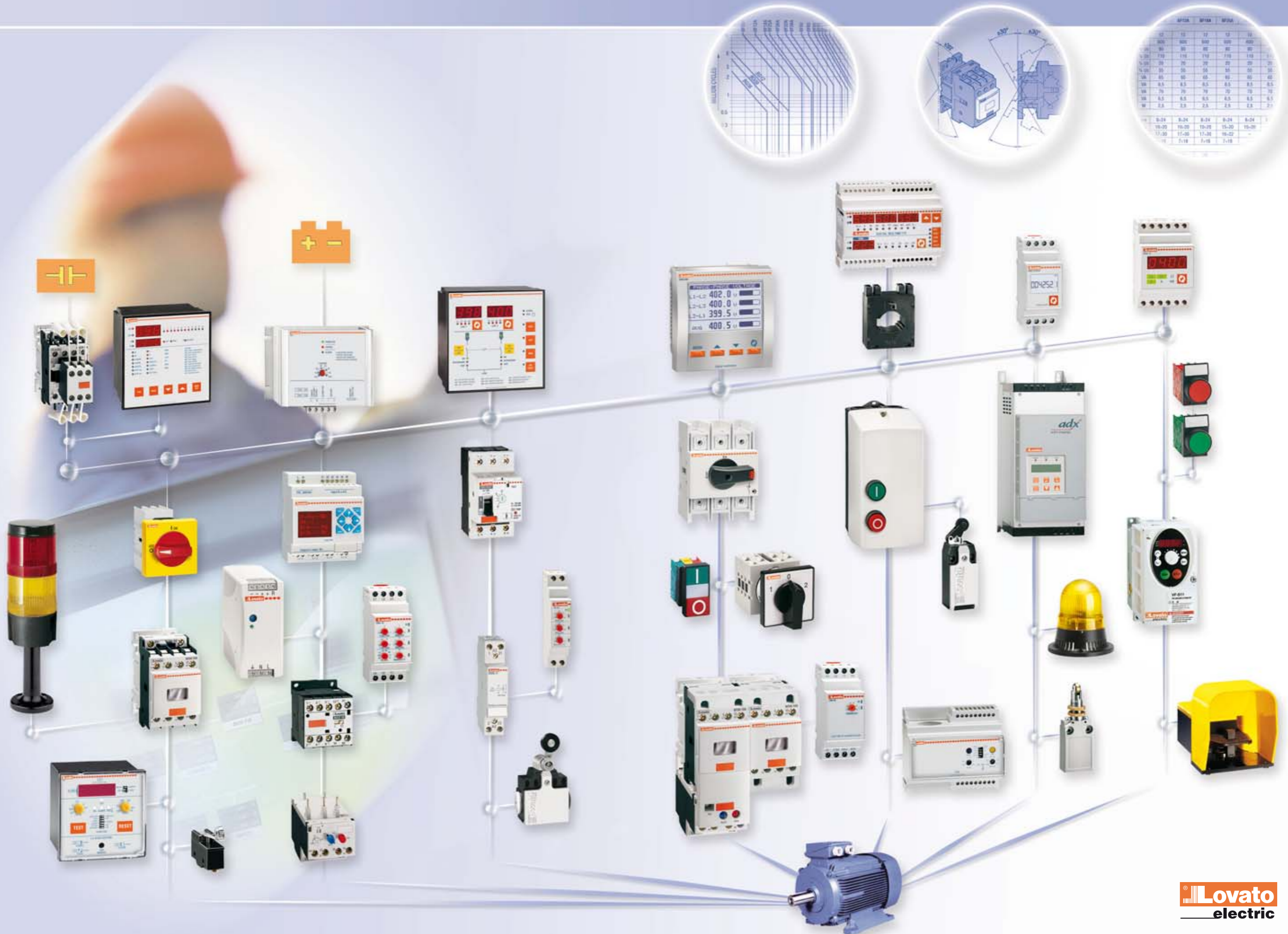


TECHNICAL CHARACTERISTICS

TC



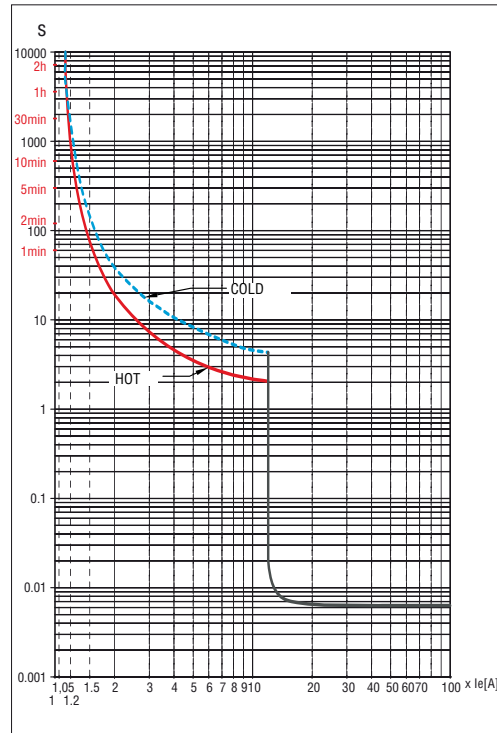
Operational characteristics

TYPE		SM1A	SM1B	SM1C	SM2A	SM3A	LMS25	
CONTACT AND RELEASE CHARACTERISTICS								
Rated insulation voltage U_i	V	690						
Rated frequency	Hz	50/60						
Rated impulse voltage U_{imp}	kV	6						
Maximum rated current	A	32	32	32	50	100	25	
Number of adjustment ranges		5	15	15	3	4	13	
Power dissipation	W	2.2-9.7	2.2-9.7	2.2-9.7	7.1-20	10-38	2-15	
Magnetic tripping		12 I_n	12 I_n	12 I_n	13 I_n	13 I_n	12 I_n	
Mechanical life	cycles	100,000	100,000	100,000	25,000	25,000	100,000	
Electrical life (I_e max AC3)	cycles	100,000	100,000	100,000	50,000	50,000	100,000	
Maximum tightening torque for terminals	Nm	2.3	2.3	2.3	4.5	6	2	
	lbft	1.7	1.7	1.7	3.3	4.4	1.5	
	Tool	PH2	PH2	PH2	PZ2	Allen 4mm	PZ2	
Minimum-maximum conductor section connectable 1 or 2 wires								
	AWG	n°	16-10	16-10	16-10	18-3	10-1/0	14-8
	Flexible without lug	mm ²	1-6	1-6	1-6	0.75-25	10-50	0.75-4
AMBIENT OPERATING CONDITIONS								
Temperature	Operating	°C	-20...+60❶	-20...+60❶	-20...+60❶	-20...+70❶	-20...+70❶	-25...+50
	Storage	°C	-50...+80	-50...+80	-50...+80	-50...+80	-50...+80	-50...+70
	Compensation	°C	-20...+50	-20...+50	-20...+50	-20...+50	-20...+50	-20...+50
Maximum altitude	m	3000						
Mounting position		any						
Mounting		35mm DIN rail (IEC/EN 60715)			Screw fixing or 35mm DIN rail (IEC/EN 60715)	Screw fixing or DIN rail 35mm (IEC/EN 60715) or 75mm (IEC/EN 60715)	Screw fixing or 35mm DIN rail (IEC/EN 60715)	

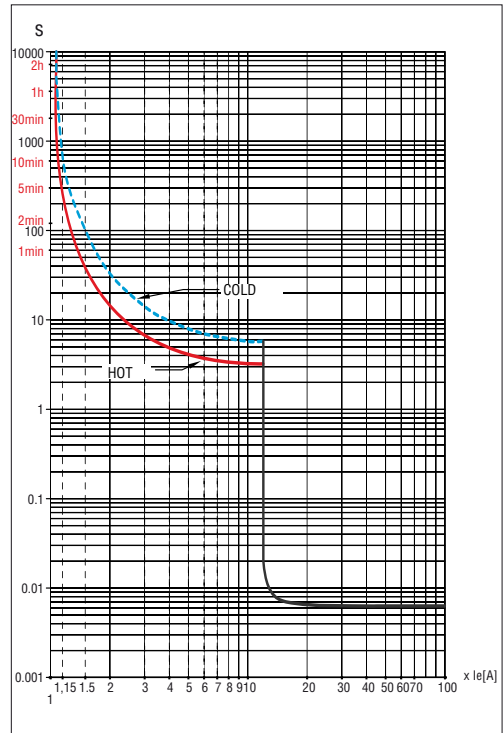
❶ When fitting more than one breaker side by side, refer to notes given on pages 1-2 and 1-3, in the right-hand column.
N.B. PH = Phillips; PZ = Pozidrive; Allen is metric type.

Thermal tripping curve (average time)

Three-phase balanced operation




Two-phase operation (phase failure)



TYPE	Three poles	GA016...	GA025...	GA032...	GA040...	GA063...	GA080...	GA100...	GA125...		
	Fourth pole	GAX42 016...	GAX42 025...	GAX42 032...	GAX42 040...	GAX42 063...	GAX42 080...	GAX42 100...	GAX42 125...		
CONTACT CHARACTERISTICS											
Conventional free air current Ith (≤40°C)	A	16	25	32	40	63	80	100	125		
Rated insulation voltage Ui	V	800									
Rated impulse withstand voltage Uimp	kV	8									
Rated operational current Ie											
AC21A	415V	A	16	25	32	40	63	80	100	125	
	500V	A	16	25	32	40	63	80	100	125	
	690V	A	16	25	32	40	63	80	100	125	
AC22A	415V	A	16	25	32	40	63	80	100	125	
	500V	A	16	25	32	40	63	80	100	125	
	690V	A	16	25	32	40	63	80	100	125	
AC23A	415V	A	16	25	32	40	63	80	100	125	
	500V	A	16	25	25	25	63	63	80	100	
	690V	A	16	25	25	25	50	50	50	50	
Rated operational power											
AC23A	415V	kW	7.5	11	15	18.5	30	45	55	55	
	690V	kW	11	22	22	22	45	45	45	45	
Protection against short-circuit											
Rated short-time withstand current (1s) Icw	A rms	800					2500				
Rated conditional short-circuit current	kA rms	50									
With fuse class gG	A	16	25	32	40	63	80	100	125		
Making capacity 415V AC23A	A	400					1250				
Breaking capacity 415V AC23A	A	320					1000				
Mechanical life	ops	100,000									
Electrical life (AC21A)	ops	30,000									
Conductor section min-max	mm ²	0.75...16					4...50				
	AWG	18...6					10...1				
Terminals	Type	Lug clamp									
	A mm	5.6					12.4				
	B mm	6.5					10.4				
	Screw	M4					M8				
	Tool	Phillips 2					Allen key 4				
Tightening torque	Nm	1.8-2					5-6				
	lbf ^t	1.3-1.5					3.7-4.4				
AMBIENT CONDITIONS											
Temperature	Operating	°C	-25...+55								
	Storage	°C	-40...+70								
Maximum altitude	m	3000									
Mounting position	normal	Vertical									
	admissible	Any									
Fixing	Screw or 35mm DIN rail (IEC/EN 60715)										




TYPE	Three poles	GE0160	GE0200	GE0250	GE0251	GE0315	GE0400	GE0500	GE0630	GE0800	GE1000	GE1250	
	Fourth pole	GE0160 T4	GE0200 T4	GE0250 T4	GE0251 T4	GE0315 T4	GE0400 T4	GE0500 T4	GE0630 T4	GE0800 T4	GE1000 T4	GE1250 T4	
CONTACT CHARACTERISTICS													
Conventional free air current I _{th} (≤40°C)	A	160	200	250	250	315	400	500	630	800	1000	125	
Rated insulation voltage U _i	V	1000											
Rated impulse withstand voltage U _{imp}	kV	8						12					
Rated operational current I _e													
AC21A	415V	A	160	200	250	250	315	400	500	630	800	1000	1250
	500V	A	160	200	250	250	315	400	500	630	800	1000	1250
	690V	A	160	180	180	250	315	400	500	630	800	1000	1000
AC22A	415V	A	160	200	250 (AC22B)	250	315	400	500	630	800	1000	1250
	500V	A	160	200	200	250	315	400	500	630	800	1000	1000
	690V	A	125	160	160	200	250	250	400	500	500	630	630
AC23A	415V	A	160	160	160	250	315	400	500	630	800	800	800
	500V	A	125	125	125	200	250	315	400	500	500	800	800
	690V	A	80	80	80	160	160	160	250	315	315	500	500
Reactive power 400V	kvar	72	72	72	112	142	180	225	284	360	360	360	
Rated operational power													
AC23A	415V	kW	90	110	110	132	185	220	300	355	475	475	
	690V	kW	75	75	75	160	160	160	250	315	315	500	
Protection against short-circuit													
Rated short-time withstand current (1s) I _{cw}	kA rms	6				10			16			19	
Rated conditional short-circuit current ^①	kA rms	100											
With fuse class gG	A	160	200	250		315	400	500	630	800	1000	1250	
Making capacity 415V AC23A	A	1600			2500	3150	4000	5000	6300		8000		
Breaking capacity 415V AC23A	A	1280			2000	2520	3200	4000	5000		6400		
Mechanical life	ops	30,000			20,000			10,000					
Electrical life (AC23A - 400V)	ops	1,000											
Maximum conductor section	mm ²	95	120		185		240	2x185	2x240		2x300		
Max bar size (thickness-width)	mm	4-13	13-18	5-30	7-125		7-40	6-40	2x 5-40		2x 10-50		
Terminals		Type	Terminal for lugs or bars										
		A mm	18	26		25		35	25	30		40	
		B mm	3			4			5			8	
		Screw	M8	M10					M14				
Tightening torque		Nm	13	24					45				
		lbft	10	18					33				
AMBIENT CONDITIONS													
Temperature	Operating	°C	-25...+55										
	Storage	°C	-40...+70										
Maximum altitude		m	3000										
Mounting position	normal		Vertical										
	admissible		Any										
Fixing			Screw										

① With protection fuse to limit current peak and let-through energy.


TYPE	BS	Three poles	GE0160 B	-	GE0200 B	GE0250B	GE0315 B	GE0400 B	GE0630 B	GE0800 B
		Four poles	GE0160 BT4	-	GE0200 BT4	GE0250BT4	GE0315 BT4	GE0400 BT4	GE0630 BT4	GE0800 BT4
	NH	Three poles	GE0160N	GE0161 N	-	GE0250N	-	GE0400 N	GE0630 N	GE0800 N
		Four poles	GE0160 NT4	GE0161 NT4	-	GE0250NT4	-	GE0400 NT4	GE0630 NT4	GE0800 NT4

CONTACT CHARACTERISTICS

Conventional free air current Ith (≤40°C)	A	160	160	200	250	315	400	630	800		
Rated insulation voltage Ui	V	800			1000						
Rated impulse withstand voltage Uimp	kV	8			12						
Rated operational current Ie											
AC21A	415V	A	160	160	200	250	315	400	630	800	
	500V	A	160	160	200	250	315	400	630	800	
	690V	A	160	160	200	250	315	400	630	630	
AC22A	415V	A	160	160	200	250	315	400	630	800	
	500V	A	160	160	200	250	315	400	630	800	
	690V	A	125	160	200	250	315	400	630	630	
AC23A	415V	A	160	160	200	250	315	400	630	630	
	500V	A	125	160	200	25	315	400	630	630	
	690V	A	100	125	160	200	250	315	400	400	
Reactive power 400V	kvar	60	60	75	115	150	200	250	325		
Rated operational power											
AC23A	415V	kW	90	90	110	132	185	220	355	355	
	690V	kW	90	110	160	250	315	400	630	800	
Protection against short-circuit											
Let-through energy I ² t	kA ² s	17	26.3	26.3	43.3	43.3	43.3	60.8	60.8		
Rated conditional short-circuit current	kA RMS	100	100	100	100	100	100	100	100		
With fuse class gG	A	160	160	200	250	315	400	630	800		
Making capacity 415V AC23A	A	1600			2000	2600	3200	5100			
Breaking capacity 415V AC23A	A	1600		2000	2500	3150	4000	6300			
Mechanical life	ops	10,000						5,000			
Electrical life (AC23A - 400V)	ops	1,000						500			
Maximum conductor section	mm ²	95	120		240			2x185	2x240		
Max bar size (thickness-width)	mm	3-25	5-25		6-40			2x 7-50	2x 7-50		
Terminals 	Type	Terminal for lugs or bars									
	A mm	20	25			30		35	40	50	
	B mm	3			4				5	6	
	Screw	M8			M10			M12		4x M8	
Tightening torque	Nm	13			24			45		13	
	lbft	10			18			33		10	
AMBIENT CONDITIONS											
Temperature	Operating	°C	-25...+55								
	Storage	°C	-40...+70								
Maximum altitude	m	3000									
Mounting position	normal	Vertical									
	admissible	Any									
Fixing	Scre										

TYPE	Three poles	GE0160 E	GE0200 E	GE0201 E	GE0250 E	GE0315 E	GE0400 E	GE0500 E	GE0630 E	GE0800 E	GE1000 E	GE1250 E
	Four poles	GE0160 ET4	GE0200 ET4	GE0201 ET4	GE0250 ET4	GE0315 ET4	GE0400 ET4	GE0500 ET4	GE0630 ET4	GE0800 ET4	GE1000 ET4	GE1250 ET4

CONTACT CHARACTERISTICS

Conventional free air current I _{th} (≤40°C)	A	160	200	250	315	400	500	630	800	1000	1250		
Rated insulation voltage U _i	V	800						1000					
Rated impulse withstand voltage U _{imp}	kV	8						12					
Rated operational current I _e													
AC21A	415V	A	160	200	200	250	315	400	500	630	800	1000	1250
	500V	A	160	200	200	250	315	400	500	630	800	1000	1250
	690V	A	160	200	200	250	315	400	500	630	800	1000	1250
AC22A	415V	A	160	200	200	250	315	400	500	630	800	1000	1250
	500V	A	160	200	200	250	315	400	500	630	800	1000	1250
	690V	A	125	160	160	200	250	315	400	500	630	800	1000
AC23A	415V	A	160	160	200	200	250	250	400	400	630	1000	1000
	500V	A	125	125	160	160	200	200	315	315	400	800	1000
	690V	A	80	80	125	125	160	160	250	250	315	630	800
Reactive power 400V	kvar	72	72	131	131	166	166	262	262	333	416	520	
Rated operational power													
AC23A	415V	kW	110	140	140	175	220	275	345	435	550	690	865
	690V	kW	190	240	240	300	375	475	595	750	950	1190	1490
Protection against short-circuit													
Rated short-time withstand current (1s) I _{cs}	kA rms	6	6	8				13			25		
Rated conditional short-circuit current 	kA rms	100	100						72				
With fuse class gG	A	160	200	250	315	400	500	630	800	1000	1250		
Making capacity 415V AC23A	A	1600	1600	3150	4000			6300		8000	10000	12500	
Breaking capacity 415V AC23A	A	1280	1280	2520	3200			5040		6400	8000	10000	
Mechanical life	ops	30,000	30,000	1,000				10,000					
Electrical life (AC23A - 400V)	ops	1,000	1,000						500				
Maximum conductor section	mm ²	95	120	240				2x240			-	-	
Max bar size (thickness-width)	mm	4-13	13-18	2x 5-30				2x 6-45			2x 10-60		
Terminals	Type	Terminal for lugs or bars											
	A mm	18	26	25			35	40			50		
	B mm	3	3						5			6	
	Screw	M8	M10				M12			M14			
Tightening torque	Nm	13	24					45					
	lbft	10	18					33					

AMBIENT CONDITIONS

Temperature	Operating	°C	-25...+55									
	Storage	°C	-40...+70									
Maximum altitude		m	3000									
Mounting position	normal		Vertical									
	admissible		Any									
Fixing			Screw									

 With protection fuse to limit current peak and let-through energy.

Utilisation category DC21B

MAXIMUM OPERATIONAL CURRENT

Voltage U _e [V]	Poles in series n°	Maximum operational current in DC21B		
		GA040 D	GA080 D	GA125 D
48	3	40	80	125
220	3	32	40	95
400	4	32	40	64
440	4	32	40	64
500	4	32	40	56
600	4	20	30	40
700	4	15	18	20
750	4	15	18	20
800	4	15	18	20
600	6	25	35	40
700	6	18	22	30
750	6	18	22	30
800	6	18	22	30
700	8	25	30	35
750	8	25	30	35
800	8	25	30	35

Voltage U _e [V]	Poles in series n°	Maximum operational current in DC21B		
		GE0160 DT4	GE0250 DT4	GE0630 DT4
48	4	160	250	630
110	4	160	250	630
220	4	125	250	630
400	4	50	250	500
500	4	85	250	500
600	4	65	250	360
750	4	55	235	300
800	4	50	225	280
850	4	45	200	270
900	4	40	175	200

Mounting position
of contactors

ON VERTICAL PLANE

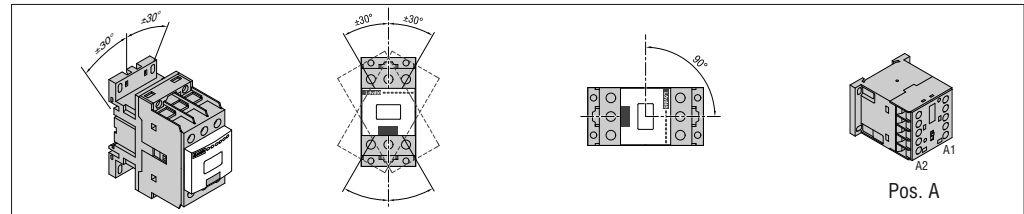
The performances given in this catalogue have been established with contactors mounted on a vertical plane with line terminals facing upwards and load terminals facing downwards.

All contactors can be mounted with a $\pm 30^\circ$ inclination to the vertical axis of the contactor without any derating. For BF series contactors, this inclination can reach $\pm 90^\circ$, that is

with the terminals are facing towards left and right.

For BG mini-contactors:

- Position A, with coil terminals A1-A2 facing downwards or upwards, is not recommended.
- The position with coil terminals A1-A2 facing upwards is not recommended for mini-contactors with NC contacts.



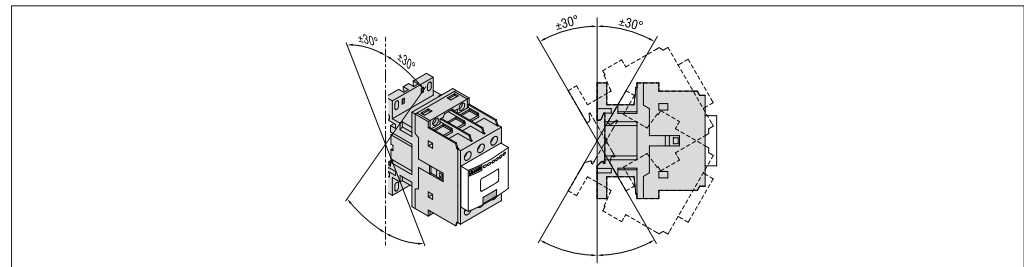
ON VERTICAL PLANE WITH 30° INCLINATION

All contactors can be mounted on a plane which varies in respect to the vertical up to $\pm 30^\circ$ angle.

On the average, a 5% increase of the minimum pick-up

voltage in -30° position can be noted.

This inclination is greater than the one prescribed by main naval registers.



ON HORIZONTAL PLANE (FOR BF SERIES CONTACTORS)

Considerable performance variations can be noted.

- It is necessary to check the two possible mounting positions:
- when the contactor is energised, the movable equipment moves upwards.
 - when the contactor is energised, the movable equipment moves downwards.

