## Presentation


*LR97 D*


*LT47*

LR97 D and LT47 electronic over current relays have been developed to satisfy machine protection requirements.
These relays have definite time characteristics: current threshold and time based function.
They are particularly recommended for providing mechanical protection on machines with high resistive torque, high inertia and with strong probability of jamming under steady state conditions.
They can be used for motor protection in the case of long starting times or frequent starting.
The LR97 D relay also incorporates two fixed time protection functions, one of 0.5 seconds against locked rotor and one of 3 seconds against phase failure.
LR97 D and LT47 can be used to provide mechanical shock protection. In this case, setting the O-Time knob to minimum will ensure tripping in 0.3 seconds.

### Applications

LR97 D and LT47 relays are particularly suitable for the following machines:
- ■ Monitoring function for excessively long starting time on machines with a risk of difficult starting:
- □ Machines with high resistive torque, high inertia machines.
- ■ Monitoring of machines during steady state operation: overtorque detection function
- □ Machines with strong risk of jamming, machines with torque build-up over time,
- □ Mechanical failure monitoring,
- □ Faster detection of malfunctioning on machines where the motor is oversized in relation to its thermal protection $I^2t$.
- ■ Motor protection for specific applications:
- □ Machines with long starting times,
- □ Machines with high on-load factor: more than 30 to 50 starts/hour,
- □ Machine with fluctuating load from a steady state, where the thermal image of a thermal overload relay (thermal memory) is unsuitable in relation to actual overheating of the motor.

**Examples of machines:**
- □ Conveyors, crushers and mixers,
- □ Fans, pumps and compressors,
- □ Centrifuges and spin-dryers,
- □ Presses, shearing machines, saws, broaching machines, sanders and lifting hoists.

### Operation

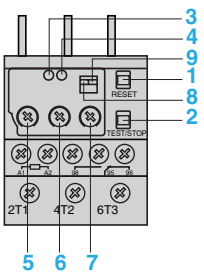
Because of their two separate time settings, LR97 D and LT47 relays can be combined with the motor-starter function:
D-Time: starting time, O-Time: trip time during steady state.
The D-Time function is only available during the motor starting phase. During this phase the overload detection function is inhibited in order to allow starting. Under steady state conditions, when the motor current is greater than the setting current due to an overload or single-phasing, the red LED lights up and the internal relay switches its contact after a time preset by the O-Time knob.
The red LED stays on, indicating that the relay has tripped.

The relays are simple to set, in 5 easy steps:
- Adjust the 3 knobs to maximum (Load, D-Time and O-Time),
- Adjust the D-Time knob to the value corresponding to the motor starting time.
- When the motor reaches steady state, adjust the Load knob (turn the knob counter-clockwise until the red LED starts to flicker).
- Slowly turn the Load knob clockwise until the LED goes out.
- Set the required tripping time, using the O-Time knob.

## Description

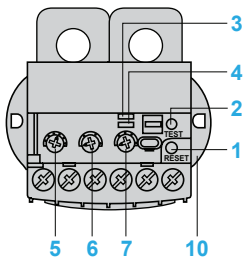
### Description

**LR97 D●●●●●**




1 RESET knob
2 TEST/STOP knob
3 Ready/Run Indicator
4 Relay tripped indicator
5 Current setting
6 Adjustment of starting time

**LT47 ●●●●●**




7 Adjustment of tripping time
8 Manual/Auto adjustment
9 Single-phase/3-phase adjustment
10 Retractable fixing lugs

### Status signalling

**LR97 D●●●●●**

To assist fast diagnostics, two LEDs (one green and one red) allow signalling of the operating status:

| Status | | | LED signal | |
|---|---|---|---|---|
| | | | Green LED | Red LED |
| Voltage | | | On | Off |
| Starting | | | | |
| Steady state | | | On | Off |
| Overload | | | On | |
| Trip | Over-current | | Off | On |
| | Rotor locked | | Off | |
| | Phase failure | L1 | Off | |
| | | L2 | Off | |
| | | L3 | Off | |

