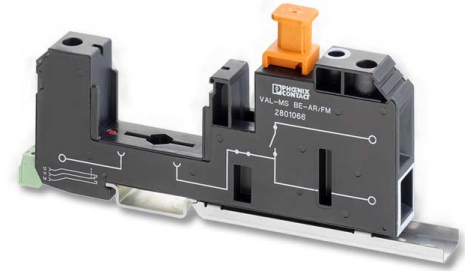


VAL-MS-AR...

Surge protection and connection for railroad controls and signals



Data sheet
3100_en_B

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1 Description

The VAL-MS-AR ...(/FM) surge protective device (SPD) modules provide reliable, touch-safe surge protection and termination specifically for railroad control and signal systems. The base has independent field input and house output terminals on the same side with ground terminals on the opposite end. A quick disconnect pin and test point separates the field input and house output for simple field diagnosis and insulation resistance tests.

Compliant with AREMA C & S recommended practices, the VAL-MS-AR ...(/FM) replaces the stud and nut terminal-style connections used in the past with a modern alternative that is easy to install, test and repair in the event of a damaged surge protection plug.

In addition to the standard VAL-MS-AR..., the VAL-MS-AR.../FM provides a remote monitoring function that signals a remote device through a set of dry contacts, providing immediate notification when a surge protection plug is damaged or missing.

A common base element (VAL-MS BE-AR(/FM)) accommodates different plugs for different modes and levels of protection. The VAL-MS-AR ...VF(/FM) modules are a hybrid SPD with a gas discharge tube in series with a metal oxide varistor and a thermal monitor. These modules are ideal for low-current signal applications where no leakage current can be tolerated.

VAL-MS-AR T1/T2 ...(/FM) modules are high-capacity SPD for Type 1 lightning, as well as for Type 2 switching surge currents. It is ideal for higher current applications and locations with a high lightning surge risk.

1.1 Features

- Pluggable surge protection for quick repairs
- Protects systems from direct lightning strikes and coupled surge energy
- Local status indication on plugs for easy location of expired plugs
- Optional remote status indication through dry contacts
- Simple, tool-free disconnect pin and test point for isolating field wires during maintenance and insulation resistance test
- Screw-type wire clamps for copper wire up to 4 AWG, solid and stranded, stripped or ferruled
- Convenient labeling solutions



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This data sheet is valid for all products listed on the following page:

2 Ordering data

Products

| Description | Type | Order No. | Pcs. / Pkt. |
|--|-----------------------|-----------|-------------|
| Module , for up to 60 V AC/DC, hybrid Type 2 surge protection with zero leakage current | VAL-MS-AR 75 VF | 2801487 | 10 |
| Module , for up to 60 V AC/DC, hybrid Type 2 surge protection with zero leakage current, function monitor contacts | VAL-MS-AR 75 VF/FM | 2801488 | 10 |
| Module , for up to 240 V AC, hybrid Type 2 surge protection with zero leakage current | VAL-MS-AR 350 VF | 2801489 | 10 |
| Module , for up to 240 V AC, hybrid Type 2 surge protection with zero leakage current, function monitor contacts | VAL-MS-AR 350 VF/FM | 2801490 | 10 |
| Module , for up to 60 V AC/DC, Type 1/2 lightning surge protection | VAL-MS-AR T1/T2 75 | 2801491 | 10 |
| Module , for up to 60 V AC/DC, Type 1/2 lightning surge protection, function monitor contacts | VAL-MS-AR T1/T2 75/FM | 2801492 | 10 |
| Base element for surge protection, with disconnect; DIN rail mount with retention screw; no surge protection plug | VAL-MS BE-AR | 2801065 | 10 |
| Base element for surge protection, with disconnect; DIN rail mount with retention screw; function monitoring contacts; no surge protection plug | VAL-MS BE-AR/FM | 2801066 | 10 |