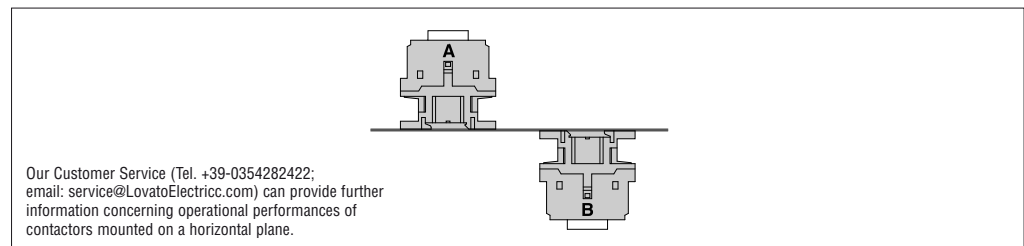
In the first case, it is difficult to close the contactor while in the second, to open it.

The variables which could influence the contactor

performance, in addition to the two mounting positions, are:

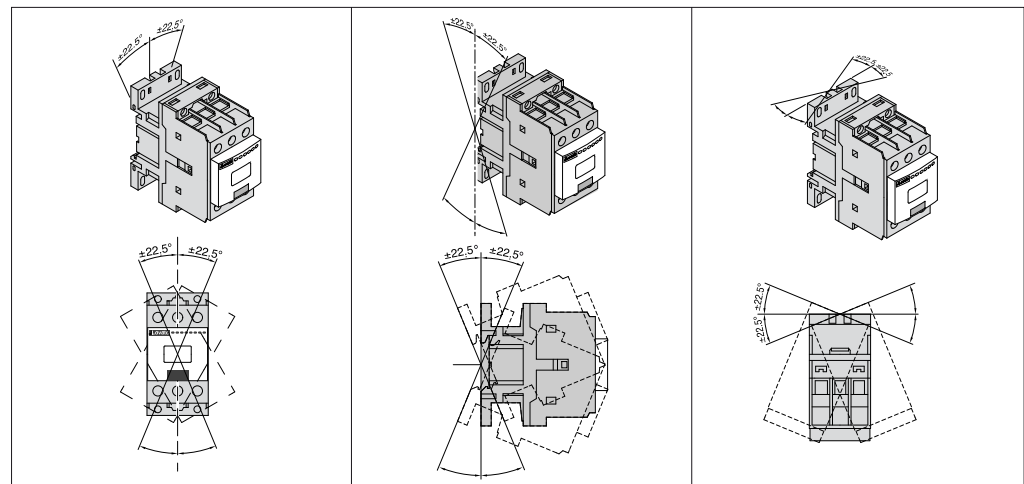
- type of contactor
- type of control
- contact configuration
- number and type of add-on blocks
- permissible tolerance of auxiliary voltage variation
- ambient temperature.

NOTE: Position B is not recommendable.



DYNAMIC TYPE TESTS

Our contactors have sustained dynamic testing, with contactor mounting position rotated $\pm 22.5^\circ$ in respect to the three orthogonal axes.



Utilisation category AC3

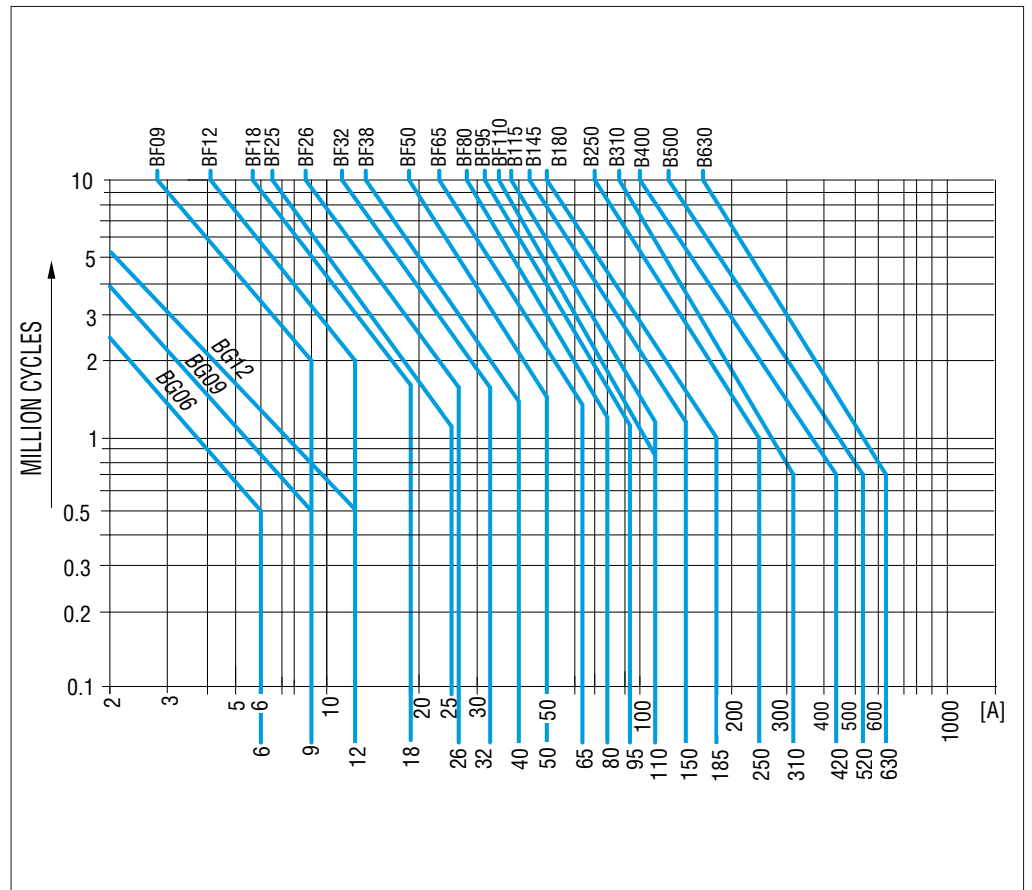
POLE CHARACTERISTICS
Squirrel-cage induction motors; breaking at rated motor current.

MAXIMUM OPERATIONAL POWER at ambient temperature $\leq 55^{\circ}\text{C}$.

Contactor type	Operational current (U _e \leq 440V) [A]	Operational power						
		220/230V [kW]	380/400V [kW]	415V [kW]	440V [kW]	500V [kW]	660/690V [kW]	1000V [kW]
BG06	6	1.5	2.2	2.4	2.5	3	3	-
BG09	9	2.2	4.0	4.3	4.5	5	5	-
BG12	12	3.2	5.7	6.2	5.5	5	5	-
BF09	9	2.2	4.2	4.5	4.8	5.5	7.5	-
BF12	12	3.2	5.7	6.2	6.2	7.5	10	-
BF18	18	4	7.5	9	9	10	10	-
BF25	25	7.0	12.5	13.4	13.4	15	18	-
BF26	26	7.3	13	14	14	15.6	18.5	-
BF32	32	8.8	16	17	17	20	22	-
BF38	38	11	18.5	18.5	18.5	20	22	-
BF50	50	14.3	25	27.2	27.2	33.2	43.5	25
BF65	65	18.5	33	36	36	45.3	59.7	30
BF80	80	23	41	46	46	56	74	37
BF95	95	27.6	50	55	55	56	74	45
BF110	110	33	61	66	70	59	80	45
B115	110	33	61	66	70	80	100	63
B145	150	46	80	88	93	100	120	75
B180	185	57	100	108	115	123	144	103
B250	265	83	140	155	164	176	212	156
B310	320	100	170	188	200	213	256	180
B400	420	130	225	247	263	271	352	208
B500	520	156	290	306	328	367	416	312
B630	630	198	335	368	368	368	440	368

Electrical life AC3 \leq 440V

Electrical life of contactors



DC utilisation TC category

POLE CHARACTERISTICS

MAXIMUM OPERATIONAL CURRENT

Voltage Ue	Contactor Type	Maximum current Ie [A] in categories:							
		DC1 with L/R ≤ 1ms and poles in series				DC3 - DC5 with L/R ≤ 15ms and poles in series			
		1	2	3	4	1	2	3	4
≤ 24V	BG06	9	12	14	-	6	7	9	-
	BG09	12	15	16	16	7	8	10	10
	BG12	12	15	16	-	7	8	10	-
	BF09	15	18	20	20	10	13	15	15
	BF12	17	20	22	20	12	15	18	15
	BF18	17	20	22	22	12	15	18	18
	BF25	20	23	23	-	15	18	22	-
	BF26	25	28	28	28	18	20	25	30
	BF32	30	32	32	-	20	25	30	-
	BF38	35	36	36	36	24	28	32	32
	BF50	45	60	60	60	30	35	50	55
	BF65	50	70	70	70	35	45	55	60
	BF80	70	100	100	100	40	60	80	90
48V	BF95	70	100	100	-	40	60	80	-
	BF110	70	100	100	-	40	60	80	-
	BG06	8	11	14	-	5	7	9	-
	BG09	10	14	16	16	6	8	10	10
	BG12	10	14	16	-	6	8	10	-
	BF09	13	18	20	20	9	11	15	15
	BF12	15	20	22	20	11	13	18	15
	BF18	15	20	22	22	11	13	18	18
	BF25	18	23	23	-	13	18	22	-
	BF26	21	28	28	28	15	20	25	30
	BF32	26	32	32	-	17	22	28	-
	BF38	30	34	34	34	20	25	28	28
	BF50	40	60	60	60	25	35	50	55
75V	BF65	50	70	70	70	25	40	50	60
	BF80	60	100	100	100	30	50	70	90
	BF95	60	100	100	-	30	55	75	-
	BF110	60	100	100	-	30	55	75	-
	BG06	4	7	8	-	2	4	5	-
	BG09	4	9	10	10	2	5	6	6
	BG12	4	9	10	-	2	5	6	-
	BF09	12	17	20	20	8	10	13	15
	BF12	13	18	20	20	10	12	15	15
	BF18	15	20	20	20	11	13	16	16
	BF25	18	23	23	-	13	16	18	-
	BF26	18	25	25	25	13	18	20	25
	BF32	22	28	32	-	15	20	28	-
BF38	23	29	33	33	17	22	28	28	
BF50	40	60	60	60	22	30	45	55	
BF65	50	70	70	70	25	40	50	60	
BF80	60	100	100	100	30	50	70	90	
BF95	60	100	100	-	30	50	70	-	
BF110	60	100	100	-	30	50	70	-	

POLE CHARACTERISTICS
MAXIMUM OPERATIONAL CURRENT

Voltage U _e	Contactor Type	Maximum current I _e [A] in categories:				DC3 - DC5 with L/R ≤ 15ms and poles in series			
		DC1 with L/R ≤ 1ms and poles in series				1	2	3	4
		1	2	3	4	1	2	3	4
110V	BG06	3	6	8	-	1	3	4	-
	BG09	3	8	10	10	1	4	5	5
	BG12	3	8	10	-	1	4	5	-
	BF09	6	12	15	16	2	7	11	12
	BF12	6	13	16	16	2	8	12	12
	BF18	6	13	16	18	2	8	12	13
	BF25	6	16	18	-	2	10	15	-
	BF26	6	22	24	24	2	13	18	20
	BF32	8	25	27	-	2.5	15	20	-
	BF38	8	32	34	34	2.5	18	23	23
	BF50	8	50	55	60	3	25	30	45
	BF65	8	60	60	70	3	30	35	50
	BF80	8	80	85	100	3	40	60	75
	BF95	8	80	85	-	3	40	60	-
BF110	8	80	85	-	3	40	60	-	
160V	BG06	-	4	6	-	-	3	3	-
	BG09	-	4	8	8	-	2	4	4
	BG12	-	4	8	-	-	2	4	-
220V	BG06	-	-	1	-	-	-	0.5	-
	BG09	-	-	2	2	-	-	0.8	0.8
	BG12	-	-	2	-	-	-	0.8	-
	BF09	4	8	10	12	0.75	1.5	5	7
	BF12	4	8	11	12	0.75	1.5	6	7
	BF18	4	8	11	13	0.75	1.5	6	8
	BF25	4	8	12	-	0.75	1.5	8	-
	BF26	5	12	14	14	0.75	1.5	10	15
	BF32	5	14	16	-	1	3	12	-
	BF38	5	20	26	26	1	4	15	15
	BF50	6	36	45	50	1	5	20	25
	BF65	6	36	50	60	1	5	25	30
	BF80	6	40	55	70	1	7	35	40
	BF95	6	40	55	-	1	7	35	-
BF110	6	40	55	-	1	7	35	-	
300V	BF09	-	-	-	10	-	-	-	5
	BF18	-	-	-	11	-	-	-	5
	BF26	-	-	-	16	-	-	-	10
	BF38	-	-	-	25	-	-	-	12
	BF50	-	-	-	45	-	-	-	20
	BF65	-	-	-	60	-	-	-	25
	BF80	-	-	-	70	-	-	-	35

DC utilisation TC category

POLE CHARACTERISTICS

MAXIMUM OPERATIONAL CURRENT

Voltage Ue	Contactor Type	Maximum current I _e [A] in categories: DC1 with L/R ≤ 1ms and poles in series				DC3 - DC5 with L/R ≤ 15ms and poles in series			
		1	2	3	4	1	2	3	4
		75V	B115	160	160	160	160	140	140
	B145	220	220	220	220	160	160	160	160
	B180	260	260	260	260	180	180	180	180
	B250	350	350	350	350	280	280	280	280
	B310	375	375	375	375	310	310	310	310
	B400	400	400	400	400	350	350	350	350
	B500	650	650	650	650	550	550	550	550
	B630	800	800	800	800	800	800	800	800
110V	B115	100	130	130	130	70	100	120	120
	B145	110	150	150	150	80	120	140	140
	B180	120	170	170	170	90	140	160	160
	B250	160	300	300	300	150	250	280	280
	B310	195	350	350	350	170	290	310	310
	B400	250	400	400	400	200	350	350	350
	B500	320	550	600	600	320	550	550	550
	B630	460	800	800	800	460	800	800	800
220V	B115	-	100	130	130	-	80	100	120
	B145	-	130	150	150	-	90	120	140
	B180	-	150	170	170	-	100	140	160
	B250	-	250	300	300	-	200	250	280
	B310	-	300	350	350	-	230	290	310
	B400	-	350	400	400	-	280	350	350
	B500	-	450	600	600	-	450	550	550
	B630	-	700	800	800	-	700	800	800
330V	B115	-	-	100	130	-	-	80	120
	B145	-	-	130	150	-	-	90	140
	B180	-	-	150	170	-	-	100	160
	B250	-	-	250	300	-	-	200	280
	B310	-	-	300	350	-	-	230	310
	B400	-	-	350	400	-	-	280	350
	B500	-	-	450	600	-	-	450	550
	B630	-	-	700	750	-	-	650	700
460V	B115	-	-	-	100	-	-	-	80
	B145	-	-	-	130	-	-	-	90
	B180	-	-	-	150	-	-	-	100
	B250	-	-	-	250	-	-	-	200
	B310	-	-	-	300	-	-	-	230
	B400	-	-	-	350	-	-	-	280
	B500	-	-	-	450	-	-	-	450
	B630	-	-	-	700	-	-	-	700

Utilisation categories DC1, DC3 and DC5. Pole characteristics

CHOICE CRITERIA

The elements to be considered for the contactor choice are:

- Rated operational current I_e
- Rated operational voltage U_e
- Utilisation category and L/R time constant
- Eventual verification of electrical life.

OPERATING CONDITIONS

Indicated current is valid for:

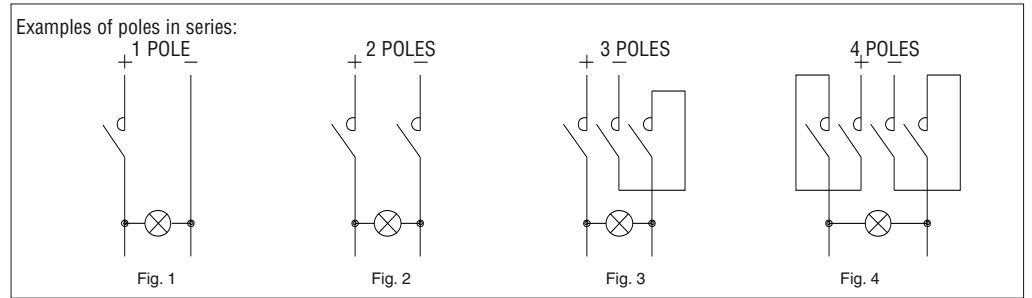
- Ambient temperature $\leq 55^\circ\text{C}$
- Operating cycles: up to 120 cy/h with 60% on-load factor up to 250 cy/h with 30% on-load factor.

POLES IN SERIES

It is important to use contactors with the indicated number of poles in series depending on operating voltage.

The poles in series can be connected to one single polarity or divided between the two polarities of the circuit indifferently.

NOTE. For voltages lower than 30V, the diagrams given in figures 3 and 4 are not recommendable since voltage drops can take place. In these cases, it is better to use poles in parallel considering the notes given in the following section.



POLES IN PARALLEL

It is possible to increase the electrical life by placing poles in series when using voltages which require 1 or 2 poles in parallel.

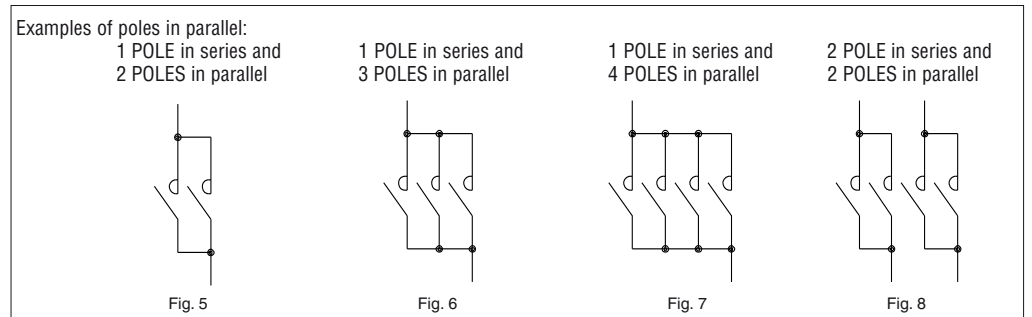
Poles in parallel do not increase the maximum operational current given in the following pages; that is, if one pole has a maximum operational current in DC5 of 8A, two poles in parallel, it will always be 8A.

With poles in parallel, it is possible to increase the rated contact capacity (Ith) only if the contactor opens and closes in no-load conditions or when used as resistance shunts. In this case, the contact capacity can be increased.

The value can be obtained by multiplying the rated current of one pole by the K factor given below; e.g.: if one pole carries 10A, three poles in parallel can carry $10 \times 2.2 = 22\text{A}$.

Therefore, the operating current is the one indicated in the tables, multiplied by the K factor given below which takes into consideration the unequal current division on the various poles.

- 2 POLES in parallel $K = 1.6$
- 3 POLES in parallel $K = 2.2$
- 4 POLES in parallel $K = 2.8$



MAXIMUM OPERATIONAL CURRENT

See tables on pages TC-9, TC-10 and TC-11.

OTHER CONDITIONS

For different operating conditions or voltage not included among those indicated in the tables, on pages TC-9 to TC-11, contact our Customer Service (Tel. +39 035 4282422; email: service@LovatoElectric.com).

Selection guide for lighting circuit switching

GENERAL INFORMATION

The elements which are to be considered for the contactor choice are:

- Type of lamp
- Power factor ($\cos\phi$)
- With or without power factor correction
- Value of current when switching on and in running conditions.

Depending on the number and type of lamps, it is also important to bear in mind the main discriminating characteristics given below for the contactor choice:

- Incandescent lamps → contactor making capacity
- Lamps not corrected → rated contactor current in AC1
- Lamps corrected → rated contactor current in AC3

The table below summarises the major characteristics depending on the more commonly used type of lamps:

Type of lamps	Switching on		Switching off	
	Multiple of I_n ①	$\cos\phi$	Multiple of I_n ①	$\cos\phi$
Incandescent	15	1	1	1
Mixed light	1.3	1	1	1
Fluorescent	1.15 - 1.3	0.2	1	0.3 - 0.5 (not corrected) 1 (corrected)
High-pressure mercury vapour	1.5 - 1.75	0.2	1	0.45 - 0.7 (not corrected)
High-pressure sodium vapour	1.3 - 1.5	0.2	1	0.3 - 0.5 (not corrected)
Low-pressure sodium vapour	1	0.2 - 0.5	1	0.2 - 0.5 (not corrected)
Metal halide	1.7 - 2.1	0.2	1	0.4 - 0.5 (not corrected)

Lamp features	Lamp power [W]	Rated current [A]	Capacitor capacity [μ F]	Maximum number [n] of lamps for each contactor pole ②															
				BG06		BF09		BF26		BF80		BF110		B115		B145		B180	
				BG09	BF12	BF18	BF25	BF32	BF38	BF50	BF65	BF110	B115	B145	B180				
INCANDESCENT 220/240V - 50/60Hz	60	0.27	-	30	48	92	118	129	203	240	296	370	425	462					
	100	0.45	-	18	28	55	71	77	122	144	177	222	255	277					
	200	0.91	-	8	14	27	35	38	60	71	87	109	126	137					
	300	1.4	-	5	9	17	22	25	39	46	57	71	82	89					
	500	2.3	-	3	5	10	13	15	23	28	34	43	50	54					
	1000	4.6	-	1	2	5	6	7	11	14	17	21	25	27					
MIXED LIGHT 220/240V - 50/60Hz	100	0.45	-	20	33	57	77	88	122	144	177	244	311	377					
	160	0.72	-	12	20	36	48	55	76	90	111	152	194	236					
	250	1.13	-	8	13	23	30	35	48	57	70	97	123	150					
	500	2.3	-	4	6	11	15	17	23	28	34	47	60	73					
	1000	4.6	-	1	3	5	7	8	11	14	17	23	30	36					
ELECTRONIC BALLAST FLUORESCENT 220/240V - 50/60Hz	Single mounting	16 / 18	0.1	(6.8) ③	48	80	160	220	220	400	450	500	750	1050	1200				
		32 / 36	0.18	(6.8) ③	27	44	88	122	122	222	250	277	416	583	666				
		50 / 58	0.27	(10) ③	17	29	59	82	82	148	166	185	277	388	444				
	Dual mounting	2x16 / 18	0.18	(10) ③	26	44	88	122	122	222	250	277	416	583	666				
		2x32 / 36	0.35	(10) ③	13	22	45	62	62	114	128	142	214	300	342				
		2x50 / 58	0.52	(22) ③	9	15	30	42	42	76	86	96	144	201	230				
STANDARD FLUORESCENT 220/240V - 50/60Hz	Not corrected Single mounting	15	0.35	-	25	42	74	100	114	157	185	228	314	400	485				
		20	0.37	-	24	40	70	94	108	148	175	216	297	378	459				
		40	0.44	-	20	34	59	79	90	125	147	181	250	318	386				
		65	0.7	-	12	21	37	50	57	78	92	114	157	200	242				
		115	1.5	-	6	10	17	23	26	36	43	53	73	93	113				
		140	1.5	-	6	10	17	23	26	36	43	53	73	93	113				
	Corrected Single mounting	15	0.11	4.5	24	40	62	94	94	200	200	200	533	533	533				
		20	0.16	4.5	24	40	62	94	94	200	200	200	533	533	533				
		40	0.24	4.5	24	40	62	94	94	200	200	200	458	500	520				
		65	0.4	7	15	25	40	50	57	125	128	128	275	300	312				
		115	0.7	18	6	10	15	23	23	50	50	50	133	133	133				
		140	0.7	18	6	10	15	23	23	50	50	50	133	133	133				
	DUO circuit	2 x 20	0.26 ④	-	54	57	100	153	153	211	250	307	423	538	653				
		2 x 40	0.46 ④	-	19	32	56	86	86	119	141	173	239	304	369				
2 x 65		0.7 ④	-	12	21	37	57	57	78	92	114	157	200	242					
2 x 115		1.3 ④	-	6	11	20	30	30	42	50	61	84	107	130					
2 x 140		1.5 ④	-	6	10	17	26	26	36	43	53	73	93	113					

① I_n = Rated lamp current.

