# PRODUCT APPLICATION – INSTRUCTIONS FOR SAFE USE

# PROTEC Z SURGE ARRESTER

## PURPOSE OF THIS DOCUMENT

- Keep these instructions available for personnel responsible for proper installation, maintenance, and operation and testing.
- These instructions are a guide to the safe use of PROTEC Z. They do not supplant or take the place of any applicable national and or local safety codes, or requirements of insurance underwriters.
- Apparatus covered by this instruction literature should be operated and serviced only by competent personnel familiar with good safety practice. These instructions are written for such personnel and are not intended as a substitute for proper training and experience in safety procedures for this type of equipment.
- All possible contingencies which may arise during installation, operation, or maintenance, and all details and variations of this equipment do not purport to be covered by these instructions. If further information is desired by purchaser regarding his particular installation, operation or maintenance of his equipment, Northern Technologies should be contacted.

## MANUFACTURED STANDARDS

The PROTEC Z product is manufactured in Europe to Bureau Veritas ISO9001 quality control system, including the capacitor unit within the PROTEC Z. All the internal and external insulation levels and testing requirements comply fully withIEC-871-1 for shunt capacitors with 660V rating and upwards.

## WARNINGS

- Installations should be done according to the electrical installation regulation.
- NOTE: BEFORE the PROTEC Z is energised, make a final check that the line voltage to be connected to the PROTEC Z is within the rated voltage of the PROTEC Z; at the same time also inspect for any physical damage that may have been caused during transportation or installation handling.
  When the apparatus is energised, bushings and insulating materials will be connected to high voltages. Keep a safe distance from energised parts as severe personal injury or death could result.
- For the safety of personnel, this apparatus should be remotely isolated from High Voltage circuits before performing maintenance, inspections, and servicing. All components should be electrically disconnected by means of a visible break, and should be securely grounded when not in service. Also refer to "CAUTION: Shock Hazard" listed under safety in this document.
- **DO NOT** remove the oil filler cap or the safety switch as this will cause the oil to leak out and could cause the unit to fail or explode.

# RECEIVING

- When unpacked, carefully inspect the unit for damage and check the nameplate to be sure the desired rating has been received.
- File a claim immediately with the carrier for any damaged sustained in transit, and notify Northern Technologies SA.

### HANDLING

- *PROTEC Z should not be lifted by the bushings or safety switch*, as this may cause damage resulting in a bushing oil leak, or, cause personal injury.

# SAFETY

Follow your company's safety procedures.

- Read these instructions carefully before attempting to install, operate, or maintain this device. Failure to follow these instructions could cause severe personal injury, death, or property damage.

## INSULATION MEDIUM

- The PROTEC Z unit is a Jarylec oil filled (See Fig 2 Oil Specification) device; the following cautions and safety comments should be noted.
- Do not remove oil filler cap, as this may cause an oil leak within the unit.

## SAFETY: EXPLOSION HAZARD

- When a PROTEC Z is subject to conditions outside the design parameters, and fails, it may rupture.
- This possibility must be considered when choosing a location for the PROTEC Z with other equipment. Explosion is also a possibility and personnel should be protected during tests. We recommend using versions that are equipped with the Safety Switch feature. See section under safety switch

## CAUTION: SHOCK HAZARD

PROTEC Z units do not contain discharge resistors, for safe handling read the following:-

- Before inspecting or working on the PROTEC Z power must be removed from the PROTEC Z.
- After disconnecting the power, the PROTEC Z will generally be left with a charge that must be removed before handling.
- The charge may be removed by the following: -
- After disconnecting the PROTEC Z from the power source, wait at least 5 minutes, then short and ground the PROTEC Z equipment using an insulated grounding stick. Shorting should be terminal-to-terminal and terminal to earth stud.
- The resistance of the grounding stick in ohms should be about equal to the maximum peak voltage that may have been on the PROTEC Z.
- The resistor should have a peak voltage capability greater than the maximum peak voltage that may be on the PROTEC Z and energy absorbing capability greater than the energy stored in the PROTEC Z.
- After discharging, a shorting connection should be installed between the terminals and removed just prior to re-connection and re-energisation.

**SAFETY: FIRE HAZARD**

- Since this product contains a combustible liquid (See attached oil specification), the location of the PROTEC Z should be chosen with consideration given to the possibility of fire and we recommend its containment in the event of PROTEC Z failure and case rupture. We recommend using the versions with the Safety Switch. The LV units are fully contained in the event of a capacitor rupture.
- See National Electric Code for location limitations.

**SAFETY SWITCH:**

All PROTEC Z HV units are fitted with a safety switch. When the pressure in the container exceeds 0.5 Bar, the switch will change state from normally open to normally closed or vice versa, and this can be used to signal the overpressure to a PLC, to an alarm feature or to open the breaker to the installation. It is highly recommended to have no time delays implemented in the tripping circuit.
This feature protects the PROTEC Z/Z+ equipment against the following danger of can rupture incidents:

- Overvoltage in the case of loss of earth
- Overvoltage from network
- Over Harmonic loading i.e. THD(V)>10%
- Over temperature i.e. >80 degrees Celsius Ambient Temperature

The Safety Switch will detect the pressure in the vessel and operate at a factory pre-set safe level
The Safety Switch is to be connected to the machine breaker via hardwiring or via a wireless connection to a mechanism that shuts the power of to the machine.
This feature will protect the machine and any personnel standing close to the machine.
The level is factory set and if the condition reverts back to normal the Safety switch will "reset"
There are solutions to disconnect the PROREC Z unit and let the machine carry on without the PROTEC Z in the circuit.
Please consult our Installation instructions or contact NTSA for further information
NTSA insists on connecting the Safety Switch in systems.
In case this device is not connected, NTSA will not be liable for any damages caused to people or assets

The switch contacts are potential free. In hazardous / highly flammable areas it is compulsory that the safety switch is connected thru an I.S. barrier or Isolator.
These barriers or isolators should be installed in a safe area.

The IS loop must be certified separately by the end user.

Recommended or equivalent MTL Isolators available from Extech safety systems

- MTL5511 (single channel) 24V DC supply (See attached data sheet Fig 3)
- MTL5516C (dual channel) 24V DC supply (See attached data sheet Fig 4)
- MTL5018ac 85 to 235V AC supply (See attached data sheet Fig 5)

In the event that the safety switch operates, it is mandatory to remove and/or replace the TSSP device, due to the fact that it indicates that the TSSP device was operating under extreme conditions which could affect the operation of the unit.

