Erection, maintenance and disposal

Zinc oxide surge arresters
HS PEXLIM P-T and HS PEXLIM T-T
For vertical, upright installation

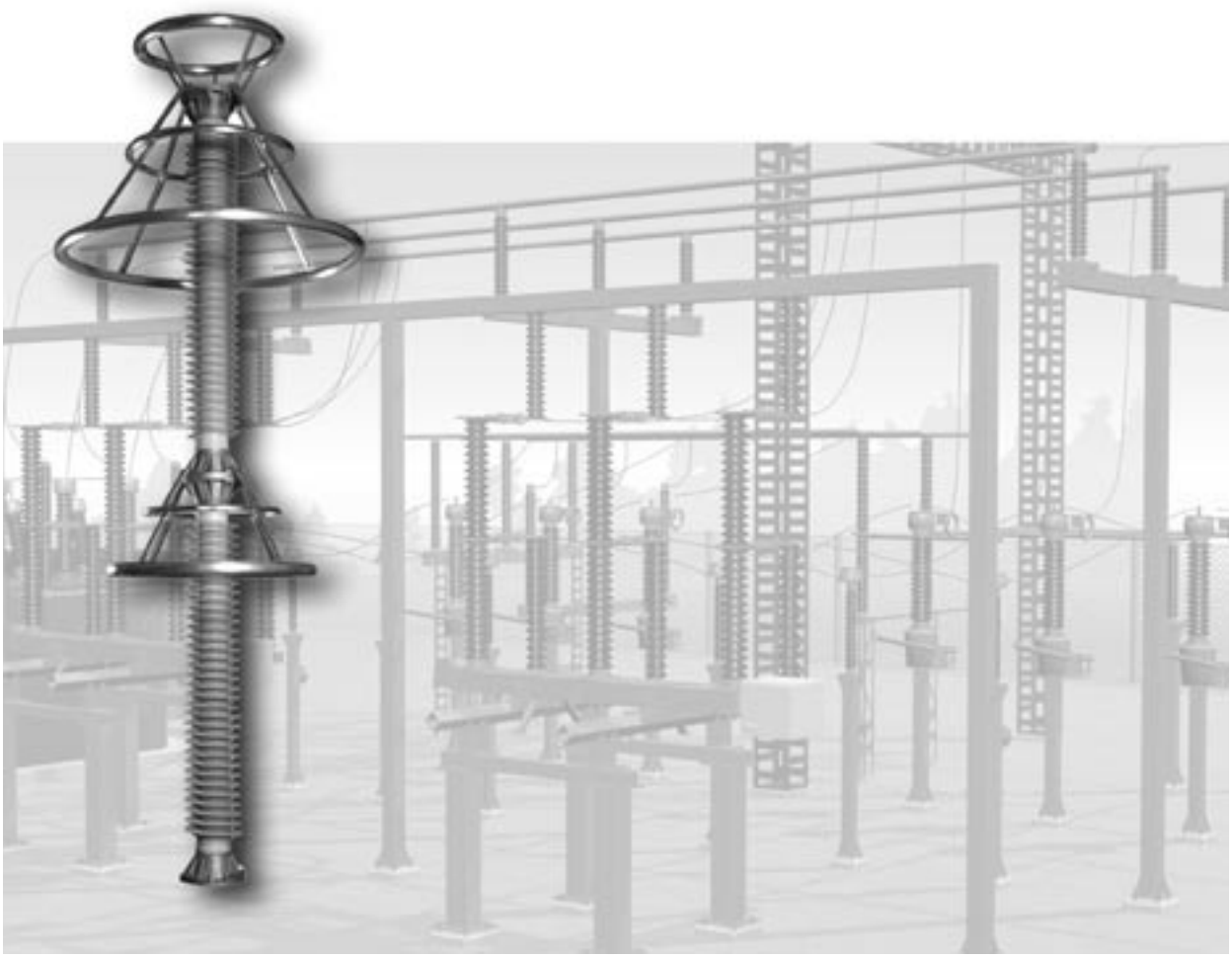


Table of contents and safety information

Table of contents

Important information

The following instruction is valid for HS PEXLIM P-T and HS PEXLIM T-T surge arresters for vertical, upright mounting

Serious material damage, severe personal injury and/or death can be the result of not following this instruction. Therefore, the personnel responsible for the installation of the equipment **shall read and follow the instruction carefully.**

Handling and maintenance of all the surge arresters described in this instruction must be done by personnel trained for this type of work.

WARNING!
All work related to the surge arresters shall be made with disconnected and earthed conductors. Follow all regulations and rules stated by international and national safety regulations.

Normally, surge arresters operate at a high voltage. Therefore, they must be installed in such a way that only qualified personnel has access to them.

The procedure outlined here should be followed for safe and correct installation of the surge arresters.

Order	Procedure	Details in section
1	Inspection upon arrival.	Below
2	Lift out the arrester units from the crate.	2
3	Fit the line terminal on the top cover.	3
4	Assemble the grading rings for the top unit and the second unit if any.	4
5	Fit the top unit grading rings and top cover on the top unit.	6
6	Lift the top unit and fit the lower grading rings, if any, to the bottom flange of the top unit and bolt together to the second unit. Repeat the procedure until the arrester is completely assembled on the ground.	6
7	Fit the insulation base under the bottom unit if any along with the earth terminal or diagnostic indicator EXCOUNT-II when provided.	7
8	Lift the arrester and secure it on the structure.	2 and 7
9	Connect the earth and line conductors.	8

Multi-unit arresters must be erected with their units in correct order, see section 5 on page 10.

The instruction must be followed in correct order to prevent problems during assembly. In the case where an arrester is not supplied with an insulating base and/or surge counter, the paragraphs dealing with these accessories may be disregarded.

Inspection upon arrival

Upon arrival it is important that the cases are inspected and the contents checked against the packing list which is attached to each case. Any shortage or damage should be reported immediately to the insurance and/or ABB representative within 30 days from the arrival of goods at site. ABB cannot take responsibility for shortage or damages not reported within this time period.

If the contents are to be stored for a long period of time prior to installation they must be repacked and stored, preferably dry and indoors. However, outdoor storage is acceptable.

