LW1D____N081-00

Manual for Installation Use and Maintenance

LW1D3050N081-00

LW1D2042N081-00

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1 INTRODUCTION

1.1 Guarantee

Ever Elettronica guarantee that their motors and drives supplied to the client (end user, machine builder or distributor), are free of defects caused by materials, shipment operations and packaging and to meet the guarantee in accordance with the client's specifications who has accepted the written terms defined by Ever.

The product guarantee is valid for the duration of one (1) year from the date of construction, which is indicated by the code on the label present on the system.
During the guarantee period of the product, Ever is in no case responsible for damages to the product caused by improper storage or installation, negligent maintenance or unauthorized modifications or repairs to the product.

The responsibility of EVER is limited to the reparation (or replacement at their insight) of any manufactured product, or part of it, which is defect due to defect materials or a manufacturing defect, in accordance with the guarantee conditions of EVER.

The content of this manual is updated until the date of printing. With the continuous development and introduction of product improvements, EVER have the right to change the technical specifications of their products and to alter the content of this manual without the obligation to announce it.

EVER dissuades the use of its products in applications that support vital functions where in the damaging or failure of its products can directly threaten the life or safety of persons, other living beings and things. The user that applies the EVER products to applications that support vital functions is responsible for all risks during the use and the indemnify of EVER from all caused damage.

1.2 In this manual

The symbols used in this manual have the following meaning:

Danger
Warning
Caution

*Used for circumstances in which the life or health of the user are exposed to **danger** or where in **serious damage** to the materials may occur.*

Attention!

***Special instructions** for a safe use and an effective installation.*

Information

*Used to stress **important additional information.***

EMC

*An essential element to stay within the limits specified by the **EMC** directives is, in addition to the use of filters, the installation in accordance with the EMC requirements.*

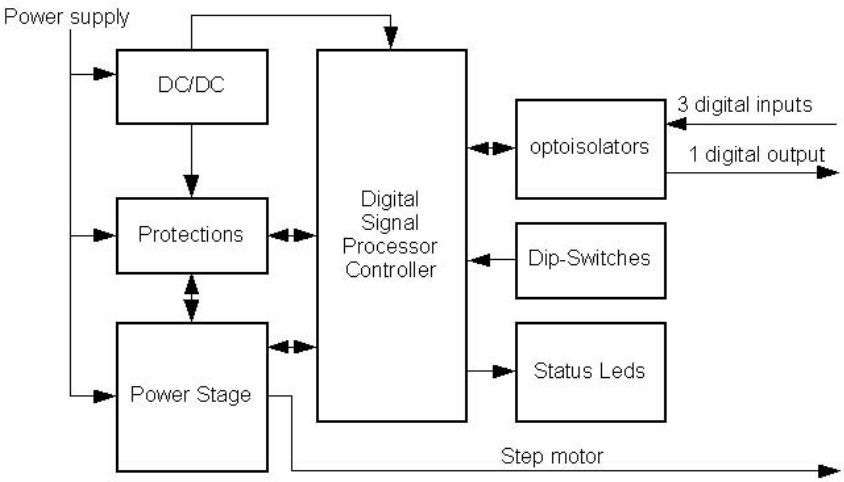
1.3 General drive description

The information in this manual refers to the standard versions of the drives LW1D3050N081-00 and LW1D2042N081-00.

The *LW1D____N081-00* drives have been designed to drive 2 phase stepper motors with bipolar chopper technology with a step angle resolution until 1/256, to realize fluid movements and precise positioning.

The drives can control the motors with winding current up to 7.8A peak current with a DC power supply voltage from 24 to 80 Vdc (including the AC network fluctuations). The drives meet the European Standards EN61800-5-1, International Standards IEC61800-5-1-, and European EN60950-1, international IEC60950-1, and the Standards which control the circuits of the type SELV (Safety Extra Low Voltage).

The diagram shows the functional blocks composing the *LW1D____N081-00*. drives.



As shown in the block diagram, the functions of the *LW1D___N081-00* drives are controlled by 3 digital opto-isolated inputs.

A digital output communicates to the external world the protection intervention (FAULT).

2 FUNCTIONAL CHARACTERISTICS

2.1 Power supply

For the functioning of the LW1D___N081-00 drives a DC power supply is needed.
For the technical specifications, limitations and connections regarding the power supply, refer to the chapters ***3.2 Planning the power supply*** and ***3.3 Choosing the stepper motor***.

2.2 Digital Inputs

The drives *LW1D____N081-00* are equipped with 3 digital inputs for the control of the functions:

- En
- Enabling of the power stage — EN
- Step (or CLK_UP) — STEP
- Direction (or CLK_DWN) — DIR

For information regarding the connection to the digital inputs, refer to paragraph ***2.3 Specification of the digital inputs*** .

The functionality of the inputs depends on the settings of jumpers JMP1,2,3

EN – ENABLE : **enable or disable the current in the motor in function of the status of JMP3**

***JMP3 closed in position 5 (default) = dis*ables the motor current.**
The current in the motor is disabled when input ENABLE is closed.

JMP3 closed in position 6 = enables the motor current.
The motor current is enabled when the ENABLE input is closed.

For other information about the functioning mode of the input EN – ENABLE, refer to paragraph ***4.6 JMP3 : Functioning mode of the EN – ENABLE input***.

When the current in the motor windings is zero, no maintenance torque is supplied (Holding Torque) and the load can drag the motor shaft.
In applications where in a maintenance torque is necessary at stand still of the motor, keep the winding current at motor stand still or provide a braking system

STEP – Step or CLK_UP : ***the motor executes a step for each switch of this input. The function depends on the status of JMP1 and JMP2.***

JMP1 closed in position 1 (default) = STEP and DIR inputs active on the leading edge.
The motor executes a movement of one step when the STEP input is engaged.

JMP1 closed in position 2 = STEP and DIR inputs active on the falling edge.
The motor executes a movement of a step when the STEP input is opened.

JMP2 closed in position 3 (default), input STEP=STEP, input DIR = Direction.
The motor executes a movement in steps equal to the number of pulses applied to the STEP input. To change the motion direction, it's necessary to change the DIR input status.

JMP2 closed in position 4, input STEP=CLK_UP, input DIR = CLK_DWN.
The motor executes a movement in a direction when the step pulses are applied to the STEP (CLK_UP) input and in the opposite direction when they are applied to the DIR (CLK_DWN) input.

For more information about the functioning of the STEP input, refer to paragraph ***4.5 JMP2 : STEP/DIR or CLK_UP/CLK_DWN Mode***.

NOTE: the clockwise or anti-clockwise rotation direction of the motor depends, besides on the inputs statuses, also on the connection of the motor windings. To avoid wrong movements and possible damages, the rotation direction must be checked before fixating the motor to the load.

Steps per Rotation Table

The rotation measured in degrees of the motor shaft, for every single step pulse depends on the settings of DIP1 SW5-6-7-8 (refer to paragraph ***4.3 Step angle*** and ***4.9.3 Select step angle***). The following table shows the number of necessary step pulses to let the motor shaft execute a full rotation (360°) and the rotation in degrees executed by the motor shaft at every step pulse (the table refers to 50 poles motors, 1.8° per full step.).

Step type	Steps per rotation	Step degree
Full Step	200	1,8°
1/2 step	400	0,9°
1/4 step	800	0,45°
1/8 step	1600	0,225°
1/16 step	3200	0,1125°
1/32 step	6400	0,05625°
1/64 step	12800	0,028125°
1/128 step	25600	0,0140625°
1/256 step	51200	0,00703125°
1/5 step	1000	0,36°
1/10 step	2000	0,18°
1/25 step	5000	0,072°
1/50 step	10000	0,036°
1/125 step	25000	0,0144°
1/250 step	50000	0,0072°

Paragraph ***4.3 Step angle*** shows a formula to calculate the step frequency (Hz) necessary to obtain the desired rotation velocity (RPM) depending on the set step angle.

DIR – Direction or CLK_DWN : rotation direction of the motor. ***The function depends on the status of JMP1 and JMP2.***

See notes about JMP1 and JMP2 related to the STEP input.

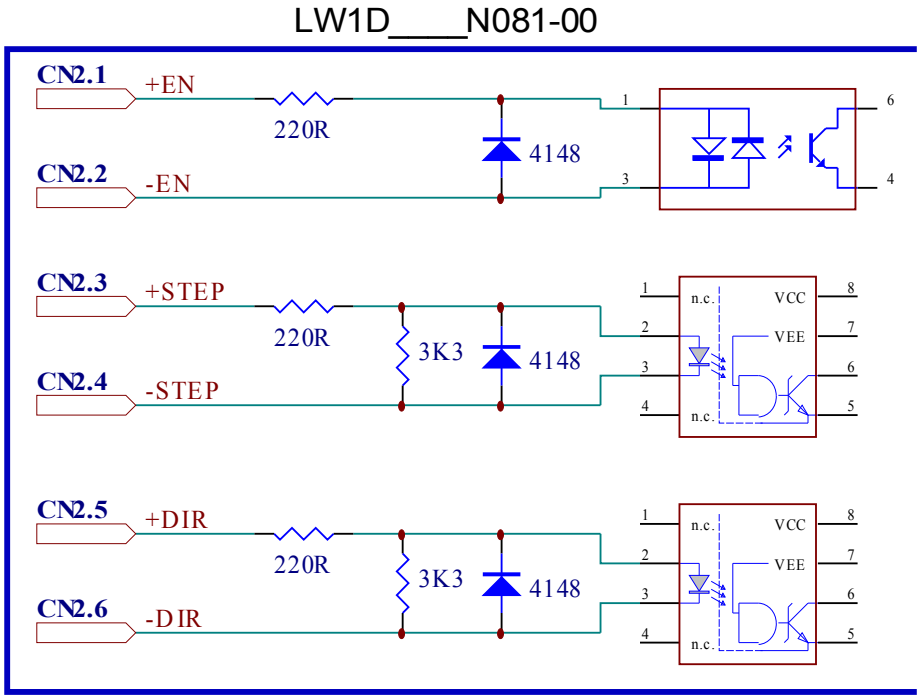
NOTE: the clockwise or anti-clockwise rotation direction of the motor depends, besides on the DIR input status, also on the connection of the motor windings. To avoid wrong movements and possible damages, the rotation direction must be checked before fixating the motor to the load.

2.3 Specification of the digital inputs

See also paragraph ***3.5 Drive connections****.*

The 3 digital inputs are available on connector CN2 of the drive and are dimensioned for a use of 5Vdc ±25% .

