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Using and Instruction Manual

DB1 ONE
DIGIBRUSHLESSGENERATION

model
DB1-40 series

Release 1.5 / 2010-May

I. MANUAL INFORMATION

This manual contains all the information required to use the product correctly. It must be considered as an integral part of the device.

The instruction manual is addressed to qualified personnel with an electro technical know-how, technical equipments knowledge and operative installations on site. For a safety and right maintenance, please care all the information here contained.

i.1 REVISIONS

Revision	Description and modify
Rel. 1.0 / 2005-Jen	1st Edition.
Rel. 1.1 / 2005-April	Chapter 6.2, application improvements modify.
Rel. 1.2 / 2005-June	Chapter 6.2 modify.
Rel. 1.3 / 2005-June	Chapter 6.2 modify picture 6.1c, Chapter 6.7 modify pictures 6.6.1 and 6.6.2 shield connection
Rel. 1.5 / 2010-May	Chapter 6.6 modify picture 6.5, Chapter 8 led description

Technical modify should be done whenever the manufacturer requires without previous warning.
The manufacturer has not any responsibilities caused by a wrong use of the electrical device.

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i.2 SYMBOLS USED

This part contains all the symbols used and their meaning.



DANGER

Electricity and defects should be a risk for the operator (high voltage, high temperatures).



WARNING

Avoid product injuries the operator must follow scrupulously all the instructions required.



NOTE

Suggests are contained into this information manual. Please care about them.



NOTE

Terms as "inverter", "servo drive", "drive", "equipment", "device" are used by a common issue.

Hereafter it will be named "drive".

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1. PRODUCT INFORMATION

1.1 WARRANTY

MD Motion warrants the drive without engineering and manufacturing defects. Transportation, out-packing and mounting injury are not taken under responsibility of the producer.

Warrant period starts from the purchasing till 24 month later.
The warranty is not taken under consideration in case of wrong mounting or tempered of the product.

Out of the rating performances utilization and mounting the manufacturer will not be responsible for all the effects caused to the people, devices or applications linked.

1.2 LABEL

Please find hereafter the label layout and the record linked. It permits to identify the product.

By MD Motion	**Code**	Drive code
	S. N.	Serial Number / Part Number
	TYPE	Model
		CE

Code Commercial drive code.
S. N. Serial or Part number. It gives a track of the manufacturing period too.
TYPE Product identify.

2. SAFETY AND INTERNATIONAL TECHNICAL STANDARD

A wrong use of the product could be dangerous for people or devices linked.
Please follow all the instructions contained into this manual, check the label data carefully before the mounting.

Mounting and Running start-up operations must be done by qualify qualified workers experienced on this matter. They must know the usual safety and linked International Technical Standard.

2.1 SAFETY INSTRUCTIONS

During the normal duty the product can show:

- exposed parts under voltage,
- driving links and power can be under tension, even in case of stopped motor,
- hot surfaces.



WARNING

- The product and/or parts of it could present high current that can be dangerous for the personnel. To avoid injury don't touch the components under tension, wait at least **5 min** after having interrupt the alimentation.
- During the normal duty cycle the drive surface could be very hot. Please be warned the **heat sink surface especially. It should be more than 80°C temp**.



NOTE: ***Sales controlled and linked rule*** *(CEI EN* 61800-3)
"Don't use the drive by a domestic low tension supply. It should be a cause of radio-frequency interferences".

In case of domestic, commercial and industrial drive application the customer must care and/or use right filter units (Not included with the drive).

2.2 DIRECTIVE and TECHNICAL STANDARD EUROPEAN

This product is manufactured according to the Low Voltage European Directive (LVD) 2006/95/CE [and following modify 73/23/CEE] and the EMC European Directive 2004/108/CE [and following modify 89/336/CEE].

According to the Low Voltage Directive in matter of safety and functional, the manufacturer observes the following International Norms:

- **CEI EN 61800-5-1** " Adjustable speed electrical power drive systems: Part 5.1 Safety
- **CEI EN 61800-2** " Adjustable speed electrical power drive systems: Part 2: General requirements - Rating specifications for low voltage adjustable frequency AC power drive systems";
- **CEI EN 60146-1** Semiconductor Converters – General prescriptions and converters switched by the line;
- **CEI EN 60204-1** "Safety of machinery - electrical equipment of industrial machines: Part 1: General requirements".

According to the EMC Directive the manufacturer observes the following International Technical Standard and product issues:

- **CEI EN 61800-3** "Adjustable-speed electric power drive systems - Part 3: EMC Product standard including specific tests".

If all the instructions here contained are respected the Drive follows the Directives mentioned above. For a correct use of the drive this manual shows to the user how to do a correct wiring.
Different way to use the machinery obliges the user to do new measurements and tests da eliminare to satisfy the Rules mentioned above. This makes the manufacter not responsable for them.

The electronic drive (PDS "Power Drive System") must be used on automatic machines with other components as motor, filter, commutation and control circuits, electrical and auxiliary protection circuits. All these parts added are considered as a final complete product pack.

In this case the drive must be considered as a component of a complete product following a different EMC Directive: the EMC rule applied referrers to the final complete system/product-pack.

In case of mounting on machinery, the drive conformity is satisfied whenever the complete system/product satisfies the directive EMC (2004/108/CE) and 2006/42/CE.



WARNING

It is responsibility of the final producer:

- **Avoid personnel injuries caused by wrong movements realazing a machinery analysis of the risks.**
- **To warrant that all the domestic rules are followed.**
- **To garantee that The EMC complete machinery value are under the parameter fixed by the rules.**

3. GENERAL INSTRUCTIONS

In this chapter will be shown the basic information about the use of the BD1 drive to permit the comprehension of the basic functions of it, clarifying what will be said in the next chapters.

3.1 GENERAL DESCTRIPTIONS

The main DB1 drives use needs a a.c. brushless servomotors in closed-loop mode control. (BT1 specify series if referred to the MDMotion group).

Basically the DB1 standard configuration provides the power supplier, the heat sink and the internal clamp. An external braking nit should be supplied on demand.

Signal, power and auxiliary connections are located into the front panel. The logic power supply connector is placed on the top surface.

The DB1 engineering development is particularly focused on the insulation between the "logic" and the "power" circuits.

- The logic part is based on a last generation DSP specially used for servo-control applications. Fast and precise positioning as in real time. The DSP permits to increase and control the direct torque by a flux vector-technology.
- The power circuit is made by a converter with DC-Bus supply, electrolytic capacitors, and IGBT module.

DB1 range is based on two models: 7Arms and 10Arms. The different size means a different IGBT intelligent module. Each model is also available with two different heat sink size. An external fan-cooling should be used for special applications on demand.

The DB1 works with a speed analogue ref.(± 10V) by an acceleration/deceleration programmed ramp; or by an internal ref. stetted before.

3.1.1 RUNNING VIEW

Two led located into the front panel show the running view. They are:

- **the GREEN LED** shows the right logic circuit supply (24Vdc supply inserted);
- **the lighted and fixed RED LED** means a right drive running. If it is not lighted continuously please care about the numbers of the intermittences. This number shows which is the alarm linked (ref. to the alarms code chapter – diagnostic manual part).

3.1.2 PROGRAMS and PARAMETERS

Thanks to the flexible and complete software the DB1 drive permits to realize custom application.

It's possible to arrange some parameters as the off-set, the maximum speed, the integral and proportional PiD.

Selecting the motor driven parameters and the main set data linked (Kp, Kt, and so on) the values will be automatically modified.

The Drive programming set up is basically made by a PC (using the RS-232 serial communication link) or by an external key-pad (available on demand).

The key-pad has a LCD display with two lines and 16 characters. A keyboard with 3 main buttons permits to control, manually insert and modify all the parameters needed.

It is possible to show the alarms code too.

The Key-pad module is provided of a 64K memory for the saving of the program of the parameters.

3.1.3 PC CONNECTIONS and RS-SERIAL LINE

Basically the Drive unit has a RS-232 communication door to be kinked with a PC.

Using the own "MOTOR CONTROL" software is possible to manage the automatic auto tuning with the motor linked (BT series in case of the MDmotion group), to modify or set the drive, and finally make tests and controls.

The "MOTOR CONTROL" program permits to make a real analysis of the main motor and drive values; which is the application applied and all the dynamic system.

Having a right and balanced system set-up is also possible to save and show graphically all the main values required (es.: voltage, current, speed, and so on).

3.1.4 WARNINGS and ALARMS

For a correct use the DB1 diagnostic shows past and present events occurred. The following protections are improved (as standard):

- Module over temperature,
- Short circuit @ground,
- Short circuit between winding motor,
- Over voltage,
- Over current.

3.1.5 AVAILABLE OPTIONS

The DB1 is a brushless motor drive as standard. The closed loop is made by an Incremental Encoder (2048ppr – 5V – Line-Driver).

This DB1 should be more than a simple brushless motor drive unit. The following configurations are also available on demand:

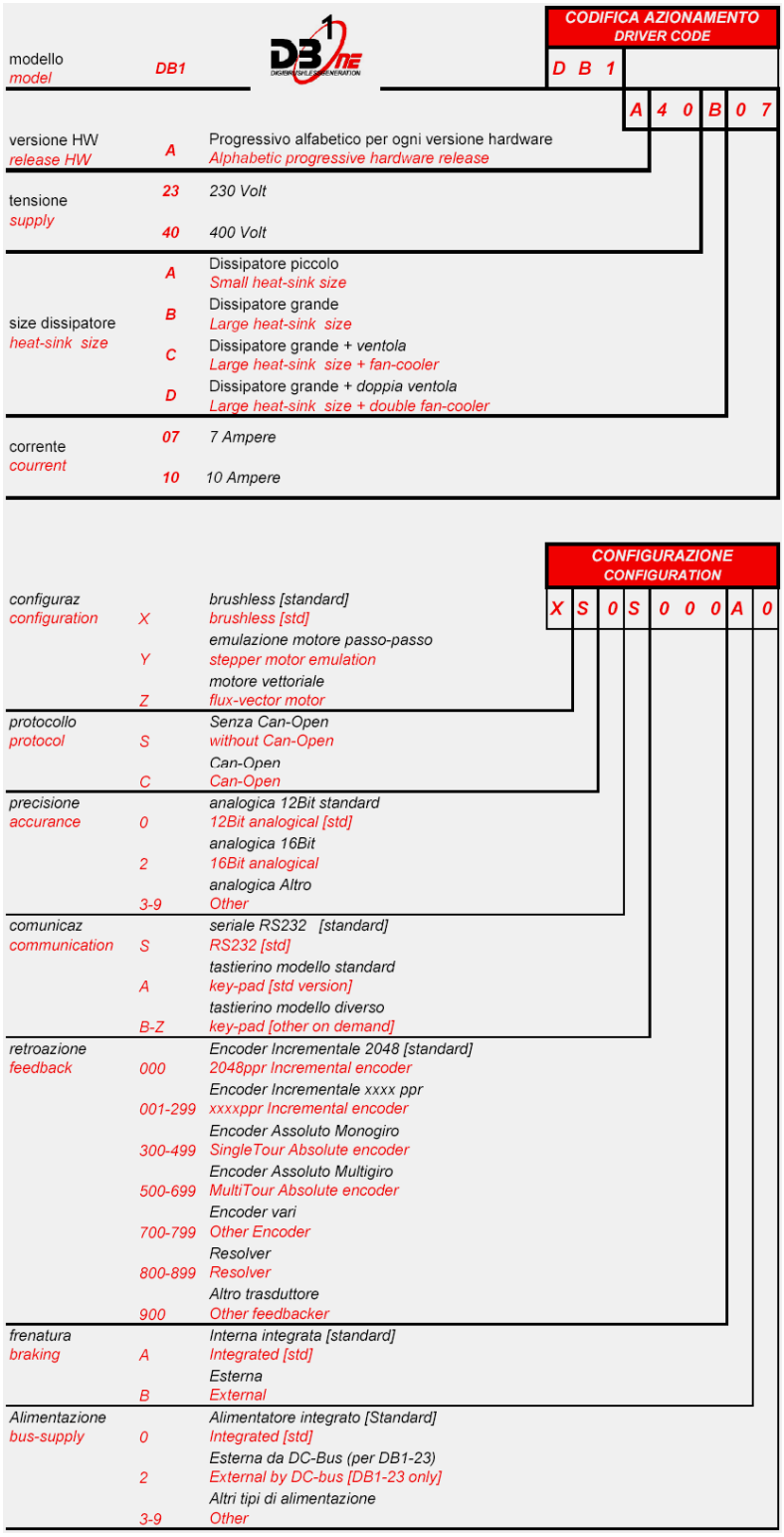
- Stepper motor simulation.
- Full vectorial a.c. motor.
- Sin/Cos.
- CAN Open.

Other options are available on demand:

- 12 bit analogue output.
- 16 bit analogue input.
- External brake unit.
- Fan-cooler.

3.2 PRODUCT and OPTIONS ORDER CODE

Please find hereafter the table code example.



CODIFICA AZIONAMENTO / DRIVER CODE									
	D	B	1						
				A	4	0	B	0	7

modello / model	DB1	
versione HW / release HW	A	Progressivo alfabetico per ogni versione hardware / Alphabetic progressive hardware release
tensione / supply	23	230 Volt
	40	400 Volt
size dissipatore / heat-sink size	A	Dissipatore piccolo / Small heat-sink size
	B	Dissipatore grande / Large heat-sink size
	C	Dissipatore grande + ventola / Large heat-sink size + fan-cooler
	D	Dissipatore grande + doppia ventola / Large heat-sink size + double fan-cooler
corrente / courrent	07	7 Ampere
	10	10 Ampere

CONFIGURAZIONE / CONFIGURATION									
X	S	0	S	0	0	0	A	0	

configuraz / configuration	X	brushless [standard] / brushless [std]
	Y	emulazione motore passo-passo / stepper motor emulation
	Z	motore vettoriale / flux-vector motor
protocollo / protocol	S	Senza Can-Open / without Can-Open
	C	Can-Open / Can-Open
precisione / accurance	0	analogica 12Bit standard / 12Bit analogical [std]
	2	analogica 16Bit / 16Bit analogical
	3-9	analogica Altro / Other
comunicaz / communication	S	seriale RS232 [standard] / RS232 [std]
	A	tastierino modello standard / key-pad [std version]
	B-Z	tastierino modello diverso / key-pad [other on demand]
retroazione / feedback	000	Encoder Incrementale 2048 [standard] / 2048ppr Incremental encoder
	001-299	Encoder Incrementale xxxx ppr / xxxxppr Incremental encoder
	300-499	Encoder Assoluto Monogiro / SingleTour Absolute encoder
	500-699	Encoder Assoluto Multigiro / MultiTour Absolute encoder
	700-799	Encoder vari / Other Encoder
	800-899	Resolver / Resolver
	900	Altro trasduttore / Other feedbacker
frenatura / braking	A	Interna integrata [standard] / Integrated [std]
	B	Esterna / External
Alimentazione / bus-supply	0	Alimentatore integrato [Standard] / Integrated [std]
	2	Esterna da DC-Bus (per DB1-23) / External by DC-bus [DB1-23 only]
	3-9	Altri tipi di alimentazione / Other

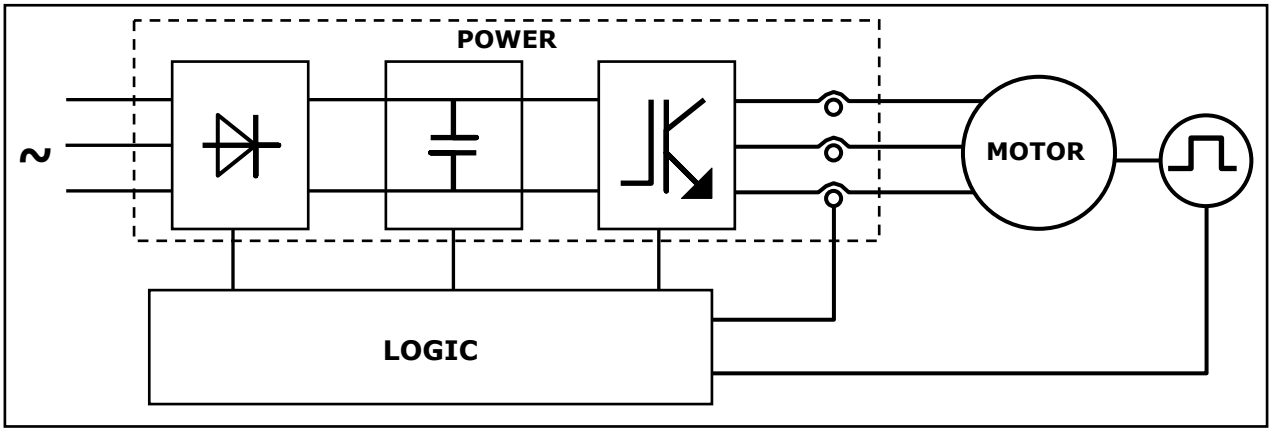
NOTE

The product is equipped of:

- Connectors .
- Instructions Manual .