2. Lifting the surge arrester

It´s very important to place the lifting slings around the metal flange and not around the flange neck covered with silicone rubber. Se figure 2.2 and figure 2.3. Arrange the lifting slings according to figure 2.1. Note, it´s important to use two lifting slings at each flange.

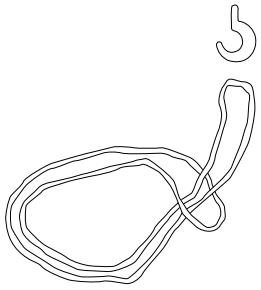
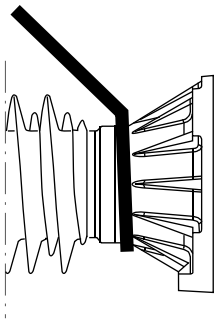


Fig 2.1 Sling arrangement (2x)

Lifting horizontal

Correct placement of lifting slings



WARNING! Faulty placement of lifting slings

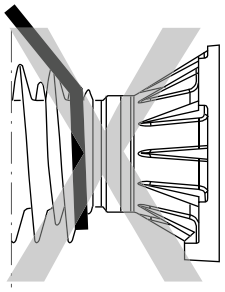
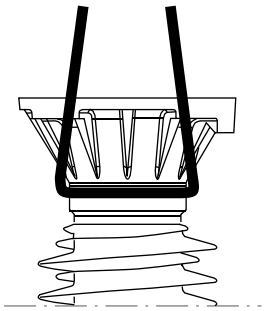


Fig 2.2 Placement of lifting slings

Lifting vertical

Correct placement of lifting slings



WARNING! Faulty placement of lifting slings

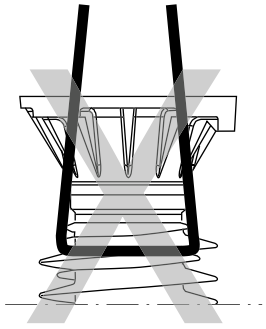


Fig 2.3 Placement of lifting slings

Be careful so that the arrester units do not hit anything during lifting!

Keep the lifting slings in place until the completely assembled arrester is securely anchored to the structure.

NOTICE! Do not place the lifting slings upon the part of the flange neck that is covered with silicone rubber, see figure 2.2 and 2.3.

2.1. Lifting the surge arrester units out of the case

When lifting the arrester unit horizontal, **two lifting slings must be used**. Place one sling around the upper metal flange and one sling around the lower metal flange of the insulator. See figure 2.4 below. See also figure 2.2 for correct placement of lifting slings.

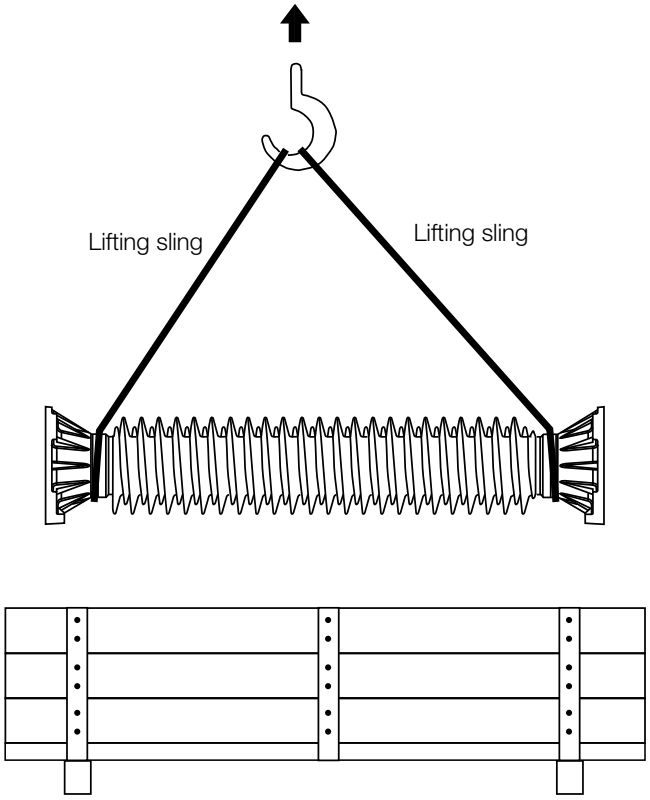


Fig 2.4 Lifting a surge arrester unit out of crate

2.2. Lifting the surge arrester during assembly

When lifting surge arrester unit or complete assembled surge arrester, **two lifting slings must be used**. Place the slings around the upper metal flange of the insulator. See figure 2.5 to 2.6. See also figure 2.3 for correct placement of lifting slings.

Table 2.1

Typical weight of the smallest to the largest surge arrester.	HS PEXLIM P-T	HS PEXLIM T-T
	115 to 365 kg	160 to 405 kg

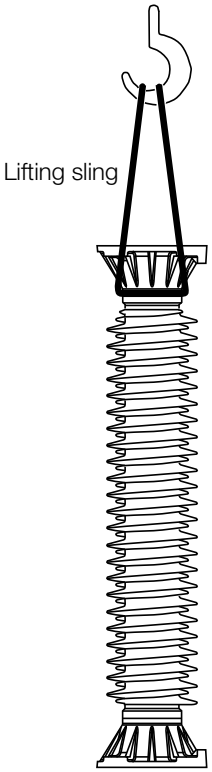


Fig 2.5 Lifting a surge arrester unit

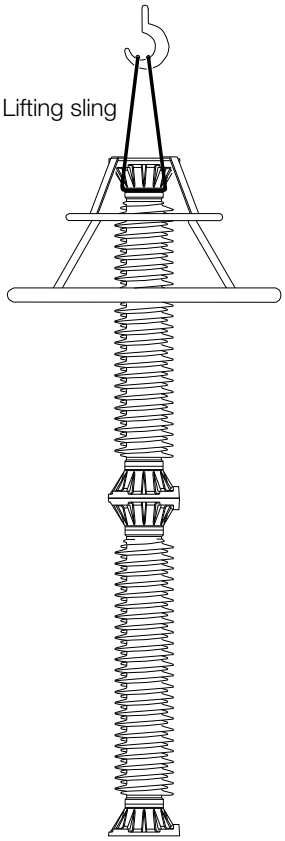


Fig 2.6 Lifting of the complete assembled surge arrester onto the structure

3. Line terminal

Fit the line terminal to the top cover according to figure 3.1 - 3.2. Recommended tightening torque is 270 Nm (M20).