Digital inputs schematic:



The following figures supply some examples of possible connections to the digital inputs:

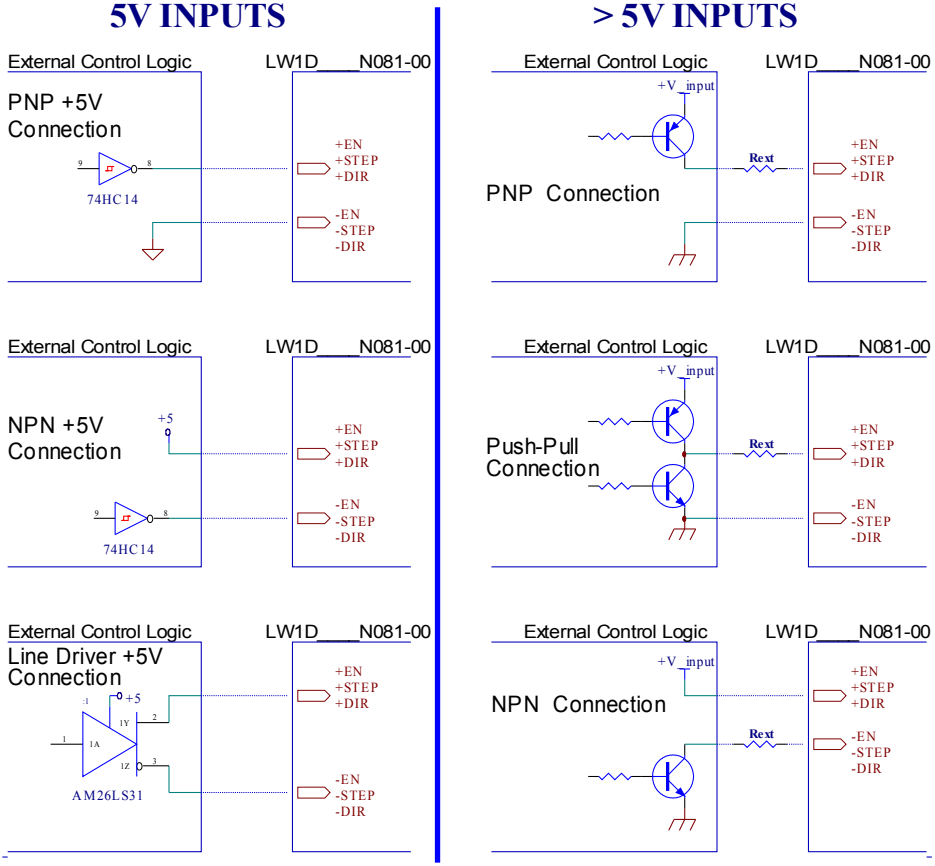
For the use of an input at a voltage higher then 5 Vdc it's necessary to insert an external resistance in series to the signal. In the table are indicated the most common situations:

V_{INPUT}	R_{EXT}
5Vdc	0 Ω
12Vdc	470 Ω 0,25W
24Vdc	1200 Ω 0,5W

For different input voltages, use the next formulas to calculate the resistive value and power of the resistances to insert in series:
$R_{EXT} = ((V_{INPUT} - 1.25) / 0.017) – 220$
$P_{R\_EXT} = ((V_{INPUT} – 1.25) / (R_{EXT} + 220))^2 * R_{EXT}$

Example for V_{INPUT} =36V :

R_{EXT} =((36-1.25) / 0.017)–220 = 1824 Ω => approximate the commercial value of 1K8
P_{R_EXT} = ((36 – 1.25) / (1800 + 220))² * 1800 = 0.533W => approximate the commercial value of 1 W.



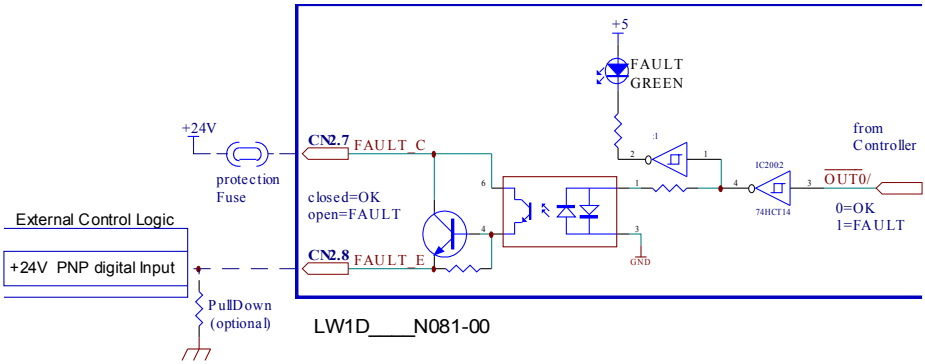
2.4 Digital FAULT output

Through this digital output you can check the operational status of the LW1D____N081-00 drives.

	FAULT output	Meaning Output	Visualization
1	Not engaged (Transistor open)	Not ready – FAULT One or more active protections.	Green FAULT LED off
2	Output engaged Transistor closed	System ready and operational	Green FAULT LED on

The FAULT output is dimensioned to function at V_{OUTmax}=24Vdc, I_{OUTmax}=100mA

schematic of the digital FAULT output for example of the connections.



Attention : the FAULT output is not protected.

Provide an external current limitation device (I_{OUTmax} = 100mA).

3 DRIVE INSTALLATION

In this section are given some guidelines for the safe installation of the LW1D____N081-00 drives and the stepper motor.

3.1 Safe installation and use of the unit

Only qualified staff is allowed to install the LW1D____N081-00 *drives, after having read and understood the information in this manual. The installation instructions have to be followed and approved. Eventual doubts need to be clarified with the supplier of the equipment before using.*

EVER will not take any responsibility for indirect damage due to negligence, wrong installation, modifications to the product without approval or wrong connections of the equipment to the wiring.

SECURITY
In particular, the user must:

- Remove the power supply before realizing or removing a connection:
- Not work on the drive without that has been realized a ground connection for the drive and the motor. The Protective Earth connection (PE) has to comply with the local requirements in force.
- Not establish connections to the internal circuit of the drive;

- Wait until the green LED light of POWER_ON is switched off before manipulating or executing maintenance to the drive;
- Not use the digital ENABLE input as safety stop. Always remove the power supply voltage from the drive to establish a safe switching off;
- Pay attention to the heat loss of some parts of the drive: using the drive in extreme applications, some surfaces reach high temperatures. Before disconnecting the device, wait until it has cooled down;
- In case of missing voltage the motor is not able to keep the load: it's thus forbidden to use the motor if the condition of missing holding torque of the motor can create a dangerous situation, unless the user provides special devices to block the load.

The negative pole of the power supply is NOT connected to the ground through an internal connection to the drive. If this default connection doesn't suit the requirements of the application, the user needs to refer to support@everelettronica.it for the necessary technical information.

ELECTROMAGNETIC COMPATIBILITY

Take all precautions and requirements which are necessary for the compliance with the electromagnetic compatibility.

Some disturbances generated by other insufficiently filtered and/or shielded equipment, can cause malfunctions in the drive which can result into uncontrolled movements.

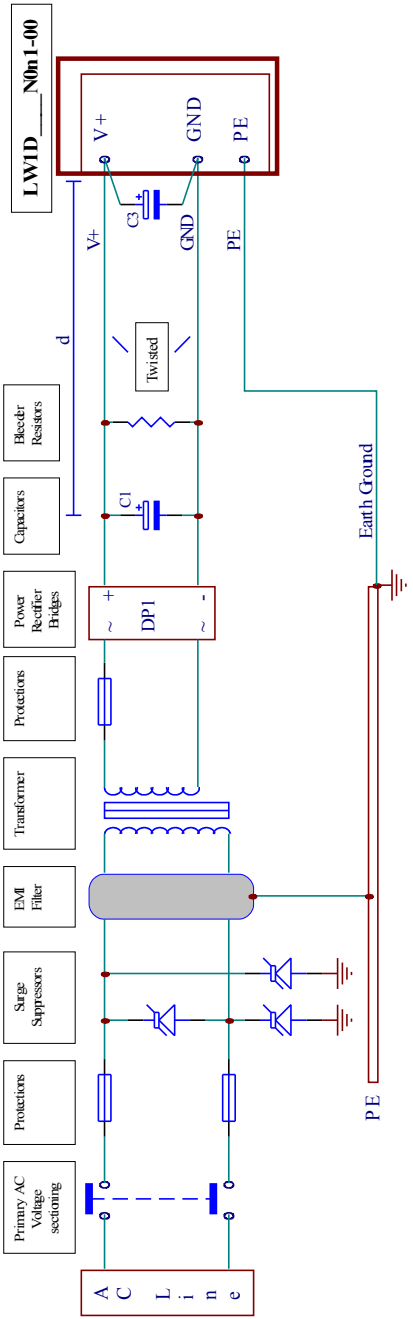
When making the connections, take into account the requirement of paragraph ***3.8 Guideline for wiring***.

When the emissions generated by the working drive are not adequately filtered, the correct functioning of other devices can be disturbed. Appendix ***A.2 TEST CONDUCTED EMISSIONS*** gives some utile guidelines for the choice of an adequate filtering system.

Note :

3.2 Planning the power supply

Circuit and power supply connection schemes.



Main characteristics of the drive power supply:

AC network Switch: is a recommended safety device.

Primary protections: use fuses of 5A nominal on the AC bus or an equivalent safety switch.

Surge suppressors: on the primary circuit, they protect the drive against Surges coming from the primary network power supply.

EMC Filter: is generally necessary to satisfy the EMC compatibility requirements related to the emissions. An EMC filter is recommended in case of sensible circuits powered by an AC line. If a commercial line filter is chosen, one needs to take into account the total RMS current of the powered system.

*The AC line filter needs to be installed following the builder's directives. Generally, the filter needs to be inserted between the principal AC line and the transformer, if the last one is positioned near the drive or to the electrical cabinet, between the transformer and the rectifier bridge in the other cases, keeping the bridge near the drive, and keeping the connection between the filter and the transformer as short as possible. Refer to Appendix **A.2 TEST CONDUCTED EMISSIONS** to choose the filter.*

Transformer: The primary circuit of the transformer must be dimensioned in function of the characteristics of the AC power supply line. The voltage peaks on the secondary circuit of the transformer are equal to 1.41*secondary RMS voltage. The DC power supply voltage must not exceed the Vdc power supply voltage of the drive.

The power of the transformer depends on the power required by the motor: to define the motion characteristics under control (dimensioning of the power supply and the motor), it's possible to contact our support department by the e-mail address: support@everelettronica.it. Alternatively the following procedure can be used to define approximately the power supply characteristics:

1. Power to the motor shaft for every axle in watts:
   Wn =π*Nn[RPM]*Tn[Nm]/30
2. Power to the total load in watts :
   WS = sum of the Wn of the axles moving simultaneously;
3. Power of the transformer in watts:
   TW = 2 * WS (efficiency = 0.5)
4. power of the transformer in VA:
   TVA=TW / 0,7 (single phase) or TVA= TW / 0,8 (three phase);
5. Take into account a voltage drop of about 8% for the transformer during the application of the load (the secondary voltage must not exceed a voltage value of 108% of the nominal value when the load is zero).

A simple and fast alternative method to calculate the power in VA of the transformer is:
$TVA(VA) = \sqrt{2} * Vdc_{BUS} * Imax_{PHASE(RMS)}$

Secondary protections: Must be placed before the rectifier bridge and must be calibrated depending on the set phase current. Instead of the secondary protections can be used an automatic safety switch.

Rectifier bridge: A rectifier of 10A is recommended for the maximum absorption of a single axle.

Capacitor: a capacitor of 3300µF (85°C) is appropriate for the LW1D3050N081-00 drives, and a capacitor of 2200µF (85°C) for the LW1D2042N081-00 drives operating at the maximal current delivered by the drive. The working voltage of the capacitor must be evaluated considering the DC voltage peaks (Vdc_{BUS}) keeping an adequate safety margin.

