HONGFA

File No.：HMD-2012-054

UEB1-70

Miniature Circuit Breaker

Technical Specification

Done by： Xu Ming

Approved by: Wade Wang

Version： Sep 10th, 2014

Xiamen Hongfa Electrical Safety & Controls Co., Ltd

1 Features

1.1 Fast short circuit current trip times to provide better protection.
1.2 Short-circuit protection throughout the ambient temperature range.
1.3 Optional mounting to provide flexibility to the design engineers and customers.
1.4 QC terminal design to provide reliable wire connections.

2 Application range

UEB1-70 series Miniature Circuit Breaker (MCB) is designed to operate with AC 50Hz/60Hz. This MCB meets the rigorous requirements of UL 489 providing your equipment the protection of over-current in AC electrical systems. This product has current ratings from 5 amps to 60 amps to voltages up to 240 VAC.

3 Catalog Numbers

UE	B	1	-	70	□□	□	□	□□	□	□□□
1	2	3		4	5	6	7	8	9	10

Digit 1：Product Family: Low Voltage Device

Digit 2：Product Type：Miniature Circuit Breaker.

Digit 3：Design Series Number.

Digit 4：Frame Ampere 70A.

Digit 5：Ampere Rating: 5,10,15,20,25,30,35,40,45,50,60A.

Digit 6：Blank - 120/240V, 10kA Short Circuit Rating;

“H” - 240V 10kA Short Circuit Rating;

Digit 7：Number of poles: 1P, 2P, 3P

Digit8：Wire connection terminal: BB—Box lug and Box lug;

BQ—Box lug and QC terminal;

Digit 9：Mounting type: D—DIN rail

S—Surface-Flush

Digit10：Customization

4 Conformed to standard

4.1 UL 489

5 UL Approval

5.1 UL 489

6 Operation environment

6.1 Operation Temperature:	-10℃ ~ +60℃(14℉ ~140℉)
6.2 Storage Temperature	-40℃ ~ +70℃(-40℉~ 158℉)
6.3 Relative Humidity	90-95%RH (below 40℃/104℉)
6.4 Altitude	≤2000m(6562 feet)

7 Technical performance

7.1 Rated Insulated Voltage	690Vac
7.2 Rated Voltage	120/240Vac, 240Vac
7.3 Rated Frequency	50/60Hz
7.4 Mechanical Endurance Life (as per UL 489)	10000 cycles
7.5 Electrical Endurance Life (as per UL 489)	6000 cycles
7.6 Interrupting capacity	10kA

8 Dimension & Wiring diagram

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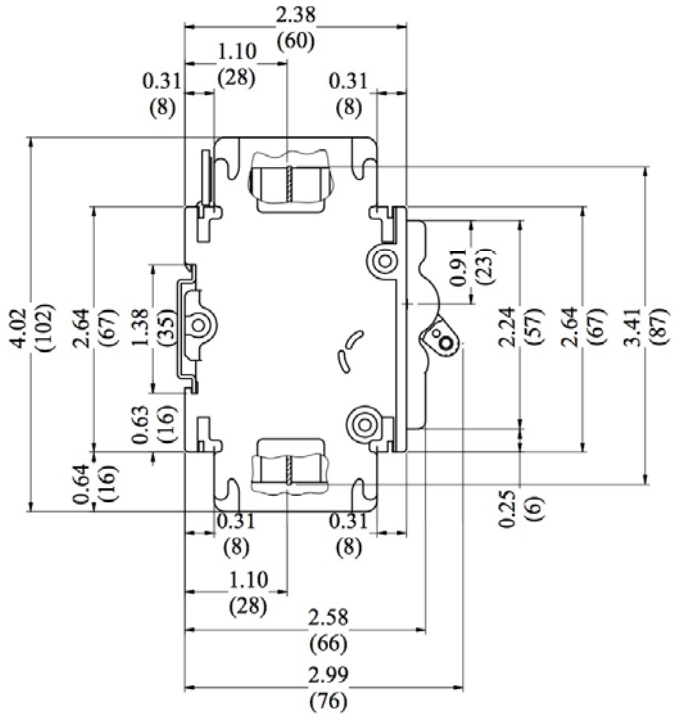
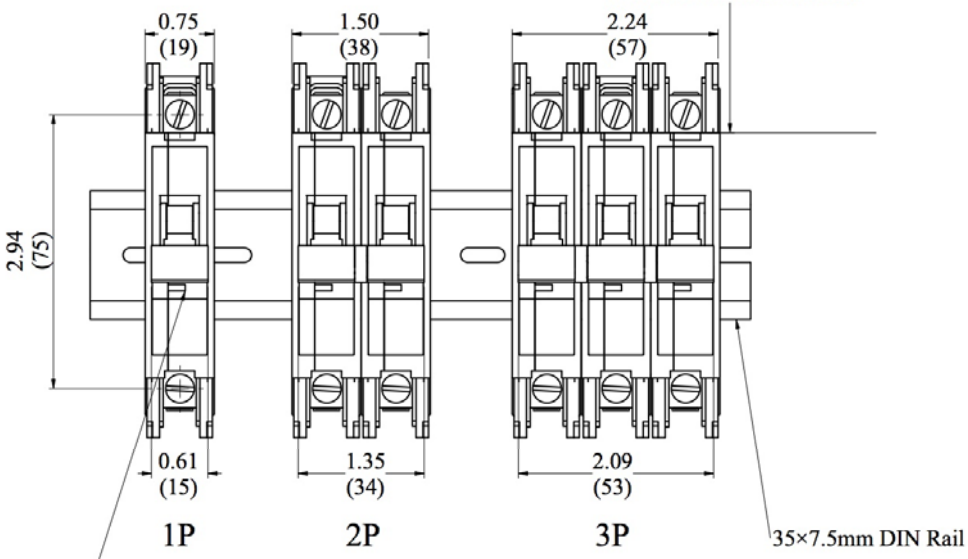
Rated Currents and Rated Voltages corresponding table

Rated Currents	Rated Voltages			
	120/240Vac,1pole	120/240Vac,2pole	240Vac,2pole	240Vac,3pole
5A	UEB1-70051BBD	UEB1-70052BBD	UEB1-7005H2BBD	UEB1-7005H3BBD
10A	UEB1-70101BBD	UEB1-70102BBD	UEB1-7010H2BBD	UEB1-7010H3BBD
15A	UEB1-70151BBD	UEB1-70152BBD	UEB1-7015H2BBD	UEB1-7015H3BBD
20A	UEB1-70201BBD	UEB1-70202BBD	UEB1-7020H2BBD	UEB1-7020H3BBD
25A	UEB1-70251BBD	UEB1-70252BBD	UEB1-7025H2BBD	UEB1-7025H3BBD
30A	UEB1-70301BBD	UEB1-70302BBD	UEB1-7030H2BBD	UEB1-7030H3BBD
35A	UEB1-70351BBD	UEB1-70352BBD	UEB1-7035H2BBD	UEB1-7035H3BBD
40A	UEB1-70401BBD	UEB1-70402BBD	UEB1-7040H2BBD	UEB1-7040H3BBD
45A	UEB1-70451BBD	UEB1-70452BBD	UEB1-7045H2BBD	UEB1-7045H3BBD
50A	UEB1-70501BBD	UEB1-70502BBD	UEB1-7050H2BBD	UEB1-7050H3BBD
60A	UEB1-70601BBD	UEB1-70602BBD	UEB1-7060H2BBD	UEB1-7060H3BBD

CIRCUIT BREAKERS
1. Approval:UL489;
2. Poles:1, 2, 3;
3. Mounting Type: Din-rail;
4. Terminal：Box lug;
   Maximum wire size for the Box Lug:#3;
   Maximum tightening torque for the Box Lug:45lbf-in(5.1N·m);
5. Rated frequency:50/60Hz;
6. Interrupting capacity:10kA;
7. Application life:
   Mechanical:10000 cycles;
   Electrical:6000cycles;
8. Operation Temperature:-10℃～+60℃(14℉～140℉);
9. Storage Temperature:-40℃～+70℃(-40℉～158℉);
10. Relative Humidity:90-95%RH（below 40℃/104℉);
11. Altitude: ≤2000m(6562 feet);



64mm MIN.WIRE BENDING SPACE FOR 4 AWG
38mm MIN.WIRE BENDING SPACE FOR 14 AWG



ON/OFF DISPLAY INDICATOR:
SIMULTANEOUS OPENING OF ALL POLES TO HAVE THEGREEN LIGHT ON
AND CLOSING OF ALL POLES TO HAVE THE RED LIGHT ON.

