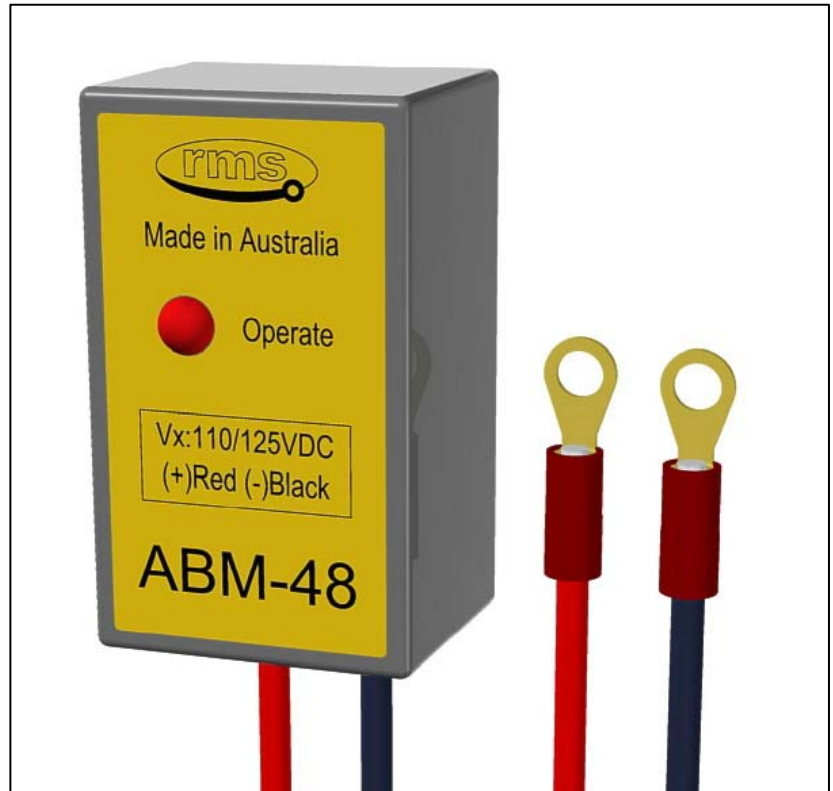


Features

- Improve security of low burden, high speed solid state status inputs
- Provides capacitor discharge protection for solid state status inputs to ESI-48-4
- Transient noise withstand to IEC60255 standards
- Compact & easy to fit
- Low average operating burden
- 15ms fixed operate time
- Wide voltage operating range
- Thermal cut out protection
- Operation check LED
- Made in Australia



ABM-48 Active Burden Module

Two flying leads with ring lugs termination allow simple fitting

Application

The ABM-48 Active Burden Module is designed for application with solid state status inputs wherever high security signaling is required.

The ABM-48 is intended to be used with digital relays & related products such as RTU's as an aid to improve electrical transient & noise immunity. In particular, for added immunity against infrequent & irregular transients such as represented by the capacitor discharge test as defined in standard ESI 48-4

In normal operation, the ABM-4 imposes a short term increased burden to the operate signal which is then removed after approximately 15 ms.

It is essential that devices that the ABM-48 module is intended to be used with are specifically designed & purpose built for power industry & substation applications & already incorporate industry standard filtering, input loading & threshold setting capabilities.

Description

Made in Australia

Binary status inputs are employed extensively in power protection & control schemes for signaling a range of system events & the reliability of these inputs is critical to avoid false operation due to voltage fluctuations under transient conditions. For example:

- ◆ Global enable or disable function;
- ◆ Blocking specific protection elements;
- ◆ Initiate timing or logical functions;
- ◆ Change protection setting groups;
- ◆ Determining status of secondary equipment circuits such as circuit breaker open / close;
- ◆ Reset of flag indicators.

The interface between different devices has historically been achieved using hard wired I/O logic with simple electro-mechanical relays employed to provide the electrical isolation & noise immunity.

With the integration of protection, control & metering functions the number of status inputs required has dramatically increased & as a consequence modern protection relays commonly employ electronic status inputs based on an optically isolated insulation barrier.

