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VVVF INVERTER FOR DOORS

CONVERTÜR-03

Convertür-03 Ver.01-English

This manual corresponds to the product detailed as follows:

Product - P/N	Convertür & Convertür/C
Hardware version	04
Software version	30
Issued date	08/06/06

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This technical information has been elaborated, written and revised in an endeavour to obtain absolute precision and simplification. If, in spite of this, you should find any lack of precision or detail which could contribute to the improvement of the product or its documentation, we would appreciate your letting us know.

Your contribution will be well received.



0. Safety

Check the following safety instructions in order to avoid and prevent damage to this product, to related products or to personnel.

Only qualified personnel are authorised to carry out operations with this material.

Whilst using this product, you may need to have access to other components of the system. Read the General Safety Summary of the manuals of those components to ensure the necessary precautions are taken.

0.1 Precautions: Personal Injury

Do not work on electrical parts of apparatus subjected to supply voltage.

To avoid electrical discharges, the components of this product should not be handled with the apparatus subjected to a supply voltage and should never be connected to the power without their protective casings.

Some parts of the equipment remain charged even when the supply has been disconnected. Do not handle the equipment until at least 10 minutes after the indicators have been shut off.

Before carrying out any movement on the input, output or any of the control or safety components, make sure that there is no-one who could be affected by the movement of the door or any of the components which could come into movement.

0.2 Precautions; Product Damage

Do not plug or unplug cards or other electronic components with the power connected.

Always ground the inverter case. The grounding method must comply with the laws of the country where the inverter is being installed.

Do not use insulation testers.

The insulation meters work with very high voltages, capable of destroying the semi-conductors. Never use "Megger" type testers on the electronic apparatus.

Do not install the controller near to heat sources, strong vibrations or high humidity which exceed the technical specifications.





Check that the electronic controller works free from vibrations in excess of the maximum levels specified, which could damage its integrity or disconnect its contacts. It should work without humidity and within the range of temperatures detailed in the technical specifications.

WARNING!

This product incorporates a protection against over-voltage up to 400 Vac. In order to guarantee the protection, the input fuse should be type GAGED 3.15 A.

0.3 Safety Terms and Symbols

The following symbols could appear on the product or its documentation.

			
DANGER High Voltage	Ground Protection	ATTENTION See manual	Double Insulation

Consult product specifications for IEC installation category and safety classification.

1. Components

The frequency variation module for automatic doors consists of the following components:

- **AC Motor + encoder**
- **Variable voltage variable frequency inverter (VVVF)**

The frequency variation module can also include a **portable programming console** to modify the regulation parameters for opening and closing the automatic doors, even though it has an **integrated programming console**.

2. Characteristics

The frequency variation module allows **regulation of the opening and closing of the automatic doors** supplying up to 250 W and allows the door to reach speeds of around 1 m/s. The module also allows the **detection of obstacles during the door closing** and the automatic reopening of the doors.

3. Standards

The frequency variation module design for automatic doors complies with the following Standards:

EMISSIONS	EN 50081-1	
	EN 55022	Conducted and radiated disturbances
	EN 61000-3-2	Harmonics
	EN 61000-3-3	Voltage fluctuations
IMMUNITY	EN 50082-1	
	EN 61000-4-2	ESD
	EN 61000-4-3	Radiated immunity
	EN 61000-4-4	Fast transient
	EN 61000-4-6	Conducted immunity
	EN 61000-4-8	Radiated immunity 50Hz
	EN 61000-4-5	Shockwave
	EN 61000-4-11	Drops and supply interruptions

table 3.1

4. Installation and wiring

The connections between the different components will be made as shown in figure 4.1.

Connect the ground correctly in the installation to avoid dysfunction in the equipment.

