ABB Sace

# ABB AC Brushless Servodrives

DGV Converters
for Speed, Torque and Positioning
Control of Brushless AC Permanent
Magnet Servomotors

## Installation Manual

ABB AC Brushless Servodrives

# DGV Converters

for driving Brushless AC Permanent Magnet Servomotors

## Installation Manual

MANIU20.0410 E

EFFECTIVE: 15.10.2004
SUPERSEDES: 30.06.2004

# *Safety Instructions*

***Introduction***

This chapter states the safety instructions that must be followed when configuring the DGV Converter. The material in this chapter and in this Manual must be studied before attempting any work on, or with, the device.

***Warnings and Notes***

This manual distinguishes two sorts of safety instructions. Warnings are used to inform of conditions that can, if proper steps are not taken, lead to a serious fault condition, physical injury and death. Notes are used when the reader is required to pay special attention or when there is additional information available on the subject. Notes are less crucial than Warnings, but should not be disregarded.

***WARNING***

Readers are informed of situations that can result in serious physical injury and/or serious damage to equipment with the following symbols:

**WARNING! Dangerous Voltage:** warns of situations in which a high voltage can cause physical injury and/or damage equipment. The text next to this symbol describes ways to avoid the danger.

**WARNING! General Warning:** warns of situations that can cause physical injury and/or damage equipment by means other than electrical. The text next to this symbol describes ways to avoid the danger.

**Electrostatic Discharge Warning**: warns of situations in which an electrostatic discharge can damage equipment. The text next to this symbol describes ways to avoid the danger.

***Notes***

Readers are notified of the need for special attention or additional information available on the subject with the following symbol:

**CAUTION!** **Caution** aims to draw special attention to a particular issue.

**Note.** **Note** gives additional information or points out more information available on the subject.

Neglecting these instructions can cause physical injury and death.

## *General Safety Instructions*

**WARNING!** Only properly qualified personnel who are familiar with operation on converters are allowed to perform the commissioning and operation activities on DGV.

**WARNING! For no reason should any person access the internal part of the converter or the terminals of the servomotor, before at least four minutes from the power outage.**

Potentially lethal voltages are present on a DC intermediate circuit and on the associated circuits.

**WARNING!** The installation must be done in conformance with **CEE 89/336** and **CEE 72/23** directives.

**WARNING!** The machine manufacturer, who commissions the converter, must install proper additional protection functions to avoid damages to health or equipment when the machine is operating.

Complete safety instructions can be found in *Chapter 9 - Standards and Safety* of the present Manual.

More Warnings and Notes are printed at appropriate instances along the text.

# Table of Contents

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# Chapter 1 - Introduction to this Manual

## Introduction

This manual, cod. MANIU20.0410 E, has been written by ABB Sace S.p.a. and describes the hardware characteristics, the software and the technical specs of the DGV vector controlled converter. Moreover it guides the user into the installation, commissioning and selection of the proper motor matching and accessories.

Besides this *Installation Manual*, the *Firmware Manual*, the *CANOpen Guide* and the *PROFIBUS Guide* are also available under this code.

## General Information

The DGV Converter is a new generation digital converter with field bus technology. Designed for motion control applications it allows for local or remote control of speed, position and torque with high dynamic performances.

Its main characteristics are:

- Field Bus Profibus-DP, CANOpen
- Motor Transducers :Resolver or Sincos encoder 1 Vpp
- Auxiliary Encoder input
- Programmable encoder emulation output
- Programmable digital inputs
- Programmable digital outputs
- 1 analog input, ± 10 V
- 1 programmable analog output
- 1 dedicated relais output
- Dynamic management of the emergency braking
- Resolver autophasing to setup every kind of brushless motor
- Notch filters to cancel mechanical resonances
- Auxiliary supply 24V ac/dc
- Internal or external braking resistor
- Setup software with digital oscilloscope, waveform generator and motor database to create every configuration through RS232 serial interface

***Typical Applications***

The characteristics of the applications that can be configured are:

- Speed and torque control, with analogic commands
- Speed and torque control, field bus managed
- Absolute and relative positioning control, field bus managed
- Digital interpolation positioning control (CanOpen)
- Positioning microinterpolator
- Position and speed synchronizations
- Torque slave (in order to connect more motors) in parallel
- Mixed analogic/digital controls
- Management of a second encoder for positioning loop
- Parameters tables changeable via I/0 or via field bus, or self commutated
- Linear motors control
- Stronger braking duty cycles thanks to DC BUS paralleling

Due to these characteristics, DGV is usually adopted for motion and positioning applications, from the simpler to the most complicated.

- Plant automation
- Axes motion
- Reel and pallets driving
- Textile
- Mixers

## General Specs of DGV Converters

### Hardware and Firmware

Within ABB product family DGV is the first digital converter with field bus technology for brushless servomotors drives. The hardware and firmware characteristics are the following:

- A control board that makes position, speed, torque control and special functions for the protection and supervision of the drive.
- An I/O board for the management of:
  - RS 232 serial interface,
  - PROFIBUS-DP/CANOpen field bus interface,
  - acquisition of the angular position transducer signals, including a second encoder input, and of the thermal sensor that can be mounted on the motor,
  - encoder emulation output,
  - dedicated and configurable analog inputs and outputs,
  - dedicated and configurable optical insulated digital I/O.
- A power board to drive the motor.

### Basic Configuration

DGV Cpnverters are available with one of the following configurations:

- DGV700, 110 ÷ 480 Vac three-phase power supply
- DGV300, 110 ÷ 230 Vac three-phase power supply
- DGV300, 110 ÷ 230 Vac single-phase power supply

### User Interface Application Software

DGV Converters are equipped with the user interface software ABB AC Brushless Servodrives Browser. The software can make commissioning, monitoring and supervision of the application. The operation of this application software is described in the *Firmware Manual* and, shortly, in Chapter 4 of this Manual.

### Complementary Equipment

DGV700 and DGV300 Converters are normally matched with ABB Sace of the 8C SERIES, even if motors from other manufacturers are controllable as well. For additional info on the motor converter matching, the uses of other complementary and auxiliary equipment please consult Chapter 6.

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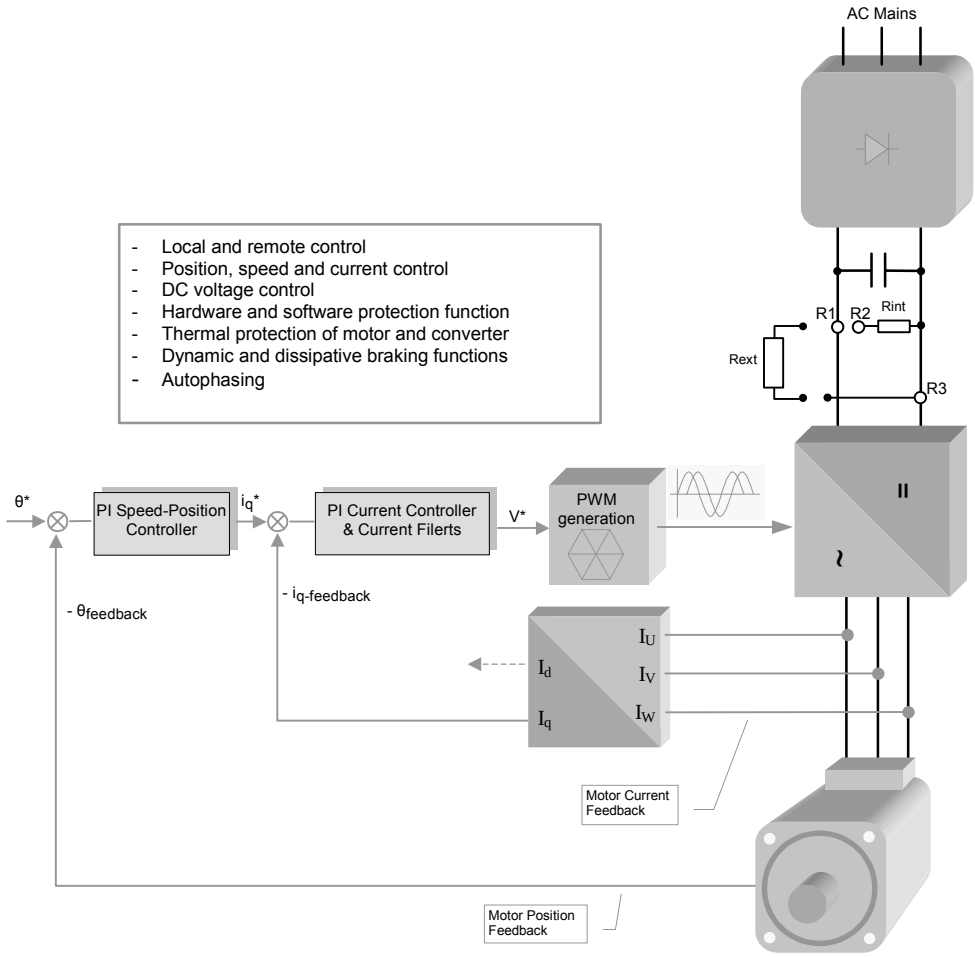
# Chapter 2 - Overview

## General Notes

This manual refers to drives made up with DGV Converters and 8C SERIES Servomotors.

DGV uses a vector control strategy and a proportional integral position, speed and current closed loop regulator. Moreover, it has an internal intelligence for the overall drive control and the optimization of its operating characteristics.

## Block Scheme



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# Chapter 3 - Mechanical Installation

## Introduction

This Chapter illustrates instructions for mechanical installation of DGV700 and DGV300 Converters.

The DGV hardware equipment is arranged inside a metallic case. The holes on the back metallic side allow for the fastening of the converter on a holding panel, usually inside an electrical cabinet (see C*hapter 6 - Installation Guidelines*). The front panel of the converter is equipped for the cable connections. The grids on the top and bottom sides of the converter allow for cooling airflow circulation.

Once the cabling of the converter is completed, the protection degree of the closed metallic case is IP20. The installer and the machine manufacturer must provide for the completion devices for the safeguard of the whole installation.

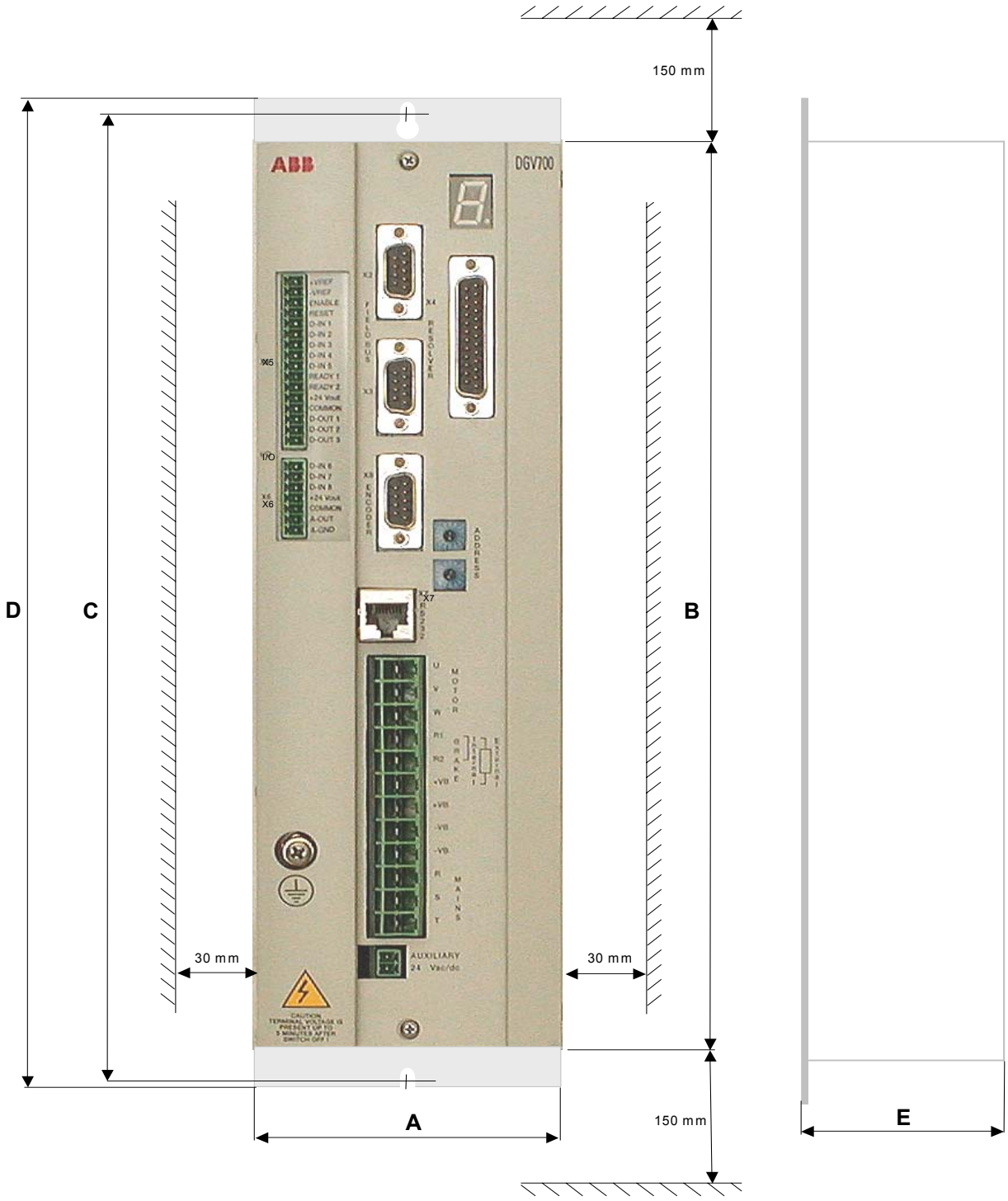
The installer must provide for:

- For DGV700, a minimum 150 mm distance of the converter from other external objects both on top and on bottom of the converter, and a minimum 30 mm distance on the lateral sides.
- For DGV300, a minimum 100 mm distance of the converter from other external objects both on top and on bottom of the converter, and a minimum 20 mm distance on the lateral sides.
- Avoiding placing the converter close to heat sources.
- Making an evaluation of the heat dissipated within the electrical cabinet and provide for suitable cooling devices when necessary. To know the heat dissipation values of the DGV please consult *Chapter 9 - Technical Data*.
- Installing proper protection devices for personnel and machinery.

The power circuit wirings must be physically separated from the driving and control circuit wirings (signal circuits); the power circuits must be carefully shielded with respect to signal circuits; this can be achieved by using metal wire channels and metal sheaths or shielded cables, even power cables, arranged within plastic channels (C*hapter 6 - Installation Guidelines*).

***DGV700***

Fix the bottom and top bracket with two screws for mounting DGV700 Converters.

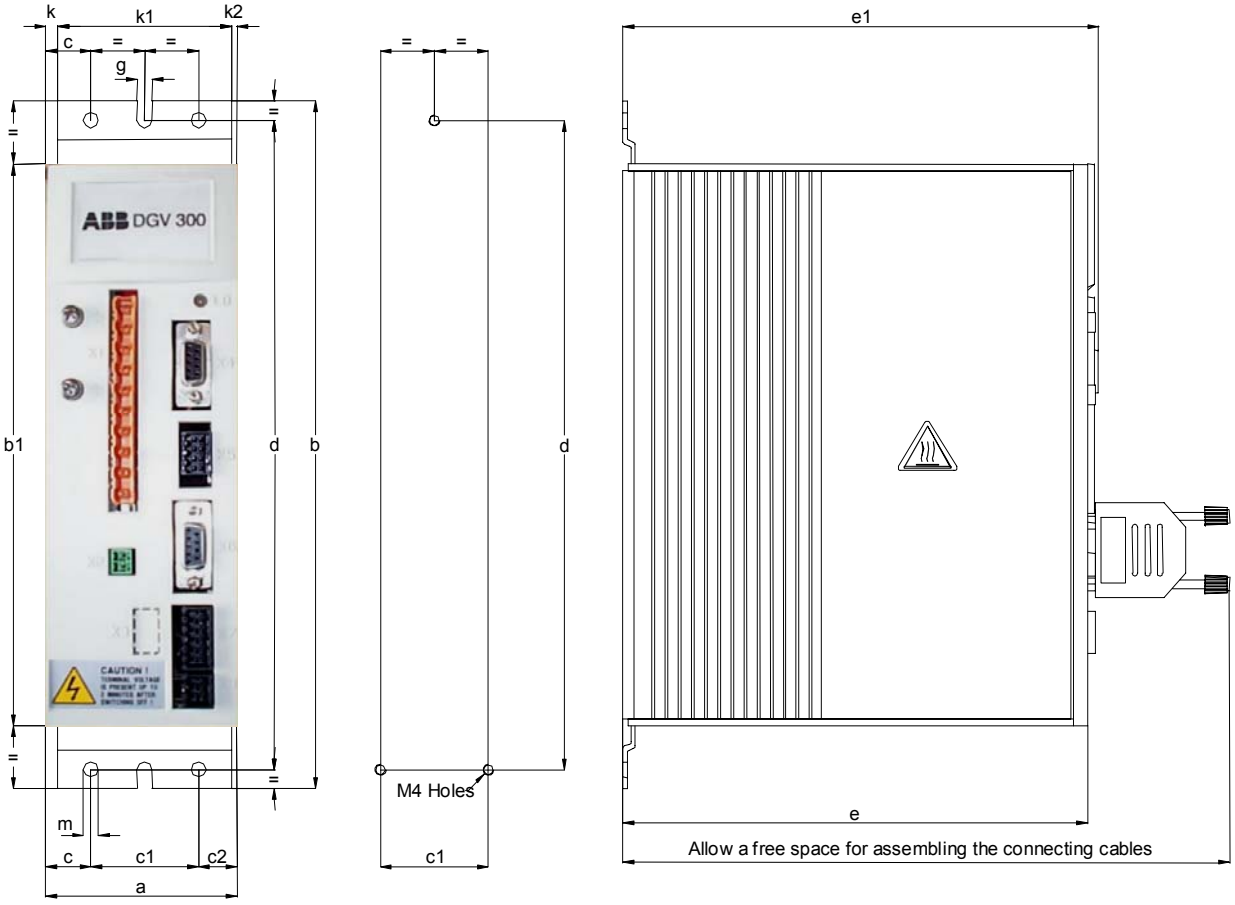



| Mechanical Dimensions | Units | Sizes 3/6, 5/10, 9/18 | Sizes 13/26, 18/36, 25/50 |
|---|---|---|---|
| **A** | [mm] | 91 | 124 |
| **B** | [mm] | 300 | 325 |
| **C** | [mm] | 324 | 352 |
| **D** | [mm] | 336 | 366 |
| **E** | [mm] | 248 | 309 |
| **Weight** | [Kg] | 4,6 | 8,6 |

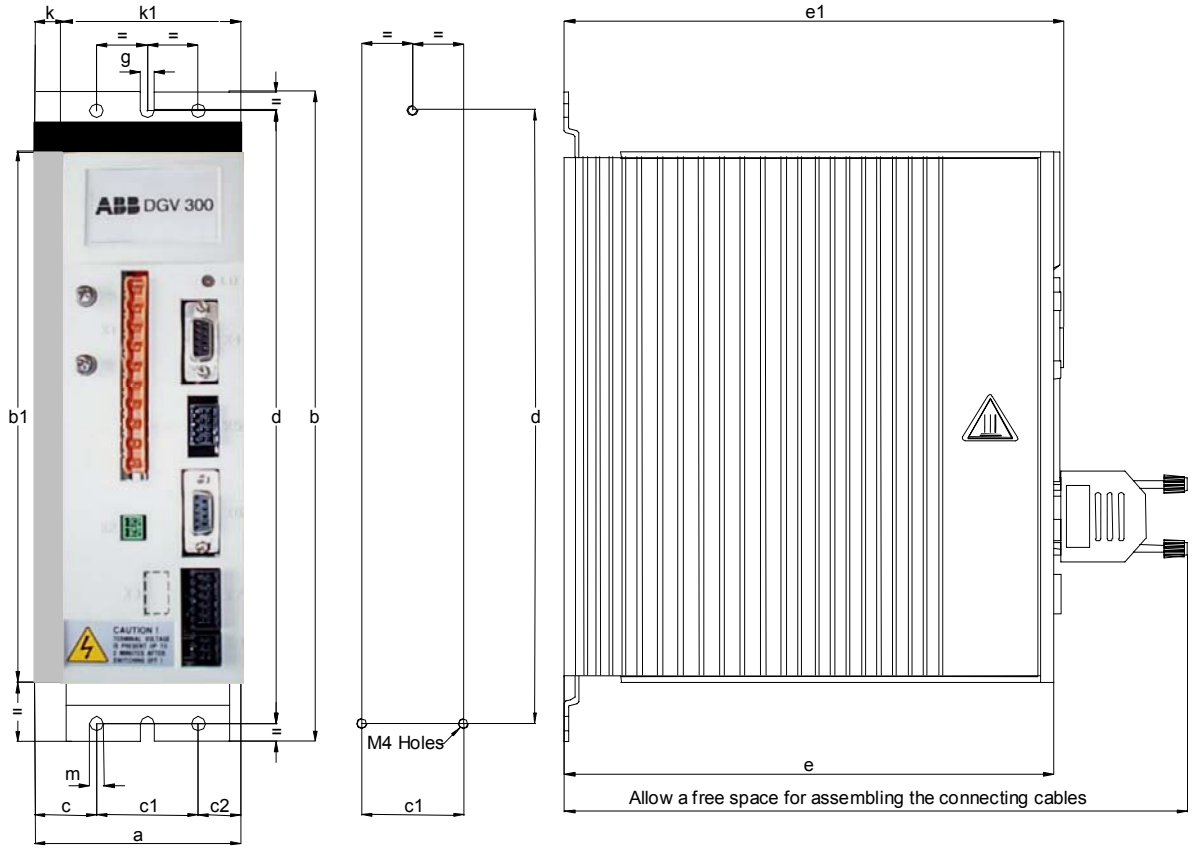
### *DGV300*

Use brackets and screws supplied with the converter for mounting single- and three-phase DGV300 Converters.

- Fix the bottom bracket to the mounting panel with two screws.
- Place the converter on the bottom bracket
- Place and fix with a screw the top bracket.




| DGV300 | Units | a | b | b1 | c | c1 | c2 | d | e | e1 | g | k | k1 | k2 | m |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size 3/6 | [mm] | 70 | 252 | 206 | 16,5 | 39,5 | 14 | $238^{+1}_{0}$ | 170 | 174 | 5,5 | 4,5 | 63,5 | 2 | ∅5,5 |
| Size 5/10 | [mm] | 70 | 252 | 206 | 16,5 | 39,5 | 14 | $238^{+1}_{0}$ | 170 | 174 | 5,5 | 4,5 | 63,5 | 2 | ∅5,5 |




| DGV300 | Units | a | b | b1 | c | c1 | c2 | d | e | e1 | g | k | k1 | m |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size 7/14 | [mm] | 80 | 268 | 206 | 24 | 39,5 | 16,5 | $254^{+1}_{-0}$ | 190 | 194 | 5,5 | 12 | 63,5 | ∅5,5 |

# Chapter 4 - User Interface

### Introduction

DGV can be controlled in different ways:

- Analog local control via RS232 serial communication protocol with the aid of a PC.
- Analog remote control with the use of the configurable analog and digital I/Os.
- Digital remote control via field bus and the aid of an external controller or PLC, by configuring the PROFIBUS-DP or the CANOpen module that is incorporated into the converter.
- In a mixed mode manner between Analog and Digital control.

### ABB AC Brushless Servodrives Browser

This Browser is the user interface of the DGV for the analogue local command. The use is very similar to other application programs developed in Windows environment.

It has the following functions:

- Drive commissioning, set-up and save of the operating parameters of the internal control loops
- Upload and download of data set containing all the data related to an application
- Fault diagnosis and elimination
- Local operative control of the drive by means of some programmable functions
- Monitoring of the drive state during the local or remote control

### Browser and Firmware versions

Since the browser is constantly updated or upgraded by ABB Sace, the revision levels are numbered as follows:

Browser vX.Y.ZZ

Example:

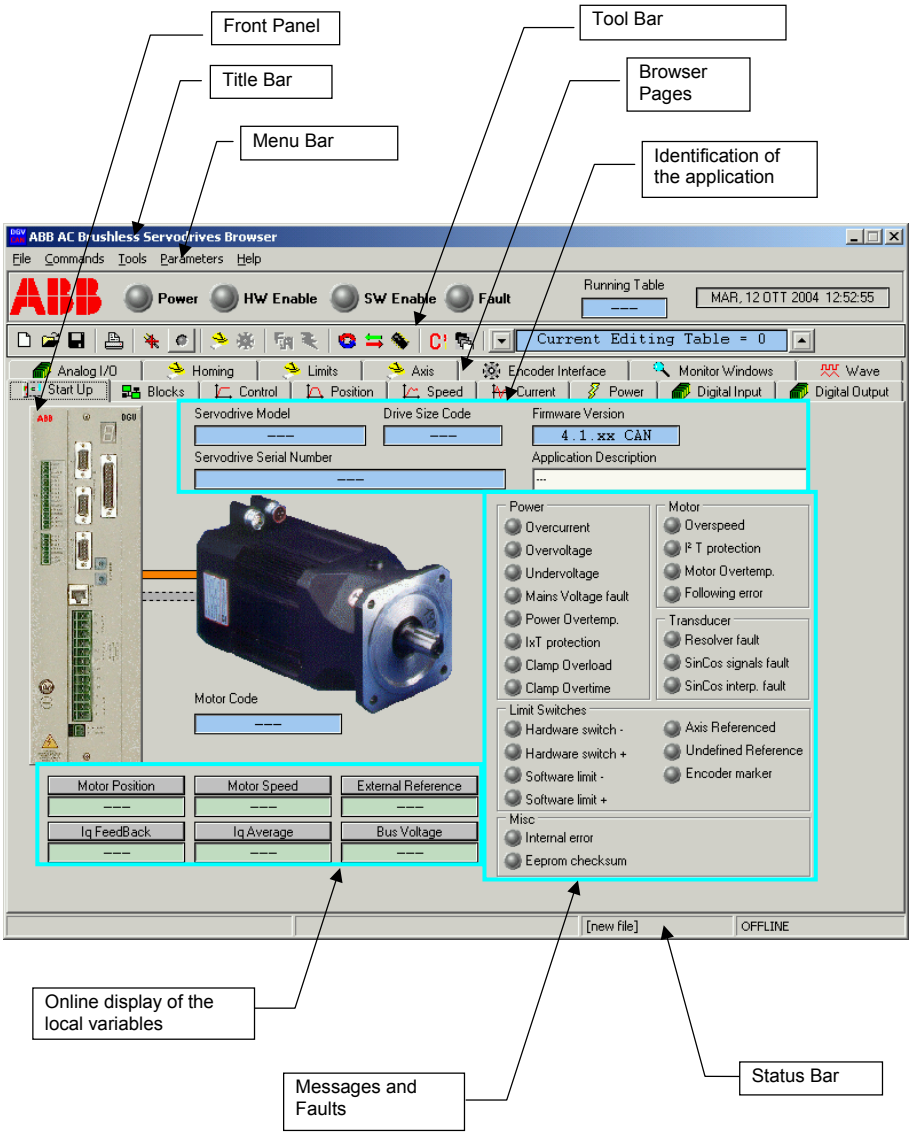
Browser v3.2.62

Where:

- The first digit “X” stands for a version totally renewed with respect to previous versione, that could also have some incompatibility with them.
- The second digit “Y” stands for a significant variation but that compatibility with previous versione is guaranteed.
- The third digits “ZZ” stand for small modifications or improvements, e.g. bug fixing, minor improvements etc.

