HITACHI
Inspire the Next

Assembly instruction

Metal Oxide Surge Arresters TEXLIM

Safety information

Key to the signs

	This sign is a visual notice to avoid mistakes which can result in damage of the material and/or no function of the surge arrester. Read the text carefully and if you don't understand do not proceed.
	Serious material damage, severe personal injury and/or death can be the result of not following the information given at this sign. Read the text carefully and if you don't understand do not proceed.
	The bolt of the given size shall be tightened with a torque wrench to the specified value.

Important information

The following instruction is valid for TEXLIM Q, P and T surge arresters for vertical, upright mounting including non-catalogue arresters with the following additional suffix letters:

E = Non-standard electrical data

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 handled and installed by qualified personnel.

Storage

In all cases and with consideration to specific local conditions, appropriate steps must be taken to ensure the equipment and packaging is stored in such a way as to protect it from damage or deterioration.

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1. Introduction

1.1 Sequence of assembly

The respective procedure in the tables below should be followed for safe and correct installation of the surge arresters

Order	Procedure	Section
1	Inspection upon arrival.	1.2
2	Lift out the arrester units from the case.	2
3	Fit the line terminal on the top cover.	3
4	Assemble the grading rings for the top unit.	4
5	Fit the top unit grading rings and top cover on the top unit.	6
6	Lift the top unit and assemble it with the second untis. 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, 7

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

1.2 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 Hitachi Energy representative; latest within 30 days from the arrival of goods at site. Hitachi Energy cannot take responsibility for shortages 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 preferably stored dry and indoors. However, outdoor storage is acceptable for the arresters themselves.

2. Lifting

2.1 Lifting the Surge arrester

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

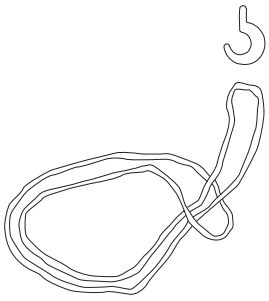
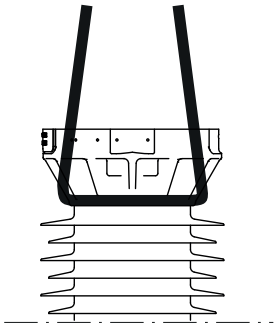


Figure 2.1
Sling arrangement
(2x)

Correct placement of
lifting slings



WARNING!
Faulty placement of lifting
slings

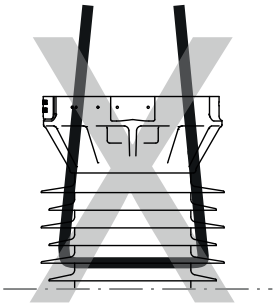


Figure 2.2
Placement of
lifting slings

NOTICE! Do not place the lifting slings upon the part of the flange neck that is covered with silicone rubber.

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.

2.1 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 2.3 and 2.4. See also figure 2.2 for correct placement of lifting slings.

Table 2.1

	TEXLIM Q-C	TEXLIM P-C	TEXLIM T-C
Typical weight of the smallest to the largest surge arrester.	92 - 270 kg	102 - 350 kg	125 - 555

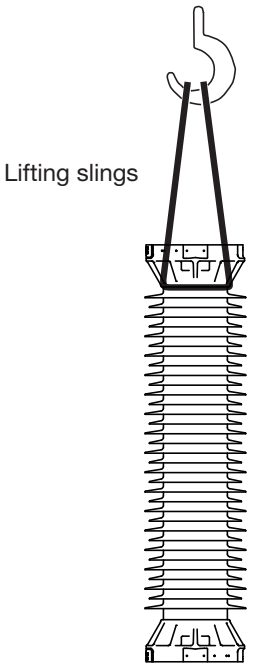


Figure 2.3
Lifting a surge arrester unit

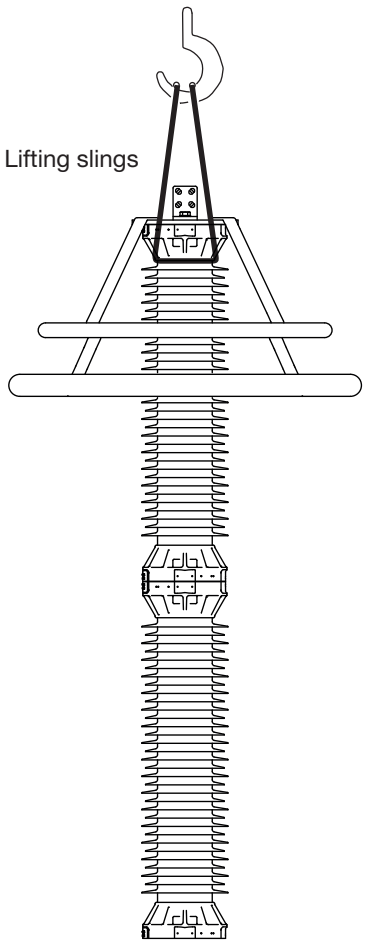


Figure 2.4
Lifting of complete assembled surge arrester onto the structure

3. Line terminal

3.1 Fit the 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 19.

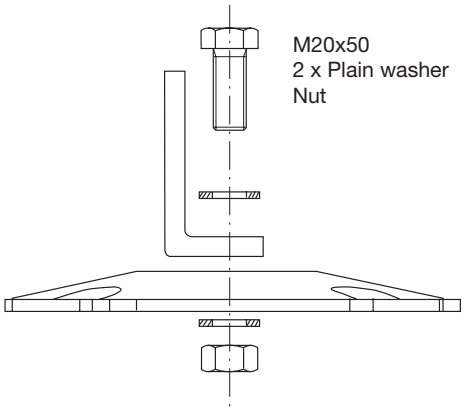


Figure 3.1
Assembly of
1HSA410000-A, -B, -F, -G, -H, -J, -K

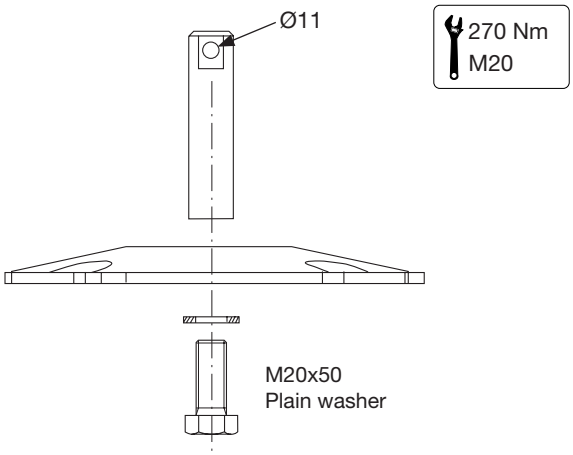


Figure 3.2
Assembly of
1HSA410000-C, -D, -E

4. Grading ring

4.1 Grading ring arrangement

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 4.1.1 and the figures on next page. The recommended tightening torque for M10 screws is 33 Nm.

