Surge protective Devices (SPDs)
Mersen is a global leader in electrical power management

- Fuses, fusegear, switches, surge protection, heating/cooling, bus bar
- N.A. headquarters in Newburyport, MA
- Production in Juarez, Mexico
- Distribution Center in Louisville, KY

TPMOV® technology: best in the industry for overvoltage protection
Have you ever used a surge strip?

Surge Strips are used for protecting your home electronics...
The terms Surge Arrestors or Surge Suppressors are no longer used...they are now called Surge Protective Devices (SPD).

SPDs have a very basic purpose... they are designed to protect electrical devices from voltage spikes.

SPDs attempt to limit the voltage supplied to an electric device by either blocking or shorting to ground any unwanted voltages above a safe threshold.

SPDs can absorb/redirect multiple smaller surge events, or potentially one major surge event and will then deteriorate and need to be replaced.

- NO SPD can absorb a direct lightning strike
- NO SPD is resettable
- MOVs sacrifice themselves, requiring replacement of the SPD

**How long does an SPD last?**

SPDs can absorb/redirect multiple smaller surge events, or potentially one major surge event and will then deteriorate and need replacing.
Although often used as separate terms in the surge industry, Transients and Surges are the same.

- Brief overvoltage spikes or disturbances that can damage, degrade or destroy electronic equipment within any home, commercial building, industrial or manufacturing facility, measuring tens of thousands of volts, lasting up to 50 microseconds
  - A microsecond is a unit of time equal to one-millionth of a second
  - One microsecond is to one second... as one second is to 11.574 days
Surge activity is often assumed to be an outside, lightning induced electrical energy burst. **However,** while lightning surges are the most accused, most surges originate from **internal** sources within a facility.

- Studies have verified that approximately 80% of transient activity at a given facility is **internally** generated.
- **Internal culprits:** Range from copiers to coffee makers, from vacuum cleaners to variable speed drives, and from fluorescent light ballasts to furnace igniters and generators.
  - Any time an inductive load is either powered ON or OFF – it generates a low magnitude surge impulse that propagates back through the electrical system.
Sources of Surges

80% of Surge Events come from *Internal* sources, causing damage over time!
- On & Off switching of loads
- Inductive loads...Motors & Pumps
- HVAC Units
- Elevators & Drives
- Office Equipment
- Cleaning Equipment

20% of Surge Events come from *External* sources, causing immediate damage!
- Lightning Strikes
- Utility Load Switching
- Fault Clearing
- Crossed power Lines
- Damaged Transformers
Lightning causes between $250M - $500M each year in property damage across the United States.
Surge Event Damage
ARE YOU PROVIDING YOUR CUSTOMERS SURGE PROTECTION FOR THEIR HEATING & AIR CONDITIONING EQUIPMENT?
Today’s expensive HVAC equipment, electronic circuitry and anything with an ECM motor requires Protection.
Higher efficiency HVAC System sales are on the rise
This translates to higher cost and more electronics integration
How A Surge Protective Device Works

The SPD senses an **OVERVOLTAGE** condition and creates a momentary past to ground redirecting the harmful overvoltage...thus limiting the voltage peak and protecting the equipment from damage. *Taking the least path of resistance*
Surge Protection Technology

TPMOV® technology (Thermally Protected Metal Oxide Varistors)

The TPMOV® Technology eliminates common destructive failure modes associated with standard MOVs. Comprised of a voltage clamping and disconnecting device inside the TPMOV, the device is securely disconnected in the event of an overvoltage by an arc shield.
**TPMOV® Surge Technology**

Complex, **expensive HVAC equipment** deserves exceptional Surge Protection.

Mersen TP MOV® Technology

1. Eliminates common destructive failure modes associated with standard, old-style MOVs
2. Comprised of a voltage clamping and disconnecting device inside the **TPMOV®**
3. Arc Shield **securely** disconnects, in the event of an overvoltage
Let's watch a 3 minute video

https://www.youtube.com/watch?v=p86t-uuyMAE
**Buyer Beware**

Although a product may advertise a “Thermally Protected Device”, this can be deceiving!

