GP - GPE

PRESSURE BOOSTER UNITS

DEFINITION AND USE OF THE PRESSURE BOOSTER UNITS

If the public water distribution system is inexistent or insufficient for correct functioning of the utilities, it is necessary to install a pressure boosting unit in order to guarantee an acceptable pressure and amount of water also in the most unfavourable points of use.
The pressure boosting unit is applied every time the pressure must be increases or where the mains water must be pressurised.
The **GPs, EBARA pressure boosting units**, are small automatic systems with 2 or more pumps in parallel, studied and realised simply and reliably to satisfy the most recurrent pressure maintenance requests in the water supply of condominiums, hotels, centres, offices, schools, auxiliary services in the industrial and agricultural ambit. They are distinguished for the construction strength, compactness, high efficiency and silence.
The GP units are set-up for the membrane autoclaves or air pocket connection.
Start-up of the individual pumps is caused by the activation of pressure switches, appropriately calibrated via an electric control panel. In the units controlled with electric control panel with INVERTER, as well as pressure switches, one of the pumps is started via the calibration of a pressure transducer.

FUNCTIONING PRINCIPLE OF THE PRESSURE BOOSTER UNIT GP

If water is requested, this is initially withdrawn from the autoclave reservoir, whenever the system is provided.
This consumption of water or, however, the escape of water from the system, with pumps off, determines the lowering of the pressure to a value such to trip the closure of the pressure switch contact with higher calibration, which determines the ignition of the first electric pump.
If the outlet discharge exceeds the flow rate of a pump, the pressure continues to drop until it causes the closure of the contact of the second pressure switch and the start-up of the second pump.
This takes place for all of the electric pumps that make up the unit.
The end of the distribution of the reduction of the outlet discharge leads to the pressure in the system rising, with opening of the pressure switch contacts and staggered pumps stops. The inversion of the ignition order of the motors reduces the number of hourly start-ups of the individual pumps and consequently a homogenous use of the same.

N.B. By connecting a float or minimum pressure pressure switch to the control panel (whether for withdrawal from the primary collection reservoir or from the hydraulic circuit), the most frequent cause of electric pump breakdown is prevented: the lack of water at suction.

FUNCTIONING PRINCIPLE OF THE PRESSURE BOOSTING UNIT GPE

The **GPE** unit is designed to function with a pump governed by a **frequency converter "INVERTER"** inserted into the electric control panel and the others with direct intervention.
This unit, thus constructed, allows to maintain constant pressure in the water network.
On variation of the network pressure, the INVERTER governed pump varies its own rotation speed, stating the pressure of the set value.
Whenever the water withdrawal should exceed the pump flow rate, the second pump intervenes directly and, in the meantime, that governed by the INVERTER goes into regulation mode in order to keep the water pressure at the set value. This takes place for all of the pumps making up the unit.
When the withdrawal has been closed, the pump governed by the INVERTER reaches the minimum rotation value and, after a few minutes, stops allowing to obtain a large energy saving.
It is possible to have various versions of the GPE units:

- With an individual INVERTER, which governs just one pump, but different from the previous start-up (Standard **EFC** Version).
- With multi-inverter, where every pump is controlled by an inverter (**MFC** versions and **HERTZ TWIN** versions).

Contolling a unit via SP EFC control panels

The SP EFC for controlling units with several pumps envision powering the pump n°1 via inverter in order to modulate performance of the system depending on the reference signal, while the other electric pumps are made to work at maximum nominal speed (about 2900 min-1) with insertion and disconnection in sequence on variation of the request.
This implies the presence of two distinct primary electric circuits:
1st- pump start-up via inverter, 2nd- start-up (direct of delta-triangle) of the other pumps, by contactors.
The system is governed by the "SYSTEM CONTROLLER" control unit on the basis of the reference signal, which derives from a pressure transmitter, flow rate measuring device or other unified control signal (4÷20 mA passive).

• In the case of water distribution with constant start pressure (Fig.1), the control unit is connected to the pressure transmitter positioned in the discharge manifold of the unit that will send a proportional signal to the network pressure.
The lowering of the network pressure, following water withdrawal, causes a reduction of the pressure transmitter signal, which, via the control unit, will control start-up, via inverter, of the first pump regulating its speed in a way to re-establish the reference/work pressure. If the flow rate of the pump is lower than that requested, the network pressure will tend to decrease and the system will react by increasing the pump rotation speed. Once the maximum speed of pump n°1