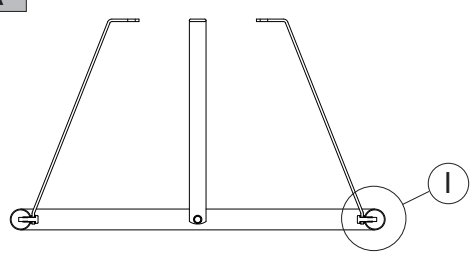
Table 4.1.1 Grading ring arrangement.
The letters in the table refer to the figures on next page.

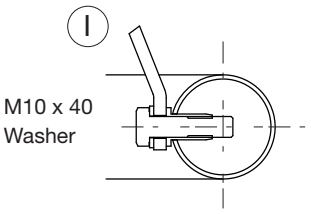
Product type	Type Designation	See 4.2	Product type	Type Designation	See 4.2
TEXLIM Q-C	Q132-CV170 — Q150-CV170	A	**TEXLIM T-C**	T180-CV245 — T228-CV245	A
	Q180-CV245 — Q228-CV245	A		T216-CH300 — T240-CH300	A
	Q216-CH300 — Q258-CH300	A		T216-CV300 — T228-CV300	B
	Q216-CV300 — Q258-CV300	B		T240-CV300 — T276-CV300	C
	Q264-CV300 — Q276-CV300	C		T258-CH362 — T288-CH362	B
	Q258-CH362 — Q288-CH362	B		T258-CV362 — T288-CV362	B
	Q258-CV362 — Q288-CV362	B		T330-CH420 — T360-CH420	B
	Q330-CH420 — Q420-CH420	B		T372-CH420 — T420-CH420	C
	Q330-CV420 — Q420-CV420	B		T330-CV420 — T381-CV420	B
TEXLIM P-C	P180-CV245 — P228-CV245	A		T390-CV420 — T420-CV420	C
	P216-CH300 — P258-CH300	A		T396-CM550 — T420-CM550	B/E
	P216-CV300 — P240-CV300	B		T396-CH550 — T444-CH550	B/E
	P258-CV300 — P276-CV300	C		T396-CV550 — T444-CV550	B/E
	P258-CH362 — P288-CH362	B		T588-CH800 — T624-CH800	D/E
	P258-CV362 — P288-CV362	B			
	P330-CH420 — P360-CH420	B			
	P372-CH420 — P420-CH420	C			
	P330-CV420 — P420-CV420	B			
	P396-CM550 — P420-CM550	B/E			
	P396-CH550 — P444-CH550	B/E			
	P396-CV550 — P444-CV550	B/E			

4.2 Grading ring assembly

Assemble the grading ring according to the applicable arrester type designation in table 5.1.1.
See also paragraph 4.3 on next page for orientation of grading ring with drainage holes.

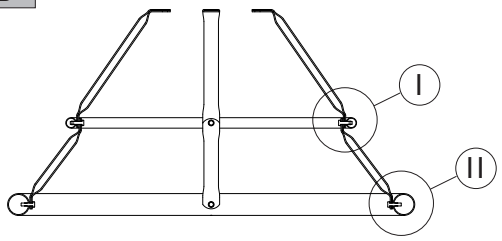
A

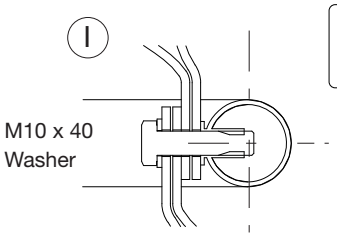




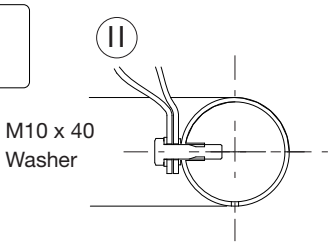
33 Nm
M10

B

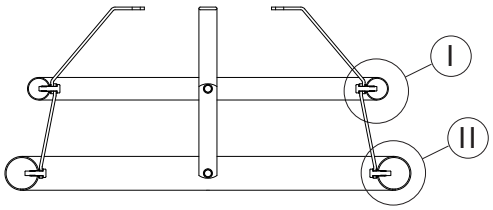


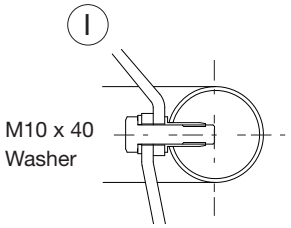


33 Nm
M10

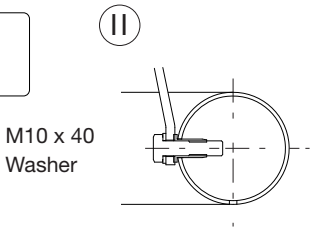


C

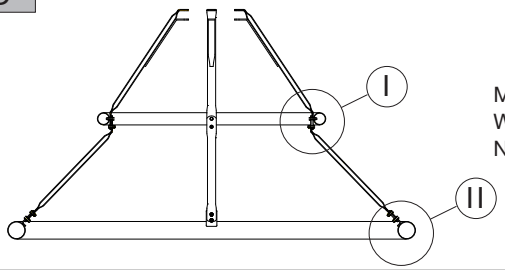


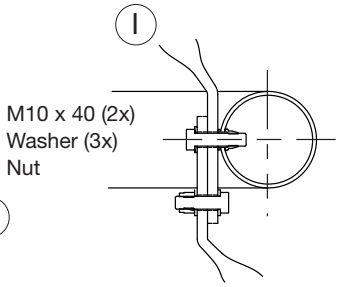


33 Nm
M10

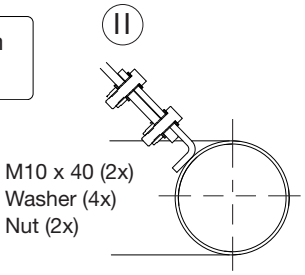


D

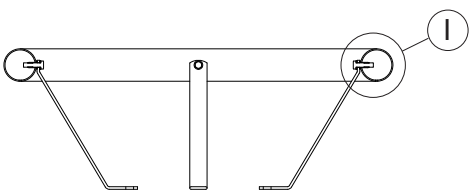


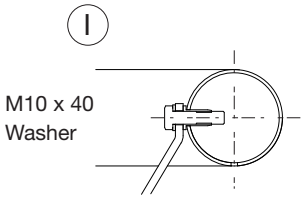


33 Nm
M10



E





33 Nm
M10

4.3 Grading rings with drainage holes

Assemble the grading ring according to the applicable arrester type designation in table 4.3.1

