

Digital DRIVE for Brushless motor IMDC Series

INSTALLATION GUIDE

Read manual before installing and respect
all indications with this icon:



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1- Introduction

1-1- Warning



Read this manual before first installing, nonobservance may result in property damages and in personal injuries.

Only suitable qualified personnel should undertake the mounting, installation, operation and maintenance of the equipment must be complied with the general setup and safety regulations for work on power installations (e.g. DIN, VDE, EN, IEC or other national and international regulations).

It is important that all safety instructions are strictly followed. Personal injury can result from a poor understanding of the safety requirements.

The following safety regulations should be followed:

• VDE 0100	Specification for the installation of power systems up to 1000 V
• VDE 0113	Electrical equipment of machines
• VDE 0160	Equipment for power systems containing electronic components.

- ***Never open the equipment.***
- ***Dangerous high voltages exist within the equipment and on the connectors. Because of this, before removing any of the connectors, it is necessary to remove the power and wait at least 5 minutes to allow the capacitors to discharge.***
- ***Never connect or disconnect the drive with power applied.***
- ***Some of the drive's surfaces can be very hot.***

Some of the drive's components are susceptible to damage from electrostatic discharges. Always handle the equipment using appropriate anti-static precautions.

We have gone to great lengths to ensure this documentation is correct and complete. However, since it is not possible to produce an absolutely error-free text. No responsibility will be assumed by SERAD for all damages caused by using this documentation and software.

We reserve the right to make changes to all or part of the specification without prior notice.

1-2- IMDC series drive description

Supply :	48 V DC $\pm 10\%$ Softstart functions integrated Peek current 0.15A at power on
Auxiliary supply :	24 V DC $\pm 10\%$ 0,5A typical
Supply filter :	Integral
Switching frequency:	6.67 KHz, motor sine-wave PMW
Rated current :	IMDC/10 : 10 Aeff IMDC/20 : 20 Aeff
Peak current (2s) :	IMDC/10 : 20 Aeff IMDC/20 : 40 Aeff
Rated power :	IMDC/10 : 480 VA IMDC/20 : 960 VA
Braking resistance :	Mini value : 4,7 Ω Max.cont.power 400W Braking level : 58 Vdc
Protections :	Short circuit between phases, phase to earth, over current, I2t Over voltage, under voltage Motor feedback fault
Motor feedback :	• Resolver (16 bits resolution) Absolute resolver precision $\pm 0,7^\circ$
Master encoder :	• Incremental : A, /A, B, /B, Z, /Z Maxi frequency: 6 MHz • Virtual • Absolute encoder (SSI)
Diagnostic :	7 segments display
Communication :	RS 232 MODBUS RTU CANopen DS402
Digital inputs :	4 inputs (with 2 standard inputs and 2 fast inputs: E3 and E4) 12 inputs with the optionnal expansion module (with 10 standard inputs and 2 fast inputs: E15 et E16) type : PNP 24 Vdc, 8mA per standard input and 15mA per fast input Logic 0 : between 0 to 5 V Logic 1 : between 8 to 30 V

Analogue input	1 input : Input voltage : $\pm 10\text{ V}$ Maximum voltage : $\pm 12\text{ V}$ Input impedance : 20Kohms Resolution : 16 bits
Digital outputs :	2 outputs as standard : S1 : relay, 48 Vdc maxi, 48 Vac maxi, 3A maxi S2 : PNP 24 Vdc, 1A, protection against the short circuits and over temperature 8 outputs on optional extension module: type : PNP 24 Vdc, 500 mA maxi per output protection against the short circuits and over temperature
Architecture :	Processor 150 MHz DSP and 100 000 gates FPGA FLASH memory for programs and parameters RAM memory for data RAM memory for saved variables Real time, multi-tasking kernel
Control loops :	Current loop : 75 μs Speed loop : 150 μs Position loop : 150μs
Operating modes :	Torque mode Speed mode Position mode MOTION functions (absolute, relative and infinite movements) Advance MOTION functions (gearbox, CAM profiles, CAMBOX function, triggered movement)
Operating temperature:	0 to 40°C
Storage temperature:	-10 to 70°C
Protection degree :	IP 20
Dimension l x h x p:	53 x 190 x 160,5
Weight	1.3 kgs

