TGM2LC Series Moulded Case Circuit Breaker with Earth Leakage Protection

1 Overview

TGM2LC series moulded case circuit breaker is a product developed for meeting the urban and rural power grids and other power grids requiring residual current reclosing functions.

This series of circuit breaker is suitable for three-phase four-wire low-voltage grids with neutral point solid ground, with AC 50Hz, rated voltage of 400V and rated isolation voltage of 800V. The frame grade of the circuit breaker is divided into 125A, 250A, 400A, 630A and 800A. Its setting current is from 65A to 800A; the rated residual action current is from 50mA to 1,000mA. It has the functions of overload protection, short-circuit protection, residual current protection, overvoltage protection, undervoltage protection, open-phase protection, reclosing and other functions. The product is extended to series special for photovoltaic and series special for fee-controlled electric energy meters

By the breaking capacity (Icu), the circuit breaker is divided into L type (standard) and M type (relatively high breaking).

The circuit breaker shall meet the standard: IEC60947-2 and IEC60947-4-1

2 Operating Conditions

(1) Ambient air temperature: -5ºC-+40ºC;
(2) The attitude of the installation site does not exceed 2,000 meters;
(3) The air relative humidity at the installation site shall not exceed 50% at a maximum temperature of +40ºC,and a higher relative humidity is allowed at the lower temperature. For example, the relative humidity can reach 90% at +20ºC. Protection measures should be taken to deal with occasional condensation due to temperature changes;
(4) Pollution degree: 3;
(5) The installation category: III;
(6) The circuit breakers should be installed in a place without explosive hazard, conductive dust and corrosion against metal and damage to insulation;
(7) The circuit breaker shall be installed in the place without invasion of rain and snow;
(8) The external magnetic field of the installation site shall not exceed 5 times of the geomagnetic field in any direction.

3 Type Designation

TG M 2 L C — □ □ /3N/ □

- Y (Liquid crystal type);
- S:(Digital type)
- Number of poles: Three-pole four-wire (3P+N)
- Breaking capacity:
  - L:low breaking(standard)
  - M:medium breaking
  - H:high breaking
- Frame current
- Automatic reclosing function
- Residual current protection function
- Design code
- Moulded case circuit breaker
- Enterprise code

