Voltage, current, ground & insulation fault detection relays

Datasheet

Railway traction systems and power distribution protection relays

Description
Protection relays are often the last barrier to protect rolling stock and trackside equipment in the event of upstream protection system failure. They do not require auxiliary supply. Their mechanical life of 100 million operations exceed train life.

Protection relays are designed on an electromechanical technology providing high reliability with friction free mobile armature and maintenance free. It has a strong ability to withstand high overloads due to its magnetic materials. It is equipped as standard with weld-no-transfer contacts (1N/O+1N/C) for safety critical applications.

Application
Protection relays are used in voltage catenary detection to protect power equipment from overheating both on board or trackside:

- 3 phase AC voltage monitoring for low voltage or phase loss
- over current and under current detection
- battery charging current
- electromagnetic brake failure
- heat tracing cable surveillance (trackside)

Ground fault from chassis to ground for trackside or differential current relay is used to detect current leakage by comparing incoming and outgoing power traction circuit lines or current unbalance in the brake system.

Features
- AC and DC voltage, current, ground or insulation fault detection relay
- Minimum, maximum, differential tripping
- Up to 4 kV nominal permanent voltage
- High galvanic insulation up to 12 kV
- No auxiliary supply needed
- High reliability, maintenance free
- Strong ability to withstand high overloads
- Equipped with weld no transfer contacts for critical applications
- Operating temperature -50 °C...+80 °C

Benefits
- High MTBF, no auxiliary supply needed
- No maintenance for the train life
- High galvanic insulation between primary and secondary
- Extreme high speed response
- Customizable to specific customer applications

Railway compliancy
- EC 60077 - Electrical equipment for rolling stock in railway applications
- IEC 61373 - Shock & vibration - Railway application
- NF F 16-101/102 - Fire and smoke behaviour for rolling stock
- IEC 60068-2 - Environmental testing
- EN 50124-1 - Railway Application - Insulation coordination
Protection relays
Technical specifications

Current & voltage detection relays

Operation

<table>
<thead>
<tr>
<th>Minimum voltage relay</th>
<th>Maximum voltage relay</th>
<th>Minimum current relay (AC/DC)</th>
<th>Over current relays (AC/DC0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N.O. contact</td>
<td>N.O. contact</td>
<td>N.O. contact</td>
<td>N.O. contact</td>
</tr>
<tr>
<td>1</td>
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<td>0</td>
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</table>

During normal operation, if the voltage is present, these relays are in operating position and switch to rest state if the voltage becomes too low.

During normal operation, if the voltage is present, these relays are in non operating position and switch to operating state if the voltage becomes too high.

During normal operation, when the current is present, these relays are in operating position and switch to rest state if the current becomes too low.

During normal operation, when the current is present, these relays are in rest state and switch to operating position if the current becomes too high.

Application

- To check voltage presence to confirm operation power supply.
- To protect a circuit against overvoltage.
- To check the presence of a current in a circuit.
- To protect a circuit against overload.

Contact configuration
Protection relays
Technical specifications

Ground & insulation detection relays

Operation

<table>
<thead>
<tr>
<th>AC/DC current detection relay</th>
<th>Differential current relay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trackside &amp; onboard</td>
<td>Onboard application</td>
</tr>
<tr>
<td>N.O. contact</td>
<td>N.O. contact</td>
</tr>
</tbody>
</table>

- During normal operation, when the current is not present or at its nominal value, these relays are in rest state and switch to operating position if the current becomes too high.
- During normal operation, when the current is in balance, these relays are in rest state and switch to operating position if the differential current becomes too high.

Application

- To check the presence of a current in a ground circuit.
- To check if the current in 2 circuits is balanced.

Contact configuration

- 1 NO + 1 NC
- Δ
- ΔN O
- ΔN C
- I Δ
- I Δ
# Protection relays
## Technical specifications

### Contact data

| Contact rating at 10⁶ operations | At 230 VAC; 2 A resistive  
24 VDC...110 VDC: 0.3 A at L/R = 30 ms |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of contacts</td>
<td>1 N/C + 1 N/O (other configuration optional)</td>
</tr>
<tr>
<td>Contact resistance</td>
<td>&lt; 20 mΩ</td>
</tr>
<tr>
<td>Material</td>
<td>Ag paladium 70/30</td>
</tr>
<tr>
<td>Contact safety</td>
<td>Weld-no-transfer</td>
</tr>
</tbody>
</table>

