

Field oriented vector AC Drive
for synchronous/asynchronous
motors



Industrial application

ADV200 ADV200-...-DC

■ ■ ■ ■ Quick start up guide
Specification and installation

GEFRAN

Information about this manual

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

The manual explaining the functions and a description of the parameters and the manuals of the expansions and field bus can be found on Gefran web site (<https://www.gefran.com/en/products/250-adv200-field-oriented-vector-inverter#downloads>).

Software version

This manual is updated according the software version V 7.X.18.

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.

The Softscope3 (Gefran's Digital Oscilloscope) Tool can be used with version V.7.X.14 and more recent of the firmware. For detailed information on use, please refer to the 1S9SF3EN manual.

Drive software / Regulation card compatibility

Software version	Regulation card R-ADV-3	
	Rev. "O"	Rev. "M"
7.6.18 and higher	YES	YES
7.5.17 and lower	NO	YES

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.

Gefran Drives and Motion 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 Gefran product.

We will be glad to receive any possible information which could help us improving this manual. The e-mail address is the following: techdoc@gefran.com.

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1 - Safety Precautions

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 pas strictement 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 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 être rigoureusement 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 consignes 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 Gefran.

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 Gefran.

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 chapter.

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



.....

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.

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

Short circuit ratings

ADV200 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 (P_{n mot} in the manual) are shown in the table below.

Short circuit current rating	
P _{n 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. “10.1 [Optional external fuses](#)”, page 156.

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 26.

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.

Drive incorporate motor overload protection. Protection is implemented as

software function. Instruction manual specify degree of protection and detailed installation instruction. *

*Applicable up to 9 May 2013.

New requirement. Applicable as from 9 May 2013.

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 24 VDC, 5 mA. The final result of this signal is the switching of the motor control device output to solid state OFF.

2 - Introduction to the product

The new inverter series ADV200 represents an innovative concept in drive technology, as a result of the constant technological research and of the experience that the Gefran Group has acquired keeping a constant presence aside that of the major sector players.

The new range has been engineered and developed to satisfy the real needs of System Integrators and OEM's in order to provide them the best innovations and economical competitiveness in the international markets.

Based on full mechanical modularity and on a powerful, intuitive and "fully open" programming platform, ADV200 offers absolute integration flexibility with high-end performance in any system architectures of the most advanced automation environments.

- **Modularity**

An innovative concept of integrated technology that offers full modularity. Mountable side by side and with accessories specifically dedicated to system solutions, ADV200 has been engineered to make installation easy for any operator, both in existing systems and in specific machine solutions, always offering a real reduction of required space in the cabinet and the best manageability.

- **Integrated Quality**

ADV200 integrates the fundamental devices for an absolute quality level, such as the DC choke that ensures maximum reliability in any conditions of working and the input filter that renders the drive in compliance with the EMC normative EN61800-3. Note: the choke and filter are not present in ADV200-DC models.

- **Fast Access**

Structured to offer simple and fast management of the product in any situation of installation and mounting. From the terminal access to the rack assembling of the options, each operation is quick and easy.

- **Smart Connections**

Dedicated accessories and fully removable terminals, ensure simple and fast installation and start-up in compliance with the EMC normative.

- **Options**

ADV200 manages up to 3 option cards.

- **Safety STO Interface** (ADV-...-SI models and the master inverter of 400 kW to 1 MW parallel versions)

Integrated on board as the 4th option or integrated in the INT-P-ADV power card (sizes ≥ 71600 and from "L" HW version), the EXP- SFTy card allows the motor to be disabled without the use of a safety contactor on the drive output, guaranteeing compliance to the directive for machine safety EN61800-5-2 SIL3.

- **Serial Line**

Integrated standard RS485 serial line with Modbus RTU protocol, for peer-to-peer or multidrop connections (with OPT-RS485-ADV card).

- **Back-Up Supply**

ADV200 can be supplied through an external +24Vdc supply in order to be kept active in case of mains input loss, ensuring in this situation the operation of all monitoring functions, programming and any connected fieldbus network.

- **Cables shield**

OMEGA clamp to grounding 360° of shielded cables.

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 of between 400 kW and 710 kW comprise one master and one slave.
- Inverters of over 900 kW comprise one master and two slaves.

When placing your order **please give the code number of the master and slave and number of these:**

Power	code	Description (Designation)
400kW	S9O25M	ADV-72000-KXX-4-MS 04 -SI
	S9O25S	ADV-72000-XXX-4-SL
500kW	S9O26M	ADV-72500-KXX-4-MS 05 -SI
	S9O26S	ADV-72500-XXX-4-SL
630kW	S9O27M	ADV-73150-KXX-4-MS 06 -SI
	S9O27S	ADV-73150-XXX-4-SL
710kW	S9O32M	ADV-73551-KXX-4-MS 07 -SI
	S9O32S	ADV-73551-XXX-4-SL
900kW	S9O27M1	ADV-73150-KXX-4-MS 09 -SI
	S9O27S	ADV-73150-XXX-4-SL
	S9O27S	ADV-73150-XXX-4-SL
1 MW	S9O32M1	ADV-73551-KXX-4-MS 10-SI
	S9O32S	ADV-73551-XXX-4-SL
	S9O32S	ADV-73551-XXX-4-SL

Power	code	Description (Designation)
400kW	S9O25MC	ADV-72000-KXX-4- MS 04-DC- SI
	S9O25SC	ADV-72000-XXX-4- SL-DC
500kW	S9O26MC	ADV-72500-KXX-4-MS 05-DC-SI
	S9O26SC	ADV-72500-XXX-4-SL-DC
630kW	S9O27MC	ADV-73150-KXX-4 -MS 06-DC-SI
	S9O27SC	ADV-73150-XXX-4 -SL-DC
710kW	S9O32MC	ADV-73551-KXX-4- MS 07-DC-SI
	S9O32SC	ADV-73551-XXX-4- SL-DC
900kW	S9O27M2	ADV-73150-KXX-4 -MS 09-DC-SI
	S9O27SC	ADV-73150-XXX-4 -SL-DC
	S9O27SC	ADV-73150-XXX-4 -SL-DC
1 MW	S9O32M2	ADV-73551-KXX-4- MS 10-DC-SI
	S9O32SC	ADV-73551-XXX-4- SL-DC
	S9O32SC	ADV-73551-XXX-4- SL-DC

Note!

From January 2015, the ADV-73550 drive size has been replaced by the ADV-73551 drive size and its parallel configurations

Technical data on this manual are valid for both models.

3 - Transport and storage



Caution

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.

Protéger le variateur contre les chocs et les vibrations pendant le transport et le stockage. Il faut également s'assurer qu'il est protégé contre l'eau (pluie), l'humidité et contre des températures excessives.

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 ADV 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 applies when 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 EN50178
	-20...+55°C (-4...+131°F), for devices with keypad
transport _____	-25...+70°C (-13...+158°F), class 2K3 per EN50178
	-20...+60°C (-4...+140°F), for devices with keypad

Air humidity

storage _____	from 5% to 95 % and 1 g/m ³ to 29 g/m ³ (class 1K3 as per EN50178)
transport _____	95 % (3), 60 g/m ³ (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 EN50178)
transport _____	[kPa] 70 to 106 (class 2K3 as per EN50178)

- (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 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.

4 - Mechanical installation



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 pas installer le drive dans des places où la température permise est dépassée.

Be sure to remove the desiccant 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).

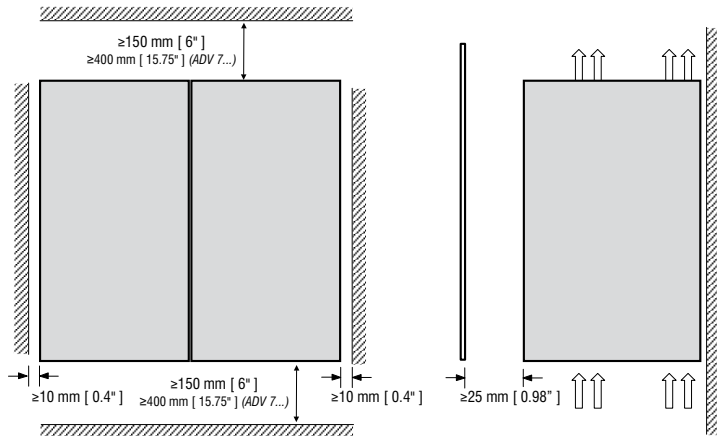
Protect the device from impermissible environmental conditions (temperature, humidity, shock etc.).

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

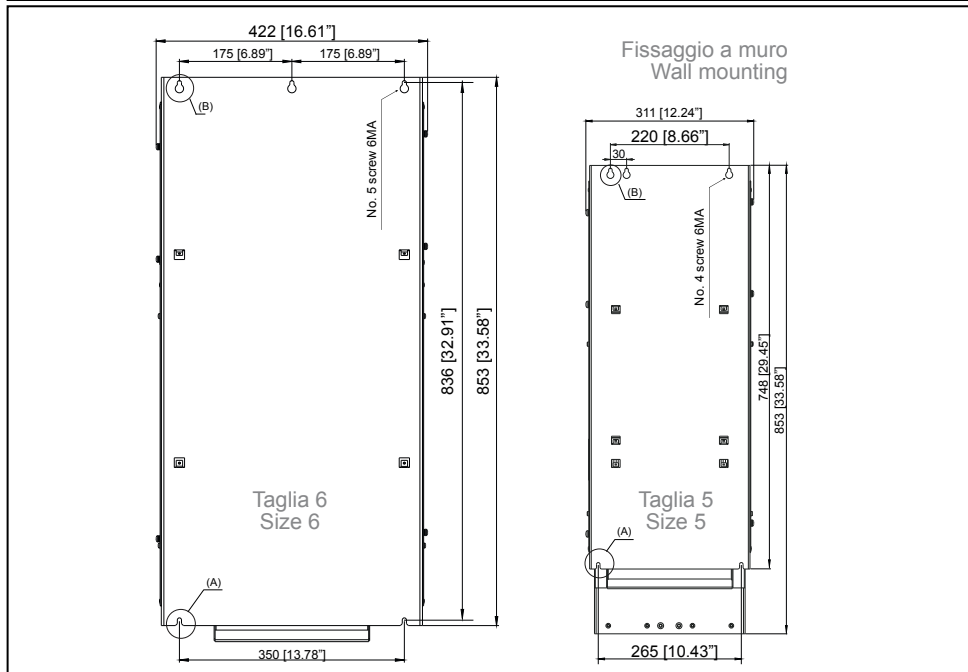
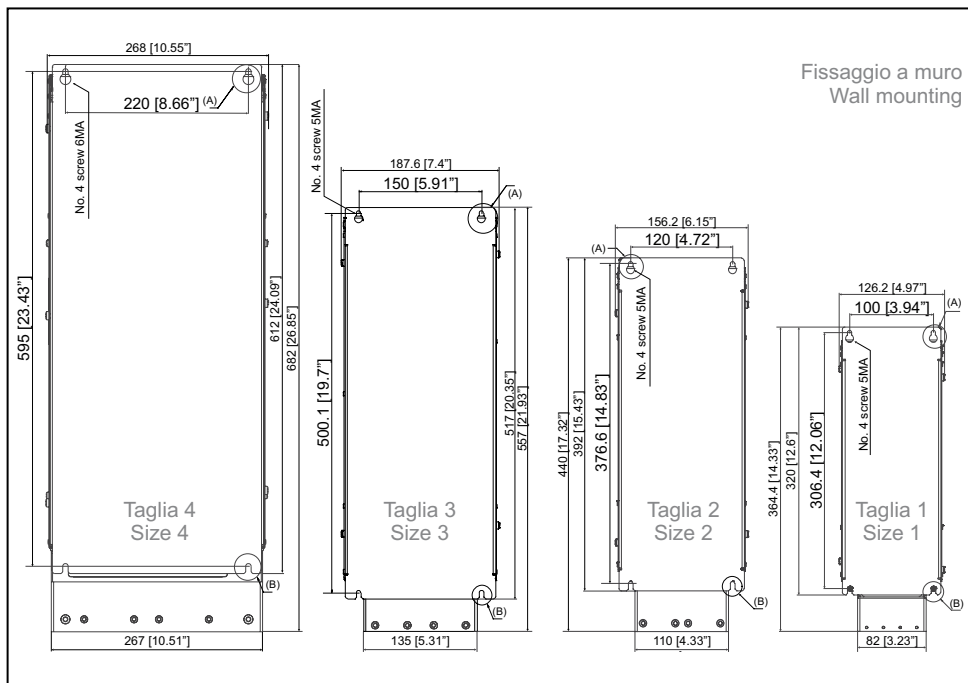
4.1 Inclination and mounting clearance

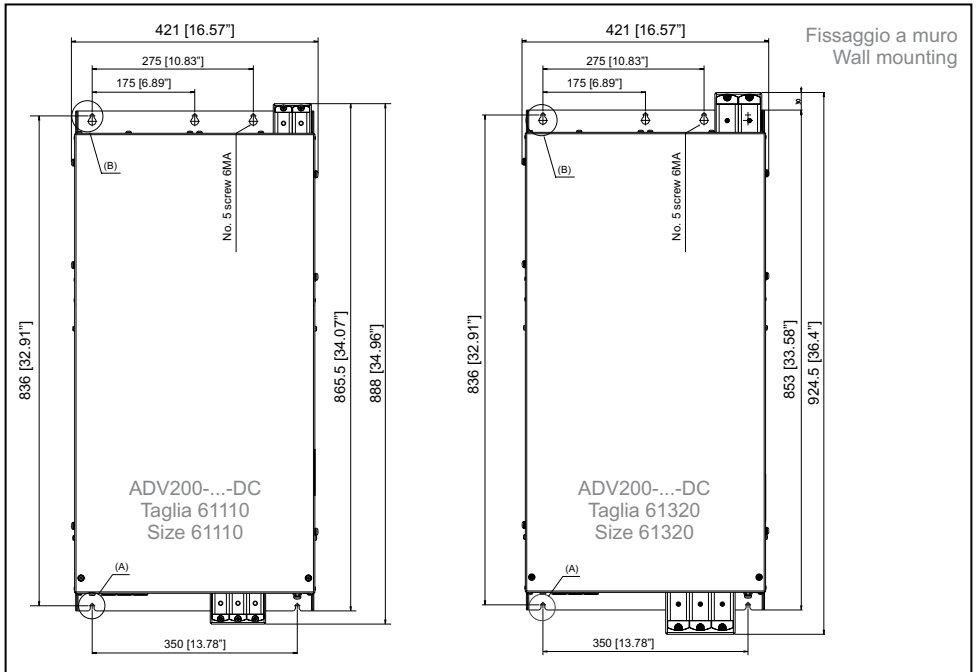
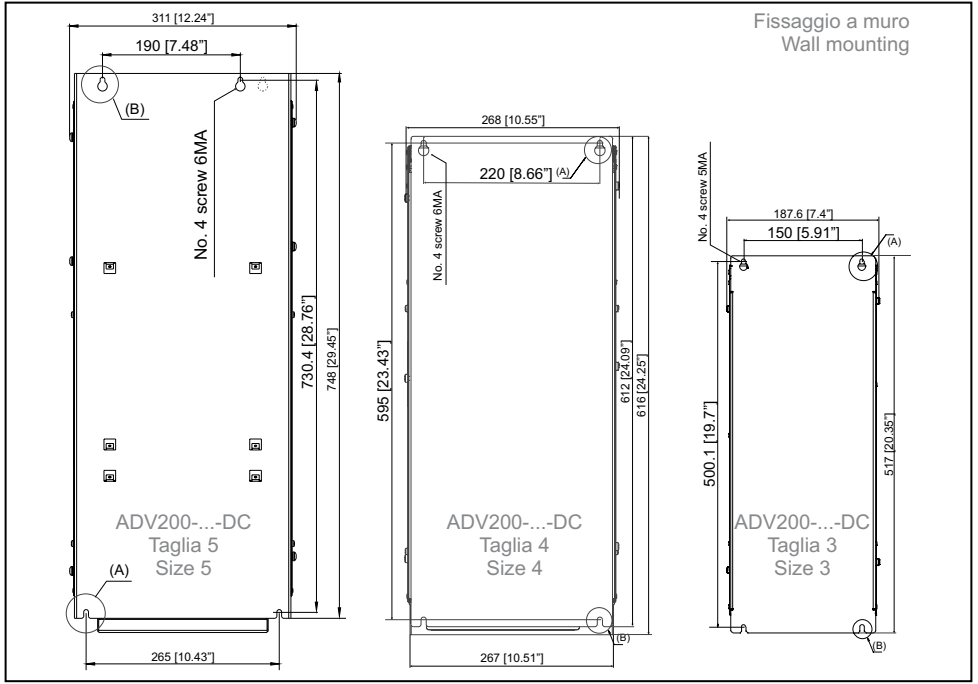
The Drives must be mounted in such a way that the free flow of air is ensured see paragraph "9.9 Cooling", page 146.

Maximum angle of inclination _____ 30° (referred to vertical position)
 Minimum top and bottom distance _____ 150 mm (≥ADV71600 = 400mm)
 Minimum free space to the front _____ 25 mm
 Minimum distance between drives _____ none
 Minimum distance to the side with the cabinet 10 mm



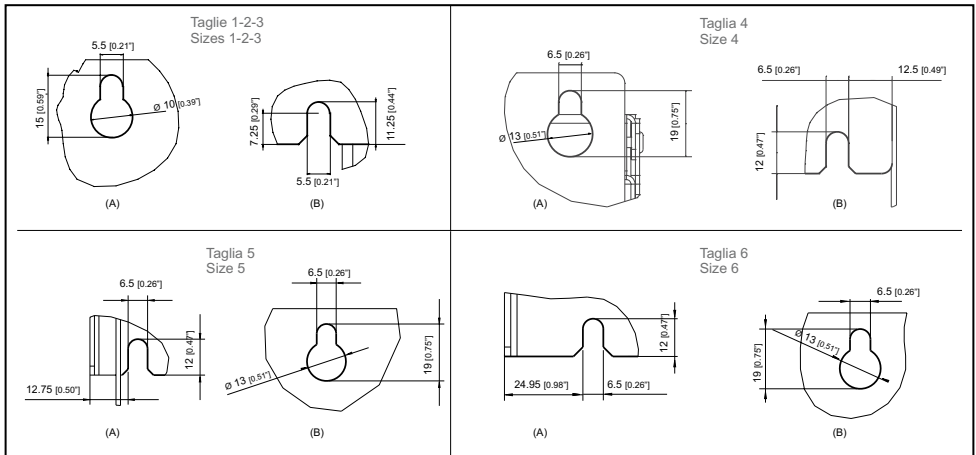
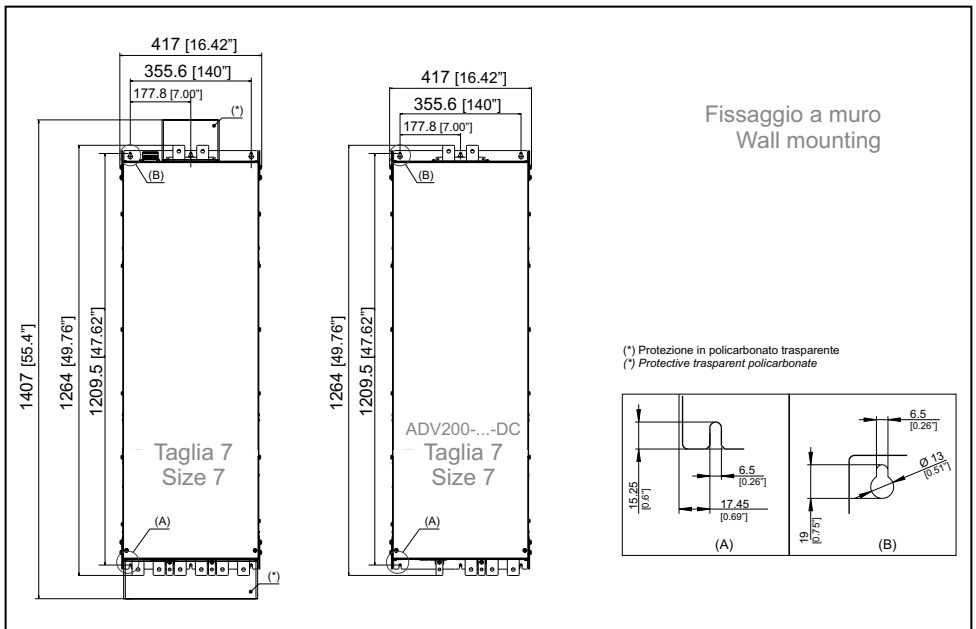
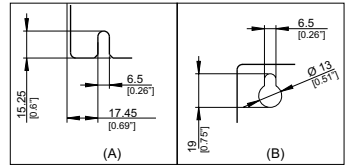
4.2 Fastening positions





Fissaggio a muro Wall mounting

(*) Protezione in policarbonato trasparente
(*) Protective transparent polycarbonate

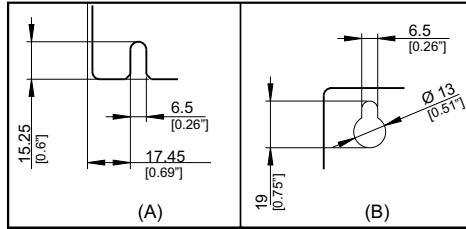


Recommended screws for fastening

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

Note!

Other dimensions see chapter "9.10 Weight and dimensions", page 147.



		Recommended screws for fastening
400 kW	ADV-72000-KXX-4-MS 04 -SI ADV-72000-XXX-4-SL	12 x M6 x 16 mm screws + Grover (spring-lock) washer + Flat washer
500kW	ADV-72500-KXX-4-MS 05 -SI ADV-72500-XXX-4-SL	
630kW	ADV-73150-KXX-4-MS 06 -SI ADV-73150-XXX-4-SL	
710kW	ADV-73551-KXX-4-MS 07 -SI ADV-73551-XXX-4-SL	
900kW	ADV-73150-KXX-4-MS 09 -SI ADV-73150-XXX-4-SL ADV-73150-XXX-4-SL	18 x M6 x 16 mm screws + Grover (spring-lock) washer + Flat washer
1 MW	ADV-73551-KXX-4-MS 10-SI ADV-73551-XXX-4-SL ADV-73551-XXX-4-SL	

Note!

Other dimensions see chapter "9.10 Weight and dimensions", page 147.

5 - Wiring Procedure



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 overspeed 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'opération. L'installation électrique et l'ouverture des drives devrait être exécuté uniquement par du personnel qualifié. De mauvaises installations de moteurs ou de drives peuvent provoquer des dommages matériels ou blesser des personnes. On doit suivre les instructions données dans ce manuel et observer les règles 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.

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 sous 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.



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.



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 fermée par les normes CSA et UL et dimensionné pour l'épaisseur du câble correspondant. Le connecteur doit être fixé à l'aide d'un instrument de serrage spécifié 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 et W). Il

n'est pas permis de raccorder la sortie de plusieurs convertisseurs en parallèle, ni d'effectuer une connexion directe de 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 de l'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.

Type of networks

ADV200 drives are designed to be powered from standard three phase lines that are electrically symmetrical with respect to ground (TN or TT network). In case of supply with IT network, the use of the "ADV200....-IT" series is mandatory.

ADV200....-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.

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 enough to use a voltage transformer with static screening between the primary and secondary windings.

Do not install an external EMI filter to the ADV200....-IT. Capacitors inside the standard EMI filter could be damaged and could cause safety problem. Special EMC filters for IT Network are available on request.

Type de réseaux :

Les variateurs ADV200 sont conçus pour être alimentés à partir des lignes triphasées standard qui sont électriquement symétrique par rapport à la terre (TN ou réseau TT). En cas d'alimentation avec le réseau IT, la référence "ADV200-IT" est obligatoire.

ADV200-IT" 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.

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.

Ne pas installer un filtre EMI externe à l'ADV200-IT. Les condensateurs à l'intérieur du filtre standard EMI pourraient être endommagés et pourraient caus-

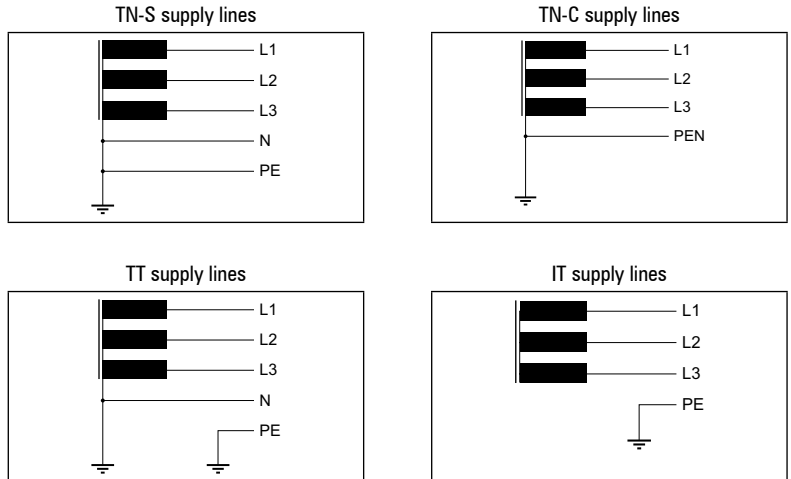
er des problèmes de sécurité. Filtres spéciaux pour Réseaux IT sont disponibles sur demande.

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)
1007	4	10	7	0,5 ... 0,6
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
2055	6	8	10	0,7 ... 0,8
2075	6	8	10	1,2 ... 1,5
2110	6	7	12	1,5 ... 1,7
3150	16	6	14	1,5 ... 1,7
3185	16	6	14	1,5 ... 1,7
3220	16	6	14	1,5 ... 1,7
4300	35	2	18	2,4 ... 4,5
4370	35	2	18	2,4 ... 4,5
4450	35	2	18	2,4 ... 4,5
5550	95 (BR1/BR2=50)	4/0 (BR1/BR2=1/0)	23 (BR1/BR2=27)	14 (BR1/BR2=10)
5750	95	4/0	23	14
5900	95	4/0	23	14
61100	150	300	30	24
61320	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)
71600 - 72000	2 x 100	2 x AWG 4/0	M10	25
72500	2 x 150	2 x kcmil 300	M10	25
73150 - 73551	2 x 185	2 x kcmil 350	M10	25

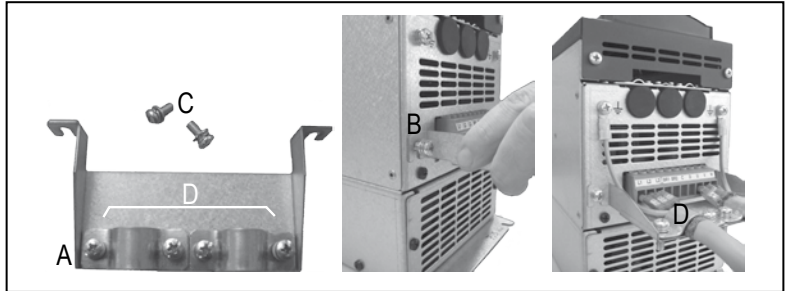
Sizes	Connection $\frac{1}{2}$ on mechanical cabinet				
	Cable Cross Section		Lock screw diameter	Recommended terminal	Tightening torque
	(mm ²)	AWG / kcmil	(mm)		(Nm)
1007 ... 1022	16	AWG 6	M5	Eyelet - Spade	5
1030 ... 4450	16	AWG 6	M6	Eyelet - Spade	5
5550 ... 5900	50	AWG 1/0	M6	Eyelet - Spade	5
61100	75	AWG 2/0	M8	Eyelet - Spade	12
61320	120	250 kcmil	M8	Eyelet - Spade	12
	Connection $\frac{1}{2}$ on bars				
71600 ... 72500	150	300 kcmil	M10	Eyelet	25
73150 - 73551	185	350 kcmil	M10	Eyelet	25

Sizes		Bars: L1 - L2 - L3 - C - D - U - V - W			
		Recommended cable cross-section		Lock screw diameter (mm)	Tightening torque (min) (Nm)
		(mm ²)	AWG / kcmil		
400kW	ADV-72000-KXX-4-MS 04	2 x 100	2 x AWG 4/0	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV-72000-XXX-4-SL	2 x 100	2 x AWG 4/0	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
500kW	ADV-72500-KXX-4-MS 05	2 x 150	2 x kcmil 300	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV-72500-XXX-4-SL	2 x 150	2 x kcmil 300	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
630kW	ADV-73150-KXX-4-MS 06	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV-73150-XXX-4-SL	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
710kW	ADV-73551-KXX-4-MS 07	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV-73551-XXX-4-SL	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
900kW	ADV-73150-KXX-4-MS 09	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV-73150-XXX-4-SL	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV-73150-XXX-4-SL	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
1 MW	ADV-73551-KXX-4-MS 10	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV-73551-XXX-4-SL	2 x 185	2 x kcmil 350	M10 (U,V,W=M12)	25 (M10) / 45 (M12)
	ADV-73551-XXX-4-SL	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 (mm)	Recommended terminal	Tightening torque (min) (Nm)
		(mm ²)	AWG / kcmil			
400kW	ADV-72000-KXX-4-MS 04	150	300 kcmil	M10	Eyelet	25
	ADV-72000-XXX-4-SL	150	300 kcmil	M10	Eyelet	25
500kW	ADV-72500-KXX-4-MS 05	150	300 kcmil	M10	Eyelet	25
	ADV-72500-XXX-4-SL	150	300 kcmil	M10	Eyelet	25
630kW	ADV-73150-KXX-4-MS 06	185	350 kcmil	M10	Eyelet	25
	ADV-73150-XXX-4-SL	185	350 kcmil	M10	Eyelet	25
710kW	ADV-73551-KXX-4-MS 07	185	350 kcmil	M10	Eyelet	25
	ADV-73551-XXX-4-SL	185	350 kcmil	M10	Eyelet	25
900kW	ADV-73150-KXX-4-MS 09	185	350 kcmil	M10	Eyelet	25
	ADV-73150-XXX-4-SL	185	350 kcmil	M10	Eyelet	25
	ADV-73150-XXX-4-SL	185	350 kcmil	M10	Eyelet	25
1 MW	ADV-73551-KXX-4-MS 10	185	350 kcmil	M10	Eyelet	25
	ADV-73551-XXX-4-SL	185	350 kcmil	M10	Eyelet	25
	ADV-73551-XXX-4-SL	185	350 kcmil	M10	Eyelet	25

5.1.2 Connection of shielding

- **Sizes 1...5**



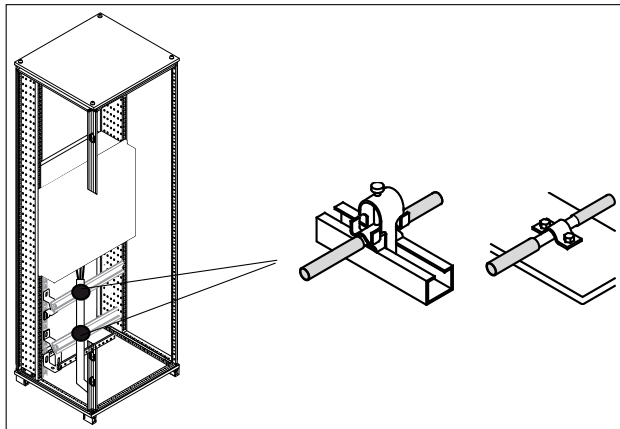
Fasten the metallic support (A), for shielding of the power section, in the two housings (B) and secure with the two screws + washer provided (C).
Fasten the shield of the cables to the omega sections (D).

- **Sizes ≥ 6**

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 interference, 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.



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.

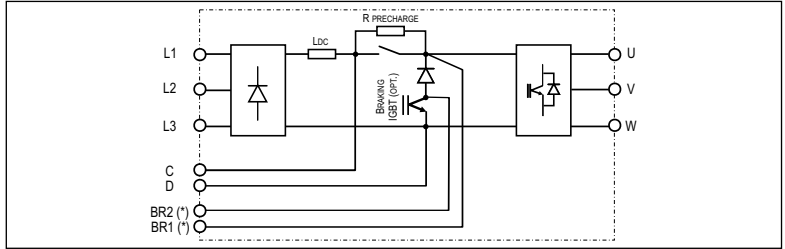
- Check for all equipment in the cabinet are well grounded using short, thick grounding cable connected to a common star point or busbar. Better solution is to use a conductive mounting plane and use that as EMC ground reference plane.
- Flat conductors, for EMC grounding, are better than other type 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 (\perp) on the associated inverter.
- Separate the control cables from the power cables as much as possible, using separate trunking, if necessary at 90° 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!

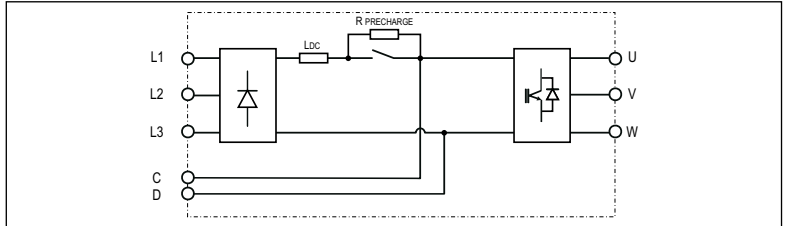
For further information regarding electro-magnetic compatibility standards, according to Directive 2014/30/EU, conformity checks carried out on Gefran appliances, connection of filters and mains inductors, shielding of cables, ground connections, etc., consult the "Electro-magnetic compatibility guide"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

5.1.4 Block diagram power section

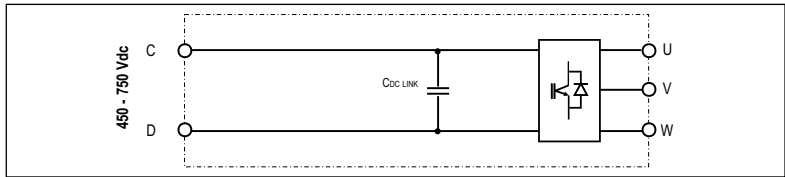
ADV1007... ADV5550, ADV61100... ADV61320



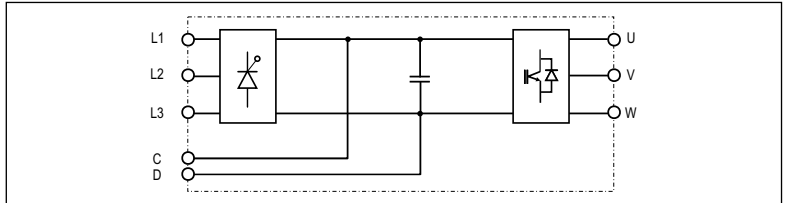
ADV5750-ADV5900



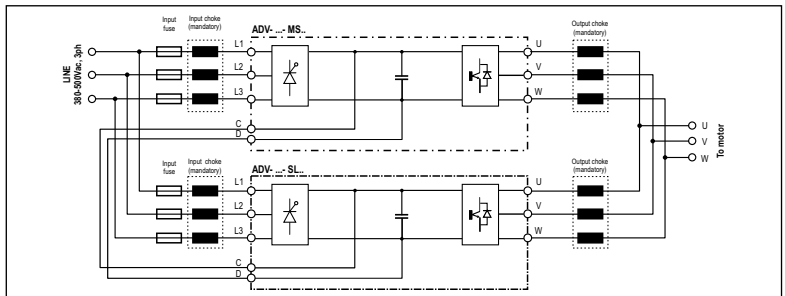
ADV3185...-DC ... ADV61320...-DC



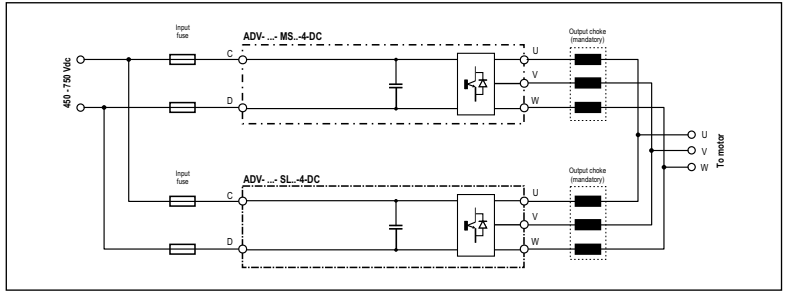
ADV71600 ... ADV73551



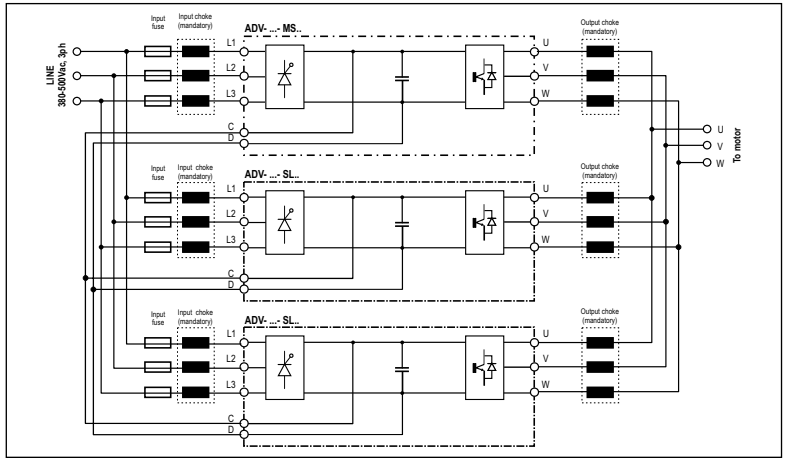
400 ... 710kW



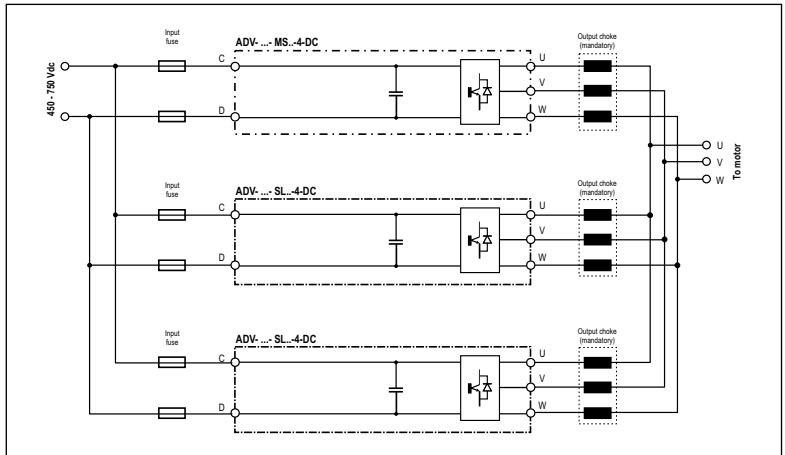
400 ... 710kW (ADV200-...-DC)



900 kW ... 1 MW



900 kW ... 1 MW (ADV200-...-DC)



(*) Terminals BR1/BR2 (and braking unit) are standard up to size ADV3220, optional in sizes ADV4300 ... 5550. These are not present in larger sizes and ADV200-...-DC versions.

Note!

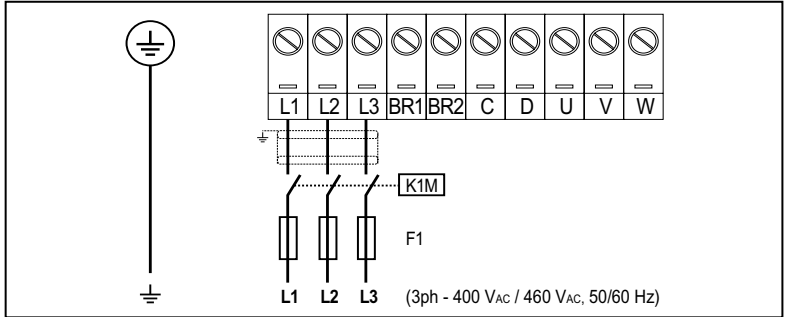
For size 7 only, internal mounting of fuses (DC side) is possible.

5.1.5 Internal EMC filter

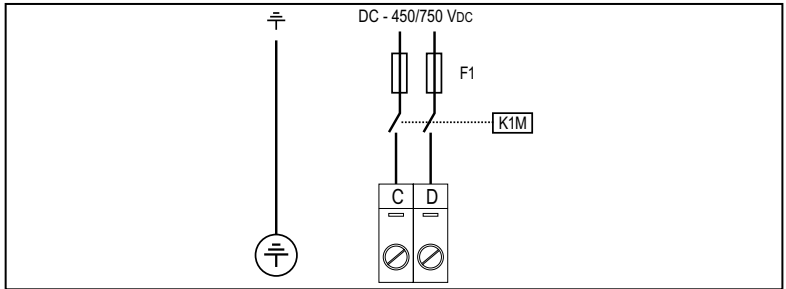
ADV200 series inverters are equipped with an internal EMI (except ADV200-...-DC models) filter able to guarantee the performance levels required by EN 61800-3 standard (according to 2nd environment, category C3) with a maximum of 20 meters of shielded motor cable (up to 50 metres for size 5 and above).

5.1.6 Power line connection

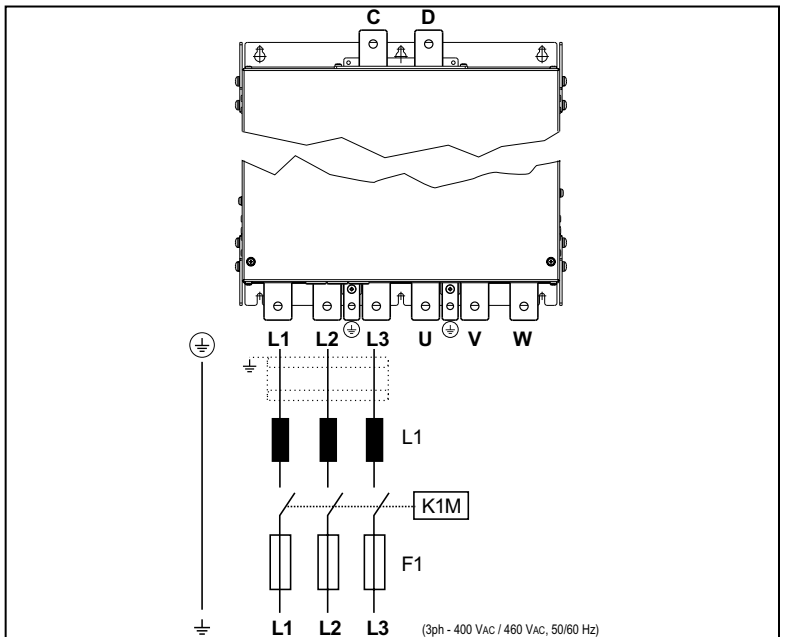
ADV1007 ... ADV61320

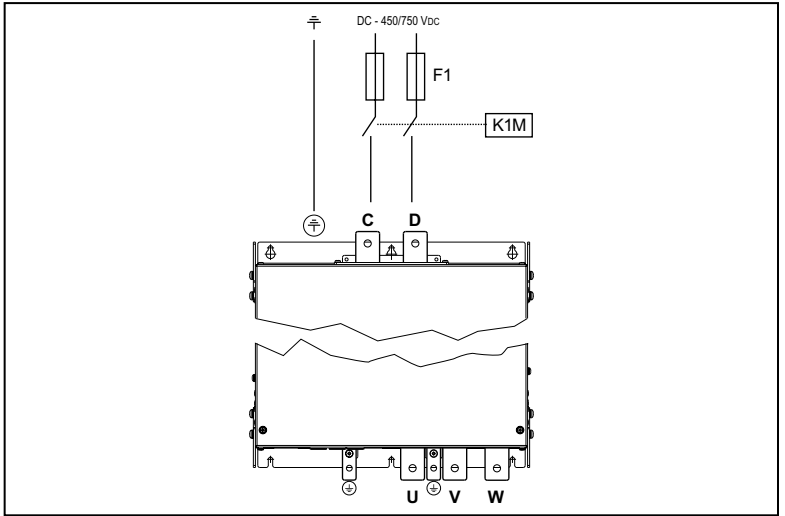


ADV3185-...-DC ... ADV61320-...-DC

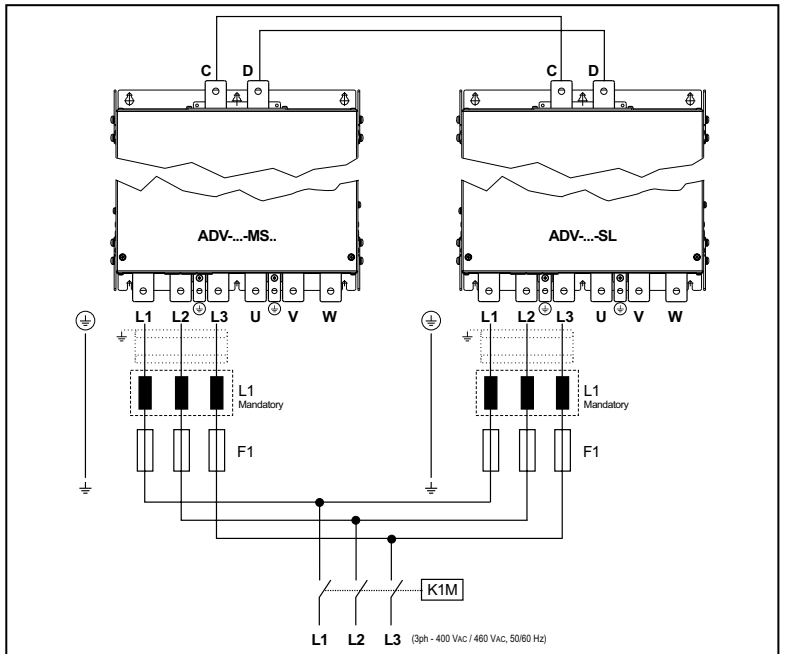


ADV71600 ... ADV73551

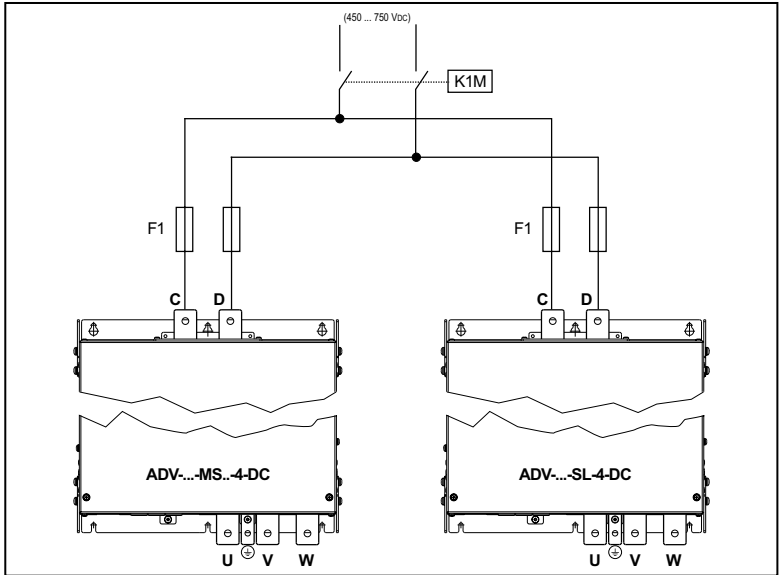




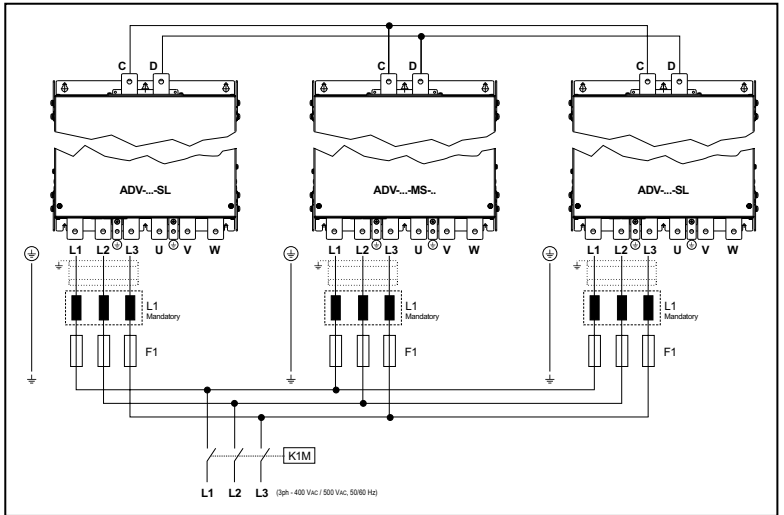
400 ... 710 kW

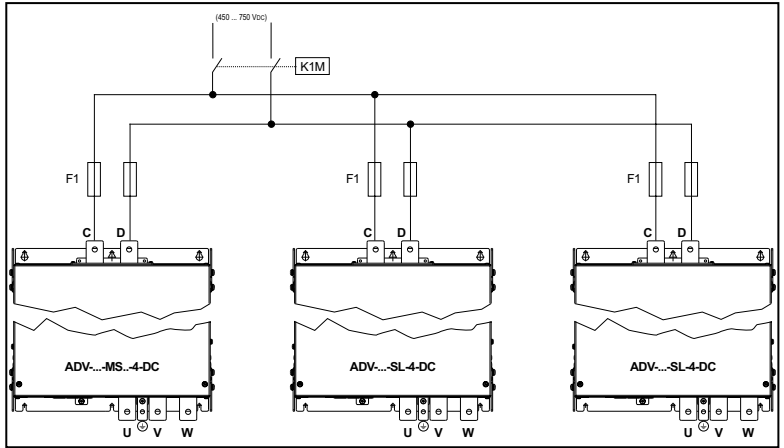


400 ... 710 kW (ADV200....-DC)



900 kW ... 1 MW





Note:

Terminal BR1/BR2 are standard up to size ADV3220, optional in sizes ADV4300 ... 5550, larger sizes are not used.

