ARC SUPPRESSION TECHNOLOGIES™

NOsparc™

MMYAC

(MMYAC1W277)

PATENTS PENDING

“Arc Suppressor”

Arc Suppression for
AC Power Relays, Contactors, and Snap-Action Switches

User Manual

c UL us

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IMPORTANT NOTES

This document provides information required to install a NOsparc™ arc suppressor. You must read and understand this document before installing this device.

If you have any problems with your installation, please refer to Technical Support contact information on the last page of this manual.

TRADEMARKS:

- "NOsparc" and the "flame" logo are trademarks of Arc Suppression Technologies LLC.
- "UL" is a trademark of Underwriters Laboratories, Inc.

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APPLICABLE DOCUMENTS:

Underwriters Laboratories
UL 508 Industrial Control Equipment
NKCR2 "Auxiliary Devices - Component"

c UL us
File No.: 3446457

The above mark indicates that Underwriters Laboratories, inc., has certified the NOsparc™ MMYAC as a UL Recognized Component for both Canada and the United States.

LIFE SUPPORT:

Arc Suppression Technologies products are specifically NOT authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Arc Suppression Technologies.

As used herein:

A. Life support devices or systems are devices or systems which support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

LEGAL NOTICE:

Information in this document is believed to be accurate and is provided solely in connection with Arc Suppression Technologies products.

Arc Suppression Technologies makes no warranties, expressed or implied, regarding the information contained herein.

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Arc Suppression Technologies only accepts products for repair or return that are accompanied by a Return Material Authorization number from the appropriate distributor or sales representative.

Please refer to your original purchase agreement or contact your distributor or sales representative for return policy information.

SAFETY INFORMATION OVERVIEW

We use note, caution and warning symbols throughout this book to draw your attention to important operational and safety information.

"WARNING" describes an alert with information that is important for protecting personnel and equipment from damage.

"CAUTION" describes any condition that could result in damage to the equipment or result in physical harm to personnel.


CAUTION or WARNING

The "SAFETY" alert symbol (an exclamation mark in a triangle) precedes a general CAUTION or WARNING statement. It describes safety requirements to meet local, national and international standards.


Electrical Shock Hazard CAUTION or WARNING

The electrical hazard symbol, (a lightning bolt in a triangle) precedes an electric shock hazard. It describes a potential electrical shock hazard which can result in personal injury or death.

"NOTE" describes any item of interest to the user, owner or operator.

WARNINGS:

Follow extreme caution when applying NOsparc™ MMYAC to trip and close contacts or in circuits containing elements that can be energized by a 1/2 power cycle pulse. This User Manual must be thoroughly understood and accurately followed to avoid unintended equipment operation.

The assembly must conform to National Electric Code (NEC) safety standards, as well as locally applicable codes. Failure to do so could result in personal injury or loss of life. See the product rating curve for wire gauge selection, ambient temperature and current restrictions.

Follow extreme caution when conducting short cycle time tests, especially below the maximum rated cycle time for the associated relay; typically 3s. Even at significantly reduced power levels through the contacts, the relay contacts can become extremely hot due to contact arcing and pose a fire danger. ALWAYS FOLLOW THE RELAY MANUFACTURERS SPECIFICATIONS AND REQUIREMENTS. Standard relays typically have a maximum short period cycle time of 1200 cycles per hour.

Only authorized and qualified personnel should install and service the NOsparc™ MMYAC. Failure to comply with these recommendations may result in damage to equipment and property and injury to personnel.

Always test the function and performance of NOsparc™ MMYAC in the intended application.

An arc suppressor DOES NOT eliminate arcing, therefore, use of the NOsparc™ MMYAC will not eliminate hazards associated with electrical current contact arcing.

SAFETY:

All creepage distances and clearances of NOsparc™ MMYAC have been designed to meet requirements of safety standards.

When using NOsparc™ MMYAC, basic safety precautions should always be followed to reduce risk of fire, electric shock, and injury to persons. When installing NOsparc™ MMYAC into your system, make sure that the Quick Connect Terminal connector is properly crimped, terminated, insulated and that the proper wire gauge is used and that the connector is securely seated. Incorrect application or termination can result in harmful or fatal electrical shock or component damage.

CAUTIONS:

The NOsparc™ MMYAC will pass a leakage current (see specifications) even though the contacts across which it is connected are open (similar to leakage present with snubber use). This capacitive leakage current can be sufficient to turn-on some solid state and electromechanical relays, or to cause electric shock to personnel. Therefore:

- The NOsparc™ MMYAC must never be connected across relay, contactor, or snap action switch contacts driving high impedance loads.
- The NOsparc™ MMYAC must never be connected across relay, contactor, or snap action switch contacts used for galvanic/ safety isolation.

