TECHNICAL MANUAL

Molded case circuit breakers VA-99M EKF

1 DESCRIPTION

The molded case circuit breaker VA-99M EKF is designed for infrequent routine close/open operations and overload/short-circuit protection to be used in electrical installations for residential and civil engineering, industrial facilities, power substations, electrical distribution points, panel electrical equipment at rated operating voltage up to 400 V AC at 50 Hz under currents from 16 to 1600 Amps.

The molded case circuit breakers comply with the requirements of IEC 60947-2:2016.

2 DESIGN AND OPERATING PRINCIPLE

The molded case circuit breaker (MCCB) VA-99M is a monoblock consisting of a base and a cover with a window for the operating handle and a window for pressing the push-button "TEST" to test the tripping mechanism.

The base is made of thermal-resistant, flame-retardant ABS plastic and is a supporting structure for connecting terminals, fixed power contacts with an arc fault protection system, a control mechanism with a system of movable contacts, electromagnetic and thermal trip units. The bimetallic strip executes thermal protection. The trip units have factory settings and are non-adjustable.

The housing cover is made of thermal-resistant ABS plastic, covers the entire mechanism and protects personnel against electric shock when operating the circuit breaker.

The control mechanism is based on the break lever principle and has a strong return spring to ensure quick tripping. The arc fault protection system consists of equidistant steel plates that direct the gas flow into an outlet window enclosed by a perforated wall, which ensures optimum discharge and dissipation. However, when the the molded case circuit breakers are installed in confined space of the switchgear, arc products can be discharged if the overcurrent protection is triggered.

The motor mechanism has manual mechanical and electrical remote control to ensure trouble-free operation, even in case of power disconnection. The front panel features an indicator of the motor mechanism status and a manual/automatic switch.

WARNING! When the switch is in the "automatic" position, the extended rotary handle is disabled. The wiring diagram is located on the left side of the motor mechanism.

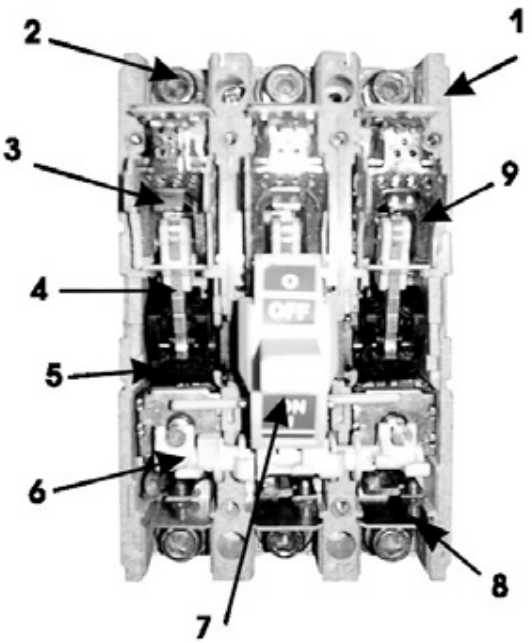
The MCCB VA-99M power supply can be connected from both fixed and movable

contact sides, i.e. connection is possible from the top and bottom of the circuit breaker.

WARNING! The operating handle of the molded case circuit breaker has three positions "ON", "OFF" and "TRIP". To switch on the MCCB after tripping, move the operating handle from the intermediate position to the "OFF" position and then to the "ON" position.

INTERNAL ARRANGEMENT

1. Housing made of thermal-resistant, flame-retardant ABS plastic
2. Connecting terminals
3. Fixed power contacts
4. Movable contacts
5. Insulation rail
6. Flat rail
7. Operating handle
8. Adjustable screws
9. Arc chute



3 TECHNICAL DATA

Type code

VA99M/XXX XXXA XP

- Molded case circuit breaker VA-99M
- Maximum rated current (housing) Inm, A
- Rated tripping current, A
- Number of poles

Main technical data are given in tables 1-5.

Table 1 - Technical data of VA-99M 63, VA-99M 100, VA-99M 250

Parameters	**Values**						
	VA-99M 63	**VA-99M 100**			**VA-99M 250**		
Rated operating voltage Ue, V	AC 400 V	DC 250 V	AC 400 V	AC 690 V	DC 250 V	AC 400 V	AC 690 V
Ultimate short-circuit breaking capacity Icu, kA	25	10	35	10	10	35	10
Service short-circuit breaking capacity Ics, kA	18	6	26	5	6	25	5
Rated currents In, A	16, 20, 25, 32, 40, 50, 63	16, 20, 25, 32, 40, 50, 63, 80, 100, 125			100, 125, 160, 200, 225, 250		
Min. mechanical endurance, O-C cycles	7000	7000			7000		
Min. electrical endurance, O-C cycles	2000						
Rated peak short-circuit current Icm, kA	2,1xIcu						
Rated insulation voltage Ui, V	800						
Utilization category according to IEC 60947-2:2016	A						
Type of trip unit	Thermal-magnetic						
Set point of electromagnetic trip unit	10xIn						
Number of poles (standard)	3P						

Table 1 continued

Parameters	Values		
	VA-99M 63	**VA-99M 100**	**VA-99M 250**
Power consumption, W	25	25	70
Protection degree	IP30		
Operating temperature, °C	from – 25 to + 40		
Weight, kg	1	1,25	2
Min. service life, years	10		

Table 2 - Technical data of VA-99M 400, VA-99M 630, VA-99M 800

Parameters	Values					
	VA-99M 400		**VA-99M 630**		***VA-99M 800**	
Rated operating voltage Ue, V	AC 400 V	AC 690 V	AC 400 V	AC 690 V	AC 400 V	AC 690 V
Ultimate short-circuit breaking capacity Icu, kA	42	15	50	15	50	35
Service short-circuit breaking capacity Ics, kA	31,5	8	35	8	30	15
Rated currents In, A	250, 315, 400		400, 500, 630		630, 800	
Min. mechanical endurance, O-C cycles	4000		4000		4000	
Min. electrical endurance, O-C cycles	2000					
Rated peak short-circuit current, kA	2,1xIcu		2,2xIcu			
Rated insulation voltage Ui, V	800					
Utilization category according to IEC 60947-2:2016	A					

Table 2 continued

Parameters	Values		
	VA-99M 400	VA-99M 630	*VA-99M 800
Type of trip unit	Thermal-magnetic		
Set point of electromagnetic trip unit	10xIn		
Number of poles (standard)	3P		
Power consumption, W	85	100	160
Protection degree	IP30		
Operating temperature, °C	from – 25 to + 40		
Weight, kg	5,75	8,25	24,6
Min. service life, years	10		

* Motor mechanism 230V AC VA-99M 800 EKF (mccb99m-a-135) shall not be used with molded case circuit breaker VA-99M 800/1000A 3P 50kA EKF (mccb99-800-1000 m).

Table 3 - Technical data of VA-99M 1250, VA-99M 1600

Parameters	Values			
	VA-99M 1250		VA-99M 1600	
Rated operating voltage Ue, V	AC 400 V	AC 690 V	AC 400 V	AC 690 V
Ultimate short-circuit breaking capacity Icu, kA	35	25	35	25
Service short-circuit breaking capacity Ics, kA	35	12,5	35	12,5
Rated currents In, A	800, 1000, 1250		1600	

Table 3 continued

Parameters	**Values**			
	VA-99M 1250		**VA-99M 1600**	
Rated operating voltage Ue, V	AC 400 V	AC 690 V	AC 400 V	AC 690 V
Min. mechanical endurance, O-C cycles	2500		2500	
Min. electrical endurance, O-C cycles	1500			
Rated peak short-circuit current Icm, kA	2,2xIcu			
Rated insulation voltage Ui, V	800			
Utilization category according to IEC 60947-2:2016	A			
Type of trip unit	Thermal-magnetic			
Set point of electromagnetic trip unit	10xIn			
Number of poles (standard)	3P			
Power consumption, W	160		160	
Protection degree	IP30			
Operating temperature, °C	from – 25 to + 40			
Weight, kg	26,8			
Min. service life, years	10			

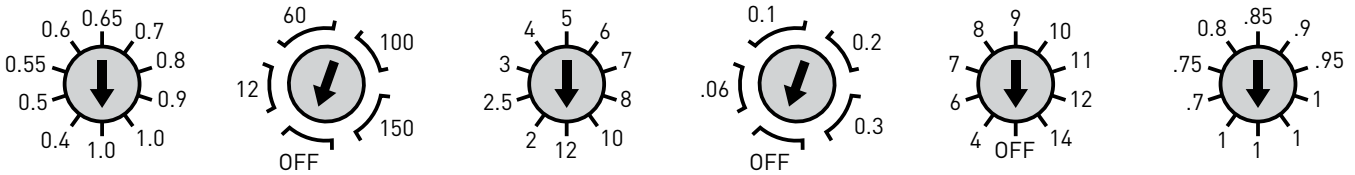
Table 4 - Technical data of VA-99M with electronic trip unit

Parameters	Values						
	VA-99M 100/63A	**VA-99M 100/100A**	**VA-99M 250/250A**	**VA-99M 400/400A**	**VA-99M 630/630A**	**VA-99M 800/800A**	**VA-99M 1250/1250A**
Rated current In, A	63	100	250	400	630	800	1250
Rated insulation voltage Ui, V	800	800	800	800	800	800	800
Rated impulse voltage, Uimp, kV	8						
Rated operating voltage Ue, V	400						
Ultimate short-circuit breaking capacity Icu, kA	50	50	50	65	65	75	65
Service short-circuit breaking capacity Ics, kA	35	35	35	42	42	50	50
Set point of thermal protection current Ir1, A	32-63	63-100	100-250	160-400	252-630	630-800	850-1250
Rated short-time withstand current Icw, kA	1,2 t=0,5 c	1,2 t=0,5 c	1,2 t=0,5 c	5 t=1 c	8 t=1 c	10 t=1 c	20 t=1 c
Utilization category	B						
Trip unit	Electrnonic						

Table 4 continued

Parameters	Values						
	VA-99M 100/63A	**VA-99M 100/100A**	**VA-99M 250/250A**	**VA-99M 400/400A**	**VA-99M 630/630A**	**VA-99M 800/800A**	**VA-99M 1250/1250A**
Min. mechanical endurance, O-C cycles	8500	8500	7000	4000	4000	2500	2500
Min. electrical endurance, O-C cycles	1500	1500	1000	1000	1000	500	500
Number of poles	3P						
Protection degree	IP30						
Operating tempera-ture, °C	from – 5 to + 40						
Min. service life, years	10						

Description of the electronic trip unit for VA-99M



IR (A) - Set point of overload protection tripping, A. Setting values for each dimension are shown in Table 4.