Recommended combination F1 fuses: see paragraph "10.1 Optional external fuses", page 156.

5.1.7 Input mains choke (L1)

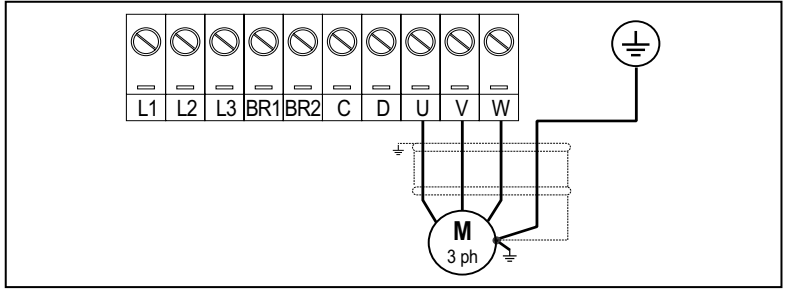
Sizes ADV1007 ... 61320: Integrated on DC-link.

Sizes ADV71600 ... and above: external choke mandatory (for the recommended combination see chapter "10.2.1 Optional input chokes (L1)", page 159).

Sizes ADV...-DC: not available.

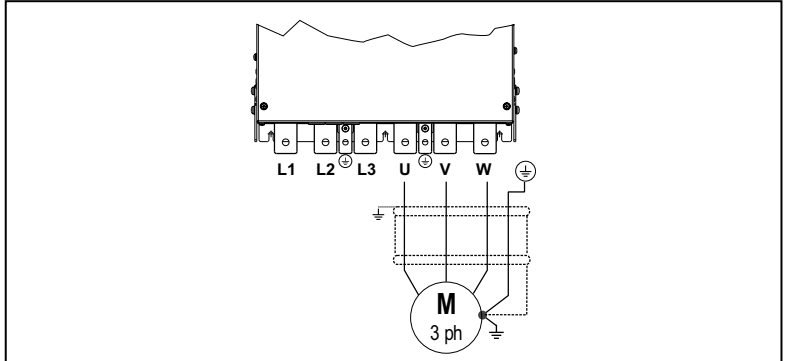
5.1.8 Motor connection

ADV1007 ... ADV61320



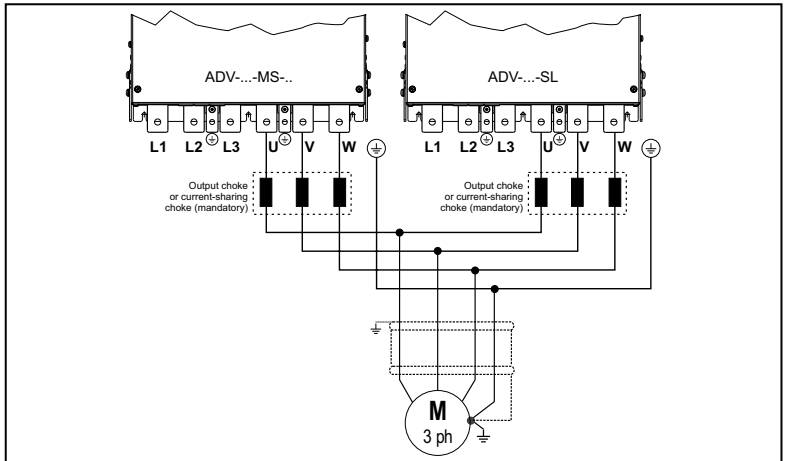
Note: terminals L1-L2 and L3 are not present in -DC versions.

ADV71600 ... ADV73551

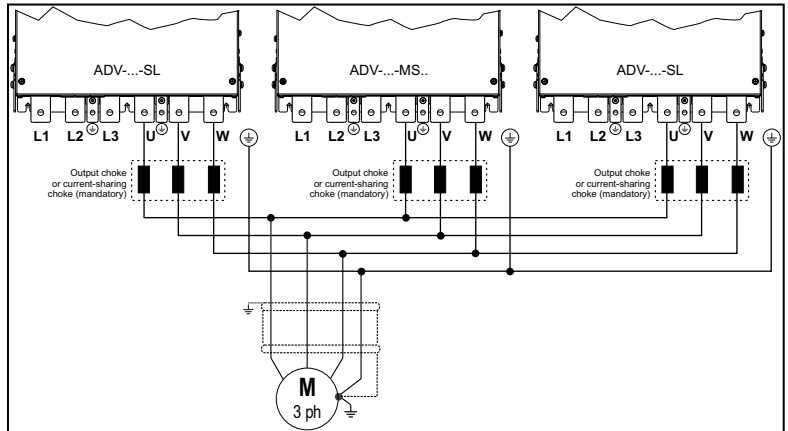


Note: terminals L1-L2 and L3 are not present in -DC versions.

400 ... 710 kW

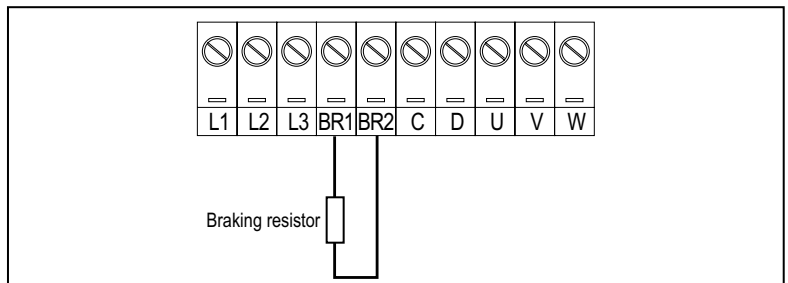


Note: terminals L1-L2 and L3 are not present in -DC versions.



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

5.1.9 Braking unit connection (optional)



Note!

ADV200...-4

Terminals BR1/BR2 are standard up to size ADV3220, optional in sizes ADV4300 ... 5550, larger sizes are not used.

From size ADV5750 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...-4-DC

Terminals BR1/BR2 are not present.

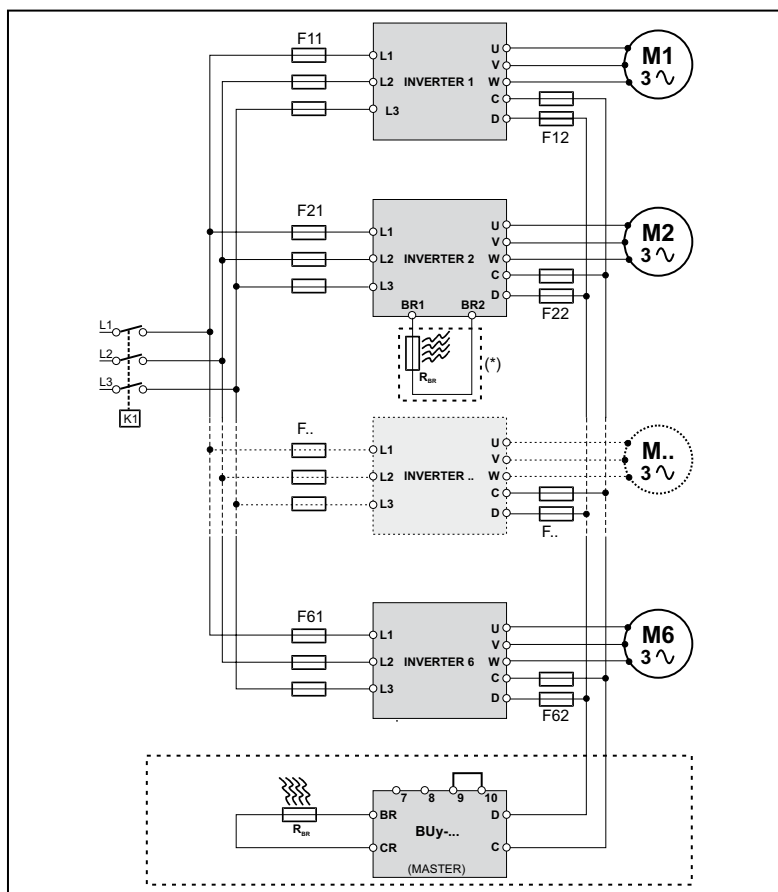
An optional BUy braking unit connected to terminals C and D can be used. For further details reference should be made to the BUy manual.

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.

5.1.10 Parallel connection on the AC (Input) and DC (Intermediate Circuit) side of several inverters



- The inverters used have to be all the same size.
- The mains power supply 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 (F12...F62) have to be fitted on the dc-link side (C and D terminals) of each inverters (see [chapter 10.1.2](#)).



Caution

(*) Do not connect if external braking units BUy.. is used.

(*) Pas raccorder si l'unité de freinage extérieure BUy... est utilisée

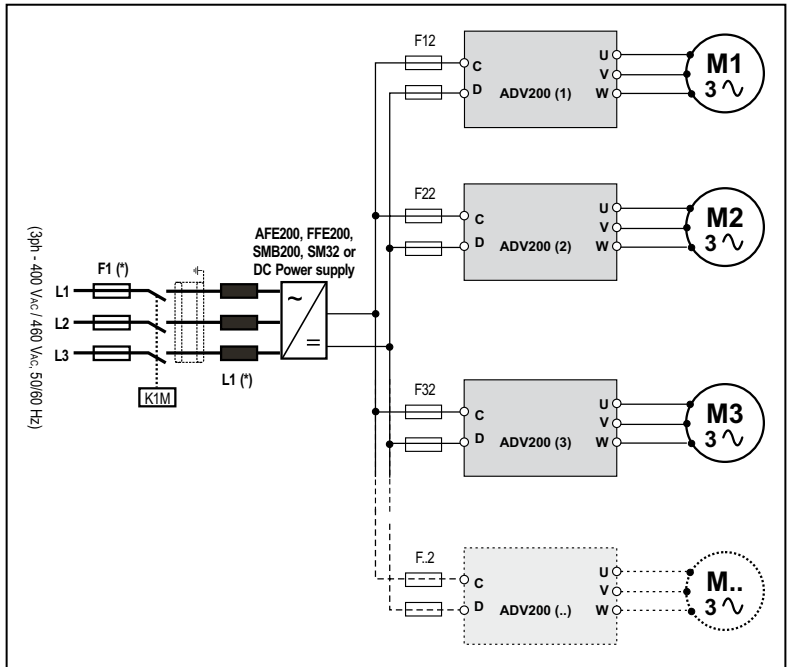
5.1.11 Parallel DC connection



In the case of DC power supply, insertion of an AC mains inductance on the power supply input of the power supply unit **is compulsory** (for the type of inductance, consult the manual of the power supply unit).

To avoid to damage the integrated EMI filter, **AFE200 regenerative power supply unit may not supply the DC power supply to standard ADV1007 ...ADV61320 drives**, version ADV....-IT must be used.

FFE200 Regenerative power supply unit may supply the DC power supply to the standard ADV200, ADV200-...-DC and ADV....-IT series.

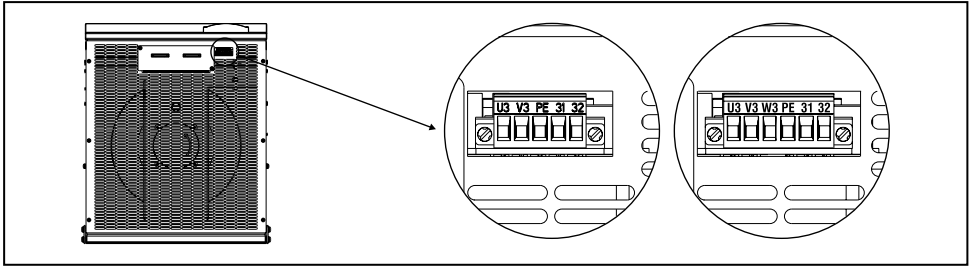


(*) Refer to AFE200, FFE200, SMB200, SM32 or DC Power supply manual.

Note!

For size 7 only, adaptation for internal mounting of "F12, F22, F32, F.2" fuses (DC side) on request

5.1.12 Connection of fans



Sizes 1007 ... 61320	No connection is necessary: the drive's internal power supply unit powers the fan (+24Vac).
--------------------------------	---

Terminals	Version before 2009/125/CE (ErP regulation)					
	U3	V3	PE	31	32	
Sizes 71600 ... 72500 400 kW (1) 500 kW (1)	1 x 230V ($\pm 10\%$) 50/60Hz, 2.4A (50Hz) - 3.3A (60Hz)		Ground	250V/10A contact OK fan contact management terminals 31-32: Closed: Internal fan OK and powered; Open: Internal fan in over temperature alarm and/or input power supply not available.		
	Power the internal fan (max 600W) with a single-phase voltage on terminals U3/V3.					
	Type of fan compliant 2009/125/CE (ErP) ADV200 starting from S/N 33GC017331					
	U3	V3	W3	PE	31	32
3 x 400V ($\pm 10\%$) 50/60Hz, 1.25/1.65Arms		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			
3 x 460V ($\pm 10\%$) 60Hz, 1.55Arms			Power the internal fan (570W @400V, 930W @460V) with a three-phase voltage on terminals U3/V3/W3.			

Terminals	Version before 2009/125/CE (ErP regulation)					
	U3	V3	W3	PE	31	32
Sizes 73150 ... 73551 630 kW (1) 710 kW (1) 900 kW (1) 1 MW (1)	3 x 400V ($\pm 10\%$) 50Hz, 1,55Arms or 3 x 460V ($\pm 10\%$) 60Hz, 1,7Arms (2)		Ground	250V/10A 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 (max 1200W) with a three-phase voltage on terminals U3/V3/W3.					
	Type of fan compliant 2009/125/CE (ErP) ADV200 starting from S/N 33GN071493					
	3 x 380...480V ($\pm 10\%$) 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) ADV200-73150-KXX-4A and ADV200-73551-KXX-4A models.



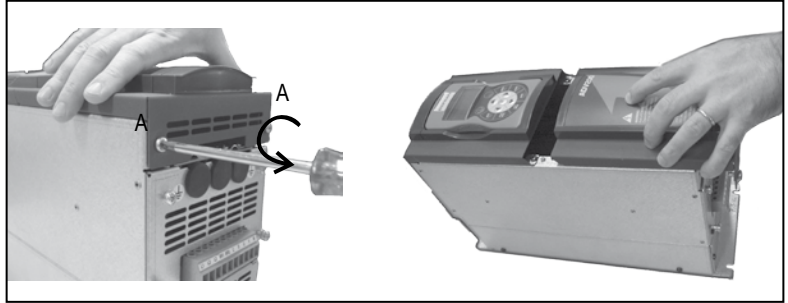
Make sure the sequence of the three-phase fan power supply phases is the same as that shown on the relative drive terminals. If not, the air flow will be inadequate to ensure correct cooling and it could cause Overtemperature alarm.

5.2 Regulation section

5.2.1 Removing the terminal cover



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

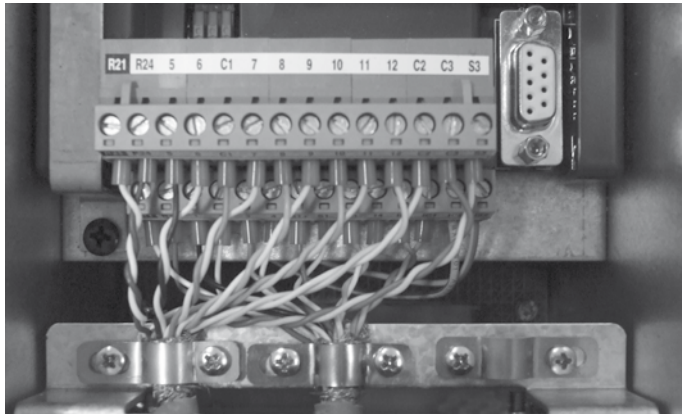


5.2.2 Cable Cross Section

Terminal strips (Regulation card)	Maximum Cable Cross Section		Recommended stripping (mm)	Tightening torque (min) (min) (Nm)
	(mm ²)	(AWG)		
	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	250 V _{ac} - 30 V _{dc} / 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 . Default = Null (not assigned)	5mA @ +24V (+30V max)
12	Digital input 5	Digital input 5 . Default = Fault reset src	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	250 V _{ac} - 30 V _{dc} / 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)
2			- current (set by switches S1-S2): 0...20mA or 4...20mA (set by PAR 1502 or 1552, 14 - ANALOG INPUTS menu)
3	Analog input 2	Programmable / configurable analog differential input. Signal: terminal 3. Reference: terminal 4. Default = Not used	- input impedance = 10 kΩ
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

Note!

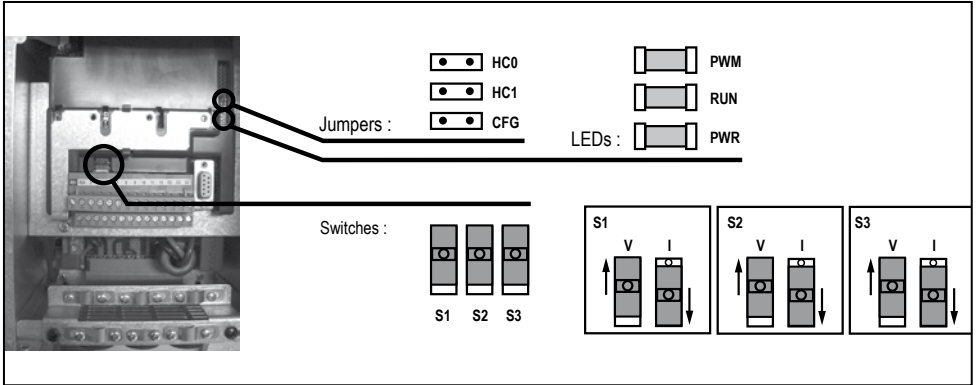
Standard Digital inputs are normally updated every 1ms. If the digital input is set as **Resolver freeze** input command (thru Positioner or customized app by using MDPLC), it will be updated every 125micros.



+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 stabilisée 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. Default = Open
CFG (1)	Open = 400 Vac rated voltage (default) (2) Closed = 460 Vac rated voltage (3)

- (1) Need to be verified the setting of the Undervoltage alarm threshold
For drive size 7 and parallel units, Threshold can be selected thru S1 switch (mounted on R-PSM board). This selection has to be the same of parameter PAR 560.
- (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.

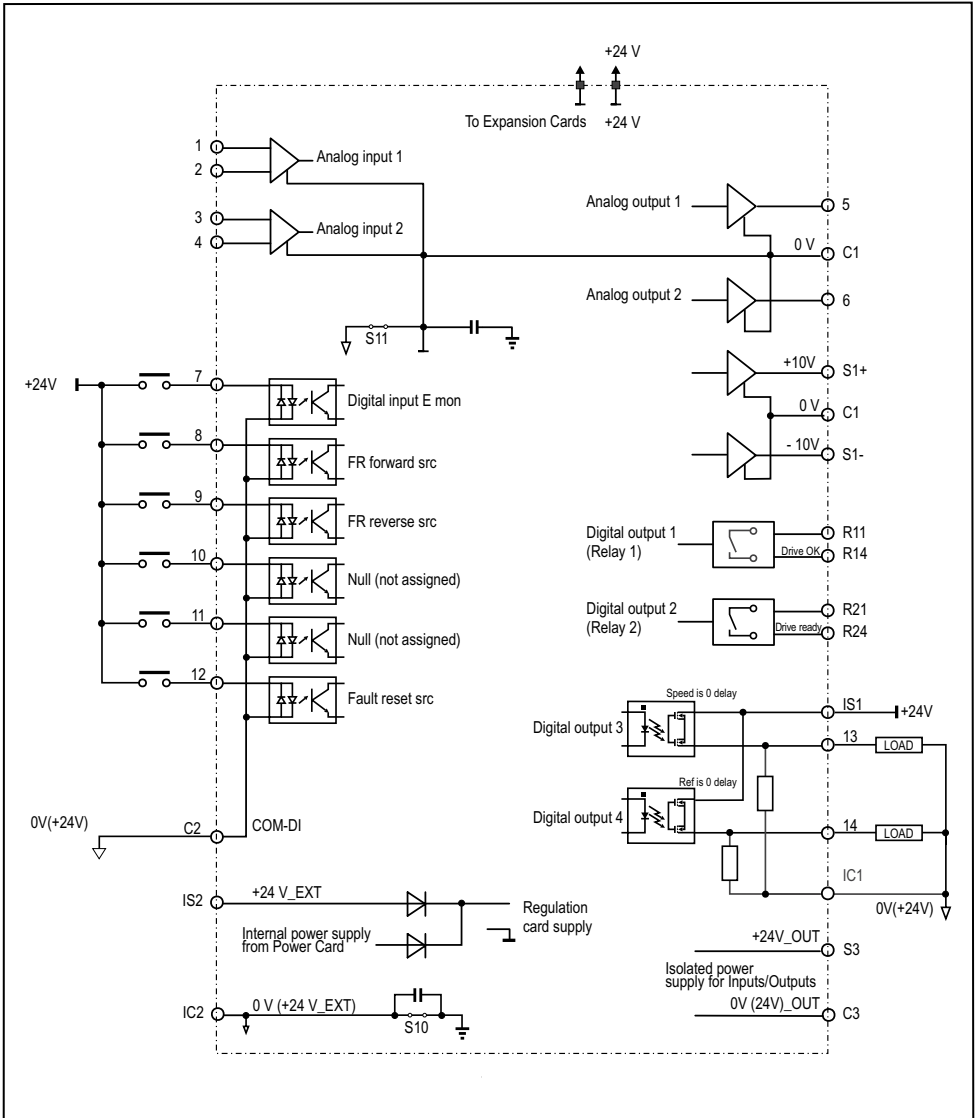


Figure 5.2.4.1: Potentials of the control section, Digital I/O PNP connection

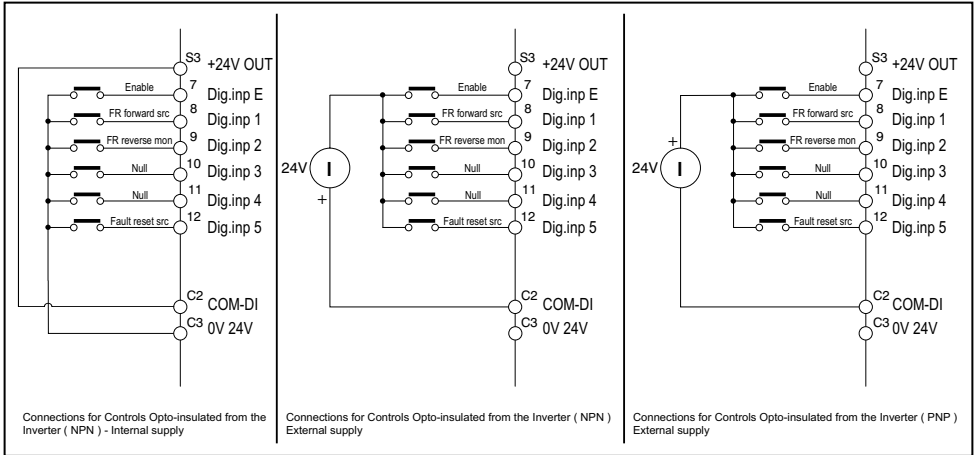


Figure 5.2.4.2: Other inputs connections (NPN-PNP)

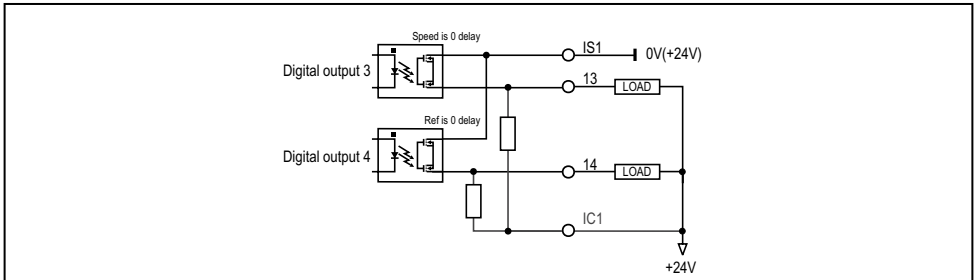


Figure 5.2.4.3: NPN outputs connection

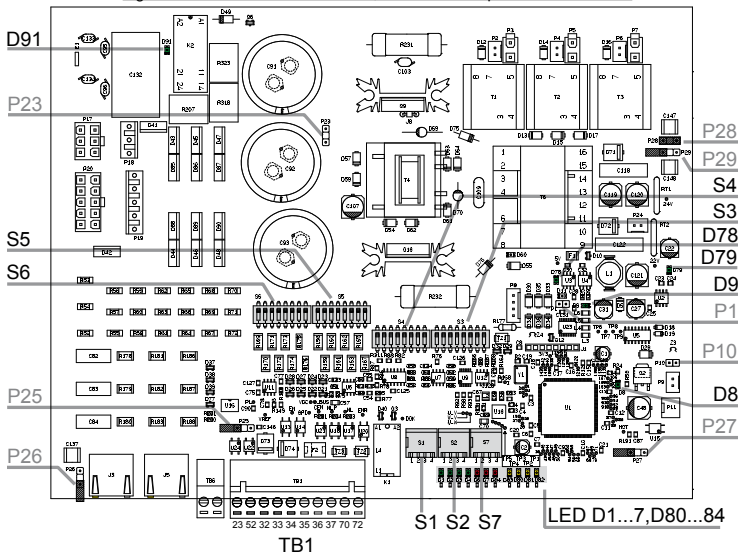
5.2.5 R-PSM pre-charge card (only for sizes ≥ 71600)

Starting from ADV200 power size $\geq 160KW$, 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:

- ADV200-...-4 = 400VAC / 50Hz
- ADV200-...-6 = 690VAC / 50Hz

the settings should not be changed.

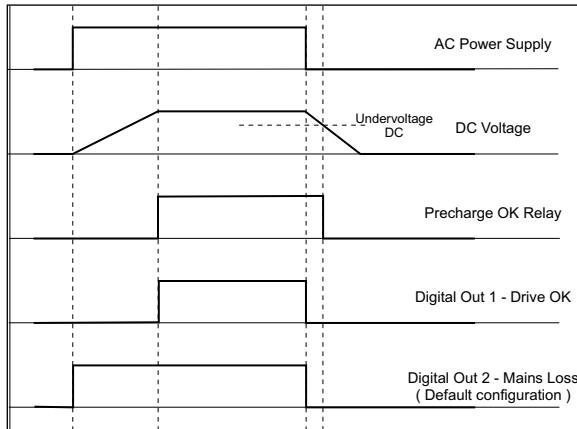
In case of non-standard power supply, see the configuration tables shown further below.

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 (mm)	Tightening torque (min) (Nm)
(mm ²)	AWG		
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 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 ($> \pm 5\%$). 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-...-4,

(**) Default setting for models ADV200-...-6

Setting for ADV200 drive starting from firmware 7.X.6 and higher (R-PSM card starting from hardware revision “F”)

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
500	435	475	1	1	1	0
575	500	540	0	0	0	1
690 (**)	600	640	1	0	0	1

Setting for ADV200 drive up to firmware 7.X.3

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	372	412	1	0	0	0
400 (*)	392	432	0	1	0	0
415	407	447	1	1	0	0
440	431	471	0	0	1	0
460	451	491	1	0	1	0
480	470	510	0	1	1	0
500	490	530	1	1	1	0
575	563	603	0	0	0	1
690 (**)	676	716	1	0	0	1

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 $\pm 5\%$.

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 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 Gefran 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 OV_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

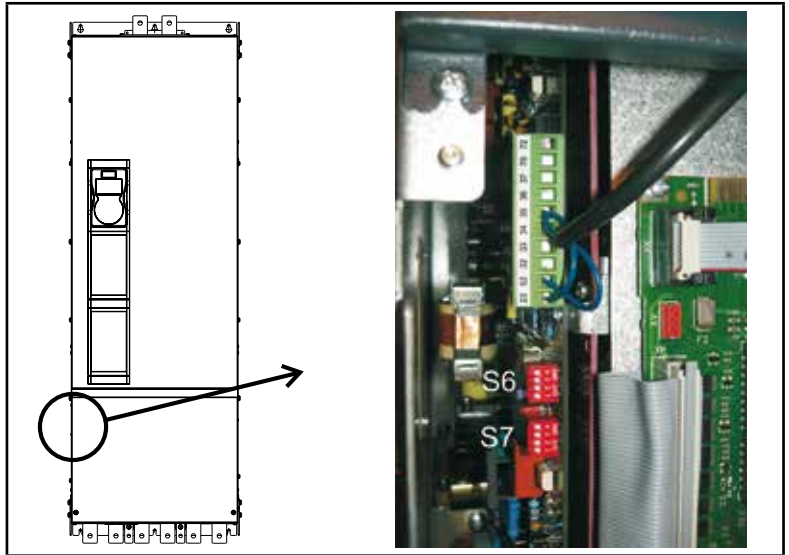
Note!

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

5.2.6 R-SM3-ADV pre-charge card (only for sizes ≥ 71600)

Pre-charge card for drive S/N previous than S/N:34GG044151 (September 2014).

Figure 1: Terminals location



Terminals	Function	Voltage / Current
23	Input of the precharge enable control	(15 - 35V, 5 - 11mA)
32	Output of the MLP static signal (low - active signal)	(5 ... 35V, 20mA source)
33	(Common) Ground of the MLP and ML static signals	-
34	Reference point for Power supply +24V	-
35	Power supply output +24V	(32V / 300mA max)
36	Output of the ML signal (low - active signal)	(5 ... 35V, 20mA max sink)
37	Power supply of the ML and MLP signals	(35V max)
52	(Common) Ground of the precharge enable control	-
70, 72	OK Relay	(max 250VAC, 1A – AC11)

Note!

The jumpers shown are factory-wired.

Wiring of the OK relay contact (70 - 72) in series with the Enable chain of the ADV200 regulation card is recommended.

Dip-switch and Jumper

S6 - S7 Selection of the AC mains frequency: 50 or 60 Hz

AC Mains frequency	S6-1...4	S7-1...4
50 Hz (Default)	OFF (50 Hz)	OFF (50 Hz)
60 Hz	ON (60 Hz)	ON (60 Hz)

Control description

- OK RELAY

The OK relay has a normally open contact which close at the end of the precharging phase if no alarm condition is present (overtemperature, power supply on the regulation card $\pm 15V$).

The contact is closed during the normal functioning of the device and also during an undervoltage situation. The contact opens when a failure occurs (see the alarm conditions described above) or when the power supply is switched off and the DC-LINK is completely discharged (C and D terminals).

5.3 Braking

There are various possible types of braking:

- via internal braking unit and external braking resistor (up to size ADV5550),
- via external braking unit (BUy, usable for all sizes),
- injection of direct current from the Inverter into the motor (DC 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 from 1000 to 800rpm) while the DC braking can only be 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 (RBR), 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 "10.5 Braking resistor (optional)", page 174.
|||||

Sizes		Technical data of the Internal Braking Units (Duty 50%)		
		Nominal current of the internal braking unit	Peak current	Minimum braking resistance value
		I _{RMS} (A)	I _{PK} (A)	R _{BR} (Ω)
1007	Internal Braking Units (standard internal)	5.7	8	100
1015		5.7	8	100
1022		5.7	8	100
1030		5.7	8	100
1040		5.7	8	100
2055		8.5	12	67
2075		8.5	12	67
2110		15.5	22	36
3150		22	31	26
3185		37	53	15
3220		37	53	15
4300		Internal Braking Units (standard internal)	57	80
4370	57		80	10
4450	76		107	7.5
5550	76		107	7.5
≥ 5750 and ADV200-...-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 Encoder

The encoders may only be connected to the inverter when an EXP-...-ADV optional card is installed.

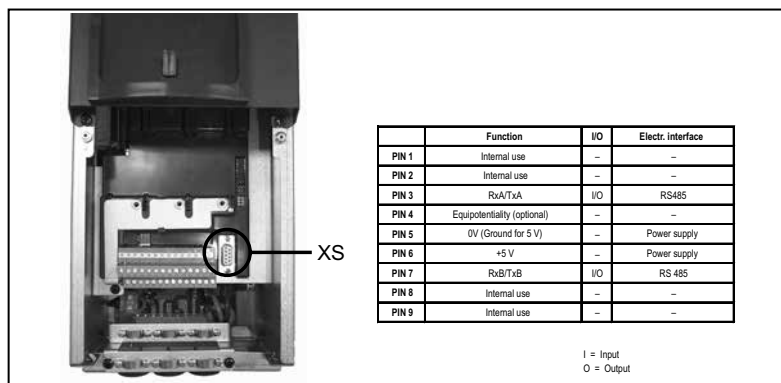
For further details of the technical specifications, refer to the EXP-...-ADV optional card manual.

For instructions regarding fastening of the optional card, see [paragraph 10.5](#) of this manual.

Optional Card	Code	Encoder	PAR 530 - 532 - 534 Slot X card type (*)
EXP-DE-I1R1F2-ADV	S5L30	Incremental Digital Encoder (DE)	Enc 1
EXP-DE-I2R1F2-ADV	S5L35	Double Incremental Digital Encoder (2 x DE)	Enc 7
EXP-SE-I1R1F2-ADV	S5L31	Incremental Sinusoidal Encoder (SE)	Enc 2
EXP-SESC-I1R1F2-ADV	S5L32	Incremental Sinusoidal Encoder + SinCos Absolute (SESC)	Enc 3
EXP-EN/SSI-I1R1F2-ADV	S5L33	Incremental Sinusoidal Encoder + Endat Absolute + SSI (SE-EnDat/SSI)	Enc 4
EXP-HIP-I1R1F2-ADV	S5L34	Incremental Sinusoidal Encoder + Hiperface Absolute (SE-Hiperface)	Enc 5
EXP-ASC-I1-ADV	S5L42	Incremental SinCos Absolute Encoder	Enc 8
EXP-RES-I1R1-ADV	S5L43	Resolver	Enc 9

(*) Enc X = name assigned to the card by the software, see PAR 530 - 532 - 534.

5.5 Serial interface (XS connector)



The ADV200 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 GF-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](#).

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

.....
 The connection indicated is without galvanic insulation !

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

.....



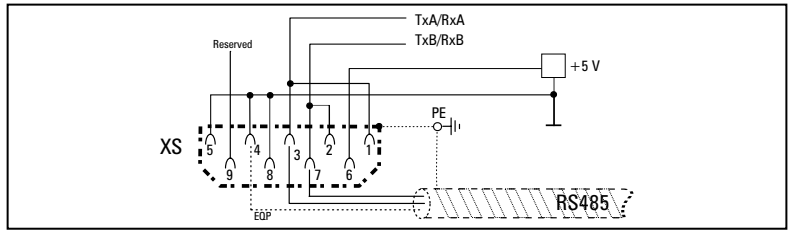


Figure 5.5.1.1: Serial connection (not insulated)

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 kBaoud.

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

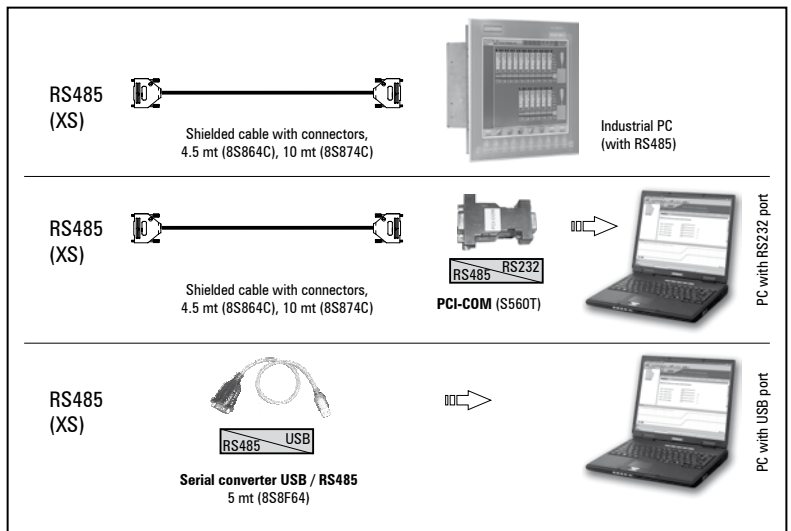


Figure 5.5.1.2: RS485 connection to the PC

Connection of an industrial PC with RS485

The following are required for connection:

- shielded cable for the **XS / RS485** connection (see figure 5.5.1.2), code 8S864C

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, see figure 5.5.1.2 .

Connection to a PC with USB port

The following is required for connection: optional adapter **USB/ RS485**, code 8S8F64, see figure 5.5.1.2 .

5.5.2 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 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 5.5.1 must be used.

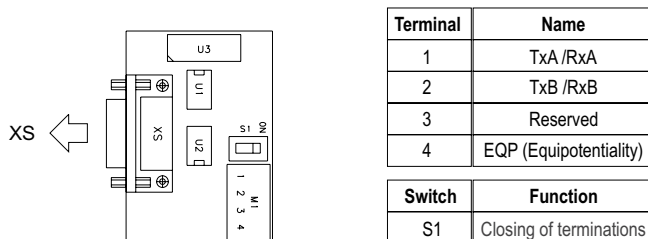


Figure 5.5.2.1: OPT-RS485-ADV card

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

Switch	Function
S1	Closing of terminations

5.5.3 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 5.5.3.1. The connection requires:

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

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

See figure 5.5.3.2. 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 5.5.3.3. The connection requires:

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

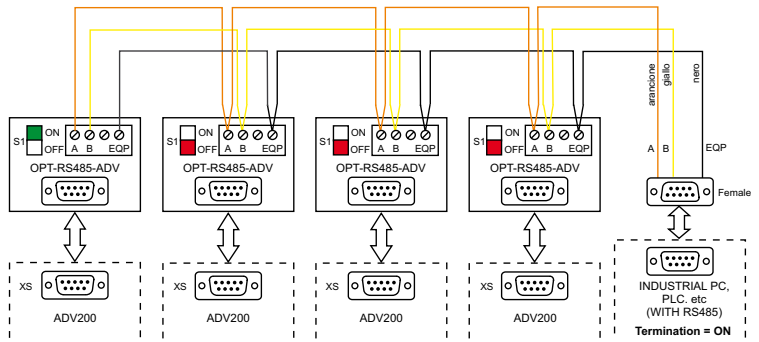


Figure 5.5.3.1: Example of Multidrop connection between ADV200 and an industrial PC with RS485 port

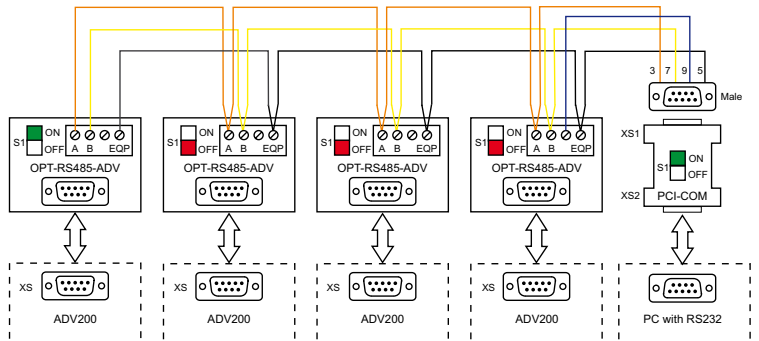
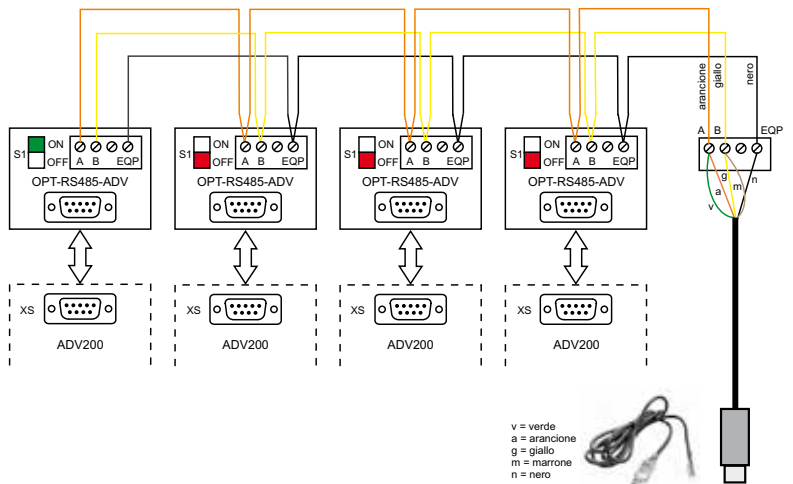


Figure 5.5.3.2: Example of Multidrop connection between ADV200 and a PC with RS232 port



USB - RS485
Serial Converter Cable

Figure 5.5.3.3: Example of Multidrop connection between ADV200 and a PC with USB port

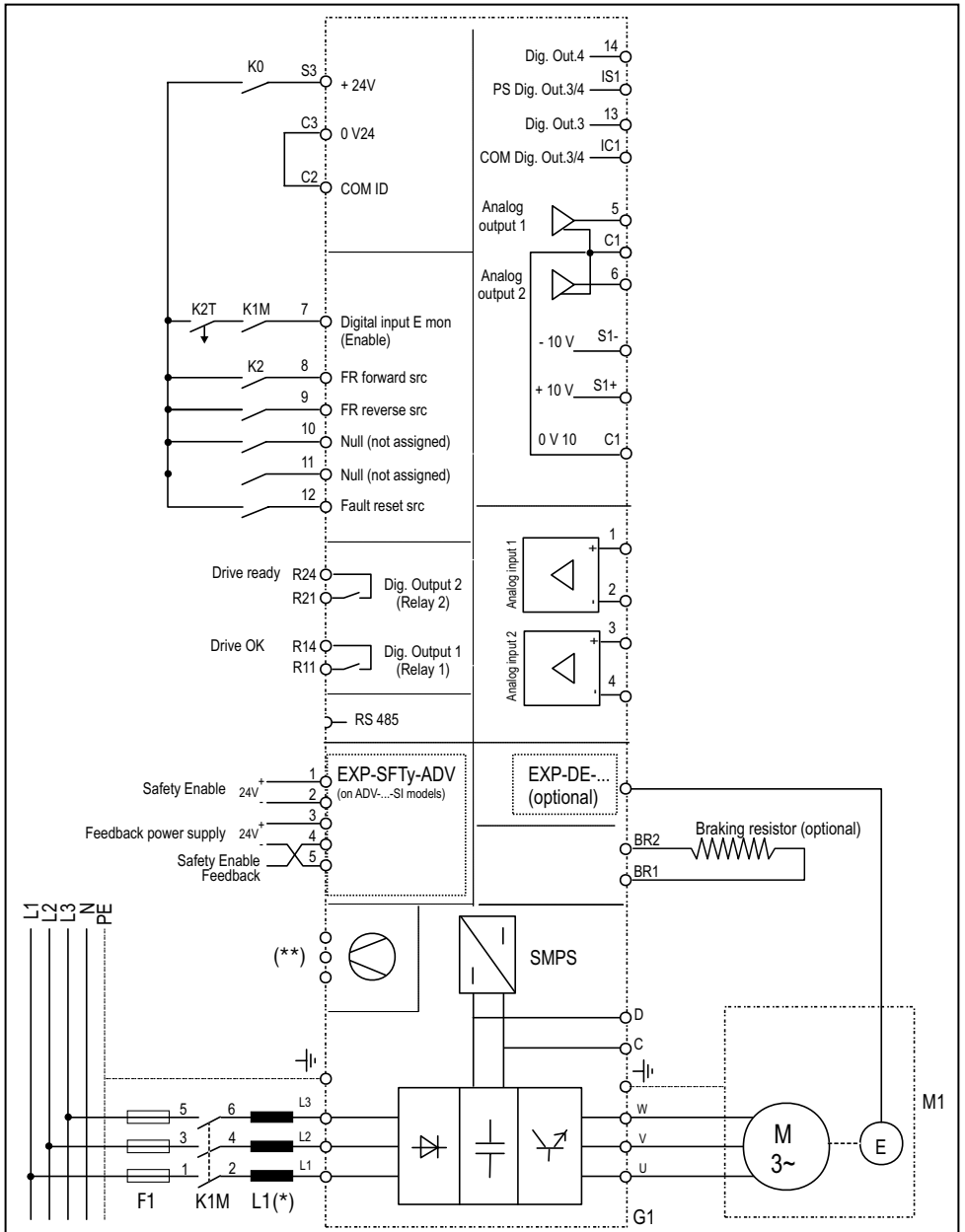
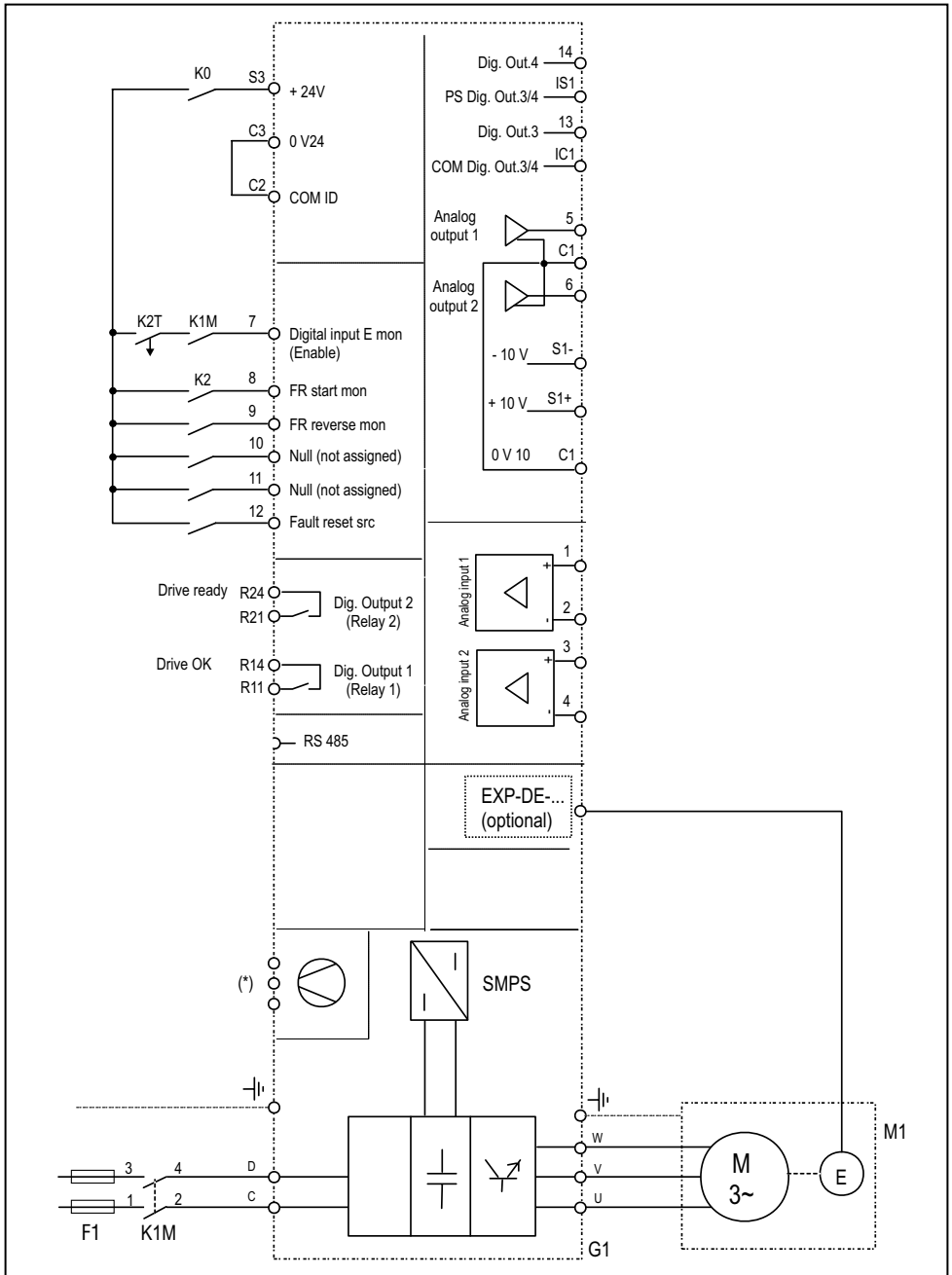


Fig 5.6.3: Simplified diagram, Safe Torque Off function (ADV...-SI models only)



Caution

For instructions on connecting and commissioning the SIL2 or SIL3 safety level function, please see chapter 7 "Application Examples" in the Safety manual (code 1S5F94) which you can download from www.gefran.com.



