AC Drive for Solar Water Pumps

ADV200 SP

Quick start up guide
Specification and installation

Language: English

Information about this manual

The ADV200 SP Quick start guide is a handy-sized manual for mechanical installation, electrical connection and fast start-up.

Software version

This manual is updated according the software version V 2.x.1 + Solar Pump V 2.x.46.4. application

The identification number of the software version is indicated on the identification plate of the drive or can be checked with the **Firmware ver.rel** - PAR 490 parameter, menu 2.5.

General information

Note ! In industry, the terms “Inverter”, “Regulator” and “Drive” are sometimes interchanged. In this document, the term “Drive” will be used.

Before using the product, read the safety instruction section carefully. Keep the manual in a safe place and available to engineering and installation personnel during the product functioning period.

WEG Automation Europe S.r.l. has the right to modify products, data and dimensions without notice. The data can only be used for the product description and they can not be understood as legally stated properties.

Thank you for choosing this WEG product.

We will be glad to receive any possible information which could help us improvingthis manual. The e-mail address is the following: techdoc@weg.net.

Table of contents

1.1 Symbols used in the manual

Warning!

Indicates a procedure, condition, or statement that, if not strictly observed, could result in personal injury or death.

Indique le mode d'utilisation, la procédure et la condition d'exploitation. Si ces consignes ne sont passtrictement respectées, il y a des risques de blessures corporelles ou de mort.

Caution

Indicates a procedure, condition, or statement that, if not strictly observed, could result in damage to or destruction of equipment.

Indique et le mode d'utilisation, la procédure et la condition d'exploitation. Si ces consignes ne sont pas strictement respectées, il y a des risques de détérioration ou de destruction des appareils.

Indicates that the presence of electrostatic discharge could damage the appliance. When handling the boards, always wear a grounded bracelet.

Indique que la présence de décharges électrostatiques est susceptible d'endommager l'appareil. Toujours porter un bracelet de mise à la terre lors de la manipulation des cartes.

Attention

Indicates a procedure, condition, or statement that should be strictly followed in order to optimize these applications.

Indique le mode d'utilisation, la procédure et la condition d'exploitation. Ces consignes doivent êtrerigoureusement respectées pour optimiser ces applications.

Note ! Indicates an essential or important procedure, condition, or statement.

Indique un mode d'utilisation, de procédure et de condition d'exploitation essentiels ou importants

Qualified personnel

For the purpose of this Instruction Manual , a "Qualified person" is someone who is skilled to the installation, mounting, start-up and operation of the equipment and the hazards involved. This operator must have the following qualifications:

- trained in rendering first aid.
- trained in the proper care and use of protective equipment in accordance with established safety procedures.
- trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety procedures.

Personne qualifiée

Aux fins de ce manuel d'instructions, le terme « personne qualifiée » désigne toute personne compétente en matière d'installation, de montage, de mise en service et de fonctionnement de l'appareil et au fait des dangers qui s'y rattachent. L'opérateur en question doit posséder les qualifications suivantes :

- *formation lui permettant de dispenser les premiers soins*
- *formation liée à l'entretien et à l'utilisation des équipements de protection selon les consigne de sécurité en vigueur*
- *formation et habilitation aux manoeuvres suivantes : branchement, débranchement, vérification des isolations, mise à la terre et étiquetage des circuits et des appareils selon les consignes de sécurité en vigueur*

Use for intended purpose only

The power drive system (electrical drive + application plant) may be used only for the application stated in the manual and only together with devices and components recommended and authorized by WEG.

Utiliser uniquement dans les conditions prévues

Le système d'actionnement électrique (drive électrique + installation) ne peut être utilisé que dans les conditions d'exploitation et les lieux prévus dans le manuel et uniquement avec les dispositifs et les composants recommandés et autorisés par WEG.

1.2 Safety precaution

The following instructions are provided for your safety and as a means of preventing damage to the product or components in the machines connected. This section lists instructions, which apply generally when handling electrical drives.

Specific instructions that apply to particular actions are listed at the beginning of each chapters.

Les instructions suivantes sont fournies pour la sécurité de l'utilisateur tout comme pour éviter l'endommagement du produit ou des composants à l'intérieur des machines raccordées. Ce paragraphe dresse la liste des instructions généralement applicables lors de la manipulation des drives électriques.
Les instructions spécifiques ayant trait à des actions particulières sont répertoriées au début de chaque chapitre.

Read the information carefully, since it is provided for your personal safety and will also help prolong the service life of your electrical drive and the plant you connect to it.

Lire attentivement les informations en matière de sécurité personnelle et visant par ailleurs à prolonger la durée de vie utile du drive tout comme de l'installation à laquelle il est relié.

1.3 General warnings

Warning!

This equipment contains dangerous voltages and controls potentially dangerous rotating mechanical parts. Non-compliance with Warnings or failure to follow the instructions contained in this manual can result in loss of life, severe personal injury or serious damage to property.

Cet appareil utilise des tensions dangereuses et contrôle des organes mécaniques en mouvement potentiellement dangereux. L'absence de mise en pratique des consignes ou le non-respect des instructions contenues dans ce manuel peuvent provoquer le décès, des lésions corporelles graves ou de sérieux dégâts aux équipements.

The drives cause mechanical movements. The user is responsible for ensuring that these mechanical movements do not create unsafe conditions. The safety blocks and operating limits provided by the manufacturer cannot be bypassed or modified

Les drives occasionnent des mouvements mécaniques. L'utilisateur est tenu de s'assurer que de tels mouvements mécaniques ne débouchent pas sur des conditions d'insécurité. Les butées de sécurité et les seuils d'exploitation prévus par le fabricant ne doivent être ni contournés ni modifiés.

Only suitable qualified personnel should work on this equipment, and only after becoming familiar with all safety notices, installation, operation and maintenance procedures contained in this manual. The successful and safe operation of this equipment is dependent upon its proper handling,installation, operation and maintenance.

Seul un personnel dûment formé peut intervenir sur cet appareil et uniquement après avoir assimilé l'ensemble des informations concernant la sécurité, les procédures d'installation, le fonctionnement et l'entretien contenues dans ce manuel. La sécurité et l'efficacité du fonctionnement de cet appareil dépendent du bon accomplissement des opérations de manutention, d'installation, de fonctionnement et d'entretien.

In the case of faults, the drive, even if disabled, may cause accidental movements if it has not been disconnected from the mains supply.

En cas de panne et même désactivé, le drive peut provoquer des mouvements fortuits s'il n'a pas été débranché de l'alimentation secteur.

Electrical Shock

The DC link capacitors remain charged at a hazardous voltage even after cutting off the power supply.

Never open the device or covers while the AC Input power supplyis switched on. Minimum time to wait before

working on the terminals or inside the device is listed in **section 9.7** .

Risque de décharge électrique

Les condensateurs de la liaison à courant continu restent chargés à une tension dangereuse même après que la tension d'alimentation a été coupée.

Ne jamais ouvrir l'appareil lorsqu'il est suns tension. Le temps minimum d'attente avant de pouvoir travailler sur les bornes ou bien àl'intérieur de l'appareil est indiqué dans la **section 9.7** *.*

Electrical Shock and Burn Hazard:

When using instruments such as oscilloscopes to work on live equipment, the oscilloscope's chassis should be grounded and a differential probe input should be used. Care should be used in the selection of probes and leads and in the adjustment of the oscilloscope so that accurate readings may be made. See instrument manufacturer's instruction book for proper operation and adjustments to the instrument.

Décharge Èlectrique et Risque de Brúlure : Lors de l'utilisation d'instruments (par example oscilloscope) sur des systémes en marche, le chassis de l'oscilloscope doit être relié à la terre et une sonde différentiel devrait être utilisé en entrée. Les sondes et conducteurs doivent être choissis avec soin pour effectuer les meilleures mesures à l'aide d'un oscilloscope. Voir le manuel d'instruction pour une utilisation correcte des instruments.

Fire and Explosion Hazard:

Fires or explosions might result from mounting Drives in hazardous areas such as locations where flammable or combustible vapors or dusts are present. Drives should be installed away from hazardous areas, even if used with motors suitable for use in these locations.

Risque d'incendies et d'explosions: L'utilisation des drives dans des zônes à risques (présence de vapeurs ou de poussières inflammables), peut provoquer des incendies ou des explosions. Les drives doivent être installés loin des zônes dangeureuses, et équipés de moteurs appropriés.

1.4 Instruction for compliance with UL Mark (UL requirements), U.S. and Canadian electrical codes

Short circuit ratings

ADV200 SP inverters must be connected to a mains capable of supplying a symmetrical short-circuit power of less than or equal to "xxxx A rms (at 480 V +10% V max).

The values of the "xxxx" A rms short-circuit current, in accordance with UL requirements (UL 508 c), for each motor power rating (Pn mot in the manual) are shown in the table below.

Short current rating	
Pn mot (kW)	SCCR (A) @480VAC
1.1...37.3	5000
39....149	10000
150....298	18000
299.....447	30000
448 ... 671	42000
672 ... 1193	85000

Note! Drive will be protected by semiconductor Fuse type as specified in the instruction manual.

Branch circuit protection

In order to protect drive against over-current use fuses specified in par. **"", page 113**.

Environmental condition

The drive has to be considered "Open type equipment". Max surrounding air temperature equal to 40°C. Pollution degree 2.

Wiring of the input and output power terminals

Use UL listed cables rated at 75°C and round crimping terminals. Crimp terminals with tool recommended by terminal manufacturer.

Field wiring terminals shall be used with the tightening torque specified in par. **“5.1.1 Cable Cross Section”, page 24.**

Over-voltage control

In compliance with CSA-requirements Overvoltage at mains terminal is achieved installing an overvoltage protection device as for :

Type OVR 1N 15 320 from ABB or similar.

Minimum time required for safe DC-link voltage

Before removing drive cover in order to access internal parts, after mains disconnection wait 300 sec for time.

Over-speed; over-load/current limit; motor overload

Drive incorporate over-speed, over-current/current limit, motor overload protection. Instruction manual specify degree of protection and detailed installation instruction.

Solid State Motor Overload Protection

The drive is not provided with the internal motor overload protection (software function) as required under UL 508c as from 9 May 2013.

The drive is designed for use with motors with integrated thermal overload protection.

The integrated thermal overload protection signal must be connected to the equipment, starting from a contact, on the “digital input connector” terminal, pins 4 and 10, that accepts a maximum of 24VDC, 5 mA. The final result of this signal is the switching of the motor control device output to solid state OFF.

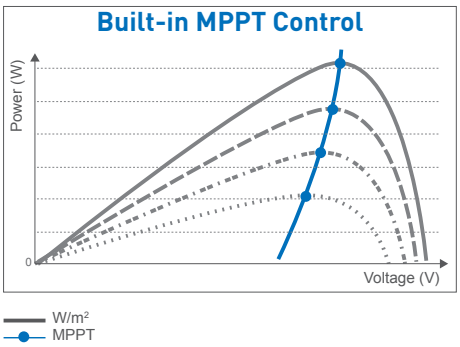
1.5 Disclaimer

Any remote connection functions shall be used only under adequate security conditions, in compliance with current regulatory provisions and only by properly trained personnel. The evaluation of such conditions is up to the user.

Solar-powered water pumping is based on PV technology that converts sunlight into electricity to pump water.

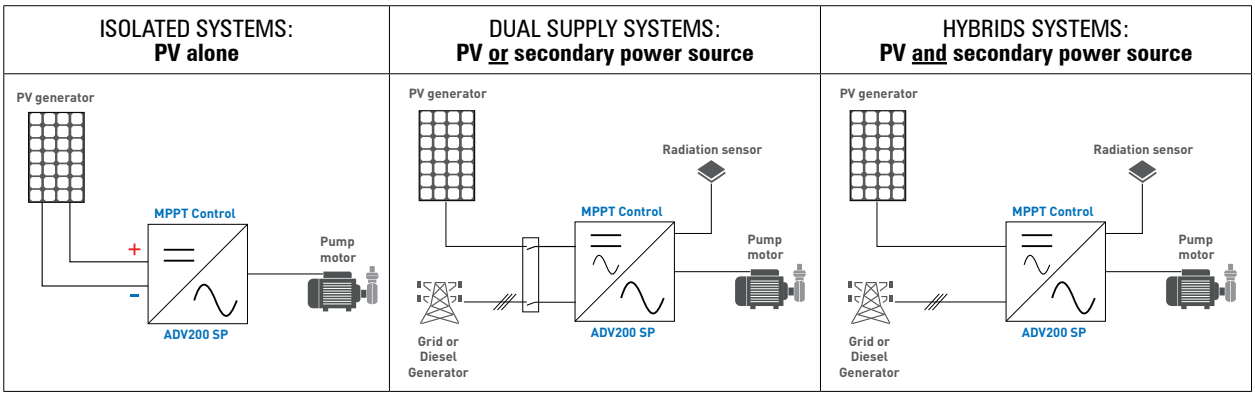
The PV panels are connected to an ADV200 SP drive, which converts the electrical energy supplied by the PV panel into mechanical energy, and this in turn is converted into hydraulic energy by the pump.

Synergies between the ADV200 SP Industrial Drives technology and the company's Solar and Pump application know-how have allowed WEG to develop a special SW app to optimize the operation of solar pump systems.



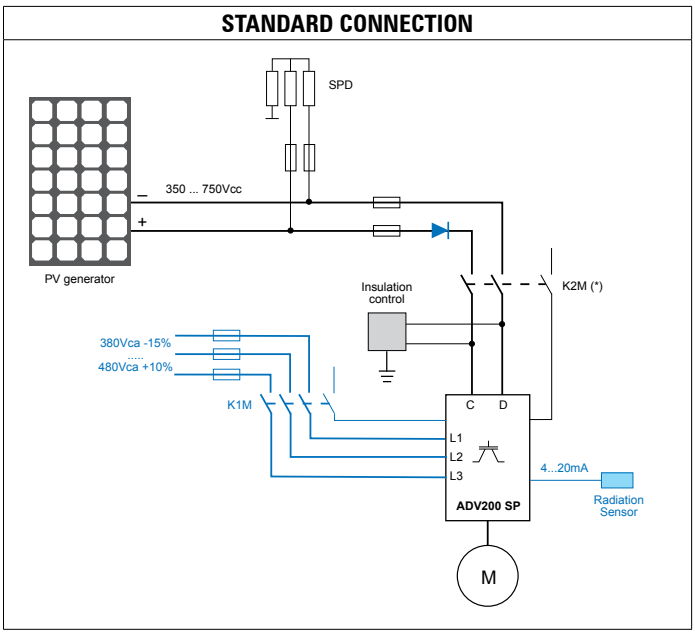
As a result of the built-in MPPT dynamic search algorithm developed by WEG, the ADV200 SP drive continuously adapts the System load at maximum output power under varying irradiation and temperature conditions. MPPT is the ideal choice to obtain the maximum pumping supply from photovoltaic cells, under any condition.

The ADV200 SP manages pumping systems powered by different sources: solar PV panels alone (off-grid), or both PV panels and grid supply (dual supply systems).



The inverter has been designed to manage the three different system configurations, illustrated above, either independently or with an external monitor.

This flexibility allows the real needs of system integrators and plant builders to be met and ensures top innovation and economic competitiveness in international markets.



Isolated systems
Dual supply systems

(*) K2M required in dual supply systems (PV OR secondary power source). Optional in the other system configurations.

For more details on the connections for each single system configuration, see section "5.5 Typical connection diagrams".

2.1 Drive type designation

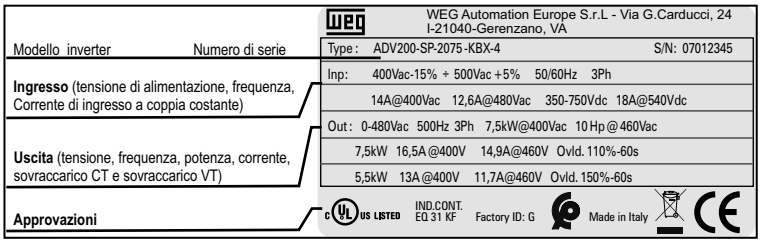
The main technical characteristic of the drive are showed in the product code and in the nameplate.

I.e. product code:

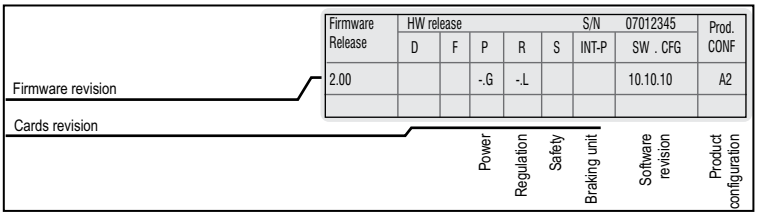
ADV200-SP -EH 1 040 -K B X -4 -XX YY -DC

DC bus power supply version		
Parallel version only: XX : MS = MASTER SL = SLAVE	YY : 05 = 500.0 kW 06 = 630.0 kW 07 = 710.0 kW 08 = 800.0 kW	10 = 1000.0 kW 11 = 1200.0 kW 15 = 1500.0 kW 18 = 1800.0 kW
Rated voltage :	4 = 400VAC 4A = 460VAC	
Software:	X = standard	
Braking unit:	X = non included B = included	
Keypad:	X = not included K = included	
Drive power, in kW:		
015 = 1.5 kW 022 = 2.2 kW 030 = 3.0 kW 040 = 4.0 kW 055 = 5.5 kW 075 = 7.5 kW 110 = 11.0 kW 150 = 15.0 kW	185 = 18.5 kW 220 = 22.0 kW 300 = 30.0 kW 370 = 37.0 kW 450 = 45.0 kW 550 = 55.0 kW 750 = 75.0 kW 900 = 90.0 kW	1100 = 110.0 kW 1320 = 132.0 kW 1600 = 160.0 kW 2000 = 200.0 kW 2500 = 250.0 kW 3150 = 315.0 kW 3550 = 355.0 kW 4000 = 400.0 kW
Mechanical drive sizes:	1 = size 1 2 = size 2 3 = size 3 4 = size 4	5 = size 5 6 = size 6 7 = size 7
External heatsink drive models with IP54 protection degree		
Drive ADV200 SP series		

Identification Nameplate



Firmware & cards revision level nameplate



The inverter must be selected according to the rated current of the motor.

The rated output current of the drive must be higher than or equal to the rated current of the motor used.

The speed of the three-phase motor is determined by the number of pole pairs and the frequency (nameplate, data sheet) of the motor concerned.

Operation above the rated frequency and speed of the motor must take into account the specifications given by the manufacturer losses (bearings, unbalance etc.). This also applies to temperature specifications for continuous operation under 20 Hz (poor motor ventilation, not applicable to motors with external ventilation).

2.1.1 Parallel inverters

- Inverters from 500 kW comprise one master and one or more slave.
- When placing your order please give the description and code of the master / slave and quantity of these:

Power	Code	Description (Designation)
500 kW	On request	ADV200-SP-72500-KXX-4-MS 05
	On request	ADV200-SP-72500-XXX-4-SL
630 kW	On request	ADV200-SP-73150-KXX-4-MS 06
	On request	ADV200-SP-73150-XXX-4-SL
710 kW	On request	ADV200-SP-73550-KXX-4-MS 07
	On request	ADV200-SP-73550-XXX-4-SL
800 kW	On request	ADV200-SP-74000-KXX-4-MS 08
	On request	ADV200-SP-74000-XXX-4-SL
1 MW	On request	ADV200-SP-73550-KXX-4-MS 10
	On request	ADV200-SP-73550-XXX-4-SL
	On request	ADV200-SP-73550-XXX-4-SL
1.2 MW	On request	ADV200-SP-74000-KXX-4-MS 12
	On request	ADV200-SP-74000-XXX-4-SL
	On request	ADV200-SP-74000-XXX-4-SL
1.5 MW	On request	ADV200-SP-73550-KXX-4-MS 15
	On request	ADV200-SP-73550-XXX-4-SL
	On request	ADV200-SP-73550-XXX-4-SL
	On request	ADV200-SP-73550-XXX-4-SL2
1.8 MW	On request	ADV200-SP-73550-KXX-4-MS 18
	On request	ADV200-SP-73550-XXX-4-SL
	On request	ADV200-SP-73550-XXX-4-SL
	On request	ADV200-SP-73550-XXX-4-SL2
	On request	ADV200-SP-73550-XXX-4-SL2

3 - Transport and storage

Correct transport, storage, erection and mounting, as well as careful operation and maintenance are essential for proper and safe operation of the equipment.

Protect the inverter against physical shocks and vibration during transport and storage. Also be sure to protect it against water (rainfall) and excessive temperatures.

Le bon accomplissement des opérations de transport, de stockage, d'installation et de montage, ainsi que l'exploitation et l'entretien minutieux, sont essentiels pour garantir à l'appareil un fonctionnement adéquat et sûr.

If the Drives have been stored for longer than two years, the operation of the DC link capacitors may be impaired and must be "reformed". Before commissioning devices that have been stored for long periods, connect them to a power supply for two hours with no load connected in order to regenerate the capacitors, (the input voltage has to be applied without enabling the drive).

En cas de stockage des variateurs pendant plus de deux ans, il est conseillé de contrôler l'état des condensateurs CC avant d'en effectuer le branchement. Avant la mise en service des appareils, ayant été stockés pendant long temps, il faut alimenter variateurs à vide pendant deux heures, pour régénérer les condensateurs : appliquer une tension d'alimentation sans actionner le variateur.

3.1 General

A high degree of care is taken in packing the ADV200 SP Drives and preparing them for delivery. They should only be transported with suitable transport equipment (see weight data). Observe the instructions printed on the packaging. This also applieswhen the device is unpacked and installed in the control cabinet.

Upon delivery, check the following:

- the packaging for any external damage
- whether the delivery note matches your order.

Open the packaging with suitable tools. Check whether:

- any parts were damaged during transport
- the device type corresponds to your order

In the event of any damage or of an incomplete or incorrect delivery please notify the responsible sales offices immediately. The devices should only be stored in dry rooms within the specified temperature ranges .

Note! A certain degree of moisture condensation is permissible if this arises from changes in temperature. This does not, however, apply when the devices are in operation. Always ensure that there is no moisture condensation in devices that are connected to the power supply!

3.2 Permissible Environmental Conditions

Temperature

storage _____ -25…+55°C (-13…+131°F), class 1K4 per EN 60721-3-1
-20…+55°C (-4…+131°F), for devices with keypad

transport _____ -25…+70°C (-13…+158°F), class 2K3 per EN 60721-3-2
-20…+60°C (-4…+140°F), for devices with keypad

Air humidity

storage _____ from 5% to 95 % and from 1 g/m³ to 29 g/m³ (class 1K3 as per EN 60721-3-1)

transport _____ 95 % (3), 60 g/m³ (4)

A light condensation of moisture may occur for a short time occasionally if the device is not in operation (class 2K3 as per EN50178)

Air pressure:

storage _____ [kPa] 86 to 106 (class 1K4 as per EN 60721-3-1)

transport _____ [kPa] 70 to 106 (class 2K3 as per EN 60721-3-2)

(3) Greatest relative air humidity occurs with the temperature @ 40°C (104°F) or if the temperature of the device is brought suddenly from -25 ...+30°C (-13°...+86°F).

(4) Greatest absolute air humidity if the device is brought suddenly from 70...15°C (158°...59°F).

Attention

The drive is suitable for use under the environmental service conditions (climate, mechanical, pollution, etc.) defined as usual service conditions according to EN61800-2.

3.3 Disposal of the device

The ADV200 SP inverter can be disposed of as electronic waste according to national regulations in force for the disposal of electronic components.

Pursuant to Article 26 of Italian Legislative Decree no. 49 of 14 March 2014 "Implementation of Directive 2012/19/EU on waste electrical and electronic equipment (WEEE)"

The symbol showing a crossed-out wheeled bin on equipment or its packaging indicates that the product must be collected separately from other waste at the end of its useful life.

The manufacturer is responsible for organising and managing the separate collection of this piece of equipment at the end of its useful life.

Users wishing to dispose of the equipment must therefore contact the manufacturer to obtain instructions from the same on how to have the equipment collected separately at the end of its useful life.

By collecting the disused equipment separately, it can be recycled, treated or disposed of in an environmentally friendly manner, thus helping to prevent the environment and public health from being affected negatively and enabling reuse and/or recycling of the materials forming the same equipment.

Caution

The Drive must be mounted on a wall that is constructed of heat resistant material. While the Drive is operating, the temperature of the Drive's cooling fins can rise to a temperature of 158° F (70°C).

Le drive doit être monté sur un mur construit avec des matériaux résistants à la chaleur. Pendant le fonctionnement du drive, la température des ailettes du dissipateur thermique peut arriver à 70°C (158° F).

Because the ambient temperature greatly affects Drive life and reliability, do not install the Drive in any location that exceeds the allowable temperature.

Étant donné que la température ambiante influe sur la vie et la fiabilité du drive, on ne devrait pasinstaller le drive dans des places ou la temperature permise est dépassée.

Be sure to remove the desicant dryer packet(s) when unpacking the Drive. (If not removed these packets may become lodged in the fan or air passages and cause the Drive to overheat).

Lors du déballage du drive, retirer le sachet déshydraté. (Si celui-ci n'est pas retiré, il empêche la ventilation et provoque une surchauffe du drive).

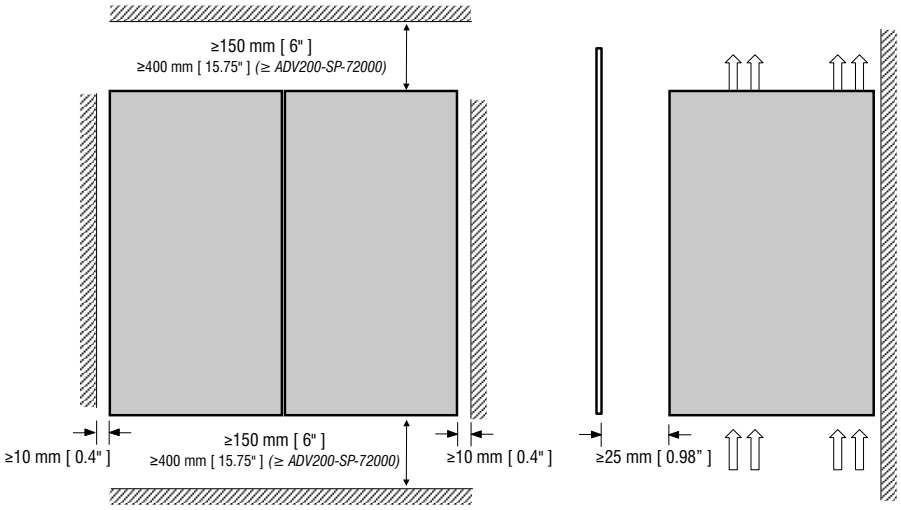
Protect the device from impermissible environmental conditions (temperature, humidity, shock etc.).

Protéger l'appareil contre des effets extérieurs non permis (température, humidité, chocs etc.).

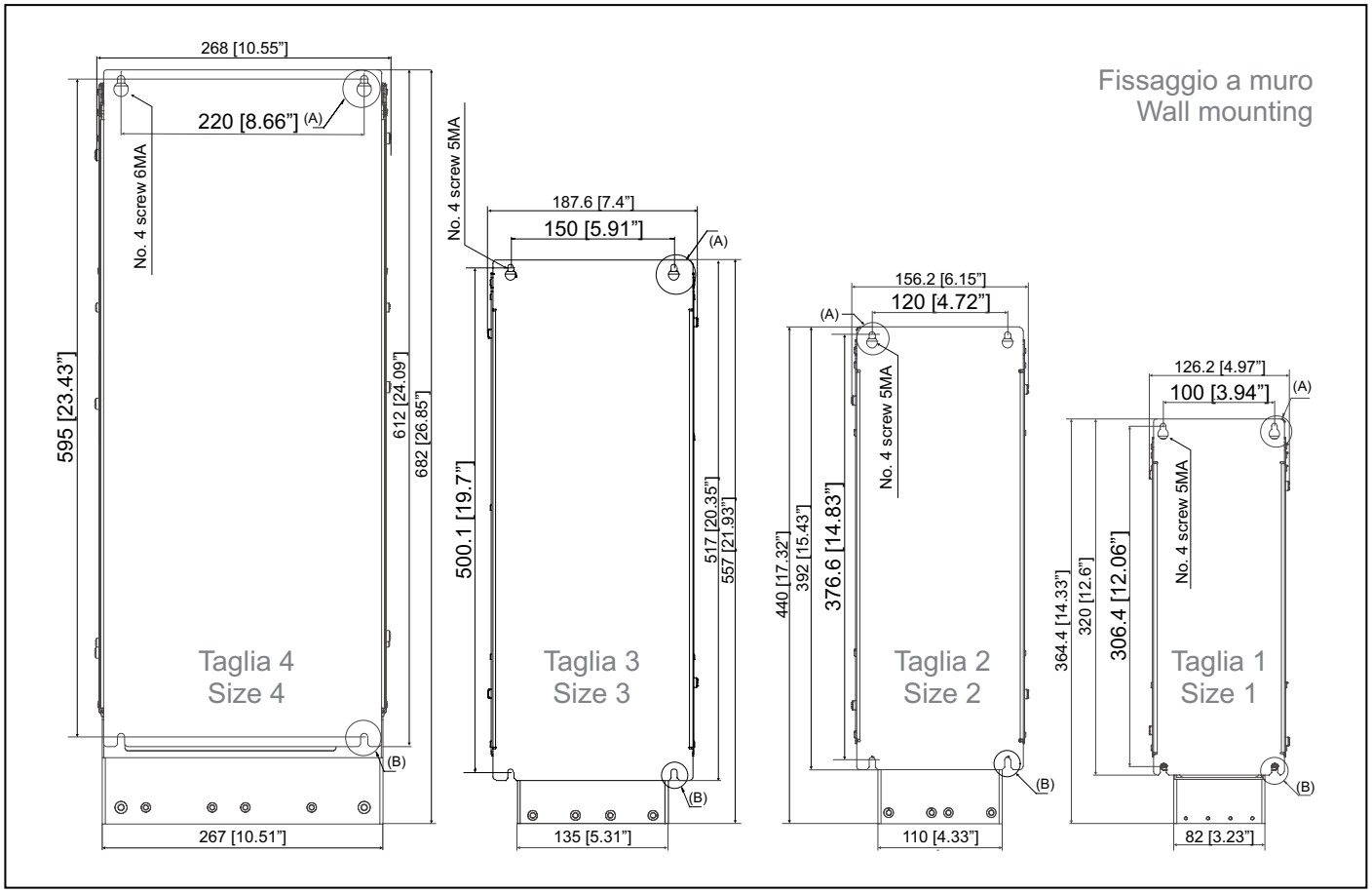
4.1 Inclination and mounting clearance

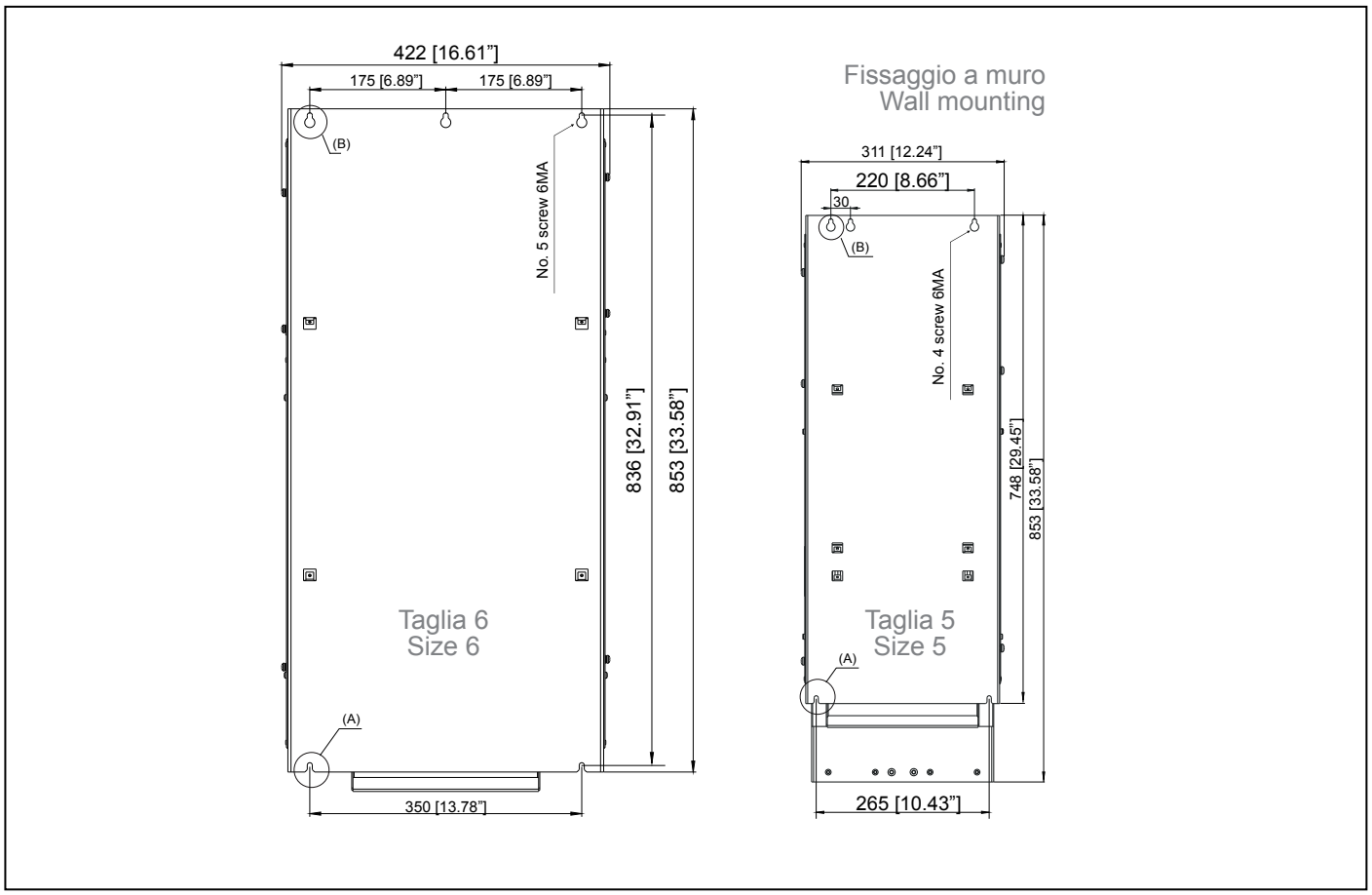
The Drives must be mounted in such a way that the free flow of air is ensured see paragraph **"9.8 Cooling", page 91**.

Maximum angle of inclination	30° (referred to vertical position)
Minimum top and bottom distance	150 mm (≥ ADV200-SP-72000 = 400mm)
Minimum free space to the front	25 mm
Minimum distance between drives	none
Minimum distance to the side with the cabinet	10 mm

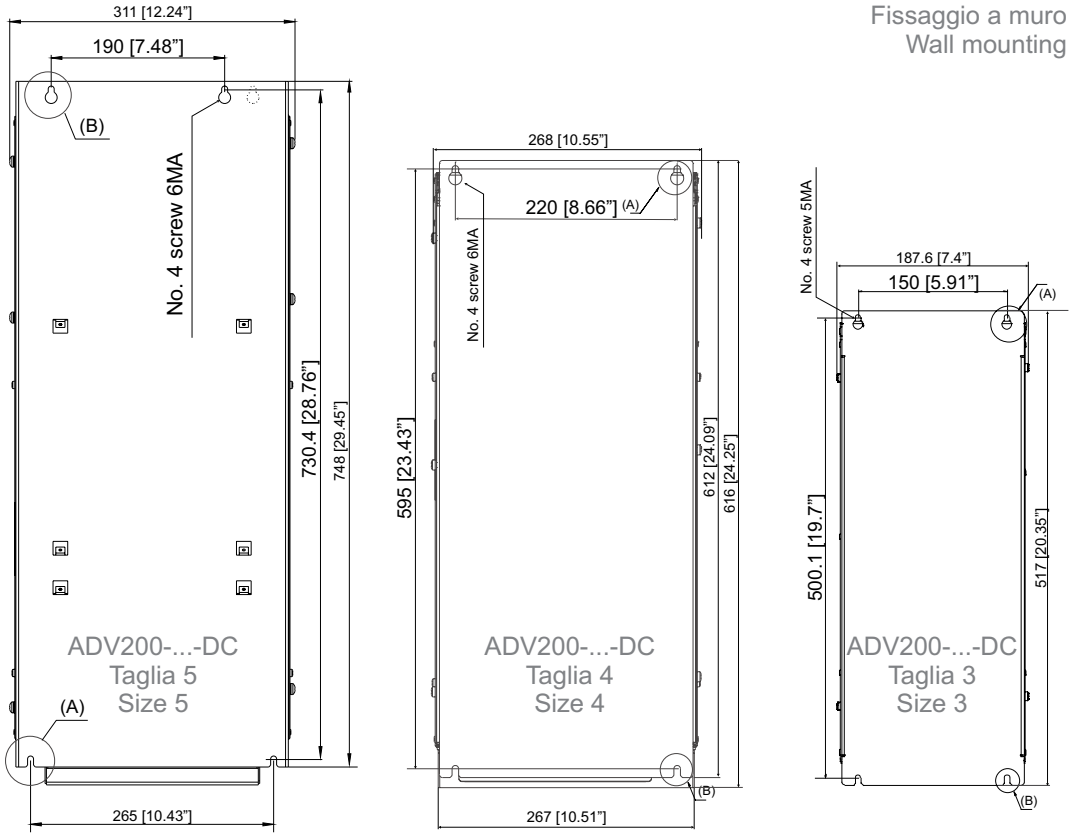


4.2 Fastening positions

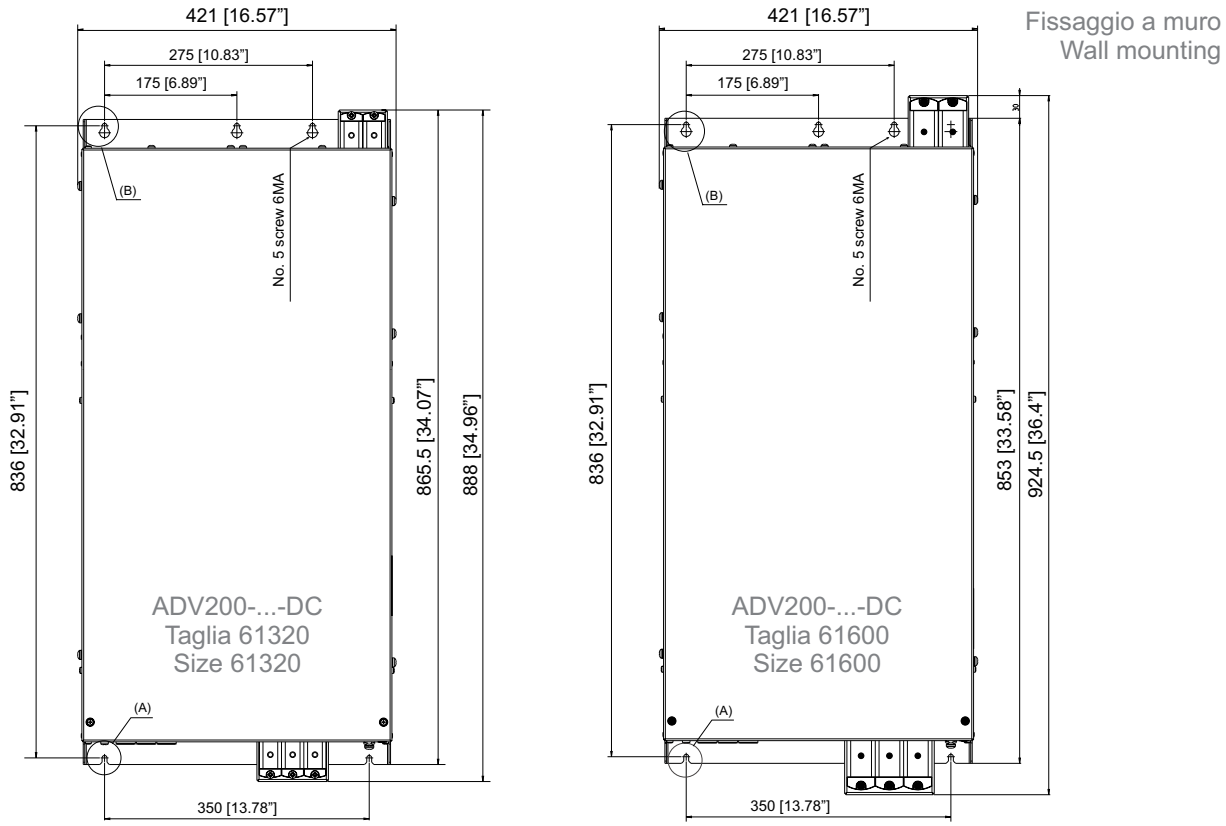


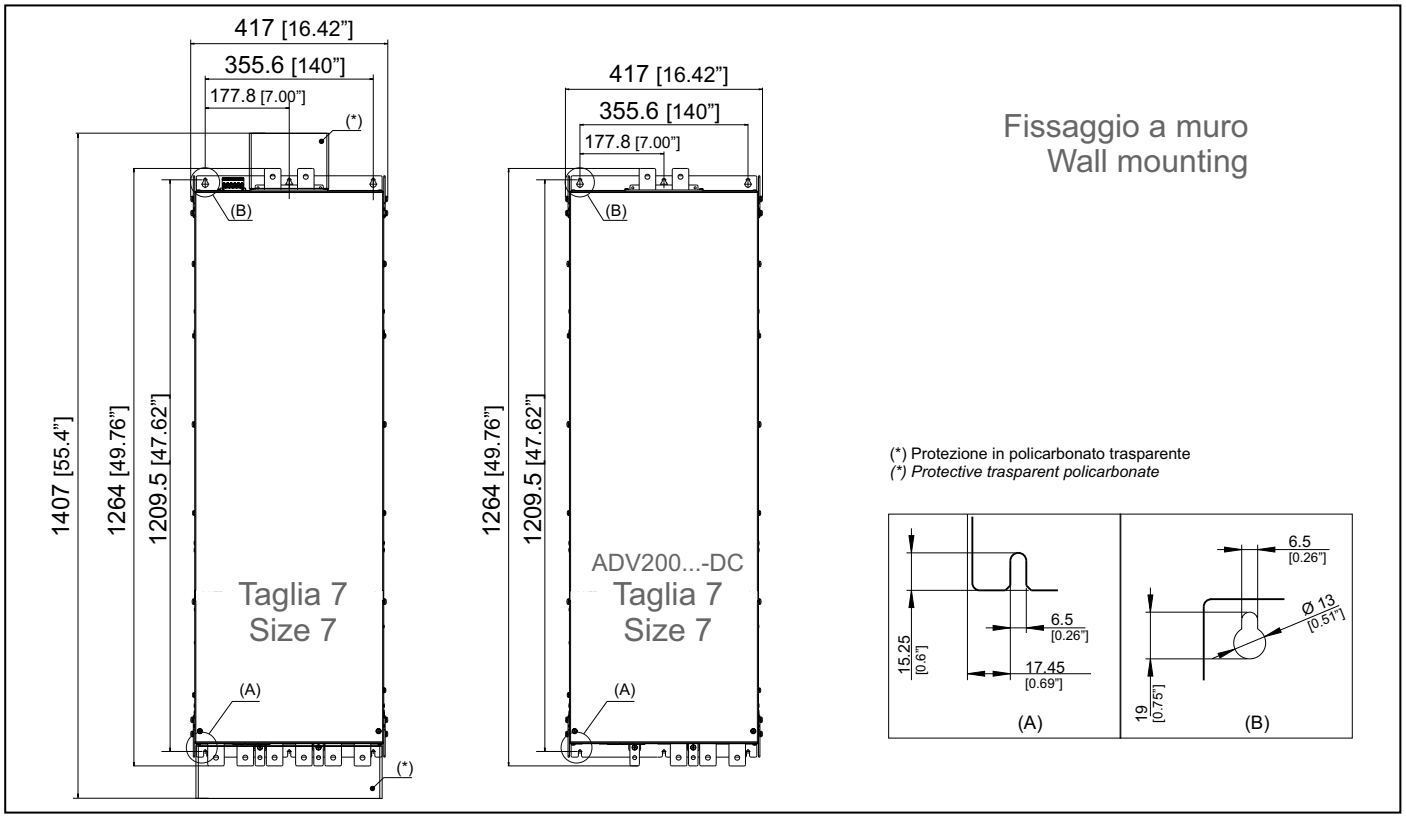


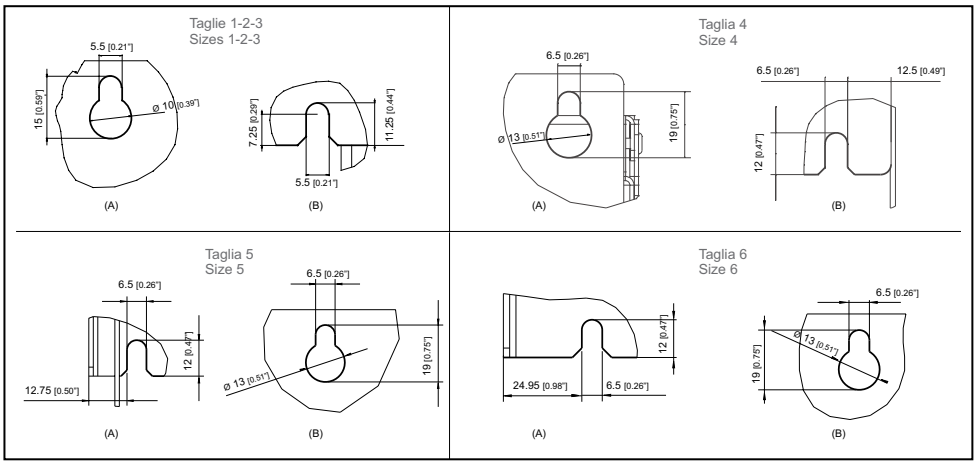
Fissaggio a muro
Wall mounting



Fissaggio a muro
Wall mounting

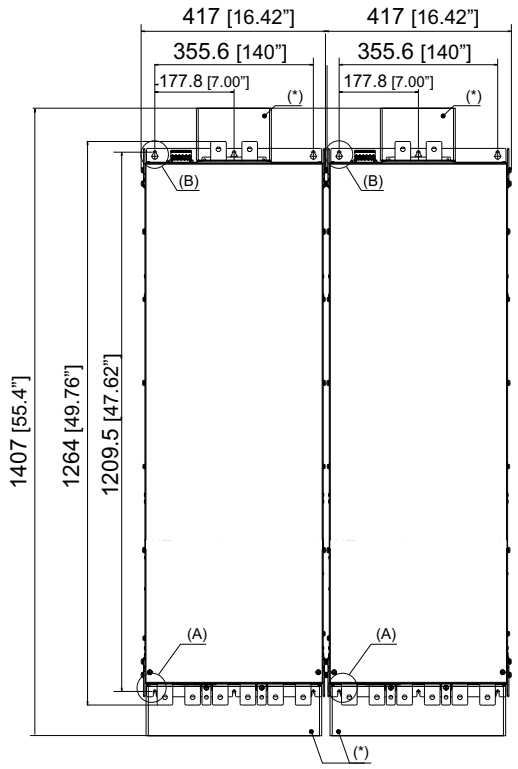






			Recommended screws for fastening
Size 1 (ADV 1...)	**Size 2 (ADV 2...)**	**Size 3 (ADV 3...)**	4 x M5 x 12 mm screws + Grover (spring-lock) washer + Flat washer
Size 4 (ADV 4...)	**Size 5 (ADV 5...)**		4 x M6 x 16 mm screws + Grover (spring-lock) washer + Flat washer
Size 6 (ADV 6...)			5 x M6 x 16 mm screws + Grover (spring-lock) washer + Flat washer
Size 7 (ADV 7...)			6 x M6 x 16 mm screws + Grover (spring-lock) washer + Flat washer

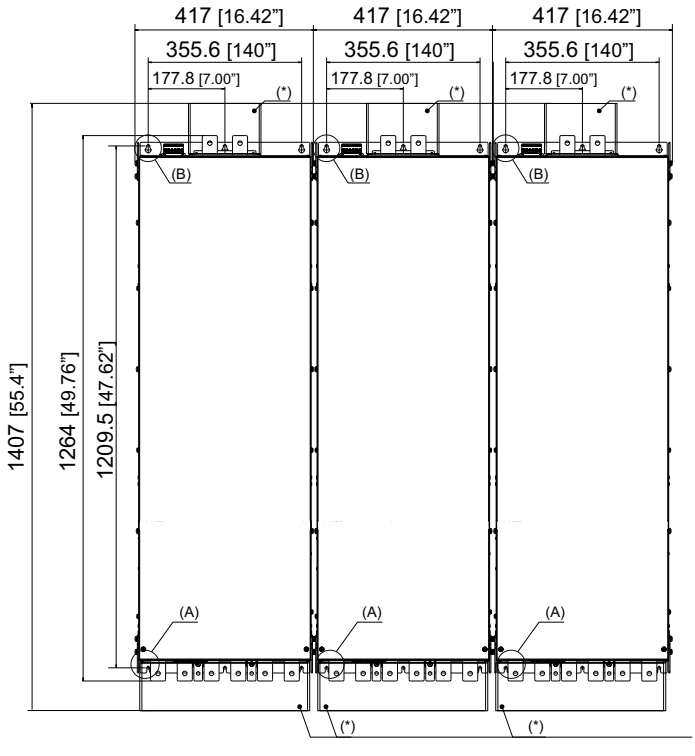
Note! Other dimensions see chapter **"9.9 Weight and dimensions", page 92**.



Fissaggio a muro
Wall mounting

500 ... 800 kW

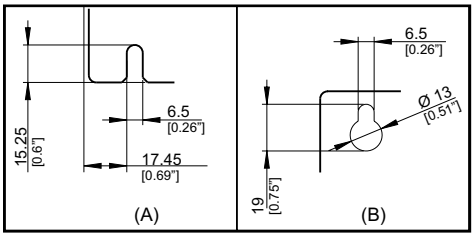
(*) Protezione in policarbonato trasparente
(*) Protective trasparent policarbonate

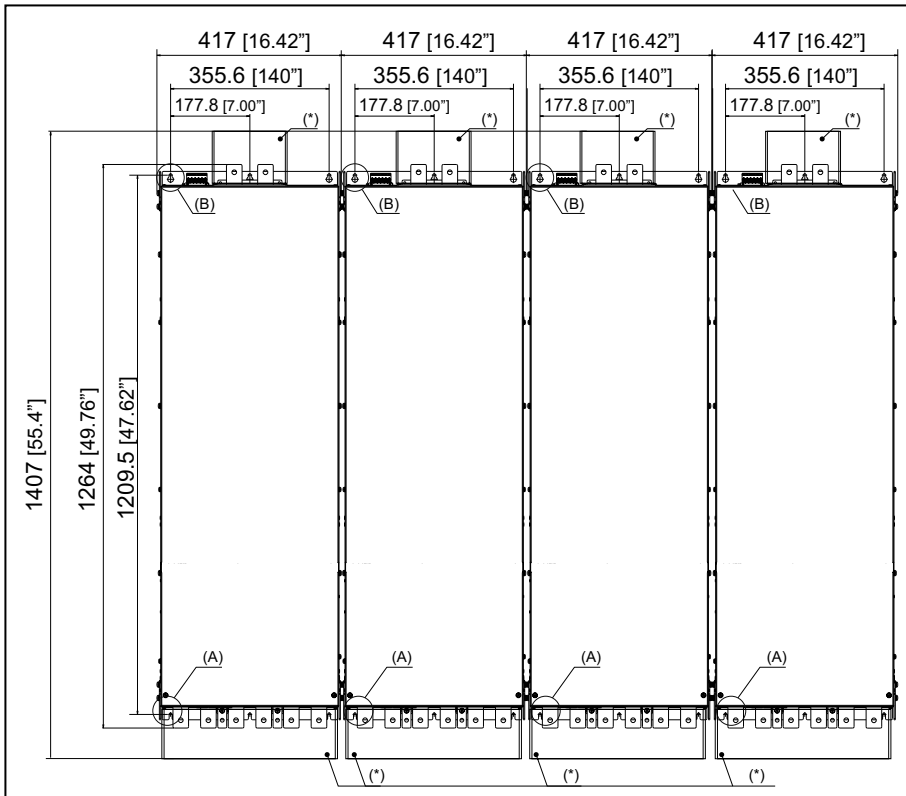


Fissaggio a muro
Wall mounting

1000 ... 1200 kW

(*) Protezione in policarbonato trasparente
(*) Protective trasparent policarbonate

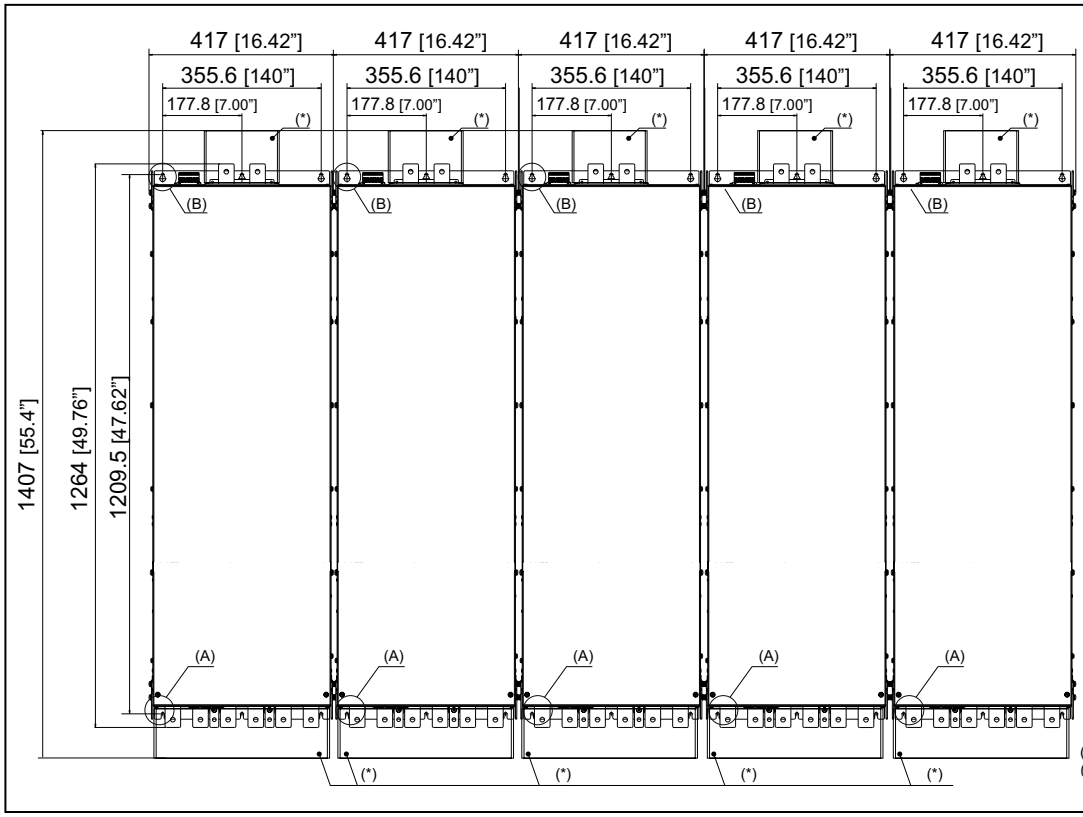




Fissaggio a muro
Wall mounting

1500 kW

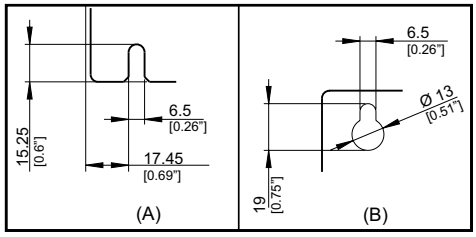
(*) Protezione in policarbonato trasparente
(*) Protective trasparent policarbonate



Fissaggio a muro
Wall mounting

1800 kW

(*) Protezione in policarbonato trasparente
(*) Protective trasparent policarbonate



Power	Description	Recommended screws for fastening
500 kW	ADV200-SP-72500-KXX-4-MS 05	12 x M6 x 16 mm screws + Grover (spring-lock) washer + Flat washer
	ADV200-SP-72500-XXX-4-SL	
630 kW	ADV200-SP-73150-KXX-4-MS 06	
	ADV200-SP-73150-XXX-4-SL	
710 kW	ADV200-SP-73550-KXX-4-MS 07	
	ADV200-SP-73550-XXX-4-SL	
800 kW	ADV200-SP-74000-KXX-4-MS 08	
	ADV200-SP-74000-XXX-4-SL	
1 MW	ADV200-SP-73550-KXX-4-MS 10	18 x M6 x 16 mm screws + Grover (spring-lock) washer + Flat washer
	ADV200-SP-73550-XXX-4-SL	
	ADV200-SP-73550-XXX-4-SL	
1.2 MW	ADV200-SP-74000-KXX-4-MS 12	
	ADV200-SP-74000-XXX-4-SL	
	ADV200-SP-74000-XXX-4-SL	
1.5 MW	ADV200-SP-73550-KXX-4-MS 15	24 x M6 x 16 mm screws + Grover (spring-lock) washer + Flat washer
	ADV200-SP-73550-XXX-4-SL	
	ADV200-SP-73550-XXX-4-SL	
	ADV200-SP-73550-XXX-4-SL2	
1.8 MW	ADV200-SP-73550-KXX-4-MS 18	30 x M6 x 16 mm screws + Grover (spring-lock) washer + Flat washer
	ADV200-SP-73550-XXX-4-SL	
	ADV200-SP-73550-XXX-4-SL	
	ADV200-SP-73550-XXX-4-SL2	
	ADV200-SP-73550-XXX-4-SL2	

Note! Other dimensions see chapter **"9.9 Weight and dimensions", page 92**.

5 - Wiring Procedure

Warning!

