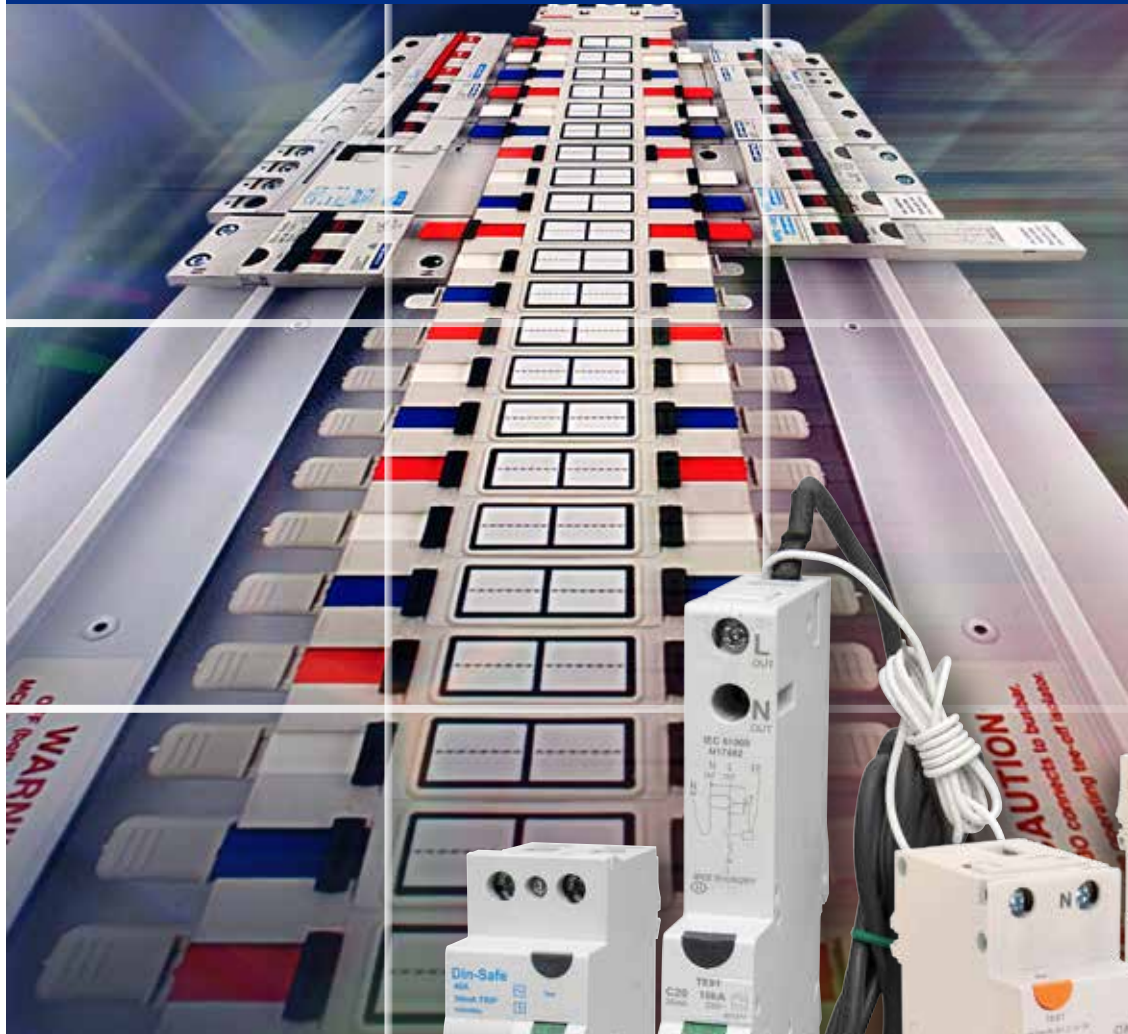




# MINIATURE CIRCUIT BREAKERS & RESIDUAL CURRENT DEVICES

Easy Selection Guide



**Miniature Circuit Breakers (MCBs)** provide short circuit and overload protection for circuits traditionally up to 125A.