Standard MOV Technology (Metal Oxide Varistor) is the most common SPD technology, however:

- Cured, flame retardant epoxy polymer
- Performance suffers
- Availability, reliability
- Ease-of-Use, inexpensive
- “Cost” for low-end technology
Without TPMOV® Surge Technology

Small array MOV’s have a “domino” like effect!… One small MOV in the array degrades… Then another, and another…. Making them less effective… Finally ending in a potential volatile state.
Without TPMOV® Surge Technology

Others... contain foreign material like sand, epoxy and “black-goo” in an attempt to assist with its protection process.
Important SPD Features to consider

- **TYPES** – Intended Application...Where?
- **UL** – Listing
- **NEMA** - Enclosure Type
- **MCOV** - Maximum Continuous Operating Voltage
- **(I_n)** **Rating** – Nominal Discharge Current
- **Imax** - Maximum Surge Current Rating
- **VPR** - Voltage Protection Rating
- **SCCR** - Short Circuit Current Rating
- **Warranty** – Product warranty
Beliefs/Misconceptions

The terms Surge Arrestors or Surge Suppressors are no longer used... they are now called Surge Protective Devices (SPD)

Joule Rating
This is not required by UL
- The amount of surge energy, measured in watts per second, that an SPD is capable of absorbing. Joule ratings should not be considered an indicator of SPD performance since the rating is based on current duration versus voltage formula
- It is important to note that NEMA, ANSI, IEEE or IEC do not recognize joule ratings as a valid metric to benchmark SPD performance
- This rating cannot be put on the actual SPD per UL

Peak surge current per phase
This is not required by UL
- Measure of life or longevity expectations of SPD. Also referred to as “single impulse rating”, “maximum current rating”, or “life rating”. There is no standard used to measure this rating. Hence, a variety of manufacturers “manufacture” this number based on inference
Surge Types

Used to describe the intended application location of the SPD, either upstream or downstream of the main overcurrent protective device of the facility.

**Type 1 SPD** - Permanently connected devices intended for installation between the secondary of the service transformer and the line side of the main service breaker, but are also suitable for installation on the load side as well. Designed and rated to be installed without the requirement for an external overcurrent protective device. COVERS ALL-THE-ABOVE

**Type 2 SPD** - Permanently connected devices intended for installation on the load side of the main service breaker; including SPDs located at the branch panel.

**Type 3 SPD** - Point of utilization SPDs, for example cord connected, direct plug-in, receptacle type and SPDs installed at the utilization equipment Being protected.
The Surge Protective Device (SPD) shall be rated for continuous operation.

Quick-Look at some key NEMA guidelines:

- Shall be permanently connected, parallel designs. In series shall not be acceptable
- Operating Temperature: -40°C to 60°C
- Relative Humidity: 0% to 95%, non-condensing

HISTORY

- February 2007 - ANSI/UL 1449 - 2nd edition: revised to include extended abnormal overcurrent testing
- September 2009 - ANSI/UL 1449 - 3rd edition, the overcurrent testing adapted even more robust testing 2016 - UL 1449 - 4th Edition Latest standard. These devices must pass a nominal discharge current level of 10 kA or 20 kA
PART 2 - PRODUCTS

2.1 GENERAL

10. Hybrid, three-tier design utilizing:

(a) Thermally Protected Metal Oxide Varistors (TpMOVs) featuring:

- “Fail-safe” design technology with integrated thermal apparatus that monitors the status of the metal oxide disk with built-in dielectric protection and indication by an integral micro-switch.

- The TpMOV eliminates the requirement of internal or external fuses (which would limit surge protection capability) for the surge protection components, while providing a Short Circuit Current Rating (SCCR) of 200,000 Amps.

GENERAL UL 1449 4th EDITION DESIGN-BUILD SPEC: SURGE PROTECTIVE DEVICES • Prepared by THOR SYSTEMS, INC. TSI
Enclosure rating – ensures that the TYPE rating of the enclosure matches the environmental conditions at the location where the device is to be installed.