Kt1 (s) - Time delay of overload current tripping for current 2Ir1, s. Possible setting is 12-100 s.

Isd (xIR) – Set point of short-circuit current protection tripping is set relative to the preset Ir1. The switch has 10 positions (2-12xIr1).

Ktsd (s) - Time delay of short-circuit current tripping, s. Possible setting is 0.06-0.3s. The function is available when any time t2 is set except off.

Ii (xIR) - Set point of instantaneous short-circuit current protection is set relative to the preset Ir1. The switch has 10 positions (4-14xIr1).

IRO (xIR) – Set point of overload alarm current is set relative to the preset Ir1, it does not trip the circuit breaker. The switch has 8 positions (0.7-1xIr1).

Table 5.1 - Kt1 Settings

<table>
<tr><td rowspan="6">Reverse delay time (s)
$T=\frac{(2Ir1)^2}{I^2}\,t1$
(Isd>I>Ir1)</td><td colspan="2">Kt1 (s)
Encoder settings</td><td>12</td><td>60</td><td>80
(100)</td><td>100
(150)</td><td></td></tr>
<tr><td>E.g.: 2Ir1</td><td rowspan="2">In≤250
(T) Tripping time</td><td>12</td><td>60</td><td>80</td><td>100</td><td rowspan="4">OFF
(without protec-tion)</td></tr>
<tr><td>E.g.: 4Ir1</td><td>3</td><td>15</td><td>20</td><td>25</td></tr>
<tr><td>E.g.: 2Ir1</td><td rowspan="2">In≥400
(T) Tripping time</td><td>12</td><td>60</td><td>100</td><td>150</td></tr>
<tr><td>E.g.: 4Ir1</td><td>3</td><td>15</td><td>25</td><td>37.5</td></tr>
<tr><td colspan="2">Error</td><td colspan="4">±20%</td><td></td></tr>
</table>

Table 5.2 - Ktsd Settings

<table>
<tr><td colspan="2" rowspan="2"></td><td colspan="2">Action</td><td colspan="2">0.9 Isd~1.1Isd Take action during</td><td colspan="4">⩽0.9 Isd no action</td></tr>
<tr><td colspan="4">>1.1Isd action</td></tr>
<tr><td rowspan="3">Fixed time characteristics</td><td rowspan="3">I>1.5Isd & I<Ii</td><td colspan="2">Encoder settings tsd (s)</td><td>0.06</td><td>0.1</td><td>0.2</td><td>0.3</td><td></td></tr>
<tr><td>⩾1.1 Isd</td><td rowspan="2">T</td><td>0.06</td><td>0.1</td><td>0.2</td><td>0.3</td><td rowspan="2">OFF (without protec-tion)</td></tr>
<tr><td>Error</td><td>±0.02</td><td>±0.03</td><td>±0.04</td><td>±0.06</td></tr>
<tr><td>Reverse time functions</td><td>I>Isd & I⩽1.5Isd</td><td>⩾1.1 Isd</td><td rowspan="2">T</td><td colspan="5">$T=\frac{(1.5\,Isd)^2}{I^2}\,tsd$</td></tr>
<tr><td colspan="2">Error</td><td colspan="5">±20%</td></tr>
</table>

Table 6 - Technical data of VA-99M with electromagnetic trip unit

Parameters	**Values**									
	VA-99M 100			**VA-99M 250**			**VA-99M 400**		**VA-99M 800**	
Rated operating voltage Ue, B	DC 250 V	AC 400 V	AC 690 V	DC 250 V	AC 400 V	AC 690 V	AC 400 V	AC 690 V	AC 400 V	AC 690 V
Ultimate short-circuit breaking capacity Icu, kA	10	35	10	10	35	10	42	15	35	30
Service short-circuit breaking capacity Ics, kA	6	26	5	6	25	5	31,5	8	35	15
Rated currents In, A	32, 63, 100, 125			160, 250			400		630	
Min. mechanical endurance, O-C cycles	7000			7000			4000		4000	
Min. electrical endurance, O-C cycles	2000									

Table 6 continued

Parameters	Values									
	VA-99M 100			VA-99M 250			VA-99M 400		VA-99M 800	
	DC 250 V	AC 400 V	AC 690 V	DC 250 V	AC 400 V	AC 690 V	AC 400 V	AC 690 V	AC 400 V	AC 690 V
Rated peak short-circuit current Icm, kA	2,1xIcu						2,2xIcu			
Rated insulation voltage Ui, V	800									
Utilization category according to IEC 60947-2:2016	A									
Type of trip unit	electromagnetic									
Set point of electromagnetic trip unit	10xIn									
Number of poles (standard)	3P									
Power consumption, W	25			70			85		160	
Protection degree	IP30									
Operating temperature, °C	from – 25 to + 40									
Weight, kg	1,25			2			5,75		24,6	
Min. service life, years	10									

TRIPPING CHARACTERISTICS

Tripping characteristics of the molded case circuit breakers VA-99M.

In the diagrams, areas 1, 2, 3 have meaning:

1 - "cold" tripping area of thermal trip unit;

2 - "hot" tripping area of thermal trip unit;

3 - tripping area of electromagnetic trip unit.

Tripping curve of VA-99M 63

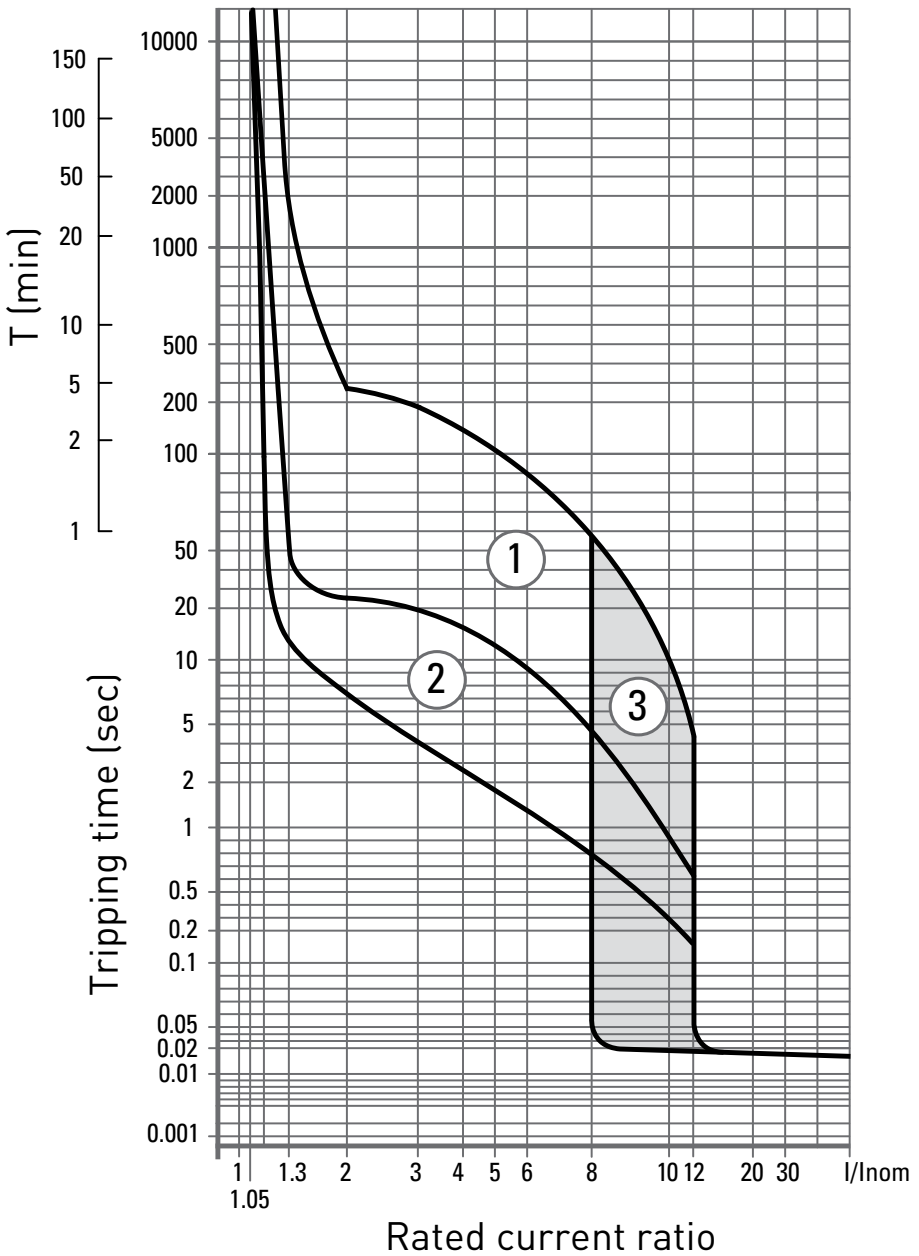


Table 7.1 - Values to test VA-99M 63 thermal trip units

Test current, A	Tripping time, s	Result
2*In	⩽ 300	MCCB tripping
4*In	⩽ 170	MCCB tripping