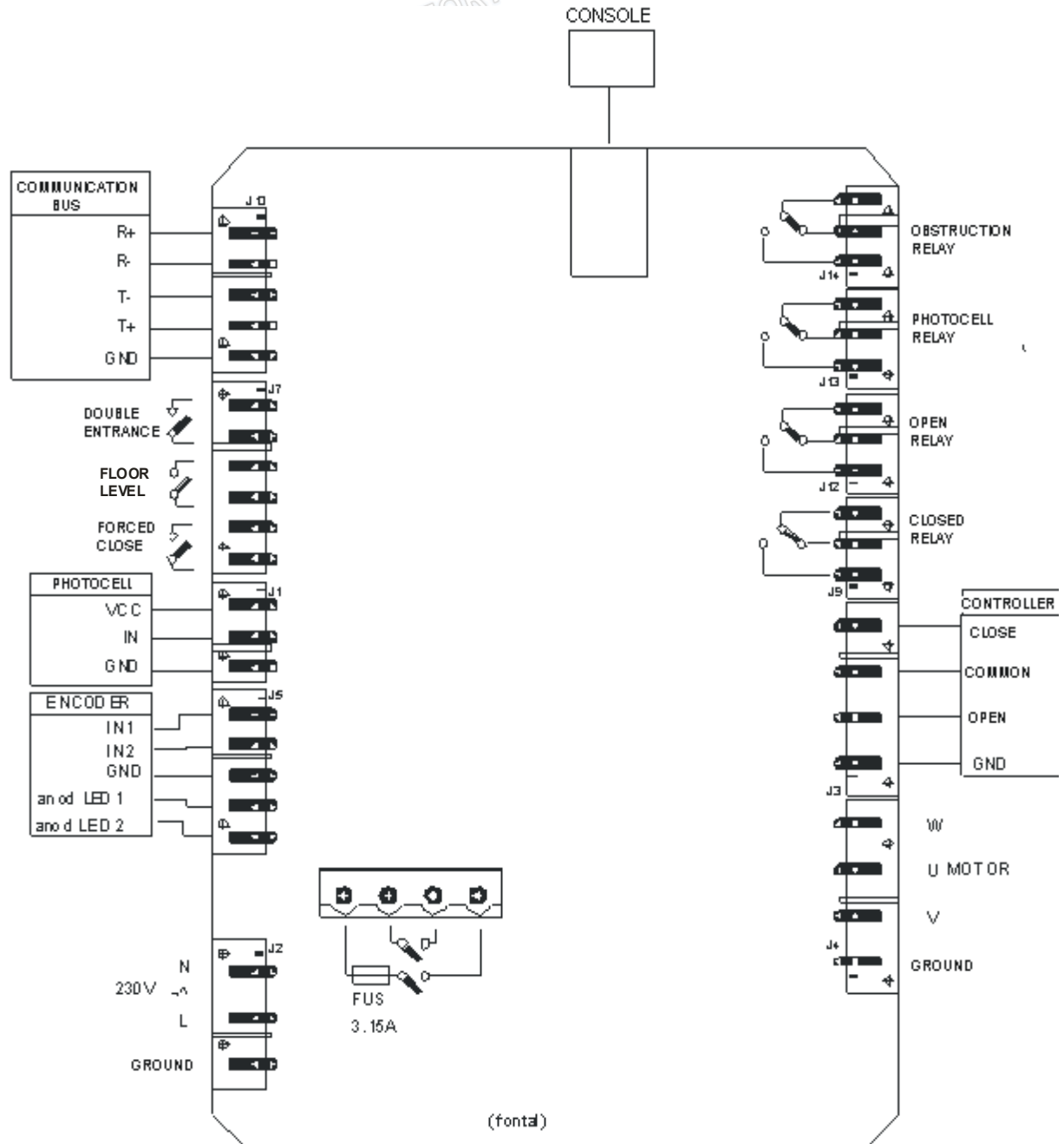


figure 4.1

The frequency variation module allows the detection of obstacles during the closing of the doors producing the automatic reopening of them.

It is also possible to connect additional devices to detect the obstacles (photocells).

The description of each connecting terminal is shown in **table 4.1**, as well as the required signal level.

J1 Photocell	1	Input 24Vdc \pm 10% (Opt isolated)
	2	Photocell Input (Opt isolated)
	3	GND (Opt isolated)
J2 Input Supply	1	230 Vrms +5% , -10% 50-60 Hz
	2	230 Vrms +5% , - 10% 50-60 Hz
	3	Ground
J3 Input Control Panel	4	Close. From 24V to 240V AC or DC
	3	Common controller.
	2	Opening. From 24V to 240V AC or DC
	1	GND (Opt isolated)
J5 Encoder Input Motor	1	Encoder diode anode. Maximum 15mA (Opt isolated)
	2	Encoder diode anode. Maximum 15mA (Opt isolated)
	3	GND. Common encoder. (Opt isolated)
	4	Encoder transistor collector. 15Vcc \pm 10% (Opt isolated)
	5	Encoder transistor collector. 15Vcc \pm 10% (Opt isolated)
J7 Auxiliary Input	1	GND (Opt isolated)
	2	Double entrance. Free voltage contact (Opt isolated)
	3	GND (Optoisolated)
	4	Lift at floor level Free voltage contact (Opt isolated)
	5	GND (Opt isolated)
	6	Forced closing. Free voltage contact (Opt isolated)
J9 Closed door relay	3	Common. Free voltage contact (max. 3A, 250V)
	2	NC. Free voltage contact (max. 3A, 250V)
	1	NA/NO Free voltage contact (max. 3A, 250V).
J12 Open door relay	3	Common. Free voltage contact (max. 3A, 250V)
	2	NC. Free voltage contact (max. 3A, 250V)
	1	NA/NO Free voltage contact (max. 3A, 250V).
J13 Photocell relay	3	Common. Free voltage contact (max. 8A, 250V)
	2	NC. Free voltage contact (max. 8A, 250V)
	1	NA/NO Free voltage contact (max. 8A, 250V).
J14 Obstruction relay	3	Common. Free voltage contact (max. 8A, 250V)
	2	NC. Free voltage contact (max. 8A, 250V)
	1	NA/NO Free voltage contact (max. 8A, 250V).
J8 I/O Console		5Vcc \pm 5% (No aislado)
J4 Output motor	4	Output 0-230 Vrms, 1-100Hz, max. 0.5 A
	3	Output 0-230 Vrms, 1-100Hz, max. 0.5 A
	2	Output 0-230 Vrms, 1-100Hz, max. 0.5 A
	1	Ground

table 4.1

4.1 Photocell or photoelectric barrier installation

Even though the frequency variation module incorporates an obstacle detection system, it also allows the connection of other additional devices such as photocells or photoelectric barriers.

There are two ways of connecting the photocell.

4.1.1 Connection of the photocell to the control panel:

-Connect any type of photocell to the control panel so that the reopening of the door is produced by an open order from the control panel to the inverter.

-In the same way, connect the obstruction terminals corresponding to the connector terminal J14 to the control panel. This which will act in case of reopening due to an obstacle. (figure 4.2).

