Drive for decentralised
control systems

FlexiMova® mm

Design and Installation Manual

REEL

Proprietary notice

Design and Instruction Manual **FlexiMova® mm - Rev.01.4**

Original operating instructions.

Technical specifications are subject to change without notice.

1 Manufacturer

Table 1: Manufacturer

Name	**REEL S.r.l.**
Address	**Via Riviera Berica, 40/42 - 36024 Ponte di Nanto (VI)**
Tel.	**+39 0444 739711**
Fax	**+39 0444 739733**
E-mail	**sales@reel.it**
Website	**www.ksb.com/REEL-en**

1.1 Customer service centres

Contact the Manufacturer for information regarding customer service centres.

1.2 Request for technical assistance

Contact the Manufacturer directly to requesttechnical assistance. Always:

1) quote the product type (size- model)
2) quote the serial number and year of construction
3) describe the problem.

2 Important information

2.1 Manual ID

This document is called **"Design and Installation Manual"** (hereinafter "manual").
The year and month of issue are specified on page 2.

2.2 Information regarding the manual

ATTENTION

This manual must be kept in good condition and in a safe place that is in the immediate vicinity of the machine and where it is accessible at all times to authorized operators.

If the product is transferred or sold, the manual must be handed over to the new user together with the product.

We recommend making a copy of the document's identification data (name of the manual and date of issue indicated on page 2) so you can contact the Manufacturer for replacement copy if you should lose or damage this one.

This manual reflects the state of the art existing at the time the machine was placed on the market and cannot be considered inadequate simply because of subsequent upgrades resulting from newly acquired knowledge through use of the product.

ATTENTION

It is mandatory for all operators to read and fully understand the contents of the manual prior to using the product.

This manual is an integral part of the product: save it for future reference.

Failure to follow the instructions and warnings described in this manual will invalidate the warranty.

Safe operation of the product is only guaranteed if it is used in compliance with the instructions contained in this manual.

The Manufacturer accepts no liability for any property damage and/or personal injury arising from failure to comply with the instructions and warnings described in this manual and from improper use of the product.

2.3 Intended audience

This manual is intended exclusively for operators authorised to use and perform maintenance on the product according to the specific technical–professional skills required for the type of action.

2.4 Authorized operators

WARNING
Authorised operators must only perform tasks for which they are qualified. Authorised operators must have no physical or mental condition that may impair their ability to operate under safe conditions.

Table 2: Authorized operators

Symbol	Description of the technical- professional skills
	**OPERATOR** This is a professionally trained operator who, in line with applicable legislation in the country of use, is qualified to use the product. All the operations must be carried out in strict compliance with the instructions contained in this manual, by the operators equipped with the personal protective equipment (PPE) specified in **par. 5.13**.
	**OPERATOR RESPONSIBLE FOR HANDLING THE MACHINE** This is a professionally trained operator who, in line with applicable legislation in the country of use, is qualified to operate forklifts, cranes including bridge cranes, and to transport, handle and unpack the product and/or parts of it safely in the workplace, equipped with the personal protective equipment (PPE) specified in **par. 5.13**.
	**MAINTENANCE ELECTRICIAN** This is a qualified technician (electrician meeting the professional technical requirements of the applicable regulations in the country of use) trained to work solely on electrical devices. He is qualified to adjust, service and repair electrical devices even in the presence of voltage and with the protections disabled (with the consent of the Safety Officer) and in complete compliance with the instructions set out in this manual or any other specific document supplied by the Manufacturer and/or the Customer Service Centre, equipped with the personal protective equipment (PPE) specified in **par. 5.13**.
	**MANUFACTURER'S TECHNICIAN** This is a qualified technician, provided by the Manufacturer and/or the Customer Service Centre, who has specific knowledge of the product and is qualified to perform the required technical assistance, routine and extraordinary maintenance and operations that are included in this manual, equipped with the personal protective equipment (PPE) specified in **par. 5.13**.
	**SUPERVISOR (person present and recognized only in the workplace)** person who, by virtue of his professional competences and within the scope of the hierarchical and functional powers entrusted to him in accordance with the nature of his position, supervises the work and ensures that instructions received are carried out correctly by the workers, while exercising a functional power of initiative.

2.5 Manual conventions

This manual is useful for installation, troubleshooting and everyday maintenance of the product. To guarantee safe operation, read the following safety guidelines before connecting the product to a powersource.
Keep this instruction manual on hand at all times and ensure it is accessible to all users for reference. The installation and maintenance instructions are addressed to the specialised technicians.

Bold Text: Highlights important words and references.
 **Generic or dedicated danger symbol:** Highlights the health and safety hazards for authorised operators and/or risk of malfunction or damage to the product.
 **Generic or dedicated mandatory symbol:** Indicates that a specific action is required.
 **Generic or dedicated prohibition symbol:** Highlights actions that you must not do.
 **EX Danger symbol :** Highlights an explosive atmosphere hazard.
 **Crossed-out wheeled bin:** Highlights that waste of electrical and electronic equipment (WEEE) must be disposed of separately.
 **Mandatory to read the manual:** This symbol indicates that it is mandatory to read and fully understand this manual in order to use the product in complete safety.
 **This symbol indicates it is mandatory to disconnect the product from the power source before beginning any maintenance or repair work.**
 **Authorised operator symbol:** This symbol found at the beginning of a chapter or a paragraph indicates which are the operators authorised **(see par. 2.4)** to perform the actions described in it.

DANGER

Indicates a hazard with a high level of risk that can lead to serious injury or death.

WARNING

Indicates a hazard with a medium level of risk that can lead to serious injury or death.

ATTENTION

Indicates a hazard with a low level of risk that can lead to slight or minor injury.

INFORMATION

Signals important information.

2.6 Main abbreviations

Table 3: Main abbreviations

approx.	Approximately	**par.**	Paragraph
chap.	Chapter	**pos.**	Position
PPE	Personal protective	**qty.**	Quantity
RH	Right	**No.**	Detail number
etc.	Et cetera	**RH**	Left
e.g.	Example	**s**	Seconds
FIG./FIGS	Figure/s	**TAB.**	Table
h	Hour/s	**see**	See
MAX.	Maximum	÷	From, to
MIN.	Minimum	**Ø**	Diameter
min	Minutes	**>**	Greater than
mm	Millimeters	≥	Greater than or equal to
No./Nos	Number/s	**<**	Less than
p.	Page	≤	Less than or equal to

2.7 All rights reserved

2.8 Warranty

The buyer, under penalty of forfeiture of the warranty, must report any workmanship and/or product defects, and number of items that do not correspond with the order, within eight days of the delivery. The complaint must be made by means of a registered letter or a PEC certified email addressed to REEL, and must describe the workmanship or product defects in detail; any other method used to deliver the complaint will not be considered by REEL. The buyer must undertake to keep, or ensure that any final third party customer keeps the flawed and/or deformed product for verification of the issue. Failure to keep and produce the alleged flawed goods will invalidate the warranty provided by REEL. If inferior to the warranty provided by law the warranty given by Reel is the one declared by the manufacturer of the various components. However, if it proves to be inferior to the warranty declared by the manufacturer of the individual components, the latter is applicable even if the components are supplied separately as spare parts. The warranty will be voided if the product shows evidence of tampering or repairs carried out by unauthorised personnel, or if is handled or used inappropriately and in any case not in compliance with the manufacturer's instructions, or if it is used for purposes other than those for which the product is intended.

Prior to dismantling and/or modifying the product, if required to do so for technical/operational reasons, the buyer must contact REEL and quote the product's serial number, to obtain written authorisation.
The warranty will only remain effective if the above data are recorded.

Tampering with and/or breaking the warranty seals without REEL's formal written authorisation, and any breakages and/or faults caused by lack of maintenance, installation that does not comply with the instructions contained in the product's user manual or those provided by REEL, environmental circumstances that are incompatible with the conservationand proper operation of the product, interferences not known and not attributable to REEL, will void the warranty.

The warranty provided by REEL is strictly limited to the supplied productand does not cover the plant in which the product is integrated or the functionality and performance of said plant.

If REEL recognises the existence of the defects claimed by the buyer, the company may, at its sole discretion, replace the whole product or replace and/orrepair the individual components of the same.

Repairs, replacements or modifications of all or part of the supplied product during the warranty period will not extend the duration of the warranty.

Defective parts replaced free of charge must be returned to REEL and remain itsproperty.

The warranty does not cover damages caused by fortuitous events, force majeur or a fraudulent or negligent act committed by the buyer or a third party.

If the product is a piece of machinery the warranty will be voided if the buyer does not perform the routine controls and/or the routine and extraordinary maintenance checks specified by REEL or by the manufacturer of the individual components.

REEL will not be liable for any direct or indirect damage, sustained by third parties, resulting from the purchase, use, failure to use the machine and/or malfunction of the machine.

3 Product ID

3.1 Designation

The product described in this manual is called:

Stand-alone frequency converter for decentralized control systems

3.2 Sizes - Models

The currents for the converter are set out in the table below.
The maximum overload current **Imax** is equal to 1.5 times (150%) the standard current **Inom**.
PWMs are available with frequencies from 2 to 12 kHz. In particular for:

- Sizes A-B-C there exists an active derating for PWM greater than 8 kHz with a reduction of 8% of standard In for every kHz.
- Sizes D-E there exists an active derating for PWM greater than4 kHz with a reduction of 8% of standard In for every kHz.

The standard Imax current will be a consequent to this reduction

Table 4: Size - Model

Size	Model	In (A)	Imax (A)	Power at 400 VaC (kW)
A	F0K37	1,3	2,0	0,37
	F0K55	1,8	2,7	0,55
	F0K75	2,5	3,8	0,75
	F1K10	3,5	5,3	1,1
	F1K50	4,9	7,4	1,5
B	F2K20	6,0	9,0	2,2
	F3K00	8,0	12,0	3
	F4K00	10,0	15,0	4
C	F5K50	14,0	21,0	5,5
	F7K50	18,0	27,0	7,5
	F11K0	26	39,0	11
D	F15K0	34,5	51,8	15
	F18K5	44	70,4	18,5
	F22K0	51	76,5	22
	F30K0	68	102,0	30
E	F37K0	84	126,0	37
	F45K0	101	151,5	45
	F55K0	120	180	55
Data referring to a **MAX. 40 °C** ambient temperature				

4 Conformity

4.1 Normative references cited in this EU Declaration of Conformity

The product is compliant with the relevant harmonisation standard of the European Union:

- **2014/30/EU, Electromagnetic Compatibility Directive (EMCD)**
- **2014/35/EU, Low Voltage Directive (LVD)**

The following harmonized and/or specific technical standards have been applied: EN61800-3:2004+A1:2012 C1 ≤11 kW C2 >11 kW
EN61000-3-2 power drive with rated current≤16 A
EN61000-3-12 power drive with rated current from 16 to 75 A
Technical standards:
EN 61800-5-1:2009-04.LVD

4.2 Normative references relating to the STO safety function

The converter implements the safety function with reference to:

- EN 61800-5-2:2007
- IEC 61508:2010
- EN ISO 13849-1&2: 2006/2009
- EN 62061:2015

For further details see the product's safety manual.

4.3 Data and CE marking plate

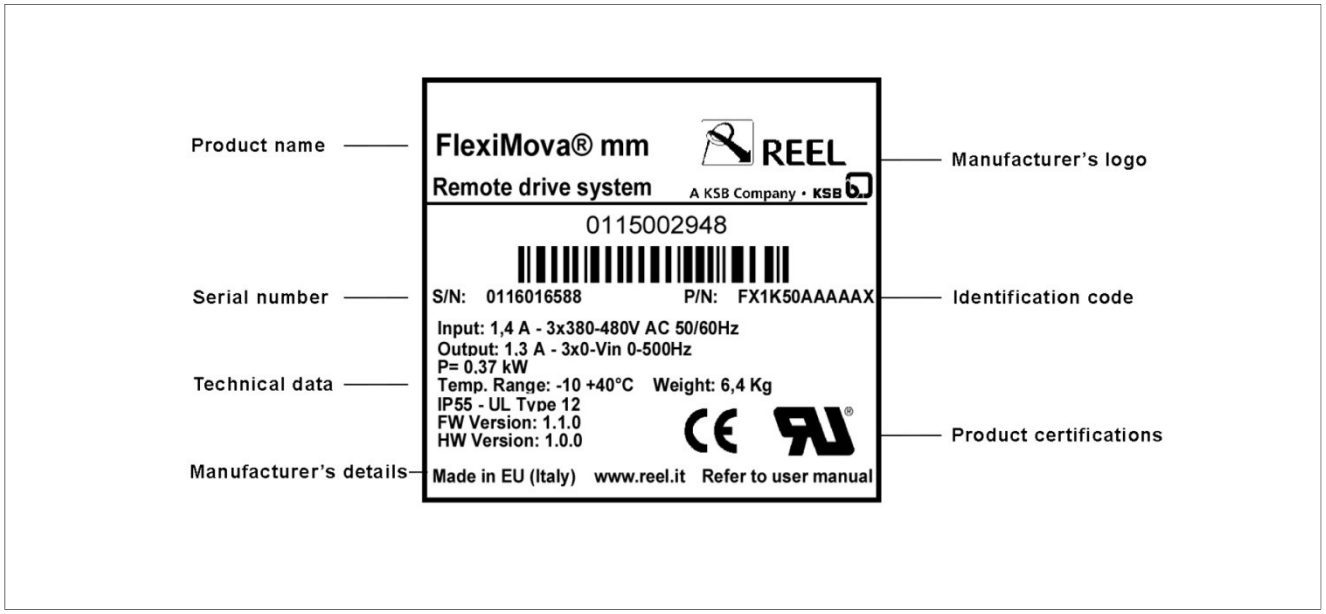
The data and CE marking plate is affixed to the product externally in compliance with Directives 2014/30/EU and 2014/35/EU.

ATTENTION

Make sure, when purchasing the product, that a data and CE marking plate is affixed to it. If it is not contact the Manufacturer or the Customer Service Centre immediately.

If there is no data and CE marking plate visible, the product is non-compliant and must not be used.

Figure 1: Data and CE marking plate



5 Product specifications

5.1 Description

The **"FlexiMova® mm"** is a latest generation self-cooled stand-alone frequency converter constructed from die-cast metal with an IP55 ingress protection rating.
Its particular structure and sturdiness makes it suitable for use in aggressive environments not necessarily inside an electric cabinet.
It can be supplied with a line disconnect switch mounted on the **FlexiMova® mm** itself. It is constructed with capacitorless technology able to withstand high temperatures with a lesser downgrading of the internal components. It is available in various power sizes and in five construction sizes. Various field bus options are available on request which can even easily be connected at a later date. **FlexiMova® mm** is available in the standard version or in the version with the optional graphical keypad.

Standard version
without optional keypad

Version with optional graphical keypad and disconnect switch

5.1.1 Ingress protection rating and requirements

FlexiMova® mm is supplied with an ingress protection rating of IP55 in compliance with all the enclosure requirements set out below:

- Tightening and locking of cable glands used for the connection.
- Presence of the stop end for the unused cable gland.
- Suitable tightening of screws used for the protection cover of the terminal blocks.

INFORMATION
It is important to verify that all the seals on the various covers are intact and in perfect condition during the installation, transit and/or handling stages.

5.2 Technical data

Table 5: Mass per size

Size	Mass (kg)
A	5
B	6,5
C	14
D	33
E	59

Table 6: Technical data

Data of the converter	
Efficiency	95 ÷ 98 %
Operating temperature	From -10 °C to + 40 °C
Storage temperature	From -10 °C to + 70 °C
Relative humidity	Operating from 5% to 85% without condensation In storage from 5% to 95% Transportation MAX. 85% without condensation
Height of installation	Up to 1000 m no changes, for higher values power reduction of 1% for every 100 m up to a maximum of 2000 m
Derating	-2% of the effective current, for every degree of temperature above 40 °C -1% of the effective current for every 100 m above 1000 m. a. s. l.

Table 7: Input data (L1, L2, L3)

Input data (L1, L2, L3)	
Supply voltage	Three-phase 380 VAC / 480 VAC
Phase imbalance	+/- 2% supply voltage
Mains frequency	50 – 60 Hz +/-2%
Unity power factor (cos PHI)	> 0.98
Real power factor (λ)	better than 0.9
Type of power supply systems	TN networks and IT networks
Switching on feed lines L1, L2, L3	2 times/min
Harmonic disturbance	In accordance with : EN 61000-3-2 for converters with rated current up to 16 A EN 61000-3-12 for converters with rated current greater than 16 A
EMC filter	C1 integrated class B up to 11 Kw C2 class A-group1 from 15 kW up to 55 kW

Table 8: Output data (U, V, W)

Output data (U, V, W)	
Output voltage	0 – 95% of the supply voltage in the standard version 0 – 100% of the supply voltage with capacitor KIT
Output frequency (according to the power)	0-500 Hz (resolution 0.1 Hz)
Ramp times	0.1 – 600 s
Overload capability	150% of the rated current
PWM modulation frequency	From 2 kHz to 12 kHz
dV/dt of the output phases	MAX. 5000 V/µs according to the size of the converter
Available motor control methods	V/f Control Sensorless vector Sensorless reluctance

Table 9: Digital inputs

Digital inputs	
Programmable digital inputs	4 (+ 2 per STO) optoisolated
ON level	18-30 V
OFF level	0-3 V
Maximum input voltage	30 VDC
Input resistance, IR	Circa 2 kΩ
Scantime	1 ms
Optional STO: Safe Torque Off	SIL 3 (IEC 61508 e EN61800-5-2)

Table 10: Pulse inputs

Pulse inputs	
Programmable pulse inputs	1
Voltage	0 – 24 VDC (PNP positive logic)
Pulse inputs accuracy (0.1 – 100 kHz)	MAX. error 0.1% of full scale

Table 11: Analog inputs

Analog inputs	
Analog inputs	2 differential inputs
Operating mode	Voltage or current
Voltage	0 to +/-10 V (scalable)
Current	0/4 to 20 mA (scalable)
Input impedance	500 Ω if in current mode Over 60 kΩ if in voltage mode
Analog inputs accuracy	MAX. error 1% of full scale 11 bit + sign
Scan time	1 ms

Table 12: Digital / analog outputs

Digital / analog outputs	
Programmable pulse outputs (as an alternative to current mode or voltage mode output)	1
Digital output voltage	0 ÷ 24 VDC
Maximum output current (PNP or NPN)	40 mA
Maximum output frequency at the output frequency	From 0 to 100 kHz
Frequency output accuracy	MAX. error 0.01% of full scale
Programmable analog output (as an alternative to pulse output)	1
Analog output current field	0/4 – 20 mA or 0 / +10 VDC
Total minimum load applicable at each analog output	500 Ω
Analog output accuracy	MAX. error 2% of full scale

Table 13: DC power supplies

DC power	
Internal power supply	+ 24V +/-10%
MAX. applicable load	Approx. 150 mA available for each output up to a total MAX. 0.5 A

Table 14: Relay outputs

Relay	
Programmable relay outputs	2
Maximum resistive load	240 VAC: 200 mA 30 VDC: 2 A
Applicable voltage	0 - 30 VDC 0 - 220 VAC 0 - 110 VAC per UL

Table 15: Environment

Environment	
Ingress protection rating	IP 55
Resistance to vibration	Size A - B - C: 1.8 g (10 - 500 Hz) Size D - E: 1 g (10 - 500 Hz)
Maximum relative humidity	5% – 95%
Ambient temperature	Up to 40 °C (50 °C with derating)
Galvanic isolation	PELV type I/O

Table 16: Fieldbus

Fieldbus	
Optional in SLOT 1	Modbus RTU
Optional in SLOT 2	ProfiBus DP V0 ProfiNet

Table 17: Built-in protections

Built-in protections
Electronic thermal protection of the motor in the event of overload with PTC or Klixon sensor
Up to 40 °C (50 °C with derating)
The thermal monitoring of the radiator and the internal environment of the product ensures that the frequency converter is protected against overload.
The frequency converter is protected against short circuits on the terminals of motors U, V, W and against shorts to ground
Protection against power failure

Table 18: I/O expansion options

I/O expansion options	
Optional on SLOT 3	Input/output expansion board (**FX-I/O-A**) Expansion boards with built-in Modbus RTU: ▪ ModBus + digital inputs (**FX-I/O-B**) ModBus + digital inputs and relay outputs (**FX-I/O-C**)

Table 19: Power options

Power options
▪Capacitor kit for critical networks ▪Line disconnect switch

5.2.1 Product efficiency

Based on its efficiency characteristics the **FlexiMova® mm** easily meets the requirements for IE2 classification. The converters of the **FlexiMova® mm** series have been designed to meet the highest levels of efficiency.
The **EN 50598-2** defines the methods for calculating the efficiency of the converter and of the motor.

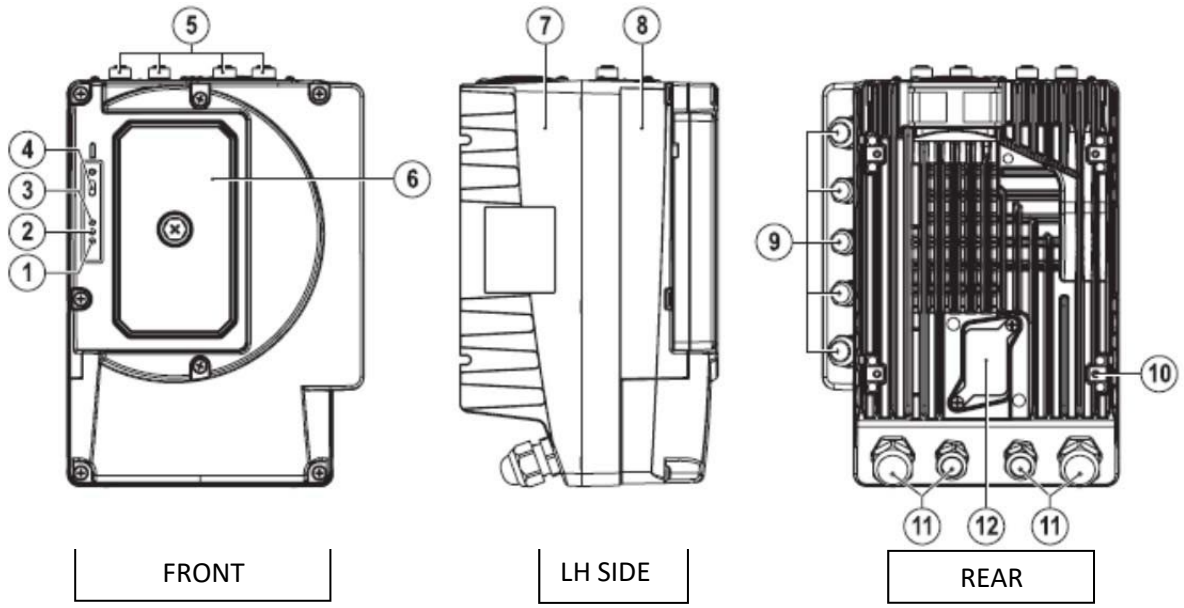
The table below shows the results calculated at various operating points of the inverter:

Table 20: Efficiency

Size		kW	Fpwm [kHz]	Inom [A]	% partial frequency/ % partial load							Nominal values 100/100	Efficiency class EN 50598-2
					0/25	0/50	0/100	50/25	50/50	50/100	100/50		
					%	%	%	%	%	%	%	%	
Power supply line 400V AC – 3 PH – 50 Hz													
A	F0K37	0,37	4	1.3	92,92	92,86	92,41	92,89	92,81	92,32	92,70	92,11	IE 2
			8		92,35	92,30	91,76	92,35	92,24	91,65	92,16	91,46	
	F0K55	0,55	4	1.8	94,78	94,73	94,27	94,76	94,69	94,16	94,58	93,80	
			8		94,31	94,24	93,76	94,27	94,20	93,65	94,09	93,29	
	F0K75	0,75	4	2.5	96,17	95,88	95,19	96,16	95,84	95,09	95,73	94,88	
			8		95,81	95,51	94,60	95,80	95,47	94,51	95,36	94,29	
	F1K10	1,1	4	3.5	97,05	96,68	95,91	97,03	96,63	95,82	96,54	95,54	
			8		96,75	96,28	95,41	96,73	96,23	95,32	96,14	95,04	
	F1K50	1,5	4	4.9	97,44	97,09	96,10	97,42	97,03	95,99	96,93	95,78	
			8		97,15	96,72	95,59	97,13	96,67	95,48	96,56	95,27	
B	F2K20	2,2	4	6	97,89	97,58	96,85	97,85	97,53	96,72	97,41	96,43	
			8		97,40	97,00	96,10	97,35	96,95	95,97	96,83	95,67	
	F3K00	3	4	8	98,03	97,72	96,93	98,00	97,67	96,83	97,57	96,59	
			8		97,58	97,19	96,22	97,56	97,14	96,12	97,04	95,88	
	F4K00	4	4	10	98,29	97,97	97,15	98,27	97,91	97,03	97,80	96,71	
			8		97,89	97,50	96,49	97,86	97,44	96,37	97,32	96,06	
C	F5K50	5,5	4	14	98,59	98,28	97,36	98,57	98,22	97,25	98,11	97,00	
			8		98,25	97,84	96,64	98,23	97,78	96,53	97,67	96,28	
	F7K50	7,5	4	18	98,79	98,49	97,57	98,79	98,43	97,44	98,31	97,16	
			8		98,48	98,08	96,89	98,46	98,02	96,76	97,89	96,49	
	F11K0	11	4	26	98,92	98,61	97,68	98,89	98,55	97,54	98,40	97,23	
			8		98,60	98,18	96,96	98,57	98,12	96,82	97,97	96,51	
D	F15K0	15	4	34.5	99,01	98,74	97,94	98,99	98,69	97,83	98,59	97,59	
	F18K5	18,5	4	44	98,95	98,67	97,84	98,93	98,62	97,72	98,50	97,45	
	F22K0	22	4	51	99,02	98,74	97,91	99,00	98,69	97,78	98,56	97,49	
E	F30K0	30	4	68	99,04	98,75	97,87	99,02	98,70	97,75	98,57	97,49	
	F37K0	37	4	84	99,19	98,94	98,13	99,17	98,89	98,02	98,78	97,73	
	F45K0	45	4	101	99,25	98,98	98,12	99,23	98,93	98,01	98,81	97,70	
	F55K0	55	4	120	99,30	99,02	98,13	99,28	98,96	98,00	98,83	97,68	

