ELECTRONICS SEGMENT

MCE

FEBBRAIO 2011

MCE (INVERTER MOUNTED ON TOP OF THE MOTOR FAN)

Families & Sizes

MCE/C >>> Circulation (closed systems)

MCE/C 11 – MCE/C 15 – MCE/C 22

MCE/C 30 – MCE/C 55

MCE/C 110 – MCE/C 150

MCE/P >>> Boosting (open systems)

MCE/P 11 – MCE/P 15 – MCE/P 22

MCE/P 30 – MCE/P 55

MCE/P 110 – MCE/P 150

ELECTRONICS SEGMENT

MCE/C 11

MCE/C 15

MCE/C 22

MCE/P 11

MCE/P 15

MCE/P 22

ELECTRONICS SEGMENT

MCE/C 11

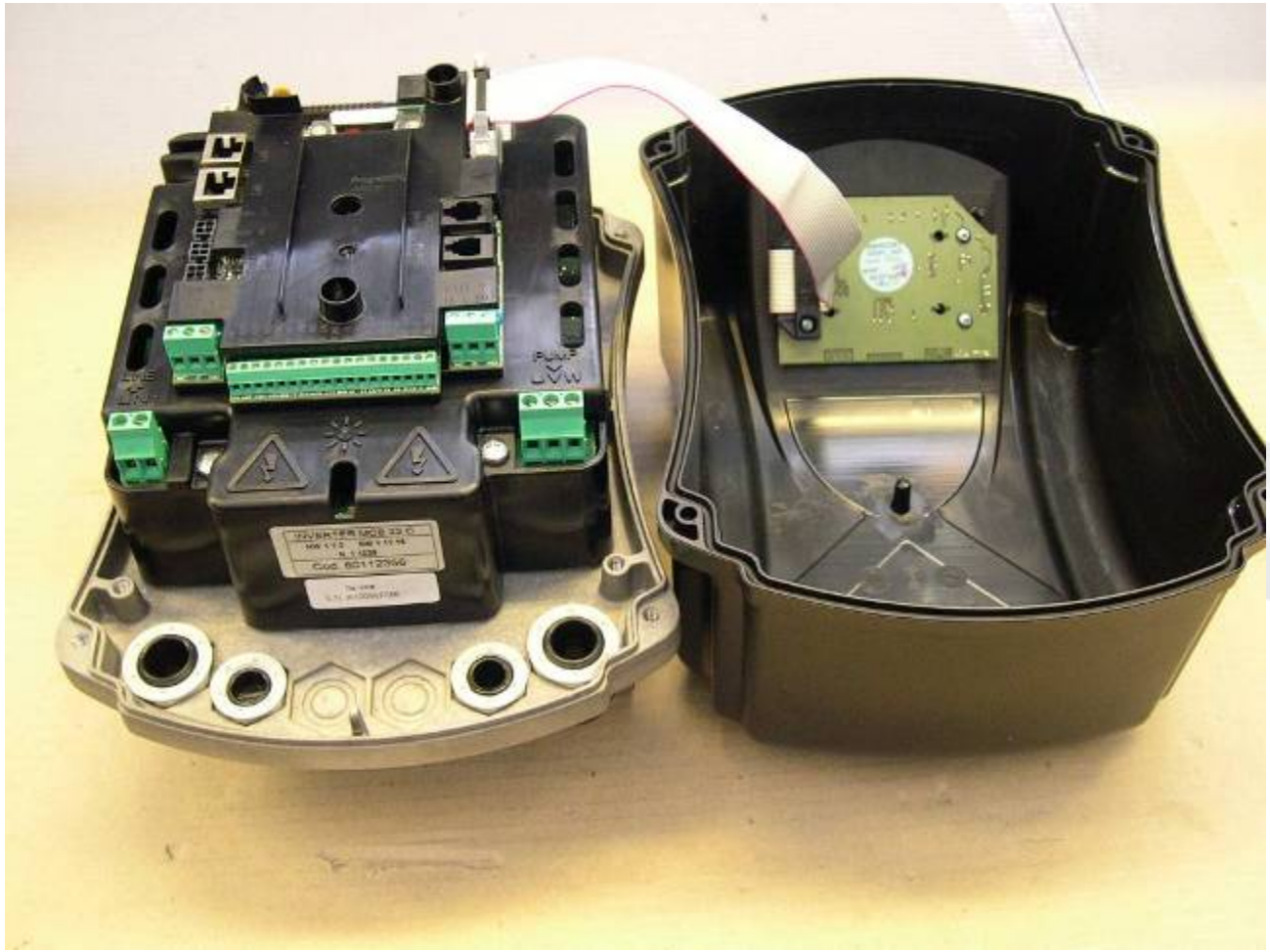
MCE/C 15

MCE/C 22

MCE/P 11

MCE/P 15

MCE/P 22



ELECTRONICS SEGMENT

MCE/C 11

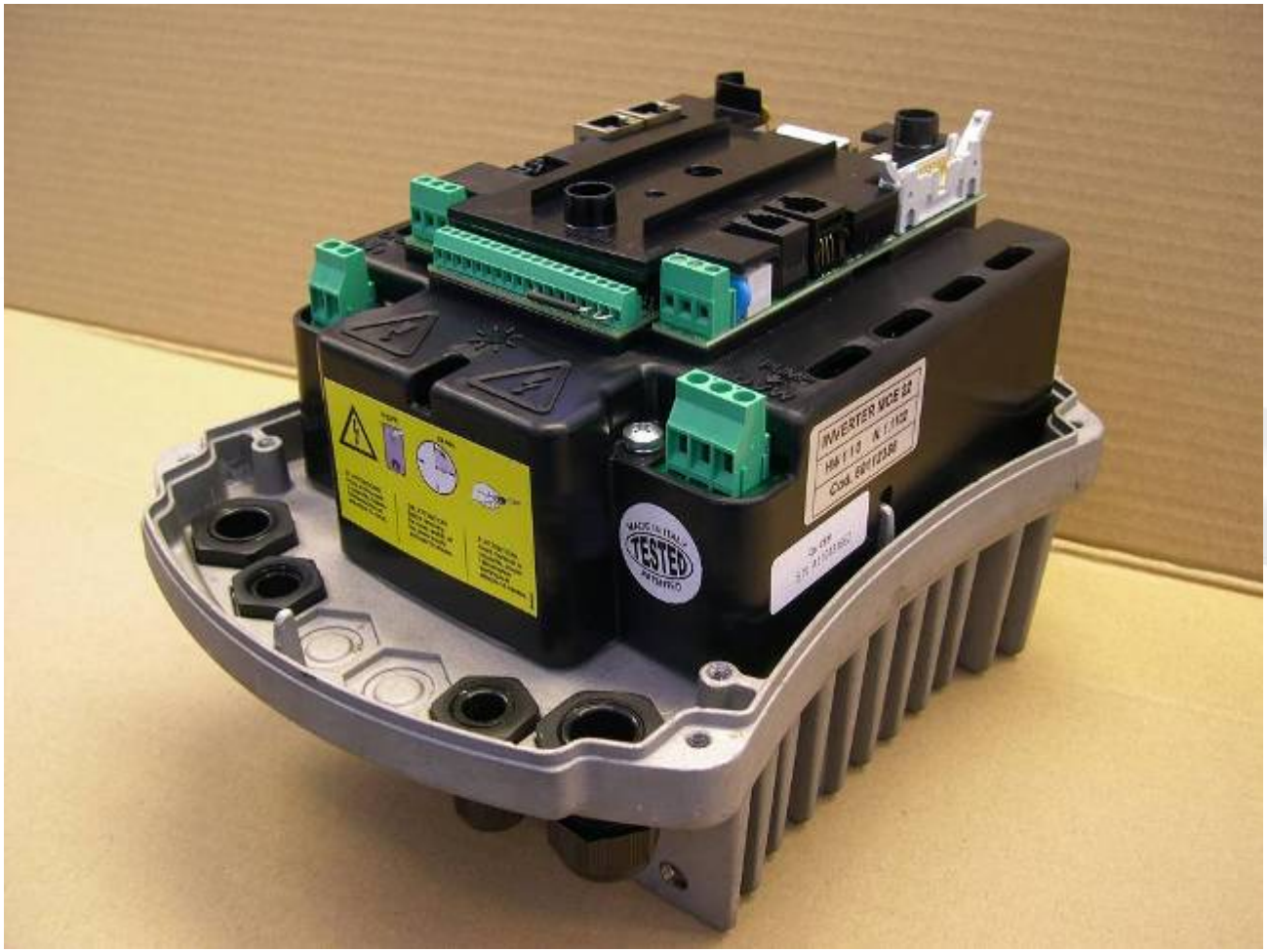
MCE/C 15

MCE/C 22

MCE/P 11

MCE/P 15

MCE/P 22



ELECTRONICS SEGMENT

MCE/C 30

MCE/C 55

MCE/P 30

MCE/P 55

ELECTRONICS SEGMENT

MCE/C 30

MCE/C 55

MCE/P 30

MCE/P 55

ELECTRONICS SEGMENT

MCE/C 110

MCE/C 150

MCE/P 110

MCE/P 150

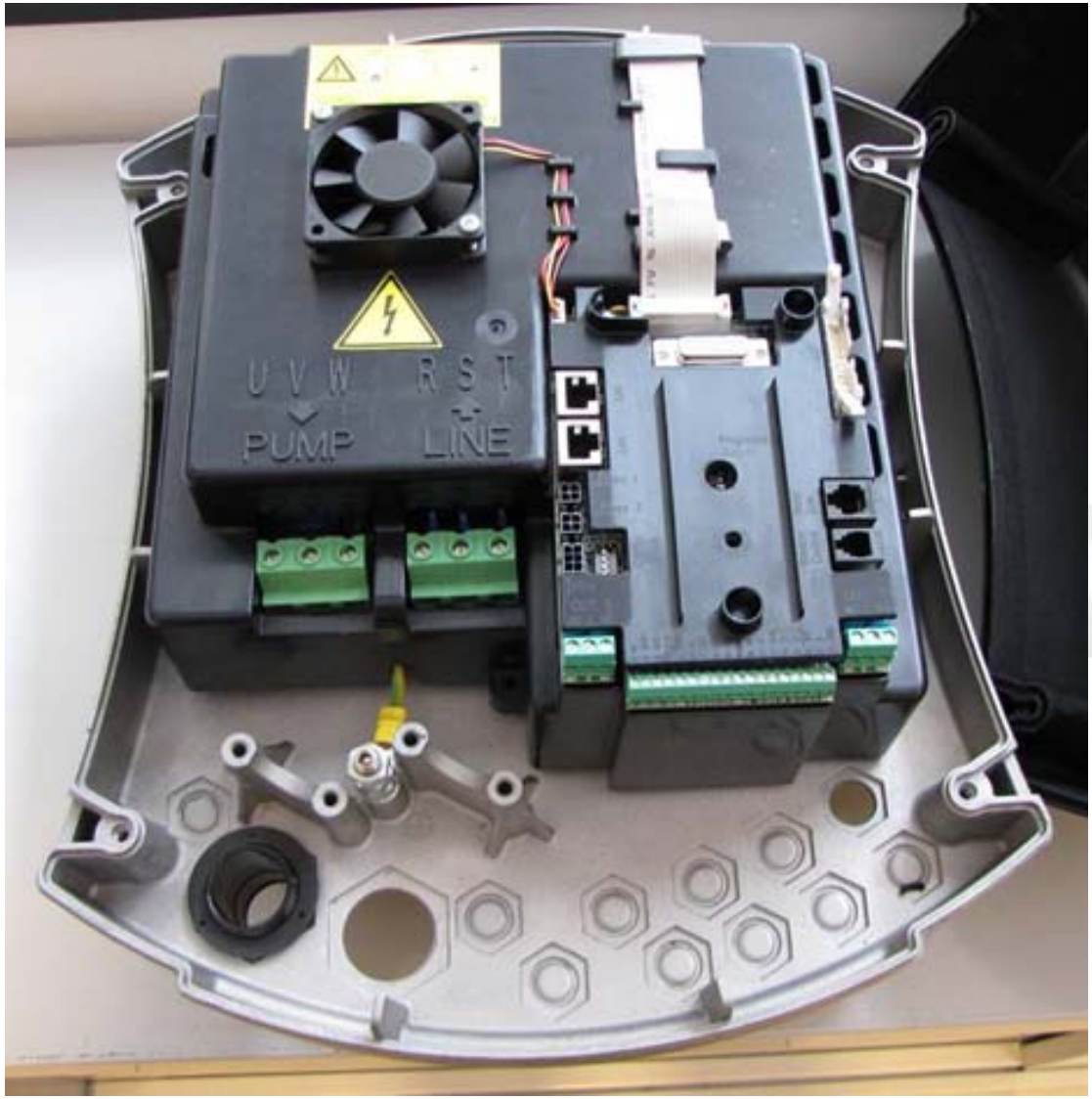
ELECTRONICS SEGMENT

MCE/C 110

MCE/C 150

MCE/P 110

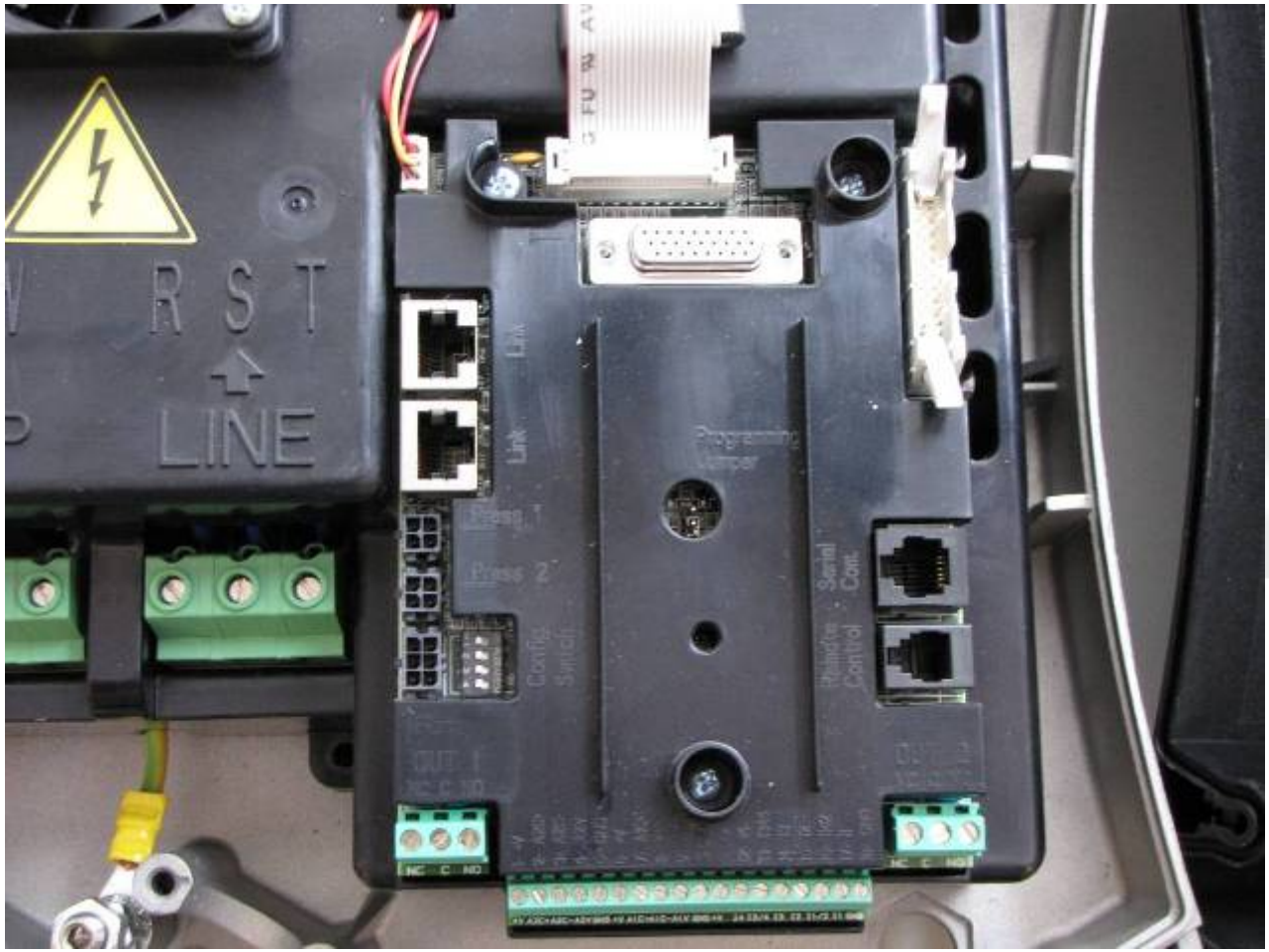
MCE/P 150



ELECTRONICS SEGMENT

MCE Series

Low Voltage Board



