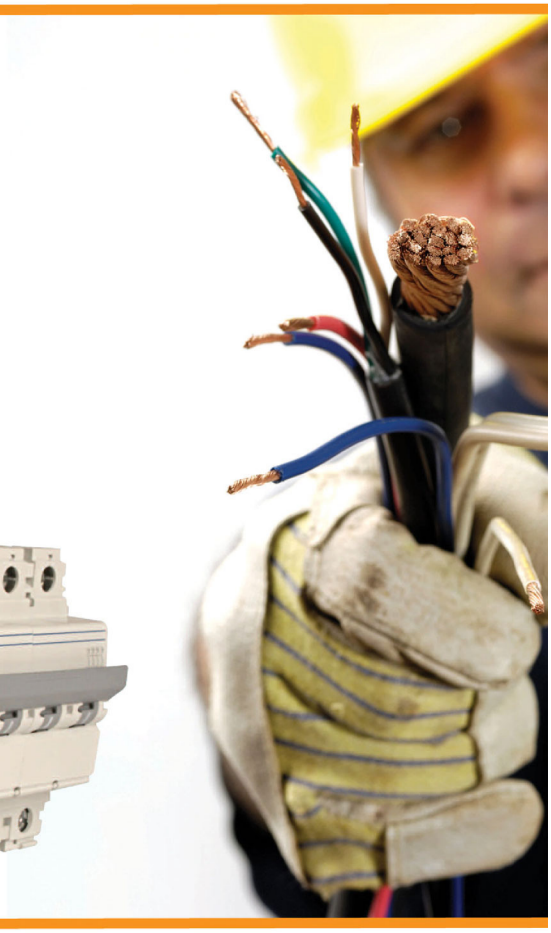
TERASAKI
Innovators in Protection Technology

Miniature Circuit Breaker Instruction Manual



11-M34E

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1. INSTALLATION AND CONNECTION

Installation precaution

- Avoid direct sunshine

Do not install in direct sunlight, the device may malfunction due to over temperature

- Avoid vibration and impact

Reduce the influence of vibration and impact by installing some cushioning/protective material

- Avoid dust and cutting powder

Rain water, oil, dust must not be in direct contact with the device especially metal cuttings used on steel plate etc.

- Do not block the arc gas vents of the device

The breaking capacity performance might be decreased. Please ensure the insulation distance of the conductive parts and any earthed parts are adequate. Please refer to catalogue for the insulation distances.

- Ensure the base of the device is secure

Do not remove any fastening that secures the back of the moulded base.

- Ensure the correct mounting position

Connection precaution

- Ensure correct torque is applied

Loose conductors cause overheating and malfunction

Over tightening conductors may cause damage of the screw and the mould

“Refer to tightening torque (below) for MCB”.

- Do not lubricate screws

Please do not apply the lubricating oil to the screw. Applying lubricating oil may make the screw loose and cause overheating

- All bare conductors to be insulated.

For front-connected breakers insulate all bare conductors up to the breaker.

If interpole barriers are supplied ensure they are fitted; insulate all bar conductors until they overlap the interpole barriers.

- Ensure all fixings have not been damaged
- Ensure a good connection to the supply and the load
- Ensure the conductors are firmly fixed at each pole in parallel.

Install conductors so that on each pole they are parallel. (Large electromagnetic forces affect the connections during a fault).

Ensure the conductors are securely supported with an insulated support, refer to the condition table below:

Electromagnetic force that works around conductors 1m

Short-circuit current kA ( ) : power factor	Electromagnetic force(In case of 3 phase short-circuit) N	
	Conductor distance(10cm)	Conductor distance(20cm)
10(0.4)	490	245

IP rating : IP2x of terminals

Temperature :

Calibration temperature : 30°C according to IEC / EN 60898

Calibration temperature : 50°C according to IEC / EN 60947-2

Working temperature : - 25°C to + 60 °C

Storage temperature : - 25°C to + 80 °C

Temperature derating : MCBs are designed and calibrated to carry their rated current and to operate within their designated thermal time/current zone at 30 °C.

Testing is carried out with the breaker mounted singly in a vertical plane in a controlled environment. Therefore if the circuit breaker is required to operate in conditions which differ from the reference conditions, certain factors have to be applied to the standard data.

For instance if the circuit breaker is required to operate at higher ambient temperature than 30 °C it will require progressively less current to trip within the designated time/current zone.

Temperature Correction factor : You will find in **Appendix 1** the correction values considering the ambient temperature

Grouping factor : **Rated current reduced by factor K** Consideration should also be given to the proximity heating effect of the breakers themselves when fully loaded and mounted together in groups. There is a certain amount of watts loss from each breaker depending on the trip rating which may well elevate the ambient air temperature of the breaker above the ambient air temperature of the enclosure

No. of units n	K (grouping factor)
n = 1	1
2 ≤ n < 4	0,95
4 ≤ n < 6	0,9
6 ≤ n	0,85

Note :If the design current of a circuit (Ib) is less than 0,85 times the nominal setting of the circuit breaker (In) grouping can be ignored.

