



EBARA

E-drive

FREQUENCY INVERTER FOR THE CONTROL
OF ELECTRIC PUMPS

50/60 Hz



FREQUENCY INVERTER FOR THE CONTROL OF ELECTRIC PUMPS



The *E-drive* is a device for the control and protection of pumping systems based on frequency variations in the power supply of the pump.

APPLICATIONS

- Domestic and industrial water supply
- Irrigation
- Heating and air conditioning
- Filtering and pressure washing

TECHNICAL FEATURES

- Energy and financial savings
- Easy system installation and at a lower cost
- Longer system life
- Increased reliability

The *E-drive* can be connected to any pump on the market, it manages operation to maintain set physical quantities constant (pressure, flow or temperature of fluid or more) depending on the conditions of use. In this way the pump is operated only as and when needed without wasting energy and as such extending its life.

At the same time the *E-drive* is able to:

- protect the motor against overloads and dry running
- implement a gentle start and stop (soft start and soft stop) to increase the system's life and reduce absorption peaks
- provide information on current consumption and power supply voltage
- record the hours of operation and, on the basis of this, any possible alarms
- monitor one or two fixed speed pumps (DOL: Direct On Line)
- connect to other *E-drive* to carry out combined operation

The aluminium body gives the *E-drive* extreme strength and easy cooling. The IP55 degree of protection makes it possible to install the *E-drive* in wet and dusty environments. The LCD display with backlight facilitates its use even in the absence of light, while an acoustic signal provides an immediate alarm warning.

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Motor mounting kit



Wall mounting kit

The *E-drive* can be installed directly onto the motor fan cover or mounted on the wall.

Motor mounting kit

It takes advantage of the motor cooling fan to also cool the *E-drive*.

The kit includes 4 hooks to allow mounting onto the motor fan cover.

Wall mounting kit

The integrated fan at the finned bottom allows the independent cooling of the unit.

A special stainless steel bracket provides a solid wall mounting.

Using the *E-drive* is very simple and straightforward. Installation consists of a few short steps:

- connect the *E-drive* to the mains
- connect the *E-drive* to the power supply of the pump
- connect the *E-drive* to the sensor, placed at any point on the circuit where you want to maintain the required physical quantity constant (pressure, flow, fluid temperature, etc.)
- program the *E-drive* in relation to the pump, the system and the performance required.

When there is a significant change in water demand, it is good practice to divide the pumping assembly into more units as it gives the system greater efficiency and reliability.

1 *E-drive* + 1 or 2 DOL

A first method of division is to install a single pump in parallel that has the frequency adjusted to that of the *E-drive* and another 1 or 2 DOL pumps directly connected to the mains (Direct On Line) that is/are switched on or off by the *E-drive* using a remote switch.

The *E-drive* manages the alternating operation of the two pumps in order to balance consumption.

From 1 to 8 *E-drive* in COMBO mode

A second method of division (called COMBO mode) involves using several pumps in parallel (up to 8) each one connected to an *E-drive*.

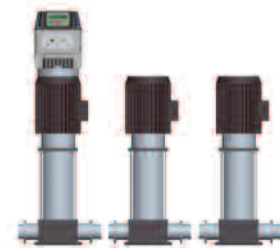
In this case, maximizing the efficiency and reliability of the pumping assembly.

Each *E-drive* controls and protects the pump to which it is connected, while the work is distributed among the various pumps in the assembly on the basis of actual hours worked by each pump.

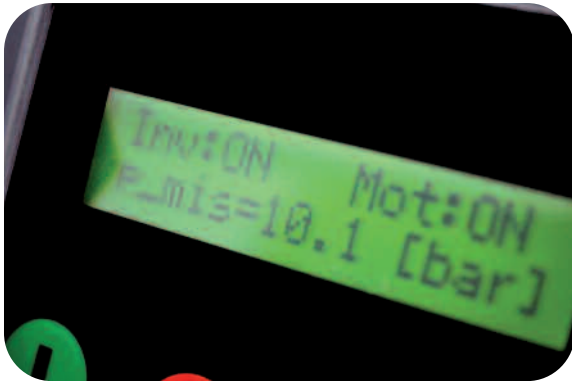
In the event of a unit in the assembly breaking down, the remaining pumps will continue to operate.