Dim.:in./mm

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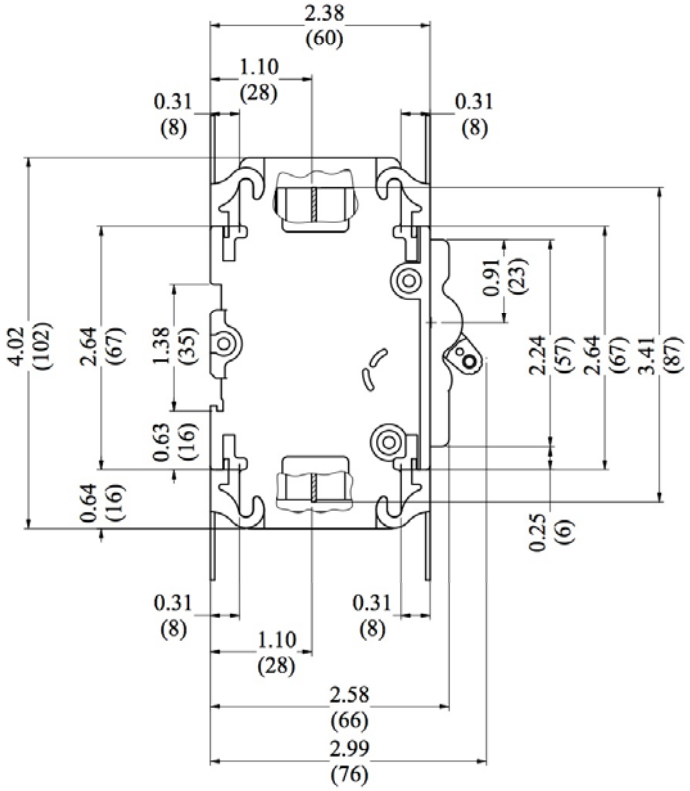
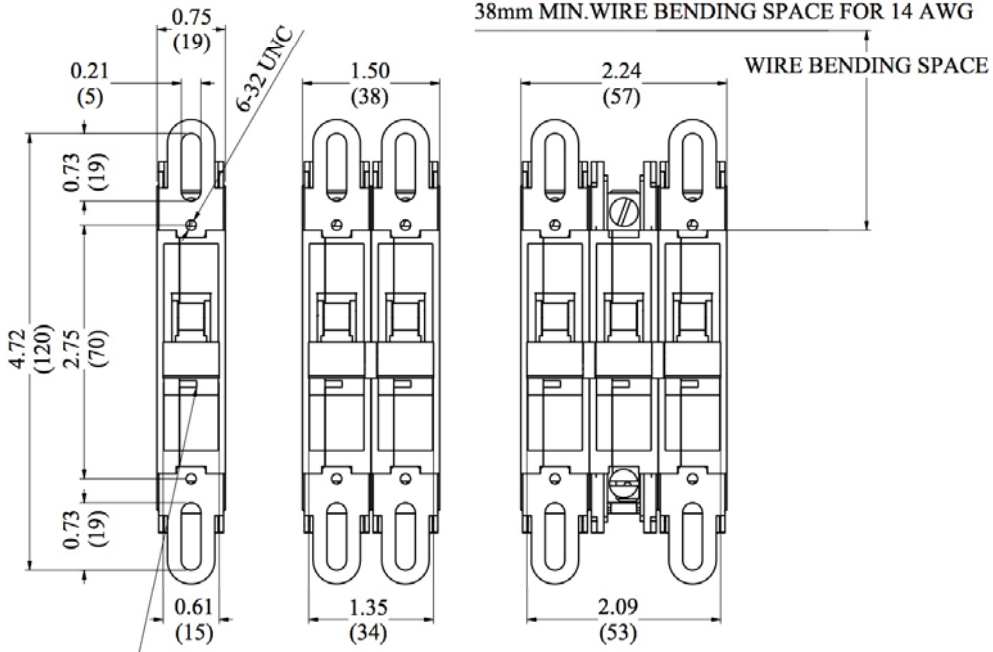
Rated Currents and Rated Voltages corresponding table

Rated Currents	Rated Voltages			
	120/240Vac,1pole	120/240Vac,2pole	240Vac,2pole	240Vac,3pole
5A	UEB1-70051BBS	UEB1-70052BBS	UEB1-7005H2BBS	UEB1-7005H3BBS
10A	UEB1-70101BBS	UEB1-70102BBS	UEB1-7010H2BBS	UEB1-7010H3BBS
15A	UEB1-70151BBS	UEB1-70152BBS	UEB1-7015H2BBS	UEB1-7015H3BBS
20A	UEB1-70201BBS	UEB1-70202BBS	UEB1-7020H2BBS	UEB1-7020H3BBS
25A	UEB1-70251BBS	UEB1-70252BBS	UEB1-7025H2BBS	UEB1-7025H3BBS
30A	UEB1-70301BBS	UEB1-70302BBS	UEB1-7030H2BBS	UEB1-7030H3BBS
35A	UEB1-70351BBS	UEB1-70352BBS	UEB1-7035H2BBS	UEB1-7035H3BBS
40A	UEB1-70401BBS	UEB1-70402BBS	UEB1-7040H2BBS	UEB1-7040H3BBS
45A	UEB1-70451BBS	UEB1-70452BBS	UEB1-7045H2BBS	UEB1-7045H3BBS
50A	UEB1-70501BBS	UEB1-70502BBS	UEB1-7050H2BBS	UEB1-7050H3BBS
60A	UEB1-70601BBS	UEB1-70602BBS	UEB1-7060H2BBS	UEB1-7060H3BBS

CIRCUIT BREAKERS
1. Approval:UL489;
2. Poles:1, 2, 3;
3. Mounting Type:surface-flush;
4. Terminal：Box lug;
   Maximum wire size for the Box Lug:#3;
   Maximum tightening torque for the Box Lug:45lbf-in(5.1N·m);
5. Rated frequency:50/60Hz；
6. Interrupting capacity:10kA；
7. Application life:
   Mechanical:10000 cycles;
   Electrical:6000cycles;
8. Operation Temperature:-10℃～+60℃(14℉ ~140℉);
9. Storage Temperature:-40℃～+70℃(-40℉～ 158℉);
10. Relative Humidity:90-95%RH（below 40℉/104℉);
11. Altitude: ≤2000m(6562 feet);



64mm MIN.WIRE BENDING SPACE FOR 4 AWG
38mm MIN.WIRE BENDING SPACE FOR 14 AWG



ON/OFF DISPLAY INDICATOR:
SIMULTANEOUS OPENING OF ALL POLES TO HAVE THEGREEN LIGHT ON
AND CLOSING OF ALL POLES TO HAVE THE RED LIGHT ON.

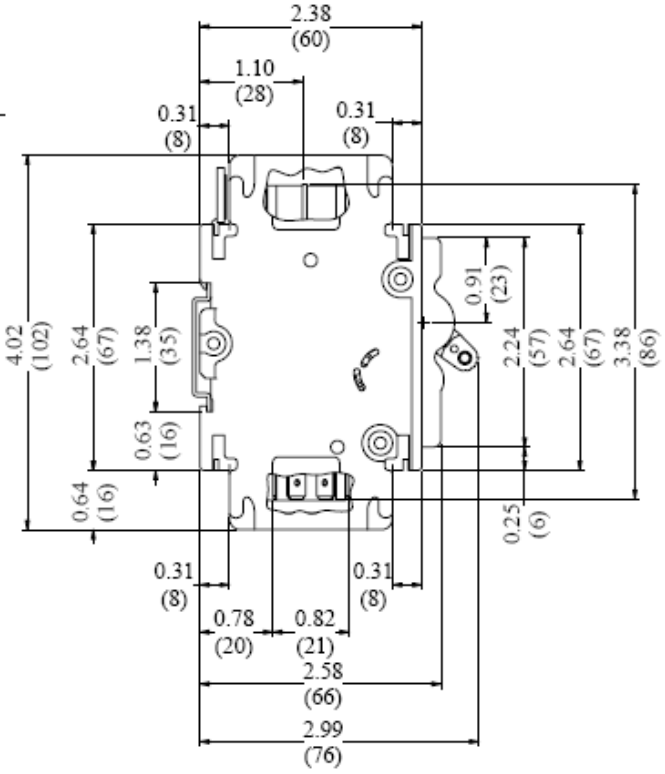
Dim.:in./mm

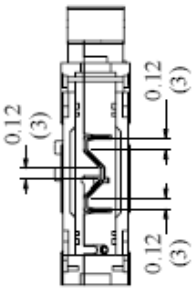
HONGFA

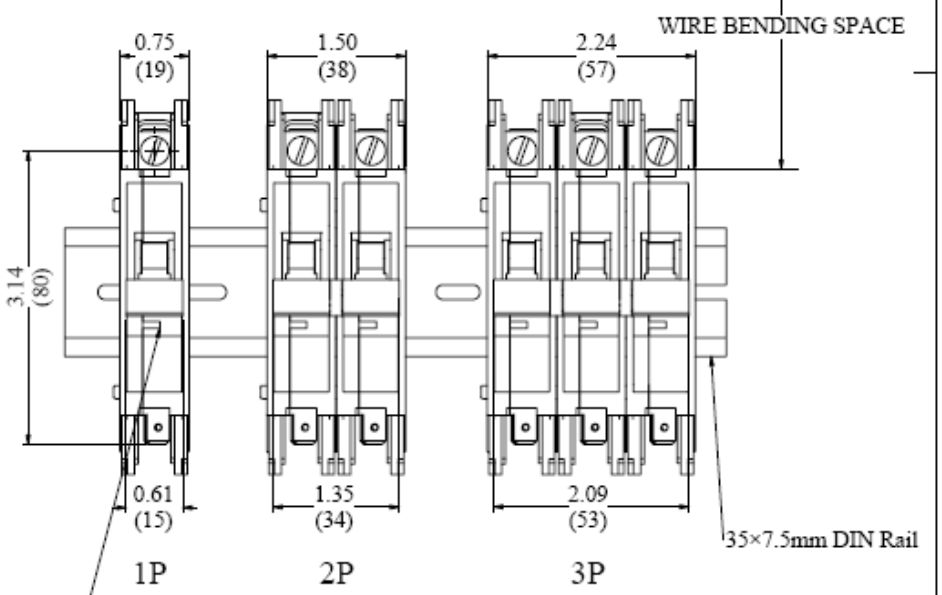
Rated Currents and Rated Voltages corresponding table

Rated Currents	Rated Voltages			
	120/240Vac,1pole	120/240Vac,2pole	240Vac,2pole	240Vac,3pole
5A	UEB1-70051BQD	UEB1-70052BQD	UEB1-7005H2BQD	UEB1-7005H3BQD
10A	UEB1-70101BQD	UEB1-70102BQD	UEB1-7010H2BQD	UEB1-7010H3BQD
15A	UEB1-70151BQD	UEB1-70152BQD	UEB1-7015H2BQD	UEB1-7015H3BQD
20A	UEB1-70201BQD	UEB1-70202BQD	UEB1-7020H2BQD	UEB1-7020H3BQD
25A	UEB1-70251BQD	UEB1-70252BQD	UEB1-7025H2BQD	UEB1-7025H3BQD
30A	UEB1-70301BQD	UEB1-70302BQD	UEB1-7030H2BQD	UEB1-7030H3BQD
35A	UEB1-70351BQD	UEB1-70352BQD	UEB1-7035H2BQD	UEB1-7035H3BQD
40A	UEB1-70401BQD	UEB1-70402BQD	UEB1-7040H2BQD	UEB1-7040H3BQD
45A	UEB1-70451BQD	UEB1-70452BQD	UEB1-7045H2BQD	UEB1-7045H3BQD
50A	UEB1-70501BQD	UEB1-70502BQD	UEB1-7050H2BQD	UEB1-7050H3BQD
60A	UEB1-70601BQD	UEB1-70602BQD	UEB1-7060H2BQD	UEB1-7060H3BQD

CIRCUIT BREAKERS
1. Approval:UL489;
2. Poles:1, 2, 3;
3. Mounting Type: Din-rail;
4. Terminal:
line:Box lug
Maximum wire size for the Box Lug:#3
Maximum tightening torque for the Box Lug:45lbf-in(5.1N·m);
load:QC
4 Standard 0.25 in. Insulated Quick Connectors available for per terminal(30A max per connector);
Wire size: up to AWG#10;
5. Rated frequency:50/60Hz;
6. Interrupting capacity:10kA;
7. Application life:
Mechanical:10000 cycles;
Electrical:6000cycles;
8. Operation Temperature:-10℃～+60℃(14℉ ~140℉);
9. Storage Temperature:-40℃～+70℃(-40℉~ 158℉);
10. Relative Humidity:90-95%RH（below 40℉/104℉);
11. Altitude: ≤2000m(6562 feet);







ON/OFF DISPLAY INDICATOR:
SIMULTANEOUS OPENING OF ALL POLES TO HAVE THEGREEN LIGHT ON AND CLOSING OF ALL POLES TO HAVE THE RED LIGHT ON.