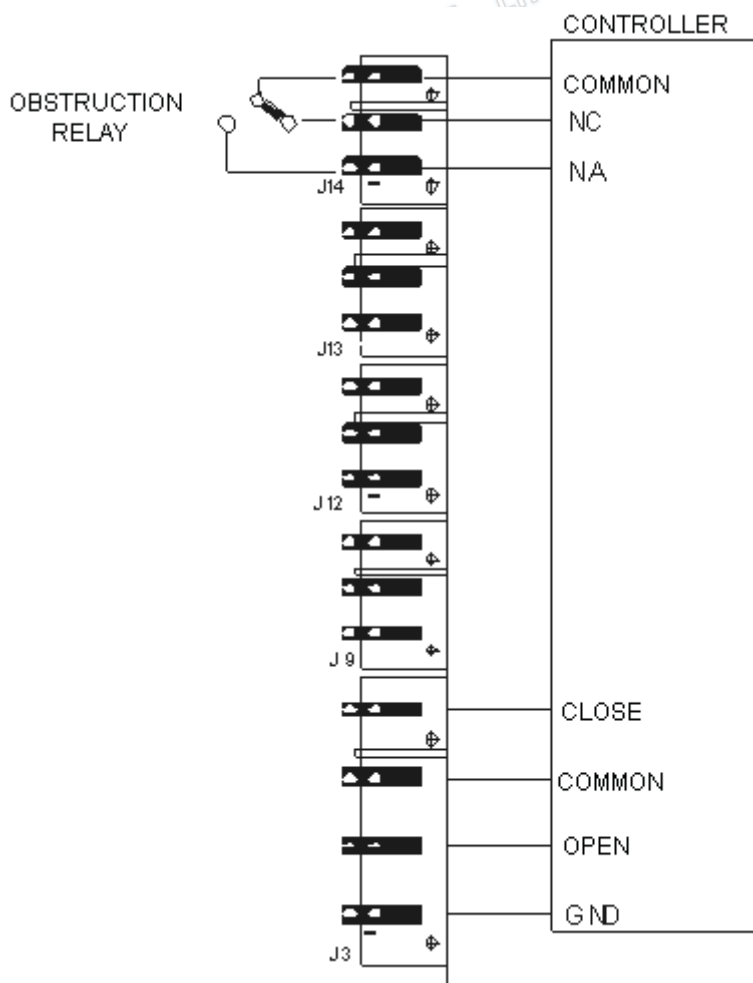


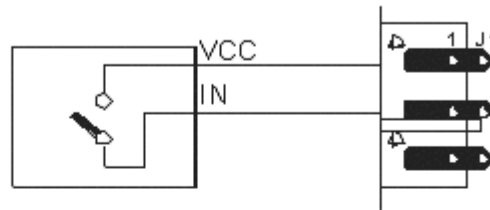
figure 4.2

4.1.2 Connection of the photocell to the inverter (figure 4.3):

-Connect the photocell to the inverter so that the reopening is produced by a reopening order from the photocell to the inverter. In this case, the photocell must be connected between the terminals marked as VCC, IN y GND in connector J1.

Two possibilities exist a) y b) according to the type of photocell

a) Potential-free contact



b) Photo-electric barrier

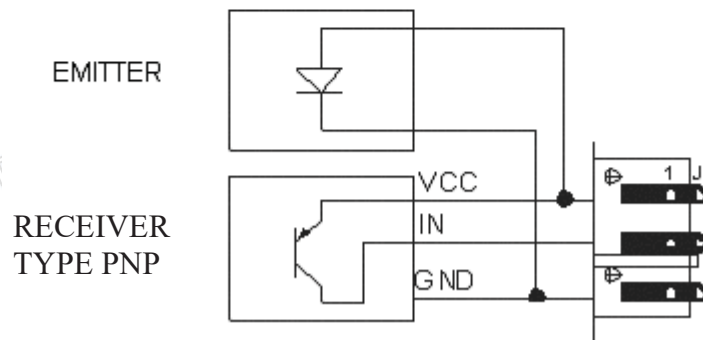


figure 4.3

-In either of these two cases the inverter will commute the photocell contact of the J13 connector (figure 4.4) which we will connect to the control panel in order for it recognize the reopening order and avoid possible time conflicts between the control panel and the inverter.

-Connect the obstruction signal corresponding to the connector terminal J14 to the control panel so that it acts in case of reopening produced by an obstacle (figure 4.2).

-If the control panel has only one input to indicate reopening, then the independent signals for OBSTRUCTION (J14) and PHOTOCCELL (J13) should be connected in parallel.