**LT47 ●●●●●**

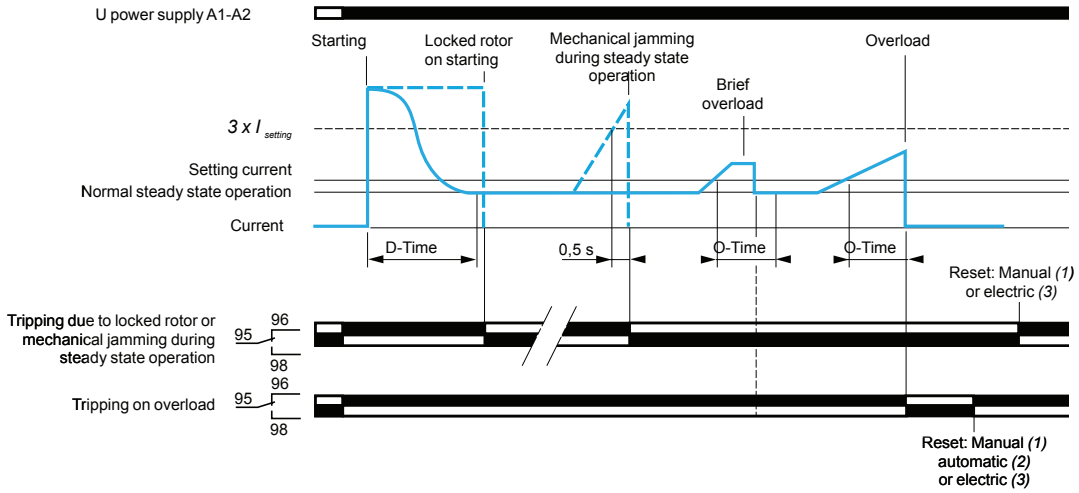
| Condition | LED signal | |
|---|---|---|
| | Green LED | Red LED |
| Voltage | On | Off |
| Starting | | |
| Steady state | On | Off |
| Overload | On | |
| Trip | Off | On |

Curves : pages 6/55 and 6/56
Characteristics : pages 6/56 and 6/57
References : page 6/58
Dimensions, mounting : page 6/59
Schemes : page 6/59