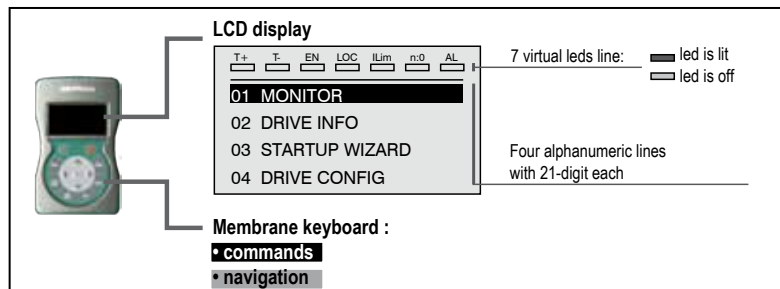
(*) See paragraph "5.1.12 Connection of fans", page 41.

Fig 5.6.4: Typical connection diagram, command via terminal strip, ADV200-...-DC models

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/Remote	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.

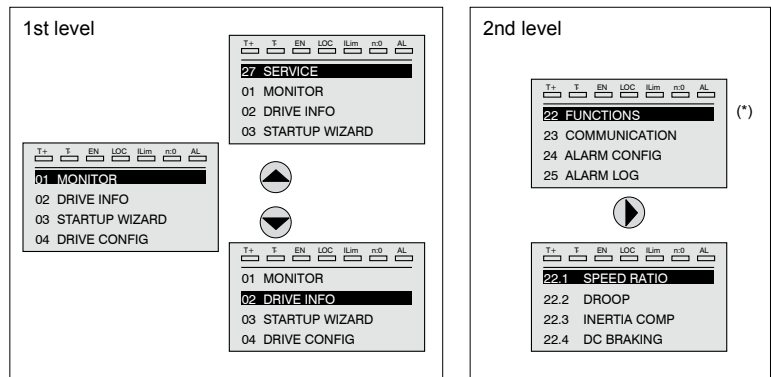
Ilim the LED is lit, when the drive operates at a current limit. During normal functioning, this led is OFF.

n=0 the LED is lit; it signals zero speed

AL the LED is lit; it signals a trip

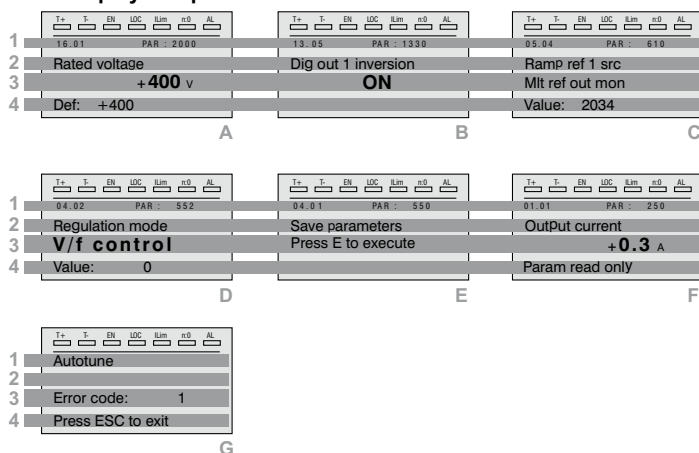
6.2 Navigation

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

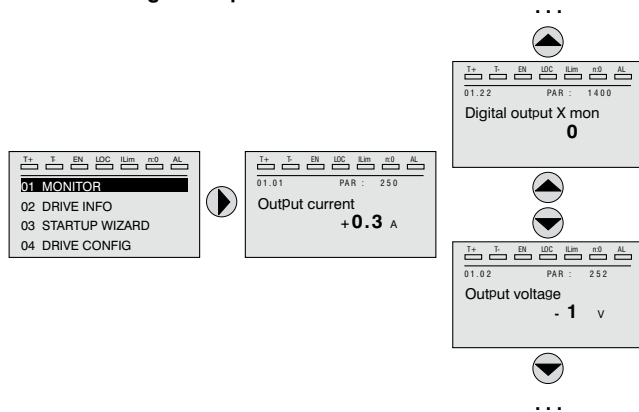


- 1 Position of the parameter in the menu structure (in figure A, 16.01); number of the parameter (in figure A, PAR: 2000).

- 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](#).

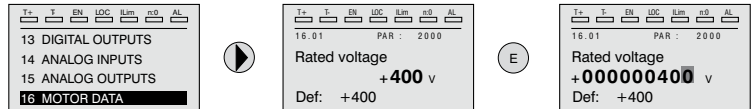
To exit from modification mode without saving the value, press the **ESC** key.

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 FP manual).

- **Numeric parameters**



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

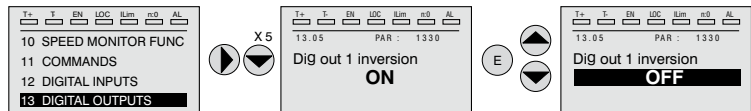
Using the ◀ and ▶ keys, the cursor can be moved to all the digits, including trailing zeros that are normally not displayed.

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.



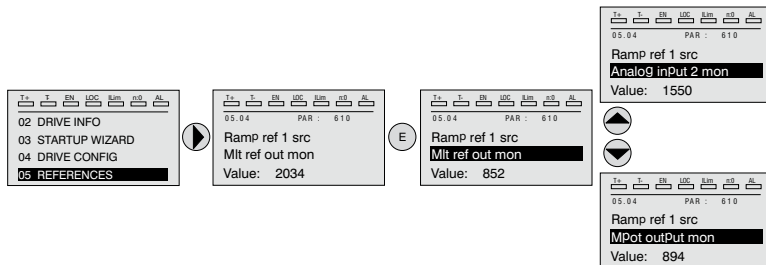
Pressing **E**, modification mode is activated. The entire line is displayed in reverse.

Use the ▲ and ▼ keys to move from one state to another.

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

- **LINK type parameter**

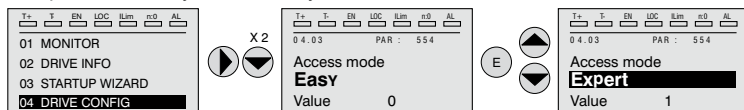
The parameter may assume the number of another parameter as value.



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.

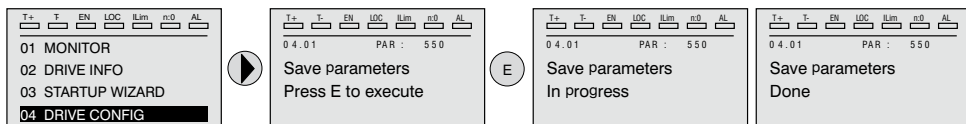
At the end of execution, if the result is positive, the “Done” caption is displayed for few seconds.

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.



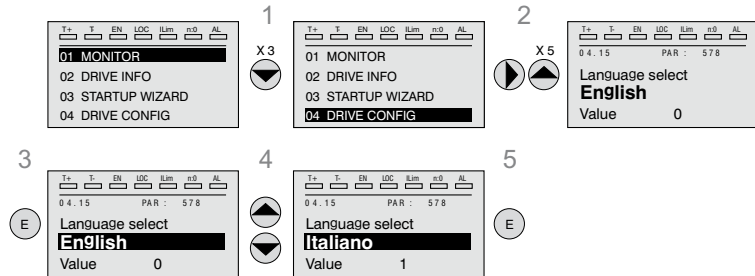
To exit, press the **◀** key.

6.5 Configuration of the display

6.5.1 Language selection

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

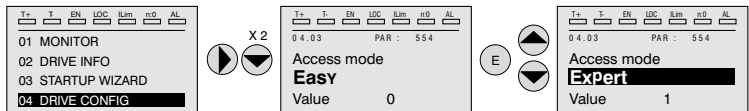
Used to set one of the languages available : English, Italian, Francais, Deutsch, Polish, Romanian, Russian, Turkish and Portuguese.



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](#)).

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.

	T ₁	T ₂	EM	LOC	EM	sd	AL
1	Alarm -RTN: 1/2						
2	Power down						
3	Code: 0000H-0						
4	Time: 28:04						

- 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.

	T+	T	EN	LOC	ILm	nO	AL
1	Message 0 1						
2	Load default						
3	Code: 0001H-1						
4	Press ESC to exit						

- 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.
- Description of the message (see [chapter 8](#) for further information)
- Sub-code of the message. Provides extra information in addition to the description.
- "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.

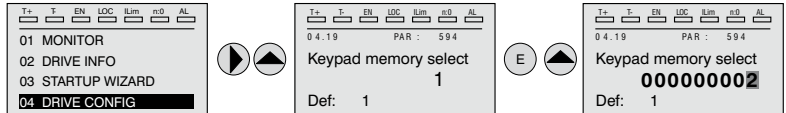
Note !

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.

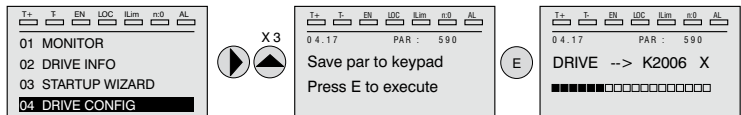
6.8.1 Selection of the keypad memory



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

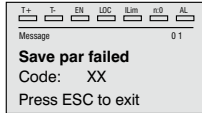


Menu 04 DRIVE CONFIG, parameter 04.19 **Save par to keypad**, PAR : 590.

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:

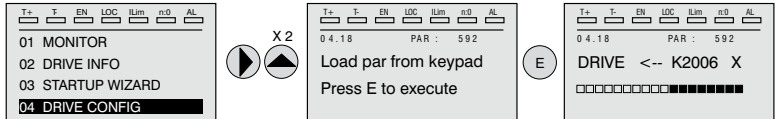


The code XX indicates the type of error, see [paragraph 8.2](#). To exit from the error message, press the **ESC** key.

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.

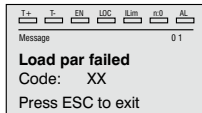


To start the operation, press the **E** key. During transfer, a bar is displayed which indicates progress of the operation.

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.

=====

7 - Commissioning via keypad (STARTUP WIZARD)



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 overspeed 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'opération. L'installation électrique et l'ouverture des drives devrait être exécuté uniquement par du personnel qualifié. De mauvaises installations de moteurs ou de drives peuvent provoquer des dommages matériels ou blesser des personnes. On doit suivre les instructions données dans ce manuel et observer les règles nationales de sécurité.

Always connect the Drive to the protective ground (PE) via the marked connection \perp . 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 (\perp) must be fixed type and doubled for redundancy if its section is lower than 10mm² CU or 16mm² AL.

Il faut toujours connecter le variateur à la terre \perp (PE). Le courant de dispersion vers la terre est supérieur à 3,5 mA sur les variateurs et sur les filtres à courant alternatif. 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 (\perp) doit avoir une double connexion pour la redondance si sa section est inférieure à 10mm² CU ou 16mm² 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 DIN VDE 0160, section 5.5.2 and 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. DIN VDE 0160, paragraphe 5.5.2 et 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.



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.
- capacitive load (e.g. Var compensation capacitors) should not be connected.

À la sortie du convertisseur (bornes U, V et W) :

- aucune tension ne doit être appliquée
- aucune charge capacitive ne doit être connectée
- il n'est pas permis de raccorder la sortie de plusieurs convertisseurs en parallèle
- il n'est pas permis d'effectuer une connexion directe de 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 de l'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 châssis du moteur doit être mis à la terre à l'aide d'un connecteur de terre séparé 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 k Ω /V) should be used for measuring the signal voltages.

Il ne faut pas exécuter de tests de rigidité diélectrique sur des parties du convertisseurs. Pour mesurer les tensions, des signaux, il faut utiliser des instruments de mesure appropriés (résistance interne minimale 10k Ω /V).

7.1 Startup Wizard

7.1.1 Startup Wizard for Asynchronous Motors

Introduction

The ADV200 can operate with regulation modes : V/f control (Voltage/Frequency) , Flux vector OL (open loop) and Flux vector CL (field-oriented control, closed 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.

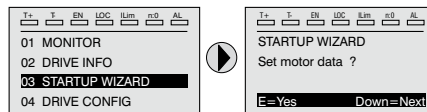
The startup wizard is a guided procedure used for quick start-up of the drive that helps to set the main parameters.

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](#)
- **Saving parameters** See [step 6](#)
- **Speed regulation setting** See [step 7](#)
- **Setting the motor in Flux vector OL control mode** See [step 8](#)

The format of the function selection page is as follows:



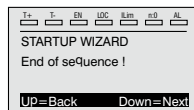
Pressing the E key, the function to be programmed is accessed.

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.

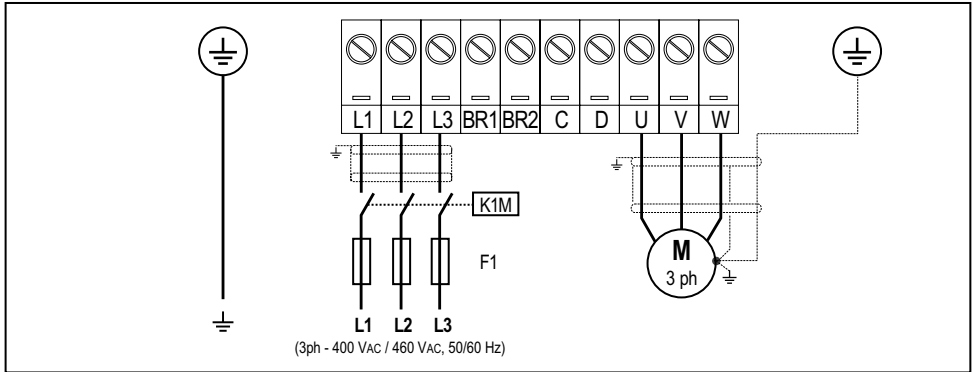
Note !

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

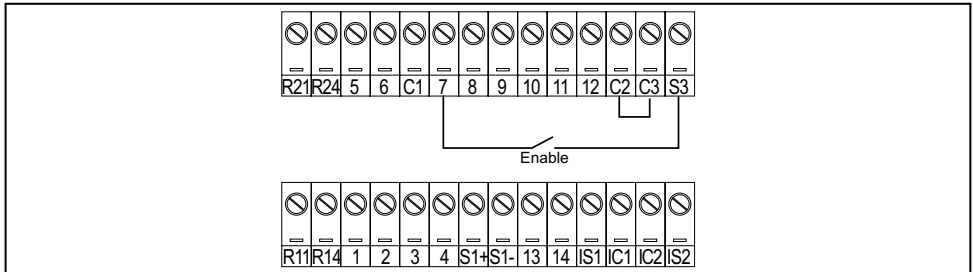
Connect the drive to the power supply as illustrated in the following diagrams:

Connection to the mains and motor

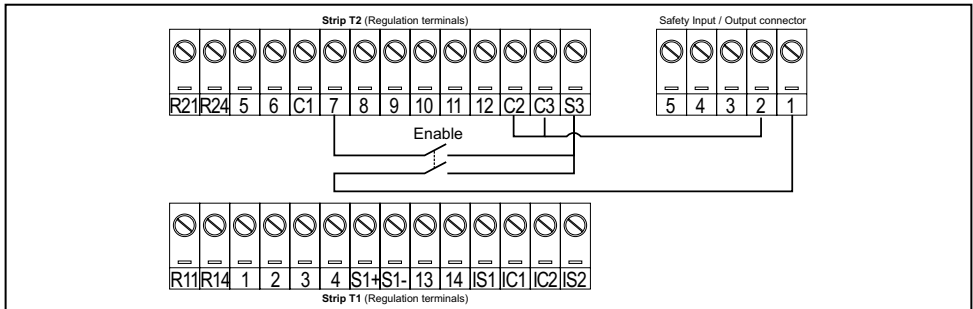


For ADV-...-DC versions please refer to the diagrams in paragraph "5.1.6 Power line connection", page 33 and "5.1.8 Motor connection", page 37.

Connection of the drive enabling contact



Connection of the drive enabling contact with Safety function (SIL2 configuration)



Checks to be performed before powering the drive

- Check that the supply voltage is correct (TN,TT for ADV200 standard series ; IT for ADV200...-IT series) and that the input terminals on the drive (L1, L2 and L3 or C and D for ADV-...-DC) are connected correctly.
- Check that the output terminals on the drive (U, V, and W) are connected to the motor correctly.
- Check that all the drive control circuit terminals are connected correctly. Check that all control inputs are open.

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 _r)	720 rpm		
IP54	Iso KI F	S1	
Made in			

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

The screenshots show the following parameter settings:

- SEQ. 01:** Rated voltage: +400 v (Def: +400)
- SEQ. 02:** Rated current: +11.8 A (Def: +11.8)
- SEQ. 03:** Rated speed: +1450 rpm (Def: +1450)
- SEQ. 04:** Rated frequency: +50.0 Hz (Def: +50.0)
- SEQ. 05:** Pole pairs: +2 (Def: +2)
- SEQ. 06:** Rated power: +5.50 kW (Def: +5.50)
- SEQ. 07:** Rated power factor: +0.83 (Def: +0.83)

- 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: $P = 60 [s] \times f [Hz] / nN [rpm]$
 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 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 !

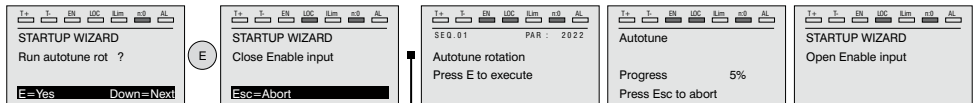
If this operation generates an error message (example Error code 1), check the connections of the power and control circuits (see Step 1 - Connections), check motor data settings (see Step 2 – Motor data setting) and then repeat the Autotune procedure (or, alternatively, select a different type of procedure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

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.




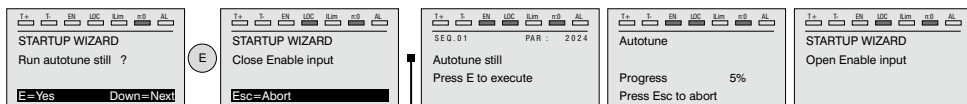
Caution

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 S3 (+24Vdc)

Note !

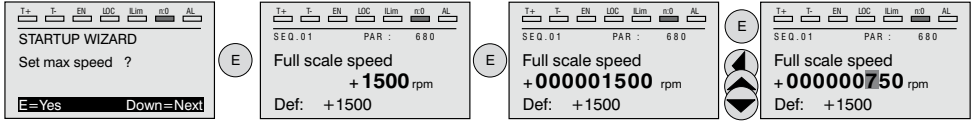
At the end of the self-tuning procedure there is a request to open the Enable contact (terminals 7 – S3); the **Take tune parameters** command (menu 16 MOTOR DATA, PAR: 2078) is automatically executed.

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)

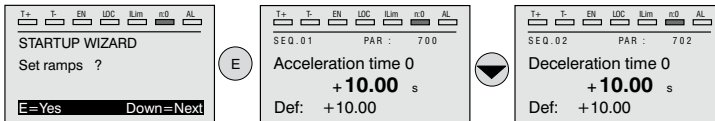
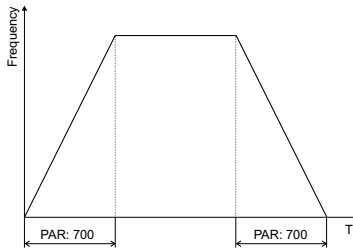
This step is used to define the maximum motor speed value that can be reached with each single reference signal (analog or digital).



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 :



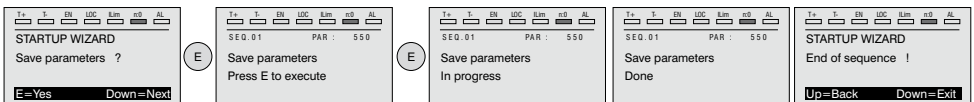
Note !

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 - Speed regulation setting

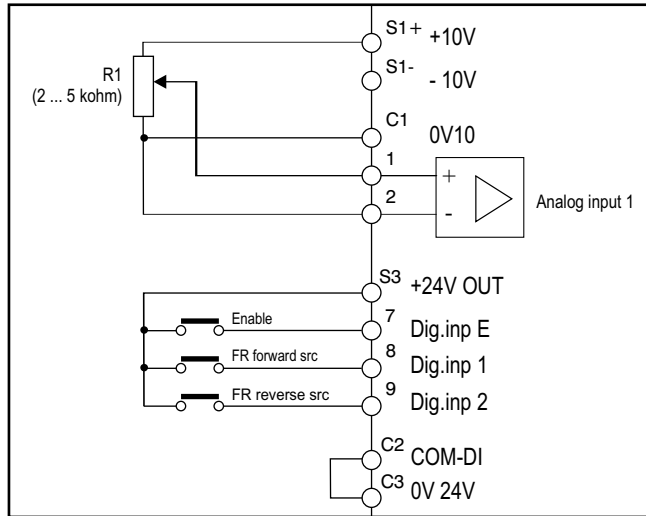
In this step the basic settings in order to perform a functional test of the drive-motor system are described. This functional test uses **factory settings as far as the analog and digital commands of the drive are concerned**. The regulation mode is that set in PAR 552 **Regulation mode**, default is V/f control.

Before starting, check the following setting:

Menu 02 DRIVE INFO, parameter 02.1 **Drive series**, PAR:480 = Asynchronous.

Menu 04 DRIVE CONFIG, parameter 04.2 **Regulation mode**, PAR: 552 (default: 0 = **V/f control**; 1 = Flux vector OL; 2 = Flux vector CL; 3 = Autotune)

• Basic connections for the speed test



After making the connections described in the previous section, proceed as follows to start the motor rotating:

1. Make sure the analog signal or potentiometer are set to the minimum value.
2. Close the **Enable** contact (terminals S3 – 7)
3. Close the **FR forward src (PAR 1042)** contact, terminals S3 – 8. The drive starts magnetizing the motor
4. Increase the reference signal gradually using the potentiometer or analog signal.
5. If the motor rotates anti-clockwise with the **FR forward src (PAR 1042)** command and a positive analog reference, stop the drive, disconnect the power supply and invert two phases between U, V and W.
6. Press the **DISP** key to check that the voltage, current and output frequency values are correct in relation to the type of motor and the set speed reference value.
7. If all the parameters are correct, increase the analog reference to the full scale value and check that the output voltage is the same as that on the motor data plate, that the current is approximately equal to the magnetizing current (for a standard asynchronous motor this is usually between 25% and 40% of the rated current) and that the output frequency is 50 Hz.

8. If the motor does not reach its maximum speed, self-tuning of the analog input may be necessary: set the input signal to its maximum value and set the **An inp 1 gain tune** parameter (PAR: 1508) to 1.
9. If the motor still rotates with a reference of zero, eliminate the condition by self-tuning the analog input offset: set the input signal to its minimum value and set 1 for **An inp 1 offset tune** (PAR: 1506).
10. To reverse the direction of rotation, keep closed the **FR forward src (PAR 1042)** contact (terminals S3 – 8) and close the **FR reverse src (PAR 1044)** contact (terminals S3 – 9). The motor will start the deceleration ramp until reaching the zero speed, after which it will reverse the direction of rotation and move to the set speed with the acceleration ramp.
11. To stop the drive, open the **FR forward src (PAR 1042)** contact (terminals S3 – 8): the motor will start the deceleration ramp and the speed will move to zero, but the motor will remain magnetized. To interrupt magnetization, open the **Enable** contact (terminals S3 – 7).
12. If the **Enable** contact is opened while the motor is running, the inverter bridge is immediately disabled and the motor stops due to inertia.

Note !

Once you have verified the correct operation of the drive-motor system, the application can be customized by changing some of the parameters.

• **Summary of parameters**

The parameters used and/or modified in the Startup Wizard procedures are listed below.

Menu	PAR	Description	
16.1	2000	Rated voltage	Motor rated voltage
16.2	2002	Rated current	Motor rated current
16.3	2004	Rated speed	Motor rated speed
16.4	2006	Rated frequency	Motor rated frequency
16.5	2008	Pole pairs	Number of pole pairs
16.6	2010	Rated power	Motor rated power
16.9	2022	Autotune rotation	Self-tuning with motor rotating
16.10	2024	Autotune still	Self-tuning with motor at stand-still or coupled to the load
5.22	680	Full scale speed	Maximum speed setting
6.1	700	Acceleration time 0	Acceleration time 0
6.2	702	Deceleration time 0	Deceleration time 0
4.1	550	Save parameters	Save parameters in the non-volatile memory

Proceed to step 8.

Step 8 - Setting the motor in “Flux Vect OL” mode (sensorless)

Menu 04 DRIVE CONFIG, parameter 04.2 **Regulation mode**, PAR: 552, set = [1] Flux vector OL.

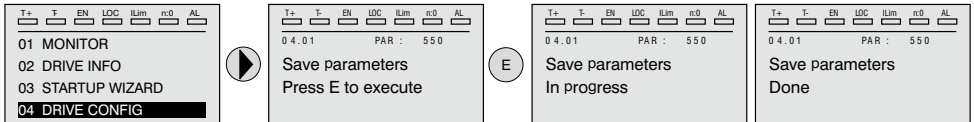
Test with no load applied to the motor

1. Set the value of PAR 2308 **OverFlux perc** to 120%.
2. Set the value of PAR 2312 **OverFlux spd thr** to approximately 25% of the rated speed.
3. Close the **Enable** contact (terminals S3 – 7).
4. Close the **FR forward src contact** (PAR 1042), terminals S3 – 8. The drive starts magnetising the motor.
5. Using the potentiometer, gradually increase the reference signal until reaching the maximum speed.
6. Open the **FR forward src contact** (PAR 1042), terminals S3 – 8, until reaching the minimum set speed requested by the application.
7. Check that the ramp is linear and, once the set value has been reached, that the minimum speed remains stable.

If the ramp is not linear and the minimum speed is not stable, reduce the value of PAR 2306 **Flux observe gain OL** in steps of 5.

Examples of values for PAR 2306 with standard 4-pole motors	
100	For motor power ratings up to 15 kW
40-50	For motor power ratings of 45-55 kW
20-30	For motor power ratings of more than 132 kW

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



Test with rated load applied to the motor

1. Close the **Enable** contact (terminals S3 – 7).
2. Close the **FR forward src contact** (PAR 1042), terminals S3 – 8. The drive starts magnetising the motor.
3. Using the potentiometer, gradually increase the reference signal until reaching the maximum speed.
4. Open the **FR forward src contact** (PAR 1042), terminals S3 – 8, until reaching the minimum set speed requested by the application.
 - if current overload conditions occur at the minimum speed,
 - if the current exceeds the rated current value setting,
 - if the motor shaft is blocked at zero speed,
 reduce the value set in PAR 2306 **Flux observe gain OL** in steps of 5 until reaching the best working condition with no overload.
5. To save, repeat step 6.

7.1.2 Startup Wizard for Synchronous Motors

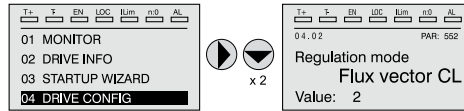
Introduction

The ADV200 can operate with regulation modes: field-oriented vector control **Flux vector CL** and **Flux vector OL** of permanent magnet synchronous motors (brushless).

Note!

Before starting, check the factory setting:

Menu 04 DRIVE CONFIG, parameter 04.2 Regulation mode, PAR: 552, default=Flux vector CL.



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

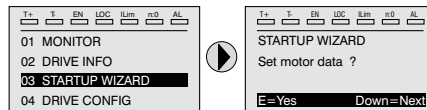
It consists of a series of questions relating to the various sequences for entering and calculating the parameters necessary for correct drive operation.

The order of these sequences is as follows:

- **Basic connections** See [step 1](#)
- **Setting motor parameters** See [step 2](#)
- **Self-tuning with motor at stand-still or coupled to the load** See [step 3](#)
- **Setting encoder parameters (*)** See [step 4](#)
- **Encoder phasing (*)** See [step 5](#)
- **Setting the maximum speed reference value** See [step 6](#)
- **Setting ramp parameters** See [step 7](#)
- **Saving parameters** See [step 8](#)
- **Setting of the synchronous motor in “Flux Vect OL” (sensorless) mode for typically variable torque load types** See [step 9](#)

(*) Flux vector CL mode only.

The format of the function selection page is as follows:



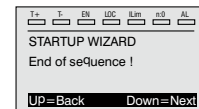
Pressing the E key, the function to be programmed is accessed.

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:



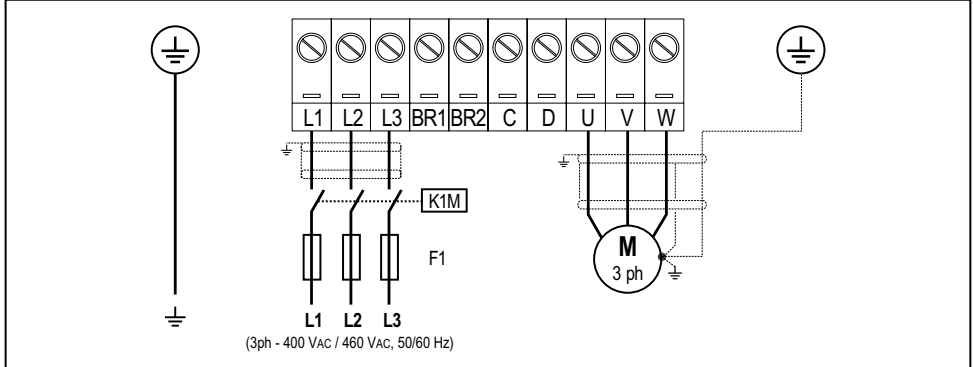
Press the ▼(Down) key to exit the sequence and return to the menu.

Step 1 - Connections

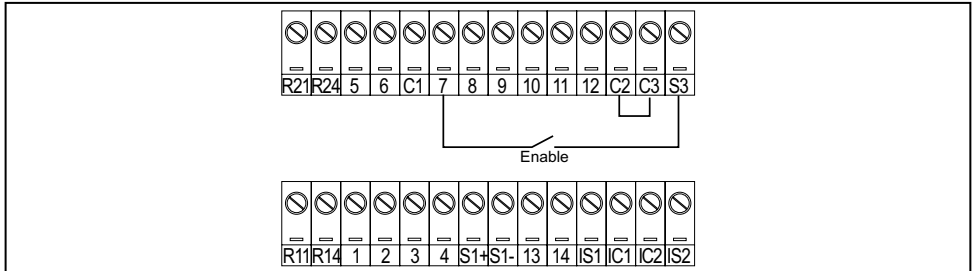
For ADV-...-4-DC versions please refer to the diagrams in paragraph "5.1.6 Power line connection", page 33 and "5.1.8 Motor connection", page 37.

Connect the drive to the power supply as illustrated in the following diagrams:

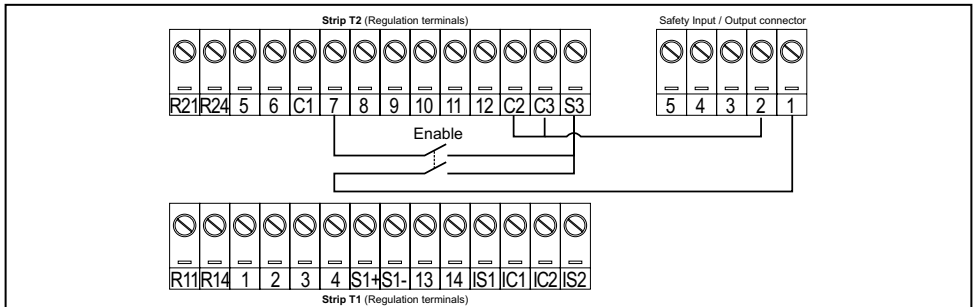
Connection to the mains and motor



Connection of the drive enabling contact



Connection of the drive enabling contact with Safety function (SIL2 configuration)



Checks to be performed before powering the drive

- Check that the supply voltage is correct (TN,TT for ADV200 standard series; IT for ADV200...-IT series) and that the input terminals on the drive (L1, L2 and L3 or C and D for ADV-...-DC) are connected correctly.
- Check that the output terminals on the drive (U, V, and W) are connected to the motor correctly.
- Check that all the drive control circuit terminals are connected correctly. Check that all control inputs are open.
- Check the encoder connections, see section A.3 of the Appendix.

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.

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

The screenshots show the following parameter settings:

- Rated voltage:** +340 V (Def: +400)
- Rated current:** +11.0 A (Def: +11.0)
- Rated speed:** +95 rpm (Def: +95)
- Pole pairs:** 12 (Def: 12)
- Torque constant:** 50.00 N/A (Def: 50.00)
- EMF constant:** 28.87 Wb (Def: 28.87)

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; see data plate.

Pole pairs: Number of motor pole pairs, see data plate.

Torque constant (KT) : (KT) Ratio between the torque generated by the motor and the current required to supply it.

EMF constant : (KE = KT / $\sqrt{3}$) Electromotive force constant, which represents the ratio between motor voltage and motor rated speed.

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 3.

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 !

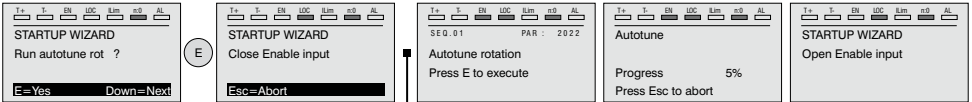
If this operation generates an error message (example Error code 1), check the connections of the power and control circuits (see [Step 1 - Connections](#)), check motor data settings (see [Step 2 – Motor data setting](#)) and then repeat the Autotune procedure (or, alternatively, select a different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

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 



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 a mechanical transmission** and cannot be made to rotate freely.


May cause limited rotation of the shaft.

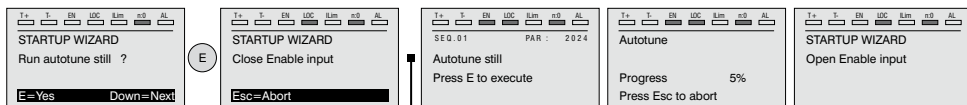
Peut entraîner une rotation de l'arbre limitée.



Caution

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.

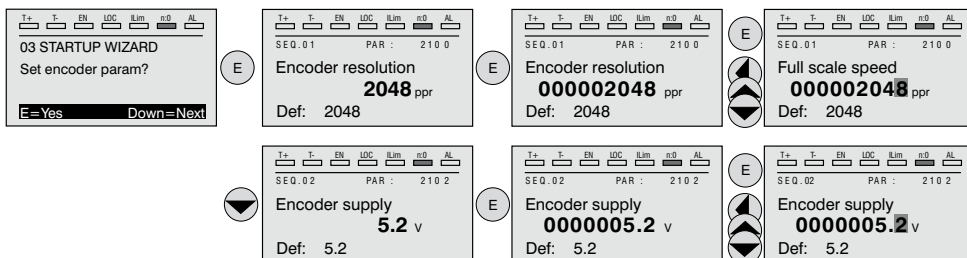
When the Enable contact is opened the drive proposes Step 4 to proceed with the wizard.

Step 4 - Setting encoder parameters

For **Flux vector CL** mode only (Menu 04 DRIVE CONFIG, parameter 04.2 **Regu-
lation mode**, PAR: 552, default=Flux vector CL).

Note !

Following procedure is valid with EXP-SESC-11R1F2-ADV optional card installed



An incorrect encoder voltage setting could result in permanent damage to the device. Check the value on the encoder data plate.

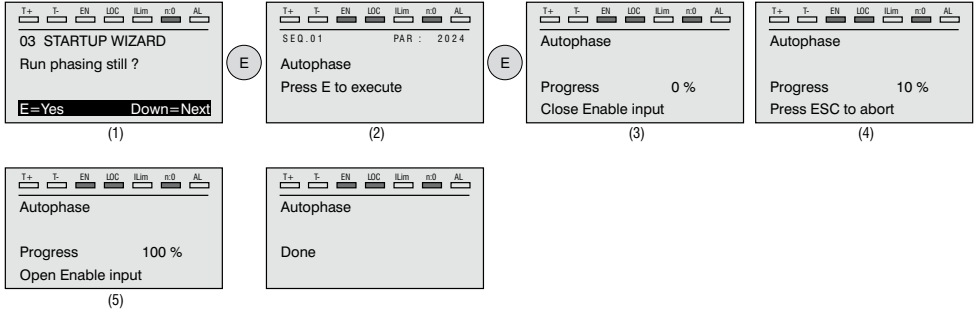
Step 5 - Encoder phasing

For **Flux vector CL** mode only (Menu 04 DRIVE CONFIG, parameter 04.2 Regulation mode, PAR: 552, default=Flux vector CL).

Note!

This procedure can be avoided if "SBM" series motors (supplied by Gefran) are used.

The drives have a command to start automatic phasing of the encoder. This procedure can be run with the motor shaft in rotation and with the shaft stopped (the brake must be blocked).



With regard to phasing with the motor stopped, with the **Autophase still mode** parameter (PAR 2194) you can select two different methods based on the different characteristics of synchronous motors on the market.

We recommend using **Mode 1** as the first option. If **Mode 1** does not run correctly, the motor (due to its constructive characteristics) requires a different mode (i.e., **Mode 2**).

If an incremental digital encoder is used, you can select different methods for phasing the motor with the **Autophase still run** parameter (PAR 2196): via "Autophase rotation" dedicate command or by Wizard procedure, only at the first enabling of the drive ("**First enable**" selection) or at each enabling of the drive ("**Each enable**" selection).

Phasing must be repeated whenever:

- the drive is replaced (alternatively, download parameters taken from previous drive)
- the motor is replaced
- the encoder is replaced.

Note !

For further information see parameters 15.15 PAR 2190 Autophase rotation and 15.16 PAR 2192 Autophase still in the Description of functions and list of parameters manual).

See section A.3.2 Phasing in the Appendix for further information.

Step 6 - Setting the maximum speed reference value (Set max speed)

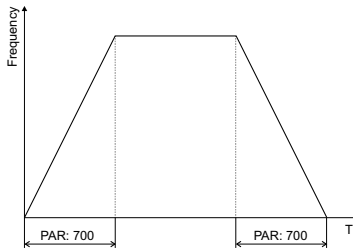
This step is used to define the maximum motor speed value that can be reached with each single reference signal (analog or digital).

<p>T+ T- EN LDC ILim nD AL</p> <p>STARTUP WIZARD</p> <p>Set max speed ?</p> <p>E=Yes Down=Next</p>	E	<p>T+ T- EN LDC ILim nD AL</p> <p>SEQ.01 PAR : 680</p> <p>Full scale speed +1500 rpm</p> <p>Def: +1500</p>	E	<p>T+ T- EN LDC ILim nD AL</p> <p>SEQ.01 PAR : 680</p> <p>Full scale speed +000001500 rpm</p> <p>Def: +1500</p>	<p>E</p> <p>▲</p> <p>▼</p>	<p>T+ T- EN LDC ILim nD AL</p> <p>SEQ.01 PAR : 680</p> <p>Full scale speed +000000750 rpm</p> <p>Def: +1500</p>
--	---	--	---	---	----------------------------	---

After setting the speed, proceed to Step 7 to set the acceleration and deceleration ramp parameters.

Step 7 - Setting ramp parameters (Set ramps)

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



<p>T+ T- EN LDC ILim nD AL</p> <p>STARTUP WIZARD</p> <p>Set ramps ?</p> <p>E=Yes Down=Next</p>	E	<p>T+ T- EN LDC ILim nD AL</p> <p>SEQ.01 PAR : 700</p> <p>Acceleration time 0 +10.00 s</p> <p>Def: +10.00</p>	<p>▼</p>	<p>T+ T- EN LDC ILim nD AL</p> <p>SEQ.02 PAR : 702</p> <p>Deceleration time 0 +10.00 s</p> <p>Def: +10.00</p>
--	---	---	----------	---

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 8.

Step 8 - Saving parameters (Save parameters)

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

<p>T+ T- EN LDC ILim nD AL</p> <p>STARTUP WIZARD</p> <p>Save parameters ?</p> <p>E=Yes Down=Next</p>	E	<p>T+ T- EN LDC ILim nD AL</p> <p>SEQ.01 PAR : 550</p> <p>Save parameters Press E to execute</p>	E	<p>T+ T- EN LDC ILim nD AL</p> <p>SEQ.01 PAR : 550</p> <p>Save parameters In progress</p>	<p>T+ T- EN LDC ILim nD AL</p> <p>SEQ.01 PAR : 550</p> <p>Save parameters Done</p>	<p>T+ T- EN LDC ILim nD AL</p> <p>STARTUP WIZARD</p> <p>End of sequence !</p> <p>Up=Back Down=Exit</p>
--	---	--	---	---	--	--

Step 9 – Setting the synchronous motor in “Flux Vect OL” mode (sensorless) for a typically variable torque-type load with OL control

Menu 04 CONFIG DRIVE, parameter 04.2 **Regulation mode**, PAR: 552, set = [1] **Flux vector OL** .

Test with no load applied to the motor

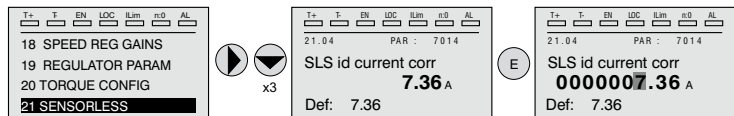
1. Close the **Enable** contact (terminals S3 – 7)
2. Close the **FR forward src** contact (PAR 1042), terminals S3 – 8. The drive starts magnetising the motor.
3. Using the potentiometer, gradually increase the reference signal until reaching the maximum speed.
4. Open the **FR forward src** contact (PAR 1042), terminals S3 – 8, until reaching the minimum set speed requested by the application.
5. Check that the ramp is linear and, once the set value has been reached, that the speed remains stable.

Test with rated load applied to the motor

1. Close the **Enable** contact (terminals S3 – 7)
2. Close the **FR forward src** contact (PAR 1042), terminals S3 – 8. The drive starts magnetising the motor.
3. Using the potentiometer, gradually increase the reference signal until reaching the maximum speed.
4. Open the **FR forward src** contact (PAR 1042), terminals S3 – 8, until reaching the minimum set speed requested by the application.

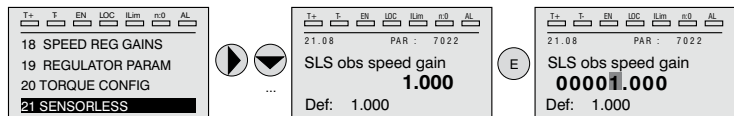
If the motor with the load applied has difficulty starting:

increase the value of **SLS id current corr** (PAR 7014) (this value depends on the size of the drive) in steps of 10% until the problem is eliminated.



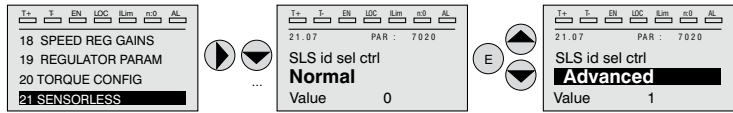
If mechanical vibrations occur during steady state operation:

reduce the value of **SLS id current corr** (PAR 7014) (this value depends on the size of the drive) in steps of 10% so as to reach a compromise with that stated above, also changing parameter **SLS obs speed gain** (PAR 7022) in steps of 0.



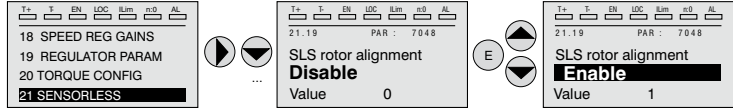
If current overloads occur during steady state operation:

with the drive disabled and the **Enable** contact (terminals S3 – 7) open, change parameter **SLS id sel ctrl** (PAR 7020) by selecting control “[1] **Advanced**”.