While this approach can provide a wide operating voltage range & fast operation, a lower DC burden is required to minimize the heat dissipated within the protection relay case. Status input pick up currents in the low mA range are common & as a consequence their stability & immunity to noise transients may be compromised.

Disturbance immunity difficulties become more apparent where control signal wiring extends outside into the switchyard or when interfacing modern equipment with traditional electro-mechanical I/O.

SPECIFICATIONS

Nominal operate voltage: Order code C: 48 V DC
 Order code D: 110 / 125 V DC
 Order code F: 220 / 250 V DC

Operating range: 65-125% of nominal operate voltage

BURDEN

The ABM-48 module presents a dynamic load, or burden, to voltage driven operate signals.

Operate burden: >100W
 <150W

Maximum repetition rate: 1 Hz

The high operate burden is maintained for a minimum of 15ms to help ensure operation of any cascade devices or relays. After the expiration of this short delay the ABM-48 will self economize to reduce the burden & associated self heating that would otherwise occur.

Operated burden: Less than 0.3W after ~15ms

SHORT TERM THERMAL RATING

150W for 30s from ambient followed by 10 minute cooling cycle.

THERMAL PROTECTION

A one shot fuse will operate in the event the economizing circuit fails to deactivate.

WIRING

~250mm flying leads with ring lug termination suitable for M4 screw connection direct to rear of protection & control equipment. It is important to note that the ABM-48 must be wired in accordance to the polarized & color codes leads:

RED lead is positive (+)

BLACK lead is negative (-)

INDICATION

Single red LED flashes each time status input is picked up to indicate correct function of the ABM-48.

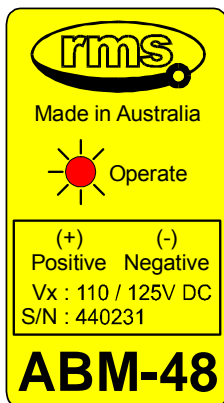


Figure 1: ABM-48 Front panel

HOUSING

Plastic case with thermally conductive potting compound. Refer to figure 5 for dimensional details.

MOUNTING

Due to the compact size, light weight & rugged insulated construction, the ABM-48 may be secured using a number of methods:

- ◆ self adhesive tape;
- ◆ cable ties;
- ◆ left free to hang from the flying leads.

Operation

OPERATION

The ABM-48 is wired to present a shunt resistance across each status input to be protected. This ensures that a higher level of current must be delivered by the source to achieve the required pick up voltage threshold. In order to achieve the necessary immunity from transient noise & to meet the capacitor discharge test, the operating burden of the ABM-48 is >100W.

When the ABM-48 detects a differential voltage a fast acting solid state switch is activated to shunt the input current through a wire wound power resistor encapsulated in heat conductive potting compound.

In the event that the pick up voltage is a transient & unable to provide adequate current, the energy is dissipated as heat within the ABM-48.

For legitimate pick up signals a short delay of ~15ms is allowed to enable the status input to pick up & then the ABM-48 is automatically economized to avoid thermal overload & prolonged burden on the DC supply.

A one shot thermal fuse is incorporated to open circuit the ABM-48 in the unlikely event that it fails to auto-economize. Even with the ABM-48 in this 'fail' condition, the status input will continue to operate but without the noise protection functionality.

The ABM-48 is fitted with an LED which flashes whenever the status input circuit is energized to provide correct functionality. This is a useful feature during commissioning checks & routine maintenance inspections.

A compact sealed enclosure with two (2) ring lug terminated flying leads are employed for ease of installation & serviceability.

ABM-48 Application Warranty

The ABM-48 is intended to be used in conjunction with digital relays specifically designed for power industry applications as an aid to improving the robustness of inputs to intermittent electrical transients & impulse noise. It is not a general panacea for making general purpose devices or inputs work in all possible power utility applications.

The ABM-48 is a unipolar device and must be connected correctly in DC circuits only. Voltage rating selection for the ABM-4 must be appropriate to the application.

