

Primary current injection testing procedure for MCCB with TMD Trip unit

1. Equipment & Tools required:

- Single phase current source
 - ➔ 5V – 2000A rating source with required cable cross section are suggested for MCCBs primary injection.
 - ➔ Spring loaded calms should not be used as the tension may not be sufficient and it loses its tension after some time.
 - ➔ Current least count value should be 1A
 - ➔ Current measuring device used should be a calibrated meter, it's least count should be at least 0.25A, ideally it should be 0.1A
 - ➔ Input voltage variation: Use a regulated power supply so that the input voltage will not fluctuated, hence the output current will not vary during the test.
- Torque wrench
 - ➔ Calibrated and adjustable torque wrenches to be used for tightening the terminal screws
 - ➔ Toque specification should be 1-5 NM, 5-20 NM, 20-60NM are suggested as these are covering all different ranges of MCCBs.
- Temperature sensor/meter
 - ➔ A temperature and Humidity meter is required to measure the ambient temperature.
 - ➔ Least count the same should be 0.1 degree, It should be calibrated at least once in a year.
- Timer
 - ➔ A time with least count of 0.1 Sec is required to check the trip time.
 - ➔ This should be integrated with the test bench, so that the timer will switch ON when we inject the primary current to the product and stops when the breaker trips.
 - ➔ This will avoid the human intervention delay
 - ➔ It also should be calibrated once in a year.

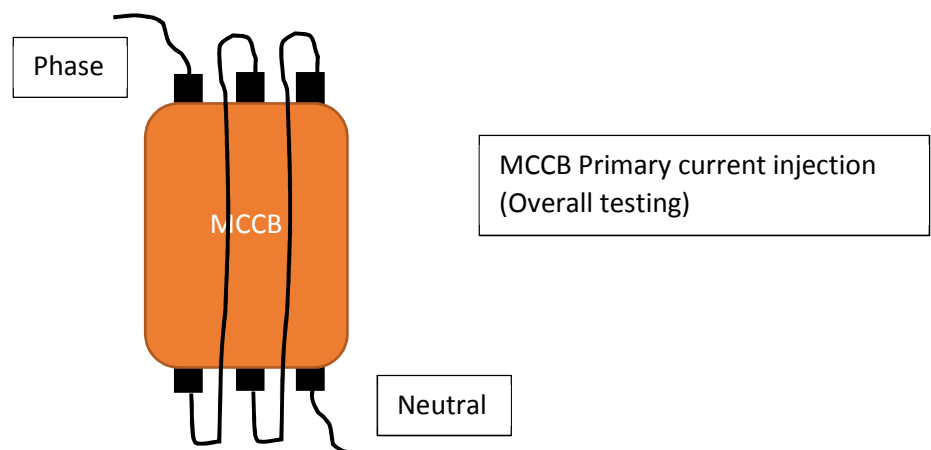
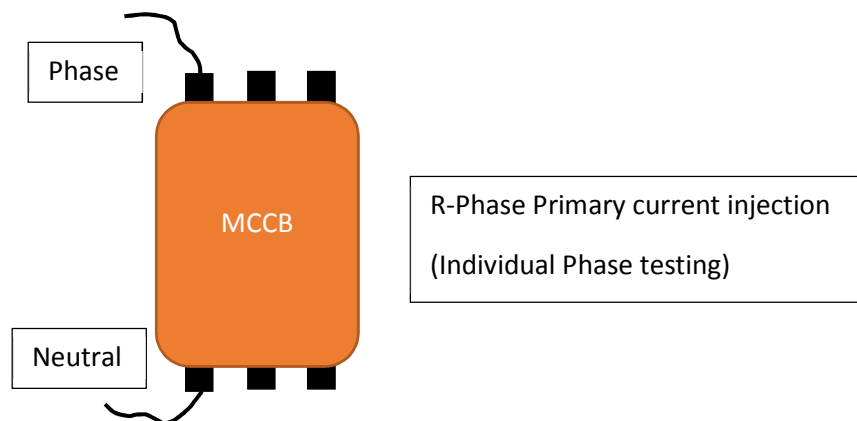
2. Connections:

- Individual phase testing:
 - ➔ This method is useful to check the tripping time of each phase of the MCCB, it is recommended as we will come to all the phases of the MCCB are working as per the requirement or not.