Accessories

| Description | Type | Order No. | Pcs. / Pkt. |
|---|-------------------|-----------|-------------|
| Bridge , for connecting modules with 17.5 mm pitch, 57 pos. | MPB 18/1-57 | 2809238 | 1 |
| Bridge , for connecting modules with 17.5 mm pitch, 2 pos. | MPB 18/1-2 | 2809209 | 10 |
| Bridge , for connecting modules with 17.5 mm pitch, 12 pos. | MPB 18/1-12 | 2748593 | 10 |
| Bridge , for parallel circuits, 2 pos. | FBS 2-18 | 2801068 | 10 |
| Zack marker strip , white, unlabeled | ZBN 18:UNBEDRUCKT | 2809128 | 10 |
| Card , sheet, white, 32 labels | UC-TMF 16 | 0819262 | 10 |
| Screwdriver , slot-headed, VDE insulated, for L0 house termination clamp screw | SZS 0,8X4,0 VDE | 1212508 | 1 |
| Screwdriver , slot-headed, VDE insulated, for L1 field termination clamp screw | SZS 1,0X6,5 VDE | 1205079 | 1 |
| Screwdriver , slot-headed, VDE insulated, for FM termination clamp screw | SZS 0,4X2,5 VDE | 1205037 | 1 |

Replacement parts

| Description | Type | Order No. | Pcs. / Pkt. |
|--|-------------------------|-----------|-------------|
| Plug , for 60 V AC/DC with hybrid Type 2 surge protection, zero leakage current | VAL-MS 75 VF ST | 2805318 | 10 |
| Plug , for 240 V AC with hybrid Type 2 surge protection, zero leakage current | VAL-MS 350 VF ST | 2856595 | 10 |
| Plug , for 60 V AC/DC with hybrid Type 1/2 surge protection, lightning surge protection | VAL-MS-T1/T2 75/12.5 ST | 2801146 | 10 |
| Connector , for function monitoring | MC 1,5/3-ST-5,08 | 1836082 | 50 |

3 Technical data

General data

Dimensions

| | |
|-----------------|---|
| VAL-MS-AR... | 153 x 17.6 x 74 mm (6.02 x 0.69 x 2.91 in.) |
| VAL-MS-AR.../FM | 160 x 17.6 x 74 mm (6.30 x 0.69 x 2.91 in.) |

Weight

| | |
|-----------------------|------------------|
| VAL-MS-AR 75 VF | 150 g (0.33 lb.) |
| VAL-MS-AR 75 VF/FM | 154 g (0.34 lb.) |
| VAL-MS-AR 350 VF | 156 g (0.34 lb.) |
| VAL-MS-AR 350 VF/FM | 160 g (0.35 lb.) |
| VAL-MS-AR T1/T2 75 | 195 g (0.43 lb.) |
| VAL-MS-AR T1/T2 75/FM | 199 g (0.44 lb.) |
| VAL-MS BE-AR | 120 g (0.26 lb.) |
| VAL-MS BE-AR/FM | 124 g (0.27 lb.) |

Ambient temperature, operating

-40 ... +80°C (-40 ... +176°F)

Relative humidity

0 ... 95%: AREMA 14.1.2.G.3

Altitude

3000 m (9842 ft) above sea level

Mounting type

DIN rail mounting (NS 35) with additional retaining screw

Color

Black

Inflammability according to UL94

V0

Pollution degree

2

Degree of protection

IP20

Housing material

PA (polyamide)

Connection data

Connection type

Screw

Ground wire connection, \perp

| | |
|--------------|---|
| Size | 15 ... 2 AWG, 1.5 ... 35 mm ² |
| Torque | 3.0 ... 4.5 Nm (26.5 ... 39.8 lb _f -in.) |
| Strip length | 16 mm (0.63 in.) |

House wire connection, L0

| | |
|--------------|---|
| Size | 20 ... 6 AWG, 0.5 ... 15 mm ² |
| Torque | 1.5 ... 1.8 Nm (13.3 ... 15.9 lb _f -in.) |
| Strip length | 10 mm (0.39 in.) |

Field wire connection, L1

| | |
|--------------|---|
| Size | 12 ... 4 AWG, 1.5 ... 25 mm ² |
| Torque | 2.5 ... 3.0 Nm (22.1 ... 26.5 lb _f -in.) |
| Strip length | 14 mm (0.55 in.) |