# INSTALLATION

The installation conditions considerations for a PROTEC Z as follows: -

- Select the correct PROTEC Z for the operating voltage.
- The PROTEC Z should be preceded by a surge arrestor if lightning can occur or be induced in the electrical system.
- The PROTEC Z should be properly bolted down.
- The PROTEC Z should be protected from excessive dust or vermin.
- The PROTEC Z can be mounted in any direction, even upside down. But care should be taken to prevent any vibration being transferred from the equipment being protected to the porcelain bushings of the PROTEC Z. Also see the section on "VIBRATION" as well as "STRESS ON BUSHINGS AND TERMINALS".

## RATING

- When installing PROTEC Z, check the nameplate of each unit to see that it has the proper rating for the circuit. The PROTEC Z will work with a 10% voltage variance.
- The line connections harmonic content should be less than 10 % Total Voltage Harmonic distortion (THD(V)). For higher harmonic loading consult Northern Technologies.

## AMBIENT TEMPERATURE

Standard operating/energising ambient temperatures range for Jarylec impregnated PROTEC Z is -40° to +80°C. Higher ambient temperatures will shorten the life of a PROTEC Z. NOTE: 80°C is the ambient temperature limit of the PROTEC Z, as measured at the PROTEC Z. For some applications, such as mounting in enclosures, ambient temperatures at the PROTEC Z units will exceed ambient temperature around equipment. For operation at temperatures above 80°C please see note below.

- From 80°C forced cooling or heat insulation of the PROTEC Z is required.
- There will be accelerated aging of the device which the safety switch will supervise and clear on fault conditions if the 80°C is exceeded.
- For temperatures over 80°C we recommend implementing the impedance matching method, please see drawings (Preferred connections, see page 10). This is the most economical method.

• For temperatures over 80°C, we recommend to insulate the PROTEC Z thermally in order to reduce the thermal stress to below 80°C
• We note from tests that the temperature gradient is the highest at the top of the vessel
• The oil specification as attached reveals that the oil can safely withstand 144°C
• The safety switch mechanism can withstand 120°C and is situated at about mid vessel height.
• The resistor can withstand according to the supplier 1000°C
• Capacitor elements can withstand 80°C and are situated at the bottom half of the vessel.
• When switching spikes occur it has no influence on the thermal image as the duration is in the order of 1 – 6 microseconds
• Note that the Compact unit will be disconnected faster than the four colour scheme units as the oil volume of the Compact unit is smaller than the latter units

Energising a PROTEC Z with an internal temperature less than -40°C may damage the PROTEC Z and possibly cause failure. PROTEC Z should therefore not be energised with internal temperature lower than -40°C. If the internal temperature of the PROTEC Z drops to less than -40°C, the unit must be brought to a minimum internal temperature of -20°C, before energisation. The LV units can withstand 75°C.

**CLAMPING**

The IEEE curve takes the effects of ageing into account. (Fig. 1).

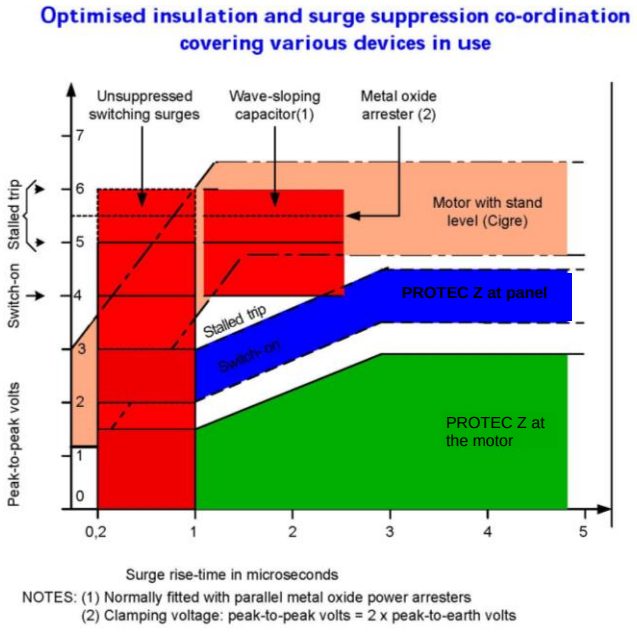



**Fig. 1 Impulses withstand levels of medium voltage motors.**
Showing unsuppressed switching surge magnitudes and rise-times, and insulation co-ordination provided by PROTEC Z HV.

### IMPLIED HARMONIC GENERATOR

- Please heed caution to implied harmonic generators like VSDs, UPSs and rectifiers and the like elements.
- The PROTEC Z must **precede** this equipment as the THD(V) after these elements could be higher than 10% THD(V)
- It is prudent to measure or calculate the THD(V) at the point where the PROTEC Z will be installed. If problematic we suggest the following solutions which include:
  - Panel mount version before these elements
  - Using 3 single phase units
  - Using a harmonic tuned filter to eliminate or mitigate the harmonic loading
- Beware also about capacitive elements in the circuit which could amplify the harmonic loading. One could also use the Safety Switch to alarm/trip if the harmonic situation would escalate. Please contact NTSA for advice if you are unsure about the correct positioning at www.ntsa.co.za

### VIBRATION

- The PROTEC Z should be installed on a stable surface, i.e. **NO** vibration is allowed.
- Vibration; especially where the porcelain bushings are large enough to create strain on the bushing oil seals can result in mechanically stressing the components and oil seals.
- Machines such as crushers where vibration is most possible, caution should be taken on where the PROTEC Z is mounted considering the potential vibration, i.e. mounting in the motor terminal box when the motor can transfer vibration through to the PROTEC Z is not advisable. A special version of LV units for use at generators is available. It has special vibration mounts. PROTEC Z LV (400-800V)

## ELECTRICAL CONNECTIONS

- Ensure that the correct size termination lug is selected
- When aluminium wire is used, an oxidation preventative should be used, especially in a salt or corrosive atmosphere. Use 2.5 $mm^2$ flexible direct connections to the bushings of the compact unit. These should be less than one 1 metre long. Do not extend the flexible leads under any circumstances.

### ELECTRICAL CLEARANCE

- When installing PROTEC Z, care should be taken to obtain the necessary spacing and electrical clearances for safe operation.

### EARTHING

- The earthing should be to machine quality earth or to the cable shielding as appropriate and not less than 16mm2 to 25mm2; preferably braided copper; using a smaller size could result in local damage and possible failure of the PROTEC Z when the discharge goes to ground via the mounting feet. This is possible when there is a bad earth or lack of capacity of installed earth cabling.