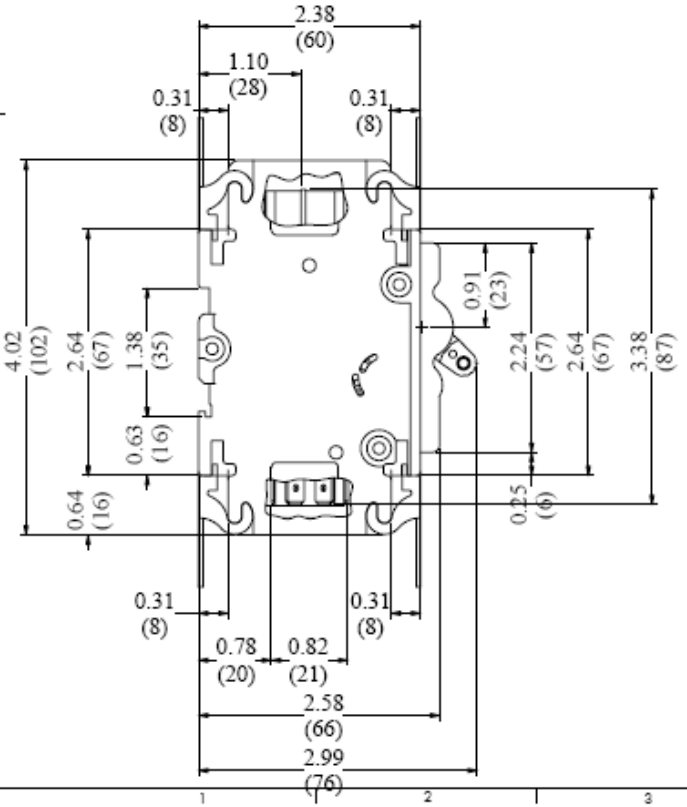
Dim.:in./mm

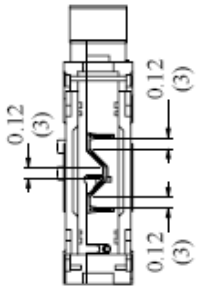
HONGFA

Rated Currents and Rated Voltages corresponding table

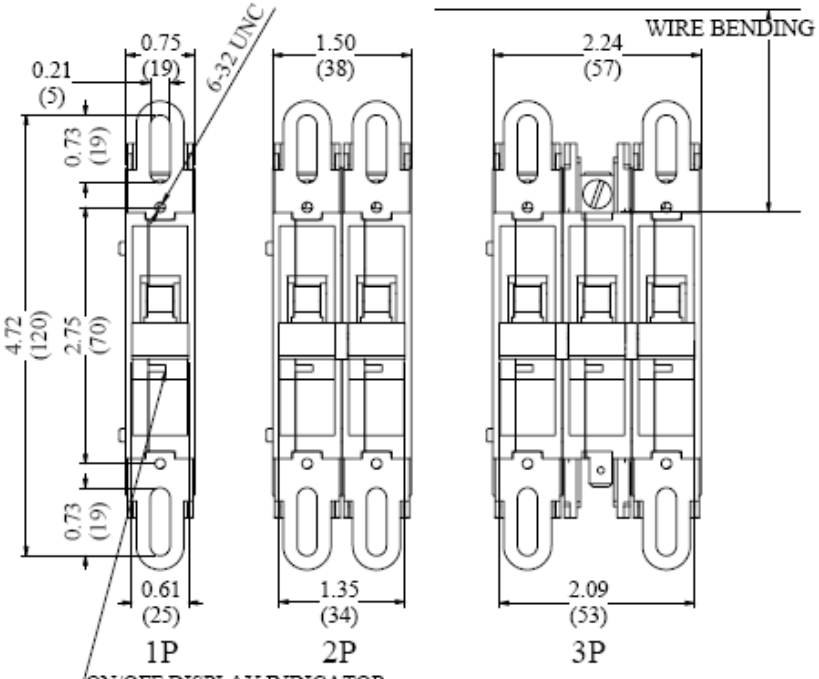
Rated Currents	Rated Voltages			
	120/240Vac,1pole	120/240Vac,2pole	240Vac,2pole	240Vac,3pole
5A	UEB1-70051BQS	UEB1-70052BQS	UEB1-7005H2BQS	UEB1-7005H3BQS
10A	UEB1-70101BQS	UEB1-70102BQS	UEB1-7010H2BQS	UEB1-7010H3BQS
15A	UEB1-70151BQS	UEB1-70152BQS	UEB1-7015H2BQS	UEB1-7015H3BQS
20A	UEB1-70201BQS	UEB1-70202BQS	UEB1-7020H2BQS	UEB1-7020H3BQS
25A	UEB1-70251BQS	UEB1-70252BQS	UEB1-7025H2BQS	UEB1-7025H3BQS
30A	UEB1-70301BQS	UEB1-70302BQS	UEB1-7030H2BQS	UEB1-7030H3BQS
35A	UEB1-70351BQS	UEB1-70352BQS	UEB1-7035H2BQS	UEB1-7035H3BQS
40A	UEB1-70401BQS	UEB1-70402BQS	UEB1-7040H2BQS	UEB1-7040H3BQS
45A	UEB1-70451BQS	UEB1-70452BQS	UEB1-7045H2BQS	UEB1-7045H3BQS
50A	UEB1-70501BQS	UEB1-70502BQS	UEB1-7050H2BQS	UEB1-7050H3BQS
60A	UEB1-70601BQS	UEB1-70602BQS	UEB1-7060H2BQS	UEB1-7060H3BQS

CIRCUIT BREAKERS
1. Approval:UL489;
2. Poles:1, 2, 3;
3. Mounting Type: Surface-flush;
4. Terminal:
line:Box lug
Maximum wire size for the Box Lug:#3
Maximum tightening torque for the Box Lug:45lbf-in(5.1N·m);
load:QC
4 Standard 0.25 in. Insulated Quick Connectors available for per terminal(30A max per connector);
Wire size: up to AWG #10;
5. Rated frequency:50/60Hz;
6. Interrupting capacity:10kA;
7. Application life:
Mechanical:10000 cycles;
Electrical:6000cycles;
8. Operation Temperature:-10℃～+60℃(14℉ ~140℉);
9. Storage Temperature:-40℃～+70℃(-40℉~ 158℉);
10. Relative Humidity:90-95%RH （below 40℉/104℉);
11. Altitude: ≤2000m(6562 feet);





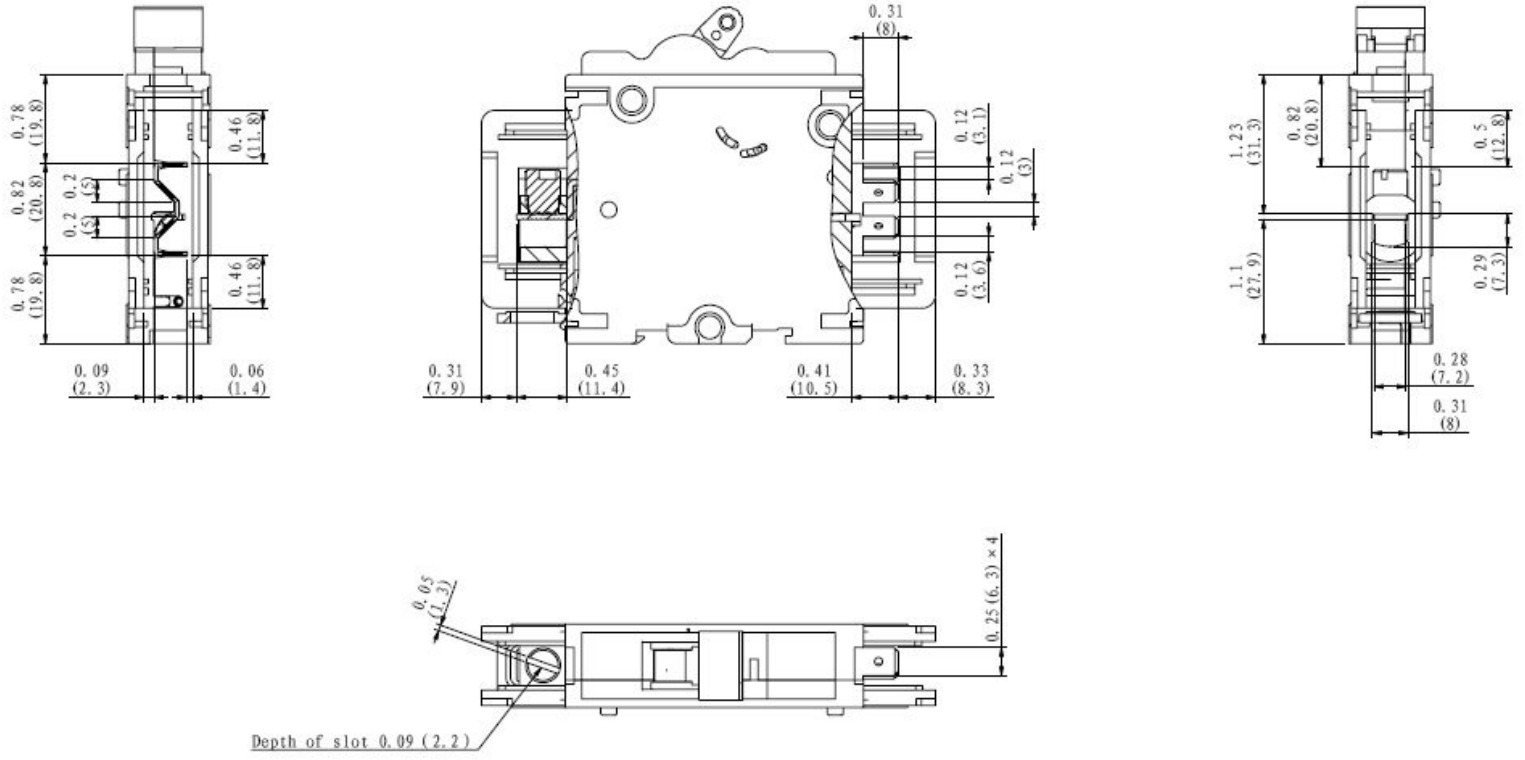
64mm MIN.WIRE BENDING SPACE FOR 4 AWG
38mm MIN.WIRE BENDING SPACE FOR 14 AWG
WIRE BENDING SPACE



ON/OFF DISPLAY INDICATOR:
SIMULTANEOUS OPENING OF ALL POLES TO HAVE THEGREEN LIGHT ON AND CLOSING OF ALL POLES TO HAVE THE RED LIGHT ON.