2- Installation

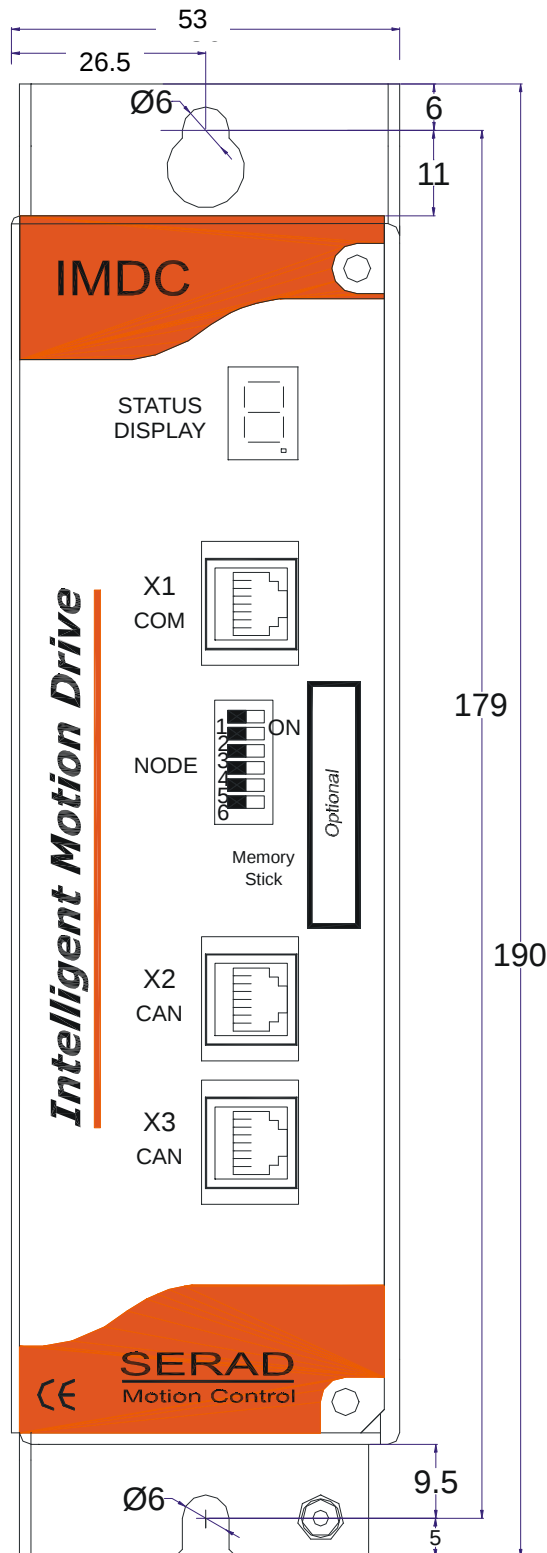
2-1- General



It is very important to adhere to the following:

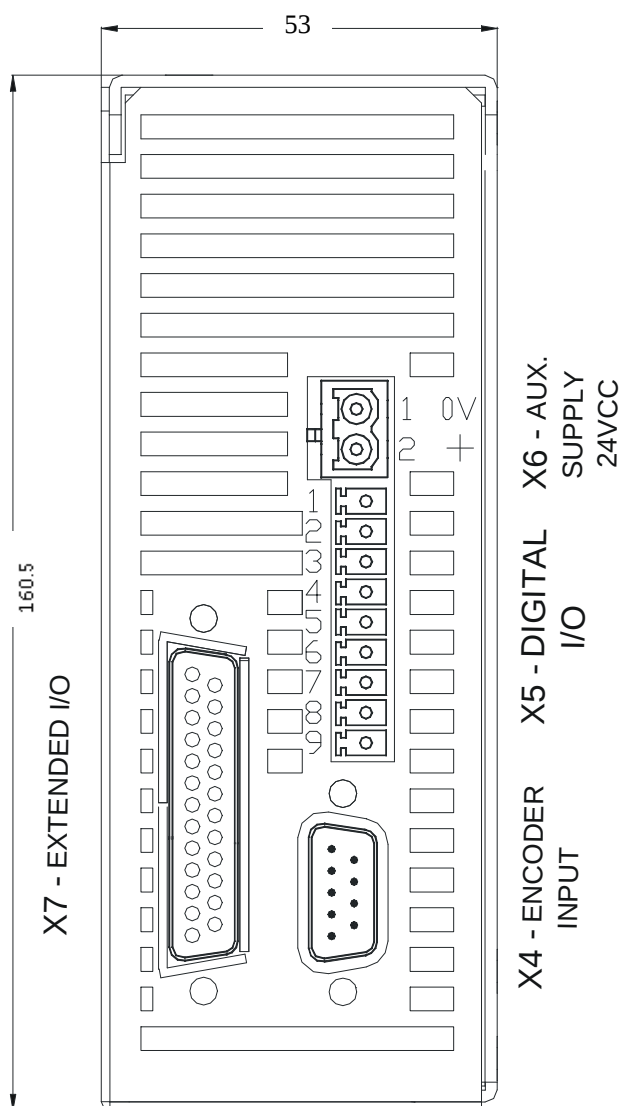
- ✎ A badly earthed connection can damage electronic drive components.
- ✎ The drive must be installed vertically in free air to ensure cooling by natural convection.
- ✎ It must be protected from excess humidity, liquids, and dirt.
- ✎ The motor, resolver and encoder cables must be screened, the screen being earthed at both ends of the cable.
- ✎ The analogue I/O must use screened cable, the screen being earthed at one end only.
- ✎ The cable for the RS 232 serial link between the drive and the PC must be screened, the screen being earthed at both ends of the cable. It should be disconnected from the drive when no longer in use. All of these cables, as well as the I/O cables, should be run separately from the power cables.
- ✎ Diodes must be fitted across the loads on all static digital outputs (Q2 to Q10). These diodes must be positioned as close to the load as possible. The supply and signal cables must be free from over-voltage transients.
- ✎ Safety standards specify a manual reset after a stop caused either by a supply interruption, or by an emergency stop or by a drive fault.
- ✎ For all serious faults, it is obligatory to remove the high voltage supply to the drive.
- ✎ The Drive Ready output should be connected in series in the emergency stop loop.
- ✎ In the case of axis over-travel, the over-travel limit switches must be connected to the limit inputs or in series with the emergency stop loop. It is also recommended to use the software limits.
- ✎ If the drive is configured in speed loop, the drive enable input should be controlled by the supervisory controller (CNC, PLC etc).
- ✎ If the drive is configured in position loop, the parameter "Maximum following error" should be set appropriately.
- ✎ If the drive contains an application program developed using iDPL, connect a signal 'Cabinet supplies OK' to one of the digital inputs and monitor it in a non-blocking safety task. On detection of an excess following error the drive will be put in open loop mode and the drive ready relay will be opened. If another action is required you should use the SECURITY instruction.