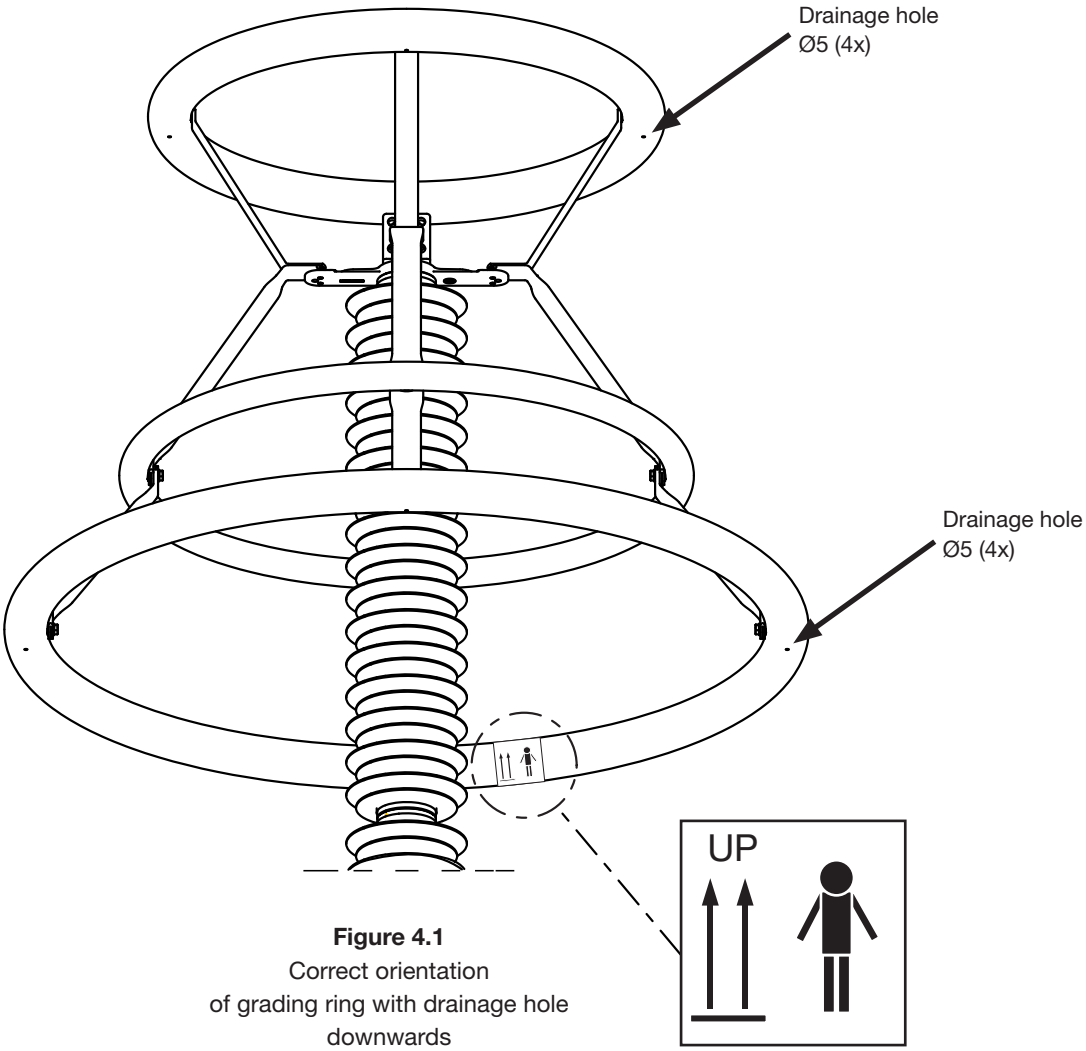


Figure 4.1
Correct orientation
of grading ring with drainage hole
downwards

NOTE! Surge arrrester with grading ring arrangement B to E: drainage hole must always be oriented downwards.

Table 4.3.1
The letters refer to the figures on page 9

Grading ring arrangement	View	Drainage hole	View	Drainage hole
B	Ⓘ	-	Ⓘ	x
C	Ⓘ	-	Ⓘ	x
D	Ⓘ	x	Ⓘ	-
E	Ⓘ	x	Ⓘ	-

5. Relative position of arrester units

5.1 Rating plate

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 5.2, 5.3, and 5.4 on next pages).

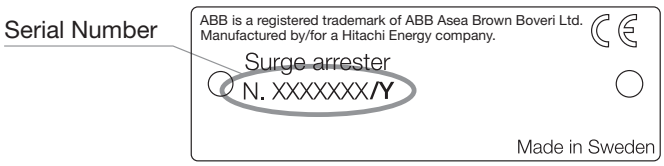
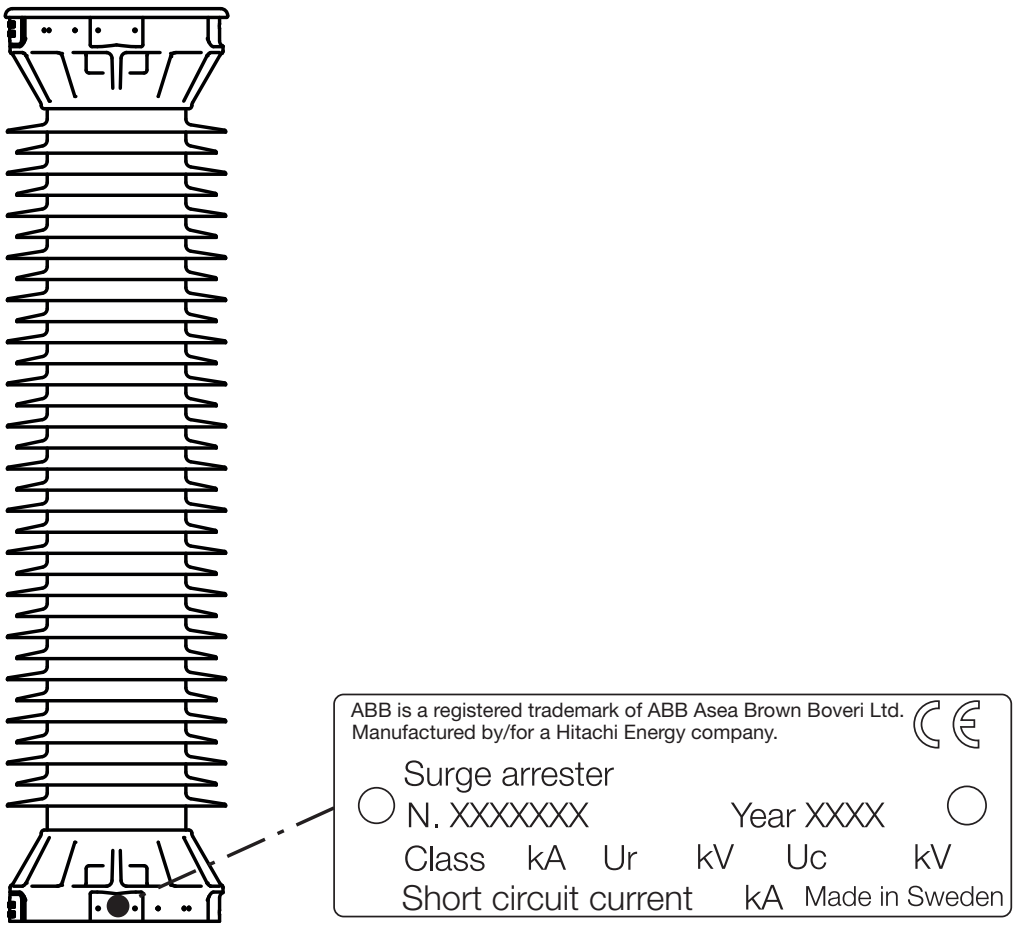