Dim.:in./mm

Dimension of terminals

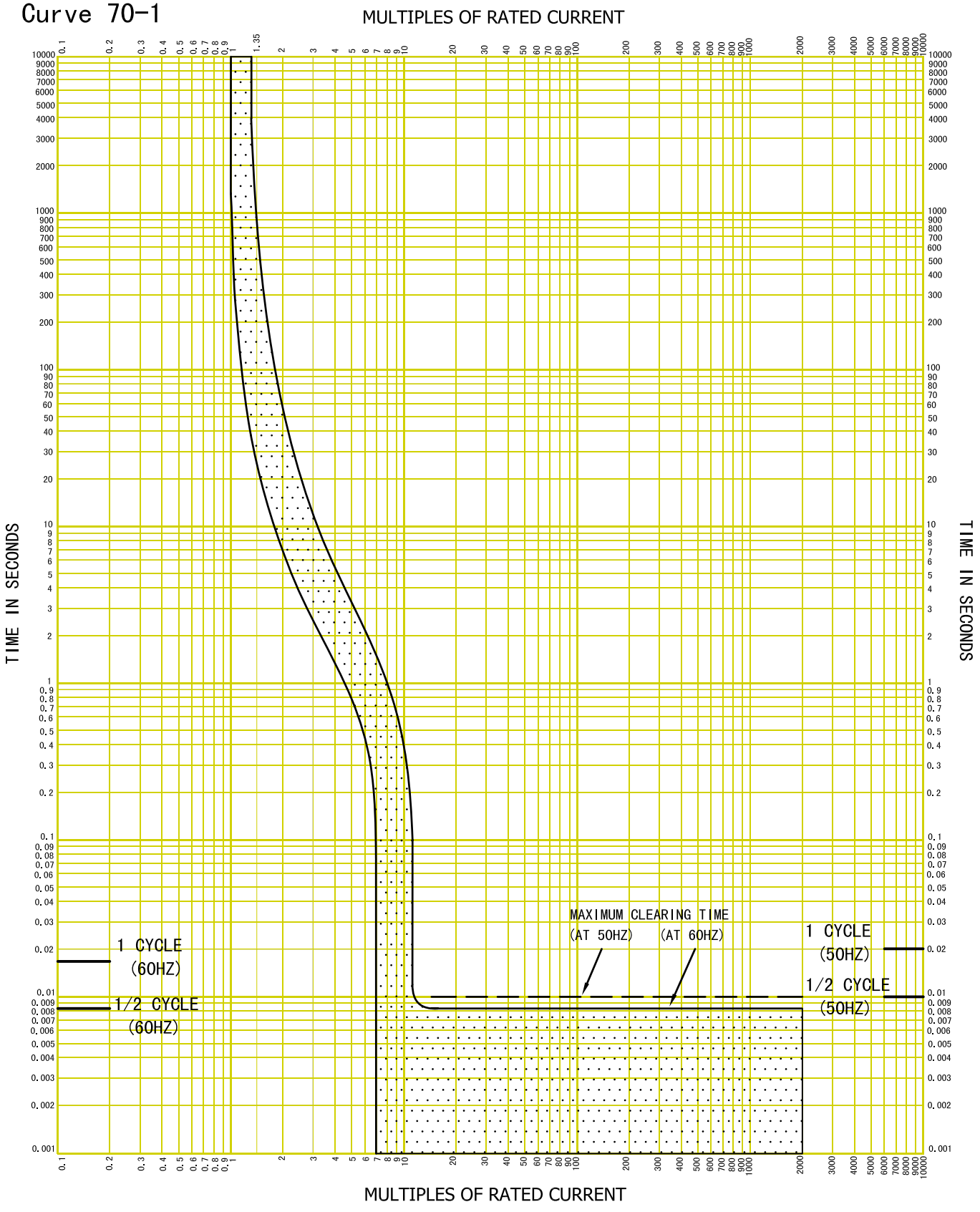


Dim.:in./mm

9 Tripping Curves

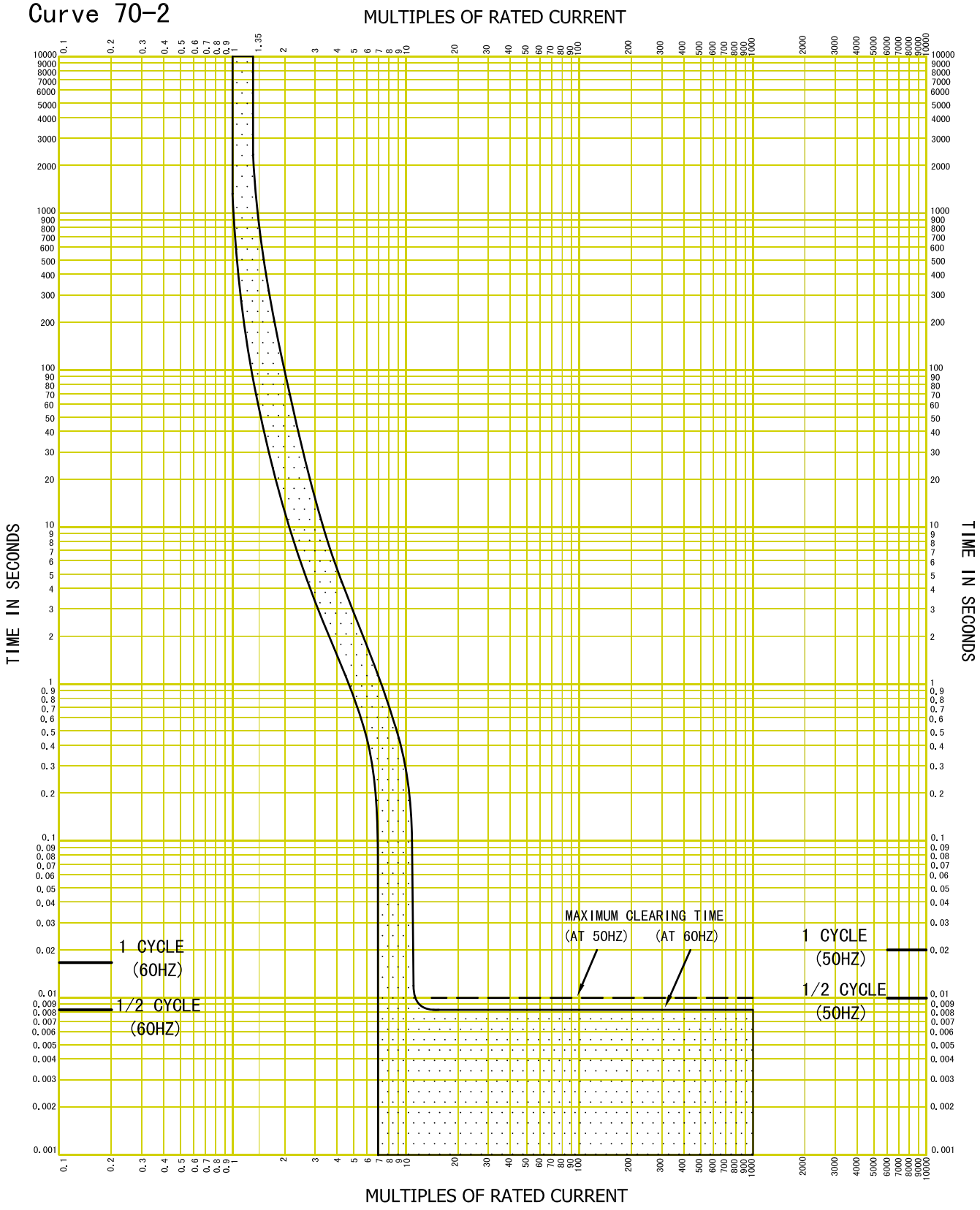
Rated Current:5A
Rated Voltage:1P, 2P-120/240Vac
2P, 3P-240Vac
Frequency:50/60Hz
Operation Temperature:25±3℃

