FREQUENCY INVERTER VFR-013
QUICK START GUIDE

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1. PEOPLE SAFETY

RISKS OF ELECTROCUTION OR EXPLOSION

- Read carefully this installation guide before using the inverter.
- The user has to conform to all the requirements of the international and national regulations about the earthing of all the equipments.
- DO NOT touch the internal parts of the inverter : use only tools isolated electrically
- DO NOT touch the terminal blocks when the inverter is supplied.
- DO NOT put in short circuit borders DC+1 and DC+2 or condensers of the bus DC. A high tension which can cause electric shocks remains present in the device after cutting the supply.
- DO NOT try to fix the inverter; you should contact your retailer.
- Put back in place and close all the cover before putting back the inverter under tension.
- The inverter must be carefully fixed before switching it under tension.
- Before any intervention on the motor, power supply of the inverter must be turned off.

NON-RESPECT OF THESE RULES MAY BE FATAL: DEATH, SERIOUS INJURIES AND MATERIAL DAMAGES

2. MATERIAL SAFETY

- Verify that the inverter VFR-013 is not damaged
- Verify that the inverter corresponds to your order and to the delivery note.
- Verify that the tension of the electric network corresponds to the supply power of the inverter : 220V single phase or 400V three phase
- Never turn off the supply power of the inverter before the end of the motor operations.
- An armored cable must be used for the control circuit, and this one must be taken away as much as possible from the circuit of power to avoid the disturbances.
- When the frequency of hashing is lower than 3 KHz, the distance between the inverter and the motor must be at the maximum 50 meters.
- If the inverter has to start frequently, do not turn off it power supply, but use the starting up at the terminal blocks, to avoid some damages.
- Never connect a supply power on terminals U, V, W of the inverter; otherwise it would be immediately destroyed.
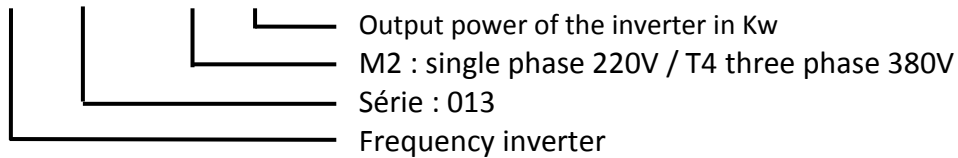- The inverter capacity in KW and A should always be higher than the motor capacity.

WARNING; IF THE INVERTER IS DAMAGED; DO NOT USE IT

3. NAME PLATE

VFR-013-M2-0K4

- Output power of the inverter in Kw
- M2 : single phase 220V / T4 three phase 380V
- Série : 013
- Frequency inverter

a. Single phase inverters

| Reference	Nominal power	Input tension	Electrical current input	Protection caliber	Cable section input	Electrical current output	Cable section output	Size
	(KW)	(V)	(A)	(A)	(mm²)	(A)		H/L/P (mm)
VFR-013-M2-0K4	0.4	220 ±10%	5.4	10	1.5	2.5	1.5	142/85/123
VFR-013-M2-0K75	0.75	220 ±10%	8.2	10	2.5	4	1.5	142/85/123
VFR-013-M2-1K5	1.5	220 ±10%	14	16	2.5	7	2.5	152/101/128

b. Three phase inverters

Reference	Nominal power	Input tension	Electrical current input	Protection caliber	Cable section input	Electrical current output	Cable section output	Size
	(KW)	(V)	(A)	(A)	(mm²)	(A)		H/L/P (mm)
VFR-013-T4-0K4	0.4	380 ±10%	2	4	1.5	1.2	1.5	152/101/128
VFR-013-T4-0K75	0.75	380 ±10%	4.3	6	1.5	2.5	1.5	152/101/128
VFR-013-T4-1K5	1.5	380 ±10%	5	10	2.5	3.8	2.5	152/101/128
VFR-013-T4-2K2	2.2	380 ±10%	5.8	10	2.5	5.1	2.5	152/101/128

