



UNITED NATIONS  
ECONOMIC COMMISSION FOR EUROPE

# IECEx International Conference 2017 Shanghai, China

## **Electrical Installations** **Design, Selection, Erection** **and Inspection**



# IECEx International Conference 2017



**Peter Thurnherr**

**Shanghai thuba Electric Co. Ltd., Shanghai (China)  
thuba Ltd., Switzerland**

**Convenor MT 60079-14  
Chairman IECEx ExPCC**



IEC 60079-14

Edition 5.0 2013-11

# INTERNATIONAL STANDARD

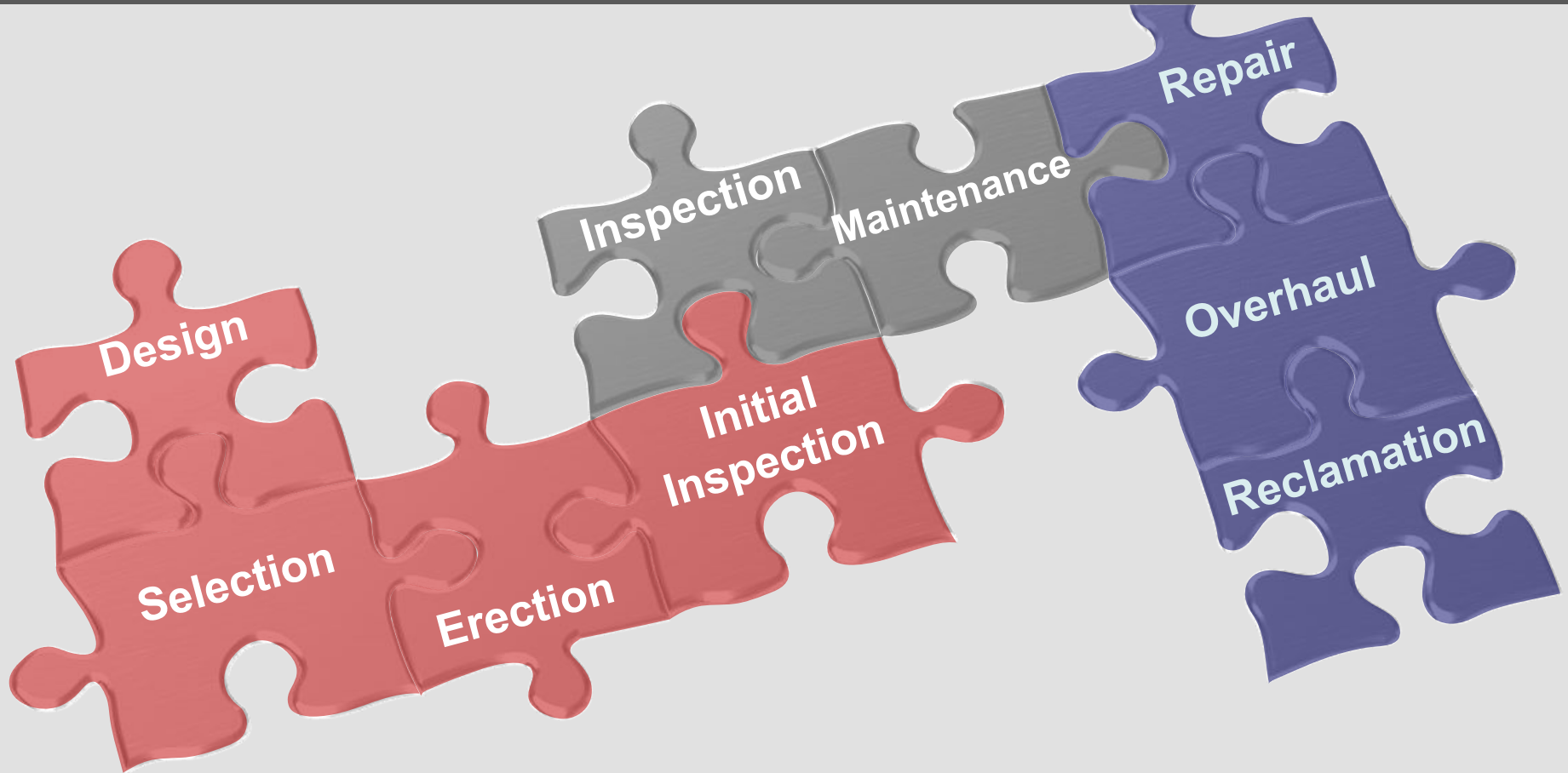
# NORME INTERNATIONALE



---

**Explosive atmospheres –  
Part 14: Electrical installations design, selection and erection**

**Atmosphères explosives –  
Partie 14: Conception, sélection et construction des installations électriques**



**IEC 60079-14**

**IEC 60079-17**

**IEC 60079-19**







# **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***





## 4.2 Documentation – Equipment

- **Manufacturer’s instruction manual**
- **Certificate of Conformity according to the standards**
- **Information with «Specific conditions for use», if the certificate number has the suffix “X”**
- **Descriptive system document for the intrinsically safe system**



# 4.2 Documentation – Equipment

The following documents are available for the identification:

- **Marking**  
(according IEC 60079-0)
- **IECEX Certificate of Conformity**  
(Online system!)
- **Instruction manual**  
(according IEC 60079-0)

