High Voltage Surge Arresters

Buyer´s Guide

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Safe, secure and economic supply of electricity — with ABB surge arresters

ABB surge arresters are the primary protection against atmospheric and switching overvoltages. They are generally connected in parallel with the equipment to be protected to divert the surge current. The active elements (ZnO-blocks) of ABB surge arresters are manufactured using a highly non-linear ceramic resistor material composed largely of zinc oxide mixed with other metal oxides and sintered together.

Strong focus on quality at all stages, from raw material until finished product, ensure that ABB surge arresters survive the designed stresses with ease and with good margins. Different dimensions permit a large variety of standard arresters as well as client-specific solutions as regards protection levels and energy capability.

This Buyer's Guide deals with high voltage surge arresters for standard AC applications. For other applications, such as series capacitors protetion, shunt capacitor protection or DC applications, contact your ABB sales representative.

Product range

Product family	Arrester classification [1]	Type	Max. system voltage [2] U_m kV_{rms}	Rated voltage [2] U_r kV_{rms}	Energy requirement/ Lightning intensity	Mechanical strength [3] Nm
PEXLIM — Silicone polymer-housed arresters Superior where low weight, reduced clearances, flexible mounting, non-fragility and additional personnel safety is required Major component for PEXLINK™ concept for transmission line protection.	10 kA, IEC class 2	PEXLIM R	24 - 170	18 - 144	Moderate	1 600
	10 kA, IEC class 3	PEXLIM Q	52 - 420	42 - 360	High	4 000
	20 kA, IEC class 4	PEXLIM P	52 - 420	42 - 360	Very high	4 000
HS PEXLIM - High strength silicone polymer-housed arresters. Specially suited to high seismic applications.	20 kA, IEC class 4	HS PEXLIM P	245 - 550	180 - 444	Very high	28 000
	20 kA, IEC class 5	HS PEXLIM T	245 - 800	180 - 612	Very high	28 000
EXLIM — Porcelain-housed arrester	10 kA, IEC class 2	EXLIM R	52 - 170	42 - 168	Moderate	7 500
	10 kA, IEC class 3	EXLIM Q-E	52 - 245	42 - 228	High	7 500
	10 kA, IEC class 3	EXLIM Q-D	170 - 420	132 - 420	High	18 000
	20 kA, IEC class 4	EXLIM P	52 - 550	42 - 444	Very high	18 000
	20 kA, IEC class 5	EXLIM T	245 - 800	180 - 624	Very high	18 000

1) Arrester classification according to IEC 60099-4 (nominal discharge current, line discharge class).
2) Arresters with lower or higher voltages may be available on request for special applications.
3) Maximum permissible dynamic service load (MPDSL).

Definitions

Note: The standards referred to hereunder are the latest editions of IEC 60099-4 and ANSI/ IEEE C62.11

Maximum system voltage (U_m)
The maximum voltage between phases during normal service.

Nominal discharge current (IEC)
The peak value of the lightning current impulse which is used to classify the arrester.

Lightning classifying current (ANSI/IEEE)
The designated lightning current used to perform the classification tests.

Rated voltage (U_r)
An arrester fulfilling the IEC standard must withstand its rated voltage (U_r) for 10 s after being preheated to 60 °C and subjected to energy injection as defined in the standard. Thus, U_r shall equal at least the 10-second TOV capability of an arrester. Additionally, rated voltage is used as a reference parameter.

> Note! TOV capability of EXLIM and PEXLIM arresters exceeds the IEC requirements.

Duty-cycle voltage rating (ANSI)
The designated maximum permissible voltage between its terminals at which an arrester is designed to perform its duty cycle.

Continuous operating voltage
It is the maximum permissible r.m.s. power frequency voltage that may be applied continuously between the arrester terminals. This voltage is defined in different ways (verified by different test procedures) in IEC and ANSI.

IEC (U_c)
IEC gives the manufacturer the freedom to decide U_c. The value is verified in the operating duty test. Any uneven voltage distribution in the arrester shall be accounted for.

ANSI (MCOV)
ANSI lists the maximum continuous operating voltage (MCOV) for all arrester ratings used in a table. The value is used in all tests specified by ANSI. MCOV is less stringent as regards uneven voltage distribution in an arrester.

Temporary overvoltages (TOV)
Temporary overvoltages, as differentiated from surge overvoltages, are oscillatory power frequency overvoltages of relatively long duration (from a few cycles to hours).

The most common form of TOV occurs on the healthy phases of a system during an earth-fault involving one or more phases. Other sources of TOV are load-rejection, energisation of unloaded lines etc.

The TOV capability of the arresters is indicated with prior energy stress in the relevant catalogues.

Residual voltage/ Discharge voltage
This is the peak value of the voltage that appears between the terminals of an arrester during the passage of discharge current through it. Residual voltage depends on both the magnitude and the waveform of the discharge current. The voltage/current characteristics of the arresters are given in the relevant catalogues.

Energy capability
Standards do not explicitly define energy capability of an arrester. The only measure specified is the Line Discharge Class in IEC. Often, this is not enough information to compare different manufacturers and, therefore, ABB presents energy capability also in kJ/kV (U_r). This is done in 3 different ways:

Two impulses as per IEC clause 8.5.5.
This is the energy that the arrester is subjected to in the switching surge operating duty test (clause 8.5.5.) while remaining thermally stable thereafter against the specified TOV and U_c.

Routine test energy
This is the total energy that each individual block is subjected to in our production tests.

Single-impulse energy
This is the maximum permissible energy, which an arrester may be subjected to in one single impulse of 4 ms duration or longer and remain thermally stable against specified TOV and U_C.

> Note! Corresponding values based on U_C are obtained by multiplying the catalogue values by the ratio U_r/U_C.

Short-circuit capability
This is the ability of an arrester, in the event of an overload due to any reason, to conduct the resulting system short-circuit current without violent shattering which may damage nearby equipment or injure personnel. After such an operation, the arrester must be replaced.

The system short-circuit current may be high or low depending on the system impedance and earthing conditions. Hence short-circuit capability is verified at different current levels.

External insulation withstand strength
It is the maximum value of the applied voltage (of a specified wave shape) which does not cause the flashover of an arrester. Unlike other equipment, arresters are designed to discharge internally and the voltage across the housing can never exceed the protective levels. Thus, the external insulation is self-protected if its withstand strength is higher than the protective levels corrected for installation altitude. The standards specify additional safety factors, exclusive of correction for altitude, as under:

- IEC: 15% for short impulses and 10% for long impulses (at sea level)
- ANSI: 20% for short impulses and 15% for long impulses (at sea level)

> Note! The altitude correction factors are 13% per 1 000 m (IEC) and 10% per 1000 m (ANSI).

All EXLIM and PEXLIM arresters fully comply with IEC and ANSI standards for installations up to 1 000 m, often with a large margin.

Pollution performance
IEC 60815 defines four levels of pollution (from light to very heavy) and stipulates the required creepage for porcelain housings as indicated in the table here.

Pollution level	Specific creepage in mm/kV (U_m)
Light (L)	16
Medium (M)	20
Heavy (H)	25
Very Heavy (V)	31

In the absence of similar standards for polymeric housings, the table also applies at present to such housings.

The creepage distance is the length measured along the housing's external profile and serves as a measure of the arrester performance in polluted environments with respect to the risk of external flashover.

Since the mean diameter for all the standard arresters is less than 300 mm, the specific creepage distance is the same as the nominal creepage distance.

Definitions — Transmission Line Arresters

Backflashover
Occurs when lightning strikes the tower structure or overhead shield wire. The lightning discharge current, flowing through the tower and tower footing impedance, produces potential differences across the line insulation.

If the line insulation strength is exceeded, flashover occurs i.e. a backflashover. Backflashover is most prevalent when tower footing impedance is high.

Compact insulation lines
Transmission lines with reduced clearances between phases and between phase and earth and with lower insulation level withstand than for normal lines for the same system voltage.

Coupling factor
is the ratio of included surge voltage on a parallel conductor to that on a struck conductor. This factor is determined from the geometric relationships between phase and ground (or protected phase conductors). A value often used for estimation purposes is 0.25.

Energy capability
The energy that a surge arrester can absorb, in one or more impulses, without damage and without loss of thermal stability. The capability is different for different types and duration of impulses.

Isokeraunic level
Number of annual thunderstorm days for a given region.

Shielding
Protection of phase conductors from direct lightning strokes; generally, by means of additional conductor(s) running on the top of the towers and grounded through the tower structures.

Shielding angle
The included angle, usually between 20 to 30 degrees, between shield wire and phase conductor.

Shielding failure
Occurs when lightning strikes a phase conductor of a line protected by overhead shield wires.

TLA
Transmission Line Arresters.

Tower footing impedance
The impedance seen by a lightning surge flowing from the tower base to true ground. The risk for backflashover increases with increasing footing impedance.

Travelling waves
Occur when lightning strikes a transmission line span and a high current surge is injected on to the struck conductor.

The impulse voltage and current waves divide and propagate in both directions from the stroke terminal at a velocity of approximately 300 meters per microsecond with magnitudes determined by the stroke current and line surge impedance.

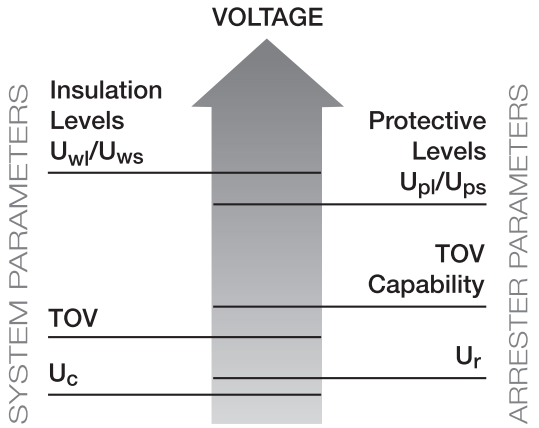
Simplified selection procedure

The selection is carried out in two major steps:

- Matching the electrical characteristics of the arresters to the system's electrical demands
- Matching the mechanical characteristics of the arresters to the system's mechanical and environmental requirements.

The final selection is reflected in the arrester type designation.

System/arrester parameters

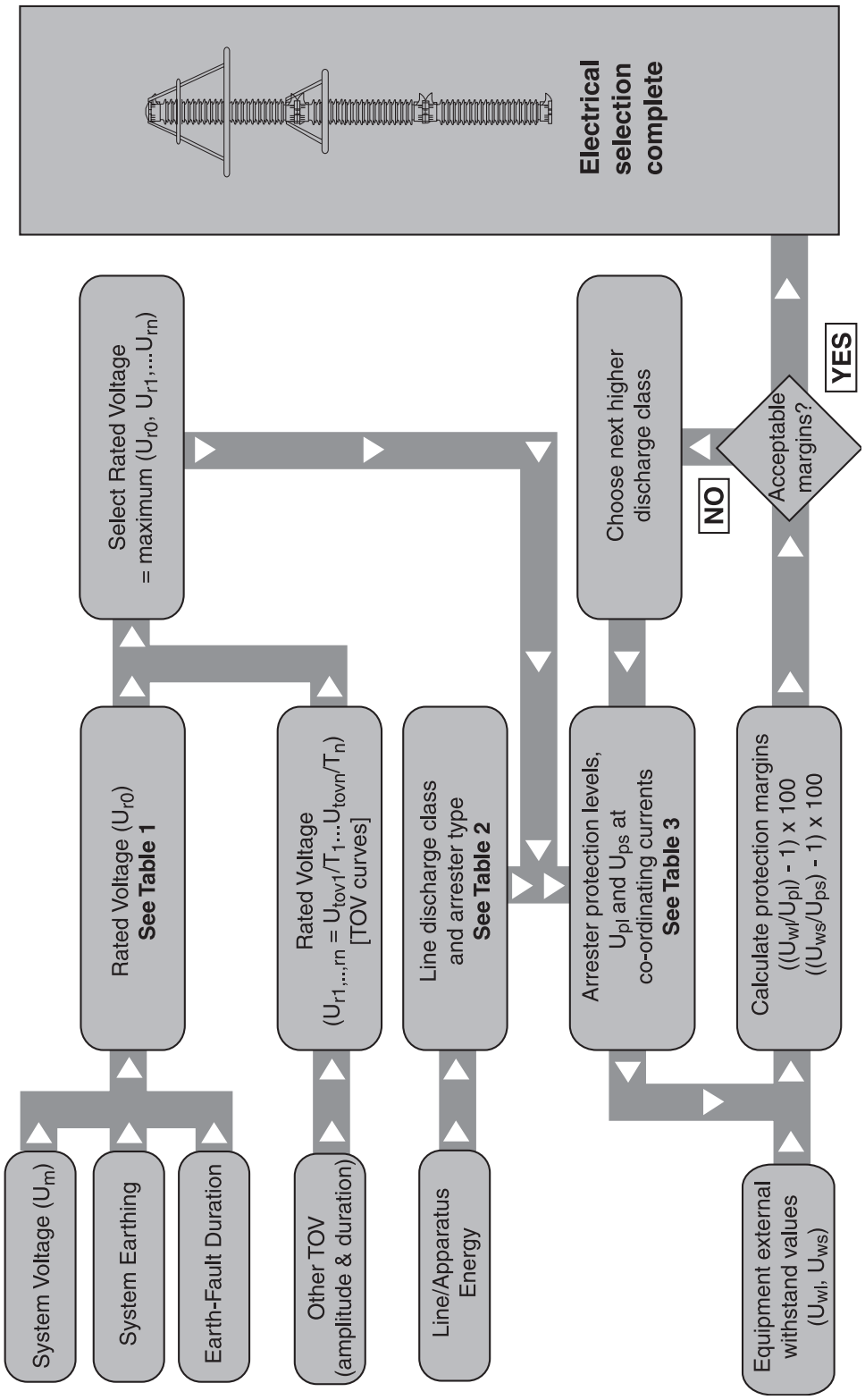


Vocabulary

U_m	Maximum system voltage
U_c	Continuous operating voltage
U_r	Rated voltage
TOV	Temporary overvoltage
T	TOV strength factor

k	Earth fault factor
U_{ps}	Switching impulse protective level
U_{pl}	Lightning impulse protective level
U_{ws}	Switching impulse withstand level
U_{wl}	Lightning impulse withstand level

Flowchart for simplified selection of surge arresters



Matching the electrical characteristics

Arrester rated voltage (U_r)

For each system voltage, the tables "Guaranteed protective data" show a range of U_r and maximum continuous operating voltages U_c, all of which are capable of withstanding the actual continuous operating voltage (U_{ca}) with sufficient margin. Hence, the selection of U_r is only a function of the applied temporary overvoltages, TOV, (U_{tov}), taking into account their amplitudes and duration.

TOV are long-duration, mostly power-frequency (p.f.) or nearly p.f. voltages, with or without harmonics, generated by system events. The arresters must withstand the heat energy generated by them.

Most commonly, a single or two-phase earth fault leads to a TOV in the healthy phase(s) and also in the neutral of Y-connected transformers. Its amplitude is determined by the system earthing conditions and its duration by the fault-clearance time.

If the earth-fault factor, (k) = U_{tov}/U_{ca}, is 1.4 or less, the system is considered to be effectively earthed. Generally, this implies a solid connection of the neutral to the earth grid. All other forms of earthing via an impedance or a non-earthing of the neutral is considered as non-effective with k = 1.73

For effectively earthed systems, the fault-clearance time is generally under 1 s but it can vary widely among different systems. The catalogues list the values of TOV capability for 1 and 10 s duration after a prior energy stress (as a conservative approach). For other durations or for specific TOV conditions, follow the procedure hereunder:

- Consider each TOV separately.
- From the TOV curves, read off the TOV strength factor (T) for the time corresponding to the fault-clearance time.
- U_{tov}/T gives the min. value of U_r for withstanding this TOV. Choose the next higher standard rating.
- The final choice of U_r will be the highest of the U_r values obtained from the above calculations for each TOV.

System Earthing	Fault Duration	System Voltage U_m (kV)	Min. Rated Voltage, U_r (kV)
Effective	≤ 1 s	≤ 100	≥ 0.8 x U_m
Effective	≤ 1 s	≥ 123	≥ 0.72 x U_m
Non-effective	≤ 10 s	≤ 170	≥ 0.91 x U_m ≥ 0.93 x U_m (EXLIM T)
Non-effective	≤ 2 h	≤ 170	≥ 1.11 x U_m
Non-effective	> 2 h	≤ 170	≥ 1.25 x U_m

Table 1.
The table gives a minimum value of the arrester rated voltage (U_r). In each case, choose the next higher standard rating as given in the catalogue.

Note: Do not select a lower value of U_r than obtained as above unless the parameters are known more exactly; otherwise the arrester may be overstressed by TOV.

Energy capability & line discharge class

IEC classifies arresters by their nominal discharge current. For 10 and 20 kA arresters, they are also classified by energy capability expressed as line discharge class (2 to 5) verified in a long duration current test and a switching surge operating duty test. In the latter, the arrester is subjected to two impulses of a given amplitude and duration after which it must be thermally stable against U_C. The "class" figure roughly gives the expected energy absorbed in kJ/kV (U_r) per impulse. As seen in Table 2, the ABB arresters are tested for a much higher energy absorption capability.

Arrester Type	Line discharge class	Energy capability (2 impulses) kJ/kV (U_r)	Normal application range (U_m)
EXLIM R	2	5.0	≤ 170 kV
PEXLIM R	2	5.1	≤ 170 kV
EXLIM Q	3	7.8	170 - 420 kV
PEXLIM Q	3	7.8	170 - 420 kV
EXLIM P	4	10.8	362 - 550 kV
PEXLIM P	4	12	362 - 550 kV
HS PEXLIM P	4	10.5	362 - 550 kV
EXLIM T	5	15.4	420 - 800 kV
HS PEXLIM T	5	15.4	420 - 800 kV

Table 2.
Energy capability of ABB arresters: The normal application range is only a guide. Arresters for higher class may be required depending on the specific parameters.

Matching the electrical characteristics

Though the energy capability is mentioned in a different manner in ANSI, the normal range of application as above applies even for ANSI systems.

For specific and special cases, e.g. capacitor banks, it may be necessary to calculate the energy capability as shown in the IEC 60099-5 and other guides.

Protection levels (U_{pl} and U_{ps})

For insulation co-ordination purposes, consider the lightning impulse protection level (U_{pl}) at 10 kA for $U_m \leq 362$ kV and at 20 kA for higher voltages. Similarly, the switching impulse protection levels (U_{ps}) for co-ordination purposes range from 0.5 kA (for $U_m \leq 170$ kV) to 2 kA (for $U_m \geq 362$ kV). The values can be read-off from the catalogue tables or easily computed from Table 3. *In the latter case, they must be rounded upwards.*

Arrester Type	Nom. Discharge current (I_n)	U_{pl}/U_r at 10 kA_p	U_{pl}/U_r at 20 kA_p	U_{ps}/U_r
EXLIM R	10	2.590		2.060 at 0.5 kA_p
PEXLIM R	10	2.590		2.060 at 0.5 kA_p
EXLIM Q	10	2.350		1.981 at 1.0 kA_p
PEXLIM Q	10	2.350		1.981 at 1.0 kA_p
EXLIM P	20	2.275	2.5	2.020 at 2.0 kA_p
PEXLIM P	20	2.275	2.5	2.020 at 2.0 kA_p
HS PEXLIM P	20	2.275	2.5	2.020 at 2.0kAp
EXLIM T	20	2.200	2.4	1.976 at 2.0 kA_p

Table 3.
U_{pl} and U_{ps} ratios for ABB arresters

Protection margins

Protection margins (in %), calculated at co-ordinating impulse currents as per Table 3, are defined as follows:

- Margin for lightning impulses = $((U_{WI}/U_{pl})-1) \times 100$, where U_{WI} is the external insulation withstand of the equipment against lightning impulses.
- Margin for switching impulses = $((U_{WS}/U_{ps})-1) \times 100$ where U_{WS} is the external insulation withstand of the equipment for switching impulses.

> Note! ANSI standards refer to U_{wl} as BIL and U_{ws} as BSL.

Margins are normally excellent due to the low U_{pl}, U_{ps} and also that most equipment at present have a high U_{wl} and U_{ws}. However, depending on the electrical distance between the arrester and the protected equipment, the U_{pl} margin is reduced and thus arresters fail to protect equipment that is not in the close vicinity of the arresters (i.e. within their protection zone). The flexible erection alternatives for PEXLIM arresters may be of benefit in reducing the distance effects. Additional line-entrance arresters may help too. For more detailed information regarding this, please refer to publications PTHVP/A 2310E and PTHVP/A 2120en.

> Note! The ”distance effect” reduction does not apply to U_{ps} margin since the front-time of a switching surge impulse is longer.

It is recommended that the protection margins (after taking into account the ”distance effect”) should be of the order of 20% or more to account for uncertainties and possible reduction in the withstand values of the protected equipment with age.

Should the selected arrester type not give the desired protection margins, the selection should be changed to an arrester of a higher line discharge class, which automatically leads to lower U_{pl}.

> Note! Do NOT use a lower-than selected (U_r) to attempt improve the margins, as this may lead to unacceptably low TOV capability.

As an additional assistance in selection, please refer to the simplified flow chart at the beginning of this chapter.

Matching the mechanical characteristics

The varistor column must be suitably housed to withstand long-term effects of the system loading and the environmental stresses.

External creepage distance

IEC 60815 defines the minimum creepage distances for different environmental conditions. Select the housing to give the desired creepage - the same as for the other equipment in the same location. If the creepage demand exceeds 31 mm/kV, please refer to ABB for a special design.

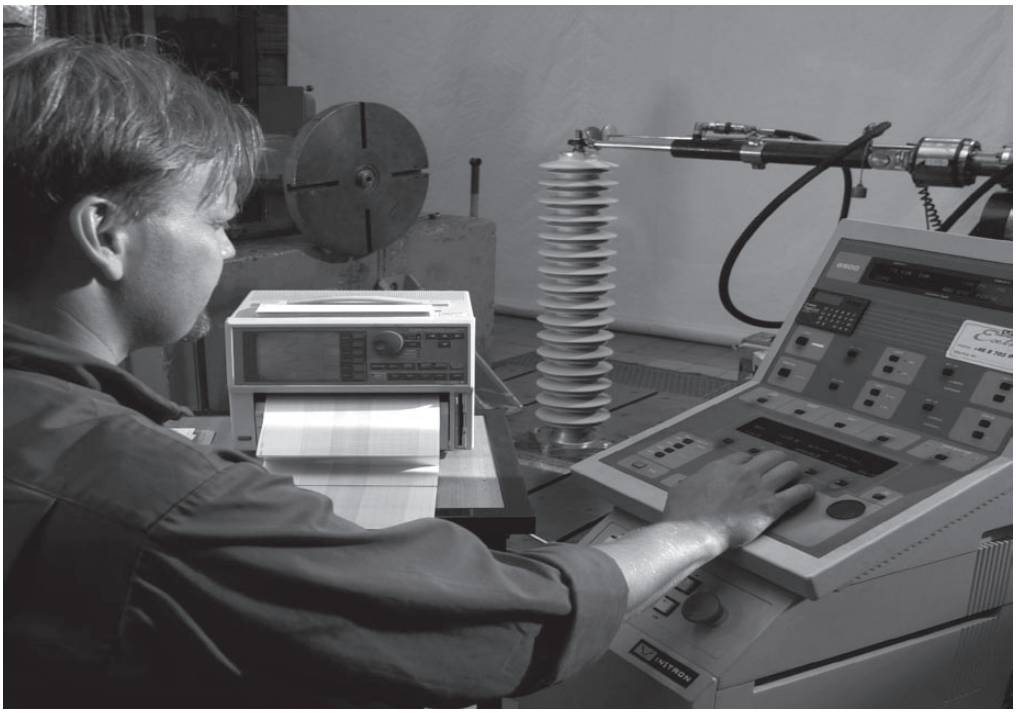
PEXLIM arresters, having a highly hydrophobic housing, are better suited for extremely polluted areas than EXLIM arresters and a lower creepage may be justified in many cases.

Mechanical strength

The maximum useable static and permissible cantilever loading is shown in the relevant catalogues and summarised in Table 4.

Since arresters do not carry any large continuous current, they should be provided with lighter leads and clamps to reduce the static loading. Suspending PEXLIM arresters further reduces the static terminal loading and allows PEXLIM arresters to also be chosen for higher voltages without mechanical problems.

For short arresters, the mechanical strength of PEXLIM approximately equals that for EXLIM. For longer arresters, the lower mechanical strength of PEXLIM arresters can be compensated by using suspended or under-hung erection or by special bracing for upright erection. For details, refer to publication PTHVP/A 2120en.



Mechanical test of silicone-housed arrester PEXLIM P.

Arrester type	Cantilever strength (Nm)		
	MPDSL	PSSL	DPSSL
EXLIM R-C	7 500	3 000	n.a.
EXLIM Q-D	18 000	7 200	n.a.
EXLIM Q-E	7 500	3 000	n.a.
EXLIM P-G	18 000	7 200	n.a.
EXLIM T-B	18 000	7 200	n.a.
PEXLIM R-Y	1 600	n.a.	1 000
PEXLIM Q-X	4 000	n.a.	2 500
PEXLIM P-X	4 000	n.a.	2 500
HS PEXLIM P	28 000	n.a.	19 000
HS PEXLIM T	28 000	n.a.	19 000

Table 4.
Permissible strength loading for ABB arresters

MPDSL - Maximum permissible dynamic service load.

PSSL - Permissible static service load (for PEXLIM arresters this is a declared value based on cyclic loading).

DPSSL - Declared permissible static service load.

Simplified selection procedure

Neutral-ground arresters

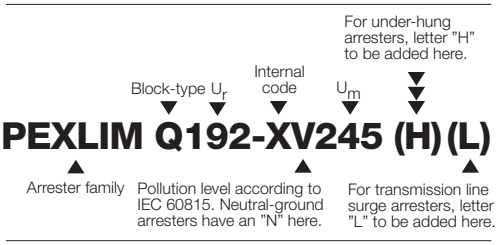
For neutral-ground arresters the recommended rated voltage is approximately the maximum system voltage divided by √3. The recommended neutral-ground arresters in the relevant sections are calculated for unearthed systems with relatively long fault duration. The electrical characteristics are identical to standard catalogue arresters with the corresponding rated voltage. For such arresters, U_C is zero and they are not subject to any voltage stress during normal service conditions. The neutral-ground arresters should preferably be of the same type as the phase-ground arresters. For resonant-earthed systems with long radial lines special considerations must be taken. A higher rated voltage (20% to 40%) than listed may be necessary.

Type designation

The type designation itself gives detailed information of the arrester and its application. See the figure below. As standard, the arresters are meant for upright vertical erection. For under-hung erection, when desired, the type designation is completed by letter "H" after system voltage (U_m). For other angular erection, please inform us at order.

For non-standard arresters, the type designation will have additional letters for example:

E	**Non-standard electrical data**
M	**Non-standard mechanical data**
P	**Parallel metal-oxide columns**



Special applications

Please consult your nearest ABB representative for help in selection of arresters for special applications such as protection of shunt or series capacitor banks, cables and cable-aerial junctions, rotating machines, traction systems, overhead lines, HVDC etc. or for non-standard arrester ratings.

Ordering data for arresters

The following information, at a minimum, is required with your order:

- Quantity and type designation
- Rated voltage
- Type of line terminal
- Type of earth terminal
- Type of surge counter, if any
- Type of insulating base, if any.

(Insulating base is required if surge counter and/or leakage current measurements are desired. One base is required for each arrester).

Ordering example

Below is a typical example of an order with three PEXLIM arresters and its accessories.

3 pcs.	PEXLIM Q192-XV245 Rated voltage 192 kV Line terminal type 1HSA 410 000-L Earth terminal type 1HSA 420 000-A
3 pcs.	Insulating base type 1HSA 430 000-A
3 pcs.	Surge counter type EXCOUNT-A

Note! We recommend that the order form, in section T-1, be filled-in and attached to your order to ensure inclusion of all the important parameters and commercial conditions.

Simple selection example

Substation data:	
Maximum system voltage:	145 kV
Arrester location:	Phase-ground
System earthing:	Effective
System fault clearance time:	1 s
Creepage distance:	3 000 mm

1 U_{r0} = 0.72xU_m (according to table 1) = 0.72x145 = 104.4 kV_{rms}. Select the next higher standard U_r (see "Guaranteed protective data"), i.e. 108 kV_{rms}.

2 According to table 2, a common choice selection for 145 kV_{rms} would be a line discharge class 2 arrester, i.e. PEXLIM R. This arrester has a U_{pl}/U_r of 2.59, i.e. U_{pl} of 280 kV_{peak} at 10 kA (according to table 3). With a U_{wl} of 550 kV_{peak} this would give a protective margin of (550/280-1)x100 = 96 %.

3 This margin appears to be excellent but it must be noted that depending on distance effect and possible insulation ageing, the margin is reduced to only 10% to 15% after taking distance effect into account and depending on the chosen impulse steepness and amplitude. Thus, it is very important that the arrester is installed as close as possible to the protected object.

4 If the margin is considered insufficient, choose a class 3 arrester, e.g. PEXLIM Q with the same rated voltage 108 kV.

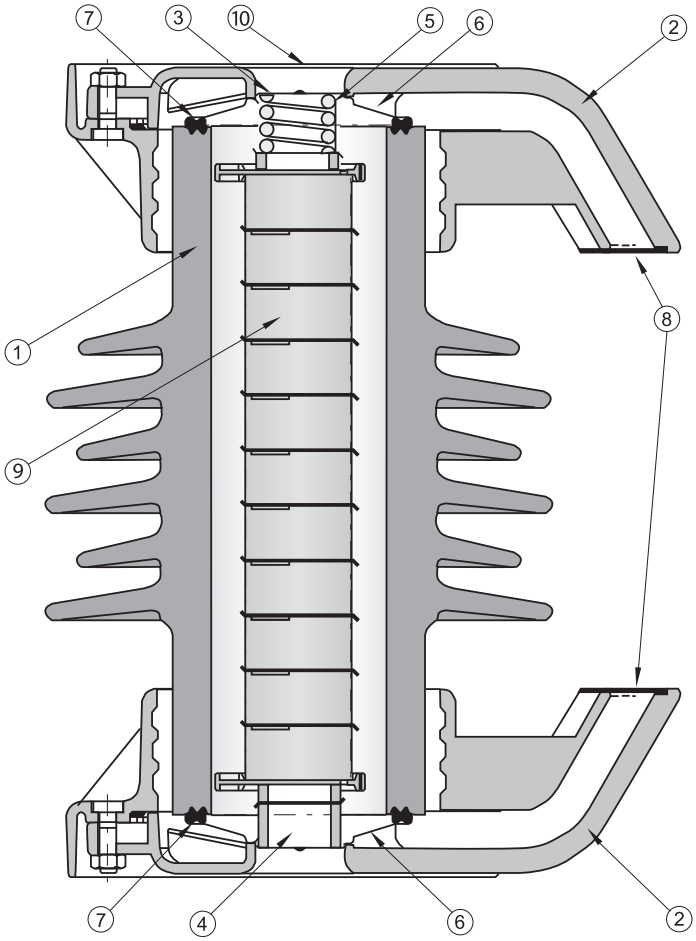
5 With a required creepage distance of 3 000 mm, i.e. 20.7 mm/kV, YH145 (XH145 for PEXLIM Q) housing should be selected.