3.3 BLOCK DIAGRAM

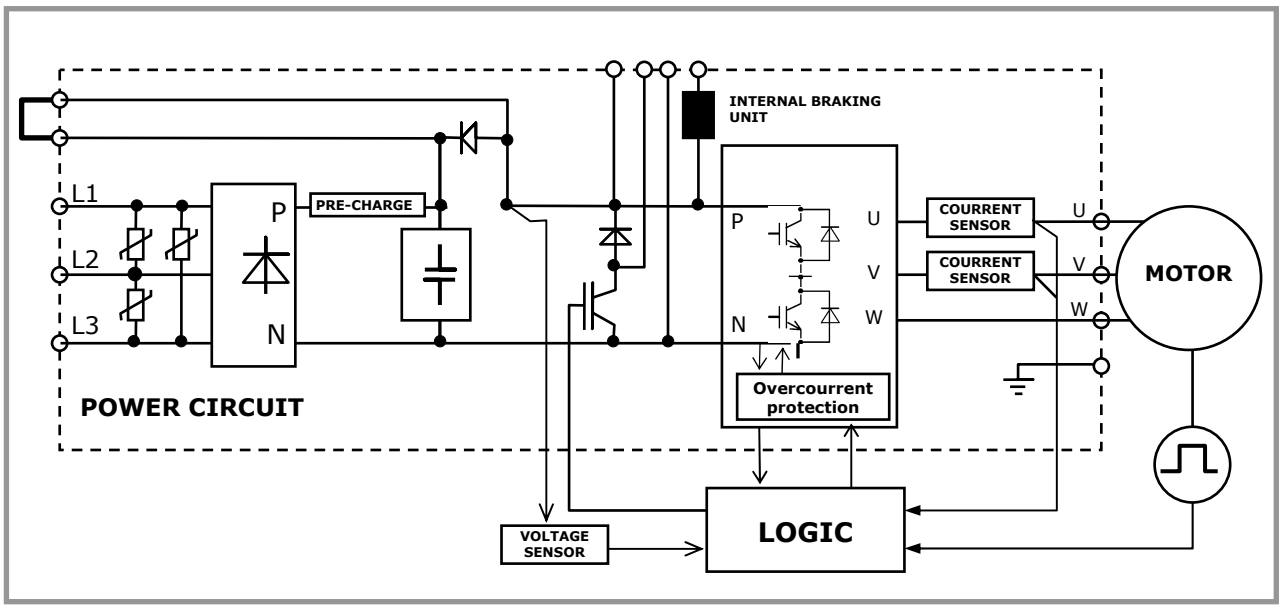
Picture 3.1 DB1 Drive block diagram .



The power and logic circuit diagrams block are following identified.

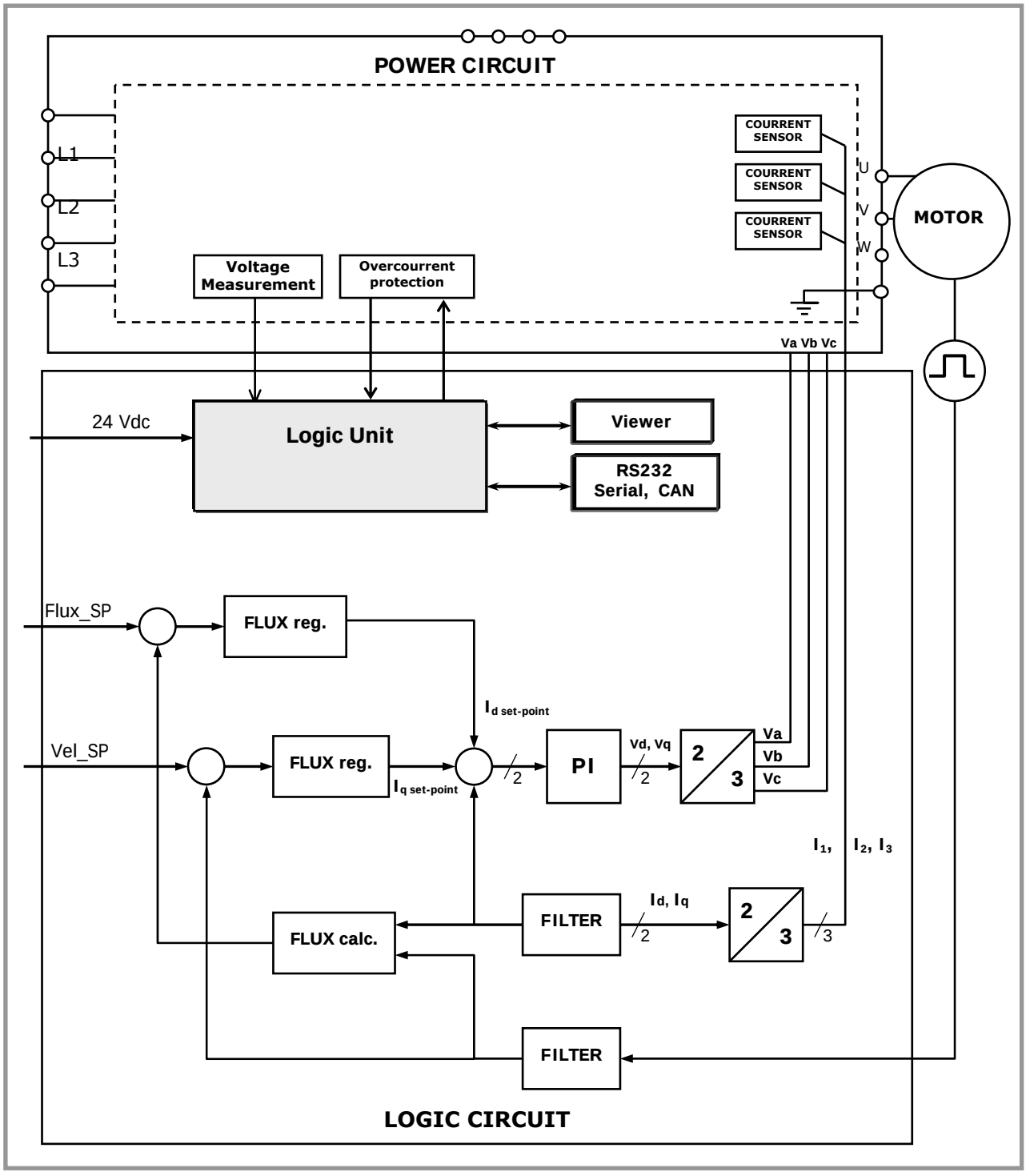
Power circuit switches constant three-phase voltage and frequency on a d.c. voltage. By the way it obtains a new variable three-phase and frequency voltage. This values permit to adjust the speed motor modulation.

Picture 3.2 Power circuit diagram block.



The drive **logic circuit diagram block** referres to the following picture.

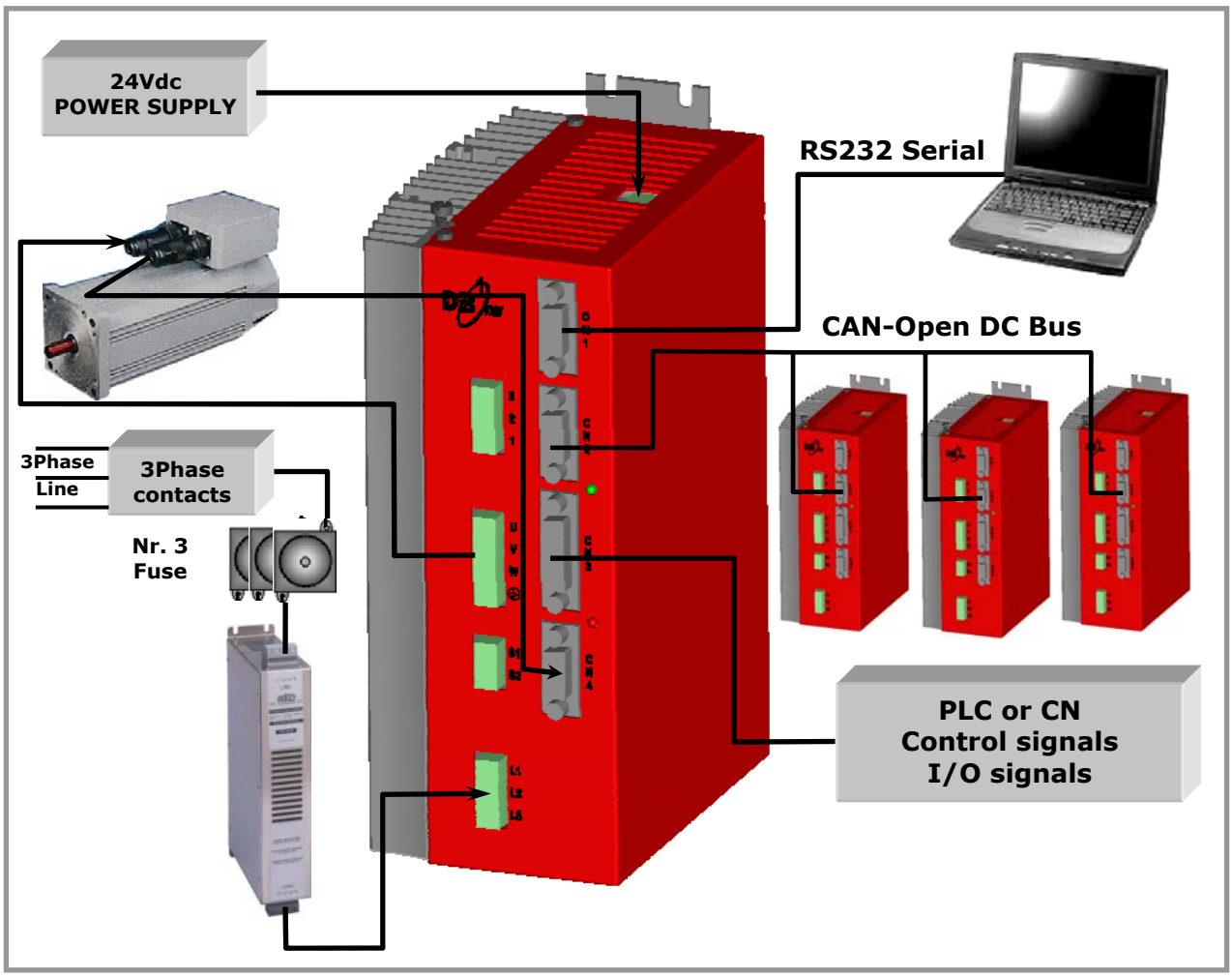
Picture 3.3 Logic circuit diagram block.



3.4 CONNECTIONS

This charter shows all the possible connections between the drive and the other components.

Picture 3.4 DB1 connections diagram.



4. TECHNICAL DATA

This charter shows the DB1 technical data and the synoptic combination table between drive-motor.

4.1 DB1 TECHNICAL DATA

This table resumes the electrical data, environment and physic values of the two DB1 models.
Analogue and Digital I/O are following remarked.

Table 4.1 DB1 Electrical Data.

Electrical Data	DB1A 40- ..-07	DB1A 40- ..-10	Unit
Supply	3x400 ±10%	3x400 ±10%	Vac a 50/60 Hz
Logic supply	+24 ±15%	+24 ±15%	Vdc **Insulated**
Motor supply	330	330	Vac RMS Phase to Phase.
PWM Frequency (switching)	20	20	kHz PWM .
Rating Power	4	7	KW
Rating Current	7	10	A rms
Peak Current	14	20	A rms

Table 4.2 DB1 Environment.

Environment	DB1A 40- .. -07	DB1A 40- ..-10	Unit
Transport temperature	-25 … +55		°C
Transport Humidity	95%		W.C.
Storage temperature	-25 … +55		°C
Storage Humidity	95%		W.C.
Rated working Temperature From +45 to +55 by power adsorbing 2,5%/K.	-20 … +45 @ nominal value		°C
Rated working Humidity	From 5% to 85%		W.C.
Altitude	Up to 1000 mt. Without derating. From 1000 to 2500 m the power must be 2% / 100mt derated.		

Table 4.3 DB1 Physic Data.

Physic Data	DB1 A 40 …				Unit
	A 07	B 07	A 10	B 10	
Weight	2,200	2,660	2,200	2,660	Kg
Braking Unit	100		100		W
Degree Protection	IP20		IP20		--
Crash resistance	0.5g		0.5g		-
Fan-Cooling	On Demand (24V d.c. supply).				
Vibration resistance	0.5 g for all the directions: 0-10Hz.				
Braking unit circuit	Internal.				

4.1.1 *PROTECTIONS*

Avoid wrong uses the drive has many protections improved as following:

- Supply over voltage: 770 Vdc on the DCBUS.
- Under voltage, DCBUS not sufficient supply: 420 Vdc.
- Motor over temperature: 125°C ± 5°C.
- Power module over temperature: 75°C.
- Short circuit between phases.
- Short circuit @earth.
- Motor over current.

4.1.2 ANALOGUE INPUT

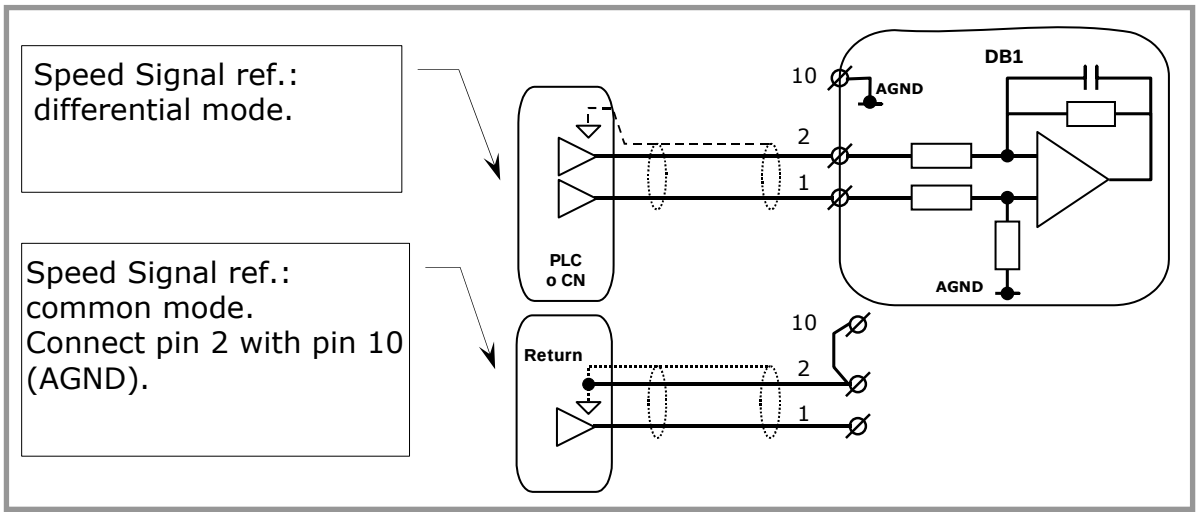
Nr. 2: Differential (+VREF, -VREF) and (ATEXREF, ATEXREF\).

- **+VREF, -VREF differential ±10V**

  The DB1 has an analogue input to be used for a PC or CNC link.

  The CNC or PLC "Ax" board used has an analogue output as "differential mode" or "common mode". The connections must be done following the figured instructions.

Picture 4.1 Differential analogue input (+VERF, -VREF).



- **ATEXREF, ATEXREF** (**A**nalogue **T**orque **Ex**ternal **Ref**erence)

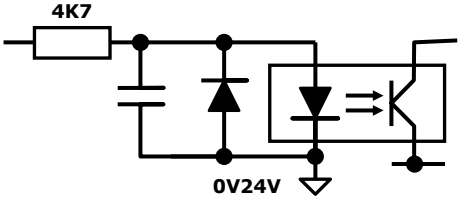
  ±10V Differential, 10KΩ Impedance.
  Differential analogue input for speed control with rated torque limited from the motor .

4.1.3 DIGITAL INPUT

DB1 drive has 8 digital input: two of them are optional (on demand).
All the digital input are insulated by opt insulators @ 0 potential; hereafter the diagram circuit.

Picture 4.2 Digital input diagram circuit.

- Nr. 6 insulated digital input.
  (DIEN, DTEN, DIN1, DIN2, DIN3, DIN4).
- Nr. 2 optional (on demand).
  (Stepper motor simulation - CLK e DIR).

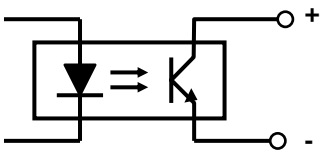


4.1.4 DIGITAL OUTPUT

The digital output are insulated. The following picture swohs the circuit diagram.

Picture 4.3 Digital output circuit diagram.

- Nr. 2, Insulated.
  ZSPEED+, ZSPEED-
  DOUT1+, DOUT1-
  0,05A/Out.

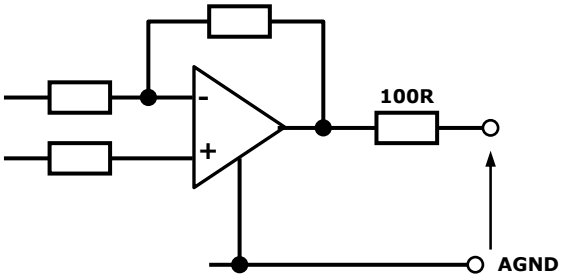


4.1.5 ANALOGUE OPTIONAL OUTPUT

The analogue output circuit diagram referres to the followed picture.

