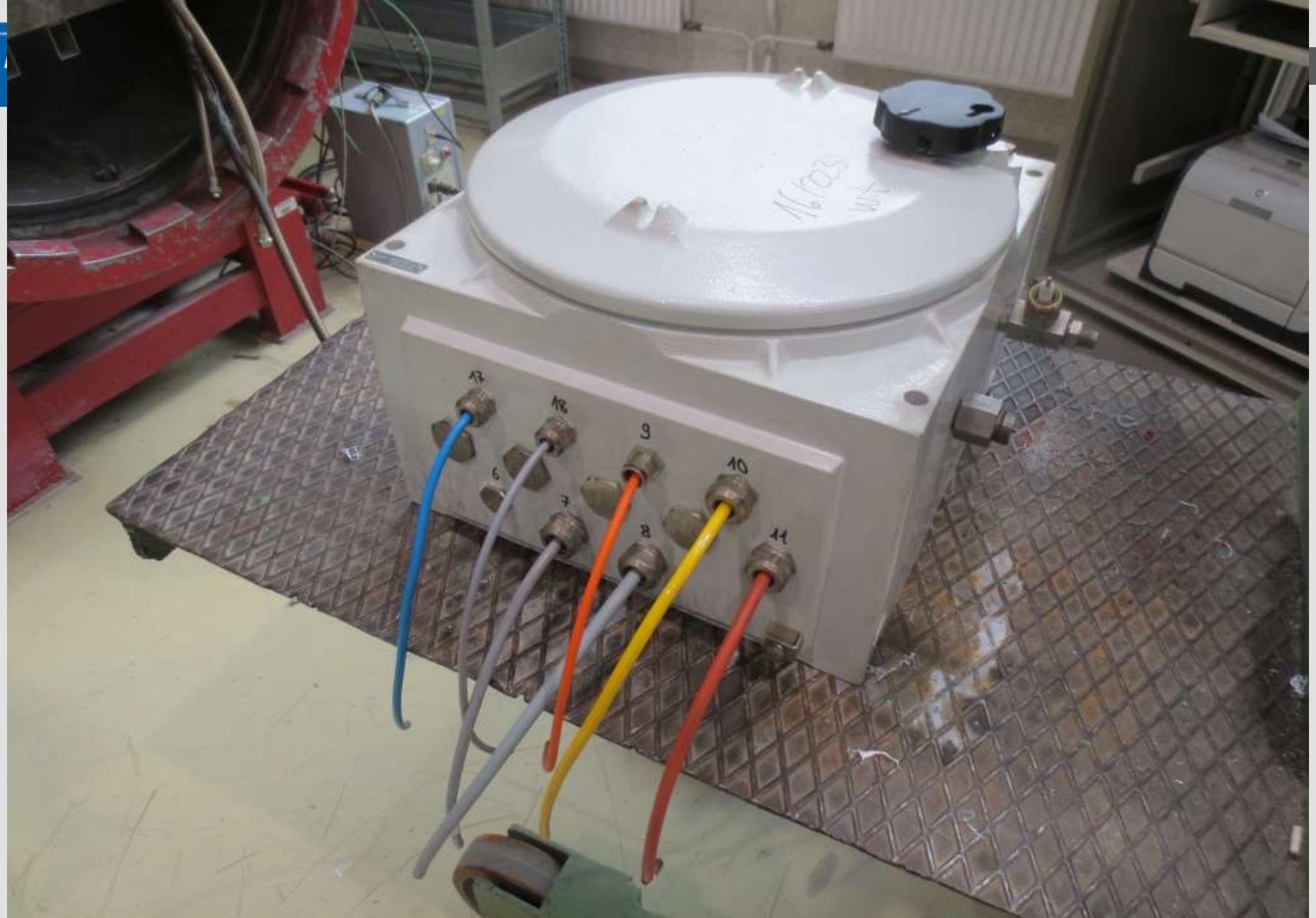
10.6 Additional requirements for type of protection “d”

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 9.3.2(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).


17
12
9
6
7
8
10
11


Kammer 8

In extension to the tests for non-transmission of an internal ignition documented in BVSPS28304 an enclosure with cables (see Fig. 1 - 3) was submitted to a further test for non-transmission of an internal ignition with propane.

Test specimen:

Z1

Z2

Fig. 1 + 2: total view of the enclosure

Test result:

Precompression stated in absolute pressure

Legend:

Gas type:	testing gas
Conc.(V-%):	gas concentration in V-%
Ign. at:	location of ignition
Test types	details of test see following list
I:	test for non-transmission of an internal ignition
Prec. (bar)	pre-compression in bar
TI:	transmission of an internal ignition (yes/no)

No.	Gas type	Conc. [vol%]	Test type	Ign. at	Prec. [bar]	TI
1	C2H2	7.5	I	Z1	1.5	No
2	C2H2	7.5	I	Z1	1.5	No
3	C2H2	7.5	I	Z1	1.5	No
4	C2H2	7.5	I	Z1	1.5	No
5	C2H2	7.5	I	Z1	1.5	No
6	H2	27.5	I	Z1	1.5	No
7	H2	27.5	I	Z1	1.5	No
8	H2	27.5	I	Z1	1.5	No
9	H2	27.5	I	Z1	1.5	No
10	H2	27.5	I	Z1	1.5	No
11	C3H8	4.3	I	Z1	1.5	No
12	C3H8	4.2	I	Z1	1.5	No
13	C3H8	4.2	I	Z1	1.5	No
14	C3H8	4.2	I	Z1	1.5	No
15	C3H8	4.2	I	Z1	1.5	No

table 3: test results

The results are only relevant for the above-mentioned test specimen.

Equipment used

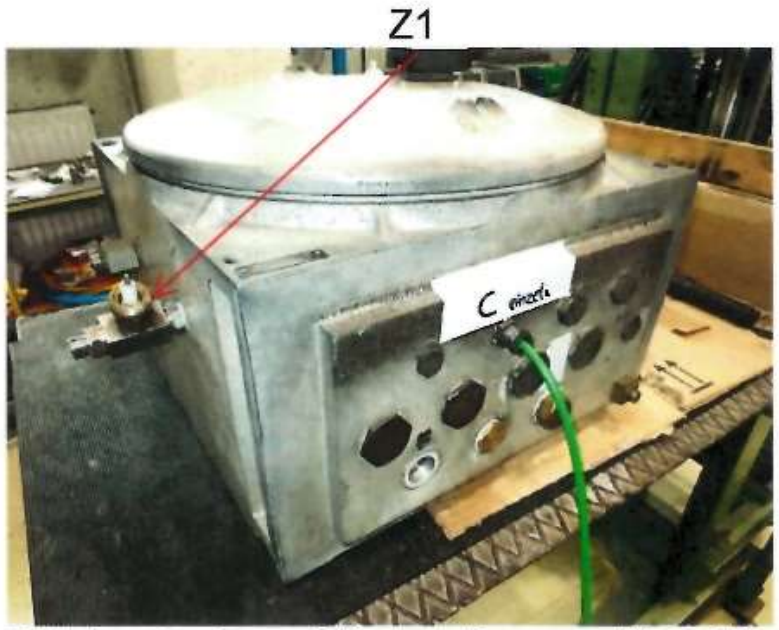
Drawing number:	**see BVSPS28304**

Test for non-transmission of an internal ignition according to IEC60079-1, Ed. 6

in combination with testing instruction PW09-Tb (Rev.01)
in combination with working instruction ABL-03Tb (Rev.02)
in combination with working instruction ABL-06Tb (Rev.01)
in combination with working instruction ABL-04Tb (Rev.01)

An enclosure with cable (see Fig. 1 + 2) was submitted to a test for non-transmission of an internal ignition for Group IIC + C_3H_8.