6 The type designation of the selected arrester will then be:

PEXLIM R108-YH145
(or PEXLIM Q108-XH145)

Design features - Porcelain-housed arresters, EXLIM

The design is based on successful experience of over 65 years, first as gapped SiC arresters, in all climates and conditions all over the world. EXLIM arresters live up to their name: EXcellent voltage LIMiters. The design is robust and well-matched with the other apparatus in substations.



1	Porcelain insulator
2	Venting duct
3	Spring
4	Desiccant bag
5	Copper sheet

6	Sealing cover
7	Sealing ring
8	Indication plates
9	ZnO-blocks
10	Flange cover

Each arrester is built up of one or more units. Each unit is a porcelain housing containing a single column of ZnO blocks, all individually extensively routine-tested during manufacture, dispersed with the necessary spacers as determined by the electrical design for the arrester. It is necessary, therefore, that the units are series-connected at site in the pre-determined order as marked on the units. Consult the installation instructions supplied with each arrester.

Longer arresters often require (and are supplied with) external grading rings to maintain a uniform and acceptable voltage stress along their length. Operation of such arresters without the grading rings, therefore, may lead to failure and invalidates our guarantees/warranties.

The standard porcelain colour is brown but grey porcelain is supplied on request.

Seaworthy packing of the arresters is standard.

Sealing and pressure-relief function

The flanges are cemented to the porcelain and enclose also the sealing arrangement. Please see the figures herein.

For satisfactory performance, it is important that the units are hermetically sealed for the lifetime of the arresters. The sealing arrangement at each end of each unit consists of a pre-stressed stainless steel plate with a rubber gasket. This plate exerts a continuous pressure on the gasket against the surface of the insulator and ensures effective sealing even if the gasket ”sets” due to ageing. It also serves to fix the column of the blocks in the longitudinal direction by means of springs. The sealing is verified for each unit after manufacture in routine tests.

The sealing plate is designed to act also as an over-pressure relief system. Should the arrester be stressed in excess of its design capability, an internal arc is established. The ionised gases cause rapid increase in the internal pressure, which in turn causes the sealing plate to flap open

and the ionised gases to flow out through the venting ducts. Since the ducts at the two ends are directed towards each other, this results in an external arc; thus relieving the internal pressure and preventing a violent shattering of the insulator.

Mechanical Strength

The mechanical strength of the housing, i.e. maximum permissible dynamic service load (MPDSL), is defined in accordance with IEC 60099-4. Thus the fracture moment is generally 120% of the specified figure. The insulating base (when supplied) matches the strength of the housing.

The permissible static service load (PSSL) i.e. continuous moment should be limited to 40% of the MPDSL in accordance with IEC 60099-4.

Arresters with mechanical strength higher than listed are quoted on request.

Mechanical loading

Horizontal (cantilever) load

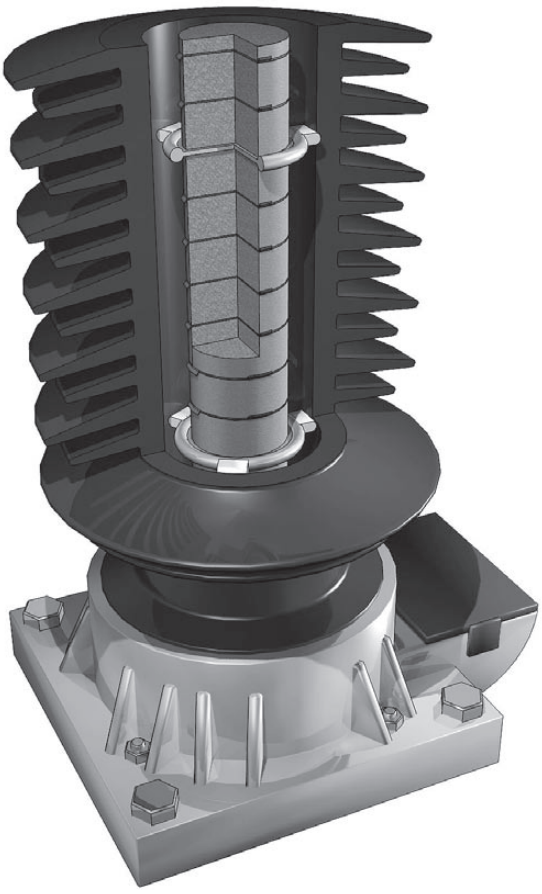
The maximum permissible continuous horizontal load is calculated as the maximum continuous (static) moment divided by the distance between the base of the arrester and the centre of the terminal load.

The continuous current through an arrester is of the order of a few mA. Hence, using a lighter terminal clamp and/or connecting the arrester by a lighter tee-off considerably reduces the demand for mechanical strength.

Installation, maintenance and monitoring

Standard EXLIM arresters are intended for vertical, upright erection on a structure and require no bracing. Special EXLIM arresters for suspension, inverted mounting or other angular erection are available on request.

EXLIM arresters are easy to install following the instructions packed with each arrester. Installation does not need any special tools or instruments. Properly chosen and installed arresters are practically maintenance-free for their lifetime and do not need any monitoring. However, if such monitoring is demanded, it is easily performed online by using the EXCOUNT-II with it's built-in features for correctly measuring the resistive leakage current.



Cutaway view of a typical EXLIM unit showing the internal arrangements designed to minimise partial discharge.

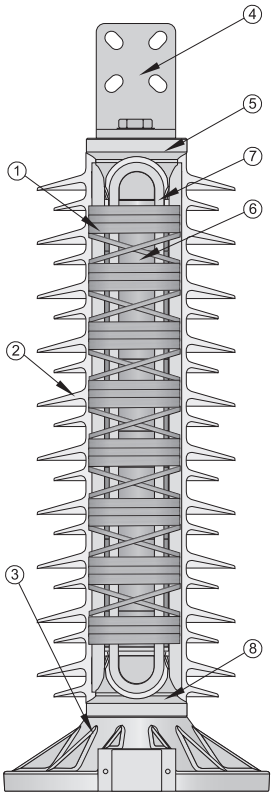
Design features - Polymer-housed arresters, PEXLIM

PEXLIM arresters, using the same ZnO blocks as the EXLIM arresters, match their electrical performance. Silicone as outer insulation material has been used for over 30 years with good results and has been chosen by ABB for arresters as well. It confers the additional benefits of low weight, improved pollution performance, increased personnel safety and flexibility in erection.

Two basic designs

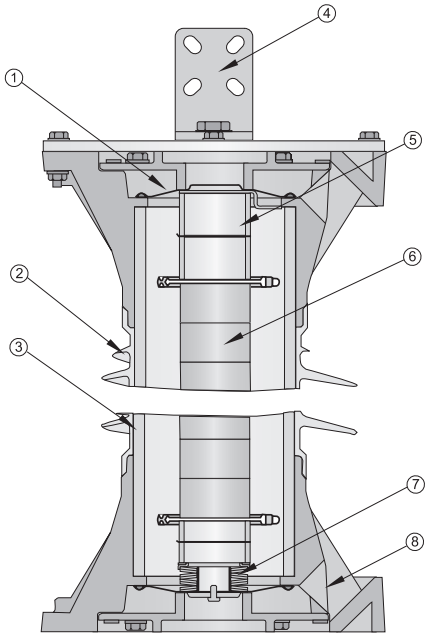
The PEXLIM family of ABB silicone-housed arresters comes in two different designs:

Moulded PEXLIM design



1	Protective winding
2	Silicone rubber insulator
3	Base
4	Line terminal
5	Top yoke
6	ZnO-blocks
7	Fibreglass loop
8	Bottom yoke

High strength (HS) PEXLIM tube design.



1	Sealing cover
2	Silicone rubber insulator
3	Fibreglass tube
4	Line terminal
5	Spacers
6	ZnO-blocks
7	Spring
8	Venting duct

Moulded PEXLIM design

Design Highlights

Each arrester is built-up of one or more units, which in turn may be made up of one or more modules. Each module contains a single column of ZnO-blocks, that are extensively individually routine-tested during manufacture, dispersed with the necessary spacers as determined by the electrical design for the arrester. The modules are standardised into different sizes based on electrical, mechanical and process considerations.

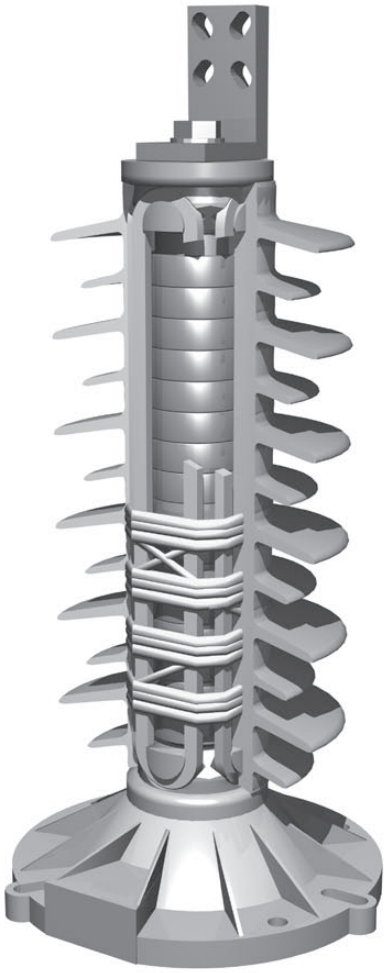
ABB employs a unique patented design to enclose the ZnO blocks of each module under axial pre-compression in a cage formed of fibreglass reinforced loops fixed between two yokes which also serve as electrodes. An aramide fibre is wound over the loops resulting in an open cage design for the module. This results in high mechanical strength and excellent short-circuit performance. See the figures hereunder.

Each module is then passed through a computer-controlled cleaning and priming process. The module is then loaded in a highly automated vulcanising press and silicone injected at a high pressure and temperature (HTV process) to completely bond to the active parts, leaving no internal voids or air spaces.

Individual modules are thereafter assembled into units and routine tested before packing and dispatch.

For satisfactory performance, it is important that the units are hermetically sealed for the lifetime of the arresters. The HTV moulding process under vacuum ensures this by bonding along the entire length from electrode to electrode. There is no air or any gas entrapped between the active parts and the housing. Hence, gaskets or sealing rings are not required.

Should the arrester be electrically stressed in excess of its design capability, an internal arc will be established. Due to the open cage design, it will easily burn through the soft silicone material, permitting the resultant gases to escape quickly and directly. At the same time, the aramide fibres prevent the explosive expulsion of the internal components. Hence, special pressure-relief vents are not required for this design. The fail-safe short-circuit capability is verified in short-circuit tests in accordance with IEC.



Cutaway view of a typical PEXLIM module showing the internal arrangements and the open-cage construction designed to improve both mechanical strength and personnel safety.

High strength (HS) PEXLIM tube design

In special cases with very high demands for mechanical strength, the moulded design may not provide the optimal solution (particularly at system voltages above 420kV). Instead, what is required is a mix between the features of the standard EXLIM and the moulded PEXLIM designs. The HS (High strength) PEXLIM tube design provides this by offering comparable mechanical strength to EXLIM arresters, but with much less mass. The seismic and pollution performance is in line with the moulded PEXLIM arresters and thus superior to conventional porcelain designs.

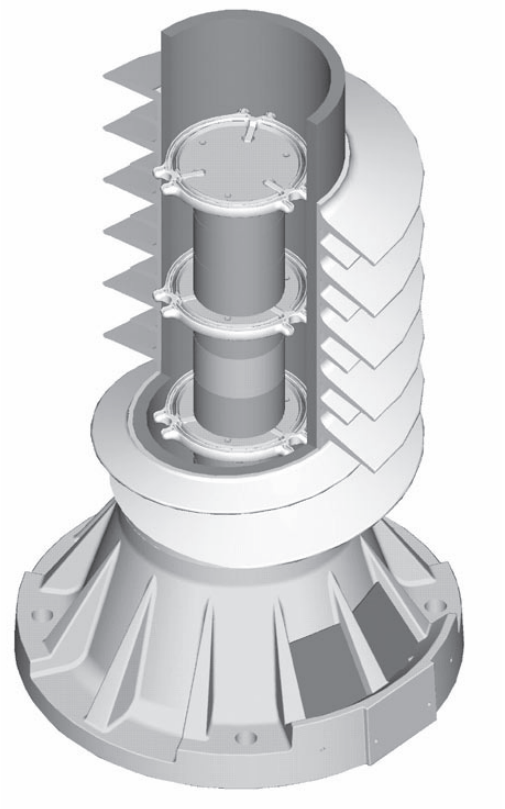
Design highlights

The basic concept is the replacement of the porcelain housing used with EXLIM arresters by a fibreglass tube housing onto which the silicone sheds are vulcanised. The metal flanges are integrated onto the tube prior to the vulcanising process. The internal arrangement and the pressure-relief devices are similar to those for EXLIM arresters.

For satisfactory performance, it is important that the units are hermetically sealed for the lifetime of the arresters. The sealing arrangement at each end of each unit is shown in the figure hereunder and consists of a pre-stressed stainless steel plate with a rubber gasket. This plate exerts a continuous pressure on the gasket against the inner surface of the flanges and ensures effective sealing even if the gasket “sets” due to ageing. It also serves to fix the column of the blocks in the longitudinal direction by means of heavy spring washers.

To maintain the interior free of any humidity, the unit is evacuated after the sealing plate and gaskets are fitted and then filled with dry air at low dew point. Additionally, a small bag of a desiccant is placed in each unit during assembly. Sealing is verified for each unit after manufacture during routine tests.

The sealing plate is designed to also act as an over-pressure relief system. Should the arrester be electrically stressed in excess of its design capability, an internal arc is established. The ionised gases cause a rapid increase in the internal pressure, which in turn causes the sealing plate to flap open and the ionised gases to flow out through the venting ducts. Since the ducts at the two ends are directed towards each other, this results in an external arc; thus relieving the internal pressure and preventing a violent shattering of the insulator. The successful operation of the pressure-relief device is verified in short-circuit tests in accordance with IEC.



Cutaway view of a typical HS PEXLIM unit showing the internal arrangements.

Silicone as an Insulator

All PEXLIM arresters utilise silicone for the external insulation. Silicone rubber is highly hydrophobic and resistant to UV radiation and has been shown to be the best insulation (compared to both porcelain and other polymers) based on world wide independent laboratory and field tests. ABB uses special fillers to enhance these properties as well as giving it high pollution resistance, tracking resistance and fire-extinguishing features. The silicone housing is available only in grey colour. For additional information, please refer to publication PTHVP/A 2120en.

Mechanical Strength

Present standards lack suitable definitions and tests regarding the mechanical strength of composite polymeric material. A “damage limit” has nevertheless been defined in IEC60099-4 as the lowest value of force perpendicular to the longitudinal axis leading to mechanical failure. Similarly, the “maximum permissible dynamic service load” (MPDSL) is the greatest dynamic force allowed to be applied during service without causing any mechanical damage to the arrester.

All PEXLIM designs exhibit very high strength under tensile or compression loading; hence it is the cantilever loading that is of interest. To be applicable to different arrester lengths, the loading is given in terms of bending moment in this guide. Furthermore, since standard multi-unit PEXLIM arresters are built with units of equal strength, the bending moment at the base of the arrester is the only figure of interest.

Due to their flexible construction, PEXLIM arresters may exhibit a visible deflection at the line-end of the arrester under maximum loading. Such deflection is limited by our declared value for permissible static service load (DPSSL) given in Table 4. This maximum recommended continuous loading ensures that the electrical and/or mechanical functions of the arrester are not impaired in any way, even during long-term cyclic loading. This value is comparable with the permissible static service load for porcelain arresters (PSSL).

If the permissible bending moment for a certain arrester appears insufficient for a given loading, consider one of the following methods to reduce the loading demand.

- Use lighter terminal clamps and/or lighter tee-offs for arresters. In contrast to the current capability (and thus the size of clamps and conductors) required for other substation equipment, the continuous current through an arrester is of the order of only a few mA. Hence, using lighter terminal clamp and/or connecting the arresters by lighter tee-offs considerably reduce the demand for mechanical strength.

- Use another erection alternative (suspension, under-hung, etc). Since PEXLIM arresters are very light compared to equivalent porcelain-housed arresters, they permit innovative erection alternatives, which could further reduce the bending moment demands; particularly in the case of the moulded design PEXLIM. Refer publication PTHVP/A 2120en. This in turn can lead to the additional benefit of lighter structures with subsequent reduced costs, or even the complete elimination of the need for a separate structure at all.

Pedestal-mounted long arresters with mechanical strength higher than listed may be quoted on request.

The line terminal and the insulating base (when supplied) match or exceed the strength of the arrester housing.

Installation, maintenance and monitoring

Standard PEXLIM arresters are intended for vertical, upright erection on a structure and require no bracing. Special PEXLIM arresters for suspension, inverted mounting or other angular erection are available on request.

There are two standard ranges of the moulded design PEXLIM arresters for the following erection alternatives:

- Vertical & upright erection mounted on a structure or suspended by the line terminal from a conductor. Such arresters may also be used for “positive” angular erection (above horizontal).

- Vertical and inverted erection for mounting under a structure, e.g. a gantry. Such arresters may also be used for “negative” angular erection (below horizontal).

All PEXLIM arresters are easy to install following the instructions packed with each arrester. Installation does not need any special tools or instruments.

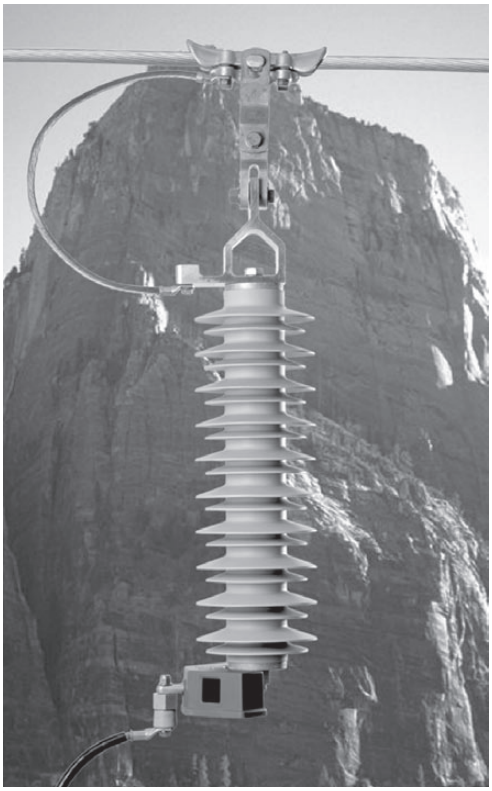
The units of multiple-unit arresters must be series-connected at site in a predetermined order as marked on the units and explained in the instructions that are packed in each case. An incorrect assembly may lead to failure and invalidates our warranty.

The design of long arresters often requires external grading rings to maintain a uniform and acceptable voltage stress along their length. Such rings are included in the delivery of arresters. Installation or operation of such arresters without these grading rings may lead to failure and invalidates our warranty.

Properly chosen and installed arresters are practically maintenance-free for their lifetime and do not need any monitoring. However, if such monitoring is demanded, it is easily performed online by using the EXCOUNT-II with it’s built-in features for correctly measuring the resistive leakage current. More information is available in the chapter dealing with this counter.

The PEXLINK concept

Both large and small public/private utility owners of transmission systems face a sharpened competitive situation which demands increased availability and reliability of the systems. Consumers have become more demanding as their processes are dependent on constant and reliable energy supply of good quality.



Picture shows a TLA for 145 kV, comprising standard components including PEXLIM arrester and EXCOUNT-II monitor.

In many countries, it has also been increasingly difficult to obtain permission to build new lines of normal dimensions. Hence, new lines under construction may mostly be ”compact-insulation” lines. This, in turn, requires optimal control of overvoltages caused by lightning or switching events. Surge arresters installed along the line or at a few selected critical towers, in this case, may be an attractive solution or a complement to other means.

Improvement in the reliability and availability of a transmission system can be obtained in one or more of the following ways:

1. Duplication of the system (more than one line).
This is a very expensive method and often impractical.

2. Increased insulation withstand.
It can both be expensive and create other problems such as the need for increased insulation of station equipment.

3. Improved footing impedance.
Often difficult and expensive, specially in hilly terrain.

4. Shield wires.
If the provision was not in the original tower design, it can be expensive to retrofit such shielding. It helps eliminate a large number of interruptions but it is not enough to obtain the now-demaded degree of reliability

5. Protection of line insulation by surge arresters
Surge arresters connected in parallel with them at selected towers. In this application usually the term line arresters is used. Protection using polymer-housed arresters (ABB type PEXLIM) along with additional accessories for fixing the arresters across the insulators and providing automatic disconnection of the arresters in the event of their being overstressed is called the PEXLINK concept. This method is simple, cost-effective and, in many cases, an attractive alternative to the methods mentioned above.

More information on internet
Visit *www.abb.com/arrestersonline* for viewing the PEXLINK video.

ABB´s protection philosophy

ABB's philosophy is to provide protection for line insulation at selected locations by using standard available components. The main item is the gapless silicone polymer-housed arrester, PEXLIM, with metal-oxide (MO) active elements. Such arresters have been used for many years for protection of equipment in substations and hence their protective performance is well-known.

TLAs, including line discharge class 3 PEXLIM Q arresters and disconnecting devices on earth leads, erected on ESKOM 300 kV system in South Africa.

The low weight permits installation on existing structures and the polymer housing gives increased safety of the line equipment as well as people and animals which may be in the vicinity of the lines during overstress conditions.

With regard to lightning energy, line arresters are exposed to more severe conditions than arresters placed in substations. The latter are benefited by the reduction of surge steepness due to line corona effect and reduction in surge amplitude as the lightning current finds parallel paths through shielding wires, flashover and parallel lines. Thus, it is necessary to ensure that the MO blocks of the TLA are not under-dimensioned from energy and current point-of-view. A computer program is used to determine the optimum number of locations (generally where the footing impedance is high) and to calculate the arrester stresses at each of the chosen locations.

The design permits installation using standard transmission-line hardware normally available locally. The design also permits mounting at different angles based on tower geometry and conductor spacing.

If very high availability is desired, a very large number of locations may have to be protected, mainly due to the unpredictable nature of lightning. In such a case it may not be economically justified to select arresters with "sufficient energy capability" and instead a higher failure rate may be acceptable.

To ensure quick, safe, automatic and controlled disconnection of a failed arrester, ABB uses a special disconnecting device with a suitable link, often in the earthing circuit of the arresters.

The earth lead is designed to withstand the short-circuit currents and the disconnecting device is tested to ensure no false operations. Thus, at a failure, the tripped line does not have to be locked-out and attended to immediately.

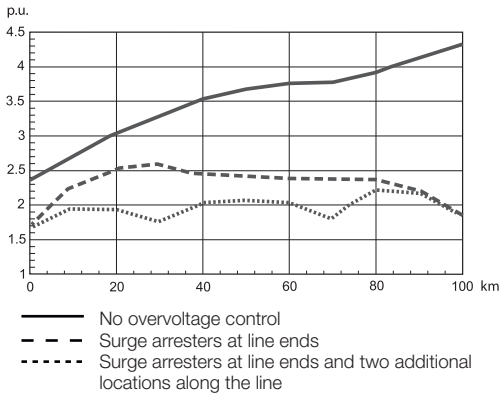
By moulding the silicone polymer housing on the active MO elements directly, internal atmosphere is eliminated and with it the risk of ingress of moisture which in the past has been established as the major cause of arrester failures in service.

Application

Increased line availability

By locating the PEXLINK on sections of lines with high footing impedance towers and one additional low footing-impedance tower at each end of the section, PEXLINK protects existing shielded and non-shielded lines from abnormal lightning surges (frequent or high amplitudes) and reduces the outages.

The reduced outages are beneficial also indirectly in that sensitive equipment is not damaged and the circuit breakers overhaul interval can be increased. Thus, total maintenance costs are also reduced. This protection may be used for all system voltages where the stated abnormal conditions exist. Arresters with moderate energy capability are often sufficient. However, the high-current capability must be large and distribution-type arresters may not be suitable.



The diagram shows overvoltages phase-ground generated by three-phase reclosing of 550 kV, 200 km transmission line with a previous ground fault. For long EHV lines pre-insertion resistors traditionally are used to limit switching overvoltages. Surge arresters, as a robust and efficient alternative, could be located at line ends and along the line at selected points.

For long EHV lines, surge arresters usually are located at line-ends. In addition, by locating arresters at one or more points along the line e.g. at midpoint or 1/3 and 2/3 line length switching surge overvoltages and thus line insulation requirements could be limited without using preinsertion resistors. Arresters used for this type of application should be designed for high energy capability. Usually a class 2 or 3 arrester will be sufficient out on the line but higher arrester classes may be necessary at the receiving end of the line.

Compact-insulation lines

Arresters placed in parallel with line insulators permit a large degree of compacting of a transmission line with lower right-of-way costs as a result.

Compact 400 kV tower without overhead shield wire. Insulators protected by TLA in top phase.

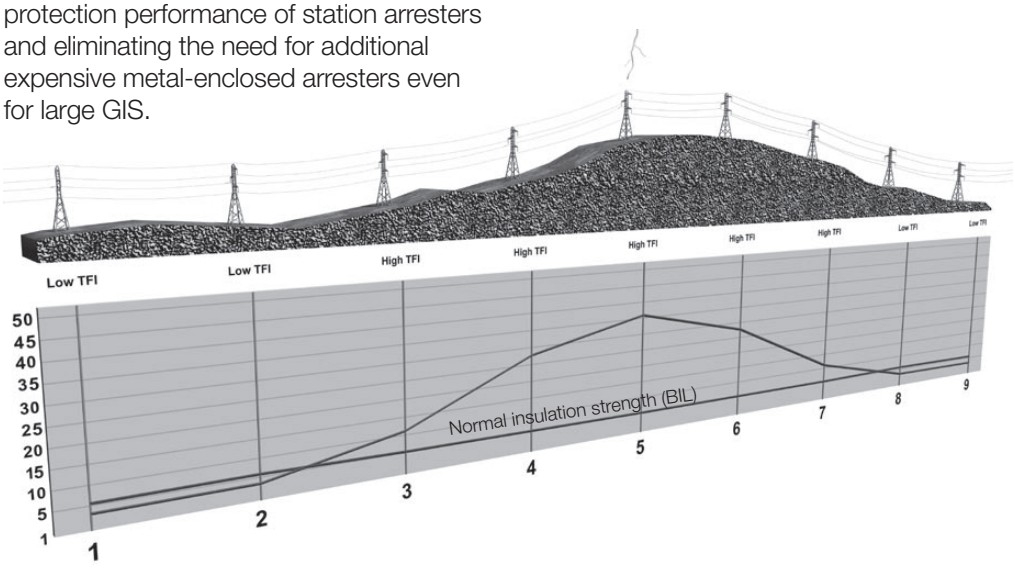
Application

Line upgrading
The existing insulation level of a line, when suitably protected by arresters, may be upgraded for service at a higher system voltage leading to greater power transfer without much additional capital cost.

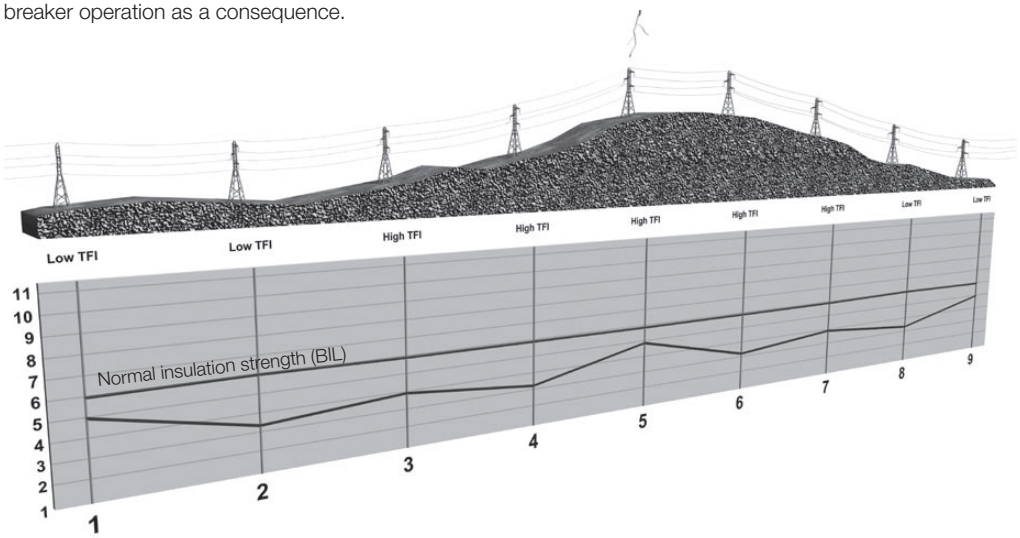
Extended station protection
By locating arresters on towers near a substation, the risk of backflashovers near the station is eliminated. This results in reduction of steepness and amplitude of incoming travelling waves, thus improving the protection performance of station arresters and eliminating the need for additional expensive metal-enclosed arresters even for large GIS.

Substitute for shield wires
In cases where provision of shield wires is not practical physically or is very expensive, e.g. very long spans, very high towers etc., arresters are a good and economical substitute.

Arresters located in all phases on each tower eliminate the need for both shield wires and good footing impedance and may be economically justified in cases where the cost of reduction in footing impedance and the cost of overhead shield wire are very high.



No arresters at all. Lightning stroke to tower number 5.
Very high risk for flashover due to high TFI (Tower Footing Impedance) with an earth fault followed by a circuit breaker operation as a consequence.



Arresters in all 9 towers. Lightning stroke to tower number 5.
The overvoltage profile is well below the BIL of the system all along the section. An ideal protection is obtained.

PEXLINK features

Standard components

The suspension of the arresters is simplified and standard clamps and similar hardware normally available may be used for this purpose. This leads to overall economy for the user.

Arrester Type	Line Discharge Class as per IEC 60099-4	Energy capability (2 impulses) kJ/kV (U_r)*
PEXLIM R	Class 2	5.1 kJ/kV (U_r)
PEXLIM Q	Class 3	7.8 kJ/kV (U_r)
PEXLIM P	Class 4	12.0 kJ/kV (U_r)

*) Ur = Rated voltage

A few examples can be seen in the figures for ”Some erection alternatives” on next page.