### METHOD FOR TERMINATING CABLES AT THE BUSHINGS

- When the PROTEC Z is fitted with bushings and connecting stud, two nuts are fitted to each terminal. It is advised that the lower nut is held by using a second spanner while tightening the top nut. This will remove the stress from the bushing mounting and ceramic insulator.
- A torque of 20 Nm maximum is recommended, anything in excess of this value may result in bushing damage and or, personal injury. On the LV unit 10Nm applies.

### STRESS ON BUSHINGS AND TERMINALS

- Connections to the PROTEC Z must not create stress on the bushings.
- Use flexible connections between the PROTEC Z and rigid/fixed system connections.

## ADDITIONAL CONSIDERATIONS

### EXTERNAL FUSING

- NOTE: With a PROTEC Z installation, a fuse failure will lead to loss of protection for the affected phase if the failure goes unnoticed. Different fault conditions make it difficult to grade fuses to protect under fault and PROTEC Z failure.

### LIGHTNING PROTECTION

- The PROTEC Z is not a lightning protection device; it is designed to shunt the breaker switching spikes.
- Additional lightning protection may be required in high lightning incidence areas.

# MAINTENANCE

A PROTEC Z is maintenance-free, requiring only periodic cleaning of bushings in contaminated areas.

- Equipment should be inspected periodically for failure or leaks. This check can be made after de-energising and following "Safety Instruction, Shock Hazard" detailed elsewhere in this document.
- The use of hoses in the vicinity of an 'open' PROTEC Z installation must be avoided.
- Testing can be carried out once a year.

**Inspection**

- Inspect the PROTEC Z for dirty, broken or chipped bushings.
- Physical damage to the casing.
- Earth & the leads. The casing earth and leads should not be corroded.
- Inspect casing for any bulging. (Needs to be removed from service immediately).
- Inspect very carefully for oil leaks. (Needs to be removed from service immediately).

# GUIDELINE FOR LIFE EXPECTANCY FOR PROTEC Z UNITS IN SERVICE

With an ideal environment and a correctly installed PROTEC Z that is inspected at regular intervals, the internal capacitor is the most vulnerable component in the PROTEC Z.

The switching spikes that the PROTEC Z clamps have the potential to accelerated the degradation of the PROTEC Z's capacitor, when compared with a standard capacitor bank

life expectancy of 30-40 years we have reduced the life span to 15 years when operated at a THD(V) of < 5% and 10 years when operated at a THD(V) of <10% to allow a safety margin when considering the environment and duty the PROTEC Z could be experiencing. The LV units have an expected lifespan of 10 years.

## TESTING

### Manufacturing Tests

Each PROTEC Z surge suppressor is routine tested prior to dispatch. We can supply factory test results per unit if required

### Field Tests

In general, PROTEC Z surge suppressors should not require re-testing prior to putting into service, and, in any case, if testing is a prerequisite before applying power, the PROTEC Z should be tested separately from the associated motor/generator/ transformer/switchgear.

In order to field or factory test and check a PROTEC Z suppressor, the following can be done:

- Check for obvious physical damage (broken bushing, leaking impregnant, bulging tank, etc.)
- Use a hand-held capacitance meter and measure the capacitance from each phase to earth and check that it is within 10% of nominal (0.1 or 0.2µF, as stamped on the PROTEC Z rating plate)
- NTSA advises using units with a safety switch.

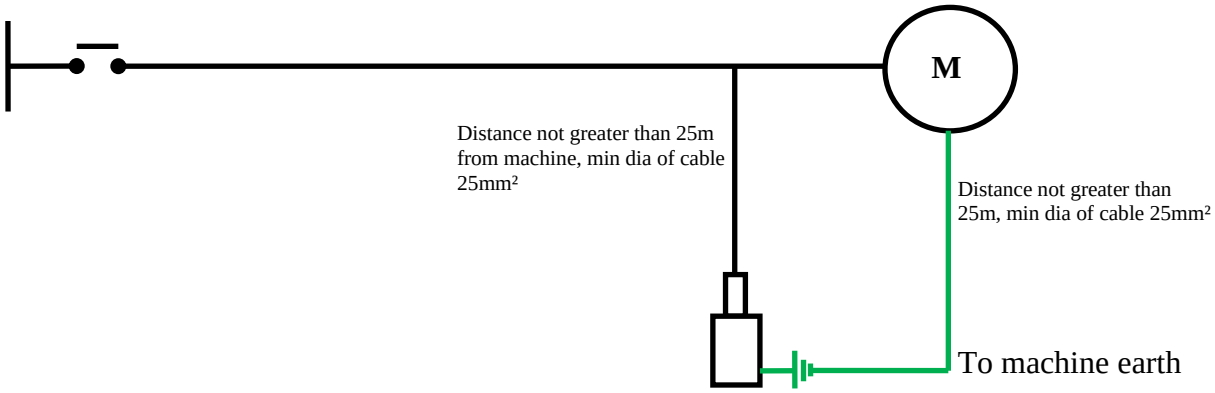
## DISPOSAL

- **CAUTION:** Avoid liquid contact with the skin and eyes and exposure to fumes in an unventilated area.
- The impregnating liquid used in this PROTEC Z is Jarylec, a biodegradable material.
- Incineration or other disposal should be in accordance with federal, state, and local regulations.
- See our oil specification documentation (Fig 2) for further information.

