Moulded case circuit breakers for Electricity Distribution Companies

Modeion

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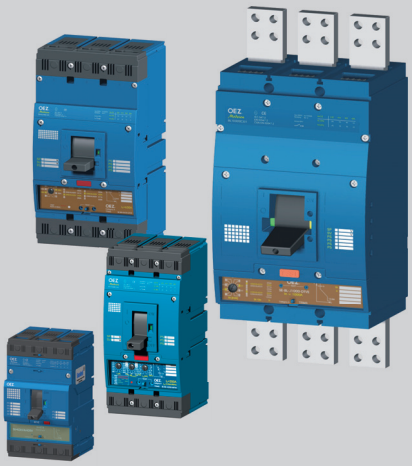
INTRODUCTION



Moulded case circuit breakers BC160N, BD250N, BH630N, BL1000S and BL1600S, delivered under the commercial brand Modeion, are circuit breakers with thermomagnetic and electronic overcurrent releases.

They are intended for the protection of electric machines, devices, other electric appliances and lines against overload and short-circuit in the circuits AC with rated current 12.5 A – 1600 A.

Use

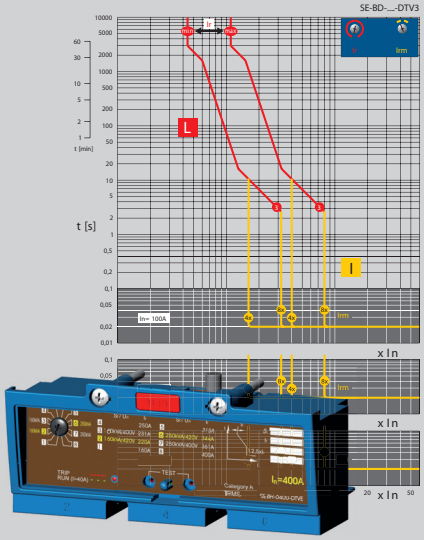
- **Protection of distribution transformers MV/LV**
  Circuit breakers Modeion with overcurrent releases type E and DTVE are intended for the protection of distribution transformers MV/LV of Electricity Distribution Companies. Specially shaped tripping characteristic of these releases enables maximal utilization of the transformer.

- **Switchboard LV**
  Circuit breaker Modeion used as the main circuit breaker of distribution switchboard. The tripping characteristic of overcurrent release DTVE is selective with the tripping characteristic of suitable fuse-link that protects the outlet cables of the switchboard.

Advantages

- **Protection of commonly used transformers is provided by 5 types of circuit breakers.**
  Circuit breakers BC160N, BD250N, BH630N, BL1000S and BL1600S with the overcurrent releases of the adjustment range 25 - 60 % I_n cover protection of transformers with power output 25 kVA - 630 kVA.

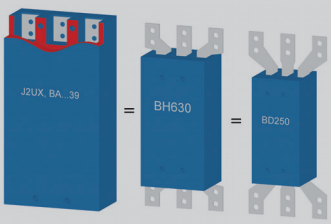
25 kVA up to 63 kVA	⇨	**BC160N**
50 kVA up to 160 kVA	⇨	**BD250N**
100 kVA up to 400 kVA	⇨	**BH630N**
250 kVA up to 630 kVA	⇨	**BL1000S**
400 kVA up to 630 kVA	⇨	**BL1600S**



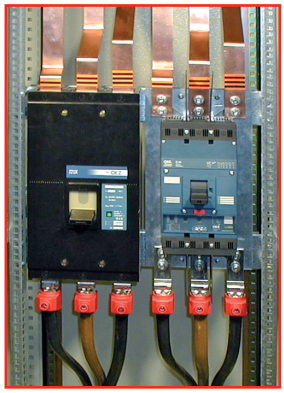
- **Simple setting of the circuit breaker according to the protected transformer**
  There is only one parameter to be set on the overcurrent release DTVE and this parameter is set exactly according to the transformer's power output. Overcurrent release with characteristic E (circuit breaker BC160N) is offered with fixed setting.

- **Specially shaped tripping characteristic**
  The tripping characteristic of overcurrent releases E and DVTE enables circuit breaker to:
  - utilize maximally the transformer in front of the circuit breaker
  - perform maximal selectivity with the suitable fuse-links that protect the outlet cables of the switchboard

- **Modularity of the circuit breaker**
  Overcurrent releases DTVE (DTV3) are easily interchangeable and can be sealed. All accessories (connecting sets, covers, additional releases...) can be easily changed or completed by the electrician.



- **Easy replacement of the old type circuit breakers**
  Special accessories to circuit breakers (connecting and mounting sets) enable easy replacement of the old type circuit breakers (mainly J2UX and BA511), without any need for switchboard modification.



Specifications to select circuit breakers *Modeion*

››› for AC operation

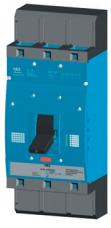
Type			BC160N	BD250N, BD250S	BH630N, BH630S	BL1000S	BL1600S
Rated normal current	I_u		**160 A**	**250 A**	**630 A**	**1000 A**	**1600 A**
Rated operating voltage	U_e		max. 690 V a.c.	max. 690 V a.c.	max. 690 V a.c.	max. 690 V a.c.	max. 690 V a.c.
Rated frequency	f_n		50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
Utilization category (selectivity)			A	A	A	A, B	A, B
Rated short-circuit ultimate breaking capacity[1]	I_{cu} / U_e	NORMAL SUPERIOR	25 kA / 415 V a.c. –	36 kA / 415 V a.c. 65 kA / 415 V a.c.	36 kA / 415 V a.c. 65 kA / 415 V a.c.	– 65 kA / 415 V a.c.	– 65 kA / 415 V a.c.
Rated short-time withstand current at U_e = 690 V a.c.	I_{cw} / t		–	2.5 kA /1 s	8 kA/50 ms, 7 kA/300 ms, 6.5 kA/1 s	15 kA /1 s	20 kA /1 s
Dimensions W x H x D			75 x 135 x 70 mm	105 x 225 x 105 mm	140 x 275 x 105 mm	210 x 350 x 135 mm	210 x 350 x 135 mm
Number of poles			3	3	3	3	3
Additional cover for overcurrent release			–	●	●	–	–
Plug-in design			–	●	●	–	–
Withdrawable design			–	●	●	●	●
Connection – front / rear			●/●	●/●	●/●	●/●	●/●
Connection – busbars / cable lugs / cables			●/●/●	●/●/●	●/●/●	●/●/●	●/●/●
Potential terminals			●	●	●	●	●
Switches – auxiliary / relative / signal / advance			●/–/●/–	●/●/●/●	●/●/●/●	●/●/–/–	●/●/–/–
Shunt trip			●	●	●	●	●
Undervoltage repase / with early contact			●/–	●/●	●/●	●/–	●/–
Hand drive/ hand drive			●/●	●/●	●/●	●/●	●/●
Motor drive / with cycle counter			●/+	●/●	●/●	●/●	●/●
Lockable lever			●	●	●	●	●
Mechanical interlocking - for manual drive / with Bowden cable			●/–	●/●	●/●	●/●	●/●
Terminal cover IP20			●	●	●	●	●

● available, – unavailable, + being prepared

[1] - **in case circuit breaker connection is reversed (input terminals 2, 4, 6, output terminals 1, 3, 5), I_{cu} does not change**

Specifications to select switch-disconnectors *Modeion*

››› for AC and DC operation

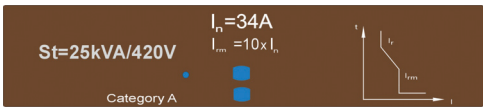
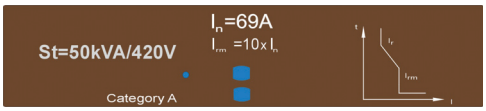
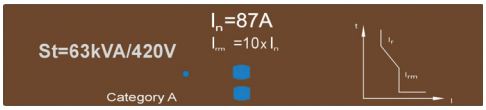
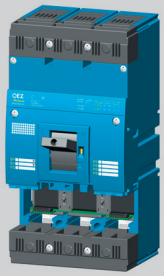
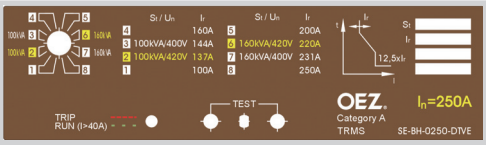
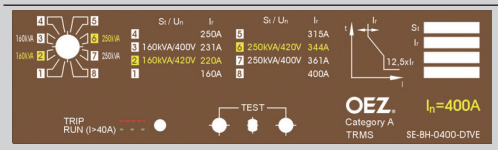
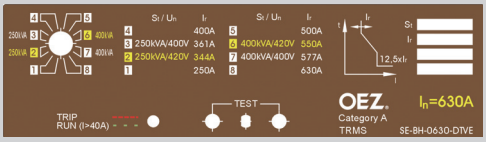
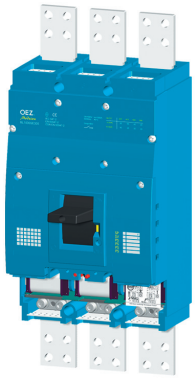
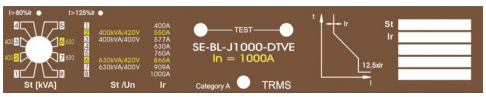
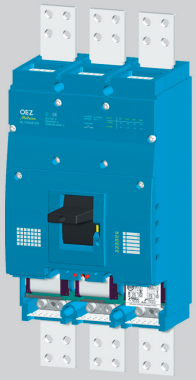


Type		BC160N	BD250N	BH630N	BL1000S	BL1600S
Rated operating current	I_e	**160 A**	**250 A**	**630 A**	**1000 A**	**1600 A**
Rated operating voltage	U_e	max. 690 V a.c.	max. 690 V a.c.	max. 690 V a.c.	max. 690 V a.c.	max. 690 V a.c.
Rated frequency	f_n	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
Utilization category (switching mode)		AC - 23B / 690 V a.c.	AC - 23B / 690 V a.c. DC - 23B / 440 V d.c.	AC - 23B / 690 V a.c. DC - 23B / 440 V d.c.	AC - 23B / 690 V a.c. DC - 23B / 440 V d.c.	AC - 23B / 690 V a.c. DC - 23B / 440 V d.c.
Rated short-time withstand current at U_e = 690 V a.c.	I_{cw} / t	2 kA / 1 s	3 kA / 5 s	8 kA / 5 s	15 kA / 1 s	20 kA / 1 s
Rated short-circuit making capacity	I_{cm} / U_e	2.8 kA / 415 V a.c.	4 kA / 415 V a.c.	13 kA / 415 V a.c.	30 kA / 415 V a.c.	40 kA / 415 V a.c.
Dimensions W x H x D		75 x 130 x 70 mm	105 x 225 x 105 mm	140 x 275 x 105 mm	210 x 350 x 135 mm	210 x 350 x 135 mm
Number of poles		3	3	3	3	3
Plug-in design		–	●	●	–	–
Withdrawable design		–	●	●	●	●
Connection – front / rear		●/●	●/●	●/●	●/●	●/●
Connection – busbars / cable lugs / cables		●/●/●	●/●/●	●/●/●	●/●/●	●/●/●
Potential terminals		●	●	●	●	●
Switches – auxiliary / relative / signal / advance		●/–/●/–	●/●/●/●	●/●/●/●	●/●/–/–	●/●/–/–
Shunt trip		●	●	●	●	●
Undervoltage repase / with early contact		●/–	●/●	●/●	●/–	●/–
Hand drive/ hand drive		●/●	●/●	●/●	●/●	●/●
Motor drive / with cycle counter		●/+	●/●	●/●	●/●	●/●
Lockable lever		●	●	●	●	●
Mechanical interlocking - for manual drive / with Bowden cable		●/+	●/●	●/●	●/●	●/●
Terminal cover IP20		●	●	●	●	●