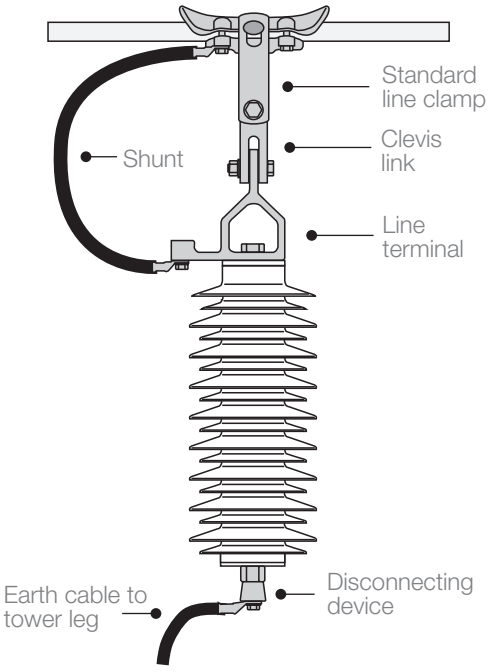
The disconnecting device is carefully chosen to perform its function only at the failure of the arrester. Generally, the same is placed in the earth circuit of the arrester but depending on the configuration, it may be placed at the high-potential end of the arrester. Please refer to the figures mentioned above.

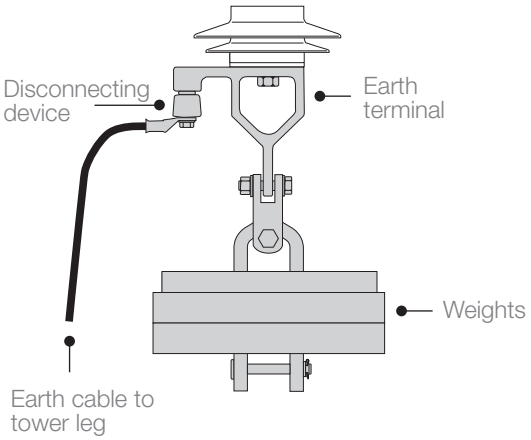
The separation of the disconnector is quick and effective and the method of connection advised by ABB in each particular case ensures that neither the disconnected wire nor the damaged arrester lead to any interference with other live parts. Thus, after a failure, the line can be re-charged without attending to it immediately.

The disconnection is easily visible from the ground and thus locating it is simple for the maintenance crew.

Easy to install

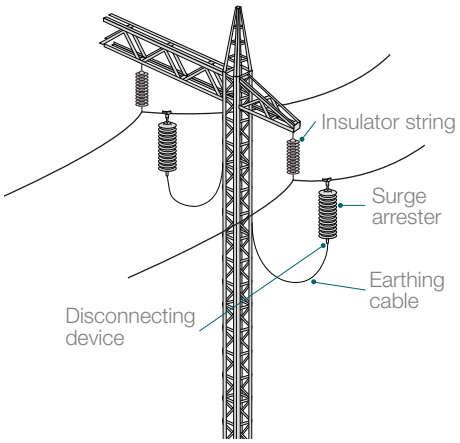
The PEXLIM arresters are built-up of optimum-length modules and hence can be easily designed for use on various voltages. They are light and hence easily transported up the towers.

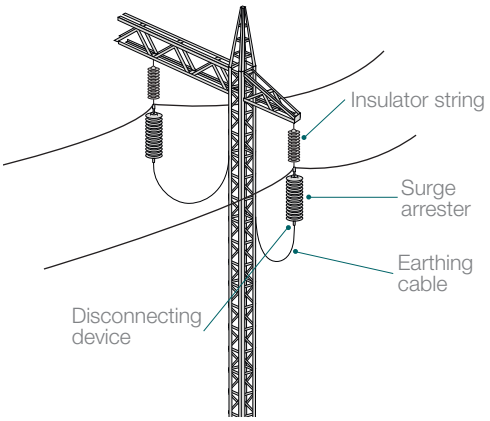


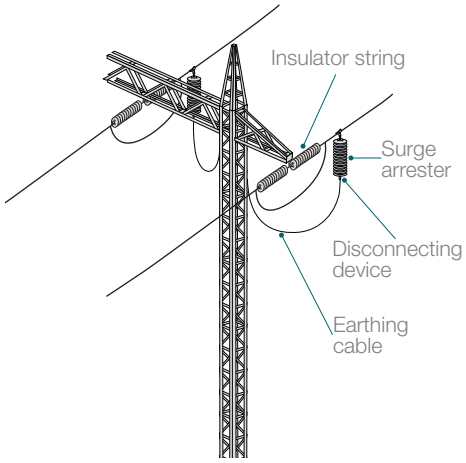


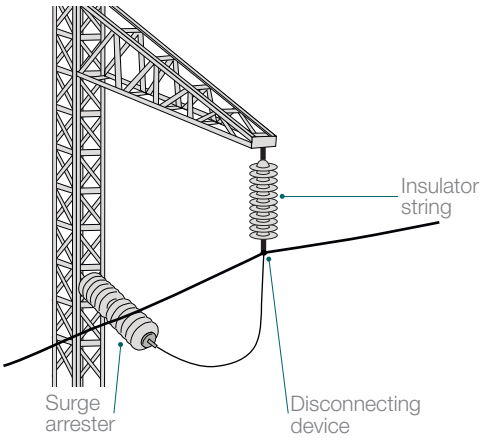
Some erection alternatives

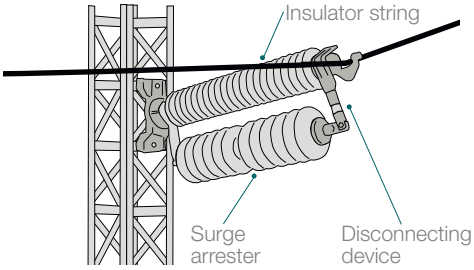
Different arrangements showing how easy it is to install the PEXLINK concept in towers of different design.











Quality control and testing

ABB is certified to fulfil the requirements of ISO 9001.

Type tests

Type (design) tests have been performed in accordance both with IEC 60099-4 and ANSI/IEEE C62.11. Test reports are available on request.

Routine tests

Routine tests are performed on ZnO blocks as well as on assembled arrester units and accessories. The most important type tests data is verified on all batches of ZnO blocks, thus verifying catalogue data.

Tests on ZnO blocks

Energy withstand test on all blocks

The blocks pass three energy test cycles with cooling in-between. In each cycle, the injected energy is far in excess of the single impulse energy capability. Blocks with insufficient energy capability are automatically rejected.

Classification of all blocks

The blocks are classified at 1 mA (d.c.) and 10 kA (8/20 µs) and the residual voltages are printed on each block together with a batch identification. Finally all blocks are visually inspected.

Accelerated life tests on samples

Power losses after 1 000 hours calculated from a test with shorter duration (approx. 300 hours) at an elevated temperature of 115°C at 1.05 times U_C shall not exceed the losses at start of the test. Batches in which unapproved blocks appear are rejected.

Impulse current tests on samples

Blocks are subjected to high current impulses (4/10 µs) and long duration current impulses (2 500 µs) of amplitudes verifying catalogue data.

Other sample tests

In addition to the above, low current characteristics, protection characteristics and capacitance are checked on samples.

Tests on assembled mechanical units

Routine tests on units fulfil the demands of both IEC 60099-4 and ANSI/IEEE C62.11. Each arrester unit has a serial number as per IEC 60099-4

Guaranteed residual voltage

The residual voltage at 10 kA, 8/20 µs impulse current of each unit is calculated as the sum of the residual voltages for all blocks connected in series in the unit.

The residual voltage of the complete arrester is the sum of the residual voltages for its units.

Tightness check (only for EXLIM and HS PEXLIM arresters)

It is performed by placing each unit in a vacuum chamber connected to a He-spectrometer. Maximum permissible leakage is 0.00001 mbarl/s at a pressure difference of 0.1 MPa.

Power frequency reference voltage

Reference voltage is measured on each arrester unit.

Internal corona

It is checked on each unit at 0.9 times U_r. A steady internal corona level less than 5 pC is required in a pass/no-pass test.

Grading current

It is measured at U_C on each unit.

Power losses

They are measured at U_C on each unit verifying that the thermal performance is in compliance with performed type tests.

Test reports

Routine test reports are filed and are available on request. The reports include reference voltages, power losses and residual voltages.

Tests on accessories

Surge counters, EXCOUNT-A

All counters are routine-tested in a pass/no-pass test before leaving the factory.

Zinc Oxide Surge Arrester PEXLIM R

Protection of switchgear, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages. For use when requirements of lightning intensity, energy capability and pollution are moderate.

Superior where low weight, reduced clearances, flexible mounting, non-fragility and additional personnel safety is required.

Major component in PEXLINK™ concept for transmission line protection.

Brief peformance data

System voltages (U_m)	24 - 170 kV
Rated voltages (U_r)	18 - 144 kV
Nominal discharge current (IEC)	10 kA_{peak}
Classifying current (ANSI/IEEE)	10 kA_{peak}
Discharge current withstand strength:	
High current 4/10 µs	100 kA_{peak}
Low current 2 000 µs	550 A_{peak}
Energy capability:	
Line discharge class (IEC)	Class 2
[2 impulses, (IEC Cl. 8.5.5)	5.1 kJ/kV (U_r)]
Fulfils/exceeds requirements of ANSI transmission-line discharge test for 170 kV systems.	
Short-circuit / Pressure relief capability	50 kA_{sym}
External insulation	Fulfils/exceeds standards
Mechanical strength:	
Declared permissible static service load (DPSSL)	1 000 Nm
Maximum permissible dynamic service load (MPDSL)	1 600 Nm
Service conditions:	
Ambient temperature	-50 °C to +45 °C
Design altitude	max. 1 000 m
(Higher altitudes on request)	
Frequency	15 - 62 Hz

Guaranteed protective data

Max. System Voltage	Rated Voltage	Max. continuous operating voltage 1)		TOV capability 2)		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_m kV_{rms}	U_r kV_{rms}	U_C kV_{rms}	MCOV kV_{rms}	1 s kV_{rms}	10 s kV_{rms}	0.5 kA kV_{peak}	1 kA kV_{peak}	2 kA kV_{peak}	5 kA kV_{peak}	10 kA kV_{peak}	20 kA kV_{peak}	40 kA kV_{peak}
24 3)	18	14,4	15,3	20,7	19,8	37,1	38,5	40,3	44,0	46,7	52,3	59,7
	21	16,8	17,0	24,1	23,1	43,2	44,9	47,0	51,3	54,4	61,0	69,7
	24	19,2	19,5	27,6	26,4	49,4	51,3	53,8	58,7	62,2	69,7	79,6
	27	21,6	22,0	31,0	29,7	55,6	57,7	60,5	66,0	70,0	78,4	89,6
36 3)	30	24,0	24,4	34,5	33,0	61,7	64,2	67,2	73,3	77,7	87,1	100
	33	26,4	26,7	37,9	36,3	67,9	70,6	73,9	80,6	85,5	95,8	110
	36	28,8	29,0	41,4	39,6	74,1	77,0	80,6	88,0	93,3	105	120
	39	31,2	31,5	44,8	42,9	80,3	83,4	87,3	95,3	102	114	130
	42	34	34,0	48,3	46,2	86,4	89,8	94,0	103	109	122	140
	48	38	39,0	55,2	52,8	98,8	103	108	118	125	140	160
52	42	34	34,0	48,3	46,2	86,4	89,8	94,0	103	109	122	140
	48	38	39,0	55,2	52,8	98,8	103	108	118	125	140	160
	51	41	41,3	58,6	56,1	105	109	115	125	133	148	170
	54	43	42,0	62,1	59,4	112	116	121	132	140	157	180
	60	48	48,0	69,0	66,0	124	129	135	147	156	175	199
	66	53	53,4	75,9	72,6	136	142	148	162	171	192	219
72	54	43	42,0	62,1	59,4	112	116	121	132	140	157	180
	60	48	48,0	69,0	66,0	124	129	135	147	156	175	199
	66	53	53,4	75,9	72,6	136	142	148	162	171	192	219
	72	58	58,0	82,8	79,2	149	154	162	176	187	209	239
	75	60	60,7	86,2	82,5	155	161	168	184	195	218	249
	84	67	68,0	96,6	92,4	173	180	188	206	218	244	279
	90	72	72,0	103	99,0	186	193	202	220	234	262	299
	96	77	77,0	110	105	198	206	215	235	249	279	319
100	75	60	60,7	86,2	82,5	155	161	168	184	195	218	249
	84	67	68,0	96.6	92,4	173	180	188	206	218	244	279
	90	72	72,0	103	99,0	186	193	202	220	234	262	299
	96	77	77,0	110	105	198	206	215	235	249	279	319
123	90	72	72,0	103	99,0	186	193	202	220	234	262	299
	96	77	77,0	110	105	198	206	215	235	249	279	319
	102	78	82,6	117	112	210	218	229	250	265	296	339
	108	78	84,0	124	118	223	231	242	264	280	314	359
	120	78	98,0	138	132	247	257	269	294	311	349	398
	132	78	106	151	145	272	283	296	323	342	383	438
	138	78	111	158	151	284	295	309	338	358	401	458
	144	78	115	165	158	297	308	323	352	373	418	478
145	108	86	86,0	124	118	223	231	242	264	280	314	359
	120	92	98,0	138	132	247	257	269	294	311	349	398
	132	92	106	151	145	272	283	296	323	342	383	438
	138	92	111	158	151	284	295	309	338	358	401	458
	144	92	115	165	158	297	308	323	352	373	418	478
170	132	106	106	151	145	272	283	296	323	342	383	438
	138	108	111	158	151	284	295	309	338	358	401	458
	144	108	115	165	158	297	308	323	352	373	418	478

More detailed information on the TOV capability and the protective characteristics are given in Publ. 1HSM 9543 13-01en.

1) The continuous operating voltages U_C (as per IEC) and MCOV (as per ANSI) differ only due to deviations in type test procedures.
Uc has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_C higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the maximum single-impulse energy stress (2.5 kJ/kV (U_r)).

3) Arresters for system voltages 36 kV or below can be supplied, on request, when the order also includes arresters for higher system voltages.

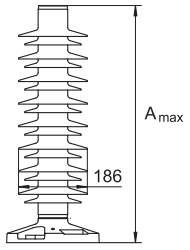
Arresters with lower or higher rated voltages may be available on request for special applications.

Technical data for housings

Max. system voltage	Rated Voltage	Housing	Creepage distance	External insulation				Dimensions				
				1.2/50 µs dry	50 Hz wet (60s)	60 Hz wet (10s)	250/2500 µs wet					
U_m kV_{rms}	U_r kV_{rms}		mm	kV_{peak}	kV_{rms}	kV_{rms}	kV_{peak}	Mass kg	A_{max}	B	C	Fig.
24	18-27	YV024	1863	310	150	150	250	13	641	-	-	1
36	30-48	YV036	1863	310	150	150	250	14	641	-	-	1
52	42-60	YV052	1863	310	150	150	250	14	641	-	-	1
	66	YV052	2270	370	180	180	300	16	727	-	-	1
72	54-60	YH072	1863	310	150	150	250	14	641	-	-	1
	54-72	YV072	2270	370	180	180	300	16	727	-	-	1
	75-96	YV072	3726	620	300	300	500	24	1216	-	-	2
100	75-96	YV100	3726	620	300	300	500	24	1216	-	-	2
123	90	YH123	3726	620	300	300	500	26	1236	400	160	3
	96-120	YH123	3726	620	300	300	500	25	1216	-	-	2
	90-96	YV123	4133	680	330	330	550	28	1322	400	160	3
	102-132	YV123	4133	680	330	330	550	27	1302	-	-	2
	138-144	YV123	4540	740	360	360	600	29	1388	-	-	2
145	108	YH145	3726	620	300	300	500	27	1236	400	160	3
	120	YH145	3726	620	300	300	500	25	1216	-	-	2
	108	YV145	4540	740	360	360	600	30	1408	400	160	3
	120-144	YV145	4540	740	360	360	600	29	1388	-	-	2
170	132-144	YH170	4540	740	360	360	600	31	1408	400	160	3
Neutral-ground arresters												
52	30-36	YN052	1863	310	150	150	250	14	641	-	-	1
72	42-54	YN072	1863	310	150	150	250	14	641	-	-	1
100	60	YN100	1863	310	150	150	250	14	641	-	-	1
123	72	YN123	2270	370	180	180	300	16	727	-	-	1
	84-120	YN123	3726	620	300	300	500	25	1216	-	-	2
145	75-120	YN145	3726	620	300	300	500	25	1216	-	-	2
170	75-120	YN170	3726	620	300	300	500	25	1216	-	-	2

*) Sum of withstand voltages for empty units of arrester.

1



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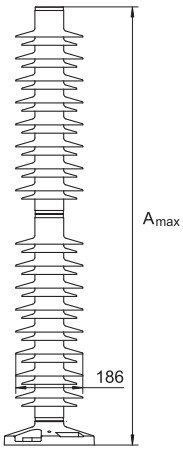

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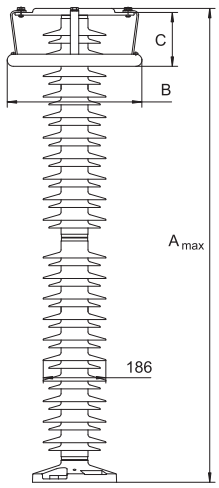
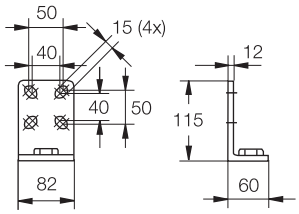
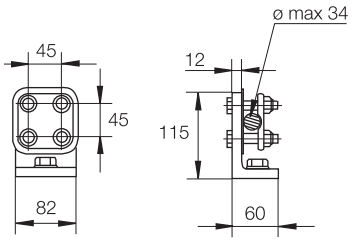


Accessories

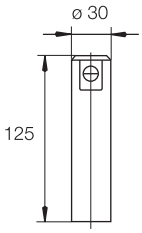
Line terminals



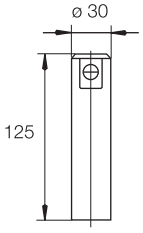
1HSA410 000-L
Aluminium



1HSA410 000-M
Aluminium flag with other items in stainless steel

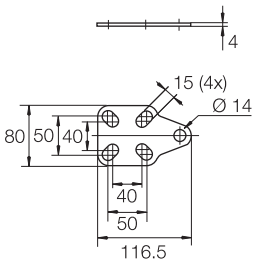


1HSA410 000-N
Aluminium

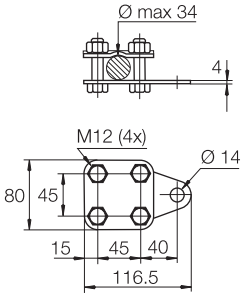


1HSA410 000-P
Stainless steel

Earth terminals



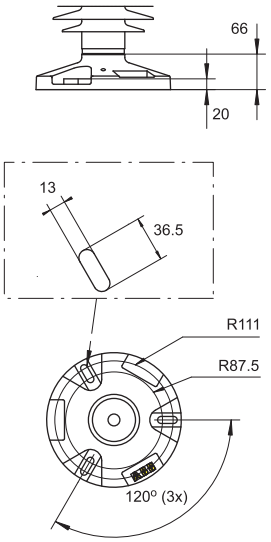
1HSA420 000-A
Stainless steel



1HSA420 000-B
Stainless steel

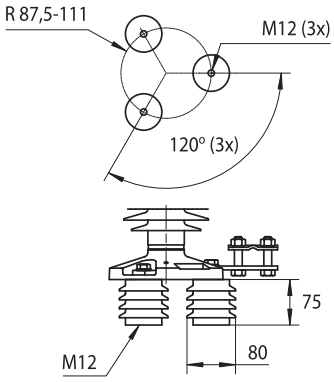
Drilling plans

Without insulating base



Aluminium

With insulating base



1HSA430 000-H
Epoxy resin

M12 bolts for connection to structure are not supplied by ABB. Required threaded grip length is 15-20 mm.

Shipping data

Rated Voltage	Housing	Number of arresters per crate					
		One		Three		Six	
U_r kV_{rms}		Volume m^3	Gross kg	Volume m^3	Gross kg	Volume m^3	Gross kg
18-27	YV024	0.5	35	0.5	65	0.9	110
30-48	YV036	0.5	36	0.5	68	0.9	116
42-60	YV052	0.5	36	0.5	68	0.9	116
66	YV052	0.5	38	0.5	74	0.9	128
54-60	YH072	0.5	36	0.5	68	0.9	116
54-72	YV072	0.5	38	0.5	74	0.9	128
75-96	YV072	0.7	51	0.7	103	1.2	181
75-96	YV100	0.7	51	0.7	103	1.2	181
90	YH123	0.7	53	0.7	109	1.2	193
96-120	YH123	0.7	52	0.7	106	1.2	187
90-96	YV123	0.7	55	0.7	115	1.2	205
102-132	YV123	0.7	54	0.7	112	1.2	199
108-120	YH145	0.7	54	0.7	112	1.2	199
138-144	YV123	0.9	61	0.9	123	1.5	216
108	YV145	0.9	62	0.9	126	1.5	222
120-144	YV145	0.9	61	0.9	123	1.5	216
132-144	YH170	0.9	63	0.9	129	1.5	228
Neutral-ground arresters							
30-36	YN052	0.5	36	0.5	68	0.9	116
42-54	YN072	0.5	36	0.5	68	0.9	116
60	YN100	0.5	36	0.5	68	0.9	116
72	YN123	0.5	38	0.5	74	0.9	128
84-120	YN123	0.7	52	0.7	106	1.2	187
75-120	YN145	0.7	52	0.7	106	1.2	187
75-120	YN170	0.7	52	0.7	106	1.2	187

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

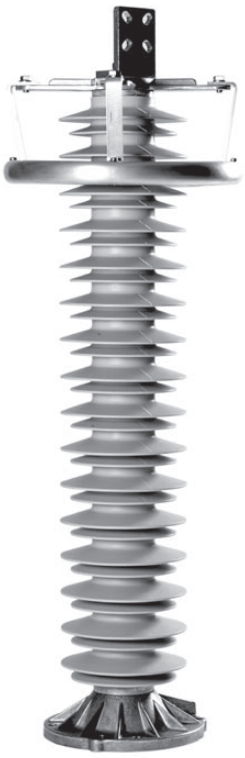
Zinc Oxide Surge Arrester PEXLIM Q

Protection of switchgear, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages.

- in areas with high lightning intensity and high energy requirements.
- where grounding or shielding conditions are poor or incomplete

Superior where low weight, reduced clearances, flexible mounting, non-fragility and additional personnel safety is required.

Major component in PEXLINK™ concept for transmission line protection.



Brief peformance data

System voltages (U_m)	52 - 420 kV
Rated voltages (U_r)	42 - 360 kV
Nominal discharge current (IEC)	10 kA_{peak}
Classifying current (ANSI/IEEE)	10 kA_{peak}
Discharge current withstand strength:	
High current 4/10 µs	100 kA_{peak}
Low current 2000 µs	900 A_{peak}
Energy capability:	
Line discharge class (IEC)	Class 3
[2 impulses, (IEC Cl. 8.5.5)	7.8 kJ/kV (U_r)]
Fulfils/exceeds requirements of ANSI transmission-line discharge test for 362 kV systems.	
Short-circuit / Pressure relief capability	50 kA_{sym}
External insulation	Fulfils/exceeds standards
Mechanical strength:	
Declared permissible static service load (DPSSL)	2 500 Nm
Maximum permissible dynamic service load (MPDSL)	4 000 Nm
Service conditions:	
Ambient temperature	-50 °C to +45 °C
Design altitude	max. 1 000 m
(Higher altitudes on request)	
Frequency	15 - 62 Hz

Guaranteed protective data

Max. System Voltage	Rated Voltage	Max. continuous operating voltage 1)		TOV capability 2)		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_m	U_r	U_C	MCOV	1 s	10 s	0.5 kA	1 kA	2 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
243)	24	19.2	19.4	27.6	26.4	46.1	47.6	49.5	53.6	56.4	62.1	69.4
363)	30	24.0	24.4	34.5	33.0	57.6	59.5	61.8	67.0	70.5	77.6	86.8
	36	28.8	29.0	41.4	39.6	69.2	71.4	74.2	80.4	84.6	93.1	105
52	42	34	34.0	48.3	46.2	80.7	83.3	86.5	93.8	98.7	109	122
	48	38	39.0	55.2	52.8	92.2	95.1	98.9	108	113	125	139
	51	41	41.3	58.6	56.1	98.0	102	105	114	120	132	148
	54	43	43.0	62.1	59.4	104	107	112	121	127	140	157
	60	48	48.0	69.0	66.0	116	119	124	134	141	156	174
	72	58	58.0	82.8	79.2	139	143	149	161	170	187	209
72	54	43	43.0	62.1	59.4	104	107	112	121	127	140	157
	60	48	48.0	69.0	66.0	116	119	124	134	141	156	174
	66	53	53.4	75.9	72.6	127	131	136	148	156	171	191
	72	58	58.0	82.8	79.2	139	143	149	161	170	187	209
	75	60	60.7	86.2	82.5	144	149	155	168	177	194	217
	78	62	63.1	89.7	85.8	150	155	161	175	184	202	226
	81	65	65.6	93.1	89.1	156	161	167	181	191	210	235
	84	67	68.0	96.6	92.4	162	167	173	188	198	218	243
100	75	59	60.7	86.2	82.5	144	149	155	168	177	194	217
	78	61	63.1	89.7	85.8	150	155	161	175	184	202	226
	84	65	68.0	96.6	92.4	162	167	173	188	198	218	243
	90	69	72.0	103	99.0	173	179	186	201	212	233	261
	96	74	77.0	110	105	185	191	198	215	226	249	278
123	90	72	72.0	103	99.0	173	179	186	201	212	233	261
	96	77	77.0	110	105	185	191	198	215	226	249	278
	102	78	82.6	117	112	196	203	210	228	240	264	295
	108	78	84.0	124	118	208	214	223	242	254	280	313
	120	78	98.0	138	132	231	238	248	268	282	311	347
	129	78	104	148	141	248	256	266	288	304	334	373
	132	78	106	151	145	254	262	272	295	311	342	382
	138	78	111	158	151	265	274	285	309	325	357	399
	144	78	115	165	158	277	286	297	322	339	373	417
	150	78	121	172	165	288	298	309	335	353	388	434
145	108	86	86.0	124	118	208	214	223	242	254	280	313
	120	92	98.0	138	132	231	238	248	268	282	311	347
	132	92	106	151	145	254	262	272	295	311	342	382
	138	92	111	158	151	265	274	285	309	325	357	399
	144	92	115	165	158	277	286	297	322	339	373	417
	150	92	121	172	165	288	298	309	335	353	388	434
	162	92	131	186	178	312	321	334	362	381	419	469
	168	92	131	193	184	323	333	346	376	395	435	486

More detailed information on the TOV capability and the protective characteristics are given in Publ. 1HSM 9543 13-01en.

1) The continuous operating voltages U_C (as per IEC) and MCOV (as per ANSI) differ only due to deviations in type test procedures.
Uc has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_C higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the maximum single-impulse energy stress (4.5 kJ/kV (U_r)).

3) Arresters for system voltages 36 kV or below can be supplied, on request, when the order also includes arresters for higher system voltages.

Arresters with lower or higher rated voltages may be available on request for special applications.

Guaranteed protective data

Max.	Rated Voltage	Max. continuous operating voltage 1)		TOV capability 2)		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_m kV_{rms}	U_r kV_{rms}	U_C kV_{rms}	MCOV kV_{rms}	1 s kV_{rms}	10 s kV_{rms}	0.5 kA kV_{peak}	1 kA kV_{peak}	2 kA kV_{peak}	5 kA kV_{peak}	10 kA kV_{peak}	20 kA kV_{peak}	40 kA kV_{peak}
170	132	106	106	151	145	254	262	272	295	311	342	382
	144	108	115	165	158	277	286	297	322	339	373	417
	150	108	121	172	165	288	298	309	335	353	388	434
	162	108	131	186	178	312	321	334	362	381	419	469
	168	108	131	193	184	323	333	346	376	395	435	486
	192	108	152	220	211	369	381	396	429	452	497	555
245	180	144	144	207	198	346	357	371	402	423	466	521
	192	154	154	220	211	369	381	396	429	452	497	555
	198	156	160	227	217	381	393	408	443	466	512	573
	210	156	170	241	231	404	417	433	469	494	543	608
	216	156	175	248	237	415	428	445	483	508	559	625
	219	156	177	251	240	421	434	451	489	515	567	634
	222	156	179	255	244	427	440	458	496	522	574	642
	228	156	180	262	250	438	452	470	510	536	590	660
300	216	173	175	248	237	415	428	445	483	508	559	625
	240	191	191	276	264	461	476	495	536	564	621	694
	258	191	209	296	283	496	512	532	576	607	667	746
	264	191	212	303	290	507	523	544	590	621	683	764
	276	191	220	317	303	530	547	569	617	649	714	798
362	258	206	209	296	283	496	512	532	576	607	667	746
	264	211	212	303	290	507	523	544	590	621	683	764
	276	221	221	317	303	530	547	569	617	649	714	798
	288	230	230	331	316	553	571	593	643	677	745	833
420	330	264	267	379	363	634	654	680	737	776	854	954
	336	267	272	386	369	646	666	692	751	790	869	972
	342	267	277	393	376	657	678	705	764	804	885	989
	360	267	291	414	396	692	714	742	804	846	931	1046

More detailed information on the TOV capability and the protective characteristics are given in Publ. 1HSM 9543 13-01en.

1) The continuous operating voltages U_C (as per IEC) and MCOV (as per ANSI) differ only due to deviations in type test procedures.
Uc has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_C higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the maximum single-impulse energy stress (4.5 kJ/kV (U_r)).

3) Arresters for system voltages 36 kV or below can be supplied, on request, when the order also includes arresters for higher system voltages.

