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MOTION TECHNOLOGY

Digital servo amplifier







DSB2-P Hardware manual



DSB2P 904 ver. D

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Table of contents

1. Introduction 6
1.1 Safety 6
1.2 DSB2-P presentation 7
1.2.1 Working principle 7
1.2.2 Applications 7
1.2.3 General operating conditions 7
1.2.4 Interfaces possibilities 7
2. Models characteristics 9
2.1 Modules main features 9
2.2 Rack module 10
2.2.1 Outline and dimensions 10
2.2.2 Block schematics 11
2.2.3 Specifications 12
2.2.4 Mounting systems – Installation requirements 13
2.3 Rack module with heat sink 15
2.3.1 Outline and dimensions 15
2.3.2 Block schematics 16
2.3.3 Specifications 17
2.3.4 Mounting systems – Installation requirements 18
2.4 Housed module without power supply 20
2.4.1 Outline and dimensions 20
2.4.2 Block schematics 21
2.4.3 Specifications 22
2.4.4 Mounting systems - installation requirements 23
2.5 Housed module with power supply 24
2.5.1 Outline and dimensions 24
2.5.2 Block schematics 25
2.5.3 Specifications 26
2.5.4 Mounting systems - installation requirements 27
3. Electrical interface 28
3.1 Encoders connectors 29
3.1.1 Connector J10: TTL position encoder 29
3.1.2 Connector J1: Analog position encoder (1Vptp, 11µAptp) 31
3.1.3 Connector J9: Digital Hall encoder & over temperature protection 32
3.2 Inputs / outputs connector 34
3.2.1 Connector J2: Customers inputs / outputs 34
3.3 Communication connectors 37

3.3.1 Connector J3: ETEL-Bus output 38
3.3.2 Connector J4: ETEL-Bus input 38
3.3.3 Connector J5: ETEL-Bus-Lite serial communication 38
3.3.4 Connector J6: Download key and EB-RS232 39
3.4 Motor connectors 40
3.4.1 ETEL motor cables numbering system 40
3.4.2 Connector J7: Standard motor connection 40
3.4.3 Connector J7B: Motor connection with short circuit relay option 40
3.4.4 Connector J16: Short circuit relay control 41
3.5 Power connectors 42
3.5.1 Connector J11: Rack modules power supply input 42
3.5.2 Connector J15: Housed module auxiliary and power supply input 43
3.5.3 Connector J14: Housed module power supply input 43
3.5.4 Connector J13: Housed module auxiliary supply input 44
3.5.5 Connector J12: External regeneration resistor 44
3.6 Optional board connector 45
3.6.1 Connector J8: Depends on the type of board 45
3.7 EMC cables connection 45
3.7.1 Cables manufacturing 45
3.7.2 Connecting the short-circuit relay power cable's shield (J16) 47
3.7.3 Connecting the external regeneration resistor cable's shield (J12) 47
3.7.4 Cables installing 47

Record of revisions, document # DSB2P 904 x

Document revisions		
Issue (x)	**Date**	**Modified**
1.0	-	First edition (French)
1.1	23/06/98	Document updated and translated in English
A	14/10/98	Document completed and updated, doc. numbering system modified
B	01/02/99	Document updated (minor changes and some errors corrected)
C	03/03/00	Document updated (minor changes and guideline for EMC & shielding added)
D	04/11/02	Document updated (housed module updated and some errors corrected)

Documentation concerning the DSB2-P

- **Hardware manual DSB2-P** **(Specifications & electrical interfaces)** **# DSB2P 904 D**
- Operation & software manual (DSB2-P programming & regulation description) # DSB2P 906 x
- EBL Communication manual (Communication interface protocol) # DSB2P 908 x

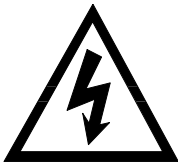
1. Introduction

This document concerns the following ETEL digital servo amplifier: **the DSB2 position controller** or **DSB2-P**, also called 'drive' in this document.
The purpose of this manual is to give details regarding specifications, installation, interfacing and hardware items. All details for proper connections (power supply, motor, encoder connection, etc...) are provided herein. Detailed information concerning the programming of the drive is provided in the «**Operation & software manual**».

1.1 Safety

Please, read all safety precautions listed below before handling the DSB2-P:

- Never use the DSB2-P for purposes other than those described in this manual.
- A competent and trained technician must install and operate the DSB2-P, respecting all specific regulations of the respective country concerning both safety and EMC aspects.
- Troubleshooting and servicing are permitted only for ETEL technicians and agreed distributors.
- Operating the DSB2-P will make the motor move. **Keep away from all moving parts to avoid injuries!**
- The safety symbols placed on the DSB2-P or written in this manual must be respected.



Danger: Signals a danger of electrical shock to the operator.
Can be fatal for a person.



Caution: Signals a danger for the DSB2-P. Can be destructive for the material.
A **danger** for the operator can result from this.



Caution: Indicates electrostatic discharges (ESD), dangerous for the DSB2-P.
The components must be handled in an ESD protected environment, only.

1.2 DSB2-P presentation

1.2.1 Working principle

The DSB2-P is a position, pseudo-speed[1] and torque/force digital controller. It has been designed for direct drive applications. Its power bridge PWM switching is determined by the motor position encoder.
The rack module includes on a single board the control circuits, the power bridge and all necessary interfaces for the communication, the encoder and the inputs/outputs.
The housed model includes also the power supplies on a second board inside the same housing.

1.2.2 Applications

The DSB2-P can drive mono-phase, two-phase and three-phase motors.
You may obtain brushless torque and linear motors from ETEL, as well as moving coils and moving magnets.

The DSB2-P can drive these motors and also the brushless motors, DC motors, steppers (if they are implemented with incremental encoders available on the market).

1.2.3 General operating conditions

The DSB2-P is designed to operate in a non-aggressive environment, with normal conditions of temperature, humidity, pressure and cleanliness. More specific information is given for each model in §2.

The DSB2-P is not designed or intended for use in the on-line control of air traffic, aircraft navigation and communications or in the design, construction, operation and maintenance of any nuclear facility.

1.2.4 Interfaces possibilities

Motor and its position encoder:
To control the position of a rotary or linear motor, the DSB2-P needs the signal coming from an analog or TTL encoder linked to this motor.

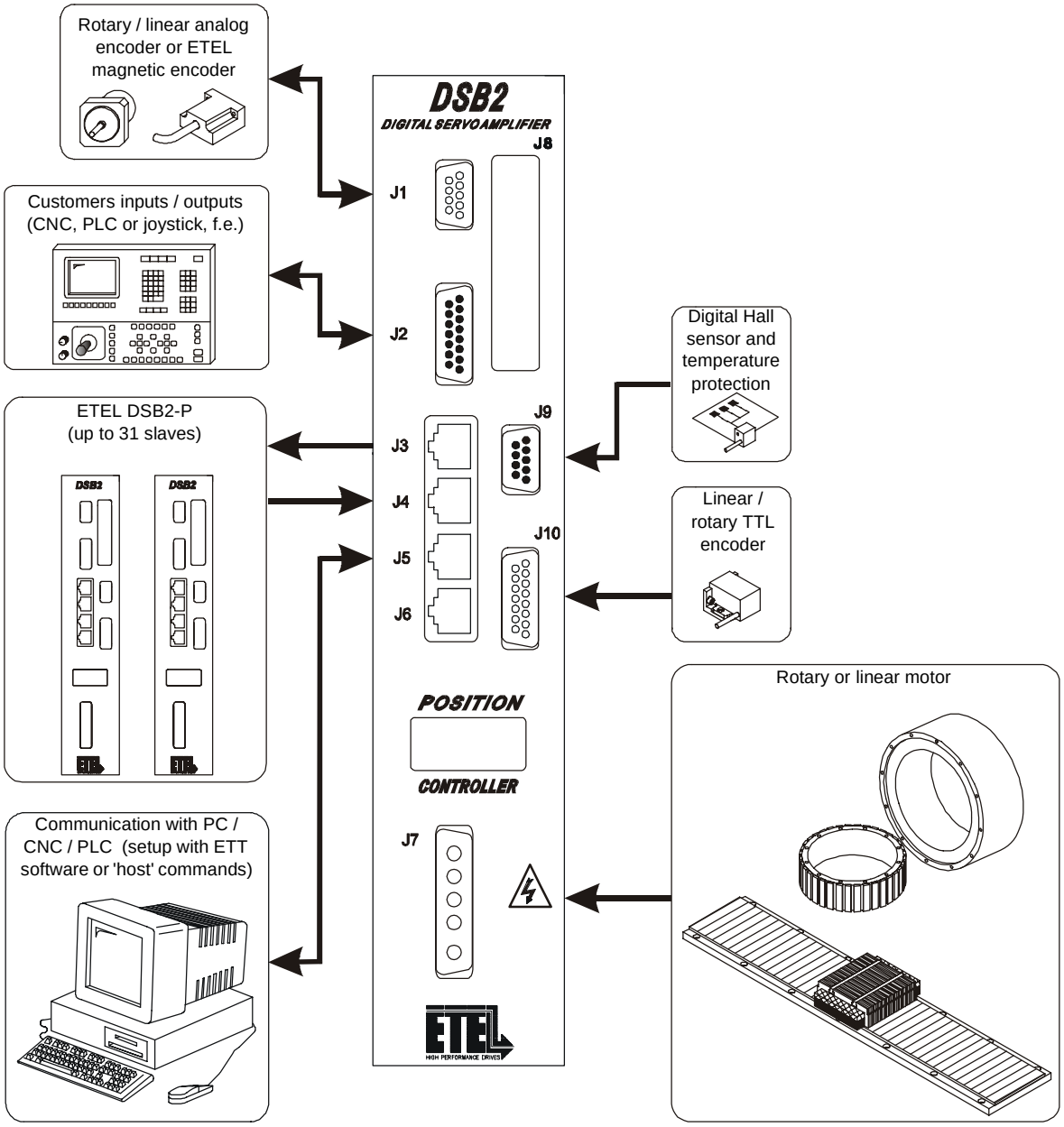
Communication:
The user can set the DSB2-P with a PC (Win9x/2000/NT/XP) using ETEL Tools (ETT) software through the ETEL-Bus-Lite (RS232 / RS422) communication port. See the «ETT Setup software manual» and the «EBL Communication manual» for more information.
After the drive setting, an 'host' (a PC, a CNC[2]machine-tool, or a PLC[3], f.e.) may be linked to the same interface to send 'on-line' commands to the DSB2-P or / and to continuously check its status. See the **«DSB2-P Operation & software manual»** for more details.
The user can daisy chain up to 32 DSB2-Ps (up to 31 slaves per master) on the ETEL-Bus (EB) communication bus.

Inputs / Outputs:
The customer's inputs / outputs can be digital and analog signals coming from a CNC machine-tool, a PLC or a joystick for example (see the diagram on next page).

The electrical interface details are given in §3.

1.If you specifically need a **speed** control, use a **DSB2-S** drive (refer to the DSB2-S specific documentation).
2.Computer Numerical Control
3.Programmable Logic Controller

The solutions used in most applications are outlined below:



2. Models characteristics

Four models of the DSB2-P are available, according to the needs:

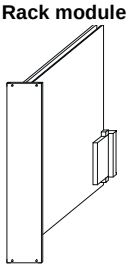
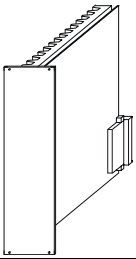
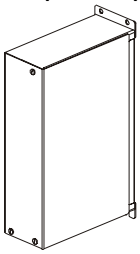
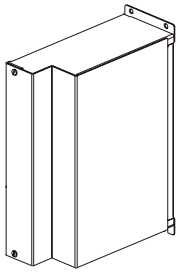
1. **Rack module (see §2.2)**
2. **Rack module with heat sink (see §2.3)**

These 2 modules are dedicated to be mounted inside a standard 6U rack (19 in). They do not include any power supply board and need to be powered through their DC power connector (J11) by an external power supply (the ETEL DSO-PWR, f.e.), ideally installed inside of the rack.

3. **Housed module without power supply (see §2.4)**
4. **Housed module with power supply (see §2.5)**

These two modules are a 'stand alone' drive. They includes a complete drive with either its power supply or an external power connector inside the same housing. The main difference between the rack modules and the housed module outlines concerns the power supply connectors.

2.1 Modules main features

Rack module 	Standard (10F wide / 6U high) rack module. Up to 21 A output current (2 secs.) depending on the model. Needs a regulated 24 - 340 Volts DC supply input. An ETEL power supply is available: DSO-PWR. Position, pseudo-speed, or force reference. Pulse/direction mode available. Two 16 bits microprocessors. Communication with PC / CNC / PLC through RS232 / RS422, up to 115'200 bauds (EBL open protoc). Multi-axis communication, up to 32 drives daisy-chained (ETEL-BUS, closed protocol). Analog or TTL position encoder interface. Optional interfaces: DSO-SIO, DSO-PRO, DSO-CAN and DSO-MAC. User programmable sequences. Specific ETEL graphical interface for setup, tuning and monitoring called ETEL Tools (ETT).
Rack module with heat sink 	Standard (14F wide / 6U high) rack module. Up to 42 A (2 secs.) / 56 A (1 sec) output current, depending on the model. Needs a regulated 24 - 340 Volts DC supply input. An ETEL power supply is available: DSO-PWR. Position, pseudo-speed, or force reference. Pulse/direction mode available. Two 16 bits microprocessors. Communication with PC / CNC / PLC through RS232 / RS422, up to 115'200 bauds (EBL open protoc). Multi-axis communication, up to 32 drives daisy-chained (ETEL-BUS, closed protocol). Analog or TTL position encoder interface. Optional interfaces: DSO-SIO, DSO-PRO, DSO-CAN and DSO-MAC. User programmable sequences. Specific ETEL graphical interface for setup, tuning and monitoring called ETEL Tools (ETT).
Housed module without power supply 	'Stand alone' housed model (65.2 x 168.7 x 318 [mm]). Up to 21 A output current (2 secs.) depending on the model. Needs a regulated 24 - 340 Volts DC supply input. Position, pseudo-speed, or force reference. Pulse/direction mode available. Two 16 bits microprocessors. Communication with PC / CNC / PLC through RS232 / RS422, up to 115'200 bauds (EBL open protoc). Multi-axis communication, up to 32 drives daisy-chained (ETEL-BUS, closed protocol). Analog or TTL position encoder interface. Optional interfaces: DSO-SIO, DSO-PRO, DSO-CAN and DSO-MAC. User programmable sequences. Specific ETEL graphical interface for setup, tuning and monitoring called ETEL Tools (ETT).
Housed module with power supply 	'Stand alone' housed model (96 x 222 x 306 [mm]). Up to 42 A (2 secs.) / 56 A (1 sec) output current, depending on the model. Supplied from mains: 84 - 240 Vac (50-60 Hz). Power supply and fan integrated. Position, pseudo-speed, or force reference. Pulse/direction mode available. Two 16 bits microprocessors. Communication with PC / CNC / PLC through RS232 / RS422, up to 115'200 bauds (EBL open protoc). Multi-axis communication, up to 32 drives daisy-chained (ETEL-BUS, closed protocol). Analog or TTL position encoder interface. Optional interfaces: DSO-SIO, DSO-PRO, DSO-CAN and DSO-MAC. Options: Phases short-circuit relay - Output for external regeneration resistor. User programmable sequences. Specific ETEL graphical interface for setup, tuning and monitoring called ETEL Tools (ETT).