### Electrical characteristics

| Dielectric strength | up to 12 kV dielectric  
2.5 kV dielectric |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>between primary and auxiliary circuit</td>
<td>≥ 5% of U_nom (-40 °C...+70 °C), ≥ 7% of I_nom (-50 °C...+85 °C)</td>
</tr>
<tr>
<td>between 3-phase and contacts + ground</td>
<td>≥ 10% of U_nom (-40 °C...+70 °C), ≥ 12% of I_nom (-50 °C...+85 °C)</td>
</tr>
<tr>
<td>Pick-up accuracy</td>
<td>NF 50163</td>
</tr>
<tr>
<td>Drop-out accuracy</td>
<td>&lt; 30 ms</td>
</tr>
<tr>
<td>Max. permanent voltage / max. peak voltage</td>
<td>EN 50163</td>
</tr>
<tr>
<td>Pick-up &amp; drop-out time delay</td>
<td>&lt; 30 ms</td>
</tr>
</tbody>
</table>

### Mechanical characteristics

<table>
<thead>
<tr>
<th>Mechanical life</th>
<th>10⁶ operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact life (mechanical)</td>
<td>100 million cycles</td>
</tr>
<tr>
<td>Weight</td>
<td>Varies per relay/housing</td>
</tr>
</tbody>
</table>

### Environmental characteristics

| Environment testing | NF EN 60068-2  
NF EN 61373  
-50 °C...+70 °C  
-50 °C...+85 °C  
IP40  
NF F 16-101, NF F16-102 |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Shock &amp; vibration</td>
<td></td>
</tr>
<tr>
<td>Operating temperature</td>
<td></td>
</tr>
<tr>
<td>Storage temperature</td>
<td></td>
</tr>
<tr>
<td>Protection degree</td>
<td></td>
</tr>
<tr>
<td>Fire &amp; smoke</td>
<td></td>
</tr>
</tbody>
</table>
Protection relays
Technical specifications

Application

On board schematic application examples showing locations of Mors Smitt protection relays in a self propelled car

Power distribution trackside schematic application examples showing location of Mors Smitt protection relays in a catenary distribution post
Protection relays
Technical specifications

Application examples

<table>
<thead>
<tr>
<th>Relay Type</th>
<th>Description</th>
<th>Features</th>
</tr>
</thead>
</table>
| **Voltage catenary detection relays** | This relay is used to detect the presence of catenary voltage for both rolling stock and trackside. | DC catenary network: These relays are used to:  
- detect DC catenary voltages presence in order to prevent overheating of traction equipment.  
- detect catenary voltage in railway network operating multi-catenary voltages  
On rolling stock it is installed on the primary circuit catenary and on trackside on the AC/DC rectifier output.  
AC catenary network: On rolling stock it is installed on the secondary of the potential transformer catenary. In operation on the metro of Singapore, it indicates the presence of the catenary voltage (overhead wires).  
The pick up and drop out are delayed to prevents intermittent tripping from momentary pantograph disconnection. The relay picks up at 750 VDC for a nominal voltage of 1500 VDC. |
| **3-phase voltage monitoring relay** | Installed on TGV POS the relay is used to monitor the 3-phase 400 V-50 Hz to protect the air compressors, air conditioning units and motor blowers from phase loss or phase unbalance that could cause a motor burn out. | Battery voltage monitoring relay: This relay is used on rolling stock to monitor load shedding of the battery. It is used to alert driver in case of low voltage output to maintain safety equipment powered and to detect minimum voltage for on board computer equipment.  
Installed on Shanghai subway, it signals low battery voltage by masking rapid falls in voltage. It picks up from 84 VDC for 100 VDC nominal. |
| **Current traction brake detection relay** | This relay is used on rolling stock to detect insufficient current in electromagnetic brake. This detection will allow switching to pneumatic brake in case of loss of magnetic brake. | Battery charging current monitoring relay: This relay is used on rolling stock to control the battery charging current and limit the load in case of over current that could damage the battery.  
Installed on Mexico subway it indicates the presence of the battery charging current. |

Protection relays
Technical specifications

Application examples

**Overload current detection relays**
This relay is used to detect overload or even shot circuit in the power equipment. In rolling stock it is installed on the primary transformer in series with a current transformer to detect an overload and trip the main breaker. It can also be mounted between the traction rectifier and inverter.

Installed on Caracas metro it detects a possible motor overload on DC power traction. Used on Korean TGV, it detects all short circuit seen from the secondary side of the power transformer.

On trackside it is mounted on the rectifier output to detect an overload level on the power cell. Some versions allow detection levels adjustment by an external supply and can be calibrated for currents up to 15000 ADC. They can also incorporate a hold memory fault and a time delay to avoid tripping during charging of capacitor filters.

