

■ ELCB should always be included in the following types of electrical installations

1. Where there is danger of people coming in contact with live conductors.
2. Where line voltage to ground exceeds 150V AC.
3. Inside buildings in which are stored inflammable or explosive materials.
4. Where heating elements are embedded in concrete.
5. Where heating panels or pipes, or portable heaters are installed.
6. Where heating elements are installed in the ground or in water or mud.
7. In underwater lighting system for swimming pool use.
8. Where portable electrical equipment and tools are used.
9. Where electrical equipment is used in dangerous locations, such as in water, wet place, on metal platforms, etc.
10. Where emergency or temporary wiring is installed, such as flood-lighting, temporary traffic signals or signs, etc.

■ Check points for selecting ELCB

1. Sensitivity current
2. Earth fault current breaking capacity
3. Short-circuit breaking capacity
4. Operating time
5. Selective protective coordination
6. Rated voltage and frequency
7. Rated current
8. Detecting device

■ Selection of sensitivity current

- Appropriate sensitivity current should be selected after considering the application purpose.

Select ELCB with a sensitivity of less than 30mA where risk of human life is present and between 200mA and 500mA for protection against fire due to electrical leakage.

- Protection system

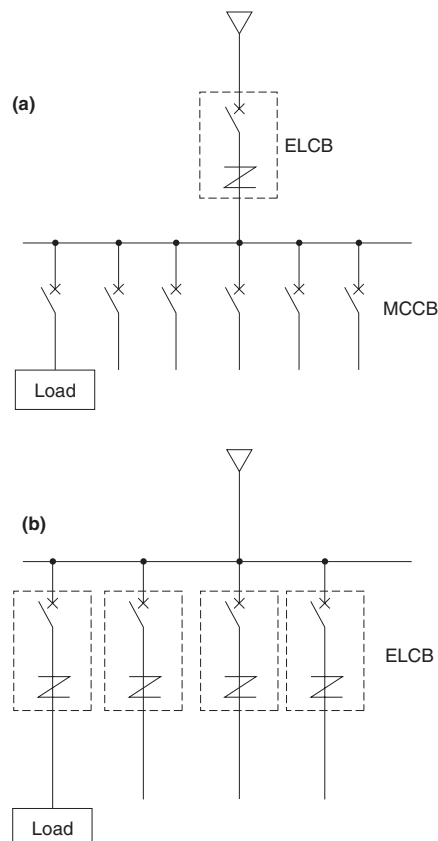
ELCB are generally arranged in one of the following ways.

(a) In this case a wide range of protection can be achieved economically using a single ELCB unit. However, if an earth fault occurs in only one branch of the circuit the main ELCB will trip and all feeders will stop. It will take time to isolate and repair the trouble.

Also, in any circuit there will be a minute

earth leakage. The more complicated the electrical wiring system the greater the accumulated effect of leakage current. Consequently, if a too sensitive ELCB is selected there is the possibility of mistripping because of this effect. Generally, taking the case of a 30mA ELCB, constantly leaking current, in some cases, would trip the breaker in the circuit of motor load over 50A or in the circuit of lamp load over 100A. However the 30mA ELCB will normally be suitable for home or small shop use.

(b) In this system an ELCB is provided to each branch feeder. This system will cost more because of the greater number of ELCB's but since only the circuit where the earth fault occurs trips the other feeders will not be affected by the outage. This system is to be preferred where there is danger to life from electric shock using high sensitivity current type ELCB.



■ Breaking capacity and short circuit protection

● Earth fault current breaking capacity

ELCB detects earth fault current and breaks the circuit. Select an ELCB which has an adequate breaking capacity as well as the appropriate earth fault current expected to occur in the circuit. The earth fault current values are determined according to the circuit voltage (Voltage to ground) and resistance. In some cases a massive earth fault current, which could have a value as much as the short circuit current, could flow.

● Short-circuit breaking capacity

Besides earth fault current and overcurrent the short-circuit current flows into the ELCB. Thus it is necessary to consider its magnitude. Generally the breaking capacity of an ELCB tends to be less than a corresponding MCCB. In case the short-circuit current is too big for the ELCB to handle it is necessary to install back-up protection using MCCB, fuse or similar devices.

To determine short-circuit currents please refer to FUJI with details of your application.