**Residual Current Devices (RCDs)** are devices “intended to isolate supply to protected circuits, socket-outlets or electrical equipment in the event of a current flow to earth that exceeds a predetermined value” – AS/NZS 3000 1.4.80.

**Residual Current Breaker with Over-Current Protection (RCBOs)** are devices that combine both the performance of a MCB and RCD for circuits traditionally up to 40A.

### STEP 1: MCB, RCD or RCBO?

# step 1



MOD6

DIN-T

The DIN-T and MOD6 MCBs are current limiting type. That is, a circuit breaker with sufficiently short trip time to prevent the short-circuit current from reaching the peak value defined by B, C and D curves.

The RCDs described in this quick selection guide are fixed setting RCDs complying with AS/NZS 3190, AS/NZS 61008.1 or AS/NZS 61009.1 and intended for use in fixed installations. RCDs are also referred to as **RCCBs (Residual Current Circuit Breakers)**. Refer to the FAQ section for more information on RCDs.

RCBOs have two functions:

- To provide protection against overload currents and short circuits.
- To provide protection against earth leakage currents.

### STEP 2: What is the number of poles?

A range of 1, 2, 3 and 4 pole MCBs and RCDs are available.

Note: This is not referring to the width of the device

You need to select the appropriate number of poles to provide the necessary protection.

# step 2

	USE	APPLICATION EXAMPLES
1 Pole	Single phase circuits.	240V power circuits.
2 Pole	Connection to active and neutral conductor OR Connection to two active conductors if device is suitably rated.	RCDs require connection to both phase and neutral as a minimum.
3 Pole	Three phase circuits with no neutral.	3-Phase Induction Motors.
4 Pole	Three phase circuits with neutral.	General three phase power distribution.

**STEP 3: What is the current rating requirement?**

step 3

**MCBs:**

As per the AS/NZS 3000 wiring rules, the current rating of circuit-breakers ( $I_N$ ) should not be greater than the cable current-carrying capacity ( $I_Z$ ). It should also be greater than or equal to the maximum current that the system is expected to carry ( $I_b$ ).

**I.e.  $I_b \leq I_N \leq I_Z$  OR Maximum full-load current in the system  $\leq$  MCB Current Rating  $\leq$  Cable Rating**

**RCDs:**

The load current rating of an RCD shall NOT be less than

- (a) The maximum demand of the portion of the electrical installation being protected by the device; or
- (b) The highest current rating of any overload protective device on the portion of the electrical installation being protected.

**STEP 4: What is the voltage of the network?**

step 4

The nominal voltage for the DIN-T and MOD6 devices is 240V/415V.

Other voltages may be allowed including DC voltages – however please check the technical data for each item in question.

For example: Most DIN-T MCBs can operate with a voltage between 12VAC – 440VAC.

Whereas, the DIN-T RCDs require 230/400 VAC in order for the test circuit to operate correctly.

A dedicated DC range of DIN-T MCBs is also available (up to 880 VDC).

Please note these are polarity sensitive.

**STEP 5: What minimum breaking capacity is required?**

step 5  
MCB specific

As per AS/NZS 3000 2.5.2 – Protective devices providing protection against both overload and short circuit current shall be capable of breaking any overcurrent up to and including the prospective short-circuit current at the point where the device is installed.

The prospective short-circuit current is the maximum amount of current which can exist in a given electrical system under short-circuit condition.

The MOD6 range is available with short circuit breaking capacity of 6kA.

DIN-T is available with short circuit breaking capacity from 6kA to 50kA.

**STEP 6: What MCB curve type is required?**

step 6  
MCB specific

The curve type describes the trip time with respect to current (expressed as a multiple of the nominal current ( $I_N$ )) – see figure 1 below.

