TeSys Integral 63
All-in-one motor starter

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Integral 63: a high performance concept for reliability of operation

Integral 63 all-in-one motor starters combine all the functions of a power switching assembly up to 63 A in a single compact device, with performance equivalent to that of the best separate specialist devices.

They conform to the main standards currently in force, in particular IEC 60947-1, IEC 60947-2, IEC 60947-3, IEC 60947-4-1 and IEC 60947-6-2 (welding of power poles impossible), as well as to international approvals UL, CSA…, and the European directives.

The integral range ensures reliability of operation up to 63 A. In addition to safety of operation, integral has numerous other functions: increased protection, communication, remote control, fault identification, isolation, padlocking.

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Functions performed by Integral 63 units

The equipment in a power switching circuit must perform 4 main functions:
- power switching,
- isolation,
- overload protection,
- short-circuit protection.

These functions are traditionally performed by separate devices which must be combined to form a motor starter assembly, the most common being:
- fuses + contactor + thermal overload relay,
- circuit breaker + contactor + thermal overload relay.

Power switching

Contactor (for automatic and remote control)

- Operational power for use in category AC-43:
  - up to 30 kW at 400/415 V 50 Hz,
  - up to 33 kW at 440/415 V 50 Hz.

- Electrical life in number of operating cycles, in category AC-43, at 415 V and at rated power: 1.2 million.

- Mechanical life in number of operating cycles: 5 million.

Reversing pairs

Two 3-pole contactors, horizontally mounted:
- mechanically interlocked.

Can be fitted with the same protection modules as Integral 63 all-in-one motor starter.

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Functions performed by Integral 63 units (continued)

Isolation

Isolation conforming to IEC 60947

Integral 63 all-in-one motor starters provide isolation and padlocking functions conforming to standards IEC 60947.
In addition, Integral 63 “LD4” all-in-one motor starters and “LD5” reversing all-in-one motor starters incorporate specific poles for control testing and padlocking.

Overload protection

Thermal-magnetic protection module (for protection against overload and overcurrent)

A range of interchangeable modules allows the equipment to be adapted to suit:
- the rated operational current (rating and settings),
- the application:
  - motors,
  - frequent starting motors,
  - distribution circuits.

Short-circuit protection

High breaking capacity current limiting circuit breaker

For short-circuit protection.

High breaking capacity with short-circuit limited by ultra-fast tripping.

Possibility of increasing the breaking capacity of the integral unit by adding a current limiter (**LA9LB920**).

The current limiter is fitted upstream of the integral unit.
Several integral units may be fitted downstream of the current limiter
(Ith = 63 A, Ie = 32 A).

Signalling and attachments

These devices provide comprehensive local signalling:
- pole position indicator,
- different signalling for “overload” and “short-circuit”.

They also allow dialogue with the automated control system by means of numerous add-on blocks:
- auxiliary contact and signalling blocks,
- remote electrical reset device,
- undervoltage and shunt trips,
- control circuit switching,
- etc.

Simple fixing and cabling methods

Integral 63 contractor breakers and reversing all-in-one motor starters fit onto 75 mm ⎓ rails using a separate mounting plate.
integral units can also be mounted on:
- panels,
- pre-slotted mounting plates type AM1 P,
- 2 x 35 mm ⎓ rails using sliding clip nuts,
- CMD prefabricated plug-in busbar trunking (providing an economical assembly, combining safety and simplicity of use),
- AK5 panel busbar systems.

Ref.
Integral 63

Product references

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LD1LD030●

3-pole power bases for AC-3 (1)

Without control test function, with padlocking facility

Standard power ratings of 3-phase motors 50/60 Hz in AC-43					Operational current	Breaking capacity (Iq) for Ue ≤ 415 V	Basic reference (3) To be completed by adding the control circuit voltage code (2)	Weight
220 V 240 V	400 V 415 V	440 V	500 V	660 V				
kW	kW	kW	kW	kW	A	kA		kg
Black knob								
15	30 33	33	37	55	63	50	**LD1LD030●**	3.700

With control test function and padlocking facility

Standard power ratings of 3-phase motors 50/60 Hz in AC-43					Operational current	Breaking capacity (Iq) for Ue ≤ 415 V	Basic reference (3) To be completed by adding the control circuit voltage code (2)	Weight
220 V 240 V	400 V 415 V	440 V	500 V	660 V				
kW	kW	kW	kW	kW	A	kA		kg
Black knob (CNOMO, VDE 0113)								
15	30 33	33	37	55	63	50	**LD4LD130●**	3.800
Red knob on yellow background (CNOMO) Emergency Stop								
15	30 33	33	37	55	63	50	**LD4LD030●**	3.800

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LD5LD130B

3-pole reversing power bases (1)

With control test function and padlocking facility

Standard power ratings of 3-phase motors 50/60 Hz in AC-43					Operational current	Breaking capacity (Iq) for Ue ≤ 415 V	Basic reference (3) To be completed by adding the control circuit voltage code (2)	Weight
220 V 240 V	400 V 415 V	440 V	500 V	660 V				
kW	kW	kW	kW	kW	A	kA		kg
Black knob (CNOMO, VDE0113)								
15	30 33	33	37	55	63	50	**LD5LD130●**	7.600
Red knob on yellow background (CNOMO) Emergency Stop								
15	30 33	33	37	55	63	50	**LD5LD030●**	7.600

(1) To be completed with a protection module (to be ordered separately).
(2) Standard control circuit voltages (for other voltages, please consult your Regional Sales Office):

Volts	24	36	42	48	110	120	220	230	240	380 400	415	440	480	500	600	660
50 Hz	B	–	D	E	F	–	M	M	U	Q	N	N	–	S	–	Y
60 Hz	BC	CC	–	CE	K	FC	LC	MC	MC	–	–	UX	Q	–	S	–
⎓ (4)	BD	–	–	ED	FD	–	–	–	–	–	–	–	–	–	–	–

*(3) Variant: UL508 "type E" approved version (SPCD) at 347/600 V; to order, add suffix **H5** to the reference.*
*Example: **LD1LD030MH5**.*
(4) For use on d.c., the unit is supplied with 1 or 2 converters, including coil suppression devices (2 converters for reversing all-in-one motor starters).

Product references

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LB1LD03M●●

Thermal-magnetic protection modules (compensated and differential for normal starting motors) (1)

Fixed magnetic protection, set at 15 Irth max, for mounting on Integral 63

Standard power ratings of 3-phase motors 50/60 Hz in category AC-43					Thermal setting range (Irth min to Irth max)	Magnetic protection	Reference	Weight
220 V 240 V	400 V 415 V	440 V	480 V 525 V	600 V 690 V				
kW	kW	kW	kW	kW	A	A		kg
3	5.5	5.5	7.5	10	10…13	–	**LB1LD03P16**	0.780
4	9	9	11	15	13…18	–	**LB1LD03P21**	0.780
5.5	11	11	15	18.5	18…25	–	**LB1LD03P22**	0.780
7.5	15	15	18.5	22	23…32	–	**LB1LD03P53**	0.780
9	22	22	25	33	28…40	–	**LB1LD03P55**	0.780
11	25	25	33	45	35…50	–	**LB1LD03P57**	0.780
15	33	33	40	55	45…63	–	**LB1LD03P61**	0.780

Adjustable magnetic protection from 6 to 12 Irth max, for mounting on Integral 63

Standard power ratings of 3-phase motors 50/60 Hz in category AC-43					Thermal setting range (Irth min to Irth max)	Magnetic protection	Reference	Weight
220 V 240 V	400 V 415 V	440 V	480 V 525 V	600 V 690 V				
kW	kW	kW	kW	kW	A	A		kg
3	5.5	5.5	7.5	10	10…13	78…156	**LB1LD03M16**	0.780
4	9	9	11	15	13…18	108…216	**LB1LD03M21**	0.780
5.5	11	11	15	18.5	18…25	150…300	**LB1LD03M22**	0.780
7.5	22	22	25	33	23…32	190…380	**LB1LD03M53**	0.780
9	22	22	25	33	28…40	240…480	**LB1LD03M55**	0.780
11	25	25	33	45	35…50	300…600	**LB1LD03M57**	0.780
15	33	33	40	55	45…63	380…760	**LB1LD03M61**	0.780

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LB6LD03M●●

Magnetic only protection modules (for frequent starting motors)

Standard power ratings of 3-phase motors 50/60 Hz in category AC-43					Magnetic protection	Reference	Weight
220 V 240 V	400 V 415 V	440 V	480 V 525 V	600 V 690 V			
kW	kW	kW	kW	kW	A		kg
3	5.5	5.5	7.5	10	78…156	**LB6LD03M16**	0.780
4	9	9	11	15	108…216	**LB6LD03M21**	0.780
5.5	11	11	15	18.5	150…300	**LB6LD03M22**	0.780
7.5	22	22	25	33	190…380	**LB6LD03M53**	0.780
9	22	22	25	33	240…480	**LB6LD03M55**	0.780
11	25	25	33	45	300…600	**LB6LD03M57**	0.780
15	33	33	40	55	380…760	**LB6LD03M61**	0.780

(1) Protection modules UL and CSA approved.

Product references

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LD1LD030●

3-pole power bases for AC-1 (1)

Without control test function, with padlocking facility

Rated thermal current I th θ ≤ 40 °C	Maximum operational current AC-1 θ ≤ 40 °C	Maximum operational voltage	Breaking capacity (Iq) for Ue ≤ 415 V	Number of poles	Basic reference. To be completed by adding the control voltage code (2)	Weight
A	A	V	kA			kg
Black knob						
63	63	690	50	3	**LD1LD030●**	3.700

With control test function and padlocking facility

Rated thermal current I th θ ≤ 40 °C	Maximum operational current AC-1 θ ≤ 40 °C	Maximum operational voltage	Breaking capacity (Iq) for Ue ≤ 415 V	Number of poles	Basic reference. To be completed by adding the control voltage code (2)	Weight
A	A	V	kA			kg
Black knob (CNOMO. VDE0113)						
63	63	690	50	3	**LD4LD130●**	3.800
Red knob on yellow background (CNOMO. VDE0113) Emergency Stop						
63	63	690	50	3	**LD4LD030●**	3.800

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LB1LD03L●●

Protection modules (for customer assembly)

Thermal-magnetic (compensated)

Thermal setting range (Irth min./Irth max.)	Magnetic setting range (3…6 Irth max)	Number of poles	Number of protected poles	Reference	Weight
A	A				kg
10…13	39…78	3	3	**LB1LD03L16**	0.780
13…18	54…108	3	3	**LB1LD03L21**	0.780
18…25	75…150	3	3	**LB1LD03L22**	0.780
23…32	95…190	3	3	**LB1LD03L53**	0.780
28…40	120…240	3	3	**LB1LD03L55**	0.780
35…50	150…300	3	3	**LB1LD03L57**	0.780
45…63	190…380	3	3	**LB1LD03L61**	0.780

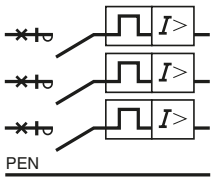
(1) To be completed with a protection module (to be ordered separately).
(2) Standard control circuit voltages (for other voltages, please consult your Regional Sales Office):

Volts	24	36	42	48	110	120	220	230	240	380 400	415	440	480	500	600	660
50 Hz	B	–	D	E	F	–	M	M	U	Q	N	N	–	S	–	Y
60 Hz	BC	CC	–	CE	K	FC	LC	MC	MC	–	–	UX	Q	–	S	–
⎓ (3)	BD	–	–	ED	FD	–	–	–	–	–	–	–	–	–	–	–

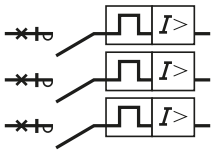
(3) For use on d.c., the unit is supplied with a converter, including coil suppression device.

