DF1

Digital Servo Amplifier

Installation Manual

02/2012 Edition

The historical evolution of the document is resumed by the following table:

Edition	Remarks
09/02/2012	Issuing

Indice generale

1   Introduction

The DF1 digital amplifier *brushless synchronous servomotors* and can be supplied from 3-phase at 230/400 VAC, 50/60 Hz. In its standard version it is equipped with CANopen field bus, incremental encoder, digital inputs and outputs, two slots for optional expansion cards are available.

1.1 Manual

The digital amplifiers are devices powered by dangerous high voltages designed to control electric motors installed in equipment with axes in motion. This manual contains instructions for installing and handling them safely. Read this manual carefully before taking any action concerning the device.

RISK OF ELECTRICAL TYPE INJURY. Indicates a hazardous situation that, if not avoided, can result in death or in serious and permanent injuries. Do not work on the device if the voltage is connected. Wait at least 5 minutes, after disconnecting the servo amplifier from the mains power supply, before touching the device.

GENERAL HAZARD. Indicates a hazardous situation that, if not avoided, can result in death or serious and permanent injuries

RISK OF BURNS. Due to the hot surfaces of the metal case.

1.2 Warnings

Do not open or touch the equipment while it is running or if the power supply is connected. On the equipment may be present:

- voltage even though the motor is not rotating
- temperature above 75°C

Warning: Read this documentation before installing and commissioning the DF1 digital amplifiers.
An incorrect use or handling of the digital amplifier may cause damage or injury.
Follow the instructions of connection, commissioning and maintenance. Permit to carry out these activities only qualified technicians who have the appropriate qualifications for conducting such activities

The company uses the product must produce a risk assessment and takes appropriate measures to ensure that unforeseen movements do not result in material damage or personal injury.

The servo amplifiers contain electrostatically sensitive components which may be damaged by these phenomena. It's important to follow all the precautions in order to not produce discharge when handling the product. Observe the following guidelines:

•   discharge its electrostatic charge before handling the servo amplifier;
•   avoid contact with highly insulating materials as plastic materials or synthetic fabrics;
•   place the servo amplifier on a conductive surface.

2   Directives

The EMC Directive 2004/108/EC and Low Voltage Directive 2006/95/EC are mandatory for the supply of servo drives within the European Community. Concerning noise immunity the servo amplifier meets the environmental requirements of the 2nd category (industrial environment).
For the noise emission, the servo amplifier meets the requirement of a product with limited availability of category C2 (motor cable length up to 10m).

In a domestic environment this product can cause high frequency noise which require the adoption of preventive measures

With a motor cable longer than 10 m, the servo amplifier meets the requirements of category C3 environment.
The servo amplifier has been tested by an authorized testing laboratory in a defined configuration, using the components of the system described in this documentation.
Any difference from the configuration and installation described in this document assumes the burden of new measurements to ensure compliance with regulatory requirements.

The servo amplifiers are components designed for integration into systems and electric machines for industrial use. When the servo amplifiers are built into machines or equipment, the intended use of the servo amplifier is prohibited until it has been established that the machine or equipment meets the requirements of the

• EC Machinery Directive (98/37/CE)
• EC EMC Directive (2004/108/EC)
• EC Low Voltage Directive (2006/95/EC)

The following rules must be applied in accordance with Directive 98/37/EC

EN 60204-1:2007 (Safety and Electrical Equipment in Machines)
EN 12100:2010 (Safety of Machines)

The machine manufacturer must produce a risk analysis for the machine and must implement appropriate measures to ensure that unforeseen movements cannot cause injury or damage to persons or property.
The following rules must be applied in accordance with Directive 2006/95/EC:

EN 60204-1 (Safety and Electrical Equipment in Machines)
EN 60439-1 (Low-voltage switchgear and controller assemblies)

The following rules must be applied in accordance with Directive 2004/108/CE:

EN 61000-6-1/-2 (Interference Immunity in Residential & Industrial Areas)
EN 61000-6-3/-4 (Interference Generation in Residential & Industrial Areas)

The manufacturer of the machine/equipment shall ensure that such machine/equipment is within the limits required by EMC regulations. Tips on correct EMC installation (such as shielding, grounding, treatment of connectors and wiring provisions) are also contained in this documentation.
The manufacturer of the machine/equipment must verify the need for application of other standards or EC directives to this machine / at this facility.
We guarantee the conformance of the servo system only to the rules mentioned here if the components used are those supply by us (motor, cables, chokes, and so on).

3 Rules for the use of the product

3.1 Transport

In order to not damage or avoid a product failure is required to follow the following rules:

•   The transport must be made by qualified personnel and in original packaging.

•   Avoid shocks or excessive pressure on the packaging

During transport the temperature must be between -20 ° C and +75 ° C, max.rate of change 20 ° C / h

•   Relative humidity max. 95%, noncondensing

•   Avoid electrostatic discharge. Discharge its electrostatic charge before handling the servo amplifier; avoid contact with highly insulating materials as plastic materials or synthetic fabrics; place the servo amplifier on a conductive surface.

•   In case of visible damage to the packaging, check the unit for visible damage and notify the shipper and the manufacturer.

3.2 Storage

• Only the original manufacturer's packaging
• Storage temperature -20 ° C +75 ° C
• Storage relative humidity max. 95%, noncondensing

4   Technical characteristics

The servo amplifier DF1 has been designed to drive brushless sinusoidal servomotors. The DSP digital architecture allows to handle a fieldbus and to control the motor in its main variables: power, speed, position. The device can also be driven by a differential analog input.

4.1   Servo amplifier TBS3

The hardware interface, in the standard version, includes the following devices:
- 5 opto-isolated digital inputs.
- 2 inputs for disabling security STO A, STO B (under approval)
- 3 opto-isolated digital outputs.
- 1 Drive OK relay
- CANopen interfacing
- RS232 interface, protocol Modbus RTU, gateway RS232/CAN (including in the CANopen)
- Motor feedback input
- Electromechanical motor brake control
- Management of braking circuit with internal or external braking resistor.

The device is supplied of two slots for expansion cards.

Power supply
The DF1 Servo amplifier must be powered by: a 24V auxiliary voltage for operation of control circuits, of electromechanical brakes and of ventilation (if present) and by 3-phase grounded current at 230/400 VAC, 50/60 Hz
All shielding connections are made directly to the amplifier.
Output Stage: IGBT module with insulated current measurement on the motor phases. Protection against overcurrent.

Operation and parameter setting
TKSED software allows you to communicate with the amplifier through ModBus RTU RS-232. Through the interface you can configure the product completely, save and load a configuration of parameters and update the firmware of the amplifier.

Control
The control is full-digital, internally the three control loops (power, speed and position) can be managed.The insertion of one or more control loops is determined by the used operating mode.

4.2 Technical data

TECHNICAL DATA				
RATED SUPPLY VOLTAGE	V	3x230-10% . . 3x400+10%		
SIZES		**3**	**6**	**12**
OUTPUT RATED CURRENT	A	3	6	12
PEAK OUTPUT CURRENT@5s	A	6	12	24
RATED INPUT POWER	kVA	1,8	3,7	7,4
RATED OUTPUT CURRENT	kW	1,30	2,59	5,75
THERMAL DISSIPATION AT RATED CURRENT	W	30	70	120
THERMAL DISSIPATION, OUTPUT STAGE DISABLED	W	10		
SWITCHING FREQUENCY OF OUTPUT STAGE (DEFAULT VALUE)	KHz	10		

TECHNICAL DATA			
RATED SUPPLY VOLTAGE	V	3x230-10% . . 3x400+10%	
SIZES		**30/60**	**42/84**
OUTPUT RATED CURRENT	A	30	42
PEAK OUTPUT CURRENT@5s	A	60	84
RATED INPUT POWER	kVA	18	26,1
RATED OUTPUT CURRENT	kW	14,3	20,1
THERMAL DISSIPATION AT RATED CURRENT	W	350	450
THERMAL DISSIPATION, OUTPUT STAGE DISABLED	W	15	
SWITCHING FREQUENCY OF OUTPUT STAGE (DEFAULT VALUE)	KHz	5	

ENVIRONMENTAL DATA						
SIZES		**3/6**	**6/12**	**12/24**	**30/60**	**42/84**
STORAGE TEMPERATURE	°C	-20°C +75°C				
AMBIENT CONDITIONS		Pollution level 2 Max ambient temperature in operation: 40°C under rated conditions, 45°C with power derating2,5%/°C Min ambient temperature in operation: 0°C Storage temperature: -20°C to 75°C Site altitude without restriction: 1000 m with power derating 2% / 100m > 1000m Rel. humidity: 10% to 85% - without condensation Vibrations: 2g, 10 Hz a 2000 H				
ENCLOSURE PROTECTION		IP20				
POLLUTION LEVEL		2 as per IEC 60664-1, 2.5.1				

BRAKE CIRCUIT					
SIZES		3A,6A	12A	30A	42A
DC-LINK CAPACITANCE	µF	280	500	2460	N.A.
SUPPLY VOLTAGE	V	3x230±10%			
SWITCH-ON THRESHOLD OF BRAKE CIRCUIT	V	390			
OVERVOLTAGE	V	420			
SUPPLY VOLTAGE	V	3x400±10%			
SWITCH-ON THRESHOLD OF BRAKE CIRCUIT	V	720			
OVERVOLTAGE	V	800			
INTERNAL BRAKE RESISTOR	Ω	100	50	-	N.A.
CONTINUOS POWER INTERNAL BRAKE RESISTOR	W	25	50	-	N.A.
PULSE BRAKE POWER(0,5s)	KW	5	10	-	N.A.
MAX PULSE BRAKE POWER	KW	6	15,7	20	N.A.
EXTERNAL BRAKE RESISTOR(*)	Ω	≥66	≥33	≥12,5	N.A.
CONTINUOS POWER EXTERNAL BRAKE RESISTOR	W	1000	1500	5000	N.A.