Usually with the browser there is a firmware version of the converter that is numbered at the same level or below.

The main page visualizes general and important information and allows the user for making immediate diagnoses of the drive state. The three green lightening LED buttons indicate respectively the presence of hardware enable, the software enable and the applied main power supply. The red lightening LED indicates on the contrary the presence of a fault and, in the section dedicated to error messages, the fault occurred is visualized.



# Chapter 5 - Main Features

## Introduction

This chapter describes the standard functions of the DGV Converters, that are activated both in local analogue control and field bus remote control. There are functions that are pre-programmed, not modifiable by the user, programmable functions to set-up the converter operating mode, parametric-functions for the protections intervention, and auxiliary functions of various kind.

To allow for saving an application with a data set containing all of user defined data, these functions are treated as parameters and for most of them there exist the possibility to modify them on the fly.

## Local Control

### Identification of the Converter Model

When starting the user interface program, the drive model and the manufacturing characteristics are automatically detected.

After the serial communication is established, the application configuration can go on.

If the converter is not connected to the PC it is anyway possible to create an application configuration, therefore most of the things here described are valid in that situation too.

### Selection of Motor Model

Usually DGV are coupled to ABB brushless servomotors of the 8C SERIES, for which ABB Sace provides a data set of motor models. The installer who wishes to use a motor of different manufacturer can anyway create his motor model if the data set required during the configuration is available to him/her.

To make online configuration of DGV please refer to the *Firmware Manual*, where the complete programming procedures, the parameters and the operating functions of this drive are also explained.

***Control Parameters*** The parameter list is given in the *Firmware Manual*.

*Control Mode* Parameter function for control mode selection:

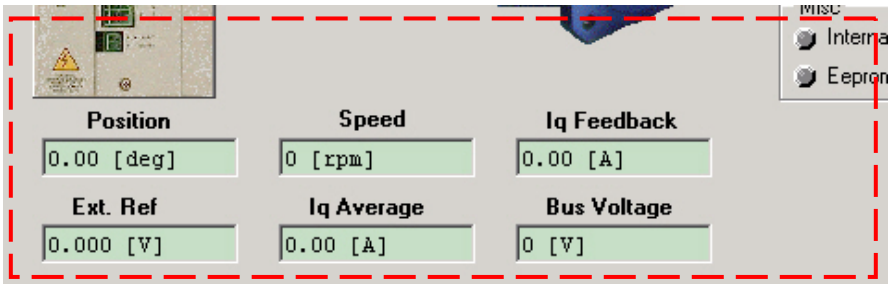
- “Local”
- “Field Bus”

*Local Operating Mode* Parameter function for selecting the local operating mode:

- “Analog Current”
- “Analog Speed”
- “Digital Torque”
- “Digital Speed”
- “Digital Position”

*Software Enable* Parameter function for software general enable (On/Off) of the drive operation.

***Local Diagnostic*** The Browser main page displays the process local variables, the operating status and the fault tracing of the drive.




In addition, the oscilloscope window in the Waveform Generator page can display the drive variables both in local and remote control mode.

## I/O Settings

DGV Converters provide programmable and manufacturer pre-programmed I/Os. The symbolic names put in brackets refer to the pin labels on the converter front panel, for example:

***DGV700***

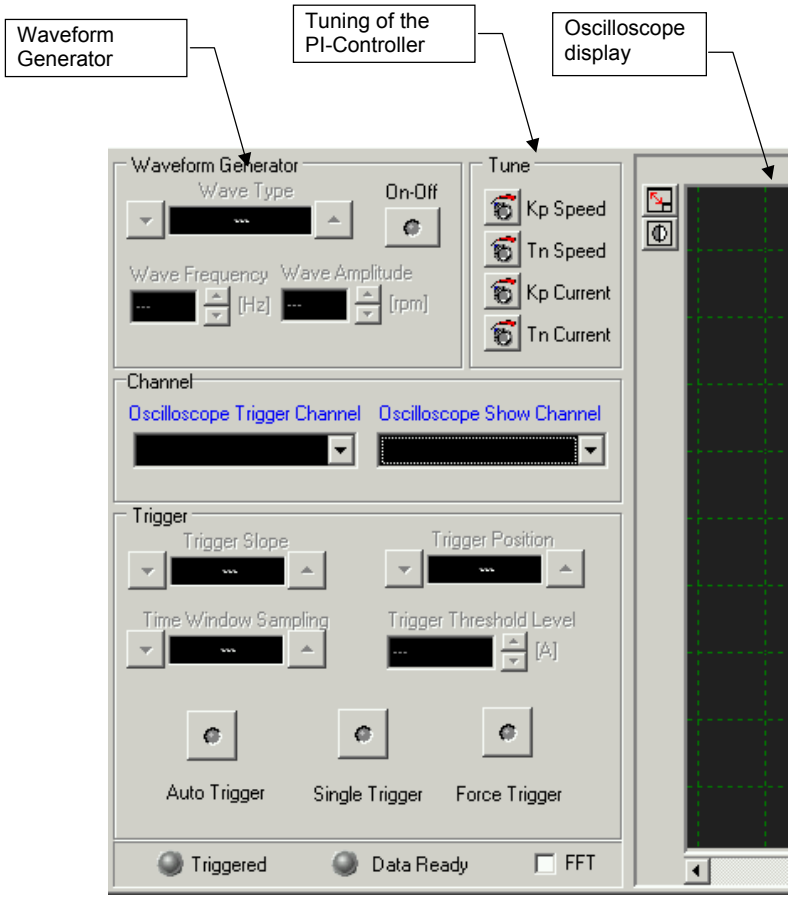
- ± VREF One analogue configurable reference input ±10 V differential with 12 bit digital conversion
- D-IN Eight optically insulated digital inputs 0-24 V, 30 mA
- D-OUT Three digital outputs 24 V, 30 mA max.
- VOUT One differential configurable analogue output
- ENABLE One digital preprogrammed input for power Hardware Enable
- RESET One digital preprogrammed input for Fault Reset
- READY One preprogrammed output fault/"drive ready"

***DGV300***

- One analogue configurable reference input ±10 V differential
- Six optically insulated digital inputs 0-24 V, 30 mA
- Two digital outputs 24 V, 30 mA max.
- One differential configurable analogue output
- One digital preprogrammed input for power Hardware Enable
- One digital preprogrammed input for Fault Reset
- One preprogrammed output fault/"drive ready"

## *Waveform Generator*

Waveform Generator provides a digital waveform generator. It works in *Local* control operating mode. This set of functions allows to set the form, amplitude and period of the digital waveform.




***Waveform Type*** Parameter function for waveform type selection (Step/Square/ Triangle/Sine wave). It is a speed or current digital waveform depending on the analog control mode (Analog Speed or Analog Current) currently selected.

***Waveform Frequency*** Parameter Waveform Frequency.

***Waveform Amplitude*** Parameter Waveform Amplitude which allows you to set command reference value (speed or current waveform amplitude).

***Waveform Generator Enable*** Parameter Waveform Generator Enable (start/stop). The drive is disabled with the *Stop* command for safety reasons.

## Parameters

In the following the PI controller parameters and protection function parameters are explained. Any numeric parameter is expressed into its units.

Any time the user selects the servomotor to be coupled with DGV, the ABB AC Brushless Servodrives Browser internally calculates all the parameter settings and sets the drive ready for operation. This automatic computation procedure uses the motor and converter technical data. However, in order to optimize the parameter settings and avoid mechanical vibrations, qualified personnel can tune the parameter values when customization is necessary or unconventional loads are used.

### Programmable Protection Functions

This concerns the parameters that affect the protection functions, i.e. under voltage and over voltage conditions, thermal protections, faults and error messages.

*Bus Overvoltage Level* — Over voltage protection on the converter DC intermediate circuit. The voltage on the DC link is $U_{dc}$ equivalent to 1.41 * Vac, where Vac is the converter supply rated voltage. When the DC voltage exceeds the trip limit during drive operation, the over voltage protection function occurs and the power stage is disabled.

*Bus Undervoltage Level* — Under voltage protection on the DC intermediate circuit. Should the DC voltage decrease below the trip limit during drive operation, the under voltage protection function occurs. When the voltage drop does not persist, the dynamic braking is activated.

*Brake Current* — Parameter for setting the braking current. The dynamic braking function allows you to keep on braking the motor after a stopping procedure. This function is quite useful in case of applications with elastic loads, or vertical axes anyway provided with the motor mechanical brake.

*Clamp Resistor Value* — The DGV Converters embody an electric braking circuit. It is possible to use an internal or external resistor (clamp) for power dissipation. This parameter displays the resistor value.

*Clamp Power Threshold* — This parameter displays the threshold for power dissipation on the internal/external braking resistor.

*Clamp Thermal Time Constant* — Thermal time constant of the braking resistor.

*AC Mains Voltage* — The supply voltage Vac minimum level allowed is equal to the minimum voltage that guaranties drive operation. When the auxiliary supply is connected, the fault code is displayed.

| | |
|---|---|
| *Overspeed Threshold Level* | If the servomotor speed or the speed command exceeds the overspeed limit, a fault occurs. This protection may occur even by using the waveform generator speed command. |
| *Ixt Threshold Level* | Protection function activated by the converter thermal model algorithm. The trip limit is calculated according to the converter continuous current. If this alarm occurs, the current is internally limited to the rated value and the drive continues operation. |
| *I2t Threshold Level* | Protection function activated by the motor thermal model algorithm. This level is calculated according to the motor ratings. If this alarm occurs, the motor current is internally limited to the rated current and the drive continues operation. |
| *Following Error* | DGV detects the following error. The following error occurs when the motor position runs out of range while performing positioning control. This is generally due to inappropriate parameter settings. |
| ***Digital Control Parameters*** | The following are the parameters of the drive internal control loop. |
| *Position Proportional Gain* | Position proportional gain of the position control loop. |
| *Position Feedforward Gain* | Feedforward gain of the position control loop. |
| *Kp Speed Gain Level* | Proportional gain of the drive speed control loop. |
| *Tn Speed* | Integrative time constant of the speed control loop. |
| *Kp Current Gain Level* | Proportional gain of the drive current control loop. |
| *Tn Current* | Integrative time constant of the current control loop. |
| *Continuous Current* | Servomotor continuous current during normal operation. This parameter is used for the internal computation of the motor rated torque. |
| *Peak Current* | Servomotor peak current. This parameter is used for the internal computation of the motor peak torque. |
| *Current Filters* | Three current filters are available to be put in series. They can be configured as low pass filter or band rejection filter. They are set Off by default. |

## Preprogrammed Functions

The DGV pre-programmed functions are protection functions or general features set by the manufacturer and not alterable by the user.

### Protection Functions

Protection functions are featured with error messages and fault codes displayed on the front panel.

*Overcurrent* Overcurrent hardware protection of the IGBT module.

*Drive Overtemperature* DGV supervises the inverter temperature by a thermistor element placed close to the IGBT module. The protection function stops drive operation if the inverter temperature exceeds 80°C.

*Motor Overtemperature* It is possible to detect the motor overtemperature by connecting the motor thermistor (PTC) to the converter signal terminal. ABB SERIES 8C Servomotors embody PTC Thermik SNM. During normal operating conditions, the thermistor resistance should be less than $\leq$ 1,5 K$\Omega$. the fault protection occurs when the thermistor resistance exceeds 4 K$\Omega$.

*Transducer Fault* It occurs when the position sensor signal feedback is missing.

*Internal Error* This is a hardware internal error due to communication fault between hardware boards.

### Additional Features

Additional features are available from the menus of the ABB AC Brushless Servodrives Browser.

*Freeze Configuration* This command stores the application configuration settings into the drive non-volatile memory.

*Reset Parameters* This command allows you to cancel all parameters alteration and reset parameters to factory defaults.

*Save Motor Data* Through this feature it is possible to extend the database of motor models with new customized models.

*Autophase* Autophasing procedure. This procedure is not necessary with ABB standard servomotors of the 8C SERIES, which embody resolver transducers with a 90° phase offset. *Autophase* procedure is mandatory if DGV is coupled with brushless servomotors of other manufacturers.

*Change Password* Once the commissioning finishes, the user can change the Browser password by this command.

*Change COM Port* Command for selecting the COM port of your PC.

## Field Bus Remote Control

For the PROFIBUS-DP/CANOpen parameter settings, configuration and communication guidelines please refer to the *PROFIBUS Guide* or the *CANOpen Guide*.

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# Chapter 6 - Installation Guidelines

## Introduction

This Chapter recalls the main reference documents for:

- Installing DGV Converters in accordance with the European Directives EEC 89/336 and EEC 72/23
- Emergency stop functions and personnel safety
- Directives concerning installation procedures

## General

DGV must be installed in an electrical control cabinet, as integrative devices of an operating machine. Therefore the compliance of the device with the EEC Directive 89/336 for EMC compatibility, as well as the compliance with the Low Voltage directive EEC 72/23 and/or local legislation, must be done by the machine manufacturer.

In addition, the machine manufacturer must install:

- The manual control power supply disconnecting device required by EN 60204-2 § 5.3.1, which can be shared by all the electrical control cabinet.
- According to EN 60204-1 § 9.2.2, the machine manufacturer must prepare the stop functions, in particular the 0 category stop, because they are inherent to the machine logic.
- According to EN 60204-1 § 9.2.5.4, the emergency stop must be a function of the specific characteristics of the operated machine and therefore it must always be made by the machine manufacturer.

More information on the purpose are given in the following *Standards*, and *Compliance with the EEC Directives and CE Marking* and *Warning and Safety Instructions* of this Chapter. Should you have any question or need further support, please contact our Customer Service.

## CE Marking

The CE mark on the converter label certifies only the compliance of the device with the directives recalled in *Low Voltage Directive*. The compliance of the machine, which integrate DGVs, with the EEC 89/336 is under the responsibility of the manufacturer.

***EMC*** EMC stands for per **E**lectro**M**agnetic **C**ompatibility. It is the ability of the electrical/electronics equipment to operate without problems within an electromagnetic environment. Likewise, the equipment must not disturb or interfere with any other product or system within its locality.

The EMC Directive defines the requirements for immunity and emissions of electrical equipment used in European Union.

The terminology related to all the subjects concerning the electromagnetic compatibility (EMC) discussed in this Manual is derived from the normative document recalled in [8] of paragraph *Normative Documents* of this Chapter.

## Standards

The main normative documents to which the text of this Manual refers are indicated below. The references in the text are reported between brackets.

### Electromagnetic Compatibility (EMC) Directive

[1] Directive 89/336/EEC, “On the approximation of the laws of the Member States relating to electromagnetic compatibility” and the subsequent amendments 92/31/EEC and 93/68/EEC.

[2] Italian Legislative Decree, 4 December 1992, No. 476 “Attuazione della direttiva 89/336/CEE del Consiglio del 3 maggio 1989, in materia di ravvicinamento delle legislazioni degli Stati membri relative alla compatibilità elettromagnetica, modificata dalla direttiva 92/31/CEE del Consiglio del 28 aprile 1992” (Directive 89/336/EEC, “On the approximation of the laws of the Member States relating to electromagnetic compatibility” and the subsequent amendments 92/31/EEC and 93/68/EEC).

[3] Italian Legislative Decree, 12 November 1996, No. 615 “ Attuazione della direttiva 89/336/CEE del Consiglio del 3 maggio 1989, in materia di ravvicinamento delle legislazioni degli Stati membri relative alla compatibilità elettromagnetica, modificata ed integrata dalla direttiva 92/31/CEE del Consiglio del 22 luglio 1993 e dalla direttiva 93/97/CEE del Consiglio del 29 ottobre 1993” (Implementation of the directive 89/336/EEC, 3 May 1989, “On the approximation of the laws of the Member States relating to electromagnetic compatibility” changed and integrated by the Directive of the Council 92/31/EEC, 22 July 1993 and by the Directive of the Council 93/97/EEC, 29 October 1993).

*IMPORTANT NOTE: This Legislative Decree repeals the Legislative Decree [2], excepting article 14, sub-section 2.*

### Low Voltage Directive

[4] Directive 73/23/EEC, 19 February 1973, “Harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits”, integrated by the Directive 93/68/EEC, 29 June 1993.

[5] Italian Law 18 October 1977, No. 791 “Attuazione della direttiva del Consiglio delle Comunità europee (n. 73/23/CEE) relativa alle garanzie di sicurezza che deve possedere il materiale elettrico destinato ad essere utilizzato entro taluni limiti di tensione” (Directive 73/23/EEC, 19 February 1973, “Harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits”, integrated by the Directive 93/68/EEC, 29 June 1993).

[6] Italian Legislative Decree, 25 November 1996, No. 626 “Attuazione della direttiva 93/68/CEE in materia di marcatura CE del materiale elettrico destinato ad essere utilizzato entro taluni limiti di tensione” (Implementation of the Directive 93/68/EEC concerning the CE marking of electric material designed for use within certain voltage limits).

### *Normative Documents*

[7] CEI EN 60204-1, issue 98/04, Fascicolo 4445 “Sicurezza del macchinario. Equipaggiamento elettrico delle macchine. Parte 1: Regole generali”. (Safety of machinery - Electrical equipment of machines - Part 1: General requirements.).

[7 bis] IEC 61800-2, First edition 1998-03, "Adjustable speed electrical power drive systems - Part 2: General Requirements - Rating Specifications for low voltage adjustable frequency a.c. power drive systems".

[8] CENELEC EN 61800-3, Adjustable speed electrical power drive systems - Part 3: EMC product standard including specific test methods.

*Documents [7], [7bis] and [8] include very detailed lists concerning the regulatory references.*

[9] CENELEC EN 60034-1, Rotating electrical machines - Part 1: Rating and performance.

[10] CENELEC EN 60034-5, Rotating electrical machines - Part 5: Classification of degrees of protection provided by enclosures of rotating electrical machines (IP code).

[11] CENELEC EN 60034-7, Rotating electrical machines - Part 7: Classification of types of constructions and mounting arrangements (IM code).

[12] CENELEC EN 60034-9, Rotating electrical machines – Part 9: Noise limits.

[13] CENELEC EN 60034-18, Rotating electrical machines - Part 18: Functional evaluation of insulation systems - Section 1: General guidelines.

### *Compliance with EEC Directives and CE Marking*

Conditions for compliance with EMC Directives of the ABB drive systems composed by **DGV Converters** and **8C SERIES Servomotors**.

The compliance of the drive systems, defined in the title of this section, with the directives and/or legislative provisions [1], [2] and [3], related to the Electromagnetic Compatibility, are only valid under the following conditions.

#### *Restricted Distribution*

The drive systems composed by DGV Converters are only delivered as PDS (Complex component), **“Restricted distribution”** Class, and only sold to professional assemblers to be included as part of a system or of an installation. The actual EMC behavior is under the responsibility of the equipment manufacturer of the system or of the installation, to which the specific standards apply.

Therefore the CE marking, placed on the converter and the 8C SERIES servomotor, only certifies the compliance of the said components with the directives and the laws specified in section *Low Voltage Directive*.

#### *Mounting and Installing Instructions*

The drive systems composed by DGV Converters presented in this Manual must be **installed according to the instructions prescribed in this Manual**; provisions indicated in this Chapter at section *Application Guide to Electromagnetic Compatibility* must also be strictly followed.

***Second Environment***

The drives defined in the title of this section are primarily intended for use in the **"Second Environment";** the professional assembler must follow the precautions described in section *EMC Filters* of Chapter 7, 8 e 9. in particular, he must install the recommended filters, suitably rated, on the power supply line.

***Compliance of the Drive Systems with the Directives***

Declaration of Conformity

ABB Sace declares that, under the conditions specified in this document, in particular in section *Compliance with EEC Directives and CE Marking*, the drive systems composed of the **DGV Converters** and **SERIES 8C Servomotors** comply with EMC European Directives [1], including the most recent changes, with the related endorsement Italian legislation [2] and [3], and with the Low Voltage European Directives [4], [5] and [6]; the applicable regulatory references are indicated in section Normative Documents.

***Note for the Application of Other EEC Directives***

Since drive systems are complex electrical components, they are not subject to other EEC directives, apart from those specified in section *Standards*. As far as the **89/392 EEC Machine Directive and subsequent changes 91/368/EEC, 93/44 EEC, 93/68 EEC, Italian legislation for implementation of the Presidential Decree No. 459, 24 July 1996**, the Certificate of Incorporation (also known as "Manufacturer's declaration") is sometimes required.

Certificate of Incorporation

ABB Sace, according to what required in the Machine Directive (MD) 89/392 EEC and subsequent changes, declares that the drive systems, composed of the **DGV Converters** and **SERIES 8C Servomotors**, must be installed in accordance with our installation instructions and must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the Machinery Directive.

## Warning and Safety Instructions

### Meaning of the Symbols

**WARNING! Dangerous Voltage**

**WARNING! General Warning**

### Installation Operation

This Manual is intended for qualified personnel who have a relevant experience with installation, troubleshooting and maintenance of drive systems.

**WARNING! Only properly qualified personnel who are familiar with operation on converters are allowed to perform the commissioning and operation activities on the drive.**

**WARNING! The cabinet, the power supply and the auxiliary supply must be disconnected during mechanical and electrical installation of the drive systems.**

For no reason should an unskilled operator work on the terminal block of the converter or open the servomotor terminal box.

### Residual Voltage

**WARNING!** The DGV Converters contains high capacity capacitors which, for functional reasons, can not always be discharged in less than 5 minutes following a power outage.

**WARNING! For no reason should any person access the internal part of the converter or the terminals of the servomotor, before at least five minutes from the power outage.**

**Potentially lethal voltages are present on a DC intermediate circuit and on the associated circuits!**

According to EN 60204-1 § 6.2.4, an appropriate warning placed in a visible place warns of this danger.

**WARNING!** Potentially lethal voltages may be present at the drive terminals or inside it for at least five minutes after main supply is switched off.

***Dangerous Temperature***

**WARNING!** While operating, the converter could reach absolute temperature up to 80 °C (when ambient temperature is 40 °C), therefore involving **burning danger**.

***Power Supply Disconnecting Device***

**WARNING!** Since the converter must be integrated in an electrical control cabinet, which may contain other equipment, the **manual control power supply disconnecting device**, required by EN 60204-2 § 5.3.1, can be shared by all the electrical control cabinet and must be, in any case, installed **by the machine manufacturer.**

***Stop Function***

WARNING! According to EN 60204-1 § 9.2.2, the **stop functions**, in particular **the 0 category stop, must be prepared by the machine manufacturer**, following the instructions contained in this manual, because they are inherent to the machine logic, which is obviously different according to the drive machine type.

***Emergency Stop***

WARNING! According to EN 60204-1 § 9.2.5.4, even the **emergency stop** must be a function of the specific characteristics of the operated machine and therefore it **must always be made by the machine manufacturer.**

***Protection Degree***

DGV Converters have an **IP20 protection degree**; to comply with section §4.4.6 “Contaminates” of the EN 60204-1 standard, the machine manufacturer must install the converters in an appropriate housing (electrical control cabinet), according to the protection degree required.

## *Application Guidelines for Electromagnetic Compatibility*

This section applies to prescriptions specified in *Note for the Application of Other EEC Directives* concerning the standard about electromagnetic compatibility for drive systems [8].

The need to follow precise rules as far as EMC is concerned, is due to the increasing use of electronic power units, which, for the used techniques, represent a noise source in a wide frequency range (**emission**). These devices are at the same time sensitive to noise produced by other devices; for this reason they must be provided with an adequate **immunity** level.

Noise is conventionally classified as **low frequency** (0 = < f < 9 kHz) and **high frequency** (f > 9 kHz) noise.

In the range of the low frequency noise, the **harmonic frequency** phenomena of the power supply line frequency are particularly important.

There are also **large spectrum** events, such as electrostatic discharges in the air or by contact.

Noise can be transmitted both through conductors (**<conducted noise>**; conducted emission: 0,15 MHz ÷ 30 MHz) and through irradiation (**<irradiated noise>**; irradiated emission: 30 MHz ÷ 1000 MHz). **Industrial experience showed that the main causes of compatibility lack are caused by conducted noise.**

The drive system installation must be carried out by closely following the instructions in this Manual and, in particular, in *Chapter 7 - Electrical Installation of DGV700* and *Chapter 8 - Electrical Installation of DGV300*.