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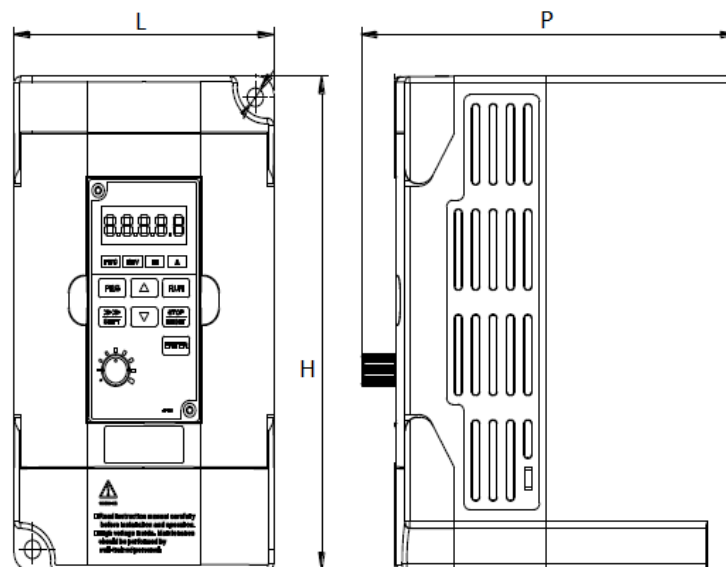
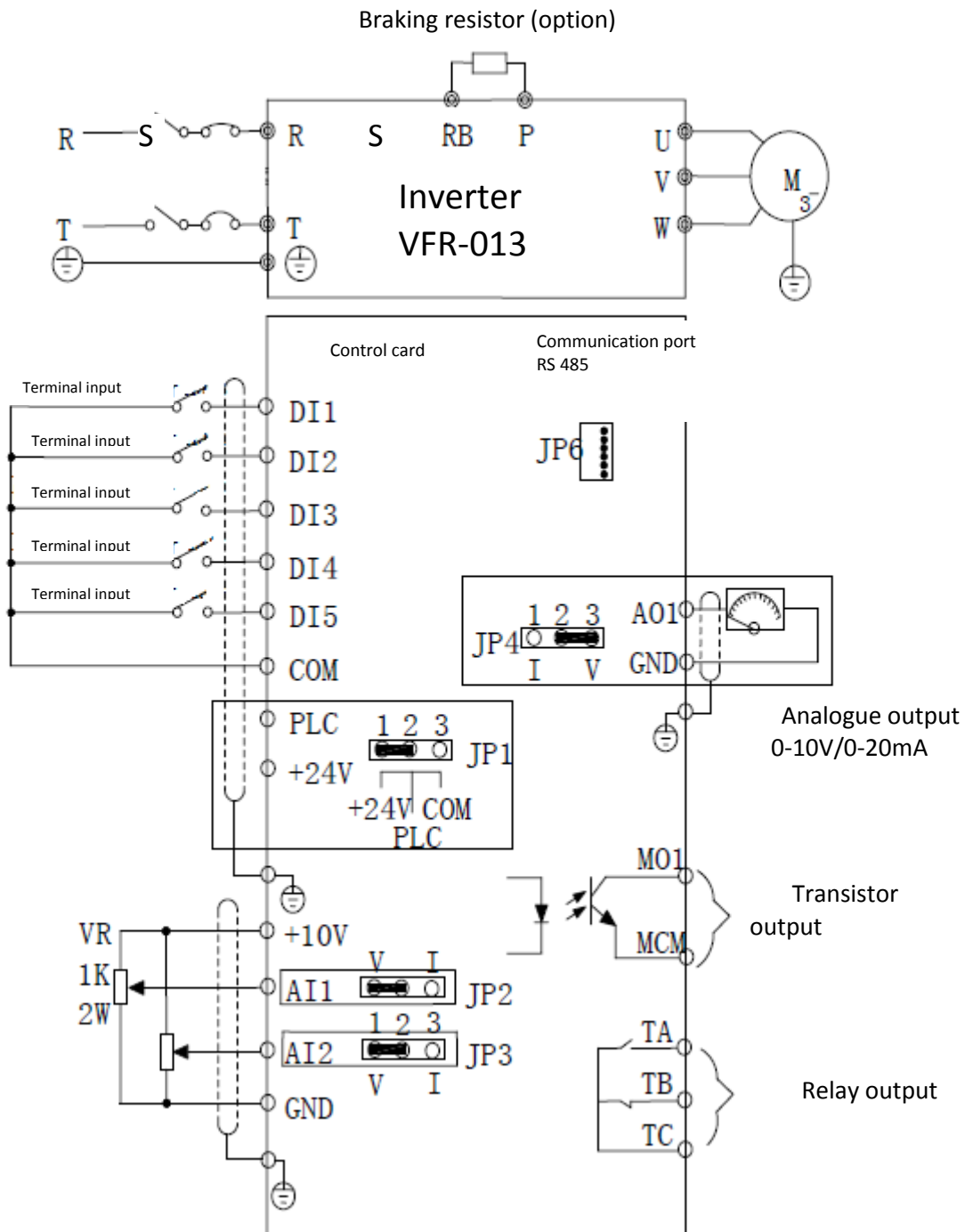## 4. INVERTER ASSEMBLY IN AN ELECTRICAL BOX
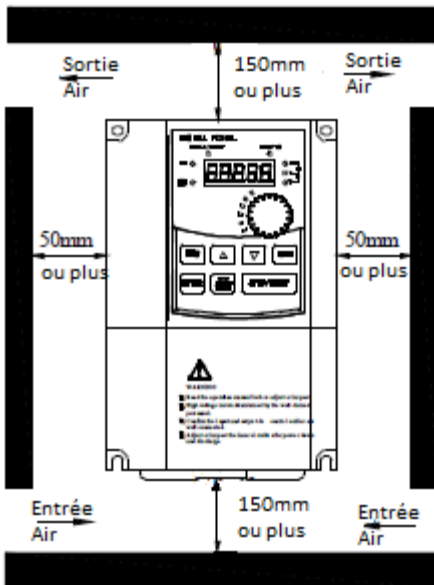
WORKING ENVIRONMENT

