



NEO-SOLAR

technical manual



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See this manual



See NEO-WiFi manual

<http://www.motive.it/manuali/manuale-NEO-WiFi-eng.pdf>



1. NEO SOLAR - INTRODUCTION

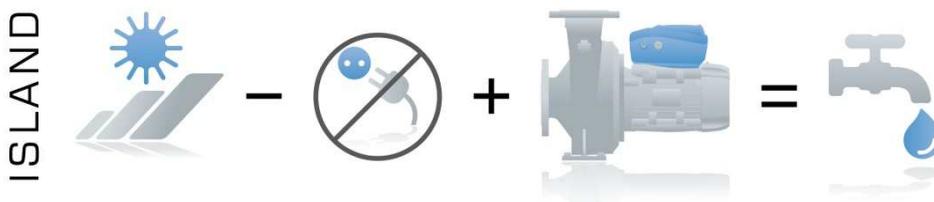
This is a new, patented inverter system, powered directly by a stand-alone photovoltaic panel or with hybrid power (photovoltaic and mains power together), to monitor, control and adjust induction motor speed. The main application relates to well water lifting systems, water storage in artificial reservoirs or containers and irrigation, where there is no electricity or/and as an alternative to motor-generators.

The inverter can be integrated directly in a three-phase AC motor or mounted on the wall, without the need to build protective electrical cabinets as the natural protection rating is IP65. In addition, the wi-fi keypad ensures interaction with the product, even when it is installed in environments that are difficult to reach.

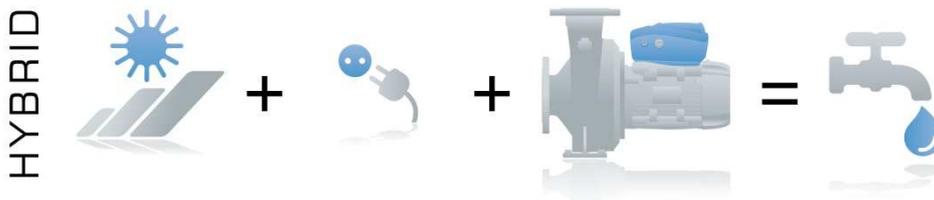


The system can operate in two ways:

1. **stand-alone:** without connection to the mains, or



2. **panel/mains hybrid:** thanks to the optional POWER-BOX device, NEO-SOLAR-3 will use the photovoltaic energy available automatically and proportionally, compensating the remaining energy with power from the mains or from the generator.

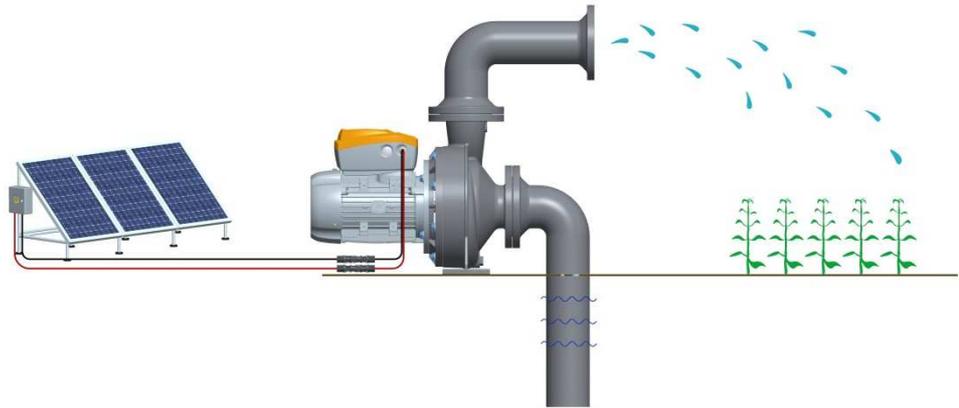


Advantages of NEO-SOLAR compared to classic DC solar pumps

- The system can be combined with a wide range of motors already installed, since these are typically AC induction motors, without requiring their replacement. An induction motor is in fact by far the most popular and cheapest option and can reach significant efficiency levels (IE3), especially in medium and large sizes
- The system installation and maintenance is known and accessible to technicians worldwide
- Compared to pumps with DC motors, the amperages are lower, the cables have smaller cross-sections and have less voltage losses
- NEO-SOLAR can be connected simultaneously to solar panels and to the electrical mains and/or to a generator, to compensate for possible insufficient solar radiation or for use at night.
- Highest maximum power, up to 11kW

Stand-alone

Solar Surface Pumps



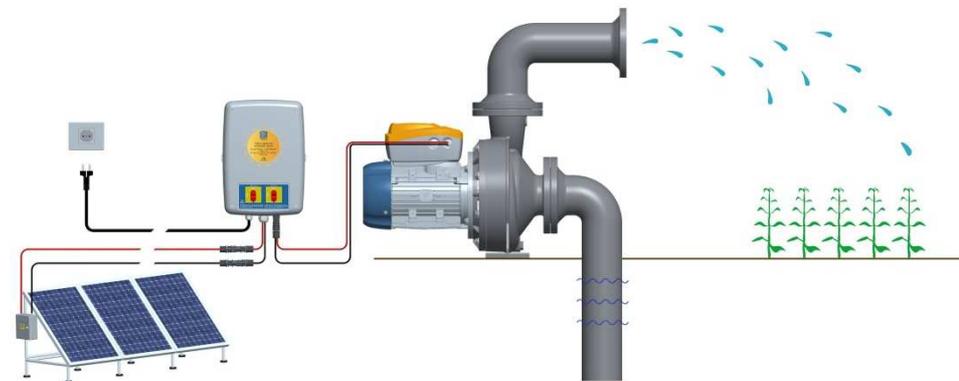
Stand-alone

Solar Submersible Pumps



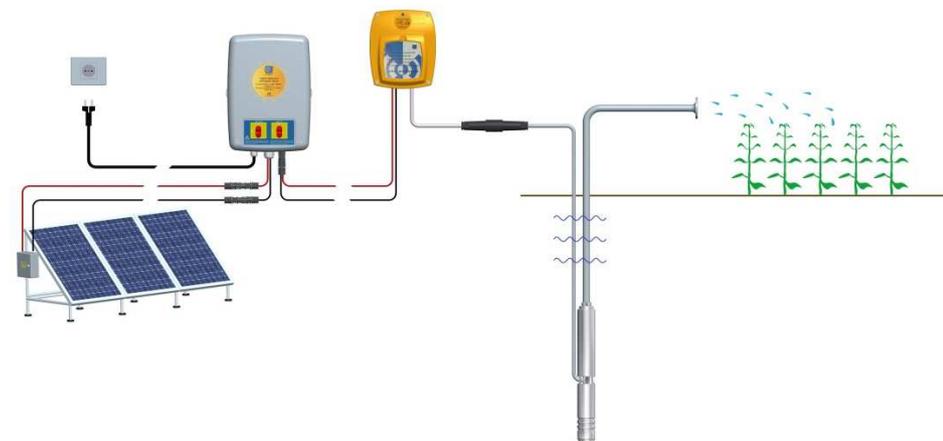
Hybrid

Solar Surface Pumps



Hybrid

Solar Submersible Pumps



2. WORKING CONDITIONS



Physical quantity	Symbol	UOM	NEO-SOLAR-3kW	NEO-SOLAR-11kW	NEO-SOLAR-22kW*
NEO-SOLAR protection degree*	IP		IP65		
 Min starting voltage (from solar panels)	V_{in}	V	250Vdc		
 Stop voltage (from solar panels)	V_{in}	V	170Vdc		
 Max voltage (from solar panels)	V_{in}	V	650Vdc		
Motor rated frequency	f_{2n}	Hz	50/60HZ		
Motor rated voltage	V_{2n}	V	190-460Vac three-phase +/- 5%		
NEO-SOLAR output frequency to motor	f_2	Hz	20-110% f_{2n}		
NEO-SOLAR output current to motor	I_{2n}	A	7.0	22	
Storage temperature	T_{stock}	°C	-20..+60		
Environmental operating temperature	T_{amb}	°C	0..40		
Maximum relative humidity		% (40°C)	50		
Maximum Wi-Fi keypad-NEO communication distance out in the open		mt	20		

*not yet available

Table 1: working conditions

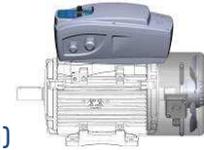
Other characteristics	NEO-SOLAR-3kW	NEO-SOLAR-11kW
Motor control	V/F	vectorial
Integrated battery-operated clock (for possible programmable start and stop);	NO	YES
EMC noise filters included as standard (industrial environment ref. EN 50081-1, section 5)	YES	YES Class A – Cat C2
EMC for DOMESTIC, COMMERCIAL AND LIGHT INDUSTRIAL ENVIRONMENT (ref. EN 50081-1, section 5)	YES (from V2.01) Class A – Cat C1	optional
3PH disconnecting switch	optional code INTEM3X32A	optional code INTEM3X32A
Communication protocol	MODBUS RS485, SCADA EIA/TIA-485-A	MODBUS RS485, SCADA EIA/TIA-485-A
Internal braking resistors	YES	YES

3. MOTORS THAT CAN BE CONNECTED

Power range of motors that can be connected

motor-kW	0.13	0.18	0.25	0.37	0.55	0.55	0.75	1.1	1.1	1.5	1.9	2.2	3	4	5	5.5	7.5	9.2	11	
NEO-SOLAR-3													SV							
NEO-SOLAR-11																			SV	SV+F