2-2- Front view



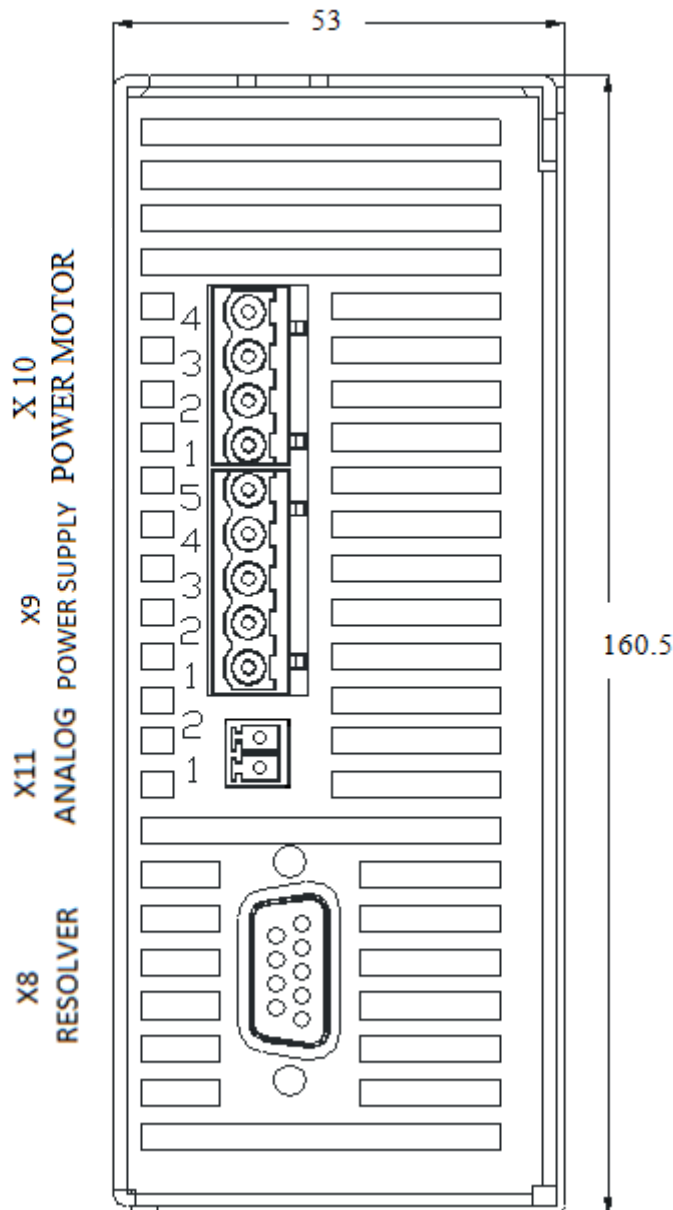
STATUS	7-segment diagnostic display
X1 COM	RS-232 serial port for communication with a PC
X2 CAN	CANopen communication bus
X3 CAN	CANopen communication bus

2-3- Top view



X4	ENCODER INPUT	Multifunction encoder INput
X5	DIGITAL I/O	Digital inputs/outputs
X6	AUX. SUPPLY 24VCC	Auxiliary 24V DC supply
X7	EXTENDED I/O	Option : Digital I/O extension