MCE, Performances

Model	MCE/C [/P] **150**	MCE/C [/P] **110**	MCE/C [/P] **55**	MCE/C [/P] **30**	MCE/C [/P] **22**	MCE/C [/P] **15**	MCE/C [/P] **11**
Mains	3 ~ 400V	3 ~ 400V	3 ~ 400V	3 ~ 400V	1 ~ 230V	1 ~ 230V	1 ~ 230V
Pump	3 ~ 400V	3 ~ 400V	3 ~ 400V	3 ~ 400V	3 ~ 230V	3 ~ 230V	3 ~ 230V
Current	32,0 A	24,0 A	13,5 A	7,5 A	10,5 A	8,0 A	6,5 A
Power **P2**	20 Hp **15** kW	15 Hp **11** kW	7,5 Hp **5,5** kW	4 Hp **3** kW	3 Hp **2,2** kW	2 Hp **1,5** kW	1,5 Hp **1,1** kW

MCE, Versions

/C
- → Stand alone
- → Assembled on the pump (max “twin version”)

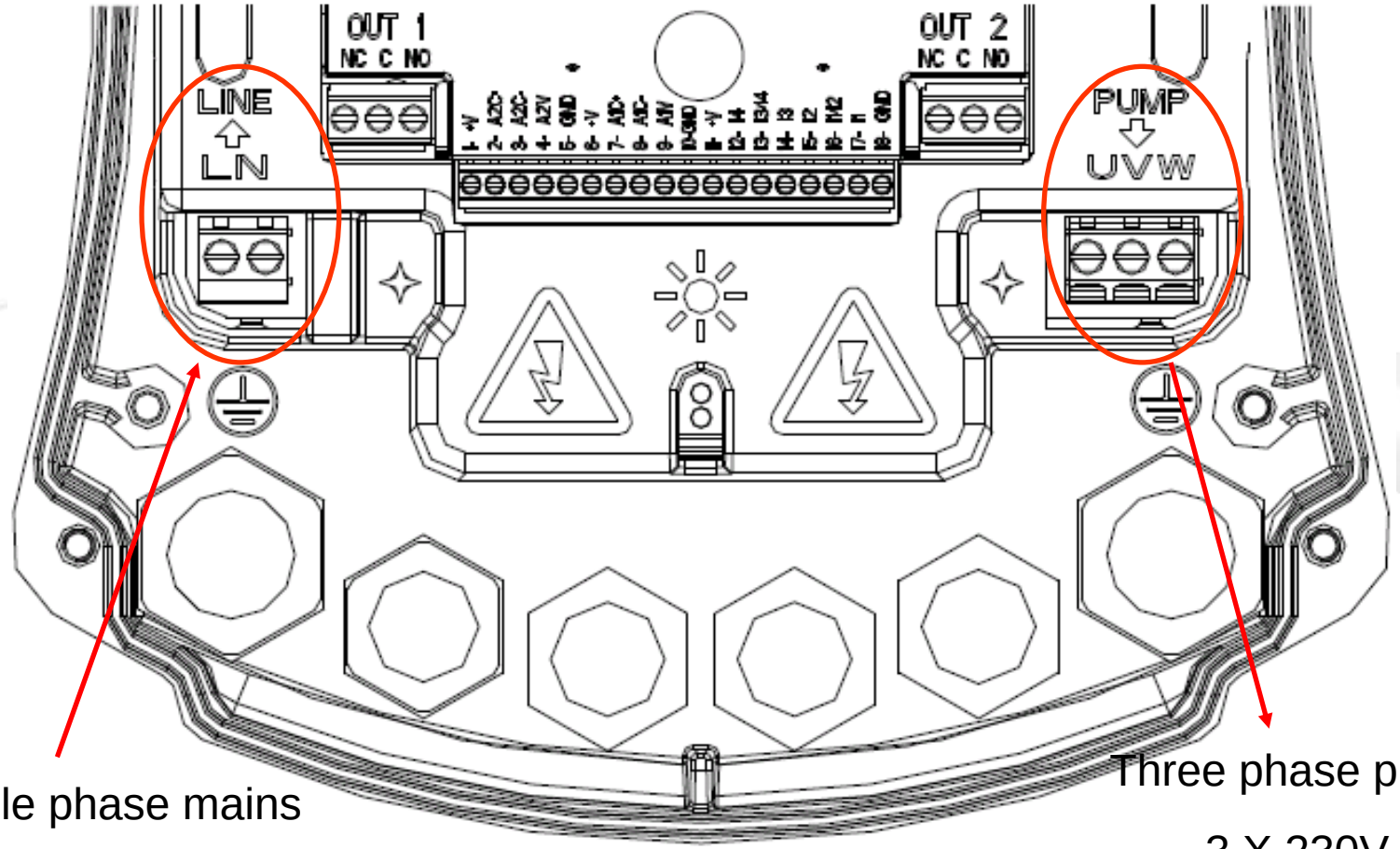
/P
- → Stand alone
- → Assembled on the pump
- → Boosters (up to 8 pumps)

MCE, Electrical Connections

Recommendations

- Wiring separate from other equipment
- One power switch per inverter
- Differential switch class A [AS] for single [three] phase mains
- Proper wire size for the current absorbed

MCE 11, 15, 22, Electrical Connections



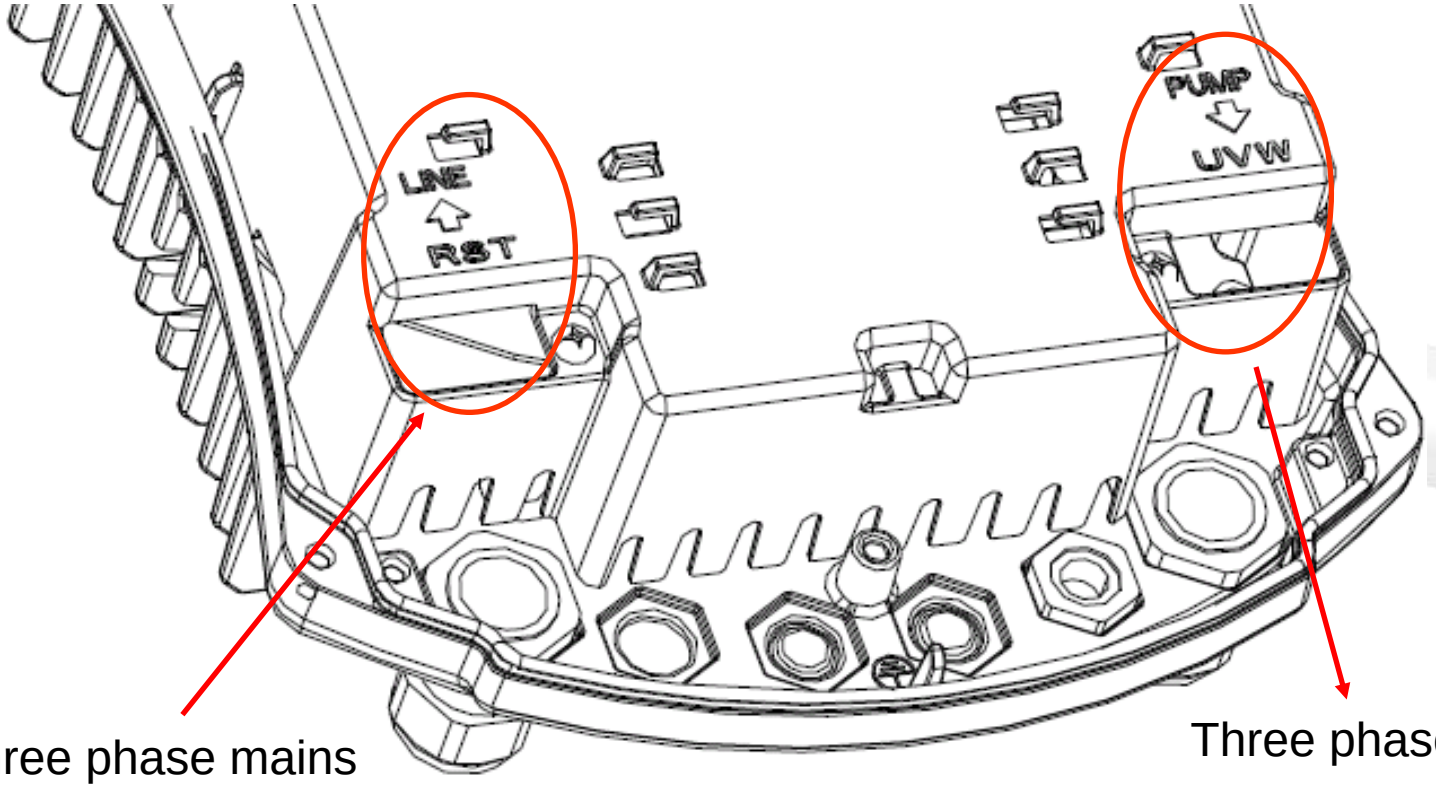
Single phase mains

Three phase pump

3 X 230V

(delta)