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4 Technical Parameters

Table 1

Frame current Inm(A)	125	250	400	630	630 large volume	800
Setting current Ir1 (A)	65/80/100/125, adjustable	100/125/140/ 160/180/200/ 225/250, adjustable	160/200/225/ 250/315/350/ 400, adjustable	400/440/480/ 500/530/560/ 600/630, adjustable	400/440/480/ 500/530/560/ 600/630, adjustable	400/500/630/ 700/800, adjustable
Number of poles	Three-phase four-wire (3P+N)					
Rated working voltage Ue	AC400V/50Hz					
Rated insulation voltage Ui	1000V					800V
Rated impulse withstand voltage Uimp	8kV					
Rated short-time withstand current Icw	1.5kA/1s	3kA/1s	5kA/1s	8kA/1s	10kA/1s	10kA/1s
Rated remaining action current gear I △ n(mA)	30,50,75,100,150,200,300,400,500,600,700,800,1000+OFF (adjustable,can be turn off), default 500					
Residual current protection type	AC type					
Action threshold of actual residual current	0.8I △ n±5%					
Time-delay limit non-actuating time (s)	0.06/0.1/0.2, one gear or adjustable					
Maximum breaking time at 1I △ n (s)	Non time-delay type: 0.3, time-delay type: 0.5/0.8/1, one gear or adjustable					
Reclosing delay time (s)	20 - 60					
Electric leakage reclosing	Once, on by default (Default OFF for photovoltaic dedicated models)					
Usage category	Category A		Category B			
Rated limit short-circuit breaking capacity Icu(kA)	L type: 35 M type: 50	L type: 50 M type: 65	L type: 65 M type: 85	L type: 65 M type: 85	L type: 65 M type: 85	L type: 65 M type: 85
Breaking capacity of rated operating short circuit Ics(kA)	L type: 25 M type: 35	L type: 35 M type: 50	L type: 50 M type: 65	L type: 50 M type: 65	L type: 50 M type: 65	L type: 50 M type: 65
Rated residual short-circuit connecting and breaking capacity I △ m	I △ m=25%Icu					
Flashover distance (top to bottom, mm)	≤50	≤50	≤100	≤100	≤100	≤100
Overvoltage protection	The function is on by default when delivery , setting value of 250-320V (adjustable), 280V for conventional type (311V by default for the special photovoltaic type); the action time delay of the conventional type is 1-5s (adjustable), 3s by default (the action time delay of the special photovoltaic type is 0-10s (adjustable), 10s by default).					
Undervoltage protection	The function is closed in default when delivery: The setting value is 145-200V (adjustable), 160V by default; the action time delay of the conventional type is 1-5s (adjustable), 3s by default (the action time delay of the special photovoltaic type is 0-10s (adjustable), 10s by default).					
Default phase protection	Off by default when delivery; the setting value is 10-100V (50V by default when delivery); the action time delay is ≤ 0.5s.					
Trip protection of special photovoltaic circuit breaker	On by default; the setting value is 0-50V (adjustable), 46V by default; The action time delay is 0-10s (adjustable), 10s by default.					
Power on closing	Off by default for conventional type (on by default for the special photovoltaic type). The product will be reclosed automatically when the power on testing voltage of the product is higher than the setting value (85% Un by default).					
Voltage reclosing	Off by default for conventional type (on by default for the special photovoltaic type); When the voltage reclosing function is on, the product will be reclosed automatically when the overvoltage fault voltage is restored to below the setting overvoltage value or the undervoltage and default phase fault voltage are restored to above the undervoltage and default phase setting values.					
Electric leakage reclosing	The electric leakage reclosing is on by default for the conventional type (off by default for the special photovoltaic type)					
Communication protocol	RS485 communication interface and infrared communication interface (optional) DL/T-645 communication protocol; Baud rate: 600-19,200 (adjustable) (DL/T 645-1 protocol default 2400, DL/T 645-4 protocol default 2400).					
Externally-mounted lightning protection module	Optional					
Auxiliary contact	Optional					

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5 Features

5.1 Overload long-time delay protection features

Table 2

Serial No.	Test current (I)	Agreed tripping time (T)	Remarks
1	I ≤ 1.05Ir1	Do not trip within 2h	Long-time delay protection function can be turned off; When I=2In, the action time t1=(27,36,54,72,90,108, 144,162s) can be adjusted. Ir2 is the setting value of short delay-time current. The unit of T is s.
2	1.2Ir1≤I ＜ Ir2	$T=(2.0Ir1)^2t1/I2$	
3	I=2Ir1	T=t1	

5.2 Short circuit short-time delay protection features

Table 3

Setting value of the current	Action feature / time	
	V1.x version controller	V2.x, V4.x, Vs.x version controller
Ir2=(2,2.5,3,4, 5,6,7,8,10) Ir1+OFF, adjustable, 6Ir1 by default	1.5Ir2, Operation time t2=(0.1±0.03s, 0.2±0.04s, 0.3±0.06s, 0.4±0.06s), Factory default value is 0.4s; When Ir2≤I<1.5Ir2, the action time T2 complies with $I^2T_2=(1.5Ir_2)^2t2$ inverse time limit; when 1.5Ir2≤I<Ir3, the operation time T2 is t2.	1.5Ir2, Operation time t2=(0.1±0.03s, 0.2±0.04s, 0.3±0.06s, 0.4±0.06s), Factory default value is 0.4s; When Ir2≤I<1.5Ir2 and I < 12 In, the action time T2 complies with $I^2T_2=(1.5Ir_2)^2t2$ inverse time limit; when 1.5Ir2≤I<Ir3 or 12In≤I < Ir3, the operation time T2 is t2.