Tripping curve of VA-99M 100

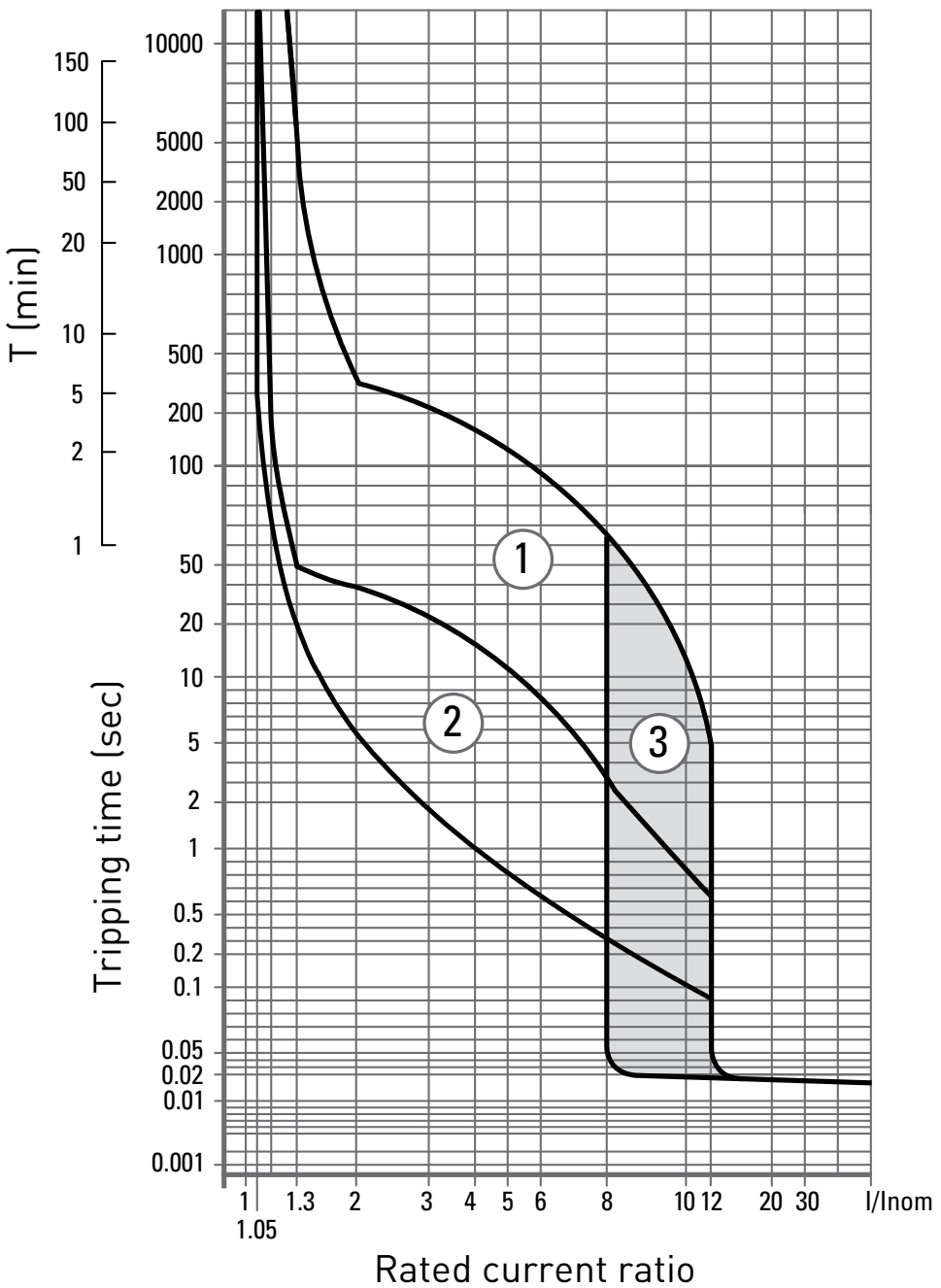


Table 7.2 - Values to test VA-99M 100 thermal trip units

Test current, A	Tripping time, s	Result
2*In	⩽ 400	MCCB tripping
4*In	⩽ 180	MCCB tripping

Tripping curve of VA-99M 250

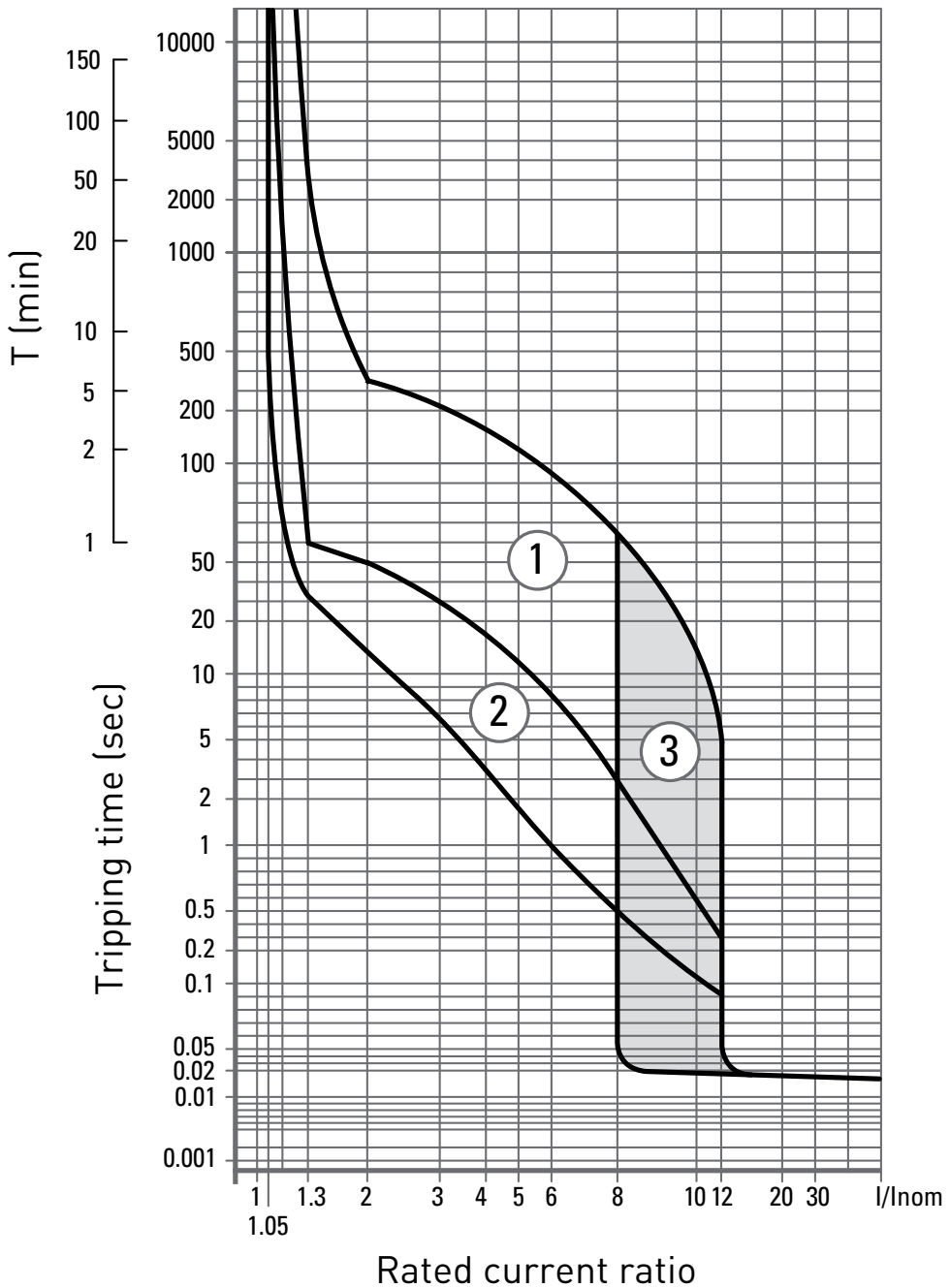


Table 7.3 - Values to test VA-99M 250 thermal trip units

Test current, A	Tripping time, s	Result
2*In	⩽ 380	MCCB tripping
4*In	⩽ 170	MCCB tripping