MCE 30, 55, 110, 150, Electrical Connections



Three phase mains

3~ X 400V

Three phase pump

3~ X 400V

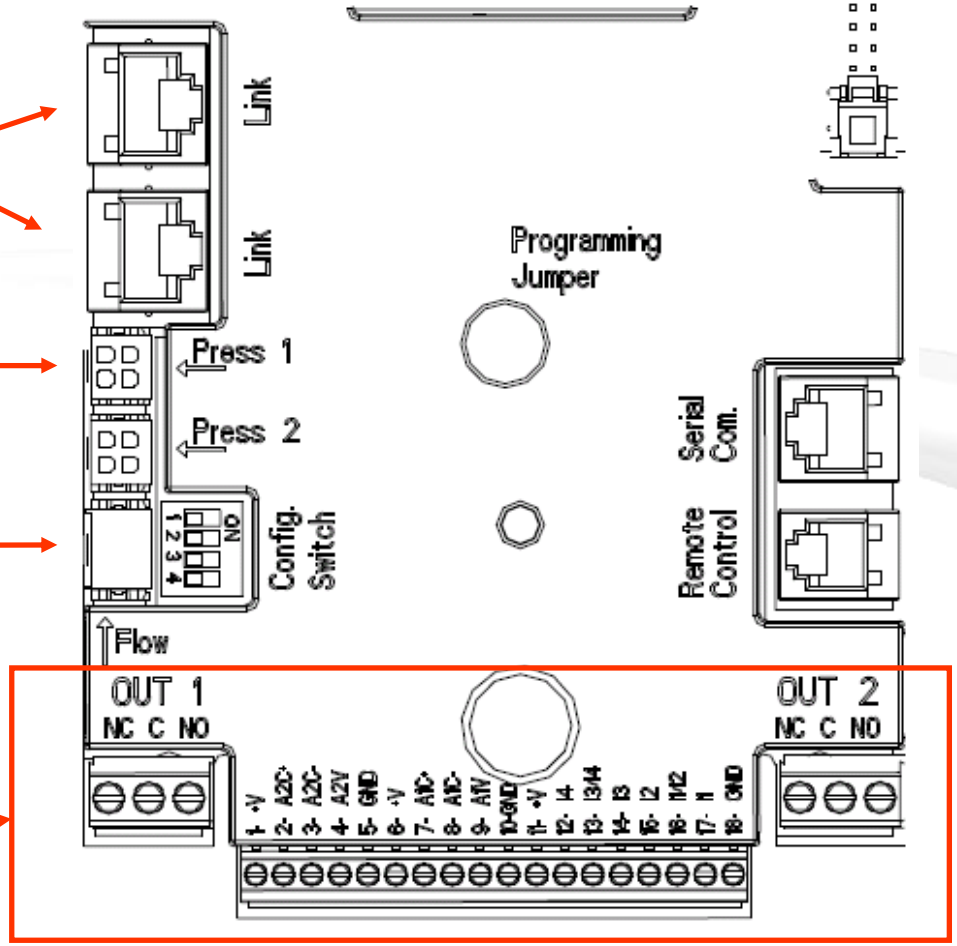
MCE, Auxiliary Electrical Connections

Communication cables (Can bus)

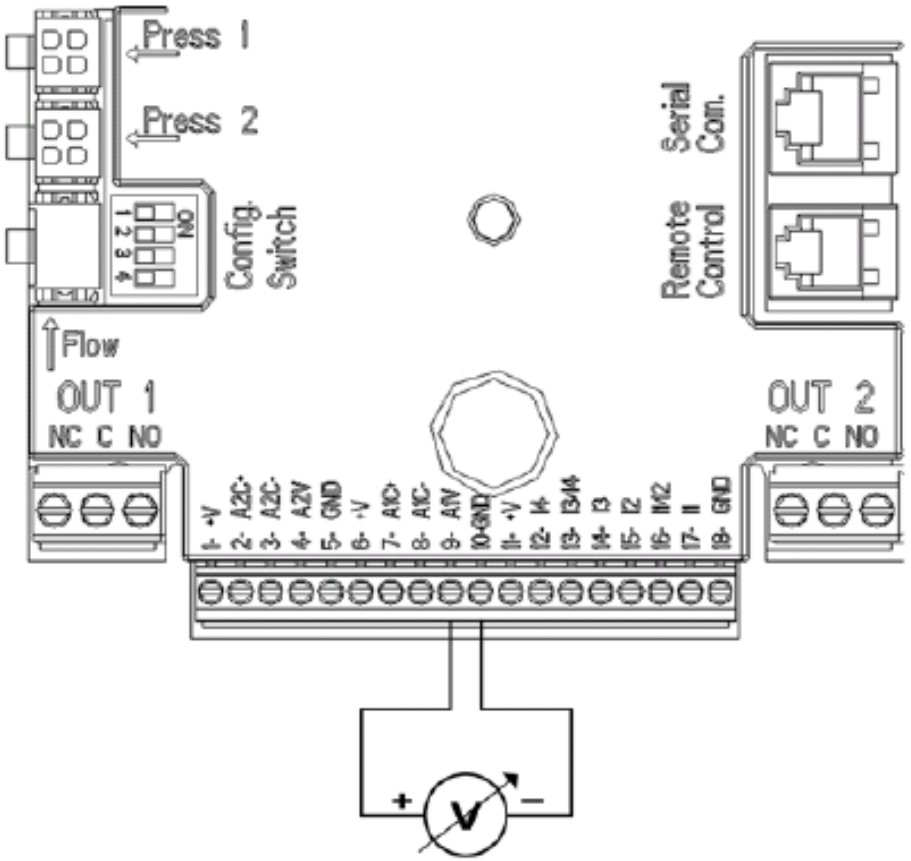
Pressure sensor

Flow sensor

Auxiliary Inputs & Outputs



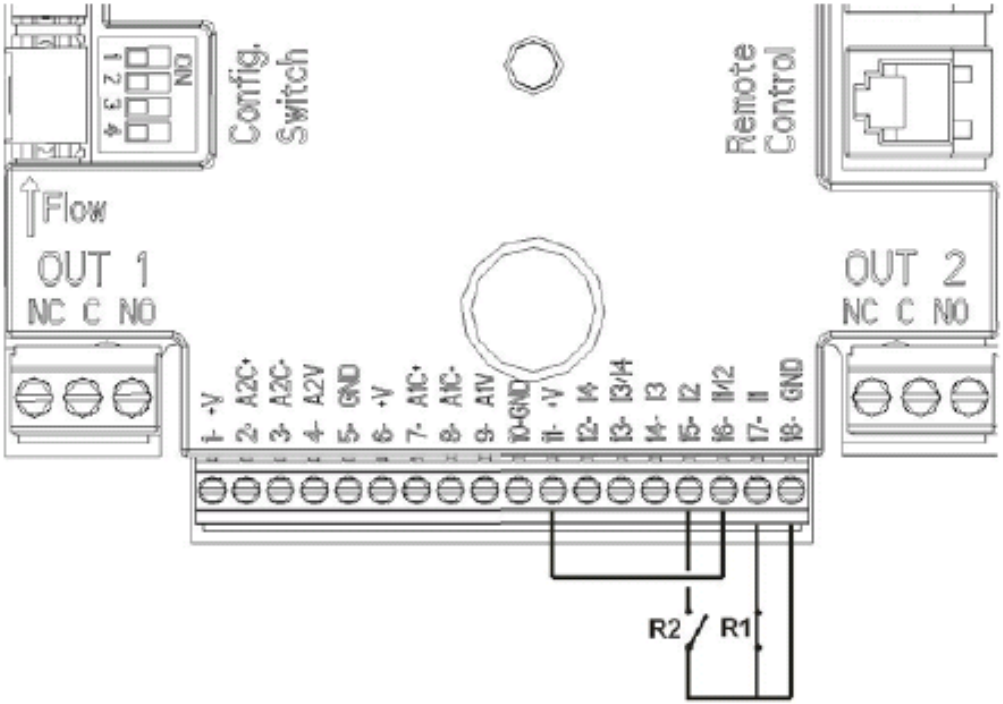
MCE/C, External analogic signal



- A1V (no. 9 input): “+”
- GND (no. 10): “-”

Purpose: adjusting the RPM proportionally with the input 0-10 V_{DC} voltage

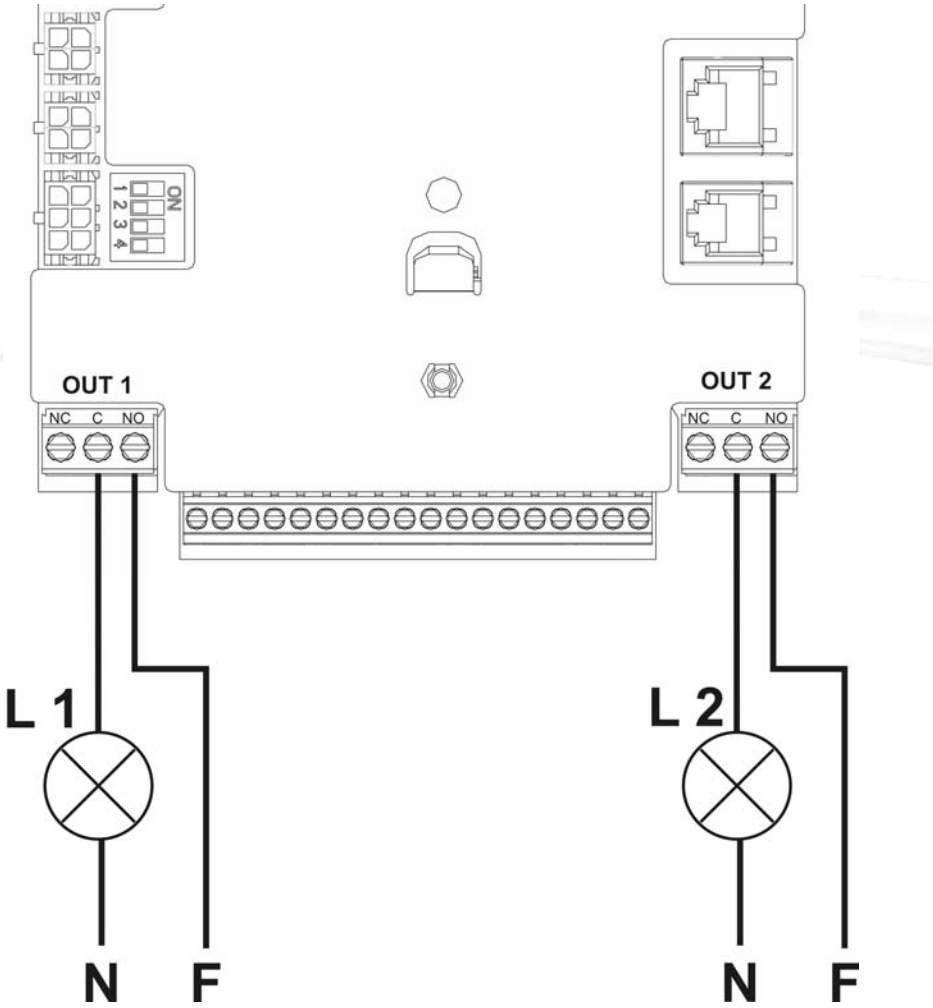
MCE/C, Digital Inputs



Ref.	Function
I1	**Start/Stop**: if enabled from control panel, it is possible to turn the inverter ON and OFF by a remote signal
I2	**Economy**: if enabled from control panel, it is possible to reduce the set point by a remote signal
I3/I4	Not used

R1	R2	State
Open	Open	Pump OFF
Open	Closed	Pump OFF
Closed	Open	Pump running with set-point selected by the user
Closed	Closed	Pump running with set-point reduced /Economy)

MCE/C, Outputs



Output 1: Fault/Alarm

Output 2: Running

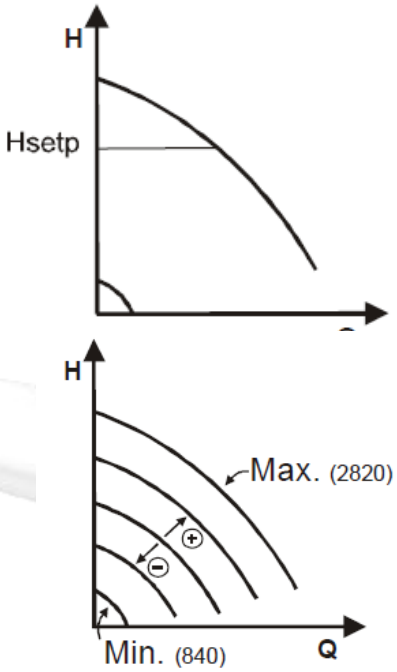
- Contacts NO, NC, COM
- Vmax 250V
- I max 5A (resistive)

MCE/C, Regulating Modes

– Regulation with constant differential pressure (factory setting).