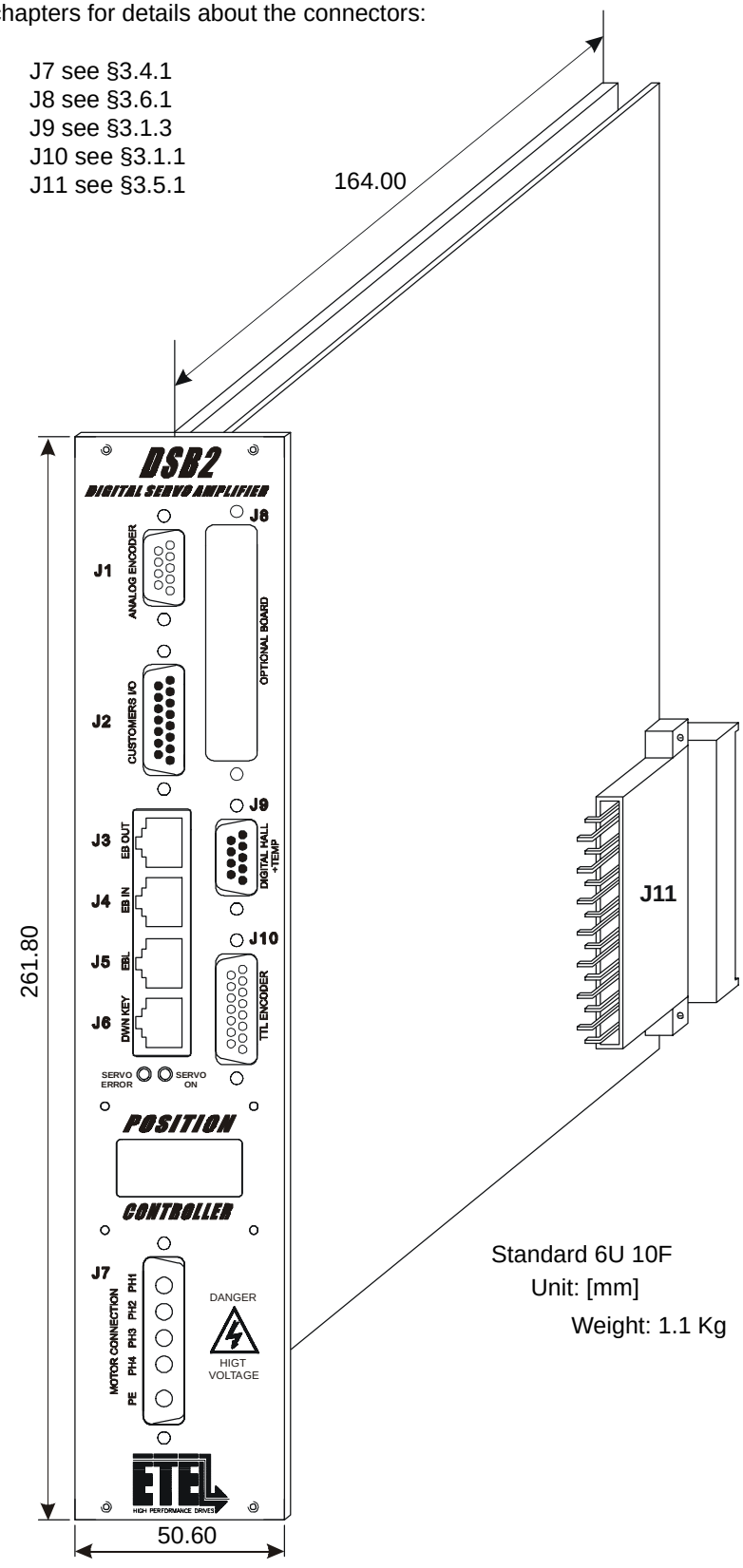
2.2 Rack module

Type # : D S B 2 P x x **1 –** x x x **E**

2.2.1 Outline and dimensions

Refer to the following chapters for details about the connectors:

J1 see §3.1.2
J2 see §3.2.1
J3 see §3.3.1
J4 see §3.3.2
J5 see §3.3.3
J6 see §3.3.4
J7 see §3.4.1
J8 see §3.6.1
J9 see §3.1.3
J10 see §3.1.1
J11 see §3.5.1



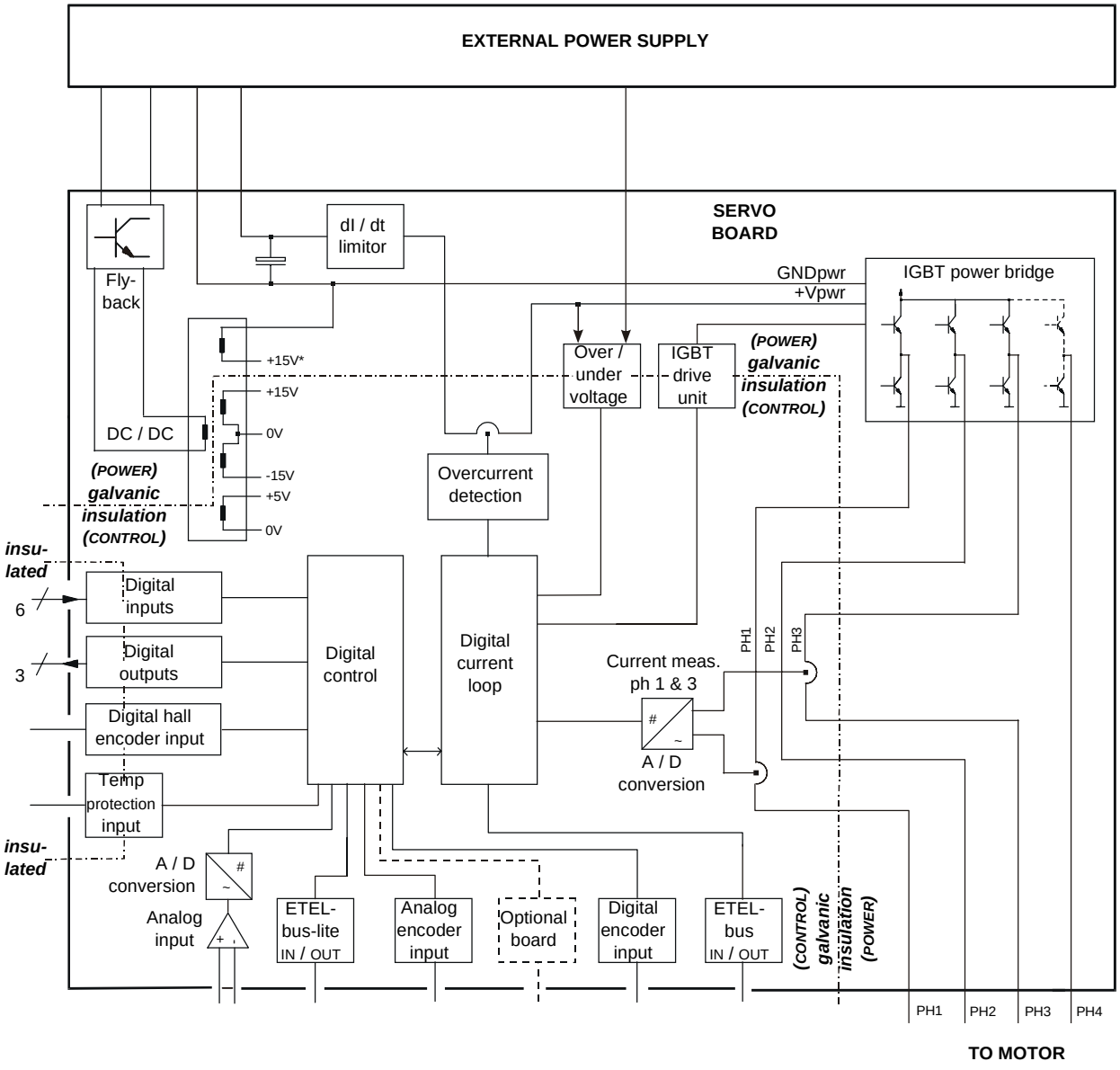
Standard 6U 10F
Unit: [mm]
Weight: 1.1 Kg

2.2.2 Block schematics

In the DSB2-P rack module, all parts are on a single board called the servo board.

It needs to be powered by an external power supply. The power supply developed by ETEL (refer to the DSO-PWR User's manual) is designed to fit most applications. If you use another power supply, it must meet all the specifications given on the next page.

On the servo board, the power part and the control part are galvanically separated. Also, some inputs and outputs are insulated from the control part by optocouplers.



Caution: Auxiliary GND (marked 0V in the control part) is internally connected to the front panel of the drive.
Power GND (marked GNDpwr in the power part) is connected to the front panel of the drive through a 22nF capacitor.

2.2.3 Specifications

To meet the specifications listed below, it is recommended to use an ETEL power supply with these 10F rack modules.

There are two types of 10F wide rack modules, according to your power needs. The DSB2-PX21 and the DSB2-PX31. Their auxiliary circuits can be supplied with 96-340Vdc (option -X1) or with 24-55Vdc (option -X2). All specifications are given at 25°C ambient temperature:

DSB2-PXX1 POWER FEATURES			
Characteristics		**-PX21-**	**-PX31-**
Output to the motor	Voltage (up to)	340 Vdc	
	3-phase motor Continuous current	4.9 A	4.9 A
		3.5(1) Arms	3.5(1) Arms
	3-phase motor Max. current during 2 seconds	11 A	21 A
		7.5 Arms	15 Arms
	2-phase motor Continuous current	4 A	4 A
		2.8(1) Arms	2.8(1) Arms
	2-phase motor Max. current during 1 second	11 A	21 A
		7.5 Arms	15 Arms
	PWM switching frequency	12 / 24 kHz(2)	
	Current ripple frequency	24 / 48 kHz(2)	
Power supply input	DC voltage	24 - 340Vdc	
	Max. DC current at 24 - 340 Vdc	8 A / 16 A peak	15 A / 30 A peak
Auxiliary supply input for DSB2-PXX1-X1	DC voltage	96-340 Vdc	
	Max. DC current at 96 Vdc	0.5(3) A	
	Max. DC current at 340 Vdc	0.15(3) A	
Auxiliary supply input for DSB2-PXX1-X2	DC voltage	24-55 Vdc	
	Max. DC current at 24 Vdc	0.6(3) A	
	Max. DC current at 55 Vdc	0.25(3) A	

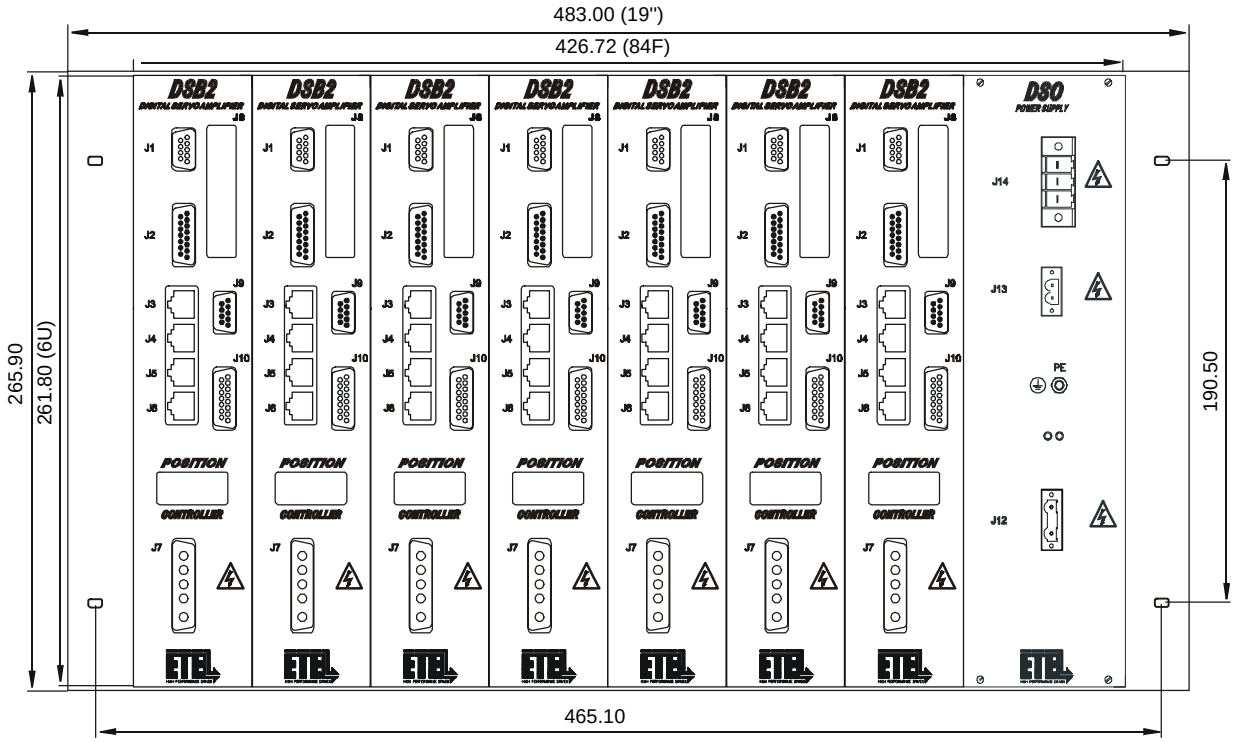
(1): Continuous current can be reached only with forced cooling (external fan necessary).
(2): If the firmware is 3.xx, PWM at 24kHz only.
(3): No optional board mounted within the drive, no external device connected to the I/O.

DSB2-PXX1 CONTROL FEATURES		
Characteristics		**All models**
General	Digital current loop sampling time	41.6 µs
	Phases commutation	with encoder position or digital hall effect
	Motion profiles	Trapezoidal / S-curve / Step / look-up table
	Two 16 bits microprocessors	Dual 80296
Position references	Position loop sampling time	166.67 µs
	Position, pseudo-speed or force reference	± 10 V

DSB2-PXX1 CONTROL FEATURES		
Characteristics		**All models**
Standard interfaces	ETEL-BUS-LITE host (PC) communication	RS232 or RS422 / 9'600 to 115'200 bauds
	ETEL-BUS multi-axis communication	RS422 / 460'000 bauds or RS232 / 115'200 (up to 32 axis)
	Pulse/direction mode available	Max. 3 MHz
	CAN bus interface option	with DSO-CAN board
	PROFIBUS interface option	with DSO-PRO board
	MACRO bus interface option	with DSO-MAC board
Position encoders interfaces	Analog 1Vptp or 11uAptp	Max. 320kHz in. / Up to 2'048 (x4) interpolation factor
	Digital TTL (RS422)	Max. 10 MHz input frequency
User's inputs / outputs	Digital inputs, insulated	6 (+ 8 with DSO-SIO option)
	Digital outputs, insulated	3 (+ 8 with DSO-SIO option)
	Analog outputs	1 (+ 2 with DSO-SIO option)
	Analog outputs	0 (+ 2 with DSO-SIO option)
Software / Programmability	Setup software 'ETEL Tools'	Windows 9x / 2000 / NT / XP
	DLL files	Windows 9x / 2000 / NT / XP / QNX4
	User's programmable sequence (# of lines)	5'420
	Liquid Crystal Display (# of characters)	16
	Firmware update through serial link	RS232

2.2.4 Mounting systems – Installation requirements

The rack modules are mounted vertically inside a sub-rack:



Sub-rack depth: 239.24

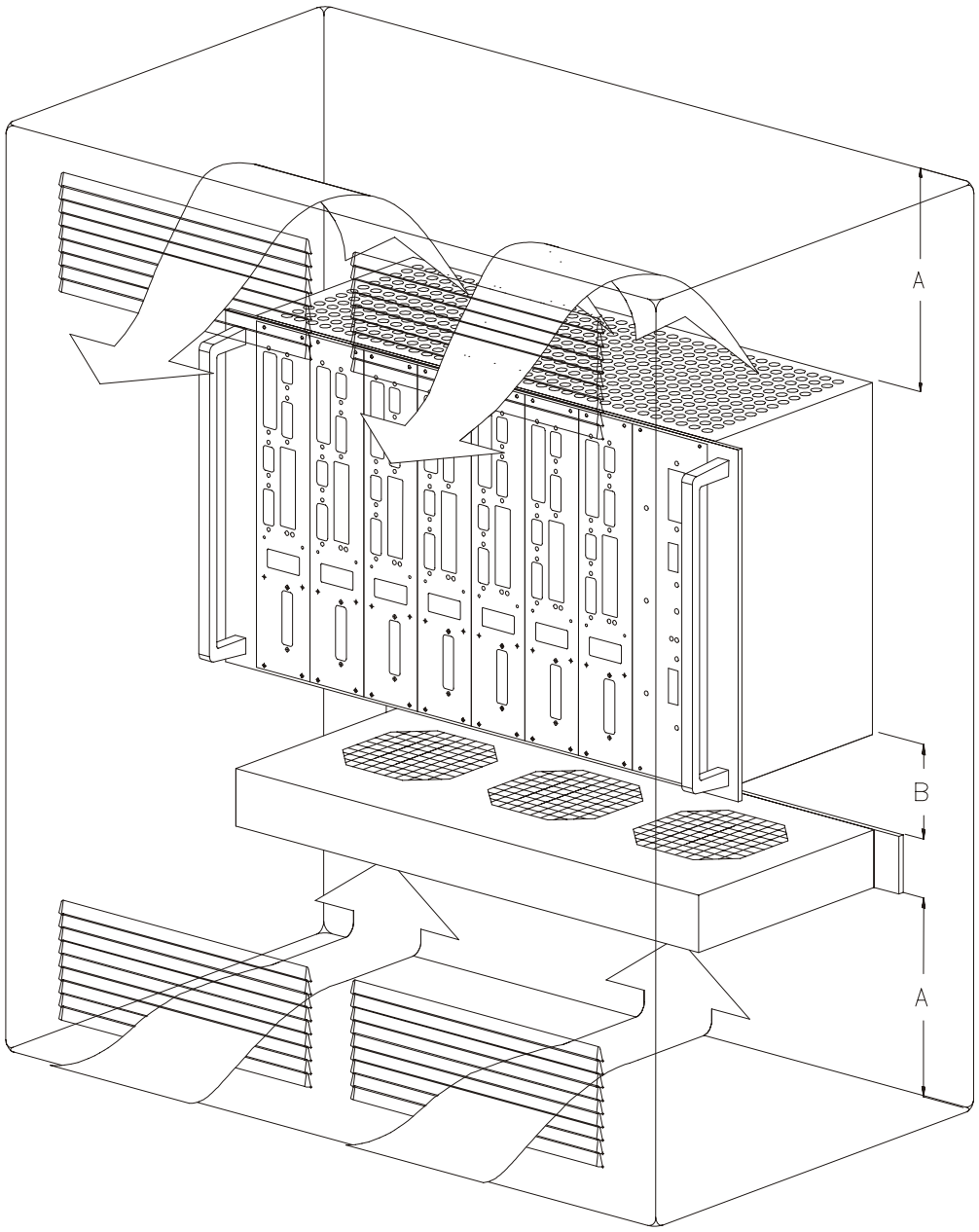
Unit: [mm]

In the solution outlined above, seven DSB2-PXX1 are powered by a DSO-PWR (ETEL's power supply).

The sub-rack systems shall be protected against any splashes of liquid and any contacts with smoke and dust. It is strongly recommended to install them inside a closed cabinet and to screw them on a metallic plate, where no vibrations will occur.