Line terminal with clamp:
When the line conductor is to be connected, put together the clamp according to section 8 on page 17.

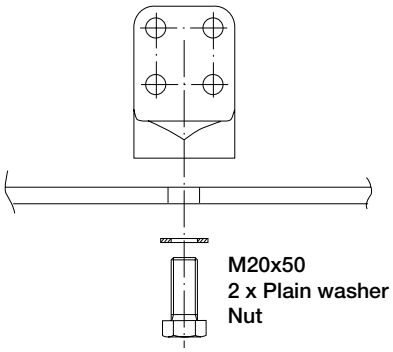


Fig 3.1
Assembly of
1HSA410 000-A, -B

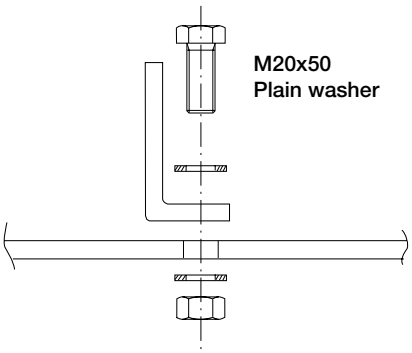
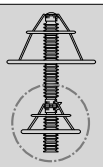


Fig. 3.2
Assembly of
1HSA410 000-C, -D

4. Grading ring

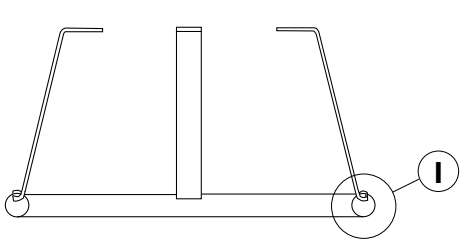
When a grading ring is supplied, it **must** be fitted to the arrester. **Otherwise the correct performance is not guaranteed**. If the surge arrester has a grading ring, assemble the stays with the ring/rings according to the table 4.1 and the figures on the right side. The recommended tightening torque for M10 screws is 49 Nm. M6 screws are tightened with a screw driver.

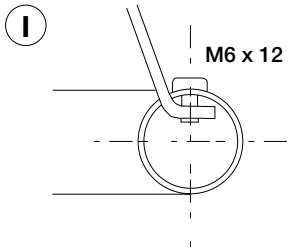
Table 4.1 Grading ring arrangement. The letters in the table refer to the figures on the next page.

Type designation			
HS PEXLIM P-T			
P180-TM245 — P192-TM245	A		
P180-TH245 — P228-TH245	A		
P228-TM300 — P264-TM300	B		
P228-TV300 — P240-TV300	C		
P264-TV300	B		
P258-TH362 — P276-TH362	C		
P288-TH300	C		
P300-TH400	C		
P330-TH420 — P390-TH420	C		
P396-TH550 — P420-TH550	C	D	E
P444-TH550	C	D	E
HS PEXLIM T-T			
T180-TH245 — T216-TH245	A		
T228-TV245	A		
T228-TV300 — T240-TV300	C		
T258-TH362 — T276-TH362	C		
T288-TH380	C		
T300-TH400	C		
T330-TH420 — T360-TH420	C		
T390-TV420	C		
T396-TH550 — T420-TH550	C	C	E
T444-TH550	C	D	E

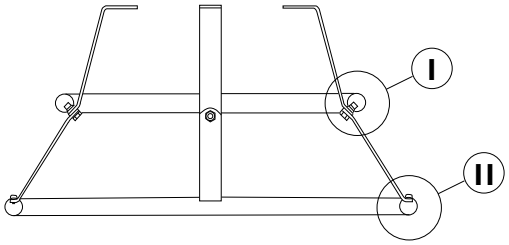
Grading ring assembly according to table 4.1.
(The numbered circles refer to the mounting alternatives in the right column of this table).

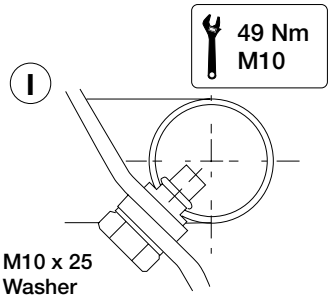
A

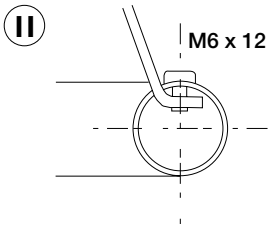




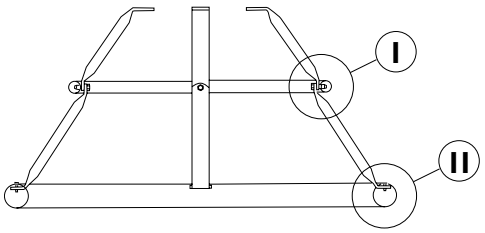
B

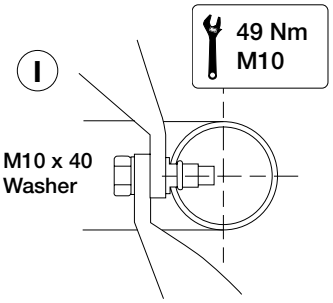


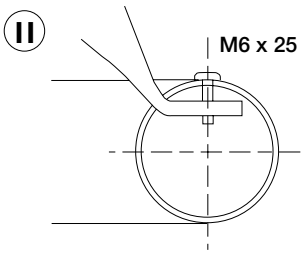




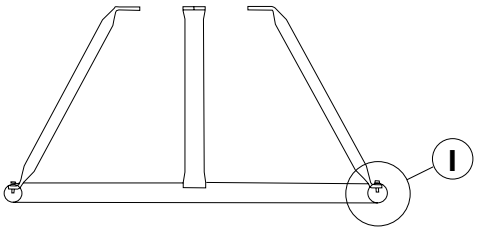
C

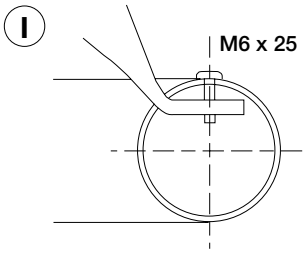




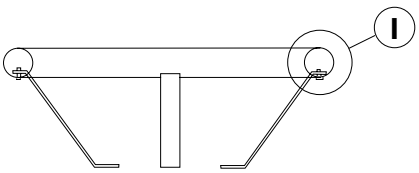


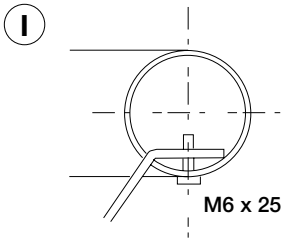
D





E





5. Relative position of arrester units

Multi-unit arresters must be erected with their units in the correct order.
All units in one arrester have the same serial number with a consecutive suffix number to identify their position, i.e. top unit = N. XXXXXXX/1, next unit = N. XXXXXXX/2, etc.

