TGM2LC Series Moulded Case Circuit Breakers with Earth Leakage Protection

1 Product overview

TGM2LC series (hereinafter referred to as 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 standards: IEC60947-2 and IEC60947-4-1

2 Normal working conditions

(1) Ambient air temperature: -5ºC-+40ºC;
(2) The attitude of the installation site does not exceed 2,000m;
(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 class: 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/ □

- None: V1.x controller (LCD type); Y1: V2.x controller (LCD type);
  Y2: V3.x controller (LCD type); Y3: V4.x controller (LCD type),
  S1: Vx.x controller (digital type)
- Pole number: Three-pole four-wire (3P+N)
- The rated limit short-circuit breaking capacity level (L: standard; M: relatively high breaking)
- Frame rated current
- Automatic reclosing function
- Residual current protection function
- Design code
- Moulded case circuit breaker
- Enterprise code

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4 Main technical specifications

Table 1

Frame rated 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
Pole number	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)	50, 75, 100, 150, 200, 300, 500, 800, 1000 (adjustable; can be turned off), default 500		100, 150, 200, 300, 500, 800, 1000 + OFF (adjustable, can be turned 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 (special for photovoltaic, off by default)					
Use 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) (9,600 by default).					
Externally-mounted lightning protection module	Optional					
Auxiliary contact	Optional					

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5 Protection 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 controller	V2.x, V4.x and Vs.x controller
Ir2=(2,2.5,3,4, 5,6,7,8,10) Ir1+OFF, adjustable, 6Ir1 by default	1.5Ir2, action time t2=(0.1±0.03s,0.2±0.04s ,0.3±0.06s,0.4±0.06s), 0.4s by default when delivery; When Ir2 ≤ I < 1.5Ir2, the action time T2 meets I2T2 =(1.5Ir2)2t2 inverse time-delay; when 1.5Ir2 ≤ I < Ir3, the action time T2 is t2.	1.5Ir2, action time t2=(0.1±0.03s,0.2±0.04s ,0.3±0.06s,0.4±0.06s), 0.4s by default when delivery; When Ir2≤I < 1.5Ir2 and I < 12 In, the action time T2 meets I2T2=(1.5Ir2)2t2 inverse time-delay; when 1.5Ir2 ≤ I < Ir3 or 12In ≤ I < Ir3, the action 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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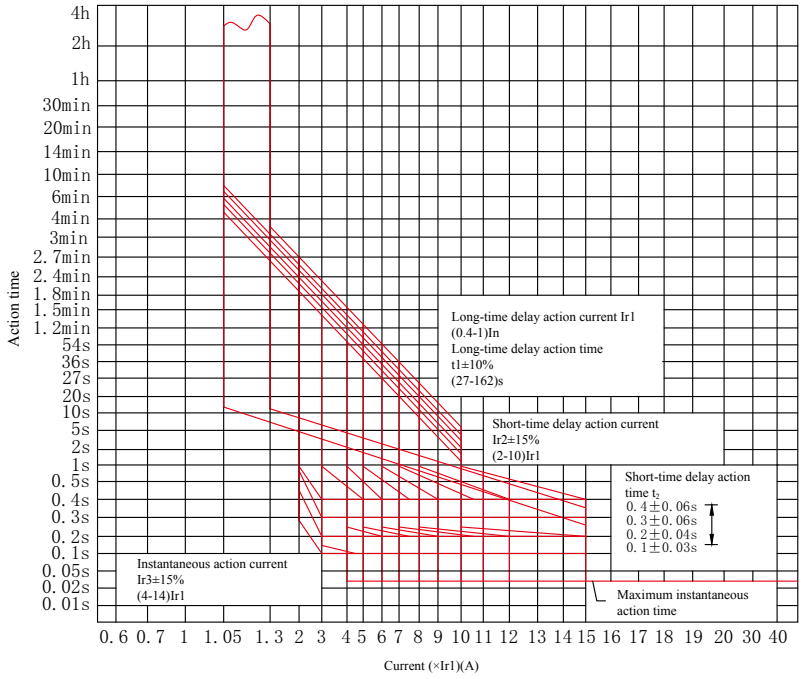
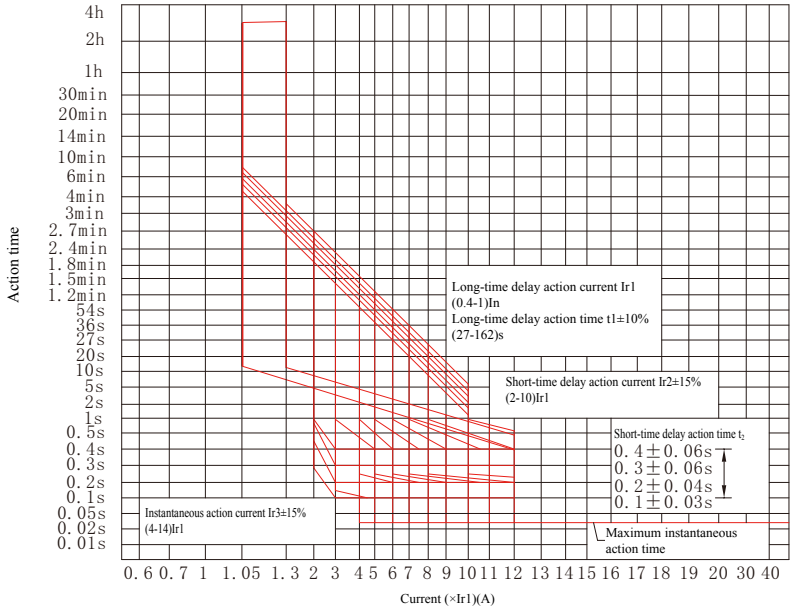
5.5 Time - current characteristic curve