Fresh air is necessary to cool them (the flow depends of the user application). It is recommended to install fans on the sub-rack or in the cabinet to guarantee an air flow (fan power depends on the user application).

This drawing shows a sub-rack with rack modules, inside a cabinet:



The following distances are recommended: A = 100 [mm], B = 0 [mm] (drawing out of scale).

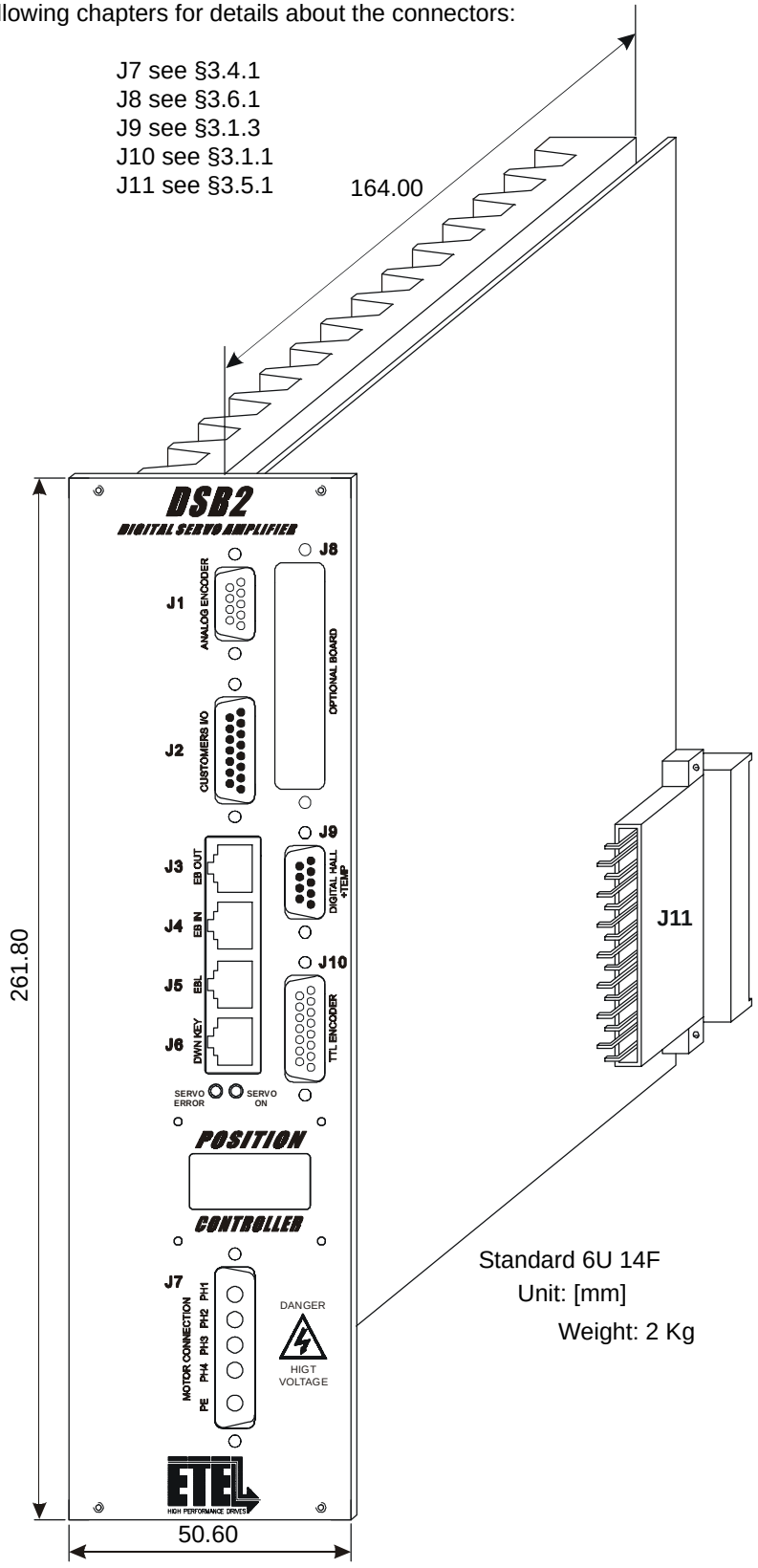
2.3 Rack module with heat sink

Type # : D S B 2 P x x **2 –** x x x **E**

2.3.1 Outline and dimensions

Refer to the following chapters for details about the connectors:

J1 see §3.1.2
J2 see §3.2.1
J3 see §3.3.1
J4 see §3.3.2
J5 see §3.3.3
J6 see §3.3.4
J7 see §3.4.1
J8 see §3.6.1
J9 see §3.1.3
J10 see §3.1.1
J11 see §3.5.1

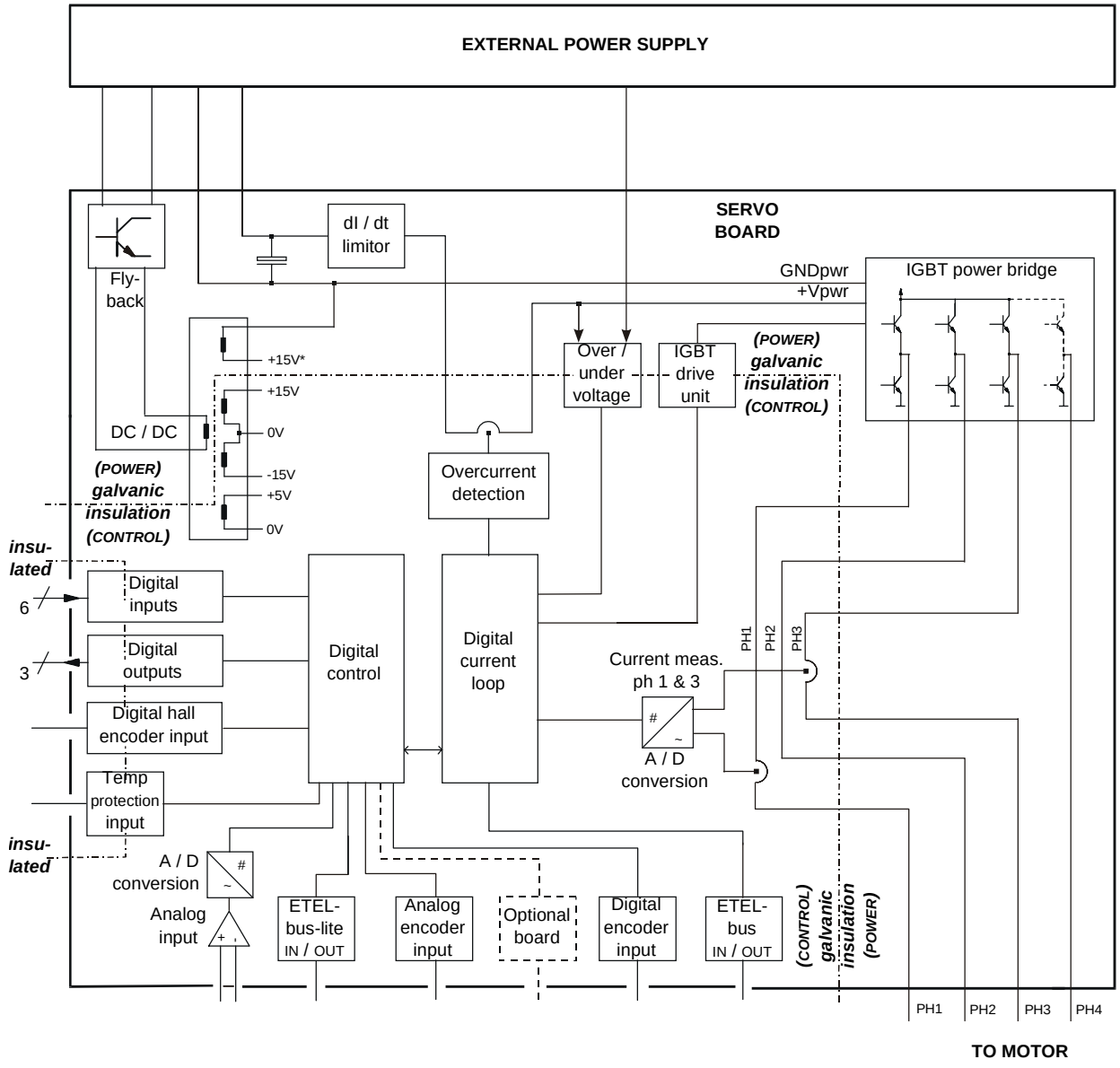


2.3.2 Block schematics

In the DSB2-P rack module, all parts are on a single board called the servo board.

It needs to be powered by an external power supply. The power supply developed by ETEL (refer to the DSO-PWR User's manual) is designed to fit most applications. If you use another power supply, it must meet all the specifications given on the next page.

On the servo board, the power part and the control part are galvanically separated. Also, some inputs and outputs are insulated from the control part by optocouplers.



Caution: Auxiliary GND (marked 0V in the control part) is internally connected to the front panel of the drive.
Power GND (marked GNDpwr in the power part) is connected to the front panel of the drive through a 22nF capacitor.

2.3.3 Specifications

To meet the specifications listed below, it is recommended to use an ETEL power supply with these 10F rack modules.
There are 3 types of rack modules with heat sink (14F), according to your power needs. The DSB2-PX32, the DSB2-PX42 and the DSB2-PX52. Their auxiliary circuits can be supplied with 96-340Vdc (opt. -X1) or with 24-55Vdc (opt. -X2). All specifications are given at 25°C ambient temperature:

DSB2-PXX2 POWER FEATURES				
Characteristics		**-PX32-**	**-PX42-**	**-PX52-**
Output to the motor	Voltage (up to)	340 Vdc		
	3-phase motor Continuous current	11 A	21 A	21 A
		7.5(1) Arms	15(1) Arms	15(1) Arms
	3-phase motor Max. current during 2 seconds	21A	42 A	56 A(2)
		15 Arms	30 Arms	40 Arms(2)
	2-phase motor Continuous current	8.9 A	17 A	17 A
		6.1(1) Arms	12(1) Arms	12(1) Arms
	2-phase motor Max. current during 1 second	21 A	42 A	56 A(2b)
		15 Arms	30 Arms	40 Arms(2b)
	PWM switching frequency	12 / 24 kHz(3)		
	Current ripple frequency	24 / 48 kHz(3)		
Power supply input	DC voltage	24 - 340Vdc		
	Max. DC current at 24 - 340 Vdc	15A / 30 A peak	30 A / 60 A peak	30 A / 60 A peak
Auxiliary supply input for DSB2-PXX2-X1	DC voltage	96-340 Vdc		
	Max. DC current at 96 Vdc	0.5(4) A		
	Max. DC current at 340 Vdc	0.15(4) A		
Auxiliary supply input for DSB2-PXX2-X2	DC voltage	24-55 Vdc		
	Max. DC current at 24 Vdc	0.6(4) A		
	Max. DC current at 55 Vdc	0.25(4) A		

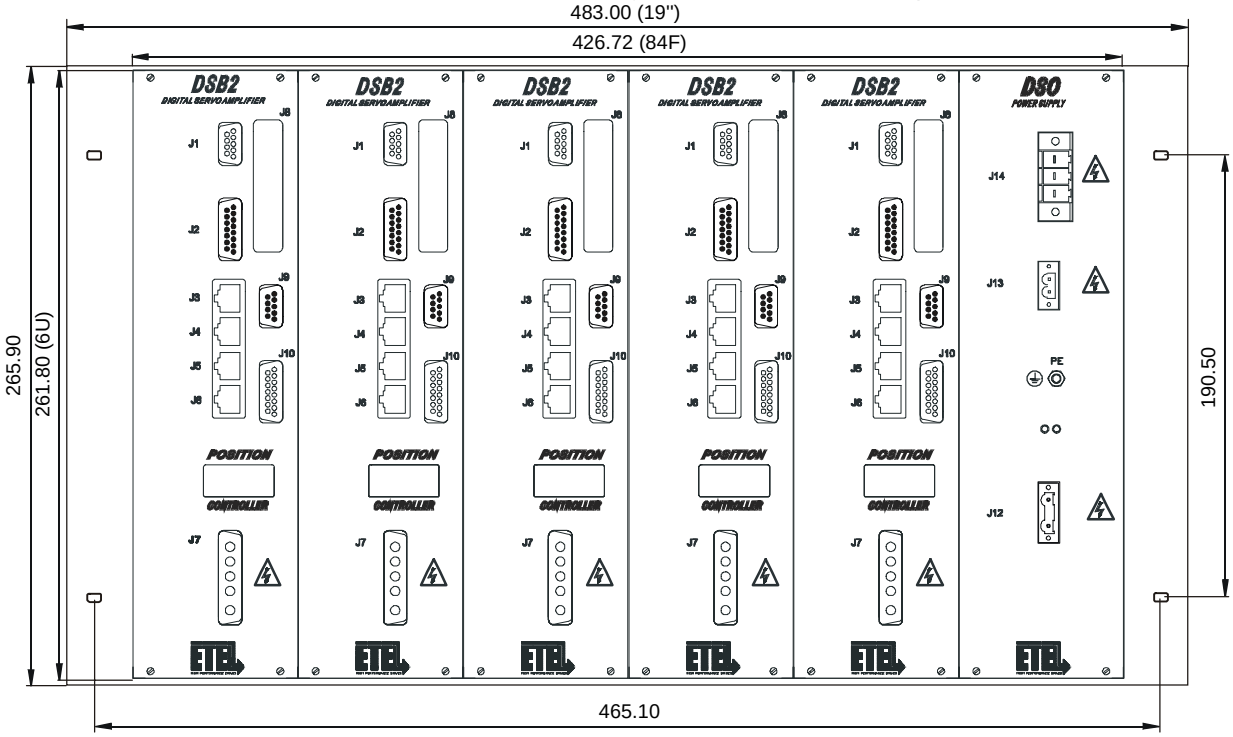
(1) : Continuous current can be reached only with forced cooling (external fan necessary)
(2) : For -PX52- the highest peak current is of 56 A or 40 Arms during 1.0 sec only (not 2 sec).
(2b) :For -PX52- the highest peak current is of 56 A or 40 Arms during 0.5 sec (not 1 sec).
(3) : If the firmware is 3.xx, PWM at 24kHz only
(4) : No optional board mounted within the drive, no external device connected to the I/O.

DSB2-PXX2 CONTROL FEATURES		
Characteristics		**All models**
General	Digital current loop sampling time	41.6 µs
	Phases commutation	with encoder position or digital hall effect
	Motion profiles	Trapezoidal / S-curve / Step / look-up table
	Two 16 bits microprocessors	Dual 80296
Position references	Position loop sampling time	166.67 µs
	Position, pseudo-speed or force reference	± 10 V

DSB2-PXX2 CONTROL FEATURES		
Characteristics		**All models**
Standard interfaces	ETEL-BUS-LITE host (PC) communication	RS232 or RS422 / 9'600 to 115'200 bauds
	ETEL-BUS mutli-axis communication	RS422 / 460'000 bauds or RS232 / 115'200 (up to 32 axis)
	Pulse/direction mode available	Max. 3 MHz
	CAN bus interface option	with DSO-CAN board
	PROFIBUS interface option	with DSO-PRO board
	MACRO bus interface option	with DSO-MAC board
Position encoders interfaces	Analog 1Vptp or 11uAptp	Max. 320kHz in. / Up to 2'048 (x4) interpolation factor
	Digital TTL (RS422)	Max. 10 MHz input frequency
User's inputs / outputs	Digital inputs, insulated	6 (+ 8 with DSO-SIO option)
	Digital outputs, insulated	3 (+ 8 with DSO-SIO option)
	Analog outputs	1 (+ 2 with DSO-SIO option)
	Analog outputs	0 (+ 2 with DSO-SIO option)
Software / Programmability	Set-up software 'ETEL Tools'	Windows 9x / 2000 / NT / XP
	DLL files	Windows 9x / 2000 / NT / XP / QNX4
	User's programmable sequence (# of lines)	5'420
	Liquid Crystal Display (# of characters)	16
	Firmware update through serial link	RS232

2.3.4 Mounting systems – Installation requirements

The rack modules with heat sink are mounted vertically inside a sub-rack, example:



