

### 1.4.3 What to do about the leakage current

#### ⚠ Caution



Mandatory  
action

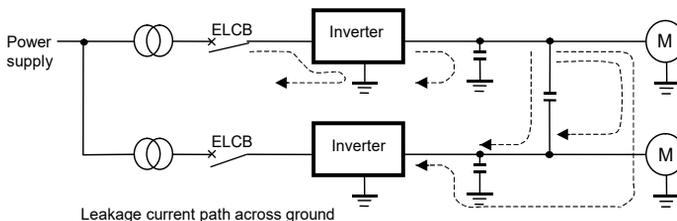
The leakage current through the input/output power cables of inverter and capacitance of motor can affect to peripheral devices.  
The value of leakage current is increased under the condition of the PWM carrier frequency and the length of the input/output power cables. In case the total cable length (total of length between an inverter and motors) is more than 100m, overcurrent trip can occur even the motor no-load current.  
Make enough space among each phase cable or install the filter (MSF) as countermeasure.

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#### (1) Influence of leakage current across ground

Leakage current may flow not just through the inverter system but also through ground wires to other systems. Leakage current will cause earth leakage breakers, leakage current relays, ground relays, fire alarms and sensors to operate improperly, and it will cause superimposed noise on the TV screen or display of incorrect current detection with the CT.

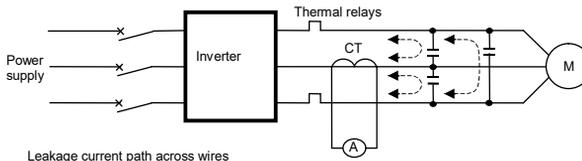
Refer to Inverter Application Manual "Leakage current"(E6581181) for detail.



#### Remedies:

1. If there is no radio-frequency interference or similar problem, detach the built-in noise filter capacitor, using the grounding capacitor switch.(Refer to 1.3.3 (2))
2. Reduce  $F_{333}$  (PWM carrier frequency).  
However, the motor magnetic noise is increased. (Refer to section 6.18.)
3. Use high frequency remedial products for earth leakage breakers

(2) Influence of leakage current across lines

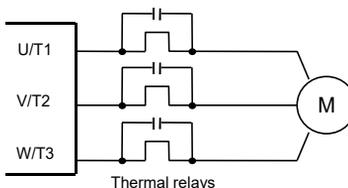


(1) Thermal relays

The high frequency component of current leaking into electrostatic capacity between inverter output wires will increase the effective current values and make externally connected thermal relays operate improperly. If the wires are more than 50 meters long, it will be easy for the external thermal relay to operate improperly with models having motors of low rated current (several A (ampere) or less), because the leakage current will increase in proportion to the motor rating.

Remedies:

1. Use the electronic thermal built into the inverter. (Refer to section 5.6)  
The setting of the electronic thermal is done using parameter  $\sigma L \eta, t H r$ .
2. Reduce  $F \exists \exists \exists$  (PWM carrier frequency). However, the motor magnetic noise is increased. (Refer to section 6.18)
3. This can be improved by installing  $0.1\mu$  to  $0.5\mu F - 1000V$  film capacitor to the input/output terminals of each phase in the thermal relay.



(2) CT and ammeter

If a CT and ammeter are connected externally to detect inverter output current, the leak current's high frequency component may destroy the ammeter. If the wires are more than 50 meters long, it will be easy for the high frequency component to pass through the externally connected CT and be superimposed on and burn the ammeter with models having motors of low rated current (several A (ampere) or less), especially the 500V class low capacity (4.0kW or less) models, because the leakage current will increase in proportion to the motor's rated current.

**Remedies:**

1. Use a meter output terminal in the inverter control circuit.  
The load current can be output on the meter output terminal (FM). If the meter is connected, use an ammeter of 1mAdc full scale or a voltmeter of 10Vdc full scale.  
0-20mAdc (4-20mAdc) can be also output. (Refer to section 5.1)
2. Set  $F\overline{3}\overline{0}\overline{0}$  (PWM carrier frequency) to 4kHz or less.  
However, the motor magnetic noise is increased. (Refer to section 6.18)
3. Use the monitor functions built into the inverter.  
Use the monitor functions on the panel built into the inverter to check current values. (Refer to section 8.2.1)

**(3) Influence and remedy of the leakage current at long-distance cable**

 <b>Caution</b>	
 Mandatory action	As a remedy, set $F\overline{3}\overline{0}\overline{0}$ (PWM carrier frequency) to 2kHz or less, when using an AC reactor (PFL series) to the output side of the inverter. This can also cause serious accidents through overheating and fire.

Make the cable length between the inverter and the motor 100 m or less, and shorten as much as possible.

When connecting two or more sets of motors, the cable length is the total cable length.

The charging current of the electrostatic capacitance between cables increases, as the cable length becomes long. Especially for low capacity (4.0kW or less) models, an over-current trip can become easy to occur.

To avoid the over-current trip, install the filter (MSF series) or the AC reactor (PFL series) to the inverter output side, or reduce the electrostatic capacitance with separating between cables, etc.

**1.4.4 Installation****■ Installation environment**

This inverter is an electronic control instrument. Take full consideration to installing it in the proper operating environment.

 <b>Warning</b>	
 Prohibited	<ul style="list-style-type: none"> <li>• Do not place any inflammable substances near the inverter. If an accident occurs in which flame is emitted, this could lead to fire.</li> <li>• Do not install in any location where the inverter could come into contact with water or other fluids. This can result in electric shock or fire.</li> </ul>