LOVOS
Low voltage surge arresters, MO blocks
Fundamentals
Overvoltages in electrical networks

Lightning surges
Switching surges
Temporary overvoltages
System voltage

\[ t = \text{time in seconds} \]

\[ 1 \text{ p.u.} = \sqrt{2} \times U_m / \sqrt{3} \]
Fundamentals
Insulation coordination

Insulation of all electric equipment is sufficient to strictly defined overvoltage level.

What options do we have?

- oversize equipment insulation to withstand all possible overvoltages
- accept overvoltages and possible damages to the equipment
- apply surge protection
  - use surge arresters

The most effective way to prevent insulation breakdown is using surge arresters.
Fundamentals
Insulation coordination

- Arrester parameters
- Network parameters

- Unprotected overvoltage level
- Basic insulation Level BIL

- Protection level
- TOV capability
- System voltage

- Voltage
- Time

- MCOV = Uc
- Ur
- Up
- TOV
- COV

- Protective margin
Protection against overvoltages in electrical systems means:

- protection of insulation against breakdown
- preventing power supply interruptions
- increasing power quality
LOVOS
Metal oxide surge arrester

- LOVOS-5 and LOVOS-10 are new generation of LV surge arresters without spark gap, with varistors of metal oxide technology

- LOVOS provides protection along LV overhead lines, for cables, motors, switches etc., any equipment connected to the line, from LV side of distribution transformer up to measuring instruments

- LOVOS is meant for high quality energy supply
- LOVOS is tested according to the new international IEC 61643-1; 2005 Standard
LOVOS
Metal oxide surge arrester

- **Application**
  - Low voltage surge arrester LOVOS provides protection along low voltage overhead distribution lines, it is used for LV switchgears, distribution transformers, cables and electric motors protection; in general, it ensures high quality energy supply.

- **LOVOS installed in LV electric systems:**
  - protects insulation against breakdowns
  - prevents power supply interruptions
  - increases power quality

- **Application:**
  - outdoor and indoor
  - altitude: up to 2000 m above sea level
  - ambient temperatures in place of work [or storage]: from –40°C to + 70°C
  - humidity up to 90%

- **Places of installation:**
  - low voltage switchgears, distribution transformers [at LV side]
  - transition points of insulated and uninsulated, overhead and underground lines and cables
  - electricity service entrance locations to buildings [in cabinets or at poles]
  - at junctions [branching]
  - every 500 / 1000 m of overhead line in locations of high lightning activity
  - at the end of dead-end feeder line
  - at the sealing ends of inserted cables
  - at any apparatuses connected to secondary voltage source
LOVOS
Technical data

- For system voltages up to 1 kV
- Frequency up to 62 Hz
- Nominal discharge current $I_n$ 8/20 μs 5 or 10 kA
- Maximum discharge current $I_{\text{max}}$ 8/20 μs 25 or 40 kA
- Limiting discharge current 4/10 μs 40 or 65 kA *)
- Classification according to IEC61643-1; 2005 - class II
- Classification according to DIN/VDE 0675/6 - class A
- Compliance with Standards:
  - IEC 61643-1; 2005-05 „Surge protective devices connected to low voltage power distribution systems Part 1: Performance requirements and testing methods”.
  - DIN/VDE 0675/6 (Überspannungableiter zur Verwendung in Wechselstromnetzen mit Nennspannungen zwischen 100V und 1000V)

*) requirement according to IEC 60099-4
## LOVOS

### Guaranteed parameters

<table>
<thead>
<tr>
<th>Arrester type</th>
<th>$U_c$ (effective value)</th>
<th>$U_p$ at $I_n$</th>
<th>$I_n / I_{max}$</th>
<th>$U_p$ at $I_{max}$</th>
<th>Energy absorption capability</th>
<th>$U_p$ at long lasting surge 2000 μs</th>
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<tbody>
<tr>
<td></td>
<td>V</td>
<td>V</td>
<td>kA</td>
<td>V</td>
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<td>V</td>
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<tr>
<td>LOVOS - 5 / 280</td>
<td>280</td>
<td>1100</td>
<td></td>
<td>1500</td>
<td>1800</td>
<td>850</td>
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<tr>
<td>LOVOS - 5 / 440</td>
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<td>1800</td>
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<td>2500</td>
<td>3000</td>
<td>1300</td>
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<td>500</td>
<td>2000</td>
<td>5 / 25</td>
<td>2600</td>
<td>3200</td>
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<tr>
<td>LOVOS - 5 / 660</td>
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<td>2500</td>
<td></td>
<td>3200</td>
<td>4000</td>
<td>1800</td>
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<td>LOVOS - 5 / 1000</td>
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<td>4000</td>
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<td>5200</td>
<td>6400</td>
<td>3200</td>
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<td>LOVOS - 10 / 280</td>
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<td>1100</td>
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<td>1700</td>
<td>2200</td>
<td>900</td>
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<td>1800</td>
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<td>1700</td>
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<td>2500</td>
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<td>3800</td>
<td>4500</td>
<td>1900</td>
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<td>LOVOS - 10 / 1000</td>
<td>1000</td>
<td>4000</td>
<td></td>
<td>5800</td>
<td>7800</td>
<td>3400</td>
</tr>
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</table>
LOVOS Technology

- LOVOS includes a varistor enclosed in a cover made by direct polyamide injection.
- In case of overstress LOVOS with disconnecting device automatically ejects an earth terminal that remains dangling. Red colour of earthing terminal makes a failure visible from a distance.
- LOVOS is offered with wide range of top and bottom accessories
LOVOS
Standard top and bottom accessories

Top accessories

Bottom accessories
Protection of distribution transformers

- Most of distribution transformers are protected on the primary side by means of surge arresters. Representing substantial capital investment and as key component for reliable and continuous electricity supply, the transformer should be always afforded the best possible protection against damage or deterioration on the secondary side as well, preferably by use of low voltage surge arresters installed directly on it’s secondary bushings.