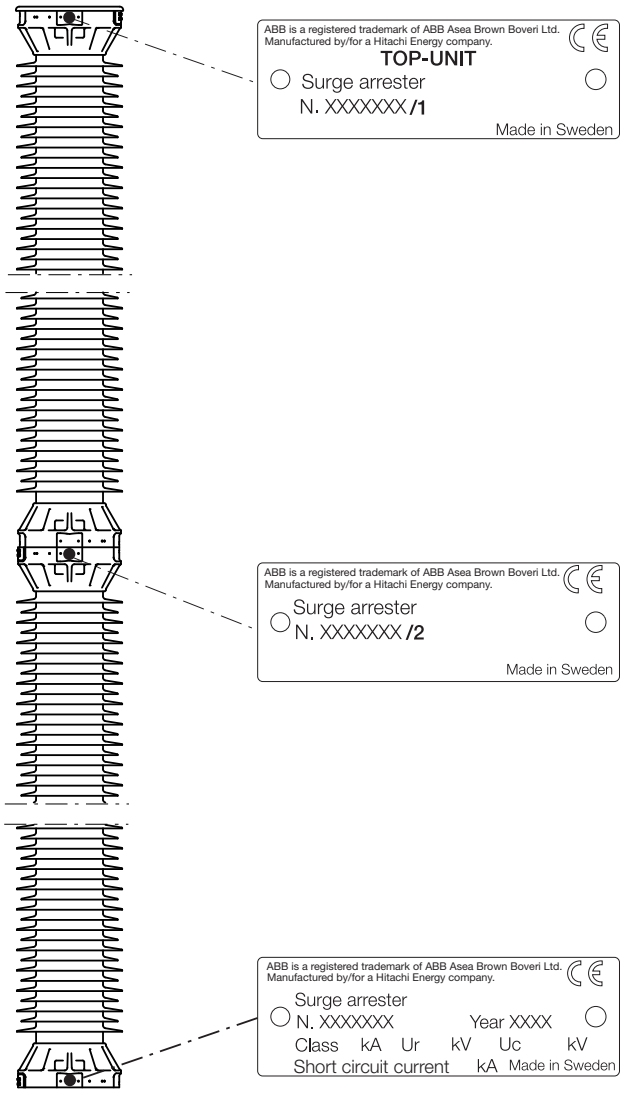
Figure 5.1
Rating plate

5.2 Single-unit arrester



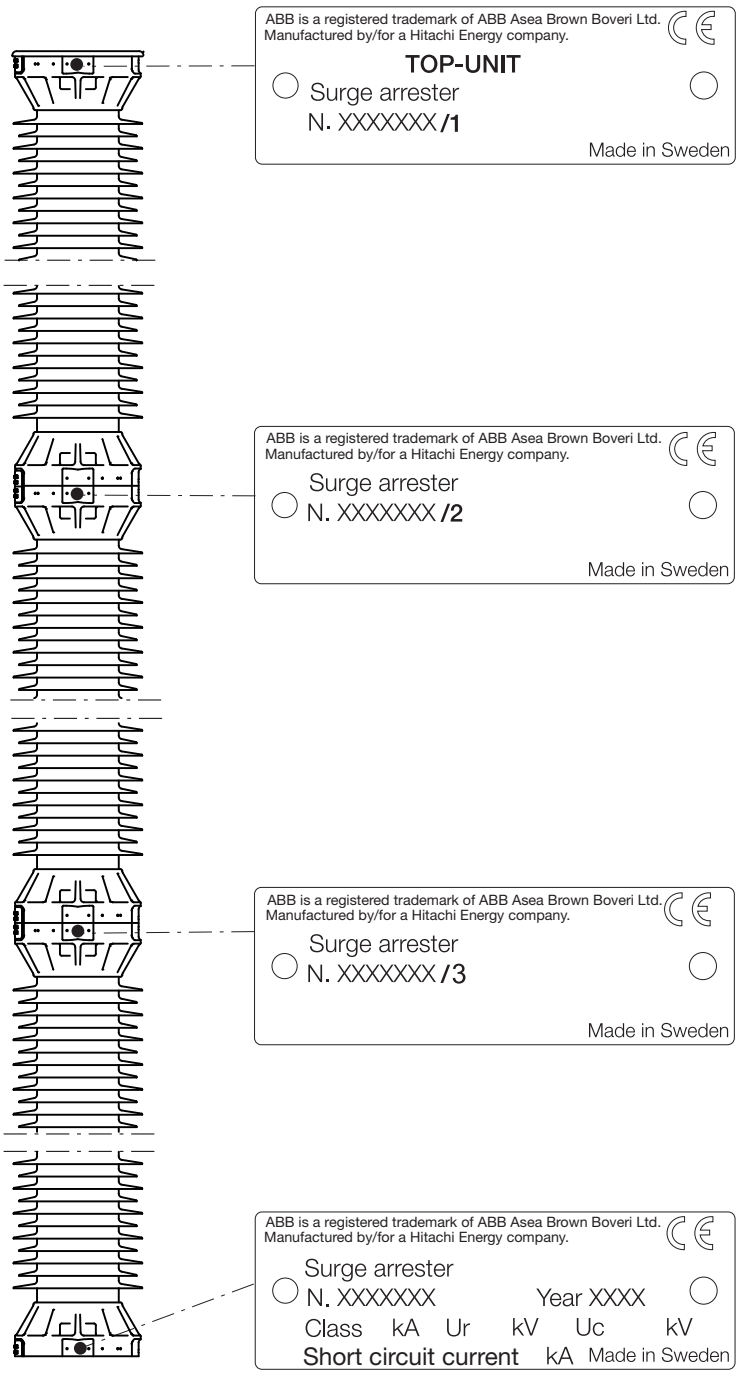
TEXLIM Q-C	TEXLIM P-C	TEXLIM T-C
Qxxx-CV123	Pxxx-CV245	Txxx-CV245
Qxxx-CN123	Pxxx-CN245	Txxx-CN245
Qxxx-CV145	Pxxx-CH300	Txxx-CH300
Qxxx-CN145		
Qxxx-CH170		
Qxxx-CV170		
Qxxx-CN170		
Qxxx-CV245		
Qxxx-CH300		
For assembly of grading rings and top units, please refer to section 6 on page 15.		