COPPER CABLES SIZE AS PER THE TEST CURRENT			
Range of Test Current (A)	Conductor Size (Sq. mm)	Range of Test Current (A)	Conductor Size (Sq. mm)
0 - 8	1	100 - 115	35
8 - 12	1.5	115 - 130	50
12 - 15	2.5	130 - 150	50
15 - 20	2.5	150 - 175	70
20 - 25	4	175 - 200	95
25 - 32	6	200 - 225	95
32 - 50	10	225 - 250	120
50 - 65	16	250 - 275	150
65 - 85	25	275 - 300	185
85 - 100	35	300 - 350	185
100 - 115	35	350 - 400	240

Cable cross section selection as per IEC 60947-1

- Combined phase testing:
→ This method is useful when we would like to test the MCCB only once. The cable connection is as mentioned below.



- Connections: Follow the cable connections either of the method based on your requirement.

- ➔ If you follow the individual method you will come to know the functioning of each phase of the MCCB which is suggested but time consuming. It is better if we perform this test when the breaker is at ASC store.
- ➔ If you follow the Overall MCCB testing, you can find the tripping time of only one phase which acts faster. In this test all the phases should be connected in series as shown in the picture, if you connect otherwise, you may not get the right tripping time.

3. Temperature correction factor:

- ➔ Need to consider the temperature correction factor for MCCB, which is necessary for TMD type of trip units as the bimetallic strips are influenced by the ambient temperature.
- ➔ The tripping times of our TMD type MCCBs are considering the ambient temperature of 40 Deg C.

Settings of CVS100 to 630 equipped with TM-D trip units as a function of the temperature
The table indicates the real Ir (A) value for a given rating and temperature.

Rat. (A)	10	15	20	25	30	35	40	45	50	55	60	65	70
16	18.4	18	18	18	17	16.6	16	15.6	15.2	14.8	14.5	14	13.8
25	28.8	28	27.5	27	26.3	25.6	25	24.5	24	23.5	23	22	21
32	36.8	36	35.2	34.4	33.6	32.8	32	31.3	30.5	30	29.5	29	28.5
40	46	45	44	43	42	41	40	39	38	37	36	35	33.5
50	57.5	56	55	54	53	51	50	49	47	46	44	43	41
63	73	72	70	68	67	65	63	61	59	57	55	53	50
80	92	90	88	86	84	82	80	78	75.5	73	70.7	68	65
100	114	112	110	107	105	102.5	100	97	95	92.0	89	86	83
125	144	141	138	134	131	128	125	122	119	116	113	109	106
160	184	180	176	172	168	164	160	156	152	148	144	140	136
200	230	225	220	215	210	205	200	195	190	185	180	175	170
250	288	281	277	269	263	256	250	244	238	231	225	219	213
320	365	358	350.5	343	335.6	328	320	312	303.6	295	286	277	267.7
400	456.6	447.7	438.6	429	419.7	410	400	390	379.3	368.5	357.3	345.8	334
500	558.6	549	539.7	530	520.3	510.2	500	489.6	479	468	457	445.4	433.6
600	672	660.5	649	637	625	612.6	600	587	574	560.6	547	532.7	518

Fig-0.01: Temperature factor table.

- ➔ If the trip unit setting is 160A, and the ambient temperature is 25 Deg C, the actual temperature to be considered is 172A. If you would like to do a testing at 2 times of the current, then we should inject 324A.

4. Tripping time measurement:

- ➔ Inject the current up to the required value (324A in above case) first and turn off the source, wait for 2 minutes to let the thermal memory impact to nullify.
- ➔ Switch On the source, and timer at a time. Ensure the current is at the set value.
- ➔ Once the MCCB trips, note down the time.
- ➔ Follow the same process for all the other phases as well

5. Tripping curve:

- ➔ Select the right tripping curve and check the time based on the intended current setting (Not the temperature factor current). 2 in this case as the intended current is 160A and the set current is at 2 times.
- ➔ Check the breaker tripping time is with on the zone of tripping curve time.