Picture 4.4 Analogue output circuit diagram.

Nr. 2: ANOUT1, ANOUT2



4.2 MOTORS DRIVEN

DB1 drive is made to control brushless a.c. servomotors.

Especially Setted and programmed for own BT brushless a.c. servomotors.

4.2.1 GENERAL DATA

BT series are an high efficiency IP54 6Poles servomotors.
Thanks to the last FeNdB permanent magnet series the motor can work up to 150°C without derating.

The main stones of these motors are high performance, fast and flexible adjustment during the duty cycle, tough and reliability. All in small and compact dimensions.

The bearings used are an high charge capability series with double standard protection and self-lubricating for their complete life.

The standard feedback is made by an incremental encoder. Also available other feedback as SinCos, Absolute Single-Multi tour Encoder, Resolver, and so on.
24Vd.c. permanent magnet braking are available on demand.

4.2.2 ELECTRICAL DATA

Find hereafter the BT-servomotors and DB1-drive combination table.

Table 4.4 Servo motor Performance.

DB1A 40 model drive			**A/B/C/D 07**	**A/B/C/D 07**	**A/B/C/D 07**	**A/B/C/D 07**
Servo motor Performance			**BT2S**	**BT2M**	**BT2L**	**BT2X**
Supply		Vac	**400**	**400**	**400**	**400**
Continuous Torque	**T_{sc}**	Nm	**2,7**	**4,7**	**7,2**	**9**
Torque constant	**Kt**	Nm/A	**1,23**	**1,14**	**1,35**	**1,45**
Continuous Current	**I_{sc}**	Arms	**1,8**	**3,5**	**4,5**	**5,2**
Rated Speed	**Nn**	Rpm	**3000**	**3000**	**3000**	**3000**
Peak Torque	**Tp**	Nm	**9,5**	**15**	**18,9**	**20,3**
Peak Current	**Ip**	Arms	**7,7**	**13,1**	**14**	**14**
Rotor Inertia	**J**	$mKgm^2$	**0,225**	**0,412**	**0,6**	**0,79**
"MOTOR" parameter value			**1**	**2**	**3**	**4**

Table 4.5 Servo motor Performance.

DB1A 23 model drive			A/B/C/D 10	A/B/C/D 10	A/B/C/D 10
Servo motor Performance			**BT2X**	**BT3M**	**BT3L**
Supply		Vac	**400**	**400**	**400**
Continuous Torque	**T_{sc}**	Nm	**9**	**14,4**	**15,2**
Torque constant	**Kt**	Nm/A	**1,45**	**1,44**	**1,52**
Continuous Current	**I_{sc}**	Arms	**5,2**	**8,7**	**11,8**
Rated Speed	**Nn**	Rpm	**3000**	**3000**	**3000**
Peak Torque	**Tp**	Nm	**24**	**29,8**	**30,4**
Peak Current	**Ip**	Arms	**16,5**	**20**	**20**
Rotor Inertia	**J**	$mKgm^2$	**0,79**	**2,35**	**2,46**
"MOTOR" parameter value			**1**	**2**	**3**

The standard sale brushless servo motors includes:

- PT100.
- Incremental Encoder 2048ppr (LESS WIRING).
- 90° reversible terminal box.
- MIL-C-26482 series 1 Signal Connector.



WARNING
The motor/drive combination is made by "MOTOR" parameter following the table mentioned above.

5. MECHANICAL MOUNTING AND DIMENTIONS

DB1 is designed for a wall mounting and vertical fixing into an electronic equipment. It can not be used in dangerous and pollution environments.

5.1 MECHANICAL DIMENTIONS

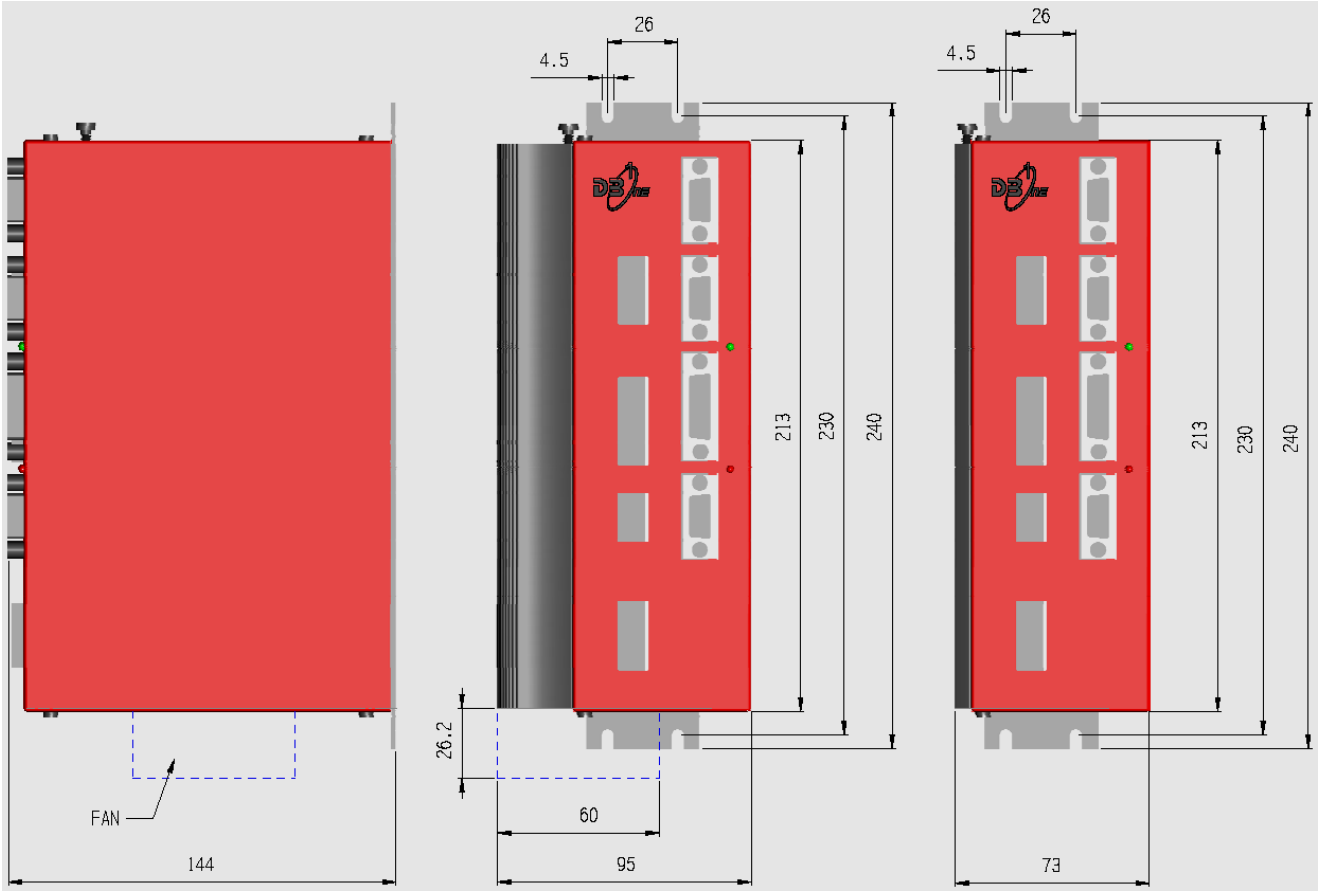
All the fixing dimensions and holes positions are following remarked. All the models configuration have a small and large heat sink. By the way the drive can be supplied either in A (small heat sink), B (large heat sink), C (large heat sink + fan cooler), D (large heat sink + double fan cooler) configuration.

Picture 5.1 DB1 Mechanical dimensions.

Lateral View
DB1 A
Depth (connectors included)

Front View
DB1 A -40- B- 07/10
With Large heat sink (**B/C/D**)

Front View
DB1 A-40 – A – 07/10
With Small heat sink (A)



Mechanical dimensions used are on mm.

5.2 MOUNTING INSTRUCIONS

The DB1 is provide for vertical fixing with an external fan cooler fixed below (on demand or required by the application). The cooling flux must be free to come trough the mechanical ways easily. Other outside component cant heat the cooling air.

The DB1 positioning and mechanical fixing must respect the following instructions.

Mounting environments: Clean industrial ambient only. Not pollution and conductor material are admitted. Corrosive, liquid and dangerous environments too.
Don't fix it near/on heat surfaces (as transformers).

Mounting distances: Having an optimal cooling action the vertical mounting is recommended. Minimum distances between the drive and the equipment walls, or other devices, must be respected too.
100mm on the top, 40mm from the heat sink and 20mm from the lateral side are distances recommended.

Airing: Please care a sufficient air exchanging into the closed equipment.
The maximum ambient temperature admitted must be warranted.

Mounting: Fix the drive vertically using the proper mounting components. Not painted metallic surface only.
Fix the DB1 using all the screws provided. Put it on the equipment earth.



WARNING

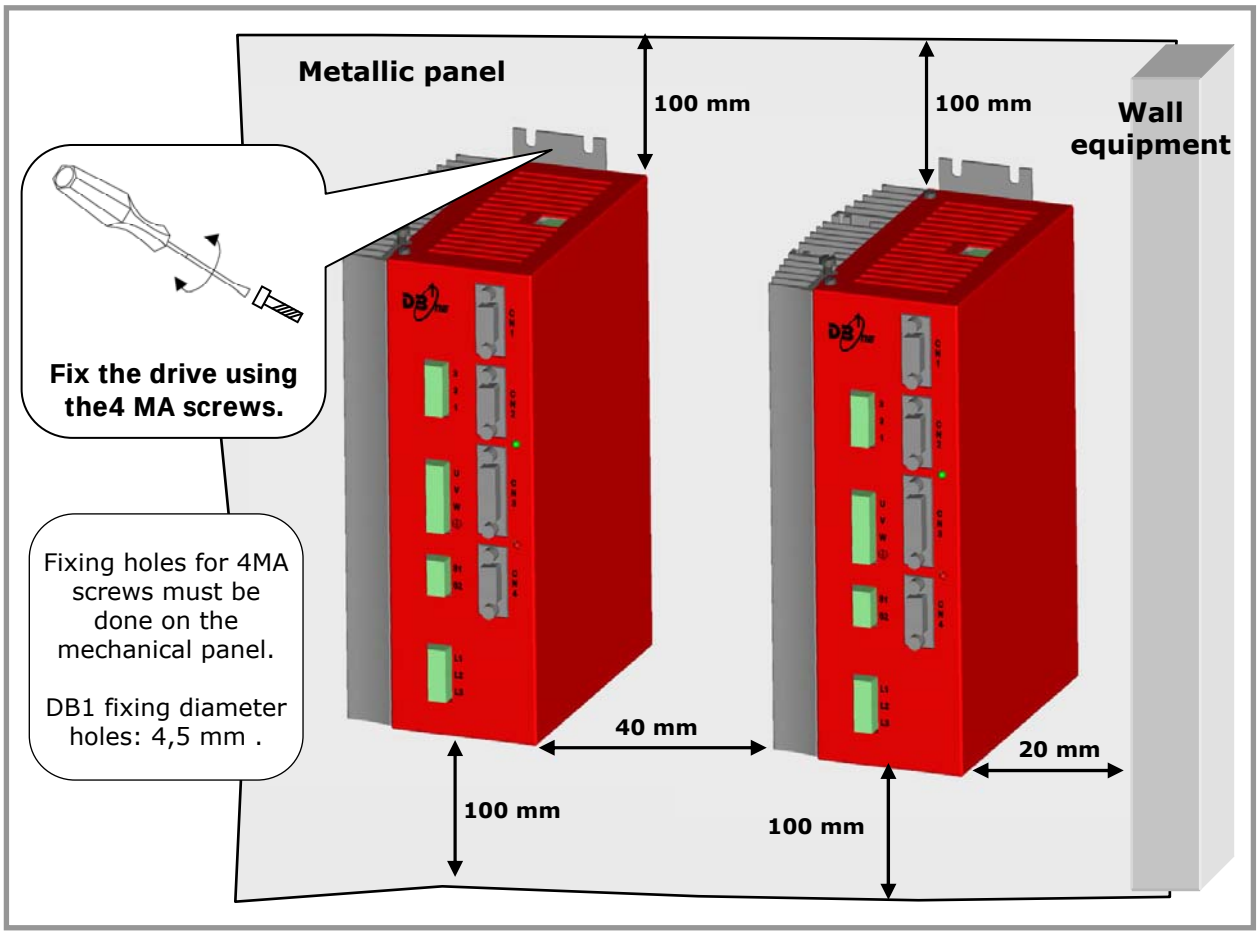
Avoid injuries and not correct use please care about the instructions mentioned above.

Avoid wrong mounting be careful to the following picture and the information.

1. Drill 4 holes 4MA screws fixing on the metallic equipment surface, due to the DB1 position provided. Respect the minimum mounting distances required.
2. Place the drive vertically on the metallic equipment surface centring the fixing holes on the top.
3. Fix the DB1 superior side by the 4MA screws without lock.
4. Verifying the right contact between the drive and the panel surface, lock the screws.
5. Turn the upper screws before and following the others.

The picture shows the mounting the minimum distances required for the drive fixing. In case of many drive too.

Picture 5.2 DB1 Mechanical Fixing and minimum distances.



5.3 FAN-COOLING

The DB1 mounting into an electric cabinet must care about the sufficient cooling required and it must not influence the right air circulation.

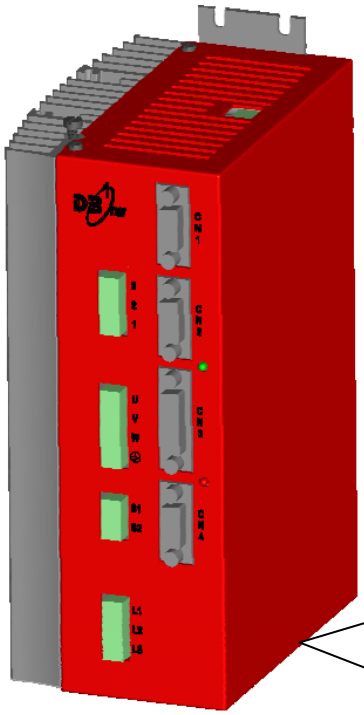
The drive dissipation should change due different charge applied or duty cycle. To have the best performance a fan-cooler should be applied if necessary.

The fan is mounted below. (For special application the DB1 has oa double fan-cooler).

WARNING: FAN

The external fan is automatically powered by the DSP if necessary. A thermistor signal the exceed temperature.

Picture 5.3 DB1 Fan.



Product code	DB1 Description
DB1 A 40 C 07 ..	Large heat sink with 1 fan (7 A)
DB1 A 40 D 07 ..	Large heat sink with 2 fan (7 A)
DB1 A 40 C 10 ..	Large heat sink with 1 fan (10 A)
DB1 A 40 D 10 ..	Large heat sink with 2 fan (10 A)

Fan position

Mechanical dimensions 60x60x26 mm.
(Mechanical dim. ref. to the picture 5.3).

6. ELECTRICAL INSTALLATION

The DB1 mounting, maintenance and running operation must be done by qualified personnel only who has a specify electro technical knowledge and have had already worked with such applications.
The personnel must care about the existing grounded kink and the right cables protection following the national and/or international rules required.
Read carefully this manual before the start up operations.

WARNING

- Avoid injuries don't apply voltage supply over the operative drive.
- The start up must be done by qualify personnel only.
- The motor must be overload protected.

The DB1 conformity is assured if all the instructions here contained are followed only.

WARNING

- ***All the links must be done without voltage applied****, the power and 24V auxiliary and other devices to.*
- ***Be sure the equipment is swiched off*** *(by blocks, warnings and so on).* ***The single voltages must be inserted if the drive is grounded only.***
- ***Do not unscrew the electrical links when the drive is under tension. Otherwise it could bring faults to the equipment.***
- ***The driving and power links can be under tension when the motor is stopped too,*** *300sec. After the switch off the capacitors could be dangerous****. Wait 5 min*** *till the supply is lesser than 40V.*

6.1 JUNCTION RULES

According to the electric international rules Drivers and motors must be grounded.
Hereafter are shown the main instructions.

6.1.1 GROUNDING

Be sure the grounding between motor and drive is made correctly.
Do not use mounting painted surfaces (these can conduct).
A correct grounding solves many systems faults before.
For a right grounding find the following suggests:

- Clean deeply the case contact DB1 surfaces before the grounding, because EMC rules and safety.
- Link the earth drive connection to the equipment earth by a yellow-green cable shorter than possible.
- A good grounded radiofrequency contact panel fixing must be done. Use larger surfaces.
- Avoid disturbs ground the motor case by a separate connection to other grounding devices. A low motor case impedance is required; the normal motor link or a simple mechanical fixing is not sufficient. An added good grounding link is required.