**IECEX Certificate of Conformity**

INTERNATIONAL ELECTROTECHNICAL COMMISSION  
IEC Certification Scheme for Explosive Atmospheres  
for rules and details of the IECEx Scheme visit www.iecex.com

Certificate No.: IECEx BVS 14 2006X      Issue No.:      Certificate History:

Status: Current

Date of Issue: 2014-07-04      Page 1 of 1

Applicant: **Stuba EXB Ltd.**  
St. Antonenstraße 18  
4013 Basel  
Switzerland

Electrical Apparatus: **Hand and machine lamp type "L"18**

Optional accessory:

Type of Protection: **Equipment protection by flameproof enclosures "d". Equipment dual ignition protection by enclosure "T"**

Marking: **Ex II IIC T5 Gb  
Ex II IIC T20°C Db**

Approved for issue on behalf of the IECEx: **H.-Ch. Griesel**  
Chairman (Italy)

Issuer: **Head of Certification Body**

Signature (for printed version): *H. Ch. Griesel*

Date: **4.7.2014**

1. This certificate and schedule may only be reproduced in full.  
2. This certificate is not transferable and remains the property of the issuing body.  
3. The Status and authenticity of this certificate may be verified by visiting the Official IECEx Website.

Certificate issued by: **DEKRA EXAM GmbH**  
Dezernat/Abteilung 5  
40108 Bochum  
Germany

**DEKRA**  
DEKRA EXAM GmbH

**Ex**

Explosiongeschützte  
Fluoreszenz-Hand- und  
Maschinenleuchten

Luminescentes fluorescentes anti-  
deflagrantes pour l'éclairage de  
machines et pour baladeuses