- Temperature:-10 ℃ à 40 ℃.
- Avoid the electromagnetic interferences, and take away sources of interferences.
- Avoid the infiltration of droplets, water vapor, dust, dirt and metallic dust.
- Avoid the penetration of oils, salt and corrosive gas.
- Avoid the vibrations.
- Avoid high temperatures, moisture and exposition to the rain. Moisture should be lower than 90% (without condensation).
- Never use the inverter in a dangerous environment; flammable, combustible, corrosive and explosive gas.

5. TECHNICAL FEATURES

Input tension (depending on the model)	Single phase 220V (±10%) Or Three phase 380V (±10%)
Input frequency	50/60Hz (±5%)
Output frequency	0 to 400Hz
Overload capabilities	150% during 1 minute, 200% during 1 second
Start-up torque	150% to 0,5Hz
Control methods	V/F, vectorial control in open torque
Inputs	5 digitals, 2 analogs
Outputs	1 shift NO/NF, 1 transistor, 1 analogs
Communication	RS485
Protection	IP20

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6. ELCTRICAL DIAGRAM

220V single phase

Braking resistor (option)

R — S ⟋⟋ R   S   RB   P   U — M 3~
                                V
T ⟋⟋ T   W

Inverter
VFR-013

Control card   Communication port RS 485

Terminal input — DI1
Terminal input — DI2   JP6
Terminal input — DI3
Terminal input — DI4
Terminal input — DI5
COM   JP4 1 2 3 AO1
                            I   V   GND
PLC 1 2 3 JP1   Analogue output
+24V   0-10V/0-20mA
+24V COM
PLC
                            MO1
                                       Transistor
VR +10V   MCM   output
1K
2W AI1 1 2 3 JP2   TA
         V   I   TB   Relay output
    AI2 1 2 3 JP3   TC
         V   I
    GND

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380V three phase

Braking resistor (option)

Inverter
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Control card

Communication
port
RS 485

Terminal input — DI1
Terminal input — DI2
Terminal input — DI3
Terminal input — DI4
Terminal input — DI5
COM

JP6

PLC
+24V
JP1 1 2 3
+24V COM
PLC

AO1
JP4 1 2 3
I   V
GND

Analogue output
0-10V/0-20mA

VR
1K
2W
+10V
AI1 JP2 V I
AI2 JP3 1 2 3
V   I
GND

MO1
MCM

Transistor
output

TA
TB
TC

Relay output

7. SETTINGS : INDICATOR LIGHT AND BUTTONS

Indicator light		Description
Status of the indicator light	FWD	Indicator ON/OFF * ON: operating motor (forward) * OFF: motor switched off
	REV	Indicator ON/OFF * ON: operating motor (reverse) * OFF: motor switched off
	HZ	Display of the frequency *Flashing value = instruction value *Fixed value = current frequency of the motor in rotation
	A	Display of the consummation of the motor in Ampere