**The NHP DIN-T range offers 3 different types:**

<b>B CURVE</b>	3-5x $I_N$	Suitable for resistive loads such as electrical heating, water heater and stoves and long cable runs (fault loop impedance).
<b>C CURVE</b>	5-10x $I_N$	Suitable for common loads such as lighting, socket outlets, small motors.
<b>D CURVE</b>	10-20x $I_N$	Suitable for high inrush loads and transformers.

**Note:** 1) The MOD6 series is limited to C curve type MCBs.

For more information please refer to NHP Catalogue Part C Section 3.

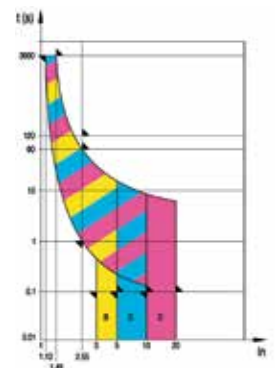






Figure 1: Tripping curves according to AS/NZS 60898

# step 7

RCD specific

## STEP 7: What RCD type?

Different types of RCDs are available differentiated by their behaviour in the presence of AC and/or DC current and time-delay.

TYPE	DESCRIPTION	USE	
AC 	<b>Type AC</b> RCDs are designed to operate when residual sinusoidal alternating currents are detected.	These type of RCDs are ideal for circuits containing AC operated equipment – general purpose applications.	The DIN-T RCDs and RCBOs are available with type AC.
A 	<b>Type A</b> RCDs are designed to operate on both residual sinusoidal alternating current and residual pulsating direct currents.	This type of RCD is ideal for use with circuits containing both AC and DC operated equipment	The DIN-T and MOD 6 range of RCDs and RCBOs offer Type A.
S 	<b>Type S</b> RCDs contain a built in time delay of 40ms serving the purpose of “vertical selectivity”.	This type of RCD is designed to be installed upstream of RCDs with lower residual operating current in order to provide full personnel protection and ensure the service in the installation in case of earth leakage in one of the downstream circuits as well as avoiding unwanted nuisance tripping due to harmonics or high inrush currents.	The DIN-T DSRCD series offers S type RCDs.
B 	<b>Type B</b> RCDs ensure tripping as described for type A RCDs as well as: i. Residual sinusoidal alternating currents up to 1000Hz. ii. Residual alternating currents or pulsating direct currents superimposed on a smooth direct current current of 0.4 times the rated residual current. iii. Residual direct currents that may result from rectifying circuits.	This type of RCD is further application specific such as solar inverters, data centres and even Electric vehicle recharging.	The DIN-T DSRCD series offers B type RCDs in 4 pole (3P+N) version only.

*Note: Where applicable, extract from AS/ NZS 3000 wiring rules states “In New Zealand, an RCD shall be of the type for which tripping is ensured for residual alternating current and residual pulsating direct current” i.e. Type A RCDs.*

# step 8

RCD specific

## STEP 8: What trip sensitivity is required?

The trip sensitivity (Rated Residual Operating Current) of the RCD is the minimum level of earth leakage current required to operate the device. The selection of the trip sensitivity needs to take into account the purpose of the RCD.

10mA RCDs may be used in areas of increased risk such as circuits supplying outdoor equipment, bathrooms, kindergartens and hospitals. However, the standing leakage current from appliances may cause nuisance tripping.

30mA trip sensitivity is the minimum requirement for providing personnel protection whereas RCDs with lower trip sensitivity (ie. 100mA or above), may be selected to avoid unwanted nuisance tripping when installing the RCD for the purpose of equipment protection or protection against fire hazards due to persistent earth fault currents not tripping the overcurrent protective device.

Please refer to AS/NZS 3000 for further details.

# step 9

## STEP 9: Select the NHP Brand:

The differences in the brand type shown below vary based on features, accessories and options available. Based on the answers to the previous steps, the required brand may already be predetermined.