② For 220/240V circuits, either single-phase (between phase and neutral) or 2-wire (between phase and phase), the maximum number of lamps is as per the table.

For three-phase circuits with neutral 380/415V or 220/240V, the maximum number of lamps controlled by the same contactor is $n \cdot 3$.

For three-phase 380/415V circuits without neutral, the maximum number of lamps controlled by the same contactor is $n \cdot \sqrt{3}$.

Electrical life is 100,000 cycles up to 55°C.

③ Incorporated capacitor.

④ Total.

Lamp features		Lamp power [W]	Rated current [A]	Capacitor capacity [μF]	Maximum number [n] of lamps for each contactor pole ①												
					BG06	BF09	BF26			BF80							
					BG09	BF12	BF18	BF25	BF32	BF38	BF50	BF65	BF95	BF110	B115	B145	B180
HIGH-PRESSURE MERCURY VAPOUR 220/240V - 50/60Hz	Not corrected	50	0.61	-	10	16	26	36	44	65	73	82	122	172	196		
		80	0.8	-	7	12	20	27	33	50	56	62	93	131	150		
		125	1.2	-	5	8	13	18	22	33	37	41	62	87	100		
		250	2.2	-	3	4	7	10	12	18	20	22	34	47	54		
		400	3.4	-	2	3	5	6	7	11	13	14	22	30	35		
		700	5.5	-	-	1	3	4	4	7	8	9	13	19	21		
		1000	8	-	-	1	2	2	3	5	5	6	9	13	15		
	Corrected	50	0.29	7	15	25	40	60	60	128	128	128	258	342	342		
		80	0.42	8	13	22	35	52	53	95	107	112	178	250	285		
		125	0.7	10	8	14	22	31	35	57	64	71	107	150	171		
		250	1.3	18	4	7	12	16	19	30	34	38	57	80	92		
		400	2.1	25	2	4	7	10	11	19	21	23	35	50	57		
		700	3.6	40	-	2	4	6	6	11	12	13	20	29	33		
		1000	5.3	60	-	1	3	4	4	7	8	9	14	19	22		
380/415V 50/60Hz	Not corrected	2000	8	-	-	-	1	2	2	3	3	4	5	8	9		
	Corrected	2000	5.5	35	-	-	1	2	2	4	5	5	8	11	13		
HIGH-PRESSURE SODIUM VAPOUR 220/240V - 50/60Hz	Not corrected	150	1.8	-	3	5	8	12	15	22	25	27	41	58	66		
		250	3	-	2	3	5	7	9	13	15	16	25	35	40		
		400	4.7	-	1	2	3	4	5	8	9	10	15	22	25		
		600	7.1	-	-	1	2	3	3	5	6	6	10	15	16		
		1000	10.4	-	-	-	1	2	2	3	4	4	7	10	11		
	Corrected	150	0.83	20	-	9	14	19	21	45	45	45	90	120	120		
		250	1.5	36	-	5	7	10	11	25	25	25	50	66	66		
		400	2.4	48	-	3	5	6	7	16	18	18	31	43	50		
		600	3.5	68	-	2	3	4	4	10	12	12	20	28	34		
		1000	6.3	120	-	1	1	2	2	6	7	7	11	16	19		
		LOW-PRESSURE SODIUM VAPOUR 220/240V 50/60Hz	Not corrected	35	1.5	-	4	6	10	14	18	26	30	33	50	70	80
				55	1.5	-	4	6	10	14	18	26	30	33	50	70	80
				90	2.4	-	3	4	6	9	11	16	18	20	31	43	50
				135	3.1	-	2	3	5	7	8	12	14	16	24	33	38
150	3.2			-	2	3	5	6	8	12	14	15	23	32	37		
180	3.3			-	2	3	4	6	8	12	13	15	22	31	36		
Corrected	35		0.31	20	-	6	10	14	18	45	45	45	120	120	120		
	55		0.42	20	-	6	10	14	18	45	45	45	120	120	120		
	90		0.63	30	-	4	6	9	11	30	30	30	80	80	80		
METAL HALIDE 220/240V 50/60Hz	Not corrected	35	0.3	-	-	28	50	66	80	100	150	167	250	330	400		
		70	0.5	-	-	16	28	40	50	60	90	100	150	200	240		
		150	1	-	-	8	14	20	25	30	45	50	75	100	120		
		250	3	-	-	3	5	7	9	13	15	16	25	35	40		
		400	3.5	-	-	2	4	6	7	11	12	14	21	30	34		
		1000	10	-	-	1	1	2	2	4	4	5	7	10	12		
380/415V 50/60Hz	Corrected	2000	17	-	-	-	1	1	2	2	2	2	4	6	7		
		35	0.17	6	-	33	60	65	65	200	240	260	400	420	440		
		70	0.28	12	-	20	36	40	40	120	145	155	240	255	265		
		150	0.6	20	-	9	17	18	18	56	68	74	112	118	120		
		250	1.5	32	-	5	7	8	10	26	28	28	46	50	53		
		400	2	35	-	4	5	6	7	20	22	25	35	37	40		
	Not corrected	1000	5.8	95	-	1	1	2	2	6	7	8	12	12	13		
		2000	11.5	148	-	-	-	1	1	3	3	4	6	6	6		
		2000	10.3	-	-	-	-	1	1	2	2	3	4	6	7		
		3500	18	-	-	-	-	-	-	1	1	1	2	3	4		
		3500	11.6	100	-	-	-	-	-	2	2	2	3	3	4		

① For 220/240V circuits, either single-phase (between phase and neutral) or 2-wire (between phase and phase), the maximum number of lamps is as per the table.
 For three-phase circuits with neutral 380/415V or 220/240V, the maximum number of lamps controlled by the same contactor is $n \cdot 3$.
 For three-phase 380/415V circuits without neutral, the maximum number of lamps controlled by the same contactor is $n \cdot \sqrt{3}$.
 Electrical life is 100,000 cycles up to 55°C.

Power factor correction capacitors

CHOICE CRITERIA

The contactor during the closing transition is influenced by electrical currents having high frequencies and high amplitudes.

The frequencies of these currents range between 1 and 10kHz; the amplitudes must have values lower than the maximum permissible current peak of the contactor to be used.

AMBIENT OPERATING CONDITIONS

Ambient temperature: $\leq 50^{\circ}\text{C}$.

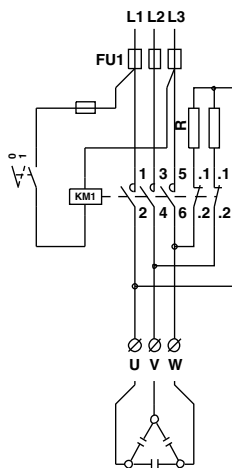
For temperatures higher than 50°C up to 70°C , stated maximum operational power ratings are to be reduced by a percentage equal to the difference between the ambient temperature and 50°C .

Operating cycle: ≤ 120 cy/h

Electrical life: $\geq 100,000$ cycles.

SELECTION GUIDE

Contactor	Rated current	Maximum permissible peak current	Maximum operational voltage	Fuse	Maximum operational power at voltages:			
					220V	380V	415V	500V
Type	[A]	[A]	[V]	[A]	[kvar]	[kvar]	[kvar]	[kvar]
BF09	12	500	690	16	4.5	7.5	9	10
BF12	16	550	690	25	6	11	12	14
BF18	22	1000	690	32	9	15	16	18
BF25	22	1000	690	32	9	15	16	18
BF26	30	1400	690	40	11	20	22	22
BF32	38	1700	690	50	14	25	27	30
BF38	42	1900	690	63	16	28	30	34
BF50	60	2500	690	80	23	40	44	50
BF65	70	2700	690	100	26	45	50	56
BF80	90	3000	690	125	34	60	65	70
BF95	90	3000	690	125	34	60	65	70
BF110	90	3000	690	125	34	60	65	70
B115	130	3200	1000	200	50	87	93	115
B145	150	3400	1000	200	57	100	108	130
B180	170	3600	1000	250	65	112	122	150
B250	240	5100	1000	315	91	158	172	210
B310	265	5900	1000	315	105	184	200	245
B400	320	7500	1000	400	122	211	230	280
B500	500	9000	1000	630	190	330	360	430
B630	610	11000	1000	800	230	400	432	520



The use of contactors with the above operational powers is allowable only when the peak current, in the installation point of the power factor correction board, is lower than the values stated in the table.

If this condition is not verified, it is necessary to use limiting inductances or specific contactors stated on page 3-12. Contact our Customer Service (Tel. +39 035 4282422; email: service@LovatoElectric.com) to obtain detailed information on the correct use of contactors without limiting inductances.

LIMITING INDUCTANCES

The use of limiting inductances is imperative when the system inductances (line transformer and cables), upstream of the power factor correction panel, are not able to maintain the maximum connecting current within the limit value of the contactor used.

FAST DISCHARGE RESISTANCES OF CAPACITORS

The use of the contactor, according to the wiring diagram given, allows the fast discharge of the capacitors as well as the instantaneous disconnection of the capacitors from the mains when the coil is de-energised.

The resistances, indicated in the following table, guarantee the discharge within a maximum time of 2 seconds.

Capacitor power [kvar]	Voltage 220-230V		Voltage 380-500V	
	[Ω]	[W]	[Ω]	[W]
2.5-5	3900	12	8200	12
10-15	1800	25	4300	25
20-50	1000	50	2200	50

Special contactors for power factor correction capacitors

GENERAL CHARACTERISTICS

These contactors are equipped with early-make contacts. This special type of contact has the purpose of connecting for a very brief interval, 2-3ms, during the contactor closing, resistors which limit the connecting current of the capacitors. These resistors are then excluded when the closing operation is complete and the current capacity is conveyed to the main contacts. With this type of circuit, it is possible to obtain minor wear of all the components of the system especially fuses and capacitors ensuring a longer life and better reliability.

The contactors are particularly suitable for use in automatic power factor correction panels since there is no need of limiting inductances and a source of heat has been eliminated. In this way, these modular electric switchboards can be more compact.

The BFK version, figure 1, is designed for three-phase switching. The peculiarity of this type is in the contacts, suitable to connect limiting resistors, which close only for the time needed to limit any in-rush current peak and then reopen to avoid eventual flow of residual currents through the resistors.

AMBIENT OPERATING CONDITIONS

Ambient temperature: $\leq 50^\circ\text{C}$
 For ambient temperature higher than 50°C up to 70°C , maximum operational power ratings, indicated in the table, are to be reduced by a percentage equal to the difference between the ambient temperature and 50°C .
 Operating cycles: ≤ 120 cy/h.
 Electrical life: $\geq 200,000$ cycles.

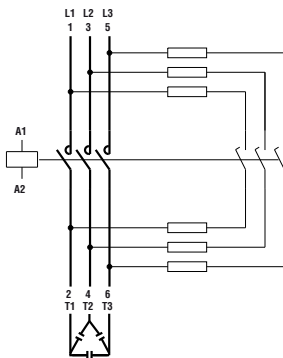


Figure 1


CHOICE OF CONTACTORS TYPE BFK

Contactor	Built-in auxiliary contacts NO	Rated current	Fuse gG	Maximum power at $\leq 50^\circ\text{C}$ (AC6b) ①			
				220V	380V	415V	500V
Type	n°	[A]	[A]	[kvar]	[kvar]	[kvar]	[kvar]
BFK09 A	1	12	16	4.5	7.5	9	10
BFK12 A	1	18	25	7	12.5	14	16
BFK18 A	1	23	40	9	15	17	20
BFK26 A	—	30	40	11	20	22	22
BFK32 A	—	36	63	14	25	27.5	30
BFK38 A	—	43	63	17	30	33	36
BF50K	—	58	80	22	38	41	46
BF65K	—	70	100	26	45	50	56
BF70K	—	75	125	30	50	56	65
BF80K	—	90	125	34	60	65	70

NOTE: See page 3-12 for order codes.

① Consult our Customer Service (Tel. +39 035 4282422; email: service@LovatoElectric.com) for the use of contactors to switch within delta connection.

Operational characteristics BG00 and BF00

TYPE		BG00	BF00 A	BF00 D	BF00 L
POLE CHARACTERISTICS					
Poles	n°	4			
Conventional free air thermal current I _{th} (≤40°C)	A	10			
Rated insulation voltage U _i	V	690			
Frequency limit	Hz	25-400 ❶			
Designation of auxiliary contacts according to IEC/EN 60947-5-1	AC	A600			
	DC	Q600			
Terminals  quick-connect	A	7.5	8.3		
	B	4	3.5		
	screw	M3	M3.5		
	Phillips	2			
	Faston	1x6.35 - 2x2.8	—		
Min-Max tightening torque for contact terminals	Nm	0.8-1	1.5-1.8		
	lbft	0.59-0.74	1.03-1.33		
Min-Max tightening torque for coil terminals	Nm	0.8-1			
	lbft	0.59-0.74			
	Phillips	2			
Maximum conductor section connectable with 1 or 2 wires	AWG	n°	18-12	16-10	
	Flexible w/o lug (min-max)	mm²	0.75-2.5	6	
	Flexible c/w lug	mm²	2x1 o 1x2.5	6	
Terminal protection according to IEC/EN 60529		IP20❷			
AMBIENT CONDITIONS					
Operating temperature	°C	-40...+60	-50...+70		
Storage temperature	°C	-55...+70	-60...+80		
Maximum altitude	m	3000			
Operation position	Normal	On vertical plane			
	Allowable	±30°			
Fixing		Screw or 35mm DIN rail (IEC/EN 60715)			


❶ Derating for use at 61-400 Hz. Contact our Customer Service (Tel. +39 035 4282422; email: service@LovatoElectric.com).

❷ IP20 protection warranted by wired equipment; minimum 0.75mm² conductor section for BG00 or 1mm² for BF00.

TYPE				BG00	BF00 A	BF00 D	BF00 L
A.C. control							
Rated control voltage at 50/60Hz or 60Hz				V	12-575	12-600	—
Operating voltage limits ^①				pick-up	% Us	75-115	80-110
				drop-out	% Us	20-55	20-55
Average coil consumption at 20°C				50Hz in-rush/holding	VA	30/4	65/9
				60Hz in-rush/holding	VA	25/3.0	78/10.8
Dissipation at holding ≤20°C 50 Hz				W	0.95	2.5	—
DC CONTROL							
Rated control voltage				V	6-250	—	6-600
Operating voltage limits				pick-up	% Us	75-115	70-125
				drop-out	% Us	10-20	—
Average consumption at 20°C (in-rush/holding)				W	3.2 ^②	—	5.4
OPERATING TIMES							
Average time Us control in		AC	closing NO	ms	12-21	8-24	—
			opening NO	ms	9-18	10-20	—
			closing NC	ms	17-26	17-30	—
			opening NC	ms	7-17	7-18	—
		DC	closing NO	ms	18-25	—	47
			opening NO	ms	2-3	—	63
			closing NC	ms	3-5	—	75
			opening NC	ms	11-17	—	40
LIFE (millions)							
Mechanical				cycles	20		
MAXIMUM OPERATING RATE							
Mechanical operations				cycles/h	3600		

① For BF00 control relay, the limits with 50/60Hz coil powered at 50Hz only. Refer to page 3-28 for data related to 50/60Hz coils, powered at 60Hz.
 ② 2.3W for low-consumption BG00...L version.

Operational characteristics BG06, BG09 and BG12

TYPE		BG06	BG09	BG12	
POLE CHARACTERISTICS					
Power poles	n°	3	3-4	3	
Rated insulation voltage Ui	V	690 ❶			
Rated impulse withstand voltage Uimp	kV	6			
Operational frequency	Hz	25 - 400 ❷			
Operational current	Conventional free air thermal Ith (≤40°C)	A	16	20	20
	AC3 (≤440V ≤55°C)	A	6	9	12
	AC4 (400V) ❸	A	3.3	4.0	4.8
Short-time allowable current for 10s (IEC/EN 60947-1)	A	96			
Max fuse size Type 1 or 2	gG	A	16	20	20
	aM	A	6	10	16
Making capacity (RMS value)	A	92	92	120	
Breaking capacity at voltage	≤ 440V	A	72	72	96
	500V	A	72	72	72
	690V	A	72	72	72
Consumption per pole and resistance (average values)		mΩ	10	10	10
	Ith	W	2.6	4	4
	AC3	W	0.36	0.81	1.44
Terminals		A	7.5	7.5	7.5
		B	4	4	4
		screw	M3	M3	M3
		Phillips	2	2	2
	quick-connect	Faston	—	1 - 6.35 or 2 - 2.8	—
	solder		—	PCB solder pin❹	—
Maximum tightening torque for contact and coil terminals		Nm	0.8-1	0.8-1	0.8-1
		lbft	0.59-0.74	0.59-0.74	0.59-0.74
		Phillips	2		
Maximum conductor section connectable with 1 or 2 wires	AWG	n°	18-12		
	Flexible w/o lug (min-max)	mm²	0.75-2.5		
	Flexible c/w lug	mm²	2 - 1 or 1 - 2.5		
	Terminal protection to IEC/EN 60529		IP20❺		
AMBIENT CONDITIONS					
Operating temperature	°C	-40...+60			
Storage temperature	°C	-55...+70			
Maximum altitude	m	3000			
Operating position	Normal	On vertical plane			
	Allowable	± 30°			
Fixing		Screw or 35mm DIN rail (IEC/EN 60715)			

❶ Rated voltage Ui for BGP is 500V only and 300V for UL ratings.

❷ Derating for use at 61-400Hz. Contact our Customer Service (Tel. +39 035 4282422; email: service@LovatoElectric.com).

❸ Current values guarantee an electrical life of about 50,000 cycles.


❹ Dimensions and drilling distances are given on page D-16.

❺ IP20 protection warranted by wired equipment; minimum 0.75mm² conductor section.

TYPE				BG06	BG09	BG12
AC CONTROL						
Rated control voltage at 50/60Hz or 60Hz	from	V		12	12	12
	to	V		575	575	575
Operating voltage limits 50/60Hz coil powered at 50Hz or 60Hz coil	pick-up	from	% Us	75	75	75
		to	% Us	115	115	115
	drop-out	from	% Us	20	20	20
		to	% Us	55	55	55
Consumption with 50/60Hz coil at 20°C	50Hz	in-rush	VA	30	30	30
		holding	VA	4	4	4
	60Hz	in-rush	VA	25	25	25
		holding	VA	3.0	3.0	3.0
Dissipation at 20°C	at 50 Hz	W		0.95	0.95	0.95
DC CONTROL						
Rated control voltage	from	V		6	6	6
	to	V		250	250	250
Operating voltage limits	pick-up	from	% Us	75	75	75
		to	% Us	115	115	115
	drop-out	from	% Us	10	10	10
		to	% Us	25	25	25
Average consumption at 20°C (in rush-holding)		W		3.2	3.2	3.2
OPERATING TIMES						
Average time for Us control in	AC	closing NO	ms	12 - 21	12 - 21	12 - 21
		opening NO	ms	9 - 18	9 - 18	9 - 18
		closing NC	ms	17 - 26	17 - 26	17 - 26
		opening NC	ms	7 - 17	7 - 17	7 - 17
	DC	closing NO	ms	18 - 25	18 - 25	18 - 25
		opening NO	ms	2 - 3	2 - 3	2 - 3
		closing NC	ms	3 - 5	3 - 5	3 - 5
		opening NC	ms	11 - 17	11 - 17	11 - 17
LIFE (millions)						
Mechanical	AC control		cycles	20	20	20
	DC control		cycles	20	20	20
Electrical (Ie at 400V AC3)			cycles	0.5	0.5	0.5
MAXIMUM OPERATING RATE						
Mechanical operations			cy/h	3600	3600	3600

❶ 2.3W for low-consumption type BG09...L.

Operational characteristics BF09A-BF38A with AC control circuit

TYPE		BF09	BF12	BF18	BF25	BF26	BF32	BF38	
POLE CHARACTERISTICS									
Power poles	n°	3-4	3-4	3-4	3	3-4	3	3-4	
Rated insulation voltage Ui	V	690							
Rated impulse withstand voltage Uimp	kV	6							
Operational frequency	Hz	25-400 ^①							
Operational current	Conventional free air thermal Ith (≤40°C)	A	25	28	32	32	45	56	56(60 ^⑤)
	AC3 (≤440V ≤55°C)	A	9	12	18	25	26	32	38
	AC4 (400V) ^②	A	4.9	7.9	8.5	10	11.5	13.5	15.5
Short-time allowable current for 10s (IEC/EN 60947-1)	A	110	110	130	160	200	320	320	
Max fuse size Type 1 or 2	gG	A	32	40	40	50	50	63	80
	aM	A	10	12	20	25	32	32	40
Making capacity (RMS value)	A	250	250	250	250	480	480	480	
Breaking capacity at voltage ≤440V	A	250	250	250	250	480	480	480	
Consumption and resistance per pole (average values)		mΩ	2.5	2.5	2.5	2.5	2.0	2.0	2.0
	Ith	W	1.6	2.0	2.6	2.6	4.0	6.0	6.0
	AC3	W	0.2	0.4	0.8	1.6	1.4	2.0	2.9
Terminals		Type	Clamp-screw						
		A	9.5	9.5	9.5	9.5	13	13	13
		B	4.5	4.5	4.5	4.5	5.5	5.5	5.5
		Screw	M3.5	M3.5	M3.5	M3.5	M4	M4	M4
		Phillips	2	2	2	2	2	2	2
Min-Max tightening torque for contact terminal	Nm	1.5-1.8	1.5-1.8	1.5-1.8	1.5-1.8	2.5-3	2.5-3	2.5-3	
	lbft	1.1-1.5	1.1-1.5	1.1-1.3	1.1-1.5	1.8-2.2	1.8-2.2	1.8-2.2	
Min-Max tightening torque for coil terminals	Nm	0.8-1	0.8-1	0.8-1	0.8-1	0.8-1	0.8-1	0.8-1	
	lbft	0.59-0.74	0.59-0.74	0.59-0.74	0.60-0.75	0.59-0.74	0.59-0.74	0.59-0.74	
	Phillips	2	2	2	2	2	2	2	
Maximum conductor section connectable with 1 or 2 wires	AWG	n°	16-10	16-10	16-10	16-10	14-6	14-6	14-6
	Flexible w/o lug (min-max)	mm ²	1-6	1-6	1-6	1-6	2.5-16	2.5-16	2.5-16
	Flexible c/w lug	mm ²	1-4	1-4	1-4	1-4	1-10	1-10	1-10
Power terminal protection according to IEC/EN 60529		IP20 ^③	IP20 ^③	IP20 ^③	IP20 ^③	IP20 ^④	IP20 ^④	IP20 ^④	
AMBIENT OPERATING CONDITIONS									
Operating temperature	°C	-50...+70							
Storage temperature	°C	-60...+80							
Maximum altitude	m	3000							
Operating position	Normal	On vertical plane							
	Allowable	± 30°							
Fixing		Screw or 35mm DIN rail (IEC/EN 60715)							

^① Derating for use at 61-400Hz. Contact our Customer Service (Tel. +39 035 4282422; email: service@LovatoElectric.com).

^② Current values guarantee an electrical life of about 200,000 cycles.

^③ IP20 protection warranted by wired equipment; minimum 1mm² conductor section.


^④ IP20 protection on front.

^⑤ For this other current value, use 16mm² wire with spade cable terminal.