SV= applicable power only with forced ventilation (chap. 4a)



F= inner fans (chap. 4a)



Power range of motors that can be connected hybrid

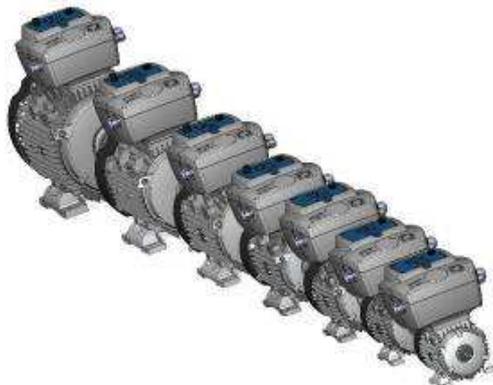
(with **POWER-BOX**)

motor-kW	0.13	0.18	0.25	0.37	0.55	0.55	0.75	1.1	1.5	1.9	2.2	3	4	5	5.5	7.5	9.2	11	
NEO-SOLAR-3																			

NEW WIFI COMBINED WITH MOTOR ACCORDING TO THE IEC DIMENSIONS

Tab. RD: Size range of IEC motors that can be connected

motor-IEC	63	71	80	90S	90L	100	112	132S	132M	160
NEO-SOLAR-3										
NEO-SOLAR-11										



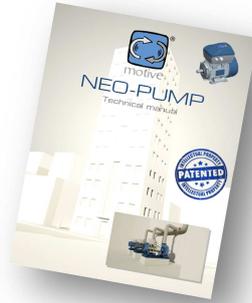
See NEO-WiFi manual <http://www.motive.it/manuali/manuale-NEO-WiFi-eng.pdf>

4. MECHANICAL ASSEMBLY

4a. motor assembly

4b. keypad installation

See NEO-PUMP manual <http://www.motive.it/manuali/manuale-NEO-PUMP-eng.pdf>



5. ELECTRICAL ASSEMBLY

5a. warnings

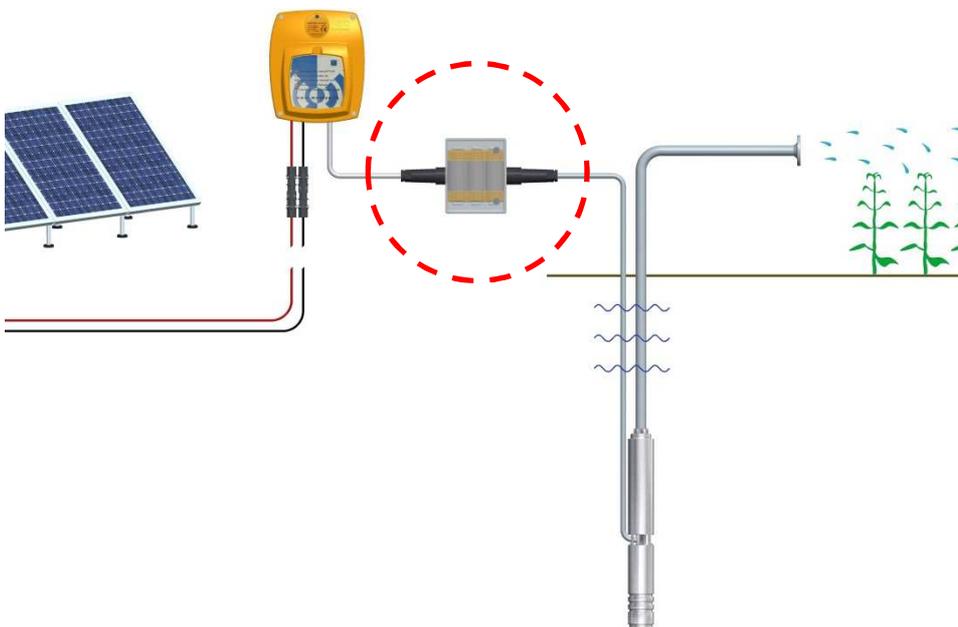
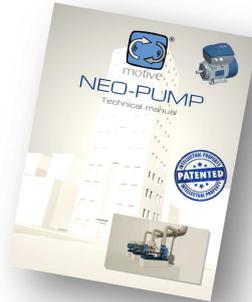
If the system features several parallel strings, cut-out fuse protection is mandatory. We recommend using cut-out fuses even for a single string.

5b. electrical connection to the motor

5c. electrical connection to the line

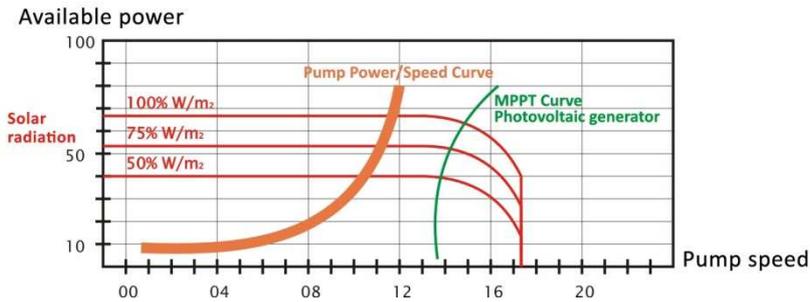
5e. connection of external devices

See NEO-PUMP manual <http://www.motive.it/manuali/manuale-NEO-PUMP-eng.pdf>



When installing NEO-SOLAR at a distance higher than 25mt from the motor, do not forget to install the induction line choke. Motive offers it in IP00 and IP55 versions.

5f. THE PHOTOVOLTAIC GENERATOR



The NEO-SOLAR SW is a better solution compared to the traditional MPPT (Maximum Power Point Tracker) to achieve maximum results from a pump.

The figure alongside features a stylized power/speed characteristic of a pump according to the typical solar exposure of a photovoltaic panel. In order to make the pump work properly, its characteristic

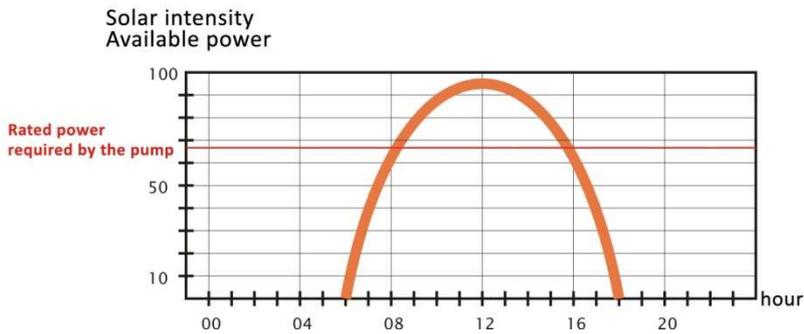
curve should ideally operate within the MPPT limit of the photovoltaic field, with an operating margin in terms of available voltage and current. As the power drops, the available voltage of the panel will not drop, thus allowing the motor to reach rated speeds, but with increasingly less availability of power. If the system has been designed to make the pump work with maximum performance, once the generator no longer has the necessary power equal to the rated power of the pump, it will stop working. A classic MPPT system, unlike an MPST (Max Point Speed Tracker) system, is not useful in this operation, while a variation in speed like that performed by the NEO-SOLAR, as well as the power absorbed by the system will ensure that the photovoltaic resource is used completely, for maximum water transport.

The NEO-SOLAR SW improves current delivery to the motor compared to an MPPT system and is therefore more suitable for the final objective, which is to have sufficient energy to maximize m²/h prevalence throughout the day. In fact, the purpose of the MPPT system is to constantly find a compromise between current and voltage, in order to store the extracted power, part of which, with such voltage and current values, if used to power a motor, would be useless for its operation. It is obvious that to make the pump work properly, its characteristic curve must operate within such a limit, leaving an operating margin in terms of available voltage and current. The MPPT point is not an operating area for the motor and the use of this power extraction system could unnecessarily limit the delivery of current or voltage to the motor

In addition, the MPPT system is incompatible with hybrid solar/mains power. The DC current generated by the mains, after going through an inverter, inevitably contains a RIPPLE (cyclic voltage variation). The descending and ascending phases of this ripple, if intercepted by the MPPT control, are recognised as a variation of the photovoltaic generator and can lead to behaviour in which the system increases or decreases delivery.



5g. PHOTOVOLTAIC GENERATOR SIZING



Please note that the sun, unlike the electrical mains, is a reliable but unpredictable energy source and therefore, the greater the peak power installed, with the same solar radiation conditions, the greater the operating hours. The basic sizing starts with the installation of peak power (Wp) equal to 1.5 times the absorbed power of the motor (note: the absorbed power is higher than the rated power, and it depends by the motor efficiency). This will

ensure optimum operation in weather conditions such as to achieve the best performance of the photovoltaic panel. The figure below features a typical curve of available solar intensity/power throughout the day. Using the chart as an example, considering 100%=1 kw-peak and the motor with 0.75kw absorbed, there will be guaranteed theoretical operation for 8 hours. Each application must therefore be sized according to m³/hour of water required per day, to the position of the system on the globe, the inclination to the sun, the average environmental temperature, the performance of the panel and of the components used (pump prevalence and efficiency, system efficiency, losses on the connections).

The proper sizing of the photovoltaic generator must necessarily consider the following factors:

- the average solar exposure of the place where the system is located,
- the work to be performed (cubic metres of water)
- the time required to perform it (according to the capacity of the hydraulic part).
- geographic location of the system,
- number of operating hours required to perform the work.