Curve 70-1



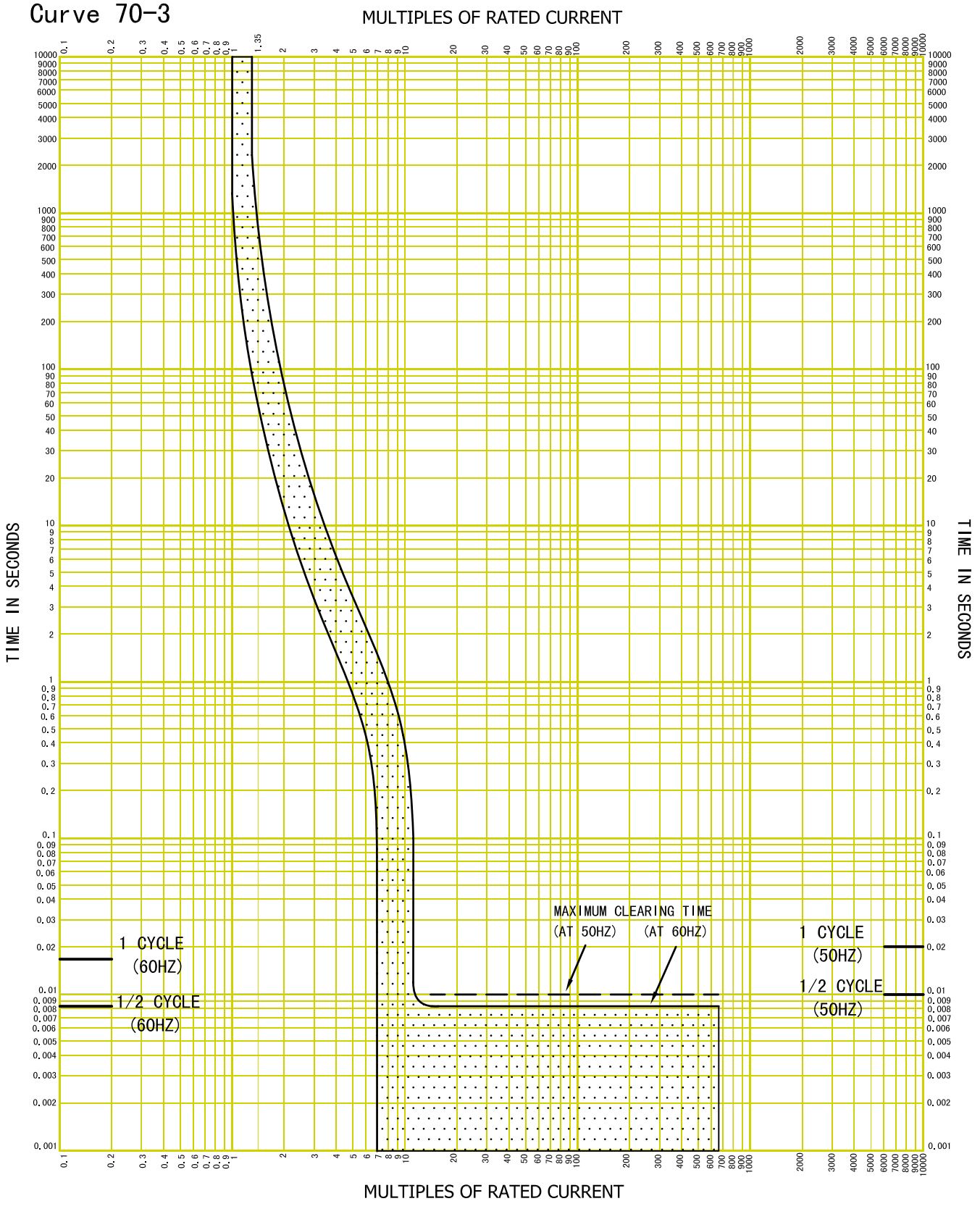
Rated Current:10A
Rated Voltage:1P,2P-120/240Vac
2P,3P-240Vac
Frequency:50/60Hz
Operation Temperature:25±3℃

Curve 70-2



Rated Current:15A
Rated Voltage:1P, 2P-120/240Vac
2P, 3P-240Vac
Frequency:50/60Hz
Operation Temperature:25±3℃

Curve 70-3

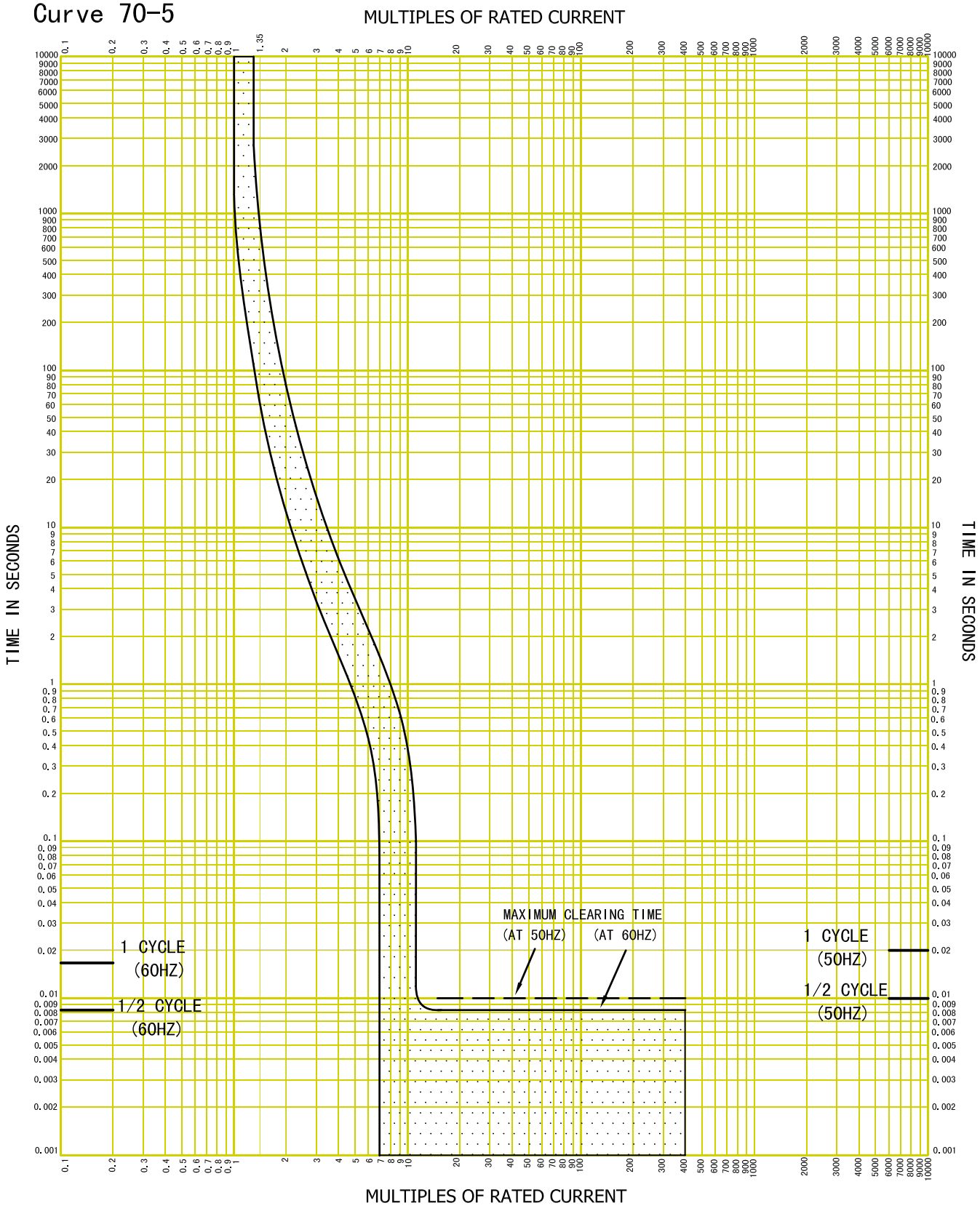


Rated Current:20A
Rated Voltage:1P, 2P-120/240Vac
2P, 3P-240Vac
Frequency:50/60Hz
Operation Temperature:25±3℃

Curve 70-4

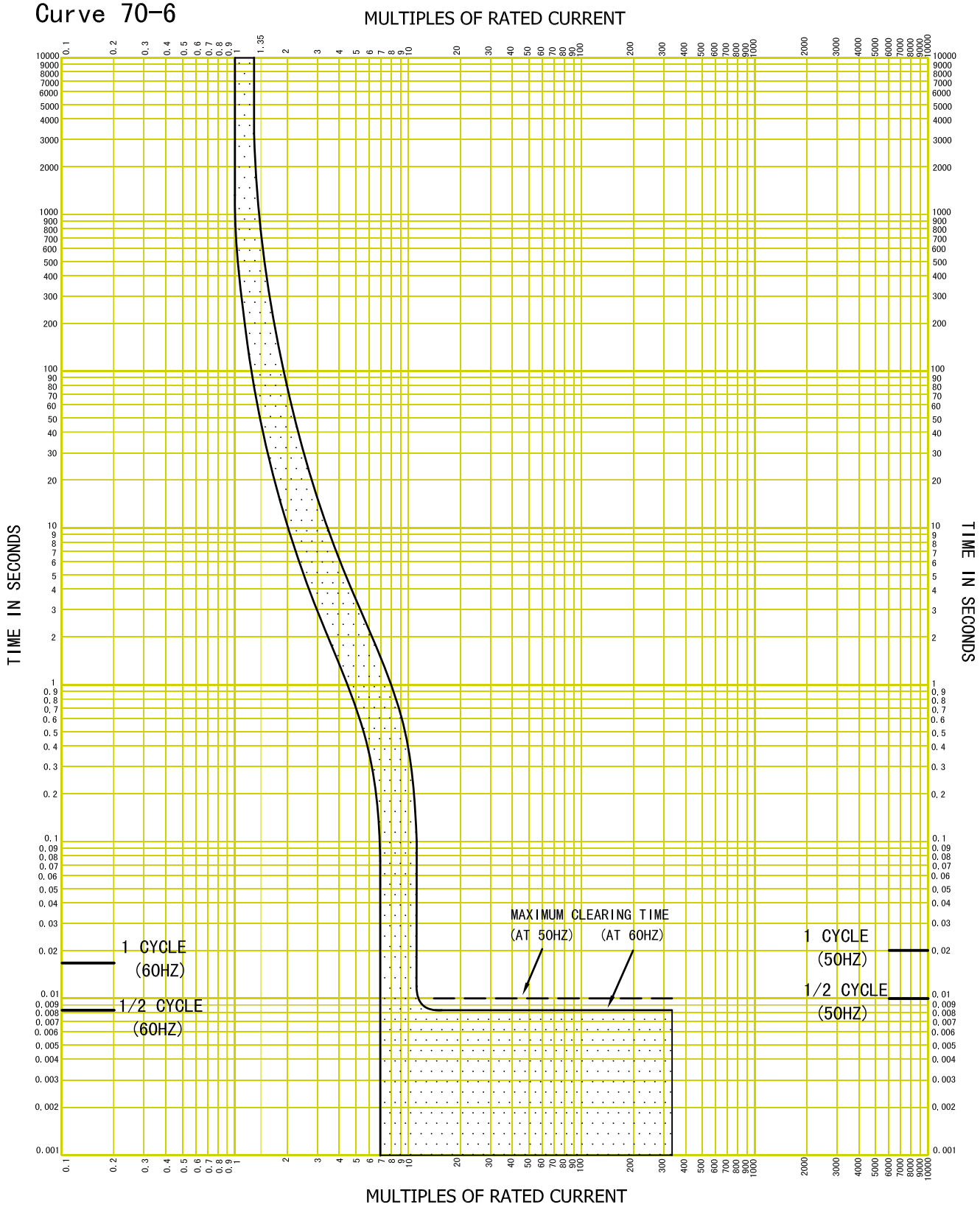
Rated Current:25A
Rated Voltage:1P, 2P-120/240Vac
2P, 3P-240Vac
Frequency:50/60Hz
Operation Temperature:25±3℃