5.3 Two-unit arrester



TEXLIM Q-C	TEXLIM P-C	TEXLIM T-C
Qxxx-CV300	Pxxx-CV300	Txxx-CV300
Qxxx-CH362	Pxxx-CH362	Txxx-CH362
Qxxx-CV362	Pxxx-CV362	Txxx-CV362
Qxxx-CH420	Pxxx-CH420	Txxx-CH420
Qxxx-CV420	Pxxx-CV420	Txxx-CV420
	Pxxx-CM550	Txxx-CM550
	Pxxx-CH550	Txxx-CH550
For assembly of grading rings and top units, please refer to section 6 on page 15.		

5.4 Three-unit arrester

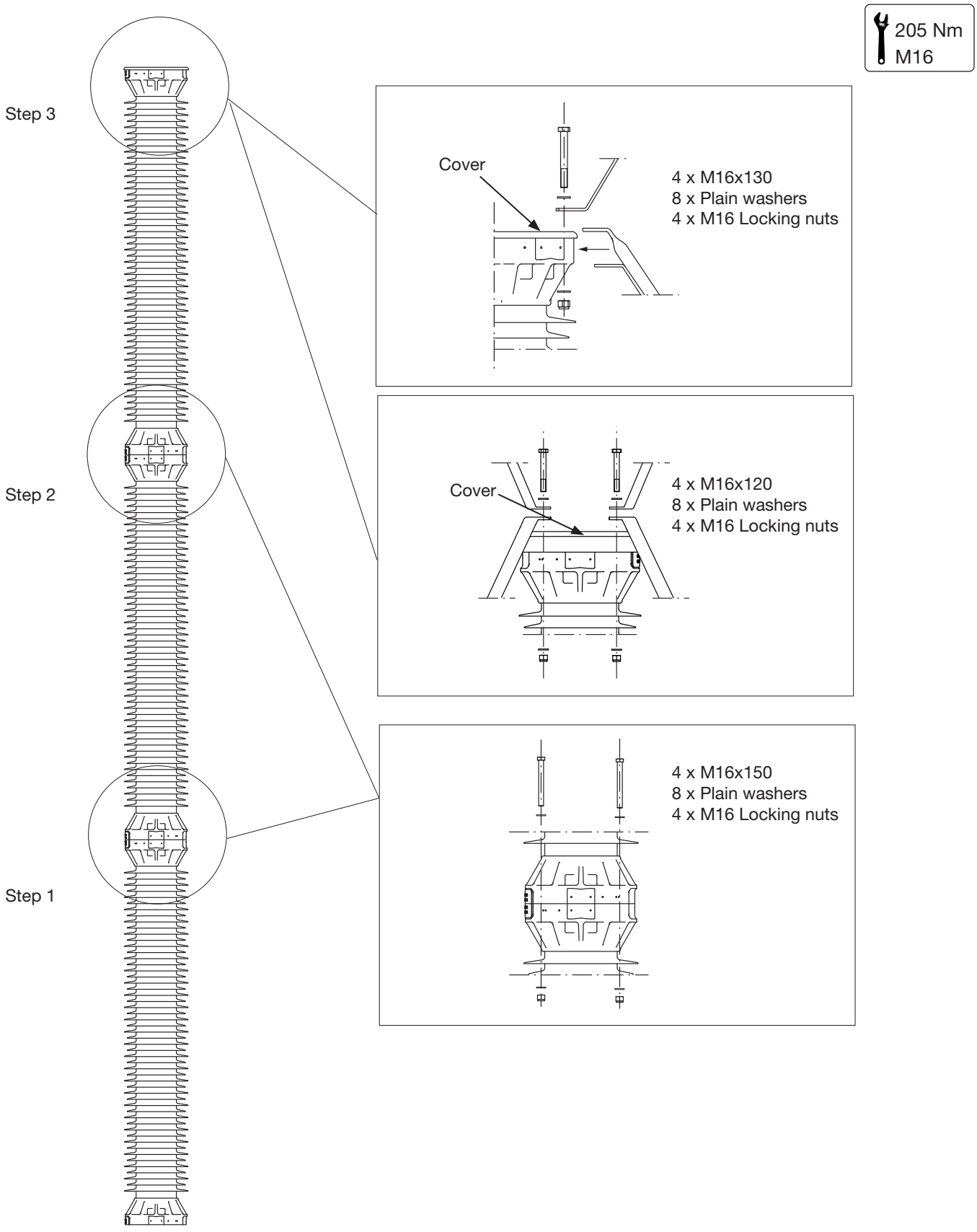


TEXLIM Q-C	TEXLIM P-C	TEXLIM T-C
Not available as three-unit arrester	Pxxx-CV550	Txxx-CV550
		Txxx-CH800
For assembly of grading rings and top units, please refer to section 6 on page 15.		

6. Assembly of units and grading rings

6.1 Assembly of TEXLIM Q-C, P-C and T-C

Recommended tightening torque for M16 bolts is 205 Nm



7. Installation on structure

7.1 Installation on structure without insulating base

This section covers installation of surge arrester on a structure without insulating base. For installation on a structure with insulating base see section 7.2. Ensure that the distance between the drilling holes in the structure are according to the corresponding figure below.

Note the lifting instructions in section 2 before undertaking installation. Anchoring bolts and nuts are **not** provided with the arrester.

Fit the arrester to the structure and the earth terminal to the bottom flange according to figures below.