2-4- Bottom view



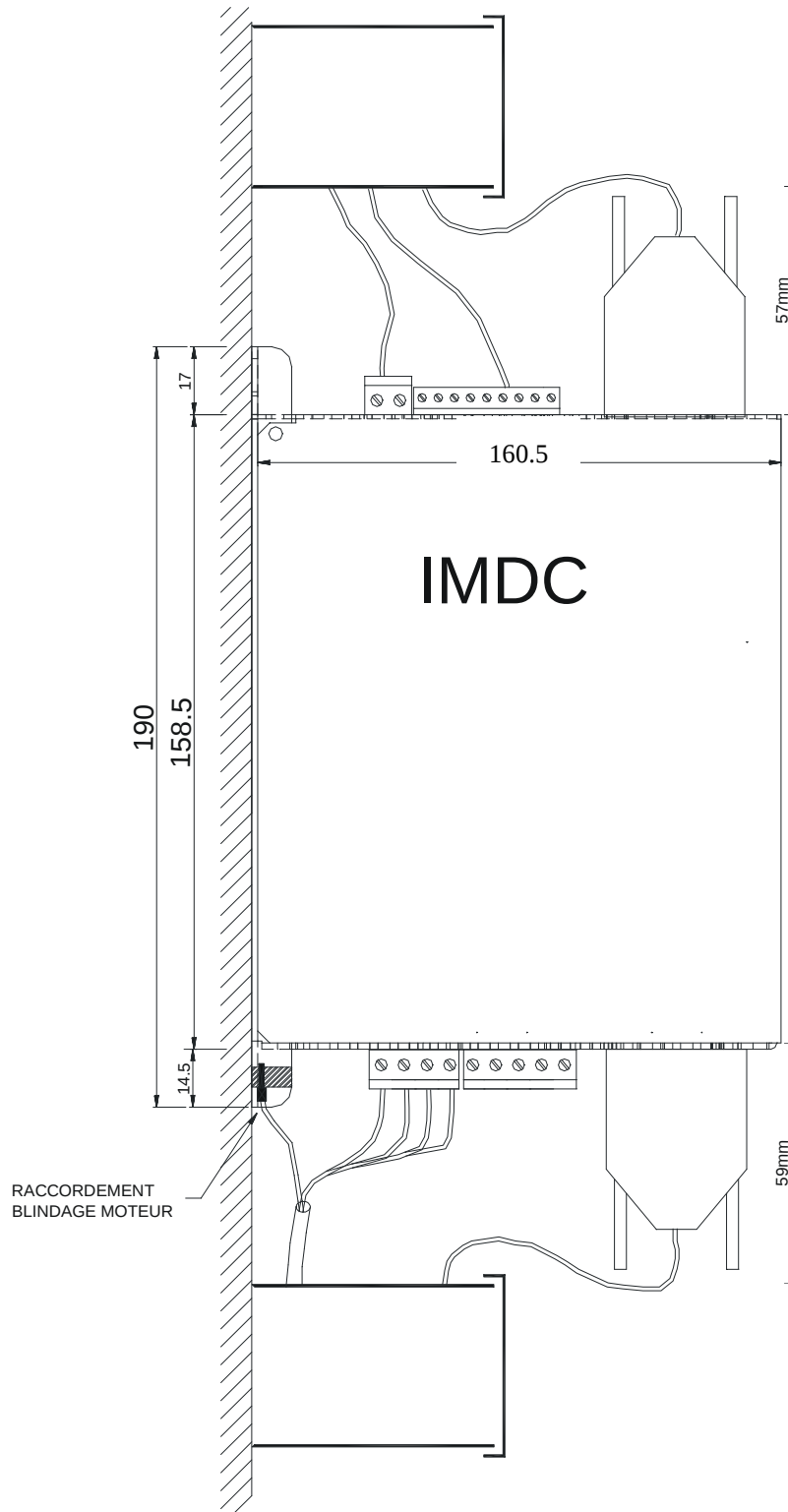
X8	RESOLVER	Motor position feedbacks (if resolver)
X9	POWER SUPPLY	48 VDC power supply
	BALLAST	External brake resistor
X10	POWER MOTOR	3 phasis motor supply
X11	ANALOG	Analogue input



Care must be taken when making connection to connector X10. An incorrect connection can seriously damage the drive. Dangerous voltages are present on X10.

2-5- Mounting

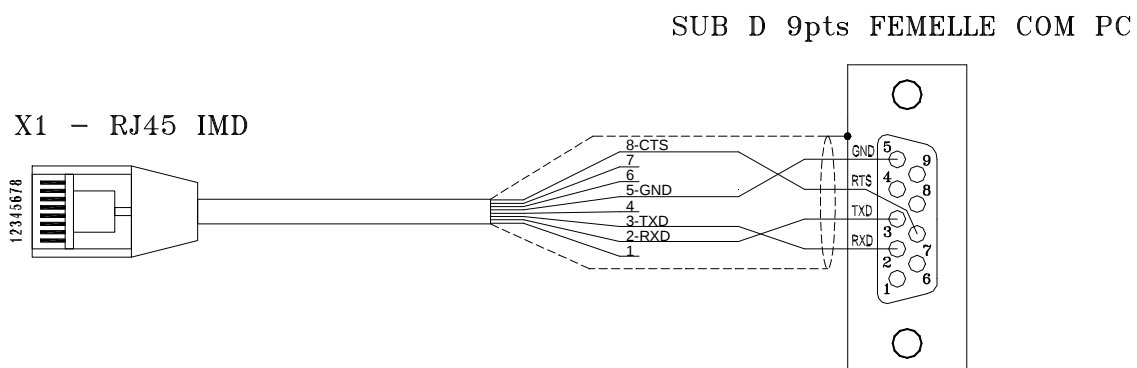
Several drives can be mounted side-by-side provided that enough space (at least 20 mm) is left to ensure good natural convection. Let a space greater than 57 cm over and under drives to allow for the various connectors and cables to be fitted



2-6- Connector pin assignments

X1: RS232 serial port for downloading programs and parameters.

N°	Name	Type	Description
1			
2	RXD	Inp	Receive data
3	TXD	Out	Transmit data
4			
5	GND		0V
6			
7			
8	CTS	Inp	Clear to send
	SHIELD		Connect the shield to the shell of the connector



X2 & X3: CANopen communication bus

RJ45 Connector

N°	Description
1	
2	
3	
4	
5	GND
6	
7	CAN_L
8	CAN_H
	SHIELD – connect the shield to the shell of the connector

- X2 and X3 are identical and have the same connection. They make easier drive network connection.
- Node Address : the NodeID corresponds to the five firstly dipswitchs + 1
Ex: dipswitchs: 1 -> ON, 2 -> OFF, 3 -> ON, 4 -> OFF, 5 -> OFF
Dipswitchs value = $1 + 4 = 5$
NodeID = $5 + 1 = 6$
- Put on Dipswitch 6 to activate terminal resistor (120Ω).

X4: Multifunction encoder input:

- Incremental encoder input
- SSI absolute encoder input
- Stepper input

5V TTL encoder (0-5V, differential)

Only one function is available at once. The choice is done with Idpl software.