Tripping curve of VA-99M 400

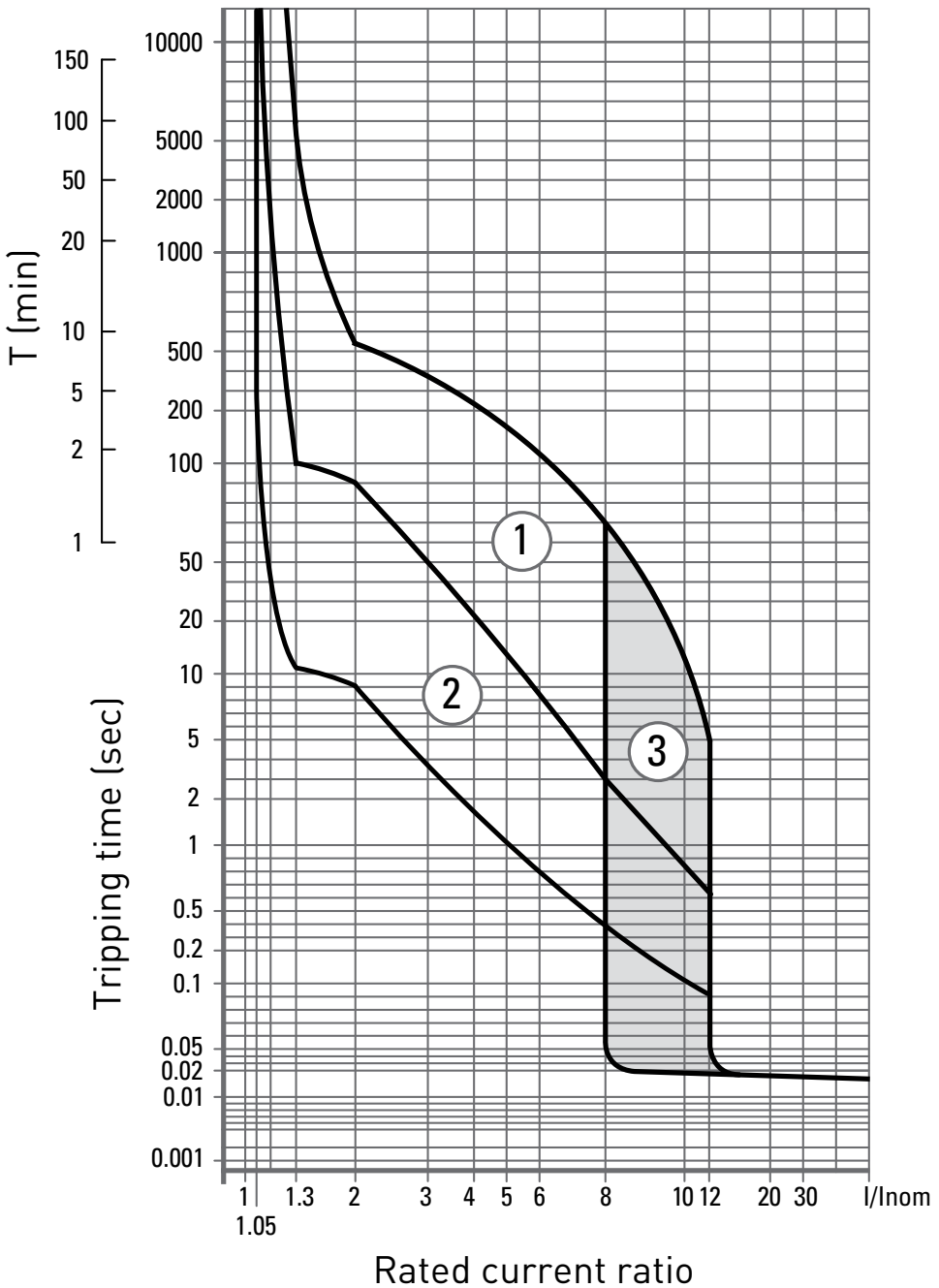


Table 7.4 - Values to test VA-99M 400 thermal trip units

Test current, A	Tripping time, s	Result
2*In	⩽ 550	MCCB tripping
4*In	⩽ 200	MCCB tripping

Tripping curve of VA-99M 630

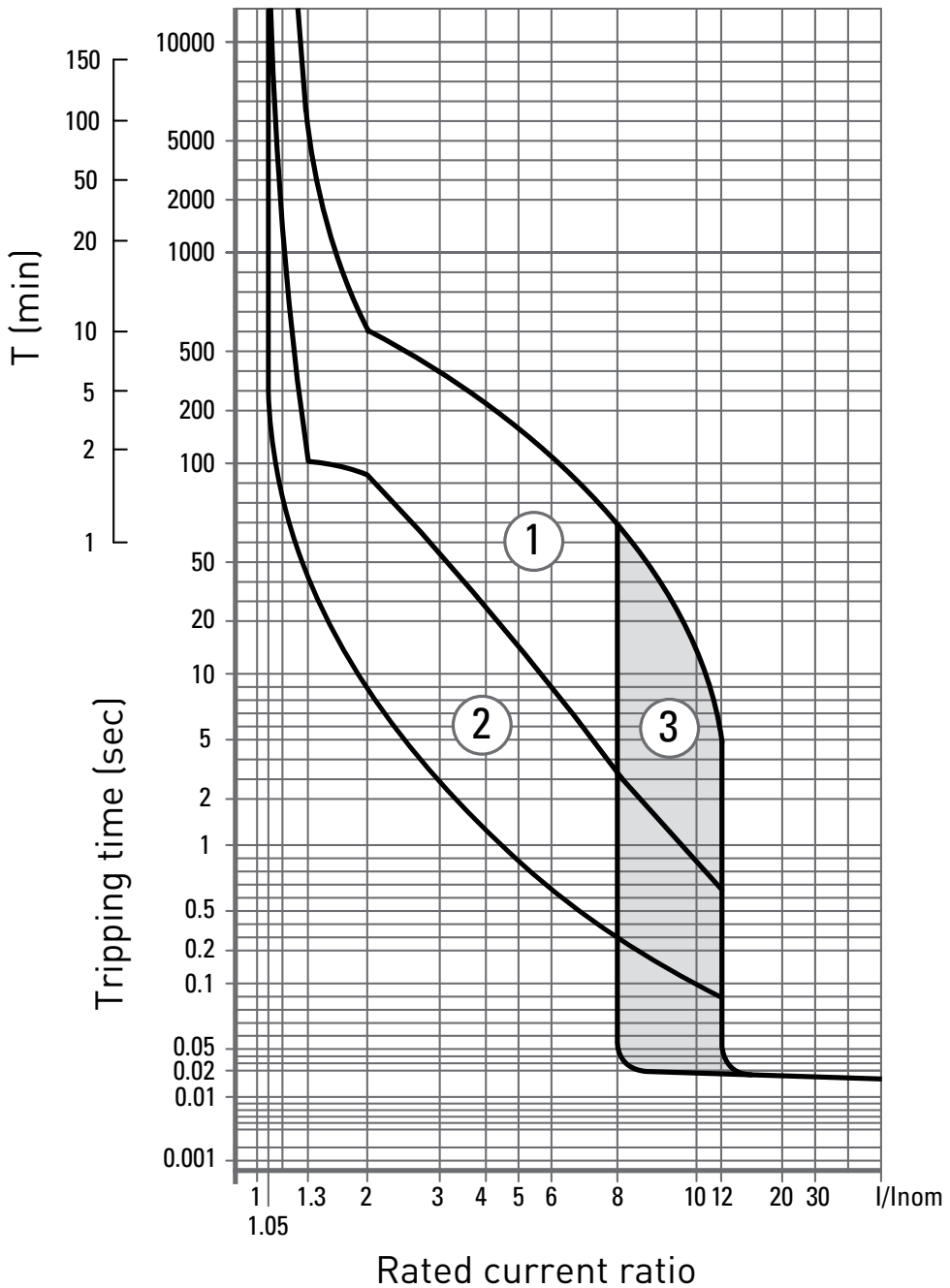


Table 7.5 - Values to test VA-99M 630 thermal trip units

Test current, A	Tripping time, s	Result
2*In	⩽ 600	MCCB tripping
4*In	⩽ 390	MCCB tripping

Tripping curve of VA-99M 800 (1600)

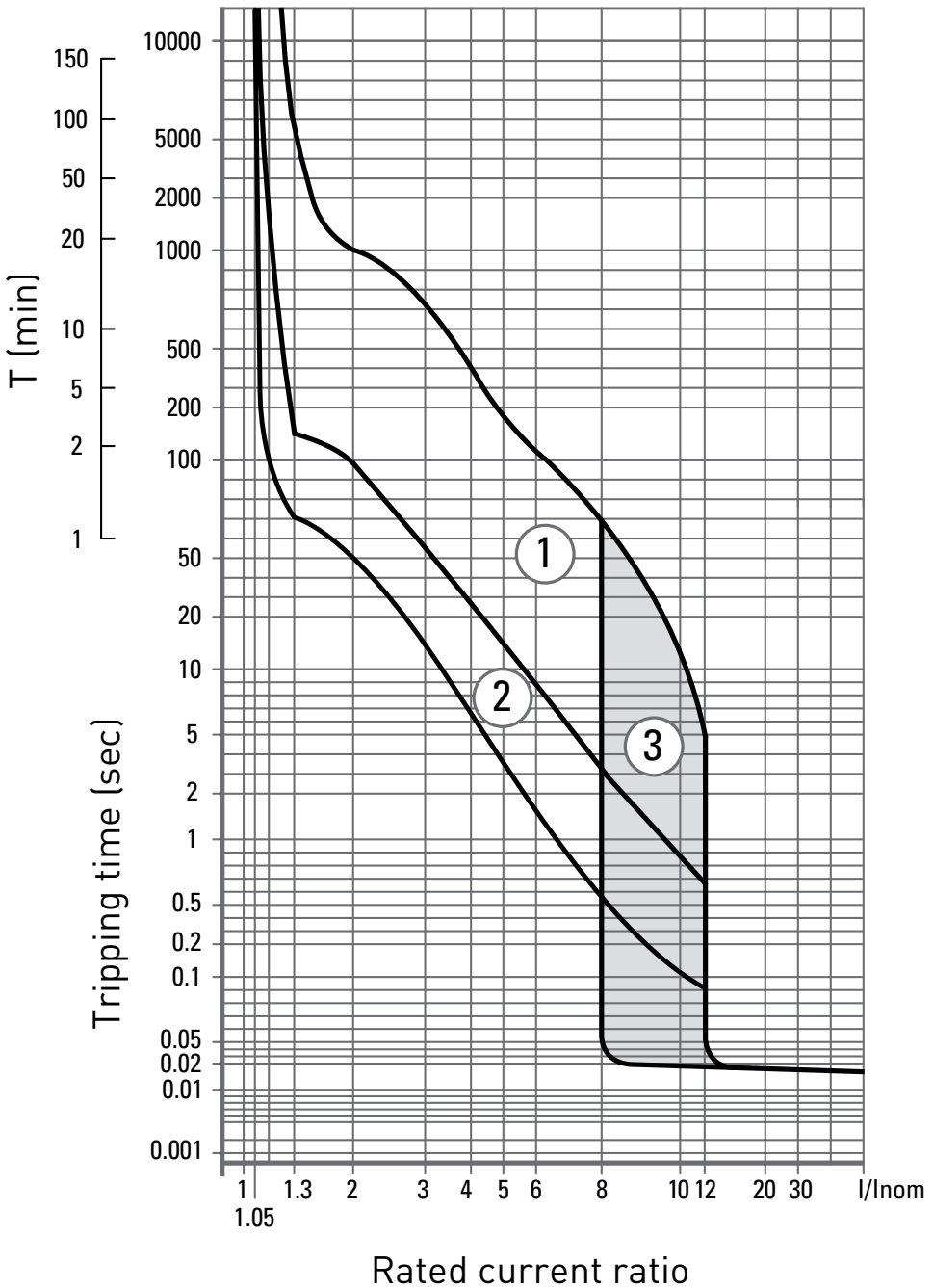


Table 7.6 - Values to test VA-99M 800 (1600) thermal trip units

Test current, A	Tripping time, s	Result
2*In	⩽ 1000	MCCB tripping
4*In	⩽ 390	MCCB tripping