Sub-rack depth: 239.24

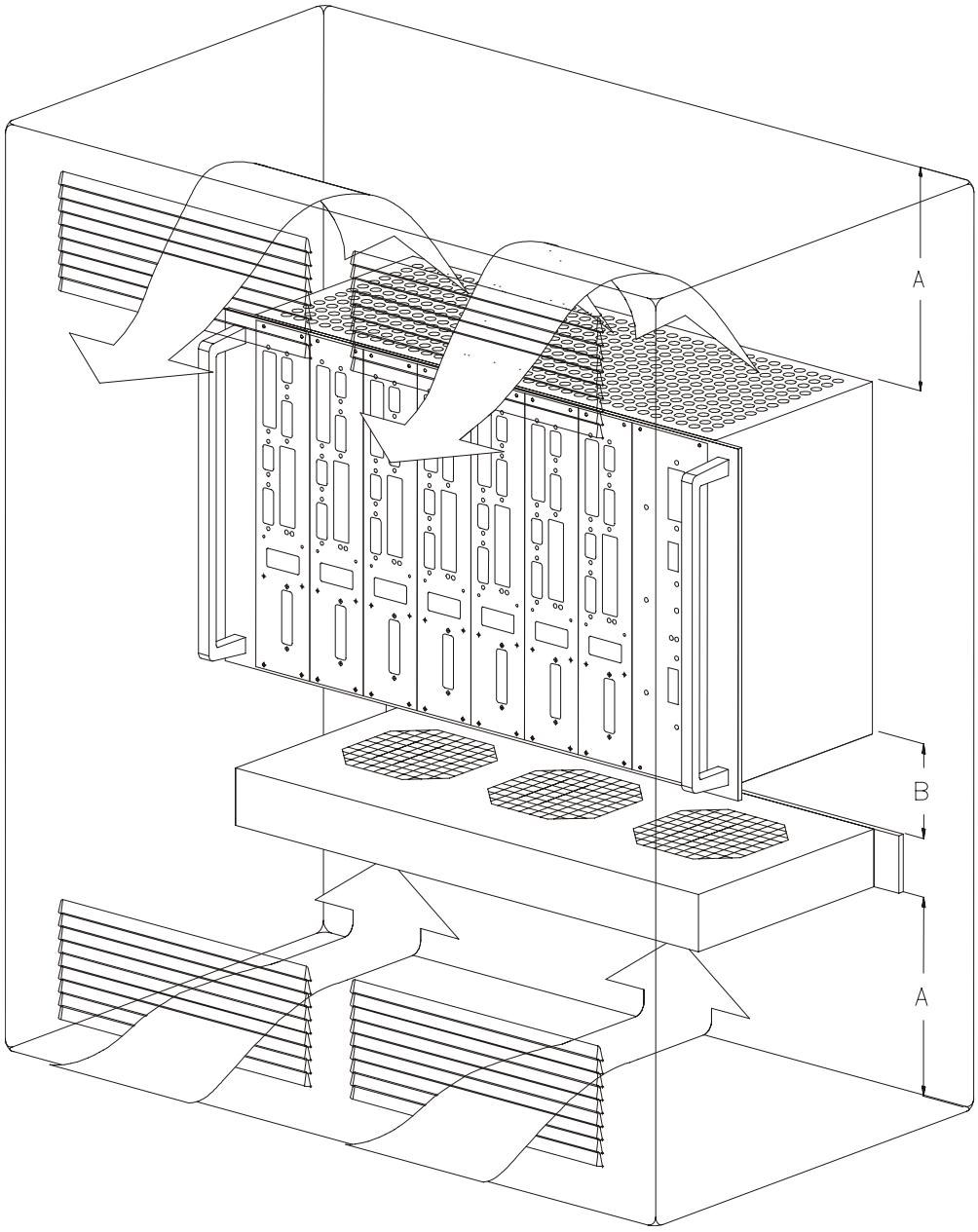
Unit: [mm]

In the solution outlined above, five DSB2-PXX2 are powered by a DSO-PWR (ETEL's power supply).

The sub-rack systems must be protected against any splashes of liquid and any contacts with smoke and dust. It is strongly recommended to install them inside a closed cabinet and to screw them on a metallic plate, where no vibrations will occur.

Fresh air is necessary to cool them (the flow depends on the user application). It is recommended to install fans on the sub-rack or in the cabinet to guarantee an air flow (the fan power depends on the user application).

This drawing shows a sub-rack with rack modules, inside a cabinet:



The following distances are recommended: A = 100 [mm], B = 0 [mm] (drawing out of scale).

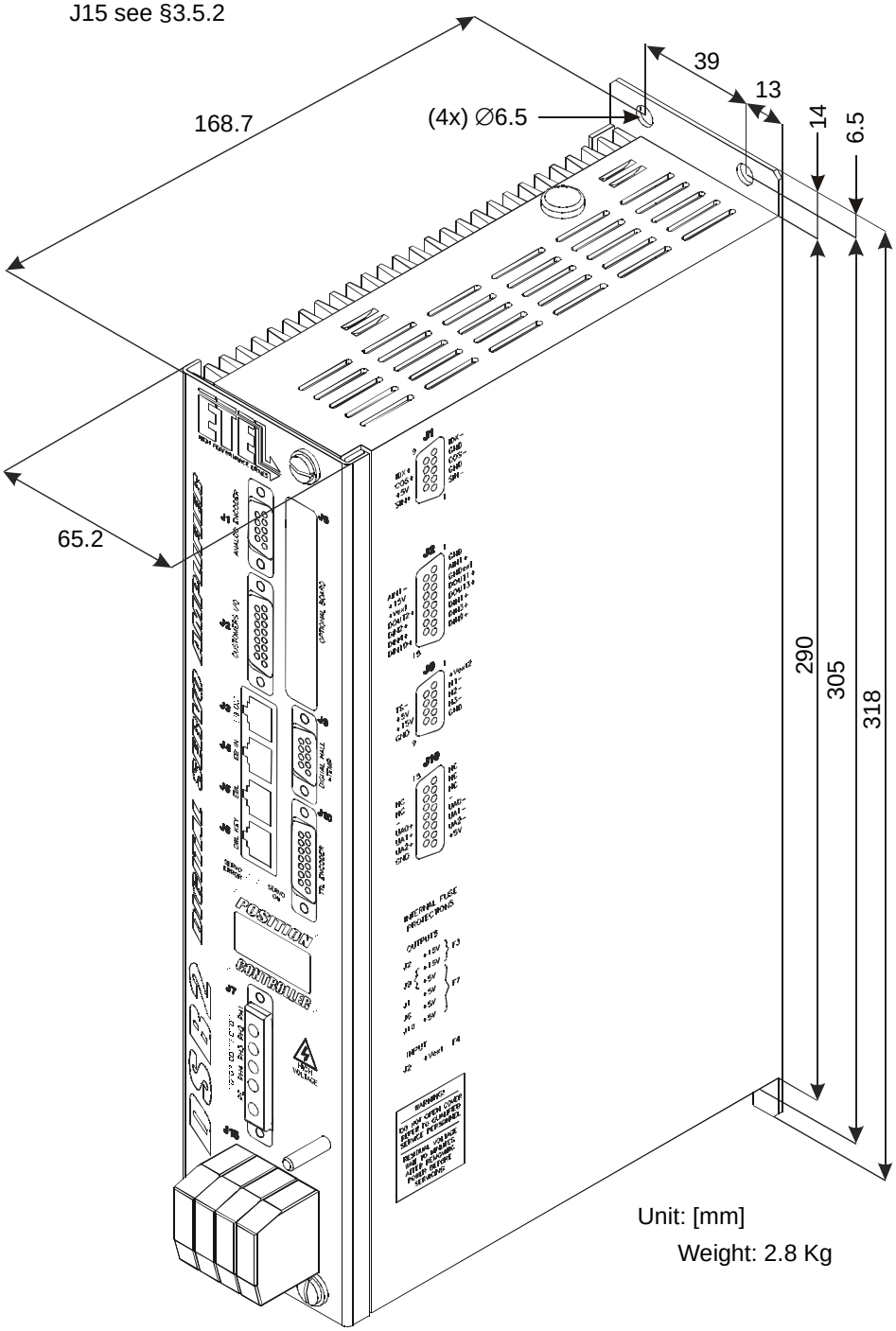
2.4 Housed module without power supply

Type # : D S B 2 P x x **3 –** x x x **E**

2.4.1 Outline and dimensions

Refer to the following chapters for details about the connectors:

J1 see §3.1.2
J2 see §3.2.1
J3 see §3.3.1
J4 see §3.3.2
J5 see §3.3.3
J6 see §3.3.4
J7 see §3.4.1
J8 see §3.6.1
J9 see §3.1.3
J10 see §3.1.1
J15 see §3.5.2

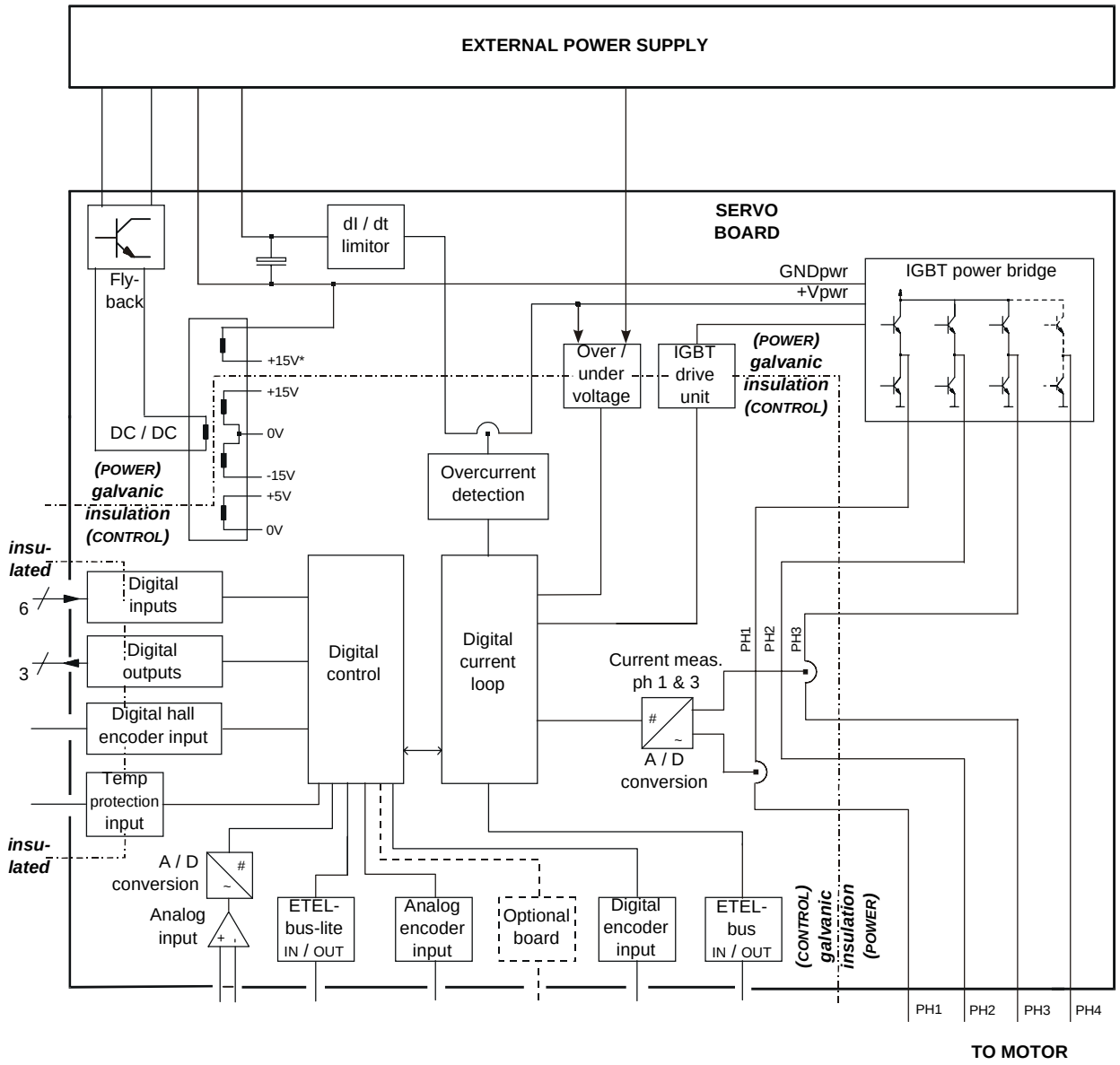


Unit: [mm]
Weight: 2.8 Kg

2.4.2 Block schematics

In this housed module, all parts are on a single board: the servo board. It includes an external power connector and then it needs to be powered by an external power supply.

On the servo board, the power part and the control part are galvanically separated. Also, some inputs and outputs are insulated from the control part by opto-couplers.



2.4.3 Specifications

There are two types of housed modules without power supply, according to your power needs.
All specifications are given at 25°C ambient temperature:

DSB2-PXX3 POWER FEATURES			
Characteristics		**-PX23-**	**-PX33-**
Output to the motor	Voltage (up to)	340 Vdc	
	3-phase motor Continuous current	4.5 A	4.5 A
		3.2 Arms	3.2 Arms
	3-phase motor Max. current during 2 seconds	11 A	21 A
		7.5 Arms	15 Arms
	2-phase motor Continuous current	3.5 A	3.5 A
		2.5 Arms	2.5 Arms
	2-phase motor Max. current during 1 second	11 A	21 A
		7.5 Arms	15 Arms
	PWM switching frequency	12 / 24 kHz(1)	
	Current ripple frequency	24 / 48 kHz(1)	
Power supply input	DC voltage	24 - 340Vdc	
	Max. DC current at 24 - 340 Vdc	8 A / 16 A peak	15 A / 30 A peak
Auxiliary supply input for DSB2-PXX3-X1	DC voltage	96-340 Vdc	
	Max. DC current at 96 Vdc	0.5(2) A	
	Max. DC current at 340 Vdc	0.15(2) A	
Auxiliary supply input for DSB2-PXX3-X2	DC voltage	24-55 Vdc	
	Max. DC current at 24 Vdc	0.6(2) A	
	Max. DC current at 55 Vdc	0.25(2) A	

(1): If the firmware is 3.xx, PWM at 24kHz only.
(2): No optional board mounted within the drive, no external device connected to the I/O.

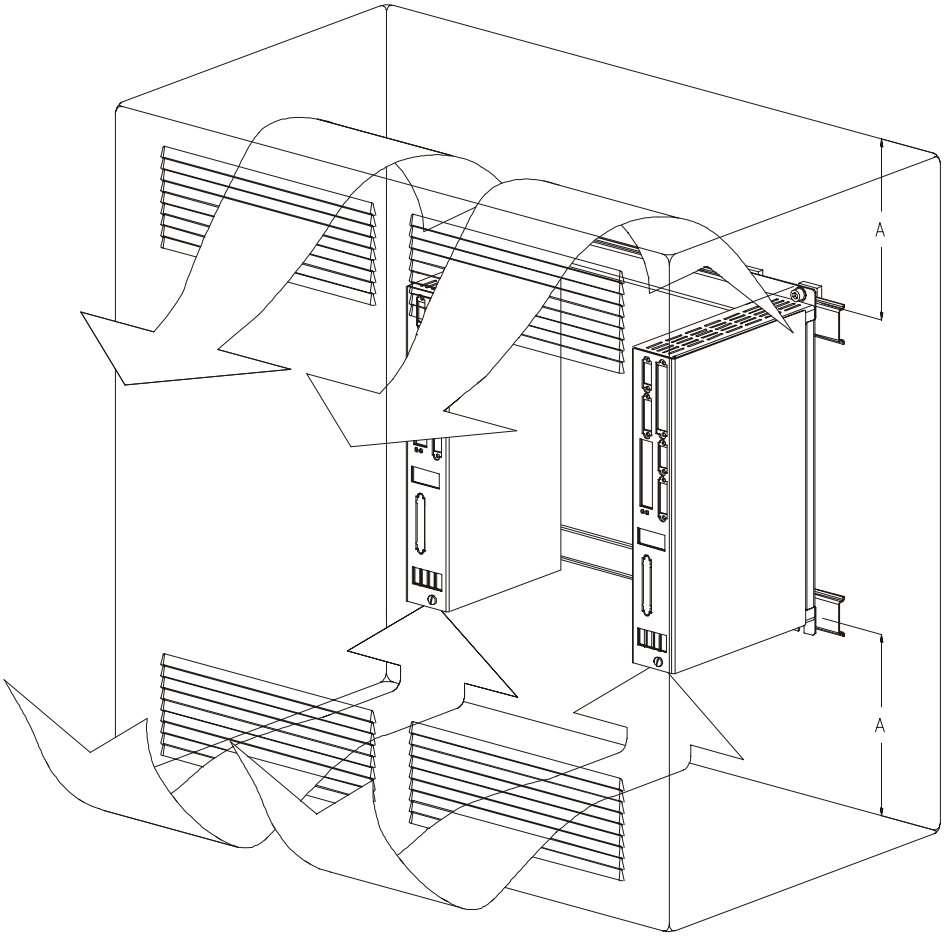
DSB2-PXX3 CONTROL FEATURES		
Characteristics		**All models**
General	Digital current loop sampling time	41.6 µs
	Phases commutation	with encoder position or digital hall effect
	Motion profiles	Trapezoidal / S-curve / Step / look-up table
	Two 16 bits microprocessors	Dual 80296
Position references	Position loop sampling time	166.67 µs
	Position, pseudo-speed or force reference	± 10 V
Standard interfaces	ETEL-Bus-Lite host (PC) communication	RS232 or RS422 / 9'600 to 115'200 bauds
	ETEL-Bus mutli-axis communication	RS422 / 460'000 bauds or RS232 / 115'200 (up to 32 axis)
	Pulse/direction mode available	Max. 3 MHz
	CAN bus interface option	with DSO-CAN board
	PROFIBUS interface option	with DSO-PRO board
	MACRO bus interface option	with DSO-MAC board
Position encoders interfaces	Analog 1Vptp or 11uAptp	Max. 320kHz in. / Up to 2'048 (x4) interpolation factor
	Digital TTL (RS422)	Max. 10 MHz input frequency

DSB2-PXX3 CONTROL FEATURES		
Characteristics		**All models**
User's inputs / outputs	Digital inputs, insulated	6 (+ 8 with DSO-SIO option)
	Digital outputs, insulated	3 (+ 8 with DSO-SIO option)
	Analog outputs	1 (+ 2 with DSO-SIO option)
	Analog outputs	0 (+ 2 with DSO-SIO option)
Software / Programmability	Setup software 'ETEL Tools'	Windows 9x / 2000 / NT / XP
	DLL files	Windows 9x / 2000 / NT / XP / QNX4
	User's program (# of lines)	5'420
	Liquid Crystal Display (# of characters)	16
	Firmware update through serial link	RS232

2.4.4 Mounting systems - installation requirements

The sub-rack systems must be protected against any splashes of liquid and any contacts with smoke and dust. It is strongly recommended to install them inside a closed cabinet and to screw them on a metallic plate, where no vibrations will occur. Fresh air is necessary to cool them (the flow depends on the user application).