– Regulation with constant curve.

- Regulation with constant curve with speed set by external analogue signal (0-10V_{DC}).



Applications:

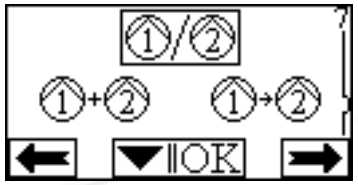
Conditioning systems,

Heating systems.

MCE/C, Twin Systems

Menu

Page 7



If operations with twin circulators have been chosen, on page 7.0, it is possible to select one of the 3 following modes:

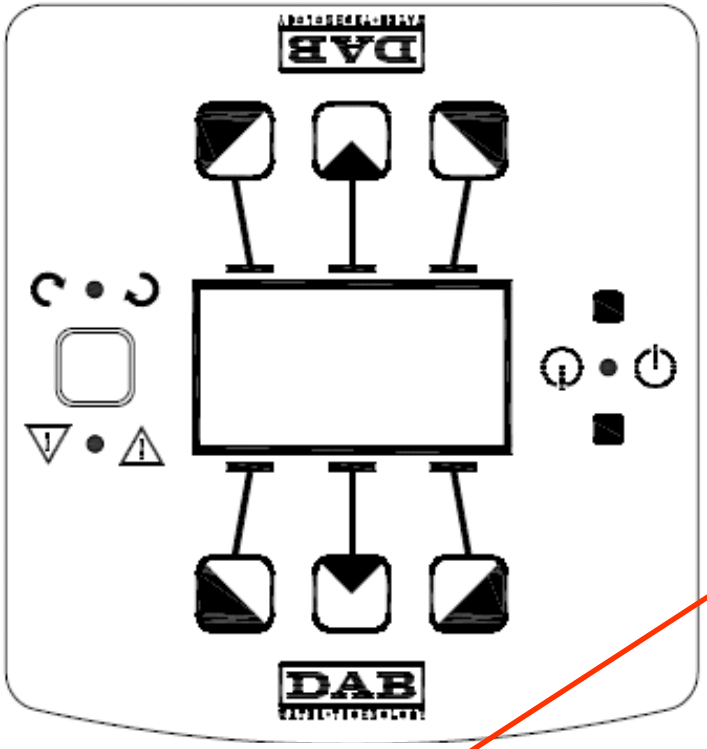
②/① -Alternate every 24h; the 2 inverters operate alternatively every 24h of working period; if one is faulty, the other inverter works;

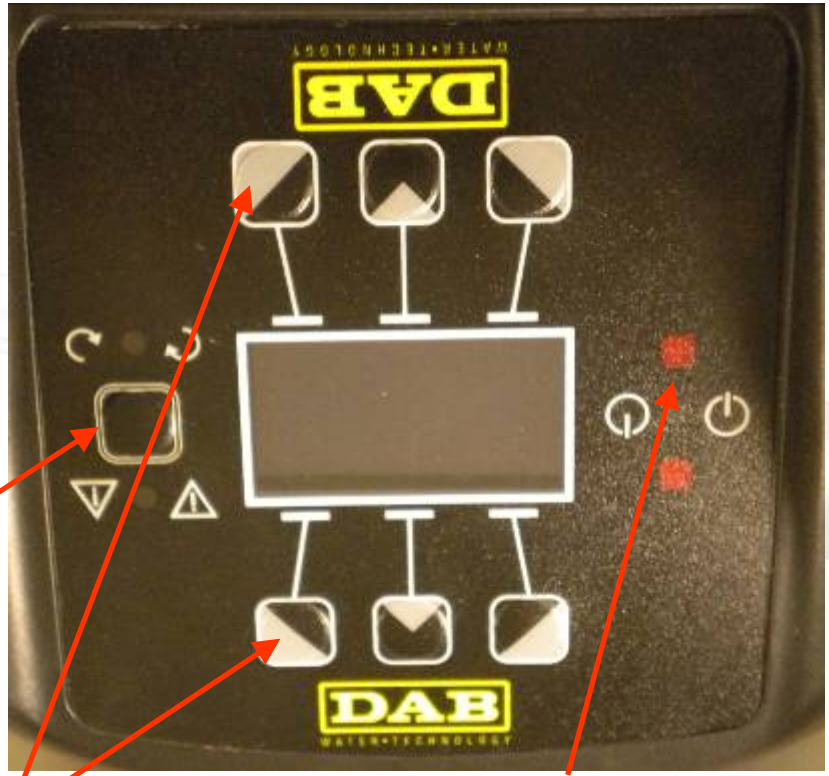
②+① -Simultaneous, the 2 inverters work together (at the same RPM); useful if the flow demand is not achievable by one single pump;

②←① -Main/Reserve; the regulating operation is performed by the same inverter (Main), the second inverter (Reserve) starts only if the Main is faulty.

Note. If the communication cable is unplugged, the two inverters automatically are self-configured as single units and work independently.

MCE/C, Control Panel





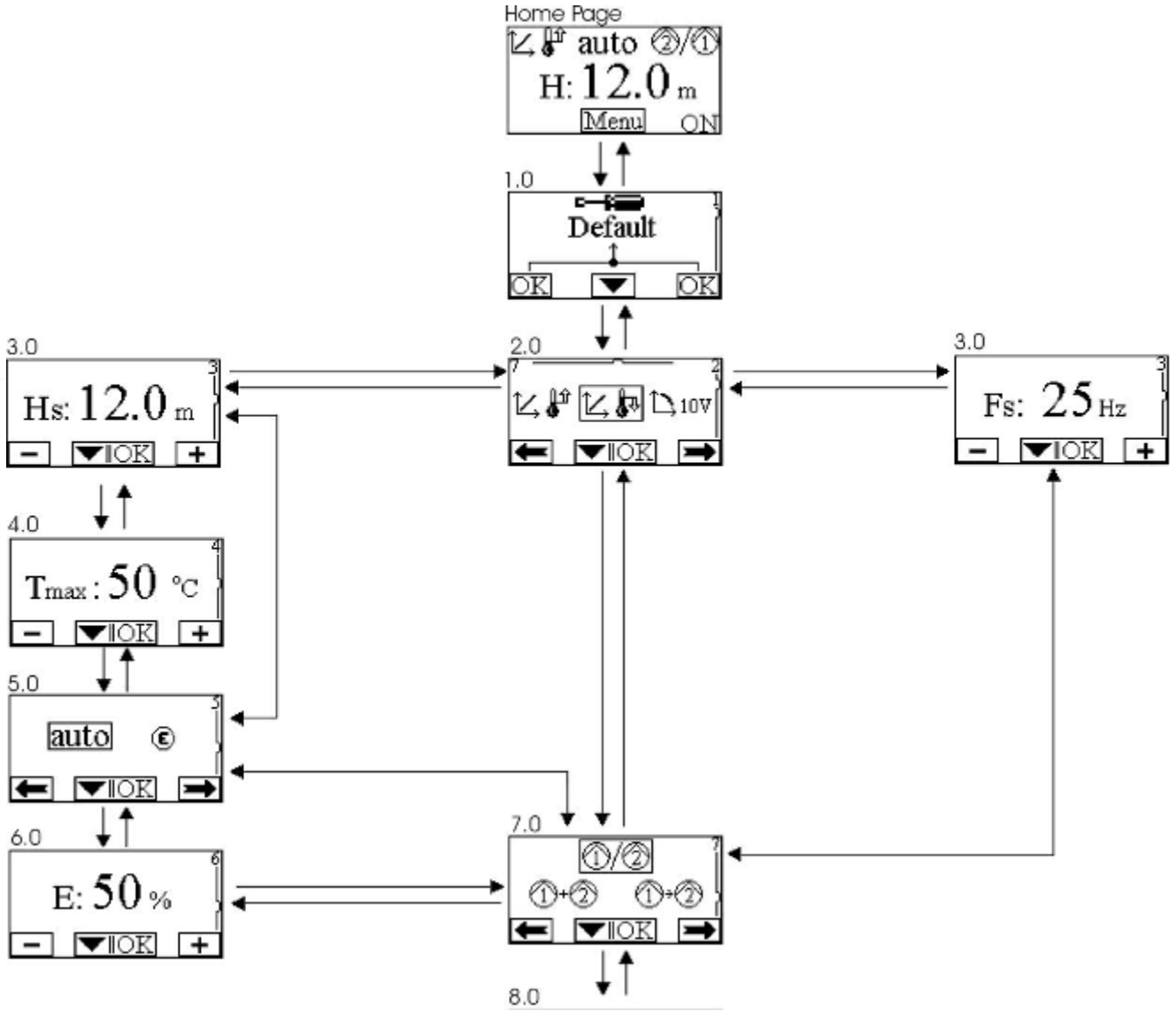
"Hydden" button
(unlock button)

Navigation buttons
DISPLAY"Flip over"

LED
Yellow ⇔ Mains connected
Red ⇔ Alarm
Green ⇔ Pump running

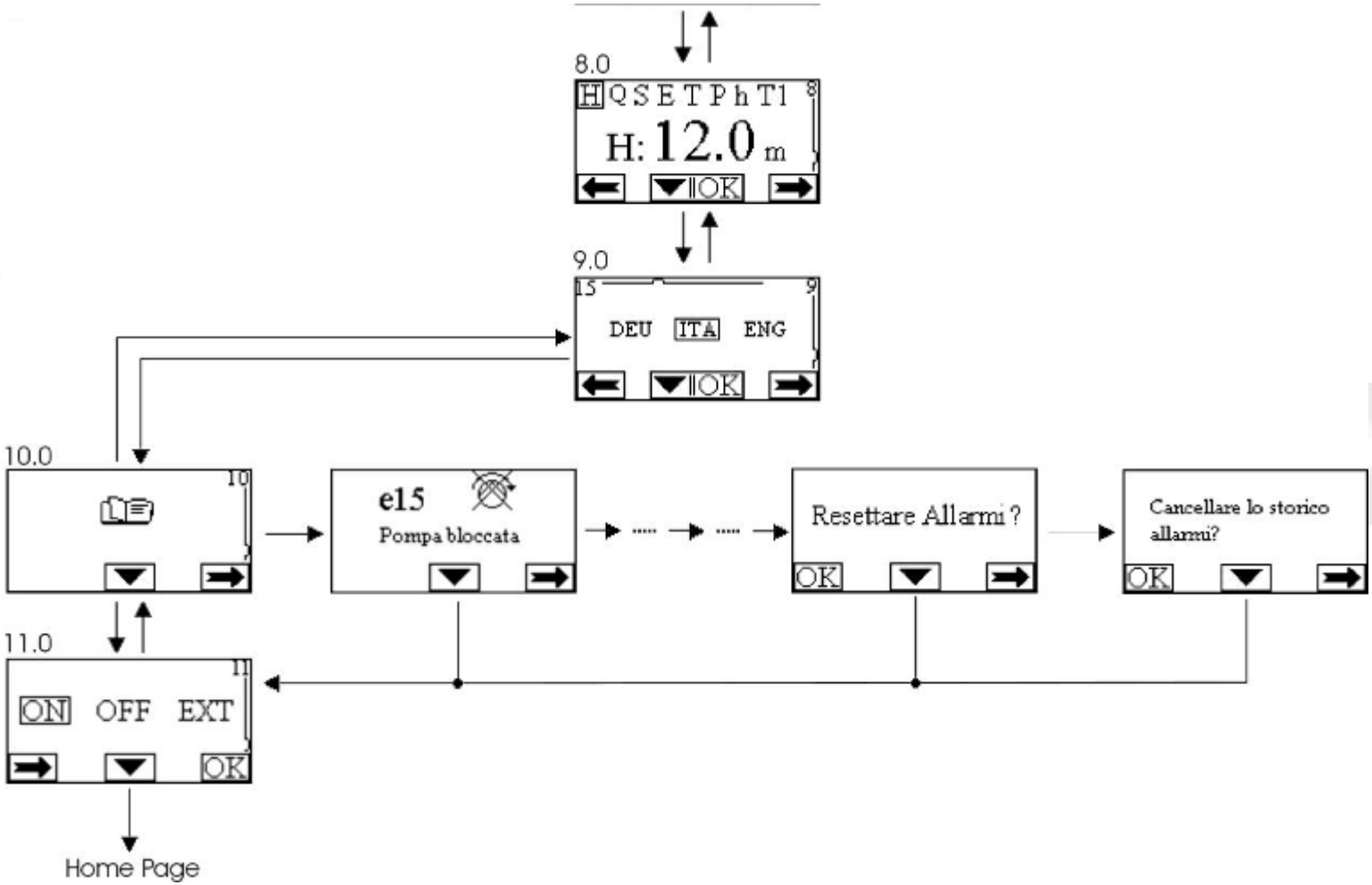
ELECTRONICS SEGMENT

MCE/C Menu (1/2)