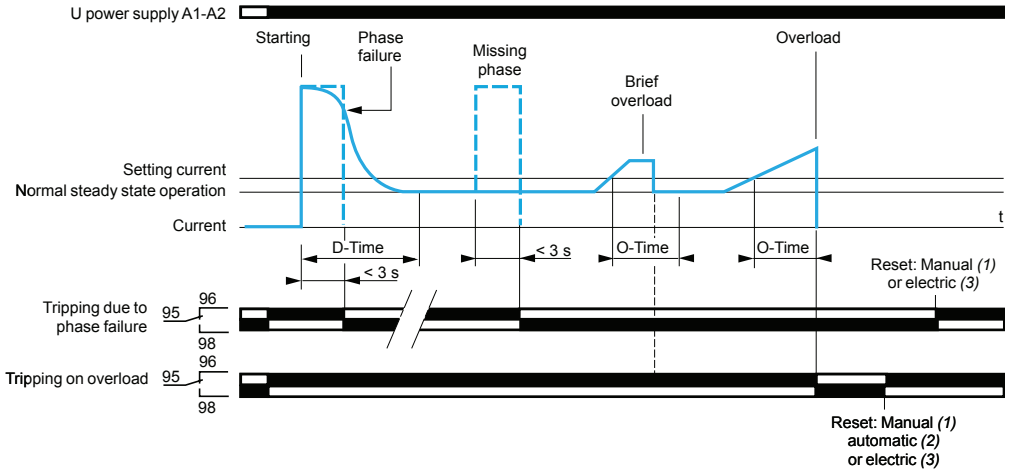
## Curves

### LR97 D

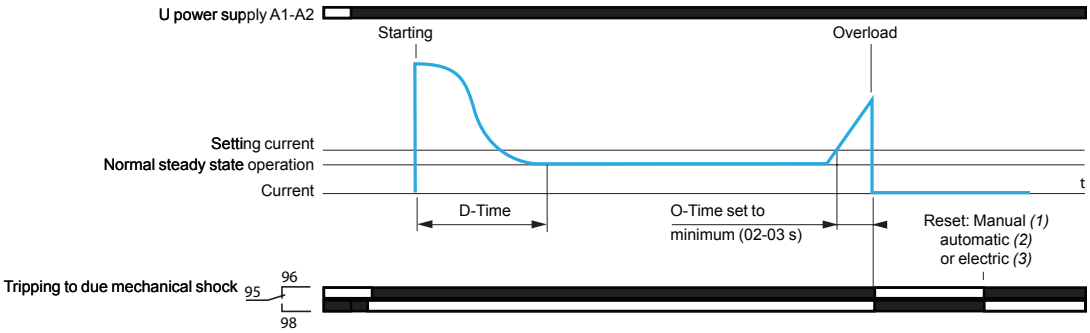
**Overload protection**
**Protection against locked rotor and mechanical jamming under steady state conditions**




**Overload protection**
**Protection against phase failure during starting and during steady state operation**




**Mechanical shock protection**

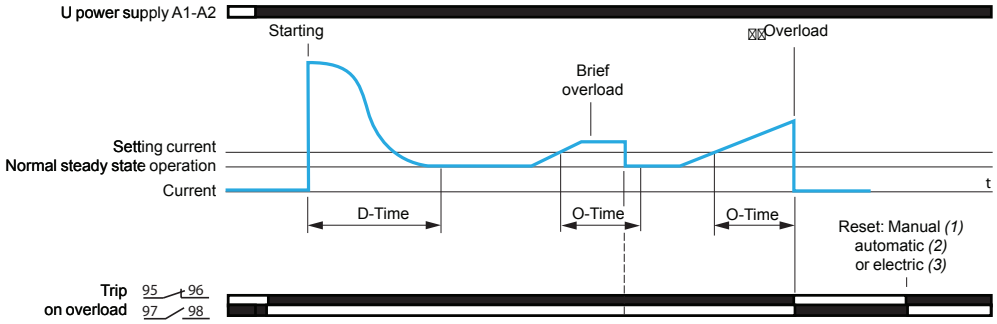



*(1) By Reset button.*
*(2) Fixed time of 120 s. Selectable by dip switch. Function not available in the event of tripping due to locked rotor/mechanical jamming (I> 3 x I setting) or phase failure.*
*(3) By brief interruption of power supply, minimum 0.1 s.*

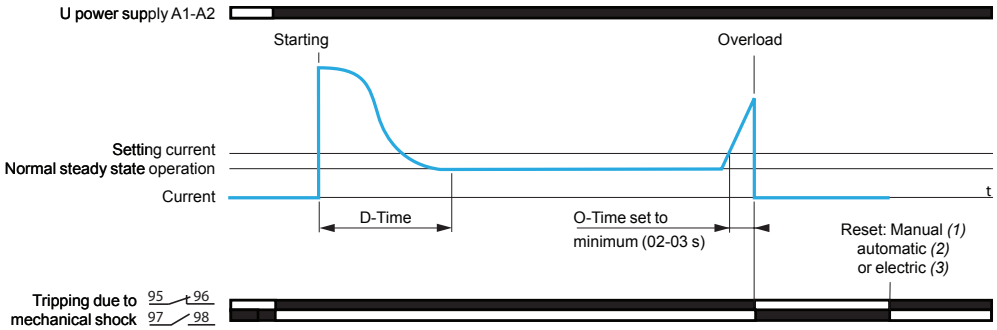
## Curves (continued)

### LT47

### Overload protection




### Mechanical shock protection




*(1) By Reset button.*
*(2) Only available on version with automatic reset (LT47 ●●●●A). Time adjustable from 1 to 120 s with the R-Time knob.*
*(3) By brief interruption of power supply, minimum 0.1 s.*