***An additional capacitor** must be provided in the nearance of the drive when the cable length of the DC power supply exceeds the length of 1 mt.*

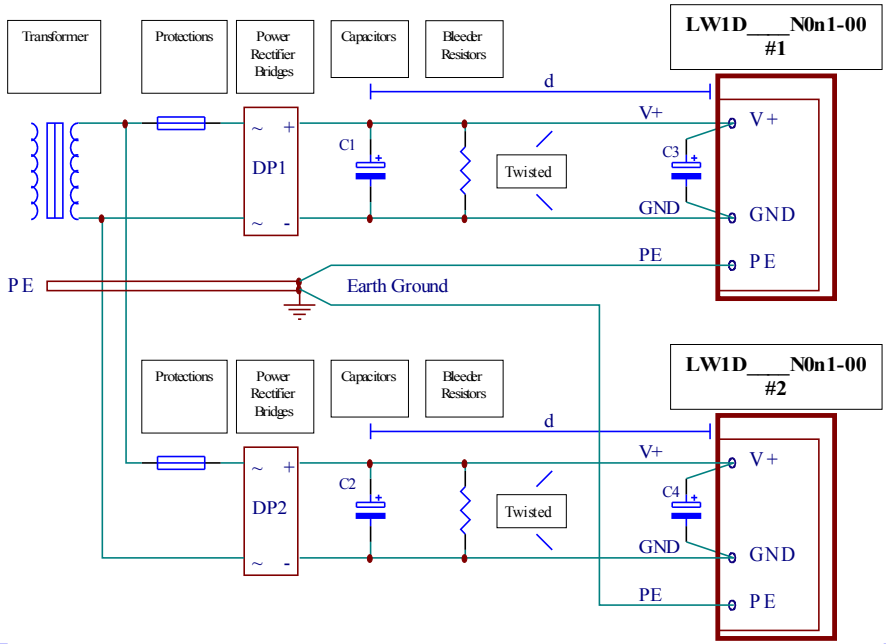
When using a power supply of the switching type, insert a capacity between the drive and the power supply able to handle the pulse current which the drive sends to the power supply in special functioning conditions and which are required for the motion handling. The purpose of this capacity is to keep the voltage applied to the drive within acceptable values.

Make sure that the switching power supply is adapted to the expected load capacity.

The dynamic motor performances depend on the power supply voltage: at a higher voltage the performances increase.

In multi-axles installations, it's recommended to provide a rectifier + capacity for every drive. Every rectifier must be positioned as close as possible to the concerning drive.

An additional capacitor is required near every drive with a distance of more then 1mt from the rectifier.



3.3 Choosing the stepper motor

The LW1D____N081-00 drives have been designed to function with 2 phase stepper motors with the following characteristics:

- The nominal winding current for the ***LW1D3050N081-00*** is 1 ÷ 5.5 A_{RMS} (1.4÷7.8A_{PK})
- The nominal winding current for the ***LW1D20420N081-00*** is 1.5 ÷ 4.2 A_{RMS} (2.2÷6A_{PK})
- With connection of the Bipolar Parallel windings: the motor is supplied by the drive with a winding current equal to 1.41 times the unipolar nominal current (I_{PHASE} * 1.41).
- With connection of the Bipolar Series windings: the motor is powered by the drive with a winding current equal to 0.7 times the unipolar nominal current (I_{PHASE} * 0.70).

The stepper motor is chosen on base of a series of variables that depend on the application: torque required by the shaft, speed, dimension of the motor, current, inductance etc.

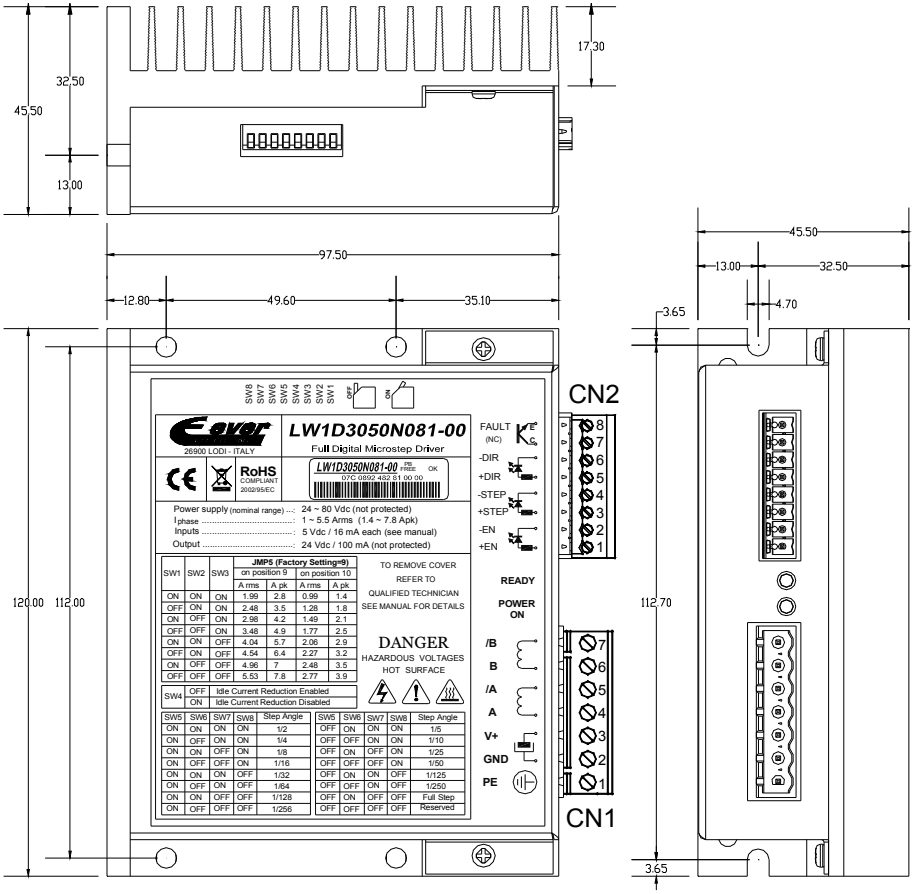
Note :

3.4 Assembling of the drive

The following figures show the necessary dimensions of the LW1D____N081-00 drives for the wall mounting.
Use the M4 screws to fix the drive to a wall of the electric cabinet.

As the heat from the LW1D____N081-00 drives is mainly dissipated through the finned side of the "L" support, make sure that there is an adequate air circulation and a sufficient chimney effect.
An insufficient heat exchange might raise the drive temperature until the thermal protection threshold blocks the system signalled by the opening of the FAULT output and the shut-down of the FAULT led.

3.4.1 Dimensions LW1D3050N081-00



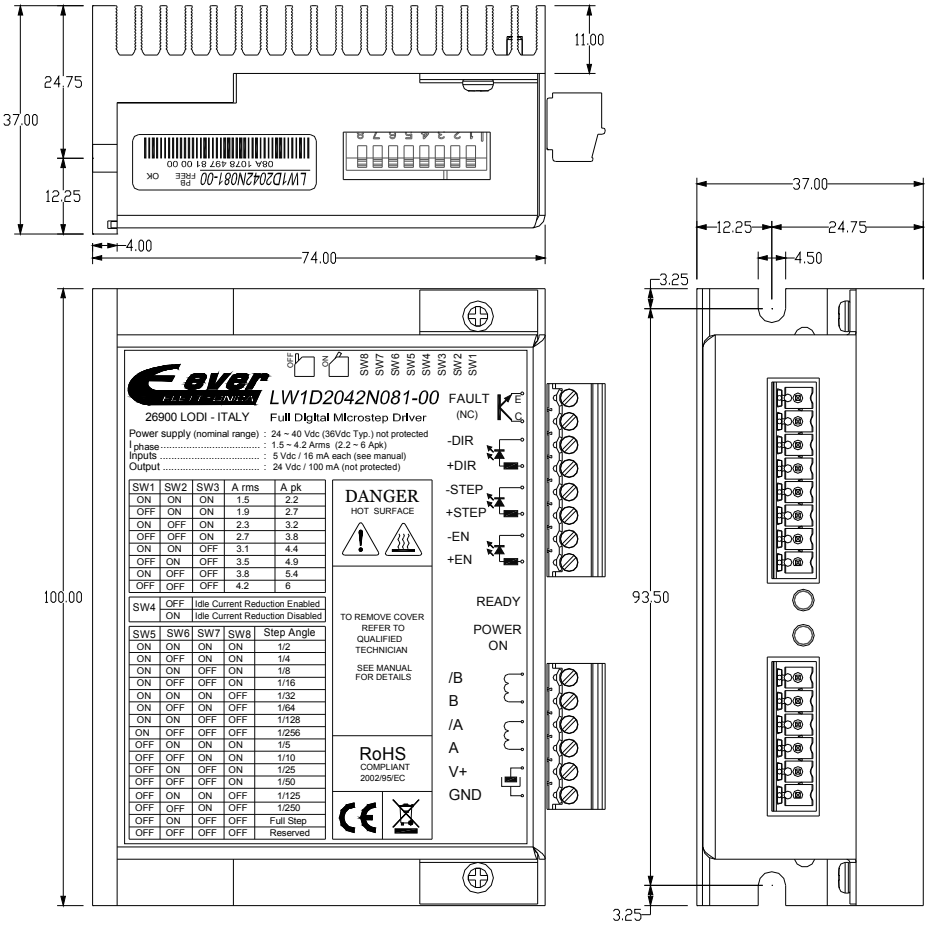
SW1	SW2	SW3	JMP5 (Factory Setting=9) on position 9 A rms	A pk	on position 10 A rms	A pk
ON	ON	ON	1.99	2.8	0.99	1.4
OFF	ON	ON	2.48	3.5	1.28	1.8
ON	OFF	ON	2.98	4.2	1.49	2.1
OFF	OFF	ON	3.48	4.9	1.77	2.5
ON	ON	OFF	4.04	5.7	2.06	2.9
OFF	ON	OFF	4.54	6.4	2.27	3.2
ON	OFF	OFF	4.96	7	2.48	3.5
OFF	OFF	OFF	5.53	7.8	2.77	3.9

SW4	
OFF	Idle Current Reduction Enabled
ON	Idle Current Reduction Disabled

SW5	SW6	SW7	SW8	Step Angle
ON	ON	ON	ON	1/2
ON	OFF	ON	ON	1/4
ON	ON	OFF	ON	1/8
ON	OFF	OFF	ON	1/16
ON	ON	ON	OFF	1/32
ON	OFF	ON	OFF	1/64
ON	ON	OFF	OFF	1/128
ON	OFF	OFF	OFF	1/256

SW5	SW6	SW7	SW8	Step Angle
OFF	ON	ON	ON	1/5
OFF	OFF	ON	ON	1/10
OFF	ON	OFF	ON	1/25
OFF	OFF	OFF	ON	1/50
OFF	ON	ON	OFF	1/125
OFF	OFF	ON	OFF	1/250
OFF	ON	OFF	OFF	Full Step
OFF	OFF	OFF	OFF	Reserved

3.4.2 Dimensions LW1D2042N081-00



SW1	SW2	SW3	A rms	A pk
ON	ON	ON	1.5	2.2
OFF	ON	ON	1.9	2.7
ON	OFF	ON	2.3	3.2
OFF	OFF	ON	2.7	3.8
ON	ON	OFF	3.1	4.4
OFF	ON	OFF	3.5	4.9
ON	OFF	OFF	3.8	5.4
OFF	OFF	OFF	4.2	6

SW4	
OFF	Idle Current Reduction Enabled
ON	Idle Current Reduction Disabled

SW5	SW6	SW7	SW8	Step Angle
ON	ON	ON	ON	1/2
ON	OFF	ON	ON	1/4
ON	ON	OFF	ON	1/8
ON	OFF	OFF	ON	1/16
ON	ON	ON	OFF	1/32
ON	OFF	ON	OFF	1/64
ON	ON	OFF	OFF	1/128
ON	OFF	OFF	OFF	1/256
OFF	ON	ON	ON	1/5
OFF	OFF	ON	ON	1/10
OFF	ON	OFF	ON	1/25
OFF	OFF	OFF	ON	1/50
OFF	ON	ON	OFF	1/125
OFF	OFF	ON	OFF	1/250
OFF	ON	OFF	OFF	Full Step
OFF	OFF	OFF	OFF	Reserved

