

TYPE TNS-2 OCR CHECKER
FOR
ELECTRONIC MCCBs
INSTRUCTION MANUAL

Applicable breaker types: **TemBreak**
TemBreak2

<p>Notice Please retain this manual for future reference.</p>



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The type TNS-2 OCR checker facilitates on-site testing of the OCR (overcurrent release) installed on electronic MCCBs, *TemBreak* and *TemBreak2*. Carefully read this manual to ensure proper use of the OCR checker.

1. SAFETY NOTICES

Thank you for purchasing the type TNS-2 OCR checker.

This chapter gives you the important information on safety. Prior to the use of the Type TNS-2 OCR Checker, be sure to thoroughly read this and subsequent chapters of this instruction manual and all the other documents that come with this product. To ensure the proper use, gain the full knowledge of the OCR checker and familiarize yourself with all the safety information and precautions. This chapter classifies the following safety precautions as “ CAUTION”, which indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury, or otherwise may result in physical property damage only. A failure in observing any instruction given under “ CAUTION” might lead to a more serious result depending on the situation. Be sure to observe these instructions, all of which include very important information.

CAUTION

- Common to transportation, operations, and storage
 - Do not store the OCR checker in an abnormal environment where it is exposed to high temperature, high humidity, excessive dust, corrosive gas, vibrations, shocks, or any other similar condition. Avoid direct sunlight and maintain the ambient temperature in a range between -20°C and 55°C and relative humidity in a range between 45% and 85% (without condensation). Otherwise, a failure may result.
- Transportation
 - Do not drop the OCR checker, nor give a shock to it. The OCR checker is an electronic product requiring careful handling. Improper handling will result in a failure.
- Operations
 - The test using the OCR checker shall be performed by a qualified operator who has the necessary expertise. The operator shall be familiar with the knowledge, safety information, and precautions on moulded case circuit breakers, OCRs, and OCR checkers. Improper handling may lead to an unexpected accident.
 - Before testing an OCR, be sure to make preparations for the test in accordance with Chapter 4. Preparation Before the Test. Otherwise, undesired tripping or a failure may result.
 - To insert the power plug into or remove it from the OCR checker, or to insert the signal plug into or remove it from the OCR, be sure to check in advance that the OCR checker is OFF. Otherwise, a failure may result.
 - To use each switch located on the OCR checker, press it with your finger at a force of 2~4 N. Using excessive force or a sharp-tipped hard tool can cause a failure.
 - Be sure to determine the current flowing through the OCR before using the OCR checker to test the OCR. An excessive current may result in damage to the OCR.
 - After the test, be sure to put the set values on the OCR back to the previous ones. Otherwise, fire or undesired tripping may occur.

2. Ratings and Specifications

Tables 1 and 2 show the ratings and specification of the OCR checker.

Table 1 Rating and specification 1 of the type TNS-2 OCR checker

Item	Description
Applicable breakers	Electronic breakers TemBreak and <i>TemBreak2</i>
Rated voltage	Specify either 100 – 120 VAC or 200 – 240 VAC (both 50/60 Hz) when placing an order.
Power consumption	7 VA
External dimensions of main unit	W250 mm × H85 mm × D160 mm
Weight of main unit	400 kg
Force for pressing a switch	2 – 4 N
Allowable ambient temperature	–5 to 40°C during use, –20 to 55°C during storage
Allowable humidity	During use and storage: RH 45% – 85%
Accessories	Power cord with AC adaptor (approx. 2 m) <ul style="list-style-type: none"> With 2P-to-3P conversion plug (for 100 – 110 VAC) SE type (for 200 – 240 VAC) Signal cable (approx. 2 m) <ul style="list-style-type: none"> For TemBreak (approx. 2 m) For <i>TemBreak2</i>: 250AF (approx. 2 m) 400AF (approx. 2 m)

Table 2 Rating and specification 2 of the type TNS-2 OCR checker

Item	Description		
Measurable OCR functions			
* For ① through ⑪, see the following “Output for signals” rows.			
	<i>TemBreak</i>	<i>TemBreak2</i>	
	<ul style="list-style-type: none"> ● Pickup current value for long time delay trip function ① ● Trip time setting value for long time delay trip function ②⑧ ● Trip current setting value for short time delay trip function ③ ● Trip time setting value for short time delay trip function ④⑨ ● Trip current setting value for instantaneous trip function ⑤ ● Trip current setting value for ground fault trip function ⑥ ● Trip time setting value for ground fault trip function ⑦⑨ 	<ul style="list-style-type: none"> ● Pickup current value for long time delay trip function ①⑨ ● Trip time setting value for long time delay trip function ②⑧⑩ ● Trip current setting value for short time delay trip function ③⑧ ● Trip time setting value for short time delay trip function ④⑧⑩ ● Trip current setting value for instantaneous trip function ⑤⑧ ● Trip current setting value for ground fault trip function ⑥⑨ ● Trip time setting value for ground fault trip function ⑦⑨⑪ 	
Output for signals	Output signal value setting range	① 0-140mA ② 0-750mA ③ 0-750mA ④ 0-800mA ⑤ 0-800mA ⑥ 0-140mA ⑦ 0-140mA	① 0-200mA ② 0-750mA ③ 0-1450mA ④ 0-1450mA ⑤ 0-1450mA ⑥ 0-140mA ⑦ 0-140mA
	Accuracy of output signal value	±1% (at 100 mA)	±1% (at 100 mA)
	Output method	Full-wave rectification	⑧ Half-wave rectification ⑨ Full-wave rectification
	Output time measurement range	0.00–999 sec	0.00–999 sec
	Output time measurement accuracy	⑧ 0.00 – 99.9 sec: 0.1 sec or ±1%, whichever is greater 100 – 999 sec: 1 sec or ±1%, whichever is greater ⑨ 0.1 sec or ±1%, whichever is greater	⑩ 0.00 – 99.9 sec: 0.1 sec or ±1%, whichever is greater 100 – 999 sec: 1 sec or ±1%, whichever is greater ⑪ 0.1 sec or ±1%, whichever is greater

3. Parts Names and Functions

Parts names and functions of the OCR checker are given below. Figs. 1 and 2 show the appearance of the OCR checker.

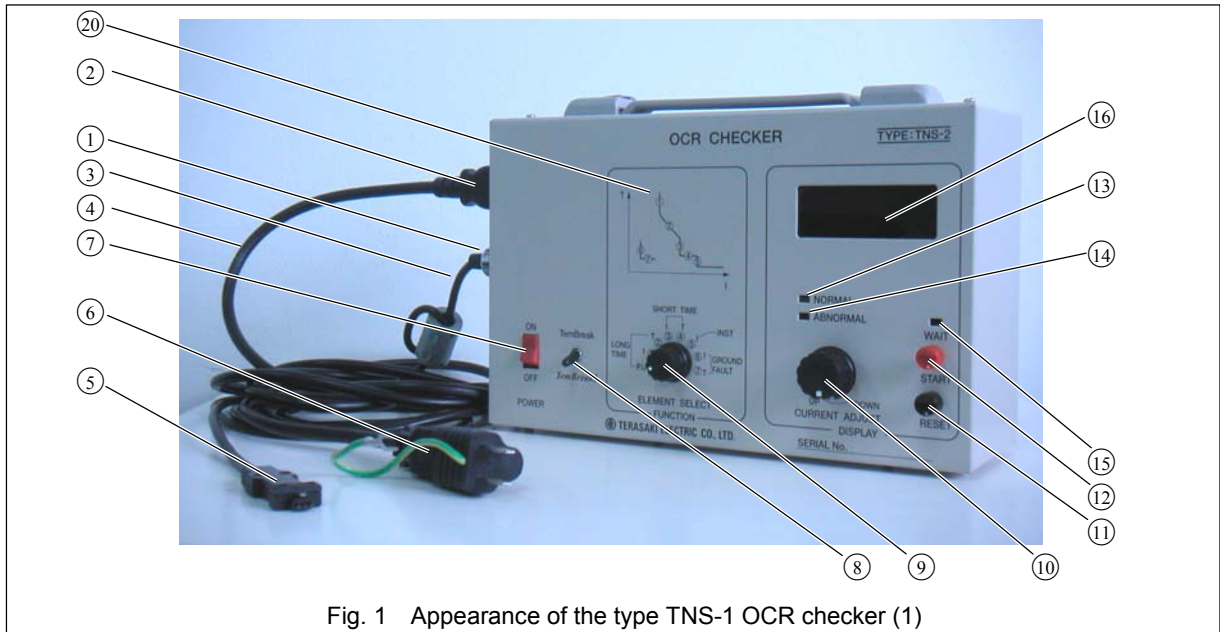


Fig. 1 Appearance of the type TNS-1 OCR checker (1)