Proper care must be taken when handling and installing NOsparc™ MMYAC.

Never plug or unplug NOsparc™ MMYAC while powered.

Do not connect NOsparc™ MMYAC directly to power!

Use caution when installing or modifying power connections.

NOTES:

Connect NOsparc™ MMYAC across the power switching relay, contactor, or snap action switch contacts only!

NOsparc™ MMYAC capabilities will be fully effective even under mixed load conditions.

NOsparc™ MMYAC has been designed to support the following AC power loads:

- General Purpose
- Resistive
- Capacitive
- Inductive
- Motor
- Tungsten
- Ballast
- Pilot Duty

DO NOT use NOsparc™ MMYAC for DC power applications.

DO NOT use NOsparc™ MMYAC under the following power conditions:

- Non-sinusoidal power circuits
- Phase controlled power circuits

DO NOT connect NOsparc™ MMYAC across the following components:

- Fuses
- Circuit breakers
- Safety interlocks
- Thermal limits

DO NOT use NOsparc™ MMYAC either above or below its ratings or specifications.

DO NOT operate the contacts to which the NOsparc™ MMYAC is attached above or below their ratings or specifications.

PRODUCT DESCRIPTION

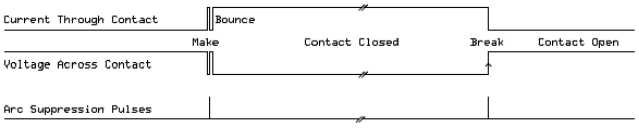
NOsparc™ MMYAC products (AC power applications) are a family of two-terminal contact arc suppressors that attach across the contact points of a power relay, contactor or snap action switch. The products are designed to protect the contact points from premature destruction due to contact current arcing.

BACKGROUND:

Electromechanical power relays, contactors, or snap action switches operating without load current may have potential mechanical lifetimes of 10M, 20M or even more operations (cycles). This mechanical lifespan, however, is reduced to as few as 5,000 operations to perhaps 100,000 operations (depending on application and specifications) when the under power.

This is mainly caused by the deleterious effects of load current arcing across the contacts as they break or bounce.

Arc Suppression Timing Diagram:

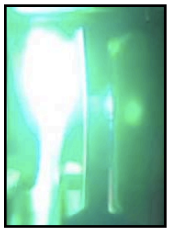


The arcing across the contacts is literally a small lightning bolt, as shown below:

***Left:** Relay contacts at rest.*

***Right:** Electrical contact current arc across the contact points of the same relay.*

ARC SUPPRESSION AND CONTACT PROTECTION:



NOsparc™ MMYAC detects the nascent arc as it forms and suppresses its energy all within about 5µs (5 millionths of a second!). The result is a low energy "arclet" with arc energy of only a few µJ as opposed to a full contact arc that is hundreds of mJ (or more). This allows an arc suppression factor to be calculated from the difference in energy. (More information is available in lab notes and application notes on our website.)

ADD "HOW DOES IT WORK"

Please note that this residual "arclet" is important as it both burns through the protective thin film coating during initial operation, and subsequently cleans of the contact surfaces during normal relay operation.

The effects of the destructive power of arcing is depicted in the pictures below:

CHARACTERISTICS:

NOsparc™ MMYAC extends contact life without requiring any external control wires, power wires or any other wires other than the two contact terminal wires that are used to connect the device to the associated power relay, contactor, or snap action switch.

NOsparc™ MMYAC requires only two wires to monitor the contact status in order to suppress the contact current arc in the instant when the contact transitions from close to open state.

RELAY END-OF-LIFE (EOL):

Every relay has a finite operating lifetime. For example: If a power relay with a 100,000 cycle electrical life is operated once every minute (60s), it will reach its EOL in a mere 69 days!

NOsparc™ MMYAC extends the inevitable end-of-life of contacts by a factor of 100 times or more under normal, specified operating conditions (please refer to the relay, contactor, or snap-action switch specifications).

