

Assembly instruction

Zinc oxide surge arresters

EXLIM R-C, EXLIM Q-D, EXLIM Q-E, EXLIM P-G and EXLIM T-B

For vertical, upright installation

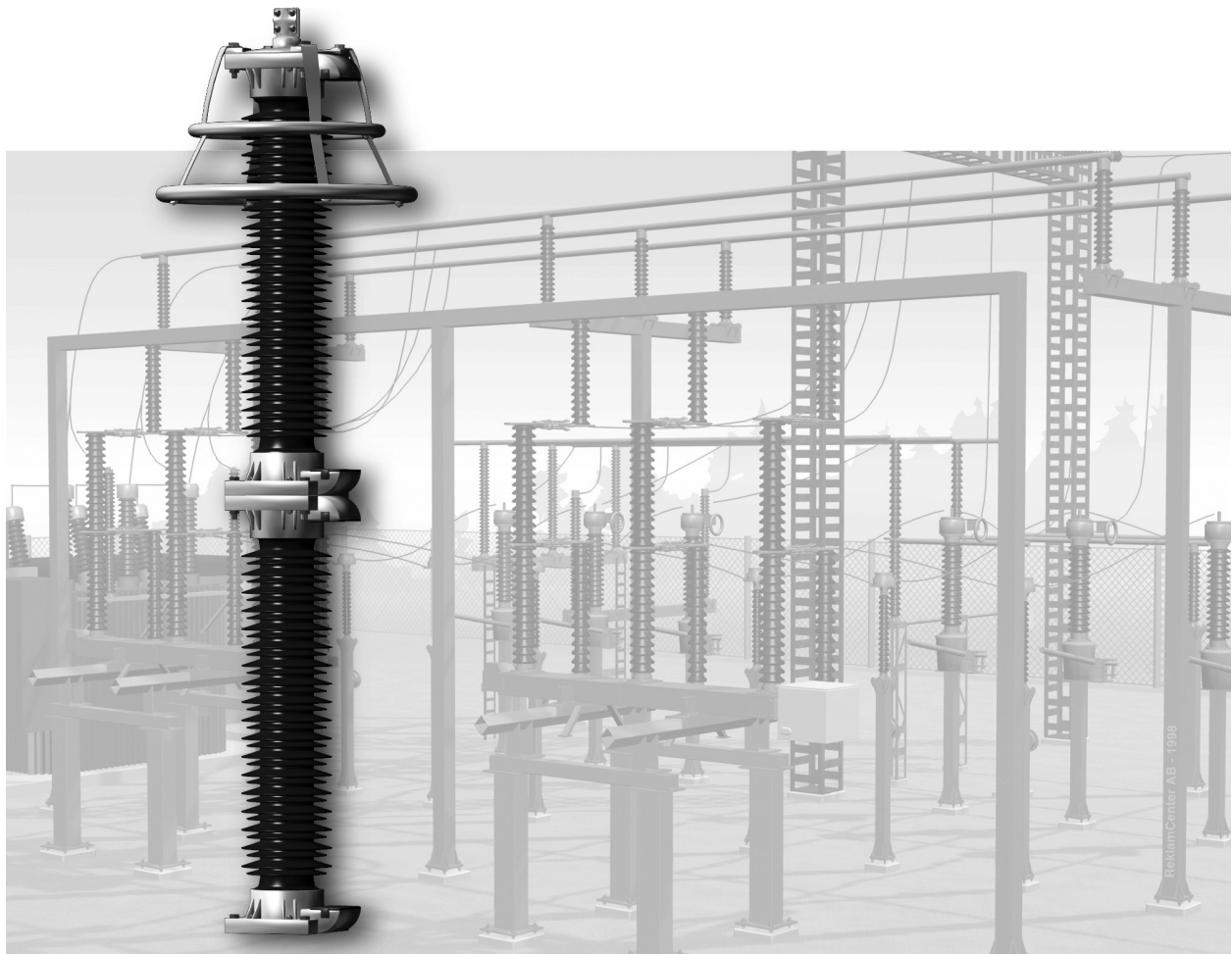


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Important information

The following instruction is valid for EXLIM R-C, Q-D, Q-E, P-G and T-B 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 case.	3
3	Fit the line terminal on the top cover.	4
4	Assemble the grading rings for the top unit and the second unit if any.	5
5	Fit the top unit grading rings and top cover on the top unit.	6, 7
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
7	Fit the insulation base under the bottom unit if any along with the earth terminal or diagnostic indicator EXCOUNT II when provided.	8
8	Lift the arrester and secure it on the structure.	8
9	Connect the earth and line conductors.	9



Multi-unit arresters must be erected with their units in correct order, see section 5 on page 8.

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. Ensure that the arrester units are vertical.

2. Lifting the surge arrester

When lifting, **two lifting slings must be used**. Place the slings beneath the upper metal flange and around the neck of the porcelain insulator. See figure 2.1 to 2.3.

Table 2.1

Typical weight of the smallest to the largest surge arrester.	EXLIM R-C and Q-E	EXLIM Q-D, P-G and T-B
		40 to 210 kg

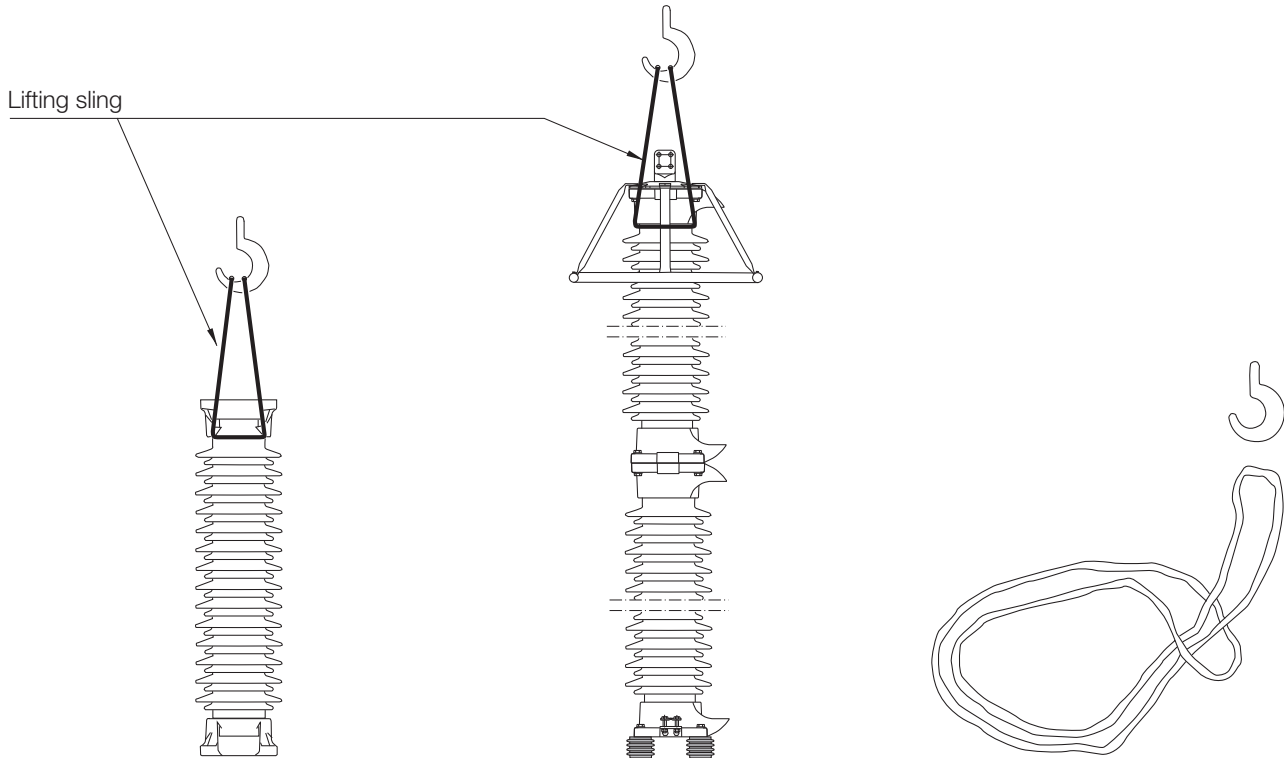


Fig 2.1 Lifting a surge arrester unit

Fig 2.2 Lifting of the complete assembled surge arrester onto the structure

Fig 2.3 Sling arrangement (2x)



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.