Adjustable frequency drives are electrical apparatus for use in industrial installations. Parts of the Drives are energized during operation. The electrical installation and the opening of the equipment should therefore only be carried out by qualified personnel. Improper installation of motors or Drives may therefore cause the failure of the device as well as serious injury to persons or material damage. Drive is not equipped with motor over-speed protection logic other than that controlled by software. Follow the instructions given in this manual and observe the local and national safety regulations applicable.

Les drives à fréquence variable sont des dispositifs électriques utilisés dans des installations industriels. Une partie des drives sont sous tension pendant l'operation. L'installation électrique et l'ouverture des drives devrait être executé uniquement par du personel qualifié. De mauvaises installations de moteurs ou de drives peuvent provoquer des dommages materiels ou blesser des personnes. On doit suivir les instructions donneés dans ce manuel et observer les régles nationales de sécurité.

Replace all covers before applying power to the Drive. Failure to do so may result in death or serious injury.

Remettre tous les capots avant de mettre sous tension le drive. Des erreurs peuvent provoquer de sérieux accidents ou même la mort.

Warning!

The drive must always be grounded. If the drive is not connected correctly to ground, extremely hazardous conditions may be generated that may result in death or serious injury.

Le drive doit toujours être raccordé au système de mise à la terre. *Un mauvais raccordement du drive au système de mise à la terre peut se traduire par des conditions extrêmement dangereuses susceptibles d'entraîner le décès ou de graves lésions corporelles.*

Never open the device or covers while the AC Input power supply is switched on. Minimum time to wait before working on the terminals or inside the device is listed in section 9.8.

Ne jamais ouvrir l'appareil lorsqu'il est suns tension. Le temps minimum d'attente avant de pouvoir travailler sur les bornes ou bien à l'intérieur de l'appareil est indiqué dans la section 9.8.

Do not touch or damage any components when handling the device. The changing of the isolation gaps or the removing of the isolation and covers is not permissible.

Manipuler l'appareil de façon à ne pas toucher ou endommager des parties. Il n'est pas permis de changer les distances d'isolement ou bien d'enlever des matériaux isolants ou des capots.

Caution

Do not connect power supply voltage that exceeds the standard specification voltage fluctuation permissible. If excessive voltage is applied to the Drive, damage to the internal components will result.

Ne pas raccorder de tension d'alimentation dépassant la fluctuation de tension permise par les normes. Dans le cas d' une alimentation en tension excessive, des composants internes peuvent être endommagés.

Operation with Residual Current Device

If an RCD (also referred to as ELCB or RCCB) is fitted, the inverters will operate without nuisance tripping, provided that:

- a type B RCD is used.
- the trip limit of the RCD is 300mA.
- the neutral of the supply is grounded (TT or TN systems)
- only one inverter is supplied from each RCD.
- the output cables are less than 50m (screened) or 100m (unscreened).

RCD: Residual Current Device
RCCB: Residual Current Circuit Breaker
ELCB: Earth Leakage Circuit Breaker

Note: The residual current operated circuit-breakers used must provide protection against direct-current components in the fault current and must be suitable for briefly suppressing power pulse current peaks. It is recommended to protect the frequency inverter by fuse separately.

The regulations of the individual country (e.g. VDE regulations in Germany) and the regional power suppliers must be observed!

Fonctionnement avec un dispositif de courant résiduel
En cas d'installation d'un RCD – dispositif de courant résiduel – (également dénommé RCCB ou ELCB), les onduleurs fonctionneront sans faux arrêt à condition que :
- le RCD utilisé soit de type B
- le seuil de déclenchement du RCD soit fixé à 300 mA
- le neutre du bloc d'alimentation soit mis à la terre (systèmes TT ou TN)
- chaque RCD n'alimente qu'un seul onduleur
- la longueur des câbles de sortie soit inférieure à 50 m (blindés) ou 100 m (non blindés)

RCD: Dispositif de courant résiduel
RCCB: Disjoncteur à courant résiduel
ELCB: Disjoncteur contre fuite à la terre

Remarque : Les RCD utilisés doivent assurer la protection contre les composants à courant continu présents dans le courant de défaut et doivent être capables de supprimer des crêtes de courant en peu de temps. Il est recommandé de protéger séparément l'onduleur au moyen de fusibles.

Respecter la réglementation des pays concernés (par exemple, les normes VDR en Allemagne) et des fournisseurs locaux d'énergie électrique.

Caution

Functioning of the Drive without a ground connection is not permitted. To avoid disturbances, the armature of the motor must be grounded using a separate ground connector from those of other appliances.

Défense de faire fonctionner le drive sans qu'il y ait eu raccordement de mise à la terre préalable. Pour éviter les perturbations, la carcasse du moteur doit être mise à la terre à l'aide d'un raccord de mise à la masse séparé de ceux des autres appareils.

The grounding connector shall be sized in accordance with the NEC or Canadian Electrical Code. The connection shall be made by a UL listed or CSA certified closed-loop terminal connector sized for the wire gauge involved. The connector is to be fixed using the crimp tool specified by the connector manufacturer.

Le raccordement devrait être fait par un connecteur certifié et mentionné à boucle fermé par lesnormes CSA et UL et dimensionné pour l'épaisseur du cable correspondant. Le connecteur doit êtrefixé a l'aide d'un instrument de serrage specifié par le producteur du connecteur.

Do not perform a megger test between the Drive terminals or on the control circuit terminals.

Ne pas exécuter un test megger entre les bornes du drive ou entre les bornes du circuit de contrôle.

No voltage should be connected to the output of the drive (terminals U, V, W). The parallel connection of several drives via the outputs and the direct connection of the inputs and outputs (bypass) are not permissible.

Aucune tension ne doit être appliquée sur la sortie du convertisseur (bornes U, V, W). Il n'est pas permis de raccorder la sortie de plusieurs convertisseurs en parallèle, ni d'effectuer une connexion directede l'entrée avec la sortie du convertisseur (Bypass).

The electrical commissioning should only be carried out by qualified personnel, who are also responsible for the provision of a suitable ground connection and a protected power supply feeder in accordance with the local and national regulations. The motor must be protected against overloads.

La mise en service électrique doit être effectuée par un personnel qualifié. Ce dernier est responsable del'existence d'une connexion de terre adéquate et d'une protection des câbles d'alimentation selon les prescriptions locales et nationales. Le moteur doit être protégé contre la surcharge

If the Drives have been stored for longer than two years, the operation of the DC link capacitors may be impaired and must be "reformed". Before commissioning devices that have been stored for long periods, connect them to a power supply for two hours with no load connected in order to regenerate the capacitors, (the input voltage has to be applied without enabling the drive).

En cas de stockage des variateurs pendant plus de deux ans, il est conseillé de contrôler l'état des condensateurs CC avant d'en effectuer le branchement. Avant la mise en service des appareils, ayant été stockés pendant long temps, il faut alimenter variateurs à vide pendant deux heures, pour régénérer les condensateurs : appliquer une tension d'alimentation sans actionner le variateur.

Caution

Type of networks

ADV200 SP drives are designed to be powered with IT network, it does not include the use of an EMI filter with internal capacitors connected to the ground. The RFI emissions level are more relevant but in accordance with EN 61800-3.

ADV200 SP can only operate on IT networks devoid of any faults (between active parts and PE) or in the presence of temporary faults.

Therefore an insulation monitor MUST be used to detect and enable prompt removal of any fault condition. For more information, see section “10.3 Insulation monitor”, page 113.

ADV200 inverters can be powered from standard three phase lines that are electrically symmetrical with respect to ground (TN or TT network).

In case of limited emission levels requirements, it is suggested to check for excessive noise from close electrical equipment or to the public low-voltage mains. If necessary, to reduce the levels of emissions is enought to use a voltage transformer with static screening between the primary and secondary windings.

For the use of mains power filters, see section “10.7 EMI filters”, page 121.

Type de réseaux

Les variateurs ADV200 SP sont conçus pour être alimentés d’un réseau IT, cette version n’inclut pas l’utilisation d’un filtre EMI avec des condensateurs internes reliés à la masse. Le niveau des émissions de RFI sont plus pertinentes, mais en conformité avec la norme EN 61800-3.

ADV200 SP n’est apte à fonctionner sur réseau IT qu’en l’absence de pannes (entre les parties actives et PE) ou qu’en présence d’une panne temporaire.

Il est donc obligatoire d’utiliser un contrôleur d’isolation capable de détecter et d’éliminer rapidement une éventuelle condition de panne. Pour plus d’informations, voir la section “10.3 Insulation monitor”, page 113.

Les variateurs ADV200 SP peuvent être alimentés par lignes triphasées standard qui sont électriquement symétrique par rapport à la terre (TN ou réseau TT).

En cas de besoins pour limités les niveaux d’émission, il est suggéré de vérifier le bruit excessif provenant des équipements électriques à proximité ou sur le réseau basse tension . Si nécessaire, pour réduire les niveaux d’émissions trop important utiliser un transformateur d’isolement entre les enroulements primaires et secondaires.

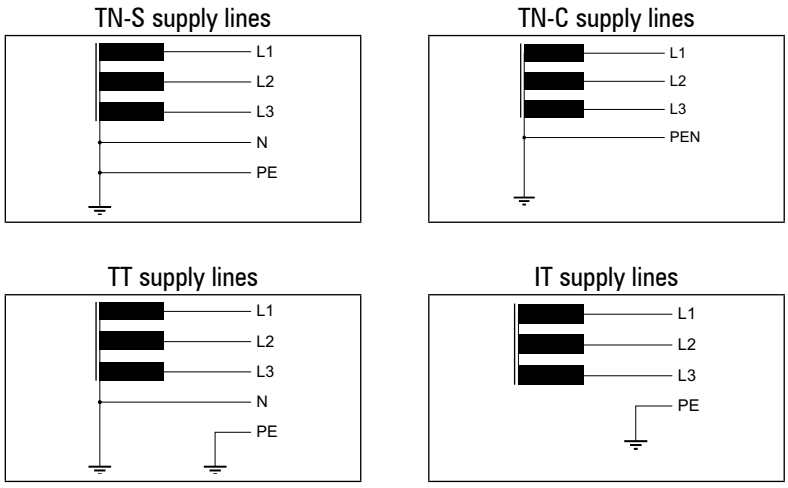
Pour utiliser des filtres secteur, se reporter au chapitre “10.7 EMI filters”, page 121.

Power supply networks

Based on the grounding method, the IEC 60634-1 describes three main types of grounding for power supply networks: TN, TT and IT systems.

In particular, the IT system has all the active parts insulated from earth or a point connected to ground through an impedance. The earths of the system are connected separately or collectively to the system ground.

The following figures show these different systems.



5.1 Power section

5.1.1 Cable Cross Section

Sizes	Terminals: L1 - L2 - L3 - BR1 - BR2 - C - D - U - V - W			
	Maximum Cable Cross Section (flexible conductor)		Recommended stripping	Tightening torque (min)
	(mm^2)	AWG	(mm)	(Nm)
1015	4	10	7	0.5 ... 0.6
1022	4	10	7	0.5 ... 0.6
1030	4	10	7	0.5 ... 0.6
1040	4	10	7	0.5 ... 0.6
1055	4	10	7	0.5 ... 0.6
2075	6	8	10	0.7 ... 0.8
2110	6	8	10	1.2 ... 1.5
2150	6	7	12	1.5 ... 1.7
3185	16	6	14	1.5 ... 1.7
3220	16	6	14	1.5 ... 1.7
3300	16	6	14	1.5 ... 1.7
4370	35	2	18	2.4 ... 4.5
4450	35	2	18	2.4 ... 4.5
4550	35	2	18	2.4 ... 4.5
5750	95 (BR1/BR2=50)	4/0 (BR1/BR2=1/0)	23 (BR1/BR2=27)	14 (BR1/BR2=10)
5900	95	4/0	23	14
51100	95	4/0	23	14
61320	150	300	30	24
61600	240	500	40	40

Sizes	Bars: L1 - L2 - L3 - C - D - U - V - W			
	Recommended cable cross-section		Lock screw diameter	Tightening torque (min)
	(mm^2)	AWG / kcmil	(mm)	(Nm)
72000 - 72500	2 x 100	2 x AWG 4/0	M10	25
73150	2 x 150	2 x kcmil 300	M10	25
73550 - 74000	2 x 185	2 x kcmil 350	M10	25

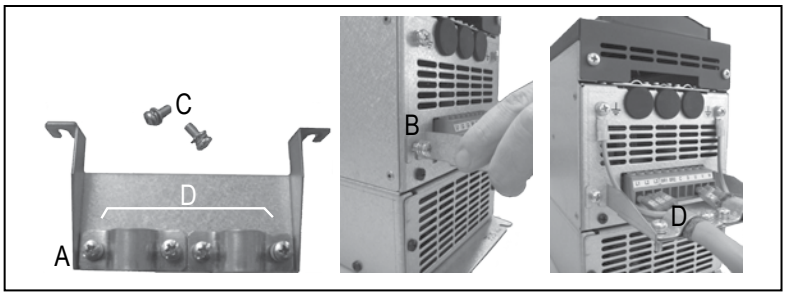
Sizes	Connection ⏚ on mechanical cabinet				
	Cable Cross Section		Lock screw diameter	Recommended terminal	Tightening torque
	(mm^2)	AWG / kcmil	(mm)	(mm)	(Nm)
1015 ... 1030	16	AWG 6	M5	Eyelet - Spade	5
1040 ... 4550	16	AWG 6	M6	Eyelet - Spade	5
5750 ... 51100	50	AWG 1/0	M6	Eyelet - Spade	5
61320	75	AWG 2/0	M8	Eyelet - Spade	12
61600	120	250 kcmil	M8	Eyelet - Spade	12
	Connection ⏚ on bars				
72000 ... 73150	150	300 kcmil	M10	Eyelet	25
73550 - 74000	185	350 kcmil	M10	Eyelet	25

Sizes		Bars: L1 - L2 - L3 - C - D - U - V - W			
		Recommended cable cross-section		Lock screw diameter	Tightening torque (min)
		(mm^2)	AWG / kcmil	(mm)	(Nm)
500kW	ADV200-SP-72500-KXX-4-MS 05	2 x 100	2 x AWG 4/0	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV200-SP-72500-XXX-4-SL	2 x 100	2 x AWG 4/0	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
630kW	ADV200-SP-73150-KXX-4-MS 06	2 x 150	2 x kcmil 300	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV200-SP-73150-XXX-4-SL	2 x 150	2 x kcmil 300	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
710kW	ADV200-SP-73550-KXX-4-MS 07	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV200-SP-73550-XXX-4-SL	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
800kW	ADV200-SP-74000-KXX-4-MS 08	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV200-SP-74000-XXX-4-SL	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
1000kW	ADV200-SP-73550-KXX-4-MS 10	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV200-SP-73550-XXX-4-SL	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV200-SP-73550-XXX-4-SL	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
1200kW	ADV200-SP-74000-KXX-4-MS 12	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV200-SP-74000-XXX-4-SL	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV200-SP-74000-XXX-4-SL	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
1500kW	ADV200-SP-73550-KXX-4-MS 10	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV200-SP-73550-XXX-4-SL	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV200-SP-73550-XXX-4-SL	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV200-SP-73550-XXX-4-SL2	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
1800kW	ADV200-SP-73550-KXX-4-MS 10	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV200-SP-73550-XXX-4-SL	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV200-SP-73550-XXX-4-SL	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV200-SP-73550-XXX-4-SL2	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV200-SP-73550-XXX-4-SL2	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)

Sizes		Connection ⏚				
		Recommended cable cross-section		Lock screw diameter	Recommended stripping	Tightening torque (min)
		(mm^2)	AWG / kcmil	(mm)	(mm)	(Nm)
500kW	ADV200-SP-72500-KXX-4-MS 05	150	300 kcmil	M10	Eyelet	25
	ADV200-SP-72500-XXX-4-SL	150	300 kcmil	M10	Eyelet	25
630kW	ADV200-SP-73150-KXX-4-MS 06	150	300 kcmil	M10	Eyelet	25
	ADV200-SP-73150-XXX-4-SL	150	300 kcmil	M10	Eyelet	25
710kW	ADV200-SP-73550-KXX-4-MS 07	185	350 kcmil	M10	Eyelet	25
	ADV200-SP-73550-XXX-4-SL	185	350 kcmil	M10	Eyelet	25
800kW	ADV200-SP-74000-KXX-4-MS 08	185	350 kcmil	M10	Eyelet	25
	ADV200-SP-74000-XXX-4-SL	185	350 kcmil	M10	Eyelet	25
1000kW	ADV200-SP-73550-KXX-4-MS 10	185	350 kcmil	M10	Eyelet	25
	ADV200-SP-73550-XXX-4-SL	185	350 kcmil	M10	Eyelet	25
	ADV200-SP-73550-XXX-4-SL	185	350 kcmil	M10	Eyelet	25
1200kW	ADV200-SP-74000-KXX-4-MS 12	185	350 kcmil	M10	Eyelet	25
	ADV200-SP-74000-XXX-4-SL	185	350 kcmil	M10	Eyelet	25
	ADV200-SP-74000-XXX-4-SL	185	350 kcmil	M10	Eyelet	25
1500kW	ADV200-SP-73550-KXX-4-MS 10	185	350 kcmil	M10	Eyelet	25
	ADV200-SP-73550-XXX-4-SL	185	350 kcmil	M10	Eyelet	25
	ADV200-SP-73550-XXX-4-SL	185	350 kcmil	M10	Eyelet	25
	ADV200-SP-73550-XXX-4-SL2	185	350 kcmil	M10	Eyelet	25
1800kW	ADV200-SP-73550-KXX-4-MS 10	185	350 kcmil	M10	Eyelet	25
	ADV200-SP-73550-XXX-4-SL	185	350 kcmil	M10	Eyelet	25
	ADV200-SP-73550-XXX-4-SL	185	350 kcmil	M10	Eyelet	25
	ADV200-SP-73550-XXX-4-SL2	185	350 kcmil	M10	Eyelet	25
	ADV200-SP-73550-XXX-4-SL2	185	350 kcmil	M10	Eyelet	25

5.1.2 Connection of shielding

- **Sizes 1...5**



Fasten the metallic support (A), for shielding of the power section, in the two housings (B) and secure with the two screws + washer provided (C).

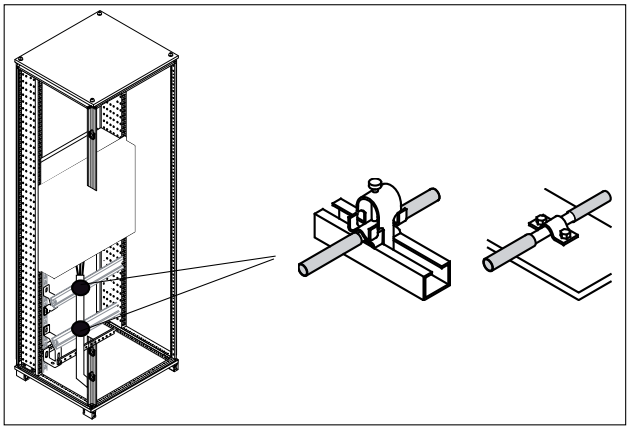
Fasten the shield of the cables to the omega sections (D).

- **Sizes 6 and higher**

For these sizes the metal support (A) is not provided. Cable shielding must be provided by the installer.

Connection of shielding inside a cabinet

The motor connection cable must be shielded inside a cabinet. The figure shows two examples.



5.1.3 EMC guide line

In a domestic environment, this product may cause radio inference, in which case supplementary mitigation measures may be required.

Dans un environnement domestique, ce produit peut causer des interférences radio, auquel cas des mesures d'atténuation supplémentaire peuvent être nécessaires.

Warning!

Attention

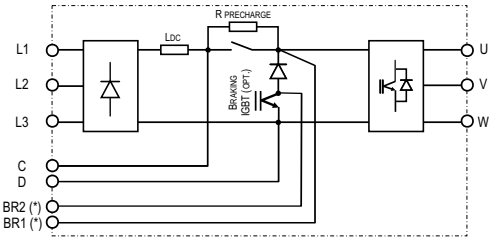
Drives are designed to operate in an industrial environment where a high level of electromagnetic interference are to be expected. Proper installation practices will ensure safe and trouble-free operation. If you encounter problems, follow the guidelines which follow.

- Check for all equipment in the cabinet are well grounded using short, thick grounding cable connected to a common star point or busbar. Better solution is to use a conductive mounting plane and use that as EMC ground reference plane.
- Flat conductors, for EMC grounding, are better than other type because they have lower impedance at higher frequencies.
- Make sure that any control equipment (such as a PLC) connected to the inverter is connected to the same EMC ground or star point as the inverter via a short thick link.
- Connect the return ground from the motors controlled by the drives directly to the ground connection (⏚) on the associated inverter.
- Separate the control cables from the power cables as much as possible, using separate trunking, if necessary at 90º to each other.
- Whenever possible, use screened leads for the connections to the control circuitry.
- Ensure that the contactors in the cubicle are suppressed, either with R-C suppressors for AC contactors or 'flywheel' diodes for DC contactors fitted to the coils. Varistor suppressors are also effective. This is important when the contactors are controlled from the inverter relay .
- Use screened or armored cables for the motor connections and ground the screen at both ends using the cable clamps.

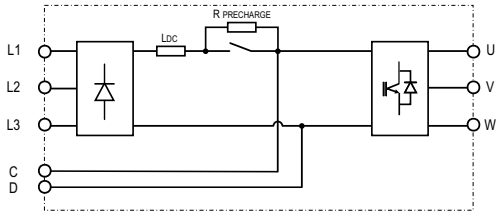
Note! For further information regarding electro-magnetic compatibility standards, according to Directive 2014/30/EU, conformity checks carried out on WEG appliances, connection of filters and mains inductors, shielding of cables, ground connections, etc., consult the "Electro-magnetic compatibility guide" (1S5E84) you can download from www.weg.net.

5.1.4 Block diagram power section

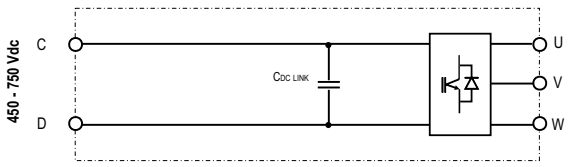
ADV200 SP-1015 ... 5750, ADV200 SP-61320-61600



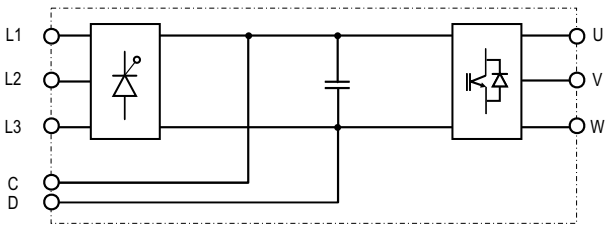
ADV200 SP-5900-51100



ADV200 SP-3220-DC... 61600-DC



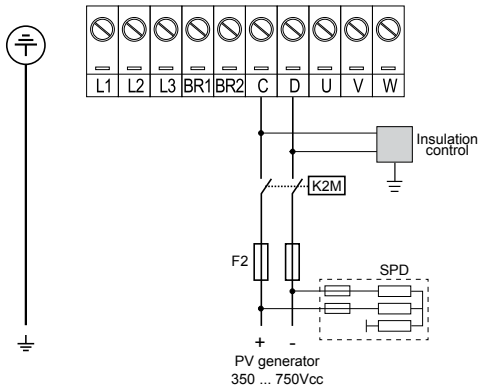
ADV200 SP-72000 ... 74000



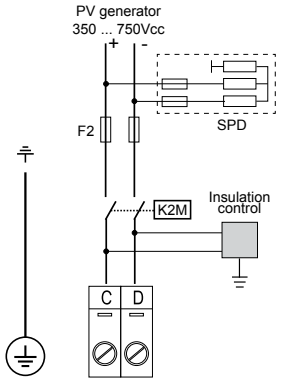
5.1.5 Power line connection

Isolated systems, PV alone:

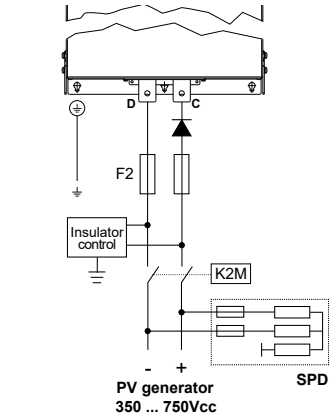
ADV200 SP-1015 ... ADV200 SP-61600



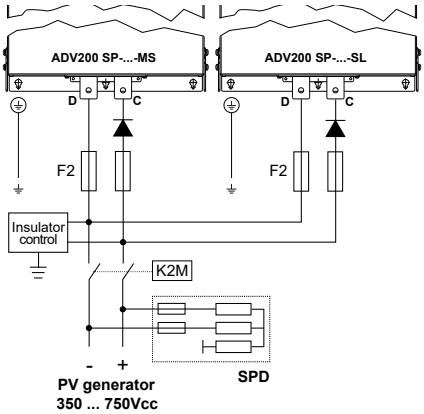
ADV200 SP-3220-DC... ADV200 SP-61600-DC



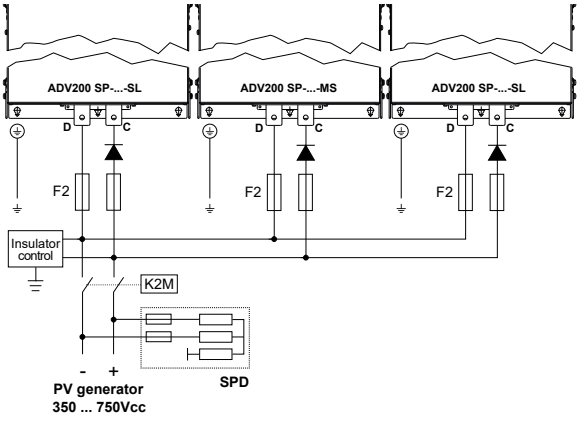
ADV200 SP-72000-.. ... ADV200 SP-74000-..



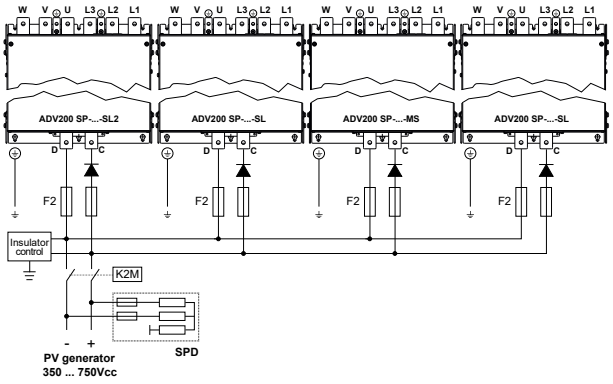
500kW ... 800kW



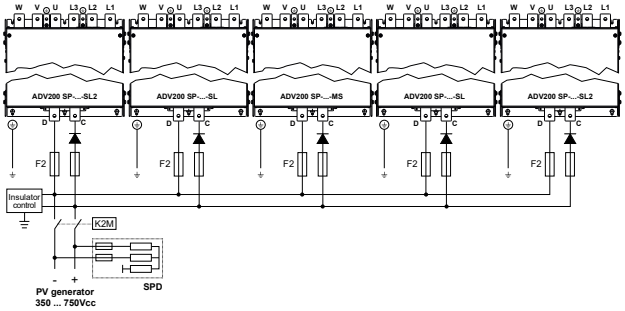
1000kW - 1200kW



1500kW

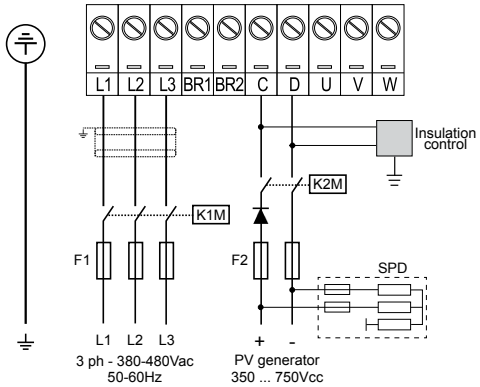


1800kW

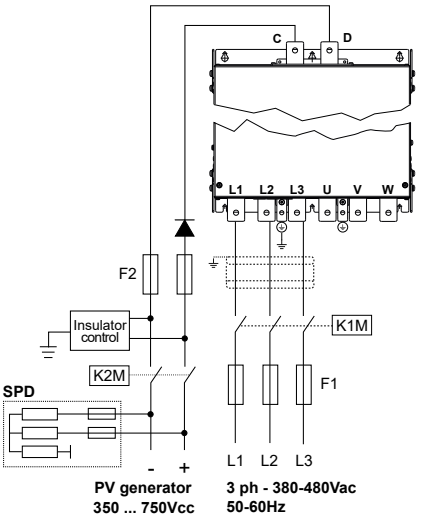


Dual supply systems, PV or Secondary power source:

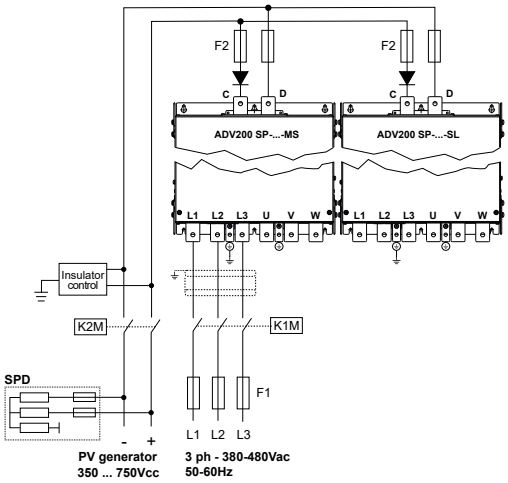
ADV200 SP-1015 ... 61600



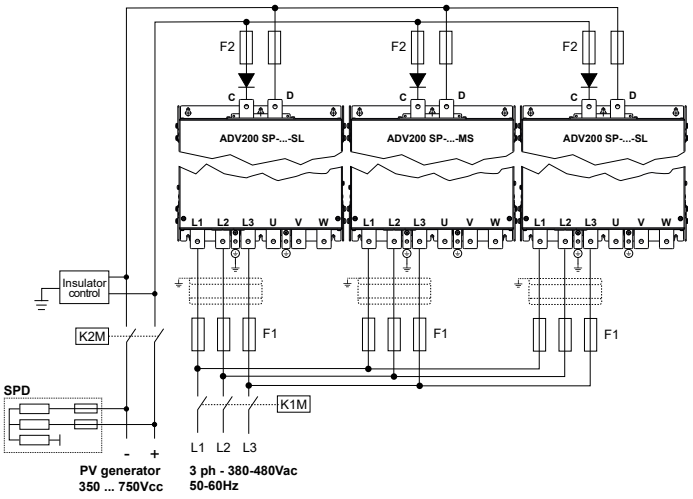
ADV200 SP-72000-.. ... ADV200 SP-74000-..



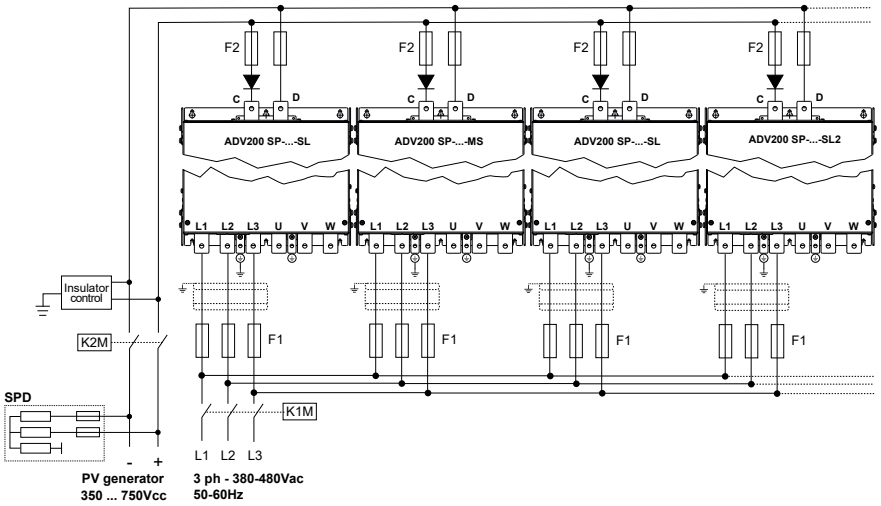
500kW ... 800kW



1000kW - 1200kW

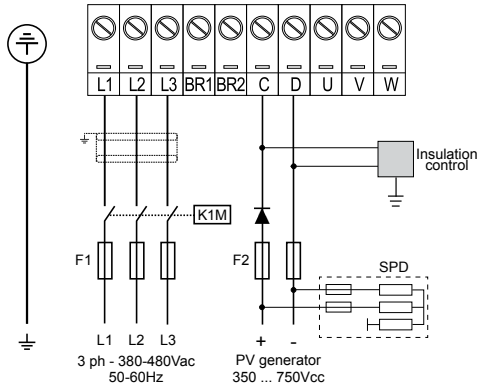


1500kW and higher

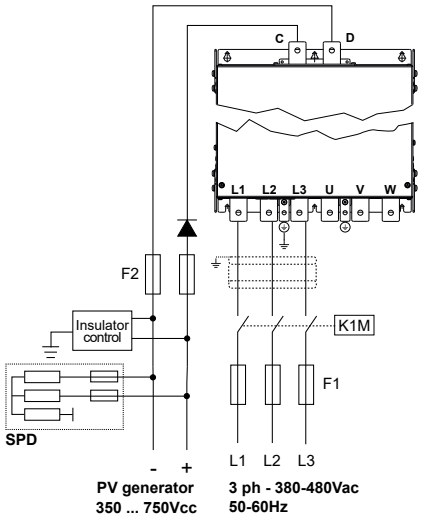


Hybrids Systems, PV and Secondary power source:

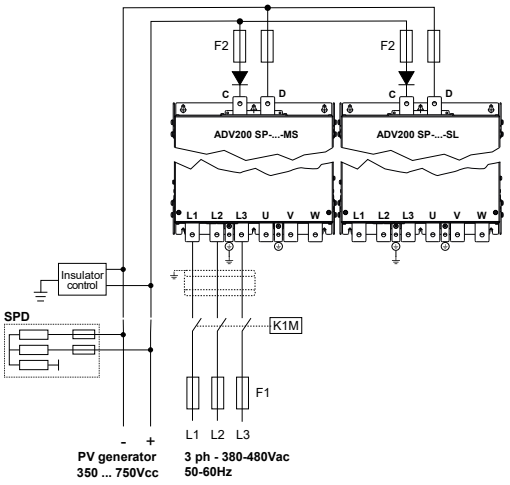
ADV200 SP-1015 ... 61600



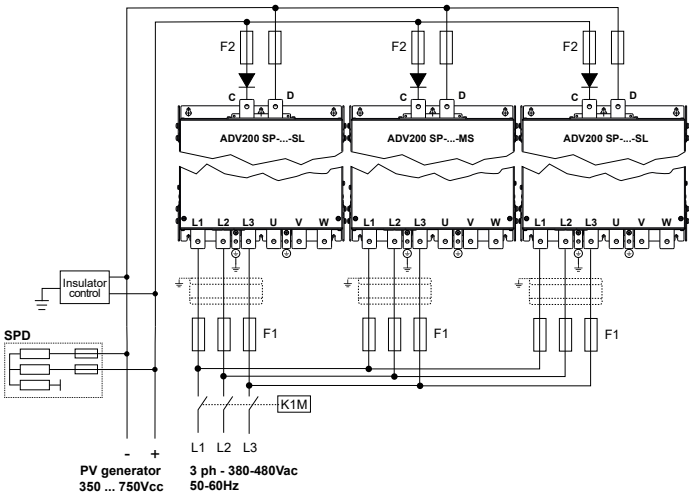
ADV200 SP-72000-.. ... ADV200 SP-74000-..



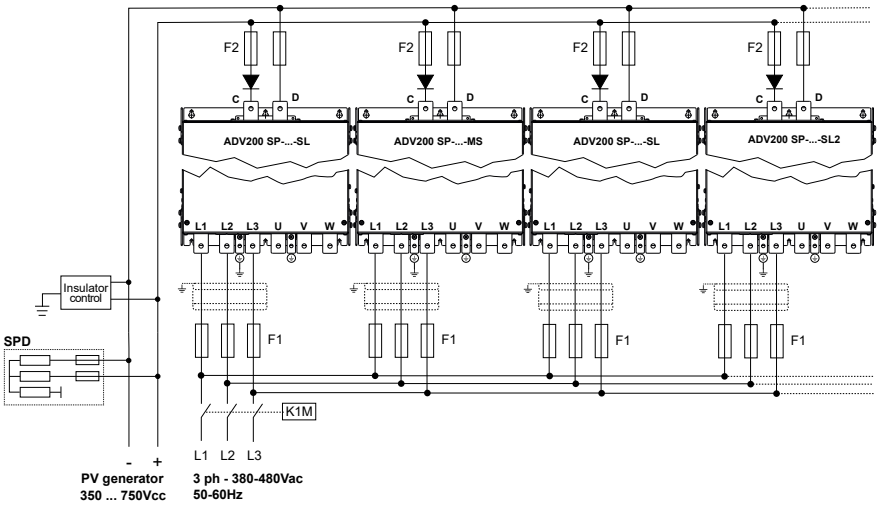
500kW ... 800kW



1000kW - 1200kW



1500kW and higher



Note! Terminals BR1/BR2 are standard up to size ADV200 SP-3300, optional in sizes ADV200 SP-4370 ... 5750, larger sizes are not used.

Recommended combination F1 fuses: see paragraph **"10.5 Fuses", page 114**

5.1.6 Input mains choke (L1)

Sizes ADV200 SP-1015 ... 61600: Integrated on DC-link.

Sizes ADV200 SP-72000 ... and higher:

> Isolated systems, PV only: no.

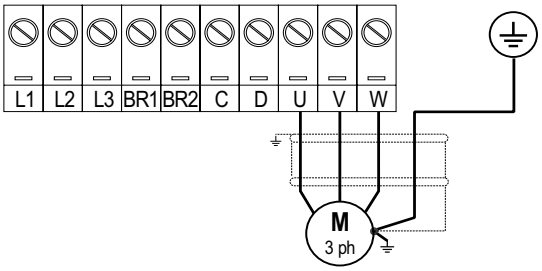
> Dual power systems, PV or secondary source: mandatory external on the secondary source (for the recommended combination, see chapter “10.6.1 Optional input chokes (L1)”, page 117).

> Hybrid systems, PV and secondary source: external mandatory on the secondary source (for the recommended matching, see chapter “10.6.1 Optional input chokes (L1)”, page 117).

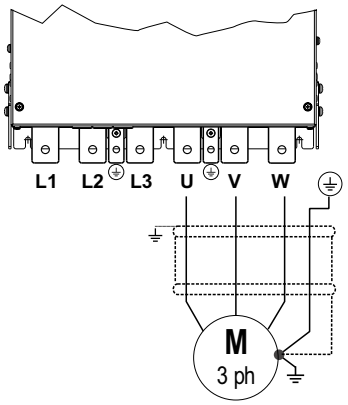
Sizes ADV200 SP-...-DC: not available.

5.1.7 Motor connection

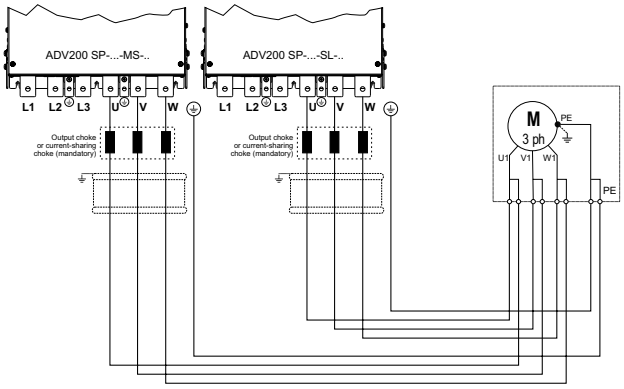
ADV200 SP-1015 ... 61600



ADV200 SP-72000 ... 74000



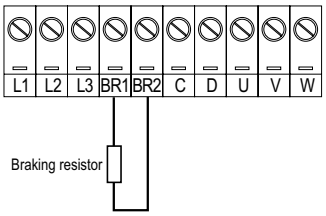
500 kW and higher



From 1 to 4 Slaves in parallel according to the section “2.1.1 Parallel inverters”, page 11.

Note: terminals L1-L2 and L3 are not present in -DC versions.

5.1.8 Braking unit connection (optional)



Note! **ADV200 SP-...-4**

Terminals BR1/BR2 are standard up to size ADV200 SP-3300, optional in sizes ADV200 SP-4370 ... 5750, larger sizes are not used.

From size ADV200 SP-5900 an optional external BUy braking unit can be used and connected to terminals C and D. Refer to the BUy handbook for further information.

Recommended combination braking resistors: see **paragraph 10.4**.

ADV200 SP-...-4-DC

Terminals BR1/BR2 are not present.

An optional BUy braking unit connected to terminals C and D can be used. For further details reference should be made to the BUy manual.

You MUST set the parameters for controlling braking resistance overload (MENU 22.6) to detect overheating of the braking resistance. Without this information on the resistance used, you have to monitor the overtemperature switch on the resistance. Overheating may be caused by:

- ramp times too short or braking too long
- wrong braking resistance size
- input voltage too high
- defective braking transistor on inverter or on braking module.

The overtemperature switch can be connected to the auxiliary contacts of the power supply contactor in order to disable the drive in case of failure.

5.1.9 Parallel connection of several inverters

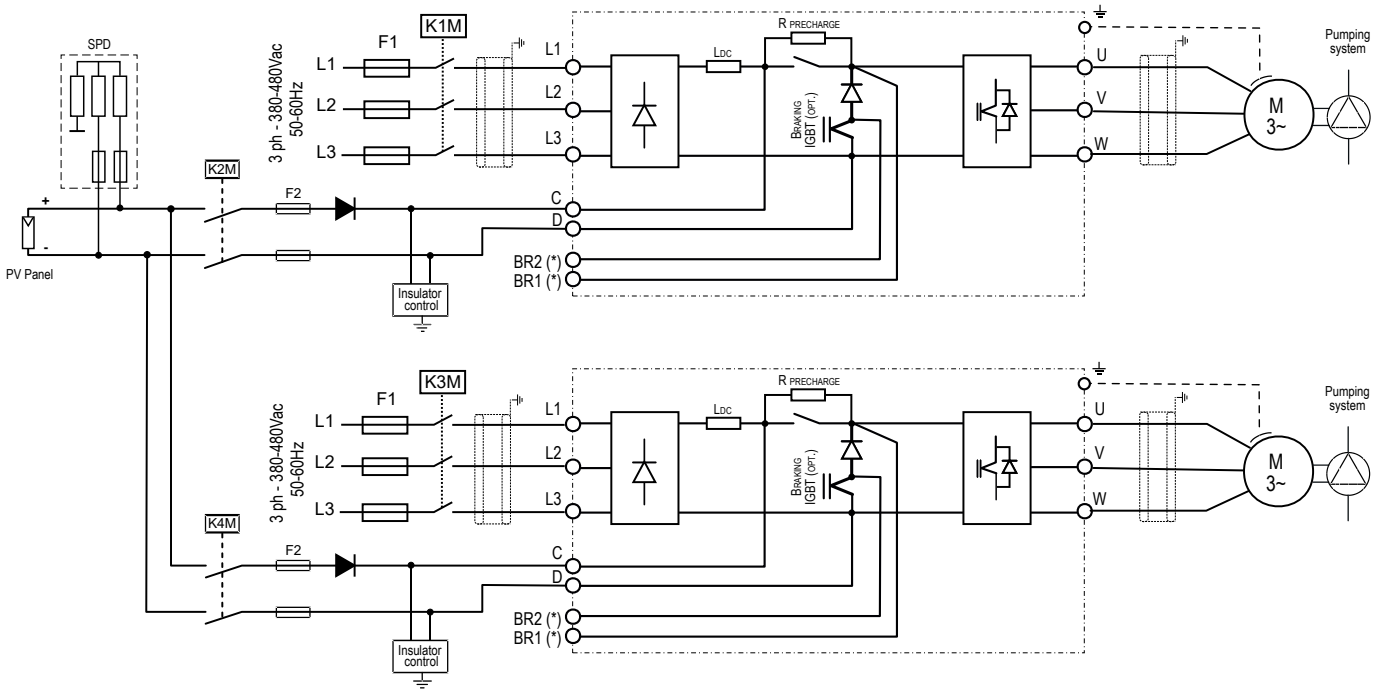
From PV field only

- Inverters come in different sizes.
- Such connection is suitable for a maximum of 6 inverters.
- If necessary dissipate braking energy; a single internal braking unit (with external resistor) has to be used or one (or several) external braking unit.
- Fast fuses have to be fitted on the dc-link side (C and D terminals) of each inverters (see chapter “10.5 Fuses”, page 114.

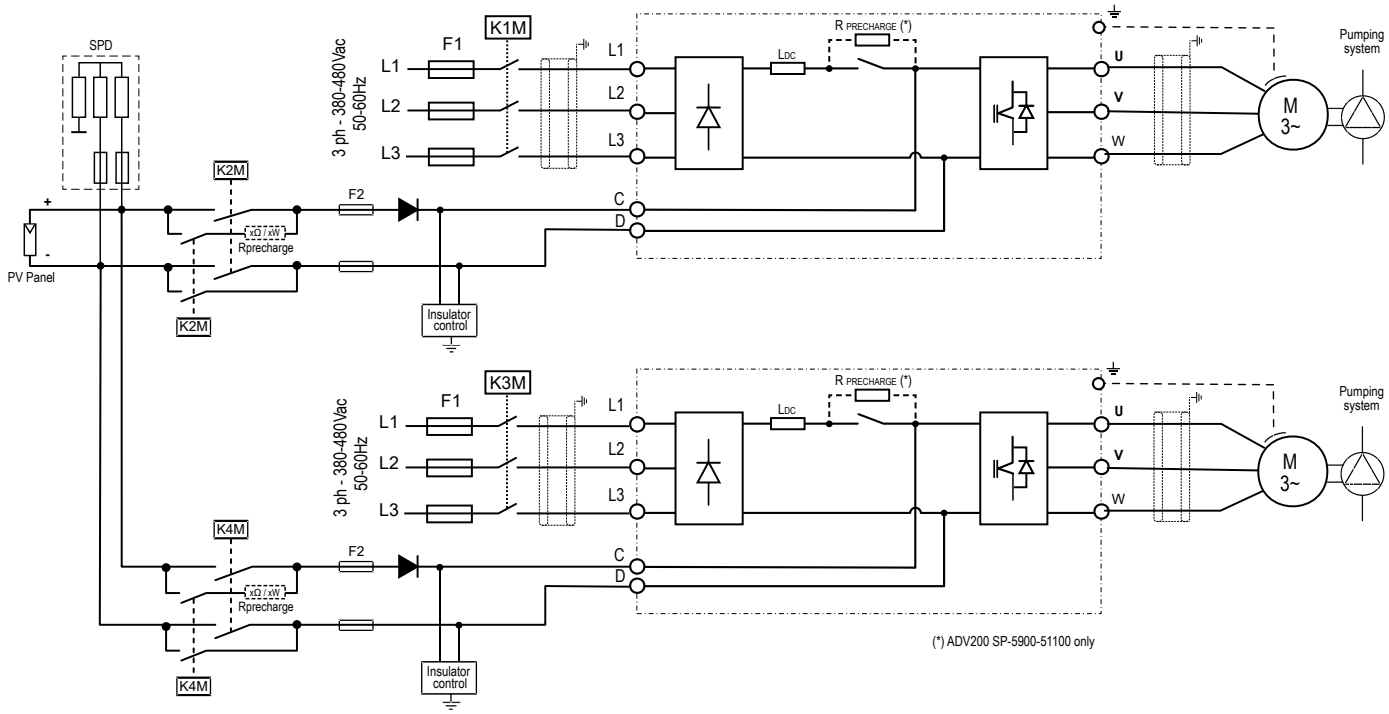
From PV field and AC input

- The inverters used have to be all the same size.
- The mains power supply and/or PV has to be simultaneous for all inverters, i.e. a single switch /line contactor has to be used.
- Such connection is suitable for a maximum of 6 inverters.
- If necessary dissipate braking energy; a single internal braking unit (with external resistor) has to be used or one (or several) external braking unit.
- Fast fuses have to be fitted on the dc-link side (C and D terminals) of each inverters (see chapter “10.5 Fuses”, page 114.

Parallel connection diagram of several inverters for ADV200 SP-1015 ... 5750, ADV200 SP-61320-61600 models

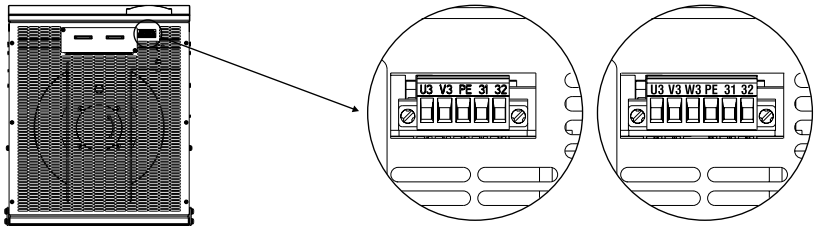


Parallel connection diagram of several inverters for ADV200 SP-5900-51100, ADV200 SP-72000 ... 74000 and ADV200 SP-3220-DC... 61600-DC models



5.1.10 Connection of fans

Sizes	Terminals
1015 ... 61600	No connection is necessary: the drive's internal power supply unit powers the fan (+24Vac).



Terminals	U3	V3	PE	31	32
Sizes	**Type of fan compliant 2009/125/CE (ErP)**				
72000 ... 73150 **500 kW** (1) **630 kW** (1)	3 x 400V (±10%) 50/60Hz, 1.25/1.65Arms 3 x 460V (±10%) 60Hz, 1.55Arms		Ground	250V/2A contact **OK fan contact management terminals 31-32:** Closed: Internal fan OK (also with non-powered fan) Open: Internal fan in over temperature alarm	
	Power the internal fan (570W @400V, 930W @460V) with a three-phase voltage on terminals U3/V3/W3.				

Terminals	U3	V3	W3	PE	31	32
Sizes	**Type of fan compliant 2009/125/CE (ErP)**					
73550 ... 74000 **710kW ... 1,8MW**(1)	3 x 380...480V (±10%) 50/60Hz, 1.9 ... 1.7 Arms			Ground	250V/10A contact **OK inverter fan contact management terminals 31-32:** Closed: Inverter fan OK and powered; Open: Inverter fan in alarm or not supplied.	
	Power the internal fan (max 1200W) with a three-phase voltage on terminals U3/V3/W3.					

(1) For each module..
(2) ADV200 SP-73550-KXX-4A and ADV200 SP-74000-KXX-4A models.

Caution

Make sure the sequence of the three-phase fan power supply phases is the same as that shown on the relative drive terminals. If not, the air flow will be inadequate to ensure correct cooling and it could cause Overtemperature alarm.

Caution

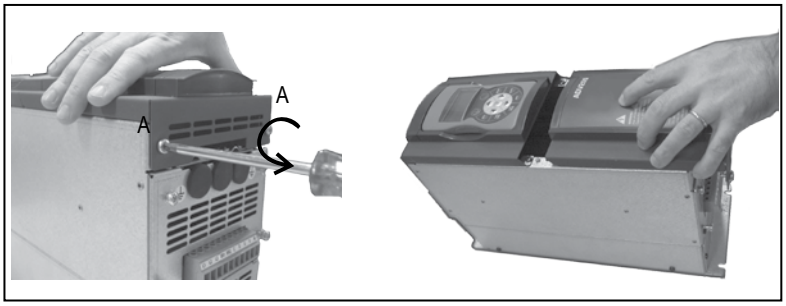
Sizes ≥ 72000: in isolated systems, provide an auxiliary power supply for fans.

5.2 Regulation section

5.2.1 Removing the terminal cover

Warning!

When removing the covers be carefull to lateral metal sheet enclosure. Presence of sharp edge are possible.

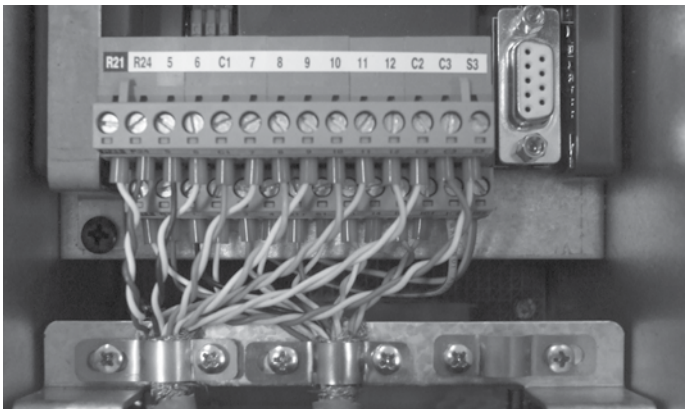


5.2.2 Cable Cross Section

Terminal strips (Regulation card)	Maximum Cable Cross Section		Recommended stripping	Tightening torque (min) (min)
	(mm^2)	(AWG)	(mm)	(Nm)
	0.2 ... 2.5	24 ... 12	7	0.5

5.2.3 Regulation section connection

Figure 5.2.3.1: Regulation shielding



For shielding of the regulation section (recommended), fasten the shield of the cables to the omega sections (see figure above).

Table 5.2.3.1: Regulation terminals

Strip T2 (top)			
Terminal	**Designation**	**Function**	**Max**
R21	**COM Digital output 2**	Common reference for digital output 2 (Relay 2)	-
R24	**Digital output 2**	Programmable digital relay output 2 (NO). Default = **Drive ready**	250VAC - 30VDC / 2A
5	**Analog output 1**	Analog output 1. Default = **Null (not assigned)**	±12,5 V (typical ±10 V / 5 mA)
6	**Analog output 2**	Analog output 2. Default = **Null (not assigned)**	- voltage (default): ±12,5 V (typical ±10V/5mA) - current (set by S3 switch): 0...20mA or 4...20mA (setting by PAR 1848, 15 - ANALOG OUPUTS menu)
C1	**COM Analog output**	Common reference for analog outputs and ±10V potential voltage reference	-
7	**Digital input E**	Digital input E. Default = **Digital input E mon (Enable)**	5mA @ +24V (+30V max)
8	**Digital input 1**	Digital input 1. Default = **FR forward src, PAR 1042**	5mA @ +24V (+30V max)
9	**Digital input 2**	Digital input 2. Default = **FR reverse src, PAR 1044**	5mA @ +24V (+30V max)
10	**Digital input 3**	Digital input 3. Default = **Null (not assigned)**	5mA @ +24V (+30V max)
11	**Digital input 4**	Digital input 4.	5mA @ +24V (+30V max)
12	**Digital input 5**	Digital input 5.	5mA @ +24V (+30V max)
C2	**COM Digital inputs**	Common reference for digital inputs	-
C3	**0V 24 OUT**	Reference point for +24V OUT	-
S3	**+ 24V OUT**	+24V supply for IO	150 mA (Resettable fuse), ±10 %

Strip T1 (bottom)			
Terminal	**Designation**	**Function**	**Max**
R11	**COM Digital output 1**	Common reference for digital output 1 (Relay 1)	-
R14	**Digital output 1**	Programmable digital relay output 1 (NO). Default = **Drive OK**	250VAC - 30VDC / 2A
1	**Analog input 1**	Programmable / configurable analog differential input. Signal: terminal 1. Reference: terminal 2. Default = **Ramp ref 1 src**	- voltage (default): ±12,5 V (typical ±10V/1mA) - current (set by switches S1-S2): 0...20mA or 4...20mA (set by PAR 1502 or 1552, 14 - ANALOG INPUTS menu) - input impedance = 10 kΩ
2			
3	**Analog input 2**	Radiation sensor analog input. Signal: terminal 3. Reference: terminal 4. Default = **Irrad Sens src**	
4			
S1+	**+10 V**	Voltage reference +10V; reference point: C1 terminal	+10 V ±1% / 10 mA
S1-	**- 10V**	Analog output -10V; reference point: C1 terminal	-10 V ±1% / 10 mA
13	**Digital output 3**	Digital output 3. Default = **Speed is 0 delay**	+24 V / 20 mA (typ), 40 mA (max)
14	**Digital output 4**	Digital output 4. Default = **Ref is 0 delay**	+24 V / 20 mA (typ), 40 mA (max)
IS1	**PS Digital output**	Digital outputs 3 / 4 power supply	-
IC1	**COM Digital output**	Common reference for digital outputs 3 / 4	-
IC2	**0V 24 EXT**	Reference for regulation card 24V external supply	-
IS2	**+ 24V EXT**	External supply of regulation card	+24V ±10% / 1A

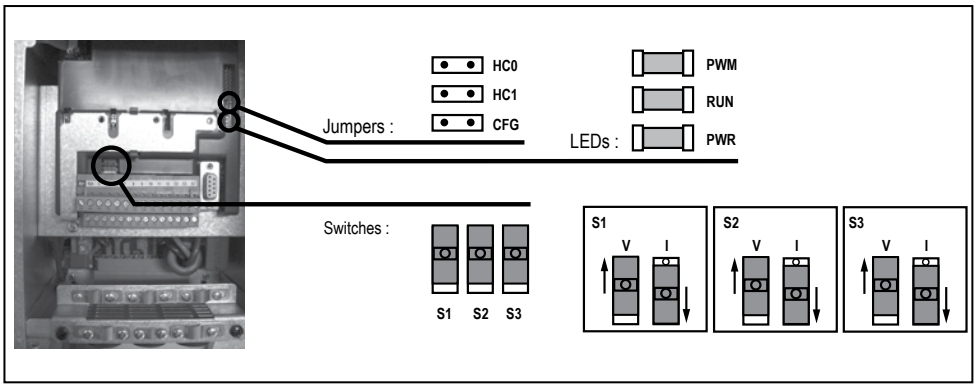
Caution

+24VDC voltage, which is used to externally supply the regulation card has to be stabilized and with a maximum ±10% tolerance. The maximum absorption is 1A.

It is not suitable to power supply the regulation card only through a unique rectifier and capacitive filter.

La tension de + 24Vdc utilisée pour alimenter extérieurement la carte de régulation doit être stabiliséeet avec une tolérance de ±10% ; absorption maximum de 1A. Les alimentations obtenues avec les seules redresseur e filtre capacitive ne sont pas appropriées.