5.3 Denomination of components of the FlexiMova® mm size A

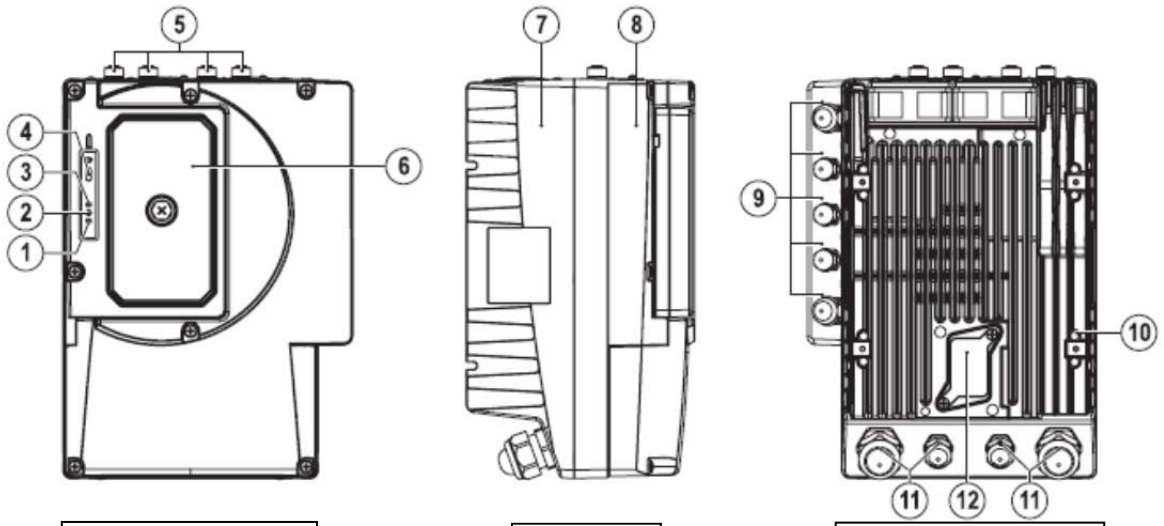
Figure 2: Denomination of components size A



No.	Denomination	Function
1	Red LED	A steady red light indicates the presence of one or more fault alerts
2	Yellow LED	A steady yellow light indicates the presence of one or more alarm messages
3	Green LED	A steady green light indicates that the product is running normally
4	Service interface	Optical interface
5	Connectors for optional boards slot 1/2	For connecting the fieldbus modules
6	Keypad recess	To accommodate a keypad
7	Radiator	Contains the components and can be can be connected to the wall or to the flange with an adapter
8	Cover	Protects the internal components
9	Cable gland for signal cables	Provide secure passage and clamping of cables
10	Holes (4) for connection to the adapter	Used for fixing the adapter
11	Cable glands	Provide secure passage and clamping of cables
12	Hole for connection to the REEL SuPremE® motor	Hole combined with the adapter for direct connection to the motor

5.4 Denomination of components of the FlexiMova® mm size B

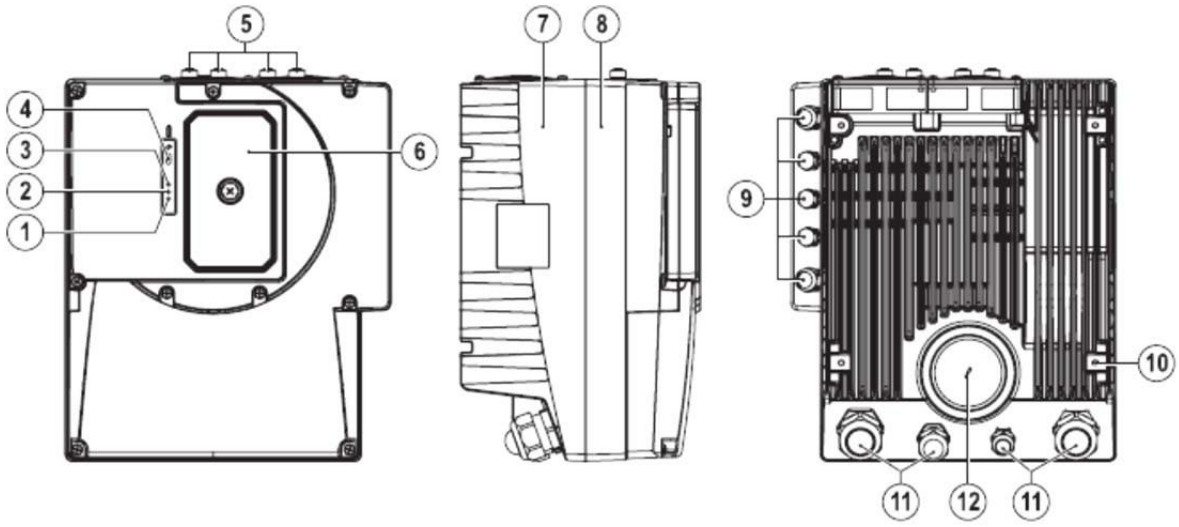
Figure 3: Denomination of components size B



No.	Denomination	Function
1	Red LED	A steady red light indicates the presence of one or more fault alerts
2	Yellow LED	A steady yellow light indicates the presence of one or more alarm messages
3	Green LED	A steady green light indicates that the product is running normally
4	Service interface	Optical interface
5	Connectors for optional boards slot 1/2	For connecting the fieldbus modules
6	Keypad recess	To accommodate a keypad
7	Radiator	Contains the components and can be can be connected to the wall or to the flange with an adapter
8	Cover	Protects the internal components
9	Cable gland for signal cables	Provide secure passage and clamping of cables
10	Holes (4) for connection to the adapter	Used for fixing the adapter
11	Cable glands	Provide secure passage and clamping of cables
12	Hole for connection to the REEL SuPremE® motor	Hole combined with the adapter for direct connection to the motor

5.5 Denomination of components of the FlexiMova® mm size C

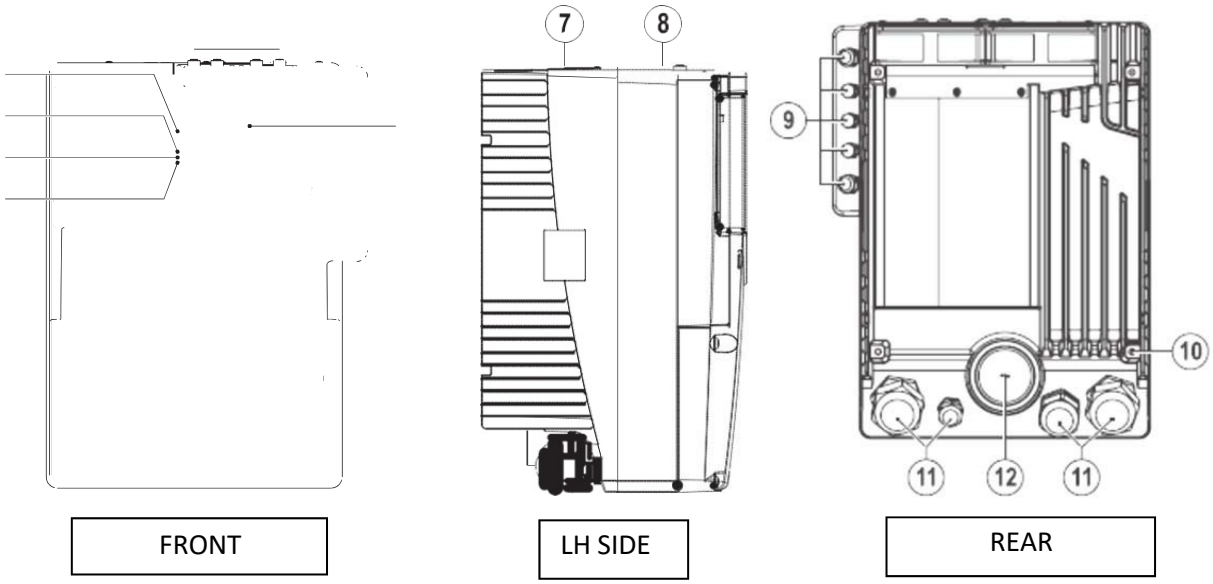
Figure 4: Denomination of components size C



No.	Denomination	Function
1	Red LED	A steady red light indicates the presence of one or more fault alerts
2	Yellow LED	A steady yellow light indicates the presence of one or more alarm messages
3	Green LED	A steady green light indicates that the product is running normally
4	Service interface	Optical interface
5	Connectors for optional boards slot 1/2	For connecting the fieldbus modules
6	Keypad recess	To accommodate a keypad
7	Radiator	Contains the components and can be can be connected to the wall or to the flange with an adapter
8	Cover	Protects the internal components
9	Cable gland for signal cables	Provide secure passage and clamping of cables
10	Holes (4) for connection to the adapter	Used for fixing the adapter
11	Cable glands	Provide secure passage and clamping of cables
12	Hole for connection to the REEL SuPremE® motor	Hole combined with the adapter for direct connection to the motor

5.6 Denomination of components of the FlexiMova® mm size D

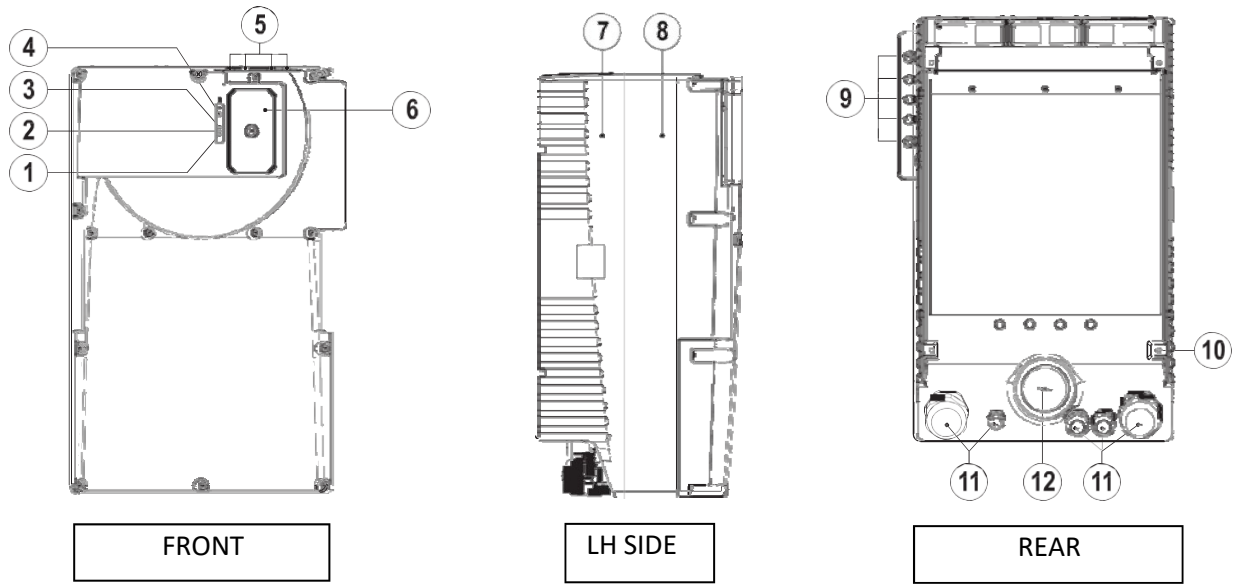
Figure 5: Denomination of components size D



No.	Denomination	Function
1	Red LED	A steady red light indicates the presence of one or more fault alerts
2	Yellow LED	A steady yellow light indicates the presence of one or more alarm messages
3	Green LED	A steady green light indicates that the product is running normally
4	Service interface	Optical interface
5	Connectors for optional boards slot 1/2	For connecting the fieldbus modules
6	Keypad recess	To accommodate a keypad
7	Radiator	Contains the components and can be can be connected to the wall or to the flange with an adapter
8	Cover	Protects the internal components
9	Cable gland for signal cables	Provide secure passage and clamping of cables
10	Holes (4) for connection to the adapter	Used for fixing the adapter
11	Cable glands	Provide secure passage and clamping of cables
12	Hole for connection to the REEL SuPremE® motor	Hole combined with the adapter for direct connection to the motor

5.7 Denomination of components of the FlexiMova® mm size E

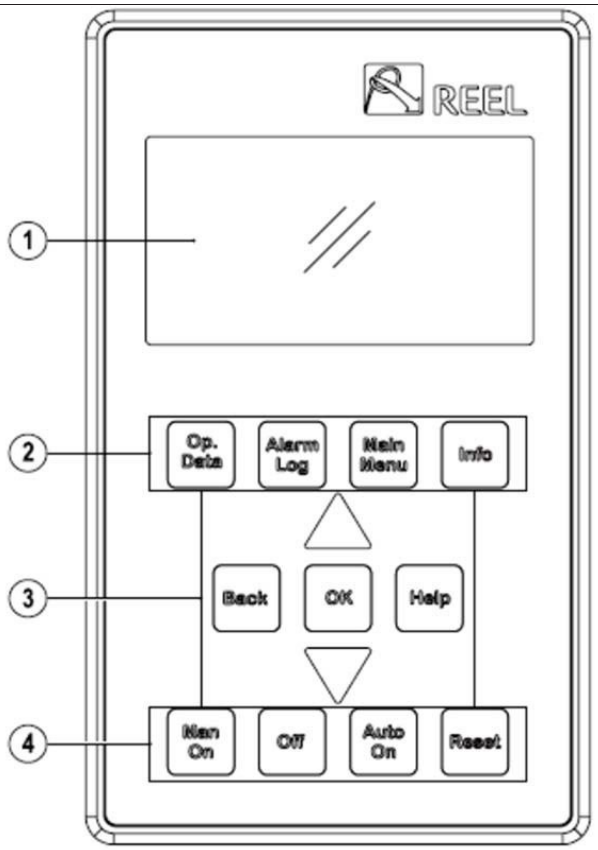
Figure 6: Denomination of components size E



No.	Denomination	Function
1	Red LED	A steady red light indicates the presence of one or more fault alerts
2	Yellow LED	A steady yellow light indicates the presence of one or more alarm messages
3	Green LED	A steady green light indicates that the product is running normally
4	Service interface	Optical interface
5	Connectors for optional boards slot 1/2	For connecting the fieldbus modules
6	Keypad recess	To accommodate a keypad
7	Radiator	Contains the components and can be can be connected to the wall or to the flange with an adapter
8	Cover	Protects the internal components
9	Cable gland for signal cables	Provide secure passage and clamping of cables
10	Holes (4) for connection to the adapter	Used for fixing the adapter
11	Cable glands	Provide secure passage and clamping of cables
12	Hole for connection to the REEL SuPremE®motor	Hole combined with the adapter for direct connection to the motor

5.8 Description of the graphic keypad (optional)

Figure 7: Description of the graphic keypad



Rif.	Description	Function
1	Display	Displays the operating information relating to the frequency converter
2	Menu keys	Press to go to the elements of the first menu level: - Operation - Diagnosis - Settings - Information
3	Navigation keys	Press to navigate and adjust the parameters
4	Function keys	Press switch operating modes

INFORMATION

For more details on use and operation refer to the programming manual.

5.9 Converter dimensions, weights and fixings

Figure 8: Dimensions

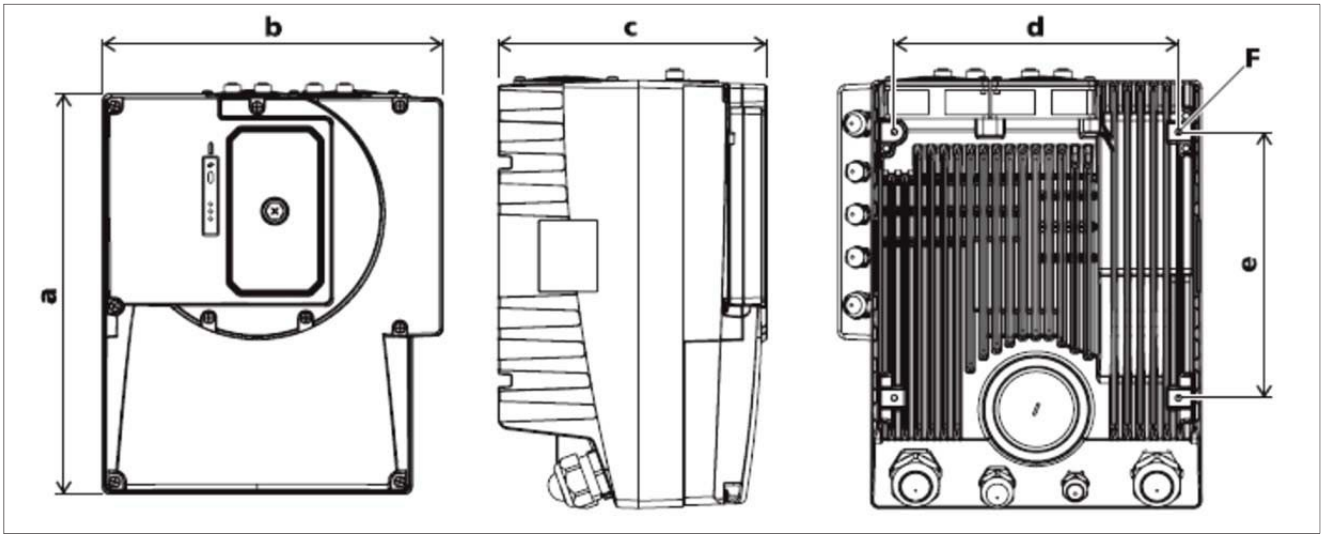


Table 21: Converter dimensions, weights and fixings

Model		a (mm)	b (mm)	c (mm)	d (mm)	e (mm)	Fixing screw (F)	Weight(kg)
A	F0K37	260	190	166	141	140	M4 x 10 DIN912	5
	F0K55							
	F0K75							
	F1K10							
	F1K50							
	F2K20							
B	F3K00	290	210	166	155	121	M4 x 10 DIN912	6,5
	F4K00							
	F5K50							
C	F7K50	330	280	207	220	205	M4 x 10 DIN912	14
	F11K0							
	F15K0							
	F18K5							
D	F22K0	460	350	287	280	309	M8 x 12 DIN912	33
	F30K0							
	F37K0							
	F45K0							
E	F55K0	700	455	336	375	475	M8 x 12 DIN912	59
	F0K37							
	F0K55							
	F0K75							
The dimensions given in this table refer only to the **FlexiMova® mm** without the fixings kit.								

5.10 Intended use

Table 22: Intended use

Field of application	Industrial and artisanal sector
Place of use	In a sufficiently ventilated place that is not exposed to direct sunlight and that allows enough room so that removal operations are not hindered. The product can even be used in aggressive environments, not necessarily in an electric cabinet.
Intended use	To control a standard electric motor or a REEL SuPremE® vector motor
Installers	Authorised operators meeting the professional technical requirements described in **par. 2.4**.

5.11 Reasonably foreseeable misuse

The product has been designed and constructed for the use described in **par. 4.1**, therefore any other use or application is prohibited. This is to ensure the safety of authorised operators and the effectiveness of the product at all times.

INFORMATION

The optimal operating temperature is -10 °C to +40 °C
The technical performance of the product decreases in one of the following conditions:
a) average temperature over 24 h > +35 °C
b) operating temperature > +40 °C
c) operating temperature < 0 °C
If the temperature is higher or lower than the optimal operating temperature the product applies a power derating in relation to the power output.

DANGER

It is forbidden to put the product into service in potentially explosive environments and/or in presence of combustible or inflammable substances.

DANGER

1) It is forbidden to use the product improperly or for uses other than those foreseen by the Manufacturer **(see par. 5.10)**.

2) It is forbidden for unauthorised persons **(see par. 5.10)** or any persons who are not physically and mentally alert to use the product .

3) It is forbidden to use the product in explosive atmospheres or environments where gases, fluids are present, or where it can come into contact with flammable components.

4) It is forbidden to use the converter with an electric motor that does not have the features indicated in **(see par. 8.1.4)**.

5) It is forbidden to use the product in environments with temperatures above or below the values indicated in **Table 15**.

6) It is forbidden to use the product in open spaces in the presence of reasonably foreseeable dangerous atmospheric events (e.g. lightning).

WARNING

1) Do not modify product. Doing so will void the warranty.
2) Do not connect non-original spare parts, equipment and/or accessories to the product.
3) Do not clean the product with flammable liquids or solvents.

5.12 Residual risks

The Manufacturer informs operators that although all possible technical-construction protective measures have been taken to make the product safe, residual risks still remain.

WARNING

To minimise exposure to the residual risks it is prohibited to use the product improperly **(see par. 5.10)**.

The personal protective equipment described in this manual must be worn at all times **(see par. 5.13)**.

RESIDUAL RISK NO. 1

Electric shock hazard: accidental contact with the connections while the product is energised may result in electric shock if unauthorised operators use the product improperly and fail to comply with the following guidelines:

- The appropriate PPE must be worn at all times **(see par. 5.13)**.
- Follow the correct mounting procedures **(see chap.7)**.
- Observe the connection conditions of the electrical energy provider.

RESIDUAL RISK NO. 2

Electric shock hazard: failure to disconnect the frequency converter from the mains supply network before beginning any maintenance or installation work and failure to comply with the following guidelines may result in electric shock:

- The appropriate PPE must be worn at all times **(see par. 5.13)**.
- Observe the correct use and maintenance procedures.

RESIDUAL RISK NO. 3

Electric shock hazard: electric shock may result if authorized operators remove the central part of the heatsink or do not observe the discharge times for the capacitors (> 10 min) after the product stops and fail to comply with the following guidelines:

- The appropriate PPE must be worn at all times **(see par. 5.13)**.
- Observe the correct use and maintenance procedures.

RESIDUAL RISK NO. 4

Crushing and injury hazard: from the product falling if authorised operators use the product improperly and fail to comply with the following guidelines:

- The appropriate PPE must be worn at all times **(see par. 5.13)**.
- Observe the correct use and maintenance procedures.

RESIDUAL RISK NO. 5

Crushing and entanglement hazard: due to the automatic startup of the product, if authorised operators use the product improperly and fail to comply with the following guidelines:

- The appropriate PPE must be worn at all times **(see par. 5.13)**.
- Observe the correct assembly procedures **(see chap.7)**.

RESIDUAL RISK NO. 6

Burn hazard: can be caused by contact with hot surfaces (motor) if authorised operators fail to comply with the following guidelines:

- The appropriate PPE must be worn at all times **(see par. 5.13)**.
- Observe the correct use and maintenance procedures.

RESIDUAL RISK NO. 7

Fire hazard: if authorised operators fail to comply with the following guidelines:

- Do not connect several motors simultaneously to the frequenc y converter.
- Do not put the product into service in potentially explosive environments
- and/or in presence of combustible or inflammable substances.

5.13 Personal protective equipment (PPE)

The use of personal protective equipment (PPE) is mandatory in compliance with Legislation in force in the country of use of the product concerning health and safety in the workplace (e.g. Directive 89/686/EEC and for Italy Leg. Dec. 81/08). The employer and the authorised operators must be familiar with and apply all the obligations and duties of the aforementioned legislation.

WARNING

It is forbidden to wear clothing and/or accessories that could catch in product (loose-fitting clothes, ties, belts, necklaces, bracelets, watches, earrings, rings, etc.); long hair must be contained or covered.

Table 23: Personal protective equipment - PPE

Mandatory PPE for all authorised operators	
	**GLOVES** (To protect hands against direct contact when working live or close to live parts 1000 V - EN 60903:2003)
	**GLOVES** (For protection against heat)
	**ELECTRICALLY INSULATING FOOTWEAR** (To protect the wearer against electric shock when working live or close to live parts EN 20344:2004/A1:2007, EN 20347:2004/A1:2007, EN 50321:1999)
	**FOOT PROTECTION** (Protective and safety footwear)
	**PROTECTIVE CLOTHING** (For protection of the body against direct and indirect action of current by contact or at a distance when working live with low voltage EN 340:2003, EN 11612:2008 and EN 50286:1999)
	**HELMET** (Head protection against direct contact up to 440 V – EN 397:1995/A1:2000)
	**FACE SHIELD** (Face protection against UV rays – electric arcs - working live or close to low-tension live parts - EN 166:2001, EN 168:2001, EN 170:2002)

5.14 Tools

The tools (screwdrivers, shears, pliers, etc.) used by authorised persons for servicing the product must be suitable
and comply with the current regulations and bear the following marking:

- Double triangle symbol.
- Manufacturer's name.
- Year of manufacture.