- Among numerous benefits of the proper selection and application of surge arresters for the protection of transformer’s secondaries, the following are essential:
  - avoidance of insulation damages
  - prolonged lifetime of a transformer
  - reduced system disturbance
  - cost savings in maintenance or equipment replacements

- All the specified benefits are reflected directly in significant cost savings in maintenance or equipment replacements. On the other hand the arresters installed on the secondary bushings reduce the overvoltages generated in the medium voltage system and transferred to the low voltage side by capacitive, magnetic or earth coupling through a transformer itself. In this way high quality of electricity supply is secured.
Lightning overvoltages caused by either direct lightning stroke at the overhead line or by induced overvoltages [when lightning strokes at some distance from the line] may be transferred to electricity end users; they endanger panels’ insulation.

Switching overvoltages created by switching on and switching off grid elements and/or electric apparatuses last longer and although they have lower amplitude they represent high danger to panels’ thermal stability.

Using surge arresters LOVOS is the most effective way of protection of low voltage switchgears and panels; LOVOS with disconnecting device will limit overvoltage amplitude and ensure safety. Besides ensuring proper resistance to TOV, it is easy to identify damaged arrester after the overstress.
Overvoltage protection Scheme

A) MV - surge arrester (e.g. MWK or POLIM-D)

B) LV - surge arrester (e.g. LOVOS)
Overvoltage protection
Arrester spacing

building
LOVOS
Metal oxide surge arrester

- **Advantages of use**
  - easy assembly and connection, no special tools are required
  - disconnecting device / damage indicator
  - broad range of connection and earthing accessories
  - all accessories made of corrosion resistant materials
  - housing resistant to UV radiation, non–flammable
  - maintenance free product
  - protection degree:
    - IP 06 for standard execution
    - IP 66 with insulated accessories
  - low cost investment when compared with the value of protected equipment [distribution transformers, switchgears, overhead lines, motors etc.]
  - lower rate of service interruptions
  - lower cost of maintenance, equipment replacements
  - better stability and predictability of the system
  - better quality of delivered power – energy consumers more satisfied
Global responsibility-MO blocks

In 2002 ABB Sp. z o.o. branch in Przasnysz was appointed the LEAD CENTRE for low voltage surge arresters production within ABB Group, with the global responsibility for the product development, marketing and sales.
Production process of MO blocks

- Składniki mieszanki
- Preparing of the slurry
- Drying
- Pressing
- Sintering of MO blocks
- Metalization
- Metalization Coating
- Control
- Stock
- Coating by fluidization
- Drying and curing of silver metalization
- Metalization
- Coating
- Control
- Stock
- Soldering
- Coating by fluidization
- Control
- Stock
ABB Group in Poland
Present product portfolio

Types of varistors produced in ABB Poland:

Round - 30mm², 41mm², 57mm², 70mm², 80 mm²
Squared - 34mm²

up to 25 mm height

Depending on client’s requirements other dimensions are available

Each of them could be:
with metallization
full equipped (metallization, electrodes, coated)

Capacity:
2 mln LV MO block per year
Lead time- 2 weeks for 5000 units
ABB Group in Poland
General information

Advantages:

High non-linearity of U-I characteristic
high discharge current capability
electrical stability during long term work at
operating voltage

Storage:

-humidity below 90%
-temperature -40°C +70°C

Application:

Protection of the electrical, electronic and power
electronic devices from the effects of lightning
and switching overvoltages
ABB Group in Poland
Technical data – Lovos round blocks

<table>
<thead>
<tr>
<th>Uc</th>
<th>280 V</th>
<th>440 V</th>
<th>660 V</th>
<th>1000V</th>
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<tbody>
<tr>
<td>Discharge current 8/20 μs</td>
<td></td>
<td>5 kA</td>
<td></td>
<td></td>
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<tr>
<td>Protection level (Up)</td>
<td>1150 V</td>
<td>1800 V</td>
<td>2500 V</td>
<td>4000V</td>
</tr>
<tr>
<td>Reference current</td>
<td></td>
<td>1 mA</td>
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<td></td>
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<tr>
<td>Discharge current (once) 8/20 wave (I max)</td>
<td>25 kA</td>
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<tr>
<td>Reference voltage at Imax</td>
<td>1800 V</td>
<td>2500 V</td>
<td>3600 V</td>
<td>5800V</td>
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<tr>
<td>Storage temperature</td>
<td></td>
<td></td>
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<td>-40°C–70°C</td>
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## ABB Group in Poland
### Technical data – Lovos round blocks

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<tr>
<th>Uc</th>
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<tr>
<td><strong>Reference current</strong></td>
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<td>1 mA</td>
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<td><strong>Reference voltage at I max</strong></td>
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<td>3600 V</td>
<td>5800V</td>
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<tr>
<td><strong>Storage temperature</strong></td>
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<td></td>
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<td>-40°C⁻⁷⁰°C</td>
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</table>
### ABB Group in Poland

**Technical data – 5kA round blocks**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<td><strong>Protection level (Up)</strong></td>
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<tr>
<td><strong>Reference current</strong></td>
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<tr>
<td><strong>Discharge current (once) 8/20 wave (I_max)</strong></td>
<td>25/40kA</td>
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<tr>
<td><strong>Reference voltage at Imax</strong></td>
<td>1800 V</td>
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<tr>
<td><strong>Storage temperature</strong></td>
<td>-40°C to +70°C</td>
</tr>
</tbody>
</table>

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Quality

Conformity with:

IEC 61643-1 for the LOVOS arrester
UL 1449 for the MO blocks
Power and productivity for a better world™