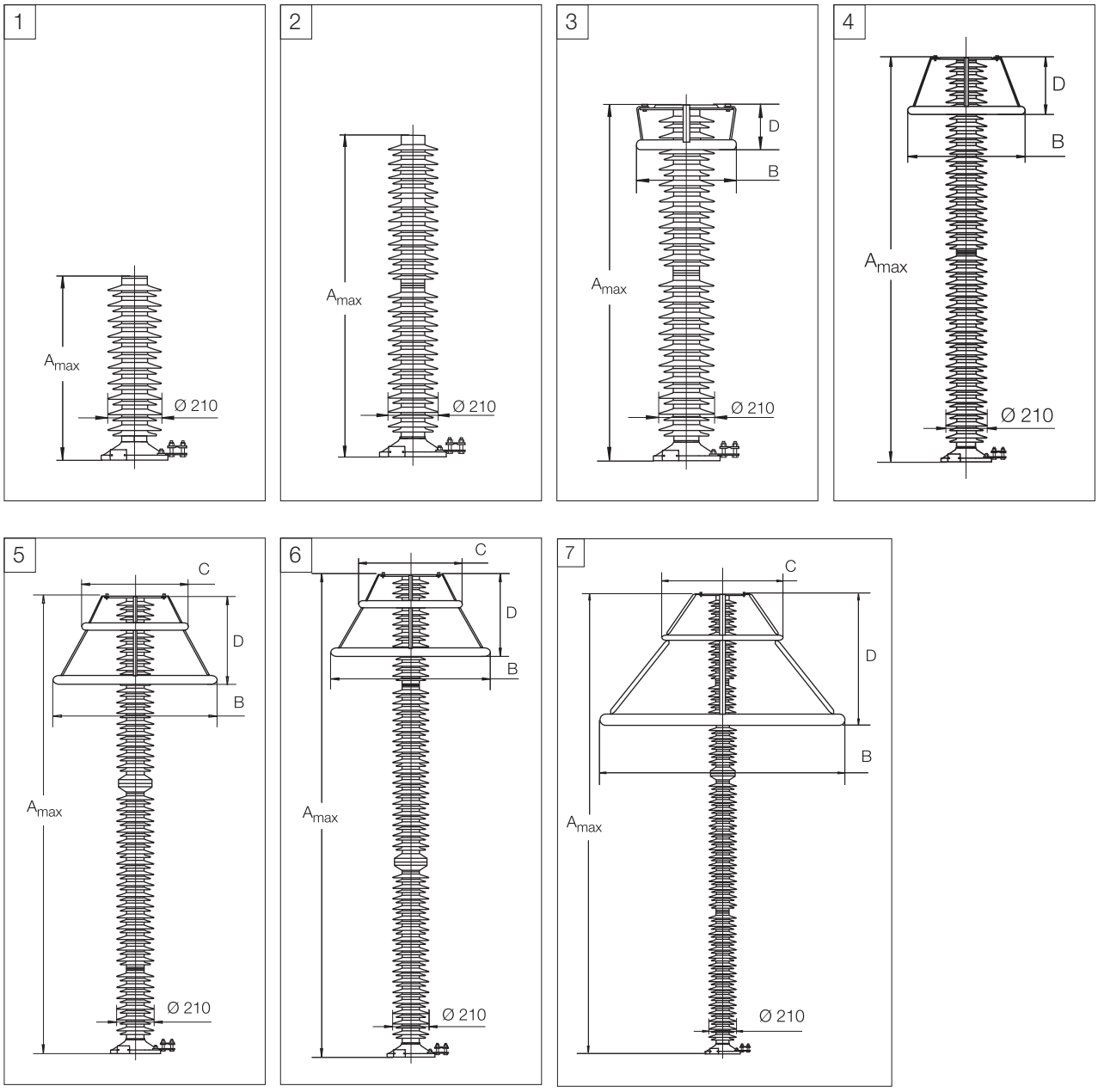
Arresters with lower or higher rated voltages may be available on request for special applications.

Technical data for housings

Max. system voltage	Rated Voltage	Housing	Creepage distance	External insulation *)				Dimensions					
				1.2/50 µs dry	50 Hz wet (60s)	60 Hz wet (10s)	250/2500 µs wet						
U_m kV_{rms}	U_r kV_{rms}		mm	kV_{peak}	kV_{rms}	kV_{rms}	kV_{peak}	Mass kg	A_{max}	B	C	D	Fig.
24	24	XV024	1363	283	126	126	242	16	481	-	-	-	1
36	30-36	XV036	1363	283	126	126	242	16	481	-	-	-	1
52	42-72	XV052	2270	400	187	187	330	24	736	-	-	-	1
72	54-72	XV072	2270	400	187	187	330	24	736	-	-	-	1
	75-84	XV072	3625	578	293	293	462	35	1080	-	-	-	1
100	75-96	XV100	3625	578	293	293	462	35	1080	-	-	-	1
123	90-120	XH123	3625	578	293	293	462	35	1080	-	-	-	1
	90-96	XV123	4540	800	374	374	660	46	1417	-	-	-	2
	108-144	XV123	4540	800	374	374	660	44	1397	-	-	-	2
	150	XV123	4988	861	419	419	704	47	1486	-	-	-	2
145	108-120	XH145	3625	578	293	293	462	37	1100	-	-	-	1
	108-120	XV145	4540	800	374	374	660	46	1417	-	-	-	2
	132-144	XV145	4540	800	374	374	660	44	1397	-	-	-	2
	150	XV145	4988	861	419	419	704	47	1486	-	-	-	2
	162-168	XV145	5895	978	480	480	792	55	1741	-	-	-	2
170	132-144	XH170	4540	800	374	374	660	46	1417	400	-	160	3
	150	XH170	4988	861	419	419	704	49	1506	400	-	160	3
	132	XV170	5895	978	480	480	792	58	1761	400	-	160	3
	144-192	XV170	5895	978	480	480	792	57	1761	400	-	160	3
245	192	XM245	5895	978	480	480	492	60	1761	600	-	300	4
	180-210	XH245	7250	1156	586	586	924	71	2105	600	-	300	4
	216-228	XH245	7250	1156	586	586	924	69	2105	600	-	300	4
	180-198	XV245	8613	1439	712	712	1166	86	2617	800	600	400	5
	210-228	XV245	8613	1439	712	712	1166	83	2617	800	600	400	5
300	216-264	XH300	8613	1439	712	712	1166	86	2617	900	600	500	5
	276	XH300	8613	1439	712	712	1166	86	2617	900	600	500	6
	216	XV300	9520	1556	773	773	1254	100	2872	900	600	500	5
	240-258	XV300	9520	1556	773	773	1254	99	2872	900	600	500	5
	264-276	XV300	9520	1556	773	773	1254	94	2872	900	600	500	5
362	258-264	XH362	9520	1556	773	773	1254	100	2872	1200	800	600	5
	276-288	XH362	9520	1556	773	773	1254	99	2872	1200	800	600	5
	258-288	XV362	11790	1956	960	960	1584	125	3533	1400	800	700	7
420	330-342	XH420	10875	1734	879	879	1386	116	3216	1400	800	700	5
	360	XH420	10875	1734	879	879	1386	116	3216	1400	800	700	5
Neutral-ground arresters													
52	30-36	XN052	1363	400	187	187	330	24	736	-	-		1
72	42-54	XN072	2270	400	187	187	330	24	736	-	-		1
100	60	XN100	2270	400	187	187	330	24	736	-	-		1
123	72	XN123	2270	400	187	187	330	24	736	-	-		1
	75-120	XN123	3625	578	293	293	462	35	1080	-	-		1
145	84-120	XN145	3625	578	293	293	462	35	1080	-	-	-	1
170	84-120	XN170	3625	578	293	293	462	36	1080	-	-	-	1
245	108-120	XN245	3625	578	293	293	462	36	1080	-	-	-	1
	132-144	XN245	4540	800	374	374	660	45	1397	-	-	-	1

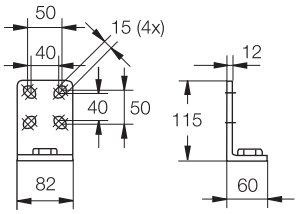
*) Sum of withstand voltages for empty units of arrester.

Technical data for housings

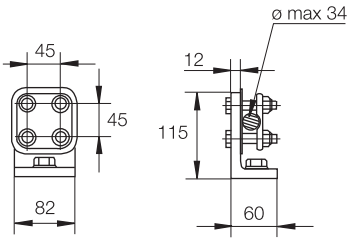


Accessories

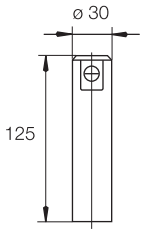
Line terminals



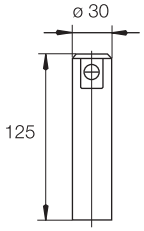
1HSA410 000-L
Aluminium



1HSA410 000-M
Aluminium flag with other items in stainless steel

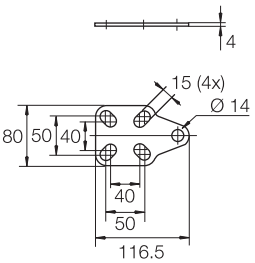


1HSA410 000-N
Aluminium

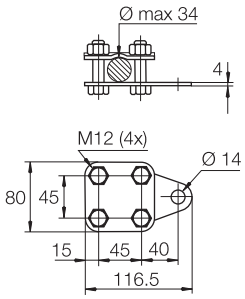


1HSA410 000-P
Stainless steel

Earth terminals



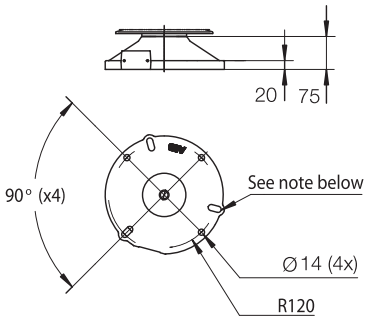
1HSA420 000-A
Stainless steel



1HSA420 000-B
Stainless steel

Drilling plans

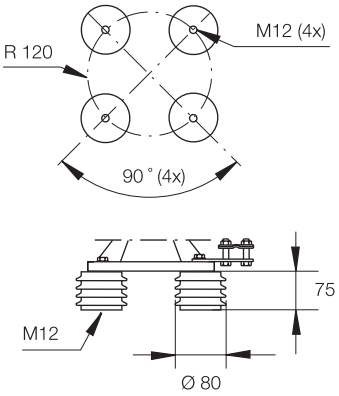
Without insulating base



Aluminium

NOTE! Alternative drilling plan — 3 slotted holes (120 º), n14 at R111-127

With insulating base



1HSA430 000-A
Epoxy resin

M12 bolts for connection to structure are not supplied by ABB. Required threaded grip length is 15-20 mm.

Shipping Data

Rated Voltage	Housing	Number of arresters per crate					
		One		Three		Six	
Ur kV_{rms}		Volume m^3	Gross kg	Volume m^3	Gross kg	Volume m^3	Gross kg
24	XV024						
30-36	XV036						
042-072	XV052	0.5	49	0.5	107	0.9	194
054-072	XV072	0.5	49	0.5	107	0.9	194
075-084	XV072	0.7	65	0.7	145	1.2	265
075-096	XV100	0.7	65	0.7	145	1.2	265
090-120	XH123	0.7	65	0.7	145	1.2	265
090-096	XV123	0.9	81	0.9	183	1.5	336
108-144	XV123	0.9	81	0.9	183	1.5	336
150	XV123	0.9	81	0.9	183	1.5	336
108-120	XH145	0.7	67	0.7	151	1.2	277
108-120	XV145	0.9	82	0.9	186	1.5	338
132-144	XV145	0.9	81	0.9	186	1.5	342
150	XV145	0.9	82	0.9	186	1.5	342
162-168	XV145	1.1	95	1.1	215	1.9	395
132-144	XH170	0.9	84	0.9	192	1.5	354
150	XH170	0.9	84	0.9	192	1.5	354
132	XV170	1.1	98	1.1	224	1.9	413
144-192	XV170	1.1	98	1.1	224	1.9	413
192	XM245	1.1	100	1.1	230	1.9	425
180-210	XH245	1.1	111	1.1	263	1.9	491
216-228	XH245	1.1	109	1.1	257	1.9	479
180-198	XV245	1.0	164	1.7	340	-	-
210-228	XV245	0.9	115	1.5	291	-	-
216-276	XH300	0.9	126	1.7	345	-	-
216	XV300	1.5	211	2.6	443	-	-
240-258	XV300	1.4	192	2.3	416	-	-
264-276	XV300	1.0	157	1.7	369	-	-
258-264	XH362	1.5	211	2.5	443	-	-
276-288	XH362	1.4	192	2.3	416	-	-
258-288	XV362	2.2	278	3.8	564	-	-
330-360	XH420	2.2	268	3.8	534	-	-
Neutral-ground arresters							
30-36	XN052	0.5	49	0.5	83	0.9	146
42-54	XN072	0.5	49	0.5	83	0.9	146
60	XN100	0.5	49	0.5	83	0.9	146
72	XN123	0.5	49	0.5	83	0.9	146
75-120	XN123	0.7	65	0.7	145	1.2	265
84-120	XN145	0.7	65	0.7	145	1.2	265
84-120	XN170	0.7	65	0.7	145	1.2	265
108-120	XN245	0.7	65	0.7	145	1.2	265
132, 144	XN245	0.9	81	0.9	183	1.5	336

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

Zinc-Oxide Surge Arrester PEXLIM P

Protection of switchgears, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages.

- in areas with very high lightning intensity
- where grounding or shielding conditions are poor or incomplete
- for important installations
- where energy requirements are very high (e.g. very long lines, capacitor protection).

Superior where low weight, reduced clearances, flexible mounting, non-fragility and additional personnel safety is required.

Major component in PEXLINK™ concept for transmission line protection.

Brief peformance data

System voltages (U_m)	52 - 420 kV
Rated voltages (U_r)	42 - 360 kV
Nominal discharge current (IEC)	20 kA_{peak}
Classifying current (ANSI/IEEE)	15 kA_{peak}
Discharge current withstand strength:	
High current 4/10 µs	100 kA_{peak}
Low current 2000 µs	1 350 A_{peak}
Energy capability:	
Line discharge class (IEC) [2 impulses, (IEC Cl. 8.5.5)	Class 4 12.0 kJ/kV (U_r)]
Fulfils/exceeds requirements of ANSI transmission-line discharge test for 362 kV systems.	
Short-circuit / Pressure relief capability	65 kA_{sym}
External insulation	Fulfils/exceeds standards
Mechanical strength:	
Declared permissible static service load (DPSSL)	2 500 Nm
Maximum permissible dynamic service load (MPDSL)	4 000 Nm
Service conditions:	
Ambient temperature	-50 °C to +45 °C
Design altitude (Higher altitudes on request)	max. 1 000 m
Frequency	15 - 62 Hz

Guaranteed protective data

Max. System Voltage	Rated Voltage	Max. continuous operating voltage 1)		TOV capability 2)		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_m kV_{rms}	U_r kV_{rms}	U_C kV_{rms}	MCOV kV_{rms}	1 s kV_{rms}	10 s kV_{rms}	1 kA kV_{peak}	2 kA kV_{peak}	3 kA kV_{peak}	5 kA kV_{peak}	10 kA kV_{peak}	20 kA kV_{peak}	40 kA kV_{peak}
24 3)	24	19.2	19.5	27.8	26.4	46.8	48.5	49.7	51.9	54.6	59.8	65.6
36 3)	30	24.0	24.4	34.8	33.0	58.5	60.7	62.2	64.9	68.3	74.8	81.9
	33	26.4	26.7	38.2	36.3	64.4	66.7	68.4	71.4	75.1	82.3	90.1
	36	28.8	29.0	41.7	39.6	70.2	72.8	74.6	77.9	81.9	89.7	98.3
	39	31.2	31.5	45.2	42.9	76.1	78.8	80.8	84.3	88.8	97.2	107
52	42	34	34.0	48.7	46.2	81.9	84.9	87.0	90.8	95.6	105	115
	48	38	39.0	55.6	52.8	93.6	97.0	99.4	104	110	120	132
	51	41	41.3	59.1	56.1	99.5	104	106	111	117	128	140
72	54	43	43.0	62.6	59.4	106	110	112	117	123	135	148
	60	48	48.0	69.6	66.0	117	122	125	130	137	150	164
	63	50	51.0	73.0	69.3	123	128	131	137	144	157	172
	72	58	58.0	83.5	79.2	141	146	150	156	164	180	197
100	66	53	53.4	76.5	72.6	129	134	137	143	151	165	181
	72	58	58.0	83.5	79.2	141	146	150	156	164	180	197
	75	60	60.7	87.0	82.5	147	152	156	163	171	187	205
	78	62	63.1	90.4	85.8	153	158	162	169	178	195	213
	81	65	65.6	93.9	89.1	158	164	168	176	185	202	222
	84	67	68.0	97.4	92.4	164	170	174	182	192	210	230
123	90	72	72.0	104	99.0	176	182	187	195	205	225	246
	96	77	77.0	111	105	188	194	199	208	219	240	263
	90	72	72.0	104	99.0	176	182	187	195	205	225	246
	102	78	82.6	118	112	199	207	212	221	233	255	279
	108	78	84.0	125	118	211	219	224	234	246	270	295
	114	78	92.3	132	125	223	231	237	247	260	284	312
	120	78	98.0	139	132	234	243	249	260	273	299	328
	129	78	104	149	141	252	261	268	279	294	322	353
	132	78	106	153	145	258	267	274	286	301	329	361
	138	78	111	160	151	270	279	286	299	314	344	377
	144	78	115	167	158	281	291	299	312	328	359	394
	150	78	121	174	165	293	304	311	325	342	374	410

More detailed information on the TOV capability and the protective characteristics are given in Publ. 1HSM 9543 13-01en.

1) The continuous operating voltages U_C (as per IEC) and MCOV (as per ANSI) differ only due to deviations in type test procedures.
Uc has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_C higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the maximum single-impulse energy stress (7.0 kJ/kV (U_r)).

3) Arresters for system voltages 36 kV or below can be supplied, on request, when the order also includes arresters for higher system voltages.

Arresters with lower or higher rated voltages may be available on request for special applications.

Guaranteed protective data

Max. System Voltage	Rated Voltage	Max. continuous operating voltage 1)		TOV capability 2)		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_m kV_{rms}	U_r kV_{rms}	U_C kV_{rms}	MCOV kV_{rms}	1 s kV_{rms}	10 s kV_{rms}	1 kA kV_{peak}	2 kA kV_{peak}	3 kA kV_{peak}	5 kA kV_{peak}	10 kA kV_{peak}	20 kA kV_{peak}	40 kA kV_{peak}
145	108	86	86.0	125	118	211	219	224	234	246	270	295
	120	92	98.0	139	132	234	243	249	260	273	299	328
	132	92	106	153	145	258	267	274	286	301	329	361
	138	92	111	160	151	270	279	286	299	314	344	377
	144	92	115	167	158	281	291	299	312	328	359	394
	150	92	121	174	165	293	304	311	325	342	374	410
	162	92	131	187	178	316	328	336	351	369	404	443
	168	92	131	194	184	328	340	348	364	383	419	459
170	132	106	106	153	145	258	267	274	286	301	329	361
	144	108	115	167	158	281	291	299	312	328	359	394
	150	108	121	174	165	293	304	311	325	342	374	410
	162	108	131	187	178	316	328	336	351	369	404	443
	168	108	131	194	184	328	340	348	364	383	419	459
	180	108	144	208	198	351	364	373	390	410	449	492
	192	108	152	222	211	375	388	398	415	437	479	525
245	180	144	144	208	198	351	364	373	390	410	449	492
	192	154	154	222	211	375	388	398	415	437	479	525
	198	156	160	229	217	387	400	410	428	451	494	541
	210	156	170	243	231	410	425	435	454	478	524	574
	214	156	173	248	235	419	434	445	464	488	535	586
	216	156	175	250	237	422	437	448	467	492	539	590
	219	156	177	254	240	427	443	454	474	499	546	598
	222	156	179	257	244	433	449	460	480	506	554	607
	228	156	180	264	250	445	461	473	493	519	568	623
300	216	173	175	250	237	422	437	448	467	492	539	590
	228	182	182	264	250	445	461	473	493	519	568	623
	240	191	191	278	264	468	485	497	519	546	598	656
	258	191	209	299	283	504	522	535	558	587	643	705
	264	191	212	306	290	515	534	547	571	601	658	721
	276	191	220	320	303	539	558	572	597	628	688	754
362	258	206	209	299	283	504	522	535	558	587	643	705
	264	211	212	306	290	515	534	547	571	601	658	721
	276	221	221	320	303	539	558	572	597	628	688	754
	288	230	230	334	316	562	582	597	623	656	718	787
420	330	264	267	382	363	644	667	684	714	751	823	901
	336	267	272	389	369	656	679	696	727	765	838	918
	342	267	277	396	376	667	691	709	740	779	852	934
	360	267	291	417	396	702	728	746	779	819	897	983

More detailed information on the TOV capability and the protective characteristics are given in Publ. 1HSM 9543 13-01en.

1) The continuous operating voltages U_C (as per IEC) and MCOV (as per ANSI) differ only due to deviations in type test procedures.
Uc has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_C higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the maximum single-impulse energy stress (7.0 kJ/kV (U_r)).

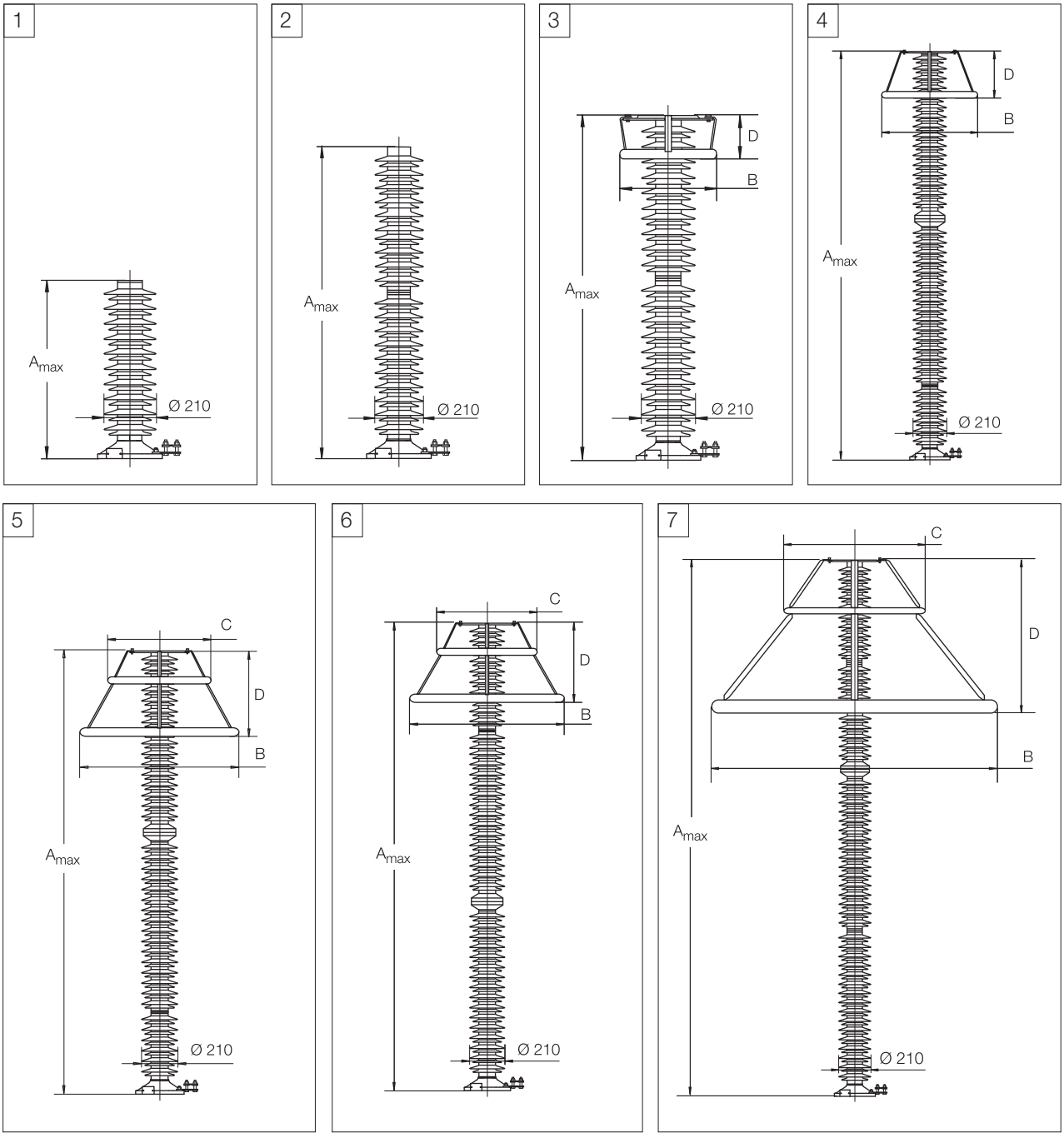
Arresters with lower or higher rated voltages may be available on request for special applications.

Technical data for housings

Max. system voltage	Rated Voltage	Housing	Creepage distance	External insulation *)				Dimensions					
				1.2/50 µs dry	50 Hz wet (60s)	60 Hz wet (10s)	250/2500 µs wet						
U_m kV_{rms}	U_r kV_{rms}		mm	kV_{peak}	kV_{rms}	kV_{rms}	kV_{peak}	Mass kg	A_{max}	B	C	D	Fig.
24	18-24	XV024	1363	283	126	126	242	18	481	-	-	-	1
36	30-36	XV036	1363	283	126	126	242	18	481	-	-	-	1
	39	XV036	2270	400	187	187	330	29	736	-	-	-	1
52	42-72	XV052	2270	400	187	187	330	29	736	-	-	-	1
72	54-72	XV072	2270	400	187	187	330	28	736	-	-	-	1
	75-84	XV072	3625	578	293	293	462	43	1080	-	-	-	1
100	75-96	XV100	3625	578	293	293	462	43	1080	-	-	-	1
123	90-120	XH123	3625	578	293	293	462	42	1080	-	-	-	1
	90-144	XV123	4540	800	374	374	660	53	1397	-	-	-	2
	150	XV123	4988	861	419	419	704	54	1486	-	-	-	2
145	108-120	XH145	3625	578	293	293	462	41	1080	-	-	-	1
	108-144	XV145	4540	800	374	374	660	52	1397	-	-	-	2
	150	XV145	4988	861	419	419	704	54	1486	-	-	-	2
	162-168	XV145	5895	978	480	480	792	65	1741	-	-	-	2
170	132-144	XH170	4540	800	374	374	660	52	1417	400	-	160	3
	150	XH170	4988	861	419	419	704	56	1506	400	-	160	3
	132-192	XV170	5895	978	480	480	792	69	1761	400	-	160	3
245	180-192	XM245	5895	978	480	480	792	65	1761	400	-	160	3
	180-228	XH245	7250	1156	586	586	924	82	2105	400	-	160	3
	180-198	XV245	8613	1439	712	712	1166	100	2617	800	600	400	5
	210-228	XV245	8613	1439	712	712	1166	97	2617	600	-	300	4
300	216-264	XH300	8613	1439	712	712	1166	101	2617	900	600	500	5
	276	XH300	8613	1439	712	712	1166	97	2617	900	600	500	6
	216-276	XV300	9520	1556	773	773	1254	109	2872	900	600	500	5
362	258-288	XH362	9520	1556	773	773	1254	117	2872	1200	800	600	5
	258-288	XV362	11790	1956	960	960	1584	146	3533	1400	800	700	7
420	330-360	XH420	10875	1734	879	879	1386	130	3216	1400	800	700	5
Neutral-ground arresters													
52	30-36	XN052	1363	283	126	126	242	19	481	-	-	-	1
72	42-54	XN072	2270	400	187	187	330	29	736	-	-	-	1
100	60	XN100	2270	400	187	187	330	30	736	-	-	-	1
123	72	XN123	2270	400	187	187	330	28	736	-	-	-	1
	75-120	XN123	3625	578	293	293	462	43	1080	-	-	-	1
145	84-120	XN145	3625	578	293	293	462	42	1080	-	-	-	1
170	96-120	XN170	3625	578	293	293	462	42	1080	-	-	-	1
245	108	XN245	3625	578	293	293	462	41	1080	-	-	-	1
	132-144	XN245	4540	800	374	374	660	50	1397	-	-	-	1

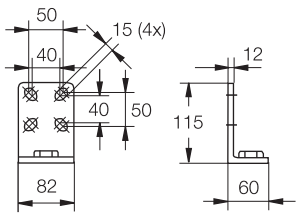
*) Sum of withstand voltages for empty units of arrester.

Technical data for housings

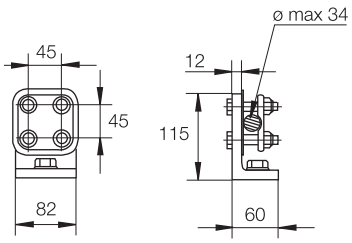


Accessories

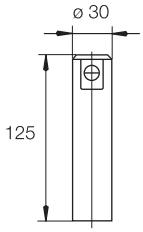
Line terminals



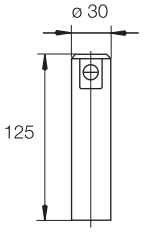
1HSA410 000-L
Aluminium



1HSA410 000-M
Aluminium flag with other items in stainless steel

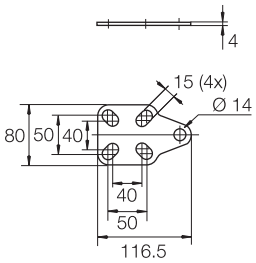


1HSA410 000-N
Aluminium

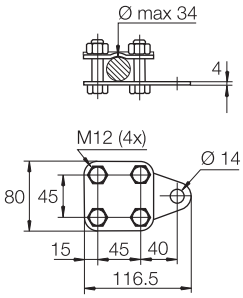


1HSA410 000-P
Stainless steel

Earth terminals



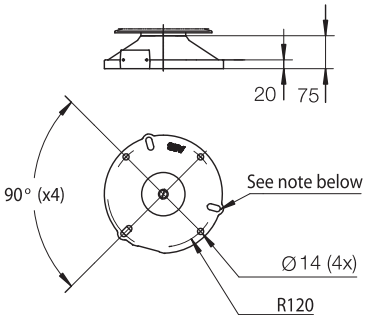
1HSA420 000-A
Stainless steel



1HSA420 000-B
Stainless steel

Drilling plans

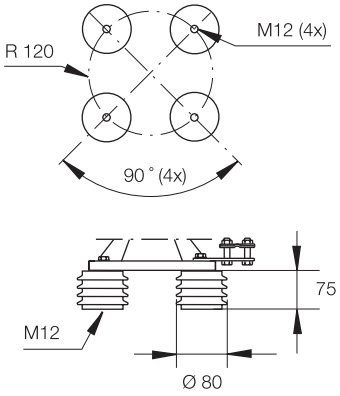
Without insulating base



Aluminium

NOTE! Alternative drilling plan — 3 slotted holes (120 °), n14 at R111-127

With insulating base



1HSA430 000-A
Epoxy resin

M12 bolts for connection to structure are not supplied by ABB. Required threaded grip length is 15-20 mm.