5.3 Instantaneous short circuit protection features

Table 4

Setting value of the current	Action feature / time
Ir3=(4,5,6,7,8,9,10,12,14)Ir1+OFF, adjustable, precision of ±15%, 10Ir1 by default	＜ 0.2s

5.4 Residual current breaking time characteristic

Non time-delay action characteristic

Table 5

Residual current	I △ n	2I △ n	5I △ n	10I △ n
Maximum break time	0. 3	0. 15	0. 04	0. 04

Time-delay action characteristic

Table 6

Minimum no-drive time (s)	Residual current	I △ n	2I △ n	5I △ n	10I △ n
0.06	Maximum action time (s)	0.5	0.2	0.15	0.15
	Minimum no-drive time (s)	/	0.06	/	/
0.1	Maximum action time (s)	0.8	0.3	0.3	0.3
	Minimum no-drive time (s)	/	0.1	/	/
0.2	Maximum action time (s)	1	0.4	0.4	0.4
	Minimum no-drive time (s)	/	0.2	/	/

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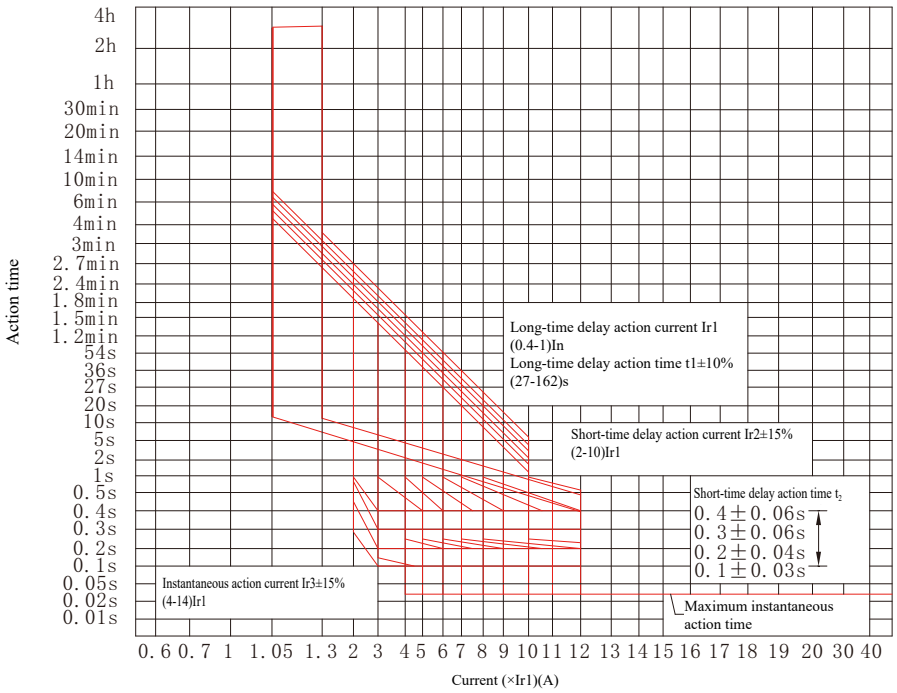
5.5 Time - current characteristic curve



6 Interpretation of Special Functions

6.1 Residual current automatic tracking

(1) Automatic reduction of residual action current setting value

When the residual current automatic tracking function is turned on, if the residual current in the circuit is less than 50% of the setting value of the next gear and lasts for 2 minutes, the circuit breaker will automatically reduce the residual action current setting value by one gear.

(2) Automatic raising of residual action current setting value

When the residual current automatic tracking function is turned on, if the residual current in the circuit is more than 50% and less than 80% of the current of the gear and lasts for 1 minute, the circuit breaker will automatically raise the residual action current setting value by one gear.