● available, – unavailable, + being prepared

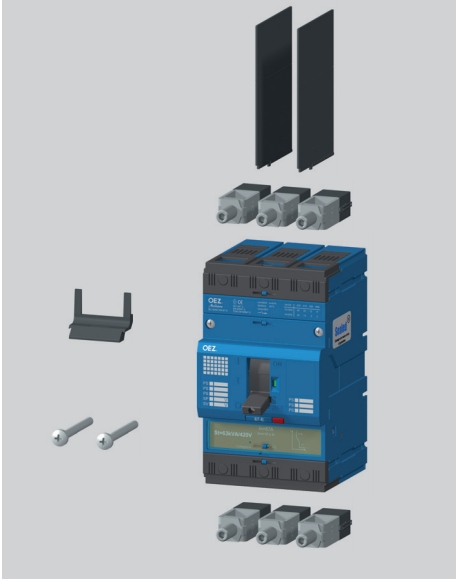
TYPE OF CIRCUIT BREAKER ACCORDING TO THE TRANSFORMER

3P

Circuit breaker / Switching unit		Circuit breaker / Overcurrent release	Transformer S_t
BC160NT305		**BC160NT305-34-E**	**25 kVA**
		**BC160NT305-69-E**	**50 kVA**
		**BC160NT305-87-E**	**63 kVA**
BH630NE305 		**SE-BH-0250-DTVE**	**100 kVA and 160 kVA**
		**SE-BH-0400-DTVE**	**160 kVA and 250 kVA**
		**SE-BH-0630-DTVE**	**250 kVA and 400 kVA**
BL1000SE305 		**SE-BL-J0630-DTVE**	**250 kVA and 400 kVA**
		**SE-BL-J1000-DTVE**	**400 kVA and 630 kVA**
BL1600SE305 		**SE-BL-1000-DTVE**	**400 kVA and 630 kVA**

CIRCUIT BREAKERS

3P



Characteristic E – protection of distribution transformers

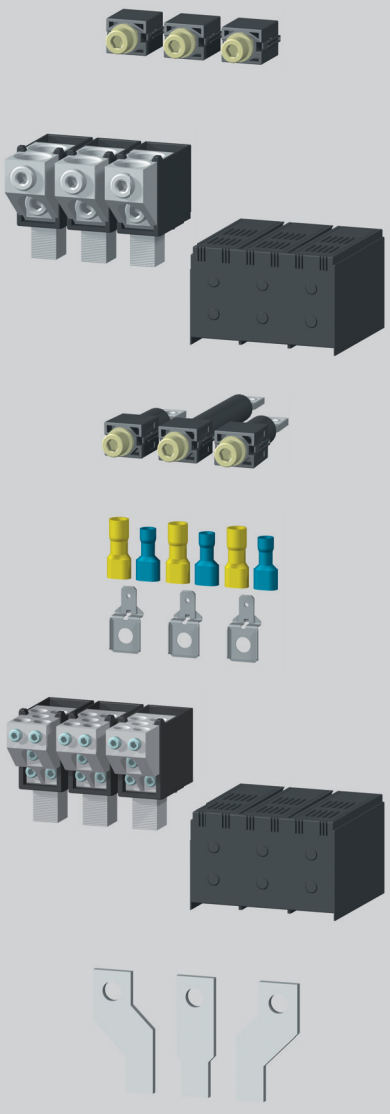
I_n	Type	Product code	Description	Weight [kg]	Package [pcs]
34	**BC160NT305-34-E**	33687	$S_t = 25$ kVA, $I_n = 34$ A	1.02	1
69	**BC160NT305-69-E**	33688	$S_t = 50$ kVA, $I_n = 69$ A	1.02	1
87	**BC160NT305-87-E**	33689	$S_t = 63$ kVA, $I_n = 87$ A	1.02	1

- circuit breaker includes:

- **2 connecting sets for connecting Cu/Al cables with cross - sections 2.5 ÷ 95 mm²**
- **insulating barriers** **OD-BC-KS02**
- **set of installation bolts** **OD-BC-MS01 (2 x M3x30)**
- **conductor holder** **OD-BC-DV01**

CONNECTING SETS

3P



RETROFIT

Type	Product code	Description	S [mm²]	Method of connection	Weight[kg]	Package [set][1)]
CS-BC-A011	20223	Front connection		Cu/Al busbars, cable lugs	0.045	1
CS-BC-B021	20237	Double block terminal	2 x 25 - 120	Cu/Al cables	0.18	1
- terminals cover included - degree of protection IP20						
CS-BC-A021	20236	Rear connection		Cu/Al busbars, cable lugs	0.175	1
CS-BC-PS01	20239	Potential terminals	1.5÷2.5;4÷6	Cu flexible conductor	0.01	1
CS-BC-B014	34957	Block terminals - for 5 cables	5x(2.5 ÷ 25)	Cu/Al cables	0.18	1
- terminals cover included - degree of protection IP20						
CS-BC-A033	20608	Reduction for BA…*33		Cu/Al busbars, cable lugs	0.103	1
- for total replacement of BA…*33 circuit breaker, also necessary is the OD-BC-MS33 mounting set						

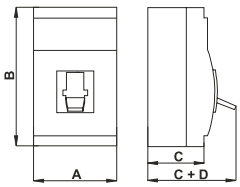
[1)] - one set enables connection of one side of the circuit breaker (set includes three terminals with necessary coupling elements)
- for other accessories see catalogue Moulded case circuit breakers Modeion

CIRCUIT BREAKERS, SWITCH-DISCONNECTORS

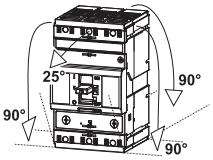
3P

Circuit breaker

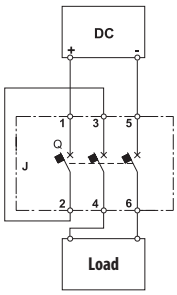
Switch-disconnector



Dimensions



Installation positions



Wiring of 3P circuit breaker in DC circuit up to 250 V d.c.

Specification		CIRCUIT BREAKER	SWITCH-DISCONNECTOR
Type		**BC160NT..**	**BC160NT...-V**
Series		NORMAL	
Dimensions A x B x C + D (3P/4P design)		75 x 130 x 70 + 23 mm	75 x 130 x 70 + 23 mm
Weight (3P/4P design)		1 kg	1 kg
Standards		EN 60 947-2 , IEC 947-2	EN 60 947-3, IEC 947-3
Approval marks		CE EAC	CE EAC
Number of poles		3	3
Rated current	I_n	34, 69, 87 A	-
Rated normal current	I_u	34, 69, 87 A	34, 69, 87 A
Rated operating current	I_e	-	34, 69, 87 A
Rated operating voltage	U_e	max. 690 V a.c. max. 250 V d.c. (3P)	max. 690 V a.c. max. 250 V d.c. (3P)
Rated frequency	f_n	50/60 Hz	50/60 Hz
Rated pulse withstand voltage	U_{imp}	8 kV	8 kV
Rated insulation voltage	U_i	690 V	690 V
Utilization category (selectivity)	690 V a.c.	A	-
Utilization category (switching mode)		AC-3 (34 - 87 A) DC-22A	AC-23 A DC-22A
Rated short-time withstand current	I_{cw} / t	-	2 kA/ 1 s
Rated short-circuit ultimate breaking capacity (RMS) [1]	I_{cu} / U_e	6 kA/ 690 V a.c. 12 kA/ 500 V a.c. 25 kA/ 415 V a.c. 40 kA/ 230 V a.c. 25 kA/250 V d.c. τ = max. 5 ms (3P)	-
Off-time at I_{cu}		7 ms	-
Rated short-circuit service breaking capacity (RMS)	I_{cs} / U_e	3 kA/ 690 V a.c. 6 kA/ 500 V a.c. 13 kA/ 415 V a.c. 20 kA/ 230 V a.c. 13 kA/250 V d.c. τ = max. 5 ms (3P)	-
Rated short-circuit making capacity (peak value)	I_{cm} / U_e	52 kA/ 415 V a.c.	2.8 kA/ 415 V a.c.
Losses per 1 pole at I_n = 160 A		15 W	15 W
Mechanical endurance		20 000 operating cycles	20 000 operating cycles
Electrical endurance (U_e = 415 V a.c.)		6 000 operating cycles	6 000 operating cycles
Switching frequency		120 operating cycles/h	120 operating cycles/h
Operating force (3P/4P design)		55/65 N	55/65 N
Front-side device protection		IP40	IP40
Terminal protection		IP20	IP20
Operating conditions			
Reference ambient temperature		40 °C	40 °C
Ambient temperature range		-40 °C ÷ +55 °C	-40 °C ÷ +55 °C
Working environment		dry and tropical climate	dry and tropical climate
Pollution degree		3	3
Max. sea level		2000 m	2000 m
Seismic resistance		3g (8 ÷ 50) Hz	3g (8 ÷ 50) Hz
Design modifi cations			
Connection - front / rear		●/●	●/●
Plug-in design		–	–
Withdrawable design		–	–
Accessories			
Switches - auxiliary / relative / signal / advance		●/–/●/–	●/–/●/–
Shunt trip / with signal switch		●/●	●/●
Undervoltage release / with early contact with signal switch		●/–/●	●/–/●
Front hand drive / side hand drive right / left		●/●/●	●/●/●
Mechanical interlocking with Bowden cable / for manual drive		–/●	–/●
Motor drive / with cycle counter		●/–	●/–
Lockable lever		●	●

● available, – unavailable, + being prepared

[1] - **in case circuit breaker connection is reversed (input terminals 2, 4, 6, output terminals 1, 3, 5), I_{cu} does not change**

OVERCURRENT RELEASES E

3P

■ Protection of distribution transformers

Description

Circuit breaker BC160NT305 with characteristic E is offered with fixed setting. This setting corresponds with the particular MV/LV distribution transformer. The transformer's power output is quoted on the plate of the circuit breaker's overcurrent release.

The release has specially shaped tripping characteristic, that enables optimal exploitation of transformers up to 1.5 I_n.