### Product Features:



FEATURES		MOD6 MCBs & RCDs	DIN-T MCBs & RCDs
Application	Domestic	✓	–
	Commercial	✓	✓
	Industrial	–	✓
Typical 1P width		18mm <sup>2</sup>	18mm <sup>2</sup>
Mounting		DIN rail	DIN rail
Breaking Capacity	6kA	✓	✓
	10kA	–	✓
	15kA – 50kA	–	✓
Current rating	Up to 63A	✓	✓
	Up to 100A	–	✓
	Up to 125A	–	✓
MCB Curve Type	B	–	✓
	C	✓	✓
	D	–	✓
RCD Type	AC	–	✓
	A	✓	✓
	S	–	✓
	B	–	✓
RCD Trip Sensitivity (Rated Residual Operating Current)	10 mA	–	✓
	30 mA	✓	✓
	100 mA	–	✓
	300 mA	–	✓
	500 mA	–	✓
NHP Chassis	CD	–	✓
	MOD6	✓	✓
	NC	–	✓
	GB	–	✓
Accessories		* Limited	*Extensive Range

## MCB Product Overview:

# MCB

	MOD6	DIN-T		
				
	<b>MOD6</b>	<b>DIN-T6</b>	<b>DIN-T10</b>	<b>DIN-T15</b>
<b>Standard (AS/NZS) <sup>1)</sup></b>	60898	60898	60898	60947-2
<b>No. poles &amp; module width</b>				
1P	18 mm	18 mm	18 mm	18 mm
2P	36 mm	36 mm	36 mm	36 mm
3P	54 mm	54 mm	54 mm	54 mm
4P	–	–	72 mm	72 mm
<b>Mounting</b>	DIN rail	DIN rail	DIN rail	DIN rail
<b>Current ratings</b>	6 A-63 A	2 A - 63 A	0.5 A - 63 A	0.5 A - 63 A
<b>Short circuit rating (kA)</b>	6 kA	6 kA	10 kA	15 kA - 50 kA
<b>Curve types</b>	C	C & D	B, C & D	C
<b>Rated AC voltage 1P/2,3,4P</b>	240/415 V	240/415 V	240/415 V	240/415 V
<b>Rated DC voltage</b>	48 V 1P 110 V 2P <sup>2)</sup>	48 V 1P 110 V 2P <sup>2)</sup>	48 V 1P 110 V 2P <sup>2)</sup>	48 V 1P 110 V 2P <sup>2)</sup>
<b>Sealable in ON-Off position</b>	Yes	Yes	Yes	Yes
<b>Terminal size- On-top</b>	25 mm <sup>2</sup>	35 mm <sup>2</sup>	35 mm <sup>2</sup>	35 mm <sup>2</sup>
<b>Terminal size- OFF-bottom</b>	25 mm <sup>2</sup>	35 mm <sup>2</sup>	35 mm <sup>2</sup>	35 mm <sup>2</sup>

### Notes:

- 1) UL listed MCB refer to NHP.
- 2) Poles connected in series.

DIN-T			
			
<b>DIN-T10H</b>	<b>DIN-T 2-in-1</b>	<b>DIN-T DC</b>	<b>DIN-T Easy-Fit</b>
60947-2	60898	60898	60898

27 mm	18 mm	18 mm	18 mm
54 mm	18 mm	36 mm	-
81 mm	36 mm	-	54 mm
108 mm	36 mm	81 mm	-
DIN rail	DIN rail	DIN rail	DIN rail
80 A-125 A	2 A-40 A	0.5 A-63 A	6 A-63 A
7.5 kA - 10 kA	6 kA	6 kA	6 kA
C & D	C	B & C	C
240/415 V	240/415 V	240/415 V	240/415 V
125 V 2P 250 V 4P <sup>2)</sup>	-	250 V 1P 500 V 2P 880 V 4P <sup>2)</sup>	48 V 1P 110 V 2P <sup>2)</sup>
No	No	Yes	Yes
70 mm <sup>2</sup>	16 mm <sup>2</sup>	35 mm <sup>2</sup>	4 mm <sup>2</sup> 6 A-20 A 35 mm <sup>2</sup> 25 A - 63 A
70 mm <sup>2</sup>	16 mm <sup>2</sup>	35 mm <sup>2</sup>	35 mm <sup>2</sup>