6

## Characteristics

### Environment

| Relay type | | | LR97 D●●●●● | LT47 ●●●●● |
|---|---|---|---|---|
| **Conforming to standards** | | | IEC 60255-6, IEC 60947 | IEC 60255-6, IEC 60947 |
| **Product certifications** | | | UL, CSA | UL, CSA |
| **Degree of protection** | Conforming to IEC 60529 and VDE 0106 | | IP 20 (front face) | IP 20 (front face) |
| **Protective treatment** | Conforming to IEC 60068 | | "TH" | "TH" |
| **Ambient air temperature around the device** | Storage | **°C** | - 30…+ 80 | - 30…+ 80 |
| | Normal operation without derating (IEC 60947-4-1) | **°C** | - 25…+ 60 | - 25…+ 60 |
| **Maximum operating altitude** | | **m** | 2000 | 2000 |
| **Operating positions without derating** | In relation to normal vertical mounting plane | | Any position | Any position |
| **Shock resistance** | Permissible acceleration conforming to IEC 60068-2-7 | | 15 gn - 11 ms | 15 gn - 11 ms |
| **Vibration resistance** | Permissible acceleration conforming to IEC 60068-2-6 | | 4 gn | 4 gn |
| **Dielectric strength at 50 Hz** | Conforming to IEC 60255-5 | **kV** | 2 | 2 |
| **Surge withstand** | Conforming to IEC 61000-4-5 | **kV** | 6 | 6 |
| **Resistance to electrostatic discharge** | In open air | **kV** | 8 (level 3) | 8 (level 3) |
| | In direct mode | **kV** | 6 (level 3) | 6 (level 3) |
| **Immunity to radiated radio-frequency disturbance** | | **V/m** | 10 (level 3) | 10 (level 3) |
| **Immunity to fast transient currents** | | **kV** | 2 | 2 |
| **Conducted emissions** | Conforming to EN 55011 | | Class A | Class A |
| **Conducted HF disturbance** | Conforming to EN 61000-4-6 | **V** | 10 | 10 |

Presentation, description : page 6/54
References : page 6/58
Dimensions, mounting : page 6/59
Schemes : page 6/59

## Characteristics

### Auxiliary contact characteristics

| Relay type | | | | LR97 D●●●●● | | | | LT47 ●●●●● | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Contact type** | | | | 1 NO/NC | | | | 1 N/O + 1N/C | | | |
| **Conventional thermal current** | | | **A** | 3 | | | | 3 | | | |
| **Maximum hold consumption** of controlled contactor coils (occasional operating cycles of contact 95-96) | Conforming to IEC 60947 | | **V** | ∼ 24 | ∼ 48 | ∼ 110 | ∼ 220 | ∼ 24 | ∼ 48 | ∼ 110 | ∼ 220 |
| | | | **VA** | 70 | 140 | 360 | 360 | 70 | 140 | 360 | 360 |
| | | | **V** | ⎓ 24 | ⎓ 48 | ⎓ 110 | ⎓ 220 | ⎓ 24 | ⎓ 48 | ⎓ 110 | ⎓ 220 |
| | | | **W** | 55 | 55 | 28 | 28 | 55 | 55 | 28 | 28 |
| **Short-circuit protection** | By gG, BS fuses. Maximum rating or **GB2** circuit-breaker | | **A** | 3 | | | | 3 | | | |
| **Connection by cable or lug-clamps** | | | | | | | | | | | |
| **Flexible cable without cable end** | 1 or 2 conductors | Min. | **mm²** | 1 x 0.75 | | | | 1 x 1 | | | |
| | | Max. | **mm²** | 2 x 2.5 | | | | 2 x 2.5 | | | |
| **Flexible cable with cable end** | 1 or 2 conductors | Min. | **mm²** | 1 x 0.34 | | | | 1 x 1 | | | |
| | | Max. | **mm²** | 1 x 1.5 + 1 x 2.5 | | | | 2 x 2.5 | | | |
| **External Ø of lugs** | | | **mm** | 7 | | | | 7 | | | |
| **Ø of screw** | | | **mm** | M3 | | | | M3.5 | | | |
| **Tightening torque** | | | **N.m** | 0.6…1.2 | | | | 0.8...1.7 | | | |