ELECTRONICS SEGMENT

MCE/C Menu (2/2)



ELECTRONICS SEGMENT

Pumps equipped with MCE/C (1/2)

IN - LINE

ALM

KL

DKL

CM-CP

DCM-DCP

VERTICAL PUMPS

KVC-KVCX

KV 3-6-10

NKV 10-15-20

DAB WATER•TECHNOLOGY

WaCS DWT GROUP

Tesla DWT GROUP

Pumps equipped with MCE/C (2/2)

NORM & BLOCK PUMPS

NKM / NKP

NKM-G / NKP-G

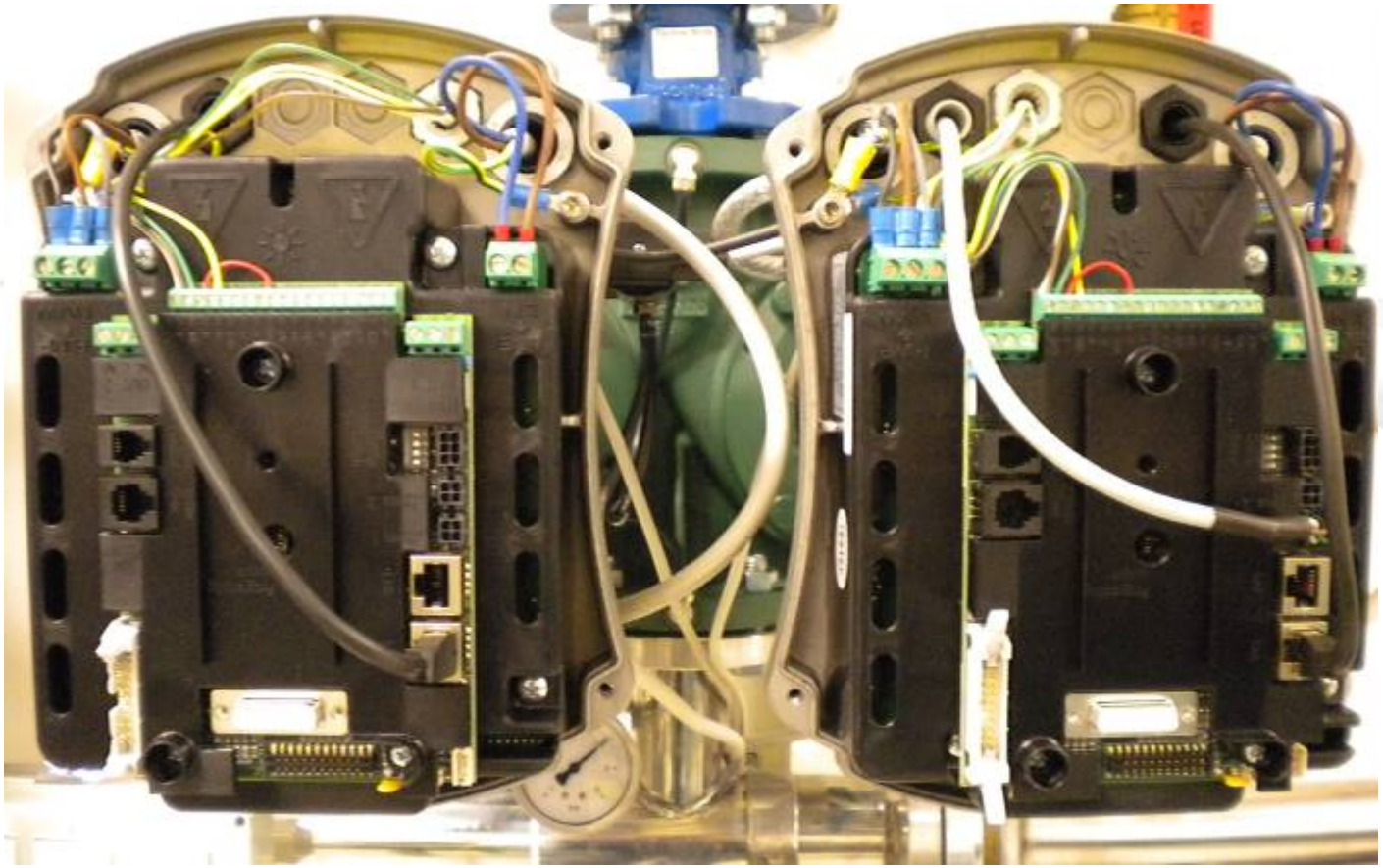
KDN

CENTRIFUGAL PUMPS

K SINGLE IMPELLER

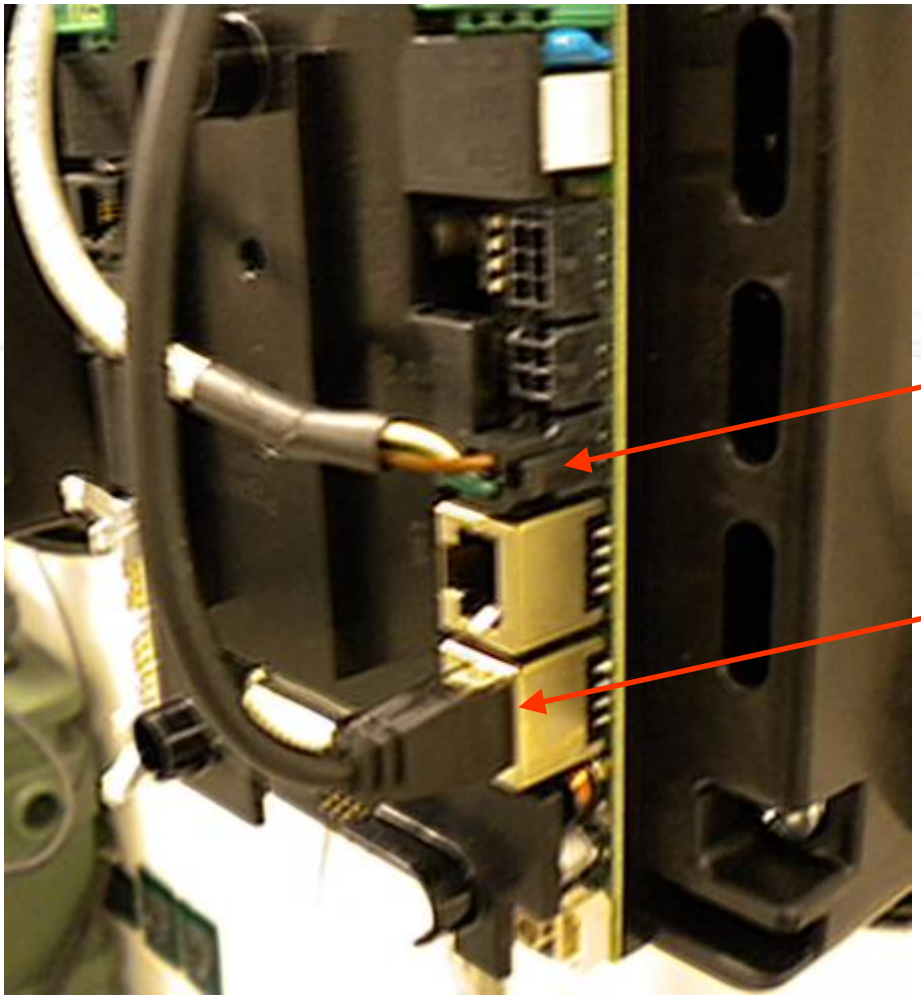
K TWIN IMPELLER

MCE/C, Electrical Connections (Figure 1)

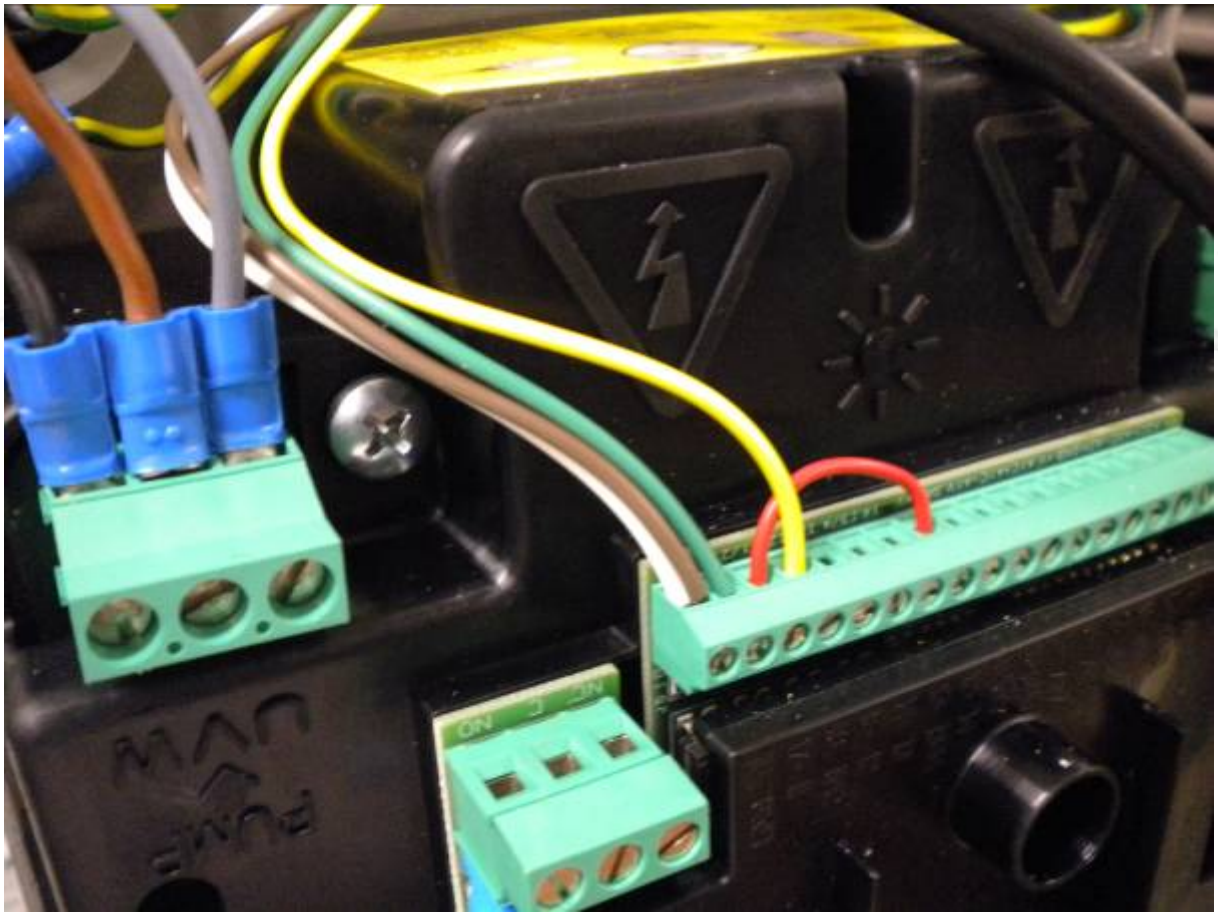


Twin System

MCE/C, Electrical Connections (Figure 2)



MCE/C, Electrical Connections (Figure 3)

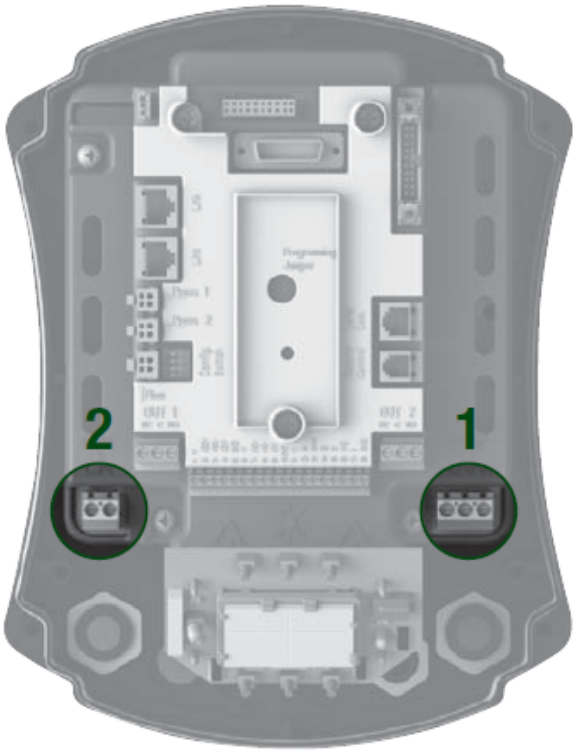


Ref.	Function
I1	**Start/Stop**: if enabled from control panel, it is possible to turn the inverter ON and OFF by a remote signal
I2	**Economy**: if enabled from control panel, it is possible to reduce the set point by a remote signal
I3/I4	Not used

