

# WESTRACE Surge Arresters

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TTTBCSS029

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## SAFETY NOTICE

### RISK OF POTENTIAL DAMAGE

Important Product Safety Notice regarding Siemens Surge Arresters  
Models 2178047-1 and 2178081-1  
("Surge Arresters")

This is an update of the bulletin released on 9<sup>th</sup> October 2018.

## 1 Executive Summary

WESTRACE Surge Arresters supplied by Siemens Mobility Pty Ltd, prior to 2020, may in limited conditions and circumstances, overheat and catch fire. These conditions and circumstances are discussed in section 3 below.

Siemens' extensive testing of the new circuits confirms that overheating and fire risk is extremely low once the new circuits are commissioned. Siemens has modified new Surge Arresters (designated as Rev C) to eliminate the risk of overheating or fire. New plug-compatible replacement top modules are now available.

The revised Surge Arresters have passed independent certification of compliance with IEC 61643-11:2011 (with minor derogations) including demonstration that they cannot overheat or catch fire. The surge protection remains unchanged.

This release of the bulletin recommends:

Unrestricted

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- only Rev C Surge Arresters be used in new installations
- only Rev C Surge Arresters be used for replacements of any failed Surge Arresters
- continued use of existing Surge Arresters in accordance with the **Conditions of Use** (attached) and in accordance with your own risk assessment
- replacement of any Surge Arresters with the modified version where there is unacceptable risk of the Surge Arresters overheating

## 2 Applicability

Siemens WESTRACE 110 Vac and 50 Vdc Surge Arresters

- 50 Vdc—model 2178047-1 (see Figure 1)
- 110 Vac—model 2178081-1 (see Figure 2)

## 3 Information

Siemens was advised of a risk of the Surge Arresters overheating when power is connected to an external circuit with a small range of low resistance load faults. One incident caused the housing of the Surge Arrester to catch fire. A second incident resulted in softening of the housing plastic.

Surge Arresters provide high transient protection to WESTRACE ROM50 (50 Vdc), LOM (110 Vac) outputs and PIM (50 Vdc) inputs and have been in service for 5 years without Siemens being notified of any other issues of this nature.

The 50 V Surge Arresters have a continuous current rating of 0.6 A, which is consistent with the maximum ROM output current of up to 50 W. WESTRACE ROM outputs will be turned off when these currents are exceeded, and the protection circuit will auto restart after the overload is removed.



*Figure 1 50 V Surge Arrester (Rev C)*

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WESTRACE PIM inputs have a nominal resistance of 4 k $\Omega$ , which will draw approximately 12 mA from an external 50 V supply.

The 110 V Surge Arresters have a continuous current rating of 0.6 A, which is consistent with the LOM output current that is configurable to a maximum of 0.6 A.



**Figure 2 110 V Surge Arrester (Rev C)**

We have revised the design of both the 50 V and 110 V Surge Arresters to prevent overheating under all load conditions. The revised Surge Arresters may fail to an open circuit state under some overloads, protecting both themselves and the WESTRACE MkII.

Both Surge Arresters retain the same part number, but can be easily recognised by:

- the additional border on the label
- additional specified values on the label ( $U_c$ ,  $I_L$ ,  $T_2$ ,  $T_3$ )
- the addition of the word *FUSED* on the label
- *Rev C* is printed on the side of the arrester

Figure 1 and Figure 2 also show the revised Surge Arresters.

### Contributing Factors

Whilst Siemens has not had the opportunity to inspect the installations where the two overheating incidents occurred, Siemens has determined:

- both incidents occurred during set to work or commissioning when several power bus pins were inserted prior to testing the circuits
- 110 V Surge Arrester was in the feed to a low resistance fault, confirmed to be a short circuit between unterminated line and return at 200–300 m from the arrester
- 50 V Surge Arrester showed evidence of softening the polycarbonate housing (Siemens believes that there was a low resistance load, but this has not been confirmed)

The information currently available indicates that the direct causal factor of the overheating is the power dissipation in two low valued resistors within the Surge Arresters when the current drawn exceeds 1 A. This has been confirmed by bench testing.

Indirect factors that most likely contributed to the two incidents were:

- 110 V:
  - the cable short circuited (mentioned above)
  - the WESTRACE LOM was not operational at the time of the failure
  - the WESTRACE LOM reverted to red-retaining mode
- 50 V: the arrester carried excessive current due to an unknown external fault

Siemens' testing has shown that a continuous current of 1 A can raise the temperature of the Rev B Surge Arrester in a 70°C operational environment near to the maximum rated softening temperature of the arrester's polycarbonate housing. WESTRACE outputs are all current limited with the maximum output current being below the Surge Arrester rating and below the levels that have shown that there is a risk of overheating in either Surge Arrester.