has been reached, if the pump flow rate is still lower than that requested, the control unit will control the start-up of the second pump, which will work at constant speed.
Pump n°1 will be immediately positioned in the conditions to modulate the rotation speed in order to take the pressure back to the work value. If the network pressure should drop even further, once the maximum rotation speed on pump n°1 has been reached again, the control unit will control start-up of pump n°3 and successively of any pump n°4. When there is a reduction of water withdrawal, the pressure tends to increase as does the pressure signal transmitter. The control unit will reduce the rotation speed of the pump n°1 in order to re-establish the reference/work pressure. If the pump flow rate exceeds that requested, the network pressure will tend to increase and the system will react by decreasing the pump rotation speed until the minimum value set is reached. At this point, the control unit will control stopping of pump n°4, while pump n°1 will be put in the conditions to modulate the rotation speed in order to take the pressure back to the work value On further decrease of the request for flow rate with consequent tendency on increase in network pressure, once the minimum rotation speed has been reached again on pump n°1, the control unit will stop pump n°3 and successively pump n°2. When the demand for water ceases, the control unit will reduce the rotation speed of pump n°1 to the minimum value and after the re-set time (about 1 minute) it will also stop this pump.

• The case of functioning with increasing set pressure is shown in an example, for a unit with two pumps, in Fig. 2. While the system controls just one pump the reference pressure is SET1.
The transmitter pressure signal is compared with SET1, a lowering or increase in active pressure, through the control unit, pump rotation speed modulation. Once the maximum speed of pump n°1 has been reached, if the pressure is below the work value, the control unit will control start-up of pump n°2 and the reference pressure becomes SET2.
The reference pressure will remain SET2 while the control unit keeps pumps n°1 and n°2 running. It will go back to the SET1 value when the control unit controls shutdown of pump n°2.

Contolling a unit via TWIN and SP MFC control panels

The SP MFC and TWIN control panels for controlling units with several pumps, envision powering each pump via an inverter in order to modulate system performance depending on the reference signal. From a construction point of view, the two types of control panel are different while from a functional point of view ruling is similar and always takes place by the SYSTEM CONTROLLER control unit. This acts on the basis of the reference signal, which is derived from a pressure transmitter, flow rate measuring device or other unified control signal (4÷20 mA passive).On these control panels, every pump is powered by the respective inverter and whenever a fault occurs on the control unit or pressure transducer, if connected, a system of pressure switches sub-enters, which controls the inviters directly.

Fig. 1 - UNIT WITH TWO PUMPS WITH CONSTANT PRESSURE REGULATION

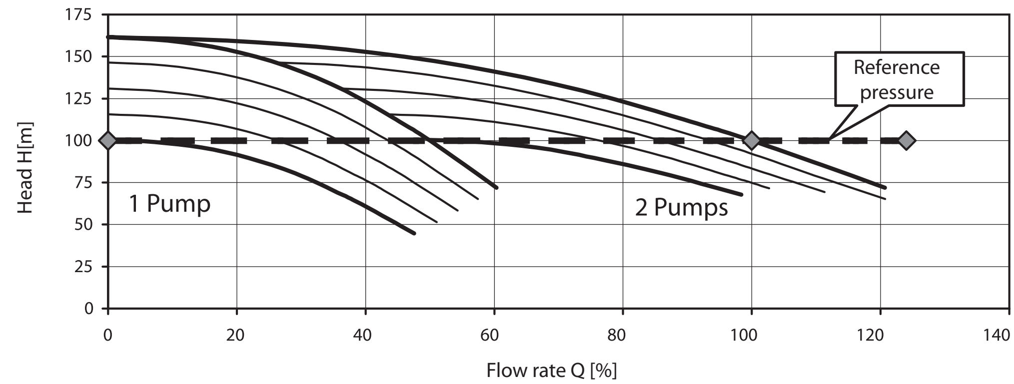
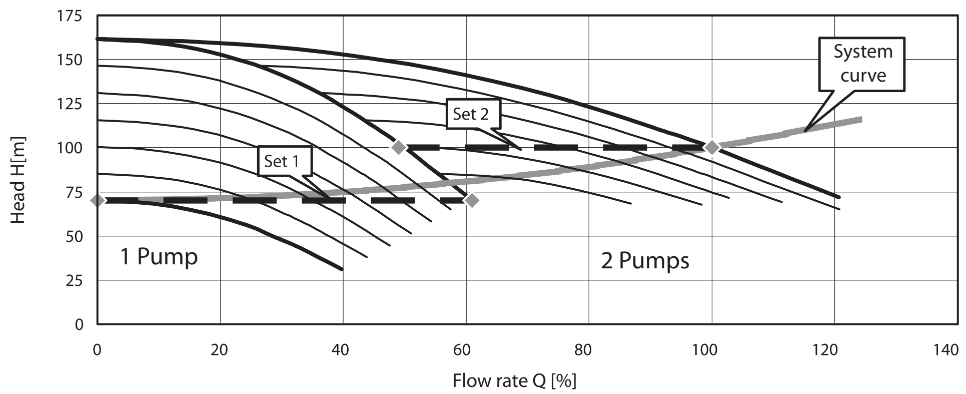