Product references

Selection of all-in-one starter and protection module for AC-1

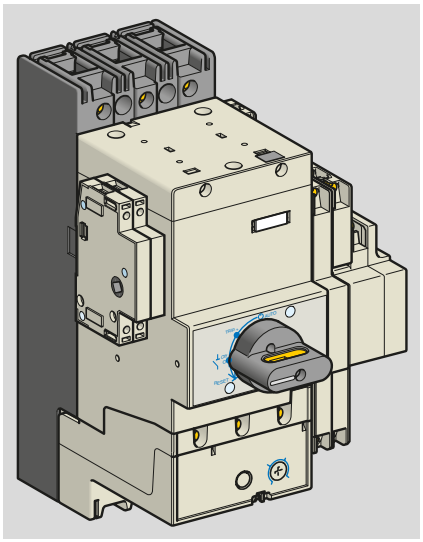
Earthing system	Type of circuit	Equipment scheme	Product combinations 3-pole all-in-one starter + protection module
TNC (Neutral and PE are combined)	3-pole + PEN		LD1LD030● + LB1LD03L●● LD4LD130● + LB1LD03L●● LD4LD030● + LB1LD03L●●

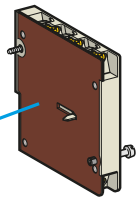
Note: *the PEN conductor must not be isolated,*

Earthing system	Type of circuit	Equipment scheme	Product references 3-pole all-in-one starter + protection module
TNS (Neutral and PE are separated)	3-pole		LD1LD030● + LB1LD03L●● LD4LD130● + LB1LD03L●● LD4LD030● + LB1LD03L●●

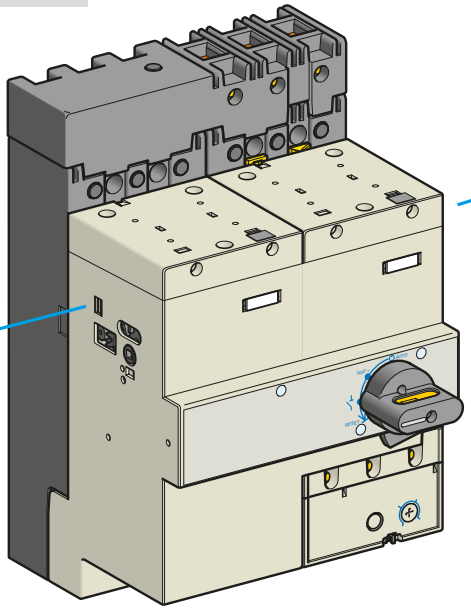
Note: *all live conductors must be isolated. Neutral protection optional.*

Integral 63

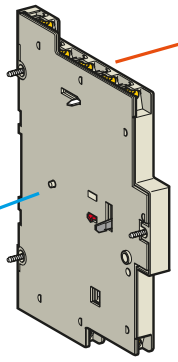




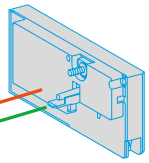
LA1 LC020



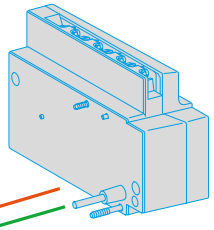
LD5 LD + LB● LD



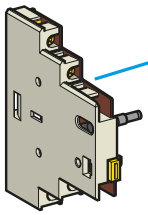
LA1 LC012



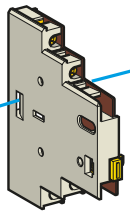
LA1 LC07●●



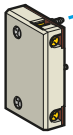
LA1 LC052●



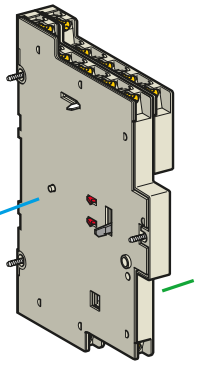
LA1 LC031



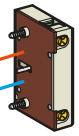
LA1 LC021



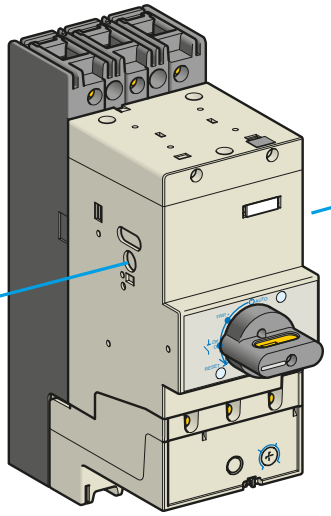
LA1 LC001



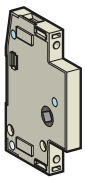
LA1 LC010



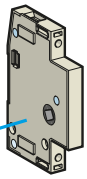
LA1 LC001



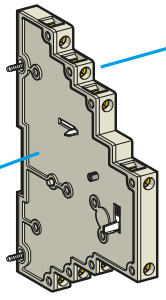
LD1 LD + LB● LD
LD4 LD + LB● LD



LA1 LC030
(LD4)



LA1 LC030
(LD4)



LA1 LC025

Product references

Instantaneous auxiliary contact blocks (IP 20) (1)

For use on	Type and number of blocks per unit	Composition N/O	N/C	C/O	Reference
LD1D, LD4 or **L5** Mounted on RH side	1 block of 6 contacts comprising:				**LA1LC010**
	■ 3 signalling contacts “contactor state”	**2**	**1**	**–**	
		–	**–**	**1**	
	■ 1 signalling contact “control knob in any position other than Auto”	**–**	**–**	**1**	
	■ 1 signalling contact tripped on short-circuit				
	■ 1 signalling contact “tripped”	**–**	**–**	**1**	
	1 block of 5 contacts comprising:				**LA1LC012**
	■ 3 signalling contacts “contactor state”	**2**	**1**	**–**	
		1	**–**	**–**	
	■ 1 signalling contact tripped on short-circuit	**1**	**–**	**–**	
	■ 1 signalling contact “tripped”				
	1 block of 4 contacts comprising:				**LA1LC025**
	■ 3 signalling contacts “contactor state”	**2**	**1**	**–**	
		1	**1**	**–**	
	■ 1 signalling contact “tripped”, selectable by the user				
	1 block of 3 signalling contacts “contactor state”	**2**	**1**	**–**	**LA1LC020**
LD4 Mounted on LH side	1 control circuit isolating block (1 or 2 blocks per unit)	**1**	**–**	**–**	**LA1LC030**
LD5 Mounted on LH side	1 block of 3 signalling contacts “contactor state”	**2**	**1**	**–**	**LA1LB021**
	1 control circuit isolating block comprising 2 contacts	**2**	**–**	**–**	**LA1LC031**

Signalling contact block (IP 10) (1)

For use on	Type and number of blocks per unit	Composition N/O	N/C	C/O	Reference
LD1, LD4 or LD5	1 block comprising 1 signalling contact “contactor state” Mounted on LH or RH side	**–**	**1**	**–**	**LA1LC001**

(1) UL and CSA approved.

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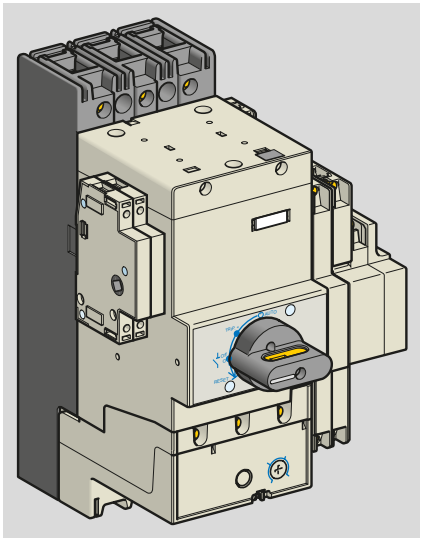

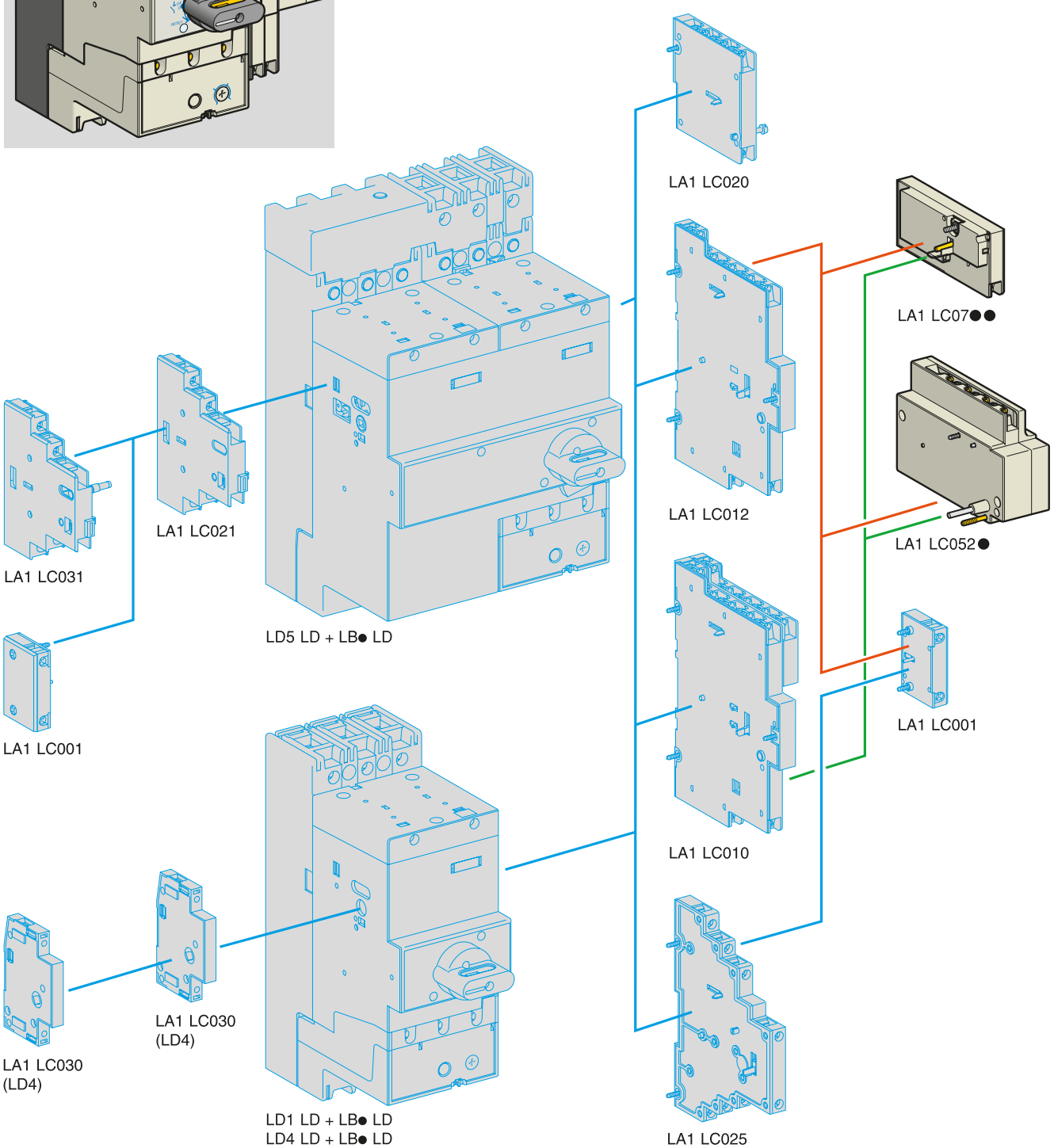

Product references

Electrical tripping and reset devices

For use on	Type and number of devices per unit		Basic reference. To be completed by adding the control voltage code (1)
LD1, LD4 or **LD5** fitted with an **LA1LC010** or **LA1LC012** block	1 undervoltage trip	Time delay 0.2 s	**LA1LC070●**
		Instantaneous	**LA1LC072●**
	or 1 shunt trip	Instantaneous	**LA1LC071●**
LD1, LD4 or **LD5** fitted with an **LA1LC010** or **LA1LC012** add-on block	1 remote electrical reset device	24 V 50/60 Hz	**LA1LC052B**
		42 V 50 Hz 48 V 50/60 Hz	**LA1LC052E**
		100/127 V 50/60 Hz	**LA1LC052F**
		200/240 V 50/60 Hz	**LA1LC052M**

(1) Standard control circuit voltages (for other voltages, please consult your Regional Sales Office):

Volts	24	48	110	120	220/230	240	380/400	415	440
50 Hz	B	E	F	–	M	U	Q	N	N
60 Hz	B	E	F	F	M	M	Q	–	N

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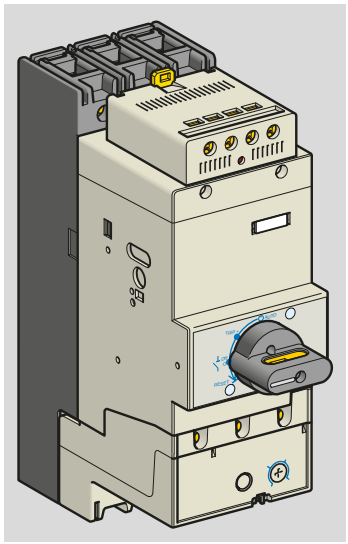
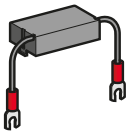
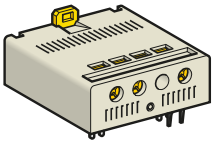
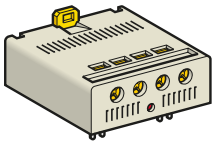




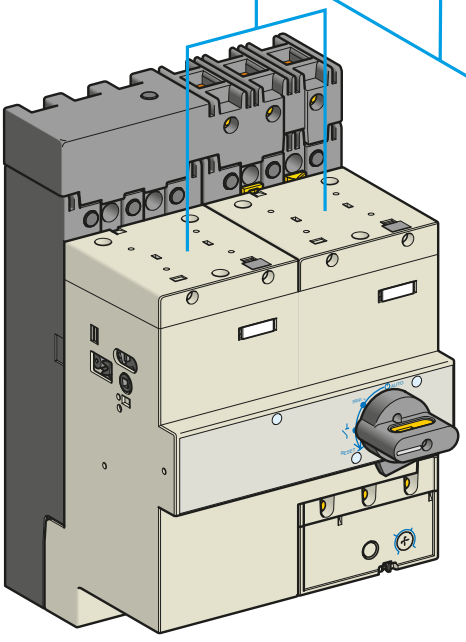
LA9 D09982



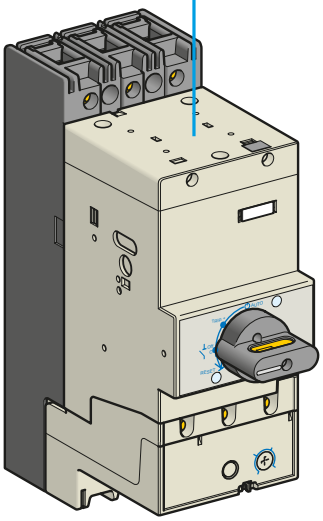
LA1 LD080●D



LA1 LD180BD
LA1 LD580●D



LD5 LD+LB● LD



LD1 LD+LB● LD
LD4 LD+LB● LD

Interface modules for coil control by a programmable Logic controller [1]

Mounting	Type	Input control voltage ⎓	Output operational voltage 50/60 Hz	Reference
		V	V	
On top of the power base	Solid state	5…24	24…240	**LA1LD180BD**
	Relay output	24	24…240	**LA1LD580BD**
		48	24…240	**LA1LD580ED**

Voltage converters for d.c. control by a PLC

Each converter is dedicated to a specific coil.
The d.c. coil and its voltage converter are automatically delivered with every d.c. power base.