Explosionproof  
Fluorescent Hand and  
Machine Lamps

*Exhibition March 2008*

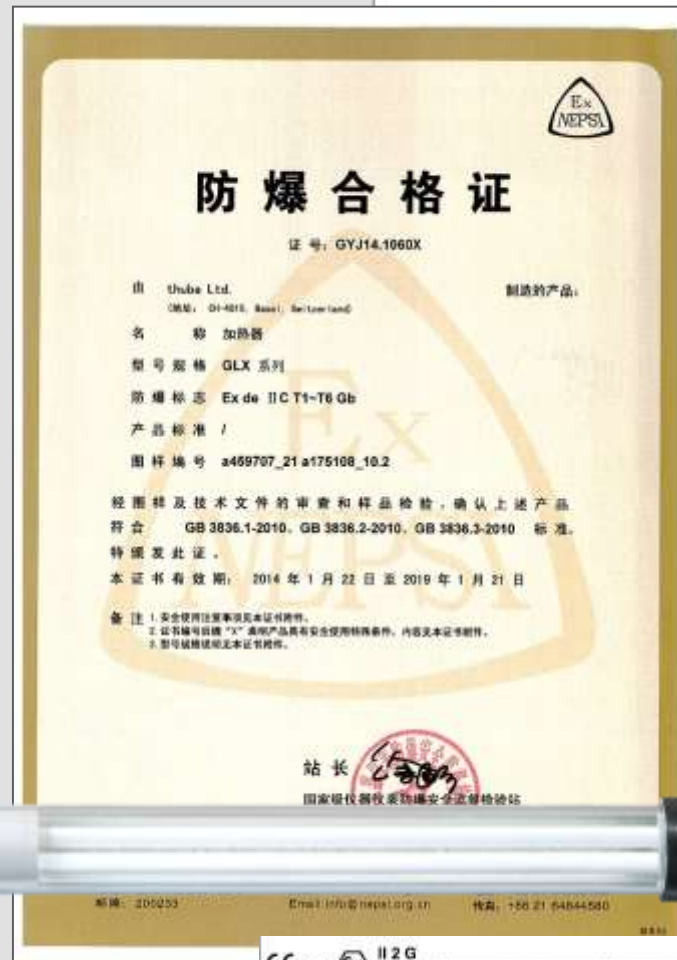


CE 0158 Ex II 2 G II 2 D	50-400 Hz	1725.2010	thuv	Ex
	Typ: ML 70d 55 833	110-240 VAC/DC		
BVS WTEX E 1 X 06	Ex d IIC T5 Gb	T20 up to 60°C	Stuba Ltd. CH-4013 Basel Made in Switzerland +41 61 367 06 00 www.stuba.com	
IECEX BVS 1406	Ex tb IIIC T95°C Db	IP 68		

# 4.2 Documentation – Equipment

The following documents are available for the identification:

- **Marking**  
(according IEC 60079-0)
- **Chinese Certificate of Conformity**
- **Instruction manual**  
(according IEC 60079-0)



CE 0158 Ex II 2 G II 2 D	50-400 Hz	1725.2010	
	Typ: ML 70d 55 833	110-240 VAC/DC	
BVS WATEX E 1 X 06	Ex d IIC T5 Gb	T20 up to 60°C	thuba Ltd. CH-4813 Basel Made in Switzerland +41 61 507 06 00 www.thuba.com
IECEx BVS 1006	Ex tb IIIC T95°C Db	IP 68	

## **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**



- Evidence of personnel competency







## 4.3 Initial inspection

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		
<b>A</b>	<b>GENERAL (ALL EQUIPMENT)</b>			
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			
13	Links of equipment are of the correct type and are complete and tight	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





## **4.5 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
<b>Gb</b>	Flameproof enclosures	db, d	IEC 60079-1
	Increased safety	eb, e	IEC 60079-7
	Intrinsically safe	ib	IEC 60079-11
	Encapsulation	mb	IEC 60079-18
	Oil immersion	ob, o	IEC 60079-6



## 5.5 Selection according to equipment grouping

Requested Group	Permissible Group
<b>IIA</b>	<b>II, IIA, IIB or IIC</b>
<b>IIB</b>	<b>II, IIB or IIC</b>
<b>IIC</b>	<b>II or IIC</b>

## 5.6.2 Temperature class

Temperature class required by the area classification	Ignition temperature of gas or vapor	Allowable temperature classes of equipment
T1	$> 450^{\circ}\text{C}$	T1 - T6
T2	$> 300^{\circ}\text{C}$	T2 - T6
T3	$> 200^{\circ}\text{C}$	T3 - T6
T4	$> 135^{\circ}\text{C}$	T4 - T6
T5	$> 100^{\circ}\text{C}$	T5 - T6
T6	$> 85^{\circ}\text{C}$	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**



J/B 55

## 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 °C and 40 °C; in this case, no additional ambient temperature marking is required.

Example of extended ambient temperature range  
 $T_{amb}$

$$-20\text{ °C} \leq T_{amb} \leq 60\text{ °C}.$$





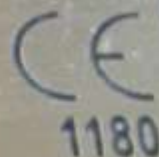
Type

PL 612



II2GD Exell ExtD A21 T6 T80

TEX0117X  
06.0028X



T amb -50°C to +40°C

IP 66/67

**DO NOT OPEN WHEN ENERGISED**

Max. Dissipated Wattage

4.1 W

550 V

37 A

Licence No.