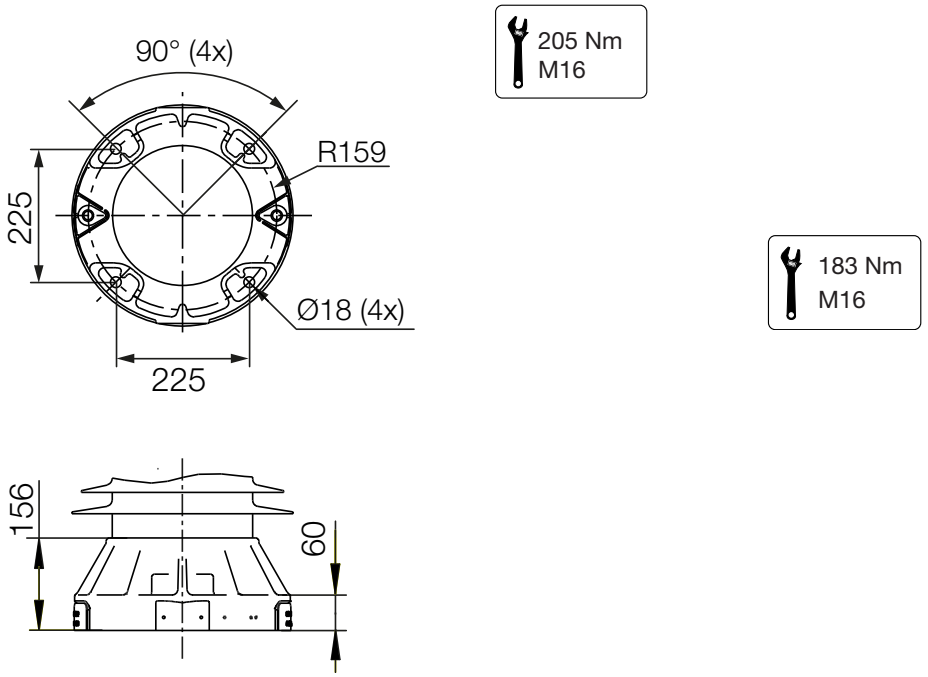


Fig. 7.1.1
Drilling plan

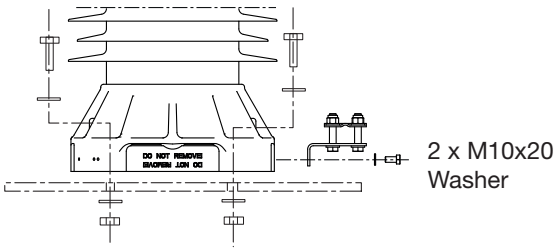


Fig. 7.1.2
Assembly of earth terminal and installation on structure

7.2 Installation on structure with insulating base

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

Ensure that the distance between the drilling holes in the structure are according to the corresponding figure 7.2.1.

Fit the plate, the insulating base and earth terminal to the bottom flange of the bottom unit. Anchoring bolts and nuts are not provided with the arrester.

Recommended tightening torque is 183 Nm.

If a surge arrester monitor EXCOUNT-II is included, an extra long bolt M16x220 and a spacer are delivered together with the surge arrester. For mounting see figure 7.3.3.

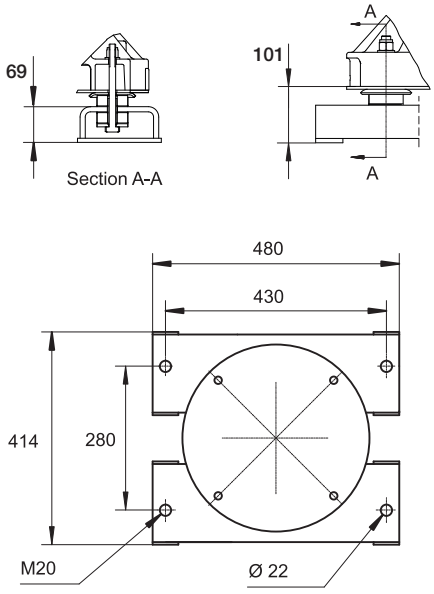


Fig. 7.2.1
Drilling plan

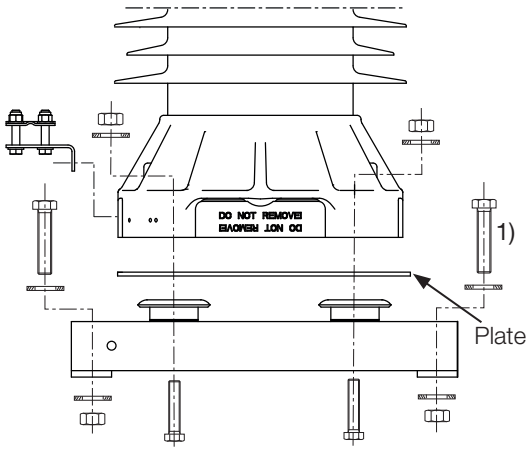


Fig. 7.2.2
With earth terminal and/or Surge counter EXCOUNT-C and EXCOUNT-I

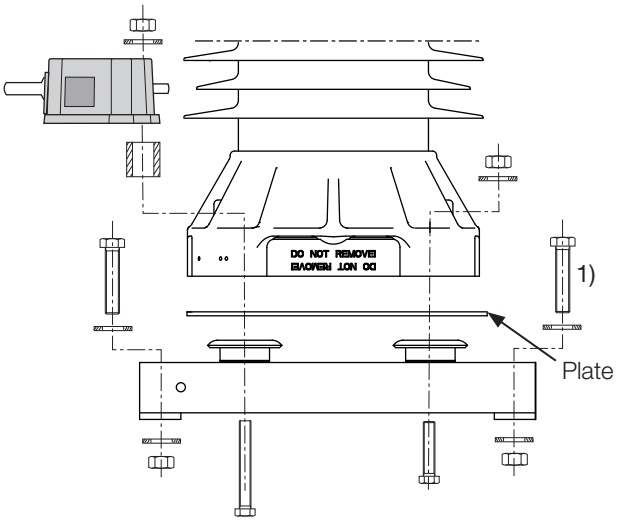


Fig. 7.2.3
With diagnostic indicator EXCOUNT-II or field probe to Online Surge Arresters monitor EXCOUNT-III

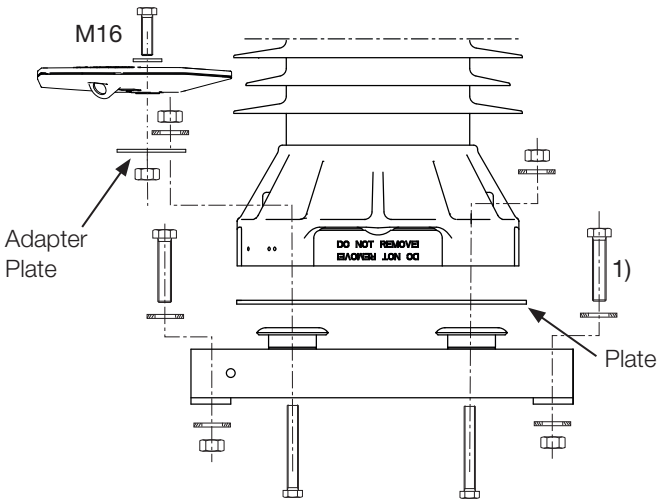


Fig. 7.2.4
With field probe to Online Surge Arresters monitor EXCOUNT-III

1) M20 bolts for installation to structure:
These bolts are not supplied with the arrester.