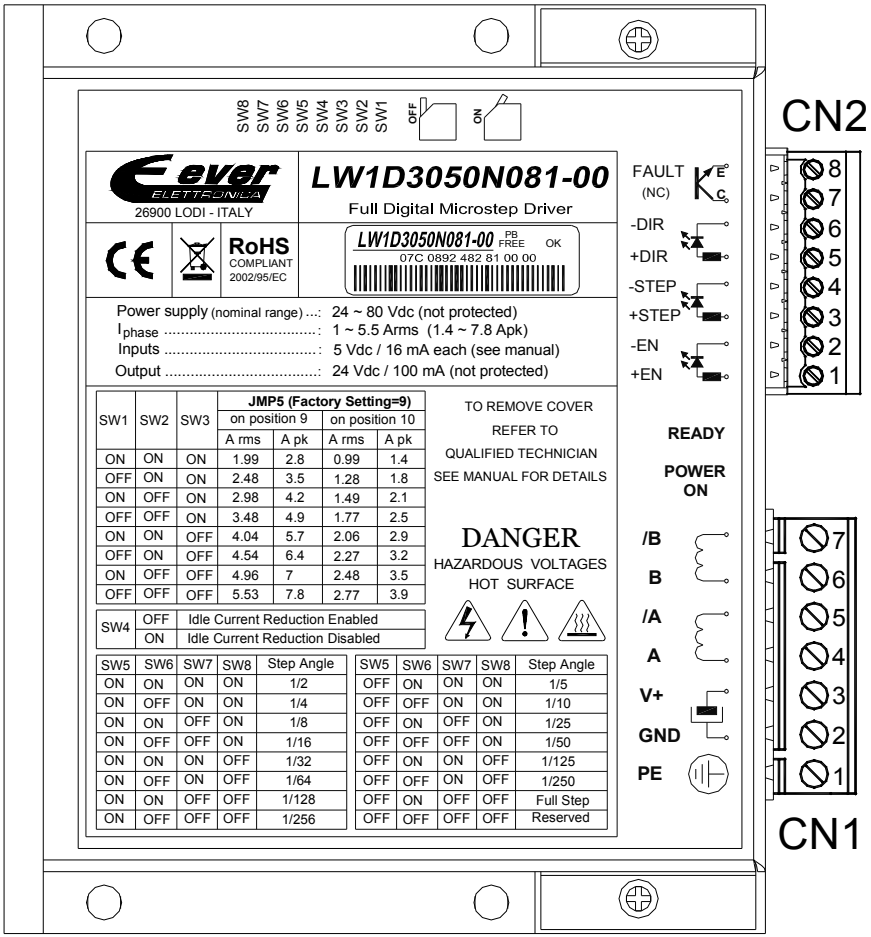
3.5 Drive connections

The LW1D____N081-00 drives need the following connections for their functioning:

CN1 = Power supply and stepper motor
CN2 = digital inputs and outputs

If the power supply provided by the client is not equipped with a double or reinforced insulation, it's obligated to execute a safety connection between the GND (power supply ground) and the protective earthing PE. A correct connection between the GND and the protective earthing PE, reduces often the electromagnetic interferences due to commutations of the drive and the motor.

3.5.1 Pin out of the LW1D3050N081-00 connectors



SW1	SW2	SW3	JMP5 (Factory Setting=9) on position 9 A rms	on position 9 A pk	on position 10 A rms	on position 10 A pk
ON	ON	ON	1.99	2.8	0.99	1.4
OFF	ON	ON	2.48	3.5	1.28	1.8
ON	OFF	ON	2.98	4.2	1.49	2.1
OFF	OFF	ON	3.48	4.9	1.77	2.5
ON	ON	OFF	4.04	5.7	2.06	2.9
OFF	ON	OFF	4.54	6.4	2.27	3.2
ON	OFF	OFF	4.96	7	2.48	3.5
OFF	OFF	OFF	5.53	7.8	2.77	3.9

SW4		
	OFF	Idle Current Reduction Enabled
	ON	Idle Current Reduction Disabled

SW5	SW6	SW7	SW8	Step Angle
ON	ON	ON	ON	1/2
ON	OFF	ON	ON	1/4
ON	ON	OFF	ON	1/8
ON	OFF	OFF	ON	1/16
ON	ON	ON	OFF	1/32
ON	OFF	ON	OFF	1/64
ON	ON	OFF	OFF	1/128
ON	OFF	OFF	OFF	1/256

SW5	SW6	SW7	SW8	Step Angle
OFF	ON	ON	ON	1/5
OFF	OFF	ON	ON	1/10
OFF	ON	OFF	ON	1/25
OFF	OFF	OFF	ON	1/50
OFF	ON	ON	OFF	1/125
OFF	OFF	ON	OFF	1/250
OFF	ON	OFF	OFF	Full Step
OFF	OFF	OFF	OFF	Reserved

TO REMOVE COVER
REFER TO
QUALIFIED TECHNICIAN
SEE MANUAL FOR DETAILS

DANGER
HAZARDOUS VOLTAGES
HOT SURFACE

Lay-out and pin out of connectors CN1 and CN2.

Connectors of drive LW1D3050N081-00 and tables of the input and output characteristics.

CN1			
Pos	**Name**	**Characteristics**	
1	PE	EARTH Input	Protective Earthing
2	GND	PWR Input	Negative power supply
3	V+	PWR Input	Positive power supply
4	A	PWR Output	phase A motor
5	A/	PWR Output	phase A/ motor
6	B	PWR Output	phase B motor
7	B/	PWR Output	phase B/ motor

CN2			
Pos	**Name**	**Characteristics**	
1	+EN	Input	Positive terminal digital input EN (ENABLE)
2	-EN	Input	Negative terminal digital input EN (ENABLE)
3	+STEP	Input	Positive terminal digital input STEP (STEP or CLK_UP)
4	-STEP	Input	Negative terminal digital input STEP (STEP or CLK_UP)
5	+DIR	Input	Positive terminal digital input DIR (Direction or CLK_DWN)
6	-DIR	Input	Negative terminal digital input DIR (Direction or CLK_DWN)
7	FAULT_C	Output	FAULT output (Transistor collector)
8	FAULT_E	Output	FAULT output (Transistor emitter)

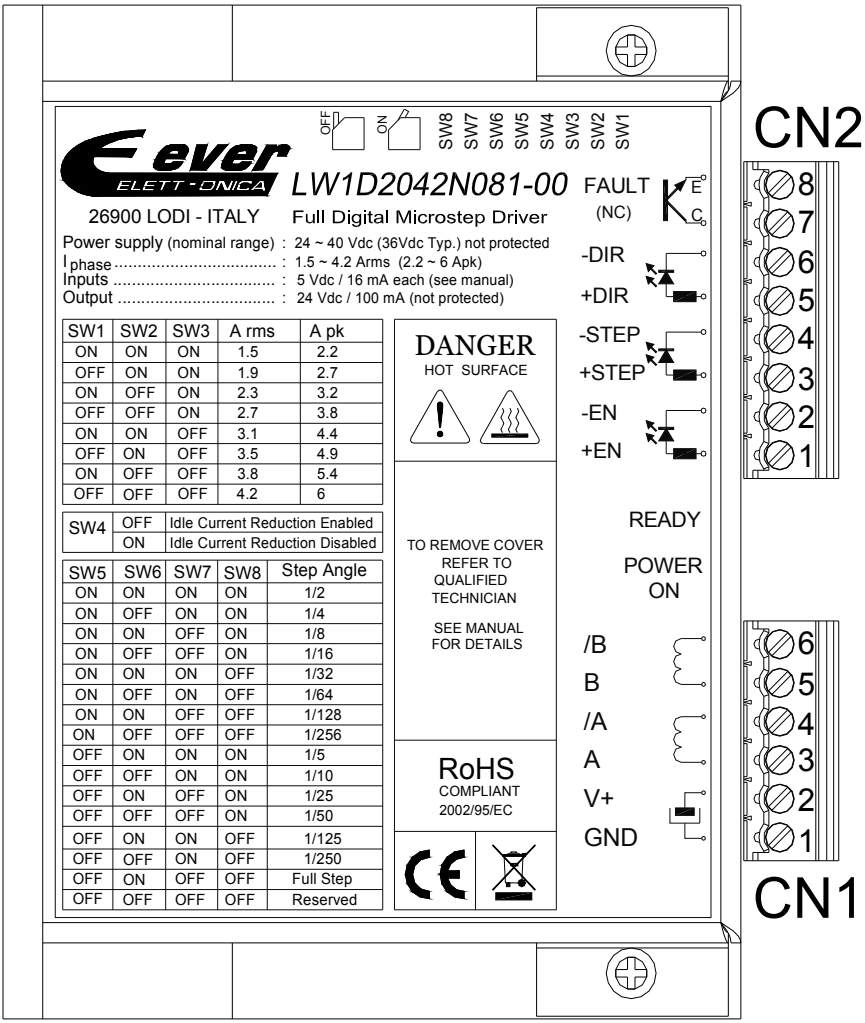
3.5.1.1 Mating connectors *LW1D3050N081-00*

The mating connectors are supplied with the drive LW1D3050N081-00.
In case it is necessary to purchase more mating connectors, the client can order them also from third parties with the codes:

CN1 7 position, pitch 5.08mm., plug connector
PHOENIX CONTACT p# **MSTB 2,5/7-ST-5,08** order code **1757064**

CN2 8 position, pitch 3.81mm., plug connector
PHOENIX CONTACT p# **MC1,5/8-ST-3,81** order code **1803633**

3.6.1 Pin- out of the LW1D2042N081-00 connectors



SW1	SW2	SW3	A rms	A pk
ON	ON	ON	1.5	2.2
OFF	ON	ON	1.9	2.7
ON	OFF	ON	2.3	3.2
OFF	OFF	ON	2.7	3.8
ON	ON	OFF	3.1	4.4
OFF	ON	OFF	3.5	4.9
ON	OFF	OFF	3.8	5.4
OFF	OFF	OFF	4.2	6

SW4		
	OFF	Idle Current Reduction Enabled
	ON	Idle Current Reduction Disabled

SW5	SW6	SW7	SW8	Step Angle
ON	ON	ON	ON	1/2
ON	OFF	ON	ON	1/4
ON	ON	OFF	ON	1/8
ON	OFF	OFF	ON	1/16
ON	ON	ON	OFF	1/32
ON	OFF	ON	OFF	1/64
ON	ON	OFF	OFF	1/128
ON	OFF	OFF	OFF	1/256
OFF	ON	ON	ON	1/5
OFF	OFF	ON	ON	1/10
OFF	ON	OFF	ON	1/25
OFF	OFF	OFF	ON	1/50
OFF	ON	ON	OFF	1/125
OFF	OFF	ON	OFF	1/250
OFF	ON	OFF	OFF	Full Step
OFF	OFF	OFF	OFF	Reserved

Layout and pin out of connectors CN1 and CN2.

Connectors of the LW1D2042N081-00 drive and tables with the input and output characteristics.