3. Line terminal

Fit the line terminal to the top cover according to figure 3.1 - 3.3. 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 18.

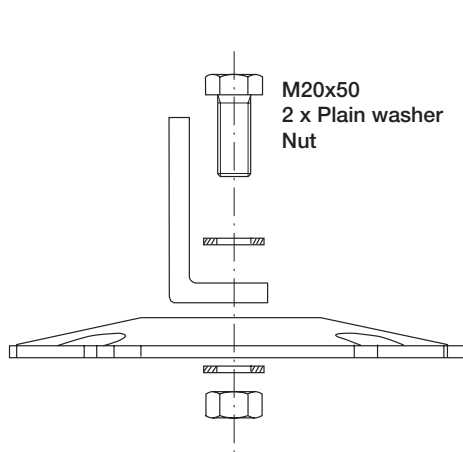


Fig 3.1
Assembly of
1HSA410 000-A, -B, -F, -G, -K

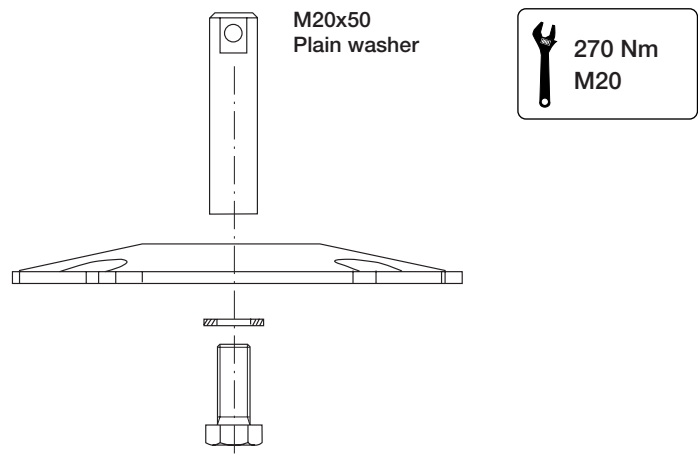


Fig. 3.2
Assembly of
1HSA410 000-C, -D, -E

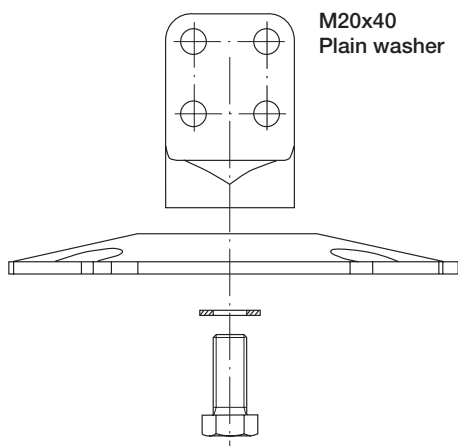


Fig 3.3
Assembly of
1HSA410 000-H, -J

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.

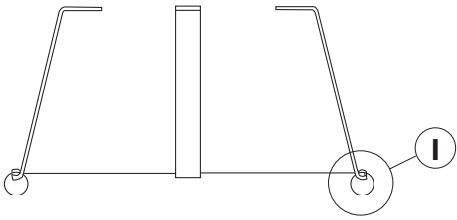
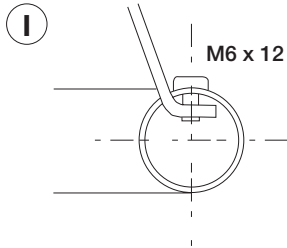
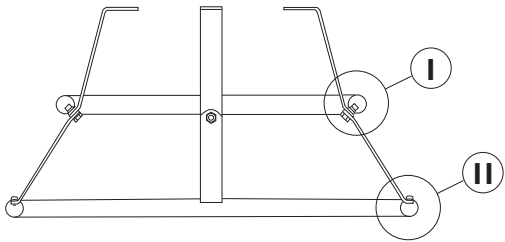
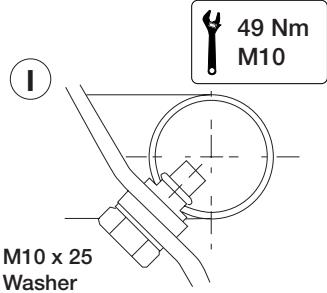
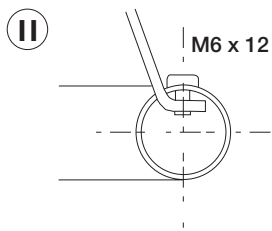
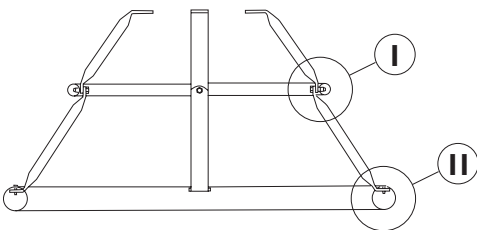
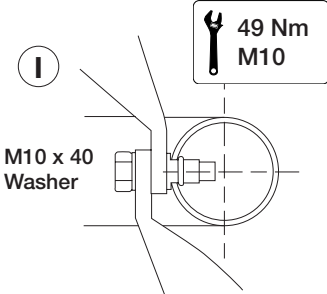
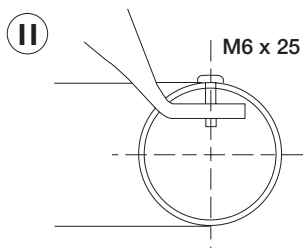
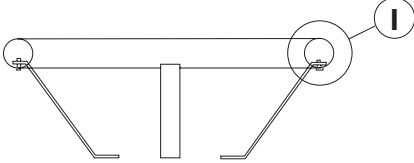
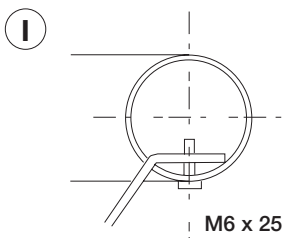
Table 4.1 Grading ring arrangement. The letters in the table refer to the figures on the next page.

