



PRESENTATION, STORAGE, ERECTION, OPERATION AND MAINTENANCE INSTRUCTION MANUAL

Station Class Polymer Housed Metal Oxide Surge Arresters **VARISIL™ HI & HTS**



Better life.
With electricity.

ENSTO Novexia

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1. PRESENTATION

Our VARISIL™ HI and HTS surge arresters are intended for the over-voltage protection of electrical equipment, especially in substations and severe lightning stress areas.

These surge arresters offer all advantages of the polymer housed metal oxide technology.

The fireproof fibreglass reinforced resin structure provides the mechanical strength required for withstanding the static and dynamic loads which may apply in service.

The silicone rubber housing brings the required insulation withstand, even in coastal or industrial pollution zones.

VARISIL™ HI and HTS surge arresters fulfil all requirements from IEC 60099-4 (respectively Line Discharge Class 2 and Class 3) and ANSI/IEEE C 62.11 (Station Class).

1.1 - Dimensions :

Please refer to the relevant drawings showing the options which are available for the line terminal and the earth arrangement :

VARISIL™ HI surge arresters :	W 8992 01 X1	up to 36 kV	(1 unit)
	W 8992 01 X2	from 42 to 72 kV	(2 units)
	W 8992 01 X3	from 78 to 108 kV	(3 units)
	W 8992 01 X4	from 120 to 144 kV	(4 units)

VARISIL™ HTS surge arresters :	W 8993 01 X1	up to 36 kV	(1 unit)
	W 8993 01 X2	from 42 to 72 kV	(2 units)
	W 8993 01 X3	from 78 to 108 kV	(3 units)
	W 8993 01 X4	from 120 to 144 kV	(4 units)
	W 8994 01 YY	from 150 to 204 kV	(4 or 5 units)

1.2 - Nameplate :

VARISIL™ HI and HTS surge arresters are identified on :

- the top cap for surge arresters rated up to 72 kV (2 units maximum)
- the pedestal for surge arresters rated from 78 kV (3 units minimum)

The following data are marked :

ENSTO brand name or/and logo

VARISIL trademark

Type : **HI** or **HTS**

Rated voltage : **Ur** (kV rms)

Continuous operating voltage : **Uc** (kV rms)

Nominal discharge current : **In = 10 kA**

Line discharge class : **LDC 2** for HI or **LDC 3** for HTS

Short circuit withstand capability : **Is = 63 kA**

Frequency : **f = 50/60 Hz**

Individual serial number : **MM/YY & chronological number**

2. STORAGE

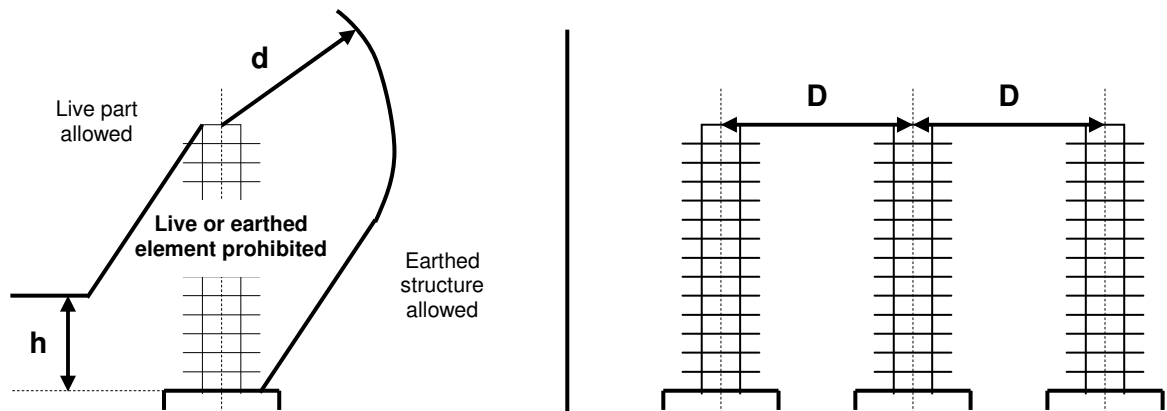
The surge arrester must be kept in its original packaging and stored indoor at a temperature not exceeding + 80 °C.