This drawing shows 2 housed modules inside a cabinet:



The following distance is recommended: A = 100 [mm] (drawing out of scale).

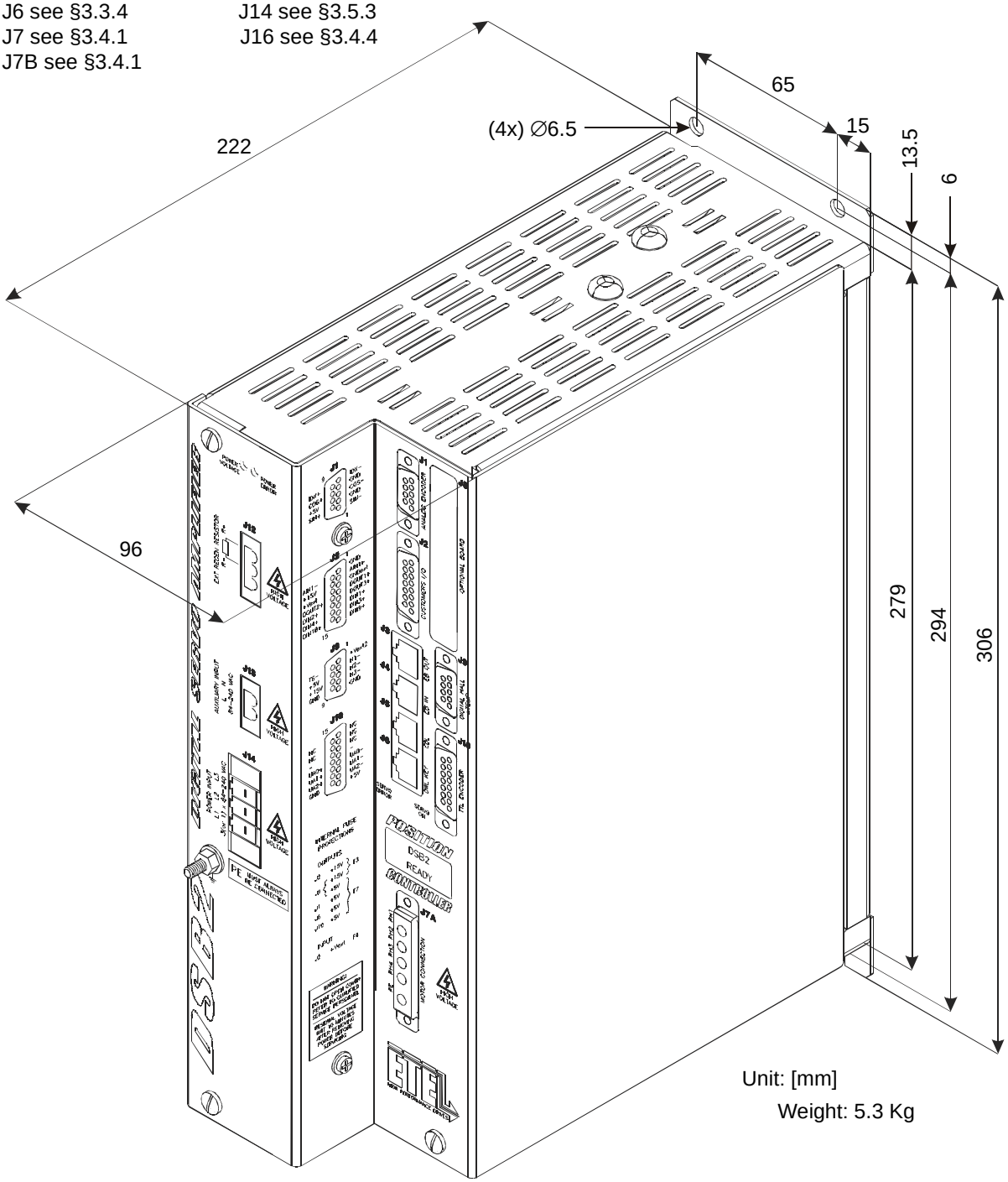
2.5 Housed module with power supply

Type # : D S B 2 P x x **4 –** x x x **E**

2.5.1 Outline and dimensions

Refer to the following chapters for details about the connectors:

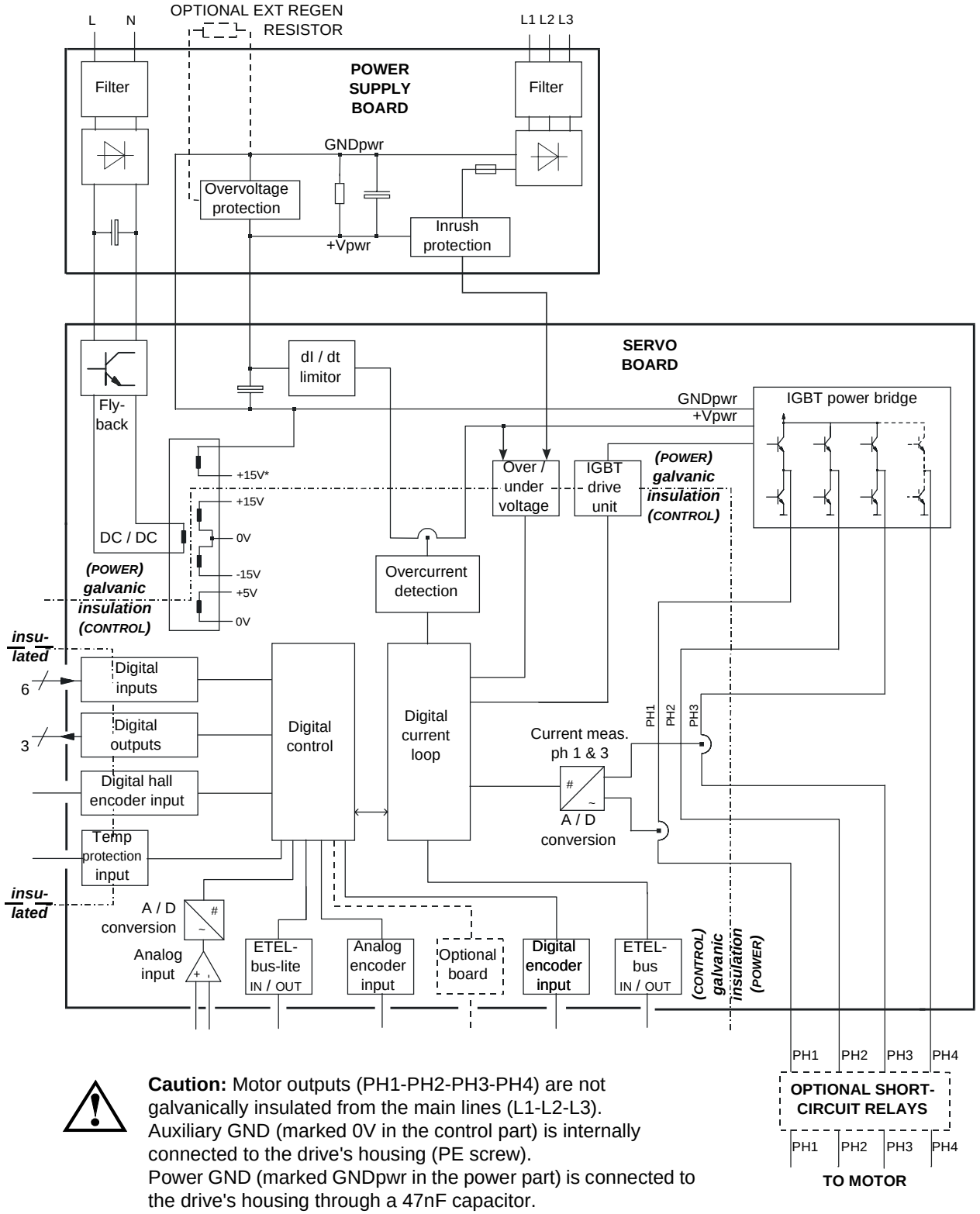
J1 see §3.1.2
J2 see §3.2.1
J3 see §3.3.1
J4 see §3.3.2
J5 see §3.3.3
J6 see §3.3.4
J7 see §3.4.1
J7B see §3.4.1
J8 see §3.6.1
J9 see §3.1.3
J10 see §3.1.1
J12 see §3.5.5
J13 see §3.5.4
J14 see §3.5.3
J16 see §3.4.4



2.5.2 Block schematics

This housed module contains two boards: the servo board and the power supply board.

On the servo board, the power part and the control part are galvanically separated. Also, some inputs and outputs are insulated from the control part by optocouplers.



Caution: Motor outputs (PH1-PH2-PH3-PH4) are not galvanically insulated from the main lines (L1-L2-L3).
Auxiliary GND (marked 0V in the control part) is internally connected to the drive's housing (PE screw).
Power GND (marked GNDpwr in the power part) is connected to the drive's housing through a 47nF capacitor.

2.5.3 Specifications

There are four types of housed modules, according to your power needs.
All specifications are given at 25°C ambient temperature:

DSB2-PXX4 POWER FEATURES					
Characteristics		**-PX24-**	**-PX34-**	**-PX44-**	**-PX54-**
Output to the motor	Voltage (up to)	340 Vdc			
	3-phase motor Continuous current	4.9 A	11 A	21 A	21 A
		3.5 Arms	7.5 Arms	15 Arms	15 Arms
	3-phase motor Max. current during 2 seconds	11 A	21 A	42 A	56 A(1)
		7.5 Arms	15 Arms	30 Arms	40 Arms(1)
	2-phase motor Continuous current	4.9 A	11 A	17 A	17 A
		3.5 Arms	7.5 Arms	12 Arms	12 Arms
	2-phase motor Max. current during 1 second	11 A	21 A	42 A	56 A(1b)
		7.5 Arms	15 Arms	30 Arms	40 Arms(1b)
	PWM switching frequency	12 / 24 kHz(2)			
	Current ripple frequency	24 / 48 kHz(2)			
Power supply input	AC voltage (1or 3 phases)	84 - 240 Vac (50 - 60 Hz)			
	Max. AC current at 1 x 84 - 240 Vac	1 x 13 A			
	Max. AC current at 3 x 84 - 240 Vac	3 x 13 A			
	Max. continuous power at 3 x 120 Vac	0.6kVA	1.2kVA	2.5 kVA	2.5 kVA
	Max. continuous power at 3 x 230 Vac	1.2kVA	2.5kVA	5 kVA	5 kVA
Auxiliary supply input for DSB2-PXX4-	AC voltage	84 - 240 Vac (50 - 60 Hz)			
	Max. AC current at 120 Vac	150(3) mA			
	Max. AC current at 240 Vac	100(3) mA			

(1) : For -PX54- the highest peak current is of 56 A or 40 Arms during 1sec only (not 2 sec).
(1b) :For -PX54- the highest peak current is of 56 A or 40 Arms during 0.5 sec only (not 1sec).
(2) : If the firmware is 3.xx, PWM at 24kHz only
(3) : No optional board mounted in the drive.

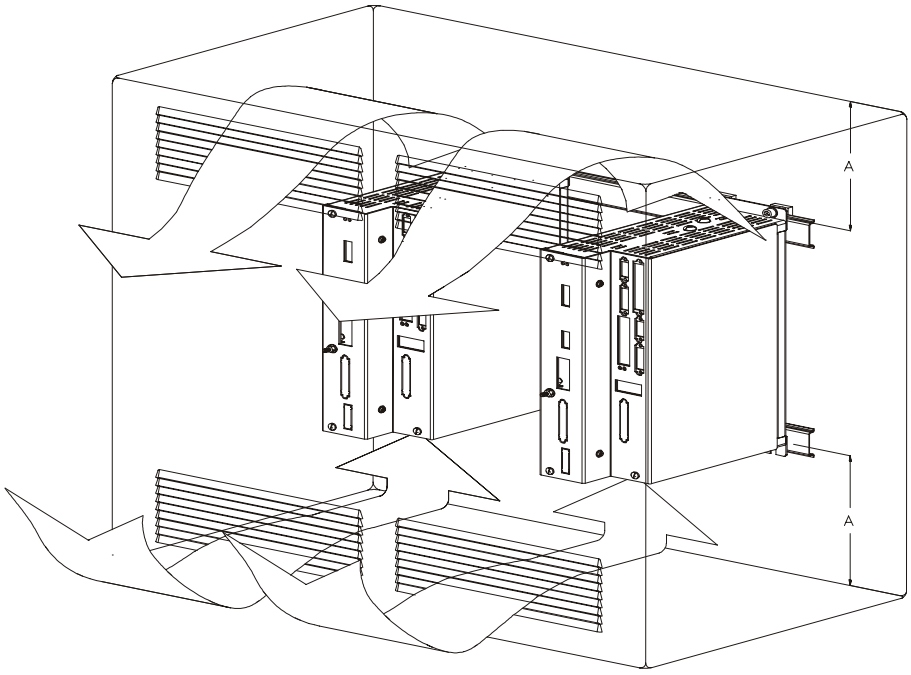
DSB2-PXX4 CONTROL FEATURES		
Characteristics		**All models**
General	Digital current loop sampling time	41.6 µs
	Phases commutation	with encoder position or digital hall effect
	Motion profiles	Trapezoidal / S-curve / Step / look-up table
	Two 16 bits microprocessors	Dual 80296
Position references	Position loop sampling time	166.67 µs
	Position, pseudo-speed or force reference	± 10 V

DSB2-PXX4 CONTROL FEATURES		
Characteristics		**All models**
Standard interfaces	ETEL-Bus-Lite host (PC) communication	RS232 or RS422 / 9'600 to 115'200 bauds
	ETEL-Bus mutli-axis communication	RS422 / 460'000 bauds or RS232 / 115'200 (up to 32 axis)
	Pulse/direction mode available	Max. 3 MHz
	CAN bus interface option	with DSO-CAN board
	PROFIBUS interface option	with DSO-PRO board
	MACRO bus interface option	with DSO-MAC board
Position encoders interfaces	Analog 1Vptp or 11uAptp	Max. 320kHz in. / Up to 2'048 (x4) interpolation factor
	Digital TTL (RS422)	Max. 10 MHz input frequency
User's inputs / outputs	Digital inputs, insulated	6 (+ 8 with DSO-SIO option)
	Digital outputs, insulated	3 (+ 8 with DSO-SIO option)
	Analog outputs	1 (+ 2 with DSO-SIO option)
	Analog outputs	0 (+ 2 with DSO-SIO option)
Software / Programmability	Setup software 'ETEL Tools'	Windows 9x / 2000 / NT / XP
	DLL files	Windows 9x / 2000 / NT / XP / QNX4
	User's program (# of lines)	5'420
	Liquid Crystal Display (# of characters)	16
	Firmware update through serial link	RS232

2.5.4 Mounting systems - installation requirements

The sub-rack systems must be protected against any splashes of liquid and any contacts with smoke and dust. It is strongly recommended to install them inside a closed cabinet and to screw them on a metallic plate, where no vibrations will occur. Fresh air is necessary to cool them (the flow depends on the user application).

This drawing shows 2 housed modules inside a cabinet:



The following distance is recommended: A = 100 [mm] (drawing out of scale). As a fan is already included into the drives, no additional fan is necessary for most applications.

3. Electrical interface

This chapter describes the pin assignment for every connector. More detailed explanations for proper connections are given from case to case. However, one may refer to the **DSB2-P Operation & software manual** for more information on some specific functions, such as digital and analog inputs and outputs.

There are six groups of connectors, according to their function:

Encoders connectors (see §3.1)

Inputs / outputs connector (see §3.2)

Communication connectors (see §3.3)

Motor connector (see §3.4)

Power connectors (see §3.5)

Option board connector (see §3.6)



Danger: High voltage may be present on all power connectors.
Turn off all power supplies and wait 10 minutes to allow the internal DC bus capacitors to discharge before installing or disconnecting a cable on one of these connectors.
The motor connectors must always be screwed or correctly fastened on the drive.
It is also recommended to fasten the cables on the system.



Danger: All input and output signals must be insulated from the power and mains lines.
Some inputs / outputs are galvanically insulated by opto-couplers.
The voltage applied between these insulated I/O and the PE must not exceed **42 Vdc max**.



Caution: Most inputs and outputs are not galvanically insulated from the GND.



Caution: The encoder, input/output and communication connectors shall be handled in an ESD protected environment, only.