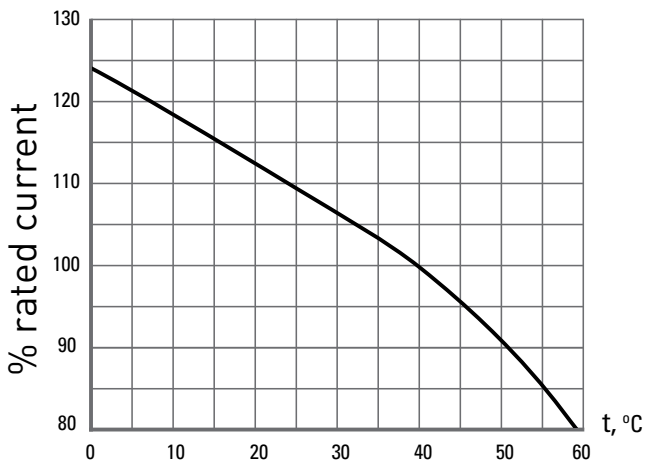
INFLUENCE OF THE AMBIENT TEMPERATURE

The devices shall be commissioned at normal operating ambient temperature.

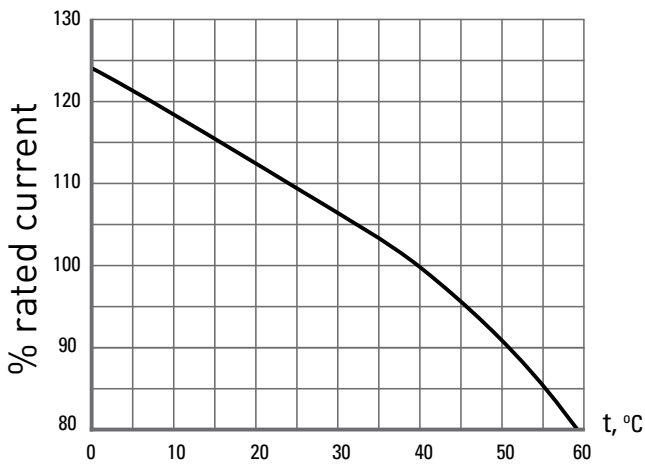
The tripping time of the molded case circuit breaker is determined by its tripping curve. The setting value of the overload protection (Ir) shall be adjusted according to the diagrams below.