From 1 to 8 *E-drive* in COMBO mode + 1 or 2 DOL

Finally, it is possible to equip the system with more pumps in COMBO mode and another 1-2 DOL pumps that act to compensate for additional water demand.



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When the E-drive is turned on for the first time it leads directly to the initial configuration process through which a quick but complete programming of the device is carried out.

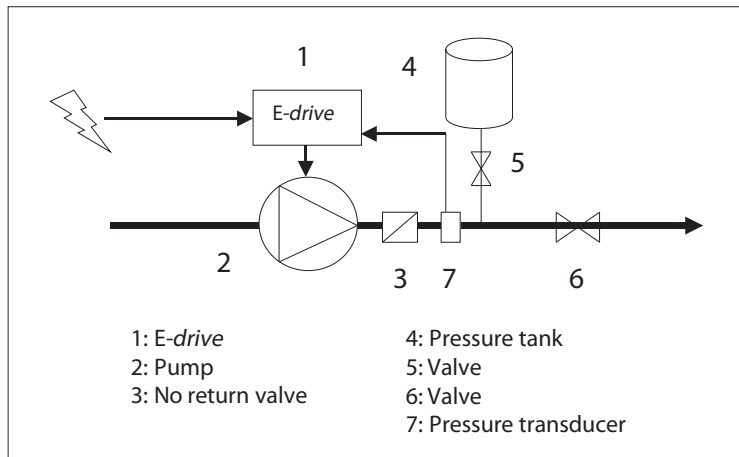
- Other parameters are then configured according to three access levels:
- User level. This is the only level not protected by a password. Allows the electrical and hydraulic parameters to be monitored as well as the status of the E-drive and the pump.
 - Installer level. On this level the programming of the E-drive is carried out according to the characteristics of the system where the pump is installed. An access password is required.
 - Advanced level. The E-drive is electrically configured according to the pump which it is coupled to. A further password is needed for entry.

Constant pressure control

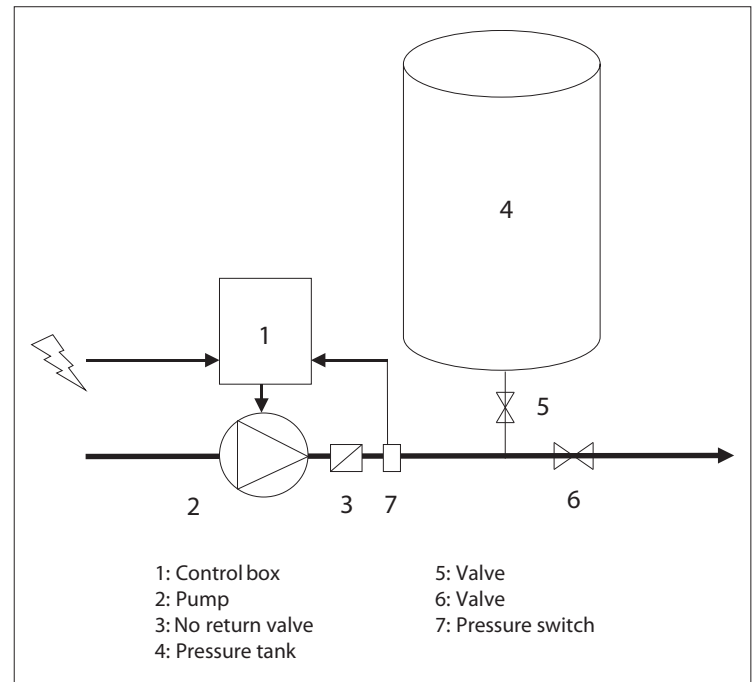
The E-drive can adjust the rotation speed of the pump so as to maintain the set pressure when the water demanded through use varies.

In water systems equipped with an E-drive the autoclave is replaced by a small expansion tank with the sole purpose of compensating losses (or the minimum water consumption) and maintaining the pressure when the pump is stopped.