Shipping data

Rated Voltage	Housing	Number of arresters per crate					
		One		Three		Six	
Ur kV_{rms}		Volume m^3	Gross kg	Volume m^3	Gross kg	Volume m^3	Gross kg
24	XV024	0.1	42	0.5	86	0.9	152
30-36	XV036	0.1	42	0.5	86	0.9	152
39	XV036	0.5	52	0.5	116	0.9	212
42-72	XV052	0.5	52	0.5	116	0.9	212
54-72	XV072	0.5	52	0.5	116	0.9	212
75-84	XV072	0.7	71	0.7	163	1.2	301
75-96	XV100	0.7	71	0.7	163	1.2	301
90-120	XH123	0.7	71	0.7	163	1.2	301
90-144	XV123	0.9	87	0.9	201	1.5	372
150	XV123	0.9	87	0.9	201	1.5	372
108-120	XH145	0.7	68	0.7	154	1.2	283
108-144	XV145	0.9	87	0.9	201	1.5	372
150	XV145	0.9	87	0.9	201	1.5	372
162-168	XV145	1.1	98	1.1	239	1.9	443
132-144	XH170	0.9	89	0.9	207	1.5	384
150	XH170	0.9	89	0.9	207	1.5	384
132-192	XV170	1.1	102	1.1	251	1.9	443
192	XM245	1.1	98	1.1	239	1.9	443
180-228	XH245	1.1	115	1.1	290	1.9	545
180-198	XV245	0.9	133	1.5	339	-	-
210-228	XV245	0.9	133	1.5	339	-	-
216-264	XH300	1.0	155	1.7	358	-	-
276	XH300	1.0	155	1.7	358	-	-
216-276	XV300	1.0	163	1.7	382	-	-
258-288	XH362	1.6	207	2.3	435	-	-
258	XV362	2.1	242	2.9	497	-	-
264-288	XV362	2.1	258	2.3	545	-	-
330-360	XH420	2.1	242	2.3	497	-	-
Neutral-ground arresters							
30-36	XN052	0.1	42	0.5	86	0.9	152
42-54	XN072	0.5	52	0.5	116	0.9	212
60	XN100	0.5	52	0.5	116	0.9	212
72	XN123	0.5	52	0.5	116	0.9	212
75-120	XN123	0.7	71	0.7	163	1.2	301
84-120	XN145	0.7	71	0.7	163	1.2	301
96-120	XN170	0.7	71	0.7	163	1.2	301
108-120	XN245	0.7	71	0.7	163	1.2	301
132-144	XN245	0.9	87	0.9	201	1.5	372

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

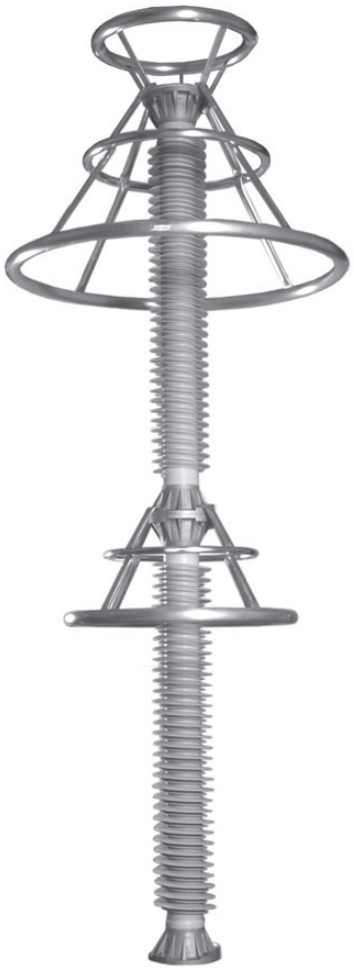
Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

Zinc-Oxide Surge Arrester HS PEXLIM P-T

Protection of switchgears, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages.

- in areas with very high lightning intensity
- where grounding or shielding conditions are poor or incomplete
- for important installations
- where energy requirements are very high (e.g. very long lines, capacitor protection).
- Specially suited to high seismic applications.

Superior where low weight, non-fragility and additional personnel safety is required.



Brief peformance data

System voltages (U_m)	245 - 550 kV
Rated voltages (U_r)	180 - 444 kV
Nominal discharge current (IEC)	20 kA_{peak}
Classifying current (ANSI/IEEE)	10/15 kA_{peak}
Discharge current withstand strength: High current 4/10 µs Low current 2000 µs	 100 kA_{peak} 1 350 A_{peak}
Energy capability: Line discharge class (IEC) [2 impulses, (IEC Cl. 8.5.5) Fulfils/exceeds requirements of ANSI transmission-line discharge test for 362 kV systems.	 Class 4 10.5 kJ/kV (U_r)]
Short-circuit / Pressure relief capability	65 kA_{sym}
External insulation	Fulfils/exceeds standards
Mechanical strength: Declared permissible static service load (DPSSL) Maximum permissible dynamic service load (MPDSL)	 19 000 Nm 28 000 Nm
Service conditions: Ambient temperature Design altitude (Higher altitudes on request) Frequency	 -50 °C to +40 °C max. 1 000 m 15 - 62 Hz

Guaranteed protective data

Max. System Voltage	Rated Voltage	Max. continuous operating voltage 1)		TOV capability 2)		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_m kV_{rms}	U_r kV_{rms}	U_C kV_{rms}	MCOV kV_{rms}	1 s kV_{rms}	10 s kV_{rms}	1 kA kV_{peak}	2 kA kV_{peak}	3 kA kV_{peak}	5 kA kV_{peak}	10 kA kV_{peak}	20 kA kV_{peak}	40 kA kV_{peak}
245	180	144	144	208	198	351	364	373	390	410	449	492
	192	154	154	222	211	375	388	398	415	437	479	525
	228	156	180	264	250	445	461	473	493	519	568	623
300	228	182	182	264	250	445	461	473	493	519	568	623
	240	191	191	278	264	468	485	497	519	546	598	656
	264	191	212	306	290	515	534	547	571	601	658	721
362	258	206	209	299	283	504	522	535	558	587	643	705
	264	211	212	306	290	515	534	547	571	601	658	721
	276	221	221	320	303	539	558	572	597	628	688	754
380	288	230	230	334	316	562	582	597	623	656	718	787
400	300	240	240	348	330	585	607	622	649	683	748	819
420	330	264	267	382	363	644	667	684	714	751	823	901
	360	267	291	417	396	702	728	746	779	819	897	983
	390	267	315	452	429	761	788	808	843	888	972	1070
550	396	317	318	459	435	773	800	820	856	901	987	1086
	420	336	336	487	462	819	849	870	908	956	1051	1152
	444	349	353	515	488	866	897	920	960	1015	1111	1217

More detailed information on the TOV capability and the protective characteristics are given in Publ. 1HSM 9543 13-01en.

1) The continuous operating voltages U_C (as per IEC) and MCOV (as per ANSI) differ only due to deviations in type test procedures.
Uc has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_C higher than or equal to the actual system voltage divided by √3 can be selected.

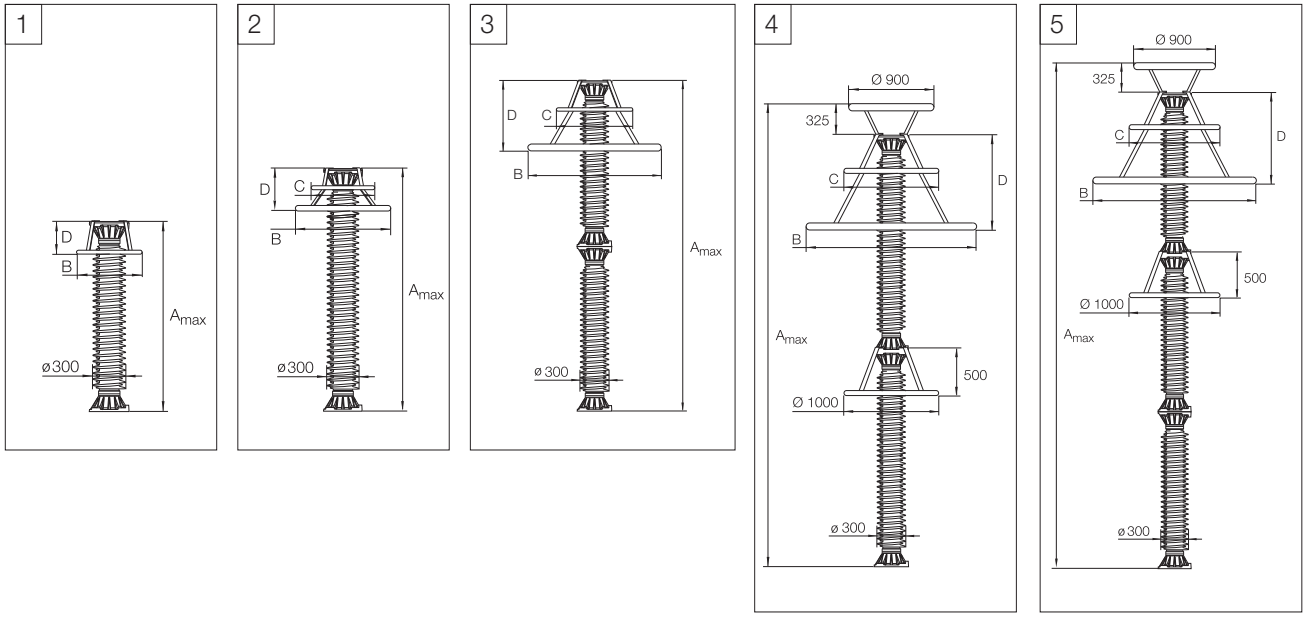
2) With prior duty equal to the maximum single-impulse energy stress (7.0 kJ/kV (U_r)).

Arresters with lower or higher rated voltages may be available on request for special applications.

Technical data for housings

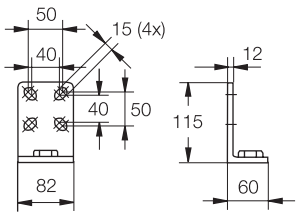
Max. system voltage	Rated Voltage	Housing	Creepage distance	External insulation *)				Dimensions					
				1.2/50 µs dry	50 Hz wet (60s)	60 Hz wet (10s)	250/2500 µs wet						
U_m kV_{rms}	U_r kV_{rms}		mm	kV_{peak}	kV_{rms}	kV_{rms}	kV_{peak}	Mass kg	A_{max}	B	C	D	Fig.
245	180-192	TM245	4950	750	350	350	525	115	1770	600	-	300	1
	180-192	TH245	7150	1081	524	510	750	150	2310	800	-	500	1
	228	TH245	7150	1081	524	510	750	150	2310	600	-	300	1
300	228-264	TM300	7150	1081	524	510	750	150	2310	900	600	400	2
	228	TV300	9900	1500	700	700	1050	245	3495	1400	800	700	3
	240	TV300	9900	1500	700	700	1050	245	3495	1200	800	600	3
	264	TV300	9900	1500	700	700	1050	235	3495	900	600	500	3
362	258-264	TH362	9900	1500	700	700	1050	245	3495	1600	800	1000	3
	276	TH362	9900	1500	700	700	1050	240	3495	1200	800	800	3
380	288	TH380	9900	1500	700	700	1050	240	3495	1400	800	700	3
400	300	TM400	9900	1500	700	700	1050	240	3495	1400	800	700	3
420	330-390	TH420	12100	1831	874	860	1275	270	4035	1200	800	800	3
550	396	TH550	14300	2162	1048	1020	1500	315	4890	1800	1000	1000	4
	420	TH550	14300	2162	1048	1020	1500	315	4890	1800	1000	800	4
	444	TH550	14850	2250	1050	1050	1575	365	5540	1800	1000	1000	5

*) Sum of withstand voltages for empty units of arrester.

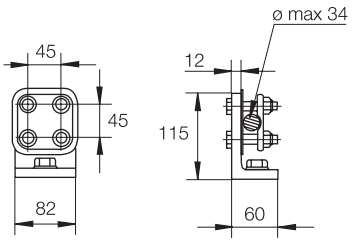


Accessories

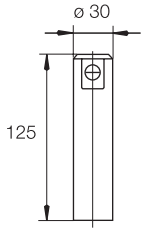
Line terminals



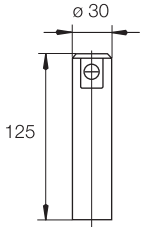
1HSA410 000-A
Aluminium



1HSA410 000-B
Aluminium flag with other items in stainless steel

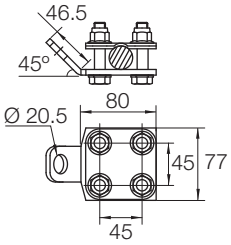


1HSA410 000-C
Aluminium

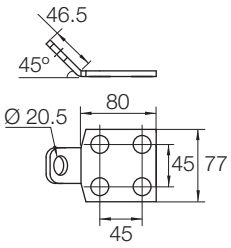


1HSA410 000-D
Stainless steel

Earth terminals



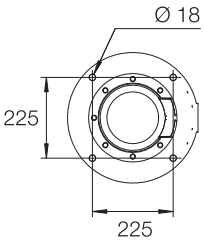
1HSA420 000-U
Stainless steel

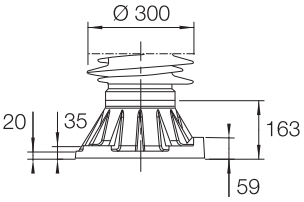


1HSA420 000-002
Stainless steel

Drilling plans

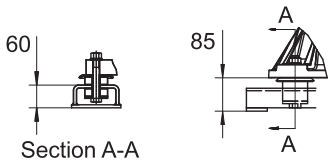
Without insulating base

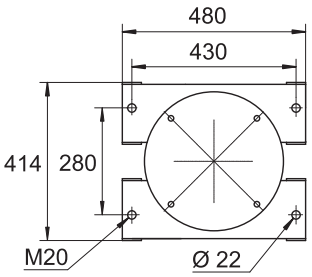




Aluminium

With insulating base





1HSA430 000-P
Galvanized steel

M20 bolts for connection to structure are not supplied by ABB.

Shipping data

Rated Voltage	Housing	Number of arresters per crate					
		One		Three		Six	
Ur		Volume	Gross	Volume	Gross	Volume	Gross
kV_{rms}		m^3	kg	m^3	kg	m^3	kg
180	TM245	2.9	298	2.9	566	3.6	1013
192	TM245	2.9	298	2.9	564	3.6	1009
180	TH245	3.8	359	3.8	696	4.7	1251
192	TH245	3.8	358	3.8	694	4.7	1247
228	TH245	3.6	350	3.6	679	4.2	1218
228	TM300	3.8	358	3.8	693	4.7	1245
240	TM300	3.8	357	3.8	691	4.7	1241
264	TM300	3.8	354	3.8	682	4.7	1223
228	TV300	2.9	441	3.2	965	-	-
240	TV300	2.8	424	3.0	943	-	-
264	TV300	3.1	419	3.1	920	-	-
258	TH362	3.3	483	4.1	1029	-	-
264	TH362	3.3	482	4.1	1028	-	-
276	TH362	2.8	423	3.0	939	-	-
288	TH380	2.9	436	3.3	950	-	-
300	TM400	2.9	437	3.3	951	-	-
330	TH420	3.4	474	3.7	1051	-	-
360	TH420	3.4	471	3.7	1041	-	-
390	TH420	3.4	467	3.7	1031	-	-
396	TH550	4.0	574	4.8	1261	-	-
420	TH550	4.0	572	4.8	1254	-	-

Rated Voltage	Housing	Number of arresters per crate			
		One		Two	
Ur		Volume	Gross	Volume	Gross
kV_{rms}		m^3	kg	m^3	kg
444	TH550	3.3	602	3.8	985

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

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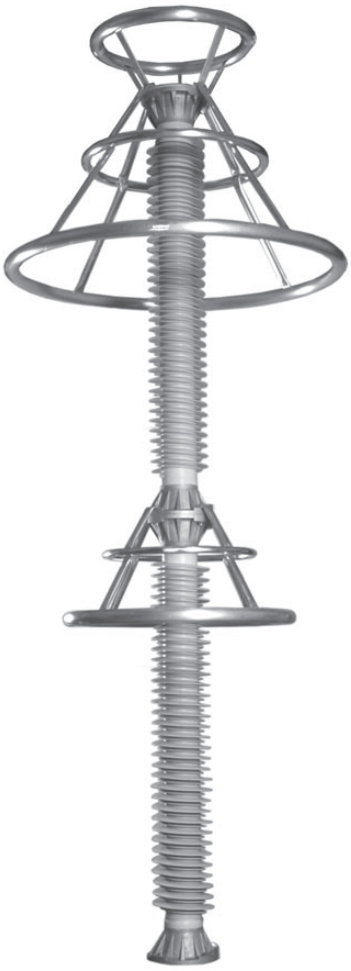
Zinc-Oxide Surge Arrester HS PEXLIM T-T

Protection of switchgears, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages.

- in areas with very high lightning intensity
- where grounding or shielding conditions are poor or incomplete
- for important installations
- where energy requirements are very high (e.g. very long lines, capacitor protection).
- Specially suited to high seismic applications.

Superior where low weight, non-fragility and additional personnel safety is required.



Brief peformance data

System voltages (U_m)	245 - 800 kV
Rated voltages (U_r)	180 - 624 kV
Nominal discharge current (IEC)	20 kA_{peak}
Classifying current (ANSI/IEEE)	10/15/20 kA_{peak}
Discharge current withstand strength: High current 4/10 µs Low current 2000 µs	 100 kA_{peak} 1 900 A_{peak}
Energy capability: Line discharge class (IEC) [2 impulses, (IEC Cl. 8.5.5) Fulfils/exceeds requirements of ANSI transmission-line discharge test for 362 kV systems.	 Class 5 15.4 kJ/kV (U_r)]
Short-circuit / Pressure relief capability	65 kA_{sym}
External insulation	Fulfils/exceeds standards
Mechanical strength: Declared permissible static service load (DPSSL) Maximum permissible dynamic service load (MPDSL)	 19 000 Nm 28 000 Nm
Service conditions: Ambient temperature Design altitude (Higher altitudes on request) Frequency	 -50 °C to +40 °C max. 1 000 m 15 - 62 Hz

Guaranteed protective data

Max. System Voltage	Rated Voltage	Max. continuous operating voltage 1)		TOV capability 2)		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_m kV_{rms}	U_r kV_{rms}	U_C kV_{rms}	MCOV kV_{rms}	1 s kV_{rms}	10 s kV_{rms}	1 kA kV_{peak}	2 kA kV_{peak}	3 kA kV_{peak}	5 kA kV_{peak}	10 kA kV_{peak}	20 kA kV_{peak}	40 kA kV_{peak}
245	180	144	144	209	198	354	364	371	389	405	438	476
	192	154	154	218	207	369	380	387	406	423	457	497
	216	156	174	246	233	415	427	435	457	476	514	559
	228	156	180	259	246	438	451	459	482	502	542	590
300	228	182	182	259	246	438	451	459	482	502	542	590
	240	191	191	273	258	461	475	484	507	528	571	621
362	258	206	209	310	293	523	538	548	575	599	647	704
	264	211	212	310	293	523	538	548	575	599	647	704
	276	221	221	314	297	531	546	556	583	608	656	714
380	288	230	230	328	310	554	569	580	609	634	685	745
400	300	240	240	342	323	577	593	604	634	660	713	776
420	330	264	267	378	358	638	656	669	702	731	789	859
	360	267	291	410	388	692	712	725	761	792	856	931
	390	267	315	444	420	750	771	786	824	858	927	1013
550	396	317	318	474	448	793	816	831	872	908	981	1072
	420	336	336	478	453	807	830	846	888	924	998	1091
	444	349	353	506	479	853	878	894	938	977	1060	1153
800	On request											

More detailed information on the TOV capability and the protective characteristics are given in Publ. 1HSM 9543 13-01en.

1) The continuous operating voltages U_C (as per IEC) and MCOV (as per ANSI) differ only due to deviations in type test procedures.
Uc has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_C higher than or equal to the actual system voltage divided by √3 can be selected.

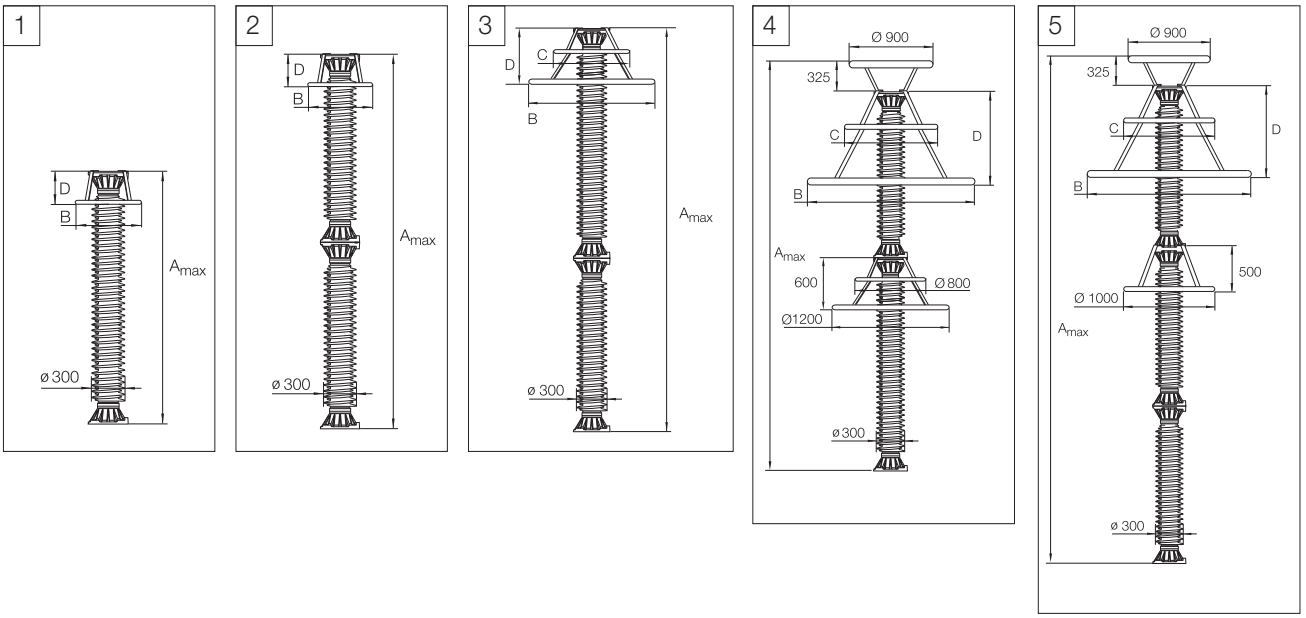
2) With prior duty equal to the maximum single-impulse energy stress (10.0 kJ/kV (U_r)).

Arresters with lower or higher rated voltages may be available on request for special applications.

Technical data for housings

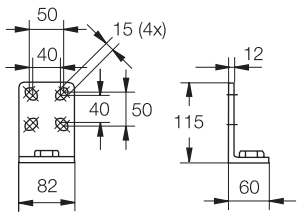
Max. system voltage	Rated Voltage	Housing	Cree-page distance	External insulation *)				Dimensions					
				1.2/50 µs dry	50 Hz wet (60s)	60 Hz wet (10s)	250/2500 µs wet						
U_m kV_{rms}	U_r kV_{rms}		mm	kV_{peak}	kV_{rms}	kV_{rms}	kV_{peak}	Mass kg	A_{max}	B	C	D	Fig.
245	180-216	TH245	7150	1081	524	510	750	170	2310	600	-	300	1
	228	TV245	9900	1500	700	700	1050	245	3495	600	-	300	2
300	228-240	TV300	9900	1500	700	700	1050	260	3495	1600	800	1000	3
362	258-276	TH362	9900	1500	700	700	1050	265	3495	1600	800	1000	3
380	288	TH380	9900	1500	700	700	1050	270	3495	1600	800	1000	3
400	300	TM400	9900	1500	700	700	1050	270	3495	1600	800	1000	3
420	330	TH420	12100	1831	874	860	1275	300	4035	1600	800	1000	3
	360	TH420	12100	1831	874	860	1275	300	4035	1200	800	600	3
	390	TV420	14300	2162	1048	1020	1500	330	4575	1200	800	600	3
550	396	TH550	14300	2162	1048	1020	1500	360	4890	1800	1000	1000	4
	420	TH550	14300	2162	1048	1020	1500	360	4890	1800	1000	1000	4
	444	TH550	14850	2250	1050	1050	1575	405	5540	1800	1000	1000	5

*) Sum of withstand voltages for empty units of arrester.

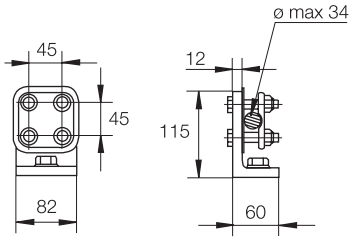


Accessories

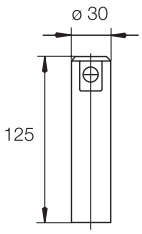
Line terminals



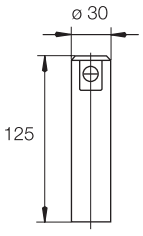
1HSA410 000-A
Aluminium



1HSA410 000-B
Aluminium flag with other items in stainless steel

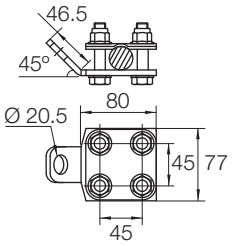


1HSA410 000-C
Aluminium

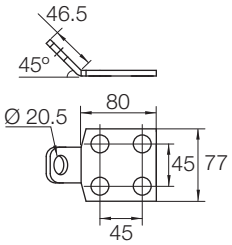


1HSA410 000-D
Stainless steel

Earth terminals



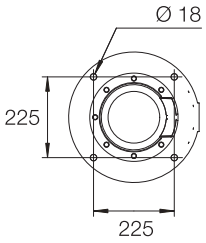
1HSA420 000-U
Stainless steel

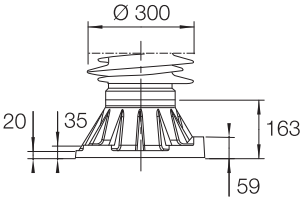


1HSA420 000-002
Stainless steel

Drilling plans

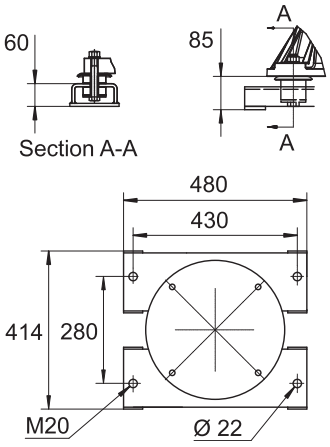
Without insulating base





Aluminium

With insulating base



1HSA430 000-P
Galvanized steel

M20 bolts for connection to structure are not supplied by ABB.

Shipping data

Rated Voltage	Housing	Number of arresters per crate					
		One		Three		Six	
Ur kV_{rms}		Volume m^3	Gross kg	Volume m^3	Gross kg	Volume m^3	Gross kg
180	TH245	3.6	366	3.6	727	4.2	1313
192	TH245	3.6	367	3.6	731	4.2	1321
216	TH245	3.6	372	3.6	743	4.2	1346
228	TV245	3.1	430	3.1	953	-	-
228	TV300	3.3	495	4.1	1066	-	-
240	TV300	3.3	497	4.1	1071	-	-
258	TH362	3.3	501	4.1	1086	-	-
264	TH362	3.3	501	4.1	1086	-	-
276	TH362	3.3	502	4.1	1088	-	-
288	TH380	3.3	504	4.1	1093	-	-
300	TM400	3.3	506	4.1	1098	-	-
330	TH420	4.0	558	4.8	1214	-	-
360	TH420	3.4	503	3.7	1137	-	-
390	TV420	3.4	534	3.7	1230	-	-
396	TH550	4.0	617	4.8	1391	-	-
420	TH550	4.0	618	4.8	1393	-	-

Rated Voltage	Housing	Number of arresters per crate			
		One		Two	
Ur kV_{rms}		Volume m^3	Gross kg	Volume m^3	Gross kg
444	TH550	3.3	642	3.8	1064

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

Zinc Oxide Surge Arrester EXLIM R

Protection of switchgear, transformers and other equipment in high voltage systems against atmospheric and switching over-voltages. For use when requirements of lightning intensity, energy capability and pollution are moderate.

Brief performance data

System voltages (U_m)	52 - 170 kV
Rated voltages (U_r)	42 - 168 kV
Nominal discharge current (IEC)	10 kA_{peak}
Classifying current (ANSI/IEEE)	10 kA_{peak}
Discharge current withstand strength: High current 4/10 µs Low current 2 000 µs	 100 kA_{peak} 550 A_{peak}
Energy capability: Line discharge class (IEC) [2 impulses, (IEC Cl. 8.5.5) Fulfils/exceeds requirements of ANSI transmission-line discharge test for 170 kV systems.	 Class 2 5.0 kJ/kV (U_r)]
Short-circuit / Pressure relief capability	50 kA_{sym}
External insulation	Fulfils/exceeds standards
Mechanical strength: Permissible static service load (PSSL) Maximum permissible dynamic service load (MPDSL)	 3 000 Nm 7 500 Nm
Service conditions: Ambient temperature Design altitude (Higher altitudes on request) Frequency	 -50 °C to +45 °C max. 1 000 m 15 - 62 Hz

Guranteed protective data

Max. System Voltage	Rated Voltage	Max. continuous operating voltage 1)		TOV capability 2)		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_m kV_{rms}	U_r kV_{rms}	U_C kV_{rms}	MCOV kV_{rms}	1 s kV_{rms}	10 s kV_{rms}	0.5 kA kV_{peak}	1 kA kV_{peak}	2 kA kV_{peak}	5 kA kV_{peak}	10 kA kV_{peak}	20 kA kV_{peak}	40 kA kV_{peak}
363)	24	19.2	19.5	27.8	26.4	49.4	51.3	53.8	58.7	62.2	69.7	79.6
	30	24.0	24.4	34.8	33.0	61.7	64.2	67.2	73.3	77.7	87.1	99.5
	33	26.4	26.7	38.2	36.3	67.9	70.6	73.9	80.6	85.5	95.8	110
	36	28.8	29.0	41.7	39.6	74.1	77.0	80.6	88.0	93.3	105	120
	39	31.2	31.5	45.2	42.9	80.3	83.4	87.3	95.3	102	114	130
52	42	34	34.0	48.7	46.2	86.4	89.8	94.0	103	109	122	140
	45	36	36.5	52.2	49.5	92.6	96.2	101	110	117	131	150
	48	38	39.0	55.6	52.8	98.8	103	108	118	125	140	160
	51	41	41.3	59.1	56.1	105	109	115	125	133	148	170
	54	43	43.0	62.6	59.4	112	116	121	132	140	157	180
	60	48	48.0	69.6	66.0	124	129	135	147	156	175	199
72	54	43	43.0	62.6	59.4	112	116	121	132	140	157	180
	60	48	48.0	69.6	66.0	124	129	135	147	156	175	199
	66	53	53.4	76.5	72.6	136	142	148	162	171	192	219
	72	58	58.0	83.5	79.2	149	154	162	176	187	209	239
	75	60	60.7	87.0	82.5	155	161	168	184	195	218	249
	84	67	68.0	97.4	92.4	173	180	188	206	218	244	279
100	75	60	60.7	87.0	82.5	155	161	168	184	195	218	249
	84	67	68.0	97.4	92.4	173	180	188	206	218	244	279
	90	72	72.0	104	99.0	186	193	202	220	234	262	299
	96	77	77.0	111	105	198	206	215	235	249	279	319
123	90	72	72.0	104	99.0	186	193	202	220	234	262	299
	96	77	77.0	111	105	198	206	215	235	249	279	319
	108	78	84.0	125	118	223	231	242	264	280	314	359
	120	78	98.0	139	132	247	257	269	294	311	349	398
	132	78	106	153	145	272	283	296	323	342	383	438
	138	78	111	160	151	284	295	309	338	358	401	458
145	108	86	86.0	125	118	223	231	242	264	280	314	359
	120	92	98.0	139	132	247	257	269	294	311	349	398
	132	92	106	153	145	272	283	296	323	342	383	438
	138	92	111	160	151	284	295	309	338	358	401	458
	144	92	115	167	158	297	308	323	352	373	418	478
170	132	106	106	153	145	272	283	296	323	342	383	438
	144	108	115	167	158	297	308	323	352	373	418	478
	162	108	131	187	178	334	347	363	396	420	470	538
	168	108	131	194	184	346	359	376	411	436	488	557

More detailed information on the TOV capability and the protective characteristics are given in Publ. 1HSM 9543 13-01en.