TEMPERATURE FACTOR

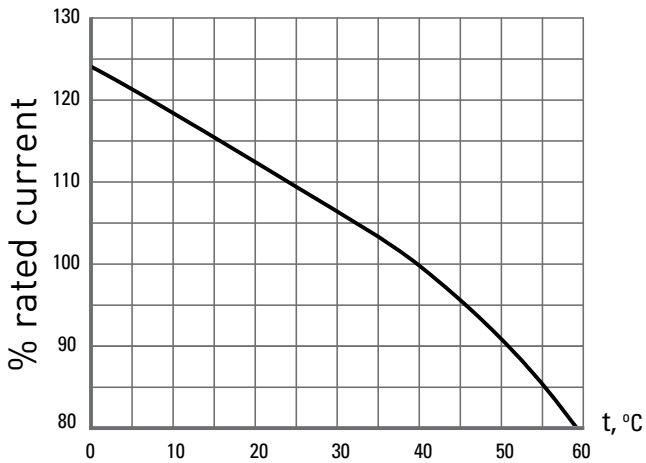
VA-99M 63



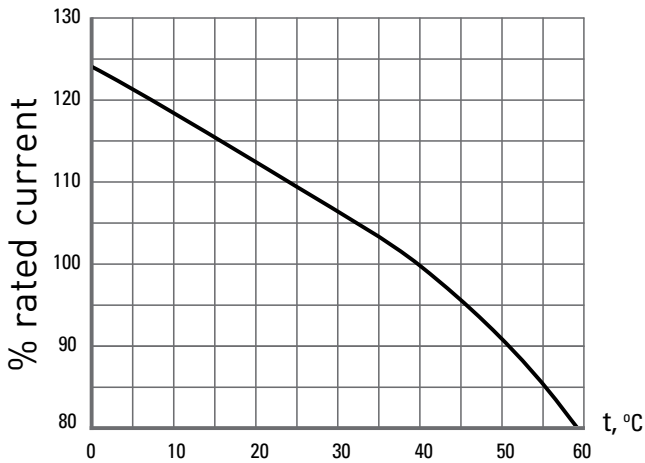
VA-99M 100



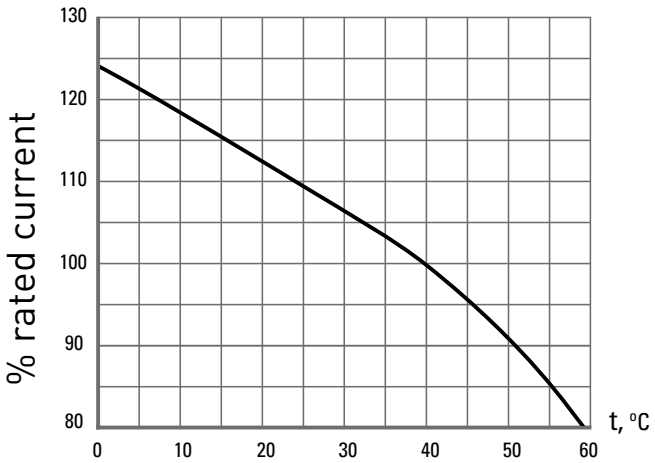
VA-99M 250



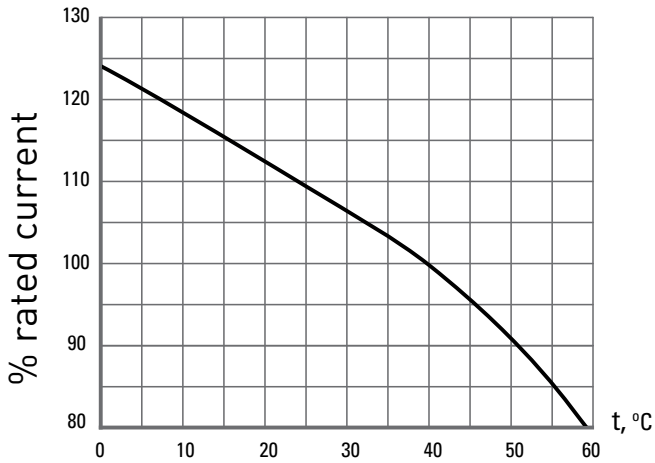
VA-99M 400



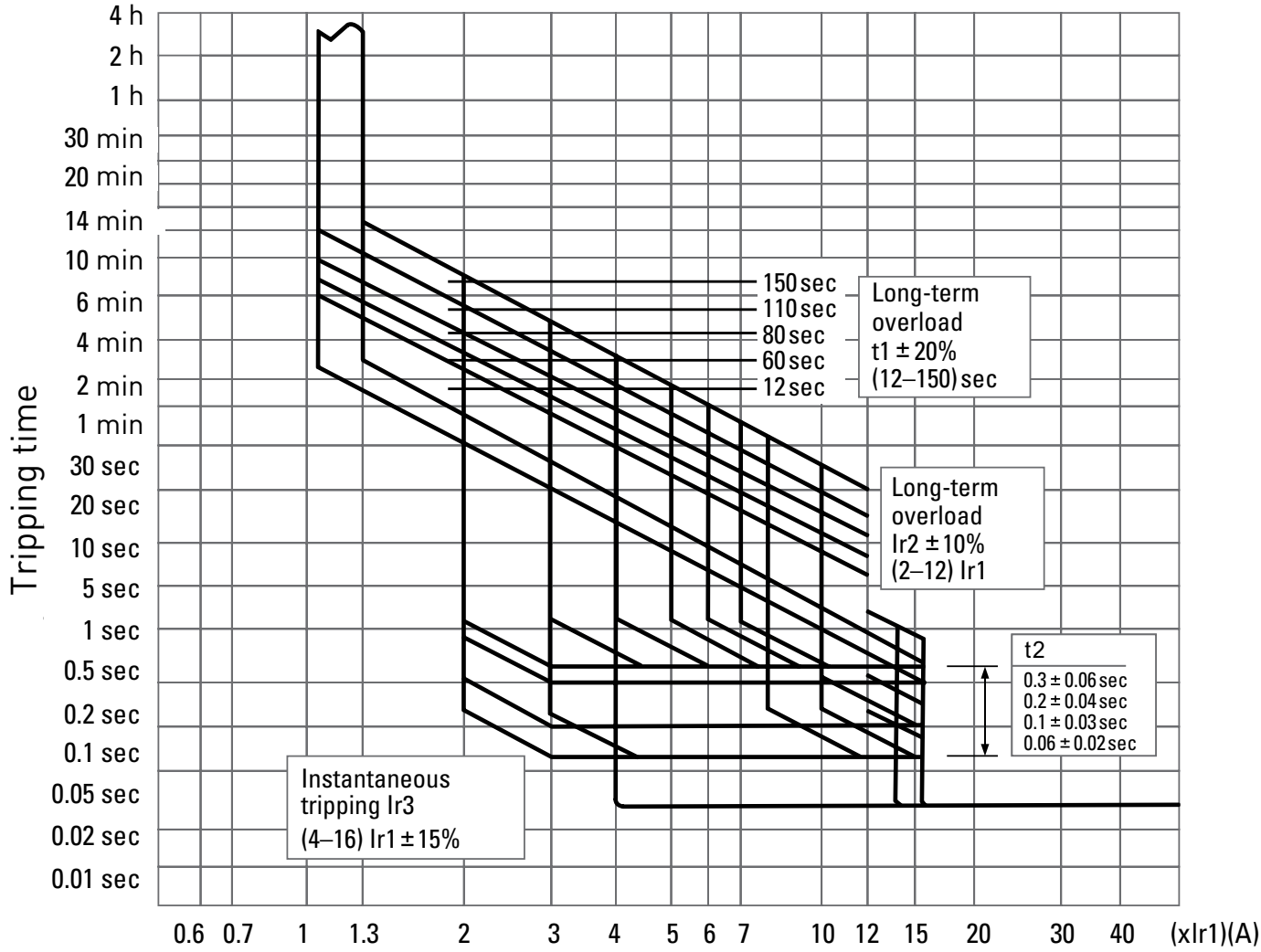
VA-99M 630



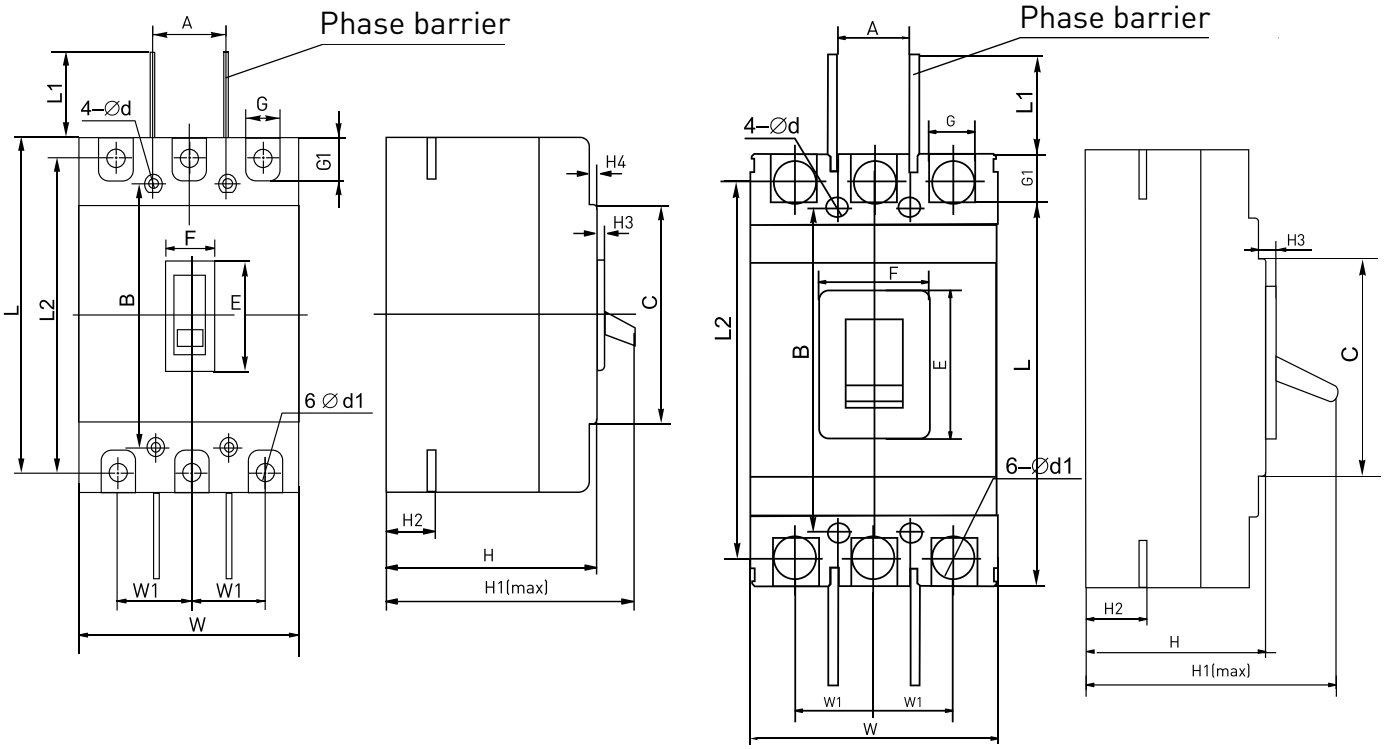
VA-99M 800 (1600)