Type designation			Type designation		
EXLIM R			EXLIM P-G		
R090-CV123 – R096-CV123	A		P180-GV245	C	
R108-CV145 – R144-CV145	A		P192-GV245 – P210-GV245	B	
R132-CH170 – R144-CH170	A		P216-GV245 – P228-GV245	A	
R132-CV170	B		Pxxx-GM300	B	
R144-CV170 – R168-CV170	A		P216-GH300	C	
EXLIM Q-E			P228-GH300 – P264-GH300	B	
Q090-EV123 – Q096-EV123	A		Pxxx-GV300	C	
Q108-EV145 – Q120-EV145	A		Pxxx-GV300	C	
Q132-EH170	A		Pxxx-GM362	C	
Q132-EV170 – Q144-EV170	A		Pxxx-GH362	C	
Q180-EH245 – Q198-EH245	B		Pxxx-GV362	C	
Q210-EH245 – Q228-EH245	A		Pxxx-GM420	C	
Q180-EV245 – Q228-EV245	C		Pxxx-GH420	C	
EXLIM Q-D			Pxxx-GV420	C	
Q132-DH170	A		Pxxx-GM550	C	D
Q132-DV170 – Q144-DV170	A		P396-GH550	C	D
Q162-DV170 – Q168-DV170	A		P420-GH550 – P444-GH550	C	D
Q180-DH245 – Q219-DH245	B		EXLIM T-B		
Q228-DH245	A		T180-BH245 – T192-BH245	B	
Q180-DV245 – Q198-DV245	C		T198-BH245 – T228-BH245	A	
Q210-DV245 – Q228-DV245	B		T180-BV245 – T198-BV245	B	
Qxxx-DM300	B		T210-BV245 – T228-BV245	A	
Q216-DH300 – Q240-DH300	C		Txxx-BM300	B	
Qxxx-DV300	C		T216-BH300	C	
Qxxx-DM362	C		T228-BH300 – T264-BH300	B	
Qxxx-DH362	C		Txxx-BV300	C	
Q258-DV362 – Q264-DV362	C		Txxx-BM362	C	
Q276-DV362 – Q288-DV362	C		Txxx-BH362	C	
Qxxx-DM420	C		T258-BV362 – T276-BV362	C	
Qxxx-DH420	C		T288-BV362	C	
Q330-DV420 – Q360-DV420	C		Txxx-BM420	C	
Q372-DV420 – Q420-DV420	C		Txxx-BH420	C	
EXLIM P-G			T330-BV420 – T336-BV420	C	
P132-GV170	B		T360-BV420 – T420-BV420	C	
P144-DV170 – P150-GV170	A		T396-BM550 – T420-BM550	C	D
P180-GH245 – P198-GH245	B		T444-BM550	C	D
P210-GH245 – P228-GH245	A		Txxx-BH550	C	D

4. Grading ring

Grading ring assembly according to table 4.1.

(The numbered circles refer to the mounting alternatives in the right column of this table).

A		 <p>M6 x 12</p>	
B		 <p>49 Nm M10</p> <p>M10 x 25 Washer</p>	 <p>M6 x 12</p>
C		 <p>49 Nm M10</p> <p>M10 x 40 Washer</p>	 <p>M6 x 25</p>
D		 <p>M6 x 25</p>	

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. XXXXXXXX/1, next unit = N. XXXXXXXX/2, etc.

N. XXXXXXXX is the serial number (according to section 5.1, 5.2, 5.3 and 5.4 on next pages).

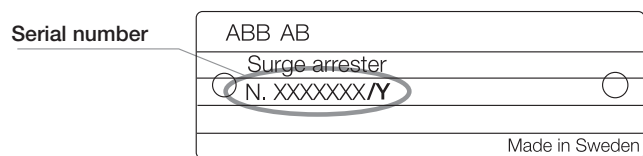
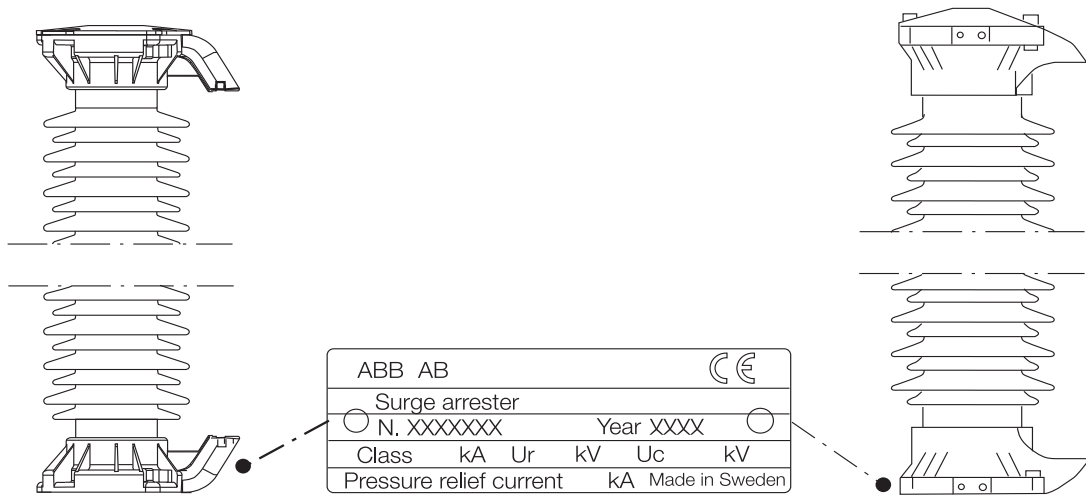