Input voltage ⎓	Consumption (Inrush)	Consumption (Sealed)	Reference
V	W	W	
24	300	8	**LA1LD080BD**
48	300	8	**LA1LD080ED**
110	300	8	**LA1LD080FD**

Suppressor module

Mounting	Type	Operational voltage 50/60 Hz	Reference
		V	
Clip-on	RC circuit (Resistor-Capacitor) [2]	≤ 250	**LA9D09982**

(1) For reversing all-in-one motor starters, order 2 interface modules or 2 voltage converters.
(2) An RC circuit provides effective protection for circuits highly sensitive to high frequency interference.
Voltage limited to 3 Uc max. and oscillating frequency limited to 400 Hz max.
Slight increase in drop-out time (1.2 to 2 times the normal time).

Product references

PB121274.eps

LA1LC090

PB121275.eps

LA9LD010

Protection accessories

Description	For use on	Sold in lots of	Unit reference
Power terminal protection shroud	Upstream power terminals (L1, L2, L3)	5	**LA9LD701**
Sealing cover	Protection module	1	**LA1LC090**

Mounting accessories

Description	For use on	Mounting on	Reference
Mounting plate	LD1, LD4, LD5	1 x 75 mm ⊐ rail or 2 x 32 mm ⊏ rails	**LA9LD010**

Door interlock mechanisms (IP 54)

Type	For use on	Colour of knob	Unit reference
Adjustable from 0 to 185 mm with extension (control knob mounted on plate or door)	LD1	Red	**LA9LC330**
		Black	**LA9LC331**
	LD4, LD5	Red	**LA9LC530**
		Black	**LA9LC531**

Product references

PB121276.eps

LX1LD●●●

Replacement a.c. coils

Rated control circuit voltages		Average resistance at 20 °C ±10 %	Inductance of closed circuit	Voltage code (1)	Reference
Uc 50 Hz	Uc 60 Hz				
V	V	Ω	H		
–	24	0.213	0.045	**BC**	**LX1LD020**
24	–	0.323	0.071	**B**	**LX1LD024**
–	36	0.503	0.106	**CC**	**LX1LD030**
–	48	0.845	0.19	**CE**	**LX1LD040**
42	–	0.987	0.22	**D**	**LX1LD042**
48	–	1.26	0.29	**E**	**LX1LD048**
–	110	4.88	1	**K**	**LX1LD090**
–	115/120	5.89	1.18	**FC**	**LX1LD100**
110	–	6.48	1.48	**F**	**LX1LD110**
127	–	9.80	2.13	**G**	**LX1LD127**
–	220	19.82	4.2	**LC**	**LX1LD180**
–	230/240	23.24	4.5	**MC**	**LX1LD190**
220/230	–	30.51	6.7	**M**	**LX1LD220**
240	–	37.66	7.9	**U**	**LX1LD240**
–	440	80.46	16.7	**UX**	**LX1LD360**
380/400	460/480	93.63	20	**Q**	**LX1LD380**
415/440	–	116.46	23.7	**N**	**LX1LD415**
500	575/600	152.18	31	**S**	**LX1LD500**
660	–	290.80	60	**Y**	**LX1LD660**

Consumption at 50 Hz: inrush (cos φ: 0.55) 350 to 400 VA; sealed (cos φ: 0.28) 20 to 30 VA.

Consumption at 60 Hz: inrush (cos φ: 0.55) 420 to 500 VA; sealed (cos φ: 0.30) 24 to 36 VA.

(1) Coil voltage code, used to complete the power base basic reference.

Replacement d.c. coils and associated voltage converters (2)

Mounting	For use on power base ref.	Input operational voltage ⎓ (3)	Consumption		Description	Reference (4)
			Inrush	Sealed		
		V	W	W		
On top of power base	LD●LD●●●BD	24	300	8	Coil	**LX1LD0249**
					Converter	**LA1LD080BD**
	LD●LD●●●ED	48 (5)	300	8	Coil	**LX1LD0489**
					Converter	**LA1LD080ED**
	LD●LD●●●FD	110	300	8	Coil	**LX1LD01109**
					Converter	**LA1LD080FD**

(2) For reversing all-in-one motor starters, order 2 interface modules or 2 voltage converters.
(3) When used on rectified single-phase or 3-phase supply, the peak to peak ripple voltage must be equal to or less than 0.14 of the average voltage.
Operating limits 0.8 to 1.1 Uc for an ambient temperature ⩽ 40 °C.
(4) It is essential that the voltage converter be associated with the specific coil indicated.
(5) 24 V and 48 V converters can be operated by "Low level input". In this case, the control circuit voltage must be the same as the supply voltage (24 or 48 V).

Integral 63

Introduction: pages A5/18 to A5/21
Characteristics: pages A5/22 to A5/27
Curves: pages A5/28 to A5/31
Dimensions, schemes: pages A5/34 to A5/37

Integral 63

Technical Data for Designers

Contents

When designing an installation, it is essential to take into account precise criteria for determining the conductor c.s.a. and selecting equipment.
In particular:
- permissible currents for the conductors,
- maximum voltage drops,
- short-circuit protection,
- protection against indirect contact.

The latter three criteria must be taken into account when selecting the integral unit.

The principle behind the rules described below is, on the whole, common to all European publications. However, the calculations and values concerning protection against indirect contact are based on French standard NF C 15-100, and it is up to the user to check the regulations in force in the country concerned.

Cable protection against overload

To achieve this, the thermal setting value Irth selected must be greater than the current drawn I_B and less than or equal to the permissible current Iz in the cable to be protected.
$I_B < Irth \leqslant Iz$

Short-circuit protection

Breaking capacity rule

Check that the breaking capacity (BC) of the integral unit is equal to or greater than the prospective short-circuit current (Isc max) at the point where it is to be installed.
BC ⩾ Isc max

Breaking time rule

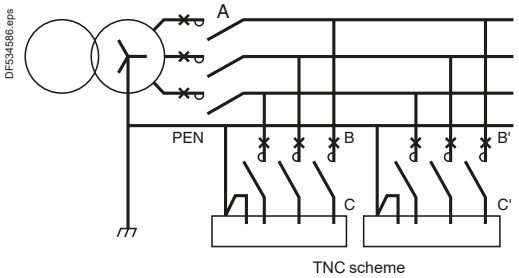
2 conditions must be fulfilled:
- The short-circuit current at the end of the circuit, Isc min, must be greater than or equal to the minimum current required for magnetic tripping of the device,
- The short-circuit current at the start of the circuit, Isc max, must be such that:

$\mathbf{I^2sc\ max\ t_m \leqslant I^2_o t_o}$ $\mathbf{I^2_o t_o}$ = permissible thermal stress limit for the circuit, $\mathbf{t_m}$ = operating time of the integral unit or of the short-circuit protection device.

These 2 checks need only be made when modules with a low rating are used.
Example: for a 6.3/10 A module, a cable c.s.a. ⩾ 2.5 mm² is required to withstand Isc max = 50 kA.

Protection against indirect contact in TN schemes

TN multiple earthed neutral scheme



TNC scheme

- Neutral is connected to earth.
- The earths are connected to neutral.
- Any phase/earth insulation fault causes a short-circuit.
- As contact voltage is dangerous, breaking must occur at the first fault.
- The PE conductor and the neutral conductor may be:
  - combined (TNC scheme),
  - separate (TNS scheme).

Protection against indirect contact in TN schemes

■ Protection against indirect contact (TN schemes), for dead shorts only, requires that the following 2 conditions be fulfilled simultaneously:

□ the fault current Id must be greater than or equal to the minimum current required for magnetic tripping of the integral unit, i.e. 1.12 μ Irth max.

$$Id = c.q.\frac{Uo}{Zb}$$

$$R = \rho\frac{L}{S} = 2\rho\frac{Lc}{S}$$

c = coefficient taking into account the upstream part of the fault loop impedance assumed to be equal to 0.8, unless otherwise indicated.
q = coefficient dependent on the earth connection scheme and equal to 1 in the TN scheme.
Uo = phase-neutral voltage in volts.
Zb = fault loop impedance in mΩ/m such that:
Zb ≠ R (fault loop resistance).
L = length of the fault loop equal to twice the length **Lc** of the circuit.
S = Sph, c.s.a of the phase conductors = S_{PE} = c.s.a. of the protective conductors.
ρ = resistivity of the copper = 0.0225.
μ = ratio between the magnetic tripping current and the maximum setting current of the instantaneous thermal tripping device.

□ the contact voltage (U_L) for a dead short is at most equal to the value determined by the safety curve for the operating time tm of the integral unit in its magnetic tripping zone.
This condition is generally fulfilled for power supplies of 230/415 V.
(In fact, for U_L = 50 V, a tm ⩽ 500 ms would be required and for U_L = 25 V, a tm ⩽ 110 ms would be required).

The first condition allows us to calculate the maximum length of the circuit to provide protection against indirect contact in the TN scheme.
For the TN scheme:

$$L \leqslant \frac{c.q.Uo.Sph}{2\rho.1.\mu\ Irth}$$

i.e. $$L\ max = \frac{0.8 \times Uo \times Sph}{2 \times 0.0225 \times 1.2\ \mu\ Irth\ max}$$

Maximum length of 230/415 V circuits with TN scheme

C.s.a.	Irth max.	μ = 3	μ = 6	μ = 12	μ = 15
mm²	A	m	m	m	m
1.5	10	180	90	45	36
	16	112	56	28	22
2.5	10	298	149	75	60
	16	186	93	47	37
	25	118	59	32	–
	32	92	46	23	–
4	16	296	148	74	60
	25	190	95	48	–
	32	148	74	37	–
	40	118	59	30	–
6	25	284	142	71	–
	32	222	111	56	–
	40	178	89	45	–
	50	142	71	36	–
10	32	370	185	93	–
	40	296	148	74	–
	50	236	118	59	–
	63	188	94	47	–
16	32	590	295	148	–
	40	472	236	118	–
	50	378	189	95	–
	63	300	150	75	–
25	32	922	461	281	–
	40	738	369	185	–
	50	590	295	148	–
	63	468	234	117	–

References: pages A5/4 to A5/15
Characteristics: pages A5/22 to A5/27
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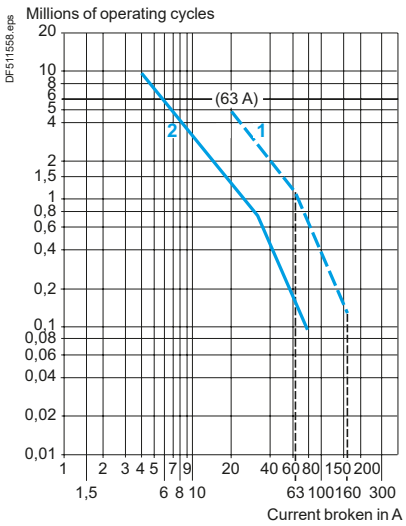
Selection for a temperature θ ≤ 40 °C						
Rated operational voltage	**V**	**220/240**	**400/415**	**440**	**480/525**	**600/690**
Rated operational currents (according to the rated operational voltage)						
Integral 63	**A**	63	63	63	63	63
Rated operational powers (for standard motors)						
Integral 63	**kW**	15	33	33	37	55

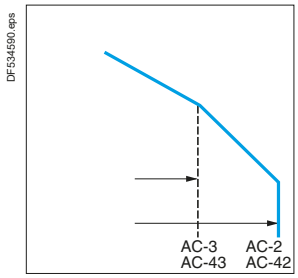
Electrical durability

Control and protection of motors at Ue ≤ 415 V

- in utilisation categories AC2, AC3 conforming to IEC 60947-4-1,
- in utilisation categories AC2, AC3 conforming to IEC 60947-6-2.