N. XXXXXXX is the serial number (according to section 5.1, 5.2 and 5.3 on next pages).

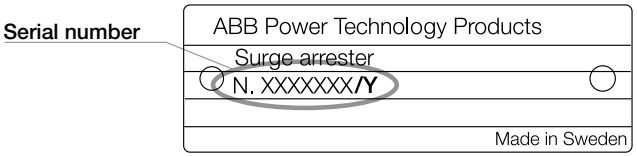
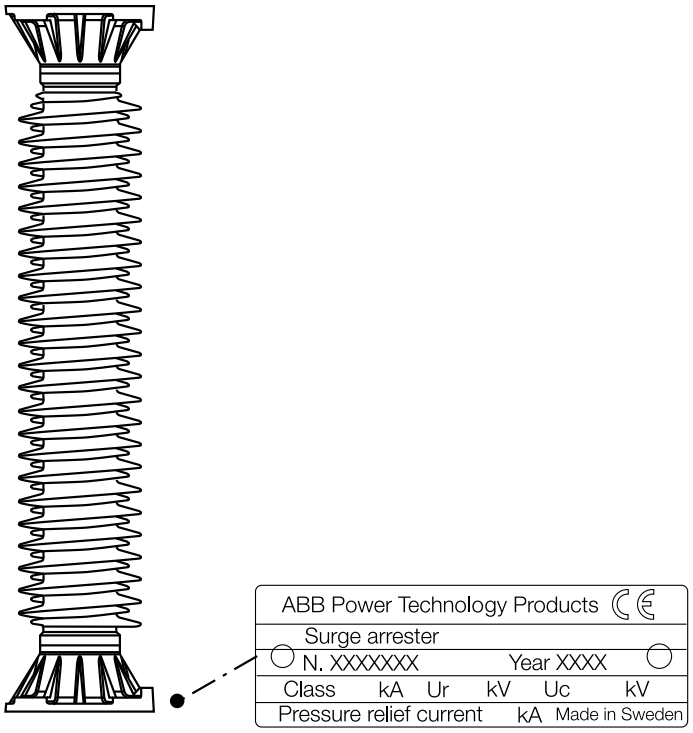