* optional

4.3 Fusing

Input Circuit	Internal fuse
24V / Brake resistor, fan	4AM
STO A/B enable	2AM

Fuses:

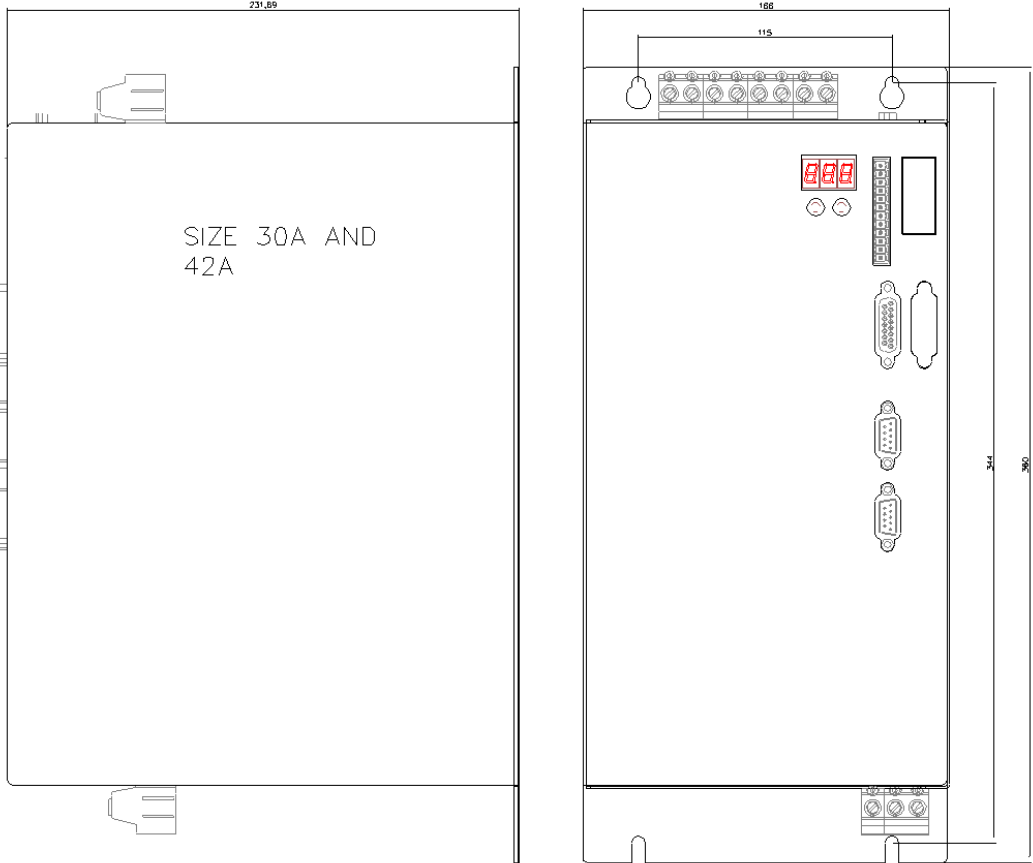| Circuit	Fuses				
SIZES	3/6	6/12	12/24	30/60	42/84
AC supply feed	6AT	10AT	16AT	40A	50A
24V	4AT			6AT	

Type: gS. >The gS class is defined by standard IEC 60269-4 Ed. 4.0, 2006.
T= time-delay fuse.

4.4   Mechanical data

Dimensions of 3/6A, 6/12A and 12/24A sizes.

SIZE 12A

SIZE UP to 6A
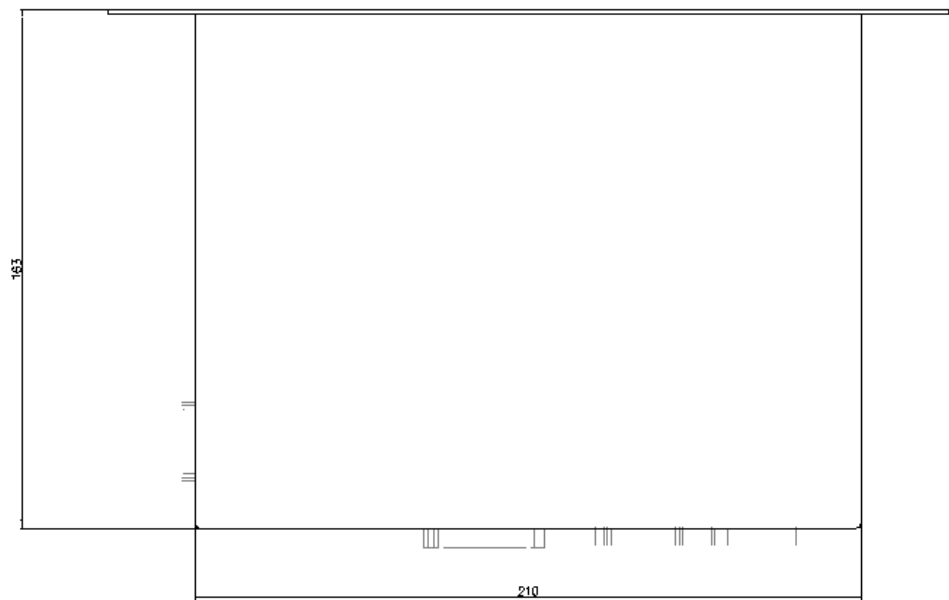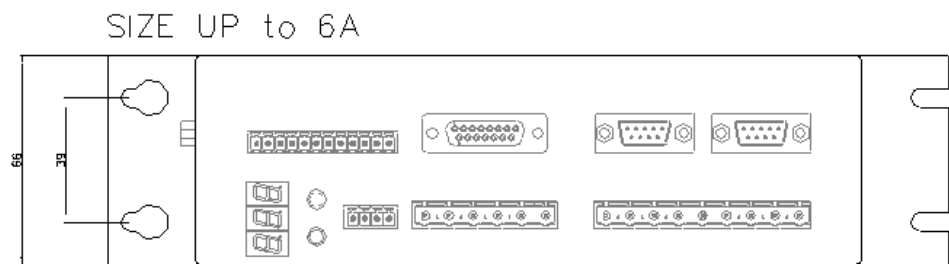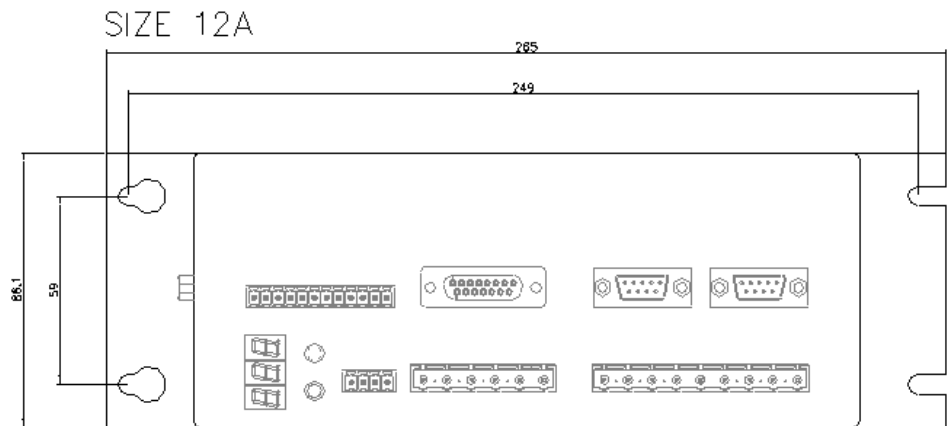
Dimensions of 30/60A and 42/84A sizes.

SIZE 30A AND
42A

5   Installation

5.1   Preliminary notes

The DF1 amplifier must be put into operation as an integrated component of a machine or equipment. The following guidelines are intended to help a qualified person through the installation and wiring of the amplifier.

Safety guidelines

This manual is intended solely for:
person with technical knowledge in the handling of elements sensitive to electrostatic discharge (for transportation);
person with adequate technical training and extensive knowledge on electrical engineering and amplifier technology (for the operation and use).

Caution: the misuse of the product can cause damage to persons or property. Absolutely and strictly observed:
The technical data and indications of link conditions;
- As prescribed by the manual;
- The relevant safety and accident prevention regulations for the prevention of accidents and residual risks

The installer must know and observe the following standards:
IEC 364 and CENELEC HD 384 or DIN VDE 0100,
IEC report 664 or DIN VDE 0110;
The national accident prevention regulations or BGV A2

The user must produce a risk analysis for the machine and must implement appropriate measures to ensure that unforeseen movements cannot cause injury or damage to persons or property.

The servo amplifiers contain electrostatically sensitive components which may be damaged by incautious handling, it is necessary to discharge any static electricity from body before touching the servo amplifier and avoid contact with highly insulating materials (plastic materials, synthetic fabrics, etc.).

Servo amplifiers may have hot surfaces during operation, it is necessary to protect the user from accidental contact.

The electrical contacts of the servo amplifiers must never be loose under tension. This could lead to failure the electronic system. The appropriate contacts of the product must always be grounded in accordance with the instructions of this manual.

Access to the servo amplifier can only take place after at least 5 minutes after its disconnection. Isolate the converter from the main supply before you access it (by removing the fuses or disconnecting the main power switch). For this operation place the converter on an external plane from the original installation place.
All control and power may be live, even though the motor is not rotating

The DF1 is equipped with a series of electrical protections that will turn them down in faults presence, in this case the motor is not controlled, ie it can stop or rotate for an inertia and for a time determined by the type of machine.

Safeguard the device from excessive mechanical vibration.

Dissect always via remote control switch or remote-control switch all power supply phases of the product.
In the case of 3-phase power supply interrupt L1, L2 and L3; in the case of single phase power supply interrupt L2 and N

Environmental conditions
Ensure a range of the operating temperature, at rated current, from 0 ° C to +45 ° C (without derating).
From +45 ° C to +55 ° C the output current and the nominal peak of the must be derated of 2.5% / ° C.
From 1000m to 2500m above sea level the output current of the system must be derated of 1.5% for every 100m.
Ensure a level of humidity between 10% and 95%, non-condensing.
Make sure that there is sufficient forced or natural ventilation within the control cabinet
Ensure around the converter a space of at least 15mm from each side.
In case of installation in a cabinet, periodically check and clean its external sides and its fan to avoid dust or dirt which may prejudice the correct dissipation.
Ensure that the grounding of the device is performed to perfection.
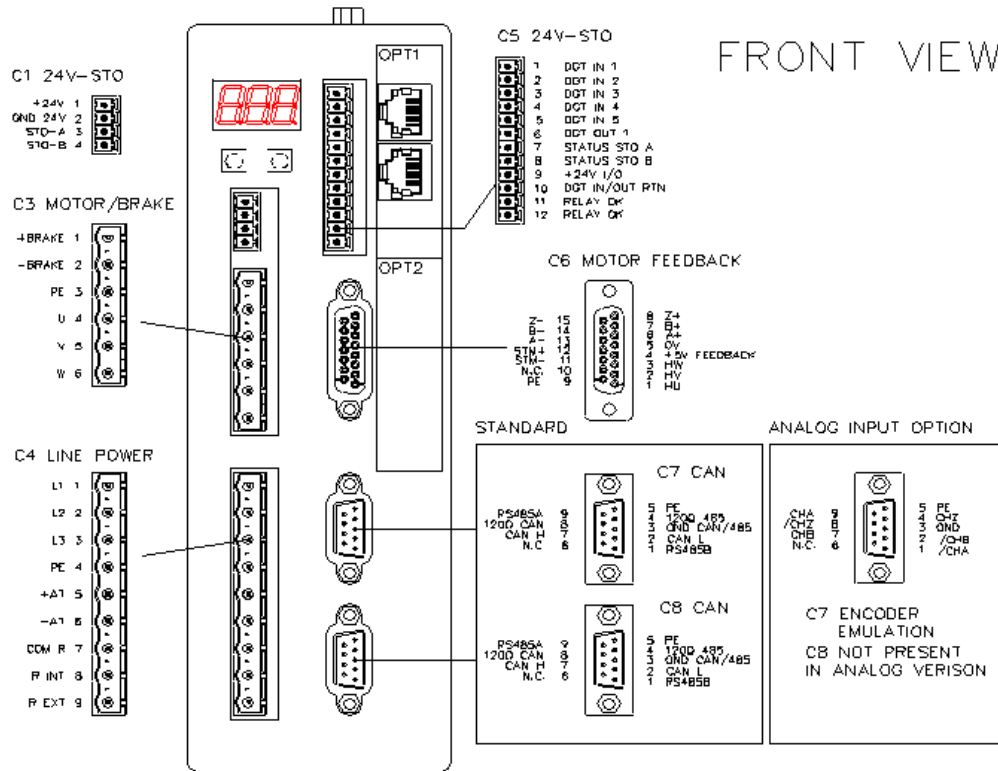
5.2 Wiring

The ground symbol ⌁ that lies in the wiring diagrams indicates that you must provide an electrically conductive connection as robust as possible (large surface area) between the circuit indicated and grounding bar or metal plate mounting in the cabinet. This connection is designed to allow the dispersion of high frequency noise and must not be confused with the symbol ⏚ (PE, Protection Earth) shown in the diagrams of this manual as a protection connection (according to European Standard EN60204).