TYPE			BF09	BF12	BF18	BF25	BF26	BF32	BF38		
AC CONTROL											
Rated control voltage at 50/60 or 60Hz	from	V	12	12	12	12	12	12	12		
	to	V	600	600	600	600	600	600	600		
Operating voltage limits for 50/60Hz coil powered at 50Hz or 60Hz coil ^①	pick-up	from	% Us	80	80	80	80	80	80		
		to	% Us	110	110	110	110	110	110		
	drop-out	from	% Us	20	20	20	20	20	20		
		to	% Us	55	55	55	55	55	55		
Average coil consumption at ≤20°C	50Hz	in-rush	VA	65	65	65	65	65	65		
		holding	VA	8.5	8.5	8.5	8.5	8.5	8.5		
	60Hz	in-rush	VA	70	70	70	70	70	70		
		holding	VA	6.5	6.5	6.5	6.5	6.5	6.5		
Dissipation at ≤20°C	at 50Hz	W	2.5	2.5	2.5	2.5	2.5	2.5	4.5		
DC CONTROL - normal and low consumption											
Rated control voltage	from	V	6								
	to	V	415								
Operation limits											
pick-up	three-pole BF...D	from	% Us	70							
		to	% Us	125							
	four-pole BF...D	from	%Us	70			80				
		to	%Us	125			110				
	three and four pole BF...L	from	% Us	80							
		to	% Us	110							
drop-out	for all versions	from	%Us	10							
		to	%Us	40							
Average coil consumption 20°C (in rush-holding)	BF...D	W	5.4								
	BF...L	W	2.4								
OPERATING TIMES											
Average time for Us control in	AC	closing NO	ms	8-24	8-24	8-24	8-24	8-24	8-24	14-27	
		opening NO	ms	10-20	10-20	10-20	15-20	15-20	15-20	8-18	
		closing NC	ms	17-30	17-30	17-30	16-22	-	-	-	
		opening NC	ms	7-18	7-18	7-18	7-18	-	-	-	
	DC	closing NO	ms	47				46			
		opening NO	ms	63							
		closing NC	ms	nd							
		opening NC	ms	nd							
		LIFE (millions)									
		Mechanical	AC control	cycles	20	20	20	20	20	20	20
Electrical (Ie at 400V AC3)		cycles	2.0	2.0	1.6	1.2	1.6	1.6	1.4		
MAXIMUM OPERATING RATE											
Mechanical operations		cy/h	3600								

^① Refer to page 3-28 for data related to 50/60Hz coils powered at 60Hz.

Operational characteristics BF50-BF110

TYPE		BF50	BF65	BF80	BF95	BF110	
POLE CHARACTERISTICS							
Power poles	n°	3-4	3-4	3-4	3	3	
Rated insulation voltage Ui	V	1000 ^①					
Rated impulse withstand voltage Uimp	kV	8					
Operational frequency	Hz	25 - 400 ^②					
Operational current	Conventional free air thermal Ith (≤40°C)	A	90	110	125	125	125
	AC3 (≤440V ≤55°C)	A	50	65	80	95	110
	AC4 (400V) ^③	A	28	31	38	43	43
Short-time allowable current for 10s (IEC/EN 60947-1)	A	390	390	480	760	880	
Max fuse size	gG	A	100	125	160	160	160
	Type 1 or 2	aM	A	50	80	80	100
Making capacity (RMS value)	A	800	1090	1200	1200	1200	
Breaking capacity at voltage	≤440V	A	800	1090	1200	1200	1200
	500V	A	660	830	1050	1050	1050
	690V	A	500	630	800	800	800
Consumption and resistance per pole (average values)		mΩ	0.8	0.8	0.6	0.6	0.6
	Ith	W	6.5	9.7	9.4	9.4	9.4
	AC3	W	2.0	3.4	3.8	5.4	7.3
Terminals		Type	Lug clamp ^④				
		A	12.3	12.3	12.3	12.3	12.3
		B	12	12	12	12	12
		Screw	M6	M6	M6	M6	M6
		Metric Allen	4	4	4	4	4
Min-Max tightening torque for contact terminal	Nm	4-5					
	lbft	2.95-3.69					
Min-Max tightening torque for coil terminals	Nm	0.8-1					
	lbft	0.59-0.74					
	Phillips	1					
Maximum conductor section connectable with 1 or 2 wires AWG	n°	2/0					
	Flexible w/o lug (min-max)	mm²	4-50	4-50	6-50	6-50	6-50
	Flexible c/w lug	mm²	4-50	4-50	6-50	6-50	6-50
Power terminal protection according to IEC/EN 60529		IP20 ^⑤					
AMBIENT CONDITIONS							
Operating temperature	°C	-50...+70					
Storage temperature	°C	-60...+80					
Maximum altitude	m	3000					
Operating position	Normal	On vertical plane					
	Allowable	± 30°					
Fixing		Screw or DIN rail 35mm ^⑥ and 75mm (IEC/EN 60715)					

^① Rated insulation voltage Ui for 4-pole types is 690V.

^② Derating for use at 61-400 Hz. Contact our Customer Service (Tel. +39 035 4282422; email: service@LovatoElectric.com).

^③ Current values guarantee an electrical life of about 200,000 cycles.

^④ In addition the main terminal, the following dimensions refer to the second entry of flexible busbars: 12.3x3.8mm.

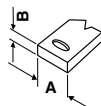
^⑤ IP20 protection warranted to three-pole contactors only by mounting the G265 protection.

^⑥ Only three-pole versions can be mounted on 35mm DIN rail.

TYPE			BF50	BF65	BF80	BF95	BF110
AC CONTROL							
Rated control voltage at 50/60Hz, 60Hz	from	V	12	12	12	12	12
	to	V	600	600	600	600	600
Operating voltage limits 50/60Hz coil powered at 50Hz or 60Hz coil ^①	pick-up	from	% Us	80	80	80	80
		to	% Us	110	110	110	110
	drop-out	from	% Us	20	20	20	20
		to	% Us	55	55	55	55
Average coil consumption at 20°C	50Hz	in-rush	VA	210	210	210	210
		holding	VA	18	18	18	18
	60Hz	in-rush	VA	252	252	252	252
		holding	VA	21.6	21.6	21.6	21.6
Dissipation at 20°C 50Hz		W	6	6	6	6	6
DC CONTROL							
Rated control voltage	from	V	12	12	12	12	12
	to	V	600	600	600	600	600
Operating voltage limits	pick-up	from	% Us	80	80	80	80
		to	% Us	110	110	110	110
	drop-up	from	% Us	10	10	10	10
		to	% Us	25	25	25	25
Average coil consumption at 20°C (in rush-holding)		W	15	15	15	15	15
OPERATING TIMES							
Average time for Us control in	AC	closing NO	ms	13-25	13-25	13-25	13-25
		opening NO	ms	8-12	8-12	8-12	8-12
	DC	closing NO	ms	60-90	60-90	60-90	60-90
		opening NO	ms	7-12	7-12	7-12	7-12
LIFE (millions)							
Mechanical	AC control	cycles	15	15	15	15	15
	DC control	cycles	15	15	15	15	15
Electrical (Ie at 400V in AC3)		cycles	1.5	1.4	1.3	1.2	0.8
MAXIMUM OPERATING RATE							
Mechanical operations		cy/h	3600				

^① Refer to page 3-28 for data related to 50/60Hz coils powered at 60Hz.

Operational characteristics B115-B1600

TYPE		B115	B145	B180	B250	B310	B400	B500	B630	B630 1000	B1250	B1600	
POLE CHARACTERISTICS													
Power poles	n°	3-4	3-4	3-4	3-4	3-4	3-4	3-4	3-4	3-4	3-4	3-4	
Rated insulation voltage Ui	V	1000											
Rated impulse withstand voltage Uimp	kV	8											
Operational frequency	Hz	25-400 ^①											
Operational current	Conventional free air thermal Ith (≤40°C)	A	160	250	275	350	450	550	700	800	1000	1250	1600
	AC3 (≤440V ≤55°C)	A	110	150	185	265	320	420	520	630	–	–	–
	AC4 (400V) ^②	A	47	57	65	92	110	133	175	210	–	–	–
Short-time allowable current for 10s (IEC/EN 60947-1)	A	1100	1300	1500	2200	2900	3600	4050	5040	5600	6500	8300	
Max fuse size Type 1 or 2	gG	A	200	250	315	400	500	630	800	1000	③	③	③
	aM	A	125	160	200	250	400	400	500	630	–	–	–
Making capacity (RMS value)	A	1100	1500	1850	2750	3150	4200	5000	6300	③	③	③	
Breaking capacity at voltage	≤440V	A	1300	1500	1850	2500	3000	4000	5000	6300	③	③	③
	500V	A	1100	1400	1600	2250	2700	3400	4500	5600	③	③	③
	690V	A	880	1200	1480	2200	2520	3360	4000	5000	③	③	③
	1000V	A	600	800	1000	1500	1700	2300	2700	3400	③	③	③
Consumption and resistance per pole (average values)		mΩ	0.30	0.30	0.30	0.20	0.20	0.20	0.14	0.14	0.14	0.07	0.07
	Ith	W	7.7	14.5	20.3	24.5	40.5	52.0	68.6	90	140	110	180
	AC3	W	4.0	6.8	9.7	12.5	20	32	35.0	56	–	–	–
Terminals		A	15	20	20	25	25	25	35	40	60	80	80
		B	4	4	4	5	5	5	6	6	6	10	10
		Screw + hex nut	M6	M8	M8	M10	M10	M10	M10	M12	2-M12	2-M12	2-M12
Maximum conductor section connectable	1 or 2 bars	mm	20x3	25x3	25x3	30x4	30x5	30x5	50x5	60x5	60x5	100x5	100x5
	N° 1 wire with lug	mm ²	70	120	150	240	–	–	–	–	–	–	–
	N° 2 wire with lug	mm ²	–	–	–	–	150	150	240	240	–	–	–
AMBIENT CONDITIONS													
Operating temperature	°C	-50...+70											
Storage temperature	°C	-60...+80											
Maximum altitude	m	3000											
Operating position	Normal	On vertical plane											
	Allowable	± 30°											
Fixing		Screw											

^① Derating for use at 61-400 Hz. Contact our Customer Service (Tel. +39 035 4282422; email: service@LovatoElectric.com).

^② Current values guarantee an electrical life of about 200,000 cycles.

^③ Consult our Customer Service (Tel. +39 035 4282422; email: service@LovatoElectric.com).

Operational characteristics B115-B1600

TYPE		B115	B145	B180	B250	B310	B400	B500	B630	B630 1000	B1250	B1600
AC CONTROL												
Supply voltage		The electromagnet can operate either in AC or DC										AC only
Rated control voltage	V	24-480	24-480	24-480	24-480	24-480	24-480	48-480	48-480	48-480	110-240	110-240
Operating voltage limits	pick-up	% Us	80-110	80-110	80-110	80-110	80-110	80-110	80-110	80-110	80-110	80-110
	drop-out	% Us	20-60	20-60	20-60	20-60	20-60	20-60	20-60	20-60	20-60	20-60
Consumption at 20°C	in-rush	VA/W	300	300	300	300	300	400	400	400	800	800
	holding	VA/W	10	10	10	10	10	18	18	18	40	40
Dissipation at 20°C	W	10	10	10	10	10	10	18	18	18	40	40
OPERATING TIMES												
Making	ms	60-100	60-100	60-100	80-120	80-120	80-120	110-180	110-180	110-180	120-210	120-210
Breaking	ms	25-60	25-60	25-60	30-75	30-75	30-75	60-100	60-100	60-110	70-130	70-130
LIFE (millions)												
Mechanical	cycles	10	10	10	10	10	10	5	5	5	5	5
Electrical (Ie at 400V in AC3)	cycles	1.1	1.1	1.0	1	0.7	0.7	0.7	0.7	-	-	-
MAXIMUM OPERATING RATE												
Mechanical operations	cy/h	2400	2400	2400	2400	2400	2400	1200	1200	1200	1200	1200
PARTICULAR CHARACTERISTICS												
Indicator		Contactor open or closed										
Safety feature		Closing operations are prevented without arc chutes										

CONTROL CIRCUIT UTILISATION

The input electronic circuit of the contactor coil B115-B1600 is designed and tested according to IEEEC 62.41 and can withstand a 10 kV impulse voltage (1.2/50µs) with 50 Joule energy.

For higher values, the use of an auxiliary step-down voltage transformer is recommended.

CONTACTORS WITH MECHANICAL LATCH

Technical data of mechanical latch G495 type is stated on page 3-26.

Contactors B115-B630 type can have mechanical latch included or can be predisposed, to be completed with mechanical latch. See pages 3-4 and 3-6 (3-pole version) or 3-8 and 3-10 (4-pole version).

Operational characteristics of incorporated auxiliary contacts of contactors BG00, BG06, BG09, BG12, BF00, BF09-BF25

TYPE		BG00...-BG06...-BG09... BG12... ^②	BF00-BF09-BF25 ^②	
CHARACTERISTICS				
Thermal current I _{th}	A	10	10	
Rated insulation voltage U _i	V	690	690	
Terminals	Screw	M3	M3.5	
	Width	mm	8.3	
	Faston ^①		1x6.35	-
			2x2.8	
	Phillips	2	2	
Maximum conductor section connectable with 1 or 2 wires				
Flexible w/o lug (min-max)	mm ²	0.75-2.5	1-6	
Flexible c/w lug	mm ²	2x1 o 1x2.5	6	
AWG	n°	10	10	
IEC/EN 60947-5-1 designation	AC	A600	A600	
	DC	Q600	P600	

^① For BG00... and BG09... types only.

^② The NO and NC auxiliary contacts are highly conductive.

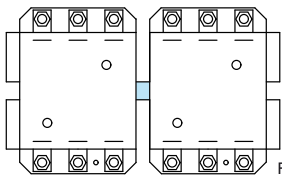


Fig.1

MECHANICAL INTERLOCK BETWEEN CONTACTORS SIDE BY SIDE B115-B630

The G355 type can interlock contactors of the same size or of a different one (e.g.: B115 interlocked to B630). This interlock cannot be used with B1250 or B1600 contactor.

Consult our Customer Service (Tel. +39 035 4282422; email: service@LovatoElectric.com) to interlock B630 1000 three-pole contactors.

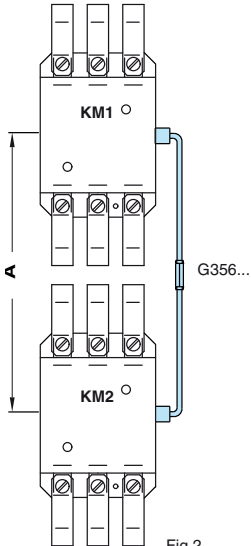


Fig.2

MECHANICAL INTERLOCK BETWEEN CONTACTORS ONE ON TOP OF THE OTHER B115-B630

It is G356... which is provided in six types to allow different fixing interaxis of contactors. Contactors of the same size can be interlocked as well as different sizes. The tables below indicate the interaxis which can be

obtained with the various interlock types; with terminal protections (INTERAXIS A) and without terminal protection (INTERAXIS B).

INTERAXIS A [mm] - For contactors with terminal protection

KM1	B115-B145-B180			B250-B310-B400			B500-B630		
	B115 B145 B180	B250 B310 B400	B500 B630	B115 B145 B180	B250 B310 B400	B500 B630	B115 B145 B180	B250 B310 B400	B500 B630
G356 1	—	—	—	—	—	—	—	—	—
G356 2	286-305	—	—	—	—	—	—	—	—
G356 3	305-345	330-345	—	330-345	—	—	—	—	—
G356 4	345-385	345-385	375-385	345-385	372-385	—	375-385	—	—
G356 5	390-425	390-425	390-425	390-425	390-425	420-425	390-425	420-425	—
G356 6	470-500	470-500	470-500	470-500	470-500	470-500	470-500	470-500	470-500

INTERAXIS B [mm] - For contactors without terminal protection

KM1	B115-B145-B180			B250-B310-B400			B500-B630		
	B115 B145 B180	B250 B310 B400	B500 B630	B115 B145 B180	B250 B310 B400	B500 B630	B115 B145 B180	B250 B310 B400	B500 B630
G356 1	225-265	—	—	—	—	—	—	—	—
G356 2	265-305	265-305	—	265-305	265-305	—	—	—	—
G356 3	305-345	305-345	305-345	305-345	305-345	305-345	305-345	305-345	—
G356 4	345-385	345-385	345-385	345-385	345-385	345-385	345-385	345-385	345-385
G356 5	390-425	390-425	390-425	390-425	390-425	390-425	390-425	390-425	390-425
G356 6	470-500	470-500	470-500	470-500	470-500	470-500	470-500	470-500	470-500

To interlock two contactors B630 1000, use type G356 6 only. To interlock two contactors B1250 or B1600, it is imperative to use two pieces of type G356 6, one fixed on the left side and the other on the right.

Interaxis B is 470-500mm for B630 1000, B1250 or B1600; refer to Fig. 4. The B1250 or B1600 cannot be interlocked with the other types of the B series.

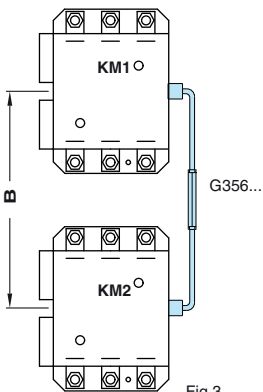


Fig.3

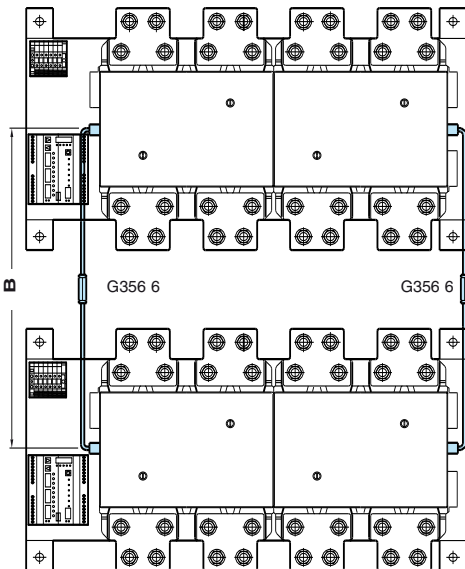


Fig.4

CONTACT BLOCKS APPLICABLE TO CONTACTORS WITH MECHANICAL INTERLOCK

Auxiliary contact blocks G350 or G354 can be mounted according to the combinations below when the mechanical interlock is used (see parts in blue in figure 1) or the G358 adapter with the auxiliary blocks as per the combinations given in figure 2.

Fig. 1

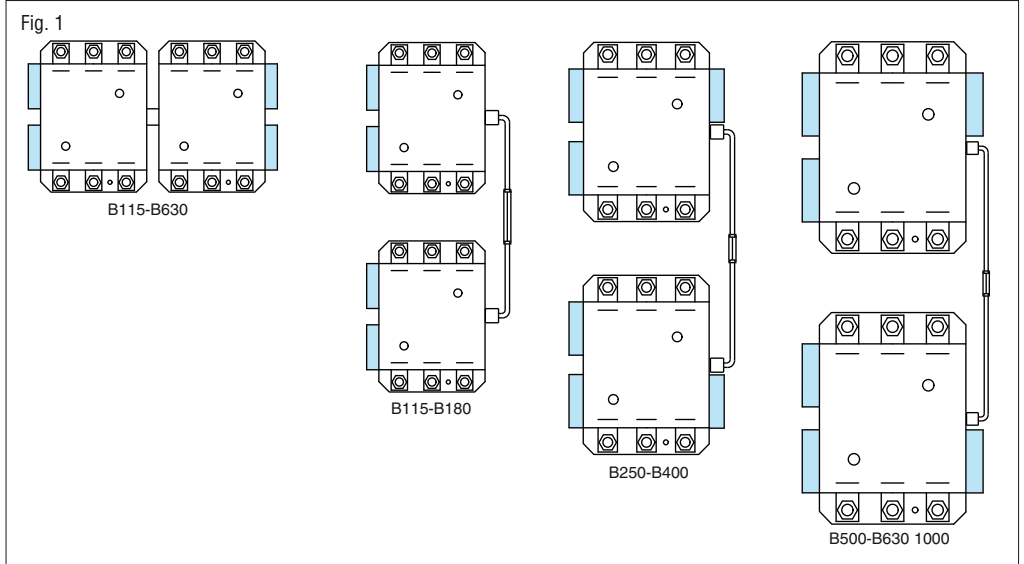
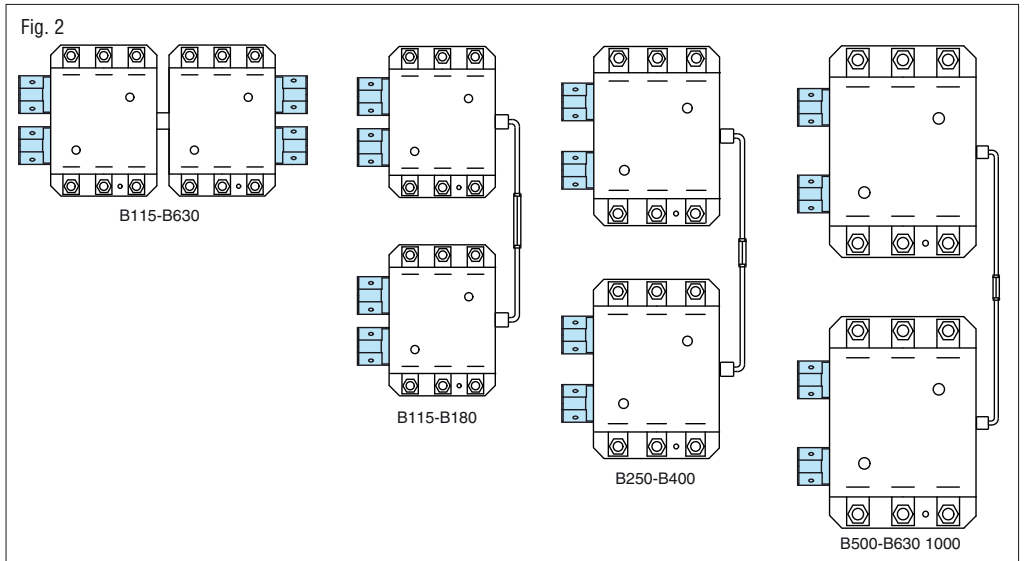


Fig. 2



MECHANICAL LATCH

Characteristics are given on page 3-26.

This device can only be introduced in to predisposed contactors otherwise contactors can be supplied complete with the latch already incorporated. See note ④ on pages 3-4, 3-8 and 3-10, or note ④ on page 3-6.

Operational characteristics thermal overload relays RF...