Bad grounding are dangerous for the motor (caused by common impedance link only). It means:

- High hot motor temp. and/or noisily running,
- Bad driving @low speeds,
- Off-set speed point difficult to be zero,
- Not regular and continuously positioning mistakes.

NOTE

The grounding picture is placed on all the connection circuits and it shows a larger conductive link between the drive and the equipment surface is required.

High frequency dissipations must be permitted by this link. Don't mistake the symbol with the PE grounding (ref. EN 60204).

EQUIPMENT GROUNDING BAR.
It's the point every DB1 grounding wires are putted on. It must be placed nearly to the PE input. From this point all the grounding DB1 0V (GND), CNC and other auxiliary (+24VDC) links start.

6.1.2 LINK WIRES

Place power and driving cables separately. 20 cm minimum distance is required. In this way the immunity interferences recommendations are respected.
Following all the standing cables suggests.

A) Separate cable techniques must be used: stand the power and driving cables separately. During the standing procedure the physic power and signal cables separation must be cared. 20 cm as min. distance is recommended. If the power cable has other signal cables inside (as brake) these must be protected and separated.

B) Don't cross the wires. 90° crosses are permitted if necessary only.

C) Metallic wire boxes grounded are recommended; the motor grounding cable must be separated and not a multi polar cable component.

Cable section

All the cables that drive high currents must be as large as the EN60204 remarks.

Motor and Supply cable sections

DB1 A 40 – A/B/C/D - 07 : 2,5 mm² section (AWG14).
DB1 A 40 – A/B/C/D -10 : 2,5 mm² section (AWG14).

Signal cable section

0,5 mm² section (AWG20).

6.2 CONNECTORS AND SIGNALS

The following two pictures show all the connectors and signals available.

Picture 6.1a DB1 Connections and Signals.

24VDC AUX: 24Vdc supply
2 poles connector

Pin	Name	Description
-	0V24V	24Vdc refereeing
+	24V	24Vdc supply

BRAKE: Brake Resistor
3 poles connector

Pin	Name	Description
1	RINT1	Internal resistor short circuit
	REXT1	External resistor
2	RINT2	Internal resistor short circuit
3	REXT2	External resistor

NOTE: Brake resistance connections must be referred to the own chapter.

MOTOR: Motor Supply
4 poles connector

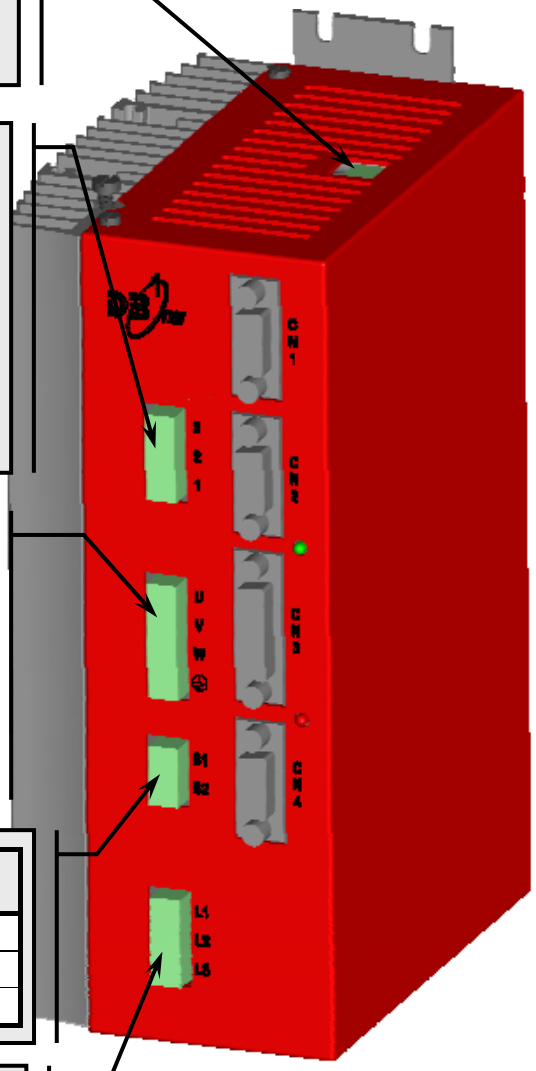
Pin	Name	Description
1	U	Motor U Out Phase
2	V	Motor V Out Phase
3	W	Motor W Out Phase
4	PE	Earth

SAFETY: Safety Supply DC BUS
2 poles connector

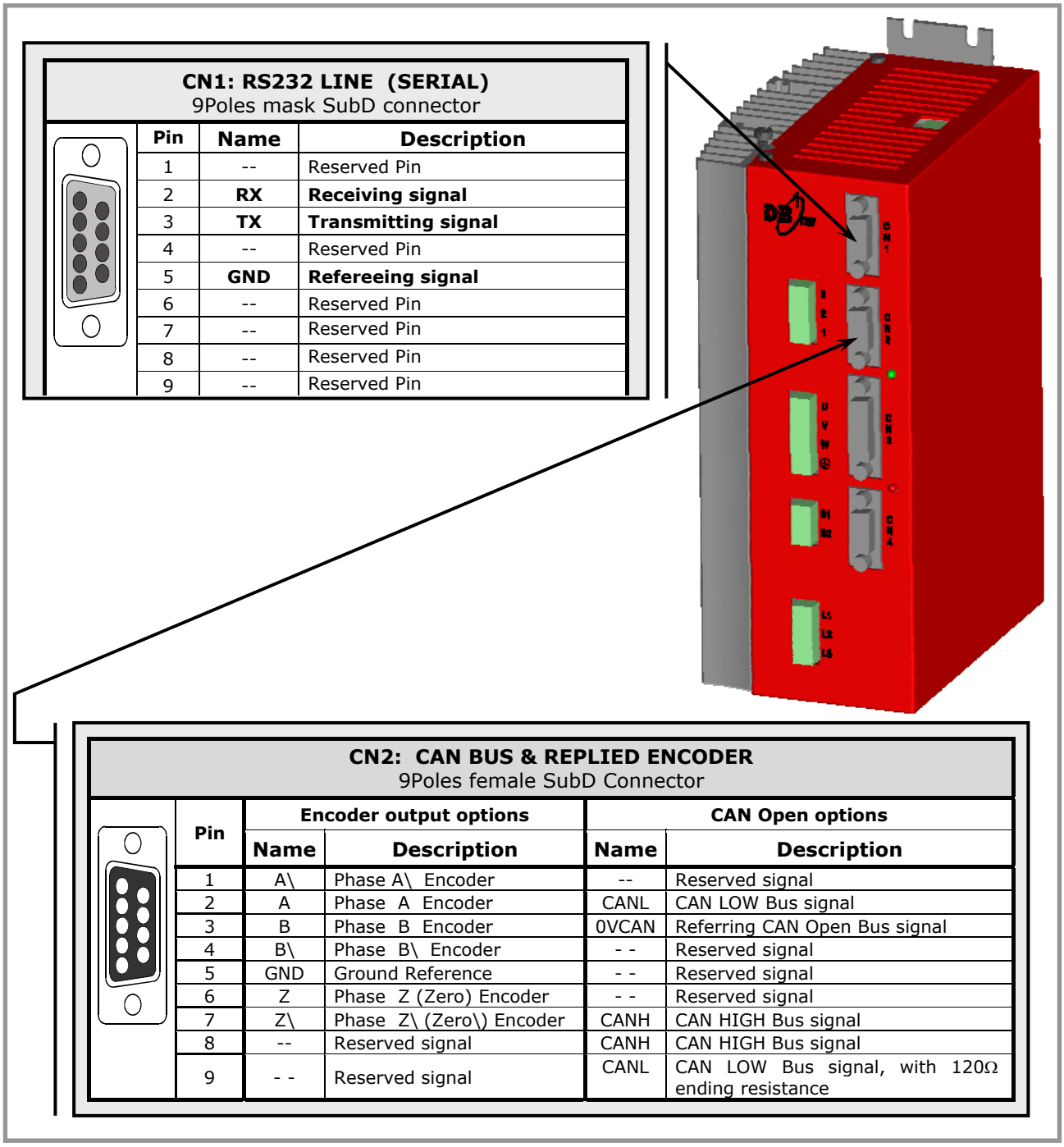
Pin	Name	Description
S1	VDC1	DCBUS short circuit supply
S2	VDC2	DCBUS short circuit supply

SUPPLY: Drive supply
3 poles connector

Pin	Name	Description
1	L1	L1 Phase Supply
2	L2	L2 Phase Supply
3	L3	L3 Phase Supply



Picture 6.1b DB1 Connections and Signals.



CN1: RS232 LINE (SERIAL)
9Poles mask SubD connector

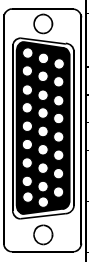
Pin	Name	Description
1	--	Reserved Pin
2	**RX**	**Receiving signal**
3	**TX**	**Transmitting signal**
4	--	Reserved Pin
5	**GND**	**Refereeing signal**
6	--	Reserved Pin
7	--	Reserved Pin
8	--	Reserved Pin
9	--	Reserved Pin

CN2: CAN BUS & REPLIED ENCODER
9Poles female SubD Connector

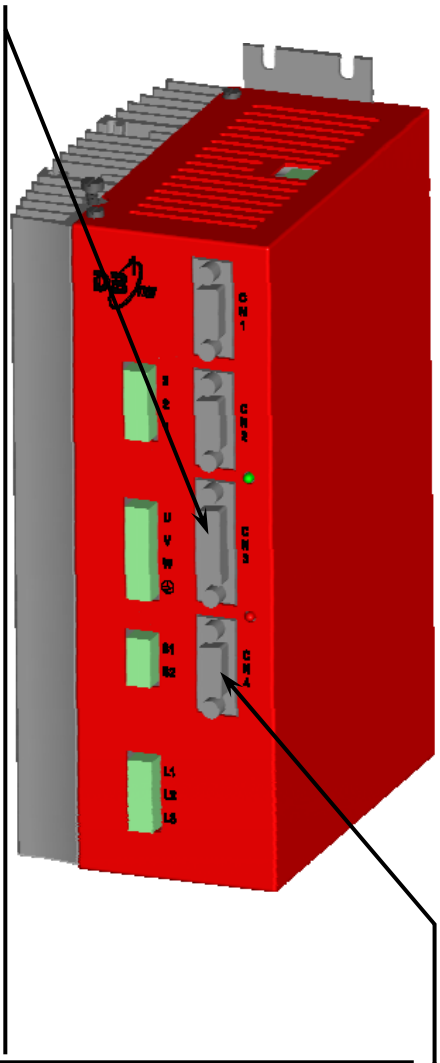
Pin	Encoder output options		CAN Open options	
	Name	Description	Name	Description
1	A\	Phase A\ Encoder	--	Reserved signal
2	A	Phase A Encoder	CANL	CAN LOW Bus signal
3	B	Phase B Encoder	0VCAN	Referring CAN Open Bus signal
4	B\	Phase B\ Encoder	- -	Reserved signal
5	GND	Ground Reference	- -	Reserved signal
6	Z	Phase Z (Zero) Encoder	- -	Reserved signal
7	Z\	Phase Z\ (Zero\) Encoder	CANH	CAN HIGH Bus signal
8	--	Reserved signal	CANH	CAN HIGH Bus signal
9	- -	Reserved signal	CANL	CAN LOW Bus signal, with 120Ω ending resistance

Picture 6.1c DB1 Signal and Connections.

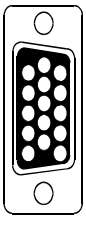
CN3: SIGNAL
26Poles female Connector SubD HD



Pin	Name	Description
1	+VREF	Positive speed differential analogue referring signal
2	-VREF	Negative speed differential analogue referring signal
3	GND	ANOUT1 and ANOUT2 referring ground
4	ZSPEED+	Zero speed output signal (Option)
5	ZSPEED-	Zero speed output signal (Option)
6	CLK	Stepper motor drive FREQUENCY positive input signal
7	0VCLK	Stepper motor drive FREQUENCY negative input signal
8	DTEN	Torque Enable
9	DIEN	+/-VREF Speed enable digital referring
10	N.C.	Not Connected
11	ATEXREF\	Programmable analogue differential Neg input
12	ANOUT1	1st analogue programmable output (option)
13	CANH	CAN Open dc Bus, CAN HIGH signal
14	DOUT1+	OK + drive signal
15	DOUT1-	OK - drive signal
16	DIR	Stepper motor positive DIRECTION signal input (optional)
17	DIN2	Programmable digital input
18	DIN1	Programmable digital input
19	ATEXREF	Programmable analogue differential Pos. input
20	ANOUT2	2nd analogue programmable output (option)
21	0VCAN	CAN Open DC Bus referring signal
22	CANL	CAN Open DC Bus CAN LOW signal
23	0V24V	24Vdc Referring, digital input ground
24	0VDIR	Stepper motor negative DIRECTION signal input (optional) Stepper motor negative DIRECTION signal input (optional)
25	DIN3	Programmable digital input
26	DIN4	Programmable digital input



CN4: FEEDBACK
15Poles female HD Connector SubD

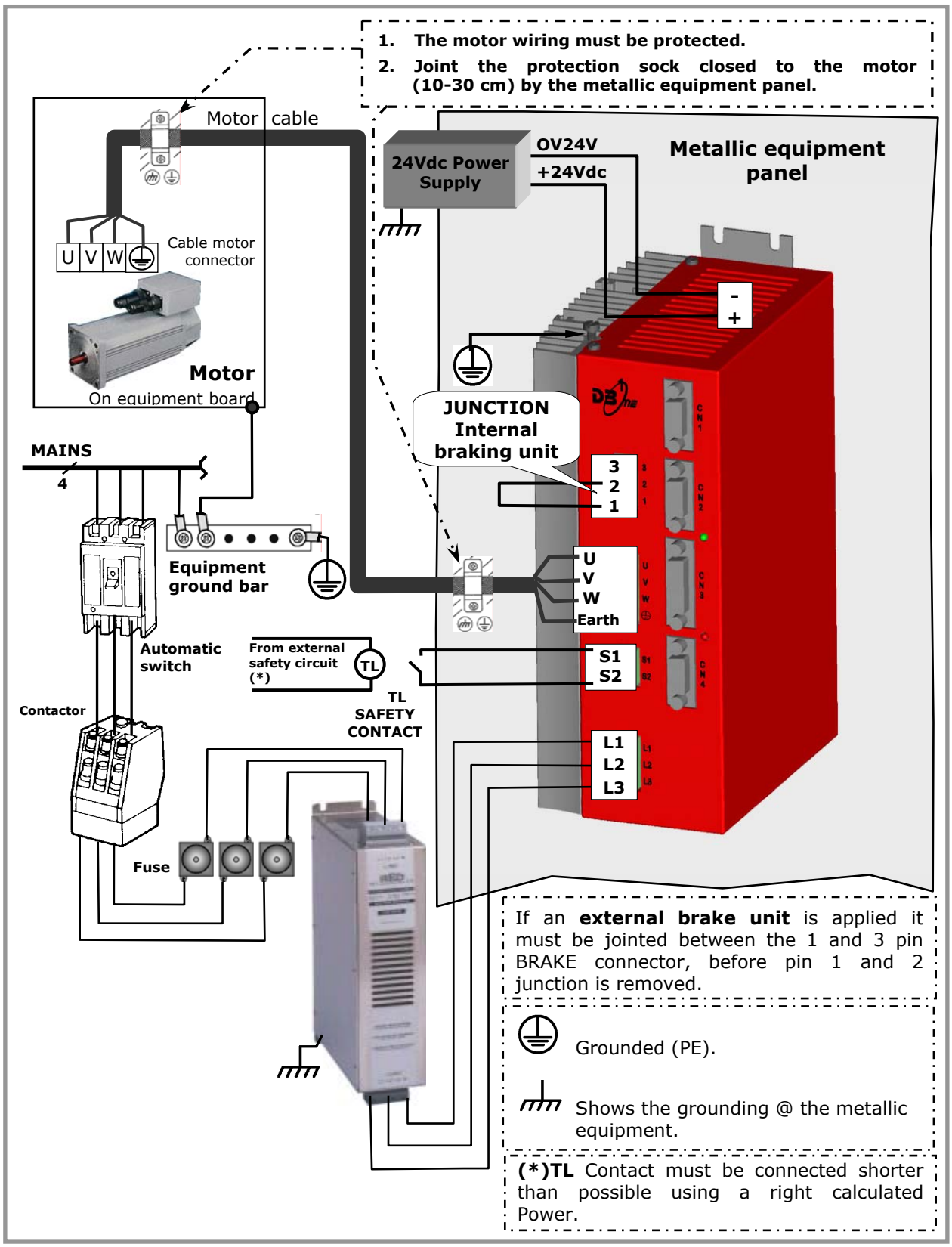


Pin	ENCODER		SIN\COS Option		RESOLVER Option	
	Name	Signal Description	Name	Signal Description	Name	Signal Description
1	+VENC	Encoder Supply	+VENC	Encoder Supply	- -	Reserved Signal
2	A	Phase A Encoder	- -	Reserved Signal	- -	Reserved Signal
3	A\	Phase A\ Encoder	- -	Reserved Signal	- -	Reserved Signal
4	B	Phase B Encoder	- -	Reserved Signal	- -	Reserved Signal
5	B\	Phase B\ Encoder	- -	Reserved Signal	- -	Reserved Signal
6	Z	Encoder Zero	REFCOS	COS\ Signal	REFCOS	COS\ Signal
7	Z\	Encoder Zero\	- -	Reserved Signal	- -	Reserved Signal
8	PTC	Motor thermistor	PTC	Motor thermistor	PTC	Motor thermistor
9	0V	Thermistor referring	0V	Thermistor referring	0VENC	Thermistor referring
10	U	Phase U Encoder	SEN	Sinus Signal	SEN	Sinus Signal
11	V	Phase V Encoder	REFSEN	SIN\ Signal	REFSEN	SIN\ Signal
12	W	Phase W Encoder	COS	Cosine Signal	COS	Cosine Signal
13	0VENC	+VENC Referring	0VENC	+VENC Referring	- -	Reserved Signal
14	- -	Reserved Signal	DATA+	RS485 Communication	ECC	ECC Signal
15	--	Reserved Signal	DATA-	RS485 Communication	REFECC	ECC Referring Signal

6.3 POWER LINKS: MOTOR and SUPPLY

This picture shows all the motor & drive links available.