Test specimen:



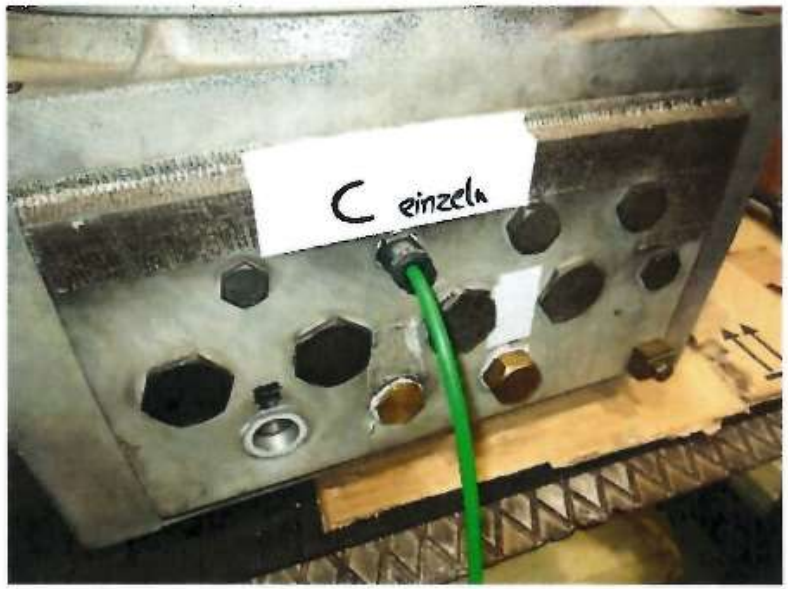


Fig. 1 + 2: view of the enclosure with cable

DEKRA EXAM GmbH
Fachstelle für
Sicherheit elektrischer
Betriebsmittel - BVS

Carl-Beyling-Haus
Dinnendahlstraße 9
44809 Bochum

No.	Gas type	Conc. [vol%]	Test type	Ign. at	Prec. [bar]	TI
1	C2H2	7.5	I	Z1	1.5	No
2	C2H2	7.6	I	Z1	1.5	No
3	C2H2	7.4	I	Z1	1.5	No
4	C2H2	7.5	I	Z1	1.5	No
5	C2H2	7.5	I	Z1	1.5	No
6	H2	27.3	I	Z1	1.5	No
7	H2	27.5	I	Z1	1.5	No
8	H2	27.5	I	Z1	1.5	No
9	H2	27.5	I	Z1	1.5	No
10	H2	27.5	I	Z1	1.5	No
11	C3H8	4.2	I	Z1	1.5	No
12	C3H8	4.2	I	Z1	1.5	No
13	C3H8	4.2	I	Z1	1.5	No
14	C3H8	4.2	I	Z1	1.5	No
15	C3H8	4.2	I	Z1	1.5	No

table 3: test results

The results are only relevant for the above-mentioned test specimen.

Equipment used

Micromanometer: FMM 011-K6 calibrated up to 08/2017


Förderer
Rüttler

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 cm^3	≥5 mm
Volume >100 cm^3	≥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.

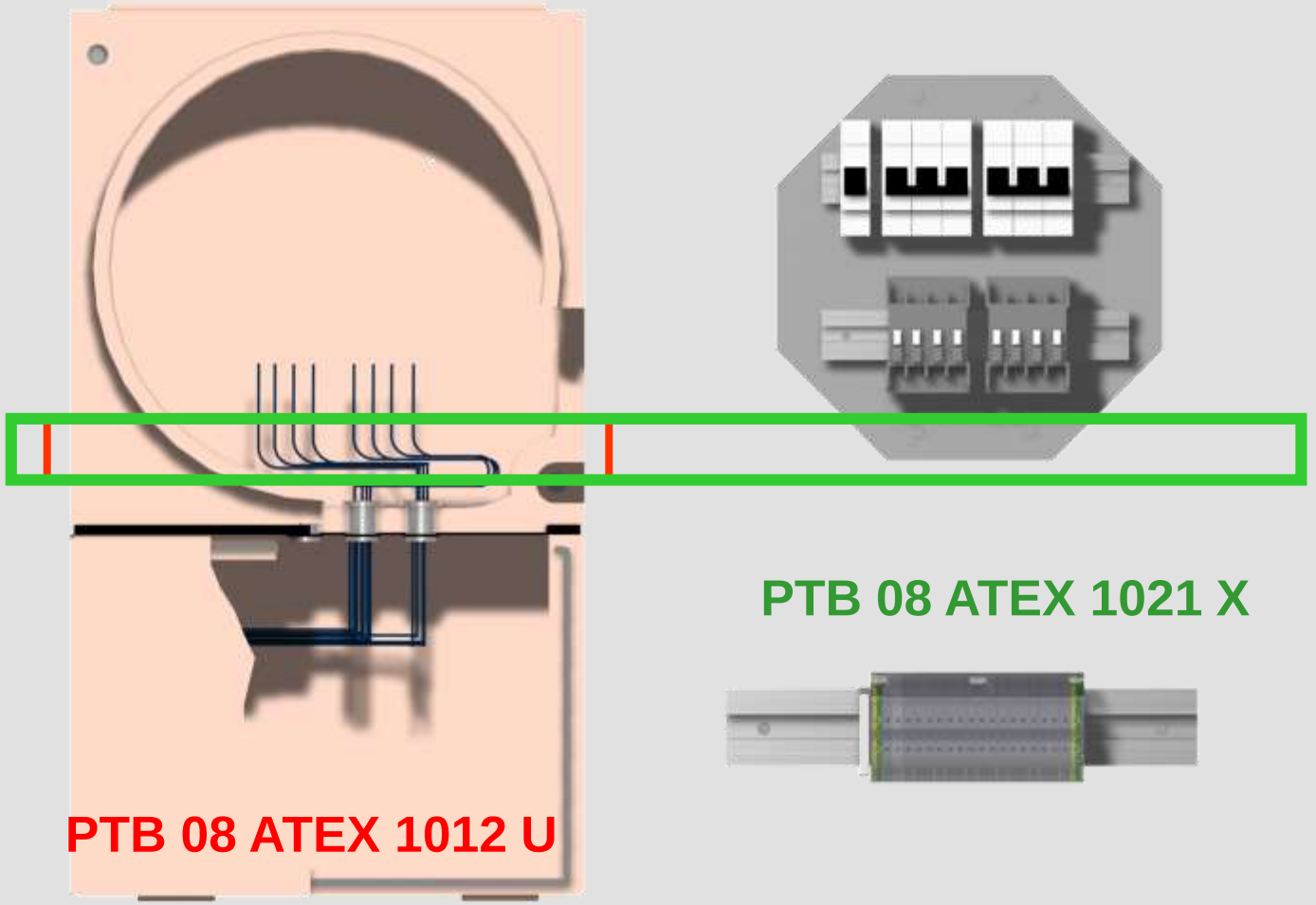
[b] Cylindrical threaded joints which do not conform with ISO 965-3 in respect of thread form or quality of fit, are permitted if the test for non-transmission of an internal ignition, prescribed in 15.2, is passed, when the width of the threaded joint specified by the manufacturer is reduced by the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