Specification

Type	S_t [kVA/V] *	I_r [A]
BC160NT305-34-E	25/420	34
BC160NT305-69-E	50/420	69
BC160NT305-87-E	63/420	87

* S_t - *transformer capacity*

Tripping characteristic

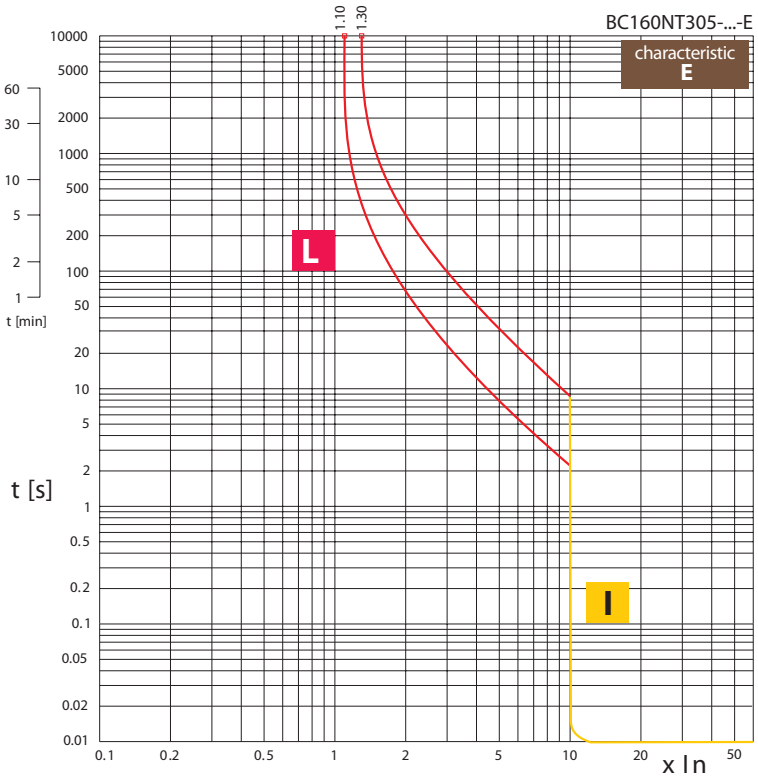
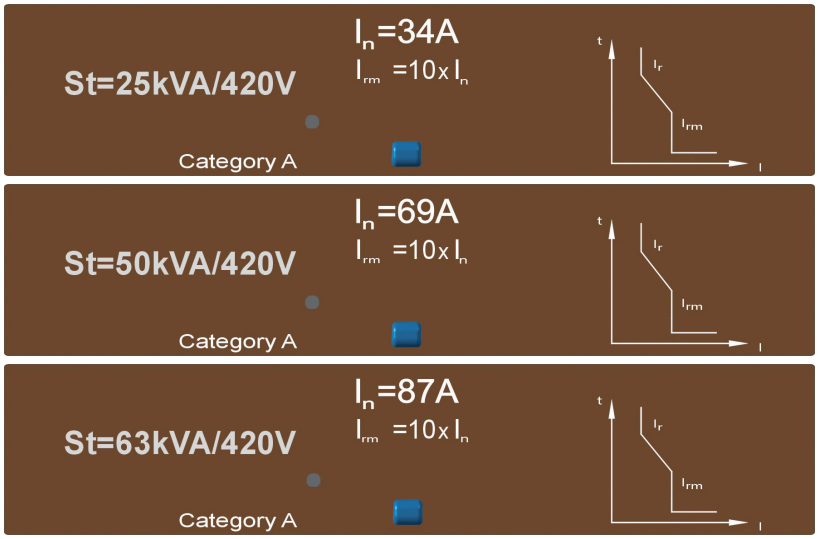
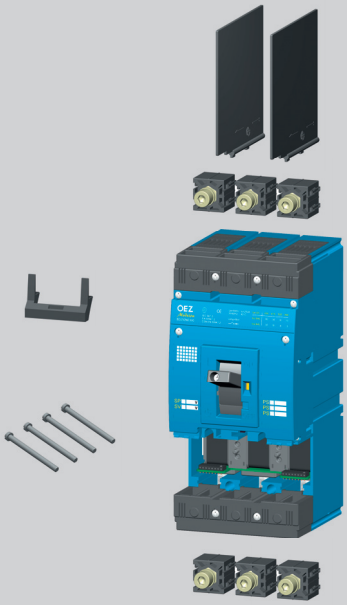


Plate of the overcurrent release



OVERCURRENT RELEASES

3P



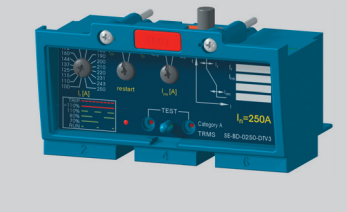
Type	Product code	I_u [A]	I_{cu} [kA]	Weight [kg]	Package [pcs]
BD250NE305	14414	250	36	2.84	1
BD250SE305	14415	250	65	2.84	1

- the way of connecting the power circuit and deionization space must follow the recommendations see catalogue Moulded case circuit breakers Modeion

- Switching unit includes:
- **2x connecting sets** — **CS-BD-A011 - for connecting busbars or cable lugs**
- **insulating barriers** — **OD-BHD-KS02**
- **set of installation bolts** — **OD-BD-MS01 (4 x M4x35)**
- **conductor holder** — **OD-BD-DV01**

SWITCHING UNITS

3P



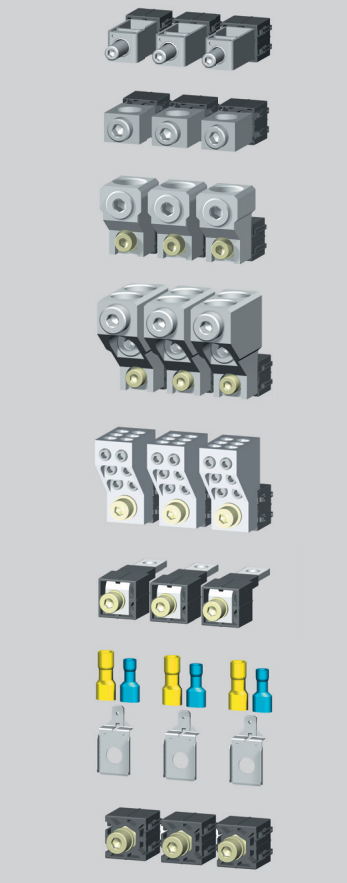
DTV3 - charackteristic D - distribution

■ protecting lines and transformers

I_n [A]	Type	Product code	Description	Weight [kg]	Package [pcs]
100	**SE-BD-0100-DTV3**	24300	I_r setting = 40 ÷ 100 A	0.317	1
160	**SE-BD-0160-DTV3**	24200	I_r setting = 63 ÷ 160 A	0.317	1
250	**SE-BD-0250-DTV3**	24100	I_r setting = 100 ÷ 250 A	0.317	1

CONNECTING SETS

3P



Type	Product code	Description	S [mm²]	Method of connection	Weight [kg]	Package [set] [1]
CS-BD-T011	24810	Clamp terminals	16 ÷ 150	Cu cables, flexibars	0.24	1
CS-BD-B011	24751	Block terminals	25 ÷ 150	Cu/Al cables	0.21	1
CS-BD-B012	17534	Block terminals	150 ÷ 240	Cu/Al cables	0.2	1
CS-BD-B021	24752	Double block terminals	2 x 25 ÷ 150	Cu/Al cables	0.51	1
CS-BD-B022	13808	Double block terminals	2 x 150 ÷ 240	Cu/Al cables	0.62	1

- with terminal cover OD-BD-KS03 meets the requirement of IP20 protection

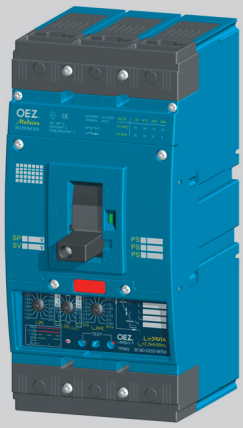
CS-BD-B014	20119	Block terminals for 6 cables	6 x 6 ÷ 35	Cu/Al cables	0.3	1
CS-BD-A021	24770	Rear connection		Cu/Al busbars, cable lugs	0.237	1
CS-BD-PS01	13682	Potential terminals	1.5 ÷ 2.5; 4 ÷ 6	Cu flexible conductor	0.017	1
CS-BD-A011	24750	Front connection		Cu/Al busbars, cable lugs, flexibars	0.12	1

- Included in every supply of switching units

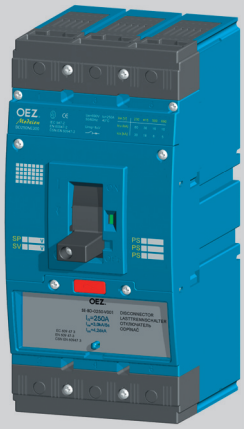
[1] - one set enables connection of one side of the circuit breaker (set includes three terminals with necessary coupling elements)
- for other accessories see catalogue Moulded case circuit breakers Modeion