8. Connection of conductors

8.1 Mechanical load of the surge arrester

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

Service loading	TEXLIM Q-C, P-C, T-C
Specified long-term load (SLL)	21 000 Nm
Specified short-term load (SSL)	40 000 Nm
Definitions as per IEC 60099-4	

8.2 Connection of the conductor

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

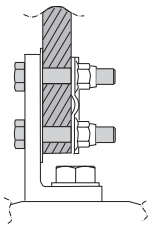


Figure 8.2.1
Correct installation

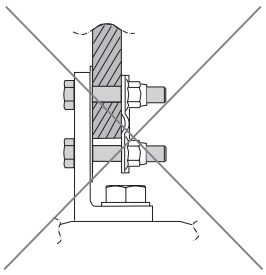


Figure 8.2.2
Warning!
Faulty connection

Compatible conductor material
All earth terminals are compatible with both copper and aluminium conductors, as are all line terminals except 1HSA410000-A, -C and -H which cannot be combined with copper conductors. In these cases use stainless steel washers between the aluminium terminal and the copper conductor

8.3 Connection of the conductor to 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.

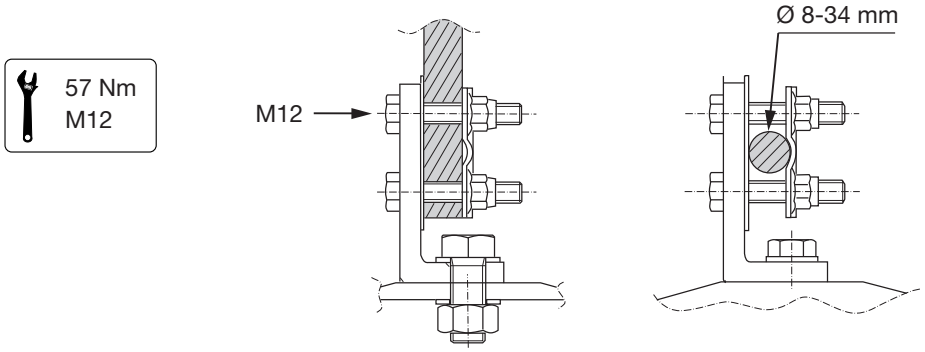


Fig 8.3.1
Connection of single line conductor
can be done from top or side

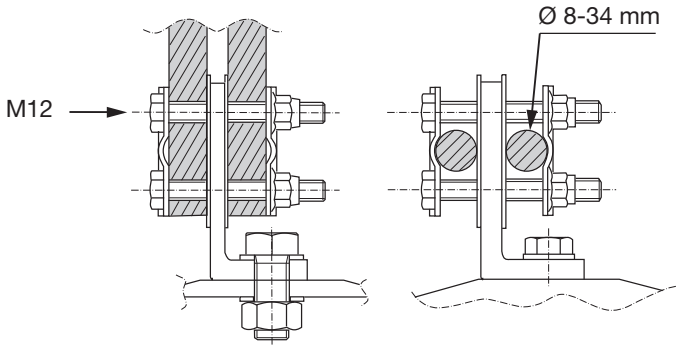


Fig 8.3.2
Connection of double line conductor
can be done from top or side

8.4 Connection of the conductor to the 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 7.1.2 on page 16. For assembly of clamp see figure 8.4.

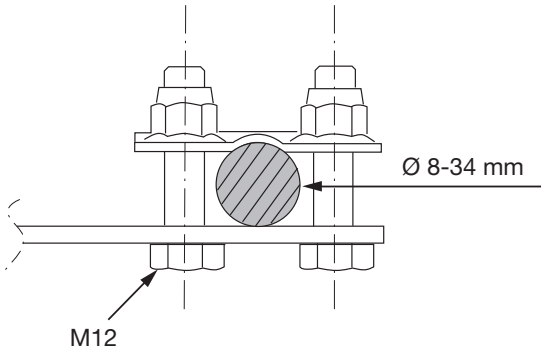


Figure 8.4
Earth terminal

8.5 Installation of surge counter

For installation of surge arrester monitor EXCOUNT-II and EXCOUNT-III, see section 7.2 on pages 16 together with the separate assembly instruction included with the delivery.

For installation of a surge counter EXCOUNT-C, EXCOUNT-I or surge counter from another manufacturer, ensure that:

- The arrester is insulated from the structure by an insulating base with a LIWV of at least 15 kV or equal to that of the conductor between the surge arrester and the surge counter (see below), whichever is the greater.

- The length of the conductor between the arrester and the surge counter is to be minimum 0.5 m when a clip-on CT is to be used for control measurements of leakage current. The maximum length shall not exceed 3 m in the case of the insulating base and conductor having a LIWV of 15 kV. Longer lengths up to 10 m could be used with an insulating base having suitably higher LIWV, see table 8.5. The insulated base and conductor shall then be insulated for 5xL kV (LIWV), where L is the conductor length in meters. Preferably, the total length between arrester earth terminal and grounding point (L+B in figure 8.5.1 and 8.5.2) should be considered in fulfilling the same requirement to avoid a flashover by the LIWV as described above being exceeded. Note that connection leads should always be kept as short as possible as longer leads result in a disadvantage from a protection point of view since inductance is added in series with the arrester.

- **Specifics for EXCOUNT-I**
  The conductor from the earth terminal of the counter to connection with the grounded support stand (point A in figure 8.5.1) on to which the counter is attached (or similar support) shall not exceed 0,5 m. For example, length B as shown in figure 8.5.1. The earth conductor may be extended from the connection point at the support to any ”earth point” if the support itself, due to local requirements, is not considered as sufficiently grounded. However a flashover of the arrester base may occur if the length (L+B in figure 8.5.1) exceeds the value in table 8.5 and the counter may be damaged if the length B exceeds 0.5 m.

- **Specifics for EXCOUNT-C**
  Since the earth conductor is normally a single continuous piece, the total length from the earth terminal of the arrester to the grounding point (length L+B in figure 8.5.2) shall be the defining criteria for maximum length and minimum LIWV as described above. The length (B in figure 8.5.2) from the counter to earth or an intermediate grounding point shall not exceed 3m. The earth conductor may be extended from an intermediate connection point (A in figure 8.5.2) at the support to any ”earth point” if the support itself, due to local requirements, is not considered as sufficiently grounded. In the event an intermediate connection is used between the arrester and counter, eg optional conductor kit 1HSA448427-A, then the same criteria as for EXCOUNT-I shall otherwise apply, except that the length B may be up to 3 m.

- The surge counter is to be installed according to the included assembly instruction.