**Traction ground fault differential current relay**
For rolling stock application, ground is not accessible therefore a differential current relay is used to detect leakage by comparing incoming and outgoing power traction circuit lines or current unbalance in the brake system. It is mounted between main rectifier and inverter and also between rectifier and auxiliary converter. It is installed on different metros, tramways and diesel locomotives.

**Substation ground fault current relay**
For trackside, this ground fault detection relay measures AC and DC current from chassis to ground.

Installed in the French railway SNCF substation, the relay is connected between the ground and the substation frame. If an insulation breakdown occurs the fault current flows through the relay which picks it up. The relay stays latched even if the fault disappears, a top button allows manual reset.

**Insulation fault relay**
For rolling stock, this insulation fault detection relay insulation breakdown in the the 3-Phase auxiliary circuit of the train. Installed in the French railway SNCF substation, the relay is connected between the ground and the substation frame. If an insulation breakdown occurs the fault current flows through the relay which picks it up. The relay stays latched even if the fault disappears.

**Return current monitoring relay**
For trackside, this polarized millivoltmetric relay detects voltage at the location of a shunt when the current is in reverse mode in case of failure of a power diode in substation cell. The relay is connected in parallel on a shunt operating in millivolts. It can incorporate a hold memory fault.

**Pilot line monitoring relay**
For trackside, this relay verifies the integrity of a telecom line and detect losses. It is directly supplied by telecom lines between stations. The relays are of very low consumption and can operate several in parallel over few km. They can be equipped with LED to support maintenance.
ST1491 DC catenary detection relay, 1500 VDC

The ST1491 detects the 1500 VDC line voltage onboard trains to protect against overheating of traction equipment.

Electrical characteristics

Primary circuit:
Nominal voltage 1500 VDC
Max. permanent voltage 1800 VDC
Pick-up 1100 VDC ± 5%
Drop-out 850 VDC ± 5%
Primary resistance 700 kΩ ± 5%

Contacts:
Contacts 1 N/C (MR-R) and 1 N/O (MT-T)
Nominal voltage 110 VDC (77 VDC mini / 137.5 VDC maxi)
Contact rating 137.5 VDC - 0.3 A - L/R = 20 ms
Electrical lifetime 10^6 operations
Contact resistance < 20 mΩ

Dielectric strength between:
Primary circuit & contacts + ground 8 kV - 50 Hz - 1 min
All terminals and ground 2 kV - 50 Hz - 1 min
Contacts 2 kV - 50 Hz - 1 min

Mechanical characteristics

Relay family EM NG HT
Weight 900 g
Storing temperature -35 °C...+85 °C
Operating temperature -35 °C...+70 °C
Mounting position Any attitude

Reference standard

Electrical equipment NF EN 60077
Shock and vibration NF EN 61373
Salt mist 96 h / NF EN 60068-2-11
Fire and smoke Cat. A1 / NF F 16101 - NF F 16102

Dimensions

Double faston 6.35 mm terminal
M6 terminals (tightening torque 5.8 Nm)
The ST1614 is a trackside DC voltage catenary relay for detection of 750 VDC line voltage for sufficient substation power supply.

**Electrical characteristics**

**Primary circuit:**
- Nominal voltage: 750 VDC
- Max. permanent voltage: 900 VDC
- Max. failure voltage: 1800 VDC - 100 ms
- Pick-up: 400 VDC mini / 450 VDC maxi
- Pick-up time (N/C contact): 30 ms maxi @ 600 VDC
- Drop-out: 100 VDC mini / 140 VDC maxi
- Relay consumption: 5 mA @ 750 VDC

**Contacts:**
- Contacts: 1 N/C (MR-R) and 1 N/O (MT-T)
- Nominal voltage: 72 VDC (50 VDC mini / 90 VDC maxi)
- Contact rating: 90 VDC - 0.3 A - L/R = 30 ms
- Electrical lifetime: 10^6 operations
- Contact resistance: < 20 mΩ
- Dielectric strength between:
  - Primary circuit & contacts + ground: 10 kV - 50 Hz - 1 min
  - All terminals and ground: 1.5 kV - 50 Hz - 1 min

**Mechanical characteristics**

**Relay family:** EM NG HT
- Weight: 830 g
- Storing temperature: -25 °C...+85 °C
- Operating temperature: -25 °C...+70 °C
- Mounting position: Any attitude

**Reference standard**

**Electrical equipment:** NF EN 60077
- Shock and vibration: NF EN 61373
- Salt mist: 96 h / NF EN 60068-2-11
- Fire and smoke: Cat. A1 / NF F 16101 - NF F 16102