Connector SUBD 9 ways male

N°	Nom	Type	Codeur incrémental	Codeur SSI	Stepper
1	A	Inp	Channel A	Data	Direction
2	/A	Inp	Channel A inverted	/Data	/Direction
3	B	Inp	Channel B	NC	Pulse
4	/B	Inp	Channel B inverted	NC	/Pulse
5	Z	I/O	Channel Z	Clock	NC
6	/Z	I/O	Channel Z inverted	/Clock	NC
7	+5Vdc	Out	Supply for external encodeur 100 mA maxi *	NC	NC
8	GND		0V	0V	0V
9		Inp	NC	SSI selection: Connect pins 8 and 9	NC
	SHIELD		Connect the shield to the shell of the connector		

NC (Not connected): It is forbidden to connect this pins.

X5: Logical inputs/outputs:

Removable 9 ways connector, 3.81mm pitch

N°	Name	Type	Description
1	I1	Inp	Programmable input1 : standar ENABLE function
2	I2	Inp	Programmable input 2
3	I3	Inp	Fast programmable input 3
4	I4	Inp	Fast programmable input 4
5	DGND		0V logical inputs / outputs
6	24V	Inp	+24Vdc
7	Q2	Out	Programmable output 2: Statical PNP type , 24 Vdc 1A
8	Q1		Relay contact N/O between terminals 8 and 9
9	Q1	Out	Programme output1 : DRIVE READY standard function

X6: 24V dc supply

Connector: Removable 2 ways, 5.08mm pitch

N°	Name	Type	Description
1	XGND		0V
2	24Vdc	Inp	Control card supply, backup motor position

X7: Option: Expansion module, 12 inputs / 8 outputs

Connector: SUBD 25 way female

N°	Name	Type	Description
1	I5	Inp	Input 5, programmable
2	I6	Inp	Input 6, programmable
3	I7	Inp	Input 7, programmable
4	I8	Inp	Input 8, programmable
5	I9	Inp	Input 9, programmable
6	I10	Inp	Input 10, programmable
7	IOGND*		0V digital I/O
8	Q3	Out	Output 3, programmable
9	Q4	Out	Output 4, programmable
10	Q5	Out	Output 5, programmable
11	Q6	Out	Output 6, programmable
12	IO 24Vdc**	Inp	External supply, 24 V dc
13	IO 24Vdc**	Inp	External supply, 24 V dc
14	I11	Inp	Input 11, programmable
15	I12	Inp	Input 12, programmable
16	I13	Inp	Input 13, programmable
17	I14	Inp	Input 14, programmable
18	I15	Inp	Input 15, programmable
19	I16	Inp	Input 16, programmable
20	Q7	Out	Output 7, programmable
21	Q8	Out	Output 8, programmable
22	Q9	Out	Output 9, programmable
23	Q10	Out	Output 10, programmable
24	IOGND*		0V digital I/O
25	IOGND*		0V digital I/O
	SHIELD		Connect the shield to the shell of the connector

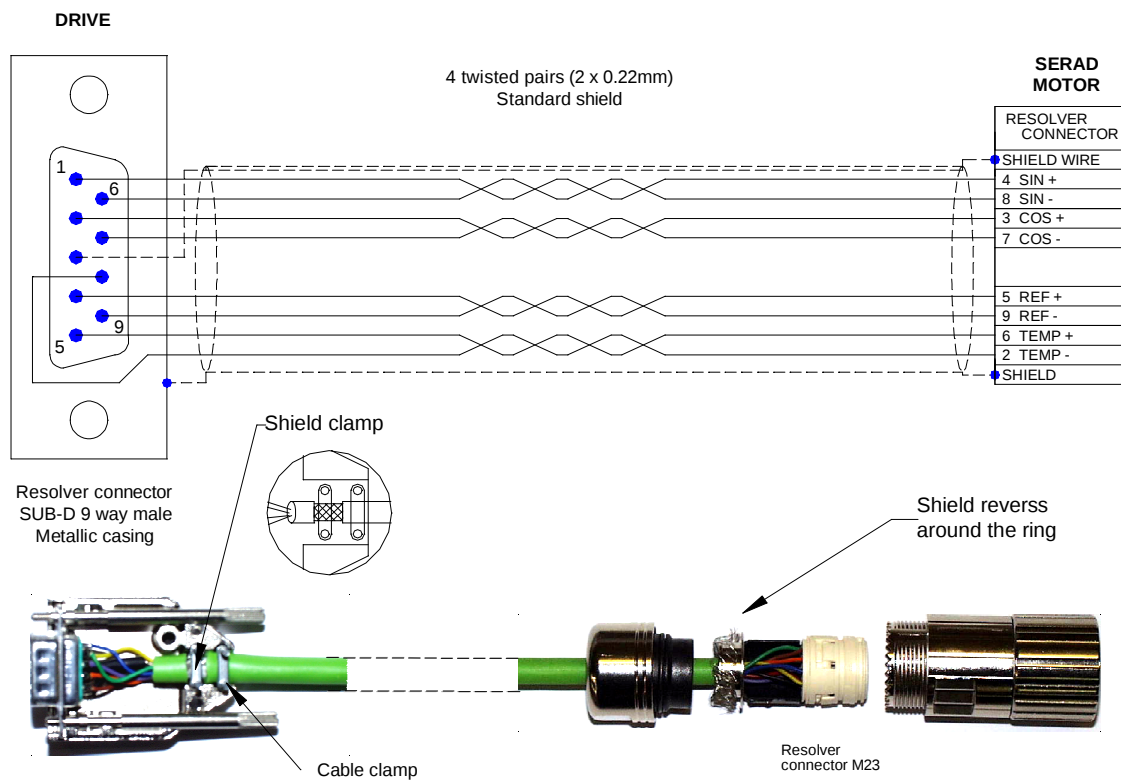
* Pins 7, 24, 25: internal connection

** Pins 12, 13: internal connection

X8: Motor position feedback (resolver)