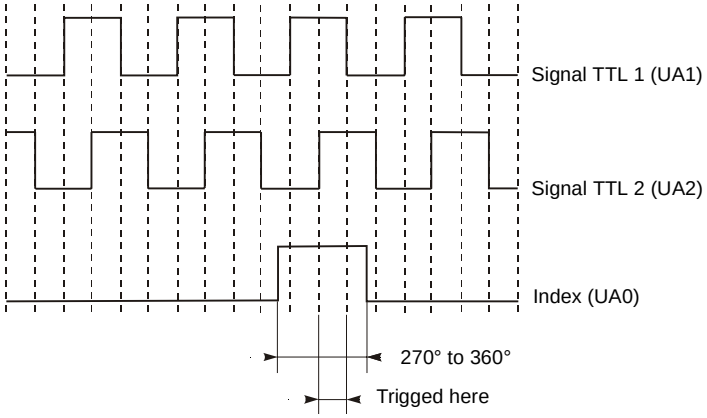
Convention: In the next chapters, connectors with male pins are indicated with the • symbol (full) and female pins are represented with the o symbol (empty).

3.1 Encoders connectors

3.1.1 Connector J10: TTL position encoder

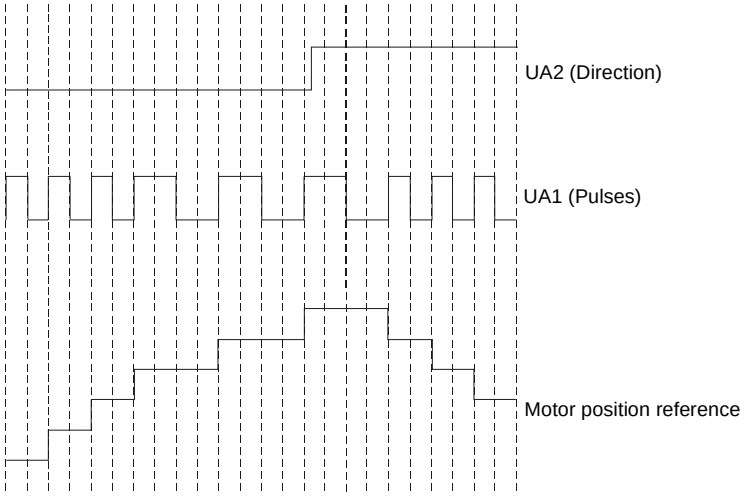
Danger: All input and output signals must be insulated from the power and mains lines.
Caution: These inputs and outputs are not galvanically insulated from the GND.

TTL encoders measure the motor position with 2 phase-shifted TTL signals. Each change of state of one of the signals corresponds to one motor position increment. A third signal (index) gives the motor absolute position. The encoder TTL signals have to be compatible with the EIA standard norm RS422. These signals have the following form:

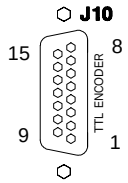
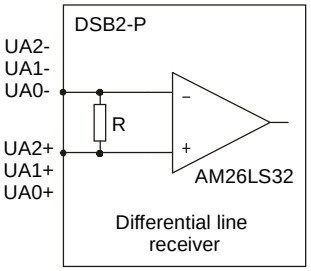


3.1.1.1 Pulses / direction mode

The pulse/direction mode is especially useful when the drive is controlled by an **axis board** because most of them can send pulses/direction signals. Both TTL logical signals are given as a reference to the motor. One of them, A (direction), input in UA2, determines the movement direction. The second one, B (pulses), input in UA1, creates a jump movement on the motor position reference. The signals have the following form:



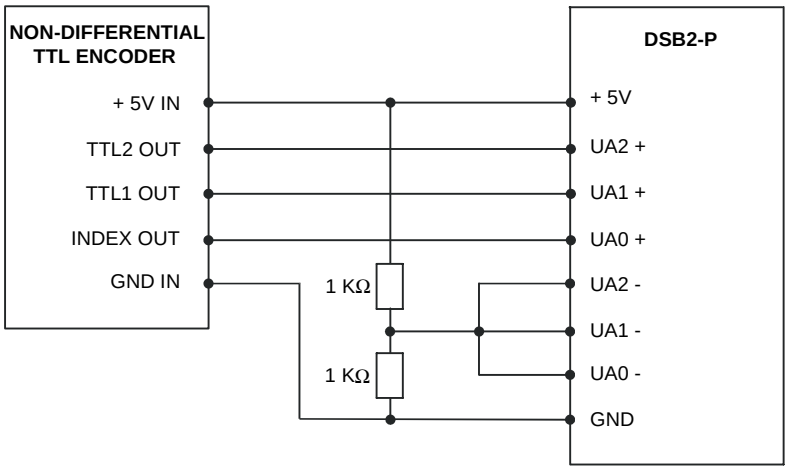
The +5V encoder supply output is protected by F7 (500mA fuse) shared with +5V encoder supply on J1and J9.

D-SUB, 15 pins, female				
TTL ENCODER	**Pin #**	**Signal**	**Function**	**Interface**
	1	+5V	Encoder supply output (F7 500mA, share with J1, J6, J9)	
	2	UA2 -	TTL 2 - signal (or direction in pulses / direction mode)	
	3	UA1 -	TTL 1 - signal (or pulses in pulses / direction mode)	
	4	UA0 -	TTL 0 - signal	
	5	-	**Do not connect**	
	6	NC	Not connected in drive	
	7	NC	Not connected in drive	
	8	NC	Not connected in drive	
	9	GND	Encoder supply output (0V)	
	10	UA2 +	TTL 2 + signal	
	11	UA1 +	TTL 1 + signal	
	12	UA0 +	TTL 0 + signal	
	13	-	**Do not connect**	
	14	NC	Not connected in drive	
	15	NC	Not connected in drive	

Caution: This connector must be handled in an ESD protected environment, only!

3.1.1.2 Non-differential TTL encoder on connector J10

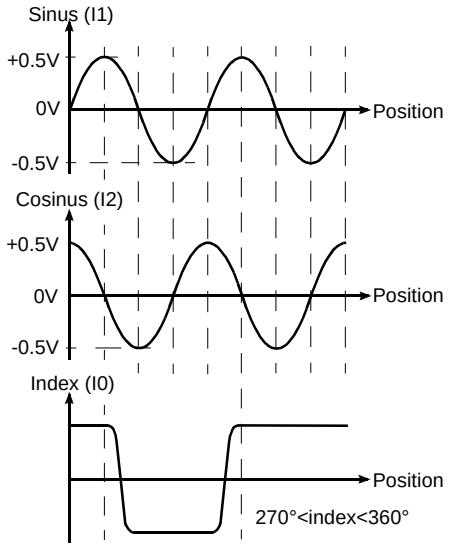
If you are using a non-differential TTL encoder (UA0-, UA1- and UA2- are not present in the encoder and not connected on DSB2-P), an external resistors must be added and connected as follows:



3.1.2 Connector J1: Analog position encoder (1Vptp, 11µAptp)

Danger: All input and output signals must be insulated from the power and mains lines.
Caution: These inputs and outputs are not galvanically insulated from the GND.

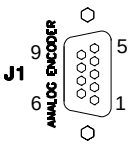
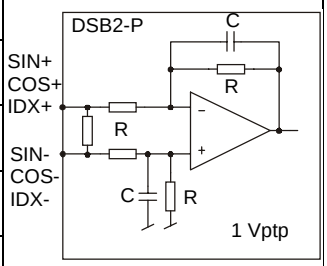
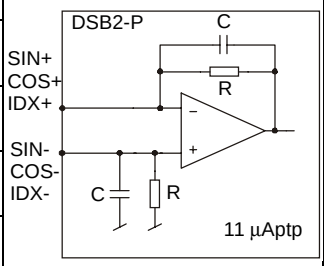
The analog encoders can determine the motor position thanks to two sinusoidal signals with a phase-shift of 90°. A third signal (index) gives the absolute motor position. These signals have the following form:



Two kinds of analog encoders may be used. They differ in their respective signals. The first one has a sine and cosine signal amplitude of 1V peak to peak with a load resistor R_0=120Ω: it is called a 1Vptp encoder. The second one has an amplitude of 11µA peak to peak: it is called a 11µAptp encoder. The +5V encoder supply output is protected by F7 (500mA fuse), shared with +5V encoder supply on J9 and J10.

Remark: If a drive is built to be used with a 1Vptp encoder, it will not be possible to use afterwards an 11µAptp encoder and contrariwise. This difference is identified in the drive's type number:
D S B 2 P **1** x x - x x x E for a 1 Vptp encoder configuration.
D S B 2 P **2** x x - x x x E for a 11µAptp encoder configuration.

D-SUB, 9 pins, female

ANALOG ENCODER	Pin #	Signal	Function	Interface
	1	SIN -	Sine - signal input	
	2	GND	Encoder supply output (0V)	
	3	COS -	Cosine - signal input	
	4	GND	Encoder supply output (0V)	
	5	IDX -	Index - signal input	
	6	SIN +	Sine + signal input	
	7	+5V	Encoder supply output (fuse F7 500mA, shared with J6, J9 and J10)	
	8	COS +	Cosine + signal input	
	9	IDX +	Index + signal input	

Caution: This connector must be handled in an ESD protected environment, only!

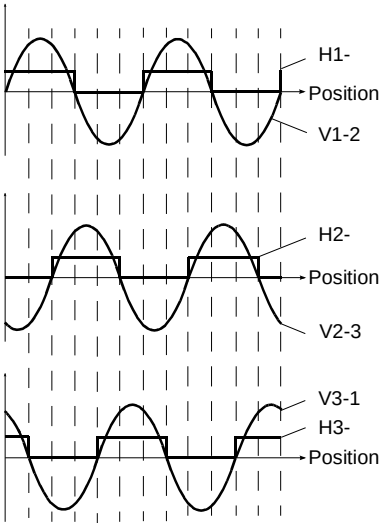
3.1.3 Connector J9: Digital Hall encoder & over temperature protection

Danger: All input and output signals must be insulated from the power and mains lines.
Caution: These inputs are galvanically insulated by opto-couplers.
The voltage applied between these insulated inputs and the PE must not exceed **42 Vdc max**.

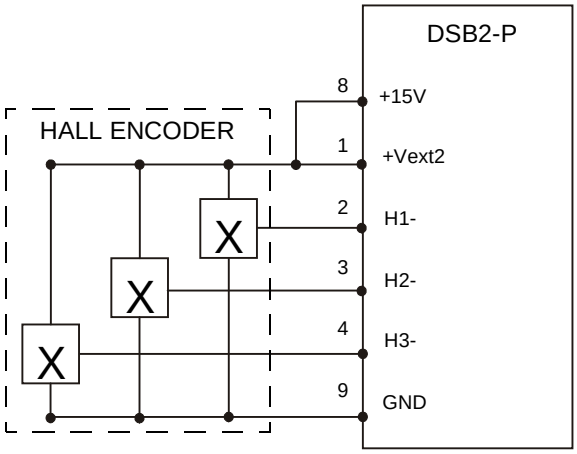
Connections for both digital Hall encoder and overtemperature protection are present on this connector. These inputs are opto-couplers whose voltage input ranges from 5 Vdc (min.) to 15 Vdc (max.)

Digital hall encoder:

The digital Hall effect encoders can determine the motor position thanks to three digital signals (one for each Hall effect sensor). On the following graph, the Hall signals of the sinusoidal voltages between the motor phase are displayed:

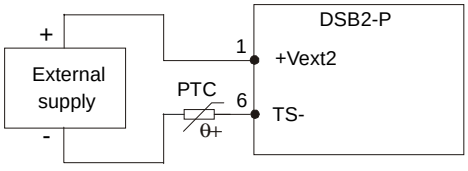


The digital hall encoder sensors (X) must be connected as follows:

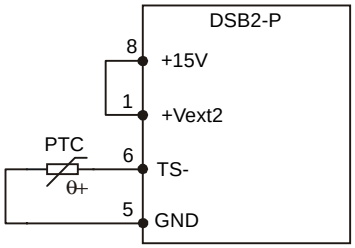


Overtemperature protection:

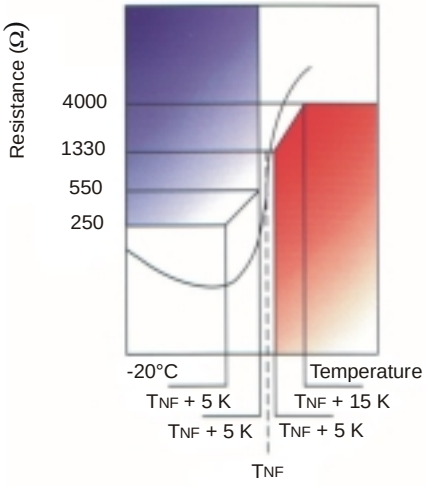
When a motor should be protected against overheating, ETEL includes an optional PTC resistor (positive temperature coefficient) inside its windings. If you have asked for this option, connect your temperature protection as follows:



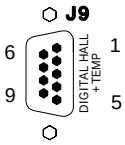
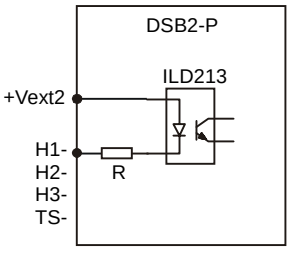
One may also use the auxiliary DC supply available on this connector, but the opto-couplers advantage would be lost, example:



Remark: The diagram above shows the connection of a Positive Temperature Coefficient sensor (PTC). A 'normally closed' thermostat may also be connected to the TS- input. Below, the PTC sensor characteristic used by ETEL (for ETEL ILx motors: T_{NF} = 100°C / LMx and TMx motors: T_{NF} = 120°C).



The +5V encoder supply output is protected by F7 (500mA fuse), shared with +5V encoder supply on J1 and J10. The +15V encoder supply output is protected by F3 (250mA fuse), shared with +15V auxiliary supply output on J2.

D-SUB, 9 pins, male				
DIGITAL HALL + TEMP	Pin #	Signal	Function	Interface
	1	+Vext2	External supply input for digital Hall encoder and motor temperature protection	
	2	H1 -	Digital Hall sensor input 1	
	3	H2 -	Digital Hall sensor input 2	
	4	H3 -	Digital Hall sensor input 3	
	5	GND	Encoder supply output (0V)	
	6	TS -	PTC or thermostat input	
	7	+5V	Encoder supply output (fuse F7 500mA, shared with J1, J6 and J10)	
	8	+15V	Encoder supply output (F3 250mA, shared with J2 auxiliary supply output)	
	9	GND	Encoder supply output (0V)	

Caution: This connector must be handled in an ESD protected environment, only!

3.2 Inputs / outputs connector

3.2.1 Connector J2: Customers inputs / outputs

The DSB2-P owns 6 digital inputs (DIN1 to DIN4, DIN9 and DIN10) and 3 digital outputs (DOUT1 to DOUT3). Every digital input and output are opto-coupled (ILD213 circuit). The drive has also one analog input (AIN1). The A/D converter used is an AD7863. It has a 14 bits resolution and can convert analog signals ranging between +10V and -10V.

Only inputs and outputs **interfacing** is considered here. Refer to the **DSB2-P Operation & software manual** for further information about the use of the different devices.

3.2.1.1 Analog input:

Danger: The analog output signal must be insulated from the power and mains lines.
Caution: The analog output is not galvanically insulated from the GND.

To use the analog input (AIN1), a voltage ranging from +10V to -10V is applied between pins 2 (AIN1+) and 9 (AIN1-).

Remark: If AIN1 = + 10 V ⇒ parameter M51 = - 8192 and if AIN1 = - 10 V ⇒ M51 = + 8191.

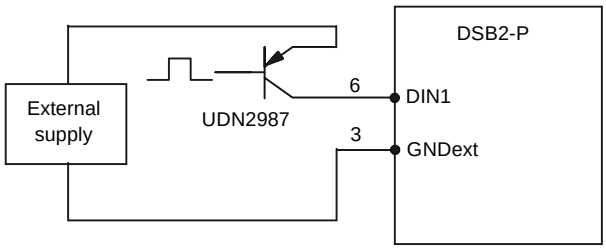
3.2.1.2 Digital inputs:

Danger: The digital inputs signals must be insulated from the power and mains lines.
The digital inputs are galvanically insulated by opto-couplers.
The voltage applied between these insulated inputs and the PE must not exceed **42 Vdc max**.

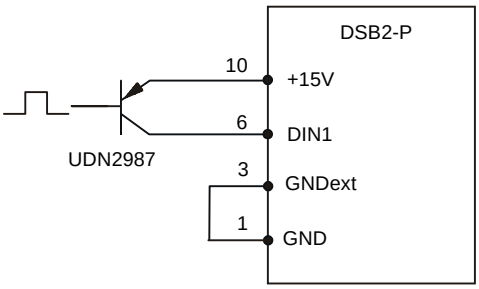
Digital inputs switch to '1' when a voltage ranging between +15V and +28V is applied between pins DIN+ and DIN- of the corresponding input. These inputs are opto-couplers.
Internal resistor R_{max} of the external auxiliary supply must not be higher than 15kΩ for an adequate functioning.
The input switches to '0' when a nil voltage is applied between pins DIN+ and DIN-.

Remark: When using a 'positive limit switch', connect it to DIN10.
When using a 'negative limit switch', connect it to DIN9.
When using a 'home switch', connect it to DIN2. (Refer to the **DSB2-P Operation & software manual** for more information).

The auxiliary supply can be external to the drive, as shown below:



It is also possible to use the auxiliary DC supply (+15V) available on this connector, but the opto-couplers advantage would be lost; example:



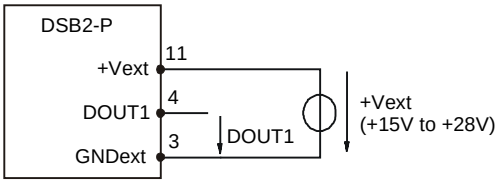
Remark: For both solutions, a bounce-free contact may be used instead of a transistor.