## RCD Product Overview:



# RCD

	MOD6			DIN-SAFE	
					
	<b>MOD6 MOD6RCCB</b>	<b>MOD6 MOD6RCBO1<sup>3)</sup></b>	<b>MOD6 MOD6RCBO2</b>	<b>DIN-Safe DSRCD</b>	<b>DIN-Safe DSRCBS<sup>3)</sup></b>
<b>Standard (AS/NZS)<sup>1)</sup></b>	61008-1	61009-1	61009-1	61008	61009
<b>No. poles &amp; module width</b>	2P - 36 mm 4P - 72 mm	1P + N - 18 mm	2P - 36 mm	2P - 36 mm 4P - 72 mm	1P + N - 18 mm
<b>Mounting</b>	DIN rail	DIN rail	DIN rail	DIN rail	DIN rail
<b>Current ratings</b>	40 A / 63 A	10 A / 16 A / 20 A 25A / 32 A	10 A / 16 A 20 A / 25A / 32 A	40 A / 63 A / 80A 100 A / 125 A	6 A / 10 A 16 A / 20 A 25A / 32 A
<b>Trip sensitivity</b>	30 mA	30 mA	10 mA / 30 mA	30 mA / 100 mA 300 mA / 500 mA	30 mA
<b>Sensitivity type</b>	A	A	A	AC, A, AI, S & B	AC & A
<b>Short circuit rating</b>	–	6 kA	6 kA	Inc -10 kA MCB or fuse backup	6 kA
<b>Curve types</b>	–	C	C	–	B & C
<b>Rated AC voltage 1P/2,3,4P</b>	240/415 V	240 V	240 V	240/415 V	240 V
<b>Sealable in ON-Off position</b>	Yes	Yes	Yes	Yes	No
<b>Terminal size - On-top</b>	50 mm <sup>2</sup>	25 mm <sup>2</sup>	25 mm <sup>2</sup>	50 mm <sup>2</sup>	16 mm <sup>2</sup>
<b>Terminal size - OFF-bottom</b>	50 mm <sup>2</sup>	25 mm <sup>2</sup>	25 mm <sup>2</sup>	50 mm <sup>2</sup>	35 mm <sup>2</sup>

### Notes:

- 1) UL listed MCB refer to NHP.
- 2) DSRCB-P with pigtail version available, however is of unswitched neutral type.
- 3) Unswitched neutral.



DIN-SAFE			
			
<b>DIN-Safe DSRCBH<sup>3)</sup></b>	<b>DIN-Safe DSRCB<sup>2)</sup></b>	<b>DIN-Safe DSRCM</b>	<b>DIN-Safe Easy-fit</b>
61009	61009	3190	61008
1P + N - 18 mm	2P - 36 mm	1P + N 3P, 3P + N	2P - 36 mm 4P - 72 mm
DIN rail	DIN rail	DIN rail	DIN rail
6 A / 10 A / 16 A 20 A / 25 A 32 A / 40 A	6 A / 10 A 16 A / 20 A / 25 A 32 A / 40 A	32 A / 63 A	40 A / 63 A
10 mA / 30 mA 100 mA	10 mA / 30 mA	30 mA / 100 mA 300 mA	30 mA
A	AC & A	AC	AC
10 kA	10 kA	-	Inc -10 kA MCB or fuse backup
C & D	C	-	-
240 V	110/240 V	240/415 V	240/415 V
Yes	Yes	No	Yes
25 mm <sup>2</sup>	25 mm <sup>2</sup>	16 mm <sup>2</sup>	50 mm <sup>2</sup>
35 mm <sup>2</sup>	35 mm <sup>2</sup>	16 mm <sup>2</sup>	50 mm <sup>2</sup>