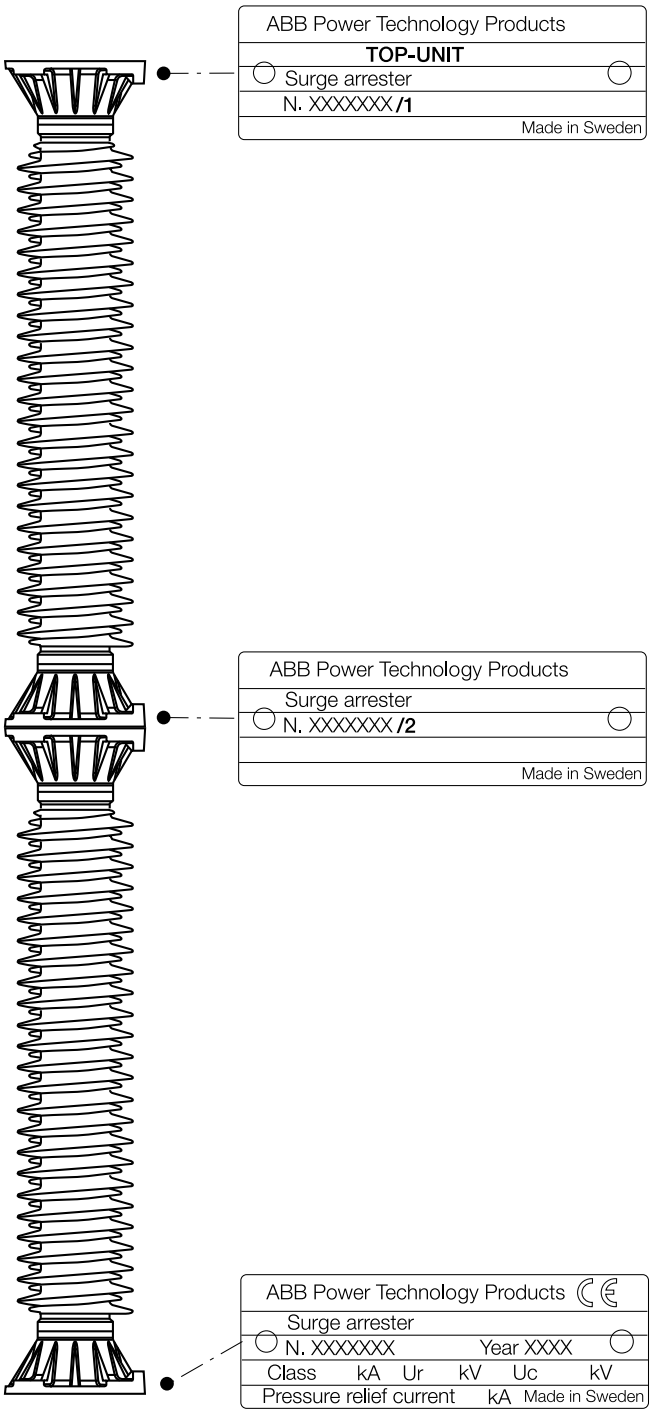
Fig. 5.1. Rating plate

5.1. Single-unit arrester



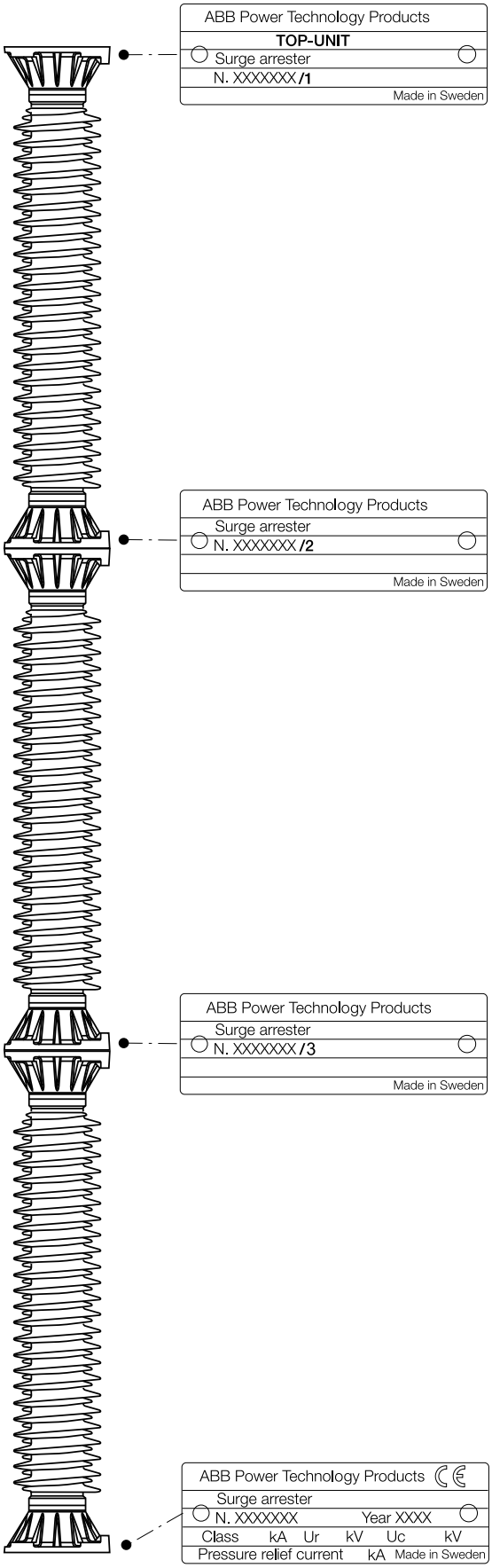
HS PEXLIM P-T	HS PEXLIM T-T
Pxxx-TM245	Txxx-TH245
Pxxx-TH245	
Pxxx-TM300	

5.2 Two-unit arresters



HS PEXLIM P-T	HS PEXLIM T-T
Pxxx-TV300	Txxx-TV245
Pxxx-TH362	Txxx-TV300
P288-TH380	Txxx-TH362
P300-TH400	T288-TH380
Pxxx-TH420	T300-TH400
P396-TH550	Txxx-TH420
P420-TH550	T390-TV420
	T396-TH550
	T420-TH550

HS PEXLIM P-T	HS PEXLIM T-T
P444-TH550	T444-TH550

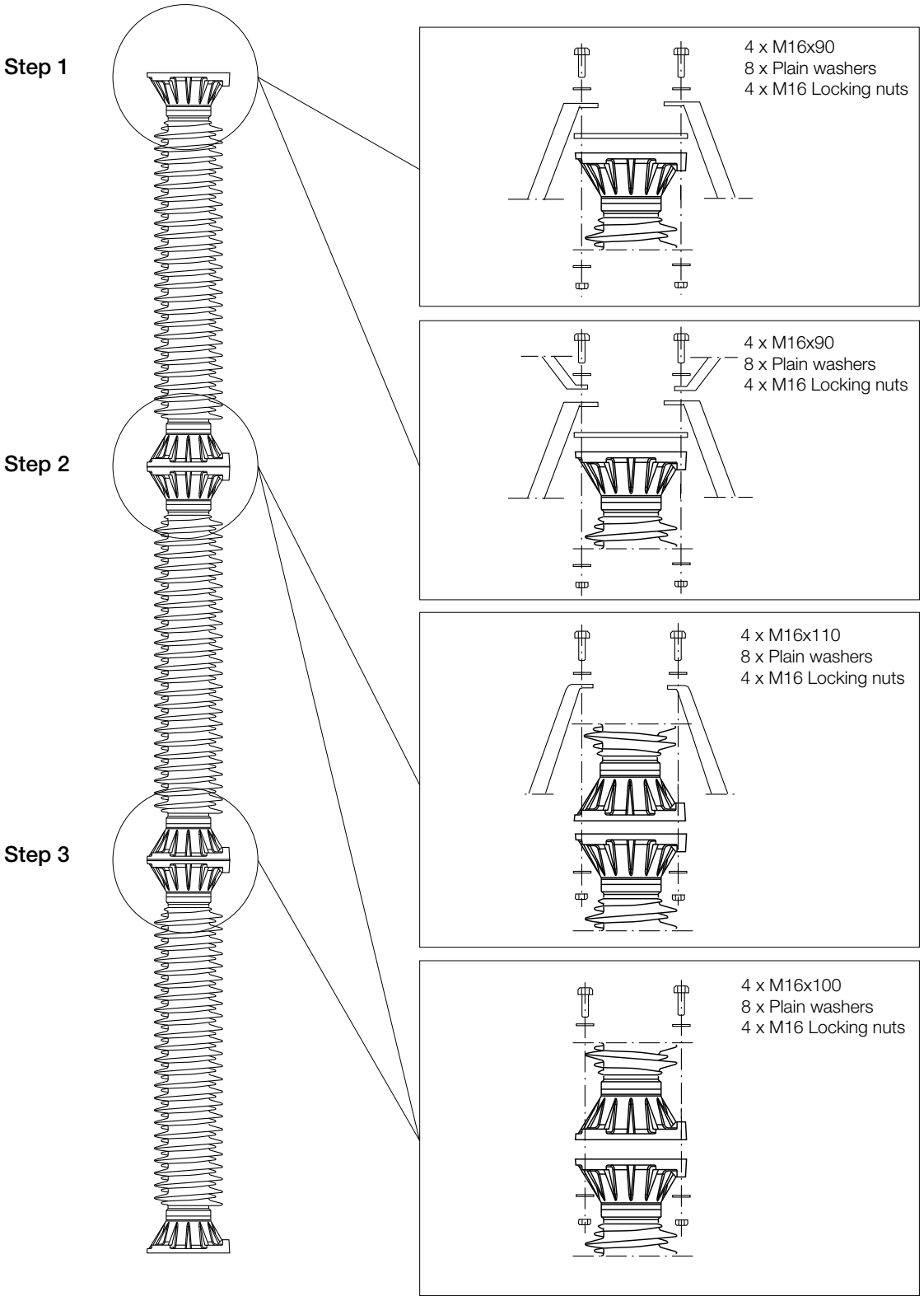


6. Assembly of units and grading rings

HS PEXLIM P-T and T-T

205 Nm
M16

Recommended tightening torque for M16 bolts is 205 Nm



Fit the insulating base and earth terminal to the bottom flange of the bottom unit according to the assembly instructions in section 7.1 on next page. Anchoring bolts and nuts are **not** provided with the arrester.