Pollute degree : 3 according to IEC60947-2

Utilization category : A according to IEC60947-2

Dielectric strength : 2,5kV *according to EN 60898*

Clearances distances : 5,5 mm according to IEC60947-2

Case material : Thermoplastic (Polyamide)

Compliance with IEC 695-2-1

Tropicalisation : All climates, treatment 2 (relative humidity = 95% at 55°C)

Installation

Mounting :	Din rail EN 50.022-35
Supply :	Feed either top or bottom
Connection capacity :	Rigid conductor : 35 mm² (TD3 M10) Flexible conductor : 25 mm² (TD3 M10) Rigid conductor : 25 mm² (TD3 M06) Flexible conductor : 16 mm² (TD3 M06) On the bottom, there is a bi-connect terminal
Tightening torque :	2,8 Nm nominal with Screw head pozidrive size 2 and slot 6 mm (TD3 M10) 3,5 Nm maximal with Screw head pozidrive size 2 and slot 6 mm (TD3 M10) 2,5 Nm nominal with Screw head pozidrive size 2 and slot 6 mm (TD3 M06) 3,15 Nm maximal with Screw head pozidrive size 2 and slot 6 mm (TD3 M06)
Installation altitude:	2000 meters max
Working position :	Product performances not affected if installed vertically, horizontally or flat

2. MAINTENANCE AND INSPECTION

2.1 Initial Inspection

Before placing the installed breaker in service, make sure of the following:

No	Inspection item**	Judgment
1	Ensure product packing, iron chippings, wire pieces, or other conductive foreign objects are not near or on breaker	There must no foreign objects.
2	Ensure the cover and base are not cracked nor damaged	There must be no cracking or damage.
3	Ensure terminal screws and wire clamp screws are securely tightened.	Is a regulated torque used? Refer to the catalogue for the tightening torque.
4	The insulation resistance is measured by using a 500V megger.	The insulation resistance is 5MΩ or more.
5	Check of the rated voltage and breaking capacity of the breaker	The rated voltage and breaking capacity of the breaker are suited to the application.

**Attention: Please check the following item after confirming the voltage is not applied.

Caution should be taken when conducting dielectric withstand voltage tests

Test voltage during dielectric withstand tests must not exceed the values shown in the following table:

Main circuit		Auxiliary/control circuit	
Rated insulation voltage	Test voltage (AC, r.m.s. value)	Rated insulation voltage	Test voltage (AC, r.m.s. value)
Ui≦300V	2000V for 1 min.	Uis≦60V	1000V for 1 min
300V<Ui≦690V	2500V for 1 min	60V<Uis≦600V	2 x Uis＋1000V(but not less than 1500V) for 1 min.

2.2 Periodic inspection

Periodic inspection is necessary to prevent unexpected failures and to maintain the breakers performance. In addition to the initial inspection a further inspection should be conducted approx one month after the breaker is placed in service. Periodic inspection of the breaker is needed at intervals depending on the service conditions.

Service environments		Examples	Suggested intervals
Standard	・Ambient air is always clean and dry.	Dust proofed, air-conditioned control room	・Within 10 years after installation: Every two or three years ・More than 10 years after installation: Every year ・More than 15 years after installation: Every six months
	・Ambient air is less dusty and free of corrosive gases.	Switchboard or distribution board is in a place or room which is not dust proofed and air-conditioned	・Within 10 years after installation: Every year ・More than 10 years after installation: Every six months ・More than 15 years after installation: Every month
Adverse	・Ambient air is dusty or contains some sulfurous acid, hydrogen sulfide or salt, or is high in humidity.	Geothermal power plant, sewage treatment facility, steel mill, paper mill and pulp plant	・Within five years after installation: Every six months ・More than five years after installation: Every month
	・Ambient air contains excessive dust or corrosive gases	Chemical plants, quarry, and mine	・Every month

Caution : Please check the following item after confirming the voltage is not applied.

Inspection item	Judgment	Remedy
Check the terminal screws	Are there any loose screws/studs?	If there is a loose screw/stud retighten to the regulated torque. Refer to the catalogue for the torque.
Check for dust and other contaminates such as oil	Terminal must be dust and contaminate free	Clean the terminals Wipe off any dust and or contaminate with a dry cloth.
Check the cover and base of the device	Check the cover and base for cracks or damage	Replace.
Check the handle operation	The handle operation must be smooth	Replace.
Check for discolouration caused by abnormal temperature rise at the terminals	The terminal must not be discoloured by overheating.	Replace. (A little discoloration of silver-plated terminal is permissible.)
Check the insulation resistance using a 500V megger.	The insulation resistance is 5MΩ or more.	Replace.（for 5MΩ or less）

2.3 Inspection and Care after Short-circuit Interruption

When a breaker trips open to interrupt a short-circuit current, a decision whether the breaker can be reused or needs to be replaced should be based on the magnitude of the short-circuit current. The following shows the guidelines for this decision.