CONNECTOR C1		
PIN	**PIN**	**DESCRIZIONE**
	Ground	
2	PE Protection Earth	Ground of auxiliary supply

6   Connections

FRONT VIEW

C1 24V-STO
+24V 1
GND 24V 2
STO-A 3
STO-B 4

C3 MOTOR/BRAKE
+BRAKE 1
-BRAKE 2
PE 3
U 4
V 5
W 6

C4 LINE POWER
L1 1
L2 2
L3 3
PE 4
+AT 5
-AT 6
COM R 7
R INT 8
R EXT 9

OPT1

OPT2

C5 24V-STO
1 DGT IN 1
2 DGT IN 2
3 DGT IN 3
4 DGT IN 4
5 DGT IN 5
6 DGT OUT 1
7 STATUS STO A
8 STATUS STO B
9 +24V I/O
10 DGT IN/OUT RTN
11 RELAY OK
12 RELAY OK

C6 MOTOR FEEDBACK
Z- 15
B- 14
A- 13
RTN+ 12
STM- 11
N.C. 10
PE 9
Z+ 8
B+ 7
A+ 6
0V 5
+5V FEEDBACK 4
HW 3
HV 2
HU 1

STANDARD

C7 CAN
RS485A 9
120Ω CAN 8
CAN H 7
N.C. 6
5 PE
4 120Ω 485
3 GND CAN/485
2 CAN L
1 RS485B

C8 CAN
RS485A 9
120Ω CAN 8
CAN H 7
N.C. 6
5 PE
4 120Ω 485
3 GND CAN/485
2 CAN L
1 RS485B

ANALOG INPUT OPTION

CHA 9
/CHZ 8
CHB 7
N.C. 6
5 PE
4 CHZ
3 GND
2 /CHB
1 /CHA

C7 ENCODER EMULATION
C8 NOT PRESENT IN ANALOG VERISON

TOP VIEW

WITH BACK-UP OPTION

C9 BACK-UP
1
2
GND BACK-UP 3
+24 BACK-UP 4

WITH ANALOG INPUT OPTION

C9 ANALOG
ANALOG-IN 1+ 1
ANALOG-IN 1- 2
AGND 3
AGND 4

C2 RS232
N.C.
RXD
TXD
N.C.
GND
1
2
3
4
5

Connectors for up to 12/24A size.

TYPE	DESCRIPTION	MODEL	MAX CROSS SECTION
C1	24V-DC/STO A-B	MINI COMBICON, MC 1.5/4-G-3,81	1,5mm^2
C2	RS232	D-SUB 9 pins male	0,5mm^2
C3	Motor	COMBICON POWER, HC/6-G-7.62	2,5mm^2
C4	AC Connection	COMBICON POWER, HC/9-G-7.62	2,5mm^2
C5	Input/output signals	MINI COMBICON, MC 1.5/12-G-3,81	1,5mm^2
C6	Motor Feedback	D-SUB 15 pins femmina	0,5mm^2
C7	Can (opt. Analog Input)	D-SUB 9 pins femmina	0,5mm^2
C8	Can	D-SUB 9 pins femmina	0,5mm^2
C9	Back-Up/Analog Input	MINI COMBICON, MC 1.5/4-G-3,81	1,5mm^2

Connectors for 30/60A and 42/84A sizes.

TYPE	DESCRIZIONE	MODEL	MAX CROSS SECTION
C1	24V-DC/STO A-B	COMBICON, MSTB-2,5/4-GF-5,08	1,5mm^2
C2	RS232	D-SUB 9 pins male	0,5mm^2
C3	Motor	HDFK 10	10mm^2
C4	AC Connection	HDFK 10	10mm^2
C5	Input/output signals	MINI COMBICON, MC 1.5/12-G-3,81	1,5mm^2
C6	MotorFeedback	D-SUB 15 pins female	0,5mm^2
C7	Can (opt. Analog Input)	D-SUB 9 pins female	0,5mm^2
C8	Can	D-SUB 9 pins female	0,5mm^2
C9	Back-Up/Analog Input	MINI COMBICON, MC 1.5/4-G-3,81	1,5mm^2
C10	Electromechanical Brake	COMBICON, MSTB-2,5/2-GF-5,08	2,5mm^2

6.1 24V / STO A-B (C1) Connection

The C1 connector includes the power supply (24VDC required) and the safety inputs STO STO-A and-B.

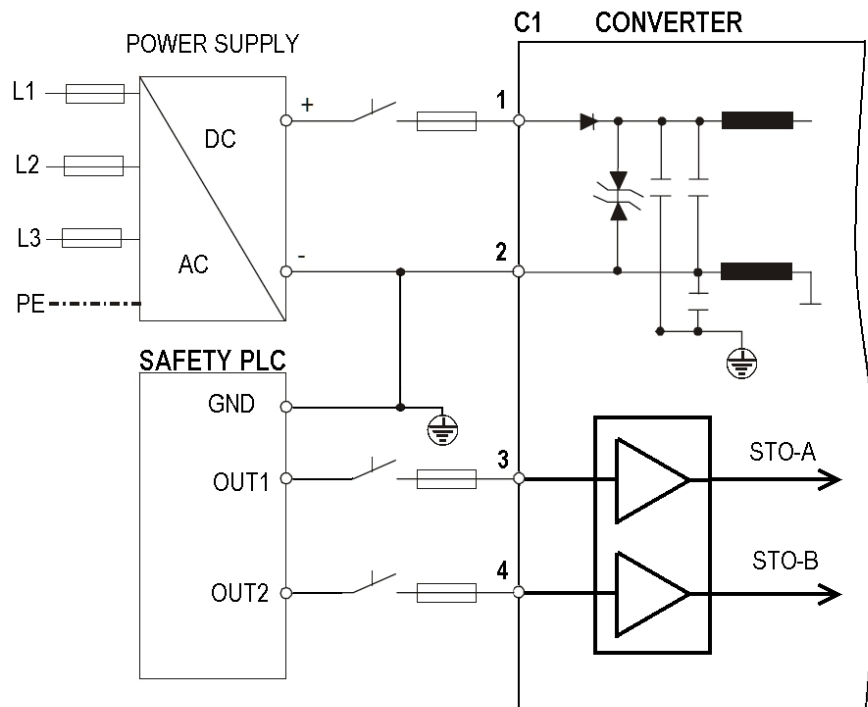| C1 Connector		
PIN	**PIN**	**Description**
1	+24V	Auxiliary power supply
2	GND	Ground of the auxiliary power supply
3	STO-A	Safety input "Safe Torque Off A" (see note below)
4	STO-B	Safety input "Safe Torque Off B" (see note below)

⚠️

VERY IMPORTANT NOTE
Inputs for redundant management Safe Torque Off
The circuit is in the stage of approval; at the moment the manufacturer cannot be held responsible for any use for security functions.

The servo amplifier cannot be enabled if these inputs are leaved disconnected, in this case the motor will remain without torque and if it is rotating, it will stop for inertia.
Is mandatory to drive the STO inputs only when the servo amplifier is disabled

If you do not intend to use the safe inputs STO-A and STO-A just connect them directly to connector 1 of C1 (see diagram below).
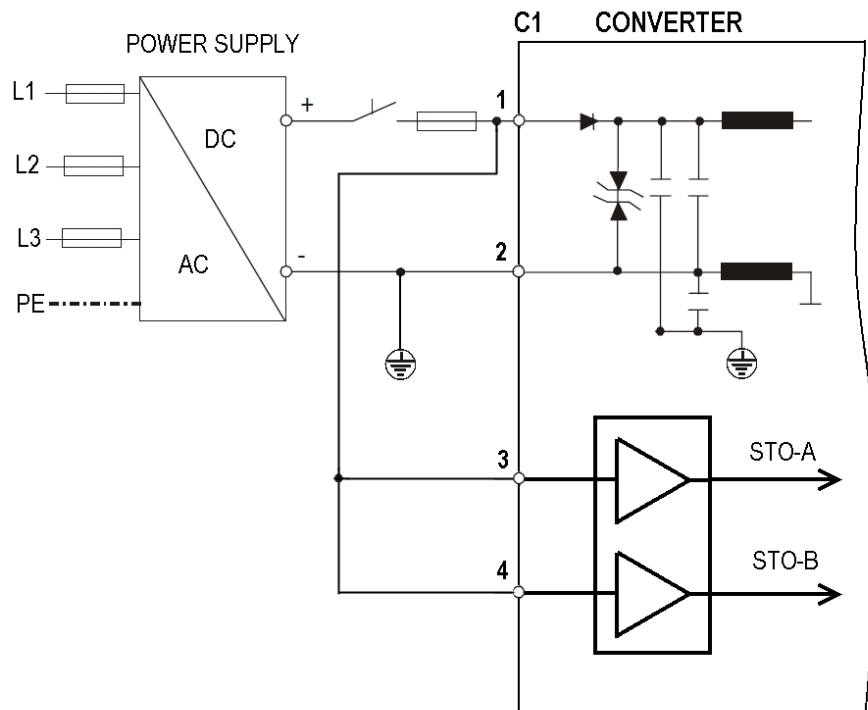
6.2 RS232 interface, PC connection (C2)

The setting of all parameters can be made by the commissioning software running on a personal computer (PC).
The device is electrically isolated, however, **is required to connect and disconnect the PC interface (C2) only with the servo amplifier supply voltages switched off** via a null modem cable (see figure)

