Vector inverter for lifts with synchronous / asynchronous motors

SIEIDrive

VDL200

.... Quick start up guide

Specification and installation

GEFRAN

Information about this manual

The VDL200 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 can be found on the CD provided with the drive.

Software version
This manual is updated according the software versions: Asynchronous V1.X.0. / Synchronous V4.X.3 .

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 2.6.

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 S.p.A 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 improvingthis 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 passtrictement respectées, il y a des risques de blessures corporelles ou de mort.

Caution

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

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

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

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

Attention

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

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

Note !

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

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

Qualified personnel

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

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

Personne qualifiée

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

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

Use for intended purpose only

The power drive system (electrical drive + application plant) may be used only for the application stated in the manual and only together with devices and components recommended and authorized by 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 chapters.
Les instructions suivantes sont fournies pour la sécurité de l'utilisateur tout comme pour éviter l'endommagement du produit ou des composants à l'intérieur des machines raccordées. Ce paragraphe dresse la liste des instructions généralement applicables lors de la manipulation des drives électriques.
Les instructions spécifiques ayant trait à des actions particulières sont répertoriées au début de chaque chapitre.

Read the information carefully, since it is provided for your personal safety and will also help prolong the service life of your electrical drive and the plant you connect to it.
Lire attentivement les informations en matière de sécurité personnelle et visant par ailleurs à prolonger la durée de vie utile du drive tout comme de l'installation à laquelle il est relié.

1.3 General warnings

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.

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

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

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

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

Electrical Shock

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

Never open the device or covers while the AC Input power supply is switched on. Minimum time to wait before working on the terminals or inside the device is listed in section 4.6.

Risque de décharge électrique

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

Ne jamais ouvrir l'appareil lorsqu'il est suns tension. Le temps minimum d'attente avant de pouvoir travailler sur les bornes ou bien àl'intérieur de l'appareil est indiqué dans la section 4.6.

Electrical Shock and Burn Hazard:

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

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

Fire and Explosion Hazard:

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

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

2 - Introduction to the product

The SIEIDrive VDL200 is the result of GEFRAN's experience in the civil lift engineering sector, gained from its commitment to working in close partnership with leading operators in the sector to develop technical solutions and application programs.
The VDL200 integrates the most complete and advanced lift inverter technology, to offer a cost-effective and immediate solution for lift control systems.
This drive is designed to power loads such as asynchronous motors, for applications in the lift sector.
This compact drive is suitable for installation in cabinets for roomless applications.

Designed and produced to meet the full range of requirements in the lift sector, the VDL200 is available in two configurations.

VDL200 asynchronous:

- Management of asynchronous motors
- 8 programmable digital inputs (NPN/PNP) + an Enable input
- 4 single-contact programmable relay outputs
- 1 analog input
- Input for 5 Vdc TTL incremental digital encoder
- Speed regulator with monitoring of the correct lifting or dropping of the machine brake according to 5.6.7 of EN 81-20:2014 and 5.8 of EN 81-50:2014 (respectively 9.11.3 and F.8 of EN 81-1:1998 + A3:2009)
- Integrated EMI filter (models VDL200-...-F)
- Suitable for UPS emergency operation
- Optimized sensorless control.

VDL200 synchronous:

- Management of synchronous motors
- 8 programmable digital inputs (NPN/PNP) + an Enable input
- 4 single-contact programmable relay outputs
- 1 analog input
- Input for absolute SinCos or Endat / SSI encoder
- Speed regulator with monitoring of the correct lifting or dropping of the machine brake according to 5.6.7 of EN 81-20:2014 and 5.8 of EN 81-50:2014 (respectively 9.11.3 and F.8 of EN 81-1:1998 + A3:2009)
- Integrated EMI filter (models VDL200-...-F)
- Suitable for UPS emergency operation
- Optimized sensorless control.

2.1 Dedicated features

The VDL200 incorporates basic and advanced lift functions in a single product, to ensure maximum comfort for all systems at all times.

• Speed control
EFC (Elevator Floor Control) function: separate function for independent management of short floors, landing zone, re-starting with lift not at floor and automatic deceleration point calculation.

• Lift sequence
Typical sequence of input/output signals used in civil lift engineering applications such as I/O management, braking, output contactor and door control.

• Parameters in linear unit
Possibility of selecting different engineering units (also with values for the US) for the main movement parameters, rpm (fpm) or m/s for speed, m/s^2, m/s^3 (ft/s^2, ft/s^3) for cabin acceleration.

• Lift mechanical parameters
Mechanical system parameters such as pulley diameter and speed ratio for converting system units and weights, system for calculating inertia and speed regulation for the desired response.

• Ramp generation
Independent configuration of acceleration and deceleration ramp parameters and of the 4 jerk values for maximum travelling comfort in the lift cabin. Two independent S-shaped ramps, selectable via digital input with 4 independent jerk settings. Dedicated deceleration ramp corresponding to the stop command.

• Multiple speeds
8 internally settable speed reference values. Possibility of overwriting at start-up with additional values to ensure smooth starting.

• Pre-torque (load compensation)
Initialisation of the speed regulator by the weight sensor to prevent jerks or bumpy starting.

• Increased overload
Overload capacity in line with typical lift application load cycles.

• Fan control logic
The fan control logic activates the internal fans according to the temperature.

• Emergency single-phase power supply to return to the floor
In emergency conditions a 230 V single-phase supply voltage can be used to return the cabin to the floor (by UPS power supply or batteries with EMS module).

• User-friendly menus
The menus feature lift-specific DISPLAY and motor STARTUP terminology

• Saving parameters
Drive parameters can be saved on the keypad (5 settings).

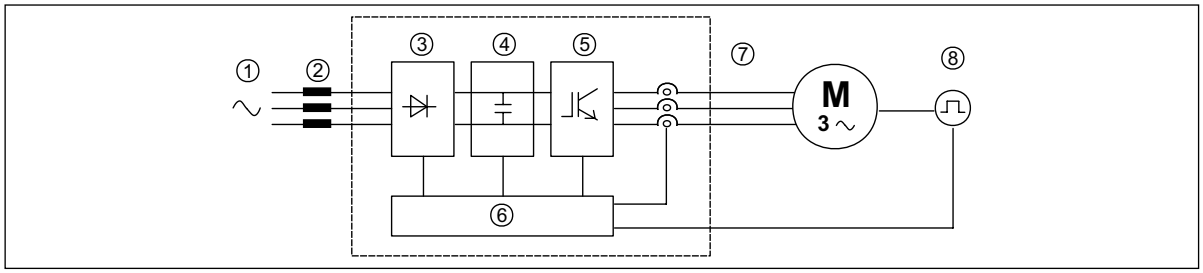
• Integrated encoder management
5 V TTL incremental digital encoder or absolute SinCos, EnDat-SSi (models VDL200-...-ED)

2.2 Other features

- Autotuning of motor parameters.
- SSC (Sensorless Scalar Control) modulation reduces noise levels to a minimum.
- Switching frequency fixed at 10 kHz.
- Output voltage up to 98% of input voltage.
- Saving of messages relating to the last 30 repairs and indication of time of repair.
- Drive, motor and braking unit overload protection.
- Speed regulator adaptive.
- Readout of speed functions.
- Easy use of the equipment via:
  - terminal strip
  - optional keypad, simple and immediate to use, with magnetic fastening and remote control at distances of up to 15 m.
- Drives are fitted with IGBTs (insulated gate bipolar transistors).
- The output is protected against accidental grounding and output phase short circuit
- Speed regulator powered by switched-mode power supply from DC bus.
- Mains dip protection.
- Galvanic isolation between power and regulation sections.

2.3 Identification of components

The inverter converts the constant frequency and voltage of an existing three-phase network into DC voltage, from which it obtains a new three-phase network with variable voltage and frequency. With this variable three-phase network the speed of three-phase asynchronous motors can be controlled continuously.



1. **Mains supply voltage**
2. **Mains choke** (see chapter 5.2)
3. **Three-phase rectifier bridge**

   Converts AC voltage into DC voltage via a three-phase full wave bridge.
4. **Intermediate circuit**

   With pre-load resistor and levelling capacitors DC voltage (U_{DC}) =√2 x mains voltage (U_{LN})
5. **IGBT inverter bridge**

   Converts DC voltage into three-phase AC voltage with variable amplitude and frequency
6. **Configurable control section**

   Cards for controlling and regulating the closed and open-loop power section. Commands, references and reactions are connected to these.
7. **Output voltage**

   Three-phase AC voltage.
8. **Speed feedback encoder** (**see paragraph "7.2.3 Feedback Connection"**)

2.4 Product identification

The basic technical data of the inverter are included in the product code and data plate.

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 asynchronous motor depends on the number of pole pairs and frequency (plate and catalog data).
If using a motor at speeds above the rated speed, contact the motor manufacturer for any related mechanical problems (bearings, unbalance, etc.). The same applies in case of continuous operation at frequencies of less than approx. 20 Hz (inadequate cooling, unless the motor is provided with forced ventilation).

Name of model (code)

VDL 200 1 040 - X B L - F -4 -ED

ED = Endat Encoder

Rated voltage:
4 = 400Vca, three-phase

EMI FILTER:
F = included

Lift application:
L = included

Braking unit:
X = not included
B = included

Keypad:
X = not included

Inverter power in kW:

040 = 4kW	150 = 15kW
055 = 5,5kW	185 = 18.5kW
075 = 7,5kW	220 = 22kW
110 = 11kW	

Mechanical dimensions of the drive:

1 = size 1	3 = size 3
2 = size 2	

Inverter, VDL200 series

Data plate

Type = Drive model; S/N = Serial number

Inp = Input (mains supply, frequency, AC Input Current at constant torque)

Out = Output (Output voltage, frequency, power, current, overload)

Approvals

Firmware and card revision plate

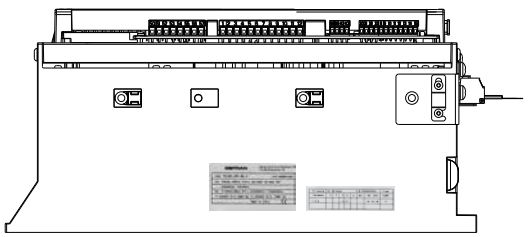
Firmware	HW Release						S/N:35GG043380	Prod.
Release	D	F	P	R	S	BU	SW. CFG	CONF.
1.0.0			-.S	-X			10.10.10	A1

P = Power, R = Regulation

SW . CFG = Software revision

Prod CONF. = Product configuration

Position of plates on the drive



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.

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 VDL200 Drives and preparing them for delivery. They should only be transported with suitable transport equipment (see weight data). Observe the instructions printed on the packaging. This also applieswhen the device is unpacked and installed in the control cabinet.

Upon delivery, check the following:
- the packaging for any external damage
- whether the delivery note matches your order.

Open the packaging with suitable tools. Check whether:
- any parts were damaged during transport
- the device type corresponds to your order

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

Note!

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

3.2 Permissible Environmental Conditions

Temperature:

storage	-25…+55°C (-13…+131°F), class 1K4 per 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	5% to 95 %, 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 a 106 (class 1K4 as per EN50178)
transport	[kPa] 70 a 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).

4 - Specification

4.1 Environmental Conditions

Installation location	Pollution degree 2 or lower (free from direct sunligth, vibration, dust, corrosive or inflammable gases, fog, vapour oil and dripped water, avoid saline environment)
Installation altitude	Max 2000m (6562 feet) above sea level. With 1.2% reduction in output current for every 100 m starting from 1000 m.
Mechanical conditions for installation	Vibrational stress: EN 60721-3-3 Class 3M1
Operating temperature	-10…+45°C (32°…113°F)
Operating temperature	+45 ... +50°C (+113 … +122°F) with 1% derating every °C starting from 45°C and up to 50°C. Operation at temperatures of > 50°C is not allowed
Air humidity (operating)	from 5 % to 85 % and from 1 g/m³ to 25 g/m³ with no humidity (or condensation)
Air pressure (operating) [kPa]	from 70 to 106

4.2 Standards

Climatic conditions	EN 60721-3-3
Electrical safety	EN 50178, EN 61800-5-1, UL508C, UL840 degree of pollution 2
Vibration	Class 3M1 EN 60721-3-3
EMC compatibility	EN 12015
Protection degree	IP20
Approvals	CE
EC directives	LVD 2014/35/EU, EMC 2014/30/EU, Lift 2014/33/EU, RoHs 2011/65/EU

4.3 Precision

4.3.1 Speed control

Speed control precision	Flux vector CL control with feedback and brushless: 0.01 % motor rated speed Flux vector OL control: ± 30 % rated slip of motor SSC control: ± 60 % rated slip of motor

4.3.2 Speed control limits

Speed range (*)	± 32000 rpm
Speed format (*)	32 bit
Frequency range	± 2000 Hz
Max frequency	Flux vector CL control with feedback and brushless: 300Hz, FVOL: 150 Hz, VF: 600 Hz
Min frequency	0 Hz

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

4.3.3 Torque control

Torque resolution (*)	> 0.1 %
Torque control precision (*)	Flux vector CL with feedback: ± 5%
Direct torque control	yes
Current limitation	Limits ±, Mot/gen limits, Variable limits

(*) referred to rated torque

4.3.4 Current rating

Overload	200% *10 sec with output frequency more than 3 Hz 150% with output frequency less than 3 Hz.
Switching frequency	10 kHz

4.4 Input electrical data

Choke _____ Sizes 1...2: Optional (DC or AC).

Note! See chapter 5.2 for THD values in accordance with EN 12015 and for selection of external inductances.

Size	Input voltage U_{LN} (Vac)	Input frequency (Hz)	Overvoltage threshold (Vdc)	Undervoltage threshold (Vdc)	Effective input current I_N (@ In out)		DC-Link Capacity
					@ 230 Vac (A)	@ 400 Vac (A)	(μF)
VDL200-...-4 , 3ph							
1040	three-phase 230 - 400 Vac -15%+10%	50/60 Hz, ± 5%	820 Vdc	@ 230 Vac = 225 Vdc; @ 380 Vac = 371 Vdc; @ 400 Vac = 391 Vdc.	12	11	470
1055					17	16	680
2075					23	22	680
2110					31	29	1020
3150					42	40	1500
3185					50	47	2250
3220					55	53	2700

4.5 Output electrical data

Maximum output voltage U2 _____ 0.98 x U_{LN} (U_{LN} = AC input voltage)
Maximum output frequency f2 _____ 300 Hz

The derating factors shown in the table below are applied to the rated DC output by the user. They are not automatically implemented by the drive: Idrive = In x K_{ALT} x K_V.

Size	I_N Rated output current (fsw = default)		P_N mot (Recommended motor power ,fsw = default)		Reduction factor		IGBT braking unit
	@U_{LN} = 230Vac (A)	@U_{LN} = 400Vac (A)	@U_{LN} = 230Vac (kW)	@U_{LN} = 400Vac (kW)	K_T (1)	K_{ALT} (2)	
VDL200-...-4, 3ph							
1040	9	9	2	4	0.95	1.2	Standard internal (with external resistor); braking torque 150% MAX
1055	13.5	13.5	3	5.5	0.95	1.2	
2075	18.5	18.5	4	7.5	0.95	1.2	
2110	24.5	24.5	5,5	11	0.95	1.2	
3150	32	32	7.5	15	0.95	1.2	
3185	39	39	9	18.5	0.95	1.2	
3220	45	45	11	22	0.95	1.2	

(1) K_T: Derating factor for ambient temperature of 50°C (1% every °C above 45°C)

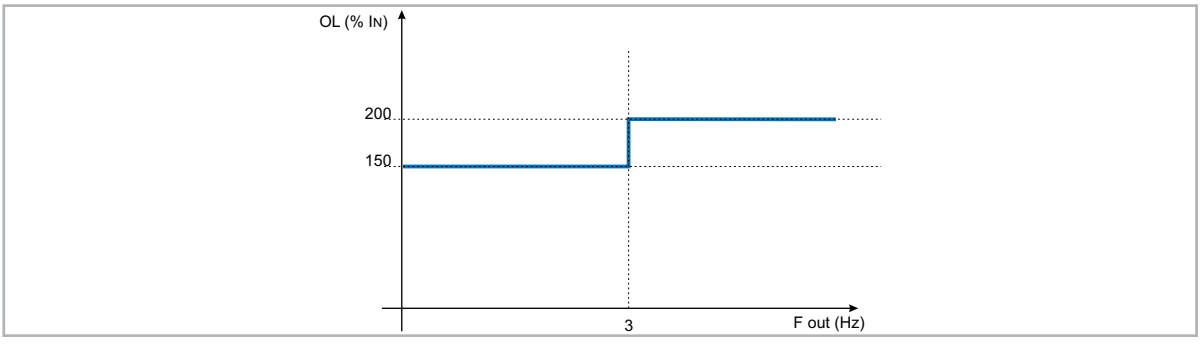
(2) K_{ALT}: Derating factor for installation at altitudes above 1000 meters a.s.l. Value to be applied = 1.2% each 100 m increase above 1000 m.

E.g.: Altitude 2000 m, Kalt = 1.2% * 10 = 12% derating; In derated = (100 - 12) % = 88 % I_N

4.5.1 Derating values in overload condition

In overload conditions the output current depends on the output frequency, as shown in the figure below.

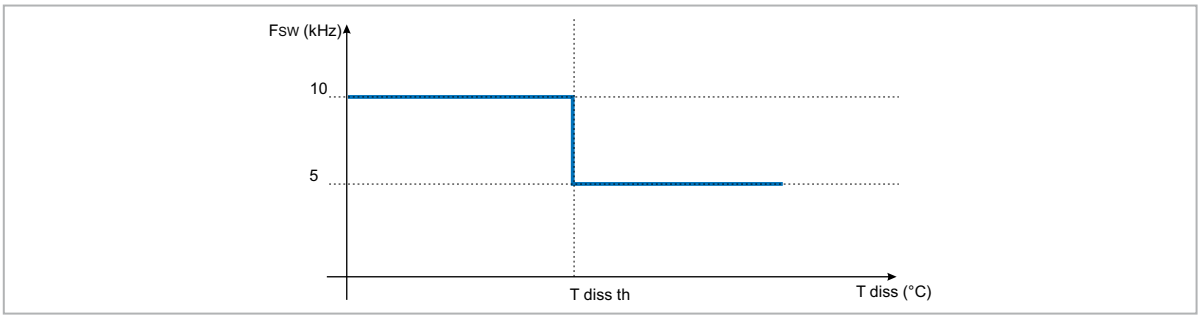
Figure 4.5.1-A: Ratio between overload/output frequency



4.5.2 Derating values for switching frequency

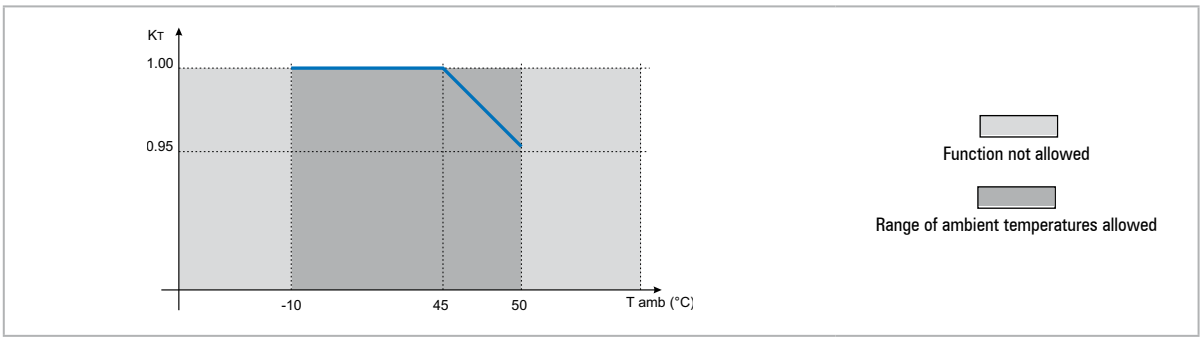
The switching frequency is modified according to the temperature of the drive (measured on the heat sink), as shown in the figure below.

Figure 4.5.2: Ratio between switching frequency/heat sink temperature



4.5.3 Kalt: Ambient temperature reduction factor

Figure 4.5.3: Tamb reduction coefficient



4.6 Voltage level of the inverter for safe operations

The minimum time between the moment in which an VDL200 inverter is disabled from the mains and that in which an operator can operate on internal parts of the inverter, without the danger of electric shock, **is 5 minutes**.

Attention

This value takes into account the time to turn off an inverter supplied without any options (time indicated for disabled inverter condition).

4.7 No-load consumption (Energy rating)

Size	No. of pre-loads allowed	Power-on time [secs]	Stand-by consumption "Fan Off" [W]	Fan consumption [W]	Stand-by consumption "Fan On" [W]
VDL200-...-4, 3ph					
1040	1 each 20 sec.	5 abt.	20	4	24
1055	1 each 20 sec.	5 abt.	20	10	30
2075	1 each 20 sec.	5 abt.	20	10	30
2110	1 each 20 sec.	5 abt.	20	8	28
3150	1 each 20 sec.	5 abt.	20	16	36
3185	1 each 20 sec.	5 abt.	20	15	35
3220	1 each 20 sec.	5 abt.	20	15	35

4.8 Cooling

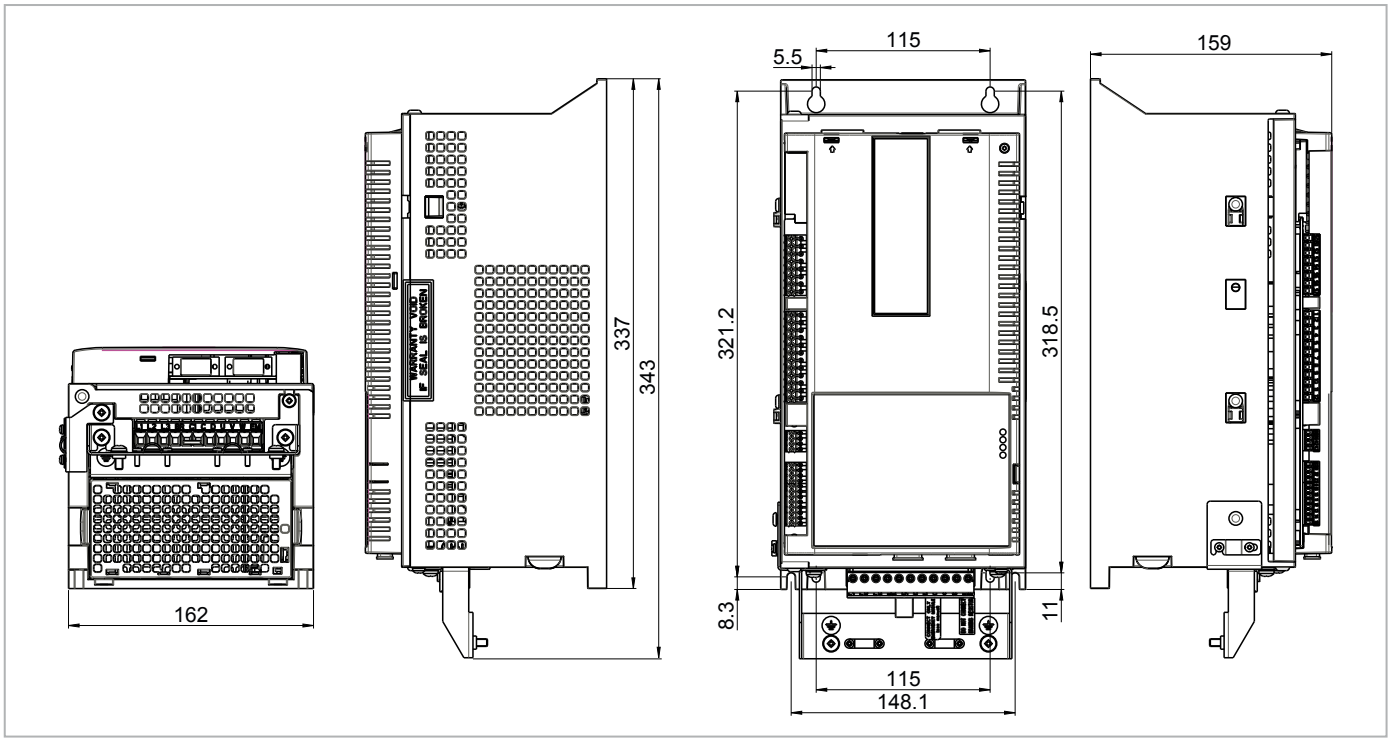
All inverters are equipped with internal fans.

Size	**Pv (Heat dissipation)**	**Fan capacity**		**Minimum cabinet opening for cooling**
	@U_{LN}=230...400V_{AC} (*)	Heat sink (m^3/h)	Internal (m^3/h)	(cm^2)
VDL200-...-4, 3ph				
1040	150	35	-	72
1055	250	2 x 58	-	144
2075	350	2 x 58	-	144
2110	400	2 x 35	-	144
3150	600	2 x 98	32	328
3185	700	2 x 98	32	328
3220	900	2 x 104	32	328

(*) values that refer to operation at default switching frequency.