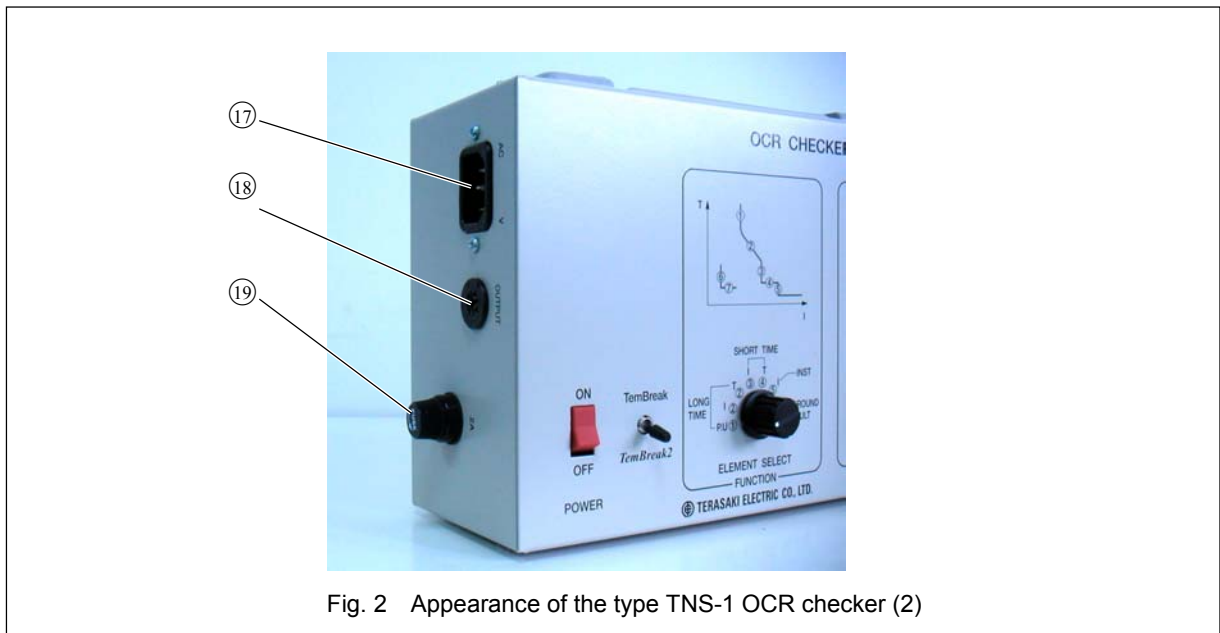
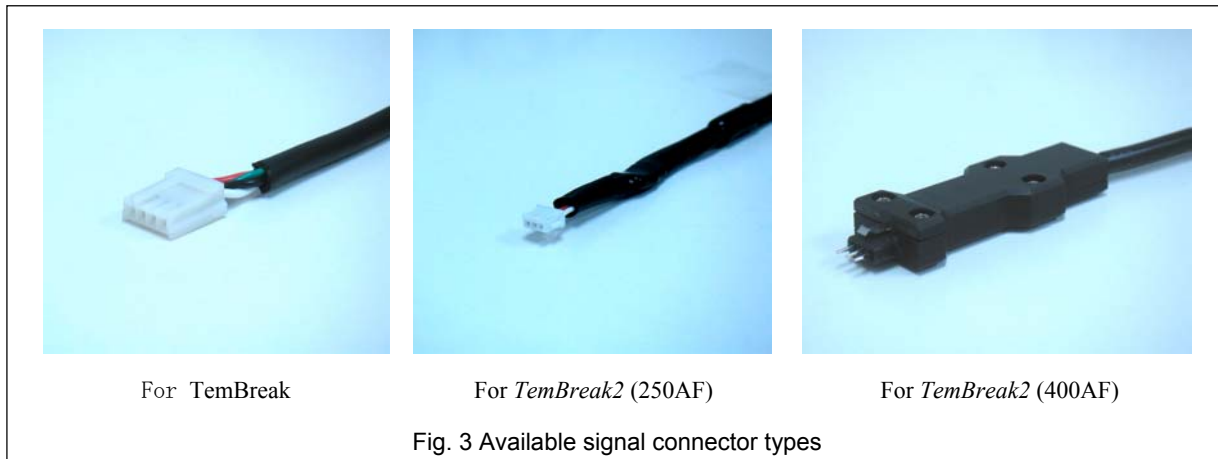


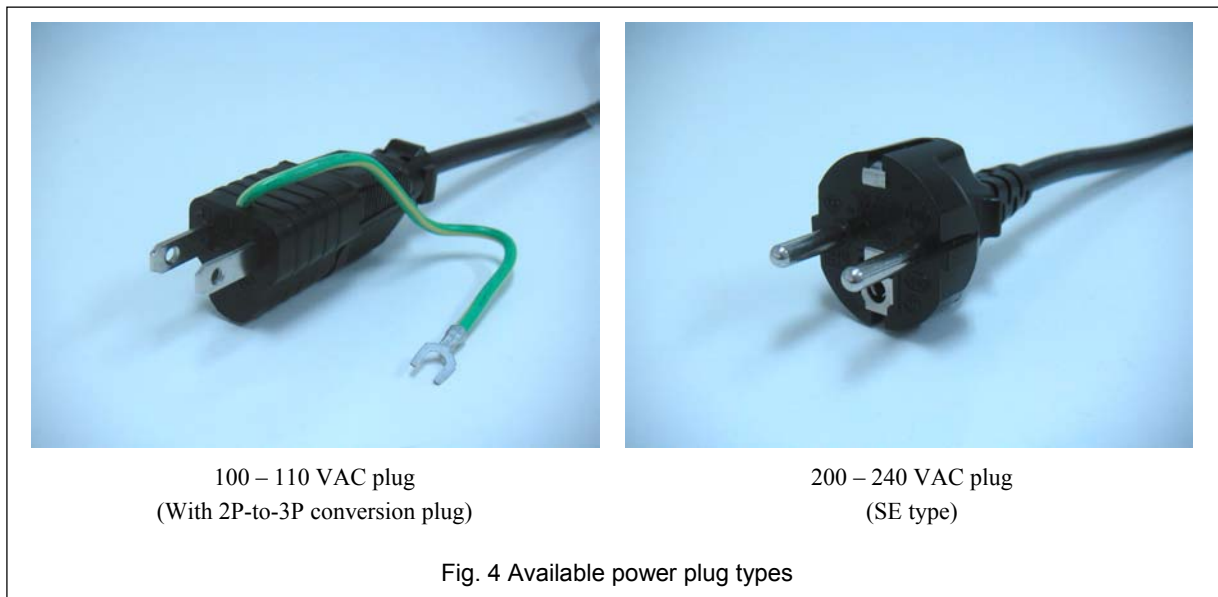
Fig. 2 Appearance of the type TNS-1 OCR checker (2)

- ① Signal connector (round type): A signal cable connector for the OCR checker
- ② Power connector (square type): A power cable connector for the OCR checker
- ③ Signal cable (approx. 2 m): A cable connecting between the OCR and the OCR checker. The OCR checker gives the output for power and signals to the OCR and receives the trip signal and pretrip alarm signal from the OCR via this cable.
- ④ Power cord (approx. 2 m): A cord used to supply power to the OCR checker.

⑤ Signal connector (square type): A signal cable connector for the OCR. Available in three types:



⑥ Power plug: A power cord plug for the power outlet. Available in two types:



100 – 110 VAC plug: For use in Japan only

200 – 240 VAC plug: For use in Europe (Austria, Netherlands, Germany, Sweden, Denmark, Norway, Finland and Belgium)

- ⑦ POWER switch: A switch used to turn ON/OFF the OCR checker.
- ⑧ Breaker selector switch: Use to select a breaker type, TemBreak or TemBreaker2.
- ⑨ Element selector switch: Use to select an item for which the OCR is checked.
- ⑩ Current adjusting knob: Use to increase or decrease the signal output level.
- ⑪ Reset switch: Use to clear indications after completion of a test or to cancel a test.
- ⑫ Start switch: Use to start a test. When this pushbutton switch is pressed, a test current is applied to the OCR.
- ⑬ NORMAL lamp (green LED): Illuminates when the OCR has passed a test.
- ⑭ ABNORMAL lamp (red LED): Illuminates when an abnormality was found in the OCR during a test.
- ⑮ WAIT lamp (red LED): Illuminates when the OCR checker cannot continue testing because of an overheat in the checker. Wait until the lamp goes off before restarting the test.
- ⑯ Display: Provides indication of current or time measurement depending on the element selector switch position.
- ⑰ Power connector socket: A socket for the power connector (square type).
- ⑱ Signal connector socket: A socket for the signal connector (round type).
- ⑲ Fuse (2A): For power supply of the OCR checker.
- ⑳ Protection characteristic curve: Shows the numbers of test items that correspond to those of element switch positions.