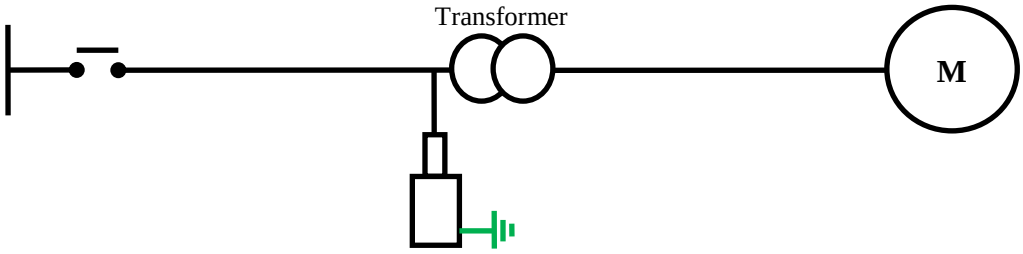
## PREFERRED CONNECTIONS

1. **MM1 / MM3** As close to the machine as possible


2. **MM3 -** Impedance matching

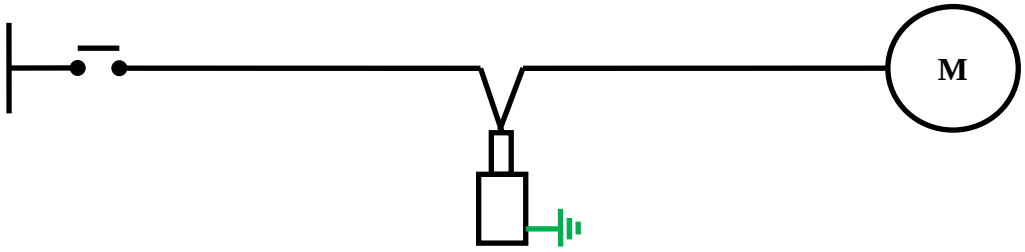



3. **MM1 / MM3** Before transformer




4. **PM3** – Panel mount

5. **PM3** if cable is $\leqslant$ 15m, **MM3** if cable is $\geqslant$ 15m




## TECHNICAL NOTE FOR ADAPTING A THREE PHASE PROTEC Z MM3 HV UNIT TO A SINGLE PHASE MM1 VERSION

Potential applications:

Customers requiring full phase segregation like in the case of a generator application

Customers requiring more cooling from the existing can size because of temporary higher harmonic loading in the plant or other excess heating phenomena

In order perform this conversion, the following steps are required:

1. Order 3 new identical MM3 units from NTSA; do not use this on Compact or PM3 versions without consulting NTSA.
2. Do all the handling and connections in accordance to the Installation Manual from NTSA
3. Connect each HV phase to the bushing opposite the earth stud side from the MM3 unit
4. Connect the two free bushing tops to the relevant can's earth-stud with at least 16 mm squared isolated cable
5. For cooling purposes allow as much space as possible between the units
6. Connect the 3 earth-studs to the machine earth in accordance to 2
7. When testing the capacitor as per 2 test the cans one by one with all connections severed and only to the relevant bushing and its matching earth-stud.
8. Treat the thus formed assembly as a "life system"

# Safety switch technical data

NTSA
DEFINED POWER SOLUTIONS

## Operation and use

The series 0180/0181 and 0186/0187 switch opens or closes an electrical circuit when a certain (adjustable) pressure is reached. A diaphragm or piston is moved by the increase in pressure. The amount of diaphragm deflection or piston travel depends on the force of the pressure applied and the (adjustable) spring tension. At a predetermined deflection of the diaphragm or movement of the piston, a microswitch is actuated which opens or closes the electrical contacts (changeover).

The pressure switch monitors a preset pressure.

## Conditions governing the use of the product

The following general instructions are to be observed at all times to ensure the correct, safe use of the pressure switch:

- Observe without fail the warning notices and other instructions laid down in the operating instructions.
- Observe the applicable safety regulations laid down by the regulatory bodies in the country of use.
- Use the switch only for monitoring fluid and gaseous medias.
- Do not exceed the specified limits for e.g. pressures, forces, moments or temperatures under any circumstances.
- Give due consideration to the prevailing ambient conditions (temperature, atmospheric humidity, atmospheric pressure, etc.).
- Never expose the pressure switch to severe side impacts or vibrations.
- Use the product only in its original condition. Do not carry out any unauthorized modifications.
- Remove all items providing protection in transit such as foils, caps or cartons.
- Disposal of the above-named materials in recycling containers is permitted.

## Operating conditions

Media temperatures other than room temperature (20 °C):

- The effects of extreme temperatures (relative to room temperature) can lead to pronounced variations in the switching point or the failure of the vacuum switch.

Type of protection IP65:

Type testing does not apply to all ambient conditions without limitations. The user is responsible for verifying that the plug-and-socket connection complies with the specified rules and regulations of CE, or whether it may be used for specialized purposes other than those intended by us.

Use with oxygen:

***Diaphragm Pressure Switch:***
If oxygen is used, the applicable accident prevention regulations must be observed. In addition, we recommend a maximum operating pressure of 10 bar (series 0180/0181) or 50 bar (series 0186/0187), which should not be exceeded.

***Piston Pressure Switch:***
Piston Pressure Switches are **not** suitable for gaseous media, particulary oxygen.

Protection against overpressure:

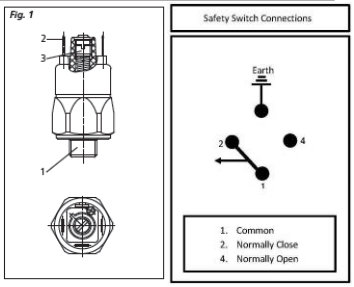
The static overpressure safety is included in the technical data.
The overpressure safety corresponds to the hydraulic, pneumatic part of the pressure switch. The dynamic rating of the overpressure safety is smaller than 30 to 50%.

## Technical data

| Rated operating voltage $U_e$ | Rated operating current $I_e$ | Utilization category |
|---|---|---|
| 250 Volt AC 50/60 Hz | 4 Ampere | AC 12 |
| 250 Volt AC 50/60 Hz | 1 Ampere | AC 14 |
| 30 Volt DC | 4 / 4 Ampere | DC 12 / DC 13 |
| 50 Volt DC | 2 / 1 Ampere | DC 12 / DC 13 |
| 75 Volt DC | 1 / 0.5 Ampere | DC 12 / DC 13 |
| 125 Volt DC | 0.3 / 0.2 Ampere | DC 12 / DC 13 |
| 250 Volt DC | 0.25 / 0.2 Ampere | DC 12 / DC 13 |
| Rated insulation voltage $U_i$ : | | 300 Volt |
| Rated surge capacity $U_{imp}$ : | | 2,5 kV |

| | |
|---|---|
| Rated thermal current $I_{the}$: | 5 Ampere |
| Switching overvoltage: | < 2.5 kV |
| Rated frequency: | DC and 50/60 Hz |
| Rated current of short-circuit protective decvice: | Up to 5 Ampere |
| Rated short-circuit current: | < 350 Ampere |
| IP protection to EN 60 529:1991: | IP65 with plug |
| Tightening torque for terminal screws: | < 0.35 Nm |
| Conductor size: | 0.5 to 1.5 mm² |
| Operating frequency: | < 200 min⁻¹ |
| Switching hysteresis: | 10 to 30% adjustable at works |
| Mechanical life<br>Diaphragm type:<br>Piston type: | <br>10⁶ operating cycles (at trip pressures up to 50 bar)<br>10⁶ operating cycles |
| Body material<br>Serie 0180/0181:<br>Serie 0186/0187: | <br>Zinc-plated steel (Fe//ZnNi(12)6//A/T2)<br>stainless steel (1.4305) |
| Temperature range: | NBR -30 °C to +100 °C<br>EPDM -30 °C to +120 °C<br>FKM -5 °C to +120 °C |
| Overpressure safety<br>Diaphragm Pressure Switch:<br>Piston Pressure Switch: | <br>100 bar (0.3 to 1.5 bar, 1 to 10 bar)<br>300 bar (1 to 10 bar with ending No. 040, 041, 042, 340, 341, 342 and residual pressure ranges)<br>600 bar |

## Operating controls and connections




## Installation

Mechanical, pneumatic, hydraulic

With a size 27 open-ended wrench (to DIN 894 or similar), install the pressure switch, by means of the hexagon connector, in the corresponding pressure socket (for torque specification, see following table).