3.2.1.3 Digital outputs:

Danger: The digital outputs signals must be insulated from the power and mains lines.
The digital outputs are galvanically insulated from the GND by opto-couplers.
The voltage applied between these insulated outputs and GND must not exceed **42 Vdc max**.

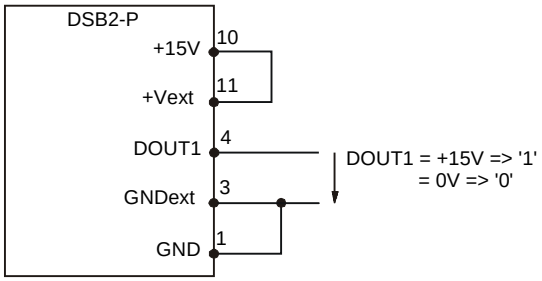
A digital output cannot be used as such. A voltage should previously be supplied to the external auxiliary supply +Vext. This voltage should range between +15V and +28V.

It is recommended to use an external auxiliary supply for voltage Vext, as shown below (in this case, the logical value '1' will correspond to Vext and '0' to GND ext).



Remark: This diagram shows the use of the output DOUT1 but it is the same with the other outputs.

Like with digital inputs, it is also possible to use the auxiliary DC supply (+15V) available on this connector, but the opto-couplers advantage would be lost, example:

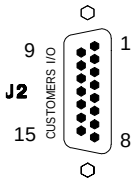
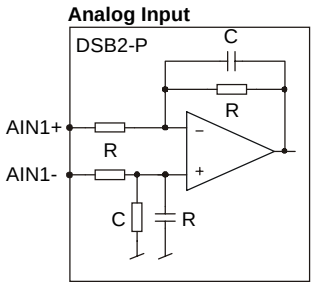
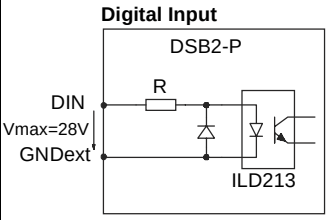
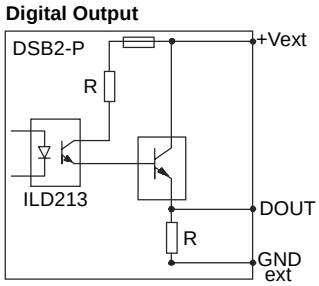


Remarks: The opto-couplers advantage will be lost with the above diagram.
This diagram shows the use of the output DOUT1 but it is the same with the other outputs.

3.2.1.4 Auxiliary DC supply:

On top of all inputs and outputs, an **auxiliary DC supply output** (+15V) is available on this connector. It can be freely used to supply an external source to the drive. However, beware not to get over the maximum current indicated when using this power supply. It is protected by F7 (500mA fuse) shared with +15V Hall encoder supply on J9.

D-SUB, 15 pins, male

CUSTOMERS I / O	Pin #	Signal	Function	Interface
	1	GND	Auxiliary supply output (0V)	
	2	AIN1 +	Analog input 1 +	
	3	GNDext	External supply input (0V) for the digital outputs Also DIN - and DOUT -	
	4	DOUT1	Digital output 1 +	
	5	DOUT3	Digital output 3 +	
	6	DIN1	Digital input 1 +	
	7	DIN3	Digital input 3 +	
	8	DIN9	Digital input 9 +	
	9	AIN1 -	Analog input 1 -	
	10	+15V	Auxiliary supply output (fuse F3 250mA shared with J9 +15V Hall encoder supply output)	
	11	+Vext	External supply input for digital outputs (fuse F4, 250mA - limits user's input current)	
	12	DOUT2	Digital output 2 +	
	13	DIN2	Digital input 2 +	
	14	DIN4	Digital input 4 +	
	15	DIN10	Digital input 10 +	

Caution: This connector must be handled in an ESD protected environment, only!

3.3 Communication connectors



Danger: All input and output signals must be insulated from the power and mains lines.
Caution: These inputs and outputs are not galvanically insulated from the GND.

The communication between a host (PC) and a drive is obtained via **ETEL-Bus-Lite (EBL)** protocol (refer to **EBL Communication manual** for more information) and the communication between the drives is obtained via **ETEL-Bus (EB)** protocol (refer to the **DSB2-P Operation & software manual**).
ETEL-Bus-Lite protocol is open to the user:

Max. transmission rate	115'200 bauds
Min. transmission rate	9'600 bauds
Data length	8 bits
Start bit	1
Stop bit	1
Parity	No
Handshaking	No

The EBL transmission rate can be selected with the parameter K195 (refer to the **DSB2-P operation & software manual**).

ETEL-BUS protocol is closed to the user who cannot have direct access to it.

The table below shows two different types of communications available for EBL and EB:

ETEL-Bus-Lite (communication between a PC and a drive)		**ETEL-Bus (communication between drives)**	
RS 232	**RS 422 (by default)**	**RS 422 (by default)**	**RS 232**
Normal connection between a PC and a drive for communication purposes (with **ETEL Tools** software, f.e).	For example, for the use of an 'on-line' control system with a communication system other than RS232, or if the PC comes with a RS422 board and its RS 232 port is already used.	Normal EB connection between drives at 460'000 bauds. Better solution because less sensitive to EMC.	Second EB connection possibility between drives, at 115'200 bauds.

It is possible to select the RS232 type for ETEL-Bus-Lite communication by connecting the pin **EBL_select_232/422** to GND (0V). If this connection is not done, RS422 type is automatically selected (default status).

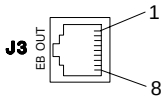
It is possible to select the RS232 type for ETEL-Bus communication by connecting the pin **EB_select_422/232** to GND (0V). If this connection is not done, RS422 type is automatically selected (default status).

Caution: When the type of communication is changed as above-mentioned, the drive must be switched off and then on in order to take the changes into account.

The communication connectors are J3, J4, J5 and J6 (see the following tables).

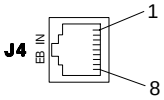
Connector J3 is for ETEL-Bus data output (RS422) and J4 is for ETEL-Bus data input (RS422). They are used to make a daisy-chain between the drives with standard RJ-45 cables. Connector J5 allows both types of ETEL-Bus-Lite communications (RS232 or RS422) and the selection between them. Connector J6 is for the download key to set the drive into the 'wait for program' mode. It can also be used for the ETEL-Bus (RS232 type) communication and its selection.

3.3.1 Connector J3: ETEL-Bus output

RJ-45, 8 pins, female			
EB OUT	**Pin #**	**Signal**	**Function**
	1	EB_Synchro +	**Do not connect** (reserved for a future application)
	2	EB_TXD422 +	Data transmission RS422 +
	3	EB_TXD422 -	Data transmission RS422 -
	4	**Reserved**	**Do not connect**
	5	**Reserved**	**Do not connect**
	6	**Reserved**	**Do not connect**
	7	**Reserved**	**Do not connect**
	8	EB_Synchro -	**Do not connect** (reserved for a future application)

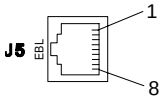
Caution: Work in an ESD safe environment if you touch this connector!

3.3.2 Connector J4: ETEL-Bus input

RJ-45, 8 pins, female			
EB IN	**Pin #**	**Signal**	**Function**
	1	EB_Synchro +	**Do not connect** (reserved for a future application)
	2	EB_RXD422 +	Data receipt RS422 +
	3	EB_RXD422 -	Data receipt RS422 -
	4	EB_TXD422 +	**Do not connect** (reserved for a future application)
	5	EB_TXD422 -	**Do not connect** (reserved for a future application)
	6	**Reserved**	**Do not connect**
	7	**Reserved**	**Do not connect**
	8	EB_Synchro -	**Do not connect** (reserved for a future application)

Caution: Work in an ESD safe environment when you touch this connector!

3.3.3 Connector J5: ETEL-Bus-Lite serial communication

RJ-45, 8 pins, female			
EBL	**Pin #**	**Signal**	**Function**
	1	EBL_select_422/232	Select transmission type (open ⇒ RS422 / connected to GND ⇒ RS232)
	2	EBL_RXD422 +	Data receipt RS422 + from the PC (host)
	3	EBL_RXD422 -	Data receipt RS422 - from the PC (host)
	4	EBL_TXD422 +	Data transmission RS422 + to the PC (host)
	5	EBL_TXD422 -	Data transmission RS422 - to the PC (host)
	6	EBL_TXD232	Data transmission RS232 to the PC (host)
	7	EBL_RXD232	Data receipt RS232 from the PC (host)
	8	GND	Auxiliary supply output (0V)

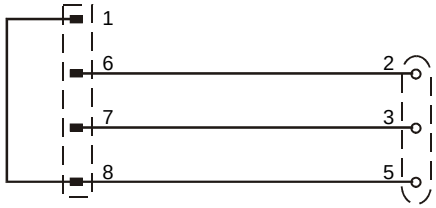
Caution: Work in an ESD safe environment if you touch this connector!

Use the cable delivered by ETEL to establish the EBL communication between your PC and the drive.

If you want to manufacture your own RS-232 communication cable, wire it as shown below:

To the drive (J5):

RJ-45 connector,
8 pins, male



To the PC (serial port) :

D-SUB connector,
9 pins, female

3.3.4 Connector J6: Download key and EB-RS232

This connector can be used for two purposes:

3.3.4.1 Download key plugging

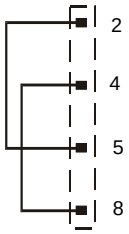
If you do not know what is a firmware download, refer to the **DSB2-P Operation & software manual**.

If the drive does not switch to 'wait for program', there is an hardware override possibility to force this mode. Simply plug the download key in the connector J6 and the drive will switch to 'wait for program' and the download of a new firmware into the drive will be possible.

A download key is a 8 pins RJ-45 male connector with bridges between pins 4-8 and 5-2:

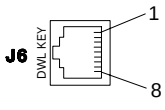
Download Key (J6):

RJ-45 connector,
8 pins, male



3.3.4.2 EB-232 serial communication

If you want an EB with an RS232 communication on connector J6, connect together pins 1 and 8:
EB with an RS422 communication through connectors J3 and J4 will be deactivated.

RJ-45, 8 pins, female			
DWL KEY	**Pin #**	**Signal**	**Function**
	1	EB_select_422/232	Select transmission type (open ⇒ 422 on J3+J4 / connect to GND ⇒ 232 - J6)
	2	+5V	Auxiliary supply output (fuse F7 500mA, shared with J1, J9 and J10)
	3	**Reserved**	**Do not connect**
	4	DWL_B -	Sets the DSB2-P to 'wait for program' (download) if connected to GND
	5	DWL_B +	Sets the DSB2-P to 'wait for program' (download) if connected to +5V
	6	EB_TXD232	Data transmission RS232
	7	EB_RXD232	Data receipt RS232
	8	GND	Auxiliary supply output (0V)

Caution: Work in an ESD safe environment if you touch this connector!

3.4 Motor connectors



Danger: Before installing or disconnecting the motor cables: **Turn off all power supplies** and wait 10 minutes to allow the internal DC bus capacitors to discharge.

The motor connectors must always be screwed correctly on the drive.
It is also recommended to fasten the cables on the system.

3.4.1 ETEL motor cables numbering system

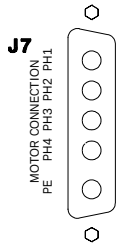
ETEL standard motors cables are numbered according to the following system:

Two-phase motors		Three-phase motors	
Designation	**Function**	**Designation**	**Function**
1	Motor phase 1 +	1	Motor phase 1
2	Motor phase 1 -	2	Motor phase 2
3	Motor phase 2 +	3	Motor phase 3
4	Motor phase 2 -	-	-
Green / Yellow	Protective earth	Green / Yellow	Protective earth

3.4.2 Connector J7: Standard motor connection

The DSB2-P can drive mono-phase, two-phase and three-phase motors. Connector J7 allows the supply of the motor phase(s) adequately.

The motor connector J7 is placed under the liquid crystal display.
This standard motor output is identified by the drive type # : D S B 2 P x x x - **1** x x E

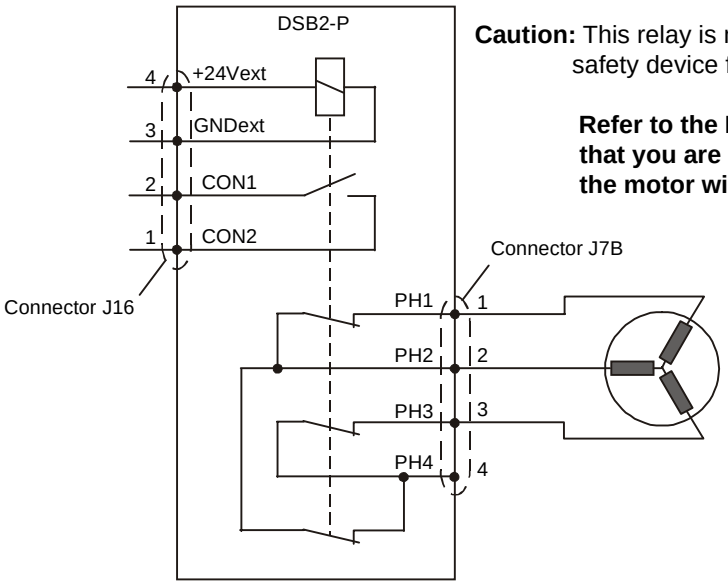
Power D-SUB, 5 pins (5W5), female					
MOTOR CONNECTION	**Pin #**	**Signal**	**Functions**		
			Single-phase motor	**Two-phase motor**	**Three-phase motor**
	1	PH1	Motor phase +	Motor phase 1 +	Motor phase 1
	2	PH2	Motor phase -	Motor phase 1 -	Motor phase 2
	3	PH3	**Do not connect**	Motor phase 2 +	Motor phase 3
	4	PH4	**Do not connect**	Motor phase 2 -	**Do not connect**
	5A	PE	Protective earth	Protective earth	Protective earth

3.4.3 Connector J7B: Motor connection with short circuit relay option

The housed modules may include an optional short circuit relay on the motor output.
This option is identified by the drive type # : D S B 2 P x x x - **2** x x E
When the short circuit relay option is present, the motor connector J7B is placed under the connector J14.

3.4.4 Connector J16: Short circuit relay control

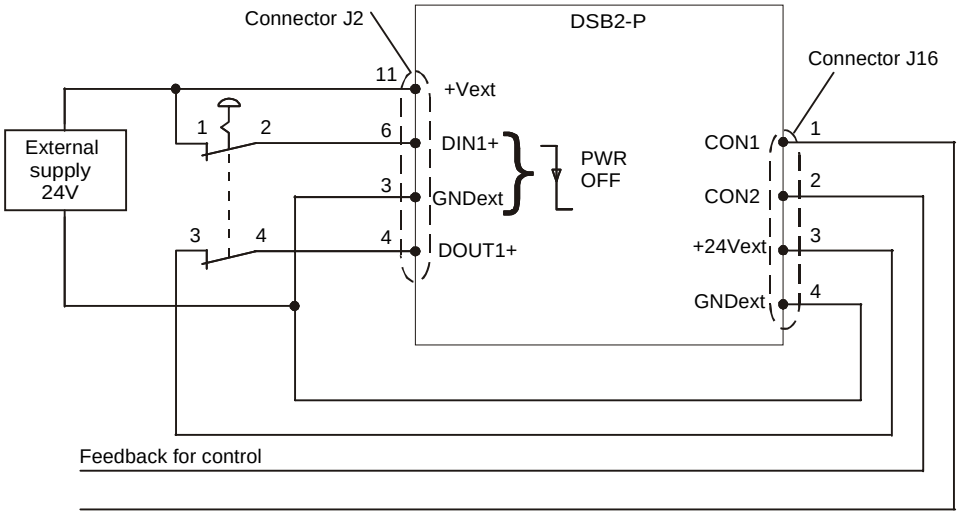
This connector is only present on the DSB2Pxx**4**-xxx module and identified by the number 2 (DSB2Pxx4-**2**xx) Single, two or three-phase motors can be short-circuited. The magnetic brake which has been produced generates a force opposite to the motor movement (but does not stop it completely!). The short-circuit contacts (located on the phases outputs toward the motor) are normally shut and must be opened when the motor works. The relay coil is powered separate of the DSB2-S circuits. The contact CON1-2 (normally open) allows the possibility to have a look at the state of the short-circuit contacts.



Caution: This relay is not designed to be used as a safety device for the user system.

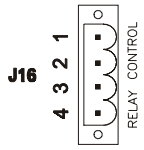
Refer to the EN 60204/1 norm to make sure that you are using the right cable section for the motor wiring.

Example of short-circuit relay used with an emergency stop push-button:



Caution: The drive must power off its power bridge when DIN1 = 0V. Likewise, for drive error, you must program DOUT1 = 0V (K37=1). See the Operation & software manual to set these parameters.

Phoenix, MSTB 2.5/4-GF-5.08

RELAY CONTROL	Pin #	Signal	Function
	1	CON1	Control pole 1 of relay auxiliary contact
	2	CON2	Control pole 2 of relay auxiliary contact
	3	GNDext	Separate external supply of the relay coil (0V)
	4	+24Vext	Separate external supply of the relay coil (+24V)

3.5 Power connectors

Danger: Before installing or disconnecting the power cables: **Turn off all power supplies** and wait 10 minutes to allow the internal DC bus capacitors to discharge.