CIRCUIT BREAKERS, SWITCH-DISCONNECTORS

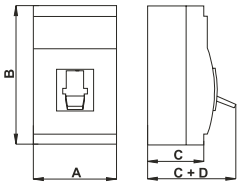
3P



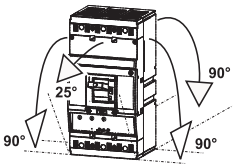
Circuit breaker



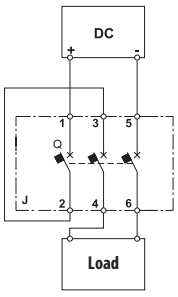
Switch-disconnector



Dimensions



Installation positions -fixed, plug-in and withdrawable designs



Wiring of switch-disconnector for DC circuits

Specification

		CIRCUIT BREAKER	SWITCH-DISCONNECTOR
Type		**BD250N, BD250S**	
Dimensions A x B x C + D (3P)		105 x 225 x 105 + 43 mm	105 x 225 x 105 + 43 mm
Weight (3P)		3 kg	3 kg
Standards		EN 60 947-2, IEC 947-2	EN 60 947-3, IEC 947-3
Approval marks			
Number of poles		3	3
Rated current	I_n	100, 160, 250 A	-
Rated normal current	I_u	250 A	250 A
Rated operating current	I_e	-	250 A
Rated operating voltage	U_e	max. 690 V a.c. -	max. 690 V a.c. max. 440 V d.c.
Rated frequency	f_n	50/60 Hz	50/60 Hz
Rated pulse withstand voltage	U_{imp}	8 kV	8 kV
Rated insulation voltage	U_i	690 V	690 V
Utilization category (selectivity)	690 V a.c.	A	-
Utilization category (switching mode)	690 V a.c. 440 V d.c.	- -	AC-23B DC-23B
Rated short-time withstand current at U_e = 690 V a.c.	I_{cw} / t	2.5 kA/1 s	3 kA/5 s
Series		NORMAL BD250N / SUPERIOR BD250S	U_e
Rated short-circuit ultimate breaking capacity (RMS) [1]	I_{cu}	60 kA / 100 kA — 230 V a.c. 36 kA / 65 kA — 415 V a.c. 16 kA / 25 kA — 500 V a.c. 10 kA / 13 kA — 690 V a.c.	-
Rated short-circuit service breaking capacity (RMS)	I_{cs}	30 kA / 50 kA — 230 V a.c. 18 kA / 36 kA — 415 V a.c. 8 kA / 13 kA — 500 V a.c. 5 kA / 8 kA — 690 V a.c.	-
Rated short-circuit making capacity (peak value)	I_{cm} / U_e	75 kA / 140 kA — 415 V a.c. - / -	4 kA/ 415 V a.c. 4 kA/ 440 V d.c.
Off-time at I_{cu}		10 ms	-
Losses per 1 pole fixed / withdrawable design		18 W/25 W	18 W/25 W
Mechanical endurance		30 000 operating cycles	30 000 operating cycles
Electrical endurance		3 000 operating cycles	3 000 operating cycles
Switching frequency		120 operating cycles/h	120 operating cycles/h
Operating force		80 N	80 N
Front-side device protection		IP40	IP40
Terminal protection		IP20	IP20
Operating conditions			
Reference ambient temperature		40 °C	40 °C
Ambient temperature range		-40 °C ÷ +55 °C	-40 °C ÷ +55 °C
Working environment		dry and tropical climate	dry and tropical climate
Pollution degree		3	3
Max. sea level		2000 m	2000 m
Seismic resistance		3g (8 ÷ 50) Hz	3g (8 ÷ 50) Hz
Design modifi cations			
Connection – front / rear		●/●	●/●
Plug-in design 3P/4P		●/●	●/●
Withdrawable design 3P/4P		●/●	●/●
Accessories			
Switches - auxiliary / relative / signal / advance		●/●/●/●	●/●/●/●
Shunt trip		●	●
Undervoltage release / with early contact		●/●	●/●
Front hand drive / hand drive		●/●	●/●
Mechanical interlocking - with Bowden cable / for manual drive		●/●	●/●
Motor drive / with cycle counter		●/●	●/●
Lockable lever		●	●
Bolt sealing insert / additional cover for overcurrent release		●/●	●/●

● available, – unavailable, + being prepared

[1] - **in case circuit breaker connection is reversed (input terminals 2, 4, 6, output terminals 1, 3, 5), I_{cu} does not change**

OVERCURRENT RELEASES DTV3

3P

■ Protecting lines and transformers

Description

The SE-BD-....-DTV3 release is intended for BD250... switching units. The operation of the release is controlled by a microprocessor. The release is outfitted with a thermal memory, that can be disabled by turning a switch on the front panel from position $T_{(t)}$ to position $T_{(0)}$. After disabling of the thermal memory, the thermal release remains active. The operational state 70 % of I_r is signalled by LED indicator, that blinks green in 1.5 s interval. As the load grows, the blinking frequency of the diode increases. In case of a load larger than 110 % of I_r, this LED indicator turns red and just before tripping begins to blink red. On the lower part of the release cover are photocells for communicating with the signalling unit.

The release has specially shaped tripping characteristic, that enables optimal exploitation of transformers up to 1.5 I_r.

The releases have simple adjustment of the tripping characteristic. There are only rated current and the tripping level of short-circuit release 4 I_r or 8 I_r that have to be set.

Specification - adjustable

Type	I_n [A]	I_r [A]	restart	I_{rm}
SE-BD-0100-DTV3	100	40 43 46 48 50 55 58 61 63 69 72 76 80 87 91 100	$T_{(0)}$ $T_{(t)}$	4 x I_r 8 x I_r
SE-BD-0160-DTV3	160	63 69 72 80 87 91 100 110 115 120 125 130 137 144 150 160	$T_{(0)}$ $T_{(t)}$	4 x I_r 8 x I_r
SE-BD-0250-DTV3	250	100 110 115 125 137 144 160 172 180 190 200 210 220 231 243 250	$T_{(0)}$ $T_{(t)}$	4 x I_r 8 x I_r

Tripping characteristic

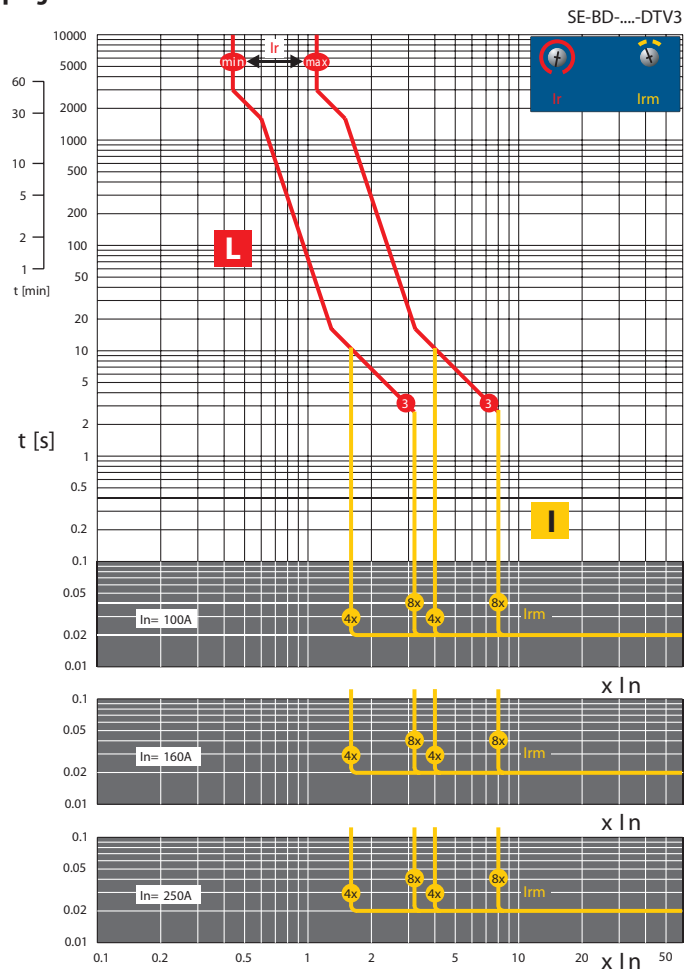
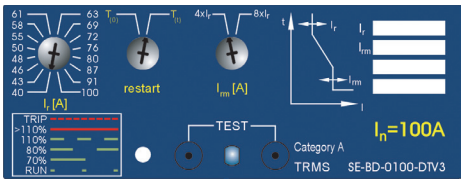
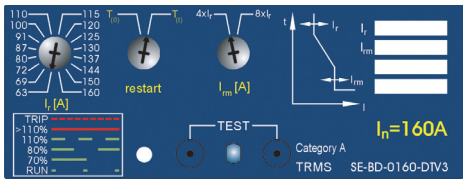
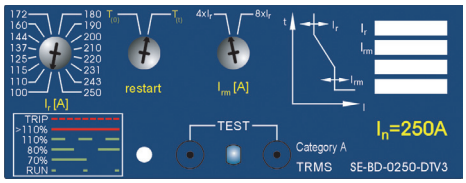


Plate of the overcurrent release

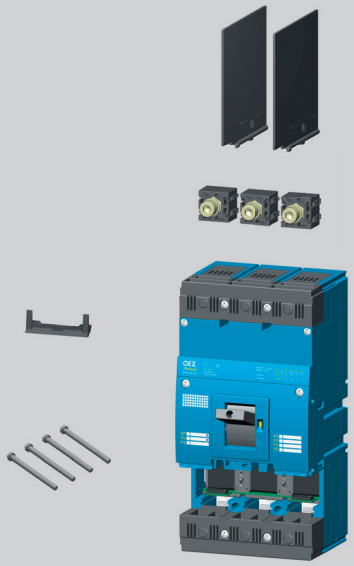






SWITCHING UNITS

3P



Type	Product code	I_u [A]	I_{cu} [kA]	Weight [kg]	Package [pcs]
BH630NE305	14412	630	36	5.4	1
BH630SE305	14413	630	65	5.4	1

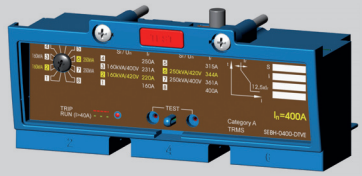
- the way of connecting the power circuit and deionization space must follow the recommendations see catalogue Moulded case circuit breakers Modeion

- Switching unit includes:

- **2x connecting sets** — **CS-BH-A011 - for connecting busbars or cable lugs**
- **insulating barriers** — **OD-BHD-KS02**
- **set of installation bolts** — **OD-BH-MS01 (4 x M5x25)**
- **conductor holder** — **OD-BH-DV01**

OVERCURRENT RELEASES

3P

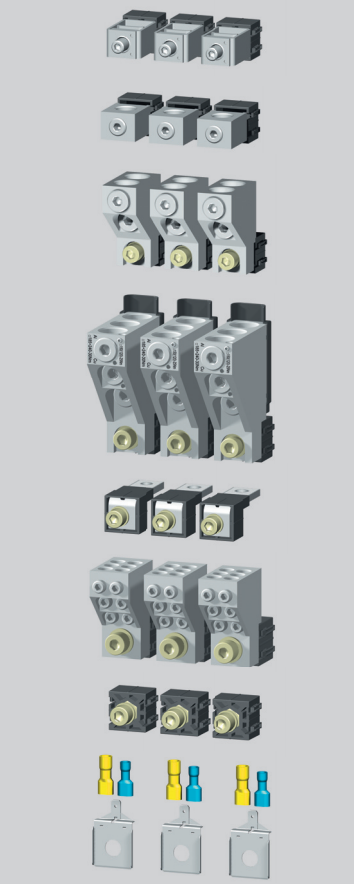


DTVE - characteristic E - protection of distribution transformers

I_n [A]	Type	Product code	Description	Weight [kg]	Package [pcs]
250	**SE-BH-0250-DTVE**	16146	S_t = 100 kVA and 160 kVA	0.35	1
400	**SE-BH-0400-DTVE**	25201	S_t = 160 kVA and 250 kVA	0.35	1
630	**SE-BH-0630-DTVE**	25101	S_t = 250 kVA and 400 kVA	0.35	1

CONNECTING SETS

3P



Type	Product code	Description	S [mm²]	Method of connection	Weight [kg]	Package [set][1)]
CS-BH-T011	24820	Clamp terminals	35÷240	Cu cables, flexibars	0.433	1
CS-BH-B011	24761	Block terminals	150÷240	Cu/Al cables	0.279	1
CS-BH-B012	24762	Block terminals	25÷150	Cu/Al cables	0.302	1
CS-BH-B021	24781	Double block terminals	2 x 150÷240	Cu/Al cables	0.721	1
CS-BH-B022	15816	Double block terminals	2 x 25÷150	Cu/Al cables	0.750	1
- with terminal cover OD-BH-KS03 meets the requirement of IP20 protection						
CS-BH-B031	36604	Block terminals	3x150÷240	Cu/Al cables	0.9	1
CS-BH-A021	24780	Rear connectio		Cu/Al busbars, cable lugs	0.567	1
CS-BH-B014	20121	Block terminals - for 6 cables	6 x 6÷35	Cu/Al cables	0.3	1
CS-BH-A011	24760	Front connection		Cu/Al busbars, cable lugs, flexibars	0.186	1
- Included in every supply of switching units						
CS-BH-PS01	13683	Potential terminals	1.5 ÷2.5;4÷6	Cu flexible conductor	0.021	1