The table below is a brief guide for choosing a photovoltaic field that is suitable for most applications. Naturally, the customer can use the panels deemed most suitable, while remaining within the required power and voltage characteristics.

Always pay attention to the system's operating temperature, bearing in mind that as the temperature increases there is a loss of power and voltage available at the ends of the photovoltaic panels.

The sensitive points to be verified are:

- **MAXIMUM STRING VOLTAGE:** It must NEVER exceed 690Vdc considering the Vopen voltage (sum of the open circuit voltages of the photovoltaic panel) of the photovoltaic panel. Exceeding this voltage even temporarily can damage the system and in any case triggers an overvoltage alarm, blocking the system. Check that this voltage is within all the required temperature limits.
- **RATED STRING VOLTAGE:** It must NEVER fall below 530Vdc for 400Vac motors and under 340Vdc for 230Vac motors, to ensure proper motor control. This voltage refers to Vnom (sum of the rated voltages of the photovoltaic panel). For this voltage check that the drop caused by the increasing temperature is not such to fall below the minimum value.
- **PEAK POWER:** The minimum power corresponds to the power absorbed (P1) by the system, added to the losses of the system that can be estimated as 10% (inverter efficiency and loss on the wiring). It is clear that the system will work with maximum performance only while the solar panels are exposed to optimum solar radiation, which implies a very limited period of time even on days with good weather. Real sizing involves power that starts from 30% to 50% more than the power absorbed, depending on the desired "potentially guaranteed" hours. "Potentially guaranteed" means with good weather.
- The longer the series of panels, the higher the volts and not the current. Panels in parallel do not increase the Volts
- The efficiency of the motor must also be considered (kW rendered/kW absorbed), marked on the plate, according to European regulations. The aim is to provide the motor with the power that it absorbs, greater than that which it must render.



Download Motive Solar Utility

: It calculates the correct photovoltaic generator sizing and chooses the right NEO-SOLAR for you after that you input some info like the panels data, max temperature, motor power, etc.



Motive Solar Utility is automatically in Italian or English (for all non-Italian users) depending by the settings of your smartphone/tablet



Only for Android

- 1. Download the APP from play-store



- 2. Digit "Motive Solar"
- 3. Click on Motive Solar Utility icon



- 4. You will be automacally given a password by e-mail to start using it. Insert it.

Motive NEO-WiFi APP is automatically in Italian or English (for all non-Italian users) depending by the settings of your smarphone/tablet.

Motive Solar Utility
Solar panel calculations

Single panel data	
Open loop voltage [V]	37
Rated voltage [V]	30
Rated current [A]	8.3
Peak power [W]	2500
Power/Temperature coefficient [%/°C]	-0.44
Voltage/Temperature coefficient [%/°C]	-0.44
Characteristic temperature [°C]	40

System data expectation	
Motor power requirement [W]	3000
Rated motor voltage [V]	230
Maximum expected temperature [°C]	50
Series recommended from 10 to 12 panels	
Panels in series number	18
Parallels number	1
Multiplication factor (minimum 1.5 suggested)	1.5

Calculate Results

Results	
Total Panels:	18
Maximum peak power installed:	43,020.00 W
Maximum open loop voltage:	666.00 V
Minimum rated voltage:	516.24 V
Rated current at characteristic temperature:	8.30 A

NEO SOLAR	
Maximum peak power installed:	PV power OK
Maximum open loop voltage:	Correct voltage
Minimum rated voltage:	OK

EXAMPLE OF MINIMUM PHOTOVOLTAIC SIZING

Motor rated power P2 (kW)	System power consumption P1 (KW)	Recommended minimum PV power (Wp)	Photovoltaic panel power (Wp)	Vopen (V)	Vnom (V)	Number of panels in series	Number of strings	Total panels and power installed (N - KWp)
0.37/230V	0.71	1.065	165	37	30	11	1	11 – 1.81Kwp
0.55/230V	0.92	1.38	165	37	30	11	1	11 – 1.81Kwp
0.75/230V	1.19	1.79	165	37	30	11	1	11 – 1.81Kwp
1.1/230V	1.72	2.58	250	37	30	11	1	11 – 2.75Kwp
1.5/230V	2.2	3.3	250	37	30	12	1	12 – 3.00-Kwp
0.37/400V	0.71	1.065	165	37	30	18	1	18 – 2.97Kwp
0.55/400V	0.92	1.38	165	37	30	18	1	18 – 2.97Kwp
0.75/400V	1.19	1.79	165	37	30	18	1	18 – 2.97Kwp
1.1/400V	1.72	2.58	165	37	30	18	1	18 – 2.97Kwp
1.5/400V	2.2	3.3	185	37	30	18	1	18 – 3.3Kwp
2.2/400V	3.17	4.75	250	37	30	18	1	18 – 4.5Kwp
3.0/400V								
4.0/400V								
5.0/400V								
5.5/400V								
7.5/400V								
9.2/400V								
11/400V								

An initial assessment of the table above points out that for low power motors, up to 1.1kW, it is best to use the motor output voltage at 230Vac, a solution that involves using a string with fewer panels. The powers are in any case the recommended minimum powers; the greater the power installed, the greater the daily duration of system operation with the same weather conditions.

It is clear that sizing cannot disregard the type of pump to be controlled and the characteristics of the water intake (depth of the well, pressure required, etc) and should always be compared to the work, in terms of the amount of water to be lifted daily or on average in a given period.



If you cannot use our App Motive Solar Utility, we can assist you in the design of the whole photovoltaic system. To do so, we just need you to fill the following form:

Customer Requirement List



Information you provide in the following form will help us to recommend you the most optimized solution for your solar pumping systems.

1 Mounting location

Country: _____

City: _____

User's Name: _____

Tel/Cell: : _____

Area category (see below):



Islands, costal area, lakes and desert areas



Agricultural fields, villages, bushland, hills, sparehousing and small settlements



Suburban buildings



Urban areas with buildings of higher level

2 Purpose of use

- | | | |
|--|---|--|
| <input type="checkbox"/> Agriculture irrigation | <input type="checkbox"/> Desert control | <input type="checkbox"/> Fountains |
| <input type="checkbox"/> Pasture animal husbandry | <input type="checkbox"/> Desalination | <input type="checkbox"/> Forestation |
| <input type="checkbox"/> Water circulation system | <input type="checkbox"/> Water supply | <input type="checkbox"/> Drought control |
| <input type="checkbox"/> Others (Please specify _____) | | |

3 Details

3 Average daily water requirement is _____ m³.

3 Do you have a storage device?

Yes

3 Do you have a minimum daily water requirement?

Yes

No

If yes, please specify the amount _____ m³/day.

3 Your water source may be _____.

(well, river, lake, pond or any other sources)

4 Please specify below details: the straight-line distance D2 is _____ m; the length of slope line D3 is _____ m; the distance of water jet D4 is _____ m; the distance between pump and static level V1 is _____ m; the vertical distance between tank and static level V2 is _____ m; the depth of well V3 is _____ m; the length of wires between pump and inverter V4 is _____ m; the distance between PV module and inverter V5 is _____ m. If the source is well, the diameter of the well D1 is _____ cm.

4 Do you have requirement on lightning protection?

Yes

No

4 Which kind of pipe do you plan to use:

PVC

Iron

Stainless

Others (Please specify _____)

The diameter of pipe is _____ inch.

4 Do you have an existing pump that you want to use?

Yes

No

If yes, the power of the pump is _____ HP or _____ W; voltage is _____ V; flow/lift is _____; type is _____.

Single phase

3-phase

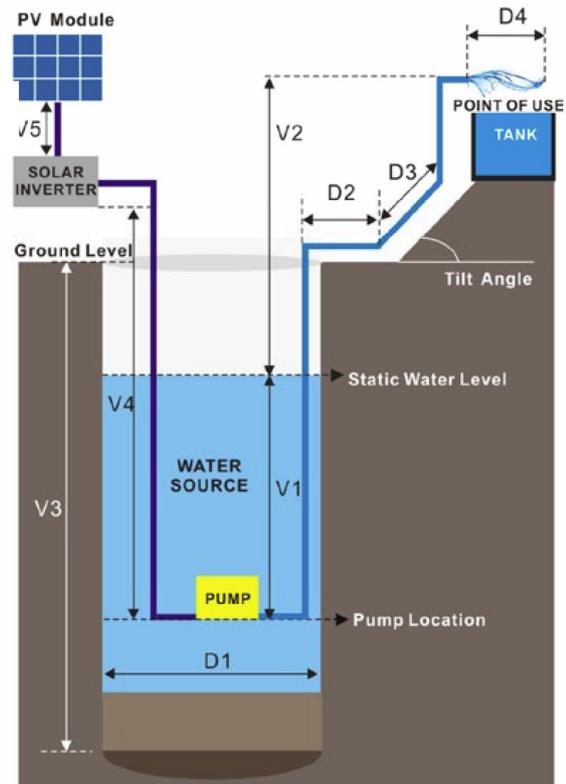
4 Do you require the system to work during some specific hours? For example: cloudy days, or before 6 am.

Yes

No

If yes, please specify the time and the frequency _____.

* Any inaccurate info will effect the working performance of solar pumping system, even damage the inverter!