Fig. 5.1. Rating plate

5.1. Single-unit arrester

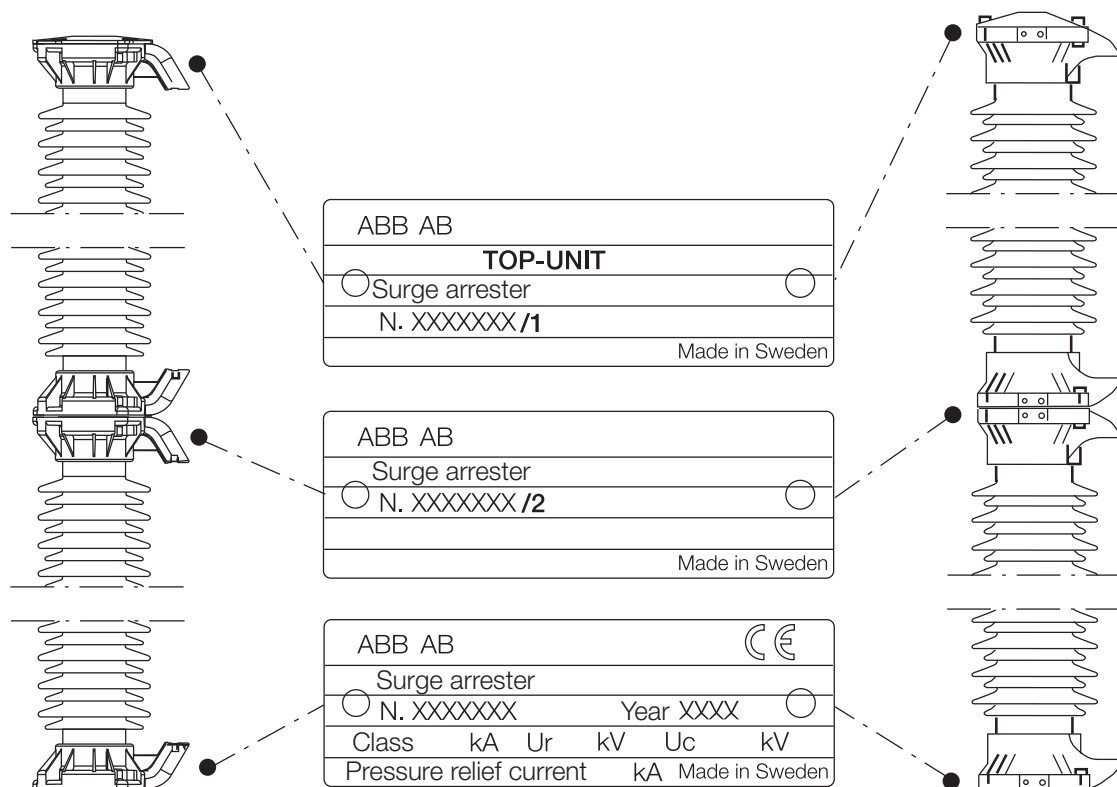


EXLIM R-C and Q-E

EXLIM Q-D, P-G and T-B

EXLIM R-C	EXLIM Q-E	EXLIM Q-D	EXLIM P-G	EXLIM T-B
Rxxx-CV036	Qxxx-EV036	Qxxx-DH170	Pxxx-GV036	Txxx-BN245
Rxxx-CV052	Qxxx-EV052		Pxxx-GH052	
Rxxx-CN052	Qxxx-EN052		Pxxx-GV052	
Rxxx-CM072	Qxxx-EV072		Pxxx-GV072	
Rxxx-CV072	Qxxx-EN072		Pxxx-GV100	
Rxxx-CN072	Qxxx-EH100		Pxxx-GH123	
Rxxx-CH100	Qxxx-EV100		Pxxx-GV123	
Rxxx-CN100	Qxxx-EN100		Pxxx-GN123	
Rxxx-CM123	Qxxx-EM123		Pxxx-GM145	
Rxxx-CH123	Qxxx-EH123		Pxxx-GH145	
Rxxx-CN123	Qxxx-EN123		Pxxx-GN145	
Rxxx-CH145	Qxxx-EH145		Pxxx-GH170	
Rxxx-CN145	Qxxx-EN145		Pxxx-GN170	
Rxxx-CM170	Qxxx-EM170		Pxxx-GN245	
Rxxx-CN170	Qxxx-EN170			
	Qxxx-EN245			
For assembly of grading rings and top units, please refer to figure 6.1 on page 13.		For assembly of grading rings and top units, please refer to figure 6.2 on page 14.		