Curve 70-5



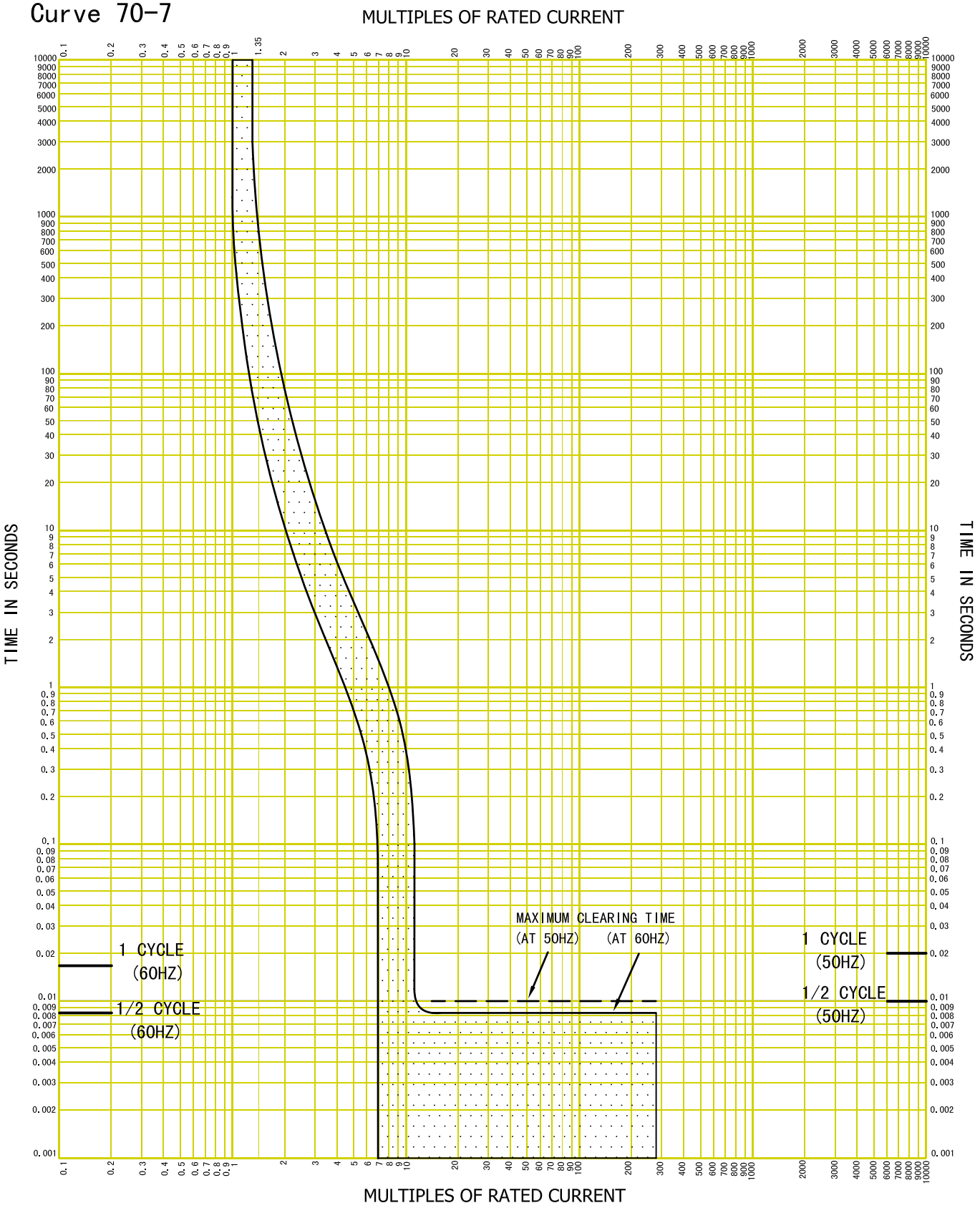
Rated Current:30A
Rated Voltage:1P,2P-120/240Vac
2P,3P-240Vac
Frequency:50/60Hz
Operation Temperature:25±3℃

Curve 70-6



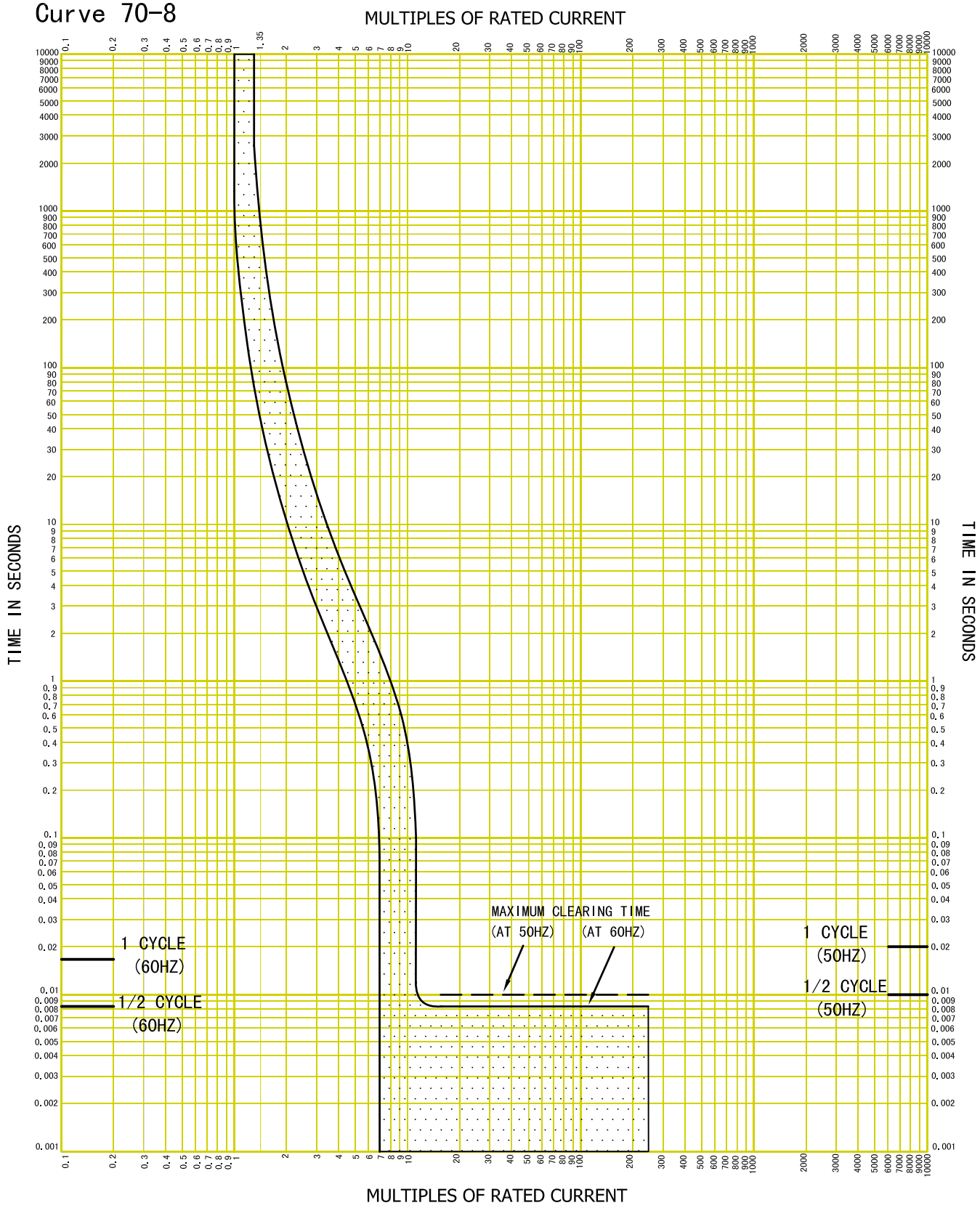
Rated Current:35A
Rated Voltage:1P, 2P-120/240Vac
2P, 3P-240Vac
Frequency:50/60Hz
Operation Temperature:25±3℃

Curve 70-7



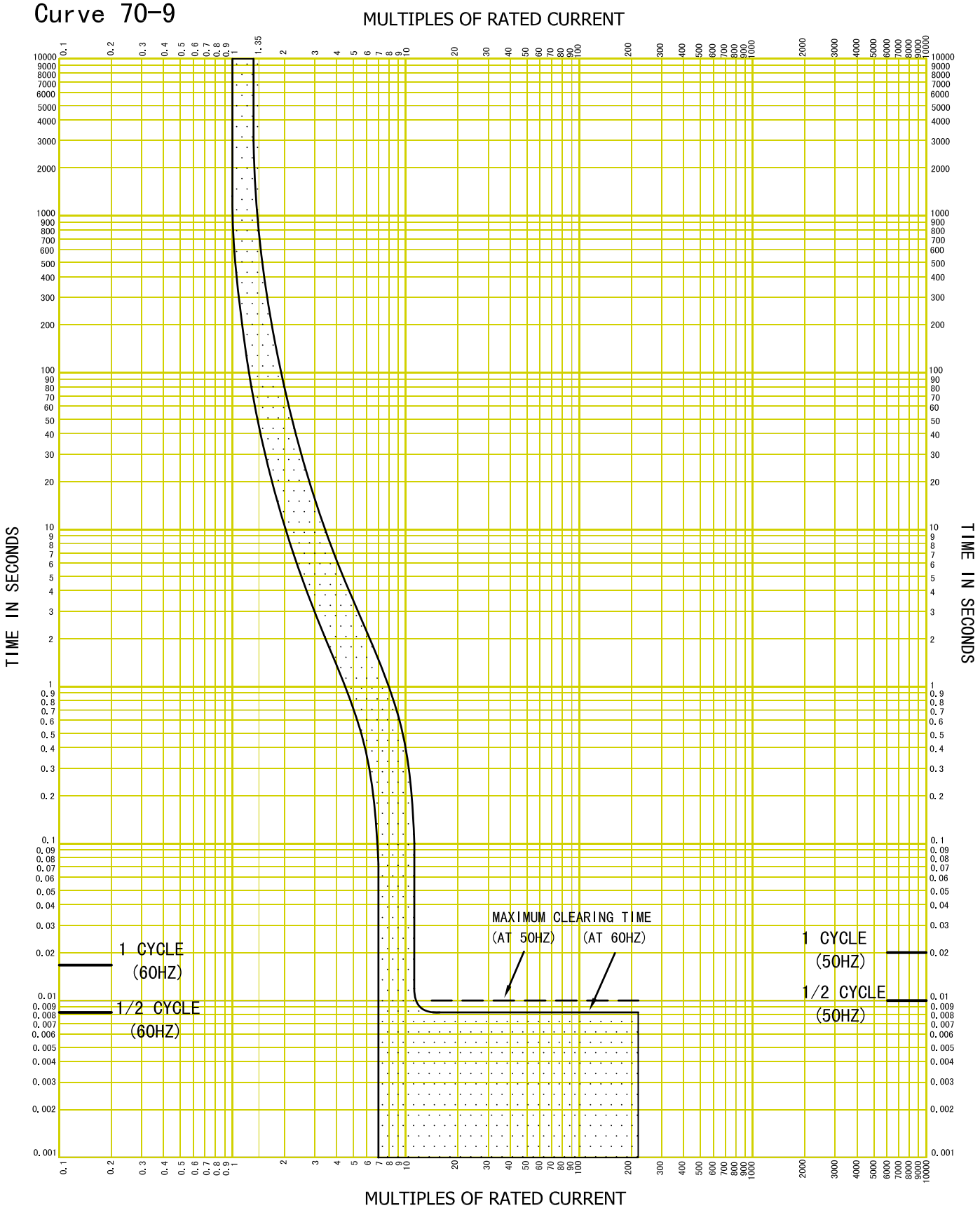
Rated Current:40A
Rated Voltage:1P, 2P-120/240Vac
2P, 3P-240Vac
Frequency:50/60Hz
Operation Temperature:25±3℃