Serial No. F101598/12



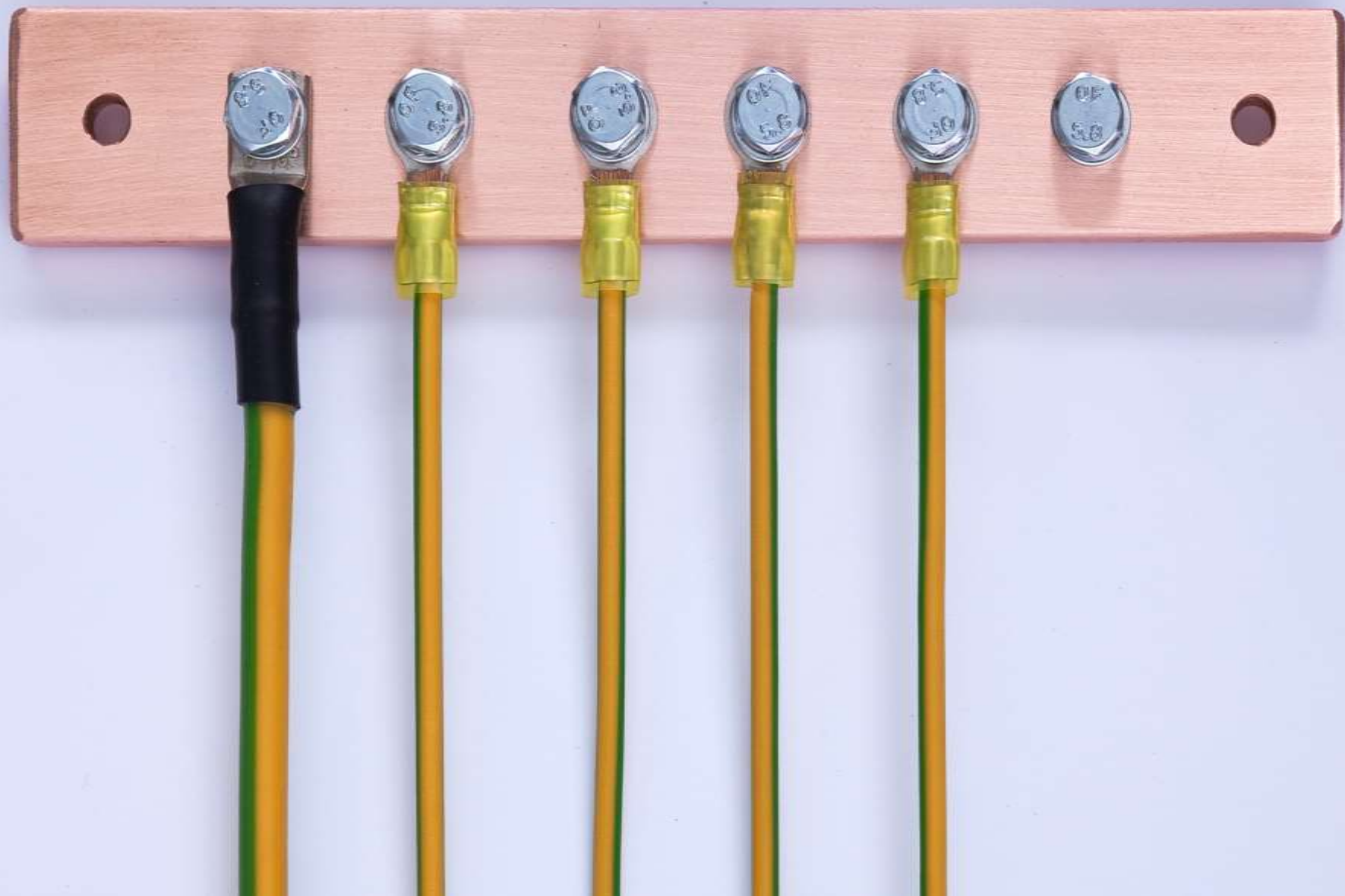
# **6. Protection from dangerous sparking**

## 6.4 Potential equalization

The minimum size for bonding conductors for the *main connection* to a protective rail shall be *at least 6 mm<sup>2</sup>* (based on conductivity of copper) in accordance to IEC 60364-5-54 and *supplementary connections* shall be a minimum of *4 mm<sup>2</sup>*.