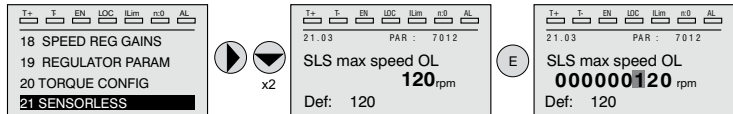
If vibrations are present at Start, modify the following parameters:

Enable parameter **SLS rotor alignment** (PAR 7048) and perform the alignment procedure as follows:

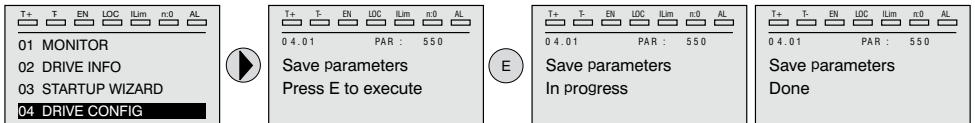


1. Close the **Enable** contact (terminals S3 – 7)
2. Set Speed reference = 0
3. Close the **FR forward src** contact (PAR 1042), terminals S3 – 8.
4. Wait 1 second (value set in parameter PAR 7050), gradually increase the reference signal using the potentiometer, until exceeding 10% of the maximum speed
5. Using the potentiometer again, reduce the speed reference signal to zero.
6. Open the **FR forward src** contact (PAR 1042), terminals S3 – 8.

If the vibrations have not been entirely eliminated, increase the value of parameter **SLS max speed OL** (PAR 7012) in steps of 10% until reaching the best working condition.



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



7.2 First customized start-up

In this section a startup test is performed, using a standard configuration, to check drive functioning and command connections.

A programming sequence has to be run to achieve a first simple customisation in order to be able to set the drive for the requested application.

Note !

The main sections to be used, depending on the desired configuration, are described below.

• Typical connection diagrams

Auxiliary control circuits _____	see chapter 5.6, figure 5.6.1
Typical connection diagram, connection through terminals strip _____	see chapter 5.6, figure 5.6.2
Potentials of the control section, Digital I/O PNP connection _____	see chapter 5.2.4, figure 5.2.4.1
Other inputs connections (NPN-PNP) _____	see chapter 5.2.4, figure 5.2.4.2
NPN outputs connection _____	see chapter 5.2.4, figure 5.2.4.3

• Digital inputs

The table on [chapter 5.2.3](#) shows the default settings for the analog and digital inputs and outputs.

Note !

Digital input settings can only be edited from the Expert parameters, see [chapter 6.5.2](#).

7.2.1 For Asynchronous Motors

• Selecting the regulation mode

First set the regulation mode in the **Regulation mode** parameter (04 DRIVE CONFIG menu, PAR: 552) :

- 0 V/f control.** This is the simplest and least advanced control mode. This mode can also be used to control several motors connected in parallel using a single drive.
- 1 Open loop field-oriented vector control (Flux vector OL).** In this mode, once the motor parameter self-tuning procedure has been performed, it is possible to create a mathematical model on which to perform all the necessary calculations in order to obtain high performance levels, especially high motor torque levels, even at very low speeds without the use of feedback, and achieve significant dynamic performance.
- 2 Closed loop field-oriented vector control (Flux vector CL).** This mode can be used to obtain maximum drive-motor efficiency in terms of speed precision, dynamic system response and motor torque regulation. It requires feedback by a digital encoder keyed to the motor shaft and connected to the relative optional expansion card mounted in the drive.

• Selecting the type of reference

After setting the regulation mode, the source of the speed reference must be set in the **Ramp ref 1 src** parameter (05 REFERENCES menu, PAR: 610). This source can be selected from among those listed in the L_MLTREF selection list:

- 1 **Analog input 1 mon** parameter (PAR: 1500) to use the signal applied to terminals 1 – 2 of analog input 1 (14 - ANALOG INPUTS menu).
- 2 **Dig ramp ref 1** parameter (05 - REFERENCES menu, PAR: 600) to set a digital speed inside the drive.
- 3 **Multi ref out mon** parameter (07 - MULTI REFERENCE menu, PAR: 852) to select the digital speeds using the digital inputs of the drive.
- 4 **Mpot output mon** parameter (08 - MOTOPOTENTIOMETER menu, PAR: 894) to use the internal motor potentiometer of the drive. If sending the command from the operator keypad, to use the motor potentiometer function enter the **Mpot setpoint** parameter (PAR: 870) modify mode and press the Up (▲) and Down (▼) keys.
- 5 **Jog output mon** parameter (09 - JOG FUNCTION menu, PAR: 920) to use one of the drive's internal jog speeds.

Signals from expansion cards, the serial line or fieldbus can also be set as speed references (see the detailed description of parameters).

• Setting the type of analog reference

If the analog input has been selected, choose the type of signal to use in the **Analog inp 1 type** parameter (14 - ANALOG INPUTS menu, PAR: 1502):

- | | |
|---|----------------|
| 0 | ± 10V |
| 1 | 0-20mA o 0-10V |
| 2 | 4-20mA |

As well as programming the **Analog inp 1 type** parameter (PAR:1502) you must also verify the position of the switches on the regulation card, as showed on chapter 5.2.4.

• Ramps setting

The acceleration and deceleration ramps can be set in **Acceleration time 0** (06 - RAMPS menu, PAR: 700) and **Deceleration time 0** (PAR: 702).

The signal available on the analog input can be adjusted using **Analog inp 1 scale** parameter (14 - ANALOG INPUTS menu, PAR: 1504), **An inp 1 offset tune** parameter (PAR: 1506) and **An inp 1 gain tune** parameter (PAR: 1508).

To use a digital speed to control the drive, enter it in the **Dig ramp ref 1** parameter (05 - REFERENCES menu, PAR: 600).

The ramps are the same used with the reference signal from the analog input.

• Multispeed

To use more than one digital speed, use the multi-speed function.

First select the source of the speed signals **Multi ref 0 src** and **Multi ref 1 src** (07 - MULTI REFERENCE menu, PAR: 832 e 834) from the L_MLTREF selection list.

Next define which digital inputs are to perform switching between the various speeds; use the **Multi ref sel .. src** parameters (PAR: from 840 to 846) to select the signals to use from the L_DIGSEL2 selection list. Set the desired speeds in the **Multi reference 0...7** parameters (PAR: from 800 to 814).

Also in this case the ramps can be set in the **Acceleration time 0** parameter (06 - RAMPS menu, PAR: 700) and **Deceleration time 0** parameter (PAR: 702) parameters.

• Motor potentiometer

To use the motor potentiometer, the signals to increase or decrease the reference must be defined: set the **Mpot up src** parameter (08 - MOTOPOTENTIOMETER menu, PAR: 884) and **Mpot down src** parameter (PAR: 886) parameters respectively to increase and decrease the reference using selection list L_DIGSEL2. Set the motor potentiometer ramps using **Mpot acceleration** (PAR: 872) and **Mpot deceleration** parameters (PAR: 874).

• Jog

Finally, for Jog mode, select the control terminal in the **Jog cmd + src** parameter (09 - JOG FUNCTION menu, PAR: 916), using a signal from selection list L_DIGSEL2.

The Jog speed must be written in the **Jog setpoint** parameter (PAR: 910), while the acceleration and deceleration ramps can be set, respectively, in **Jog acceleration** (PAR: 912) and **Jog deceleration** parameters (PAR: 914).

• Speed limits

After selecting the reference, set the speed limits in the following parameters (05 - REFERENCES menu):

- **Full scale speed** (PAR: 680). Setting of the maximum motor speed, which usually coincides with the rated speed indicated on the motor data plate.
- **Speed ref top lim** (PAR: 670). Upper speed limit: the maximum setting is 200% of the **Full scale speed**.
- **Speed ref bottom lim** (PAR: 672). Lower speed limit: the maximum setting is -200% of the **Full scale speed**.
- **Overspeed threshold** (24 - ALARM CONFIG menu, PAR: 4540). Overspeed alarm limit.

• Input and Output terminals

The default setting of the input terminals is as follows:

- Terminal 7	Digital input E	Enable
- Terminal 8	Digital input 1	FR forward src, PAR 1042
- Terminal 9	Digital input 2	FR reverse src, PAR 1044
- Terminal 10	Digital input 3	Null (not assigned)
- Terminal 11	Digital input 4	Null (not assigned)
- Terminal 12	Digital input 5	Fault reset src
- Terminal S3	+ 24V OUT	I/O supply

The default configuration of the terminals dedicated to digital outputs are as follows:

- Terminal R14	Digital output 1	Drive OK (Relay 1)
- Terminal R11	COM Digital output 1	Common digital output 1 (Relay 1)
- Terminal R24	Digital output 2	Drive ready (Relay 2)
- Terminal R21	COM Digital output 2	Common digital output 2 (Relay 2)
- Terminal 13	Digital output 3	Speed is 0 delay
- Terminal IC1	COM Digital output 3/4	Common ref. for digital outputs 3 / 4
- Terminal 14	Digital output 4	Ref is 0 delay
- Terminal IS1	PS Digital output 3/4	Digital outputs 3 / 4 power supply

Signals for the digital outputs can be programmed using the **Digital output 1...4 src** parameters (13 - DIGITAL OUTPUTS menu, PAR: from 1310 to 1316) using the settings in the L_DIGSEL1 selection list.

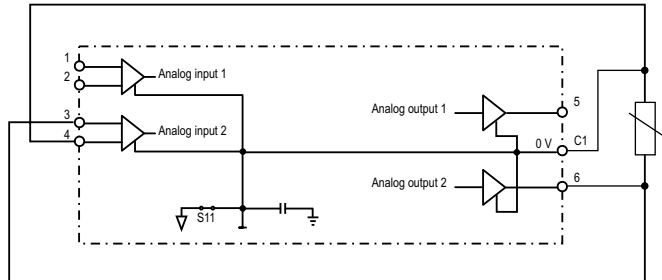
The drive also includes two analog outputs which are not factory-set. These outputs must be enabled by setting **Analog out 1 src** (15 - ANALOG OUTPUTS menu, PAR: 1800) and **Analog out 2 src** parameters (PAR: 1802) with a signal selected from selection list L_ANOUT.

The signal available on analog output 1 is $\pm 10V$, while the analog output 2 signal can be selected using the **Analog out 2 type** parameter (PAR: 1848) between:

- 0 0-20mA
- 1 4-20mA
- 2 $\pm 10V$

The analog output signal can be adjusted using **Analog out 1 scale** (PAR: 1808) and **Analog out 2 scale** parameters (PAR:1810).

• Setting an analog output for reading a temperature sensor



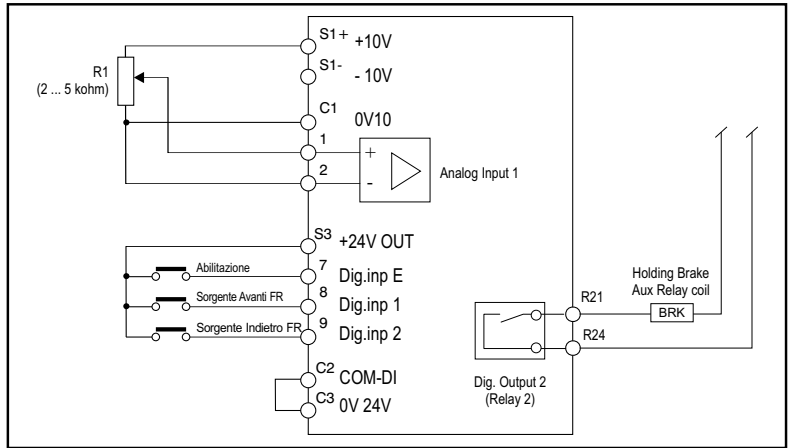
The following is a description of the commissioning procedure to use the drive's **ADV200** regulation card to acquire the temperature of a motor with **KTY84 / PTC** sensors:

- The sensor can be powered via analog output 2 of the ADV200: connect the signal to analog output 2 as shown (input 1 can be used as an alternative).
- Set analog output 2 to "current" via the Jumper (S3=I).
- Set analog output 2 (or 1) to voltage via the Jumper (S2=V or S1=V).
- On the **ANALOG OUTPUTS** menu, assign the value "0..20mA" to the **Analog out 2 type** parameter (PAR 1848).
- On the **ANALOG INPUTS** menu, assign the value "-10V..+10V" to **Analog inp 2 type** parameter (PAR 1552) or to the **Analog inp 1 type** parameter (PAR 1502).
- On the **ANALOG OUTPUTS** menu, assign the selection "Null" to the **Analog out 2 src** parameter (PAR 1802), which sets a null current in output.
- On the **ANALOG INPUTS** menu, run automatic calibration of the analog offset of the selected output: 1 or 2 via the **An inp 1 offset tune** parameter (PAR 1506) or the **An inp 2 offset tune** parameter (PAR 1556).
- On the **ANALOG OUTPUTS** menu, assign the selection "KTY84/PTC current" to the **Analog out 2 src** parameter (PAR 1802), which lets you set a current of 2mA in output to power the temperature sensor.
- On the **ALARM CONFIG** menu, assign the value "KTY84 An1" or "KTY84 An2" ("PTCAn1" or "PTC An2"), depending on the analog output selected, to the **MotorOT probe** parameter (PAR 4530).
- On the **MONITOR** menu, the **Motor temperature** parameter (PAR 290)

- displays the motor temperature in °C (if KTY84 is selected).
- On the **ALARM CONFIG** menu, the **MotorOT mon** parameter (PAR 4536) displays sensor resistance in ohms or °C.
- On the **ANALOG INPUTS** menu, the **Analog inp 1 filter** parameter (PAR 1510) or **Analog inp 2 filter** parameter (PAR 1560) can be used to filter the resistance and temperature measurements.

• **Setting the mechanical brake function (Hoist mode 1)**

• **Basic connections**



Set the following parameters as shown in the “Set to” column:

Menu	PAR	Description	Default	Set to
13.2	1312	Digital output 2 src Selection of the function of digital output 2 (another available digital output may be used)	Drive ready	Brake control mon

Menu	PAR	Description	Default	Set to
22.13.1	3170	Brake control funct This parameter is used to enable the Brake Control function mode.	Disable	Hoist mode 1
22.13.2	3172	Brake open delay Setting of the delay for opening an external mechanical brake.	0.20	Based on customer application
22.13.3	3174	Brake close delay Setting of the delay to reach the motor zero speed before closing the brake.	0.20	Based on customer application

22.13.4	3176	Brake open spd thr	Setting of the brake opening speed threshold value	0	Based on customer application
22.13.5	3178	Brake close spd thr	Setting of the brake closing speed threshold value	0	Based on customer application
22.13.6	3182	Brake open thr sel	Selection of the type of comparison between the brake opening threshold value and the torque or current value.	Output curr	Torque ref% (for Flux vector OL and Flux vector CL)
22.13.7	3184	Brake open thr	Value of the threshold at which the comparison is made	10	Based on customer application
22.13.8	3186	Brake open thr src	Selection of the origin (source) of the signal to be used	PAR 3184	Based on customer application

• Basic settings to control asynchronous multi-windings motor



Through two separate inverters in Master-Slave configuration, it is possible to control only motors with separate windings, isolated and in phase with each other. For this operating mode, only the “Flux vector CL” operating mode is possible and a motor equipped with an encoder is required.

Here below are indicated all necessary setting to control asynchronous “multi-windings” motor by using drives in **Master/Slave** configuration. The function is managed via Fast Link communication (requires EXP-FL-XCAN-ADV card).

The **Master** drive sends to the **Slave** drive the three control variables (PAR 220 **Theta mon**, PAR 224 **Flux ref mon**, and PAR 2388 **Torque ref nofilter**) needed to command the function.

Below configuration is required for the MASTER drive:

- > REFERENCES menu
- PAR 222 **Theta ref src** set to “**Theta ref mon**” (default)
- PAR 226 **Flux ref src** set to “**Flux ref mon**” (default)
- > COMMUNICATION/FAST LINK menu
- PAR 5730 **FL Fwd 1 src** set to “**Theta ref mon**”
- PAR 5732 **FL Fwd 2 src** set to “**Flux ref mon**”
- PAR 5734 **FL Fwd 3 src** set to “**Torque ref nofilter**”
- > FUNCTIONS/CONTROL MODE menu
- PAR 6208 **Ctrl mode mon** set to “**Ramp**”

Save the setting, switch the drive off and on again to make the enabling effective.

Below configuration is required for the SLAVE drive:

- > REFERENCES menu
- PAR 222 **Theta ref src** set to “**FL Fwd 1 mon**”
- PAR 226 **Flux ref src** set to “**FL Fwd 2 mon**”
- > TORQUE CONFIG menu
- PAR 2382 **Torque ref 1 src** set to “**FL Fwd 3 mon**”
- > FUNCTIONS/CONTROL MODE menu
- PAR 6208 **Ctrl mode mon** set to “**Torque**”.

Save the setting, switch the drive off and on again to make the enabling effective.

• Keypad

Use the **LOC / REM** key with the Enable input open (terminal 7 on terminal strip T2) to control running, to stop and reverse the direction of rotation of the motor using the operator keypad on the drive. Use the potentiometer or an analog signal to control speed.

For information on how to use a digital speed reference, see the example on [chapter 7.3.3](#). The reference can have a positive or negative value, making it possible to reverse the direction of rotation of the motor.

When the Enable input is closed, to enable motor running press **START**. The motor starts the acceleration ramp and moves to the speed set in the FWD direction. With the motor running you can adjust the speed using the PAR 602 **Dig ramp ref 2** (or PAR 604 **Dig ramp ref 3**, in this case modify also the selection PAR 614 **Ramp ref 3 src** to PAR 604 **Dig ramp ref 3**), and the acceleration/deceleration ramps using **Acceleration time 0** (PAR: 700) and **Deceleration time 0** (PAR: 702).

To change the direction of rotation press **FWD/REV**.

To stop the motor with the deceleration ramp, press **STOP**.

If the Enable contact is opened the inverter bridge is immediately disabled and the motor stops for inertia

To return to control using the terminal strip commands and analog speed reference:

1. Stop the motor
2. Open the Enable terminal
3. Press **LOC / REM** key.

Note !

For more customizations and any information that is not included in this initial customization guide, see the "Function description and parameters list" manual downloadable from Gefran web site (<https://www.gefran.com/en/products/250-adv200-field-oriented-vector-inverter#downloads>).

7.2.2 For Synchronous Motors, Flux vector CL and Flux vector OL control

Note !

At start-up, the synchronous motor may turn slightly in the direction opposite to that of rotation. This may depend on the parameter settings, the position of the rotor and the inertia/load applied.

• Selecting the regulation mode

First set the regulation mode in the **Regulation mode** parameter (04 DRIVE CONFIG menu, PAR: 552) :

- 1 Open-loop field-oriented vector control (sensorless).**
(Flux vector OL) In this mode, once the motor parameter self-tuning procedure has been performed, it is possible to create a mathematical model on which to perform all the necessary calculations in order to obtain high performance levels, especially high motor torque levels, even at very low speeds without the use of feedback, and achieve high dynamic performance increasingly similar to closed-loop operation.
- 2 Closed loop field-oriented vector control.**
(Flux vector CL) This mode can be used to obtain maximum drive-motor efficiency in terms of speed precision, dynamic system response and motor torque regulation. It requires feedback by a digital encoder keyed to the motor shaft and connected to the relative optional expansion card mounted in the drive.

• Inertia

Set the value of inertia applied to the motor axis in the Inertia parameter (menu 18 - SPEED REG GAINS, PAR: 2240).

• Selecting the type of reference

After setting the regulation mode, the source of the speed reference must be set in the **Ramp ref 1 src** parameter (05 REFERENCES menu, PAR: 610). This source can be selected from among those listed in the L_MLTREF selection list:

- 1 Analog input 1 mon** parameter (PAR: 1500) to use the signal applied to terminals 1 – 2 of analog input 1 (14 - ANALOG INPUTS menu).
- 2 Dig ramp ref 1** parameter (05 - REFERENCES menu, PAR: 600) to set a digital speed inside the drive.
- 3 Multi ref out mon** parameter (07 - MULTI REFERENCE menu, PAR: 852) to select the digital speeds using the digital inputs of the drive.
- 4 Mpot output mon** parameter (08 - MOTOPOTENTIOMETER menu, PAR: 894) to use the internal motor potentiometer of the drive. If sending the command from the operator keypad, to use the motor potentiometer function enter the **Mpot setpoint** parameter (PAR: 870) modify mode and press the Up (▲) and Down (▼) keys.
- 5 Jog output mon** parameter (09 - JOG FUNCTION menu, PAR: 920) to use one of the drive's internal jog speeds.

Signals from expansion cards, the serial line or fieldbus can also be set as speed references (see the detailed description of parameters).

• Setting the type of analog reference

If the analog input has been selected, choose the type of signal to use in the **Ana-**

log inp 1 type parameter (14 - ANALOG INPUTS menu, PAR.1502):

- 0 ± 10V
- 1 0-20mA o 0-10V
- 2 4-20mA

As well as programming the **Analog inp 1 type** parameter (PAR:1502) you must also verify the position of the switches on the regulation card, as showed on chapter 5.2.4.

• Ramps setting

The acceleration and deceleration ramps can be set in **Acceleration time 0** (06 - RAMPS menu, PAR: 700) and **Deceleration time 0** (PAR: 702).

The signal available on the analog input can be adjusted using **Analog inp 1 scale** parameter (14 - ANALOG INPUTS menu, PAR: 1504), **An inp 1 offset tune** parameter (PAR: 1506) and **An inp 1 gain tune** parameter (PAR: 1508).

To use a digital speed to control the drive, enter it in the **Dig ramp ref 1** parameter (05 - REFERENCES menu, PAR: 600).

The ramps are the same used with the reference signal from the analog input.

• Multispeed

To use more than one digital speed, use the multi-speed function.

First select the source of the speed signals **Multi ref 0 src** and **Multi ref 1 src** (07 - MULTI REFERENCE menu, PAR: 832 e 834) from the L_MLTREF selection list.

Next define which digital inputs are to perform switching between the various speeds; use the **Multi ref sel .. src** parameters (PAR: from 840 to 846) to select the signals to use from the L_DIGSEL2 selection list. Set the desired speeds in the **Multi reference 0...7** parameters (PAR: from 800 to 814).

Also in this case the ramps can be set in the **Acceleration time 0** parameter (06 - RAMPS menu, PAR: 700) and **Deceleration time 0** parameter (PAR: 702) parameters.

• Motor potentiometer

To use the motor potentiometer, the signals to increase or decrease the reference must be defined: set the **Mpot up src** parameter (08 - MOTOPOTENTIOMETER menu, PAR: 884) and **Mpot down src** parameter (PAR: 886) parameters respectively to increase and decrease the reference using selection list L_DIGSEL2.

Set the motor potentiometer ramps using **Mpot acceleration** (PAR: 872) and **Mpot deceleration** parameters (PAR: 874).

• Jog

Finally, for Jog mode, select the control terminal in the **Jog cmd + src** parameter (09 - JOG FUNCTION menu, PAR: 916), using a signal from selection list L_DIGSEL2.

The Jog speed must be written in the **Jog setpoint** parameter (PAR: 910), while the acceleration and deceleration ramps can be set, respectively, in **Jog acceleration** (PAR: 912) and **Jog deceleration** parameters (PAR: 914).

• Speed limits

After selecting the reference, set the speed limits in the following parameters (05 - REFERENCES menu):

- **Full scale speed** (PAR: 680). Setting of the maximum motor speed, which usually coincides with the rated speed indicated on the motor data plate.

- **Speed ref top lim** (PAR: 670). Upper speed limit: the maximum setting is 200% of the **Full scale speed**.
- **Speed ref bottom lim** (PAR: 672). Lower speed limit: the maximum setting is -200% of the **Full scale speed**.
- **Overspeed threshold** (24 - ALARM CONFIG menu, PAR: 4540). Overspeed alarm limit.

• Input and Output terminals

The default setting of the input terminals is as follows:

- Terminal 7	Digital input E	Enable
- Terminal 8	Digital input 1	FR forward src, PAR 1042
- Terminal 9	Digital input 2	FR reverse src, PAR 1044
- Terminal 10	Digital input 3	Null (not assigned)
- Terminal 11	Digital input 4	Null (not assigned)
- Terminal 12	Digital input 5	Fault reset src
- Terminal S3	+ 24V OUT	I/O supply

The default configuration of the terminals dedicated to digital outputs are as follows:

- Terminal R14	Digital output 1	Drive OK (Relay 1)
- Terminal R11	COM Digital output 1	Common digital output 1 (Relay 1)
- Terminal R24	Digital output 2	Drive ready (Relay 2)
- Terminal R21	COM Digital output 2	Common digital output 2 (Relay 2)
- Terminal 13	Digital output 3	Speed is 0 delay
- Terminal IC1	COM Digital output 3/4	Common ref. for digital outputs 3 / 4
- Terminal 14	Digital output 4	Ref is 0 delay
- Terminal IS1	PS Digital output 3/4	Digital outputs 3 / 4 power supply

Signals for the digital outputs can be programmed using the **Digital output 1...4 src** parameters (13 - DIGITAL OUTPUTS menu, PAR: from 1310 to 1316) using the settings in the L_DIGSEL1 selection list.

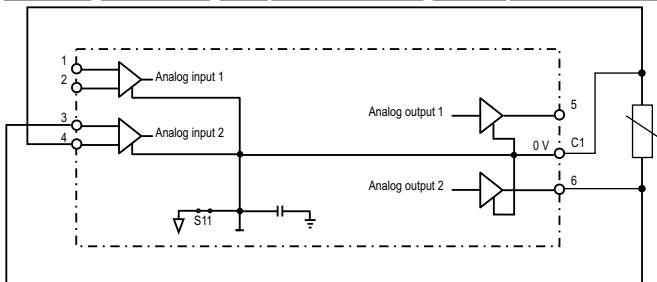
The drive also includes two analog outputs which are not factory-set. These outputs must be enabled by setting **Analog out 1 src** (15 - ANALOG OUTPUTS menu, PAR: 1800) and **Analog out 2 src** parameters (PAR: 1802) with a signal selected from selection list L_ANOUT.

The signal available on analog output 1 is $\pm 10V$, while the analog output 2 signal can be selected using the **Analog out 2 type** parameter (PAR: 1848) between:

0	0-20mA
1	4-20mA
2	$\pm 10V$

The analog output signal can be adjusted using **Analog out 1 scale** (PAR: 1808) and **Analog out 2 scale** parameters (PAR:1810).

• Setting an analog output for reading a temperature sensor



The following is a description of the commissioning procedure to use the drive's **ADV200** regulation card to acquire the temperature of a motor with **KTY84 / PTC** sensors:

- The sensor can be powered via analog output 2 of the ADV200: connect the signal to analog output 2 as shown (input 1 can be used as an alternative).
- Set analog output 2 to "current" via the Jumper (S3=I).
- Set analog output 2 (or 1) to voltage via the Jumper (S2=V or S1=V).
- On the **ANALOG OUTPUTS** menu, assign the value "**0..20mA**" to the **Analog out 2 type** parameter (PAR 1848).
- On the **ANALOG INPUTS** menu, assign the value "**-10V..+10V**" to **Analog inp 2 type** parameter (PAR 1552) or to the **Analog inp 1 type** parameter (PAR 1502).
- On the **ANALOG OUTPUTS** menu, assign the selection "**Null**" to the **Analog out 2 src** parameter (PAR 1802), which sets a null current in output.
- On the **ANALOG INPUTS** menu, run automatic calibration of the analog offset of the selected output: 1 or 2 via the **An inp 1 offset tune** parameter (PAR 1506) or the **An inp 2 offset tune** parameter (PAR 1556).
- On the **ANALOG OUTPUTS** menu, assign the selection "**KTY84/PTC current**" to the **Analog out 2 src** parameter (PAR 1802), which lets you set a current of **2mA** in output to power the temperature sensor.
- On the **ALARM CONFIG** menu, assign the value "**KTY84 An1**" or "**KTY84 An2**" ("**PTCAn1**" or "**PTC An2**"), depending on the analog output selected, to the **MotorOT probe** parameter (PAR 4530).
- On the **MONITOR** menu, the **Motor temperature** parameter (PAR 290) displays the motor temperature in °C (if KTY84 is selected).
- On the **ALARM CONFIG** menu, the **MotorOT mon** parameter (PAR 4536) displays sensor resistance in ohms or °C.
- On the **ANALOG INPUTS** menu, the **Analog inp 1 filter** parameter (PAR 1510) or **Analog inp 2 filter** parameter (PAR 1560) can be used to filter the resistance and temperature measurements.

• Keypad

Use the **LOC / REM** key with the Enable input open (terminal 7 on terminal strip T2) to control running, to stop and reverse the direction of rotation of the motor using the operator keypad on the drive. Use the potentiometer or an analog signal to control speed.

For information on how to use a digital speed reference, see the example on chapter "7.3.3 Variable interconnections mode", page 111. The reference can have a positive or negative value, making it possible to reverse the direction of rotation of the motor.

When the Enable input is closed, to enable motor running press **START**. The mo-

tor starts the acceleration ramp and moves to the speed set in the FWD direction. With the motor running you can adjust the speed using the PAR 602 **Dig ramp ref 2** (or PAR 604 **Dig ramp ref 3**, in this case modify also the selection PAR 614 **Ramp ref 3 src** to PAR 604 **Dig ramp ref 3**) and the acceleration/deceleration ramps using **Acceleration time 0** (PAR: 700) and **Deceleration time 0** (PAR: 702).

To change the direction of rotation press **FWD/REV**.

To stop the motor with the deceleration ramp, press **STOP**.

If the Enable contact is opened the inverter bridge is immediately disabled and the motor stops for inertia

To return to control using the terminal strip commands and analog speed reference:

1. Stop the motor
2. Open the Enable terminal
3. Press **LOC / REM** key.

Note !

For more customizations and any information that is not included in this initial customization guide, see the "Function description and parameters list" manual downloadable from Gefran web site (<https://www.gefran.com/en/products/250-adv200-field-oriented-vector-inverter#downloads>).

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.

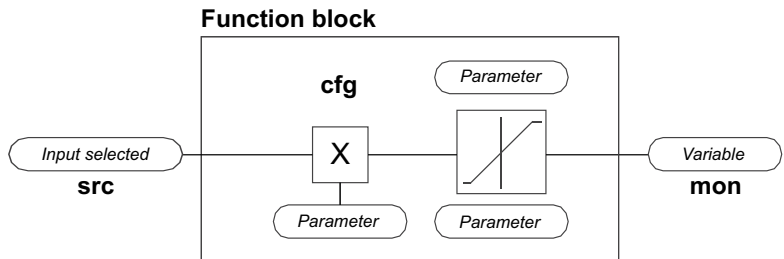
7.3.2 Programming of “function block” analog and digital input signals

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 field-bus 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**”.

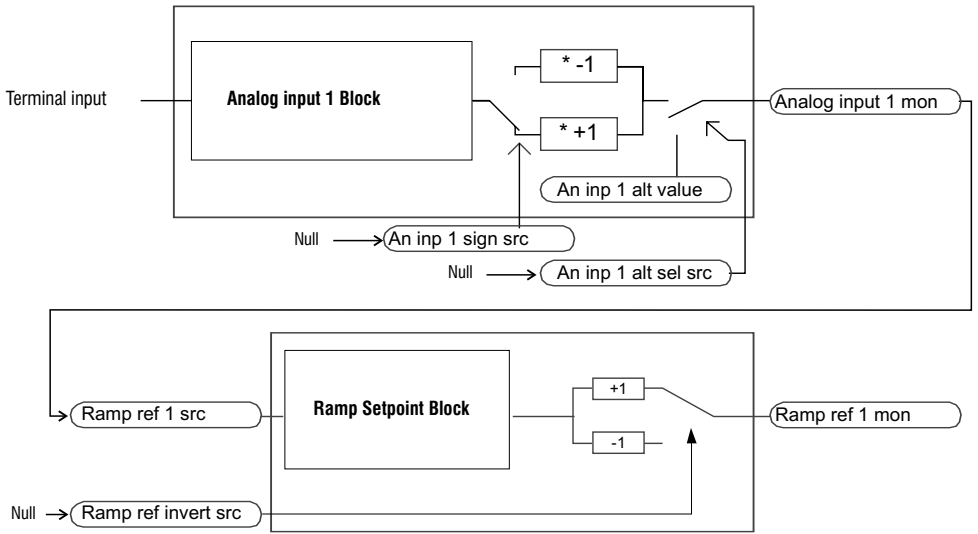
Its default source is the **Analog input 1 mon** signal (PAR: 1500), from the output of the function block “**Analog input 1 Block**”, which in this case refers to analog input 1 of the signal terminal strip.

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.

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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.

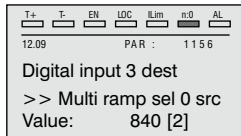
The output signal from the “**Ramp setpoint**” block is displayed in the **Ramp ref 1 mon** parameter (PAR: 620).

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 the VDC 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 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
		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	Condition: Intake drive air temperature too high alarm.
		Solution: - Check correct fan operation - Check that the heatsinks are not clogged - Check temperature in electrical panel.
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 ² t 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 ² t 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 ² t 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 I/O 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 10.5.
19	Opt 2 I/O 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 10.5.
20	Opt Enc fault	Condition: Error in the communication between Regulation and Encoder feedback card.
		Solution: Check that it has been inserted correctly, see chapter 10.5.
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	Speed fbk loss	Condition: Speed feedback loss alarm. The encoder is not connected, not connected properly or not powered: verify encoder operation by selecting the PAR 260 Motor speed parameter in the MONITOR menu.
		Solution: - Check encoder wiring for integrity. - Check that the encoder is connected to the power supply. - With the drive disabled, turn the motor clockwise (seen from the motor shaft side). A positive value must be displayed. - If the value does not change or values are indicated randomly, check the encoder power supply and cables. - If the value displayed is negative, invert the encoder connections. Change channel A+ and A- or B+ and B-. - Check that the encoder electronics are consistent with those of the relative expansion card. - Generated in case of an encoder fault. Each type of encoder generates a "Loss of feedback" alarm differently. See parameter 2172 SpdFbkLoss code for information about the cause of the alarm and chapter D.1 Speed fbk loss alarm.
23	Overspeed	Condition: Motor overspeed alarm. The motor speed exceeds the limits set in the PAR 4540 Overspeed threshold parameter .
		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 and Flux Vect OC mode.
		Solution: - Check the drive load conditions - Check the number of encoder impulses
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: Check drive power supply.
27	ExtIO fault	Condition: Communication fault with the external module. Solution: See paragraph "8.1.2 "ExtIO fault" Alarm", page 126
28	FastLink fault	Condition: FastLink communication fault Solution: See paragraph "8.1.3 "FastLink" Alarm", page 127
29	Brake fault	Condition: Incorrect setting of brake control function parameters.
		Solution: See menu 22.13 - FUNCTIONS/BRAKE CONTROL
30	Motor pre OT	Condition: Motor overtemperature prealarm. % value of threshold compared to PAR 4532 MotorOT thr ,
		Solution: - Value set too low for duty cycle - Heavy duty cycle
31	Mot phase loss	Condition: Output phase loss.
		Solution: Check Drive/motor connection.
32	Condensation	Condition: High condensation level inside the drive. Operating conditions (combination of ambient temperature, humidity and cooling liquid temperature) are not safe,
		Solution: Safe conditions are obtained when the work point is under the respective curve indicated in the graph of chapter 22.18 - FUNCTIONS/LC CONTROL . Otherwise, you have to take adequate precautions to lower the ambient temperature and/or the relative humidity or to raise the cooling liquid temperature.

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.
41	Watchdog	Condition: may occur during functioning when the watchdog protection of the micro is activated; the alarm is inserted in the alarm list and alarm log. After this alarm: - the drive automatically runs a reset - motor control is not available.
		XXXXH-X The XXXXH-X code indicates the reason for the error: take note for examination with the service centre.
		Solution: If the alarm was a consequence of a variation to the drive configuration (parameter setting, installation of an option, downloading of a PLC application), remove it. Switch the drive off and then switch it on again.
42	Trap error	Condition: this condition can occur during operation when the trap micro protection is enabled; the alarm is included in the list of alarms and alarm log. After this alarm: - the drive automatically runs a reset - motor control is not available.
		XXXXH-X The XXXXH-X code (SubHandler-Class) indicates the reason for the error: take note for examination with the service centre.
		Solution: If the alarm was a consequence of a variation to the drive configuration (parameter setting, installation of an option, downloading of a PLC application), remove it. Switch the drive off and then switch it on again.
43	System error	Condition: this condition can occur during operation when the operating system protection is enabled; the alarm is included in the list of alarms and alarm log. After this alarm: - the drive automatically runs a reset - motor control is not available.
		XXXXH-X The XXXXH-X code (Error-Pid) indicates the reason for the error: take note for examination with the service centre.
		Solution: If the alarm was a consequence of a variation to the drive configuration (parameter setting, installation of an option, downloading of a PLC application), remove it. Switch the drive off and then switch it on again.
44	User error	Condition: this condition can occur during operation when the software protection is enabled; the alarm is included in the list of alarms and alarm log. After this alarm: - the drive automatically runs a reset - motor control is not available.
		XXXXH-X The XXXXH-X (Error-Pid) code indicates the reason for the error: make a note of this to discuss it with the service centre.
		Solution: If the alarm was a consequence of a variation to the drive configuration (parameter setting, installation of an option, downloading of a PLC application), remove it. Switch the drive off and then switch it on again.
45	Param error	Condition: if an error occurs during the enabling of the parameter database saved in the Flash memory; the alarm is included in the list of alarms and alarm log.
		XXXXH-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 parameter . 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.
46	Load default	Condition: this can occur during loading of the parameter database saved in the Flash memory it is normal if it appears in the following conditions: the first time the drive is switched on, when a new version of the firmware is downloaded, when the regulation is installed on a new size, when a new region is entered. If this message appears when the drive is already in use it means there has been a problem in the parameter database saved in the Flash memory. 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 saved database refers to a different size and not to the current size

		0004H-4	The saved database refers to a different region and not to the current region
		Solution: Set the parameters to the desired value and run Save parameter	
47	Plc cfg error	Condition: this can occur during loading of the MDPLC application The Mdplic application present on the drive is not run.	
		0004H-4	The application that has been downloaded has a different Crc on the DataBlock and Function table.
		0065H-101	The application that has been downloaded has an invalid identification code (Info).
		0066H-102	The application that has been downloaded uses an incorrect task number (Info).
		0067H-103	The application that has been downloaded has an incorrect software configuration.
		0068H-104	The application that has been downloaded has a different Crc on the DataBlock and Function table.
		0069H-105	A Trap error or System error has occurred. The drive has automatically executed a Power-up operation. Application not executed. See the Alarm List for more information about an error that has occurred.
		006AH-106	The application that has been downloaded has an invalid identification code (Task).
		006BH-107	The application that has been downloaded uses an incorrect task number (Task).
		006CH-108	The application that has been downloaded has an incorrect Crc (Tables + Code)
		Solution: Remove the MDPLC application or download a correct MDPLC application.	
48	Load par def plc	Condition: this can occur during loading of the parameter database saved in the Flash memory of the MDPLC application it is normal if it appears the first time the drive is switched on, after downloading a new application. If this message appears when the drive is already in use it means there has been a problem in the parameter database saved in the Flash memory. If this message appears the drive automatically runs the Load default command.	
		0001H-1	The database saved is not valid
		Solution: Set the parameters to the desired value and run Save parameter .	
49	Key failed	Condition: this can occur at drive power-on if the wrong enabling key is entered for a given firmware function	
		0001H-1	Incorrect PLC key. PLC application not available.
		Solution: Ask Gefran for the correct key to enable the desired firmware function.	
50	Encoder error	Condition: this condition may occur when the drive is powered during encoder setup each time parameter 552 Regulation mode is set.	
		100H-256	An error occurred during setup; the information received from the encoder is not reliable. If the encoder is used for feedback the Speed fbk loss [22] alarm is also generated.
		Solution: Take the recommended action for the Speed fbk loss [22] alarm.	
		200H-512	Cause: The firmware on the optional encoder card is incompatible with that on the regulation card. The information received from the encoder is not reliable
		Solution: Contact Gefran in order to update the firmware on the optional encoder card.	
51	Opt cfg change	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.
		0078H-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.	
52	HumTempSensErr	Condition: Disconnection or short circuit of the humidity sensor built into the ADV200-LC drive.	
		0x0	No error.
		0x1	Communication error on humidity / temperature sensor
		0x2	Error on NTC temperature sensor for temperature of liquid flowing into heatsink
		0x3	Communication error and NTC temperature sensor
		Solution: Reset the drive. If the problem persists, contact Gefran Customer Service.	

53 ... 60	Plc9 fault ... Plc16 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.
61	UV Wng&Restart	Condition: parameter 4640 UnderV restart is set to "Enable". Undervoltage condition is detected, the drive is disabled and UV Wng & Restart warning signal is generated.
		Solution: Check drive power supply wirings and its correct range.
62	An inpLoss	Condition: Occurs when: • the input signal is below 0.1V or 4-20mA • the KTY84 sensor short-circuits or disconnect
		Solution: Check the wiring.
63	UV Ride Thr	Condition: Parameter 3280 UV RT enable is set = 1. Due to a mains voltage dip (Mains loss) the DC link voltage value is lower than the threshold PAR 3282 UV RT on .
		Solution: Check drive power supply wirings and its correct range.

8.1.1 Speed fbk loss alarm according to the type of feedback

Note !

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 To interpret the causes of the alarm correctly, read the parameter 17.30 **SpdFbkLoss code**, PAR 2172, as described below.

Take the digits of the number in hexadecimal format and enter them in the table below:

	D7..D4	D3	D2	D1	D0
Value					

For each D0, D1, D2, D3 value other than 0x0 (0x0 = no alarm active)search for the sub-values it can be divided into in the table below.

D0	D1	D2	D3		
0x0	0x0	0x0	0x0	0x0	0x0
0x1	0x0	0x0	0x0	0x0	0x1
0x2	0x0	0x0	0x0	0x2	0x0
0x3	0x0	0x0	0x0	0x2	0x1
0x4	0x0	0x4	0x0	0x0	0x0
0x5	0x0	0x4	0x0	0x0	0x1
0x6	0x0	0x4	0x0	0x2	0x0
0x7	0x0	0x4	0x0	0x2	0x1
0x8	0x8	0x0	0x0	0x0	0x0
0x9	0x8	0x0	0x0	0x0	0x1
0xA	0x8	0x0	0x0	0x2	0x0
0xB	0x8	0x0	0x0	0x2	0x1
0xC	0x8	0x4	0x0	0x0	0x0
0xD	0x8	0x4	0x0	0x0	0x1
0xE	0x8	0x4	0x0	0x2	0x0
0xF	0x8	0x4	0x0	0x2	0x1

In the table regarding the type of encoder in use, search for the sub-values obtained from each D0, D1, D2, D3 digit in the corresponding columns Value.D0, Value.D1, Value.D2, Value.D3.

Example with Endat encoder:

PAR 2172 = A0H

Take the digits of the number in hexadecimal format and enter them in the table

below:

	D7..D4	D3	D2	D1	D0
Value				0xA	0x0

For each D0, D1, D2, D3 value other than 0x0 search for the sub-values it can be divided into in table 1.

D0	D1	D2	D3		
0x0	0x0	0x0	0x0	0x0	0x0
0x1	0x0	0x0	0x0	0x0	0x1
0x2	0x0	0x0	0x0	0x2	0x0
0x3	0x0	0x0	0x0	0x2	0x1
0x4	0x0	0x4	0x0	0x0	0x0
0x5	0x0	0x4	0x0	0x0	0x1
0x6	0x0	0x4	0x2	0x0	0x0
0x7	0x0	0x4	0x2	0x0	0x1
0x8	0x8	0x0	0x0	0x0	0x0
0x9	0x8	0x0	0x0	0x0	0x1
0xA	0x8	0x0	0x2	0x0	0x0
0xB	0x8	0x0	0x2	0x0	0x1
0xC	0x8	0x4	0x0	0x0	0x0
0xD	0x8	0x4	0x0	0x0	0x1
0xE	0x8	0x4	0x2	0x0	0x0
0xF	0x8	0x4	0x2	0x0	0x1

For each D0, D1, D2, D3 value other than 0x0 search for the sub-values it can be divided into in table 1.

In the table regarding the type of encoder in use, search for the sub-values obtained from each D0, D1, D2, D3 digit in the corresponding columns Value.D0, Value.D1, Value.D2, Value.D3

Value.D1 = 2H

Cause: (CRC_CKS_P)disturbed SSI signals cause a CKS error or Parity.

Value.D1 = 8H

Cause: (DT1_ERR) Encoder has detected a malfunction and signals this to the drive via Error bit. Bits 16..31 contain the type of malfunction detected by the encoder.

• **Speed fbk loss [22] alarm with digital incremental encoder**

Bit	Value					Name	Description
	D7..D4	D3	D2	D1	D0		
0					0x1	CHA	<p>Cause: no impulses or disturbance on incremental channel A.</p> <p>Solution: Check the connection of the encoder-drive channel A, check the connection of the screen, check the encoder supply voltage. Check parameters 2102 Encoder 1 supply and 2104 Encoder 1 input cfg (if encoder 1 is used). Check parameters 5102 Encoder 2 supply and 5104 Encoder 2 input cfg (if encoder 2 is used).</p>
1					0x2	CHB	<p>Cause: no impulses or disturbance on incremental channel B.</p>

Bit	Value					Name	Description
	D7..D4	D3	D2	D1	D0		
							<p>Solution: Check the connection of the encoder-drive channel B, check the connection of the screen, check the Encoder 1 supply voltage. Check parameters 2102 Encoder 1 supply and 2104 Encoder 1 input cfg (if encoder 1 is used). Check parameters 5102 Encoder 2 supply and 5104 Encoder 2 input cfg (if encoder 2 is used).</p>
2					0x4	CHZ	<p>Cause: no impulses or disturbance on incremental channel Z.</p> <p>Solution: Check the connection of the encoder-drive channel Z, check the connection of the screen, check the Encoder 1 supply voltage. Check parameters 2102 Encoder 1 supply and 2104 Encoder 1 input cfg (if encoder 1 is used). Check parameters 5102 Encoder 2 supply and 5104 Encoder 2 input cfg (if encoder 2 is used).</p>

- **Speed fbk loss [22] alarm with sinusoidal incremental encoder**

Bit	Value					Name	Description
	D7..D4	D3	D2	D1	D0		
3					0x8	MOD_INCR	<p>Cause: voltage level not correct or disturbance on signals of incremental channels A-B.</p> <p>Solution: Check the connection of the encoder-drive channels A-B, check the connection of the screen, check the encoder supply voltage, check parameter 2102 Encoder 1 supply, check parameter 2108 Encoder 1 signal Vpp.</p>

- **Speed fbk loss [22] alarm with SinCos encoder**

Bit	Value					Name	Description
	D7..D4	D3	D2	D1	D0		
3					0x8	MOD_INCR	<p>Cause: voltage level not correct or disturbance on signals of incremental channels A-B.</p> <p>Solution: Check the connection of the the encoder-drive channels A-B, check the connection of the screen, check the encoder supply voltage, check parameter 2102 Encoder 1 supply, check parameter 2108 Encoder 1 signal Vpp.</p>
4				0x1	0x0	MOD_ABS	<p>Cause: voltage level not correct or disturbance on signals of absolute SinCos channels.</p> <p>Solution: Check the connection of the the encoder-drive channels A-B, check the connection of the screen, check the encoder supply voltage, check parameter 2102 Encoder 1 supply, check parameter 2108 Encoder 1 signal Vpp.</p>

- **Speed fbk loss [22] alarm with SSI absolute encoder**

Bit	Value					Name	Description
	D7..D4	D3	D2	D1	D0		
3					0x8	MOD_INCR	<p>Cause: voltage level not correct or disturbance on signals of incremental channels A-B.</p>

Bit	Value					Name	Description
	D7..D4	D3	D2	D1	D0		
							Solution: Check the connection of the the encoder-drive channels A-B, check the connection of the screen, check the encoder supply voltage, check parameter 2102 Encoder 1 supply , check parameter 2108 Encoder 1 signal Vpp .
5				0x2	0x0	CRC_CKS_P	Cause: SSI signals not present or disturbed. Solution: Check the connection of the clock and encoder-drive data, check the connection of the screen, check the encoder supply voltage, check parameter 2102 Encoder 1 supply , check parameter 2112 Encoder 1 SSI bits .
8			0x1	0x0	0x0	Setup error	Cause: An error occurred during setup. Solution: Check the connection of the clock and encoder-drive data, check the connection of the screen, check the encoder supply voltage, check parameter 2102 Encoder 1 supply , check parameter 2112 Encoder 1 SSI bits .