4. Preparation Before the Test

⚠ CAUTION

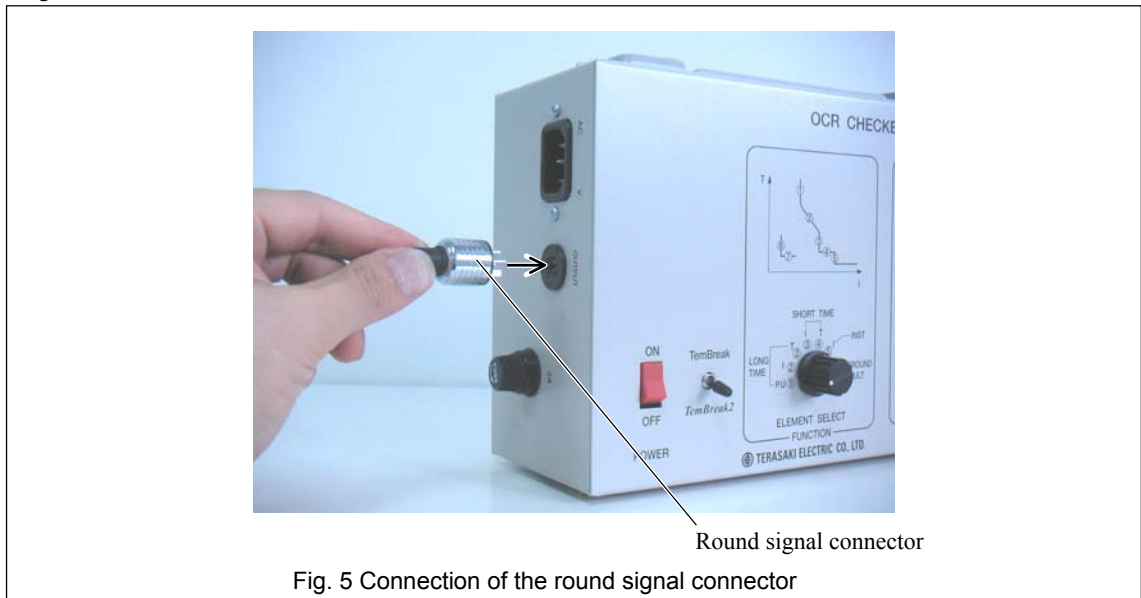
- Before testing an OCR, be sure to make preparations for the test in accordance with Chapter 4 Preparation Before the test. Otherwise, undesired tripping or a failure may result.
- To insert the power plug into or remove it from the OCR checker, or to insert the signal plug into or remove it from the OCR, be sure to check in advance that the OCR checker is OFF. Otherwise, a failure may result.

This chapter describes the preparations for the test. Make the preparations in accordance with the following steps.

4-1. Preparation Before the Test (1)

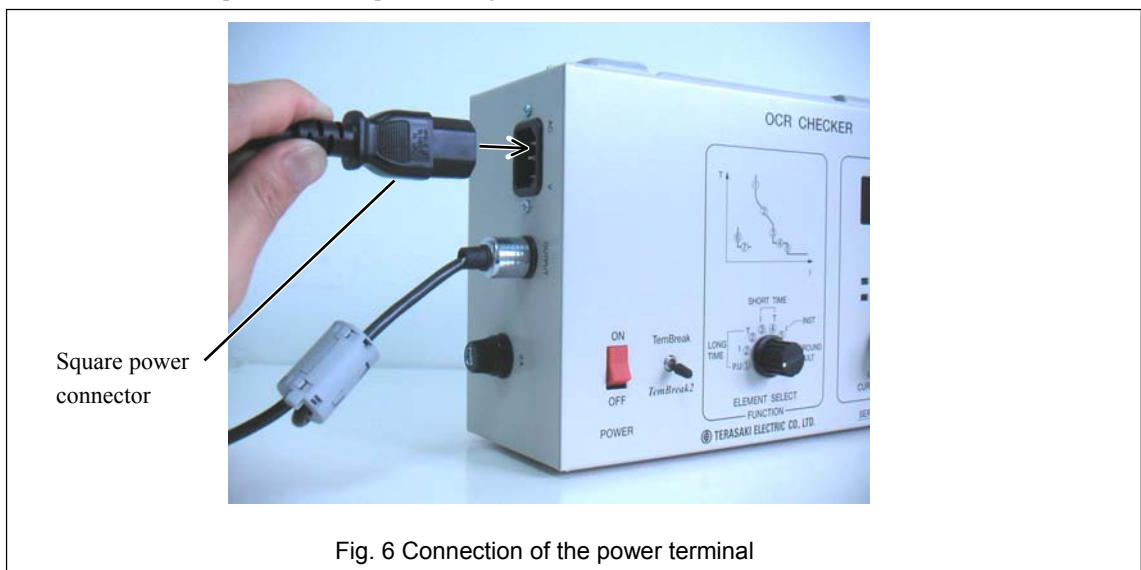
- 1) Make sure that the display of the OCR checker provides no indications and all lamps are off.
- 2) Plug the round signal connector at one end of the signal cable into the signal terminal port in the side of the OCR checker.

See Fig. 5



Make sure that the square signal connector at the other end of the signal cable is matched to the breaker subject to testing. See Fig. 3.

- 3) Check the rated supply voltage indicated beside the power terminal port in the side of the OCR checker and plug the square power connector into the power terminal port. See Fig. 6

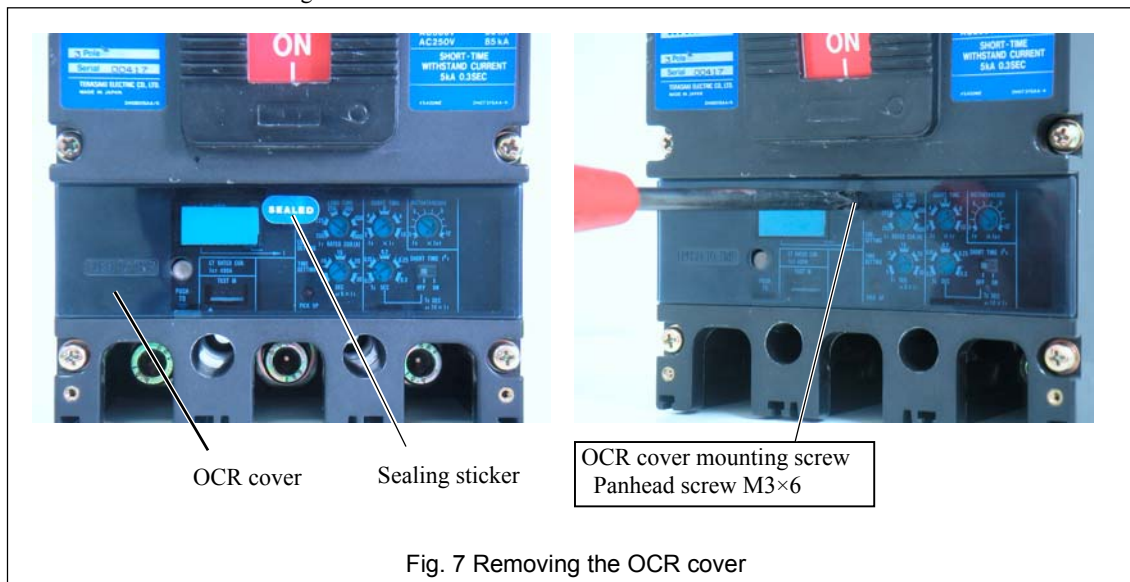


4-2. Preparation Before the Test (2)

4-2-1. For TemBreak

If the breaker subject to testing is located in a system, open the breaker and turn off an upstream breaker or the like to isolate the breaker main and control circuits from any power.