5.15 Protective devices

5.15.1 Fuses

The input bridge must be protected against overload or sudden current surges with **rapid** or **ultra rapid fuses** sized according to the product's rated output current (**IaN**) and technical characteristics.
The tables below indicate the maximum I^2t (A^2/s) value of the fuse recommended by the Manufacturer to ensure correct protection of the product. The tables have been prepared in compliance with the relevant regulations (EC normative references). When selecting the appropriate fuse, the following factors must be taken into consideration :

- The nominal value of the fuse's rms current which **must be greater** than the declared nominal output current.
- The temperature derating, therefore possible oversizing.
- Overload index and service class.
- The rated voltage (≥ 600 VAC).
- The I^2t value of the fuse used which **must be less than** the value indicated in the following table.

Table 24: Recommended fuses

Recommended fuses			
FlexiMova® mm Size and power (kW)	**Input Inom** (A)	**I²t (25°C) MaX. a²/s**	**Ampere rating** (A)
Size A (0,35 – 1,5)	1,4 – 5,2	180	6/16
Size B (2,2 - 3 - 4)	6,3 – 10,4	250	16/25
Size C (5,5 -11)	14,6 – 25,9	1400	32/50
Size D (15 – 30)	35,7 – 69,7	7000	50/100
Size E (37 – 45 – 55)	85,9 – 122	7000	150/180

5.15.2 Automatic differential thermal-magnetic circuit breaker at line inlet

This type of protection must take into consideration the leakage current in relation to the network filters mounted on the product.
From the various tests carried out each **FlexiMova® mm** model has a different leakage current value. It is the responsibility of the installer to select an RCD (residual current differential) protection device appropriate for the category of the inverter (for PWM modulation) and with protection trip threshold calibrated according to the table below.

Table 25: Recommended differential thermal-magnetic circuit breaker

Recommended differential thermal-magnetic circuit breaker		
FlexiMova® mm Size and Power (kW)	**Input Inom** (A)	**Id** (*) (mA)
Size A (0,35 – 1,5)	1,4 - 5,2	30
Size B (2,2 – 4)	6,3 - 10,4	30
Size C (5,5 -11)	14,6 - 25,9	100
Size D (15 – 30)	35,7 - 69,7	100
Size E (37 – 45 – 55)	85,9 - 122	300
(*) Indicate electrical connection protected by differential with **Id** trip threshold higher than the standard for non-industrial use.		

5.15.3 Motor PTC protections

For the line and motor connections use the respective cable glands provided.
In the event of discharge in the motor windings and the PTC connection the system self-protects through the fuse connected in series with the same PTC.
The opening of this fuse prevents the transfer of dangerous voltage to the part of the control that is accessible to the operator.
In the event of failure, the fuse can only be replaced by the Manufacturer.

6 Transportation - Storage - Disposal

6.1 Packaging

Upon delivery of the goods check every package to verify that there are no visible signs of damage. The packaging enclosure, when the product is supplied separately as a separate non-assembled element, must be intact and dry. In the event of damage during transit determine the exact extent of the damage, document it and notify the supplier immediately.

6.2 Transportation

DANGER

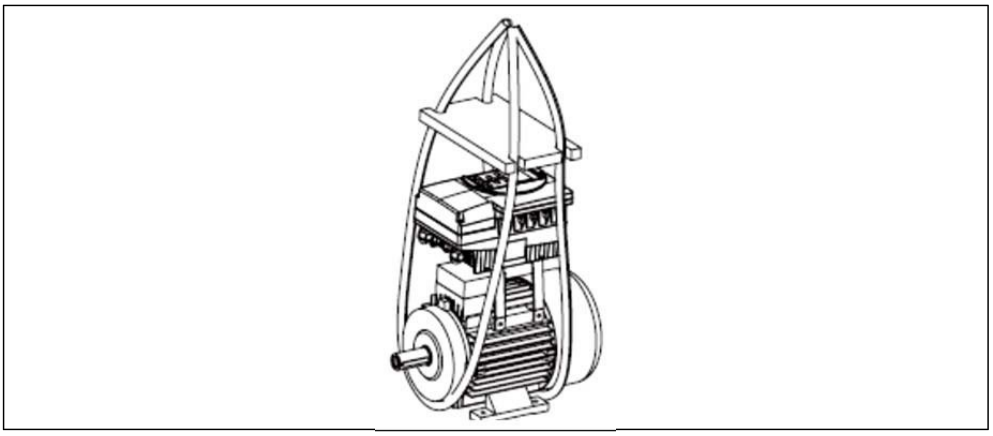
Safely move the product and motor to the designated position.
Observe the centre of gravity and the masses of the product.
Observe the accident prevention regulations in force in the country of use.
Use approved lifting equipment.

WARNING

When handling masses >25 kg it is mandatory to employ 2 operators or to use appropriate lifting equipment.

For assembled converter and motor secure and move the product as illustrated in **Figure 9**.

Figure 9: Transporting the product mounted on the motor



6.3 Storage

If the product is to remain unused for a long time:

1) Thoroughly clean the product
2) Store it in the original packaging
3) Place it in an environment that is:
- Dry with no strong fluctuations of moisture.
- Vibration-free.
- Safe.
- Sheltered from extreme weather conditions, direct sunlight and dust.

4) Cover it with a sheet or use some other protective means to avoid buildup of dust.

6.4 Disposal

The product is considered special waste due to some of its components so the required disposal procedure is as follows:

- Disassemble the product
- Separate the recoverable materials such as :
  - Aluminium
  - Plastic cover (recyclable plastic)
  - Network impedance with copper windings
  - Copper wires for internal wiring
  - Mechanical parts and metal
  - Electronics (boards and ventilation)
  - Resins

Consequently dispose of in accordance with local or state regulations. The electronic boards, the power components, the capacitors and the electronic components are considered special waste.

7 Mounting instructions for the converter

7.1 General instructions

ATTENTION

When selecting an installation site you must comply with the conditions set out in **par. 7.2.1**.

If the product is installed outdoors, protect the product from direct sunlight to prevent the formation of condensation on the electronic components.

Use of the product in ambient conditions other than those specified in the manual must be assessed together with the Manufacturer .

WARNING

Prior to starting any mounting operations verify, in **Table 5,** the mass of your **FlexiMova® mm** model, in order to determine the proper size of the fixings and supporting structure for the product.

7.2 Mounting types

There are three possible installation methods for the product:

- **Wall or machine mounted.**
- **Motor mounted with an adapter** (specific for REEL SuPremE® motors).
- **Motor mounted** (also on motors other than REEL SuPremE®) using the purpose-made adaptation KIT (not available as an optional).

7.2.1 Wall or machine mounted

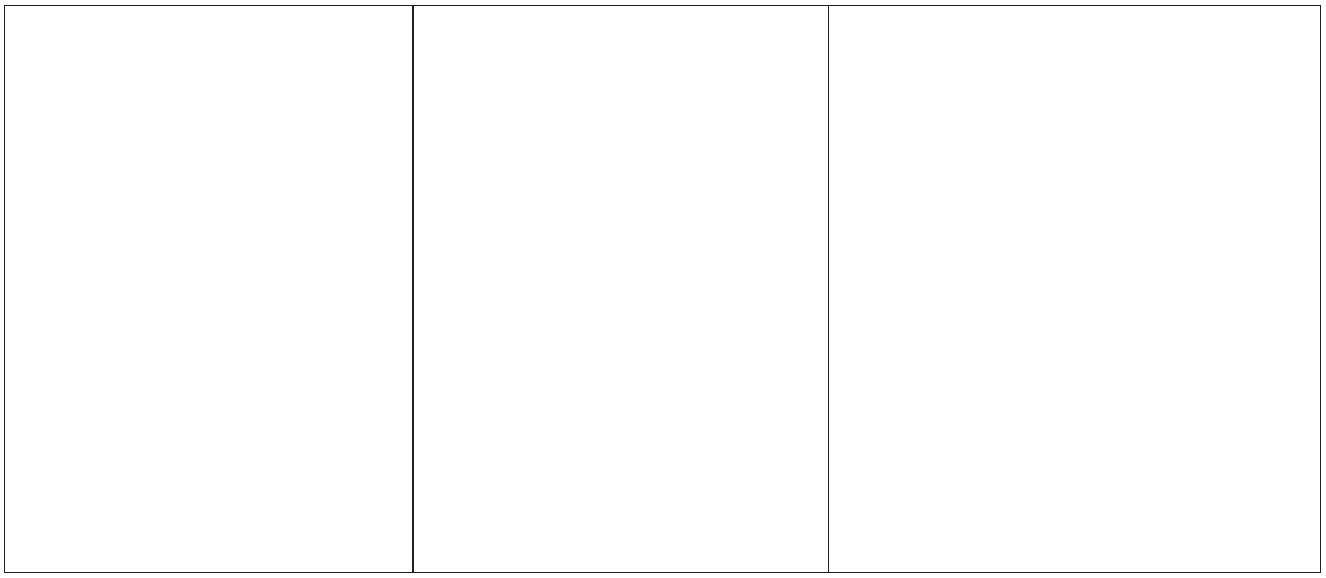
A KIT (optional) is available for wall/machine mounting, consisting of metal plate and brackets that are fixed to the product to enable installation.

Figure 10, Figure 11 and **Figure 12** illustrate the three different KIT models, differentiated by the size of the product.

Figure 10: Model of the wall-mount KIT
Sizes A, B, C

Figure 11: Model of the wall-mount KIT
Size D

Figure 12: Model of the wall-mount KIT
Size E



The product sizes A, B, C must sit flat against the wall of the fan in order to convey the airflow from the fan through the heatsink. For sizes D and E this function is already guaranteed by the special fixing plate mentioned above.
To ensure sufficient cooling, when mounting the device, make sure that the exhaust air is not directly drawn in or obstructed by other devices.
Comply with the minimum clearance specified in **Table 26**.

Table 26: Minimum clearance for mounting in the electric cabinet

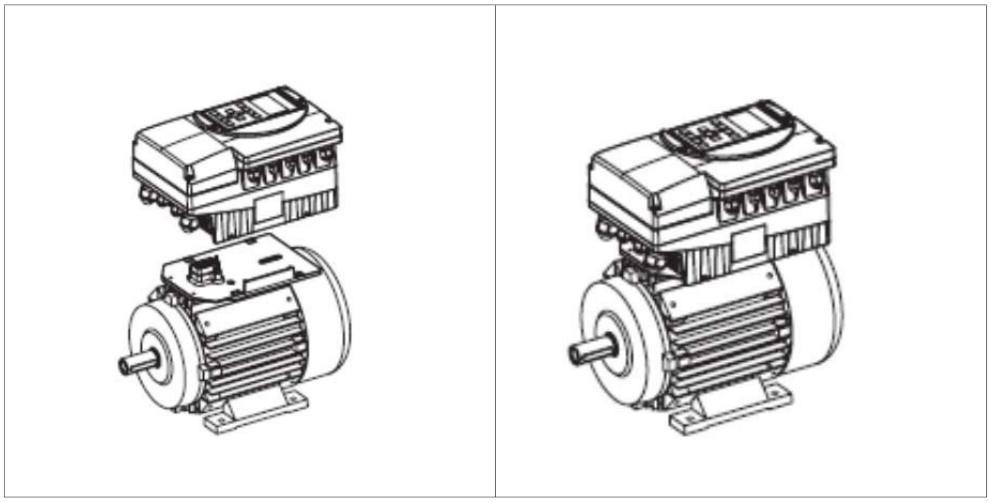
Minimum clearance from other devices	mm
Top and bottom	100
Side	20

7.2.2 Motor mounted

Direct mounting on the motor is a specific installation for REEL SuPremE® motors . The connection is made on top of the motor by means of an adapter to allow the cables to pass through to the inside **(Figure 16)**.

For direct mounting on the motor the **FlexiMova® mm** will require the adapter illustrated in **Figure 14**, and be mounted as illustrated in **Figure 13**.

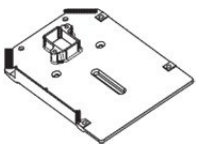
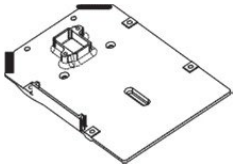
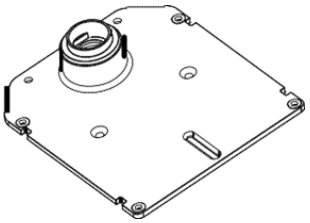
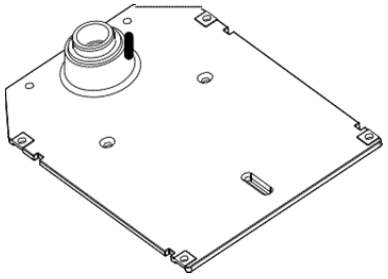
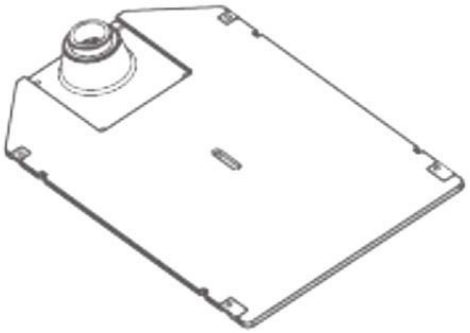
Figure 13: Example of the **FlexiMova® mm** converter mounted directly on the REEL SuPremE® motor.



The REEL SuPremE® motors also require an outlet that allows them to connect to the product:

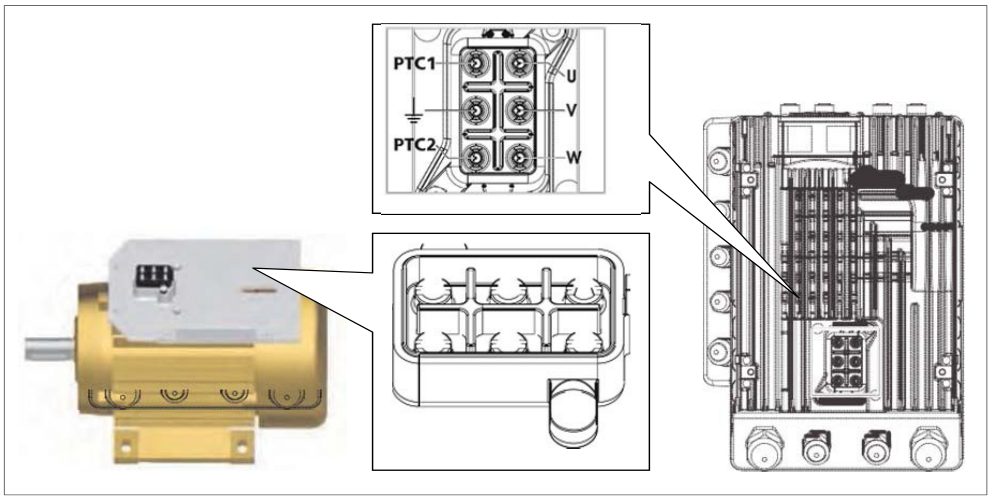
- For sizes A and B: fitting for quick connector **(see Figure 15),** provided as standard. The connector is coupled directly onto the motor using the adapter.
- For sizes C, D and E: fitted with internal hole arrangement and a dedicated outlet for the motor cables to pass through **(Figure 16)**.

Figure 14: Adapter

		
Adapter for **FlexiMova® mm** size A	Adapter for **FlexiMova® mm** size B	Adapter for **FlexiMova® mm** size C
		
Adapter for **FlexiMova® mm** size D	Adapter for **FlexiMova® mm** size E	

The REEL SuPremE® motors also require an outlet to enable connection that is suitable for the converter in use. In this case for REEL SuPremE® motors connecting to sizes A and B a quick connector arrangement will be fitted as illustrated below.

Figure 15: REEL SuPremE® motor with adapter for **FlexiMova® mm** sizes A and B



INFORMATION
If the installation (or not) of the connector on sizes A and B must be specified at the time the order is placed for the product.

For sizes A and B the connector is the same.

For sizes C, D, E the arrangement is an internal cable passage fitted at the rear of the radiator which will couple directly to the adapter provided for fixing to the motor.
Remember to remove the protective cover.

Figure 16: Example of cable passage in sizes C, applicable also to sizes D and E

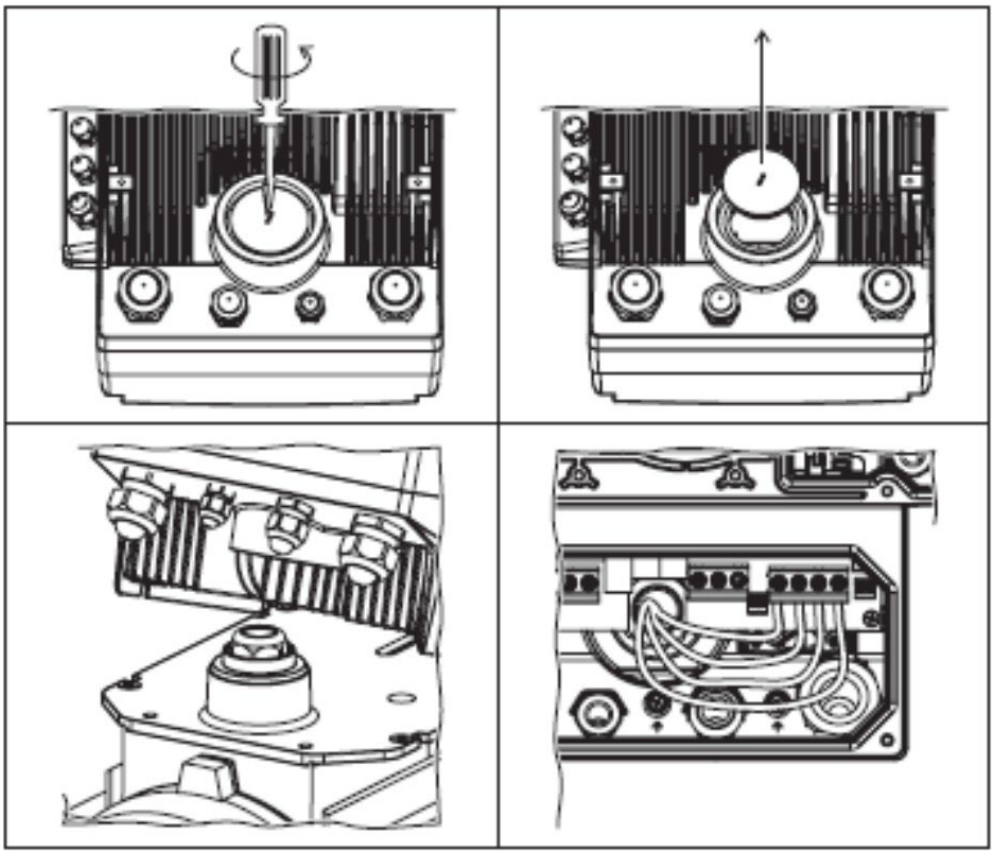
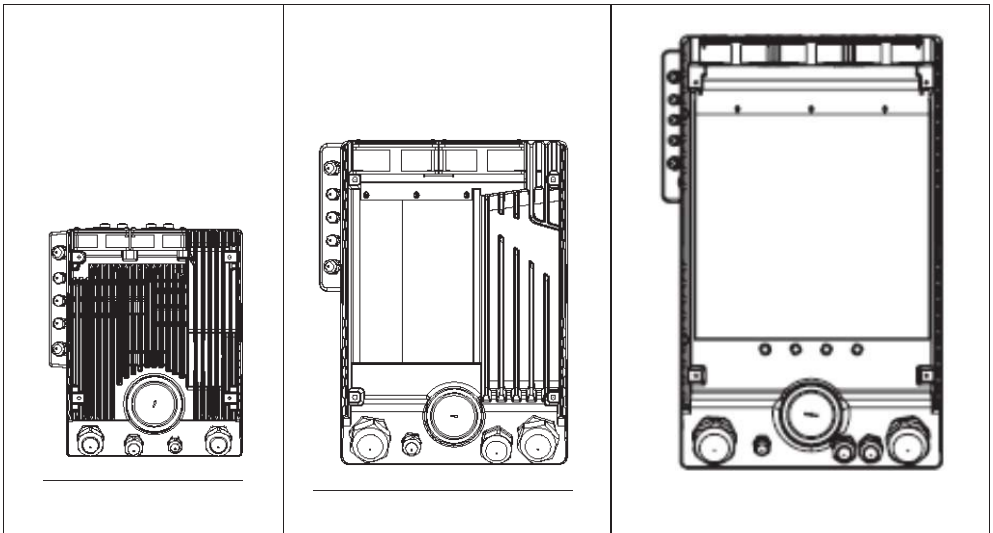


Figure 17: Hole diameter

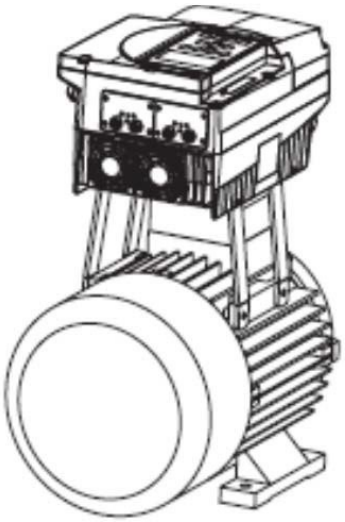


Size C: ø 50 mm	Size D: ø 50 mm	Size E: ø 63 mm

7.2.3 Direct mounting on REEL SuPremE® motor fitted with traditional terminal box by means of mechanical adapter plate

This type of mounting is a specific installation for REEL SuPremE® motors fitted with a traditional terminal box (supplied as standard) which is used for the electrical connection to the motor.
The Manufacturer can supply mechanical plates which differ according to the size of the product (A,B,C,D or E).
The cable gland outlet of the **FlexiMova® mm** converter and the inlet to the terminal box by means of a standard shielded cable are arranged specifically for each size.

Figure 18: Example of mounting with mechanical plate

Mounting of **FlexiMova® mm** with adapter plate and motor with traditional terminal box	Example of mechanical plate
	

8 Electrical connections

8.1 Electromagnetic compatibility

8.1.1 Classification

The product is designed in compliance with the EMC Directive 2014/30/UE "Electromagnetic Compatibility" in accordance with the reference standard EN 61800-3 which in turn refers to EN 55011 for the part relating to electromagnetic emissions.

Table 27: Product classification

Size	Category (*)	Definition	Limit values according to EN 55011
A - B - C	C1	In the first environment (domestic and office premises) frequency converters installed with a power supply voltage less than 1000 V.	Class B
D - E	C2	In the first environment (domestic and office premises) frequency converters installed with a power supply voltage less than 1000 V, plug-in or movable, installed and commissioned by specialist technicians.	Class A group 1
(*) The categories are only achieved if the instruction in this chapter are fully complied with.			

8.1.2 Requirements for network harmonics

In compliance with EN 61000-3-2 and EN 61000-3-12 the product in question is a professional device. For its connection to the public mains supply network the following main technical standards are applied:

- EN 61000-3-2 for symmetrically-controlled three-phase equipment up to 16A
- EN 61000-3-12 for equipment with current per phase between 16 A and 75A

If a further reduction of the network harmonics is required, suitable line reactors or filters can be installed (see chapter on "Electrical connections" where you will find all the tables with the necessary data).

8.1.3 Immunity of the electrical connections

Particular attention must be given to the electrical connections and to a good ground connection, as the propagation of the disturbances received and emitted by the inverter occurs through the connection cables.
The tests carried on **FlexiMova® mm** demonstrate high immunity to disturbances and low emission. The following are some important wiring and installation guidelines:

- The cable connections and the type of cable must be chosen according to their function.
- Signal cables must be shielded with a minimum coverage of 80%.
- For inverter-motor power cables the shield must be connected at both ends.
- The cable shield should not be considered an equipotential ground connection.
- Freewheeling diodes must always be installed on the DC-controlled relays and RC groups on AC-controlled relays or contactors in the electric cabinets that contain and/or share the same power supplies as the inverter.
- Connect the signal cable shield to the fixings provided inside the converter.
- The cable shield must be one continuous piece.

- The shield of the signal cable must only be connected on the converter side with its ground terminal. If the signal cable is particularly long (longer than 20 m) connect the shield at both ends.
- No signal cables must be arranged parallel to the power cables and they must maintain a distance of at least 0.3 m.
- If it is not possible to keep at a distance of at least 0.3 m employ suitably-sized metal separators (sheets) that will achieve an equivalent surface distance.
- If it is not possible to avoid intersecting the signal cables and the power cables, at least make it a 90° angle.
- Arrange the signal and power cables in separate conduits.
- The earth connections of the signal cables must be kept separate from those of the power cables; the connections will then be made to the PE input cable to the panel.
- For complex systems it is preferable to use a ground rod dedicated solely to power.
- Choose the cable section and insulation suitable for the power of the converter.
- Make sure that the cable is firmly fixed to the converter's terminal block: a loose cable could cause electrical discharges that could in turn damage the converter.

8.1.4 Inverter – Motor power connections

The inverter-motor power connection must:

- Be fitted with the correct cable selected for the specific use.
- Use a low capacity cable.
- Use shielded cables with a coverage ≥ 80%.
- Use ferrites (when required).
- Comply with the correct wiring regulations.

INFORMATION
The use of high parasitic capacitance cables can trigger the converter's protection. Always verify that the parasitic capacitance in accordance with the length of the connection does not exceed 10 nF (if the parasitic capacitance value is not available contact the cable manufacturer for a copy of the technical sheet). If this requirement cannot be met then line reactors oroutput filters are required to reduce the dV/dt (see relevant connection table).

Table 28 indicates the type of cables to use and the corresponding ferrites when necessary (also depending on the length of the power cable between the inverter and the motor) to maintain the declared EMC category.

Failure to comply with these instructions will downgrade the product to category C4.