- **Speed fbk loss [22] alarm with EnDat absolute encoder**

Bit	Value					Name	Description
	D7..D4	D3	D2	D1	D0		
3					0x8	MOD_INCR	Cause: voltage level not correct or disturbance on signals of incremental channels A-B. Solution: Check the connection of the the encoder-drive channels A-B, check the connection of the screen, check the encoder supply voltage, check parameter 2102 Encoder 1 supply , check parameter 2108 Encoder 1 signal Vpp .
5				0x2	0x0	CRC_CKS_P	Cause: SSI signals not present or disturbed cause an error on CRC Solution: Check the connection of the clock and encoder-drive data, check the connection of the screen, check the encoder supply voltage, check parameter 2102 Encoder 1 supply .
8			0x1	0x0	0x0	Setup error	Cause: An error occurred during setup. Solution: Check the connection of the clock and encoder-drive data, check the connection of the screen, check the encoder supply voltage, check parameter 2102 Encoder 1 supply .

The following conditions occur while resetting the encoder following **Speed fbk loss [22]** activation

Bit	Value					Name	Description								
	D7..D4	D3	D2	D1	D0										
6				0x4	0x0	ACK_TMO	Cause: SSI signals not present or disturbed cause an error on CRC Solution: Check the connection of the clock and encoder-drive data, check the connection of the screen, check the encoder supply voltage, check parameter 2102 Encoder 1 supply .								
7				0x8	0x0	DT1_ERR	Cause: Encoder has detected malfunction and signals this to the drive via bit DT1. Bits 16..31 contain the type of malfunction detected by the encoder. Solution: See the encoder manufacturer's technical guide.								
16.31	xxxx						<table border="1"> <thead> <tr> <th>Bit</th> <th></th> <th>=0</th> <th>=1</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Light source</td> <td>OK</td> <td>Failure (1)</td> </tr> </tbody> </table>	Bit		=0	=1	0	Light source	OK	Failure (1)
Bit		=0	=1												
0	Light source	OK	Failure (1)												

Bit	Value					Name	Description				
	D7..D4	D3	D2	D1	D0						
							1	Signal amplitude	OK	Erroneous (1)	
							2	Position value	OK	Erroneous (1)	
							3	Over voltage	NO	Yes (1)	
							4	Under voltage	NO	Under voltage supply (1)	
							5	Over current	NO	Yes (1)	
							6	Battery	OK	Change the battery (2)	
							7..15				
							(1) Can also be set after the power supply is switched off or on.				
							(2) Only for battery-buffered encoders				

- **Speed fbk loss [22] alarm with Hiperface absolute encoder**

Bit	Value					Name	Description			
	D7..D4	D3	D2	D1	D0					
3					0x8		Cause: voltage level not correct or disturbance on signals of incremental channels A-B. Solution: Check the connection of the the encoder-drive channels A-B, check the connection of the screen, check the encoder supply voltage, check parameter 2102 Encoder 1 supply , check parameter 2108 Encoder 1 signal Vpp .			
5				0x2	0x0		Cause: disturbed SSI signals cause a CKS error or Parity Solution: Check the connection of the clock and encoder-drive data, check the connection of the screen, check the encoder supply voltage, check parameter 2102 Encoder 1 supply .			
6				0x4	0x0		Cause: Encoder does not recognise the command that has been sent to it and replies with ACK. The SSI signals not present cause a TMO error. Solution: Check the connection of the clock and encoder-drive data, check the connection of the screen, check the encoder supply voltage, check parameter 2102 Encoder 1 supply .			
8			0x1	0x0	0x0		Cause: An error occurred during setup. Solution: Check the connection of the clock and encoder-drive data, check the connection of the screen, check the encoder supply voltage, check parameter 2102 Encoder 1 supply .			

The following conditions occur while resetting the encoder following **Speed fbk loss [22]** activation.

Bit	Value					Name	Description			
	D7..D4	D3	D2	D1	D0					
7				0x8	0x0	DT1_ERR	Cause: Encoder has detected malfunction and signals this to the drive via Error bit. Bits 16..31 contain the type of malfunction detected by the encoder. Solution: See the encoder manufacturer's technical guide.			
16.31	xxxx						Type	Code	Description	
							Transmission	09h	Transmitted parity bit is incorrect	

Bit	Value					Name	Description		
	D7..D4	D3	D2	D1	D0				
							0AH	Checksum of transmitted data is wrong	
							0BH	Incorrect command code	
							0CH	Wrong number of transmitted data	
							0DH	Illegal transmitted command argument	
							0FH	Wrong access authorization specified	
							0EH	Selected field has READ ONLY status	
							10H	Data field (re) definition not executable due to field size	
							11H	Specified address is not available in selected field	
							12H	Selected field does not yet exist	
							00H	No encoder error, no error message	
							03H	Data field operations disabled	
							04H	Analog monitoring inoperative	
							08H	Counting register overflow	
							01H	Encoder analog signals are unreliable	
							02H	Wrong synchronisation or offset	
							05H-07H	Encoder-internal hardware fault, no operation possible	
							1CH-1DH	Error in sampling, no operation possible	
							1EH	Permissible operation temperature is exceeded	

- **Speed fbk loss [22] alarm with Resolver**

Code	Name	Error description	Possible solution
0x00000001	D0 FAULT REGISTER	Configuration parity error	Reset Resolver card
0x00000002	D1 FAULT REGISTER	Phase error exceeds phase lock range	
0x00000004	D2 FAULT REGISTER	Velocity exceeds maximum tracking rate	
0x00000008	D3 FAULT REGISTER	Tracking error exceeds LOT (Loss of Signal) threshold	
0x00000010	D4 FAULT REGISTER	SIN/COS inputs exceed DOS (Degradation of signal) mismatch threshold	Check the connection of the Resolver input pins (SIN-,SIN+,COS-,COS+), check PAR 2128
0x00000020	D5 FAULT REGISTER	SIN/COS inputs exceed DOS (Degradation of signal) over range threshold	Check the connection of the Resolver input pins (SIN-,SIN+,COS-,COS+), check PAR 2126
0x00000040	D6 FAULT REGISTER	SIN/COS inputs below LOS (Loss of Signal) threshold	Check the connection of the Resolver input pins (SIN-,SIN+,COS-,COS+), check PAR 2124
0x00000080	D7 FAULT REGISTER	SIN/COS inputs clipped	Check if any of the Resolver input pins (SIN-,SIN+,COS-,COS+) are shorted with power input or ground of the resolver board

8.1.1.1 Reset Speed fbk loss alarm

The reasons for activating the **Speed fbk loss** alarm and the information acquired by the encoder are shown in parameter 2172 **SpdFbkLoss code**.

If no card has been installed the **Speed fbk loss [22]** alarm is generated and no cause is displayed in parameter 2172 **SpdFbkLoss code**. Several causes may be present at the same time.

If no card is recognised, the system runs a routine that always returns **Speed fbk loss [22]** active without specifying a cause.

8.1.1.2 Encoder error alarm

Setup is performed each time the drive is turned on, regardless of the regulation mode that has been selected. If an error is detected during setup the **Encoder error** alarm is generated with the following codes:

Bit	Value					Name	Description
	D7..D4	D3	D2	D1	D0		
8			0x1	0x0	0x0	Setup error	Cause: An error occurred during setup. When this has been signalled the information obtained from the encoder is not reliable.
							Solution: Take the action recommended for Speed fbk loss [22] alarm according to the type of encoder.
9			0x2	0x0	0x0	Compatibility error	Cause: Firmware on option card incompatible with firmware on regulation card. When this has been signalled the information obtained from the encoder is not reliable.
							Solution: Contact Gefran in order to update the firmware on the optional card.

8.1.2 “ExtIO fault” Alarm

The drive may generate an “ExtIO fault” alarm for a series of reasons. At drive startup there may be problems with configuration, associated with the EXP-FL-XCAN-ADV card or parameter settings. During the Config phase the alarm might depend on an SDO communication error. During the Control phase the HeartBeat or NodeGuarding protocol might fail due to an interruption in the communication with the slave. An Emergency message sent by the slave could generate the “ExtIO fault” alarm.

Each reason for the alarm can be identified by to the associated subcode. The table below shows information about the subcodes and how to associate these with the cause of the alarm, to enable troubleshooting and proper use of the system.

Subcode		Description	Remarks
0	0	BusLoss	Loss of communication in the Operational state
1..51	1h..35h	SDO error	Error sending the SDO. See the SDO Configuration Table on appendix to identify the object with the problem
200	0xC8	CAN error	Internal hardware fault; if the problem cannot be solved, replace the regulation card
202	0xCA	Config error	The number or I/Os in the slave module has changed. Check parameter 5482 External IO info . Save the parameters to store the current configuraiton.
203	0xCB	Lost Messages	TPDOs coming from the slave too frequently. Check that the slave meets CANopen specifications for TPDO sending times
204	0xCC	Opt IO installed	An optional internal I/O expansion card has been installed. The EXP-XCAN-ADV card functions are not available.
255..65535	0xFF.0xFFFF	Slave Emergency	Emergency message sent by the slave.

If the alarm is due to an Emergency message sent by the slave, the subcode contains the error code (Error code low and Error code Hi) of the message, while 4 of the 5 additional bytes in the message are shown by parameter 5486 **External IO Failcode**.

Emergency message content:

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
Error code Low	Error code Hi	Error register	Info 0	Info 1	Info 2	Info3	Info4
Subcode	PAR 5486 External IO Failcode						

See the slave manual for information about the meaning of the Emergency message.

8.1.3 “FastLink” Alarm

Reasons why the FastLink alarm is generated:

Bit					Name	Description
	D3	D2	D1	D0		
0				0x1	Cks	<p>Cause: The drive has detected a checksum error</p> <p>Solution: Take all the necessary precautions to increase the resistance of the drive to disturbance</p>
1				0x2	Not used	<p>Cause:</p> <p>Solution:</p>
2				0x4	Not used	<p>Cause:</p> <p>Solution:</p>
3				0x8	Not used	<p>Cause:</p> <p>Solution:</p>
4			0x1		Not used	<p>Cause:</p> <p>Solution:</p>
5			0x2		RX Timeout	<p>Cause: The slave drive has not received a new data frame for 2 consecutive cycles.</p> <p>Solution: Take all the necessary precautions to increase the resistance of the drive to disturbance</p>
6			0x4		Pwm sync slave	<p>Cause: On the slave drives there is a problem with the function that enables the generation of Pwm signals to be synchronised with the Pwm signals of the master and with the function that enables the execution of control tasks to be synchronised with execution of control tasks by the master. An error exceeding the maximum error allowed has been detected for 4 consecutive cycles.</p> <p>Solution: Take all the necessary precautions to increase the resistance of the drive to disturbance</p>
7			0x8		Cable open	<p>Cause: No optical fibre.</p> <p>Solution: Check connection with optical fibre.</p>
8		0x1			Setup error	<p>Cause: An error occurred during setup; the information received from the FastLink is not reliable.</p> <p>Solution: Check setting of FastLink parameters.</p>
9		0x2			Compatibility error	<p>Cause: The firmware on the optional FastLink card is incompatible with that on the regulation card.</p> <p>Solution: Contact Gefran in order to update the firmware on the optional FastLink card.</p>
10		0x4			Slave answer NOK	<p>Cause: situation in which an interrogated Slave does not reply</p> <p>Solution: check FastLink connection</p>

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
		0208H-520	Enc 3 EXP-SESC- I1R1F2-ADV
		0301H-769	I_0_1
		0308H-776	Enc 4 EXP-EN/SSI- I1R1F2-ADV
		0408H-1032	Enc 5 EXP-HIP- I1R1F2-ADV
		0608H-1544	Enc 1 EXP-DE-I1R1F2-ADV
		0701H-1793	I_0_2
		0108H-1800	Enc 2 EXP-SE-I1R1F2-ADV
		0808H-2056	Enc 7 EXP-DE-I2R1F2-ADV
		0901H-2305	I_0_3
		0D01H-3329	I_0_4
		0508H-1288	Enc 6 EXP-RES-I1R1-ADV
		908H-2312	Enc 8 EXP-ASC-I1-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 Gefran technical support centre.
		9	The drive has measured a stator resistance value exceeding the set limit. Solution: contact the Gefran technical support centre.
		10	The drive has measured a stator resistance value below the set limit. Solution: contact the Gefran 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 Gefran 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 Gefran technical support centre.
		15 - 16 -17	LS leakage inductance value outside accepted range. Solution: Perform autotuning once more, if the problem persists, contact the Gefran technical support centre.
		18-19	Measurement of Im magnetising current outside accepted range. Solution: Perform autotuning once more, if the problem persists, contact the Gefran technical support centre.
		20-21	Measurement of Rr rotor resistor outside accepted range. Solution: Perform autotuning once more, if the problem persists, contact the Gefran 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 parameters, 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: $[(\text{Rated frequency} * 60) / \text{Pole pairs}]$. 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.

Index	Error message shown on the display	Sub-code	Description
		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
		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 9	Load par failed Load par incomplete	Condition: during transfer of the parameters from the memory of the keypad to the drive	
		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 application 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

Index	Error message shown on the display	Sub-code	Description
			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.
		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	Plc 1	Reserved messages and dedicated to the PLC application. See the application manual.	
14	Plc 2		
15	Plc 3		
16	Plc 4		
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 Gefran 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 Gefran for the correct key to enable the desired firmware function.

Index	Error message shown on the display	Sub-code	Description
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	Encoder error	Condition: this condition may occur when the drive is powered during encoder setup each time parameter 552 Regulation mode is set.	
		100H-2564	Cause: An error occurred during setup; the information received from the encoder is not reliable. If the encoder is used for feedback the Speed fbk loss [22] alarm is also generated.
		Solution: Take the recommended action for the Speed fbk loss[22] alarm.	
		200H-512	Cause: The firmware on the optional encoder card is incompatible with that on the regulation card. The information received from the encoder is not reliable
		Solution: Contact Gefran in order to update the firmware on the optional encoder card.	
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.	
23	Autotune (phasing) (Only Synchronous)	0	No error
		40	The encoder card in use cannot manage automatic phasing.
			Solution: Use the appropriate encoder card
		41	Incorrect Incremental encoder impulse count
			Solution: Check the electric signals of the incremental encoder. Check the value of the encoder impulse parameter
		42	Incorrect absolute encoder impulse count
			Solution: Check the electric signals of the absolute encoder. Check the configuration of the absolute encoder
		43	Incorrect incremental encoder impulse count or incorrect absolute encoder impulse count probably caused by an incorrect value of the pole pairs parameter or a load applied to the motor.
Solution: Check the value of the pole pairs parameter, check whether a load is applied			
44	Incorrect incremental encoder impulse count probably caused by the incorrect value of the encoder impulse parameter.		
	Solution: Check the electric signals of the incremental encoder. Check the value of the encoder impulse parameter.		
45	Incorrect absolute encoder impulse count		
	Solution: Check the electric signals of the absolute encoder. Check the configuration of the absolute encoder.		

Index	Error message shown on the display	Sub-code	Description
		46	Incremental encoder impulse count sign inverted with respect to the absolute encoder impulse count. Solution: Invert the A+ and A- signal of the incremental encoder.
		47	Incremental encoder impulse count sign inverted with respect to the absolute encoder impulse count. Solution: Invert the A+ and A- signal of the absolute encoder.
		48	Incorrect phase sequence. (Message not signalled) Solution: The automatic procedure has modified the setting of the Encoder direction parameter. No other action is required
		49	During automatic phasing a communication channel is activated between the drive and encoder. An error has occurred on this communication channel. Solution: Repeat the procedure.
		Solution: If the message has a value other than 0 follow the instructions provided for each case and repeat automatic phasing.	
24	Safe start active	Condition: The drive was restarted when PAR 1010 Safe Start Command = ON and in presence of Enable command. Solution: Press the ESC key to cancel the message You have to disable the Enable command to restart the drive.	

Note!

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 If any messages not included in this list are displayed, reference should be made to the manual of the application used by the drive.

8.3 Other anomalies

Noisy motor (Flux vector OL mode)	Condition: triggering of "noises" (torque instability and/or ripple) when controlling speed mainly due to mechanical coupling (resonance bands at 500rad/s ≈80Hz) between motor and load
	Solution: manually change the value of one or more of the following parameters as shown: · IPA 2242 Bandwidth (rad/s): reduce · IPA 2236 Speed reg P gain (N/rpm): reduce · IPA 2134 Encoder speed filter (ms): increase to 0.5 ... 2ms

9 - Specification

9.1 Environmental Conditions

Installation location _____	Pollution degree 2 or lower (free from direct sunlight, 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 9.7.1 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 EN50178)
Air pressure (operating) [kPa] _____	86 to 106 (class 3K3 as per EN50178)

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






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

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9.2 Standards

Directive EC _____	LVD 2014/35/EU, EMC 2014/30/EU, RoHS 2011/65/EU
Climatic conditions _____	EN 60721-3-3
Electrical safety _____	EN 50178, EN 61800-5-1, UL508C, UL840 degree of pollution 2
Operating safety _____	(for ADV200...+SI series) IEC EN 61800-5-2 , SIL 3 ; ISO EN 13849-1 , PL "e"
Vibration _____	EN 60068-2-6, test Fc.
Shock _____	EN60068-2-27
EMC compatibility _____	EN61800-3 EN61800-3 (EMC conducted: immunity and emissions) Immunity: environment 2, EN12016 Conducted emission: environment 2, category C2 and C3, EN12015 Radiated emission: determined by cabinet of final application
Protection degree _____	IP20, ≥ size 7: IP00
Approvals _____	  

9.3 Accuracy (Asynchronous)

9.3.1 Current control

Type _____	Flux vector CL (Field Oriented Control with feedback) and Flux vector OL (Open Loop Field Oriented Control)
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Loop sampling time _____ 125 μ s
 Response time _____ 600 - 1600 μ s
 PWM frequency _____ 2, 4, 6, 8, 10, 12 kHz (size dependent)

9.3.2 Speed control

Type _____ Flux vector CL (Field Oriented Control with feedback) and
 Flux vector OL (Open Loop Field Oriented Control)
 Loop sampling time _____ 125 μ s
 Response time _____ 5 - 10ms
 Speed measurement _____ FP, F mode
 Speed regulation accuracy _____ FOC with Speed feedback : 0.01 % rated speed
 FOC open loop : \pm 30 % rated slip
 V/F : \pm 60 % rated slip

9.3.3 Speed control limits

Control range (1) _____ \pm 32000 rpm
 Speed format (1) _____ 32 bit
 Frequency range _____ \pm 2000 Hz

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

Sizes	Max frequency			Min frequency		
	Flux vector CL	Flux vector OL	V/f control	Flux vector CL	Flux vector OL	V/f control
1007 ... 72000	300 Hz	150 Hz	500 Hz	0 Hz	0,5 Hz	1 Hz
72500 ... 1 MW	200 Hz	150 Hz	200 Hz			

9.3.4 Torque control

Torque resolution (2) _____ > 0.1 %
 Torque regulation accuracy (2) _____ Flux vector CL : \pm 5%
 Direct torque control _____ yes
 Current limitation _____ Limits \pm , 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 Accuracy (Synchronous)

9.4.1 Current control

Type _____ Flux vector CL (Field Oriented Control with feedback) and
 Flux vector OL (Open Loop Field Oriented Control)
 Loop sampling time _____ 125 μ s
 Band width _____ < 1000Hz
 PWM frequency _____ 2, 4, 6, 8, 10, 12 kHz (depending on the size)
 Torque ripple _____ < 5%
 Control limits _____ Programmable (3)

(3) See PAR 2354, in the ADV200 FP manual for details.

9.4.2 Speed control

Type _____ Flux vector CL (Field Oriented Control with feedback) and
 Flux vector OL (Open Loop Field Oriented Control)

Loop sampling time _____ 125 μ s
Band width _____ < 100 Hz (Flux vector CL), < 10 Hz (Flux vector OL)
Control range _____ 1:1500 (Flux vector CL), 1:20 (Flux vector OL)
Speed control precision _____ Flux vector CL: 0.01% @ Rated speed
Flux vector OL: 0.1% @ Rated speed

9.4.3 Initial torque limit

Flux vector CL _____ 200% (> 3Hz)
Flux vector OL _____ 100% @ 10% Rated speed (4)

(4) The initial torque limit in Flux vector OL mode depends on the inertia and friction applied to the motor.

9.4.4 Overload

Heavy duty (HD) _____ 160% 60 sec each 300 sec, 200% 3 sec each 300 sec.
Light duty (LD) _____ 110% 60 sec each 300 sec.

9.4.5 Flux reduction

Control loop sampling time _____ 125 μ s
Band width _____ < 100Hz (Flux vector CL), < 10Hz (Flux vector OL)
Control range _____ 1:1,5 of Rated speed (5).

(5) The flux reduction range depends on the type of motor. Please contact Gefran for further details.

9.5 DC circuit

Overvoltage threshold (Overvoltage) _____ 820 V_{DC}
Undervoltage threshold (Undervoltage) _____ 390 V_{DC} (@400 V_{DC})
470 V_{DC} (@480 V_{DC})

9.6 Input electrical data

9.6.1 AC power supply

AC Input voltage, U_{LN} _____ 3 ph 380 V_{AC} -15% ... 500 V_{AC} +5%,
 AC Input frequency _____ 50/60 Hz, \pm 5%
 Choke _____ integrated (DC) up to size 61320
 Total harmonic distortion (THD) _____ 40% Light duty, 50% Heavy duty (at nominal current)
 Connection to TT and TN Networks _____ yes, standard version
 Connection to IT Networks _____ yes, special version ADV200...-IT only (upon request).

Sizes	ADV200-...-4 versions (Motor cos phi 0.9 @ 400 V _{AC})	
	AC Input current	
	Heavy duty (Arms)	Light duty (Arms)
1007	2.1	3.7
1015	3.7	4.9
1022	4.9	6.5
1030	6.5	8.1
1040	8.1	11.1
2055	11.1	14.0
2075	14.0	19.6
2110	19.6	26.4
3150	26.4	32.3
3185	32.3	39
3220	39	53
4300	53	64
4370	64	74
4450	74	89
5550	100	143
5750	143	171
5900	171	200
61100	200	238
61320	238	285
71600	300	350
72000	350	420
72500	420	580
73150	580	640
73551	640	710
400 kW	665	800
500 kW	800	1100
630 kW	1100	1215
710 kW	1215	1350
900 kW	1650	1800
1 MW	1800	2020

9.6.2 DC power supply

Input voltage _____ 450 - 750 V_{DC}

Sizes ADV200-...-DC	ADV200-...-4-DC DC versions (Motor cos phi 0.9 @ 400 V _{AC})	
	DC Input current (*)	
	Heavy duty (Arms)	Light duty (Arms)
3185	39	48
3220	48	65
4300	65	80
4370	80	90
4450	90	125
5550	125	175
5750	175	210
5900	210	240
61100	240	290
61320	290	350
71600	370	430
72000	430	510
72500	510	710
73150	710	780
73551	780	850
400 kW	2 x 430	2 x 510
500 kW	2 x 510	2 x 710
630 kW	2 x 710	2 x 780
710 kW	2 x 780	2 x 850
900 kW	3 x 710	3 x 780
1 MW	3 x 780	3 x 850

(*) RMS input current in case of power from 6 impulse bridge.

Nota!

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 Contact Gefran if an AFE200 series regenerative power supply is used.

9.7 Output electrical data

U2 Max output voltage _____ 0,94 x U_{LN} (U_{LN} = AC Input voltage)
 f2 Max output frequency _____ 500 Hz (Sizes 1007 ... 72000) , 200 Hz (≥ Size 72500):
 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
 BR ON/OFF (Programmable through P454) _ @ 400V = Default 670-660Vdc
 @ 480V = Default 800-790Vdc

Sizes	Inverter Output		Pn mot (Recommended asynchronous motor output)			
	Heavy duty (KVA)	Light duty (KVA)	Heavy duty		Light duty	
			@400 V _{AC} (kW)	@460 V _{AC} (Hp)	@400 V _{AC} (kW)	@460 V _{AC} (Hp)
1007	1.7	3.0	0.75	1	1.5	2
1015	3.0	4.0	1.5	2	2.2	3
1022	4.0	5.3	2.2	3	3	5
1030	5.3	6.6	3.0	5	4	5
1040	6.6	9	4.0	5	5.5	7.5
2055	9	11.4	5.5	7.5	7.5	10
2075	11.4	15.9	7.5	10	11	15
2110	15.9	21.5	11	15	15	20
3150	21.5	26.3	15	20	18.5	25
3185	26.3	32	18.5	25	22	30
3220	32	43	22	30	30	40
4300	43	52	30	40	37	50
4370	52	60	37	50	45	60
4450	60	73	45	60	55	75
5550	73	104	55	75	75	100
5750	104	125	75	100	90	125
5900	125	145	90	125	110	150
61100	145	173	110	150	132	175
61320	173	208	132	175	160	200
71600	208	267	160	200	200	250
72000	267	319	200	250	250	300
72500	319	409	250	300	315	400
73150	409	450	315	400	355	450
73551	450	506	355	450	400	500
400 kW	506	603	400	500	500	650
500 kW	603	776	500	650	630	850
630 kW	776	852	630	850	710	950
710 kW	852	956	710	950	800	1100
900 kW	1108	1247	900	1200	1000	1300
1 MW	1247	1420	1000	1300	1200	1600

Sizes	In Rated output current (For Asynchronous motors)				In Rated output current (For Synchronous motors)			
	@U _{LN} =400Vac		@U _{LN} =460Vac		@U _{LN} =400Vac		@U _{LN} =460Vac	
	Heavy duty (A)	Light duty (A)	Heavy duty (A)	Light duty (A)	Heavy duty (A)	Light duty (A)	Heavy duty (A)	Light duty (A)
1007	2.5	4.3	2.3	3.9	2.3	3.9	2.1	3.5
1015	4.3	5.8	3.9	5.2	3.9	5.2	3.5	4.7
1022	5.8	7.6	5.2	6.8	5.2	6.8	4.7	6.1
1030	7.6	9.5	6.8	8.6	6.8	8.6	6.1	7.7
1040	9.5	13	8.6	11.7	8.6	11.7	7.7	10.5
2055	13	16.5	11.7	14.9	11.7	15	10.5	13.5
2075	16.5	23	14.9	20.7	15	21	13.5	18.9
2110	23	31	20.7	27.9	21	28	18.9	25.2
3150	31	38	27.9	34.2	28	34	25.2	30.6
3185	38	46	34.2	41.4	34	41	30.6	36.9
3220	46	62	41.4	55.8	41	56	36.9	50.4
4300	62	75	55.8	67.5	56	68	50.4	61.2
4370	75	87	67.5	78.3	68	78	61.2	70.2
4450	87	105	78	94.5	78	95	70.2	85.5
5550	105	150	94.5	135	95	135	85.5	121.5
5750	150	180	135	162	135	162	122	146
5900	180	210	162	189	162	189	146	170
61100	210	250	189	225	189	225	170	203
61320	250	300	225	270	225	270	203	243
71600	300	385	270	347	270	347	243	312
72000	385	460	347	414	347	414	312	373
72500	460	590	414	531	414	531	373	469
73150	590	650	531	585	531	585	469	527
73551	650	730	585	657	585	657	527	591
400 kW	730	870	657	783	657	783	591	705
500 kW	870	1120	783	1008	783	1008	705	907
630 kW	1120	1230	1008	1107	1008	1107	907	996
710 kW	1230	1380	1107	1242	1107	1242	996	1118
900 kW	1600	1800	1440	1620	1440	1620	1296	1458
1 MW	1800	2050	1620	1845	1620	1845	1458	1661

Sizes ADV200-DC	I _N Rated output current (For Asynchronous motors)				I _N Rated output current (For Synchronous motors)			
	@540 Vdc Heavy duty (A)	@540 Vdc Light duty (A)	@650 Vdc Heavy duty (A)	@650 Vdc Light duty (A)	@540 Vdc Heavy duty (A)	@540 Vdc Light duty (A)	@650 Vdc Heavy duty (A)	@650 Vdc Light duty (A)
3185	38	46	34.2	41.4	34	41	30.6	36.9
3220	46	62	41.4	55.8	41	56	36.9	50.4
4300	62	75	55.8	67.5	56	68	50.4	61.2
4370	75	87	67.5	78.3	68	78	61.2	70.2
4450	87	105	78	94.5	78	95	70.2	85.5
5550	105	150	94.5	135	95	135	85.5	121.5
5750	150	180	135	162	135	162	122	146
5900	180	210	162	189	162	189	146	170
61100	210	250	189	225	189	225	170	203
61320	250	300	225	270	225	270	203	243
71600	300	385	270	347	270	347	243	312
72000	385	460	347	414	347	414	312	373
72500	460	590	414	531	414	531	373	469
73150	590	650	531	585	531	585	469	527
73551	650	730	585	657	585	657	527	591
400 kW	730	870	657	783	657	783	591	705
500 kW	870	1120	783	1008	783	1008	705	907
630 kW	1120	1230	1008	1107	1008	1107	907	996
710 kW	1230	1380	1107	1242	1107	1242	996	1118
900 kW	1600	1800	1440	1620	1440	1620	1296	1458
1 MW	1800	2050	1620	1845	1620	1845	1458	1661

9.7.1 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

$$I_{DRIVE} = I_N \times K_{V1} \times K_T \times K_{ALT} \times K_F$$

$K_{V1}^{(1)}$: 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, $K_{ALT} = 1.2 \cdot 10 = 12\%$ di derating; I_N derated = $100 - ((12 \cdot 100)/100) = 88\%$ I_N

$K_F^{(4)}$: 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 Kv ₁ (1)						
	@U _{LN} =400Vac				@U _{LN} =460...480Vac		
	T _{amb} = 40°C	from AFE200		T _{amb} ≤ 30°C	T _{amb} = 40°C	from AFE200	
		T _{amb} ≤ 30°C	T _{amb} 31 ... 40°C			T _{amb} ≤ 30°C	T _{amb} 31 ... 40°C
1007 ... 1 MW	1	1	0.9	1	0.9	0.9	0.81

Sizes	fsw Switching frequency		Derating factor							
	Default	Higher	Kr	KALT	Kf (4)					
			(2)	(3)	2 kHz	4 kHz	6 kHz	8 kHz	10 kHz	12 Hz
1007	8	10, 12	0.9	1.2	1	1	1	1	0.85	0.7
1015	8	10, 12	0.9	1.2	1	1	1	1	0.85	0.7
1022	4	6, 8, 10, 12	0.9	1.2	1	1	0.85	0.7	0.55	0.4
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	0.6	0.5
2055	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
3150	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
4300	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	0.9	1.2	1	1	0.85	0.7	0	0
5550	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
61100	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
71600	4	-	0.9	1.2	1	1	0	0	0	0
72000	4	-	0.9	1.2	1	1	0	0	0	0
72500	2	4	0.9	1.2	1	0.85	0	0	0	0
73150	2	-	0.9	1.2	1	0	0	0	0	0
73551	2	-	0.9	1.2	1	0	0	0	0	0
400 kW	4 (5)	-	0.9	1.2	1	1 (5)	0	0	0	0
500 kW	2	4 (5)	0.9	1.2	1	0.85 (5)	0	0	0	0
630 kW	2	-	0.9	1.2	1	0	0	0	0	0
710 kW	2	-	0.9	1.2	1	0	0	0	0	0
900 kW	2	-	0.9	1.2	1	0	0	0	0	0
1 MW	2	-	0.9	1.2	1	0	0	0	0	0

(5) from fw 6.03.

Note!

In Light Duty mode the switching frequency is set at 4 kHz for sizes up to 72000 plus size 400kW (setting to 2kHz is possible), and is fixed at 2kHz for sizes 72500 up to 1MW (400kW excluded).

Note!

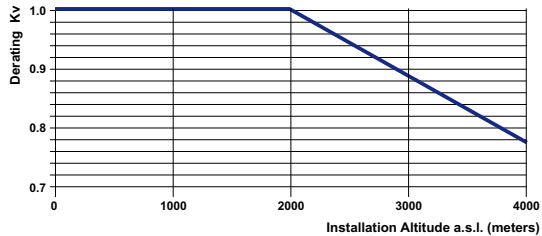
If, in the Heavy duty mode, the factory setting of **Switching freq mode** (PAR: 568) is changed from 0=Fixed to 1=Variable, the switching frequency is controlled by the temperature of the drive heat sink and the output frequency. For further information see the Functions and Parameters manual, menu 4.9.

Installation altitude above sea level	Kr 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

Kv⁽⁶⁾ : Derating factor of the input voltage based on altitudes

Figure 9.7.1: Kv² derating factor based on altitudes



Installation altitude	Kv ² Derating factor (6)					
	Mains voltage [V]					
m (a.s.l.)	380 Vac	400 Vac	415 Vac	440 Vac	460 Vac	480 Vac
≤ 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 occur a drive breakdown.

9.7.2 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]
1007	100	3	4.8	100	3
1015	100	3	4.8	75	3
1022	100	3	4.8	75	3
1030	100	3	4.8	80	3
1040	100	3	4.8	100	3
2055	100	3	4.8	100	3
2075	100	3	4.8	75	3
2110	100	3	4.8	75	5
3150	100	5	8	75	7
3185	100	5	8	85	5
3220	100	3	4.8	80	5
4300	100	3	4.8	80	3
4370	100	3	4.8	80	3
4450	100	3	4.8	80	3
5550	100	3	4.8	85	5
5750	100	5	8	85	5
5900	100	5	8	85	5
61100	100	3	4.8	100	3
61320	100	3	4.8	100	3
71600	100	3	4.8	80	3
72000	100	3	4.8	100	3
72500	100	3	4.8	75	5
73150	100	3	4.8	100	3
73551	100	3	4.8	100	3
400 kW	100	3	4.8	100	3
500 kW	100	3	4.8	75	5
630 kW	100	3	4.8	100	3
710 kW	100	3	4.8	100	3
900 kW	100	3	4.8	100	3
1 MW	100	3	4.8	100	3

Figure 9.7.2.1: HD Overload (For Asynchronous motors)

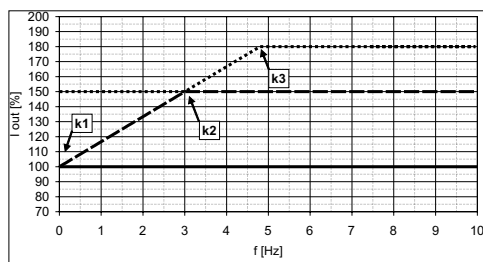
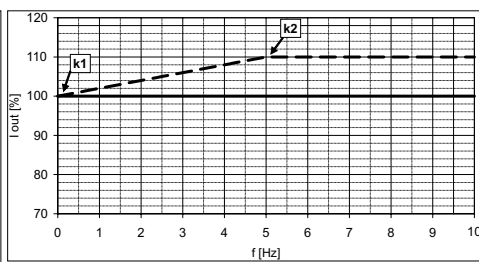


Figure 9.7.2.2: LD Overload (For Asynchronous motors)



-- Islow, Ifast; __ I_N

-- Islow, __ I_N

Sizes	For Synchronous motors				
	Heavy duty			Light duty	
	K1 SP [%]	K2 SP [Hz]	K3 SP [Hz]	K1 SL [%]	K2 SL [Hz]
1007	100	3	5	100	3
1015	100	3	5	75	3
1022	100	3	5	75	3
1030	100	3	5	80	3
1040	100	3	5	100	3
2055	100	3	5	100	3

Sizes	For Synchronous motors				
	Heavy duty			Light duty	
	K1 SP [%]	K2 SP [Hz]	K3 SP [Hz]	K1 SL [%]	K2 SL [Hz]
2075	100	3	5	75	3
2110	100	3	5	75	5
3150	100	5	8.3	75	7
3185	100	5	8.3	85	5
3220	100	3	5	80	5
4300	100	3	5	80	3
4370	100	3	5	80	3
4450	100	3	5	80	3
5550	100	3	5	85	5
5750	100	5	8.3	85	5
5900	100	5	8.3	85	5
61100	100	3	5	100	3
61320	100	3	5	100	3
71600	100	3	5	80	3
72000	100	3	5	100	3
72500	100	3	5	75	5
73150	100	3	5	100	3
73551	100	3	5	100	3
400 kW	100	3	5	100	3
500 kW	100	3	5	75	5
630 kW	100	3	5	100	3
710 kW	100	3	5	100	3
900 kW	100	3	5	100	3
1 MW	100	3	5	100	3

Figure 9.7.2.3: HD Overload (For Synchronous motors)

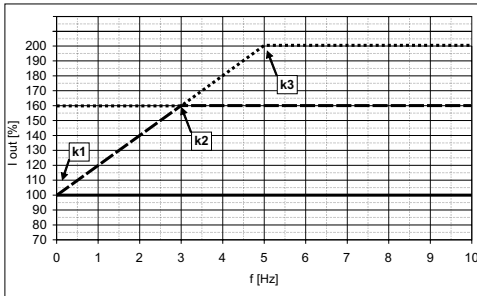
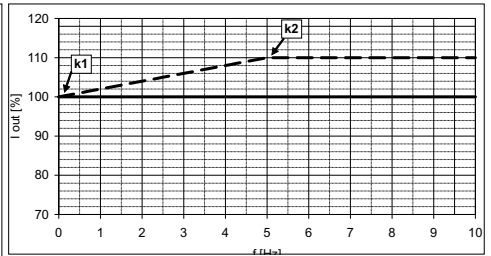


Figure 9.7.2.4: LD Overload For Synchronous motors



-- lslow, lfast; __ lN
 (1) FAST current limit; (2) SLOW current limit; (3) RATED current limit

-- lslow, __ lN

9.8 Voltage level of the inverter for safe operations

The minimum time between the moment in which an ADV200 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).

9.9 Cooling

All the Drives have internal fans.

Sizes		Dissipated power	Airflow of fan	
		W	Heatsink (m ³ /h)	Internal (m ³ /h)
1007		60	32	26
1015		90	32	32
1022		100	32	32
1030		120	32	32
1040		160	32	32
2055		200	32	32
2075		250	56 x 2	32
2110		300	56 x 2	32
3150		380	80 x 2	32
3185		460	80 x 2	32
3220		600	80 x 2	32
4300		900	2 x 250	2 x 50
4370		1000	2 x 250	2 x 50
4450		1290	2 x 250	2 x 50
5550		1760	2 x 285	1 x 170
5750		2150	2 x 355	2 x 170
5900		2400	2 x 355	2 x 170
61100		2850	3 x 310	2 x 170
61320		3600	3 x 310	2 x 170
71600		3900	1500	-
72000		4000	1500	-
72500		5200	1500	-
73150		6000	2000	-
73551		6500	2000	-
400 kW	ADV-72000-KXX-4-MS 04	4000	1500	-
	ADV-72000-XXX-4-SL	4000	1500	-
500 kW	ADV-72500-KXX-4-MS 05	5200	1500	-
	ADV-72500-XXX-4-SL	5200	1500	-
630 kW	ADV-73150-KXX-4-MS 06	6000	2000	-
	ADV-73150-XXX-4-SL	6000	2000	-
710 kW	ADV-73551-KXX-4-MS 07	6500	2000	-
	ADV-73551-XXX-4-SL	6500	2000	-
900 kW	ADV-73150-KXX-4-MS 09	6000	2000	-
	ADV-73150-XXX-4-SL	6000	2000	-
	ADV-73150-XXX-4-SL	6000	2000	-
1 MW	ADV-73551-KXX-4-MS 10	6500	2000	-
	ADV-73551-XXX-4-SL	6500	2000	-
	ADV-73551-XXX-4-SL	6500	2000	-

9.10 Weight and dimensions

Sizes ADV200-...-4	Weight (kg)	Weight (lbs)
1007 ... 1040	5.8	12.8
2055 ... 2110	10.2	22.5
3150 ... 3185	16.4	36.2
3220	22	48.5
4300 ... 4450	32	70.6
5550 ... 5900	60	132
61100 ... 61320	90	198
71600 ... 72000	130	287
72500	140	309
73150 ... 73551	150	331
400 kW	260	573
500 kW	280	617
630 ... 710 kW	450	992
900 kW ... 1 MW	450	992

Sizes ADV200-...-4-DC	Weight (kg)	Weight (lbs)
-	-	-
-	-	-
3185	12	26.5
3220	18	39.7
4300 ... 4450	24	52.9
5550 ... 5900	40	88.2
61100 ... 61320	68	150
71600 ... 72000	120	267
72500	130	287
73150 ... 73551	140	307
400 kW	240	529
500 kW	260	573
630 ... 710 kW	420	926
900 kW ... 1 MW	420	926

Note !