Digital Inputs

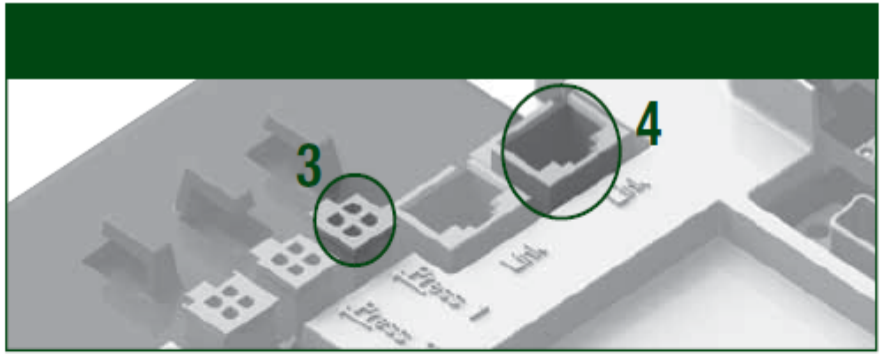
Quick start guide

Installation



1 *Connect the power supply to the pump*
2 *Connect eletrically the inverter*

ELECTRONICS SEGMENT



3. Sensor lead connection

The pressure sensor lead must be connected to press1

4. Communication lead connection

In a twin system, connect the communication lead between the two

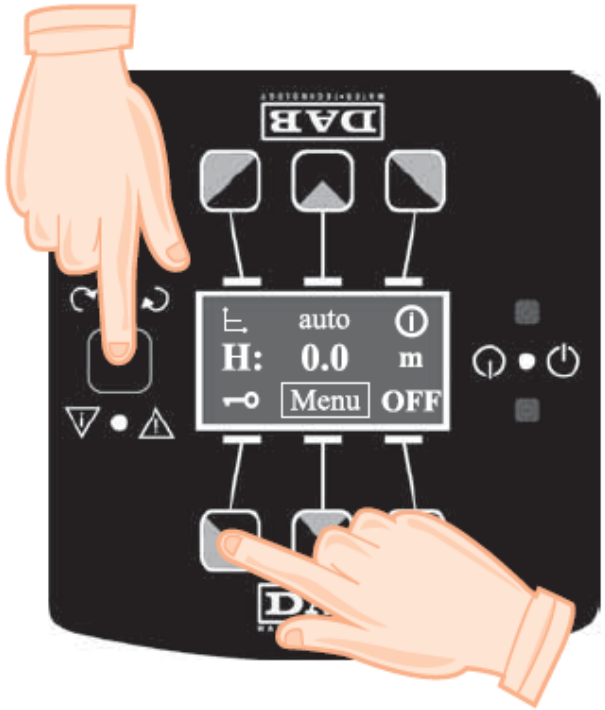
inverters

5. MCE/C Confi guration

Close the cover and power up the inverter, the display will show

ELECTRONICS SEGMENT

6



Button functions

The central button enables the user to scroll through the parameters

Buttons + and – are used to input the required value.

The value is saved if the OK button is pressed for 3 seconds

6. Inverter unlocking

Press and hold the key button and side button for 5 seconds until the key symbol disappears (See Fig. 6)

7. Installation Menu

Press and hold the central button for 5 seconds until the

product name is displayed.

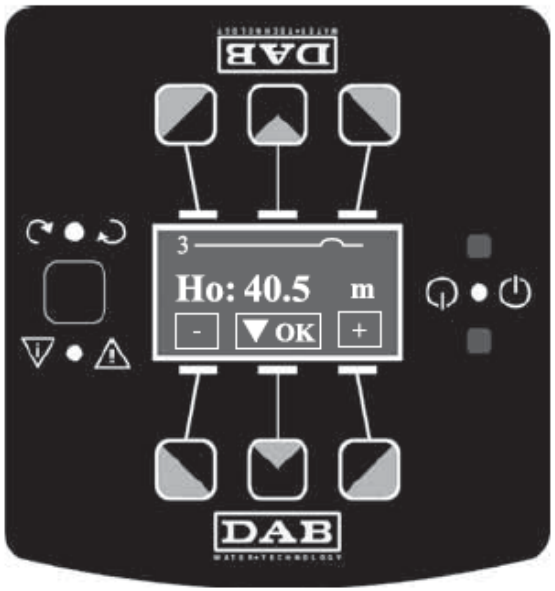
8. Installation Menu

Briefl y press the central button to display the

rated frequency of the pump, ***Fn, and modify if necessary***

ELECTRONICS SEGMENT

7



9. Current control protection settings

In: Rated current of pump.

Set the pump protection current according to the data of the electric pump

10. Setting the direction of rotation

Press + and - to set ***Rt (direction of pump rotation).***

11. Optional parameters

if necessary, set: Minimum frequency, maximum frequency,

Rpm

12. Setting the type of pressure sensor

Select the type of differential pressure sensor installed

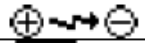
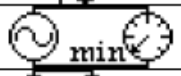
13. Set the maximum pump pressure head

14. Setting the carrier frequency

If necessary, set the carrier frequency value.

If necessary, return to the installation menu from the home page and press and hold the central button for 5 seconds.

MCE/C, Alarms

Alarm Code	Symbol	Description
e0 - e16; e21		Internal error
e17 - e19		Short circuit
e20		Voltage error (DC bus)
e22 - e30		Voltage error (Internal voltages)
e31		Protocol error
e32 - e35		Over temperature alarm
e37		Low voltage alarm (mains)
e38		Over voltage alarm (mains)
e39 - e40		Over current alarm
e43; e44; e45; e54		Pressure sensor alarm
e46		Pump not connected

Digital Inputs

MCE, Spare parts

Cover

Flat display cable

Display board

LV board

HV power board

Heatsink

Pressure sensor

Assembling kits (brackets for inverter on the motor fan)

ELECTRONICS SEGMENT

MCE/P

ELECTRONICS SEGMENT

MCE/P

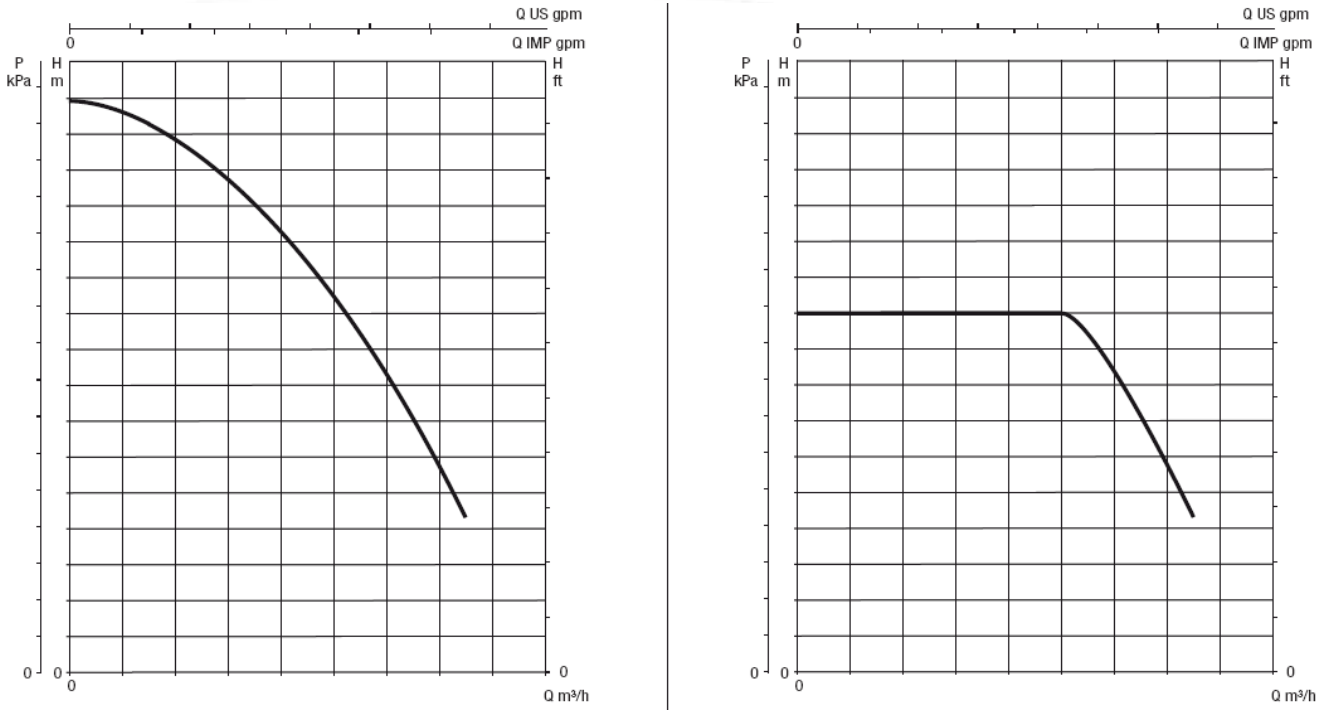
Applications

- Booster sets (up to 8 units)
- Submersible pumps sets
- Heavy duty systems
- Replacement markets