Function monitor connection

| | |
|------------------|------------------------------------|
| Size, UL rating | 30 ... 14 AWG |
| Size, CSA rating | 28 ... 16 AWG |
| Size, IEC rating | 0.08 ... 2.0 mm ² |
| Torque | 0.25 Nm (2.2 lb _f -in.) |
| Strip length | 7 mm (0.27 in.) |

Electrical data

| | |
|---|--------------------|
| Operating frequency | 50 ... 60 Hz |
| Current rating, protection circuit | 80 A AC/DC |
| Current rating, function monitor, typical | 5 mA @ 5 V minimum |
| Current rating, function monitor, maximum | 1.5 mA |
| Voltage rating, protection circuit | 240 V AC/DC |
| Voltage rating, function monitor | 250 V AC/30 V DC |

Surge protection data

| | |
|---|--------|
| Maximum discharge surge current, 8/20 μ s, I_{max} (VAL-MS BE-AR/(FM)...) only) | 100 kA |
|---|--------|

| | |
|------------------------------------|-------|
| Short circuit current rating, SCCR | 25 kA |
|------------------------------------|-------|

Protection level with **VAL-MS 75 VF ST** plug

| | |
|---|----------------|
| UL nominal discharge current, I_n | 10 kA |
| VPR (3 kA/6 kV, IEEE combo wave) | 370 V |
| Protection level, 20 surges (10+, 10-, 8/20 μ s), U_p | 1003 V @ 25 kA |
| Protection level, 2 surges (1+, 1-, 8/20 μ s), U_p | 1815 V @ 48 kA |
| Lightning protection level, 20 surges (10+, 10-, 10/350 μ s), U_{IMP} | 584 V @ 5 kA |
| Lightning protection level, 2 surges (1+, 1-, 10/350 μ s), U_{IMP} | 788 V @ 15 kA |

Protection level with **VAL-MS 350 VF ST** plug

| | |
|---|----------------|
| UL nominal discharge current, I_n | 10 kA |
| VPR (3 kA/6 kV, IEEE combo wave) | 840 V |
| Protection level, 20 surges (10+, 10-, 8/20 μ s), U_p | 1495 V @ 15 kA |
| Protection level, 2 surges (1+, 1-, 8/20 μ s), U_p | 2130 V @ 21 kA |
| Lightning protection level, 20 surges (10+, 10-, 10/350 μ s), U_{IMP} | 334 V @ 3.0 kA |
| Lightning protection level, 2 surges (1+, 1-, 10/350 μ s), U_{IMP} | 348 V @ 3.7 kA |

Protection level with **VAL-MS-T1/T2 75/12.5 ST** plug

| | |
|---|--------------------------|
| UL nominal discharge current, I_n | 20 kA (8/20 μ s) |
| IEC lightning discharge current, I_{IMP} | 12.5 kA (10/350 μ s) |
| VPR (3 kA/6 kV, IEEE combo wave) | 613 V |
| Protection level, 20 surges (10+, 10-, 8/20 μ s), U_p | 1536 V @ 50 kA |
| Protection level, 2 surges (1+, 1-, 8/20 μ s), U_p | 2345 V @ 85 kA |
| Lightning protection level, 20 surges (10+, 10-, 10/350 μ s), U_{IMP} | 960 V @ 17 kA |
| Lightning protection level, 2 surges (1+, 1-, 10/350 μ s), U_{IMP} | 930 V @ 21 kA |

Mechanical tests/Conformance

Vibration (AREMA 11.5.1.D.4; 14.1.2.G.6)

| | |
|-------------|--------------------|
| 5...20 Hz | 0.07 in. water p-p |
| 20...200 Hz | 1.5g peak |

| | |
|-----------------------------------|----------|
| Mechanical shock (AREMA 11.5.1.5) | 10g peak |
|-----------------------------------|----------|

| | |
|---------------------|--------|
| Dielectric strength | 3000 V |
|---------------------|--------|

| | |
|----------------------|----------------------------------|
| Abrasive environment | Dust: MIL-STD-810F, Method 510.4 |
| | Salt: IEC 60068-2.52, 6.2 |
| | Corrosion: AREMA 14.1.2 |