**Dimensions**
The ST1532 is a 3-phase voltage relay for detection of 380 V presence onboard traincars.

### Electrical characteristics

**Primary circuit:**
- Nominal voltage: 380 Veff, 50 Hz
- Maximum voltage: 900 V peak, 20 µs
- Pick-up: 388 Veff mini / 412 Veff maxi, 50 Hz
- Drop-out: 363 Veff mini / 386 Veff maxi, 50 Hz
  - at phase loss (U=45- Veff maxi) at power off

**Contacts:**
- 1 N/C (MR-R) and 1 N/O (MT-T)
- Nominal voltage: 72 VDC (50 VDC mini / 90 VDC maxi)
- Contact rating: 90 VDC - 0.3 A - L/R = 30 ms
- Electrical lifetime: 10⁶ operations
- Contact resistance: < 20 mΩ

**Dielectric strength between:**
- Primary circuit & contacts + ground: 2.5 kV - 50 Hz - 1 min
- All terminals and ground: 1.5 kV - 50 Hz - 1 min
- Contacts: 1.5 kV - 50 Hz - 1 min

### Mechanical characteristics

**Relay family:** EM NG
- Weight: 630 g
- Storing temperature: -25 °C...+85 °C
- Operating temperature: -25 °C...+70 °C
- Mounting position: Any attitude

### Reference standard

- Electrical equipment: NF EN 60077
- Electromagnetic compatibility: NF EN 50121-3-2
- Shock and vibration: NF EN 61373
- Salt mist: 96 h / NF EN 60068-2-11
- Fire and smoke: Cat. A2 / NF F 16101 - NF F 16102

### Dimensions

Double faston 6.35 mm terminal
The ST1348N is a minimum current relay. It indicates the presence of the tramway traction current. The relay picks up at 100 A and can operate with a nominal traction current between 600 - 800 ADC.

**Electrical characteristics**

**Primary circuit:**
- Nominal voltage: 750 VDC (450 VDC mini / 900 VDC maxi)
- Max. permanent voltage: 6000 ADC - 15 ms / ± 37 kADC - 0.5 ms
- Pick-up: 100 ADC ± 10% (direct current flow direction)
- Drop-out: < 50 ADC
- Pick-up & drop-out time:
  - < 25 ms @ I = 1.1*le
  - < 20 ms @ I = 1.15*le
  - < 15 ms @ I ≥ 1.2*le

**Contacts:**
- 1 N/C (MR-R) and 1 N/O (MT-T)
- Nominal voltage: 72 VDC (50 VDC mini / 90 VDC maxi)
- Contact rating: 90 VDC - 0.3 A - L/R = 30 ms
- Electrical lifetime: 10⁶ operations
- Contact resistance: < 20 mΩ

**Dielectric strength between:**
- Primary circuit & contacts + ground: 3.9 kV - 50 Hz - 1 min
- All terminals and ground: 1.5 kV - 50 Hz - 1 min
- Contacts: 1.5 kV - 50 Hz - 1 min

**Mechanical characteristics**
- Relay family: EM NG HT
- Weight: < 800 g
- Storing temperature: -25 °C...+85 °C
- Operating temperature: -25 °C...+70 °C
- Mounting position: Any attitude

**Reference standard**
- Electrical equipment: NF EN 60077
- Shock and vibration: NF EN 61373
- Salt mist: 96 h / NF EN 60068-2-11
- Fire and smoke: Cat. A1 / NF F 16101 - NF F 16102

**Dimensions**

- Double faston 6.35 mm terminal
- 175 x 50 x 5 mm busbar with Ø 9 mm connection holes
Minimum current relay for heater

The ST1501 is a minimum current detection relay for onboard train heating.

**Electrical characteristics**

**Primary circuit:**
- Nominal voltage: 1500 VDC
- Maximum current: 20 ADC (22 ADC - 2 min)
- Pick-up: < 11 ADC min
- Pick-up time: < 30 ms @ I = 11 ADC
- Drop-out: At power off

**Contacts:**
- 1 N/C (MR-R) and 1 N/O (MT-T)
- Nominal voltage: 72 VDC (50 VDC min / 90 VDC max)
- Contact rating: 90 VDC - 0.3 ADC - L/R = 20 ms
- Electrical lifetime: 10⁶ operations

**Dielectric strength between:**
- Primary circuit & contact + ground: 10 kV - 50 Hz - 1 min
- Contact and ground: 2 kV - 50 Hz - 1 min
- Contacts: 2 kV - 50 Hz - 1 min

**Mechanical characteristics**

**Relay family:** EM NG HT
- Weight: 740 g
- Storing temperature: -25 °C...+85 °C
- Operating temperature: -25 °C...+70 °C
- Mounting position: Any attitude

**Reference standard**

- Electrical equipment: NFEN 60077
- Shock and vibration: NFEN 61373
- Salt mist: 96 h / NFEN 60068-2-11
- Fire and smoke: Cat. B / NF F 16101 - NF F 16102

**Dimensions**

- Double faston 6.35 mm terminal
- M6 terminals (tightening torque 5.8 Nm)
**PRA - Current detection relay**

**ST1600N**

Current presence detection relay

The ST1600N is a current measuring relay to detect the presence of current in a protection circuit hardcrowbar onboard.