Picture 6.2 DB1 power wire connections.



The protection made by press-cable is better if made on the conductors closed to the drive filter.



WARNING: MOTOR WIRE

The motor wire must be protected.

Link the cable by press-cable nearly to the metallic equipment surface (10-30 cm are sufficient).



WARNING: LINE FILTER

The Filter unit must be linked nearly to the drive. Don't stand input and out cables on parallel.

The DB1 and Filter unit cable length must be shorter than 30 cm. If not protected cables must be used. In this case the protection must be done grounding @360° to all the cable points.

6.3.1 SUPPLY CIRCUIT: External fuse and switches

A protection gate between the net and the drive is always recommended; for this goal late fuses and switches can be used.

Fuses

Avoid switch on current peaks the fuses used must be on "late type".

To get superior warranties Extra-Fast fuses.

If many drives are linked to a common secondary wind three fuses per drive are necessary.
Avoid switch on current peaks the fuses used must be on "late type".

Switches

Avoid not regular d.c. adsorbing values use differential switches on d.c. dispersion or universal.

For a correct switch size calculation is necessary to care about the internal RFI filter capacitors.

Drive	Fuse	Note
DB1A 40-A/B/C/D- 07	14 A	-
DB1A 40-A/B/C/D- 10	20 A	-

6.3.2 LINE FILTER

PWM 20KHz power signal switching is are the drive standard value.
Referring to the international rules it is a disturbs generator. PWM 20KHz are switched by the DB1. Referring to the EMC norms the drive is considerate a disturbs generator. To respect the EMC values fixed a filter unit must be applied. The filter must be placed on the main supply line, before the drive (see picture 6.2).

Filter unit mission is to ground the bad frequency. These units can drive leakage currents (mA values). To put on safety link the connector before the drive is switch on. A wrong link invalids the filter action.
Leakage current values must be considered while the drive adjustment are made.



WARNING: LINE FILTER

The filter must be calculated according to the rated current drive.

For multi-ax systems a single filter unit is suggested. Put it before the drive supply.

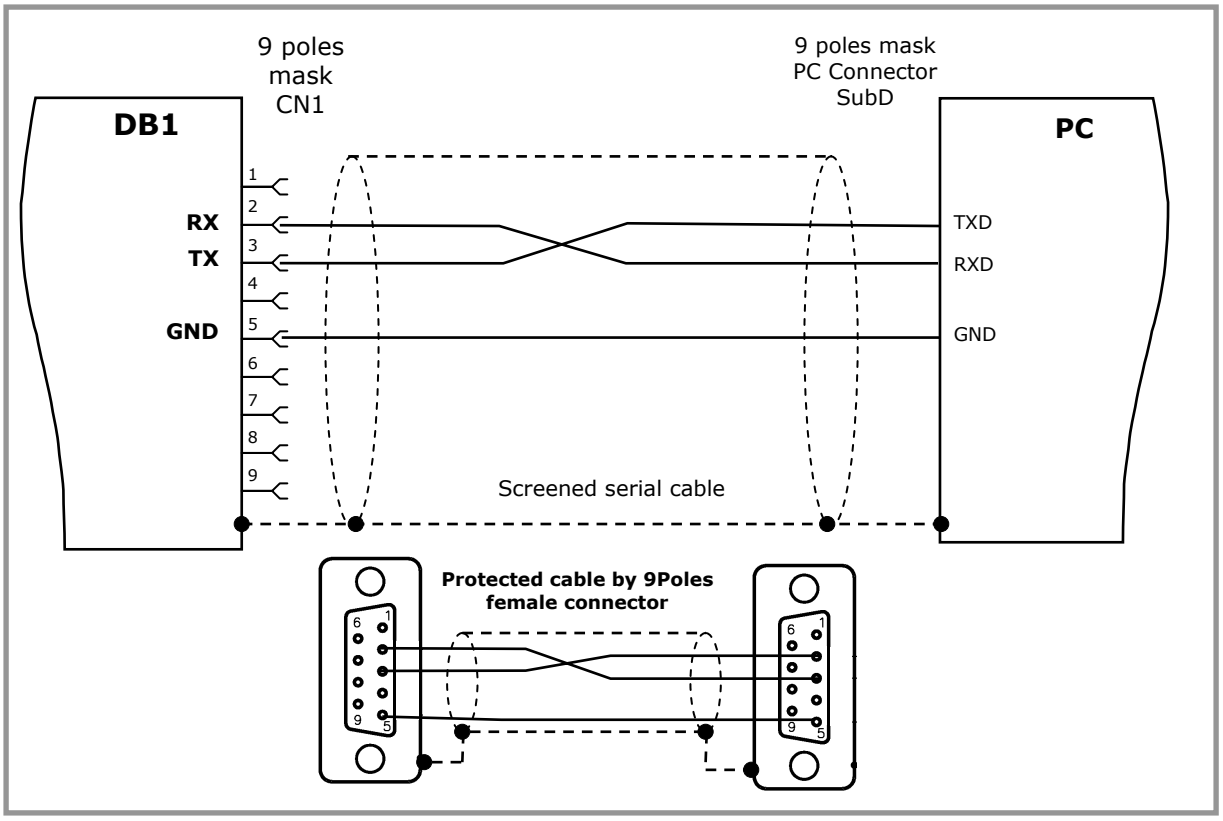
In this case the filter calculation must care about all the current added.

6.4 CN1 CONNECTOR LINK: RS232 LINE

The automatic drive set up is made through the RS232 interface communication.
All the parameters can be modified by the "Motion Control" software (set up, positioning, running and others main parameters).
This software must be installed on a PC supporting systems as. Windows 98 - Windows 2000 - Windows XP - Windows NT, see capther 7.

Link the serial interface (CN1) drive interface to the PC interface with an own transmission cable (see the following connections).

Picture 6.3 Connector Links CN1, RS232 LINE.



WARNING: SERIAL CABLE

- **The Serial cable must be protected and its length must be 5mt maximum.**
- **Serial cable connected without supply voltage only.**
- **Transmission cable can be supplied on demand (optional).**

6.5 CN2 CONNECTOR LINK: CAN BUS & REPLIED ENCODER

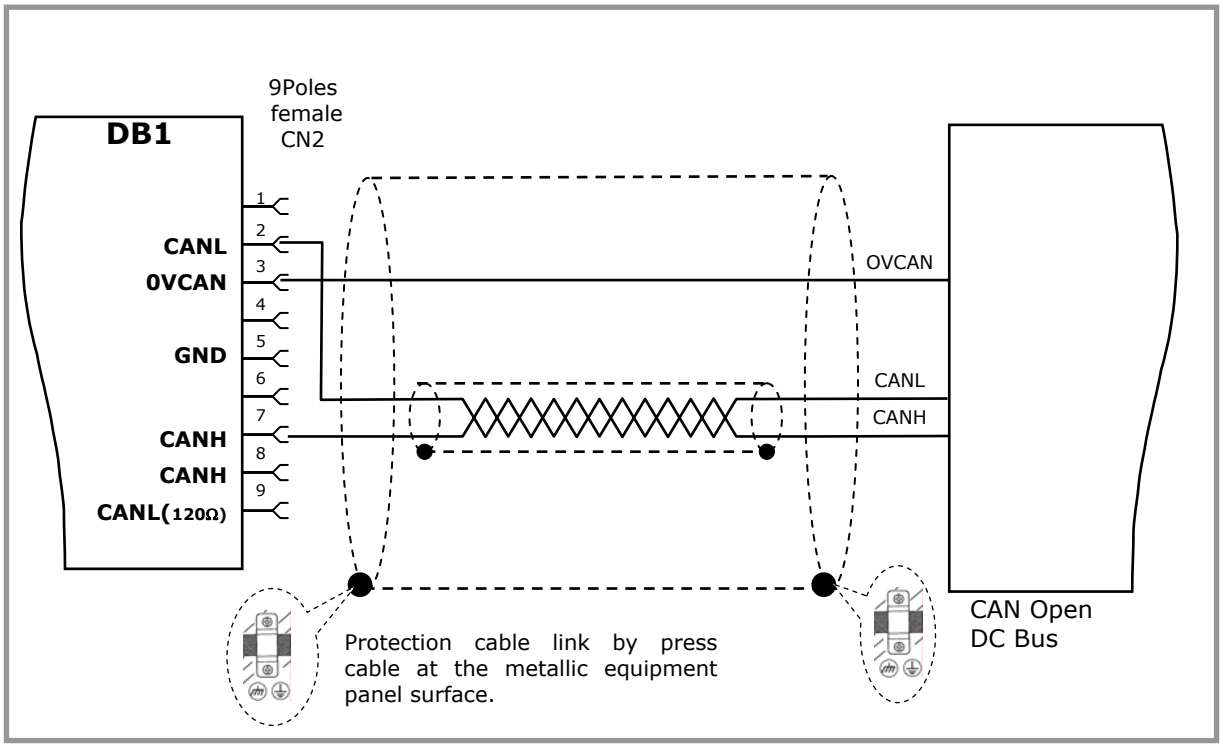
By the CN2 input or the Can Open or the replied encoder are available.

CAN BUS CONNECTIONS

Can-Open interface is insulated by opt insulators.
The integrated communication protocol is based on Can Open DS301 and DSP402 profile (500KBaud speed, 1Mbit/sec. max.).
Other information can be found on the special application data sheet.

If CN2 is linked to a CAN Open field bus the connections to be used are the following picture.

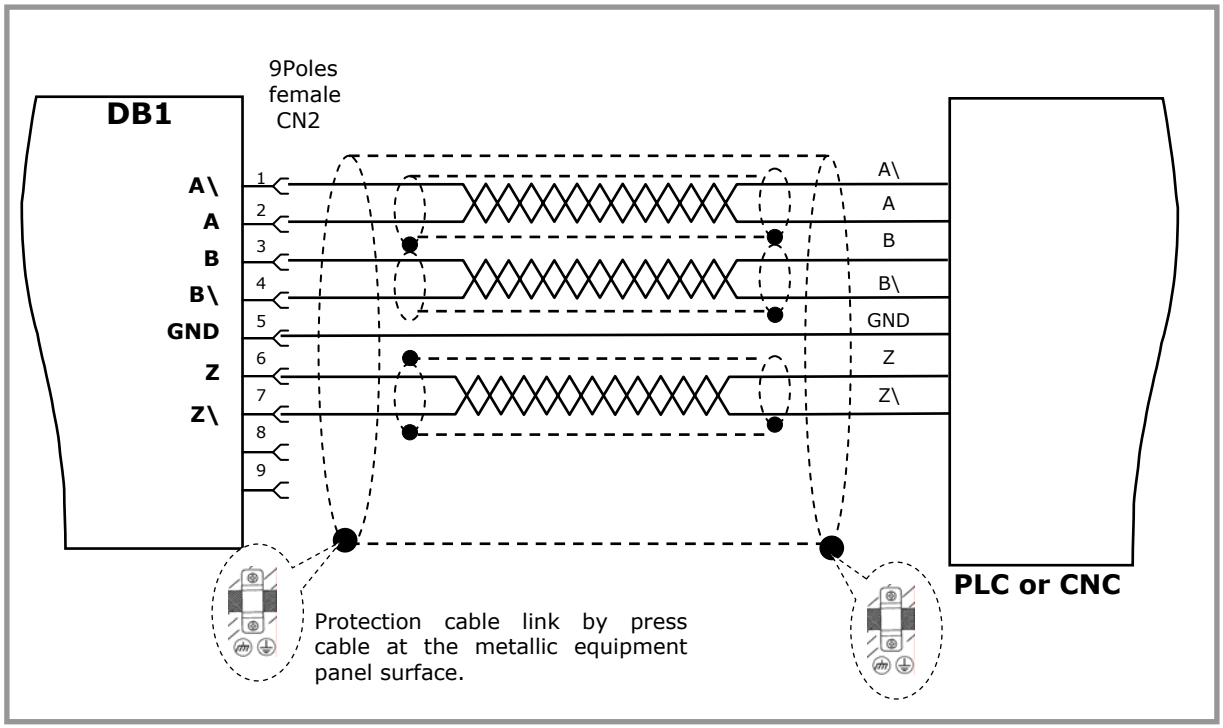
Picture 6.4a CN2 connector connections: CANBUS.



REPLIED ENCODER CONNECTIONS

If CN2 is linked to a PLC or CNC device by replied encoder feedback the connections to be used are the following picture.

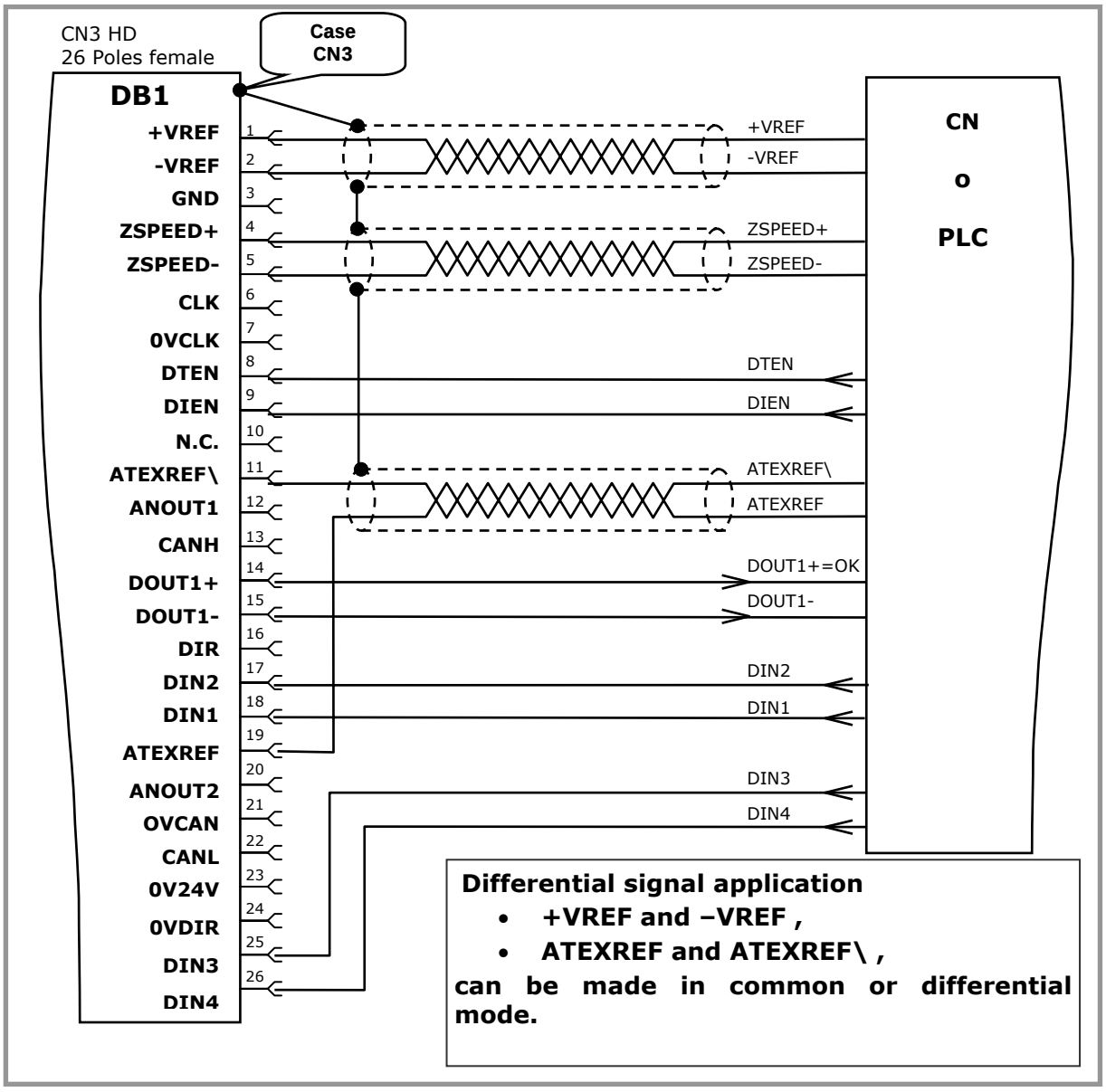
Picture 6.4b CN2 connector connections: REPLIED ENCODER.