CN1			
Pos	**Name**	**Characteristics**	
1	GND	PWR Input	Negative power supply
2	V+	PWR Input	Positive power supply
3	A	PWR Output	phase A motor
4	A/	PWR Output	phase A/ motor
5	B	PWR Output	phase B motor
6	B/	PWR Output	phase B/ motor

On the LW1D2042N081-00 drives, the security connection to the protective earthing PE must be executed by means of a mechanical clamping screw with a minimal diameter of M4.

CN2			
Pos	**Name**	**Characteristics**	
1	+EN	Input	positive terminal digital input EN (ENABLE)
2	-EN	Input	negative terminal digital input EN (ENABLE)
3	+STEP	Input	positive terminal digital input STEP (STEP or CLK_UP)
4	-STEP	Input	negative terminal digital input STEP (STEP or CLK_UP)
5	+DIR	Input	positive terminal digital input DIR (Direction or CLK_DWN)
6	-DIR	Input	negative terminal digital input DIR (Direction or CLK_DWN)
7	FAULT_C	Output	FAULT output (Transistor collector)
8	FAULT_E	Output	FAULT output (Transistor emitter)

3.6.1.1 Mating connectors *LW1D2042N081-00*

The mating connectors are supplied with the LW1D2042N081-00 drive.
In case it is necessary to purchase more mating connectors, the client can order them also from third parties with the codes:

CN1 6 position, pitch 3.81mm., plug connector
PHOENIX CONTACT p# **MC1,5/6-ST-3,81** order code **1803617**

CN2 8 position, pitch 3.81mm., plug connector
PHOENIX CONTACT p# **MC1,5/8-ST-3,81** order code **1803633**

3.7 Cables section

Power supply	Minimum	0.5mm² (AWG20)
	Maximum	1.5mm² (AWG15)
Motor output	Minimum	0.5mm² (AWG20)
	Maximum	1.5mm² (AWG15)
Digital inputs Digital outputs	Minimum	0.14mm² (AWG25)
	Maximum	0.5mm² (AWG20)

3.8 Guideline for wiring

For a correct drive installation:

Guideline for wiring	***Effects***
Connect on the LW1D3050N081-00 drives the earth terminal to CN1.1 to the main terminal of environmental earthing (PE) of the installation. Establish the PE connection on the LW1D2042N081-00 drives by means of a mechanical clamping screw with a diameter of at least M4.	Necessary electrical safety connection. Increases the immunity against irradiated disturbances and electrostatic discharges (ESD).
Connect both ends of the signal cables shields to the earthing.	Increases the immunity against disturbances and reduces the irradiated and conducted emissions.
It is recommended to use shielded cables for the motor connection. When a shielded cable is used for the motor, connect the screen to terminal CN1.1 on the LW1D3050N081-00 drive or to the screws used for the connection of the PE on the LW1D2042N081-00 drive. AVOID the connection of the screen to the motor body.	Increases the immunity against disturbances and reduces the irradiated and conducted emissions.
Connect the body of the motor to the earthing with a special cable. *The motor body and the cable shield must be connected to the ground terminal by means of 2 separated cables.*	Necessary electrical safety connection. Reduces the conducted emissions.
When powering different drives with a single power supply, create a star connection of every drive to the terminals of the filter capacitor of the power supply (star center).	Reduce the disturbances due to pulse current.
Keep the connections (cables) as short as possible and avoid ground loops.	Increases the immunity against disturbances and reduces the irradiated and conducted emissions.
The paths of the signal cables and controls must be separated and/or shielded from the motor cables and power supply to avoid that the inductive coupling can cause incorrect operations.	Increases the immunity against disturbances.

3.9 First start up procedure

- Check all connections: power supply, motor and control logic.
- Make sure that the application settings are correct.
- Make sure that the DC power supply characteristics are suitable for the drive.
- If possible, remove the load from the motor shaft to avoid that wrong movements cause damage.
- Power and make sure that the green POWER_ON LED is switched on.
- IF the green LED or the green FAULT LED remain off, turn down the system immediately and verify if all connections are present and if they are correct.
- Enable the current to the motor and verify if the torque is present.
- Execute a movement of some steps and verify if the rotation direction is the desired one.

To reverse the rotation direction of the motor shaft, reverse the connection of one of the motor phases, for example A with A/, after having removed the power supply.

- Remove the power supply, fixate the motor to the load and check the full functionality.

3.10 Analyses of malfunctions

The burning green LED light indicates that the LW1D____N081-00 drives are powered correctly.

When one of the following situations occurs, the drive enters an alarm status, the green FAULT led is switched off and the FAULT output is opened.

DEFECT	The external fuse of the drive burns.
CAUSE	Can be caused due to a wrong connection of the power supply.
ACTION	Fix the connection and replace the fuses. Use only fuses described in paragraph ***3.2 Planning the power supply***.

DEFECT	Intervention of the thermal protection
CAUSE	May be caused due to a heavy working cycle or high current.
ACTION	Improve the thermal exchange by facilitating the air stream on the heatsink or by applying a fan.

DEFECT	Intervention by the current protection.
CAUSE	Short circuit on the motor outputs.
ACTION	Control the motor windings and cables, remove the short circuit replacing the broken cable or the broken motor.

When one of the following situations occurs, the drive DOESN'T enter an alarm status, the green FAULT led remains on and the FAULT output remains closed.

DEFECT	Noisy motor movement with vibrations.
CAUSE	Can be caused due to a missing power supply to a motor phase, or to a situation of resonance.
ACTION	Check the motor cables, increase the step angle resolution (SW5-6-7-8), and/or change the velocity of the motor to exit a resonance region.

N.B. : only valid for drive LW1D3050N081-00, functionality not available on drive LW1D2042N081-00.

DEFECT	At high speed, the motor hasn't sufficient torque.
CAUSE	It can be caused due to the automatic limitation of the motor current.
ACTION	Enable the VOLTAGE Mode (JMP 4 closed in position 8)

In case it's not possible to resolve the problem, thinking that the system hasn't been damaged, contact EVER for technical support or send a message including the following information:

- The system version (LW1D____N081-00) and serial number printed on the label present on the system.
- The complete problem description and the circumstances where in the problem occurs.
- The description of the drive configuration in the application (Current, type of step, type of functioning, etc.).
- The serial number of the motor (EVER code)
- The value of the power supply voltage and the characteristics (ripple.....).
- The description of the power supply, control signal cables and the presence of other components in the installation.
- The description of the application (motor movements, loads, velocity, etc.).

Return procedure To return a defect drive to EVER for reparation or substitution:

1) If possible put the drive back in its original package.
   [EVER is not responsible for damages as a result of inadequate packing or shipping].
   Attach if possible a complete problem description in a way that the damage can be detected faster.
2) Send the drive to:

EVER Elettronica s.r.l.
Via del Commercio 9/11
Zona Industriale Loc. San Grato
26900 - LODI - ITALY
Attn: AR Dept.
E-mail: reparations@everelettronica.it

*EVER co. is used sending to customers a **repair costs estimation offer before repairing** the unit.*
All shipment costs are charged to customer.

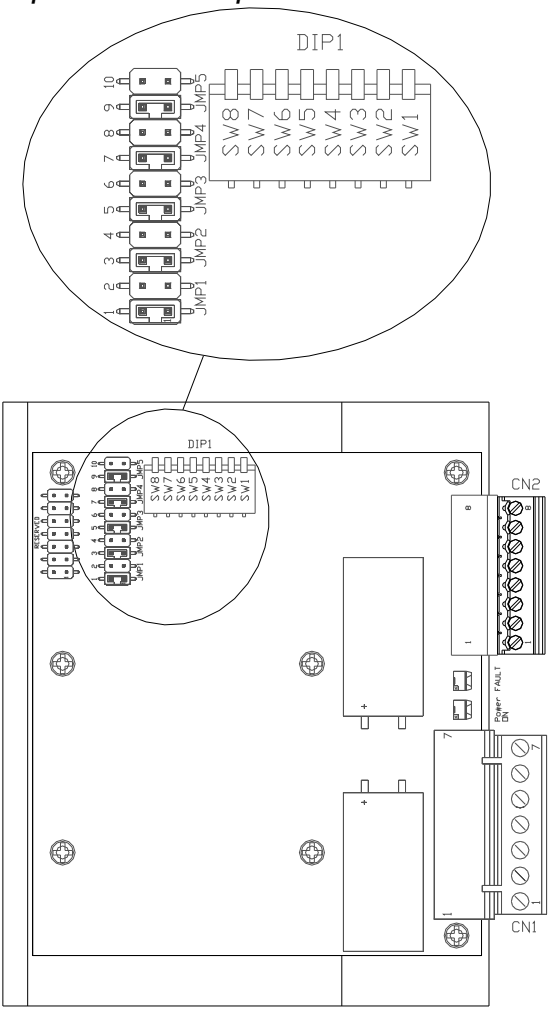
4 SETTINGS AND ADJUSTMENTS

This section gives the indications for adjustments and the setting of the operational parameters to obtain the best performances from the LW1D____N081-00 drives.
The figures display the positions of the Dip-switches and jumpers.

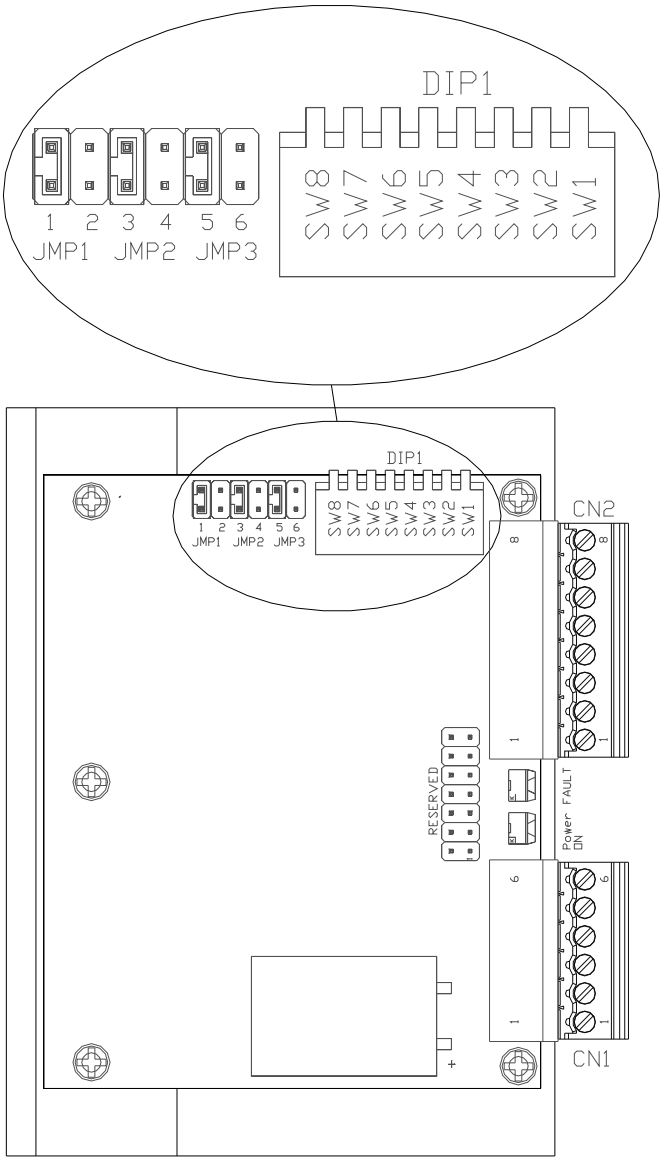
*Some internal parts of the unit can be potential sources of **electric shocks**,therefore, before operating on the Dip-Switches and Jumpers, shut down the drive and wait until the LEDS are switched off completely.*

NOTE : the Dip-Switches and Jumpers are only read at switching on. If necessary to execute a change, shut down the system, modify the settings and restart the system to make the change operative.