Fig. 2 - UNIT WITH TWO PUMPS WITH REGULATION SET AT TWO LEVELS



PRESSURE BOOSTER UNITS

• In the case of water distribution with constant start pressure (Fig.1), the control unit is connected to the pressure transmitter positioned in the discharge manifold of the unit that will send a proportional signal to the network pressure. The lowering of the network pressure following water withdrawal causes a reduction of the pressure transmitter signal, which, via the control unit, will control start-up, via inverter, of the first pump regulating its speed in a way to re-establish the reference/work pressure.
If the flow rate of the pump is lower than that requested, the network pressure will tend to decrease and the system will react by increasing the pump rotation speed. Once the maximum speed of pump n°1 has been reached, if the pump flow rate is still lower than the request, the control unit will control start-up of the second pump, which will also work with various speeds. The two pumps will be immediately placed in conditions to modulate the rotation speed in order to take the pressure to the work value. The modulation frequency is the same for both pumps, therefore, as noted in Fig.1, when both pumps operate, the curves are different with respect to that highlighted in Fig.1. If the network pressure should lower further, once the maximum rotation speed on pump n°1 is reached again, the control unit will control the start-up of pump n°3 and successively also pump n°4. When there is a reduction of the withdrawal of water the pressure tends to increase as does the pressure transmitter signal. The control unit will reduce the rotation speed of pumps n°1, n°2, n°3 and n°4 (the four pumps are modulated in parallel) in order to re-establish the reference/work pressure. If the pump flow rate exceeds that requested, the network pressure will tend to increase and the system will react by decreasing the rotation speed of the pumps until the minimum value set for pump n° 4. At this point, the control unit will control stopping of pump n°4 while pumps n°1, n°2 and n°3 will be put in the conditions to modulate the speed of rotation in order to take the pressure back to the work value. On further decrease of the flow rate request, with consequent tendency of increase of the network pressure, once the minimum rotation speed set for pump n°3 has been reached, the control unit will control the stopping of pump n°3 while the rotation speed on pumps n°1 and n°2 will be modulated. On successive decrease of the request, the control unit will also stop pump n°2 and will modulate the speed of pump n°1. When the demand for water stops, the control unit will reduce the rotation speed of pump n°1 to the minimum value and after the pre-set time (about 1 minute) will also stop this pump.

• Also for these types of control panels there is functioning with incremental pressure set in order to compensate the pressure drops (pressure transmitter positioned at start). The control unit operates in steps with two pressure steps; when just pump n°1 is started, the reference set is SET1 and becomes SET2 when both pumps are started, as represented in Fig.2. Both pumps are modulated in parallel.

CONDITIONS FOR USE

The GP-GPE EBARA pressure boosting units, can be used, in the standard versions, for civil, industrial and agricultural applications, in particular for:

• lifting or moving water
• air conditioning
• heating
• irrigation
• washing systems

The liquid conveyed can be: clean water, drinkable, rain, sheet, mixed or however without solid bodies or fibres in suspension and without aggressive chemical substances.
The units must be installed in environments that are covered and protected from weather conditions and freezing.
• Temperature of the conveyed water is 0°÷50°C (according to the types of pumps installed).
• Environmental functioning area is 0°÷40°C at a height not exceeding 1000 m a.s.l.
• Max. relative humidity 50% at +40°C.

N.B. The available system NPSH must be greater than the NPSH requested by the pump.
For applications with different technical features, uses, climatic conditions (type of liquid conveyed, marine environment, aggressive industrial environment) contact our sales network .

TESTS AND INSPECTIONS

All EBARA pressure boosting units undergo hydraulic, mechanical and electrical tests before packaging.

HYDRAULIC MECHANICAL TESTS

Pressure switch calibration Verification of the pump rotation direction
• Mechanical test of moving parts and noise test (on every pump)
• Sealing test at closed discharge inlet and verification of plate head
• Functioning test in MANUAL (via button on electric control panel) of each individual pump
• Functioning test in AUTOMATIC (via switch on electric control panel) of the unit