The ABM-48 unit will not tolerate sustained excessive, over voltage transients with high energy content. The ABM-48 can be degraded & damaged by such conditions & is designed to ultimately fuse internally in such situations to prevent the possibility of catastrophic failure that may otherwise impact surrounding wiring.

The ABM-48 modules are not warranted for such applications or against such failure modes.

Capacitor Discharge

CAPACITOR DISCHARGE ESI 48-4 for classes EB 1 & EB 2
 The ABM-48 module is specifically designed to absorb electrical energy associated with transient impulses that may be coupled onto digital input lines from electrical switching events & other such sources of disturbance.

The industry standard test for high energy, non repetitive transients of this form is the capacitor discharge test as defined in ESI 48-4 for class EB1 & EB2 relays.

Appendix B of the standard describes the high energy impulse used for testing utilizing a 10 μ F capacitor charged to 120% of the nominal operate voltage & applied differentially directly to the input circuit of the protection or control relay.

As solid state status inputs may typically require only a few mA to pick up, the minimum operate voltage must be set high & the time delay $\gg 20$ ms to pass the capacitor discharge test. Such voltage levels & time delays are usually not acceptable in the design & grading of protection & control schemes.

Figure 2 depicts the time required to dissipate the capacitive discharge voltage applied during this test. To meet the requirements of this test even a status input that pulls 50mA will require a de-bounce time delay of >17 ms.

The ABM-48 module is capable of absorbing & dissipating the total energy delivered by the capacitor discharge test **in less than 5 ms**.

With digital input filtering typically set to 10-15ms to provide half wave filtering of input signals, the ABM-48 module is able to contain the capacitor discharge impulse within the sample filtering time thus eliminating any false or mal op readings being raised by the digital relay.

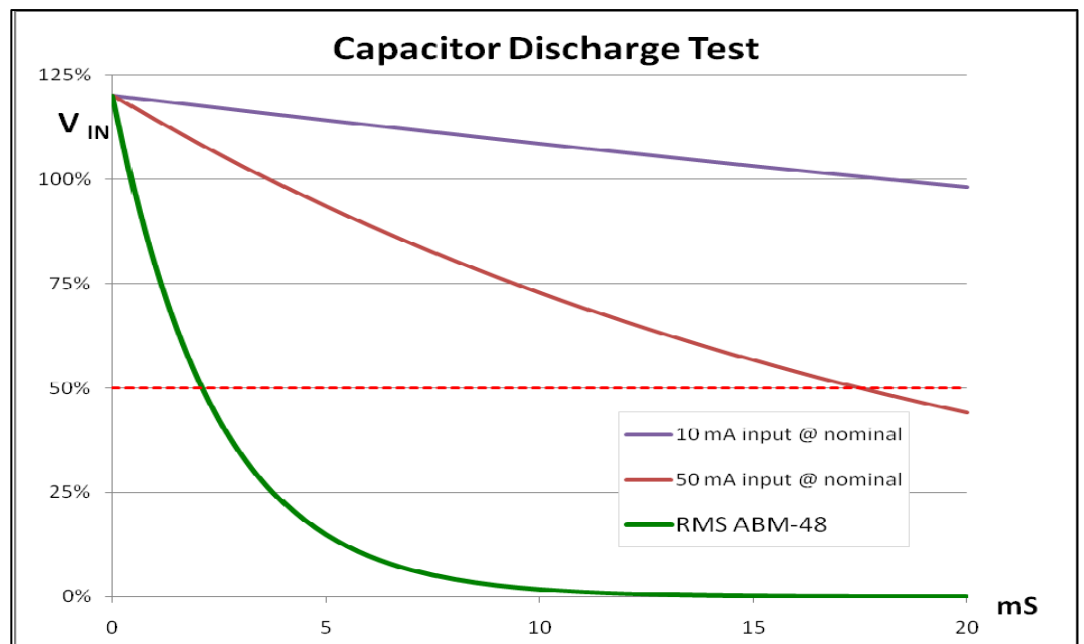


Figure 2: Capacitor discharge test

SURGE IMMUNITY

IEC 60255-22-5

Inputs to digital relays can be exposed to transients such as can be coupled into wiring systems from switching & the operation of large contactors & external environmental events such as lightning.