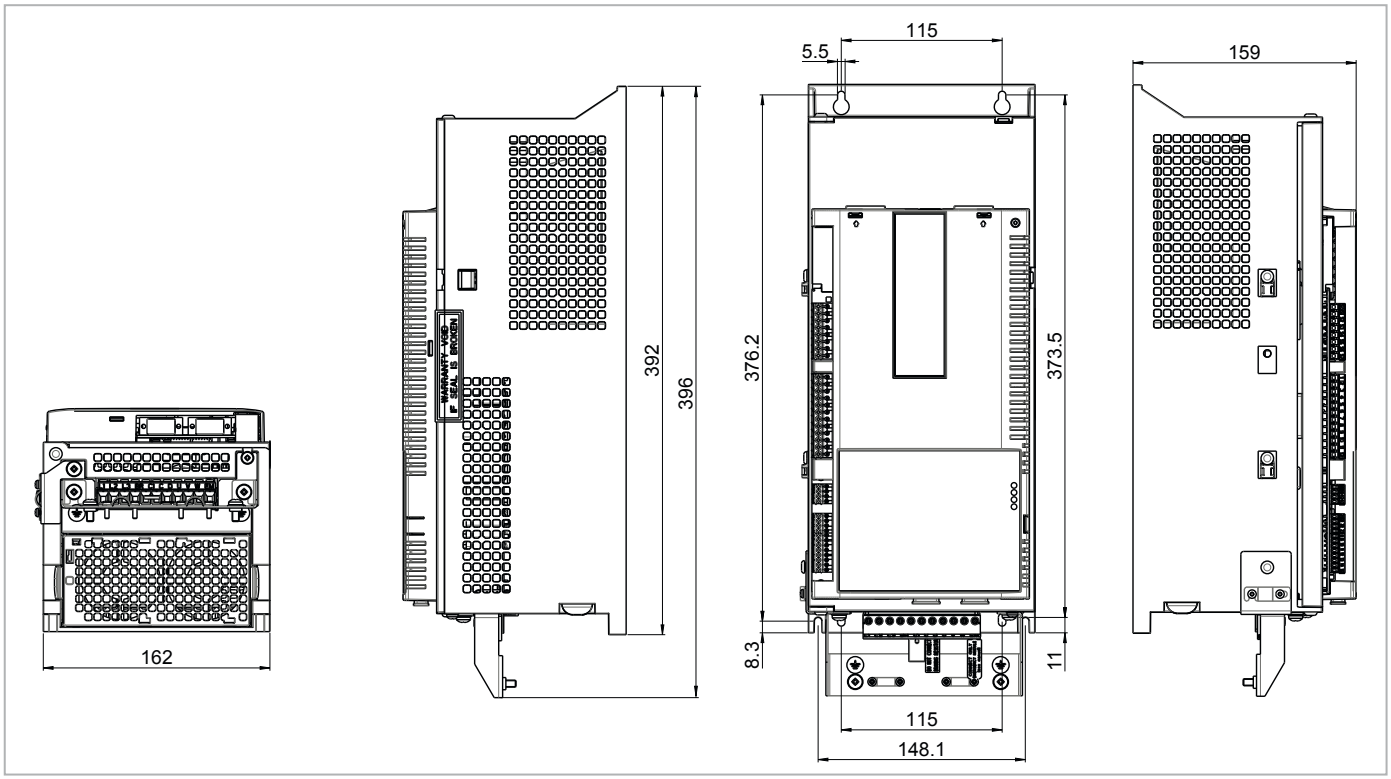
4.9 Weights and dimensions

Figure 4.9.1: Size 1 dimensions



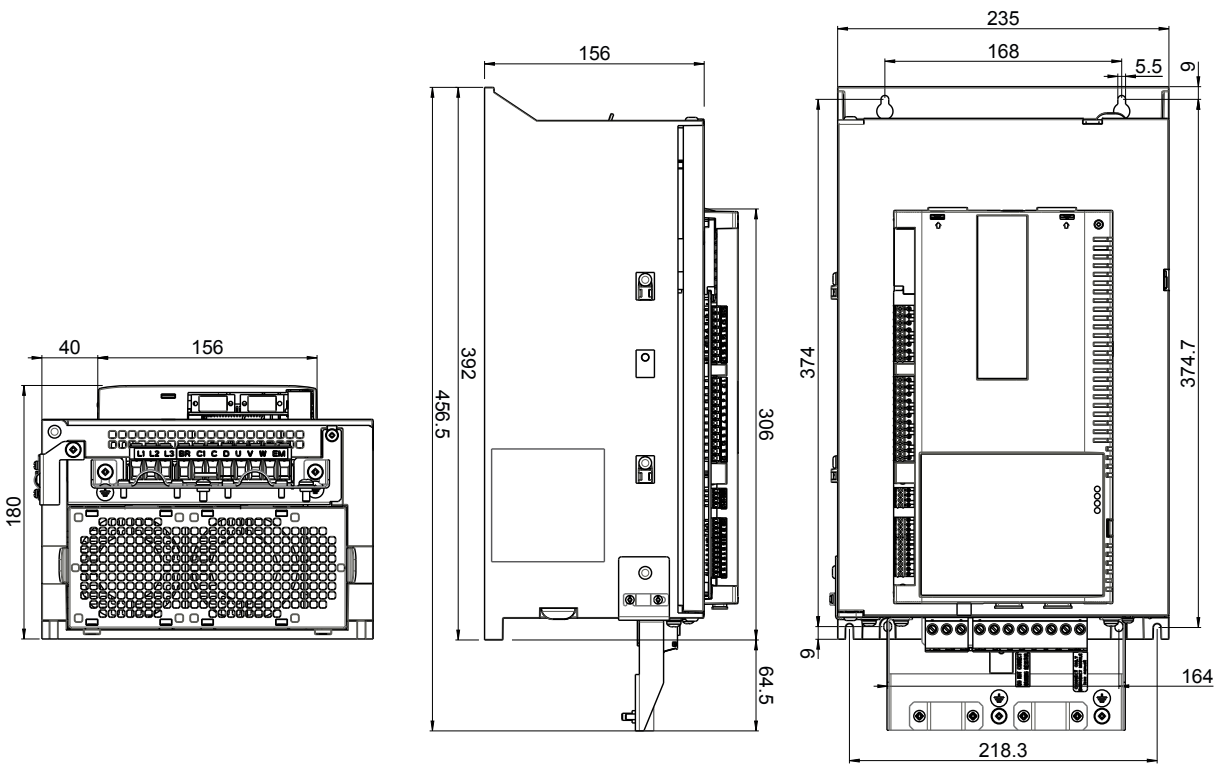
Sizes	Dimensions: Width x Height x Depth		Weight	
	(mm)	(inches)	(kg)	(lbs)
VDL200-1040-...-4 **VDL200-1055-...-4**	162 x 343 x 159	6.38 x 13.50 x 6,26	5.6	12.3

Figure 4.9.2: Size 2 dimensions



Sizes	Dimensions: Width x Height x Depth		Weight	
	(mm)	(inches)	(kg)	(lbs)
VDL200-2075-...-4 **VDL200-2110-...-4**	162 x 396 x 159	6.38 x 15.59 x 6.26	7.6	16.7

Figure 4.9.3: Size 3 dimensions



Sizes	Dimensions: Width x Height x Depth		Weight	
	(mm)	(inches)	(kg)	(lbs)
VDL200-3150-...-4 **VDL200-3185-...-4** **VDL200-3220-...-4**	235 x 456.5 x 180	9,25 x 17.97 x 7.08	10.5	23.15

5 - Options

5.1 Optional external fuses

5.1.1 Network side fuses (F1)

The inverter must be fused upstream on the network side.
Use fast-acting fuses only.

Size	F1 - External network side fuses				
	DC link capacitor hours of service life [h]	EUROPE		AMERICA	
		Type	Code	Type	Code
VDL200-...-4, 3ph					
1040	> 15000	GRD2/20	F4D15	A70P20	S7G48
1055	> 15000	GRD2/25	F4D16	A70P25	S7G51
2075	> 15000	GRD3/35	F4D20	A70P40	S7G52
2110	> 15000	Z22GR40	F4M16	A70P40	S7G52
3150	> 15000	Z22GR63	F4M17	A70P60-4	S7I34
3185	> 15000	Z22GR80	F4M19	A70P80	S7G54
3220	> 15000	Z22GR80	F4M19	A70P80	S7G54

Technical data for fuses, including dimensions, weights, power leakage, fuse carriers etc. are reported in the corresponding manufacturers' data sheets:
GRD... (E27), S00... Jean Müller, Eltville
A70... Ferraz

5.2 Input chokes

The three-phase mains choke is strongly recommended in order to:

- limit the RMS input current of the VDL200 inverter.
- increase the life of intermediate circuit capacitors and reliability of input diodes.
- reduce mains harmonic content
- reduce problems due to power supply via a low impedance line (≤ 1%).

In accordance with EN 12015 (THD values < 35%), provide the following:

- sizes ≤ 22kW: DC input inductance (see paragraph 5.2.2)

5.2.1 AC input chokes

Size	Effective input current I_N (@400V/50Hz, with AC input chokes) (A)	Model	Code	Dimensions: W x H x d mm [inches]	Weight kg [lbs]
VDL200-...-4, 3ph					
1040	9	LR3y-2040	S7AAG	120 x 125 x 65 [4.7 x 4.9 x 2.6]	2 [4.4]
1055	13.5	LR3y-2055	S7AB5	120 x 125 x 75 [4.7 x 4.9 x 2.6]	2.2 [4.4]
2075	18	LR3y-2075	S7AB6	150 x 155 x 79 [5.9 x 6.1 x 3.1]	4.9 [10.8]
2110	24	LR3y-3110	S7AB7	150 x 155 x 79 [5.9 x 6.1 x 3.1]	5 [11]
3150	32	LR3y-3150	S7AB8	150 x 169 x 85 [5.9 x 6.7 x 3.3]	5.5 [12.1]
3185	39	LR3y-3150	S7AB8	150 x 169 x 85 [5.9 x 6.7 x 3.3]	5.5 [12.1]
3220	44.5	LR3-022	S7FF4	180 x 182 x 130 [7.1 x 7.2 x 5.1]	7.8 [17.2]

5.2.2 DC input chokes

Size	Effective input current I_N (with external DC chokes)		External DC chokes					
	@230V/50Hz (A)	@400V/50Hz (A)	Rated current (Arms)	Overload current (*) (Arms)	Model	Code	Dimensions: Width x Height x Depth mm [inches]	Weight kg [lbs]
1040	8	8	10	20	LDC-004	S7AI10	99 x 96 x 93 [3.90 x 3.78 x 3.66]	2.4 [5.3]
1055	12	12	16	31	LDC-005	S7AI11	125 x 112 x 98 [4.92 x 4.41 x 3.86]	4.1 [9.0]
2075	16	16	21	41	LDC-007	S7AI12	125 x 127 x 122 [4.92 x 5.00 x 4.80]	4.9 [10.8]
2110	21	21	28	54	LDC-011	S7AI13	125 x 127 x 142 [4.92 x 5.00 x 5.59]	6.6 [14.6]
3150	28	28	36	70	LDC-015	S7AI14	125 x 127 x 152 [4.92 x 5.00 x 5.98]	8 [17.6]
3185	34	34	45	90	LDC-022	S7AI15	155 x 160 x 148 [6.10 x 6.30 x 5.83]	8.5 [18.7]
3220	39.5	39.5	45	90	LDC-022	S7AI15	155 x 160 x 148 [6.10 x 6.30 x 5.83]	8.5 [18.7]

5.3 AC output chokes

The VDL200 inverter can be used with standard motors or motors designed specifically for use with inverters. 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 inverters do not require any specific filtering of output from the inverter. For standard motors, especially with long cable runs (typically over 100 m) an output choke may be necessary to maintain the voltage waveform with the specified limits.

The range of recommended chokes are listed in the following table. The rated current of the chokes should be approx. 20% higher than that of the inverter in order to take into account additional losses due to modulation of the output waveform.

Size	Model	Code	Dimensions: W x H x d mm [inches]	Weight kg [lbs]
VDL200-...-4, 3ph				
1040	LU3-005	S7FG3	180 x 170 x 110 [7.1 x 6.7 x 4.3]	5.8 [12.8]
1055	LU3-005	S7FG3	180 x 170 x 110 [7.1 x 6.7 x 4.3]	5.8 [12.8]
2075	LU3-005	S7FG3	180 x 170 x 110 [7.1 x 6.7 x 4.3]	5.8 [12.8]
2110	LU3-011	S7FG4	180 x 180 x 130 [7.1 x 7.1 x 5.1]	8 [17.6]
3150	LU3-015	S7FH2	180 x 160 x 170 [7.1 x 6.3 x 6.7]	7.5 [16.5]
3185	LU3-015	S7FH2	180 x 160 x 170 [7.1 x 6.3 x 6.7]	7.5 [16.5]
3220	LU3-022	S7FH3	180 x 160 x 185 [7.1 x 6.3 x 7.3]	8 [17.6]

Note!

With the inverter operated at the rated current and a frequency of 50 Hz, the output chokes cause a voltage drop of approx. 2% of the output voltage.

5.4 External braking resistors (optional)

Recommended combinations for use with internal braking unit.

Table 5.4.1: Recommended combination VDL200

Size	List and technical data of standard external resistors									
	Resistor type	Code	Q.ty	Max. overload, 1" - service 10% E_{BR} (kJ)	Max. overload, 30" - service 25% E_{BR} (kJ)	P_{NBR} (W)	R_{BR} (Ω)	Housing	Dimensions: W x H x d mm	Weight kg
VDL200-...-4, 3ph										
1040	RFPD 750 DT 100R	S8SY4	1	7.5	38	750	100	IP44	200 x 70 x 106	1.7
1055	RFPR 750 D 68R	S8SZ3	1	7.5	38	750	68	IP44	245 x 75 x 100	2.7
2075	RFPR 750 D 68R	S8SZ3	1	7.5	28	750	68	IP44	245 x 75 x 100	2.7
2110	RFPR 1200 D 49R	S8SZ4	1	7.5	28	1200	49	IP44	310 x 75 x 100	4.2
3150	RFPR 1900 D 28R	S8SZ5	1	12	43	1500	28	IP44	365 x 75 x 100	4.2
3185	BRT4K0-15R4	S8T00G	1	40	150	4000	15.4	IP20	625 x 100 x 250	7.0
3220	BRT4K0-15R4	S8T00G	1	40	150	4000	15.4	IP20	625 x 100 x 250	7.0

P_{NBR} Braking resistor rated power
R_{BR} Braking resistor ohmic value
E_{BR} Maximum energy that can be dissipated on the resistor

Warning!

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

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

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

5.5 EMC Filter (optional)

The VDL200-...-F-4 inverters are equipped with an internal EMI filter, optional external filters are reported in the table.

Size	Type	Code	Dimensions: W x H x d (mm)	Weight (kg)	Conducted emissions according to / Motor cable length
VDL200-... , 3ph					
1040	EMI-FTF-480-7	S7GHL	190 x 40 x 70	0.6	EN 12015 / 10 m
1055	EMI-FTF-480-16	S7GHO	250 x 45 x 70	0.8	
2075	EMI-FTF-480-16	S7GHO	250 x 45 x 70	0.8	
2110	EMI-FTF-480-30	S7GHP	270 x 50 x 85	1	EN 12015 / 10 m
3150	EMI-FTF-480-30	S7GHP	250 x 50 x 85	1	
3185	EMI-FTF-480-42	S7GOA	310 x 50 x 85	1.3	
3220	EMI-FTF-480-42	S7GOA	310 x 50 x 85	1.3	

6 - 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 pasinstaller le drive dans des places ou la temperature permise est dépassée.

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

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

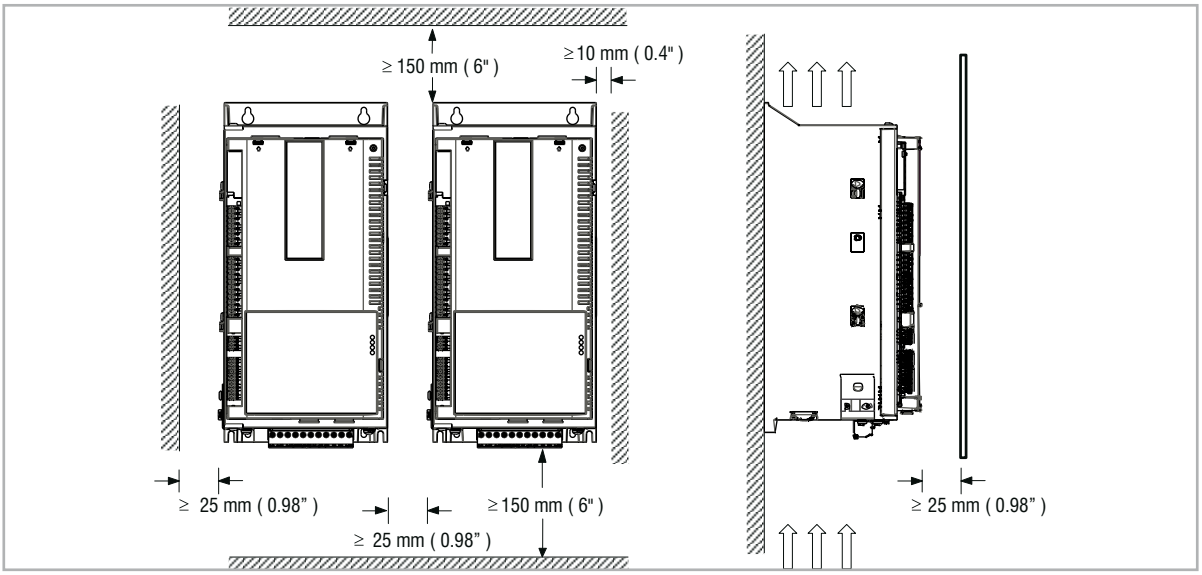
Protect the device from impermissible environmental conditions (temperature, humidity, shock etc.).

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

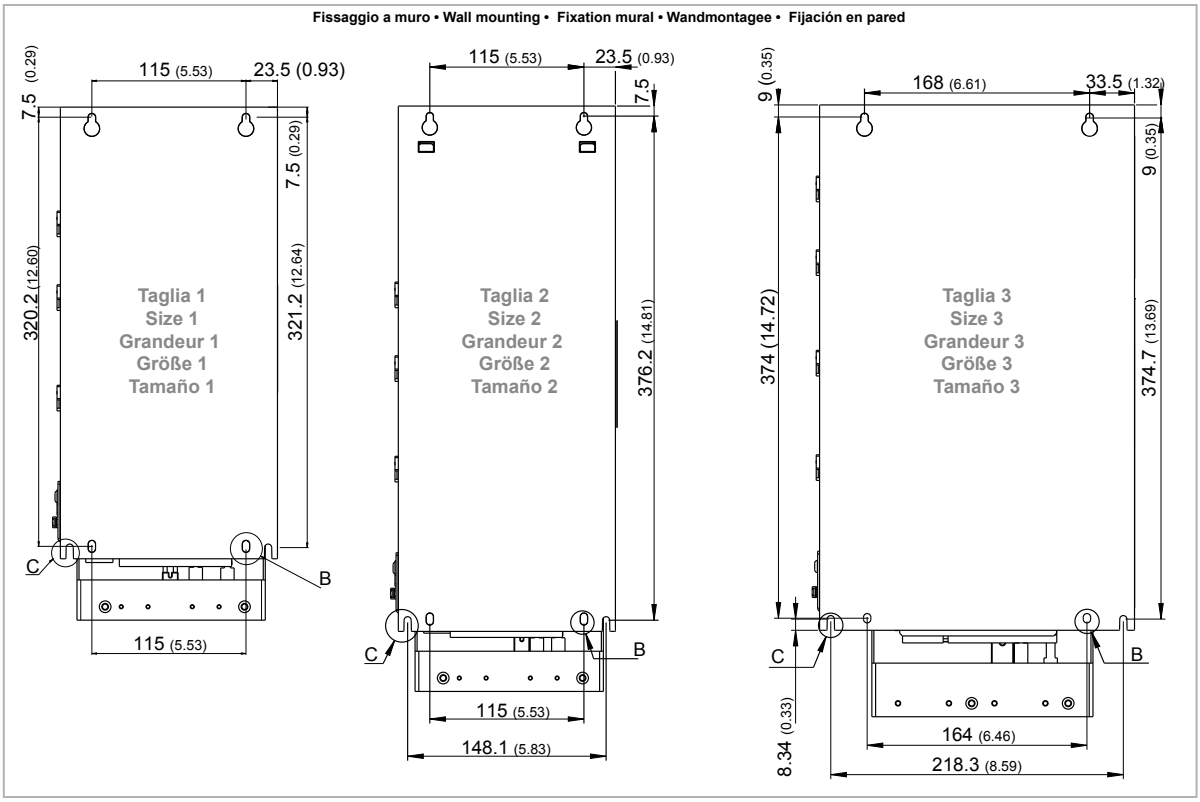
6.1 Maximum inclination and assembly clearances

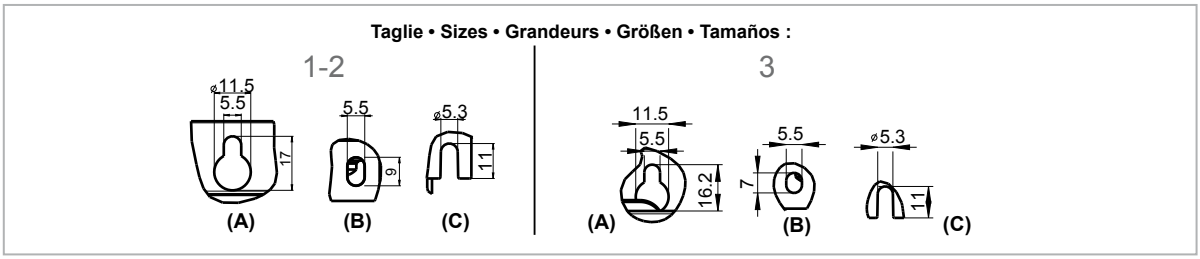
The inverters must be mounted in such a way that air can flow freely around them, **see paragraph 4.8 Cooling**.

Maximum angle of inclination _____ 30° (referred to vertical position)
Minimum top and bottom distance _____ 150 mm
Minimum free space to the front _____ 25 mm
Minimum distance between drives _____ 25 mm
Minimum distance to the side
with the cabinet _____ 25 mm



6.2 Fastening positions





	Recommended screws for fastening
Size 1 (VDL200..-1...)	4 x M5 x 12 mm screws + Grover (spring-lock) washer + flat washer
Size 2 (VDL200..-2...)	4 x M5 x 12 mm screws + Grover (spring-lock) washer + flat washer
Size 3 (VDL200...-3...)	4 x M5 x 12 mm screws + Grover (spring-lock) washer + flat washer

Note!

Other dimensions **see chapter 4.9** Weights and dimensions.

7 - Wiring Procedure

Warning!

Adjustable frequency drives are electrical apparatus for use in industrial installations. Parts of the Drives are energized during operation. The electrical installation and the opening of the device 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'operation. L'installation électrique et l'ouverture des drives devrait être executé uniquement par du personel qualifié. De mauvaises installations de moteurs ou de drives peuvent provoquer des dommages materiels ou blesser des personnes. On doit suivir les instructions donneés dans ce manuel et observer les régles nationales de sécurité.

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

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

Warning!

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

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

Never open the device or covers while the AC Input power supply is switched on. Minimum time to wait before working on the terminals or inside the device is listed in section 4.6.

Ne jamais ouvrir l'appareil lorsqu'il est suns tension. Le temps minimum d'attente avant de pouvoir travailler sur les bornes ou bien à l'intérieur de l'appareil est indiqué dans la section 4.6.

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

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

Caution

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

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

<u>Operation with Residual Current Device (Differential switch)</u>

If an RCD (also known as an RCCB or ELCB) is installed, it must have a high leakage current (≥ 300 mA).

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!

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

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

Caution

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

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

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

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

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

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

No voltage should be connected to the output of the drive (terminals U2, V2 W2). 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 U2, V2 et W2). Il n'est pas permis de raccorder la sortie de plusieurs convertisseurs en parallèle, ni d'effectuer une connexion directede l'entrée avec la sortie du convertisseur (Bypass).

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

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

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

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

7.1 Power section

7.1.1 Cable cross-sections

Size VDL200-...-4, 3ph	Terminals: L1 - L2 - L3 - BR - C1 - C - D - U - V - W - EM				
	Maximum cable cross-section (flexible conductor)		Recommended stripping	Recommended terminal	Tightening torque (min)
	(mm^2)	AWG	(mm)	(mm)	(Nm)
1040	4	10	10	None / pin	0.7 ... 0.8
1055	4	10	10	None / pin	0.7 ... 0.8
2075	6	8	10	None / pin	0.7 ... 0.8
2110	6	8	10	None / pin	0.7 ... 0.8
3150	16	6	14	None / pin	1.7 ... 1.8
3185	16	6	14	None / pin	1.7 ... 1.8
3220	16	6	14	None / pin	1.7 ... 1.8

Note!

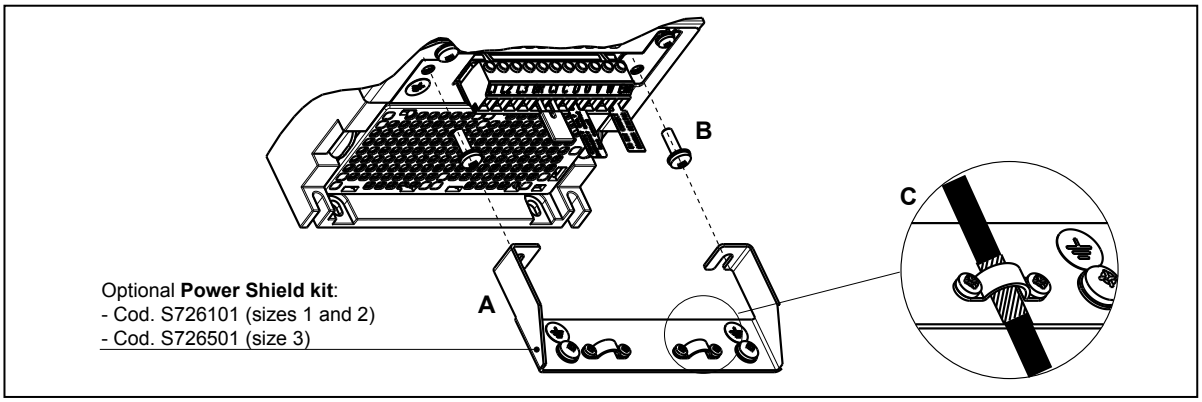
The power terminal strip is extractable on sizes 1040 ... 2110. The EM terminal strip is extractable on all mechanical sizes.