1) The continuous operating voltages U_C (as per IEC) and MCOV (as per ANSI) differ only due to deviations in type test procedures.
Uc has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_C higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the maximum single-impulse energy stress (2.5 kJ/kV (U_r)).

3) Arresters for system voltages 36 kV or below can be supplied, on request, when the order also includes arresters for higher system voltages.

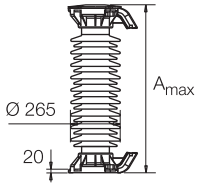
Arresters with lower or higher rated voltages may be available on request for special applications.

Technical data for housings

Max. system voltage	Rated Voltage	Housing	Creepage distance	External insulation			Dimensions					
				1.2/50 µs	50 Hz	250/2500 µs						
U_m kV_{rms}	U_r kV_{rms}		mm	dry kV_{peak}	wet (60s) kV_{rms}	wet kV_{peak}	Mass kg	A_{max}	B	C	D	Fig.
36	24-39	CV036	1615	275	129	212	43	725	-	-	-	1
52	42-60	CV052	1615	275	129	212	45	725	-	-	-	1
72	54-75	CM072	1615	275	129	212	46	725	-	-	-	1
	54-84	CV072	2651	394	221	320	62	997	-	-	-	1
100	75-96	CH100	2651	394	221	320	63	997	-	-	-	1
	84-96	CV100	3685	568	288	433	78	1268	-	-	-	1
123	90-108	CM123	2651	394	221	320	64	997	-	-	-	1
	90-138	CH123	3685	568	288	433	81	1268	-	-	-	1
	90-96	CV123	4266	669	350	532	103	1697	600	-	300	3
	108-138	CV123	4266	669	350	532	103	1697	-	-	-	2
145	108-144	CH145	3685	568	288	433	82	1268	-	-	-	1
	108-144	CV145	5302	788	442	640	119	1969	600	-	300	3
170	132-144	CM170	3685	568	288	433	82	1268	-	-	-	1
	132-144	CH170	4266	669	350	532	105	1697	600	-	300	3
	162-168	CH170	4266	669	350	532	105	1697	-	-	-	2
	132	CV170	5302	788	442	640	120	1969	600	800	400	4
	144-168	CV170	5302	788	442	640	122	1969	600	-	300	3
Neutral-ground arresters												
52	30-36	CN052	1615	275	129	212	43	725	-	-	-	1
72	42-54	CN072	1615	275	129	212	45	725	-	-	-	1
100	60	CN100	1615	275	129	212	45	725	-	-	-	1
123	72	CN123	1615	275	129	212	62	725	-	-	-	1
	84-108	CN123	2651	394	221	320	64	997	-	-	-	1
	120	CN123	3685	568	288	433	79	1268	-	-	-	1
145	84	CN145	2651	394	221	320	62	997	-	-	-	1
	90-108	CN145	2651	394	221	320	64	997	-	-	-	1
	120	CN145	3685	568	288	433	79	1268	-	-	-	1
170	96-108	CN170	2651	394	221	320	64	997	-	-	-	1
	120	CN170	3685	568	288	433	79	1268	-	-	-	1

*) Sum of withstand voltages for empty units of arrester.

1



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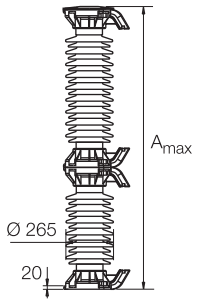

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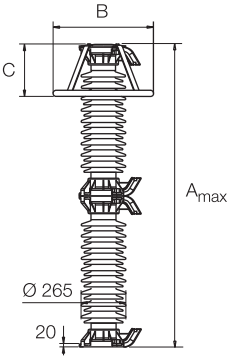

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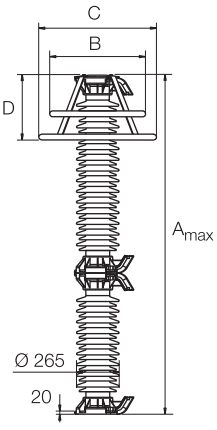
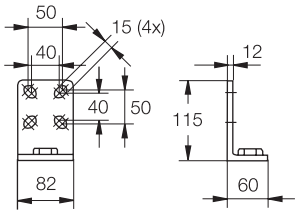
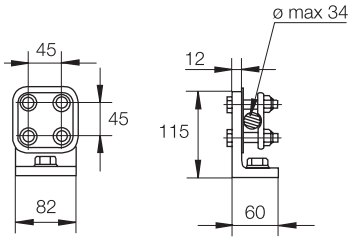


Accessories

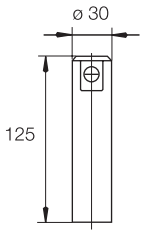
Line terminals



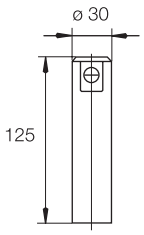
1HSA410 000-A
Aluminium



1HSA410 000-B
Aluminium flag with other items in stainless steel

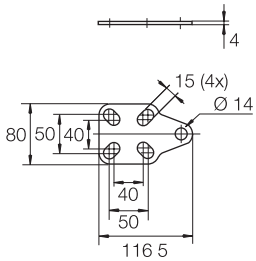


1HSA410 000-C
Aluminium

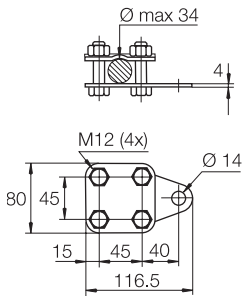


1HSA410 000-D
Stainless steel

Earth terminals



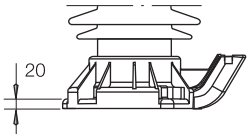
1HSA420 000-A
Stainless steel

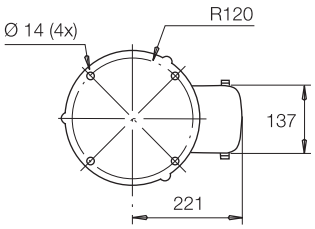


1HSA420 000-B
Stainless steel

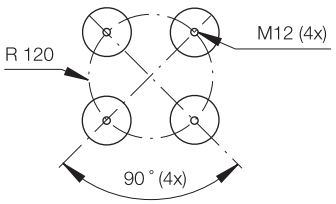
Drilling plans

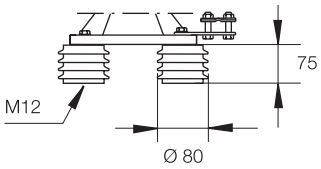
Without insulating base





With insulating base





1HSA430 000-A
Epoxy resin

M12 bolts for connection to structure are not supplied by ABB. Required threaded grip length is 15-20 mm.

Shipping data

Rated Voltage	Housing	Number of arresters per crate					
		One		Three		Six	
Ur kV_{rms}		Volume m^3	Gross kg	Volume m^3	Gross kg	Volume m^3	Gross kg
24-39	CV036	0.3	74	0.5	171	1.0	337
42-60	CV052	0.3	76	0.5	177	1.0	349
54-75	CM072	0.3	77	0.5	180	1.0	355
54-84	CV072	0.3	93	0.7	228	1.4	451
75-96	CH100	0.3	94	0.7	231	1.4	457
84-96	CV100	0.4	115	0.8	276	1.7	547
90-108	CM123	0.3	92	0.7	234	1.4	463
90-138	CH123	0.4	116	0.8	279	1.7	553
90-138	CV123	0.7	131	1.4	367	-	-
108-144	CH145	0.4	119	0.9	288	1.7	571
108-144	CV145	0.7	147	1.4	415	-	-
132-144	CM170	0.4	119	0.9	288	1.7	571
132-168	CH170	0.7	133	1.4	373	-	-
132-168	CV170	0.7	148	1.4	418	-	-
Neutral-ground arresters							
30-36	CN052	0.3	75	0.5	175	1.0	340
42-54	CN072	0.3	80	0.5	180	1.0	350
60	CN100	0.3	80	0.5	180	1.0	350
72	CN123	0.3	80	0.5	180	1.0	355
84-108	CN123	0.3	95	0.7	235	1.4	465
120	CN123	0.4	115	0.8	280	1.7	555
84	CN145	0.3	95	0.7	230	1.4	455
90-108	CN145	0.3	95	0.7	235	1.4	465
120	CN145	0.4	115	0.8	280	1.7	555
96-108	CN170	0.3	95	0.7	235	1.4	465
120	CN170	0.4	115	0.8	280	1.7	555

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

Zinc Oxide Surge Arrester EXLIM Q-E

Protection of switchgear, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages.

- in areas with high lightning intensity and high energy requirements.
- where grounding or shielding conditions are poor or incomplete

Brief performance data

System voltages (U_m)	52 - 245 kV
Rated voltages (U_r)	42 - 228 kV
Nominal discharge current (IEC)	10 kA_{peak}
Classifying current (ANSI/IEEE)	10 kA_{peak}
Discharge current withstand strength:	
High current 4/10 µs	100 kA_{peak}
Low current 2 000 µs	900 A_{peak}
Energy capability:	
Line discharge class (IEC)	Class 3
[2 impulses, (IEC Cl. 8.5.5)	7.8 kJ/kV (U_r)]
Fulfils/exceeds requirements of ANSI transmission-line discharge test for 245 kV systems.	
Short-circuit / Pressure relief capability	65 kA_{sym}
External insulation	Fulfils/exceeds standards
Mechanical strength:	
Permissible static service load (PSSL)	3 000 Nm
Maximum permissible dynamic service load (MPDSL)	7 500 Nm
Service conditions:	
Ambient temperature	-50 °C to +45 °C
Design altitude (Higher altitudes on request)	max. 1 000 m
Frequency	15 - 62 Hz

Guaranteed protective data

Max. System Voltage	Rated Voltage	Max. continuous operating voltage 1)		TOV capability 2)		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_m	U_r	U_C	MCOV	1 s	10 s	0.5 kA	1 kA	2 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
36[3]	24	19.2	19.5	27.8	26.4	46.1	47.6	49.5	53.6	56.4	62.1	69.4
	30	24.0	24.4	34.8	33.0	57.6	59.5	61.8	67.0	70.5	77.6	86.8
	33	26.4	26.7	38.2	36.3	63.4	65.4	68.0	73.7	77.6	85.4	95.4
	36	28.8	29.0	41.7	39.6	69.2	71.4	74.2	80.4	84.6	93.1	105
	39	31.2	31.5	45.2	42.9	74.9	77.3	80.3	87.1	91.7	101	113
52	42	34	34.0	48.7	46.2	80.7	83.3	86.5	93.8	98.7	109	122
	48	38	39.0	55.6	52.8	92.2	95.1	98.9	108	113	125	139
	51	41	41.3	59.1	56.1	98.0	102	105	114	120	132	148
	54	43	43.0	62.6	59.4	104	107	112	121	127	140	157
	60	48	48.0	69.6	66.0	116	119	124	134	141	156	174
72	54	43	43.0	62.6	59.4	104	107	112	121	127	140	157
	60	48	48.0	69.6	66.0	116	119	124	134	141	156	174
	66	53	53.4	76.5	72.6	127	131	136	148	156	171	191
	72	58	58.0	83.5	79.2	139	143	149	161	170	187	209
	75	60	60.7	87.0	82.5	144	149	155	168	177	194	217
	78	62	63.1	90.4	85.8	150	155	161	175	184	202	226
	81	65	65.6	93.9	89.1	156	161	167	181	191	210	235
	84	67	68.0	97.4	92.4	162	167	173	188	198	218	243
100	84	67	68.0	97.4	92.4	162	167	173	188	198	218	243
	90	72	72.0	104	99.0	173	179	186	201	212	233	261
	96	77	77.0	111	105	185	191	198	215	226	249	278
123	90	72	72.0	104	99.0	173	179	186	201	212	233	261
	96	77	77.0	111	105	185	191	198	215	226	249	278
	108	78	84.0	125	118	208	214	223	242	254	280	313
	120	78	98.0	139	132	231	238	248	268	282	311	347
	132	78	106	153	145	254	262	272	295	311	342	382
	138	78	111	160	151	265	274	285	309	325	357	399
145	108	86	86.0	125	118	208	214	223	242	254	280	313
	120	92	98.0	139	132	231	238	248	268	282	311	347
	132	92	106	153	145	254	262	272	295	311	342	382
	138	92	111	160	151	265	274	285	309	325	357	399
	144	92	115	167	158	277	286	297	322	339	373	417
170	132	106	106	153	145	254	262	272	295	311	342	382
	144	108	115	167	158	277	286	297	322	339	373	417
	162	108	131	187	178	312	321	334	362	381	419	469
	168	108	131	194	184	323	333	346	376	395	435	486
245	180	144	144	208	198	346	357	371	402	423	466	521
	192	154	154	222	211	369	381	396	429	452	497	555
	198	156	160	229	217	381	393	408	443	466	512	573
	210	156	170	243	231	404	417	433	469	494	543	608
	216	156	175	250	237	415	428	445	483	508	559	625
	219	156	177	254	240	421	434	451	489	515	567	634
	222	156	179	257	244	427	440	458	496	522	574	642
	228	156	180	264	250	438	452	470	510	536	590	660

More detailed information on the TOV capability and the protective characteristics are given in Publ. 1HSM 9543 13-01en.

1) The continuous operating voltages U_C (as per IEC) and MCOV (as per ANSI)) differ only due to deviations in type test procedures.
U_C has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_C higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the maximum single-impulse energy stress (4.5 kJ/kV (U_r)).

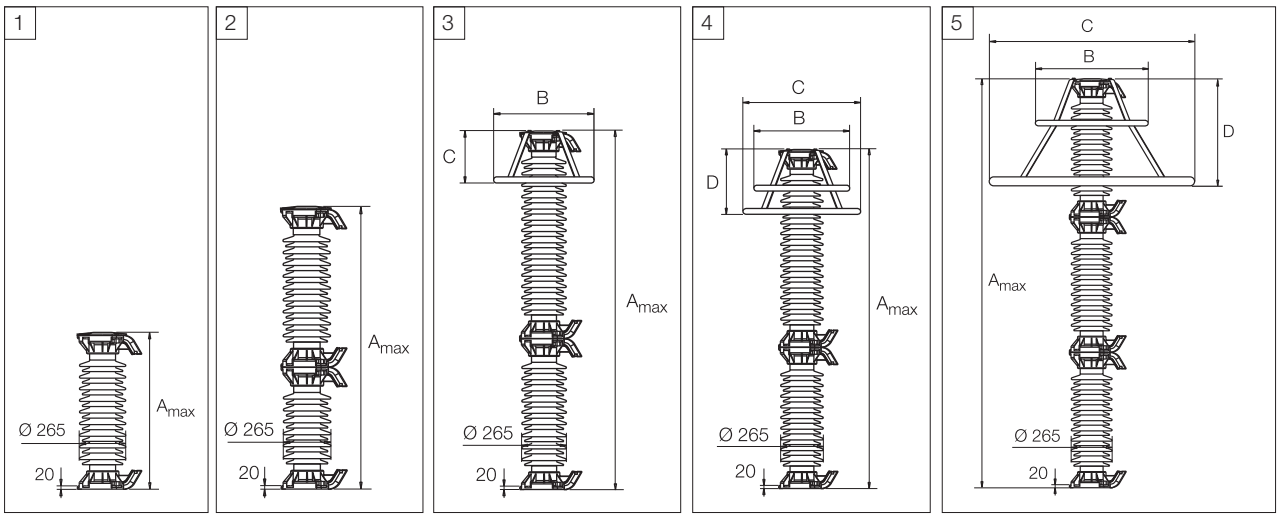
3) Arresters for system voltages 36 kV or below can be supplied, on request, when the order also includes arresters for higher system voltages.

Arresters with lower or higher rated voltages may be available on request for special applications.

Technical data for housings

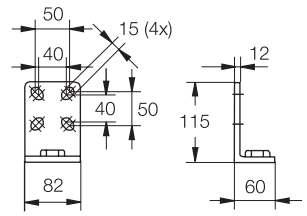
Max. system voltage	Rated Voltage	Housing	Creepage distance	External insulation *)				Dimensions					
				1.2/50 µs dry	50 Hz wet (60s)	60 Hz wet (10s)	250/2500 µs wet						
U_m kV_{rms}	U_r kV_{rms}		mm	kV_{peak}	kV_{rms}	kV_{rms}	kV_{peak}	Mass kg	A_{max}	B	C	D	Fig.
36	24-39	EV036	1615	275	129	133	n.a.	45	725	-	-	-	1
52	42-60	EV052	1615	275	129	133	n.a.	48	725	-	-	-	1
72	54-84	EV072	2651	394	221	203	n.a.	66	997	-	-	-	1
100	84-96	EH100	2651	394	221	203	n.a.	67	997	-	-	-	1
	84-96	EV100	3685	568	287	261	n.a.	82	1268	-	-	-	1
123	90-108	EM123	2651	394	221	203	n.a.	69	997	-	-	-	1
	90-138	EH123	3685	568	287	261	n.a.	88	1268	-	-	-	1
	90-96	EV123	4266	669	350	336	n.a.	106	1697	600	-	300	3
	108-138	EV123	4266	669	350	336	n.a.	110	1697	-	-	-	2
145	108-144	EH145	3685	568	287	261	n.a.	88	1268	-	-	-	1
	108-120	EV145	5302	788	442	406	n.a.	124	1969	600	-	300	3
	132-144	EV145	5302	788	442	406	n.a.	125	1969	-	-	-	2
170	132-144	EM170	3685	568	287	261	n.a.	88	1268	-	-	-	1
	132	EH170	4266	669	350	336	n.a.	111	1697	600	-	300	3
	144-168	EH170	4266	669	350	336	n.a.	113	1697	-	-	-	2
	132-144	EV170	5302	788	442	406	n.a.	127	1969	600	-	300	3
	162-168	EV170	5302	788	442	406	n.a.	128	1969	-	-	-	2
245	180-198	EH245	6336	962	508	464	753	151	2240	600	800	400	4
	210-228	EH245	6336	962	508	464	753	153	2240	600	-	300	3
	180-228	EV245	7953	1182	663	609	960	201	2941	800	1400	700	5
Neutral-ground arresters													
52	30-36	EN052	1615	275	129	133	n.a.	45	725	-	-	-	1
72	42-54	EN072	1615	275	129	133	n.a.	48	725	-	-	-	1
100	60	EN100	1615	275	129	133	n.a.	48	725	-	-	-	1
123	72-108	EN123	2651	394	221	203	n.a.	69	997	-	-	-	1
	120	EN123	3685	568	287	261	n.a.	88	1268	-	-	-	1
145	84-108	EN145	2651	394	221	203	n.a.	69	997	-	-	-	1
	120	EN145	3685	568	287	261	n.a.	88	1268	-	-	-	1
170	96-108	EN170	2651	394	221	203	n.a.	69	997	-	-	-	1
	120	EN170	3685	568	287	261	n.a.	88	1268	-	-	-	1
245	108	EN245	2651	394	221	203	n.a.	69	997	-	-	-	1
	120-144	EN245	3685	568	287	261	n.a.	88	1268	-	-	-	1

*) Sum of withstand voltages for empty units of arrester.

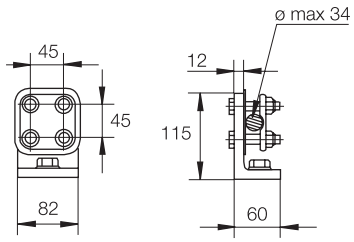


Accessories

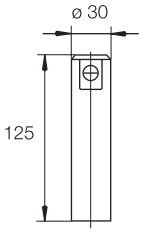
Line terminals



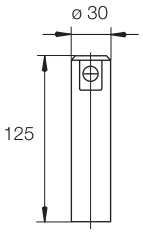
1HSA410 000-A
Aluminium



1HSA410 000-B
Aluminium flag with other items in stainless steel

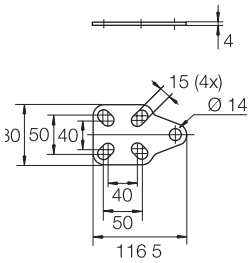


1HSA410 000-C
Aluminium

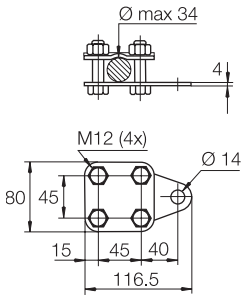


1HSA410 000-D
Stainless steel

Earth terminals



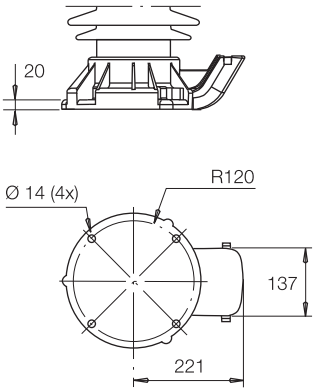
1HSA420 000-A
Stainless steel



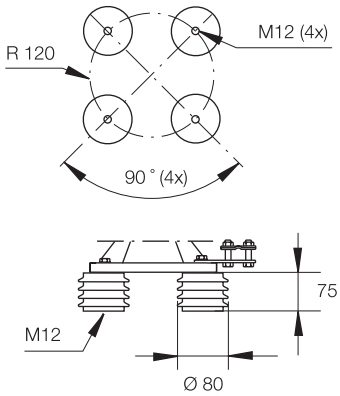
1HSA420 000-B
Stainless steel

Drilling plans

Without insulating base



With insulating base



1HSA430 000-A
Epoxy resin

M12 bolts for connection to structure are not supplied by ABB. Required threaded grip length is 15-20 mm.

Shipping data

Rated Voltage	Housing	Number of arresters per crate					
		One		Three		Six	
Ur kV_{rms}		Volume m^3	Gross kg	Volume m^3	Gross kg	Volume m^3	Gross kg
24-39	EV036	0.3	76	0.5	177	1.0	349
42-60	EV052	0.3	79	0.5	186	1.0	367
54-84	EV072	0.3	97	0.7	240	1.4	475
84-96	EH100	0.3	98	0.7	243	1.4	481
84-96	EV100	0.4	119	0.8	288	1.7	571
90-108	EM123	0.3	100	0.7	249	1.4	493
90-108	EH123	0.4	125	0.8	306	1.7	607
90-138	EV123	0.7	138	1.4	389	-	-
108-144	EH145	0.4	125	0.9	306	1.7	607
108-144	EV145	0.7	152	1.4	431	-	-
132-144	EM170	0.4	125	0.9	306	1.7	607
132-168	EH170	0.7	141	1.4	398	-	-
132-168	EV170	0.7	156	1.4	662	-	-
180-228	EH245	0.8	181	1.7	518	-	-
180-228	EV245	1.7	320	3.1	743-	-	-
Neutral-ground arresters							
30-36	EN052	0.3	80	0.5	180	1.0	350
42-54	EN072	0.3	80	0.5	190	1.0	370
60	EN100	0.3	80	0.5	190	1.0	370
72-108	EN123	0.3	100	0.7	250	1.4	495
120	EN123	0.4	125	0.8	310	1.7	610
84-108	EN145	0.3	100	0.7	250	1.4	495
120	EN145	0.4	125	0.8	310	1.7	610
96-108	EN170	0.3	100	0.7	250	1.4	495
120	EN170	0.4	125	0.8	310	1.7	610
108	EN245	0.3	100	0.7	250	1.4	495
120-144	EN245	0.4	125	0.8	310	1.7	610

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

Zinc Oxide Surge Arrester EXLIM Q-D

Protection of switchgear, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages.

- in areas with high lightning intensity and high energy requirements.
- where grounding or shielding conditions are poor or incomplete

Brief performance data

System voltages (U_m)	170 - 420 kV
Rated voltages (U_r)	132 - 420 kV
Nominal discharge current (IEC)	10 kA_{peak}
Classifying current (ANSI/IEEE)	10 kA_{peak}
Discharge current withstand strength: High current 4/10 µs Low current 2 000 µs	 100 kA_{peak} 900 A_{peak}
Energy capability: Line discharge class (IEC) [2 impulses, (IEC Cl. 8.5.5) Fulfils/exceeds requirements of ANSI transmission-line discharge test for 362 kV systems.	 Class 3 7.8 kJ/kV (U_r)]
Short-circuit / Pressure relief capability	65 kA_{sym}
External insulation	Fulfils/exceeds standards
Mechanical strength: Permissible static service load (PSSL) Maximum permissible dynamic service load (MPDSL)	 7 200 Nm 18 000 Nm
Service conditions: Ambient temperature Design altitude (Higher altitudes on request) Frequency	 -50 °C to +45 °C max. 1 000 m 15 - 62 Hz

Guaranteed protective data

Max.	Rated Voltage	Max. continuous operating voltage 1)		TOV capability 2)		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_m kV_{rms}	U_r kV_{rms}	U_C kV_{rms}	MCOV kV_{rms}	1 s kV_{rms}	10 s kV_{rms}	0.5 kA kV_{peak}	1 kA kV_{peak}	2 kA kV_{peak}	5 kA kV_{peak}	10 kA kV_{peak}	20 kA kV_{peak}	40 kA kV_{peak}
170	132	106	106	153	145	254	262	272	295	311	342	382
	144	108	115	167	158	277	286	297	322	339	373	417
	162	108	131	187	178	312	321	334	362	381	419	469
	168	108	131	194	184	323	333	346	376	395	435	486
245	180	144	144	208	198	346	357	371	402	423	466	521
	192	154	154	222	211	369	381	396	429	452	497	555
	198	156	160	229	217	381	393	408	443	466	512	573
	210	156	170	243	231	404	417	433	469	494	543	608
	216	156	175	250	237	415	428	445	483	508	559	625
	219	156	177	254	240	421	434	451	489	515	567	634
	228	156	180	264	250	438	452	470	510	536	590	660
300	216	173	175	250	237	415	428	445	483	508	559	625
	228	182	182	264	250	438	452	470	510	536	590	660
	240	191	191	278	264	461	476	495	536	564	621	694
	258	191	209	299	283	496	512	532	576	607	667	746
	264	191	212	306	290	507	523	544	590	621	683	764
362	258	206	209	299	283	496	512	532	576	607	667	746
	264	211	212	306	290	507	523	544	590	621	683	764
	276	211	221	320	303	530	547	569	617	649	714	798
	288	230	230	334	316	553	571	593	643	677	745	833
420	330	264	267	382	363	634	654	680	737	776	854	954
	336	267	272	389	369	646	666	692	751	790	869	972
	360	267	291	417	396	692	714	742	804	846	931	1046
	372	267	301	431	409	715	737	766	831	875	962	1080
	378	267	306	438	415	726	749	779	844	889	978	1098
	381	267	308	441	419	732	755	785	851	896	985	1106
	390	267	315	452	429	749	773	803	871	917	1013	1132
	396	267	318	459	435	761	785	816	885	931	1029	1150
	420	267	335	487	462	807	833	865	938	987	1091	1219

More detailed information on the TOV capability and the protective characteristics are given in Publ. 1HSM 9543 13-01en.

1) The continuous operating voltages U_C (as per IEC) and MCOV (as per ANSI)) differ only due to deviations in type test procedures.
U_C has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_C higher than or equal to the actual system voltage divided by $\sqrt{3}$ can be selected.

2) With prior duty equal to the maximum single-impulse energy stress (4.5 kJ/kV (U_r)).

3) Arresters for system voltages 36 kV or below can be supplied, on request, when the order also includes arresters for higher system voltages.

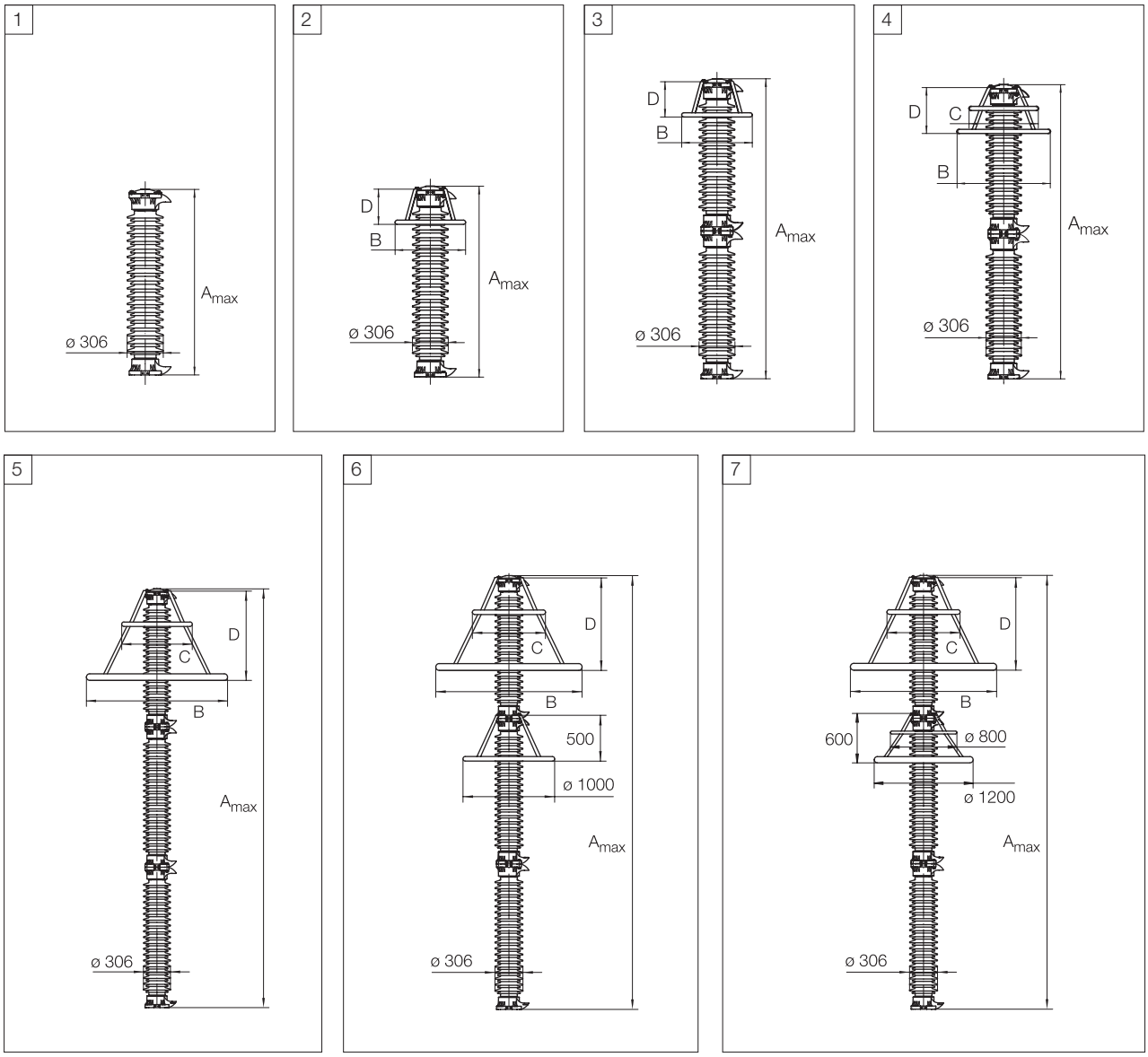
Arresters with lower or higher rated voltages may be available on request for special applications.