**Electrical characteristics**

**Primary circuit:**
- Max. short circuit current: 9000 A - 6 ms (5 times per day)
- Pick-up: 30 ADC ± 10% (direct current flow direction)
- Drop-out: At power off (define hold time)

**Contacts:**
- 1 N/C (MR-R) and 1 N/O (MT-T)
- Nominal voltage: 72 VDC (50 VDC mini / 90 VDC maxi)
- Contact rating: 90 VDC - 0.1 ADC - L/R = 30 ms
- Electrical lifetime: 10^6 operations
- Contact resistance: < 20 mΩ
- Dielectric strength between:
  - Primary circuit & contacts + ground: 3 kV - 50 Hz - 1 min
  - Contacts and ground: 1.5 kV - 50 Hz - 1 min
  - Contacts: 1.5 kV - 50 Hz - 1 min

**Mechanical characteristics**

- Relay family: EMM NG
- Weight: 700 g
- Storing temperature: -25 °C...+85 °C
- Operating temperature: -25 °C...+70 °C
- Pollution degree: PD3
- Mounting position: Any attitude

**Reference standard**

- Electrical equipment: NF EN 60077
- Shock and vibration: NF EN 61373
- Salt mist: 96 h / NF EN 60068-2-11
- Fire and smoke: Cat B / NF F 16101 - NF F 16102

**Dimensions**

Double faston 6.35 mm terminal

150 x 30 x 5 mm busbar with Ø 11 mm connection holes
Primary overcurrent relay, Q-L (M)

The ST1728 is an overcurrent detection relay for primary winding of onboard main transformer.

Electrical characteristics

Primary circuit:
- Nominal current: 5 Aeff - 50 Hz / 5.3 Aeff - 16 Hz 2/3
- Maximum current: 40 Aeff - 200 msec
- Pick-up: 16.5 Apeak ± 10% - 50 Hz / 16 Hz 2/3
- Pick-up time delay: < 30 ms @ I ≥ 19.8 A peak
- Holding time: 30 ms mini / 50 ms maxi (see below)
- Drop-out: No default current

Contacts:
- 1 N/C (MR-R) and 2 N/O (MT1-T1 and MT2-T2)

Nominal voltage: 110 VDC (77 VDC mini / 137.5 VDC maxi)

Contact rating:
- 137.5 VDC - 0.5 ADC - L/R = 30 ms
- 10 mADC @ 110 VDC

Electrical lifetime: 10^5 operations

Dielectric strength between:
- Primary circuit & contact + ground: 1.5 kV - 50 Hz - 1 min
- Contact and ground: 1.5 kV - 50 Hz - 1 min
- Contacts: 1.5 kV - 50 Hz - 1 min

Mechanical characteristics

Relay family: EMM NG HT
- Weight: 800 g
- Storing temperature: -50 °C...+85 °C
- Operating temperature: -50 °C...+70 °C
- Mounting position: Any attitude

Reference standard

Electrical equipment: NF EN 60077
Shock and vibration: NF EN 61373
Salt mist: 96 h / NF EN 60068-2-11
Fire and smoke: Cat. B / NF F 16101 - NF F 16102

Dimensions

[Diagram of the ST1728 relay]

Double faston 6.35 mm terminal
M6 terminals (tightening torque 5.8 Nm)
The ST1617 is a trackside current measuring relay to detect the presence of current in a 3kV railway substation.

**Electrical characteristics**

**Primary circuit:**
- Nominal current: 600 ADC
- Maximum current: 3 kA - 100 ms
- Pick-up: 350 ADC ± 5%
- Drop-out: At power off

**Contacts:**
- Contacts: 1 N/C (MR-R) and 1 N/O (MT-T)
- Nominal voltage: 72 VDC (50 VDC mini / 90 VDC maxi)
- Contact rating: 0.2 ADC - 90 VDC - L/R = 30 ms
- Electrical lifetime: 10⁶ operations
- Contact resistance: < 20 mΩ
- Dielectric strength between:
  - Primary circuit & contacts + ground: 10 kV - 50 Hz - 1 min
  - Contacts and ground: 1.5 kV - 50 Hz - 1 min
  - Contacts: 1.5 kV - 50 Hz - 1 min

**Mechanical characteristics**

- Relay family: EMM HT
- Weight: tbd
- Storing temperature: -40 °C...+85 °C
- Operating temperature: -25 °C...+70 °C
- Mounting position: Any attitude

**Reference standard**

- Electrical equipment: NF EN 60077
- Shock and vibration: NF EN 61373
- Salt mist: 96 h / NF EN 60068-2-11
- Fire and smoke: Cat. B / NF F 16101 - NF F 16102

**Dimensions**
Differential current relay 80 ADC - 600 ADC

The ST1470 relay is an onboard differential current relay. The relay activates when the difference between the currents through the primary bus bars are higher than the preset setting.