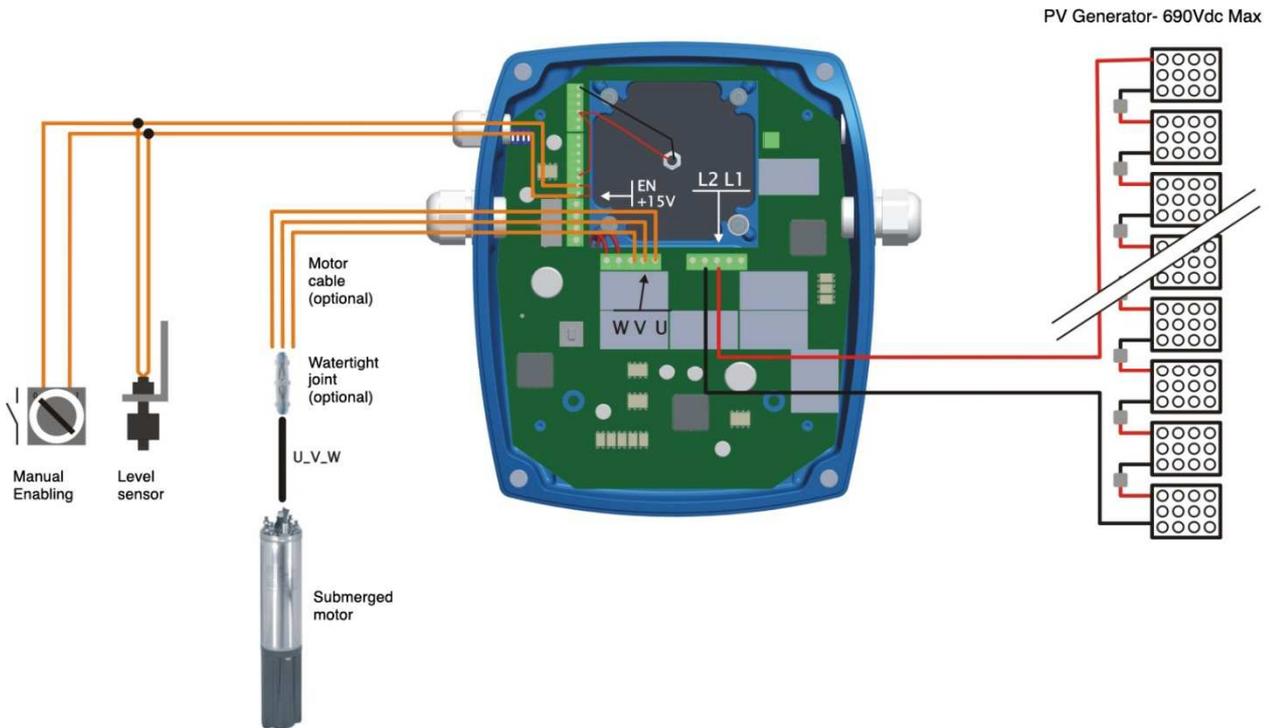


5i. BEHAVIOUR IN THE ABSENCE OF SUN

UNDERVOLTAGE alarms are related to the disappearance of energy from the photovoltaic system (PV-powered versions only).

NEO-SOLAR will try to restart every 999 seconds (or a shorter time if programmed). If the cause of the alarm has been eliminated, NEO-SOLAR will restart the motor, otherwise the alarm will remain. In this case, write down the code that appears on the display and contact the technical support service.

5d. EXTERNAL ELECTRICAL CONNECTIONS



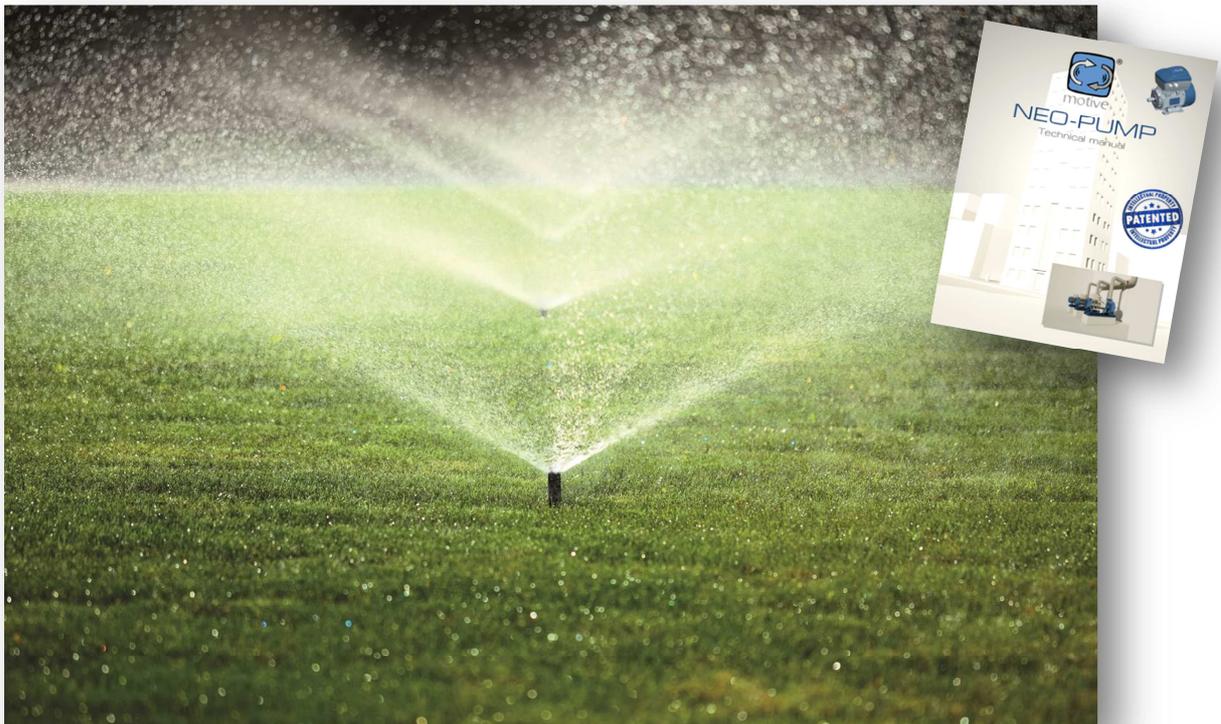
Above is the basic connection diagram for the product. The product comes with a fixed enabling (bridge between terminal +15V and EN of the control terminal board). If level sensors or an external switch-operated enabling are used, the bridge must be removed. Connect an earth connection to the GND terminals of the terminal board.

Control type 1: Speed (MSPT)



Control type 2: Pressure

In systems where it is required to work only at a constant BAR pressure controlled by a pressure sensor, the programming menu of NEO-SOLAR permits to select also such alternative working way (<http://www.motive.it/manuali/manuale-NEO-PUMP-eng.pdf>)



6b. keypad buttons



Button	Description
	To enter the function menu
START  ENTER	To start the engine / to access the sub-menu or to enter the function and change its values
	Allows you to scrolls up through the menu items or change in positive the values of the variables; at the end of the change press ENTER. During operation also allows to increase the BAR / RPM, which is saved automatically after 10 seconds from the change
	Allows you to scroll down through the menu items or change in negative the values of the variables; at the end of the change press ENTER. During operation also allows to increase the BAR / RPM, which is saved automatically after 10 seconds from the change
STOP  ESC	To stop the engine / to exit from the sub-menu (by entering the main menu); to exit from the main menu enabling the motor controls and automatically saving the set data if pressed in a rapid sequence (at the end it must show the writing "DATA SAVED").

Table 3: Buttons

6c. keypad leds



Led	Descrizione
Power ON	 Green - signals the presence of mains voltage on the feed
Motor ON	 Green - Motor functioning
Alarm	 Red – signals an anomaly (see list of Alarms) when turned on

Table 4: Led description

6d. functions menu:

main menu

Menu	Sub-menu	Description
Language		Italian / English
Communication	1. Code Motor	1. from 1 to 15
	2. Radio frequency This function is enabled only if pins +15V and SET (for NEO3) / 0V and SET (for NEO11/22) are connected by a cable bridge.	2. from 860 to 879 MHz
Reference Pressure (irrelevant setting if you set the control type mode on "speed")	Each Set Point is an input that defines the reference pressure in force; the Set Point value depends on the status of the two set digital inputs (see the table of IN/OUT inverter connections). For all the 4 Set Points: range 0.5 .. Pmax (value set in the pump data)	
	1. SetP1	1. from 0.5 to 16 bar
	2. SetP2	2. from 0.5 to 16 bar
	3. SetP3	3. from 0.5 to 16 bar
	4. SetP4	4. from 0.5 to 16 bar



By setting the digital inputs (D2 and E2 for NEO3, A+ and B+ for NEO11/22) you can set up to a maximum of 4 reference pressure Set Points (Reference pressure menu), with the default values shown below:

Set Point	A+ (N°1 – J11)	B+ (N°3 – J11)	Valore default	Note
P1	0	0	3.00 Bar	Standard configuration, with contact D2 and E2 simultaneously open (NEO-3) Standard configuration, with contact A+ and B+ simultaneously open (NEO-11/22)
P2	0	1	2.00 Bar	Contact E2 closed on 15V (NEO3) - Contact B+ closed on 0V (NEO11/22)
P3	1	0	1.50 Bar	Contact D2 closed on 15V (NEO3) - Contact A+ closed on 0V (NEO11/22)
P4	1	1	1.00 Bar	Contact D2 and E2 simultaneously closed on 15V (NEO3) Contact A+ and B+ simultaneously closed on 0V (NEO11/22)

All Set Points can always be changed directly from the + and - buttons on the keypad, while the NEO-PUMP runs, and they are automatically saved.