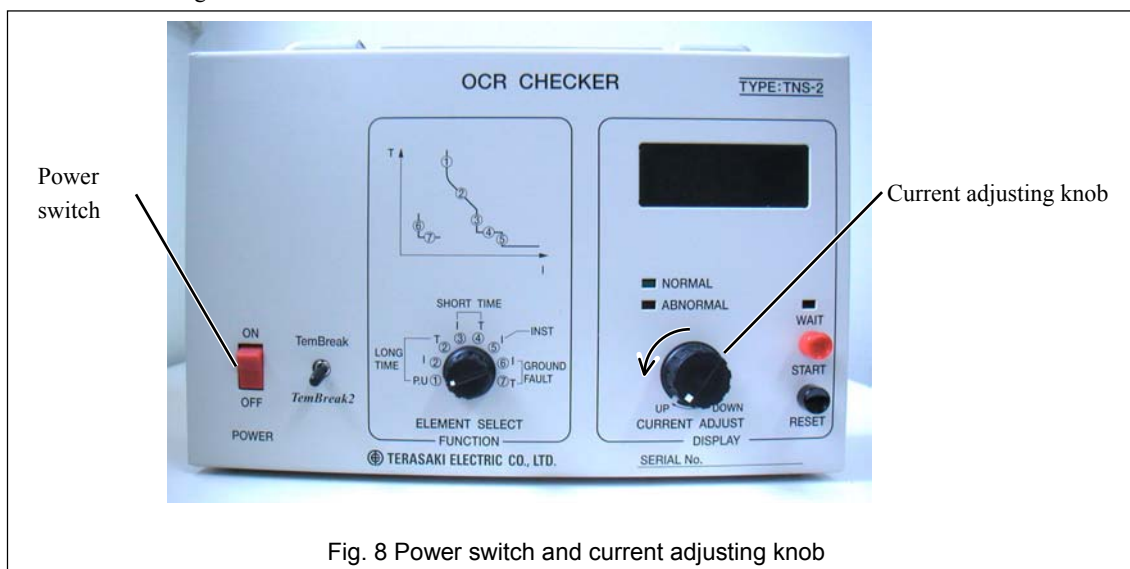
- 1) Peel off the sealing sticker on the OCR cover, loosen the OCR cover mounting screw under the sticker and remove the OCR cover from the breaker. See Fig. 7.



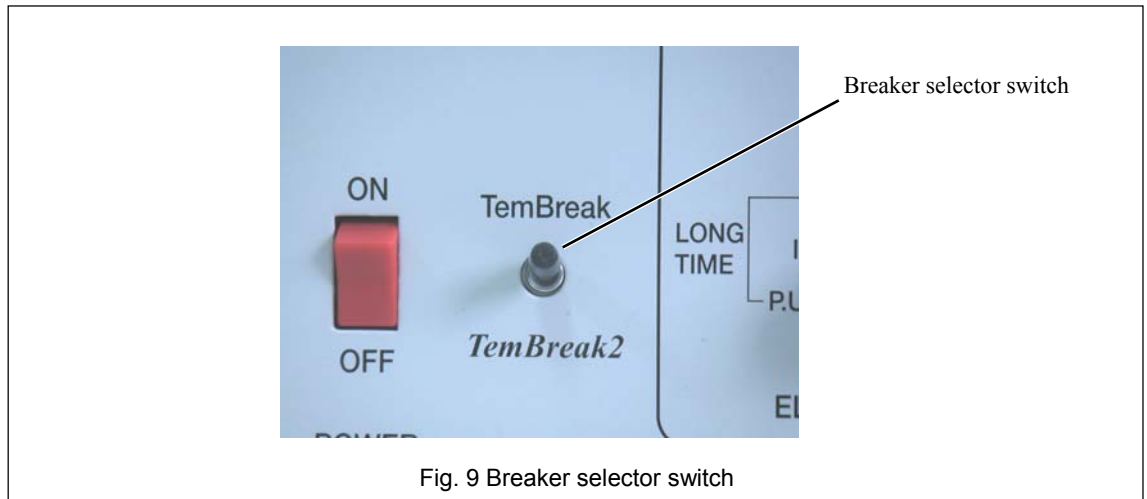
After completion of a test, be sure to reinstall the OCR cover with the mounting screw and seal the screw with a spare sealing sticker.

Spare sealing stickers are in the rear pocket of the OCR cover.

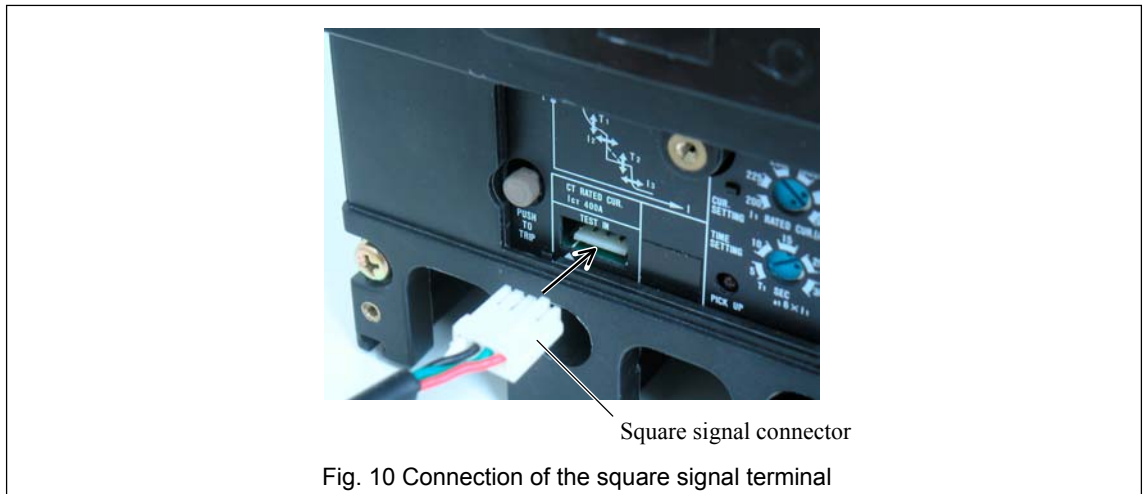
- 2) Make sure that the power switch of the OCR checker is in the OFF position and the current adjusting knob is turned full counterclockwise. See Fig. 8.



- 3) Set the breaker selector switch to the TemBreak position. See Fig. 9.



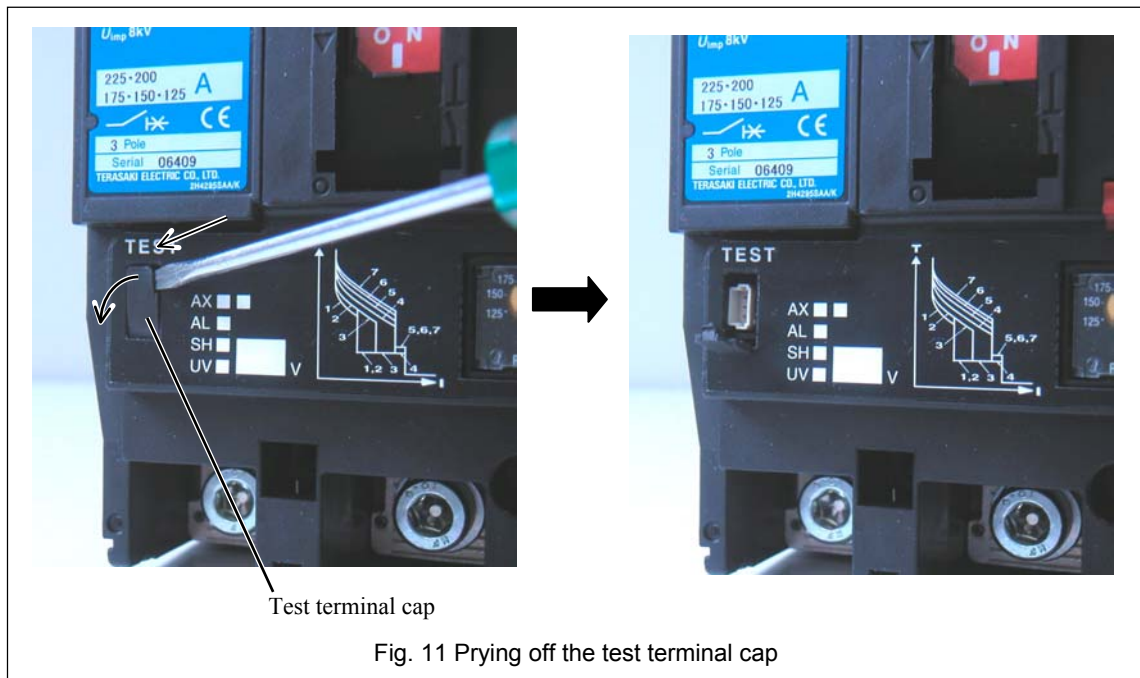
- 4) Make sure that the display of the OCR checker provides no indications and all lamps are off. Plug the square signal connector of the signal cable into the TEST IN port of the breaker. See Fig. 10.