Our units carry an industry best NEMA 4X enclosure rating

Type 4X – Enclosures constructed for either indoor or outdoor use to provide protection against incidental contact with the interior AND protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, hose-directed water, and corrosion and the formation of ice on the enclosure.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Protects against</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEMA 1</td>
<td>General Purpose Indoor, prevents accidental contact of personnel with the enclosed equipment</td>
</tr>
<tr>
<td>NEMA 3R</td>
<td>Windblown dust, vertical rain, severe external corrosion</td>
</tr>
<tr>
<td>NEMA 4</td>
<td>dust, watertight, splashing rain, hose directed water, severe external condensation</td>
</tr>
<tr>
<td>NEMA 4X</td>
<td>Dust, rain, splashing rain, hose directed water, ice, corrosion resistant</td>
</tr>
</tbody>
</table>
Surge Specifications

\( (I_n) \) Rating: Nominal Discharge Rating
- The peak current that can pass through the SPD where the SPD remains functional after 15 surges. Like a STRESS TEST
- Rating for Ruggedness of overall performance (think - ½ Ton Truck)
- Higher rating provides better performance
- 20kA is the highest rating that can be assigned by UL

\( (I_{\text{Max}}) \) Rating: Maximum Discharge Rating
**Surge Specifications**

**MCOV – Maximum Continuous Operating Voltage**
- This is the maximum steady state voltage the SPD can withstand without becoming a fire or safety hazard
- Maximum voltage the device can withstand before clamping “kicks-in”
- Ideally rating should be slightly higher than operating voltage (good buffer)
  For 120V, 130-150V range is acceptable
- Lower rating is better
Surge Specifications

VPR – Voltage Protection Rating
- How much voltage is allowed through the surge protector after it’s done its job
- The value assigned by UL which specifies the measured limited voltage value of the SPD. This was formally known as the “suppressed voltage rating”
- Lower ratings generally provide better performance

SCCR– Short Circuit Current Rating
- Is the amount of “available” current that the SPD can be subjected to and safely disconnect from the power source under short circuit conditions
- The amount of current “interrupted” by the SPD is typically significantly less than the “available” current. The higher the rating, the more rugged the SPD performance.
### Part # | Description | Additional Key Spec’s
--- | --- | ---
STXH240S05 | 240/120V Split Phase (3W) | **Single Phase Residential and Light Commercial**<br>1/2” – 14 threaded hub w/sealing locking washer<br>Pre-wired 18” 10AWG, in a NEMA 4X Non-metallic enclosure<br>Operating & Storage Temperature: -40°C to +85°C<br>Relative Humidity Range: 0 to 95% non-condensing<br>Visual End-of-Life Indicator: GREEN = OK, OUT = REPLACE<br>Frequency: 50-60Hz

STXR480Y05 | 480/277V 3-Phase WYE | **3-Phase Commercial**<br>3/4” – 14 threaded hub with locking washer<br>Pre-wired 3’ (1m) 10AWG in a NEMA 4X Non-metallic enclosure<br>Operating & Storage Temperature: -40°C to +85°C<br>Relative Humidity Range: 0 to 95% non-condensing<br>Visual End-of-Life Indicator: GREEN = OK, OUT = REPLACE<br>Frequency: 50-60Hz

STXR480Y05A | 480/277V 3-Phase WYE with Audible Alarm and Dry Contact (A) | Add Suffix “A” for Audible Alarm and Dry Contact.<br>(Pre-wired 3’ 18AWG)<br>• 125VAC, 1A Resistive; 30VDC, 2A General Purpose<br>Red = Normally Closed; Gray = Common; Blue = Normally Open<br>Audible Alarm - Alarm sounds when any protection is lost
Features and Benefits
STXH240505

3-Year Warranty

Unmatched Surge Capacity Ratings

3½” threaded hub with sealing lock washer. Pre-wired 18” 10AWG

120/240V Split Phase (3W)

Type 1 or 2 SPD installations with 3 Modes of Protection (L-N, L-L)

NEMA 4X Non-Metallic Indoor/Outdoor Rated Enclosure

LED Status Indicator
All-Angle Visual Status Indicator
(ON = Protected, OFF = Replace)

† UL 1449 4th Edition Listed
† CSA C22.2 Listed
† Type 1 SPD

Designed with the popular, industry leading, Mersen patented TPMOV® Technology.
The best performing, most reliable surge suppression technology on the market
Installation & Wiring

Its compact footprint is designed to partner with the AC Disconnect or Furnace Switch.