### Electrical characteristics of power circuit

| Relay type | | | | LR97 D015●● to LR97 D25●● | LR97 D38●● | LT47 ●●●●● |
|---|---|---|---|---|---|---|
| **Setting range** | Depending on model | | **A** | 0.3…38 | | 0.5…60 |
| **Tripping class** | | | | Adjustable | | Adjustable |
| **Rated insulation voltage (Ui)** | Conforming to IEC 60947-4-1 | | **V** | 690 | | 690 |
| | Conforming to UL, CSA | | **V** | 600 | | 600 |
| **Rated impulse withstand voltage (Uimp)** | | | **kV** | 6 | | 6 |
| **Frequency limits** | Of the operating current | | **Hz** | 50…60 | | 50…60 |
| **Connection by cable or lug-clamps** | | | | | | |
| **Flexible cable without cable end** | 1 conductor | Min. | **mm²** | 1.5 | 2.5 | – |
| | | Max. | | 10 | 10 | – |
| **Flexible cable with cable end** | 1 conductor | Min. | **mm²** | 1 | 1 | – |
| | | Max. | | 4 | 6 | – |
| **External Ø of lugs** | | | **mm** | 10 | 12 | – |
| **Ø of screw** | | | **mm** | M4 | M4 | – |
| **Tightening torque** | | | **N.m** | 2 | 2 | – |

### Operating characteristics

| Relay type | | | | LR97 D●●●●● | | LT47 ●●●●S | | LT47 ●●●●A |
|---|---|---|---|---|---|---|---|---|
| **Adjustment** | Current | | **A** | "Load" knob | | "Load" knob | | "Load" knob |
| | Time | D-time knob | **s** | 0.5…30 | | 0.5…30 | | – |
| | | O-time knob | **s** | 0.2/0.3…10 | | 0.2/0.3…10 | | 0.2/0.3…30 |
| | | R-time knob | **s** | – | | – | | 1…120 |
| **Reset** | Manual | | | Reset button | | Reset button | | Reset button |
| | Automatic | | | 120 s fixed | | – | | R-time knob: 1-120 s |
| | Electrical | | | By interruption of power supply (minimum 0.1 s) | | By interruption of power supply (minimum 0.1 s) | | By interruption of power supply (minimum 0.1 s) |
| **Protection functions** | | | | **On starting** | **Steady state** | **On starting** | **Steady state** | – |
| **Overload $I_{max} > I_{setting}$** | Tripping | | | Inhibited during D-time | After O-time | Inhibited during D-time | After O-time | After O-time |
| **Locked rotor, mechanical jamming $I > 3 \times I_{setting}$** | Tripping | | | After D-time | < 0.5 s | Inhibited during D-time | After O-time | After O-time |
| **Sensitivity to phase failure** | Tripping | | | < 3 s | < 3 s | Inhibited during D-time | After O-time | After O-time |
| **Status and fault signalling** (see table page 6/54) | | | | 2 LEDs | | 2 LEDs | | 2 LEDs |
| **TEST/STOP function** | Test | | | No load | | No load | | No load |
| | Stop | | | Under load | | Under load | | Under load |
| **Sealing** | | | | Yes | | Yes | | Yes |

# TeSys protection components
## Electronic over current relays

510429

*LR97 D07●●*

## LR97 D electronic over current relays

| Relay setting range | Usable range *(1)* | For use with contactor *(2)* | Relay supply voltage | Reference *(3)* | Weight |
|---|---|---|---|---|---|
| A | A | | | | kg |
| **0.3…1.5** | **0.3…1.3** | LC1 D09…D38 | ∼ 200…240 V | **LR97 D015M7** | 0.172 |
| | | | ∼ 100…120 V | **LR97 D015F7** | 0.172 |
| | | | ⎓/∼ 24 V | **LR97 D015B** | 0.172 |
| | | | ⎓/∼ 48 V | **LR97 D015E** | 0.172 |
| **1.2…7** | **1.2…6** | LC1 D09…D38 | ∼ 200…240 V | **LR97 D07M7** | 0.172 |
| | | | ∼ 100…120 V | **LR97 D07F7** | 0.172 |
| | | | ⎓/∼ 24 V | **LR97 D07B** | 0.172 |
| | | | ⎓/∼ 48 V | **LR97 D07E** | 0.172 |
| **5…25** | **5…21** | LC1 D09…D38 | ∼ 200…240 V | **LR97 D25M7** | 0.172 |
| | | | ∼ 100…120 V | **LR97 D25F7** | 0.172 |
| | | | ⎓/∼ 24 V | **LR97 D25B** | 0.172 |
| | | | ⎓/∼ 48 V | **LR97 D25E** | 0.172 |
| **20…38** | **20…34** | LC1 D25…D38 | ∼ 200…240 V | **LR97 D38M7** | 0.172 |
| | | | ∼ 100…120 V | **LR97 D38F7** | 0.172 |
| | | | ⎓/∼ 24 V | **LR97 D38B** | 0.172 |
| | | | ⎓/∼ 48 V | **LR97 D38E** | 0.172 |