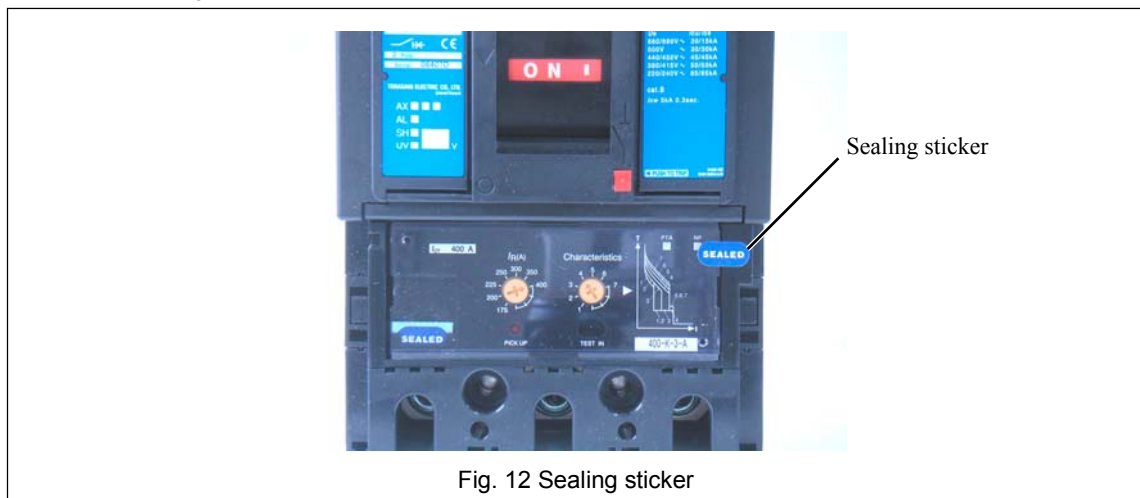
- 5) Plug the power cable into an outlet.
- 6) It is recommended that OCR settings be noted before testing so that the settings can be returned to the original values after testing.

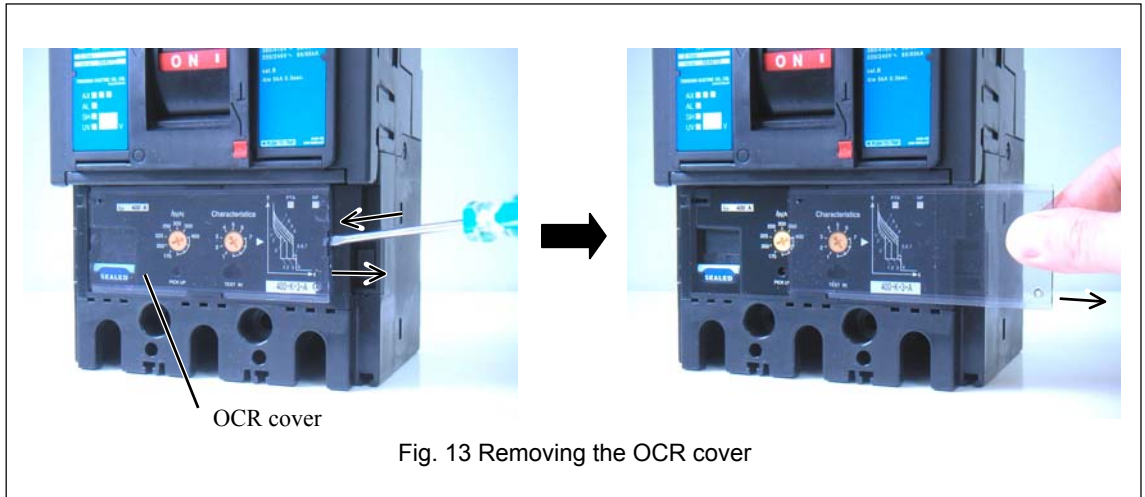
4-2-2. For *TemBreak2*

- 1) If the breaker subject to testing is located in a system, open the breaker and turn off an upstream breaker or the like to isolate the breaker main and control circuits from any power.
- 2) For a 250AF breaker, use a flatblade screwdriver to pry off the test terminal cap. See Fig. 11.



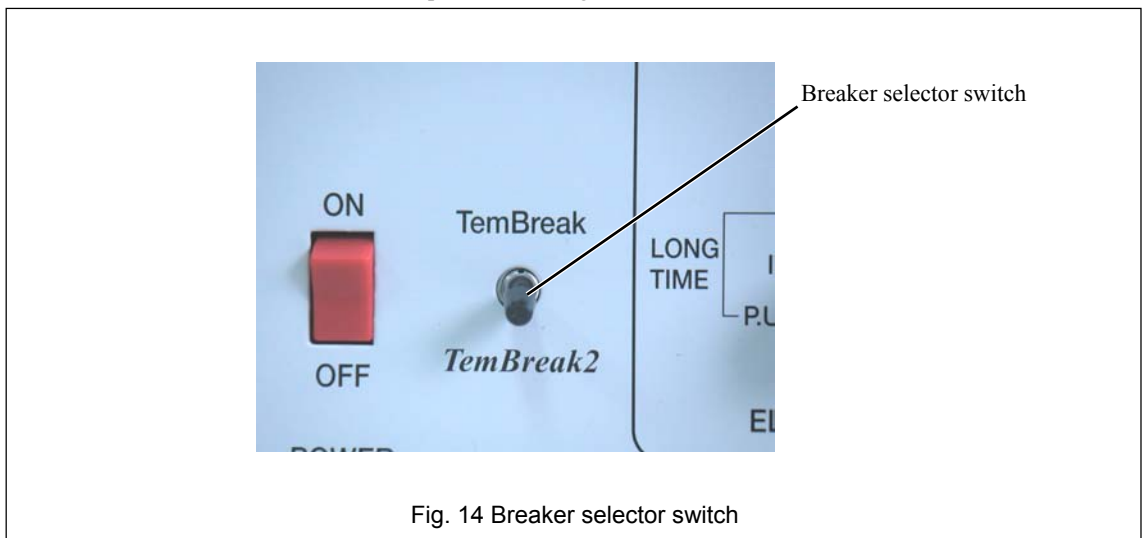
- 3) For a 400AF breaker, peel off the sealing sticker on the OCR cover, pry the OCR cover with a flatblade screwdriver and slide it to remove. See Figs. 12 and 13.



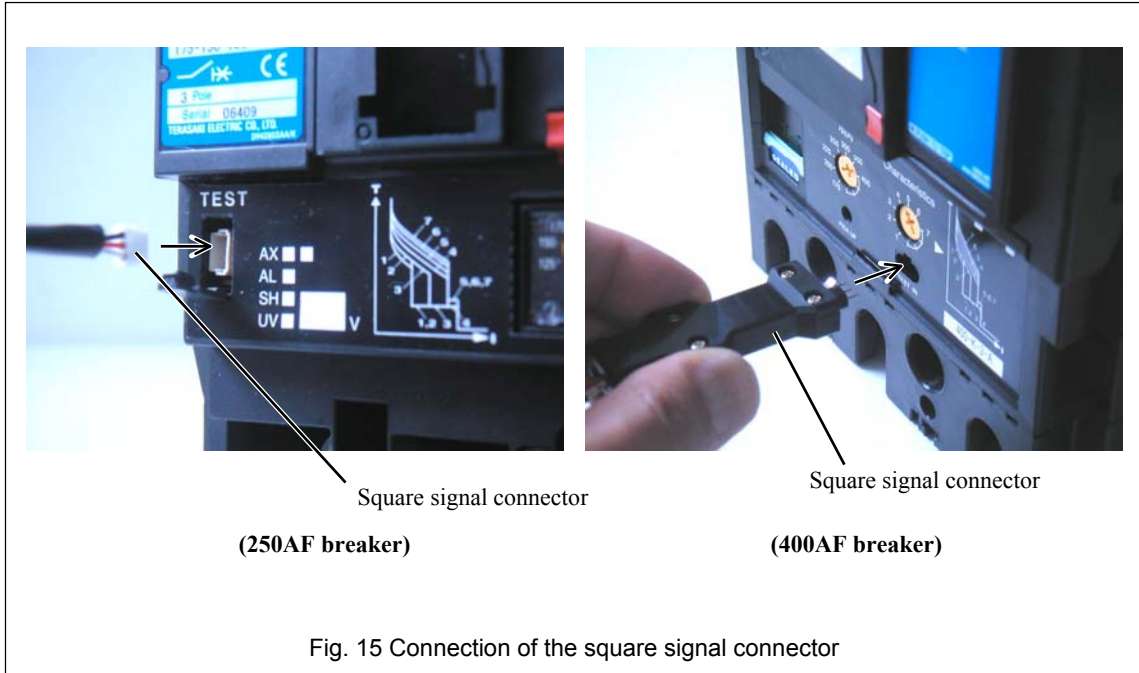


After completion of a test, be sure to reinstall the OCR cover and seal it with a spare sealing sticker. Spare sealing stickers are in the rear pocket of the OCR cover.