For electromagnetic compatibility, the installation must be carried out following some appropriate instructions; the most important follows:

1) Apart from some very specific cases, the **DGV Converter** is enclosed into a metal cabinet (the so-called electrical control cabinet), also containing different kinds of electrical equipment (other power electronic converters, contactors, transformers, chokes, etc.).
2) **The motor assembly**, including the **8C SERIES** servomotor and the angle position transducer, as well as the motor thermal switch and - where necessary - the brake, is usually mounted on the machine at a certain distance from the electrical control cabinet.

There are actually two different types of installations: the one referring to the electrical control cabinet manufacture and the actual on-site installation, which is carried out by the installer at the premises of the final user.

### *Electrical Control Cabinet*

According to the EMC, it is important to keep in mind some important prescriptions for the electrical control cabinet, which are listed in the following.

- **The arrangement of the components within the electrical control cabinet, both in terms of positioning and distances, must be carried out to minimize the mutual influences of the equipment mounted for the electromagnetic noises.**

  As an example, note that some types of transformers, power chokes or also contactor coils can generate rather strong fields at short distance.

  The power circuit wirings must be physically separated from the driving and control circuit wirings (signal circuits); the power circuits must be carefully shielded against signal circuits; this can be achieved by using metal wire channels and metal sheaths or shielded cables, even power cables, arranged within plastic channels.

  As an example, the power circuit wirings of terminal X1 (see *Power Connections* of Chapter 7 and 8) must be physically separated, in the above mentioned way, from the cables provided with end terminals or connectors with signal cables.

- **All the equipment, for which supplementary units are prescribed in order to comply with EMC standards, must be provided with these units, mounted according to the manufacturers prescriptions.**

  Example: anti-noise units to be mounted in line with AC contactor coils, diodes to be installed in parallel with relays or DC coil contactors, filters against high frequency conducted noise to be mounted at the line input of some converters.

- **Cable shields must end as close as possible to the terminal block; if the shield has to be connected to ground or sometimes to earth, the connections must be as short as possible and the conductors must have an adequate section.**

- **Within the electrical control cabinet, it is important that all the panels are connected one to the other with mechanical connections and that they have low electrical impedance at high frequencies.**

  As an example, to achieve this connection, it could be necessary to add locking screws, remove the paint in the interconnecting points and use special EMC metal gaskets.

***Electrical Equipment***

As stated above, we refer to the on-site installation, in the final installation of the machine. For some types of machines (such as small machine tools), the electrical control cabinet is physically connected to the machine and therefore the on-site electrical equipment is reduced to the connection of the machine to the power mains. Nevertheless, the electrical control cabinet is usually placed at a certain distance from the machine, on which the motor assembly is mounted; sometimes there is also a remote control desk, to which conductors could be connected.

In this case, since the emission problem is strictly linked to installation factors, the following recommendations come from good technique standards and from experience in field and must be basically considered as guidelines and not as sure solutions.

- **For the use foreseen in a "Second Environment", i.e. industrial environments where the low voltage network does not feed residential buildings, it is necessary to follow the instructions prescribed in this Manual. It is mandatory that additional filters are adopted.** See section *EMC Filters* of Chapter 7 and 8.
- **The connections in the electrical control cabinet from the MAINS (R,S,T) terminal block of the DGV and the mains circuit breaker** (see *Power Supply Disconnecting Device*), **as well as the connection lines from this device and the secondary of the medium voltage transformer of the plant must avoid voltage drops which can get the power supply voltage values at converter terminals out of contractual tolerance.**
- **Sometimes, the low tension power factor compensation systems of the power supply line can cause problems, with possible resonances.**
- **Carefully study the installation cable routes, minimizing their length.**
- **All the metal channels and sheaths and, in general, all the shields, if not otherwise specified, must be earthed both on the electrical control cabinet side and on the motor side; the earthing connections must have a largely dimensioned section and their route must be as short as possible.**

  This is an EMC specific need, which can seem in contrast with what is often prescribed, that is to say the need to earth shields at only one side; this prescription requires very efficient earths.

***First Environment***

The use of the DGV Converters is not foreseen in “First Environment”, i.e. where the low voltage network feeds residential buildings.

If the drive system has to be used in “First Environment”, the professional installer must provide to their proper shielding.

***Second Environment***

DGV Converters are intended for use primarily in “Second Environment” only, i.e. industrial environments where the low voltage network does not feed residential buildings.

To comply with the existing normative references on Second Environment, the professional installer must install the recommended filters, suitably rated, on the power supply line, and, in any case, autonomously provide for the certification of the whole equipment according to the norms.

See the EMC prescriptions of this Chapter and the following paragraph *Power Connections*, together with the ordering codes of the line filters recommended by ABB Sace in Chapter 9, *EMC filters*.

## *Additional Equipment*

The system or the installation are provided, or may be provided, with the following additional components:

- Line automatic circuit breaker or breaker plus line fuse;
- Line filters (ABB Sace recommends to use only the approved filters listed in Chapter 9).
- Power and signal connecting cables (ABB Sace recommends to use only approved cables listed in Chapter 9).
- External braking resistor.
- Line transformer.
- External controller, generally a PLC.
- PC to be used for start-up and commissioning, or diagnostics and troubleshooting.

These components are not part of the converter scope of supply. ABB Sace may supply these components on request, except for the last two components, which remain at user’s choice.

See *Chapter 9 - Technical Data* for the ordering codes.

For choosing the servomotor, the user should refer to *Chapter 10 - Selecting the Motor* and to the ABB 8C SERIES Servomotors Manual, or contact the Customer Service for further information.

# Chapter 7 - Electrical Installation of DGV700

***Introduction***

This Chapter describes how to perform the correct installation of DGV700 Converters, specially:

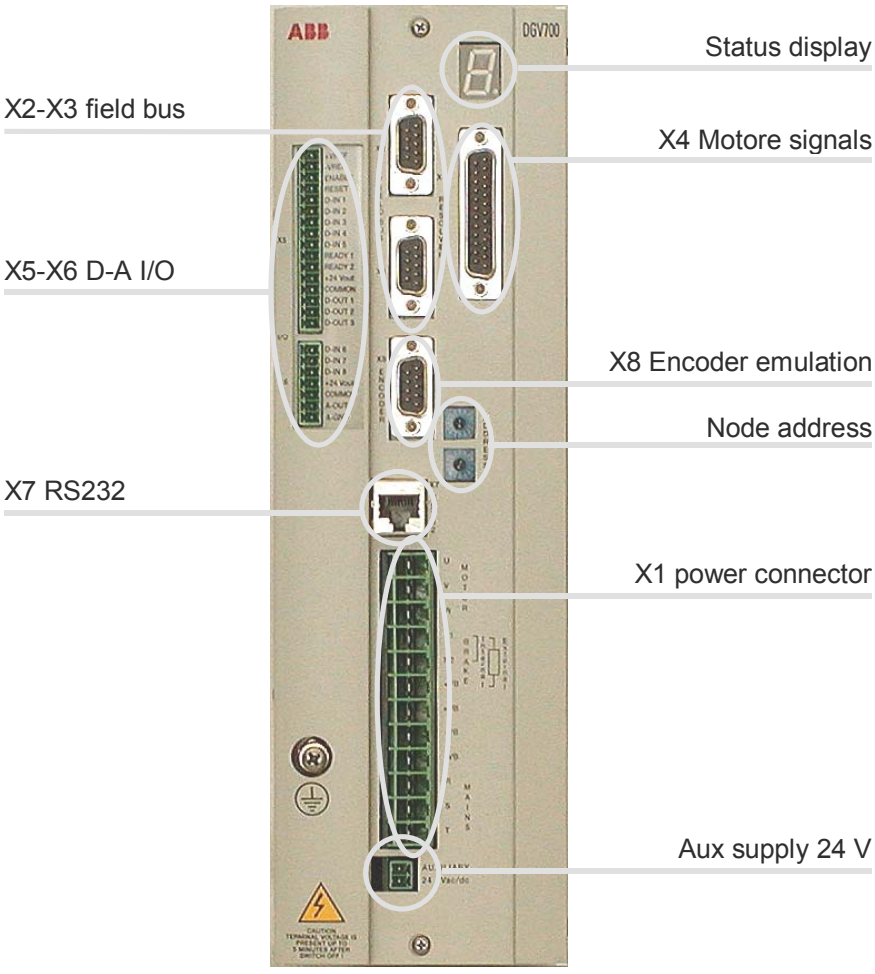
- Cabling instructions for power and signal connection
- Braking resistor plug in
- EMC filtering instructions
- Switches, fuses and optional equipment

## *Description of the available connectors*

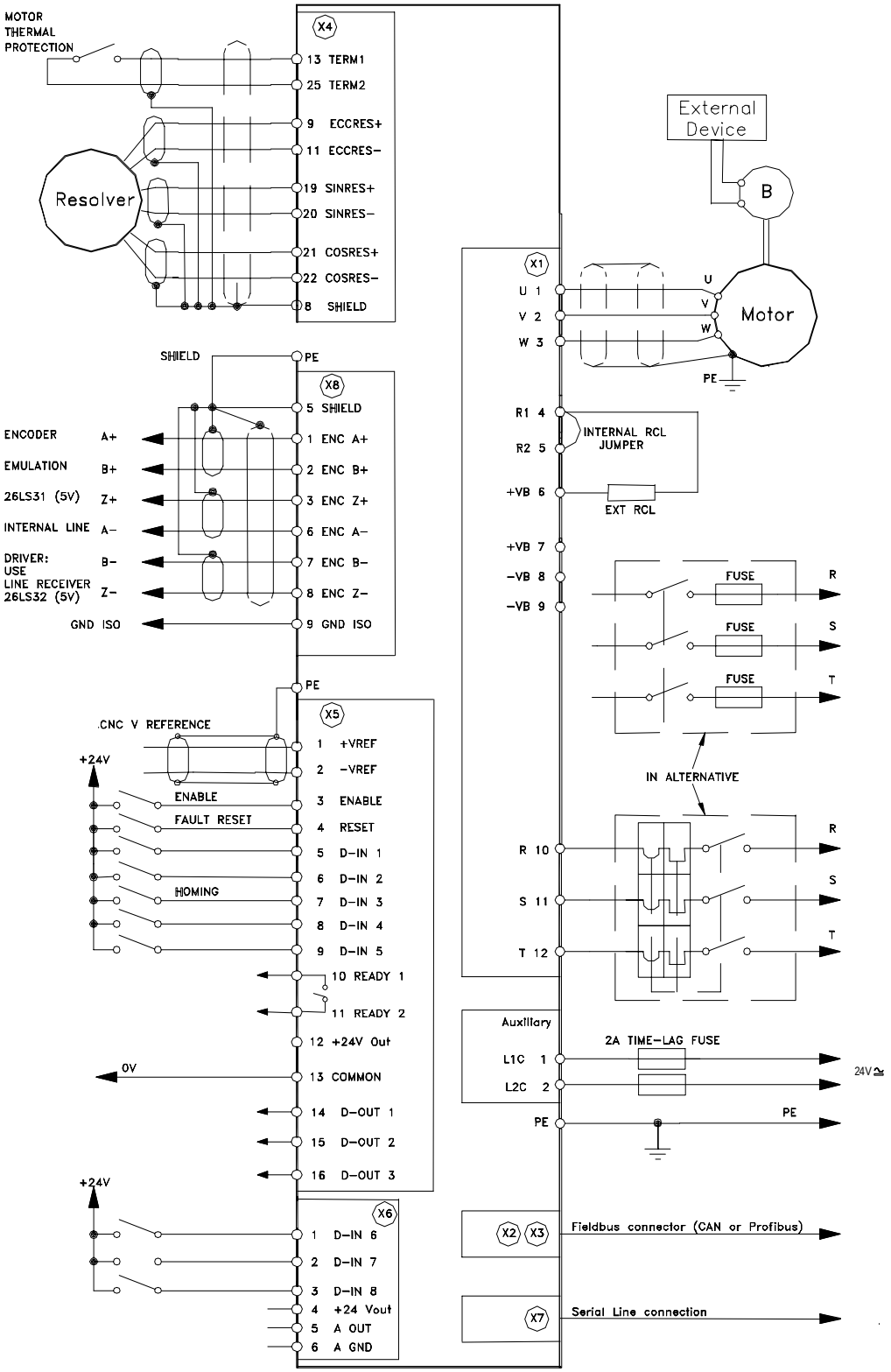
Terminals are located on the front panel of DGV700 Converters are

- X1 power connections
- X2-X3 field bus connections
- X4 motor signals connections
- X5-X6 digital-analog I/O connections
- X7 RS232 serial connections
- X8 encoder emulation connections

Moreover two “dip-switches” are available for setting node address and connecting to field bus.



## *Wiring Scheme*



## *Power Connections*

In the following the DGV700 power terminal connections are described.

DGV700 is to be supplied by a direct three-phase multi voltage ac power system. The DGV700 power stage can be operated at any voltage supply levels between:

- min rated Vac = 110 Vac
- max rated Vac = 400 Vac

Optionally DGV700 converters can be provided by ABB Sace in a configuration capable to be supplied from 400 Vac up to 480 Vac. For this option please contact the Customer Service.

The operating frequency of the ac power supply system has to be 50-60 Hz.

**WARNING! Standard converters must not be used at voltages higher than 400 Vac** otherwise the DC link capacitors are at serious risk of voltage breakdown. In this cases it is mandatory to use the special version of the converter.

Moreover, an auxiliary power supply at 24Vac/Vdc is required.

This auxiliary supply feeds the control board and the front panel interface board. The front panel interface board contains (among the others connectors) the field bus connectors and the display. This helps to maintain the configuration data and fault tracing even after accidental voltage drops, breakdowns, etc.

24Vac/Vdc auxiliary supply is mandatory.

The power terminal block X1 on the converter front panel allows to connect:

- the main power supply,
- the auxiliary supply,
- the servomotor power connections,
- the internal or external braking resistor,
- the DC link voltage.

**WARNING! Dangerous Voltage:** On the DC link terminal blocks the whole DC link (up to 800Vdc) is present. This voltage can be very dangerous, carefully avoid any accidental contact.


| Pin | Description |
|---|---|
| U | Motor Phase U |
| V | Motor Phase V |
| W | Motor Phase W |
| R1 | Braking resistor internal/external terminal |
| R2 | Braking resistor internal terminal |
| +VB | DC bus positive terminal / Connection of external braking resistor |
| +VB | DC bus positive terminal / Connection of external braking resistor |
| -VB | DC bus negative terminal |
| -VB | DC bus negative terminal |
| R | Three-phase ac power supply |
| S | Three-phase ac power supply |
| T | Three-phase ac power supply |
| V24 | Single-phase auxiliary supply (24 V ac or dc) |
| V24 | Single-phase auxiliary supply (24 V ac or dc) |

***Main Power Supply***

Connect R, S, T terminals to the main three-phase power supply and the ground cable to the screwed PE placed on the front panel.

The power supply three-phase line has to be protected by an automatic circuit breaker or, alternatively, by a disconnecting switch plus three fuses.

In case of systems with power components, e.g. lines and circuit breakers, common to more drive systems, it is necessary to size them in relation to the installed apparent power rating (kVA), and to the minimum overload voltage, considering the following factors:

- rated and peak power required by each drive system,
- simultaneous operation function,
- duty cycle of each drive system.

For the power ratings of DGV700, consult paragraph *Technical Specs* of *Chapter 9 - Technical Data*.

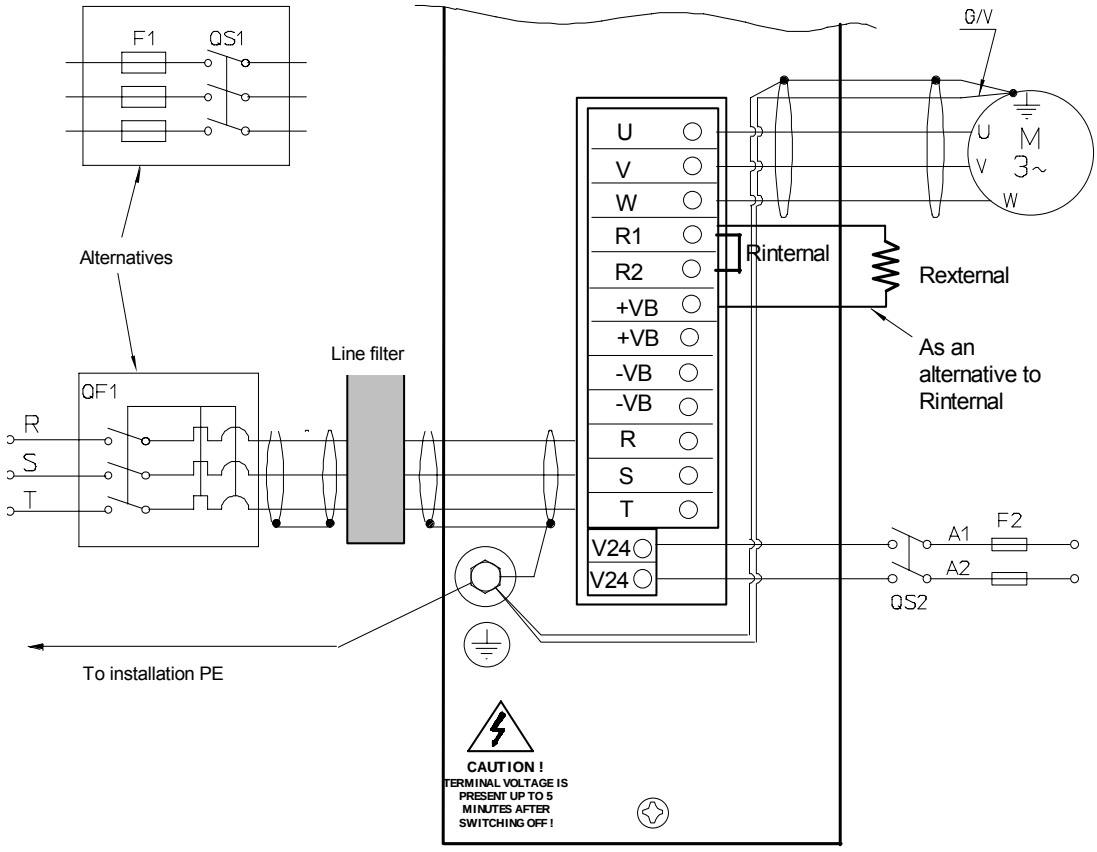
For the correct connection of the filter see next paragraph.

**Note.** Concerning the power circuit breaker, ABB recommend the use of a selective switch not-sensitive to pulse currents and suitable for setting the operating threshold of both current and delay time; in certain circumstances, indeed, the power circuit breaker might break off during converter switch-on or -off, due to the use of line filters, or due to the converter itself, or due to a not-instantaneous breaking of the three-phase ac system (which may depend on the grounding of the installation).

The possibility of setting both the delay operating time and the operating threshold allow to adapt the operation of the circuit breaker, in order to avoid interruption under such circumstances, while preserving the safety conditions of the installation.

*Typical connection scheme*

This figure shows a typical connection scheme. Other schemes are possible and valid, therefore see next paragraphs for examples.




***Auxiliary Supply***

Connect the two terminal marked with V24 to the secondary of a single phase transformer, 24Vac ± 15%, 50/60 Hz, rated 40 VA..

Alternatively a 24Vdc ± 15%, 40 VA, ripple free (according to EN 60204.1 par 6.4.1) can be used.

The single-phase auxiliary supply line must be protected by an automatic switch or by two fuses. A disconnecting switch may be useful as well. These devices must be rated based on the TC transformer power.

When more than one drive is connected on the same secondary of such transformer, this must be suitably rated according to the overall power of all the drives connected to it. The load factor to be considered in this case is 1, i.e. every converter, independently on its operating condition always requires the rated current.

***EMC Filters*** The mains must be provided with an appropriate EMC filter, to be chosen among those listed in Chapter 9.

If several DGV700s are to be installed, it is possible to use one filter only (dedicated) for more than one converter; therefore the filter input must be connected to three-phase power line and all the converters must be connected in parallel to the filter output.

*Filter Size* In case of more parallel connection of several converters to a single EMC filter, it is necessary to choose the filter taking into account the rated and peak apparent power of all the connected drives, the simultaneous operating factor and the duty cycle of each converter.

*Filter installation* **The filter must be connected as close as possible to the converters**. The connections between the R, S, T terminals of the drives and the L1', L2', L3' terminals on the "LOAD" side of the filter are as short as possible. It is good practice to connect the supply cables coming from the various converters directly on the filter's terminals; a backup terminal can be used provided that the connections between filter and the terminal mentioned above are the shortest possible and that cables section is adequate.

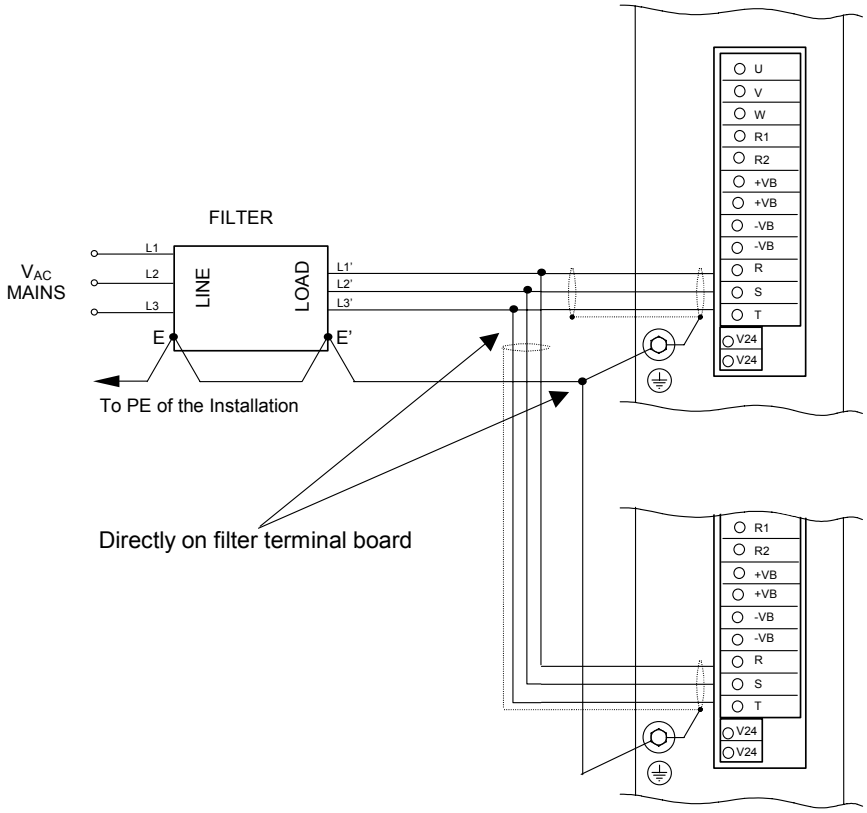
The shields of the power cables connecting converter and filter should be connected at the converter side.

However, in some cases it is more convenient, to eliminate disturbances on the converter, to connect the shields at the filter side.

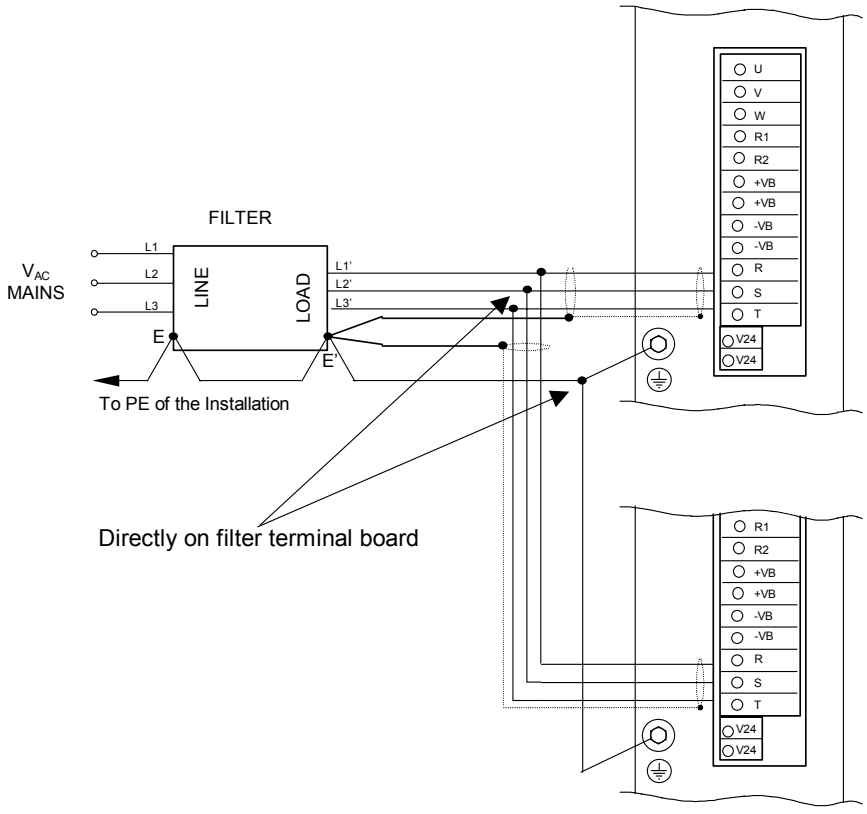
The connection of the shields must be therefore adapted to the different environments and applications.

The following figures show two possible and valid connection schemes for the shields.

*Filter connection (solution 1)*




*Filter connection (solution 2)*



*Earthing*

**The good connection between converter grounds E, filter ground E' and the PE of the installation is very important**. The connection of these grounds must be done as shown in figure, with a cable having a cross section not smaller than the phase cables section and with the shortest possible path.

***Braking Resistor Connections***

DGV700 is provided with the so called electric braking function, i.e the motor decelerating power can be dissipated on a suitable power resistor.

According to the required braking power capability the braking resistor can be mounted internally (on the sizes 3, 5, 9, 13 and 18) or, alternatively, externally.

On the 25 A size the resistor is always mounted externally.

The use of the external resistor is mandatory for very heavy duty cycles and in any case when the power to be dissipated on the resistor exceeds the rated power of the internal resistor.

- In case of an internal resistor, connect terminal R1 to terminal R2; do not connect VB+.
- In case of an external resistor, connect the external resistor between terminal R1 to terminal VB+; do not connect R2.