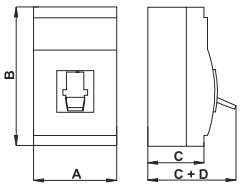
[1)] - one set enables connection of one side of the circuit breaker (set includes three terminals with necessary coupling elements
- for other accessories see catalogue Moulded case circuit breakers Modeion

CIRCUIT BREAKERS, SWITCH-DISCONNECTORS

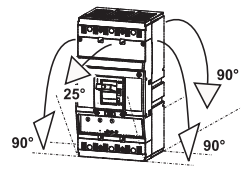
3P

Circuit breaker

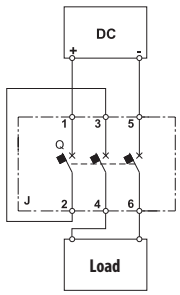
Switch-disconnector



Dimensions



Installation positions - fixed, plug-in and withdrawable designs



Wiring of switch-disconnector for DC circuits

Specification

Specification		CIRCUIT BREAKER	SWITCH-DISCONNECTOR
Type		**BH630N, BH630S**	
Dimensions A x B x C + D (3P)		140 x 275 x 105 + 49 mm	140 x 275 x 105 + 49 mm
Weight (3P)		5.4 kg	5.4 kg
Standards		EN 60 947-2, IEC 947-2	EN 60 947-3, IEC 947-3
Approval marks		CE EAC B PG UA	
Number of poles		3	3
Rated current	I_n	250, 400, 630 A	-
Rated normal current	I_u	630 A	630 A
Rated operating current	I_e	-	630 A
Rated operating voltage	U_e	max. 690 V a.c. -	max. 690 V a.c. max. 440 V d.c.
Rated frequency	f_n	50/60 Hz	50/60 Hz
Rated pulse withstand voltage	U_{imp}	8 kV	8 kV
Rated insulation voltage	U_i	690 V	690 V
Utilization category (selectivity)	690 V a.c.	A	-
Utilization category (switching mode)	690 V a.c. 440 V d.c.	- -	AC-23B DC-23B
Rated short-time withstand current at U_e = 690 V a.c.	I_{cw} / t	8 kA/50 ms, 7 kA/300 ms, 6.5 kA/1 s	7.5 kA/5 s
Series		NORMAL BH630N / SUPERIOR BH630S	U_e -
Rated short-circuit ultimate breaking capacity (RMS) [1]	I_{cu}	60 kA / 100 kA 230 V a.c. 36 kA / 65 kA 415 V a.c. 20 kA / 35 kA 500 V a.c. 15 kA / 20 kA 690 V a.c.	-
Rated short-circuit service breaking capacity (RMS)	I_{cs}	40 kA / 75 kA 230 V a.c. 18 kA / 36 kA 415 V a.c. 10 kA / 20 kA 500 V a.c. 8 kA / 15 kA 690 V a.c.	-
Rated short-circuit making capacity (peak value)	I_{cm} / U_e	75 kA / 140 kA 415 V a.c. - / -	14 kA/ 415 V a.c. 14 kA/ 440 V d.c.
Off-time at I_{cu}		20 ms	-
Losses per 1 pole fixed / withdrawable design		75W/85W	75W/85W
Mechanical endurance		20 000 operating cycles	20 000 operating cycles
Electrical endurance		5 000 operating cycles	5 000 operating cycles
Switching frequency		120 operating cycles/h	120 operating cycles/h
Operating force		110 N	110 N
Front-side device protection		IP40	IP40
Terminal protection		IP20	IP20
Operating conditions			
Reference ambient temperature		40 °C	40 °C
Ambient temperature range		-40 ÷ +55 °C	-40 ÷ +55 °C
Working environment		dry and tropical climate	dry and tropical climate
Pollution degree		3	3
Max. sea level		2000 m	2000 m
Seismic resistance		3g (8 ÷ 50) Hz	3g (8 ÷ 50) Hz
Design modifi cations			
Connection front/rear		●/●	●/●
Plug-in design 3P/4P		●/●	●/●
Withdrawable design 3P/4P		●/●	●/●
Accessories			
Switches - auxiliary / relative / signal / advance		●/●/●/●	●/●/●/●
Shunt trip		●	●
Undervoltage release / with early contact		●/●	●/●
Front hand drive / hand drive		●/●	●/●
Mechanical interlocking with Bowden cable / for manual drive		●/●	●/●
Motor drive / with cycle counter		●/●	●/●
Lockable lever		●	●
Bolt sealing insert / additional cover for overcurrent release		●/●	●/●

● available, – unavailable, + being prepared

[1] - **in case circuit breaker connection is reversed (input terminals 2, 4, 6, output terminals 1, 3, 5), I_{cu} does not change**

OVERCURRENT RELEASES DTVE

3P

■ Protection of distribution transformers

Description

Overcurrent release SE-BH-xxxx-DTVE and switching unit BH630NE305 together form a circuit breaker meant for protection of distribution transformers MV/LV. Overcurrent release is controlled by micro processor (independent of the ambient temperature)

The release has specially shaped tripping characteristic, that enables optimal exploitation of transformers up to 1.5 I_n.

Setting of the rated current and transformer's power output can be done easily by one control gear on the front panel. Rated current can be set in the range of (0.4-1) x I_n in 8 grades or directly in the value of the MV/LV transformer's power output. The short circuit release setting corresponds with the set current in a way that enables the best selectivity with the suitable fuse-link. (I_{rm}=12.5 x I_n) The release's operation at current I>40 A is indicated on the front panel by means of LED diode.

Specification - adjustable

Type	Position	S_t [kVA/V] *	I_r [A]
SE-BH-0250-DTVE	1		100
	2	100/420	137
	3	100/400	144
	4		160
	5		200
	6	160/420	220
	7	160/400	231
	8		250
SE-BH-0400-DTVE	1		160
	2	160/420	220
	3	160/400	231
	4		250
	5		315
	6	250/420	344
	7	250/400	361
	8		400
SE-BH-0630-DTVE	1		250
	2	250/420	344
	3	250/400	361
	4		400
	5		500
	6	400/420	550
	7	400/400	577
	8		630

* S_t - *transformer capacity*

Tripping characteristic

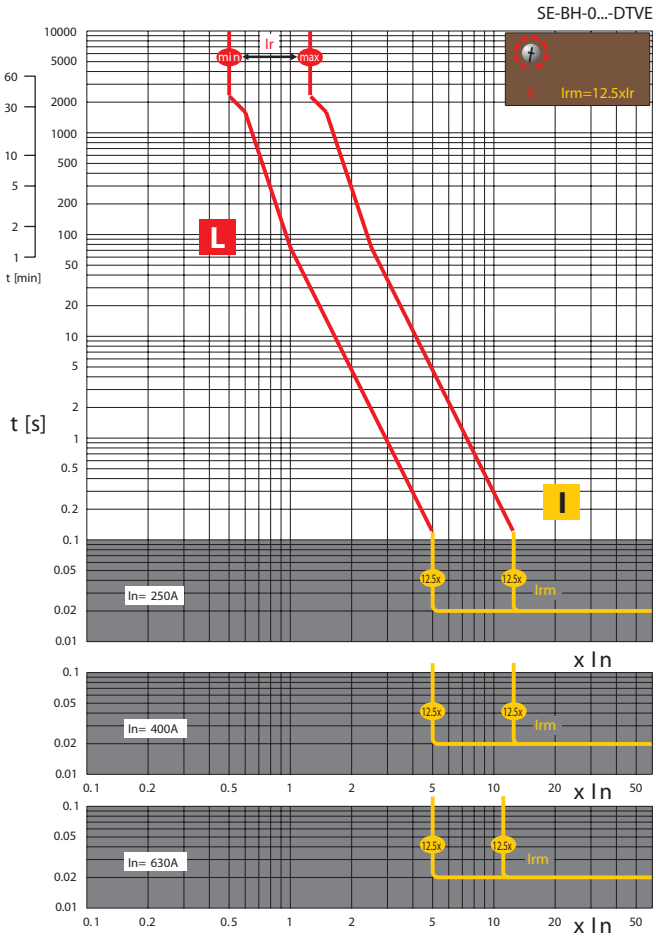
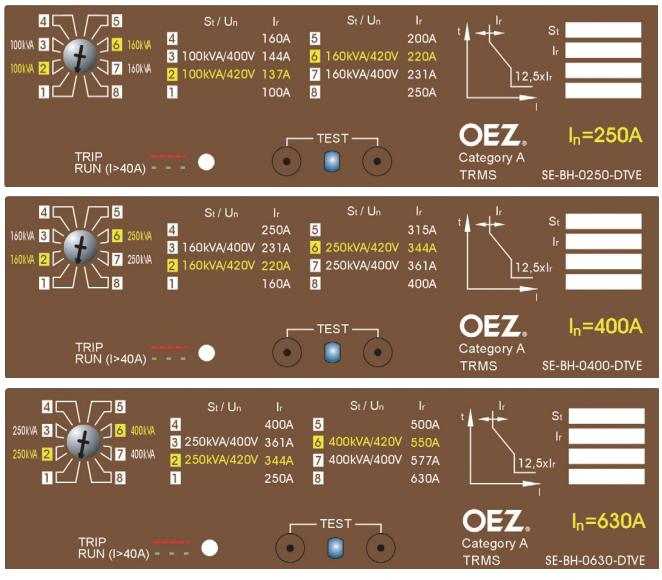
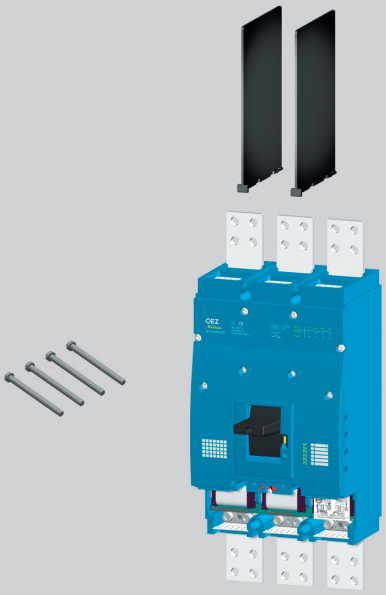


Plate of the overcurrent release



SWITCHING UNITS

3P



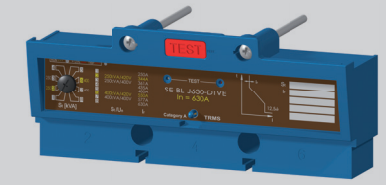
Type	Product code	I_u [A]	I_{cu} [kA]	Weight [kg]	Package [pcs]
BL1000SE305	19381	1000	65	20	1