5.2.4 Switches, jumpers and LED



Switch	V/I settings on inputs and analog output
S1	Analog input 1 Default = voltage (±10 V)
S2	Analog input 2 Default = voltage (±10 V)
S3	Analog output 2 Default = voltage (±10 V)

LEDs	Function
PWM (green)	LED lit during IGBT modulation
RUN (green)	Flashes (freq. 1 sec) if no errors or faults have occurred. If ON or OFF, indicates an error conditions (software hangup)
PWR (green)	ON when the regulation card is correctly powered

Jumpers	Function
HC0 **HC1**	Reserved. Deafult = Open
CFG (1)	Open = 400VAC rated voltage (default) (2) Closed = 460VAC rated voltage (3)

(1) Need to be verified the setting of the Unvervoltage alarm threshold

(2) Drive is automatically set for EU configuration (400V/50Hz). Parameter 460 will show 0 : EU (default configuration).

(3) Drive is automatically set for USA configuration (460V/60Hz). Parameter 460 will show 1 : USA.

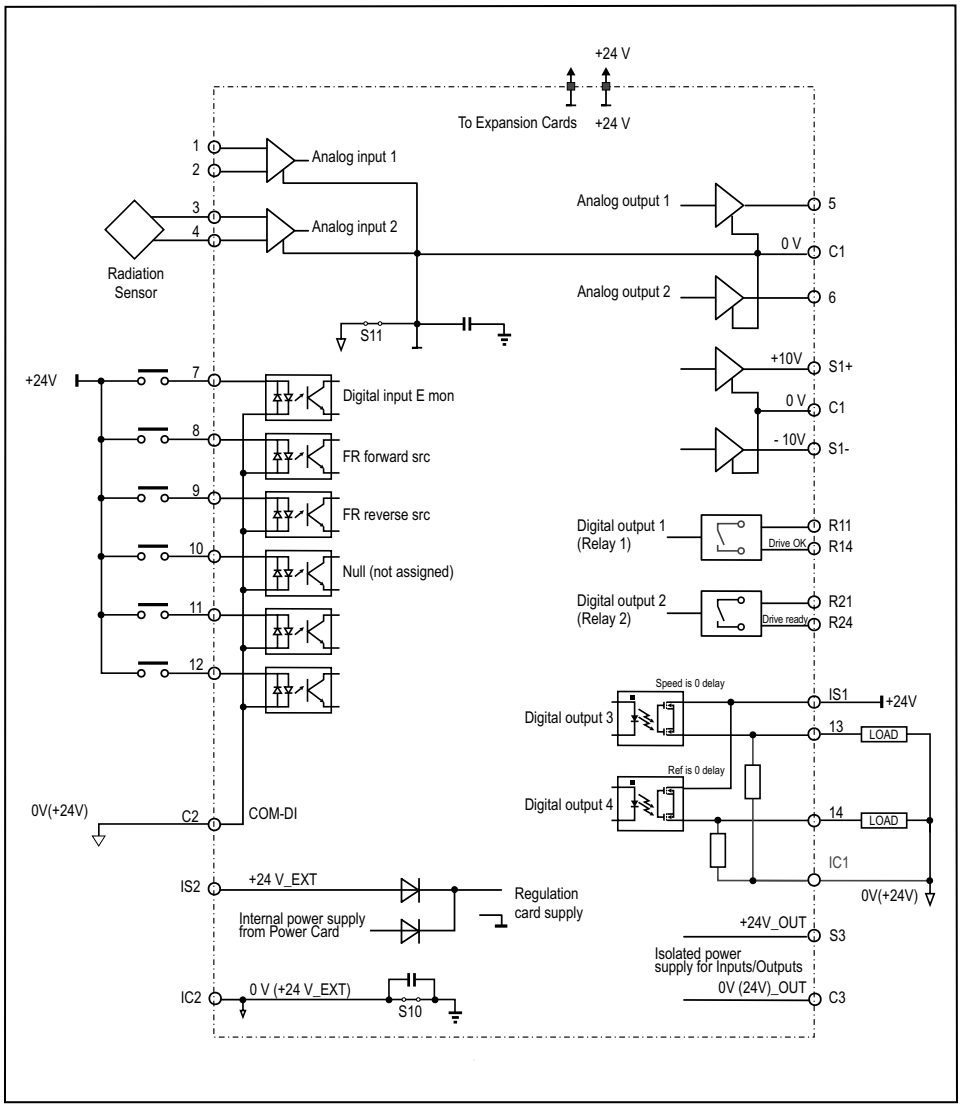


Figure 5.2.4.1: Potentials of the control section, Digital I/O PNP connection

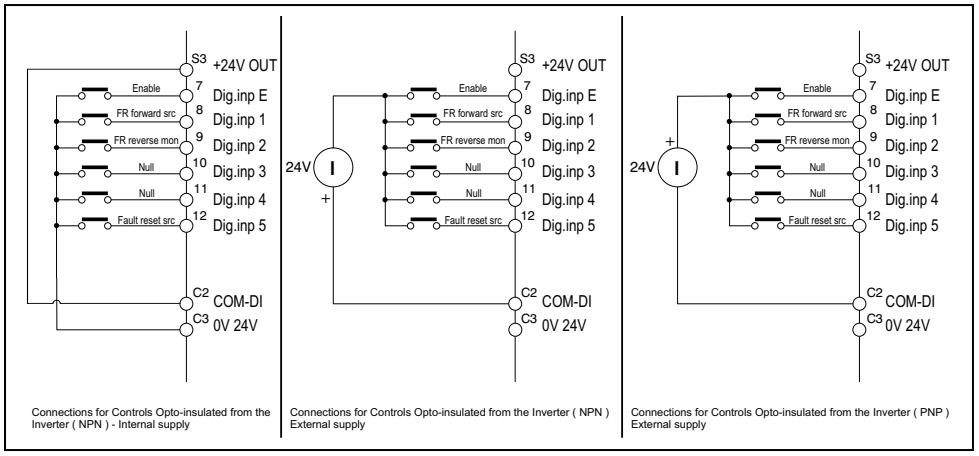


Figure 5.2.4.2: Other inputs connections (NPN-PNP)

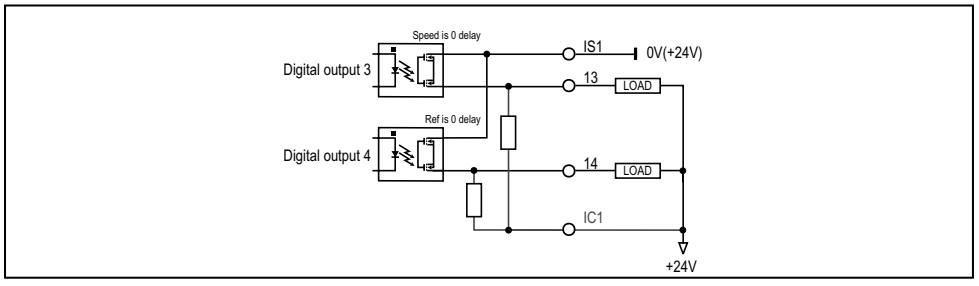


Figure 5.2.4.3: NPN outputs connection

5.2.5 R-PSM pre-charge card (only for sizes ≥ 72000)

Starting from ADV200-SP power size ≥ 200kW, the R-PSM card is used to control the pre-charge circuit on the power supply module. When the pre-charge circuit is connected to the mains (terminals L1 – L2 – L3), the R-PSM regulation card generates the internal power supplies needed for operation. Therefore, additional external power supplies are unnecessary.

If an UNDERVOLTAGE alarm is detected when the SCR bridge is enabled, the pre-charge ramp can be repeated only after 300ms, the time needed for the phase loss circuit to confirm that normal mains conditions have been restored.

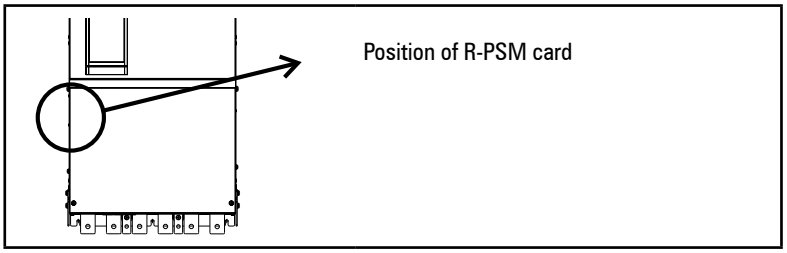
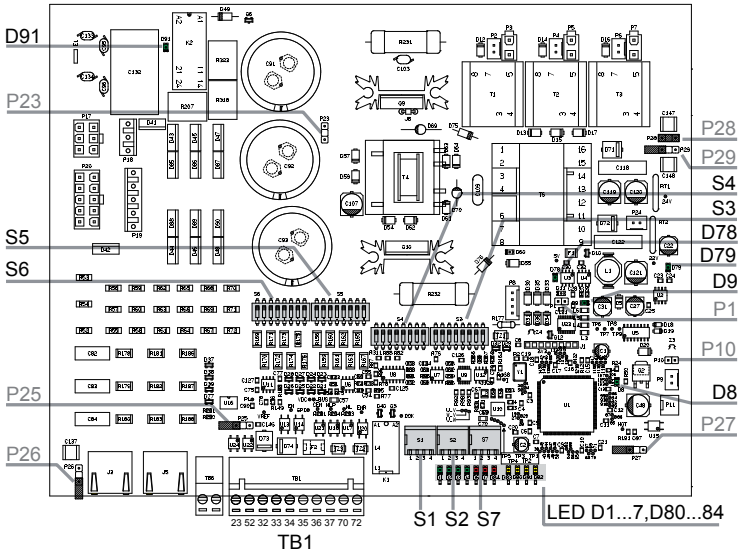


Figure 5.2.5.1: Position of Switches, LEDs and Jumpers on R-PSM card



5.2.5.1 Input/Output R-PSM Regulation card

The switches and jumpers on the R-PSM card are factory-set.

If the module is used according to its standard power supply characteristics (400VAC / 50Hz), the settings should not be changed.

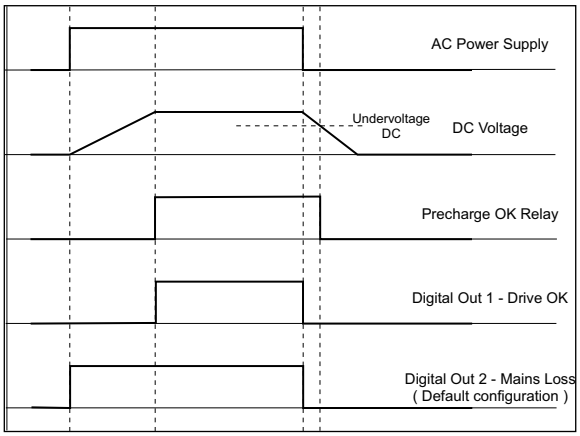
In case of non-standard power supply, see the configuration tables shown further below.

Table 5.2.5.1: TB1 terminal strip on R-PSM

Terminal	Designation	Function	Electrical specifications
23	ENABLE	ENABLE digital input of the pre-charge control	5mA @ +24Vdc (+20% max, -20% min)
52	ENABLE in COM	ENABLE common digital input	
32	Digital Out 1	Drive OK	24V / 20mA typ (40mA max)
33	Dig Out Com	Common Digital Out 1 and Digital Out 2	-
34	0V24 Out	Reference point for power supply	-
35	+24V Out	Power supply output	150mA resettable fuse
36	Digital Out 2	Digital output : Factory preset as Mains Loss	24V / 20mA typ (40mA max)
37	Dig Out Supply	Power supply for digital outputs	-
70, 72	Relay 1	Factory preset as Precharge OK	250Vac - 30Vdc - 0,5A

Terminal strip TB1			
Cable Cross Section (flexible conductor)		Recommended stripping	Tightening torque (min)
(mm^2)	AWG	(mm)	(Nm)
0,2 ... 2,5	24 ... 12	7	0,5

5.2.5.2 Behavior of Pre-charge OK Relay-Digital Out 1, Digital Out 2 at "PowerOn" and "PowerOff"



Relay 1 – Precharge OK (factory setting)

The relay between terminals 70 – 72 closes at the end of the pre-charge phase and opens when DC voltage drops below the DC Undervoltage threshold. Wiring of the OK relay contact (70 - 72) in series with the Enable chain of the ADV200 SP regulation card is recommended

Digital Out 1 – Drive OK

Digital output 1 connected to terminal 32 goes high at the end of the pre-charge phase and goes low under one of the following conditions:

- power failure
- lack of a power supply phase
- mains frequency out of range (> ±5%). This condition occurs only during the power-on phase.
- presence of Enable command at terminal 23.

Digital Out 2 – Mains Loss (factory setting)

Digital output 2 connected to terminal 36 goes high at Power On and goes low under one of the following conditions.

- power failure;
- lack of a power supply phase.

5.2.5.3 R-PSM card configuration switches

The jumpers and switches on these cards are factory-set. **If the module is used according to its standard power supply characteristics the settings should not be changed.**

The R-PSM card has three 4-position configuration switches.

The following tables show all of the permitted combinations.

Legenda:

0 OPEN
1 CLOSE

(*) Default setting for models ADV200 SP-...-4

Setting for ADV200 SP with R-PSM card revision "F" and higher

S1 - Mains voltage configuration switches						
Mains voltage [Vac]	**DC undervoltage trip threshold** [Vdc]	**DC undervoltage return threshold** [Vdc]	**S1-1**	**S1-2**	**S1-3**	**S1-4**
380	330	370	1	0	0	0
400 (*)	330	370	0	1	0	0
415	361	401	1	1	0	0
440	383	423	0	0	1	0
460	400	440	1	0	1	0
480	417	457	0	1	1	0

The correct selection of mains voltage is very important for correct setting of UNDERVOLTAGE limits.

The same value set has to be carried out on PAR560 (DRIVE CONFIG MENU).

S2 - Mains frequency configuration switch	
Mains frequency [Hz]	**S2-1**
50 (*)	0
60	1

An incorrect mains frequency setting will disable the control card: the mains frequency tolerance is ±5%.

S2 – Switch configuration for pre-charge times				
Selection of pre-charge time for 50Hz [s]	**Selection of pre-charge time for 60Hz** [s]	**S2-2**	**S2-3**	**S2-4**
17.4	24.1	0	0	0
11.6 (*)	12.1	1	0	0
8.7	8	0	1	0
6.9	6	1	1	0
5.0	4.8	0	0	1
3.5	3.4	1	0	1
2.7	2.7	0	1	1
1.9	2	1	1	1

Switch S2-2…4 lets you set the pre-charge time for the capacitors connected to the DC link.

The default configuration calls for a time of 11.6[s] for a 50[Hz] line and 12.1[s] for a 60[Hz] line.

Remember that with equal levels of energy to be transferred to the condenser bank, decreasing the precharge time increases the current draw.

The rectifier bridge and pre-charge inductance are sized for maximum peak current of 400[Apk].

Considering that with decreased pre-charge time the increased current is not linear, and that the larger the capacitors bank connected to the DC Link the greater the energy to be transferred, if you need a pre-charge time shorter than the default configuration you have to run the following check procedure:

1) Keep the default configuration of switches S2-2…4 and connect an current probe to output C or D of the ADV200 SP module. The probe must be able to measure a peak current ≤ 10[ms].
2) Power and enable the pre-charge bridge by measuring the value of the peak current absorbed.
3) Cut power to the pre-charge bridge and wait for the DC Link to discharge completely (discharge time depends on the total capacitance installed on the DC Link).
4) Set the switches to have a pre-charge time of 8.7[s] (8[s] for 60[Hz] line).
5) Repeat point 2). If the peak current measured is below 400[Apk] you can further reduce the pre-charge time. In this case, run the entire procedure again until you reach the required pre-charge time.

S7-1…3 – Dig Out 2 configuration switch	S7-1	S7-2	S7-3
No Mains Loss or Phase Loss (*)	0	0	0
Mains Loss alarm	1	0	0
Phase Loss alarm	0	1	0
Drive OK (excluded UV alarm)	1	1	0
Heatsink OT alarm	0	0	1
SCRs pulses enabled	1	0	1
Precharge ramp finished	0	1	1
Undervoltage alarm	1	1	1

The configurable output goes high when the condition indicated in the table occurs.

S7-4 -Function exchange between Relay 1 and Digital Out 2	
Function	**S7-4**
Factory preset	0 (*)
Function exchanged between Relay 1 and Digital Out 2	1

5.2.5.4 Jumpers

The configuration of the configuration Jumpers can be changed ONLY by WEG personnel. Unauthorized changes will invalidate the warranty.

Jumper	Function	Default
P1	FPGA manual reset	OPEN
P10	Disables heatsink overtemperature monitor	CLOSE
P23	Enables function of 230VAC line power supply	OPEN
P25	Internal use	OPEN
P26	Connects J3 shield with ground	OPEN
P27	Connects 0V control with 0V_24 I/O	OPEN
P28	Grounds 0V control	CLOSE
P29	Grounds 0V_24 I/O	CLOSE

Note!

For the position of the Jumpers, see "Figure 5.2.5.1: Position of Switches, LEDs and Jumpers on R-PSM card" .

5.2.5.5 Leds on R-PSM card

LED	Color	"MONITOR" function
D9	GREEN	+3V3 logic power
D78	GREEN	+5V logic power
D79	GREEN	+22V driver power
D91	BLUE	Presence of DC-Link voltage
LED	**Colore**	**"SIGNAL" function**
D1	GREEN	DC-Link voltage above UNDERVOLTAGE limit
D2	GREEN	Power supply enabled
D3	GREEN	Not used
D4	GREEN	Power supply OK (no alarms – excluding UV)
D6	RED	Phase loss or Main loss alarm
D7	RED	Heatsink overtemperature alarm
D8	GREEN	FPGA configuration in progress
D84	RED	Wrong line frequency alarm
LED	**Color**	**"POWER SUPPLY STATE" functions**
D83	YELLOW	Bit S0: codes STATE of power supply (LSB)
D80	YELLOW	Bit S1: codes STATE of power supply
D81	YELLOW	Bit S2: codes STATE of power supply (MSB)
D82	YELLOW	SCR bridge enabled

Note!

For the position of the Jumpers, see "Figure 5.2.5.1: Position of Switches, LEDs and Jumpers on R-PSM card" .

5.3 Braking

There are various possible types of braking:

- via internal braking unit and external braking resistor (up to size ADV5750),
- via external braking unit (BUy, usable for all sizes),
- Injection of direct current from the Inverter into the motor (D.C. braking)
- through a special overflux function (AC braking) available if V/F control is selected.

The various possibilities have the following key difference:

- Using a braking unit or the AC braking function it is possible to control a speed reduction (for example form 1000 to 800rpm) while the DC braking can only used to stop the motor.
- Using a braking unit the energy is dissipated into heat in the braking resistor
- Using the AC braking function or the DC braking function, the energy is dissipated into heat in the motor windings (resulting in a further rise in the motor temperature)
- By using the AC braking function in place of the DC braking, the braking action is more efficient (more braking capability) and allows to maintain the same speed control without introducing operational discontinuities. It means that the AC braking allows the machine to change quickly its behavior from motorizing to braking when required.

5.3.1 Braking unit

Frequency-regulated asynchronous motors during hyper-synchronous or regenerative functioning behave as generators, recovering energy that flows through the inverter bridge, in the intermediate circuit as continuous current.

This leads to an increase in the intermediate circuit voltage.

Braking units (internal to drive or external BUy) are therefore used in order to prevent the DC voltage rising to an impermissible value. When used, these activate a braking resistor (external to drive) that is connected in parallel to the capacitors of the intermediate circuit. The feedback energy is converted to heat via the braking resistor (R_{BR}), thus providing very short deceleration times and restricted four-quadrant operation.

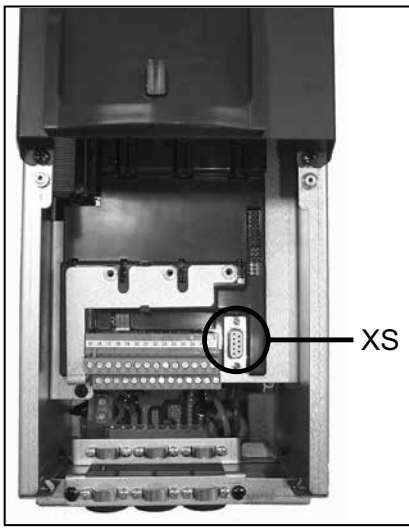
Note! An optional BUy braking unit connected to terminals C and D can be used. For further details reference should be made to the BUy manual.

Recommended combination braking resistors: see chapter **"10.9 Braking resistor (optional)", page 125.**

Sizes		Technical data of the Internal Braking Units (Duty 50%)		
		Nominal current of the internal braking unit I_{RMS} (A)	Peak current I_{PK} (A)	Minimum braking resistance value R_{BR} (Ω)
1015	Internal Braking Units (standard internal)	5.7	8	100
1022		5.7	8	100
1030		5.7	8	100
1040		5.7	8	100
1055		5.7	8	100
2075		8.5	12	67
2110		8.5	12	67
2150		15.5	22	36
3185		22	31	26
3220		37	53	15
3300		37	53	15
4370	Internal Braking Units (standard internal)	57	80	10
4450		57	80	10
4550		76	107	7.5
5750		76	107	7.5

Sizes		Technical data of the Internal Braking Units (Duty 50%)		
		Nominal current of the internal braking unit I_{RMS} **(A)**	**Peak current** I_{PK} **(A)**	**Minimum braking resistance value** R_{BR} **(Ω)**
≥ 5900 and ADV200 SP-...-DC	**External Braking Unit (optional)**	See BUy manual for all technical details.		
	BUy-1020	28	40	17
	BUy-1050	70	100	6.8
	BUy-1085	120	170	4

5.4 Serial interface (XS connector)



	Function	I/O	Electr. interface
PIN 1	Internal use	–	–
PIN 2	Internal use	–	–
PIN 3	RxA/TxA	I/O	RS485
PIN 4	Equipotentiality (optional)	–	–
PIN 5	0V (Ground for 5 V)	–	Power supply
PIN 6	+5 V	–	Power supply
PIN 7	RxB/TxB	I/O	RS 485
PIN 8	Internal use	–	–
PIN 9	Internal use	–	–

I = Input
O = Output

The ADV200 SP drive is equipped as standard with a port (9-pin D-SUB receptacle connector: **XS**) for connection of the RS485 serial line used for drive/PC point-to-point communication (through the WEG_eXpress configuration software) or for multi-drop connection.

To access the connector, remove the lower cover as illustrated in shown in **paragraph 5.2.1**.

5.4.1 Drive / RS 485 Port (not insulated) point-to-point connection

Caution

The connection indicated is without galvanic insulation !

Le raccordement indiqué n'a pas d'isolation galvanique !

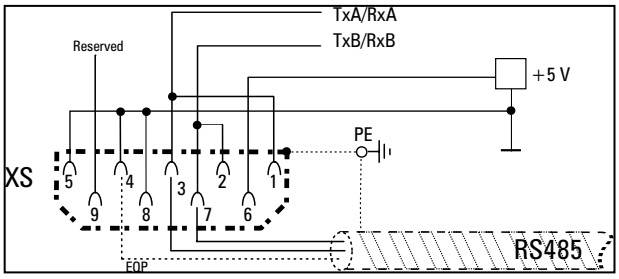


Figure 5.4.1.1: Serial connection (not insulated)

A twin-pair consisting of two symmetrical conductors, spiral wound with a common shield plus the bonding connection cable, connected as shown in the figure, must be used for connection. The transmission speed is 38.4 kBaud.

For connection of the RS485 serial line to the PC, see the figure below.

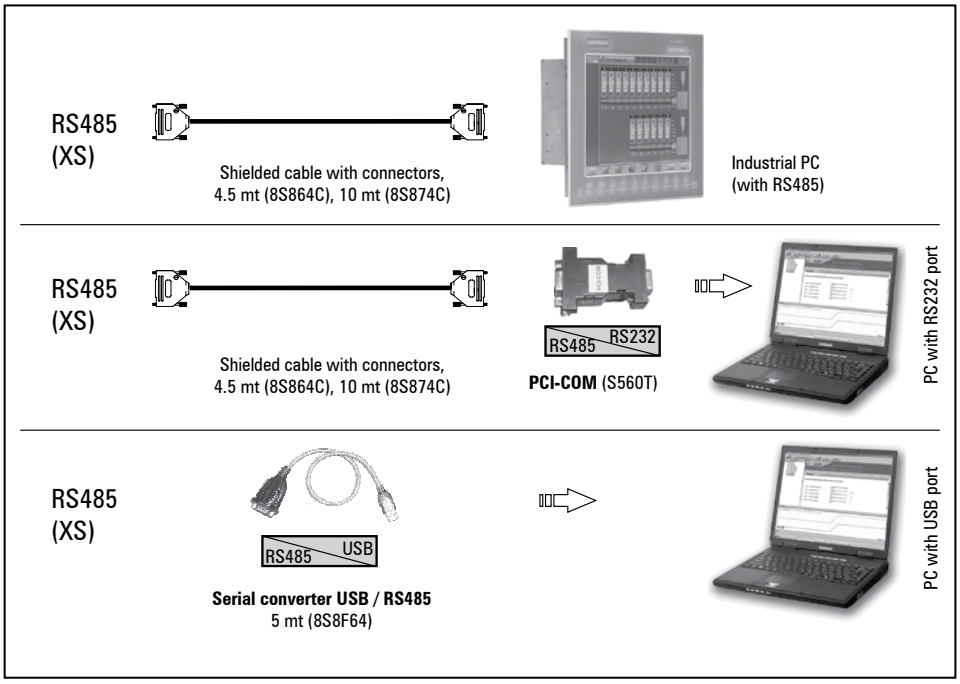


Figure 5.4.1.2: RS485 connection to the PC

Connection of an industrial PC with RS485

The following are required for connection:

- shielded cable for the **XS / RS485** connection (see figure 5.4.1.2), code 8S864C (L=4.5 mt) or 8S874C (L=10 mt).

Connection to a PC with RS232 port

The following are required for connection:

- an optional **PCI-COM** (or PCI-485) adapter, code S560T.
- shielded cable for **XS / PCI-COM** (or PCI-485) connection, code 8S864C (L=4.5 mt) or 8S874C (L=10 mt), see figure 5.4.1.2 .

Connection to a PC with USB port

The following is required for connection:

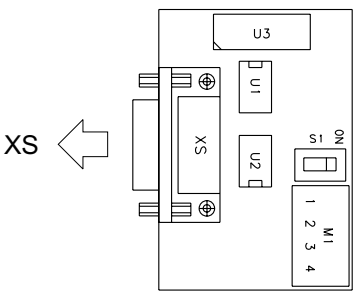
- an optional **USB/ RS485** adapter, code 8S8F64, see figure 5.4.1.2 .

5.4.2 Drive / RS485 port point-to-point connection (with insulation)

To make the connection with galvanic isolation, the **OPT-RS485-ADV** optional card is required.

The card is equipped with a 9-pin D-SUB male receptacle connector which must be inserted in the **XS** connector of the ADV200 SP drive.

Connect terminals 1, 2 and 4 to the serial line as shown in the figure below; for the connection from the serial line to the PC, the adapters indicated in paragraph 5.4.1 must be used.



Terminal	Name
1	TxA /RxA
2	TxB /RxB
3	Reserved
4	EQP (Equipotentiality)

Switch	Function
S1	Closing of terminations

Figure 5.4.2.1: OPT-RS485-ADV card

5.4.3 RS 485 multi-drop connection

For the multi-drop connection, the **OPT-RS485-ADV** optional card must be installed on each drive; the ends of the connection must have **S1** termination switch set to ON (for point 3: ON only on the first).

The multi-drop connection is always galvanically insulated.

Up to 20 drives can be connected; the maximum length of the connection is 200 meters.

1) Multidrop connection between ADV200 and an industrial PC with RS485 output

See figure 5.4.3.1. The connection requires:

- an optional **OPT-RS485-ADV** card for each ADV200,
- shielded wires to connect the **OPT-RS485-ADV t**o the PC.

2) Multidrop connection between ADV200 and a PC with RS232 output

See figure 5.4.3.2. The connection requires:

- an optional **OPT-RS485-ADV** card for each ADV200,
- shielded wires to connect the **OPT-RS485-ADV** to the PC, and an optional **PCI-COM** adapter (code S560T).

3) Multidrop connection between ADV200 and a PC with USB output

See figure 5.4.3.3. The connection requires:

- an optional **OPT-RS485-ADV** card for each ADV200,
- a **USB-RS485** Serial converter interface (8S8F60).

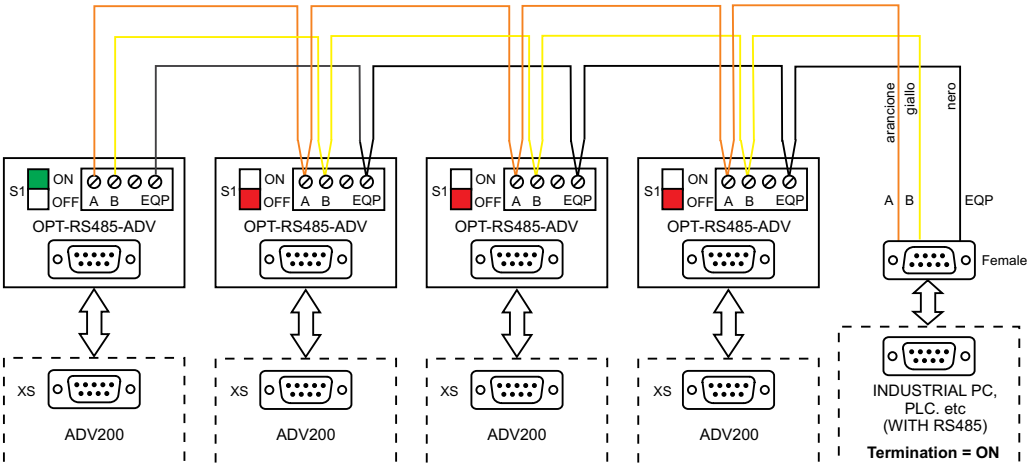


Figure 5.4.3.1: Example of Multidrop connection between ADV200 and an industrial PC with RS485 port

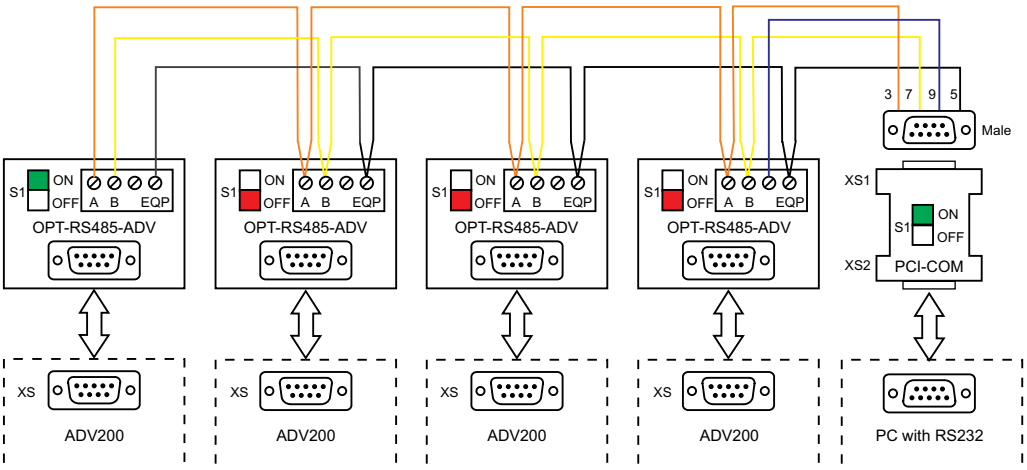


Figure 5.4.3.2: Example of Multidrop connection between ADV200 and a PC with RS232 port

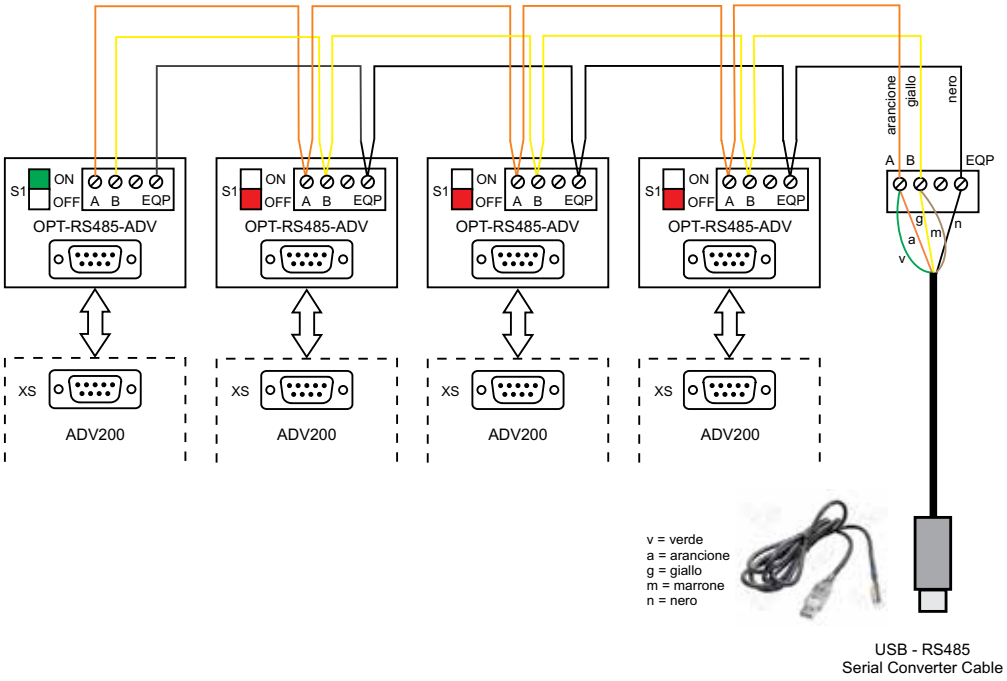
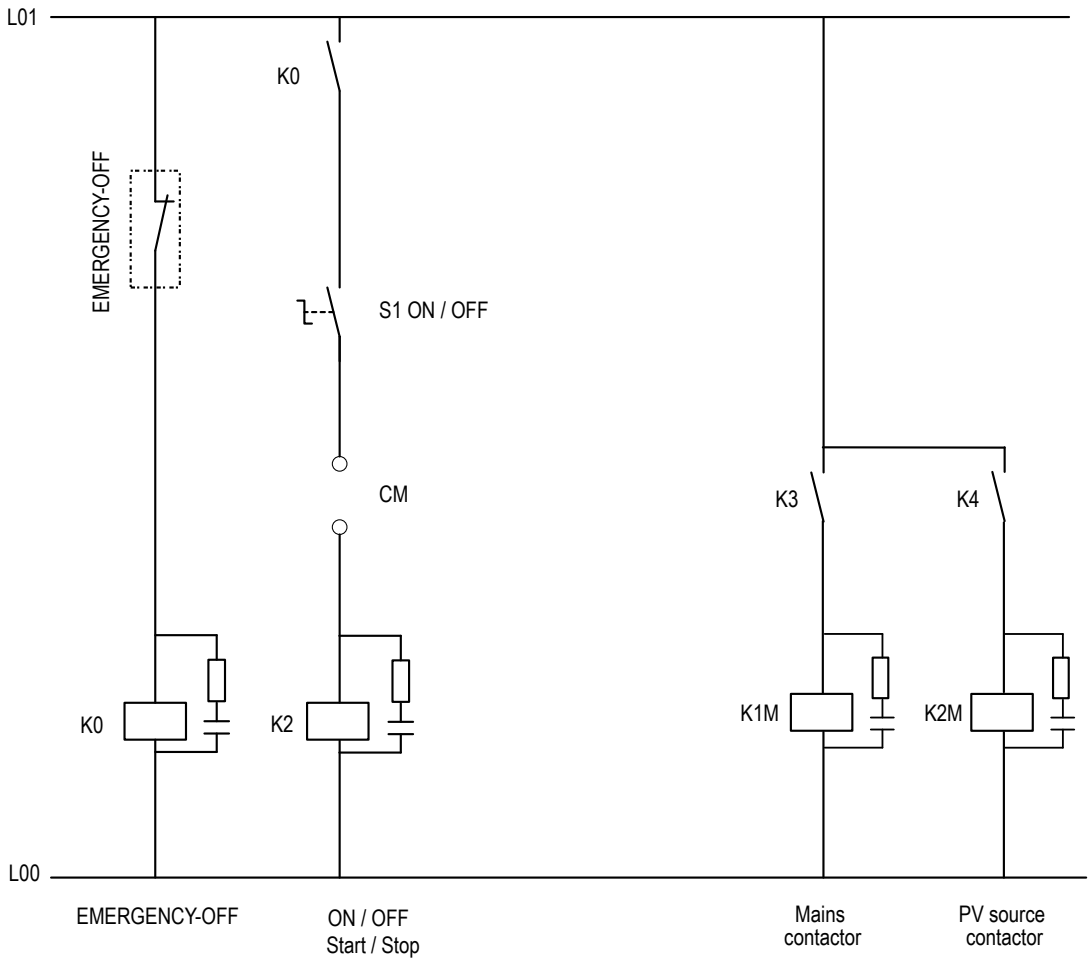


Figure 5.4.3.3: Example of Multidrop connection between ADV200 and a PC with USB port

5.5 Typical connection diagrams

The diagrams shown are for example only, in any case the installer must comply with the rules relating to the state of competence, in order to have a state-of-the-art system.

Figure 5.5.1: Auxiliary control circuits



Push button switch

S1 = Power On Selector

EMERGENCY-OFF = Emergency

Auxiliary relays

K0 = “Emergency” relay coil

K2 = “Command” relay coil

Power relays

K1M = AC relay coil

K2M = DC relay coil

Other

CM = Run consent

Figure 5.5.2: PV power supply

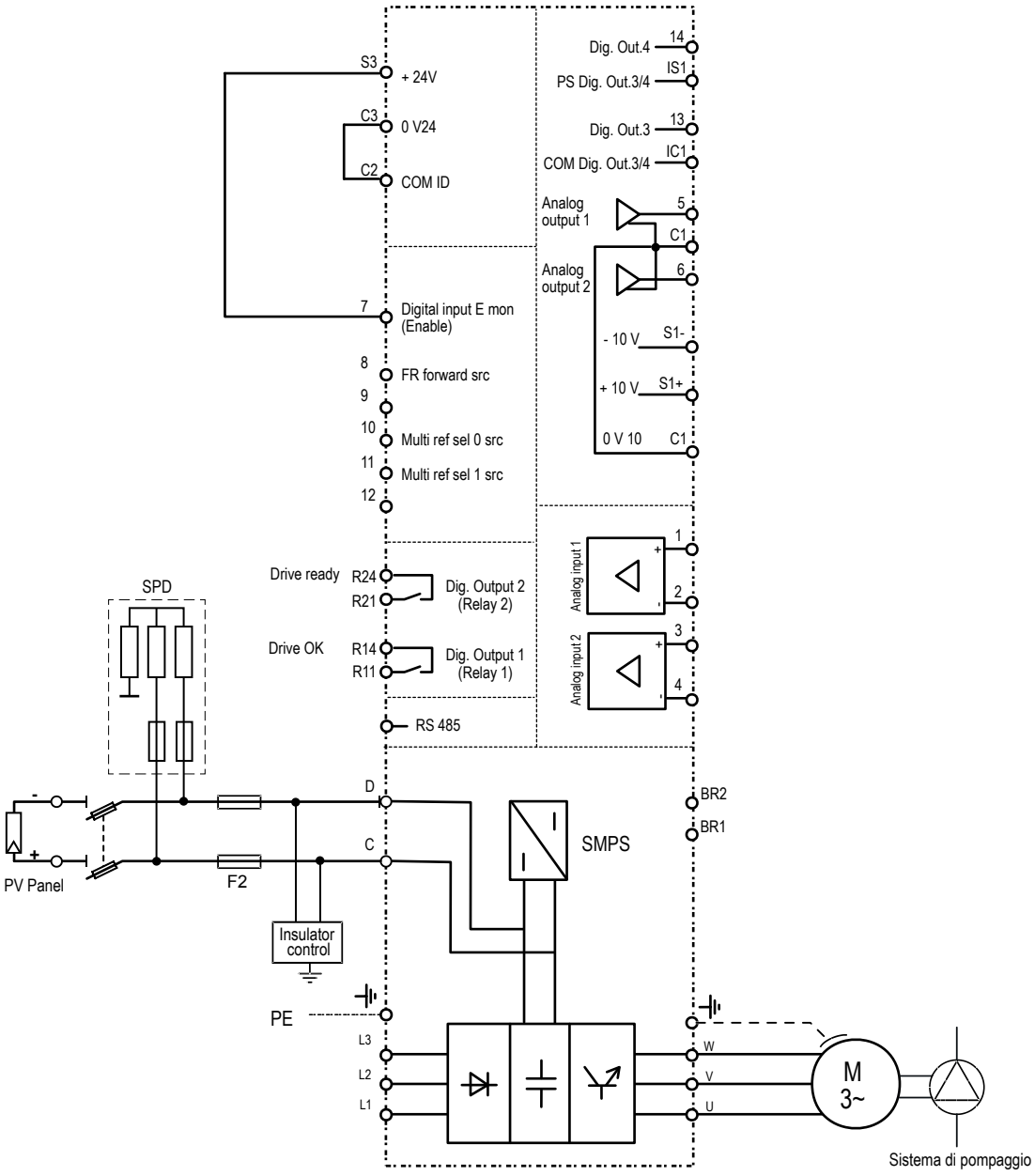
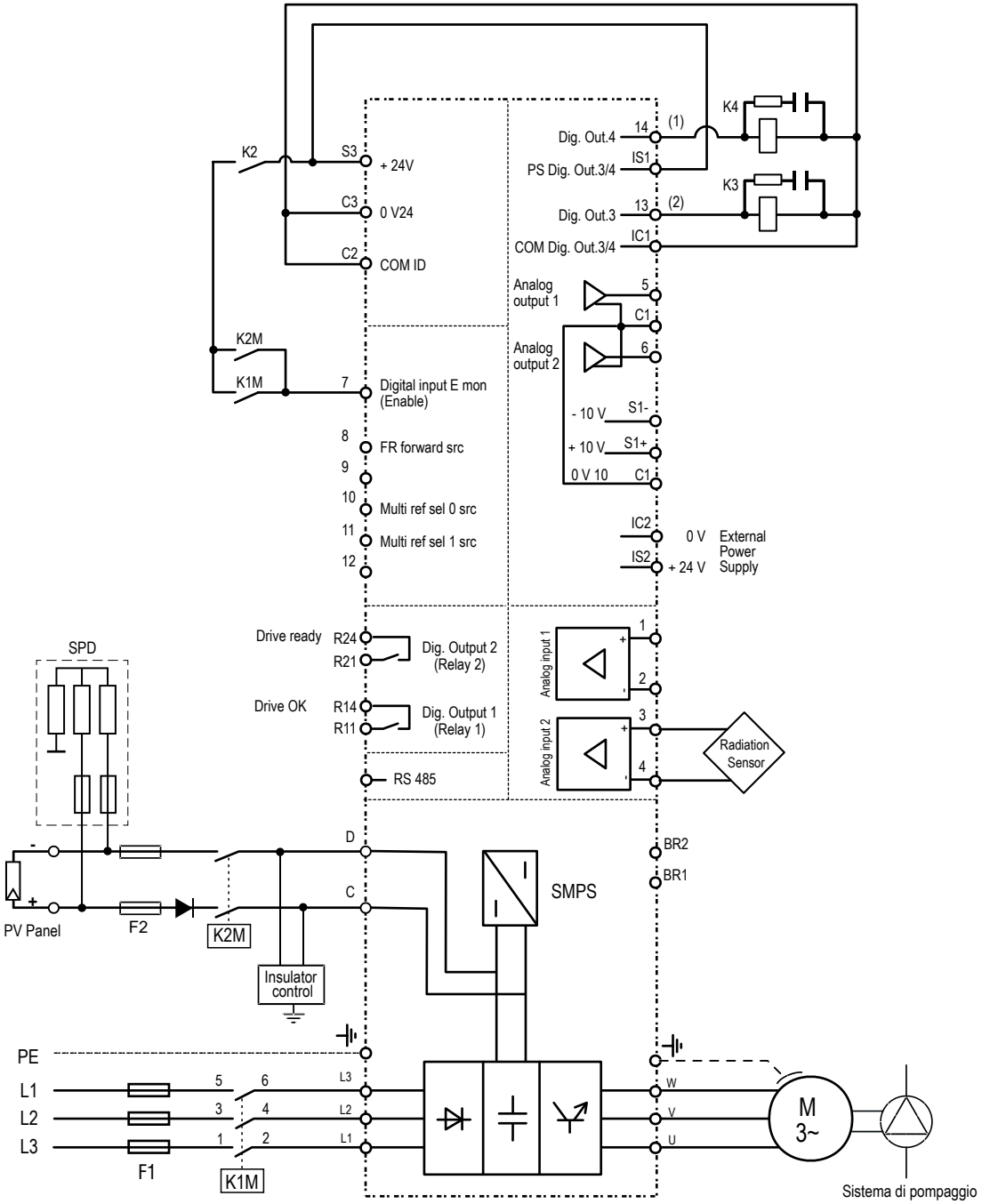
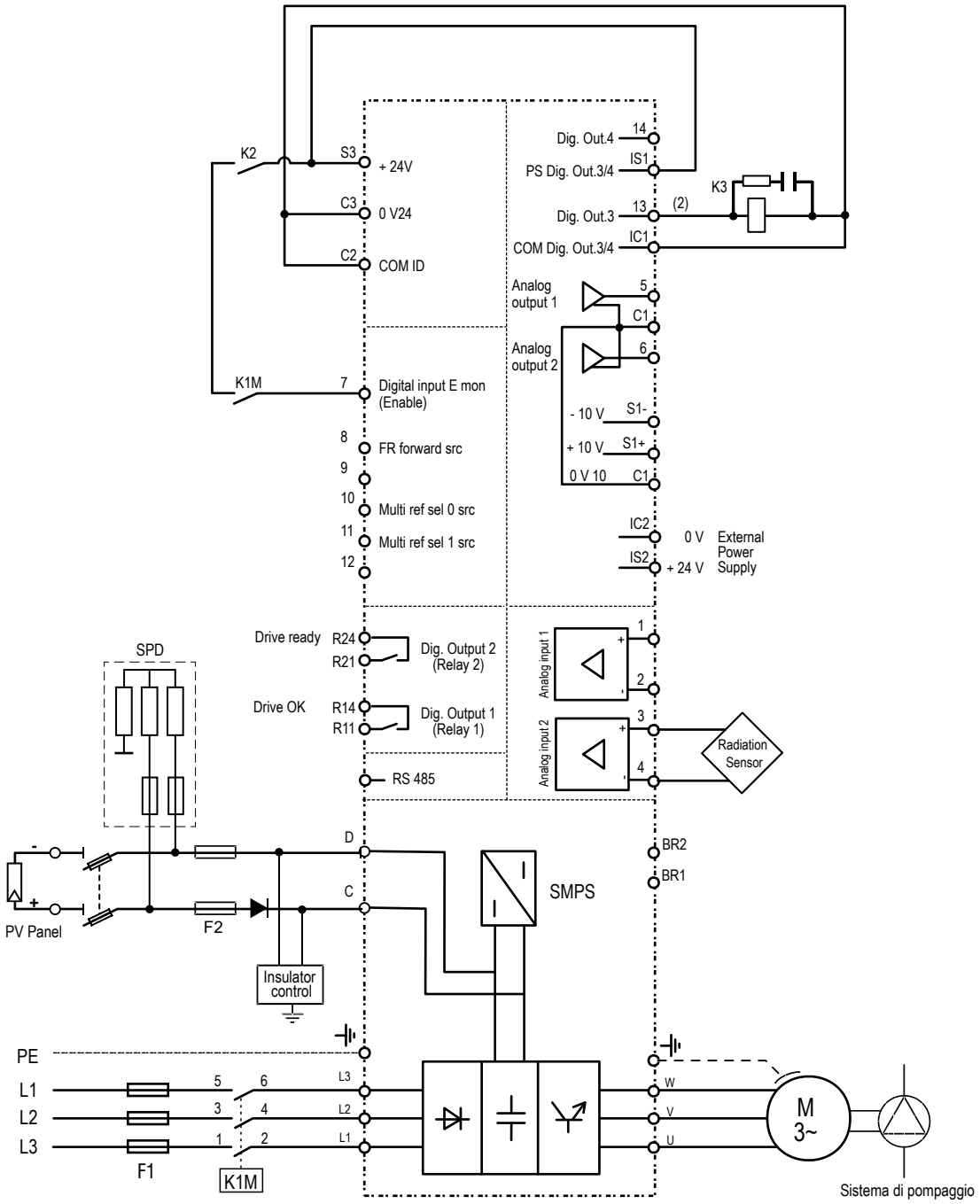


Figure 5.5.3: PV power supply or AC mains power supply



(1) PAR 1316 Digital output 4 src = PAD16
(2) PAR 1314 Digital output 3 src = PAD15

Figure 5.5.4: PV power supply and AC mains power supply



(2) PAR 1314 Digital output 3 src = PAD15

Caution

Each string must be protected against short circuits and reverse current using devices suitable for direct current (thermal-magnetic circuit breakers or fuses).

These protection devices must have a rated voltage greater than or equal to the no-load voltage of the string output.

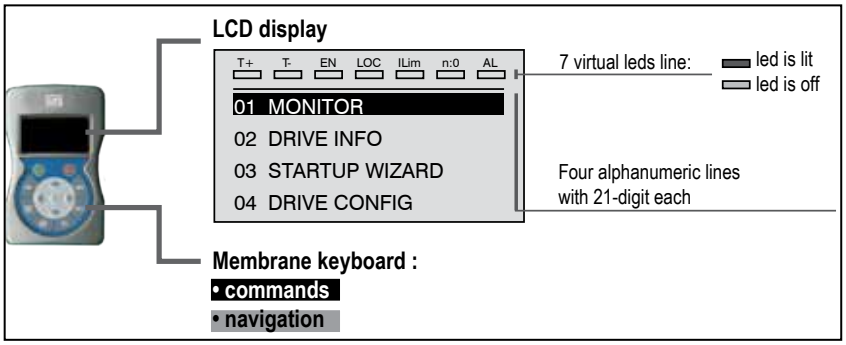
If fuses are used as protection, they must have gPV type breaking characteristics, a 1000V rating and a current rating that does not exceed the manufacturer's recommendations for panel protection.

To ensure that the system can be completely disconnected on both sides, each string should be protected with two fuses, one at each pole.

6 - Use of the keypad

This chapter describes the keypad and methods of use for display and programming of inverter parameters.

6.1 Description



Membrane keyboard

Inverter control programming menu navigation keys.

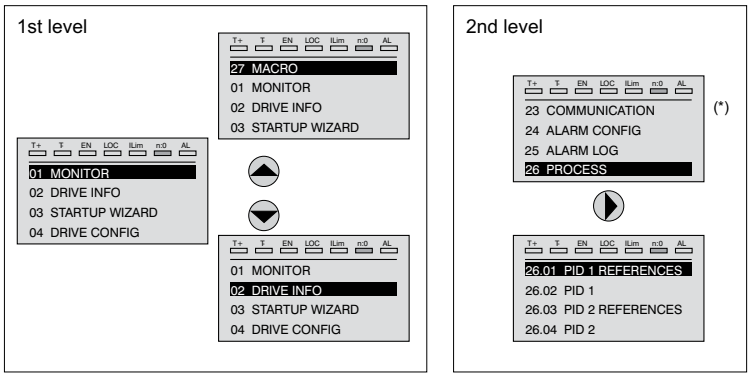
Symbol	Reference	Description
	Start	Starts the motor
	Stop	Stops the motor
ESC	**Escape**	Returns to the higher level menu or submenu. Exit from a parameter, a list of parameters, from the list of the last 10 parameters and from the **Goto** parameter function (see CUST). Can be used to exit from a message that requires use of this.
FWD REV	**Forward/ Reverse**	Reverses the direction of rotation of the motor
LOC REM	**Local/Re-mote**	Changes the method of use from local to remote and vice versa. Is active only if the drive is not enabled.
RST	**Reset**	Resets alarms only if the causes have been eliminated.
CUST	**Custom**	The first time it is pressed, displays the list of the last 10 parameters modified. Pressing this key a second time activates the Goto parameter function for access to a parameter through its number. To exit these functions, press the ◄ key.
DISP	**Display**	Displays a list of drive functioning parameters.
E	**Enter**	Accesses the submenu or parameter selected or selects an operation, Is used during parameter modification to confirm the new value set.
▲	**Up**	Moves selection in a menu or a list of parameters up. During modification of a parameter, increases the value of the digit under the cursor.
▼	**Down**	Moves the selection in a menu or a list of parameters down. During modification of a parameter, decreases the value of the digit under the cursor.
◄	**Left**	Returns to the higher level menu. During modification of a parameter, moves the cursor to the left.
►	**Right**	Accesses the submenu or parameter selected. During modification of a parameter, moves the cursor to the right.

LED's meaning:

T+ the LED is lit, when the drive operates with a positive torque
T- the LED is lit, when the drive operates with a negative torque
EN the LED is lit, when the drive is enabled
LOC The led is lit when the drive is in local mode and OFF when in remote mode.
Ilim the LED is lit, when the drive operates at a current limit. During normal functioning, this led is OFF.
n=0 the LED is lit; it signals zero speed
AL the LED is lit; it signals a trip

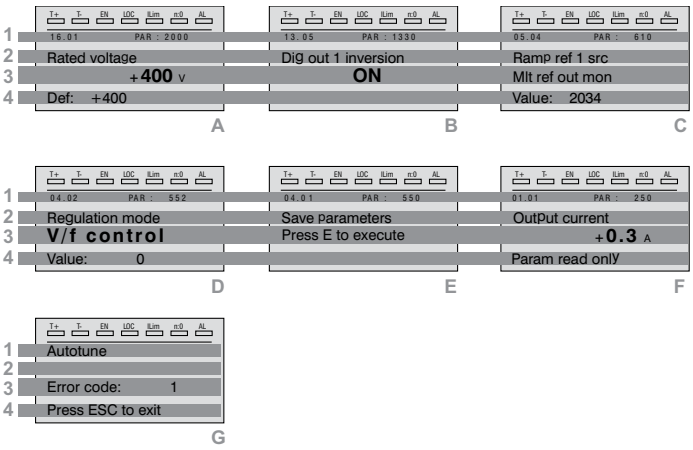
6.2 Navigation

6.2.1 Scanning of the first and second level menus



(*) This example is visible only in **Export** mode (see **paragraph 6.5.2**).

6.2.2 Display of a parameter



1 Position of the parameter in the menu structure (in figure A, 16.01);
number of the parameter (in figure A, PAR: 2000).

2 Description of the parameter.

3 Depends on the type of parameter:

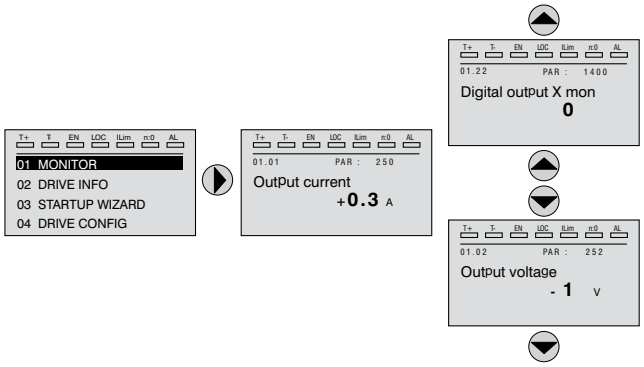
- **Numeric parameter:** displays the numeric value of the parameter, in the format required, and unit of measurement (figure A).
- **Binary selection:** the parameter may assume only 2 states, indicated as OFF-ON or 0 - 1 (figure B).
- **LINK type parameter:** displays the description of the parameter set from the selection list (figure C).
- **ENUM type parameter:** displays the description of the selection (figure D)
- **Command:** displays the method of execution of the command (figure E)

4 In this position, the following may be displayed:

- **Numeric parameter:** displays the default, minimum and maximum values of the parameter. These values are displayed in sequence pressing the ► key (figure A).
- **LINK type parameter:** displays the number (PAR) of the parameter set (figure C) .
- **ENUM type parameter:** displays the numeric value corresponding to the current selection (figure D).
- **Command:** in the case of an error in the command, indicates that ESC must be pressed to terminate the command (figure G).
- **Messages and error conditions** (figure F):

Param read only	attempt to modify a read-only parameter
Password active	the parameter protection password is active
Drive enabled	attempt to modify a non-modifiable parameter with the drive enabled
Input value too high	the value entered too high
Input value too low	the value entered too low
Out of range	attempt to insert a value outside the min. and max. limits

6.2.3 Scanning of the parameters



6.2.4 List of the last parameters modified

Pressing the **CUST** key, a list containing the last 10 parameters modified is accessed. One parameter at a time is displayed and the list can be scrolled using the ▲ and ▼ keys.

To exit this list, press the ► key.

6.2.5 “Goto parameter” function

Pressing the **CUST** key twice, or once if already in the “List of modified parameters”, the “Goto parameter” is activated.

This function permits access to any parameter entering only the software number of the parameter (PAR).

When the parameter reached by the “Goto” command is displayed, it is possible to navigate all the parameters forming part of the same group using the ▲ and ▼ keys.

Pressing the ► key returns to the “Goto” function.

To exit the “Goto” function, press the ► key.

6.3 Parameter modification

To enter parameter modification mode, press the **E** key when the parameter to be modified is displayed.

To save the value of the parameter, following modification, press the **E** key again.

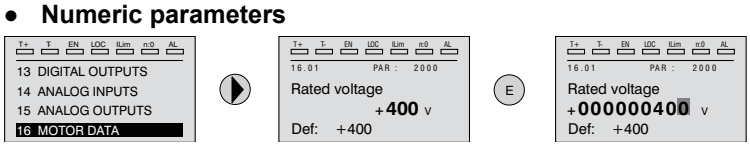
Note ! To save permanently, see **paragraph 6.4**.