**WARNING! Dangerous Voltage:** Between the braking resistor terminals and with respect to ground there are dangerous DC electric voltages (up to 800 V), carefully avoid any accidental contact.

When the braking resistor is external, it must be mounted in an electrical control cabinet, provided with adequate measures to ensure insulation and cooling.

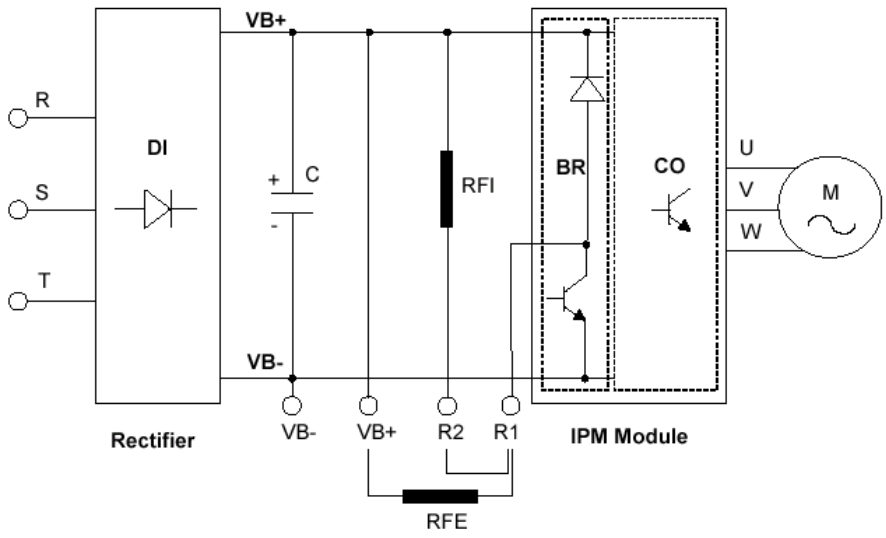
DGV700 is fully protected against any short circuit between the terminals R1, R2 and VB.

On the contrary a short-circuit between VB+ and the earth may seriously damage the converter. Therefore it is necessary to adopt proper precautions on the electric installation to avoid damages.

For the connection between the converter and the resistor, use cables with section at least equal to the section of power supply cables; the cables must be twisted and as short as possible; **the maximum length must be 2 m.** The lay-out of these cables must avoid any interaction with other signal or power cables.

Resistors compliant with standards can be purchased from ABB Sace. For technical specs, ratings and main characteristics of the internal and external braking resistor see the features provided in *Chapter 9 - Technical Data*.

*Power Stage Basic Diagram*




*Calculation of the braking resistor*

Using either the internal resistor or the external resistor depend on the drive duty cycle. The braking resistors have the following electrical specifications:

(1) Resistance R;

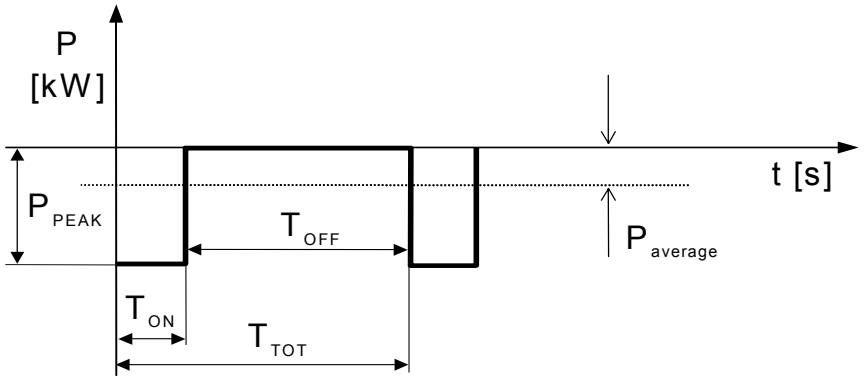
(2) $P_{CONT}$ , Continuous Power;

(3) $P_{PEAK}$ , Peak Power;

(4) $T_{ON}$ , maximum duration of the peak power;

(5) $T_{OFF}$ , minimum off time between two brakings at the peak power.

In the following example, the braking cycle reproduces the working limit conditions of a braking resistor. The braking power is negative, because the motor acts as generator in this case:




$T_{TOT}$ = cycle length

$T_{ON}$ = braking period

$T_{OFF}$ = period when no braking is allowed

$P_{PEAK}$ = actual braking power

$P_{average}$ = average breaking power

For correct use of the braking circuit:

1) the braking power should never exceed the peak power $P_{PEAK}$ typical of the braking resistor employed. See table *Braking Resistors* in Chapter 7.
2) $T_{ON}$ and $T_{OFF}$ are the safety durations for preserving the resistor, and they are valid for braking at the peak power; lower braking power allow longer braking duration.
3) The average power $P_{average}$ dissipated on the braking resistor through more complex cycles is calculated considering each braking power and related duration, divided by the overall cycle duration time $t_{TOT}$, i.e.:

$$P_{average} = \frac{(P_{PEAK} \cdot t_{ON})_1 + (P_{PEAK} \cdot t_{ON})_2 + (P_{PEAK} \cdot t_{ON})_3 + \cdots}{t_{TOT}}$$

**these average power value should never exceed the continuous power $P_{CONT}$ typical of the braking resistor.**

Should you need to use the external resistor and/or apply special working cycles, it is necessary to contact the Customer Service.

We also advice to contact this service when special cycles or loads are foreseen.

**CAUTION!**

The internal braking resistor can assume only one predefined value for each converter size.

ABB Sace has optimized this value for the 400 Vac voltage supply.

If the converter has to be used at voltages below 400 Vac the braking power may be not enough, and therefore the converter can enter in an overvoltage alarm status.

It is highly recommended to make an accurate calculation of the necessary braking power and to compare it with the allowable braking power of the resistor at the given voltage..

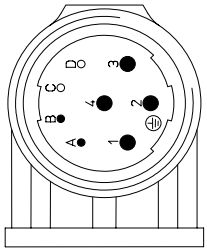
If the resistance value was not adequate, it is always possible to use an external resistor.

***Motor Power Connections***

ABB 8C SERIES Servomotors are provided with an 8 pin power terminal fixed on the motor frame, or in alternative with a terminal box available for 8C4 and 8C5 sizes only.

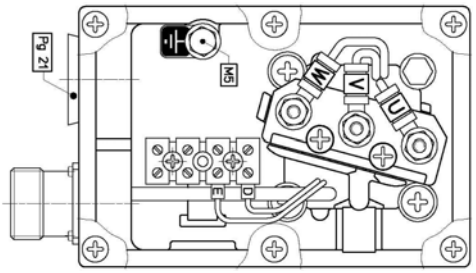
Connect the motor power terminals to the U, V, W terminals on the converter front panel following the polarity prescriptions. Connect the ground cable to the screwed PE placed on the front panel.

Power terminal
8C and 8N SERIES




| Pin | Description |
|---|---|
| 1 | MOTOR PHASE V |
| 2 | Ground PE Terminal |
| 3 | MOTOR PHASE U |
| 4 | MOTOR PHASE W |
| A | Mechanical brake + 24 V |
| B | Mechanical brake 0 V |
| C | - |
| D | - |

Terminal box
Sizes 8C4 / 8C5




| Pin | Description |
|---|---|
| U | MOTOR PHASE U |
| V | MOTOR PHASE V |
| W | MOTOR PHASE W |
| Screw M5 | Ground PE Terminal |
| D | Mechanical brake + 24 V |
| E | Mechanical brake 0 V |

## *Field Bus Connections*

DGV700 front panel provides two terminals (x2 and X3) for field bus connections. Terminals are Sub-D 9-pin:

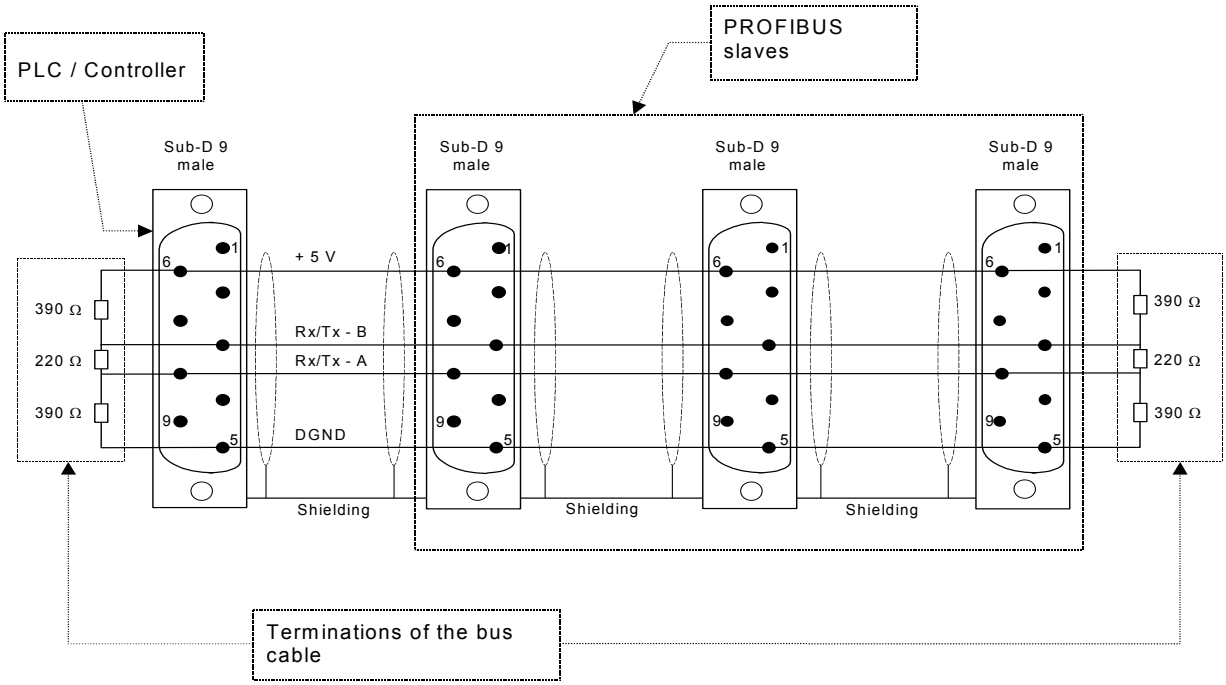
- **female** for PROFIBUS-DP version
- **male** for CANOpen version.

These two terminals are internally connected in parallel. The installer can use either terminals (one as input and one as output), or just one terminal preparing an input/output cable.

### *Diagram of the PROFIBUS cable*

The PROFIBUS communication protocol uses the field bus data transfer technology, i.e. data are transferred on a serial RS 485 twisted and shielded pair cable.

Only Standard cables are to be used according to the PROFIBUS EN 50170 standard.



The PROFIBUS cable is connected to the standard 9-pin sub-D female terminals X2 and X3 on the converter side. Pin-out of terminals X2 and X3 is described below.

| Pin | Signal | Description |
|---|---|---|
| 1 | - | Not connected |
| 2 | - | Not connected |
| 3 | Rx/Tx - B | Receive/Transmit + , B line |
| 4 | - | Not connected |
| 5 | DGND | Data ground reference 0V |
| 6 | VP | Supply voltage + 5V min.10 mA |
| 7 | - | Not connected |
| 8 | Rx/Tx - A | Receive/Transmit - , A line |
| 9 | - | Not connected |

These are the electrical characteristics for PROFIBUS standard cables (EN 50170):

- Characteristic impedance 135 ÷ 165 Ω
- Capacitance max. 30 pF
- Resistance max. 110 Ω /km
- Cross-section 0,34 $mm^2$.

DGV700 supports all the communication rates defined for the PROFIBUS protocol. Moreover, it automatically detects the baudrate from the bus. The following table presents the maximum cable lengths allowed as a function of the communication rate.

| Baudrate [kbit/s] | Maximum Bus Length [m] |
|---|---|
| 12000 | 100 |
| 6000 | 100 |
| 3000 | 100 |
| 1500 | 200 |
| 500 | 400 |
| 187,5 | 1000 |
| 93,75 | 1200 |
| 45,45 | 1200 |
| 19,2 | 1200 |
| 9,6 | 1200 |

See the *PROFIBUS Guide* for more details.

### *Diagram of the CANOpen cable*

The CAN bus cable is connected to the standard 9-pin sub-D male terminals X2 and X3 on the converter side.

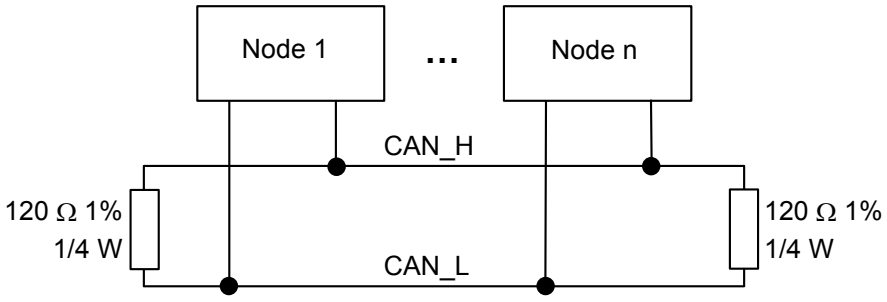
Pin-out of terminals X2 and X3 is described below.

| Pin | Signal | Description |
|---|---|---|
| 1 | - | Not connected |
| 2 | CAN_L | CAN_L bus line (dominant low) |
| 3 | CAN_GND | CAN Ground |
| 4 | - | Not connected |
| 5 | - | Not connected |
| 6 | - | Not connected |
| 7 | CAN_H | CAN_H bus line (dominant high) |
| 8 | - | Not connected |
| 9 | - | Not connected |

The terminal on the controller side may be one of the standard connectors, recommended by *CiA Recommendation DR303*,

- 9-pin sub-D connector
- 5x2 multipole connector
- RJ10 connector
- RJ45 connector
- 5-pin “mini” style industrial connector
- 5-pin “micro” style industrial connector
- open style industrial connector
- or other special connectors mentioned in the DR303.

The CAN bus line must be terminated with 120 ohm resistors connected between the CAN_L and CAN_H wires at each end as shown below.



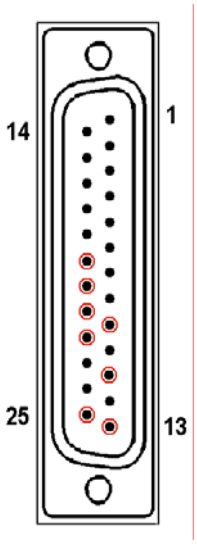

See the *CANOpen Guide* for more details.

### *Signal Connections*

Terminal X4, 25-pin SubD male connector, is provided for the signal connections of the motor position transducer and the motor thermal transducer. ABB Sace of 8C SERIES embody resolver position transducer. ABB Sace may provide servomotors manufactured with encoder transducers. In order to configure the converter for the transducer type actually mounted into the motor, different signal connections cables have to be realized for resolver connections, or encoder as an alternative.

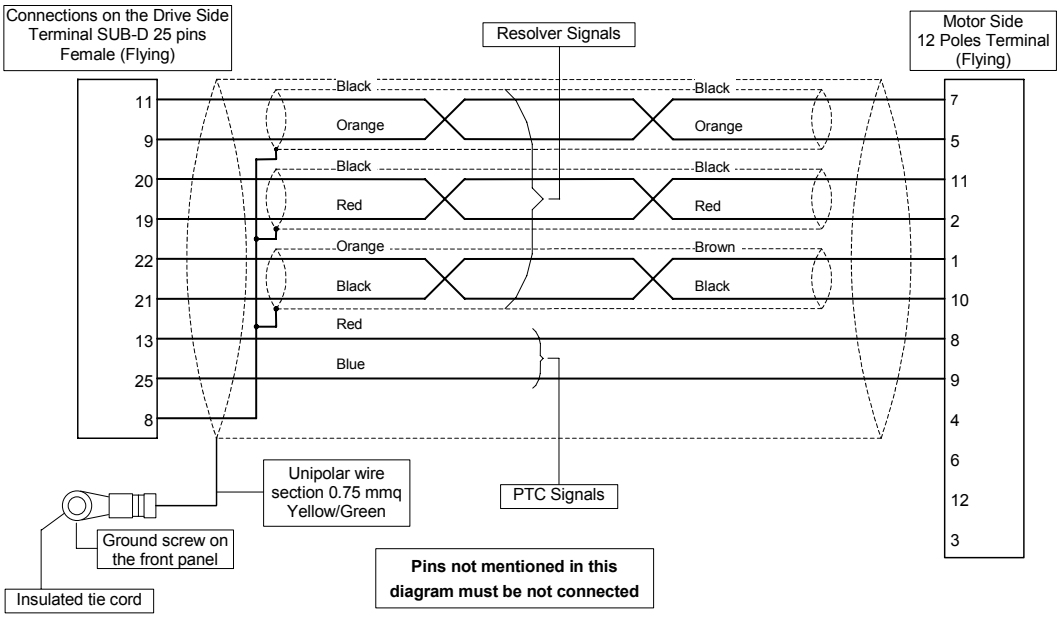
### *Resolver Connections*

Terminals of connections on the converter side for motors with resolvers.




| Pin | Signal | Description |
|---|---|---|
| 1 | N.C. | Not connected |
| 2 | N.C. | Not connected |
| 3 | N.C. | Not connected |
| 4 | N.C. | Not connected |
| 5 | SHIELD | Shielding (chassis) |
| 6 | N.C. | Not connected |
| 7 | N.C. | Not connected |
| 8 | SHIELD | Shielding (chassis) |
| 9 | ECCRES+ | Resolver excitation (10KHz) + |
| 10 | N.C. | Not connected |
| 11 | ECCRES- | Resolver excitation reference - |
| 12 | N.C. | Not connected |
| 13 | TERM1 | Motor PTC (pull up 10KΩ) |
| 14 | N.C. | Not connected |
| 15 | N.C. | Not connected |
| 16 | N.C. | Not connected |
| 17 | N.C. | Not connected |
| 18 | N.C. | Not connected |
| 19 | X-SIN-RES+ | Resolver signal SIN + |
| 20 | X-SIN-RES- | Resolver signal SIN - |
| 21 | X-COS-RES+ | Resolver signal COS + |
| 22 | X-COS-RES- | Resolver signal COS - |
| 23 | N.C. | Not connected |
| 24 | SHIELD | Shielding (chassis) |
| 25 | TERM2 | Motor PTC input |

### *Connection Diagram of the Resolver Cable*

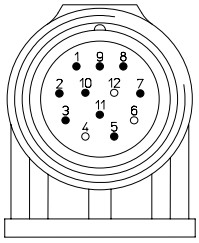



| Pin on the Converter Side | Signal | Pin on the Motor Side |
|---|---|---|
| 22 | X-COS-RES - | 1 |
| 19 | X-SIN-RES + | 2 |
| - | - | 3 |
| - | - | 4 |
| 9 | ECCRES + | 5 |
| - | - | 6 |
| 11 | ECCRES - | 7 |
| 13 | TERM + | 8 |
| 25 | TERM - | 9 |
| 21 | X-COS-RES + | 10 |
| 20 | X-SIN-RES - | 11 |
| - | - | 12 |

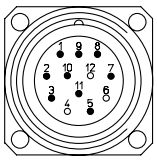
*Signals Connections on the Motor Side*

There can be two types of 12-poles signal terminals fixed on the 8C SERIES servomotors:

1. right angle fixed terminal

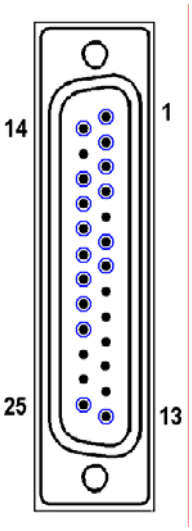



2. fixed terminal embodied into the terminal box (only for 8C4 and 8C5 sizes of the 8C SERIES)



### *Sincos Encoder Connections*

ABB SERIES 8C Servomotors embody position transducer of resolver type with 90° phase offset. Upon request, servomotors with encoder position transducer may be available.




| Pin | Signal | Description |
|---|---|---|
| 1 | UPSUPPLY | Encoder supply +5V ± 5%, 150mA |
| 2 | GND | Ground |
| 3 | X-SIN-A+ | Encoder Signal (incremental tracks) SIN + |
| 4 | X-SIN-A- | Encoder Signal (incremental tracks) SIN - |
| 5 | SHIELD | Shielding (chassis) |
| 6 | X-COS-B+ | Encoder Signal (incremental tracks) COS + |
| 7 | X-COS-B- | Encoder Signal (incremental tracks) COS - |
| 8 | SHIELD | Shielding (chassis) |
| 9 | N.C. | Not connected |
| 10 | N.C. | Not connected |
| 11 | N.C. | Not connected |
| 12 | N.C. | Not connected |
| 13 | TERM1 | Motor PTC (pull up 10KΩ) |
| 14 | UPSENSE | Encoder supply compensation + |
| 15 | N.C. | Not connected |
| 16 | 0VSENSE | Encoder supply compensation - |
| 17 | X-INDEX+ | Encoder zero marker + |
| 18 | X-INDEX- | Encoder signal zero marker - |
| 19 | X-SIN-RES+ | Encoder Signal (absolute tracks) SIN + |
| 20 | X-SIN-RES- | Encoder Signal (absolute tracks) SIN - |
| 21 | X-COS-RES+ | Encoder Signal (absolute tracks) COS + |
| 22 | X-COS-RES- | Encoder Signal (absolute tracks) COS - |
| 23 | N.C. | Not connected |
| 24 | SHIELD | Shielding (chassis) |
| 25 | TERM2 | Motor PTC Input |

## *I/O Connections*

Terminal blocks X5 and X6 located on the front panel of DGV700 are available for connections of analog and digital inputs and outputs, both configurable and dedicated.

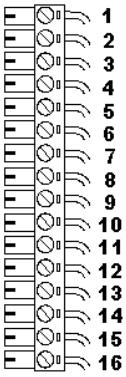
Specially, a number of inputs and outputs are configurable:

- One analogue reference input ±10 V differential with 12 bit digital conversion (± VREF)
- Eight optically insulated digital inputs 0-24 V, 30 mA, one of which is 200 μs fast (D-IN 1) (D-IN 2, … , D-IN 8)
- Three digital outputs 24 V, 30 mA max. (D-OUT 1, D-OUT 2, D-OUT 3)
- One differential analogue output (V-OUT)

And a number of inputs and outputs are preprogrammed:

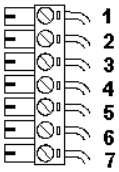
- Two optically insulated digital inputs, 0-24 V, preprogrammed for power Hardware Enable and reset of faults (ENABLE, RESET)
- One optically insulated digital input preprogrammed for axis referencing (Homing)
- One fault output (READY 1, READY 2)
- One analog ground signal (AGND)

Pin-out of the 16-pin terminal block X5 is as follows:




| Pin | Signal | Description |
|---|---|---|
| 1 | +VREF | Speed/Current analogue external reference + |
| 2 | -VREF | Speed/Current analogue external reference - |
| 3 | ENABLE | Power Hardware Enable input |
| 4 | RESET | Fault Reset |
| 5 | DIN 1 | Programmable Digital Input |
| 6 | DIN 2 | Programmable Digital Input |
| 7 | DIN 3 | Zero axis input (Homing) |
| 8 | DIN 4 | Programmable Digital Input |
| 9 | DIN 5 | Programmable Digital Input |
| 10 | RDY 1 | Fault output |
| 11 | RDY 2 | Fault output |
| 12 | +24 V | +24V - 100 mA max |
| 13 | COMMON | Digital Input 0 V reference |
| 14 | DOUT 1 | Programmable Digital Output |
| 15 | DOUT 2 | Programmable Digital Output |
| 16 | DOUT 3 | Programmable Digital Output |

Pin-out of the 7-pin terminal block X6 is as follows:




| Pin | Signal | Description |
|---|---|---|
| 1 | DIN 6 | Programmable Digital Input |
| 2 | DIN 7 | Programmable Digital Input |
| 3 | DIN 8 | Programmable Digital Input |
| 4 | +24 V | Output +24V - 100 mA max |
| 5 | COMMON | Digital Input 0 V reference |
| 6 | AOUT | Programmable Analogue Output +/- 10V, 20 mA |
| 7 | AGND | Analog Ground |

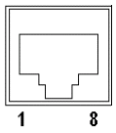
## RS 232 Connections

Terminal X7, connector type 8-pin RJ45, is used for controlling the converter by RS 232 serial communication protocol.

This connection is reserved to a PC, or in general to any other device equipped with a serial COM port and RS232 protocol, where the user can install the ABB AC Brushless Servodrives Browser for drive start-up and commissioning.

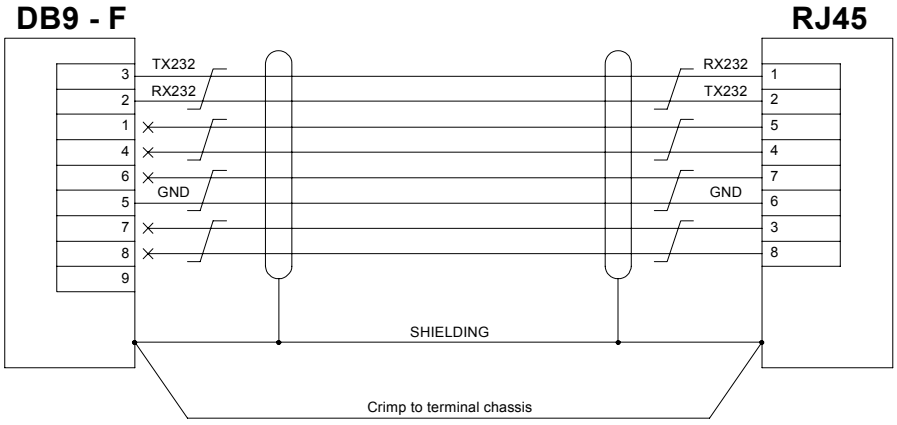
Instructions for installing and using the Browser are given in the *Firmware Manual*.