For sealing the system, use a standard copper gasket of the appropriate dimensions.

| Connecting thread | Torque |
|---|---|
| M10x1taper and NPT 1/8 | Tighten until system is hermetically sealed |
| M10x1straight | 35 Nm |
| Others | 45 Nm |

Electrical:

Connect up the pressure switch in accordance with the circuit diagram (Fig. 2).

Use a connector type 1-1-80-652-002 (not included in the delivery).

## Entry into service

1. Using a continuity tester, wire up the electrical connecitons 1 and 4 (Fig. 2).

If using a testing lamp as a continuity tester, observe the maximum permissible switching capacity (see Technical Data).

2. First, screw in the adjusting screw (3) as far as it will go. To adjust the pressure switch, use a screwdriver with a 6,3 mm wide blade.

Take care to ensure that the adjusting screw (3) does not seize at any point other than when it is fully tightened down.

3. Adjust the pressure switch to the desired actuating pressure (a test pressure gauge is required).
4. Ease off the adjusting screw (3) to a sufficient extent to cause the pressure switch to trip (continuity tester reacts).
5. If necessary, adjust the trip pressure setting by turning the adjusting screw (3).

When putting the pressure switch into service, please observe the applicable safety regulations laid down by the governing bodies in the country of use.

The adjustment of hysteresis can only be carried out in the factory. If this is unexpertly undertaken, damage may be caused to the pressure swich.

## Removing the pressure switch

When removing the pressure switch, observe the following important instructions:

- The pressurized system from which the pressure switch is intended to be removed must be entirely relieved of pressure.
- All the relevant safety regulations must be observed.
- Use a size 27 open-ended wrench (to DIN 894 or similar), to remove the pressure switch.

Fig 1

## Oil specification

ARKEMA

SAFETY DATA SHEET
according to Regulation (EC) No. 1907/2006

| Product: | JARYLEC C101D | Page: 1 / 8 |
|---|---|---|
| SDS No.: 001084-001 | Version 2.0 | Date 22.04.2008<br>Cancel and replace : 28.01.2008 |

**1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING**

Identification of the preparation : JARYLEC C101D

Recommended use : Dielectric fluid

Supplier : ARKEMA – France
CHLOROCHIMIE ET PVC
420 rue d'Estienne d'Orves
92705 Colombes Cedex
France
Téléphone : +33 (0)1 49 00 80 80
Télécopie : +33 (0)1 49 00 83 96
http://www.arkema.com

Email address : pars-drp-fds@arkema.com

Emergency telephone : +33 1 49 00 77 77

**2. HAZARDS IDENTIFICATION**

Most important hazards:

Potential health effects : Repeated exposure may cause skin dryness or cracking.
May cause allergic skin reaction.

Environmental Effects : May cause long-term adverse effects in the aquatic environment.

Physical and chemical hazards : Thermal decomposition giving toxic products
Decomposition products: See chapter 10

Specific hazards / EC :

Repeated exposure may cause skin dryness or cracking.

**3. COMPOSITION/INFORMATION ON INGREDIENTS**

Chemical nature of the preparation : Preparation based on :

**Components**

| Chemical Name *) | EC-No. | CAS-No. | Concentration | Classification |
|---|---|---|---|---|
| Benzyltoluene | 248-654-8 | 27776-01-8 | | – |
| Dibenzyltoluene | 248-097-0 | 26898-17-9 | | R66 |
| Cycloaliphatic Epoxide (Mw < 700) | | | < 1 % | Xi; R43 |

*) See chapter 14 for Proper Shipping Name

For the full text of the R phrases mentioned in this Section, see Section 16.

## 4. FIRST AID MEASURES

| | | |
|---|---|---|
| General advice | : | Take off immediately all contaminated clothing |
| Inhalation | : | Inhalation of vapours due to thermal decomposition :<br>Move to fresh air.<br>Oxygen or artificial respiration if needed.<br>In case of problems :<br>Consult a physician. |
| Skin contact | : | Wash immediately, abundantly and thoroughly with soap and water |
| Eye contact | : | Wash immediately, abundantly and thoroughly with water<br>If irritation persists, consult an ophthalmologist |
| Ingestion | : | Do NOT induce vomiting.<br>Consult a physician. |
| Protection of first-aiders | : | If entering a saturated atmosphere, wear a self contained breathing apparatus |

## 5. FIRE-FIGHTING MEASURES

| | | |
|---|---|---|
| Suitable extinguishing media | : | Dry powder<br>Foam<br>Carbon dioxide (CO2)<br>Water |
| Specific hazards | : | At high temperature:<br>Thermal decomposition gives :<br>Benzene<br>toluene |
| Specific methods | : | Cool containers / tanks with water spray.<br>Ensure a system for the rapid emptying of containers<br>In case of fire nearby, remove exposed containers |
| Special protective equipment for fire-fighters | : | Wear self-contained breathing apparatus and protective suit. |

## 6. ACCIDENTAL RELEASE MEASURES

| | | |
|---|---|---|
| Personal precautions | : | Avoid contact with skin and eyes and inhalation of vapours |
| Environmental precautions | : | Do not release into the environment<br>Do not let product enter drains.<br>Dam up. |
| Recovery | : | Pump into a labelled inert emergency tank<br>Absorb the remainder with an inert absorbent material<br>sand, vermiculite, perlite) |
| Elimination | : | Destroy the product by incineration. (in accordance with local and national regulations) |

## 7. HANDLING AND STORAGE

Handling

Technical measures/Precautions : Storage and handling precautions applicable to products:
Liquid
Probably sensitizer
Provide appropriate exhaust ventilation at machinery.
Provide showers, eye-baths.
Provide self-contained breathing apparatus nearby.