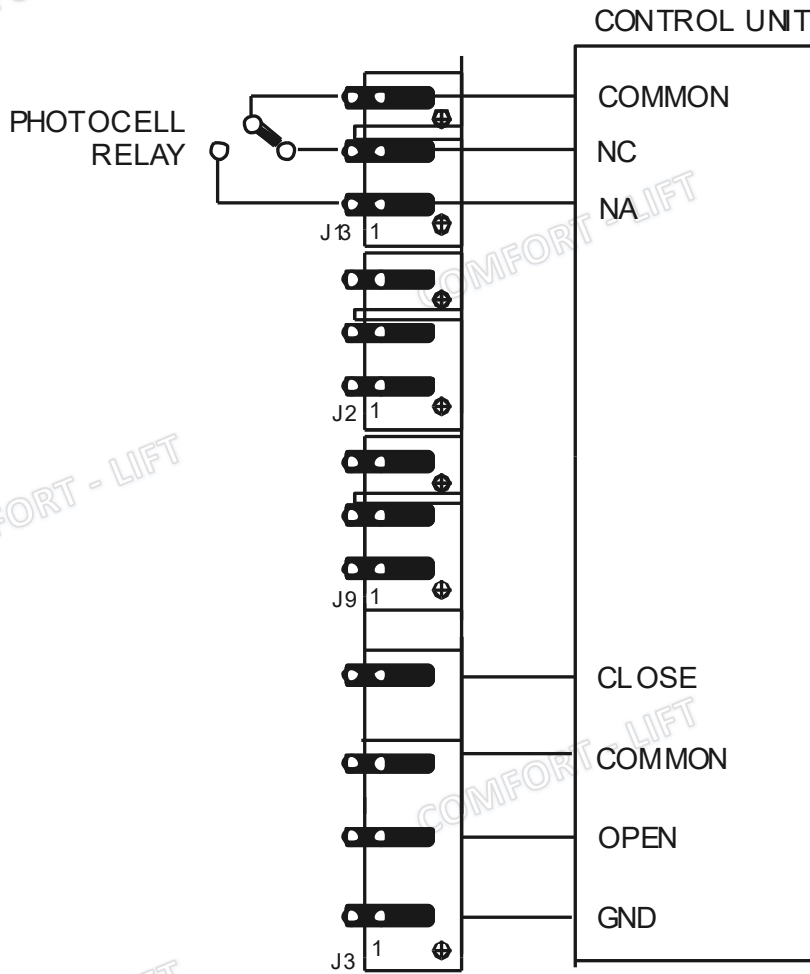


figure 4.4

-For the connection of a photocell barrier (type b), we recommend the connection of a button-type photocell. Check the connection with figure 4.5

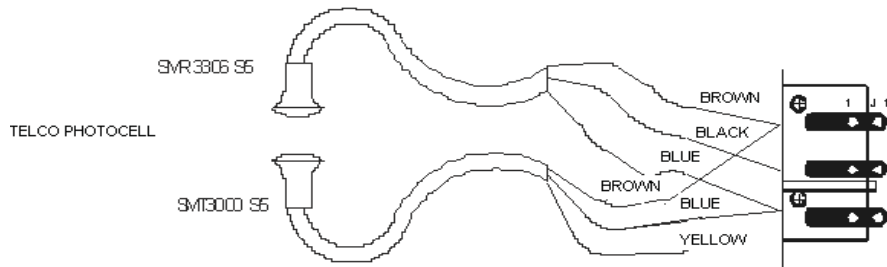
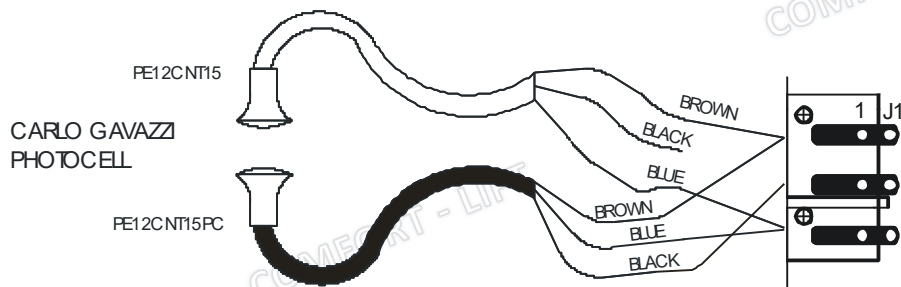


figure 4.5



4.2 Auxiliary Inputs

In connector J7 we have auxiliary inputs which give characteristics to the frequency variation module which, in some cases, can be very useful (figure 4.6).

- **Double entrance / boarding:** When this contact is closed (potential-free), the inverter does not recognise the OPEN or PHOTOCCELL signals. This is very important for lifts with double and/or triple entrances when the control panel cannot control in an independent way.
- **Floor level:** When this contact is closed (free of potential), the inverter interprets that the lift is at floor level and will give the order to the OPENTÜR (external emergency feeder) to carry out the opening manoeuvre in case of lack of current by way of a 12V battery capable of giving current during 60 seconds, sufficient to rescue passengers.
- **Forced closing:** This entrance allows us to force the closing of the door at slow speed, ignoring the state of the photocell and the control signals. It is devised to work with fire detection centres.

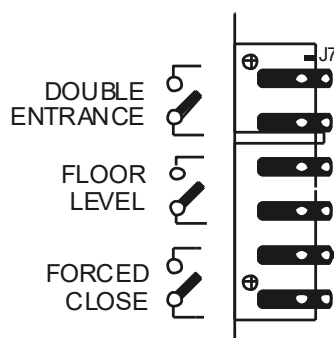


figure 4.6

4.3 Control inputs

Control inputs are those signals which produce the opening or closing of the door. These inputs are multi-voltage, that is that any voltage can be connected between 24 and 240

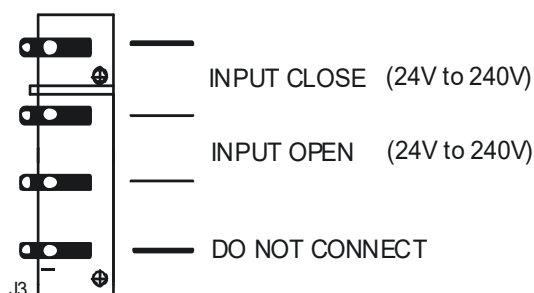


figure 4.7

If we have potential-free orders, the connection to the inverter could be carried out according to figure 4.8.