The standard test for immunity to such disturbances is IEC 60255-22-5 *Electrical disturbance tests – Surge immunity test*. This test consists of applying a number of **high voltage, high energy** impulses **differentially** across the relay inputs. Both Positive & Negative pulses are applied.

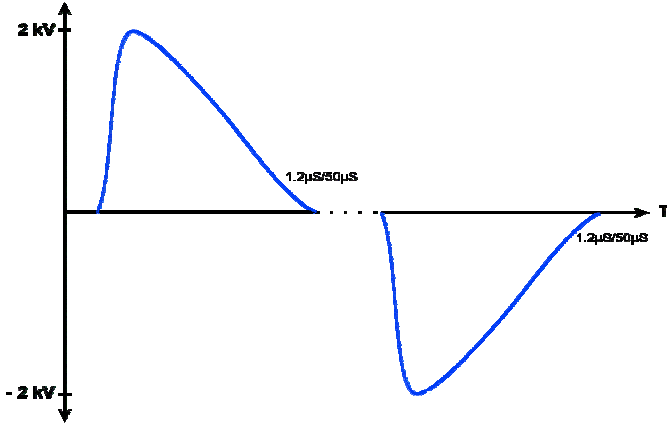


Figure 3:

IEC 60255-22-5 *Severe Environments* – 2kV differential mode

The ABM-48 helps protect digital relay inputs from such surges by limiting the peak voltage level, clamping the major negative voltage excursions, minimizing the total transient time & by absorbing the total energy of the disturbance.

Peak Voltage containment

Positive going	Less than 300V
Negative going	Less than 2V
Transient pulse time	Less than 25μs
Energy absorbed	100%

Noise Immunity

HIGH FREQUENCY DISTURBANCE

IEC 60255-22-1

Digital relay inputs can be exposed to repetitive damped oscillatory waves such as those originating from closing or opening circuit breakers or disconnectors in high voltage substations or power plants.

The standard test for confirming immunity to such disturbances is IEC 60255-22-1 *Electrical disturbance tests – 1 MHz burst immunity test*

The **Differential mode** test consists of a 1 kV peak, 1MHz decaying envelope, repeated at a rate of 400 bursts per second for 2 seconds applied across the relay inputs both in the non energized state & the operated/energized state.

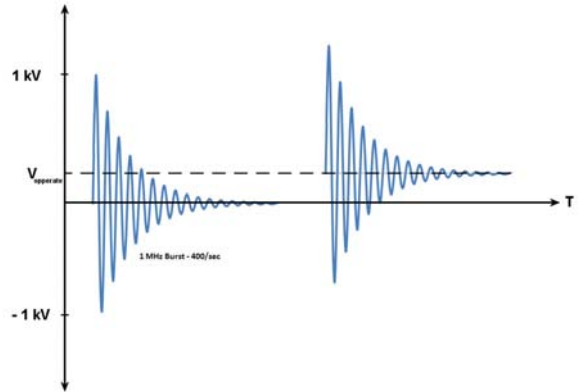


Figure 4:

IEC 60255-22-1 HFD Differential – 1kV, 1 MHz bursts

The ABM-48 helps protect digital relay inputs from such high frequency disturbances by limiting the peak voltage level, clamping the major negative voltage excursions, & minimizing the total transient time.

Peak Voltage containment

Positive going	Less than 300V
Negative going	Less than 2V
Burst containment time	Less than 25μs
Energy absorbed	100%

COMMON MODE DISTURBANCES

The ABM-48 does not require a ground connection & does not have provision for one. Common mode tests are therefore not applicable to the module & it does not compromise common mode ratings of equipment to which it is attached.