Curve 70-8



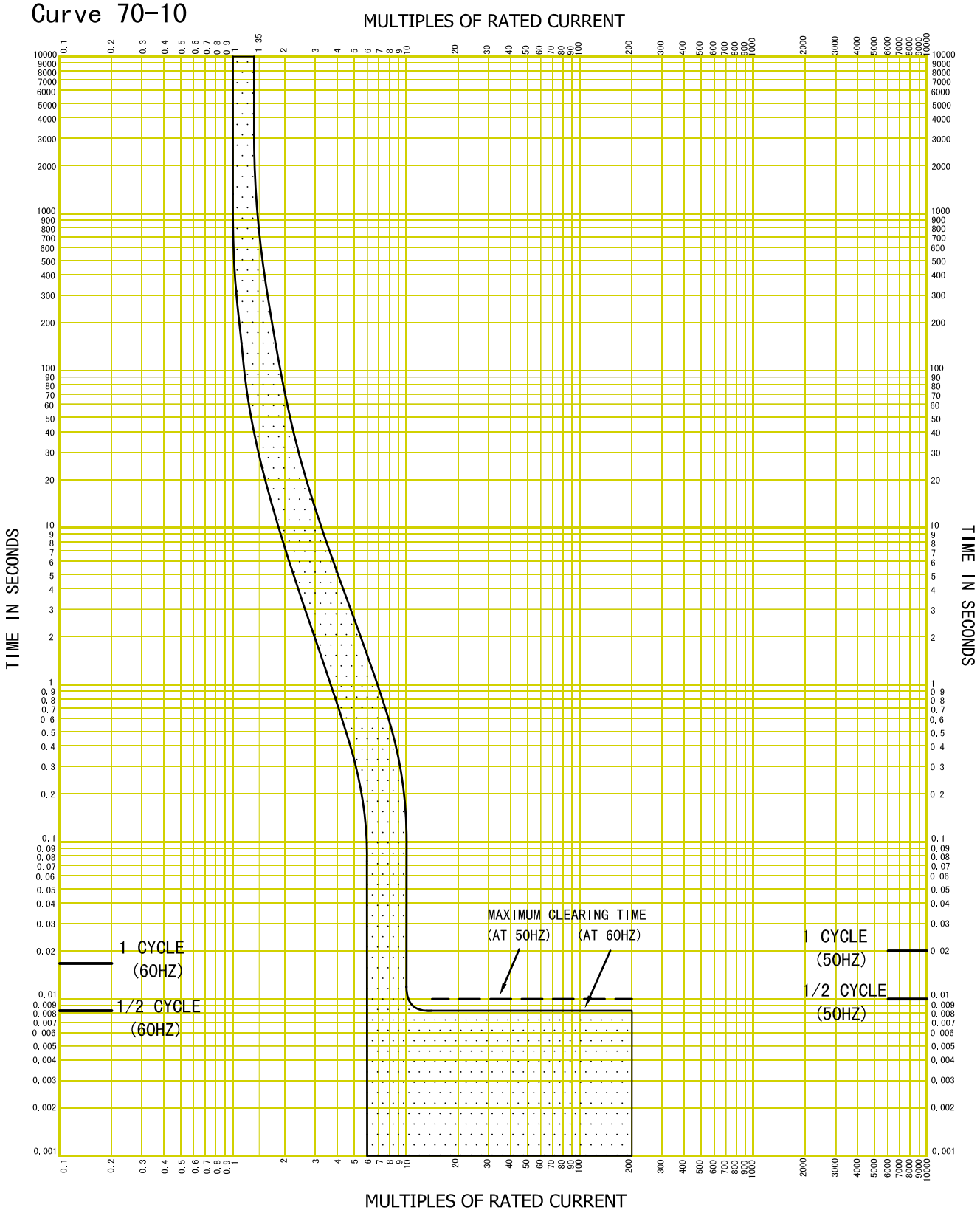
Rated Current:45A
Rated Voltage:1P, 2P-120/240Vac
2P, 3P-240Vac
Frequency:50/60Hz
Operation Temperature:25±3℃

Curve 70-9



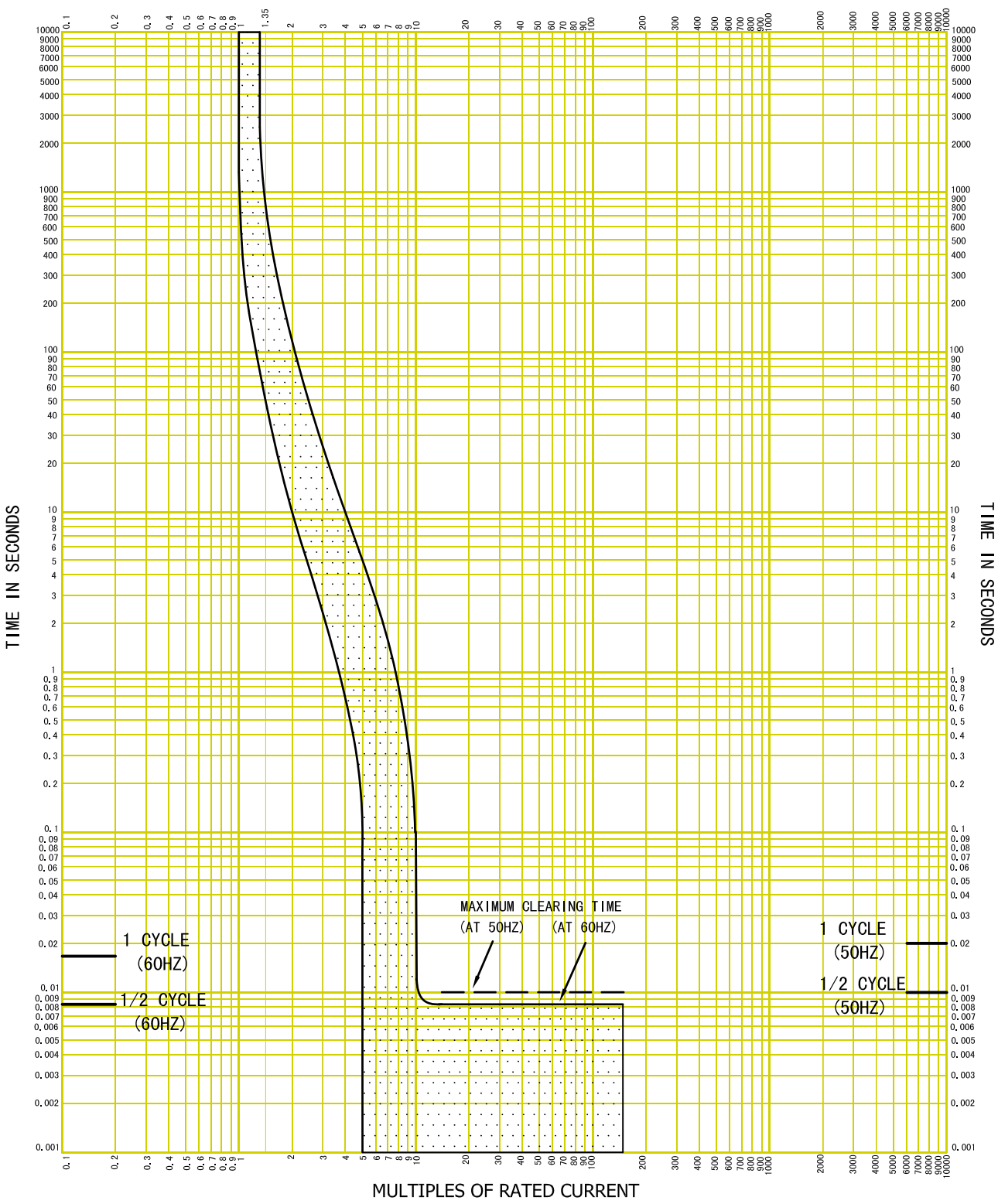
Rated Current:50A
Rated Voltage:1P, 2P-120/240Vac
2P, 3P-240Vac
Frequency:50/60Hz
Operation Temperature:25±3℃

Curve 70-10



Rated Current:60A
Rated Voltage:1P, 2P-120/240Vac
2P, 3P-240Vac
Frequency:50/60Hz
Operation Temperature:25±3℃

Curve 70-11



10 Ambient Temperature Rating

Our thermal-magnetic circuit breakers are designed, built and calibrated for use on 50/60 Hz ac systems in a 104° F (40° C) ambient temperature to meet the requirements of UL 489 and the Canadian Standards Association. Time/current characteristic trip curves are drawn from actual test data that meets UL 489 testing requirements.

The ambient temperature is the temperature of the air surrounding the circuit breaker. Thermal-magnetic circuit breakers are temperature-sensitive devices, and their rated continuous current carrying capacity is based on a UL specified 104° F (40° C) calibration temperature. The ambient temperature can affect the performance characteristics of the circuit breaker. Thus, when applying a circuit breaker at temperatures other than 104° F (40° C), it is necessary to determine the circuit breaker's actual current carrying capacity under this condition. It may be necessary to rerate the circuit breaker to compensate for these ambient conditions. See Figure 3:

Thermal-magnetic circuit breakers use bimetal strips that bend in response to temperature changes. Current flowing through the circuit breaker creates most of the heat that causes the tripping action. The ambient temperature surrounding the circuit breaker either adds to or subtracts from this available heat. Conductors are sized using the ampacity rerating factors shown on the bottom of NEC Table 310-16 when designing systems for ambient temperatures other than 40° C.