The natural end-of-life (EOL) is failure in one of the following three modes:

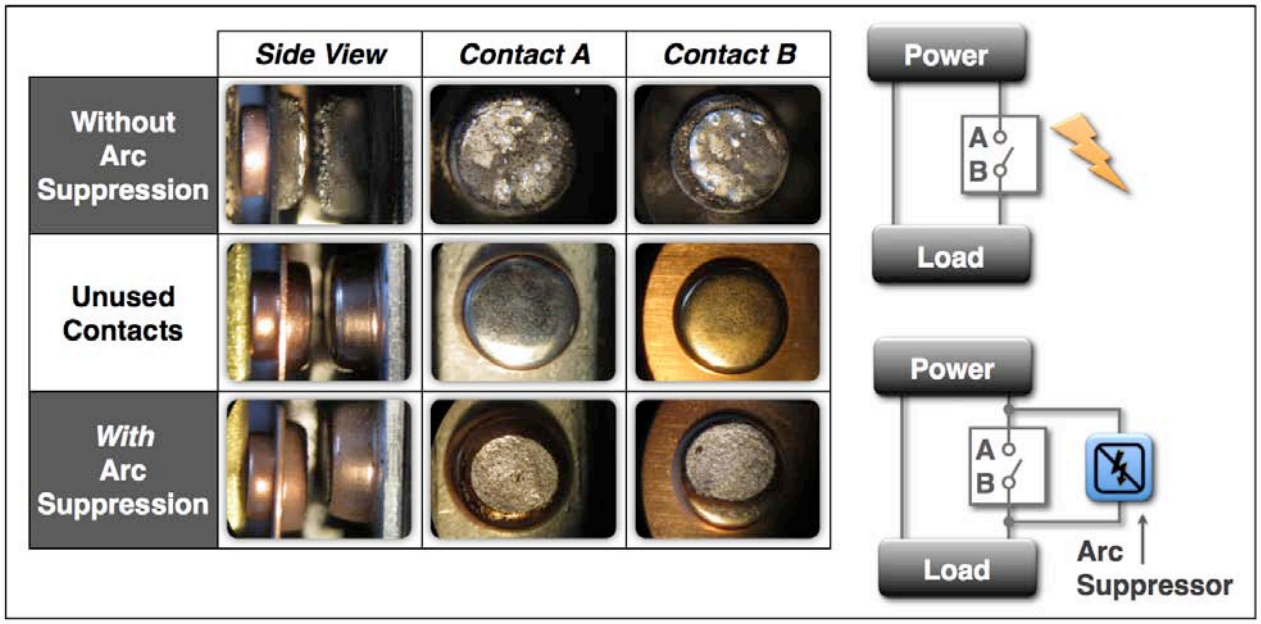
1. Contact fails closed
2. Contact fails open
3. Contact fails with resistance

This inevitable EOL can be extended out even further with the proper use of a NOsparc™ MMYAC.

SYSTEM WIRING

NOsparc™ MMYAC has two male quick connect terminal which must mate with two properly crimped female quick connect terminals.

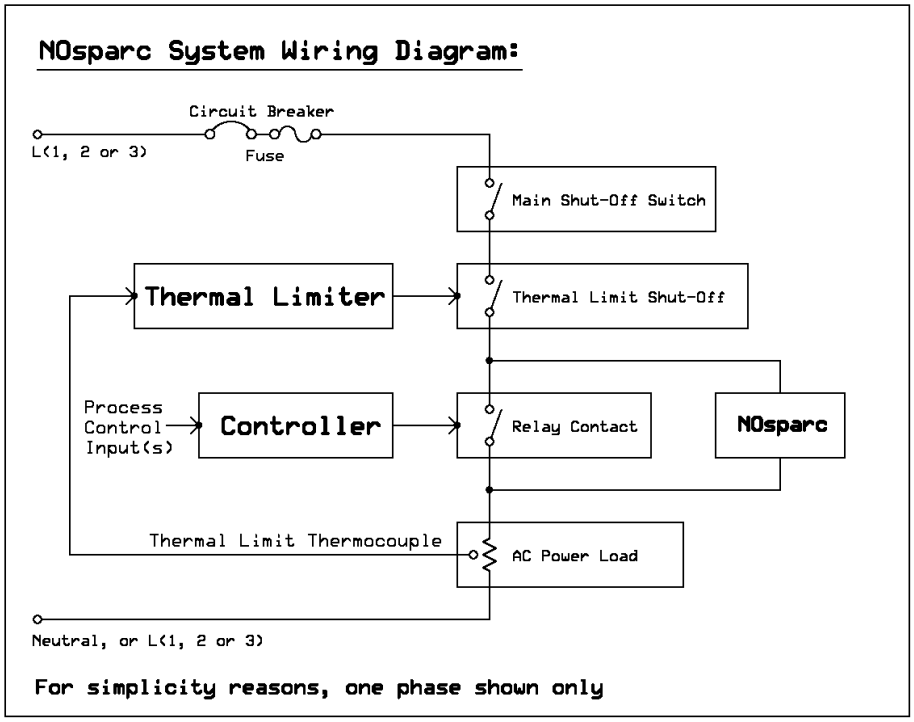
In order to provide effective arc suppression, the two wires between NOsparc™ MMYAC and the relay, contactor, or snap action switch contact terminals should be as short as possible.