Motor data (See motor plate)	1. Rated voltage [V]	1. from 180 to 460
	2. Rated frequency [Hz]	2. from 50 to 140
	3. Rated current [A]	3. 0.6 ÷ 7A (NEO-3); 0.6 ÷ 22.0A (NEO-11); 0.6 ÷ 45.0A (NEO-22)
	4. Rated RPM	4. from 1400 to 8300
	5. Power factor cosφ	5. from 0.60 to 0.93
	6. Rotation	6. 0=clockwise, 1=counter clockwise
	7. Minimum flow protection [%]	7. from 50 to 127
	8. Dry working power protection [%]	8. from 10 to 100
Pump data	1. Pressure max [bar]	1. To limit the maximum pressure from 1 to 50 bar
	2. Check [ON/OFF]	2. With Check=ON, the auto-tuning Check is run upon the next Start-up.
Pressure transducer	1. min [mA; V]	1. minimum pressure sensor threshold from 0.6mA / 0.15V to 16mA / 4V
	2. max [mA; V]	2. maximum pressure sensor threshold from 4mA / 1V to 22mA / 5,5V
	3. range [bar]	3. flow rate: sensor proportional reading field from 1 to 50 bar
Advanced function	Access to the advanced functions sub-menu	To access enter numeric access Password (number pre-assigned by Motive: 1).
Saving/Reset	Yes save: the changes made are saved	Save the changed data, or restore the default values
	Not save: returns to the values preceding the changes	NOTE: auto-saves every time you exit the from function menu
	Factory data: resets the factory values	CAUTION: Reset is enabled without the presence of the bridge +15V-SET (NEO-3) / 0V-SET (NEO-11/22) (III. X)
	Communication reset	Communication Reset is enabled only in the presence of the bridge +15V- SET (NEO-3) / 0V-SET (NEO-11/22) (III. X)

Table 5: main menu

advanced functions menu

Advanced Function Menu	Sub-menu	Description
Motor limits	1. Maximum speed [% di rpm]	1. from 90 to 110%
	2. Minimum speed [% di rpm]	2. from 20 to 80%
	3. Acceleration [s]	3. from 0.1 to 99.9
	4. Deceleration [s]	4. from 0.1 to 99.9
	5. Maximum current [%]	5. 80 ÷ 150 (NEO-3) 80 ÷ 200 (NEO-11) 80 ÷ 150 (NEO-22)
Pressure control (irrelevant setting if you set the control type mode on "speed")	1. Pressure hysteresis [Bar]	1. Hysteresis pressure control - from 0.10 to 3.00 Bar If for example the value of reference pressure is set on 3.0 Bar and Hysteresis is set on 0.2 Bar, the pump will restart working when the pressure go down to 2.8 Bar
	2. Dry working stop delay [s]	2. Delay before the dry operation alarm warning – from 10 to 300 sec
	3. Dry working restart delay [min]	3. Restart attempts interval after dry operation alarm; after 5 restart attempts: block with manual reset - from 0.3 to 99.9 min
	4. Pipe filling delay [s]	4. Duration at minimum speed (motor limits) during start-up, when the pressure is less than the completed filling limit pressure; this delay is excluded in the minimum flow restart - from 0 to 999 sec
	5. Filling pressure limit [Bar]	5. Limit pressure below which the motor maintains the minimum speed upon start-up for the time set in the previous point - from 0.1 to 16 Bar
	6. Minimum flow stop delay [s]	6. Waiting time before switch-off due to Closed Supply - from 4 to 120 sec
	7. Minimum flow restart delay [s]	7. Restart time after switch-off due to Closed Supply - from 4 to 120 sec
	8. Emergency restart delay [s]	8. Waiting time before the restarting after motor switch-off due to an emergency - from 5 to 120 sec
	9. Dry working Power Factor $\cos\phi$ limit	9. When $\cos\phi$ drops below this value dry operation is indicated (with insufficient intake or air) - from 0.0 to 0.9 $\cos\phi$
	10. Alternating time [min]	10. Time of working alternation between pumps and the other for the translation of the first low – from 2 to 999 min
Control type	1. Mode: · Master-Slave RS485 · Pump pressure · Speed	1. Control mode (Default: Pump Pressure): - Master-Slave with pump pressure mode: group operation with other inverters connected by an RS485 serial cable. (in Speed mode is not possible in master-slave mode); - Pump pressure: pressure for single pump retroactive control (requires the pressure transducer); - Speed: directly regulates the speed even without the pressure sensor (safety stop due to dry operation/closed supply with manual reset).

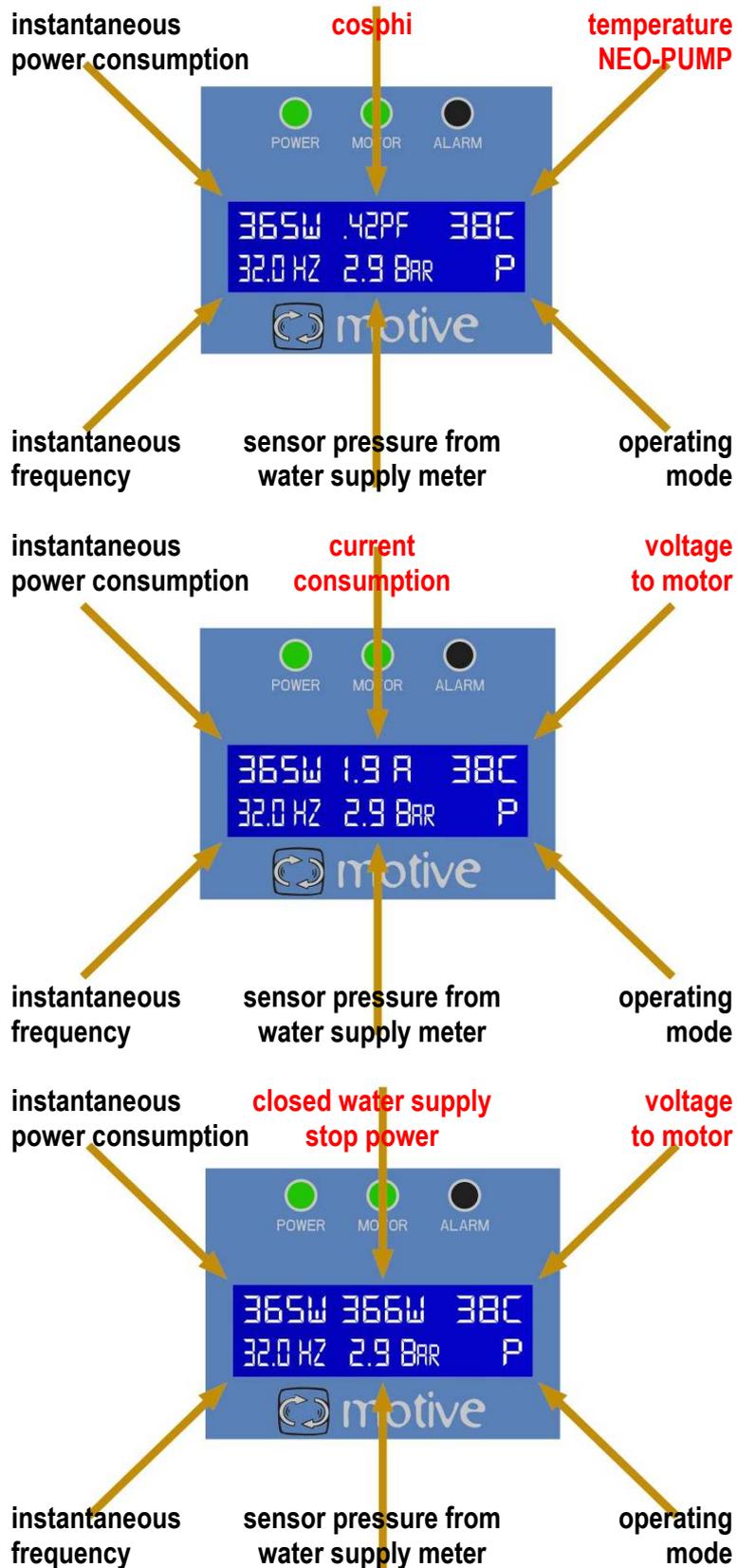
	<p>2. Number of pumps</p> <p>3. Code (0=7)</p> <p>4. Speed reference [RPM]</p> <p>5. Start/Stop input</p> <p>4. Pressure reference input</p> <p>5. Preheating temperature in stand-by [°C]</p>	<p>2. Number of pumps running in a group - from 2 to 8</p> <p>3. Code 0 for Master; ≥1 for each Slave</p> <p>4. Speed reference in speed control mode - from 600 to 8300</p> <p>5.</p> <ul style="list-style-type: none"> · keypad · external remote wired control <p>4.</p> <ul style="list-style-type: none"> · keypad · signal 0-10V on AN2 · signal 4-20mA on AN2 <p>5. In case of wide thermal excursions, in order to avoid the condensation of water drops inside enclosure which could take to oxidation and/or to short circuit, the internal braking resistors are used to keep a minimum internal temperature (0÷50°C, default 25°C). NEO-WIFI shall remain powered and the internal resistors must remain connected.</p>
P.I.D. Factors	<p>1. K Proportional factor</p> <p>2. K Integral factor</p> <p>3. Ramp pressure [bar / s]</p>	<p>For speed control in feedback</p> <p>1. $K_{proportional}$: 1-100. Multiplies the error of the reference quantity</p> <p>2. $K_{integral}$: 1-100. Multiplies the integral of the error</p> <p>3. Pressure Ramp: rising speed of the pressure reference – from 0.01 to 1.27</p>
Date adjournment (function based on the battery clock, which is there only on NEO-11 and NEO-22; not there on NEO-3)	<p>Date and hour setting: to unlock the clock, modify the SECONDS value.</p> <p>The estimated duration of the clock battery type CR2430 is 6-8 years. After its replacement you must reset the clock and modify the seconds to unlock it.</p>	<p>Year: XX</p> <p>Month: XX</p> <p>Day: XX</p> <p>Hour: XX</p> <p>Minute: XX</p> <p>Second: XX</p>
Starts timer (Function based on the battery clock, which is there only on NEO-11 and NEO-22; not there on NEO-3)	Timer ON/OFF	<p>When the Timer is ON, you can set up to 5 programs (consecutive starts/stops) inside 24 hours, which will be repeated every day. Every day of the week will be the same, and you cannot set different programs for different week days:</p> <ul style="list-style-type: none"> · P1: XX (Start HOUR 1), YY (Start MIN 1); A1: ZZ (Stop HOUR 1); WW (Stop MIN 1); · P2: XX (Start HOUR 2), YY (Start MIN 2); A1: ZZ (Stop HOUR 2); WW (Stop MIN 2); · P3: XX (Start HOUR 3), YY (Start MIN 3); A1: ZZ (Stop HOUR 3); WW (Stop MIN 3); · P4: XX (Start HOUR 4), YY (Start MIN 4); A1: ZZ (Stop HOUR 4); WW (Stop MIN 4); · P5: XX (Start HOUR 5), YY (Start MIN 5); A1: ZZ (Stop HOUR 5); WW (Stop MIN 5).