		RF9 RFA9 RFN9 RFNA9	RF38 ^① RFN38 ^①	RF95 RFA95 RFN95 RFNA95	RF200 ^① RFN200 ^①	RF420 ^① RFN420 ^①
Phase failure sensitive hand reset						
Phase failure sensitive automatic reset						
Non phase failure sensitive hand reset						
Non phase failure sensitive automatic reset						
POWER CIRCUIT CHARACTERISTICS						
Rated insulation voltage Ui	V	690	690	690	1000	1000
Rated impulse withstand voltage Uimp	kV	8	6	8	6	6
Frequency limit	Hz	0-400	0-400	0-400	50-60	50-60
Operational range	from	A	0.09	0.1	14	60
	to	A	15	38	110	200
Connection		Direct			With current transformers ^②	
Terminals	Type	Screw & washer		Yoke clamp	Screw & flat washer	
	Screw	M 4	M4	M5	M8 (hex)	M10 (hex)
	Terminal width	mm	9.8	12.6	9	20
	Phillips	n°	2	2	2	13mm ^③
Tightening torque for power terminals	Nm	2.3	2...2.5	3.9	18	35
	lbft	1.7	1.5...1.8	2.88	13.3	25.9
Maximum conductor section connectable	AWG	N°	10	8	2	-
	flexible w/o lug	mm ²	6	10	35	-
	flexible c/w lug	mm ²	10	6	-	150
	Bar	mm	-	-	-	25 x 3
						30 x 5
Dissipation per phase	W	0.7-2.4	0.7-2.4	2.0-4.2	0.7-2.4	0.7-2.4
AUXILIARY CIRCUIT CHARACTERISTICS						
Available contacts	NO	N°				1
	NC	N°				1
Rated insulation voltage	V				690	
Conventional free air thermal current	A				10	
Terminals with screw and washer	Screw				M3.5	
	Terminal width	mm				8
	Phillips	n°				1
Maximum conductor section connectable	Flexible w/o lug	mm ²				2.5
	Flexible c/w lug	mm ²				2.5
Tightening torque for auxiliary terminals	Nm	1	1...1.5	1	1...1.5	1...1.5
	lbft	0.74	0.74...1.1	0.74	0.74...1.1	0.74...1.1
IEC/EN 60947-5-1 designation		B600 - P600 ^⑤	B600-R300	B600-P600 ^⑤	B600-R300	B600-R300
AMBIENT CONDITIONS						
Operating temperature	°C	-20...+55	-25...+60	-20...+55	-25...+60	-25...+60
Storage temperature	°C	-55...+70	-50...+70	-55...+70	-50...+70	-50...+70
Compensation temperature	°C	-15...+55	-20...+60	-15...+55	-20...+60	-20...+60
Maximum altitude	m	3000				
Operation position	normal	On vertical plane				
	Allowable	±30°				
Mounting		On contactor or separately				
Tripping class		10A				
Particular characteristics		Test button - Trip indicator				

^① With manual and automatic resetting.

^② For currents higher than 420A, contact our Customer Service (Tel. +39 035 4282422; email: service@LovatoElectric.com).

^③ Standard supplied.

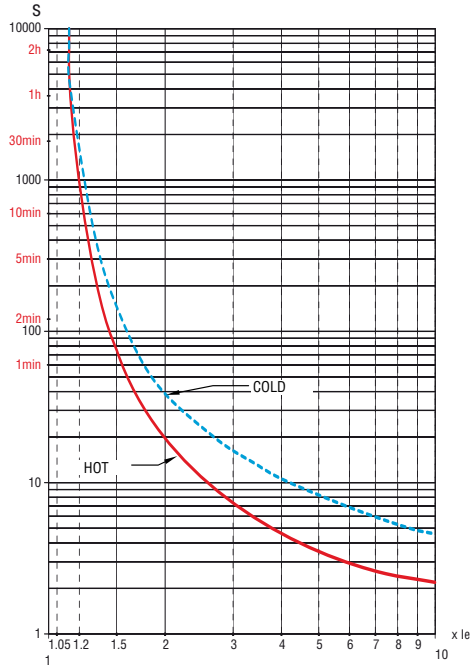
^④ Metric wrench/spanner.

^⑤ C600-R300 for automatic reset type.

Trip characteristic curves RF thermal overload relays (average time)

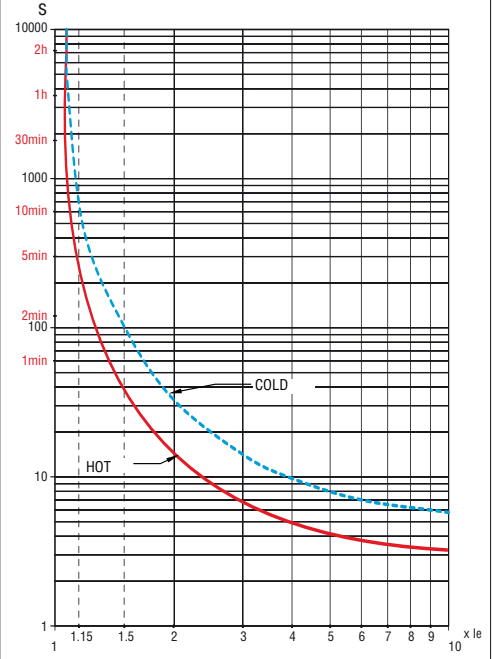
Funzionamento equilibrato su 3 fasi

RF9	RF38	RF95
RFA9	RFN38	RFA95
RFN9		RFN95
RFNA9		RFNA95

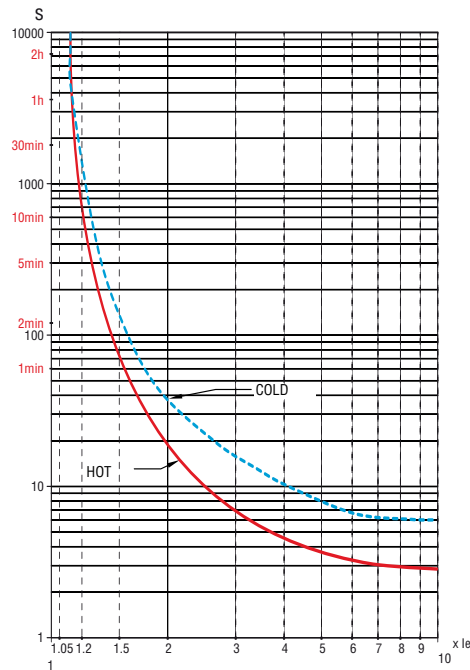


Funzionamento su 2 fasi (mancanza fase)

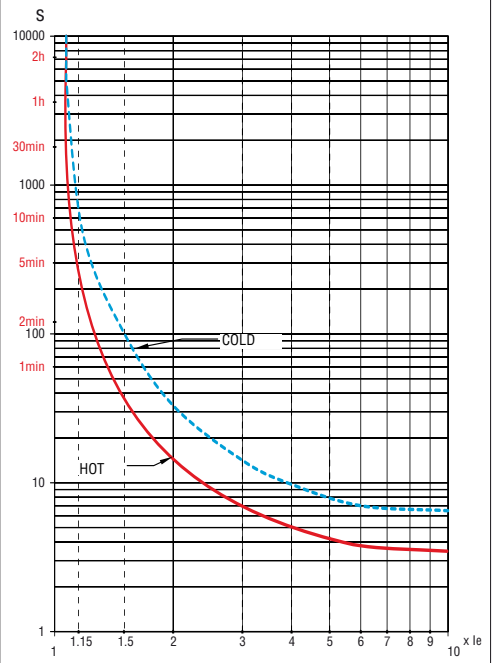
RF9	RF38	RF95
RFA9		RFA95



RF200	RF420
RFN200	RFN420



RF200	RF420
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SELECTION GUIDE

The choice of a rotary cam switch and the relative type are based on the functional diagram and the type of application as well.

IEC standards provide a comprehensible and quick classification of the most frequent utilisation categories:

AC1: Connection and disconnection of non-inductive or slightly inductive loads ($\cos\varphi \geq 0.95$)

AC21: Resistance furnaces

AC3: Starting and switching off motors during running

AC23A: Switching of motor loads or other highly inductive loads

AC15: Control of electromagnetic loads

For DC applications, the rotary cam switches are used for the switching of minor loads or in control circuits, such as:

DC13: Control of electromagnets

DC21A: Switching of resistive loads

DC23: Switching of highly inductive loads

Other prescriptions and recommendations concerning the use of cam switches as auxiliary equipment of electrical machines are given in IEC/EN 60204-1 standards and specifically as given under utilisation.

UTILISATION

MAIN SUPPLY DISCONNECTING SWITCH WITH EMERGENCY-STOP OPERATION:

- Red operating handle with yellow background
- Lockable in open position (OFF).

EMERGENCY-STOP SWITCH

- Red operating handle with yellow background
- Independent operation and the breaking of the load circuit of switching devices before the opening of its main contacts
- Rated capacity is sufficient in order to break the sum of the rated operating currents of all the connected equipment
- Breaking capacity equal to the current of the largest motor when stalled (locked rotor) together with the total of the normal running currents of the other motors or loads.

MAIN SUPPLY DISCONNECTING SWITCH

- Used to disconnect all live electrical equipment from the power supply circuit
- Contact clearance distance is to comply with IEC/EN 60947-3 standards
- Provided with a means in order to be locked in the OFF position
- Selection of current breaking according to AC1 and AC21 utilisation categories.

Operational characteristics

TYPE			GX16	GX20	GX32	GX40	GN12	GN20	GN25	GN32	GN40	GN63	GN125		
Rated insulation voltage ^① Ui	IEC/EN	V	690	690	690	690	690	690	690	690	690	690	690		
	UL/CSA	V	600	600	600	600	300	300	600	600	600	600	600		
Rated impulse withstand voltage ^① Uimp	IEC/EN 60947-3	kV	6	6	6	6	6	6	6	6	6	6	8		
Conventional free air thermal current Ith	IEC/EN	A	16	20	32	40	12	20	25	32	40	63	125		
	UL/CSA (general purpose)	A	12	15	32	40	12	15	20	32	35	55	100		
Rated operating voltage (switch disconnect) ^①		V	440	440	440	440	480	480	480	480	480	480	690		
Operational impulse voltage		kV	4	4	4	4	4	4	4	4	4	4	6		
Maximum fuse size for short-circuit protection In (gG)	10kA	A	20	20	40	40	16	20	25	32	40	63	125		
	25kA	A	16	16	35	35	10	16	25	32	40	63	100		
	50kA	A	–	–	32	35	–	–	–	32	40	63	100		
	63kA	A	–	–	–	35	–	–	–	–	40	63	100		
Short-time withstand current Icw	1sec	A	200	250	800	800	200	250	400	800	1000	1200	2100		
Rated operational current Ie	AC1/AC21A (IEC/EN)	A	16	20	32	40	12	20	25	32	40	63	125		
	110V	A	10	10	25	25	10	10	16	25	25	32	40		
	AC15 (IEC/EN) 220-230V	A	8	4	20	22	8	8	12	20	22	25	28		
	380-400V	A	4	6	10	12	4	6	8	10	12	14	15		
	660-690V	A	3	3.7	5.5	7.5	1.5	1.5	2	2	2	4	5		
Motor power for switches in AC utilisation categories AC3 (IEC/EN)	3 phases	220-230V	kW	3.5	3.7	7.5	7.5	2.5	3	5.5	7.5	8	11	18.5	
		380-440V	kW	4.5	5.5	11	15	4	5.5	7.5	11	15	18.5	37	
		500-690V	kW	5.5	5.5	11	15	5.5	5.5	7.5	11	15	18.5	33	
	1 phase (2 poles)	110V	kW	0.55	0.75	1.8	2.2	0.8	0.8	1.5	2.2	3	3.7	5	
		220-230V	kW	1.5	1.8	3.5	4.4	1.5	2.2	3	4	6.5	6.5	11	
		380-440V	kW	2.2	3	5.5	7	2.2	3	5.5	6.5	8	11.5	15	
	AC23A (IEC/EN)	3 phases	220-230V	kW	3.7	4	8	9	3	5	6.5	8	8	12.5	30
			380-440V	kW	6.5	7.5	15	18.5	6	7.5	11	15	18.5	30	45
			500-690V	kW	7.5	7.5	15	15	7.5	7.5	11	18.5	22	30	37
	1 phase (2 poles)	110V	kW	0.75	0.75	2.2	3	0.8	0.8	1.5	2.2	3	3.7	5	
		220-230V	kW	1.8	2.2	3.5	5.2	1.7	2.5	3.7	5	6	7.5	11	
		380-440V	kW	3	3.5	6	7.5	3	3.7	5.5	8	11	12.5	15	

① Valid for systems with earthed neutral, overvoltage category III, pollution degree 3.

Rotary cam switches Modular contactors

Operational characteristics - Rotary cam switches

TYPE		GX16	GX20	GX32	GX40	GN12	GN20	GN25	GN32	GN40	GN63	GN125	
DOL motor powers for switches (UL/CSA-DOL) 3 phases	115V	HP	1.5	1.5	3	5	1.5	1.5	3	5	5	7.5	15
	230V	HP	3	3	7.5	10	3	3	5.5	10	10	15	25
	480V	HP	5	5	15	15	-	-	10	15	20	25	50
	600V	HP	5	5	15	15	-	-	10	15	20	25	40
	1 phase (2 poles)	115V	HP	0.75	0.75	1.5	2	0.75	0.75	1.5	2	2	5
	230V	HP	1	1.5	3	5	1	2	3	5	5	10	15
Motor power for switches in DC utilisation categories 1 contact DC21A	48V	A	16	20	32	40	12	20	25	32	40	63	125
	60V	A	16	20	32	40	12	20	25	32	40	50	80
	110V	A	4	4	5	6	4	4	4	6	6	8	10
	220V	A	0.5	0.6	0.8	0.8	0.6	0.6	0.7	0.8	-	-	-
	440V	A	0.25	0.25	0.25	0.25	0.25	0.25	-	-	-	-	-
DC23A	24V	A	16(1)	20(1)	32(1)	40(1)	10(1)	20(1)	25(1)	32(1)	40(1)	50(1)	125(1)
	48V	A	16(2)	20(2)	32(2)	40(1)	10(2)	20(2)	25(2)	32(2)	40(2)	50(2)	125(2)
	60V	A	16(3)	20(3)	32(3)	40(3)	10(3)	20(3)	25(3)	32(3)	40(3)	50(3)	125(3)
No. of contacts connected in series are indicated in brackets	110V	A	10(3)	10(3)	15(3)	20(3)	5(3)	10(3)	12(3)	15(3)	20(3)	25(3)	50(3)
	220V	A	7(4)	8(4)	12(4)	12(4)	5(4)	8(4)	10(4)	12(4)	12(4)	15(4)	20(4)
DC13	24V	A	16	20	32	40	12	20	25	32	40	63	125
	48V	A	14	16	25	32	10	16	20	25	32	40	100
	60V	A	12	12	16	16	8	12	16	16	16	28	50
	110V	A	0.8	1	3	3	1	1	1.5	3	3	3.3	4
	220V	A	0.3	0.4	0.5	0.5	0.4	0.4	0.4	0.5	-	-	-
440V	A	0.15	0.15	0.15	0.15	0.15	0.15	-	-	-	-	-	
Mechanical life	cycles	5x10 ⁶	5x10 ⁶	5x10 ⁶	5x10 ⁶	3x10 ⁶	5x10 ⁶	5x10 ⁶	5x10 ⁶	5x10 ⁶	5x10 ⁶	1x10 ⁶	
Terminal screw	M	3	3	4	4	3	3	3.5	4	4	5	2 x 5	
Maximum tightening torque	Nm	0.5	0.8	1.2	1.2	0.5	0.5	0.8	1.2	1.2	2	2	
Conductor cross section max. r/f	2 mm ²	2.5/2.5	2.5/2.5	10/6	10/6	1.5/1.5	2.5/2.5	4/4	6/4	10/6	16/10	70/50	
	2 AWG	14/14	14/14	8/10	8/10	16/16	14/14	10/12	10/12	8/10	6/8	2/0 / 1/0	
r: rigidomin. r/f f: flexible	2 mm ²	0.5/0.5	0.5/0.5	1.5/1.5	1.5/1.5	0.5/0.5	0.5/0.5	0.5/0.5	1.5/1.5	1.5/1.5	2.5/2.5	2.5/2.5	
	2 AWG	20/20	20/20	16/16	16/60	20/20	20/20	20/20	16/16	16/16	14/14	14/14	

CONDIZIONI AMBIENTALI

Operating temperature	°C	-25...+55
Storage temperature	°C	-40...+70

Operational characteristics Modular contactors

TYPE		CN20...	CN25...	CN40...	CN63...
CONTACT CHARACTERISTICS					
Conventional free air thermal current I _{th} (40°C)	A	20	25	40	63
Rated insulation voltage U _i	V	440	440	500	500
Av. coil consumpt. at in-rush and holding	W	2.5	3	5	5
Maximum tightening torque for coil terminals	Nm	0.6	0.6	0.6	0.6
	lbft	0.44	0.44	0.44	0.44
	Tool	PZ1	PZ1	PZ2	PZ2
Coil terminal conductor section	minimum	mm ² 1			
	maximum	mm ² 2.5			
Maximum tightening torque for power terminals	Nm	1.2	1.2	2	2
	lbft	0.9	0.9	1.48	1.48
	Tool	PZ1	PZ1	PZ2	PZ2
Coil conductor section	minimum	mm ² 2.5	2.5	1	1
	maximum	mm ² 6	6	25	25
AC/DC CONTROL CIRCUIT					
Operating voltage limits	pick-up	da % Us	85		
		a % Us	110		
	drop-out	da % Us	20		
		a % Us	75		
LIFE					
Electrical (in AC3 duty)	cycles	300,000	500,000	150,000	150,000
AMBIENT CONDITIONS					
Operating temperature	C°	-5...+55			-5...+40

N.B.: PZ... = Pozidrive.

Lighting circuit switching

MAXIMUM NUMBER OF LAMPS FOR EACH CONTACTOR POLE

Type of lamp	Power	CN20	CN24	CN40	CN63
Incandescent	60W	21	25	65	85
	100W	13	15	40	50
	200W	7	7	20	25
	500W	3	3	8	10
	1000W	1	1	4	5
Energy saving	7W	10	15	100	150
	11W	10	15	100	150
	15W	5	15	100	150
	20W	3	10	70	70
Metal halide	200W	—	5	15	20
	300W	—	3	10	13
	500W	—	2	6	8
	1000W	—	1	3	4
Low-pressure sodium vapour (not corrected)	35W	5	6	13	20
	55W	5	6	13	20
	90W	3	4	9	14
	135W	2	3	6	9
	180W	2	3	6	9
High-pressure sodium vapour (not corrected)	50W	12	12	24	38
	70W	10	10	20	30
	110W	8	7	16	25
	150W	6	5	10	16
	250W	3	3	6	10
	400W	2	2	4	6
	1000W	1	—	2	3
Low-pressure sodium vapour (corrected)	35W	1	1	10	16
	55W	1	1	10	16
	90W	—	1	8	12
	135W	—	—	4	7
	180W	—	—	4	7
High-pressure sodium vapour (corrected)	50W	3	3	22	33
	70W	2	3	18	27
	110W	2	2	18	27
	150W	1	1	10	16
	250W	—	1	6	9
	400W	—	—	4	7
	1000W	—	—	2	3
Standard fluorescent (not corrected)	18W	24	24	90	140
	36W	17	20	65	95
	58W	10	13	40	60
Standard fluorescent (corrected)	18W	6	8	45	70
	36W	6	8	45	70
	58W	4	5	25	43
Standard fluorescent (duo circuit)	2 - 18W	22	48	100	150
	2 - 36W	17	24	65	95
	2 - 58W	10	15	40	60
Electronic ballast fluorescent AC operation	1 - 18W	22	30	60	80
	1 - 36W	12	16	30	42
	1 - 58W	8	12	22	30
	2 - 18W	23	32	40	48
	2 - 36W	12	16	20	26
	2 - 58W	7	10	10	18

TYPE	TM P	TM M1	TM M2	TM PL	TM D	TM ST	TM LS
DESCRIPTION							
	On delay	Programmable multifunction	Programmable multifunction timing	Asymmetrical recycle	True off delay	For starting	Staircase illumination
	Multiscale	Multiscale	Multiscale	Multiscale	Multiscale	Multiscale	Single scale
	Multivoltage	Multivoltage	Multivoltage	Multivoltage	Multivoltage	Multivoltage	Single voltage
CONTROL CIRCUIT							
Rated auxiliary supply voltage Us	24-48VDC 24-240VAC	12-240VAC/DC			24-240VAC/DC	24-48VDC 24-240VAC 380-440VAC	220-240VAC
Rated frequency	50/60Hz						
Operating voltage range	0.85-1.1 Us						
Power consumption (maximum)	1.2VA/0.8W max (24...48VAC/DC) 16VA/0.9W max (110...240VAC/DC)	0.6VA/0.3W max (12...48VAC/DC) 1.6VA/1.2W max (110...240VAC/DC)	1.1VA/0.8W max (12...48VAC/DC) 1.8VA/1.2W max (110...240VAC/DC)	0.6VA/0.3W max (12...48VAC/DC) 1.6VA/1.2W max (110...240VAC/DC)	0.1VA/0.1W (24...48VAC/DC) 1.1VA/0.8W (110...240VAC/DC)	1.2VA/0.8W max (24...48VAC/DC) 1.6VA/0.9W max (110...240VAC)	Relè diseccitato 5VA/0.5W max Relè eccitato 12VA/0.8W max
TIMING CIRCUIT							
Time setting range	Multiscale 0.1-1s 1-10s 6s-60s 1-10min 6min-1h 1-10h 0.1-1day 1-10days ON only OFF only		Multiscale 0.1-1s 1-10s 6s-60s 1-10min 6min-1h 1h-10h 0.1-1day 1-10days 3-30days 10-100days	Multiscale 0.06-0.6s 0.6-6s 6s-60s 18s-180s	Multiscale 0.1-1s 1-10s 6s-60s 1-10min	Multiscale 0.5-20min	
Setting accuracy	< ±9%						
Repeat accuracy	< ±0.1%	< ±0.5%	< ±0.2%	< ±0.5%			
Influence of voltage variation	< ±0.01%						< ±0.5%
Average variation of set delays related at -20°C to +20°C condition	< ±0.2%						< ±0.25%
Minimum power time	—	—	—	—	≥ 200ms	—	—
Minimum ON time	—	25ms (no maximum limit)			—	—	≥60ms (no max lim.)
Resetting during timing time	≥ 100ms				—	≥ 100ms	≥ 100ms
Resetting elapsed time	≥ 50ms				—	≥ 50ms	—
Immunity time for microbreakings	≤ 50ms	≤ 25ms	≤ 15ms	≤ 25ms	—	≤ 40ms ^①	≤ 20ms
OUTPUT RELAYS							
Contact arrangement	1 delayed changeover		1 inst./delayed N/O + 1 delayed c/o	1 delayed changeover		2 delayed N/O	1 delayed N/O
Maximum switching voltage	250VAC						
Conventional free air thermal current (Ith)	8A			5A		8A	16A
IEC/EN 60947-5-1 designation	B300						—
Electrical life (with rated load)	10 ⁵ cycles						
Mechanical life	30x10 ⁶ cycles						
Tightening torque (maximum)	0.8Nm (7lbin)						
Conductor section (min-max)	0.2-4mm ² (24-12 AWG)						
INSULATION (input-output)							
Rated insulation voltage	250V						
Rated impulse withstand voltage	4kV						
Power frequency withstand voltage	2kV (50Hz - 60sec)						
AMBIENT CONDITIONS							
Operating temperature	-20...+60°C						
Storage temperature	-30...+80°C						
Housing material	Self-extinguishing polyamide						

Note: N/O = normally open
c/o = changeover

① Used at 24-48VDC or 24-240VDC; ≤30ms at 380-440VAC.