Wiring for a Furnace Switch application. Wire the two black-wires together.
WIRING

- Wiring is in parallel
- When wiring in the surge device, be sure to keep the proper lengths and not wind, twist or bunch-up excess wire inside disconnect
- Wire nut wires together as per NECA Code as apposed to double-lug

What is “Modes of Protection”?
Electrical paths where the SPD offers defense against transient surge voltages. Examples include, Line to Neutral (L-N), line to Ground (L-G), Line to Line (L-L) and Neutral to Ground (N-G).
**LED indicators provide:**
Real-time diagnostics for quick and easy troubleshooting

<table>
<thead>
<tr>
<th>Condition</th>
<th>Green LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surge Protection – “Working”</td>
<td>ON</td>
</tr>
<tr>
<td>Surge Protection Failed – “Did its job”</td>
<td>OFF</td>
</tr>
<tr>
<td>REPLACE SURGE DEVICE</td>
<td></td>
</tr>
</tbody>
</table>
Targeted Applications

Heating and Cooling Surge Protective Device

- Residential or Light commercial
  - Mini Splits/Ductless
  - Condensing Units
  - Air Handlers
  - Heat Pumps
  - Central Air Conditioners
  - Furnace
  - Hydronic Heating
Surge Applications

Point-Of-Use

- HVAC Equipment
- Mini-Splits
- Condensing Units
- Air Conditioners
- Furnace
- Boilers
- Residential
- Light Commercial
- Commercial – 3-Phase
- Industrial Motors
- Traffic Controllers
- Residential Meters
- Irrigation Controllers
- Homes
- Schools
- Restaurants
- Stores
- Hotels
- Parks
- Apartments/MRO
- Farms
- Garden Center
- OEM Equip
- Sump Pumps
Targeted Applications

The perfect applications are Ductless or Mini-Split application

Ductless Advancements Spur Interest

Contractors, Consumers More Apt to Consider Mini-Split Solutions

By Angela D. Harris
Of The NEWS Staff

Ductless technology is gaining ground in the HVAC marketplace. What began in the U.S. as a niche technology is seemingly setting its sights on mainstream application.

“Almost every contractor in the industry is now selling some version of a ductless product,” said Bryan Rocky, director of residential product management, unitary products group, Johnson Controls Inc. “Those who are not [selling ductless products] will most likely add a ductless unit to their product offering to accommodate certain applications over the next few years. The popularity of ductless units is increasing in add-on/replacement installations, and contractors today are less reluctant to quote ductless products than they were a few years ago.”

* See ADVANCEMENTS | page 20

The multifamily housing segment has become a hot application for mini-splits, allowing tenants to cut down on their utility bills.
Packaged for the Home Owner and General Consumer (End User)
Its compact footprint is designed to partner with the AC Disconnect or Furnace Switch.

Wiring for a Furnace Switch application. Wire the two black-wires together.
3 and 5-Year Warranty

- Warrants to the original purchaser (Homeowner/End User), that our products shall be free from defects in material or workmanship for a period of 3-years for Residential single phase products. 5-year for 3-phase

- SPDs employ suppression components that wear out over time, it is recommended to replace SPDs as part of a preventative measure after the warranty expires
1. **ECM/CIRCUITRY** - Repairs revolving around Surge & “Power Quality Issues” are typically outside of seasonal maintenance plans. Today’s ECM/Circuitry needs protection

2. **PMA/SMC** - Add support and Home-Owner comfort & “*Piece-of-Mind*” to your Service Maintenance Contract

3. **CUSTOMER** - Protect your customers investment! Put yourself ahead of the competition and add a **Robertshaw Surge Device** to your Preventative Maintenance Agreement (PMA)

“Great ADD-ON to your Seasonal Maintenance Contract. Installs in 10 Minutes or Less”
Perfect Scenario and Pairing

Complete Protection for the Central Air-Conditioning System, Condensing Unit, Air Handler, Furnace (Cascade Protection)

Surge Protection Device
- Condensing Unit

Surge Protective Device
- Air Handler

Other Applications
- Mini-Split/Ductless System
- Furnace
- Hydronic/Boiler
- Heating Systems
What About 3-Phase Surge Protection?
Features and Benefits
STXR480Y05 & STXR480Y05A