- the way of connecting the power circuit and deionization space must observe recommendations see catalogue Moulded case circuit breakers Modeion

- Switching unit includes:
- **insulating barriers** — **OD-BL-KS02**
- **set of installation bolts** — **OD-BL-MS01 (4x M8x80)**
- **connecting sets for front connection - connecting busbars**

OVERCURRENT RELEASES

3P

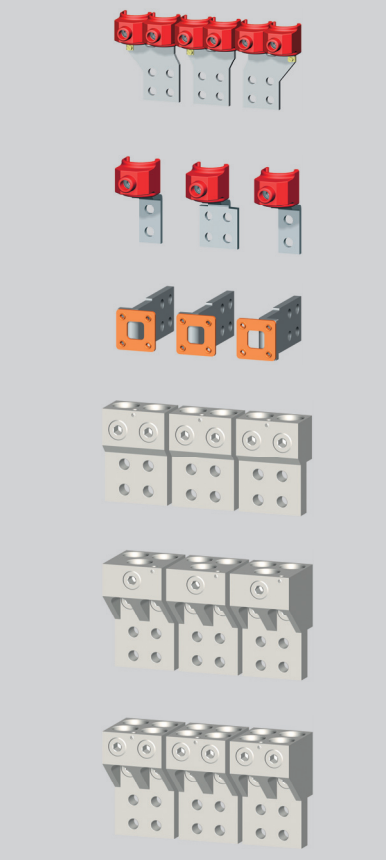


DTVE - characteristic E - protection of distribution transformers

I_n [A]	Type	Product code	Description	Weight [kg]	Package [pcs]
630	**SE-BL-J0630-DTVE**	36703	S_t = 250 kVA and 400 kVA	0.65	1
1000	**SE-BL-J1000-DTVE**	19386	S_t = 400 kVA and 630 kVA	0.65	1

CONNECTING SETS

3P



Type	Product code	Description	S [mm²]	Method of connection	Weight [kg]	Package [set][1)]
CS-BL-W010	20710	Double block terminals	2 x 70 ÷ 240	Cu/Al cables	1.47	1

- For connecting four 70 ÷ 240 mm² cables to pole, it is possible to use two CS-BL-W010 connecting sets see p. H19 (not for BL1000SE305 switching unit)
- conductor cross-section for the potential terminal is 2.5 mm²

CS-BL-W011	20930	Clamp terminals	70 ÷ 240	Cu/Al cables	0.663	1

- For connecting three 70 ÷ 240 mm² cables to pole it is possible to combine CS-BL-W011 connecting set with CS-BL-W010 connecting set, see p. H16, H19 (not for BL1000SE305 switching unit)

CS-BL-A022	20611	Rear connection – up to 1000 A - for fixed design		Busbars	1.43	1
CS-BL-B002	20116	Block terminal - for 2 cables	150 ÷ 300	Cu/Al cables	1.00	1

- conductor cross-section for the potential terminal is 1.5 ÷ 6 mm²
- it is necessary to use the insulating barriers

CS-BL-B003	20117	Block terminal - for 3 cables	150 ÷ 300	Cu/Al cables	2.00	1

- conductor cross-section for the potential terminal is 1.5 ÷ 6 mm²
- it is necessary to use the insulating barriers

CS-BL-B004	20118	Block terminal - for 4 cables	150 ÷ 300	Cu/Al cables	1.80	1

- conductor cross-section for the potential terminal is 1.5 ÷ 6 mm²
- it is necessary to use the insulating barriers

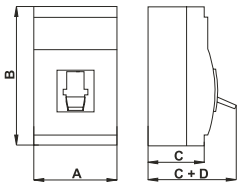
[1)] - one set enables connection of one side of the circuit breaker (set includes three terminals with necessary coupling elements)
- for other accessories see catalogue Moulded case circuit breakers Modeion

CIRCUIT BREAKERS, SWITCH-DISCONNECTORS

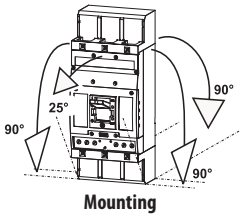
3P

Circuit breaker

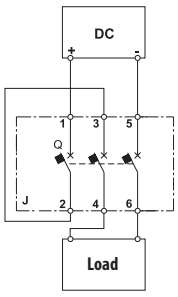
Switch-disconnector



Dimensions



Mounting



Wiring of switch-disconnector for DC circuits

Specification

		CIRCUIT BREAKERS	SWITCH-DISCONNECTORS
Type		**BL1000S**	
Series		SUPERIOR	
Dimensions A x B x C + D		210 x 350 x 135 + 63 mm	210 x 350 x 135 + 63 mm
Weight		20 kg	20 kg
Standards		EN 60 947-2 IEC 947-2	EN 60 947-3 IEC 947-3
Approval marks			
Number of poles		3	3
Rated current	I_n	630, 1000 A	-
Rated normal current	I_u	1000 A	1000 A
Rated operating current	I_e	-	1000 A
Rated operating voltage	U_e	max. 690 V a.c. -	max. 690 V a.c. max. 440 V d.c.
Rated frequency	f_n	50/60 Hz	50/60 Hz
Rated pulse withstand voltage	U_{imp}	8 kV	8 kV
Rated insulation voltage	U_i	690 V	690 V
Utilization category (selectivity)	690 V a.c.	A, B	AC-23B
Utilization category (switching mode) at I_e = 1000 A	690 V a.c. 440 V d.c.	- -	AC-23B DC-23B
Rated short-time withstand current at U_e = 690 V a.c.	I_{cw} / t	15 kA / 1 s	15 kA / 1 s
Rated short-circuit ultimate breaking capacity (RMS) [1]	I_{cu} / U_e	85 kA / 230 V a.c. 65 kA / 415 V a.c. 45 kA / 500 V a.c. 20 kA / 690 V a.c.	-
Off-time at I_{cu}		30 ms	-
Rated short-circuit service breaking capacity (RMS)	I_{cs} / U_e	45 kA / 230 V a.c. 36 kA / 415 V a.c. 30 kA / 500 V a.c. 20 kA / 690 V a.c.	-
Rated short-circuit making capacity	I_{cm} / U_e	140 kA / 415 V a.c.	30 kA / 415 V a.c. 30 kA / 440 V d.c.
Losses per 1 pole fixed/withdrawable design		100 W/139 W	100 W/139 W
Mechanical endurance		10 000 operating cycles	10 000 operating cycles
Electrical endurance		4 000 operating cycles	4 000 operating cycles
Switching frequency		120 operating cycles/h	120 operating cycles/h
Operating force		230 N	230 N
Front-side device protection		IP40	IP40
Terminal protection		IP20	IP20
Operating conditions			
Reference ambient temperature		40 °C	40 °C
Ambient temperature range		-40 ÷ +55 °C	-40 ÷ +55 °C
Working environment		dry and tropical climate	dry and tropical climate
Pollution degree		3	3
Max. sea level		2000 m	2000 m
Seismic resistance		3g (8 ÷ 50) Hz	3g (8 ÷ 50) Hz
Design modifi cations			
Connection front/rear		●/●	●/●
Plug-in design		–	–
Withdrawable design		●	●
Accessories			
Switches - auxiliary / relative / signal / advance		●/●/–/–	●/●/–/–
Shunt trip		●	●
Undervoltage release / with early contact		●/–	●/–
Front hand drive / hand drive		●/●	●/●
Mechanical interlocking - with Bowden cable / for manual drive		●/●	●/●
Motor drive / with cycle counter		●/●	●/●
Lockable lever		●	●
Bolt sealing insert / additional cover for overcurrent release		●/–	●/–

● available, – unavailable

[1] - **in case circuit breaker connection is reversed (input terminals 2, 4, 6, output terminals 1, 3, 5), I_{cu} does not change**

OVERCURRENT RELEASES DTVE

3P

■ Protection of distribution transformers

Description

Overcurrent release SE-BL-xxxx-DTVE and switching unit BL1000SE305 together form a circuit breaker meant for protection of distribution transformers MV/LV. Overcurrent release is controlled by micro processor (independent of the ambient temperature). The release has specially shaped tripping characteristic, that enables optimal exploitation of transformers up to 1.5 I_n. Setting of the rated current and transformer's power output can be done easily by one control gear on the front panel. Rated current can be set in the range of (0.4-1) x I_n in 8 grades or directly in the value of the MV/LV transformer's power output.

The short circuit release setting corresponds with the set current in a way that enables the best selectivity with the suitable fuse-link (I_{rm}=12.5 x I_n).

The reaching of 80 % and 125 % of I_r is indicated by LED diodes on the front panel of the SE-BL-J1000-DTVE marked I > 80 % of I_r and I > 125 %. When there is bigger load at the SE-BL-J0630-DTVE than 125 % I_r the diode turns red and shortly before switching off starts to blink.

Specification - adjustable

Type	Position	S_t [kVA/V] *	I_r [A]
SE-BL-J0630-DTVE	1		250
	2	250/420	344
	3	250/420	361
	4		435
	5		480
	6	400/420	550
	7	400/400	577
	8		630
SE-BL-J1000-DTVE	1		400
	2	400/420	550
	3	400/400	577
	4		630
	5		760
	6	630/420	866
	7	630/400	909
	8		1000