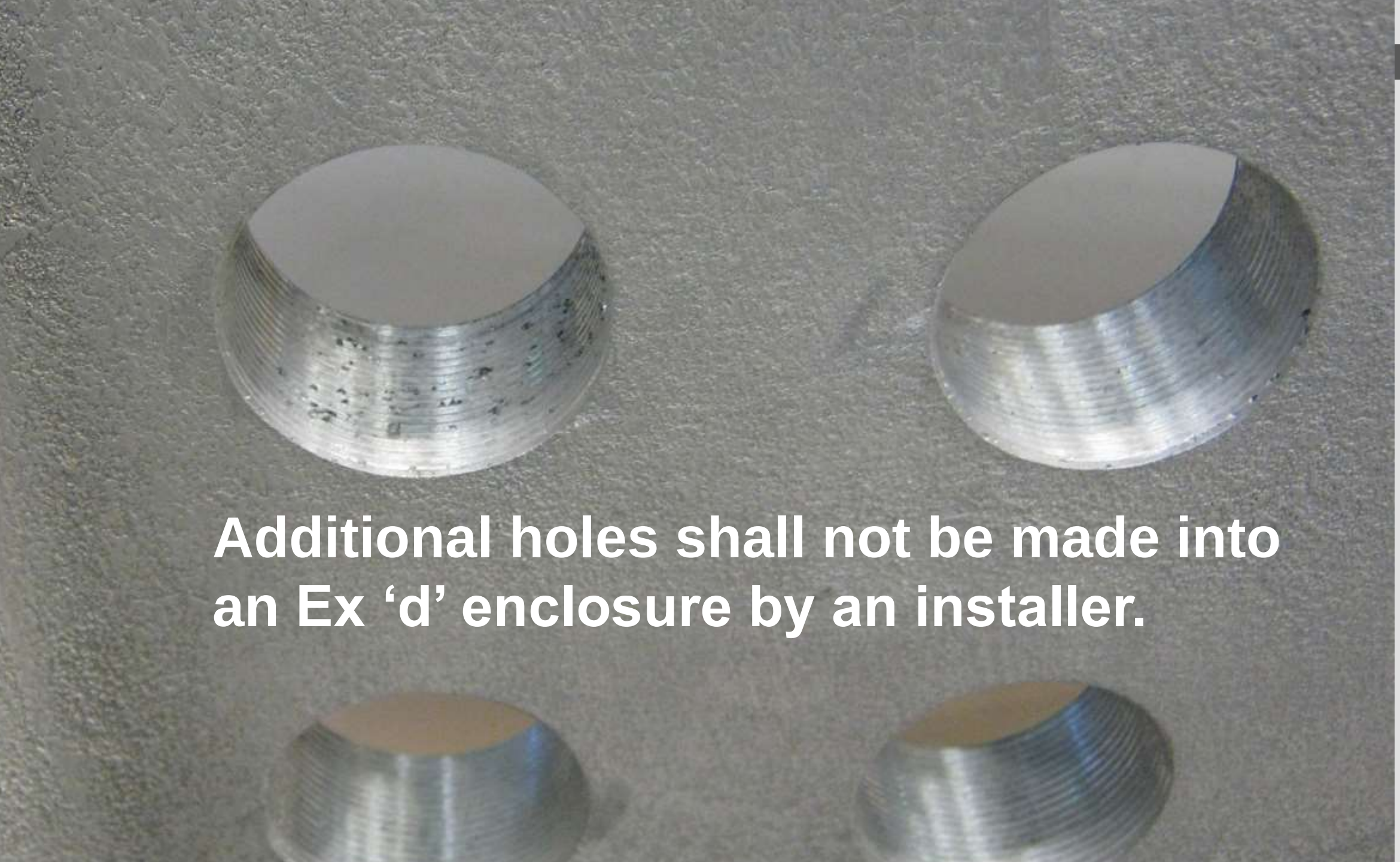
14. Additional requirements for type of protection ‘d’ Flameproof enclosures

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.

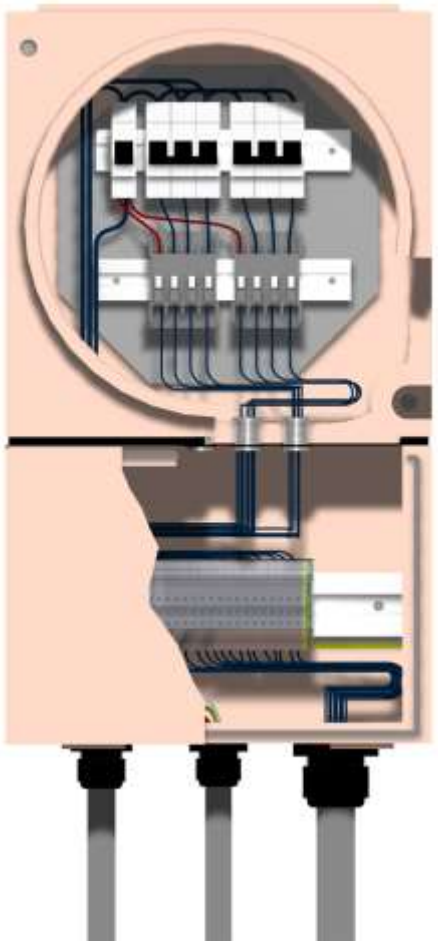
14. General



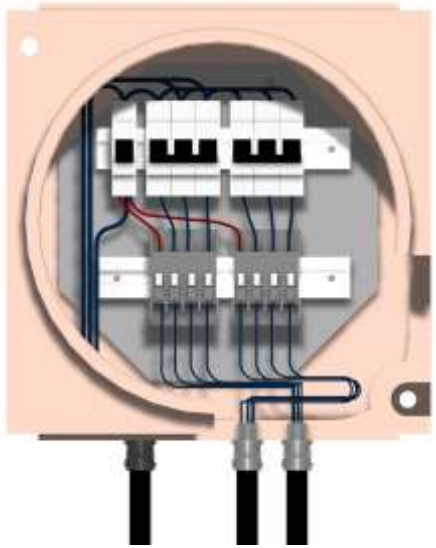


Additional holes shall not be made into an Ex ‘d’ enclosure by an installer.