Performance Standards

Table 1 summarizes the operating parameters & standards that the ABM-48 complies with:

Operating Voltage Range The ABM-4 is rated for continuous operation at the maximum voltages for their class as specified in ESI 48 - 4	ESI 48 - 4 Class EB 2	Complies
Operating Burden	ESI 48 - 4 Class EB 2	Complies
Non Operate Energizing Current	ESI 48 - 4 Class EB 2	N/A
Drop Out Voltage	ESI 48 - 4 Class EB 2	N/A
Insulation Coordination – Dielectric withstand	IEC 60255-5	Complies Note 2
Insulation Coordination – Impulse Voltage	IEC 60255-5	Complies Note 2
Insulation Coordination – Insulation Resistance The ABM-4 module is potted in a specifically designed insulated housing to allow it to come into direct contact with other system wiring. Insulation: 2.5kV RMS for 1 minute	IEC 60255-5	Complies
Thermal limits The ABM-4 complies with the Maximum allowable temperatures as defined in Table 2 IEC 60255-6. The ABM-4 module is potted in a specifically designed insulated housing to allow it to come into direct contact with other system wiring Furthermore, in the event of exposure to sustained and excessive overvoltages, the ABM-4 is provided with an internal, non resettable fuse to eliminate any over temperature condition that could impact other wiring.	IEC 60255-6	Complies
Capacitor Discharge	ESI 48 - 4 Class EB 2	Pass
High Frequency Disturbance	IEC 60255-22-1 Class III	Pass
Fast Transient	IEC 60255-22-4 Class IV	Pass
Surge Immunity	IEC 60255-22-5; IEC 61000-4-5 level 3	Pass
Vibration	IEC 60255-21-1 class I	Immune No mal operation
Shock	IEC 60255-21-2 class I	Immune No mal operation
Bump	IEC 60255-21-2 class I	Immune No mal operation
Seismic	IEC 60255-21-3 class I	Immune No mal operation
Radiated EMI Immunity	IEC 60255-22-3 Class III	Immune No mal operation
Conducted EMI Immunity	IEC 60255-22-6	Immune No mal operation
Electrostatic Discharge	IEC 60255-22-2 class III	Immune No mal operation
Magnetic Field	IEC 61000-4-8 level 5, Class 5	Complies
Temperature Operation -10 C to +55 C Storage -20 C to +70 C	IEC 60068-2-1&2, IEC 60255-6	Complies
Humidity 40°C and 95% relative humidity	IEC 60068-2-3	Complies
IP Rating The RMS ABM-48 provides a protection rating of more than IP20 in accordance with the standard.	IEC 60255-6	Complies

- N/A: Not Applicable
- Note 1: The ABM-48 is a single circuit device with no ground connection
- Note 2: Tests conducted with ABM-48 sitting directly on copper ground plane

Table 1

ESI-48-4 Reference Guide

Table 2 provides a guide for the requirements specified in the ESI 48-4 standard for classes EB 1 & EB 2 relays.

DC System Nominal Voltage	30	48	110	220 [‡]
Relay Rated Voltage	30	48	125	250
Nominal Working Voltage	34	54	125	250
Operative Voltage range	18-36	29-60	66-143	66-143
Energizing Current Current (mA) at or below which relay shall not operate:				
For EB 1 Relays	10	10	25	25
For EB 2 Relays	20	20	50	50
Capacitance discharge test				
For EB 1 Relays	Not Required	Not Required	Not Required	Not Required
For EB 2 Relays	Not Required	10 µF 60 V	10 µF 150 V	10 µF 300 V
Thermal Withstand Voltage at 40°C Ambient	39	60	143	300
Maximum Percentage AC ripple permitted on DC supply	± 12% of rated Voltage	± 12% of rated Voltage	± 12% of rated Voltage	± 12% of rated Voltage