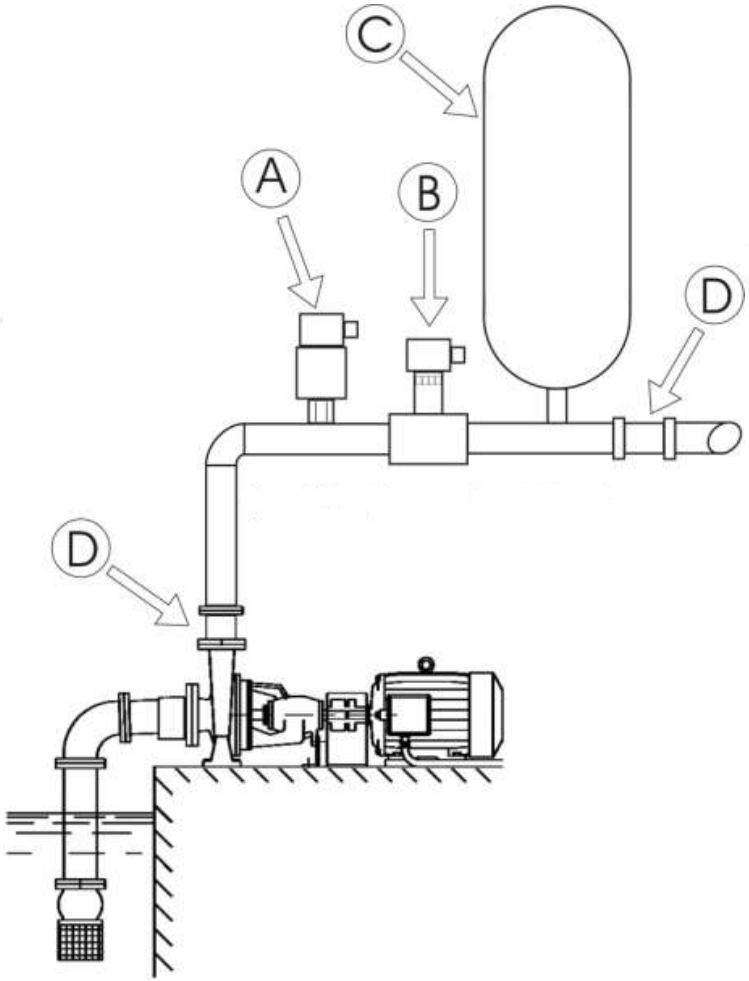
MCE/P, Regulating Modes

– Regulation with constant pressure

> Application: boosters



MCE/P , HYDRAULIC INSTALLATION



KEY

A	Pressure sensor
B	Flow sensor
C	Expansion vessel
D	Check valve

MCE/P, Electrical Connections

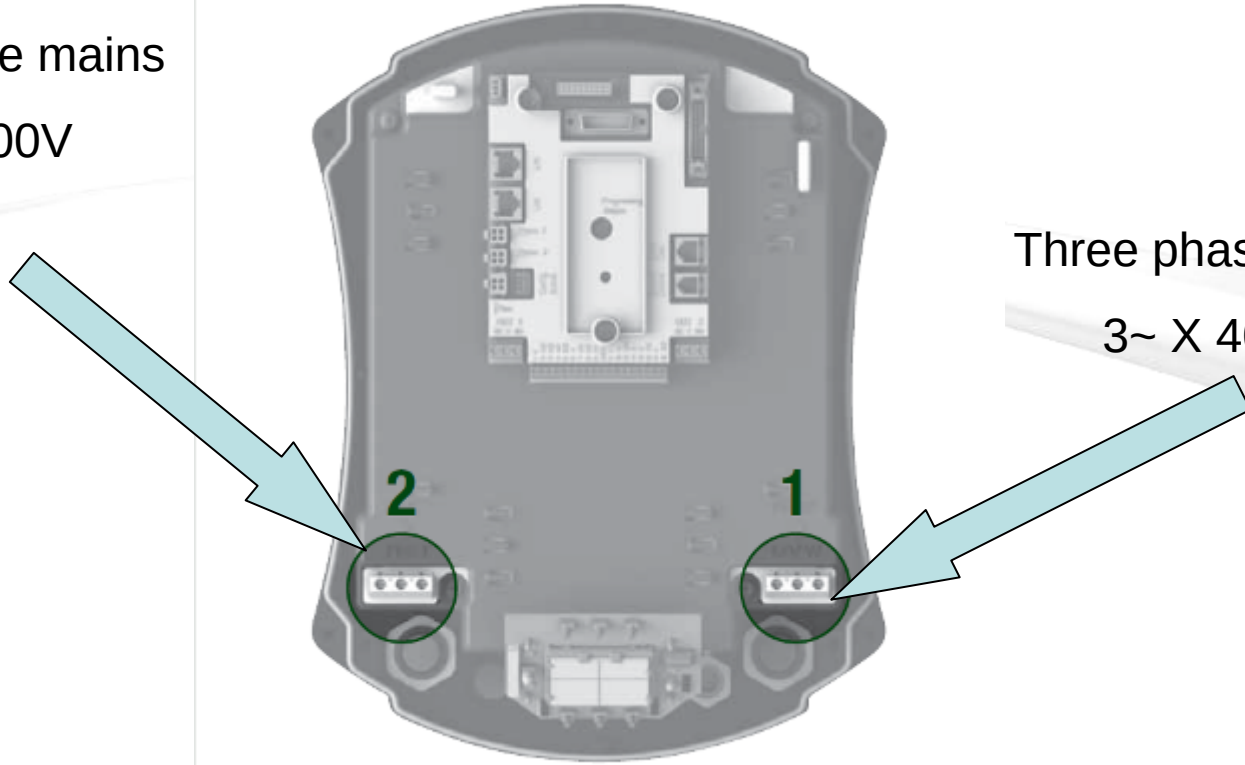
Recommendations

- Wiring separate from other equipment
- One power switch per inverter
- Differential switch class A [AS] for single [three] phase mains
- Proper wire size for the current absorbed

MCE, Electrical Connections (2)

Three phase mains

3~ X 400V

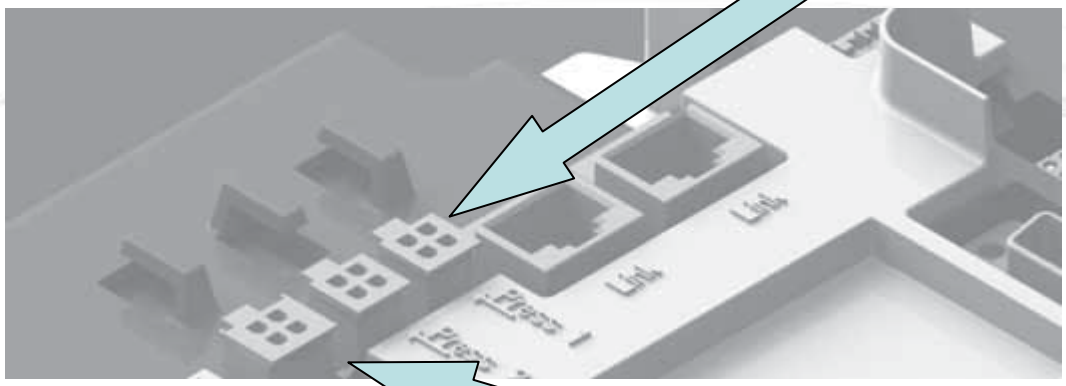


Three phase pump

3~ X 400V

ELECTRONICS SEGMENT

MCE/P, Sensors



Press 1: Pressure sensor

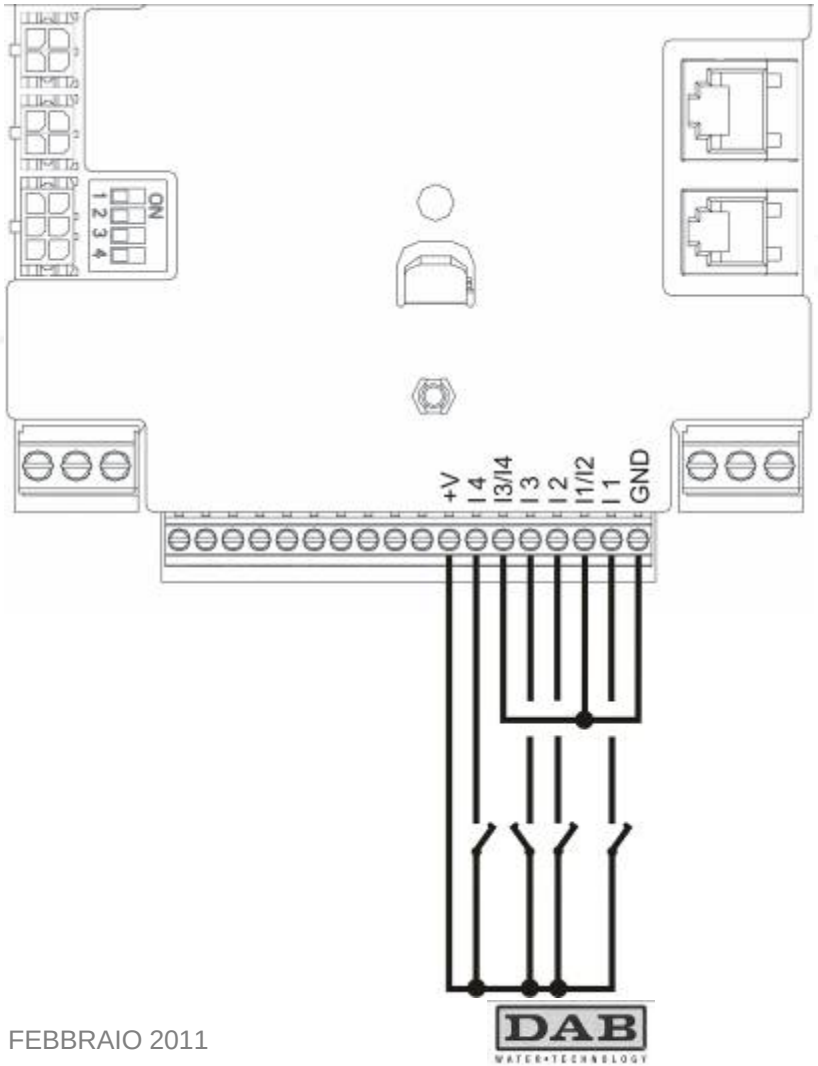
(4 wires), Necessary

Flow: Flow sensor

(6 wires), Optional

To avoid EMC disturbances, the sensors cables are screened.

MCE/P, Photocoupled input contacts



- Specifications:

Voltage 6-36 V AC [AC Inputs]

Voltage 8-36 V DC [DC Inputs]

- The Inputs share the negative polarity
- +V e GND are available
- For every single input, the following operations are available:

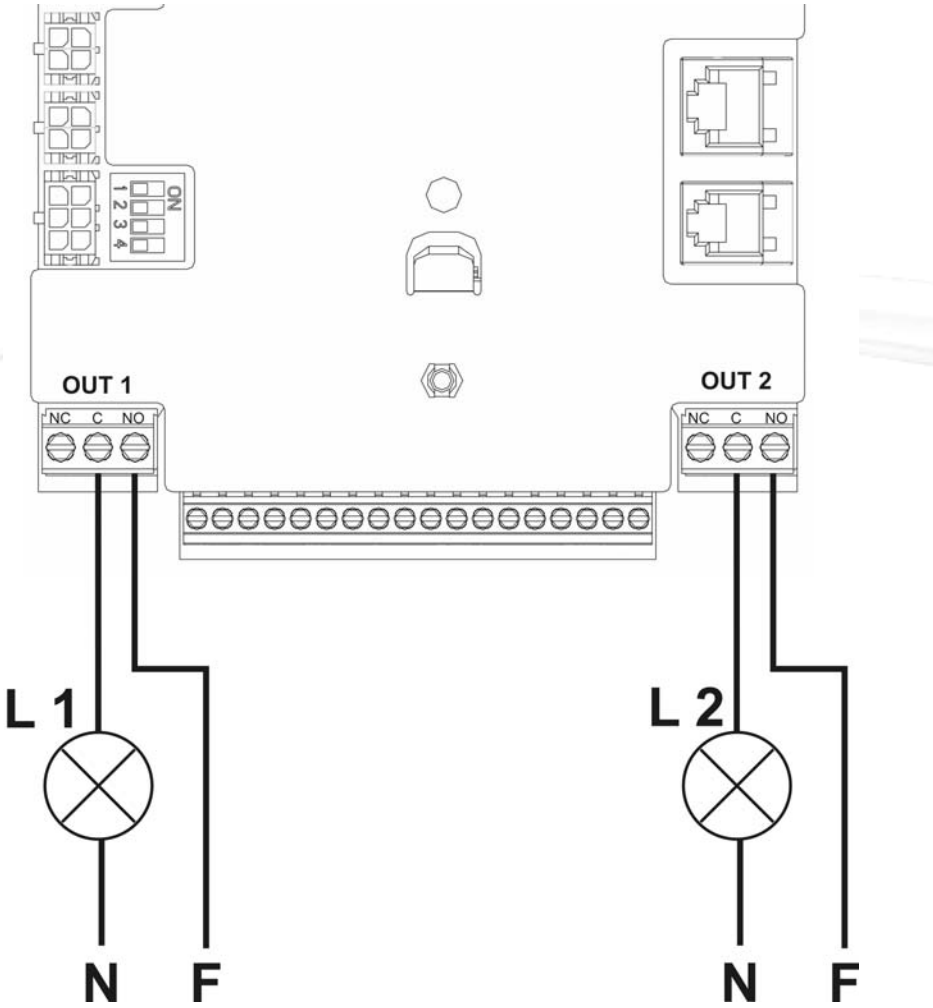
External float switch

Auxiliary pressure

System disabled & alarms reset

Low input pressure

MCE/P, Outputs



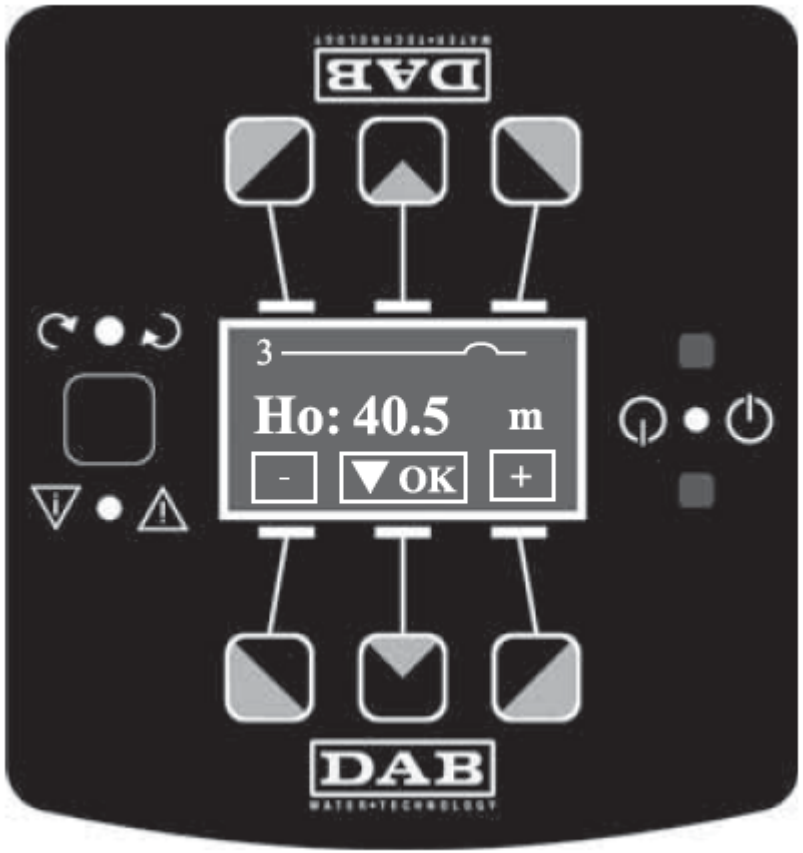
Output 1: Fault/Alarm

Output 2: Running

- Contacts NO, NC, COM
- Vmax 250V
- I max 5A (resistive)