Size VDL200-...-4, 3ph	Terminals: ⏚ on structural work				
	Cable cross-section		Lock screw diameter	Recommended terminal	Tightening torque (min)
	(mm^2)	AWG	(mm)	(mm)	(Nm)
1040 ... 3220	Same as the maximum cross-section used for the power terminal strip		M5	Eyelet - Fork	6

Note!

The minimum cross-section for both ground connections must comply with EN61800-5-1 prescriptions. Always ground both points on structural steel.

7.1.2 Connection of shielding (recommended)



Loosen the two screws (B), put the metal support (A) (optional, POWER SHIELD KIT) in place and screw down tightly. Fasten the power cable shield to the omega sections (C) as illustrated in the figure.

7.1.3 EMC guide line

Warning!

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

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

Attention

The converters are protected in order to be used in industrial environments where, for immunity purposes, large amounts of electromagnetic interference can occur. Proper installation practices will ensure safe and trouble-free operation. If you encounter problems, follow the guidelines which follow.

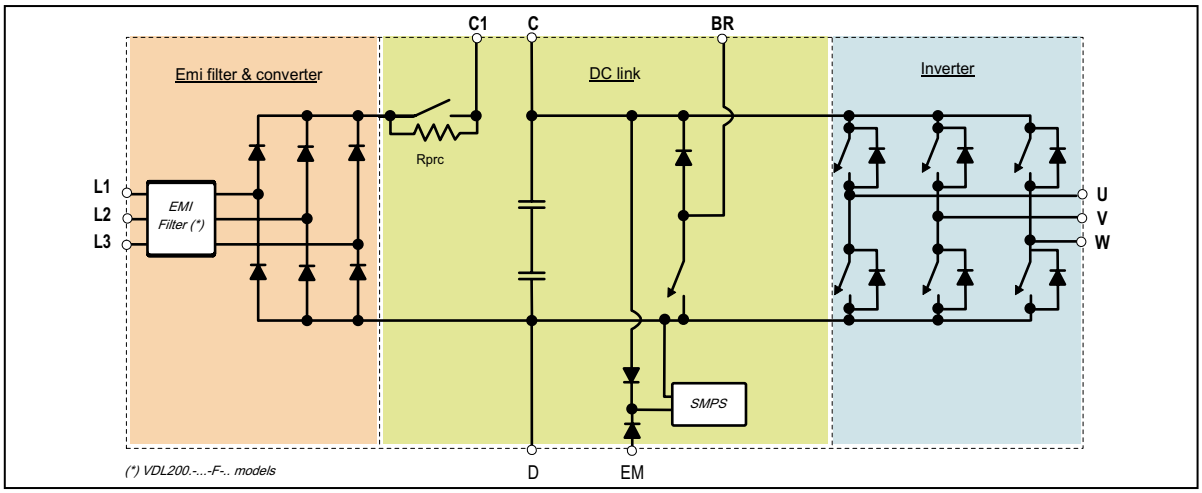
- Check for all equipment in the cabinet are well grounded using short, thick grounding cable connected to a common star point or busbar. Better solution is to use a conductive mounting plane and use that as EMC ground reference plane.
- Flat conductors, for EMC grounding, are better than other type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

Note!

For further information regarding electro-magnetic compatibility standards, according to Directive 2014/30/EC, 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” on the CD attached to this drive.

7.1.4 Block diagram of power section

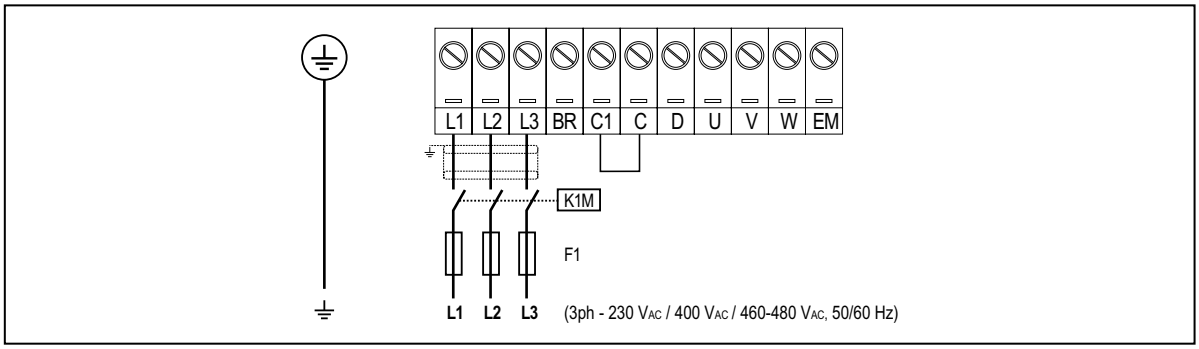
This type is equipped with an EMI input filter (models VDL200-...-F), an AC/DC converter, a system for pre-loading DC capacitors, a DC/AC converter, a power supply unit and an integrated braking unit.
To manage emergency situations (drive power failure) the unit also envisages connection of an emergency unit between terminals EM and D.
A specific external resistor must be connected to perform the braking function: connect the resistor between terminals C and BR.



7.1.5 Internal EMC filter (standard)

The VDL200-...-F-.. series of inverters are equipped with an internal EMI filter able to guarantee the performance levels required by EN 12015 with max 10 m of shielded motor cable.
Compliance with these requirements means the drive can be incorporated into lift systems built to EN 12015.

7.1.6 Power line connection



Note!

Recommended combination F1 fuses: **see paragraph 5.1.1**.

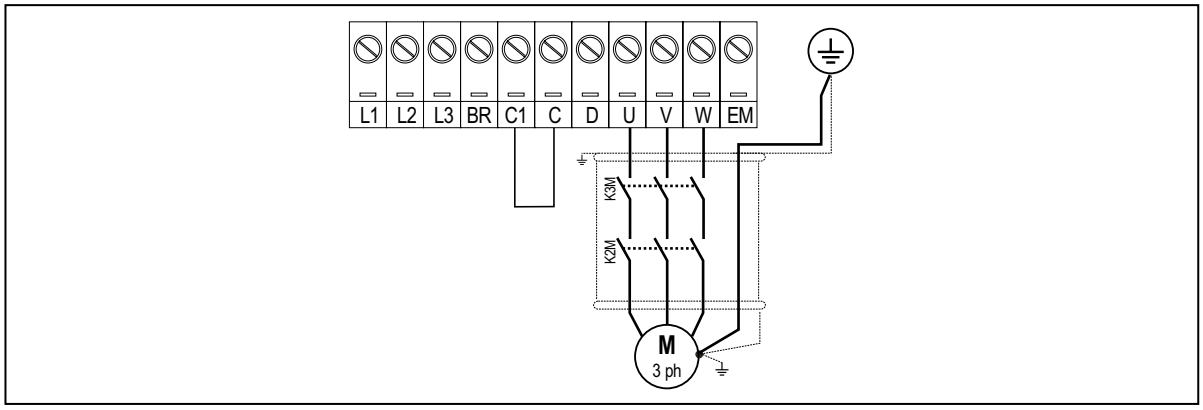
7.1.7 Connection of AC and DC chokes (optional)

The drive can use both a three-phase choke on the AC power line and, for 4 to 22 kW drives only, a DC choke between terminals C1 and C. Refer to **chapter 5.2** for the recommended connections.
If no DC choke is used on 4 to 22 kW drives, terminals C1 and C must be bridged.

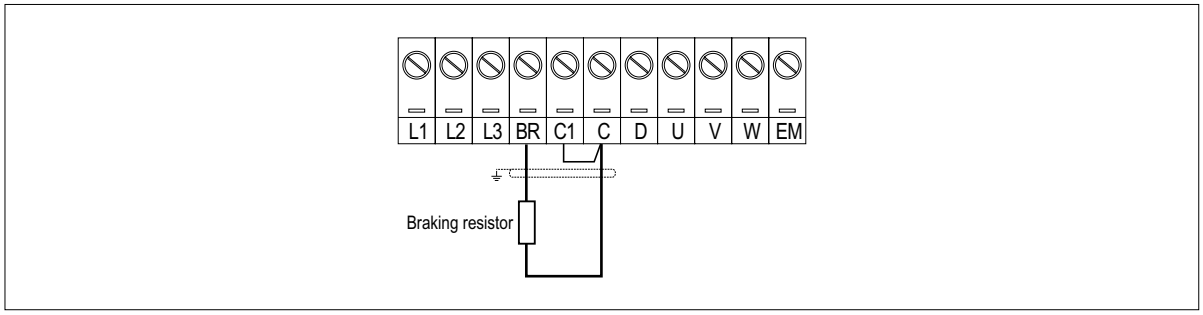
Attention

If no DC choke is used, terminals C1 and C must be bridged (sizes 1, 2 and 3).

7.1.8 Motor connection



7.1.9 Connection of braking resistor (optional)



Note! Recommended combination braking resistors: **see paragraph 5.4**.

7.2 Regulation section

Figure 7.2.1: Identification of cards and terminals VDL200 Asynchronous (R-VDL200 card)

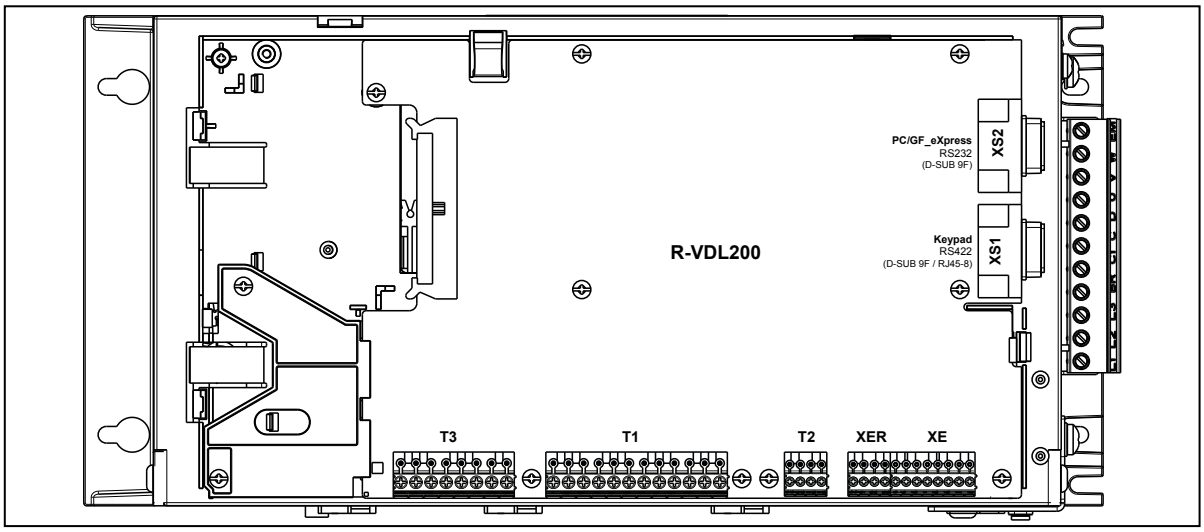
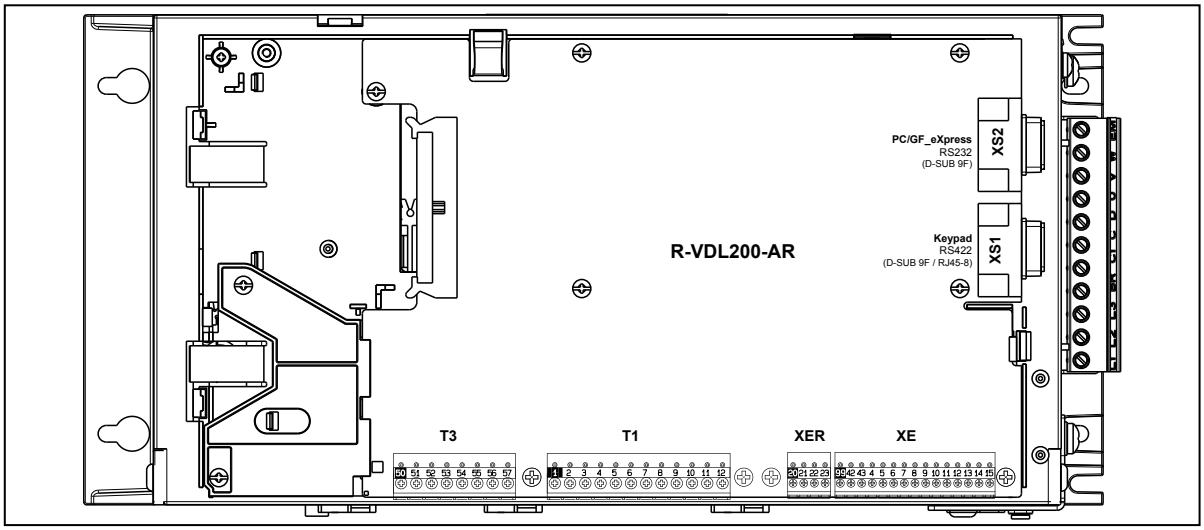


Figure 7.2.2: Identification of cards and terminals VDL200 Synchronous (R-VDL200-AR card)



7.2.1 Cable cross-sections

Terminals	Maximum cable cross-section		Recommended stripping	Tightening torque (min)
	(mm^2)	(AWG)	(mm)	(Nm)
T3, T2, T1	0,2 ... 2.5 (1 cable) 0,2 ... 0.75 (2 cables)	26 ... 12 26 ... 19	5	0.4
XER, XE	0,2 ... 1.5 (1 cable) 0,2 ... 0.5 (2 cables)	26 ... 16 26 ... 19	5	0.25

7.2.2 Connection of I/O

Note! For electrical properties of analog, digital and relay inputs/outputs **see section "A.1 - I/O Specification".**

Figure 7.2.2-A: terminal strip and connection VDL200 Asynchronous

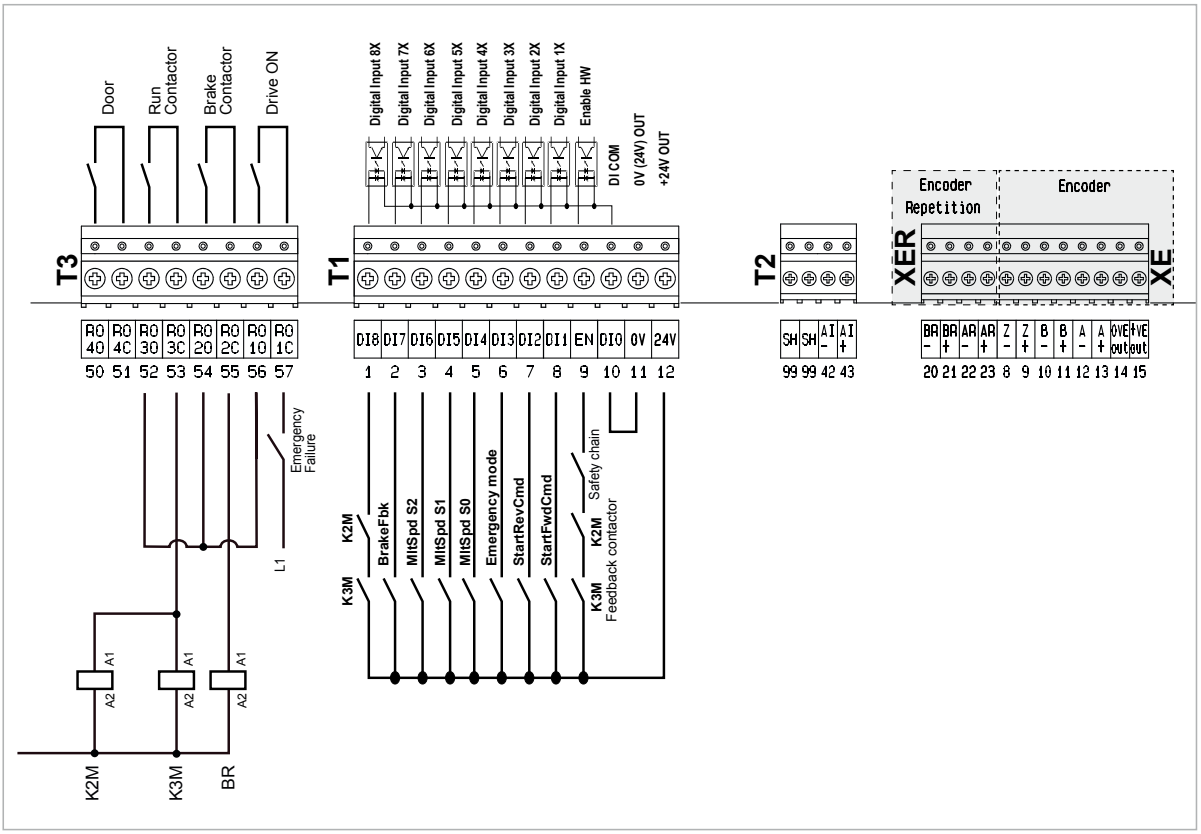


Figure 7.2.2-B: terminal strip and connection VDL200-...-ED Synchronous

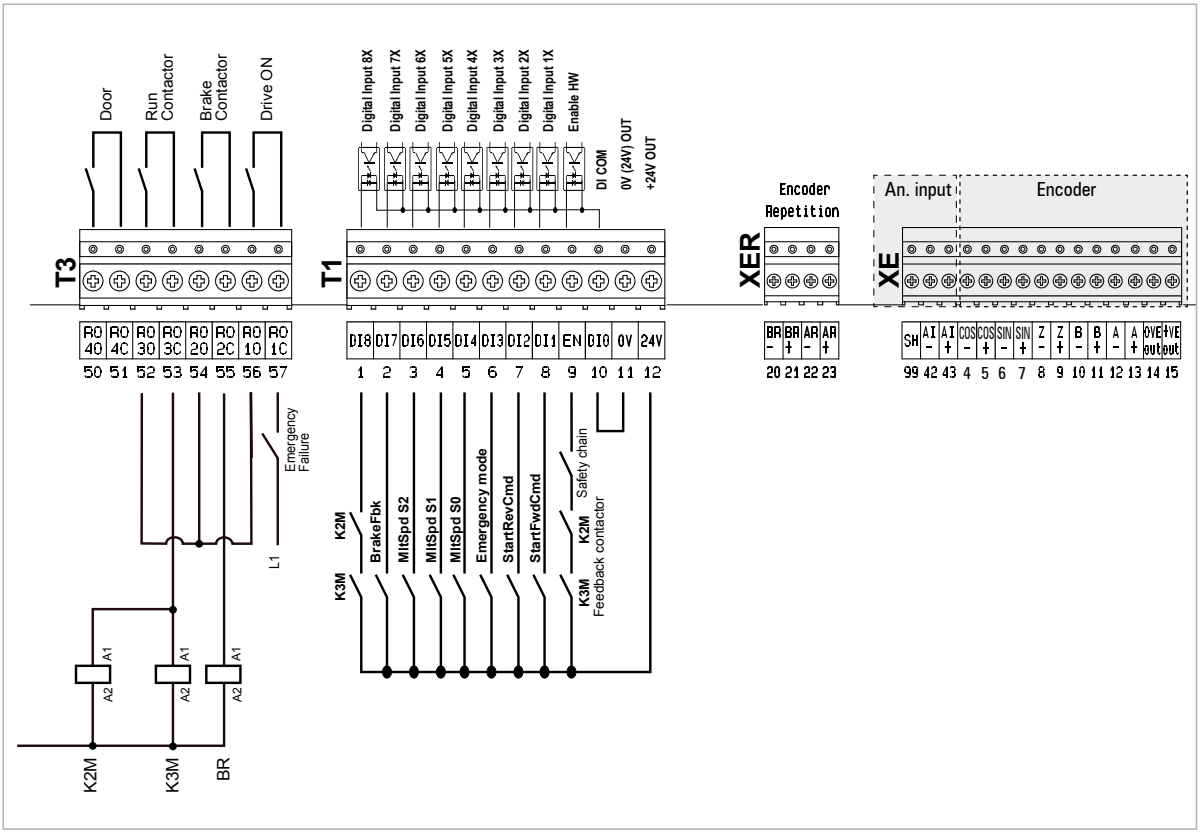
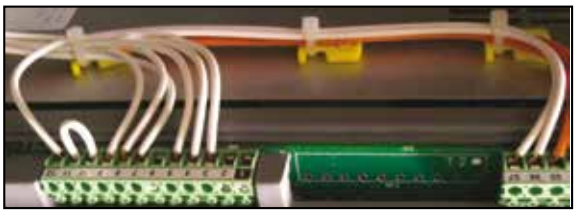


Figure 7.2.3: Recommended card wiring



7.2.3 Feedback Connection

This section describes the feedback connections for the VDL200 series.

VDL200 Asynchronous:
1) Connection digital encoder 3 Channels, TTL Line Driver / Push pull(DE)
4) Repeat Encoder (TTL line-driver)

VDL200-...-ED Synchronous:
1) Connection digital encoder 3 Channels, TTL Line Driver / Push pull (DE)
2) Connection sinusoidal encoder 3 Channels (SE)
3) Connection EnDat Encoder (EnDat-SSi)
4) Repeat Encoder (TTL line-driver)

Figure 7.2.4: Connection of shielding (recommended)

1) Connection digital encoder 3 Channels, TTL Line Driver / Push pull (DE)

Note !

The encoder power supply must be adequate considering the cable length and the absorption rates as shown in paragraph "7.2.4 Internal power supply of the encoder" .

(TTL Line-driver / Push pull)

Channels	A+ A-, B+ B-, Z+ Z-, differential line drivers, optoisolated. Management of loss of encoder signals (via software).
Max frequency	100 kHz (check the number of encoder impulses according to the maximum speed)
Number of impulses	min 128, max 16384 (default 1024)
Electrical interface	TTL (ref. GND) Ulow ≤ 0.5 V Uhigh ≥ 2.5 V
Load capacity	13 mA @ 5.5 V (Zin 300Ω)
Programmable internal power supply	min +5.2 V, max +6.1 V (default + 5.2 V) — Imax 150 mA. See paragraph **"7.2.4 Internal power supply of the encoder"** (step: 5.2V / 5.5V / 5.8V / 6.1V).
Cable length	max 50m

VDL200 Asynchronous:

Digital Incremental Encoder: to control asynchronous motors in field-oriented flux vector mode (FOC).

Figure 7.2.5: Connection Incremental digital encoder (DE), TTL Line Driver / Push pull

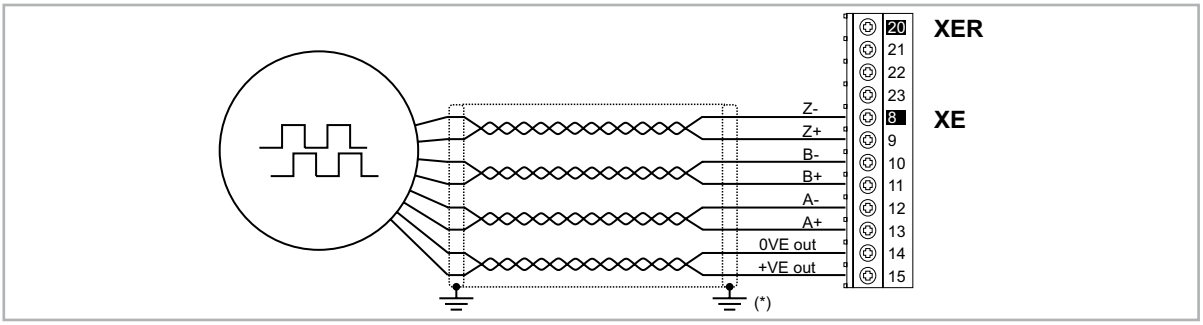
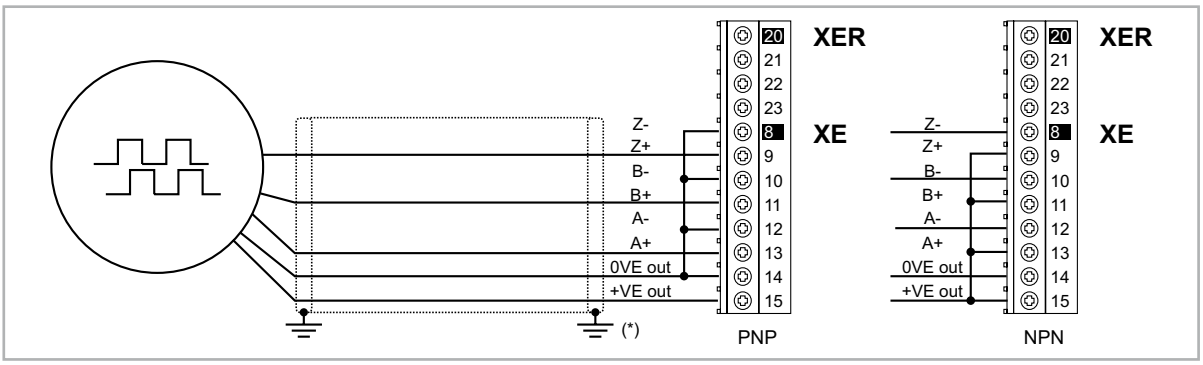


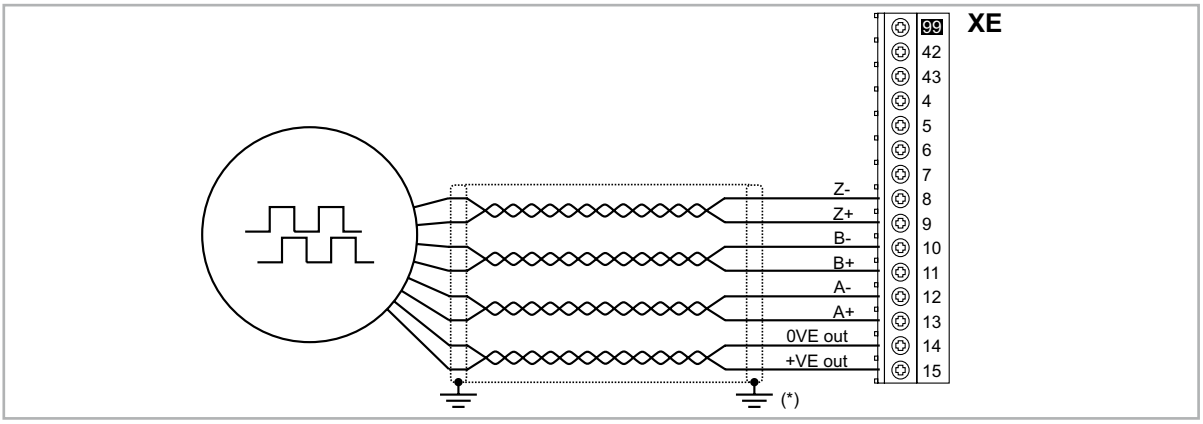
Figure 7.2.6: Connection Incremental digital encoder (DE), Single Ended PNP O.C./ NPN O.C



(*) Connection of shielding, see figure 7.2.4

VDL200-...-ED Synchronous:

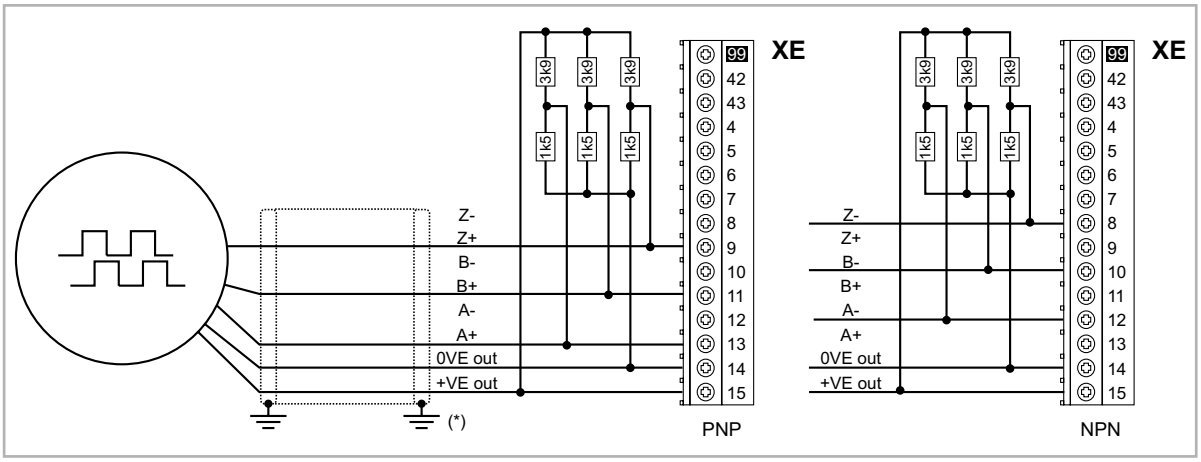
Figure 7.2.7: Connection Incremental digital encoder (DE), TTL Line Driver / Push pull



(*) Connection of shielding, see figure 7.2.4

The following resistive divider must be added on single-ended configurations.