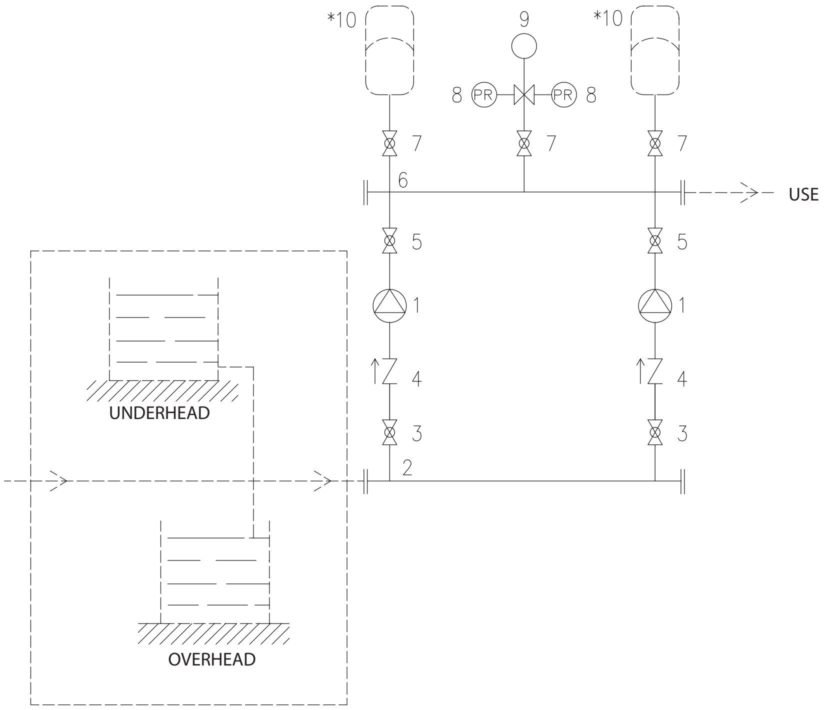
ELECTRIC TESTS

• Verification of continuity of the earth circuit
• Test at applied voltage (dielectric strength).
• Isolation resistance test

PRESSURE BOOSTER UNITS

PRESSURE BOOSTING UNIT HYDRAULIC LAYOUT WITH PUMPS IN PARALLEL

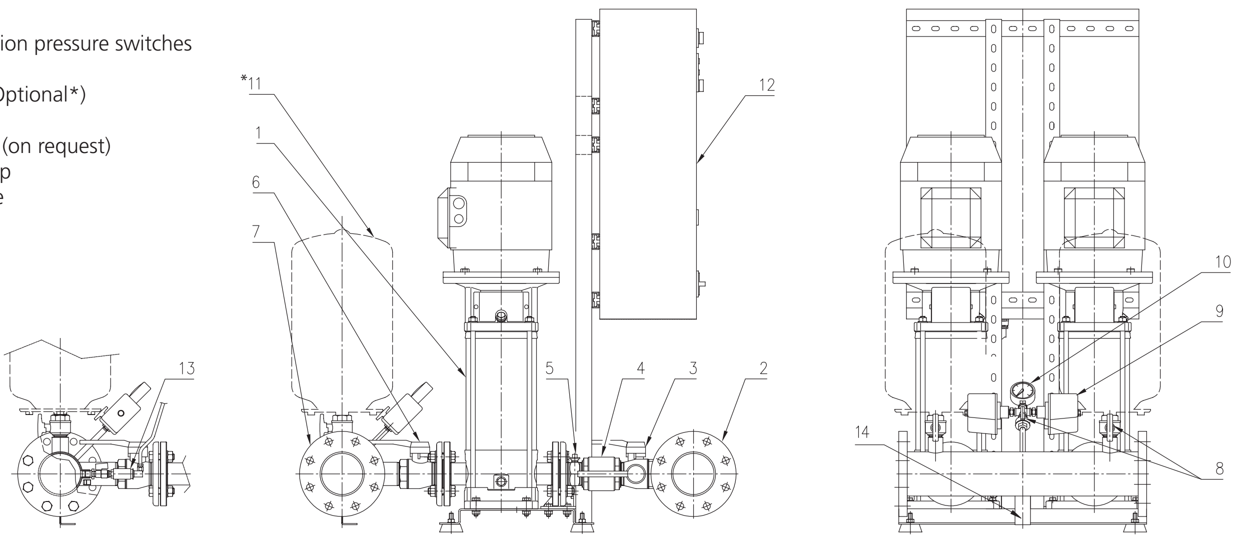
KEY
1 Electric pump
2 Suction manifold
3 Shut-off valve in suction
4 Non-return valve
5 Shut-off valve in discharge
6 Discharge manifold
7 Shut-off valve
8 Pump control/regulation pressure switches
9 Pressure gauge
10 Membrane vessel (Optional*)



SUPPLY SYSTEM UPSTREAM FROM THE UNIT
AT THE DISCRETION OF THE CUSTOMER
OF THE SYSTEM DESIGNER

PRESSURE BOOSTING UNIT LAYOUT AND COMPONENTS

KEY
1 Electric pump
2 Suction manifold
3 Ball shut-off valve
4 Non-return valve
5 Air vent nipple
6 Ball shut-off valve
7 Discharge manifold
8 Ball shut-off valve
9 Pump control/regulation pressure switches
10 Pressure gauge
11 Membrane vessel (Optional*)
12 Control panel
13 Pressure transducer (on request)
14 Bracket/sleeve set-up
manifold anchorage



Data under revision. For more information please contact our sales network.

EBARA

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