6.6 CN3 CONNECTOR LINK: SIGNAL

CN3 possible connections are shown in the following picture.

Picture 6.5a CN3 connector connections.



WARNING

Option connections as

- **Stepper motor emulation (CLK, 0VCLK, DIR, OVDIR Signals);**
- **CAN Open (CANH, CANL, OVCAN Signals);**
- **Analogue Output (ANOUT1, ANOUT2 Signals);**

must be referred to the own chapter (Applications).

6.7 CN4 CONNECTOR LINK: ENCODER FEEDBACK SIGNALS

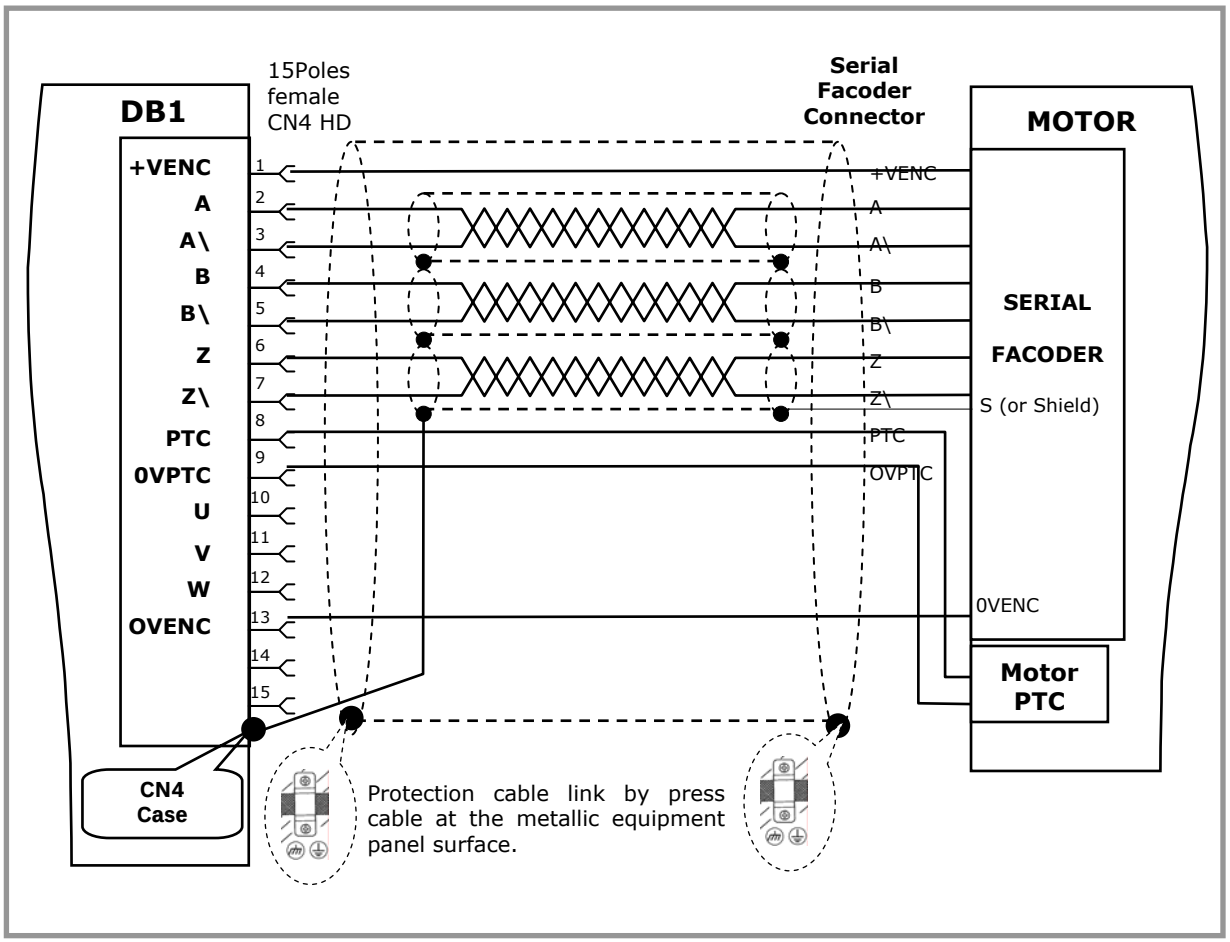
CN4 connector (15 poles) contains the motor feedback signals.
The cable used must be protected with a minimum section:

- 0,25 mm² for distance of 20 mt.
- 0,35 mm² for superior distance of 20 mt.

Sock and other wires must be connected as in the following picture.

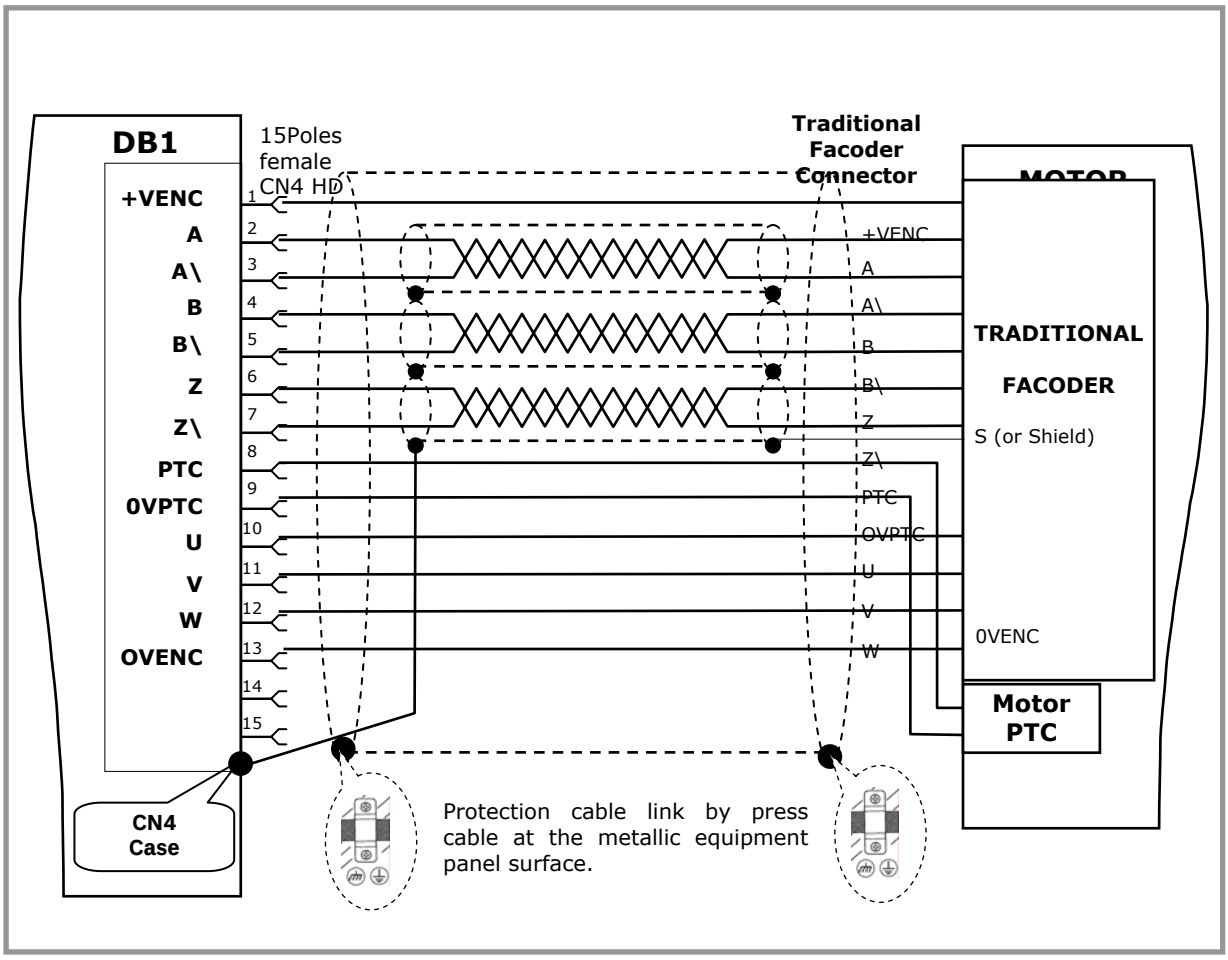
DB1 is able to drive motors on which are installed both **traditional encoder** (Facoder) and **serial encoder**, for the link look in the following two pictures.

Picture 6.6.1 Links connector CN4, feedback from Serial Facoder.



For the traditionalencoder look at the following links.

Picture 6.6.2 Links connector CN4, feedback from Traditional Facoder.



WARNING: ENCODER CABLE

- **Encoder cable protected only. It must be linked at the metallic equipment panel surface; the doubles differential signals A and A\, B and B\, Z and Z\ must be linked with the 13 connector pin protection.**

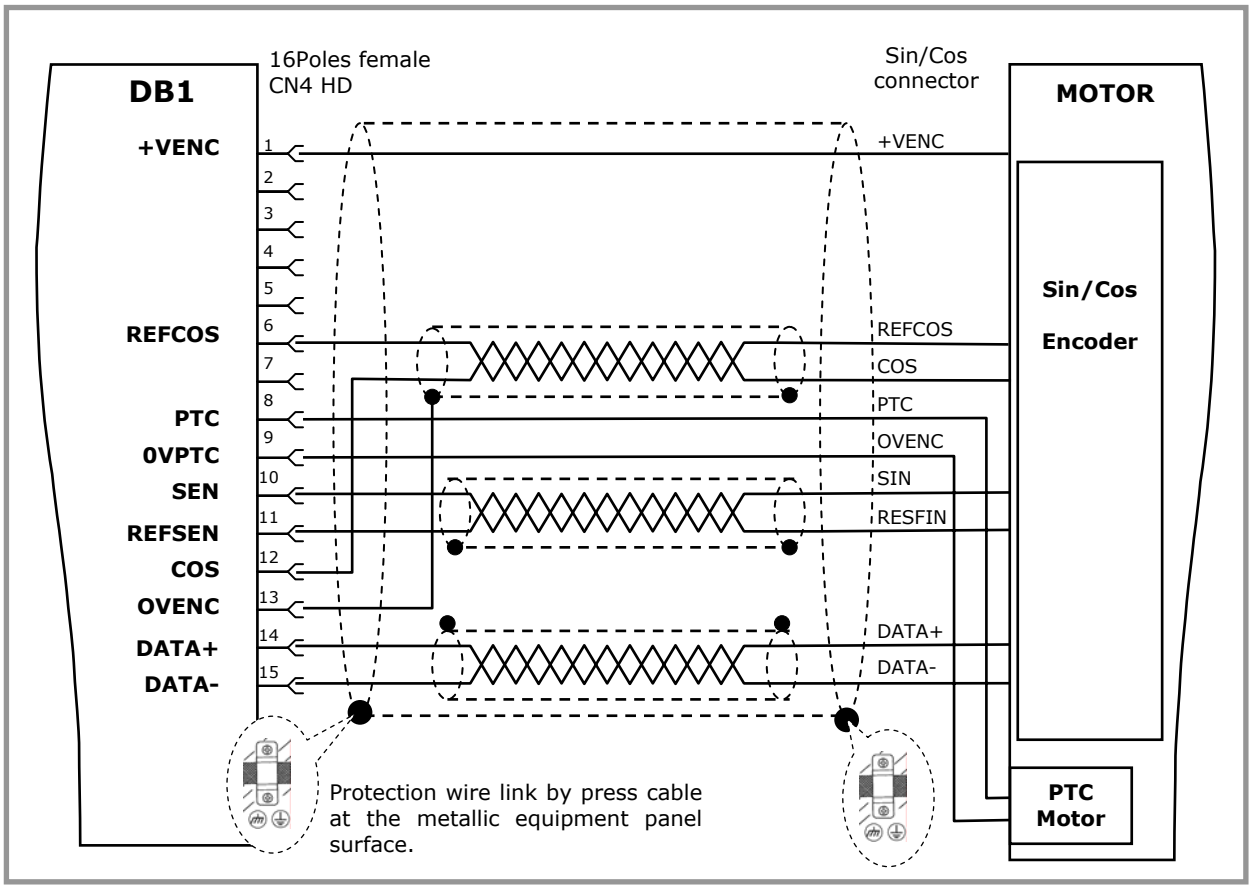
6.8 CN4 CONNECTOR LINK: Sin/Cos FEEDBACK SIGNALS

DB1 can receive single-multi tour absolute encoder, sin/cos feedback on demand.

High accurate positioning required can be satisfy by the mentioned above feedback.

The links to be used are showed by the following picture.

Picture 6.7 Links connector CN4, Sin/Cos feedback.



WARNING: Sin/Cos Cable

- **Sin/Cos cable protected only. It must be linked at the metallic equipment panel surface; the doubles differential signals COS e REFCOS, SIN e REFSIN, DATA- e DATA+ must be protected.**

6.9 BRAKING MODULE

In case of fast decelerations, high inertial charges the brushless motors are generators. The drives save the energy get back from the motors as d.c. current.
Avoid dangerous voltage by DC BUS increases is necessary to use a braking module.
The energy saved is dissipated on the braking unit as hot.

Basically DB1 is equipped with an internal brake unit (**50Ω, 100W**). The module is operative linking the BRAKE connector 1 and 2 Pin.
If the internal resistor is not sufficient is possible to add an external braking module.

In case of external unit used (on demand) disconnect the mentioned above link.
On the contrary link the BRAKE connector 1 and 3 Pin.

The rated clamp value must correspond to the medium dissipated energy during the deceleration.
The calculation formula to be used is the following:

$$P = 0.2 * J_t * \cdot \omega^2 * f$$

Where:

- **P** = Dissipated Power [Watt] .
- **J t** = Total Inertia [Kg m^2] .
- **ω** = Max angular speed [rad / sec] .
- **f** = Work cycle repetition frequency (Hertz, Nr. of cycles per sec.) .

7. PROGRAM AND PARAMETERS

DB1 drive are set by standard program and parameters.

Many applications can be satisfied with the standard configuration.

An accurate and good quality modulation of these parameters can obtain better performance in all the applications.

Read carefully the following parameters description.

The correct DB1 use is obtained after a complete parameters set up. The following table shows how all the parameters and values have to be setted, configuration default is included.

Table 7.1 DB1 Parameters.

Parameters		Min. Value	Max. Value	Default Value
GPS	SPEED LOOP: Speed loop proportional gain	0	255	50
GIS	SPEED LOOP: Speed loop integral gain	0	255	50
SPEEDn	Motor rated speed	0	115	100
Offset	Speed Set-point speed Offset	0	200	100
PTsc	Torque set on continuous duty (Tsc)	20	120	100
PTp	Peak torque set (Tp)	20	120	100
I2t	Derating Set-Up	0	200	100
MOTOR	Motor Selection	0	10	-
RAMP	Acceleration and Deceleration maximum Ramp	0	250	0
Speed Filter	Input set point filter	5	250	100
Direction	Motor direction	0	1	0
LoopControl	Loop motor control	1	5	2
Current Filter	Current loop gate/filter	10	100	50
Node_Id	CANopen Net block number	1	127	0
CANBaudRate	CAN Open Baude rate net	0	8	0

The parameters value are between 0 and 255. All the sets can be saved on RAM, EEPROM or others file. The files can be used for other applications in a second time.

7.1 PARAMETERS MENU and DESCRIPTION

This charter describes the changable DB1 parameters and their mains.
The new value setted too.

Title	**SPEED LOOP:** S***peed loop proportional gain***
Parameter	**GPS**
Description	Sets the speed loop proportional gain. It's a direct inertia function. Having a perfect speed motor control this value must be set.
Min. Value	0
Max. Value	255
Default	50

Title	**SPEED LOOP:** ***Speed loop integral gain***
Parameter	**GIS**
Description	Sets the speed loop integral gain.
Min. Value	0
Max. Value	255
Default	50

Title	**Motor rated speed**
Parameter	**SPEEDn**
Description	Sets the rated speed motor.
Min. Value	0
Max. Value	115
Default	100
Note	By SPEEDn =100 the rated speed is the standard referred to the maximum set_point (see the table); this value cannot be higher than the maximum motor speed admitted.

Title	**Speed Set-point speed Offset**
Parameter	**Offset**
Description	Sets the rated the offset on speed set-point. With 100 no offset compensations are in.
Min. Value	0
Max. Value	200
Default	100

Title	**Torque set on continuous duty (Tsc)**
Parameter	**PTsc**
Description	Sets the motor torque on continuous duty.
Min. Value	20
Max. Value	120
Default	100
Note	By PTsc=100 rated motor torque is available on Δθavv=65°. By PTsc>100 motor torque is increased. Be careful to the dissipation motor available. 20% torque increases are obtained by PTsc =120. By PTsc<100 motor torque is decreased. In case of hot/dangerous environments this derating mode is suggested.