1 Not having previously broken a short-circuit current
2 Having broken a short-circuit current 10 times at 30 Ie (most common values of short-circuit current during operation)



a.c. supply, utilisation categories AC-1, AC-3, AC-41, AC-43

Rated operational currents (according to ambient temperature)

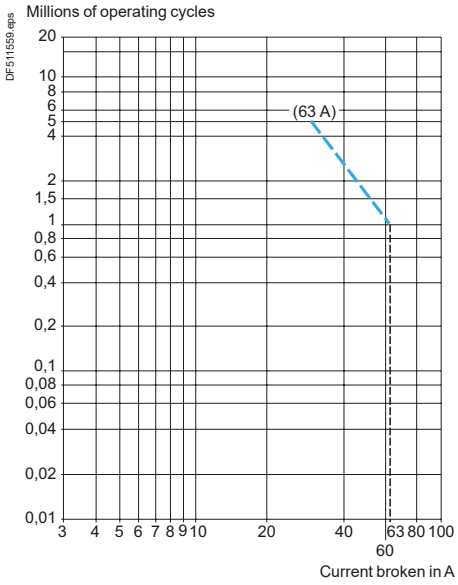
	With cable c.s.a.		θ ≤ 40 °C	θ ≤ 55 °C	θ ≤ 70 °C
Integral 63	16 mm²	**A**	63	55	50

a.c. supply, utilisation categories AC-1, AC-41

Maximum operating rates in operating cycles/hour

		On-load factor 85 %		On-load factor 25 %
		Operation at Ie max	Operation at 0.5 Ie	Operation at Ie max
Integral 63	**Operating cycles/h**	1200	2400	1800

Electrical durability Ue ≤ 415 V



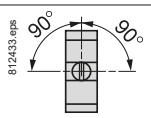
Note: *for use in category AC-44, please consult your Regional Sales Office.*

Ref.
Integral 63

Characteristics

Type				Integral 63
Number of poles				3
Rated operational current (Ie)	In AC-3		**A**	63
Rated operational voltage (Ue)			**V**	690
Electrical durability	In AC-3 at 400 V			1.2 million operating cycles
Mechanical durability at Uc				5 million operating cycles
Maximum operating rate at ambient temperature ≤ 55 °C	~			3600 operating cycles/hour
	⎓ with converter			600 operating cycles/hour

Environment

Conforming to standards				IEC: 158-1, 204-1, 204-2, 364, 947-1/2 and 4
				UTE: NF C 63-110, C 63-120, C 63-130, C 63-650, C 79-100, C 20-040
				VDE: 0100, 0110, 0113, 0170, 0171, 471, 0660
				BS: 5424, 4752, 4941
				NEN, NBN
Product certifications				ASE, ASEFA, ASTA, BV, CSA, DEMKO, DNV, GL NEMKO, NKK, ÖVE, RINA, SCC, SETI, UL, USSR, LROS
Protective treatment				"TH"
Ambient air temperature around the device	~	Operation	**°C**	-20…+60
		Storage	**°C**	-40…+80
	⎓ (1)	Operation	**°C**	-25…+50
		Storage	**°C**	-25…+70
Vibration resistance Permissible acceleration	5…100 Hz			Energised state: 3 gn
				De-energised state: 3 gn
Shock resistance Permissible acceleration	Impulse duration: 11 ms			Energised state: 8 gn
				De-energised state: 8 gn
Degree of protection	Conforming to IEC 60144 & 60529			IP 20B
	Conforming to VDE 0106			Protection against direct finger contact
Flame resistance				Conforming to IEC 60295-2-1, NF C 20-455 and decree of 22-12-81 (JO 27 NC of 1st and 2/2/1982) Conforming to UL 94 - V0 and NF T 51-072
Maximum operating altitude	Without derating		**m**	3000
Operating positions (without derating)	In relation to normal vertical mounting plane			From main axis (left-right tilt) 

Control circuit characteristics

Rated control circuit voltage (Uc)	~ 50 Hz		**V**	24…660
	~ 60 Hz		**V**	24…600
	⎓ with converter		**V**	24, 48, 110
Voltage limits at θ ≤ 55 °C	Operation			0.85…1.1 Uc
	Drop-out			0.25…0.7 Uc
Average consumption at 20 °C and at Uc	~	Inrush	**VA**	375 (50 Hz), 450 (60 Hz)
		Sealed	**VA**	25 (50 Hz or 60 Hz)
	⎓ (1)	Inrush	**W**	300 for 50 ms
		Sealed	**W**	8
Heat dissipation			**W**	8 (50 Hz), 11 (60 Hz)
Operating time (2) at 20 °C and at Uc	~ 50/60 Hz	"C"	**ms**	12…35
		"O"	**ms**	7…20
	⎓ with converter	"C"	**ms**	25…40
		"O"	**ms**	15…25

(1) With converter.
(2) The closing time "C" is measured from the moment the coil supply is switched on to initial contact of the main poles.
The opening time "O" is measured from the moment the coil supply is switched off to the moment the main poles separate.

References: pages A5/4 to A5/15
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Characteristics

Pole characteristics

Type			Integral 63					
Conventional thermal current (Ith)	θ ≤ 40 °C	A	63					
Frequency limits of the operational current		Hz	40…60					
Rated impulse withstand voltage (Uimp)	Conforming to IEC 60947-4	kV	8					
Rated insulation voltage (Ui)	Conforming to IEC 60947-1	V	690					
Heat dissipation in the power circuits of the all-in-one motor starter and its protection module	Operational current	A	25	32	40	50	63	
	Power per pole, hot state	W	4.4	5	5.8	7	9	
Rated making capacity								
I rms	Conforming to IEC 60947-4	A	12 or 15 x Ith (above this value. the breaker trips)					
I peak	Conforming to IEC 60947-2	kA	105					
Rated breaking capacity								
conforming to IEC 60947-2	Operational voltage	V	**220/240**	**380/415**	**440**	**480/525**	**600/690**	
	Value of cos φ		0.25	0.25	0.25	0.25	0.5	
	Cycle P1 (O-t-CO) Icu (1)	kA rms	50	50	50	35	10	
	Cycle P2 (O-t CO-t-CO) Ics (1)	kA rms	50	50	50	35	10	
conforming to IEC 60947-6-2 ensuring reliability of operation	Icu = Ics	kA rms	up to 80 (see table page A5/27)	up to 80 (see table page A5/27)	50	30	10	
Total breaking time		ms	4					
Electrical durability in AC-3 at Ie max and at 415 V after 1 cycle O-CO-r-CO at Isc	Prospective rms short-circuit current at terminals of a new device	kA	3	10	25	35	50	80
	Millions of operating cycles		1	0.9	0.6	0.5	0.2	(2)
Thermal limit	With Isc max. at 415 V, 50 Hz	A^2s	300 x 10^3					
Cabling			Maximum c.s.a.		Minimum c.s.a.			
	Flexible cable without cable end	mm^2	1 x 50 or 2 x 35		1 x 6			
	Flexible cable with cable end	mm^2	2 x 25		1 x 6			
	Solid cable	mm^2	1 x 50		1 x 6			
Tightening torque		N.m	6					

Characteristics of thermal-magnetic or magnetic only protection modules

Module type			LB1LD03P	LB1LD03M	LB6LD03M	LB1LD03L
Protection			Standard motors	Standard motors	Frequent starting	Distribution circuits
	Conforming to standards		NF C 63-650	NF C 63-650	NF C 63-650	NF C 63-120
	Number of poles		3	3	3	3
	Number of protected poles		3	3	3	3
	Rated operational voltage	V	690	690	690	690
	Max. continuous current	A	13…63	13…63	13…63	13…63
Thermal protection	Setting (Irth min./Irth max.)	A	10/13…45/63	10/13…45/63	–	10/13…45/63
	Temperature compensation	°C	-20…+60	20…+60	20…+60	20…+60
	Protection against phase imbalance		With	With	Without	Without
	Tripping class		20	20	–	–
Magnetic protection conforming to IEC 60947-1/2/4/6-2	Instantaneous trip current setting range		Fixed at 15 Irth max	6…12 Irth max (usual setting 9…10 Irth maxi)	6…12 Irth max	3…6 Irth max
	Tripping tolerance		±20 %	±20 %	±20 %	±20 %

Characteristics of versions without control test function, with padlocking facility

Conforming to standards			IEC 60947
Rated operational voltage		V	690
Mechanical durability	Operating cycles		10 000
Padlocking			By 1, 2 or 3 padlocks, Ø8 mm shank

Characteristics of versions with control test function and padlocking facility

Conforming to standards			IEC 60947, NF C 63-130, VDE 0660, VDE 0113
Rated operational voltage		V	690
Mechanical durability	Operating cycles		10 000
Padlocking			1, 2 or 3 padlocks, shank Ø8 mm max and Ø5 mm min. When flush mounting, interlocking of the enclosure or cabinet door is possible.

(1) O: breaking short-circuit current (open),
t: time
CO: closing on short-circuit, breaking short-circuit current (closed-open)

(2) Please consult us.

References: pages A5/4 to A5/15
Introduction: pages A5/18 to A5/21
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Characteristics

Instantaneous auxiliary contacts LA1L●●

Conventional thermal current (Ith)		A	6				
Rated insulation voltage (Ui)	Conforming to IEC 60947-5-1	V	690				
Switching capacity	With U ≥ 17 V and I ≥ 10 mA	mVA	600				
Rated operational power	∼ category AC-15 (1)	**Voltage**	**V**	**48**	**110/127**	**220/240**	**380/415**	**440**
	1 million operating cycles	VA	300	500	600	520	500
	1.5 million operating cycles	VA	160	300	330	300	280
Making capacity	∼ category AC-15	VA	1500	3500	6000	7500	7000
Rated operational power	⎓ category DC-13 (2)	**Voltage**	**V**	**24**	**48**	**110**	**220**	**440**
	1 million operating cycles	W	120	90	75	68	61
	1.5 million operating cycles	W	70	50	38	33	28
Making capacity	⎓ category DC-13	W	800	700	400	260	220
Cabling		mm²	Maximum c.s.a.: 2 x 2.5 Minimum c.s.a.: 2 x 1				

Isolating auxiliary contacts LA1LC03●

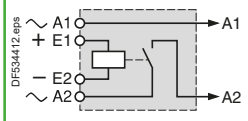
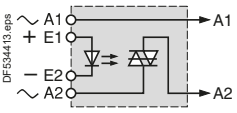
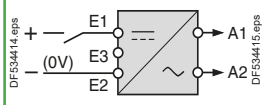
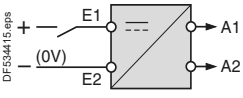
Conventional thermal current (Ith)		A	6				
Rated insulation voltage (Ui) Conforming to IEC 60947 and NF C 63-130	a.c. supply	V	690				
	d.c. supply	V	125				
Cabling		mm²	Maximum c.s.a.: 2 x 1.5 or 1 x 2.5				

Signalling contacts LA1LC001

Conventional thermal current (Ith)		A	3				
Rated insulation voltage (Ui)	Conforming to IEC 60947-5-1	V	250				
Operational power for 200000 operating cycles	∼ **Voltage**	**V**	–	–	**110/127**	**220**
	Resistive load	VA	–	–	600	750
	Lamp load (3)	VA	–	–	90	125
	Inductive load (4)	VA	–	–	875	500
	Motor (5)	VA	–	–	160	200
	⎓ **Voltage**	**V**	**24**	**48**	**110/125**	**200**
	Resistive load	W	100	100	50	50
	Lamp load (3)	W	50	50	6	7.5
	Inductive load (4)	W	75	75	50	50
	Motor (5)	W	75	75	6	7.5
Cabling		mm²	Maximum c.s.a.: 2 x 2.5 Minimum c.s.a.: 2 x 1				

(1) Electrical durability on an inductive load such as the coil of an electromagnet: making current (cos φ 0.7) = 10 times the power broken (cos φ 0.4).
(2) Electrical durability on an inductive load such as the coil of an electromagnet, the time constant increasing with the load.
(3) Lamp load: peak current = 10 times the rated current.
(4) Inductive load: cos φ 0.4 for a.c. operation; time constant 7 ms for d.c. operation.
(5) Motor: peak current = 6 times the rated current.