- 4) Make sure that the power switch of the OCR checker is in the OFF position and the current adjusting knob is turned full counterclockwise. See Fig. 8.
- 5) Set the breaker selector switch to the *TemBreak2* position. See Fig. 14.



- 6) Make sure that the display of the OCR checker provides no indications and all lamps are off. Plug the square signal terminal of the signal cable into the TEST IN port of the breaker. See Fig. 15.



- 7) Plug the power cable into an outlet.
- 8) The test involves changes in OCR settings. It is recommended that OCR settings be noted before testing so that the settings can be returned to the original values after testing.

5. TESTING PROCEDURES

This chapter describes the procedures for testing the OCR checker.

⚠ CAUTION

- To use each switch located on the OCR checker, press it with your finger at a force of 2~4 N. Using excessive force or a sharp-tipped hard tool can cause a failure.
- Be sure to determine the current flowing through the OCR before using the OCR checker to test the OCR. An excessive current may result in damage to the OCR.
- After the test, be sure to put the set values on the OCR back to the previous ones. Otherwise, fire or undesired tripping may occur.

- 1) Press the power switch of the OCR checker to turn on the power. See Fig. 1.
- 2) Press the reset switch. "O" will be indicated on the display. See Fig. 1.

Follow the procedures shown below for testing the OCR.

5-1. Testing Procedure for Pickup Current Value for Long Time Delay Trip Function

The OCR should have been so adjusted as to trip open the breaker when the current flowing through the breaker reaches a setpoint that is between 105% and 125% of the rated current. When the current flowing through the breaker reaches the setpoint, a red LED for the breaker OCR turns on. See Fig. 16.

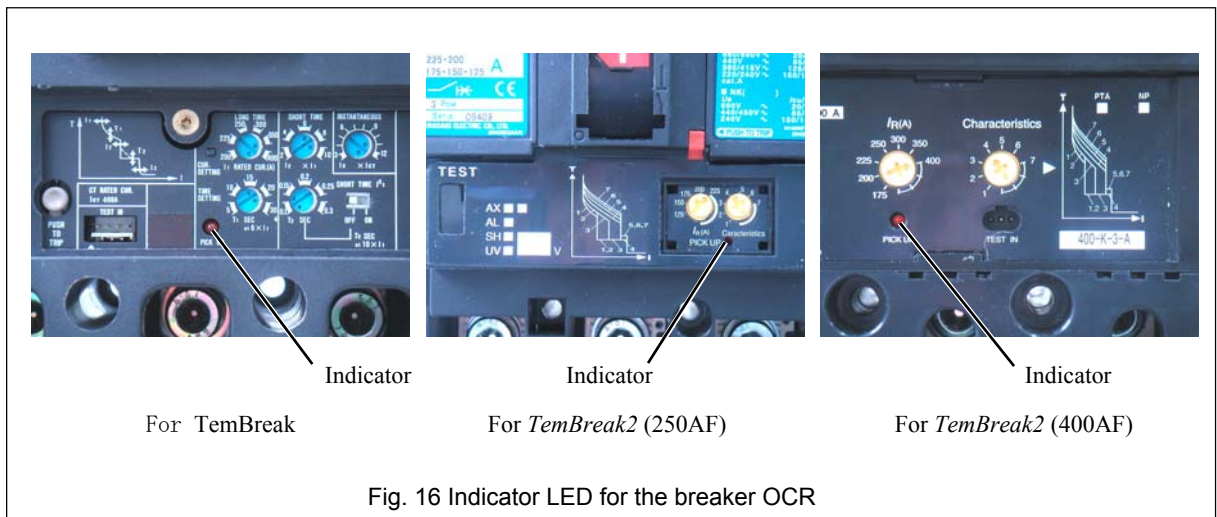


Fig. 16 Indicator LED for the breaker OCR

- 1) Calculate the criterion value of the current flowing through the breaker as follows:

(For TemBreak)

$$[I_1 / I_{CT} \times 50 \times 1.05] < I_T \leq [I_1 / I_{CT} \times 50 \times 1.25] \text{ (mA)}$$

(For TemBreak2)

$$[I_1 / I_{CT} \times 100 \times 1.05] < I_T \leq [I_R / I_{CT} \times 100 \times 1.25] \text{ (mA)}$$

I_1, I_R : Trip pickup current setting (A)

I_T : Current flowing through the OCR (mA)

I_{CT}, I_{CT} : CT rated primary current (A) *1

*1: The value of I_{CT} is indicated on the OCR.

The CT rated secondary current is 50 mA for TemBreak and 100 mA for TemBreak2.

- 2) Set the element selector switch to the LONG TIME-P.U. ① position. See Fig. 1.
- 3) Press the start switch to start energization. See Fig. 1.
- 4) Turn the current adjusting knob clockwise to increase the current until the indicator LED for the breaker OCR turns on. See Fig. 1.

- 5) Turn the current adjusting knob counterclockwise to decrease the current until the LED turns off. See Fig. 1.
- 6) Repeat steps 4 and 5 a few times and note the value at which the LED turns on. *2
 - *2: If the breaker has the pretrip alarm (PTA) function, the LED for the breaker OCR starts blinking when the current flowing through the breaker reaches the PTA pickup current setting (I_p). The LTD trip pickup function will be activated if the current continues exceeding the trip pickup current setting.
- 7) Compare the LTD trip pickup current indicated on the display of the OCR checker with the criterion value calculated in step 1) above. The OCR has passed the test if the indicated value falls within the range of criterion values.
- 8) After completion of the test, turn the current adjusting knob to the MIN position without delay. See Fig. 1.
- 9) Press the reset switch. See Fig. 1. "0" will be indicated on the display of the OCR checker.

5-2. Testing Procedure for Trip Time Setting Value for Long Time Delay Trip Function

- 1) Consult the table below to change the OCR setting as appropriate.
After completion of the test, be sure to return the setting to the original value.

Breaker	OCR setting to be changed
TemBreak	If I_2 is set to 6 or less, change it to 10.
TemBreak2	If "Characteristics" is set to 3 or less, change it to 4 or more.

- 2) Calculate the current flowing through the OCR as follows:
(For TemBreak)

$$I_T = I_1 / I_{CT} \times 50 \times 6 \text{ (mA)}$$
 (For TemBreak2)

$$I_T = I_R / I_{CT} \times 100 \times 6 \text{ (mA)}$$

 I_1, I_R : Trip pickup current setting (A)
 I_T : Current flowing through the OCR (mA)
 I_{CT}, I_{CT} : CT rated primary current (A) *3
 - *3: The CT rated secondary current is 50 mA for TemBreak and 100 mA for TemBreak2.
- 3) Set the element selector switch to the LONG TIME-I ② position. See Fig. 1.
- 4) Press the start switch to start energization. See Fig. 1.
- 5) Turn the current adjusting knob clockwise to increase I_T until it reaches the value calculated in step 1) above. See Fig. 1.
- 6) Press the reset switch. See Fig. 1. "0" will be indicated on the display of the OCR checker.
- 7) Set the element selector switch to the LONG TIME-T ② position. See Fig. 1.
- 8) Press the start switch to start energization. See Fig. 1.
- 9) The breaker will trip open when the trip pickup time setting has elapsed. The NORMAL lamp will turn on and the display provide indication of the LTD trip pickup time setting. *4
 - *4: When the OCR is activated, the current consequently turns off.
- 10) Compare the LTD trip pickup time indicated on the display of the OCR checker with the setting (T_1 for TemBreak or t_R for TemBreak2). The OCR has passed the test if the indicated value falls within the range of criterion value $\pm 20\%$.
- 11) Return the current adjusting knob to the MIN position without delay. See Fig. 1.
- 12) Press the reset switch. See Fig. 1. "0" will be indicated on the display of the OCR checker.

5-3. Testing Procedure for Trip Current Setting Value for Short Time Delay Trip Function (definite time characteristic)

Before testing a TemBreak, make sure that the SHORT TIME I_t switch on the OCR is in the OFF position. If this switch is in the ON position, turn it OFF. After completion of the test, return the switch position to ON.