PIN	NAME	DESCRIPTION
— C2 CONNECTOR		
1	N.C.	-
2	RxD	Input RS232
3	TxD	Output RS232
4	N.C.	-
5	GND	Ground RS232
6	N.C.	-
7	N.C.	-
8	N.C.	-
9	N.C.	-
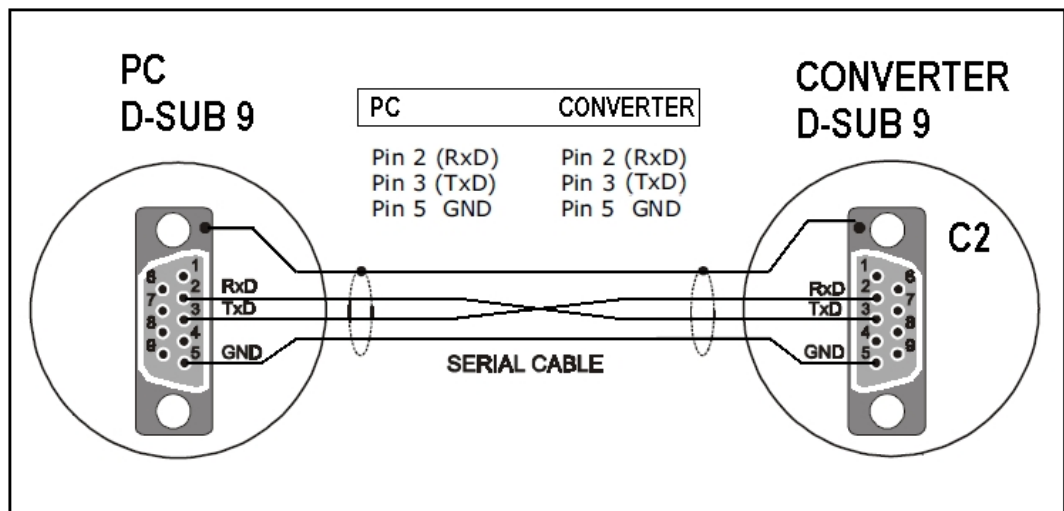
6.3 Connection of motor and holding brake

The servo amplifier motor-holding brake connection must be done using shielded cable. The shield must be connected at both ends. One side must be connected to the case of the motor that must be connected to the ground network. The other end should be connected to C3 / 3 (PE) or directly to the case of the servo amplifier.

The servo amplifier allows to automatically manage the electromechanical motor brake (if present)
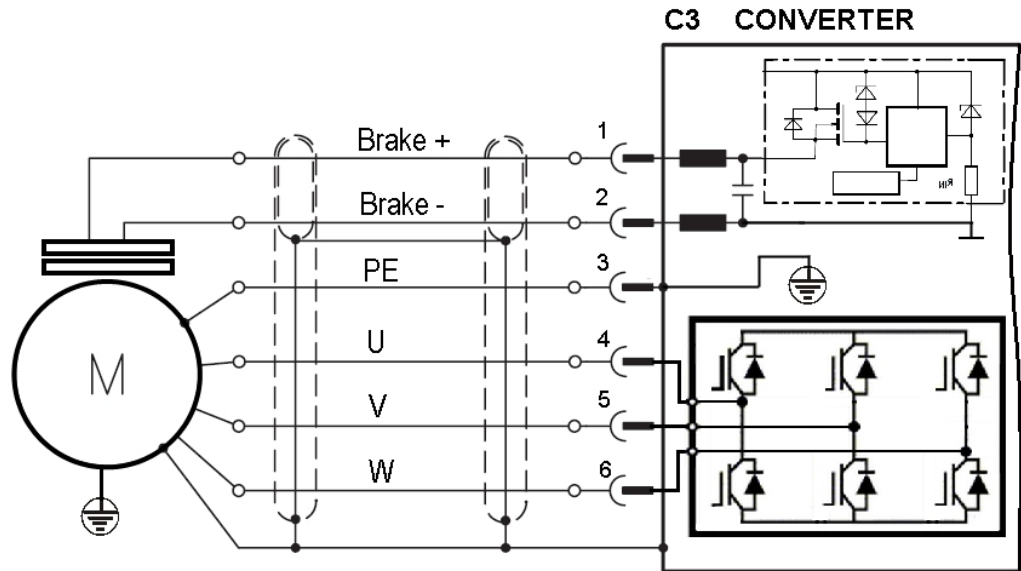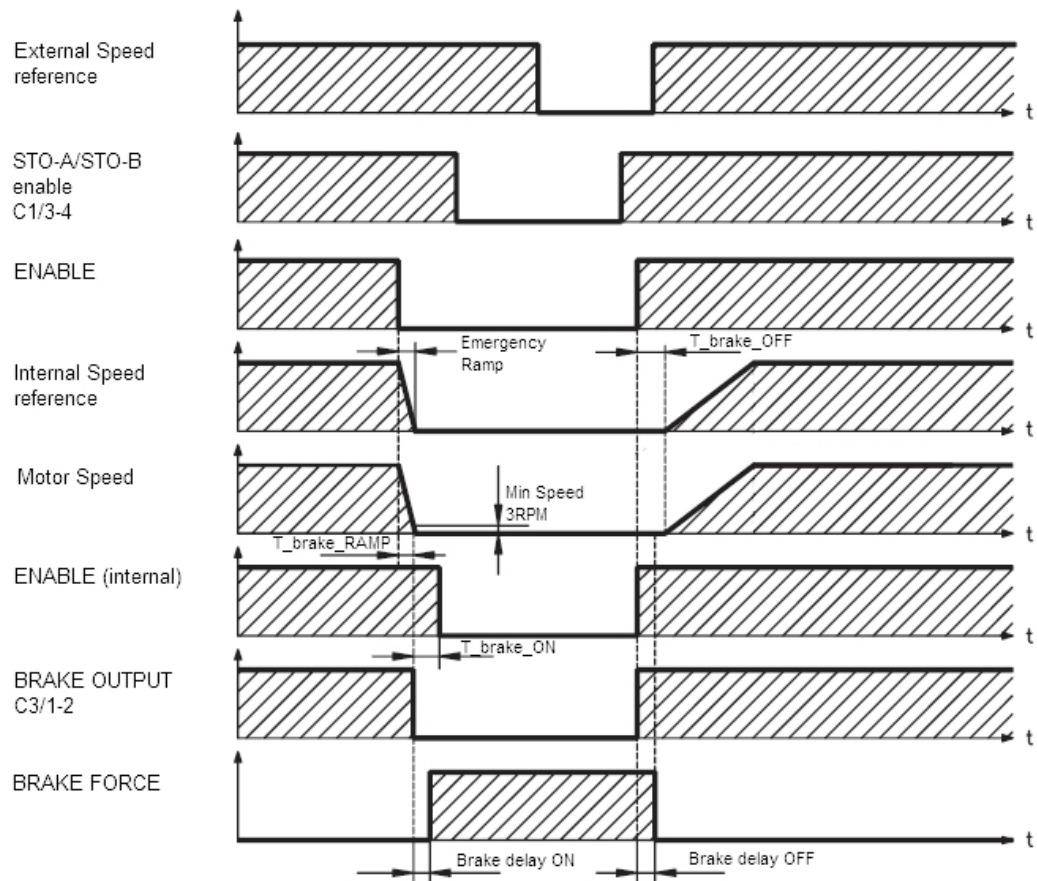

C3 CONNECTOR		
PIN	**PIN**	**DESCRIPTION**
1	+Brake	Motor holding brake, positive
2	-Brake	GND Motor holding brake
3	PE	Protective earth
4	U	Motor phase U
5	V	Motor phase V
6	W	Motor phase W

6.3.1 Holding brake management

To enable the automatic management of the holding brake, set to value YES the menu "Mechanical Brake", in the "Motor" window.
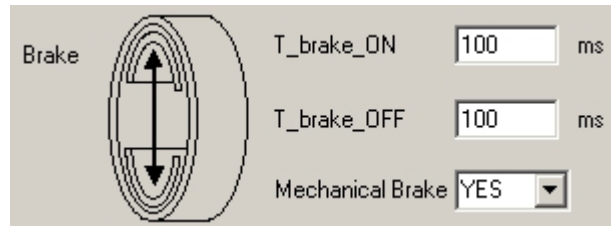

The meaning of the T_brake_ON and T_brake_OFF parameters is described in the following diagram.

6.4 Connection to 3-phases Mains Supply Networks

The connection of the main electrical supply is made via the C4 connector.
The servo amplifier must be powered only by a 3-phase grounded current in the range 230V-10%, 400 +10% and 50/60Hz frequency.

C4 CONNECTOR		
PIN	**NAME**	**DESCRIPTION**
1	L1	Power Line 1
2	L2	Power Line 2
3	L3	Power Line 3
4	PE	Protective Earth
5	+AT	+DC-link
6	-AT	-DC-link
7	R COM	Braking resistor common pole
8	R INT	Internal braking resistor connection, jumper between pin 7 and 8. (default)
9	R EXT	External braking resistor connection, connect the reistor to the pin 7 and 9
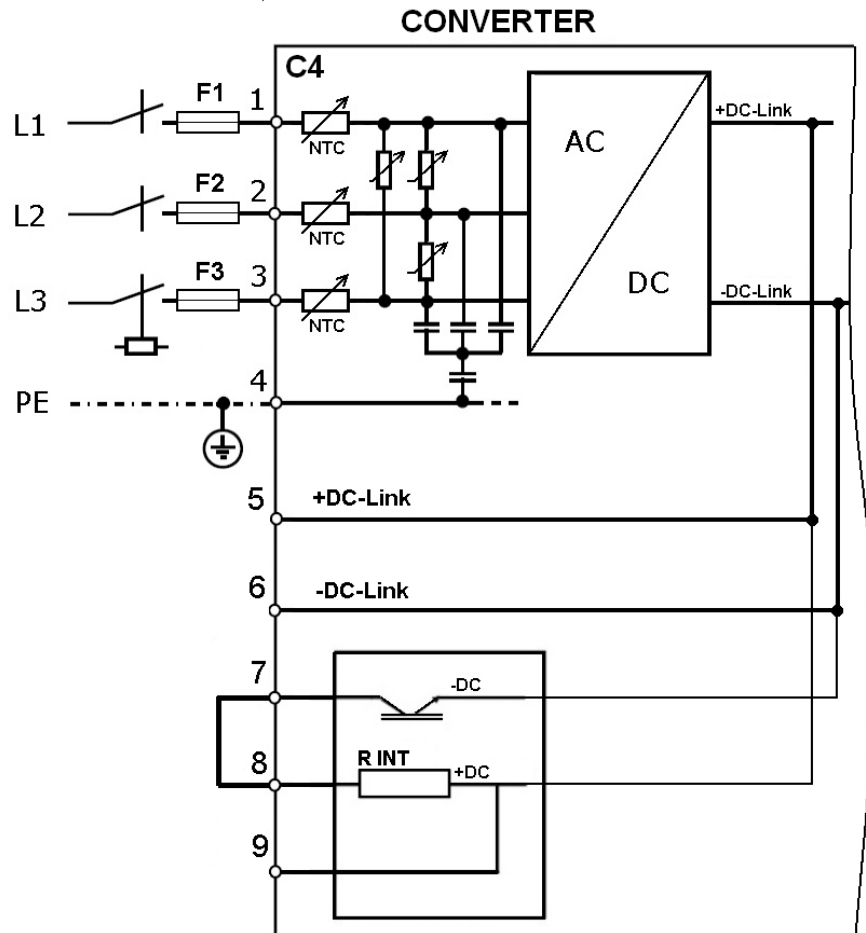
6.5   External braking resistor

This servo amplifier, except 30/60A and 42/84A sizes, is equipped with internal braking resistor. To disconnect the internal resistor from the brake circuit in order to use an external resistor remove the jumper between terminals 7 and 8 of C4 connector and connect the external resistor as shown.
The admitted values and the braking power concerning the external braking resistor are located on the table in paragraph 4.2.