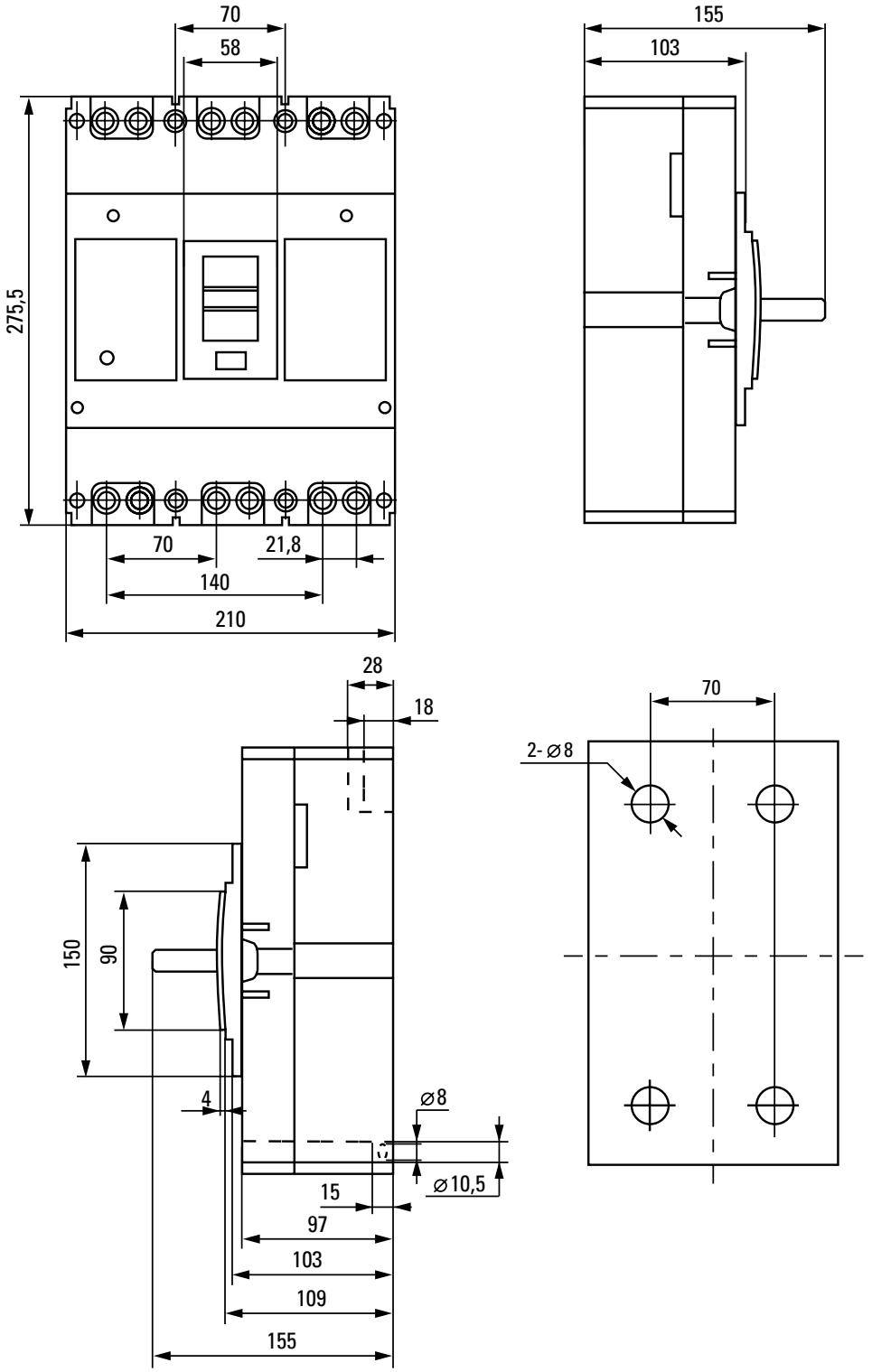
TRIPPING CURVE FOR VA-99M WITH ELECTRONIC TRIP UNIT



4 OVERALL AND INSTALLATION DIMENSIONS

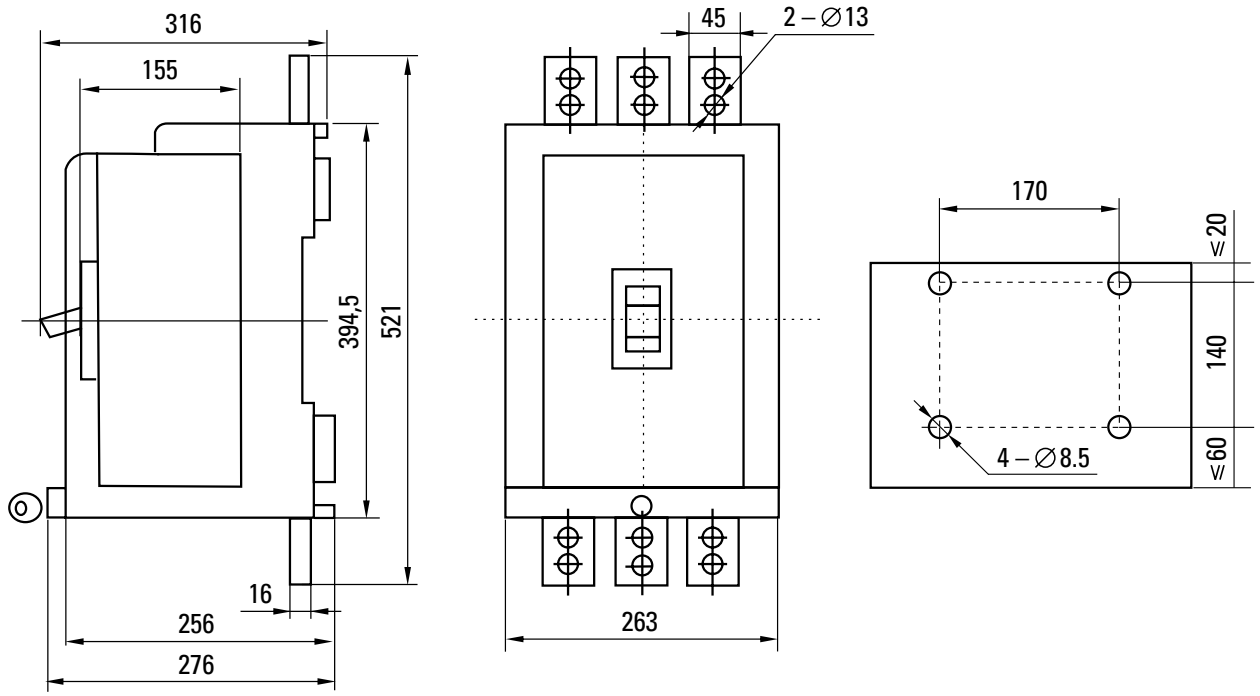


Dimentions		Name				
		VA-99M 63	VA-99M 100	VA-99M 250	VA-99M 400	VA-99M 630
Overall dimensions, mm	C	85	84	102	102	134
	E	48	50	50	86	88
	F	22	22	22	90	64
	G	14	17	23	32	45
	G1	14	16	24	32	34
	H	73	68	84	104	110
	H1	90	86	110	155	165
	H2	20	24	24	38	44
	H3	4,5	4	4	6	6,5
	H4	7	7	5	-	-
	L	135	155	165	258	270
	L1	14	60	80	105	105
	L2	117	132	144	225	234
	W	76	90	105	140	182
	W1	25	30	35	44	58
Installation dimensions, mm	A	25	30	35	44	58
	B	117	129	126	194	200
	Ø D	3,5	4,5	5,5	7	7
	Ø D1	7	10	10	26	30

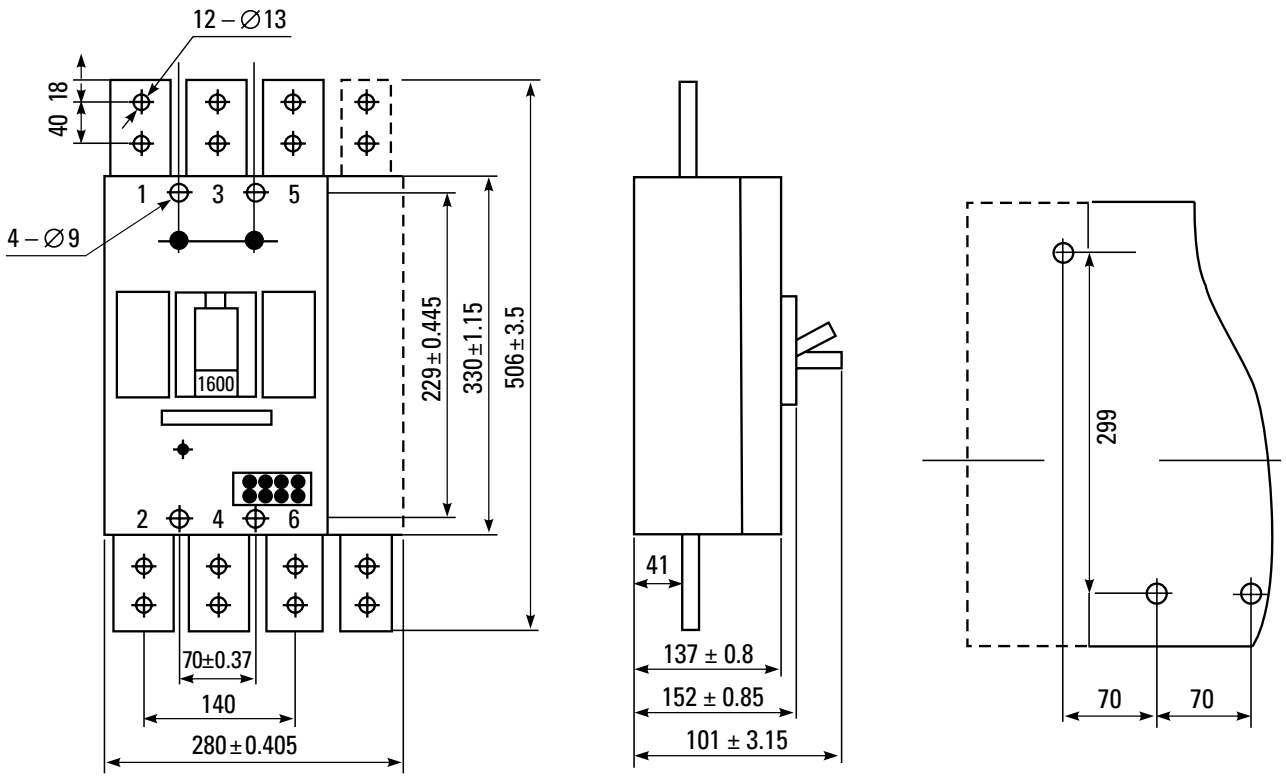


Overall and installation dimensions of VA-99M 800-1000A*

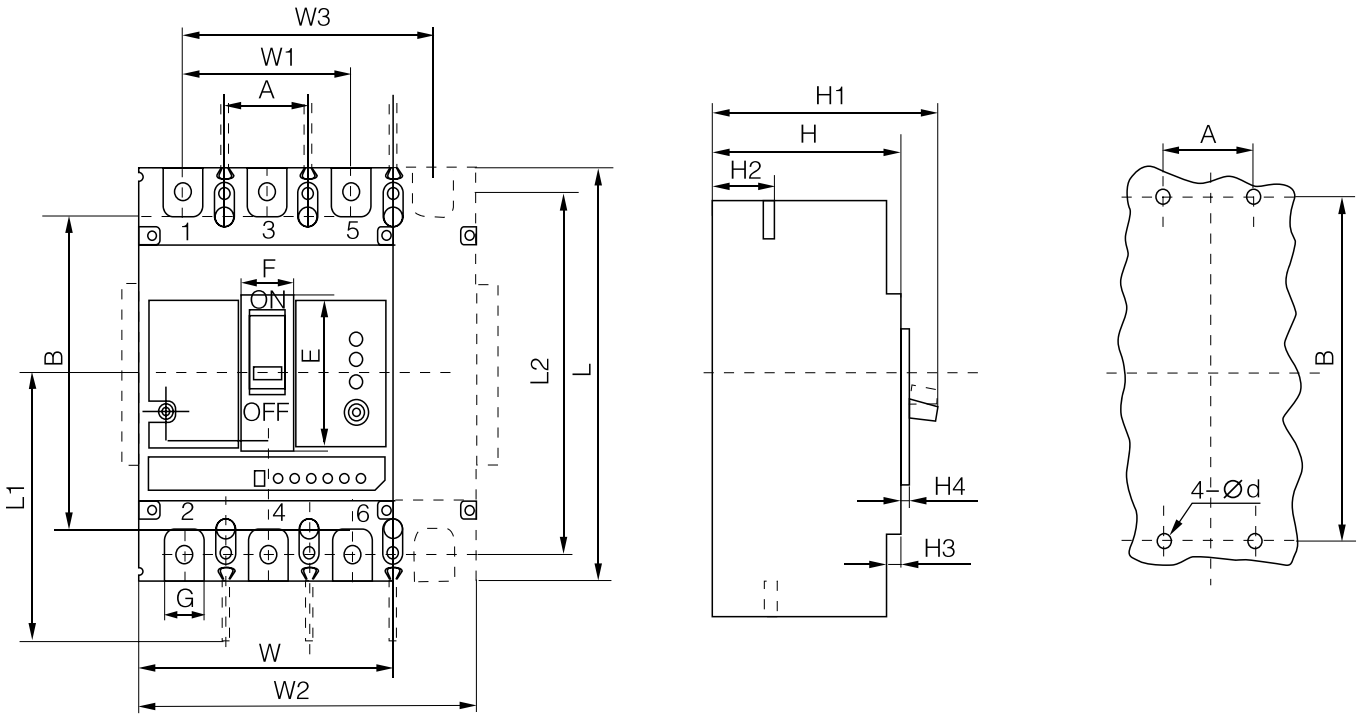
* Motor mechanism 230V AC VA-99M 800 EKF (mccb99m-a-135)
shall not be used with the molded case circuit breaker VA-99M 800/1000A 3P 50kA EKF (mccb99-800-1000m).