**Electrical characteristics**

**Primary circuit:**
- Nominal voltage: 1500 VDC
- Permanent primary current: 600 ADC
- Maximum default current: 10 kADC - 200 msec
- Pick-up: 80 ADC ± 10%
- Pick-up time delay: < 30 ms @ 100 ADC
- Drop-out: > 0

**Contacts:**
- 1 N/C (MR-R) and 1 N/O (MT-T)
- Nominal voltage: 110 VDC (77 VDC min / 137.5 VDC max)
- Contact rating: 0.3 ADC - 110 VDC - L/R = 20 ms
- Electrical lifetime: 10⁶ operations
- Contact resistance: < 20 mΩ

**Dielectric strength between:**
- Busbars: 12 kV - 50 Hz - 1 min
- Busbars and contacts: 12 kV - 50 Hz - 1 min
- Contacts: 2 kV - 50 Hz - 1 min
- Contacts and ground: 2 kV - 50 Hz - 1 min

**Mechanical characteristics**

**Relay family:** EMM NG

**Weight:** < 2.5 kg

**Storing temperature:** -25 °C...+85 °C

**Operating temperature:** -25 °C...+70 °C

**Mounting position:** Any attitude

**Reference standard**

**Electrical equipment:** NF EN 60077

**Shock and vibration:** NF EN 61373

**Salt mist:** 96 h / NF EN 60068-2-11

**Fire and smoke:** Cat. B / NF F 16101 - NF F 16102
The ST1774 relay is an onboard insulation fault detection relay between the main circuit and chassis. The relay trips when an insulation fault appears between the + and - of primary circuit. The insulation fault is linked to an insulation resistance between the + or - and chassis. Depending the importance of the fault, the insulation resistance varies. The extreme case being a short circuit between primary circuit and chassis.

**Electrical characteristics**

- **Primary circuit:**
  - Nominal voltage: 750 VDC
  - Maximum voltage: 1000 VDC
  - Pick-up: 10 mA ± 10%
  - Drop-out: Absence of fault
  - Contacts: 1 N/C (R-MR) and 1 N/O (T-MT)
  - Nominal voltage: 110 VDC (77 VDC mini / 137.5 VDC maxi)
  - Contact rating: 0.3 A - 110 VDC - L/R = 30 ms
  - Electrical lifetime: 10^6 operations
  - Contact resistance: < 20 mΩ
  - Dielectric strength between:
    - Primary circuit & contacts + ground: 5.6 kV - 50 Hz - 1 min
    - Contacts and ground: 1.5 kV - 50 Hz - 1 min
    - Contacts: 1 kV - 50 Hz - 1 min

- **Mechanical characteristics**
  - Relay family: MS RELAIS SAS
  - Weight: 2.0 kg
  - Storing temperature: -40 °C ... +85 °C
  - Operating temperature: -25 °C ... +70 °C
  - Mounting position: Any attitude

- **Reference standard**
  - Electrical equipment: NF EN 60077
  - Shock and vibration: NF EN 61373
  - Salt mist: 96 h / NF EN 60068-2-11
  - Fire and smoke: Cat. A / NF F 16101 - NF F 16102

- **Dimensions**
  - Double faston 6.35 mm terminal
  - M4 terminal (lightning torque 2.2 Nm)
**ST1698 Ground fault relay ADC**

The ST1698 relay is a trackside ground fault relay. The relay holds after picking up. A push button is used to reset (return in N/C position). The same button allows testing of the relay operation.

**Electrical characteristics**

**Primary circuit:**
- Current in normal operation: 0 A
- Maximum current: 12500 ADC - 250 msec

**Pick-up**
- Levels according below chart label

**Drop-out**
- By pressing push button (REA)

**Label**
- 1 2 3 4 (advice on order)

**Pick-up ADC**
- 20 40 60 80 (level tolerance ± 10%)

**Contacts:**
- 1 N/C (MR-R) and 1 N/O (MT-T)

**Nominal voltage**
- 48 VDC

**Contact rating**
- 48 VDC - L/R = 40 ms - I < 1 A
- Electrical lifetime: 2.10^5 operations
- Contact resistance: < 20 mΩ

Note: the relay remains in closed position after pick-up (this current pick-up value varies according the label #) and falls in rest position after pushing button (RES). The button in position TEST allows contact testing.