Lower value resistors could irreversibly damage the servo amplifier.

Considering that the resistor's case can overcame easily the 80°C will be necessary to indicate with warning labels the presence of dangerous high temperature an protect from accidental contacts the electrical connections.
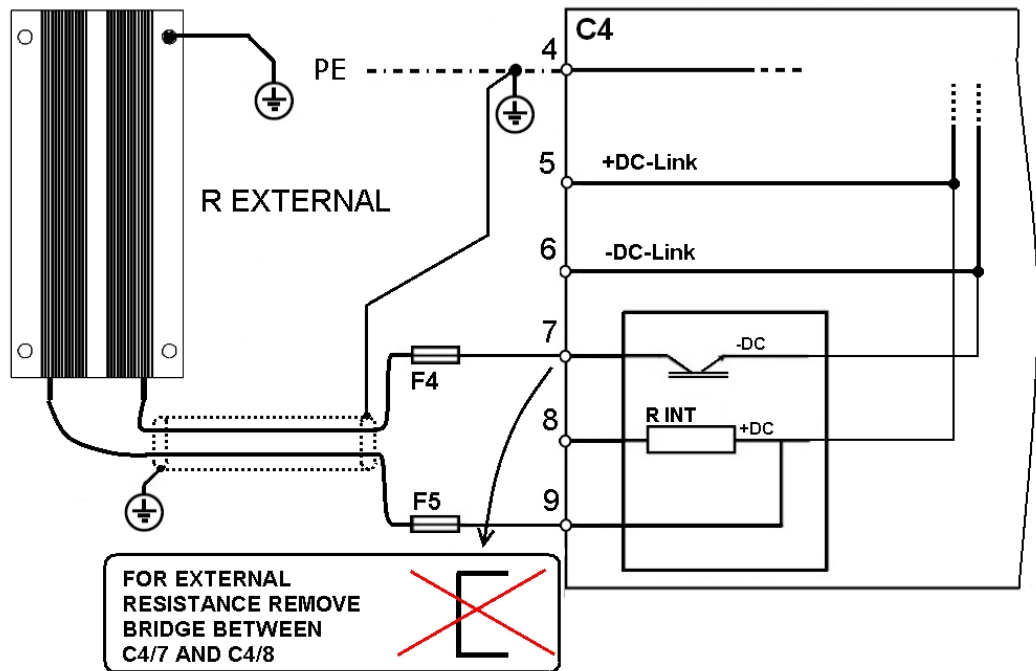
6.6 I/O Signals

The C5 connector has 5 digital inputs and 3 digital outputs. To these signals is added a differential analog input. All the digital inputs are optically isolated and all have in common a pole (DGT-IN-RTN) which acts as a return; normally is protected by grounding connection. Even for the digital outputs one of the poles is in common for all (see figure on the C5 connector).
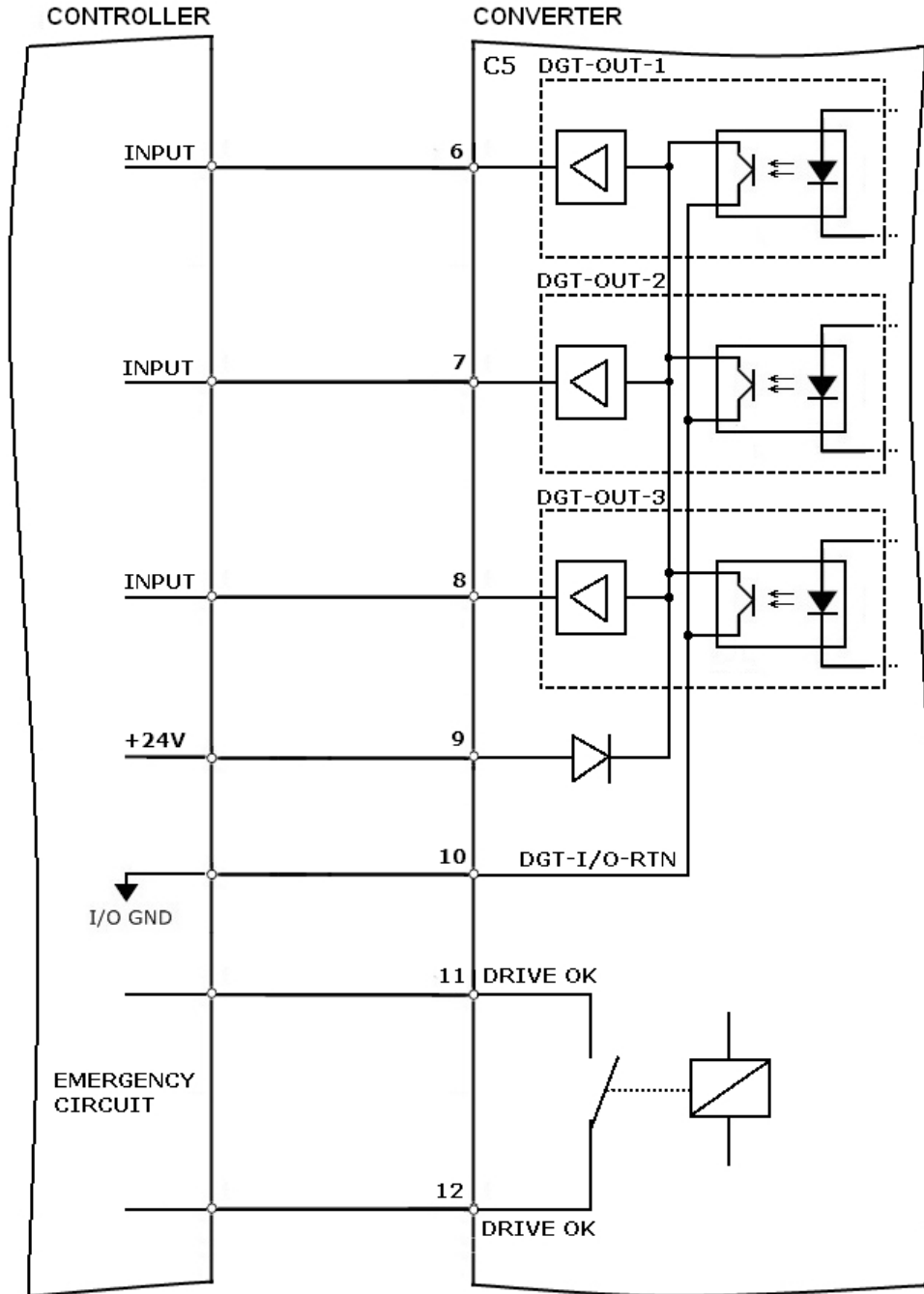
PIN	NAME	DESCRIPTION
	C5 CONNECTOR	
1	DGT_IN1	Programmable Digital input 1, 24V@10mA. Normally configured as Drive ENABLE
2	DGT_IN2	Digital input 2, 24V@10mA - Programmable
3	DGT_IN3	Digital input 3, 24V@10mA - Programmable
4	DGT_IN4	Digital input 4, 24V@10mA - Programmable
5	DGT_IN5	Digital input 5, 24V@10mA - Programmable
6	DGT_OUT1	Digital Output 1, max. 30V@50mA - Programmable
7	DGT_OUT2	Digital Output 2, max. 30V@50mA - Programmable, Default STO-A.
8	DGT_OUT3	Digital Output 3, max. 30V@50mA - Programmable, Default STO-B.
9	+24V I/O	Link the auxiliary +24 VDC if I/O are used
10	DGT_IN_RTN	IN/OUT return. Link to 0V if I/O are used; digital input 1-5 / digital output 1-3.
11	DRIVE OK	Max. 30VDC/42VAC, 200mA
12	DRIVE OK	

6.6.1 Digital Input
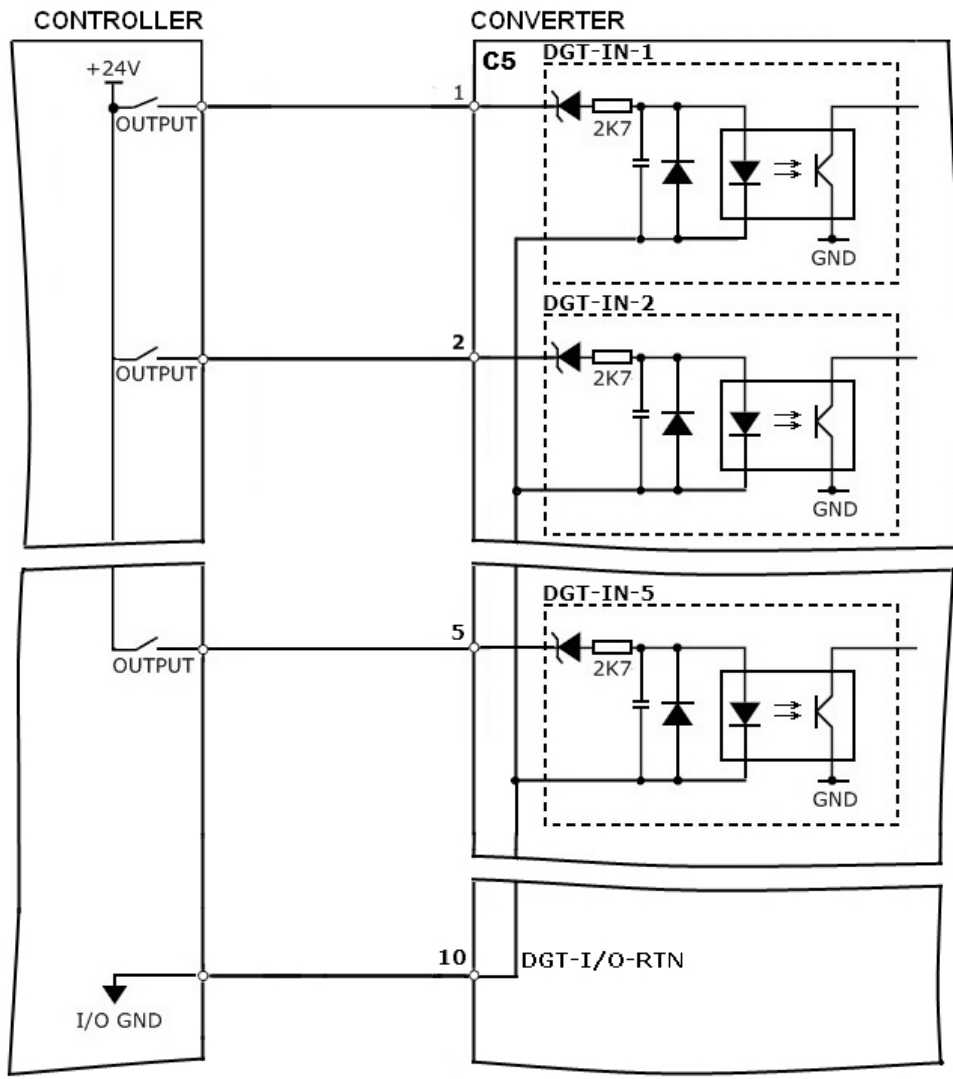
6.6.2 Digital Output

The servo amplifier supplies 3 programmable digital outputs. All outputs are protected against overvoltage and overcurrent.