To exit from modification mode without saving the value, press the **ESC** key.

The operations to be carried out to modify the value depend on the type of the parameter, as described below.

Note ! For further information about the type of parameters displayed, see **chapter Parameters List (ADV200 SP FP manual)**.

- **Numeric parameters**



When **E** is pressed to access modification mode, the cursor is activated on the digit corresponding to the unit.

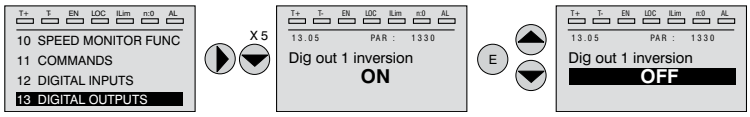
Using the ◄ and ► keys, the cursor can be moved to all the digits, including trailing zeros that are normally not displayed.

With the ▲ and ▼ keys, the digit under the cursor is increased or decreased.

Press **E** to confirm the modification or **ESC** to cancel.

- **Binary parameters (BIT type)**

The parameter may assume only two states which are indicated as OFF-ON or 0-1.

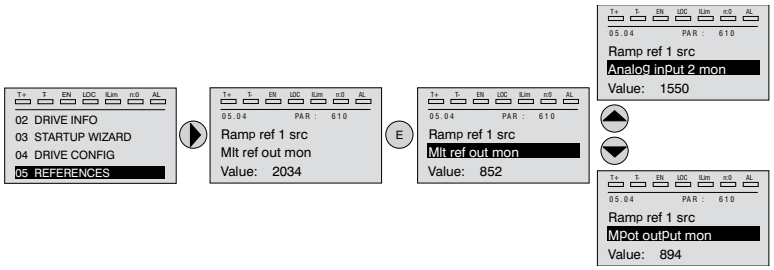


Pressing **E**, modification mode is activated. The entire line is displayed in reverse. Use the ▲ and ▼ keys to move from one state to another.

Press **E** to confirm the modification or **ESC** to cancel.

- **LINK type parameter**

The parameter may assume the number of another parameter as value.

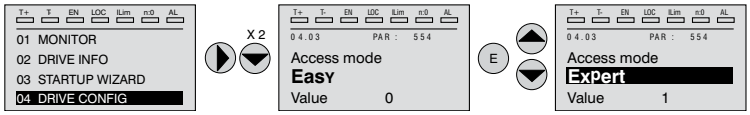


Pressing **E**, modification mode is activated. The entire line is displayed in reverse. The elements of the list of parameters associated to this parameter can be scrolled using the ▲ and ▼keys.

Press **E** to confirm the modification or **ESC** to cancel.

- **ENUM type parameter**

The parameter may assume only the values contained in a selection list.



Pressing **E**, modification mode is activated. The entire line is displayed in reverse. The elements of the selection list can be scrolled using the ▲ and ▼ keys.

Press **E** to confirm the modification or **ESC** to cancel.

- **Execution of commands**

A parameter can be used to carry out a number of operations on the drive.

For an example, see **paragraph 6.4**: in this case, the “Press E to execute” request is displayed instead of the value.

To perform the command, press **E**.

During execution of the command, the “In progress” caption is displayed to indicate that the operation is in course.

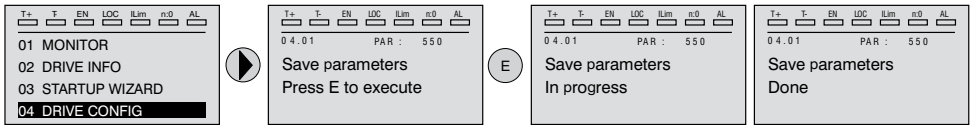
At the end of execution, if the result is positive, the “Done” caption is displayed for few seconds.

If execution has failed, an error message is displayed.

6.4 How to save parameters

Menu 04 DRIVE CONFIG, parameter 04.01 **Save parameters**, PAR : 550.

Used to save changes to parameter settings so that they are maintained also at the power-off.



To exit, press the ◄ key.

6.5 Configuration of the display

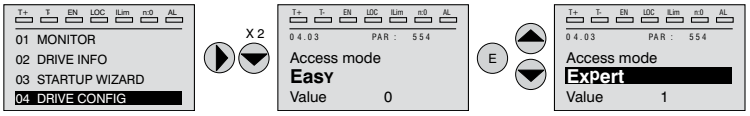
6.5.1 Language selection

Menu 04 DRIVE CONFIG, parameter 04.15 **Language select**, PAR: 578, default=English.

Used to set one of the languages available : English, Italian, Francais, Deutsch, Polish, Romanian, Russian, Turkish and Portuguese.

Note ! **To access the Cyrillic font:** : 1) press the E key and hold it down while you switch the drive on, 2) select the required font using the ▲ and ▼ keys, 3) press E to confirm and return to normal operating mode.

6.5.2 Selection of Easy / Export mode



Menu 04 DRIVE CONFIG, parameter 04.03 **Access mode** , PAR: 554.

Makes it possible to configure two methods of access :

Easy (default) only the main parameters are displayed.

Expert for advanced users, all the parameters are displayed.

6.5.3 Startup display

Note ! This parameter is visible only in **Expert** mode (see **paragraph 6.5.2**).

Menu 04 DRIVE CONFIG, parameter 04.13 **Startup display**, PAR : 574.

Used to set the parameter that will be displayed automatically at drive power-on.

Entering the value -1 (default), the function is disabled and the main menu is displayed at power-on. Set to 0 to show the display menu.

6.5.4 Back-lighting of the display

Note ! This parameter is visible only in **Expert** mode (see **paragraph 6.5.2**).

The display will flash when the inverter operating conditions change.

Menu 04 DRIVE CONFIG, parameter 04.16 **Display backlight**, PAR : 576.

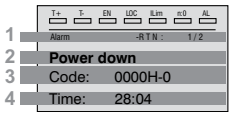
Sets lighting of the display

ON the light of the display remains always on.

OFF (default) the light switches off after approx. 3 minutes from pressing of the last key.

6.6 Alarms

The alarms page is displayed automatically when an alarm occurs.



1 **Alarm**: identifies the alarm page.

RTN : indicates that the alarm has been reset; if the alarm is still active, nothing is displayed.

x/y : x indicates the position of this alarm in the list of alarms and y the number of alarms (the alarm with lowest x is the most recent)

2 Description of the alarm

3 Sub-code of the alarm, provides other information in addition to the description

4 Moment of occurrence of the alarm in machine time.

The list of alarms is scrolled using the ▲ and ▼ keys.

6.6.1 Alarm reset

● If the alarm page is displayed:

Pressing the **RST** key, the alarms are reset and all alarms reset are eliminated from the list.

If, after this operation, the list of alarms is empty, the alarm page is closed.

If the list is not empty, press the ► key to exit from the alarms page.

● If the alarms page is not displayed:

Pressing the **RST** key, the alarms are reset.

If active alarms are still present following reset, the alarm page is opened.

Note ! For further information, see **chapter 8.2.**

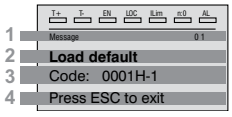
6.7 Messages

Operator messages are displayed with this page.

The messages are of two types:

- *timed* (closed automatically after a certain number of seconds),
- *fixed* (remain displayed until the operator presses the **ESC** key).

Several concurrent messages are enqueued and presented to the operator in sequence, starting from the most recent.



1 **MESSAGE** : identifies a message.

xx indicate show many messages are enqueued. The queue may contain a maximum of 10 messages and the message with the highest number is the most recent.

2 Description of the message (see **chapter 8** for further information)

3 Sub-code of the message. Provides extra information in addition to the description.

4 “Press ESC to exit” is displayed if the message requires acknowledgment.

When a message is closed, the next message is displayed until the queue is empty.

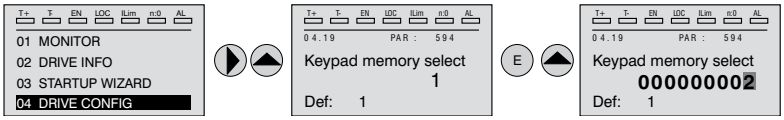
Note ! For further information, see **chapter 8.2**.

6.8 Saving and recovery of new parameter settings

Drive parameters can be saved on the keypad in 5 different memory areas.

This function is useful to obtain various sets of parameters, for safety backup or to transfer the parameters from one drive to another.

6.8.1 Selection of the keypad memory



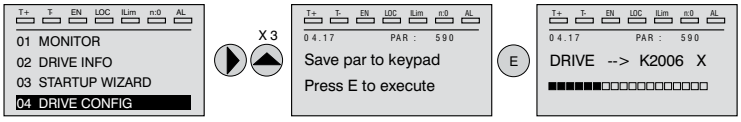
Menu 04 DRIVE CONFIG, parameter 04.21 **Keypad memory select**, PAR : 594.

The keypad features 5 memory areas dedicated to saving parameters.

The memory to be used is selected using the **Keypad memory select** parameter.

Subsequent saving and recovery operations will be carried out on the memory selected.

6.8.2 Saving of parameters on the keypad



Menu 04 DRIVE CONFIG, parameter 04.19 **Save par to keypad**, PAR : 590.

Is used to transfer the parameters from the drive to the selected keypad memory.

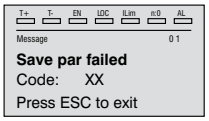
To start the operation, press the **E** key.

During transfer, a bar is displayed which indicates progress of the operation.

Instead of the letter **X**, the number of the currently selected keypad memory is displayed.

At the end of transfer, if this has been completed successfully, the “Done” caption is displayed for a few seconds with subsequent return to the initial page.

If an error occurs during transfer, the following message is displayed:



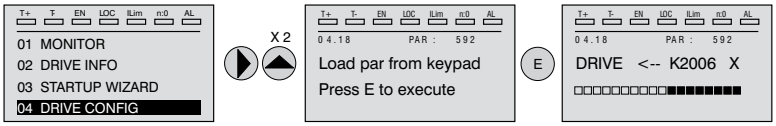
The code XX indicates the type of error, see **paragraph 8.2**.

To exit from the error message, press the **ESC** key.

6.8.3 Load parameters from keypad

Menu 04 DRIVE CONFIG, parameter 04.20 **Load par from keypad**, PAR : 592.

Is used to transfer the parameters from the selected memory of the keypad to the drive.

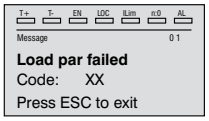


To start the operation, press the **E** key. During transfer, a bar is displayed which indicates progress of the operation.

Instead of the letter **X**, the number of the currently selected keypad memory is displayed.

At the end of transfer, if this has been completed successfully, the “Done” caption is displayed for a few seconds with subsequent return to the initial page.

If an error occurs during transfer, the following message is displayed:



The code XX indicates the type of error, see **paragraph 8.2**.

To exit from the error message, press the **ESC** key.

6.8.4 Transfer of parameters between drives

Transfer the parameters of the source drive to the keypad memory as indicated in **paragraph 6.8.2**, then connect the keypad to the drive on which the new setting is to be saved and proceed as indicated in paragraph 6.8.3.

Caution

To prevent possible damage to equipment, it is advisable to disconnect and connect the keypad with the drive OFF.

Pour éviter tout endommagement possible des appareils, il est conseillé de débrancher et de brancher le pavé de commande une fois le drive éteint.

Warning!

Adjustable frequency drives are electrical apparatus for use in industrial installations. Parts of the Drives are energized during operation. The electrical installation and the opening of the equipment should therefore only be carried out by qualified personnel. Improper installation of motors or Drives may therefore cause the failure of the device as well as serious injury to persons or material damage. Drive is not equipped with motor over-speed protection logic other than that controlled by software. Follow the instructions given in this manual and observe the local and national safety regulations applicable.

Les drives à fréquence variable sont des dispositifs électriques utilisés dans des installations industriels. Une partie des drives sont sous tension pendant l'operation. L'installation électrique et l'ouverture des drives devrait être executé uniquement par du personel qualifié. De mauvaises installations de moteurs ou de drives peuvent provoquer des dommages materiels ou blesser des personnes. On doit suivir les instructions donneés dans ce manuel et observer les régles nationales de sécurité.

Always connect the Drive to the protective ground (PE) via the marked connection ⏚.

ADV Drives and AC Input filters have ground leakage currents greater than 3.5 mA. EN61800-5-1 specifies that with leakage currents greater than 3.5 mA the protective conductor ground connection (⏚) must be fixed type and doubled for redundancy if its section is lower than 10mm^2 CU or 16mm^2 AL.

Il faut toujours connecter le variateur à la terre ⏚ (PE).

Le courant de dispersion vers la terre est supérieur à 3,5 mA sur les variateurs et sur les filtres à courant alterné. Les normes EN61800-5-1 spécifient qu'en cas de courant de dispersion vers la terre, supérieur à 3,5 ma, la mise à la terre (⏚) doit avoir une double connexion pour la redondance si sa section est inférieure à 10mm^2 CU ou 16mm^2 AL.

Only permanently-wired input power connections are allowed. This equipment must be grounded (IEC 536 Class 1, NEC and other applicable standards).

If a Residual Current-operated protective Device (RCD) is to be used, it must be an RCD type B. Machines with a three phase power supply, fitted with EMC filters, must not be connected to a supply via an ELCB (Earth Leakage Circuit-Breaker - see EN 61800-5-1 section 4.3.10).

The following terminals can carry dangerous voltages even if the inverter is inoperative:

- the power supply terminals L1, L2, L3, C, D.
- the motor terminals U, V, W.

This equipment must not be used as an 'emergency stop mechanism' (see EN 60204, 9.2.5.4).

Seuls des branchements électriques permanents par câble en entrée sont admis. Mettre l'appareil à la masse (IEC 536 Classe 1, NEC et autres normes applicables).
S'il s'avère nécessaire d'utiliser un dispositif protecteur de courant résiduel (RCD), il convient de choisir un RCD de type B. Les machines à alimentation triphasée et dotées de filtres EMC ne doivent pas être raccordées au bloc d'alimentation par le biais d'un disjoncteur ELCB (Earth Leakage Circuit-Breaker – cf. EN 61800-5-1 paragraphe 4.3.10).
Les bornes suivantes peuvent recevoir des tensions dangereuses, même si l'onduleur est désactivé :
- bornes d'alimentation L1, L2, L3, C, D.
- bornes du moteur U, V, W.
Ne pas utiliser cet appareil en tant que « dispositif d'arrêt d'urgence » (cf. EN 60204, 9.2.5.4).

Do not touch or damage any components when handling the device. The changing of the isolation gaps or the removing of the isolation and covers is not permissible.

Manipuler l'appareil de façon à ne pas toucher ou endommager des parties. Il n'est pas permis de changer les distances d'isolement ou bien d'enlever des matériaux isolants ou des capots.

According to the EU directives the ADV and accessories must be used only after checking that the machine has been produced using those safety devices required by the 2006/42/EC set of rules, as far as the machine industry is concerned. These standards do not apply in the Americas, but may need to be considered in equipment being shipped to Europe.

Selon les normes EEC, les drives ADV et leurs accessoires doivent être employés seulement après avoir verifié que la machine ait été produit avec les même dispositifs de sécurité demandés par la réglementation 89/392/EEC concernant le secteur de l'industrie.

Motor parameters must be accurately configured for the motor overload protection to operate correctly.

Configurer soigneusement les paramètres du moteur afin que la protection contre les surcharges équipée sur le moteur fonctionne convenablement.

High voltage levels are present in the drive.

Les tensions, à l'intérieur du drive, sont élevées.

Wherever faults occurring in the control equipment can lead to substantial material damage or even grievous bodily injury (i.e. potentially dangerous faults), additional external precautions must be taken or facilities provided to ensure or enforce safe operation, even when a fault occurs (e.g. independent limit switches, mechanical interlocks, etc.).

Adopter des mesures de précaution supplémentaires à l'extérieur du drive (par exemple, des interrupteurs de fin de course, des interrupteurs mécaniques, etc.) ou fournir des fonctions aptes à garantir ou à mettre en place un fonctionnement sécurisé en cas de survenue d'une panne de l'appareil de commande susceptible d'occasionner des dégâts matériels d'envergure, voire même des lésions corporelles graves (par exemple, des pannes potentiellement dangereuses).

Certain parameter settings may cause the inverter to restart automatically after an input power failure.

Certaines configurations de paramètres peuvent provoquer le redémarrage automatique de l'onduleur après une coupure de l'alimentation.

This equipment is suitable for use in a circuit capable of delivering not more than 10,000 symmetrical amperes (rms), for a maximum voltage of 480 V .

Cet appareil est conçu pour une utilisation sur un circuit d'alimentation en mesure de délivrer 10.000 ampères symétriques (rms) maximum pour une tension maximale de 480V.

This equipment must not be used as an 'emergency stop mechanism' (see EN 60204, 9.2.5.4).

Ne pas utiliser cet appareil en tant que « dispositif d'arrêt d'urgence » (cf. EN 60204, 9.2.5.4).

Do not open the device or covers with the product connected to the mains or a DC power supply. Minimum time to wait before working on the terminals or inside the device is listed in **section 9.8** .

Ne pas ouvrir le dispositif ou les couvercles tant que le produit est sous alimentation secteur ou DC. Le temps minimum d'attente avant de pouvoir travailler sur les bornes ou bien àl'intérieur de l'appareil est indiqué dans la **section 9.8** .

Fire and Explosion Hazard:

Fires or explosions might result from mounting Drives in hazardous areas such as locations where flammable or combustible vapors or dusts are present. Drives should be installed away from hazardous areas, even if used with motors suitable for use in these locations.

Risque d'incendies et d'explosions. *L'utilisation des drives dans des zônes à risques (présence de vapeurs ou de poussières inflammables), peut provoquer des incendies ou des explosions. Les drives doivent être installés loin des zônes dangeureuses, et équipés de moteurs appropriés.*

Protect the device from impermissible environmental conditions (temperature, humidity, shock etc.).

Protéger l'appareil contre des effets extérieurs non permis (température, humidité, chocs etc.).

To the output of the drive (terminals U, V, W) :

- no voltage should be connected to the output of the drive
- the parallel connection of several drives are not permissible.
- the direct connection of the inputs and outputs (bypass) are not permissible.
- capacitative load (e.g. Var compensation capacitors) should not be connected.

À la sortie du convertisseur (bornes U, V, W) :
- aucune tension ne doit être appliquée
- aucune charge capacitive ne doit être connectée
- il n'est paspermis de raccorder la sortie de plusieurs convertisseurs en parallèle
- I n'est paspermis d'effectuer une connexion directede l'entrée avec la sortie du convertisseur (Bypass).

The electrical commissioning should only be carried out by qualified personnel, who are also responsible for the provision of a suitable ground connection and a protected power supply feeder in accordance with the local and national regulations. The motor must be protected against overloads.

La mise en service électrique doit être effectuée par un personnel qualifié. Ce dernier est responsable del'existence d'une connexion de terre adéquate et d'une protection des câbles d'alimentation selon les prescriptions locales et nationales. Le moteur doit être protégé contre la surcharge.

Do not connect power supply voltage that exceeds the standard specification voltage fluctuation permissible. If excessive voltage is applied to the Drive, damage to the internal components will result.

Ne pas raccorder de tension d'alimentation dépassant la fluctuation de tension permise par les normes. Dans le cas d' une alimentation en tension excessive, des composants internes peuvent être endommagés.

Do not operate the Drive without the ground wire connected.

The motor chassis should be grounded to earth through a ground lead separate from all other equipment ground leads to prevent noise coupling.

Ne pas faire fonctionner le drive sans prise de terre.

Le chassis du moteur doit être mis à la terre à l'aide d'un connecteur de terre separé des autres pour éviter le couplage des perturbations.

No dielectric tests should be carried out on parts of the drive. A suitable measuring instrument (internal resistance of at least 10 kΩ/V) should be used for measuring the signal voltages.

Il ne faut pas éxécuter de tests de rigidité diélectrique sur des parties du convertisseurs. Pour mesurer lestensions, des signaux, il faut utiliser des instruments de mesure appropriés (résistance interne minimale 10kΩ/V).

7.1 Startup Wizard and dedicated settings

Only for isolated PV systems.

Introduction

The ADV200 SP can operate with regulation modes : V/f control (Voltage/Frequency) and Flux vector OL (open loop).

Menu 04 DRIVE CONFIG, parameter 04.2 **Regulation mode**, PAR: 552, default=V/f control.

Start-up in one mode is valid also for the other regulation modes.

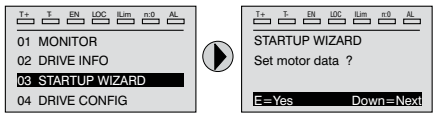
The startup wizard is a guided procedure used for quick start-up of the drive that helps to set the main parameters.

It consists of a series of questions relating to the various sequences for entering and calculating the parameters necessary for correct drive operation.

The order of these sequences is as follows:

- Basic connections — See **step 1**
- **Setting motor parameters** — See **step 2**
- **Self-tuning with rotating motor** — See **step 3A**
- **Self-tuning with motor at stand-still or coupled to the load** — See **step 3B**
- **Setting the maximum speed reference value** — See **step 4**
- **Setting ramp parameters** — See **step 5**
- **Skip "Motopotentiometer, Jog and Braking resistor" settings**
- **Saving parameters** — See **step 6**
- **Calibrate the parameters required for V/f control** — See **step 7**
- **Basic application settings** — See **step 8**
- **Application parametrization** — See **step 9**
- **Enable system / Checks** — See **step 10**
- **Saving parameters** — See **step 11**

The format of the function selection page is as follows:



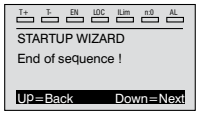
Pressing the E key, the function to be programmed is accessed.

Press the ▼ (Down) key to move to the next function skipping the current function.

Press the ▲ key to return to the previous function.

To terminate the sequence of functions and return to the menu, press the **ESC** key.

The end of the start-up sequence is indicated with the page:



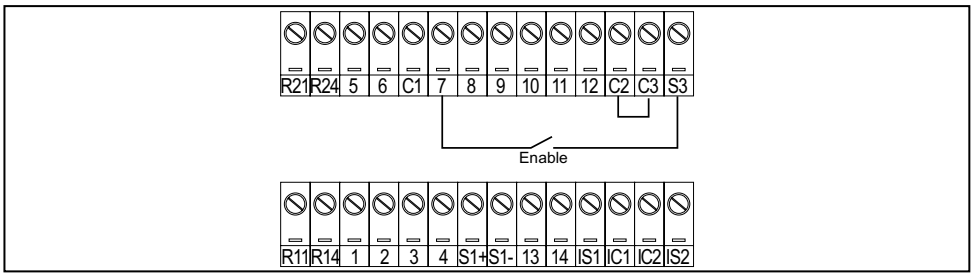
Press the ▼(Down) key to exit the sequence and return to the menu.

Note ! In the procedures described below, the settings have been made using the ADV2075 drive and a 10 Hp (7.36 kW) asynchronous motor.

Step 1 - Connections

1. Connect the solar panels to the inverter DC-Link (see section “5.5 Typical connection diagrams”, page 49);
2. Connect the centrifugal pump actuator motor to the inverter (see section “5.1.7 Motor connection”, page 31);
3. Insert an enabling contact between terminals 7 and S3 (Enable the drive and +24V inputs) on the R-ADV200 board.

Connection of the drive enabling contact



4. Checks to be performed before powering the drive
   - Check that the power supply voltage is in the 450 ... 750VDC range.
   - Check that the Drive output terminals (U, V and W) are properly connected to the motor.
   - Check that all the terminals in the drive control circuit are properly connected. Check that all control inputs are open.
   - Powering the Drive: once the above checks have been completed, apply power to the drive and go on to the next step in the procedure.

Powering the drive

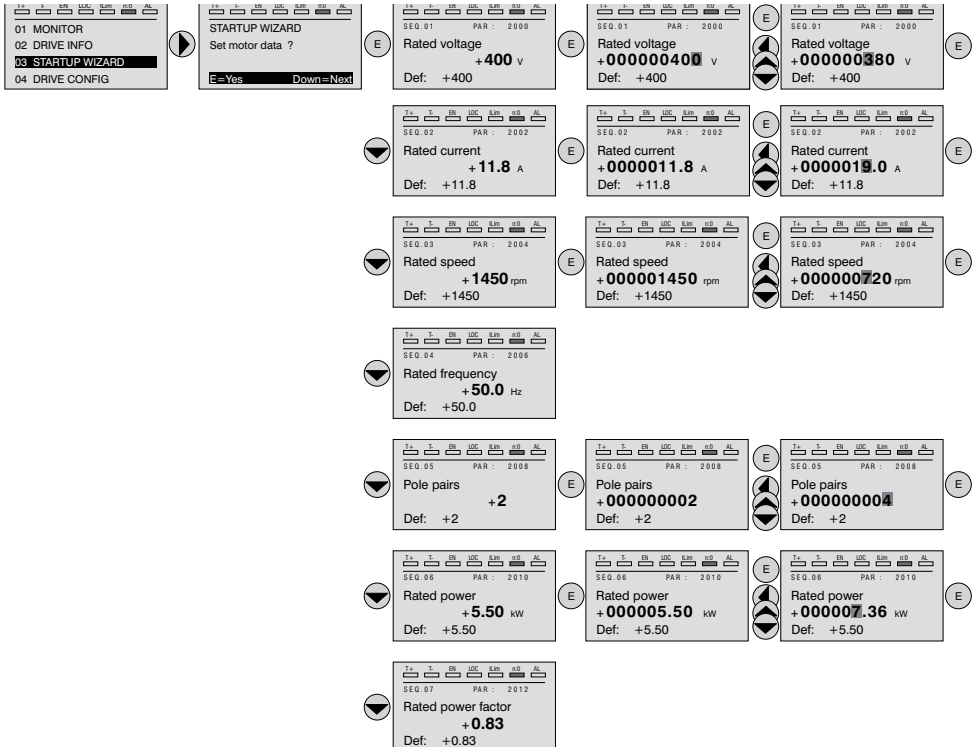
- After completing all the checks described above, power the drive and proceed to Step 2.

Step 2 - Setting motor parameter (Set motor data)

Set the rating data of the motor connected: rated voltage, rated frequency, rated current, rated speed, rated power, power factor (cosφ).

Motor & Co.			
Type: ABCDE		IEC 34-1 / VDE 0530	
Motor: **3 phase**	**50 Hz**	Nr	**12345-91**
Rated voltage	**380 V**	I nom	**19.0 A**
Rated power	**10 Hp**	Power factor	**0.83**
Rated speed (n_N)	**720 rpm**		
IP54	**Iso Kl F**	**S1**	
Made in			

The self-tuning procedure is described below using the data of an imaginary motor by way of example.



Rated Voltage [V]: motor rated voltage as indicated on the data plate.

Rated current [A]: motor rated current, approximately, the value should not be less than 0.3 times the rated current of the drive, output current class 1 @ 400V on the rating plate of the drive.

Rated speed [rpm]: motor rated speed, the value must reflect the speed of the motor at full load at rated frequency. If slip is indicated on the motor rating data, set the **Rated speed** parameter as follows:

Rated speed = Synchronous speed - Slip

Rated frequency [Hz]: motor rated frequency, as shown on the data plate.

Pole pairs: Number of motor pole pairs. The number of motor pole pairs is calculated using the data on the plate and the following formula: P = 60 [s] x f [Hz] / nN [rpm]

Where: p = motor pole pairs

f = motor rated frequency (menu 16 MOTOR DATA par. 2006)
nN = motor rated speed (menu 16 MOTOR DATA par. 2004)

Rated power [kW]: motor rated power, for a motor rating plate with a HP power value, set the rated power kW = 0.736 x motor power Hp value.

Rated power factor: leave the default value of Cos φ if the data are not not available.

Note ! When data entry is complete the **Take parameters** command (menu 16 MOTOR DATA, PAR: 2020) is executed automatically. The motor data entered during the STARTUP WIZARD procedure are saved in a RAM memory to enable the drive to perform the necessary calculations.

These data are lost if the device is switched off. To save the motor data follow the procedure described in Step 6.

At the end of the procedure, proceed to Step 3A (motor free to rotate and uncoupled from transmission) or to Step 3B (motor coupled to transmission).

Step 3 - Autotune of the motor

The drive carries out the motor autotune procedure (real measurement of motor parameters).

Autotune may last a few minutes.

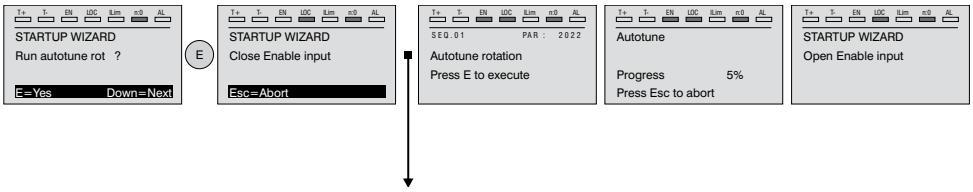
Note ! If this operation generates an error message (example Error code 1), check the connections of the power and control circuits (see **Step 1** - Connections), check motor data settings (see **Step 2** – Motor data setting) and then repeat the Autotune procedure (or, alternatively, select a different type of procedure (Rotation or Still)

Two modes are possible: Self-tuning with rotating motor (Step 3A) or Self-tuning with motor at stand-still (Step 3B):

Step 3A - Self-tuning with rotating motor (Autotune rotation)

Use this procedure when the motor is not coupled or the transmission does not represent more than 5% of the load. This procedure obtains the most accurate data.

Note ! Autotuning can be cancelled at any time by pressing 



Connect terminal 7 (Enable) to terminal S3 (+24VDC).

To interrupt this operation, press the **ESC** key.

Note ! At the end of the self-tuning procedure there is a request to open the Enable contact (terminals 7 – S3); the **Take tune parameters** command (menu 16 MOTOR DATA, PAR: 2078) is automatically executed.

The calculated parameters are saved in a RAM memory to enable the drive to perform the necessary calculations. These data are lost if the device is switched off. To save the motor data follow the procedure described in Step 6.

When the Enable contact is opened the drive proposes Step 4 to proceed with the wizard

Step 3B - Self-tuning with motor at stand-still or coupled to the load (Autotune still)

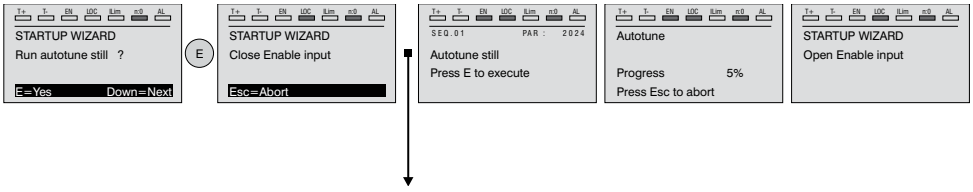
Use this procedure when the motor is **coupled to the transmission** and cannot rotate freely.

Caution

May cause limited rotation of the shaft.

Peut entraîner une rotation de l'arbre limitée.

Note ! Autotuning can be cancelled at any time by pressing 



Connect terminal 7 (Enable) to terminal C3 (+24VDC)

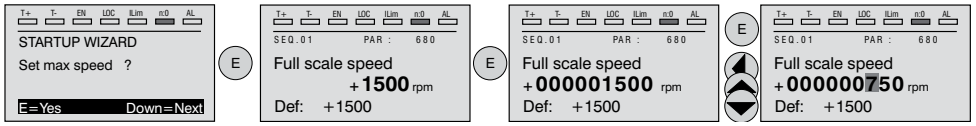
Note ! At the end of the self-tuning procedure there is a request to open the Enable contact (terminals 7 – S3); the **Take tune parameters** command (menu 16 MOTOR DATA, PAR: 2078) is automatically executed.

The calculated parameters are saved in a RAM memory to enable the drive to perform the necessary calculations. These data are lost if the device is switched off. To save the motor data follow the procedure described in Step 6.

When the Enable contact is opened the drive proposes Step 4 to proceed with the wizard.

Step 4 - Setting the maximum speed reference value (Set max speed)

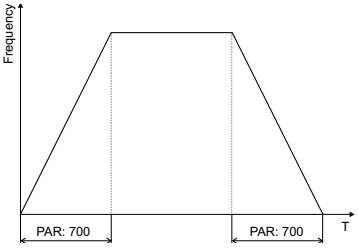
This step is used to define the maximum motor speed value that can be reached with each single reference signal (analog or digital).

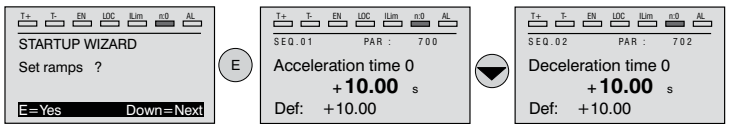


After setting the speed, proceed to Step 5 to set the acceleration and deceleration ramp parameters.

Step 5 - Setting ramp parameters (Set ramps)

Set the acceleration and deceleration times for the profile of ramp 0 :



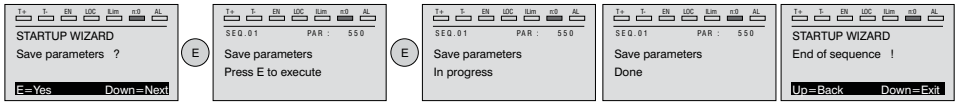


Note ! After setting the acceleration and deceleration ramps, the parameters that have been set manually and calculated using the self-tuning procedures can be saved permanently in a non-volatile flash memory.

To save the parameters proceed to Step 6.

Step 6 - Saving parameters (Save parameters)

To save the new parameter settings, so that they are maintained also after power-off, proceed as follows:



Step 7 - Calibrate the parameters required for V/f control

Menu 21 - VF PARAMETERS (see the ADV200 SP FP manual).

If necessary, change the parameters in menu 21 - VF PARAMETERS:

PAR 2400 Voltage flux boost
PAR 2402 Voltage boost gain
PAR 2404 Boost tens coppia
PAR 2406 Vf voltage
PAR 2408 Vf frequency
PAR 2410 Vf voltage 1
PAR 2412 Vf frequency 1
PAR 2414 Vf voltage 0
PAR 2430 Vf shape
PAR 2440 Slip comp
PAR 2442 Slip comp filter
PAR 2444 Slip comp mode
PAR 2446 Slip P gain
PAR 2448 Slip I gain
PAR 2460 Vfcurrent lim P gain
PAR 2462 Vfcurrent lim I time
PAR 2470 Damping gain
PAR 2472 Damping threshold 1
PAR 2474 Damping threshold 2
PAR 2480 Vf min frequency
PAR 2482 Vf min freq delay
PAR 2490 Dig Vf scale
PAR 2492 Vf scale src

Proceed to Step 8

Step 8 - Autotaratura parametri applicazione Solar Pump

Menu 27 - SOLAR PUMP / CONFIGURATION

1. Enable the application: PAR 11000 **App Enable** = ON
2. Set the maximum pump speed value (PAR 11002 **Max Pump Speed**)
3. Set the minimum pump speed value (PAR 11004 **Min Pump Speed**)
4. Start the automatic system parameter setting procedure required to run the application (inverter disabled: enabling contact between terminals 7 and S3 open): PAR 11006 **AutoSetup** = ON

   The command will set the system variables as follows:
   - PAR 556 **Control Mode** = Ramp
   - PAR 3000 **Speed Ratio** = 0
   - PAR 652 **Speed Reference** = Pad 1
   - PAR 4500 **Alarm Reset** (*) = Pad 3
   - PAR 1000 **Commands remote sel** = Digital
   - PAR 1010 **Safe Start** = OFF
   - PAR 1018 **Start / Enable** = Pad 4
   - PAR 750 **Ramp In 0** = Pad 5
   - PAR 752 **Ramp Out 0** = Pad 5

   This setting will automatically reset the system in case of **Undervoltage**.

5. Select PAR 11008 **Control Mod** to set the desired control type; there are four (4) possible modes: SOLAR SOURCE, AUTO DUAL SOURCE, AC SOURCE, AUTOHYBRID

Proceed to Step 9.

Step 9 – Abilitazione applicazione Solar Pump

Menu 27 SOLAR PUMP / CONFIGURATION

1. Enable the application by setting the parameter PAR 11000 **Enable** = On (CONFIGURATION Menu).
2. Set the configuration parameters, CONFIGURATION menu:
   - PAR 11002 **Max Pump Speed** = set the value desired
   - PAR 11004 **Min Pump Speed** = set the value desired
3. Enter the reference points in the ramp system menu (e.g. PAR 602, 612, menu 5 - REFERENCES).
4. Configure start commands (PAR 1020 **Digital Start**)
5. Properly configure the functions required for the I/O menu (for more information, see the ADV200 SP FP manual).
   a) Programming the dedicated input for the radiation sensor. If the sensor is used with an analog input, check the type of sensor used (if it is for current or voltage) and set the parameters in the Analog Input menu accordingly. Enter the full-scale value of the sensor in parameter 11032;

   b) Set the digital output parameters to control the relays and set their outputs in the DIGITAL OUTPUTS System Menu.

   c) Set the input source on the Multi Source control.
6. Configure the required functions in the Multi Source menu in order to identify the operation starting condition with a DC source and switching to AC or for shut down (for more information see the ADV200 SP FP manual).
7. Configure the MPPT operating mode based on the parameters described in the MPPT menu. The standard configuration is provided by the Perturb and Observe control algorithm (for more information see the ADV200 SP FP manual).

Note! The MPPT algorithm must be coordinated with the DC-BUS voltage control. In general, the DC-LINK reference voltage should be well tracked with respect to the voltage calculated by the MPPT algorithm. The user can check this condition with the parameters PAR 12012 (ref) and 12047 (real) in the Monitor Menu.

8. Configure the Autorestore operating mode (automatic reset in case of alarm) using the parameters described in the AUTORESTORE menu in the ADV200 SP FP manua

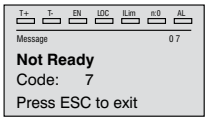
Note! Restart times that are too fast may cause the inverter to wear prematurely due to its continuous switching on and off.

9. Set the additional functions required in the Process menu (dedicated functions for pump control).
   For example, if a dedicated ramp needs to be set faster in its first phase the MIN FREQUENCY function can be used. Or, if pressure control is used, the dedicated PIDs can be set.

Proceed to Step 10.

Step 10 – Enable system / Checks

1. The system will start when the hardware enable contact is activated (the contact is usually used by closing the circuit between terminals 7 and S3) and when the start command setting is high.
   The keypad display shows the current operating conditions. Before the inverter is enabled, the item at the top of the list will read NOT-READY. The system is not ready. The Enable command is missing.



In the next phases, the display will show the operating status based on the monitor variable described by parameter 12042.

2. During start up, check that the DC and AC control relays function properly according to their settings. Perform a manual switch from DC to AC mode (if both sources have been installed)

3. Carry out the voltage control verification tests. Then, if necessary, change the control parameters in the VDC CONTROL menu (see the ADV200 SP FP manual).

Note! In isolated system operations (only PV) the DC voltage operating point can lead to DC-LINK voltage fluctuations; these can be mitigated by manual gain calibration or by the STABILITY menu functions, which permit automatic gain management.

Inverter shut down is possible due to rapid changes in insolation, which typically occur on windy and partially cloudy days. To obtain better system response, the gain settings can be changed, mostly by increasing the integrated part (PAR 11004) and using the scheduled gain settings PAR 11120 and PAR 11122, which permit faster response times if the DC-LINK voltage deviates from the set-point values.

7.3 Programming

7.3.1 Menu display modes

The programming menu can be displayed in two modes, which can be selected using the **Access mode** parameter (04 - DRIVE CONFIG menu), see **chapter 6.5.2**:

- **Easy** (default) only the main parameters are displayed.
- **Expert** all the parameters are displayed.

7.3.2 Programming of “function block” analog and digital input signals

The signals, variables and parameters of each single “function block” of the drive are interconnected in order to achieve the configurations and controls inside the control system.

These can be managed and modified using the keypad, PC configurator or fieldbus programming.

The programming mode is based on the following logic:

src (source; i.e.: **Ramp ref 1 src**, PAR: 610)

This term defines **the source of the function block input,** i.e. the signal to be processed in the function block.

The different configurations are defined in the relative **selection lists**.

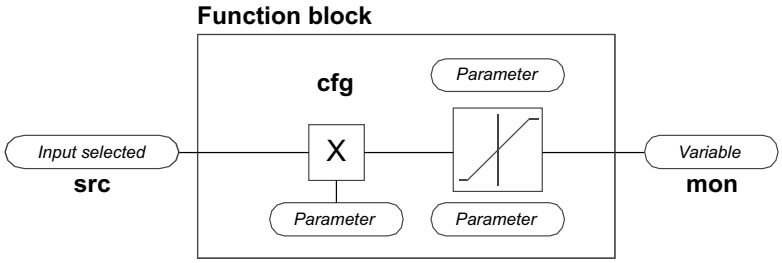
cfg (configuration; i.e.: **Mpot init cfg**, PAR: 880)

This term refers to **the parameter setting and its effect on the function block**.

For example: Ramp times, internal reference adjustment, etc...

mon (display; i.e.: **Ramp ref 1 mon**, PAR: 620)

This term refers to the **variable output from the function block**, **which is the result of the calculations performed on the actual block**.



7.3.3 Variable interconnections mode

The **source (src)** allows the desired control signal to be assigned to the function block input.

This operation is performed by using specific selection lists.

Possible control signal sources:

1 – Physical terminal

The analog and digital signals come from the terminal strip of the regulation card and/or from those of the expansion cards.

2 – Drive internal variables

Internal drive control system variables, from “function block” calculations, sent via keypad, PC configurator or fieldbus.

Practical example

The following examples illustrate the philosophies and methods with which more or less complex operations are performed in the single “function blocks”, the results of which represent the output of the block.

• Example: Changing the Speed Reference source

The main drive reference (in the default configuration) **Ramp ref 1 mon** (PAR: 620) is generated by the output of the function block "**Ramp setpoint Block**".

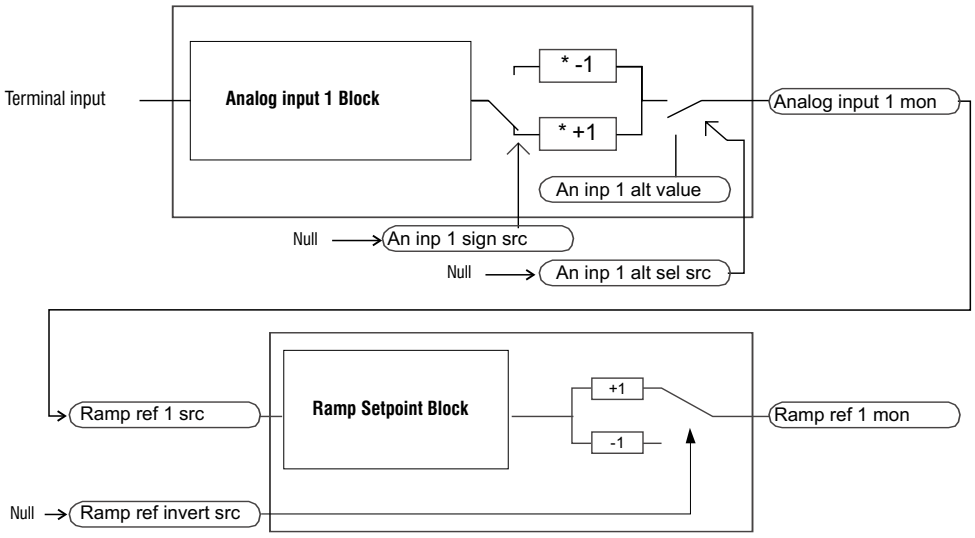
Its default source is the **Analog input 1 mon** signal (PAR: 1500), from the output of the function block "**Analog input 1 Block**", which in this case refers to analog input 1 of the signal terminal strip.

To change the reference source from the analog input to a digital reference inside the drive, the input signal must be changed to "**Ramp setpoint Block**".

Enter the **Ramp ref 1 src** parameter (PAR: 610) and set a new reference, selecting it from among those listed in the L_MLTREF selection list, for example **Dig ramp ref 1** (PAR: 600).

• Example: Inverting the analog reference signal

To invert the "**Analog input 1 Block**" output signal, the value of the **An inp 1 sign src** parameter (PAR: 1526), which has a default setting of **Null** (no operation), must be changed by selecting the source of the command signal from among those listed in the L_DIGSEL 2 selection list, for example **Digital input X mon**, **One** (function always enabled), etc.



The diagrams above illustrate the internal processing philosophy of the single "function blocks" and the result of these changes on the other interconnected "function blocks".

Note ! This section contains a brief description of the functions of the other parameters in the function blocks not included for the changes in the example.

The **An inp 1 alt sel src** parameter (PAR: 1528) can be used to select an alternative reference for the **Analog input 1 mon** (PAR: 1500) output.

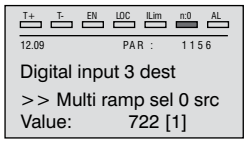
The **An inp 1 alt value** parameter (PAR: 1524) determines the alternative reference value for the **Analog input 1 mon** (PAR: 1500) output.

The **Ramp ref invert src** parameter (PAR: 616) can be used to select the source for the command to reverse the "**Ramp setpoint**" function block output.

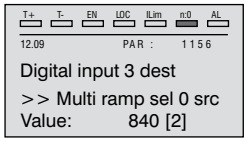
The output signal from the "**Ramp setpoint**" block is displayed in the **Ramp ref 1 mon** parameter (PAR: 620).

7.3.4 Multiple destination

Several functions can be assigned together to each input: to display which and how many functions have been assigned to each input, check the relative “**dest**” parameter to see whether there is a number shown in square brackets to the right of the number of the selected parameter (as shown in the figure below).



If there is a number, press the key to display the next source applied to the selected input.



8 - Troubleshooting

8.1 Alarms

Note ! To reset alarms, see **paragraph 6.6.1**.

In the following table, the Code is visible only from serial line.

Code	Error message shown on the display	Sub-code	Description
0	**No alarm**		**Condition:** No alarm present
1	**Overvoltage**		**Condition: DC link overvoltage alarm due to energy recovered from the motor.** The voltage arriving at the drive power section is too high compared to the maximum threshold relating to the PAR 560 **Mains voltage** parameter setting.
			Solution: - Extend the deceleration ramp. - Use a braking resistor between terminals BR1 and BR2 to dissipate the recovered energy - Use theVDC Control function
2	**Undervoltage**		**Condition:** DC link undervoltage alarm. The voltage arriving at the drive power section is too low compared to the minimum threshold relating to the 560 Mains voltage parameter setting due to:. - the mains voltage being too low or overextended voltage drops. - poor cable connections (e.g. loose contactor terminals, inductance, filter, etc.).
			Solution: Check the related connections of the drive power supply and its correct range.
3	**Ground fault**		**Condition:** Ground short circuit alarm
			Solution: - Check drive and motor wiring. - Check that the motor is not grounded.
4	**Overcurrent**		**Condition: Instantaneous overcurrent protection intervention alarm.** This may be due to the incorrect setting of current regulator parameters or a short circuit between phases or ground fault on the drive output.
			Solution: - Check the current regulator parameters - Check wiring towards the motor
5	**Desaturation**		**Condition: Instantaneous overcurrent in the IGBT bridge alarm.**
			Solution: Switch the drive off and then switch it on again. If the alarm persists, contact the technical service centre.
6	**MultiUndervolt**		**Condition:** The number of attempted automatic restarts after the **Undervoltage** alarm has exceeded the set **PAR 4650 UVRep attempts** value in the **PAR 4652 UVRep delay** time.
			Solution: Too many Undervoltage alarms. Adopt the proposed solutions for the Undervoltage alarm.
7	**MultiOvercurr**		**Condition:** 2 attempted automatic restarts after the Overcurrent alarm within 30 seconds. If more than 30 seconds pass after the Overcurrent alarm was generated, the attempt counter is reset.
			Solution: Too many Overcurrent alarms. Adopt the proposed solutions for the Overcurrent alarm.
8	**MultiDesat**		**Condition:** 2 attempted at automatic restarts after the Desaturation alarm within 30 seconds. If more than 30 seconds pass after the Desaturation alarm was generated, the attempt counter is reset.
			Solution: Too many **Desaturation** alarms. Adopt the proposed solutions for the **Desaturation** alarm.
9	**Heatsink OT**		**Condition:** Heatsink temperature too high alarm
			Solution: - Verify the correct operation of the cooling fan. - Check that the heatsinks are not clogged - Check that the openings for the cabinet cooling air are not blocked.
10	**HeatsinkS OTUT**		**Condition:** IGBT modules temperature too high or too low alarm

Code	Error message shown on the display	Sub-code	Description
		Solution: - Verify the correct operation of the cooling fan. - Check that the heatsinks are not clogged - Check that the openings for the cabinet cooling air are not blocked.	
11	**Intakeair OT**	**Solution:** **-** Check correct fan operation - Check that the heatsinks are not clogged - Check temperature in electrical panel.	
		Solution: Check correct fan operation	
12	**Motor OT**	**Condition:** Motor overtemperature alarm. Possible causes: - Load cycle too heavy - The motor is installed in a place where the ambient temperature is too high - If the motor is provided with a blower: the fan is not working - If the motor is not provided with a blower: the load is too high at slow speeds. Cooling the fan on the motor shaft is not sufficient for this load cycle. - The motor is used at less than the rated frequency, causing additional magnetic losses.	
		Solution: - Change the processing cycle. - Use a cooling fan to cool the motor.	
13	**Drive overload**	**Condition:** Drive overload alarm. The overload threshold of the accumulator of the I^2t drive thermal image has been exceeded.	
		Solution: Check that the size of the drive is suitable for the application.	
14	**Motor overload**	**Condition:** Motor overload alarm. The current absorbed during operation is greater than that specified on the motor data plate. The overload threshold of the accumulator of the I^2t motor thermal image has been exceeded.	
		Solution: - Reduce the motor load. - Increase the size of the motor.	
15	**Bres overload**	**Condition:** Braking resistor overload alarm. The current absorbed by the resistor is greater than the rated current. The overload threshold of the accumulator of the I^2t braking resistor thermal image has been exceeded.	
		Solution: Increase the Watt value of the braking resistor	
16	**Phase loss**	**Condition:** Power phase loss alarm.	
		Solution: Check the mains voltage and whether any protections upstream of the drive have been tripped.	
17	**Opt Bus fault**	**Condition:** Error in the configuration stage or communication error.	
		XXX0H-X	If the first digit to the left of "H" in the alarm sub-code is 0, the error regards a communication problem.
		XXXXH-X	If the first digit to the left of "H" in the alarm sub-code is other than 0, the error regards a configuration problem.
		Solution: For configuration errors, check the configuration of the bus communication, type of bus, baudrate, address, parameter setting. For communication errors verify wiring, resistance of terminations, interference immunity, timeout settings. For further details, please refer to the user guide for the specific bus.	
18	**Opt 1 IO fault**	**Condition:** Error in the communication between Regulation and I/O expansion card in slot 1	
		Solution: Check that it has been inserted correctly, see chapter 11.10.	
19	**Opt 2 IO fault**	**Condition:** Error in the communication between Regulation and I/O expansion card in slot 2 or 3	
		Solution: Check that it has been inserted correctly , see chapter 11.10.	
20	**Not Used 1**		
21	**External fault**	**Condition:** External alarm present. A digital input has been programmed as an external alarm, but the +24V voltage is not available on the terminal.	
		Solution: Check that the terminal screws are tight	
22	**Not Used 2**		
23	**Overspeed**	**Condition:** Motor overspeed alarm. The motor speed exceeds the limits set in the **PAR 4540 Overspeed threshold parameter.**	

Code	Error message shown on the display	Sub-code	Description
		Solution: - Limit the speed reference. - Check that the motor is not driven in overspeed during rotation.	
24	**Speed ref loss**	**Condition: Speed reference loss alarm** Occurs if the difference between the speed regulator reference and the actual motor speed is more than 100 rpm. This condition occurs because the drive is in the current limit condition. It is only available in the Flux Vect OL mode.	
		Solution: - Check the drive load conditions	
25	**Emg stop alarm**	**Condition:** Emergency stop alarm. The Stop key on the keypad was pressed with the PAR 1008 **Stop key mode** parameter set to **EmgStop&Alarm.** Active in remote control mode (PAR 1012=1) both by using "Terminals" command or "Digital" commands and, in local control mode (PAR 1012=0) by using "Terminals" command.	
		Solution: Eliminate the reason for which the Stop key on the keypad was pressed and reset the drive.	
26	**Power down**	**Condition:** The drive was enabled with no supply voltage at the power section.	
		Solution: Emergency stop alarm. The Stop key on the keypad was pressed with the **Stop key mode** parameter set to **EmgStop&Alarm** in case of Remote->Terminal Strip or Remote->Digital or Local->Terminal Strip mode.	
27	**Broken belt**	**Condition:** Occurs if torque required from motor falls below a programmed threshold (PAR 7702) and if speed exceeds a programmed threshold (PAR 7706).	
		Solution: Check system mechanics.	
28	**End curve**	**Condition:** The value of the feedback signal (for example, pressure transducer) is below the reference value and rotation speed is higher than the threshold set in parameter 7712. The alarm is generated if this condition persists for a time equal to the value set in parameter 7714	
		Solution: • Check configuration of parameters on menu 26.11. • Check for system leakages. • Check the feedback sensor.	
29 **30**	**Dry pump** **No flow**	**Condition:** The value of delivered power (parameter 7752) is below the limits defined by the minimum power curve.	
		Solution: • Check configuration of parameters on menu 26.11. • Check for system leakages.	
31	**Clean alarm**	**Condition:** If cleaning cycles are performed too frequently, there may be a problem with the pump that requires the attention of an operator. In that case a specific alarm is generated. Only cleaning cycles that start following an external event (digital signal) or analog measurement are considered for this alarm.	
		Solution: Check the system.	
32	**Not Used 6**		
33 ... **40**	**Plc1 fault** **...** **Plc8 fault**	**Condition:** Enabled application developed in the IEC 61131-3 environment has found the conditions for generating this specific alarm to be true. The meaning of the alarm depends on the type of application. For more information, refer to the documentation concerning the specific application..	
		XXXXH-X	The XXXXH-X code indicates the reason for the error: make a note of this to discuss it with the service centre.
		Solution: Refer to the documentation concerning the enabled application.	

Code	Error message shown on the display	Sub-code	Description
52 **53** **54** **55**	**Analog 1 Err** **Analog 2 Err** **Analog 3 Err** **Analog 4 Err**		**Condition:** If an analog measurement is out of the allowed range an "Analog X err" alarm is generated. This control is only possible for 4-20 mA, PT100, PT1000, NI1000 probes. For temperature probes both short-circuits and power loss on the cable are detected. For 4-20 mA probes only power loss on the cable is detected. Analog 1 Err = Error on analog channel 1 Analog 2 Err = Error on analog channel 2 Analog 3 Err = Error on analog channel 1 of expansion card Analog 4 Err = Error on analog channel 2 of expansion card
			Solution: Check connections.

8.2 Messages

Note ! For more information see **chapter 6.7**.

Index	Error message shown on the display	Sub-code	Description
1	**Load default param**		**Condition:** may occur during loading of the parameter database saved in flash normally appears in the following conditions: at initial power-on when a new firmware version is downloaded, when the regulation is installed on a new size, when the region is changed. If this message is displayed when the drive is already operating, this means that a problem has occurred in the parameter database saved in Flash. If this message is displayed the drive restores the default database, i.e. the one downloaded.
		0001H-1	The database saved is not valid
		0002H-2	The database saved is not compatible
		0003H-3	The database saved refers to a different size from the current size
		0004H-4	The database saved refers to a different region from the current region
		Solution:	Set the parameters to the value required and perform **Save parameter**
2 3 4	**Option detect slot 1** **Option detect slot 2** **Option detect slot 3**		**Condition:** at power-on, the drive recognizes the presence of an optional card in one of the three expansion slots. One of the three messages is shown on the display
		0H-0	None
		0004H-4	Can/DeviceNet
		00FFH-255	Unknown
		0104H-260	Profibus
		0204H-516	Rte
		0301H-769	I_O_1
		0701H-1793	I_O_2
		0901H-2305	I_O_3
		0D01H-3329	I_O_4
		1601H-5633	I_O_6 (EXP-IO-SENS-100-ADV)
		1901H-6401	I_O_7 (EXP-IO-D5R8-ADV)
		1E01H-7681	I_O_8 (EXP-IO-SENS-1000-ADV)
		Solution:	
5	**Autotune**	**Condition:**	this may occur during the **Autotune** procedure
		0	No error
		1	The commands are not configured in Local mode.
			Solution: Execute the requested configuration
		2	The Commands local sel parameter has not been configured from the keypad
			Solution: Execute the requested configuration
		3	The motor plate data parameters have changed but the **Take parameters** command, PAR 2020, has not been executed
			Solution: Execute the **Take parameters** command.