Figure 7.2.6: Connection Incremental digital encoder (DE), Single Ended PNP O.C./ NPN O.C



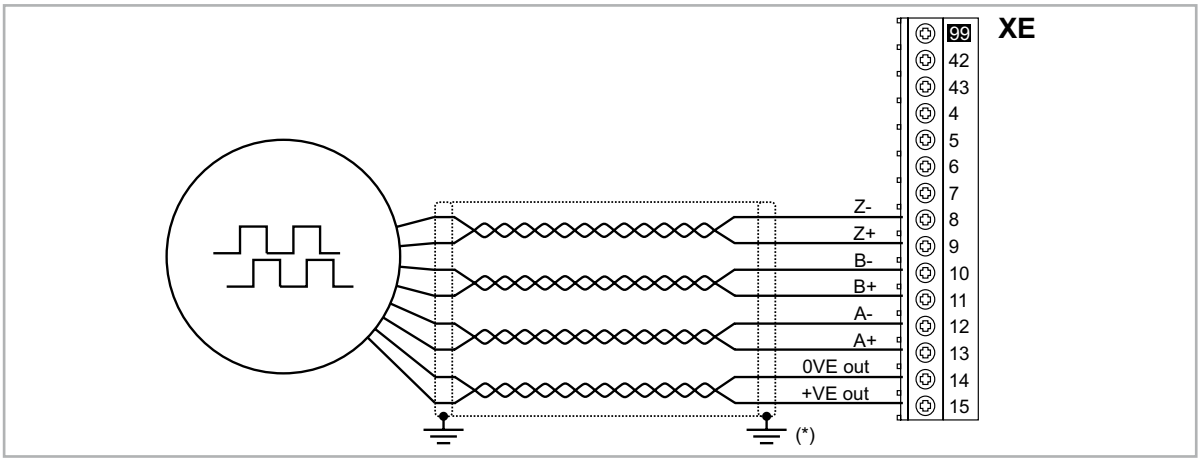
2) Connection sinusoidal encoder 3 Channels (SE)

Technical specification:

Channels	A+ A-, B+ B-, Z+ Z-, differential Management of loss of encoder signals.
Max frequency	200 kHz (check the number of encoder impulses according to the maximum speed)
Number of impulses	min 128, max 16384 (default 1024)
Electrical interface	Channels A/B 0.6 V ≤ Vpp ≥ 1.2 V (typ. 1.0 V) – Channel Z* 0.2 V ≤ Vpp ≥ 0.8 V
Load capacity	Channels A/B/Z* 8 mA @ 1.0 Vpp (Zin 120Ω)
Programmable internal power supply	min +5.2 V, max +6.1 V (default + 5.2 V) – Imax 150 mA. See paragraph **"7.2.4 Internal power supply of the encoder"** (step: 5.2V / 5.5V / 5.8V / 6.1V).
Cable length	max 50m

* Channel Z = I (Index mark)

Figure 7.2.9: Connection sinusoidal encoder 3 Channels (SE)



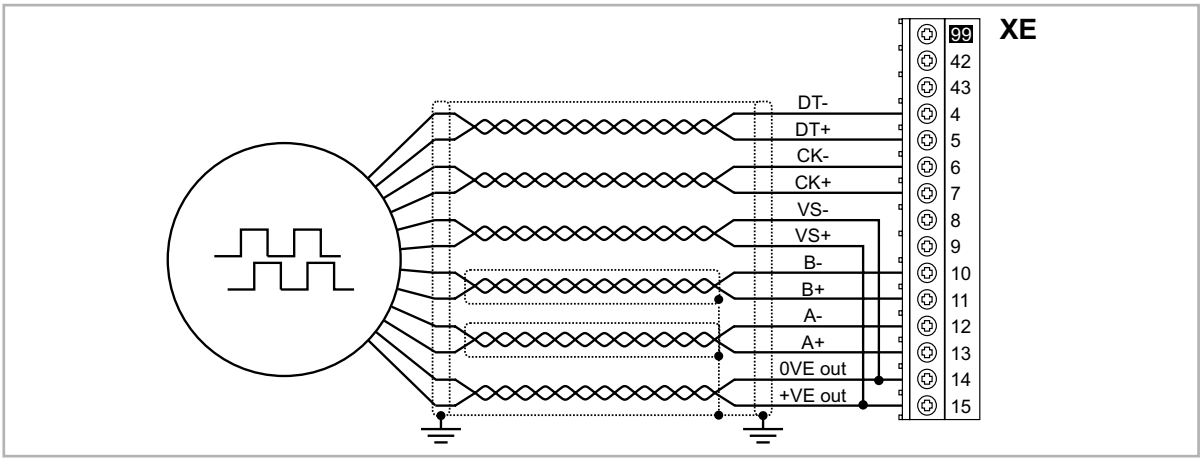
(*) Connection of shielding, see figure 7.2.4

3) Connection EnDat Encoder (EnDat-SSi)

Technical specification:

Channels	A+ A-, B+ B-, differential Management of loss of encoder signals.
Max frequency	200 kHz (check the number of encoder impulses according to the maximum speed)
Number of impulses	min 128, max 16384 (automatic recognition at initialisation)
Electrical interface	0.6 V ≤ Vpp ≥ 1.2 V (typ. 1.0 V)
Load capacity	8 mA @ 1.0 Vpp (Zin 120Ω)
Programmable internal power supply	min +5.2 V, max +6.1 V (default + 5.2 V) – Imax 150 mA. See paragraph **"7.2.4 Internal power supply of the encoder"** (step: 5.2V / 5.5V / 5.8V / 6.1V).
Cable length	max 50m (see encoder cable length section)
Absolute channels	CK+ CK-, DT+ DT- differential, RS-485 Management of loss of encoder signals.
Interface	EnDat: 2.1/2.2 single/multi-turn (command set managed only compatible with 2.1) SSI: Standard Sick/Stegman single/multi-turn
Max frequency	EnDat: 1 MHz with delay compensation (not programmable) SSI: 400 KHz (not programmable)
Number of bits	EnDat: max 32 bit/turn* max 32bit/turn (automatic recognition at initialisation) SSI:13-25 bits (default 25)

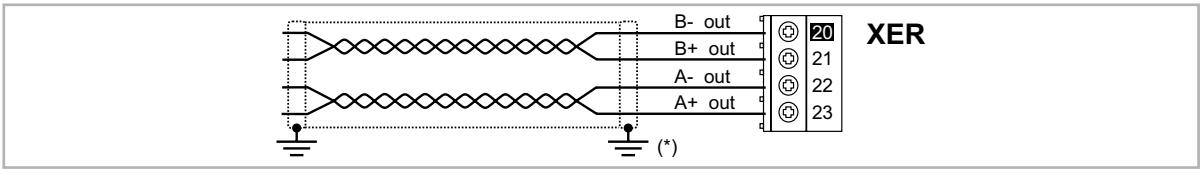
Figure 7.2.7: Connection EnDat Encoder (EnDat-SSi)



(*) Connection of shielding, see figure 7.2.4

4) Repeat Encoder (TTL line-driver)

Encoder expansion cards have an incremental encoder output with TTL/HTL Line Driver levels (according to the main encoder supply) to be used to repeat the servomotor feedback device. This function is performed via HW and an encoder output can be repeated with a programmable divider. The encoder output signals are available on the XER connector:



(*) Connection of shielding, see figure 7.2.4

Channels	A+ A-, B+ B-, differential line drivers, optoisolated.
Max frequency	100 kHz
Number of impulses	1/1-1/2-1/4-1/8 repeat (default 1/1)
Electrical interface	TTL (ref. GND) Ulow ≤ 0.5 V Uhigh ≥ 2.5 V
Load capacity	TTL 20mA @ 5,5V (Zin 120Ω) for each channel
Cable length	max 50m

7.2.4 Internal power supply of the encoder

The internal power supply of the encoder can be selected from the keypad (ENCODER CONFIG menu, parameter **Encoder supply** (PAR 2102) to balance the loss of voltage due to the length of the encoder cable and load current.

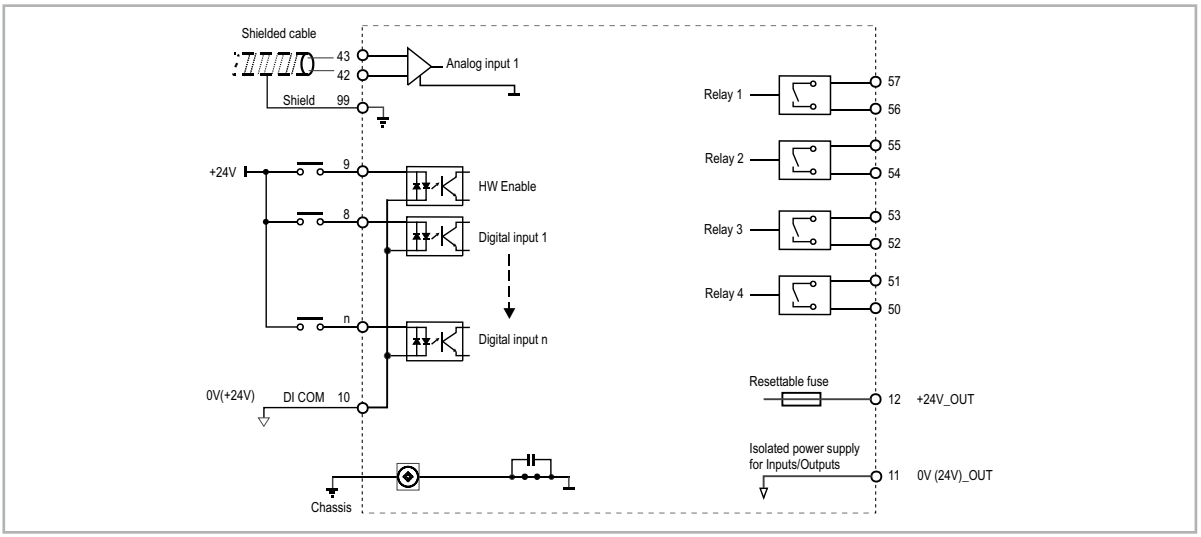
PAR 2102 **Encoder supply** range: min=5.2V, max= 6.1V, step of 0.1V; default=5,2V.
The encoder supply voltage will be rounded off to the nearest value among those 4 values available via hw: 5.2V / 5.5V / 5.8V / 6.1V.

7.3 Connection diagrams

Note! This chapter describes the typical wiring diagrams with reference to VDL200 drives with standard configuration.

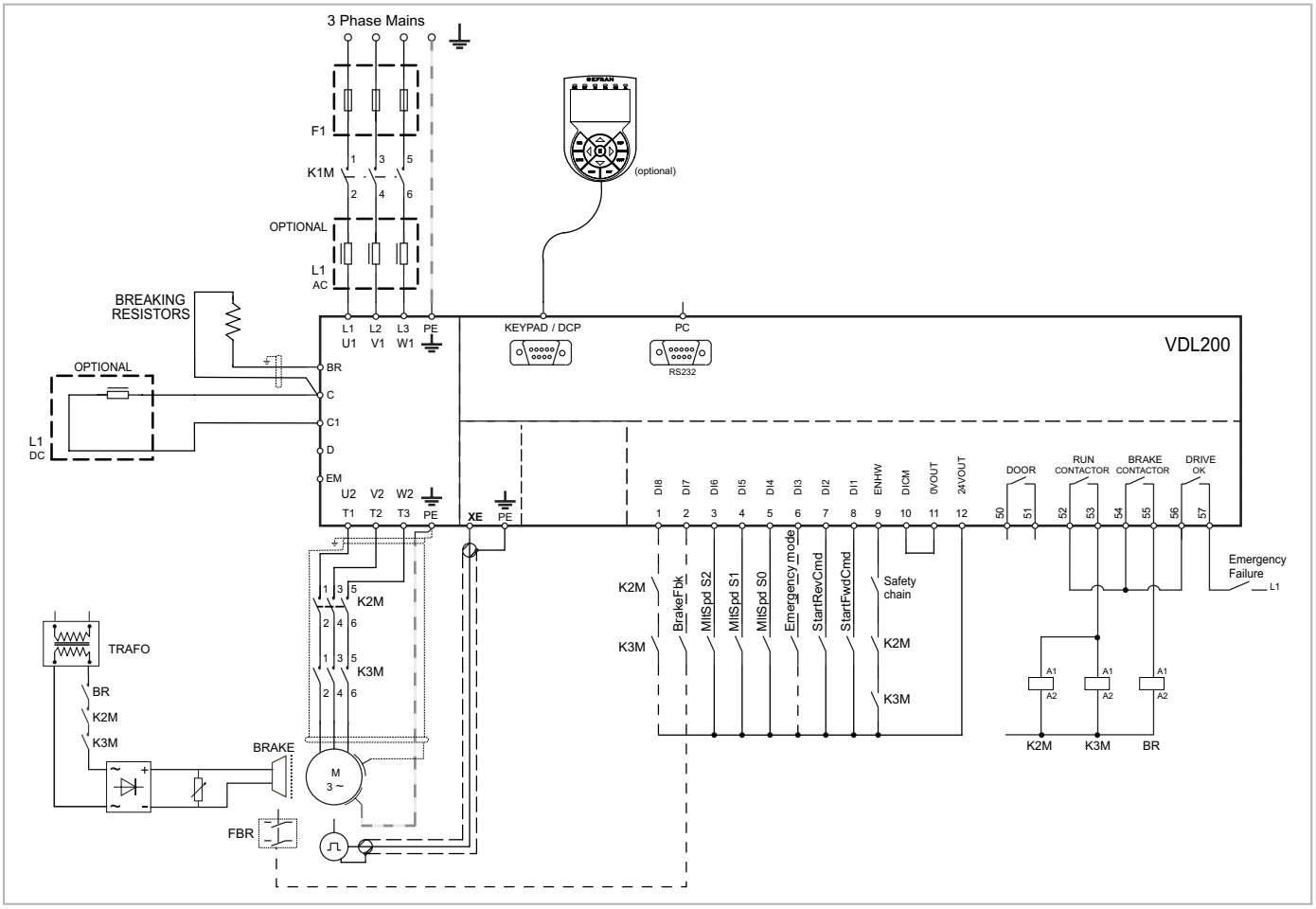
7.3.1 Regulation potentials, digital I/O

Figure 7.3.1.1: Regulation potentials (VDL200)



7.3.2 Typical connection diagram

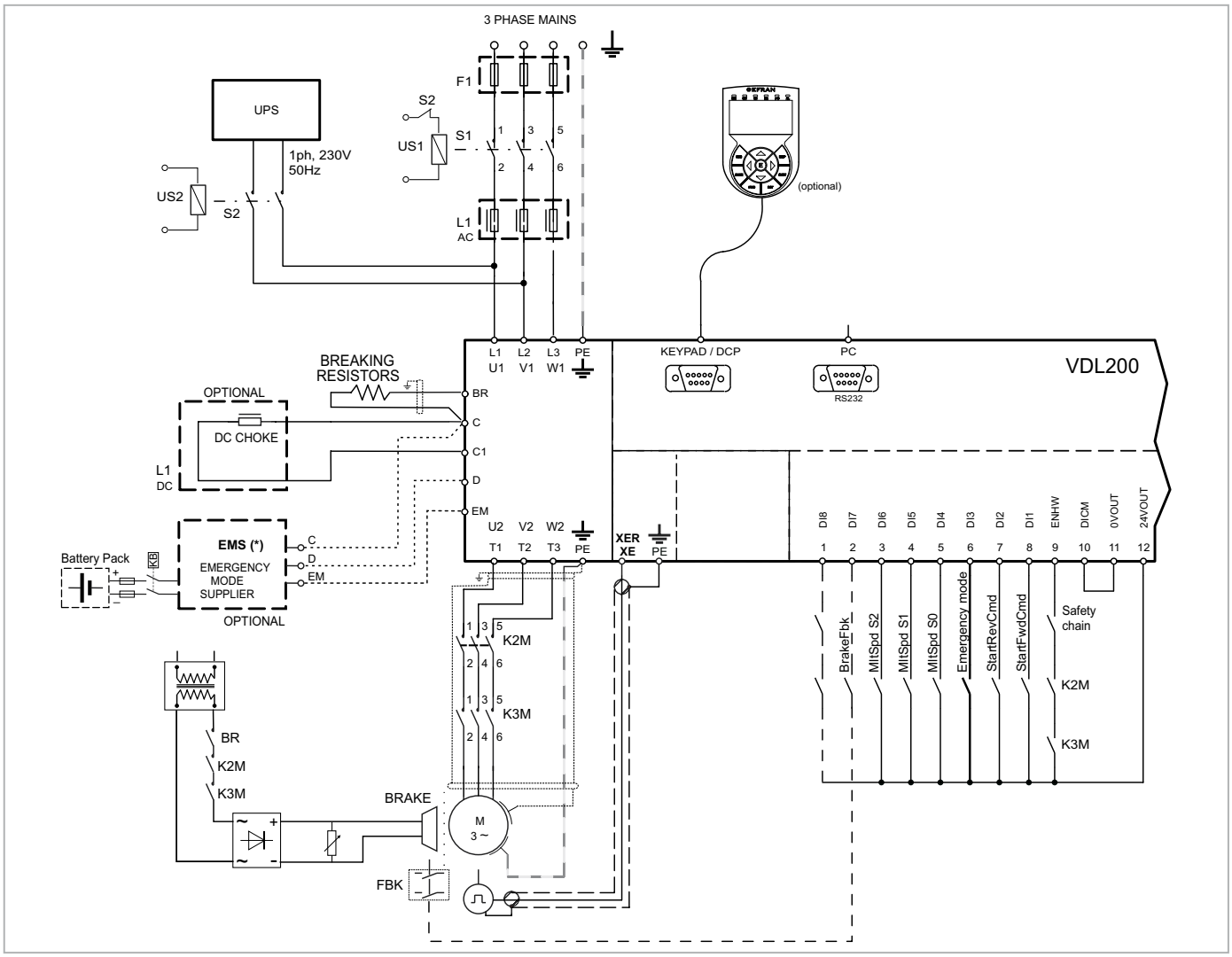
Figure 7.3.2.1: Typical connection diagram



7.3.3 Emergency connection diagram

The configuration described in this paragraph can be used to manage the motor in an emergency power failure condition (with 230 VAC single-phase UPS power supply or EMS module).

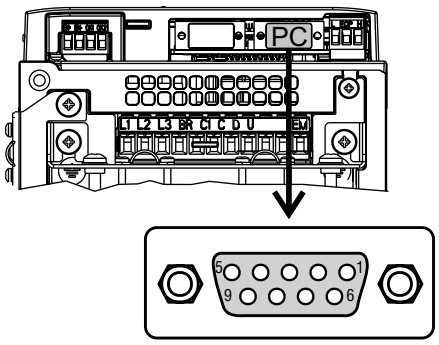
Figure 7.3.3.1: Emergency connection diagram



(*) EMS module instead of UPS device.

If an emergency power supply with UPS is used, the voltage on the DC_Link must not be below the minimum limit of 230V. If this occurs, connect the EM terminal to an additional power supply (see above: emergency connection in EMS mode).

7.4 Serial interface (PC connector)



	Funzione / Function	I/O	Interfaccia elettr./ Elect. Interface
PIN 1	-	–	–
PIN 2	TxD	O	RS232
PIN 3	RxD	I	RS232
PIN 4	-	–	–
PIN 5	0V (Ground)	–	Alimentazione / Supply
PIN 6	-		–
PIN 7	-	–	–
PIN 8	-	–	–
PIN 9	+5V	–	Alimentazione / Supply

I = Ingresso / Input O = Uscita / Output

The VDL200 drive is provided with a port as standard (9-pin D-SUB receptacle connector) for connection of the RS232 serial line used for drive-PC point-to-point communication (with the GF-eXpress configuration software).

Note!

The port **is not galvanically isolated**. The **PC-OPT-ADL option must be used If galvanic separation is required.**

7.4.1 Drive/RS232 port point-to-point connection

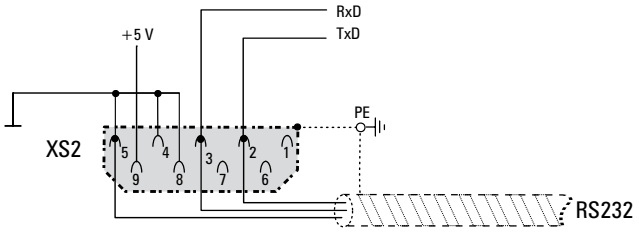


Figure 7.5.1: Serial connection (not isolated)

The serial connection must consist of a twin pair with two symmetrical conductors, spiral wound with a common shield, plus the ground connection cable, connected as shown in the figure (a 3-wire RS232 cable, not cross-over, is recommended). The maximum transmission speed is 38.4 kBaud.
For connection of the RS232 serial line to the PC, see the figure below.

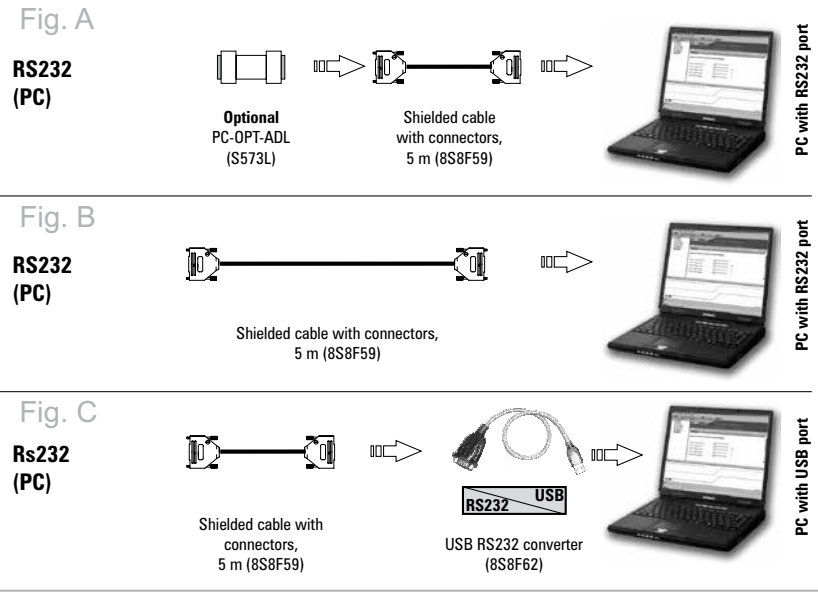


Figure 7.5.2: RS232 connection to the PC

Connection to a PC with RS232 port and PC-OPT-ADL option (isolated)

The following are required for connection:

- optional PC-OPT-ADL card (for galvanic isolation), code S573L
- a shielded cable (code 8S8F59) for connection to the RS232 PC port of the drive to the RS232 connector of the PC, see figure 7.4.1-A.

Connection to a PC with RS232 port (not isolated)

The following are required for connection:

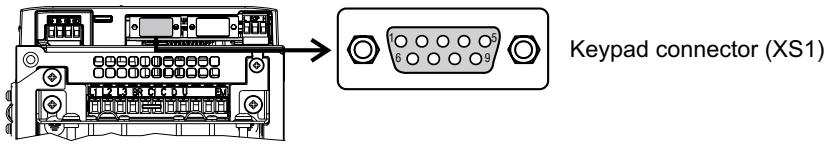
- a shielded cable (code 8S8F59) for connection to the RS232 PC port of the drive to the RS232 connector of the PC, see figure 7.4.1-B.