Buttons	Name	Function
PRG	Parameters button / output	Change the parameter Back to the display menu or to the functions menu
≫≫ SHIFT	SHIFT	Select the different types of display of the unit ON or OFF Select the characters during the parameter modification
▲	UP	Data or code of the increasing function
▼	DOWN	Data or code of the decreasing function
RUN	RUN	Use to start the motor in mode keyboard piloting
STOP RESET	STOP / RESET	Use to stop the motor Use to reset a defect of the alarm Button in relation with the F6.00 parameter
ENTER	ENTER	Use to enter in a parameter Allows to confirm a parameter modification
Keyboard potentiometer	Keyboard potentiometer	If F0.02 is set on 3, the keyboard potentiometer is used to manage the frequency currently being implemented
ENTER + ≫≫ SHIFT		Used together these 2 buttons allow to lock and unlock the keyboard

Inverter power-up

Last display before switch-off

PRG

PRG   Select the
             setting
             group

Display of the different groups

ENTER

PRG   Select the
             oarameter
             of the group

Display of the parameter

ENTER
PRG   ENTER   Change of
                          the
                          parameter

Modification of the parameter
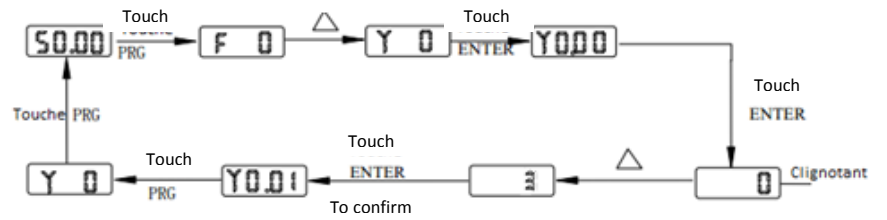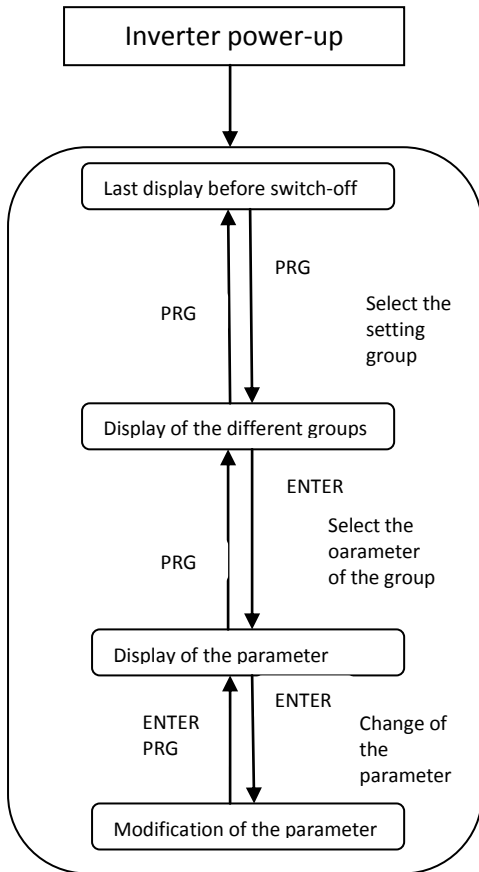
8. INVERTER PARAMETERS

Code	Parameter name	Description
d0	Display of values surveillance of measures	Display of: frequency, voltage, electric current etc...
F0	Basic functions	Setting of frequency, control mode, acceleration and deceleration
F1	Group of input terminals	Analogue functions and digital input
F2	Group of output terminals	Analogue functions and digital output
F3	On and off states control parameters	Choice of on and off states
F4	Control parameters V / F	Control parameters V / F
F5	Vector control parameters	Vector control parameters
F6	Keypad and screen	To define the keypad and screen parameters
F7	Group of auxiliary functions	To define the auxiliary functions parameters
F8	Failure and protection	To define the failure and protection parameters
F9	Communication parameters	To adjust the communication parameters Modbus
FA	Torque control parameters	To define the parameters in mode torque control
FB	Optimization control parameters	To define the parameters of the optimization of the performances of control
E0	Rebalancing of length and the counting	To define the parameters of rebalancing, length and the counting
E1	Multi-speed	Multi-speed
E2	Function PID	To define and integrate the parameters PID
E3	DI virtual, DO virtual	Settings of the virtual parameters I/O
b0	Motor parameters	Settings of the motor features
y0	Function codes management	To define a password, installation of the parameters
y1	Error messages	Error messages