A dedicated output, called relay Ok, provides a clean contact.

In the start sequences you have to take account of the Relay OK contact. After the auxiliary power supply +24 V to pin C1/1-2 is provided, the servo amplifier makes a check, if there aren't abnormalities the C5/11-12 Relay OK contact is closed allowing the system controller to provide the main power on C4/1-2-3.

6.7 Motor feedback

The standard feedback device used is an incremental encoder with Hall.

| PIN	NAME	DESCRIPTION
		C6 CONNECTOR
1	HU	U Hall sensor
2	HV	V Hall sensor
3	HW	W Hall sensor
4	+5V	Encoder supply 5VDC@250mA
5	GND	GND encoder supply
6	CHA	A Channel incremental encoder
7	CHB	B Channel incremental encoder
8	CHZ	Z Channel incremental encoder
9	SHIELD	Shield
10	N.C.	Not Connected
11	GND	Negative motor thermal sensor -
12	STM	Positive motor thermal sensor +
13	CHA-	Encoder negative A channel
14	CHB-	Encoder negative B channel
15	CHZ-	Encoder negative Z channel
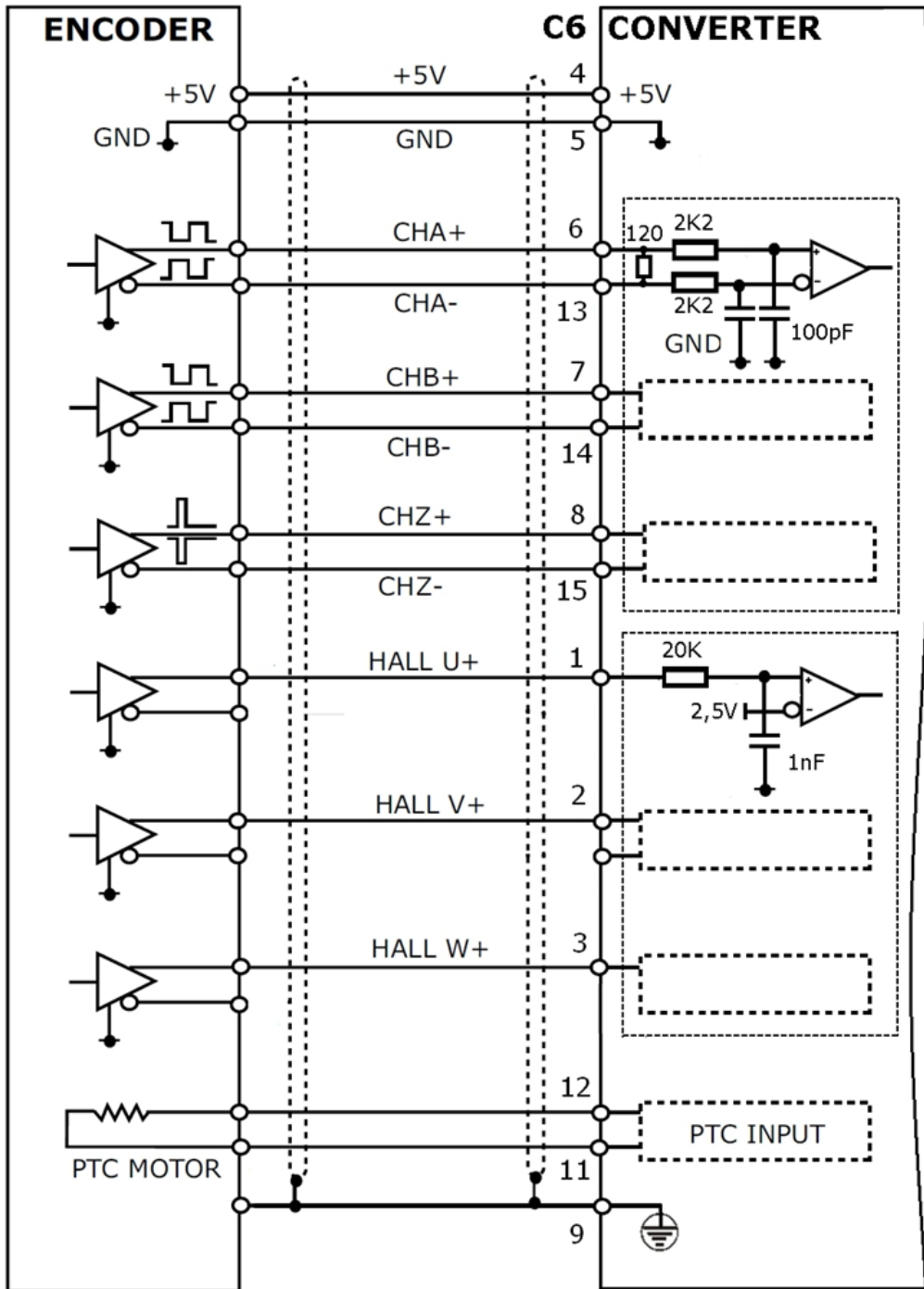
6.8   CANopen interface

The D-SUB **C6/C7** connectors are used for CANopen connection.
The default baud rate is 500Kbps, the maximum acceptable value is 1Mbps. The CANopen GND is galvanically isolated from zero signals inside the card.
The cable used to connect CANopen must be shielded. The shield must be connected to the ground network, for this purpose the **C6/C7** connector is metallic and is connected to PE.

| PIN	NAME	DESCRIPTION
	C6/C7 CONNECTORS	
1	-	-
2	CANL	CAN_Low
3	CAN_GND	CAN-GND
4	-	-
5	-	-
6	-	-
7	CANH	CAN-Hight
8	TERMINATION	Connect with a jumper, this pin to pin 7 by inserting a 120 Ω terminating resistor
9	-	-
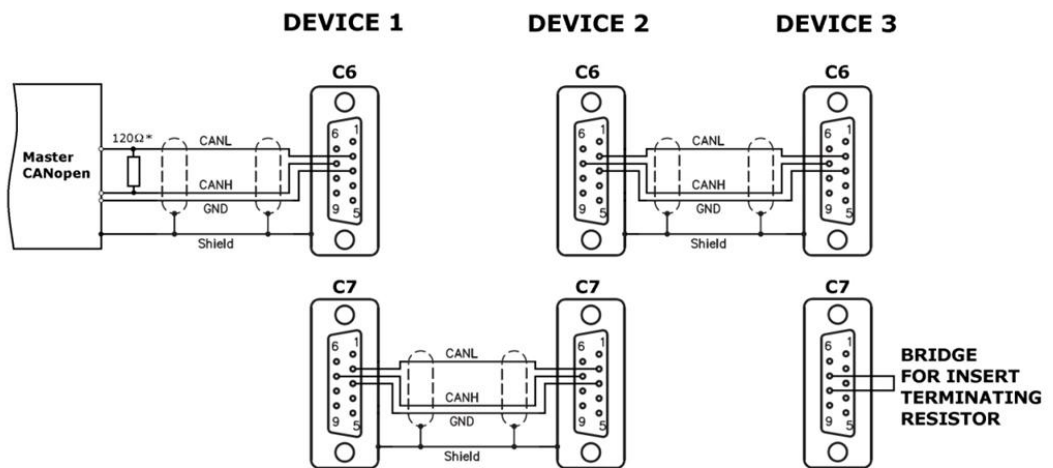
Connections
The connection CANOpen must be made with a pair of shielded cables having the following characteristics:
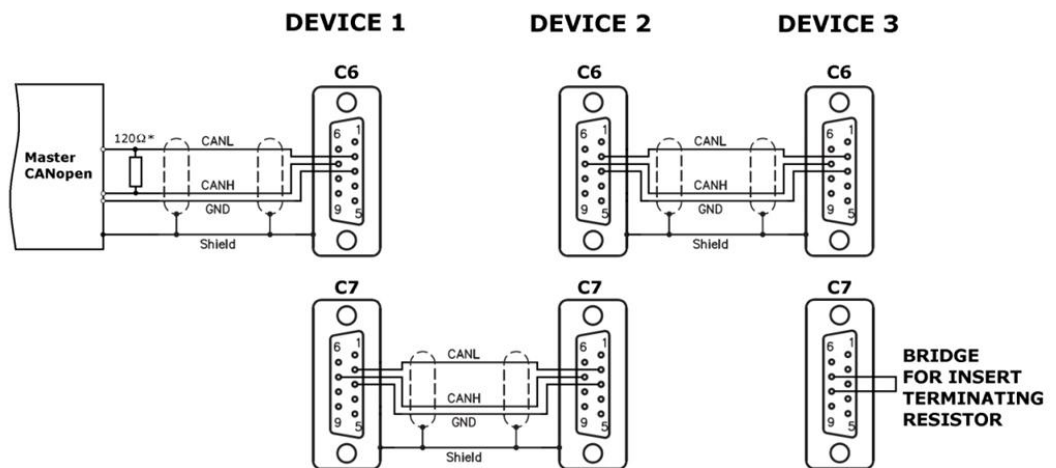•   Characteristic impedance of 100Ω ≤ Z ≥ 120Ω
•   Exercise capacity ≤ 60pF / m.
You can insert a 120Ω termination resistance by a jumper between pin 8 with and pin 7 in either C6 or C7 connectors.

Converter

C6/C7

Master CANOpen

CAN H 7
CAN L 2
8
3

120Ω

+5V
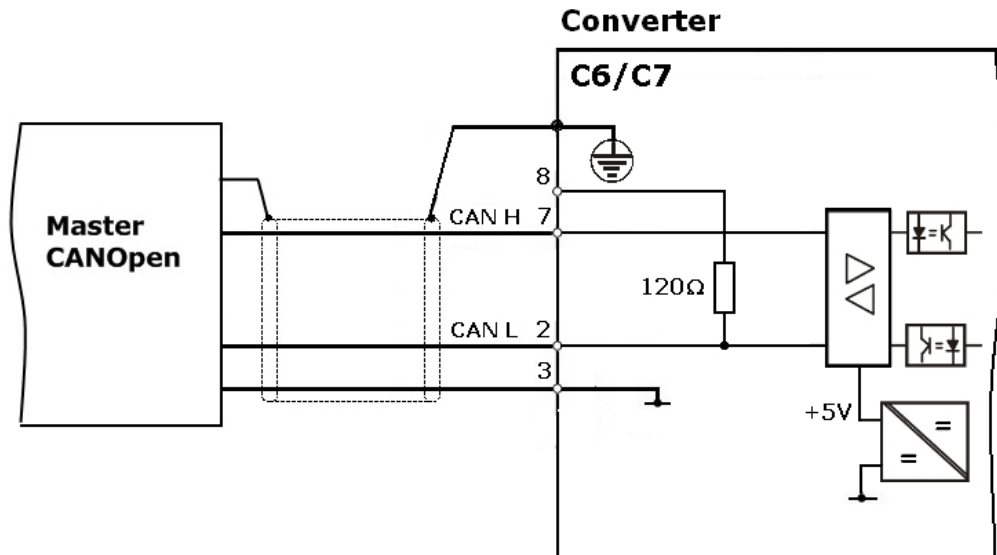
Here's an example of connecting a CANopen master with 3 devices.
For electromagnetic compatibility reasons of the case of Sub D connector must have these characteristics:
- Metallic body or covered in metal body
- Possibility of connecting the cable shield directly to the metal body of the conductor by means of a secure and spacious connection.