Connection to a PC with USB port (not isolated)

The following are required for connection:

- an optional **USB/RS232** adapter, code 8S8F62 (including the cable for USB connection)
- a shielded cable (code 8S8F59) for connection to the RS232 PC port of the drive to the USB/RS232 adapter, see figure 7.4.1-C.

7.5 Optional Keypad interface (keypad connector)



Several devices can be connected to the multifunction keypad connector (9-pin D-SUB receptacle connector XS1) and are automatically recognised and managed.

1) **Optional KB-ADL keypad** (default connection)

- The keypad is supplied with a 40 cm-long cable, for longer distances, a 1:1 non-crossover cable must be used (9 shielded cables, e.g. code 8S8F59, length 5 m).
- Very long cables (max. 15 m) must be of good quality with low voltage loss (max. 0.3 ohm/m).

2) **I/F DCP protocol**

- For the connection reference should be made to the DCP specifications (see next screen)

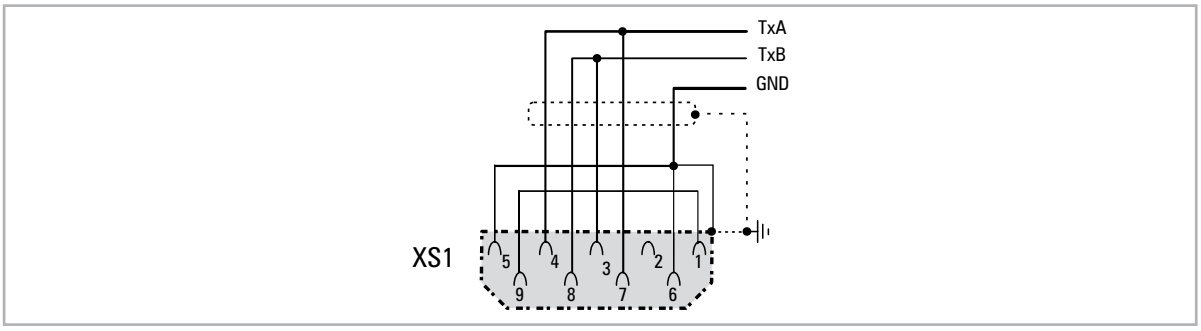


Figure 7.5.3: DCP connection (not isolated)

Caution

The connections (1) and (2) have no galvanic isolation!

7.6 Braking

There are various possible types of braking:

- Internal Braking Unit
- Injection of direct current from the Inverter into the motor (D.C. braking)

There are two essential differences between the two braking methods:

- A braking unit can be used for speed reduction (e.g.: from 1000 to 800 rpm), whereas D.C. braking can only be usedfor braking to standstill.
- The energy in the drive is converted into heat in both cases. This conversion takes place in a braking resistor encased in the braking unit. With D.C. braking, the energy is converted into heat in the motor itself, resulting in a further rise in motor temperature.

7.6.1 Braking unit (internal)

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

In the standard configuration, VDL200 drives comprise an internal braking unit.

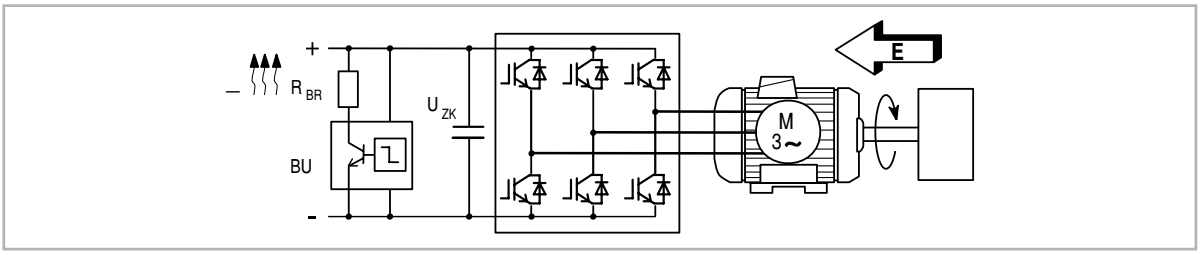


Figure 7.6.1: Operation with braking unit (circuit diagram)

Note! When the internal braking unit is present the protection must consist of fast-acting fuses! Follow the relative assembly instructions.

A twisted cable must be used for the connection of the braking resistor (terminals BR and C or BR1 and BR2). If the resistor includes a thermal protection device (Klixon), this must be connected to the "External fault" input of the drive.

Table 7.8.1: Technical data of the internal braking unit

Size	I_{RMS} (A)	I_{PK} (A)	R_{BR} (Ω)
VDL200-...-4, 3ph			
1040	5.5	7.8	100
1055	8.5	12	67
2075	8.5	12	67
2110	15.5	22	36
3150	22	31	26
3185	37	52	15
3220	37	52	15

I_{RMS} Braking unit rated current, duty cycle = 50%
I_{PK} Peak current that can be delivered for max 60 seconds
R_{BR} Minimum braking resistance value

Table 7.8.2: Braking unit intervention threshold

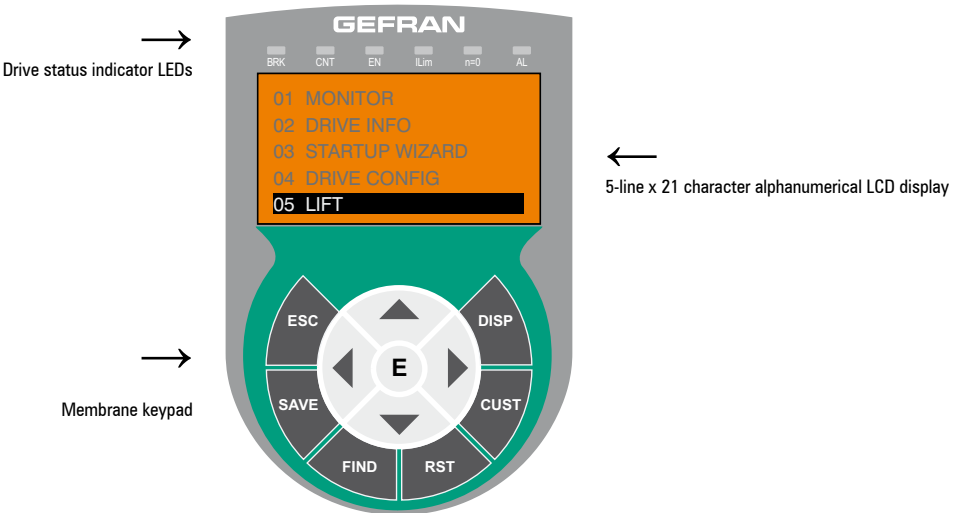
Size	V_{BR} @ 400 V		V_{BR} @ 230 V	
	ON	OFF	ON	OFF
VDL200-...-4, 3ph				
1040 ... 3220	670 Vdc	660 Vdc	394 Vdc	384 Vdc

Note! For the combination of recommended braking resistors **refer to chapter 5.4**.

8. Use of the keypad

This chapter describes the optional KB-ADL keypad and methods of use for displaying and programming inverter parameters.

8.1 Description of KB-ADL optional programming keypad



The optional programming keypad is used to display the status and diagnostics parameters during operation. It has a strip of magnetic material on the back so that it can be attached to the front of the drive or other metal surface (e.g. door of the electrical panel). The keypad can be used remotely from distances of up to 15 m. A 70 cm-long connection cable is supplied as standard. Up to 5 sets of parameters can be saved using the KB-ADL keypad and sent to other drives.

8.1.1 Membrane keypad

This section describes the keys on the membrane keypad and their functions

Symbol	Reference	Description
ESC	Escape	Returns to the higher level menu or submenu. Exits a parameter, a list of parameters, the list of the last 10 parameters and the FIND function. Can be used to exit a message that requires use of this.
SAVE	Save	Saves the parameters directly in the non-volatile memory without having to use **4.1 Save parameters**
FIND	Find	Enables the function for accessing a parameter using its number. To exit these functions, press the ◀ key.
RST	Reset	Resets alarms, only if the causes have been eliminated.
CUST	Custom	Displays the last 10 parameters that have been modified. To exit these functions, press the ◀ key.
DISP	Display	Displays a list of drive functioning parameters.
E	Enter	Enters the submenu or selected parameter, or selects an operation. It is used when modifying parameters to confirm the new value that has been set.
▲	Up	Moves the selection up in a menu or list of parameters. During modification of a parameter, increases the value of the digit under the cursor.
▼	Down	Moves the selection down in a menu or list of parameters. 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.

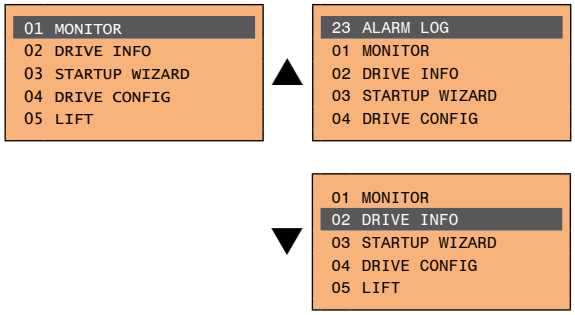
8.1.2 Meaning of LEDs

LEDs	Colour	Meaning of LEDs
BRK	Yellow	The LED is lit when the drive has activated the brake release command
CNT	Yellow	The LED is lit when the drive has activated the close contactors command
EN	Green	The LED is lit during IGBT modulation (drive operating)
ILIM	Red	When this LED is lit the drive has reached a current limit condition. During normal functioning, this LED is off.
N=0	Yellow	The LED is lit when motor speed is 0.
AL	Red	The LED is lit when the drive signals that an alarm has been triggered

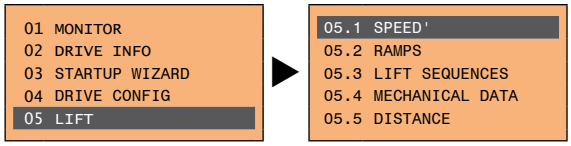
8.2 Navigating with the optional keypad

8.2.1 Scanning of the first and second level menus

First level

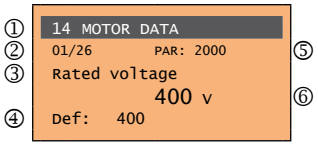


First level Second level



Note! This example is only visible in Expert mode.

8.2.2 Display of a parameter



(1) Reference to the menu where the parameter is to be found (in this case menu 14 - MOTOR DATA)

(2) Position of the parameter in the menu structure (01)

(3) Description of the parameter (Rated voltage)

(4) Depends on the type of parameter:

- Numeric parameter: displays the numeric value of the parameter, in the format required, and unit of measurement.
- Binary selection: the parameter may assume only 2 states, indicated as **On** - **Off** or 0 - 1.
- LINK type parameter: displays the description of the parameter set from the selection list.
- ENUM type parameter: displays the description of the selection
- Command: displays the method of execution of the command

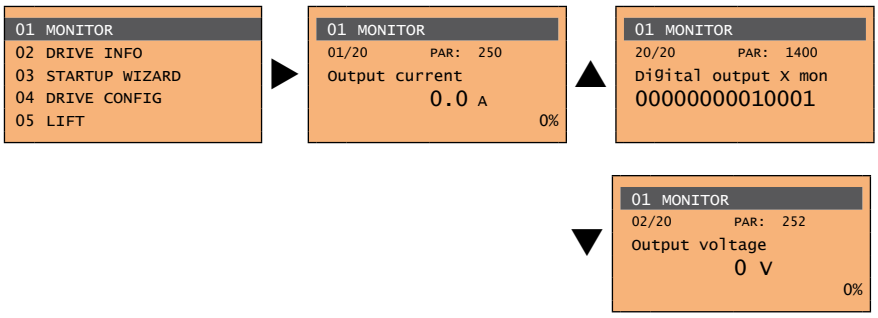
(5) Parameter number

(6) 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.
- LINK type parameter: displays the number (PAR) of the parameter set.
- ENUM type parameter: displays the numeric value corresponding to the current selection.
- Command: in the case of an error in the command, indicates that **ESC** must be pressed to terminate the command.
- Messages and error conditions:

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

8.2.3 Scanning of the parameters



8.2.4 List of the last parameters modified

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

8.2.5 "FIND" function

Pressing the **FIND** key activates the function that makes it possible to access any parameter simply by entering the parameter software number (PAR).
When the parameter reached by the "**FIND**" 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 "**FIND**" function.
To exit, press the ► key.

8.2.6 Parameter modification

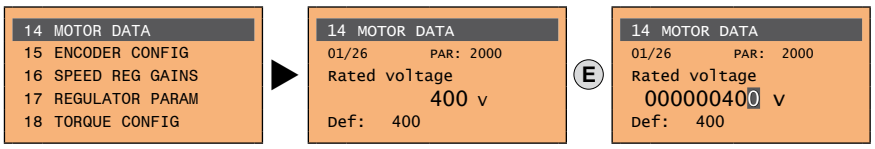
To enter parameter modification mode, press the **E** key when the parameter to be modified is displayed.
To save the value of the parameter, following modification, press the **E** key again.

Note! To save permanently, **see paragraph 8.2.7**.

To exit 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 paragraph 8.2.2**.

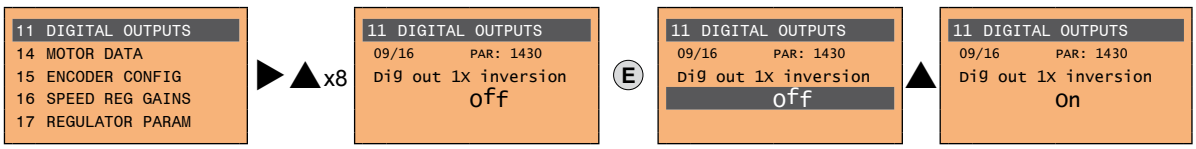
- **Numeric parameters**



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)**

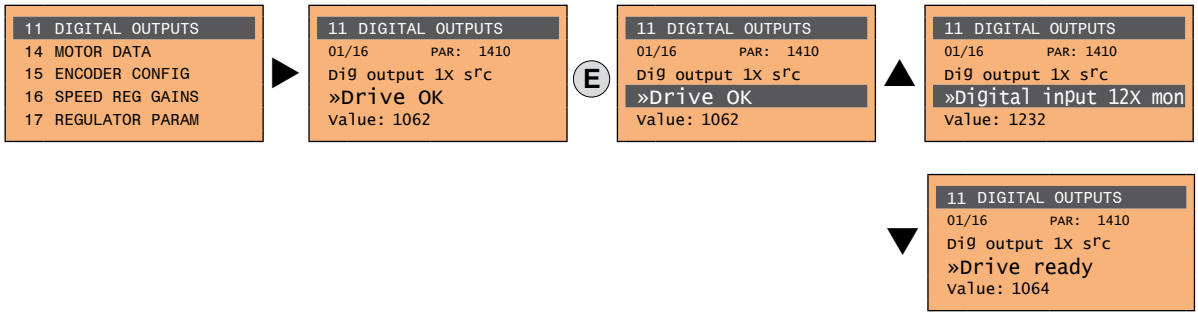
The parameter may assume only two states which are indicated as **On**-**Off** or 0-1.



Press **E** to activate modification mode. 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 parameters**

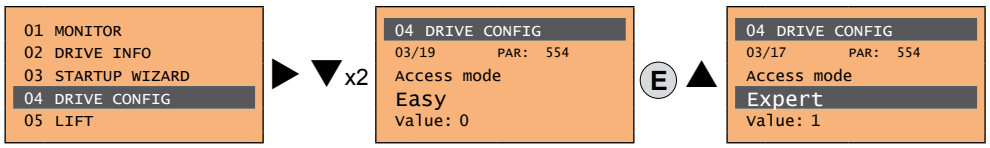
The parameter may assume the number of another parameter as value.



Press **E** to activate modification mode. The entire line is displayed in reverse. The elements of the list of parameters associated with this parameter can be scrolled using the ▲ and ▼ keys.
Press **E** to confirm the modification or **ESC** to cancel.

- **ENUM parameters**

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



Press **E** to activate modification mode. 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.

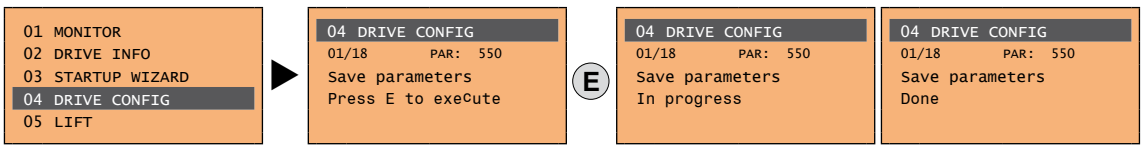
- **Execution of commands**

A parameter can be used to carry out a number of operations on the drive. For an example, see next paragraph: in this case the request "**Press E to execute**" is displayed.
To execute 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.

8.2.7 How to save parameters

There are two ways of saving parameters in the non-volatile memory of the drive:

1) By pressing the **SAVE** key on the keypad.
2) Menu 04 DRIVE CONFIG, parameter 04.01 **Save parameters**, PAR : 550. This is used to save changes to parameter settings so that they are maintained even after power-off.

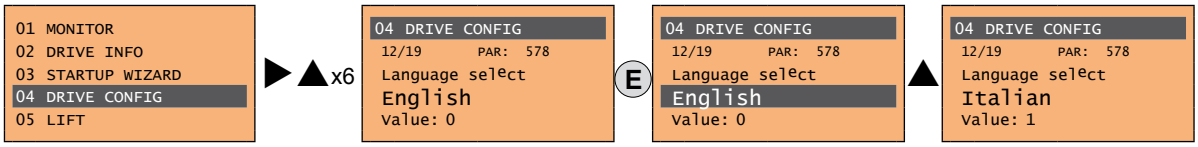


To exit, press the ◄ key.

8.2.8 Configuration of the display

8.2.8.1 Language selection

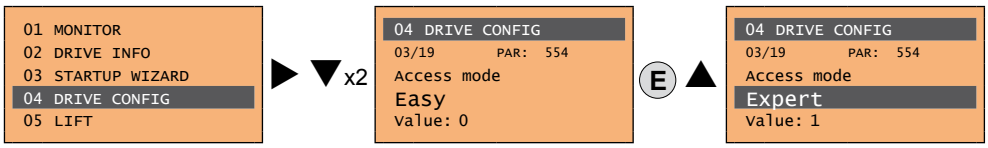
Menu 04 DRIVE CONFIG, parameter 04.19 **Language select**, PAR: 578,
default=English. This is used to set one of the languages available: English, Italian, French, German, Spanish and Turkish.



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

8.2.8.2 Selection of Easy/Expert mode

Menu 04 DRIVE CONFIG, parameter 04.03 **Access mode**, PAR: 554.
Enables two methods of access to be configured:
Easy (default) only the main parameters are displayed
Expert for advanced users, all the parameters are displayed



8.2.9 Startup display

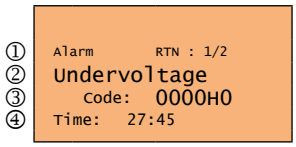
Menu 04 DRIVE CONFIG, parameter 04.9 **Startup display**, PAR: 574.
This is used to set the parameter that will be displayed automatically at drive power-on.
Entering the value -1 (default), the function is disabled and the main menu is displayed at power-on.

8.2.10 Back-lighting of the display

Menu 04 DRIVE CONFIG, parameter 04.10 **Display backlight**, PAR: 576. Sets lighting of the display:
On the light of the display always stays on.
Off (default) the light switches off approx. 3 minutes after the last key is pressed.

8.2.11 Alarms

The alarms page is displayed automatically when an alarm occurs.



(1) **Alarm**: identifies the alarm page.
RTN: indicates that the alarm has been reset; if the alarm is still active, nothing is displayed.
x/y: **x** indicates the position of this alarm in the list of alarms and **y** the number of alarms (the alarm with lowest x is the most recent)
(2) Description of the alarm
(3) Sub-code of the alarm, provides other information in addition to the description
(4) Moment the alarm occurred in machine time.
The list of alarms is scrolled using the ▲ and ▼ keys.

Note!

For further information, see **chapter 10.1**.

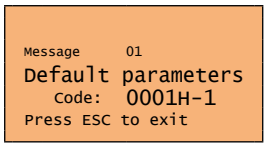
8.2.11.1 Alarm reset

- **If the alarm page is displayed:**
  Pressing the **RST** key, the alarms are reset and all alarms that have been 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 the alarms page.
- **If the alarm page is not displayed:**
  Press the **RST** key to reset the alarms. If active alarms are still present following reset, the alarm page is opened.

8.2.12 Messages

Operator messages are displayed with this page.
There are two types of messages:
- timed (closed automatically after a certain number of seconds),
- permanent (continue to be displayed until the operator presses the **ESC** key).

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



(1) **Message**: identifies a message.
xx indicates how many messages are enqueued. The queue may contain a maximum of 10 messages and the message with the highest number is the most recent.
(2) Description of the message
(3) Sub-code of the message. Provides extra information in addition to the description.
(4) "**Press ESC to exit**" is displayed if the message requires acknowledgment.

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

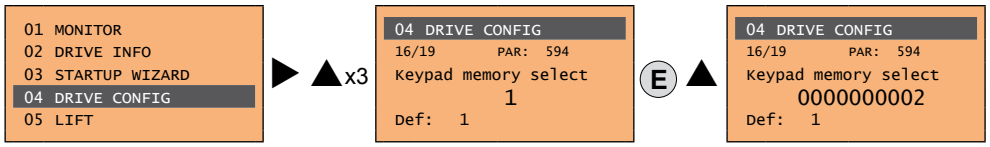
Note! For further information, see **chapter 10.3**.

8.2.13 Saving and recovery of new parameter settings

Drive parameters can be saved on the keypad in 5 different memory areas. This function is useful for obtaining various sets of parameters, for safety backup or transferring parameters from one drive to another.

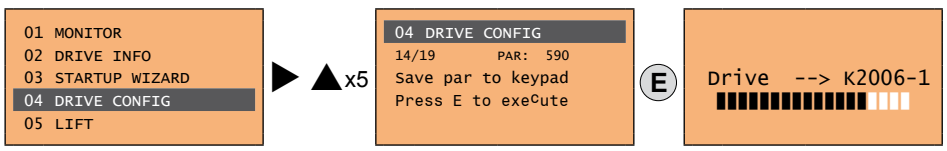
8.2.13.1 Selection of the keypad memory

Note! This example is only visible in Expert mode.



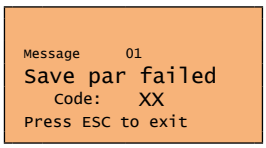
Menu 04 DRIVE CONFIG, parameter 04.16 **Keypad memory select**, PAR: 594. The keypad features 5 memory areas dedicated to saving parameters.
The memory to be used is selected using the **Keypad memory select** parameter. Subsequent saving and recovery operations will be carried out on the memory selected.

8.2.13.2 Saving of parameters on the keypad



Menu 04 DRIVE CONFIG, parameter 04.14 **Save par to keypad**, PAR: 590. This 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.

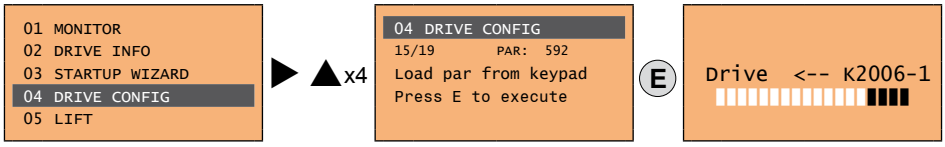
If an error occurs during transfer, the following message is displayed:



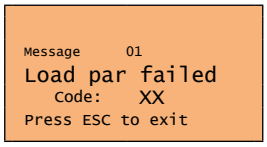
The code **XX** indicates the type of error, see **paragraph 10.3**. To exit the error message, press the **ESC** key.

8.2.13.3 Load parameters from keypad

Menu 04 DRIVE CONFIG, parameter 04.15 **Load par from keypad**, PAR: 592. This 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 10.3**. To exit the error message, press the **ESC** key.

9 - Commissioning via keypad

Warning!

Adjustable frequency drives are electrical apparatus for use in industrial installations. Parts of the Drives are energized during operation. The electrical installation and the opening of the device 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'operation. L'installation électrique et l'ouverture des drives devrait être executé uniquement par du personel qualifié. De mauvaises installations de moteurs ou de drives peuvent provoquer des dommages materiels ou blesser des personnes. On doit suivir les instructions donneés dans ce manuel et observer les régles nationales de sécurité.

Always connect the Drive to the protective ground ⏚ (PE) via the marked connection.
VDL200 Drives and AC Input filters have ground discharge currents greater than 3.5 mA. EN 50178 specifies that with discharge currents greater than 3.5 mA the protective conductor ground connection (⏚) must be fixed type and doubled for redundancy.
Il faut toujours connecter le variateur à la terre ⏚ (PE). Le courant de dispersion vers la terre est supérieur à 3,5 mA sur les variateurs et sur les filtres à courant alterné. Les normes EN 50178 spécifient qu'en cas de courant de dispersion vers la terre, supérieur à 3,5 ma, la mise à la terre (⏚) doit avoir une double connexion pour la redondance.

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 EN50178 section 5.2.11.1).
The following terminals can carry dangerous voltages even if the inverter is inoperative:
- the power supply terminals L1, L2, L3, C1, 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 EN50178 paragraphe 5.2.11.1).
Les bornes suivantes peuvent recevoir des tensions dangereuses, même si l'onduleur est désactivé :
- bornes d'alimentation L1, L2, L3, C1, C, D.
- bornes du moteur U, V, W.
Ne pas utiliser cet appareil en tant que « dispositif d'arrêt d'urgence » (cf. EN 60204, 9.2.5.4)

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

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

According to the EEC standards the VDL200 and accessories must be used only after checking that the machine has been produced using those safety devices required by the 89/392/EEC set of rules, as far as the machine industry is concerned. These standards do not apply in the Americas, but may need to be considered in equipment being shipped to Europe.