4 Temperature rise

| Current (A) | Temperature rise (°C) |
|-------------|-----------------------|
| 0 | 0 |
| 30 | 12.21 |
| 45 | 26.70 |
| 60 | 45.83 |
| 75 | 68.23 |

Test criteria: Five active bases connected in series

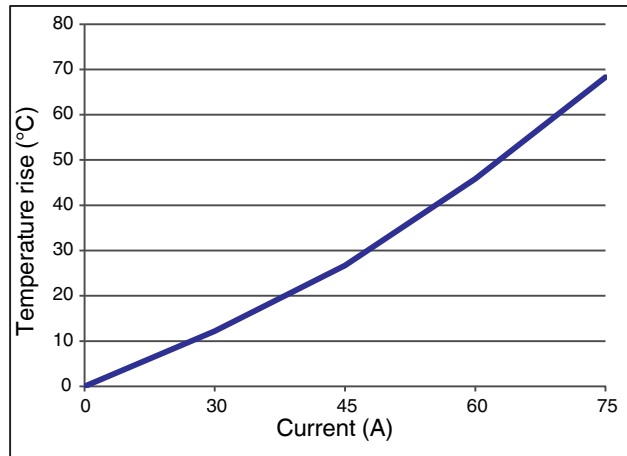


Figure 1 Temperature rise between L0 and L1 across disconnect

| Current (A) | Temperature rise (°C) |
|-------------|-----------------------|
| 0 | -0.62 |
| 10 | 0.65 |
| 20 | 5.64 |
| 30 | 14.34 |
| 40 | 32.28 |
| 50 | 44.06 |
| 60 | 59.75 |

Test criteria: Four active bases connected in series using three FBS bridges

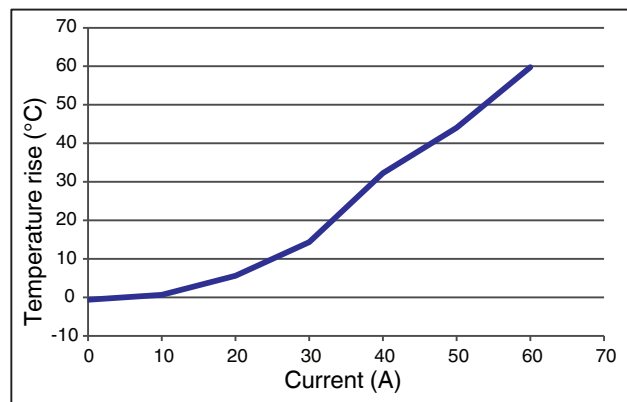


Figure 2 Temperature rise through an FBS bridge (L1 - L1)

5 Dimensions

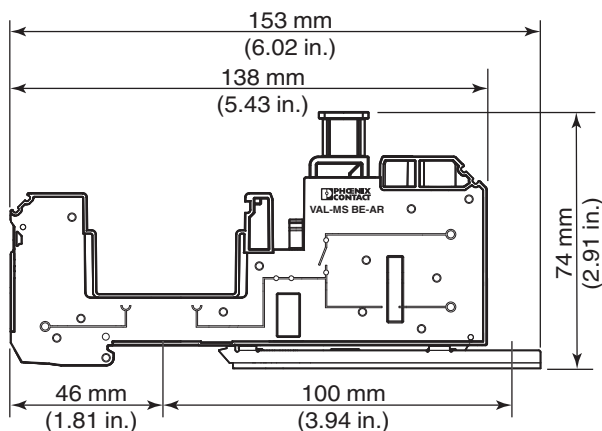


Figure 3 VAL-MS BE-AR dimensions

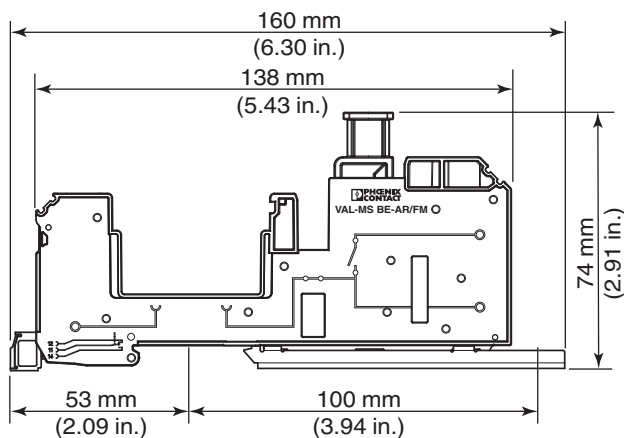


Figure 4 VAL-MS BE-AR/FM dimensions

6 Safety notes

Installation and maintenance work on this device may only be carried out by an authorized electrician.