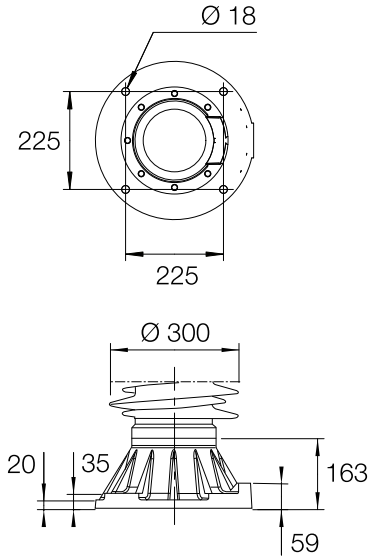


Fig. 7.1. Drilling plans

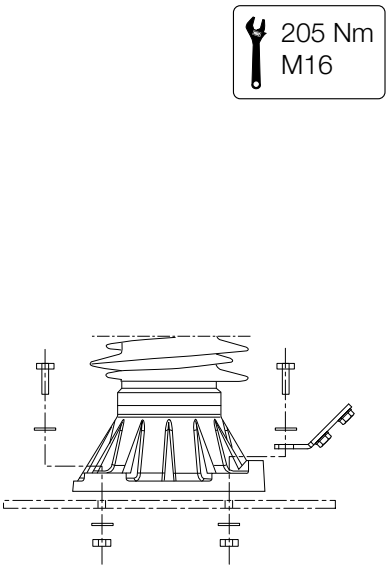


Fig. 7.2. Assembly of earth terminal and installation on structure

7.1. Installation of insulating base for HS PEXLIM P-T and T-T

This instruction covers insulating base 1HSA430 000-P. In the case where another insulating base is to be fitted, the installation instructions included with the delivery shall be followed.

The extra long bolt M16x160 delivered together with the insulating base is only used for connecting the diagnostic indicator EXCOUNT-II. See figure 7.1.3.
If EXCOUNT-II is not to be mounted, the shorter bolt M16x130 shall be used instead. See figure 7.1.2.
The extra long bolt is accordingly disregarded.

Recommended tightening torque is 183 Nm.

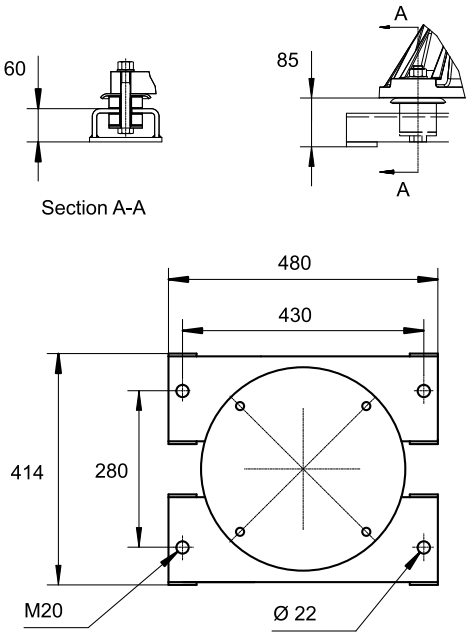


Fig. 7.1.1. Drilling plan

183 Nm
M16

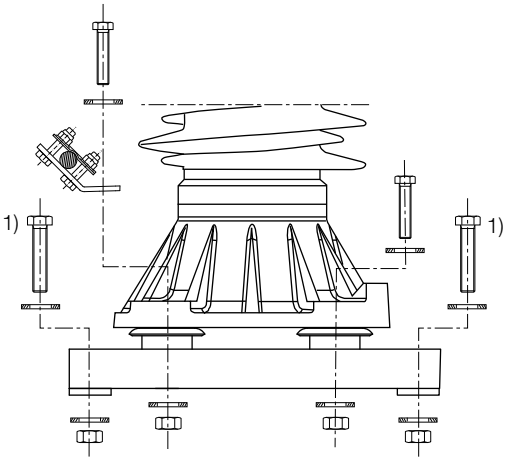


Fig. 7.1.2. With earth terminal and/or surge counter EXCOUNT-A

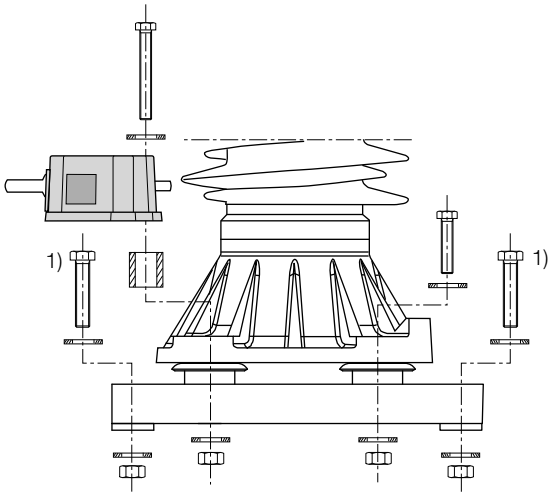


Fig. 7.1.3. With diagnostic indicator EXCOUNT-II

1) Requirements on M16 bolts for installation to structure:
These bolts are not supplied with the arrester.
Recommended tightening torque: Acc. to strength class. max 240 Nm.
Strength class: 8.8 or higher
Material: Hot dip galvanized steel or waxed stainless steel.
Required threaded grip length: 15 to 20 mm.
A washer shall be placed under the bolts head.