6.2 Residual current automatic reclosing function

When the electric leakage reclosing function is turned on, the controller operation interface displays “automatic status”; When the electric leakage reclosing function is turned off, the controller operation interface displays “manual status”. When the product is at the automatic status, the circuit breaker will be reclosed automatically after 20s – 60s if it trips due to residual current. After automatic reclosing, if the circuit breaker re-trips on account of that the residual current fault is not eliminated, the circuit breaker will be closed and will not be reclosed automatically.

6.3 Voltage fault automatic reclosing function

In case of outgoing overvoltage, undervoltage and phase loss and other faults at the incoming end of the product and the corresponding protection function is turned on, the product will trip for protection; When the voltage reclosing function is turned on, the product will be reclosed automatically after the voltage recovers.

Attention: If the circuit breaker has 5 voltage failures consecutively within 5 minutes, the product will enter locking status and will no longer be reclosed automatically.

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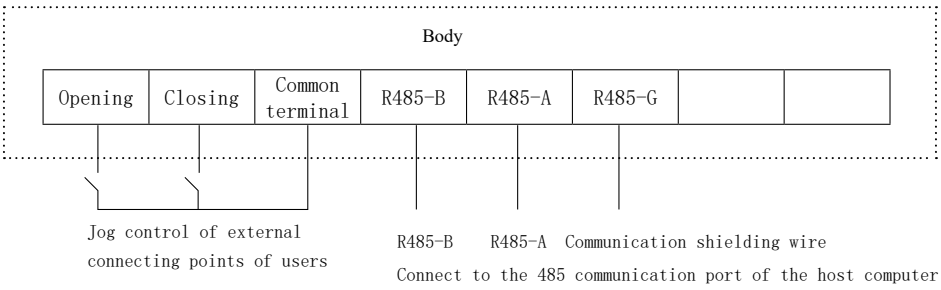
7 External Terminals

Figure 1



Attention:
1. Closing and opening terminals can only be accessed to passive signal. Access to active signal will damage the controller.
2. Signal output port can be equipped with alarm output or closing and opening status signal output. The contact capacity is 0.25A/AC250V;
3. Shield cables shall be adopted as the connecting line of external terminals to the greatest extent, to enhance the communication effect.

8 Derating Coefficient under Different Temperature

Table 7

Current (a)	Ambient temperature					
	40℃	50℃	55℃	60℃	65℃	70℃
125	1In	0.9In	0.89In	0.85In	0.81In	0.78In
250	1In	0.9In	0.89In	0.85In	0.81In	0.78In
400	1In	0.9In	0.89In	0.85In	0.81In	0.78In
630	1In	0.9In	0.89In	0.85In	0.81In	0.78In
800	1In	0.9In	0.89In	0.85In	0.81In	0.78In

9 Electrical Performance Correction Table When Above 2000 Meters

Table 8

Altitude (m)	2000	2500	3000	4000	5000
Power frequency withstand voltage (V)	3000	3000	2500	2000	1800
Insulation voltage (V)	1000	800	700	600	500
Operating current correction coefficient	1In	1In	0.94In	0.88In	0.85In

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10 Outline and Installation Dimensions

10.1 outline and installation dimension(Figure 2 and Table 9).