The Browser allows for monitoring and quick diagnostic in case of malfunction.




| Pin | Signal | Description |
|---|---|---|
| 1 | Rx232 | RS 232 data input |
| 2 | Tx232 | RS 232 data output |
| 3 | N.C. | Not connected |
| 4 | N.C. | Not connected |
| 5 | N.C. | Not connected |
| 6 | GND | Ground |
| 7 | GND | Ground |
| 8 | N.C. | Not connected |

### Diagram of the RS 232 Serial Cable



### *Encoder Emulation*

Terminal X8, 9-pin Sub-D male connector, is to be used for signals of the encoder emulation interface.

Signal of this terminal are bi-directional, since the encoder emulation interface can be programmed to:

- send out a position reference internally generated
- or, receive a position feedback coming from an external encoder or from other devices.

See the *CANOpen Guide* or the *PROFIBUS Guide* for more details regarding available and programmable functions of the encoder emulation interface.

| Pin | Signal | Description |
|---|---|---|
| 1 | ENCA+ | Encoder signal RS422 A+ |
| 2 | ENCB+ | Encoder signal RS422 B+ |
| 3 | ENCZ+ | Encoder signal RS422 Z+ |
| 4 | N.C. | Not connected |
| 5 | SHIELD | Shielding |
| 6 | ENCA- | Encoder signal RS422 A- |
| 7 | ENCB- | Encoder signal RS422 B- |
| 8 | ENCZ- | Encoder signal RS422 Z- |
| 9 | GNDISO | Insulated Ground |

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# Chapter 8 - Electrical Installation of DGV300

## *Introduction*

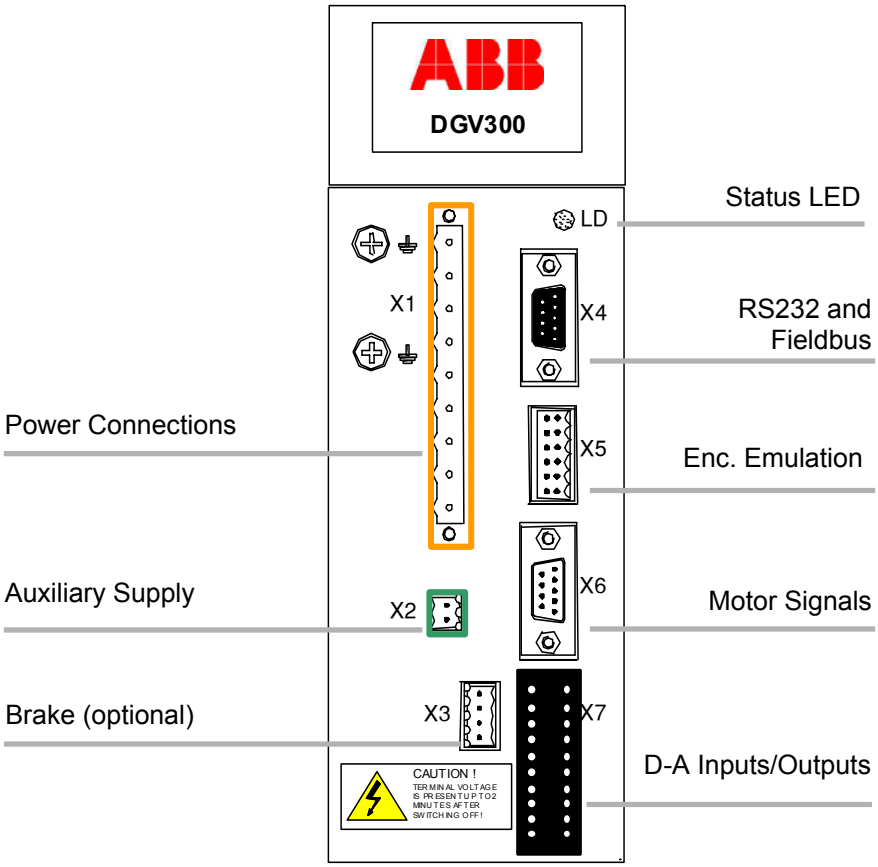
This Chapter describes terminals, cabling instructions, signal and power connections, the use of braking resistors and EMC filters of DGV300 Converters.

Note that the front panel of DGV300 *Three-Phase Version* and *Single-Phase Version* are equal.

The following connection terminals are provided

- X1 power connections
- X2 auxiliary supply
- X3 optional board for mechanical brake
- X4 serial RS232 and field bus connections (CANOpen or Profibus-DP)
- X5 encoder emulation interface
- X6 motor signals
- X7 digital-analog inputs and outputs

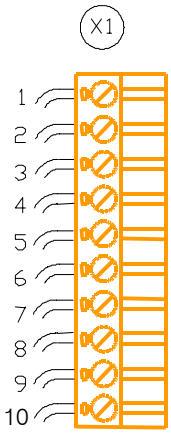
A LED indicator is also present.



## *Single-Phase Version*

### *Power Connections*

Terminal X1 is reserved to connections of power supply, motor and clamp resistor.




| Pin | Reference | Description |
|---|---|---|
| 1 | L1 | Single-phase power supply (230 Vac) |
| 2 | L2 | Single-phase power supply (neutral) |
| 3 | - | Not connected |
| 4 | U | Motor phase U |
| 5 | V | Motor phase V |
| 6 | W | Motor phase W |
| 7 | +VBUS | DC bus positive terminal |
| 8 | RCL | Internal clamp resistor |
| 9 | RCL EXT | Internal/external clamp resistor |
| 10 | -VBUS | DC bus negative terminal |

*Main Supply Connections*

Connect terminals L1 and L2 according the electrical diagrams specific for each network type.

It is possible to connect to TN and TT network type.

The connection to the IT network it is possible only if the voltage between the phase and the ground cannot exceed 253 Vac (230 Vac ± 10%).

**Considering that it is very difficult to check the voltage limit during the voltage transient, this connection type is unsuitable.**

Therefore with IT network we suggest you to introduce a transformer.

Connect the PE cable to one of the two PE screw terminals on the front panel.

*Clamp Resistor Connection*

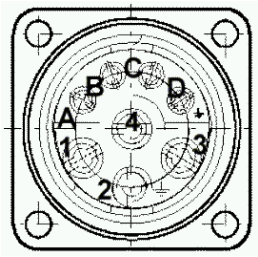
- When using the internal resistor connect terminals 8 and 9.
- When using an external resistor, connect the resistor between terminals 7 and 9.

*Motor Power Connections*

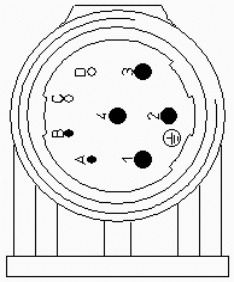
Connect the motor wires to U, V, W, PE terminal observing the correct pole connection.

Connect the PE cable to one of the two PE screw terminals on the front panel.

Power Connections
SDM motor side

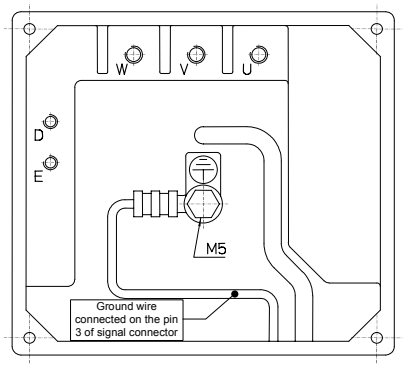



Power Connections
8C and 8N motor side



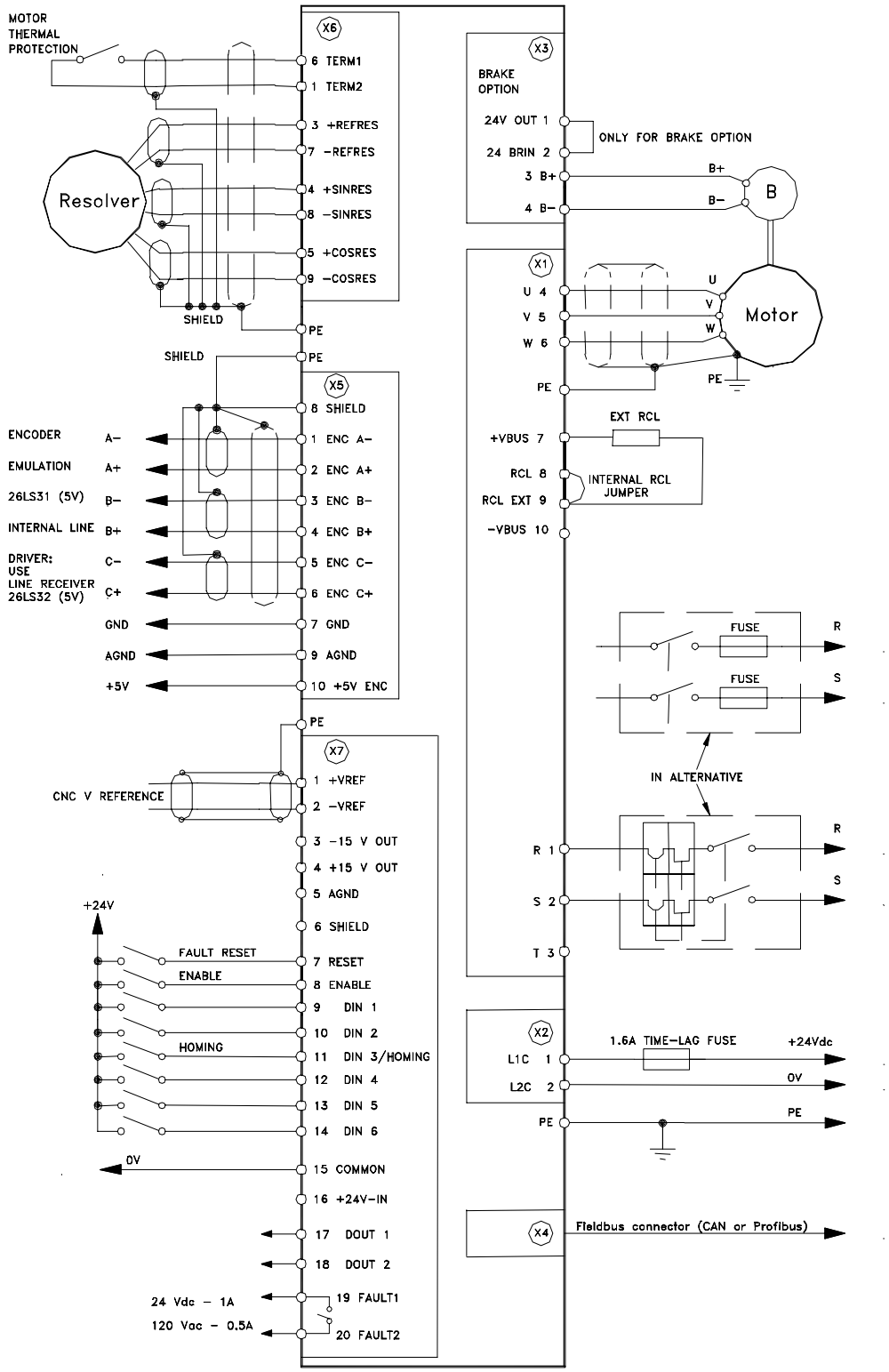

| Pin | SDM Connections | 8C1 Connections | 8N Connections |
|---|---|---|---|
| 1 | Phase U | Phase V | Phase U |
| 2 | Ground | Ground | Ground |
| 3 | Phase W | Phase U | Phase W |
| 4 | Phase V | Phase W | Phase V |
| A | + Brake (optional) | + Brake (optional) | + Brake (optional) |
| B | - Brake (optional) | - Brake (optional) | - Brake (optional) |

Power terminal box for 8C4 servomotors:

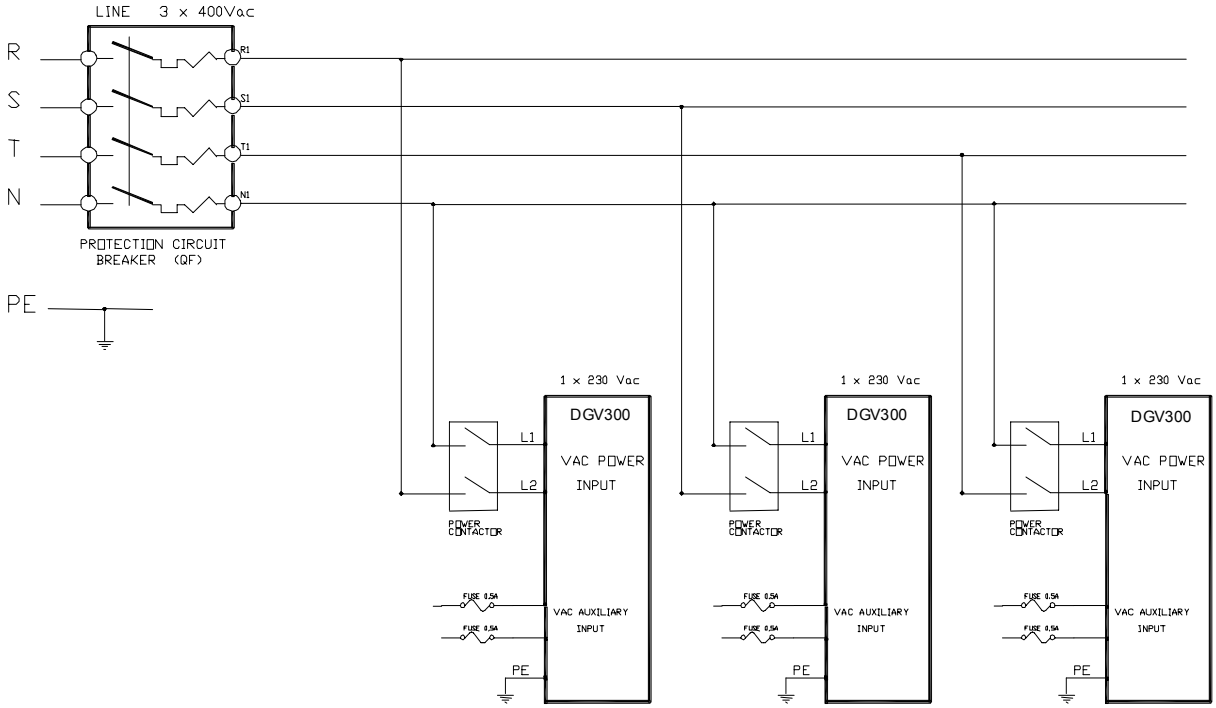



| Pin | 8C4 Connections |
|---|---|
| U | Phase U |
| V | Phase V |
| W | Phase W |
| Screw M5 | Ground |
| D | + Brake (optional) |
| E | - Brake (optional) |

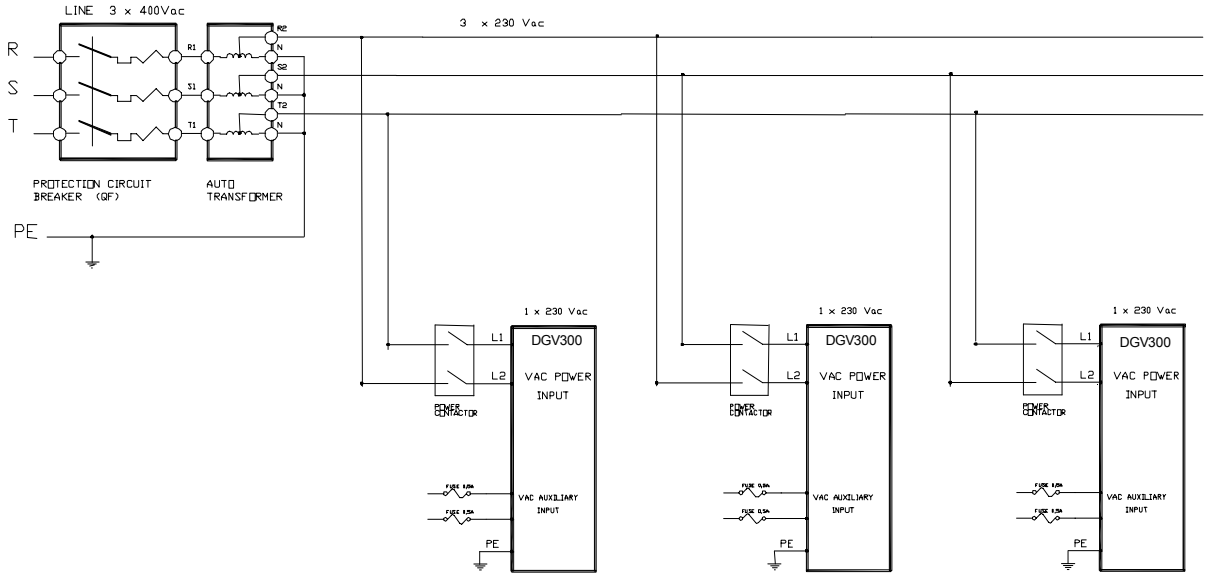
### *Wiring Scheme*



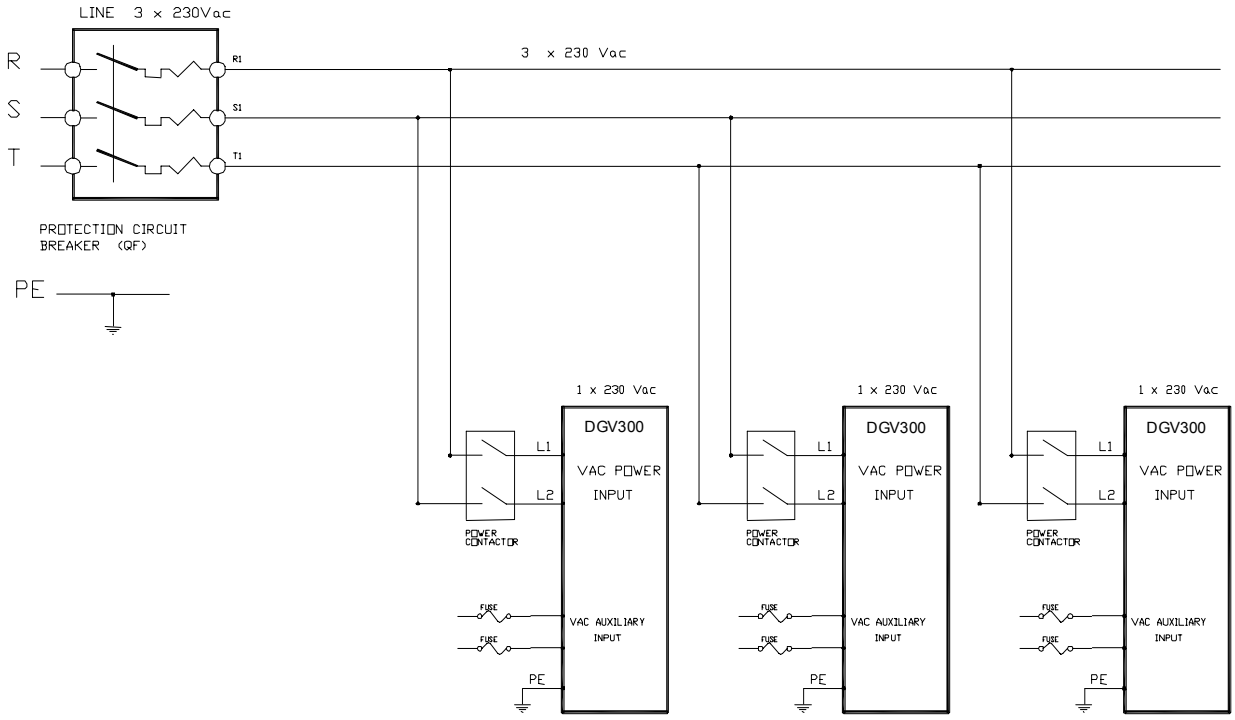
### Direct Connection to 400Vac TN-Network



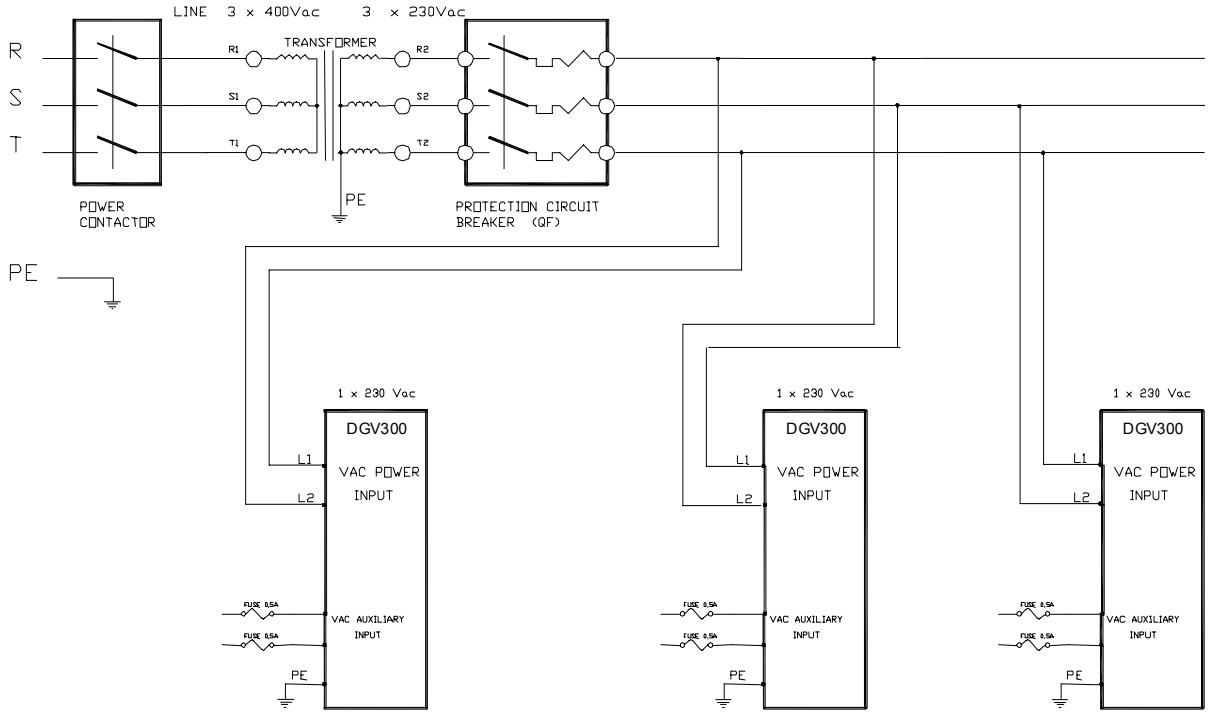

### Connection to 400Vac TT-Network with Autotransformer



### *Direct Connection to 230Vac TT-Network*



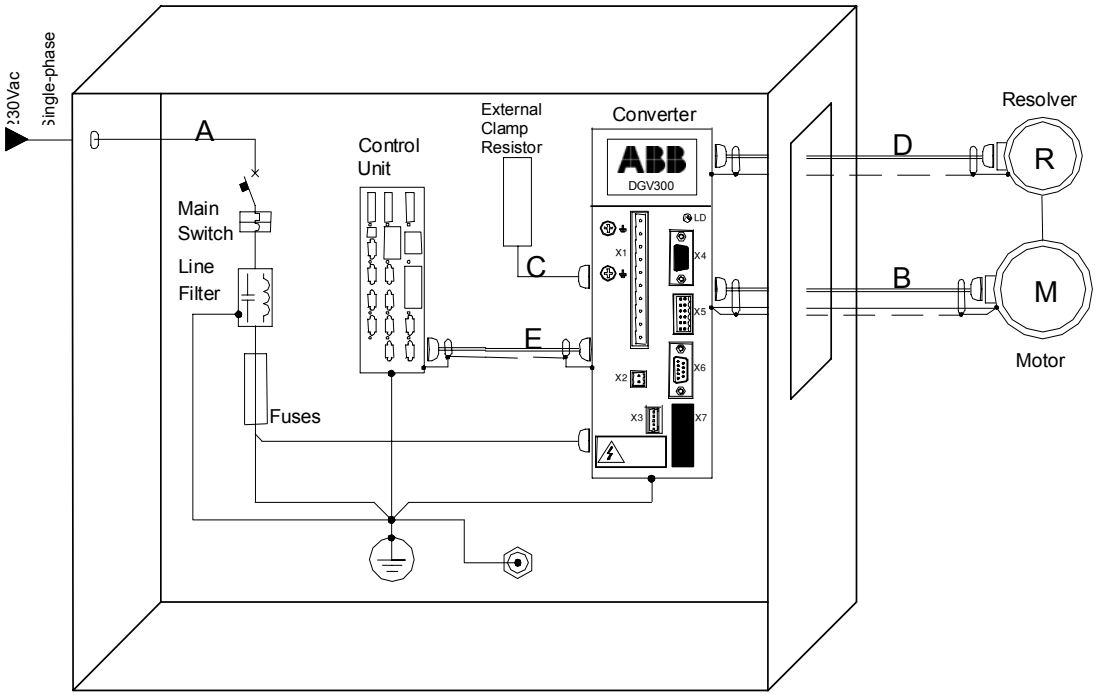

### *Connection to 400Vac IT-Network with Transformer*



***Installation in First Environment***

The use of the DGV300 Converters is not foreseen in “First Environment”, i.e. where the low voltage network feeds residential buildings.

If the drive system has to be used in “First Environment”, the professional installer must provide to their proper shielding.