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

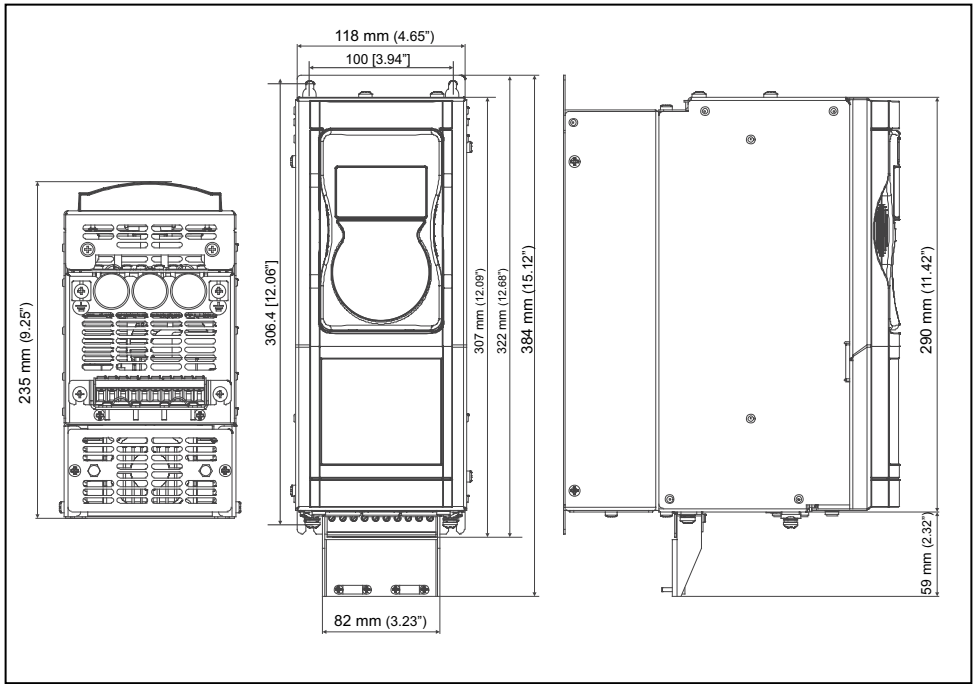


Figure 9.10.1: Size 1 Dimensions

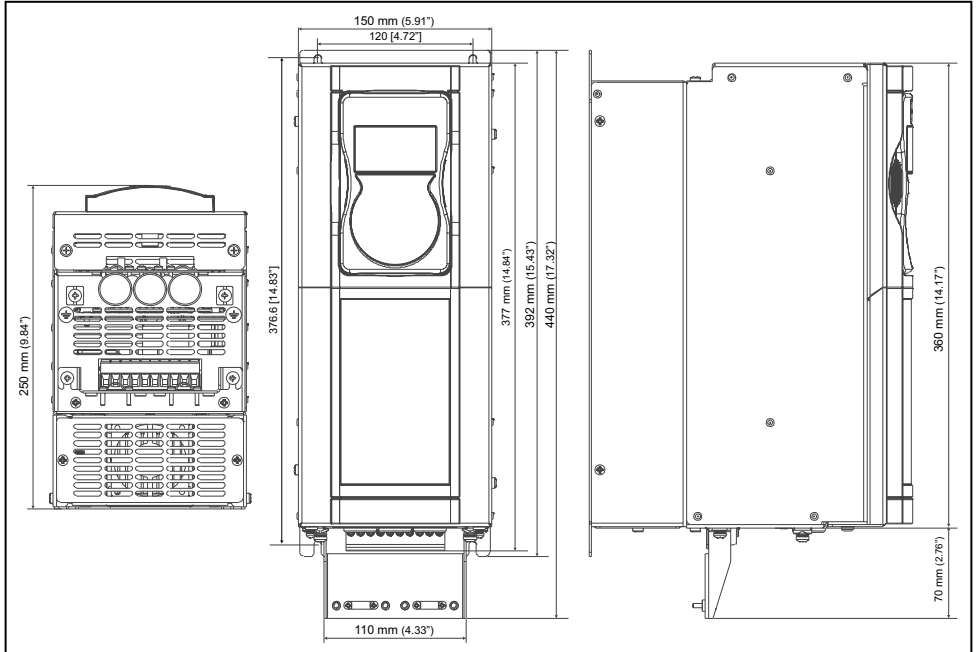


Figure 9.10.2: Size 2 dimensions

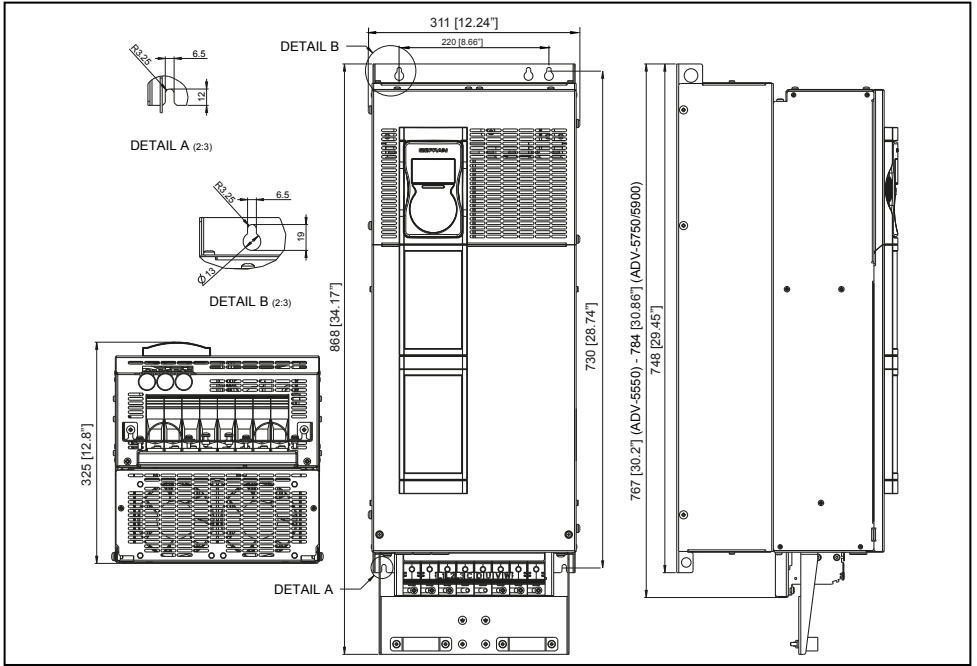


Figure 9.10.3: Size 3 dimensions (ADV200-...-4)

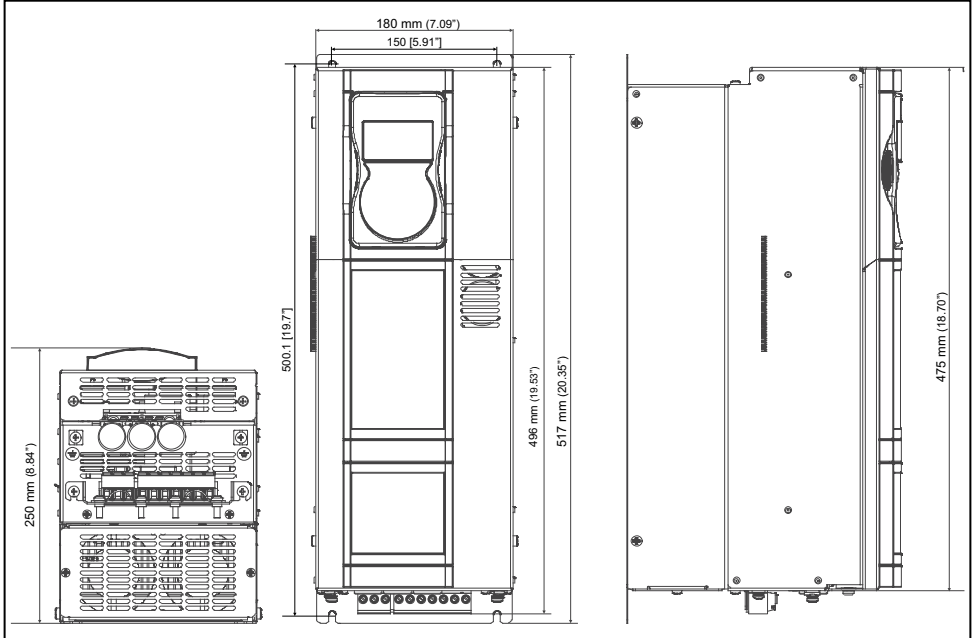


Figure 9.10.4: Size 3 dimensions (ADV200-...-4-DC)

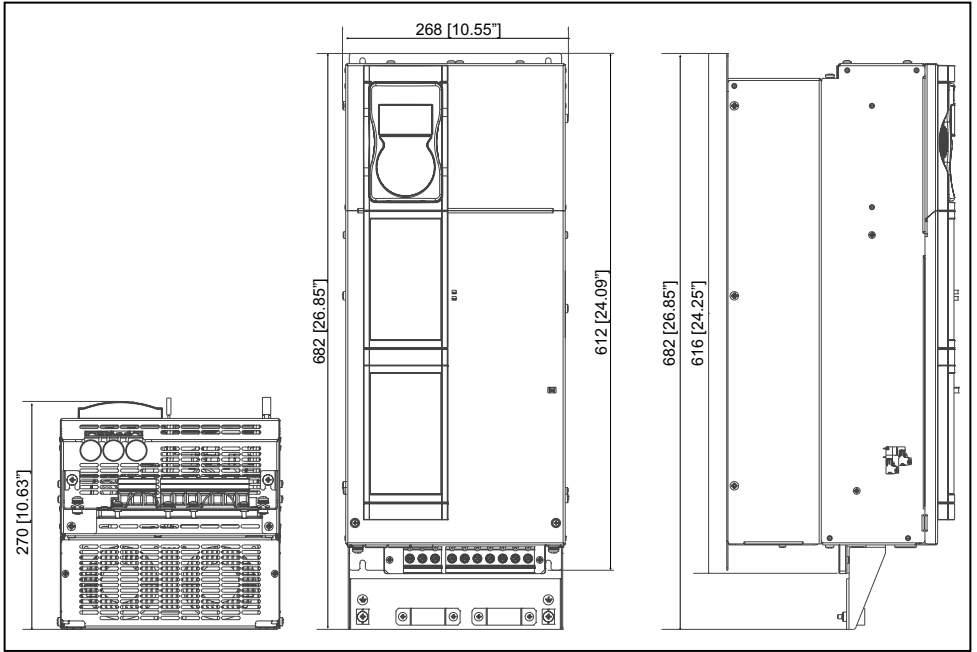


Figure 9.10.5: Size 4 dimensions (ADV200-...-4)

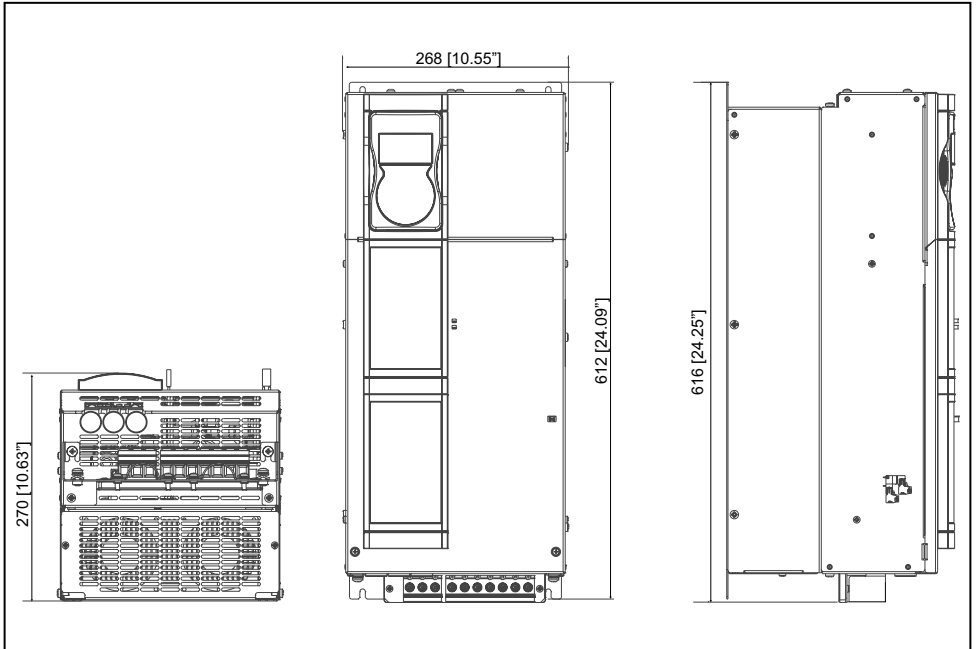


Figure 9.10.6: Size 4 dimensions (ADV200-...-4-DC)

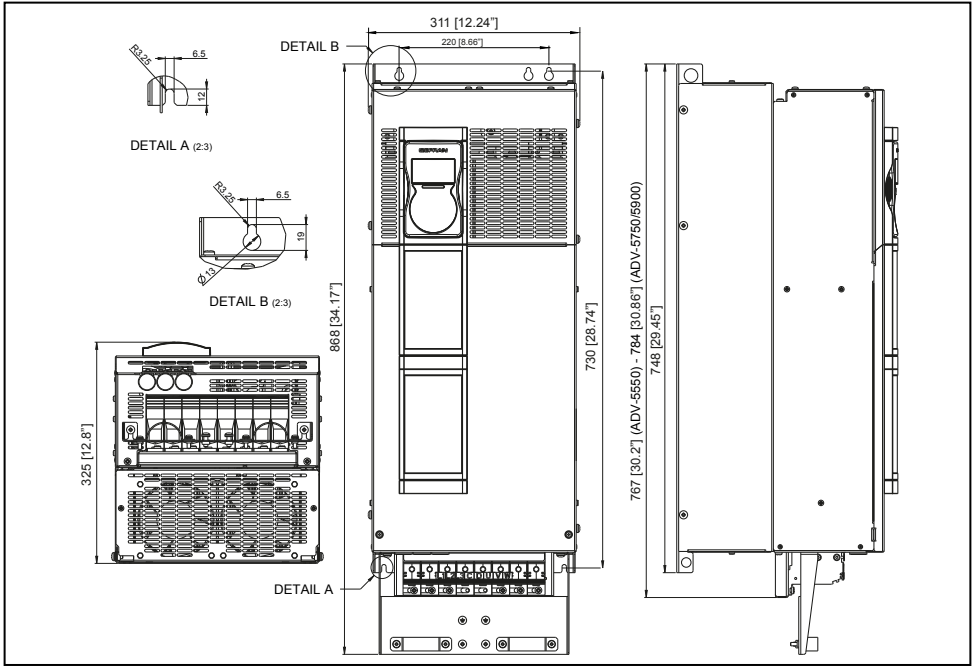


Figure 9.10.7: Size 5 dimensions (ADV200-...-4)

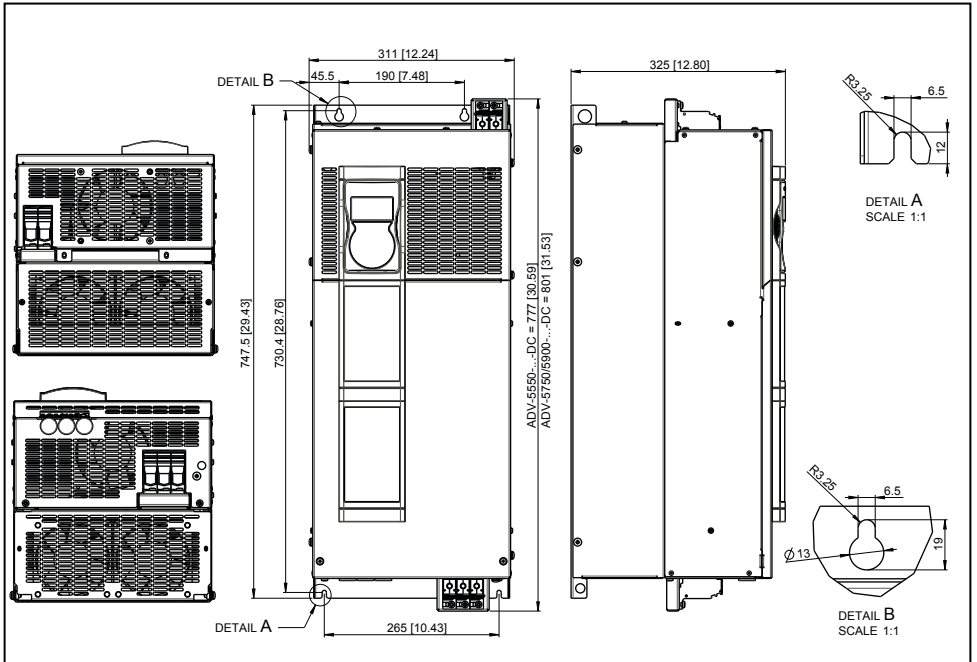


Figure 9.10.8: Size 5 dimensions (ADV200-...-4-DC)

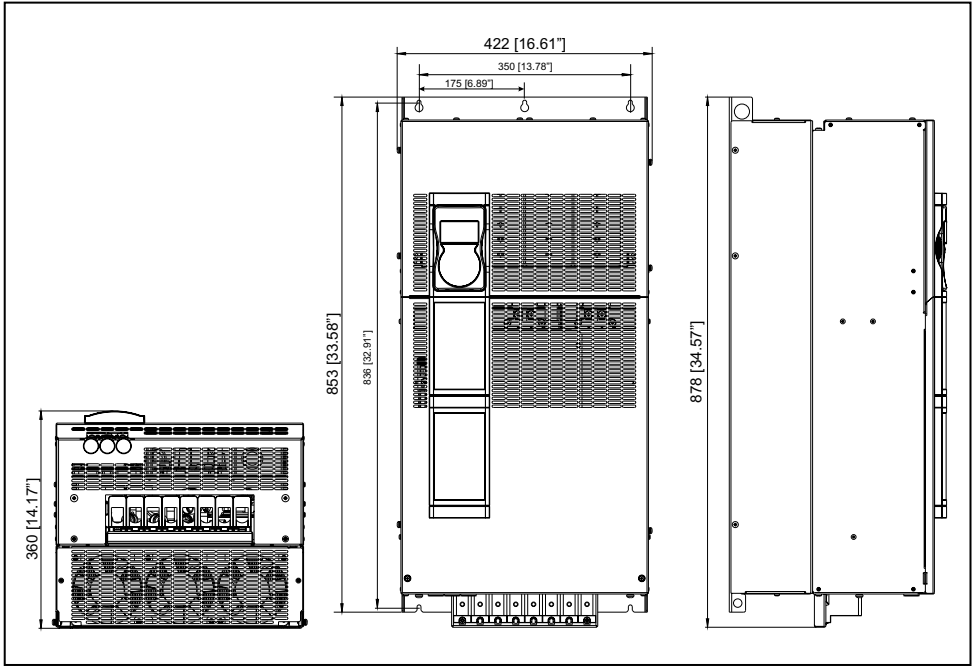


Figure 9.10.9: Size 6 dimensions (ADV200-...-4)

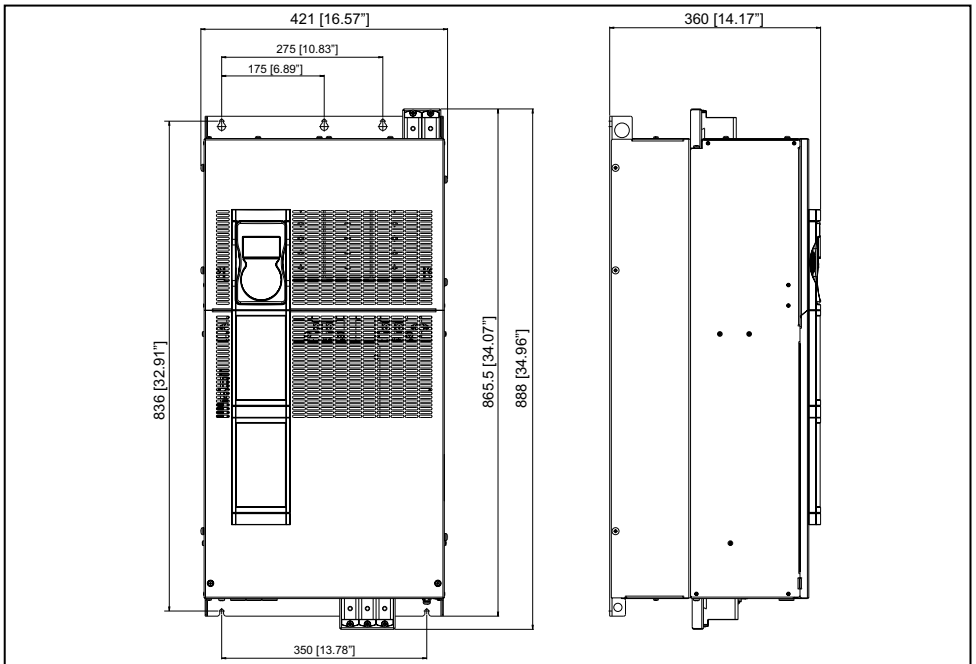


Figure 9.10.10: Size ADV61110-...-DC dimensions

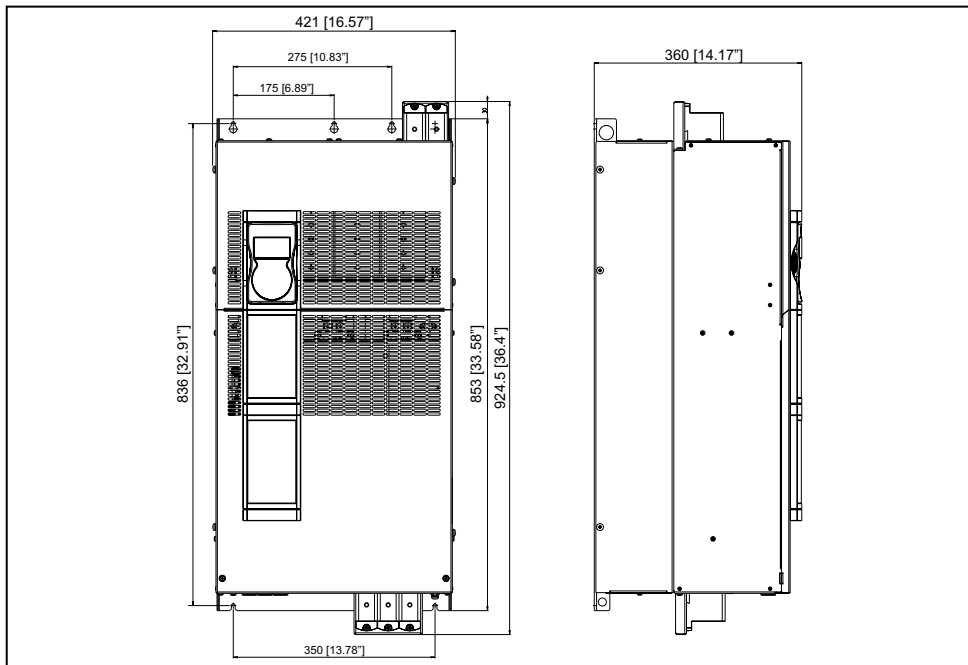


Figure 9.10.11: Size ADV61320...-DC dimensions

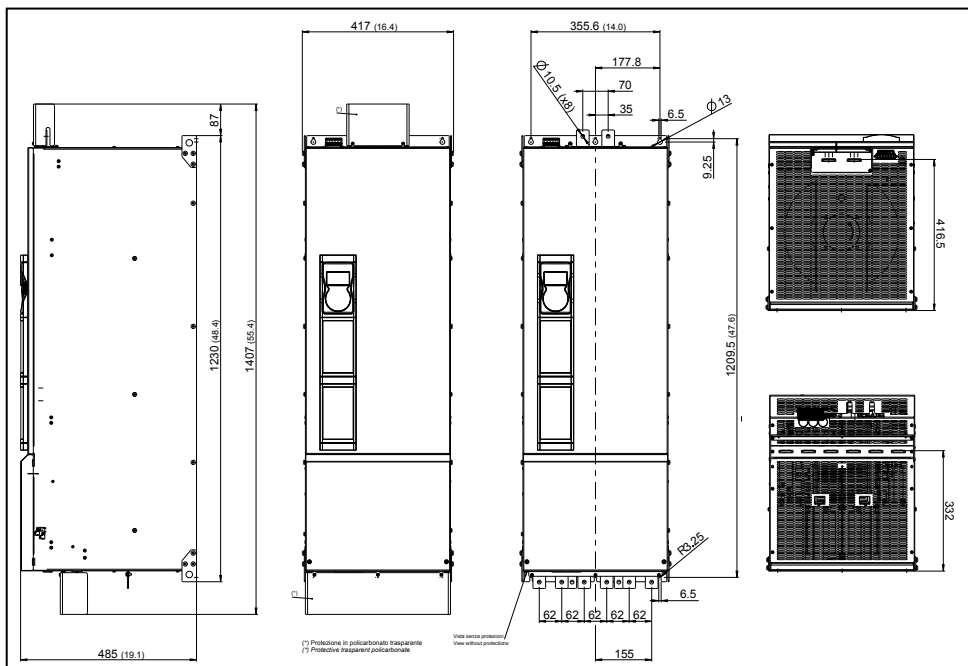


Figure 9.10.12: Size 7 dimensions

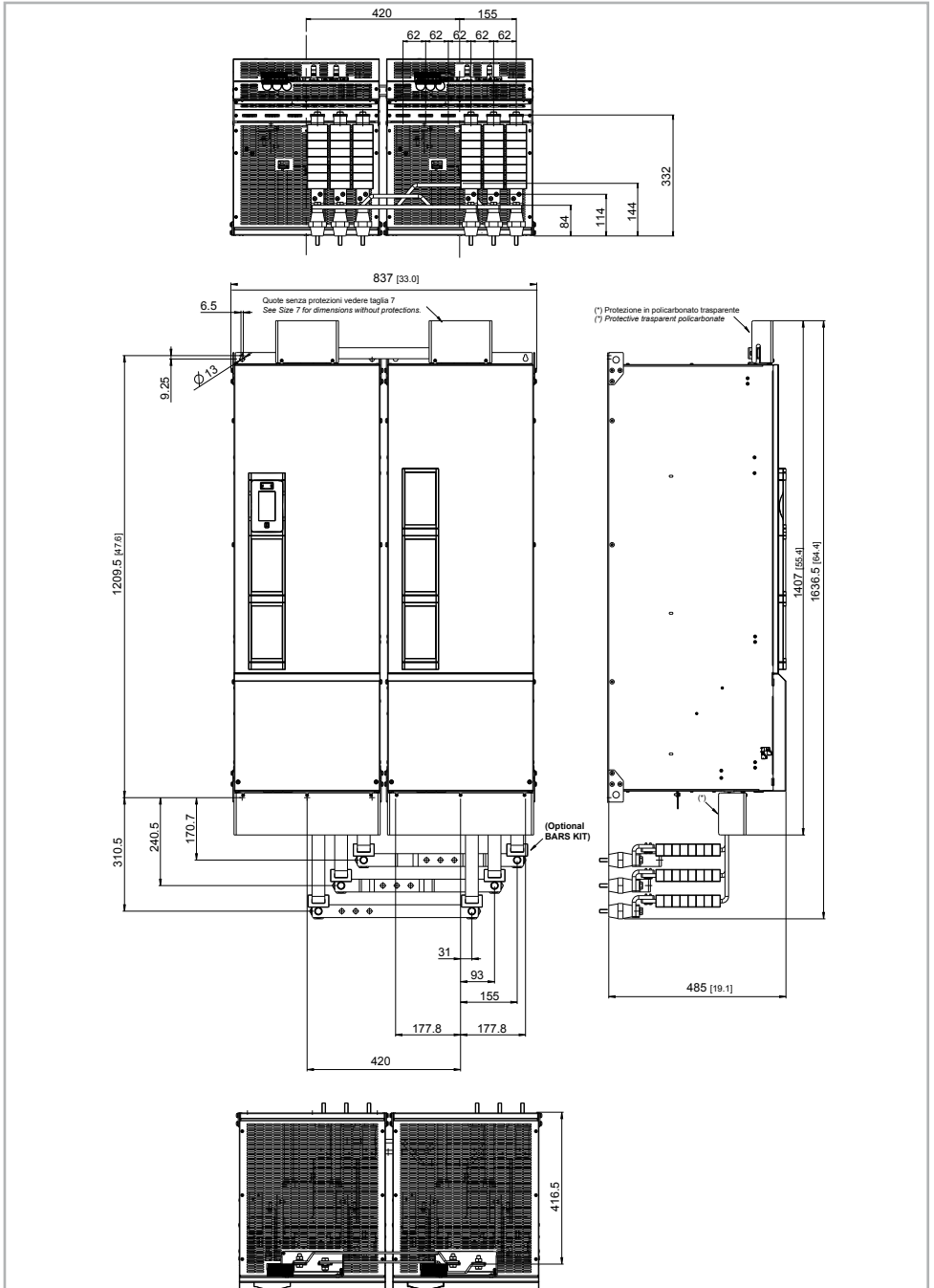


Figure 9.10.13: Sizes 400 ... 710 kW dimensions

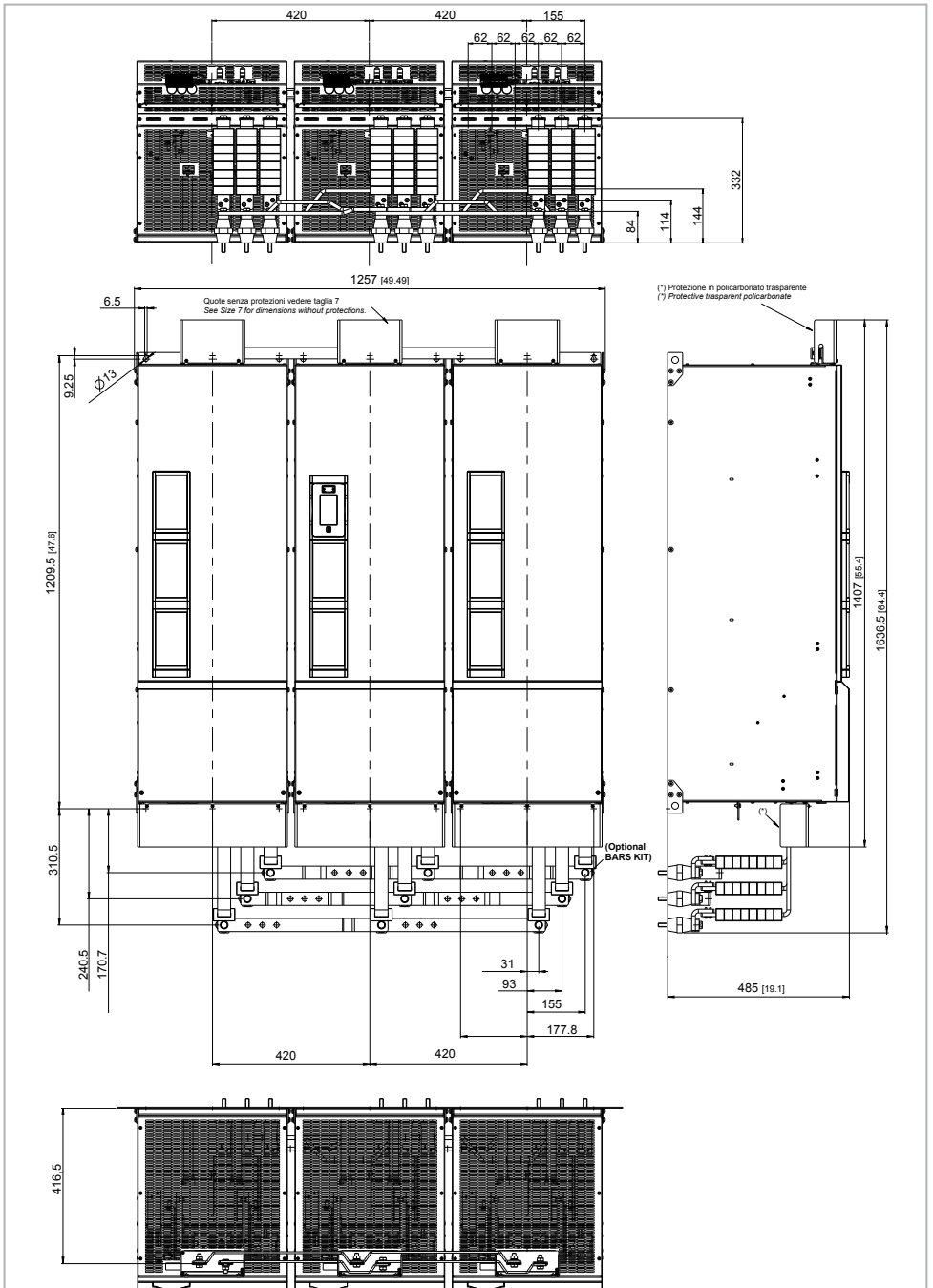


Figure 9.10.14: Sizes 900 kW - 1 MW dimensions

10 - Options

10.1 Optional external fuses

10.1.1 AC input side fuses (F1)

The inverter must be fused on the AC Input side.
Use fast fuses only.

Sizes		F1 - AC input side fuses				
		DC link capacitors life time [h]	EUROPE		AMERICA	
			Type	Code	Type	Code
1007 ... 1030		50000	URZ 50 124 06.11 FWP-10A14Fa	S7G49	URZ 50 124 06.11 FWP-10A14Fa	S7G49
1040 - 2055		50000	FWP-20A14F	S7G48	FWP-20A14F	S7G48
2075 - 2110		50000	FWP-40B	S7G52	FWP-40B	S7G52
3150 - 3185		50000	FWP-50B	S7G53	FWP-50B	S7G53
3220 - 4300		50000	S00C + /üf1/80A/690V	F4EAF	FWP-80B	S7G54
4370		50000	S00C + /üf1/100A/690V	F4EAG	FWP-100B	S7G55
4450		50000	S00C + /üf1/125A/690V	F4EAJ	FWP-150A	S7G56
5550 - 5750		50000	S00üf1/80/200A/690V	F4G23	FWP-200A	S7G58
5900		50000	S1üf1/110/250A/690V	F4G28	FWP-250A	S7G59
61100		50000	S1üf1/110/315A/690V	F4G30	FWP-350A	S7G61
61320		50000	S2üf1/110/400A/690V	F4G34	FWP-400A	S7G62
71600		50000	S2üf1/110/500A/690V	F4E30	FWP-500A	S7G63
72000 - 72500		50000	S2üf1/110/630A/690V	F4E31	FWP-600A	S7G65
73150 - 73551		50000	S3üf1/110/800A/690V	F4H02	FWP-800A	S7813
400 kW	ADV-72000-KXX-4-MS 04	50000	S2üf1/110/630A/690V	F4E31	FWP-600A	S7G65
	ADV-72000-KXX-4-SL	50000	S2üf1/110/630A/690V	F4E31	FWP-600A	S7G65
500 kW	ADV-72500-KXX-4-MS 05	50000	S2üf1/110/630A/690V	F4E31	FWP-600A	S7G65
	ADV-72500-KXX-4-SL	50000	S2üf1/110/630A/690V	F4E31	FWP-600A	S7G65
630 kW	ADV-73150-KXX-4-MS 06	50000	S3üf1/110/800A/690V	F4H02	FWP-800A	S7813
	ADV-73150-KXX-4-SL	50000	S3üf1/110/800A/690V	F4H02	FWP-800A	S7813
710 kW	ADV-73551-KXX-4-MS 07	50000	S3üf1/110/800A/690V	F4H02	FWP-800A	S7813
	ADV-73551-KXX-4-SL	50000	S3üf1/110/800A/690V	F4H02	FWP-800A	S7813
900 kW	ADV-73150-KXX-4-MS 09	50000	S3üf1/110/800A/690V	F4H02	FWP-800A	S7813
	ADV-73150-KXX-4-SL	50000	S3üf1/110/800A/690V	F4H02	FWP-800A	S7813
	ADV-73150-KXX-4-SL	50000	S3üf1/110/800A/690V	F4H02	FWP-800A	S7813
1 MW	ADV-73551-KXX-4-MS 10	50000	S3üf1/110/800A/690V	F4H02	FWP-800A	S7813
	ADV-73551-KXX-4-SL	50000	S3üf1/110/800A/690V	F4H02	FWP-800A	S7813
	ADV-73551-KXX-4-SL	50000	S3üf1/110/800A/690V	F4H02	FWP-800A	S7813

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

URZ (SIBA), FWP (Bussmann), S.. (Jean Müller).

10.1.2 External fuses of the power section DC input side (F2)

The following fuses must be used with an external DC power supply or regenerative converter (for further details refer to the converter instruction manual):

Sizes		F2 - External fuses for DC input side			
		EUROPE		AMERICA	
		Type	Code	Type	Code
1007 ... 1022		URZ 50 124 06.11 FWP-10A14Fa	S7G49	URZ 50 124 06.11 FWP-10A14Fa	S7G49
1030 - 1040		FWP-20A14F	S7G48	FWP-20A14F	S7G48
2055		FWP-30A14F	S7I50	FWP-30A14F	S7I50
2075		FWP-40B	S7G52	FWP-40B	S7G52
2110		FWP-50B	S7G53	FWP-50B	S7G53
3150 ... 3220		S00C +/üf1/80A/690V	F4EAF	FWP-80B	S7G54
4300		S00C +/üf1/100A/690V	F4EAG	FWP-100B	S7G55
4370		S00C +/üf1/125A/690V	F4EAJ	FWP-150A	S7G56
4450		S00C +/üf1/160A/690V	F4EAL	FWP-150A	S7G56
5550		S00üf1/80/200A/690V	F4G23	FWP-200A	S7G58
5750		S1üf1/110/250A/690V	F4G28	FWP-250A	S7G59
5900		S1üf1/110/315A/690V	F4G30	FWP-350A	S7G61
61100		S2üf1/110/400A/690V	F4G34	FWP-400A	S7G62
61320 - 71600		S2üf1/110/500A/690V	F4E30	FWP-500A	S7G63
72000		S2üf1/110/630A/690V	F4E31	FWP-600A	S7G65
72500		S3üf1/110/800A/690V	F4H02	FWP-800A	S7813
73150 - 73551		S3üf1/110/1000A/690V	F4H03	FWP-1000A	S7812
400 kW	ADV-72000-KXX-4-MS 04	S2üf1/110/630A/690V	F4E31	FWP-600A	S7G65
	ADV-72000-KXX-4-SL	S2üf1/110/630A/690V	F4E31	FWP-600A	S7G65
500 kW	ADV-72500-KXX-4-MS 05	S3üf1/110/800A/690V	F4H02	FWP-800A	S7813
	ADV-72500-KXX-4-SL	S3üf1/110/800A/690V	F4H02	FWP-800A	S7813
630 kW	ADV-73150-KXX-4-MS 06	S3üf1/110/1000A/690V	F4H03	FWP-1000A	S7812
	ADV-73150-KXX-4-SL	S3üf1/110/1000A/690V	F4H03	FWP-1000A	S7812
710 kW	ADV-73551-KXX-4-MS 07	S3üf1/110/1000A/690V	F4H03	FWP-1000A	S7812
	ADV-73551-KXX-4-SL	S3üf1/110/1000A/690V	F4H03	FWP-1000A	S7812
900 kW	ADV-73150-KXX-4-MS 09	S3üf1/110/1000A/690V	F4H03	FWP-1000A	S7812
	ADV-73150-KXX-4-SL	S3üf1/110/1000A/690V	F4H03	FWP-1000A	S7812
	ADV-73150-KXX-4-SL	S3üf1/110/1000A/690V	F4H03	FWP-1000A	S7812
1 MW	ADV-73551-KXX-4-MS 10	S3üf1/110/1000A/690V	F4H03	FWP-1000A	S7812
	ADV-73551-KXX-4-SL	S3üf1/110/1000A/690V	F4H03	FWP-1000A	S7812
	ADV-73551-KXX-4-SL	S3üf1/110/1000A/690V	F4H03	FWP-1000A	S7812

Note!

For size 7 only, adaptation for internal mounting of fuses (DC side) on request.

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

URZ (SIBA), FWP (Bussmann), S.. (Jean Müller).

10.1.3 Optional internal fuses for the DC connection (F2)

Sizes	F2 - External fuses for DC input side	
	EUROPE, AMERICA	
	Type	Code
71600	20 623 32.500 / 170M5160	S8B21BF
72000	20 623 32.630 / 170M5162	S8B22BF
72500	20 623 32.800 / 170M5164	S8B23BF
73150 - 73551	20 623 32.1000 / 170M5166	S8B24BF

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

170.. Bussmann (Square body)

20 ... Siba (SQB 3 DIN 110)

10.2 Choke

10.2.1 Optional input chokes (L1)



Caution

.....
A three-phase mains choke is mandatory for sizes of ≥ 160 kW.

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 Gefran.

In case of a Master and Slave connection (400 kW to 1 MW 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	Code	Dimensions (WxHxd, mm) and Weights
1007 ... 61320		HD / LD	Integrated on DC-link					
71600		HD	0.085	309	618	LR3-160	S7D40	300 x 270 x 260, 44kg
		LD	0.085	420	710	LR3-200	S7AE9	300 x 270 x 355, 54kg
72000		HD / LD	0.085	420	710	LR3-200	S7AE9	
72500		HD / LD	0.06	550	1050	LR3-315	S7D28	375 x 400 x 220, 74kg
73150		HD / LD	0.04	700	900	LR3-ADV-355	S7LR01	390 x 400 x 290, 83kg
73551		HD / LD	0.04	700	900	LR3-ADV-355	S7LR01	
400 kW	ADV-72000-KXX-4-MS 04	HD / LD	0.085	420	710	LR3-200	S7AE9	300 x 270 x 355, 54kg
	ADV-72000-XXX-4-SL		0.085	420	710	LR3-200	S7AE9	
500 kW	ADV-72500-KXX-4-MS 05	HD / LD	0.06	550	1050	LR3-315	S7D28	375 x 400 x 220, 74kg
	ADV-72500-XXX-4-SL		0.06	550	1050	LR3-315	S7D28	
630 kW	ADV-73150-KXX-4-MS 06	HD / LD	0.04	700	900	LR3-ADV-355	S7LR01	390 x 400 x 290, 83kg
	ADV-73150-XXX-4-SL		0.04	700	900	LR3-ADV-355	S7LR01	
710 kW	ADV-73551-KXX-4-MS 07	HD / LD	0.04	700	900	LR3-ADV-355	S7LR01	
	ADV-73551-XXX-4-SL		0.04	700	900	LR3-ADV-355	S7LR01	
900 kW	ADV-73150-KXX-4-MS 09	HD / LD	0.04	700	900	LR3-ADV-355	S7LR01	
	ADV-73150-XXX-4-SL		0.04	700	900	LR3-ADV-355	S7LR01	
	ADV-73150-XXX-4-SL		0.04	700	900	LR3-ADV-355	S7LR01	
1 MW	ADV-73551-KXX-4-MS 10	HD / LD	0.04	700	900	LR3-ADV-355	S7LR01	
	ADV-73551-XXX-4-SL		0.04	700	900	LR3-ADV-355	S7LR01	
	ADV-73551-XXX-4-SL		0.04	700	900	LR3-ADV-355	S7LR01	

10.2.2 Optional external choke (L2)



Attention

.....
 On 400 kW to 1 MW devices, 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 guarantee correct current sharing.

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

The ADV200 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 maintain 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 1007 ... 73551

Sizes	Inverter output	Mains inductance (mH)	Rated current (A)	Saturation current (A)	Type	Code	Dimensions (W x H x d, mm) and Weights
1007 ... 1040	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	
2055	HD	0.87	16	34	LU3-005	S7FG3	180 x 185 x 130 - 8 kg
	LD	0.51	27	57	LU3-011	S7FG4	
2075 - 2110	HD	0.51	27	57	LU3-011	S7FG4	180 x 185 x 140 - 7 kg
	LD	0.43	32	68	LU3-015	S7FH2	
3150	HD	0.43	32	68	LU3-015	S7FH2	180 x 185 x 160 - 8.2 kg
	LD	0.33	42	72	LU3-022	S7FH3	
3185	HD	0.33	42	72	LU3-022	S7FH3	180 x 185 x 170 - 10 kg
	LD	0.23	58	100	LU3-030	S7FH4	
3220	HD	0.23	58	100	LU3-030	S7FH4	180 x 185 x 170 - 10 kg
	LD	0.24	58	100	LU3-030	S7FH4	
4300	HD	0.24	58	100	LU3-030	S7FH4	240 x 216 x 170 - 16 kg
	LD	0.18	76	130	LU3-037	S7FH5	
4370	HD	0.18	76	130	LU3-037	S7FH5	180 x 165 x 195 - 15 kg
	LD	0.12	120	205	LU3-055	S7FH6	
4450	HD	0.12	120	205	LU3-090	S7F10	180 x 165 x 195 - 15 kg
	LD	0.07	180	310	LU3-090	S7F10	
5550 - 5750	HD / LD	0.07	180	310	LU3-090	S7F10	300 x 265 x 220 - 30 kg
5900	HD	0.07	180	310	LU3-090	S7F10	
		LD	0.041	310	540	LU3-160	S7FH8
61100 - 61320	HD / LD	0.041	310	540	LU3-160	S7FH8	300 x 270 x 230 - 33 kg
71600	HD	0.041	310	540	LU3-160	S7FH8	
		LD	0.03	400	770	LU3-200	S7AF0
72000	HD	0.03	400	770	LU3-200	S7AF0	370 x 400 x 210 - 65 kg
	LD	0.022	580	1100	LU3-315	S7FH9	
72500	HD / LD	0.022	580	1100	LU3-315	S7FH9	390 x 430 x 270 - 73 kg
73150	HD	0.022	580	1100	LU3-315	S7FH9	
73150	LD	0.015	730	1240	LU3-400	S7F08	
73551	HD / LD	0.015	730	1240	LU3-400	S7F08	

Note !

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 400 kW ... 1 MW

The use of output chokes is **mandatory** 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 Table 1) or Only Ferrites may be used (see Table 2) or single distributor chokes may be used (see Table 3);
- for applications with long motor cables (> 100 m long) output choke may be used (see Table 4);

Table 1: Busbars with integrated output chokes

Sizes	Busbar kit		Code
	Motor cable length distance ≤ 100 m		
	Heavy Duty	Light Duty	
400 kW	OUT-PW-KIT 2P		S72641
500 kW	OUT-PW-KIT 2P		S72641
630 kW	OUT-PW-KIT 2P		S72641
710 kW	OUT-PW-KIT 2P		S72641
900 kW	OUT-PW-KIT 3P		S726411
1 MW	OUT-PW-KIT 3P		S726411

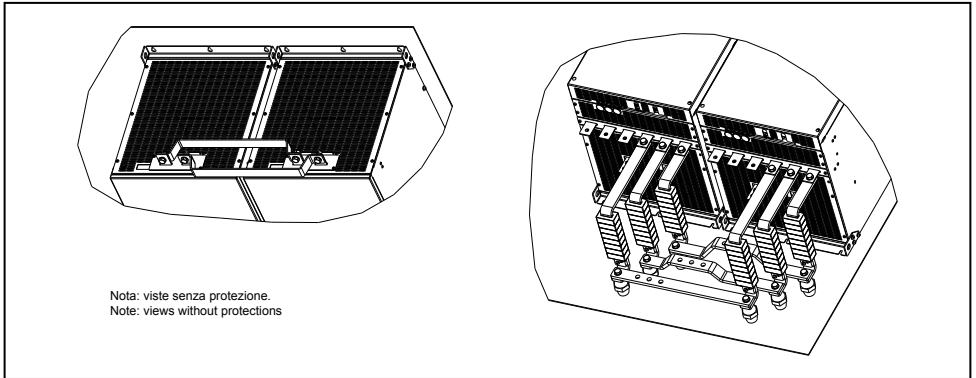


Figure 2.1: Busbar kit for sizes 400 ... 710 kW

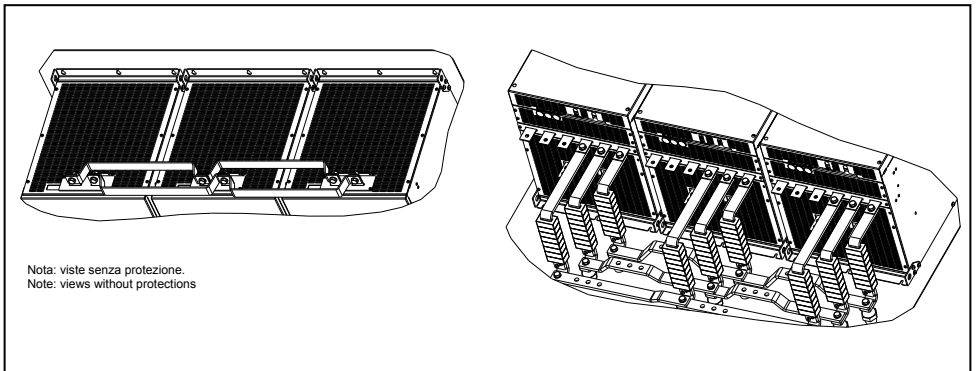


Figure 2.2: Busbar kit for sizes 900 kW - 1 MW

Table 2: Ferrites

Sizes	Inverter output	Motor cable length distance ≤ 100 m @400Vac ... 460Vac										
		Q.ty (*)	Type	Code	Dimensions (mm)							Weights
					A	B	D	E	F	G	R	kg
400 kW	SP / SL	48		S7DDV	33.5	57.2	22	10	11.5 min	35 min	1.5 max	0.2
500 kW	SP / SL	48										
630 kW	SP / SL	48										
710 kW	SP / SL	48										
900 kW	SP / SL	72										
1 MW	SP / SL	72										

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

Table 3: Current distributor output choke

Sizes		Inverter output	Motor cable length distance ≤ 100 m @400Vac ... 460Vac							
			Mains inductance (μH)	Rated current (A)	Saturation current (A)	Q.ty	Type	Code	Dimensions and Weights	
400 kW	ADV-72000-KXX-4-MS 04	HD / LD	7.5	450	675	1	LU3-500P S7FFI2	W = 280 mm H = 315 mm d = 155 mm		
	ADV-72000-XXX-4-SL					1				
500 kW	ADV-72500-KXX-4-MS 05	HD	7.5	450	675	1			LU3-500P S7FFI2	22 kg
	ADV-72500-XXX-4-SL					1				
500 kW	ADV-72500-KXX-4-MS 05	LD	7.5	450	675	1	LU3-800P S7FFI1	W = 280 mm H = 315 mm d = 155 mm		
	ADV-72500-XXX-4-SL					1				
630 kW	ADV-73150-KXX-4-MS 06	HD / LD	7.5	450	675	1			LU3-800P S7FFI1	28 kg
	ADV-73150-XXX-4-SL					1				
710 kW	ADV-73551-KXX-4-MS 07	HD / LD	5.0	730	975	1	LU3-800P S7FFI1	28 kg		
	ADV-73551-XXX-4-SL					1				
900 kW	ADV-73150-KXX-4-MS 09	HD / LD	5.0	730	975	1			LU3-800P S7FFI1	28 kg
	ADV-73150-XXX-4-SL					1				
1 MW	ADV-73150-XXX-4-SL	HD / LD	5.0	730	975	1	LU3-800P S7FFI1	28 kg		
	ADV-73551-KXX-4-MS 10					1				
1 MW	ADV-73551-KXX-4-MS 10	HD / LD	5.0	730	975	1			LU3-800P S7FFI1	28 kg
	ADV-73551-XXX-4-SL					1				
1 MW	ADV-73551-XXX-4-SL	HD / LD	5.0	730	975	1	LU3-800P S7FFI1	28 kg		
	ADV-73551-XXX-4-SL					1				

Table 4: output choke

Sizes		Inverter output	Motor cable length distance > 100 m @400Vac ... 460Vac			
			Q.ty	Type	Code	Dimensions and Weights
400 kW	ADV-72000-KXX-4-MS 04	HD	1	LU3-200	S7AF0	W x H x d: 300 x 270 x 230 mm 33 kg
	ADV-72000-KXX-4-SL		1			
400 kW	ADV-72000-KXX-4-MS 04	LD	1	LU3-315	S7FH9	W x H x d: 370 x 400 x 210 mm 65
	ADV-72000-KXX-4-SL		1			
500 kW	ADV-72500-KXX-4-MS 05	HD / LD	1	LU3-400	S7F08	W x H x d: 390 x 430 x 270 mm 73 kg
	ADV-72500-KXX-4-SL		1			
630 kW	ADV-73150-KXX-4-MS 06	HD / LD	1			
	ADV-73150-KXX-4-SL		1			
710 kW	ADV-73551-KXX-4-MS 07	HD / LD	1			
	ADV-73551-KXX-4-SL		1			
900 kW	ADV-73150-KXX-4-MS 09	HD / LD	1			
	ADV-73150-KXX-4-SL		1			
	ADV-73150-KXX-4-SL		1			
1 MW	ADV-73551-KXX-4-MS 10	HD / LD	1			
	ADV-73551-KXX-4-SL		1			
	ADV-73551-KXX-4-SL		1			

10.3 External EMC filter (optional)

ADV200 series inverters (except ADV200-...-DC models) are equipped with an internal EMI filter able to guarantee the performance levels required by EN 61800-3 standard (according to 2nd environment, category C3) with a maximum of 20 meters of shielded motor cable (up to 50 metres for size 5 and above).