RS485/MODBUS (vedi par. 6h)	1. MB comm.	1. OFF= modbus disabled; ON= programming and working only by MODBUS ON+KEY = Prgramming by MODBUS and working by keypad (including further remote wired commands and speed signals)
	2. Baude Rate	2. 4800 – 9600 (default) – 14400 – 19200. It shows the bits speed transmission in bits/second. The transmitted bits include start bits, data bits and parity bits (if used), and stop bits. However, only data bits are memorized.
	3. Modbus code	3. From 1 to 127 (default = 1).
Alarm history	List of alarms recorded	View in chronological order (from first to last) all the last 99 Alarm events (chap. 9) recorded during the life of the inverter. The same data is saved in the memory and is made available for analysis from the PC by means of a USB connection for the technical support and repair service (ATTENTION: only with inverter not powered).

Table 6: Advanced functions menu

NOTE: The keypad automatically recognizes if it is connected to a NEO-3 or NEO-11, and changes the enabled limits and functions of the menu according to that

6f. Views on the display:





*The **Volts** to the motor are never as much as the Volts into the inverter from the net. The first stage in which any inverter rectifies the input voltage from ac to dc reduces about 8% the Volts. At a frequency lower than 100% of the net, such 8% effect disappears gradually, but it remains the following further falls of voltage. In fact, any inverter has further internal voltage falls of about 5-6V for diodes, IGBT bridge, and the inductance filter. So, with an input of 400V into an inverter, the voltage to the motor is about 362V at 100% frequency. The motor works anyway without any trouble because the inverter sets the magnetic flux according to such real voltage.

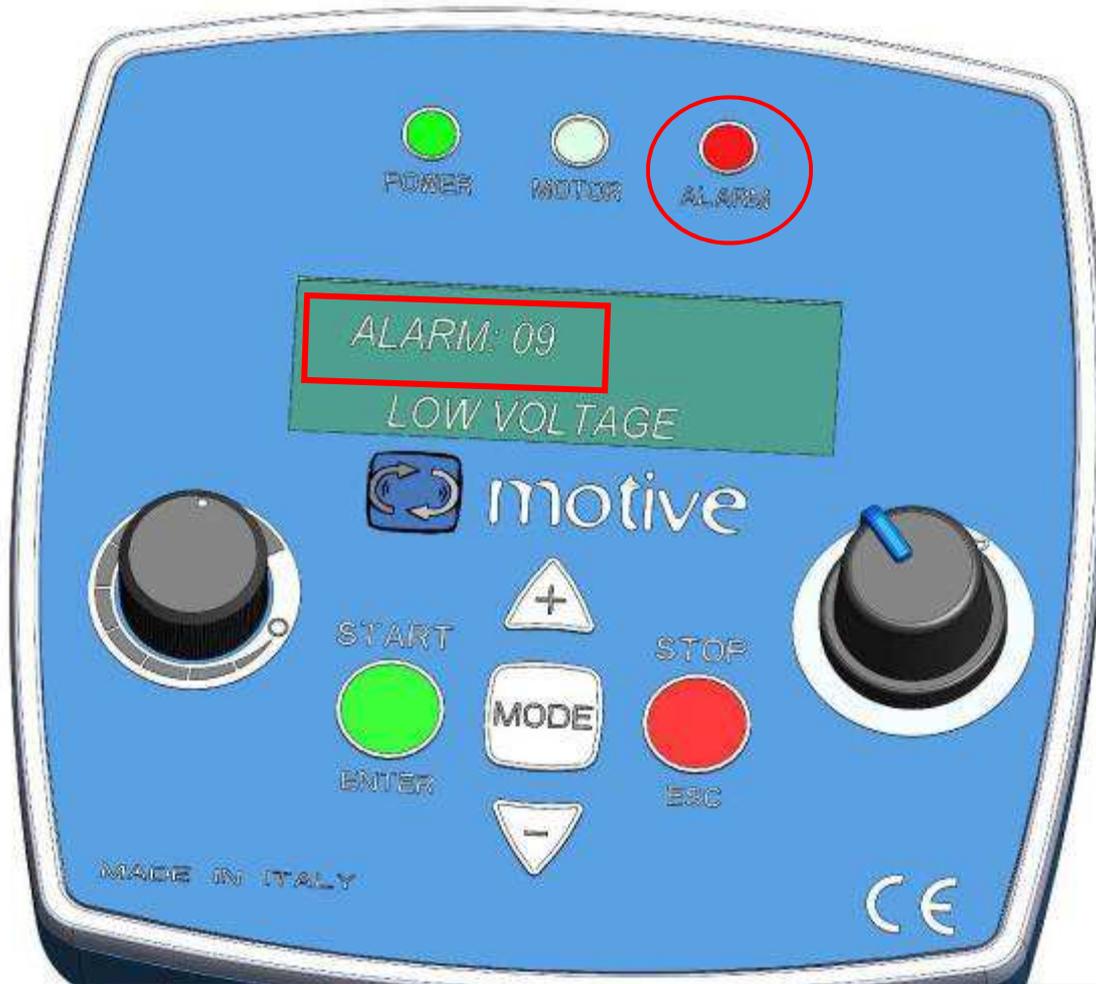
****Hertz ****: In speed or pressure control NEO chases the RPM speed or the BAR pressure not the frequency Hz. If for example the motor torque increases, NEO tends to compensates such higher resistance by increasing the Hz to the motor in order to maintain constant RPM. This is true both with and without encoder (in the latter case less accurately calculated).

for 2 seconds when you switch the keypad on) it is possible to see the battery charge.



For that, keep MODE  pressed for min 1 second (16 squares = fully charged);

6g. alarms



			NEO-3	NEO-11
1	Current peak	Immediate intervention for short circuit Self-resetting; blocks after 10 consecutive interventions	✓	✓
2	Overvoltage	Normally due to a fast voltage fluctuation. Self-resetting; blocks after 10 consecutive interventions	✓	✓
3	Inverter temperature	Exceeding the temperature limit on the electronic board (86°C). Self-resetting al calare della temp. di 10°C, senza limiti nel numero di interventi.	✓	✓
4	Motor heating	Motor thermal protection (it works on the same principle of thermal magnetic circuit breakers: the current) Self-resetting; blocks after 10 consecutive interventions	✓	✓
5	Encoder problem	Not active	✗	✗
6	Enable Off	Enable contact EN-C open; motor cannot work when this contact is open.	✓	✓
7	Locked rotor	Not active	✗	✗
8	IN-OUT inversion	Possible inversion error of the input and output cables of motor and line	✓	✓
9	Undervoltage	Voltage value insufficient to keep the engine running at a given load condition	✓	✓