- 1) Criterion value
(For TemBreak)

Calculate the criterion value as follows:

$$I_T = I_2 / I_{CT} \times 50 \text{ (mA)}$$

I₂: Short time delay trip pickup current setting (A)

I_T: Current flowing through the OCR (mA)

I_{CT}: CT rated primary current (A) *5

*5 The CT rated secondary current is 50 mA.

(For *TemBreak2*)

Select the criterion value from Table 3 of Page 16 to 19.

Table 3-1 Criterion value for Short Time Delay Trip Function (1)

Breaker Types	Rated Current [A]	Setting value of rated current adjustment dial for Breakers	Setting value of characteristics adjustment dial for Breakers	Criterion value for Short Time Delay Trip function [mA]		
S250-NE S250-GE S250-PE H250-NE	40 125 160 250	0.4	1,2	100		
			3	200		
			4,5	400		
		0.5	1,2	125		
			3	250		
			4,5	500		
		0.63	1,2	158		
			3	315		
			4,5	630		
		0.8	1,2	200		
			3	400		
			4,5	800		
		0.9	1,2	225		
			3	450		
			4,5	900		
		0.95	1,2	238		
			3	475		
			4,5	950		
		1	1,2	250		
			3	500		
			4,5	1000		
		S400-NE S400-GE H400-NE L400-NE	400	0.4	1,2	100
					3	200
					4,5,6,7	400
0.5	1,2			125		
	3			250		
	4,5,6,7			500		
0.63	1,2			158		
	3			315		
	4,5,6,7			630		
0.8	1,2			200		
	3			400		
	4,5,6,7			800		
0.9	1,2			225		
	3			450		
	4,5,6,7			900		
0.95	1,2			238		
	3			475		
	4,5,6,7			950		
1	1,2			250		
	3			500		
	4,5,6,7			1000		

Table 3-2 Criterion value for Short Time Delay Trip Function (2)

Breaker Types	Rated Current [A]	Setting value of rated current adjustment dial for Breakers	Setting value of characteristics adjustment dial for Breakers	Criterion value for Short Time Delay Trip function [mA]		
S630-CE S630-GE	630	0.4	1,2	100		
			3	200		
			4,5,6,7	320		
		0.5	1,2	125		
			3	250		
			4,5,6,7	400		
		0.63	1,2	158		
			3	315		
			4,5,6,7	504		
		0.8	1,2	200		
			3	400		
			4,5,6,7	640		
		0.85	1,2	213		
			3	425		
			4,5,6,7	680		
		0.9	1,2	225		
			3	450		
			4,5,6,7	720		
		0.95	1,2	238		
			3	475		
			4,5,6,7	760		
		1	1,2	250		
			3	500		
			4,5,6,7	800		
		S800-NE	800	0.4	1,2	100
					3	200
					4,5,6,7	320
0.5	1,2			125		
	3			250		
	4,5,6,7			400		
0.63	1,2			158		
	3			315		
	4,5,6,7			504		
0.8	1,2			200		
	3			400		
	4,5,6,7			640		
0.9	1,2			225		
	3			450		
	4,5,6,7			709		
0.95	1,2			238		
	3			475		
	4,5,6,7			742		
1	1,2			250		
	3			500		
	4,5,6,7			776		

Table 3-3 Criterion value for Short Time Delay Trip Function (3)

Breaker Types	Rated Current [A]	Setting value of rated current adjustment dial for Breakers	Setting value of characteristics adjustment dial for Breakers	Criterion value for Short Time Delay Trip function [mA]		
S1000-NE	1250	0.4	1,2	100		
			3	200		
			4,5,6,7	320		
		0.5	1,2	125		
			3	250		
			4,5,6,7	400		
		0.63	1,2	158		
			3	315		
			4,5,6,7	504		
		0.8	1,2	200		
			3	400		
			4,5,6,7	640		
		0.9	1,2	225		
			3	450		
			4,5,6,7	709		
		0.95	1,2	238		
			3	475		
			4,5,6,7	742		
		1	1,2	250		
			3	500		
			4,5,6,7	776		
		S1250-NE S1250-GE	1250	0.4	1,2	100
					3	200
					4,5,6,7	400
				0.5	1,2	125
					3	250
					4,5,6,7	500
0.63	1,2			158		
	3			315		
	4,5,6,7			630		
0.8	1,2			200		
	3			400		
	4,5,6,7			800		
0.9	1,2			225		
	3			450		
	4,5,6,7			900		
0.95	1,2			238		
	3			475		
	4,5,6,7			939		
1	1,2			250		
	3			500		
	4,5,6,7			977		

Table 3-4 Criterion value for Short Time Delay Trip Function (4)

Breaker Types	Rated Current [A]	Setting value of rated current adjustment dial for Breakers	Setting value of characteristics adjustment dial for Breakers	Criterion value for Short Time Delay Trip function [mA]
S1600-NE	1600	0.4	1,2	100
			3	200
			4,5,6,7	400
		0.5	1,2	125
			3	250
			4,5,6,7	500
		0.63	1,2	158
			3	315
			4,5,6,7	630
		0.8	1,2	200
			3	400
			4,5,6,7	758
		0.9	1,2	225
			3	450
			4,5,6,7	833
		0.95	1,2	238
			3	475
			4,5,6,7	870
		1	1,2	250
			3	500
			4,5,6,7	908

- 2) Set the element selector switch to the SHORT TIME-I ③ position. See Fig. 1.
- 3) Turn the current adjusting knob a bit clockwise from the MIN position. See Fig. 1.
- 4) Press the start switch to start energization. See Fig. 1. *6
 - *6: ① The duration of energization is as short as approx. 1500 ms. The current turns off automatically after such a duration of time and the display of the OCR checker provides indication of the value of current applied.
 - ② Repeat the following steps to increase/decrease the current:
 - 1) Press the reset switch.
 - 2) Use the current adjusting knob to adjust the current. See Fig. 1.
 - 3) Press the start switch. See Fig. 1.
 - 4) Check the current flowing through the OCR
 - ③ Turning off the breaker will facilitate adjusting the current. If the breaker is on while the current is adjusted, RESET and then ON operation will be required after the breaker trips open.
- 5) The breaker will trip open when the current flowing through the OCR exceeds the trip pickup current setting. The NORMAL lamp will turn on and the display provide indication of the STD trip pickup current setting. See Fig. 1.
- 6) Compare the STD trip pickup current indicated on the display of the OCR checker with the criterion value calculated in step 1) above. The OCR has passed the test if the indicated value falls within the range of criterion value $\pm 15\%$.
- 7) Return the current adjusting knob to the MIN position. See Fig. 1. *7
 - *7: This step is not required if this test is followed by a test for STD trip pickup timing.
- 8) Press the reset switch. See Fig. 1. "0" will be indicated on the display of the OCR checker.

5-4. Testing Procedure for Trip Time Setting Value for Short Time Delay Trip Function (definite time characteristic)

Before testing a TemBreak, make sure that the SHORT TIME I²t switch on the OCR is in the OFF position.

If the short time delay trip function is selected, the OCR operates at a definite time when the current flowing through the OCR exceeds the trip pickup current setting.

During a test for short time delay trip timing, approx. 120% of the short time delay trip pickup current setting is applied to the breaker.

- 1) Turn the current adjusting knob a bit more clockwise than for the test in section 5.3. See Fig. 1. *8
 - *8: When testing a TemBreak, make sure that the test current does not exceed the instantaneous trip pickup current setting (I_3). If the short time delay trip pickup current setting (I_2) is too close to the instantaneous trip pickup current setting (I_3) to set the test current, however, maximize the instantaneous trip pickup current setting for convenience of testing, and return it to the original value after completion of the test.
- 2) Set the element selector switch to the SHORT TIME-T ④ position. See Fig. 1.
- 3) Press the start switch to start energization. See Fig. 1. *9
 - *9: The current turns off automatically approx. 1500 ms after the start of energization.
- 4) The breaker will trip open when the trip pickup time setting has elapsed. The NORMAL lamp will turn on and the display provide indication of the STD trip pickup time setting. See Fig. 1.
- 5) Compare the STD trip pickup time indicated on the display of the OCR checker with the STD trip pickup time setting. The OCR has passed the test if the indicated value falls within the range of setting ± 20 ms.
- 6) Return the current adjusting knob to the MIN position. See Fig. 1.
- 7) Press the reset switch. See Fig. 1. "0" will be indicated on the display of the OCR checker.