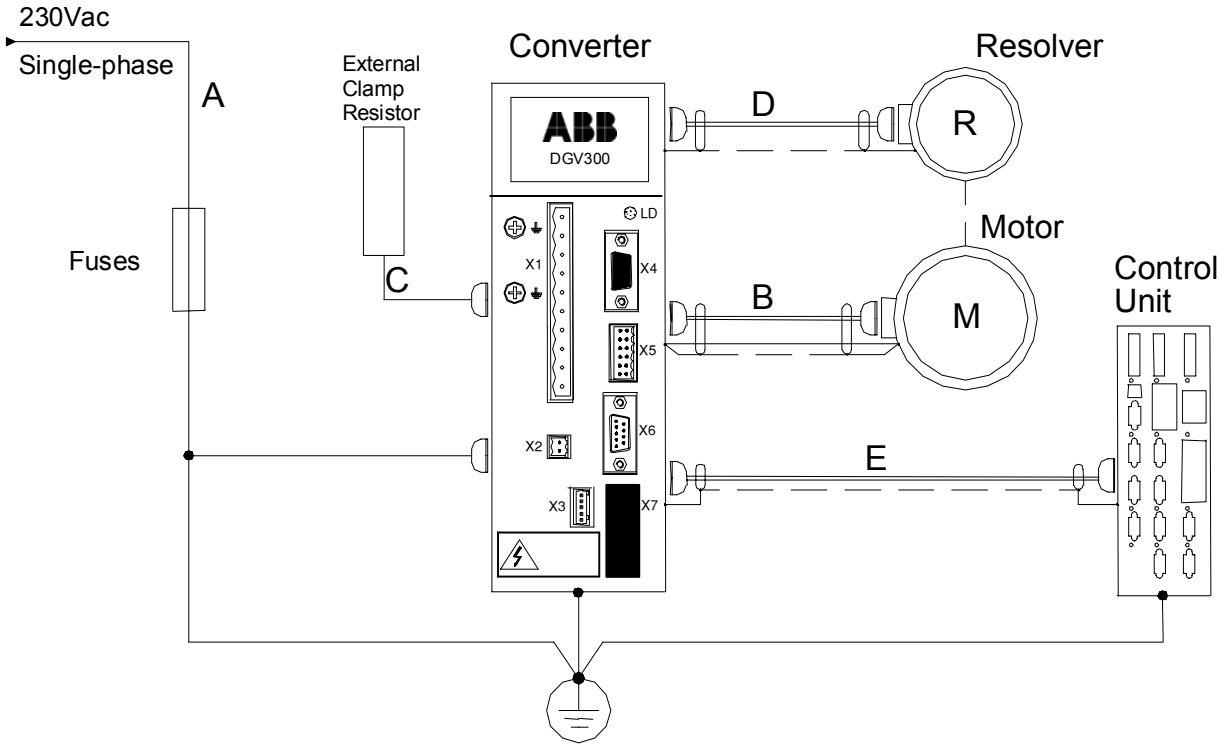



- **Supply cable (A)**: no prescription.
- **Motor cable (B)**: to prevent emission of the motor cable is recommended to use of shielded cable. The shield must be connected to the converter ground terminal and to the ground terminal of the motor. The cable length must be less or equal 25m.
- **Clamp resistor (C)**: connected through twisted cable with length less or equal 2m.
- **Motor signal cable (D)**: shielded cable with length less or equal 25m.
- **Control connections (E)**: shielded cable with length less or equal 3m.
- **Network filter** with following characteristics:
  - Nominal voltage: 440/250 Vac, 50/60Hz
  - Phase number: 2
  - Temperature range: -25..+40 degrees
  - Nominal current: range XX = 10 A
- **Cabinet**: All equipments should be installed in metal cabinet closed over all sides.

***Installation in Second Environment***

DGV300 Converters are intended for use primarily in “Second Environment” only, i.e. industrial environments where the low voltage network does not feed residential buildings.

To comply with the existing normative references on Second Environment, the professional installer must install the recommended filters, suitably rated, on the power supply line, and, in any case, autonomously provide for the certification of the whole equipment according to the norms.

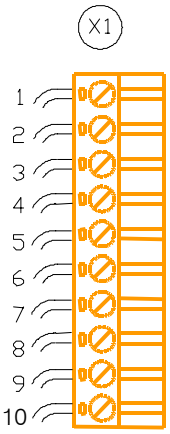



- **Supply cable (A)**: no prescription.
- **Motor cable (B)**: to prevent emission of the motor cable is recommended to use of shielded cable. The shield must be connect to the converter ground terminal and to the ground terminal of the motor. The cable length must be less or equal 25m.
- **Clamp resistor (C)**: connected through twisted cable with length less or equal 2m.
- **Motor signal cable (D)**: shielded cable with length less or equal 25m.
- **Control connections (E)**: shielded cable with length less or equal 3m.

## Three-Phase Version

### Power Connections

Terminal X1 is reserved to connections of power supply, motor and clamp resistor.




| Pin | Reference | Description |
|---|---|---|
| 1 | R | Three-phase power supply (230 Vac) |
| 2 | S | Three-phase power supply (230 Vac) |
| 3 | T | Three-phase power supply (230 Vac) |
| 4 | U | Motor phase U |
| 5 | V | Motor phase V |
| 6 | W | Motor phase W |
| 7 | +VBUS | DC bus positive terminal |
| 8 | RCL | Internal clamp resistor |
| 9 | RCL EXT | Internal/external clamp resistor |
| 10 | -VBUS | DC bus negative terminal |

*Main Supply Connections*

Connect terminals R, S and T according the electrical diagrams specific for each network type.

It is possible to connect to TT network type.

The connection to the IT network it is possible only if the voltage between the phase and the ground cannot exceed 253 Vac (230 Vac ± 10%).

**Considering that it is very difficult to check the voltage limit during the voltage transient, this connection type is unsuitable.**

Therefore with IT network we suggest you to introduce a transformer.

Connect the PE cable to one of the two PE screw terminals on the front panel.

*Clamp Resistor Connection*

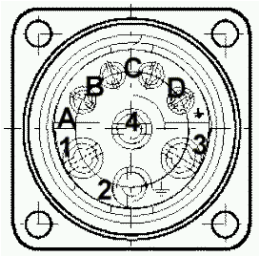
- When using the internal resistor connect terminals 8 and 9.
- When using an external resistor, connect the resistor between terminals 7 and 9.

*Motor Power Connections*

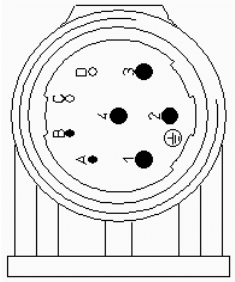
Connect the motor wires to U, V, W, PE terminal observing the correct pole connection.

Connect the PE cable to one of the two PE screw terminals on the front panel.

Power Connections
SDM motor side

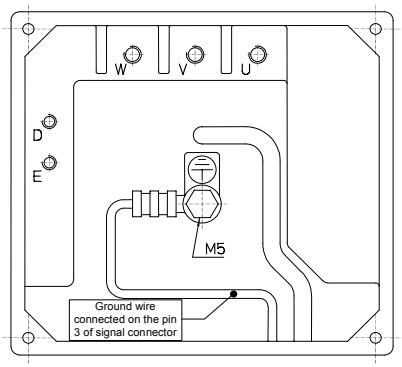



Power Connections
8C and 8N motor side



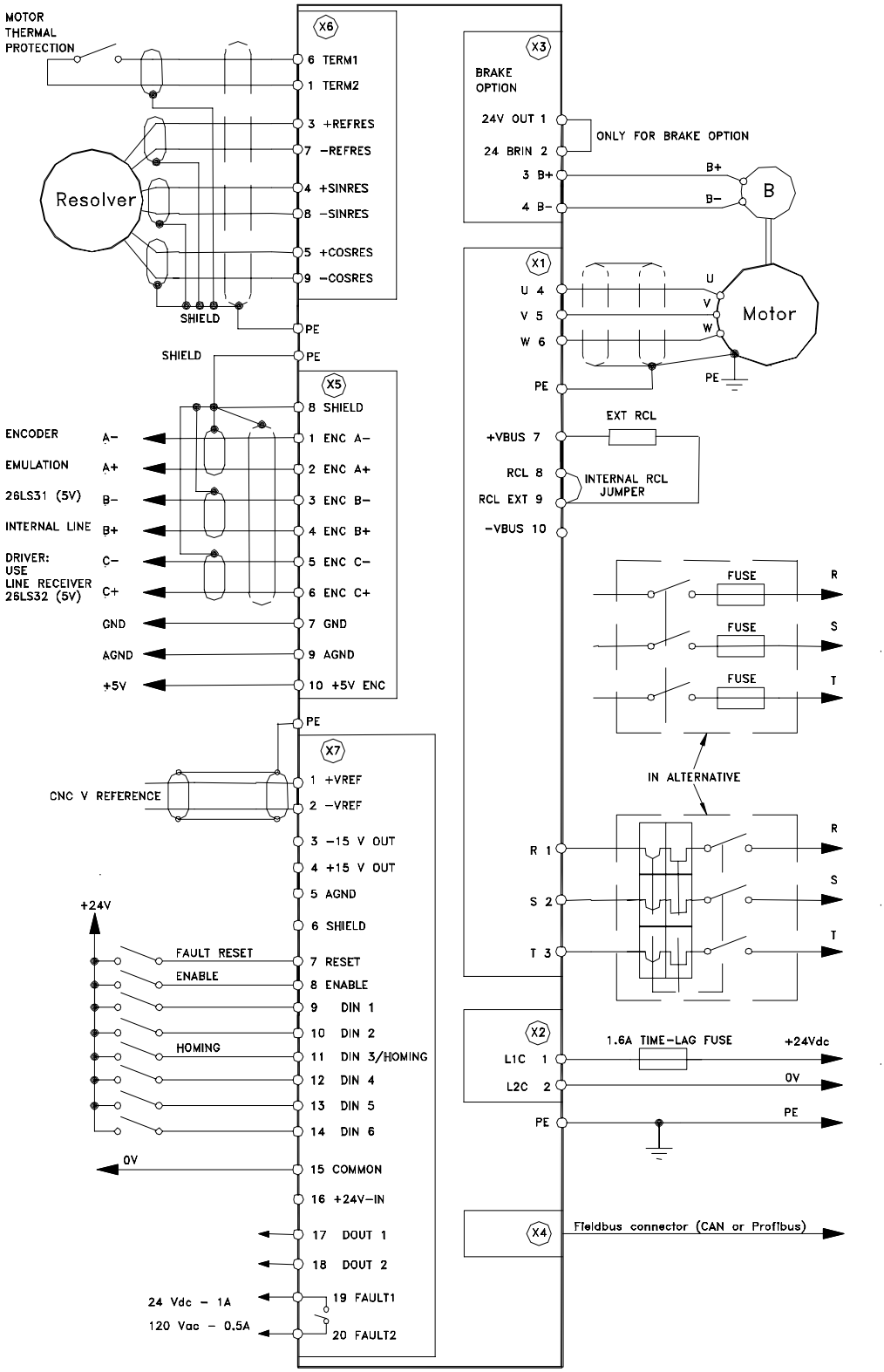

| Pin | SDM Connections | 8C1 Connections | 8N Connections |
|---|---|---|---|
| 1 | Phase U | Phase V | Phase U |
| 2 | Ground | Ground | Ground |
| 3 | Phase W | Phase U | Phase W |
| 4 | Phase V | Phase W | Phase V |
| A | + Brake (optional) | + Brake (optional) | + Brake (optional) |
| B | - Brake (optional) | - Brake (optional) | - Brake (optional) |

Power terminal box for 8C4 servomotors:

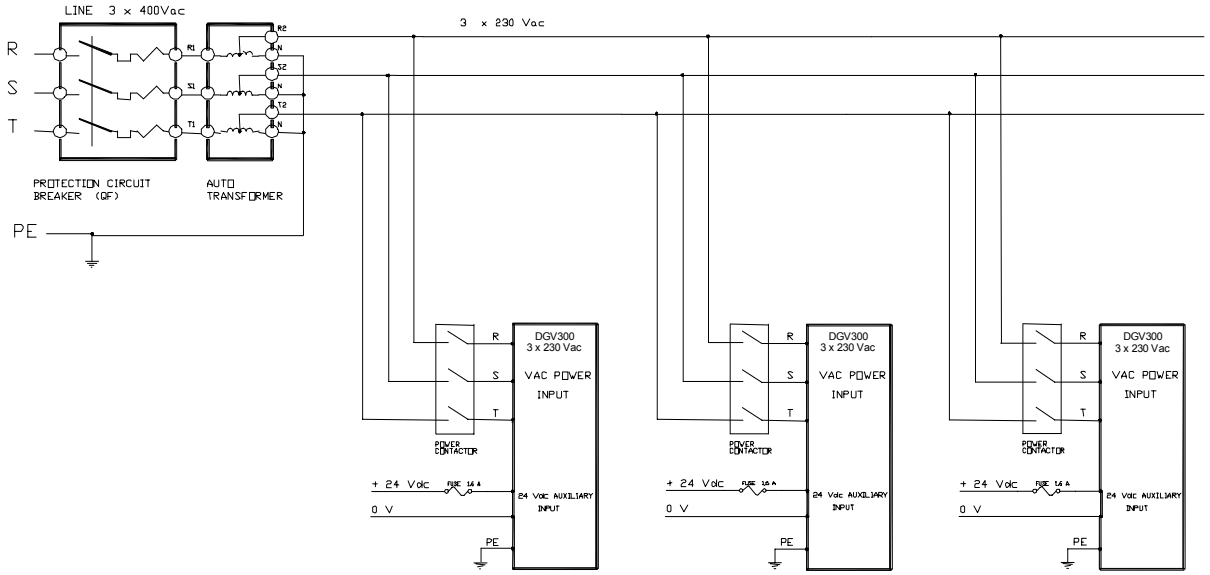



| Pin | 8C4 Connections |
|---|---|
| U | Phase U |
| V | Phase V |
| W | Phase W |
| Screw M5 | Ground |
| D | + Brake (optional) |
| E | - Brake (optional) |

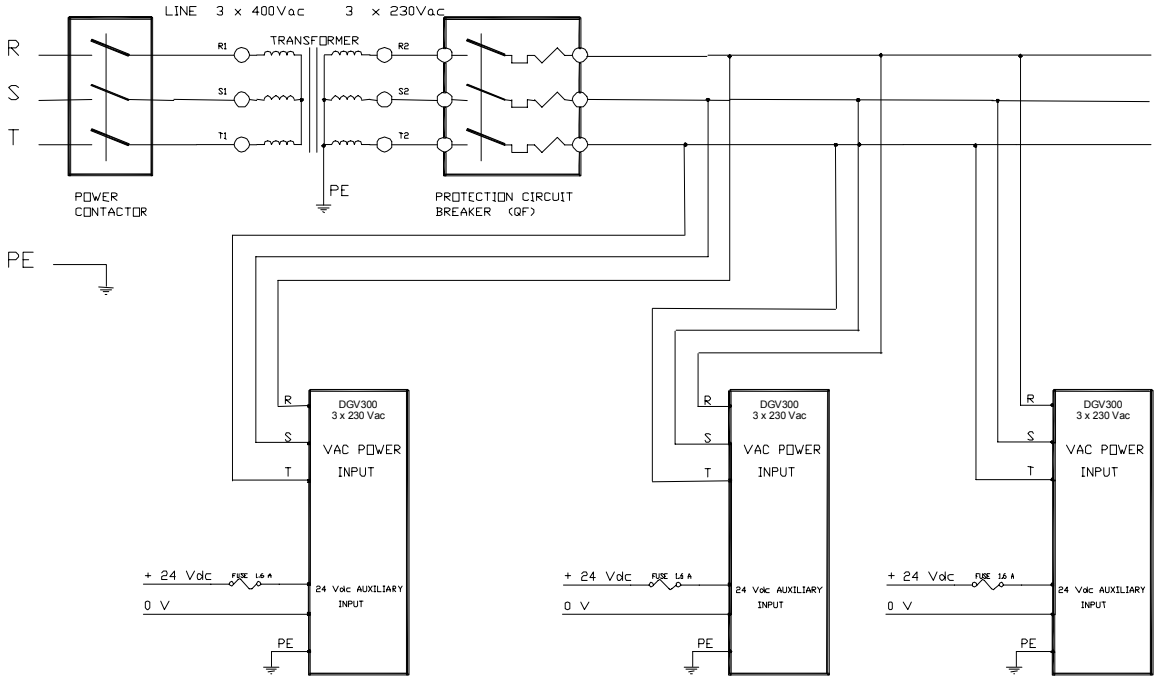
## *Wiring Scheme*



## Connection to 400 Vac TT-Network with Autotransformer

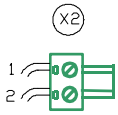



## Connection to 400 Vac IT-Network with Transformer



### *Auxiliary Supply Connections*

Auxiliary supply is mandatory and necessary to maintain the converter in absence of the main power supply. Auxiliary supply must be 24 Vdc ± 15%, 1,5 A max, derived from a DC power supply.




| Pin | Reference | Description |
|---|---|---|
| 1 | 24 Vdc | 24 Vdc ± 15%, 30 VA max. |
| 2 | GND | GND 24 Vdc |

### *Brake Connections*

Connecting Terminal X3 is optional. It may be used with motors including an electromagnetic brake.


| Pin | Reference | Description |
|---|---|---|
| 1 | 24VOUT | Brake Output 24V (24Vdc, 0.8A max) |
| 2 | 24BRIN | Brake Input 24V (24Vdc, 2A max) |
| 3 | B+ | Positive brake supply |
| 4 | B- | Negative brake supply |

The drive automatically cuts off power and releases the electro mechanic brake when connection between pins 1 and 2 is open.

Connect a potential free contact emergency switch between pins 1 and 2, or jumper them.

If the brake current is over 0,8 A, it is necessary supply the brake with an external voltage (24V dc with a maximum current of 2A) connected on pin B- (4) and 24BRIN (2).

## *Field Bus and Serial Connections*

Terminal X4 is used for both RS232 serial connections and field bus connections.

X4 is a Sub-D 9-pin terminal type

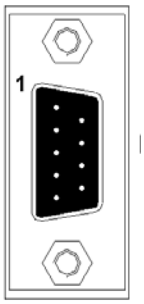
- Female for *Profibus-DP Version* converters
- Male for *CANOpen Version* converters

In any case, we advice you to prepare two different cables, a first one for the RS232 serial connection and a second one for connecting to a field bus.

### *Profibus-DP Version*

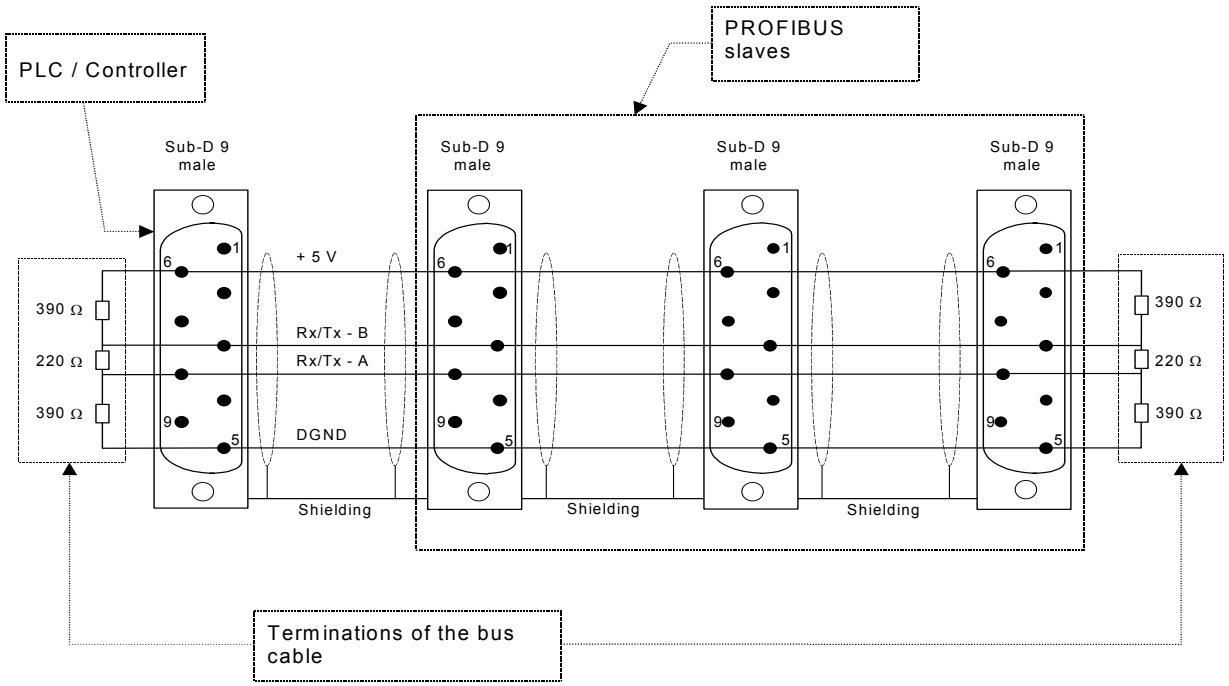
The PROFIBUS communication protocol uses the field bus data transfer technology, i.e. data are transferred on a serial RS 485 twisted and shielded pair cable.

Pin-out of terminal X4 for *Profibus-DP Version* of DGV300 Converters is:




| Pin | Reference | Description |
|---|---|---|
| 1 | SHIELD | Terminal shield |
| 2 | RX232 | RS232 RX signal |
| 3 | RxD/TxD + | Receive/Transmit Data + |
| 4 | - | Not connected |
| 5 | DGND | 0V Reference |
| 6 | VP | Supply + 5V, min.10 mA |
| 7 | TX232 | RS232 TX signal |
| 8 | RxD/TxD - | Receive/Transmit Data - |
| 9 | GND | RS232 Ground |

Connection diagram of a Profibus-DP standard cable.




Only Standard cables are to be used according to the PROFIBUS EN 50170 standard.

Electrical characteristics for PROFIBUS standard cables (EN 50170):

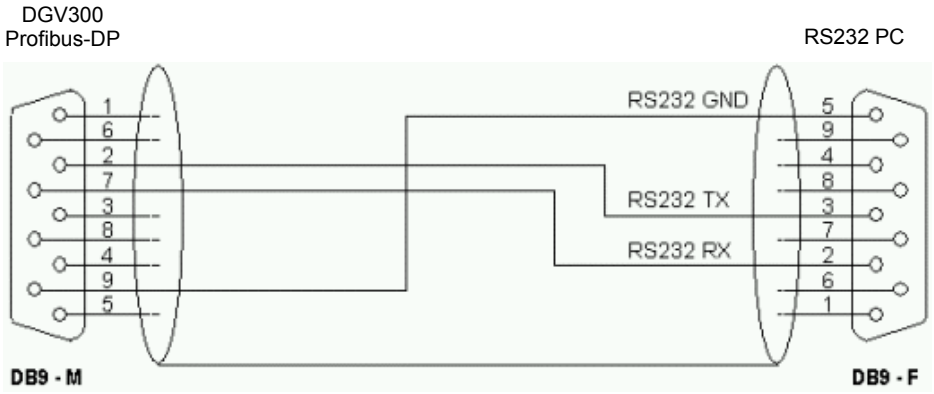
- Characteristic impedance 135 ÷ 165 Ω
- Capacitance max. 30 pF
- Resistance max. 110 Ω /km
- Cross-section 0,34 $mm^2$.

DGV300 supports all the communication rates defined for the PROFIBUS protocol. Moreover, it automatically detects the baudrate from the bus. The following table presents the maximum cable lengths allowed as a function of the communication rate.

| **Baudrate [kbit/s]** | **Maximum Bus Length [m]** |
|---|---|
| 12000 | 100 |
| 6000 | 100 |
| 3000 | 100 |
| 1500 | 200 |
| 500 | 400 |
| 187,5 | 1000 |
| 93,75 | 1200 |
| 45,45 | 1200 |
| 19,2 | 1200 |
| 9,6 | 1200 |

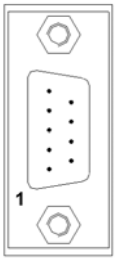
See the *PROFIBUS Guide* for more details.

Connection diagram of the RS232 serial cable for Profibus-DP Version of DGV300 Converters.




***Note.*** When using a Profibus standard cable with input/output connector, it is possible to plug the RS232 serial cable over the Profibus cable and to use both the RS232 and Profibus-DP connections.

***CANOpen Version*** Pin-out of terminal X4 for *Profibus-DP Version* of DGV300 Converters is:

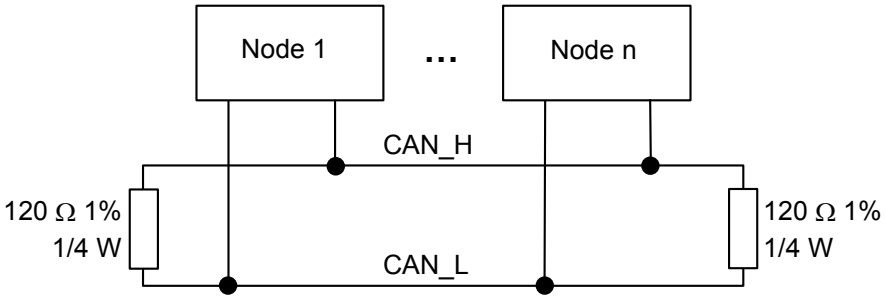



| Pin | Reference | Description |
|---|---|---|
| 1 | - | Not Connected |
| 2 | CAN_L | CAN_L bus line (dominant low) |
| 3 | - | Not Connected |
| 4 | RX232 | RS232 RX signal |
| 5 | - | Not Connected |
| 6 | GND | RS232 Ground |
| 7 | CAN_H | CAN_H bus line (dominant high) |
| 8 | TX232 | RS232 TX signal |
| 9 | - | Not Connected |

The terminal on the controller side may be one of the standard connectors, recommended by *CiA Recommendation DR303*,

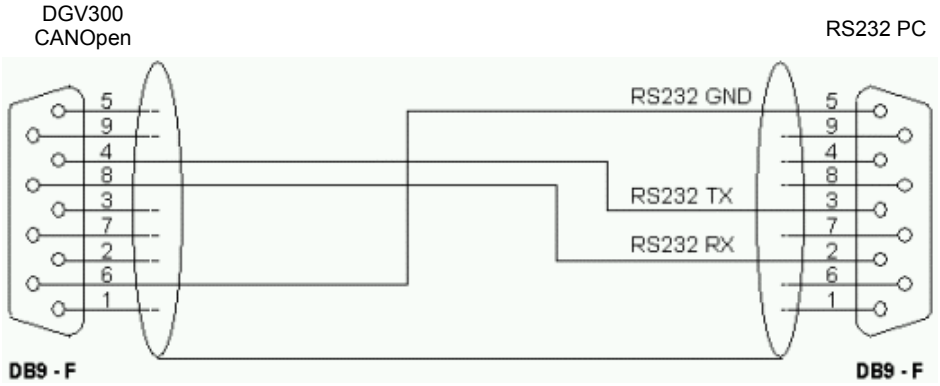
- 9-pin sub-D connector
- 5x2 multipole connector
- RJ10 connector
- RJ45 connector
- 5-pin “mini” style industrial connector
- 5-pin “micro” style industrial connector
- open style industrial connector
- or other special connectors mentioned in the DR303.