Operational characteristics

TYPE	AT1P...	AT1CP...	ATD...	AT1DP...
DESCRIPTION				
	On delay	ON delay	Off delay	Off delay, auxiliary supply
	Multiscale	Multiscale	Multiscale	Multiscale
	Multivoltage	Multivoltage	Single voltage	Single voltage
CONTROL CIRCUIT				
Rated supply voltage (Us)	24VAC / 100-240VAC ^①	12-24VAC/DC ^①	24VAC/DC ^①	24VAC/DC ^①
	24VAC / 220-440VAC ^①	48-60 / 110-125VAC/DC ^①	48VAC/DC ^①	48VAC/DC ^①
			110-127VAC ^① 220-240VAC ^①	110-127VAC ^① 220-240VAC ^①
Rated frequency	50-60Hz			
Operating voltage range	0.85-1.1 Us	0.85-1.1 Us in AC 0.6-1.3 Us in DC	0.8-1.1 Us	
Power consumption (maximum)	24V=1VA; 100-240V=10VA 110V=1.4VA 220-440V=15.6VA (220V=3.2VA)	1.5W (12/24V) 2.5W (48-60/110-125V)	2.7VA AC 0.3W DC	8.7VA AC 1.6W DC
Power dissipation (maximum)	②	②	②	②
TIMING CIRCUIT				
Time setting range	Multiscale	Multiscale	Multiscale	Multiscale
	0.3-3s	0.3-3s	0.3-3s	0.3-3s
	1.2-12s	1.2-12s	1.2-12s	1.2-12s
	9.6-96s	9.6-96s	9.6-96s	9.6-96s
	76.8-768s	76.8-768s	76.8-768s	76.8-768s
Setting accuracy	±9%			
Repeat accuracy	≤ ±0.5%			
Influence of voltage variation	±0.3%	-0.3% 0.74%	±0.3%	
Average variation of set delays in related to 20°C condition	at -20°C	+2%		
	at +60°C	-3%		
Minimum ON time	—			25ms
Resetting during operation time	elapsed time	≥ 80ms	≥ 60ms	200ms
	elapsed time	≥ 55ms	≥ 50ms	—
Immunity time for microbreakings	≤ 30ms	≤ 30ms	≤ 7ms	≤ 7ms
OUTPUT RELAYS				
Number of relays	1	1	1	1
Contact arrangement	1 delayed changeover			
Maximum switching voltage	440VAC (rated 250V)		250VAC	250VAC
Conventional free air thermal current (Ith)	8A			
IEC/EN 60947-5-1 designation	B300			
Electrical life (with rated load)	10 ⁵ cycles			
Mechanical life	30x10 ⁶ cycles			
CONNECTIONS				
Tightening torque (maximum)	1Nm			
Conductor section (min-max)	—			
INSULATION (input-output)				
Rated insulation voltage	250V			
Rated impulse withstand voltage	4kV			
Power frequency withstand voltage	2.5kV (50Hz - 60s)			
AMBIENT CONDITIONS				
Operating temperature	-10...+60°C			
Storage temperature	-30...+80°C			
Housing material	Self-extinguishing polyamide			

NOTE:
 del. = delayed
 inst. = instantaneous
 c/o = changeover
 ① Other voltage on request.
 ② Contact our Customer Service
 (Tel. +39 035 4282422;
 e-mail: service@LovatoElectric.com)

BTPM...		DRPL...	BT2N...	L48T...	L48TP...	L48TPB...	L48M...
Programmable multifunction		Asymmetrical recycle	For starting	On delay	On delay	On delay	Programmable multifunction
Multiscale			Single scale	Single scale	Multiscale	Multiscale	Multiscale
Multivoltage			Dual voltage	Single voltage	Multivoltage	Single voltage	Multivoltage
24VAC/DC 110-127VAC 220-240VAC		24/48VAC/DC❶		24VAC/DC❶	24VAC/DC❶	24VAC/DC❶	24-240VAC/DC❶
		24VAC/DC-110-127VAC❶		220-240VAC❶	110VAC❶	220-240VAC❶	
		24VAC/DC-380-415VAC❶			220-240VAC❶		
		24VAC/DC-110-127VAC❶					
		24VAC/DC-415-440VAC❶					
0.8-1.1 Us				50-60Hz			
				0.85-1.1 Us			
9.2VA AC 2.9W DC		12.8VA AC 1W DC		8.7VA AC 1.5W DC		6VA	
Ⓜ							
Multiscale 0.3-3s 1.2-12s 9.6-96s 76.8-768s 0.3-3min 1.2-12min 9.6-96min 76.8-768min	Multiscale 0.3-3s/min 0.6-6s/min 1.2-12s/min 3-30s/min 6-60s/min 12-120s/min	Single scale start time:	0.1-3s	Multiscale 0.3-3s 0.12-12s 10-100s 78-780s 18s-3min 72s-12min 10-100min 78-780min	Multiscale 0.05-1s 0.10-10s 0.6s-1min 6s-10min	Multiscale 0.05-1s 0.1-10s 0.6s-1min 6s-10min 0.05-1min 0.1-10min 0.6min-1h 1min-10h	
			0.6-6s				0.1-6s
			1.2-12s				0.5-30s
			3-30s				0.5-60s
			6-60s				1s-3min
		Transition time 20-300ms	3s-6min		30s-30min		
			30s-60min		30s-60min		
			3min-3h		3min-3h		
±9%		±9%		±5%			
≤±0.5%		≤±0.5%		±0.5%			
±0.3%		±0.3%		±0.5%			
+2%		+2%		+2%			
-3%		-3%		-3%			
—							
≥ 75ms	≥ 85ms	≥ 75ms	≥ 0.1s	≥ 0.1s	≥ 0.1s	≥ 0.1s	
≥ 45ms	≥ 75ms	≥ 70ms	≥ 65ms	≥ 65ms	≥ 65ms	≥ 65ms	
≤ 7ms	≤ 7ms	≤ 7ms	≤ 40ms	≤ 40ms	≤ 40ms	≤ 40ms	
2	2	2	1	1	2	2	
2 del. or 1 inst. + 1 del. c/o		2 delayed c/o		1 delayed c/o		2 del. or 1 inst. + 1 del. c/o	
250VAC		380VAC		250V		250V	
8A				5A			
B300							
10 ⁵ cycles				10 ⁵ cycles			
30x10 ⁶ cycles				30x10 ⁶ cycles			
1Nm				—			
1.5-5.0mm ² (18-14AWG)				—			
250V		500V		250V			
4kV				—			
2.5kV				2kV			
-10...+60°C				-10...+60°C			
-30...+80°C				-30...+80°C			
Self-extinguishing polyamide				Self-extinguishing polyamide			

Operational characteristics

TYPE	Single phase	PMV55	—	—	—	—
	Three phase	—	PMV10	PMV20	PMV30	PMV40
	Three-phase with or w/o neutral	—	—	—	—	—
DESCRIPTION						
	Minimum and maximum AC voltage		Phase sequence and phase loss		Minimum AC voltage, phase sequence and phase loss	Phase sequence, phase loss and asymmetry
CONTROL CIRCUIT						
Rated voltage to be monitored Ue	208-240VAC 380-440VAC	208-480VAC	100-240VAC 208-575VAC 380-600VAC	208-240VAC 380-575VAC 600VAC		
Maximum voltage set-point	105-115% Ue	—	—	—	—	—
Minimum voltage set-point	80-95% Ue	—	—	80-95% Ue	—	—
Asymmetry set-point	—	—	—	—	5-15%Ue	—
Min and max frequenz set point	—	—	—	—	—	—
Tripping delay time	0.1-20s	60ms		0.1-20s		
Resetting time	0.1-20s (0.5s all'accensione)	0.5s		0.1-20s (0.5s all'accensione)		
Resetting hysteresis	3%	5%		3%		
Instantaneous tripping for Ue	<70% Ue selez.	Umin<70% Umax		<70% Ue selez.	<70% Ue minima	
Repeat accuracy	< ±0.1%	< ±1%		< ±0.1%	< ±0.1%	
SUPPLY						
Supply voltage Us	Powered by monitored voltage					
Operating voltage range	0.7...1.2Ue	0.85...1.1Ue		0.7...1.2Ue		
Rated frequency	50/60Hz ±5%					
Power consumption (maximum)	10VA (208-240VAC)❶ 17VA (380-440VAC)❶	20VA❶	28VA❶	11VA (208-240VAC)❶ 30VA (380-575VAC)❶ 19VA (600VAC)❶		
Power dissipation (maximum)	1.5W	2.2W	2.5W			
RELAY OUTPUTS						
Number of relays	1					
Relay state	Normally energised De-energises at tripping					
Contact arrangement	1 changeover contact					
Rated operational voltage	250VAC					
Maximum switching voltage	400VAC					
Conventional free air thermal current Ith	8A					
IEC/EN 60947-5-1 designation	B300					
Electrical life (with rated load)	10 ⁵ cycles					
Mechanical life	30x10 ⁶ cycles					
Indications	Green LED for power on and tripping 2 red LEDs for tripping	Green LED for power on and tripping		Green LED for power on and tripping 1 red LED for tripping		
CONNECTIONS						
Tightening torque (maximum)	0.8Nm (7lbin)					
Conductor section (min-max)	0.2-4.0mm ² (24-12AWG)					
INSULATION (input-output)						
Rated insulation voltage	440VAC	480VAC	600VAC			
Rated impulse withstand voltage	6kV					
Power frequency withstand voltage	4kV					
AMBIENT CONDITIONS						
Operating temperature	-20...+60°C					
Storage temperature	-30...+80°C					
HOUSING						
Housing material	Self-extinguishing polyamide					

❶ Power consumption (maximum) at 50Hz.

❷ Contact our Customer Service
(Tel. +39 035 4282422 -
email: service@LovatoElectric.com).

	— PMV50	— PMV60	— PMV70	— — PMV50 N	— — PMV70 N	— — PMV80 N
	Minimum and maximum AC voltage, phase sequence and phase loss	Minimum AC voltage, phase sequence, phase loss and asymmetry	Minimum and maximum AC voltage, phase sequence, phase loss and asymmetry	Minimum and maximum AC voltage, phase sequence, neutral loss and phase loss	Minimum and maximum AC voltage, phase loss, neutral loss, phase sequence and asymmetry	Minimum and maximum AC voltage, minimum and maximum frequency, phase loss, neutral loss and phase sequence
	208-240VAC	208-240VAC	208-240VAC	208-240VAC	208-240VAC	208-240VAC
	380-575VAC	380-575VAC	380-575VAC	380-440VAC	380-440VAC	380-440VAC
	600VAC	600VAC	600VAC	480-600VAC	480-600VAC	480-600VAC
	105-115% U _e	—	105-115% U _e	105-115% U _e	105-115% U _e	105-115% U _e
	80-95% U _e	80-95% U _e	80-95% U _e	80-95% U _e	80-95% U _e	80-95% U _e
	—	5-15% U _e	5-15% U _e	—	5-15% U _e	—
	—	—	—	—	—	1-10% rated frequency
	0.1-20s					
	0.1-20s 0.5s at power up	0.1-20s 0.5s at power up	0.5s	⊗	⊗	⊗
	3%	3%	3%	⊗	⊗	⊗
	<70% U _e selected					
	< ±0.1%					
	Powered by monitored voltage					
	0.7...1.2U _e					
	50/60Hz ±5%					
	11VA (208-240VAC) ❶ 30VA (380-575VAC) ❶ 19VA (600VAC) ❶			⊗		
	2.5W			⊗		
	1					
	Normally energised					
	De-energises at tripping					
	1 changeover contact					
	250VAC					
	400VAC					
	8A					
	B300					
	10 ⁵ cycles					
	30x10 ⁶ cycles					
	Green LED for power on and tripping 2 red LEDs for tripping	Green LED for power on and tripping 3 red LEDs for tripping		Green LED for power on and tripping 2 red LEDs for tripping		
	0.8Nm (7lbin)					
	0.2-4.0mm ² (24-12AWG)					
	600VAC					
	6kV					
	4kV					
	-20...+60°C					
	-30...+80°C					
	Self-extinguishing polyamide					

Operational characteristics

TYPE	Single phase	DRV1...	—	—	—
	Three phase	—	DRV3...	DRA...	ASF...
	Three-phase with neutral	—	DRV3N	—	—
DESCRIPTION					
		Minimum and maximum AC voltage	Minimum and maximum AC voltage	Phase sequence, phase loss and asymmetry	Phase sequence
CONTROL CIRCUIT					
Rated voltage to be monitored Ue	100/110/127VAC	100/110/127VAC	220-240VAC 50Hz ②	220-240VAC	
	220/230/240VAC	220/230/240VAC	380-415VAC 50Hz ②	380-415VAC	
	380/400/415VAC	380/400/415VAC		440-480VAC	
	440/460/480VAC	440/460/480VAC			
Maximum voltage set-point	102-110% Ue	102-110% Ue	—	—	
Minimum voltage set-point	85-98% Ue	85-98% Ue	—	—	
Asymmetry set-point	—	—	5-15%Ue①	—	
Tripping delay time	0.1-10s	0.1-10s	0.1-10s	Instantaneous	
Resetting time	0.1-10s	0.1-10s	200ms	0.5s	
Resetting hysteresis	Instantaneous	Instantaneous	10% of the set-up value	—	
Instantaneous tripping for Ue	<70% Ue	<70% Ue	—	<70% average Ue	
Repeat accuracy	< ±0.1%	< ±0.1%	< ±1%	< ±1%	
SUPPLY					
Supply voltage Us	Powered by monitored voltage				
Operating voltage range	0.8-1.15 Ue	0.7-1.15	0.85-1.1 Ue	0.85-1.1 Ue	
Rated frequency	50/60 Hz ±5%	50/60 Hz ±5%	50Hz	50/60Hz	
Power consumption (maximum)	7VA	3.6VA	5VA	10VA	
Power dissipation (maximum)	③	3.3W	③	③	
RELAY OUTPUTS					
Number of relays	1	2	1	1	
Relay state	Normally energised De-energises at tripping				
Contact arrangement	1 changeover contact	1 changeover each	1 changeover contact	1 changeover contact	
Rated operational voltage	250VAC				
Maximum switching voltage	400VAC	380VAC	380VAC	380VAC	
Conventional free air thermal current Ith	8A				
IEC/EN 60947-5-1 designation	B300				
Electrical life (with rated load)	10 ⁵ cycles				
Mechanical life	30x10 ⁶ cycles				
Indications	Green LED "ON" Red LED "Max" Red LED "Min"	Green LED "ON" Red LED "Max" Red LED "Min"	Green LED "ON" Yellow LED on = normal when off = alarm	Green LED on = normal	
CONNECTIONS					
Tightening torque (maximum)	0.8Nm (7lbin)				
Conductor section (min-max)	0.2-4.0mm ² (24-12AWG)				
INSULATION (input-output)					
Rated insulation voltage	500V				
Rated impulse withstand voltage	5kV				
Power frequency withstand voltage	2.5kV				
AMBIENT CONDITIONS					
Operating temperature	-10...+60°C				
Storage temperature	-30...+80°C				
HOUSING					
Housing material	Self-extinguishing polyamide				

① Based on measured value of the line voltage, intended within the 0.85-1.1Ue operating range.

② 60Hz type available.

③ Contact our Customer Service (Tel. +39 035 4282422; email: service@LovatoElectric.com).

Operational characteristics

TYPE	PMA20	PMA30	PMA40	DLA1...
DESCRIPTION				
	Single-phase maximum current monitoring AC/DC multiscale	Single-phase minimum or maximum current monitoring AC/DC multiscale	Single-phase minimum and maximum current monitoring AC/DC multiscale	Single-phase maximum current monitoring AC/DC multiscale
CONTROL CIRCUIT				
Rated current to be monitored I _e	5 - 16A		0.02-0.05-0.25-1-5-16A	
Rated frequency	50/60Hz ±5%			
Overload capacity	5 I _e for 1s 160A for 10ms Constant 16A	50mA - 1A	16A	1A
		5 I _e for 1s 10I _e for 10ms Constant 2I _e	5 I _e for 1s 160A for 10ms Constant 16A	25A for 1s 8 I _e for 3s 6 I _e for 5s 2.5I _e for 20s Constant 2A
Connection	Direct or by current transformer			
Adjustment	Tripping values	5-100% f.s.		0.1-1 I _e
	Tripping time	0.1-30s		0.1-10s
	Inhibition time	1-60s		0.1-10s
	Resetting hysteresis	1-50%		3% fixed
Resetting	Automatic / Manual			
External input	Resetting / Inhibition		—	Reset by ext. NC contact
Repeat accuracy	±1% with constant parameters			±1.5%
AUXILIARY SUPPLY				
Auxiliary supply voltage U _s	24-240VAC/DC			Depending on type: 24VDC 110-127VAC 220-240VAC
Operating range	0.85-1.1 U _s			
Rated frequency	50/60Hz ±5%			
Power consumption (maximum)	3.2VA		7VA	4.5VA
Power dissipation (maximum)	1.6W		1.7W	2.8W
RELAY OUTPUTS				
Number of relays	1		2	1
Relay state	Normally energised / de-energised (selectable)			Normally de-energised. Energises at tripping
Contact arrangement	1 changeover contact			
Rated operational voltage	250VAC			
Maximum switching voltage	400VAC			380VAC
Conventional free air thermal current I _{th}	8A			
IEC/EN 60947-5-1 designation	B300			
Electrical life (with rated load)	10 ⁵ cycles			
Mechanical life	30x10 ⁶ cycles			
Indications	Green LED for power on/inhibition Red LED for tripping		Green LED for power on/inhibition 2 red LEDs for max/min tripping	Green LED for power on Red LED for tripping
CONNECTIONS				
Tightening torque (maximum)	0.8Nm (7 lbin)			1.2Nm (9 lbin)
Conductor section (man-max)	0.2-4.0mm ² (24-12AWG)			
INSULATION (input-output)				
Rated insulation voltage	415V			500V
Rated impulse withstand voltage	4kV			5kV
Power frequency withstand voltage	2.5kV			2.5kV
AMBIENT CONDITIONS				
Operating temperature	-20...+60°C			-10...+60°C
Storage temperature	-30...+80°C			
HOUSING				
Material	Self-extinguishing polyamide			

Operational characteristics

TYPE	PMA50	PMA60	
DESCRIPTION	Single and three-phase pump protection (motor underload and overcurrent control) monitoring for max AC current, min $\cos\varphi$, phase loss and incorrect phase sequence	Single and three-phase shift control for minimum and maximum $\cos\varphi$ monitoring	
CURRENT AND $\cos\varphi$ CONTROL CIRCUIT			
Rated current I_e	16A		
Rated frequency	50/60Hz		
Overload capacity	5 I_e for 1s 160A for 10ms Constant 16A		
Connection	Direct or by current transformer		
Adjustments	End-scale value	5A or 16A	—
	Tripping for MAX current	5-100% I_e	—
	Tripping for $\cos\varphi$	0.1-0.99 $\cos\varphi$ (MIN)	0.1-0.99 $\cos\varphi$ (MIN and MAX)
	Tripping delay	0.1-10s	0.1-30s
	Inhibition time	1-60s	
	Automatic resetting delay	OFF-100min	—
External input	Consent for running/resetting	—	
Repeat accuracy	±1% with constant parameters		
VOLTAGE CONTROL CIRCUIT			
Voltage measuring range (U_e)	80...660VAC		
Tripping time for phase loss	60ms		
AUXILIARY SUPPLY			
Auxiliary supply voltage U_s	220-240VAC		
	380-415VAC		
	440-480VAC		
Operating range	0.85-1.1 U_s		
Frequency range	50/60Hz ±5%		
Power consumption (maximum)	4.5VA	4.4VA	
Power dissipation (maximum)	2.3W	2.4W	
RELAY OUTPUTS			
Number of relays	1	2	
Relay state	Normally energised, de-energises at tripping	Normally energised / de-energised (ON-OFF) (configurable)	
Contact arrangement	1 changeover contact		
Rated operational voltage	250VAC		
Maximum switching voltage	400VAC		
Conventional free air thermal current I_{th}	8A		
IEC/EN 60947-5-1 designation	B300		
Electrical life (With rated load)	10 ⁵ cycles		
Mechanical life	30x10 ⁶ cycles		
Indications	Green LED for power on/inhibition 2 red LEDs for minimum/maximum tripping		
ONNECTIONS			
Tightening torque	0.8Nm (7 lbin)		
Conductor section (min-max)	0.2-4.0mm ² (24-12 AWG)		
INSULATION (input-output)			
Rated insulation voltage	600V		
Rated impulse withstand voltage	6kV		
Power frequency withstand voltage	2.5kV (50Hz-60s)		
AMBIENT CONDITIONS			
Operating temperature	-20...+60°C		
Storage temperature	-30...+80°C		
HOUSING			
Material	Self-extinguishing polyamide		

Operational characteristics

TYPE	PMF20	
DESCRIPTION	Single-phase minimum and maximum frequency control	
FREQUENCY CONTROL CIRCUIT		
Rated frequency	50 or 60Hz selectable	
Operating frequency range	40-70Hz	
Adjustment	MAX tripping	101-110% operating frequency
	MIN tripping	90-99% operating frequency
	Resetting hysteresys	0,5%
	Inhibition time	0.1-20s
	Reset delay	0.1-20s
Resetting	Automatic	
Repeat accuracy	< ±0.1%	
AUXILIARY SUPPLY		
Auxiliary supply voltage Us	220-240VAC	
	380-415VAC	
Operating range	0.85-1.1 Us	
Rated frequency	50/60Hz	
Power consumption (maximum)	10VA (220-240VAC); 17VA (380-415VAC)	
Power dissipation (maximum)	1.5W	
RELAY OUTPUTS		
Number of relays	1	
Relay state	Normally energised, de-energises at tripping ^❶	
Contact arrangement	1 changeover contact	
Rated operational voltage	250VAC	
Maximum switching voltage	400VAC	
Conventional free air thermal current Ith	8A	
IEC/EN 60947-5-1 designation	B300	
Electrical life (with rated load)	10 ⁵ cycles	
Mechanical life	30x10 ⁶ cycles	
Indications	Green LED for power on/tripping 2 red LEDs for min-max tripping	
CONNECTIONS		
Tightening torque (maximum)	0.8Nm (7 lbin)	
Conductor section (min-max)	0.2-4.0mm ² (24-12 AWG)	
INSULATION (input - output)		
Rated insulation voltage	575V	
Rated impulse withstand voltage	6kV	
Power frequency withstand voltage	4kV (50Hz-60s)	
AMBIENT CONDITIONS		
Operating temperature	-20...+60°C	
Storage temperature	-30...+80°C	
HOUSING		
Material	Self-extinguishing polyamide	

❶ Normally de-energized, energises at tripping with MAX function configured.

Operational characteristics

TYPE	LVM20...	LVM25...	LVM30...	LVM40...
DESCRIPTION				
	Modular			
	Automatic resetting			
	Single voltage	Multi voltage	Dual voltage	Single voltage
Application (examples)	Emptying function	Emptying or filling functions		Multiple functions
Operating principle	Electrical conductivity of liquids			
AUXILIARY SUPPLY				
Supply voltage U_s	24VAC 110-127VAC 220-240VAC 380-415VAC	24-240VAC/DC	24/220-240VAC 110-127/380-415VAC	24VAC 110-127VAC 220-240VAC 380-415VAC
Operating voltage range	0.85-1.1 U_e 50/60Hz \pm 5%			
Power consumption (maximum)	3.5VA	4VA	5.5VA	4.5VA
Power dissipation (maximum)	1.8W	1.2W	2.8W	
OUTPUTS				
Number of connectable electrodes	3	3	3	5
Type of electrode	Electrodes and electrode holders: SN1 / SCM / CGL / PS31 / PS3S or similar			
Electrode voltage	7.5VAC	5VPP	7.5VAC	5VPP
Sensitivity	2.5-50kohm	2.5-100kohm	2.5-50kohm	2.5-200kohm
TIME DELAYS				
Tripping time (minimum)	\leq 600ms	\leq 1s	1s	
Resetting time (minimum)	\leq 750ms	\leq 1s	1s	
Probe tripping delay	—	—	OFF-10s	1-10s
Relay energising delay	—	—	OFF-300s	0-30min
RELAY OUTPUTS				
Number of relays	1	1	1	2
Relay state	Normally de-energized, energises at tripping			
Contact arrangement	1 changeover contact	1 changeover contact	2 changeover contacts	1 changeover and 1 with 1 N/O contact
Rated utilisation voltage	250VAC			
Maximum switching voltage	400VAC			
Conventional free air thermal current I_{th}	8A			
IEC/EN 60947-5-1 designation	B300			
Electrical life (with rated load)	10^5 cycles			
Mechanical life	30×10^6 cycles			
Indications	Green LED for power on Red LED for relay state	Green LED for power on Red LED for relay state	Green LED for power on Red LED for relay state	Green LED for power on 2 red LEDs for relay state 2 red LEDs for probe state
CONNECTIONS				
Tightening torque (maximum)	0.8Nm (7lbin)			
Conductor section (min-max)	0.2-4mm ² (24-12 AWG)			
INSULATION				
Rated impulse withstand voltage U_{imp}	6kV	4kV	6kV	
Power frequency withstand voltage	4kV	2kV	4kV	
Rated insulation voltage U_i	415VAC	240VAC	415VAC	
Double insulation Supply/relay/electrode	\geq 250VAC			
AMBIENT CONDITIONS				
Operation temperature	-20...+60°C			
Storage temperature	-30...+80°C			
HOUSING				
Housing material	Self-extinguishing polyamide			
Typical configuration (examples)	LVM20 + n° 3 SN1 electrodes	LVM25 + n° 3 SN1 electrodes	LVM30 + n° 3 SN1 electrodes LVM40 + n° 5 SN1 electrodes	
Maximum cable length	—			

- ① Double insulation between supply, electrodes and output relay circuit.
 ② Voltage applied to input contacts, not insulated at power supply.