1) If there is no contamination of arc gas vents and no other abnormal symptons are found, the breaker can be reused.

2) If contamination with black soot is found at arc gas vents, measure the insulation resistance. If the insulation resistance exceeds 5 MΩ, the breaker will be reusable.
However, the breaker should still be monitored for overheating at the terminals.
If the insulation resistance measured is less than 5 MΩ conduct a dielectric withstand test on the breaker; if this testing shows that the breaker has the specified dielectric strength, minimize the load on breaker. Doing this will permit the breaker to be used with the provision that it should be replaced as soon as practicable.
While the breaker is reused always monitor for overheating at the terminals.

3) If the operating handle and/or arc gas vents is contaminated heavily with soot and molten metal particles, replace the breaker immediately.

3. SWITCHING DURABILITY (number of switching cycles) of breaker

Electrical endurance :	10 000 cycles (O-C) to In *according to EN60898* (TD3 M10)
	12 cycles (O-C) to 6 x In according to IEC60947-2 (TD3 M10)
	10 000 cycles (O-C) up to 25A to In *according to EN60898* (TD3 M06)
	12 cycles (O-C) up to 63A according to IEC60947-2 (TD3 M06)
Mechanical endurance :	20 000 cycle without load

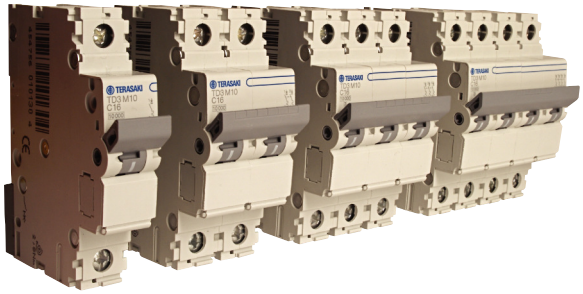
Appendix 1 : Temperature correction factor table

Miniature circuit breaker

Standard EN 60898

Curve B, C and D

In (A)	-25°C	-20°C	-15°C	-10°C	-5°C	0°C	5°C	10°C	15°C	20°C	25°C	30°C	35°C	40°C	45°C	50°C	55°C	60°C
0.5	0.72	0.7	0.68	0.66	0.64	0.62	0.6	0.58	0.56	0.54	0.52	0.5	0.48	0.46	0.44	0.42	-	-
1	1.44	1.4	1.36	1.32	1.28	1.24	1.2	1.16	1.12	1.08	1.04	1	0.96	0.92	0.88	0.84	0.8	0.76
2	2.88	2.8	2.72	2.64	2.56	2.48	2.4	2.32	2.24	2.16	2.08	2	1.92	1.84	1.76	1.68	1.6	1.52
3	4.32	4.2	4.08	3.96	3.84	3.72	3.6	3.48	3.36	3.24	3.12	3	2.88	2.76	2.64	2.52	2.4	2.28
4	5.76	5.6	5.44	5.28	5.12	4.96	4.8	4.64	4.48	4.32	4.16	4	3.84	3.68	3.52	3.36	3.2	3.04
6	8.64	8.4	8.16	7.92	7.68	7.44	7.2	6.96	6.72	6.48	6.24	6	5.76	5.52	5.28	5.04	4.8	4.56
10	14.4	14	13.6	13.2	12.8	12.4	12	11.6	11.2	10.8	10.4	10	9.6	9.2	8.8	8.4	8	7.6
13	18.7	18.2	17.7	17.2	16.6	16.1	15.6	15.1	14.6	14.0	13.5	13	12.5	12.0	11.4	10.9	10.4	9.9
15	21.6	21	20.4	19.8	19.2	18.6	18	17.4	16.8	16.2	15.6	15	14.4	13.8	13.2	12.6	12	11.4
16	23.0	22.4	21.8	21.1	20.5	19.8	19.2	18.6	17.9	17.3	16.6	16	15.4	14.7	14.1	13.4	12.8	12.2
20	28.8	28	27.2	26.4	25.6	24.8	24	23.2	22.4	21.6	20.8	20	19.2	18.4	17.6	16.8	16	15.2
25	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19
32	46.1	44.8	43.5	42.2	41.0	39.7	38.4	37.1	35.8	34.6	33.3	32	30.7	29.4	28.2	26.9	25.6	24.3
40	57.6	56	54.4	52.8	51.2	49.6	48	46.4	44.8	43.2	41.6	40	38.4	36.8	35.2	33.6	32	30.4
50	-	-	-	-	-	62	60	58	56	54	52	50	48	46	44	42	40	38
63	-	-	-	-	-	-	-	-	-	-	-	63	60.5	58.0	55.4	52.9	50.4	47.9



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