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.



**Table 9 – Minimum cross-sectional area of protective conductors**

Cross-sectional area of phase conductors, $S$ mm <sup>2</sup>	Minimum cross-sectional area of the corresponding protective conductor, $S_p$ mm <sup>2</sup>
$S \leq 16$	$S$
$16 < S \leq 35$	16
$S > 35$	$0,5 S$

Equipotential bonding connection facilities on the outside of electrical equipment shall provide effective connection of a conductor with a cross-sectional area of at least 4 mm<sup>2</sup>.

#### 15.4 Protection against corrosion

Connection facilities shall be effectively protected against corrosion. Special precautions shall be taken if one of the parts in contact consists of a material containing light metal, for example, by using an intermediate part made of steel when making a connection to a material containing light metals.

#### 15.5 Secureness of electrical connections

Connection facilities shall be designed so that the electrical conductors cannot be readily loosened or twisted. Contact pressure on the electrical connections shall be maintained and not be affected by dimensional changes of insulating materials in service, due to factors such as temperature or humidity. For non-metallic walled enclosures provided with an internal earth continuity plate, the test of 26.12 shall be applied.

## 15.3 Size of protective earthing conductor connection

Protective earthing (PE) conductor connection facilities shall allow for the effective connection of at least one conductor with a cross-sectional area given in Table 1. Protective earthing (PE) conductor connection facilities for electrical machines shall be according to IEC 60034-1.

**Table 1 – Minimum cross-sectional area of PE conductors**

Cross-sectional area of phase conductors, $S$ mm <sup>2</sup>	Minimum cross-sectional area of the corresponding PE conductor, $S_p$ mm <sup>2</sup>
$S \leq 16$	$S$
$16 < S \leq 35$	16
$S > 35$	$0,5 S$

## 15.4 Size of equipotential bonding conductor connection

Equipotential (EP) bonding connection facilities on the outside of electrical equipment shall provide effective connection of a conductor with a cross-sectional area of at least 4 mm<sup>2</sup>. When this connection facility is also intended to serve as the PE connection, the requirements of Table 1 apply, but with a with a cross-sectional area of at least 4 mm<sup>2</sup>.