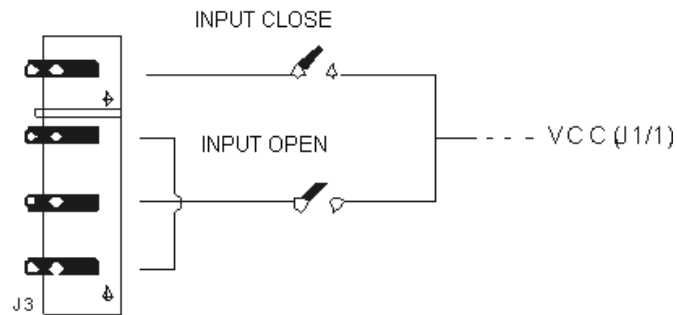


figure 4.8

4.4 Auxiliary outputs

In connectors J12 y J9 exist commuted and potential-free output contacts denominated **open door** and **closed door** respectively.

- **Door open:** This contact will only commute when the door is completely open. Whilst the door is in the open stage, it will be in repose (figure 4.9).
- **Door closed:** This contact will only commute when the door is completely closed. Whilst the door is in the closed stage, it will be in repose (figure 4.9).

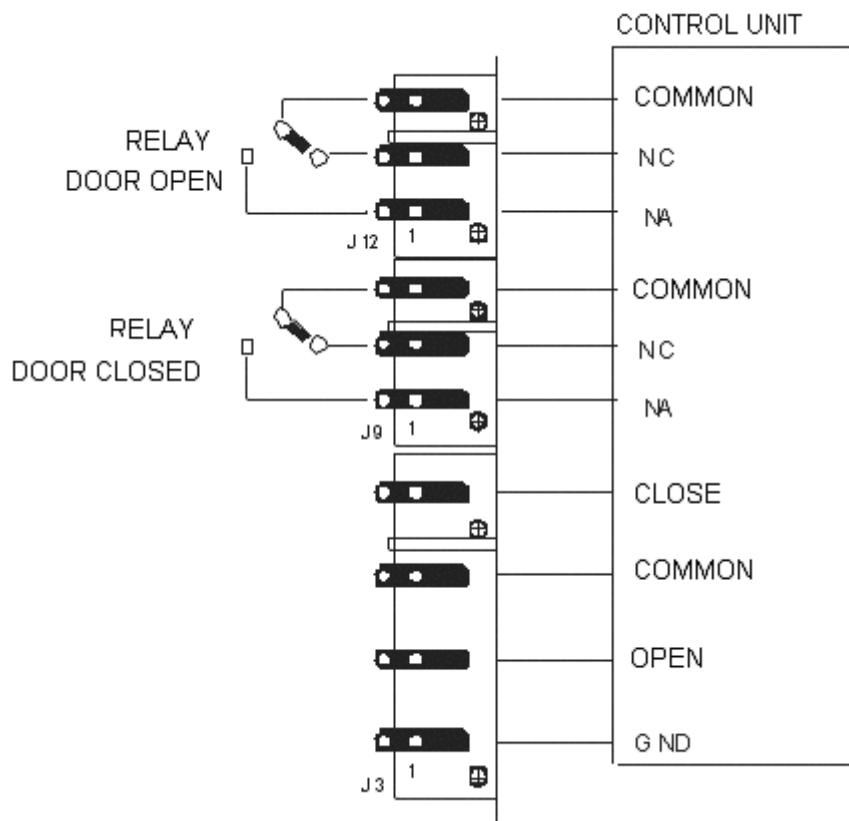


figure 4.9

4.5 Encoder

The motor incorporates an encoder at the back. This provides the necessary information to the frequency variation module of where the door can be located at all times. The connection of this element to the inverter can be seen in figure 4.10.

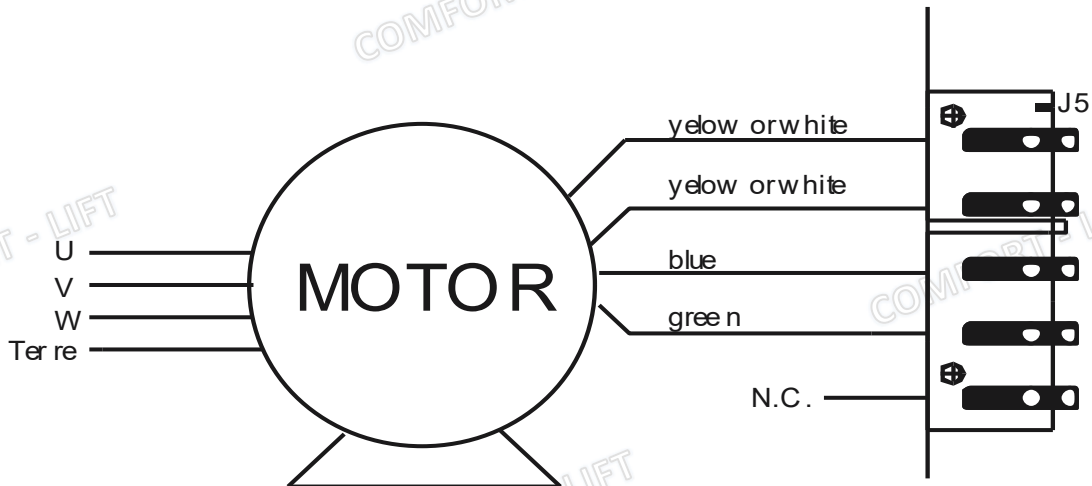


figure 4.10

4.6 Communication Bus

The frequency variation module **convertür** has a version which works by way of a **communication bus**. It is called **convertür/c**. By way of connector J10, it is connected to the control unit (figure 4.11) and thanks to the communications protocol, the control unit sends the necessary information to the inverter for its correct operation.