Technical data for housings

Max. system voltage	Rated Voltage	Housing	Creepage distance	External insulation *)				Dimensions					
				1.2/ 50 µs dry	50 Hz wet (60s)	60 Hz wet (10s)	250/ 2500 µs wet						
U_m kV_{rms}	U_r kV_{rms}		mm	kV_{peak}	kV_{rms}	kV_{rms}	kV_{peak}	Mass kg	A_{max}	B	C	D	Fig.
170	132	DH170	4432	774	378	359	n.a.	155	1645	600	-	300	2
	144-168	DH170	4432	774	378	359	n.a.	155	1645	-	-	-	1
	132-144	DV170	6570	1172	556	546	924	230	2585	800	600	400	4
	162-168	DV170	6570	1172	556	546	924	230	2585	600	-	300	3
245	180-198	DH245	6570	1172	556	546	924	235	2585	900	600	500	4
	210-219	DH245	6570	1172	556	546	924	235	2585	800	600	400	4
	228	DH245	6570	1172	556	546	924	240	2585	600	-	300	3
	180	DV245	7717	1360	656	632	1078	270	2915	1400	800	700	4
	192-198	DV245	7717	1360	656	632	1078	270	2915	1200	800	600	4
	210	DV245	7717	1360	656	632	1078	270	2915	900	600	500	4
	216-228	DV245	7717	1360	656	632	1078	270	2915	800	600	400	4
300	228	DM300	6570	1172	556	546	924	240	2585	800	600	500	4
	240-264	DM300	6570	1172	556	546	924	245	2585	900	600	400	4
	216	DH300	7717	1360	656	632	1078	275	2915	1400	800	700	4
	228-240	DH300	7717	1360	656	632	1078	280	2915	1200	800	600	4
	258-264	DH300	7717	1360	656	632	1078	275	2915	900	600	500	4
	216	DV300	9855	1758	834	819	1386	350	3859	1600	800	1200	4
	228-240	DV300	9855	1758	834	819	1386	355	3859	1600	800	1000	4
	258-264	DV300	9855	1758	834	819	1386	355	3859	1200	800	800	4
362	258-264	DM362	7717	1360	656	632	1078	280	2915	1400	800	700	4
	276-288	DM362	7717	1360	656	632	1078	285	2915	1200	800	600	4
	258-288	DH362	9855	1758	834	819	1386	360	3859	1600	800	1000	5
	258-264	DV362	12149	2134	1034	991	1694	430	4520	1800	1000	1000	7
	276-288	DV362	12149	2134	1034	991	1694	430	4520	1800	1000	1000	6
420	330-360	DM420	8864	1458	756	718	1232	330	3245	1600	1000	650	4
	330-360	DH420	11002	1946	934	905	1540	400	4190	1800	1000	1000	5
	372-396	DH420	11002	1946	934	905	1540	400	4190	1400	800	700	5
	420	DH420	11002	1946	934	905	1540	400	4190	1200	800	600	5
	330-360	DV420	13296	2322	1134	1077	1848	470	4850	1800	1000	1000	6
	372-420	DV420	13296	2322	1134	1077	1848	470	4850	1800	1000	1000	5

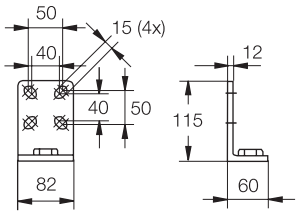
*) Sum of withstand voltages for empty units of arrester.

Technical data for housings

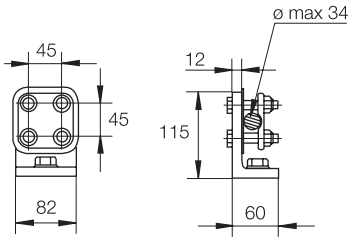


Accessories

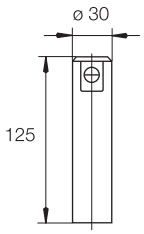
Line terminals



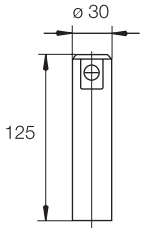
1HSA410 000-A
Aluminium



1HSA410 000-B
Aluminium flag with other items in stainless steel

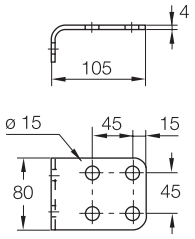


1HSA410 000-C
Aluminium

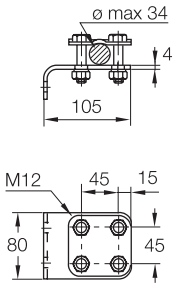


1HSA410 000-D
Stainless steel

Earth terminals



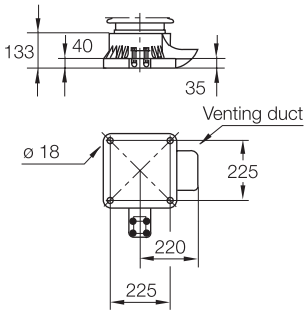
1HSA420 000-C
Stainless steel



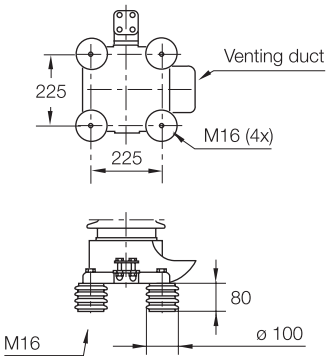
1HSA420 000-D
Stainless steel

Drilling plans

Without insulating base



With insulating base



1HSA430 000-C
Epoxy resin

M16 bolts for connection to structure are not supplied by ABB. Required threaded grip length is 15-20 mm.

Shipping data

Rated Voltage	Housing	Number of arresters per crate					
		One		Two		Three	
Ur kV_{rms}		Volume m^3	Gross kg	Volume m^3	Gross kg	Volume m^3	Gross kg
132-168	DH170	0.5	195	1.7	365	1.7	530
132-168	DV170	1.4	275	2.8	545	2.8	790
180-228	DH245	1.4	280	2.8	555	2.8	805
180	DV245	2.4	375	4.2	685	4.1	960
192-198	DV245	2.2	360	3.8	670	3.9	950
210-228	DV245	1.7	315	3.1	615	3.1	890
228-264	DM300	1.4	290	2.8	575	2.8	835
216	DH300	2.4	380	4.2	695	4.1	975
228-240	DH300	2.2	365	3.8	680	3.9	965
258-264	DH300	1.7	320	3.1	630	3.1	910
216-240	DV300	2.9	500	5.7	930	6.1	1315
258-264	DV300	1.9	445	3.6	875	5.0	1240
258-264	DM362	2.4	385	4.2	705	4.1	995
276-288	DM362	2.2	375	3.8	690	3.9	985
258-288	DH362	2.9	505	5.7	940	6.1	1330
258-264	DV362	3.2	575	6.3	1075	6.7	1535
276-288	DV362	3.2	575	6.0	1060	6.7	1525
330-360	DM420	4.2	475	4.9	835	5.3	1175
330-360	DH420	3.2	545	6.0	1015	6.7	1430
372-396	DH420	2.4	505	5.6	970	5.5	1380
420	DH420	2.2	485	5.2	945	5.3	1370
330-360	DV420	3.2	615	6.6	1150	7.0	1450

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

Zinc Oxide Surge Arrester EXLIM P

Protection of switchgears, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages.

- in areas with very high lightning intensity
- where grounding or shielding conditions are poor or incomplete
- for important installations
- where energy requirements are very high (e.g. very long lines, capacitor protection).

Brief performance data

System voltages (U_m)	52 - 550 kV
Rated voltages (U_r)	42 - 444 kV
Nominal discharge current (IEC)	20 kA_{peak}
Classifying current (ANSI/IEEE)	10/15 kA_{peak}
Discharge current withstand strength:	
High current 4/10 µs	100 kA_{peak}
Low current 2 000 µs	1 350 A_{peak}
Energy capability:	
Line discharge class (IEC)	Class 4
[2 impulses, (IEC Cl. 8.5.5)	10.8 kJ/kV (U_r)]
Fulfils/exceeds requirements of ANSI transmission-line discharge test for 550 kV systems.	
Short-circuit / Pressure relief capability	65 kA_{sym}
External insulation	Fulfils/exceeds standards
Mechanical strength:	
Permissible static service load (PSSL)	7 200 Nm
Maximum permissible dynamic service load (MPDSL)	18 000 Nm
Service conditions:	
Ambient temperature	-50 °C to +45 °C
Design altitude	max. 1 000 m
(Higher altitudes on request)	
Frequency	15 - 62 Hz

Guranteed protective data

Max.	Rated Voltage	Max. continuous operating voltage 1)		TOV capability 2)		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_m kV_{rms}	U_r kV_{rms}	U_C kV_{rms}	MCOV kV_{rms}	1 s kV_{rms}	10 s kV_{rms}	1 kA kV_{peak}	2 kA kV_{peak}	3 kA kV_{peak}	5 kA kV_{peak}	10 kA kV_{peak}	20 kA kV_{peak}	40 kA kV_{peak}
36[3]	30	24.0	24.4	34.8	33.0	58.5	60.7	62.2	64.9	68.3	74.8	81.9
	33	26.4	26.7	38.2	36.3	64.4	66.7	68.4	71.4	75.1	82.3	90.1
	36	28.8	29.0	41.7	39.6	70.2	72.8	74.6	77.9	81.9	89.7	98.3
	39	31.2	31.5	45.2	42.9	76.1	78.8	80.8	84.3	88.8	97.2	107
52	42	34	34.0	48.7	46.2	81.9	84.9	87.0	90.8	95.6	105	115
	48	38	39.0	55.6	52.8	93.6	97.0	99.4	104	110	120	132
	54	43	43.0	62.6	59.4	106	110	112	117	123	135	148
	60	48	48.0	69.6	66.0	117	122	125	130	137	150	164
72	54	43	43.0	62.6	59.4	106	110	112	117	123	135	148
	60	48	48.0	69.6	66.0	117	122	125	130	137	150	164
	66	53	53.4	76.5	72.6	129	134	137	143	151	165	181
	72	58	58.0	83.5	79.2	141	146	150	156	164	180	197
	75	60	60.7	87.0	82.5	147	152	156	163	171	187	205
	78	62	63.1	90.4	85.8	153	158	162	169	178	195	213
	84	67	68.0	97.4	92.4	164	170	174	182	192	210	230
100	84	67	68.0	97.4	92.4	164	170	174	182	192	210	230
	90	72	72.0	104	99.0	176	182	187	195	205	225	246
	96	77	77.0	111	105	188	194	199	208	219	240	263
123	90	72	72.0	104	99.0	176	182	187	195	205	225	246
	96	77	77.0	111	105	188	194	199	208	219	240	263
	108	78	84.0	125	118	211	219	224	234	246	270	295
	120	78	98.0	139	132	234	243	249	260	273	299	328
	132	78	106	153	145	258	267	274	286	301	329	361
	138	78	111	160	151	270	279	286	299	314	344	377
145	108	86	86.0	125	118	211	219	224	234	246	270	295
	120	92	98.0	139	132	234	243	249	260	273	299	328
	132	92	106	153	145	258	267	274	286	301	329	361
	138	92	111	160	151	270	279	286	299	314	344	377
	144	92	115	167	158	281	291	299	312	328	359	394
170	132	106	106	153	145	258	267	274	286	301	329	361
	144	108	115	167	158	281	291	299	312	328	359	394
	150	108	121	174	165	293	304	311	325	342	374	410
	162	108	131	187	178	316	328	336	351	369	404	443
	168	108	131	194	184	328	340	348	364	383	419	459
245	180	144	144	208	198	351	364	373	390	410	449	492
	192	154	154	222	211	375	388	398	415	437	479	525
	198	156	160	229	217	387	400	410	428	451	494	541
	210	156	170	243	231	410	425	435	454	478	524	574
	216	156	174	250	237	422	437	448	467	492	539	590
	219	156	177	254	240	427	443	454	474	499	546	598
	228	156	180	264	250	445	461	473	493	519	568	623

More detailed information on the TOV capability and the protective characteristics are given in Publ. 1HSM 9543 13-01en.

1) The continuous operating voltages U_c (as per IEC and MCOV (as per ANSI) differ only due to deviations in type test procedures.
U_c has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_c higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the maximum single-impulse energy stress (7.0 kJ/kV (U_r)).

3) Arresters for system voltages 36 kV or below can be supplied, on request, when the order also includes arresters for higher system voltages.

Arresters with lower or higher rated voltages may be available on request for special applications.

Guranteed protective data

Max. System Voltage	Rated Voltage	Max. continuous operating voltage 1)		TOV capability 2)		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_m	U_r	U_C	MCOV	1 s	10 s	1 kA	2 kA	3 kA	5 kA	10 kA	20 kA	40 kA
kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{rms}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}	kV_{peak}
300	216	173	174	250	237	422	437	448	467	492	539	590
	228	182	182	264	250	445	461	473	493	519	568	623
	240	191	191	278	264	468	485	497	519	546	598	656
	258	191	209	299	283	504	522	535	558	587	643	705
	264	191	212	306	290	515	534	547	571	601	658	721
362	258	206	209	299	283	504	522	535	558	587	643	705
	264	211	212	306	290	515	534	547	571	601	658	721
	276	221	221	320	303	539	558	572	597	628	688	754
	288	230	230	334	316	562	582	597	623	656	718	787
420	330	264	267	382	363	644	667	684	714	751	823	901
	336	267	272	389	369	656	679	696	727	765	838	918
	360	267	291	417	396	702	728	746	779	819	897	983
	372	267	301	431	409	726	752	771	804	847	927	1021
	378	267	306	438	415	737	764	783	817	860	942	1037
	381	267	308	441	419	743	770	789	824	867	950	1045
	390	267	315	452	429	761	788	808	843	888	972	1070
	396	267	318	459	435	773	800	820	856	901	987	1086
	420	267	336	487	462	819	849	870	908	956	1051	1152
550	396	317	318	459	435	773	800	820	856	901	987	1086
	420	336	336	487	462	819	849	870	908	956	1051	1152
	444	349	353	515	488	866	897	920	960	1015	1111	1217

More detailed information on the TOV capability and the protective characteristics are given in Publ. 1HSM 9543 13-01en

1) The continuous operating voltages U_c (as per IEC and MCOV (as per ANSI) differ only due to deviations in type test procedures.
U_c has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_c higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the maximum single-impulse energy stress (7.0 kJ/kV (U_r)).

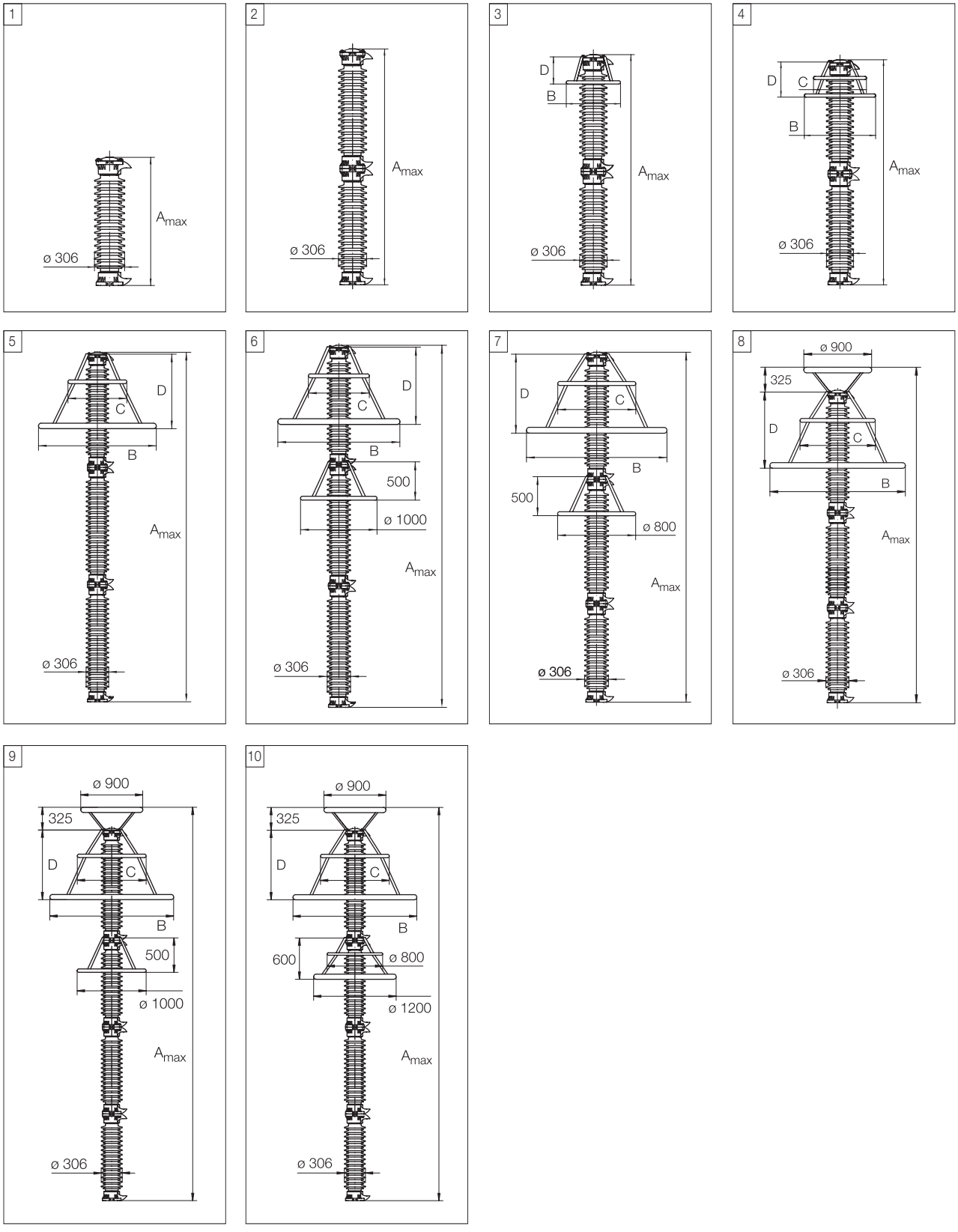
Arresters with lower or higher rated voltages may be available on request for special applications.

Technical data for housings

Max. system voltage	Rated Voltage	Housing	Creepage distance	External insulation *)				Dimensions					
				1.2/50 µs dry	50 Hz wet (60s)	60 Hz wet (10s)	250/2500 µs wet						
U_m kV_{rms}	U_r kV_{rms}		mm	kV_{peak}	kV_{rms}	kV_{rms}	kV_{peak}	Mass kg	A_{max}	B	C	D	Fig.
36	30-39	GV036	1444	318	151	135	228	85	785	-	-	-	1
52	42-60	GH052	1444	318	151	135	228	90	785	-	-	-	1
	42-60	GV052	3285	586	278	273	462	115	1315	-	-	-	1
72	54-84	GV072	3285	586	278	273	462	115	1315	-	-	-	1
100	84-96	GV100	3285	586	278	273	462	120	1315	-	-	-	1
123	90-138	GH123	3285	586	278	273	462	120	1315	-	-	-	1
	90-138	GV123	4432	774	378	359	616	150	1645	-	-	-	1
145	108-138	GM145	3285	586	278	273	462	120	1315	-	-	-	1
	108-120	GH145	4432	774	378	359	616	150	1645	-	-	-	1
	132-144	GH145	4432	774	378	359	616	155	1645	-	-	-	1
	108-144	GV145	4729	904	429	408	690	200	2060	-	-	-	2
170	132-168	GH170	4432	774	378	359	616	155	1645	-	-	-	1
	132	GV170	6570	1172	556	546	924	230	2585	800	600	400	4
	144-150	GV170	6570	1172	556	546	924	230	2585	600	-	300	3
	162-168	GV170	6570	1172	556	546	924	230	2585	-	-	-	2
245	180	GH245	6570	1172	556	546	924	240	2585	900	600	500	4
	192-198	GH245	6570	1172	556	546	924	240	2585	800	600	400	4
	210-228	GH245	6570	1172	556	546	924	240	2585	600	-	300	3
	180	GV245	7717	1360	656	632	1078	275	2915	1200	800	600	4
	192-198	GV245	7717	1360	656	632	1078	270	2915	900	600	500	4
	210	GV245	7717	1360	656	632	1078	270	2915	800	600	400	4
	216-228	GV245	7717	1360	656	632	1078	270	2915	600	-	300	3
300	228	GM300	6570	1172	556	546	924	245	2585	900	600	500	4
	240-264	GM300	6570	1172	556	546	924	245	2585	900	600	400	4
	216	GH300	7717	1360	656	632	1078	280	2915	1400	800	700	4
	228-264	GH300	7717	1360	656	632	1078	275	2915	900	600	500	4
	216	GV300	9855	1758	834	819	1386	355	3860	1600	800	1000	5
	228	GV300	9855	1758	834	819	1386	355	3860	1400	800	700	5
	240	GV300	9855	1758	834	819	1386	355	3860	1200	800	600	5
	258-264	GV300	9855	1758	834	819	1386	355	3860	1200	800	600	5
362	258	GM362	7717	1360	656	632	1078	285	2915	1400	800	700	4
	264-288	GM362	7717	1360	656	632	1078	285	2915	1200	800	600	4
	258-264	GH362	9855	1758	834	819	1386	360	3860	1600	800	1000	5
	276-288	GH362	9855	1758	834	819	1386	360	3860	1400	800	700	5
	258-288	GV362	12149	2134	1034	991	1694	425	4850	1600	800	1200	7
420	330-360	GM420	8864	1548	756	718	1232	325	3245	1200	800	600	4
	330-336	GH420	11002	1946	934	905	1540	405	4190	1800	1000	1000	5
	360-372	GH420	11002	1946	934	905	1540	405	4190	1400	800	700	5
	378-420	GH420	11002	1946	934	905	1540	405	4190	1200	800	600	5
	330	GV420	13296	2322	1134	1077	1848	465	4850	1600	800	1000	6
	336-396	GV420	13296	2322	1134	1077	1848	465	4850	1600	800	1000	6
	420	GV420	13296	2322	1134	1077	1848	465	4850	1400	800	700	5
550	396-444	GM550	11002	1946	934	905	1540	420	4500	1800	1000	800	8
	396	GH550	14287	2352	1212	1178	2002	530	5763	1800	1000	1000	10
	420-444	GH550	14287	2352	1212	1178	2002	530	5763	1800	1000	1000	9
Neutral-ground arresters													
123	72-84	GN123	3285	586	278	273	462	115	1315	-	-	-	1
	90-120	GN123	3285	586	278	273	462	120	1315	-	-	-	1
145	84	GN145	3285	586	278	273	462	115	1315	-	-	-	1
	90-120	GN145	3285	586	278	273	462	120	1315	-	-	-	1
170	96-120	GN170	3285	586	278	273	462	120	1315	-	-	-	1
245	108-120	GN245	3285	586	278	273	462	120	1315	-	-	-	1
	132	GN245	3285	586	278	273	462	125	1315	-	-	-	1
	144	GN245	4432	774	378	359	616	155	1645	-	-	-	1

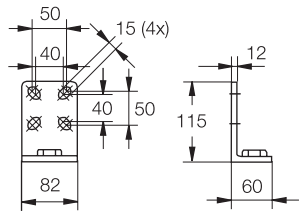
*) Sum of withstand voltages for empty units of arrester.

Technical data for housings

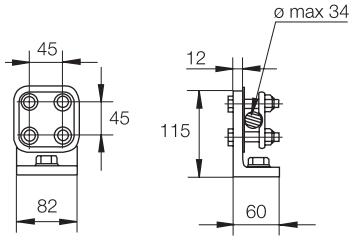


Accessories

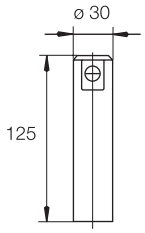
Line terminals



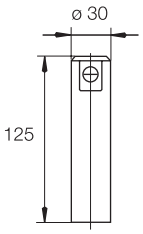
1HSA410 000-A
Aluminium



1HSA410 000-B
Aluminium flag with other items in stainless steel

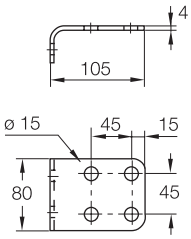


1HSA410 000-C
Aluminium

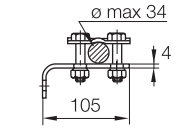


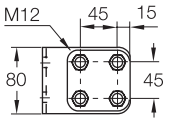
1HSA410 000-D
Stainless steel

Earth terminals



1HSA420 000-C
Stainless steel

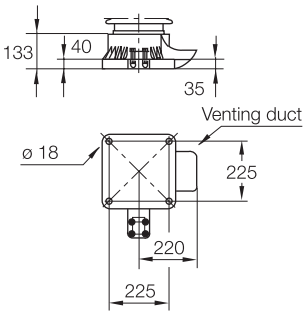




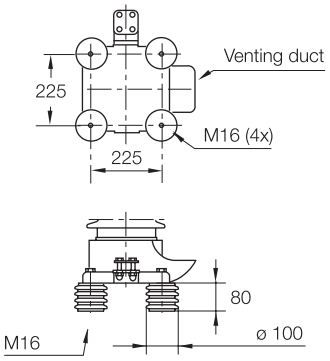
1HSA420 000-D
Stainless steel

Drilling plans

Without insulating base



With insulating base



1HSA430 000-C
Epoxy resin

M16 bolts for connection to structure are not supplied by ABB. Required threaded grip length is 15-20 mm.

Shipping data

Rated Voltage	Housing	Number of arresters per crate					
		One		Two		Three	
Ur kV_{rms}		Volume m^3	Gross kg	Volume m^3	Gross kg	Volume m^3	Gross kg
30-39	GV036	0.4	115	0.9	225	0.90	320
42-60	GH052	0.4	120	0.9	235	0.9	335
42-60	GV052	0.5	150	1.4	285	1.4	410
54-84	GV072	0.5	150	1.4	285	1.4	410
84-96	GV100	0.5	155	1.4	295	1.4	425
90-138	GH123	0.5	155	1.4	295	1.4	425
90-138	GV123	0.5	190	1.7	355	1.7	515
108-138	GM145	0.5	155	1.4	295	1.4	425
108-144	GH145	0.5	190	1.7	355	1.7	515
108-144	GV145	1.4	245	2.3	470	2.3	690
132-168	GH170	0.5	195	1.7	365	1.7	530
132-168	GV170	1.4	275	2.8	545	2.8	780
180-228	GH245	1.4	285	2.8	565	2.8	810
180	GV245	2.2	365	3.8	665	3.9	945
192-228	GV245	1.7	315	3.1	615	3.1	895
228-264	GM300	1.4	290	2.8	575	2.8	825
216	GH300	2.4	385	4.2	690	4.1	975
228-264	GH300	1.7	320	3.1	630	3.1	905
216	GV300	2.5	500	5.2	930	6.1	1315
228	GV300	2.1	460	5.2	890	5.2	1255
240-264	GV300	1.9	445	4.9	875	5.0	1240
258	GM362	2.4	390	4.2	705	4.1	995
264-288	GM362	2.2	375	3.8	690	3.9	985
258-264	GH362	2.5	505	5.2	940	6.1	1330
276-288	GH362	2.1	465	5.2	900	5.2	1270
258-288	GV362	3.2	570	6.3	1055	6.7	1510
330-360	GM420	2.2	410	4.1	770	4.2	1105
330-336	GH420	3.2	545	6.0	1010	6.0	1440
360-372	GH420	2.4	505	5.5	970	5.5	1375
378-420	GH420	2.2	490	3.8	960	5.3	1370
330-396	GV420	3.2	610	6.6	1150	7.0	1645
420	GV420	2.4	570	6.1	1110	6.1	1585
396-444	GM550	3.2	565	6.0	1045	6.0	1495
396	GH550	4.6	700	7.4	1300	7.8	18550
420-444	GH550	4.6	700	7.4	1295	7.8	1850
Neutral-ground arresters							
72-78	GN123	0.4	150	1.4	285	1.4	410
84	GNxxx	0.4	150	1.4	285	1.4	410
90-132	GNxxx	0.4	155	1.4	295	1.4	425
144	GNxxx	0.5	190	1.7	355	1.7	515

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

Zinc Oxide Surge Arrester EXLIM T

Protection of switchgears, transformers and other equipment in high voltage systems against atmospheric and switching overvoltages.

- in areas with very high lightning intensity
- where grounding or shielding conditions are poor or incomplete
- for important installations
- where energy requirements are very high (e.g. very long lines, capacitor protection).