Index	Error message shown on the display	Sub-code	Description
		4	Error in motor connection.
			Solution:Check the motor connection, set the value of the direct current of the motor to 1/3 and perform the motor autotune procedure. Then increase the direct current until autotuning is executed. The penultimate value is the nominal current value at which the drive performs autotuning.
		5	While running self-tuning the ESC key was pressed or the enable contact was opened or an alarm occurred. The **Autotune** command was sent with the drive in the alarm condition
			Solution: Eliminate the reason for the alarm, remove the reason for the opening of the enable contact, reset alarms.
		6	A setting performed by the **Autotune** function produced a parameter value outside the min or max range.
			Solution: Check the motor plate data or drive and motor sizes have been combined incorrectly.
		7	The **Autotune** command was sent without being enabled.
			Solution: Close the enable contact before sending the **Autotune** command
		8	Internal calculation error concerning IGBT control
			Solution: Perform autotuning once more, if the problem persists, contact the WEG technical support centre.
		9	The drive has measured a stator resistance value exceeding the set limit.
			Solution: contact the WEG technical support centre.
		10	The drive has measured a stator resistance value below the set limit.
			Solution: contact the WEG technical support centre.
		11-12	Measurement of DTL internal compensation voltage outside accepted range.
			Solution: check connection between drive and motor. If correct, the drive is faulty, contact the WEG technical support centre.
		13-14	Measurement of DTS internal voltage outside accepted range.
			Solution: check connection between drive and motor. If correct, the drive is faulty, contact the WEG technical support centre.
		15 - 16 -17	LS leakage inductance value outside accepted range.
			Solution: Perform autotuning once more, if the problem persists, contact the WEG technical support centre.
		18-19	Measurement of Im magnetising current outside accepted range.
			Solution: Perform autotuning once more, if the problem persists, contact the WEG technical support centre.
		20-21	Measurement of Rr rotor resistor outside accepted range.
			Solution: Perform autotuning once more, if the problem persists, contact the WEG technical support centre.
		Solution: If the message appears with a value other than 0, follow the instructions supplied for each particular case and repeat **Autotune**. This should be performed using the wizard function available from the keypad (STARTUP WIZARD) and the Tool software on the PC. Pay attention to all motor plate data parmaeters, especially: - **Rated speed**, **Motor rated speed** in rpm. - **Rated frequency**, **Motor rated frequency** in Hz - **Pole pairs**, **Motor pole pairs** Take care not to set the **Rated speed** parameter to the synchronous speed. The value of the **Rated speed** parameter must be less than: [(**Rated frequency** * 60) / **Pole pairs**]. If the problem persists even after following the instructions supplied, confirm the values of the motor plate data parameters, execute the **Take parameters** command but not **Autotune**..	
6	**Power config**	**Condition:** may occur during recognition of power cards. If this message is displayed, it is not possible to drive the motor.	
		0020H-32	The power card is configured for a drive that is incompatible with the regulation card
		0021H-33	The configuration of the power card is not compatible with the regulation card

Index	Error message shown on the display	Sub-code	Description
		0017H-23	The configuration required is not available on the power card
		Solution: Download the correct configuration on the power card	
7	**Save par failed**	**Condition:** during transfer of the parameters from the drive to the memory of the keypad	
		0H-0	Communication error
		0025H-37	The data saved on the keypad are not valid
		0026H-38	Incompatible drive series
		0027H-39	Incompatible software version
		0028H-40	Incompatible drive size
		0029H-41	Error during saving of parameters on the drive
		Solution:	
8	**Load par failed**	**Condition:** during transfer of the parameters from the memory of the keypad to the drive	
9	**Load par incomplete**	**0H-0**	Communication error
		0025H-37	The data saved on the keypad are not valid. No parameter is transferred from the keypad to the drive
		0026H-38	Incompatible control type. No parameter is transferred from the keypad to the drive
		0027H-39	Incompatible software version. All the parameters present in the memory of the keypad have been transferred to the drive. The set of parameters transferred refers to a drive with a different firmware version; therefore, certain parameters may not be updated.
		0028H-40	Incompatible control type. All the parameters present in the memory of the keypad (excluding those that depend on the size of the drive), have been transferred to the drive. The parameters that depend on size maintain their original value.
		0029H-41	Error during saving of parameters on the drive. All the parameters present in the memory of the keypad have been transferred to the drive. The transfer of one or more parameters has caused an “out of range” error, or one or more parameters does not exist. At the end of transfer, one or more parameters may not have been updated.
		002AH-42	PLC application release and version not compatible. All parameters in the keypad memory have been transferred to the drive. The transferred set of parameters relates to a drive with a PLC application in which the version and release of the application are different. As a result some of the PLC application parameters may not be updated.
		002BH-43	PLC application not compatible. All the parameters in the keypad memory except those relating to the PLC applciation have been transferred to the drive. The transferred set of parameters relates to a drive with a different PLC application. As a result none of the PLC application parameters are updated.
		Solution: Recover a set of parameters from a compatible drive (model and size)	
10	**Options config error**	**Condition:** may occur at drive start-up, during recognition of the optional cards installed	
		0001H-1	Non-permissible optional card in slot 1
		0002H-2	Non-permissible optional card in slot 2
		0004H-4	Non-permissible optional card in slot 3
		0010H-16	Conflict slot 1 with slot 2
		0020H-32	Conflict slot 1 with slot 3
		0040H-64	Conflict slot 2 with slot 3
		Solution: Remove the optional cards from the incorrect slots and insert them in the correct slots	
11	**Load def plc**	**Condition:** may occur during loading of the parameter database saved in the Flash of the Mdplc application Normally appears at initial power-on after downloading a new application. If this message is displayed when the drive is already operating, this means that a problem has occurred in the parameter database saved in Flash. If this message appears the drive restores the default database, i.e. the one that was downloaded.	

Index	Error message shown on the display	Sub-code	Description
		0001H-1	The database saved is not valid
		Solution: Set the parameters to the value required and perform **Save parameter**	
12	**Plc cfg error**	**Condition:** may occur during loading of the Mdplc application The Mdplc application present on the drive is not run.	
		0004H-4	The application downloaded has a different Crc on DataBlock and Function table
		0065H-101	The application downloaded has an invalid identifier (Info)
		0066H-102	The application downloaded has an incorrect task number (Info)
		0067H-103	The application downloaded has an incorrect software configuration
		0068H-104	The application downloaded has a different Crc on DataBlock and Function table
		0069H-105	A Trap error or System error has occurred. The drive automatically performs a Power-up operation. The application is not run. See in Alarm List for further information regarding the error occurred
		006AH-106	The application downloaded has an incorrect identifier (Task)
		006BH-107	The application downloaded has an incorrect task number (Task)
		006CH-108	The application downloaded has an incorrect Crc (Tables + Code)
		Solution: Remove the Mdplc application or download a correct Mdplc application	
13 **14** **15** **16**	**Plc 1** **Plc 2** **Plc 3** **Plc 4**	Reserved messages and dedicated to the PLC application. See the application manual.	
17	**Option bus fault**	**Condition:** this may occur when the drive is turned on, during fieldbus card setup. Error during configuration or communication error.	
		XXX0H-X	If the first digit to the left of "H" in the alarm sub-code is 0, the error regards a communication problem.
		XXX0H-X	If the first digit to the left of "H" in the alarm sub-code is other than 0, the error regards a configuration problem.
		Solution: For configuration errors, check the configuration of the bus communication, type of bus, baudrate, address, parameter setting. For communication errors, check wiring, termination resistors, disturbance immunity, timeout settings. For further details, please refer to the user guide for the specific bus.	
18	**Key failed**	**Condition**: this may occur when powering the drive, if the incorrect enable key is inserted for a given firmware function.	
		0001H-1	Incorrect PLC key. PLC application not available.
		Solution: Ask WEG to supply the correct key to enable the desired firmware function.	
19	**Key expiring**	**Condition:** this may occur at drive power-on if the incorrect enabling key was inserted for a given firmware function. At this stage the firmware function can still be used freely, but this time limit is about to expire.	
		xxxxH-x	Number of hours for which the function can still be used freely.
		Solution: Ask WEG for the correct key to enable the desired firmware function.	
20	**Param error**	**Condition**: if an error occurs during activation of the parameter database saved in flash; the alarm is inserted in the alarm list and alarm log.	
		XXX0H-X	The code XXXXH-X indicates the IPA of the parameter that has been set outside the range allowed when the database is enabled.
		Solution: Set the parameter causing the error to a value within the range and run **Save parameters**. Switch the drive off and then switch it back on again. If the IPA of the parameter is not shown in the manual, contact the service centre.	
21			
22	**Options cfg changed**	**Condition**: this may occur when powering the drive if an expansion card has been removed or replaced or the incorrect enable key is inserted for a given firmware function.	
		0064H-100	Card removed from slot 1
		0014H-20	Card removed from slot 2
		0003H-3	Card removed from slot 3
		0078H-120	Card removed from slot 1 and from slot 2
		0067H-103	Card removed from slot 1 and from slot 3
		0017H-23	Card removed from slot 2 and from slot 3
		007BH-123	Card removed from slot 1, from slot 2 and from slot 3
		Solution: Check the hardware configuration, then press ESC. Save the parameters (**Save parameters**, menu 04.01 par 550) to save the new hardware configuration.	

9.1 Environmental Conditions

Installation location	Pollution degree 2 or lower (free from direct sunligth, vibration, dust, corrosive or inflammable gases, fog, vapour oil and dripped water, avoid saline environment)
Installation altitude	Up to 1000m (3280 feet) above sea level without derating.
	Over 1000m and up to 4000m (13123 feet): see section 9.6.1 Derating factors.
Mechanical conditions for installation	Vibrational stress: EN 60721-3-3 Class 3M1
Operating temperature	-10…+40°C (32°…104°F)
Operating temperature (1)	+40 ... +50°C with derating, (+104 … +122°F with derating)
Air humidity (operating)	from 5 % to 85 % and from 1 g/m^3 to 25 g/m^3 without moisture condensation or icing (class 3K3 as per EN 60721-3-3)
Air pressure (operating) [kPa]	86 to 106 (class 3K3 as per EN 60721-3-3)

(1) In menu 4 - DRIVE CONFIG set the Ambient temperature parameter, PAR 564, to 1 (50°C). 10 % derating of output current.

Attention

The drive is suitable for use under the environmental service conditions (climate, mechanical, pollution, etc.) defined as usual service conditions according to EN61800-2.

9.2 Standards

Directive EC	LVD 2014/35/EU, EMC 2014/30/EU, RoHs 2011/65/EU
Electrical safety	EN 61800-5-1, UL508C, UL840 degree of pollution 2, Overvoltage category 3.
Operating safety	(for ADV200...+SI series) IEC EN 61800-5-2 , SIL 3 ; ISO EN 13849-1 , PL "e"
EMC compatibility	EN61800-3 (EMC conducted: immunity and emissions)
	With std integrated filters (excluded ADV200 SP-...-DC):
	Immunity: environment 2
	Conducted emission: environment 2, category C3 and motor cable lenght 20 mt (up to 50 mt for sizes 5 and higher)
	Radiated emission: determined by cabinet of final application
	With external optional filters (see ch. 10.7):
	Immunity: environment 1 or 2
	Conducted emission: sizes 1007...4450 (environment 1, cat. C2 and motor cable lenght 30 mt), sizes 5550 ... 73551 (environment 2, cat. C3 and motor cable lenght 100 mt),
	Radiated emission: determined by cabinet of final application
Overvoltage category on the AC side	III according to EN61800-5-1 (between the L1, L2 and L3 power terminals and ground)
Overvoltage category on the DC side	II according to EN62109-1 (between the C and D power terminals and ground)
Protection degree	IP20 (IP54 ADV200 SP-EH models), ≥ size 7: IP00
Approvals	CE, UL, cULus

9.3 Accuracy (Asyncronous)

9.3.1 Current control

Type	Flux vector OL (Open Loop Field Oriented Control)
Loop sampling time	125μs
Response time	600 - 1600μs
PWM frequency	2, 4, 6, 8, 10, 12 kHz (size dependent)

9.3.2 Speed control

Type	Flux vector OL (Open Loop Field Oriented Control)
Loop sampling time	125μs
Response time	5 - 10ms
Speed measurement	FP, F mode
Speed regulation accuracy	Flux vector OL : ± 30 % rated slip V/F : ± 60 % rated slip.

9.3.3 Speed control limits

Control range (1)	± 32000 rpm
Speed format (1)	32 bit
Frequency range	± 2000 Hz

(1) referred to Full scale speed, PAR:680.

Sizes	Max frequency		Min frequency	
	Flux vector OL	VF	Flux vector OL	VF
1015 ... 72500	150 Hz	500 Hz	0.5 Hz	1 Hz
73150 ... 1800 kW	150 Hz	200 Hz		

9.3.4 Torque control

Torque resolution (2)	> 0.1 %
Direct torque control	yes
Current limitation	Limits ±, Limits mot/gen, Limits variable

(2) referred to rated torque

9.3.5 Overload

Heavy duty (HD)	150% 60 sec each 300 sec, 180% 0,5 sec each 300 sec.
Light duty (LD)	110% 60 sec each 300 sec.

9.4 DC circuit

Overvoltage threshold (Overvoltage)	820V$_{DC}$
Undervoltage threshold (Undervoltage)	390V$_{DC}$ (@400V$_{DC}$) 470V$_{DC}$ (@480V$_{DC}$)

9.5 Input electrical data

9.5.1 AC power supply

AC Input voltage, U_{LN} 3 ph 380V_{AC} -15% ... 480V_{AC} +10%

Types of networks IT, TN and TT (with the possible adoption of EMI filters external to the drive)

AC Input frequency 50/60 Hz, ± 5%

Choke integrated (DC) up to size 61320

Total harmonic distortion (THD) 40% Light duty, 50% Heavy duty (at nominal current)

Sizes ADV200 SP	ADV200 SP-...-4 versions (Motor cos phi 0.9 @ 400V_{AC})	
	AC Input current	
	Heavy duty (Arms)	Light duty (Arms)
1015	2.1	**3.7**
1022	3.7	**4.9**
1030	4.9	**6.5**
1040	6.5	**8.1**
1055	8.1	**11.1**
2075	11.1	**14.0**
2110	14.0	**19.6**
2150	19.6	**26.4**
3185	26.4	**32.3**
3220	32.3	**39**
3300	39	**53**
4370	53	**64**
4450	64	**74**
4550	74	**89**
5750	100	**143**
5900	143	**171**
51100	171	**200**
61320	200	**238**
61600	238	**285**

Sizes ADV200 SP	ADV200 SP-...-4 versions (Motor cos phi 0.9 @ 400V_{AC})	
	AC Input current	
	Heavy duty (Arms)	Light duty (Arms)
72000	300	**350**
72500	350	**420**
73150	420	**580**
73550	580	**640**
74000	640	**710**
500 kW	665	**800**
630 kW	800	**1100**
710 kW	1100	**1215**
800 kW	1215	**1350**
1000 kW	1650	**1800**
1200 kW	1800	**2020**
1500 kW	2210	**2460**
1800 kW	2780	**3080**

9.5.2 DC power supply

DC voltage supply (from photovoltaic panels) 350V_{DC} - 750V_{DC} operational, 800V_{DC} maximum (only configurations where the positive and negative poles of the PV panels are insulated from the ground are allowed).

Sizes ADV200 SP	ADV200 SP-...-4 versions (Motor cos phi 0.9 @ 400V_{AC})	
	DC Input current	
	Heavy duty (Arms)	Light duty (Arms)
1015	3	**4.7**
1022	5	**6.2**
1030	6	**8.1**
1040	8	**10**
1055	10	**14**
2075	14	**18**
2110	18	**25**
2150	25	**33**
3185	33	**40**
3220	39	**48**
3300	48	**65**
4370	65	**80**
4450	80	**90**
4550	90	**125**
5750	125	**175**
5900	175	**210**
51100	210	**240**
61320	240	**290**
61600	290	**350**

Sizes ADV200 SP	ADV200 SP-...-4 versions (Motor cos phi 0.9 @ 400V_{AC})	
	DC Input current	
	Heavy duty (Arms)	Light duty (Arms)
72000	370	**430**
72500	430	**510**
73150	510	**710**
73550	710	**780**
74000	780	**850**
500 kW	2 x 430	**2 x 510**
630 kW	2 x 510	**2 x 710**
710 kW	2 x 710	**2 x 780**
800 kW	2 x 780	**2 x 850**
1000 kW	3 x 710	**3 x 780**
1200 kW	3 x 780	**3 x 850**
1500 kW	4 x 710	**4 x 780**
1800 kW	5 x 710	**5 x 780**

9.6 Output electrical data

U2 Max output voltage _____ 0,94 x U_{LN} (U_{LN} = AC Input voltage)

f2 Max output frequency _____ 500 Hz (Sizes 1015 ... 61600)
see section 9.3.3 for more details.

Braking IGBT Unit _____ KBX models: standard internal with external resistor,
KXX: not included;
braking torque 150 % MAX

Maximum voltage imbalance _____ 400Vrms, 565V_{PK}

Note! In the event of insulation loss, the drive must be immediately disabled and disconnected from power sources.

Sizes ADV200 SP	Inverter Output		P_N mot (Recommended asynchronous motor output)			
	Heavy duty	Light duty	Heavy duty		Light duty	
	(kVA)	(kVA)	@400V_{AC} (kW)	@460V_{AC} (Hp)	@400V_{AC} (kW)	@460V_{AC} (Hp)
1015	1.7	**3.0**	0.75	1	**1.5**	**2**
1022	3.0	**4.0**	1.5	2	**2.2**	**3**
1030	4.0	**5.3**	2.2	3	**3**	**5**
1040	5.3	**6.6**	3.0	5	**4**	**5**
1055	6.6	**9**	4.0	5	**5.5**	**7.5**
2075	9	**11.4**	5.5	7.5	**7.5**	**10**
2110	11.4	**15.9**	7.5	10	**11**	**15**
2150	15.9	**21.5**	11	15	**15**	**20**
3185	21.5	**26.3**	15	20	**18.5**	**25**
3220	26.3	**32**	18.5	25	**22**	**30**
3300	32	**43**	22	30	**30**	**40**
4370	43	**52**	30	40	**37**	**50**
4450	52	**60**	37	50	**45**	**60**
4550	60	**73**	45	60	**55**	**75**
5750	73	**104**	55	75	**75**	**100**
5900	104	**125**	75	100	**90**	**125**
51100	125	**145**	90	125	**110**	**150**
61320	145	**173**	110	150	**132**	**175**
61600	173	**208**	132	175	**160**	**200**
72000	208	**267**	160	200	**200**	**250**
72500	267	**319**	200	250	**250**	**300**
73150	319	**409**	250	300	**315**	**400**
73550	409	**450**	315	400	**355**	**450**
74000	450	**506**	355	450	**400**	**500**
500 kW	506	**603**	400	500	**500**	**650**
630 kW	603	**776**	500	650	**630**	**850**
710 kW	776	**852**	630	850	**710**	**950**
800 kW	852	**956**	710	950	**800**	**1100**
1000 kW	1108	**1247**	900	1200	**1000**	**1300**
1200 kW	1247	**1420**	1000	1300	**1200**	**1600**
1500 kW	1566	**1760**	1350	1800	**1500**	**2000**
1800 kW	1919	**2148**	1650	2200	**1800**	**2500**

Sizes ADV200 SP	I_N Rated output current (For Asynchronous motors)			
	@U_{LN}=400V_{AC}		@U_{LN}=460V_{AC}	
	Heavy duty (A)	Light duty (A)	Heavy duty (A)	Light duty (A)
1015	2.5	**4.3**	2.3	**3.9**
1022	4.3	**5.8**	3.9	**5.2**
1030	5.8	**7.6**	5.2	**6.8**
1040	7.6	**9.5**	6.8	**8.6**

Sizes ADV200 SP	In Rated output current (For Asynchronous motors)			
	@ULN=400VAC		@ULN=460VAC	
	Heavy duty (A)	Light duty (A)	Heavy duty (A)	Light duty (A)
1055	9.5	**13**	8.6	**11.7**
2075	13	**16.5**	11.7	**14.9**
2110	16.5	**23**	14.9	**20.7**
2150	23	**31**	20.7	**27.9**
3185	31	**38**	27.9	**34.2**
3220	38	**46**	34.2	**41.4**
3300	46	**62**	41.4	**55.8**
4370	62	**75**	55.8	**67.5**
4450	75	**87**	67.5	**78.3**
4550	87	**105**	78	**94.5**
5750	105	**150**	94.5	**135**
5900	150	**180**	135	**162**
51100	180	**210**	162	**189**
61320	210	**250**	189	**225**
61600	250	**300**	225	**270**
72000	300	**385**	270	**347**
72500	385	**460**	347	**414**
73150	460	**590**	414	**531**
73550	590	**650**	531	**585**
74000	650	**730**	585	**657**
500 kW	730	**870**	657	**783**
630 kW	870	**1120**	783	**1008**
710 kW	1120	**1230**	1008	**1107**
800 kW	1230	**1380**	1107	**1242**
1000 kW	1600	**1800**	1440	**1620**
1200 kW	1800	**2050**	1620	**1845**
1500 kW	2260	**2540**	2034	**2286**
1800 kW	2770	**3100**	2493	**2790**

Sizes ADV200 SP-DC	In Rated output current (For Asynchronous motors)			
	@540VDC Heavy duty (A)	@540VDC Light duty (A)	@650VDC Heavy duty (A)	@650VDC Light duty (A)
3220	38	46	34.2	41.4
3300	46	62	41.4	55.8
4370	62	75	55.8	67.5
4450	75	87	67.5	78.3
4550	87	105	78	94.5
5750	105	150	94.5	135
5900	150	180	135	162
51100	180	210	162	189
61320	210	250	189	225
61600	250	300	225	270
72000	300	385	270	347
72500	385	460	347	414
73150	460	590	414	531
73550	590	650	531	585
74000	650	730	585	657
500 kW	730	870	657	783
630 kW	870	1120	783	1008
710 kW	1120	1230	1008	1107
800 kW	1230	1380	1107	1242
1000 kW	1600	1800	1440	1620

Sizes ADV200 SP-DC	In Rated output current (For Asynchronous motors)			
	@540VDC Heavy duty (A)	@540VDC Light duty (A)	@650VDC Heavy duty (A)	@650VDC Light duty (A)
1200 kW	1800	2050	1620	1845
1500 kW	2260	**2540**	2034	**2286**
1800 kW	2770	**3100**	2493	**2790**

9.6.1 Output current derating factors

The derating factors shown below are applied to the rated DC output by the user. They are not automatically implemented by the drive.

Output current derating factors

IDRIVE = IN x KV1 x KT x KALT x KF

K_{V1}[(1)]: Derating factor for mains voltage from 460VAC to 480VAC and power supply from AFE200.

K_T[(2)]: Derating factor for 50°C ambient temperature (1 % each °C above 40°C)

K_{ALT}[(3)]: Derating factor for installation at altitudes above 1000 meters a.s.l.. Value to be applied at each 100 m increase above 1000 m (up to a maximum of 4000 m).

I.e.: Altitude 2000 m, K_{ALT} = 1.2 *10 = 12% di derating; IN derated = 100 - ((12*100)/100) = 88 % IN

K_F[(4)]: Derating factor for higher switching frequency

Caution

If not all of the derating factors are considered, this could result in a drive overtemperature condition.

The specific alarm indicates this condition and normal drive operation is stopped.

Sizes	Derating factor KV1 (1)						
	@ULN=400VAC			@ULN=460...480VAC			
	Tamb = 40°C	from AFE200		Tamb ≤ 30°C	Tamb = 40°C	from AFE200	
		Tamb ≤ 30°C	Tamb 31 ... 40°C			Tamb ≤ 30°C	Tamb 3 1 ... 40°C
1015 ... 1.8MW	1	1	0.9	1	0.9	0.9	0.81

Sizes	fsw Switching frequency		Derating factor						
	Default	Higher	KT (2)	KALT (3)	KF (4) 2 kHz	4 kHz	6 kHz	8 kHz	10 kHz	12 Hz
1015	8	10, 12	0.9	1.2	1	1	1	1	0.85	0.7
1022	8	10, 12	0.9	1.2	1	1	1	1	0.85	0.7
1030	4	6, 8, 10, 12	0.9	1.2	1	1	0.85	0.7	0.55	0.4
1040	4	6, 8, 10, 12	0.9	1.2	1	1	0.85	0.7	0.55	0.4
1055	4	6, 8, 10, 12	0.9	1.2	1	1	0.85	0.7	0.6	0.5
2075	4	6, 8, 10, 12	0.9	1.2	1	1	0.85	0.7	0.6	0.5
2110	4	6, 8, 10, 12	0.9	1.2	1	1	0.85	0.7	0.6	0.5
2150	4	6, 8, 10, 12	0.9	1.2	1	1	0.85	0.7	0.6	0.5
3185	4	6, 8, 10, 12	0.9	1.2	1	1	0.85	0.7	0.6	0.5
3220	4	6, 8, 10, 12	0.9	1.2	1	1	0.85	0.7	0.6	0.5
3300	4	6, 8, 10, 12	0.9	1.2	1	1	0.85	0.7	0.6	0.5
4370	4	6, 8, 10, 12	0.9	1.2	1	1	0.85	0.7	0.6	0.5
4450	4	6, 8, 10, 12	0.9	1.2	1	1	0.85	0.7	0.6	0.5
4550	4	6, 8	0.9	1.2	1	1	0.85	0.7	0	0
5750	4	6, 8	0.9	1.2	1	1	0.85	0.7	0	0
5900	4	6, 8	0.9	1.2	1	1	0.85	0.7	0	0
51100	4	6, 8	0.9	1.2	1	1	0.85	0.7	0	0
61320	4	6, 8	0.9	1.2	1	1	0.85	0.7	0	0
61600	4	6, 8	0.9	1.2	1	1	0.85	0.7	0	0
72000	4	-	0.9	1.2	1	1	0	0	0	0

Sizes	fsw Switching frequency		Derating factor							
	Default	Higher	K_T (2)	K_{ALT} (3)	K_F (4)					
					2 kHz	4 kHz	6 kHz	8 kHz	10 kHz	12 Hz
72500	4	-	0.9	1.2	1	1	0	0	0	0
73150	2	4	0.9	1.2	1	0.85	0	0	0	0
73550	2	-	0.9	1.2	1	0	0	0	0	0
74000	2	-	0.9	1.2	1	0	0	0	0	0
500 kW	4 (5)	-	0.9	1.2	1	1 (5)	0	0	0	0
630 kW	2	4 (5)	0.9	1.2	1	0.85 (5)	0	0	0	0
710 kW	2	-	0.9	1.2	1	0	0	0	0	0
800 kW	2	-	0.9	1.2	1	0	0	0	0	0
1000 kW	2	-	0.9	1.2	1	0	0	0	0	0
1200 kW	2	-	0.9	1.2	1	0	0	0	0	0
1500 kW	2	-	0.9	1.2	1	0	0	0	0	0
1800 kW	2	-	0.9	1.2	1	0	0	0	0	0

Note!

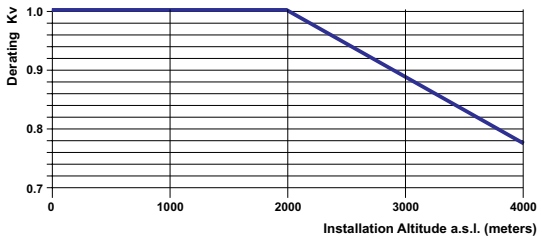
In Light Duty mode the switching frequency is set at 4 kHz for sizes up to 72500 plus size 500kW (setting to 2kHz is possible), and is fixed at 2kHz for sizes 73150 up to 1.8MW (500kW excluded). If, in the Heavy duty mode, the factory setting of **Switching freq mode** (PAR: 568) is changed from 0=Fixed to 1=Variable, the switching frequency is controlled by the temperature of the drive heat sink and the output frequency. For further information see the Functions and Parameters manual, menu 4.9.

Installation altitude above sea level	K_T Output Current derating factor at Ambient Temperature of:						
	20°C	25°C	30°C	35°C	40°C	45°C	50°C
0 … 1000 m	1					0.95	0.90

Input voltage derating factor

K_{V2} (6) : Derating factor of the input voltage based on altitudes

Figure 9.6.1: K_{V2} derating factor based on altitudes



Installation altitude	K_{V2} Derating factor (6)					
	Mains voltage [V]					
m (s.l.m.)	380VAC	400VAC	415VAC	440VAC	460VAC	480VAC
≤ 2000	100%	100%	100%	100%	100%	100%
≤ 2250	100%	100%	100%	100%	100%	97%
≤ 2500	100%	100%	100%	100%	98%	94%
≤ 2750	100%	100%	100%	100%	96%	92%
≤ 3000	100%	100%	100%	97%	93%	89%
≤ 3250	100%	100%	99%	94%	90%	86%
≤ 3500	100%	100%	96%	91%	87%	83%
≤ 3750	100%	96%	93%	88%	84%	80%
≤ 4000	98%	93%	90%	85%	81%	78%

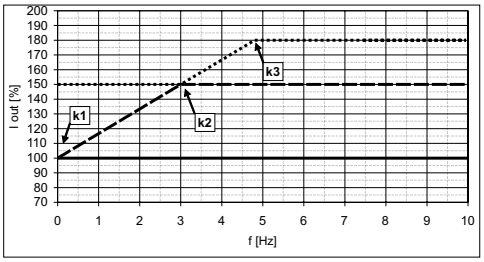
Caution

If the voltage derating factor is not considered, may occour a drive breakdown.

9.6.2 Overload for output frequency

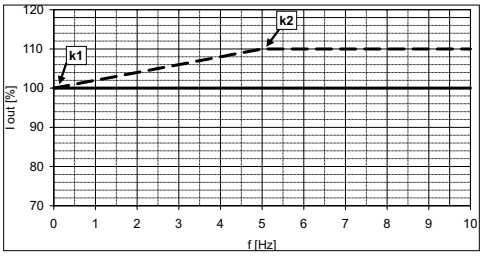
Sizes	For Asynchronous motors				
	Heavy duty			Light duty	
	K1 SP [%]	K2 SP [Hz]	K3 SP [Hz]	K1 SL [%]	K2 SL [Hz]
1015	100	3	4.8	**100**	**3**
1022	100	3	4.8	**75**	**3**
1030	100	3	4.8	**75**	**3**
1040	100	3	4.8	**80**	**3**
1055	100	3	4.8	**100**	**3**
2075	100	3	4.8	**100**	**3**
2110	100	3	4.8	**75**	**3**
2150	100	3	4.8	**75**	**5**
3185	100	5	8	**75**	**7**
3220	100	5	8	**85**	**5**
3300	100	3	4.8	**80**	**5**
4370	100	3	4.8	**80**	**3**
4450	100	3	4.8	**80**	**3**
4550	100	3	4.8	**80**	**3**
5750	100	3	4.8	**85**	**5**
5900	100	5	8	**85**	**5**
51100	100	5	8	**85**	**5**
61320	100	3	4.8	**100**	**3**
61600	100	3	4.8	**100**	**3**
72000	100	3	4,8	**80**	**3**
72500	100	3	4,8	**100**	**3**
73150	100	3	4,8	**75**	**5**
73550	100	3	4,8	**100**	**3**
74000	90	5	7,5	**90**	**5**
500 kW	100	3	4,8	**100**	**3**
630 kW	100	3	4,8	**75**	**5**
710 kW	100	3	4,8	**100**	**3**
800 kW	90	5	7,5	**90**	**5**
1000 kW	100	3	4,8	**100**	**3**
1200 kW	90	5	7,5	**90**	**5**
1500 kW	100	3	4,8	**100**	**3**
1800 kW	100	3	4,8	**100**	**3**

Figure 9.6.2.1: HD Overload (For Asynchronous motors)



_ _ Islow, ... Ifast; __ In

Figure 9.6.2.2: LD Overload (For Asynchronous motors)



_ _ Islow, __ In

9.7 Voltage level of the inverter for safe operations

The minimum time between the moment in which an ADV200 SP drive is disabled from the mains and that in which an operator can operate on internal parts of the drive, without the danger of electric shock**, is 5 minutes.**

Attention

The value consider the time to turn-off for a drive supplied at 460Vac +10%, without any options (time indicated for disabled drive condition).

9.8 Cooling

All the Drives have internal fans.

Sizes		Dissipated power	**Dissipated power (ADV200 SP-EH models)**	Airflow of fan	
		(W)	(W)	Heatsink (m^3/h)	Internal (m^3/h)
1015		60	-	32	26
1022		90	-	32	32
1030		100	-	32	32
1040		120	-	32	32
1055		160	-	32	32
2075		200	-	32	32
2110		250	107.5	56 x 2	32
2150		300	118	56 x 2	32
3185		380	130	80 x 2	32
3220		460	-	80 x 2	32
3300		600	151	80 x 2	32
4370		900	218	2 x 250	2 x 50
4450		1000	235	2 x 250	2 x 50
4550		1290	255	2 x 250	2 x 50
5750		1760	293	2 x 285	1 x 170
5900		2150	430	2 x 355	2 x 170
51100		2400	520	2 x 355	2 x 170
61320		2850	-	3 x 310	2 x 170
61600		3600	-	3 x 310	2 x 170
72000		3900	-	1500	-
72500		4000	-	1500	-
73150		5200	-	1500	-
73550		6000	-	2000	-
74000		6500	-	2000	-
500 kW	ADV200-SP-72500-KXX-4-MS 05	3900	-	1500	-
	ADV200-SP-72500-XXX-4-SL	3900	-	1500	-
630 kW	ADV200-SP-73150-KXX-4-MS 06	5200	-	1500	-
	ADV200-SP-73150-XXX-4-SL	5200	-	1500	-
710 kW	ADV200-SP-73550-KXX-4-MS 07	6000	-	2000	-
	ADV200-SP-73550-XXX-4-SL	6000	-	2000	-
800 kW	ADV200-SP-74000-KXX-4-MS 08	6500	-	2000	-
	ADV200-SP-74000-XXX-4-SL	6500	-	2000	-
1 MW	ADV200-SP-73550-KXX-4-MS 10	6500	-	2000	-
	ADV200-SP-73550-XXX-4-SL	6500	-	2000	-
	ADV200-SP-73550-XXX-4-SL	6500	-	2000	-
1.2 MW	ADV200-SP-74000-KXX-4-MS 12	6500	-	2000	-
	ADV200-SP-74000-XXX-4-SL	6500	-	2000	-
	ADV200-SP-74000-XXX-4-SL	6500	-	2000	-
1.5 MW	ADV200-SP-73550-KXX-4-MS 15	6500	-	2000	-
	ADV200-SP-73550-XXX-4-SL	6500	-	2000	-
	ADV200-SP-73550-XXX-4-SL	6500	-	2000	-
	ADV200-SP-73550-XXX-4-SL2	6500	-	2000	-
1.8 MW	ADV200-SP-73550-KXX-4-MS 18	6500	-	2000	-
	ADV200-SP-73550-XXX-4-SL	6500	-	2000	-
	ADV200-SP-73550-XXX-4-SL	6500	-	2000	-
	ADV200-SP-73550-XXX-4-SL2	6500	-	2000	-
	ADV200-SP-73550-XXX-4-SL2	6500	-	2000	-

9.9 Weight and dimensions

Sizes ADV200 SP-...-4 ADV200 SP-EH-...-4	Weight (kg)	Weight (lbs)
1015 ... 1055	5,8	12,8
2075 ... 2150	10,2	22,5
3185 ... 3220	16,4	36,2
3300	22	48,5
4370 ... 4550	32	70,6
5750 ... 51100	60	132
61320 ... 61600	90	198
72000 ... 72500	130	287
73150	140	309
73550 ... 74000	150	331
500 kW	260	573
630 kW	280	617
710 ... 800 kW	300	661
1 ... 1.2 MW	450	992
1.5 MW	600	1323
1.8 MW	750	1653

Sizes ADV200 SP-...-4-DC	Weight (kg)	Weight (lbs)
-	-	-
-	-	-
3220	12	26,5
3300	18	39,7
4370 ... 4550	24	52,9
5750 ... 51100	40	88,2
61320 ... 61600	68	150
72000 ... 72500	120	264,5
73150	130	286,6
73550 ... 74000	140	308,6
500 kW	240	529
630 kW	260	573
710 ... 800 kW	280	617
1 ... 1.2 MW	420	926
1.5 MW	560	1235
1.8 MW	700	1543

Note ! Weights referred to standard drive with keypad, without options, packaging not included.

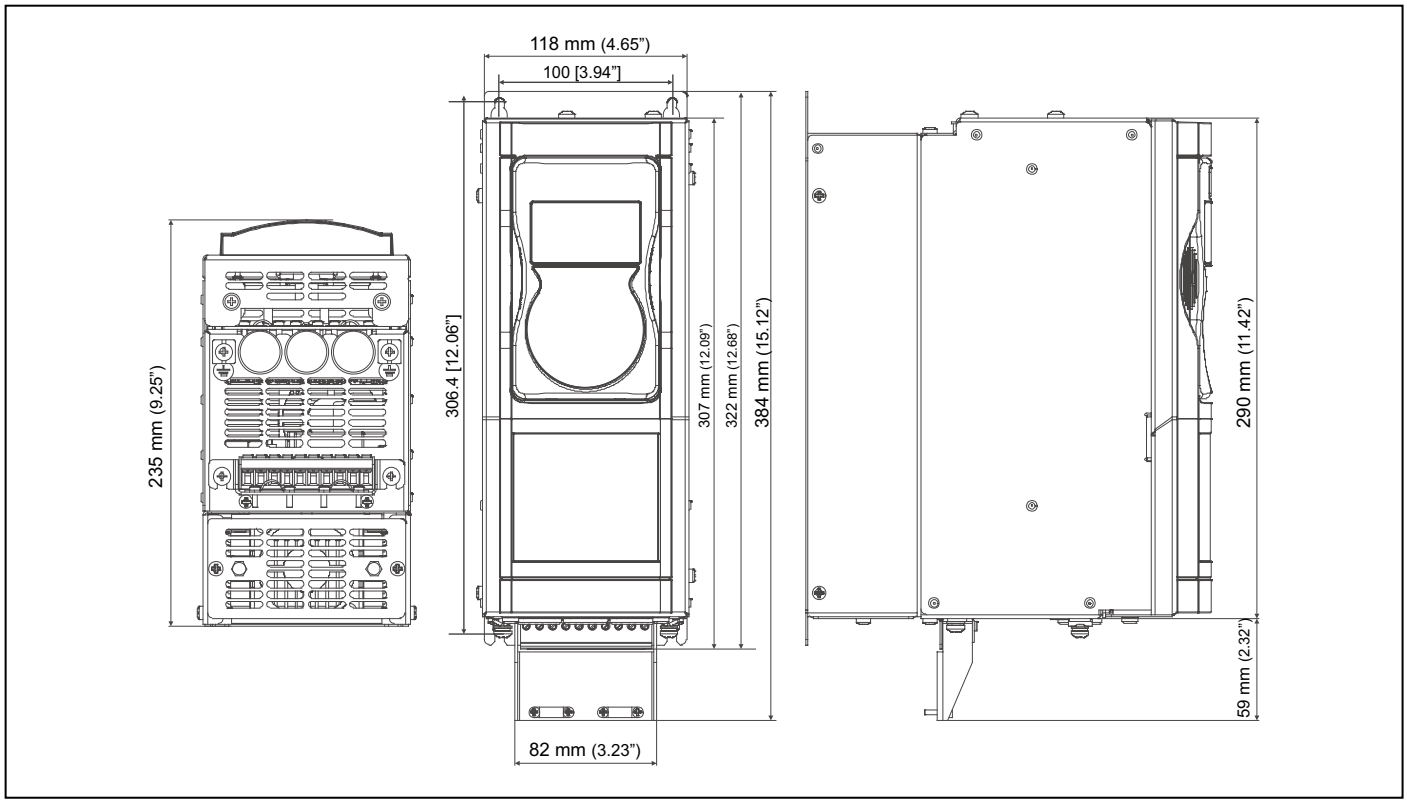


Figure 9.9.1: Size 1 Dimensions

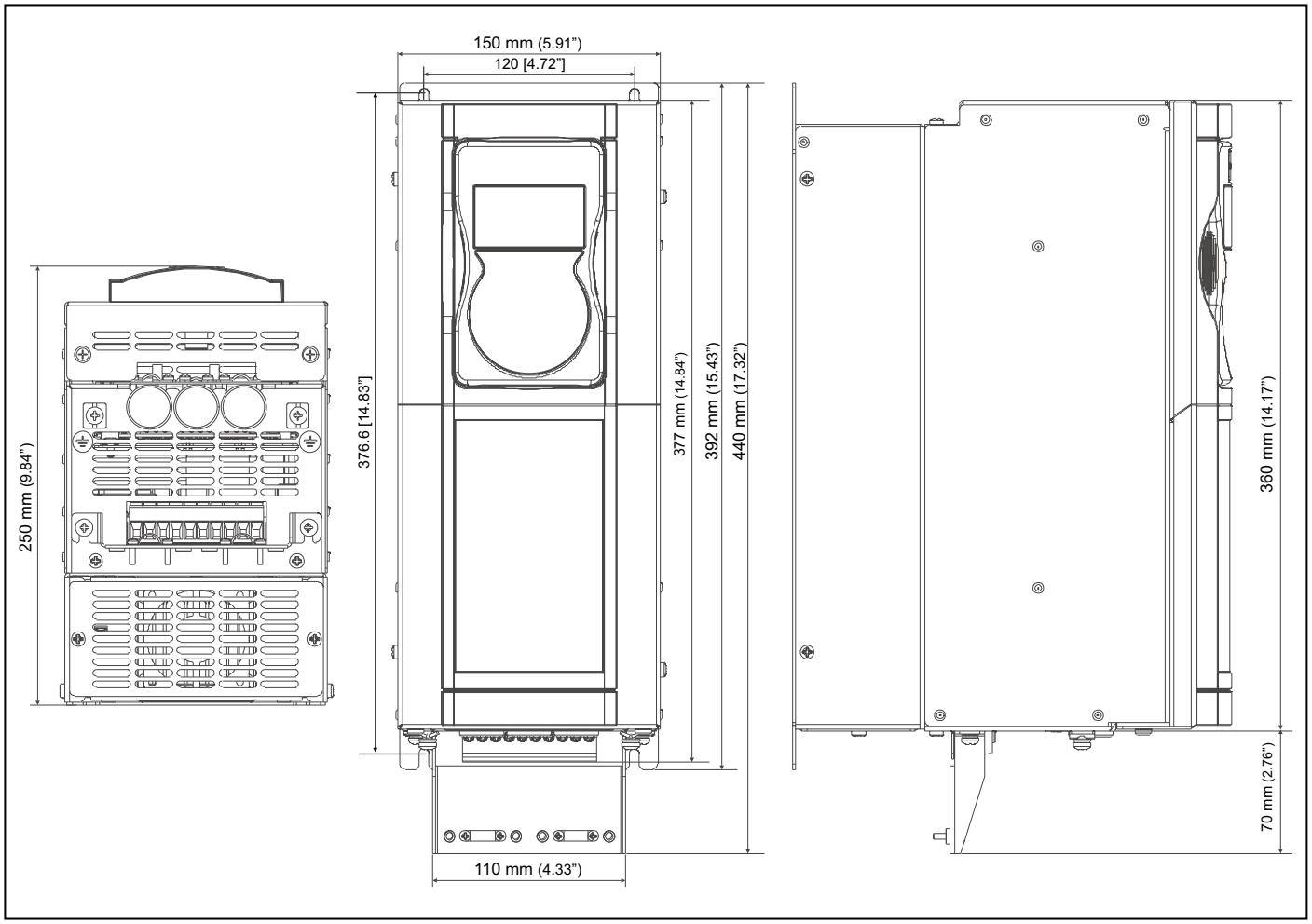


Figure 9.9.2: Size 2 dimensions

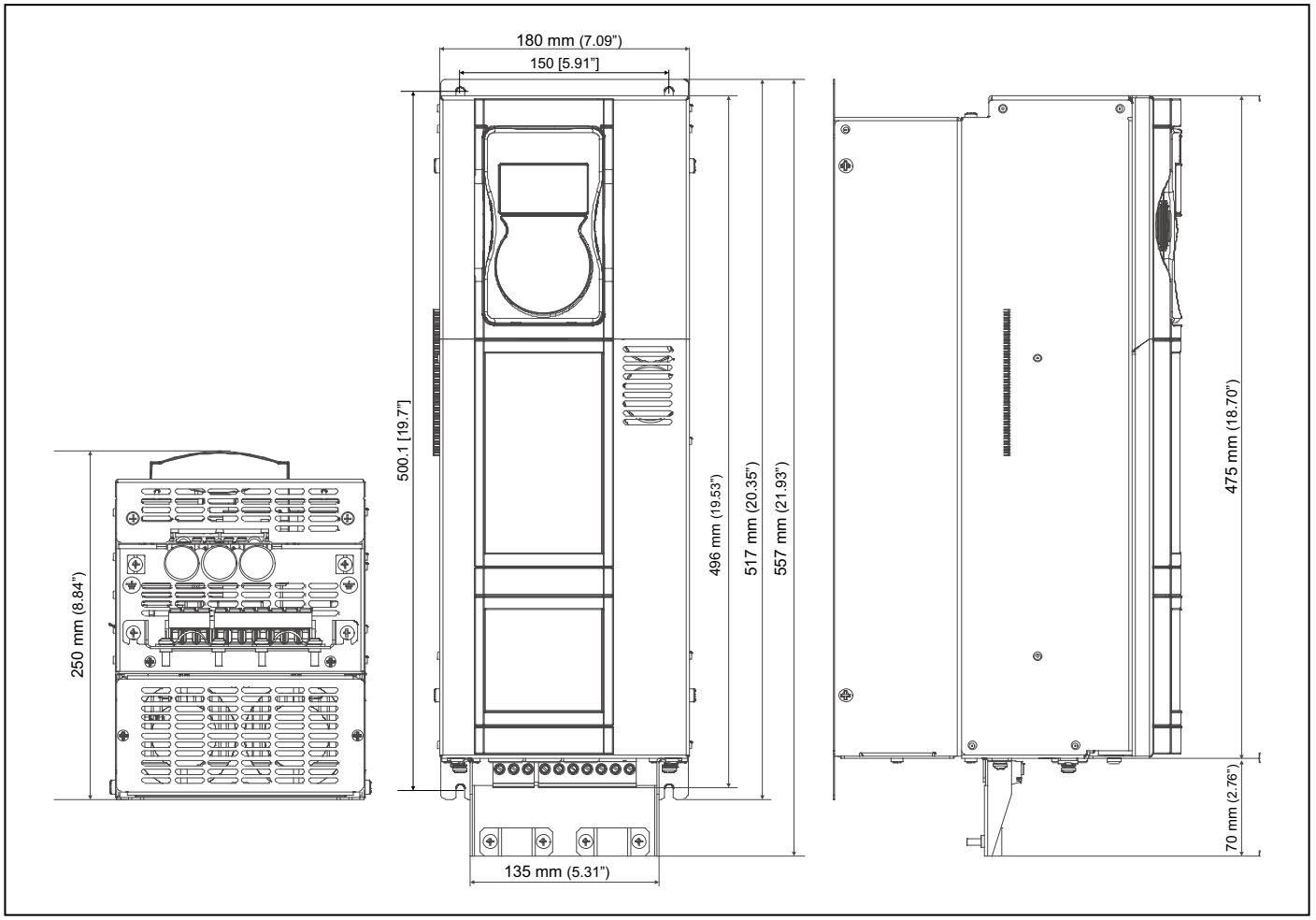


Figure 9.9.3: Size 3 dimensions (ADV200 SP-...-4)

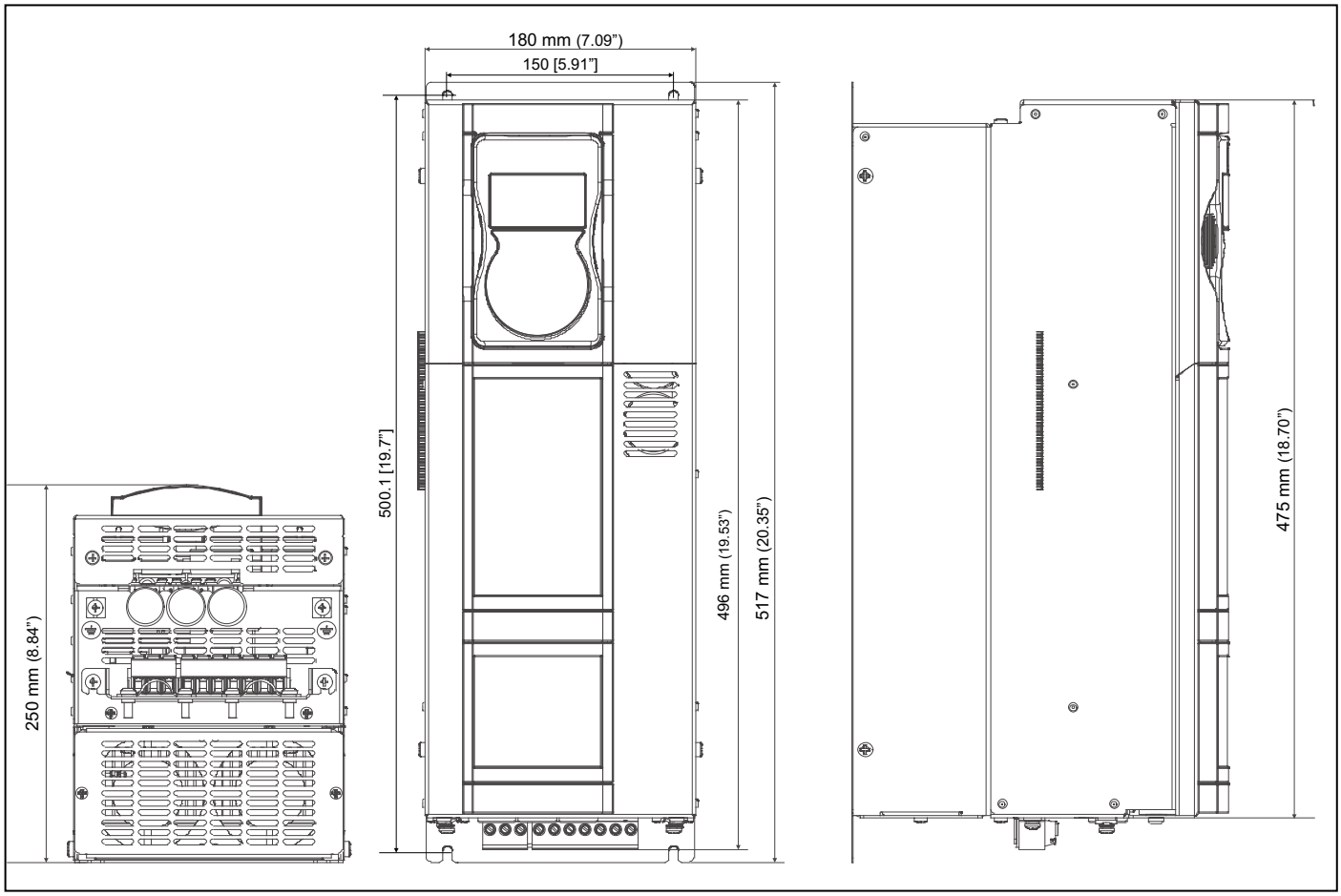


Figure 9.9.4: Size 3 dimensions (ADV200 SP-...-4-DC)

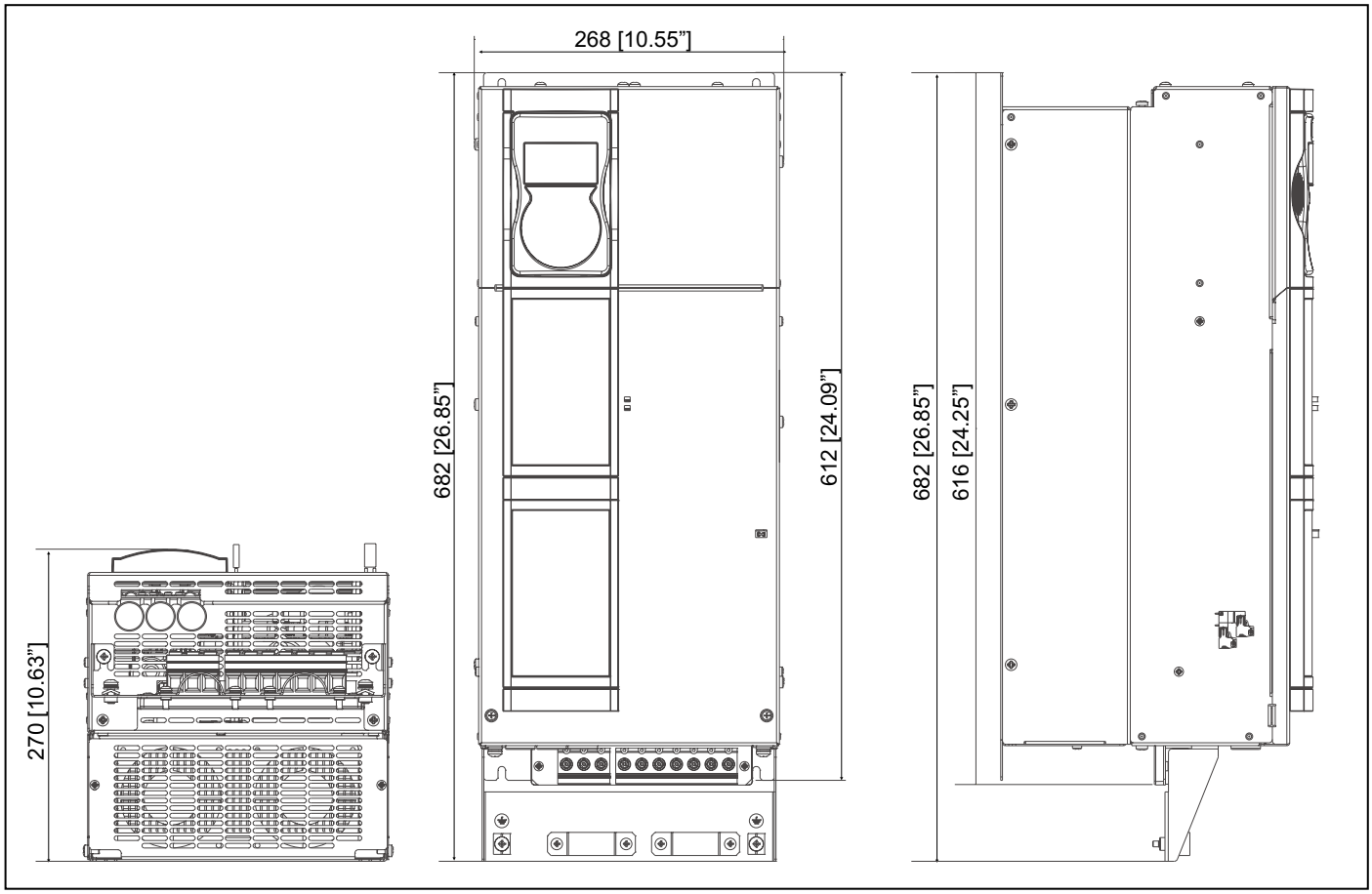


Figure 9.9.5: Size 4 dimensions (ADV200 SP-...-4)

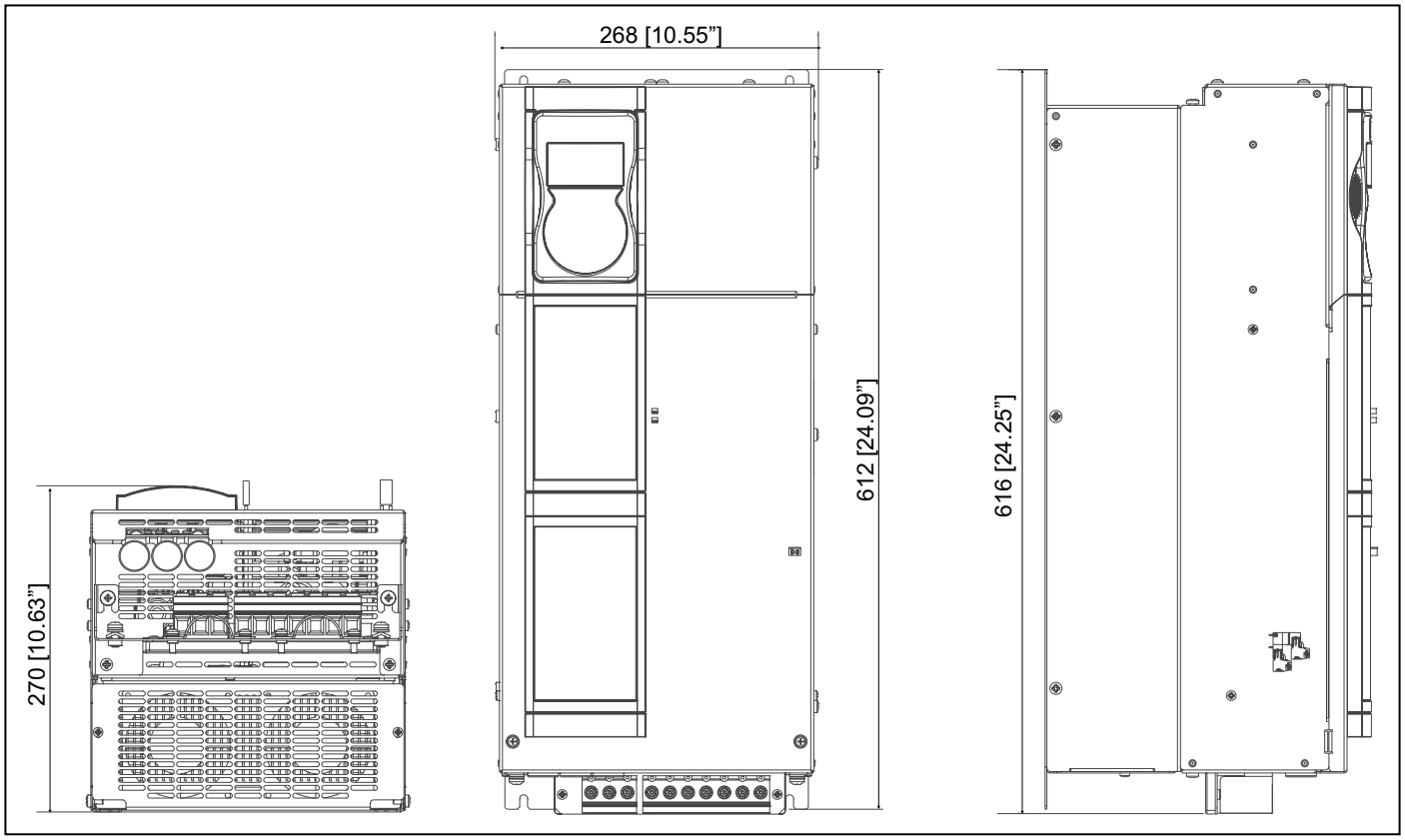


Figure 9.9.6: Size 4 dimensions (ADV200 SP-...-4-DC)