5-5. Testing Procedure for Trip Time Setting Value for Short Time Delay Trip Function (I²t characteristic)

This section describes how to test the OCR when the SHORT TIME I²t switch on the OCR is in the ON position.

- 1) Calculation of the criterion value:

For the I²t characteristic, since the trip pickup timing is so adjusted that T₂ is 0.1 to 0.3s when I₂ = 10, 10² × T₂ is assumed to be constant. Consequently, the trip pickup time T_X at I₂ is given by

$$T_X = 10^2 \times T_2 / I_2^2$$

If T₂ = 0.2s, for example, the trip pickup time at I₂ = 2 or I₂ = 6 is as follows:

$$T_{X1} = 10^2 \times 0.2 / 2^2 = 5s$$

$$T_{X2} = 10^2 \times 0.2 / 6^2 \approx 0.56s$$

Criterion values calculated as shown above are listed in the table 4.

Tables 4 Criterion values for short time delay trip time setting

	Breaker I ² dial position				
	2	4	6	8	10
Short time delay trip pickup time setting	7.50	1.88	0.83	0.47	0.30
	6.25	1.56	0.69	0.39	0.25
	5.00	1.25	0.56	0.31	0.20
	3.75	0.94	0.42	0.23	0.15
T ₂ (sec)	2.50	0.63	0.28	0.16	0.10

- 2) Adjust the test current so that the short time delay trip pickup current I₂ is in a range of I₁ × 6 to 8 according to steps 2 to 4 in section 5.3.
- 3) Set the element selector switch to the SHORT TIME-T ④ position. See Fig. 1.
- 4) Press the start switch to start energization. See Fig. 1.
- 5) Current I₂ = I₁ × 6 to 8 (A) will be applied to the breaker and the breaker trips open. The NORMAL lamp will turn on and the display provide indication of the STD trip pickup time setting. See Fig. 1.
- 6) Compare the STD trip pickup time indicated on the display of the OCR checker with the STD trip pickup time setting. See table 3. The OCR has passed the test if the indicated value falls within the range of setting ±20 ms.
- 7) Return the current adjusting knob to the MIN position. See Fig. 1.
- 8) Press the reset switch. See Fig. 1. "0" will be indicated on the display of the OCR checker.

5-6. Testing Procedure for Trip Current Setting Value for Instantaneous Trip Function

- 1) Criterion value
(For TemBreak)

Calculate the criterion value as follows:

$$I_T = I_3 / I_{CT} \times 50 \text{ (mA)}$$

I₃: Instantaneous trip pickup current setting (A)

I_T: Current flowing through the OCR (mA)

I_{CT}: CT rated primary current (A) *10

*10: The CT rated secondary current is 50 mA.

(For *TemBreak2*)

Select the criterion value from Table 5 of Page 22 and 23.

Table 5-1 Criterion value for Instantaneous Trip Function (1)

Breaker Types	Rated Current [A]	Setting value of rated current adjustment dial for Breakers	Criterion value for Instantaneous Trip function [mA]
S250-NE S250-GE S250-PE H250-NE	40	0.4	560
		0.5	700
		0.63	882
		0.8	1098
		0.9	1184
		0.95	1196
		1	1196
		125 160 250	0.4
	0.5		700
	0.63		882
	0.8		998
	0.9		1090
	0.95		1105
	S400-NE S400-GE H400-NE L400-NE	400	0.4
0.5			700
0.63			882
0.8			1081
0.9			1197
0.95			1209
1			1209
S800-NE			800
	0.5	200	
	0.63	400	
	0.8	800	
	0.9	225	
	0.95	450	
	1	900	
	S1000-NE	1000	
0.5			672
0.63			829
0.8			885
0.9			885
0.95			885
1			885

Table 5-2 Criterion value for Instantaneous Trip Function (2)

Breaker Types	Rated Current [A]	Setting value of rated current adjustment dial for Breakers	Criterion value for Instantaneous Trip function [mA]
S1250-NE S1250-GE	1250	0.4	560
		0.5	700
		0.63	856
		0.8	1047
		0.9	1107
		0.95	1107
		1	1107
S1600-NE	1600	0.4	532
		0.5	641
		0.63	767
		0.8	938
		0.9	996
		0.95	996
		1	996

- 2) Set the element selector switch to the INST-I ⑤ position. See Fig. 1.
- 3) Turn the current adjusting knob a bit clockwise from the MIN position. See Fig. 1
- 4) Press the start switch to start energization. See Fig. 1. *11
 - *11: ① The duration of energization is as short as approx. 50 ms. The current turns off automatically after such a duration of time and the display of the OCR checker provides indication of the value of current applied.
 - ② Repeat the following steps to increase/decrease the current:
 - 1) Press the reset switch.
 - 2) Use the current adjusting knob to adjust the current. See Fig. 1.
 - 3) Press the start switch. See Fig. 1.
 - 4) Check the current flowing through the OCR.
 - ③ Turning off the breaker will facilitate adjusting the current.
If the breaker is on while the current is adjusted, RESET and then ON operation will be required after the breaker trips open.
- 5) The breaker will trip open when the current flowing through the OCR exceeds the trip pickup current setting. The NORMAL lamp will turn on and the display provide indication of the instantaneous trip pickup current setting. See Fig. 1.
- 6) Compare the INST trip pickup current indicated on the display of the OCR checker with the criterion value calculated in step 1) above. The OCR has passed the test if the indicated value falls within the range of criterion value $\pm 20\%$. *12
 - *12: For TemBreak, saturation characteristics of the built-in CT may cause larger measurement error when the instantaneous trip pickup current (I_2) is set to the max value.
- 7) Return the current adjusting knob to the MIN position. See Fig. 1.
- 8) Press the reset switch. See Fig. 1. "0" will be indicated on the display of the OCR checker.

5-7. Testing Procedure for Trip Current Setting Value for Ground Fault Trip Function

- 1) Criterion values for the ground fault trip pickup current are shown in table 6 below:

Table 6 Criterion values for ground fault trip pickup current

Breaker	Setting	Criterion value (mA)	
TemBreak	I_G dial position	0.1	23
		(0.15) ^{*13}	36
		0.2	49
		(0.25) ^{*13}	62
		0.3	75
		(0.35) ^{*13}	87
0.4	100		
TemBreak2	$I_{CT} \times 0.2$ (fixed)	20	

*13: Values in parentheses "()" are intermediates between calibration marks.

- 2) Set the element selector switch to GROUND FAULT-I ⑥ position. See Fig. 1.
- 3) Press the start switch to start energization. See Fig. 1.
- 4) Turn the current adjusting knob clockwise gradually. See Fig. 1.
- 5) The breaker will trip open when the current flowing through the OCR exceeds the trip pickup current setting. The NORMAL lamp will turn on and the display provide indication of the ground fault trip pickup current setting. See Fig. 1.
- 6) Compare the GF trip pickup current indicated on the display of the OCR checker with the criterion value calculated in step 1) above. The OCR has passed the test if the indicated value falls within the range of criterion value $\pm 15\%$.
- 7) Return the current adjusting knob to the MIN position. See Fig. 1. *14
 - *14: This step is not required if this test is followed by a test for GF trip pickup timing.
- 8) Press the reset switch. See Fig. 1. "0" will be indicated on the display of the OCR checker.

5-8. Testing Procedure for Trip Time Setting Value for Ground Fault Trip Function

If the ground fault trip function is selected, the OCR operates at a definite time when the current flowing through the OCR exceeds the trip pickup current setting. During a test for ground fault trip timing, approx. 120% of the ground fault trip pickup current setting is applied to the breaker.

- 1) Turn the current adjusting knob a bit more clockwise than for the test in section 5.3. See Fig. 1.
- 2) Set the element selector switch to GROUND FAULT-T ⑦ position. See Fig. 1.
- 3) Press the start switch to start energization. See Fig. 1. *15
*15: The current turns off automatically approx. 1500 ms after the start of energization.
- 4) The breaker will trip open when the trip pickup time setting has elapsed. The NORMAL lamp will turn on and the display provide indication of the GF trip pickup time setting. See Fig. 1.
- 5) Compare the GF trip pickup time indicated on the display of the OCR checker with the GF trip pickup time setting (T_G). The OCR has passed the test if the indicated value falls within the range of setting $T_G \pm 20\%$.
- 6) Return the current adjusting knob to the MIN position. See Fig. 1.
- 7) Press the reset switch. See Fig. 1. "0" will be indicated on the display of the OCR checker.

5-9. Adjustment

The type TNS-2 OCR checker is a measuring instrument. It is recommended that adjustment be performed approximately once for a correct testing. If adjustment is necessary, contact us.

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