In traditional systems, with fixed speed pumps, the size of the autoclave depends on the limited number of consecutive starts of the motor and, to meet the maximum flow rates, are often considerable. This means special precautions when working pressures grow and the prolonged stagnation of water in the autoclave can lead to the growth of bacteria.



When receiving the pressure signal from the relevant sensor, the E-drive varies the pump speed to match the set pressure regardless of the demand for water.



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The software installed in each inverter from the *E-drive* range is the result of a long history of meeting the needs of our customers and constantly keeping up to date with new applications.

Minimum motor frequency

This parameter prevents the motor from operating below a certain frequency, thus avoiding damage to the thrust in flooded engines.

Minimum motor frequency ramp

The engine can accelerate from 0 to the minimum motor frequency following a very fast ramp and then continuing by way of a slower start up ramp.

Intelligent stop of the pump during conditions of zero flow

After reaching the minimum frequency at zero flow ($F_{min} Q=0$) the *E-drive* progressively slows the pump speed by monitoring the response of the pressure measured in the system. If this value is kept close to the required pressure, the *E-drive* proceeds by completely stopping the pump.

Compensation for load loss when increasing flow

If the pressure sensor is placed near the pump, when the flow increases the pressure measured during use when furthest away, is lower than the set pressure.

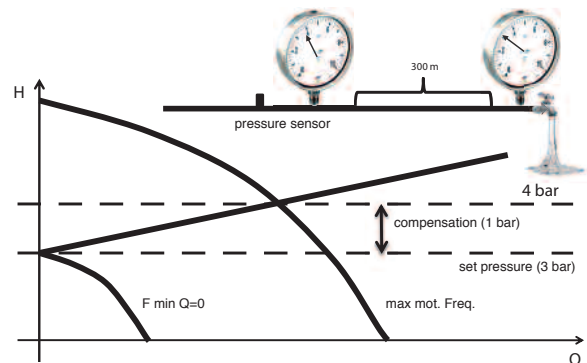
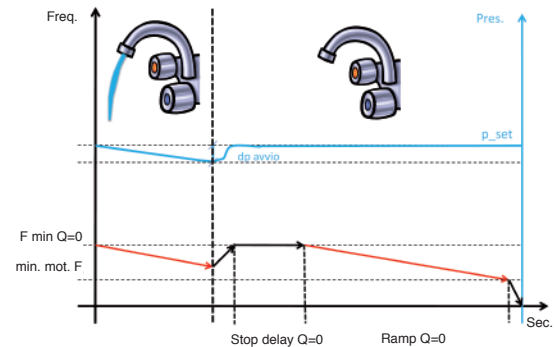
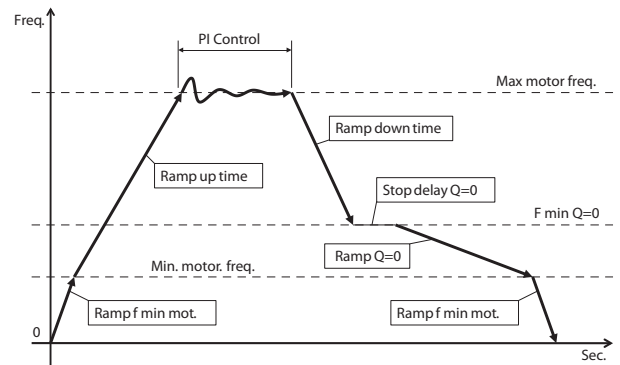
To overcome this problem, the *E-drive* makes it possible to compensate for load losses in proportion to frequency.

Dry running alarm through reading the power factor

When the pump is operating dry, the value of the power factor ($\cos\phi$) falls below a set critical value and the *E-drive* stops the pump. The *E-drive* carries out several successive attempts to restart (after 10, 20, 40, 80, 160 minutes) at the conclusion of which, if the lack of water alarm does not return, the pump stops completely.

Maximum and minimum pressure alarm

When the system pressure rises above a certain set value, the *E-drive* quickly stops the pump while maintaining the integrity of the most critical hydraulic components. Similarly, if the pressure falls below a set value of pressure and the pump is operating at the maximum speed a minimum pressure alarm is activated which is useful for identifying any cracks in the pipes.