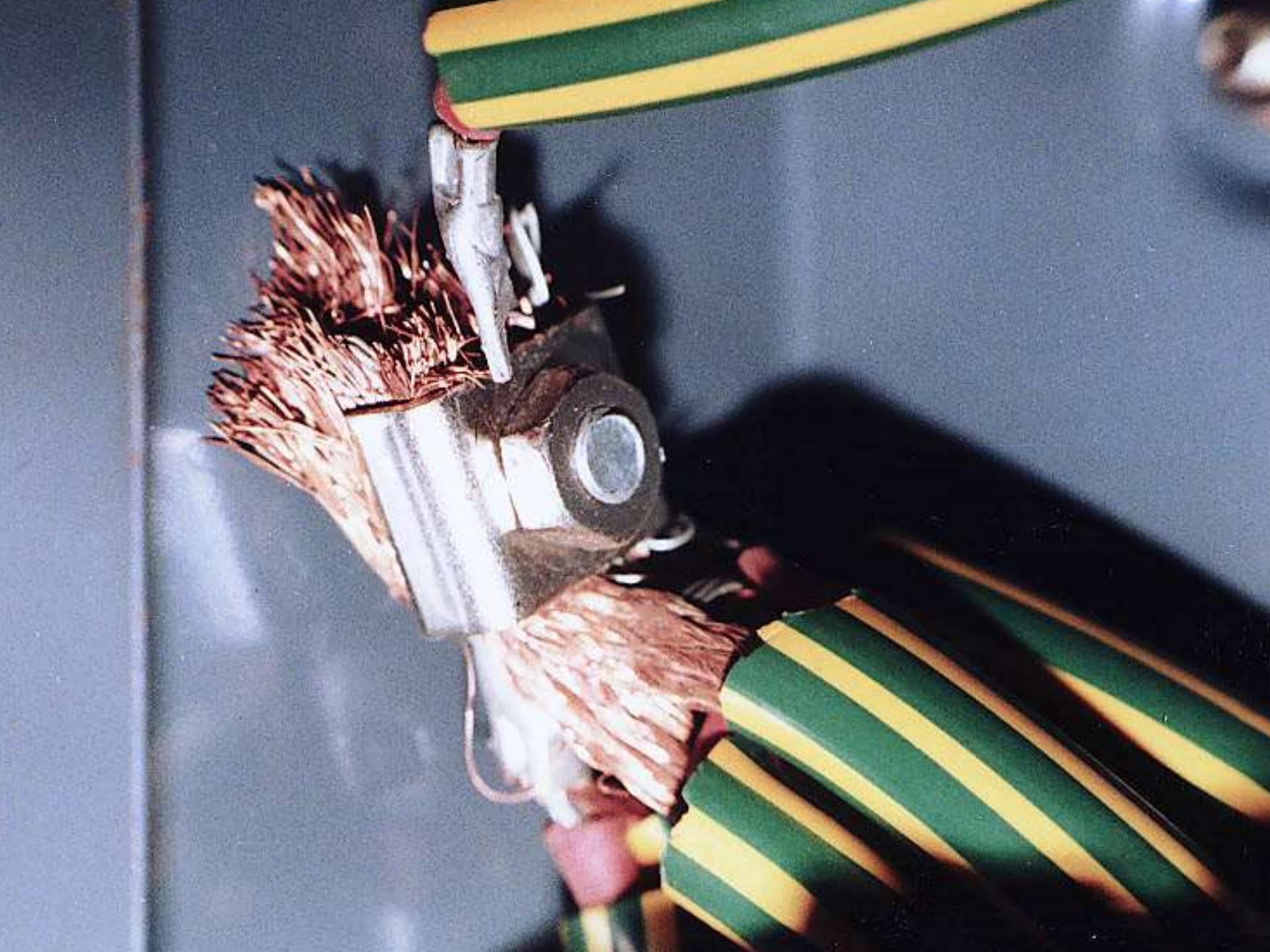
















## Limitation of the size of chargeable non-conductive surfaces

EPL	Surface [mm <sup>2</sup> ]		
	IIA	IIB	IIC
Ga	5000	2500	400
Gb	10000	10000	2000
Gc	10000	10000	2000

shall be  $\leq 4$  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  $10^9 \Omega$ . The resistance shall be measured in accordance with 26.13 but using a  $100 \text{ mm}^2$  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

## 6.5 Static electricity







# 9. Wiring systems

Cables shall be:

- Sheathed with thermoplastic, thermosetting, or elastomeric material.

***They shall be circular and compact.***

Any bedding or sheath shall be extruded.