Optional external filters for different installations are listed in the table below.

Note !

The filters indicated are for connection to networks "TT" and "TN".

In the case of supply of the inverter through IT networks, a series of special EMI filters are available.

Sizes	AC mains voltage 400V -15% ... 480V +10%					EN 61800-3 : Category / Environment / Motor cable length
	Heavy duty		Light duty			
	Type	Code	Type	Code		
1007	EMI FTF-480-7	S7GHL	EMI FTF-480-7	S7GHL	C2 / 1st / 30 m	
1015	EMI FTF-480-7	S7GHL	EMI FTF-480-7	S7GHL	C2 / 1st / 30 m	
1022	EMI FTF-480-7	S7GHL	EMI FTF-480-7	S7GHL	C2 / 1st / 30 m	
1030	EMI FTF-480-7	S7GHL	EMI FTF-480-16	S7GHO	C2 / 1st / 30 m	
1040	EMI FTF-480-16	S7GHO	EMI FTF-480-16	S7GHO	C2 / 1st / 30 m	
2055	EMI FTF-480-16	S7GHO	EMI FTF-480-16	S7GHO	C2 / 1st / 30 m	
2075	EMI FTF-480-16	S7GHO	EMI FTF-480-30	S7GHP	C2 / 1st / 30 m	
2110	EMI FTF-480-30	S7GHP	EMI FTF-480-30	S7GHP	C2 / 1st / 30 m	
3150	EMI FTF-480-30	S7GHP	EMI FTF-480-42	S7GOA	C2 / 1st / 30 m	
3185	EMI FTF-480-42	S7GOA	EMI FTF-480-55	S7GOB	C2 / 1st / 30 m	
3220	EMI FTF-480-55	S7GOB	EMI FTF-480-75	S7GOC	C2 / 1st / 30 m	
4300	EMI FTF-480-75	S7GOC	EMI FTF-480-75	S7GOC	C2 / 1st / 30 m	
4370	EMI FTF-480-75	S7GOC	EMI FTF-480-100	S7GOD	C2 / 1st / 30 m	
4450	EMI FTF-480-100	S7GOD	EMI FTF-480-130	S7GOE	C2 / 1st / 30 m	
5550	EMI FTF-480-130	S7GOE	EMI FTF-480-180	S7GOF	C3 / 2nd / 100 m	
5750	EMI FTF-480-180	S7GOF	EMI FTF-480-180	S7GOF	C3 / 2nd / 100 m	
5900	EMI FTF-480-180	S7GOF	EMI-480-250	S7DGG	C3 / 2nd / 100 m	
61100	EMI-480-250	S7DGG	EMI-480-250	S7DGG	C3 / 2nd / 100 m	
61320	EMI-480-250	S7DGG	EMI-480-320	S7DGH	C3 / 2nd / 100 m	
71600	EMI-480-400	S7DGI	EMI-480-400	S7DGI	C3 / 2nd / 100 m	
72000	EMI-480-400	S7DGI	EMI-480-600	S7DGL	C3 / 2nd / 100 m	
72500	EMI-480-600	S7DGL	EMI-480-600	S7DGL	C3 / 2nd / 100 m	
73150	EMI-480-600	S7DGL	EMI-480-800	S7DGM	C3 / 2nd / 100 m	
73551	EMI-480-800	S7DGM	EMI-480-800	S7DGM	C3 / 2nd / 100 m	

Sizes		AC mains voltage 400V -15% ... 480V +10%					EN 61800-3 : Category / Environment / Motor cable length
		Heavy duty		Light duty			
		Type	Code	Type	Code		
400 kW	ADV-72000-KXX-4-MS 04	EMI-480-400	S7DGI	EMI-480-600	S7DGL	C3 / 2nd / 100 m	
	ADV-72000-XXX-4-SL	EMI-480-400	S7DGI	EMI-480-600	S7DGL	C3 / 2nd / 100 m	
500 kW	ADV-72500-KXX-4-MS 05	EMI-480-600	S7DGL	EMI-480-600	S7DGL	C3 / 2nd / 100 m	
	ADV-72500-XXX-4-SL	EMI-480-600	S7DGL	EMI-480-600	S7DGL	C3 / 2nd / 100 m	
630 kW	ADV-73150-KXX-4-MS 06	EMI-480-800	S7DGM	EMI-480-800	S7DGM	C3 / 2nd / 100 m	
	ADV-73150-XXX-4-SL	EMI-480-800	S7DGM	EMI-480-800	S7DGM	C3 / 2nd / 100 m	

Sizes		AC mains voltage 400V -15% ... 480V +10%				
		Heavy duty		Light duty		EN 61800-3 : Category / Environment / Motor cable length
		Type	Code	Type	Code	
710 kW	ADV-73551-KXX-4-MS 07	EMI-480-800	S7DGM	EMI-480-800	S7DGM	C3 / 2nd / 100 m
	ADV-73551-XXX-4-SL	EMI-480-800	S7DGM	EMI-480-800	S7DGM	C3 / 2nd / 100 m
900 kW	ADV-73150-KXX-4-MS 09	EMI-480-800	S7DGM	EMI-480-800	S7DGM	C3 / 2nd / 100 m
	ADV-73150-XXX-4-SL	EMI-480-800	S7DGM	EMI-480-800	S7DGM	C3 / 2nd / 100 m
	ADV-73150-XXX-4-SL	EMI-480-800	S7DGM	EMI-480-800	S7DGM	C3 / 2nd / 100 m
1 MW	ADV-73551-KXX-4-MS 10	EMI-480-800	S7DGM	EMI-480-800	S7DGM	C3 / 2nd / 100 m
	ADV-73551-XXX-4-SL	EMI-480-800	S7DGM	EMI-480-800	S7DGM	C3 / 2nd / 100 m
	ADV-73551-XXX-4-SL	EMI-480-800	S7DGM	EMI-480-800	S7DGM	C3 / 2nd / 100 m

Sizes		AC mains voltage 400V -15% ... 480V +10%				
		Heavy duty		Light duty		EN 61800-3 : Category / Environment / Motor cable length
		Type	Code	Type	Code	
≥ 1007		ECF3	F4ZZ2	ECF3	F4ZZ2	C4 / 2nd / 100 m

Filters		Dimensions	Weights
Type	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-480-400	S7DGI	300 x 260 x 135	13,4
EMI-480-600	S7DGL	300 x 260 x 135	13,6
EMI-480-800	S7DGM	350 x 280 x 150	23

10.4 External filters to reduce grid harmonics (optional)

ADV200-RHF filters are used to reduce total harmonic distortion (current) on the power supply line.

The choice of filter depends on the rated characteristics of the motor, on its service conditions (LD or HD), and on the performance levels you want to achieve in terms of line THDi.

The tables in section 10.4.3 show the standard performance for each motor size as defined by motor tables in efficiency class IE2 – High Efficiency (according to standard).

Considering that filters are normally required in HVAC applications, the service use of the motor (and therefore of the inverter) is always Light Duty.

The following section shows the formula and an example of calculation of line current starting from motor data. Therefore, you can always select an appropriate filter for HD service as well.

On RHF-A and RHF-B series filters, input choke inductance is integrated in the filters. On RHF-AS and RHF-BS series filters, inductance is external and is supplied with these filters

Drive efficiency = 0.975

RHF efficiency = 0.99.

10.4.1 Choice of performance and calculation of current in RHF filters

Models

RHF -X XX-XXX-XX-XX -X

Version
Protection degree (IP)
Mains frequency
Grid
Filter rated current
A: THDi ≤ 10% with mains or DC choke (THDu ≤ 2%)
B: THDi ≤ 5% with mains or DC choke (THDu ≤ 2%)
Passive filter to reduce harmonics

RHF -XS XX-XXX-XX-XXX -X

Version
Fan voltage supply
Mains frequency
Grid
Filter rated current
AS: THDi ≤ 10% (THDu ≤ 2%) and supply of external input choke inductance L0
BS: THDi ≤ 5% (THDu ≤ 2%) and supply of external input choke inductance L0
Passive filter to reduce harmonics

Choice of performance

RHF-A		RHF-B	
Inverter without input choke inductance or DC	Inverter with input choke inductance or DC	Inverter without input choke inductance or DC	Inverter with input choke inductance or DC
< 16%	< 10%	< 10%	< 5%

Calculation of filter current

$$I_{\text{filter}} [A] = \frac{P_m}{U_{ln} * \sqrt{3} * \eta_f * \eta_l * \eta_m}$$

Example:

Rated motor power P_m	18.5 [kW]
Motor efficiency η_m	95%
Mains voltage U_{ln}	400 [V]
Mains frequency	50 [Hz]
Inverter efficiency η_l	98%
Passive filter efficiency η_f	99.0%
Filter current	29.0 [A]

The rated current of the chosen filter must be \geq the filter current calculated above:
RHF-A/B 29-400-50-20-A

10.4.2 Connection diagrams

Figure 10.4.1: RHF-A-... and RHF-B-... models

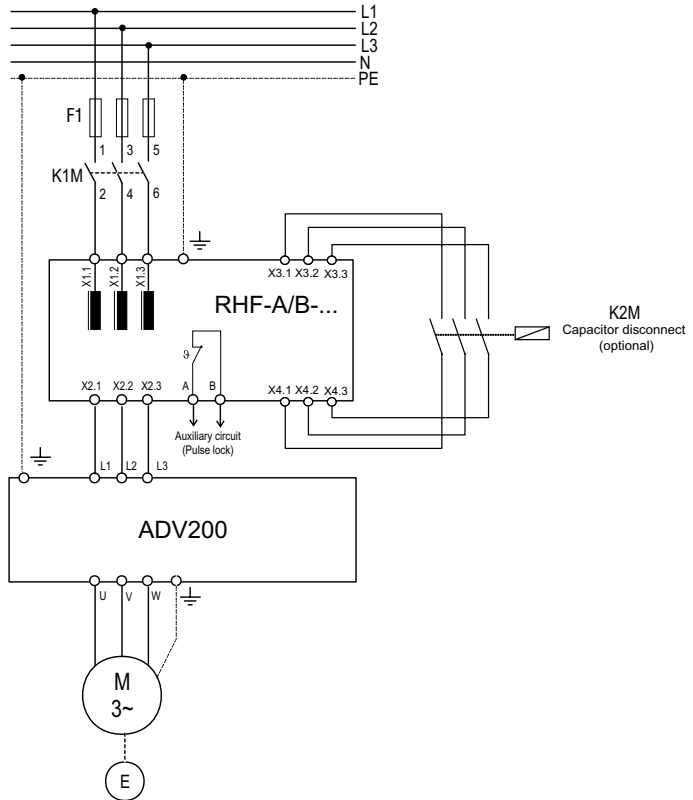


Figure 10.4.2: Parallel connection of RHF-A-... and RHF-B-... models

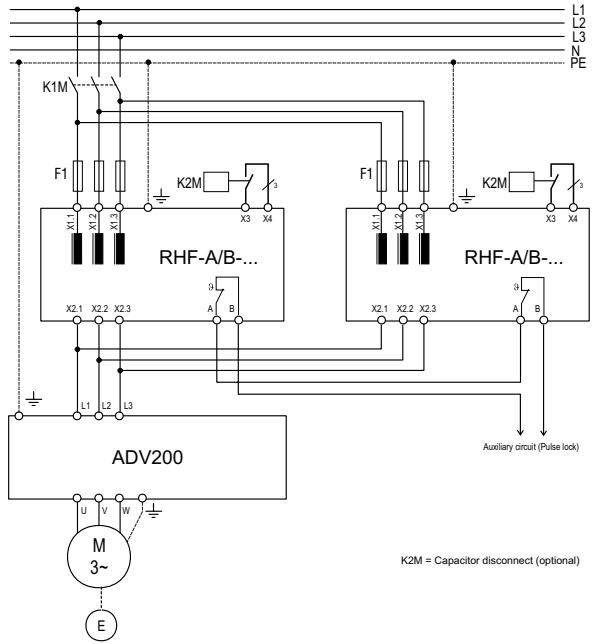
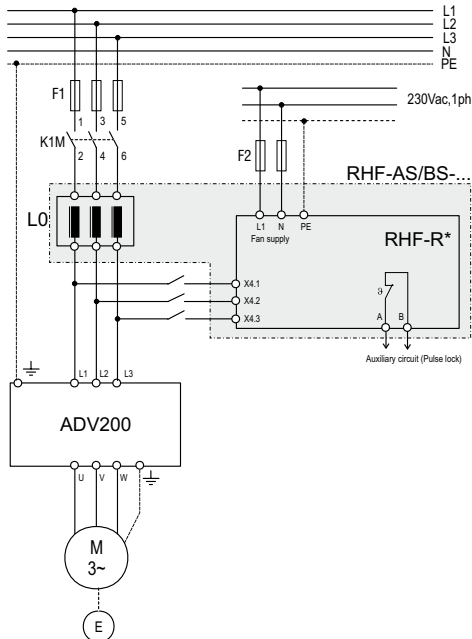


Figure 10.4.2: RHF-AS-... and RHF-BS-... models



10.4.3 Matching motors, RHF filters and ADV200 drives

Grid: 380V / 50Hz								
Motor Power 4 poles IE2	Motor Efficiency [%]	Drive Size	Drive Output: Light Duty			RHF Passive Filter		Line Input Current @ 380V [A]
			Rated Power [kW]	Rated Current [A]	Overload	Type (1)	Current [A]	
1.5	82.8	1007	1.5	4.3	(2)	RHF-A/B 6-400-50-20-A (3)	6	2.9
2.2	84.3	1015	2.2	5.8		RHF-A/B 6-400-50-20-A (3)	6	4.1
3	85.5	1022	3	7.6		RHF-A/B 6-400-50-20-A	6	5.5
4	86.6	1030	4	9.5		RHF-A/B 10-400-50-20-A	10	7.3
5.5	87.7	1040	5.5	13		RHF-A/B 10-400-50-20-A	10	9.9
7.5	88.7	2055	7.5	16.5		RHF-A/B 14-400-50-20-A	14	13.3
11	89.8	2075	11	23		RHF-A/B 22-400-50-20-A	22	19.3
15	90.6	2110	15	31		RHF-A/B 29-400-50-20-A	29	26.1
18.5	91.2	3150	18.5	38		RHF-A/B 35-400-50-20-A	35	31.9
22	91.6	3185	22	46		RHF-A/B 35-400-50-20-A	35	37.8
30	92.3	3220	30	62		RHF-A/B 58-400-50-20-A	58	51.2
37	92.7	4300	37	75		RHF-A/B 58-400-50-20-A	58	62.8
45	93.1	4370	45	87		RHF-A/B 72-400-50-20-A	72	76.1
55	93.5	4450	55	105		RHF-A/B 86-400-50-20-A	86	92.6
75	94	5550	75	150		RHF-A/B 144-400-50-20-A	144	125.6
90	94.2	5750	90	180		RHF-A/B 144-400-50-20-A	144	150.4
110	94.5	5900	110	210		RHF-A/B 180-400-50-20-A	180	183.2
132	94.7	61100	132	250		RHF-A/B 217-400-50-20-A	217	219.4
160	94.9	61320	160	300		RHF-A/B 252-400-50-20-A	252	265.4
200	95.1	71600	200	385		RHF-A/B 325-400-50-20-A	325	331.0
250	95.1	72000	250	460		RHF-A/B 433-400-50-20-A	433	413.8
315	95.1	72500	315	590		RHF-AS/BS 480-400-50-230-A	480	521.4
355	95.1	73150	355	650		RHF-AS/BS 550-400-50-230-A	550	587.6
400	95.5	73551	400	730		RHF-AS/BS 650-400-50-230-A	650	659.3
500	95.8	400 kW	500	870		RHF-AS/BS 850-400-50-230-A	850	821.5
630	96	500 kW	630	1120		RHF-AS/BS 980-400-50-230-A	980	1033.0
710	96.5	630 kW	710	1230		RHF-AS/BS 1090-400-50-230-A	1090	1158.1
800	96.7	710 kW	800	1380		RHF-AS/BS 1200-400-50-230-A	1200	1302.2
1000	96.7	900 kW	1000	1800		On request		
1200	96.7	1 MW	1200	2050		On request		
1500	96.7	1.35 MW	1650	2540		On request		
1800	96.7	1.65 MW	1800	3100	On request			

(1) RHF-A/B: RHF-A Models ... or RHF-B-..., RHF-AS/BS: RHF-AS Models ... or RHF-BS-...; see section 10.4.1.

(2) Overload 110% the Rated Current for 60s every 300s

(3) Reduced THDi performance due to part load

Grid: 400 - 415V / 50Hz								
Motor Power 4 poles IE2	Motor Efficiency [%]	Drive Size	Drive Output: Light Duty			RHF Passive Filter		Line Input Current @ 400V [A]
			Rated Power [kW]	Rated Current [A]	Overload	Type (1)	Current [A]	
1,5	82,8	1007	1,5	4,3	(2)	RHF-A/B 6-400-50-20-A (3)	6	2,7
2,2	84,3	1015	2,2	5,8		RHF-A/B 6-400-50-20-A (3)	6	3,9
3	85,5	1022	3	7,6		RHF-A/B 6-400-50-20-A	6	5,2
4	86,6	1030	4	9,5		RHF-A/B 10-400-50-20-A	10	6,9
5,5	87,7	1040	5,5	13		RHF-A/B 10-400-50-20-A	10	9,4
7,5	88,7	2055	7,5	16,5		RHF-A/B 14-400-50-20-A	14	12,6
11	89,8	2075	11	23		RHF-A/B 22-400-50-20-A	22	18,3
15	90,6	2110	15	31		RHF-A/B 29-400-50-20-A	29	24,8

Grid: 400 - 415V / 50Hz								
Motor Power 4 poles IE2	Motor Efficiency [%]	Drive Size	Drive Output: <u>Light Duty</u>			RHF Passive Filter		Line Input Current @ 400V [A]
			Rated Power [kW]	Rated Current [A]	Overload	Type (1)	Current [A]	
18,5	91,2	3150	18,5	38	(2)	RHF-A/B 29-400-50-20-A	29	30,3
22	91,6	3185	22	46		RHF-A/B 35-400-50-20-A	35	35,9
30	92,3	3220	30	62		RHF-A/B 43-400-50-20-A	43	48,6
37	92,7	4300	37	75		RHF-A/B 58-400-50-20-A	58	59,7
45	93,1	4370	45	87		RHF-A/B 72-400-50-20-A	72	72,3
55	93,5	4450	55	105		RHF-A/B 86-400-50-20-A	86	88,0
75	94	5550	75	150		RHF-A/B 144-400-50-20-A	144	119,3
90	94,2	5750	90	180		RHF-A/B 144-400-50-20-A	144	142,9
110	94,5	5900	110	210		RHF-A/B 180-400-50-20-A	180	174,1
132	94,7	61100	132	250		RHF-A/B 217-400-50-20-A	217	208,4
160	94,9	61320	160	300		RHF-A/B 252-400-50-20-A	252	252,1
200	95,1	71600	200	385		RHF-A/B 325-400-50-20-A	325	314,5
250	95,1	72000	250	460		RHF-A/B 380-400-50-20-A	380	393,1
315	95,1	72500	315	590		RHF-AS/BS 480-400-50-230-A	480	495,3
355	95,1	73150	355	650		RHF-AS/BS 550-400-50-230-A	550	558,2
400	95,5	73551	400	730		RHF-AS/BS 600-400-50-230-A	600	626,3
500	95,8	400 kW	500	870		RHF-AS/BS 750-400-50-230-A	750	780,4
630	96	500 kW	630	1120		RHF-AS/BS 980-400-50-230-A	980	981,3
710	96,5	630 kW	710	1230		RHF-AS/BS 1090-400-50-230-A	1090	1100,2
800	96,7	710 kW	800	1380		RHF-AS/BS 1200-400-50-230-A	1200	1237,1
1000	96,7	900 kW	1000	1800		On request		
1200	96,7	1 MW	1200	2050		On request		
1500	96,7	1,35 MW	1650	2540		On request		
1800	96,7	1,65 MW	1800	3100		On request		

(1) RHF-A/B: RHF-A Models ... or RHF-B-..., RHF-AS/BS: RHF-AS Models ... or RHF-BS-..., see section 10.4.1.

(2) Overload 110% the Rated Current for 60s every 300s

(3) Reduced THDI performance due to part load

Grid: 380V / 60Hz								
Motor Power 4 poles IE2	Motor Efficiency [%]	Drive Size	Drive Output: <u>Light Duty</u>			RHF Passive Filter		Line Input Current @ 380V [A]
			Rated Power [kW]	Rated Current [A]	Overload	Type (1)	Current [A]	
1.5	82.8	1007	1.5	4.3	(2)	RHF-A/B 10-380-60-20-A (3)	10.0	2.9
2.2	84.3	1015	2.2	5.8		RHF-A/B 10-380-60-20-A (3)	10.0	4.1
3	85.5	1022	3	7.6		RHF-A/B 10-380-60-20-A (3)	10.0	5.5
4	86.6	1030	4	9.5		RHF-A/B 10-380-60-20-A	10.0	7.3
5.5	87.7	1040	5.5	13		RHF-A/B 10-380-60-20-A	10.0	9.9
7.5	88.7	2055	7.5	16.5		RHF-A/B 14-380-60-20-A	14.0	13.3
11	89.8	2075	11	23		RHF-A/B 22-380-60-20-A	22.0	19.3
15	90.6	2110	15	31		RHF-A/B 29-380-60-20-A	29.0	26.1
18.5	91.2	3150	18.5	38		RHF-A/B 35-380-60-20-A	35.0	31.9
22	91.6	3185	22	46		RHF-A/B 35-380-60-20-A	35.0	37.8
30	92.3	3220	30	62		RHF-A/B 58-380-60-20-A	58.0	51.2
37	92.7	4300	37	75		RHF-A/B 58-380-60-20-A	58.0	62.8
45	93.1	4370	45	87		RHF-A/B 72-380-60-20-A	72.0	76.1
55	93.5	4450	55	105		RHF-A/B 86-380-60-20-A	86.0	92.6
75	94	5550	75	150		RHF-A/B 144-380-60-20-A	144.0	125.6
90	94.2	5750	90	180		RHF-A/B 144-380-60-20-A	144.0	150.4
110	94.5	5900	110	210		RHF-A/B 180-380-60-20-A	180.0	183.2

Grid: 380V / 60Hz								
Motor Power 4 poles IE2	Motor Efficiency [%]	Drive Size	Drive Output: <u>Light Duty</u>			RHF Passive Filter		Line Input Current @ 380V [A]
			Rated Power [kW]	Rated Current [A]	Overload	Type (1)	Current [A]	
132	94.7	61100	132	250	(2)	RHF-A/B 217-380-60-20-A	217.0	219.4
160	94.9	61320	160	300		RHF-A/B 252-380-60-20-A	252.0	265.4
200	95.1	71600	200	385		RHF-A/B 325-380-60-20-A	325.0	331.0
250	95.1	72000	250	460		RHF-A/B 433-380-60-20-A	433.0	413.8
315	95.1	72500	315	590		2 x RHF-A/B 252-380-60-20-A	504.0	521.4
355	95.1	73150	355	650		2 x RHF-A/B 304-380-60-20-A	608.0	587.6
400	95.5	73551	400	730		2 x RHF-A/B 325-380-60-20-A	650.0	659.3
500	95.8	400 kW	500	870		2 x RHF-A/B 380-380-60-20-A	760.0	821.5
630	96	500 kW	630	1120		On request	975.0	1033.0
710	96.5	630 kW	710	1230		On request	1140.0	1158.1
800	96.7	710 kW	800	1380		On request	1299.0	1302.2
1000	96.7	900 kW	1000	1800		On request	1520.0	1627.8
1200	96.7	1 MW	1200	2050		On request	2165.0	1953.3
1500	96.7	1.35 MW	1650	2540		On request	2598.0	2441.6
1800	96.7	1.65 MW	1800	3100		On request	3031.0	2930.0

(1) RHF-A/B: RHF-A Models ... or RHF-B-..., RHF-AS/BS: RHF-AS Models ... or RHF-BS-...; see section 10.4.1.

(2) Overload 110% the Rated Current for 60s every 300s

(3) Reduced THDi performance due to part load

Grid: 460V / 60Hz - Motor voltage: 460V								
Motor Power 4 poles IE2	Motor Efficiency [%]	Drive Size	Drive Output: <u>Light Duty</u>			RHF Passive Filter		Line Input Current @ 380V [A]
			Rated Power [kW]	Rated Current [A]	Overload	Type (1)	Current [A]	
1.5	82.8	1007	1.5	3.9	(2)	RHF-A/B 6-460-60-20-A (3)	6.0	2.4
2.2	84.3	1015	2.2	5.2		RHF-A/B 6-460-60-20-A (3)	6.0	3.4
3	85.5	1022	3	6.8		RHF-A/B 6-460-60-20-A	6.0	4.6
4	86.6	1030	4	8.6		RHF-A/B 6-460-60-20-A	6.0	6.0
5.5	87.7	1040	5.5	11.7		RHF-A/B 10-460-60-20-A	10.0	8.2
7.5	88.7	2055	7.5	14.9		RHF-A/B 14-460-60-20-A	14.0	11.0
11	89.8	2075	11	20.7		RHF-A/B 19-460-60-20-A	19.0	15.9
15	90.6	2110	15	27.9		RHF-A/B 25-460-60-20-A	25.0	21.5
18.5	91.2	3150	18.5	34.2		RHF-A/B 31-460-60-20-A	31.0	26.4
22	91.6	3185	22	41.4		RHF-A/B 31-460-60-20-A	31.0	31.2
30	92.3	3220	30	55.8		RHF-A/B 48-460-60-20-A	48.0	42.3
37	92.7	4300	37	67.5		RHF-A/B 60-460-60-20-A	60.0	51.9
45	93.1	4370	45	78.3		RHF-A/B 73-460-60-20-A	73.0	62.8
55	93.5	4450	55	94.5		RHF-A/B 86-460-60-20-A	86.0	76.5
75	94	5550	75	135		RHF-A/B 118-460-60-20-A	118.0	103.7
90	94.2	5750	90	162		RHF-A/B 154-460-60-20-A	154.0	124.2
110	94.5	5900	110	189		RHF-A/B 154-460-60-20-A	154.0	151.4
132	94.7	61100	132	225		RHF-A/B 183-460-60-20-A	183.0	181.2
160	94.9	61320	160	270		RHF-A/B 231-460-60-20-A	231.0	219.2
200	95.1	71600	200	347		RHF-A/B 291-460-60-20-A	291.0	273.5
250	95.1	72000	250	414		RHF-A/B 355-460-60-20-A	355.0	341.8
315	95.1	72500	315	531		RHF-A/B 436-460-60-20-A	436.0	430.7
355	95.1	73150	355	585		2 x RHF-A/B 291-460-60-20-A	582.0	485.4
400	95.5	73551	400	657		2 x RHF-A/B 291-460-60-20-A	582.0	544.6
500	95.8	400 kW	500	783		2 x RHF-A/B 355-460-60-20-A	710.0	678.7
630	96	500 kW	630	1008		2 x RHF-A/B 436-460-60-20-A	872.0	853.3

Grid: 460V / 60Hz - Motor voltage: 460V

Motor Power 4 poles IE2	Motor Efficiency [%]	Drive Size	Drive Output: <u>Light Duty</u>			RHF Passive Filter		Line Input Current @ 380V [A]
			Rated Power [kW]	Rated Current [A]	Overload	Type (1)	Current [A]	
710	96.5	630 kW	710	1107	(2)	On request		
800	96.7	710 kW	800	1242		On request		
1000	96.7	900 kW	1000	1620		On request		
1200	96.7	1 MW	1200	1845		On request		
1500	96.7	1.35 MW	1650	2286		On request		
1800	96.7	1.65 MW	1800	2790		On request		

(1) RHF-A/B: RHF-A Models ... or RHF-B-..., RHF-AS/BS: RHF-AS Models ... or RHF-BS-...; see section 10.4.1.

(2) Overload 110% the Rated Current for 60s every 300s

(3) Reduced THDi performance due to part load

10.4.4 Dimensions and weights of RHF filters

RHF Passive Filter (4)	Q.ty * Frame	Dimensions: H * W * d (mm)	Weight (kg)
RHF-A/B 6-400-50-20-A			
RHF-A/B 10-400-50-20-A	X1	347 * 190 * 206	18
RHF-A/B 14-400-50-20-A	X2	451 * 232 * 248	20
RHF-A/B 22-400-50-20-A	X2	451 * 232 * 248	30
RHF-A/B 29-400-50-20-A	X3	605 * 378 * 242	52
RHF-A/B 35-400-50-20-A	X3	605 * 378 * 242	53
RHF-A/B 43-400-50-20-A	X3	605 * 378 * 242	58
RHF-A/B 58-400-50-20-A	X4	634 * 378 * 333	76
RHF-A/B 72-400-50-20-A	X4	634 * 378 * 333	98
RHF-A/B 86-400-50-20-A	X5	747 * 418 * 333	104
RHF-A/B 144-400-50-20-A	X6	778 * 418 * 400	126
RHF-A/B 180-400-50-20-A	X6	778 * 418 * 400	135
RHF-A/B 217-400-50-20-A	X7	911 * 468 * 449	172
RHF-A 252-400-50-20-A	X7	911 * 468 * 449	136
RHF-B 252-400-50-20-A	X7	911 * 468 * 449	206
RHF-A 325-400-50-20-A	X7	911 * 468 * 449	147
RHF-B 325-400-50-20-A	X8	911 * 468 * 540	230
RHF-A 380-400-50-20-A	X7	911 * 468 * 449	172
RHF-B 380-400-50-20-A	X8	911 * 468 * 540	265
RHF-A 433-400-50-20-A	X8	911 * 468 * 540	205
RHF-B 433-400-50-20-A	X8	911 * 468 * 540	272
RHF-AS/BS 480-400-50-230-A	X38	951 * 211 * 431	
RHF-AS/BS 550-400-50-230-A	X38B	951 * 307 * 444,5	
RHF-AS/BS 600-400-50-230-A	2 * X38	951 * 211 * 431	
RHF-AS/BS 650-400-50-230-A	2 * X38	951 * 211 * 431	
RHF-AS/BS 750-400-50-230-A	2 * X38	951 * 211 * 431	
RHF-AS/BS 850-400-50-230-A	2 * X38B	951 * 307 * 444,5	
RHF-AS/BS 980-400-50-230-A	2 * X38B	951 * 307 * 444,5	
RHF-AS/BS 1090-400-50-230-A	2 * X38B	951 * 307 * 444,5	
RHF-AS/BS 1200-400-50-230-A	3 * X38B	951 * 307 * 444,5	

(4) RHF-A/B: RHF-A Models ... or RHF-B-..., RHF-AS/BS: RHF-AS Models ... or RHF-BS-...

10.4.5 Dimensions and weights of L0-RHF chokes

L0-RHF-AS/BS mais chokes are included in delivery of the RHF-AS/BS module filters series (RHF-AS/BS = L0 RHF-AS/BS choke + n filters RHF-R).

L0 RHF-AS/BS External choke	Dimensions: W * H * d (mm)	Weight (kg)
L0-RHF-AS 480-400-50-230-A	420 * 370 * 325	
L0-RHF-AS 550-400-50-230-A	420 * 370 * 340	
L0-RHF-AS 600-400-50-230-A	420 * 370 * 370	
L0-RHF-AS 650-400-50-230-A	420 * 370 * 370	
L0-RHF-AS 750-400-50-230-A	480 * 420 * 370	
L0-RHF-AS 850-400-50-230-A	480 * 420 * 385	
L0-RHF-AS 980-400-50-230-A	480 * 420 * 400	
L0-RHF-AS 1090-400-50-230-A	480 * 520 * 420	
L0-RHF-AS 1200-400-50-230-A	480 * 520 * 420	
L0-RHF-BS 480-400-50-230-A	510 * 500 * 400	
L0-RHF-BS 550-400-50-230-A	510 * 540 * 400	
L0-RHF-BS 600-400-50-230-A	570 * 620 * 360	
L0-RHF-BS 650-400-50-230-A	600 * 620 * 370	
L0-RHF-BS 750-400-50-230-A	600 * 620 * 385	
L0-RHF-BS 850-400-50-230-A	600 * 620 * 400	
L0-RHF-BS 980-400-50-230-A	600 * 620 * 420	
L0-RHF-BS 1090-400-50-230-A	600 * 640 * 440	
L0-RHF-BS 1200-400-50-230-A	600 * 640 * 460	

10.5 Braking resistor (optional)

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

Sizes	List and technical data of standard external resistors						
	Resistor type	Code	Max Overload energy, 1"- duty-cycle 10% EBR (kJ)	Max Overload energy, 30"- duty-cycle 25% EBR (kJ)	Braking resistor nominal power P _{NBR} (W)	Resistance value R _{BR} (Ω)	Enclosure
1007	RF 220 T 100R	S8TOCE	1.5	11	220	100	IP44
1015	RF 220 T 100R	S8TOCE	1.5	11	220	100	IP44
1022	RF 300 DT 100R	S8TOCB	2.5	19	300	100	IP44
1030	RF 300 DT 100R	S8TOCB	2.5	19	300	100	IP44
1040	RFPD 750 DT 100R	S8SY4	7.5	38	750	100	IP44
2055	RFPD 750 DT 68R	S8TOCD	7.5	38	750	68	IP44
2075	RFPD 900 DT 68R	S8SY5	9	48	900	68	IP44
2110	RFPD 1100 DT 40R	S8SY6	11	58	1100	40	IP44
3150	RFPR 1900 D 28R	S8SZ5	19	75	1500	28	IP44
3185	BRT4K0-15R4	S8T00G	40	150	4000	15.4	IP20
3220	BRT4K0-15R4	S8T00G	40	150	4000	15.4	IP20
4300	BRT4K0-11R6	S8T00H	40	150	4000	11.6	IP20
4370	BRT4K0-11R6	S8T00H	40	150	4000	11.6	IP20
4450	BRT8K0-7R7	S8T00I	40	150	8000	7.7	IP20
5550	BRT8K0-7R7	S8T00I	40	150	8000	7.7	IP20
≥ 5750 and ADV200-...-DC	External braking unit (BUy series, optional)						

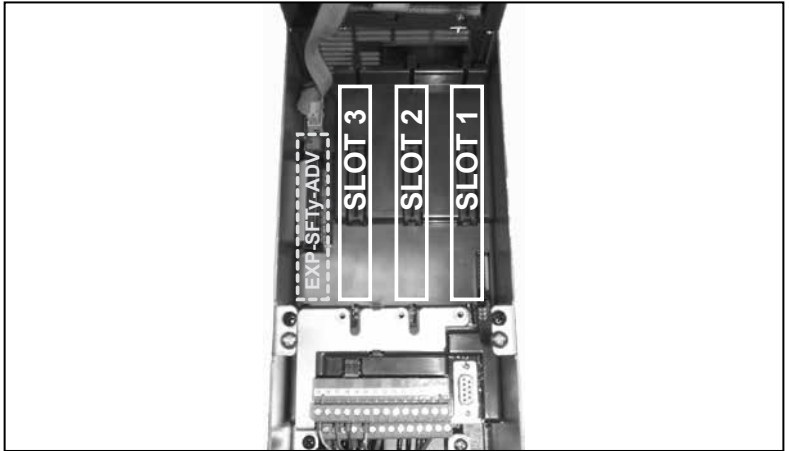
Resistor type	Code	Dimensions (Wx H x d) - mm	Weights (kg)
RF 220 T 100R	S8TOCE	300 x 27 x 36	0,5
RF 300 DT 100R	S8TOCB	260 x 47 x 108	1,4
RFPD 750 DT 100R	S8SY4	200 x 70 x 106	1,7
RFPD 750 DT 68R	S8TOCD	200 x 70 x 106	1,7
RFPD 900 DT 68R	S8SY5	260 x 70 x 106	2,2
RFPD 1100 DT 40R	S8SY6	320 x 70 x 106	2,7
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



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.

10.6 Installation of optional cards



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

- **Slot 1** ⁽¹⁾: dedicated to IO cards (EXP-IO-...-ADV , EXP-FL-XCAN-ADV)
- **Slot 2**: dedicated to Encoder cards (EXP-...-ADV) and I/O cards ⁽²⁾.
- **Slot 3** ⁽¹⁾: dedicated to field Bus cards (EXP-PDP-ADV, EXP-CAN-ADV, etc.) and I/O cards ⁽²⁾.

Note!

||||| (1) If managing 2 or 3 encoders, these slots can also be used for the encoder cards or the EXP-RES-... resolver card, see section 10.5.1 for further details.

(2) On all of the slots on the control card, you can connect the three I/O expansion cards (*) dedicated to the analog/digital I/O and to reading of temperature sensors PT100 / PT1000 / NI1000 / PTC / KTY84.

(*) EXP-IO-SENS-100-ADV card (recognized as I/O 8 at slot level), EXP-IO-SENS-1000-ADV card (recognized as I/O 6 at slot level), and EXP-IO-D5R8-ADV card (recognized as I/O 7 at slot level).

EXP- SFTy-ADV card (models ADV-...SI): Integrated on board as the 4th option or integrated in the INT-P-ADV power card (sizes \geq 71600 and "L" HW version and above).

|||||



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.

|||||

10.6.1 SLOT / Encoder Card Management



Attention

Note !

Configurations other than those described below are not allowed.

Encoder 1 = Encoder menu, parameters 21XX.
 Encoder 2 = Encoder menu, parameters 51XX.
 Encoder 3 = Encoder menu, parameters 52XX.

1 encoder managed (one optional card)

Optional Card		SLOT	Software recognition
EXP-DE-I1R1F2-ADV	Incremental Digital Encoder (DE)	2	Encoder 1
EXP-RES-I1R1-ADV	Resolver	(o slot 1/3)	(Encoder 2)
EXP-SE-I1R1F2-ADV	Incremental Sinusoidal Encoder (SE)	2 (o slot 3) (1)	Encoder 1 (Encoder 2) (1)
EXP-SESC-I1R1F2-ADV	Incremental Sinusoidal Encoder + SinCos Absolute (SESC)		
EXP-EN/SSI-I1R1F2-ADV	Incremental Sinusoidal Encoder + Endat Absolute + SSI (SE-EnDat/SSI)		
EXP-HIP-I1R1F2-ADV	Incremental Sinusoidal Encoder + Hiperface Absolute (SE-Hiperface)		
EXP-ASC-I1-ADV	Incremental SinCos Absolute Encoder		

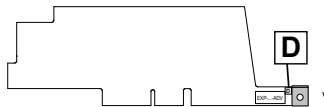
2 encoders managed (one optional card)

Optional Card		SLOT	Software recognition
EXP-DE-I2R1F2-ADV	Double Incremental Digital Encoder (2 x DE)	2	Encoder 1 / Encoder 2
		1 (or 3)	Encoder 2 / Encoder 3

2 encoders managed (two optional cards)

Optional Card	SLOT	Software recognition		Optional Card	SLOT	Software recognition
EXP-DE-I1R1F2-ADV	2	Encoder 1	+	EXP-DE-I1R1F2-ADV	1 (or slot 3)	Encoder 2
EXP-SE-I1R1F2-ADV				EXP-SE-I1R1F2-ADV (1)		
EXP-SESC-I1R1F2-ADV				EXP-SESC-I1R1F2-ADV (1)		
EXP-EN/SSI-I1R1F2-ADV				EXP-EN/SSI-I1R1F2-ADV (1)		
EXP-HIP-I1R1F2-ADV				EXP-HIP-I1R1F2-ADV (1)		
EXP-ASC-I1-ADV				EXP-ASC-I1-ADV (1)		
EXP-RES-I1R1-ADV (2)				EXP-RES-I1R1-ADV (2)		

(1) configuration possible only with optional board revision "D" or higher.



(2) two RESOLVER boards cannot be used.

3 encoders managed (two optional cards)

Optional Card	SLOT	Software recognition
EXP-DE-I1R1F2-ADV	2	Encoder 1
EXP-SE-I1R1F2-ADV		
EXP-SESC-I1R1F2-ADV		
EXP-EN/SSI-I1R1F2-ADV		
EXP-HIP-I1R1F2-ADV		
EXP-ASC-I1-ADV		
EXP-RES-I1R1-ADV		

+

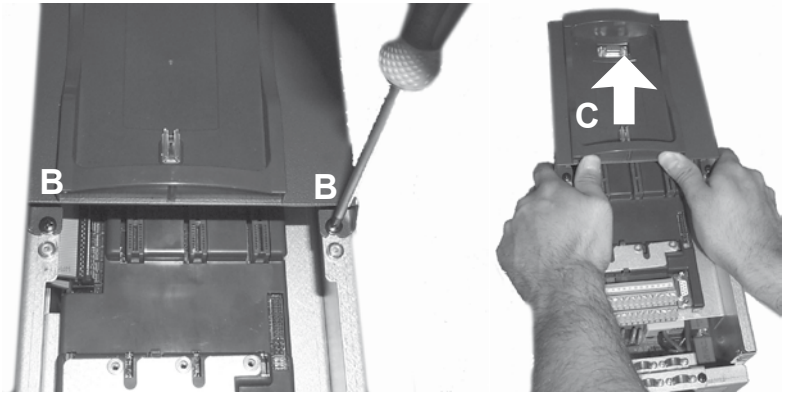
Optional Card	SLOT	Software recognition
EXP-DE-I2R1F2-ADV	1 (o slot 3)	Encoder 2 / Encoder 3

3-encoder managed (three optional cards)

Prohibited combination.

10.6.2 Procedure

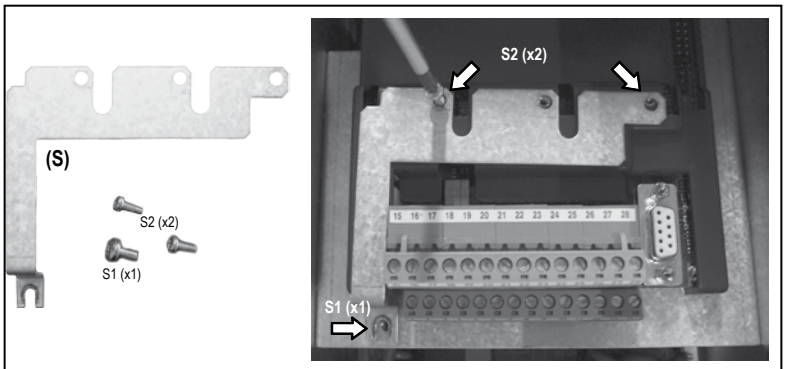
1. Remove the bottom cover as indicated in [paragraph 5.2.1](#).



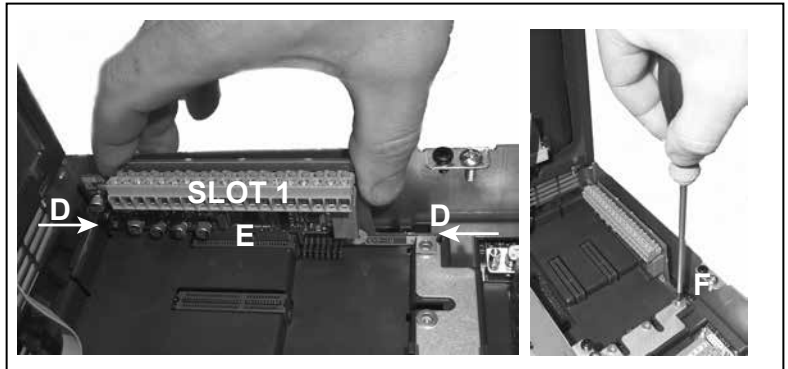
2. To remove the top cover, loosen screws B by about 2 turns and slide out cover C as shown in the figure.



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.

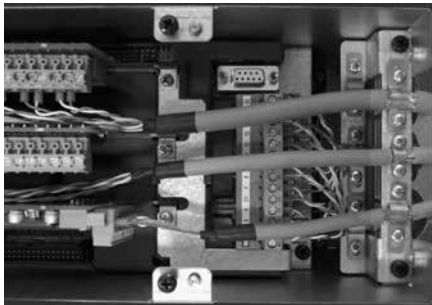


4. Position and fasten the metallic shield (S), provided with the optional card, with the screws S1 and S2 (x1) as shown in the figure.



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.

10.6.3 Shielding of optional card connections



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



10.7 Wiring connection using SBM motor series

Drive/Feedback connections

Following paragraphs specify the connection between the drive ADV200 and sensors feedback installed on SBM standard series synchronous motors.

10.7.1 Resolver wiring (RES)

Following table shows the connections needed using Resolver sensor mounted on SBM5, SBM7, SBM8, SBM9 Gefran series motor:

Resolver		
19poles SBM motor connector SBM5, SBM7, SBM8, SBM9		EXP-RES-11R1-ADV board
A		
B (SHIELD)		Drive side
C	resolver cos+ channel	23
D	resolver cos- channel	24
E	resolver sin - channel	22
F	resolver sin+ channel	21
G		
H		
J		
K		
L		
M		
N		
P		
R		
S (KLIXON)	Klixon contact	Note 1
T (KLIXON)	Klixon contact	Note 1
U	Excitation resolver +	25
V	Excitation resolver -	26

Resolver		
10poles SBM3 motor connector		EXP-RES-11R1-ADV board
A		
B (SHIELD)		Drive side
C	resolver cos+ channel	23
D	resolver cos- channel	24
E	resolver sin - channel	22
F	resolver sin+ channel	21
G	Excitation resolver +	
H	Excitation resolver -	26
J (KLIXON)	Klixon contact	Note 1
K (KLIXON)	Klixon contact	Note 1

- For resolver cable use twisted pair shielded cable; the pairs should be the signal wires cos+/cos-,sin+/sin-, exc+/exc-, motor temperature sensor wires. All the shields must be connected together to cable shield pin of resolver connector on the motor side and on drive side.

Note 1 : "Klicson" Motor thermal contact can be connected to a digital input of the drive programmed as alarm Motor Overtemperature, [12] Motor OT.