Programmable V/f control

The *E-drive* allows you to choose between two methods of torque control (voltage) when varying the motor revolutions (frequency):

- constant torque (linear V/f)
- quadratic variable torque (squared V/f)

For centrifugal pumps, the quadratic V/f control mode allows a considerable energy saving.

Switching frequency selectable between 2.5, 4, 6, 8, 10 kHz

With long cables, as is the case when the *E-drive* powers submersible pumps, it is important to decrease the switching frequency to increase the life of the motor.

Different control modes

Besides operating at constant pressure, the *E-drive* allows you to choose from other control modes including constant differential pressure, fixed frequency, constant flow, constant temperature.

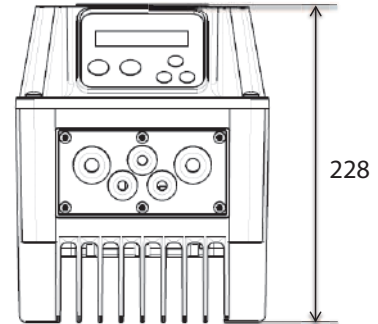
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Model	V _{in} +/- 15% [V]	Max. V _{out} [V]	I _{out} [A]	P ₂ typical motor [kW]
E-drive 1500	1 x 230	1 x 230	9	1,1
		3 x 230	7	1,5
E-drive 3000	1 x 230	1 x 230	9	1,1
		3 x 230	11	3
E-drive 2200	3 x 400	3 x 400	6	2,2
E-drive 4000	3 x 400	3 x 400	9	4
E-drive 5500	3 x 400	3 x 400	14	5,5
E-drive 7500	3 x 400	3 x 400	18	7,5
E-drive 11000	3 x 400	3 x 400	25	11
E-drive 15000	3 x 400	3 x 400	30	15

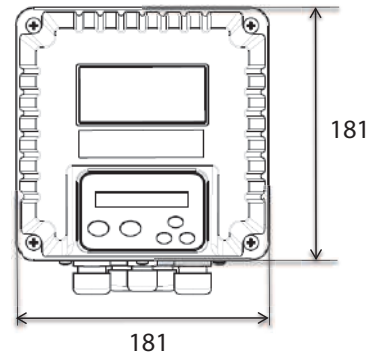
General features

- Power supply frequency: 50 - 60 Hz (+/- 2%)
- Max. working ambient temperature under a nominal load: 40°C (104 °F)
- Max. altitude under a nominal load: 1000 m
- Degree of protection: IP55 (NEMA 4)
- Configurable digital outputs NO or NC:
 1. running motor signal
 2. alarm
 3. pump control DOL 1
 4. pump control DOL 2
- Analogue inputs, (10 or 15 Vdc):
 1. 4-20 mA
 2. 4-20 mA
 3. 4-20 mA / 0 - 10 Vdc (configurable)
 4. 4-20 mA / 0 - 10 Vdc (configurable)
- 4 Digital inputs, configurable NO or NC, to start and stop motor
- Serial RS485

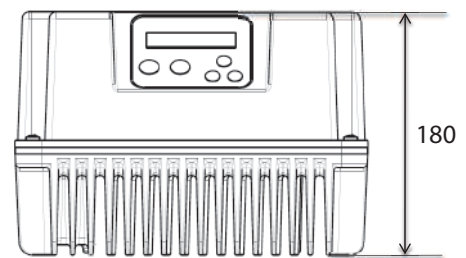
E-drive 1500/3000/2200/4000



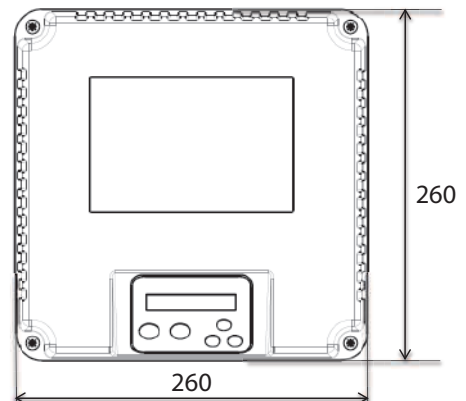
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E-drive 5500/7500/11000/15000



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