5.5.1 V1.x Controller



5.5.2 V2.x, V4.x and Vs Controller



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6 Interpretation of special functions

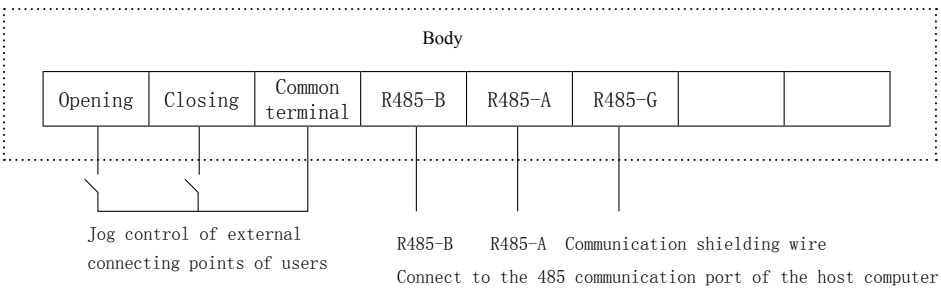
6.1 Residual current automatic tracking
(1) Automatic reduction of residual action current setting value
When the residual current automatic tracking function is turned on, if the residual current in the circuit is less than 50% of the setting value of the next gear and lasts for 2 minutes, the circuit 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.

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.

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8 Outline and installation dimension

8.1 outline and installation dimension(Figure 2 and Table 7).

Figure 2

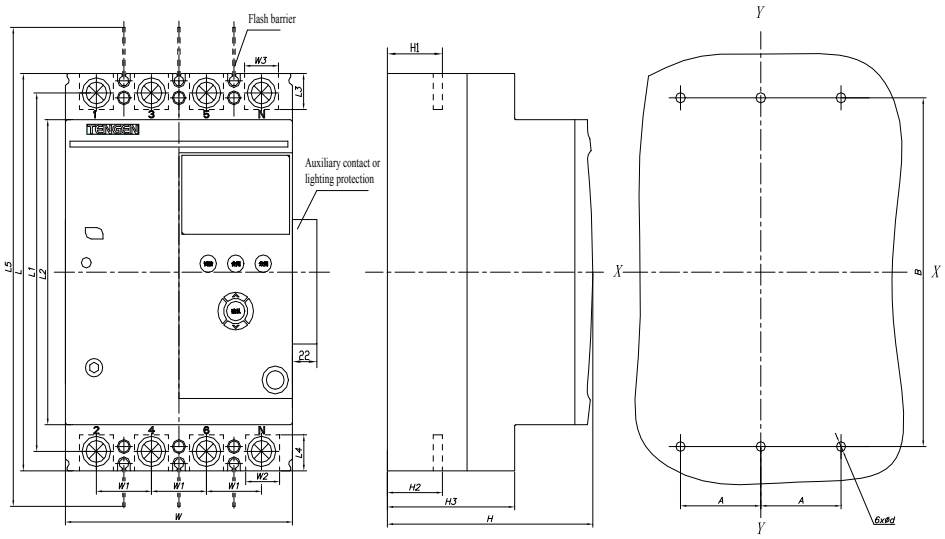

Table 7 Unit: mm

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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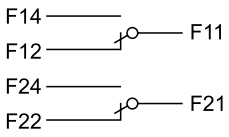
8.2 Auxiliary contact

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"	

9 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 8

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 9

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

10 Ordering instructions

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

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.