## MCB - Frequently Asked Questions:

# MCB



**Q:** Where do I find the trip times for overcurrent and short circuit current for the MCBs?

**A:** Refer to Part C Section 3 for DIN-T and MOD6 Price List for MOD6 MCBs.

**Q:** Can the DIN-T accessories be used in conjunction with the MOD6 range?

**A:** No, most accessories are exclusive to a specific range.

**Q:** Can the MOD6 MCBs and RCDs connect to a standard chassis within a Concept panelboard?

**A:** No, MOD6 MCBs and RCDs can only be fitted to the MOD6 chassis featured within a MOD6 panelboard.

**Q:** Can multiple single pole MCBs be used to protect 3 phase circuits?

**A:** No, a 3 phase MCB is required to be used on a 3 phase circuit.

## RCD/RCBO - Frequently Asked Questions:

# RCD / RCBO



**Q:** Why does a RCBO or RCD feature a black lead?

**A:** This is a neutral lead designed to pick up the line side neutral. This is a time saving feature, especially when fitting units into load centres.

**Q:** Why does a RCBO unit have a white lead? (eg. DSRCBS, DSRCBH, MOD6RCBO1)

**A:** This is an earth reference lead. This is a backup in case of loss of neutral. The RCD function is disabled without a voltage reference if the neutral is lost.

**Q:** Why is the earth lead white?

**A:** This is not an earth. The white lead is only a voltage reference "functional earth" for the operation of the electronics of the RCD which is common in 1 pole width RCBOs.

**Q:** Do we have to connect the white wire "lead"?

**A:** The unit will still operate with the earth reference disconnected. However, if the neutral is lost with the white lead disconnected the unit will not trip on an earth leakage.

**Q:** Is the product covered under warranty if the earth reference lead is removed?

**A:** If the earth reference lead is removed from the device on the product has been altered from the Manufacturer's Specification then warranty is NOT VALID.

## RCD/RCBO - Frequently Asked Questions:

# RCD / RCBO



**Q:** Can I fit auxiliary contacts to MOD6 devices?

**A:** No! The MOD6 family does not have any auxiliary/alarm options. Din-T accessories cannot be fitted to MOD6 devices.

**Q:** I have a 20A RCBO running at 6A but the unit still trips?

**A:** When selecting a RCBO the earth leakage current of the end devices needs to be considered not just the load current. Typically a RCD device should be designed to run at not more than 1/3 of its rating e.g: 30mA device normally run at 10mA or less.

Device	Typical leakage current
Computer	1.5 mA
Fluorescent light	0.5 mA
Printer	0.8 mA

Approximate values only, as leakage will vary from device to device, brand to brand.

**Q:** What is the tripping time for general type 30mA RCDs as per standards AS/NZS 61009 & AS/NZS 61008?

**A:** As per the table below:

Test leakage current	Tripping times
$I_{\Delta n}$ 30 mA	$\leq 300$ ms
$I_{\Delta n}$ 60 mA	$\leq 150$ ms
$I_{\Delta n}$ 150 mA	$\leq 40$ ms

**Q:** When does the RCD need to switch the neutral conductor in accordance with New Zealand regulation?

**A:** According to the Electricity (Safety) Regulations 2010 (reprint as at 1 February 2014) RCDs are required to switch all live conductors (e.g active and neutral conductors) when an RCD is installed to protect against electric shock.

This includes installations where RCDs are installed for protection against electric shock to patients (during patient treatment) and children as per AS/NZS 3000.

The DSRCB (without pigtail) and MOD6RCBO2 RCBOs along with 2P and 4P DIN-T and MOD6 RCDs switch the neutral pole.

**Q:** When testing the RCD/RCBO with an external tester the unit doesn't trip?

**A:** Disconnect any loads as they will affect the results of the test. Check connections.

### Did you know?

10mA RCDs complying to AS/NZ 61009.1 are required to have a fixed tripping time of 40 msec. 10 mA RCDs/ RCBOs also referred to as Type 1 RCDs are used in high risk applications such as hospitals, kindergartens, day care centres etc. Also refer to AS/ NZS 3000 and local distribution codes for further details.



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