**Dielectric strength between:**
- Primary circuit: 6.5 kV - 50 Hz - 1 min
- Contacts: 1.5 kV - 50 Hz - 1 min

**Mechanical characteristics**

**Relay family**
- EMM NG

**Weight**
- 800 g

**Storing temperature**
- -40 °C...+85 °C

**Operating temperature**
- -40 °C...+70 °C

**Mounting position**
- Any attitude

**Reference standard**
- Electrical equipment: NF EN 60077
- Shock and vibration: NF EN 61373
- Salt mist: 96 h / NF EN 60068-2-11
- Fire and smoke: Cat. A1 / NF F 16101 - NF F 16102
## Protection relays

### Reference list

<table>
<thead>
<tr>
<th>Relay type</th>
<th>Application</th>
<th>Project</th>
<th>Carbuilder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differential current relay</td>
<td>Onboard</td>
<td>Shanghai Pearl Line</td>
<td>Alstom</td>
</tr>
<tr>
<td>Insulation fault relay</td>
<td>Onboard</td>
<td>Insulation fault</td>
<td>Gemafer</td>
</tr>
<tr>
<td>Ground fault relay</td>
<td>Trackside</td>
<td>Substation</td>
<td>Alstom</td>
</tr>
<tr>
<td>DC catenary detection</td>
<td>Onboard</td>
<td>AGC InterCity train</td>
<td>Bombardier</td>
</tr>
<tr>
<td>DC catenary detection</td>
<td>Trackside</td>
<td>Metro Substation</td>
<td>RATP</td>
</tr>
<tr>
<td>3-phase 380 VAC detection</td>
<td>Onboard</td>
<td>TGV Duplex</td>
<td>Alstom</td>
</tr>
<tr>
<td>Traction current detection</td>
<td>Onboard</td>
<td>Citadis Tramway</td>
<td>Alstom</td>
</tr>
<tr>
<td>Trainheater monitoring</td>
<td>Onboard</td>
<td>Intercity train</td>
<td>SNCF</td>
</tr>
<tr>
<td>Maximum current relay</td>
<td>Onboard</td>
<td>Russian locs EP20</td>
<td>Alstom</td>
</tr>
<tr>
<td>Catenary minimum voltage</td>
<td>Onboard</td>
<td>KTX &amp; KTX II</td>
<td>Hyundai Rotem</td>
</tr>
<tr>
<td>Battery charging current</td>
<td>Onboard</td>
<td>Mexico subway</td>
<td>Alstom</td>
</tr>
<tr>
<td>Ground fault detection</td>
<td>Trackside</td>
<td>Substation</td>
<td>SNCF</td>
</tr>
<tr>
<td>Minimum voltage relay</td>
<td>Onboard</td>
<td>Chinese locs</td>
<td>Chinese railway</td>
</tr>
<tr>
<td>Secondary transformer current</td>
<td>Onboard</td>
<td>High speed train</td>
<td>Korean railway</td>
</tr>
<tr>
<td>Catenary voltage relays</td>
<td>Onboard</td>
<td>Singapore subway</td>
<td>Singapore subway</td>
</tr>
<tr>
<td>Overtraction current relay</td>
<td>Onboard</td>
<td>Caracas subway</td>
<td>Caracas subway</td>
</tr>
<tr>
<td>Ground fault detection relay</td>
<td>Onboard</td>
<td>SNCF locs</td>
<td>Siemens</td>
</tr>
</tbody>
</table>
Protection relays
Request form for quote - voltage protection relay

Customer name:_____________________________________________________________
Project name: ___________________________ Designation: __________________
Address: ___________________________________________________________________
Technical contact:____________________________________________________________
Tel direct:___________________________________________________________________
Fax: _______________________________________________________________________
Email:______________________________________________________________________
Customer specification #: ______________________ Others: ______________________
Applicable standards:________________________________________________________

Mors Smitt reference:
Requested by:________________________________________________________________
Request N°: __________________________________________________________________

Application type:
Track side:    On board:    
Minimum voltage relay:    Maximum voltage relay:    
Primary circuit:
Voltage:    DC    AC   f=________Hz
Nominal voltage: _________________(10 VDC...3000 VDC, 100 VAC...400 VAC)
Max permanent value: defined by application, other specify: _________________
Pick-up value: _________________ (5 V...4000 V)
Drop-out value: _________________ (0 or 40 to 85 % of pick-up value)
Time delay: < 30 ms, other specify: ____________________________________________
Connection: M4 terminals or Faston for battery voltage or 3-phase AC low voltage