3. ERECTION

The surge arrester should be installed as close as possible to the equipment to be protected and connected to the general earth of the installation having an ohmic value as low as possible.

3.1 - Clearances :

Phase-to-phase and phase-to-ground distances shall not be less than the values required by existing regulations, procedures and/or operating rules.
The recommendations below are not intended to take precedence over such requirements.



Ur (kV rms)	5	10	15	21	24	30	36	42	45	48	54	60	66	72	78
h min (mm)	175	175	175	175	175	215	215	330	330	330	370	370	410	410	525
d min (mm)	125	175	220	270	290	340	400	450	480	500	560	620	670	730	800
D min (mm)	175	225	270	320	340	400	460	520	550	580	640	700	760	820	890

Ur (kV rms)	84	96	102	108	120	132	144	150	156	162	168	180	192	198	204
h min (mm)	525	565	600	600	710	750	790	800	840	840	840	850	930	930	930
d min (mm)	850	950	1010	1070	1380	1480	1580	1650	1700	1750	1800	2200	2250	2300	2350
D min (mm)	950	1070	1130	1200	1720	1820	1920	2000	2050	2100	2150	2800	2900	2950	3000

3.2 - Mounting :

The bottom end of the surge arrester must be connected to earth. The mounting conditions depend on the earth arrangement which was selected (refer to the corresponding drawing).

Maximum recommended tightening torques :

3.5 daN.m for **M12** hardware (TF, TFL, ST, STI options)

1.2 daN.m for **M8** hardware (SC, SCI options)

If used, the surge counter must be secured at the bottom of the supporting structure in order to be easily readable.

The conductor between the surge arrester and the surge counter must be isolated at 5 kV rms minimum. The conductor between the surge counter and the earth need not be isolated.

Both connections shall be as short and straight as possible.

3.3 - Connection to line :

The line terminal of the surge arrester must be connected using an appropriate conductor. The connecting conditions depend on the line terminal which was selected (refer to the corresponding drawing).

Maximum recommended tightening torques :

3.5 daN.m for **M12** hardware (TF, TFL options)

5.5 daN.m for **M16** hardware (PE, PEI, TC options)

A grading ring designed for balancing the voltage distribution is required for surge arresters made of at least 4 units (typically rated above 120 kV).

When supplied, this device must be inserted between the top cap and the line terminal (refer to the corresponding drawing, the warning labels and/or the assembling sheet for further details).

3.4 - Testing at site :

As each surge arrester is routine tested in our factory, no further electrical verification is necessary prior to commissioning.

If a surge counter is used, the initial value of the counter shall be recorded. If an integrated ammeter is available, the initial deviation shall be recorded as well.

These initial data will be needed for further diagnostic.

4. OPERATION

The active stack of the surge arrester is made of series metal oxide varistors (MOV) blocks.

MOV blocks are ceramics components which have a highly non linear voltage vs current characteristic curve, i.e. are able to change instantaneously from a highly isolating status to a very conductive status, and conversely.

Under normal conditions, the surge arrester is very high impedance : its internal leakage current remains very low, and may reach only a few milliamps in the worst case (high ambient temperature for instance).

In the event of an over-voltage, either generated by a lightning stroke or a switching operation, the resistance of the surge arrester progressively decreases as the voltage increases. A current impulse flows through the surge arrester, thus directing the energy to earth and limiting the actual over-voltage level close to the residual voltage of the surge arrester.

Once the transient conditions have disappeared, the surge arrester automatically returns to high impedance.

5. MAINTENANCE

Special maintenance of the surge arrester is not necessary.

The surge arrester may be washed together with insulators and bushings of other equipment, when scheduled.

If any, periodic recording of the counter and the ammeter readings will be made according to the procedures implemented by the user.