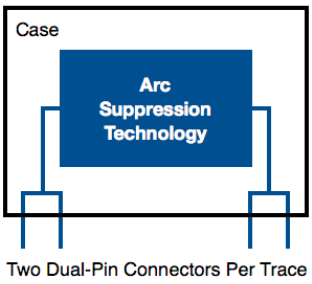


NOsparc MMYac has two dual post pins for mounting on a printed circuit board for the relay or contactor requiring contact protection.

In order to provide effective arc suppression, the two traces between NOsparc MMYac and the relay or contactor contact terminals should be as short, wide and thick as possible, per the following:

- Trace Length should not to exceed 12"
- Trace width should be 0.1" minimum
- Trace thickness should be 1Oz copper or heavier
- All four pins must be firmly soldered and connected to the individual traces (i.e., a dual-pin connector for each trace).





NOsparc™ AC POWER PRODUCT FAMILY

Part Number and Product Description

Part Number: **NOsparc™ MHYAC1W277**

M	M	Y	A	C	1	W	2	7	7

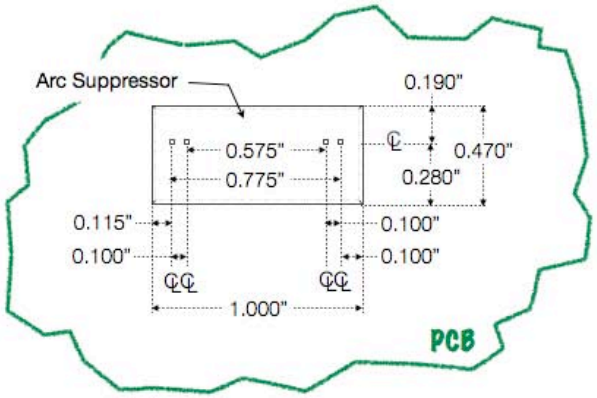
Maximum Circuit Fuse Rating	Case	Power Type	Poles	Connector	Voltage
MM = 50A	Y = PCB mount	AC = AC power	1 = 1-phase	W = two dual pins	277 = 277V

SPECIFICATIONS

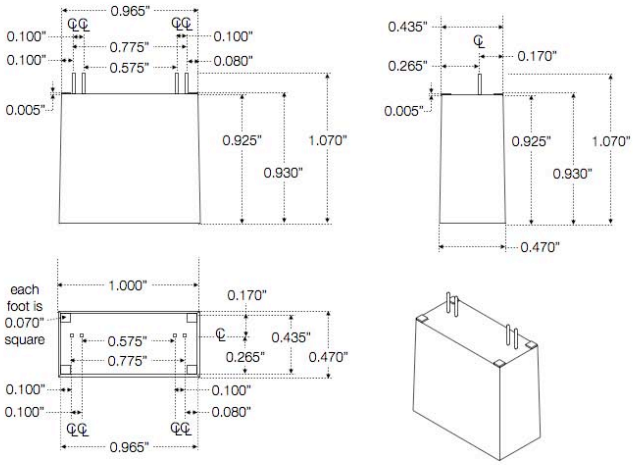
NOsparc™ MODEL	MMYAC (MMYAC1W277)
ARC CURRENTS	break: "steady-state" make: "inrush"
ARC SUPPRESSION	duration: ½ AC power cycle (maximum)
CIRCUITS (POLES)	one (1) unit per pole (multiple units required for multi-pole relays)
CIRCUIT FUSE RATING	maximum: 50A (do not exceed fuse rating)
CLAMPING VOLTAGE	470V (typical at 1mA)
CONTACT CYCLING	maximum cycle time: per relay specifications (DO NOT EXCEED relay operating specifications)
DIMENSIONS	length: 1.000in (2.540cm) width: 0.470in (1.195cm) height: 0.920in (2.335cm)
ENVIRONMENTAL	operating temperature: -40°C to 85°C (-40°F to 185°F) storage temperature: -50°C to 125°C (-58°F to 257°F) humidity: 5% to 95% (non-condensing)
FREQUENCIES	typical operating frequencies: 50Hz / 60Hz
INTERFACE WIRES	across contacts: two (2) (W1/W2 non-polarized)
LEAKAGE CURRENT	10mA (nominal)
PRINTED CIRCUIT BOARD (PCB) MOUNTING	orientation: any (see “BOARD AFFIXATION” section of User Manual) four plated through holes: 0.038in diameter (on Printed Circuit Board (PCB))
OPERATING VOLTAGE	277Vac (nominal)
POWER-ON	load current passthrough: ½ cycle (maximum)
POWER TYPE	AC (alternating current)
RELIABILITY	MTBF: 50,000 years (MIL-HDBK-217F)
TERMINATION	two 0.025in square-post dual posts (0.1in center)
TERMINATION MATE	four plated through holes: 0.038in diameter (on Printed Circuit Board (PCB))
WEIGHT	net weight: 1oz (28g)