Safe handling advice : Avoid contact with the skin and the eyes.
Avoid inhalation of vapours

Storage

Technical measures/Storage conditions : Keep container tightly closed in a dry and well-ventilated place.
Provide a catch-tank in a bunded area

Incompatible products : Oxidizing agents

Packaging material

Recommended : Ordinary steel

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

General protective measures : Ensure sufficient air exchange and/or exhaust in work areas

**Products of decomposition:**

**Benzene**

| Source | Date | Value type | Value (ppm) | Value (mg/m3) | Remarks |
|---|---|---|---|---|---|
| EU OELIII | 06 2004 | TWA | 1 | 3,25 | – |
| EU OELIII | 06 2004 | SKIN | – | – | Can be absorbed through the skin. |
| ACGIH | 2007 | TWA | 0,5 | – | – |
| ACGIH | 2007 | STEL | 2,5 | – | – |
| ACGIH | 2007 | SKIN | – | – | Can be absorbed through the skin. |

**Toluene**

| Source | Date | Value type | Value (ppm) | Value (mg/m3) | Remarks |
|---|---|---|---|---|---|
| EU ELV | 02 2006 | TWA | 50 | 192 | – |
| EU ELV | 02 2006 | STEL | 100 | 384 | – |
| EU ELV | 02 2006 | SKIN | – | – | Can be absorbed through the skin. |
| ACGIH | 2007 | TWA | 20 | – | – |
| ACGIH | 01 2006 | SKIN | – | – | Can be absorbed through the skin. |

Personal protective equipment

Respiratory protection : High concentrations or prolonged activity:
Wear a mask, if necessary

Hand protection : Splash contact, intermittent and prolonged
PVC gloves
Glove thickness: 1,2 - 1,4 mm

Eye protection : Safety glasses

Skin and body protection : At the workplace:
Combination with delayed penetration

Intervention at incident:
Combination with delayed penetration

Hygiene measures : Avoid contact with the skin and the eyes.
Avoid inhalation of vapours

**9. PHYSICAL AND CHEMICAL PROPERTIES**

Physical state (20°C) : liquid

Colour : light yellow

Odour : aromatic

Pour point : < -50 °C

Flash point : 144 °C open cup ( Method: Standard NF T 60 118 )

154 °C Ignition temperature ( Method: Standard NF T 60 118 )

Autoignition temperature : 459 °C
Method: Standard A15 (D. 92/69/EEC)

Vapour pressure : 0,0034 hPa (20 °C)

1,3 hPa (100 °C)

Density : 1.010 kg/m3 (20 °C)

999 kg/m3 (50 °C)

960 kg/m3 (80 °C)

Solubility

| | | |
|---|---|---|
| Water solubility | : | (20 °C)<br>immiscible |
| Solubility in other solvents | : | Soluble in most organic solvents |
| Viscosity, kinematic | : | 6,5 mm2/s (20 °C) |
| Surface tension | : | 38,24 mN/m ( 25 °C) |
| Partition coefficient: n-octanol/water | : | BENZYLTOLUENE :<br>log Kow : 4,31 - 4,40 (measured) |

## 10. STABILITY AND REACTIVITY

| | | |
|---|---|---|
| Materials to avoid | : | Oxidizing agents |
| Hazardous decomposition products | : | At high temperature:<br>Thermal decomposition giving toxic products<br>Benzene<br>toluene |
| Further information | : | The product is stable under normal handling and storage conditions |

## 11. TOXICOLOGICAL INFORMATION

Acute toxicity

| | | |
|---|---|---|
| Inhalation | : | According to its composition, this product should not be harmful in normal conditions of use<br>• In animals:<br>At high vapour/mist concentrations<br>Non lethal<br>4 h/rat<br>Inhalation of vapours due to thermal decomposition:<br>Non lethal<br>Formation of carboxyhaemoglobin<br>Difficulty in breathing<br>Effect reversible within a few days |
| Ingestion | : | According to its composition, can be considered as:<br>Slightly harmful by ingestion<br>LD50/rat: 3.080 mg/kg |
| Dermal | : | According to its composition, can be considered as:<br>Slightly harmful in contact with skin |

Local effects

Skin contact : • In animals:
Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.

Eye contact : • In animals:
Slightly or not irritating to eyes
(rabbit)

Sensitisation

Skin contact : CYCLOALIPHATIC EPOXIDE (MW < 700) :
Risk of skin sensitization

Repeated dose toxicity : According to available experimental data
- By oral route: rat
No specific toxic effects
No Observed Adverse Effect Level (NOAEL): 500 mg/kg/d

Specific effects

Genotoxicity
In vitro : Ames test in vitro: Inactive

In vivo : Micronucleus test in vivo rat: Inactive

## 12. ECOLOGICAL INFORMATION

Persistence and degradability
In water : DIBENZYLTOLUENE :
Inherently biodegradable.:
Aerobic primary degradation: 100 % after 149 d

in air : BENZYLTOLUENE :
Degradation by radicals OH :
Direct photolysis (Half-life) : 16 h

DIBENZYLTOLUENE :
Degradation by radicals OH :
Direct photolysis (Half-life) : 8 h

Bioaccumulation : BENZYLTOLUENE :
log Kow : 4,31 - 4,40 (measured)

Aquatic toxicity

Acute toxicity
Aquatic invertebrates : No effect up to the limit of solubility.
(Daphnia)

microorganisms : DIBENZYLTOLUENE :
EC0 (Bacteria) : 1.000 mg/l

## 13. DISPOSAL CONSIDERATIONS

Disposal of product : Destroy the product by incineration. (in accordance with local and national regulations)

## 14. TRANSPORT INFORMATION

**ADR** : not regulated

**ADNR** : not regulated

**RID** : not regulated

**IATA Cargo** : not regulated

**IATA Passenger** : not regulated

**IMDG** : not regulated

## 15. REGULATORY INFORMATION

EEC DIRECTIVE

Safety data sheets : according to Regulation (EC) No. 1907/2006

EC classification / labelling

Dangerous Preparations : D. 1999/45/EC amended by D. 2001/60/CE

R-phrase(s)
R66 Repeated exposure may cause skin dryness or cracking.

S-phrase(s)
S36/37 Wear suitable protective clothing and gloves.

Special labelling of certain preparations : Contains epoxy constituents. See information supplied by the manufacturer.