510430

*LT47 30●●●*

## LT47 electronic over current relays

| Relay setting range | Usable range *(1)* | Relay supply voltage | Reference | Weight |
|---|---|---|---|---|
| A | A | | | kg |
| **LT47 relay with manual/electric reset** | | | | |
| **0.5…6** | **0.5…5** | ∼ 200…240 V | **LT47 06M7S** | 0.192 |
| | | ∼ 100…120 V | **LT47 06F7S** | 0.192 |
| | | ⎓/∼ 24 V | **LT47 06BS** | 0.192 |
| | | ⎓/∼ 48 V | **LT47 06ES** | 0.192 |
| **3…30** | **3…25** | ∼ 200…240 V | **LT47 30M7S** | 0.192 |
| | | ∼ 100…120 V | **LT47 30F7S** | 0.192 |
| | | ⎓/∼ 24 V | **LT47 30BS** | 0.192 |
| | | ⎓/∼ 48 V | **LT47 30ES** | 0.192 |
| **5…60** | **5…50** | ∼ 200…240 V | **LT47 60M7S** | 0.192 |
| | | ∼ 100…120 V | **LT47 60F7S** | 0.192 |
| | | ⎓/∼ 24 V | **LT47 60BS** | 0.192 |
| | | ⎓/∼ 48 V | **LT47 60ES** | 0.192 |
| **LT47 relay with automatic reset** | | | | |
| **0.5…6** | **0.5…5** | ∼ 200…240 V | **LT47 06M7A** | 0,192 |
| | | ∼ 100…120 V | **LT47 06F7A** | 0.192 |
| | | ⎓/∼ 24 V | **LT47 06BA** | 0.192 |
| | | ⎓/∼ 48 V | **LT47 06EA** | 0.192 |
| **3…30** | **3…25** | ∼ 200…240 V | **LT47 30M7A** | 0.192 |
| | | ∼ 100…120 V | **LT47 30F7A** | 0.192 |
| | | ⎓/∼ 24 V | **LT47 30BA** | 0.192 |
| | | ⎓/∼ 48 V | **LT47 30EA** | 0.192 |
| **5…60** | **5…50** | ∼ 200…240 V | **LT47 60M7A** | 0.192 |
| | | ∼ 100…120 V | **LT47 60F7A** | 0.192 |
| | | ⎓/∼ 24 V | **LT47 60BA** | 0.192 |
| | | ⎓/∼ 48 V | **LT47 60EA** | 0.192 |

### Accessories (to be ordered separately)

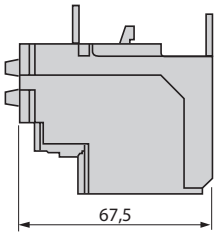
| Description | For use with | Sold in lots of | Unit reference | Weight |
|---|---|---|---|---|
| | | | | kg |
| **Pre-wiring kits** allowing connection of the LR97 D relay N/C contact directly to the contactor | LC1 D09…D18 | 10 | **LAD 7C1** | 0.002 |
| | LC1 D25…D38 | 10 | **LAD 7C2** | 0.003 |
| **Terminal block** for clip-on mounting on 35 mm rail (AM1 DP200) | LR97 D | 1 | **LAD 7B106** | 0.100 |

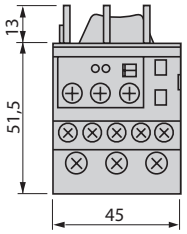
*(1) To allow adjustment of the tripping sensitivity, see adjustment method (page 6/54).*
*(2) Please see pages 5/46 and 5/47.*
*(3) If a pre-wiring kit is used, it is no longer possible to electrically wire signalling of tripped status.*

Presentation, description : page 6/54 | Curves : pages 6/55 and 6/56 | Characteristics : pages 6/56 and 6/57 | Dimensions, mounting : page 6/59 | Schemes : page 6/59