		Self-resetting; blocks after 10 consecutive interventions		
10	Communication error	Radio communication error between keypad and inverter	✓	✓
11	IGBT overcurrent	High current at low speed, overload. Self-resetting; blocks after 10 consecutive interventions	✓	✓
12	microprocessor temperature	Intervention for microprocessor overheat protezione attiva soltanto per le versioni NEO da 11kW e oltre.	✗	✓
13	phase U overcurrent	current overload on NEO-PUMP output to/by the motor on phase U	✗	✓
14	phase V overcurrent	current overload on NEO-PUMP output to/by the motor on phase V	✗	✓
15	phase W overcurrent	current overload on NEO-PUMP output to/by the motor on phase W	✗	✓
16	Braking peak	Overcurrent into the terminals BR+/BR-	✗	✓
17	Read error I1	current I1 read error, on phase U	✗	✓
18	Read error I2	current I2 read error, on phase V	✗	✓
19	Read error I3	current I3 read error, on phase W	✗	✓
20	Current imbalance	high imbalance between the currents in the three phases (>15% on RMS value) Self-resetting; stop after 10 consecutive interventions	✗	✓
21	phase U current peak	Short circuit protection localized on phase U	✗	✓
22	phase V current peak	Short circuit protection localized on phase V	✗	✓
23	phase W current peak	Short circuit protection localized on phase W	✗	✓
24	current leakage	protection in case of a high earth leakage current (> 5A). Warning: this is not a replacement of the differential switch.	✗	✓
25	Fan 2 current peak	Not active	✗	✗
26	Fan 1 current peak	Not active	✗	✗
27	Fan overcurrent	Not active	✗	✗
28	AN2 out of limits	Signal <3mA if set to 4-20mA in Type of Control - Pressure remote reference input on AN2 at 4-20mA	✗	✓
29	Dry operation	No water in suction or the presence of air; Self-resetting; Blocks after 5 consecutive interventions	✓	✓
30	Problem with the pressure transducer	Problem with the pressure sensor Self-resetting; Blocks after 10 consecutive interventions	✓	✓
31	Minimum flow	Pump switch-off due to the minimum water flow limit being reached; although it is present in the list of alarms it is a normal operating condition of the system (no supply water request) Self-resetting with no limit on the number of interventions	✓	✓

Tabella 7: Menù Allarmi



√ = activated alarm

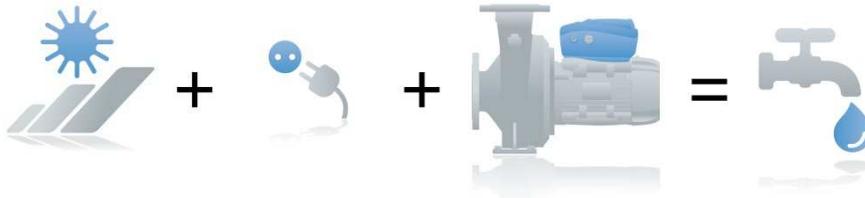
× = not activated alarm

The restart after alarm must be preceded by a verification of the system, in order to find the reason of the alarm. Unconditioned restarts can lead to the product destruction and to a risk for the safety of the connected machines and the users.

The alarm can be reset by using the button STOP. If it returns, contact the technical service.

7. POWER BOX (optional)

HYBRID

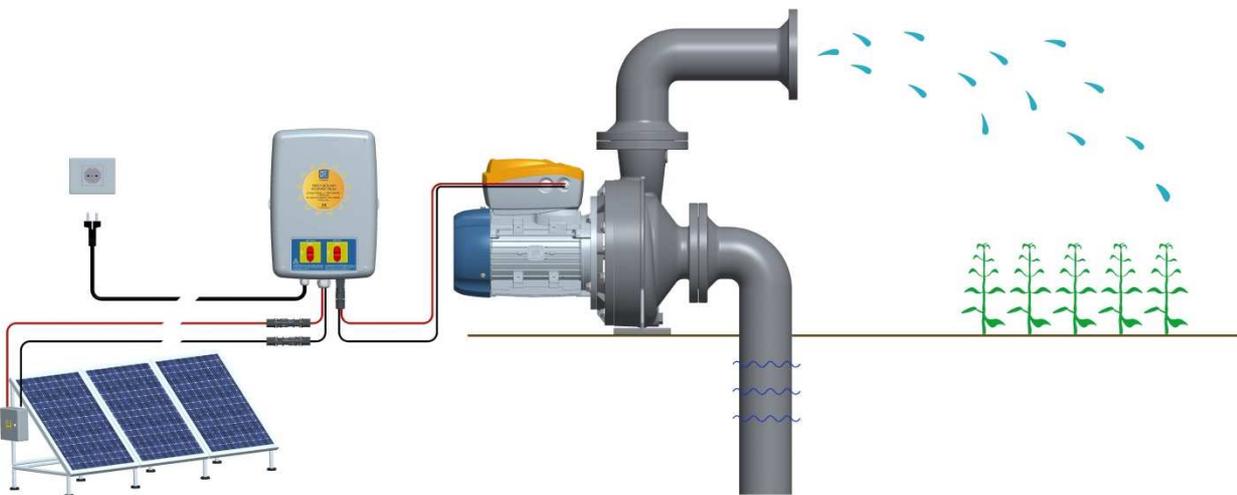
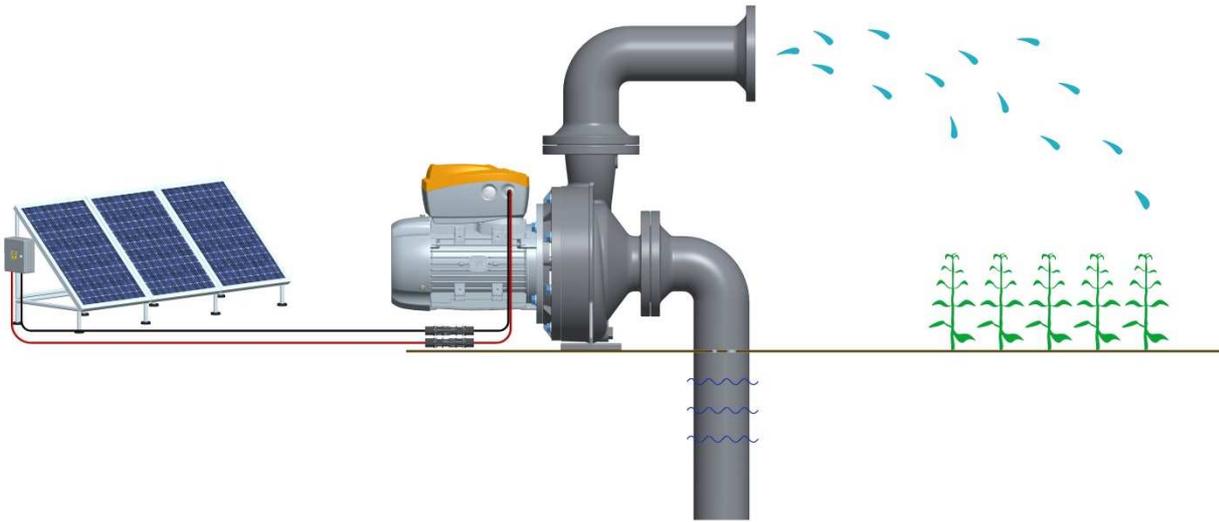


In the stand-alone version the system can work with no electrical mains connection or, if combined with the optional POWER-BOX, it can use both power from the mains (three-phase AC) and photovoltaic energy (DC), both as an alternative to each other as well as simultaneously. By setting the photovoltaic power appropriately, the system will use the photovoltaic energy available automatically and proportionally, compensating the remaining energy with power from the mains (or generator). In the stand-alone version with photovoltaic power only, once a minimum available energy level has been reached, the pump will stop working.

	Power BOX 1.5KW (for NEO-SOLAR-3 hybrid power supply)
Protection rating	IP55
Supply voltage	230 Vac single phase +/- 20% 50/60Hz 340-490 Vdc +/- 5%
Output voltage	200-240 Vac 3 phase +/- 5%
Rated input current (A)	10
Rated output current (A)	7

If the POWER BOX is used, they are already integrated (DC and AC side fuses, overvoltage arresters, polarity reversal protection device for the photovoltaic power supply and main switches).