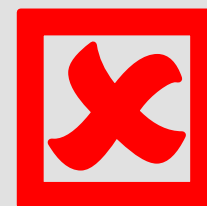
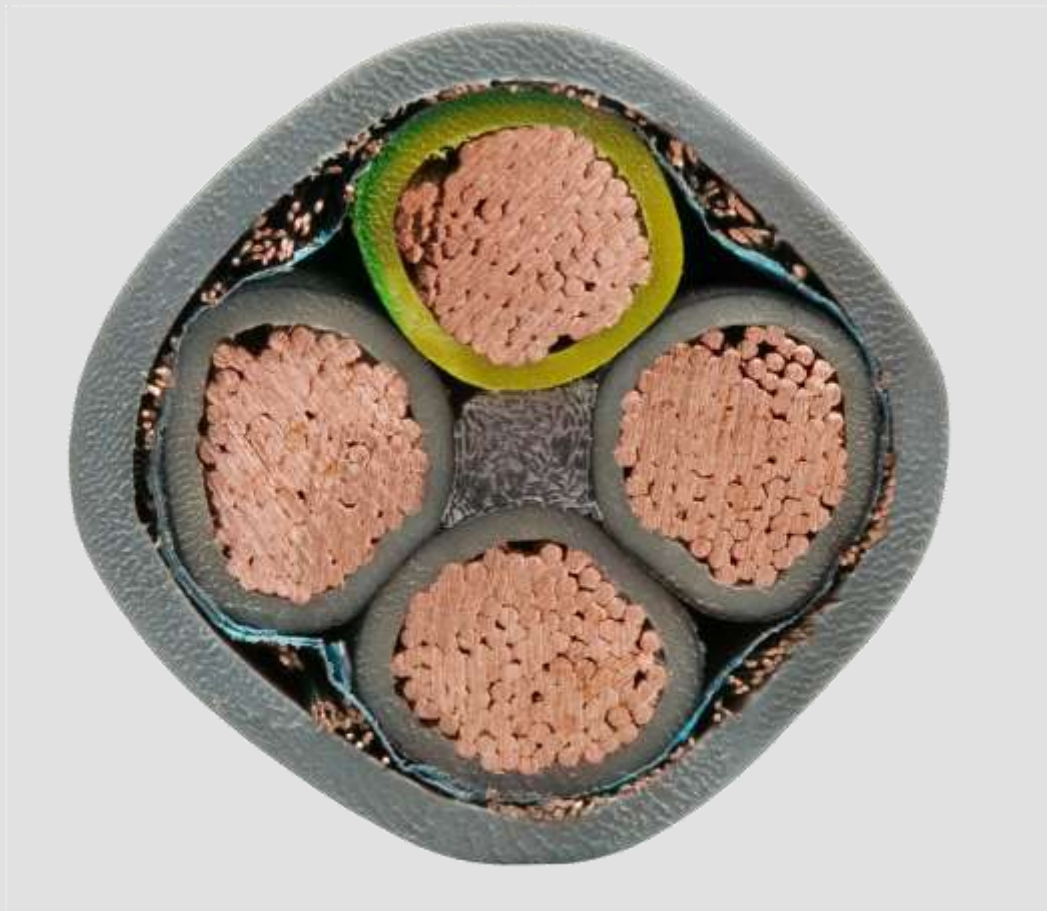
Fillers, if any, shall be non hygroscopic.

- Mineral insulated metal sheathed, or
- Special, e.g. flat cables with appropriate cable glands.