Connector: SUBD 9 way female

N°	Name	Type	Description
1	S2	Inp	Sine Hi
2	S1	Inp	Cosine Hi
3	AGND		0V analogue
4	R1	Out	Reference Hi
5	°CM+	Inp	Motor temperature sensor Hi
6	S4	Inp	Sine Lo
7	S3	Inp	Cosine Lo
8	°CM-	Inp	Motor temperature sensor Lo
9	R2	Out	Reference Lo
	SHIELD		Connect the shield to the shell of the connector



X9: Power supply

Connector: Removable 5 ways, 7.62mm pitch

No.	Name	Type	Description
1	PE		Supply earth
2	+48Vdc	Inp	
3	0v	Inp	
4	RB -		Brake resistance
5	RB +		Brake resistance

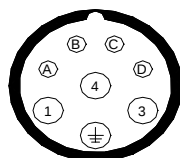
X10: Motor armature

Connector: Removable 4 ways, 7.62mm pitch

No.	Name	Type	Description
1	U	Out	Motor phase U
2	V	Out	Motor phase V
3	W	Out	Motor phase W
4	PE	Out	Supply earth



The tension on X10 connector can reach 60V

SERAD MOTOR

DESCRIPTION	
1	Phase U
4	Phase V
3	Phase W
2	Earth
C	Break +
D	Break -



Be careful. Care must be taken when making connection to connector X10. An incorrect connection can seriously damage the drive. Dangerous voltages are present on X10.

The armoured motor cable must arrive directly on the terminals of the drive. Connect the shield (on drive side) to the screw provided (see 2-2 Front view).

The maximum length for the power and feedback cables is 20m. For more than 20m, please contact our technical support.

X11: Analogue input

Connector: Removable 2 ways, 3.81 mm pitch

No.	Name	Type	Description
1	IN1 -	Inp	Analogue input 1
2	IN1 +	Inp	Analogue input 1

2-7-Cables

We can made you all cables with connectors (standard, robotics ...), contacts us.

- RS 232 serial communication cable, X1:

Screened cable, 4 cores

Connect the shield on each extremity, to the shell of the connector (RJ45 and SUBD).

- ENCODER cable, X4:

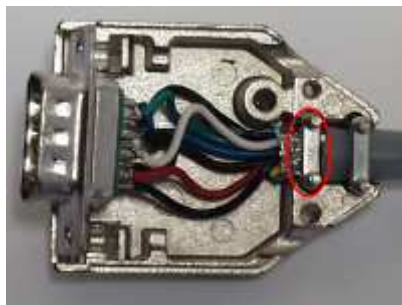
Screened cable with 4 twisted pairs, 0.25 mm²

Connect the shield on each extremity, to the shell of the connector.

- Motor FEEDBACK cable (resolver), X8 :

Screened cable with 4 twisted pairs, 0.25 mm²

Ground the shield of the feedback SUBD as shown below:



- Motor power cable, X10 :

Screened cable, 4 core, (+2 for a brake), 1.5 mm²

Connect the shield (on drive side) to the screw provided (see Front view of the drive).

2-8- Connection diagrams / Protections



All connections must be realized by qualified personnel. The cables must be tested before being connected as any wiring fault can give rise to serious problems

Remove all voltages before inserting the connectors.

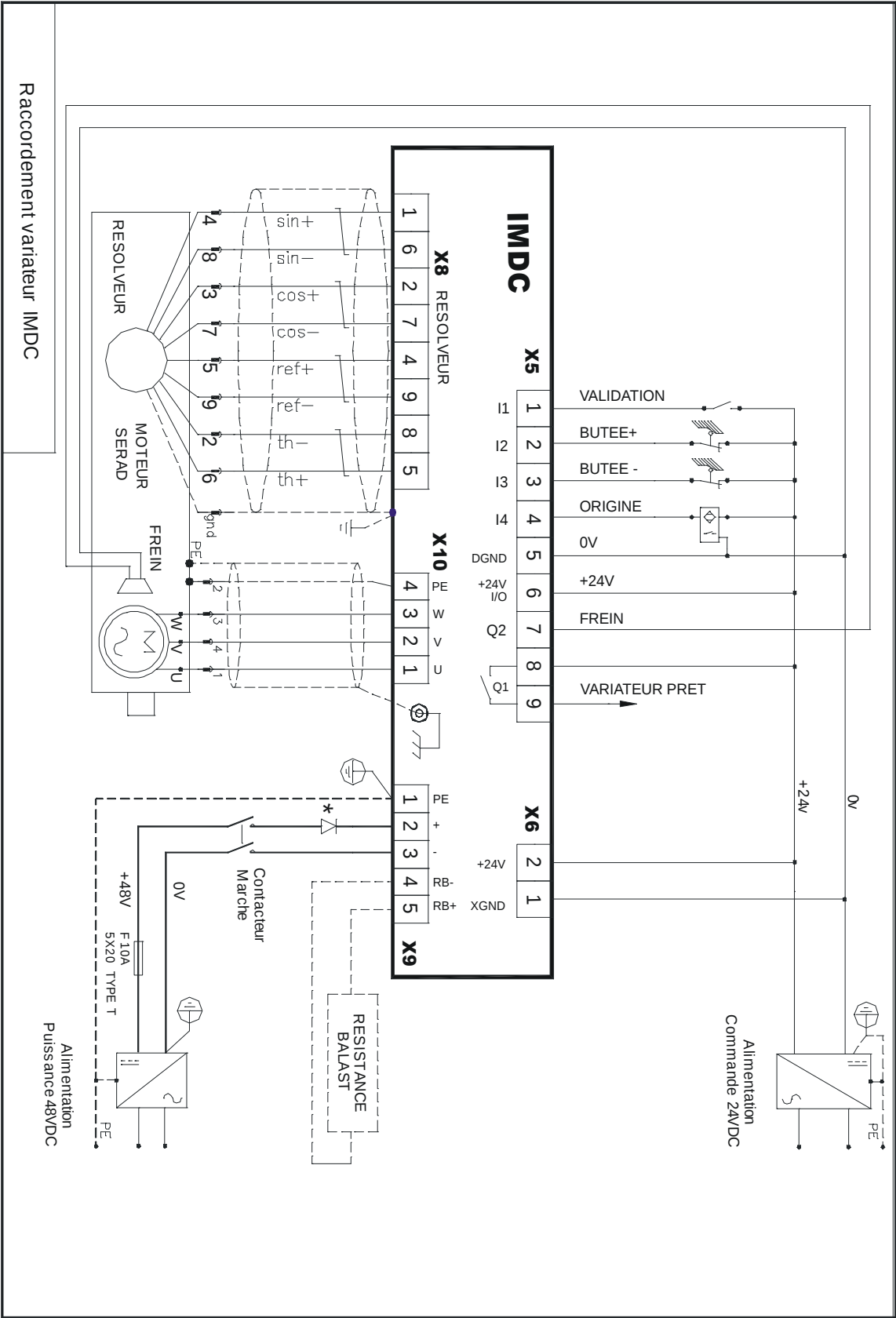
Ensure that the earth connection to the drive is correctly made (pin 4 of the connector X8).