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a. Parameters: system y0

Code	Designation	Range		Factory value	Possible if the inverter is on ON
y0.00	Reset of the basic parameters	No action	0	0	No
		Reset of the basic parameters except parameters motor	1		
		Historic disappearance	2		
		Reset of the basic parameters with parameters motor	3		
		Save users actual parameters	4		
		Reset from a backup	5		

b. Parameters: motor b0

Code	Designation	Range	Factory value	Possible if the inverter is on ON
b0.01	Nominal power	0,4Kw to 900Kw	Depending on the model	No
b0.02	Nominal voltage	0V à 460V	Depending on the model	No
b0.03	Nominal current electric	0,1A à 2000A	Depending on the model	No
b0.04	Nominal frequency	0,01Hz to F0.08 (max. frequency)	50.00Hz	No
b0.05	Nominal speed	0rpm to 3600rpm	Depending on the model	No

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c. Standard parameters

Code	Designation	Range		Factory value	Possible if the inverter is on ON
F0.00	Control mode	Vector control without return coder	0	2	No
		Control V/F	2		
		Torque control	3		
F0.01	High limit of frequency instruction	0.00Hz à F0.08 (maximum frequency)		50.00 Hz	Yes
F0.02	Main piloting of the frequency	Arrow Up/Down on keyboard	0	0	No
		Analog input AI1 on terminal	1		
		Analogue input AI2 on terminal	2		
		Screen potentiometer	3		
		Multi-speed	5		
F0.04	Start-up mode	Keyboard	0	0	No
		Terminal block	1		
		Modbus communication	2		
F0.05	Acceleration time	0.00s à 3600s		-	Yes
F0.06	Deceleration time	0.00s à 3600s		-	
F0.10	Maximum limit output frequency	F0.11(mini) to F0.08(maxi)		50.00Hz	Yes
F0.11	Minimum limit output frequency	0.00Hz to F0.10 (maxi)		0.00Hz	Yes

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d. Input settings

Code	Designation	Range	Factory value	Possible if the inverter is on ON
F1.00	Input terminal block DI1	0 to 24	1	No
F1.01	Input terminal block DI2	0 to 24	2	
F1.02	Input terminal block DI3	0 to 24	0	
F1.03	Input terminal block DI4	0 to 24	9	
F1.04	Input terminal block DI5	0 to 24	4	

Setting value	Function	Description
0	No function	No action of the inverter
1	Direction of rotation forward(FWD)	Choice of direction of rotation
2	Direction of rotation reverse(REV)	
3	Control mode 3 electric wires	For more details look at the instructions of the functions code F1.06
4	Mode : JOG Forward	JOG
5	Mode: JOG Reverse	
6	Frequency increase	Change the frequency of the increment/decrement control when the digital setting is selected as the frequency control (F0.03=0 or 1)
7	Frequency decrease	
8	Stop "Freewheel"	The motor stops on his own.
9	Reset of a defect	To restore an inverter defect
10	External defect	When the signal is sent to the inverter, it puts itself in error and stops.
11	Erasing of the frequency value	Changes the frequency parameters using external terminals as a minimum control. The function is used to erase the frequency value set by UP / DOWN in such way that the frequency is equal to the frequency defined by the terminal frequency.
12	Multi-speed : terminal 1	The speed setting can be done by 16 settings predefined and controlled through 4 input terminals. For more details, look at the **table 1.**
13	Multi-speed : terminal 2	
14	Multi-speed : terminal 3	
15	Multi-speed : terminal 4	