Dislocation Dip-switches and Jumpers on LW1D3050N081-00



Dislocation Dip-switches and Jumpers on LW1D2042N081-00



4.1 Motor current

The motor current can be set by means of the SW1-2-3 on 16 different levels.

Note : only on the LW1D3050N08-00 you can set 2 different current ranges by means of JMP5 (see paragraph Errore: sorgente del riferimento non trovata).

Factory default = maximum phase current (SW1-2-3 = all OFF, JMP5 on position 9).

4.2 Reduction of the motor current (RWC)

The reduction of the motor current can be enabled or disabled by means of the SW4.
When this function is enabled, the motor current will be reduced to 60% of the nominal value 1 second after the last step pulse.

The current in the motor returns automatically to the nominal value after the first pulse of the external step has been sent to the drive.

Factory default = RWC enabled (SW4 = OFF).

4.3 Step angle

The type of step angle defines the angular resolution of the motor and is normally set to obtain the desired positioning precision or a more fluid movement, without vibrations with a smalls step angle and a higher frequency.
In a 2 phase motor with 50 poles, to every step pulse corresponds a shaft rotation of 1.8° at full step, 0,9° at ½ step and so further. If necessary refer to the table of paragraph *2.2 Digital Inputs Digital Inputs* of this manual.

When choosing the Full Step a higher RMS current value is obtained in the motor windings with a maximum torque, but, at determined step frequencies depending on the motor or on the load characteristics, it's possible that torque drops occur due to resonances.

The formula : *F = (RPM / 60) x ((360° / Full Step Degrees) x Step Setting))*

is useful to calculate the step frequency F(Hz) at a determined motor velocity (RPM).

For example, the step frequency to obtain a rotation velocity of 150 RPM with a motor of 1.8° driven at 1/8 step is:

F = (150 / 60) x ((360° / 1.8°) x 1/8)) = 4000 Hz

The factory default is SW5-6-7-8 = all OFF = RESERVED: this condition is chosen as Default as it prevents any movement to the motor until the user hasn't configured the Dip-Switches.

4.4 JMP1 : Selection active front STEP and DIR inputs

It's possible to choose the active front of the STEP and DIR inputs by means of JMP1,and to choose if the step execution is executed at the engagement of the input or at its disengagement.

	JMP1	Default	Function
on position	1	X	STEP / CLK_UP & CLK_DWN on Rising Edge
	2		STEP / CLK_UP & CLK_DWN on Falling Edge

4.5 JMP2 : STEP/DIR or CLK_UP/CLK_DWN Mode

The functioning mode of the STEP and DIR inputs is defined by means of JMP2.
In STEP/DIR mode (JMP2 in position 3) the to be executed step sequence must be supplied to the STEP input, while the rotation direction of the motor depends on the DIR status (Direction).

In CLK_UP/CLK_DWN mode (JMP2 on position 4), a motor movement in a direction is obtained by applying a pulse sequence to the STEP input (CLK_UP). When applying a pulse sequence to the DIR input (CLK_DWN) a movement in the opposite direction is obtained.

	JMP2	Default	Function
on position	3	X	STEP – DIR mode
	4		STEP = CLK_UP , DIR = CLK_DWN

4.6 JMP3 : Functioning mode of the EN – ENABLE input

The functioning mode of the EN input (ENABLE) is defined by means of JMP3.
It's possible to have a “DISABLE” function or “I_{OFF}” in which the motor is energized by opening the EN input (ENABLE). It's possible to leave the EN input disconnected to have the functioning of the Drive.

In the “ENABLE” mode it's necessary to engage the EN input to enable to power stage of the Drive.

	JMP3	Default	Function
on position	5	X	EN asserted = Drive Disable
	6		EN asserted = Drive Enable

4.7 JMP4 : Functioning Voltage Mode

Note : only for the drive LW1D3050N08-00, the function is not present on drive LW1D2042N08-00.

It's possible to insert the "Voltage Mode" by means of JMP4 when the motor exceeds the rotation speed of 400_{RPM} The Voltage Mode switches automatically to a full step movement with the aim to compensate the efficiency and torque loss due to auto limitation when increasing the rotation speed.

	JMP4	Default	Function
on position	7	**X**	Voltage Mode Disabled
	8		Voltage Mode Enabled

4.8 JMP5 : Selection of the motor current range

Note : function only present on drive LW1D3050N08-00, not on drive LW1D2042N08-00.

By means of JMP5 it's possible to set 2 current ranges finely adjustable with SW1-2-3:

	JMP5	Default	Function
on position	9	**X**	High Motor Phase Current Range ➔1,99A_{RMS} ÷ 5,53A_{RMS} (2,8A_{PK} ÷ 7,8A_{PK})
	10		Low Motor Phase Current Range ➔ 0,99A_{RMS} ÷ 2,77A_{RMS} (1,4A_{PK} ÷ 3,9A_{PK})

4.9 Table DIP Switches settings

4.9.1 Selection Motor current

NOTE : the LW1D____N081-00 drives control the RMS current (***A_{RMS}***). The peak current (***A_{pk}***) is the result of the form factor (FF = 1.41 for all step angles, except for the Full Step for which FF = 1) and the regulation ripple which varies depending on the motor type and the power supply voltage.

4.9.1.1 Selection Motor current LW1D3050N081-00

#	SW1	SW2	SW3	JMP5				Default	Function
				on position 9		*on position 10*			
				A_{RMS}	A_{PK}	A_{RMS}	A_{PK}		
0	ON	ON	ON	1,99	2,8	0,99	1,4		Motor Phase Current Selection
1	OFF	ON	ON	2,48	3,5	1,28	1,8		
2	ON	OFF	ON	2,98	4,2	1,49	2,1		
3	OFF	OFF	ON	3,48	4,9	1,77	2,5		
4	ON	ON	OFF	4,04	5,7	2,06	2,9		
5	OFF	ON	OFF	4,54	6,4	2,27	3,2		
6	ON	OFF	OFF	4,96	7	2,48	3,5		
7	OFF	OFF	OFF	5,53	7,8	2,77	3,9	**X**	

4.9.1.2 Selection Motor current LW1D2042N081-00

#	SW1	SW2	SW3	A_{RMS}	A_{PK}	Default	Function
0	ON	ON	ON	1,5	2,2		Motor Phase Current Selection
1	OFF	ON	ON	1,9	2,7		
2	ON	OFF	ON	2,3	3,2		
3	OFF	OFF	ON	2,7	3,8		
4	ON	ON	OFF	3,1	4,4		
5	OFF	ON	OFF	3,5	4,9		
6	ON	OFF	OFF	3,8	5,4		
7	OFF	OFF	OFF	4,2	6,0	**X**	

NOTE : At Full Step, the form factor is 1, as a result the peak current is equal to the RMS current (***A_{RMS}***). *At Full Step,* the indication of the peak current must not be taken into consideration.

4.9.2 Set current reduction

#	*SW4*	*Action*	Default	Function
0	ON	Idle Current reduction disabled		RWC Selection
1	OFF	Idle Current reduction enabled	**X**	

4.9.3 Select step angle

#	*SW5*	*SW6*	*SW7*	*SW8*	Step Angle	Default	Function
0	ON	ON	ON	ON	½		Step Angle Selection
1	ON	OFF	ON	ON	¼		
2	ON	ON	OFF	ON	1/8		
3	ON	OFF	OFF	ON	1/16		
4	ON	ON	ON	OFF	1/32		
5	ON	OFF	ON	OFF	1/64		
6	ON	ON	OFF	OFF	1/128		
7	ON	OFF	OFF	OFF	1/256		
8	OFF	ON	ON	ON	1/5		
9	OFF	OFF	ON	ON	1/10		
10	OFF	ON	OFF	ON	1/25		
11	OFF	OFF	OFF	ON	1/50		
12	OFF	ON	ON	OFF	1/125		
13	OFF	OFF	ON	OFF	1/250		
14	OFF	ON	OFF	OFF	Full Step (1)		
15	OFF	OFF	OFF	OFF	RESERVED Function (2)	**X**	

NOTE : At Full Step, the form factor is 1, as a result the peak current is equal to the RMS current (***A_{RMS}***). *At Full Step,* the indication of the peak current must not be taken into consideration.

The configuration of SW5-6-7-8 = OFF, forces the firmware to the ESM condition (Enable Setup Mode – Factory Reserved). This condition is chosen as Default as it prevents any movement to the motor until the user has configured the Dip-Switches.

5 TECHNICAL SPECIFICATIONS

5.1 Electrical specifications

		LW1D3050N081-00			LW1D2042N081-00			Unit	Note
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.		
DC Power supply	Voltage	24	68	80	24	36	40	Vdc	Including the ripple and the network fluctuations.
	Minimal current	0.23			0.23			A_{RMS}	@ motor current zero, V+=24Vdc, without load to the shaft.
	Maximal current			5			4	A_{RMS}	@ maximum motor current, V+=24Vdc, full step, maximum load to the shaft.
	Power			600			500	VA	@ maximum motor current, V+=maximum allowed, full step, maximum load to the shaft.
Motor	Current	1		5.5	1.5		4.2	A_{RMS}	Settable by means of DIPs and Jumpers (see paragraph 4)
		1.4		7.8	2.2		6	A_{PK}	
	PWM frequency	Ultrasonic 33KHz (an event every 33µsec)						KHz	
	Step angle	Full step, ½, ¼, 1/8, 1/16, 1/32, 1/64, 1/128, 1/256, 1/5, 1/10, 1/25, 1/50, 1/125, 1/250							Settable by means of DIPs (see paragraph 4)
	Rotation speed			4500			4500	RPM	(1)
Drive status	POWER ON	Green LED							
	FAULT	Green LED (ON=OK, OFF=FAULT)							

(1) theoretical rotation limit managed by the drive, depending on the following physical parameters: power supply voltage, phase current, dynamic motor characteristics, load to the shaft.
Outside this limit, the drive is not able to guarantee a correct sequences control.

Protections:

Protection	*Trigger*	*Effect*	*Restore*
Over Current Fast electronic protection on the motor outputs against short circuits between the motor phases and between the phases and ground.	Short circuit or excessive current absorption.	- opening of the drive power stages. - Switching off of the FAULT LED. - Opening of the FAULT output.	It's necessary to remove the power supply to the drive to eliminate the cause of the protection.

Protection	*Trigger*	*Effect*	*Restore*
Over Temperature detects an over temperature of the heatsink.	Temperature of heatsink >75°C	- opening of the drive power stages. - Switching off of the FAULT LED - opening of the FAULT output.	Automatically when the temperature drops to a value within the correct range.

Protection	*Trigger*	*Effect*	*Restore*
Over/Under Voltage detects a power supply voltage outside the functioning range.	Low power supply voltage, too high, extra voltages due to BEMF generated by the motor dragged by the load.	- opening of the drive power stages. - switching off of the FAULT LED. - opening of the FAULT output.	Automatically when the voltage re-enters within the correct range.

In the FAULT conditions, every drive operation is interrupted, the power supply to the motor is interrupted, the FAULT output is opened and the FAULT LED is switched off.
When the current in the motor windings is zero, no maintenance torque (Holding Torque) is supplied and the load can drag the motor shaft.