Title	**Peak torque set (Tp)**
Parameter	**PTp**
Description	Sets the motor peak torque.
Min. Value	20
Max. Value	120
Default	100
Note	By PTp=100 standard peak is available (see the tab.). This value can be 20% increased by PTp=120. If the standard peak is the same of the drive/motor available no increases are possible. Tsc is always lesser or the same than Tp. It means that if Tp decreases more that Tsc, automatically Tsc decreases until is like Tp.

Title	**Derating Set-Up**
Parameter	**I2t**
Description	This parameter sets up the derate factor. By 100 – Overload standard, default. I^2T function increase the rated current value in a defined cycle. It depends to the motor driven.
Min. Value	0
Max. Value	200
Default	100
Note	By value >100 is possible to increase the overload time. On the contrary the time is decreased.

Title	**Motor Selection**
Parameter	**MOTOR**
Description e	This parameter selects the motor drive (ref. to the following tables).
Min. Value	0
Max. Value	10
Default	This parameter is on default.

Table 7.2a MOTOR Setting parameter.

DB1 A 40 drive type (7A)	A/B/C/D 07	A/B/C/D 07	A/B/C/D 07	A/B/C/D 07
Brushless motor type	BT2S	BT2M	BT2L	BT2X
"MOTOR" parameter value	1	2	3	4

Table7.2b MOTOR setting parameter.

DB1 A 40 drive type (10A)	A/B/C/D 10	A/B/C/D 10	A/B/C/D 10
Brushless motor type	BT2X	BT3M	BT3L
"MOTOR" parameter value	1	2	3

Title	**Acceleration and Deceleration maximum Ramp**
Parameter	**RAMP**
Description	This parameter sets the acceleration and/or deceleration ramp based on a speed ref. step.
Min. Value	0
Max. Value	250
Default	0
Note	By Ramp=0, NO Ramps. Ramp=250 the Ramp decrease to 0 (zero) in 5sec.

Title	**Input set point filter**
Parameter	**Speed Filter**
Description	Sets the input set point filter .
Min. Value	5
Max. Value	250
Default	100
Note	By Speed Filter=100 the frequency cut is 200Hz.

Title	**Motor direction**
Parameter	**Direction**
Description	Shows the rotation verse.
Min. Value	0
Max. Value	1
Default	0
Note	CW is on direction=0, CCW is on direction=.

Title	**Loop motor control**
Parameter	**LoopControl**
Description	Sets the loop mode.
Min. Value	1
Max. Value	4
Default	2 (sped loop control)
Note	LoopControl = 1: current loop LoopControl = 2: speed loop(default) LoopControl = 3: positioning loop LoopControl = 4: stepper motor emulation

Title	**Current loop gate/filter**
Parameter	**Current Filter**
Description	It maked a gate/filter on the current loop.
Min. Value	10
Max. Value	100
Default	50
Note	It is possible to change the frequency value previously standard set. By 50= Standard/Rating frequency. By >50 the gate frequency is increased. Less than 50 the frequency is decreased. In case of high inertia it is right.

Title	**CANopen Net block number**
Parameter	**Node_Id**
Description	Sets the number of the CANopen.
Min. Value	1
Max. Value	127
Default	0
Note	It's the Id drive linked to a CAN net. (Nr. 0 code is reserved to the Master).

Title	**CAN Open Baude rate net**
Parameter	**CAN BaudRate**
Description	Sets the Baude rate net.
Min. Value	0
Max. Value	8
Default	0 (speed loop)
Note	The CAN baud rate is set by on the following value: CAN BaudRate = 0 : 250k CAN BaudRate = 1 : 10k CAN BaudRate = 2 : 20k CAN BaudRate = 3 : 50k CAN BaudRate = 4 : 125k CAN BaudRate = 5 : 250k CAN BaudRate = 6 : 500k CAN BaudRate = 7 : 800k CAN BaudRate = 8 : 1M

7.2 MOTOR CONTROL SOFTWARE (DB – MOVER)

The "Motor Control" is the set up program standard supplied with the drive. The minimum PC features required are Windows 98/2000/NT/XP.

The software operates through the RS232 drive port (CN1 connector).

7.2.1 MOTOR CONTROL NSTALLATION (DB- MOVER)

Hardware Requires
The Drive serial interface (CN1, RS232) must be linked by the serial cable (**standard supplied**).

Minimum PC features required

Processor:	Pentium II o or more.
Operative system:	WINDOWS 98 /2000 / ME/XP , WINDOWS NT4.0.
Graphic board :	Colours and Windows compatible
Drive :	CD-ROM (for software and the operative system).
Hard Disk:	5 Mb free as minimum.
Memory flash :	8Mb free as minimum.
Interface:	COM1, COM2, COM3 o COM4 serial free.

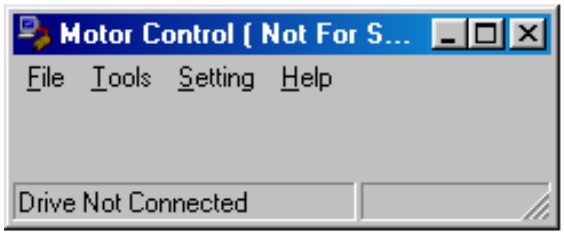
Link to the PC serial interface
Link to the PC serial interface connect the cable of transmission from one serial inteface to the serial interface RS 232 (CN1) of the DB1.
Extract and plug-in the alimentation cable only if the power supply are not connected (driver and PC)

Installation instruction on WINDOWS 98/ 2000/ ME/ XP/ NT
The CD-ROM contains the program file Setup.exe which makes easier the installation of the software for the working on PC.
Turn on the Pc and the monitor, once ended the starting process (the initiation process), on the monitor appears Windows interface.
Click on START (comand bar), then on Enter. On the immissione window, follow the track of the program: y:\setup.exe (where y= the letter of the drive unit or CD). Click on OK and follow the istructions shown.
The program is installed in the chosen directory and the icon Motor Control is shown for the start of the program.

7.2.2 MOTOR CONTROL USING

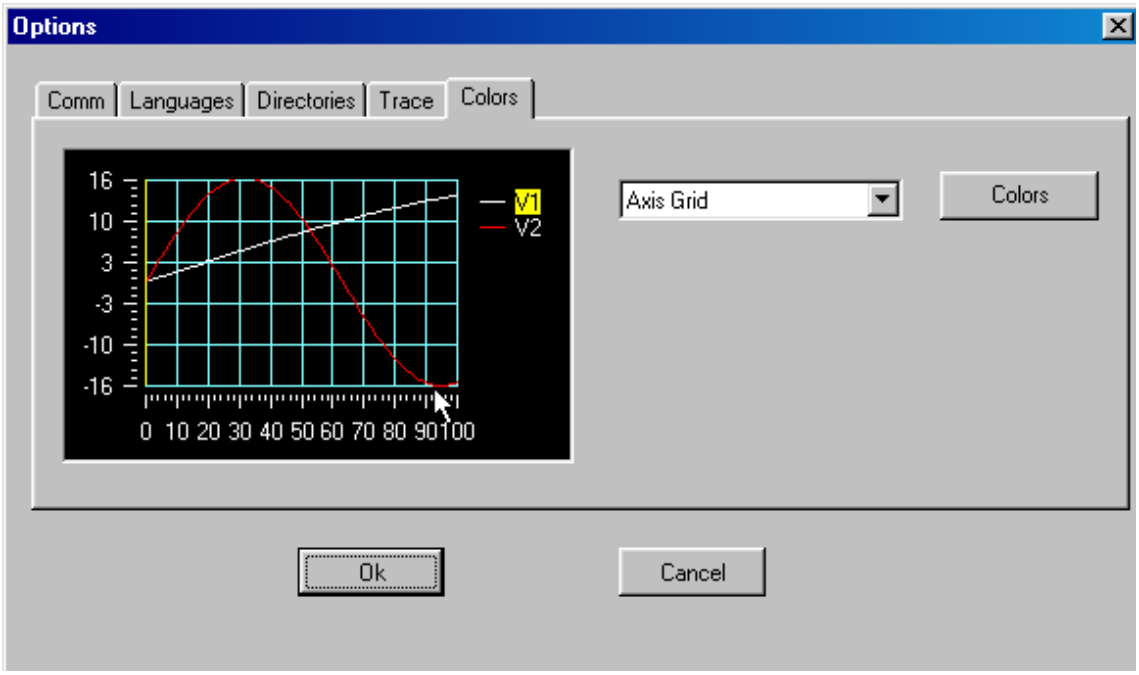
The Motor Control software permits a typical file management by the "File" and "Setting" menu for set-up and viewing.
See the following pictures.

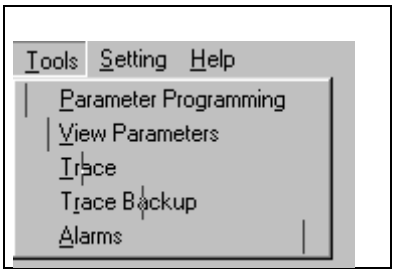
Picture 7.1 Motor Control Main Menu.



By the Setting menu is possible to set the program, the communication PC port, the language and the grid colours.

Picture 7.2 Setting Option sub folder menu.



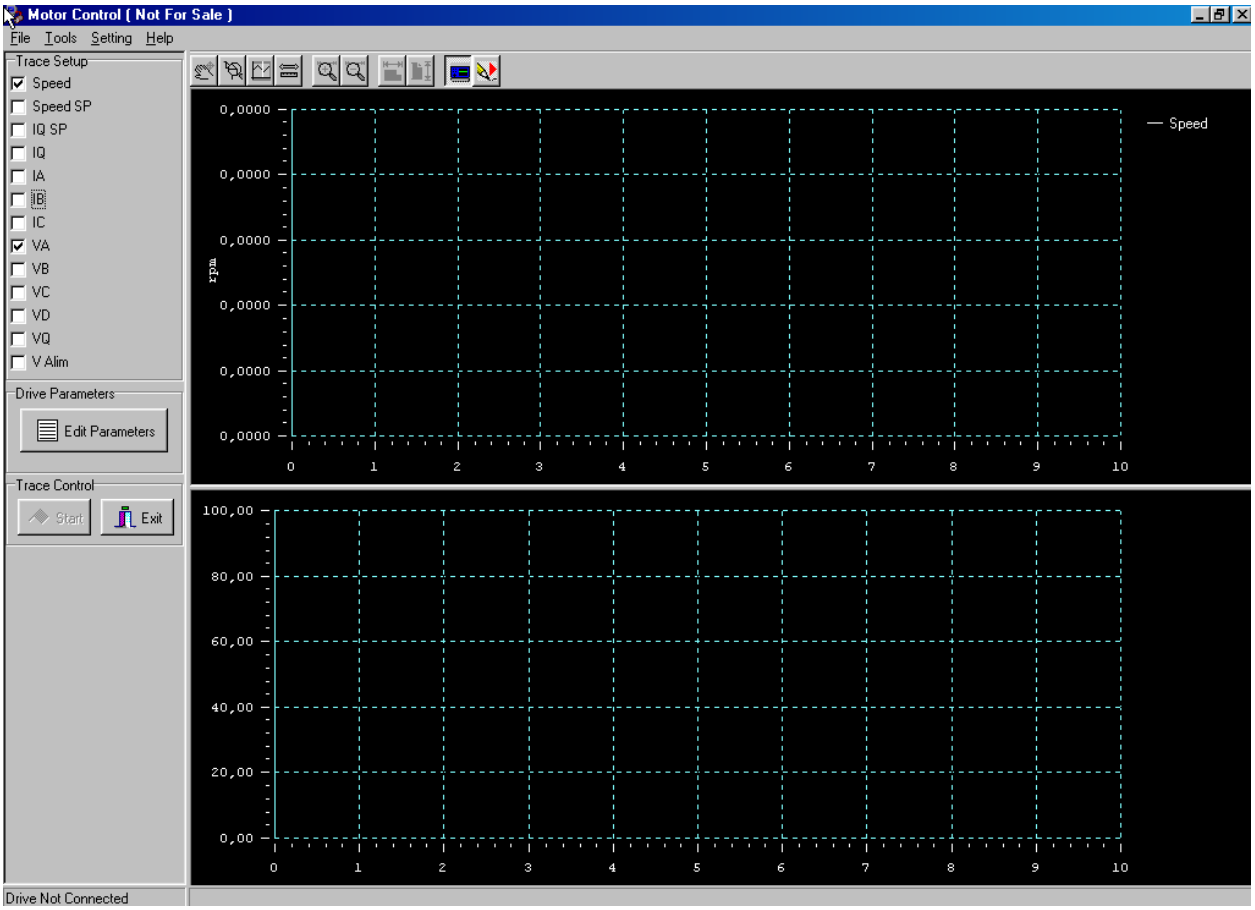


By the "Tools" menu is possibile to set up the drive (Parameter Programming).

Is also available the Trace value viewer.

By the following Trace menu is possibile to analyze all the main values motor/drive system. A graphic grid is also viewed by the same system. For a real time modify view the graphic mode has the oscilloscope simulation function.

Picture 7.2 Toos sub folber: Trace.



8. DIAGNOSTIC

On the driver frontal are expected two leds to view the working progress and discovers and identifies the DB1 alarm.

The **READY** indicator (green led)

- turns on when the logical section is alimentated.

The **FAULT** indicator (red led)

- does not flash without alarms.
- with no alarms and supply torque to motor it flash at high frequency.
- with an alarm it flashes at low frequency continually for the number of times that rapresents the code of the error and then rispects a long break which identifies the beginning of the signal frame. For the code of the errors refer to table 8.1.

8.1 ALARMS

Ne The intermittence shows the alarm code.

The following table contents the alarms and the nr. of intermittences.

Table 8.1 DB1 alarms code.

Red led intermitt.	ALLARM	DESCRIPTION
Nr. 01	OVERVOLTAGE	Too high DC-Bus voltage admitted.
Nr. 02	UNDERVOLTAGE	DC-Bus too low supply.
Nr. 03	OVERCURRENT	Too high drive current required.
Nr 04	ENCODER FAULT	Feedback Alarm.
Nr. 05	HEATSINK OVERTEMP	High heat sink temperature.
Nr. 06	MOTOR OVERTEMP	High motor temperature.
Nr. 07	IGBT FAULT	High current or U-V-W phases; short circuit; power component under-voltage.
Nr. 08	EPROM FAULT	Wrong parameter tuning at the start-up.
Nr. 09	CURRENT LIMIT	I^2t on limit, with temporary torque limitation.
Nr. 10	OVERLOAD	Exceed load required.

For a complete and correct alarm explanation please refer to the “trouble” chapter.

8.2 TROUBLES

The following chapter cares about the DB1 generated alarms and the solutions available.

Table 8.2a DB1 alarms code and possible solutions.

Alarm code	Description	Possible solutions to stop the alarm
Nr 01: OVERVOLTAGE	Too high DC-Bus voltage admitted.	• Too high voltage supply. • High inertia load and braking resistor wrong calculated. • Braking resistor on fault or not linked. Werify the internal link.
Nr 02: UNDERVOLTAGE	DC-Bus too low supply.	• Too low supply voltage. • No supply.
Nr 03: OVERCURRENT	Too high drive current required.	• Fast acceleration with high load inertia. • Fast braking with high load inertia. • Verify the motor selected is the motor really used.
Nr 04: ENCODER FAULT	Feedback Alarm.	• Verify the right mounting and links.
Nr 05: HEATSINK OVERTEMP	High heat sink temperature.	• Environment temps. Higher than the admitted rated value. • Insufficient cooling. • Hard duty cycle.
Nr 06: MOTOR OVERTEMP	High motor temperature.	• Verify the motor link is right. • Too high motor load. • Hard duty cycle.
Nr 07: IGBT FAULT	High current or U-V-W phases; short circuit; power component under-voltage.	• Verify the motor link is right. • Verify if short circuits are occurred.

Table 8.2b DB1 alarms code and possible solutions.

Alarm code	Description	Possible solutions to stop the alarm
Nr 08: EPROM FAULT	Wrong parameter tuning at the start-up.	• Switch off and restart the logic drive. If the alarm disappears insert the right parameters and save it on the EEPROM.
Nr 09: CURRENT LIMIT	I^2t on limit, with temporary torque limitation.	• Exceed load required. The load/time is higher than the rated motor torque. • Decrease the accelerations.
Nr 10: OVERLOAD	Exceed load required.	• Exceed load required. The load is higher than the rated motor torque.

Table 8.3 BD1 faults and possible solutions.

Fault	Possible causes	Possible solutions to eliminate the fault
A) **Bad communication**	**A.1)** Wrong cable. **A.2)** Error link. **A.3)** Wrong PC interface.	**A.1)** Use a NON null modem cable. **A.2)** Connect on the right port. **A.3)** Select the right interface.
B) **GREEN LED OFF**	**B.1)** The logic isn't powered.	**B.1)** 24VDC AUX connector must be supplied.

Hereafter few possible fault caused by the drive. Possible solutions are included too.

Table 8.4 Motor fault and possible solutions.