* S_t - *transformer capacity*

Tripping characteristic

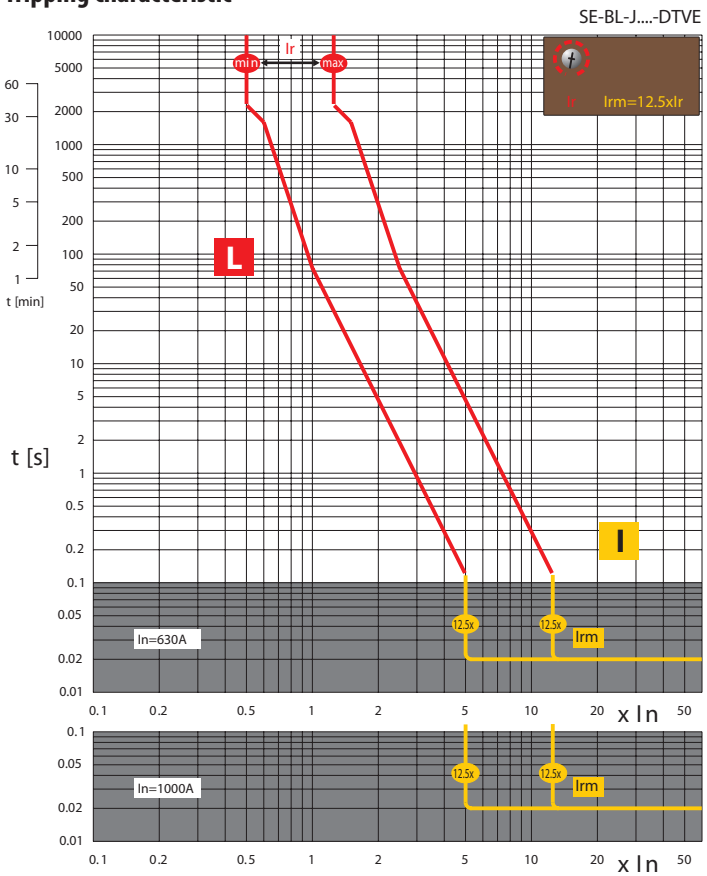
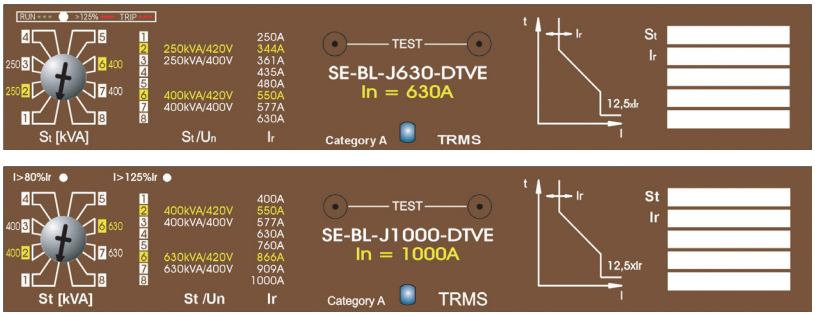
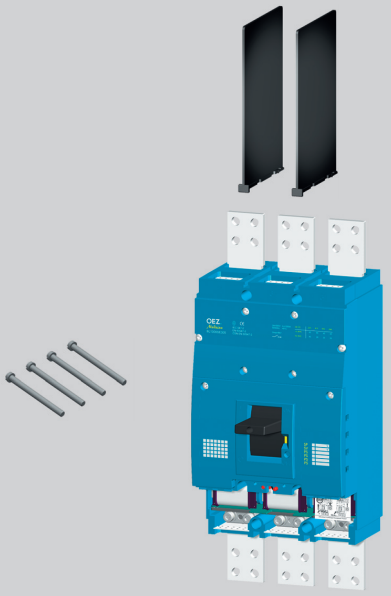


Plate of the overcurrent release



SWITCHING UNITS

3P



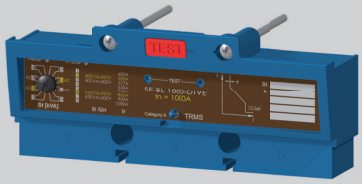
Type	Product code	I_u [A]	I_{cu} [kA]	Weight [kg]	Package [pcs]
BL1600SE305	14410	1600	65	22	1

- the way of connecting the power circuit and deionization space must follow the recommendations see catalogue Moulded case circuit breakers Modeion

- Switching unit includes:
- **insulating barriers** — **OD-BL-KS02**
- **set of installation bolts** — **OD-BL-MS01 (4x M8x80)**
- **connecting sets for front connection - connecting busbars**

OVERCURRENT RELEASES

3P

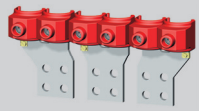


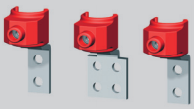
DTVE - charcteristic E - protection of distribution transformers

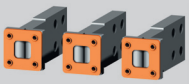
I_n [A]	Type	Product code	Description	Weight [kg]	Package [pcs]
1000	**SE-BL-1000-DTVE**	18020	S_t = 400 kVA and 630 kVA	0.65	1

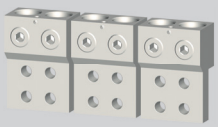
CONNECTING SETS

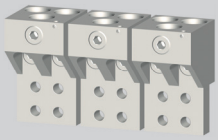
3P

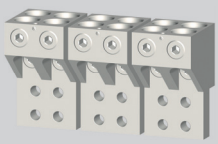












Type	Product code	Description	S [mm²]	Method of connection	Weight [kg]	Package [set][1)]
CS-BL-W010	20710	Double block terminals	2 x 70 ÷ 240	Cu/Al cables	1.47	1

- For connecting four 70 ÷ 240 mm² cables to pole, it is possible to use two CS-BL-W010 connecting sets see p. H19 (not for BL1000SE305 switching unit)
- conductor cross-section for the potential terminal is 2.5 mm²

CS-BL-W011	20930	Clamp terminals	70 ÷ 240	Cu/Al cables	0.663	1

- For connecting three 70 ÷ 240 mm² cables to pole it is possible to combine CS-BL-W011 connecting set with CS-BL-W010 connecting set, see p. H16, H19 (not for BL1000SE305 switching unit)

CS-BL-A021	20610	Rear connection – up to 1600 A - for fixed design		Busbars	2.76	1

CS-BL-B002	20116	Block terminal - for 2 cables	150 ÷ 300	Cu/Al cables	1.00	1

- conductor cross-section for the potential terminal is 1.5 ÷ 6 mm²
- it is necessary to use the insulating barriers

CS-BL-B003	20117	Block terminal - for 3 cables	150 ÷ 300	Cu/Al cables	2.00	1

- conductor cross-section for the potential terminal is 1.5 ÷ 6 mm²
- it is necessary to use the insulating barriers

CS-BL-B004	20118	Block terminal - for 4 cables	150 ÷ 300	Cu/Al cables	1.80	1

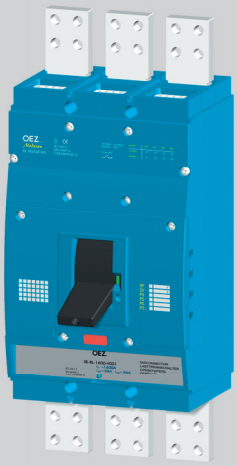
- conductor cross-section for the potential terminal is 1.5 ÷ 6 mm²
- it is necessary to use the insulating barriers

[1)] - one set enables connection of one side of the circuit breaker (set includes three terminals with necessary coupling elements)
- for other accessories see catalogue Moulded case circuit breakers Modeion

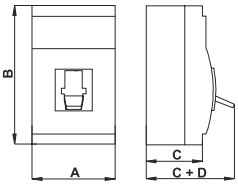
CIRCUIT BREAKERS, SWITCH-DISCONNECTORS

3P

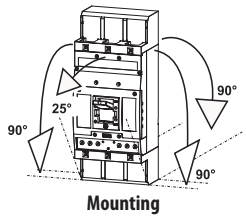
Circuit breaker



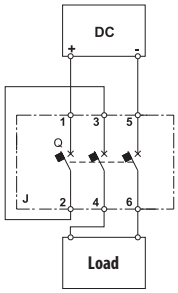
Switch-disconnector



Dimensions



Mounting



Wiring of switch-disconnector for DC circuits

Specification

		CIRCUIT BREAKERS	SWITCH-DISCONNECTORS
Type		**BL1600S**	
Series		SUPERIOR	
Dimensions A x B x C + D		210 x 350 x 135 + 63 mm	210 x 350 x 135 + 63 mm
Weight		22 kg	22 kg
Standards		EN 60 947-2 IEC 947-2	EN 60 947-3 IEC 947-3
Approval marks			
Number of poles		3	3
Rated current	I_n	1000 A	-
Rated normal current	I_u	1600 A	1600 A
Rated operating current	I_e	-	1600 A
Rated operating voltage	U_e	max. 690 V a.c. -	max. 690 V a.c. max. 440 V d.c.
Rated frequency	f_n	50/60 Hz	50/60 Hz
Rated pulse withstand voltage	U_{imp}	8 kV	8 kV
Rated insulation voltage	U_i	690 V	690 V
Utilization category (selectivity)	690 V a.c.	A, B	-
Utilization category (switching mode)	690 V a.c. 440 V d.c.	- -	AC-23B DC-23B
Rated short-time withstand current at U_e = 690 V a.c.	I_{cw} / t	20 kA/1 s	20 kA/1 s
Rated short-circuit ultimate breaking capacity (RMS) [1]	I_{cu} / U_e	85 kA/ 230 V a.c. 65 kA/ 415 V a.c. 45 kA/ 500 V a.c. 20 kA/ 690 V a.c.	-
Off-time at I_{cu}		30 ms	-
Rated short-circuit service breaking capacity (RMS)	I_{cs} / U_e	45 kA/ 230 V a.c. 36 kA/ 415 V a.c. 30 kA/ 500 V a.c. 20 kA/ 690 V a.c.	-
Rated short-circuit making capacity	I_{cm} / U_e	140 kA/ 415 V a.c.	40 kA/ 415 V a.c. 40 kA/ 440 V d.c.
Losses per 1 pole fixed/withdrawable design		120 W/300 W	120 W/300 W
Mechanical endurance		10 000 operating cycles	10 000 operating cycles
Electrical endurance		4 000 operating cycles	4 000 operating cycles
Switching frequency		120 operating cycles/h	120 operating cycles/h
Operating force		230 N	230 N
Front-side device protection		IP40	IP40
Terminal protection		IP20	IP20
Operating conditions			
Reference ambient temperature		40 °C	40 °C
Ambient temperature range		-40 ÷ +55 °C	-40 ÷ +55 °C
Working environment		dry and tropical climate	dry and tropical climate
Pollution degree		3	3
Max. sea level		2000 m	2000 m
Seismic resistance		3g (8 ÷ 50) Hz	3g (8 ÷ 50) Hz
Design modifi cations			
Connection front / rear		●/●	●/●
Plug-in design		–	–
Withdrawable design		●	●
Accessories			
Switches - auxiliary / relative / signal / advance		●/●/–/–	●/●/–/–
Shunt trip		●	●
Undervoltage release / with early contact		●/–	●/–
Front hand drive / hand drive		●/●	●/●
Mechanical interlocking - with Bowden cable / for manual drive		●/●	●/●
Motor drive / with cycle counter		●/●	●/●
Lockable lever		●	●
Bolt sealing insert / additional cover for overcurrent release		●/–	●/–

● available, – unavailable

[1] - **in case circuit breaker connection is reversed (input terminals 2, 4, 6, output terminals 1, 3, 5), I_{cu} does not change**

OVERCURRENT RELEASES DTVE

3P

■ Protection of distribution transformers

Description

Overcurrent release SE-BL-xxxx-DTVE and switching unit BL1600SE305 together form a circuit breaker meant for protection of distribution transformers MV/LV. Overcurrent release is controlled by micro processor (independent of the ambient temperature). The release has specially shaped tripping characteristic, that enables optimal exploitation of transformers up to 1.5 x I_n.

Setting of the rated current and transformer's power output can be done easily by one control gear on the front panel.

Rated current can be set in the range of (0.4-1) x I_n in 8 grades or directly in the value of the MV/LV transformer's power output. The short circuit release setting corresponds with the set current in a way that enables the best selectivity with the suitable fuse-link (I_{rm}=12.5 x I_n). The reaching of 80 % and 125 % of I_r is indicated by LED diodes on the front panel denoted as I > 80 % of I_r and I >125 % I_r.