LV1E...	LV2E...	LVMP 05	LVMP 10	CSP2E
Plug-in		Modular		Plug-in
Automatic resetting	Automatic resetting	—	—	—
Single voltage	Dual voltage	Multivoltage	Multivoltage	Single voltage
– Minimum-maximum level threshold – Maintains level between minimum and maximum – Protection against dry pump running		Scambio precedenza motori		
Electrical conductivity of liquids		—		
24VAC	24-48VAC	24-48VDC	24VAC	24VAC [Ⓢ]
110-120VAC	110-120VAC/220-240VAC	24-240VAC	110-127VAC	48VAC [Ⓢ]
220-240VAC	220-240VAC/380-415VAC		220-240VAC	110VAC [Ⓢ]
380-415VAC			380-415VAC	220VAC [Ⓢ]
0.8-1.1 Ue 50/60Hz				
5.5VA		1.6VA	4.8VA	5VA
2.8W		0.9W	3W	3W
3		—	—	—
Electrodes and electrode holders: SN1 / SCM / CGL / PS31 / PS3S / or similar		—	—	—
9VAC (voltage between probes)		—	—	—
7 - 8kohm adjustable		—	—	—
≤50ms		—	—	—
≤100ms		—	—	—
—		—	—	—
—		—	—	—
1		2	2	2
Normally de-energized, energises at tripping				
1 changeover contact		1 N/O contact	1 N/O contact	1 N/O contact
220VAC		250VAC	250VAC	250VAC
380VAC		—	—	—
5A		8A	8A	5A
B300		B300	B300	B300
2.5x10 ⁵ cycles		10 ⁵ cycles	10 ⁵ cycles	10 ⁵ cycles
50x10 ⁶ cycles		30x10 ⁶ cycles	30x10 ⁶ cycles	30x10 ⁶ cycles
Red LED for relay tripping		Green LED for power on Red LED for relay state	Green LED for power on Red LED for relay state	Green LED for power on Red LED for relay state
—		0.8Nm (7 lbin)	0.8Nm (7 lbin)	
—		0.2-4.0mm ² (24-12 AWG)	0.2-4.0mm ² (24-12 AWG)	
5kV		4kV	4kV	4kV
2kV		2kV	2.5kV	2.5kV
415VAC		250VAC	415VAC	250VAC
		—		
-20...+60°C				
-30...+80°C				
Self-extinguishing polycarbonate		Self-extinguishing polyamide	Self-extinguishing polyamide	Self-extinguishing polycarb.
LV1E + n° 3 SN1 electrode		—	—	—
LV2EM + n° 2 SN1 electrodes + reset button		—	—	—
500m single-core, double insulated cables		—	—	—

Operational characteristics

TYPE	R1D ^①	R2D ^①	R3D ^①	
DESCRIPTION				
	Flush mount with transparent cover 1 operating threshold	Flush mount with transparent cover 2 operating thresholds constant toroid-relay circuit control		
CONTROL CIRCUIT				
Toroidal transformer	External (see types given on page 13-3)	External (see types given on page 13-3)	External (see types given on page 13-3)	
Adjustments				
Tripping set-point (I Δ) (configurable)	0.025-0.25A (x0.1) 0.25-2.5A (x1) 2.5-25A (x10) 25-250A (external multiplier)	0.025-0.25A (x0.1) 0.25-2.5A (x1) 2.5-25A (x10) 25-250A (external multiplier)	0.025-0.25A (x0.1) 0.25-2.5A (x1) 2.5-25A (x10) 25-250A (external multiplier)	
Prealarm set-point	—	70% I Δ n (fixed)	70% I Δ n (fixed)	
Tripping delay time (t)	0.02-0.5s (tx1) 0.2-5s (tx10)	0.02-0.5s (tx1) 0.2-5s (tx10)	0.02-0.5s (tx1) 0.2-5s (tx10)	
Selection of multiplier for I Δ n and t	By dip switches	By dip switches	By dip switches	
Resetting	Configurable automatic or manual by button on front ^②	Automatic by remote contact closing or rear jumper connection Manual by button on front or remote contact closing		
Shunt circuit control	—	—	—	
AUXILIARY SUPPLY				
Auxiliary voltage Us	24/48VAC/DC			
	110-125VAC/DC 220-240/380-415VAC	110-125/220-240/380-415VAC		
Operating voltage range	0.85 - 1.1 Us			
Rated frequency	50-60Hz	50-60Hz	50-60Hz	
Power consumption (maximum)	5.5VA	4.5VA	4.5VA	
RELAY OUTPUTS				
State	Normally de-energised	Configurable normally de-energised or energised	Configurable normally de-energised or energised	
Contact arrangement	1 changeover (trip)	2 changeover (configurable: 2 trip or 1 trip and 1 alarm)		
Rated contact capacity I _{th}	5A - 250VAC	5A - 250VAC	5A - 250VAC	
Electrical life	3 x 10 ⁵ cycles	3 x 10 ⁵ cycles	3 x 10 ⁵ cycles	
Mechanical life	50 x 10 ⁶ cycles	50 x 10 ⁶ cycles	50 x 10 ⁶ cycles	
INSULATION				
Power frequency withstand voltage	2.5kV for 1 minute	2.5kV for 1 minute	2.5kV for 1 minute	
INDICATIONS				
Auxiliary voltage available (ON)	Green LED	Green LED	Green LED	
Relay tripping (TRIP)	Red LED	Red LED	Red LED	
Trip prealarm (ALARM)	—	Red LED	Red LED	
Mechanical (TRIP MEMORY)	—	—	Flag indicator	
Shunt circuit tripping	—	—	—	
CONNECTIONS				
Type of terminals	Fixed			
Tightening torque (maximum)	0.5Nm (4.5lbin)			
Conductor section (min-max)	0.2-2.5mm ² (24-12 AWG)			
AMBIENT CONDITIONS				
Operating temperature	-10...+60°C	-10...+60°C	-10...+60°C	
Storage temperature	-20...+80°C	-20...+80°C	-20...+80°C	
Relative humidity	≤90%	≤90%	≤90%	
Housing material	Self-extinguishing polycarbonate	Self-extinguishing polycarbonate	Self-extinguishing polycarbonate	

^① Type A, sensitive to residual sinusoidal AC and pulsating DC currents.

^② Remote resetting by removing power for more than 1 second.

R4D ^{①②}	RM1... ^①	RM... ^①	RMT... ^①	RC... ^①
Flush mount with transparent cover 2 operating thresholds - constant toroid-relay circuit control	Modular with transparent cover 1 operating threshold	Modular with transparent cover 1 operating threshold	Modular with transparent cover 1 operating threshold	Compact 1 operating threshold
External (see types given on page 13-3)	External (see types given on page 13-3)	External (see types given on page 13-3)	Incorporated Ø 28 mm	Incorporated 35-60-80-110 mm standard diameter
0.03-0.3A (x0.1) 0.3-3A (x1) 3-30A (x10) 30-300A (external multiplier)	0.3A or 0.5A only	0.025-0.25A (x0.1) 0.25-2.5A (x1) 2.5-25A (x10) 25-250A (external multiplier)	0.025-0.25A (x0.1) 0.25-2.5A (x1) 2.5-25A (x10)	0.025-0.25A (x0.1) 0.25-2.5A (x1) 2.5-25A (x10)
70% I _{Δn} (fisso)	—	—	—	—
0.03-0.5s (tx1) 0.3-5s (tx10)	0.02s or 0.5s only	0.02-0.5s (tx1) 0.2-5s (tx10)	0.02-0.5s (tx1) 0.2-5s (tx10)	0.02-0.5s (tx1) 0.2-5s (tx10)
By dip switches	By dip switches	By dip switches	By dip switches	By dip switches
Automatic by remote contact closing or rear jumper. Manual by button on front or remote contact closing	Configurable A: Automatic or M: Manual by button on front	Configurable A: Automatic or M: Manual by button on front	Configurable A: Automatic or M: Manual by button on front	Configurable AUTO: Automatic or MAN: Manual by button on front
Yes	—	—	—	—
24/48VAC/DC	24/48VAC/DC			
110-125/220-240/380-415VAC	110-125VAC/DC 220-240/380-415VAC			
0.85-1.1 Us	0.85-1.1 Us			
50/60Hz	50/60Hz			
5.5VA	3VA			
Configurable normally de-energised or energised	Normally de-energised	Normally de-energised	Configurable normally de-energised or energised	Normally de-energised
2 changeover (configurable: 2 trip or 1 trip and 1 alarm)	1 changeover (trip)	1 changeover (trip)	2 changeover (both trip)	1 changeover (trip)
5A - 250VAC	5A - 250VAC	5A - 250VAC	5A - 250VAC	5A - 250VAC
3x10 ⁵ cycles	3x10 ⁵ cycles	3x10 ⁵ cycles	3x10 ⁵ cycles	3x10 ⁵ cycles
50x10 ⁶ cycles	50x10 ⁶ cycles	50x10 ⁶ cycles	50x10 ⁶ cycles	50x10 ⁶ cycles
2.5kV for 1 minute	2.5kV for 1 minute	2.5kV for 1 minute	2.5kV for 1 minute	2kV for 1 minute
Green LED	Green LED	Green LED	Green LED	Green LED
Red LED	Red LED	Red LED	Red LED	Red LED
Red LED	—	—	—	—
Flag indicator	—	—	—	—
Red LED	—	—	—	—
Fixed				
0.5Nm (4.5lbin)				
0.2-2.5mm ² (24-12 AWG)				
-10...+60°C	-10...+60°C	-10...+60°C	-10...+60°C	-10...+60°C
-20...+80°C	-20...+80°C	-20...+80°C	-20...+80°C	-20...+80°C
≤90%	≤90%	≤90%	≤90%	≤90%
Self-extinguishing polycarbonate	Self-extinguishing polycarbonate			

- ① Type A, sensitive to residual sinusoidal AC and pulsating DC currents.
- ② Digital display of fault current measurement and tripping value memory.

TYPE	DMK 80 - DMK 80 R1 DMK 00 - DMK 00 R1	DMK 81 - DMK 81 R1 DMK 01 - DMK 01 R1	DMK 82 DMK 02	DMK 83 - DMK 83 R1 DMK 03 - DMK 03 R1	DMK 84 - DMK 84 R1 DMK 04 - DMK 04 R1
AUXILIARY SUPPLY					
Rated voltage Us	24VAC❶ 110...127VAC❶ 220...240VAC 380...415VAC❶				
Operating voltage range	0.85...1.1 Us				
Rated frequency	50...60Hz ±10%				
Power consumption (maximum)	3.3VA (DMK...) 3.6VA (DMK... R1)		3.3VA	3.3VA (DMK...) 3.6VA (DMK... R1)	
Power dissipation (maximum)	1.5W (DMK...) 1.8W (DMK... R1)		1.5W	1.5W (DMK...) 1.8W (DMK... R1)	
VOLTAGE INPUTS					
Rated voltage Ue	600VAC	—	600VAC	—	600VAC
Operating voltage range	15...660VAC	—	15...660VAC	—	—
Operating voltage range, phase-to-phase	—	—	—	—	15...660VAC (DMK...) 25...660VAC (DMK... R1)
Frequency range	50...60Hz ±10%	—	50...60Hz ±10%	—	50...60Hz ±10%
Method of measuring	TRMS	—	TRMS	—	—
CURRENT INPUTS					
Rated current Ie	—	5A	—	—	5A
Measuring range	—	0.05...5.75A	—	—	0.05...5.75A (DMK...) 0.1...5.75A (DMK... R1)
Frequency range	—	50...60Hz ±10%	—	—	50...60Hz ±10%
Type of input	—	Shunts connected by external LV CT 5A max	—	—	Shunts connected by external LV CT 5A max
Type of measuring	—	TRMS	—	—	—
Overload capacity	—	+20% Ie	—	—	+20% Ie
FREQUENCY INPUTS					
Measuring range	—	—	—	15...65Hz ±10%	—
Voltage range	—	—	—	15...660VAC	—
Input rated voltage	—	—	—	600VAC	—
MEASURING ACCURACY					
Measure conditions (Temperature +23°C ±1°C) (Relative humidity 45 ±15% R.H.)	cosφ	—	—	—	± 1° ±1 digit
	voltage	±0.25% f.s. ±1 digit	—	±0.25% f.s. ±1 digit	—
	current	—	±0.5% f.s. ±1 digit	—	—
	frequency	—	—	—	±1 digit
ADDITIONAL ERRORS					
Relative humidity	±1 digit 60%...90% R.H..				
Temperature	±1 digit -20...+60°C				
RELAY OUTPUT FOR DMK...R1 TYPES ONLY					
Number and type of contact	1 changeover				
Rated voltage	250VAC				
IEC/EN 60947-5-1 designation	AC1 8A 250VAC / B300				
Electrical life	10 ⁵				
Mechanical life	30x10 ⁶				
INSULATION					
Rated insulation voltage Ui	600VAC	415VAC (DMK81) 600VAC (DMK81 R1)	600VAC		
CONNECTIONS					
Type of terminals	Fixed (DMK 8...); Removable (DMK 0...)				
Conductor section (Min - Max)	0.2...4.0 mm ² (24...12 AWG)				
Tightening torque (min-max)	0.8Nm (7lbin)				
AMBIENT CONDITIONS					
Operating temperature	-20...+60°C				
Storage temperature	-30...+80°C				
Housing material	Polyamide (DMK 8...) / Thermoplastic (DMK 0...)				

❶ On specific request

TYPE	DMK 70 - DMK 70 R1 DMK 10 - DMK 10 R1	DMK 71 - DMK 71 R1 DMK 11 - DMK 11 R1	DMK 75 - DMK 75 R1 DMK 15 - DMK 15 R1	DMK 16 DMK 16 R1	
AUXILIARY SUPPLY					
Rated voltage U_s	24VAC ^① 110...127VAC ^① 220...240VAC 380...415VAC ^①				
Operating voltage range	0.85...1.1 U_s				
Rated frequency	50...60Hz $\pm 10\%$				
Power consumption (maximum)	3.3VA (DMK...) 3.6VA (DMK... R1)	3.3VA (DMK...) 3.6VA (DMK... R1)	3.3VA (DMK...) 3.6VA (DMK... R1)	3.6VA (DMK...) 3.9VA (DMK... R1)	
Power dissipation (maximum)	1.5W (DMK...) 1.8W (DMK... R1)	1.5W (DMK...) 1.8W (DMK... R1)	1.5W (DMK...) 1.8W (DMK... R1)	1.8W (DMK...) 2.1W (DMK... R1)	
VOLTAGE INPUTS					
Rated voltage U_e	phase-phase	600VAC	—	600VAC	
	phase-neutral	347VAC	—	347VAC	
Operating voltage range	phase-phase	15...660VAC	—	35...660VAC	
	phase-neutral	10...382VAC	—	20...382VAC	
Frequency range	50...60Hz $\pm 10\%$	—	50...60Hz $\pm 10\%$	50...60Hz $\pm 10\%$	
Method of measuring	TRMS	—	TRMS	TRMS	
CURRENT INPUTS					
Rated current I_e	—	5A	5A	5A	
Measuring range	—	0.05...6A	0.05...5.75A	0.05...5.75A	
Frequency range	—	50...60Hz $\pm 10\%$	50...60Hz $\pm 10\%$	50...60Hz $\pm 10\%$	
Type of input	—	Shunts connected by external LV CT 5A max			
Type of measuring	—	TRMS	TRMS	TRMS	
Overload capacity	—	+20% I_e	+20% I_e	+20% I_e	
MEASURING ACCURACY					
Measure conditions (Temperature +23°C $\pm 1^\circ\text{C}$) (Relative humidity 45 $\pm 15\%$ R.H.)	voltage	$\pm 0.25\%$ f.s. ± 1 digit	—	$\pm 0.25\%$ f.s. ± 1 digit	
	current	—	$\pm 0.5\%$ f.s. ± 1 digit	$\pm 0.5\%$ f.s. ± 1 digit	
	power	—	—	1% f.s. ± 1 digit	
	energy	—	—	—	Class 2
	frequency	—	—	± 1 digit	± 1 digit
RELAY OUTPUT FOR DMK...R1 TYPES ONLY					
Number and type of contact	1 changeover	1 changeover	1 changeover ^②	1 changeover	
Rated voltage	250VAC	250VAC	250VAC	250VAC	
IEC/EN 60947-5-1 designation	AC1 8A 250VAC / B300	AC1 8A 250VAC / B300	AC1 8A 250VAC / B300	AC1 8A 250VAC / B300	
Electrical life	10^5	10^5	10^5	10^5	
Mechanical life	30×10^6	30×10^6	30×10^6	30×10^6	
INSULATION					
Rated insulation voltage U_i	600VAC	415VAC	600VAC	600VAC	
CONNECTIONS					
Type of terminals	Fixed (DMK 7...); removable (DMK 1...)				
Conductor section (min-max)	0.2...4.0 mm ² (24...12 AWG)	0.2...4.0 mm ² (24...12 AWG)	0.2...4.0 mm ² (24...12 AWG)	0.2...4.0 mm ² (24...12 AWG)	
Tightening torque (maximum)	0.8Nm (7lbin)	0.8Nm (7lbin)	0.8Nm (7lbin)	0.8Nm (7lbin)	
AMBIENT CONDITIONS					
Operating temperature	-20...+60°C	-20...+60°C	-20...+60°C	-20...+60°C	
Storage temperature	-30...+80°C	-30...+80°C	-30...+80°C	-30...+80°C	
HOUSING					
Material	Polyamide (DMK 7...)/ Thermoplastic (DMK 1...)				

^① On specific request.

^② One N/O contact for DMK 75 R1.

Operational characteristics

TYPE	DMK 20 - DMK 21 - DMK 22	DMK 25 - DMK 26
AUXILIARY SUPPLY		
Rated supply voltage U_s	208-240VAC	12-24VDC from battery
Operating voltage range	154-288VAC for DMK 20 177-264VAC for DMK 21 - DMK 22	9-32VDC
Frequency	45-65Hz	—
Power consumption	5.5VA ($U_s=240V$) for DMK 20 - DMK 21 6VA ($U_s=240$) for DMK 22	1.1W maximum
Power dissipation	2.5W ($U_s=240V$) for DMK 20 - DMK 21 2.8W ($U_s=240$) for DMK 22	1.1W maximum
Immunity time of microbreakings	20ms	500ms
VOLTAGE INPUTS		
Maximum rated voltage	690VAC L-L (400VAC L-N)	
Operating voltage range	60-830V L-L (30-480VAC L-N)	
Frequency range	45-65Hz	
Method of measuring	True RMS value	
Measuring input impedance	>1.1M Ω L-L and >570k Ω L-N	
Method of connection	Single phase, two-phase, three-phase or balanced three-phase system	
Measuring error	$\pm 0.25\%$ full scale ± 1 digit (Class 0.5)	
CURRENT INPUTS		
Rated current I_e	standard 5A (1A on request)	
Measuring range	0.05-6A	
Method of measuring	True RMS value	
Overload capacity	+20% I_e via external CT with 5A secondary	
Overload peak	50A for 1 second	
Dynamic peak	125A for 10ms	
Power consumption	<0.6W for phase	
Measuring error	Class 0.5 $\pm 0.25\%$ f.s. ± 1 digit	
MEASURING ACCURACY		
Measure conditions	voltage	Class 0.5 $\pm 0.35\%$ f.s. (830V)
(Temperature $+23^\circ\text{C} \pm 1^\circ\text{C}$ Humidity $45 \pm 15\%$ R.H.)	current frequency	Class 0.5 $\pm 0.5\%$ f.s. (6A)
	active energy	Class 2
	frequency	—
	harmonic distortion	—
OUTPUTS		
Relay	—	
Static	—	
INSULATION		
Rated insulation voltage U_i	690V	
CONNECTIONS		
Type of terminals	Removable / Plug-in	
Tightening torque (maximum)	0.5Nm (4.5 lbin)	
Conductor section (min-max)	0.2-2.5mm ² (24-12 AWG)	
AMBIENT CONDITIONS		
Operating temperature	-20...+60°C	
Storage temperature	-30...+80°C	
Relative humidity	<90%	
Maximum pollution degree	2	
HOUSING		
Material	Self-extinguishing black plastic	

❶ For DMK 32D 048 only.