The power connectors must always be screwed correctly on the drive.
It is also recommended to fasten the cables on the system.

3.5.1 Connector J11: Rack modules power supply input

You have the possibilities to power the rack modules:

3.5.1.1 With an ETEL power supply

If you are using an ETEL power supply (with an ETEL back panel), all necessary connections are already realized according to the table below. Just plug the rack into the right place.

An inrush measurement is present in the power supply. The signals sent to the drive pin d14 (INR) are:

- +15V (loading): The power supply is delivering current to load the drive DC bus capacitors.
- 0V (OK): The power supply has finished to load the drive DC bus capacitors.

Remark: Do not power the motor phases until the DC bus capacitors are loaded.

3.5.1.2 With a power supply from the market

If you are using a power supply from the market, an additional bridge is necessary:
Connect pins d14 (INR) and d18 (GNDpwr) together.

DIN 41612-H15, 15 pins, male

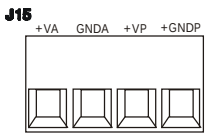
GENERAL POWER SUPPLY	Pin #	Signal	Function
	z4	+24V	**Do not connect!**
	d6	+15V*	**Do not connect!**
	z8	GND24V	**Do not connect!**
	d10	REGEN	**Do not connect!**
	z12	+VAUX	Auxiliary supply input, 24 to 55Vdc or 96 to 340Vdc depending on the model
	d14	INRUSH	Inrush input (0V = ok / +15V = loading) **Connected to ETEL power supply**
	z16	GNDpwr	Power supply input (0V) - **Always connect z16 and d18**
	d18	GNDpwr	Power supply input (0V) - **Always connect z16 and d18**
	z20	+VPWR	Power supply input, 24 to 340Vdc - **Always connect z20 and d22**
	d22	+VPWR	Power supply input, 24 to 340Vdc - **Always connect z20 and d22**
	z24	GNDaux	Auxiliary supply input (0V)
	d26	GNDpwr	Power supply input (0V)
	z28	PE	Protective earth - **Must always be connected first for safety!**
	d30	PE	Protective earth - **Must always be connected first for safety!**
	z32	PE	Protective earth - **Must always be connected first for safety!**

Danger: High voltage may be present on this connector!

For safety reasons, always connect first the protective earth (PE) to the dedicated pins!

3.5.2 Connector J15: Housed module auxiliary and power supply input

This connector is only present on the DSB2Pxx**3**-xxx module.

Phoenix HDFK 4		
AUXILIARY AND POWER INPUT	Pin # Signal	Function
	+VA	Auxiliary supply input: 96 to 340 Vdc for DSB2Pxx3-x1x or 24 to 55 Vdc for DBS2Pxx3-x2x
	GNDA	Ground output (0 V)
	+VP	Power supply input: 24 to 340 Vdc
	GNDP	Ground output (0 V)

Danger: High voltage may be present on this connector!

For safety reasons, always connect first the protective earth (PE) to the front plate screw!

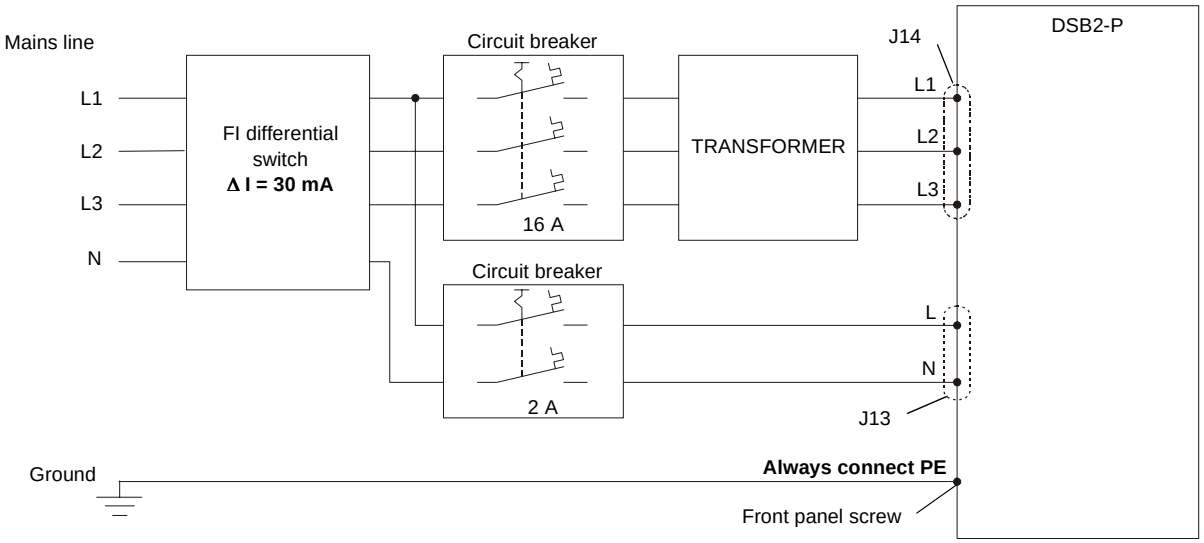
Warning: An external RFI filter is necessary to comply with EMC directives.
To avoid current spike at the switching on (capacitor charging), an 'inrush limiter' is necessary.
To reduce transient overvoltage coming from the main, a MOV (varistor) has to be used.

3.5.3 Connector J14: Housed module power supply input

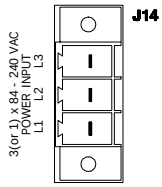
This connector is only present on the DSB2Pxx**4**-xxx module.

Important: It is recommended to supply the power with an external transformer, whose characteristics depend on the user's application and on the mains supply characteristics.
Examples of transformers:

- With European mains: Primary 3 x 380V ∇ - Secondary 3 x 220V Y; the transformer adapts the mains voltage to the drive and prevents possible disturbances from invading the mains (meet CE norm).
- With US mains: Primary 3 x 220V ∇ - Secondary 3 x 220V Y; the insulation transformer prevents possible disturbances from invading the mains (meet CE norm).
- As **example**, a circuit breaker on the Power line (J14) allows the turn-off of the motor (in case of emergency) without loosing the position reading data. So, a new initialization/indexation process would not be necessary after an emergency stop.



Remark: This diagram shows a connecting example of the transformer with a three-phase main. **For the motor wiring, refer to the EN 60204/1 norm in order to use the adequate cable section.**

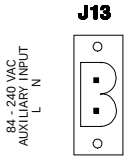
Phoenix PC 4/3-G-7.62				
POWER INPUT	**Pin # Signal**	**Function**	**3-phase mains**	**1-phase mains**
	L1	Mains line input for power supply (84 to 240Vac MAX, between L1-L2)	Mains L1	Mains Lx
	L2	Mains line input for power supply (84 to 240Vac MAX, between L2-L3)	Mains L2	Mains N
	L3	Mains line input for power supply (84 to 240Vac MAX, between L3-L1)	Mains L3	**Do not connect**

Danger: High voltage may be present on this connector!

For safety reasons, always connect first the protective earth (PE) to the front plate screw!

3.5.4 Connector J13: Housed module auxiliary supply input

This connector is only present on the DSB2Pxx**4**-xxx module.

Phoenix MSTB 2.5/2-GF-5.08		
AUXILIARY INPUT	**Pin # Signal**	**Function**
	L	Mains line input for auxiliary supply (84 to 240 Vac MAX between L-N)
	N	Mains neutral (return) input for auxiliary supply (84 to 240 Vac MAX between N-L)

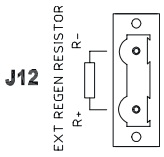
Danger: High voltage may be present on this connector!

For safety reasons, always connect first the protective earth (PE) to the front plate screw!

3.5.5 Connector J12: External regeneration resistor

This connector is only present on the DSB2Pxx**4**-xxx module.

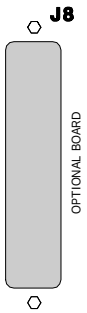
Caution: The resistor minimal value is 39Ω / 3,8kW at 380Vdc to protect the internal regen. transistor.

Phoenix GIC 2.5/2-GF-7.62		
EXT REGEN RESISTOR	**Pin # Signal**	**Function**
	R +	Connect + of external regeneration resistor, if necessary
	R -	Connect + of external regeneration resistor, if necessary

Danger: High voltage may be present on this connector!

3.6 Optional board connector

3.6.1 Connector J8: Depends on the type of board

Depends on the type of board	
OPTIONAL BOARD	
	Refer to the specific documentation if you have an optional board, please.

3.7 EMC cables connection

As every voltage choppers, the DSB2-P creates EMI (electromagnetic interferences), which are retained inside its metal housing. To avoid having EMI disturbing other electronic systems, you must use shielded cables.

The shield must be connected to GND on both cables ends, except if another specification is given by ETEL.

3.7.1 Cables manufacturing

If you do not use the cables delivered by ETEL, follow the recommendations below. Two cables must be shielded:

- The motor cable to J7.
- The encoder cable to J1 or J9 or J10 (**double shield** if you are using a **11 µa** analog position encoder).

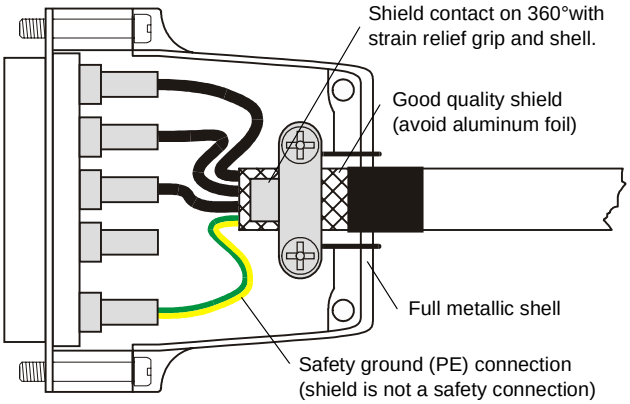
Simple shields must be linked to the connector shells on both cable ends.

On a double-shielded cable, the external shield must be linked to the connector shells on both cable ends. The internal shield must be connected to the electronics GND, on one cable end only.

Use only connectors with full metallic conductive shells.
Shielded cables must be of types ISOCOM CY ®, or ISOCOL CY ®, or equivalent (avoid aluminum foil!).
Connect the shield on both cable ends. The shield must cover entirely all wires. Connecting short "pig tails" to cable shielding is forbidden! (out of EMC directives). Shield contact on 360° with the connector shell and strain relief grip is necessary.

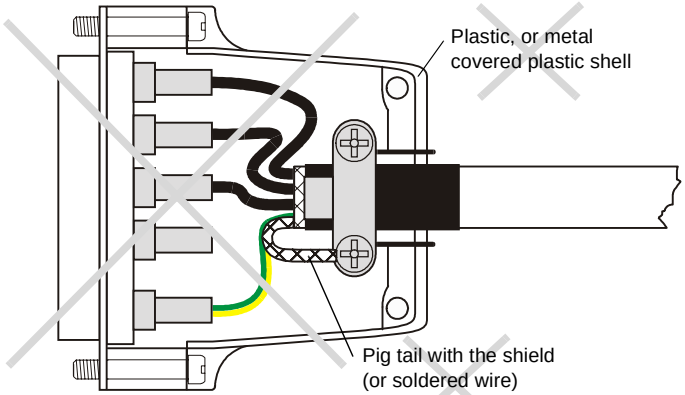
See the example below:

GOOD !

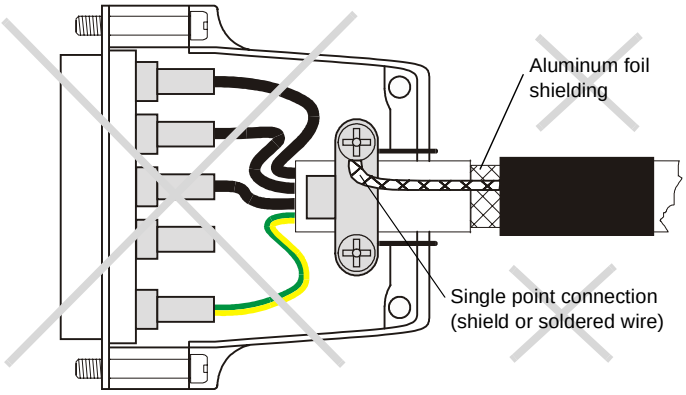


Here are two examples of bad shield connections:

BAD !

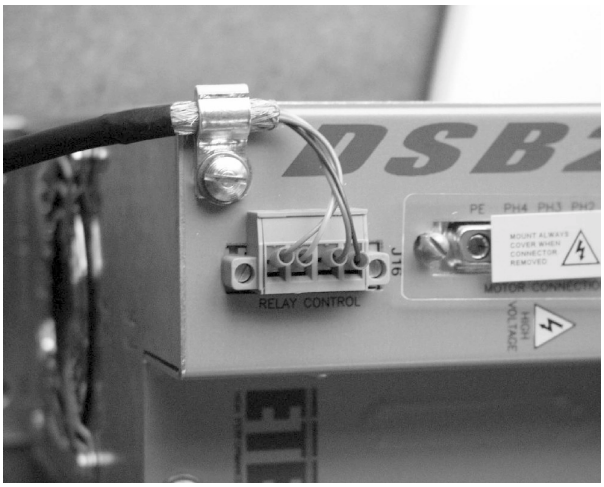


BAD !



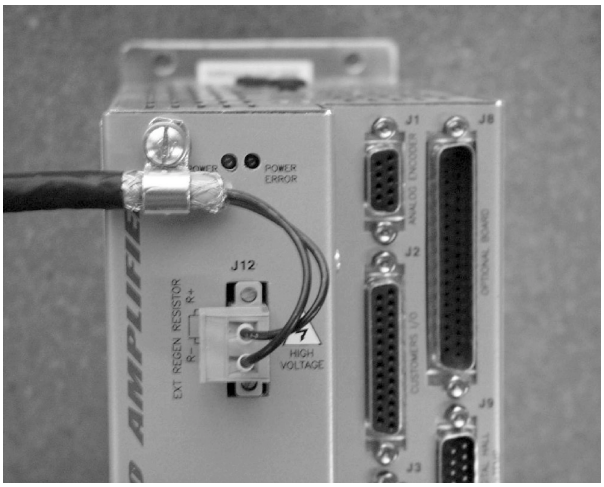
3.7.2 Connecting the short-circuit relay power cable's shield (J16)

On the DSB2-P (connector J16), it is necessary to add a conductive cable holder, connected to the metal housing with the existing screw. A contact on 360° between the shield and the cable holder is needed, as shown below:



3.7.3 Connecting the external regeneration resistor cable's shield (J12)

On the DSB2-P (connector J12), it is necessary to add a conductive cable holder, connected to the metal housing with the existing screw. A contact on 360° between the shield and the cable holder is needed, as shown below:



3.7.4 Cables installing

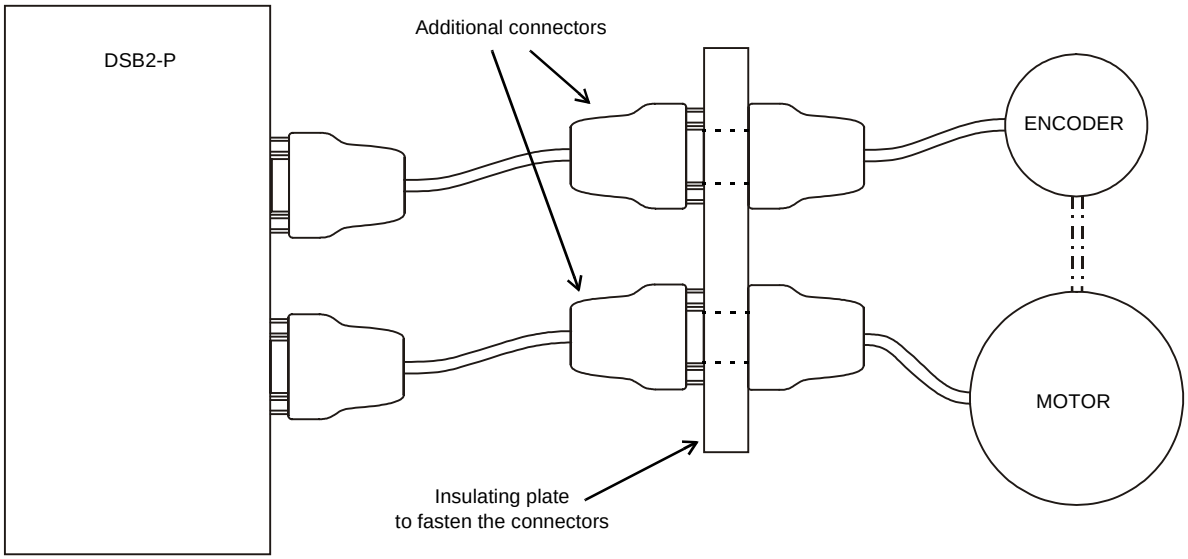
Danger: Before installing or disconnecting the power cables: **Turn off all power supplies** and wait 10 minutes to allow the internal DC bus capacitors to discharge.

The power connectors must always be screwed correctly on the drive.
It is also recommended to fasten the cables on the system.

Power cables from/to the DSB2-P should be kept close together and separated from signal cables, if possible.

Remark: If there are additional connectors along shielded cables, they must be fastened and insulated so that their shells will not come into contact. This is to avoid having ground loops, where parasitic currents could circulate.

You should install your cables as outlined below:



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