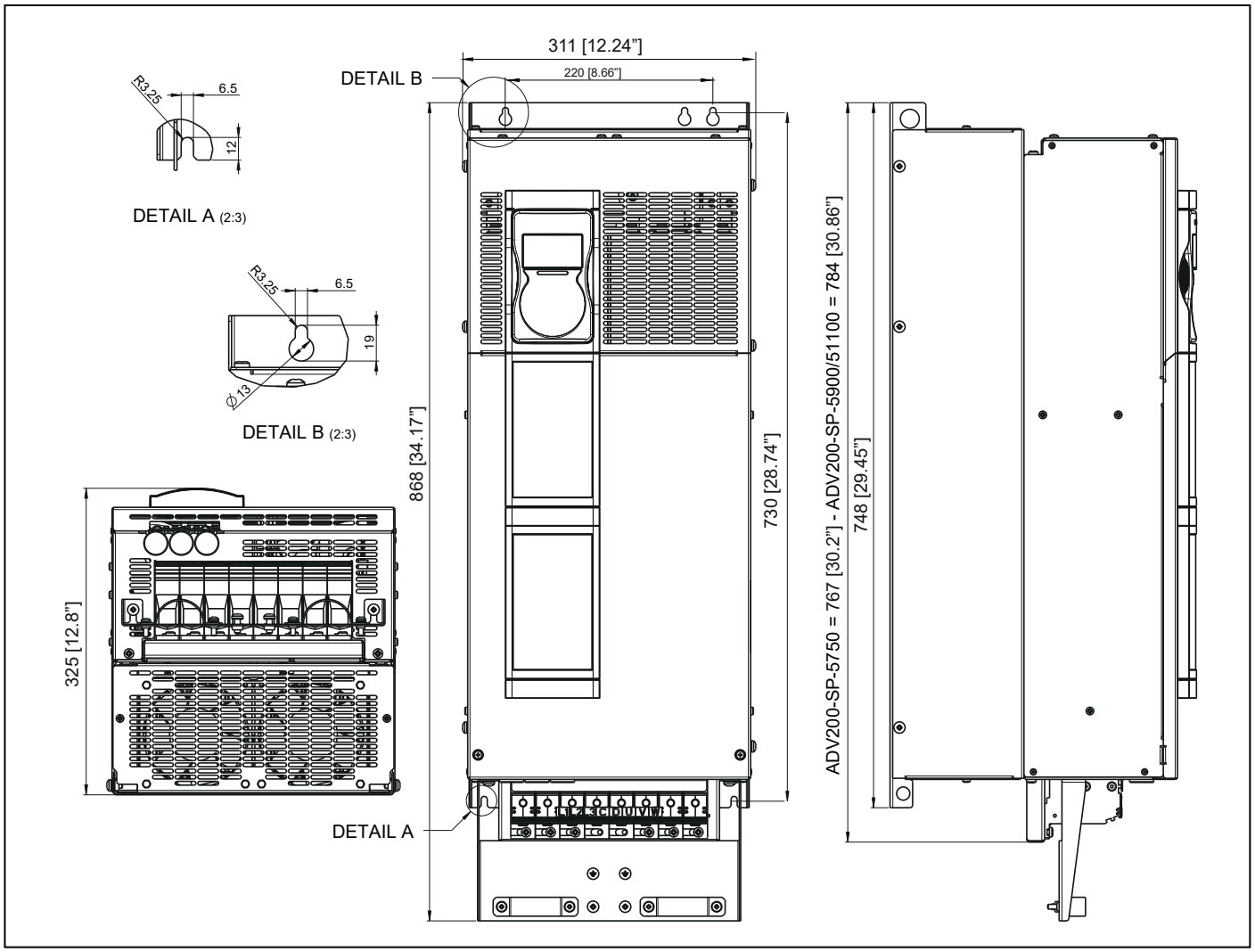


Figure 9.9.7: Size 5 dimensions (ADV200 SP-...-4)

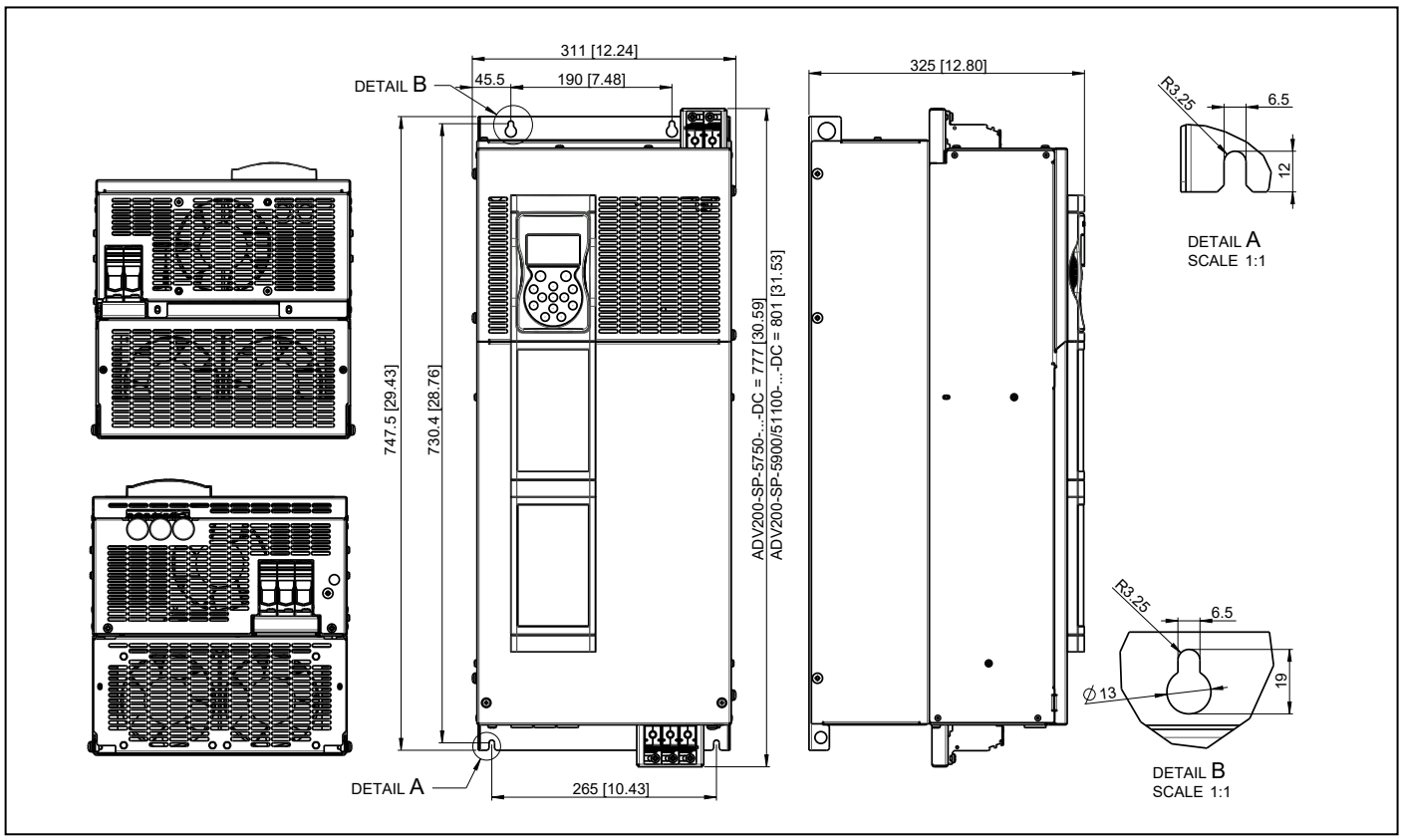


Figure 9.9.8: Size 5 dimensions (ADV200 SP-...-4-DC)

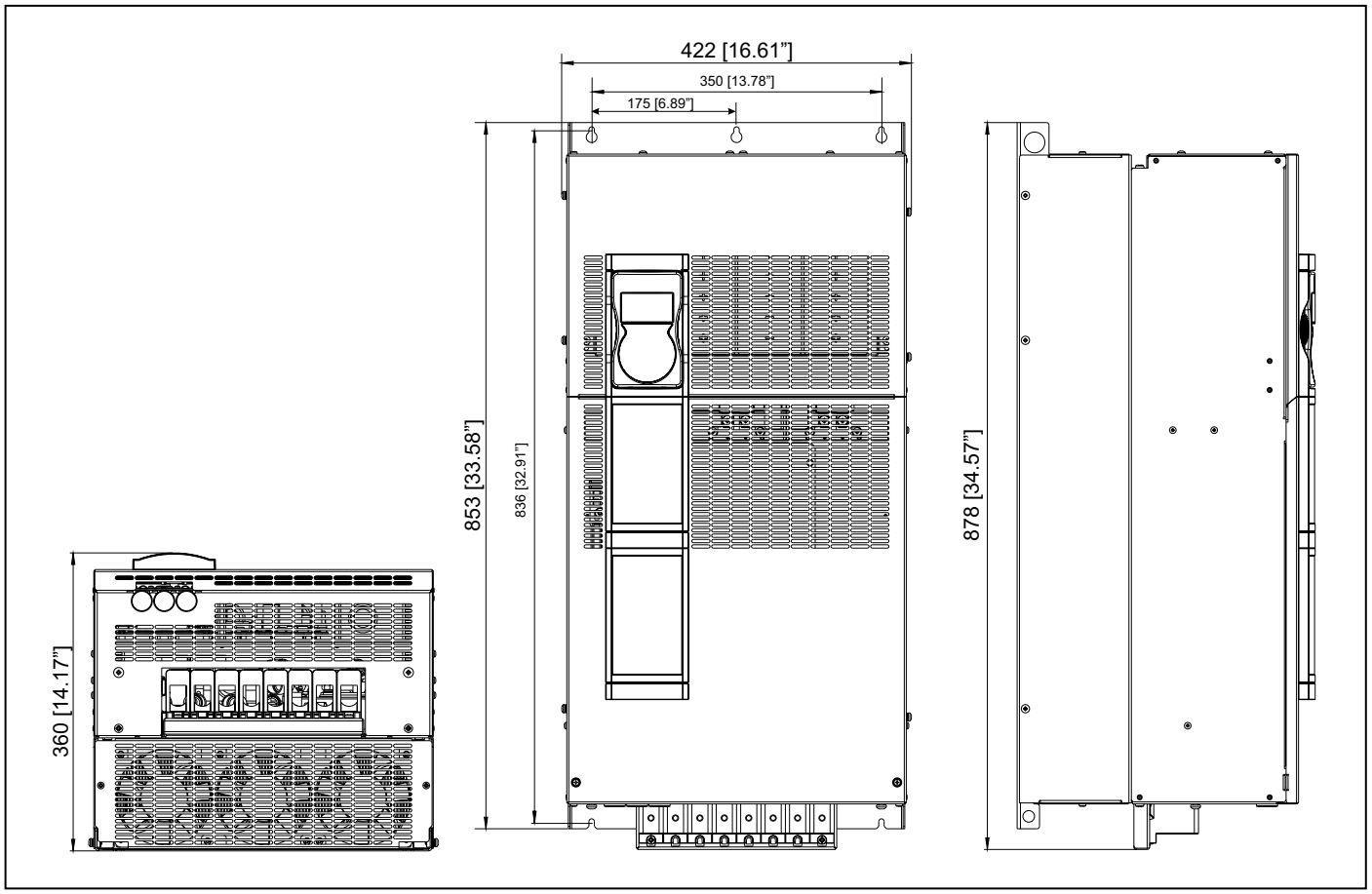


Figure 9.9.9: Size 6 dimensions (ADV200 SP-...-4)

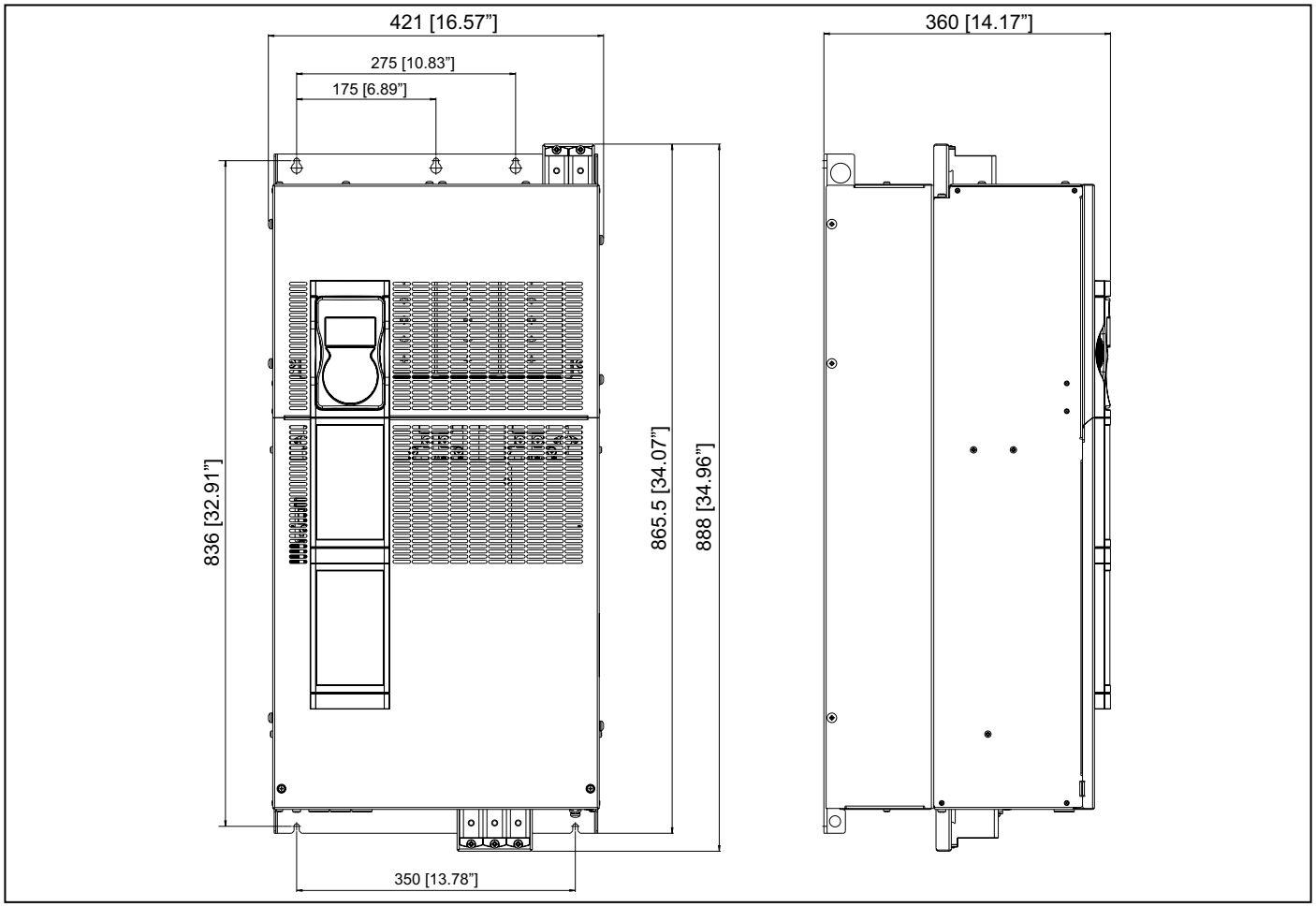


Figure 9.9.10: Size ADV200 SP-61320-...-DC dimensions

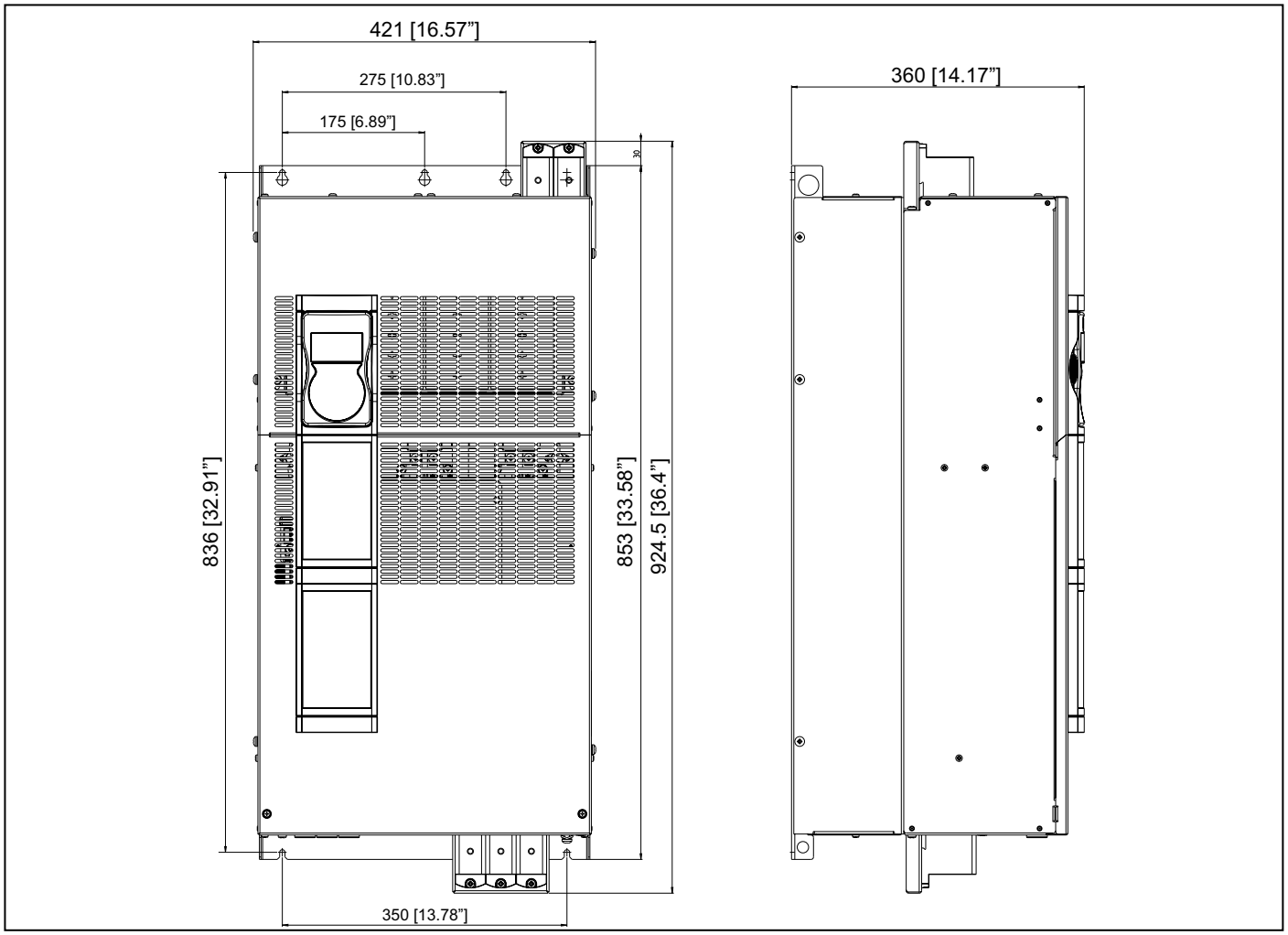


Figure 9.9.11: Size ADV200 SP-61600...-DC dimensions

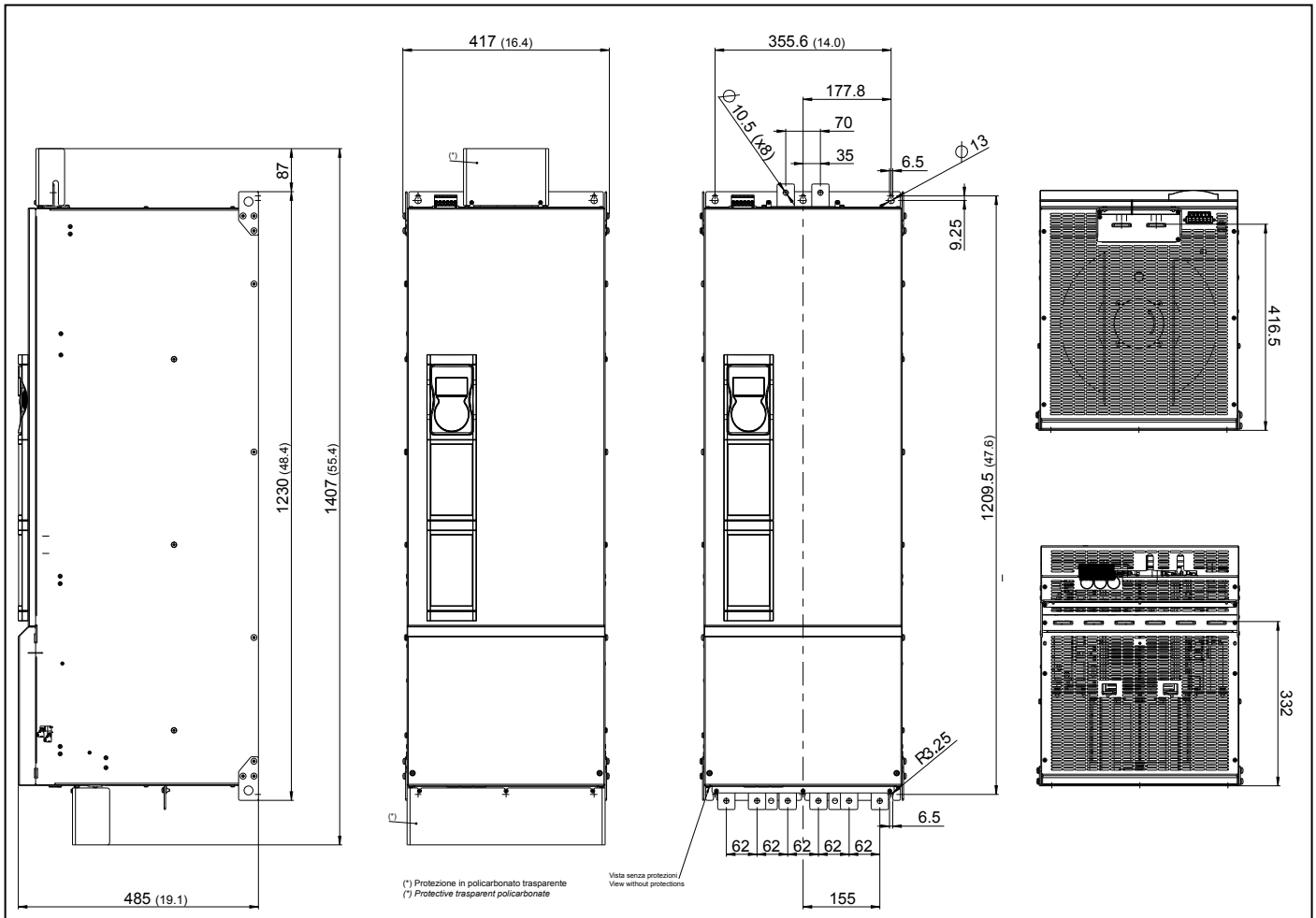


Figure 9.9.12: Size 7 dimensions (ADV200 SP-...-4)

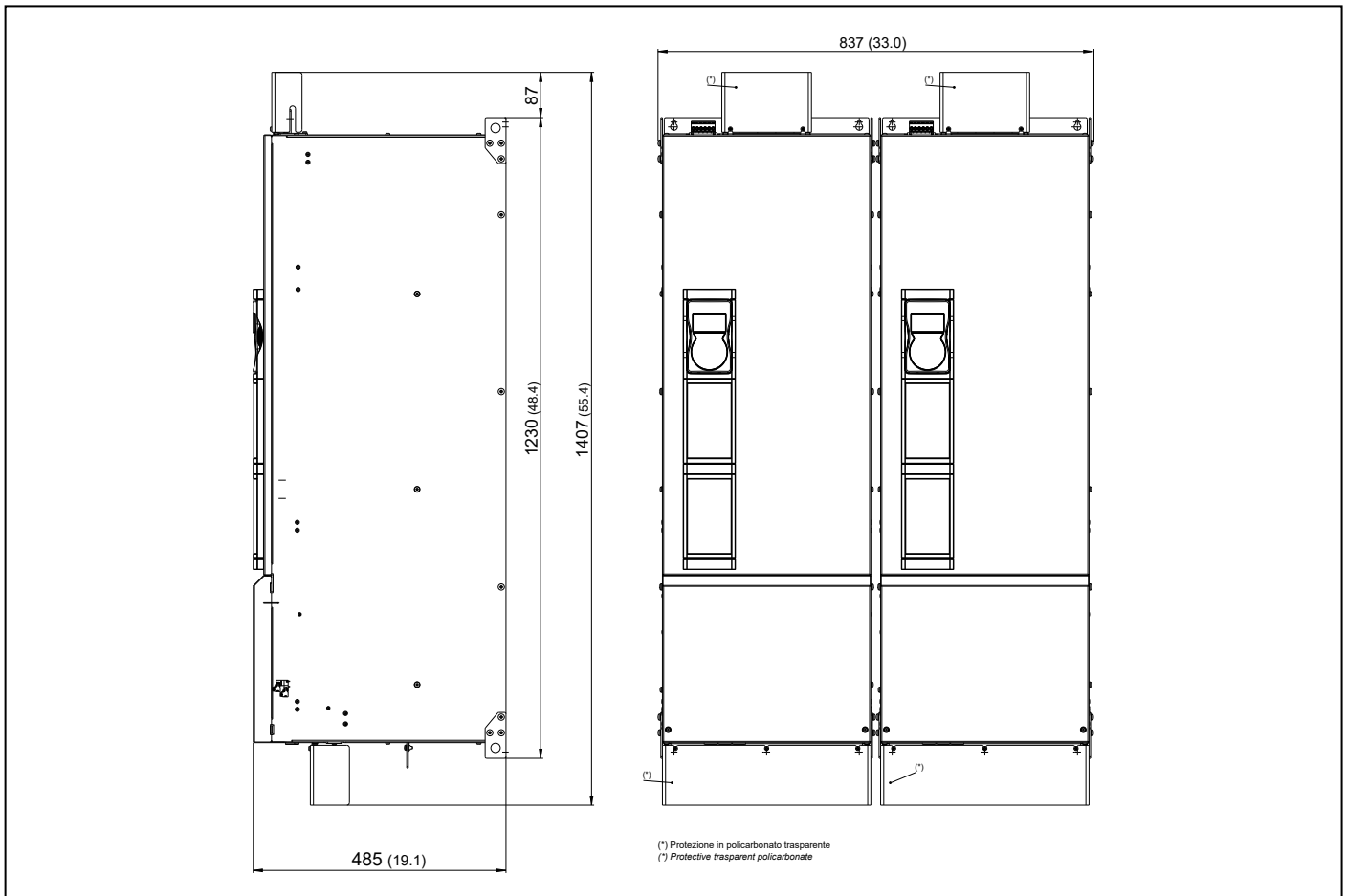


Figure 9.9.13: 500...800 kW dimension

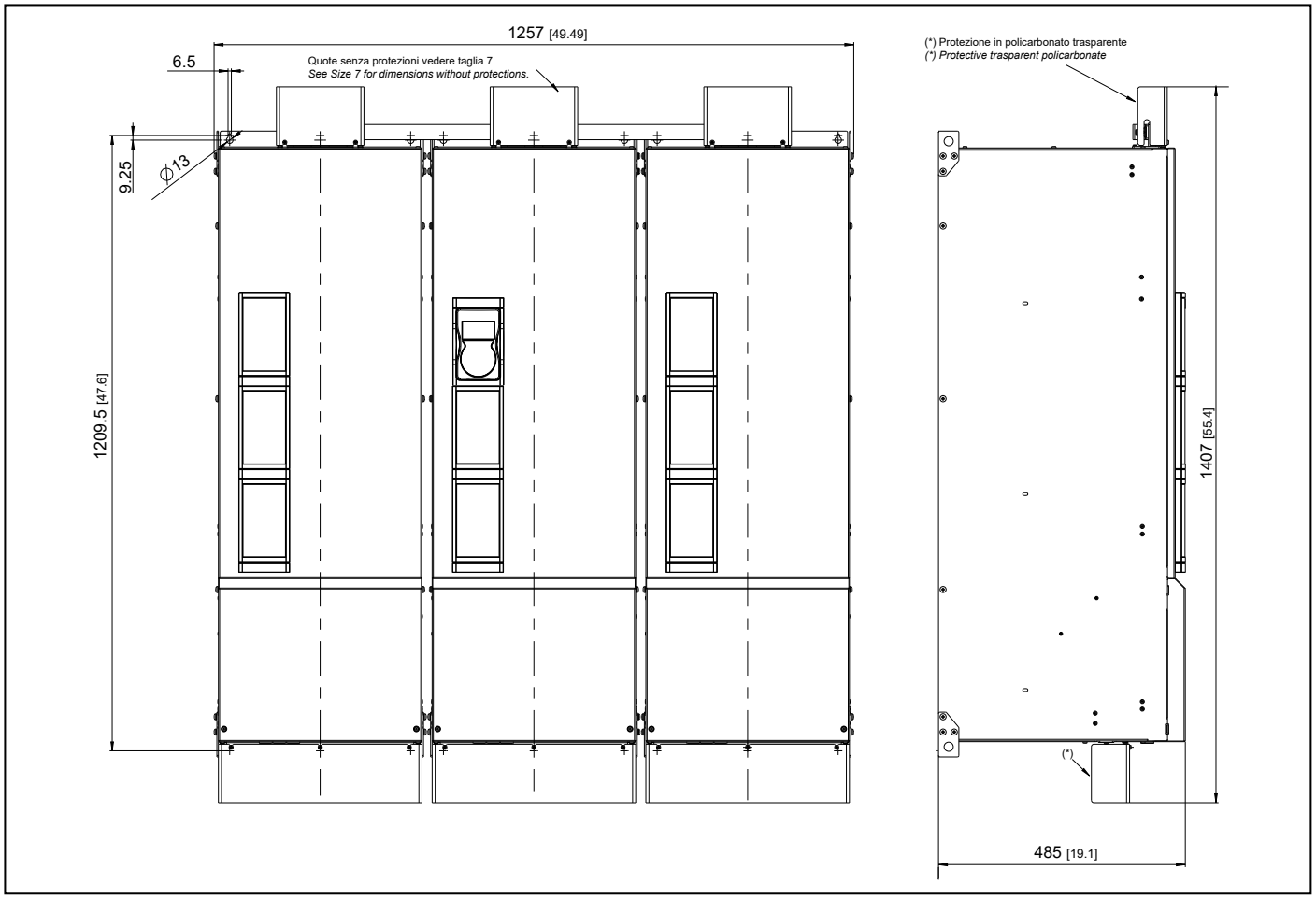


Figure 9.9.14: 1...1.2 MW dimension

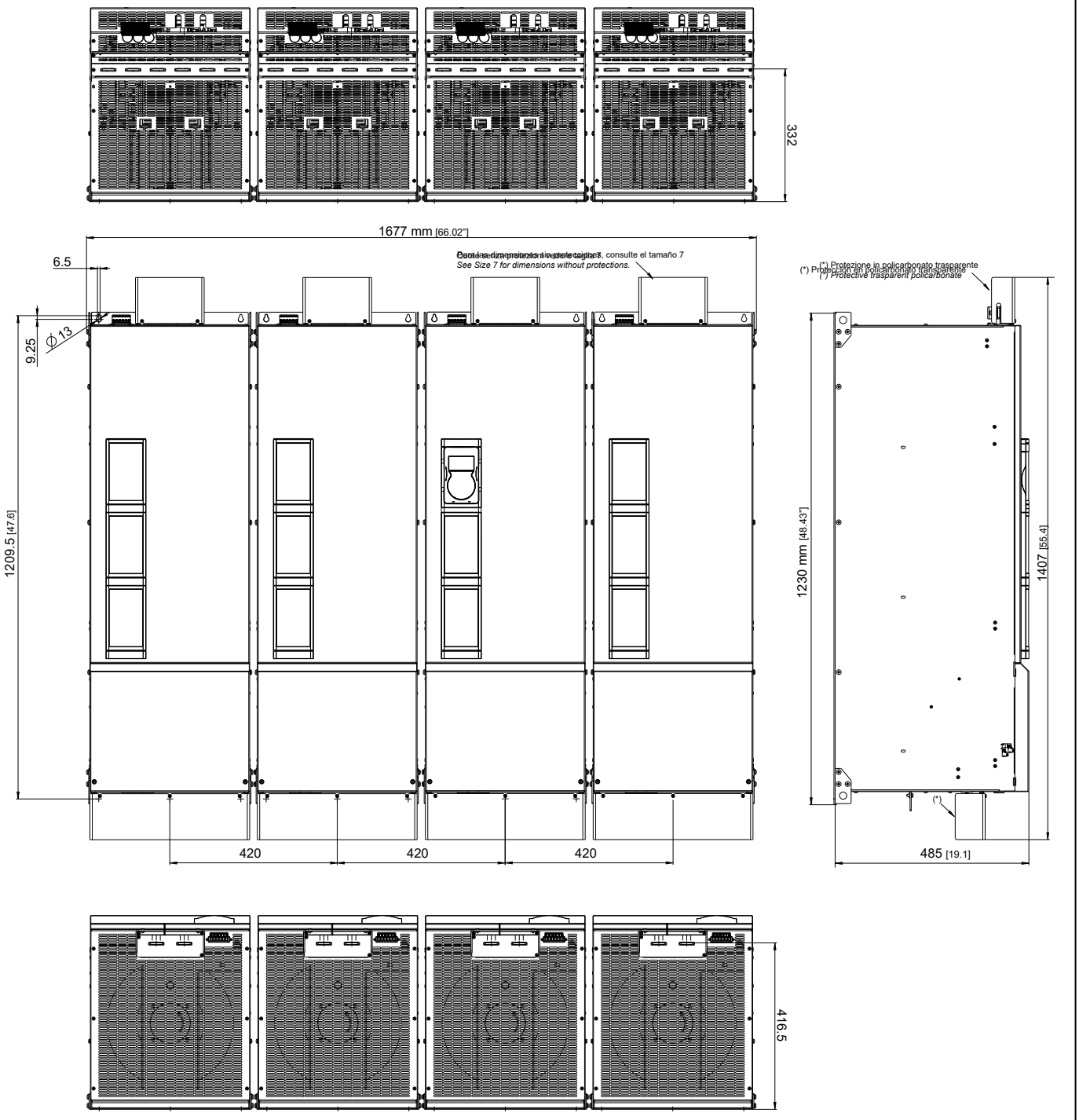


Figure 9.9.15: 1.5 MW dimension

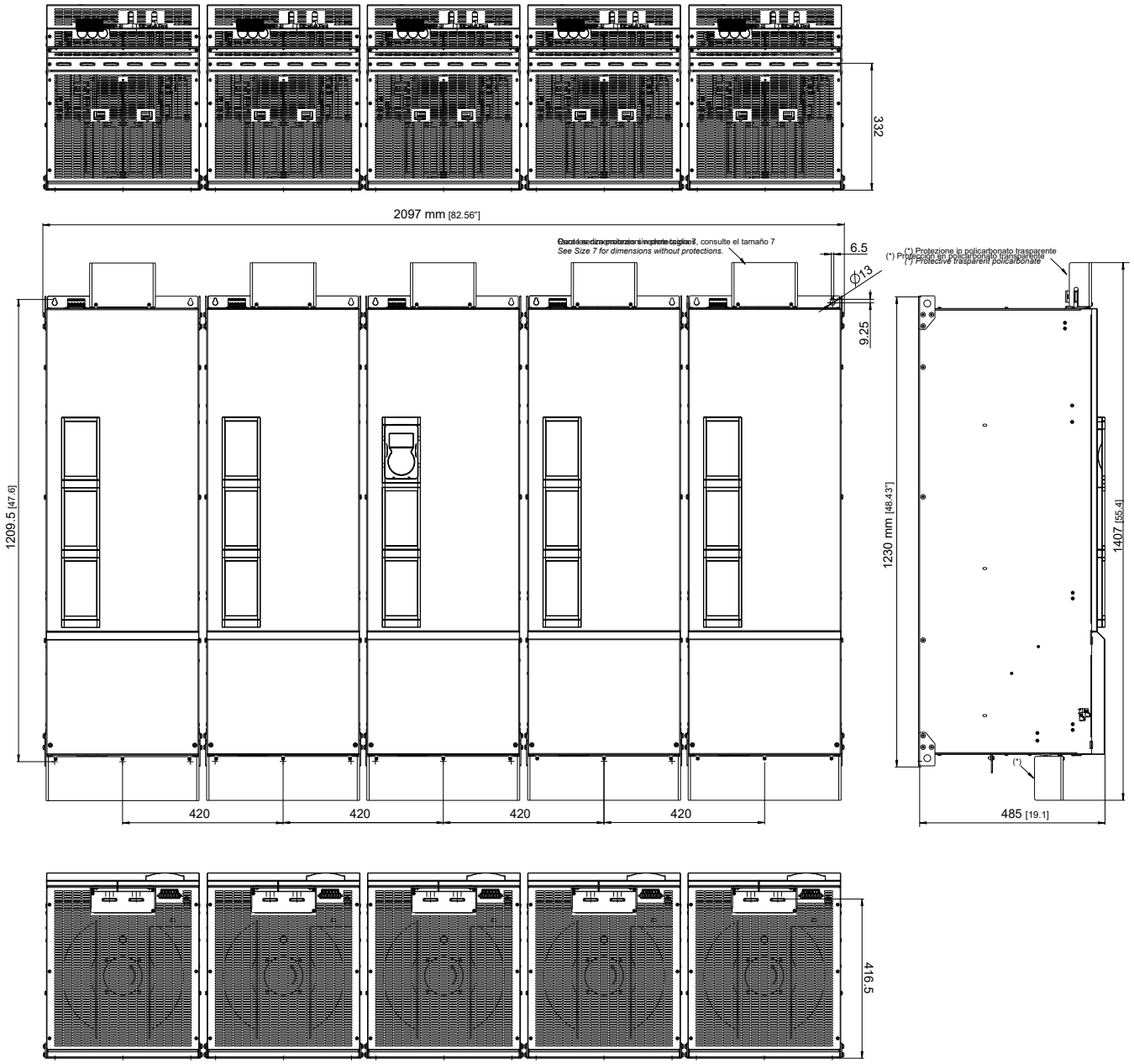


Figure 9.9.16: 1.8 MW dimension

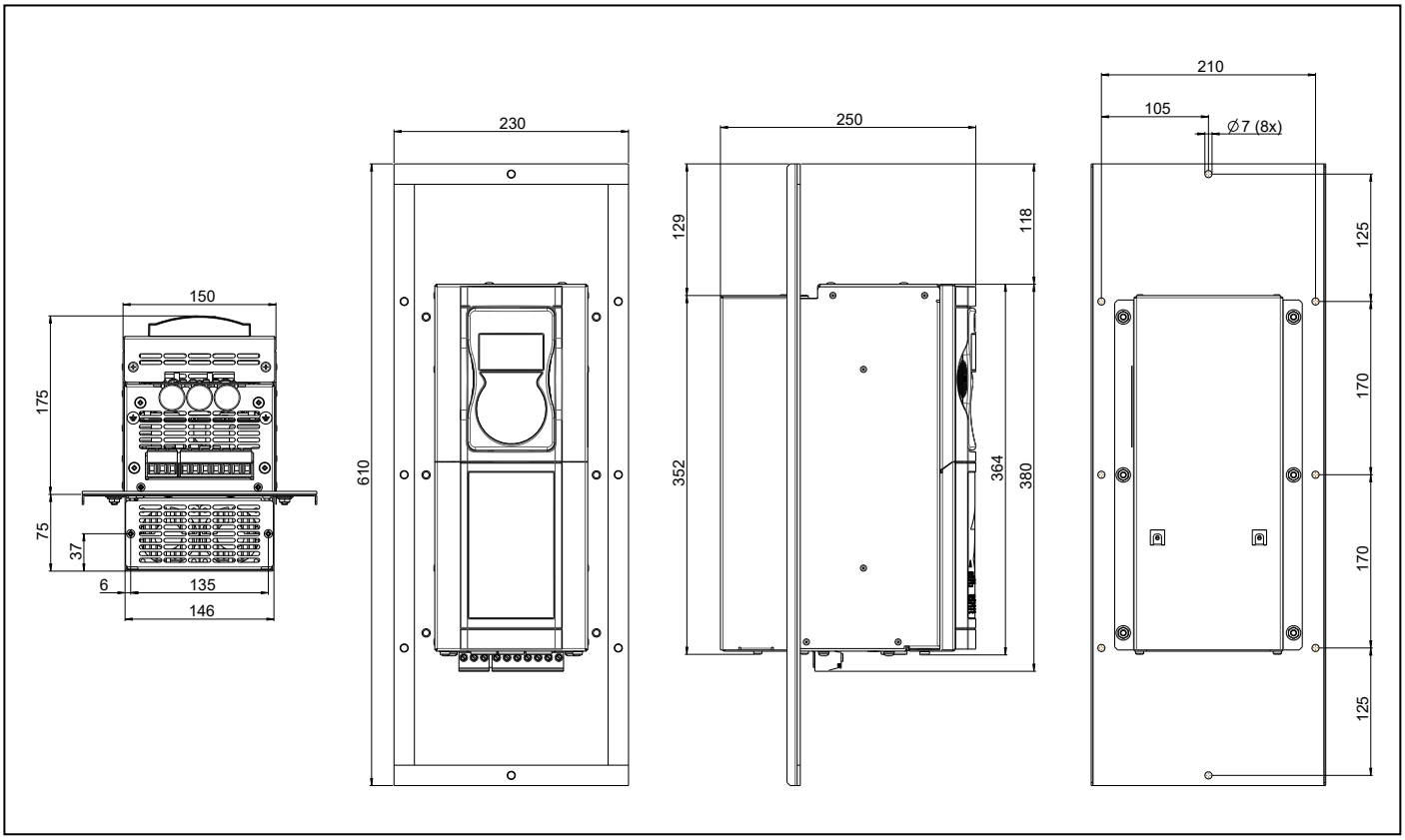


Figure 9.9.17: Size 2 ADV200 SP-EH-... dimensions

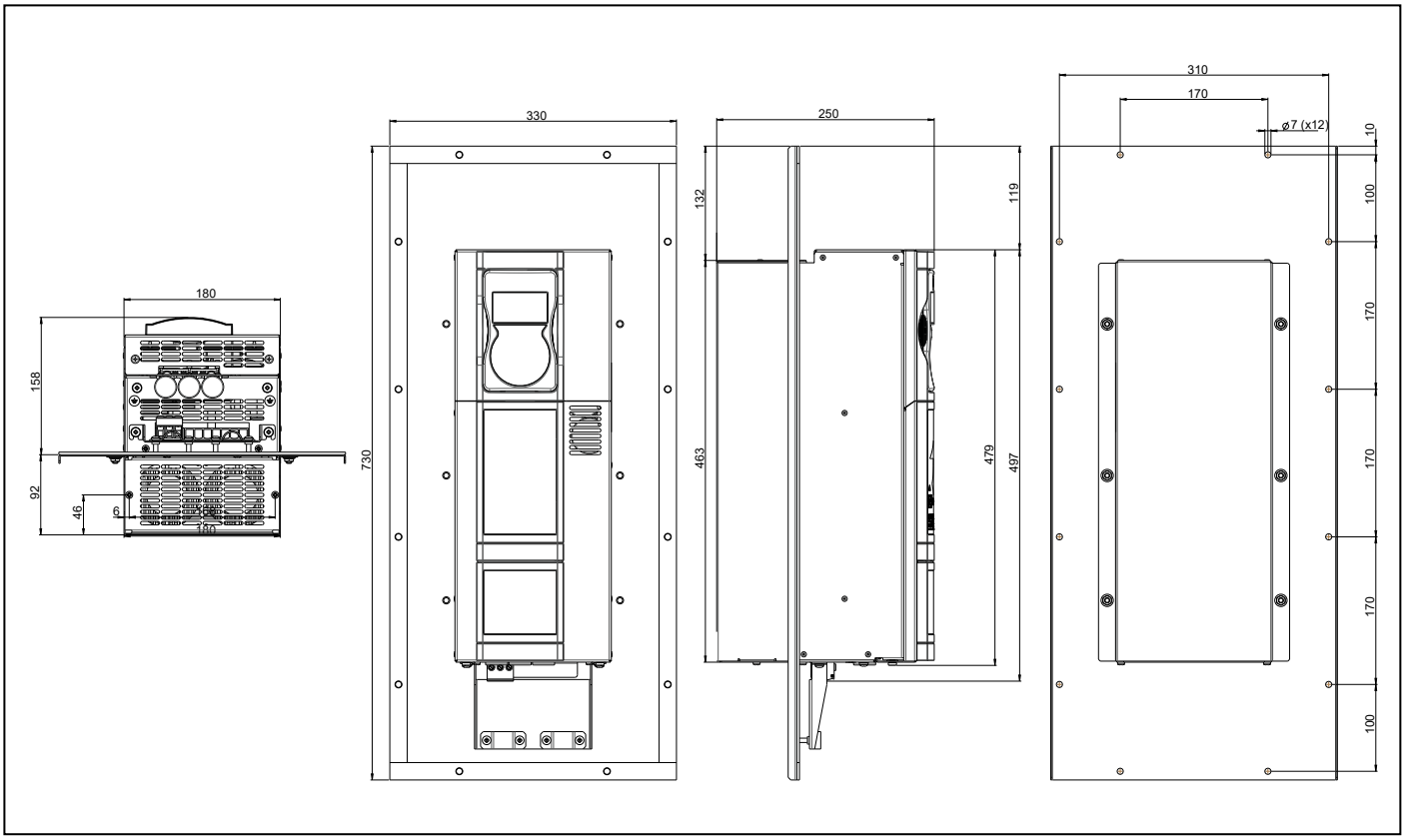


Figure 9.9.18: Size 3 ADV200 SP-EH-... dimensions

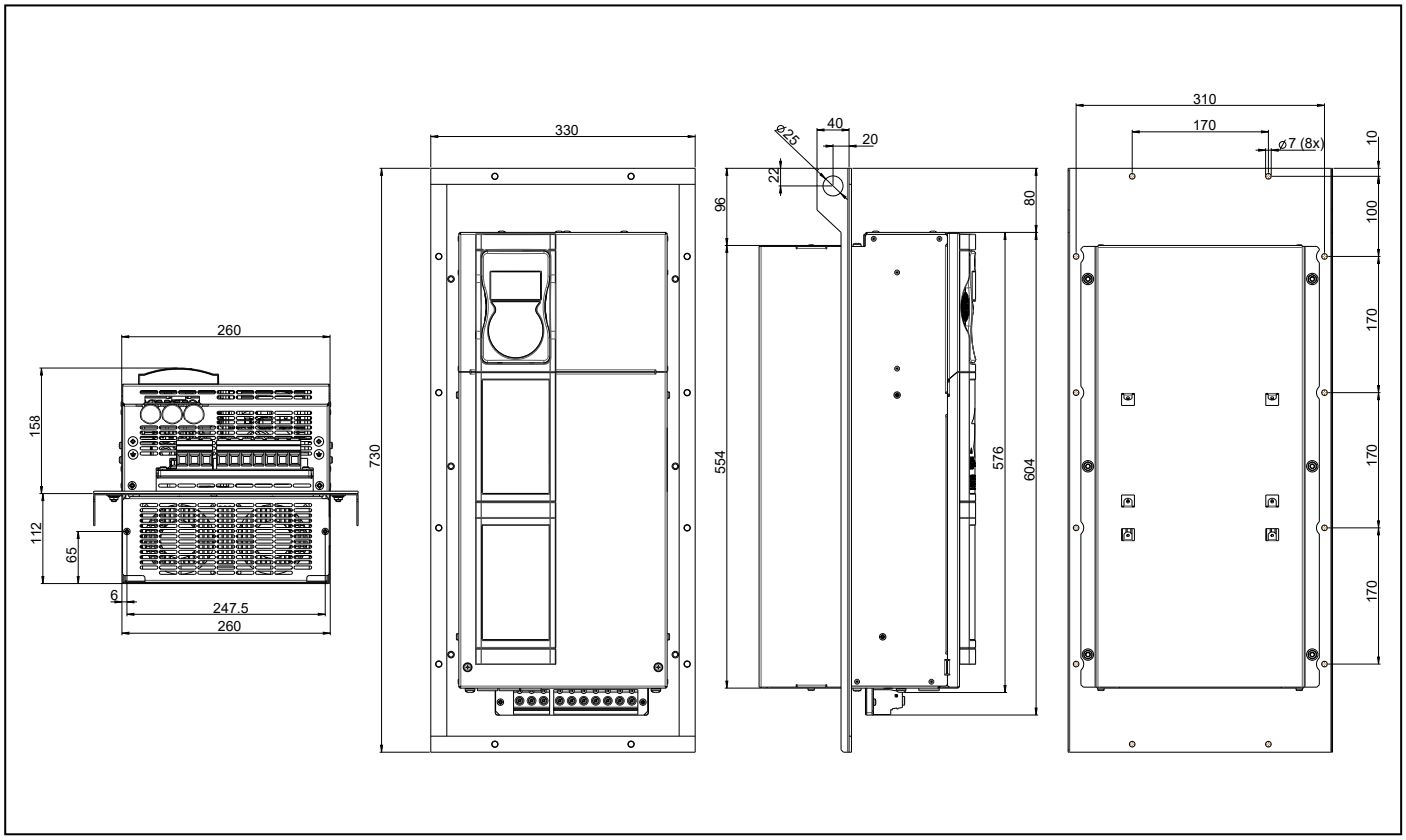


Figure 9.9.19: Size 4 ADV200 SP-EH-... dimensions

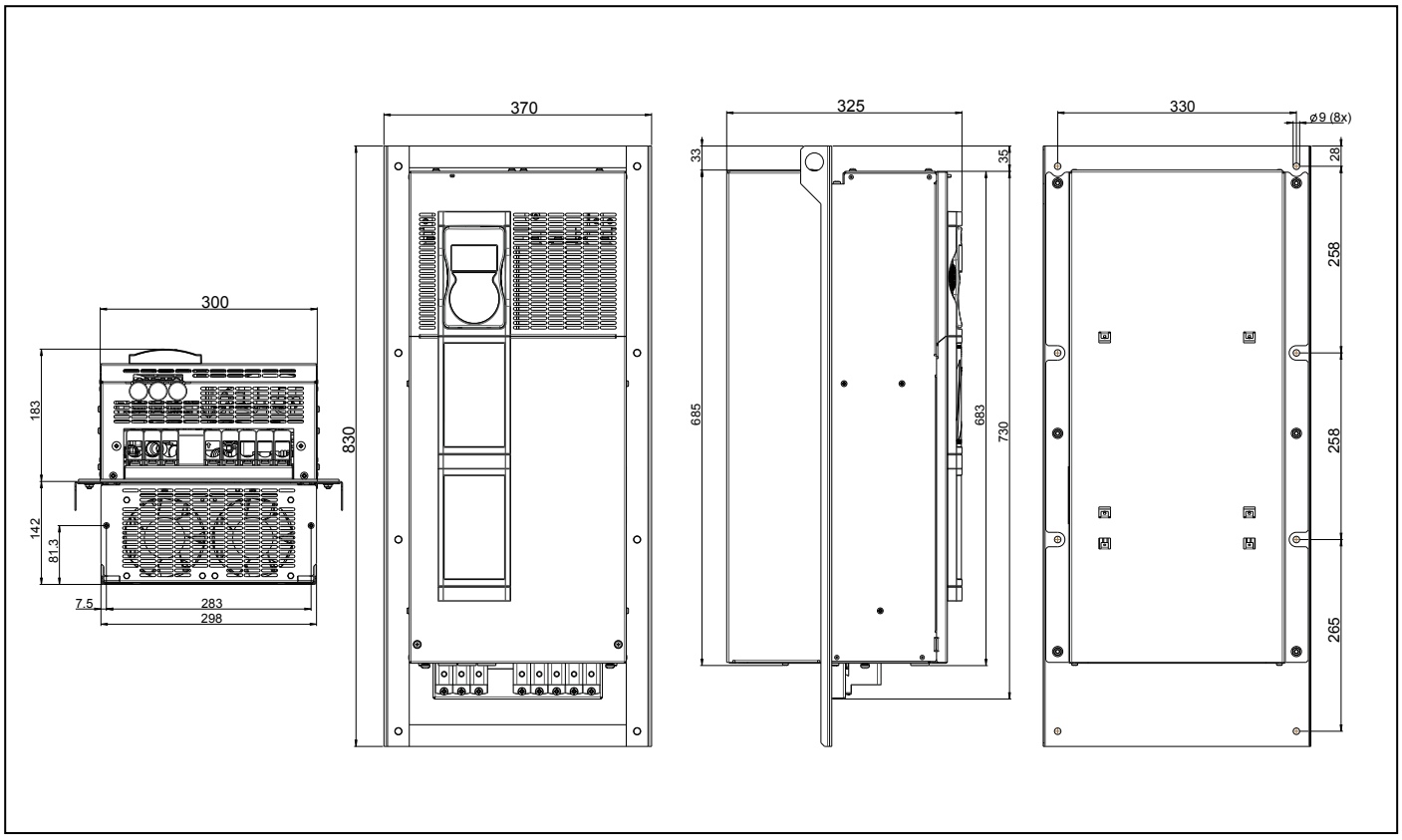


Figure 9.9.20: Size 5 ADV200 SP-EH-... dimensions

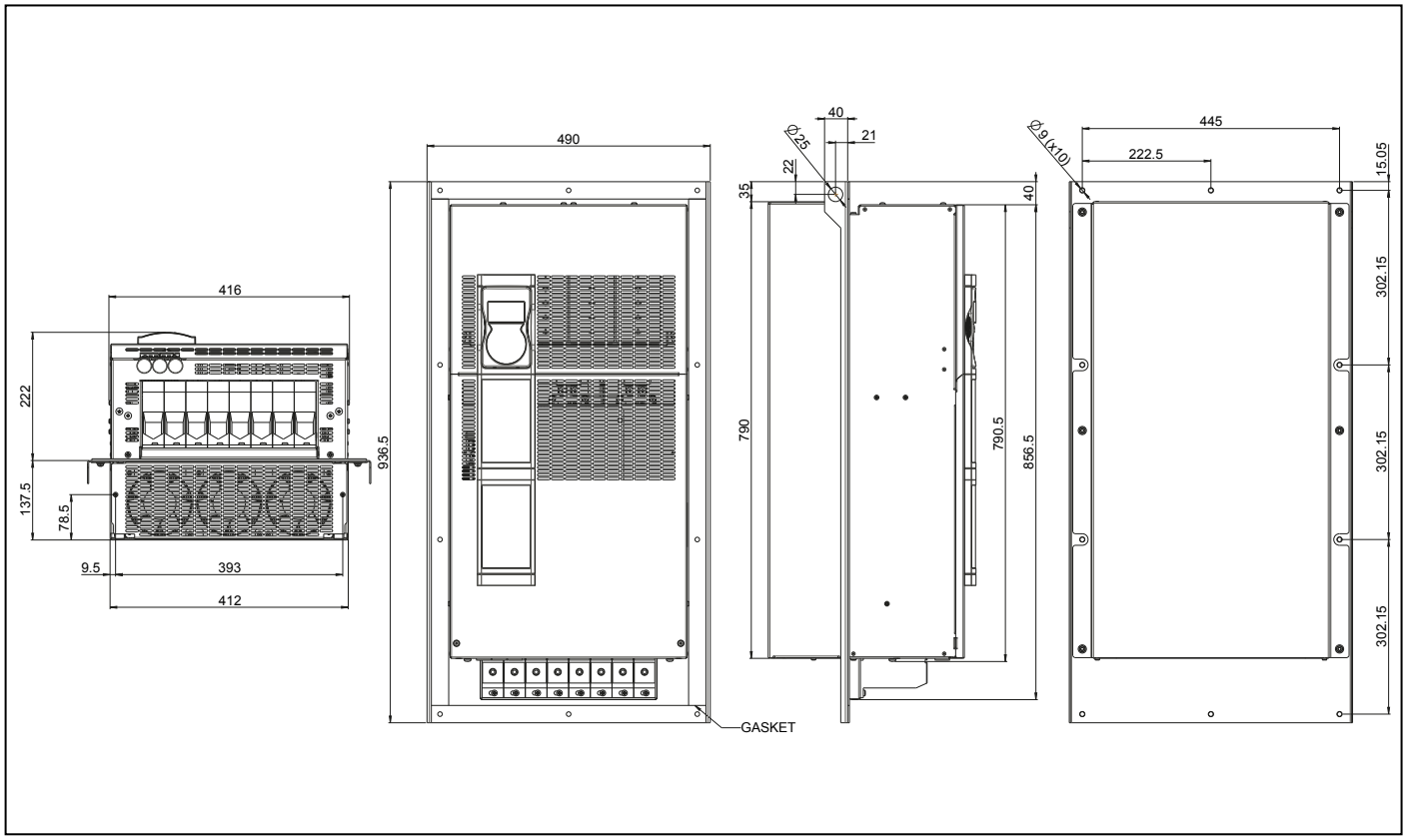


Figure 9.9.21: Size 6 ADV200 SP-EH-... dimensions

10.1 DC-side diode

The blocking diodes provide protection against reverse current to the panels, which arises when the voltage generated by the photovoltaic field is lower than the rectified mains voltage.

Note! The diodes must have a minimum blocking voltage of 1600V.

The diodes and their cooling system must be sized for the maximum currents on the DC side.

Typically, the maximum currents on the DC side are equivalent to the PV field short circuit current.

Refer to figures 5.5.3/5.5.4 of “5.5 Typical connection diagrams” chapter, for the positioning and wiring of the blocking diode.