Connect the motor earth to the drive (pin 5 of the connector X10) before applying any voltages.

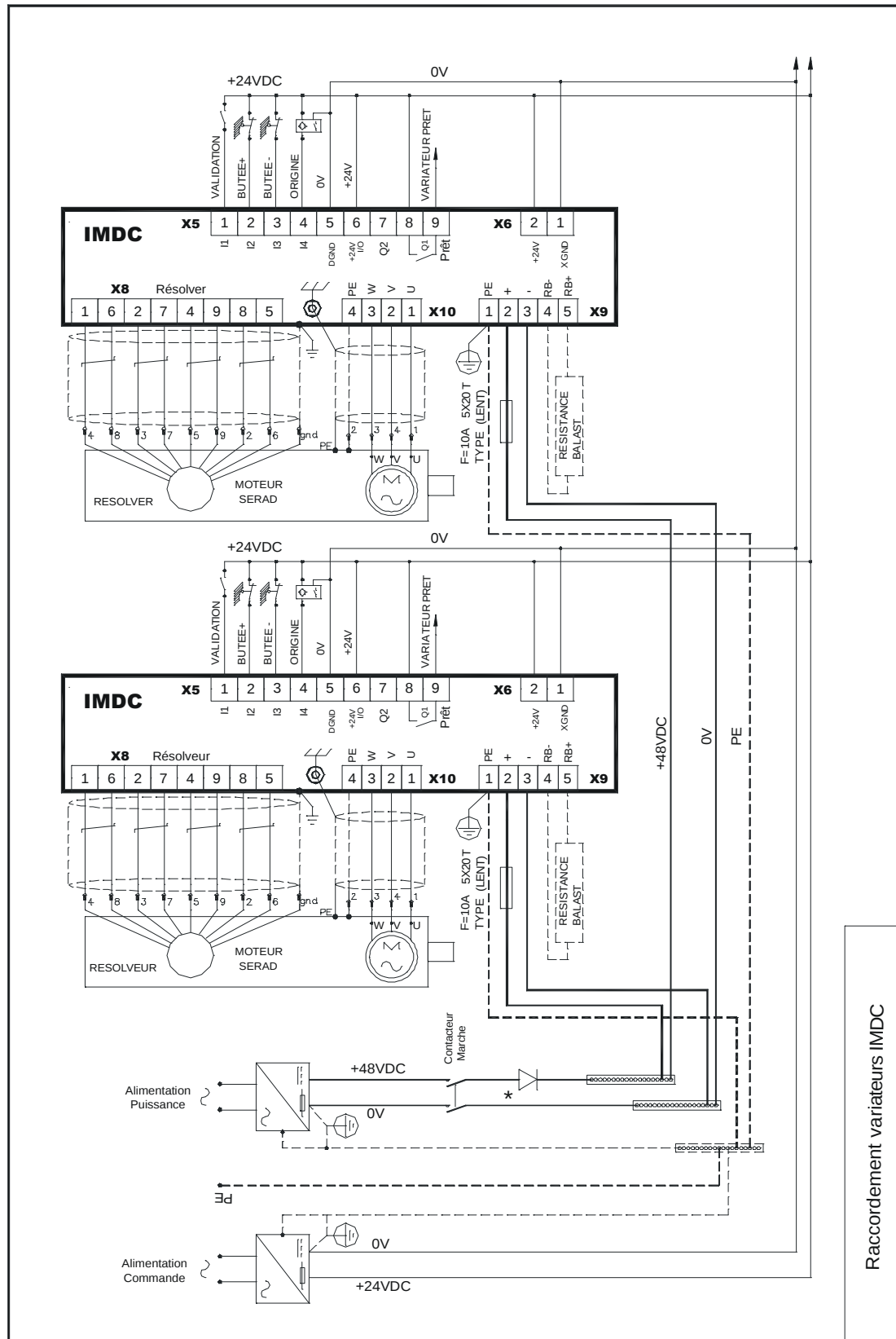
For the shielded cables, to connect the braid to the frame at each extremity via the caps of the connectors (for the SUBD) or the screws provided for this purpose (X7) in order to ensure an optimal equipotentiality.