Selon les normes EEC, les drives VDL200 et leurs accessoires doivent être employés seulement après avoir verifié que la machine ait été produit avec les même dispositifs de sécurité demandés par la réglementation 89/392/EEC concernant le secteur de l'industrie.

VDL200 operate at high voltages.

L'VDL200 fonctionne à des tensions élevées.

When operating electrical devices, it is impossible to avoid applying hazardous voltages to certain parts of the equipment.

L'actionnement de dispositifs électriques fait qu'il est impossible d'éviter l'application de tensions dangereuses sur certaines parties de l'appareil.

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

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

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

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

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

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

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

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

Never open the device or covers while the AC Input power supplyis switched on. Minimum time to wait before working on the terminals or inside the device is listed **in section 4.6**.

Ne jamais ouvrir l'appareil lorsqu'il est suns tension. Le temps minimum d'attente avant de pouvoir travailler sur les bornes ou bien àl'intérieur de l'appareil est indiqué dans la section 4.6.

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

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

Caution

Protect the device from impermissible environmental conditions (temperature, humidity, shock etc.).
Protéger l'appareil contre des effets extérieurs non permis (température, humidité, chocs etc.).

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

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

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

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

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

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

Do not operate the Drive without the ground wire connected.
The motor chassis should be grounded to earth through a ground lead separate from all other equipment ground leads to prevent noise coupling.

Ne pas faire fonctionner le drive sans prise de terre.
Le chassis du moteur doit être mis à la terre à l'aide d'un connecteur de terre separé des autres pour éviter le couplage des perturbations.

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

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

Note!

This chapter describes commissioning using the optional keypad.

For use of the integrated keypad, reference should be made to chapter "8.2 Navigating with the integrated keypad" on page 59.

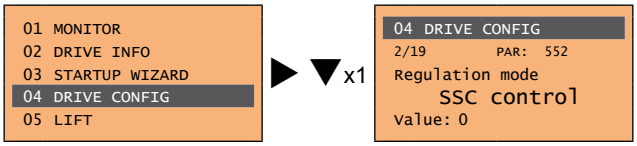
9.1 Asynchronous motor startup wizard (with the optional keypad)

The VDL200 can operate with regulation modes: Voltage/Frequency (SSC) , Sensorless (open loop) and field-oriented vector control (closed loop).

Note!

Before starting, check the factory settings:

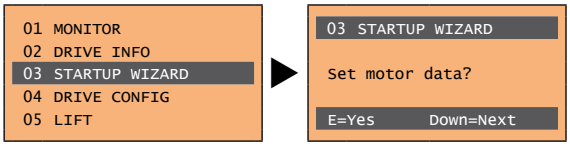
Menu 04 DRIVE CONFIG, parameter 04.2 **Regulation mode**, PAR: 552, default=SSC control.



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 and lift application operation. The order of these sequences is as follows:

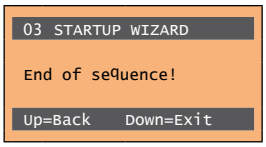
- **Electrical connections** **See step 1**
- **Setting motor parameters** **See step 2**
- **Autotune with motor at stand-still or coupled to the load** **See step 3**
- **Setting encoder parameters** (with control mode=Flux vector CL) **See step 4**
- **Setting the maximum speed reference and maximum system speed** **See step 6**
- **Setting system weights** **See step 7**
- **Setting application parameters** **See step 8**
- **Saving parameters** **See step 9**

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 ▲ (Up) 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 - Electrical connections

Make the connections as described in paragraph 7.3.2.

Checks to be performed before powering the drive

- Check that the supply voltage is correct and that the input terminals on the drive (L1, L2 and L3) 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 parameters

Note!

Def: The factory (default) setting depends on the size of the drive that is connected. These values refer to the VDL200-1055.

Set the plate data of the motor connected, according to the procedures described on the previous pages.

Rated voltage [V]:	the rated voltage of the motor 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 @ 400 V on the data plate of the drive.
Rated speed [rpm]:	rated speed of the motor; this value must reflect the speed of the fully loaded motor at rated frequency. If slip is indicated on the motor data plate, set the Rated speed parameter as follows: Rated speed = Synchronous speed - Slip (e.g. for a 4-pole motor Rated speed = 1500 - 70 = 1430).
Rated frequency [Hz]:	rated frequency of the motor, as shown on the data plate (asynchronous motors only).
Pole pairs:	Number of motor pole pairs. The number of motor pole pairs is calculated using the plate data and the following formula: P = 60 [s] x f [Hz] / nN [rpm] Where: P = motor pole pairs, f = motor rated frequency (e.g. 50); nN = motor rated speed (e.g. 1450)
Rated power [kW]:	Motor rated power; for a motor data plate with an HP power value, set the rated power kW = 0.736 x the motor power HP value.
Rated power factor:	Leave the default rated power factor if the data are not available on the data plate.

Note!

When data entry is complete the **Take parameters** command is executed automatically (menu 14 MOTOR DATA, PAR: 2020). 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 9.

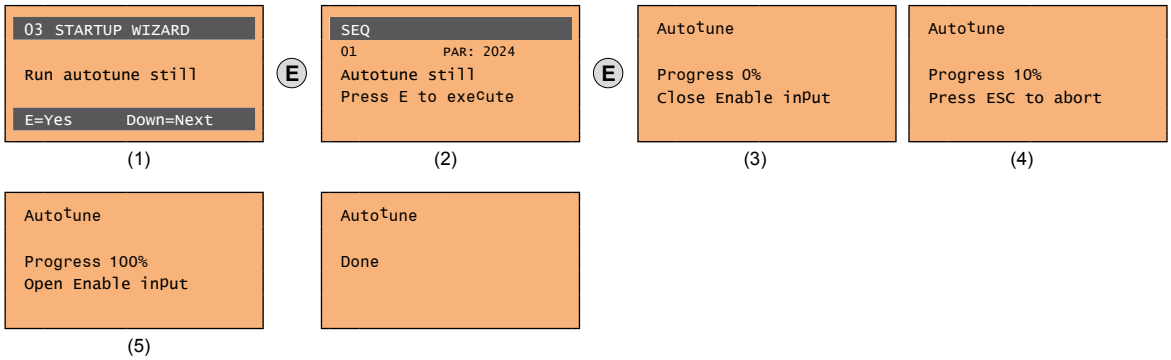
At the end of the procedure proceed to step 3

Step 3 - Autotune with motor at stand-still or coupled to the load

The drive carries out the motor autotune procedure (real measurement of motor parameters).
There are two self-tuning modes: **Reduced** (default) and **Extended**, which can be selected using parameter 2026 **Autotune mode**. The reduced procedure is fast and recommended in most cases. The extended procedure can be used to achieve maximum efficiency, but may take several minutes.

Note!

If this operation generates an error message (e.g. Error code 1), check the connections of the power and control circuits (see **step 1** - Connections), check the motor data settings (see **step 2** - Setting motor parameters) and then repeat the guided Autotune procedure.



(1) Press the **E** key to proceed to the autotune procedure.

(2) Press the **E** key to start the autotune procedure.

(3) Enable the drive by connecting terminal 9 on the I/O card (Enable) to terminal 12 (+24 V). To abort this operation, press the **ESC** key.

(4) Once the drive is enabled the autotune procedure starts. This may take a few minutes, depending on the type of motor being used.

(5) At the end of the procedure the following screen is displayed. After opening the Enable contact, go to step 4 (if using a feedback card) or 5 to proceed with the wizard.

Note!

At the end of the autotune procedure there is a request to open the Enable contact (terminals 9 - 12); this results in the automatic execution of the **Take tune parameters** command (menu 14 MOTOR DATA, PAR: 2078).

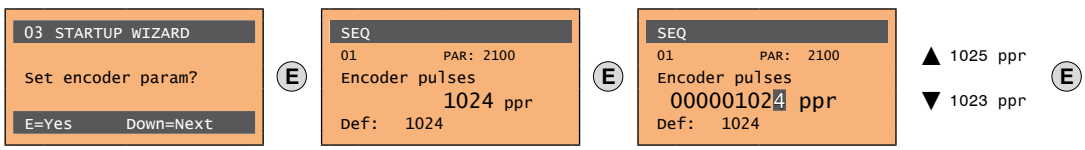
The calculated parameters are saved in a RAM memory to enable the drive to perform the necessary calculations. These data are lost if the device is switched off. To save the motor data follow the procedure described in step 6.

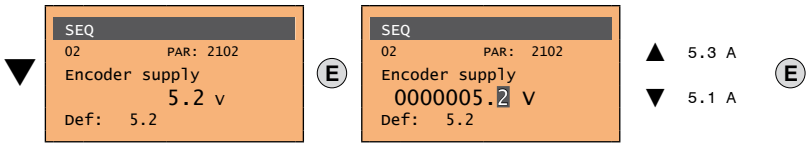
Step 4 - Setting encoder parameters

Caution

The incorrect configuration of the encoder tension can permanently damage the device; therefore, it is advisable to check the values on the encoder's specification plate.

If the drive is to be used in closed loop mode, a check must be run to make sure that an encoder feedback card is installed; make the connections as described in paragraph 7.2.3 and set the following parameters for the encoder installed on the motor:



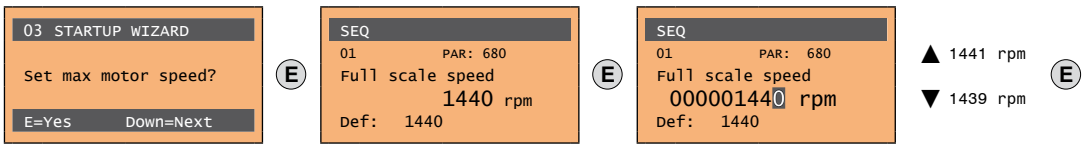


Step 5 – Encoder phasing

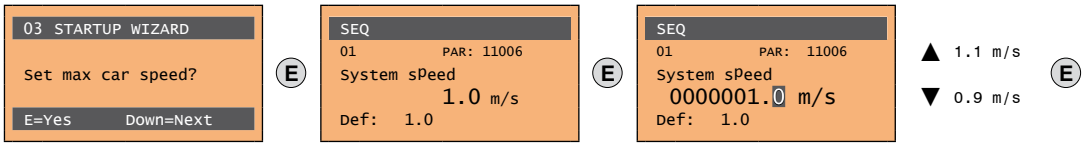
Not available in this mode.

Step 6 - Setting the maximum speed reference value and system speed

Setting the maximum speed reference value: this defines the maximum motor speed value (in rpm) that can be reached with each single reference signal (analog or digital).



Set the maximum system speed in m/s



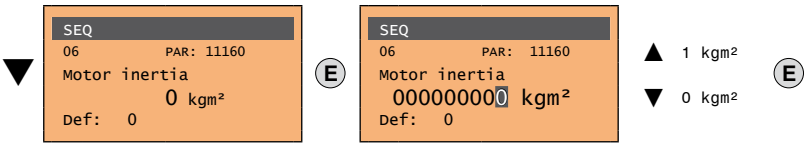
After setting the speed, proceed to step 7 to set the system weights.

Note!

The factory (default) setting depends on the size of the drive that is connected. These values refer to the VDL200-1055.

Step 7 - Setting the system weights

The system weights must be entered in this part of the wizard procedure.

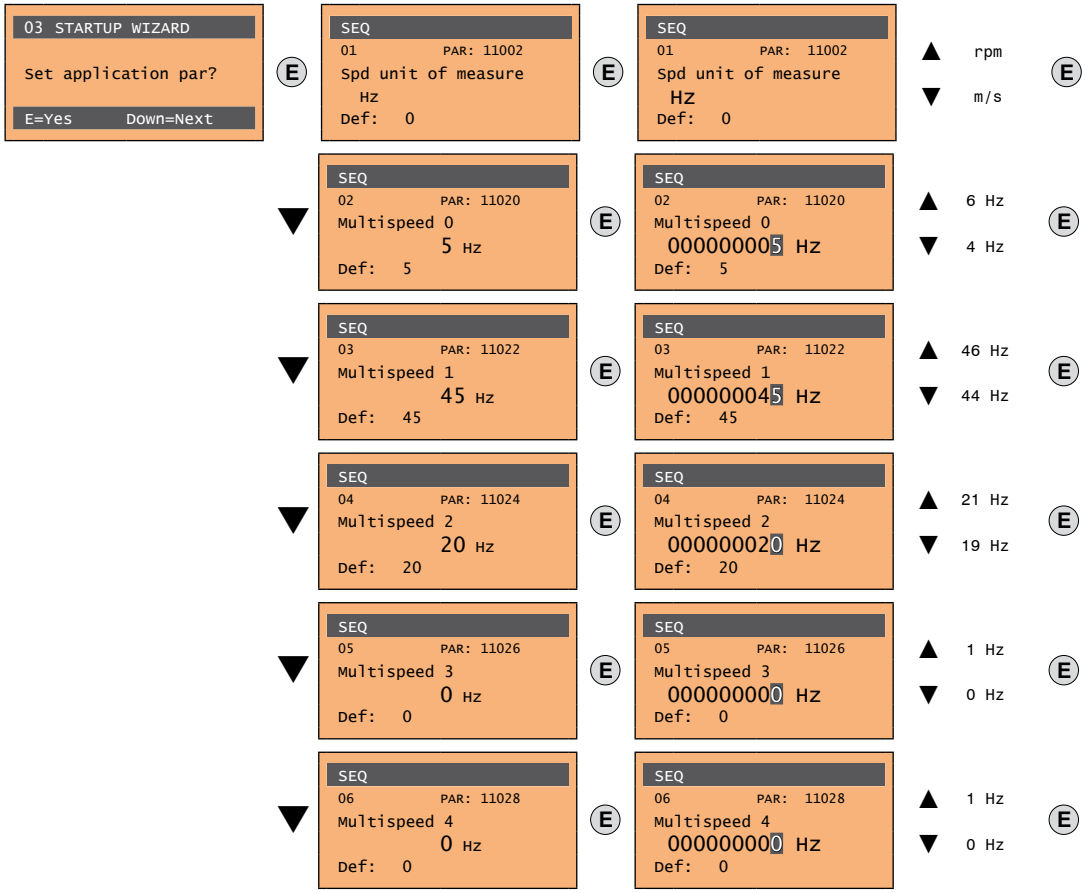


After setting the mechanical measurements, proceed to the next step.

Step 8 - Setting application parameters

The application data can be entered at this stage.

- **Set the multispeed values**



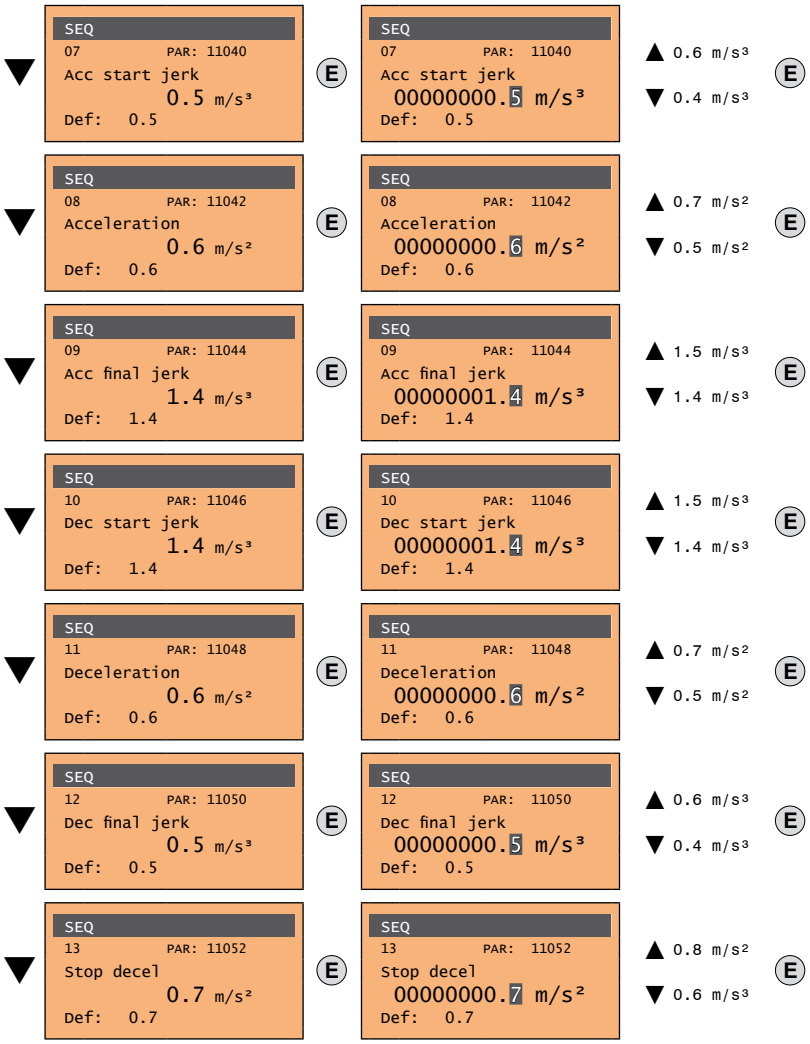
Attention

Multi speed selection

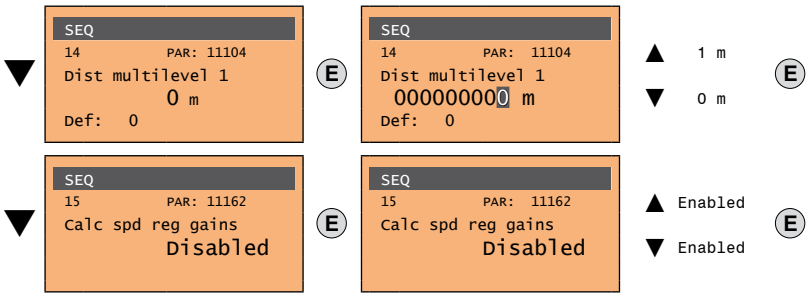
Through the combination of "MtlSpd S0" (Digital input 4), "MtlSpd S1" (Digital input 5) and "MtlSpd S2" (Digital input 6) commands, is possible to select Multi speed desired, according to next table:

MtlSpd S2	MtlSpd S1	MtlSpd S0	ACTIVE SPEED
0	0	0	Multispeed 0, PAR 11020
0	0	1	Multispeed 1, PAR 11022
0	1	0	Multispeed 2, PAR 11024
0	1	1	Multispeed 3, PAR 11026
1	0	0	Multispeed 4, PAR 11028
1	0	1	Multispeed 5, PAR 11030
1	1	0	Multispeed 6, PAR 11032
1	1	1	Multispeed 7, PAR 11034

- **Set the ramp values**



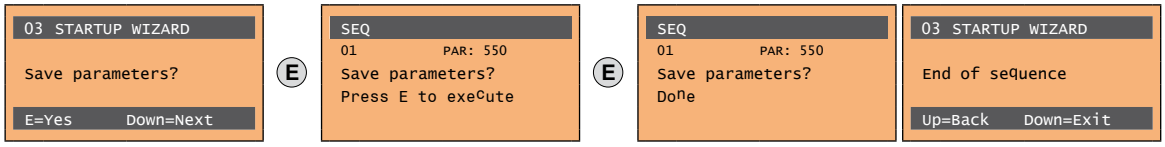
- **Set the distance values**



Next proceed to step 9 to save the system parameters that have been entered and those calculated by the drive using the autotune and automatic phasing procedures.

Step 9 - Save parameters

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



(1) (2) (3) (4)

(1) Press the **E** key to start the save parameters procedure.

(2) Press **E to confirm**

(3) End of procedure

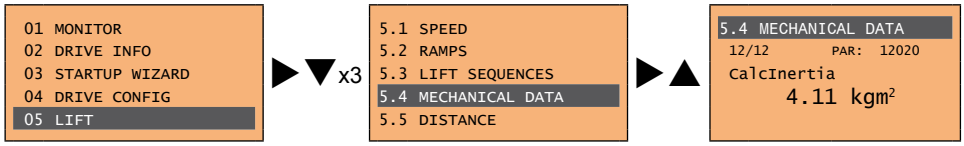
(4) When the parameters have been saved correctly the drive displays this screen to show that the startup wizard is complete.

Final check

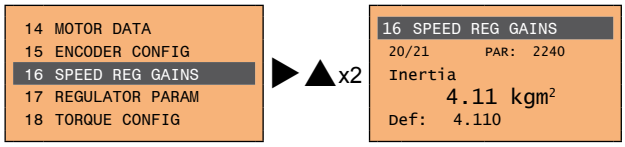
Note!

If you wish to use the inertia value calculated by the converter, you should copy the parameter value 5.4.20 CalcInertia (PAR 12020, Menu LIFT/ MECHANICAL INFORMATION) in parameter 16.20 Inertia, PAR: 2240.

Menu 5.4 MECHANICAL DATA, parameter 5.4.20 **CalcInertia**, PAR: 12020, default=(S).



Menu 16 SPEED REG GAINS, parameter 16.20 **Inertia**, PAR: 2240, default=(S).



Check the regulation mode setting before starting the motor and change it if necessary.

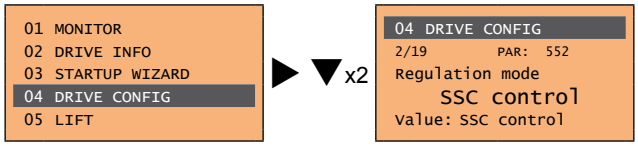
Available selections:

0 SSC control

1 Flux vector OL

2 Flux vector CL

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



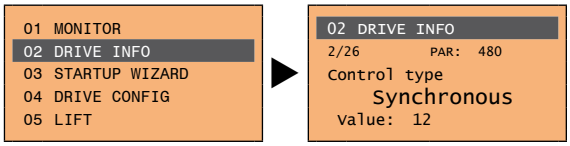
9.2 Startup wizard for brushless motors (with the optional keypad)

The VDL200-...-ED can operate with regulation modes: field-oriented vector control of permanent magnet synchronous motors (brushless).

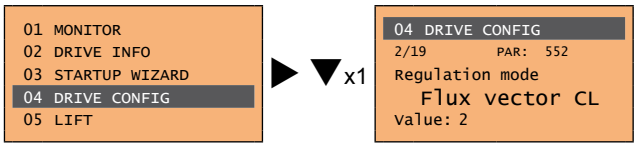
Note!

Before starting, check the factory setting:

Menu 02 DRIVE INFO, parameter 02.2 **Control type**, PAR: 480, default=12.



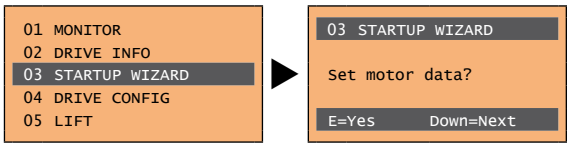
Menu 04 DRIVE CONFIG, parameter 04.2 **Regulation mode**, PAR: 552, default=Flux vector CL.



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 and lift application operation. The order of these sequences is as follows:

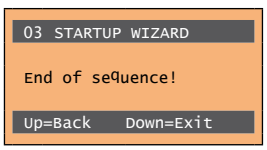
- **Electrical connections** **See step 1**
- **Setting motor parameters** **See step 2**
- **Autotune with motor at stand-still or coupled to the load** **See step 3**
- **Setting encoder parameters** **See step 4**
- **Encoder phasing** **See step 5**
- **Setting the maximum speed reference and maximum system speed** **See step 6**
- **Setting system weights** **See step 7**
- **Setting application parameters** **See step 8**
- **Saving parameters** **See step 9**

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 ▲ (Up) 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 - Electrical connections

Make the connections as described in paragraph 7.3.2.

Checks to be performed before powering the drive

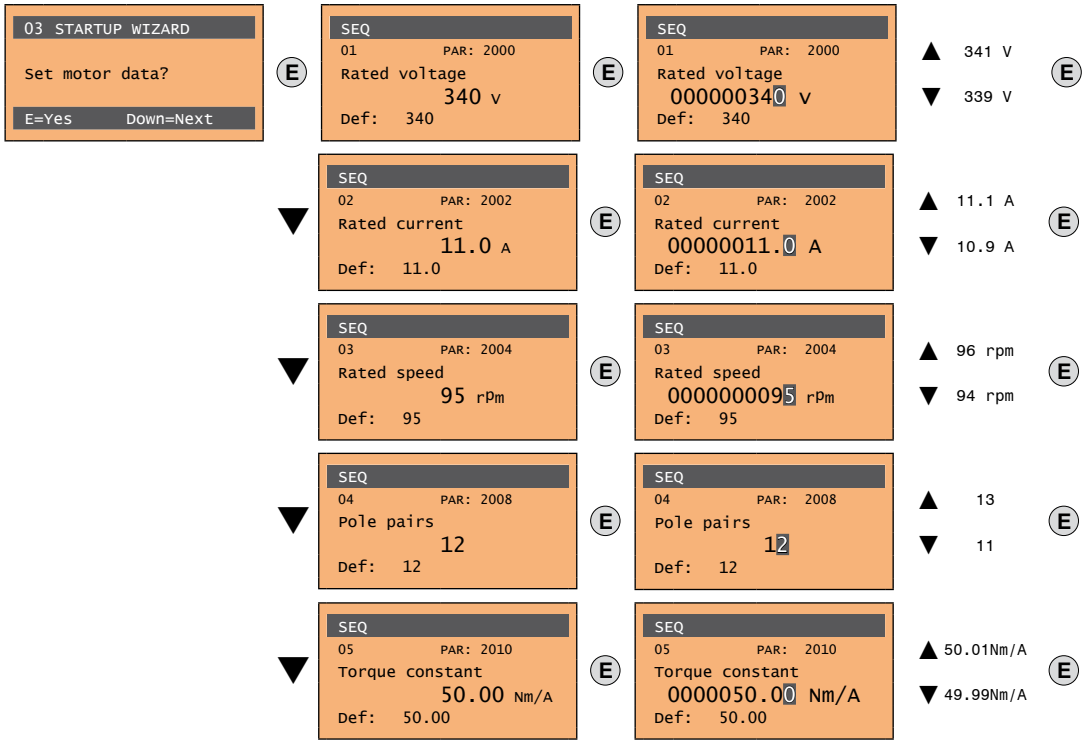
- Check that the supply voltage is correct and that the input terminals on the drive (L1, L2 and L3) are connected correctly.
- Check that the output terminals on the drive (U, V and W) are connected to the motor correctly.
- Check that all the drive control circuit terminals are connected correctly. 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 parameters

Note! **Def:** The factory (default) setting depends on the size of the drive that is connected. These values refer to the VDL200-1055



Set the plate data of the motor connected, following the instructions given on the previous pages.