The manufacturer's warranty is invalid if the VAL-MS BE-AR... surge protective device is opened.

7 Installation

1. Hook the ground end of the base on the top of the rail. Rotate the opposite end into the rail until it snaps into place.
2. Secure the device to the back panel by inserting the self-tapping screw through the retention foot.
3. Strip 0.4 in. (10 mm) of the house wire insulation and insert it into the lower terminal, L0. Tighten the wire clamp screw to 13 - 16 lb_f-in. (1.5 - 1.8 Nm).

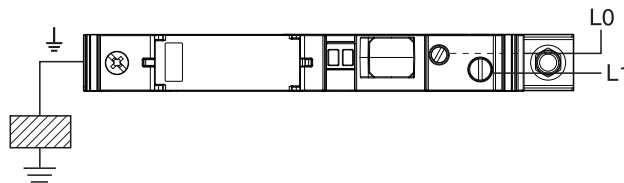


Figure 5 Connections

4. Strip 0.55 in. (14 mm) of the field wire insulation and insert it in the upper terminal, L1. Tighten the wire clamp screw to 22 - 27 lb_f-in. (2.5 - 3.0 Nm).
5. Strip 0.63 in. (16 mm) of the ground wire insulation and insert it in the ground terminal, \perp . Alternately, install a grounding bar. Tighten the ground screws to 27 - 40 lb_f-in. (3.0 - 4.5 Nm).
6. (VAL-MS-AR.../FM only) Connect monitoring circuit to green connector according to Figure 6. Strip 0.28 in. (7 mm) of insulation from each conductor before inserting into the appropriate position. Tighten wire clamp screws to 2 - 4 lb_f-in. (0.25 Nm).



Figure 6 Function monitor installation

7. If not already equipped, install arrestor plug as specified for the circuit being tested.

8 Testing/Maintenance

8.1 Diagnostic disconnection



WARNING:

Always disconnect power to the device before moving the disconnect button. Arc flash may occur.

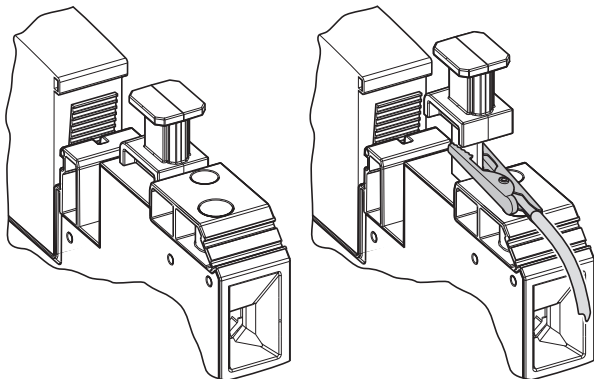


Figure 7 Test equipment field connection

- Lift the orange button to disconnect the circuit. Connect test equipment to field wire by attaching to exposed disconnect metal using an alligator clip.
- When finished, remove alligator clip and push orange button in to connect circuit.

8.2 Plug replacement

The plug has a visual status indicator. If the window is green, it is functioning. If it is red, the plug must be removed and replaced.

To replace plug:

1. Squeeze the tabs on each end of the plug and pull it straight out of the base.
2. Obtain a replacement plug of the same rating.



Each plug is keyed in a specific way. If the keyway is not the same as the plug removed, it will not fit into the base.

3. Orient the plug properly with the base, making sure the keyway aligns with the key slot in the base. Push the plug straight into the base until the retaining tabs on each end of the plug snap into the base.

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