The CAN bus line must be terminated with 120 ohm resistors connected between the CAN_L and CAN_H wires at each end as shown below.




See the *CANOpen Guide* for more details.

Connection diagram of the RS232 serial cable for CANOpen Version of DGV300 Converters.



### *Encoder Emulation*

Terminal block X5 is to be used for signals of the encoder emulation interface.

Signal of this terminal are bi-directional, since the encoder emulation interface can be programmed to:

- send out a position reference internally generated
- or, receive a position feedback coming from an external encoder or from other devices.

See the *CANOpen Guide* or the *PROFIBUS Guide* for more details regarding available and programmable functions of the encoder emulation interface.

| Pin | Signal | Description |
|---|---|---|
| 1 | ENCA- | Encoder signal RS422 A- |
| 2 | ENCA+ | Encoder signal RS422 A+ |
| 3 | ENCB- | Encoder signal RS422 B- |
| 4 | ENCB+ | Encoder signal RS422 B+ |
| 5 | ENCZ- | Encoder signal RS422 Z- |
| 6 | ENCZ+ | Encoder signal RS422 Z+ |
| 7 | GND | Ground |
| 8 | SHIELD | Shielding |
| 9 | AGND | Analog ground |
| 10 | +5V ENC | +5V - max. 150 mA, encoder supply |

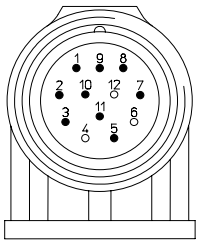
## Resolver Connections

Terminal X6 is used for connecting the resolver transducer.

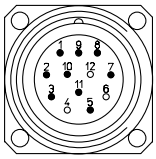
| Pin | Riferimento | Descrizione |
|---|---|---|
| 1 | THERMAL2 | Protezione termica motore (2)* |
| 2 | - | Non connesso |
| 3 | RESREF + | Riferimento positivo resolver |
| 4 | SINRES + | Segnale positivo seno resolver |
| 5 | COSRES + | Segnale positivo coseno resolver |
| 6 | THERMAL1 | Protezione termica motore (1)* |
| 7 | RESREF – | Riferimento negativo resolver |
| 8 | SINRES – | Segnale negativo seno resolver |
| 9 | COSRES – | Segnale negativo coseno resolver |

There can be two types of 12-poles signal terminals fixed on the 8C SERIES servomotors:

1. right angle fixed terminal

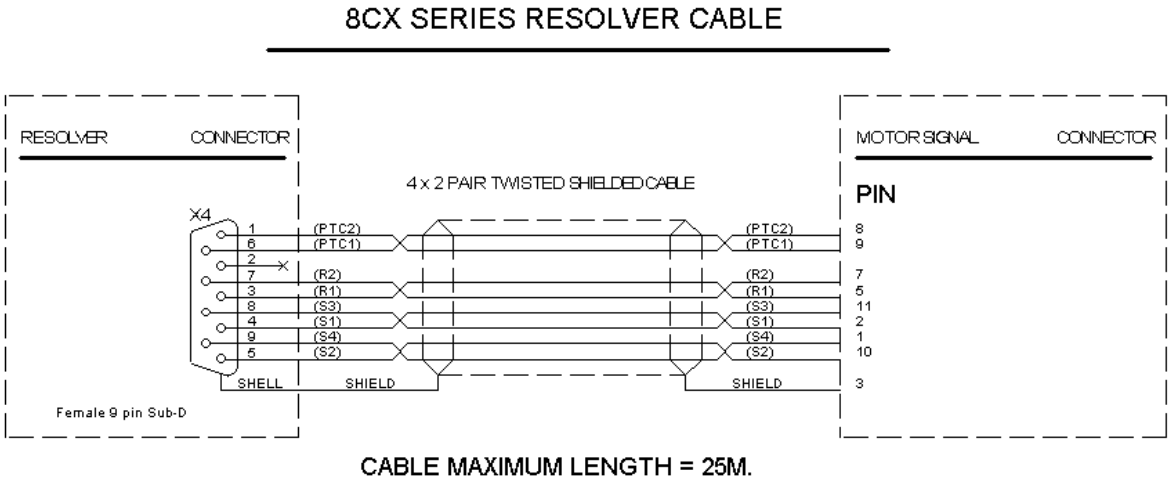



2. fixed terminal embodied into the terminal box (only for 8C4 and 8C5 sizes of the 8C SERIES)



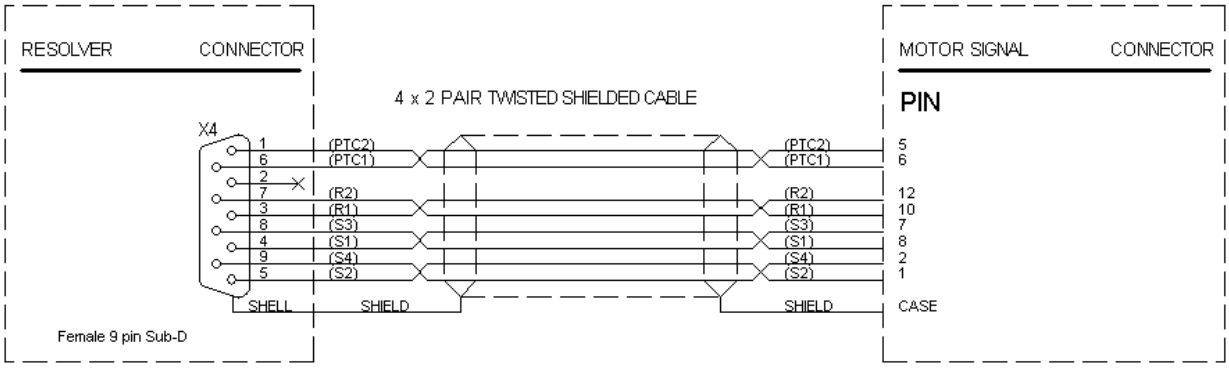

## Connection Diagram of the Resolver Cable

Connection diagram of the revolver cable for DGV300 Converters and, 8C and 8N SERIES servomotors.



Connection diagram of the revolver cable for DGV300 Converters and SDM SERIES servomotors.

SDM251 SERIES RESOLVER CABLE



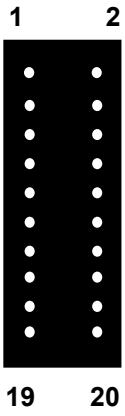

CABLE MAXIMUM LENGTH = 25M.

## *I/O Connections*

Block terminal X7 is reserved for control signals, i.e. analog-digital inputs and outputs, preprogrammed and configurable through the user software interface (see *Firmware Manual*).

Specially the following are available:

- ± VREF one analog input ±10 V - 25kΩ, configurable as differential analog reference input for controlling the drive speed or current;
- VOUT one configurable analog output +/- 15 V
- D-IN six configurable digital inputs
- D-OUT two configurable digital outputs
- ENABLE one digital input, preprogrammed for power hardware enable (15 ÷ 24 V, 20 mA)
- RESET one digital input, preprogrammed for fault reset (15 ÷ 24 V, 20 mA)
- FAULT one fault output, contact normally closed when the converter status is “Running” status, contact normally open when the converter is in “Stop” status and some fault conditions are present; break off capacity of contact is 24 Vdc - 1A, or 120 Vac - 0,5 A.




| Pin | Reference | Description |
|---|---|---|
| 1 | VREF+ | Input of the analog differential reference |
| 2 | VREF - | Input of the analog differential reference |
| 3 | -15 V-OUT | Analog output 15 V (50 mA max.) |
| 4 | +15 V-OUT | Analog output 15 V (50 mA max.) |
| 5 | AGND | Analog ground |
| 6 | SHIELD | Shielding |
| 7 | RESET | Fault reset input |
| 8 | ENABLE | Power hardware enable input |
| 9 | D-IN1 | Digital configurable input |
| 10 | D-IN2 | Digital configurable input |
| 11 | D-IN3 | “Home” Digital configurable input |
| 12 | D-IN4 | Digital configurable input |
| 13 | D-IN5 | Digital configurable input |
| 14 | D-IN6 | Digital configurable input |
| 15 | GNDCMD | Common signal 24 V |
| 16 | +24V-IN | 24 V input |
| 17 | D-OUT1 | Digital configurable output |
| 18 | D-OUT2 | Digital configurable output |
| 19 | FAULT1 | “drive ready“ output signal |
| 20 | FAULT2 | “drive ready“output signal |

# Chapter 9 - Technical Data

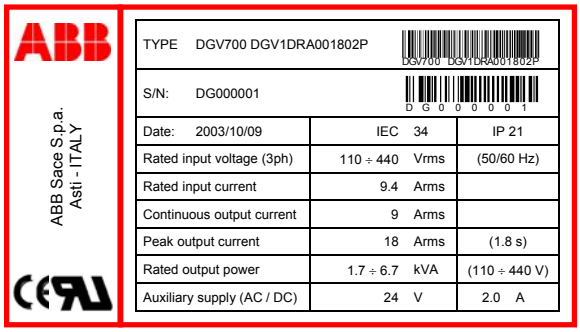
## Introduction

In this chapter the ratings of DGV300 and DGV700 Converters and the typical features of complementary components are provided.

## Converter Label

On one lateral side of the drive you can find the label hereby presented. The label is in black undelible ink. Type designation and serial number are reported also as BARCODE EAN128.

Some marks here reproduced could not be present.




## Customer Service

For any explanation, interventions, or spare parts, please contact directly the Customer Service:

ABB Sace S.p.a.
Customer Service
Frazione Stazione Portacomaro, 97/C
I - 14100 ASTI (ITALY)
Telephone +39 0141 276. 230
Telefax +39 0141 276. 294

When contacting our Customer Service please note the *Part Number* and serial number *S.N.* given on the drive label.

## *Technical Specifications*

The power stage is based on the IGBT technology (IPM – Intelligent Power Module).

The converter size is provided by the ratio **In/Imax**, i.e. **the rms rated current over the rms maximum current** supplied by the converter.

According to these current specifications, the following sizes are available:

- six sizes of DGV700 Converters,
    - 03/06
    - 05/10
    - 09/18
    - 13/18
    - 18/36
    - 25/50
- three sizes of the *Three-Phase Version* of DGV300 Converters
    - 03/06
    - 05/10
    - 07/14
- two sizes of the *Single-Phase Version* of DGV300 Converters
    - 03/06
    - 05/10

Maximum current can be delivered for no longer than 1,8 seconds. After this period the I*t protection function is internally activated and the output current is limited to the rated value.

### *Main Characteristics*

The following table resumes the typical ratings for each size DGV700 standard Converters.

| **DGV700** | | | **Sizes** | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **M.U.** | **03/06** | **05/10** | **09/18** | **13/26** | **18/36** | **25/50** |
| *Power supply phase to phase rated voltage* | | [$V_{RMS}$] | Three-phase 110 ÷ 440 (480 optional) Vac ± 10% | | | | | |
| *Power supply frequency* | | [Hz] | 50/60 | | | | | |
| *Auxiliary supply voltage* | | [$V_{RMS/DC}$] | 21÷36, 40 VA | | | | | |
| *Max Auxiliary supply current @ 24 Vdc* | | [$A_{DC}$] | 2 | | | | | |
| *Rated input current $I_{VN}$* | | [$A_{RMS}$] | 3,8 | 5,7 | 9,4 | 13,8 | 19 | 26,5 |
| *Rated output continuous current $I_{aN}$* | | [$A_{RMS}$ ] | 3,5 | 5,3 | 8,8 | 13 | 18 | 25 |
| *Output continuous power @ U* | 110 V | [kVA] | 0.7 | 1.0 | 1.7 | 2.5 | 3.4 | 4.8 |
| | 220 V | | 1.3 | 2.0 | 3.4 | 5.0 | 6.9 | 9.5 |
| | 400 V | | 2.4 | 3.6 | 5.5 | 9 | 12.4 | 17.3 |
| | 440 V | | 2.7 | 4.0 | 6.7 | 9.9 | 13.7 | 19.1 |
| | 480 V | | 2.9 | 4.4 | 7.3 | 10.8 | 15.0 | 20.8 |
| *Overload time @ $I_{aM} = 2 \times I_{aN}$* | | [s] | 1,8 | | | | | |
| *Power dissipation (excluding brake resistor)* | | [W] | 100 | 130 | 180 | 270 | 360 | 485 |
| *Ambient temperature* | | [°C] | +5 ÷ +40 | | | | | |
| *Max ambient temperature* | | [°C] | +55 | | | | | |
| *Derating in the 40÷55 °C* | | [%/ °C] | 2,5 | | | | | |
| *Humidity (moisture not allowed)* | | [%] | max 85 | | | | | |
| *Altitude* | | [masl] | 1000 | | | | | |
| *Max altitude* | | [masl] | 2000 | | | | | |
| *Derating every 100 m in the 1000÷ 2000 m a.s.l. range* | | [%] | 1% | | | | | |

| **DGV300 Three-Phase Version** | | **Sizes** | | |
|---|---|---|---|---|
| | **M.U.** | **03/06** | **05/10** | **07/14** |
| *Power supply phase to phase rated voltage* | [$V_{RMS}$] | Three-phase 110 ÷ 230 Vac ± 10% | | |
| *Power supply frequency* | [Hz] | 50/60 | | |
| *Auxiliary supply voltage* | [$V_{DC}$] | 24 Vdc ± 15% | | |
| *Max Auxiliary supply current @ 24 Vdc* | [$A_{DC}$] | 1,5 A | | |
| *Rated input current $I_{VN}$* | [$A_{RMS}$] | 2,8 | 4,75 | 6,7 |
| *Rated output continuous current $I_{aN}$* | [$A_{RMS}$ ] | 3 | 5 | 7 |
| *Continuous output power @ 230 V* | [kVA] | 1 | 1,7 | 2,4 |
| *Overload time @ $I_{aM} = 2 \times I_{aN}$* | [s] | 1,8 | | |
| *Ambient Temperature* | [°C] | +5 ÷ +40 | | |
| *Max ambient temperature* | [°C] | +55 | | |
| *Derating in the 40÷55 °C* | [%/ °C] | 2,5 | | |
| *Humidity (moisture not allowed)* | [%] | max 85 | | |
| *Altitude* | [masl] | 1000 | | |
| *Max altitude* | [masl] | 2000 | | |
| *Derating every 100 m in the 1000÷ 2000 m a.s.l. range* | [%] | 1% | | |

| DGV300 Single-Phase Version | M.U. | Sizes 03/6 | 05/10 |
|---|---|---|---|
| *Power supply phase to phase rated voltage* | [$V_{RMS}$] | single-phase 110 ÷ 230 Vac ± 10% | |
| *Power supply frequency* | [Hz] | 50/60 | |
| *Auxiliary supply voltage* | [$V_{DC}$] | 24 Vdc ± 15% | |
| *Max Auxiliary supply current @ 24 Vdc* | [$A_{DC}$] | 1,5 A | |
| *Rated input current* $I_{VN}$ | [$A_{RMS}$] | 4,8 | 8,2 |
| *Rated output continuous current* $I_{aN}$ | [$A_{RMS}$ ] | 3 | 5 |
| *Continuous output power @ 230 V* | [kVA] | 1 | 1,7 |
| *Overload time @* $I_{aM} = 2 \times I_{aN}$ | [s] | 1,8 | |
| *Ambient Temperature* | [°C] | +5 ÷ +40 | |
| *Max ambient temperature* | [°C] | +55 | |
| *Derating in the 40÷55 °C* | [%/ °C] | 2,5 | |
| *Humidity (moisture not allowed)* | [%] | max 85 | |
| *Altitude* | [masl] | 1000 | |
| *Max altitude* | [masl] | 2000 | |
| *Derating every 100 m in the 1000÷ 2000 m a.s.l. range* | [%] | 1% | |

### *Output Current Derating*

As a general rule to calculate the derating, note that the converter output current depends on the ambient temperature, as well as the altitude for installations over 1000 m (3300 ft) above the sea level.

- Above 40 °C of ambient temperature, the converter output rated current is decreased 2,5% for every additional 1°C, e.g. with an ambient temperature of 50 °C:

$$100\% + \frac{2{,}5\%}{°C} \cdot (40°C - T_{ambient}) = 75\% \Rightarrow I_{out} = 0{,}75 \cdot I_{outRATED}$$

- At sites over 1000 m above the sea level, the output current is derated 1 % for every additional 100 m up to a maximum altitude of 2000 m (6600 ft):

$$100\% - 1\% \cdot \left(\frac{H_{m.a.s.l.}}{100m}\right) + \frac{2{,}5\%}{°C} \cdot (40°C - T_{ambient})$$

**Note.** In this case must be $T_{ambient} < 40$ °C.

If the installation site is higher than 2000 m (6600 ft) above the sea level, please contact the Customer Service for more information.

**WARNING! Using the converter in a simultaneous condition of:**

- **speed close to zero RPM**

**and**

- **rated current or greater**

**is forbidden.**

These condition would cause an irreversible breakdown of the intelligent power module.

If an usage of the converter in the above mentioned conditions is foreseen, than the converter must be oversized.

A speed value below 10 RPM is considered close to zero. In this case it is allowed only to supply 70% of the rated current.

This limitation does not obviously apply when accelerating from standstill, when stopping and in the fast speed inversions.

### *Position Transducer Signal Acquisition*

DGV Converters are able to perform signal acquisition of both resolver and sincos encoder transducer types.

*Resolever Interface*

The resolver signals provide the motor absolute position on a single turn. The DGV device makes the conversion analogue to digital of the resolver sine/cosine signals.

Autophasing is not necessary for ABB SERIES 8C standard Servomotors, while it is mandatory when using servomotors from other manufacturers.

*Sincos Encoder Interface*

Concerning sincos encoder, the transducer signals must have the following specifics:

- Input signal maximum amplitude 1.2 Vpp
- Input signal minimum amplitude 0.6 Vpp
- Bandwidth 480 kHz
- Provide two sine fast tracks of 512, 1024, 2048 pulses/turn, a zero marker and two sine slow tracks of 1 pulse/turn. The fast tracks are the signals type A and B; the DSP unit makes the A and B signals acquisition and allows a resolution of 512, 1024, 2048 pulses/turn. While the slow tracks are used for evaluating the motor absolute position and for calculating the electric angle.
- Autophasing.

### *Minimum Wire Cross Sections*

These are the wire minimum cross section for each terminal of DGV300 and DGV700 Converter front panel.

| DGV300 | Terminal | 03/06 | 05/10 | 07/14 |
|---|---|---|---|---|
| Braking resistor cable | X1 | 1.5 $mm^2$ | | |
| Motor power cable | X1 | 1.5 $mm^2$ | 2.5 $mm^2$ | |
| Power supply cable | X1 | 1.5 $mm^2$ | 2.5 $mm^2$ | |
| Auxiliary supply cable | X2 | 0.5 ÷ 1 $mm^2$ | | |
| Resolver-signals cable | X3-X6 | 0,22 $mm^2$ | | |
| Field bus cable | X4 | 0,5 $mm^2$ | | |
| Encoder emulation cable | X5 | 0,25 $mm^2$ | | |
| Control signals cable | X7 | 0.14 $mm^2$ | | |

| DGV700 | Terminal | All sizes |
|---|---|---|
| Braking resistor cable | X1 | 2.5 ÷ 4 $mm^2$ |
| Motor power cable | X1 | 4 $mm^2$ |
| Power supply cable | X1 | 4 $mm^2$ |
| Auxiliary supply cable | X1 | 1 $mm^2$ |
| Resolver-signals cable | X4-X8 | 0,22 $mm^2$ |
| Field bus cable | X2-X3 | 0,5 $mm^2$ |
| Control signals cable | X5-X6 | 0,14 $mm^2$ |
| Encoder emulation cable | X8 | 0,25 $mm^2$ |

## *Braking Resistors*

The following tables provide the electrical specifications and compatibility of the external clamp resistors to be coupled with DGV300 and DGV700 Converters.

Instructions for use of braking resistors, see Chapter 7 and 8.

### *DGV700*

Electrical specifications of the internal braking resistors.

| Size of DGV700 Converter | Electrical Specifications of the internal resistor | | | | | Notes |
|---|---|---|---|---|---|---|
| | Resistance | Rated power | Peak power and duration | | Toff | |
| | [Ω] | [W] | [W] | [sec] | [sec] | |
| 03/06 | 75 | 120 | 7000 | 0,6 | 35 | - |
| 05/10 | 75 | 120 | 7000 | 0,6 | 35 | - |
| 09/18 | 75 | 120 | 7000 | 0,6 | 35 | - |
| 13/26 | 54 | 200 | 10000 | 0,6 | 30 | - |
| 18/36 | 54 | 200 | 10000 | 0,6 | 30 | - |
| 25/50 | - | - | - | - | - | External resistors only |

Caratteristiche elettriche del resistore di frenatura esterno.

| External Resistor Type | Compatibility with DGV700 Converter Sizes | | | | | | Electrical Specifications of the external resistor | | | | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 03/06 | 05/10 | 09/18 | 13/26 | 18/36 | 25/50 | Resistance | Rated power | Peak power and duration | Toff | | Dimensions | |
| | | | | | | | [Ω] | [W] | [W] | [sec] | [sec] | [mm] | |
| UREP9375 S | x | x | x | | | | 75 | 350 | 7000 | 0,8 | 15 | 102 x 81 x 13 | [1] |
| UREP9375 M | x | x | x | | | | 75 | 500 | 7000 | 0,8 | 10,4 | 102 x 81 x 13 | [2] |
| UREP9475 S | x | x | x | | | | 75 | 350 | 7000 | 0,8 | 15 | 145 x 124 x 13 | [3] |
| UREP9475 M | x | x | x | | | | 75 | 500 | 7000 | 0,8 | 10,4 | 145 x 124 x 13 | [1] |
| UREP9575 M | x | x | x | | | | 75 | 500 | 7000 | 0,8 | 10,4 | 195 x 174 x 13 | [3] |
| UREP9575 L | x | x | x | | | | 75 | 1000 | 7000 | 0,8 | 4,8 | 195 x 174 x 13 | [2] |
| UREP9675 L | x | x | x | | | | 75 | 1000 | 7000 | 0,8 | 4,8 | 510 x 90 x 120 | [3] |
| UREP9454 S | | | | x | x | | 54 | 500 | 10000 | 0,8 | 15,2 | 145 x 124 x 13 | [1] |
| UREP9554 S | | | | x | x | | 54 | 500 | 10000 | 0,8 | 15,2 | 195 x 174 x 13 | [3] |
| UREP9554 M | | | | x | x | | 54 | 1000 | 10000 | 0,8 | 7,2 | 195 x 174 x 13 | [2] |
| UREP9654 M | | | | x | x | | 54 | 1000 | 10000 | 0,8 | 7,2 | 510 x 90 x 120 | [3] |
| UREP9754 L | | | | x | x | | 54 | 1500 | 10000 | 0,8 | 4,5 | 498 x 100 x 250 | [3] |
| UREP9538 S | | | | | | x | 38 | 500 | 16500 | 0,8 | 24,8 | 195 x 174 x 13 | [3] |
| UREP9538 M | | | | | | x | 38 | 1000 | 16500 | 0,8 | 12 | 195 x 174 x 13 | [2] |
| UREP9638 M | | | | | | x | 38 | 1000 | 16500 | 0,8 | 12 | 510 x 90 x 120 | [3] |
| UREP9738 L | | | | | | x | 38 | 2000 | 16500 | 0,8 | 5,6 | 498 x 100 x 250 | [3] |

[1] To be used fixed inside the electrical control cabinet
[2] To be used fixed on a proper dissipating element of 0,5°C/W
[3] Without dissipation limits

| Model UREP9375 | | |
|---|---|---|
| **Electrical Specifications of the External Clamp Resistor** | **Value** | **Units** |
| Compatibility with Converter Sizes | 3/6<br>5/10<br>9/18 | - |
| Power Rating **with 0,5 W/°C heat sink** | 600 | W |
| Temperature Rise @ Pr | 390 | °C |
| Max. Power without heat sink | 300 | W |
| Absorbed Energy @ 250°C ΔT | 35000 | J |
| Absorbed Energy in 5 seconds overload | 3000 | J |
| Resistance | 75 | Ω |
| Tolerance | 5 | % |
| Parasitic Capacity from 1 to 100 kHz | 90 | pF |
| Max. Working Voltage | 1000 | V |
| Thermal Time Constant | 10 | min |
| Dimensions | 102 x 81 x 13 | mm |

| Model UREP9475 | | |
|---|---|---|
| **Electrical Specifications of the External Clamp Resistor** | **Value** | **Units** |
| Compatibility with Converter Sizes | 3/6<br>5/10<br>9/18 | - |
| Power Rating **with 0,5 W/°C heat sink** | 900 | W |
| Temperature Rise @ Pr | 390 | °C |
| Max. Power without heat sink | 450 | W |
| Absorbed Energy @ 250°C ΔT | 50000 | J |
| Absorbed Energy in 5 seconds overload | 4000 | J |
| Resistance | 75 | Ω |
| Tolerance | 5 | % |
| Parasitic Capacity from 1 to 100 kHz | 110 | pF |
| Max. Working Voltage | 1000 | V |
| Thermal Time Constant | 10 | min |

***DGV300*** The braking resistor is mounted internally for all sizes. However, when the power dissipated on the internal resistor exceeds the rated power, ar external resistor is required (contact the Customer Service).