5.2 Input Specifications

Electrical specifications

Input type	CHARACTERISTICS	MIN.	TYP.	MAX.	Unit
+5Vdc NPN/PNP standard digital inputs (EN)	Power supply voltage	4,5	5	5,5	V
	Threshold voltage of switching logic	1,3	/	2,3	V
	current	1,3	17,3	19,5	mA
+5Vdc NPN/PNP fast digital inputs (STEP, DIR)	Power supply voltage	4,5	5	5,5	Vdc
	Threshold voltage of switching logic	2,5	/	3,8	Vdc
	Current	5,5	16	18	mA

5.3 Specifications FAULT output

Electrical specifications

Type	CHARACTERISTICS	MIN.	TYP.	MAX.	Unit
PNP Transistor Output	Power supply voltage Output	19	24	30	V
	Voltage drop on output			0,3	V
	Output current			100	mA

5.4 Timing specifications

Input type	Characteristic		Symbol	LW1D3050N081-00		LW1D3050N081-00		Unit
				MIN.	MAX.	MIN.	MAX.	
NPN/PNP	Fast inputs STEP, DIR (2,4)	Clock pulse width	t_{fastH}	1		2		µs
			t_{fastL}	1		2		µs
		Maximum frequency	F_{fast}		300		200	KHz
	Standard input EN	Clock pulse width	$tstd_H$	150		150		µs
			t_{stdL}	150		150		µs
		Maximum frequency	F_{std}		2		2	KHz
	ENABLE vs. I_{PHASE} Delay time		t1	(1)		(1)		µs
			t2	(1)		(1)		µs
	ENABLE vs. first STEP pulse		t3	500		500		µs
	STEP = DIR Delay Time		t4	1		1		µs
			t5	1		1		µs
	RWC vs. I_{PHASE} Delay time		t6	1		1		s
	CLK_UP vs. CLKDWN (2,3)		t7	3		3		ms
			t8	3		3		ms
Note: refer to timing diagram								

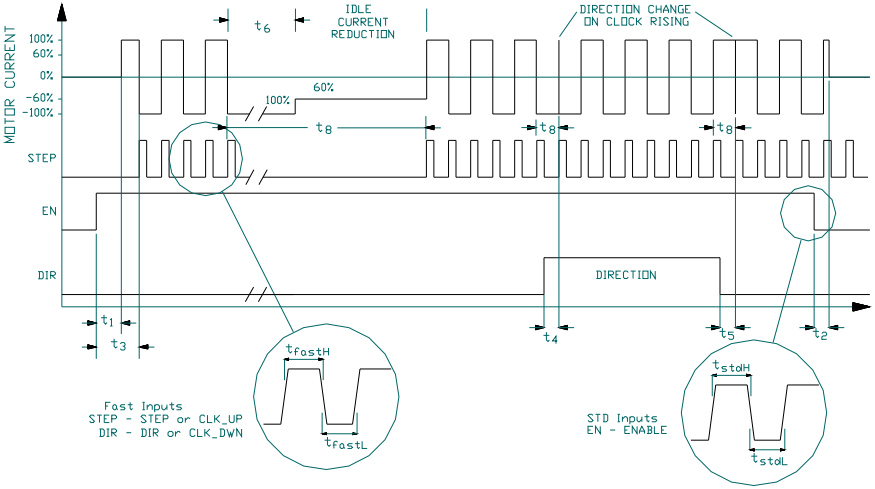
(1) Depending on the inductance of the motor windings, the power supply voltage and the current level which have to be reached. The winding starts after 500µS from the input engagement.

(2) When a clock is applied to the STEP and/or DIR inputs, the initial frequency must be lower then 8 KHz (T>125µsec). Next, the frequency can be increased until the maximum value.

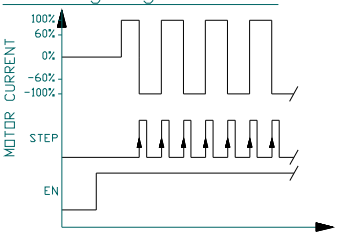
(3) The minimum time between the last active front of a movement and the first active front of the following movement (in the same direction or in the contrary direction) must not be shorter then 3mS.

(4) The maximum applicable frequency of the fast STEP and DIR inputs of the LW1D2042N081-00 drives is <u>200KHz</u>.

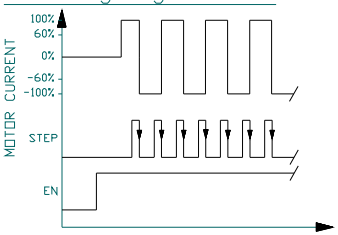
Control Signals Timing



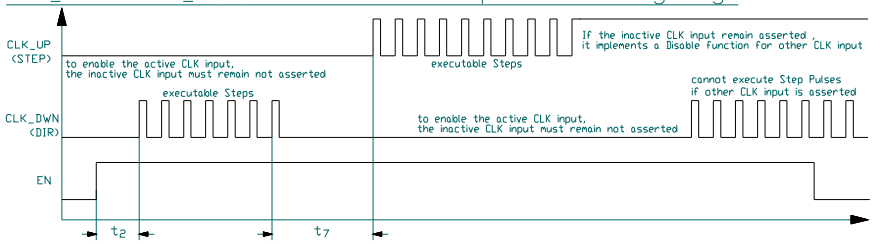
STEP, DIR active inputs on Rising Edge



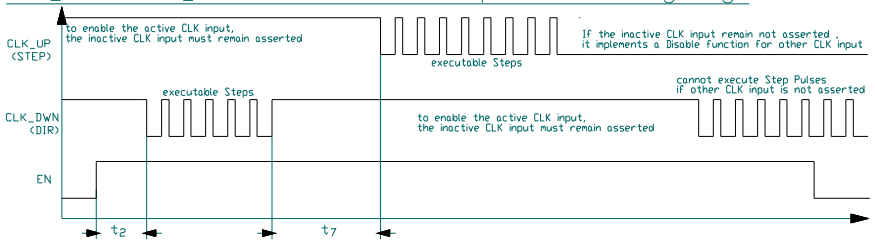
STEP, DIR active inputs on Falling Edge



CLK_UP / CLK_DWN Mode - active Inputs on Rising Edge



CLK_UP / CLK_DWN Mode - active Inputs on Falling Edge



5.5 Mechanical and environmental specifications

	LW1D3050N081-00	LW1D2042N081-00	Unit	Note
Dimensions	120 x 97.5 x 45.5	100 x 74 x 37	mm	Excluding the dimensions of the mating connectors (L x D x H refer to the figures of paragraph ***3.4 Assembling of the drive***)
Weight	500	255	gr	Including the mating connectors
IP protection class	IP20	IP20		
Working temperature	0°C ÷ 50°C	0°C ÷ 50°C	°C	
Storage temperature	0°C ÷ 55°C	0°C ÷ 55°C	°C	
Humidity	0% ÷ 90%	0% ÷ 90%	%	Without condense

5.6 Standards

The EVER drives LW1D____N081-00 have been designed and produced observing the following Directives and Standards:

Directives :	73/23/CE	Low Voltage Material
	89/392/CE	Machines
	89/336/CE	Electromagnetic compatibility
Standards :	EN 61800-3	Variable speed drives – Electromagnetic compatibility and specific testing methods.
	EN 61800-5-1	Variable speed drives – Safety requirements
	EN 60950-1	Information technology equipment – Security.
	EN60204-1	Security of the machine – Electrical equipment of the machines.

The compliance with the Electromagnetic Compatibility directives of the EVER product can only be verified if the entire machine, where from the drive is a component, has been designed and realized in compliance with the requirements for Electromagnetic Compatibility.

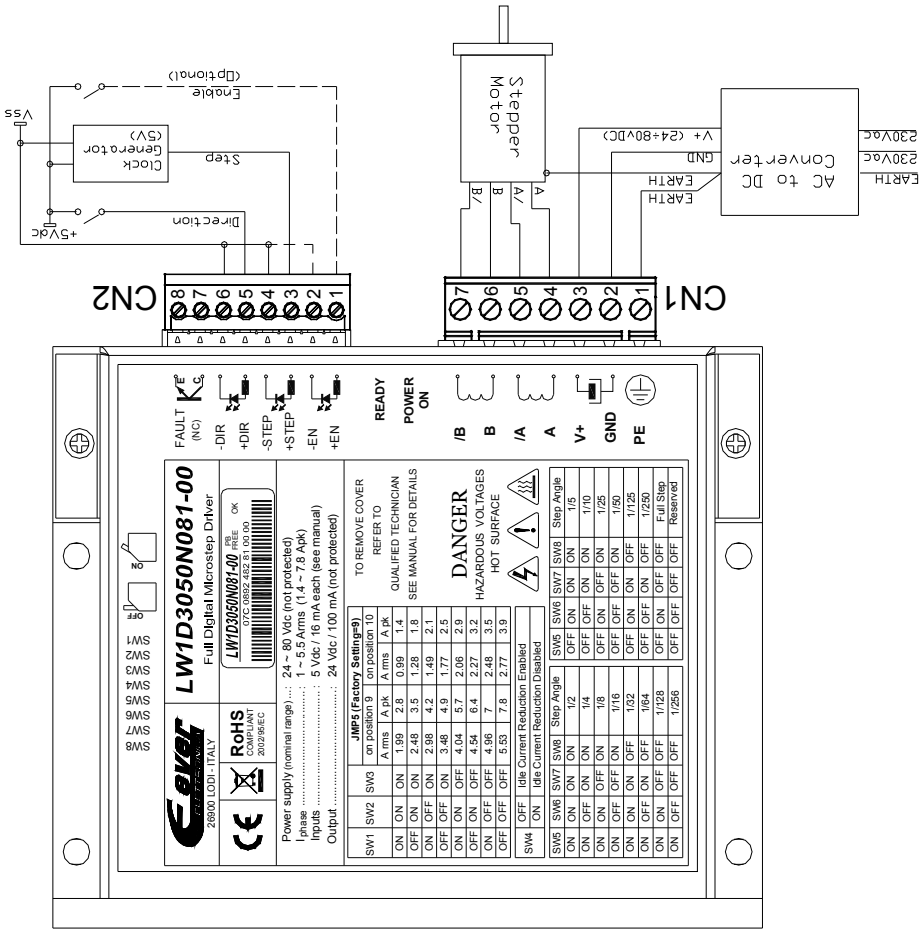
The drive must be installed following the guidelines indicated in chapter ***3 DRIVE INSTALLATION***.