8. Connection of conductors

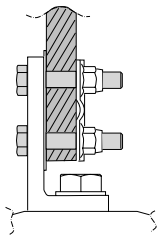
Surge arresters are dimensioned for use at an operating voltage that is equal to or lower than the continuous operating voltage Uc (as per IEC) or MCOV (as per ANSI), as is shown on the rating plate.

Surge arresters are dimensioned to withstand bending moments according to table 8.1. To obtain the best protection performance, **the arresters must be connected with as short connectors as possible to both line and earth.** However the mechanical aspects must be taken into consideration. Connectable diameter for terminals with clamps is 8-34 mm.

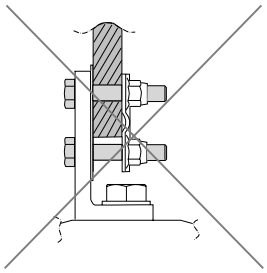
Table 8.1.

Sevice loading	HS PEXLIM P-T and T-T
Declared permissible static service load (DPSSL)	19 000 Nm
Maximum permissible dynamic service load (MPDSL)	28 000 Nm
Definitions as per forthcoming amendment (no 2) to IEC 60099-4	

Connection of the conductor must be done correctly. For vertical mounting the conductor must be fixed edge to edge with the clamp.



Correct installation



Warning! Faulty connection

Compatible conductor material

All earth terminals are compatible with both copper and aluminium conductors, as are all line terminals except 1 HSA 410 000-A and C which cannot be combined with copper conductors. In these cases use stainless steel washers between the aluminium terminal and the copper conductor.

8.1 Connection of line terminal

Connect the line conductor to the line terminal in such way that the permissible static loading together with steady wind load does not exceed the maximum value according to table 8.1.

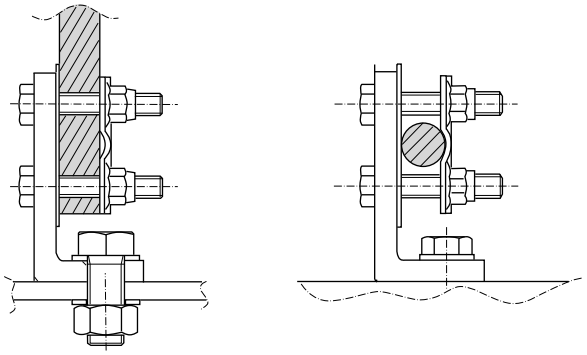


Fig 8.1 Connection of single line conductor can be done from top or side.

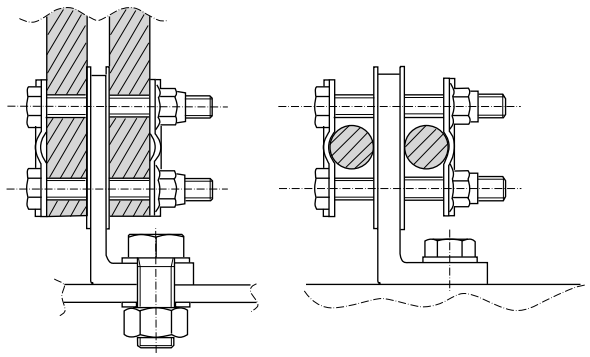


Fig 8.2 Connection of double line conductor can be done from top or side.

8.2 Connection of earth terminal

The earth conductor cross section shall be chosen in accordance with local regulations and earth fault current requirements. For assembly of earth terminal to flange, see figure 7.2 on page 15. For assembly of clamp see figure 8.3.

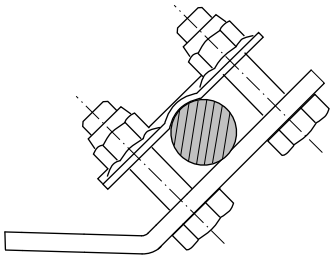


Fig 8.3.

8.3 Installation of surge counter or EXCOUNT II

For installation of diagnostic monitor EXCOUNT II, see section 7.1 on page 16 and the included assembly instruction.

For installation of a surge counter (EXCOUNT A) ensure that:

- The arrester is insulated from the structure by an insulating base.
- The length of the conductor between the arrester and the surge counter is minimum 0,5 m but shall as a recommendation not exceed 5 m, see figure 8.4. Longer distances up to 10 m could be used but please note that longer connection leads means a disadvantage from protection point of view since inductance is added in series with the arrester. The conductor shall be insulated for 5xL kV (LIWL), where L is the conductor length in meter as shown in figure 8.4.
- The surge counter is installed according to the included assembly instruction.

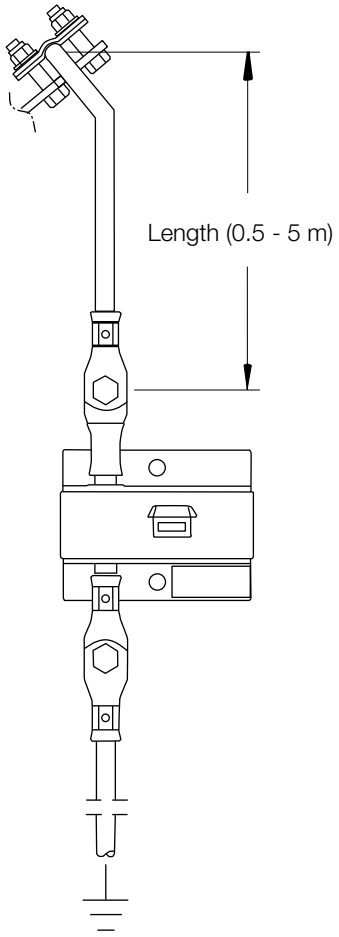


Fig 8.4

9. Maintenance and checking

A properly chosen and installed HS PEXLIM P-T and T-T surge arrester is maintenance free during its lifetime, when operating under normal operating conditions. A properly chosen arrester means that both its electrical capability as well as its mechanical design correspond to the service conditions of the actual network.

Cleaning

PEXLIM arresters do not require any cleaning of the external surfaces for their lifetime. The surface may appear to be dirty, but this is of no significance.

Should however for any reason the arresters be subjected to live washing observe the following in addition to normal precautions for live washing:

- Arrester insulators usually have shorter flash-over distances than other insulators for the same system voltage, which means a higher risk for external flash-over during washing.