Specification - adjustable

Type	Position	S_t [kVA/V] *	I_r [A]
SE-BL-1000-DTVE	1		400
	2	400/420	550
	3	400/400	577
	4		630
	5		760
	6	630/420	866
	7	630/400	909
	8		1000

** S_t - transformer capacity*

Tripping characteristic

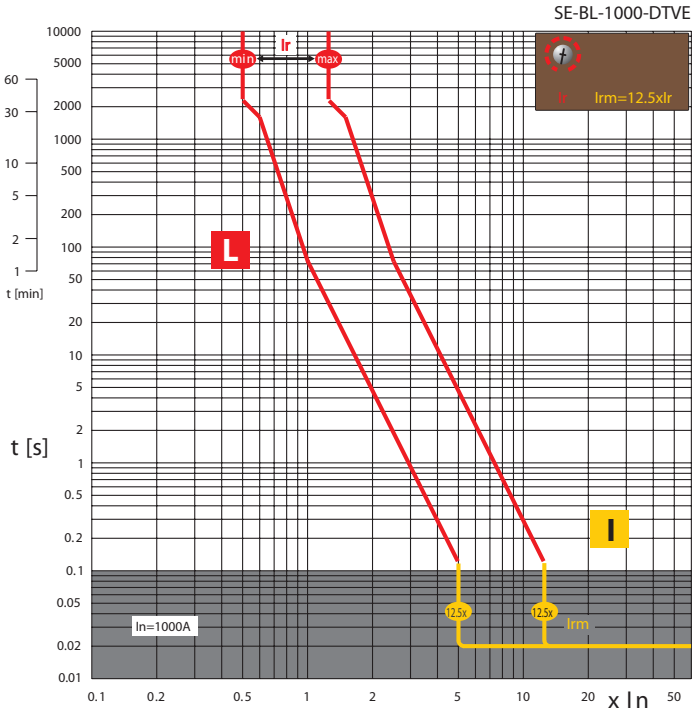
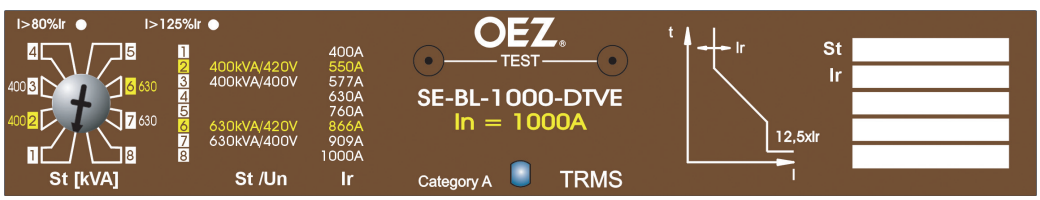


Plate of the overcurrent release



GLOSSARY

Note: Precise wording of definitions and texts relating to a given term are detailed in the respective standards (see Name).

Name	Symbol	Explanation
Rated operating voltage EN 60947-1; 4.3.1.1	$\mathbf{U_e}$	Voltage fixed by the manufacturer. Several pertinent tests relate to its determination, as may also the utilization category. Along with the rated (operating) current, it determines the device's utilization. The highest value of rated operating voltage may in no case be greater than the value of the rate insulation voltage $\mathbf{U_i}$.
Rated insulation voltage EN 60947-1; 4.3.1.2	U_i	Voltage measure to which are related tests of dielectric strength and creepage distance.
Rated current EN 60947-2; 4.3.2.3	I_n	Current value of particular circuit breaker that can be handled uninterruptedly. The highest current valued tripping the circuit breaker in conformity with a specifi cally stated tripping characteristic.
Reduced rated current	I_r	Specifi cally established, reduced value of $\mathbf{I_n}$ current for a regulated time-dependent (thermal) release and that the circuit breaker can handle continuously. Maximum setting is at value equal to $\mathbf{I_n}$. Changing $\mathbf{I_r}$ shifts the release's tripping characteristic along the current axis. $\mathbf{I_r = k \times I_n}$ holds where $\mathbf{k \leq 1}$
Tripping time at a given multiple $\mathbf{I_r}$	t_r	Time after which circuit breaker will trip, if a current fl ows through it that is equal to the given multiple of $\mathbf{I_r}$. Changing $\mathbf{t_r}$ shifts the tripping characteristic along the time axis.
Actuating current of (selective) release's timeindependent delay	I_{rmv}	Minimum current value causing the release's time-independent delay to actuate.
Delay of time-independent delayed release	t_v	If a current fl ows through the circuit breaker equal to at least $\mathbf{I_{rmv}}$ but not reaching $\mathbf{I_{rm}}$ the circuit breaker will trip with time delay $\mathbf{t_v}$. Total shut-off time is infl uenced by the tripping of the circuit breaker itself and is about 10 ÷ 20 ms longer.
Release current of independent instantaneous (short-circuit) release	I_{rm}	Minimum current value causing the time-independent instantaneous release to actuate.
Rated operating current EN 60947-1; 4.3.2.3	I_e	Rated operating current of device (switch-disconnector) is fi xed by the manufacturer with consideration for the rated operating voltage, rated frequency, rated operation, utilization category and type of protective cover, if that comes into consideration.
Rated normal current EN 60947-1; 4.3.2.4	I_u	Current value set by the manufacturer and which the device can handle in continuous operation, i.e. during a period longer than 8 hours (weeks, months, or longer).
Rated short-circuit ultimate breaking capacity EN 60947-2; 2.15.1; 4.3.5.2.1	I_{cu}	Ultimate short-circuit breaking capacity value expressed as the rms value of the alternating component of the assumed short-circuit current that the circuit breaker must be able to manage in the mode: 1x switching off of the short circuit and a following 1x make-break sequence. After testing, the circuit breaker need not be able to conduct the rated current uninterruptedly. $\mathbf{I_{cu}}$ is set for the rated operating voltage at the rated frequency and at the established power factor for alternating current or at the time constant for direct current. Must fulfi l the condition: $\mathbf{I_{cu} \geq I_k''}$
Rated short-circuit service breaking capacity EN 60947-2; 2.15.2; 4.3.5.2.2	I_{cs}	Value of the operating short-circuit breaking capacity expressed as the rms value of the alternating component of the assumed short-circuit current, that the circuit breaker must be able to manage in the mode: 1x switching off of the short circuit and a following 2x make-break sequence. May also be expressed as a percentage of $\mathbf{I_{cu}}$. After testing, the circuit breaker must be able uninterruptedly to conduct the rated current and to switch off the overcurrent. Temperature increase of the main terminals may be greater. $\mathbf{I_{cs}}$ is set for the rated operating voltage at the rated frequency and at the established power factor for alternating current or at the time constant for direct current. Permitted: $\mathbf{I_{cs} \geq I_k''}$
Rated short-time withstand current EN 60947-1; 4.3.6.1 EN 60947-2; 4.3.5.4 EN 60947-3; 4.3.6.1	I_{cw}	Value of short-time withstand current specifi ed by the manufacturer that the device is able to handle without damage during a designated time period (short-time delay). In case of alternating current, it is the rms value of the alternating component of the assumed short-circuit current $\mathbf{I_p}$.

GLOSSARY

Note: Precise wording of definitions and texts relating to a given term are detailed in the respective standards (see Name).

Name	Symbol	Explanation
Rated short-circuit making capacity EN 60947-1; 4.3.6.2 EN 60947-2; 4.3.5.1 EN 60947-3; 4.3.6.2	I_{cm}	Value of short-circuit making capacity specifi ed by the manufacturer for the rated operating voltage at the rated frequency and at the established power factor for alternating current or at the time constant for direct current. It is expressed as the maximum assumed peak current. Must fulfi l the condition: $I_{cm} \geq i_p$
Initial peak short-circuit current EN 60909-0; 1.3.5	I_k''	Short-circuit current value at the moment of its arising at a given point in the electrical distribution expressed as the rms value of the alternating symmetrical component of the assumed short-circuit current.
Surge short-circuit current EN 60909-0; 1.3.8	i_p	Maximum possible momentary value of the assumed short-circuit current. (Corresponds to the moment the short arises, as a result of which there occurs the peak value of the short-circuit current.)
Prospective short-circuit current EN 60947-1; 2.5.5 EN 60909-0; 1.3.3	I_p	Short-circuit current value, which would fl ow through the circuit if the protection device were replaced and a short circuit were experienced by conductors with negligible impedance. (In a three-phase distribution, it is assumed that the short circuit is simultaneous in all phases.)
Rated pulse withstand voltage EN 60947-1; 4.3.1.3	U_{imp}	Peak value of the voltage impulse of the prescribed form and polarity, Peak value of the voltage impulse of the prescribed form and polarity which the device is able to withstand without failure at the established conditions and pertinent to which is the value of the separating air distance. U_{imp} of the device must be equal to or higher than the value established for momentary overvoltage at the point in the circuit (overvoltage category) where the device is used.
Overvoltage category EN 60947-1; 2.5.60		Numerically defi ned level of momentary overvoltage, i.e. overvoltage having its origin in atmospheric or switching. Standard EN 60664-1 establishes for electrical equipment the overvoltage categories: **Overvoltage category IV** - service entrance, outside lead **Overvoltage category III** - fixed wiring **Overvoltage category II** - appliances **Overvoltage category I** - light-current appliances
Rated frequency EN 60947-1; 4.3.3	f_n	Frequency of the supply network for which the device is proposed and that corresponds to its other characteristics values.
Utilization category (circuit breakers - timing selectivity) EN 60947-2; 4.4		Utilization category of circuit breaker establishes whether or not the circuit breaker specifi cally is intended for providing selectivity by means of intentional time delay (timing selectivity) with other protective devices connected in series on the load side in short-circuiting conditions. **Utilization category:** **A** - circuit breakers are not specifi cally intended for providing timing selectivity **B** - circuit breakers are specifi cally intended for providing timing selectivity
Utilization category (switch-disconnectors - switching mode) EN 60947-3; 4.4		Utilization category defi nes the assumed use of switch devices (switch-disconnectors). Characterised by values of current and voltage, expressed as multiples of rated operating current and rated operating voltage, and further by power factors or time constants of the circuit. **Utilization category:** **AC-21B (DC-21B)** - infrequent switching of resistive loads, including moderate overloading **AC-22B (DC-21B)** - infrequent switching of mixed resistive and inductive loads, including moderate overloading **AC-23B (DC-23B)** - infrequent switching of motor loads or other highly inductive loads.
Pollution degree EN 60947-1; 2.5.58; 6.1.3.2		Pollution degree relates to the conditions of the surrounding environment for which the device is intended. **Pollution degree:** **1** - No contamination will occur, or only dry, non-conducting contamination. **2** - Normally occurs only non-conducting contamination, but sometimes there may occur temporary conductibility due to condensation. **3** - There occurs conductive contamination or dry non-conducting contamination that with the eff ect of condensation will become conductive. **4** - Contamination generates continuous conductibility, by means of, for example, conductive dust, rain or snow.

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