Characteristics

Type			Interface modules						Converters					
Used for control of the integral 32			By a programmable controller, with a.c. control of the electromagnet						By a programmable controller, with d.c. control of the electromagnet Control on d.c. supply					
Ambient air temperature around the device														
	Storage	°C	-25…+70						-25…+50					
	Operation	°C	-25…+50						-25…+50					
Isolation		kV	rms voltage between inputs and outputs: 2.5						Common negative terminal					
Cabling	Min.	mm²	1 x 1						1 x 1					
	Max.	mm²	2 x 2.5						2 x 2.5					
Operating limits			0.85...10.1 Uc						0.8...1.1 Uc (2)					
Protection			Against reverse polarity (by diode) and against overvoltage						Against reverse polarity (by diode) and against overvoltage					
Module or converter type			**LA1LC**						**LA1LC**					
			580BD	**580ED**		**180BD**			**080BD**	**080ED**		**080FD**		
Control circuit characteristics														
Schemes			**LA1LC●580●D**			**LA1L●180BD**			**LA1L●080BD** **LA1L●080ED**			**LA1L●080FD**		
														
Indication of input state			By LED			–			–					
Input signals (logic side)	**Voltage**	**V**	**⎓ 24 (E1-E2)**	**⎓ 48 (E1-E2)**	**⎓ 5…24 (E1-E2)**	**⎓ 24 (E1-E2)**	**⎓ 48 (E1-E2)**	**⎓ 5…24 (E1-E2)**	**⎓ 24 (1) (E3-E2)**	**⎓ 48 (1) (E3-E2)**	**–**	**⎓ 24 (1) (E3-E2)**	**⎓ 48 (1) (E3-E2)**	**–**
	Current	mA	30	20	15…24 V 8.5…5 V	50	25	15…24 V 8.5…5 V	20	10	–	20	10	–
State "0" guaranteed	For U	V	< 2.4	< 4.8	< 2.5	< 2.4	< 4.8	< 2.5	<7	< 14	–	< 7	<14	–
	For I	mA	< 2	< 2	< 2	< 2	< 2	< 2	< 5	< 2.5	–	< 5	< 2.5	–
State "1" guaranteed	For U	V	> 20.4	> 40.8	> 4	> 20.4	> 4	> 4	> 14	> 28	–	> 14	> 28	–
Supply voltage		V	∼ 24…240 (A1-A2)	∼ 24…240 (A1-A2)	∼ 24…240 (A1-A2)	∼ 24…240 (A1-A2)	∼ 24…240 (A1-A2)	∼ 24…240 (A1-A2)	⎓ 24 (2) (E1-E2)	⎓ 48 (2) (E1-E2)	⎓ 110 (2 (E1-E2)	⎓ 24 (2 (E3-E2)	⎓ 48 (2 (E3-E2)	⎓ 110 (2 (E1-E2)
Operating characteristics														
Electrical durability in millions of operating cycles			5						1					
Average consumption	Inrush 50 Hz	VA	160	160	160	375	375	375	–	–	–	–	–	–
	60 Hz	VA	185	185	185	450	450	450	–	–	–	–	–	–
	⎓	W	–	–	–	–	–	–	250	250	250	300	300	300
	Sealed 50/60 Hz	VA	12	12	12	25	25	25	–	–	–	–	–	–
	⎓	W	–	–	–	–	–	–	4	4	4	8	8	8
Operating time at 20 °C and at Uc	Pull-in	ms	15…30	15…30	10…35	20…40	20…40	10…45	30	30	30	35	35	35
	Drop-out	ms	22…35	22…35	8…30	25…45	25…45	8…30	15	15	15	20	20	20

(1) For direct control by external contact: connect E1-E3.
(2) Warning: for supply from rectified a.c., the 2 following conditions must be met: the power supply must exceed 300 VA and the maximum ripple must be ⩽ 14 %.

References: pages A5/4 to A5/15
Introduction: pages A5/18 to A5/21
Curves: pages A5/28 to A5/31
Dimensions, schemes: pages A5/34 to A5/37

Characteristics

Environment

Conforming to standards			IEC 60337-1
Protective treatment			"TH"
Ambient air temperature around the device	Storage	°C	-40…+80
	Operation	°C	-25…+55
	Permissible for operation at Uc	°C	-25…+70
Protection against direct finger contact			Conforming to VDE 0106

Tripping devices

Type			LA1LC070●, LC072●	LA1LC071●
Pull-in voltage	Uc		0.8…1.1	0.7…1.1
Drop-out voltage	Uc		0.35…0.7	–
Average consumption	Inrush	VA	8	8
	Sealed	VA	4	4
Minimum pulse time		ms	–	10

Reset devices

Type		LA1LC052●
Consumption	VA	9
Duration of a reset cycle	s	9
Minimum pulse duration	s	0.5

Suppressor module LA9D09982

Type of protection		RC (resistor-capacitor)
Connection scheme		
Operational voltage	V	≤ 250

Ref.
Integral 63

Breaking capacity of Integral 63 all-in-one motor starters, according to the operational voltage and protection module fitted.

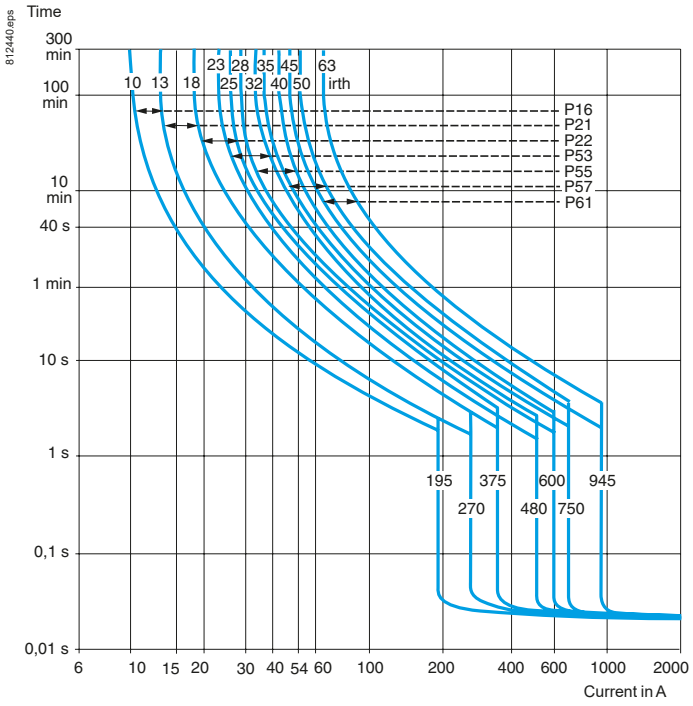
Breaking capacity

Protection module			Operational voltage				
Reference	Irth		220/240 V	400/415 V	440 V	500 V	600/690 V
	min	max					
	A	A	kA	kA	kA	kA	kA
LB●LD03●16	10	13	⩾ 130	⩾ 130	⩾ 130	⩾ 130	10
LB●LD03●21	13	18	⩾ 130	⩾ 130	⩾ 130	⩾ 130	10
LB●LD03●22	18	25	⩾ 130	⩾ 130	50	35	10
LB●LD03●53	23	32	⩾ 130	80	50	35	10
LB●LD03●55	28	40	⩾ 130	80	50	30	10
LB●LD03●57	35	50	⩾ 130	80	50	30	10
LB●LD03●61	45	63	⩾ 130	50	50	30	10

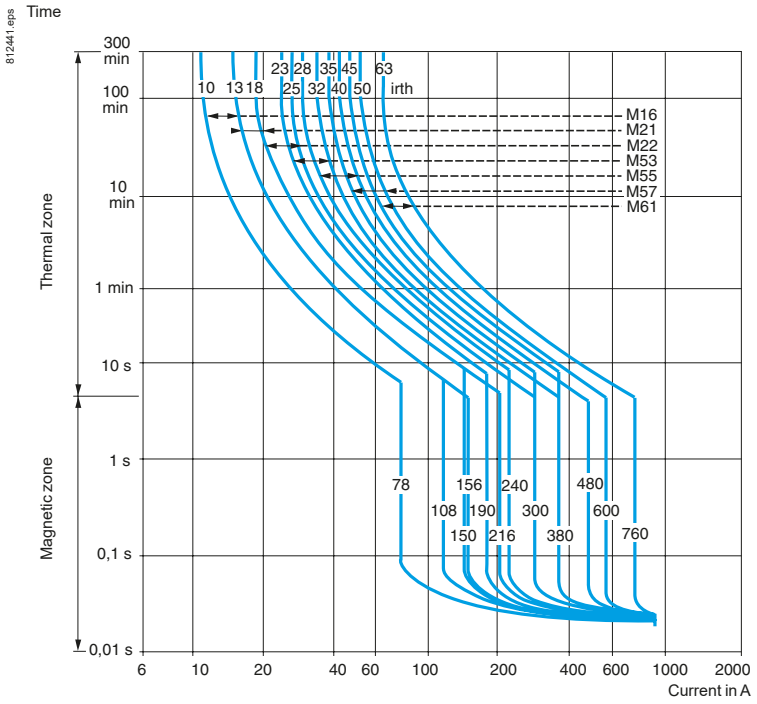
References:
pages A5/4 to A5/15
Introduction:
pages A5/18 to A5/21
Curves:
pages A5/28 to A5/31
Dimensions, schemes:
pages A5/34 to A5/37

Motor protection (normal starting) - Tripping curves

By thermal-magnetic modules LB1LD03P (1)



By thermal-magnetic modules LB1LD03M (1)

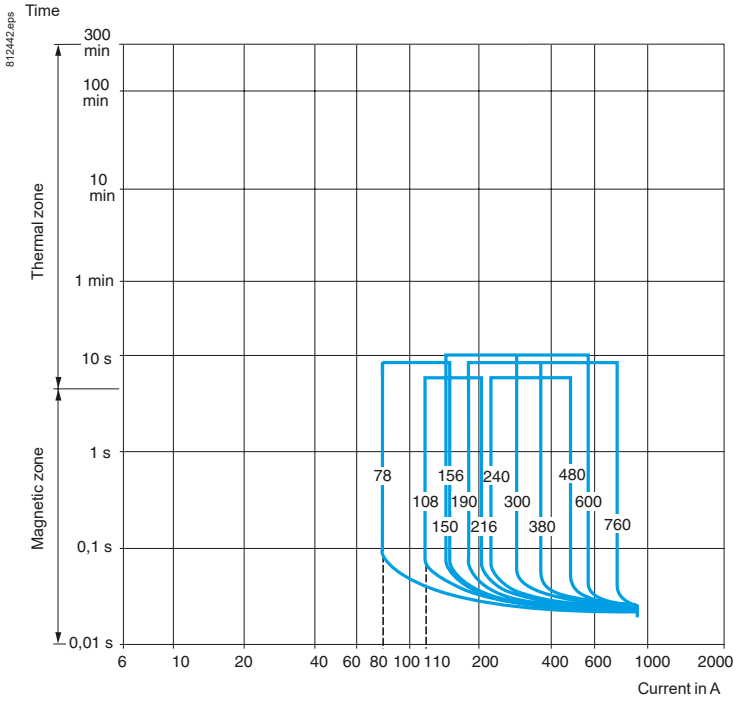


(1) Thermal protection: the average operating times shown in the above curves are for an ambient air temperature of 20 °C, without prior current flow (cold state). The average operating times after prolonged current flow (hot state) can be calculated by applying the coefficient 0.5.

References: pages A5/4 to A5/15
Introduction: pages A5/18 to A5/21
Characteristics: pages A5/22 to A5/27
Dimensions, schemes: pages A5/34 to A5/37

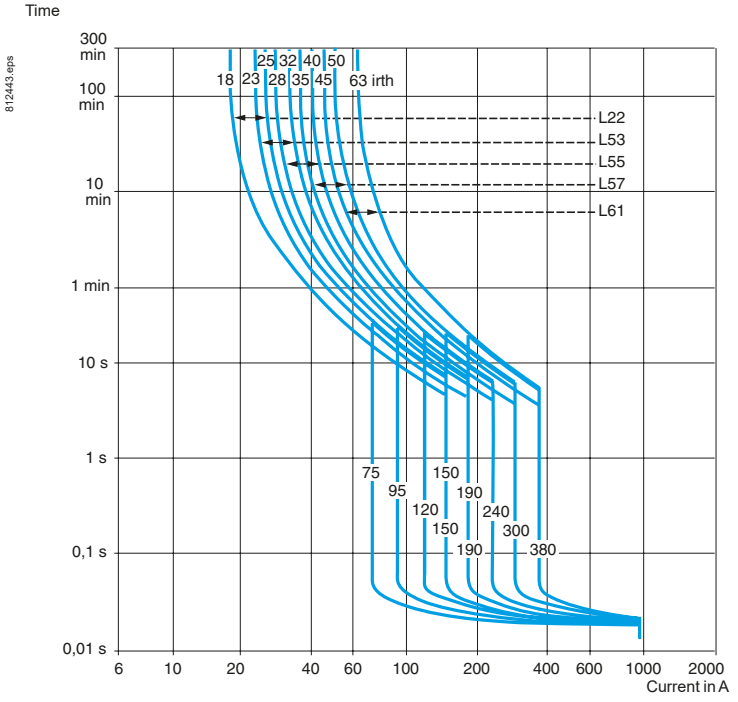
Motor protection (frequent starting) - Tripping curves