Table 8.5

Standard Hitachi Energy Insulated base	Maximum length L *)
1HSA430 000-A, -V	3 m

*) On the condition the connecting conductor has at least LIWV = 5xL kV

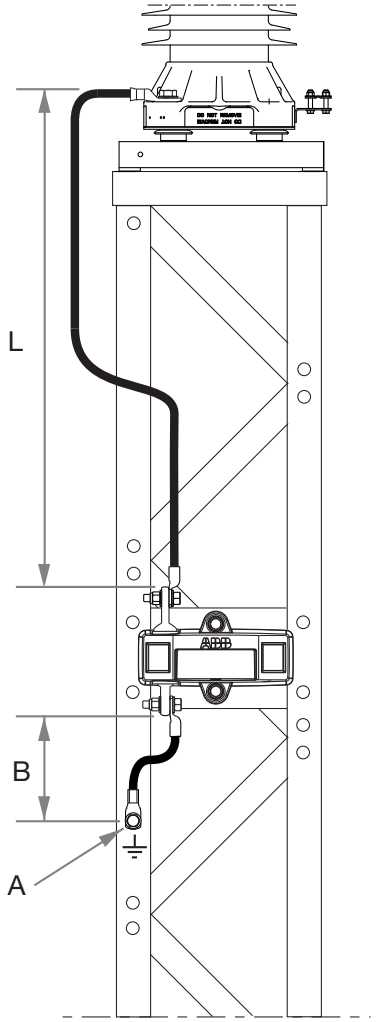


Figure 8.5.1

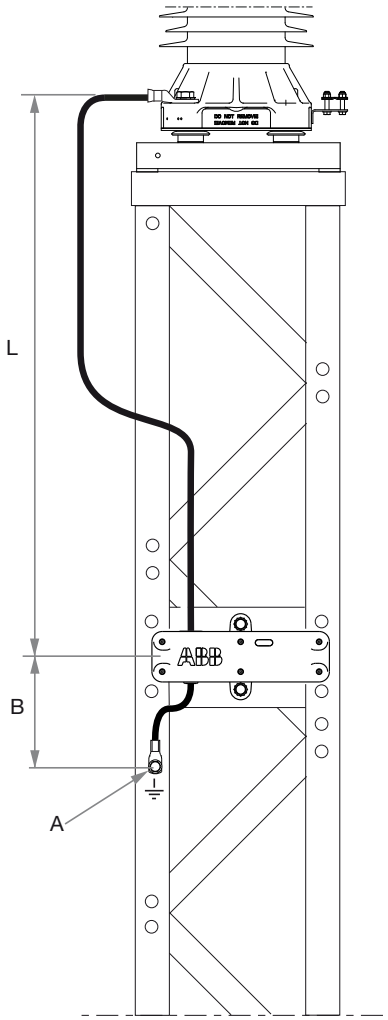


Figure 8.5.2

9. Maintenance

9.1 Maintenance and checking

A properly chosen and installed TEXLIM 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

TEXLIM 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 Hitachi Energy Sweden AB.

General

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

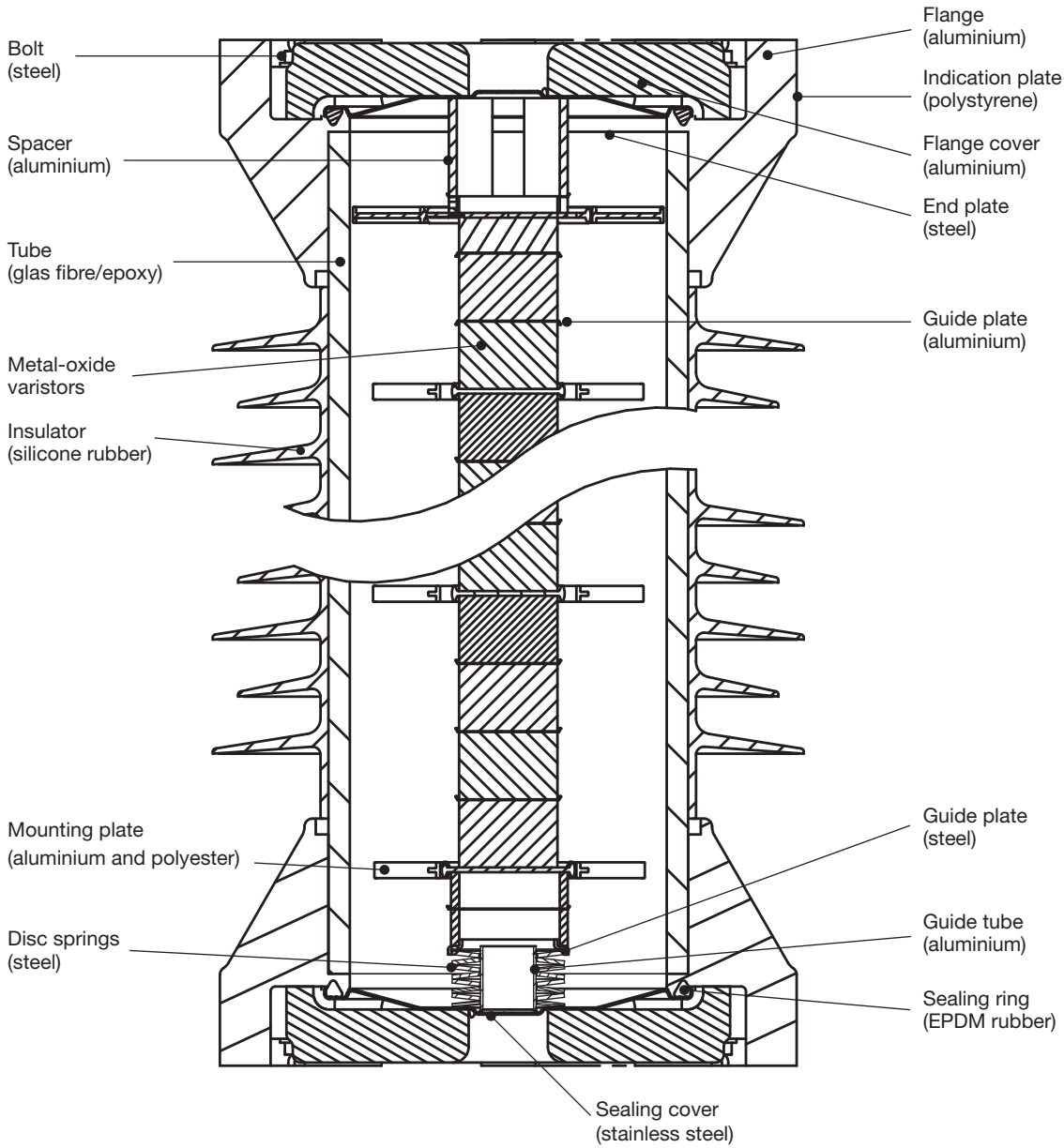
Indications of arrester failure due to overstress

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

10.1 Disposal of the surge arrester

When the surge 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.



NOTES

Additional information
We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. Hitachi Energy Ltd. does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

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