Table 28: Inverter – motor power connections

Inverter – motor Cable length			0 ÷ 5 m	5 ÷ 50 m		50 ÷ 200 m				
Size		Power (kW)	Type of power connection			(**) Additional components				
		(*) Cable	Connection through cable glands or with direct quick connector on the motor	Connection through cable glands	EMC classification achieved	Output reactor for 1500 rpm (mH) motors	Output reactor for 3000 rpm (mH) motors	dV/dt output filter for 1500 rpm motors	dV/dt output filter for 3000 rpm motors	EMC classification achieved
			(*) Ferrites							
A	F0K37	Teco Cable supplier	No ferrites needed	RICHCO RKCF-13_A5	Classification C1 class B	7.10	3.5	PREMO FOVT-008B		Category to be verified in the system
	F0K55					5	2.5			
	F0K75					3.60	1.8			
	F1K10					2.60	1.3			
	F1K50					1.90	1.0			
B	F2K20			RICHCO RKCF-13_A5		1.60	0.8			
	F3K00					1.10	0.6			
	F4K00					0.90	0.5	PREMO FOVT-016B		
C	F5K50			FAIR-RITE 0431176451		0.60	0.3			
	F7K50					0.50	0.3	PREMO FOVT-025B		
	F11K0					0.40	0.2			
D	F15K0			FAIR-RITE 0431177081	Classification C2 class A group 1	0.30	0.14	PREMO FOVT-036B	Schaffner FN510-66-34	
	F18K5					0.20	0.10	Schaffner FN510-50-34	Schaffner RWK-305-60-KL	
	F22K0					0.20	0.10	Schaffner FN510-66-34		
	F30K0			FAIR-RITE 2631626202		0.15	0.07		Schaffner RWK 305-90-KL	
E	F37K0			FAIR-RITE 2631626202		0.10	0.06	RWK-305-90-KL	Schaffner RWK 305-90-KL	
	F45K0					0.09	0.05	RWK-305-124-KS	Schaffner RWK-305-124-KS	
	F55K0					0.08	0.04	RWK-305-156-KS	Schaffner RWK 305-156-KS	

(*)REEL's tests are carried out with the cable and ferrites declared in the table; equivalent components can be used.
(**)For connections with cables longer than 50 m the installer is responsible for selecting the most suitable solutions and for verifying the classification achieved.

INFORMATION

The Manufacturer suggests various solutions to cover possible problems. The system designer selects the most suitable solution and/or alternative components with similar characteristics to those suggested.

- **Output line reactor:** is mandatory for installations with long cables
- when the parasitic capacitance of the cables exceeds 10 nF as the increased parasitic capacitance can cause the inverter to trip due to overcurrent and overvoltage on the motor.
- **dV/dt filter**: is required to limit the radiated emissions; it is also useful for reducing the overvoltage across the motor terminals and the leaked current caused by the parasitic capacitance of the cables.

8.2 Safety measures relating the electrical connection

DANGER

The Manufacturer informs operators that although all possible technical-construction protective measures have been taken to make the product safe possible residual risks Nos. 1, 2, 3 and 7 still remain **(see par. 5.12)**.

ATTENTION

Never position automatic disconnect devices between the converter output and the motor: this could result in damage to the product. Disconnection is only permitted with the converter disabled.

ATTENTION

Never perform insulation tests on the components of the frequency converter without the support of the Manufacturer's assistance service. Incorrectly performed insulation tests can cause damage to the product.

ATTENTION

Disconnect the frequency converter before performing insulation tests on the motor, the motor's connection cable or on the cable connecting to the mains power supply network.
Incorrectly performed insulation tests can cause damage to the product.

INFORMATION

The product is fitted with electronic protection and safety devices that disable the motor in the event of failures. To install them use only the holes provided. Drilling additional holes will void the warranty and the swarf could damage the product.

8.3 Selecting and laying the power cables

The choice of connecting cables depends on various factors including the type of connection, the environmental conditions and the type of system.
The connecting cables must comply with regulations, and selected with particular attention to: manufacturer's details, rated voltage, insulation class, rated current, operating temperature and thermal effects.

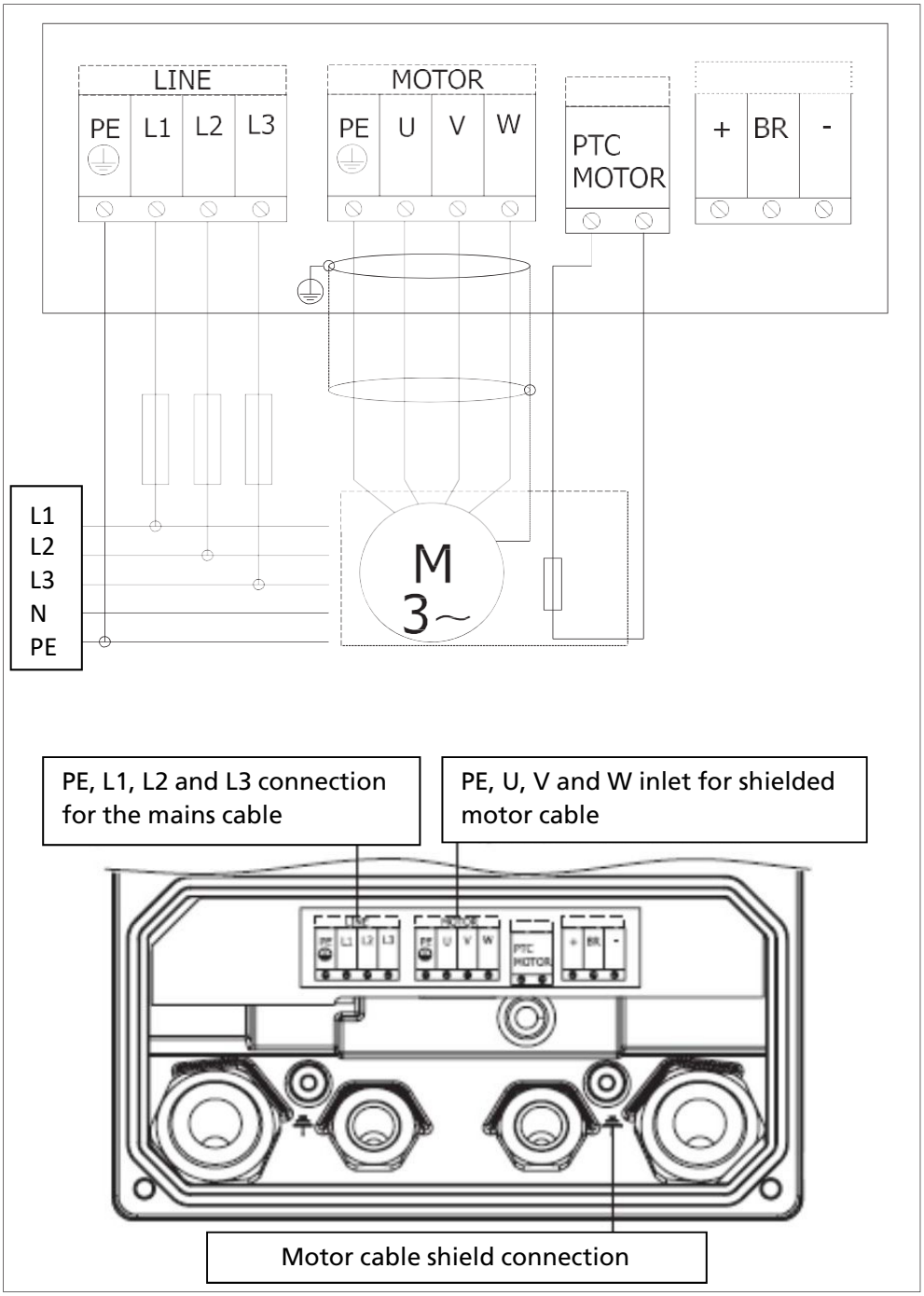
- Do not lay cables on or near hot surfaces (unless they are cables intended for this type of use).
- If mobile system components are used, use cables with adequate elasticity.
- Arrange the power cables and the signal cables in separate conduits.
- Arrange the power cables and signal cables separately on the floor, using a star connection to limit the possibility of disturbances or signal alterations.
- See **par. 8.4.6** "Ground connection" for a correct definition of the connections.
- If necessary (also depending on the powers involved) use diversified ground rods for the signal ground connections and the power ground connections.
- Verify that the signal rods are not interfered with by power circuit currents, being sources of possible disturbances coming from the control system (PWM, high di/dt, etc.) or from the connection systems (brushes, sliding contacts, etc.).
- Connect the fixed equipment correctly with the shortest cables possible.

8.3.1 Connection to the AC power supply network

FlexiMova® mm requires a shielded cable with ground conductor for its connection to the power supply network.

FlexiMova® mm is already equipped with a terminal for connecting L1, L2, L3 and ground.

Figure 19: Connection to the AC power supply network



- Size the connecting cables to the mains supply network with a section suitable for the rated current plus an additional amount for greater distances or higher temperatures.
- If using a protection on the connection cable to the mains supply network (upstream from frequency converter) this must be sized as an AC1 contactor.

Use ultra rapid fuses for protection as described in **(par. 5.15.1)**.
For the connecting cable to the mains supply network see the following table.

Table 29: Connection to the AC mains supply network AC and to the motor

Size and Model		Power (kW)	Rated input current (A)	Section of input cable (mm^2)	Minimum and maximum cable diameter (mm)	Type of cable gland used in the converter	Type of motor cable required
A	F0K37	0.37	1.4	3 x1,5 +1,5	7-13	M20	CABLE FRX 4X1,5+(2X1)ST
	F0K55	0.55	2	3 x1,5 +1,5	7-13	M20	CABLE FRX 4X1,5+(2X1)ST
	F0K75	0.75	2.7	3 x1,5 +1,5	7-13	M20	CABLE FRX 4X1,5+(2X1)ST
	F1K10	1.1	3.7	3 x1,5 +1,5	7-13	M20	CABLE FRX 4X1,5+(2X1)ST
	F1K50	1.5	5.2	3 x1,5 +1,5	7-13	M20	CABLE FRX 4X1,5+(2X1)ST
B	F2K20	2.2	6.3	3 x1,5 +1,5	10-17	M25	CABLE FRX 4X1,5+(2X1)ST
	F3K00	3	8.4	3 x1,5 +1,5	10-17	M25	CABLE FRX 4X1,5+(2X1)ST
	F4K00	4	10.4	3 x1,5 +1,5	10-17	M25	CABLE FRX 4X1,5+(2X1)ST
C	F5K50	5.5	14.6	3 x 4 + 4	13-21	M32	CABLE FRX (4X4+(2X1)ST)ST
	F7K50	7.5	18.7	3 x 4 + 4	13-21	M32	CABLE FRX (4X4+(2X1)ST)ST
	F11K0	11	25.9	3 x 6 + 6	13-21	M32	CABLE FRX 4X6+(2X1,5)ST
D	F15K0	15	35.7	3 x 10 + 10	19-28	M40	CABLE OFS 4X10+(2X1,5)ST
	F18K5	18.5	45.4	3 x 16 + 16	19-28	M40	CABLE FRX (4X16+(2X1,5)ST)ST
	F22K0	22	52.4	3 x 16 + 16	19-28	M40	CABLE FRX (4X16+(2X1,5)ST)ST
	F30K0	30	69.7	3 x 25 + 25	22-32	M40	CABLE OFS 4X25+(2X1,5) 18216
E	F37K0	37	85.9	3 x 35 + 35	27-39	M63	CABLE FRX-ST (4X35+(2X1,5)ST)ST
	F45K0	45	103.1	3 x 50 + 50	34-45	M63	CABLE FRX-ST (4X50+(2X1,5)ST)ST
	F55K0	55	122.4	3 x 70 + 70	34-45	M63	CABLE FRX-ST (4X70+(2X1,5)ST)ST

8.3.2 Installation of line impedance and network filters

The input reactor is built-in to reduce harmonic distortion and to ensure it falls within the declared category.
As well as the built-in input impedance in the frequency converter (included in the power range up to 55 kW) it is possible to use external network impedance to further reduce the harmonic distortion.

Figure 20: Installation of line impedance and line input filter (if required)

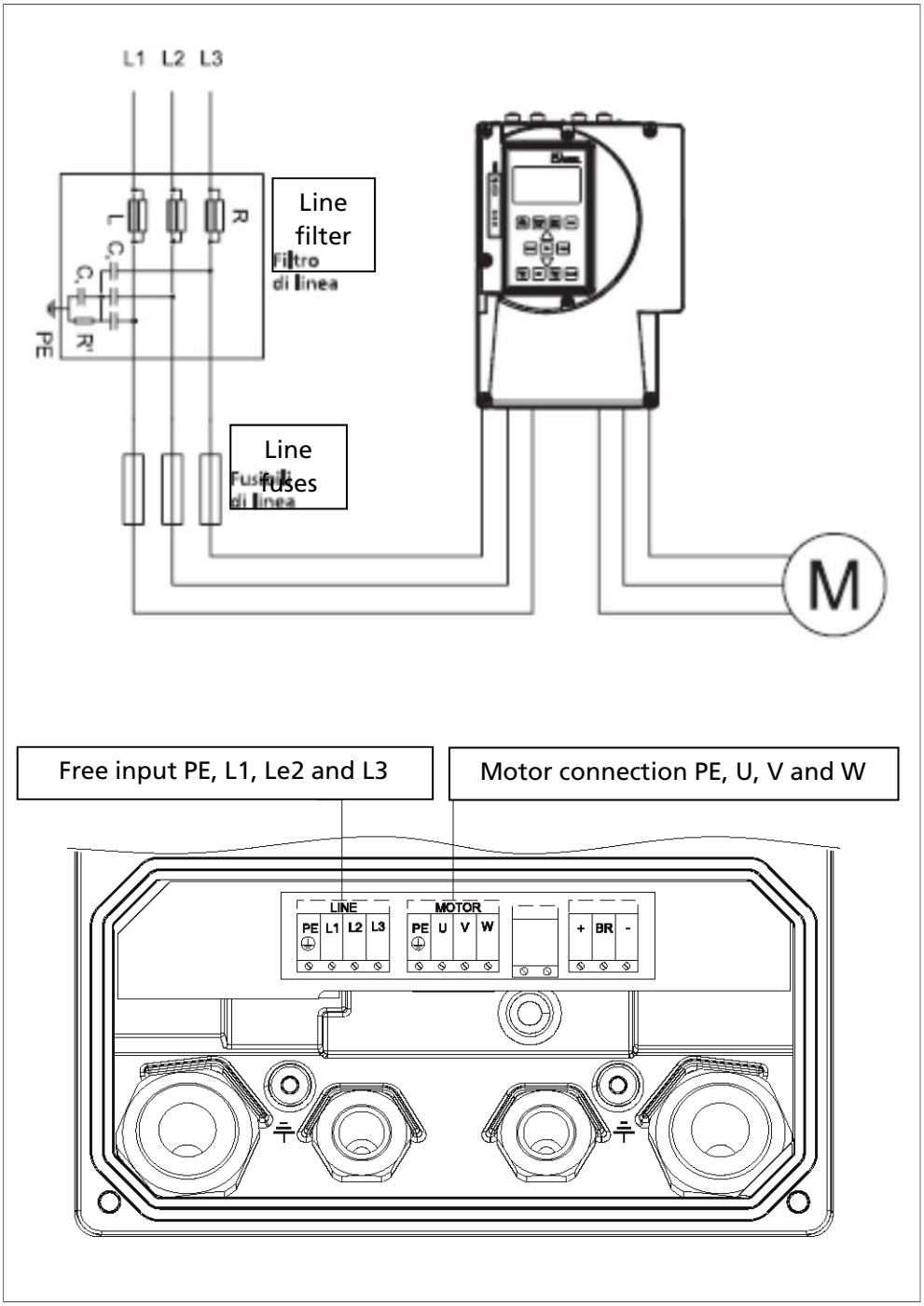


Table 30: Table for the selection of the 3-phase input line reactors

Size		Power (kW)	Inductance Ln (mH)	Rated current In (A)	MAX saturation current Isat (A)
A	F0K37	0.37	7,0	6	1,5 In
	F0K55	0.55			
	F0K75	0.75			
	F1K10	1.1			
	F1K50	1.5			
B	F2K20	2.2	2,0	11	1,5 In
	F3K00	3			
	F4K00	4			
C	F5K50	5.5	1,1	28	1,5 In
	F7K50	7.5			
	F11K0	11			
D	F15K0	15	0,5	51	1,5 In
	F18K0	18.5			
	F22K0	22			
	F30K0	30	0,1	100	1,5 In
E	F37K0	37			
	F45K0	45			
	F55K0	55	0,1	125	1,5 In

Table 31: Table for selection of recommended line filters

Size		Power (kW)	Line current (A)	Recommended model (supplier Schaffner)
A	F0K37	0,37	1,4	FN 3410-10-44
	F0K55	0,55	2	FN 3410-10-44
	F0K75	0,75	2,7	FN 3410-10-44
	F1K10	1,1	3,7	FN 3410-10-44
	F1K50	1,5	5,2	FN 3410-10-44
B	F2K20	2,2	6,3	FN 3410-10-44
	F3K00	3	8,4	FN 3410-10-44
	F4K00	4	10,4	FN 3410-10-44
C	F5K50	5,5	14,6	FN 3410-13-44
	F7K50	7,5	18,7	FN 3410-16-44
	F11K0	11	25,9	FN 3410-24-33
D	F15K0	15	34,1	FN 3410-32-33
	F18K0	18,5	43,3	FN 3410-38-33
	F22K0	22	52,4	FN 3410-45-34
	F30K0	30	67,7	FN 3410-60-34
E	F37K0	37	83,4	FN 3410-75-35
	F45K0	45	99	FN 3410-90-35
	F55K0	55	122,4	FN 3410-110-35

8.3.3 Motor connecting cables

The cables for the connection of the motor must be shielded cables with adequate insulation. The ground connection must be made to both the motor and the converter by means of the connection in the terminal block.
The various sizes of the **FlexiMova® mm** has built-in:

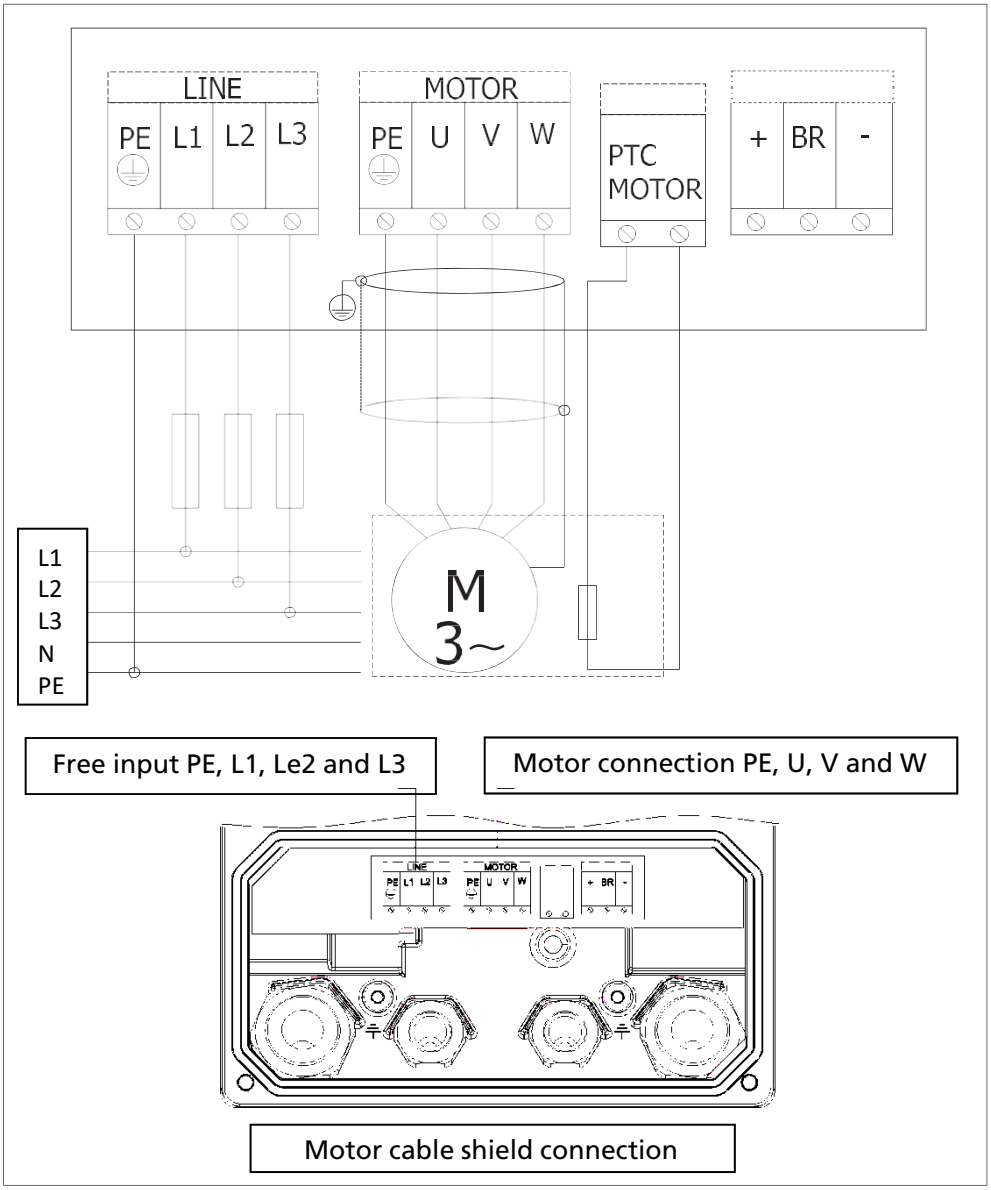
- terminal for the ground connection of the motor cable.
- screw for fixing the shield directly to the converter.

INFORMATION

The connection of both the shield and the ground wire of the motor cable must be made at both ends, that is, at the inverter end (using the dedicated fixings) and at the motor end.

The shield must have a coverage of at least 80% of the cable's length and it must be connected directly to the structure by means of the screws provided **(see Figure 21)**. For the ground connection use the inlet provided on the terminal block.

Figure 21: Example of motor cable connection - use shielded cable



8.3.4 Length of the motor connecting cables

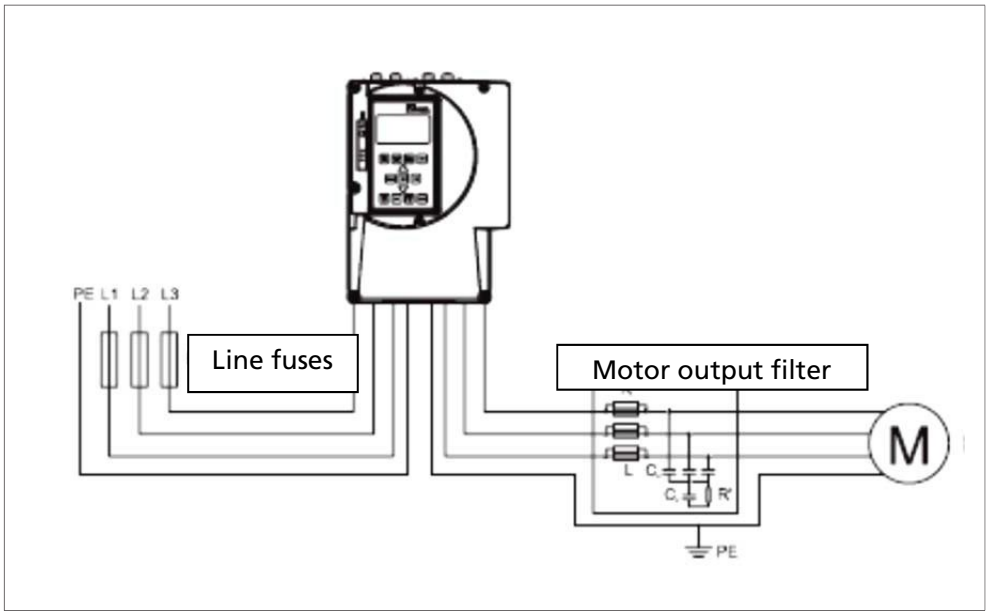
If the frequency converter is not mounted directly on the motor longer connecting cables may be necessary. Using cables that are longer than the maximum permissible length, it can cause the internal protections to trip as all the cables have parasitic capacitance existing between the various conductors, due to the parallel arrangement and close proximity to the shield. Depending on the parasitic capacitance of the
connecting cables high frequency parasitic currents can be induced through the ground wire of the cables. The cable Manufacturer provides a technical sheet specifying the magnitude of the parasitic capacitance for each metre of length of the cable.

INFORMATION
Do not in any circumstances apply a parasitic capacitance greater than 10 nF.

8.3.5 Output filter

If, installation reasons, the length of the cables is such that the parasitic capacitance
exceeds the maximum permitted value, then a dV/dt filter must be installed between the product and the motor to protect against excessive current leakage which would activate a safety shutdown. In addition, the filter will reduce the high frequency emissions.
The switching time of the internal IGBT is roughly 5000 V/µS. Always refer to **Table 27 (see par. 8.1.1)** "Electromagnetic compatibility" for recommended output filters according to the type and length of the cables.