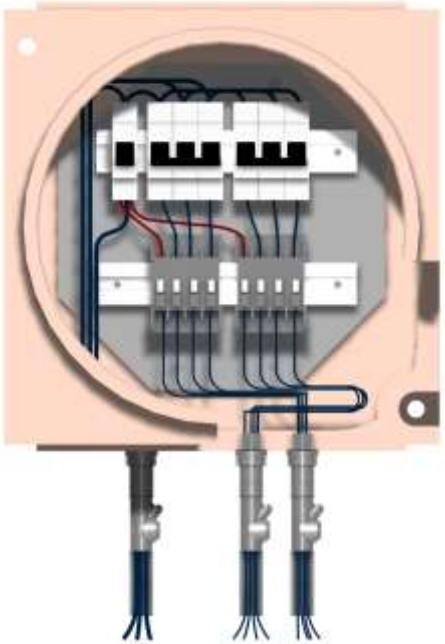
14. Installation



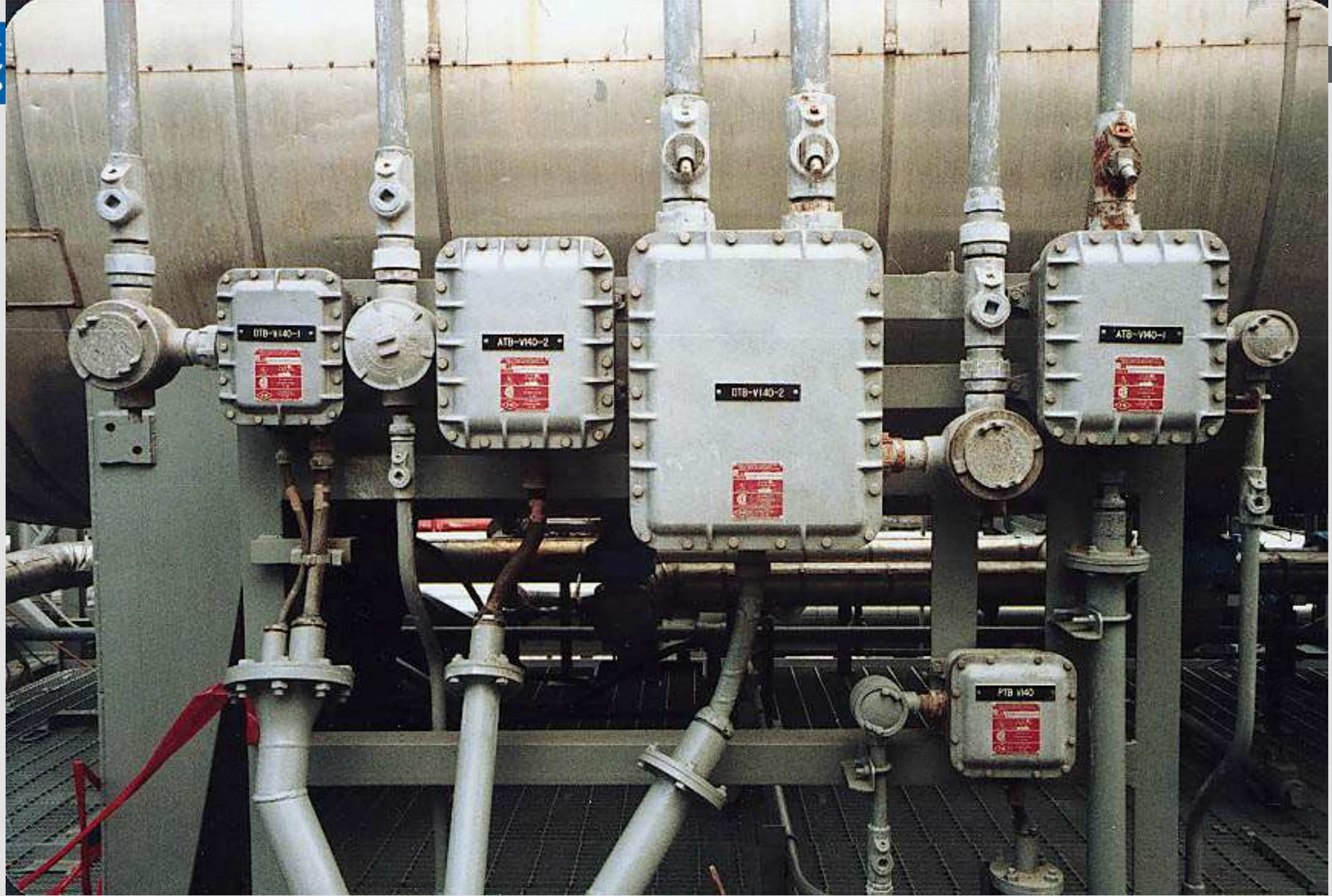
Indirect



Direct



Conduit entries

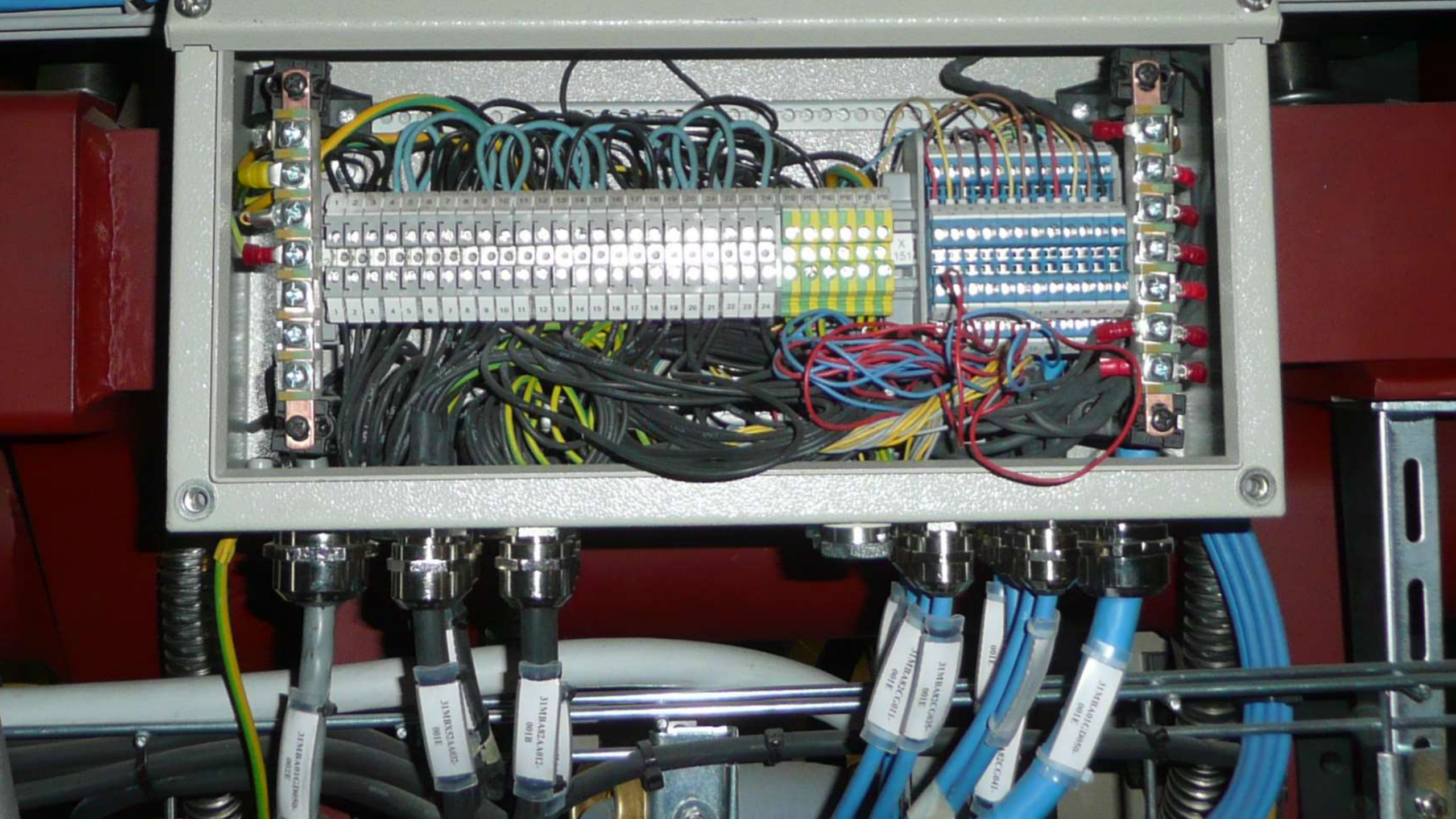