DMK 30 - DMK 31 - DMK 32		DMK 40	DMK 50 - DMK 51 - DMK 52	DMK 60 - DMK 61 - DMK 62
24-48VDC ^① /100-240VAC/110-250VDC			208-240VAC	100-240VAC/110-250VDC
18-70VDC ^① 85-265VAC/93.5-300VDC			154-288VAC for DMK 50 177-264VAC for DMK 51 - DMK 52	85-265VAC/93.5-300VDC
45-450Hz			45-65Hz	45-450Hz
10VA/4W			5.5VA (Us=240V) for DMK 50 - DMK 51 6VA (Us=240V) for DMK 52	10VA/4W
3W (DMK 30) 4W (DMK 31 - DMK 32)		4W	2.5W (Us=240V) for DMK 50 - DMK 51 2.8W (Us=240V) for DMK 52	3W for DMK 60 4W for DMK 61 - DMK 62
20ms				
690VAC L-L (400VAC L-N)				
20-830V L-L (10-480VAC L-N)			60-830V L-L (30-480VAC L-N)	20-830V L-L (10-480VAC L-N)
45-65Hz				
True RMS value				
>1.1MΩ L-L and >570kΩ L-N				
Single-phase, two-phase or three-phase system with or without neutral			Single-phase, two-phase, three-phase or balanced three-phase system	Single-phase, two-phase or three-phase system with or without neutral
Class 0.5 ±0.25% full scale ±1digit				
5A (1A on request)				
0.02-6A			0.05-6A	0.02-6A
True RMS value				
+20% Ie via external CT with 5A secondary				
50A for 1 second				
125A for 10ms				
<0.3VA			<0.6W per fase	<0.3VA
Class 0.5 ±0.25% full scale ±1digit				
0.25% f.s. (830V) 0.35% f.s.(6A)			Class 0.5 ±0.35% f.s. (830V) Class 0.5 ±0.5% f.s.(6A)	0.25% f.s. (830V) 0.35% f.s.(6A)
Class 1			Class 2	Class 1
±1 digit			—	±1 digit
±1 digit			—	±1 digit
5A - 250VAC in AC1 for DMK 31 - DMK 32		—	—	5A - 250VAC in AC1 for DMK 61 - DMK 62
55mA - 60VAC/DC in AC1 for DMK 31 - DMK 32		—	—	55mA - 60VAC/DC in AC1 for DMK 61 - DMK 62
690V				
Removable / plug-in			Fixed	
0.5Nm (4.5 lbin)			0.45Nm (4 lbin)	
0.2-2.5mm ² (24-12 AWG)			0.2-1.5mm ² (24-16 AWG)	
-20...+60°C				
-30...+80°C				
<90%				
2				
Self-extinguishing black plastic			Self-extinguishing grey plastic	

Operational characteristics

TYPE	DMG 200	DMG 210	DMG 300
AUXILIARY SUPPLY			
Rated voltage Us	110-240VAC 110-250VDC		
Operating voltage range	85-265VAC 93.5-300VDC		
Frequency range	45-66Hz		
VOLTAGE INPUTS			
Type of input	Three phase + neutral		
Maximum rated voltage Ue	690VAC phase-phase (400VAC phase-neutral)		
Measurement range	10-830VAC phase-phase (5-480VAC phase-neutral)		
Frequency range	45-66Hz		
Method of measurement	True RMS value		
Method of connection	Single, two, three phase with or without neutral, balanced three phase systems		
CURRENT INPUTS			
Rated current Ie	5A	5A	1A/5A
Measurement range	0.005...6A	0.005...6A	0.005-1.2A/0.005-6A
Method of measurement	True RMS value		
Overload capacity	+20% Ie through external CT with 5A secondary		
Overload peak	50A for 1 second		
SUPPLY CIRCUIT/VOLTAGE MEASUREMENTS CONNECTIONS			
Type of terminal	Fixed		
Conductor section min-max	0.2 - 4.0mm ² (24-12 AWG)		
CTightening torque (maximum)	0.8Nm (7lbin)		
CURRENT MEASUREMENT CIRCUIT AND RS485^① CONNECTIONS			
Type of terminal	Fixed		
Conductor section min-max	0.2-2.5mm ² (24-12 AWG)		
Tightening torque (maximum)	0.44Nm (4lbin)		
AMBIENT CONDITIONS			
Operating temperature	-20...+60°C		
Storage temperature	-30...+80°C		
Relative humidity	<90%		
Maximum pollution degree	2		
Measurement class	3		
HOUSING			
Material	Polycarbonate		

① RS485 communication port for DMG210 only.

② For DMG 800 D048, DMG 900 D048 and DMG 900T D048 only.

DMG 700	DMG 800	DMG 900	DMG 900 T
	100-440VAC 110-250VDC - (12-48VDC \oplus)		
	90-484VAC 93.5-300VDC - (9-70VDC \oplus) 45-65Hz		
	Three phase + neutral		
	690VAC phase-phase (400VAC phase-neutral)		
	10-830VAC phase-phase (5-480VAC phase-neutral)		
	45-66Hz		45-65Hz and 350-450Hz
	True RMS value		
	Single, two, three phase with or without neutral, balanced three phase systems		
	5A 0.02-6A		1A/5A 0.002-1.2A / 0.02-10A
	True RMS value		
	+20% I _e through external CT with 5A secondary		
	50A for 1 second		
	Removable / Plug-in		
	0.2-2.5mm ² (24-12 AWG)		
	0.5Nm (4.5lbin)		
	Fixed		
	0.5-4mm ² (26-10 AWG)		
	0.77Nm (7lbin)		
	-20...+60°C		
	-30...+80°C		
	<90%		
	2		
	3		
	Polycarbonate		

Operational characteristics

TYPE		ADXM 06/12/18BP (with integrated by-pass relay)	ADXM 25/38/45BP (with integrated by-pass relay)
Motor	type	Asynchronous three phase	
	power	2.2kW 3-phase (ADXM 06BP) 5.5kW 3-phase (ADXM 12BP) 7.5kW 3-phase (ADXM 18BP) 1.1kW 3-phase (ADXM 06BP A220) 3kW 3-phase (ADXM 12BP A220) 4kW 3-phase (ADXM 18BP A220)	11kW 3-phase (ADXM25BP) 18.5kW 3-phase (ADXM38BP) 22kW 3-phase (ADXM45BP) 5.5kW 3-phase (ADXM 25BP A220) 11kW 3-phase (ADXM 38BP A220) 11kW 3-phase (ADXM 45BP A220)
	rated current	6A (ADXM 06BP...) 12A (ADXM 12BP...) 18A (ADXM 18BP...)	25A for ADXM25BP 35A for ADXM38BP 45A for ADXM43BP
Supply voltage	Power circuit	400VAC -15% +10% ADXM...BP) 220VAC -15 +10% (ADXM...BP A220)	
	Auxiliary	A1-A2: 110VAC/DC ±15% (1-5mA) A1-A3: 110-480VAC ±15% (1-5mA)	A1-A2: 24-550VAC/DC ±15% (1.5mA)
	Frequency	50 or 60Hz ±10% self-configurable	
Starting method		Voltage control	
Stopping method		Voltage control	
Number of controlled phases		2	
Protections	motor	—	High temperature
Indications	power on	Green LED	
	ramp up/down	Yellow LED (constantly on)	Yellow LED (flashing)
	by-pass relay	Yellow LED (constantly on)	
	overtemperature inside starter	—	Red LED (flashing)
	overtemperature motor (PTC sensor)	—	Red LED (constantly on)
	wrong phase sequence	—	Red LED (flashing)
	phase failure/loss	—	Red LED (flashing)
	voltage too low	—	Red LED (flashing)
Cooling system		Natural	
AUXILIARY VOLTAGE CONNECTIONS			
Type of terminal		Screw (fixed)	
Conduction section min...max		0.5...1.5mm ² (AWG22...12)	0.75...2.5mm ² (AWG22...14)
Tightening torque		0.5Nm (4.5lbin) with Phillips bit 0	0.3...0.5Nm (2.7...4.5lbin) with Phillips bit 0
INPUT VOLTAGE CONTROL CONNECTIONS			
Type of terminal		Screw (fixed)	
Conduction section min...max		2.5...10mm ² (14...8 AWG)	0.75...16mm ² (14...4 AWG)
Tightening torque		2.5Nm (22lbin) with Pozidrive bit 2	1.5...2.5Nm (13...22lbin) with Pozidrive bit 2
AMBIENT CONDITIONS			
Operating temperature		-20...+60°C	
Storage temperature		-50...+85°C	
Relative humidity		≤95% without condensation	
Pollution degree (maximum)		3	
Over-voltage category		3	
Altitude		Up to 1000m with no derating; higher up, derate starter current value 1% every 100m. 2000m maximum	
HOUSING			
Mounting		35mm DIN rail (IEC/EN 60715)	

Operational characteristics

TIPO		ADX...BP - ADX...B (with integrated by-pass contactor)	ADX... (to complete with external by-pass contactor)
Motor	type	Asynchronous three phase	
	power	9.2-110kW (ADX...BP) 7.5-132kW (ADX...B)	160-630kW
	rated current	22-231 (ADX...BP) 17-245A (ADX...B)	310-1200A
Supply voltage	power circuit	208 - 500VAC ±10% standard (208-575VAC ±10% on request)	208 - 415VAC ±10% standard Other voltages up to 690VAC maximum on request)
	rated supply voltage	208 - 240VAC ±10%	
	frequency	50 or 60Hz ±5% self configurable	
Starting		Torque ramp with maximum current control	
Stopping		Free wheel or torque ramp deceleration	
Braking		DC dynamic by external contactor	
Protections	auxiliary supply	Voltage too low	
	power supply	Phase failure, frequency out of limits, minimum and maximum voltage and phase sequence, 24VDC static short circuit	
	motor	Overload at starting (trip class 2, 10A, 10, 15, 20, 25, 30, 35 and 40), overload during running (trip class 2, 10A, 10, 15, 20 25 and 30), locked rotor, current asymmetry, minimum torque and maximum starting time	
	starter	Overcurrent and high temperature	
	analog inputs and outputs	24VDC static short circuit	
	Functions	clock calendar	With back-up battery
	event log	20 event registrations in date and time sequential order	
	operating data memory	Hour counter, one each for energy usage, number of startings, motor running and maintenance expiry	
	multilanguage capability	Italian / English / Spanish / French	
Setup configuration		By incorporated or remote keypad or PC	
Keyboard	display and LED indicators	LCD, 2 line x 16 character, backlight, POWER, RUN, FAULT	
	membrane keys	ENTER/START, RESET/STOP, PREVIOUS, NEXT, ▲ and ▼	
	setup parameters	Adjustment menus: basic, advanced, functions, clock and controls	
	readings display	Voltage, current, power factor (cosφ), torque, power (kVA, kW, kvar) and energy usage	
	graphic display	Current and torque	
	display	Operating status, events, alarms, event log, data	
Control inputs	voltage	24VDC (no need for external feeder)	
	fixed functions	2 for starting and stopping/reset	
	multifunction input (digital functions)	Free-wheel stopping, external alarm, motor preheat, on board control, alarm inhibition, thermal protection manual reset, cascade starting and keypad lock	
	multifunction input (analog functions)	Motor protection via PTC probes, acceleration and/or deceleration ramp via analog input, analog input thresholds for motor starting and stopping, analog input thresholds for programmable relay enable and disable, PT100 input thresholds for motor starting and stopping and PT100 input thresholds for programmable relay enable and disable	
Relay outputs	voltage and capacity	250VAC 5A (AC1)	
	fixed functions	1 with 1 NO + 1NC contacts for overall alarm	
	programmable functions	3 each with 1 NO contact for running motor, motor starting, braking, current tripping threshold, maintenance expiry, etc.	
Analogue output	format configuration	0-20mA, 4-20mA or 0-10V	
	associated source	Current, torque, motor thermal status and power factor	
Communications interface	RS-232 port	Setup and remote control	
	RS-485 port	Used for remote keypad only	
Degree of protection		IP00 ^①	
Cooling system	natural	22-48A (ADX...BP); 17-45A (ADX...B)	—
	forced	58-231A (ADX...BP); 60-245A (ADX...B)	All types
Operating temperature		-10...+45°C (higher up to maximum 55°C with derating)	
Storage temperature		-30...+70°C	
Maximum altitude		1000m	
Maximum pollution degree		3	
Operating position		Vertical ±15°	

^① IP20 for ADX0022BP to ADX0126BP and ADX0017B to ADX0125B only.

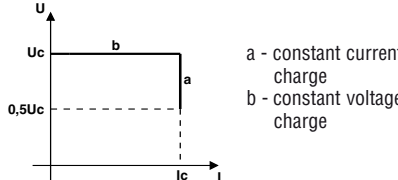
Operational characteristics

TYPE	DCRK5 - DCRK7	DCRK8 - DCRK12	DCRJ8 - DCRJ12	DCRJ12F
AUXILIARY SUPPLY CIRCUIT				
Rated auxiliary voltage (Us)	①	①	110-127 / 220-240VAC ② (dual voltage)	110-127 / 220-240VAC ② (dual voltage)
Operating limit	—		-15 to +10%	
Operating frequency	—		50Hz or 60Hz ±5%	
Power consumption (maximum)	—		9.7VA	9.2VA
Maximum dissipation (output contacts excluded)	—		5.5W	
VOLTAGE CIRCUIT				
Control voltage	380-415VAC ② (powered by monitored voltage)		100-690VAC	
Operating limit	-15 to +10%		85 to +760VAC	
Operating frequency	50 or 60Hz ±1% (self configurable)			
Power consumption	6.2VA	5VA	0.03VA	
Maximum dissipation (output contacts excluded)	2.7W	3W	—	
Maximum dissipation of each output contact (5A 250VAC load)	0.5W			
Immunity time for microbreaking	≤65ms		≤45ms	
No-voltage release	≥8ms			
CURRENT CIRCUIT				
Rated current Ie	5A (1A on request)			
Operating limit	0.125-6A			
Constant overload	1.2 Ie			
Short time withstand current	10 Ie for 1s			
Power consumption	0.65W		0.27VA	
DETECTION DATA				
Type of voltage and current detection	RMS			
Power factor adjustment	0.8 ind.-0.8 cap.			
Type of temperature sensor	Semiconductor (internal)		NTC01 (external)	
Temperature measurement range	-30...+85°C		-40...+85°C external	
RELAY OUTPUTS				
Number of outputs	5 or 7	8 or 12		1
Contact arrangement	1 each W/1 NO contact	7 or 11 contacts each with 1 NO + 1 changeover		1 changeover
Rated capacity Ith	5A - 250V (AC1)			
Maximum capacity of contact common	12A			
Maximum switching voltage	440VAC			
IEC/EN 60947-5-1 designation	B300			
Electrical life (at rated load)	10 ⁵ cycles			
Mechanical life	30x10 ⁶			
STATIC OUTPUTS				
Number of outputs	—		11	
Type of output	—		Opto-isolated bidirectional (Opto-Mosfet)	
Rated operational voltage	—		40VDC - 30VAC	
Rated operational current	—		55mA at 60°C	
CONNECTIONS				
Type of termination	Removable/plug-in			
Conductor cross section	0.2-2.5mm ² (AWG 24-12)			
AMBIENT CONDITIONS				
Operating temperature	-20...+60°C			
Storage temperature	-30...+80°C			
HOUSING				
Version	Flush mount 96x96mm		Flush mount 144x144mm	
Material	Self-extinguishing thermoplastic Noryl		Self-extinguishing thermoplastic LEXAN	

① Refer to data given under voltage circuit below.

② Other voltages available on request.

Operational characteristics

TYPE	BCE...
Description	Single phase automatic battery charger 1 charging level for lead-acid batteries
Supply voltage	220-240VAC $\pm 10\%$ 50/60Hz
Rated output voltage (Ue)	12-24VDC
Rated charging current (Ie)	3-6-12A (12VDC) 2.5-5-10A (24VDC)
CHARGING CYCLE	
Reference standards	DIN 41773
Diagram	 <p>a - constant current charge b - constant voltage charge</p>
End charge voltage (Uc)	12V battery: 13.8VDC (2.3V/cell) 24V battery: 27.6VDC (2.3V/cell)
Charge current (Ic)	Adjustable 30% to 100% Ie (using potentiometer on front)
Current limit	Yes
PROTECTIONS	
	<ul style="list-style-type: none"> - Mains supply fuse (5, 6, 10, 12A types only) - Battery output fuse - Charging inhibition due to: <ul style="list-style-type: none"> • short circuit at battery terminals • battery polarity inverted • low voltage at battery poles (<0.5 Ue) • disconnected battery
ALARM OUTPUT CIRCUIT	
	Static output (NPN transistor) ❶; relay with 1 changeover contact, 5A 250VAC ❷
AMBIENT CONDITIONS	
Operating temperature	-10...+50°C
Storage temperature	-30...+80°C
HOUSING	
Version	Open frame
Degree of protection	IP00
Cooling	Natural
Connections	Removable/plug-in terminals❶ Fixed terminals❷

❶ For 2.5A and 3A types only.

❷ For 5, 6, 10 and 12A types only.

Operational characteristics

TYPE	ATL10	ATL20	ATL30
AUXILIARY SUPPLY			
Rated auxiliary voltage (Us)	12-48VDC	12-48VDC; 220-240VAC	
Operating voltage range	9-70VDC	9-70VDC; 187-264VAC	
Frequency	—	45-65Hz	
Power consumption (maximum)	3W	9VA (240VAC)	
Power dissipation (maximum)	3W	4.1W (48VDC); 6.3W (240VAC)	
Current consumption (maximum)	250mA (12VDC); 130mA (24VDC); 65mA (48VDC)	300mA (12VDC); 180mA (24VDC); 90mA (48VDC)	
Immunity time for microbreakings	50ms	50ms	
VOLTAGE INPUTS			
Maximum rated voltage	480VAC L-L (277VAC L-N)	690VAC L-L (400VAC L-N)	
Measure range	50-576VAC (L-L)	80-800VAC (L-L)	
Frequency range	45-65Hz		
Method of measuring	True RMS value		
Measuring input impedance	>1.1MΩ L-L and >0.5MΩ L-N		
Method of connection	Single-phase, two-phase or three-phase system		
Measuring error	±0.25% f.s. ±1 digit (Class 0.5)		
CURRENT INPUTS			
Number of inputs	6	8	
Type of input	Negative		
Input current	≤10mA		
Input signal - "0" logic state	≤1.5V (2.9V typical)		
Input signal - "1" logic state	≥5.3V (4.3V typical)		
Input signal delay	≥50msec		
RELAY OUTPUTS			
Number of outputs	6	7	
Contact configuration	6 relays, each with 1 N/O contact - 5A - 250VAC (AC1)	- 2 relays, each with 1 N/O contact - 16A - 250VAC AC1 - 3 relays, each with 1 N/O contact - 5A - 250VAC AC1 - 2 relays, each with 1 chang. contact - 5A - 250VAC AC1	
COMMUNICATION LINES			
Serial interface	RS232 connection by RJ6/6 jack	RS232 with programmable baud rate 1200-38400bps connection by RJ6/6 jack	
	—	—	RS485 opto-isolated with programmable baud rate 1200...38400 bps Connection by removable/plug-in terminals
INSULATION VOLTAGE			
Rated insulation voltage Ui	480V	690V	
CONNECTIONS			
Type of terminals	Removable / Plug-in		
Conduction section (min-max)	0.5Nm (4.5 lbin)		
Tightening torque (maximum)	0.2-2.5mm ² (24-12AWG)		
AMBIENT OPERATING CONDITIONS			
Operating temperature	-20...+60°C		
Storage temperature	-30...+80°C		
Relative humidity	<90%		
Maximum pollution degree	2	3	
HOUSING			
Material	Black self-extinguishing Noryl UL94 V0	Self-extinguishing thermoplastic LEXAN	
Version	Flush mount 96x96mm	Flush mount 144x144mm	

Operational characteristics

TYPE		LRD... D024	LRD... A024	LRD... A240
POWER SUPPLY				
Rated utilisation voltage U _e (Frequency range)		24VDC	24VAC	100-240VAC (50-60Hz)
Operating limits		20.4-28.8VDC	20.4-28.8VDC	85-265VAC (47-63Hz)
DIGITAL INPUTS				
Rated voltage		24VDC	24VAC	110-220VAC
Input voltage	State 0	≤ 5VDC / < 0.625mA	<6VAC	< 40VAC / < 0.28mA (LRD10A240) < 0.15mA (LRD20A240)
	State 1	> 15VDC / >1.875mA	>14VAC	> 79VAC / >0.41mA
Delay time	0 to 1	5ms	5ms	50ms (U _e =110VAC) - 25ms (U _e =220VAC)
	1 to 0	3ms	3ms	50ms (U _e =110VAC) - 90ms (U _e =220VAC)
ANALOG INPUTS FOR 24VDC VERSION ONLY				
Input signal range		0-10V	—	—
Display resolution		0.01V	—	—
Conversion		10bit	—	—
Current consumption at 10VDC		< 0.17mA	—	—
Input impedance		< 1kΩ	—	—
Admissible overload		28VDC	—	—
Sampling time		5-20ms (LADDER); 2-10ms (FBD)		
Maximum cable length		≤ 30m of screened type	—	—
DIGITAL OUTPUTS				
Type of output / Rated current I _{th}		Relay / 8A (only for LDR...R... / LRE08R...) Transistor / 0.3A 24VDC (only for LRD...T... / LRE08T...)		
Applied voltage		12-24VAC / 12-125VDC (only for LDR...R... / LRE08R...) 10-28.8VDC (only for LRD...T... / LRE08T...)		
AMBIENT CONDITIONS				
Operating temperature		-0...+55°C		
Storage temperature		-40...+70°C		
Relative humidity		20-90% with condensation		
HOUSING				
Version		Modular for mounting on 35mm DIN rail (IEC/EN 60715) or M4x15mm screw fixing		
Connections	Type of terminal	Screw		
	Conductor section	0.14-2.5mm ² / 26-14 AWG		
	Tightening torque	0.4-0.6Nm / 0.3-0.4lbft		
	Maximum cable length	≤ 100m		
Degree of protection		IP20		

Operational characteristics

TYPE	Single phase	PSL1M 010 12 - PSL1M 010 24	PSL1M 024 12 - PSL1M 024 24	PSL1M 033 12 - PSL1M 036 24	PSL1M 054 12 - PSL1M 060 24	PSL1M 072 12 - PSL1M 100 24	
	Two phase	—	—	—	—	—	
	Three phase	—	—	—	—	—	
INPUT CHARACTERISTICS							
Rated supply voltage	Multivoltage 100...240VAC						
Operating range	90...264VAC / 120...370VDC						
Frequency range	47...63Hz						
PFC	—						
Insulation voltage Input/output	3000VAC						
OUTPUT CHARACTERISTICS							
Voltage	12VDC (PSL1M...12) - 24VDC (PSL1M...24)						
Current	0.83A (PSL1M...12) 0.42A (PSL1M...24)	2A (PSL1M...12) 1A (PSL1M...24)	2.7A (PSL1M...12) 1.5A (PSL1M...24)	4.5A (PSL1M...12) 2.5A (PSL1M...24)	6A (PSL1M...12) 4.2A (PSL1M...24)		
Line adjustment	±1%						
Load adjustment	±1%						
Efficiency	78 (PSL1M...12) 80 (PSL1M...24)	84 (PSL1M...12) 85 (PSL1M...24)	83 (PSL1M...12) 84 (PSL1M...24)	84 (PSL1M...12) 86 (PSL1M...24)	86 (PSL1M...12) 89 (PSL1M...24)		
Overload protection	110-160%	120-160%	110-150%	110-150%	110-150%		
Short-circuit protection	Hiccup			Fold forward			
Parallel connection (n° of units)	—						
INDICATIONS							
LED indicator for power on	Yes						
LED indicator for low voltage	Yes						
Power Rdy (Ready)	—						
CONNECTIONS							
Type of terminal	Screw terminals						
AMBIENT CONDITIONS							
Operating temperature	-25...+71°C						
Storage temperature	-25...+85°C						
Derating >60°C	2.5%/°C						
HOUSING							
Material	Plastic						

PSL1 005 24	PSL1 010 24	PSL1 018 24	PSL1 030 24	PSL1 060 24	PSL1 100 24	PSL1 120 24	PSL1 240 24	PSL1 300 24	PSL1 480 24	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	PSL2 100 24	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	PSL3 120 24	PSL3 240 24	PSL3 480 24	PSL3 960 24
Multivoltage 100...240VAC					Configurable 115-230VAC					Multivoltage 400...500VAC				
90...265VAC / 120...370VDC			85...264VAC / 90...375VDC		90...264VAC / 120...375VDC	90...132VAC - 186...264VAC / 210...370VDC			90...264VAC / 120...370VDC		340...575VAC / 480...820VDC			
47...63Hz														
—					0.7			0.99		0.6			0.7	
3000VAC														
24VDC														
0.21A	0.42A	0.75A	1.25A	2.5A	4.2A	5A	10A	12.5A	20A	4.2A	5A	10A	20A	40A
±1%			0.5%		±1%	±0.5%				±1%				
±2%			0.5%		±1%									
72%	76%	77%	86%	89%	85%	86%	89%		89%	87%	89%	90%	90%	92%
110-135%			110-140%	110-150%	110-140%	110-145%	120-145%		110-140%	115-135%				110-130%
Hiccup			Fold forward		Current limitation									
—					—	3			—	—	2	2	2	
Yes														
Yes			—	—	Yes									
—			Yes (transistor output)		Yes (relay output)									
Screw terminals														
-10...+71°C					-25...+71°C		-10...+71°C	-25...+71°C	-10...+71°C		-25...+71°C			
-25...+85°C														
2.5%/°C	3%/°C	3%/°C	2.5%/°C									3.5%/°C		
Plastic					Metal					Plastic		Metal		