5.2 Two-unit arresters

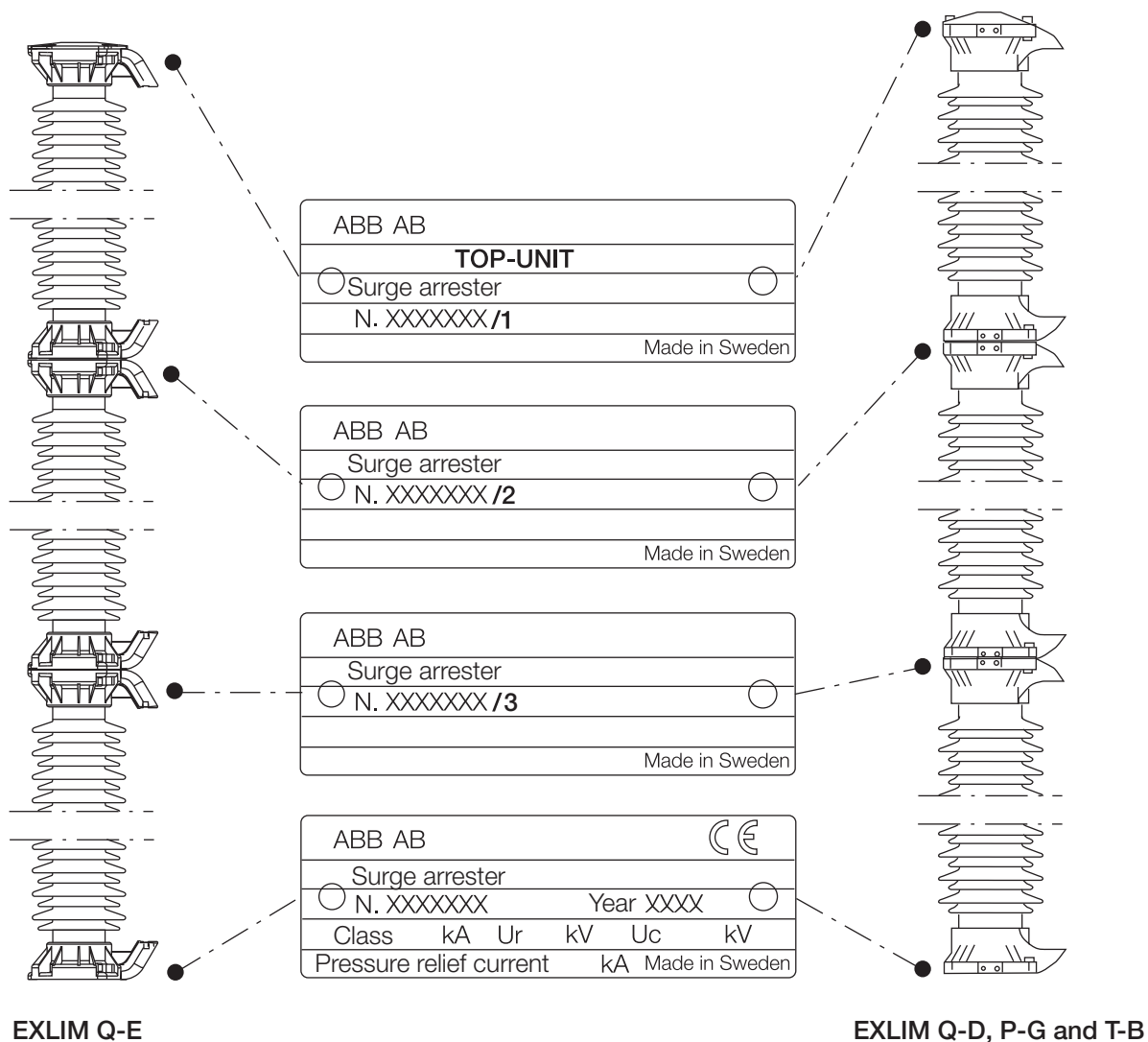


EXLIM R-C and Q-E

EXLIM Q-D, P-G and T-B

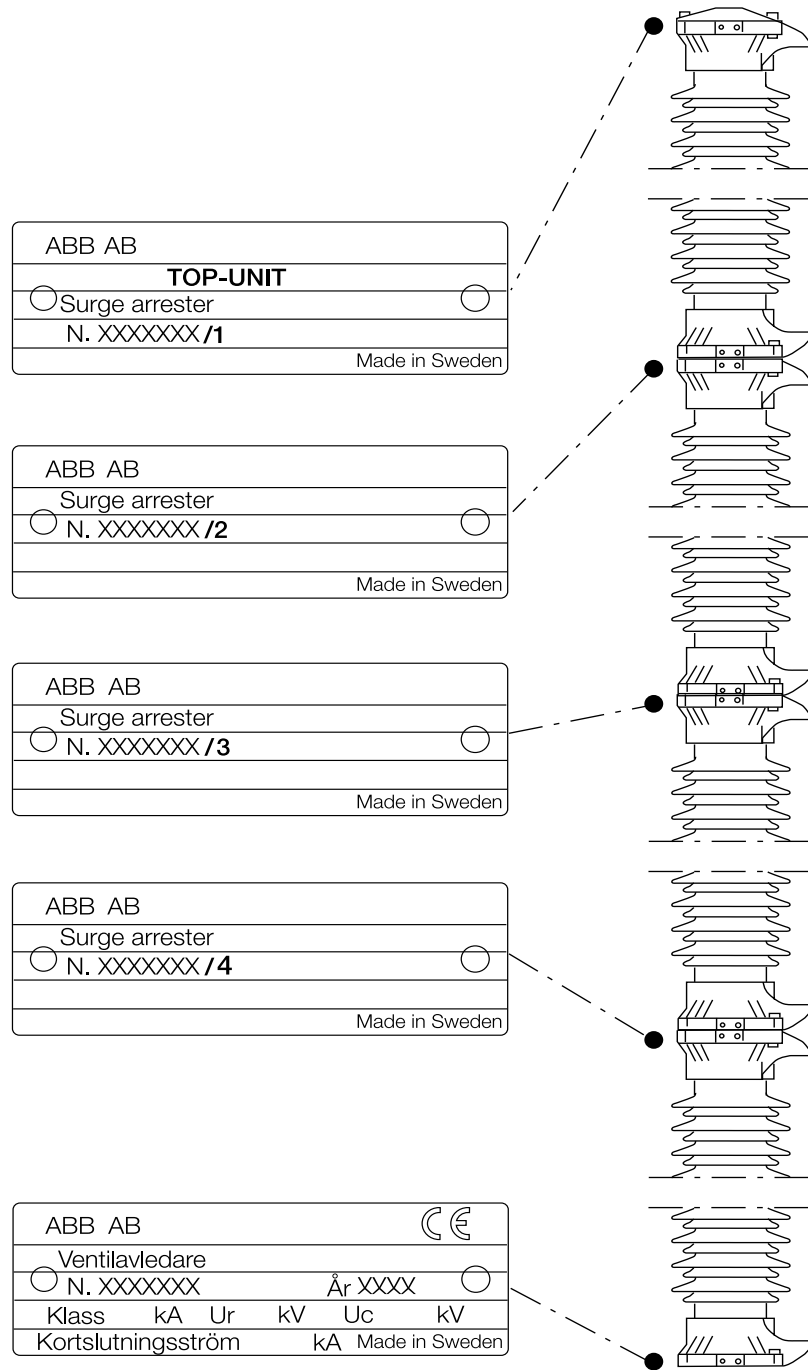
EXLIM R-C	EXLIM Q-E	EXLIM Q-D	EXLIM P-G	EXLIM T-B
Rxxx-CV123	Qxxx-EV123	Qxxx-DV170	Pxxx-GV145	Txxx-BH245
Rxxx-CV145	Qxxx-EV145	Qxxx-DH245	Pxxx-GV170	Txxx-BV245
Rxxx-CH170	Qxxx-EH170	Qxxx-DV245	Pxxx-GH245	Txxx-BM300
Rxxx-CV170	Qxxx-EV170	Qxxx-DM300	Pxxx-GV245	Txxx-BH300
	Qxxx-EH245	Qxxx-DH300	Pxxx-GM300	Txxx-BM362
		Qxxx-DM362	Pxxx-GH300	Txxx-BM420
		Qxxx-DM420	Pxxx-GM362	
			Pxxx-GM420	
For assembly of grading rings and top units, please refer to figure 6.1 on page 13.		For assembly of grading rings and top units, please refer to figure 6.2 on page 14.		

5.3 Three-unit arresters



EXLIM R-C	EXLIM Q-E	EXLIM Q-D	EXLIM P-G	EXLIM T-B
Not available as three-unit arrester	Qxxx-EV245	Qxxx-DV300	Pxxx-GV300	Txxx-BV300
		Qxxx-DH362	Pxxx-GH362	Txxx-BH362
		Qxxx-DV362	Pxxx-GV362	Txxx-BV362
		Qxxx-DH420	Pxxx-GH420	Txxx-BH420
		Qxxx-DV420	Pxxx-GV420	Txxx-BV420
			Pxxx-GM550	Txxx-BM550
For assembly of grading rings and top units, please refer to figure 6.1 on page 13.		For assembly of grading rings and top units, please refer to figure 6.2 on page 14.		

5.4 Four-unit arresters



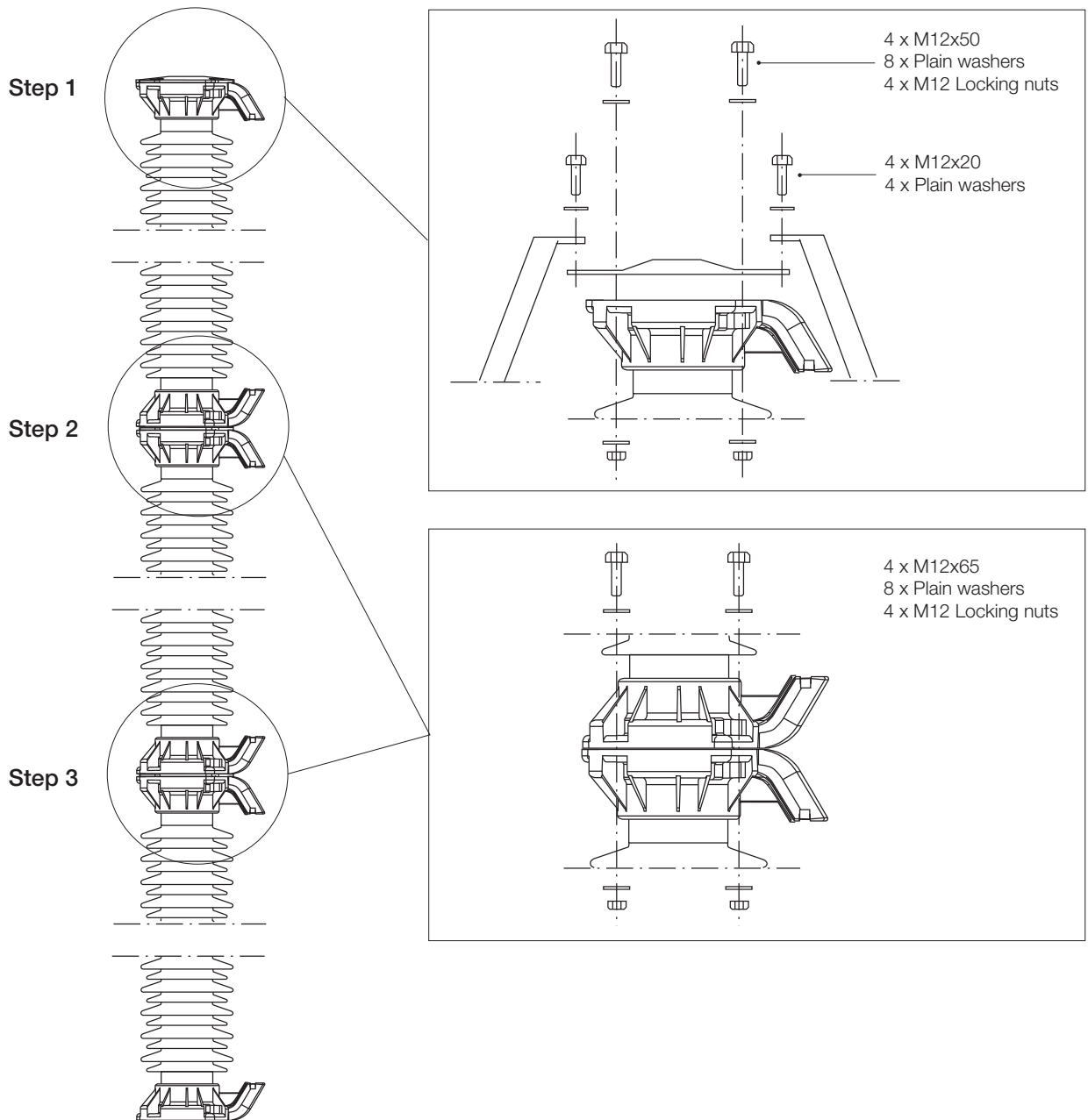
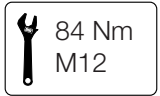
EXLIM P-G and T-B

EXLIM R-C	EXLIM Q-E	EXLIM Q-D	EXLIM P-G	EXLIM T-B
Not available as four-unit arrester	Not available as four-unit arrester	Not available as four-unit arrester	Pxxx-GH550	Txxx-BH550
			For assembly of grading rings and top units, please refer to figure 6.2 on page 14.	