DTB-V140-1
ATB-V140-2
DTB-V140-2
ATB-V140-1
PTB V140

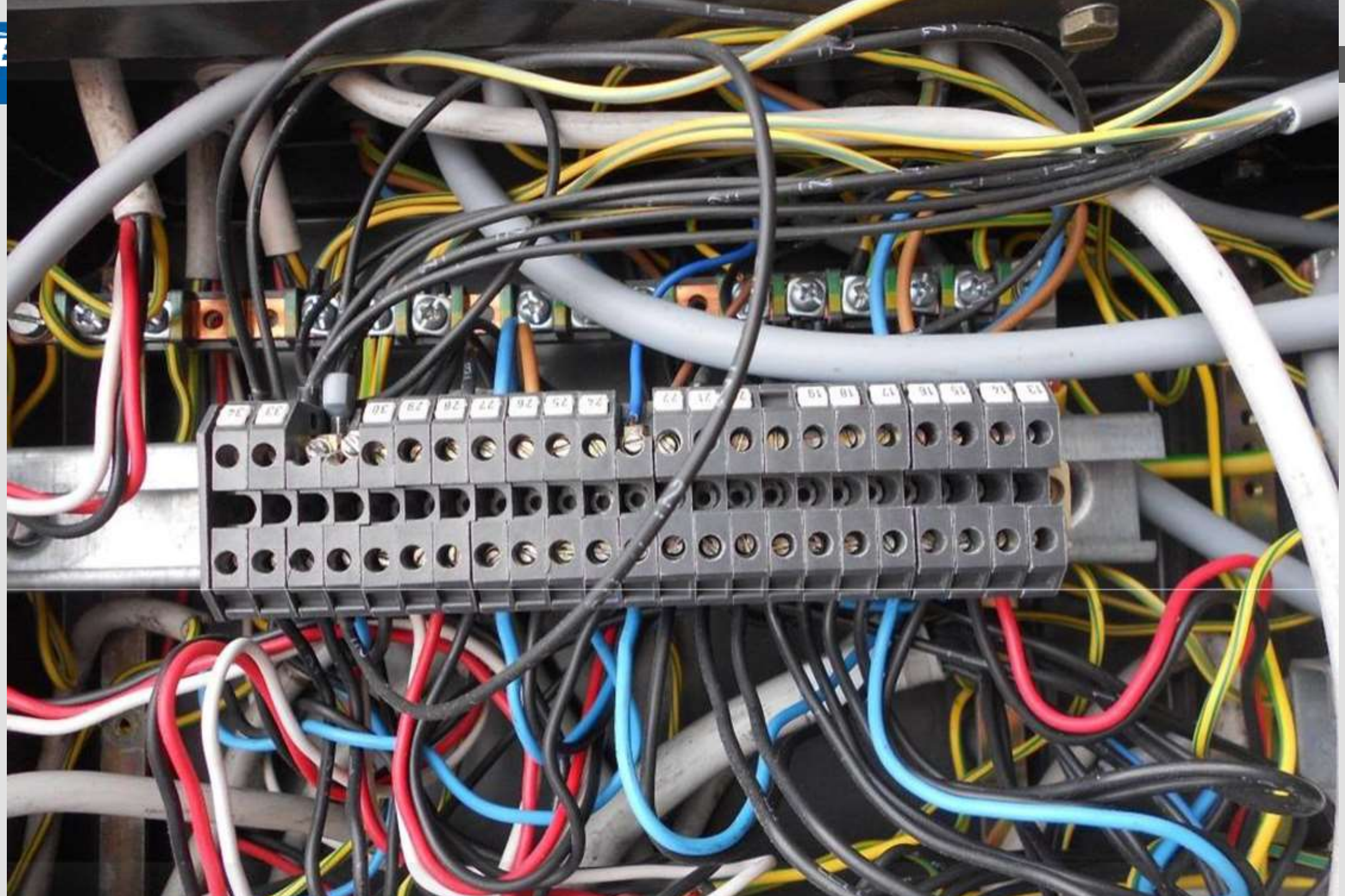
15. Additional requirements for type of protection ‘e’ – Increased safety