Rated voltage [V]:	the rated voltage of the motor 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 @ 400 V on the data 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.

Note! When data entry is complete the **Take parameters** command is executed automatically (menu 14 MOTOR DATA, PAR: 2020). 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 9.

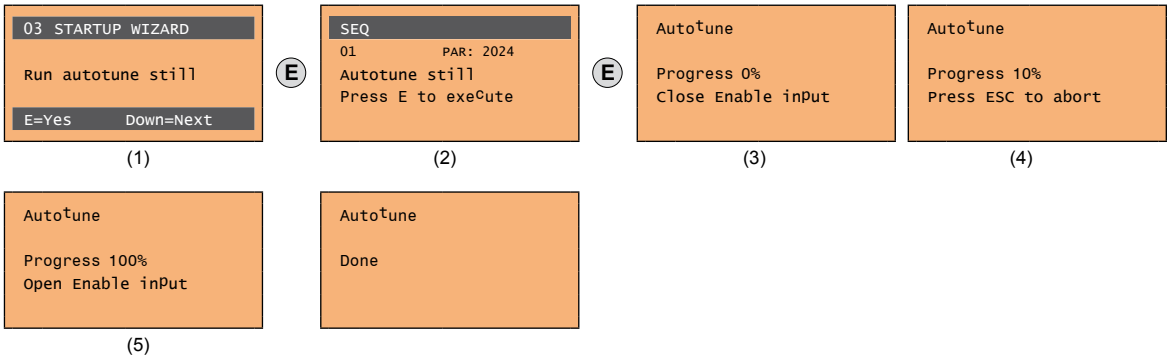
At the end of the procedure proceed to step 3

Step 3 - Autotune with motor at stand-still or coupled to the load

The drive carries out the motor autotune procedure (real measurement of motor parameters).
Autotuning may take a few minutes.

Note!

If this operation generates an error message (e.g. Error code 1), check the connections of the power and control circuits (see **step 1** - Connections), check the motor data settings (see **step 2** - Setting motor parameters) and then repeat the guided Autotune procedure.



(1) Press the **E** key to proceed to the autotune procedure.

(2) Press the **E** key to start the autotune procedure.

(3) Enable the drive by connecting terminal 9 on the I/O card (Enable) to terminal 12 (+24 V). To abort this operation, press the **ESC** key.

(4) Once the drive is enabled the autotune procedure starts. This may take a few minutes, depending on the type of motor being used.

(5) At the end of the procedure the following screen is displayed. After opening the Enable contact, proceed to step 4.

Note!

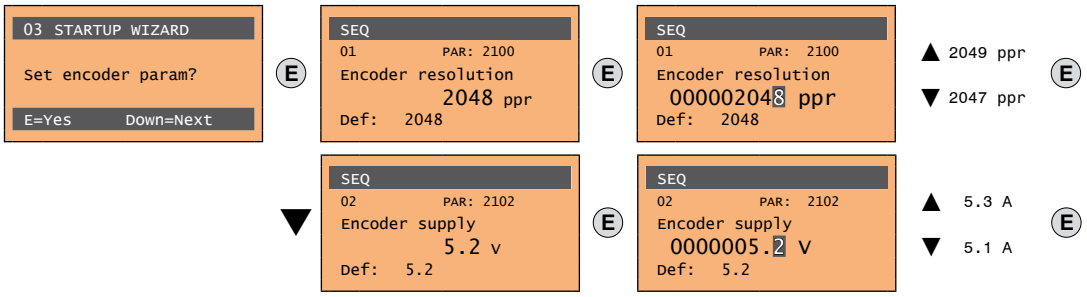
At the end of the autotune procedure there is a request to open the Enable contact (terminals 9 - 12); this results in the automatic execution of the **Take tune parameters** command (menu 14 MOTOR DATA, PAR: 2078).

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 9.

Step 4 - Setting encoder parameters

Caution

The incorrect configuration of the encoder tension can permanently damage the device; therefore, it is advisable to check the values on the encoder's specification plate.



Step 5 - Setting encoder parameters (Standard card EXP-SESC-I1R1F2-ADL)

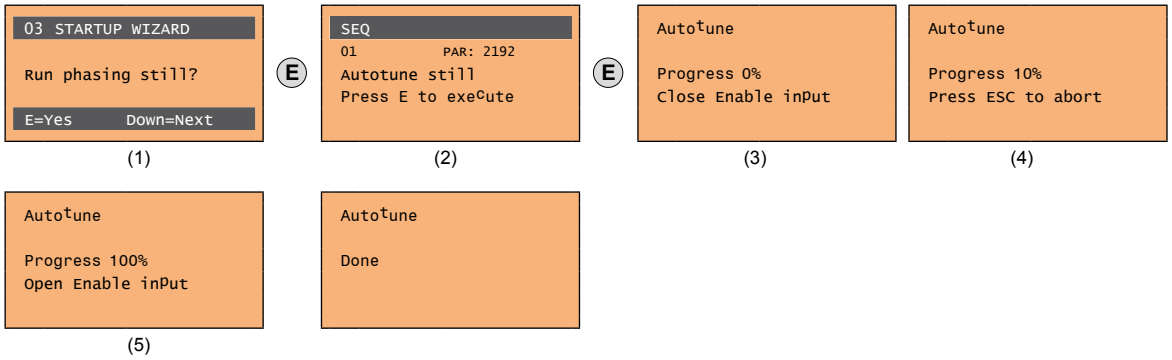
VDL200-...-ED drives have a command to start automatic phasing of the absolute encoder (**the brake must be blocked**).

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 more information see parameters 15.15 PAR 2190 **Autophase rotation** and 15.16 PAR 2192 **Autophase still** on "Functions description and parameters list" manual (VDL200 Vector inverter for lifts with **synchronous motors**).

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



(1) Press the **E** key to proceed to the autotune procedure.

(2) Press the **E** key to start the autotune procedure.

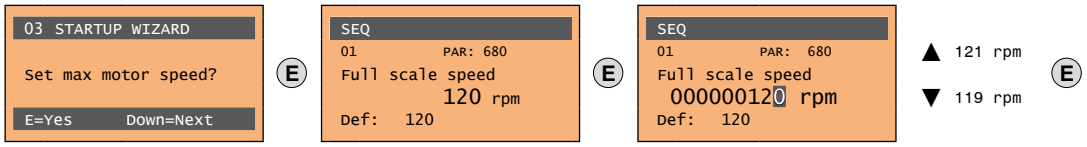
(3) Enable the drive by connecting terminal 9 on the I/O card (Enable) to terminal 12 (+24 V). To abort this operation, press the **ESC** key.

(4) Once the drive is enabled the autotune procedure starts. This may take a few minutes, depending on the type of motor being used.

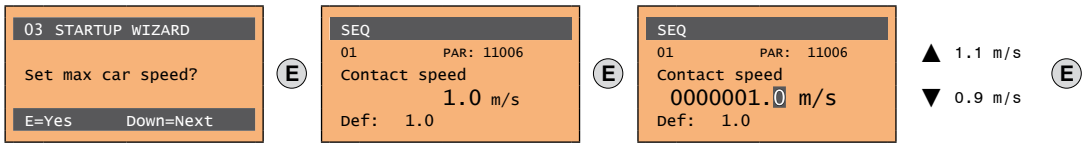
(5) At the end of the procedure the following screen is displayed. After opening the Enable contact, proceed to step 6.

Step 6 - Setting the maximum speed reference value and system speed

Setting the maximum speed reference value: this defines the maximum motor speed value (in rpm) that can be reached with each single reference signal (analog or digital).



Set the maximum system speed in m/s



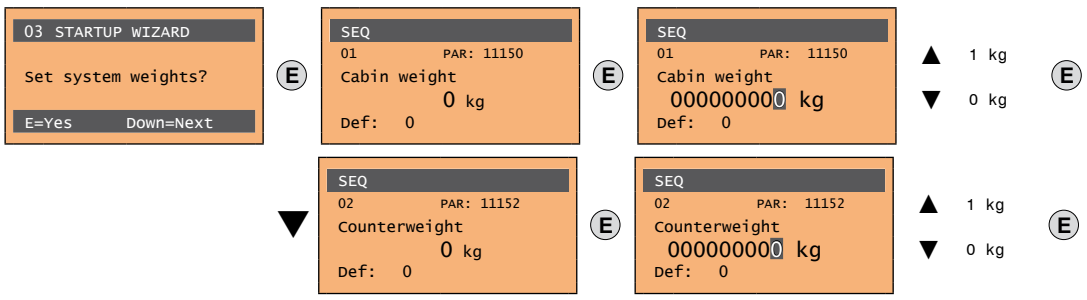
After setting the speed, proceed to step 7 to set the system weights.

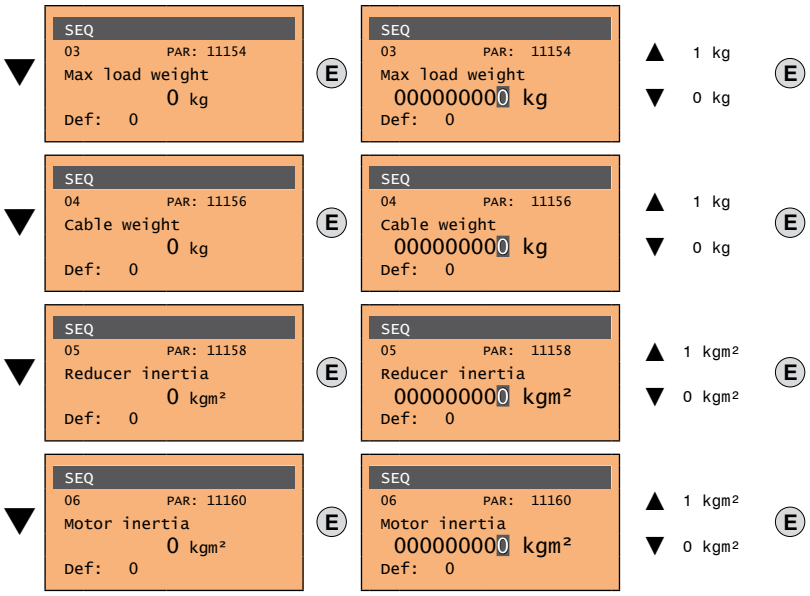
Note!

The factory (default) setting depends on the size of the drive that is connected. These values refer to the VDL200-1055

Step 7 - Setting the system weights

The system weights must be entered in this part of the wizard procedure.



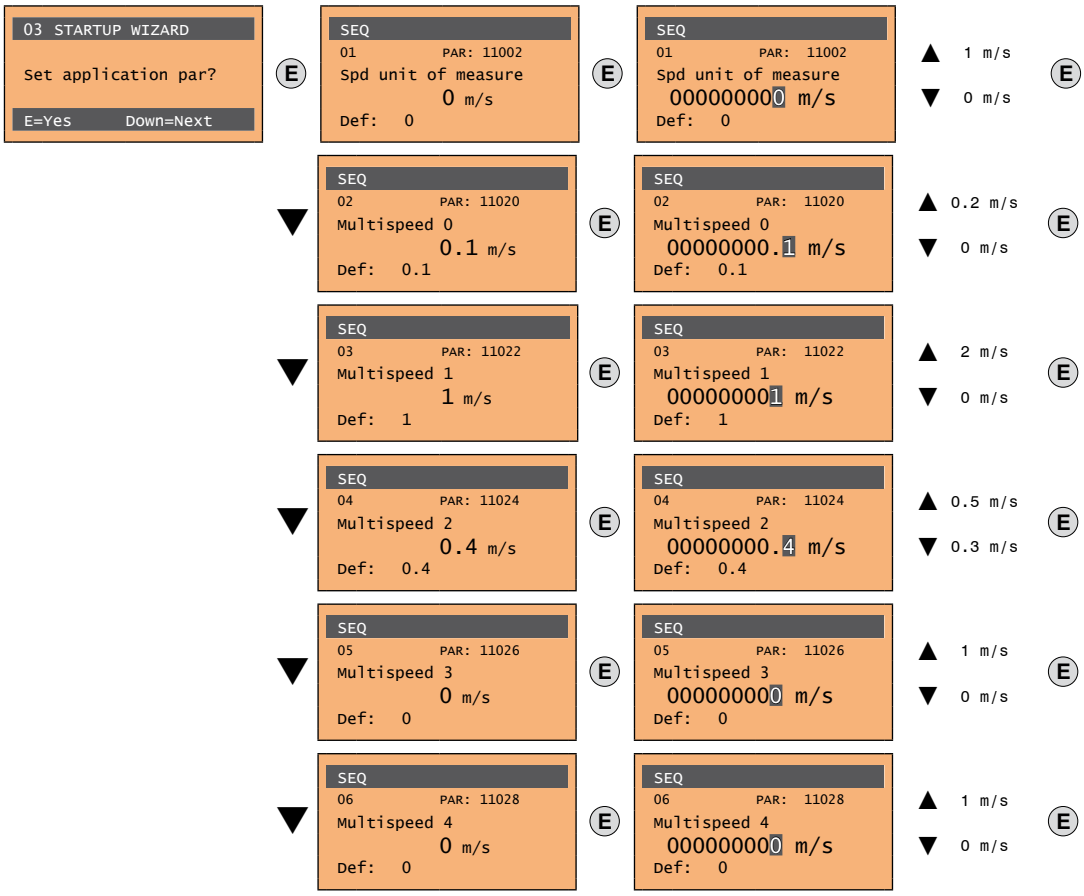


After setting the mechanical measurements, proceed to the next step.

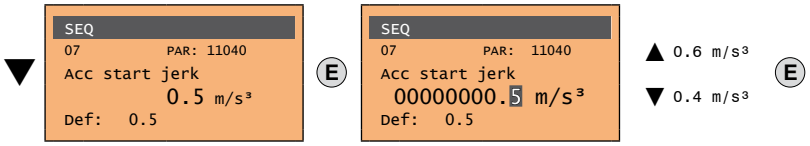
Step 8 - Setting application parameters

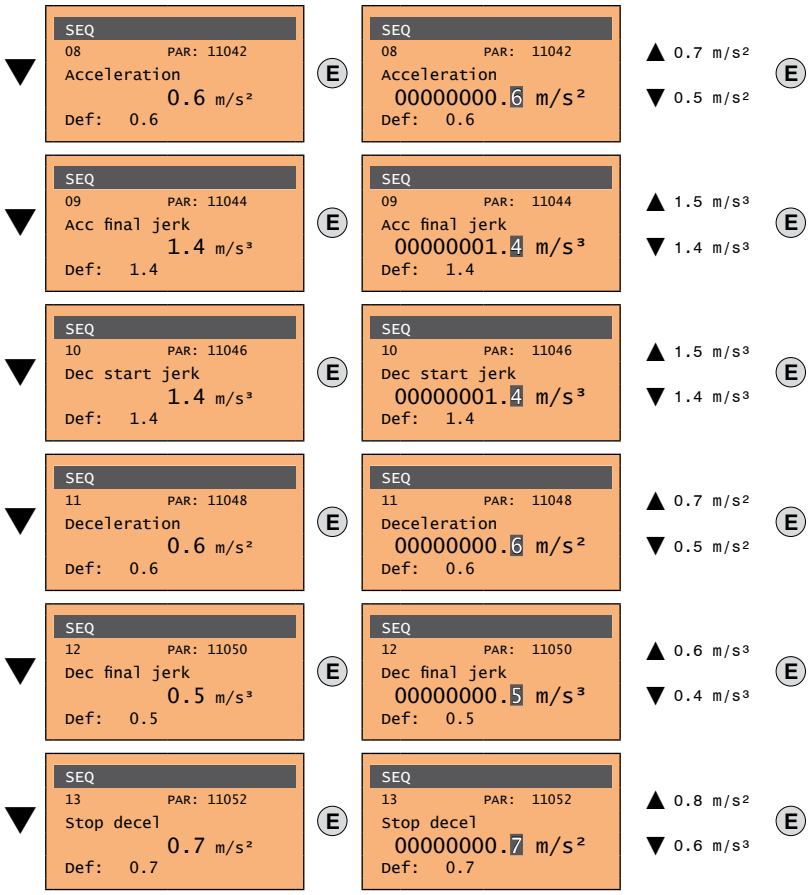
The application data can be entered at this stage.

- **Set the multispeed values**

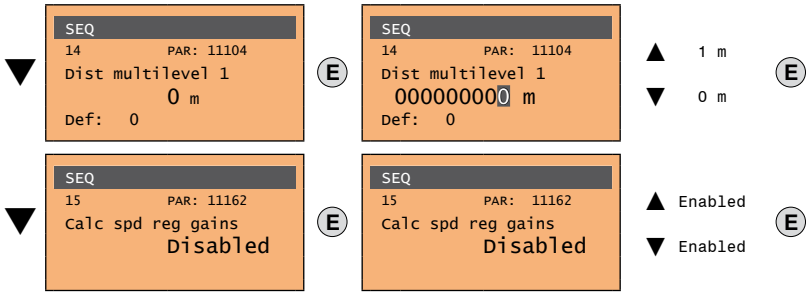


- **Set the ramp values**





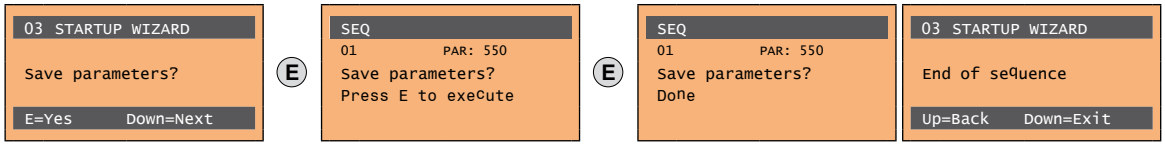
- **Set the distance values**



Next proceed to step 9 to save the system parameters that have been entered and those calculated by the drive using the autotune and automatic phasing procedures.

Step - Save parameters

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



(1) (2) (3) (4)

(1) Press the **E** key to start the save parameters procedure.

(2) Press "E" to confirm

(3) End of procedure

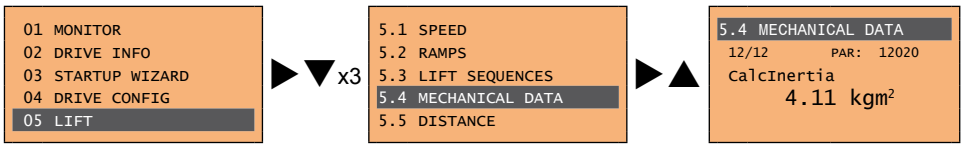
(4) When the parameters have been saved correctly the drive displays this screen to show that the startup wizard is complete.

Final check

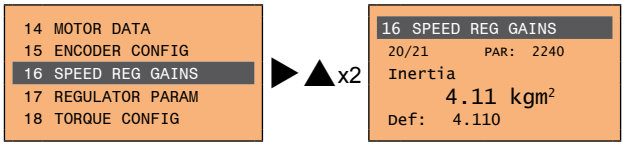
Note!

If you wish to use the inertia value calculated by the converter, you should copy the parameter value 5.4.20 CalcInertia (PAR 12020, Menu LIFT/ MECHANICAL INFORMATION) in parameter 16.20 Inertia, PAR: 2240.

Menu 5.4 MECHANICAL DATA, parameter 5.4.20 **CalcInertia**, PAR: 12020, default=(S).

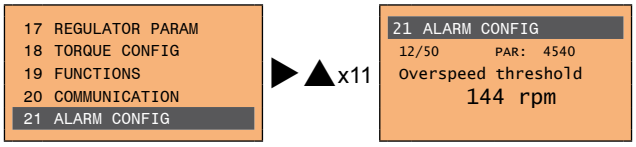


Menu 16 SPEED REG GAINS, parameter 16.20 **Inertia**, PAR: 2240, default=(S).



Check parameter settings before starting the motor and change if necessary.

Menu 21 ALARM CONFIG, parameter 21.12 Overspeed threshold, PAR: 4540.



10 - Troubleshooting

10.1 Alarms

Note ! To reset alarms, see **paragraph "8.2.11 Alarms".**

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 [OV]**		**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 to dissipate the energy recuperation, to be connected to the specific terminals. See section "7.1.9 Connection of braking resistor (optional)" on page .
2	**Undervoltage [UV]**		**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 connections and mains voltage
3	**Ground fault [GNDF]**		**Condition:** Ground short circuit alarm
			Solution: - Check drive and motor wiring. - Check that the motor is not grounded.
4	**Overcurrent [OC]**		**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 (menu 17) - Check wiring towards the motor
5	**Desaturation [DES]**		**Condition: Instantaneous overcurrent in the IGBT bridge alarm.**
			Solution: **-** Switch the drive off and then switch it on again. - Check the condition of the braking resistor isolation. Make sure there are no earth leakages. - If the alarm persists, contact the technical service centre.
6	**MultiUndervolt [MUV]**		**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 [MOC]**		**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 [MDES]**		**Condition:** 2 attempted at automatic restarts after the Desaturation alarm within 30 seconds. If more than 30 seconds pass after the Desaturation alarm was generated, the attempt counter is reset.
			Solution: Too many **Desaturation** alarms. Adopt the proposed solutions for the **Desaturation** alarm.
9	**Heatsink OT [HOT]**		**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 [HSOT]**		**Condition:** IGBT module 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 [IOT]**		**Condition:** Input air temperature too high alarm.
			Solution: Check correct fan operation - Check that panel cooling air openings are unobstructed. - Check temperature in electrical panel.
12	**Motor OT [MOT]**		**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 [DOL]**		**Condition:** Drive overload alarm. - The inverter output current has exceeded the allowed overload value. - The overload cycle has exceeded the allowed values.

Code	Error message shown on the display	Sub-code	Description
		Solution: - Check that the load is not excessive. - Check that accelerations are not excessive. - Check that the overload cycle is within allowed limits.	
14	**Motor overload [MOL]**	**Condition:** Motor overload alarm. The current absorbed during operation is greater than that specified on the motor data plate.	
		Solution: - Reduce the motor load. - Increase the size of the motor.	
15	**Bres overload [BOL]**	**Condition:** Braking resistor overload alarm. The current absorbed by the resistor is greater than the rated current.	
		Solution: - Check the size of the braking resistor. - Check the condition of the braking resistor.	
16	**Phase loss [PHL]**	**Condition:** Power phase loss alarm.	
		Solution: Check the mains voltage and whether any protections upstream of the drive have been tripped.	
17 - 18	**Not used**		
19 - 20			
21	**External fault [EF]**	**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 [SFL]**	**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: See parameter 2172 **SpdFbkLoss code** for information about the cause of the alarm and chapter 10.2 **Speed fbk loss** [22] alarm	
23	**Overspeed [OS]**	**Condition:** Motor overspeed alarm. The motor speed exceeds the limits set in the **PAR 4540** parameter.	
		Solution: - Limit the speed reference. - Check that the motor is not driven in overspeed during rotation.	
24	**Speed ref loss [SRL]**	**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 CL mode (see PAR 4550).	
		Solution: Check that the load is not excessive.	
25	**Not Used**		
26	**Power down [PRR]**	**Condition:** The drive was enabled with no supply voltage at the power section.	
		Solution: Emergency stop alarm. The Stop key on the keypad was pressed with the **Stop key mode** parameter set to **EmgStop&Alarm** in case of Remote->Terminal Strip or Remote->Digital or Local->Terminal Strip mode.	
27	**Phaseloss out [PHLO]**	**Condition:**	
		Solution:	
28 - 29	**Not Used**		
30	**Mot phase loss [MOTL]**	**Condition:** Output phase loss.	
		Solution: Check Drive/motor connection.	
31	**Ropes change [ROPC]**	This may occur in two conditions: • the drive continues to run but the rope usage threshold set in parameter 3404 **Ropes change thr** has been reached; • the drive finishes the current travel and then locks because parameter 3414 **Direction counter** has reached 0 (corresponding to parameter 3412 **Ropes usage** = 100%).	
		Solution: replace the ropes. By switching the drive off and back on you can run a single travel to bring the car to a better position for the procedure. After you have changed the ropes, reset the direction change counter to eliminate the lock condition.	
32	**Not Used**		
33 ... 40	**Plc1 fault [PLC1]** **...** **Plc8 fault [PLC8]**	**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. With regards to the standard application EFC refer to Functional Parameter Manual section LIFT ALARMS. For the applications DCP3/DCP4, EPC and CiA 417 refert to the application manual section ALARMS.	
41	**Watchdog [WDT]**	**Condition:** this condition can occur during operation when the watchdog 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 indicates the reason for the error: make a note of this to discuss it with the service centre.
		Solution: If the alarm is the consequence of a change in the drive configuration (parameter setting, option installation, PLC application download) remove it. Turn the drive off and then on again.	
42	**Trap error [TRAP]**	**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 (SubHandler-Class) 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.	
43	**System error [SYS]**	**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 (Error-Pid) code indicates the reason for the error: make a note of this to discuss it with the service centre.