16	Acceleration / deceleration time	The selection of acceleration/deceleration can be chosen by ON/OFF. For more details, look at the **table 2**
17	Start-up mode communication	Example; if you are in control terminal block mode (F0.04=1), you can turn on a keyboard control when the input is activated. If you are in communication control RS 485 (F0.04=2), you turn on the keyboard control.
18	Acceleration / deceleration prohibited	Make sure that the inverter is exempt of external signals. This function maintains the current output frequency.
19	Break of the PID regulation	The PID regulation is deactivated temporally; the inverter maintains the current output frequency.
20	Pause of the rebalancing	The inverter puts in pause the output. When this function is removed, the inverter works at the instruction frequency.
21	Reset of the rebalancing	The instruction frequency goes back to the half of the value
22	Torque control prohibited	When the inverter torque control is prohibited, the inverter turns on speed control mode.
23	Temporary disappearance of the frequency	When the frequency is in impulse mode on terminal blocks, this value is suspended during the activation of this input.
24	Immediate release of the braking by direct current	In stage of deceleration, the activation of this input triggers the braking parameters (F3.07 to F3.09)

e. Table 1 Multi-speed

Terminal4	Terminal3	Terminal2	Terminal1	Setting of the control	Parameters Value in % of F0.08
OFF	OFF	OFF	OFF	Speed 0 Setting 0	E1.00
OFF	OFF	OFF	ON	Speed 1 Setting 1	E1.01
OFF	OFF	ON	OFF	Speed 2 Setting 2	E1.02
OFF	OFF	ON	ON	Speed 3 Setting 3	E1.03
OFF	ON	OFF	OFF	Speed 4 Setting 4	E1.04
OFF	ON	OFF	ON	Speed 5 Setting 5	E1.05
OFF	ON	ON	OFF	Speed 6 Setting 6	E1.06
OFF	ON	ON	ON	Speed 7 Setting 7	E1.07
ON	OFF	OFF	OFF	Speed 8 Setting 8	E1.08
ON	OFF	OFF	ON	Speed 9 Setting 9	E1.09
ON	OFF	ON	OFF	Speed 10 Setting 10	E1.10
ON	OFF	ON	ON	Speed 11 Setting 11	E1.11
ON	ON	OFF	OFF	Speed 12 Setting 12	E1.12
ON	ON	OFF	ON	Speed 13 Setting 13	E1.13
ON	ON	ON	OFF	Speed 14 Setting 14	E1.14
ON	ON	ON	ON	Speed 15 Setting 15	E1.15

f. Table 2 Piloted acceleration and deceleration

Borne	Acceleration and deceleration time	Parameters
OFF	Acceleration and deceleration 1	F0.05 and F0.06
ON	Acceleration and deceleration 2	F7.03 and F7.04

Control modes

| Code	Designation	Mode	Range	Factory value	Modif. ON
F1.06	Terminal blocks control mode	Two electric wires type 1	0	0	No
		Two electric wires type 2	1		
		Three electric wires type 1	2		
		Three electric wires type 2	3		

This parameter (F1.06) defines four different modes to control the inverter by terminal blocks input.

0: two electric wires type 1
This mode is the most used. The operation forward/reverse of the motor is determined by the terminal DI1, DI2.

Terminal Block inputs	To be entered value	Description
DI1	1	Forward rotation (FWD)
DI2	2	Reverse rotation (REV)

K1	K2	Control
0	0	Stop
1	0	Forward (FWD)
0	1	Reverse (REV)
1	1	Stop
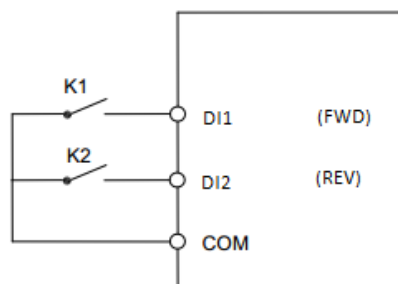
Setting:

F0.04=1 (Inverter control by terminal block)
F1.06=0 (Two electric wires mode type 1)
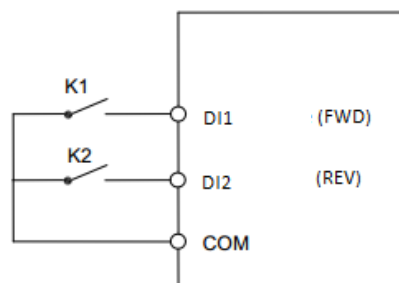F1.00=1 (Terminal DI1 Forward rotation)
F1.01=2 (Terminal DI2 Reverse rotation)

1: Two electric wires type 2
In this case, DI1 allows the rotation and the forward direction, while the terminal block DI2 is used to activate the reverse direction.