FOOTPRINT AND CASE DIMENSIONS:

PCB FOOTPRINT:



CASE DIMENSIONS:



BOARD AFFIXATION

WAVE SOLDERING GUIDELINE:

Arc Suppression Technologies recommends using a rosin-based, non-corrosive flux during the wave solder process. The NOsparc MMYac™ is completely epoxy sealed.

WATER WASH GUIDELINE:

Arc Suppression Technologies recommends using a de-ionized water cleaning process. The NOsparc MMYac™ is completely epoxy sealed.

HAND SOLDERING GUIDELINE:

Arc Suppression Technologies recommends using a rosin-based, non-corrosive flux solder wire using a 60W maximum soldering tool. Solder tool should not touch terminals for more than five (5) seconds. Optimal solder temperature is 350°C.

DEFINITIONS

Arc Current ..... Plasma flow supported between open contacts

Arc Suppression Duration ..... Time during which the electrical current contact arc is arrested

Arc Suppressor ..... Device designed to reduce contact arcing

Break ..... Action of a contact which transitions from close to open

Bounce ..... One or more brief transition(s) to the OPEN state as the contact is closing *or* to the CLOSE state as the contact is opening

Break Current ..... Contact current during Break

Cycle Time ..... Time between successive ON or OFF contact states

Inductive Load ..... Motor or transformer form the main part of the load

Inrush Current ..... Resulting turn-on current when powering an inductive, capacitive or tungsten load

Inrush Current Limiter ..... Device intended to limit the amount of turn-on current when powering an inductive, capacitive or tungsten load

Make ..... Action of a contact which transitions from open to close

Make Current ..... Contact current during Make

MOV ..... Metal Oxide Varistor

MTBF ..... Mean-Time-Between-Failures

Power-On Passthrough ..... Current passing through the arc suppressor during initial power-up

RC Snubber ..... Device with resistor and capacitor in series across contact

Snubber ..... Device designed to limit voltage rise times

Suppression ..... Action of minimization of undesired event

Varistor Clamping Voltage ..... Voltage at which steady state current through the arc suppressor is ≥ 1mA

Maximum Varistor AC Voltage ..... Maximum allowed voltage across the arc suppressor (NOT operating voltage)

WARRANTY

Please contact your distributor or sales representative for warranty information.

TECHNICAL SUPPORT

Please contact your distributor or sales representative with technical support and product support questions.

Have the following information available when contacting your representative:

- Model Number
- Serial Number

In certain circumstances, direct product support from Arc Suppression Technologies may be reached via the following communication methods:

- support@ArcSuppressionTechnologies.com
- http://arcsuppressiontechnologies.com/Support.aspx
- (612) 928-5546

CONDITIONS FOR SERVICE

In the event of a product malfunction, Arc Suppression Technologies or an authorized agent should perform all repairs to a NOsparc™ MMYAC unit. It is the responsibility of users requiring service to report the need for service to their distributor or sales representative.

Any components, devices or other equipment used with or adjacent to a NOsparc™ MMYAC device is the sole responsibility of the end user and not of Arc Suppression Technologies or any of its agents, resellers, representatives or distributors.

RETURN MATERIAL AUTHORIZATION AND PROCESS

Authorization prior to returning product is required. Please refer to your original purchase agreement or contact your distributor or sales representative for an RMA number and instructions before returning product.

NOTE: Terms and conditions vary by distributor and representative. Please refer questions to your distributor or sales representative.

CONTACT INFORMATION

ARC SUPPRESSION TECHNOLOGIES™

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BLOOMINGTON, MN 55425

612-928-5546

www.ArcSuppressionTechnologies.com

Your Comments:

We welcome your comments or suggestions on this User's Manual.