Figure 2

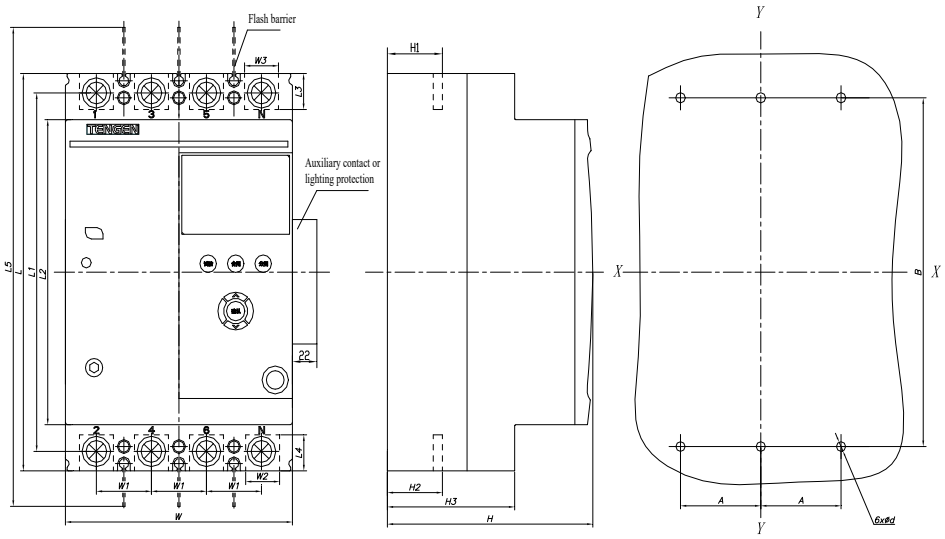

Table 9 Unit: mm

Dimension \ Model		TGM2LC-125	TGM2LC-250	TGM2LC-400	TGM2LC-630	TGM2LC-630 Large volume	TGM2LC-800
Outline dimension	L	220	242	327	327	350	370
	W	122.5	142	198	198	239	280
	H	120	144	180	180	180	182
Remaining dimensions	L1	202	221	295	295	315	332.2
	W1	30	35	48	48	58	70
	W2	18	23	32	32	44	45
	W3	18	23	32	32	44	45
	H1	28	24.5	40	45	45	40.2
	H2	28	24	40	42	35	40.2
	H3	67	89	113	113	104	102.5
	L2	170	193	251	251	258	283
	L3	16.5	20	25	25	27	34
	L4	16.5	20	25	25	27	34
	L5	334	377	555	555	580	598
Installation dimension (mm)	A	30	35	48	48	58	70
	B	198	204	287	287	280	332.2
	Mounting hole φd	6-φ4.5	6-φ4.5	6-φ6	6-φ6	6-φ6	6-φ7
Wiring screw		M8	M8	M10	M10	M12	M12
Mounting screw		M4×45	M4×55	M5×90	M5×90	M5×95	M5×95

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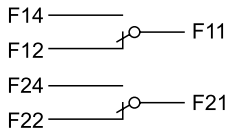
10.2 Auxiliary contact

The auxiliary contacts of the circuit breaker are divided into two groups. The parameters of auxiliary contacts are shown in Figure 3. The schematic diagram of wiring is as follows.

Figure 3

When the circuit breaker is at the position of "opening"	

11 Cross-sectional area of external connecting lead

Cross-sectional areas that match with the connecting lead when the rated current doesn't exceed 400A.

Table 10

Rated current (A)	16 20	25	32	40 50	63	80	100	125 140	160	180 200 225	250	315 350	400
Cross-sectional area of copper lead (mm^2)	2.5	4.0	6.0	10	16	25	35	50	70	95	120	185	240

Cross-sectional areas that match with the connecting lead when the rated current exceeds 400A

Table 11

Rated current A	Copper cable		Copper bar	
	Cross-sectional area mm^2	Quantity	Dimension mm×mm	Quantity
500	150	2	30×5	2
630	185	2	40×5	2
800	240	2	50×5	2

12 Ordering Notice

Rated current	125	250	400	630	800
Number of packing case	4 pcs	2 pcs	1 piece	1 piece	1 piece

Please specify when ordering: Name, model, specifications, breaking capacity level, rated current, order quantity and other information of the circuit breaker.

For example: Order 100 sets of TGM2LC circuit-breakers incorporating residual current protection, 400 frame, L type, digital tube controller; Fill in TGM2LC-400L/3N/S1400A 100 sets.

If needing special products for photovoltaic, with lighting protection module, and with infrared communication device, specify when ordering.