Menu: 24 - ALARM CONFIG			
IPA	Description	Note	Default
4520	Motor OT src	Digital input selection	Zero
4522	Motor OT activity	Alarm type selection	Fast Stop
4528	Motor OT holdoff	Digital filter setting	1000ms

10.7.2 Sinusoidal Encoder SinCos wiring (SESC)

Following table shows the connections needed using SinCos encoder mounted on SBM5, SBM7, SBM8, SBM9 Gefran series motor (it cannot be applied those type of encoder with SBM3):

SinCos		
19poles SBM motor connector SBM5, SBM7, SBM8, SBM9		
A	Ref encoder power supply 0VDC	C5
B (SHIELD)	cable shield	Drive side
C	Absolute Cos+ channel	29
D	Absolute Cos- channel	30
E	Absolute Sin- channel	28
F	Absolute Sin+ channel	27
G		
H	Sinusoidal incremental B+ channel	23
J	Sinusoidal incremental B- channel	24
K	Sinusoidal incremental A- channel	22
L	Sinusoidal incremental A+ channel	21
M	Zero pulse Z+ channel	25
N	Zero pulse Z- channel	26
P	Power supply encoder +5VDC	S5
R		
S (KLIXON)	Klixon contact	Note 1
T (KLIXON)	Klixon contact	Note 1
U		
V		

- For encoder cable use twisted pair shielded cable; the pairs should be the signal wires A+/A-, B+/B-, Z+/Z-, .cos+/cos-, sin+/sin-, motor temperature sensor wires, encoder supply wires. All the shields must be connected together to cable shield pin of encoder connector on the motor side and on drive side.

Note 1 : "Klixon" Motor thermal contact can be connected to a digital input of the drive programmed as alarm Motor Overtemperature, [12] Motor OT.

Menu: 24 - ALARM CONFIG			
IPA	Description	Note	Default
4520	Motor OT src	Digital input selection	Zero
4522	Motor OT activity	Alarm type selection	Fast Stop
4528	Motor OT holdoff	Digital filter setting	1000ms

Power Connector

SBM MOTOR	DRIVE SIDE
A	U
B	V
C	W
D	GND
(E)	(BRAKE +24V)
(F)	(BRAKE 0V)

Appendix 1 - Parallel connection (400 kW ... 1 MW sizes)

A 1.1 Introduction

To obtain a drive of more than 355 kW connect a number of single units of between 200 kW and 355 kW in parallel.

A parallel connection of several drives basically consists of one MASTER unit and one or more SLAVE units.

Power	code	Description (Designation)
400kW	S9O25M	ADV-72000-KXX-4-MS 04 -SI
	S9O25S	ADV-72000-XXX-4-SL
500kW	S9O26M	ADV-72500-KXX-4-MS 05 -SI
	S9O26S	ADV-72500-XXX-4-SL
630kW	S9O27M	ADV-73150-KXX-4-MS 06 -SI
	S9O27S	ADV-73150-XXX-4-SL
710kW	S9O32M	ADV-73551-KXX-4-MS 07 -SI
	S9O32S	ADV-73551-XXX-4-SL
900kW	S9O27M1	ADV-73150-KXX-4-MS 09 -SI
	S9O27S	ADV-73150-XXX-4-SL
	S9O27S	ADV-73150-XXX-4-SL
1 MW	S9O32M1	ADV-73551-KXX-4-MS 10-SI
	S9O32S	ADV-73551-XXX-4-SL
	S9O32S	ADV-73551-XXX-4-SL

Power	code	Description (Designation)
400kW	S9O25MC	ADV-72000-KXX-4- MS 04-DC- SI
	S9O25SC	ADV-72000-XXX-4- SL-DC
500kW	S9O26MC	ADV-72500-KXX-4-MS 05-DC-SI
	S9O26SC	ADV-72500-XXX-4-SL-DC
630kW	S9O27MC	ADV-73150-KXX-4 -MS 06-DC-SI
	S9O27SC	ADV-73150-XXX-4 -SL-DC
710kW	S9O32MC	ADV-73551-KXX-4- MS 07-DC-SI
	S9O32SC	ADV-73551-XXX-4- SL-DC
900kW	S9O27M2	ADV-73150-KXX-4 -MS 09-DC-SI
	S9O27SC	ADV-73150-XXX-4 -SL-DC
	S9O27SC	ADV-73150-XXX-4 -SL-DC
1 MW	S9O32M2	ADV-73551-KXX-4- MS 10-DC-SI
	S9O32SC	ADV-73551-XXX-4- SL-DC
	S9O32SC	ADV-73551-XXX-4- SL-DC

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:

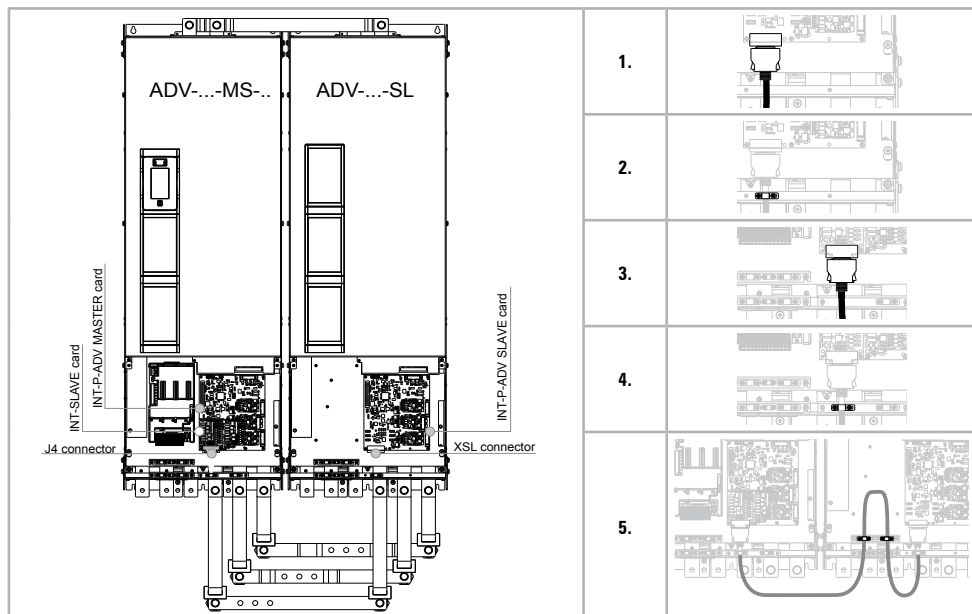
- alarm signal management (including local diagnostics via LED)
- temperature signal management.

A 1.2 MS-SL interface cable wiring sizes 400...710 kW

Fit the ADV200 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:

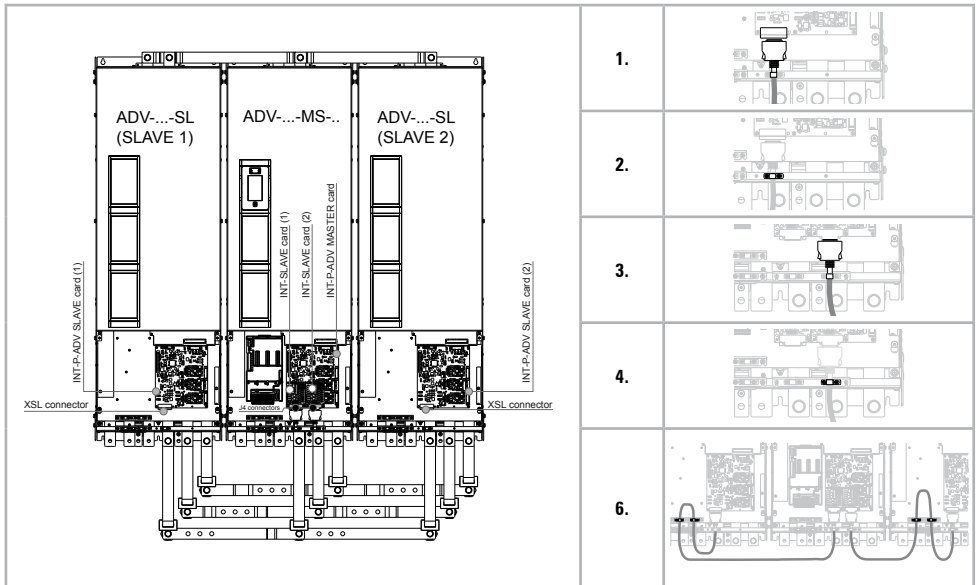
1. Connect one of the 2 ends of the interface cable to the XSL connector of the INT-P-ADV-SLAVE card.
2. Secure the cable using the specific clamp.
3. Connect the other end of the cable to connector J4 of the INT-SLAVE card mounted on the INT-P-ADV-MASTER card of the MASTER drive.
4. Secure the cable in the relative clamp
5. 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 900 kW ... 1 MW

Fit the ADV200 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 Jumpers and Switches

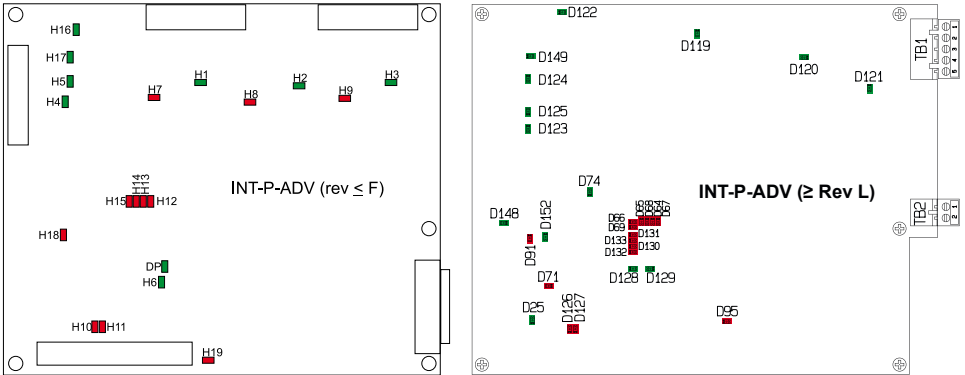
INT-P-ADV (MASTER and SLAVE) cards

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

A 1.5 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) cards



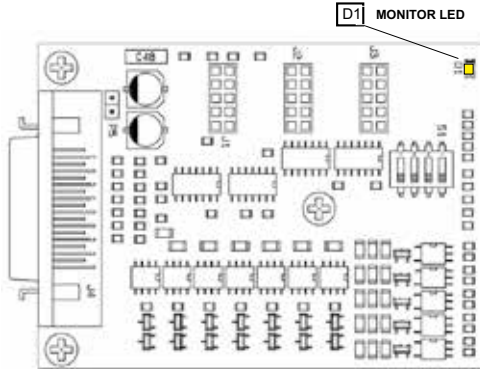
LEDS		Colour	FUNCTION	Normal functioning
≤ F (*)	≥ L (*)			
MONITOR				
H1	D119	Green	+15V_PWR_U monitor	On
H2	D120	Green	+15V_PWR_V monitor	On
H3	D121	Green	+15V_PWR_W monitor	On
H4	D123	Green	+15V monitor	On
H5	D125	Green	-15V monitor	On
H6	D129	Green	+3,3V monitor	On
	D25	Green	+3,3V R monitor	On
H16	D122	Green	+24V monitor	On
H17	D124	Green	+5V monitor	On
DP*	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				
H7	D67/D64	Red	PHASE U	Off
H8	D68/D65	Red	PHASE V	They light up to indicate a short circuit between the output phases
H9	D69/D66	Red	PHASE W	
H10	D126	Red	It lights up to indicate a power rectifier heat sink overtemperature	

LEDS		Colour	FUNCTION		Normal functioning
≤ F (*)	≥ L (*)				
H11	D127	Red	It lights up to indicate overtemperature of the air inside the drive		Off
H12	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
H13	D130	Red	IGBT V		Off
H14	D133	Red	IGBT W		Off
H15	D131	Red	<p>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.</p> <p>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.</p> <p>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.</p>		Off
H18	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
H19	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
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

(*) HW revision of INT-P-ADV card

(*) Led H15 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

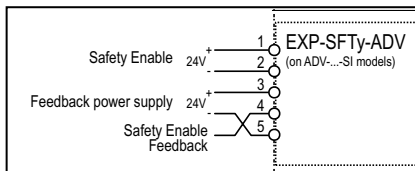


LEDS	Colour	FUNCTION	Normal functioning
MONITOR			
D1	Yellow	It flashes to indicate the presence of the temperature signal of the slave drive that is connected	Flashes

A 1.6 Safety STO Interface

A 1.6.1 ADV-...-MS-SI models (INT-P-ADV card, revision “F” and lower)

The EXP-SFTy card is integrated as standard in the master inverter of 400 kW to 1 MW parallel versions.



Caution

.....
 If the safety function is not required, **the safety enable command must still be sent to terminal 1** on the EXP-SFTy-ADV card **to enable the drive**.



Caution

.....
 For instructions on connecting and commissioning the safety card with the SIL2 or SIL3 safety level function, please see chapter 7 “Application Examples” in the Safety manual (code 1S5F94), which you can download from www.gefran.com.

A 1.6.2 ADV-...-MS-SI models (INT-P-ADV card, from revision “L”)

The ADV200 size 7 (and parallel unit ADV-...-MS) does not have the EXP-SFTy-ADV card, it is integrated and maintains all of the functions in the INT-P-ADV MASTER card (from revision “L”).

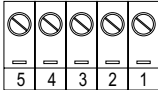
In the reference manual for “Description of functions and parameters list” (ADV200 ASY FP, code 1S9H51 or ADV200 SYN FP, code 1S9H66) safety function management parameters maintain the reference to the “EXP-SFTy-ADV card”.



.....
 If the safety function is not required, the safety enable command (**SFTy ENABLE**) must still be sent to PIN1 terminal TB1 on the INT-P-ADV card to enable the drive.

For instructions on connecting and commissioning the safety card with the SIL2 or SIL3 safety level function, please see chapter 7 "Application Examples" in the STO Safety Interface manual (code 1S5F94) which you can download from www.gefran.com.

TB1 terminal



Terminal	Signal name	Function Description	Electrical limits and range
5	0-	+0 COM power supply for alarm feedback circuit	(IN) 0V
4	FB	+24V@100mA output feedback signal SAFETY DISABLED	(OUT) 0...35V; 150mA maximum DC current
3	0+	+24V power supply for alarm feedback circuit	(IN) +5v...35v with respect to #5
2	- (SFTy ENABLE)	0V COM for disabling the safety function	(IN) 0V
1	+ (SFTy ENABLE)	+24v for disabling the safety function	(IN) +12...+35v with respect to #2

State of feedback to terminal TB1-4 based on (**SFTy ENABLE**) command to pins 1, 2 and of ENABLE control to pin 7 of the R-ADV200 card:

CONTROLLER ENABLE	(SFTy ENABLE)	FB Feedback (SFTy ENABLE)
24V	OPEN	0-
OPEN	24V	0+
OPEN	OPEN	0-
24V	24V	0+

TB2 terminal

SAFETY STATUS digital output ad OPTOMOS: 0...35V, 150mA max



Terminal TB2 provides a digital output to OPTOMOS (SAFETY STATUS), which is not used in the safety chain but can be used to signal the STO state to the R-ADV200 control card (via digital input).

A typical application can be to program as DRIVE INTERLOCK the source of the digital input to which +24V is delivered via the SAFETY STATUS output.

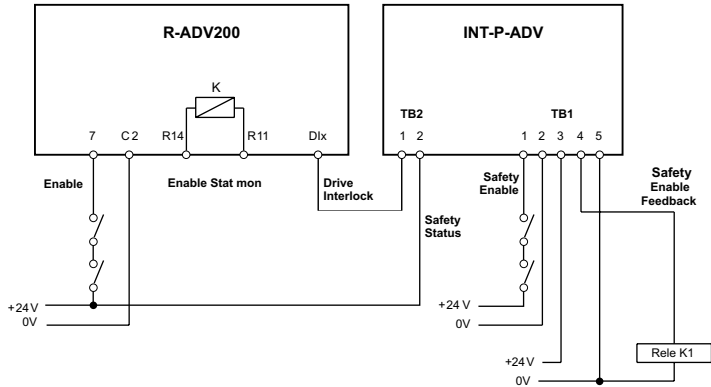
When the STO function is disabled (24V present between terminals 1 and 2 of TB1), the contact (SAFETY STATUS) between pins 1 and 2 of TB2 is closed

CONTROLLER ENABLE	(SFTy ENABLE)	FB2 Feedback (SAFETY ENABLE)
24V	OPEN	Open
OPEN	24V	Close

CONTROLLER ENABLE	(SFTy ENABLE)	FB2 Feedback (SAFETY ENABLE)
OPEN	OPEN	Open
24V	24V	Close

In this way, when the (SFTy ENABLE) command is high, the control input programmed as DRIVE INTERLOCK is also high and the drive can be enabled.

Figure A1: Connection of safety terminals TB1 and TB2 on INT-P-ADV card



If the (SFTy ENABLE) command is removed, the DRIVE INTERLOCK input on the control card goes low and the drive is disabled instantaneously. To re-enable the drive, you first have to set the (SFTy ENABLE) command to high (see parameter 1032 **Drv Interlock src** in ADV200 manual) and then remove and re-give the ENABLE and START commands to the control card.

Note!

If the (SFTy ENABLE) signal is removed from terminal TB1 of the INT-P-ADV card and the SAFETY STATUS signal is not connected to the control card, the PWM impulses (from the control card) are blocked by the STO interface but the control card (not having feedback on STO state) remains enabled. This irregular condition is signaled by LED D152 blinking at 3Hz, and the drive remains in this condition even when the (SFTy ENABLE) signal is given again.

To resume control of the motor, you first have to remove the ENABLE and START commands from the control card and re-give them only after setting the (SFTy ENABLE) command to high.

The (SFTy ENABLE) command can also be re-given before removing the ENABLE and START commands.

Appendix 2 - Miscellaneous

A 2.1 DC-link capacity

Size	DC-link capacity
	(μ F)
1007	235
1015	235
1022	340
1030	340
1040	340
2055	680
2075	680
2110	840
3150	1500
3185	1500
3220	1500
4300	2350
4370	2800
4450	3400
5550	4700

Size	DC-link capacity
	(μ F)
5750	5600
5900	6800
61100	11200
61320	13600
71600	16800
72000	16800
72500	25200
73150	25200
73551	25200
400kW	33600
500kW	50400
630kW	50400
710kW	50400
900kW	75600
1 MW	75600



Attention

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You cannot add an external on 1007 ... 61320 sizes.

You can add an external capacitor from sizes 71600 and higher (ask Gefran for more details).

A 2.2 Encoders

Encoders provide motor speed and position feedback

The regulation algorithms in the ADV200 drive are capable of controlling asynchronous and permanent magnet synchronous (brushless) motors.

The regulation algorithm may or may not use the speed measurement obtained from the encoder reading.

The drive supports different types of encoders, each managed by a specific expansion card. The card is automatically recognised at startup

Possible configurations are summarised in the table:

Encoder type	Card code EXP – xx	PAR 532, Slot2 card type	ASYNCHRONOUS				SYNCHRONOUS		PAR 552 Regulation mode
			V/f control		Flux vector OL	Flux vector CL	Flux vector CL	Flux vector OL	
			Open Loop	Closed Loop					
Incremental Digital	DE	Enc 1	-	●	-	●	●	-	
Double Incremental Digital	DE	Enc 1	-	●	-	●	○	-	
Incremental sinusoidal	SE	Enc 2	-	○	-	●	✘	-	
Incremental sinusoidal + absolute SinCos	SESC	Enc 3	-	○	-	○	●	-	
Incremental sinusoidal + absolute Endat/SSI	EN/SSI	Enc 4	-	○	-	○	●	-	
Incremental sinusoidal + Hiperface absolute	HIP	Enc 5	-	○	-	○	●	-	
Incremental SinCos Absolute	ASC	Enc 8	-	✘	-	✘	●	-	
Resolver	RES	Enc 9	-	✘	-	○	●	-	

- = encoder not used,

Recommended = ●

Possible use but with lower performance = ○

Not allowed = ✘

Note!

Up to 7.0.1 Firmware version , the drive can operate with encoder type with number of pulses power by 2 (e.g. 1024, 2048, 4096, etc). This restriction does not apply for firmware 7.0.3 and higher.

A.2.3 Phasing

In order for the Brushless regulation algorithm to function correctly, it is necessary to know the position of the rotor with respect to the stator power phases. Therefore the 0° position provided by the absolute encoder must be known with respect to the position of a motor pole and the encoder count direction must match the motor power phases.

This is called phasing. Phasing can be performed manually, directly by means of the mechanical encoder assembly position on the motor shaft and on the phases, or using the automatic procedures available in the drive.

Phasing must always be repeated whenever:

- the encoder assembly position is changed
- the phase sequence of the motor power supply connection is changed
- the encoder incremental signal connection is changed
- the encoder absolute signal connection is changed
- the value of the PAR 2008 **Pole pairs** parameter is changed
- the value of the PAR 2100 **Encoder pulses** parameter is changed
- the drive is replaced (alternatively, download parameters taken from previous drive)

There are two different procedures that can be launched by writing two different parameters:

- **PAR 2190 Autophase rotation** -> rotation phasing:
this procedure must be performed with the motor free to turn and with no load applied.
With regard to phasing with the motor stopped, with the **Autophase still mode** parameter (PAR 2194) you can select two different methods based on the different characteristics of synchronous motors on the market.
We recommend using **Mode 1** as the first option. If **Mode 1** does not run correctly, the motor (due to its constructive characteristics) requires a different mode (i.e., **Mode 2**).
- **PAR 2192 Autophase still** -> static phasing:
this procedure must be performed with the motor still and brake applied.
If an incremental digital encoder is used, you can select different methods for phasing the motor with the **Autophase still run** parameter (PAR 2196): via "Autophase rotation" dedicate command or by Wizard procedure, only at the first enabling of the drive ("First enable" selection) or at each enabling of the drive ("Each enable" selection).
- **PAR 2198 Autophase run type**, selection (2) **Virtual**:
Use this setting when the value in mechanical degrees of the distance of the rotor pole from the "zero" of the encoder is known. This value must be entered manually before starting the phasing (contact Gefran's Customer Service for further information).

Rotation phasing

This procedure is based on the possibility of moving the motor, by a maximum angle of two pole pairs, to find correct encoder phasing, cross-check the available encoder and motor data and, if the encoder count direction does not match the phase sequence of the motor power supply, correct it by automatically modifying PAR 2130 **Encoder direction**.

Note!

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In the case described above, a positive speed reference could generate a rotation in reverse with respect to that defined as positive for the encoder (usually clockwise), while still ensuring good motor control.  
~~~~~

The encoder direction defined as positive can be stored as the positive reference direction by inverting two motor power phases and repeating the rotation phasing procedure.

If the procedure is terminated without any errors, code 0 is shown on the keypad, otherwise if any differences have been detected that cannot be corrected by the

drive, one of the codes listed in Autotune (phasing), [see chapter 8.2 Messages](#), is shown.

Possible faults:

- faults in electric signals not detected with a “**Speed fbk loss [22]**” alarm
- error in the PAR 2008 **Pole pairs** parameter setting
- error in the PAR 2100 **Encoder pulses** parameter setting

Static phasing

Using this method, in which the motor cannot move, the encoder and motor data cannot be cross-checked to verify the matching of parameters or count direction. This condition must therefore be checked before launching the procedure.

Appendix 3 - ADV200-EH/EHR models

The following tables shows the electrical specifications of external heatsink drive models with IP54 protection degree.

Although not shown, the previous chapters also apply to ADV200-EH/EHR models.

A3.1 Rated total power dissipated side card

Sizes	Dissipated power
	W
ADV200-EH-2075	107.5
ADV200-EH-2110 ADV200-EHR-2110	118
ADV200-EH-3150 ADV200-EHR-3150	130
ADV200-EH-3185 ADV200-EHR-3185	145
ADV200-EH-3220 ADV200-EHR-3220	151
ADV200-EH-4300 ADV200-EHR-4300	218
ADV200-EH-4370	235
ADV200-EH-4450	255
ADV200-EH-5550	293
ADV200-EH-5750	430
ADV200-EH-5900	520
ADV200-EH-61320	650

A3.2 Weight and dimensions

Sizes ADV200-...-4	Weight	
	(kg)	(lbs)
ADV200-EH-2075	10.2	22.5
ADV200-EH-2110 ADV200-EHR-2110		
ADV200-EH-3150 ADV200-EHR-3150 ADV200-EH-3185 ADV200-EHR-3185	16.4	36.2
ADV200-EH-3220 ADV200-EHR-3220		
ADV200-EH-4300 ADV200-EHR-4300 ADV200-EH-4370 ADV200-EH-4450	32	70.6
ADV200-EH-5550		
ADV200-EH-5750 ADV200-EH-5900	60	132
ADV200-EH-61320		
	90	198

Figure 3.2.1: Size 2 dimensions (ADV200-...-EH)

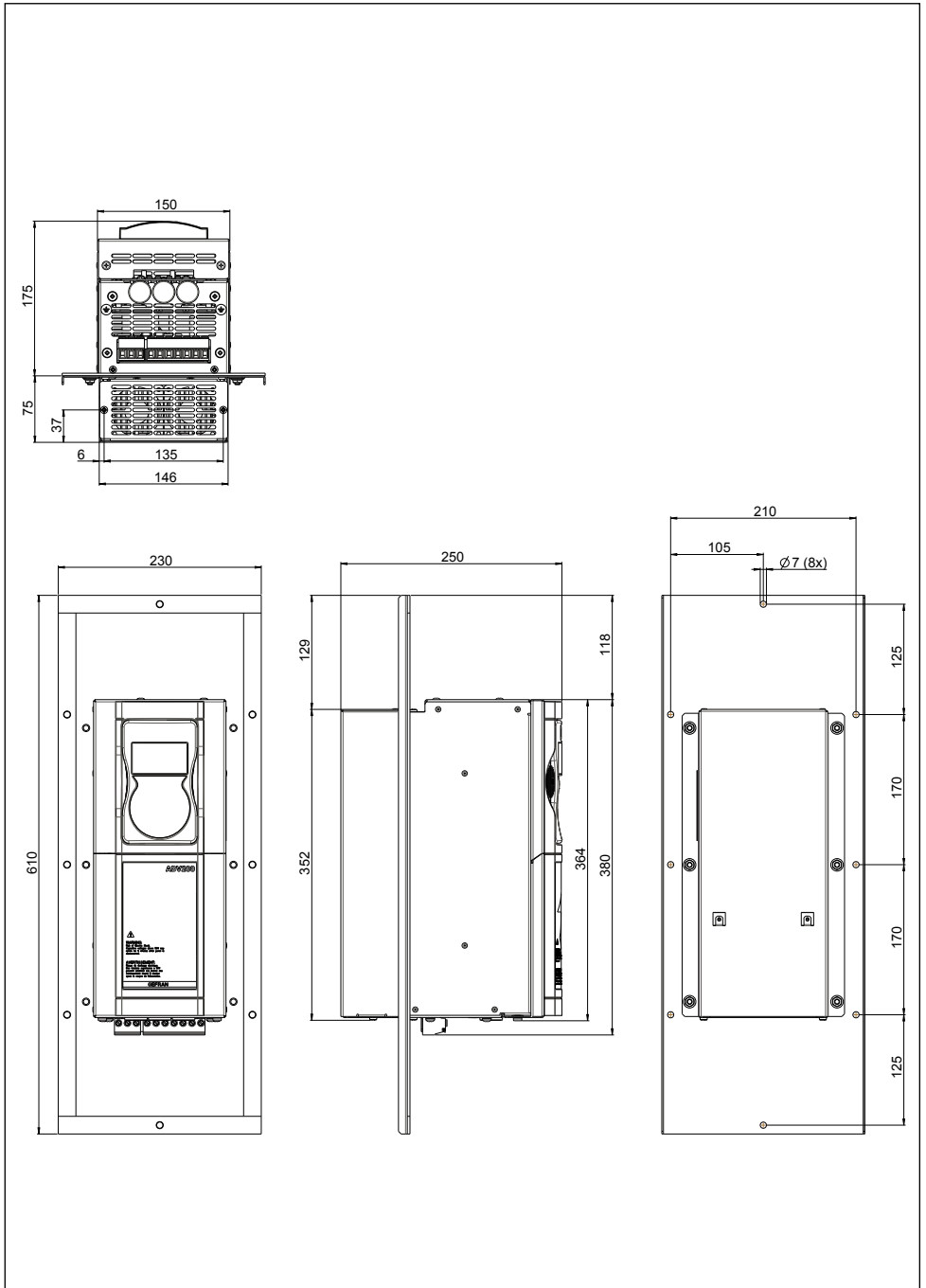


Figure 3.2.3: Size 4 dimensions (ADV200-...-EH)

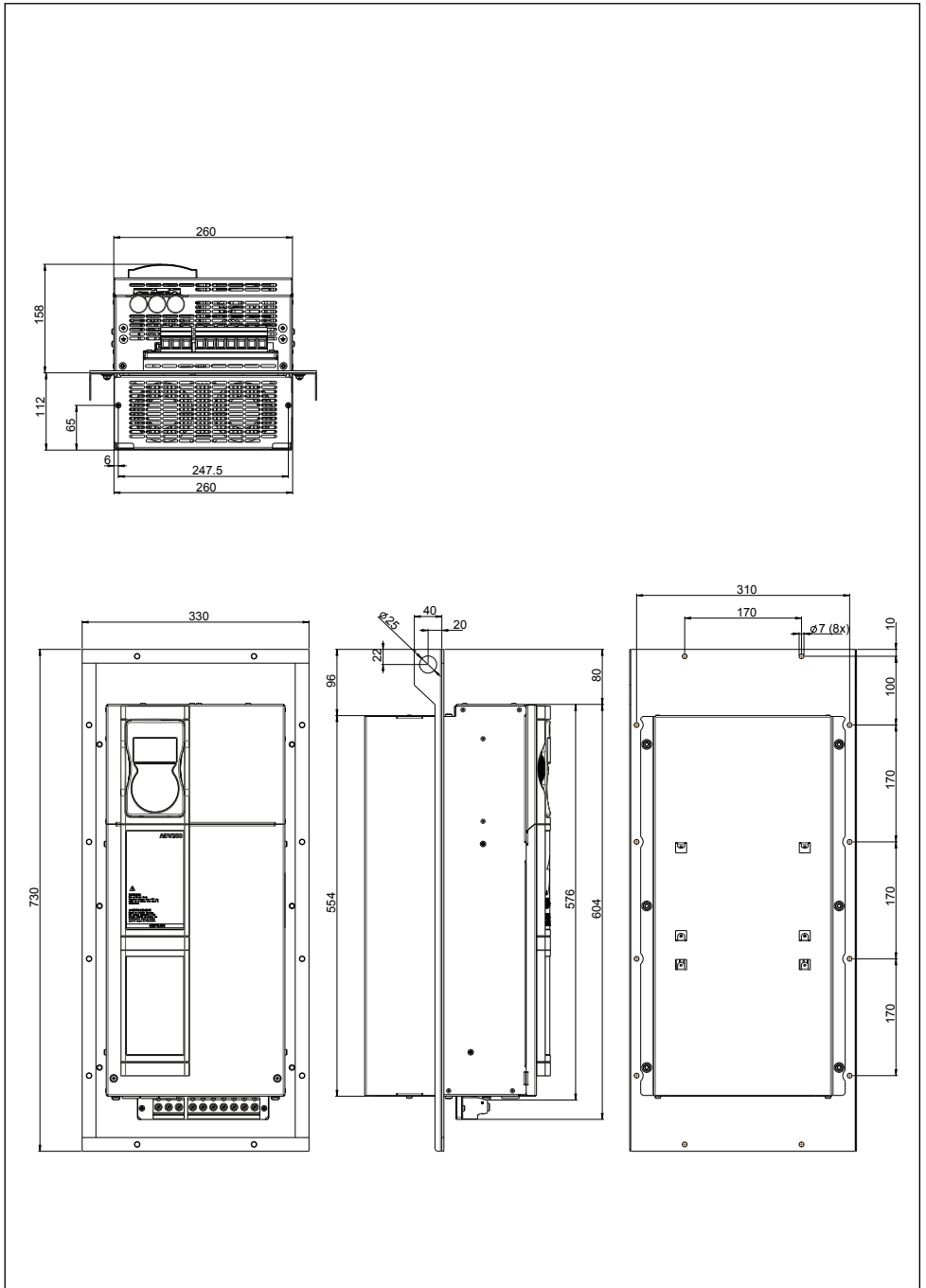


Figure 3.2.4: Size 5 dimensions (ADV200-...-EH)

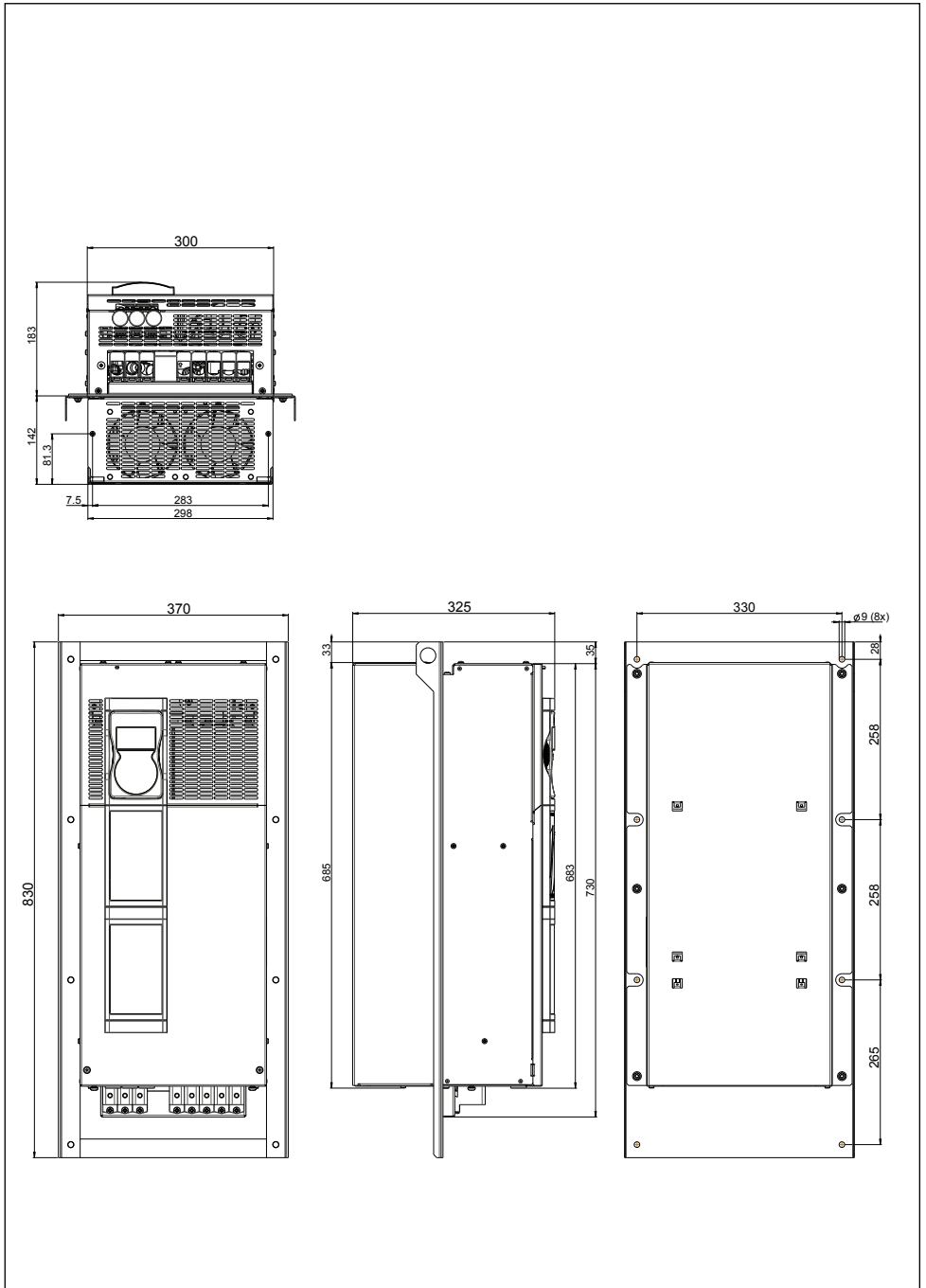


Figure 3.2.5: Size 6 dimensions (ADV200-...-EH)

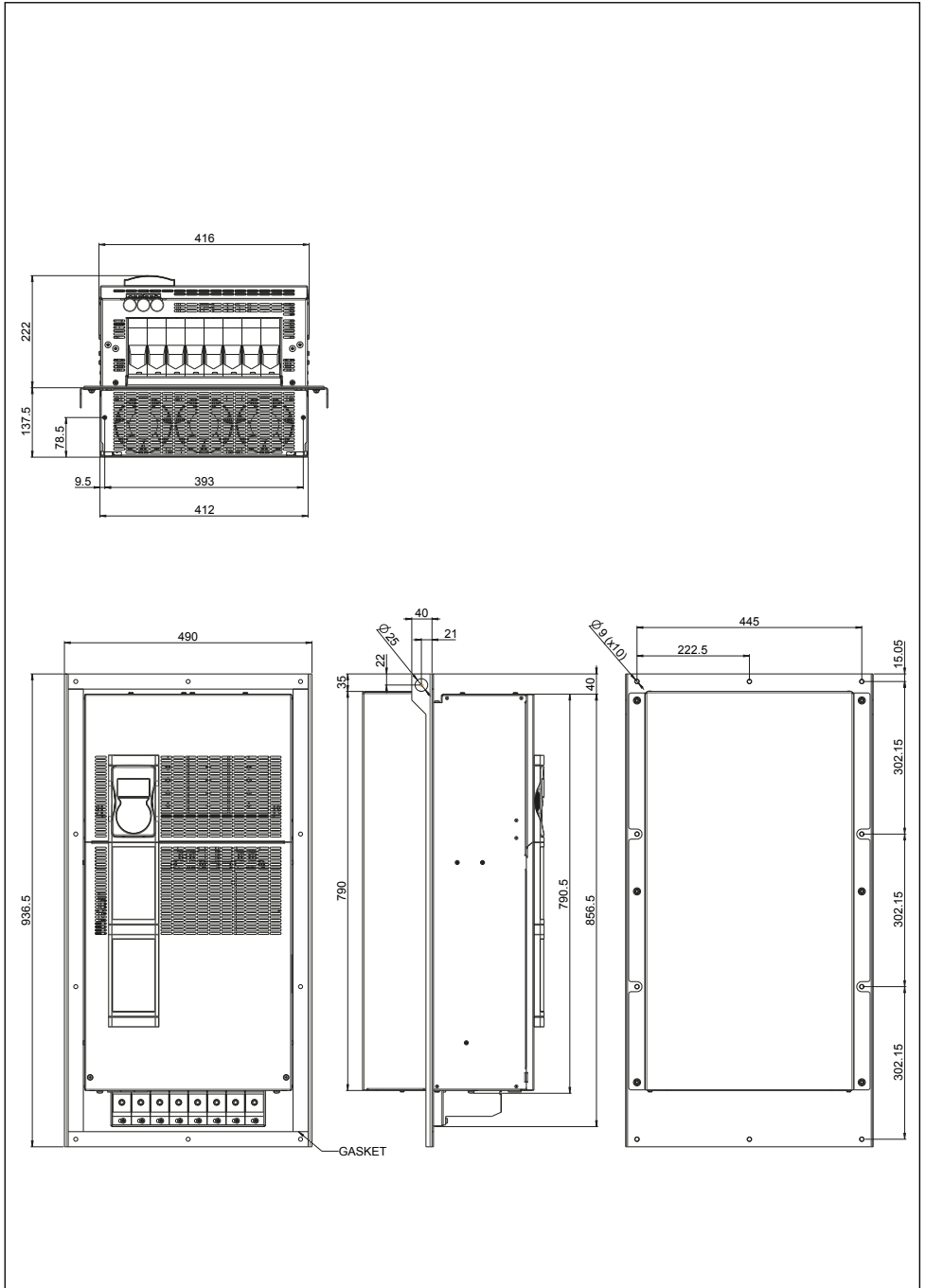


Figure 3.2.6: Size 2 dimensions (ADV200-...-EHR)

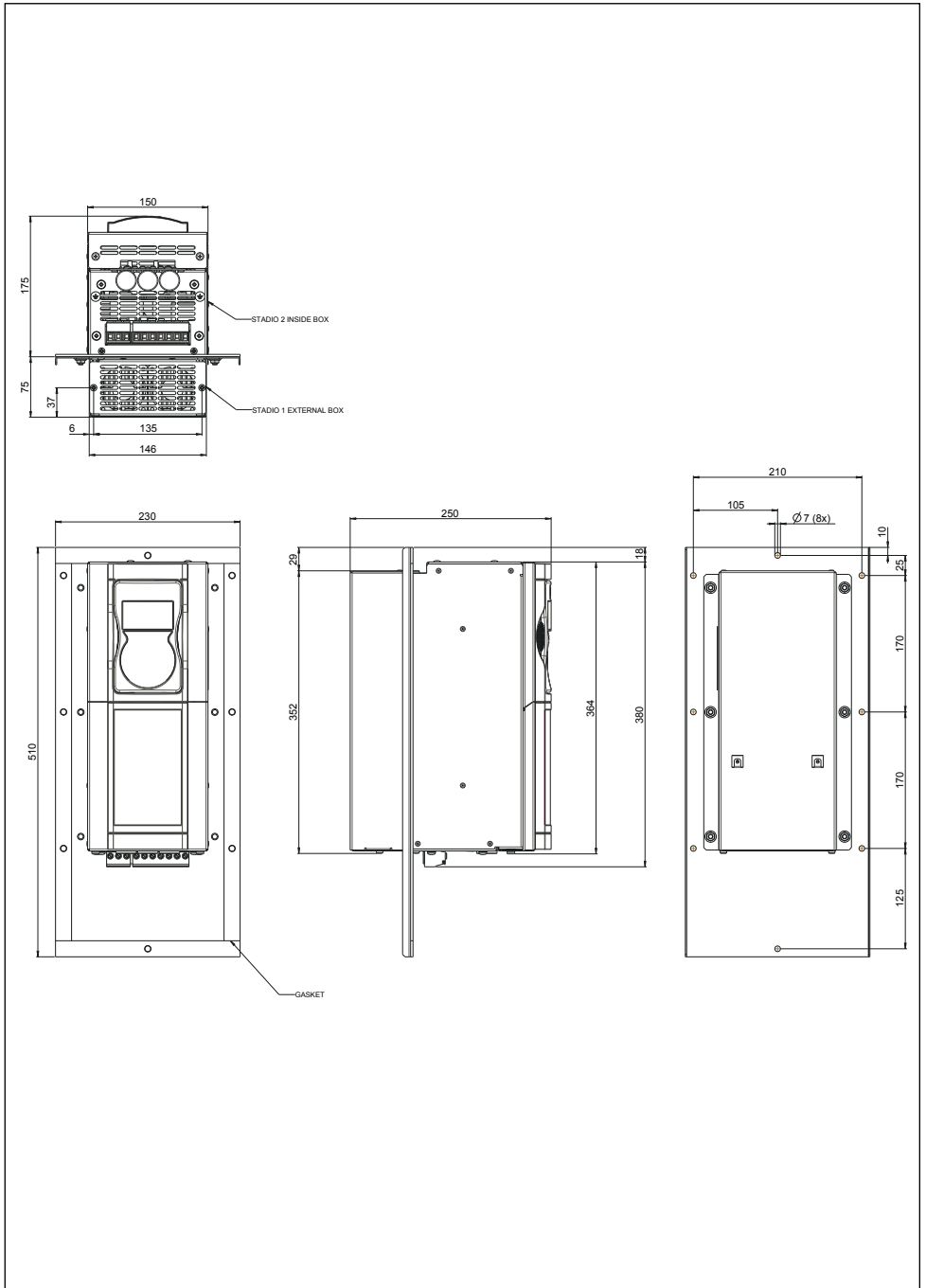
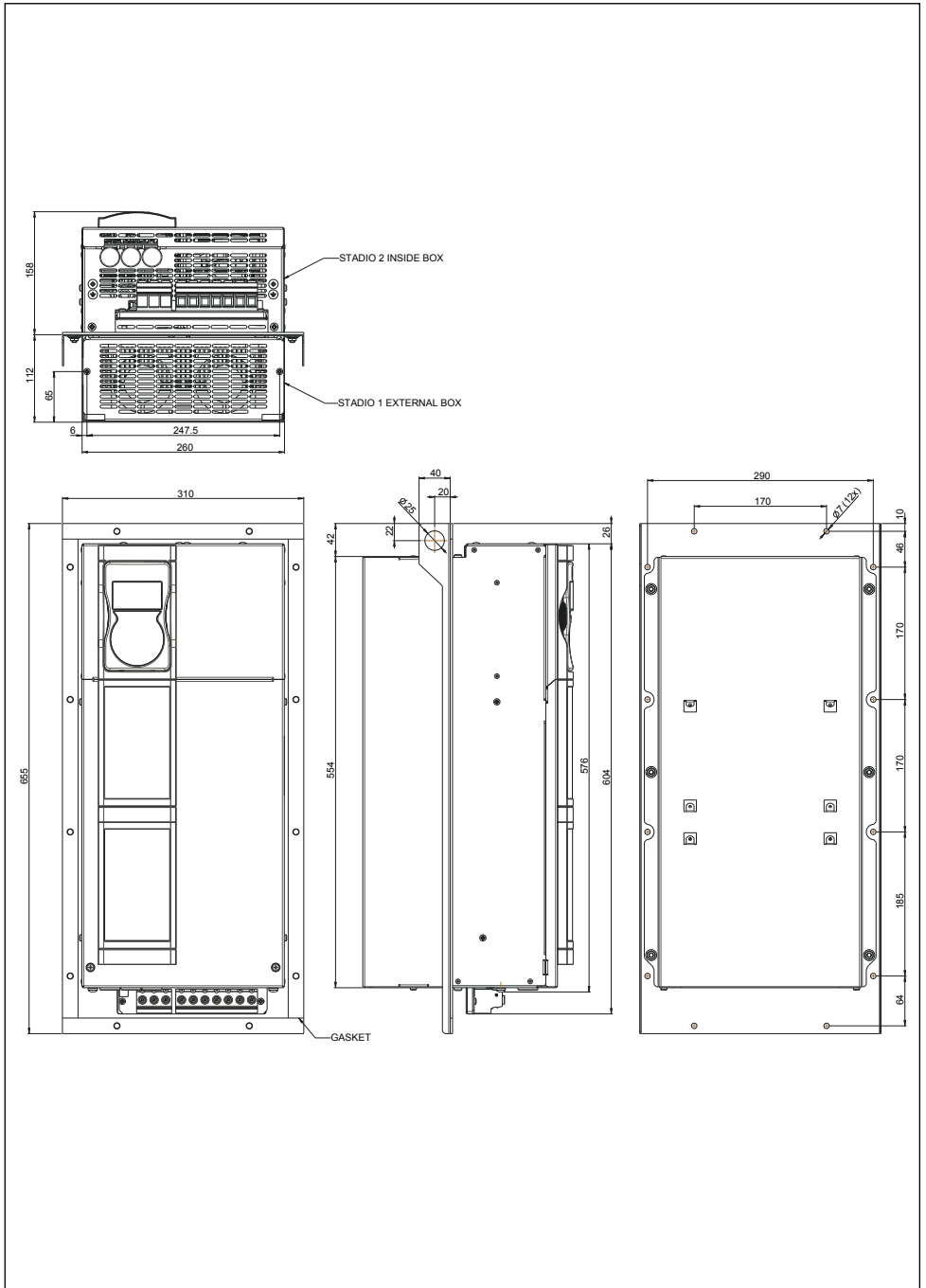


Figure 3.2.8: Size 4 dimensions (ADV200-...-EHR)



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