Overall and installation dimensions of VA-99M 1250A

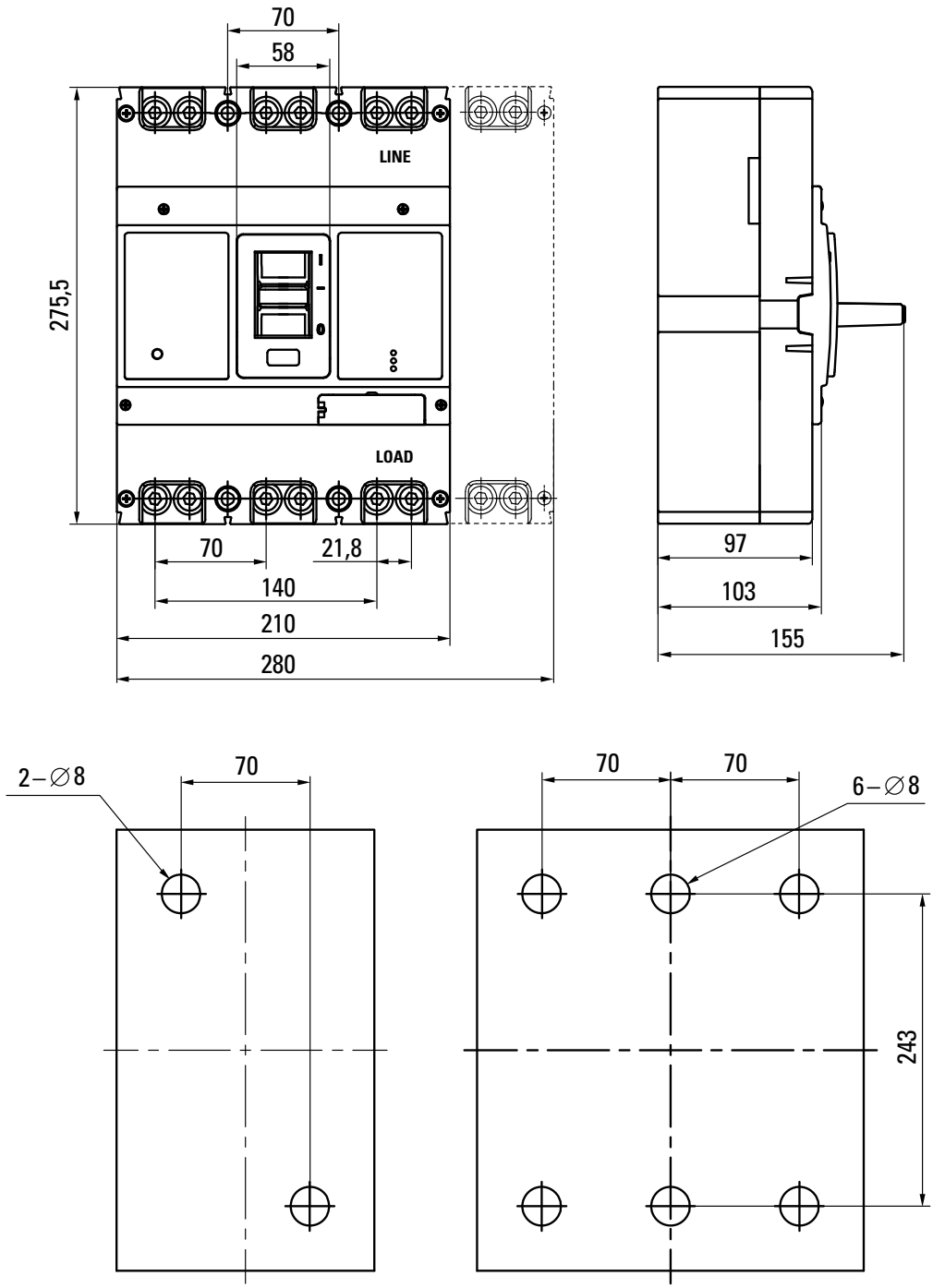


Overall and installation dimensions of VA-99M 1600A



Overall and installation dimensions
of VA-99M 100, VA-99M 250, VA-99M 400, VA-99M 630-800 with electronic trip unit

Dimensions		Name			
		VA-99M 100	VA-99M 250	VA-99M 400	VA-99M 630-800
		with electronic trip unit			
Overall dimensions, mm	E	50	62	88,6	81
	F	22	22	65	66
	G	17,6	22	30	44
	H	92	90	106,5	115,5
	H1	110	110	146,5	155
	H2	28,5	24	38	45,3
	H3	10	5	4,5	8
	H4	4	4	3,5	9
	L	150	165	257	280
	L1	100	132,5	220,5	240
	L2	132	144	224	243
	W	92	107	150	210
	W1	60	70	96	140
	W2	122	142	198	280
	W3	90	105	144	210
Installation dimensions, mm	A	30	35	44	70
	B	129	126	194	243
	Ø d	4,5	4,5	7	7



Overall and installation dimensions of VA-99M 1250 with electronic trip unit

5 DELIVERY SCOPE

Molded case circuit breakers VA-99M are supplied in one individual package. For all available documentation, scan the QR-code on the insert or on the inside of the package.

6 INSTALLATION, CONNECTION AND OPERATION

6.1. Storage and operation conditions

The molded case circuit breakers VA-99M shall be stored in the original package indoors with natural ventilation at ambient air temperature from -60 to +55°C and relative humidity up to 80% at +25°C.

The molded case circuit breakers can be operated at temperatures between -25°C and +40°C.

The average temperature during 24 hours shall not exceed +35 °C.

Altitude above sea level shall not exceed 2000 meters.

Pollution degree: III.

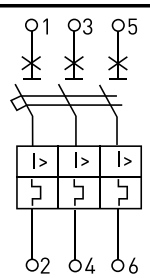
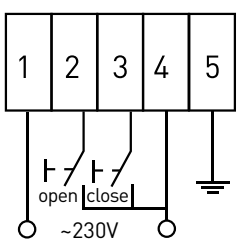
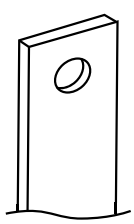
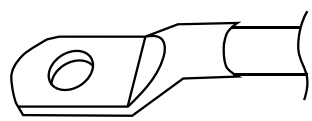
The device supports connection of alumiuim and copper wires. Do not coneect copper and aluminium wires to one terminal at the same time.

Degree of ingress protection (according to IEC 60529:2013): IP30 - circuit breaker housing; IP00 - terminals for connection of external conductors.

At the air temperature of +40 °C, the relative humidity shall not exceed 50%. The relative humidity may be higher at lower air temperatures. The maximum monthly average relative humidity shall not exceed 90% in the wettest month at the lowest monthly average temperature of +25°C. Be aware that sudden changes in temperature can lead to condensation on the surface of the molded case circuit breaker.

6.2 Connection

Typical wiring diagrams:

VA-99M	Motor mechanism VA-99M, 1250, 1600	Power busbar	Conductor with cable lug of TML type
			

6.3 Installation of accessories

Accessories for the molded case circuit breaker VA-99M with thermomagnetic trip unit shall not be installed to the molded case circuit breaker VA-99M with electronic trip unit, and accessories for the molded case circuit breaker VA-99M with electronic trip unit shall not be installed to the molded case circuit breaker VA-99M with thermomagnetic trip unit.

Only internal mounting accessories can be used.

6.4 Integrated motor mechanism (VA-99M 1250A and 1600A)

The motor mechanism has 2 modes of operation: manual and automatic. The mode switch is located on the front panel of the motor mechanism. In manual mode, the molded case circuit breaker is operated by the extended rotary handle. In automatic mode, the molded case circuit breaker is controlled remotely. The motor mechanism control circuits are connected to terminals located on the side of the motor mechanism

Contacts 1(L) and 4(N) are used to supply power to the motor mechanism, the ON and OFF buttons with spring return are connected to contacts 2 and 3, these buttons control the motor mechanism. Contact 5 is for earthing. The "ON" button is used to turn the handle of the molded case circuit breaker to the "ON" position. The "OFF" button is used to turn the handle of the molded case circuit breaker to the "OFF" position.

7 SAFETY REQUIREMENTS

By protection method against electric shock, molded case circuit breakers VA-99M belong to protection class "0" according to IEC 61140 and shall be installed in distribution enclosures with protection degree of min. IP30 according to IEC 60529:2013.

8 TRANSPORTATION AND STORAGE

8.1 The molded case circuit breakers VA-99M can be transported by any type of enclosed transport that ensures the protection of packed products against mechanical and atmospheric impacts.

8.2 The molded case circuit breakers VA-99M shall be stored in the original package indoors at the ambient temperatures from –40°C to +50°C and relative humidity of max. 85% at +25 ° C.

9 MANUFACTURER'S WARRANTY

The manufacturer guarantees that the molded case circuit breaker corresponds to the requirements of IEC 60947-2:2016 provided that the consumer follows the operating, transportation and storage conditions.
Warranty period: 7 years from the date of sale, specified in the sales receipt.
Shelf life: 7 years from the date of manufacture, specified on the product package or housing.
Service life: 10 years.

Manufacturer: For information, refer to the product package.

Importer and EKF trademark service representative: EKF ELECTRICAL SOLUTION – FZCO, Dubai Silicon Oasis, DDP, Building A2, Dubai, United Arab Emirates.

Importer and EKF trademark service representative on the territory of the Russian Federation: ООО «Electroresheniya», Otradnaya st., 2b bld. 9, 5th floor, 127273, Moscow, Russia. Tel.: +7 (495) 788-88-15.

Importer and EKF trademark service representative on the territory of the Republic of Kazakhstan: ТОО «Energoresheniya Kazakhstan», Kazakhstan, Almaty, Bostandyk district, Turgut Ozal st., 247, apt 4.

10 DISPOSAL

Life-expired and failed products shall be disposed of in compliance with the national and local laws and regulations in force.
To dispose of the product, send it to an authorized company for recycling in compliance with the national and local laws and regulations in force.

11 CERTIFICATE OF ACCEPTANCE

The molded case circuit breaker VA-99M EKF has been approved for operation.

Date of manufacture:
for information, refer to the product package.

Quality control stamp

ekfgroup.com

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