10.1.1 Diodes selection

Model	Code	DC MAX current @1600VDC TH=70 ... 80°C	DC MAX current @1600VDC TH=100 ... 110°C	Diode connection
BD-SP-1600V-50A/100C	S8DI100	-	50A	Ø 4.1mm (cathode)
BD-SP-1600V-50A/70C-150A/100C	S8DI101	50A	150A	Ø 8.3mm (anode)
BD-SP-1600V-150A/70C-200A/100C	S8DI102	150A	200A	Ø 8.3mm (anode)
BD-SP-1600V-200A/70C-300A/100C	S8DI103	200A	300A	capsule
BD-SP-1600V-300A/70C-400A/100C	S8DI104	300A	400A	capsule
BD-SP-1600V-400A/70C-450A/100C	S8DI105	400A	450A	capsule
BD-SP-1600V-450A/70C-500A/100C	S8DI106	450A	500A	capsule
BD-SP-1600V-500A/70C-600A/100C	S8DI107	500A	600A	capsule
BD-SP-1600V-600A/70C-700A/100C	S8DI108	600A	700A	capsule
BD-SP-1600V-700A/70C-800A/100C	S8DI109	700A	800A	capsule
BD-SP-1600V-800A/70C-1000A/100C	S8DI110	800A	1000A	capsule
BD-SP-1600V-1000A/70C-1500A/100C	S8DI111	1000A	1500A	capsule

TH = Heatsink temperature @45°C ambient temperature

10.1.2 Diodes and weight dimensions

Model	Code	Dimensions (W x H x d) - mm	Weights kg
BD-SP-1600V-50A/100C	S8DI100	120 x 90 x 65	0.84
BD-SP-1600V-50A/70C-150A/100C	S8DI101	120 x 120 x 100	2.1
BD-SP-1600V-150A/70C-200A/100C	S8DI102	120 x 120 x 100	2.1
BD-SP-1600V-200A/70C-300A/100C	S8DI103	120 x 141,6 x 126	2.7
BD-SP-1600V-300A/70C-400A/100C	S8DI104	250 x 174,6 x 177	7.25
BD-SP-1600V-400A/70C-450A/100C	S8DI105	250 x 174,6 x 177	7.25
BD-SP-1600V-450A/70C-500A/100C	S8DI106	250 x 186 x 177	7.45
BD-SP-1600V-500A/70C-600A/100C	S8DI107	250 x 186 x 177	7.45
BD-SP-1600V-600A/70C-700A/100C	S8DI108	250 x 186 x 177	7.45
BD-SP-1600V-700A/70C-800A/100C	S8DI109	300 x 168 x 177	9.1
BD-SP-1600V-800A/70C-1000A/100C	S8DI110	300 x 224 x 240	17.2
BD-SP-1600V-1000A/70C-1500A/100C	S8DI111	300 x 224 x 240	17.2

Figure 10.1.1: S8DI100 dimensions

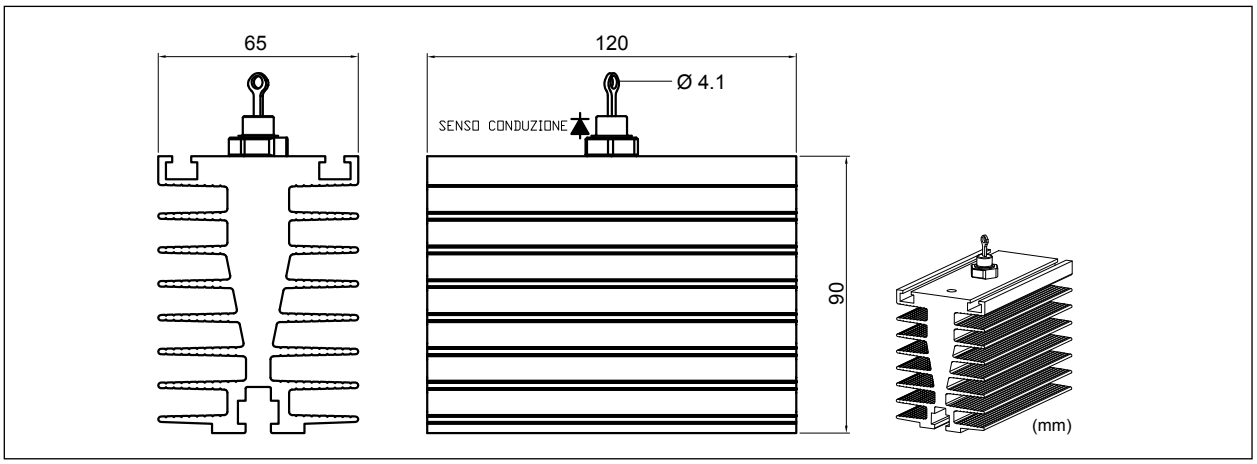


Figure 10.1.2: S8DI101 dimensions

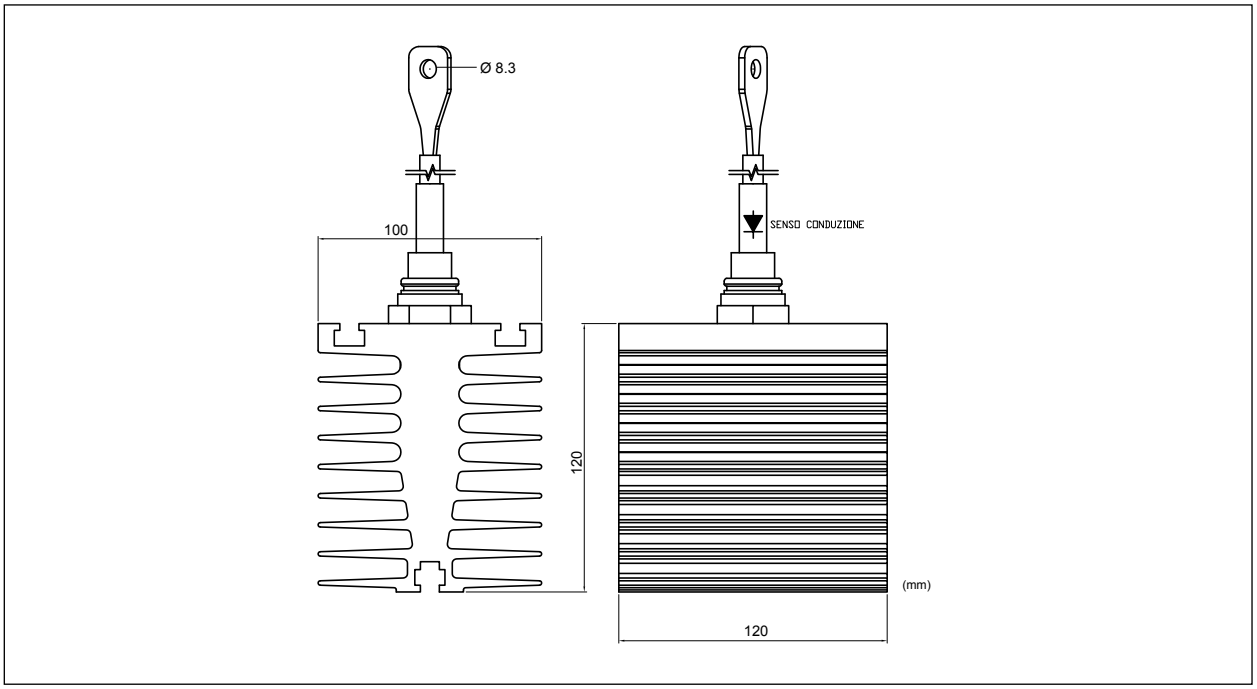


Figure 10.1.3: S8DI102 dimensions

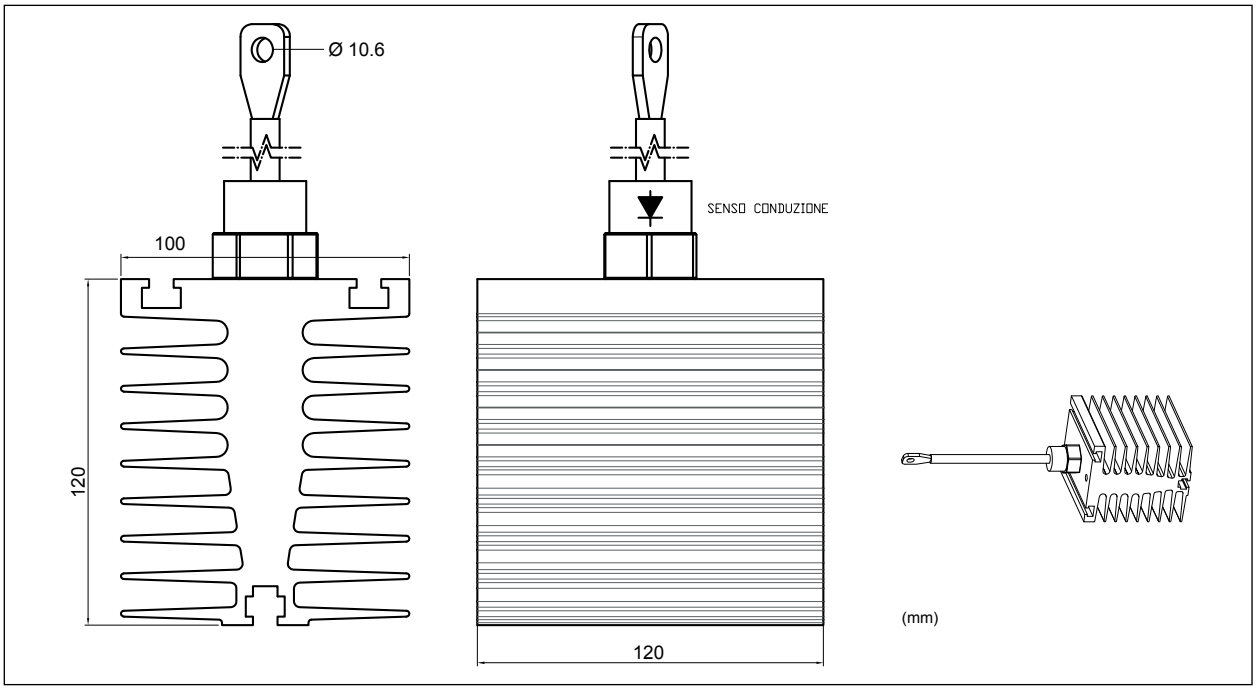


Figure 10.1.4: S8DI103 dimensions

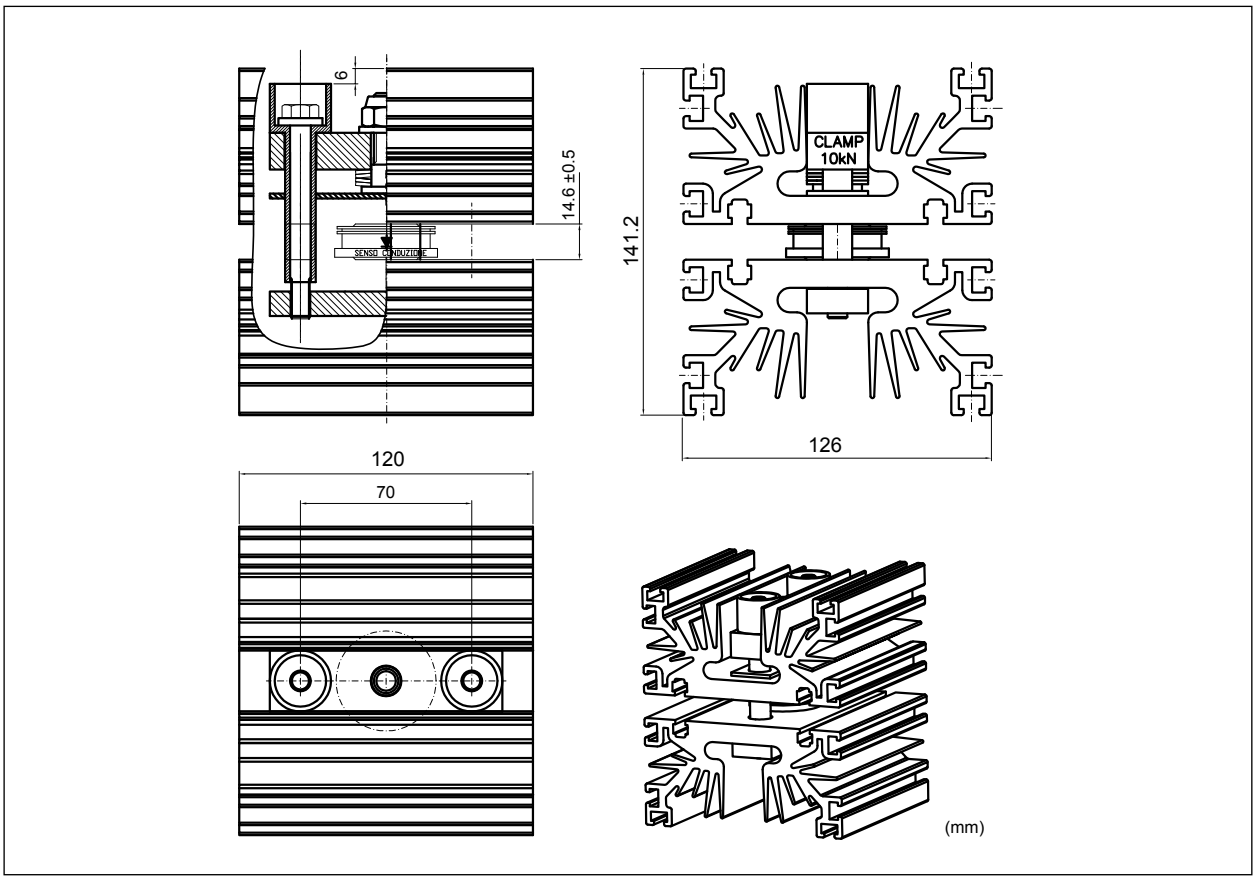


Figure 10.1.5: S8DI104 dimensions

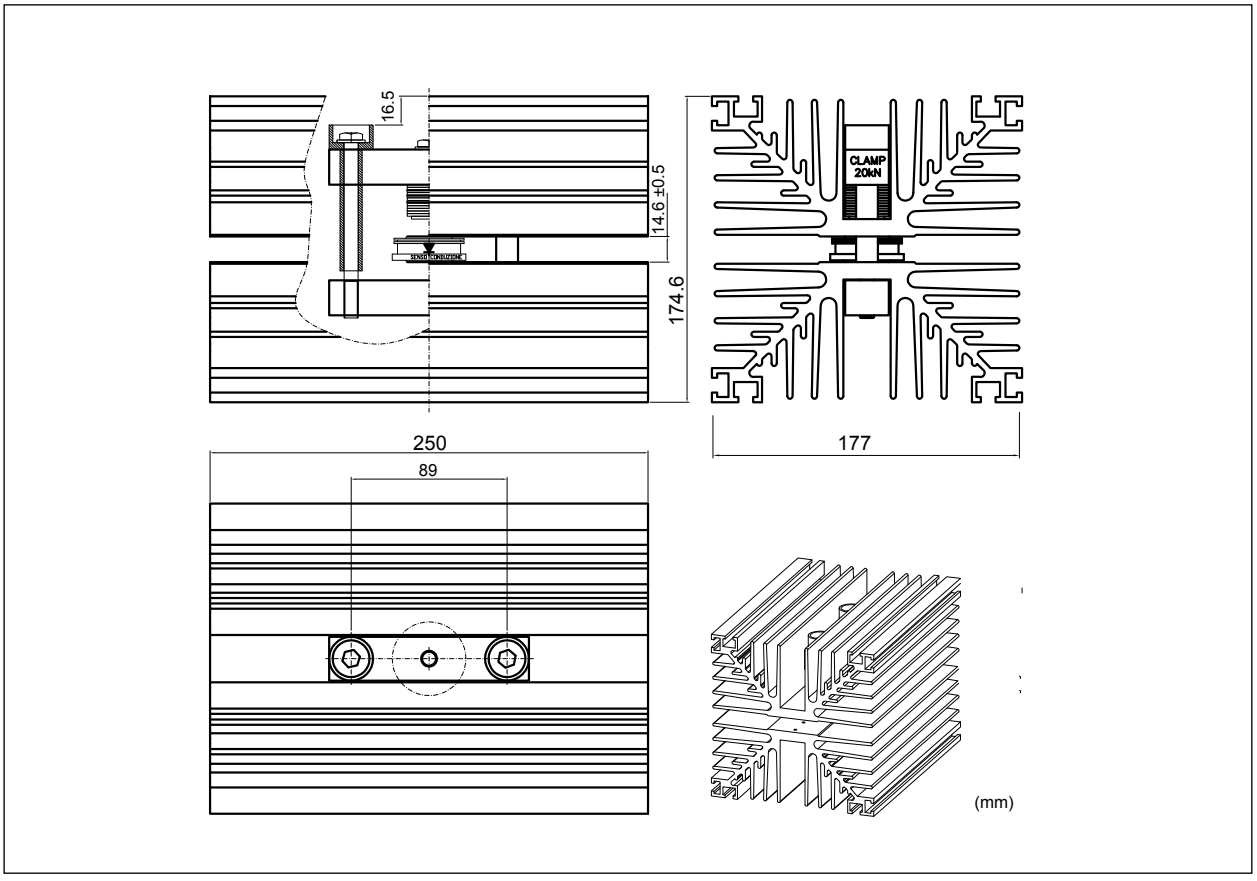


Figure 10.1.6: S8DI105 dimensions

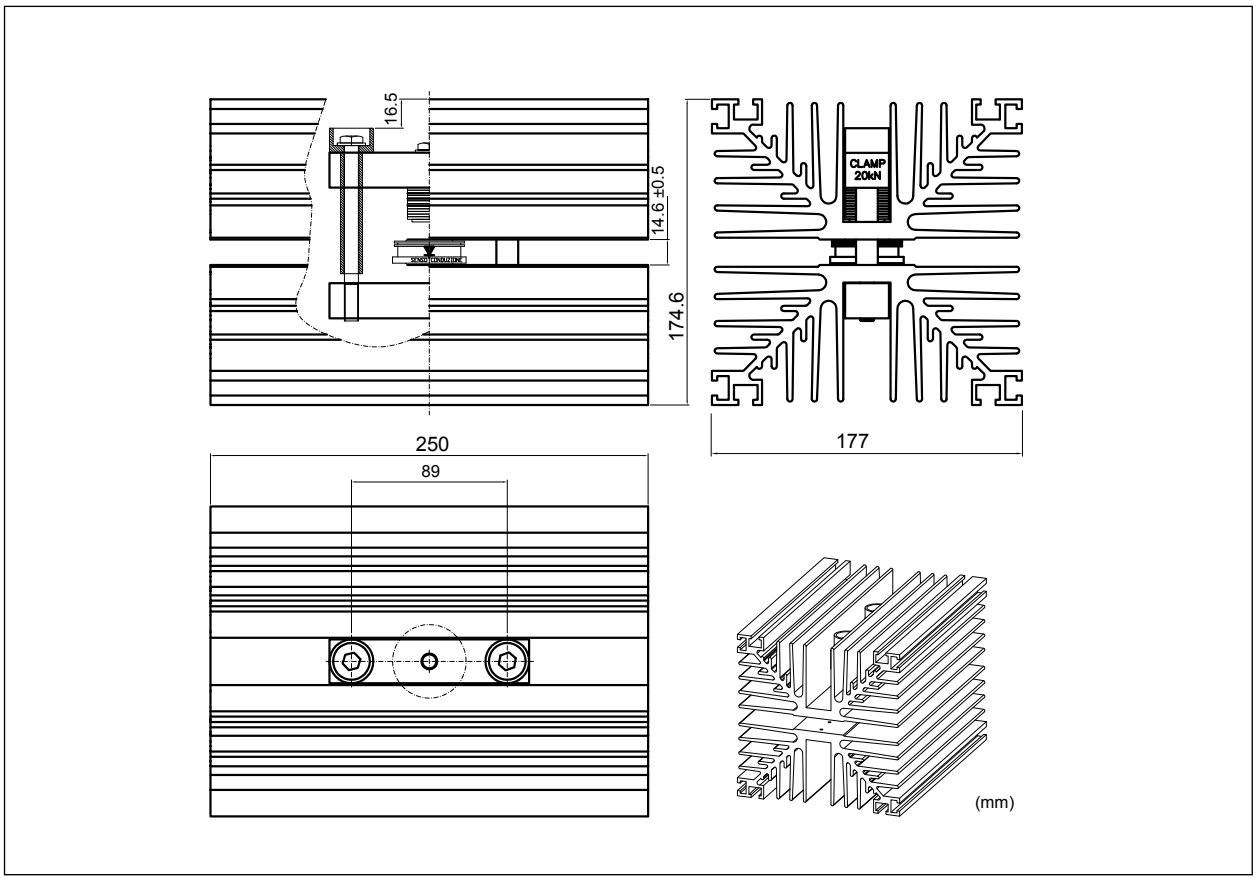


Figure 10.1.7: S8DI106, S8DI107 and S8DI108 dimensions

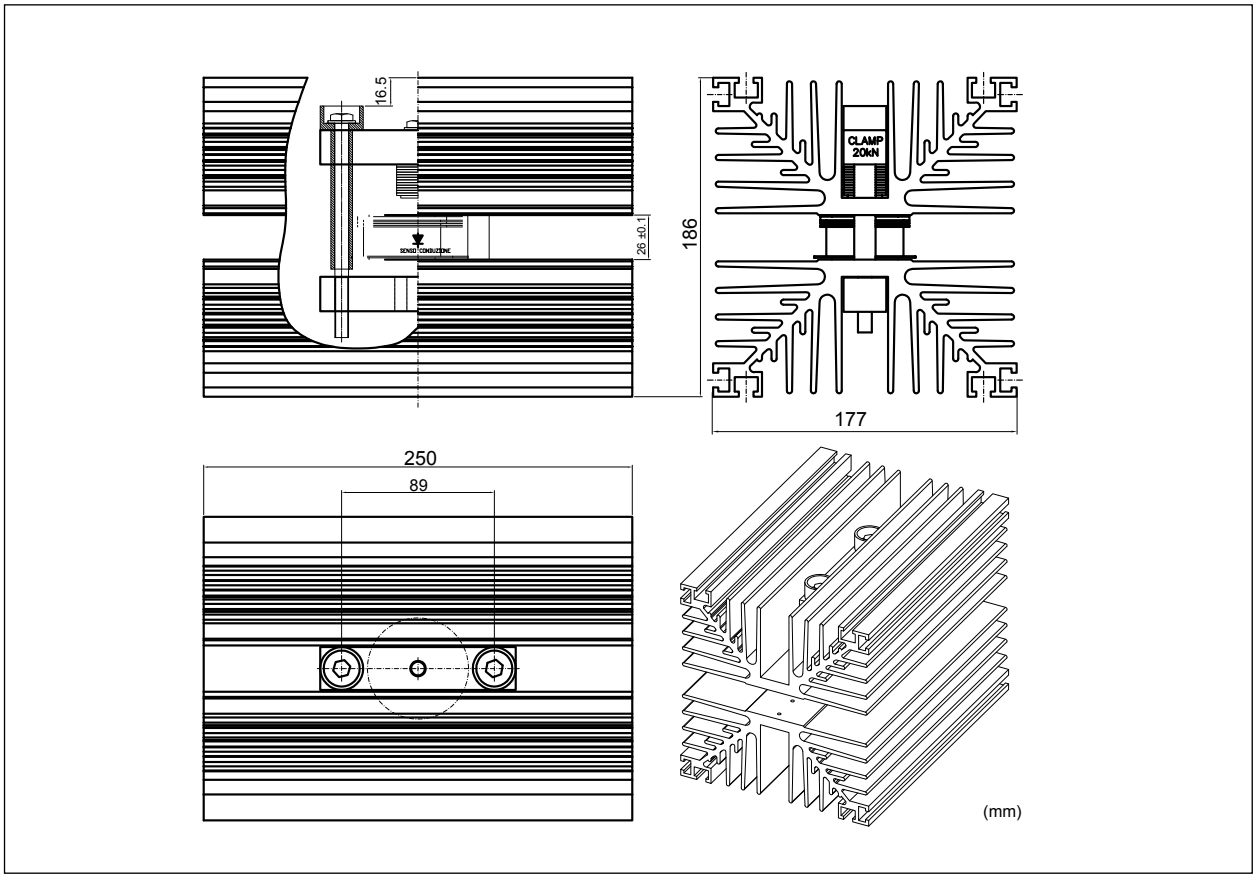


Figure 10.1.8: S8DI109 dimensions

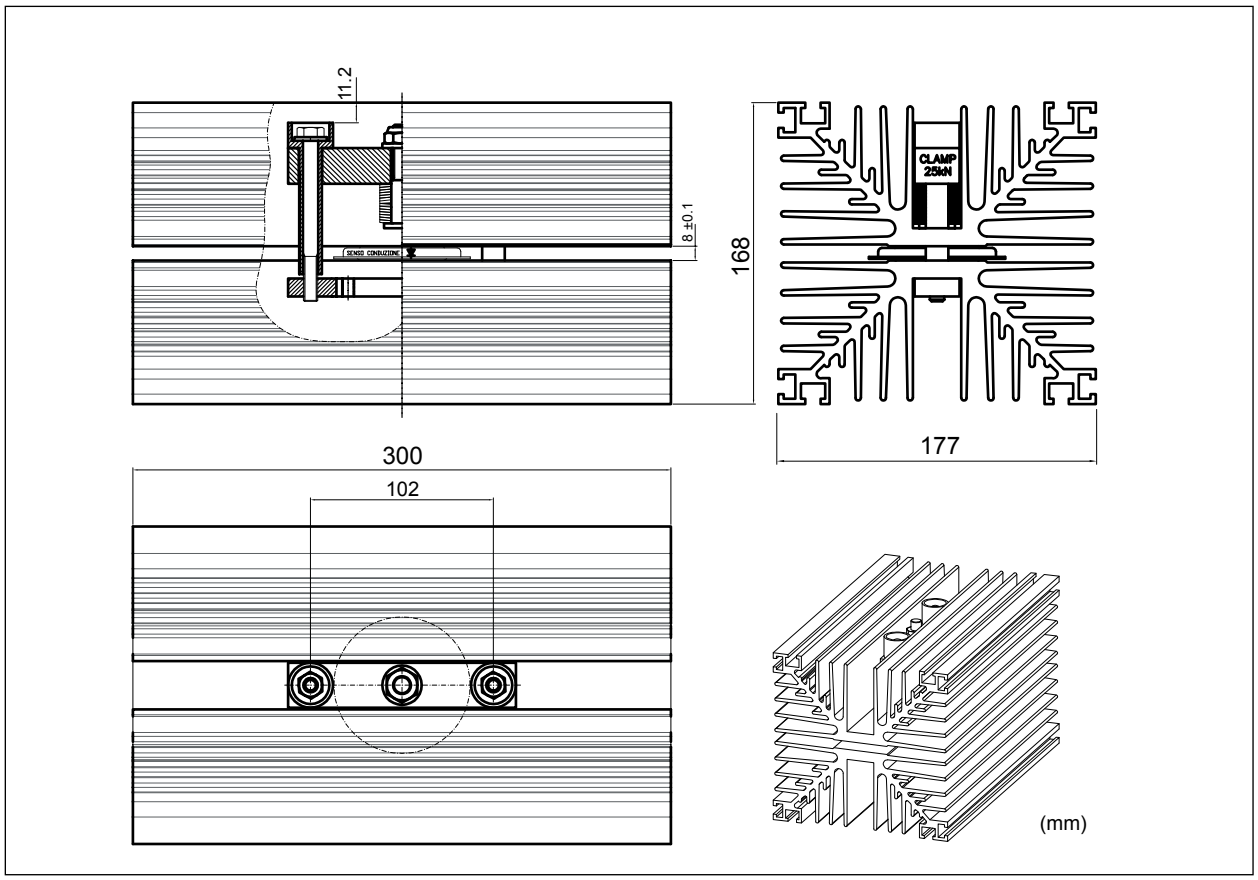
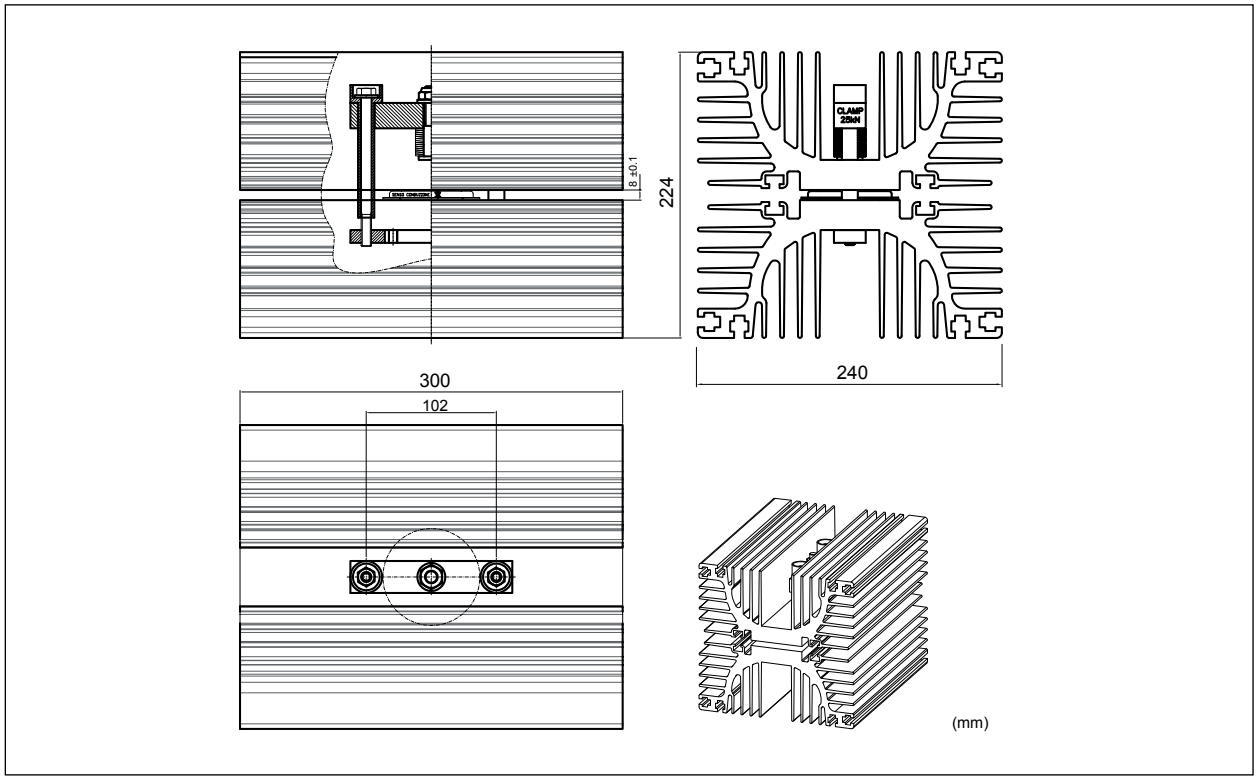
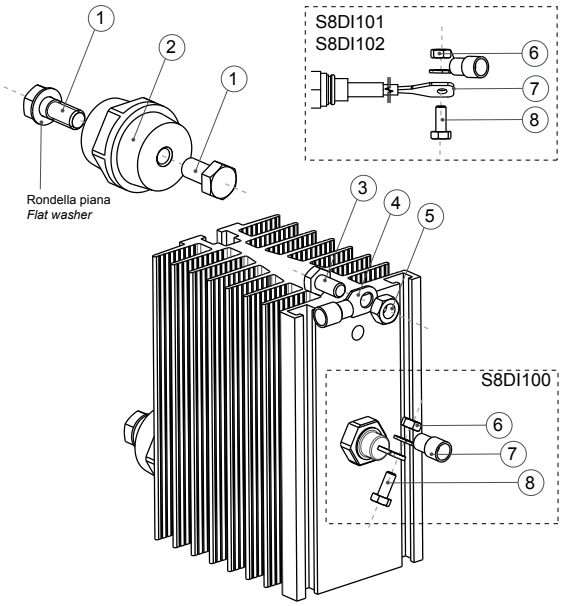
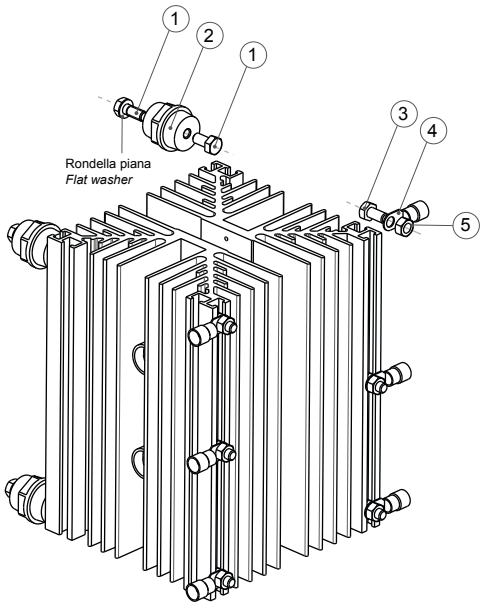


Figure 10.1.9: S8DI110 and S8DI111 dimensions



10.1.3 Mounting instructions and Precautions

Assembly example

S8DI100 ... S8DI102	S8DI103 ... S8DI111
	

Models BD-SP-1600V-...	Cod.	① Hexagonal head screw (N2)	② Insulator (thread)	③ Hexagonal head screw (N2)	④ Round terminal	⑤ Nut (N2)	⑥ Nut (N2)	⑦ Round terminal	⑧ Screw
-50A/100C	S8DI100	4 x M8	2 (M8)	1 x M6	1 x M6	1 x M6	1 x M4	1 x M4	1 x M4
-50A/70C-150A/100C	S8DI101	4 x M8	2 (M8)	1 x M8	1 x M8	1 x M8	1 x M8	1 x M8	1 x M8
-150A/70C-200A/100C	S8DI102	4 x M8	2 (M8)	1 x M8	1 x M8	1 x M8	1 x M10	1 x M10	1 x M8
-200A/70C-300A/100C	S8DI103	8 x M6	4 (M6)	(N1) x M6	(N1) x M6	(N1) x M6	-	-	-
-300A/70C-400A/100C	S8DI104	8 x M8	4 (M8)	(N1) x M8	(N1) x M8	(N1) x M8	-	-	-
-400A/70C-450A/100C	S8DI105								
-450A/70C-500A/100C	S8DI106								
-500A/70C-600A/100C	S8DI107								
-600A/70C-700A/100C	S8DI108								
-700A/70C-800A/100C	S8DI109								
-800A/70C-1000A/100C	S8DI110								
-1000A/70C-1500A/100C	S8DI111								

(N1) The amount must be calculated taking into account the maximum DC current and the related cable section(s).

(N2) Suggested tightening torque: M6=5Nm, M8=12Nm, M10=25Nm.

Temperature

Warning!

The device has metal parts (heat sinks) that can reach dangerous temperatures.
The device must therefore be protected by a casing and / or barrier that prevent contact by service personnel.

Based on the expected temperature of the heatsink depending on the blocking diode selected, the installer must consider and use the correct spacers and provide the right distances inside the electric cabinet.

Voltages on heatsink and diode

The device has dangerous voltages (see electrical data on the DC supply side and AC supply side) on all its parts (heatsinks and diode). In this regard, the insulation of the fastening components of the device towards the metal parts of the electrical panel where it is installed must be considered.

It is also necessary to provide enclosures and / or barriers in order to avoid possible direct contact to live parts of the device for service personnel, in accordance with the requirements of the applicable standards such as for example EN 60204-1.

The electrical connections on the metal parts of the device must be made in compliance with the requirements of the applicable standards, such as EN 60204-1, and in relation to the operating voltages, currents and temperatures. In this regard, consider the operating temperature of the heat sinks, chosen according to the current of use.

Electrical safety requirements distances

All the parts receiving voltage from the blocking diodes must feature a minimum distance in relation to any other device of at least 12.7 mm, including the mounting wall and the protective elements of the direct contacts (barrier). The insulating separators for the mounting must be equipped for withstanding voltages of at least 1000 V DC.

Adequate ventilation distances

The blocking diodes must be installed in such a way that they ensure the free flow of air inside them. The higher and lower distances must be of at least 150 mm. The front section must be allowed at least 50 mm of free space.

10.2 SPDs (surge protection devices)

Note! SPDs must be installed in the immediate vicinity of the drive and with an overall connection cable length of less than 50 cm (out and back < 50 cm).

The ADV200-SP has been designed to be connected to a power supply with category III overvoltage (to ground) and 4 kV pulse voltage.

On AC side the overvoltage protection devices must be used to ensure that the ADV200-SP drive cannot be damaged.

The higher level of protection of the 3kV surge arrester guarantees an adequate level of protection, even considering the increase in overvoltage at the drive due to the parasitic inductance of the surge arrester's connection cable.

10.2.1 DC-side SPD devices

Recommended minimum specifications for DC-side SPDs:

Maximum operating voltage of the SPD	800V_{DC} (maxV_{AC}uum panel voltage) *1.25
Type of surge arrester according to EN 61643-11	T2
Nominal discharge current (8/20us)	20kA (or higher depending on the electrocution risk level)
Maximum discharge current (8/20us)	40kA (or higher depending on the electrocution risk level)
Configuration	Y
Test class	II (suitable for protection against indirect discharges)
C-D surge arrester	varistor
C-PE and D-PE arresters	gas spark gap (or a different technology provided that it is expressly indicated for operation on IT networks. The gas spark gap ensures galvanic insulation to ground and therefore does not affect the operation of the insulation monitor).
Superior level of protection L-PE	≤3kV
Response time	≤25ns

10.2.2 AC-side SPD devices

Recommended minimum specifications for AC-side SPDs:

Continuous operating voltage SPD	480V_{AC}*1.1 (for IT systems) 277Vac*1.1 (for TT and TN systems)
Type of surge arrester according to EN 61643-11	T2
Nominal discharge current (8/20us)	20kA (or higher depending on the electrocution risk level)
Maximum discharge current (8/20us)	40kA (or higher depending on the electrocution risk level)
Configuration	Y
Test class	II (suitable for protection against indirect discharges)
L-PE surge arrester	varistor (or a different technology provided that it is expressly indicated for operation on IT networks.)
Superior level of protection L-PE	≤3kV
Response time	≤25ns

10.3 Insulation monitor

Since the ADV200-SP drive is normally used in a ground-insulated system (IT), in accordance with IEC 61557-8, use of insulation resistance monitoring is required. In an island or dual source configuration, we can have one of the following types of power supply:

- A system (DC) powered by insulated photovoltaic panels
- A system (AC) with insulated mains supply
- A multiple power supply system, from insulated AC mains + from insulated DC photovoltaic panels
- A multiple power supply system, from non-insulated AC mains + from insulated DC photovoltaic panels

The monitoring system must be able to detect insulation loss, both on the AC and DC power supply sides and on the motor side.

A ground fault must be promptly detected and removed as quickly as possible to avoid damage to either the inverter or the entire system as a unit (in the event of insulation loss, the drive must be immediately disabled and disconnected from power sources).

The insulation monitoring device must have the following specifications:

Nominal system voltage to be monitored	0 ... 480V_{AC}, 0 ... 800V_{DC}
Nominal frequency to be monitored	DC or 50Hz -5% ≤ rf ≤ 60Hz + 5%
Adjustable alarm threshold	1 … 500kOhm (recommended)
Recommended insulation monitor:	BENDER iso PV425 ISOMETER with AGH420 coupling device

The insulation monitor must be installed on the DC side, between the photovoltaic panels and any blocking diodes.

The insulation monitor alarm threshold should be set to the highest possible resistance value.

10.4 Contactors

10.4.1 DC-side contactors

Recommended minimum specifications for DC-side contactors:

Rated operating voltage	≥ 800V_{DC}
Rated pulse voltage	≥4kV
Utilisation category	DC1
	(or higher depending on the value of the L/R time constant of the connection circuit and the type of utilisation. With utilisation category DC1, L/R < 2ms).
Rated current	See table in section 10.1
	The rated currents of the DC contactors must be greater than or equal to the minimum values given in the table.

10.4.2 AC-side contactors

Recommended minimum specifications for AC-side contactors:

Rated operating voltage	≥ 480V_{AC}
Rated pulse voltage	≥4kV
Utilisation category	AC3
Rated current	See section “9.5.1 AC power supply”, page 85
	The rated currents of the AC contactors must be greater than or equal to the minimum values given in the table.

10.5 Fuses

10.5.1 AC input side fuses

The inverter must be fused on the AC Input side.

Use fast fuses only.

The table below shows the recommended fuses up to a maximum ambient temperature of 40°C.

Sizes		F1 - AC input side fuses				
		DC link capacitors life time [h]	EUROPE		AMERICA	
			Type	Code	Type	Code
1015 ... 1030		50000	GRD2/10	F4D13	A70P10	S7G49
1040		50000	GRD2/10	F4D13	A70P10	S7G49
1055 ... 2075		50000	GRD2/16	F4D14	A70P20-1	S7G48
2110		50000	GRD2/25	F4D16	A70P40	S7G52
2150		50000	GRD3/35	F4D20	A70P40	S7G52
3185 - 3220		50000	GRD3/50	F4D21	A70P50	S7G53
3300 - 4370		50000	S00C+/üf1/80/80A/690V	F4EAF	A70P80	S7G54
4450		50000	S00C+/üf1/80/100A/690V	F4G18	A70P100	S7G55
4550		50000	S00C+/üf1/80/125A/690V	F4EAJ	A70P150	S7G56
5750 - 5900		50000	S00/üf1/80/200A/690V	F4G23	A70P200	S7G58
51100		50000	S1üf1/110/250A/690V	F4G28	A70P250	S7G59
61320		50000	S1üf1/110/315A/690V	F4G30	A70P350	S7G61
61600		50000	S2üf1/110/400A/690V	F4G34	A70P400	S7G62
72000		50000	S2üf1/110/500A/690V	F4E30	A70P500	S7G63
72500		50000	S2üf1/110/630A/690V	F4E31	A70P600	S7G65
73150		50000	S2üf1/110/630A/690V	F4E31	A70P600	S7G65
73550		50000	S2üf1/110/800A/690V	F4G87	A70P800	S7813
74000		50000	S2üf1/110/800A/690V	F4G87	A70P800	S7813
500 kW	ADV200-SP-72500-KXX-4-MS 05	50000	S2üf1/110/630A/690V	F4E31	A70P600	S7G65
	ADV200-SP-72500-XXX-4-SL	50000	S2üf1/110/630A/690V	F4E31	A70P600	S7G65
630 kW	ADV200-SP-73150-KXX-4-MS 06	50000	S2üf1/110/630A/690V	F4E31	A70P600	S7G65
	ADV200-SP-73150-XXX-4-SL	50000	S2üf1/110/630A/690V	F4E31	A70P600	S7G65
710 kW	ADV200-SP-73550-KXX-4-MS 07	50000	S2üf1/110/800A/690V	F4G87	A70P800	S7813
	ADV200-SP-73550-XXX-4-SL	50000	S2üf1/110/800A/690V	F4G87	A70P800	S7813
800 kW	ADV200-SP-74000-KXX-4-MS 08	50000	S2üf1/110/800A/690V	F4G87	A70P800	S7813
	ADV200-SP-74000-XXX-4-SL	50000	S2üf1/110/800A/690V	F4G87	A70P800	S7813
1 MW	ADV200-SP-73550-KXX-4-MS 10	50000	S2üf1/110/800A/690V	F4G87	A70P800	S7813
	ADV200-SP-73550-XXX-4-SL	50000	S2üf1/110/800A/690V	F4G87	A70P800	S7813
	ADV200-SP-73550-XXX-4-SL	50000	S2üf1/110/800A/690V	F4G87	A70P800	S7813
1.2 MW	ADV200-SP-74000-KXX-4-MS 12	50000	S2üf1/110/800A/690V	F4G87	A70P800	S7813
	ADV200-SP-74000-XXX-4-SL	50000	S2üf1/110/800A/690V	F4G87	A70P800	S7813
	ADV200-SP-74000-XXX-4-SL	50000	S2üf1/110/800A/690V	F4G87	A70P800	S7813
1.5 MW	ADV200-SP-73550-KXX-4-MS 15	50000	S2üf1/110/800A/690V	F4G87	A70P800	S7813
	ADV200-SP-73550-XXX-4-SL	50000	S2üf1/110/800A/690V	F4G87	A70P800	S7813
	ADV200-SP-73550-XXX-4-SL	50000	S2üf1/110/800A/690V	F4G87	A70P800	S7813
	ADV200-SP-73550-XXX-4-SL2	50000	S2üf1/110/800A/690V	F4G87	A70P800	S7813
1.8 MW	ADV200-SP-73550-KXX-4-MS 18	50000	S2üf1/110/800A/690V	F4G87	A70P800	S7813
	ADV200-SP-73550-XXX-4-SL	50000	S2üf1/110/800A/690V	F4G87	A70P800	S7813
	ADV200-SP-73550-XXX-4-SL	50000	S2üf1/110/800A/690V	F4G87	A70P800	S7813
	ADV200-SP-73550-XXX-4-SL2	50000	S2üf1/110/800A/690V	F4G87	A70P800	S7813
	ADV200-SP-73550-XXX-4-SL2	50000	S2üf1/110/800A/690V	F4G87	A70P800	S7813

The technical data of the fuses, e.g. dimensions, weights, heat dissipation, auxiliary contactors, are reported in the corresponding manufacturer data sheets.

GRD... (E27), S... Jean Müller, Eltville

A70... Ferraz

10.5.2 DC fuses on the inverter side for short-circuit protection

Rated voltage _____ 1000V_{DC}

Fuse specification _____ gPV

Rated current _____ See the following table

Recommended fuses for an ambient temperature of 40°C:

Sizes		Rated current gPV fuse [A]	EATON FUSES CODE	Q.ty	EATON FUSES SIZE	IR (kA)	I^2t total 1000V [A^2s]	Watt loss @ In [W]
1015		6	PV-6A10F	2	10x38	50	90	1.8
1022		8	PV-8A10F	2	10x38	50	32	2.1
1030		10	PV-10A10F	2	10x38	50	70	2.3
1040		15	PV-15A10F	2	10x38	50	220	2.9
1055		20	PV-20A10F	2	10x38	50	350	3.6
2075		32	PV-32ANH1	2	NH1	50	720	8.5
2110		32	PV-32ANH1	2	NH1	50	720	8.5
2150		40	PV-40ANH1	2	NH1	50	1670	9
3185		50	PV-50ANH1	2	NH1	50	3600	11
3220		63	PV-63ANH1	2	NH1	50	4300	12
3300		80	PV-80ANH1	2	NH1	50	5760	15.5
4370		100	PV-100ANH1	2	NH1	50	11700	16.5
4450		125	PV-125ANH1	2	NH1	50	23400	17.5
4550		160	PV-160ANH2	2	NH2	50	37000	28
5750		250	PV-250ANH2	2	NH2	50	136000	38
5900		300	PV-315ANH3	2	NH3	50	260000	44
51100		300	PV-315ANH3	2	NH3	50	260000	44
61320		400	PV-400ANH3	2	NH3	50	550000	50
61600		500	PV-500A-3L	2	3L	50	442000	85
72000		630	PV-350-3L	2+2 (1)	3L	50	161200	65
72500		720	PV-400-3L	2+2 (1)	3L	50	231400	82
73150		1080	PV-600-3L	2+2 (1)	3L	50	712400	108
73550		1200	PV-500-3L	3+3 (2)	3L	50	442000	85
74000		1200	PV-500-3L	4+4 (3)	3L	50	442000	85
500 kW	ADV200-SP-72500-KXX-4-MS 05	720	PV-400-3L	2+2 (1)	3L	50	231400	82
	ADV200-SP-72500-XXX-4-SL	720	PV-400-3L	2+2 (1)	3L	50	231400	82
630 kW	ADV200-SP-73150-KXX-4-MS 06	1080	PV-600-3L	2+2 (1)	3L	50	712400	108
	ADV200-SP-73150-XXX-4-SL	1080	PV-600-3L	2+2 (1)	3L	50	712400	108
710 kW	ADV200-SP-73550-KXX-4-MS 07	1200	PV-500-3L	3+3 (2)	3L	50	442000	85
	ADV200-SP-73550-XXX-4-SL	1200	PV-500-3L	3+3 (2)	3L	50	442000	85
800 kW	ADV200-SP-74000-KXX-4-MS 08	1200	PV-500-3L	4+4 (3)	3L	50	442000	85
	ADV200-SP-74000-XXX-4-SL	1200	PV-500-3L	4+4 (3)	3L	50	442000	85
1 MW	ADV200-SP-73550-KXX-4-MS 10	1200	PV-500-3L	3+3 (2)	3L	50	442000	85
	ADV200-SP-73550-XXX-4-SL	1200	PV-500-3L	3+3 (2)	3L	50	442000	85
	ADV200-SP-73550-XXX-4-SL	1200	PV-500-3L	3+3 (2)	3L	50	442000	85
1.2 MW	ADV200-SP-74000-KXX-4-MS 12	1200	PV-500-3L	4+4 (3)	3L	50	442000	85
	ADV200-SP-74000-XXX-4-SL	1200	PV-500-3L	4+4 (3)	3L	50	442000	85
	ADV200-SP-74000-XXX-4-SL	1200	PV-500-3L	4+4 (3)	3L	50	442000	85
1.5 MW	ADV200-SP-73550-KXX-4-MS 15	1200	PV-500-3L	3+3 (2)	3L	50	442000	85
	ADV200-SP-73550-XXX-4-SL	1200	PV-500-3L	3+3 (2)	3L	50	442000	85
	ADV200-SP-73550-XXX-4-SL	1200	PV-500-3L	3+3 (2)	3L	50	442000	85
	ADV200-SP-73550-XXX-4-SL2	1200	PV-500-3L	3+3 (2)	3L	50	442000	85
1.8 MW	ADV200-SP-73550-KXX-4-MS 18	1200	PV-500-3L	3+3 (2)	3L	50	442000	85
	ADV200-SP-73550-XXX-4-SL	1200	PV-500-3L	3+3 (2)	3L	50	442000	85
	ADV200-SP-73550-XXX-4-SL	1200	PV-500-3L	3+3 (2)	3L	50	442000	85
	ADV200-SP-73550-XXX-4-SL2	1200	PV-500-3L	3+3 (2)	3L	50	442000	85
	ADV200-SP-73550-XXX-4-SL2	1200	PV-500-3L	3+3 (2)	3L	50	442000	85

The technical data of the fuses, e.g. dimensions, weights, heat dissipation, auxiliary contactors, are reported in the Eaton - Bussmann data sheets.
(1): 2 fuses in parallel; (2): 3 fuses in parallel; (3): 4 fuses in parallel.

Note! The fuses must have gPV type breaking characteristics, a 1000V rating and a current rating that does not exceed the manufacturer's recommendations for panel protection.

To ensure that the system can be completely disconnected on both sides, each string should be protected with two fuses, one at each pole.

Normally the rated current of the fuse must be between 1.25 and 2 times the panel's Isc (short circuit current):

1,25*Isc ≤ Infuse ≤ 2*Isc.

The string fuse ensures protection against reverse currents, since the possibility that the blocking diode may short-circuit is considered.

Normally, a photovoltaic panel can withstand a reverse current between 2.5 and 3 times its Isc.

Once the fuse breaking capacity has been defined, make sure that the minimum current at which the fuse is guaranteed to break (specification to be requested from the manufacturer) is lower than the maximum reverse current that can be withstood by the photovoltaic panels:

I min fusibile < Imax inversa

Realistic values for a fuse's minimum breaking current are around 2 times its rated current.

If the DC cables connecting the inverter are sized for a current of 1.25*Isc*n, where n is the number of strings in parallel, then it is not necessary to protect the cable at the inverter output from overloads, but only from short circuits.

Therefore, the DC fuses used at the inverter output should also be 1000V gPV fuses, used only for short circuit protection in the event of a ground fault.

10.6 Choke

10.6.1 Optional input chokes (L1)

Caution

A three-phase mains choke is mandatory for sizes 2075 (LD) ... 4450 and ≥ 72000 .

Il faut obligatoirement utiliser une inductance de réseau triphasée pour les grandeurs 2075 (LD) ... 4450 et ≥ 72000.

Use of mains chokes with an impedance of at least 3% is recommended.

The table below shows the minimum inductance values and current ratings with the codes proposed by WEG.

In case of a Master and Slave connection (500 to 1800 kW devices) the use of identical chokes (same inductance value and same current rating) for Master drive and for each Slave drive is mandatory to ensure the correct distribution of current over the drive input rectifier bridges.

Sizes	Inverter Output	Mains inductance (mH)	Rated current (A)	Saturation current (A)	Type	Q.ty	Code
1015 ... 1055	HD / LD	Integrated on DC-link					
2075	HD	Integrated on DC-link					
	LD	0.89	16.5	31	LR3y-2073-35%	1	S7F09
2110	HD / LD	1.75	23	43	LR3y-3110-35%	1	S7HB3
2150	HD / LD	1.3	30	55	LR3y-3150-35%	1	S7HB0
3185	HD / LD	1.1	36	66	LR3y-4185-35%	1	S7HB4
3220	HD / LD	0.88	44	81	LR3y-4220-35%	1	S7HB5
3300	HD / LD	0.66	59	108	LR3y-4300-35%	1	S7HB6
4370	HD / LD	0.52	75	128	LR3y-4370-35%	1	S7HB7
4450	HD	0.44	96	163	LR3-4-045-35%	1	S7FF10
	LD	Integrated on DC-link					
4550 ... 61600	HD / LD	Integrated on DC-link					
72000	HD	0.085	309	618	LR3-160	1	S7D40
	LD	0.085	420	710	LR3-200	1	S7AE9
72500	HD / LD	0.085	420	710	LR3-200	1	S7AE9
73150	HD / LD	0.06	550	1050	LR3-315	1	S7D28
73550	HD / LD	0.04	700	900	LR3-ADV-355	1	S7LR01
74000	HD / LD	0.04	700	900	LR3-ADV-355	1	S7LR01
500 kW	HD / LD	0.085	420	710	LR3-200	2	S7AE9
630 kW	HD / LD	0.06	550	1050	LR3-315	2	S7D28
710 kW	HD / LD	0.04	700	900	LR3-ADV-355	2	S7LR01
800 kW	HD / LD	0.04	700	900	LR3-ADV-355	2	S7LR01
1000 kW	HD / LD	0.04	700	900	LR3-ADV-355	3	S7LR01
1200 kW	HD / LD	0.04	700	900	LR3-ADV-355	3	S7LR01
1500 kW	HD / LD	0.04	700	900	LR3-ADV-355	4	S7LR01
1800 kW	HD / LD	0.04	700	900	LR3-ADV-355	5	S7LR01

Type	Code	Dimensions (WxHxd, mm)	Weights (kg)
LR3y-2073-35%	S7FO9	150 x 155 x 94	6.2
LR3y-3110-35%	S7HB3	180 x 185 x 134	8
LR3y-3150-35%	S7HB0	180 x 185 x 144	10
LR3y-4185-35%	S7HB4	180 x 185 x 154	12
LR3y-4220-35%	S7HB5	180 x 165 x 190	15
LR3y-4300-35%	S7HB6	240 x 216 x 180	19
LR3y-4370-35%	S7HB7	240 x 216 x 190	22
LR3-4-045-35%	S7FF10	300 x 265 x 230	30
LR3-160	S7D40	300 x 270 x 260	44
LR3-200	S7AE9	300 x 270 x 355	54
LR3-315	S7D28	375 x 400 x 220	74
LR3-ADV-355	S7LR01	390 x 400 x 290	83

10.6.2 Input chokes for conformity to EN61000-3-12 for drives with input currents of between 16A and 75A

Sizes	Type	Code	Value [μH]
2110	LR3y-3110-35%	S7HB3	1750
2150	LR3y-3150-35%	S7HB0	1300
3185	LR3y-4185-35%	S7HB4	1100
3220	LR3y-4220-35%	S7HB5	880
3300	LR3y-4300-35%	S7HB6	660
4370 - 4450	LR3y-4370-35%	S7HB7	520

With this combination the maximum output voltage falls to Vout = 0.94 Vin

There are no limitations for inverter sizes with output current ≤16A as these are considered to be for professional use.

The applicable standard for inverters with output currents of more than 75 A is EN61000-3-4.

10.6.3 Optional external choke (L2)

Attention

On Master and Slave devices (500 kW to 1.8 MW sizes), output chokes must be used: value and their technical characteristics MUST be the same for all the drive power modules (same inductance value and same current rating) to garantee correct current sharing.

Cable lenght must be the same between the drive power modules.

The ADV200 SP drive can be used with general purpose standard motors or with motors specially designed for drive use. The latter usually have a higher isolation rating to better withstand PWM voltage.

Examples of reference regulations are provided below:

Motors designed for use with Adjustable Frequency Drives do not require any specific filtering of the voltage waveform from the drive. For general purpose motors, especially with long cable runs (typically over 100 m [328 feet]) an output choke is recommended to mantain the voltage waveform within the specified limits.

The rated current of the chokes should be approx. 20% above the rated current of the frequency drive in order to take into account additional losses due to PWM waveform.