[‡] Extrapolated for higher voltages

Table 2

Ordering Information

Generate the required ordering code as follows:
 e.g. ABM-48-E

General Type	Order Code
ABM-48	1

1 NOMINAL AUXILIARY VOLTAGE

- C 48V DC
- D 110 / 125V DC
- F 220 / 250V DC

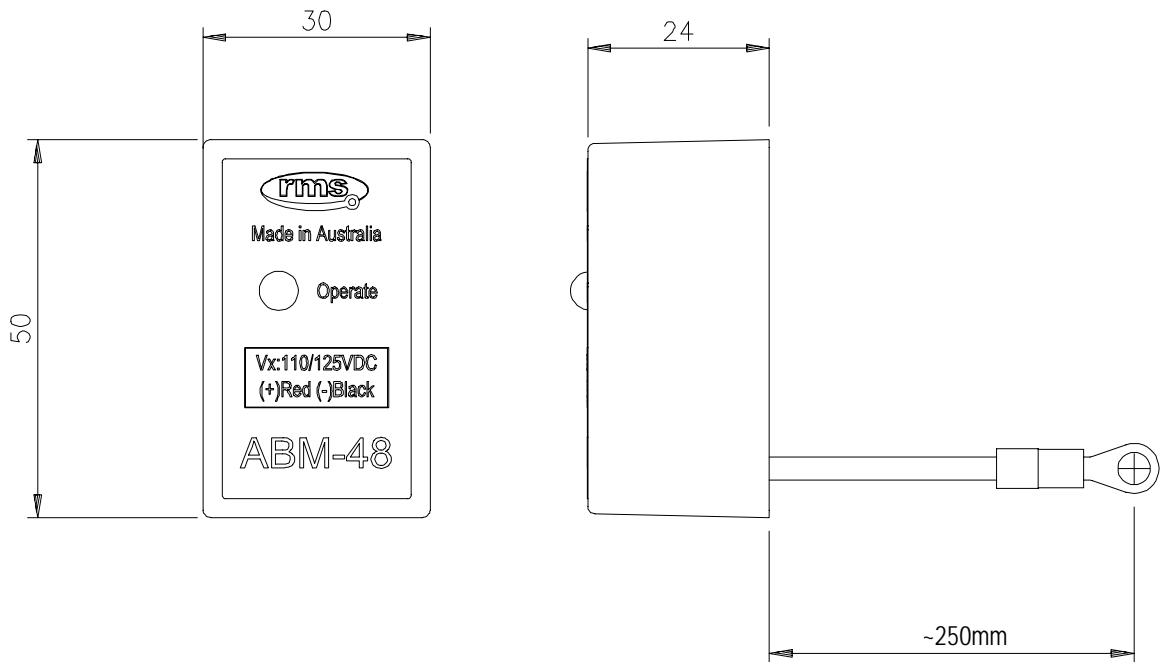


Figure 5: ABM-48 Dimensional details

Australian Content

Unless otherwise stated the product(s) quoted are manufactured by RMS at our production facility in Melbourne Australia. Approximately 60% of our sales volume is derived from equipment manufactured in house with a local content close to 90%. Imported components such as semi-conductors are sourced from local suppliers & preference is given for reasonable stock holding to support our build requirements.

Quality Assurance

RMS holds NCSI (NATA Certification Services International), registration number 6869 for the certification of a quality assurance system to AS/NZS ISO9001-2008. Quality plans for all products involve 100% inspection and testing carried out before despatch. Further details on specific test plans, quality policy & procedures may be found in section A4 of the RMS product catalogue.

Product Packaging

Protection relays are supplied in secure individual packing cardboard boxes with moulded styrene inserts suitable for recycling. Each product & packing box is labeled with the product part number, customer name & order details.

Design References

The products & components produced by RMS are based on many years of field experience since Relays Pty Ltd was formed in 1955. A large population of equipment is in service throughout Australia, New Zealand, South Africa & South East Asia attesting to this fact. Specific product & customer reference sites may be provided on application.

Product Warranty

All utility grade protection & auxiliary relay products, unless otherwise stated, are warranted for a period of 24 months from shipment for materials & labour on a return to factory basis. Repair of products damaged through poor application or circumstances outside the product ratings will be carried out at the customer's expense.

Standard Conditions of Sale

Unless otherwise agreed RMS Standard Terms & Conditions (QF 907) shall apply to all sales. These are available on request or from our web site.



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