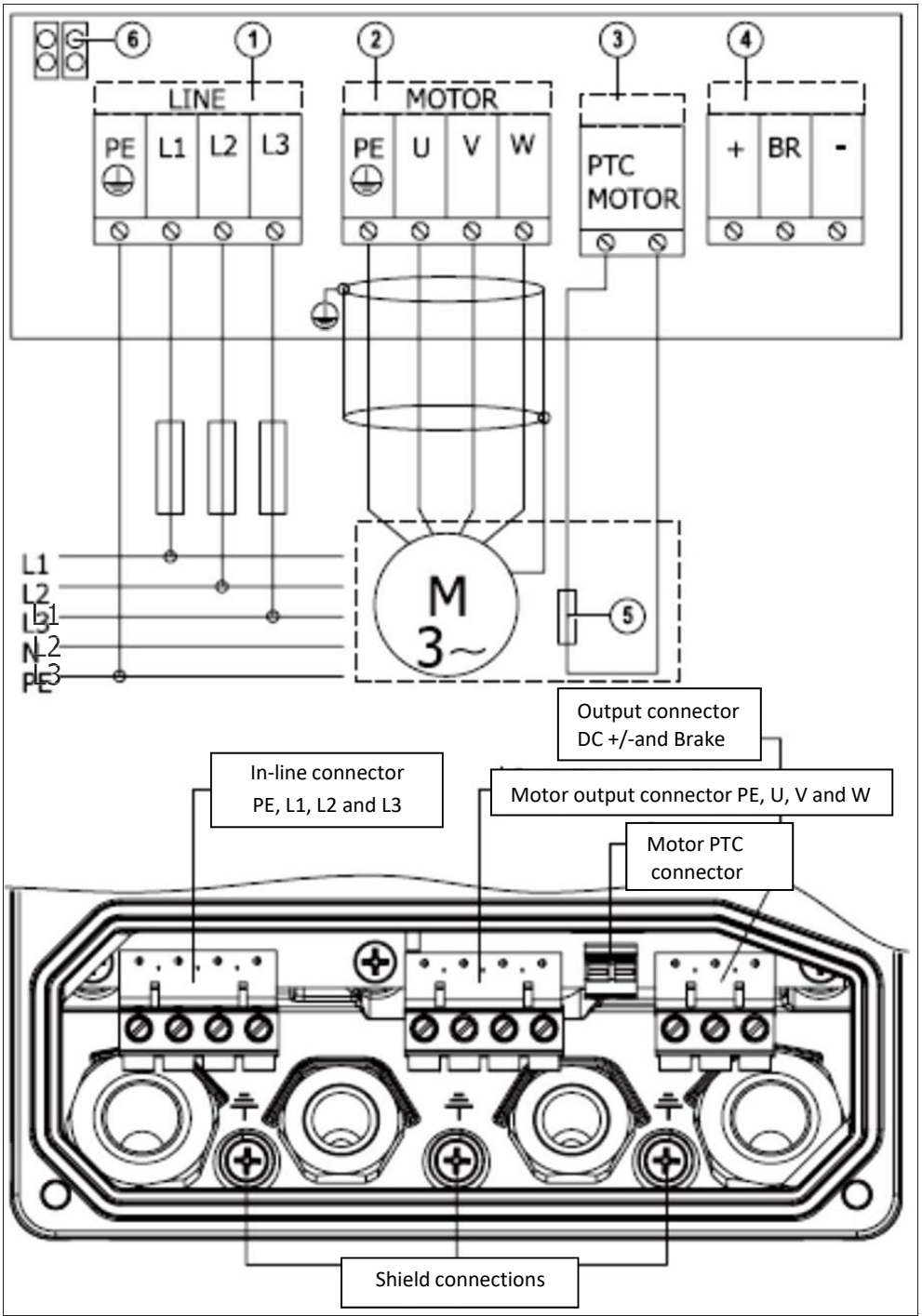
Figure 22: Motor output filter assembly



8.4 General wiring diagram of the various sizes of the FlexiMova® mm

8.4.1 Layout of power terminal block Size A

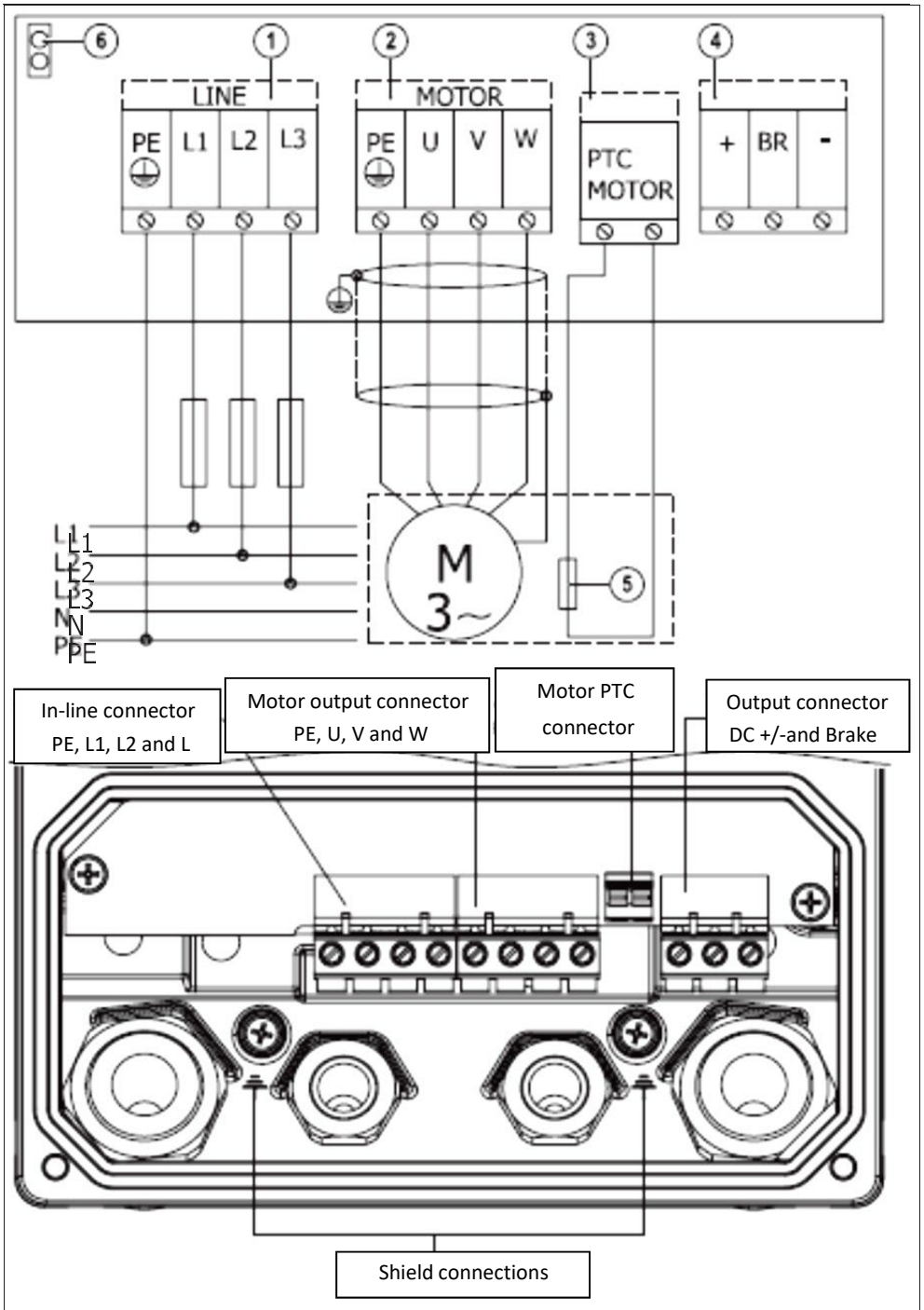
Figure 23: Connection size A



No.	Denomination	No.	Denomination
1	Mains connection	4	Brake and DC link
2	Motor connection	5	Motor PTC: only PTC with double insulation
3	PTC connection	6	Jumper for IT network

8.4.2 Layout of power terminal block Size B

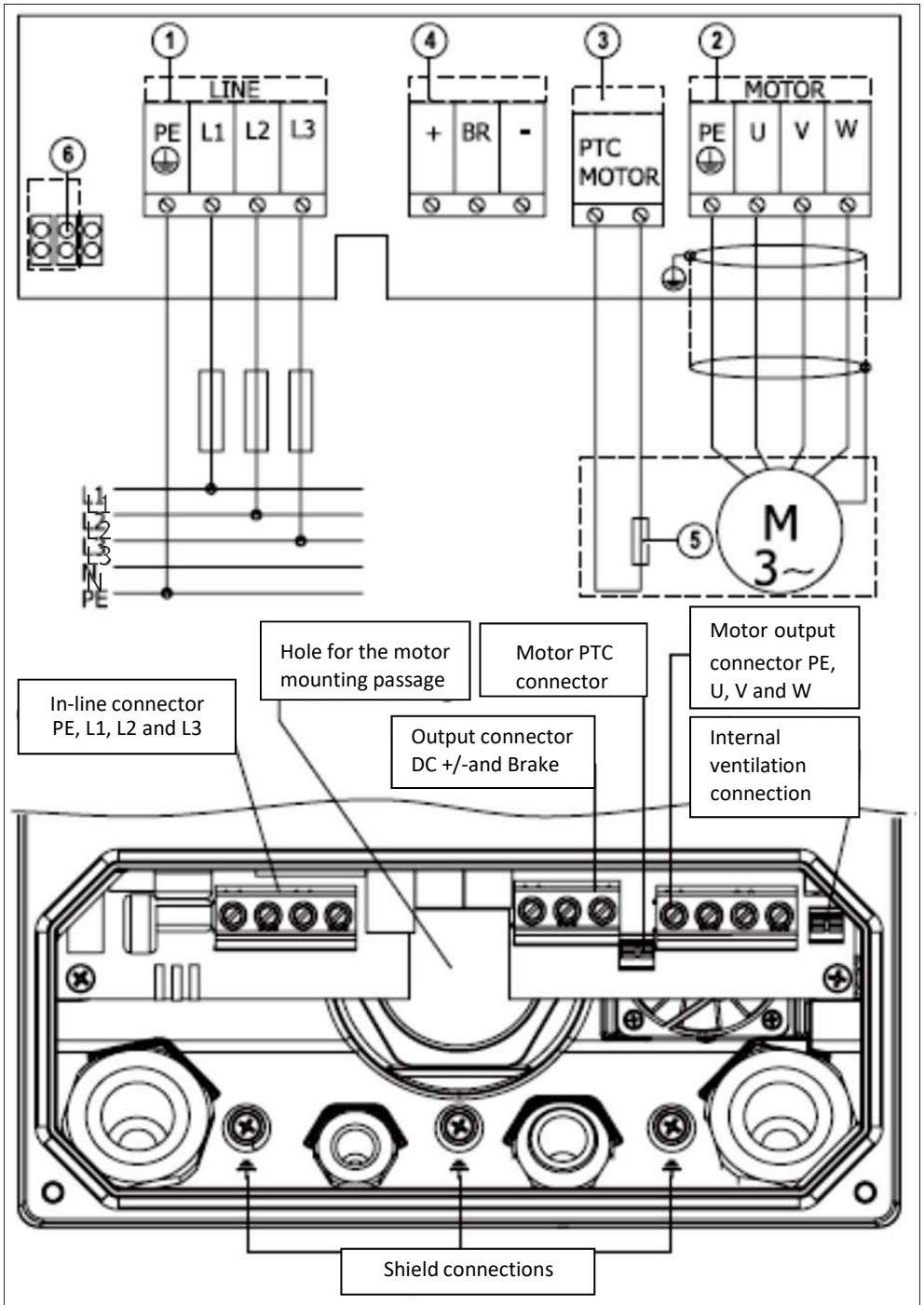
Figure 24: Connection size B



No.	Denomination	No.	Denomination
1	Mains connection	4	Brake and DC link
2	Motor connection	5	Motor PTC: only PTC with double insulation
3	PTC connection	6	Jumper for IT network

8.4.3 Layout of power terminal block Size C

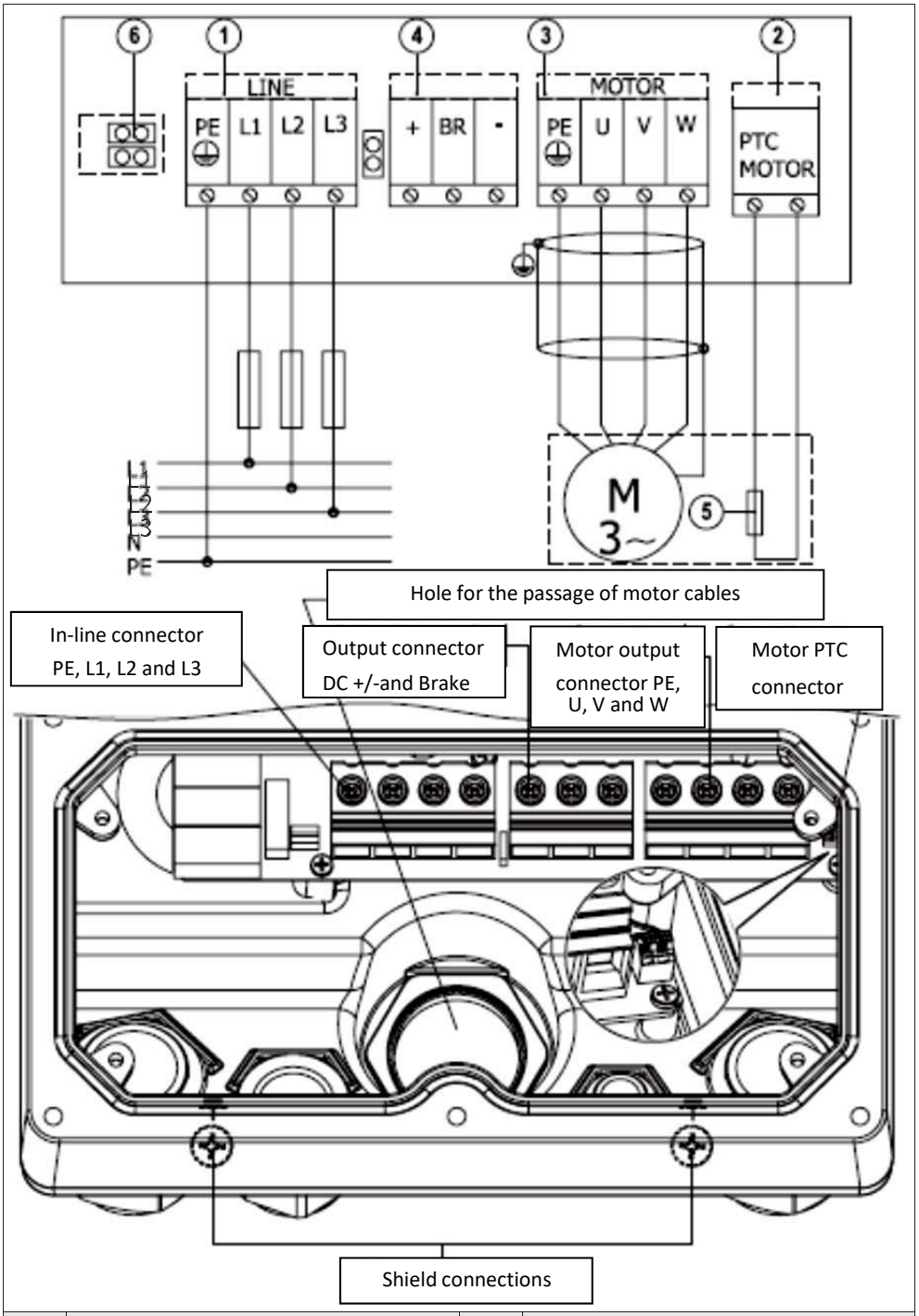
Figure 25: Connection size C



No.	Denomination	No.	Denomination
1	Mains connection	4	Brake and DC link
2	Motor connection	5	Motor PTC: only PTC with double insulation
3	PTC connection	6	Jumper for IT network

8.4.4 Layout of power terminal block Size D

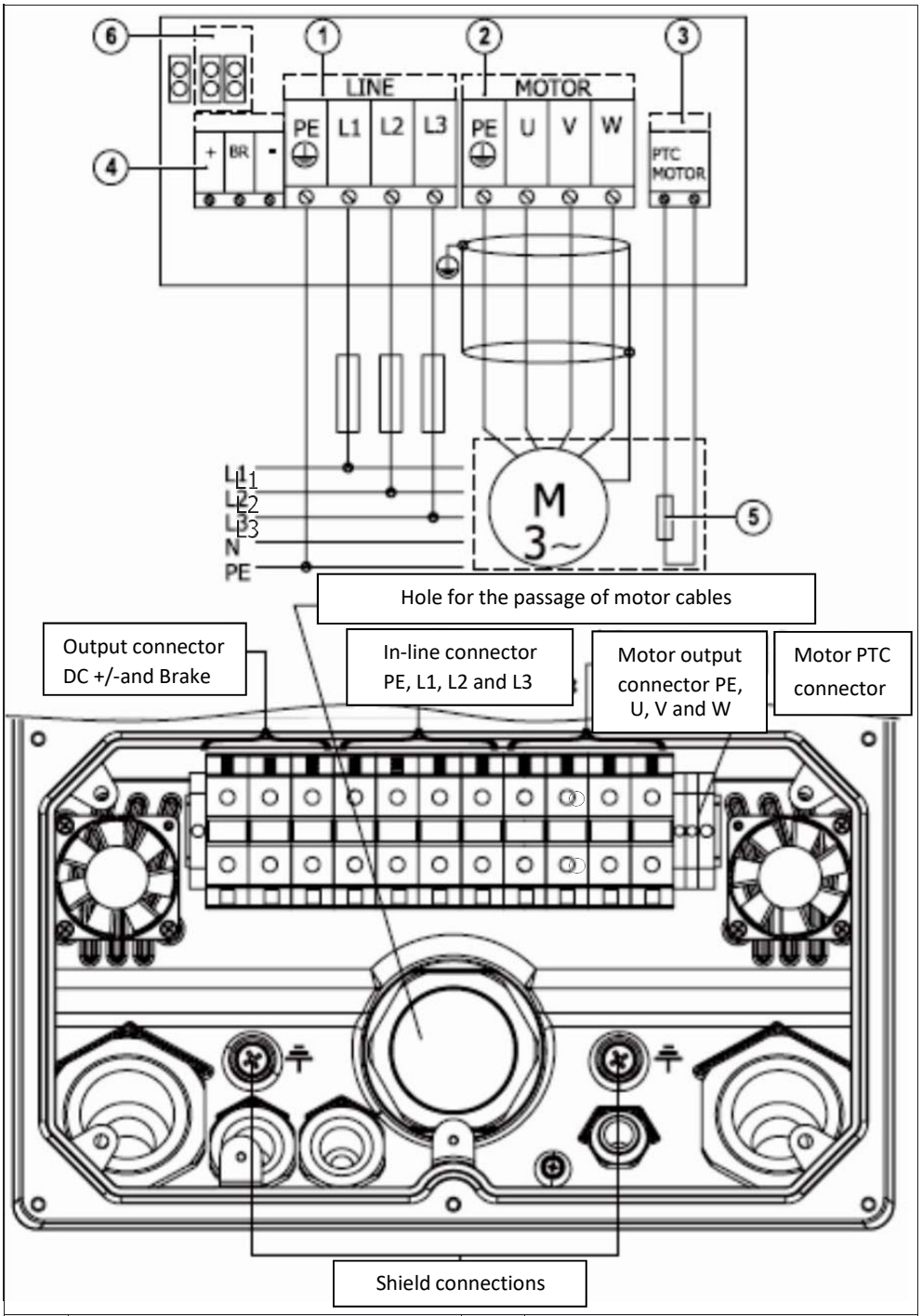
Figure 26: Connection size D



No.	Denomination	No.	Denomination
1	Mains connection	4	Brake and DC link
2	Motor connection	5	Motor PTC: only PTC with double insulation
3	PTC connection	6	Jumper for IT network

8.4.5 Layout of power terminal block Size E

Figure 27: Connection size E



No.	Denomination	No.	Denomination
1	Mains connection	4	Brake and DC link
2	Motor connection	5	Motor PTC: only PTC with double insulation
3	PTC connection	6	Jumper for IT network

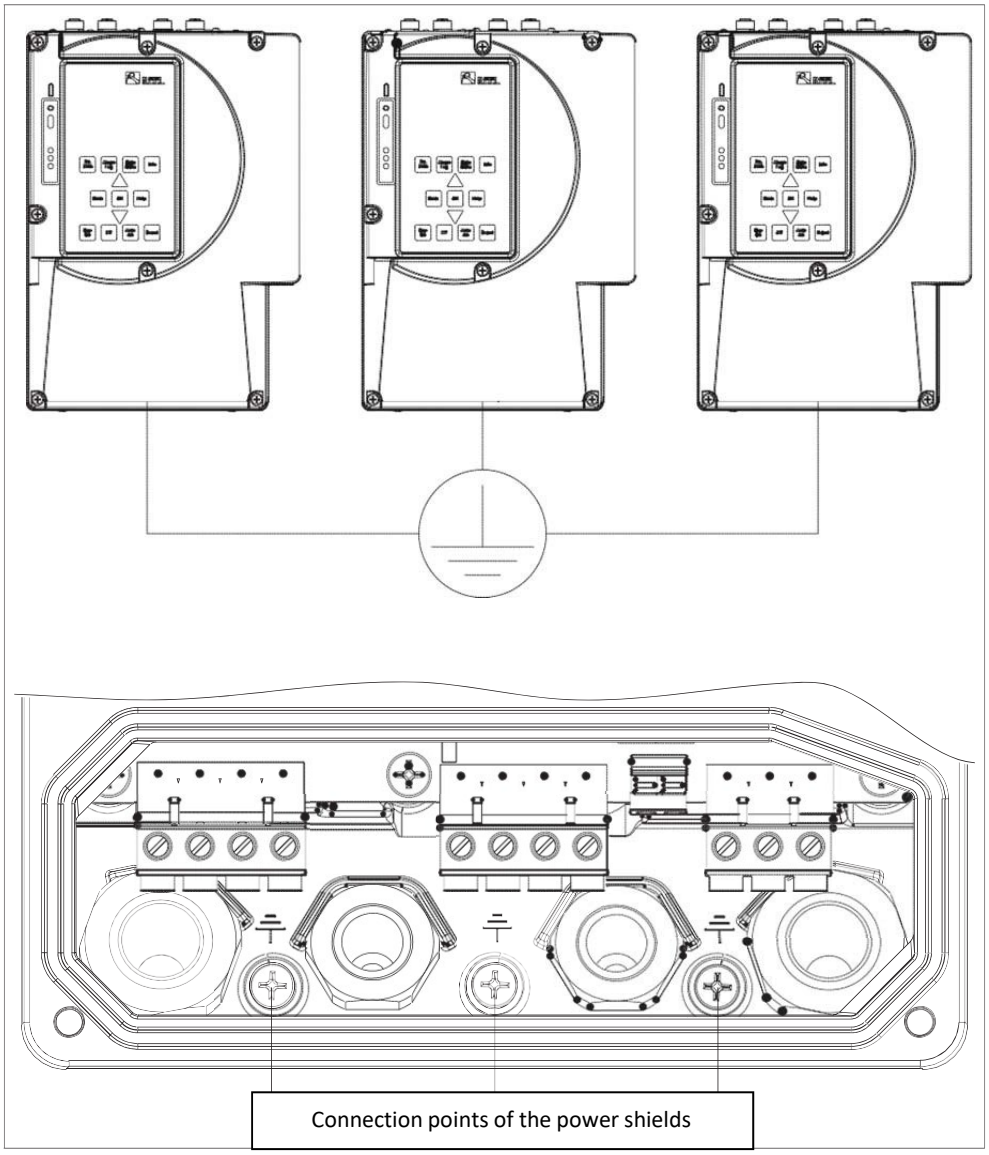
INFORMATION

The connection of both the shield and the ground wire of the motor cable must be made at both ends, that is, at the inverter end (using the dedicated fixings) and at the motor end. The shield must have a coverage of at least 80% of the cable's length and it must be connected directly to the structure by means of the screws provided **(see Figure 28)**. For the ground connection use the inlet provided on the terminal block.

8.4.6 Ground connection

The frequency converter must be correctly connected to the ground. To increase immunity to interference always provide a large contact surface for the ground connections (reduced contact resistance).
The ground connection must always be wired in a star configuration, so that all the parasitic disturbances and currents are conveyed to a safe point at zero potential.

Figure 28: Ground connection



8.5 Selecting the signal connecting cables

8.5.1 Removing the cover from the product

DANGER

The Manufacturer informs operators that although all possible technical-construction protective measures have been taken to make the product safe possible residual risks Nos. 2 and 3 still remain **(see par. 5.12)**.

WARNING

It is prohibited to remove the central part of the heatsink.

WARNING

It is mandatory to disconnect the frequency converter from the mains power network before beginning any maintenance or installation work.