By magnetic modules LB6LD03M



Distribution circuit protection - Tripping curves

By thermal-magnetic modules LB1LD03L

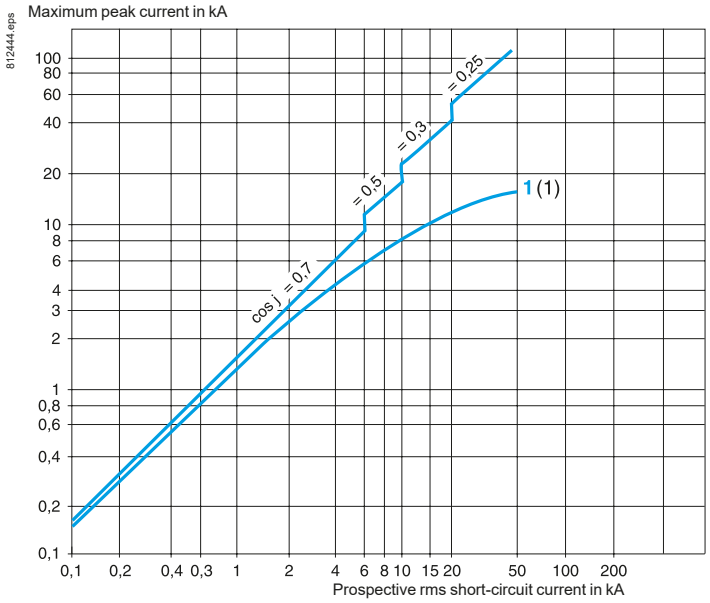


References:
pages A5/4 to A5/15
Introduction:
pages A5/18 to A5/21
Characteristics:
pages A5/22 to A5/27
Dimensions, schemes:
pages A5/34 to A5/37

Current limitation and thermal limit on short-circuit

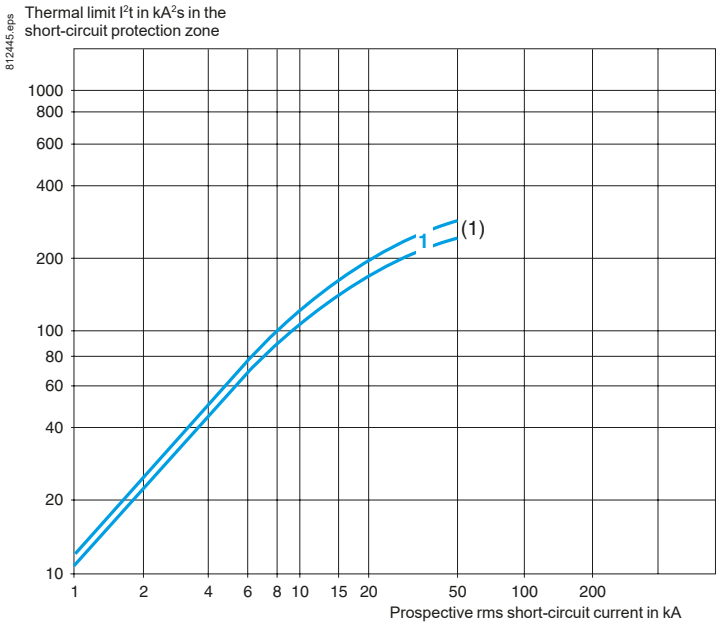
3-phase 400/415 V, 50 Hz

Current limitation on short-circuit



1 18 to 25 A up to 45 to 63 A

Maximum thermal limit on short-circuit



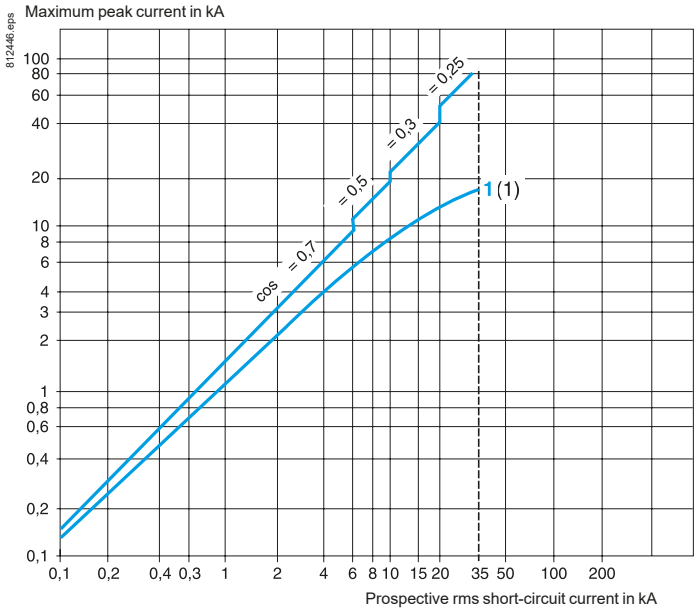
1 18 to 25 A up to 45 to 63 A

(1) ***LB1LD03●22*** *to* ***LD06●61****: rating of associated thermal overload module.*

Current limitation and thermal limit on short-circuit

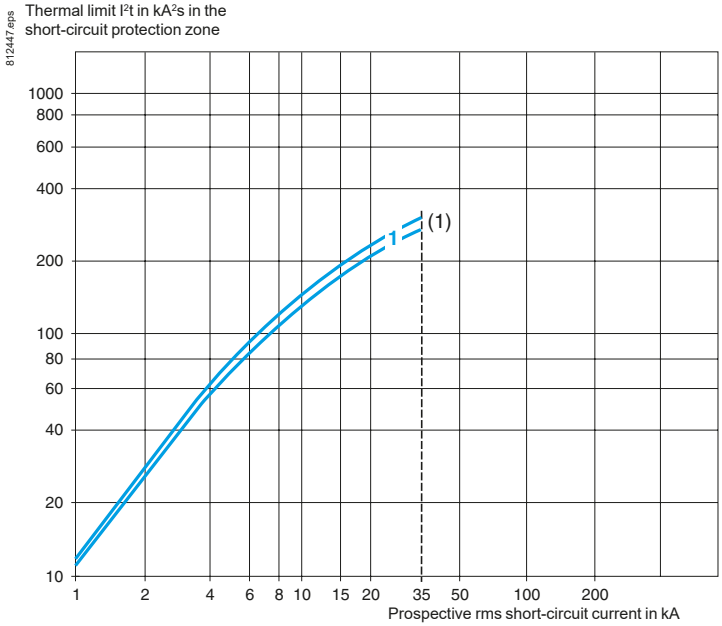
3-phase 480/500 V, 50 Hz

Current limitation on short-circuit



1 18 to 25 A up to 45 to 63 A

Current limitation on short-circuit



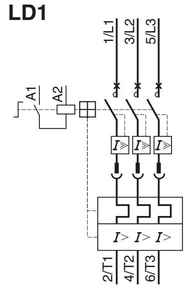
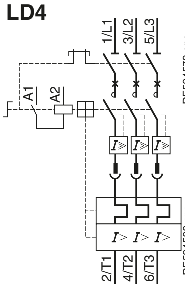
1 18 to 25 A up to 45 to 63 A

(1) ***LB1LD03●22*** *to* ***LD03●61****: rating of associated thermal overload module.*

Ref.
Integral 63

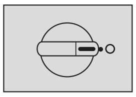
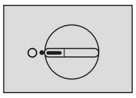
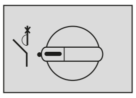
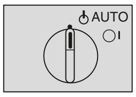
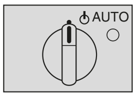
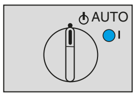
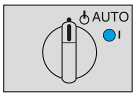
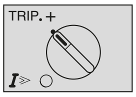
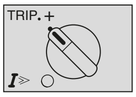
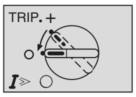
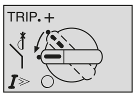
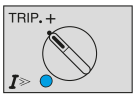
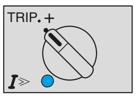
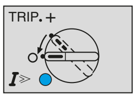
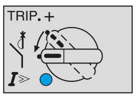
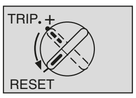
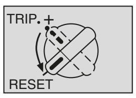
Integral 63 All-in-one motor starter

Operating status indication

LD1	LD4
	

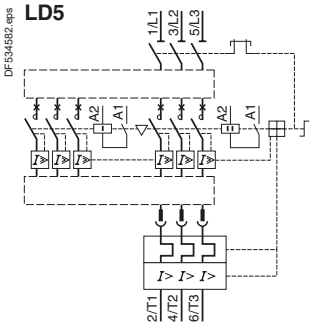
□ *Contact open*
■ *Contact closed*

Auxiliary contact actuators / **Auxiliary contacts**

LD1	LD4	LA1 LC010 (13 23 31 / 14 24 32)	LA1 LC010 (16 18 / 15)	LA1 LC010 (06 08 / 05)	LA1 LC010 (96 98 / 95)	LA1 LC012 (13 23 31 / 14 24 32)	LA1 LC012 (08 / 05)	LA1 LC012 (98 / 95)	LA1 LC025 (13 23 31 / 14 24 32)	LA1 LC025 (96 98 / 95 ou 95)	LA1 LC001 (41 / 42)	LA1 LC020 (13 23 31 / 14 24 32)	LA1 LC030 ((53) 63 / (54) 64)
Off + control test function		□□■	□■	■□	■□	□□■	□	□	□□■	■ □	■	□□■	□
Off 		□□■	□■	■□	■□	□□■	□	□	□□■	■ □	■	□□■	■
On, contactor open 		□□■	■□	■□	■□	□□■	□	□	□□■	■ □	■	□□■	■
On, contactor closed 		■■□	■□	■□	■□	■■□	□	□	■■□	■ □	□	■■□	■
Off after overload 		□□■	□■	■□	□■	□□■	□	■	□□■	□ ■	■	□□■	■
Tripped on overload 		□□■	□■	■□	■□	□□■	□	□	□□■	■ □	■	□□■	■
Tripped on short-circuit 		□□■	□■	□■	□■	□□■	■	■	□□■	□ ■	■	□□■	■
Off after short-circuit 		□□■	□■	□■	■□	□□■	■	□	□□■	■ □	■	□□■	■
Manual reset 		□□■	□■	■□	■□	□□■	□	□	□□■	■ □	■	□□■	■

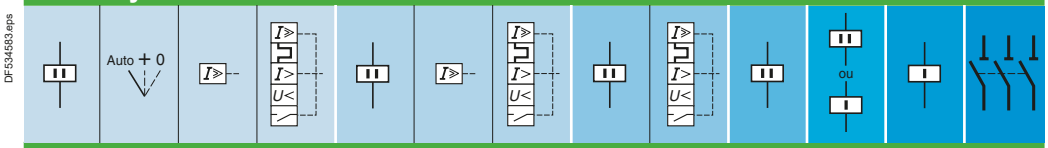
Operating status indication

LD5



Contact open

Contact closed



Auxiliary contact actuators

Auxiliary contacts

DF536039.eps

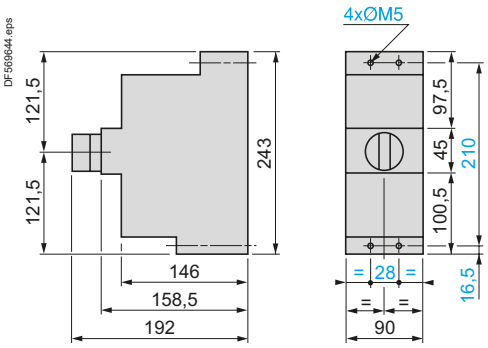
	LA1 LC010				LA1 LC012			LA1 LC025			LA1 LC020	LA1 LC001	LA1 LC021	LA1 LC031
	13 23 31 14 24 32	16 18 15	06 05	96 98 95	13 23 31 14 24 32	08 05	98 95	13 23 31 14 24 32	96 98 95 95		13 23 31 14 24 32	41 42	13 23 31 14 24 32	53 63 54 64
Off + control test function														
Off														
On, reversing contactor open														
On, closed														
On, closed														
Tripped on overload														
Off after overload														
Tripped on short-circuit														
Off after short-circuit														
Manual reset			06 08 05											

References: pages A5/4 to A5/15
Introduction: pages A5/18 to A5/21
Characteristics: pages A5/22 to A5/27
Curves: pages A5/28 to A5/31
Dimensions, schemes: pages A5/34 to A5/37

All-in-one motor starters Integral 63

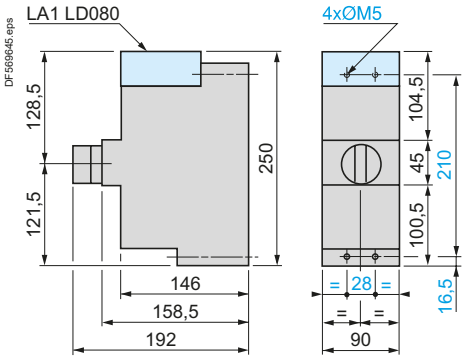
Control circuit: a.c.