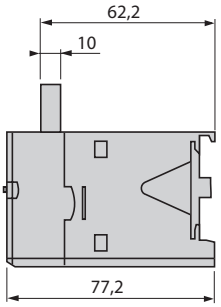
## Dimensions

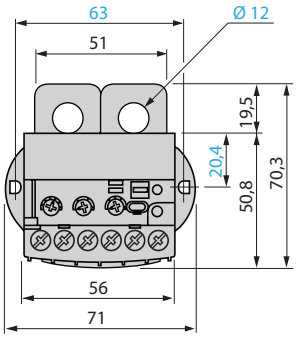
### LR97 D●●●●




### LT47 ●●●●

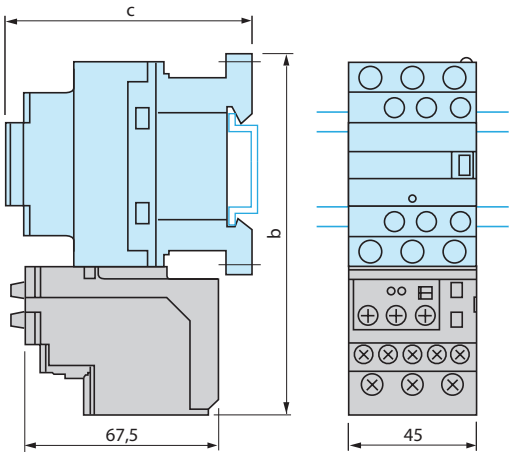



## Mounting

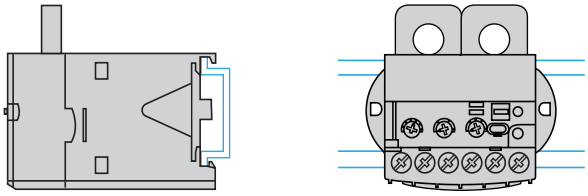
### LR97 D●●●●

**Direct mounting beneath the contactor**




| LC1 | D09…D18 | D25…D38 |
|---|---|---|
| b | 123 | 137 |
| c | See pages 5/92 and 5/93 | |

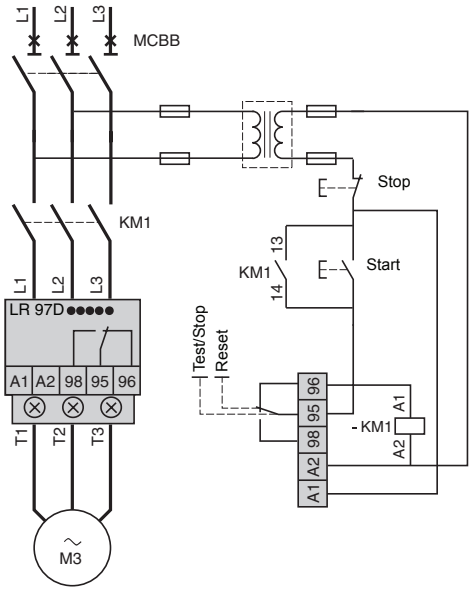
### LT47 ●●●●



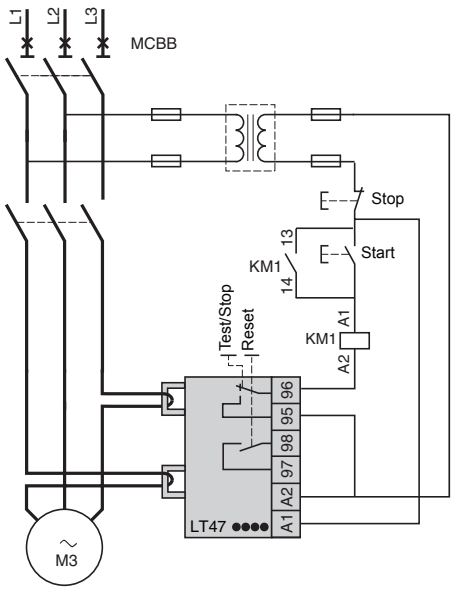
***Note:*** *Can be mounted on ⊔ rail.*

## Schemes

### LR97 D●●●●




### LT47 ●●●●




Presentation, description : page 6/54
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References : page 6/58



6