6. Assembly of units and grading rings

EXLIM R-C and Q-E

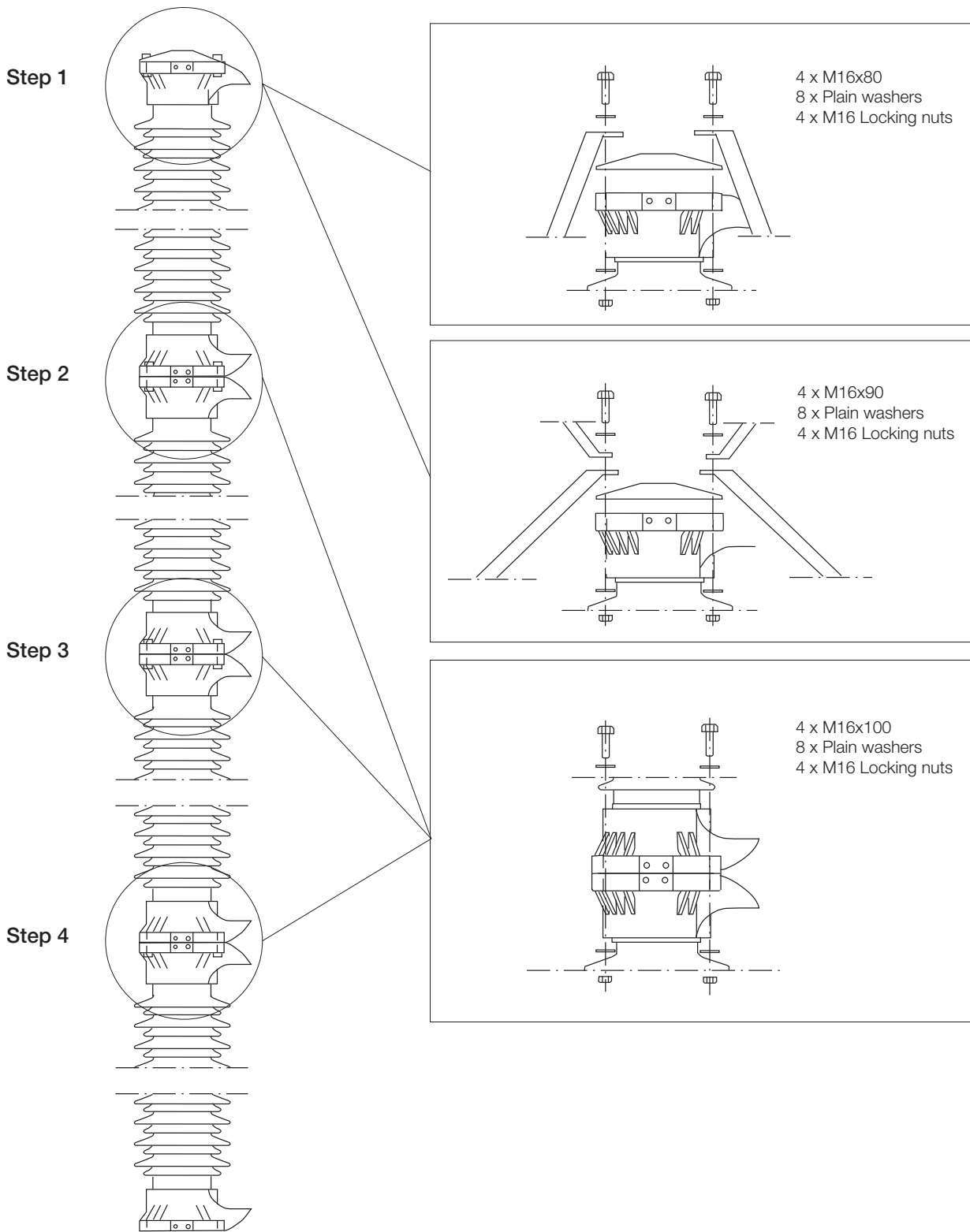
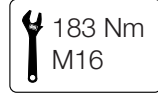
Recommended tightening torque for M12 bolts is 84 Nm



6. Assembly of units and grading rings

EXLIM Q-D, P-G and T-B

Recommended tightening torque for M16 bolts is 183 Nm

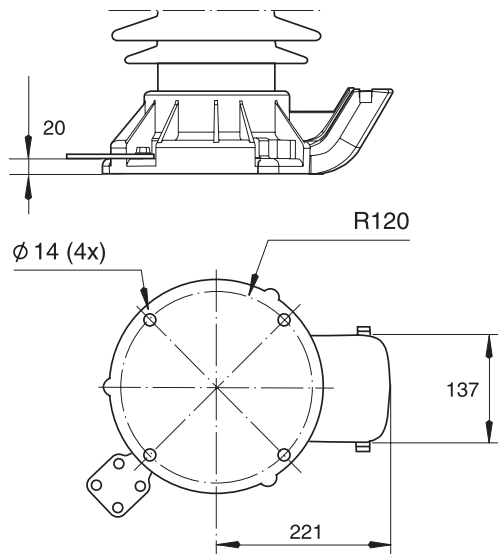


7. Installation on structure

Fit the insulating base and earth terminal to the bottom flange of the bottom unit according to the assembly instructions according to section 7.1 and 7.2 on next pages. Anchoring bolts and nuts are **not** provided with the arrester.

EXLIM R-C and Q-E

84 Nm
M12



EXLIM Q-D, P-G and T-B

183 Nm
M16

49 Nm
M10

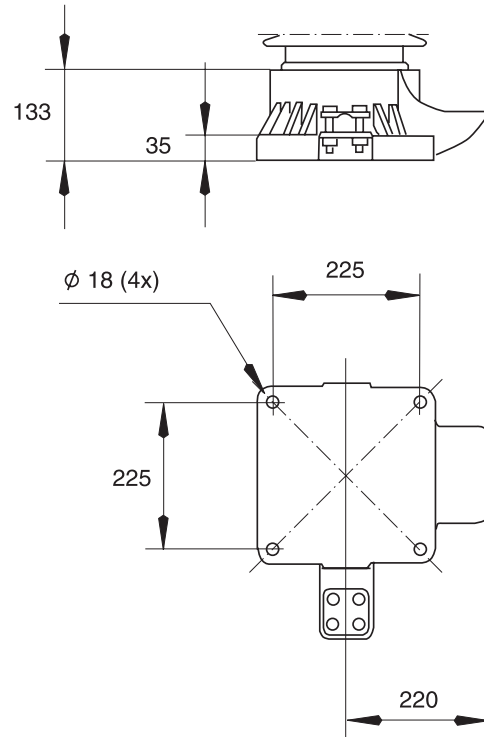


Fig. 7.1. Drilling plans

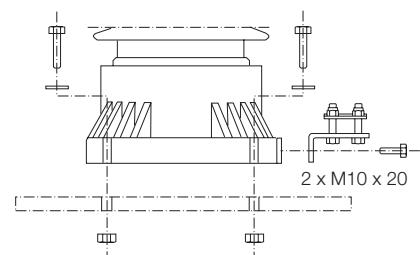
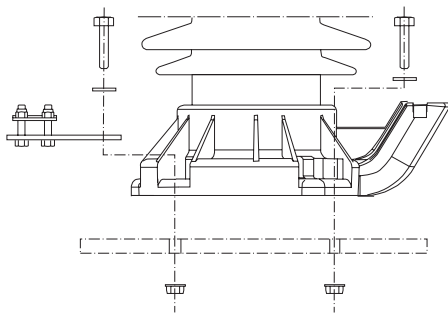