- 5-Year Warranty
- ¾” threaded hub with lock washer.
- Pre-wired 36” 10AWG wire
- 480/277V 3-Phase WYE
- Type 1 or 2 SPD installations up to 10 modes of Protection (L-N, L-L, L-G optional, N-G optional)
- Unmatched Surge Capacity Ratings
- Designed with the popular, industry leading, Mersen patented TPMOV® Technology. The best performing, most reliable surge suppression technology on the market

NEMA 4X
Non-Metallic Indoor/Outdoor Rated Enclosure

- UL 1449 4th Edition Listed
- CSA C22.2 Listed
- Type 1 SPD

LED & Remote Status Indicator
All-Angle Visual Status Indicator
(ON = Protected, OFF = Replace)

- Suffix “A” Optional Audible Alarm and Dry Contact (NO/NC)

SURGE-TRAP®
3-Phase HVAC Applications

- Commercial / Light commercial
  - Rooftop Units & Air-Handlers
  - City-Multi’s
  - Cooling Towers/Hydronic Heating/Boilers

Commercial HVAC equipment OEMs expect reliable circuit protection for their equipment, assuring that motors, controls and other equipment are adequately protected against power and voltage fluctuations and other electrical problems.
3-Phase WYE, 4-Wire

- **Normally open** (Normalmente abierto / Normalement ouvert)
  - Blue / Azul / Bleu

- **Common** (Común / Commun)
  - Gray / Gris / Gris

- **Normally closed** (Normalmente cerrado / Normalement fermé)
  - Red / Rojo / Rouge

Optional mounting bracket

- 3 ft (1m) 18 AWG
- "A" Option
  - 125VAC, 1A Resistive
  - 30VDC, 2A General Purpose
MERSEN REVISITED

- Flexibility/support
- Sales tools
- Resources
- Technical Services:
  TechnicalServices.NBY@us.mersen.com
  +1.978.465.4853
Surge & Power Protection Competition

- Intermatic
- Ditek
- SUPCO
- MARS
- 5-2-1 (CPS)
- ICM
- Diversitech
- PSP
- ZEBRA

Note:
Intermatic sold 100K single phase units with $3.5M in sales in 2017
$10K in 3-phase

Mersen = Using Mersen Component
DISTRIBUTION
Targets

HVAC Distributors  (KWGA & BH Members)
- Johnstone Supply (62% HVAC)
- WATSCO – CE, GEMAIRE, BAKER
- Goodman Parts Stores
- Lennox Stores
- TRANE Stores
- CARRIER – TOTALINE
- Ferguson
- Winsupply
- RE Michel
- PEIRCE-PHELPS INC
- 2-J SUPPLY CO INC
- YANDLE WITHERSPOON SUPPLY
- WITTICHEN SUPPLY CO
- UNITED REFRIGERATION
- US AIR CONDITIONING
- TROPIC SUPPLY
- THE BOYS LLC
- AIREFCO INC

HVAC Contractors
Service Experts; ARS-American Residential Services-Rescue Rooter; 1-Hour;
Work towards an approved vendor status with these national contractors
Resources

Publications

- Sell sheet with technical specifications
  - English: 150-2679
  - Spanish: 150-2688
  - French: 150-2687

- Mersen catalog customized for the parts being sold

- Competitor information and comparison chart

- TPMOV® Defined Video (Length 3:32)
  https://www.youtube.com/watch?v=p86t-uuyMAE

- Benefits of Mersen SPDs
  https://youtu.be/2jQdDg3Q9oU

- Residential Application (Length 3:00)
  https://www.youtube.com/watch?v=EaJazijrrK0

- Installation Video
  https://www.youtube.com/watch?v=Lmro9S5GOFM
Surge Certification Education & Installation Training

Certification & Qualified Installer

- Become a certified surge expert and authorized install technician
- Short quiz on use, installation and knowledge of surge protection for HVAC equipment
- 1-hour course providing you and your company a surge specialist with the training, knowledge, education, and installation expertise of HVAC Surge Protection Products

As an authorized Robertshaw Surge Protection Installer, you will receive:

- Surge training class completion certification mailed to your address provided on quiz
- NATE qualified Contractor Technicians, earn a 2-hour credit towards continued education requirement’s. Please be sure to provide your NATE# on the quiz.
- Continued educational support of surge related products
Surge Protection Installer Quiz
Please take a short quiz
Please Include your NATE # if applicable

Fill in completely for processing of certificate