● SG and EG series

This series provides protection in three ways, against earth fault current, overcurrent and short-circuit current.

Earth Leakage Circuit Breakers

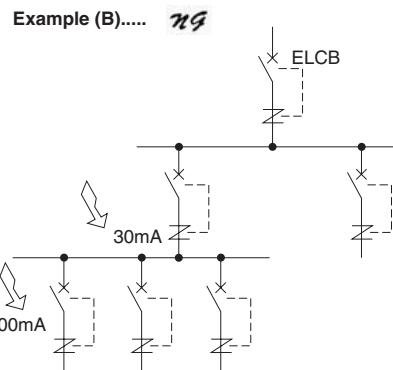
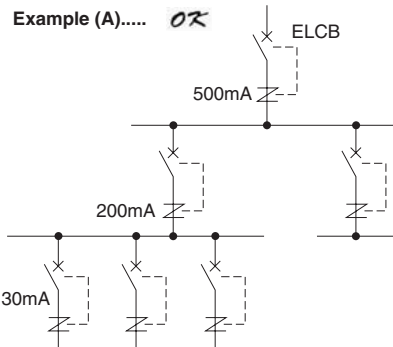
Application guide

■ ELCB operating time

The safe limit of current time that a human being can withstand is 30mA sec. Thus an ELCB for shock protection must satisfy operating time less than 30mA sec/total current through body (mA). So, assuming that the resistance of a human body is 500Ω and the voltage to ground 200V the body current will be $\frac{200V}{500\Omega} = 400mA$. Hence the ELCB must operate within $\frac{30mA \cdot s}{400mA} = 0.075 s$. FUJI ELCB's meet this requirement and so ensure complete and certain safety in operation.

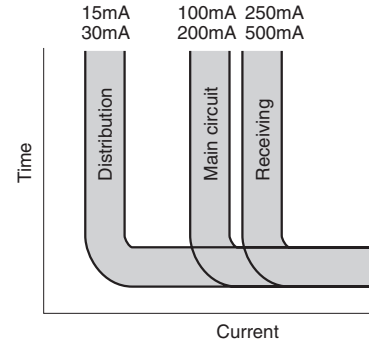
■ Selective earth-fault current breaking coordination

Where several ELCB's are provided between the power source and branch load, consideration must be given to the appropriate selection of operating time and sensitivity current. In case the sensitivity current of the branch circuit ELCB is higher than that of the main circuit ELCB, mistripping may occur because selective protective coordination is lost as is seen in example (B). Therefore the arrangement given in example (A) could be employed. That is, the less sensitive ELCB should be positioned nearest to the power source.

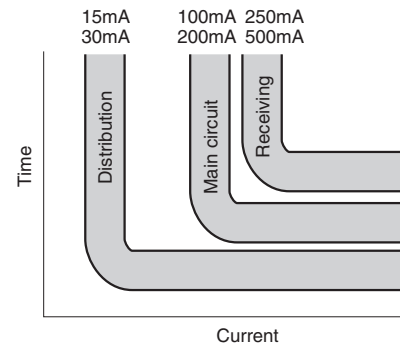


However, using this method perfect earth fault protection cannot be expected. This is because even if the ELCB's are installed according to their sensitivities, i.e., 500mA, 200mA, 30mA, the operating times are the same. Consequently, if the earth fault should occur in branch load the main circuit ELCB might trip. Thus the nearer an ELCB is positioned to the power source the slower its operating time should be. In order to meet this requirement FUJI can supply earth leakage protective relays provided with a time delay function. Since its operating time is adjustable between 0.2 and 2 seconds it facilitates the selection protective coordination of systems of all kinds. These protective relays are generally installed in main circuits in combination with MCCB.

Instantaneous type operating characteristic



Time delay type operating characteristic



■ Rated voltage

When selecting solid-state amplifier type ELCB's make sure that a correct rated voltage is chosen. This is not necessary in the case of the permanent magnet ELCB, since in this case no outside control source is required.

■ Rated current

FUJI ELCB's are calibrated for ambient temperature of 40°C. Overheating may be expected if ELCB's are used at their maximum rated current at ambient temperatures exceeding 40°C. Select a rated current with a suitable allowance. The load should be around 80% of the rated current.