The internal resistor is short-circuit protected; an Ixt circuit limits the average power to the value shown in the table below.

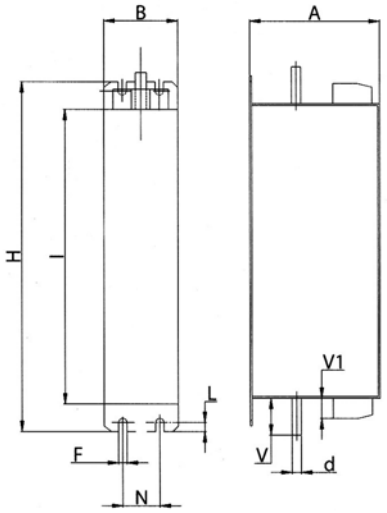
| **Size of DGV300 Converter** | **Electrical Specifications of the internal resistor** | | | | | **Notes** |
|---|---|---|---|---|---|---|
| | Resistance | Rated power | Peak power and duration | | Toff | |
| | [Ω] | [W] | [W] | [sec] | [sec] | |
| 03/06 | 56 | 110 | 2800 | 0,4 | 1,8 | - |
| 05/10 | 33 | 110 | 2800 | 0,4 | 1,8 | - |
| 07/14 | 15 | 110 | 2800 | 0,4 | 1,8 | - |

## EMC filters

ABB Sace recommends the following filters.

### Complete ordering codes

| | $I_n$ [Arms] |
|---|---|
| DGVFF000I007 | 7 |
| DGVFF000I016 | 16 |
| DGVFF000I030 | 30 |
| DGVFF000I042 | 42 |
| DGVFF000I055 | 55 |
| DGVFF000I075 | 75 |




### Overall dimensions

[mm]

| Filter | A | B | d | F | H | I | N | V | V1 |
|---|---|---|---|---|---|---|---|---|---|
| DGVFF000I007 | 100 | 90 | M6 | 5.4 | 250 | 220 | 60 | 19 | 16 (HDFK6) |
| DGVFF000I016 | 100 | 90 | M6 | 5.4 | 250 | 220 | 60 | 19 | 16 (HDFK6) |
| DGVFF000I030 | 100 | 90 | M6 | 5.4 | 250 | 220 | 60 | 19 | 16 (HDFK6) |
| DGVFF000I042 | 100 | 90 | M6 | 5.4 | 250 | 220 | 60 | 19 | 16 (HDFK6) |
| DGVFF000I055 | 100 | 90 | M6 | 5.4 | 250 | 220 | 60 | 19 | 35 (HDFK10) |
| DGVFF000I075 | 135 | 85 | M6 | 6.5 | 270 | 240 | 60 | 18.5 | 39 (HDFK25) |

### How to choose the filter

Choose the filter according to the rated input current of the converter:

$$I_{filter} \geq I_{VN}$$

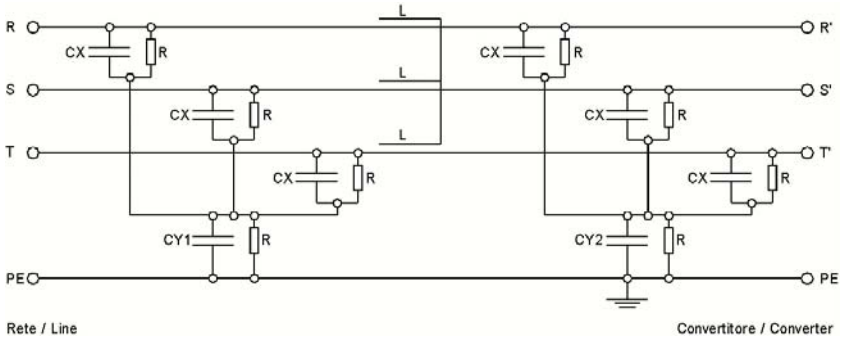
Where $I_{VN}$ is the rated input current of the converter (see electrical characteristics)

Choosing to use one filter only for more converters connected in parallel, this formulas has to be applied:

$$I_{filter} \geq (I_{VN1} + I_{VN2} + I_{VN3} + \ldots + I_{VNn}) * \text{Load factor}$$

where the “Load Factor is a number lower or equal to 1 that must be defined by the machine manufacturer.

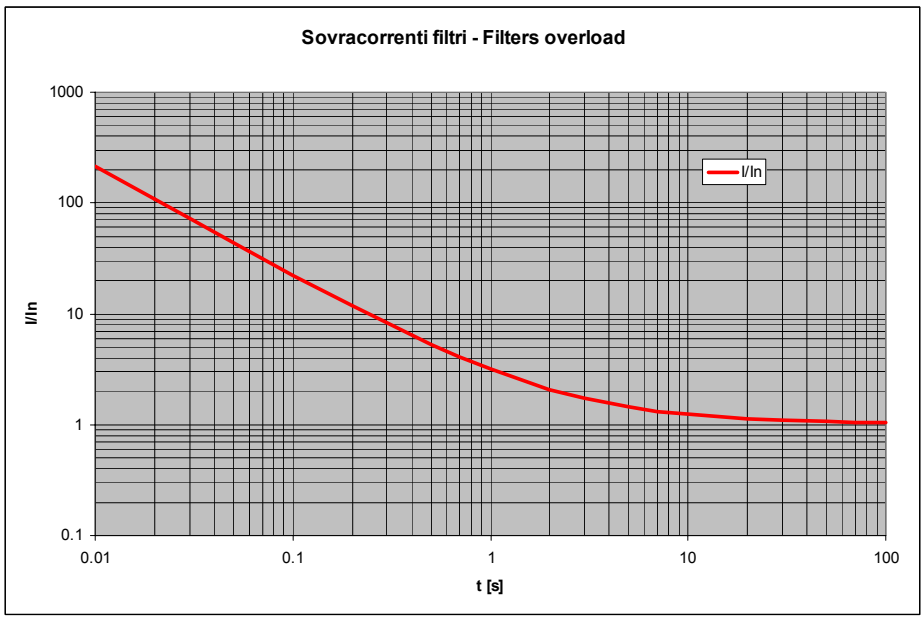
***Electrical characteristics*** The following figure reports the electrical scheme while the next tables list their electrical characteristics.




| | |
|---|---|
| Rated voltage | 0 ÷ 600 Vac |
| Frequency | 50 ÷ 60 Hz |
| Phase to phase test voltage | 2400 Vdc (2 s) |
| Phase to ground test voltage | 1800 Vac – 50 Hz (2 s) |
| Climatic class | -25 ÷ +85 °C |
| Total leakage current 230 Vac, phase to ground, 50 Hz, 40 °C | < 80 mA |

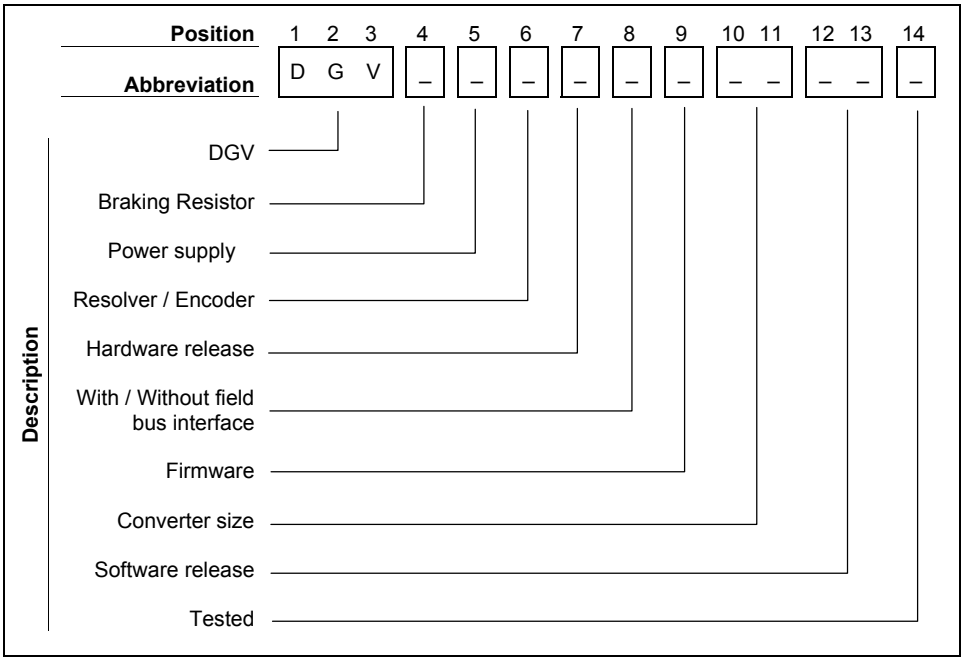
| *Filter* | Rated current [Arms] T = 40°C | Rated current [Arms] T = 50°C | ∑ Cx [µF] ± 5% | CY1 [nF] ± 5% | CY2 [nF] ± 5% | L [mH] ±10% |
|---|---|---|---|---|---|---|
| DGVFF000I007 | 8 | 7 | 15 | 1000 | 100 | 1.5 |
| DGVFF000I016 | 18 | 16 | 15 | 1000 | 100 | 1.5 |
| DGVFF000I030 | 34 | 30 | 15 | 1000 | 100 | 1.4 |
| DGVFF000I042 | 47 | 42 | 15 | 1000 | 100 | 1.3 |
| DGVFF000I055 | 60 | 55 | 15 | 1000 | 100 | 1.2 |
| DGVFF000I075 | 83 | 75 | 15 | 1000 | 100 | 1.1 |

*Overload* The following curve reports the current overload of the filters in function of the overload duration.



## *Product Type Designation*

The figure below describes DGV Converters designations.



# Chapter 10 - Selecting the Servomotor

## Introduction

Excellent performances are provided by appropriately matching the motor ratings with the converter size. This Chapter gives the reader the basic information for selecting the motor.

## Selecting the Motor

Here you can find the standard couplings of 8C Servomotors and DGV Converters. These couplings provide the best matches between motor and converter ratings in order to provide the best drive performances.

For trying different couplings, contact the Customer Service.

The operating curves here listed are reported in the “8C series motor manual” (MANUM02).

| Servo-Motor<br>400 V | DGV 700<br>Size | Stall torque<br>$M_0$ [Nm] | Current at stall torque<br>$I_0$ [A] | Peak stall torque<br>$M_{max}$ [Nm] | Current at Mmax<br>$I_{max}$ [A] | Peak torque at rated speed<br>$M_{mn}$ [Nm] | Current at Mmn<br>$I_{mn}$ [A] | Operating curve N |
|---|---|---|---|---|---|---|---|---|
| SERIE 8C | | | | | | | | |
| 8C1.1.30 | 03/06 | 1.3 | 1.4 | 4.6 | 5.5 | 4.6 | 5.5 | 50.1000 |
| 8C1.1.60 | 03/06 | 1.3 | 2.1 | 4.0 | 7 | 4.0 | 7 | 50.1001 |
| 8C1.2.30 | 03/06 | 2.5 | 2.5 | 6.4 | 7 | 6.4 | 7 | 50.1002 |
| 8C1.2.60 | 03/06 | 2.5 | 3.1 | 5.1 | 7 | 5.1 | 7 | 50.1003 |
| 8C1.3.30 | 03/06 | 3.6 | 2.4 | 9.7 | 7 | 9.5 | 6.9 | 50.1004 |
| 8C1.3.60 | 05/10 | 3.6 | 4.3 | 8.2 | 10.6 | 7.6 | 9.9 | 50.1005 |
| 8C1.4.30 | 03/06 | 4.5 | 2.8 | 10.5 | 7 | 10.5 | 7 | 50.1006 |
| 8C1.4.60 | 05/10 | 4.5 | 4.9 | 9.0 | 10.6 | 6.1 | 7.1 | 50.1007 |
| 8C4.0.15 | 03/06 | 3.9 | 1.5 | 14.0 | 5.8 | 9.3 | 3.8 | 50.1008 |
| 8C4.0.30 | 03/06 | 3.9 | 2.8 | 9.3 | 7 | 9.3 | 7 | 50.1009 |
| 8C4.1.15 | 03/06 | 7.3 | 2.5 | 18.3 | 7 | 18.3 | 7 | 50.1010 |
| 8C4.1.30 | 05/10 | 7.3 | 4.6 | 15.6 | 10.6 | 15.6 | 10.6 | 50.1011 |
| 8C4.2.15 | 03/06 | 9.6 | 3.3 | 18.9 | 7 | 18.9 | 7 | 50.1012 |
| 8C4.2.30 | 09/18 | 9.6 | 5.8 | 26.3 | 17.6 | 26.3 | 17.6 | 50.1013 |
| 8C4.3.15 | 05/10 | 11.6 | 3.9 | 29.2 | 10.6 | 29.2 | 10.6 | 50.1014 |
| 8C4.3.30 | 09/18 | 11.6 | 7.2 | 26.2 | 17.6 | 26.2 | 17.6 | 50.1015 |
| 8C4.4.15 | 05/10 | 14.1 | 4.6 | 30.2 | 10.6 | 30.2 | 10.6 | 50.1016 |
| 8C4.4.30 | 09/18 | 14.1 | 7.9 | 29.0 | 17.6 | 27.4 | 16.5 | 50.1017 |
| 8C5.0.15 | 05/10 | 12.2 | 4.2 | 28.4 | 10.6 | 28.2 | 10.5 | 50.1018 |
| 8C5.0.30 | 09/18 | 12.2 | 8 | 25.0 | 17.6 | 25.0 | 17.6 | 50.1019 |
| 8C5.1.15 | 05/10 | 16.9 | 5.3 | 31.7 | 10.6 | 31.7 | 10.6 | 50.1020 |
| 8C5.1.30 | 13/26 | 16.9 | 11 | 36.8 | 26 | 36.8 | 26 | 50.1021 |
| 8C5.2.15 | 09/18 | 21.5 | 7.5 | 46.6 | 17.6 | 46.6 | 17.6 | 50.1022 |
| 8C5.2.30 | 18/36 | 21.5 | 14.1 | 50.8 | 36 | 50.8 | 36 | 50.1023 |
| 8C5.3.15 | 09/18 | 25.8 | 8.4 | 50.1 | 17.6 | 50.1 | 17.6 | 50.1024 |
| 8C5.3.30 | 18/36 | 25.8 | 15.6 | 55.1 | 36 | 55.1 | 36 | 50.1025 |
| 8C5.4.15 | 13/26 | 30.0 | 9.8 | 73.3 | 26 | 73.3 | 26 | 50.1026 |
| 8C5.4.30 | 18/36 | 30.0 | 17.8 | 56.2 | 36 | 56.2 | 36 | 50.1027 |
| 8C5.5.15 | 13/26 | 34.1 | 11.9 | 69.1 | 26 | 69.1 | 26 | 50.1028 |
| 8C5.5.30 | 25/50 | 34.1 | 21.2 | 74.4 | 50 | 74.4 | 50 | 50.1029 |
| 8C5.6.15 | 13/26 | 38.2 | 12.5 | 74.0 | 26 | 74.0 | 26 | 50.1030 |
| 8C5.6.30 | 25/50 | 38.1 | 23.4 | 75.5 | 50 | 75.5 | 50 | 50.1031 |
| 8C7.1.20 | 25/50 | 45.0 | 21.7 | 95.9 | 50 | 95.9 | 50 | 50.1032 |
| 8C7.2.15 | 25/50 | 69.1 | 25 | 128.8 | 50 | 128.8 | 50 | 50.1033 |
| 8C7.3.10 | 25/50 | 93.5 | 25 | 174.7 | 50 | 174.7 | 50 | 50.1034 |

| Servo-Motor<br><br>230 V | DGV 700<br><br>Size | Stall torque<br><br>$M_0$ [Nm] | Current at stall torque<br><br>$I_0$ [A] | Peak stall torque<br><br>$M_{max}$ [Nm] | Current at Mmax<br><br>$I_{max}$ [A] | Peak torque at rated speed<br><br>$M_{mn}$ [Nm] | Current at Mmn<br><br>$I_{mn}$ [A] | Operating curve N |
|---|---|---|---|---|---|---|---|---|
| 8N SERIES | | | | | | | | |
| 8NB.2.40 | 03/06 | 0.36 | 0.79 | 1.0 | 2.25 | 1.0 | 2.2 | 50.1035 |
| 8N0.1.40 | 03/06 | 0.53 | 1.05 | 1.5 | 3 | 1.5 | 3.0 | 50.1036 |
| 8N0.2.40 | 03/06 | 0.95 | 1.86 | 2.7 | 5.3 | 2.7 | 5.3 | 50.1037 |
| 8C SERIES | | | | | | | | |
| 8C1.1.30 | 03/06 | 1.3 | 2.1 | 3.4 | 6 | 3.4 | 6 | 50.1064 |
| 8C1.1.30 | 05/10 | 1.3 | 2.1 | 4.6 | 8.1 | 4.3 | 7.5 | 50.1038 |
| 8C1.1.60 | 03/06 | 1.2 | 3 | 2.3 | 6 | 2.3 | 6 | 50.1065 |
| 8C1.1.60 | 05/10 | 1.3 | 3.2 | 3.9 | 10.6 | 3.1 | 8.4 | 50.1039 |
| 8C1.2.30 | 03/06 | 2.5 | 3 | 4.6 | 6 | 4.6 | 6 | 50.1066 |
| 8C1.2.30 | 05/10 | 2.5 | 3.1 | 7.9 | 10.6 | 6.6 | 8.8 | 50.1040 |
| 8C1.2.60 | 05/10 | 2.5 | 5 | 4.7 | 10 | 3.4 | 7.2 | 50.1067 |
| 8C1.2.60 | 05/10 | 2.5 | 5 | 4.9 | 10.6 | 3.4 | 7.2 | 50.1041 |
| 8C1.3.30 | 05/10 | 3.6 | 4 | 8.4 | 10 | 8.2 | 9.8 | 50.1068 |
| 8C1.3.30 | 05/10 | 3.6 | 4 | 8.8 | 10.6 | 8.2 | 9.8 | 50.1042 |
| 8C1.3.60 | 09/18 | 3.6 | 7.9 | 7.5 | 17.6 | 7.5 | 17.6 | 50.1043 |
| 8C1.4.30 | 05/10 | 4.5 | 4.9 | 8.5 | 10 | 8.5 | 10 | 50.1069 |
| 8C1.4.30 | 05/10 | 4.5 | 4.9 | 9.0 | 10.6 | 9.0 | 10.6 | 50.1044 |
| 8C1.4.60 | 13/26 | 4.5 | 9.2 | 11.7 | 26 | 11.0 | 24.2 | 50.1045 |
| 8C4.0.15 | 03/06 | 3.9 | 2.9 | 7.4 | 6 | 7.4 | 6 | 50.1070 |
| 8C4.0.15 | 05/10 | 3.9 | 2.9 | 12.8 | 10.6 | 12.8 | 10.6 | 50.1046 |
| 8C4.0.30 | 05/10 | 3.9 | 4.8 | 7.6 | 10 | 7.6 | 10 | 50.1071 |
| 8C4.0.30 | 05/10 | 3.9 | 4.8 | 8.1 | 10.6 | 8.1 | 10.6 | 50.1047 |
| 8C4.1.15 | 05/10 | 7.3 | 4.4 | 15.6 | 10 | 15.6 | 10 | 50.1072 |
| 8C4.1.15 | 05/10 | 7.3 | 4.4 | 16.5 | 10.6 | 16.5 | 10.6 | 50.1048 |
| 8C4.1.30 | 09/18 | 7.3 | 7.5 | 15.9 | 17.6 | 15.4 | 17.1 | 50.1049 |
| 8C4.2.15 | 05/10 | 9.6 | 4.8 | 18.9 | 10 | 13.8 | 7.2 | 50.1073 |
| 8C4.2.15 | 05/10 | 9.6 | 4.8 | 19.9 | 10.6 | 13.8 | 7.2 | 50.1050 |
| 8C4.2.30 | 13/26 | 9.6 | 9.3 | 24.6 | 26 | 16.1 | 16.7 | 50.1051 |
| 8C4.3.15 | 09/18 | 11.6 | 6.8 | 27.2 | 17.6 | 27.2 | 17.6 | 50.1052 |
| 8C4.3.30 | 13/26 | 11.6 | 12.6 | 22.4 | 26 | 22.4 | 26.0 | 50.1053 |
| 8C4.4.15 | 13/26 | 14.1 | 7.5 | 44.4 | 26 | 34.4 | 19.9 | 50.1054 |
| 8C4.4.30 | 18/36 | 14.1 | 14.3 | 32.2 | 36 | 32.2 | 36.0 | 50.1055 |
| 8C5.0.15 | 13/26 | 12.2 | 8 | 35.4 | 26 | 34.7 | 25.4 | 50.1056 |
| 8C5.0.30 | 18/36 | 12.2 | 13 | 30.3 | 36 | 27.1 | 32.1 | 50.1057 |
| 8C5.1.15 | 13/26 | 16.9 | 10 | 40.3 | 26 | 40.3 | 26.0 | 50.1058 |
| 8C5.1.30 | 18/36 | 16.9 | 17 | 33.2 | 36 | 29.9 | 32.3 | 50.1059 |
| 8C5.2.15 | 18/36 | 21.5 | 13.2 | 53.9 | 36 | 53.9 | 36.0 | 50.1060 |
| 8C5.2.30 | 25/50 | 21.5 | 21.1 | 47.2 | 50 | 35.4 | 37.1 | 50.1061 |
| 8C5.3.15 | 25/50 | 25.8 | 16.9 | 70.1 | 50 | 70.1 | 50.0 | 50.1062 |
| 8C5.3.30 | 25/50 | 25.8 | 25 | 47.5 | 50 | 47.4 | 49.9 | 50.1063 |

| **Servomotor**<br><br>**230 V** | **DGV300**<br><br>**Size** | **Stall Torque at zero speed**<br>$M_0$<br>[Nm] | **Peak Torque at zero speed**<br>$M_{max}$<br>[Nm] | **Rated Torque at rated speed**<br>$M_n$<br>[Nm] | **Rated speed**<br><br>$n_N$<br>[rpm] |
|---|---|---|---|---|---|
| SERIE SDM | | | | | |
| SDM 251…0N3-55 | 03/06 | 0.34 | 1.3 | 0.32 | 6000 |
| SDM 251…0N5-55 | 03/06 | 0.5 | 1,7 | 0.48 | 6000 |
| SDM 251…1N0-55 | 03/06 | 0,94 * | 1,8 | 0.71 | 6000 |
| SERIE 8N | | | | | |
| 8NB.2.40… ..E | 03/06 | 0,36 | 1 | 0,34 | 4000 |
| 8N0.1.40… ..E | 03/06 | 0,53 | 1,5 | 0,47 | 4000 |
| 8N0.2.40… ..E | 03/06 | 0,95 | 2,7 | 0,84 | 4000 |
| SERIE 8C | | | | | |
| 8C1.1.30... ..E | 03/06 | 1,3 | 3,4 | 4,3 | 3000 |
| 8C1.1.60... ..E | 03/06 | 1,2 | 2,2 | 3,6 | 6000 |
| 8C1.2.30... ..E | 03/06 | 2,5 | 4,4 | 7,4 | 3000 |
| 8C1.2.60... ..E | 05/10 | 2,5 | 4,5 | 5,0 | 6000 |
| 8C1.3.30... ..E | 05/10 | 3,6 | 8,2 | 8,2 | 3000 |
| 8C1.4.30... ..E | 05/10 | 4,5 | 8,2 | 9,1 | 3000 |
| 8C4.0.15... ..E | 03/06 | 3,9 | 7,2 | 12,0 | 1500 |
| 8C4.0.30... ..E | 05/10 | 3,9 | 7,4 | 8,2 | 3000 |
| 8C4.1.15... ..E | 05/10 | 7,3 | 15,1 | 16,8 | 1500 |
| 8C4.2.15... ..E | 05/10 | 9,6 | 18,2 | 17,5 | 1500 |

* The motor nominal torque (1 Nm) is limited from the nominal drive current.

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# *Appendix A - Ambient Conditions*

## *Operating Conditions*

Operating conditions refer to the conditions the DGV device is subjected to when installed and commissioned.

| | |
|---|---|
| **Mechanical Installation** | As prescribed in the *Installation Manual* of DGV Converters, *Chapter 3 - Mechanical Installation* |
| **Electrical Installation** | As prescribed in the *Installation Manual* of DGV Converters, *Chapter 7 - Electrical Installation of DGV700* and *Chapter 8 - Electrical Installation of DGV300* |
| **EMC Compliance** | As prescribed in the *Installation Manual* of DGV Converters, *Chapter 6 - Installation Guidelines* |
| **Protection Degree** | As prescribed in the *Installation Manual* of DGV Converters, *Chapter 6 - Installation Guidelines* |
| **Air Temperature** | 0 to + 40 °C; + 40 to max. + 55 °C with derating of 2,5 %/°C |
| **Relative Humidity** | Maximum 85 %, no condensation allowed |
| **Installation Altitude** | 0 to 1000 m.s.l.m.; 1000 to max. 2000 m.s.l.m. derating of 1% / 100 m. |
| **Vibrations** | Not allowed. Vibration insulation devices must be adopted. |
| **Shock** | Not allowed. Shock reduction or elimination methods must be adopted. |

## *Storage Conditions*

Storage conditions refer to the conditions the DGV device is subjected to during storage in the protective package.

| | |
|---|---|
| **Temperature** | – 25 to + 55 °C. For short periods not exceeding 24h, up to +70 °C |
| **Relative Humidity** | Maximum 85 %, no condensation allowed |
| **Vibrations** | Not allowed. |
| **Shock** | Not allowed. |

## *Transportation Conditions*

Transportation conditions refer to the conditions the device is subjected to during transportation in the protective package.

| | |
|---|---|
| **Temperature** | – 25 to + 55 °C. For short periods not exceeding 24h, up to +70 °C |
| **Relative Humidity** | Maximum 85 %, no condensation allowed |
| **Vibrations** | Tolerated only with the converter in its original untouched packing. |
| **Shock** | Tolerated only with the converter in its original untouched packing. |

DGV
MANIU20.0410 E

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