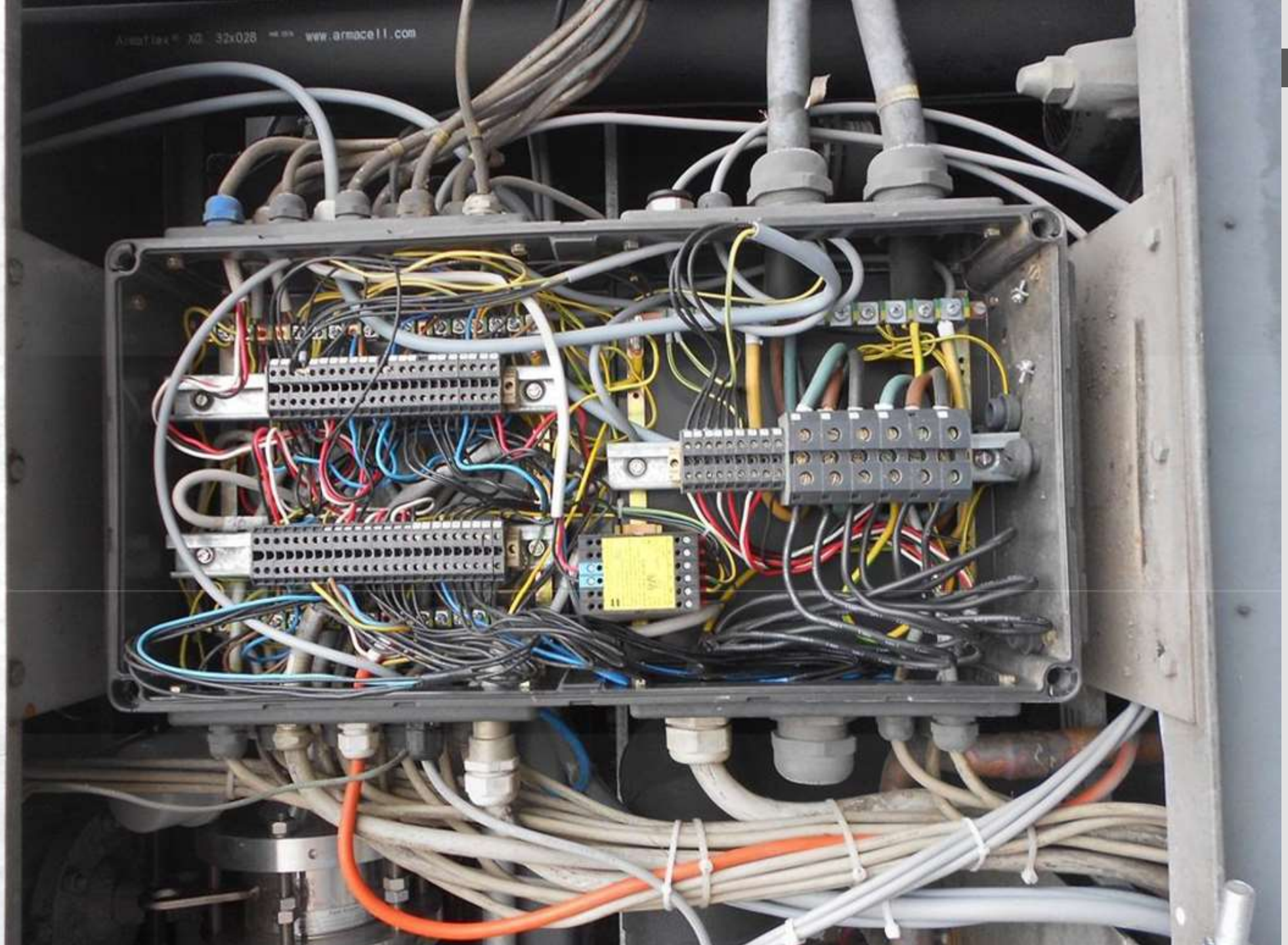
15.2 Maximum dissipated power

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



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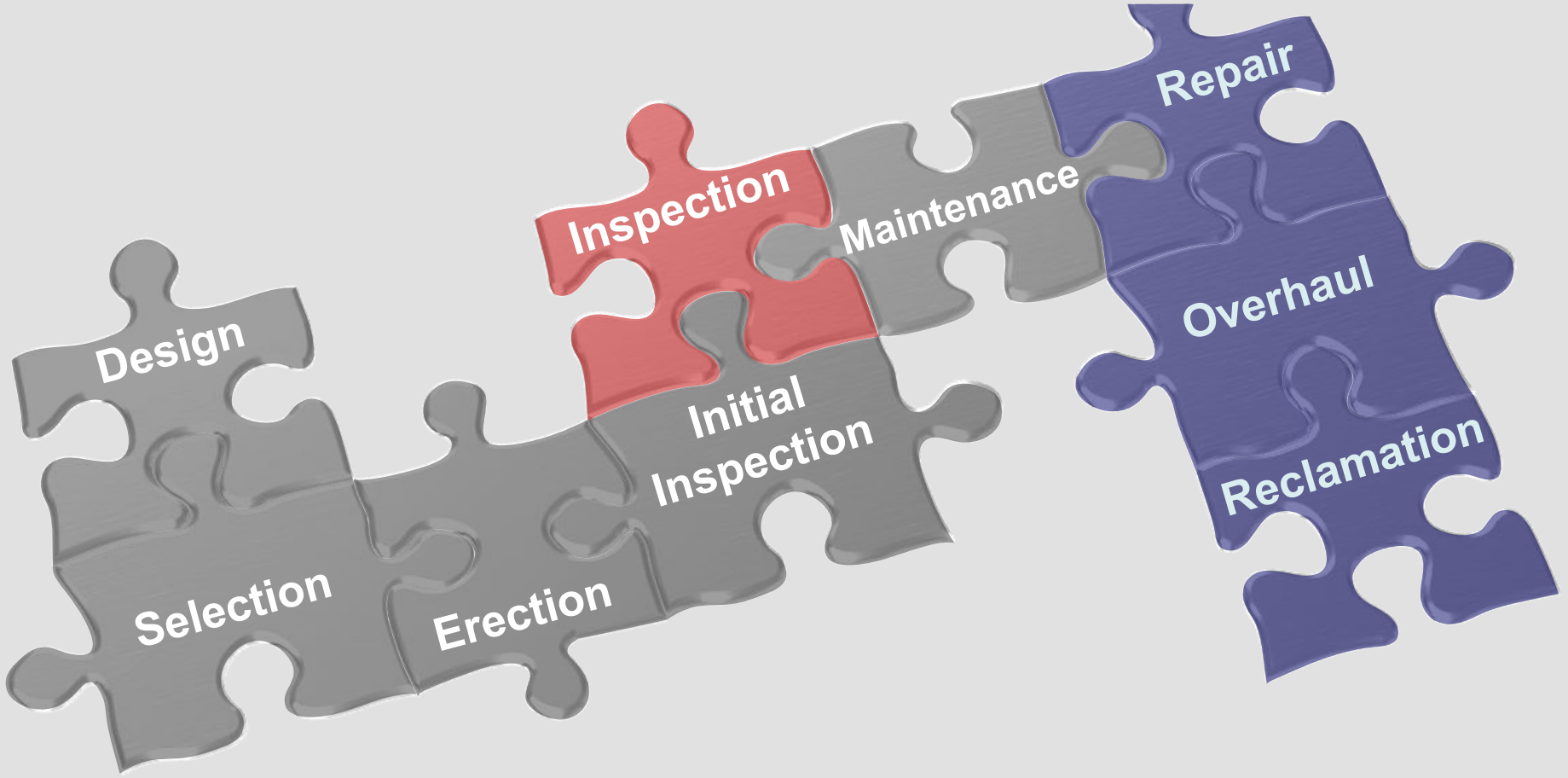
Electrical Installations
Design, Selection, Erection
and Inspection

Standards



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

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.