Sizes 1015 ... 74000

Sizes	Inverter output	Mains inductance (mH)	Rated current (A)	Saturation current (A)	Type	Code	Dimensions (W x H x d. mm) and Weights
1015 ... 1055	HD	1.4	9.5	20	LU3-003	S7FG2	180 x 170 x 110 - 6.8 kg
	LD	0.87	16	34	LU3-005	S7FG3	
2075	HD	0.87	16	34	LU3-005	S7FG3	
	LD	0.51	27	57	LU3-011	S7FG4	180 x 185 x 130 - 8 kg
2110 - 2150	HD	0.51	27	57	LU3-011	S7FG4	
	LD	0.43	32	68	LU3-015	S7FH2	180 x 185 x 140 - 7 kg
3185	HD	0.43	32	68	LU3-015	S7FH2	
	LD	0.33	42	72	LU3-022	S7FH3	180 x 185 x 160 - 8.2 kg
3220	HD	0.33	42	72	LU3-022	S7FH3	
	LD	0.23	58	100	LU3-030	S7FH4	180 x 185 x 170 - 10 kg
3300	HD	0.23	58	100	LU3-030	S7FH4	
	LD	0.24	58	100	LU3-030	S7FH4	
4370	HD	0.24	58	100	LU3-030	S7FH4	
	LD	0.18	76	130	LU3-037	S7FH5	
4450	HD	0.18	76	130	LU3-037	S7FH5	
	LD	0.12	120	205	LU3-055	S7FH6	240 x 216 x 170 - 16 kg

Sizes	Inverter output	Mains inductance (mH)	Rated current (A)	Saturation current (A)	Type	Code	Dimensions (W x H x d. mm) and Weights
4550	HD	0.12	120	205	LU3-090	S7F10	180 x 165 x 195 - 15 kg
	LD	0.07	180	310	LU3-090	S7F10	
5750 - 5900	HD / LD	0.07	180	310	LU3-090	S7F10	
51100	HD	0.07	180	310	LU3-090	S7F10	
	LD	0.041	310	540	LU3-160	S7FH8	300 x 265 x 220 - 30 kg
61320 - 61600	HD / LD	0.041	310	540	LU3-160	S7FH8	
72000	HD	0.041	310	540	LU3-160	S7FH8	
	LD	0.03	400	770	LU3-200	S7AF0	300 x 270 x 230. 33 kg
72500	HD	0.03	400	770	LU3-200	S7AF0	
	LD	0.022	580	1100	LU3-315	S7FH9	370 x 400 x 210. 65
73550	HD / LD	0.022	580	1100	LU3-315	S7FH9	
74000	HD	0.022	580	1100	LU3-315	S7FH9	
74000	LD	0.015	730	1240	LU3-400	S7FO8	390 x 430 x 270. 73 kg

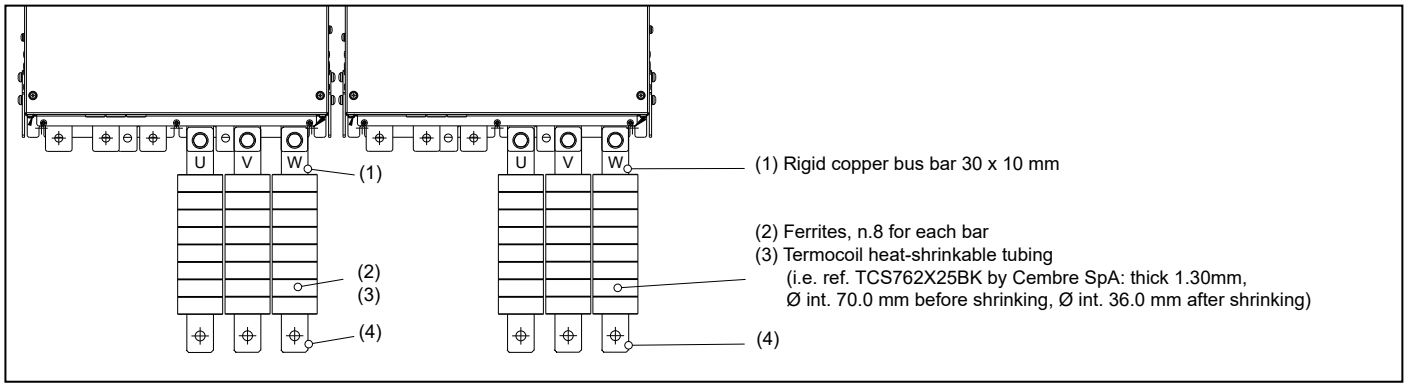
Nota ! When the drive is operated at the rated current and at 50 Hz, the output chokes cause a voltage drop of approx. 2% of the output voltage.

Sizes 500 ... 1800 kW

The use of output chokes is mandatory for for parallel units; as a function of the application/connection, according to the following criteria:

- for applications with short motor cables (≤ 100 m long) bus bars with an integrated ferrites (see Figure 2.1 and Table 1) or single distributor chokes may be used (see Table 2);
- for applications with long motor cables (> 100 m long) output choke may be used (see Table 3);

Figure 2.1: Busbars with integrated ferrites



Caution

At the output of each drive it is recommended to fix vertical straight bus bars for each phase (1), on which to mount the ferrites (2), it is also recommended to use heat-shrink tubing for insulate the ferrites (3).

One or more cables must start from each phase (4) depending on the currents and cable sections and the parallel of the cables is done directly on the motor (see “5.1.7 Motor connection”, page 31).

To avoid unbalancing the cables must be the same (material, section and length).

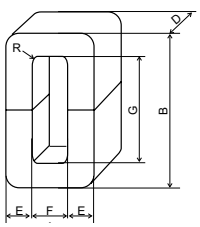
Bars or cables can be used for the connection between C and D.

À la sortie de chaque entraînement, il est conseillé de fixer des barres droites verticales pour chaque phase (1), sur lesquelles installer les ferrites (2). Il est en outre conseillé d’utiliser des gaines thermorétractables pour isoler les ferrites.

Une ou plusieurs courses doivent se déployer à partir de chaque phase (4), en fonction des courants et des sections des câbles. Le parallèle des courses s’effectue directement sur le moteur (voir sect. “5.1.7 Motor connection”, page 31). Pour éviter des déséquilibres, les câbles doivent être identiques (matériau, section et longueur).

Pour le raccordement entre C et D, il est possible d’utiliser des barres ou des câbles.

Table 1: Ferrites

Sizes	Inverter output	Motor cable lenght distance ≤ 100 m @400Vac … 460Vac										
		Q.ty (1)	Type	Code	Dimensions (mm)							Weights
					A	B	D	E	F	G	R	kg
500 kW	HD / LD	48	**Ferrite -N 57L 34P 22H t1.6** 	S7DDV	33.5	57.2	22	10	11.5 min	35 min	1.5 max	0,2
630 kW	HD / LD	48										
710 kW	HD / LD	48										
800 kW	HD / LD	48										
1000 kW	HD / LD	72										
1200 kW	HD / LD	72										
≥1500 kW	HD / LD	*(2)*										

(1) A total of 8pcs of ferrites has to be mounted on each drive module output phase.

(2) Solution not recommended: use output inductances.

Table 2: Current distributor output choke

Sizes	Inverter output	Motor cable lenght distance ≤ 100 m @400Vac … 460Vac						
		Mains inductance (μH)	Rated current (A)	Saturation current (A)	Q.ty	Type	Code	Dimensions and Weights
500 kW	HD / LD	7.5	450	675	2	LU3-500P	S7FFI2	W = 280 mm, H = 315 mm d = 155 mm, 22 kg
630 kW	HD				2			
630 kW	LD	5.0	730	975	2	LU3-800P	S7FFI1	W = 280 mm, H = 315 mm d = 155 mm, 28 kg
710 kW	HD / LD				2			
800 kW	HD / LD				2			
1000 kW	HD / LD				3			
1200 kW	HD / LD				3			
1500 kW	HD / LD				4			
1800 kW	HD / LD				5			

Table 3: output choke

Sizes	Inverter output	Motor cable lenght distance > 100 m @400Vac … 460Vac			
		Q.ty	Type	Code	Dimensions and Weights
500 kW	HD	2	LU3-200	S7AF0	W x H x d: 300 x 270 x 230 mm, 33 kg
500 kW	LD	2	LU3-315	S7FH9	W x H x d: 370 x 400 x 210 mm, 65 kg
630 kW	HD / LD	2	LU3-400	S7FO8	W x H x d: 390 x 430 x 270 mm, 73 kg
710 kW	HD / LD	2			
800 kW	HD / LD	2			
1000 kW	HD / LD	3			
1200 kW	HD / LD	3			
1500 kW	HD / LD	4			
1800 kW	HD / LD	5			

Attention

Using specific crtieria regarding the choice of cables, their minimum lenght and laying in the ducts, is it possible to avoid the use of the output chokes.

Ask to the WEG Technical Assistance for more details.

10.7 EMI filters

10.7.1 EMI filters for IT network connections

In the case of IT-type AC power `supply systems (generator insulated from PE), generally components connected between the supply phases and PE are prohibited. This is required for the operational reliability and safety of the system.

Therefore, EMC filters cannot be used on the AC side as they always have high capacitance when connected between the power supply phases and PE.

However, if a reduction in conducted emission levels is required and the ground insulation monitoring systems are compatible with the capacitance connected between the power supply phases and PE, as well as with electrical safety requirements, there is a series of filters available that will work on IT-type AC networks.

Below are the combinations of EMC filters and drives.

Sizes	AC Input voltage 400V-480V, System earthing IT				
	Heavy Duty		Low Duty		EN 61800-3 : Category / Motor cable length
	Model	Code	Model	Code	
1015	FN 258 HVIT-7-29		**FN 258 HVIT-7-29**		C4 / 100 m
1022	FN 258 HVIT-7-29		**FN 258 HVIT-7-29**		C4 / 100 m
1030	FN 258 HVIT-7-29		**FN 258 HVIT-7-29**		C4 / 100 m
1040	FN 258 HVIT-7-29		**FN 258 HVIT-16-29**		C4 / 100 m
1055	FN 258 HVIT-16-29		**FN 258 HVIT-16-29**		C4 / 100 m
2075	FN 258 HVIT-16-29		**FN 258 HVIT-16-29**		C4 / 100 m
2110	FN 258 HVIT-16-29		**FN 258 HVIT-30-33**		C4 / 100 m
2150	FN 258 HVIT-30-33		**FN 258 HVIT-30-33**		C4 / 100 m
3185	FN 258 HVIT-30-33		**FN 258 HVIT-42-33**		C4 / 100 m
3220	FN 258 HVIT-42-33		**FN 258 HVIT-55-34**		C4 / 100 m
3300	FN 258 HVIT-55-34		**FN 258 HVIT-75-34**		C4 / 100 m
4370	FN 258 HVIT-75-34		**FN 258 HVIT-75-34**		C4 / 100 m
4450	FN 258 HVIT-75-34		**FN 258 HVIT-100-35**		C4 / 100 m
4550	FN 258 HVIT-100-35		**FN 258 HVIT-130-35**		C4 / 100 m
5750	FN 258 HVIT-130-35		**FN 3311 HVIT-250**		C4 / 100 m
5900	FN 3311 HVIT-250		**FN 3311 HVIT-250**		C4 / 100 m
51100	FN 3311 HVIT-250		**FN 3311 HVIT-250**		C4 / 100 m
61320	FN 3311 HVIT-250		**FN 3311 HVIT-250**		C4 / 100 m
61600	FN 3311 HVIT-400		**FN 3311 HVIT-400**		C4 / 100 m
≥ 72000	On request, contact WEG Commercial Department.				

Note! Codes provided on request

Additional technical specifications are available from the manufacturer in the Schaffner website or catalogue.

Model	Dimensions	Weights
	(W x H x d) - mm	kg
FN 258 HVIT-7-29	255 x 126 x 50	1,0
FN 258 HVIT-16-29	305 x 142 x 55	1,5
FN 258 HVIT-30-33	335 x 150 x 60	1,8
FN 258 HVIT-42-33	329 x 185 x 70	2,5
FN 258 HVIT-55-34	329 x 185 x 80	3,0
FN 258 HVIT-75-34	329 x 220 x 80	4,3
FN 258 HVIT-100-35	379 x 90 x 220	5,6
FN 258 HVIT-130-35	439 x 110 x 240	7,1
FN 3311 HVIT-250	170 x 140 x 267	2,7
FN 3311 HVIT-400	175 x 140 x 280	3.3

.10.7.2 EMI filters for TT or TN network connections

Standard EMC filters (with capacitors connected between phases and PE) can be used in TN or TT grounded AC power supply networks, where both the generator and the load (AC motor) are electrically connected to PE.

Sizes		AC Input voltage 400V-480V, System earthing TN ,TT				
		Heavy Duty		Low Duty		EN 61800-3 : Category / Motor cable length
		Model	Code	Model	Code	
1015		EMI FTF-480-7	S7GHL	**EMI FTF-480-7**	S7GHL	C2 / 30 m
1022		EMI FTF-480-7	S7GHL	**EMI FTF-480-7**	S7GHL	C2 / 30 m
1030		EMI FTF-480-7	S7GHL	**EMI FTF-480-7**	S7GHL	C2 / 30 m
1040		EMI FTF-480-7	S7GHL	**EMI FTF-480-16**	S7GHO	C2 / 30 m
1055		EMI FTF-480-16	S7GHO	**EMI FTF-480-16**	S7GHO	C2 / 30 m
2075		EMI FTF-480-16	S7GHO	**EMI FTF-480-16**	S7GHO	C2 / 30 m
2110		EMI FTF-480-16	S7GHO	**EMI FTF-480-30**	S7GHP	C2 / 30 m
2150		EMI FTF-480-30	S7GHP	**EMI FTF-480-30**	S7GHP	C2 / 30 m
3185		EMI FTF-480-30	S7GHP	**EMI FTF-480-42**	S7GOA	C2 / 30 m
3220		EMI FTF-480-42	S7GOA	**EMI FTF-480-55**	S7GOB	C2 / 30 m
3300		EMI FTF-480-55	S7GOB	**EMI FTF-480-75**	S7GOC	C2 / 30 m
4370		EMI FTF-480-75	S7GOC	**EMI FTF-480-75**	S7GOC	C3 / 100 m
4450		EMI FTF-480-75	S7GOC	**EMI FTF-480-100**	S7GOD	C3 / 100 m
4550		EMI FTF-480-100	S7GOD	**EMI FTF-480-130**	S7GOE	C3 / 100 m
5750		EMI FTF-480-130	S7GOE	**EMI FTF-480-180**	S7GOF	C3 / 100 m
5900		EMI FTF-480-180	S7GOF	**EMI FTF-480-180**	S7GOF	C3 / 100 m
51100		EMI FTF-480-180	S7GOF	**EMI-480-250**	S7DGG	C3 / 100 m
61320		EMI-480-250	S7DGG	**EMI-480-250**	S7DGG	C3 / 100 m
61600		EMI-480-250	S7DGG	**EMI-480-320**	S7DGH	C3 / 100 m
72000		EMI-480-400	S7DGI	**EMI-480-400**	S7DGI	C3 / 2° / 100 m
72500		EMI-480-400	S7DGI	**EMI-480-600**	S7DGL	C3 / 2° / 100 m
73150		EMI-480-600	S7DGL	**EMI-480-600**	S7DGL	C3 / 2° / 100 m
73550		EMI-480-600	S7DGL	**EMI-480-800**	S7DGM	C3 / 2° / 100 m
74000		EMI-480-800	S7DGM	**EMI-480-800**	S7DGM	C3 / 2° / 100 m
500 kW	ADV200-SP-72500-KXX-4-MS 05	EMI-480-400	S7DGI	**EMI-480-600**	S7DGL	C3 / 2° / 100 m
	ADV200-SP-72500-XXX-4-SL	EMI-480-400	S7DGI	**EMI-480-600**	S7DGL	C3 / 2° / 100 m
630 kW	ADV200-SP-73150-KXX-4-MS 06	EMI-480-600	S7DGL	**EMI-480-600**	S7DGL	C3 / 2° / 100 m
	ADV200-SP-73150-XXX-4-SL	EMI-480-600	S7DGL	**EMI-480-600**	S7DGL	C3 / 2° / 100 m
710 kW	ADV200-SP-73550-KXX-4-MS 07	EMI-480-800	S7DGM	**EMI-480-800**	S7DGM	C3 / 2° / 100 m
	ADV200-SP-73550-XXX-4-SL	EMI-480-800	S7DGM	**EMI-480-800**	S7DGM	C3 / 2° / 100 m
800 kW	ADV200-SP-74000-KXX-4-MS 08	EMI-480-800	S7DGM	**EMI-480-800**	S7DGM	C3 / 2° / 100 m
	ADV200-SP-74000-XXX-4-SL	EMI-480-800	S7DGM	**EMI-480-800**	S7DGM	C3 / 2° / 100 m
1 MW	ADV200-SP-73550-KXX-4-MS 10	EMI-480-800	S7DGM	**EMI-480-800**	S7DGM	C3 / 2° / 100 m
	ADV200-SP-73550-XXX-4-SL	EMI-480-800	S7DGM	**EMI-480-800**	S7DGM	C3 / 2° / 100 m
	ADV200-SP-73550-XXX-4-SL	EMI-480-800	S7DGM	**EMI-480-800**	S7DGM	C3 / 2° / 100 m
1.2 MW	ADV200-SP-74000-KXX-4-MS 12	EMI-480-800	S7DGM	**EMI-480-800**	S7DGM	C3 / 2° / 100 m
	ADV200-SP-74000-XXX-4-SL	EMI-480-800	S7DGM	**EMI-480-800**	S7DGM	C3 / 2° / 100 m
	ADV200-SP-74000-XXX-4-SL	EMI-480-800	S7DGM	**EMI-480-800**	S7DGM	C3 / 2° / 100 m
1.5 MW	ADV200-SP-73550-KXX-4-MS 15	EMI-480-800	S7DGM	**EMI-480-800**	S7DGM	C3 / 2° / 100 m
	ADV200-SP-73550-XXX-4-SL	EMI-480-800	S7DGM	**EMI-480-800**	S7DGM	C3 / 2° / 100 m
	ADV200-SP-73550-XXX-4-SL	EMI-480-800	S7DGM	**EMI-480-800**	S7DGM	C3 / 2° / 100 m
	ADV200-SP-73550-XXX-4-SL2	EMI-480-800	S7DGM	**EMI-480-800**	S7DGM	C3 / 2° / 100 m
1.8 MW	ADV200-SP-73550-KXX-4-MS 18	EMI-480-800	S7DGM	**EMI-480-800**	S7DGM	C3 / 2° / 100 m
	ADV200-SP-73550-XXX-4-SL	EMI-480-800	S7DGM	**EMI-480-800**	S7DGM	C3 / 2° / 100 m
	ADV200-SP-73550-XXX-4-SL	EMI-480-800	S7DGM	**EMI-480-800**	S7DGM	C3 / 2° / 100 m
	ADV200-SP-73550-XXX-4-SL2	EMI-480-800	S7DGM	**EMI-480-800**	S7DGM	C3 / 2° / 100 m
	ADV200-SP-73550-XXX-4-SL2	EMI-480-800	S7DGM	**EMI-480-800**	S7DGM	C3 / 2° / 100 m

Filters		Dimensions	Weights
Model	Code	(W x H x d) - mm	kg
ECF3	F4ZZ2	150 x 120 x 110	1.2
EMI FTF-480-7	S7GHL	190 x 40 x 70	0.6
EMI FTF-480-16	S7GHO	250 x 45 x 70	0.8
EMI FTF-480-30	S7GHP	270 x 50 x 85	1
EMI FTF-480-42	S7GOA	310 x 50 x 85	1.3
EMI FTF-480-55	S7GOB	250 x 85 x 90	1.9
EMI FTF-480-75	S7GOC	270 x 80 x 135	2.6
EMI FTF-480-100	S7GOD	270 x 90 x 150	3
EMI FTF-480-130	S7GOE	270 x 90 x 150	3.6
EMI FTF-480-180	S7GOF	400 x 120 x 170	6.2
EMI-480-250	S7DGG	300 x 260 x 135	13
EMI-480-320	S7DGH	300 x 260 x 135	13.2

10.7.3 EMI filters for DC connections

On the DC side, the standards have not set limits on conducted emissions. If necessary, the EMC filters listed below can be installed to reduce emissions from the photovoltaic field.

Filters can be supplied with capacitors connected between the DC-link and PE; in that case, FN 2200 version filters (with no B) should be requested. In this case, the filter attenuation rate is higher but the ground insulation monitoring systems and the electrical safety requirements must be compatible with the capacities connected between the DC-link and PE.

Sizes	AC Input voltage 400V-480V, System earthing IT				
	Heavy Duty		Low Duty		EN 61800-3 Category
	Model	Code	Model	Code	
1015	FN 2200B-25-33		**FN 2200B-25-33**		C4
1022	FN 2200B-25-33		**FN 2200B-25-33**		C4
1030	FN 2200B-25-33		**FN 2200B-25-33**		C4
1040	FN 2200B-25-33		**FN 2200B-25-33**		C4
1055	FN 2200B-25-33		**FN 2200B-25-33**		C4
2075	FN 2200B-25-33		**FN 2200B-25-33**		C4
2110	FN 2200B-25-33		**FN 2200B-25-33**		C4
2150	FN 2200B-25-33		**FN 2200B-50-34**		C4
3185	FN 2200B-50-34		**FN 2200B-50-34**		C4
3220	FN 2200B-50-34		**FN 2200B-50-34**		C4
3300	FN 2200B-75-34		**FN 2200B-75-34**		C4
4370	FN 2200B-100-35		**FN 2200B-100-35**		C4
4450	FN 2200B-100-35		**FN 2200B-100-35**		C4
4550	FN 2200B-100-35		**FN 2200B-150-40**		C4
5750	FN 2200B-150-99		**FN 2200B-250-99**		C4
5900	FN 2200B-250-99		**FN 2200B-250-99**		C4
51100	FN 2200B-250-99		**FN 2200B-250-99**		C4
61320	FN 2200B-250-99		**FN 2200B-400-99**		C4
61600	FN 2200B-400-99		**FN 2200B-400-99**		C4
≥ 72000	On request, contact WEG Commercial Department.				

Note! Codes provided on request

Additional technical specifications are available from the manufacturer in the Schaffner website or catalogue

Model	Dimensions	Weights
	(W x H x d) - mm	kg
FN 2200B-25-33	170 x 65 x 80	0,9
FN 2200B-50-34	200 x 80 x 95	1,6
FN 2200B-75-34	200 x 80 x 95	1,7
FN 2200B-100-35	220 x 95 x 125	2,7
FN 2200B-150-40	250 x 115 x 140	4,9
FN 2200B-250-99	300 x 110 x 180	5,0
FN 2200B-400-99	300 x 110 x 190	6,1

10.8 Radiation sensor

Voltage or current output _____ 0 ... 20mA / 4 ... 20mA or 0 ... 10 V for connection to the ADV200 SP inverter analog input.

10.9 Braking resistor (optional)

Recommended resistors for use with internal braking unit (except ADV200 SP-DC models):

Sizes	List and technical data of standard external resistors						
	Resistor type	Code	Max Overload energy, 1"- duty-cycle 10% E_{BR} (kJ)	Max Overload energy, 30"- duty-cycle 25% E_{BR} (kJ)	Braking resistor nominal power P_{NBR} (W)	Resistance value R_{BR} (Ω)	Enclo-sure
1015	RF 220 T 100R	S8T0CE	1.5	11	220	100	IP44
1022	RF 220 T 100R	S8T0CE	1.5	11	220	100	IP44
1030	RF 300 DT 100R	S8T0CB	2.5	19	300	100	IP44
1040	RF 300 DT 100R	S8T0CB	2.5	19	300	100	IP44
1055	RFPD 750 DT 100R	S8SY4	7.5	38	750	100	IP44
2075	RFPD 750 DT 68R	S8T0CD	7.5	38	750	68	IP44
2110	RFPD 900 DT 68R	S8SY5	9	48	900	68	IP44
2150	RFPD 1100 DT 40R	S8SY6	11	58	1100	40	IP44
3185	RFPR 1900 D 28R	S8SZ5	19	75	1500	28	IP44
3220	BRT4K0-15R4	S8T00G	40	150	4000	15.4	IP20
3300	BRT4K0-15R4	S8T00G	40	150	4000	15.4	IP20
4370	BRT4K0-11R6	S8T00H	40	150	4000	11.6	IP20
4450	BRT4K0-11R6	S8T00H	40	150	4000	11.6	IP20
4550	BRT8K0-7R7	S8T00I	40	150	8000	7.7	IP20
5750	BRT8K0-7R7	S8T00I	40	150	8000	7.7	IP20
≥ 5900 and ADV200 SP-...-DC	External braking unit (BUy series, optional)						

Resistor type	Code	Dimensions (Wx H x d) - mm	Weights (kg)
RF 220 T 100R	S8T0CE	300 x 27 x 36	0.5
RF 300 DT 100R	S8T0CB	260 x 47 x 108	1.4
RFPD 750 DT 100R	S8SY4	200 x 70 x 106	1.7
RFPD 750 DT 68R	S8T0CD	200 x 70 x 106	1.7
RFPD 900 DT 68R	S8SY5	260 x 70 x 106	2.2
RFPD 1100 DT 40R	S8SY6	310 x 75 x 100	3.5
RFPR 1900 D 28R	S8SZ5	365 x 75 x 100	4.2
BRT4K0-15R4	S8T00G	625 x 100 x 250	7.0
BRT4K0-11R6	S8T00H	625 x 100 x 250	7.0
BRT8K0-7R7	S8T00I	625 x 160 x 250	11.5

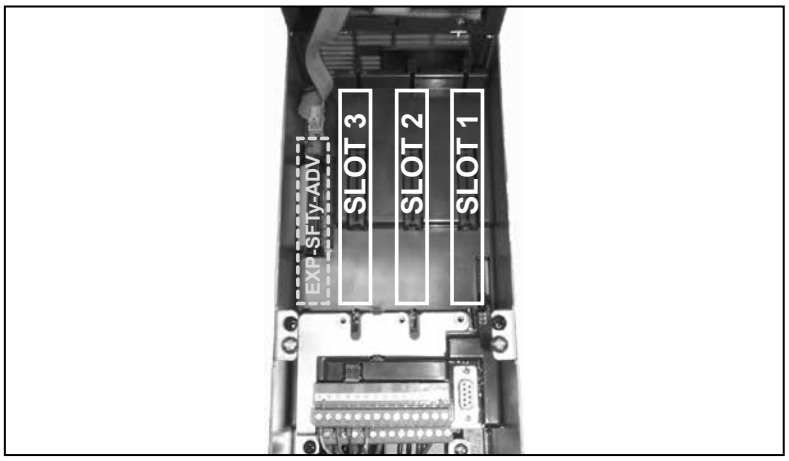
Warning!

Braking resistors may be subject to unexpected overloads due to faults.

Resistors MUST be protected using thermal cutouts. These devices must not interrupt the circuit in which the resistor is inserted but their auxiliary contact must cut off the power supply to the power section of the drive. If the resistor requires a protection contact, this must be used together with that of the thermal cutout.

A la suite de pannes, les résistances de freinage peuvent être sujettes à des surcharges imprévues. La protection des résistances au moyen de dispositifs de protection thermique est absolument capitale. Ces dispositifs ne doivent pas interrompre le circuit qui abrite la résistance, mais leur contact auxiliaire doit couper l'alimentation du côté puissance du drive. Si la résistance prévoit un contact de protection, ce dernier doit être utilisé conjointement à celui du dispositif de protection thermique.

10.10 Installation of optional cards



Up to three optional cards can be inserted in the three slots under the top cover:

- **Slot 1-2:** dedicated to IO cards (EXP-IO-...-ADV)
- **Slot 3:** dedicated to field Bus cards (EXP-PDP-ADV, EXP-CAN-ADV, etc.).

Attention

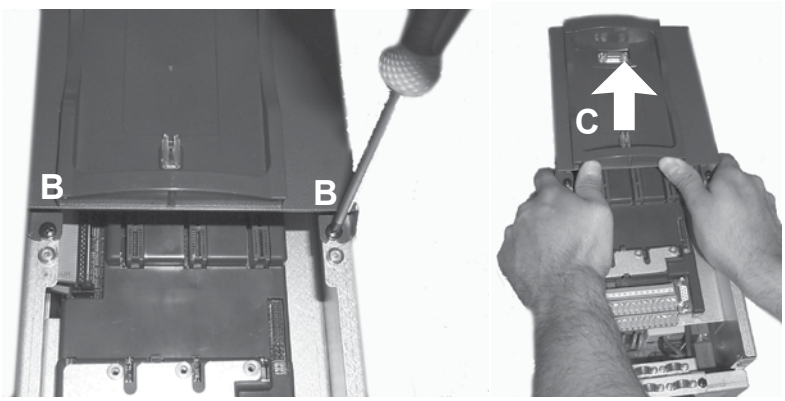
If an optional card is inserted in an incorrect Slot, the drive will send an error message.
The EXP-SFTy-ADV safety card can be installed and configured only in factory.

Caution

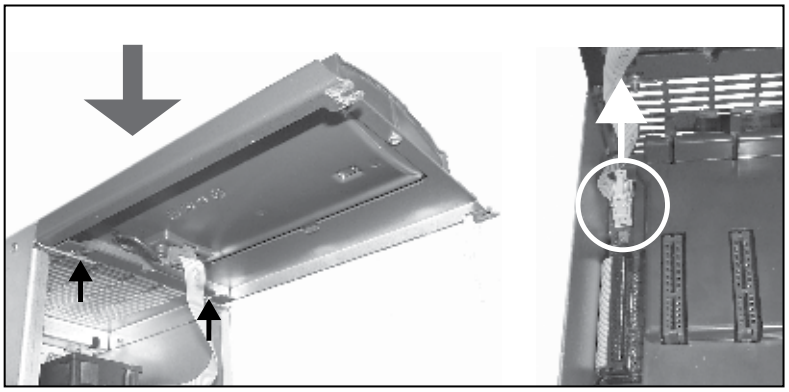
Use only the screws supplied with the optional cards.
Utilisez uniquement les vis fournies avec les cartes optionnelles.

10.10.1 Procedure

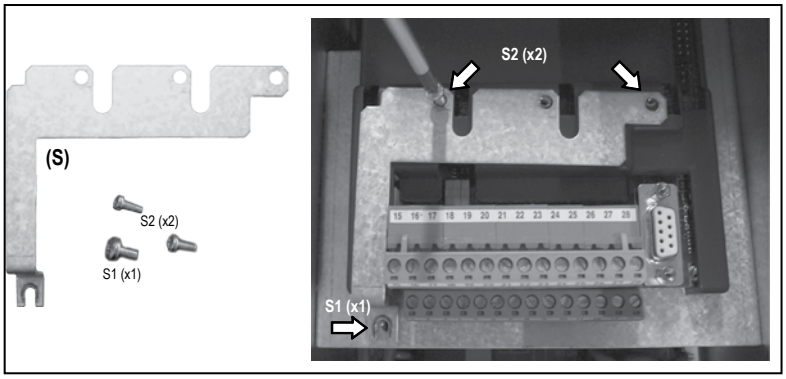
1. Remove the bottom cover as indicated in **paragraph 5.2.1**.



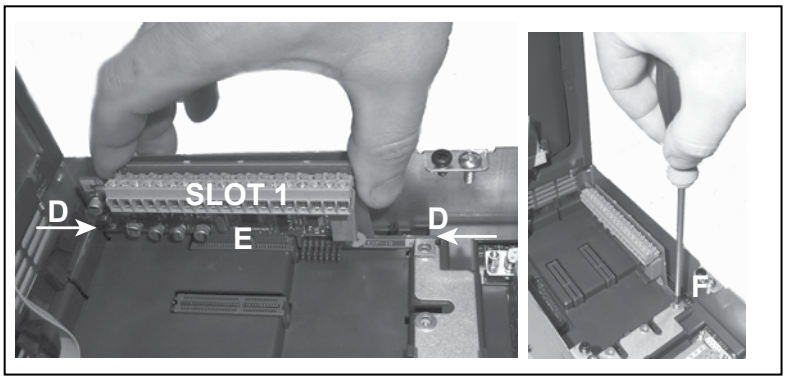
2. To remove the top cover, loosen screws B by about 2 turns and slide out cover C as shown in the figure.



3. To prevent damage to the connection of the keypad, the top cover can be positioned as indicated in the figure. Alternatively, remove the connector of the keypad and rest the cover in a safe place.

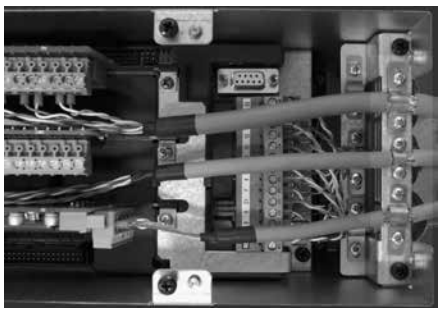


4. Position and fasten the metallic shield (S), provided with the optional card, with the screws S1 and S2 (x1) as shown in the figure.



5. Position the optional card in the dedicated Slot (in the example, the EXP-IO card is inserted in Slot 1).
   Align the ends of the card (D) in the slots and then fully insert the connector of the card in the connectors of the drive (E).
6. Fasten the card with the screw + washer (provided with the optional card) in housing (F) as shown in the figure.

10.10.2 Shielding of optional card connections



Fasten the shield of the cables to the omega sections as showed on figure.

Appendix 1 - Parallel connection (500kW ... 1.8MW sizes)

A 1.1 Introduction

To obtain a drive of more than 400kW connect a number of single units of between 250kW and 400kW in parallel.
A parallel connection of several drives basically consists of one MASTER unit and one or more SLAVE units.

Power	Code	Description (Designation)
500 kW	On request	ADV200-SP-72500-KXX-4-MS 05
	On request	ADV200-SP-72500-XXX-4-SL
630 kW	On request	ADV200-SP-73150-KXX-4-MS 06
	On request	ADV200-SP-73150-XXX-4-SL
710 kW	On request	ADV200-SP-73550-KXX-4-MS 07
	On request	ADV200-SP-73550-XXX-4-SL
800 kW	On request	ADV200-SP-74000-KXX-4-MS 08
	On request	ADV200-SP-74000-XXX-4-SL
1 MW	On request	ADV200-SP-73550-KXX-4-MS 10
	On request	ADV200-SP-73550-XXX-4-SL
	On request	ADV200-SP-73550-XXX-4-SL
1.2 MW	On request	ADV200-SP-74000-KXX-4-MS 12
	On request	ADV200-SP-74000-XXX-4-SL
	On request	ADV200-SP-74000-XXX-4-SL
1.5 MW	On request	ADV200-SP-73550-KXX-4-MS 15
	On request	ADV200-SP-73550-XXX-4-SL
	On request	ADV200-SP-73550-XXX-4-SL
	On request	ADV200-SP-73550-XXX-4-SL2
1.8 MW	On request	ADV200-SP-73550-KXX-4-MS 18
	On request	ADV200-SP-73550-XXX-4-SL
	On request	ADV200-SP-73550-XXX-4-SL
	On request	ADV200-SP-73550-XXX-4-SL2
	On request	ADV200-SP-73550-XXX-4-SL2

Master unit

This is the only one to have the regulation card and keypad. It differs from the standard single unit in that the power section control card (INT-P-ADV) is reconfigured to function as MASTER and includes one or more MASTER - SLAVE (INT-SLAVE) interface cards, one card for each slave that is connected.

The MASTER - SLAVE interface is achieved via a specific signal cable included in the SLAVE drive packaging.

Slave unit

It differs from the standard single unit in that it has a dedicated power section control card (INT-P-ADV) and there is no regulation card or keypad.

INT-P-ADV-MASTER card

The INT-P-ADV-MASTER card provided with one or more INT-SLAVE cards, acts as the interface between the R-ADV regulation card and the power section of the master unit and all the slave units. It also performs the following functions:

- current signal scaling (via dip switch, factory-set)
- hardware dead time compensation
- alarm signal management (including local diagnostics via LED)
- temperature signal management.

INT-P-ADV-SLAVE card

The INT-P-ADV-SLAVE card interfaces between the power section of the slave unit and the master unit. It also performs the following functions:

- alarm signal management (including local diagnostics via LED)
- temperature signal management.

INT-SLAVE card

The INT-SLAVE interface card manages communication between a master unit and a slave unit.

The INT-SLAVE cards are mounted on the master unit, their number corresponding to that of the slaves that are connected (max. 4 slaves).

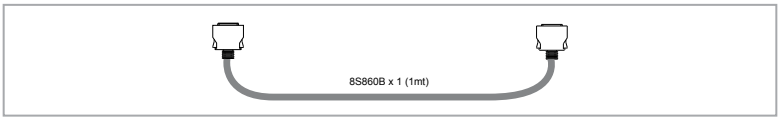
The INT-SLAVE card is factory-set.

Caution

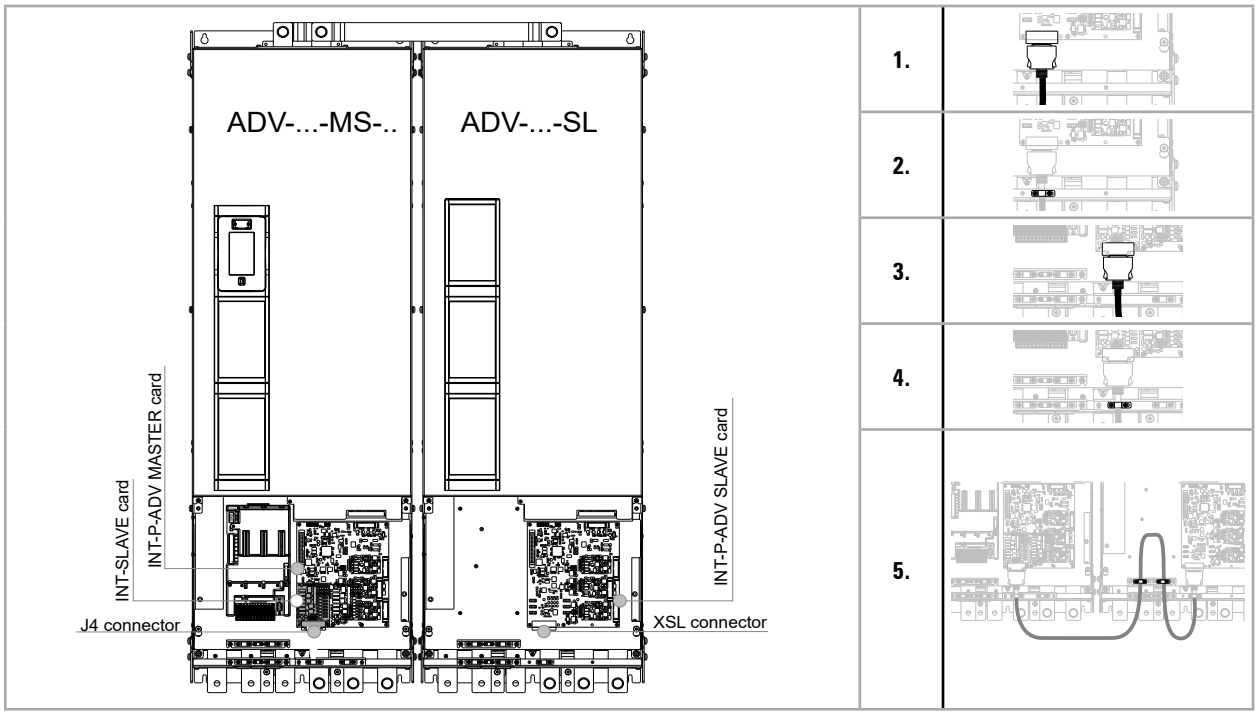
In the event of a failure, the INT-P-ADV card may only be replaced by trained and specialized WEG personnel.

A 1.2 MS-SL interface cable wiring sizes 500...800kW

Fit the ADV200 SP MASTER and SLAVE inverters inside the electrical panel. Connect all the power section cables and connect the signal cable for interfacing between the 2 drives.



The cable (code 8S860B) for connecting 2 drives is one metre long and has two quick coupling male MDR connectors at the ends.

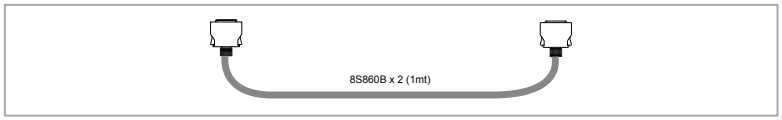


Wiring instructions:

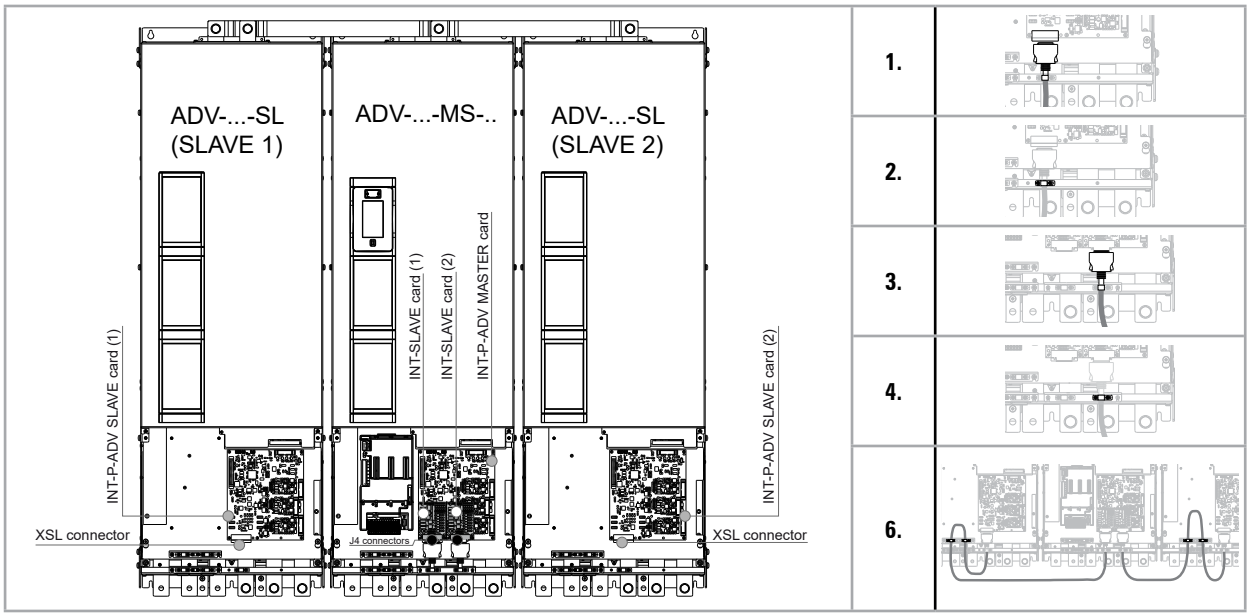
5. Connect one of the 2 ends of the interface cable to the XSL connector of the INT-P-ADV-SLAVE card.
6. Secure the cable using the specific clamp.
7. Connect the other end of the cable to connector J4 of the INT-SLAVE card mounted on the INT-P-ADV-MASTER card of the MASTER drive.
8. Secure the cable in the relative clamp
9. To prevent the interface cable from coming into contact with the power terminals, fold the excess length of cable inside the SLAVE drive as shown in the figure and secure it using the specific cable clamps.

A 1.3 MS-SL interface cable wiring sizes 1... 1.2 MW

Fit the ADV200 SP MASTER and SLAVE inverters inside the electrical panel. Connect all the power section cables and connect the 2 signal cables for interfacing between the 3 drives.



The cable (code 8S860B, x 2) for connecting the drives is one metre long and has two quick coupling male MDR connectors at the ends.

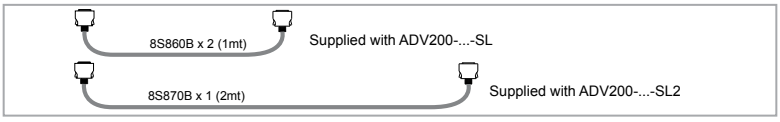


Wiring instructions:

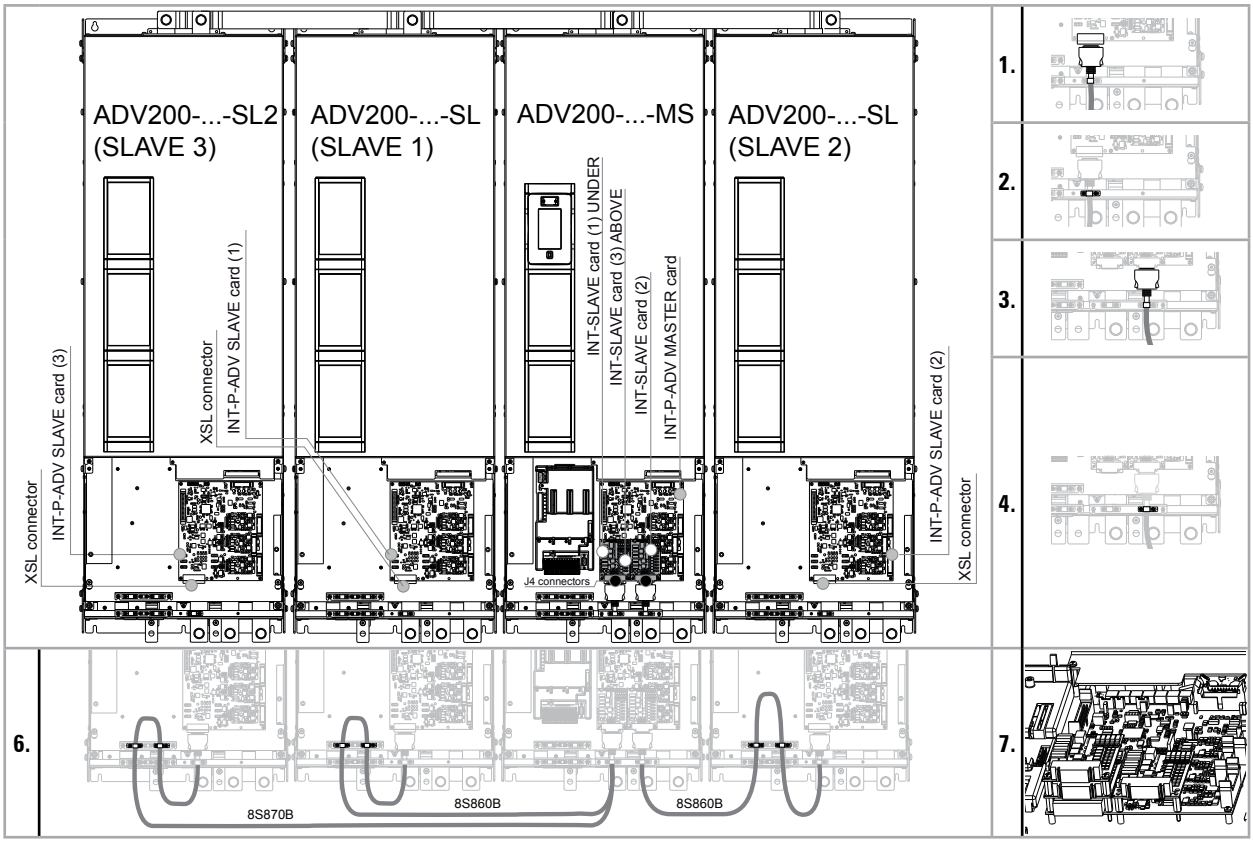
1. Connect one of the 2 ends of the interface cable to the XSL connector of the INT-P-ADV-SLAVE (SLAVE 2) card.
2. Secure the cable using the specific clamp.
3. Connect the other end of the cable to connector J4 of the INT-SLAVE (2) card mounted on the INT-P-ADV-MASTER card of the MASTER drive.
4. Secure the cable in the relative clamp
5. Repeat steps 1-2-3-4 for SLAVE 1.
6. To prevent the interface cables from coming into contact with the power terminals, fold the excess length of cable inside the SLAVE drive as shown in the figure and secure it using the specific cable clamps.

A 1.4 MS-SL interface cable wiring sizes 1.5 MW

Fit the ADV200 MASTER and SLAVE inverters inside the electrical panel. Connect all the power section cables and connect the 3 signal cables for interfacing between the 4 drives.



The cables (cod. 8S860B x2 + cod. 8S870B x 1) for connecting the ADV200 SP-...-SL and ADV200 SP-...-SL2 drives are respectively one meter and two meters long and has two quick coupling male MDR connectors at the ends.

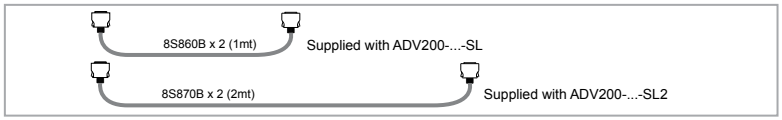


Wiring instructions:

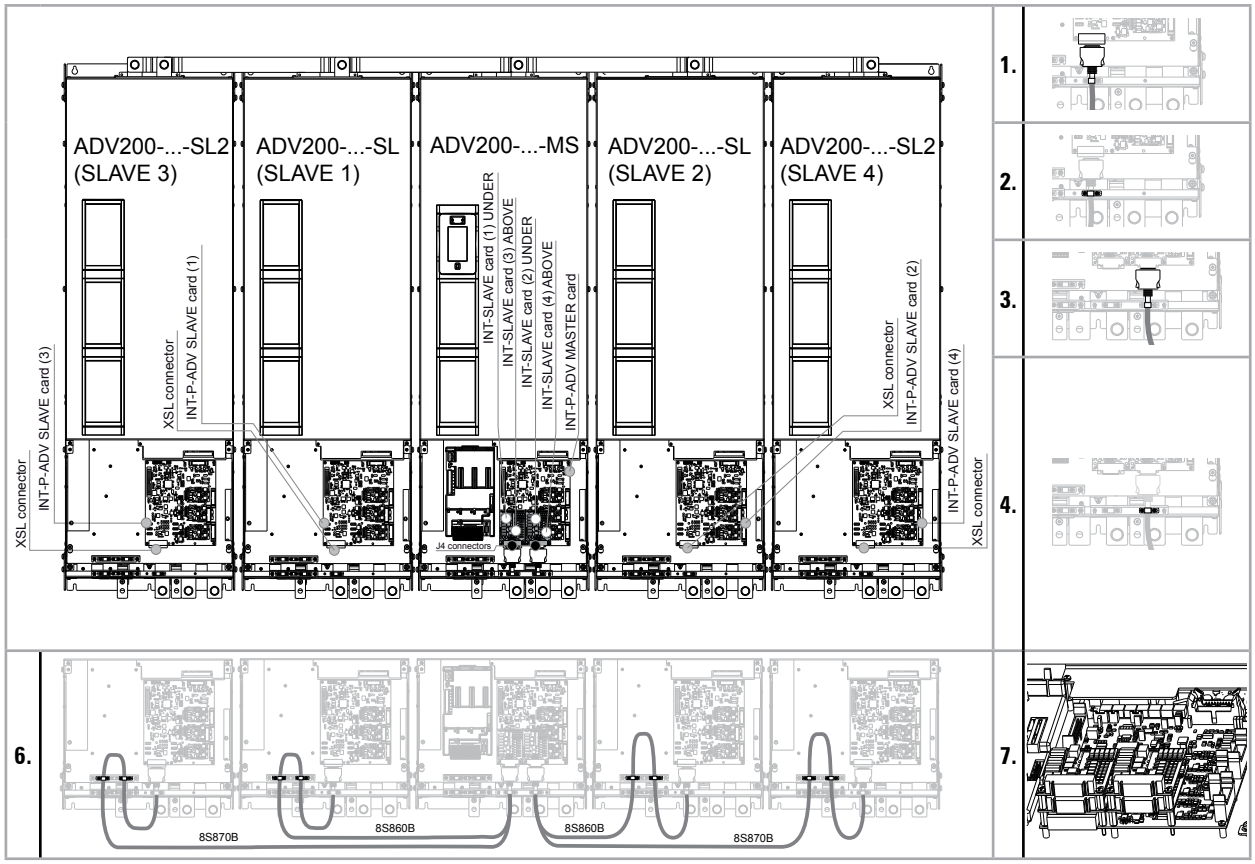
1. Connect one of the 2 ends of the interface cable to the XSL connector of the INT-P-ADV-SLAVE (SLAVE 2) card.
2. Secure the cable using the specific clamp.
3. Connect the other end of the cable to connector J4 of the INT-SLAVE (2) card mounted on the INT-P-ADV-MASTER card of the MASTER drive.
4. Secure the cable in the relative clamp
5. Repeat steps 1-2-3-4 for SLAVE 1 and SLAVE 3 (see figure 6-7 for location and wiring of INT-SLAVE card on INT-P-ADV-MASTER card)
6. To prevent the interface cables from coming into contact with the power terminals, fold the excess length of cable inside the SLAVE drive as shown in the figure and secure it using the specific cable clamps.

A 1.5 MS-SL interface cable wiring sizes 1.8 MW

Fit the ADV200 SP MASTER and SLAVE inverters inside the electrical panel. Connect all the power section cables and connect the 4 signal cables for interfacing between the 5 drives.



The cables (cod. 8S860B x2 + cod. 8S870B x 2) for connecting the ADV200 SP-...-SL and ADV200 SP-...-SL2 drives are respectively one meter and two meters long and has two quick coupling male MDR connectors at the ends.



Wiring instructions:

1. Connect one of the 2 ends of the interface cable to the XSL connector of the INT-P-ADV-SLAVE (SLAVE 2) card.
2. Secure the cable using the specific clamp.
3. Connect the other end of the cable to connector J4 of the INT-SLAVE (2) card mounted on the INT-P-ADV-MASTER card of the MASTER drive.
4. Secure the cable in the relative clamp
5. Repeat steps 1-2-3-4 for SLAVE 1, SLAVE 3 and SLAVE 4 (see figure 6-7 for location and wiring of INT-SLAVE card on INT-P-ADV-MASTER card)
6. To prevent the interface cables from coming into contact with the power terminals, fold the excess length of cable inside the SLAVE drive as shown in the figure and secure it using the specific cable clamps.

A 1.6 Jumpers and Switches

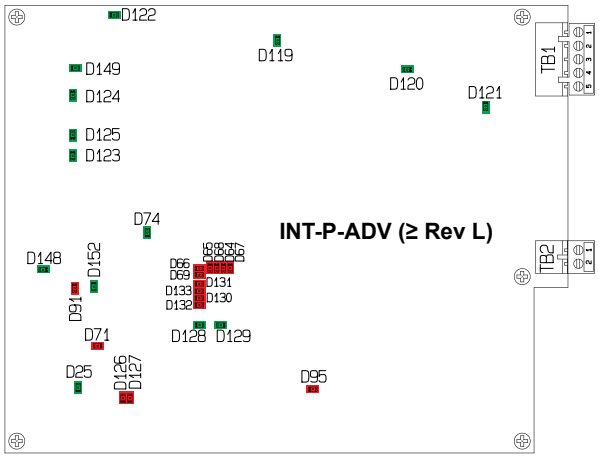
INT-P-ADV (MASTER and SLAVE) cards

The jumpers and switches on these cards are factory-set. DO NOT change these settings.

A 1.7 LEDs

The cards incorporate a LED diagnostics system for rapid analysis of everything happening on a multi-unit drive.

INT-P-ADV (MASTER and SLAVE) card



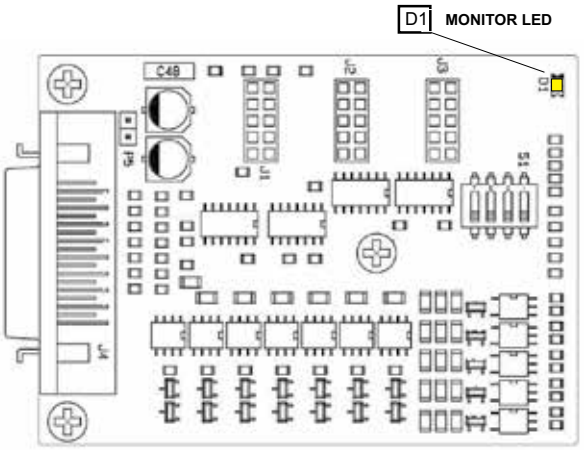
LEDS	Colour	FUNCTION		Normal functioning
MONITOR				
D119	Green	+15V_PWR_U monitor		On
D120	Green	+15V_PWR_V monitor		On
D121	Green	+15V_PWR_W monitor		On
D123	Green	+15V monitor		On
D125	Green	-15V monitor		On
D129	Green	+3,3V monitor		On
D25	Green	+3,3V R monitor		On
D122	Green	+24V monitor		On
D124	Green	+5V monitor		On
D128	Green	It switches on after power supply start-up when the FPGA configuration sequence is complete		On
D149	Green	+5V safety monitor		On
ALARM				
D67/D64	Red	PHASE U	They light up to indicate a short circuit between the output phases	Off
D68/D65	Red	PHASE V		Off
D69/D66	Red	PHASE W		Off
D126	Red	It lights up to indicate a power rectifier heat sink overtemperature		Off
D127	Red	It lights up to indicate overtemperature of the air inside the drive		Off
D132	Red	IGBT U	They light up to indicate loss of the feedback signal relating to the moment the IGBT devices are switched on. The signal is used for hardware dead time compensation	Off
D130	Red	IGBT V		Off
D133	Red	IGBT W		Off
D131	Red	It lights up in case of overtemperature of one of the IGBT devices. The signal temperature relating to the hotter of the master and slave IGBT devices is sent to the regulation card. A temperature signal is also sent automatically to the regulation card in case of minimum temperature, which could occur in the event of a fault in one of the temperature reading circuits. The loss of one of the temperature signals is indicated by LED H15, with the code indicated by the number of flashes (*): the sequence of flashes to indicate the faulty PHASE or SLAVE has a 3Hz frequency and is repeated cyclically every 5 seconds.		Off
D91	Red	It lights up on the INT-P-ADV MASTER card to indicate that the drive's total current (master + slave) has exceeded the overcurrent value for the size of drive, whereas it lights up on the INT-P-ADV SLAVE card to indicate that the SLAVE current has only exceeded the overcurrent value of the SLAVE.		Off
D95	Red	It lights up to indicate a fault on the DC-BUS power supply regulation card		Off
D71	Red	Overvoltage / Undervoltage safety supply		Off

LEDS	Colour	FUNCTION	Normal functioning
OPERATIONS			
D148	Red	FPGA active reset HW	On
D152	Green	Active PWM from regulation and sent to power (master drive or single drive only)	On
		Active PWM from regulation but cancelled (master drive or single drive only)	Blinking
		Active PWM to power (master drive and single drive only)	On
D74	Green	Active PWM to power	On

(*) see next table..

(*) Led D131 code indicated by number of flashes	NO. FLASHES
PHASE U	1
PHASE V	2
PHASE W	3
SLAVE 1	4
SLAVE 2	5
SLAVE 3	6
SLAVE 4	7

INT-SLAVE cards



LEDS	Colour	FUNCTION	Normal functioning
MONITOR			
D1	Yellow	It flashes to indicate the presence of the temperature signal of the slave drive that is connected	Flashes

Appendix 2 - DC-link capacity

Size	DC-link capacity (μF)
1015	235
1022	235
1030	340
1040	340
1055	340
2075	680
2110	680
2150	840
3185	1500
3220	1500
3300	1500
4370	2350
4450	2800
4550	3400
5750	4700
5900	5600

Size	DC-link capacity (μF)
51100	6800
61320	11200
61600	13600
72000	16800
72500	16800
73150	25200
73550	25200
74000	25200
500 kW	33600
630 kW	50400
710 kW	50400
800 kW	50400
1000 kW	75600
1200 kW	75600
1500 kW	
1800 kW	

Attention

You cannot add an external capacitor on 1015 ... 61600 sizes.

You can add an external capacitor from sizes 72000 and higher (ask WEG for more details).

Quick Start Manual
Series: ADV200 SP
Revision: 0.6
Date: 16-11-2022
Code: 1S9SQEN

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