This version is available for the operation of the Autür (**Twister®**) and is supplied without the connectors J3, J13 and J14.

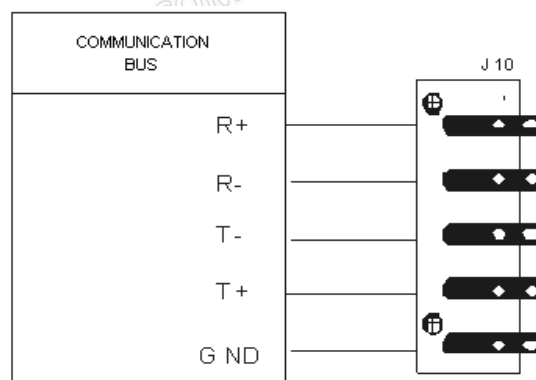
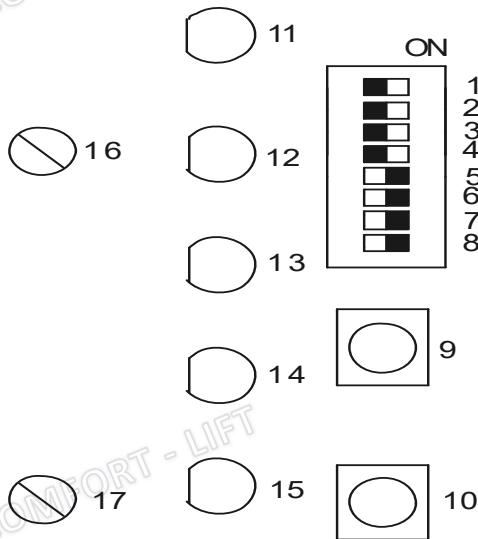


figure 4.11

5 Start-up

Once the installation has been carried out and the mechanical parts which comprise the car and landing doors have been adjusted and correctly connected, the frequency variation module, according to the indications in the previous chapter, will follow this procedure:

- 1-** When the doors are half-way, switch on the inverter with the **switch ON/OFF**. On carrying out this operation, all of the inverter LEDs will progressively light up. The inverter will remain in repose until it receives an order to open or close and will not make any movement until then.
- 2-** Press the push-button marked "**Start**" for a few seconds until the inverter recognises the clear opening of the installed door. On pressing "**Start**", the doors should open; afterwards a slight movement of close and open will be made and finally the door will close in a constant speed and torque.
If the push-buttons "**Start**" and "**Test**" are pressed simultaneously, at the end of the recognition, the system will charge the values of the right parameters, in general, in accordance with the door in question. It is essential that this is done the first time that the system is connected. In this way the most adequate values will be acquired for the correct operation without the need to use the programming console.
- 3-** Press the push-button marked "**Test**" in order to check that the opening and closing are being carried out in a satisfactory manner.
- 4-** Should it be that the regulation of the opening and closing of the door were not satisfactory, then the inverter permits the adjustment of all of the values by way of the portable programming console (see chapter 6.2.1) or by way of the integrated console in the inverter itself with the micro-switches 5, 6, 7 y 8 (see chapter 6.2.2).

**Micro-switches :**

1- Control unit with one or two inputs. In position ON, with voltage in CLOSE the door closes, without voltage the door opens (CAM signal).

In position OFF, the inverter will open the doors when there is voltage in the input OPEN and will close the doors when there is voltage in the input CLOSE

2- Turning direction of the motor. This selector activates the reverse movement of two phases.

(previous versions)

2015 versions → The Convertur-03.15 frequency converter, is set to open door on left.

To change the direction of rotation of the motor (change of direction of the door opening) need to change the power supply phases of the motor connector J4 exchanging positions W (red cable) and U (black cable).

For the change of direction of rotation already not be used the switch No. 2 indicated to do so

3- In position OFF it is as SEMI-AUTOMATIC DOORS and in ON as AUTOMATIC.

4- In position OFF it is as SLAVE MODE and in ON as INTELLIGENT MODE.

5, 6, 7 y 8- Programming console (see chapter **6.2 Modifying parameters**).

Push-buttons :

9- Test push-button: permits the opening and closing of the door from the inverter.

10- Start push-button: allows to register the clear opening of the door to be regulated (and reset all of the parameters, if pressed together with "Test").

Leds:

11- On: led lights up when the inverter is connected. Intermittent in case of alarm.

12- Open: led blinks rapidly whilst the door is opening; fixed light led when the door is open (switch 3 in OFF: SEMI-AUTOMATIC DOORS); led blinks slowly when the door is open (switch 3 in ON: AUTOMATIC DOORS).

13- Closed: led blinks rapidly whilst the door is closing; led blinks slowly when the door is closed.

14- Photocell: led lights up when the photocell detects an obstacle.

15- Reopening: led lights up when door reopens upon detection of an obstacle during closure.

Potentiometers:

16- Console adjustment: Potentiometer to regulate the parameters of the frequency variation module.

17- Sensitivity: Potentiometer to regulate the sensitivity of the reopening of the door.