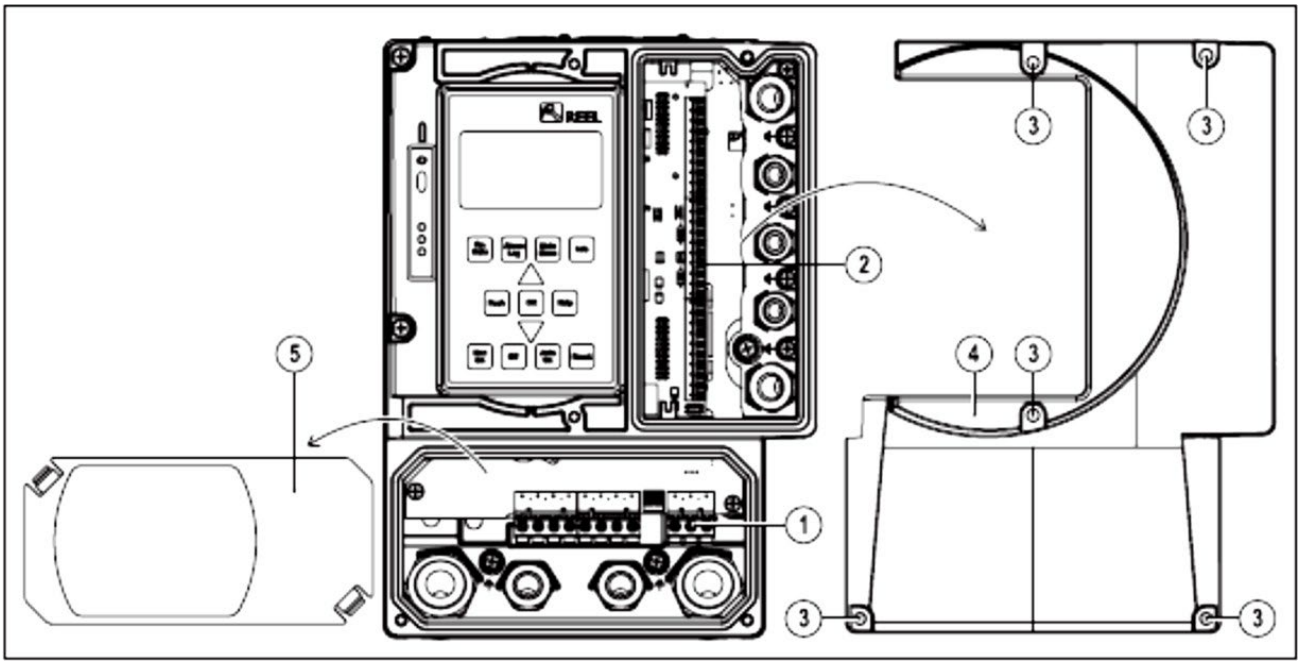
WARNING

It is mandatory to observe the specified discharge time of the capacitors after stopping (> 10 min).

Figure 29 refers to a small size but the components and shapes are the same for all the **FlexiMova® mm** models.
Moreover, the terminals of the power and motor cables are fitted with an extra protective cover to safeguard against contact.
To remove the covers proceed as follows:

1) Use a Phillips screwdriver to remove the cross head screws **(Figure 29 - No. 3)** from the cover **(Figure 29 - No. 4)**,.
2) Remove the cover.
3) Carefully lift the plastic protective cover **(Figure 29 - No. 5)** with a suitable tool.

Figure 29: Removing the cover

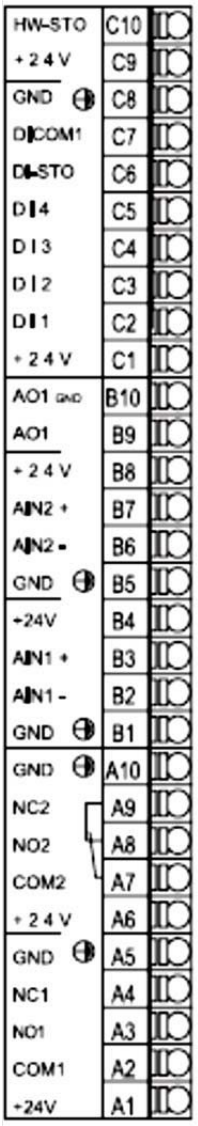


8.5.2 Terminal blocks

Table 32: Designation of the terminal blocks

Figure 29 - No.	Designation
1	Power board terminal block
2	Control board terminal block

Table 33: Control board terminal block



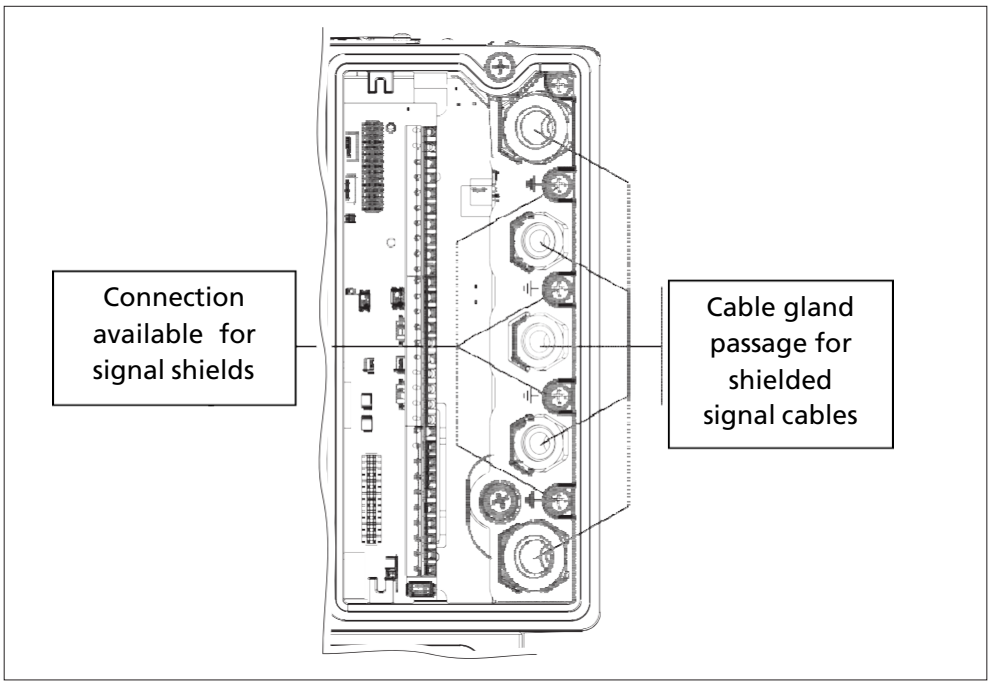
Terminals	Signal	Description	Technical characteristics
C10	HW-STO	Safety Hardware Channel STO digital input	ON ≥ 15 ÷ 30 VDC OFF ≤ 3 VDC Impedance 2 kΩ
C9	+24 V	User power supply +24 V	+24 VDC - 150 mA **MAX.**
C8	GND	Ground (0P)	Zero reference of +24 V
C7	DICOM1	Digital input common	
C6	DI-STO	Diagnostic Channel STO digital input	Digital inputs ON ≥ 15 ÷ 30 VDC OFF ≤ 3 VDC Impedance 2 kΩ
C5	DI4	Configurable digital input “D14”	
C4	DI3	Configurable digital input “DI3”	
C3	DI2	Configurable digital input “DI2”	
C2	DI1	Configurable digital input “DI1”	
C1	+24 V	User power supply +24 V	+24 VDC - 150 mA **MAX.**
B10	A01-GND	Analog output 1 zero reference	Zero reference of +24 V
B9	A01	Analog output 1	Configurable analog output 0-10 V / 4-20 mA / 0-100 kHz
B8	+24 V	User power supply +24 V	+24 VDC - 150 mA **MAX.**
B7	AIN2+	Differential analog input AIN2	Differential analog input 2 0-10 V 4-20 mA
B6	AIN2-	Zero Differential analog input AIN2	Zero Differential analog input AIN2
B5	GND	Ground	Zero reference of +24 V
B4	+24 V	User power supply +24 V	+24 VDC - 150 mA **MAX.**
B3	AIN1+	Differential analog input AIN1	Differential analog input 1
B2	AIN1-	Zero Differential analog input AIN1	Zero Differential analog input AIN1
B1	GND	Ground	Zero reference of +24 V
A10	GND	Ground	
A9	NC2	Normally closed relay output 2	24 V - 1 A
A8	NO2	Relay output 2 normally open	24 V - 1 A
A7	COM2	Relay output 2 common	Relay output 2 common
A6	+24 V	User power supply +24 V	+24 VDC - 150 mA **MAX.**
A5	GND	Ground	Zero reference of +24 V
A4	NC1	Relay output 1 normally closed	24 V - 1 A
A3	NO1	Relay output 1 normally open	24 V - 1 A
A2	COM1	Relay output 1 common	Relay output 1 common
A1	+24 V	User power supply +24 V	+24 VDC - 150 mA **MAX.**

Note: 150 mA available for each +24 output pin for an overall total of 500 mA on all the outputs.

8.5.3 Signal cable

Always use shielded cables for the signal connections.
The shield must have a coverage of at least 80% of the cable length. The shield can be connected directly to the structure of the converter by means of the fixings provided **(see Figure 30).** For the ground connection use the inlet provided on the terminal block. The shield is connected by means of the dedicated screws.

Figure 30: Signal cable



For signal connections negligible lengths less than 5 m it is always advisable to only connect the shield at one end in order to avoid potentially critical loops for the propagation of disturbances. If the length of the cable is > 5 m connect the shield at both ends to avoid the propagation of disturbances.

INFORMATION

See chapter "Electromagnetic compatibility –signal connections" for some recommended standard cabling rules.

I mportant notes relating to the connections:

- Use shielded cables.
- Passage through the cable glands provided.
- Insertion with quick connector in terminal block with ferrule.
- Connection of the shield on dedicated screw provided on the structure of the product.
- Lock the cable glands to guarantee ingress protection rating IP55.

8.5.4 Description and examples of connections to the terminal block of the control board

- **Digital inputs**

The product has 6 digital inputs (DI1...DI4, DI-STO, HW-STO).

The digital inputs DI-STO and HW-STO are reserved solely for Safe-Torque-Off function whereas the functions of the digital inputs from DI1 to DI4 can be programmed as desired.
The digital inputs are galvanically separated, consequently the reference ground DICOM1of the digital inputs is also galvanically separated. If using 24 V inside the converter the DICOM1 must be connected to the GND of the digital inputs.
For this purpose a bridge must be formed between GND and DICOM1.

INFORMATION
See the Safety Manual for the correct use and connection of the DI-STO and HW-STO signals.

- **Relay outputs**

All the relay outputs of the product are programmable.

The converter has:
- 2 relay outputs (NO/NC contact) with changeover contact

- Analog inputs/outputs

All the inputs and outputs of the converter are programmable.
It has:
- One analog output 0-10 V / 0-20 mA / 0-100 kHz that can be programmed with all of the product's operating values (current, DC, voltage, speed, frequency, estimated torque, delivered power).
- Two analog inputs AN1 and AN2 that can be set in voltage mode or in current mode.

Figure 31: Example of connection with +24 V power supplied by the converter - total available power **MAX. 500 ma, MAX. 150 ma** for each output.

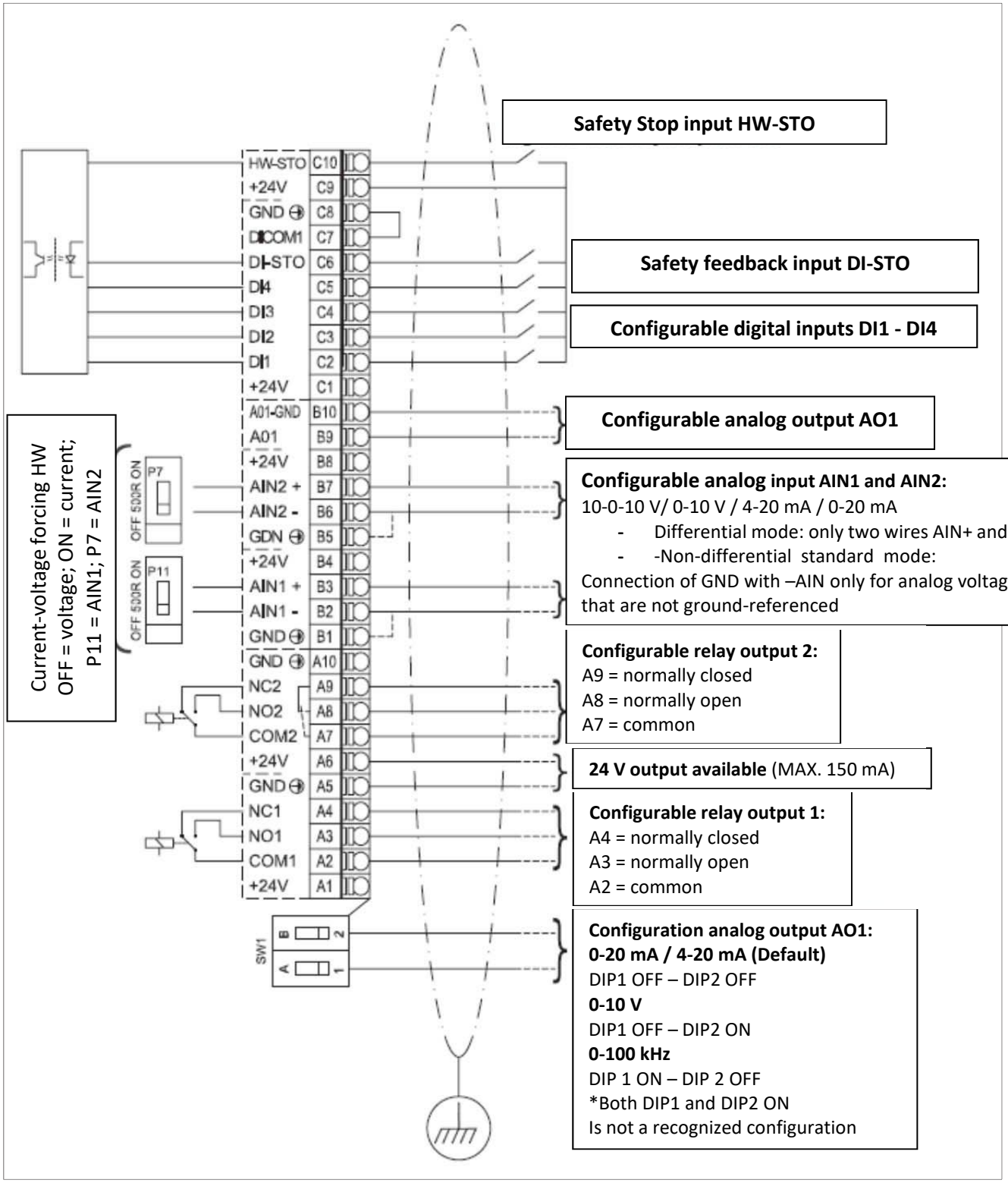
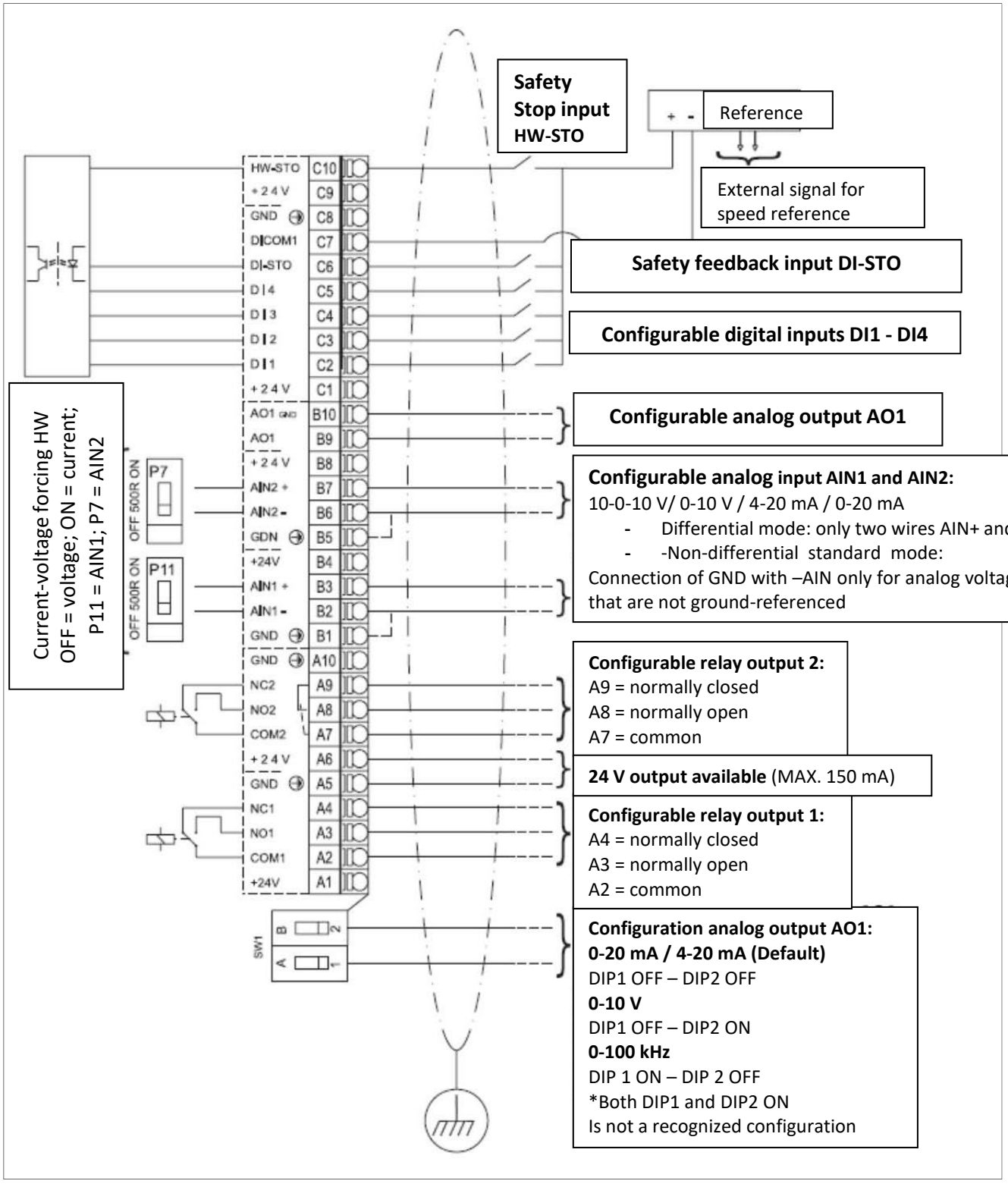


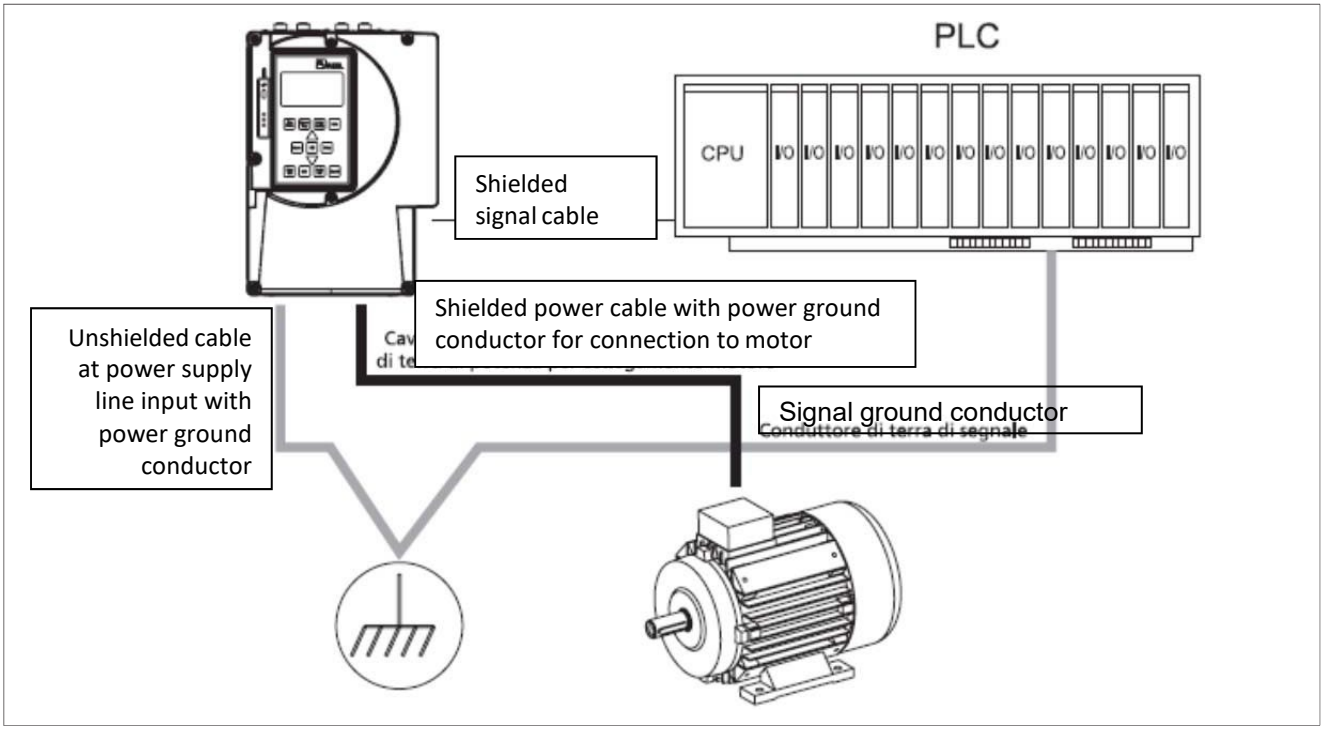
Figure 32: Example of connection with connection with external +24 V power supply



8.5.5 Converter wiring diagram

The product is provided with fixing points for the ground wire and the power and signal shield.

Figure 33: Example of standard connection of a single converter



INFORMATION

Important notes relating to the connections

- For the power supply line input use an unshielded cable with suitable section equipped with ground conductor connected to the dedicated input.
- For the motor connection use a shielded cable with suitable section equipped with ground conductor connected to the dedicated input.
- The shield of the motor cable must always be connected at both ends (at the product end on the structure by means of the screw provided and at the other end on the motor casing).
- The ground wire of the motor cable must always be connected at both ends (at the product end on the dedicated input and at the other end on the motor casing).
- For the signal connections use a shielded cable and connect the shield of the signal cable only at the product end using the fixing screw on the structure. Only in the case of particular applications with several products, where the length of the signal cable exceeds 5 m, can the shielded be connected at both ends, preferably using a separate connection (see following note)
- Keep the connections of the signal shields and ground wires separate from the power ones: next make a single connection towards the plant ground wire, according to the star connection principle.
- The shield must have a coverage of at least 80% of the cable's length.
- Do not use the converter as a connection or ground point for other devices.

8.6 Braking resistor

8.6.1 Guidelines for selecting the braking resistor

See **Table 34** for the selection of the resistor (value and power). Use DC insulated cables suitable for the voltage that can reach values up to 840 VDC.
For the braking resistor connection see **par. 8.6.2**.
The value of the product's "3-3-11-4 Brake resistor action time" parameter determines the maximum brake pulse expressed in m/s: if this time is exceeded alarm A11 "Brake resistor overload" appears.

INFORMATION

If the parameter "3-3-11-4" is set at zero, the braking chopper is disabled. Always adopt suitable protections for this component as the utilization factor is linked to the system dynamics and may be unpredictable.
In particular it is necessary to adopt protections against excessive use of the braking resistor, to prevent the component from overheating and possibly even breaking.
Suitable devices for this use are:

- Thermal sensors affixed directly to the component.
- Thermal devices for monitoring current/power and having the sole function of signalling a triggered event (without interrupting the power supply).

To safely shut down the system use a command from the installed protection. Do not shut down the system by cutting off the power to the braking resistor.

DANGER

The Manufacturer informs operators that although all possible technical-construction protective measures have been taken to make the product safe possible residual risks Nos. 2 and 3 **(see par. 5.12)**.

WARNING

It is prohibited to remove the central part of the heatsink.

WARNING

It is mandatory to disconnect the frequency converter from the mains power network before beginning any maintenance or installation work.

WARNING

It is mandatory to observe the specified discharge time of the capacitors after stopping (> 10 min).

8.6.2 Connection of the braking resistor

If the application requires the use of the braking resistor (requiring dynamics or rapid decelerations) the product must be connected as illustrated in **Figure 34**, and comply with the resistance values specified for each size. The braking resistor must be connected between the "+" terminal and the "BR" terminal.

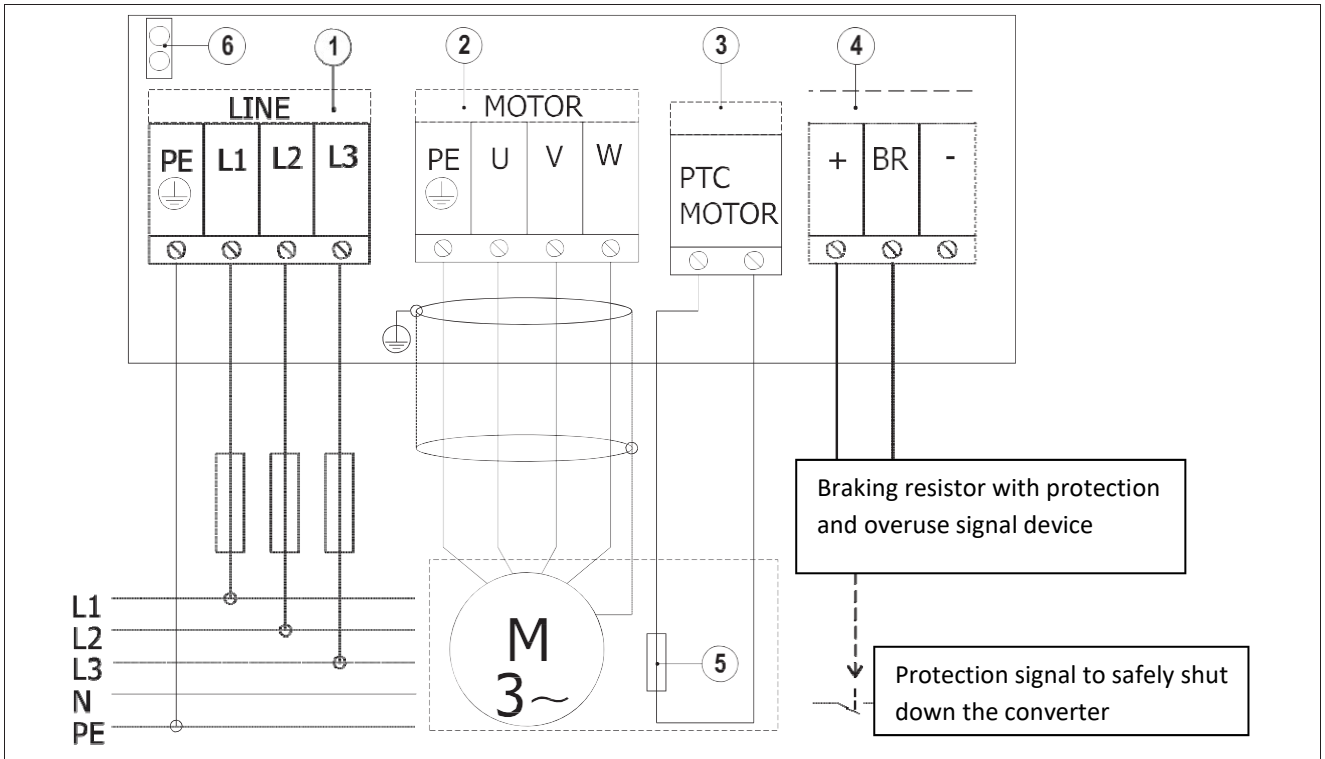
WARNING

Be careful with the braking resistor connections.