LD●LD●30 + LB●LD03



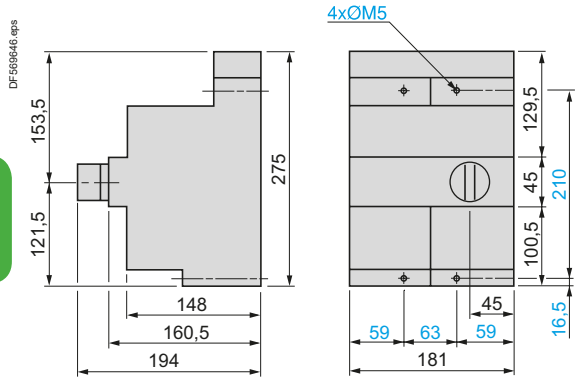
Control circuit: d.c.

LD●LD●30 + LB●LD03 + LA1LD080



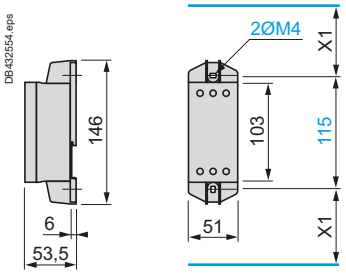
Reversing all-in-one motor starters Integral 63

LD5LD●30 + LB●LD03M



Current limiter

LA9LB920

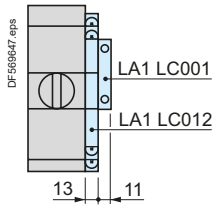


X1: Electrical clearance = 30 mm for Ue ≤ 690 V

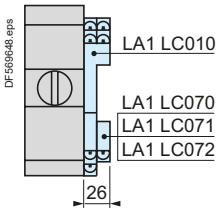
Add-on blocks

For mounting on all-in-one motor starters Integral 63

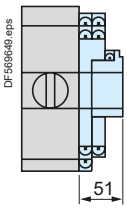
LA1LC012
LA1LC001



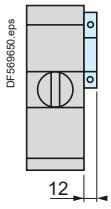
LA1LC010
LA1LC07●



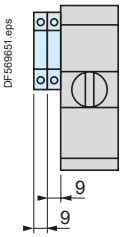
LA1LC052



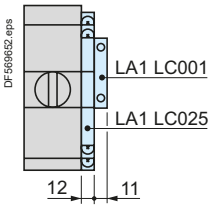
LA1LC020



LA1LC030
(1 ou 2)

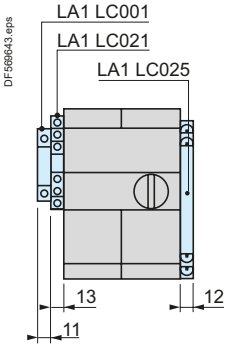


LA1LC025
LALC001

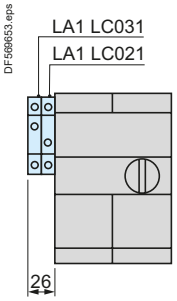


For mounting on reversing all-in-one motor starters Integral 63

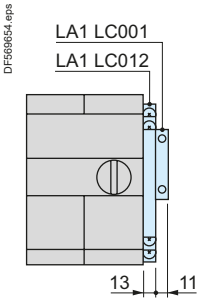
LA1LC021, LC025
LA1LC001



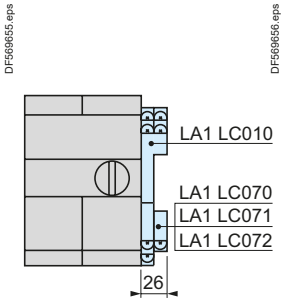
LA1LC031



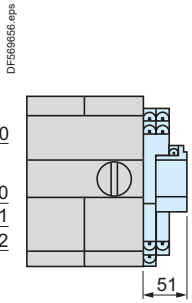
LA1LC012
LA1LC001



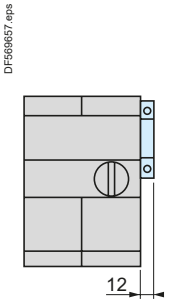
LA1LC010
LA1LC07●●



LA1LC052●

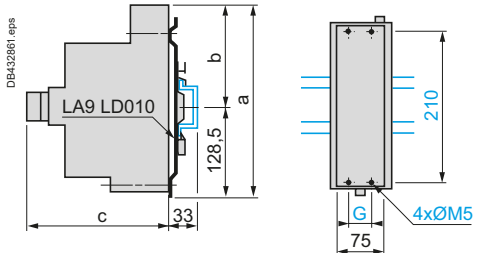


LA1LC020



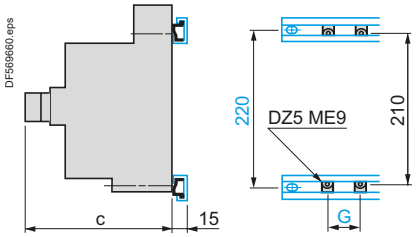
Mounting

On 75 mm ⊔ rail, with mounting plate LA9LD010



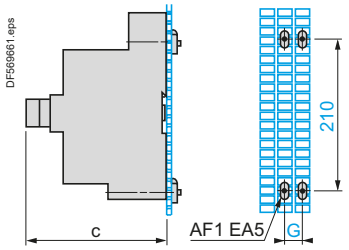
	a	b	c	G
LD1	266	137.5	192	28
LD4	266	137.5	192	28
LD5	282	153.5	194	63

On 32 mm ⊏ rails, at 220 mm centres



	c	G
LD1	192	28
LD4	192	28
LD5	194	63

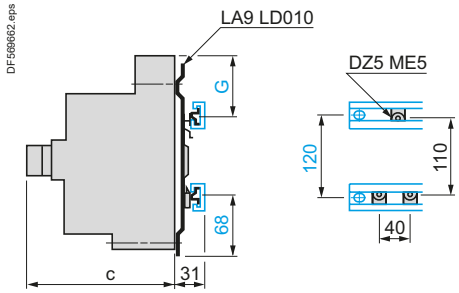
On pre-slotted mounting plate AM1P



	c	G
LD1	192	28
LD4	192	28
LD5	194	63

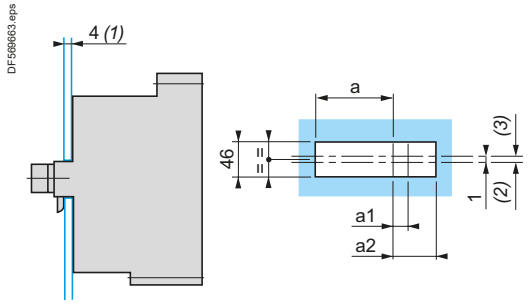
With mounting plate LA9LD010

SOn 32 mm ⊏ rails, at 120 mm centres



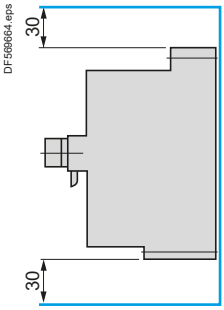
	c	G
LD1	192	78
LD4	192	78
LD5	194	94

Flush mounting (all-in-one motor starters and reversing all-in-one motor starters)



	a	a1	a2
LD1LD030	90	–	–
LD4LD●30	90	–	–
LD5LD●30	181	–	–
LA1LC010	–	13	–
LA1LC012	–	13	–
LA1LC010 + LA1LC052●	–	–	51
LA1LC012 + LA1LC052●	–	–	51

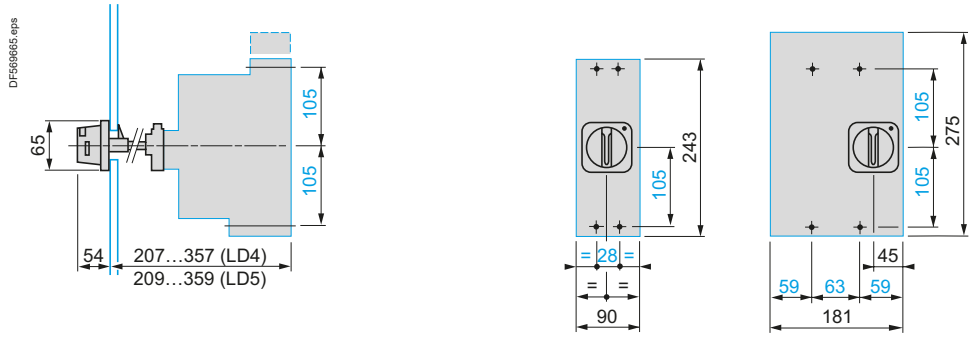
Minimum electrical clearance



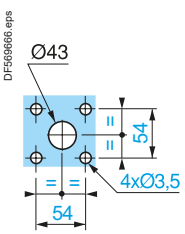
(1) Maximum door thickness for interlocking by LD4 and LD5.
(2) Centre of operating handle.
(3) Fixing centre.

Adjustable door interlock mechanisms LA9LC33● and LA9LC53●

For mounting on LD4LD●30 and LD5LD●30



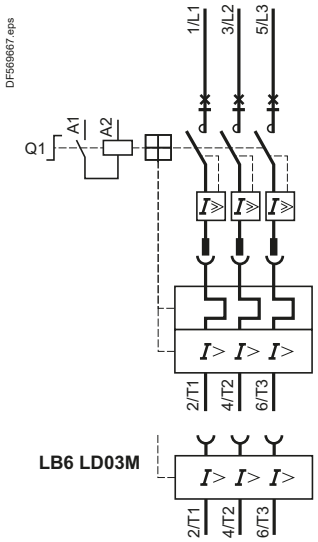
Door drillings



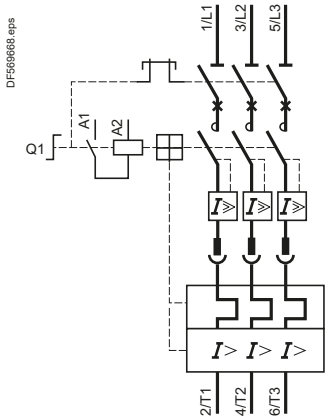
Schemes

All-in-one motor starters Integral 63 with protection module LB●

LD1LD030 + LB1LD03●

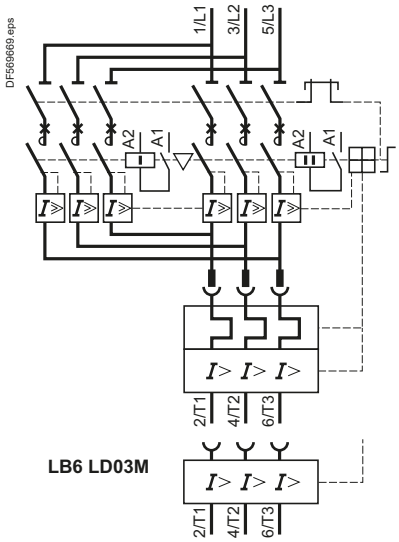


LD4LD●30 + LB1LD03●



Reversing all-in-one motor starters Integral 63 with protection module LB●

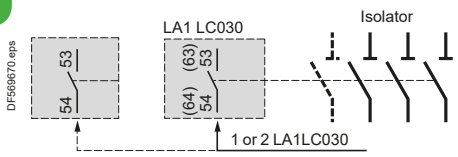
LD5LD●30 + LB1LD03M ou LD03P



Add-on blocks

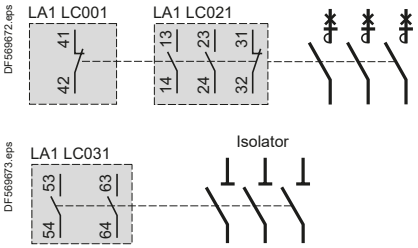
For all-in-one motor starters LD4

Mounted on LH side



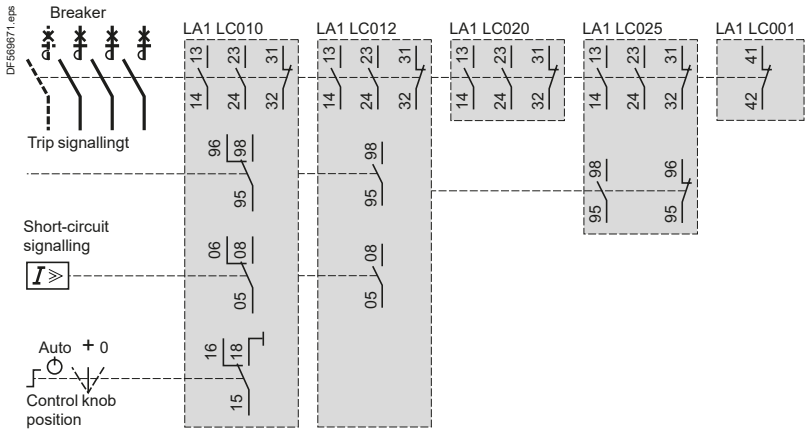
For reversing all-in-one motor starters LD5

Mounted on LH side



For all-in-one motor starters LD1 or LD4 and reversing all-in-one motor starters LD5

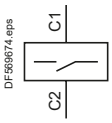
Mounted on RH side



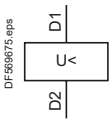
Schemes

Tripping devices (1) for LD1, LD4, LD5

LA1LC071

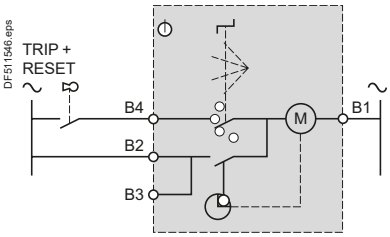


LA1LC070, LC072



Remote electrical reset devices (1) for LD1 to LD5

LA1LC052●

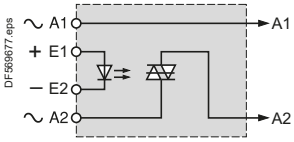


The use of instantaneous auxiliary contact block LA1LC020 prevents the use of tripping devices or electrical reset devices

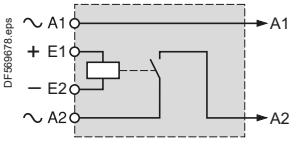
(1) For all-in-one motor starters and reversing all-in-one motor starters already fitted with an LA1 LC010 or LA1 LC012 instantaneous auxiliary contact block.