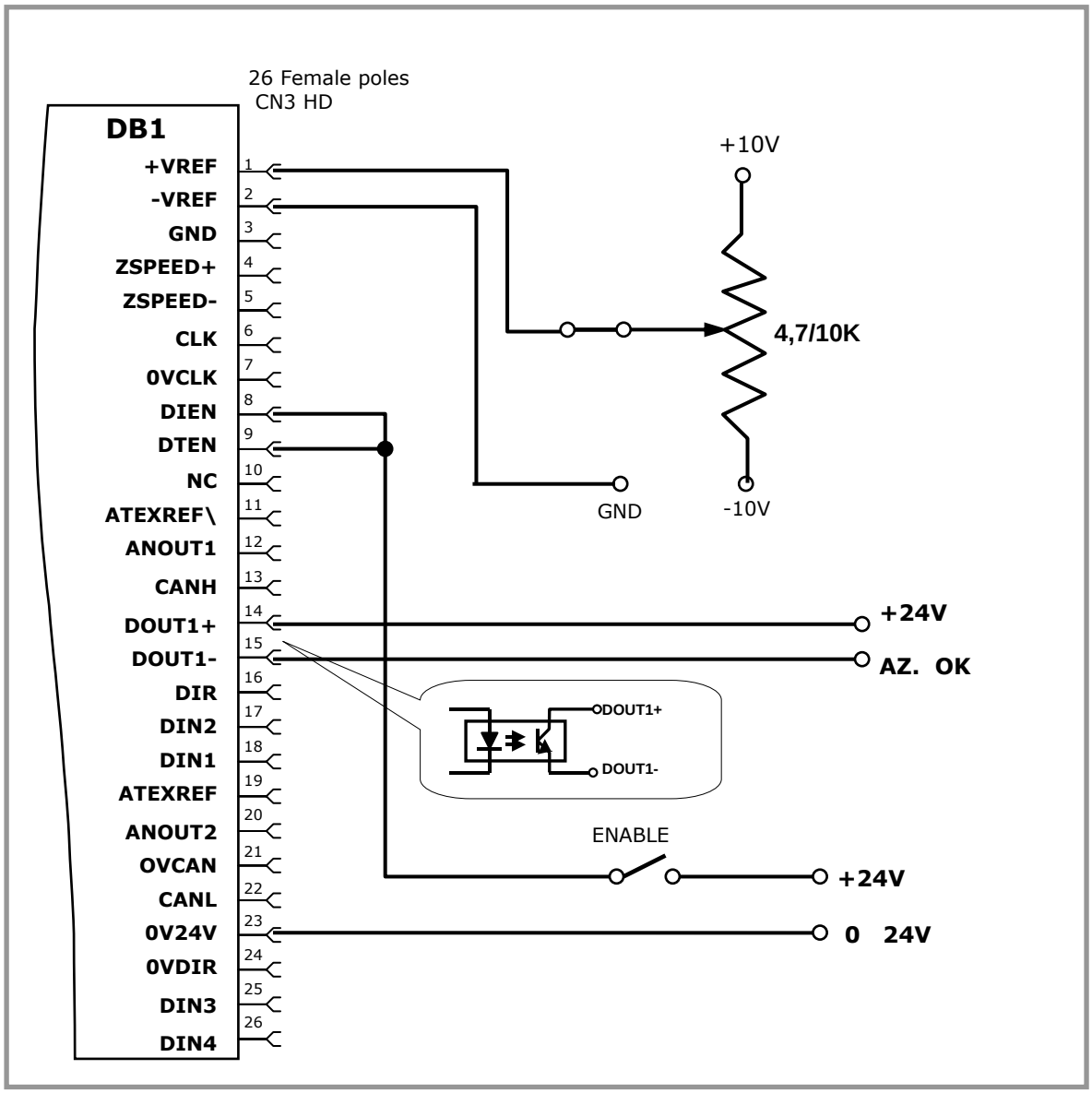
Fault motor	Trouble	Solutions
A) The motor runs on step mode or vibrates	**A.1)** Bad link. **A.2)** Set-Point wrong value.	**A.1)** Be sure the resolver/motor links are accorded to the instructions showed on chapt. 6. Protection cables included. **A.2)** Verify and/or modify the set-up value.
B) The motor remains "on torque mode" and doesn't follow the speed analogical ref.	**B.1)** No enable. **B.2)** Set-Point.	**B.1)** DIEN enabled signal must be verified. **B.2)** Verify +/-VREF of **CN4** set point is in.
C) Analogical speed ref. not well followed	**C.1)** CN3 connection port.	**C.1)** Verify 0V signal and the set point speed ref. (**CN3** pin 3).
D) Not fix rotor position on motor looked mode.	**D.1)** Feedback. **D.2)** Wrong links.	**D.1)** Encoder fault. **D.2)** Be sure the Encoder/Motor links are accorded to the instructions showed on chapt. 5.2. Protection cables included.
E) The motor doesn't performe	**E.1** Electromagnetic disturbs. **E.2** Setup. **E.3** Wrong link.	**E.1** External disturbs can be present closet to the cables (ex: releis, switching, powers, electrovalves and so on). **E.2** Verify and/or modify the I^2T parameter. **E.3** Verify the power and signal cables are rightly speared.

9. APPLICATIONS

9.1 DRIVE USING ON MANUAL MODE APPLICATION

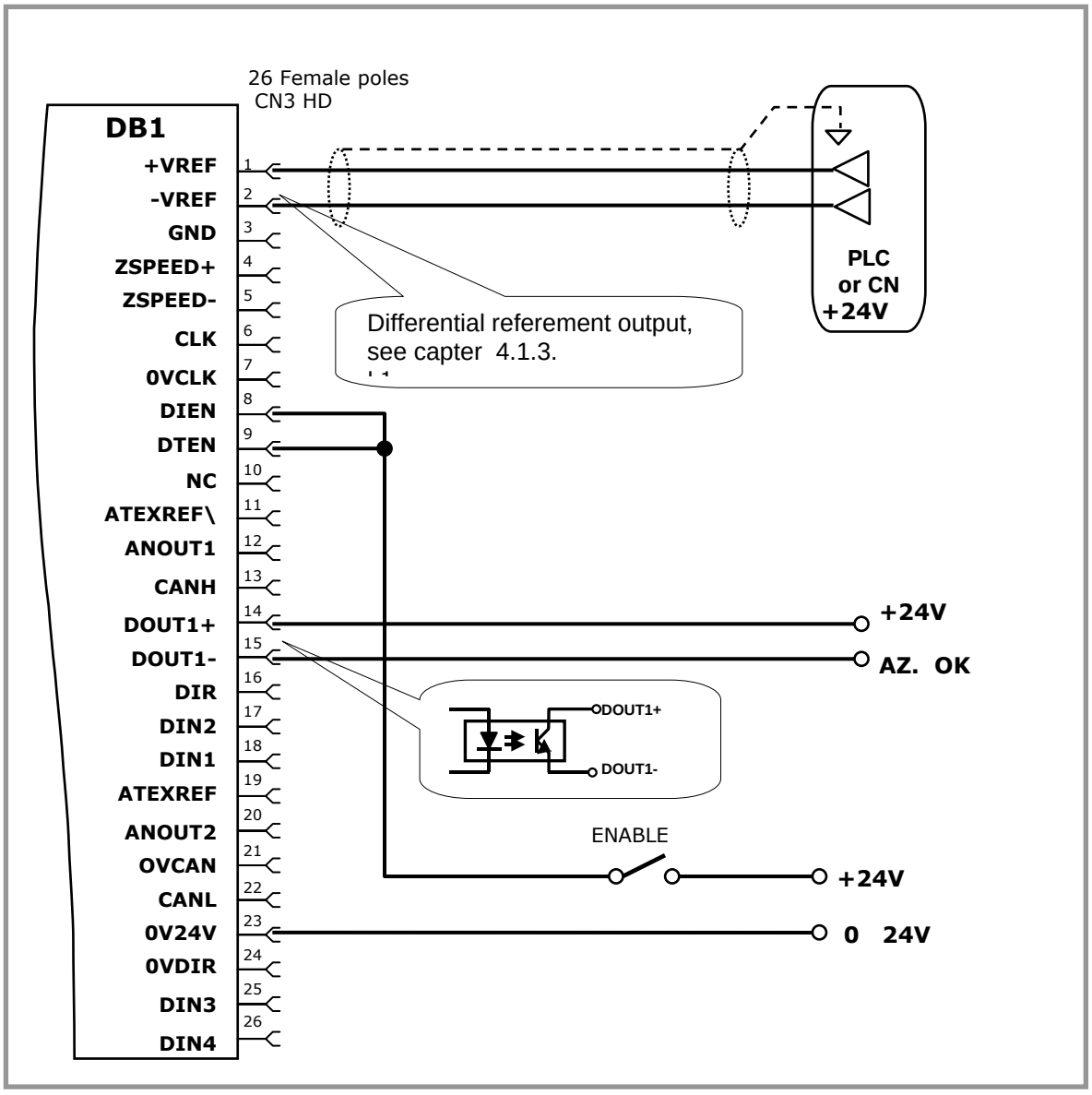
ENABLE SIGNAL LINK

Picture 9.1 CN3 Links on manual mode using.



9.2 NUMERICAL CONTROL and DIFFERENTIAL REFEREMENT APPLICATION

Picture 9.2 CN3 links on numerical control and differentila referement application.



9.3 STEPPER MOTOR EMULATION - *OPZIONAL*

STEPPER MOTOR EMULATION SIGNAL LINKS

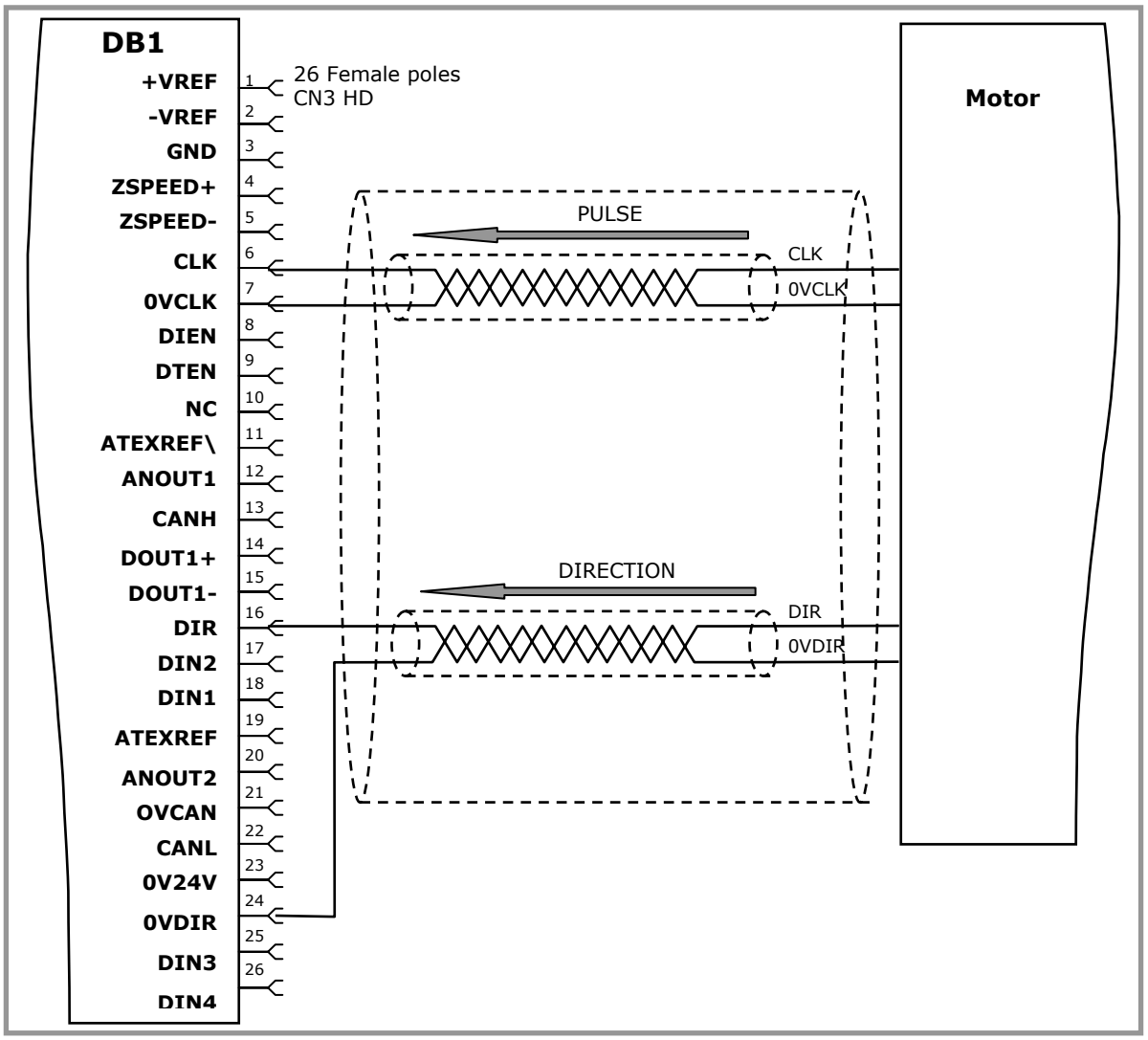
By this interface is possible to drive a brushless motor in a stepper motor mode.

The drive parameters are set by the start-up software. The step numbers can be set right to adapt the DB1 to the direction/pulses stepper motor command.

Messages can be transmitted too.

Analogue input are switched off.

Picture 9.3 Stepper motor emulation CN3 Links.



To do this application CLK, 0VCLK, DIR, OVDIR signals are used. These signals are on CN3 connector.
Maximum Frequency: 1 MHz.

9.4 CAN OPEN PROFILE

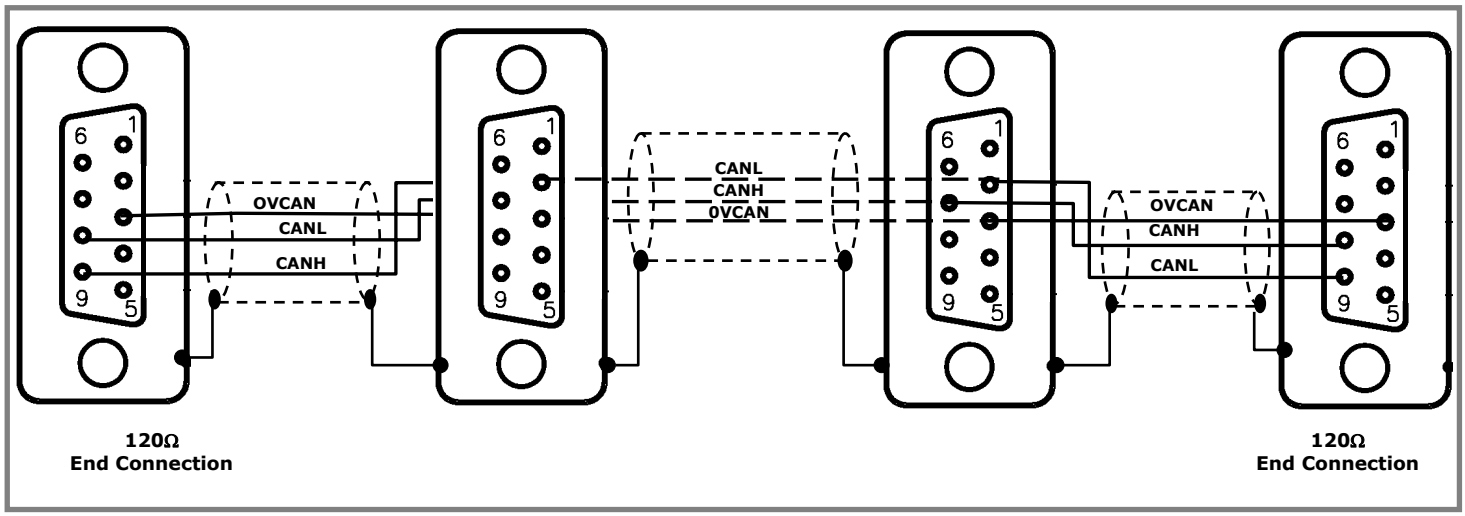
CAN BUS FILELD SIGNAL LINK (Can Open mode)

The DB1 communication is based on CAN Open DS301 – DSP402.
The Can-open field interface is on default: 250 kBaud. Galvanically insulated by opt jointer with the same RS-232 potential value.

For more information have a look on CAN Open manual.

CAN Open option the CANH, CANL, OVCAN signals are distributed on CN2 and CN3 connectors (pin 13, pin 22 e pin 21)
On CN2 the signals are on many pin. This because an internal 120Ω is provided, See the picture 9.2.

Picture 9.4 CN4 connector connections, Can Open.



CAN BUS CABLE
According to the ISO 11898 a specific bus cable with low impedance must be used.
The cable length must be decreased as much as the fast transmission is going on.

The cable length must be decreased as much as the fast transmission is going on.

Transmission Speed/kBaud	Cable length (max./m)
1000	20
500	70
250	115

Due to electro magnetic matters the CN2 connector must be according to the following issues:

- Metallic iron body (or iron sock)
- Body sock link on a large space frame.