Fig. 7.2. Assembly of earth terminal and installation on structure

7.1. Installation of insulating base for EXLIM R-C and Q-E

This instruction covers insulating base 1HSA430 000-A and -B. 1HSA430 000-B is identical with -A apart from the bolts used being of UNC-type. If you have purchased -B, please use the bolts size indicated in brackets.

In the case where another insulating base is to be fitted, the installation instructions included with the delivery shall be followed.

The bolt M12x45 (1/2" x 45) is only used to fix the earth terminal.

If diagnostic indicator EXCOUNT-II is to be mounted on the flange, the longer bolt M12x50 (1/2" x 51) shall be used instead. In this case the M12x45 (1/2"x45) bolt is not required and can be discarded.

Recommended tightening torque is 84 Nm.

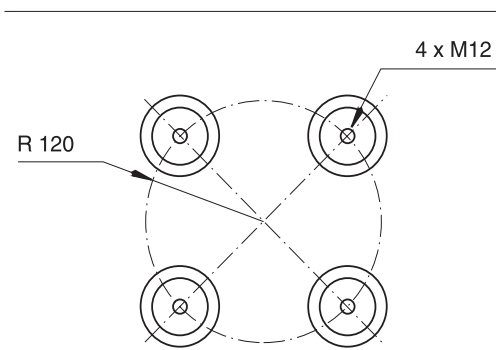


Fig. 7.1.1. Drilling plan

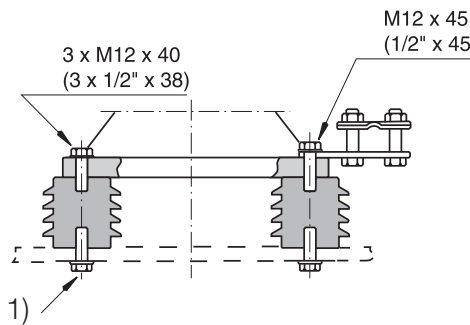
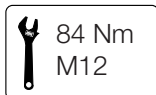


Fig. 7.1.2. With earth terminal and/or surge counter EXCOUNT-A

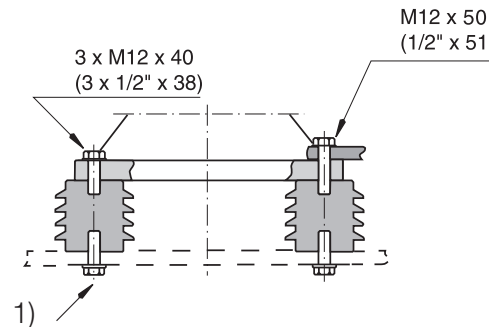


Fig. 7.1.3. With diagnostic indicator EXCOUNT-II

1) Requirements on M12 (1/2") bolts for installation to structure:

These bolts are not supplied with the arrester.

Recommended tightening torque: Acc. to strength class. max. 120 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.

7.2. Installation of insulating base for EXLIM Q-D, P-G and T-B

This instruction covers insulating base 1HSA430 000-C and -D. 1HSA430 000-D is identical with -C apart from the bolts used being of UNC-type. If you have purchased -D, please use the bolts size indicated in brackets.

In the case where another insulating base is to be fitted, the installation instructions included with the delivery shall be followed.

The bolt M16x65 (5/8" x 64) is only used for connecting in the diagnostic indicator EXCOUNT-II. If EXCOUNT-II is not to be mounted, the shorter bolt M16x55 (5/8" x 57) shall be used instead. In this case the M16x65 (5/8" x 64) bolt is not required and can be discarded. Recommended tightening torque is 183 Nm.

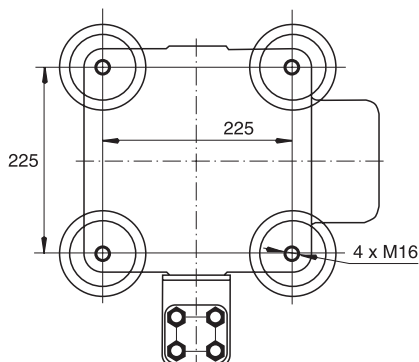


Fig. 7.2.1. Drilling plan

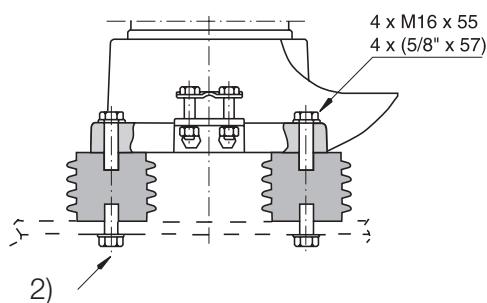


Fig. 7.2.2. With earth terminal and/or surge counter EXCOUNT-A

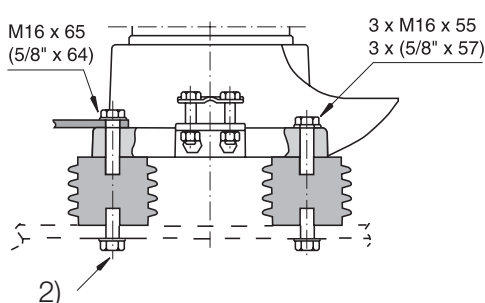


Fig. 7.2.3. With diagnostic indicator EXCOUNT-II



2) 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.

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 U_c (as per IEC) or MCOV (as per ANSI), as is shown on the rating plate.

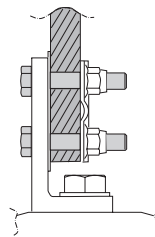
Surge arresters are dimensioned to withstand bending moments according to table 8.1. To obtain the best protection performance, **the arresters must be connected with as short connectors as possible to both line and earth.** However the mechanical aspects must be taken into consideration. Connectable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

Table 8.1.

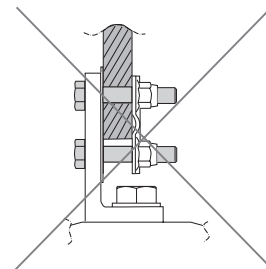
Service loading	EXLIM R-C and Q-E	EXLIM Q-D, P-G and T-B
Permissible static service loading (PSSL)	3000 Nm	7200 Nm
Max permissible dynamic service loading (MPDSL)	7500 Nm	18000 Nm
Definitions as per forthcoming amendment (no 2) to IEC 60099-4		



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, -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.

8.1 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.