DEVICE 1   DEVICE 2   DEVICE 3

C6   C6   C6

Master CANopen

120Ω* CANL
CANH
GND
Shield

CANL
CANH
GND
Shield

C7   C7   C7

CANL
CANH
GND
Shield

CANL
CANH
GND
Shield

BRIDGE FOR INSERT TERMINATING RESISTOR

7   Drive with analog reference

Upon request, the servo amplifier can be controlled via analog input, also it is fitted with an output "line driver" 5V type encoder emulation.
The resolution of the emulated encoder is the same as the main motor encoder.
You can't set an encoder emulation with a variable number of pulses / revolutions.
Is it possible to find a comprehensive overview of the device connections in paragraph 6. The connectors to be used for driving in analog are C9: analog input; C7 encoder emulation and C5: inputs and outputs.

7.1   Analog input

Analog-In 1 Input (terminal C9/1-4), differential analog input 12bit. Differentials input voltage of max. ± 10 V.
Connect the controller (PLC or NC) as following indicated.

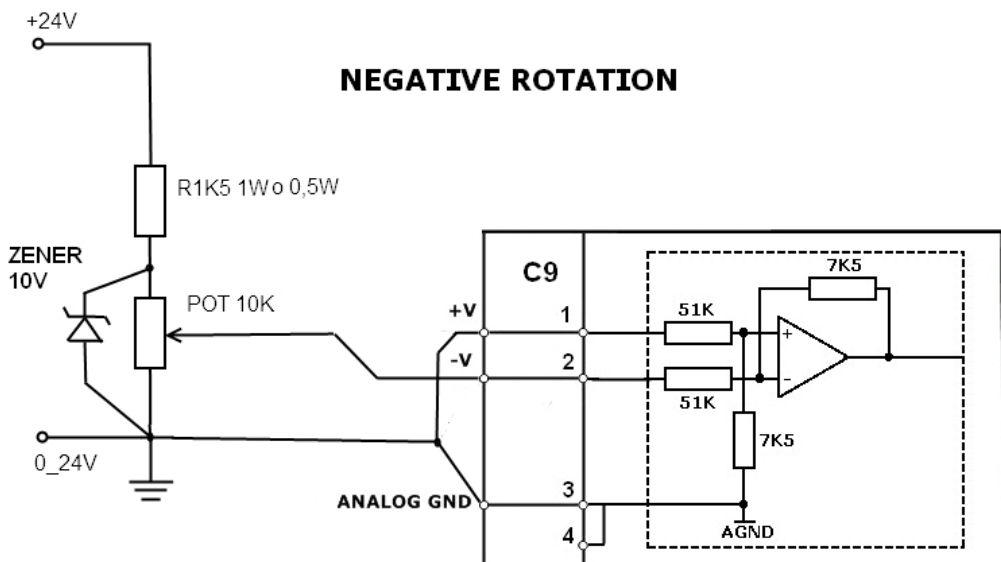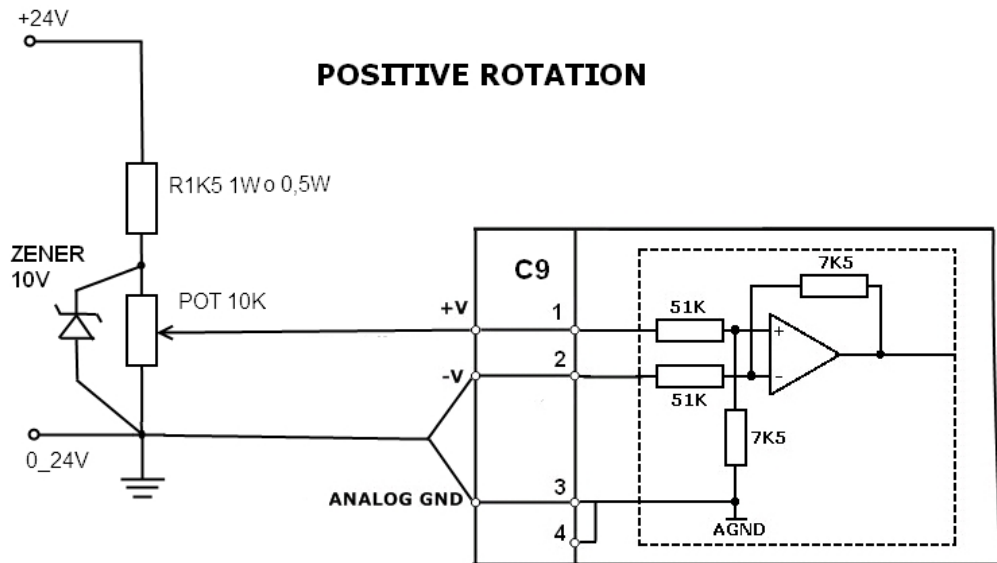| CONNECTOR C9		
PIN	**NAME**	**DESCRIPTION**
1	Analog In1 +	Analog input 1 positive
2	Analog In1 -	Analog input 1 negative
3	AGND	Analog Ground
4	AGND	Analog Ground
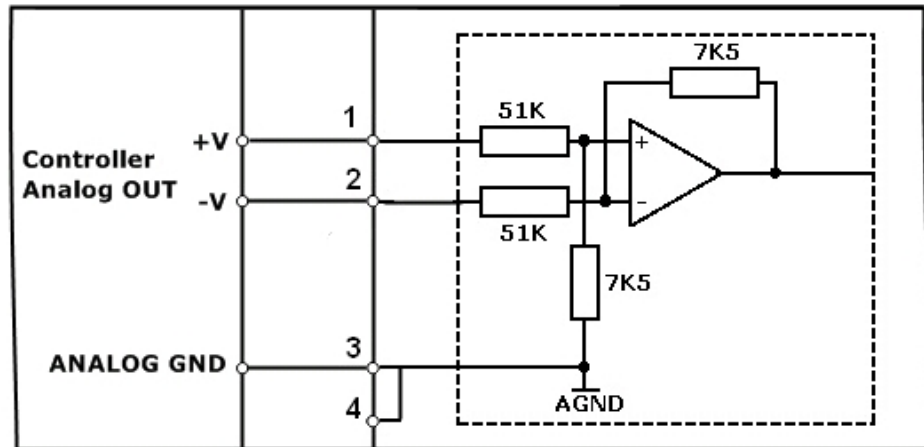
7.1.1 Using a potentiometer

If you want to drive the servo amplifier by a potentiometer and you do not have a ± 10V dual voltage power supplies, the voltage can be derived using the following circuitry. In the first diagram is shows how to drive the motor with a voltage from 0 to 10V, in the second with a voltage from 0 to-10V.

POSITIVE ROTATION

+24V

R1K5 1W o 0,5W

ZENER 10V

POT 10K

0_24V

C9

+V   1

-V   2

ANALOG GND

3

4

51K

51K

7K5

7K5

AGND

NEGATIVE ROTATION

+24V

R1K5 1W o 0,5W

ZENER 10V

POT 10K

0_24V

C9

+V   1

-V   2

ANALOG GND

3

4

51K

51K

7K5

7K5

AGND

7.2 Encoder emulation

With the "analog" option the connector C7 provides the emulation of the motor encoder. The C8 connector on the contrary will not mount.
The emulated encoder output is a 5V opto line-driver type.
The emulated encoder resolution is fixed and it is the same as the motor main encoder (default 2048ppr)

PIN	NAME	DESCRIZIONE

| C7 DESCRIPTION		
PIN	NAME	DESCRIZIONE
1	/CHA	Negative A channel
2	/CHB	Negative B channel
3	GND	Ground of the simulated encoder interface
4	CHZ	Z Channel.
5	PE	Shield, connected to the servo amplifier ground
6	N.C.	Not connected
7	CHB	B Channel.
8	/CHZ	Negative Z channel
9	CHA	A Channel.