Rerating of Thermal-magnetic Circuit Breakers for Ambient Conditions

UEB1-70 thermal-magnetic circuit breakers are to be applied in ambient temperatures within the range of 14° F to 140° F (-10° C to 60° C). Use the following rerating guidelines:

• Ambient Temperatures Between 77° F and 104° F (25° C and 40° C):

— No rerating is necessary.

• Ambient Temperatures Between 14° F and 75° F (-10° C and 24° C):

— Thermal-magnetic circuit breakers operating within this ambient temperature range will carry more than their continuous current rating without tripping. Conductor and equipment damage can result if they are not in the same low ambient environment as the circuit breaker.

— Nuisance tripping will not be a problem. However, if closer protection of the equipment and conductor is required, the increased current carrying capacity of the circuit breaker at the lower ambient temperature should be taken into consideration.

• Ambient Temperatures Between 106° F and 140° F (41° C and 60° C):

— Thermal-magnetic circuit breakers operating within this ambient temperature range will carry less than their continuous current rating and must be carefully selected to prevent nuisance tripping.

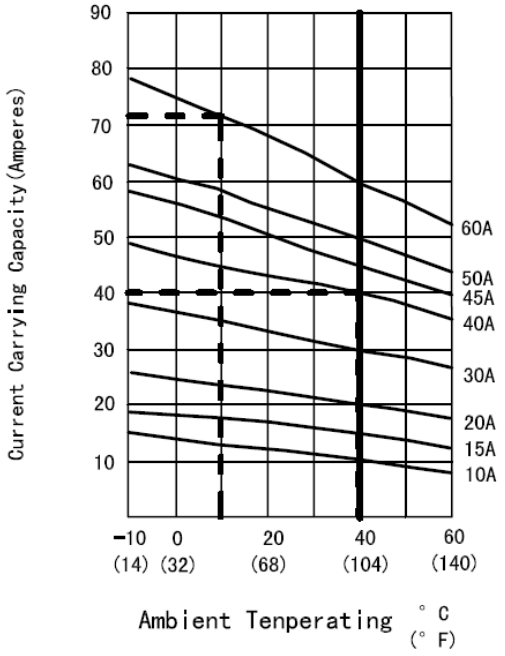
To determine the continuous current carrying capacity of a thermal-magnetic circuit breaker at an ambient temperature other than 104° F (40° C), perform the following steps:

1. Choose the ambient rerating curve in Figure 3 for the specific amperage rating of the circuit breaker you wish to apply. Note that the curve crosses the 104° F (40° C) ambient temperature line at the circuit breaker's rated continuous current carrying capacity (Circuit Breaker Handle Rating on the curve).

2. Follow this curve to the appropriate ambient temperature.

3. Read the adjusted continuous current carrying capacity at this point (on the left axis).

Figure 3: Ambient Rerating of UEB1-70 Circuit Breaker



4. Add in any other applicable factors, such as continuous loading, per the NEC requirement.

For example, Figure 3 shows the ambient rerating curves for UEB1-70 miniature circuit breakers. What is the continuous current capacity of a 40 A circuit breaker applied at 104° F (40° C)? A 60 A circuit breaker at 50° F (10° C)?

By finding 40° C on the horizontal axis and reading up to the 40 A curve, you find that the circuit breaker will carry 40 A, which is its rated current carrying capacity. If the circuit breaker will be used on a continuous load (defined as three hours or more), Section 210-20(a) of the 2005 NEC requires that loading not exceed 80% of the rating. Here, 40 A x .80 = 32 A.

Locate 50° F (10° C) on the horizontal axis and move straight up to the 60A curve. The circuit breaker will carry 72 A. Again, if the circuit is used on a continuous load, it must be applied at 80% of its rating. In this example the equation is 72 A x .80 = 57.6 A.

As explained in Section 210-20(a) of the NEC:

"Where a branch circuit supplies continuous loads or any combination of continuous and noncontinuous loads, the rating of the overcurrent device shall not be less than the noncontinuous load plus 125 percent of the continuous load.

"Exception: Where the assembly, including the overcurrent devices protecting the branch circuit(s), is listed for operation at 100 percent of its rating, the ampere rating of the overcurrent device shall be permitted to be not less than the sum of the continuous load plus the noncontinuous load."

11 Frequency Rating

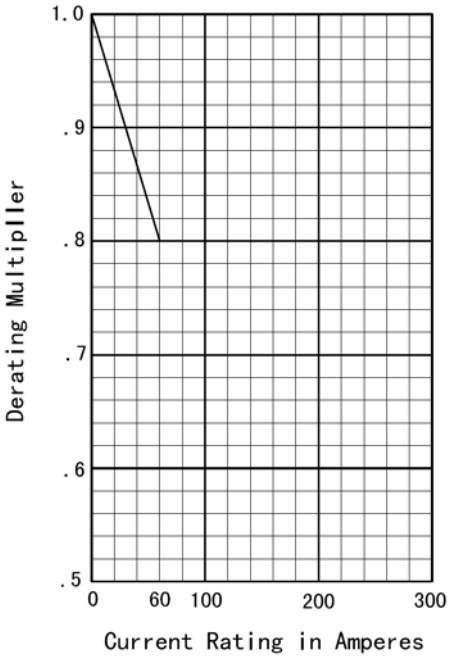
The standard-rated frequency for circuit breakers is 60 Hz, but UEB1-70 circuit breakers can be applied on 50 Hz systems without thermal or magnetic rerating. Other frequencies can affect the thermal, magnetic and short-circuit tripping characteristics of circuit breakers.

Applying thermal-magnetic circuit breakers at frequencies above 50/60 Hz requires special consideration of the effects of high frequency on circuit breaker tripping characteristics. Thermal and magnetic operations must be treated separately.

Thermal Tripping Performance at High Frequency

At frequencies below 60 Hz, the thermal rerating of thermal-magnetic circuit breakers is negligible. However, at frequencies above 60 Hz, thermal rerating is required. High-frequency operation causes abnormal heat rise in the current-carrying parts because of the skin effect.

Figure 4: Frequency Rerating of UEB1-70 Circuit Breaker at 400 Hz



One of the most common high-frequency applications is at 400 Hz. Figure 4 indicates the thermal rerating multiplier to be used with each circuit breaker family when applied on 400 Hz systems.

When applying a 60 A UEB1-70 circuit breaker on a 400 Hz system, the circuit breaker's current carrying capacity is as follows:

• Non-continuous Loads (less than three hours): Using Figure 4, the UEB1-70 circuit breaker may be applied at .85 of rating, or 51 A.

• Continuous Loads (three hours of more): NEC Article 210-20(a) requires that standard circuit breaker loading does not exceed 80% of the circuit breaker's rating when used for continuous loads. Therefore, the current carrying capacity of a 60 A UEB1-70 circuit breaker operating under continuous load at 400 Hz would be 60 A x .78 x .80 = 40.8A.

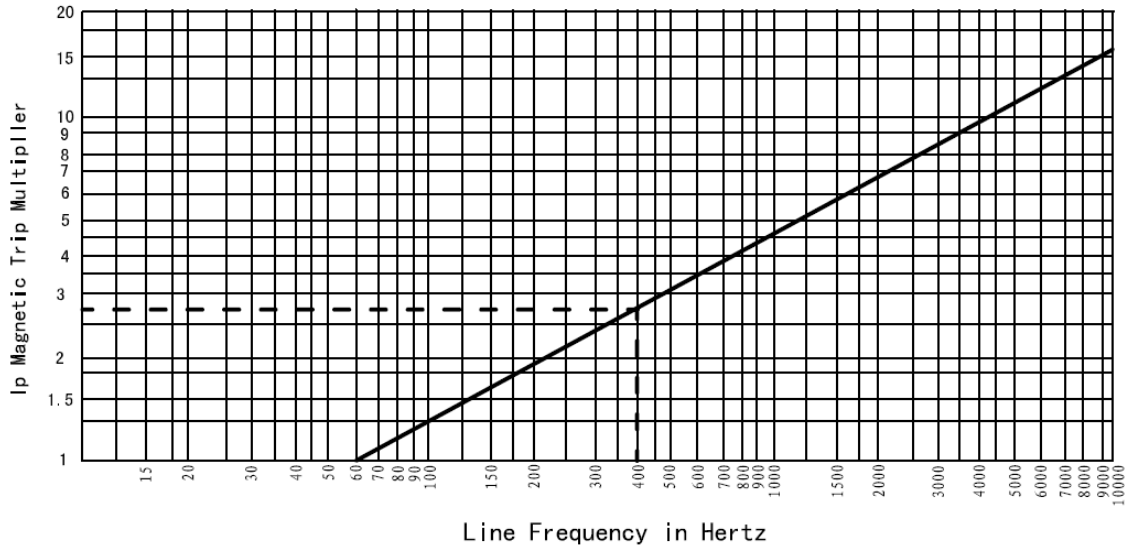
Interrupting Rating (AIR) at 400 Hz.

At frequencies above 60 Hz, the interrupting rating of thermal-magnetic circuit breakers is less than the 60 Hz interrupting rating. Unless specifically marked for use of 400 Hz systems, the interrupting rating of UEB1-70 circuit breakers is reduced to 1/10th of the 60 Hz interrupting rating.

Magnetic Tripping Performance

At frequencies above 60 Hz more current is necessary to magnetically trip a circuit breaker than at 60Hz. Fig. 3 shows the multipliers of 60 Hz current that it takes to instantaneously trip a circuit breaker when applied at various frequencies. For example, at 60 Hz, it takes 300 A or more to magnetically trip a 60 A UEB1-70 circuit breaker per trip curve 70-11(page 14). At 400 Hz, it takes 780 A (2.6 multiplier) or more to magnetically trip the same circuit breaker.

Figure 5: 60 Hz Current Multiplier



12 Notes

12.1 Tightening torque for M5 screw: 2.5N·m～3.0 N·m.

12.2 Tightening torque for M8 screw: 3.5N·m～4.5 N·m。

12.3 If terminal are used for wire connection, the male terminal and female terminal must contact reliably with each other.

12.4 If your application environment is different from the abovementioned in this technical specification, please communicate with us before you use our product.