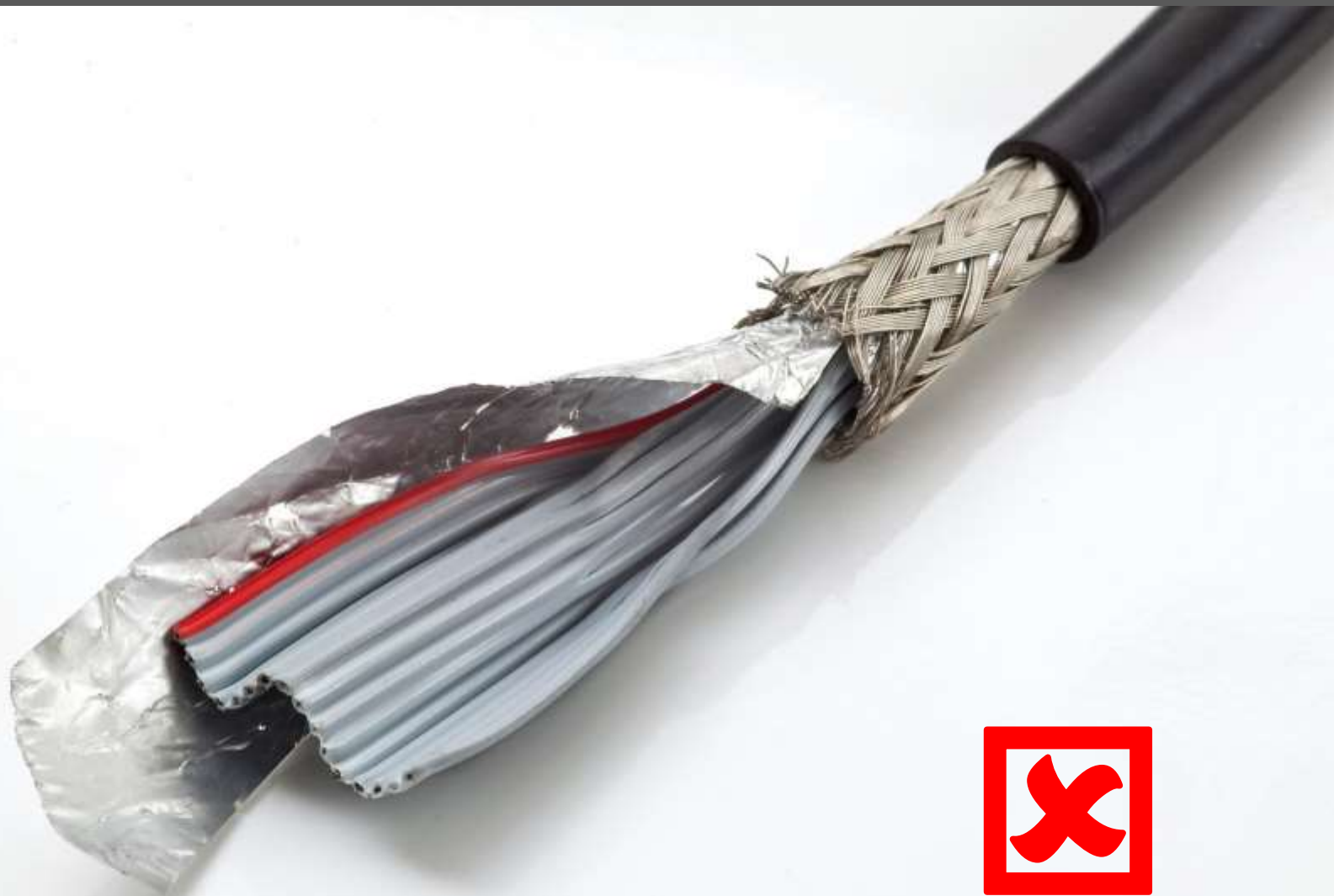
## 9.3.2 Cable for fixed installations



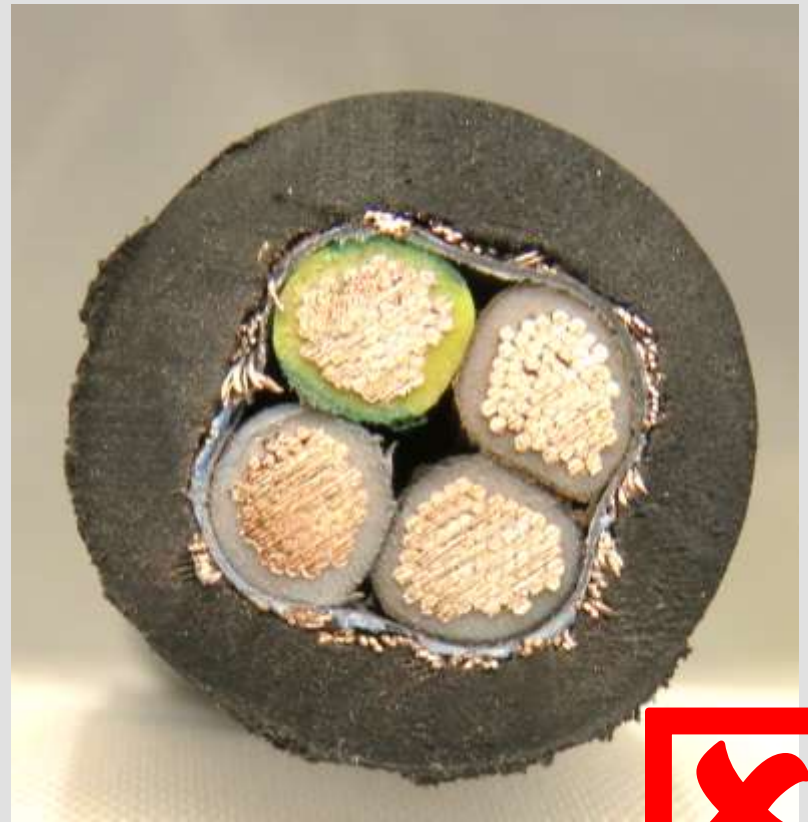
## 9.3.2 Cable for fixed installations



## 9.3.2 Cable for fixed installations



# 9.3.2 Cables for fixed installations





**Please download Part 2 to  
get full presentation**