Brief performance data

System voltages (U_m)	245 - 800 kV
Rated voltages (U_r)	180 - 624 kV
Nominal discharge current (IEC)	20 kA_{peak}
Classifying current (ANSI/IEEE)	10/15/20 kA_{peak}
Discharge current withstand strength:	
High current 4/10 µs	150 kA_{peak}
Low current 2 000 µs	1 900 A_{peak}
Energy capability:	
Line discharge class (IEC)	Class 5
[2 impulses, (IEC Cl. 8.5.5)	15.4 kJ/kV (U_r)]
Fulfils/exceeds requirements of ANSI transmission-line discharge test for 800 kV systems.	
Short-circuit / Pressure relief capability	65 kA_{sym}
External insulation	Fulfils/exceeds standards
Mechanical strength:	
Permissible static service load (PSSL)	7 200 Nm
Maximum permissible dynamic service load (MPDSL)	18 000 Nm
Service conditions:	
Ambient temperature	-50 °C to +45 °C
Design altitude	max. 1 000 m
(Higher altitudes on request)	
Frequency	15 - 62 Hz

Guranteed protective data

Max.	Rated Voltage	Max. continuous operating voltage 1)		TOV capability 2)		Max. residual voltage with current wave						
		as per IEC	as per ANSI/IEEE			30/60 µs			8/20 µs			
U_m kV_{rms}	U_r kV_{rms}	U_C kV_{rms}	MCOV kV_{rms}	1 s kV_{rms}	10 s kV_{rms}	1 kA kV_{peak}	2 kA kV_{peak}	3 kA kV_{peak}	5 kA kV_{peak}	10 kA kV_{peak}	20 kA kV_{peak}	40 kA kV_{peak}
245	180	144	144	205	194	346	356	363	381	396	428	466
	192	154	154	218	207	369	380	387	406	423	457	497
	198	156	160	225	213	381	392	399	419	436	471	512
	210	156	170	239	226	404	415	423	444	462	499	543
	216	156	174	246	233	415	427	435	457	476	514	559
	219	156	177	249	236	421	433	441	463	482	521	567
	228	156	180	259	246	438	451	459	482	502	542	590
300	216	173	174	246	233	415	427	435	457	476	514	559
	228	182	182	259	246	438	451	459	482	502	542	590
	240	191	191	273	259	461	475	484	507	528	571	621
	258	191	209	294	278	496	510	520	545	568	614	667
	264	191	212	300	285	508	522	532	558	581	628	683
362	258	206	209	294	278	496	510	520	545	568	614	667
	264	211	212	300	285	508	522	532	558	581	628	683
	276	221	221	314	298	531	546	556	583	608	656	714
	288	230	230	328	311	554	569	580	609	634	685	745
420	330	264	267	376	356	634	652	665	697	726	785	854
	336	267	272	383	362	646	664	677	710	740	799	869
	360	267	291	410	388	692	712	725	761	792	856	931
	372	267	301	424	401	715	735	749	786	819	884	962
	378	267	306	430	408	726	747	761	799	832	899	978
	381	267	308	434	411	732	753	767	805	839	906	985
	390	267	315	444	421	750	771	786	824	858	927	1013
	396	267	318	451	427	761	783	798	837	872	941	1029
	420	267	336	478	453	807	830	846	888	924	998	1091
550	396	317	318	451	427	761	783	798	837	872	941	1029
	420	336	336	478	453	807	830	846	888	924	998	1091
	444	349	353	506	479	853	878	894	938	977	1060	1153
800	588	470	470	670	635	1134	1167	1189	1247	1299	1402	1525
	612	490	490	697	660	1180	1214	1237	1298	1351	1459	1587
	624	499	499	711	673	1203	1238	1261	1323	1378	1488	1618

More detailed information on the TOV capability and the protective characteristics are given in Publ. 1HSM 9543 13-01en.

1) The continuous operating voltages U_c (as per IEC and MCOV (as per ANSI) differ only due to deviations in type test procedures.
Uc has to be considered only when the actual system voltage is higher than the tabulated.
Any arrester with U_c higher than or equal to the actual system voltage divided by √3 can be selected.

2) With prior duty equal to the maximum single-impulse energy stress (10.0 kJ/kV (U_r)).

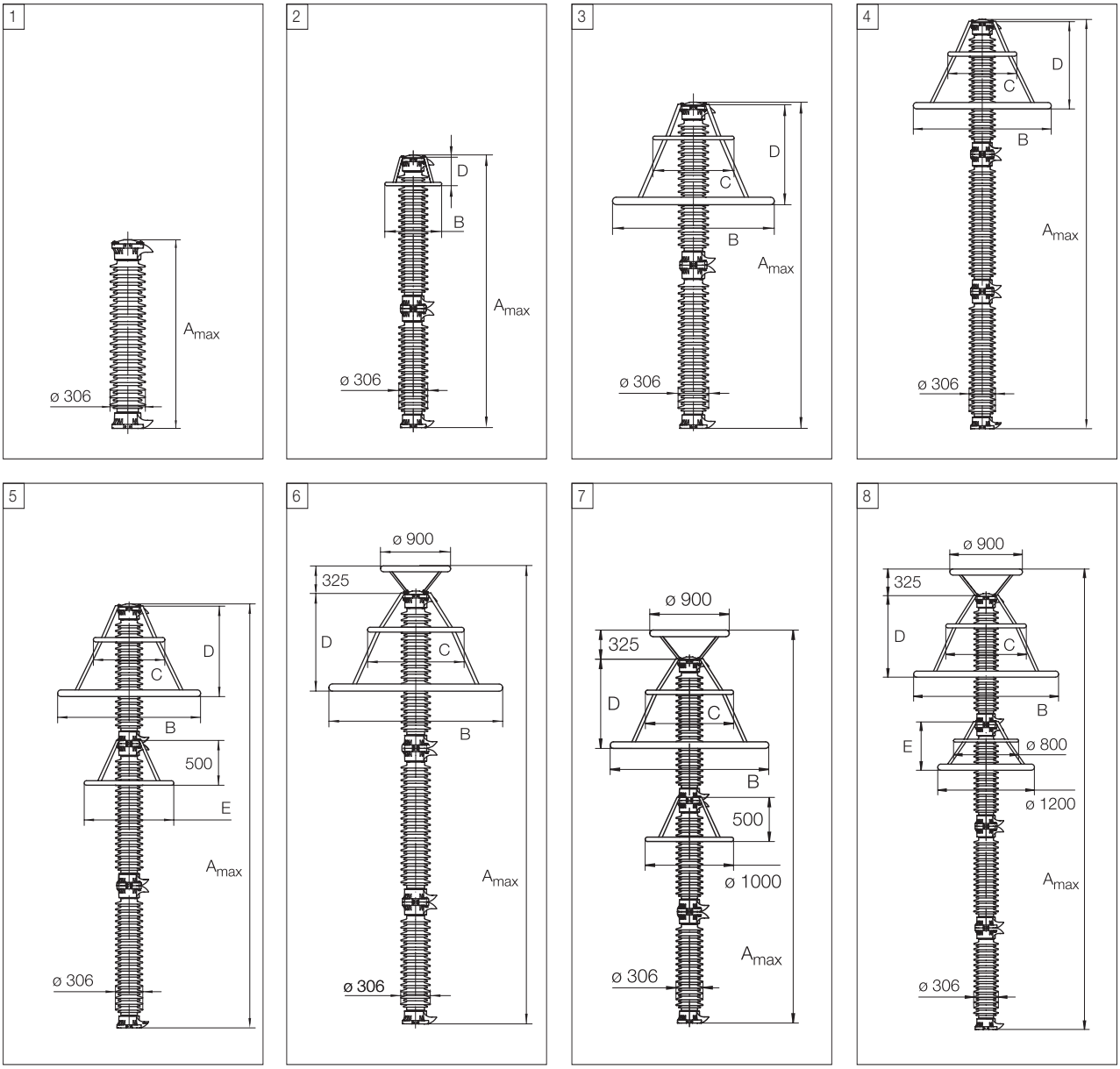
Arresters with lower or higher rated voltages may be available on request for special applications.

Technical data for housings

Max. system voltage	Rated Voltage	Housing	Creepage distance	External insulation *)				Dimensions						
				1.2/50 µs	50 Hz	60 Hz	250/2500 µs							
U_m kV_{rms}	U_r kV_{rms}		mm	dry kV_{peak}	wet (60s) kV_{rms}	wet (10s) kV_{rms}	wet kV_{peak}	Mass kg	A_{max}	B	C	D	E	Fig.
245	180	BH245	6570	1172	556	546	924	270	2585	900	600	500	-	3
	192	BH245	6570	1172	556	546	924	270	2585	800	600	400	-	3
	198-228	BH245	6570	1172	556	546	924	275	2585	600	-	300	-	2
	180	BV245	7717	1360	656	632	1078	300	2915	900	600	500	-	3
	192-198	BV245	7717	1360	656	632	1078	300	2915	800	600	400	-	3
	210-228	BV245	7717	1360	656	632	1078	305	2915	600	-	300	-	2
300	228-240	BM300	6570	1172	556	546	924	285	2585	900	600	400	-	3
	258-264	BM300	6570	1172	556	546	924	295	2585	900	600	400	-	3
	216	BH300	7717	1360	656	632	1078	315	2915	1200	800	600	-	3
	228-264	BH300	7717	1360	656	632	1078	320	2915	900	600	400	-	3
	216-240	BV300	9855	1758	834	819	1386	395	3859	1600	800	1000	-	4
	258-264	BV300	9855	1758	834	819	1386	400	3859	1200	800	800	-	4
362	258	BM362	7717	1360	656	632	1078	330	2915	1400	800	700	-	3
	264-288	BM362	7717	1360	656	632	1078	335	2915	1200	800	600	-	3
	258-288	BH362	9855	1758	834	819	1386	410	3859	1600	800	1000	-	4
	258-276	BV362	12149	2134	1034	991	1694	470	4520	1600	800	1200	800	5
	288	BV362	12149	2134	1034	991	1694	475	4520	1600	800	1200	-	4
420	330-360	BM420	8864	1548	756	718	1232	385	3245	1200	800	600	-	3
	330-336	BH420	11002	1946	934	905	1540	460	4190	1600	800	1000	-	4
	360	BH420	11002	1946	934	905	1540	465	4190	1400	800	700	-	4
	372-420	BH420	11002	1946	934	905	1540	475	4190	1200	800	600	-	4
	330-336	BV420	13296	2322	1134	1077	1848	525	4850	1600	800	1000	1000	5
	360-372	BV420	13296	2322	1134	1077	1848	530	4850	1600	800	1000	-	4
	378	BV420	13296	2322	1134	1077	1848	530	4850	1600	1000	650	-	4
	381-396	BV420	13296	2322	1134	1077	1848	530	4850	1400	800	700	-	4
	420	BV420	13296	2322	1134	1077	1848	540	4850	1200	800	600	-	4
550	396-420	BM550	11002	1946	934	905	1540	490	4500	1800	1000	800	-	7
	444	BM550	11002	1946	934	905	1540	495	4500	1800	1000	800	-	6
	396-420	BH550	14287	2352	1212	1178	2002	600	5763	1800	1000	1000	800	8
	444	BH550	14287	2352	1212	1178	2002	605	5763	1800	1000	1000	600	8
800	On request													
Neutral-ground arresters														
245	108	BN245	3285	586	278	273	462	140	1315	-	-	-	-	1
	120-132	BN245	3285	586	278	273	462	145	1315	-	-	-	-	1
	144	BN245	4432	774	378	359	616	180	1645	-	-	-	-	1

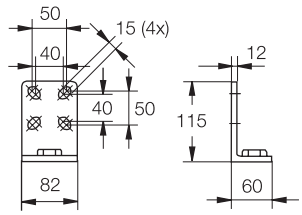
*) Sum of withstand voltages for empty units of arrester.

Technical data for housings

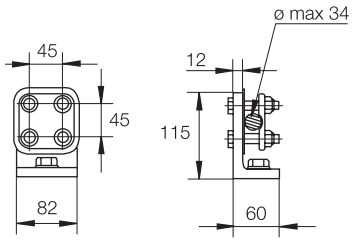


Accessories

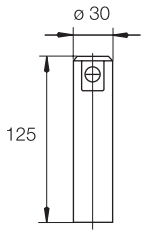
Line terminals



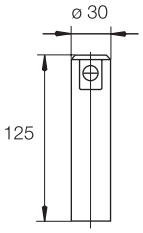
1HSA410 000-A
Aluminium



1HSA410 000-B
Aluminium flag with other items in stainless steel

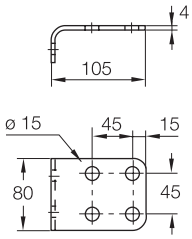


1HSA410 000-C
Aluminium

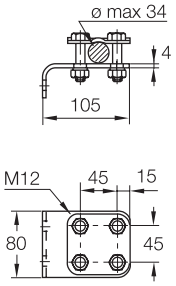


1HSA410 000-D
Stainless steel

Earth terminals



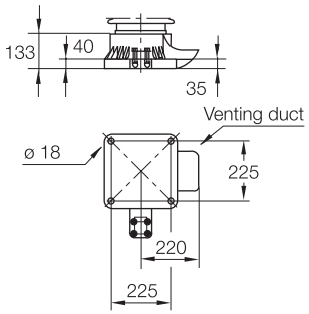
1HSA420 000-C
Stainless steel



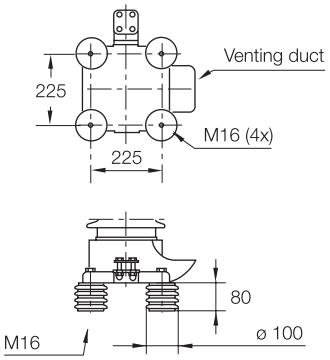
1HSA420 000-D
Stainless steel

Drilling plans

Without insulating base



With insulating base



1HSA430 000-C
Epoxy resin

M16 bolts for connection to structure are not supplied by ABB. Required threaded grip length is 15-20 mm.

Shipping data

Rated Voltage	Housing	Number of arresters per crate					
		One		Two		Three	
Ur kV_{rms}		Volume m^3	Gross kg	Volume m^3	Gross kg	Volume m^3	Gross kg
180-228	BH245	1.4	320	2.8	635	2.8	925
180-228	BV245	1.7	360	3.1	705	3.1	1025
228-264	BM300	1.4	340	2.8	675	2.8	985
216	BH300	2.2	410	3.8	755	3.8	1080
228-264	BH300	1.7	375	3.1	730	3.1	1060
216-240	BV300	2.9	540	5.7	1010	6.1	1435
258-264	BV300	1.9	490	3.5	965	5.0	1375
258	BM362	2.4	435	4.2	800	4.2	1140
264-288	BM362	2.2	430	3.8	800	3.8	1145
258-288	BH362	2.9	555	5.7	1040	6.1	1480
258-288	BV362	3.2	620	6.3	1160	6.3	1670
330-360	BM420	2.2	485	4.1	900	3.4	1300
330-336	BH420	3.2	605	6.3	1130	6.3	1620
360	BH420	2.4	570	4.2	1100	4.2	1570
372-420	BH420	2.2	575	3.8	1120	3.8	1610
330-336	BV420	3.2	670	6.6	1270	7.0	1825
360-378	BV420	3.2	680	6.6	1280	7.0	1840
381-396	BV420	2.4	640	6.1	1240	6.1	1780
420	BV420	2.2	635	5.8	1225	5.9	1795
396-444	BM550	3.2	655	6.0	1215	6.3	1730
396-444	BH550	3.2	765	6.0	1475	6.3	2115
Neutral-ground arresters							
108-132	BN245	0.5	180	1.4	345	1.4	500
144	BN245	0.5	220	1.7	415	1.7	605

Each crate contains a certain number of arrester units and accessories for assembly and erection. A packing list is attached externally on each crate.

Each separate crate is numbered and the numbers of all crates and their contents are listed in the shipping specification. ABB reserves the right to pack arresters in the most effective/economic combination. Alternate or non-standard crates may involve additional charges.

Surge Arrester Monitor EXCOUNT-II

As businesses strive to remain competitive, improved reliability of electricity supply and reduced maintenance costs are demanded by both power utilities and users alike.

ABB has in response developed EXCOUNT-II; an advanced surge arrester monitor for effectively, reliably and safely monitoring and recording surges on high voltage electrical networks.

More than just a counter

Discharge operation counters have been available for use with surge arresters for many years, however these have lacked the ability of giving a direct indication of the true health of surge arresters. Even counters fitted with simple mA meters are of very limited use, as they are unable to differentiate between the internal and external leakage currents nor exclude harmonic effects.

EXCOUNT-II is an entirely new monitoring system, as it can be used as an aid to assess the health of the entire substation by monitoring surges transmitted in and out of the network. The device is fitted to surge arresters within a substation similar to normal counters, but in addition to counting the number of discharges, EXCOUNT-II also records the amplitude of the surges, together with their date and time, plus measures the total leakage current and (optionally) resistive current through the arrester.

The measurements are stored in the EXCOUNT-II sensor, and can be collected when convenient with the aid of a hand-held cordless transceiver. The raw data is then transferred over to a computer for statistical analysis.

The detailed results obtained from EXCOUNT-II are not limited to a simple estimation of arrester stresses but instead give a true indication of the number and severity of surges and, when combined with data from event recorders, SCADA, etc, facilitiates an effective analysis of the amount and degree of voltage stress all equipment in the substation have been subjected to.

Unique data acquisition method

EXCOUNT-II is unique in its method of acquiring data. Each surge arrester is fitted with a sensor, which detects the total number of discharges, the surge amplitude, date and time of occurrence, as well as the leakage current through the arrester. All data is stored in the sensor's memory, and can then be read when convenient with the aid of a hand-held transceiver.

EXCOUNT-II´s measurement method is unique and simple. The sensor´s measured data is cordlessly transferred to a hand held transceiver. The measured data from the transceiver can then be transfered to a computer for statistical analysis.

Remote reading

Every sensor has a unique identity. Via the hand-held transceiver, the user selects the identity of the sensor he is interested in interrogating and communication will then be established directly with that sensor. The operator may take data from sensors in the substation within a distance of 60 m from where he is standing, and up to 30 sensors can be interrogated in one and the same session.

Remote reading leads to increased personnel safety compared with conventional counter reading. Indeed, the person does not necessarily have to even be inside the substation perimeter, so saving the need to arrange entry permits or have electrically trained personnel perform the work.

Surge counting

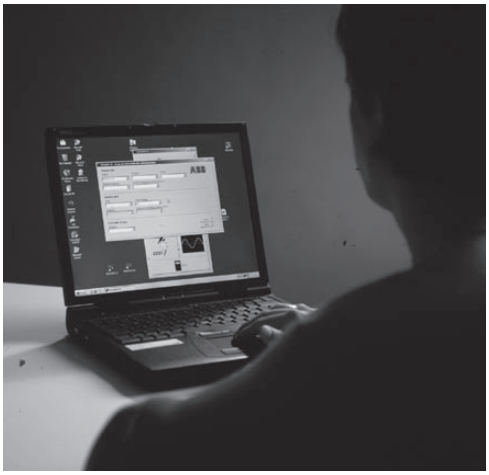
EXCOUNT-II does more than just count surges. It also registers the date and time as well as amplitude of the surge each time the arrester has discharged a current over 10 A. Time and amplitude measurement gives the user better information about overvoltages in the network and the operation of the arrester.

Leakage current measurement and condition monitoring

EXCOUNT-II gives the user the possibility to measure both the total leakage current as well as the resistive component of the current through the arrester. Measurement of the resistive current gives a good indication of the arrester's condition. The measurement method employed is based on third-harmonic analysis of the leakage current, and is the same as that used with the LCM (Leakage Currrent Monitor) which is internationally well proven since 1989. This is considered the most reliable measuring method for condition monitoring according to IEC 60099-5.

Statistical analysis

Included with EXCOUNT-II is specially designed software which facilitates download of the measured data from the transceiver and permits analysis and reporting of the collected information.



The included program is easy to use with a standard MS Windows interface, and gives details about over-voltages in the network as well as the surge arrester´s condition.

Maintenance free

The sensor is housed in a sealed, weather-proof case, suitable for outdoor use and proven to match the short-circuit capability of the arrester. The sensor requires no external power supply as it incorporates its own internal power supply in the form of a solar cell, field probe and capacitor. For indoor use, the sensor may be alternatively powered by a standard 9 volt battery.

Flexibility

EXCOUNT-II is available in two different versions. Both versions measure surge currents (number, amplitude and time) as well as total leakage current. The full version additionally measures the resistive component of leakage current.

Simple installation

EXCOUNT-II surge monitoring system incorporates a sensor, which is mounted on the arrester, a transceiver, for remote reading, and a PC-program (Windows 95/98/ME/XP and NT/2000). The system is easy to install on both existing and newly purchased surge arresters fitted with an insulating base.

Technical data

Surge Counting

Counting threshold (8/20 µs)	10 A
Surge current amplitude classification (8/20 µs)	10 - 99 A 100 - 999 A 1000 - 4999 A 5000 - 9999 A > 10 000 A
Error in surge counting amplitude	< 20 %
Surge counting time resolution	< 0.5 s
Surge counting time stamp format	YYYY:MM:DD:hh:mm:ss (1 s resolution)
Surge counting memory capacity	1000 registrations (wrap around)

Leakage Current Measurement

Measuring range of total leakage current (peak level)	0.1 - 50 mA (10-bit A/D conversion, autorange)
Error in total leakage current	< 5 %

Optional

Measuring range of resistive leakage current (peak level)	10 - 2000 µA
Error in resistive leakage current	< 10 µA (10 - 50 µA); < 20 % (50 - 2000 µA)
Diagnostic method classification acc. to IEC 60099-5, Amendment 1	Method B2 - Third order harmonic analysis with compensation for harmonics in the voltage

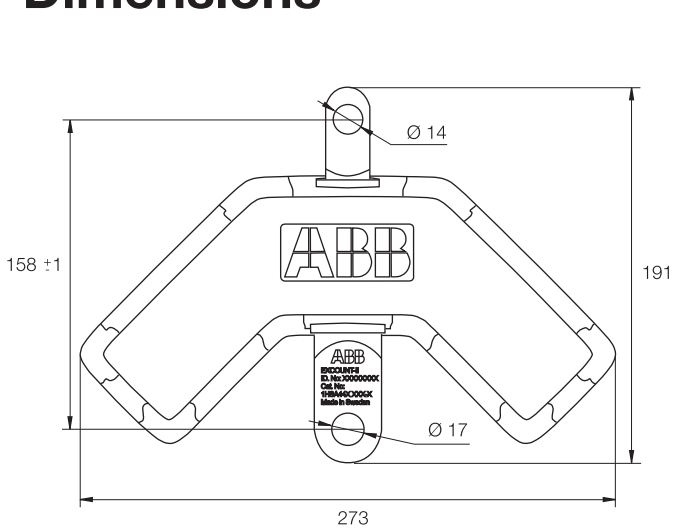
Sensor/Transceiver Data Communication

Type	AM radio (OOK) ETS and FCC approved
Frequency	868.35 MHz (916.50 MHz for North/ South America and Australia)
Antenna	Integrated on circuit-board
Output power	- 3 dBm (0.75 mW)

General

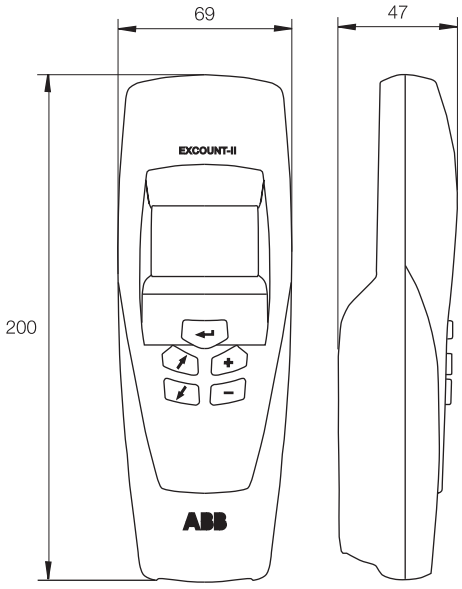
	Sensor	Transceiver
Climatic conditions	Sealed, water-tight design, IP 67 (Battery compartment, IP 65)	Weather-proof, IP 54
Ambient temperature range	–50 °C to +60 °C Operation: –40 °C to +60 °C	-10 °C to +50 °C
Measuring frequency range	50 or 60 Hz (automatic)	N/A
Short-circuit capability	65 kA acc. to IEC 60099-4	N/A
Power supply	Outdoor version: Powered from built-in solar cell and field probe Indoor version: 9 Volt lithium battery 6LR61/PP3	9 Volt battery Alkaline type 6LR61/PP3
Battery replacement period	8 years with 1200 mAh lithium battery (for indoor use)	> 4 hours

Dimensions



Sensor

Item no.	Frequency
1HSA441 000-A	for 868.35 MHz
1HSA441 000-C	for 916.50 MHz



Transceiver

Transceiver model 1

Application: Measuring total leakage current and surge data.

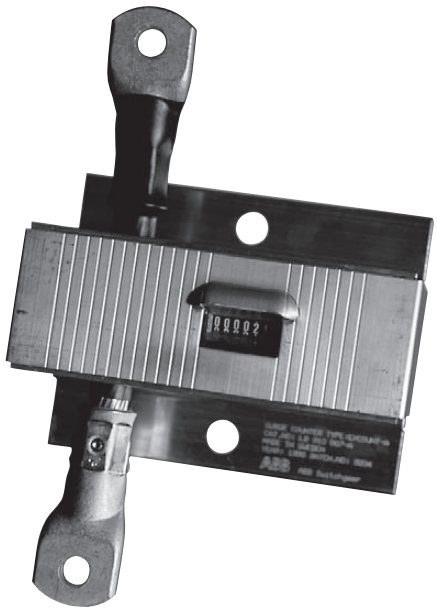
Item no.	Frequency
1HSA442 000-C	for 868.35 MHz
1HSA442 000-E	for 916.50 MHz

Transceiver model 2

Application: Measuring total leakage current, resistive leakage current and surge data.

Item no.	Frequency
1HSA442 000-A	for 868.35 MHz
1HSA442 000-D	for 916.50 MHz

Surge Counter EXCOUNT-A



Highest personnel safety
- Explosion-proof for short-circuit currents up to 80 kA.
- Same safe performance as arresters.

Negligible residual voltage
- Does not reduce protection margins.
- Reduces risk against accidental contact during surges.

Long life
- Moulded components, non-sensitive to humidity or temperature variations.
- Verified by tests per IEC 60068.

Universal application
- All makes and types of surge arresters.
- All weather and temperature conditions.

For gapless surge arresters, surge counters are used only to obtain information regarding surge activities in the corresponding surge arrester and its location.

Surge counter, EXCOUNT-A is designed therefore, to withstand the same severe conditions as the arresters without failure.

Design features
EXCOUNT-A comprises basically of an impulse current transformer with a single-turn primary in the form of an insulated stranded-copper cable to be connected in the earth circuit of an arrester. The cable is provided at both ends with tinned-copper cable shoes.

The secondary circuit consists of a rectifier, capacitor and an electronic switch connected to a mechanical counting relay and is totally moulded in plastic which makes it ideal for exposed installation. The complete assembly is then housed in an elegant vented aluminium casing. A suitable-angled window permits easy reading of the 6-digit cyclometer-typ counter.

The principle of operation is shown in figure 1 on next page.

Performance
The design of the secondary circuit ensures that the counting relay is not energised for low lightning current impulses which are insignificant to the arrester capability and life. The stepping criteria are given in figure 2 on next side. The current transformer secondary output is sufficient for driving the counter and external supply source is not needed.

The single-turn primary ensures that the voltage drop across the counter, even at the highest impulse currents encountered in service, is negligible, leading to added personnel safety and no increase in the protection level of the arrester.

Since no gaps or series impedance are used, there is no risk of internal arcing and consequent explosive faillure in the event of a short-circuit following an arrester failure.

Type tests

EXCOUNT-A has been subjected to severe electrical, mechanical and climate tests:

Shock test, 15 g	IEC 60068-2-27
Vibration test	IEC 60068-2-6
Temperature test (-55°C/+70°C)	IEC 60068-2-14
Humidity test	IEC 60068-2-30
Salt fog test (500h, +35°C, 95%RH, 5% salt)	DIN 50021
Impulse tests	IEC 60099-4
Short-circuit test (full asymmetry of 2.6)	IEC 60099-4

At 65 kA, there were no damages at all. At 80 kA, the insulation of the primary conductor was burnt.

However, the counter function was not impaired and no pieces were ejected.

Routine tests

All surge counters are routine-tested with a sufficient number of impulses in a pass/no pass test prior to despatch from the factory.

Packing, installation and maintenance

Counters are packed in cases together with arresters. For separate supply, they are packed in cartons.

Detailed instructions are enclosed with each counter. However, the following may be noted.

The counter must be placed at a suit able height for easy reading. The electrical lead between the earth terminal and the counter should be insulated and its length kept to a minimum. If the length is too long, the counter may not register for very steep impulses when the inductive voltage between the earth terminal and the counter exceeds the lightning impulse withstand level of the insulating base.

The counters are maintenance-free.

Refer to assembly instructions for more details.

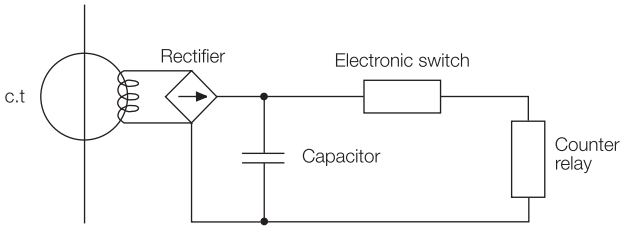


Fig. 1 Schematic diagram

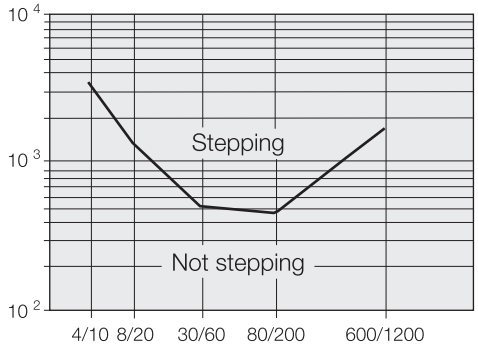


Fig. 2 Stepping criteria

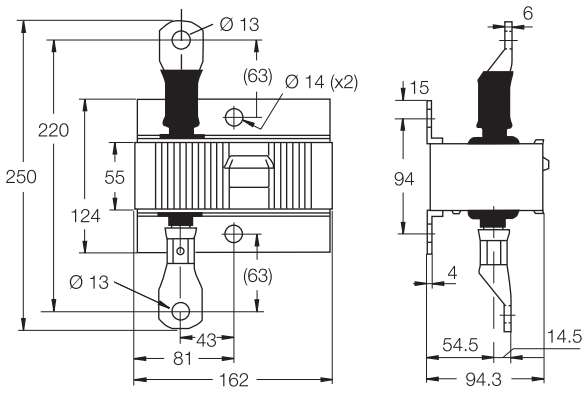


Fig. 3 Dimensions

Purchase order

Project		Handled by, e-mail or fax		Tender referency no (if any)
Buyer			Date (yyyy-mm-dd)	Buyer reference
End user				End user reference (if any)
Shipping terms	Destination			Means of transport
Freight forwarder (if FCA or FOB)				Payment terms
Goods marking		Delivery address		
Inspection of routine tests ☐No ☐Yes	Routine test standard	Documentation language	Rating plate language	Currency

Items

EXAMPLE

Quantity 3	Arrester type designation EXLIM Q120-EH145		
Color (porcelain) Brown	Line terminal 1HSA410000-A	Earth terminal 1HSA420000-A	Insulating base 1HSA430000-A
Delivery date (EXW) yyyy-mm-dd 2004-06-03		Unit price (if known) XXXX EUR	Total price (if known) XXXX EUR

Quantity	Arrester type designation		
Color (porcelain)	Line terminal	Earth terminal	Insulating base
Delivery date (EXW) yyyy-mm-dd		Unit price (if known)	Total price (if known)

Quantity	Arrester type designation		
Color (porcelain)	Line terminal	Earth terminal	Insulating base
Delivery date (EXW) yyyy-mm-dd		Unit price (if known)	Total price (if known)

Quantity	Arrester type designation		
Color (porcelain)	Line terminal	Earth terminal	Insulating base
Delivery date (EXW) yyyy-mm-dd		Unit price (if known)	Total price (if known)

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Customer Notes

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NOTE! ABB Power Technologies AB is working to continuously improve the products.
Therefore we reserve the right to change design, dimensions and data without prior notice.

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