Inventories :

| | |
|---|---|
| EINECS: | Conforms to |
| TSCA: | Conforms to |
| AICS: | Conforms to |
| DSL: | All components of this product are on the Canadian DSL list. |
| ENCS (JP): | Conforms to |
| KECI (KR): | Conforms to |
| PICCS (PH): | Does not conform |
| INV (CN): | Conforms to |

SAFETY DATA SHEET
according to Regulation (EC) No. 1907/2006

| Product: | JARYLEC C101D | Page: 8 / 8 |
|---|---|---|
| SDS No.: 001084-001 | Version 2.0 | Date 22.04.2008<br>Cancel and replace : 28.01.2008 |

**16. OTHER INFORMATION**

**Full text of R-phrases referred to under sections 2 and 3**

| | |
|---|---|
| R43 | May cause sensitization by skin contact. |
| R66 | Repeated exposure may cause skin dryness or cracking. |

Further information : When used in formulations, contact us for labelling

This information applies to the PRODUCT AS SUCH and conforming to specifications of ARKEMA
In case of formulations or mixtures, it is necessary to ascertain that a new danger will not appear
The information contained is based on our knowledge of the product, at the date of publishing and it is given quite sincerely.
Users are advised of possible additional hazards when the product is used in applications for which it was not intended. This sheet shall only be used and reproduced for prevention and security purposes.
The references to legislative, regulatory and codes of practice documents cannot be considered as exhaustive. It is the responsibility of the person receiving the product to refer to the totality of the official documents concerning the use, the possession and the handling of the product.
It is also the responsibility of the handlers of the product to pass on to any subsequent persons who will come into contact with the product (usage, storage, cleaning of containers, other processes) the totality of the information contained within this safety data sheet and necessary for safety at work, the protection of health and the protection of environment.

**NB: In this document the numerical separator of the thousands is the "." (point), the decimal separator is "," (comma).**

Vertical lines in the left hand margin indicate an amendment from the previous version.



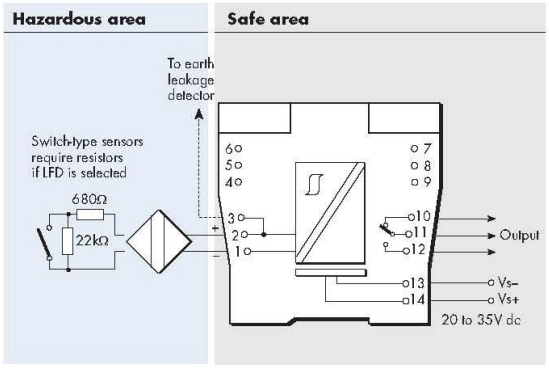
Fig 2

## I.S Barriers / Isolators

# MTL5511 SWITCH/ PROXIMITY DETECTOR INTERFACE

single channel, with line fault detection

The MTL5511 enables a safe-area load to be controlled by a switch or proximity detector located in a hazardous-area. When selected, open or short circuit conditions in the field wiring are detected by the line-fault-detect (LFD) facility and also indicated on the top of the module. Phase reversal for the channel is selected by a switch on the side of the module and output is provided by changeover relay contacts.




| Terminal | Function |
|---|---|
| 1 | Input –ve |
| 2 | Input +ve |
| 3 | To earth leakage detector* |
| 10 | Output normally-closed contact |
| 11 | Common |
| 12 | Output normally-open contact |
| 13 | Supply –ve |
| 14 | Supply +ve |

* Signal plug HAZ1-3 is required for access to this function

## SPECIFICATION

***See also common specification***

**Number of channels**
One

**Location of switches**
Zone 0, IIC, T6 hazardous area
Div. 1, Group A hazardous location

**Location of proximity detector**
Zone 0, IIC, T4–6 hazardous area if suitably certified
Div. 1, Group A hazardous location

**Hazardous-area inputs**
Inputs conforming to BS EN60947–5–6:2001 standards for proximity detectors (NAMUR)

**Voltage applied to sensor**
7 to 9V dc from 1kΩ ±10%

**Input/output characteristics**
Normal phase
Outputs closed if input > 2.1mA (< 2kΩ in input circuit)
Outputs open if input < 1.2mA (> 10kΩ in input circuit)
Hysteresis: 200µA (650Ω) nominal

**Line fault detection (LFD) (when selected)**
User-selectable via switches on the side of the unit. A line fault is indicated by an LED. The channel output relay is de-energised if an input line fault is detected.
Open-circuit alarm on if Iin < 50µA
Open-circuit alarm off if Iin > 250µA
Short-circuit alarm on if Rin < 100Ω
Short-circuit alarm off if Rin > 360Ω
*Note: Resistors must be fitted when using the LFD facility with a contact input*
*500Ω to 1kΩ in series with switch*
*20kΩ to 25kΩ in parallel with switch*

**Safe-area output**
Single pole relay with changeover contacts
*Note: reactive loads must be adequately suppressed*

**Relay characteristics**
Response time: 10ms maximum
Contact rating: 250V ac, 2A, cosØ >0.7
40V dc, 2A, resistive load

**LED indicators**
Green: power indication
Yellow: channel status, on when output is energised
Red: LFD indication, on when line fault is detected

**Maximum current consumption**
25mA at 24V

**Power dissipation within unit**
0.6W at 24V

**Safety description (each channel)**
$V_o$=10.5V $I_o$=14mA $P_o$=37mW $U_m$ = 253V rms or dc

Fig 3

# MTL5516C SWITCH/ PROXIMITY DETECTOR INTERFACE

two-channel, with line fault detection

The MTL5516C enables two safe-area loads to be controlled by a switch or proximity detector located in a hazardous-area. When selected, open or short circuit conditions in the field wiring are detected by the line-fault-detect (LFD) facility and also indicated on the top of the module. Phase reversal for each channel is selected by a switch on the side of the module and output is provided by changeover relay contacts.