Secondary circuit:
Contacts:  1 N/O + 1/N/C other specify:__________________________________________
Nominal voltage: 110 VDC other specify:__________________________________________
Contact rating: 0.3 A at L/R = 30 ms other specify:__________________________________
Connections: Double faston 6.35 mm
Other: ______________________________________________________________________

Dielectric strength:
Between primary circuit and auxiliary circuit + ground: 2.5 kV / 6 kV / 10 kV,
other specify: ______________________________________________________________

Environmental requirements:
Standard operating temperature: -50 °C...+70 °C, other specify:_____________________
Other: ______________________________________________________________________
Protection relays
Requestform for quote - current detection relay

Customer name:_____________________________________________________________
Project name: _______________________________ Designation: __________________
Address: ___________________________________________________________________
Technical contact:____________________________________________________________
Tel direct:___________________________________________________________________
Fax: _______________________________________________________________________
Email:______________________________________________________________________
Customer specification #: ______________________ Others: ______________________
Applicable standards: __________________________________________________________

Mors Smitt reference: Requested by: ______________________________________________
Request N°: _________________________________________________________________

Application type:
Track side: On board: ___ ___
Minimum current relay: Maximum current relay: ___ ___

Primary circuit:
Voltage: DC AC f=________Hz
Current: DC AC f=________Hz
Nominal voltage: (10 VDC...4000 VDC, 100 VAC...400 VAC)
Nominal current: (0...3500 A)
Max current: (0....5000 A)
Max non permanent current: (e.g 12500 ADC - 250 ms)

Pick-up value: (0.5 A...11000 A)
Drop-out value: (0 or 40 to 85 % of pick-up value or by reset)
Connection: defined by application: M6 terminals or busbar

Secondary circuit:
Contacts: 1 N/O + 1/N/C other specify: _________________________________
Nominal voltage: 110 VDC other specify: _________________________________
Contact rating: 0.3 A at L/R = 30 ms other specify: _________________________________
Connections: M4 terminals or Faston for battery voltage or 3-phase AC low voltage
Other: _________________________________

Dielectric strength:
Between primary circuit and auxiliary circuit + ground: 1.5 kV / 2.5 kV / 6 kV / 10 kV / 12 kV
other specify: _________________________________

Environmental requirements:
Standard operating temperature: -50 °C...+70 °C, other specify: _________________________________
Other: _________________________________
### Protection relays

**Req. for quote - gr. & insulation fault detection relay**

<table>
<thead>
<tr>
<th>Customer name:</th>
<th>Designation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project name:</td>
<td>Designation:</td>
</tr>
<tr>
<td>Address:</td>
<td></td>
</tr>
<tr>
<td>Technical contact:</td>
<td></td>
</tr>
<tr>
<td>Tel direct:</td>
<td></td>
</tr>
<tr>
<td>Fax:</td>
<td></td>
</tr>
<tr>
<td>Email:</td>
<td></td>
</tr>
<tr>
<td>Customer specification #:</td>
<td>Others:</td>
</tr>
<tr>
<td>Applicable standards:</td>
<td></td>
</tr>
</tbody>
</table>

**Mors Smitt reference:**

| Requested by: | |
| Request N°: | |

#### Application type:

- **Track side:**
- **On board:**

- **Ground fault detection relay:**
- **Insulation fault detection relay:**

#### Primary circuit:

- **Voltage:**
  - DC
  - AC \( f=\) Hz

- **Current:**
  - DC
  - AC \( f=\) Hz

- **Nominal voltage:** (10 VDC...4000 VDC, 100 VAC...400 VAC)
- **Nominal current:** (0...3500 A)
- **Max current:** (0...5000 A)
- **Max non permanent current:** (e.g. 12500 ADC - 250 ms)

- **Pick-up value:** (10 mA...150 A)
- **Drop-out value:** (0...25 ADC)
- **Connection:** defined by application: M6 terminals or busbar

#### Secondary circuit:

- **Contacts:** 1 N/O + 1 N/C
- **Nominal voltage:** 110 VDC
- **Contact rating:** 0.3 A at L/R = 30 ms
- **Connections:** M4 terminals or Faston for battery voltage or 3-phase AC low voltage
- **Other:**

#### Dielectric strength:

- Between primary circuit and auxiliary circuit + ground: \( 1.5 \text{ kV} / 2.5 \text{ kV} / 6 \text{ kV} / 10 \text{ kV} / 12 \text{ kV} \)
- Other specify:

#### Environmental requirements:

- **Standard operating temperature:** -50 °C...+70 °C
- **Other specify:**

- **Other:**