Preventive reference rejection measures should be taken for control panel, such as connections contactors (obligatory on brake) and relay using RC elements or diodes (ex 1N4007).

2-8-1-Stand-alone drive



2-8-2 Multi-axis connection



*If the power supply doesn't control the power regeneration, see to put a diode and an external brake resistor

It is obligatory to put the 2 protection diodes else drive components can be damaged.

2-9- System checks before starting

- ↪ With the Enable input off, switch on the auxiliary 24V dc supply.
- ↪ Ensure that the **STATUS display** is lit.
- ↪ Apply power.
- ↪ If the Status display shows an **error message** check the list of error codes.

2-10- Error messages:The error code E01 is displayed in a red, seven-segment digital font. The 'E' is formed by the top, bottom, and left segments. The '0' is formed by the top, bottom, and middle segments. The '1' is formed by the right segment.

DC Bus over-voltage : an over-voltage has been detected on the internal dc bus. This fault can be due either to an over-voltage on the supply or to the braking resistance being insufficient.

The error code E02 is displayed in a red, seven-segment digital font. The 'E' is formed by the top, bottom, and left segments. The '0' is formed by the top, bottom, and middle segments. The '2' is formed by the top, middle, and right segments.

DC Bus under-voltage : an under-voltage has been detected on the internal dc bus. This condition is only monitoring when the drive is active (Enable = ON, tension DC Bus voltage lesser then a drive's parameter) and when drive try to pass enable (DC Bus voltage lesser than 250V).

The error code E03 is displayed in a red, seven-segment digital font. The 'E' is formed by the top, bottom, and left segments. The '0' is formed by the top, bottom, and middle segments. The '3' is formed by the top, middle, and right segments.

I²t motor : I²t motor detected.

The error code E04 is displayed in a red, seven-segment digital font. The 'E' is formed by the top, bottom, and left segments. The '0' is formed by the top, bottom, and middle segments. The '4' is formed by the top, middle, and right segments.

Over-current : a current greater than the maximum current has been detected.

The error code E05 is displayed in a red, seven-segment digital font. The 'E' is formed by the top, bottom, and left segments. The '0' is formed by the top, bottom, and middle segments. The '5' is formed by the top, middle, and right segments.

Short-circuit : a short-circuit between phases or between a motor phase and earth has been detected.

The error code E06 is displayed in a red, seven-segment digital font. The 'E' is formed by the top, bottom, and left segments. The '0' is formed by the top, bottom, and middle segments. The '6' is formed by the top, middle, and right segments.

Temperature IGBT : maximum temperature attained in the drive.

The error code E07 is displayed in a red, seven-segment digital font. The 'E' is formed by the top, bottom, and left segments. The '0' is formed by the top, bottom, and middle segments. The '7' is formed by the top, middle, and right segments.

Temperature motor : maximum motor temperature reached.

The error code E08 is displayed in a red, seven-segment digital font. The 'E' is formed by the top, bottom, and left segments. The '0' is formed by the top, bottom, and middle segments. The '8' is formed by the top, middle, and right segments.

Resolver fault : Resolver feedback or absolute encoder or SinCOS signals defective.

The error code E09 is displayed in a red, seven-segment digital font. The 'E' is formed by the top, bottom, and left segments. The '0' is formed by the top, bottom, and middle segments. The '9' is formed by the top, middle, and right segments.

Invalid parameters : checksum error on the drive parameters or parameters not initialized.

The error code E10 is displayed in a red, seven-segment digital font. The 'E' is formed by the top, bottom, and left segments. The '1' is formed by the right segment. The '0' is formed by the top, bottom, and middle segments.

Drive type error : the parameter file does not correspond to the drive type or parameters not configured.

The error code E11 is displayed in a red, seven-segment digital font. The 'E' is formed by the top, bottom, and left segments. The '1' is formed by the right segment. The '1' is formed by the right segment.

iDPL error : an error has been detected during the execution of the iDPL tasks (division by zero, not correct instruction, CAM or synchro. movement error ...).

The error code E12 is displayed in a red, seven-segment digital font. The 'E' is formed by the top, bottom, and left segments. The '1' is formed by the right segment. The '2' is formed by the top, middle, and right segments.

Following error : the maximum following error has been exceeded. Contact technical support.

The error code E13 is displayed in a red, seven-segment digital font. The 'E' is formed by the top, bottom, and left segments. The '1' is formed by the right segment. The '3' is formed by the top, middle, and right segments.

FLASH memory error: impossible writting. Contact technical support.

E 14

FPGA error : impossible loading or CAN communication error.
Contact technical support.

E 15

Over velocity : motor velocity is higher than nominal speed in torque mode

E 16

Feedback saturation error. Feedback or SinCos signals are too high.

E 17

Auxiliary supply 24Vdc error

E 18

Writing memory stick module error

E 19

Corrupted memory stick module error

E 20

Corrupte memory stick module error

E 21

« Extern » error. Contact our technical support

E 22

Feedback SSI position error