Interface modules

LA1LD180



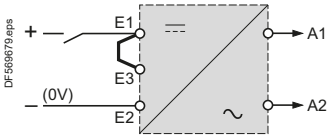
LA1LD580

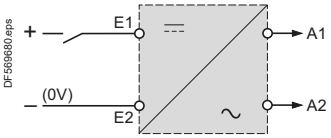


Voltage converter LA1LD080 (supply with all-in-one motor starters for ⎓ control circuit operation)

Switching by control contact

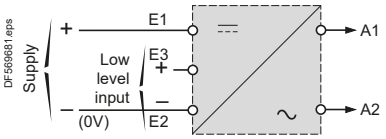
24 or 48 V





Switching by "Low level" input

24 or 48 V



Terminology

Altitude

The rarefied atmosphere at high altitude reduces the dielectric strength of the air and hence the rated operational voltage of the all-in-one motor starter. It also reduces the cooling effect of the air and hence the rated operational current of the all-in-one motor starter (unless the temperature drops at the same time).

No derating is necessary up to 3000 m.

Derating factors to be applied above this altitude for main pole operational voltage and current (a.c. supply) are as follows:

Altitude	3500 m	4000 m	4500 m	5000 m
Rated operational voltage	0.90	0.80	0.70	0.60
Rated operational current	0.92	0.90	0.88	0.86

Ambient air temperature

The temperature of the air surrounding the device, measured near to the device.
The operating characteristics are given:
- with no restriction for temperatures between - 5 and + 55 °C.
- with restrictions, if necessary, for temperatures between - 50 and + 70 °C.

Rated operational current (Ie)

This is defined taking into account the rated operational voltage, operating rate and duty, utilisation category and air temperature around the device.

Conventional rated thermal current (Ith) (1)

The current Ith which a closed all-in-one motor starter can sustain for a minimum of 8 hours without its temperature rise exceeding the limits given in the standards.

Short time rating

The current which a closed all-in-one motor starter can sustain for a short time, after a period of no load, without dangerous overheating.

Rated operational voltage (Ue)

This is the voltage value which, in conjunction with the rated operational current, determines the use of the all-in-one motor starter or starter, and on which the corresponding tests and the utilisation category are based. For 3-phase circuits, it is expressed as the voltage between phases.
Apart from exceptional cases such as rotor short-circuiting, the rated operational voltage Ue is less than or equal to the rated insulation voltage Ui.

Rated control circuit voltage (Uc)

The rated value of the control circuit voltage, on which the operating characteristics are based. For a.c. applications, the values are given for a near sinusoidal wave form (less than 5 % total harmonic distortion).

Rated insulation voltage (Ui)

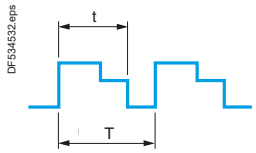
This is the voltage value used to define the insulation characteristics of a device and referred to in dielectric tests determining leakage paths and creepage distances. As the specifications are not identical for all standards, the rated values given for each of them are not necessarily the same.

Rated impulse withstand voltage (Uimp)

This is the highest peak value of an impulse voltage, of prescribed form and polarity, which the device is able to withstand without failure under specified test conditions, and to which isolation clearance values are referred.
The rated impulse withstand voltage of a device must be equal to or higher than the values stated for the transient overvoltages appearing in the circuit in which the device is fitted.

Note: these definitions are based on extracts from standard IEC 60947.

(1) Conventional free air thermal current, conforming to IEC standards.



Terminology

Rated operational power (expressed in kW)

The rated power of the standard motor which can be switched by the all-in-one motor starter, at the stated operational voltage.

Rated breaking capacity (Iq) (1)

This is the current value which the all-in-one motor starter can break in accordance with the breaking conditions specified in the IEC standard.

Rated making capacity (1)

This is the current value which the all-in-one motor starter can make in accordance with the making conditions specified in the IEC standard.

On-load factor (m)

This is the ratio between the time the current flows (t) and the duration of the cycle (T):

$$m = \frac{t}{T}$$

Cycle duration: duration of current flow + time at zero current.

Pole impedance

The impedance of one pole is the sum of the impedance of all the circuit components between the input terminal and the output terminal.

The impedance comprises a resistive component (R) and an inductive component X = Lω). The total impedance therefore depends on the frequency and is normally given for 50 Hz. The average value is given for the pole at its rated operational current.

Electrical durability

This is the average number of on-load operating cycles which the main pole contacts can perform without maintenance. The electrical durability depends on the utilisation category, the rated operational current and the rated operational voltage.

Mechanical durability

This is the average number of no-load operating cycles (i.e. with zero current flow through the main poles) which the all-in-one motor starter can perform without mechanical failure.

Coordination

The coordination of protection devices involves combining, in a selective way, a short-circuit protection device (fuses or magnetic circuit-breakers) with a contactor and an overload protection device. Its objective is to break any abnormal current, in plenty of time, without any danger to personnel, whilst providing adequate protection of the equipment against an overload or short-circuit current.

Type 1 - IEC 60947-4-1

In a short-circuit condition, the contactor or starter must not present any danger to personnel or installations and may not be able to resume operation without repair or the replacement of parts.

Type 2 - IEC 60947-4-1

In a short-circuit condition, the contactor or starter must not present any danger to personnel or installations and must be able to resume operation. The risk of contact welding is permissible if they can be easily separated.

Total, ensuring reliability of operation - IEC 60947-6-2

In the event of a short-circuit, no damage or risk of welding is permissible on the equipment constituting the motor starter. Operation can be resumed without any maintenance.

Note: *these definitions are based on extracts from standard IEC 60947.*

(1) For a.c. applications, the breaking and making capacities are expressed by the rms value of the symmetrical component of the short-circuit current. Taking into account the maximum asymmetry which may exist in the circuit, the contacts therefore have to withstand a peak asymmetrical current which may be twice the rms symmetrical component.

Definition

The standard utilisation categories define the current values which the all-in-one motor starter must be able to make or break. These values depend on:
- the type of load being switched: squirrel cage or slip ring motor, resistors,
- the conditions under which making or breaking takes place: motor stalled, starting or running, reversing, plugging.

Reminder of standards IEC 60947

- **IEC 60947-1**: general rules,
- **IEC 60947-2**: circuit breakers,
- **IEC 60947-3**: isolating devices,
- **IEC 60947-4-1**: contactors and motor starters,
- **IEC 60947-5-1**: control and signalling units,
- **IEC 60947-6-2**: control and protection devices,

Standards for all-in-one motor starters

IEC 60947-4-1

Standard IEC 60947-4-1: covers contactors and electromechanical motor starters.
It concerns:
- types of equipment with main contacts designed for connection to circuits whose rated operational voltage does not exceed 1000 V for a.c. applications or 1500 V for d.c. applications,
- contactors used in conjunction with overload and/or short-circuit protection devices,
- motor starters used in conjunction with separate short-circuit protection devices and/or with separate short-circuit protection devices and built-in overload protection devices,
- contactors and combination motor starters which incorporate their own short-circuit protection device.

IEC 60947-6-2

Standard IEC 60947-6: covers multi-function equipment.
It concerns connection, power switching and protection devices (or equipment) with main contacts designed for connection to circuits whose rated operational voltage is less than or equal to 1000 V for a.c. applications, or 1500 V for d.c. applications.
Such devices are designed to perform both the power switching function and the protection of remotely controlled circuits function; they can also perform other functions, such as isolation.
After short-circuit (Isc) tests, the products must be able to make and break the currents corresponding to the specified utilisation categories, and to the number of operating cycles specified in the standard, without failing. This series of tests is completed by temperature rise tests.
Standard IEC 947-6-2 specifies that, in the event of a short-circuit, no damage or risk of contact welding is permissible on the devices constituting the motor starter.
The integral all-in-one motor starter, through its design, ensures reliability of operation. After eliminating the fault, operation can be resumed instantly without any maintenance work on the product, other than resetting.

Utilisation categories for a.c. applications

Category AC-1

This category applies to all types of a.c. device (load) with a power factor equal to or greater than 0.95 ($\cos \varphi \leqslant 0.95$). Non inductive or slightly inductive loads.
Application examples: heating, distribution.

Category AC-2

This category applies to starting, plugging and inching of slip ring motors.
- On closing, the all-in-one motor starter makes the starting current, which is about 2.5 times the rated current of the motor.
- On opening, it must break the starting current, at a voltage less than or equal to the mains supply voltage.

Category AC-3

This category applies to squirrel cage motors with breaking while motor running.
- On closing the all-in-one motor starter makes the starting current, which is about 5 to 7 times the rated current of the motor.
- On opening, it breaks the rated current drawn by the motor; at this point, the voltage at the all-in-one motor starter terminals is about 20 % of the mains supply voltage. Breaking is light.

Application examples: all standard squirrel cage motors (lifts, escalators, conveyor belts, bucket elevators, compressors, pumps, mixers, air conditioning units, etc.).

Standards for all-in-one motor starter

Utilisation categories for a.c. applications

Category AC-4

This category covers starting, plug braking and inching of squirrel cage motors.
On closing, the all-in-one motor starter makes a current peak which may be as high as 5 to 7 times the rated motor current. On opening, it breaks this same current at a voltage which is higher, the lower the motor speed. This voltage can be the same as the mains voltage. Breaking is severe.
Application examples: printing machines, wire drawing machines, hoisting equipment, metallurgy industry.

Category AC-41

This category applies to all types of a.c. device (load) with a power factor equal to or greater than 0.95 (cos $\varphi \leqslant 0.95$). Non inductive or slightly inductive loads.
Application examples: heating, distribution.

Category AC-42

This category applies to starting, plugging and inching of slip ring motors.
■ On closing, the all-in-one motor starter makes the starting current, which is about 2.5 times the rated current of the motor.
■ On opening, it must break the starting current, at a voltage less than or equal to the mains supply voltage.

Category AC-43

This category applies to squirrel cage motors with breaking while motor running; inching or occasional reversing of limited duration are permissible if the number of operating cycles does not exceed 5 per minute, or 10 within a 10 minute period.
■ On closing the all-in-one motor starter makes the starting current, which is about 5 to 7 times the rated current of the motor.
■ On opening, it breaks the rated current drawn by the motor; at this point, the voltage at the all-in-one motor starter terminals is about 20% of the mains supply voltage. Breaking is light.
Application examples: all standard squirrel cage motors: lifts, escalators, conveyor belts, bucket elevators, compressors, pumps, mixers, air conditioning units, etc.).

Category AC-44

This category covers applications with plug braking and inching of squirrel cage or slip ring motors.
On closing, the all-in-one motor starter makes a current peak which may be as high as 5 to 7 times the rated motor current. On opening, it breaks this same current at a voltage which is higher, the lower the motor speed. This voltage can be the same as the mains voltage. Breaking is severe.
Application examples: printing machines, wire drawing machines, hoisting equipment, metallurgy industry.

Tripping classes of protection modules

The creation of thermal tripping classes allows better adaptation of the thermal protection to suit different motor and application technologies (short or long starting times). Conforming to IEC 60947-4-1 and IEC 60947-6-2.

Class	10 A	10	20	30
Tripping time at 7.2 Ir (1)	2…10 s	4…10 s	6…20 s	9…30 s

Standards for auxiliary contacts

IEC 60947-5

Standard IEC 60947-5-1: covers switching devices and components for control circuits.
It concerns electromechanical devices for control circuits.

Utilisation categories for a.c. applications

Category AC-14 (2)

This category applies to the switching of electromagnetic loads whose power drawn with the electromagnet closed is less than 72 VA.
Application example: switching the operating coil of contactors and relays.

Category AC-15 (2)

This category applies to the switching of electromagnetic loads whose power drawn with the electromagnet closed is greater than 72 VA.
Application example: switching the operating coil of contactors.

Utilisation categories for d.c. applications

Category DC-13 (3)

This category applies to the switching of electromagnetic loads for which the time taken to reach 95 % of the steady state current (T = 0.95) is equal to 6 times the power P drawn by the load (with $P \leqslant 50$ W).
Application example: switching the operating coil of all-in-one motor starters.

(1) Ir = protection module setting current.
(2) Replaces category AC-11.
(3) Replaces category DC-11.