A red-retained output of a non-installed or non-functional WESTRACE MkII LOM has relays that connect the incoming 110 V supply directly to the output, which bypasses the current limits on WESTRACE LOM. A 2 A medium blow fuse is typically used to protect the supply in these circumstances, but as stated above, an external fault that draws between 1 and 3 A from a red-retained output may be sufficient to cause overheating. There needs to be both a failure of the WESTRACE LOM and an external fault event simultaneously, to risk overheating the Surge Arrester.

Siemens is also aware that some customers install additional Surge Arresters at remote parts of the circuits. Some Surge Arresters installed in these applications—and when fed from a non-WESTRACE source—may not be protected from excessive currents as they are when they are installed in conjunction with WESTRACE and its current limited outputs. In these circumstances an external fault that draws between 1 and 3 A may be sufficient to cause overheating.

### Long Term Solution

Siemens has modified the Surge Arresters to Rev C, so that they will fail to an open circuit state on excessive line current, and before any risk of overheating, combustion or external damage occurs. The revised Surge Arresters have been independently certified to be compliant with IEC 61643-11 with two derogations. The compliance demonstrates the absence of overheating. (IEC 61643-11 strictly does not scope the 50 V Surge Arrester, but it has been used as the most applicable reference).

The derogations are:

- Use of a 4 A, or lower, fuse in the supply feed to the 110 V device. A 2 A or 4 A fuse is normally fitted in the supply to the LOM and red-retaining module, so no circuit change is required.

The fuse protects extreme damage to the Surge Arrester when it is fed with a high

prospective current and the shunt devices (GDT and MOV) are short circuited. In Siemens view, this is an unlikely occurrence.

- Accepting a temperature rise of 90°C of the housing under excessive load conditions in lieu of the 50°C required by the standard. The maximum housing temperature (~115°C) under overload conditions remains substantially the same within the permitted ambient temperature range. The softening temperature of the polycarbonate housing is approximately 150°C so there is no risk of damage.

The Surge Arrester base will be modified to increase the clearance distance between the terminal screws and a fictitious conducting shield around the base. This will initially use a 1 mm thick label on the base for new installations until the tooling can be modified to add additional polycarbonate around the screw hole to achieve the required clearance. (Existing bases do not need replacement.)

RCM compliance for electrical safety does not require this clearance in the protected signalling environment.

All Surge Arresters supplied from 2020 will be the revised design.

## Summary

Based on current information:

- There have been no reported incidents of normal operation of the Surge Arresters or operation with a single load fault where the specified Surge Arrester ratings have been exceeded and caused overheating.
- There is a residual risk that the combination of a red-retained LOM output, typical fuse and an external low resistance fault may not limit the current to 1 A.
- There is a risk that externally fed Surge Arresters (ie current not coming from a WESTRACE) may not limit current to be below 1 A.
- Continuous currents greater than 1 A may cause the Surge Arresters to overheat, and in extreme cases this could lead to fires, resulting in damage or injury. **The revised design eliminates this risk.**

**Note:** WESTRACE is designed so that any external faults will not result in a reduction of safety, so that a failure of an arrester, even due to a thermal event, will not have an impact on the safety of the interlocking.

Siemens has modified the Surge Arresters (to Rev C) to eliminate the possibility of overheating on normal or excessive loads, while maintaining the same high transient protection.

## 4 What do I need to do?

Based on Siemens' findings, and the modified Rev C design, we recommend customers:

- use the revised (Rev C) Surge Arresters on all new installations and for all Surge Arrester replacements

- amend procedures for set to work and commissioning—connect only one circuit at a time, and test to confirm that the current is below specified levels
- review existing installations for risk of excessive load current through the Rev B Surge Arresters. Conduct a risk assessment on their continued use
- observe the **Conditions of Use** (attached) for use of **existing** Surge Arresters; the Conditions of Use is mandatory for Rev B Surge Arresters, but also recommended for Rev C Surge Arresters
- continue to use existing installations with an inspection for damage at normal maintenance intervals
- replace any unacceptably high-risk Surge Arresters with the revised (Rev C) model

## 5 Action Plan

Action	Status
Product investigation	Completed
Application study	Completed and design revised
Notify users	This is an update of existing notification
Rectification actions	Recommended in the bulletin

## 6 Further Information

Please contact your sales representative if you wish to arrange a discussion with a Siemens expert.