Hot surfaces: residual risk **No. 6** exists **(see par. 5.12)**.

Cabling of this component is the responsibility of the installer who must use suitable cables and comply with the specified resistance values.

Figure 34: Connection of the braking resistor



No.	Denomination	No.	Denomination
1	Mains connection	4	Brake and DC link
2	Motor connection	5	Motor PTC: only PTC with double insulation
3	PTC connection	6	Jumper for IT network

8.6.3 Sizing the braking resistor

Table 34: Braking resistor information table

FlexiMova® mm Size		FlexiMova® mm			MAX. Braking Current (A)	Minimum braking resistor value (Ω)	MAX. braking resistor power (kW)
		Power (kW)	Rated current (A)	MAX. Current (A)			
A	F0K37	0.37	1.3	2.0	2.8	280	2,2
	F0K55	0.55	1.8	2.7	2.8	280	2,2
	F0K75	0.75	2.5	3.8	2.8	280	2,2
	F1K10	1.1	3.5	5.3	2.8	280	2,2
	F1K50	1.5	4.9	7.4	2.8	280	2,2
B	F2K20	2.2	6.0	9.0	6,5	120	4,9
	F3K00	3	8.0	12.0	6,5	120	4,9
	F4K00	4	10.0	15.0	6,5	120	4,9
C	F5K50	5.5	14.0	21.0	9.7	82	7,7
	F7K50	7.5	18.0	27.0	12	66	9,5
	F11K0	11	26	39.0	17,2	46	13,7
D	F15K0	15	34.5	518	23,5	34.00	18,0
	F18K5	18.5	44	70.4	29	27.00	23,2
	F22K0	22	51	76.5	34,5	23.00	27.5
	F30K0	30	68	102.0	47	17.6	37,5
E	F37K0	37	84	126.0	46	17.4	37
	F45K0	45	101	151.5	55	14.5	44
	F55K0	55	120	180	55	14.5	44

9 Configuration of the converter for IT network

The IT network is also commonly referred to as “isolated power supply ” as the star point of the IT power supply is not grounded.
This type of power supply uses an isolation controller that constantly monitors the galvanic isolation between the ground and the various powered parts. The product is already set up so that it can be adapted to work on these power supply networks.
To use the product in the IT system the associated jumpers (printed indications) present in every product model.
This function renders the EMI filter inside the converter ineffective: consequently to ensure it falls within a specific category alternative solutions will have to be adopted.
The jumper is typically positioned in the vicinity of the connecting terminal block between the electric line and the motor.

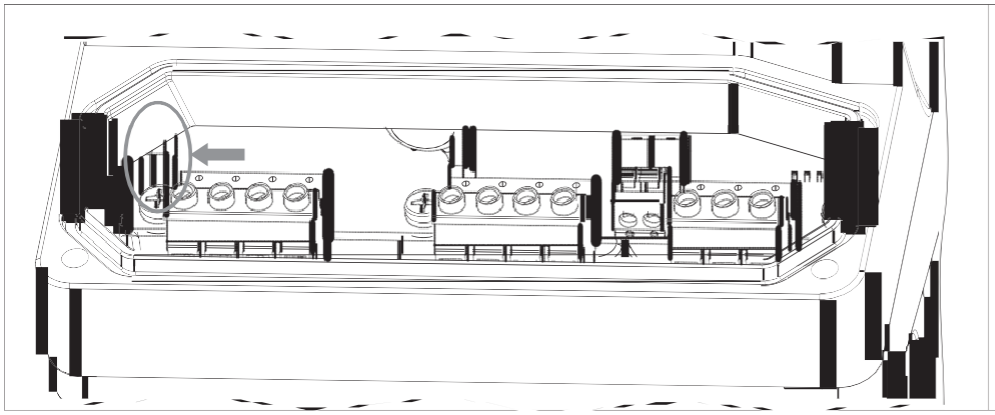
DANGER

Contact with live parts: residual risk No.1 **(see par. 5.12)**.
Always disconnect the voltage to the product and wait 10 min.

INFORMATION

Do not remove any jumpers other than those specified. **Figure 35, Figure 36, Figure 37, Figure 38 and Figure 39,** illustrate the layout of the various sizes with the exact position of the jumpers.

Figure 35: IT configuration for size A



Jumper IT network
Size A
(2 Jumpers present J1 and J2)
Inserted= standard TN network
Removed = IT network

Figure 36: IT configuration for size B

Jumper IT network
Size B
(1 Jumpers present J1)
Inserted= standard TN network
Removed = IT network

Figure 37: IT configuration for size C

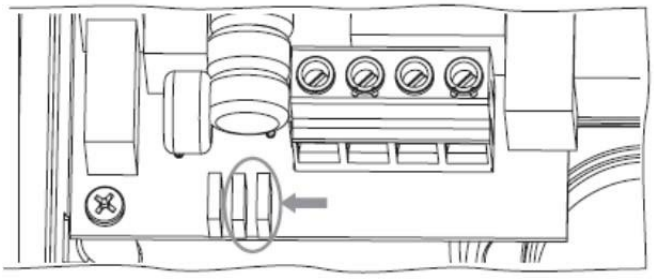
	Jumper IT network Size C (2 Jumpers present J1 and J2) Inserted= standard TN network Removed = IT network

Figure 38: IT configuration for size D

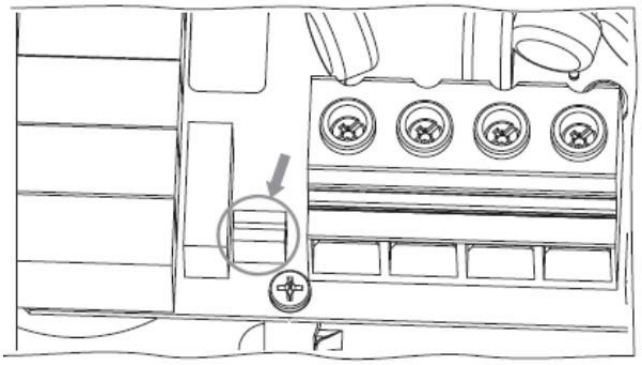
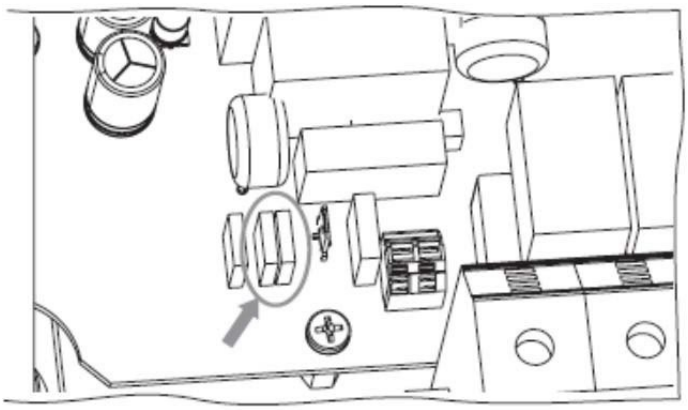
	Jumper IT network Size D (2 Jumpers present J2 and J3) Inserted= standard TN Network Removed = IT network

Figure 39: IT configuration for size E

	Jumper IT network Size E (2 Jumpers present J2 and J5) Inserted= standard TN network Removed = IT network

10 FlexiMova® mm version with electrolytic capacitors

ATTENTION

The **FlexiMova® mm** converter version with electrolytic capacitors for sizes A, B, C must be OFF when being installed.

ATTENTION

Be sure to connect **FlexiMova® mm** converter version with electrolytic capacitors with correct + and - polarity: a wrong connection will damage the converter.

The FlexiMova® mm converter is also supplied in the version with built-in electrolytic capacitors: This configuration arises from the need to connect to particularly unstable lines with high inductiveness (for example generators) or with particular dynamics where the DC voltage is subjected to abrupt fluctuations.
In all these critical conditions the capacitors compensate for any voltage dips and abrupt fluctuations of the DC link.
The capacitors are available in sizes A, B and C in a box affixed externally and connected with the cable glands provided on the product (+ and – DC connection)
The box containing the capacitors is available in two models:

- standard single external box for all the models of sizes A and (dimensions 130 x 210 x 71.5 mm).
- standard single external box for all the C sizes (dimensions 238 x 277 x 83.5 mm).

Both external boxes are affixed to the product by means of mechanical fixings **(see chap.7)**.
For both types of external boxes there also exists a version for direct mounting on the motor. For bigger sizes (sizes D and E) to install the capacitors the product must be equipped with an electrolytic capacitor board.

INFORMATION

The **FlexiMova® mm** converter version with electrolytic capacitors for sizes D, E must be requested at the time the order is placed.

WARNING

Even after power off dangerous voltage can remain on the DC-link capacitors. To prevent personal injury, ensure that the voltage is cut off before working on the converter and wait 10 min for the capacitors to discharge to a safe level. Use a multimeter to test for residual DV voltage.

ATTENTION

Only genuine accessories and spare parts must be used.

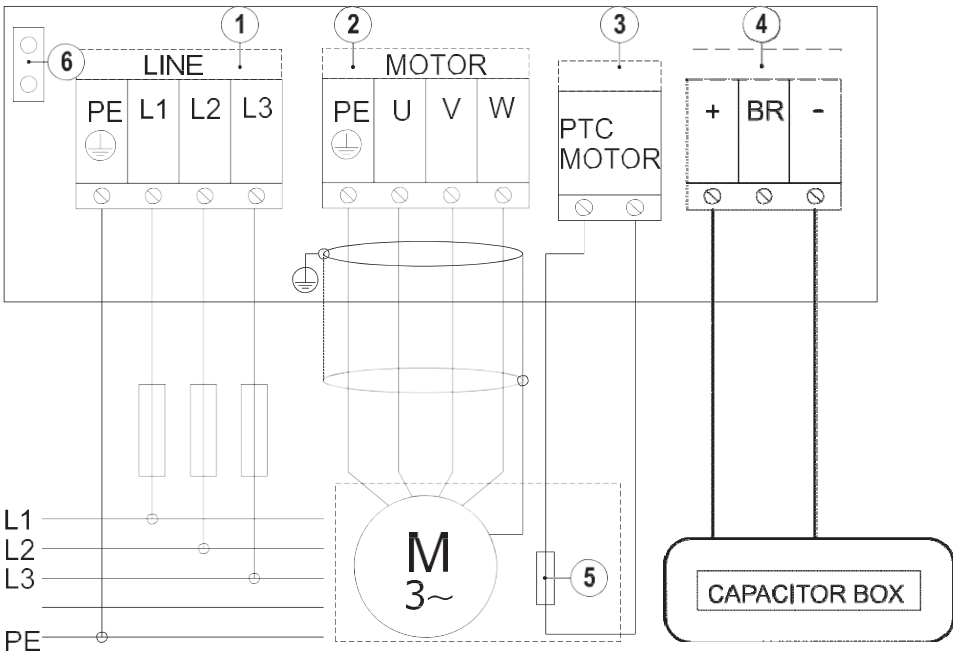
Always replace the safety and protection devices immediately on completion of the procedure.

WARNING

It is strictly prohibited to work on the product in the presence of voltage.

Connection is by means of the cable glands provided and the +/- DC connection present on the terminal block:

Figure 40: **FlexiMova® mm** version with electrolytic capacitors



Connection NOTE: Red wire (+) terminal , Black wire (-) terminal

No.	Denomination	No.	Denomination
1	Mains connection	**4**	Brake and DC link
2	Motor connection	**5**	Motor PTC: only PTC with double insulation
3	PTC connection	**6**	Jumper for IT network

10.1 Capacitor box for Size A

Figure 41: Capacitor box for size A version without connector (dimensions in mm)

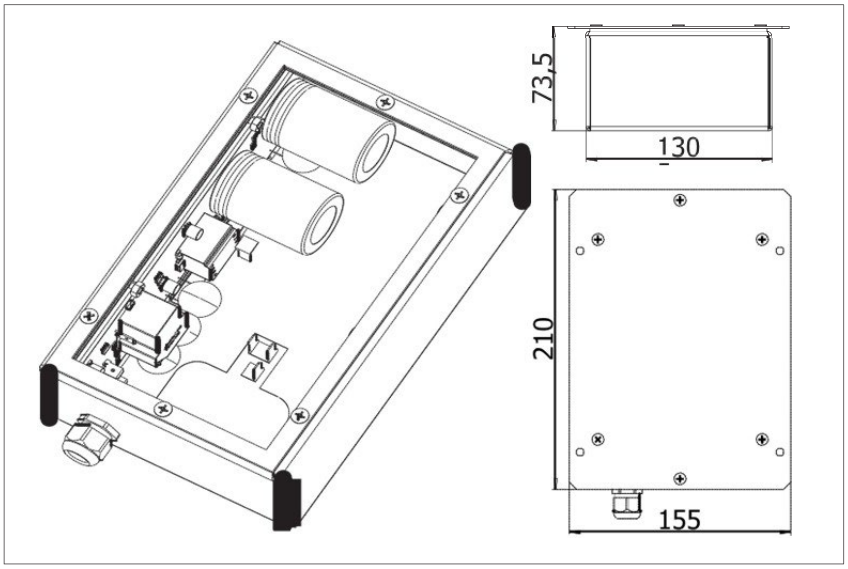
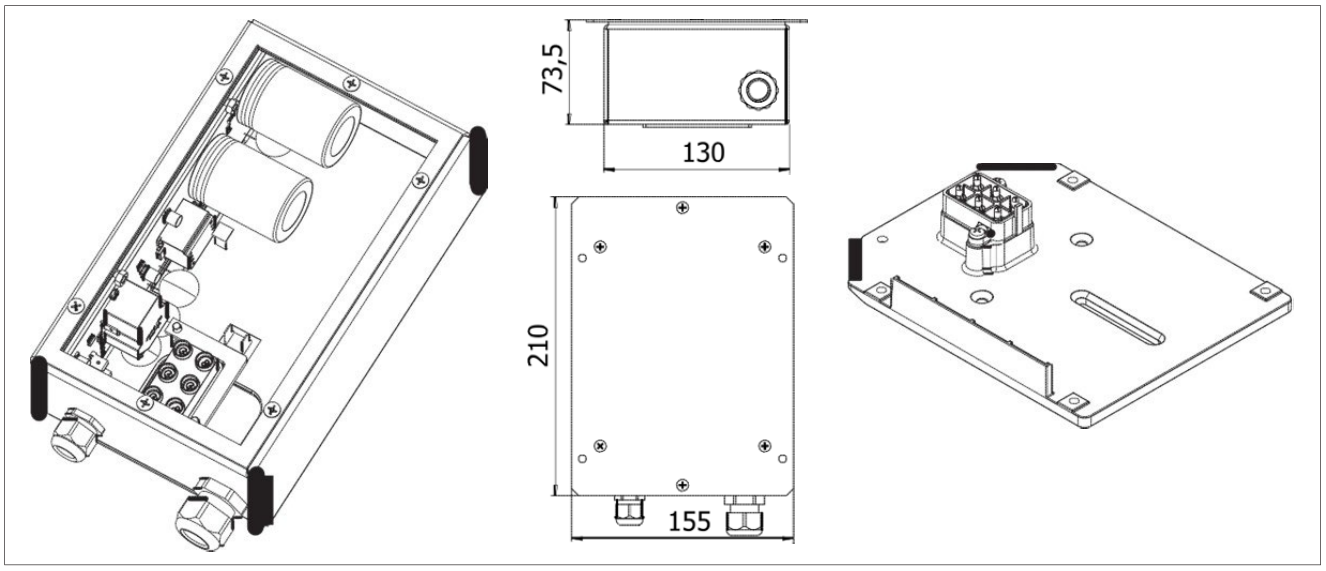


Figure 42: Capacitor box for size A version mounted on the motor with connector provided for adapter (dimensions in mm)



(Only for REEL SuPremE® motors)

10.2 Capacitor box for Size B

Figure 43: Capacitor box for size B version without connector (dimensions in mm)

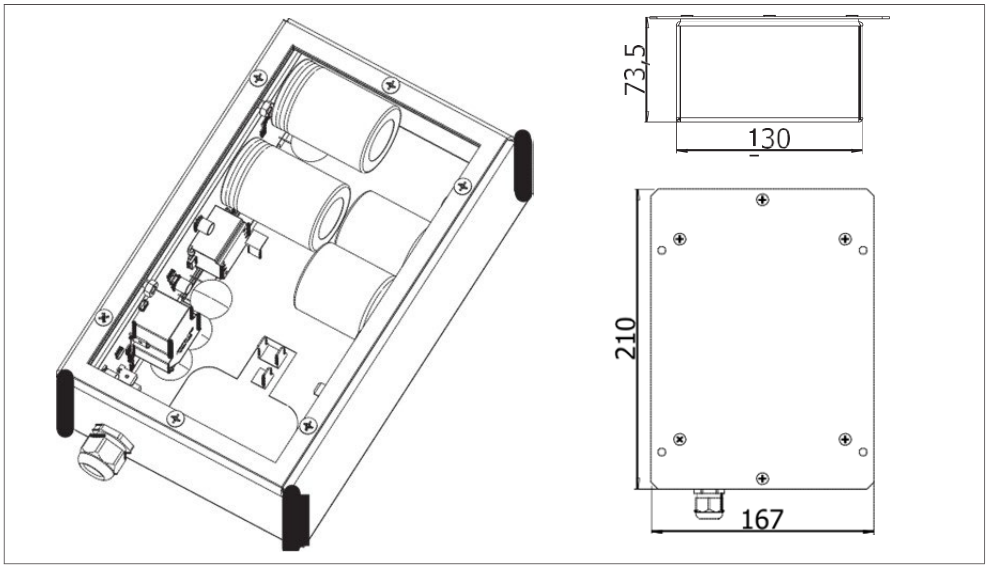
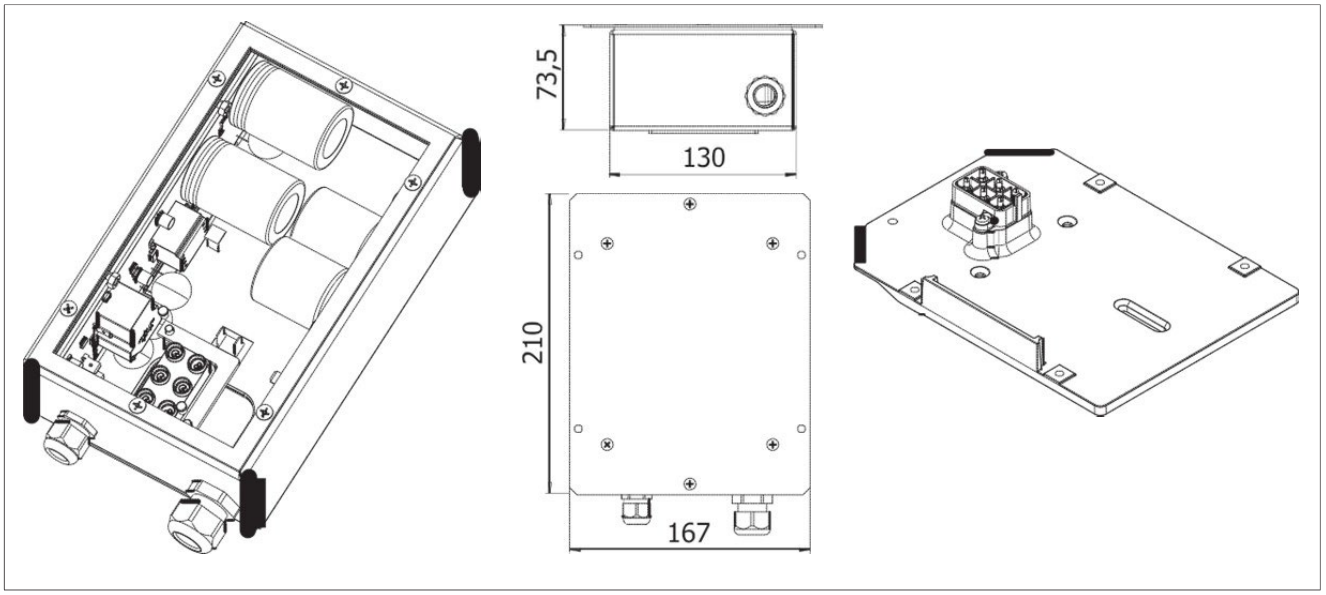


Figure 44: Capacitor box for size B version mounted on the motor with connector provided for adapter (dimensions in mm)



(Only for REEL SuPremE® motors)

10.3 Capacitor box for Size C

Figure 45: Capacitor box for size C version without adaptor (dimensions in mm)

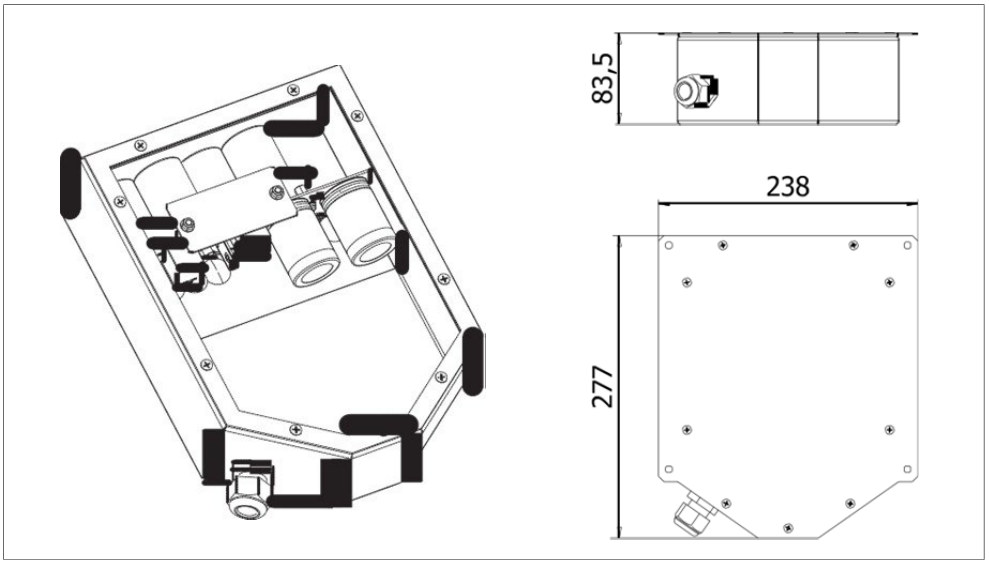
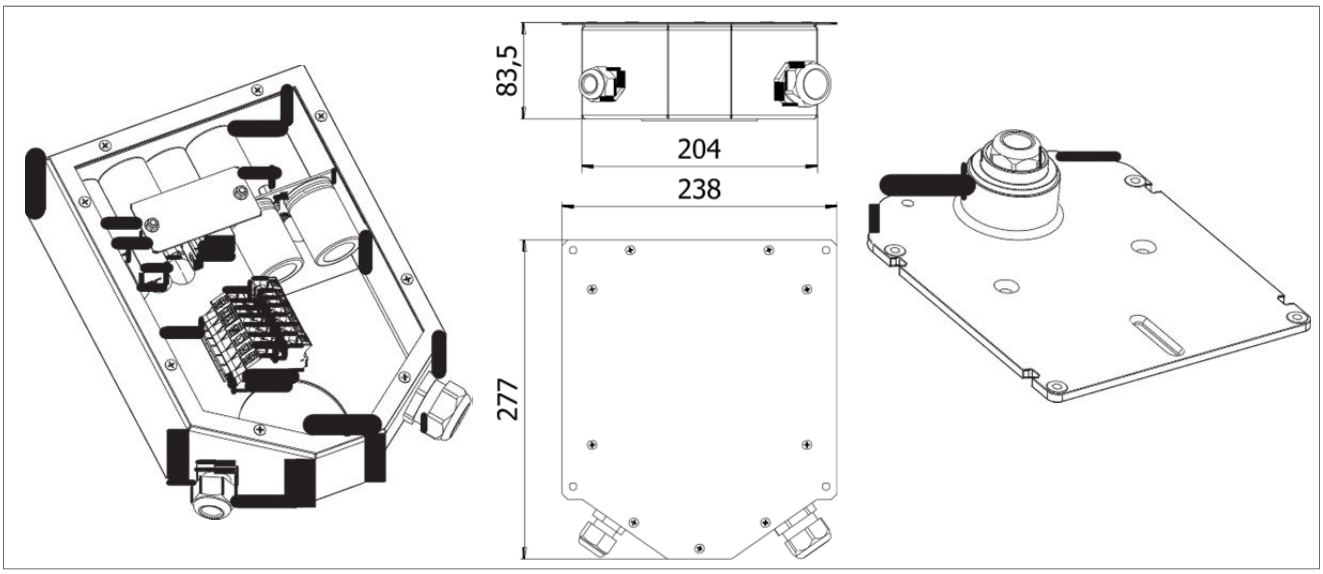