7.3 OPMODE "Analog Speed": software setting

7.4 OPMODE 3 setting: Analog Speed

Set the OPMODE selector into position "3": Analog Speed
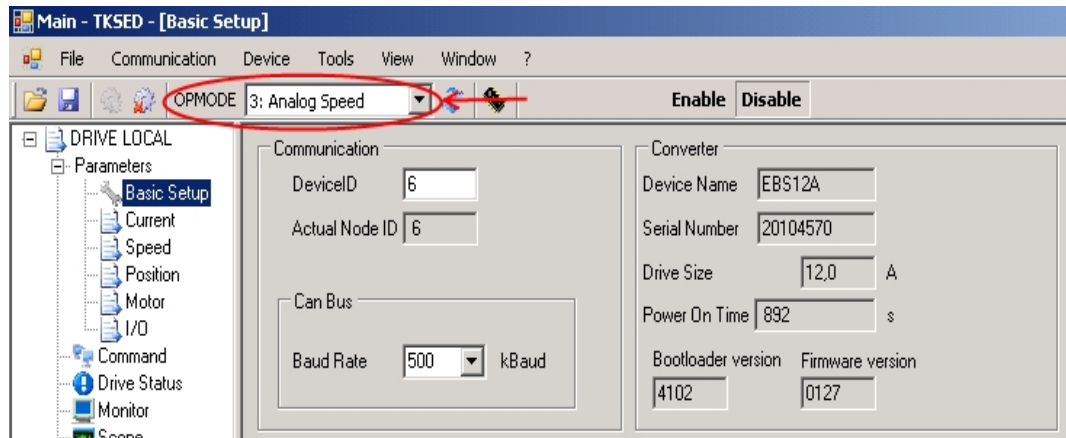
In this mode, the acceleration ramp (Acc Ramp and Dec.Ramp) is enabled. If you drive the device by a NC, you have to disable the ramps by setting the "Acc Ramp "(default 500ms) and Dec. Ramp" (default 500ms) parameters   to 0.
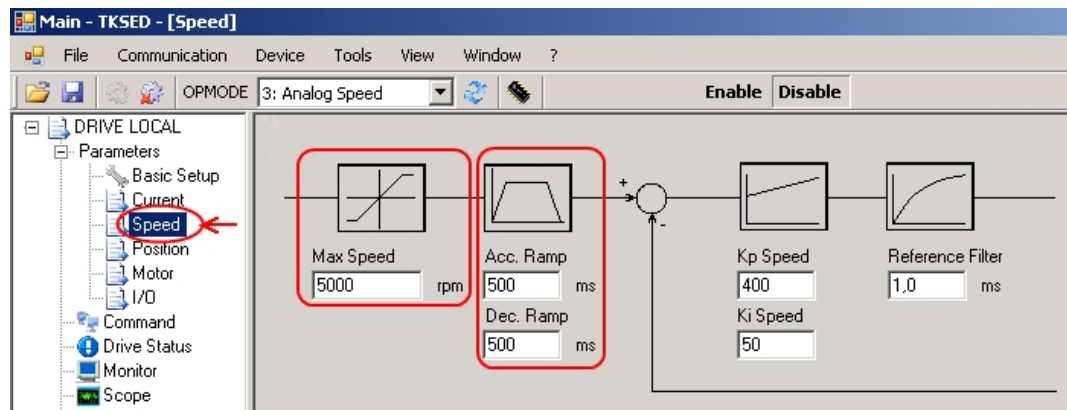
N.B.: at the end of the parameters setting procedure, press the icon
Save parameters in drive memory **to make the changes permanent.**
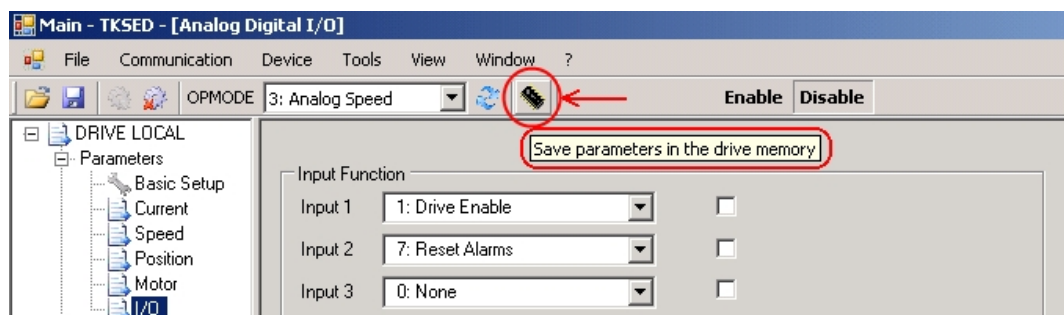
7.5 Input/Output window setting

In this window there are the settings for the programmable digital inputs and
analog input 1.

Digital inputs setting
Example:
setting Input 1 in position 1: Enable Drive and providing 24V on digital input 1
the servo amplifier is enabled.
Setting Input 2 in position 7: Reset Alarms and providing 24V digital input 2; any
servo amplifier alarm is reseted.

Setting the analog input 1 scaling.
Example:
Setting Analog In1 Scale = 9000mV and supplying the analog input with a
voltage of 9V, motor will rotate at a speed equal to that is seted in "Max Speed"
parameter on Speed Window, in our example, the motor will rotate at 5000rpm.
By providing -9V, the motor will rotate at-5000rpm.
The values range allowed by the analog input is ± 10V.
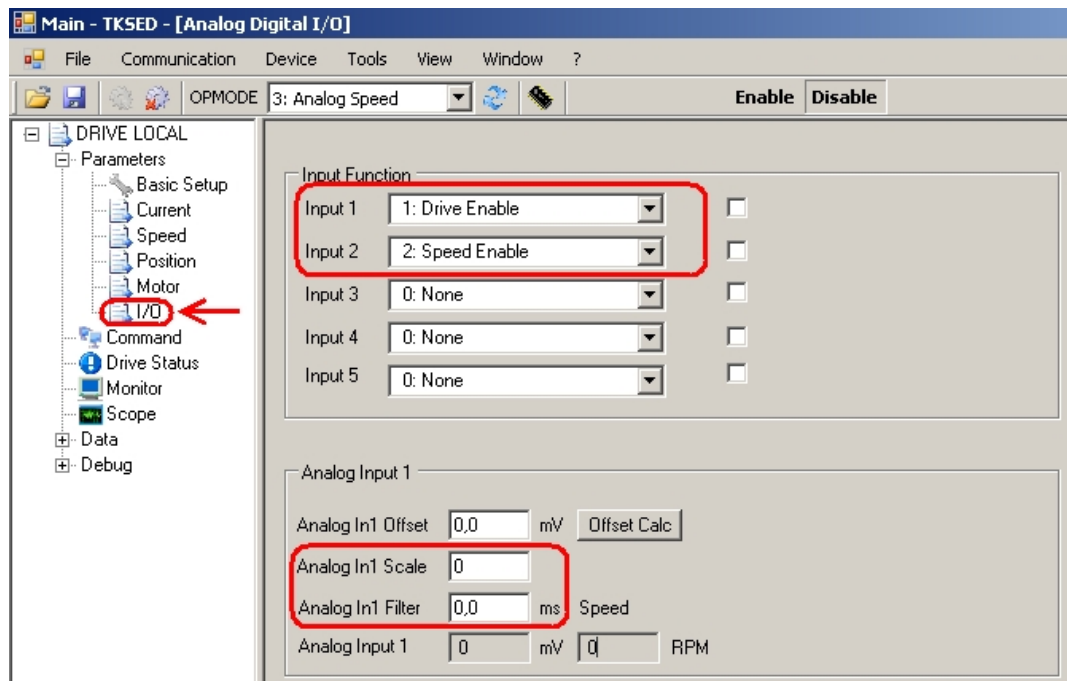
7.6   Automatic calculation of the Offset

Provide a 0V analog reference from a NC. Press 'Calc Offset'; after 1.5 s the analog input offset will be captured and displayed, in mV, in the Analog In1 Offset box.

Is it possible to perform a fine tuning of the offset with a manual editing of the 'Analog In1 Offset' parameter
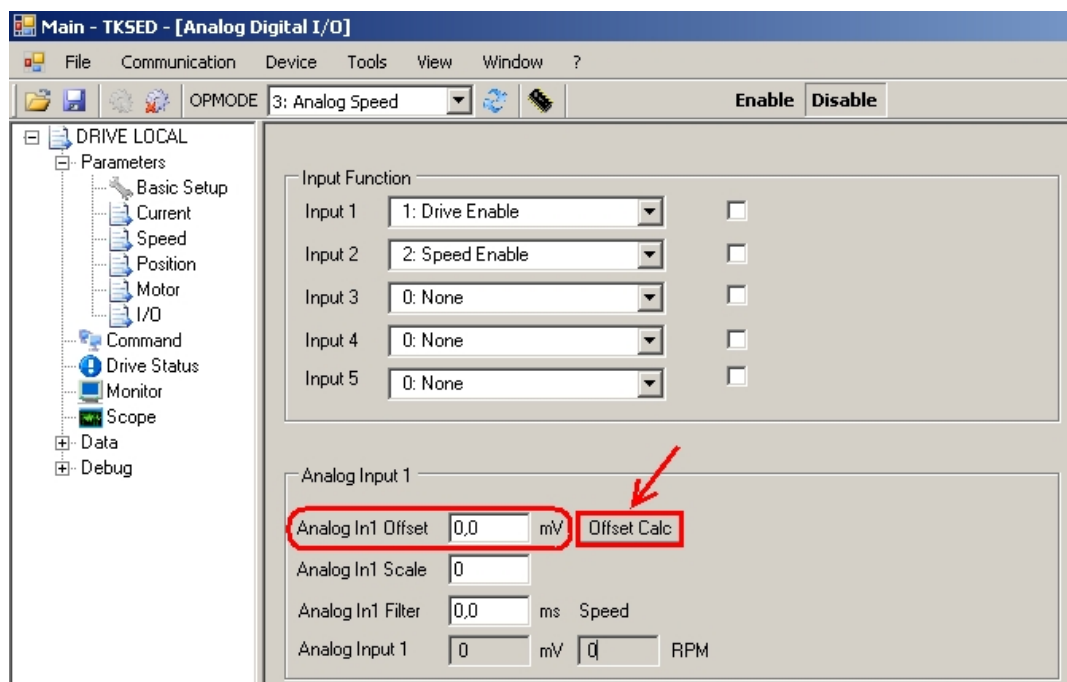
N.B.: at the end of the parameters setting procedure, press the icon
Save parameters in drive memory **to make the changes permanent.**

7.7 Fault and Warning Messages

Any error message is displayed on the servo amplifier display. All error messages result in the opening of the OK relay contact (C5/11-12) and in the switching off of the servo amplifier final stage (motor torque). At the same time the motor-holding brake will be actived.

While the R type alarms are resettable by the user, the B type alarms are blockers. In the latter case, to reset the alarm, it must power off and on again the servo amplifier (24V auxiliary power and main power).

CODE	TYPE	MESSAGE	CAUSE
F00	B	Flash failure	Fault parameters flash memory
F01	R	Loaded default param.	Error in reading the user parameters
F02	R	Loaded default protected	Error in reading the tuning parameters
F03	-	Reserved	Reserved
F04	R	I^2t drive	Achieved the maximum value of the servo amplifier I2t
F05	R	Overvoltage	Exceeded the maximum DC-link voltage
F06	R	Undervoltage	Intervention of the DC-Link voltage lower limit or qualification of the servo amplifier with DC-Link not yet active
F07	B	Power fail	Overcurrent or fault of the servo amplifier power stage.
F08	R	Heatsink temperature	Achieved the heatsink maximum temperature
F09	R	Motor temperature	Motor high temperature limit reached
F10	R	Regenerative resistance overload	Braking power limit reached
F11	R	Internal temperature	Unmanaged
F12	R	Overcurrent regenerative circuit	Overcurrent on braking circuit. Check the ohmic value of the resistor
F13	R	Overvoltage 24V	Achieved the maximum value of 24V auxiliary voltage.
F14	R	Undervoltage 24V	Achieved the minimum value of 24V auxiliary voltage.
F15	-	-	Unmanaged
F16	R	Brake	Malfunction of the mechanical brake. Detected a short circuit or a open circuit
F17	R	Fan	Unmanaged
F18	R	Phase loss	No current was detected in one of the motor's phase. Check wiring, connections and protection devices.
F19	R	Feedback	Problem in motor feedback. Check wiring and connectors
F20	R	Feedback initialization	Initialization of the feedback motor failed. Check wiring and connectors
F21	R	Current over range	The current output has exceeded the alarm threshold. Check gains Kp and current Ti
F22	-	Reserved	Reserved
F23	-	Reserved	Reserved
F24	-	Reserved	Reserved
F25	-	Reserved	Reserved
F26	-	Reserved	Reserved
F27	-	Reserved	Reserved
F28	-	Reserved	Reserved
F29	-	Reserved	Reserved
F30	R	STO	Safe Torque Off circuit is not ready. Verify enable sequences of the servo amplifier
F31	-	Reserved	Reserved