Code	Error message shown on the display	Sub-code	Description
		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 [USR]**	**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 [PE]**	**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.	
		XXXH-X	Code XXXXH-X indicates the number of the parameter (Hex-Dec) that has caused the error: make a note of this to discuss it with the service centre.
		Solution: Set the parameter causing the error to the correct value and run **Save parameter**. Switch the drive off and then switch it back on again.	
46	**Load default [LD]**	**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 during production.	
		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 execute **Save parameters**	
47	**Plc cfg error [PLCE]**	**Condition:** this can occur during loading of the MDPLC application The Mdplc 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 applciation 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 [LDP]**	**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 [KEY]**	**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: Contact Gefran to request the key to enable the desired firmware function.	
50	**Encoder error [ENC]**	**Condition:** this condition may occur when the drive is powered during encoder setup each time parameter 552 **Regulation mode** is set.	
		100H-256	**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** alarm is also generated.
			Solution: Take the recommended action for the **Speed fbk loss** 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 [OCFG]**	**Condition:** an optional card has been removed with respect to the configuration present when the last **Save parameters** command was executed or there is a fault on the optional card or on the regulation card.	
		Solution: If the user has removed the card on purpose, execute **Save parameters**. If the user has not removed the card, identify and replace the faulty card.	

10.2 Speed fbk loss alarm according to the type of feedback

Note !

For the correct interpretation of the cause of the alarm trigger, it is necessary to transform the hex code indicated in parameter 15.13 **SpdFbkLoss code,** PAR 2172 , in the corresponding binary and verify in the encoder table that the active bits and related description are used.

Example with digital incremental encoder:

PAR 2172 = 3 (hex value)

In the table "**Speed fbk loss [22] alarm with digital incremental encoder**" 0x03 is not indicated in the value column.
0x03 should be contemplated as a bitword with meaning 00011 -> bit 0 and bit 1 . The following causes simultaneously intervene:

Bit 0 = 0x01 Cause: no impulses or disturbance on incremental channel A.
Bit 1 = 0x02 Cause: no impulses or disturbance on incremental channel B.

The value is displayed in hexadecimal format on the optional and standard keypad.

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

Bit	Value	Name	Description
0	0x01	CHA	**Cause:** no impulses or disturbance on incremental channel A.
			Solution: Check the connection of the encoder-drive channel A, check the connection of the screen, check the encoder supply voltage, check parameter 2102 **Encoder supply**.
1	0x02	CHB	**Cause:** no impulses or disturbance on incremental channel B.
			Solution: Check the connection of the encoder-drive channel B, check the connection of the screen, check the encoder supply voltage, check parameter 2102 **Encoder supply**.
2	0x04	CHZ	**Cause:** no impulses or disturbance on incremental channel Z.
			Solution: Check the connection of the encoder-drive channel Z, check the connection of the screen, check the encoder supply voltage, check parameter 2102 **Encoder supply**, check parameter 2110 **Encoder signal check**

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

Bit	Value	Name	Description
3	0x08	MOD_INCR	**Cause:** voltage level not correct or disturbance on signals of incremental channels A-B.
			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 supply**.

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

Bit	Value	Name	Description
3	0x08	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 supply**, check parameter 2108 **Encoder signal Vpp**.
4	0x10	MOD_ABS	**Cause:** voltage level not correct or disturbance on signals of absolute SinCos channels.
			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 supply**, check parameter 2108 **Encoder signal Vpp**.

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

Bit	Value	Name	Description
3	0x08	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 supply**, check parameter 2108 **Encoder signal Vpp**.
5	0x20	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 supply**, check parameter 2112 **Encoder SSI bits**.
8	0x100	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 supply**, check parameter 2112 **Encoder SSI bits**.

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

Bit	Value	Name	Description
3	0x08	MOD_INCR	**Cause: v**oltage 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 supply**, check parameter 2108 **Encoder signal Vpp**.
5	0x20	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 supply**.
8	0x100	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 supply**.

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

Bit	Value	Name	Description			
6	0x40	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 supply**.			
7	0x80	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			**Bit**		**=0**	**=1**
			0	Light source	OK	Failure (1)
			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			

10.2.1 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.

10.2.2 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
8	0x100	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	0x200	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.

10.3 Messages

Note ! For more information see **paragraph "8.2.12 Messages".**

Index	Error message shown on the display	Sub-code	Description
1	**Load default param [LDEF]**	**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 automatically performs the **Load default** command.	
		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 [OPT1]** **Option detect slot 2 [OPT2]** **Option detect slot 3 [OPT3]**	**Condition:** when the drive is turned on it recognises the presence of an optional card. One of the messages is shown on the display for a few seconds	
		0H-0	None
		0004H-4	Can
		0008H-8	Enc 1 EXP-DE-I1R1F2-ADL
		0108H-264	Enc 2 EXP-SE-I1R1F2-ADL
		0208H-520	Enc 3 EXP-SESC- I1R1F2-ADL
		0308H-776	Enc 4 EXP-EN/SSI- I1R1F2-ADL
		0408H-1032	Enc 5 EXP-HIP- I1R1F2-ADL
		0101H-257	I/O 1 EXP-IO-D4-ADL
		0501H-1281	I/O 1 EXP-IO-D8R4-ADL
		0901H-2305	I/O 1 EXP-IO-D16R4-ADL
		0F01-3841	I/O 1 EXP-IO-D12A2R4-ADL
		1301H-4865	I/O 1 EXP-IO-D8A4R4-ADL
		1501H-5377	I/O 1 EXP-IO-D6R2-F-ADL
		00FFH-255	Unknown
		Solution:	
5	**Autotune (motor)** **[SLFT]**	**Condition:** this may occur during the self-tuning procedure	
		0	No error
		1	N.A.
		2	N.A.
		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.
		4	The motor is not connected
			Solution: Connect the motor
		5	While running self-tuning the ESC key was pressed or the enable contact was opened or an alarm occurred. The self-tuning 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 self-tuning 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 self-tuning command was sent without being enabled.
			Solution: Close the enable contact before sending the self-tuning command
		8 ... 21	A setting performed by self-tuning has reached a measurement method limit
			Solution: Check the motor plate data or the drive and motor sizes have been combined incorrectly.
		30	The Enable was not given or removed in time during the phasing procedure.
			Solution: Repeat the phasing procedure and check the connection of the enable signals.
		Solution: If the message appears with a value other than 0, follow the instructions supplied for each particular case and repeat self-tuning. 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. - Take care not to set the **Rated speed** parameter to the synchronous speed. The value of the **Rated speed** parameter must be less than: [(**Rated frequency** * 60) / **Pole pairs**]. - **Rated frequency**, **Motor rated frequency** in Hz - **Pole pairs**, **Motor 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 self-tuning.	
6	**Power config** **[PC]**	**Condition:** may occur during recognition of power cards. If this message is displayed, it is not possible to drive the motor.	
		0020H-32	The power card is configured for a drive that is incompatible with the regulation card
		0021H-33	The configuration of the power card is not compatible with the regulation card
		0017H-23	The configuration required is not available on the power card

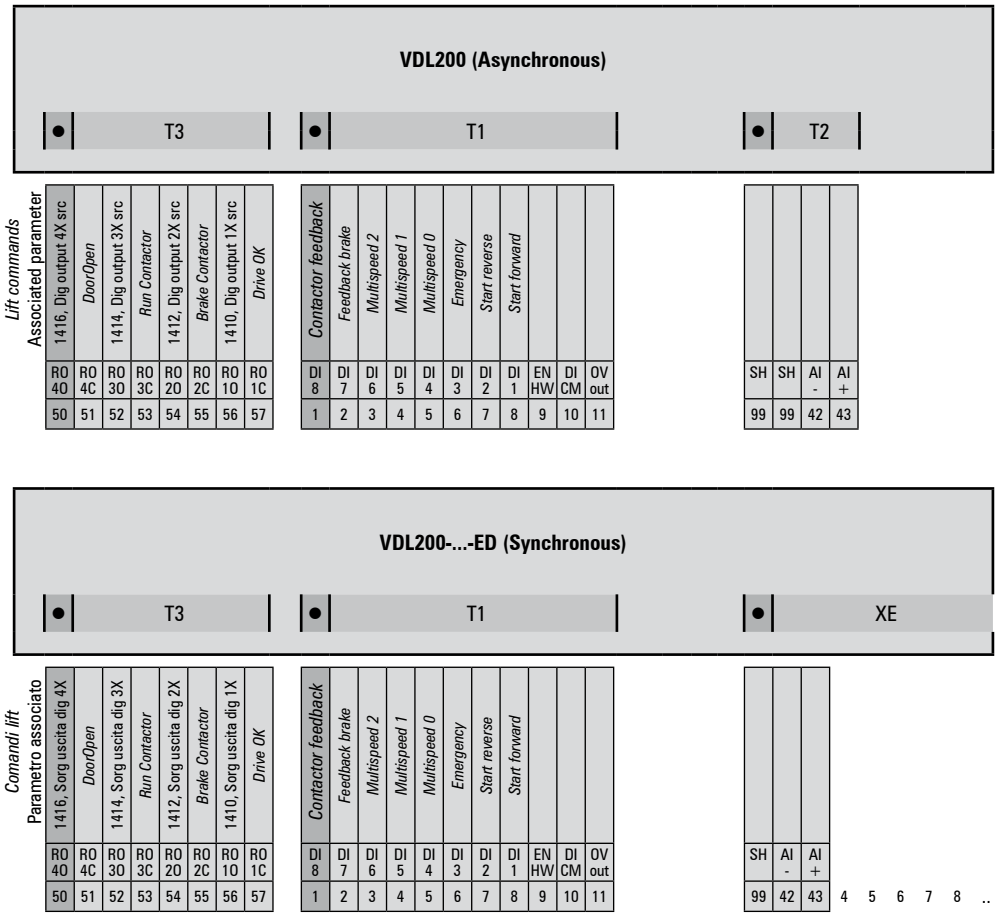
Index	Error message shown on the display	Sub-code	Description
		Solution: Download the correct configuration on the power card	
7	**Save par failed**	**Condition:** during transfer of the parameters from the drive to the memory of the keypado	
	[FAIL]	**0H-0**	Communication error
		0023H-35	Communication error
		0023H-36	Communication error
		0025H-37	The data saved on the keypad are not valid
		Solution:	
8	**Load par failed [FAIL]**	**Condition:** during transfer of the parameters from the memory of the keypad to the drive	
9	**Load par incomplete**	**0H-0**	Communication error
	[LPNC]	**0023H-35**	Communication error
		0023H-36	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 drive series. 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 drive size. All the parameters present in the memory of the keypad (excluding those that depend on the size of the drive), have been transferred to the drive. The parameters that depend on size maintain their original value.
		0029H-41	Error during saving of parameters on the drive. All the parameters present in the memory of the keypad have been transferred to the drive. The transfer of one or more parameters has caused an "out of range" error, or one or more parameters does not exist. At the end of transfer, one or more parameters may not have been updated.
		002AH-42	PLC application release and version not compatible. All parameters in the keypad memory have been transferred to the drive. The transferred set of parameters relates to a drive with a PLC application in which the version and release of the application are different. As a result some of the PLC application parameters may not be updated.
		002BH-43	PLC application not compatible. All the parameters in the keypad memory except those relating to the PLC applciation have been transferred to the drive. The transferred set of parameters relates to a drive with a different PLC application. As a result none of the PLC application parameters are updated.
		Solution: Recover a set of parameters from a compatible drive (model and size)	
10	**Options config error**	**Condition:** may occur at drive start-up, during recognition of the optional cards installed	
	[OPTC]	**0001H-1**	Non-permissible optional card in slot 1
		0002H-2	Non-permissible optional card in slot 2
		0004H-4	
		0010H-16	Conflict slot 1 with slot 2
		0020H-32	
		0040H-64	
		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.	
	[LDPL]	**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.	
	[PLCE]	**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 [PLC1]**	Reserved messages and dedicated to the PLC application. See the application manual.	
14	**Plc 2 [PLC2]**		
15	**Plc 3 [PLC3]**		
16	**Plc 4 [PLC4]**		
17	**Opt bus fault**	**Condition:** this may occur when the drive is turned on, during fieldbus card setup. Error during configuration or communication error.	
	[OPTB]	**XXX0H-X**	If the first digit to the left of "H" in the alarm sub-code is 0, the error regards a communication problem.

Index	Error message shown on the display	Sub-code	Description
		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	**Wrong key** **[KEYF]**	**Condition**: this may occur when powering the drive, if the incorrect enable key is inserted for a given firmware function.	
		xxxxH-x	
		Solution: Ask Gefran to supply the correct key to enable the desired firmware function.	
19	**Key expiring** **[KEYE]**	**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.	
20	**SD card error** **[FAIL]**	**Condition:** this condition may occur when sending data from the drive to the SD card or from the SD card to the drive. It could be due to a memory card that is incompatible or not present.	
		XXX0H-X	Communication error
		Solution: Check the memory card being used	
21	**Parameter error** **[PE]**	**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	Code XXXXH-X indicates the number of the parameter (Hex-Dec) that has caused the error: make a note of this to discuss it with the service centre.
		Solution: Set the parameter that has caused the error to the correct value and execute **Save parameters**, switch the drive off and then back on.	
22	**Encoder error** **[ENCE]**	**Condition:** this condition may occur when the drive is powered during encoder setup each time parameter 552 **Regulation mode** is set.	
		100H-256	**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** alarm is also generated.
			Solution: Take the recommended action for the **Speed fbk loss** 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.
23	**Options cfg changed** **[OCFG]**	**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
		0078H-120	Card removed from slot 1 and from slot 2
		Solution: Check the hardware configuration, then press ESC. Save the parameters (**Save parameters**, menu 04.01 par 550) to save the new hardware configuration.	
24	**Fw update failed** **[FAIL]**	**Condition:** When updating the firmware, check whether the file is in the wrong format or corrupt.	
		Solution: try again with a correct file.	

Appendix

A.1 - I/O Specification

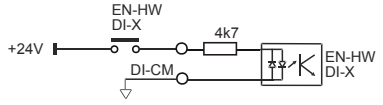
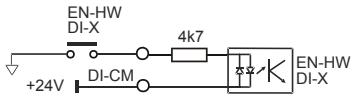
The I/O integrated in the R-VDL200 regulation card are: 1 enable input (Enable) + 8 digital inputs (DI) + 4 relay outputs (RO) + 1 analog input (AI).



A.1.1 Input/Output features

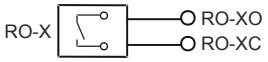
24V DC power supply	
Tolerance	± 10%
Maximum current	150 mA
Isolation	1 KV

- **Digital inputs (DI) and enable hardware inputs (EN-HW)**

Description	Features
Type	24 V PNP / NPN
Operating voltage	0 V to + 24 V (+ 30 V max)
Load	5 mA @ +24 V - R_L = 4.7 kΩ
Thresholds	V_{IC} < 5 V – V_{IH} > 15 V
Isolation	Yes – Functional (> 1 kV)
PNP 	NPN 

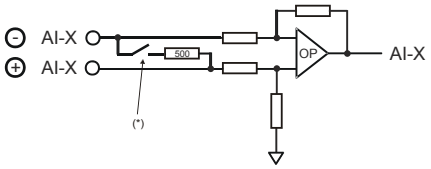
- **Relay outputs (RO)**

Description	Features
Type	NO Relay (single contact)
Operating voltage	250 VAC / - 30 VDC / 2 A
Load	50 mA @ +10 V
Isolation	Yes – 4 kV



- **Analog inputs (AI)**

Description	Features
Type	Voltage differential
Input voltage	± 10 V (± 12.5 V full scale)
Input R	10 kΩ
Resolution	12 Bits (11 + sign)
Precision	1% of full scale
Isolation	NO
Description	Features
Type	Current differential
Input current	0 (4) mA to 20 mA
Input R	500 Ω
Resolution	12 Bits (11 + sign)
Precision	1% of full scale
Isolation	NO



(*) Select input V/I (V=OFF, I=ON)

A.2 Encoders and Phasing

A.2.1 Encoders

Encoders provide motor speed and position feedback

The regulation algorithms in the VDL200 drive are capable of controlling asynchronous and permanent magnet synchronous (brushless) motors. With asynchronous motors the regulation algorithm may or may not use the speed measurement obtained from the encoder reading. With brushless motors the regulation algorithm needs an encoder that also allows the absolute motor position to be verified.

Possible configurations are summarised in the table:

	VDL200 (Asynchronous)	VDL200-...-ED (Synchronous)	Asynchronous				Brushless	
			SSC		Flux Vector OL	Flux Vector CL	Flux Vector CL	PAR 552 – Regulation mode
			SSC OL	SSC CL	-	-		PAR 2444 – Slip comp mode
Tipo encoder								
Incrementale Digitale	●		-	Recommended	-	Recommended	Possible	
Incrementale Sinusoidale	●		-	Possible	-	Recommended	Possible	
Incrementale sinusoidale + assoluto SinCos		●	-	Possible	-	Possible	Recommended	
Incrementale sinusoidale + Assoluto Endat/SSI		●	-	Possible	-	Possible	Recommended	

- = encoder not used

Encoders must be fitted to the motor shaft using anti-backlash couplings. The best control is achieved with configurations that have incremental sinusoidal channels.
For electrical connections always use good quality cables with shielded twisted pairs, according to the procedures and specifications described in the following paragraphs.

The configuration parameters for each encoder can be found in the ENCODER CONFIG.
In the event of an encoder malfunction the drive generates the **Speed fbk back loss** alarm and the cause of the malfunction is shown in parameter 2172 **SpdFbkLoss code**.
If the encoder is not used by the regulation algorithm the drive still manages the encoder position reading but does not generate an alarm in case of malfunctioning.

A.2.2 Phasing

In order for the VDL200 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.

- PAR 2192 **Autophase still** -> static phasing:

this procedure must be performed with the motor still and brake applied.

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!

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 10.3 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.

A.3 - Brake monitoring system (A3 Amendment)

A.3.1 Introduction

The brake monitoring function in the VDL200 series enables implementation of the automatic brake monitoring function as required by EN81-1 A.3 §9.11.3.

Two functional elements are required to implement the brake monitoring function:
1. Management of the **Brake fault** alarm
2. Resetting of the **Brake fault** alarm

The basic wiring diagram for implementing this function is shown in Figure 1.

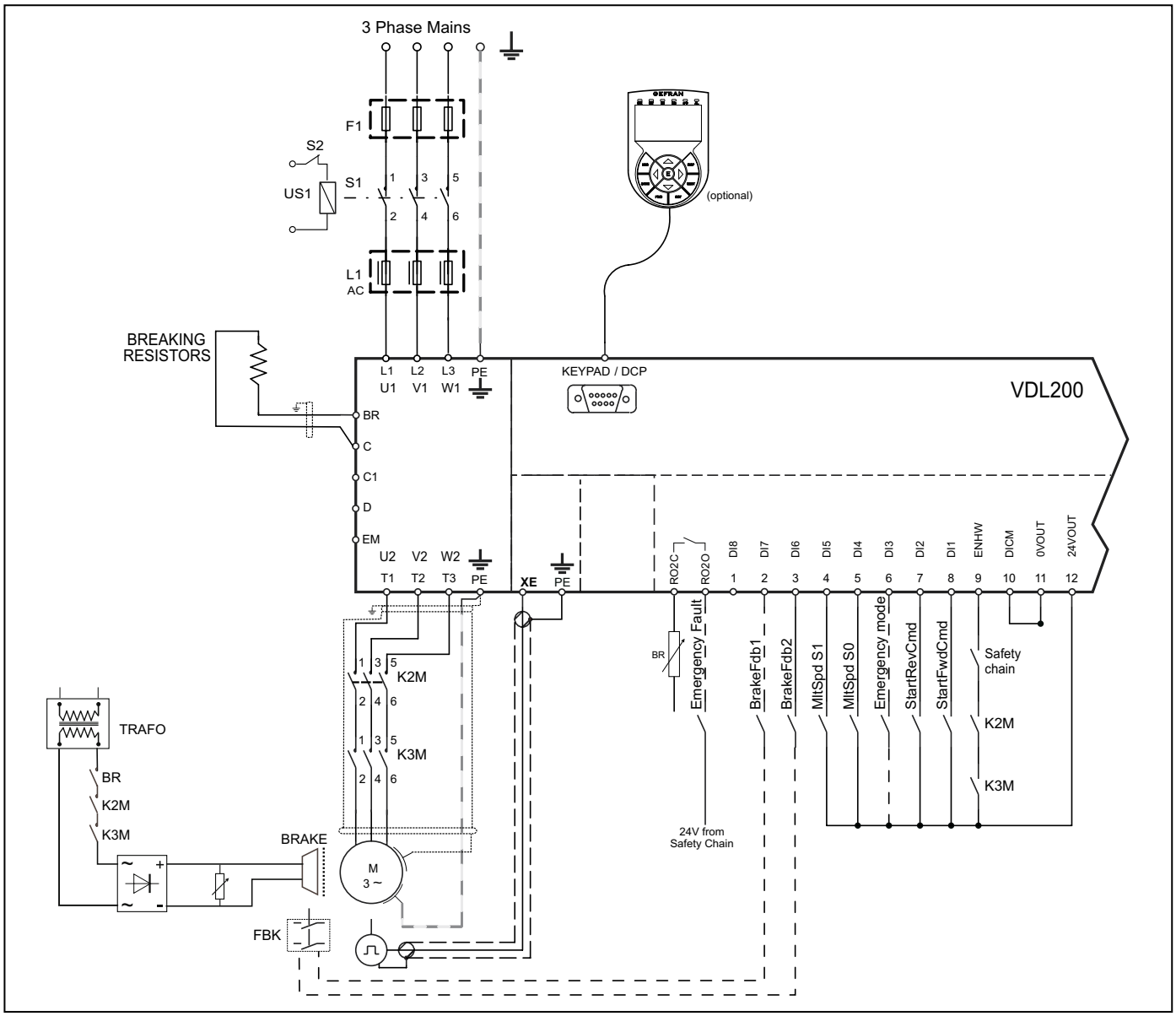


Figure 1 : VDL200 connection diagram for amendment A3.

This shows that :

A) The VDL200 controls brake activation/deactivation via relay BR

B) Both brake feedback signals are sent to the VDL200 inputs

C) The VDL200 signals any malfunctions (including brake malfunctions) to the system control unit via internal relay RO1.

D) The system control unit blocks the system brake in safety by deactivating contactors K2 and K3.

According to an alternative arrangement, the VDL200 closes/opens contactors K2 and K3 but the power supply to the coils and to the VDL200 commands comes from the control unit.

The purpose of the brake fault alarm is to check whether the states of the two feedback signals from the brake are consistent and, in case of doubt, to include a function whereby the VDL200 drive stops the system. The procedure for including the alarm is described below.

A.3.2 Configuration of the brake fault alarm

- **Activation of the brake fault alarm function.**

The installer must have previously located the necessary digital inputs of the VDL200 drive and connected the corresponding wires to the feedback signals on these inputs. Note that depending on the type of wiring arrangement, the brake feedback signals are normally asserted (brake closed – digital input to 1) or normally not asserted (brake closed – digital input to 0).
The brake fault alarm function envisages signals that are normally asserted. If the wiring is functionally inverted, simply negate the corresponding digital inputs in the VDL200 configuration.

To configure the brake fault alarm function, proceed as follows:

1. In the 5.7 INPUTS/OUTPUTS menu , change the setting of parameter 11252 **Brake Fbk A3 Sel** (default **Null**) and select the digital input corresponding to the second brake feedback signal If **Brake Fbk A3 Sel** is set to a value other than **Null**, the brake fault alarm function is automatically enabled.
2. Next select the digital input corresponding to the first brake feedback signal in parameter 11236 **Brake Fbk Sel**.

The brake fault function is enabled. **The installer in charge of the system must test the function each time it is activated or modified, following the brake fault test procedure.**

- **Resetting the brake fault alarm**

1. Open the 5.9 LIFT ALARM menu and check that the **Brake Alarm** is on.
2. In the 5.9 LIFT ALARM menu, select parameter 11268 **Reset Brake Alarm** (default 0).
3. The system asks for a code, enter release code 5313.
4. Check again to see whether the **Brake Alarm** has been reset.

- **Disabling the brake fault alarm**

1. In the 5.7 INPUTS/OUTPUTS menu, change the setting of parameter 11252 **Brake Fbk A3 Sel** to **Null** The brake fault alarm function is disabled.
2. If the new configuration does not manage any brake feedback signals, change the setting of parameter 11236 **Brake Fbk Sel** to [3708] **Brake cont mon** .

- **Brake fault alarm test procedure**

Proceed as follows:

1. Disconnect the wire connecting the first brake feedback signal to the relative digital input.
2. Try re-starting from the floor with the feedback signal disconnected. If the lift car does not move (correct behaviour), proceed to step 3. If the lift car moves, the alarm is not working properly. Check the various parts of the system.
3. If the brake fault alarm is connected, reset it and proceed to step 4. If the alarm is not connection, re-check the various parts of the system.
4. Repeat steps 1, 2 and 3, disconnecting the second brake feedback signal from the corresponding input.

If the procedure is successful, the brake fault alarm will function properly.

A.3.3 Maintenance of the brake fault alarm function

The installer must repeat the brake fault alarm test procedure during periodical inspections and whenever messages concerning the brake unit are displayed.
The installer must check the alarm log each time for any faults

A.3.4 Troubleshooting

Fault	Possible cause	Solution
Motor does not run, the brake fault alarm is triggered continuously	Feedback signals disconnected/incorrectly connected	Re-check brake feedback signal wiring and electric levels
	Brake feedback not configured correctly	Check PAR 11236 **Brake Fbk Sel**, PAR 11252 **Brake Fbk Sel A3** configuration. Check correct signal operation (electric levels) and invert digital inputs if necessary
	Monitoring time too short in relation to system response times	Set a longer PAR 11206 **Brake Hold Off time**
The motor runs even with the feedback signals disconnected	The brake fault alarm is not connected.	Check the setting of PAR 11252 **Brake Fbk Sel A3**.
	Incorrect PAR 11252 **Brake Fbk Sel A3** / PAR 11236 **Brake Fbk Sel** setting.	PAR 11252 **Brake Fbk Sel A3** and PAR 11236 **Brake Fbk Sel** must not be set to **Null** or **Brake Cont Mon**.

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