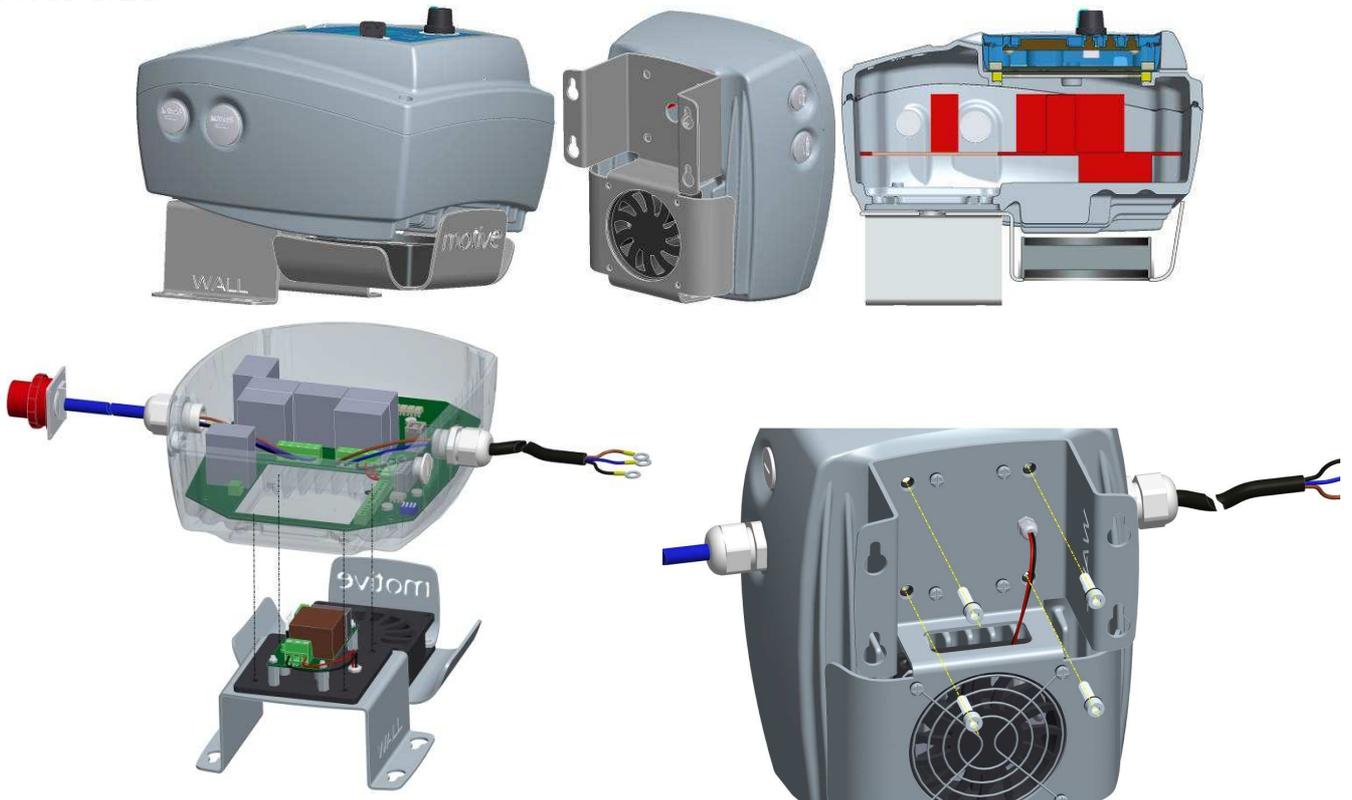


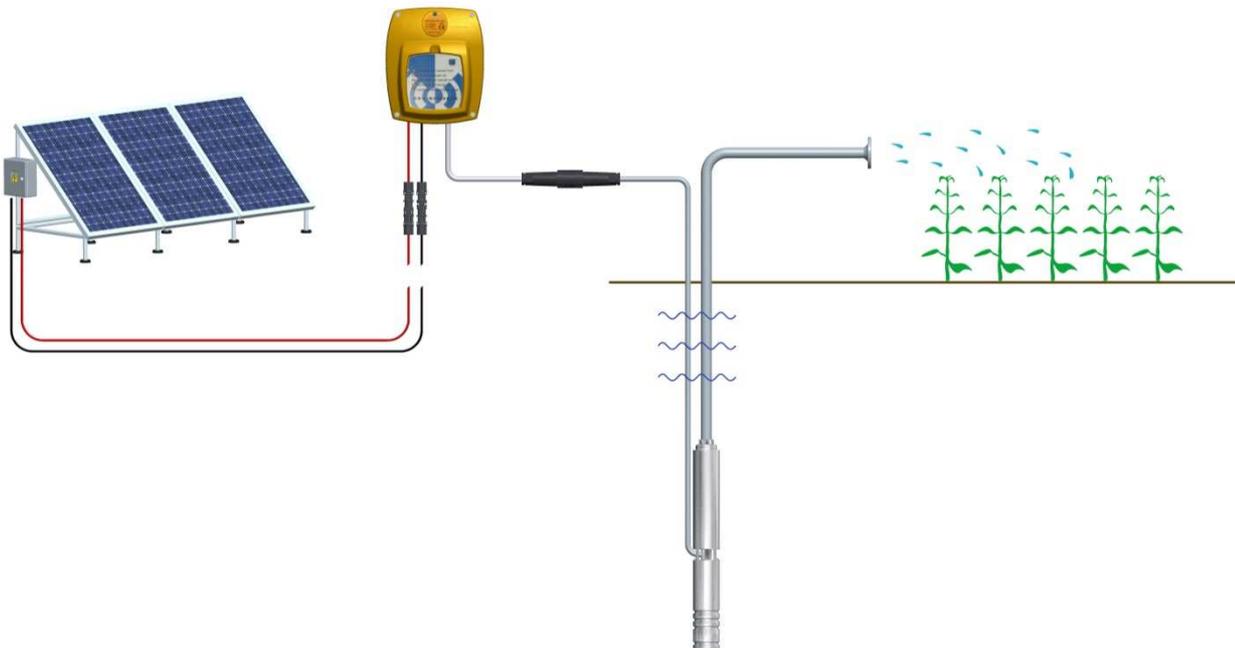
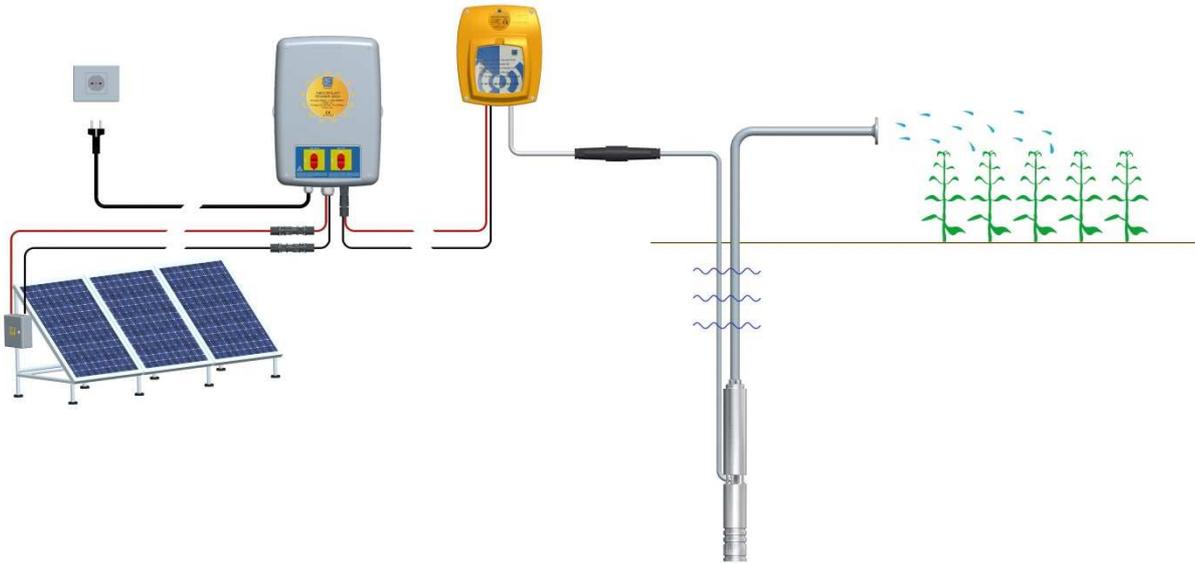


8.NEO-WALL (optional)



In the event of wall installation, for example when used for submersible pumps, NEO-SOLAR can be installed using the "WALL" system
24Vdc 0.28A





Declaration of conformity

Motive srl with seat in Castenedolo (BS) - Italy

declares, under its exclusive responsibility, that its range of “NEO-WiFi” inverters and motor-inverters
is constructed in accordance with the following international regulations (latest edition)

- **EN60034-1.** Rotating electrical machines: rating and performance
- **EN60034-5.** Rotating machines: definition of degrees of protection
- **EN 60034-6.** Rotating machines: methods of cooling
- **EN60034-7.** Rotating electrical machines - Part 7: Classification of types of construction, mounting arrangements and terminal box position
- **EN60034-8.** Terminal markings and direction of rotation for rotating electrical machines
- **EN60034-30.** Rotating electrical machines: efficiency classes of single-speed, three-phase, cage-induction motors
- **EN50347.** General purpose three-phase induction motors having standard dimensions and outputs - Frame numbers 56 to 315 and flange numbers 65 to 740
- **EN60335-1.** Safety of household and similar electrical appliances
- **EN 60335-2-41.** Safety of household and similar electrical appliances - Part 2 Particular requirements for pumps
- **EN 55014-2,** Electromagnetic compatibility. Requirements for household appliances, electric tools and similar apparatus. Part 2: Immunity
- **EN 61000-3-2,** Limits for harmonic current emissions (equipment input current ≤ 16 A per phase).
- **EN 61000-3-3.** Limitation of voltage fluctuations and flicker in low-voltage supply systems, for equipment with rated current ≤ 16 A
- **EN 61000-3-12.** Limits for harmonic currents produced by equipment connected to public low-voltage systems with rated input current greater than 16 A and ≤ 75 A per phase
- **EN61000-6-4.** Electromagnetic compatibility (EMC): Part 6-4: Generic standards - Emission standard for industrial environments
- **EN 50178.** Electronic equipment for use in power installations
- **ETSI 301 489-3** Electromagnetic compatibility standard for radio equipment. Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 40 GHz.

	NEO-WiFi-3 Cat. C1	NEO-WiFi-11 NEO-WiFi-22 Cat. C2
EMC for DOMESTIC, COMMERCIAL AND LIGHT INDUSTRIAL ENVIRONMENT (ref. EN 50081-1, para 5)	YES (since V2.01)	optional
EMC for INDUSTRIAL ENVIRONMENT (ref. EN 50081-2, para 5)	YES	YES

as required by the Directives

- Low Voltage Directive (LVD) 2014/35/EC
- Electromagnetic Compatibility Directive (EMC) 2004/108 EEC
- Ecodesign Directive for energy related products EEC 2009/125

NB: the Machinery Directive (MD) 2006/42/EC expressly excludes from its scope electric motors (Art. 1, paragraph 2)

Castenedolo, 1 January 2013
The Legal Representative





ALL THE DATA WAS COMPILED AND CHECKED WITH THE UTMOST CARE.
WE DO NOT HOWEVER ASSUME ANY RESPONSIBILITY FOR ANY ERRORS OR OMISSIONS.
MOTIVE srl MAY AT ITS SOLE DISCRETION CHANGE AT ANY TIME THE CHARACTERISTICS OF THE PRODUCTS SOLD.



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