## SPECIFICATION

***See also common specification***

**Number of channels**
Two

**Location of switches**
Zone 0, IIC, T6 hazardous area
Div. 1, Group A hazardous location

**Location of proximity detector**
Zone 0, IIC, T4–6 hazardous area if suitably certified
Div. 1, Group A hazardous location

**Hazardous-area inputs**
Inputs conforming to BS EN60947–5–6:2001 standards for proximity detectors (NAMUR)

**Voltage applied to sensor**
7 to 9V dc from 1kΩ ±10%

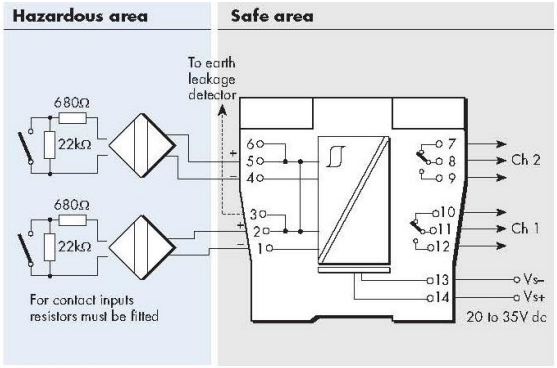
**Input/output characteristics**
Normal phase
Outputs closed if input > 2.1mA (< 2kΩ in input circuit)
Outputs open if input < 1.2mA (> 10kΩ in input circuit)
Hysteresis: 200μA (650Ω) nominal

**Line fault detection (LFD) (when selected)**
User-selectable via switches on the side of the unit. Line faults are indicated by an LED for each channel. The channel output relay is de-energised if an input line fault is detected.
Open-circuit alarm on if $I_{in}$ < 50μA
Open-circuit alarm off if $I_{in}$ > 250μA
Short-circuit alarm on if $R_{in}$ < 100Ω
Short-circuit alarm off if $R_{in}$ > 360Ω

*Note: Resistors must be fitted when using the LFD facility with a contact input*
*500Ω to 1kΩ in series with switch*
*20kΩ to 25kΩ in parallel with switch*

**Safe-area output**
Two single-pole relays with changeover contacts
*Note: reactive loads must be adequately suppressed*

**Relay characteristics**
Response time: 10ms maximum
Contact rating: 250V ac, 2A, cosØ >0.7
40V dc, 2A, resistive load




| Terminal | Function |
|---|---|
| 1 | Input –ve (Ch 1) |
| 2 | Input +ve (Ch 1) |
| 3 | To earth leakage detector* |
| 4 | Input –ve (Ch 2) |
| 5 | Input +ve (Ch 2) |
| 6 | To earth leakage detector* |
| 7 | Normally-closed contact (Ch 2) |
| 8 | Common (Ch 2) |
| 9 | Normally-open contact (Ch 2) |
| 10 | Normally-closed contact (Ch 1) |
| 11 | Common (Ch 1) |
| 12 | Normally-open contact (Ch 1) |
| 13 | Supply –ve |
| 14 | Supply +ve |

* Signal plug HAZ1-3 is required for access to this function

**LED indicators**
Green: power indication
Yellow: two: channel status, on when output is energised
Red: two: LFD indication, on when line fault detected

**Maximum current consumption**
35mA at 24V

**Power dissipation within unit**
0.84W at 24V

**Safety description (each channel)**
$V_o$=10.5V $I_o$=14mA $P_o$=37mW $U_m$ = 253V rms or dc

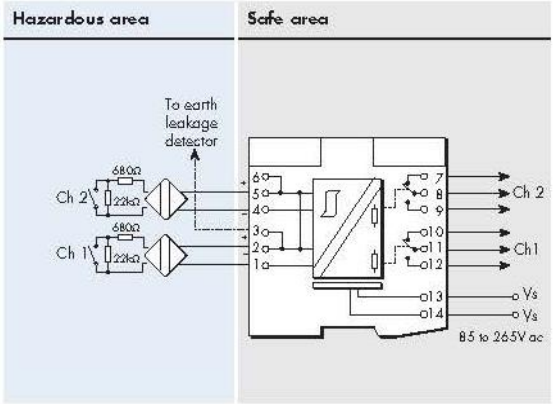
Fig 4

# MTL5018AC SWITCH/ PROXIMITY DETECTOR INTERFACE

two-channel, with line fault detection and phase reversal

CE

The MTL5018ac enables two safe-area loads to be controlled by two switches or proximity detectors located in a hazardous area. Two relay outputs are provided. Independent phase reversal control allows an alarm condition to be signalled for either state of the sensor. A selectable line fault detect (LFD) facility detects an open or short circuit in either field circuit.




## SPECIFICATION

***See also common specification***

**Number of channels**
Two

**Location of switches**
Zone 0, IIC, T6 hazardous area
Div. 1, Group A hazardous location

**Location of proximity detector**
Zone 0, IIC, T4–6 hazardous area if suitably certified
Div. 1, Group A hazardous location

**Safe-area output**
Two relays with changeover contacts

**Hazardous-area inputs**
Inputs conforming to NAMUR/DIN 19234 standards for proximity detectors

**Voltage applied to sensor**
7 to 9V from 1kΩ ±10%

**Input/output characteristics**
Normal (reverse) phase:
output energised (de-energised) if $I_{in}$ >2.1mA or $R_{in}$ <2kΩ
output de-energised (energised) if $I_{in}$ <1.2mA or $R_{in}$ >10kΩ
Hysteresis: 200µA, typical

**Line fault detection (LFD)**
User-selectable via switches on the top of the unit. Line faults are indicated by an LED for each channel. A detected line fault de-energises the relay.
Open-circuit alarm on if $I_{in}$<100µA
Open-circuit alarm off if $I_{in}$>250µA
Short-circuit alarm on if $R_{in}$<100Ω
Short-circuit alarm off if $R_{in}$>360Ω

*Note: Resistors must be fitted when using the LFD facility with a contact input*
*500Ω to 1kΩ in series with switch*
*20kΩ to 25kΩ in parallel with switch*

**Phase reversal**
Independent for each channel, user-selectable

**Relay type**
Single pole, changeover contacts
*Note: reactive loads must be adequately suppressed*

**Relay characteristics**
Response time: 10ms maximum
Contact rating: 250V ac, 2A, cosø >0.7
40V dc, 2A, resistive load

| Terminal | Function |
|---|---|
| 1 | Input –ve (Ch 1) |
| 2 | Input +ve (Ch 1) |
| 3 | Earth leakage detection |
| 4 | Input –ve (Ch 2) |
| 5 | Input +ve (Ch 2) |
| 6 | Earth leakage detection |
| 7 | Normally-closed contact (Ch 2) |
| 8 | Common (Ch 2) |
| 9 | Normally-open contact (Ch 2) |
| 10 | Normally-closed contact (Ch 1) |
| 11 | Common (Ch 1) |
| 12 | Normally-open contact (Ch 1) |
| 13 | AC Supply |
| 14 | AC Supply |

**LED indicators**
Green: power indication
Yellow: two: status of each channel (on when outputs are energised)
Red: two: LFD indication for each channel (on when line fault detected)

**Maximum power dissipation**
<2.5W

**Isolation**
250V ac or dc between power supply, hazardous-area circuits and relay outputs

**Safety description (each channel)**
10.5V, 800Ω, 14mA, $U_m$= 250V rms or dc

**Power Supply**
85 to 265V ac
45 to 65 Hz

Fig 5