ELECTRONICS SEGMENT

MCE, Display



- Display “oled” 64X128
(**O**rganic **L**ight **E**mitting **D**iode)
- 4 push buttons
- Same menu (see A.D.)
- Description (see units)
- Permanent status indication

ELECTRONICS SEGMENT

MCE/P Menu

Quick-view menu (visible)			Full Menu (direct or password access)			
Main menu	**User menu** *mode*	**Monitor menu** *set-minus*	**Setpoint menu** *mode-set*	**Manual menu** *set-plus-minus*	**Installer menu** *mode-set-minus*	**Tech. Assist. menu** *mode-set-plus*
MAIN (Main page)	FR Minimum of rotation	VF Flow display	SP Restart pressure	FP Minimum frequency	RC Rated frequency	TB Block time due to water failure
Menu selection	VP Restart	TE Temperature temperature	P1 Aux. 1 pressure	VP Restart	RT Direction of rotation	T1 Shutdown time after low pressure
	C1 Pump phase current	BT Temperature temperature	P2 Aux. 2 pressure	C1 Pump phase current	FN Minimum frequency	T2 Delay on shutdown
	SM System monitor	FF Fault & Warning Log	P3 Aux. 3 pressure	RT Direction of rotation	OD Type of system	GP Integral gain
	VE HW and SW information	CT Contrast	P4 Aux. 4 pressure	VF Flow display	RP Restart pressure	GI Integral gain
		LA Language			AD Address	FS Minimum frequency
		HO Operating hours			PR Pressure sensor	FL Minimum frequency
					MS Measurement system	NA Active inverters
					FI Flow sensor	NC Max. simultaneous inverters
					FD Pipe diameter	IC Inverter config
					FK K-factor	ET Max. exchange time
					FT Min. flow threshold	CF Carrier
						AC Acceleration
						AE Antiblocking
						I1 Output 2 function
						I2 Output 2 function
						I3 Output 2 function
						I4 Output 2 function
						O1 Output 2 function
						O2 Output 2 function
						RF fault & warning reset

MCE/P Settings

Turn the power ON (cover closed)

Setting the Rated Current (“RC”)

Press 

 for 5 seconds

The display shows “RC” (rated current)

“rC” corresponds to the rated current (A), visible on the motor plate (A) and it is adjustable by means of the buttons 

MCE/P Settings

Setting the Rotation (“RT”)

Press 

“RT” is shown

By the buttons   select the clockwise or counterclockwise rotation

Suggestion: open a tap and look at the frequency shown on the display; adjust the tap so that the operating frequency is less than the rated frequency of the pump (FN, usually 50Hz).

Modify the parameter RT by means of buttons  or  and check frequency again.

The correct RT is the one corresponding to the lower frequency.

MCE/P Settings

Flow sensor

Flow sensor used

Press 

until the parameter FD is shown (size of the pipe, “), select the diameter of the pipe where the flow sensor is mounted.

Flow sensor not used

Press 

until the parameter FI is shown (type of sensor), select absent.

FI = 0 [1], flow sensor absent [present]

MCE/P Settings

Set Point

Press SET to quit the “Installer Menu”.

Press MODE SET to set up the operating pressure.

SP is shown, adjust the pressure by the buttons 

MCE/P Settings

Flow sensor, Operating notes

The inverter can detect the flow by 3 modes:

- using the flow sensor;
- self-adapting mode (no flow sensor)
- manual mode (no flow sensor)

MCE/P Settings

Flow sensor, Operating notes

If the flow sensor is used, the inverter in real time monitors the delivery flow.

Benefits: the regulating operations are optimized and quicker.

- For booster sets, it is possible to use one flow sensor per pump (useful if the pumps are different).

Disadvantage: using one or several sensors is expensive.

MCE/P Settings

Flow sensor, Operating notes

Self-adapting mode:

- The inverter automatically detects if the pump is delivering flow (checking other parameters, e.g. frequency, current, RPM vs. pressure);
- Settings: FI = 0 (flow sensor absent)
- During the first working hours, the inverter monitors and checks the system, also turning the pump ON and OFF to simulate the “no flow” condition.

MCE/P Settings

Flow sensor, Operating notes

Manual mode:

- the inverter turns the pump OFF if it works below a certain frequency
- Settings: FI = 0 (flow sensor absent); FZ = stopping frequency
- Warning: if FZ is not properly adjusted, it may be that the pump will never be switched OFF.
- Operating mode implemented for the replacement market (see Hydrovar, Lowara)

MCE/P Settings

Requirements and reccommandations for installations without flow sensor

- Pump correctly sized (the pump is capable to generate the working pressure)
- Regulating operations stable (no cycling or pressure fluctuations)
- Parameters **FT**, **RC, FL** properly set up (e.g. at the minimum frequency, the pump generates a pressure lower than the setpoint)

AD AC & PWM SA

Main parameters

- SP, P1, P2, P3, P4
- FN, RC, RP, FI, FD
- FZ (Operations without flow sensor, Manual mode)
- GI, GP

MCE/P, “Multi inverter” systems

Boosters with up to 8 pumps

Purposes:

- Increasing the performances
- Assuring the operations also with inverter or pump damaged/faulty (back-up units = reserves)
- Splitting the power into smaller units

MCE/P, “Multi inverter” systems

Settings. Relevant parameters

- **N no. of inverters** (automatically detected)
- **NA no. of working (“active”) inverters** (they participate in pumping) , **NA ≤ N** (N-NA = no. of back-up units)
- **NC max no. of inverters simultaneously working, NC ≤ NA**
- **ET Switching time** (default 2h)
- **IC back-up (“reserve”) configuration** (default: “auto” >>> inverter participates in pumping OR “reserve” >>> lowest priority)

MCE/P, “Multi inverter” systems

Anti-stagnant algorithm & Exchange time

- Anti-stagnant algorithm: once every 23 hours, the start-up priority is changed to ensure that each inverter (reserves & not active inverters too) works at least one minute per day avoiding deterioration of the water in the impeller and safeguarding the moving parts.
- ET (10 sec. – 9 h): elapsed the TE time, the starting priority is changed, the inverter with a longer working time has the lowest priority. The priority can be changed at standby or pumping.

MCE/P, “Multi inverter” systems

Example 1

Booster with 2 inverters/pumps, inverter A and B

N=2 automatically detected,

NA=1, >>> 1 inverter activated;

NC=1 >>> 1 inverter max working simultaneously

IC=“reserve” for inverter B

<u>Operations</u>: only the “active” inverter A works; if the water demand exceeds its performances, the set point pressure is reduced (max frequency). If and only if the inverter A is faulty, <u>the inverter B is turned ON.</u>

MCE/P, “Multi inverter” systems

Example 2

Booster with 2 inverters/pumps, inverter A and B

N=2 automatically detected,

NA=2, >>> 2 inverters activated;

NC=2 >>> 2 inverters max working simultaneously

IC=“reserve” for inverter B

<u>Operations</u>: the inverter A starts always first; if the water demand exceeds its performances, the inverter B is turned ON. If the inverter A is faulty, <u>the inverter B is turned ON</u> as well.

MCE/P, “Multi inverter” systems

Example 3

Booster with 6 inverters/pumps, inverters A, B, C, D, E, F

N=6 automatically detected,

NA=4, >>> 4 inverters activated;

NC=3 >>> 3 inverters max working simultaneously

IC=“reserve” for inverter E, F

Operations: max 3 inverters work together. The rotation (see ET) is applied to the inverters A, B, C, D (4 activated, max 3 simultaneous). If one inverter is faulty, no reserve is switched ON (3 are still working). Only if a further inverter is faulty, E[F] is switched ON. If a further inverter is faulty, then F[E] is switched ON.

ADAC & PWM SA, Timing

PWM 420, 415, 410

PWM 407

PWM 203

Available

PWM 405, 404

PWM 202, 201

ADAC (all models)

Available starting from May 2011 (also for boosters without flow sensor – only optionally mounted)

ELECTRONICS SEGMENT

MCE/P

Troubleshooting

(1/2)

Fault	Possible causes	Remedy
The display shows EC	Pump current (RC) not set	Set parameter RC (see section 6.5.1).
The display shows BL	1) No water. 2) Pump not primed. 3) Flow sensor disconnected. 4) Entry of setpoint too high for pump. 5) Inverted direction of rotation. 6) Incorrect setting of pump current RC(*). 7) Maximum frequency too low (*).	1-2) Prime the pump ad ensure that there is no air in the pipelines. Check that intake or any filters are not obstructed Check that the pipeline from the pump to the PWM is not damaged or leaking. 3) Check the connections to the flow sensor. 4) Lower the setpoint or use a pump suited to system requirements. 5) Check the direction of rotation (see section 6.5.2). 6) Set a correct value for pump current RC(*) (see section 6.5.1). 7) If possible, increase FS or lower RC(*) (see section 6.6.6).
The display shows BP1	1) Pressure sensor disconnected. 2) Pressure sensor faulty.	1) Check the pressure sensor cable connection. 2) Replace the pressure sensor.
The display shows OF	1) Excessive absorption. 2) Pump blocked. 3) Pump absorbs high current on start-up.	1) Check type of connection; star or delta. Check that the motor does not absorb current over the max. admissible value for PWM. Check that the motor has all phases connected. 2) Check that the impeller or motor is not blocked or obstructed by foreign bodies. Check motor phase connections 3) Reduce the acceleration parameter AC (see section 6.6.11).
The display shows OC	1) Incorrect pump current setting (RC). 2) Excessive absorption. 3) Pump blocked. 4) Inverted direction of rotation.	1) Set RC with the current according to the type of connection (star or delta) as stated on the motor dataplate (see section 6.5.1) 2) Check that the motor has all phases connected. 3) Check that the impeller or motor is not blocked or obstructed by foreign bodies. 3) Check the direction of rotation (see section 6.5.2).

ELECTRONICS SEGMENT

MCE/P

Troubleshooting

(2/2)

The display shows LP	1) Low power supply voltage 2) Excessive voltage drop on line	1) Ensure presence of correct line voltage. 2) Check the power cable section (see section 2.2.1).
Regulation pressure greater than SP	FL setting too high	Reduce minimum operating frequency FL (if electric pump enables this)
The display shows SC	Short circuit between phases	Ensure that the motor is in the correct condition and check connections to the latter
The pump never stops	1) Minimum flow threshold FT setting too low. 2)Short observation time(*). 3) Unstable pressure regulation(*). 4) Incompatible use (*).	1) Set a higher FT threshold 2) Wait for ½ day for self-learning process (*) or implement quick learning process (see section 6.5.9.1.1) 3) Correct GI and GP(*) (see sections 6.6.4 and 6.6.5) 4) Ensure that the system meets the operating requirements without the flow sensor (*) (see section 6.5.9.1). Attempt to reset by pressing MODE SET + - to recalculate conditions without the flow sensor.
The pump stops even when not required	1)Short observation time(*). 2) Minimum frequency FL setting too high (*).	1) Wait for ½ day for self-learning process (*) or implement quick learning process (see section 6.5.9.1.1). 2) If possible set a lower FL value(*).
The multi inverter system does not start	One or more inverters have an incorrect RC current setting.	Check the RC current setting on each inverter.
The display shows: Press + to align this config	One or more inverters have sensitive parameters not aligned	Press + on the inverter that has the most recent and correct configuration of parameters.
(*) The asterisk refers to cases of systems without the flow sensor		

MCE/P

Main alarms

Automatic reset of error conditions		
Display message	**Description**	**Automatic reset sequence**
BL	Block due to water failure	- One attempt every 10 minutes for a total of 6 attempts - One attempt every hour for a total of 24 attempts - One attempt every 24 hours for a total of 30 attempts
LP	Block due to low line voltage (less than 295 Vac)	- Reset when voltage on the terminal returns to above 348 Vac
HP	Block due to high internal power supply voltage	- Reset when voltage returns to a specified value
OT	Block due to overheating of final power stages (TE > 100°C)	- Reset when temperature of final power stages falls below 85°C
OB	Block due to overheating of printed circuit (BT> 120°C)	- Reset when temperature of printed circuit falls below 100°C
OC	Block due to current overload on electric pump motor	- One attempt every 10 minutes for a total of 6 attempts
OF	Block due to current overload on final stages of output	- One attempt every 10 minutes for a total of 6 attempts

MCE/P

GI, GP Settings, Rule of thumb

- Set up GP & GI to the minimum values
- Open a tap (small water demand). Change the water demand (opening/closing slowly the tap), looking at the pressure gauge
- Increase GI until the first fluctuations of pressure occur (opening/closing slowly the tap)
- Set up GI = ¼ of the value found at the step above
- Now increase GP until the fluctuations of pressure occur and again set up GP = ¼ of the value found