Terminal Block inputs	To be entered value	Description
DI1	1	Forward rotation allowed (FWD)
DI2	2	Reverse rotation (REV)

K1	K2	Control
0	0	Stop
1	0	Forward (FWD)
0	1	Stop
1	1	Reverse (REV)

Setting:

F0.04=1 (Inverter control by terminal block)
F1.06=0 (Two electric wires mode type 2)
F1.00=1 (Terminal DI1 Forward rotation)
F1.01=2 (Terminal DI2 Reverse rotation)

2: Three electric wires type 1
In this case, DI2 is used to allow the control per pulse with DI1 et DI2.

Terminal Block inputs	To be entered value	Description
DI1	1	Forward (FWD)
DI2	3	Authorization of the control mode per pulse 3 electric wires type 1
DI3	2	Reverse (REV)

To start-up, the terminal DI2 must be closed. The direction of rotation FWD or REV is controlled per pulse on DI1 or DI3.
To stop, you have to switch off the terminal DI2 per pulse.
DI1, DI2, DI3 are the inputs terminals multi-function de DI1 à DI15.

So:
SB: Stop button
SB2: Forward button
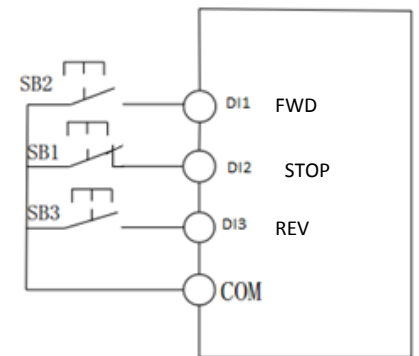SB3: Reverse button

Setting:

F0.04=1 (Inverter control by terminal block)
F1.06=0 (Two electric wires mode type 2)
F1.00=1 (Terminal DI1 Forward rotation)
F1.01=3 (terminal DI2 authorization of the control mode per pulse)
F1.02=2 (Terminal DI3 reverse)

3: Three electric wires type 2
In this case, DI2 is used to allow the control per pulse with DI1 or DI2.

Terminal Block inputs	To be entered value	Description
DI1	1	Forward (FWD)
DI2	3	Authorization of the control mode per pulse 3 wires type 2
DI3	2	Reverse (REV)

To start-up, the terminal DI2 must be closed. The start of the motor is controlled per pulse on DI and DI3 reverses the direction of rotation as long as this contact is maintained and that DI2 is still closed.
To spot, you have to switch off DI2 per pulse.
DI1, DI2, DI3 are the inputs terminals multi-function de DI1 à DI15.

SB3	Control
0	Forward(FWD)
1	Reverse (REV)

Setting:

F0.04=1 (Inverter control by terminal block)
F1.06=0 (Two electric wires mode type 2)
F1.00=1 (Terminal DI1 Forward rotation)
F1.01=3 (terminal DI2 authorization of the control mode per pulse)
F1.02=2 (Terminal DI3 reverse)
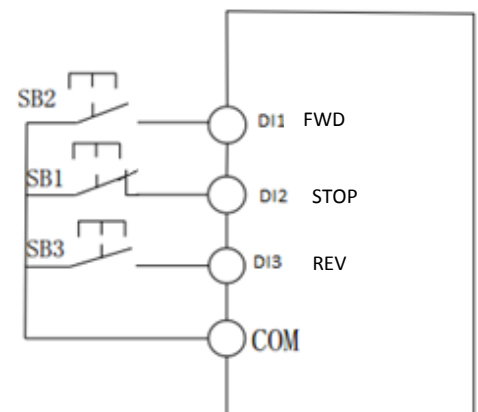
Code	Designation	Range					Factory value	Possible if the inverter is on ON
F1.19	Polarities inversion of the inputs DI1 à DI5 (contacts NO or NF)	Bit 0	DI1	High signal	0		00000	No
				Low signal	1			
		Bit 1	DI2	High signal	0			
				Low signal	1			
		Bit 2	DI3	High signal	0			
				Low signal	1			
		Bit 3	DI4	High signal	0			
				Low signal	1			
		Bit 4	DI5	High signal	0			
				Low signal	1			

g. Output settings

Code	Setting	Range of setting	Factory value
F2.00	Static output (MO1, MCM)	0 to 8	1
F2.03	Relay output (TA,TB,TC)	0 to 8	1