Figure 46: Capacitor box for size C version mounted on the motor with connector provided for adapter (dimensions in mm)



(Only for REEL SuPremE® motors)

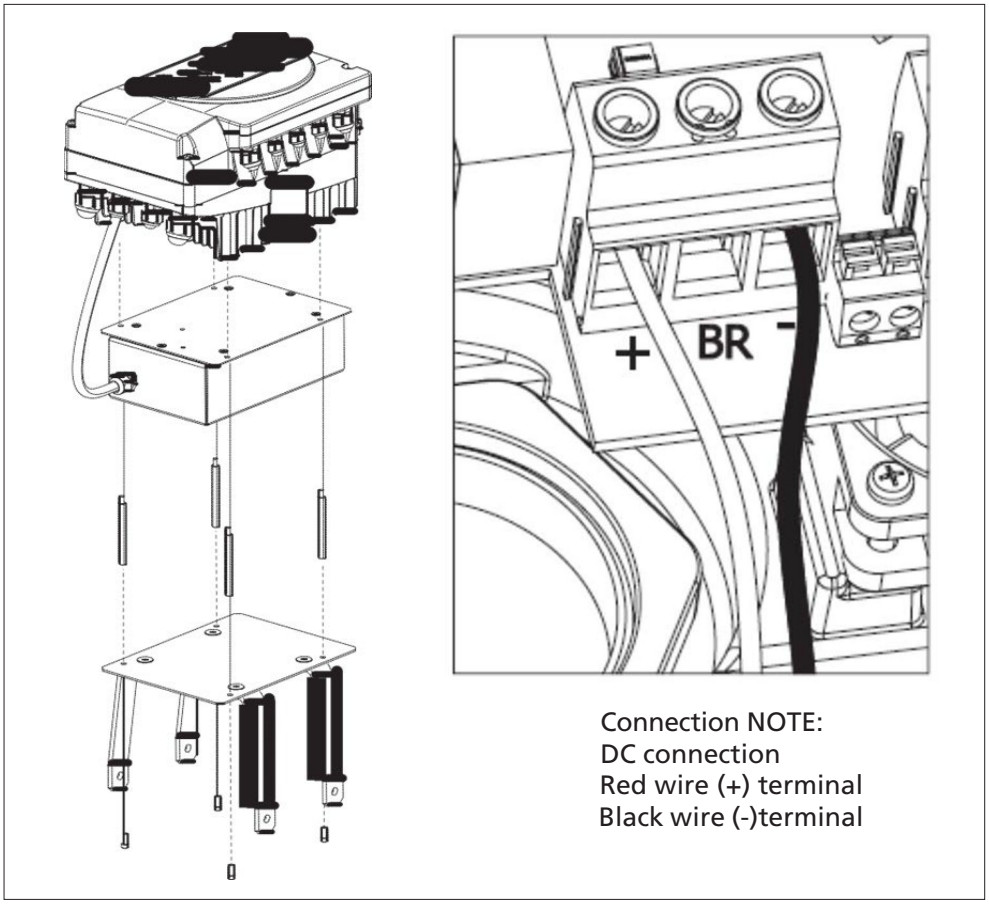
10.4 Mechanical mounting of the capacitor box sizes A and B

Both versions of the capacitor box (with and without connector) described above for sizes A and B must be mounted as illustrated in **Figure 47** and **Figure 48**.

- Capacitor box without connector mounted on a standard motor.

In this case the capacitor box is only connected via the outgoing DC cables from the box, whereas the motor is connected via the traditional terminal block.

Figure 47: Motor connection via cable gland outlet and traditional terminal block

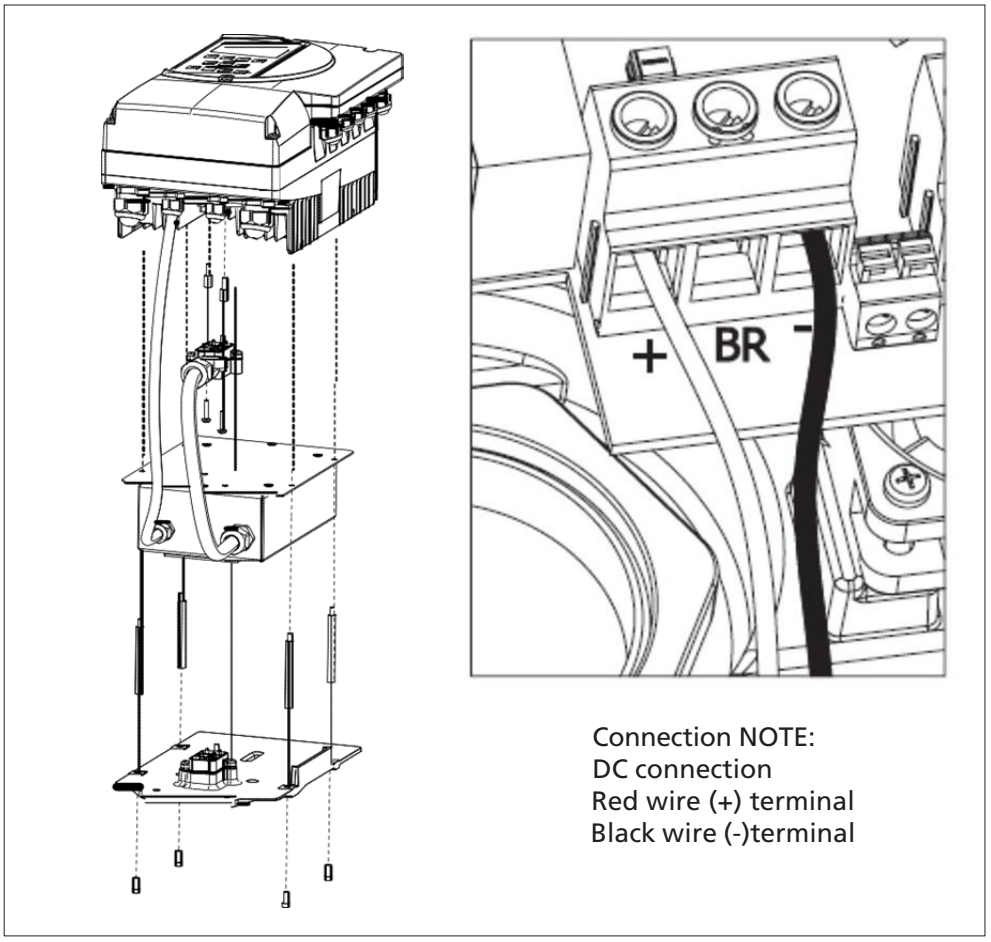


(Only for REEL SuPremE® motors)

- Capacitor box with connector on **FlexiMova® mm** version mounted on REEL SuPremE® motor .

In this case the capacitor box is connected to the product via both the outgoing DC cables from the box, and via the motor cable that plugs into the connector on the converter.
The box then plugs into the motor via the adapter.

Figure 48: Motor connection via motor cable to the connector on the converter. Plugs directly into the motor adapter.



(Only for REEL SuPremE® motors)

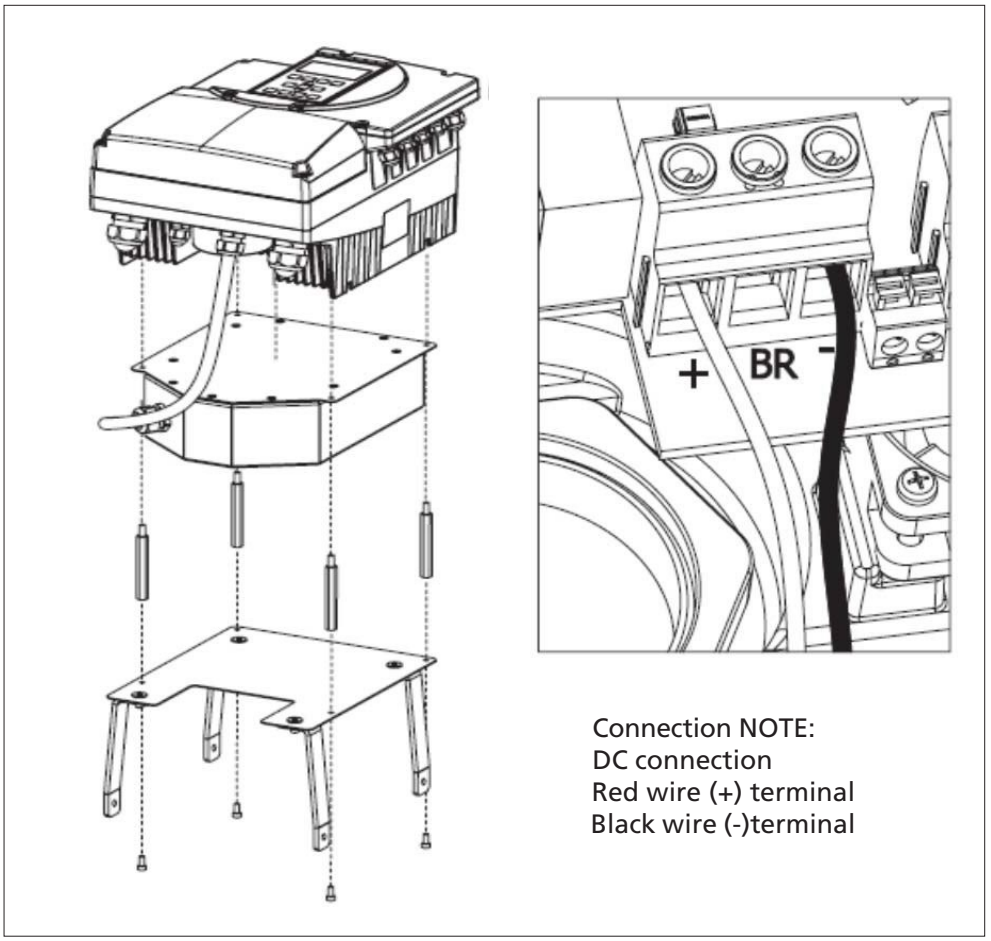
10.5 Mechanical mounting of the capacitor box for size C

Both versions of the capacitor box (with and without connector) described above must be mounted as indicated below.

- Capacitor box on **FlexiMova® mm** version mounted on a standard motor without connector

In this case the capacitor box is only connected via the outgoing DC cables from the box, whereas the motor is connected via the traditional terminal block.

Figure 49: Standard connection without connector

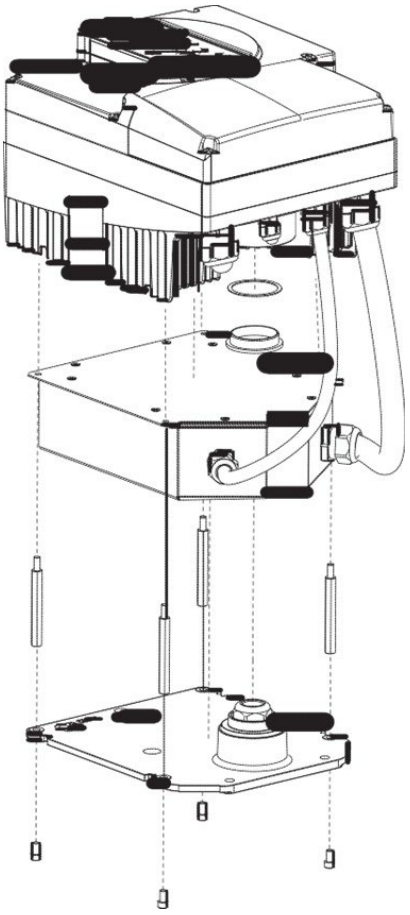


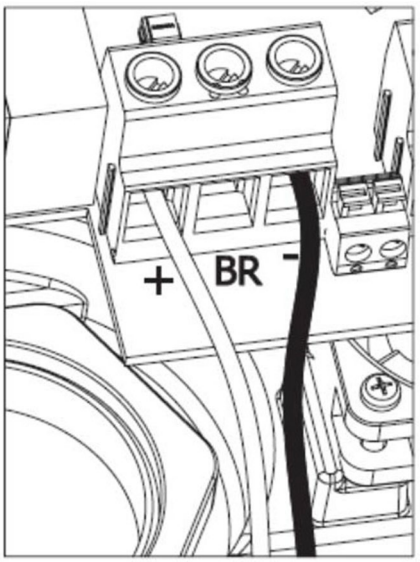
(Only for REEL SuPremE® motors)

- Capacitor box with connector mounted on a REEL SuPremE® motor .

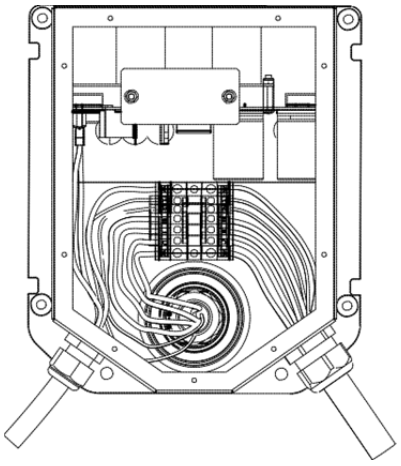
In this case the capacitor box is connected to the product via both the outgoing DC cables from the box, and via the motor cable that plugs into the connector on the converter.
The box then plugs into the adapter of the motor.

Figure 50: Connection with connector





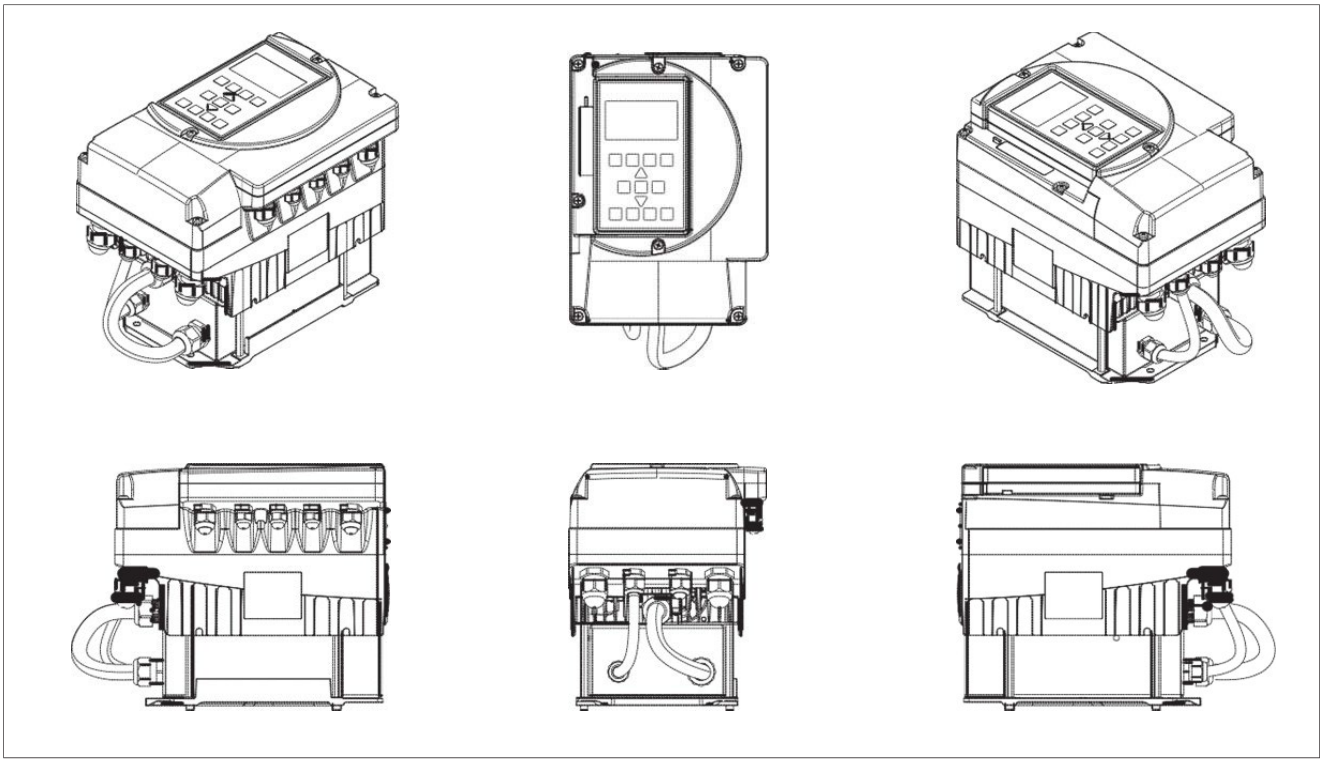
Connection NOTE:
DC connection
Red wire (+) terminal
Black wire (-)terminal



(Only for REEL SuPremE® motors)

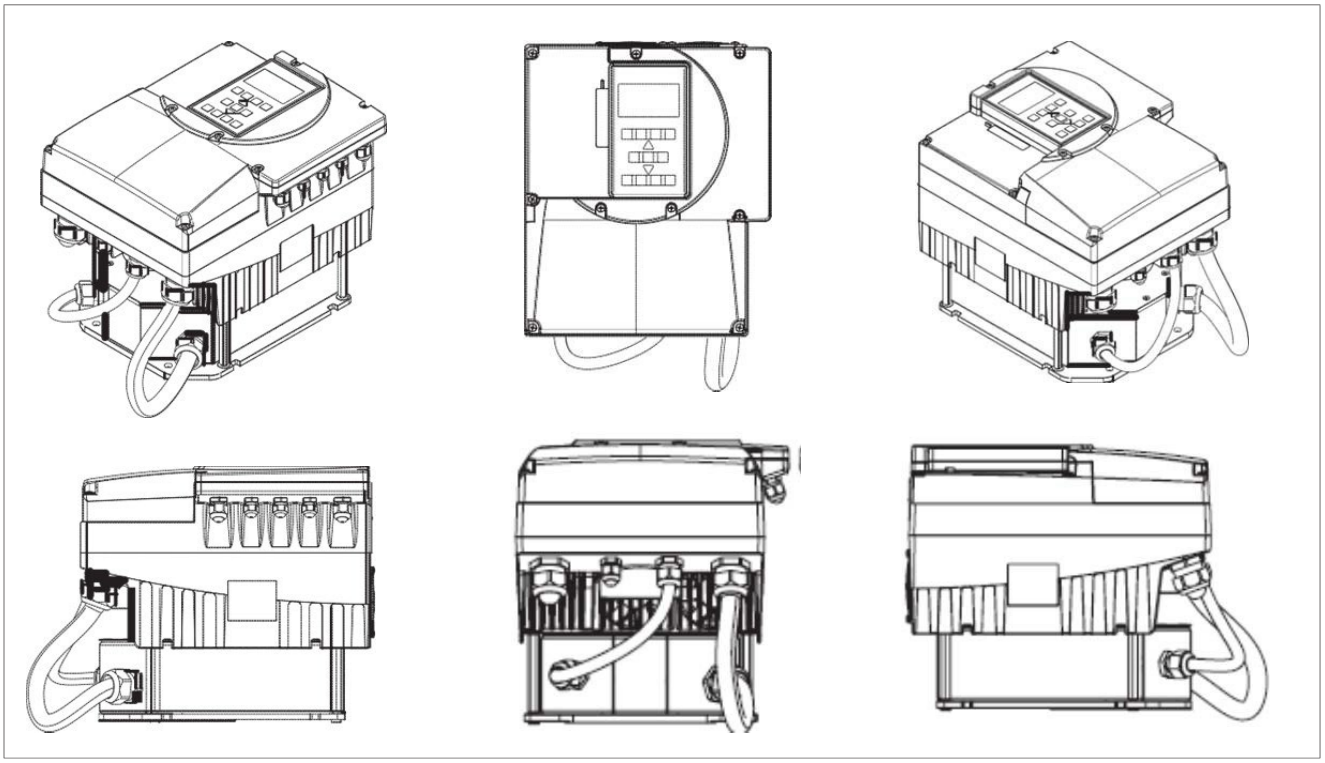
10.6 Connection layout of the capacitor box for sizes A and B

Figure 51: Capacitor box for sizes A and B



10.7 Connection layout of the capacitor box for size C

Figure 52: Capacitor box for size C



10.8 Sizes D and E: version with electrolytic capacitors

This version must be selected at the time the order is placed with REEL so that it can be purpose-built from the beginning. For all the converters with electrolytic capacitor version **(see par. 10.9)**.

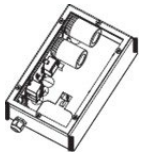
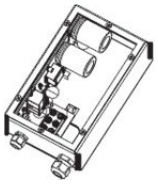
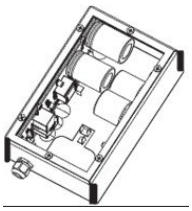
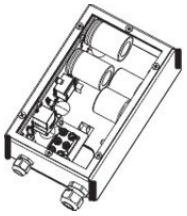
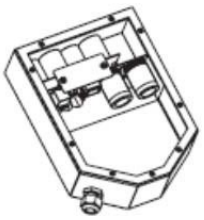
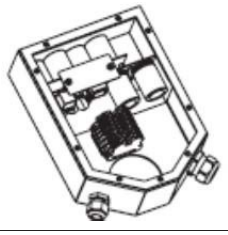
WARNING

Even after power off dangerous voltage can remain on the DC-link capacitors. To prevent personal injury, ensure that the voltage is cut off before working on the converter and wait 10 min for the capacitors to discharge to a safe level. Use a multimeter to test for residual DV voltage.

10.9 Optional modules (accessories)

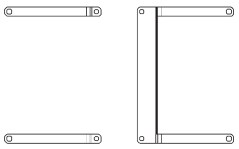
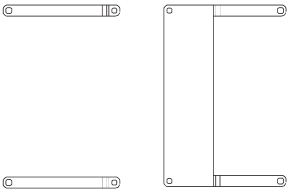
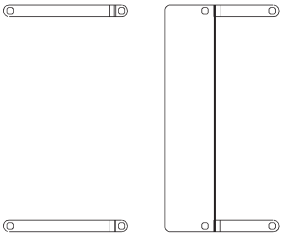
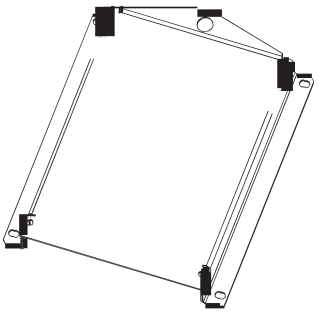
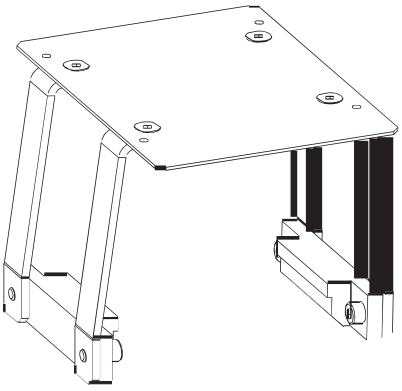
10.9.1 Accessories for the power connections

Table 35: Accessories for the power connections

Name / Description	Image
Capacitor box for size A without connector	
Capacitor box for size A with connector	
Capacitor box for size B with connector	
Capacitor box for size B without connector	
Capacitor box for size C without connector	
Capacitor box for size C with connector	

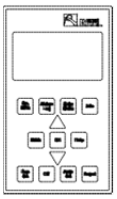
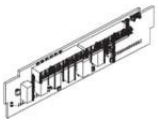
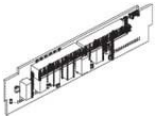
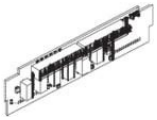
10.9.2 Accessories for mounting the converter

Table 36: Accessories for mounting the converter

Name / Description	Image
Wall mount KIT for size A	
Wall mount KIT for size B	
Wall mount KIT for size C	
Wall mount KIT for size D	
Wall mount KIT for size E	
KIT for mounting on REEL SuPremE® motor with standard terminal box	

10.9.3 Accessories for communication and available optional extras

Table 37: Accessories for communication and available optional extras

Name / Description	Image
Infrared communication module	
Graphic keypad operator interface	
ModBus RTU communications board for installation in SLOT 1	
ProfiBus DPV10 communications board for installation in SLOT 2	
Profinet communications board for installation in SLOT 2	
Ether CAT* communications board for installation in SLOT 2	
Mod Bus TCP* communications board for installation in SLOT 2	
I/O - FX-I/O-A expansion board for installation in SLOT 3 1 differential analog input, 1 analog output, 3 digital inputs 24 V PNP, 2 digital outputs 24 V PNP, 1 relay output with changeover contact, 5 relay outputs with NO contact.	
I/O - FX-I/O-B expansion board with ModBus RTU for installation in SLOT 3 1 communication port RS 485 with Modbus RTU protocol, 3 digital inputs 24V PNP.	
I/O - FX-I/O-C expansion board with ModBus RTU and relay outputs for installation in SLOT 3 1 communication port RS 485 with Modbus RTU protocol, 3 digital inputs 24V PNP, 1 relay output with changeover contact, 2 solid-state relay outputs NO contact, 3 relay outputs with NO contact.	

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