APPENDICES

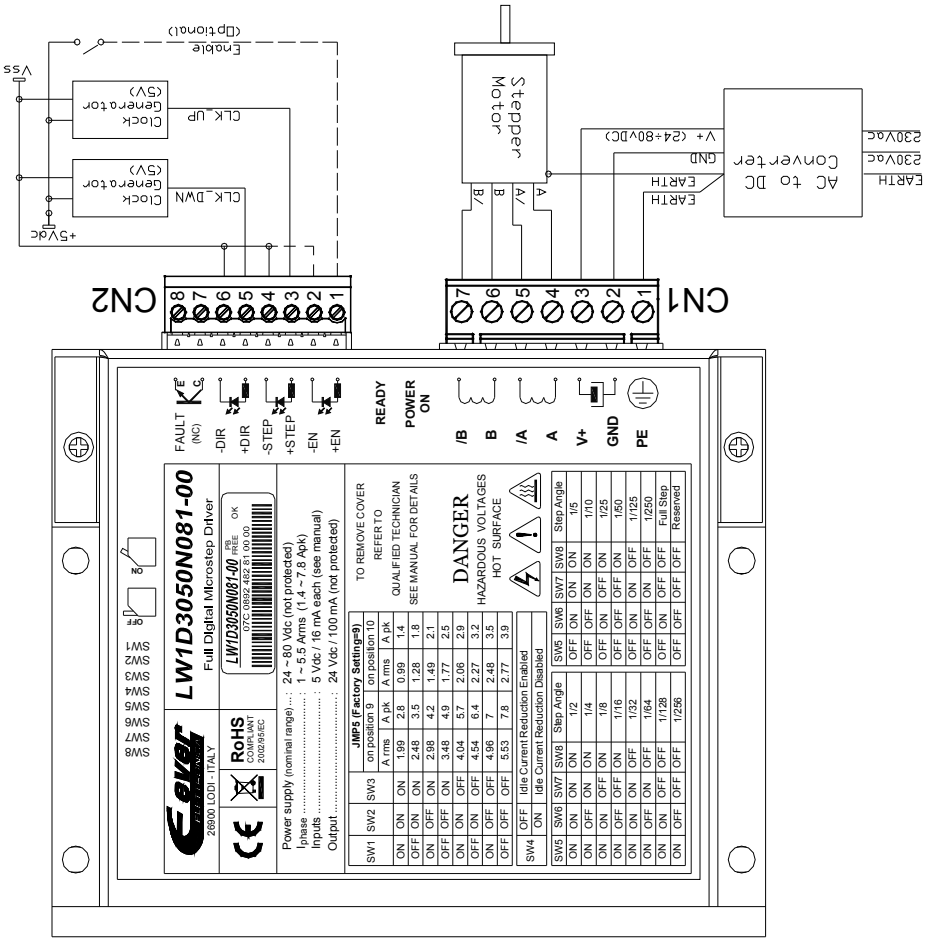
A.1 BASIC CONNECTIONS AND ADJUSTMENTS

The following figures show examples of typical connections.
The displayed connections of drive LW1D3050N081-00 are also applicable to drive LW1D2042N081-00 except for the earthing connection (see paragraph ***3.5 Drive connections***) .

A.1.1 Step / Direction – Basic connections



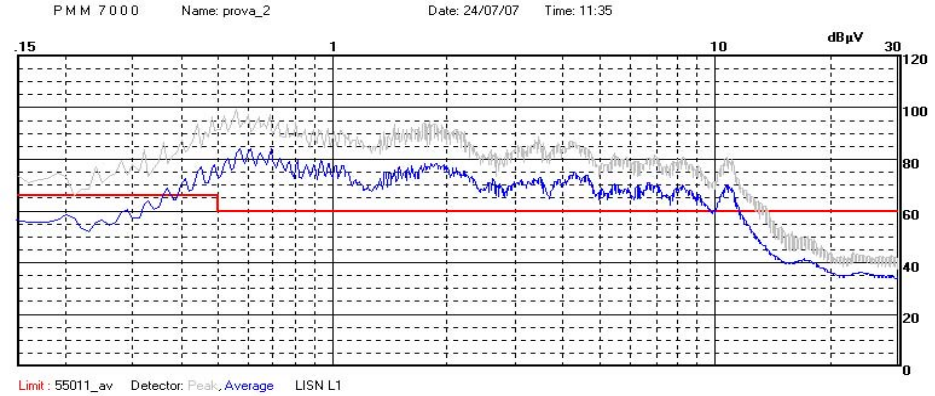
A.1.2 CLK_UP / CLK_DWN – Basic connections



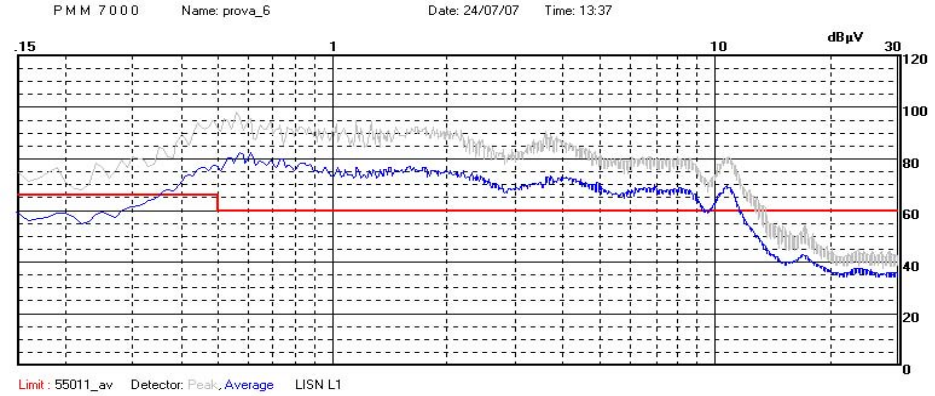
A.2 TEST CONDUCTED EMISSIONS

TEST EMISSIONS OF 24/07/2007
TEST EQUIPMENT (LISN) : brand PMM – mod. 7000 – sn 3210J60803
NETWORK FILTER: NOT PRESENT
CABLE 230VAC --> ISOLATION TRANSFORMER 230-->230 : 1.5 m.
CABLE TRANSFORMER--> LISN : 3.9 m. NOT shielded
CABLE LISN--> POWER SUPPLY : 2.0 m. not shielded.
CABLE POWER SUPPLY - EUT : 2.0 m. not shielded with protective earthing (PE).
POWER SUPPLY : 65Vdc (linear power supply).
EUT : STEPPER DRIVER LW1D3050N081-00
CABLE MOTOR : 3.2 m. shielded with protective earthing motor and braided cable on clamp power supply connector
FUNCTIONING :CONTINUOUS FULL STEP MOVEMENT OF 500Hz AND IF=5.53A DRIVE COMMANDED BY MEANS OF CK AND DIR

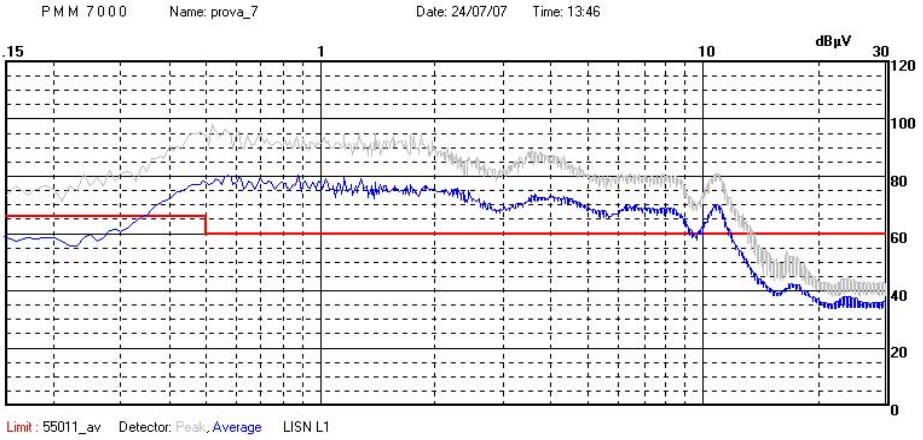
FULL STEP CK=500Hz IF=5.53A V+=65VDC
MOTOR BODY AND SHIELD MOTOR CABLE CONNECTED TO PE TERMINAL
AVERAGE MEASURES – 55011_av



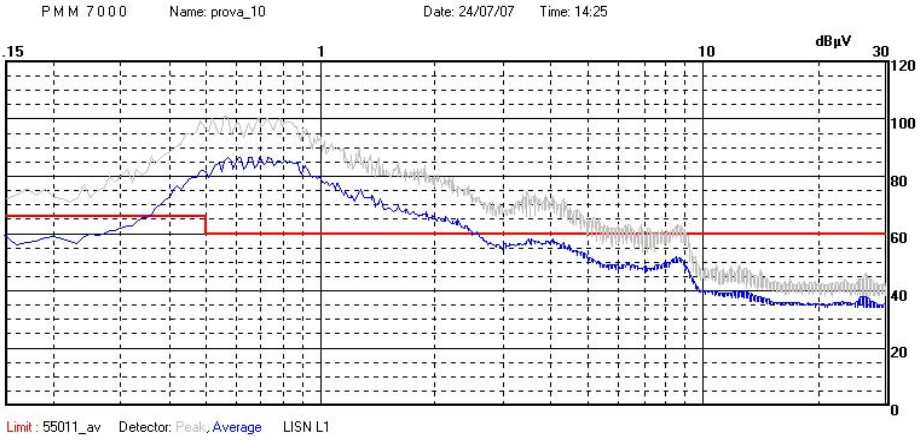
1/32 STEP CK=500Hz IF=5.53A V+=65VDC
MOTOR BODY AND SHIELD MOTOR CABLE CONNECTED TO PE TERMINAL
AVERAGE MEASURES - 55011_av



1/128 STEP CK=500Hz IF=5.53A V+=65VDC
MOTOR BODY AND SHIELD MOTOR CABLE CONNECTED TO PE TERMINAL
AVERAGE MEASURES - 55011_av

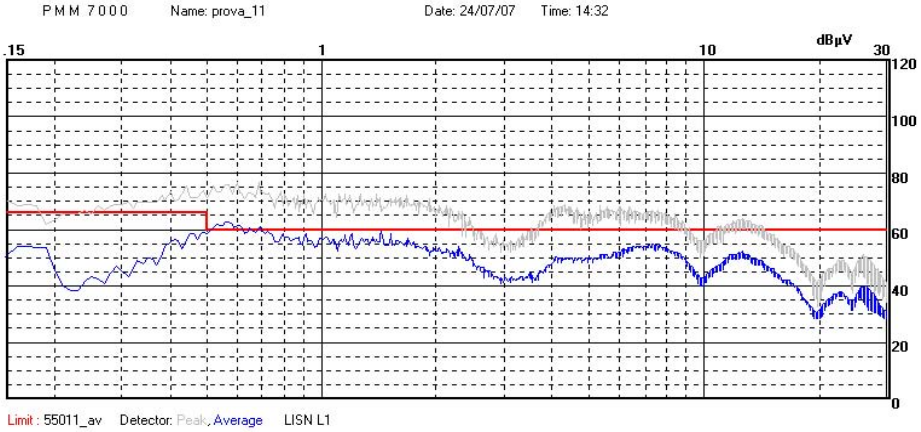


1/32 STEP CK=500Hz IF=5.53A V+=65VDC
MOTOR BODY AND SHIELD MOTOR CABLE CONNECTED TO PE TERMINAL OF THE DRIVE.
WIRES MOTOR PHASES WINDED WITH 2 WINDINGS IN THE SAME TOROID.
AVERAGE MEASURES – 55011_av



1/32 STEP CK=500Hz IF=5.53A V+=65VDC
MOTOR BODY AND SHIELD MOTOR CABLE CONNECTED TO PE TERMINAL OF THE DRIVE.
WIRES MOTOR PHASES WINDED WITH 2 WINDINGS IN THE SAME TOROID NEAR THE DRIVE.
EARTHING WIRE PASSING THROUGH A TOROID WITH 18 WINDINGS NEAR THE DRIVE

AVERAGE MEASURES - 55011_av



1/32 STEP CK=500Hz IF=5.53A V+=65VDC
MOTOR BODY AND SHIELD MOTOR CABLE CONNECTED TO PE TERMINAL OF THE DRIVE.
EARTHING WIRE PASSING THROUGH A TOROID WITH 18 WINDINGS NEAR THE DRIVE

QUASI PEAK MEASURES – 55011_qp