Inspection

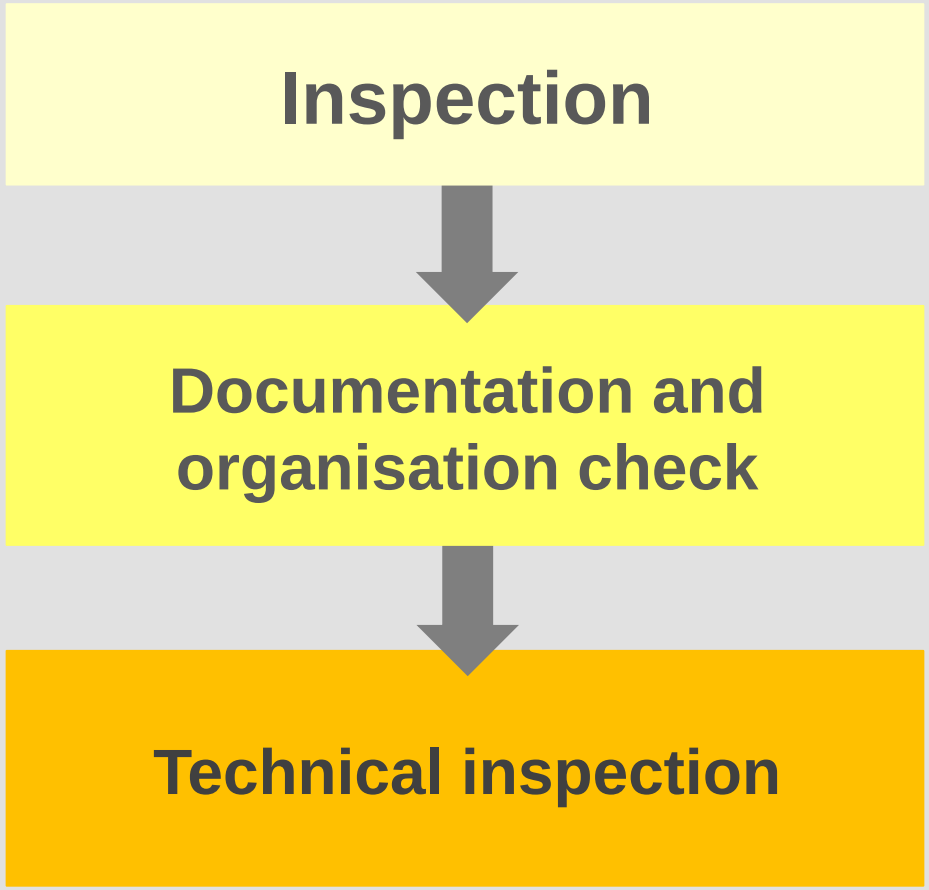

Inspection
Documentation and organisation check
Technical inspection

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.**

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.