Setting value	Function	Description
0	No control of the output	No control of the output
1	Inverter ON	The output is activated when the output frequency is different than 0.
3	Defect in the inverter output	The output is activated when the inverter stops because of a defect.

h. Error messages

Error message	Type of defect	Potential causes	Solutions
E.oUP	Defect on a U,V or W phase	1. Over-speeding acceleration 2. Internal damages of the IGBT 3. Failure of phase caused by some interferences	1. Increase the acceleration time 2.Check if others elements closed to the device are creating interferences. If that it the case, keep the inverter away from this device.
E.oC1	Over current to acceleration	1.Acceleration phase is too short 2.Tension is too low 3.Inverter model is too low for the motor power 4.Lost of a phase in output	1. Increase the acceleration time 2. Control the tension 3. Chose an inverter model more powerful 4. Control the output cabling of the inverter
E.oC2	Over current to deceleration	1. Acceleration phase is too short 2. The inertia of the system is too big 3. Inverter model is too low for the motor power 4. Lost of a phase in output	1. Increase the deceleration time 2.Install a braking device and braking resistances 3. Chose an inverter model more powerful 4. Control the output cabling of the inverter
E.oC3	Over current on constent speed	1. Sudden increase of the load 2. Tension is too low 3. Inverter model is too low for the motor power 4. Lost of a phase in output	1. Control the tension 3. Chose an inverter model more powerful 4. Control the output cabling of the inverter
E.oU1	Over tension to acceleration	1. Input tension is too high 2.After a temporary power outage, resumption with the motor in rotation 3. Acceleration phase is too short	1. Control the tension 2. After a short-circuit do not restart the motor when it works on his own 3.Increase the acceleration time
E.oU2	Over tension to deceleration	1. Acceleration phase is too short 2. The inertia of the system is too big 3. Input tension is not regular	1. Increase the deceleration time 2. Install a braking device and braking resistances 3. Check the input tension
E.oU3	Over tension to increasing speed	1. Input tension has unusually changed 2. Big inertia of the load	1. Stabilize the supply network 2. Install a braking device and braking resistances
E.LU	Power interruption	1. Tension too low 2. Wrong parameters set 3. Power outage of the inverter with the motor ON	1. Check the input tension 2. Control that the settings are right

E.oL1	Motor overload	1.Tension is too low 2. Setting of the electric current of the motor is incorrect 3. The load is too big or blocking of the motor happened	1. Check the input tension 2. Set the current limit of the motor 3.Reduce the load and verify that there is no mechanical bindings
E.oL2	Inverter overload	1. Acceleration phase is too short 2. Restart the motor when this one still turns by its own 3. Tension is too low 4.The load is too important	1. Increase the acceleration time 2. After a power outage, avoid restarting the motor when it works on its own. 3. Check the input tension 4. Chose an inverter more powerful
E.oUT1	Lost of a motor phase	Supply cable is disconnected	Check and reconnect the supply phases of the motor
E.oH2	Inverter overheat	1. Instantaneous over current of the inverter 2.Short-circuit of the three phase output 3. Blocking ventilation 4. Temperature is too high 5. Power electric wires on terminal blocks are not tight	1.Find the over current cause and try to fix it 2.Rewire 3. Change the fan 4. Reduce the temperature 5. Check the electric wires
E.SET	External defect	External defect signal on the DI input of the terminal block	Reset the defect
E.CE	Communication defect	1. Speed transmission is wrong set 2. Communication error with the other device	1. Set the speed transmission 2. Check the parameters
E.oCC	Current detection defect	1. Wrong connection of the control card connector 2. Check the Hall effect	1. Verify the connection of the control card 2. Change the device with effect Hall
E.TE	Motor auto tuning setting defect	1. Motor settings haven't been set according to the name plate 2. Waiting time of the setting for auto tuning is over	1. Properly set the value according to the name plate 2. Check the wires from the inverter to the motor 3. Start the motor without load
E.EEP	Defect of writing et reading of the memory EEPROM	1. EEPROM is damaged	Replace the screen of the main control panel
E.PId	Loss of the PID return signal	Loss of the PID return signal	Check the signal cabling

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