6. Programming of parameters

6.1 Variable parameters

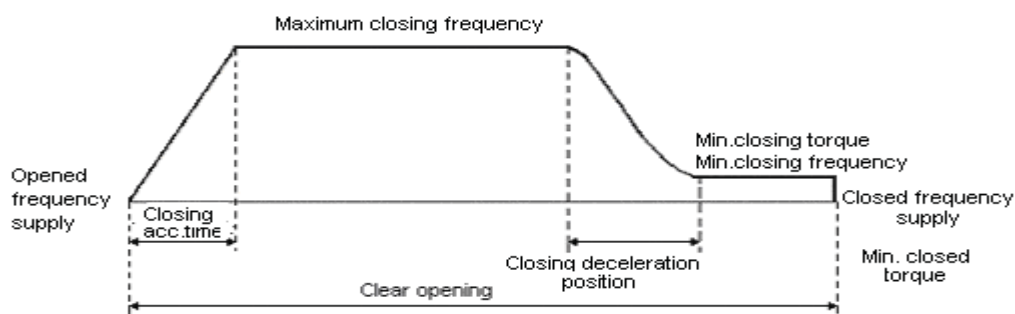
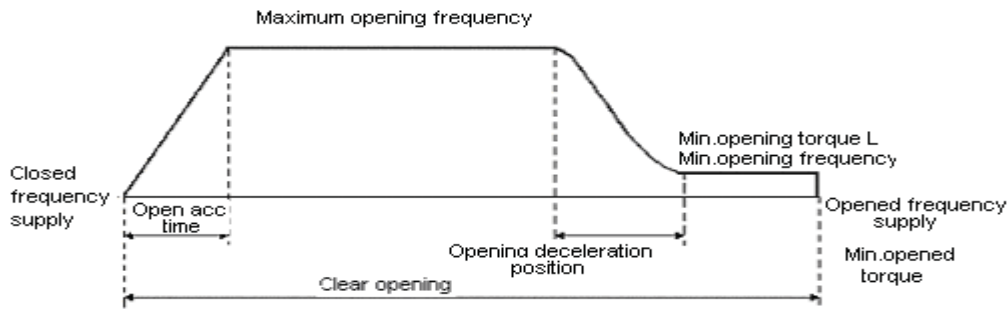
The VVVF inverter arranges some parameters by default for the adjustment of the opening and closing of the automatic doors depending on the clear opening. Some of these parameters can be adjusted without programming, (see previous chapter). However, all of the inverter parameters which intervene in the adjustment can be modified with a portable console.

The variable parameters and their designation in the screen of the console are as follows:

- Fast open freq:** Motor frequency supply when the door is opening at maximum speed.
- Slow open freq:** Motor frequency supply when the door is opening at minimum speed.
- Opened fr supply:** Motor frequency supply when the door is opened to overcome the force of the retrieval spring (which tends to close the door).
- Fast close freq:** Motor frequency supply when the door is closing at maximum speed.
- Slow close freq:** Motor frequency supply when the door is closing at minimum speed.
- Closed fr supply:** Motor frequency supply when the door is closed (if the motor supply is kept when the door is closed).
- Min open torque:** The percentage of the maximum motor torque supplied when the door is opening at minimum speed.
- **Min close torque:** The percentage of the maximum motor torque supplied when the door is closing at minimum speed.
- **Min opened torque:** The percentage of the maximum motor torque supplied when the door is opened.
- **Min closed torque:** The percentage of the maximum motor torque supplied when the door is closed
- Open accel time1:** Time required to unlock latch. The value in this parameter must be divided into 50 in order to know the real value in seconds since the door is closed until the latch is

totally unlocked. The value is very practical to avoid the initial hit when setting a very high acceleration time on the opening.

- **Open accel time2:** Time, in fractions of a second, in which the motor passes from the frequency supply when the latch is totally unlocked to the frequency supply when the door opens at maximum speed.
- **Close accel time:** Time, in fractions of a second, in which the motor frequency supply passes from the opened frequency supply to the maximum closing frequency.
- **Open decel pos:** Distance in millimeters starting from Door Open to where the deceleration begins whilst opening.
- **Close decel pos:** Distance in millimeters starting from Door Closed to where the deceleration begins whilst closing.
- **1=ESP 2=FR 3=ENG:** Language change.
- **Automat measure:** Measurement of the door clear opening. Remember that this distance will be half when the automatic doors are central. This measurement will be adjusted automatically after having performed the Start-up.



6.2 Modifying parameters

By default the language of the programming console will be Spanish. In order to change it, enter in parameters and look for the section 1=ESP 2=FR 3=ENG and set the number corresponding to the preferred language (ESP= Spanish, FR= French, ENG= English)

It is important to wait for the motor to reach its working temperature (after approximately 3 hours working) before modifying any of the regulation parameters because the motor torque can lightly vary with temperature and this can affect the regulation carried out with a cold motor.

To modify any of the regulation parameters, the door must be totally closed or totally open.

There are two ways to modify the parameters:

6.2.1 Portable programming console.

Once inside the menu for modifying parameters, the commands for open, close and test do not work. In order for them to work it will NOT be necessary to disconnect the console, simply push the OFF button.

Figure 6.1 shows the front of the portable programming console. The procedure to follow to modify any of the regulation parameters is the following:

- 1- Connect the console to the VVVF Inverter.
- 2- With the inverter connected, press ON to establish communication.
- 3- With the arrows, select the parameter to be modified.
- 4- Modify the parameter using + / -.
- 5- Press OFF to record the new parameter value.
- 6- Disconnect the console from the VVVF Inverter (when finalised).