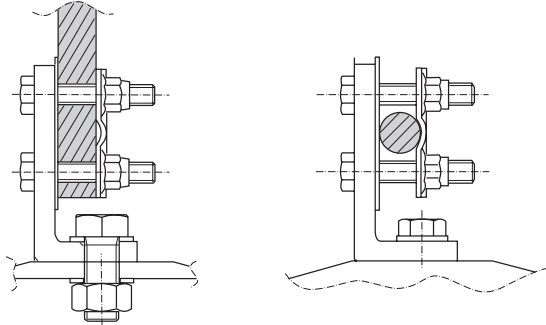


Fig 8.1 Connection of single line conductor can be done from top or side.

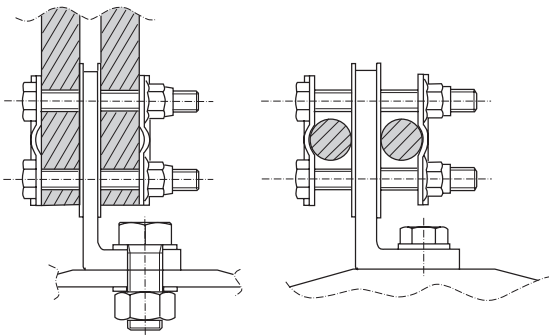


Fig 8.2 Connection of double line conductor can be done from top or side.

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.

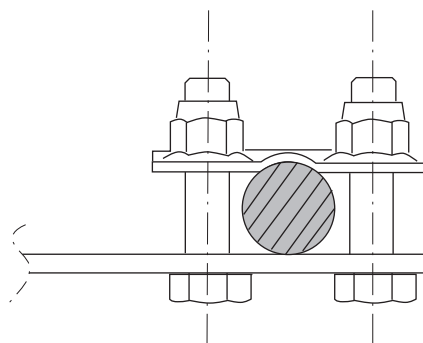


Fig 8.3.

8.3 Installation of surge counter or EXCOUNT II

For installation of diagnostic monitor EXCOUNT II, see section 7.1 or 7.2 on pages 16/17 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 $5 \times L$ 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.

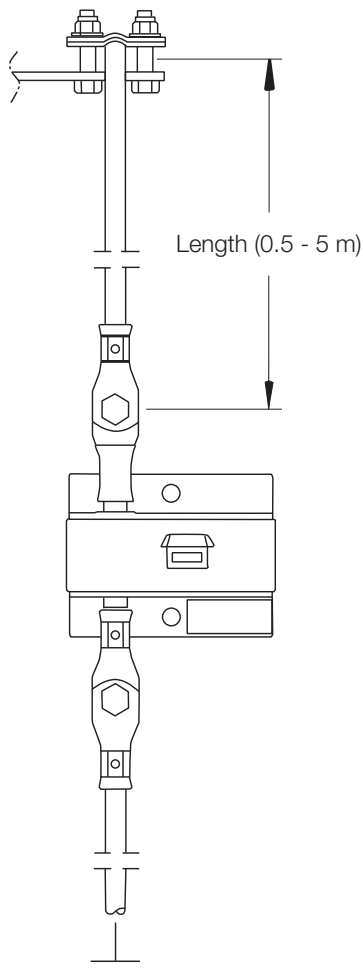


Fig 8.4

9. Maintenance and checking

A properly chosen and installed EXLIM 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

Cleaning is normally not necessary. However, under conditions of heavy marine or industrial pollution, where thick layers of pollutants are built up on the insulators, periodical cleaning of the surge arrester may be advantageous. Live washing is permitted. However, 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 higher risk for external flash-over during washing.
- Arresters with series-connected units, must have all units spray-washed simultaneously, in order to avoid overheating of any unit.

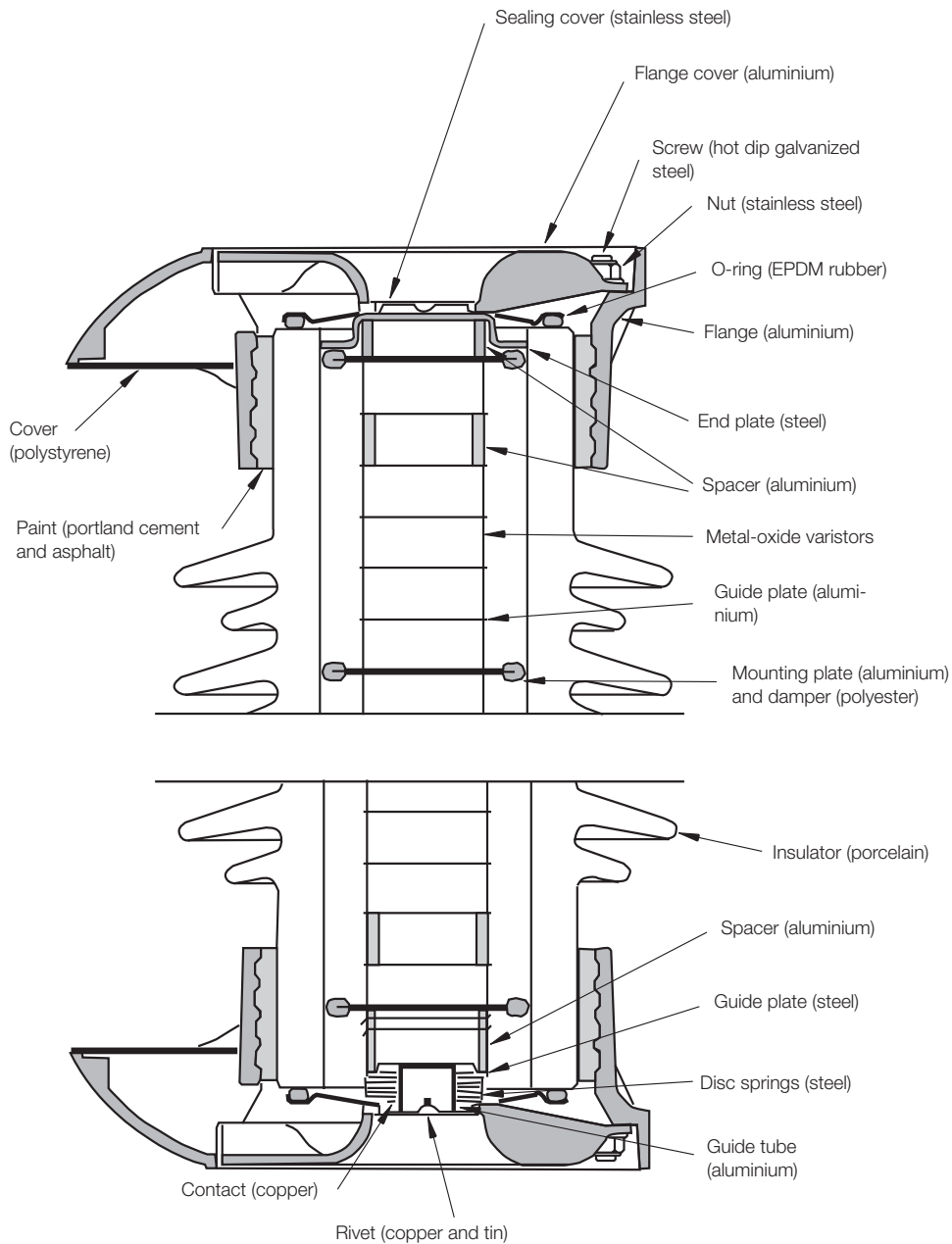
General

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.

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





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

ABB AB

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