- Arresters must be spray-washed evenly in order to avoid overheating. Do not use high pressure on the water.

For extreme environments (e.g. high acidity, cement) please contact ABB.

General

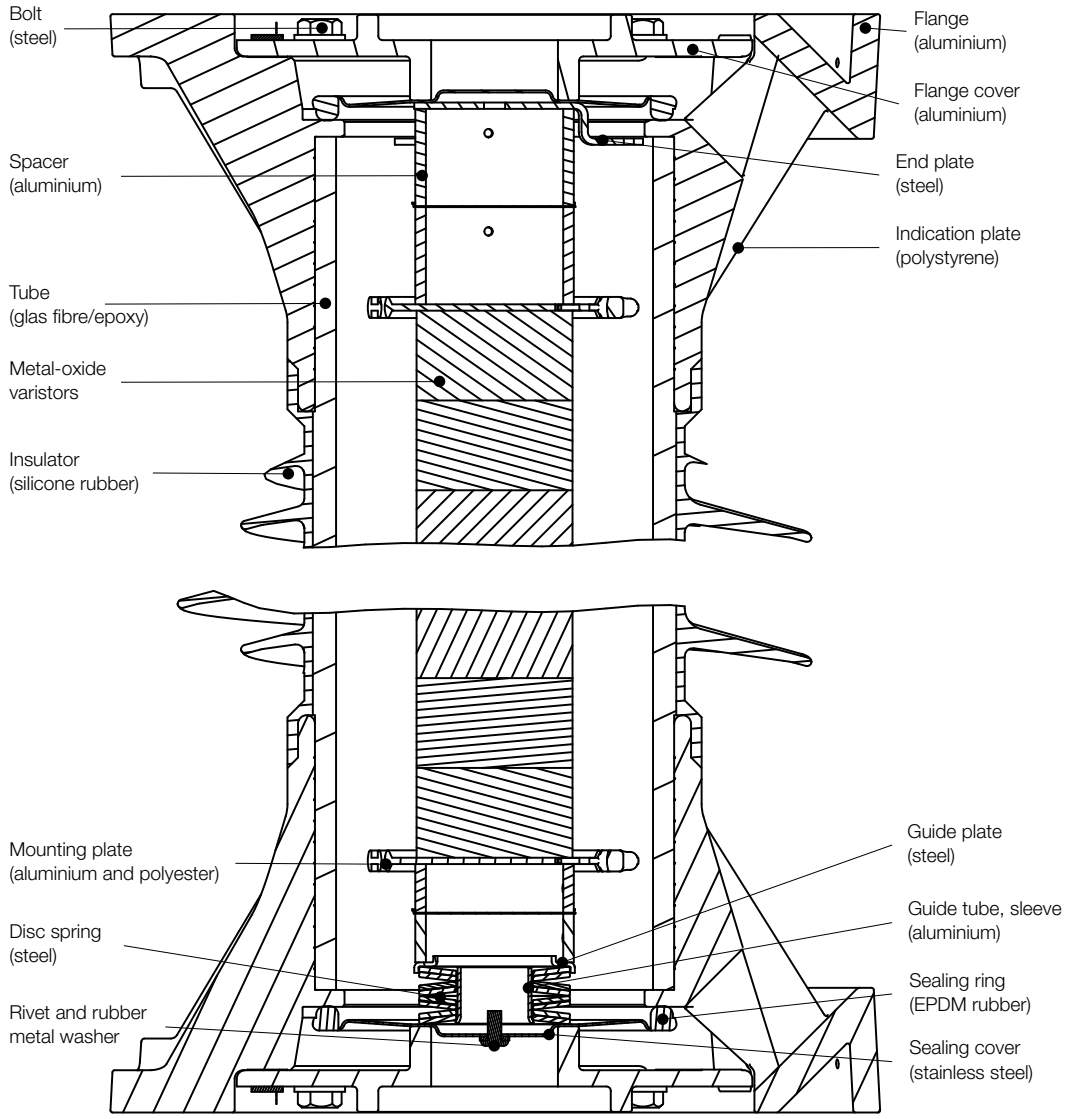
Should a routine check be desired, the only reliable method is to measure the resistive component of the leakage current periodically. For this purpose, use of ABB Leakage Current Monitor, LCM, together with ABBs clip-on current meter or ABB diagnostic indicator EXCOUNT-II is recommended. For description of the LCM/ EXCOUNT-II and measurement procedures, please refer to relevant catalogues.

Indications of arrester failure due to overstress

A red plastic cover covers each venting duct of the arrester. Check that these covers are in position before installation. In the event of an arrester failure due to overstress, one of the indications may be the blowing of these covers. Other indications may be soot marks around the venting ducts.

10. Disposal

When the arrester is taken out of service due to age or in case of an arrester failure due to overstress, its components shall be taken care of according to local regulations. The composition of the arrester and its components is shown in the figure below



Handling of HS HS PEXLIM P-T and T-T Metal-Oxide Surge Arresters taken out of Service

A surge arrester type HS HS PEXLIM P-T and HS HS PEXLIM T-T consists of an outer hollow insulator made of non-halogenated silicon rubber on a fibre-glass reinforced epoxy tube with end fittings and terminals made of aluminium. The inside of the arrester consists of metal oxide varistors, components out of steel, aluminium and polyester and EPDM gaskets. Each arrester unit also contains small packages of desiccant of silica gel.

The metal-oxide varistors are sintered bodies composed mainly of ZnO (90%), with the following other substances in more than 1% weight (in accordance with the common market rules for hazardous components):

Bi_2O_3
Sb_2O_3

For hazardous substances (according to the Council Directive 91/689/EEG on hazardous waste), the following substances are existing in more than 0,1% weight but less than 1%:

Co_2O_3
NiO
Cr_2O_3

In addition the metal-oxide varistors are coated with a thin glass layer (<0,1% weight) containing PbO.

When the arrester is disposed of the polymer parts will eventually decompose into SiO_2 and CO_2. As the substances of the sintered metal-oxide varistors exists in an oxidized state, a leaching test according to EPA-test (Federal Register / vol.45, No 98 / Rules and Regulation), has shown that the sintered bodies may be disposed of without violating the EEG Directive.

NOTE! ABB is working with continous improvements, therefore we reserve the right to change design and specifications without notice.

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