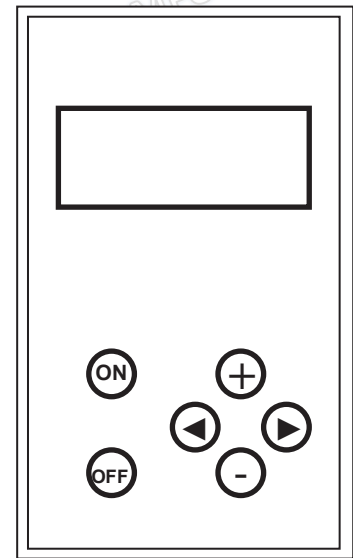
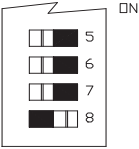
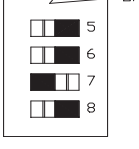

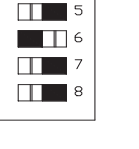
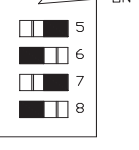
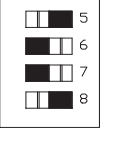
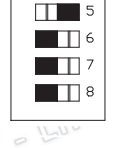
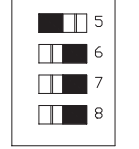
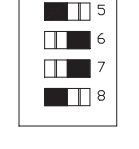


figure 6.1

6.2.2 Integrated programming console.

By way of the micro-switches 5, 6, 7 y 8 up to a maximum of 15 values can be modified through a simple system of binary coding (see table 6.2).

Micro-switches	Value to modify	Modifying range
	OFF	

	Fast opening frequency	20-50 Hz
	Slow opening frequency	1-8 Hz
	Opened frequency supply	5-20 Hz
	Fast closing frequency	20-50 Hz
	Slow closing frequency	1-8 Hz
	Closed frequency supply	3-10 Hz
	Minimum opening torque	10-40% V
	Minimum closing torque	10-40% V
	Minimum closed	10-20% V

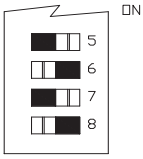


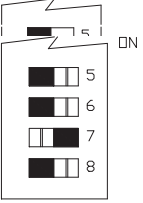
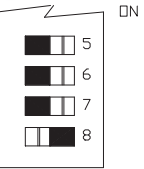
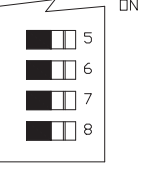
	torque	
	Minimum opened torque	5-15% V
	Opening acceleration time 1	0-300 seg.
	Opening acceleration time 2	2-15 seg.
	Closing acceleration time	2-15 seg.
	Opening deceleration position	200-500 mm
	Closing deceleration position	200-500 mm

table 6.2

The procedure to follow to modify any of the regulation parameters is the following:

- 1- Set the sequence of the parameter micro-switches to be modified.

2- With the “**console adjustment**” (n° 16) of the potentiometer, adjust the parameter value bearing in mind that all LEDs switched off will be the minimum value and all the LEDs switched on will be the maximum value

3- Press the key “**start**” to record the selected value. The LEDs will flash in confirmation.

4- Press the key “**test**” to check the results. If this is not satisfactory then return to chapter 2 and begin the procedure again.

5- When the result of the adjustment is satisfactory, set all of the micro-switches again in the OFF position and automatically the new values will be registered. The inverter will then be in the normal mode for operation with the control unit.

NOTE: Whilst in the programming mode, the inverter will take no notice of the external signals of open and close doors.

7. Problems and Breakdowns

Explained next are some of the problems that can arise during the handling and operation of the frequency variation module.

1- If the LEDs do not light up when connecting the VVVF inverter with the **ON/OFF switch**, probably the no current reaches the VVVF inverter. Check the fuse.

2- If the door does not open but closes when pressing **“Start”**, disconnect the inverter and change the position of the micro-switch no. 2 marked **“motor turning direction”**.

3- Pressing **“Start”**, the doors should open completely; afterwards a brief movement of opening and closing will be done. This movement is normal and does not correspond to any wrong function of the device but simply verifies that the motor turning direction corresponds with the reading direction of the encoder, finishing with the complete closure of the doors.

4- If any of the LEDs marked ON, PHOTOCCELL and/or REOPENING flash, this indicates that some type of anomaly has occurred. Check with the following table:

LEDs	ON	Open	Close	Photocell	Re-opening	Stop Door	Reset
ALARMS							
Encoder (working)					X	NO	Push-button
Encoder (initiating)	X	X				SI	NO
Time-out open	X					NO	Inputs Control Unit
Internal Test Memory				X		NO	Automatic
Internal Test Supply	X		X			SI	Automatic
Insufficient Voltage	X				X	SI	Automatic
Motor Lineal Over current	X			X		SI	Timer 3 tries
Motor Lineal Short-circuit	X			X	X	SI	Timer 3 tries

8. Software version

¡ VERY IMPORTANT!

This model of inverter has two different software versions incorporated according to the motor model used in the operator:

- * VERTICAL MOTOR (working at 1500 rpm)
- * HORIZONTAL MOTOR (working at 500 rpm)

According to the need, we must configure the switch shown in the drawing:

- * Switch ON (software for 1500 rpm)
- * Switch OFF (software for 500 rpm)

This switch comes configured from factory. Only in the case of substitution by defect of the CONVERTÜR, will the correct position of the switch have to be assured.