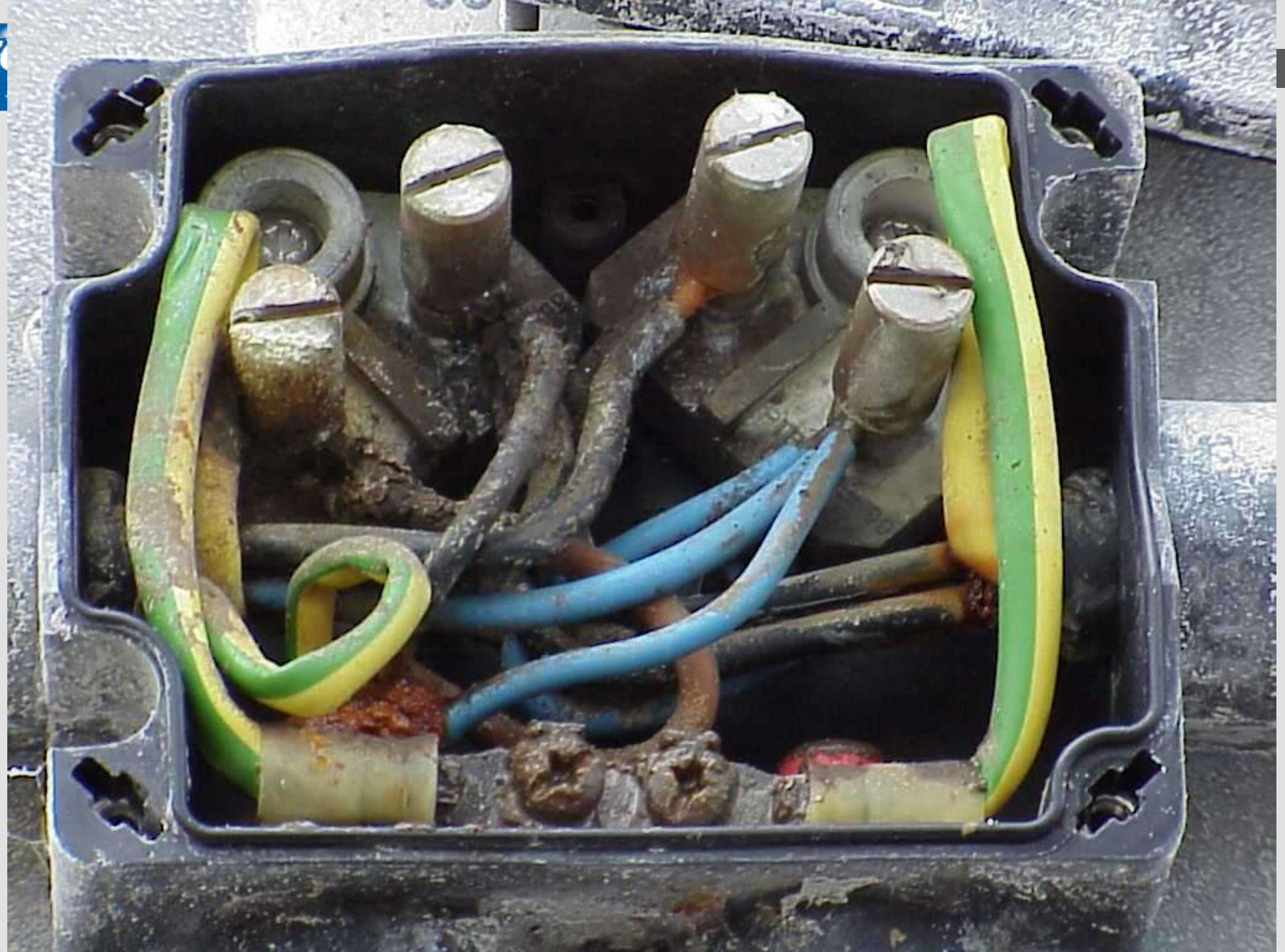
Inspection of portable equipment

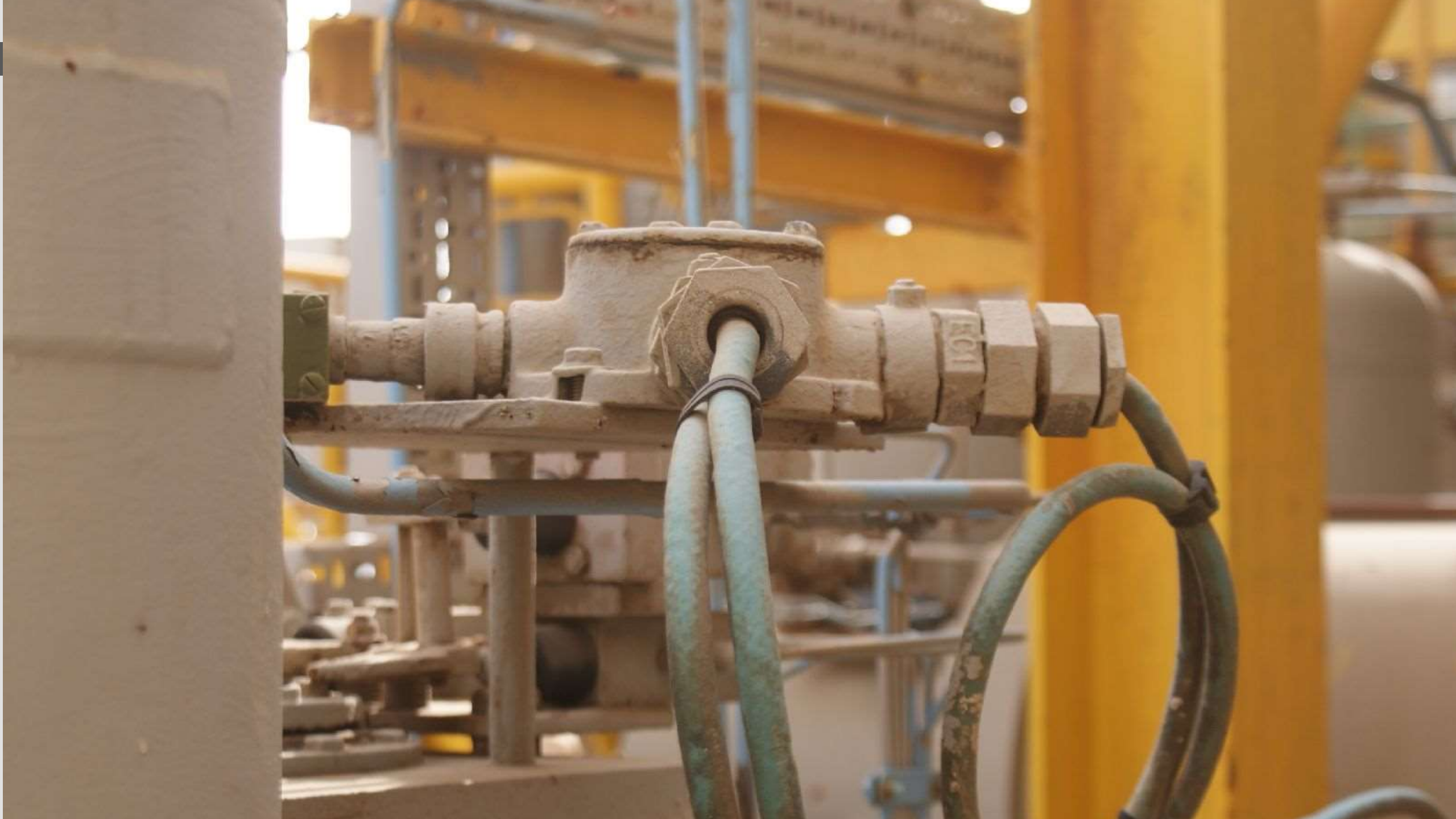
Potable electrical equipment (hand-held, portable and transportable) is particularly prone to damage or misuse and therefore the interval between periodic inspections may need to be reduced.

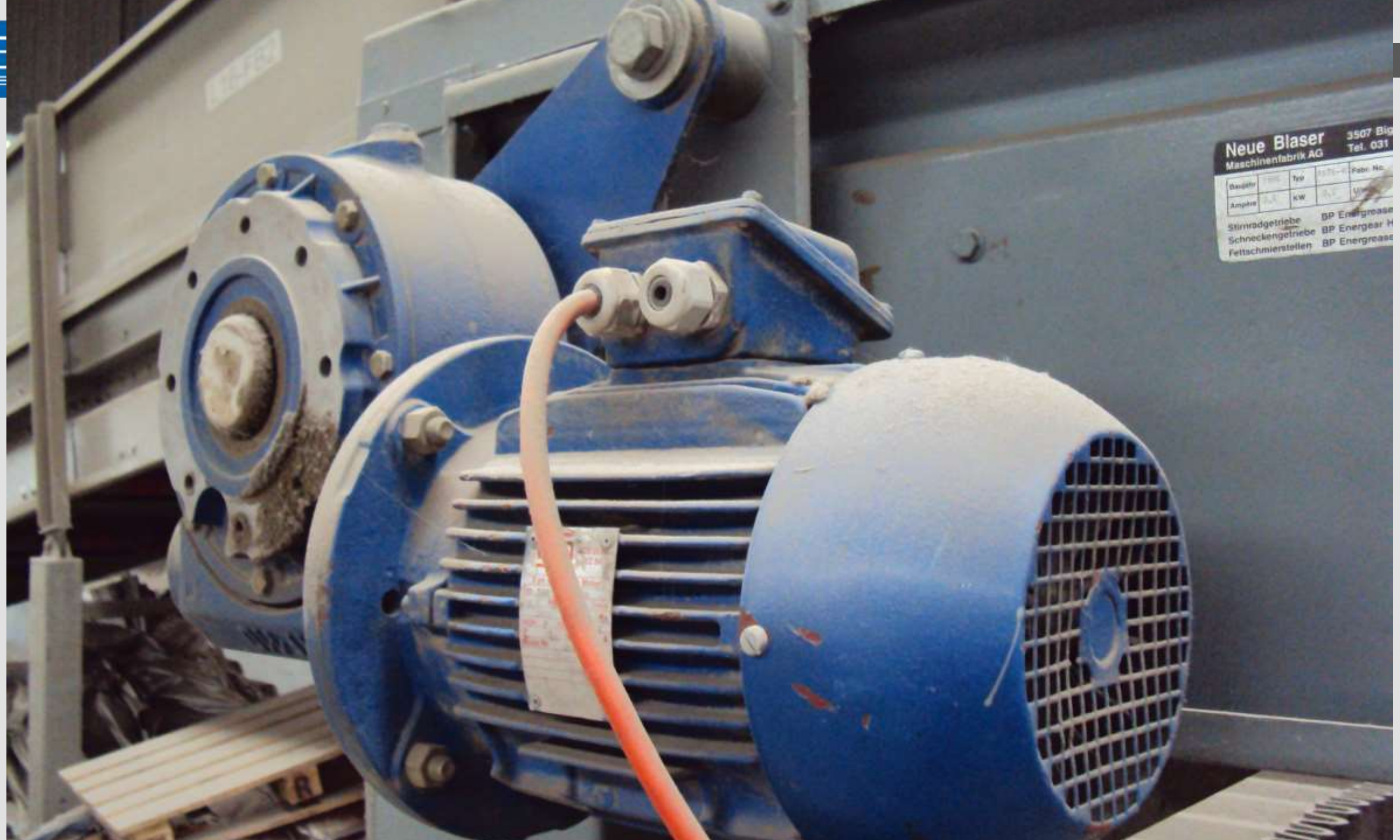
Inspection of portable equipment

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






Neue Blaser
Maschinenfabrik AG
Stirnradgetriebe
Schneckengetriebe
Fettschmierstellen

TUNGSRAM 58W


032
FAN
STOP
SHUT DOWN
ALARM
V


Testing With
Fasteners
Installed
With
Reduced Torque


B.2

Thank you for your attention!