IMP-PHA

Movable hydraulic generator

Project description

The mobile hydraulic generator (IMP-PHA) is an IMP-Automation & Control System product intended for testing hydraulic equipment, as well as for testing hydraulic equipment in the field. It consists of a metal trolley (110 x 80 [cm]) on which there is a sump tank - a metal tray for collecting any leaked oil during the hydraulic consumers' connection to the generator.
The sump tank has an oil tank, dimensions 70 x 60 x 50 [cm], electric motor 4 [kV], variable flow pump 0 ÷ 40 [L / min], and an electrical cabinet attached to the carrier on the trolley, Picture 1. The reservoir is internally protected with a special zinc powder that is resistant to oil, high temperatures, and mechanical shocks, Picture 2.

Picture 2. A reservoir from the inside

The reservoir cover contains filler neck with cap, level gauge, thermometer, hydraulic block with preparation group (safety and relief valve), as well as control manifolds (NO6, NO10, …).

On the side of the reservoir, there are level glass, electric heater 370 [W], return filter, plug, and ball valve for oil discharge.

The variable flow pump allows meeting the needs of any hydraulic consumer (or more of them), in the range 0 ÷ 40 [L / min]. There is a possibility of increasing the flow by installing an electric motor twice the speed (2800 [min-1]).

Picture 1. IMP-PHA – front view

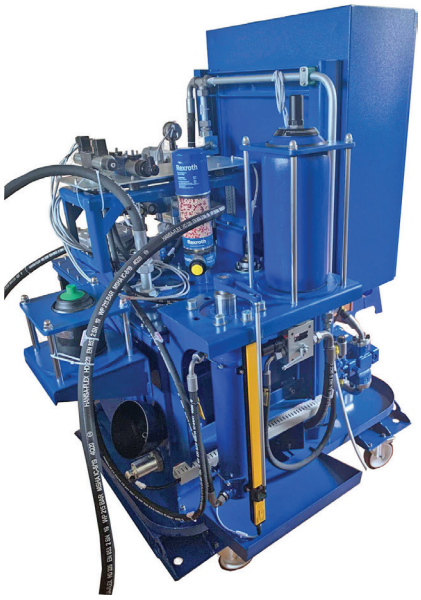
It is possible to maintain any pressure in the system, in the range of 20 ÷ 280 [bar]. An operator can manually set the value on the touch screen. This hydraulic generator can be easily pulled manually to any hydraulic consumer and provided with appropriate working sizes (p, Q, P).

In addition, it is possible to test individual devices correctness on the spot until the plant operation necessary conditions have been provided (e.g in the hydropower plant the supply line DN700 is not filled with water, L = 1600 [m]), and pressure transmitters can be tested using appropriate oil pressure generated by IMP-PHA, etc.).

If there are certain problems during the generator work - IMP-PHA is taken to the generator and connected at a certain place in the installation (directly to the actuator - servo motor, hydraulic motor, or distributor) and in a short time is found and removed plant failure.

The IMP-PHA is equipped with a mechanical safety valve that primarily protects the installation from overload. The installation is made with an ERMETO-sealing system, which withstands working pressure PN250 [bar]. On the IMP-PHA, there is also a hydraulic accumulator with a nominal volume of V0 = 6 [L], which provides a stable pressure in the system with minimal oscillations due to a sudden change in oil consumption in consumers.

Finally, it should be said that IMP-PHA is easy to use, adapted for work in the laboratory and the field in all conditions, can monitor the system, as well as the ability to connect to another arbitrary volume reservoir.



Picture 3. IMP-PHA – side view

Information:

Poer supply:	3 x 380 [V] AC
Power:	Pn = 4 [kW]
Pressure:	Pn = 20 ÷ 280 [bar]
Flow:	QN = 0 ÷ 40 [L/min]
Volume:	VN = 145 [L]
Oil:	HV - 46
Filter:	3 [µm]
Weight:	400 [kg]
Dimensions:	L x W x H = 1.2 x 0.85 x 1.5 [m]

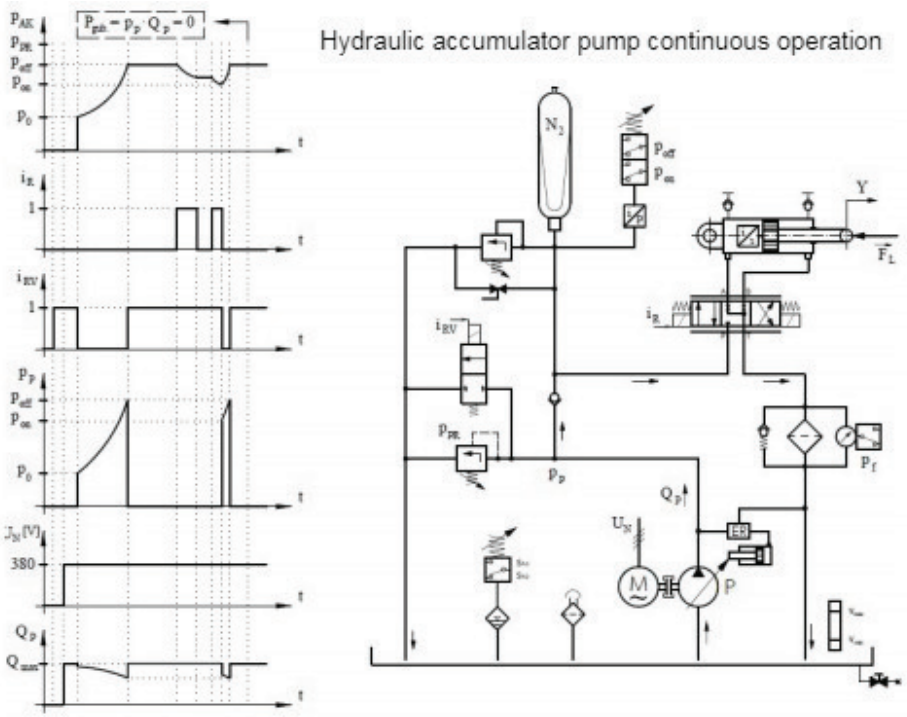
Electric drive

The IMP-PHA control cabinet contains compact components for power supply and power distribution, electricity, operation management, and supervision as well as mutual communication. A device for protection against inappropriate phase sequence is installed to prevent the pump from starting in the wrong direction.

The pump motor drive is protected by a motor protection switch of adjustable rated overload current 10 ÷ 16 [A], and a feedback signal from the contactor.

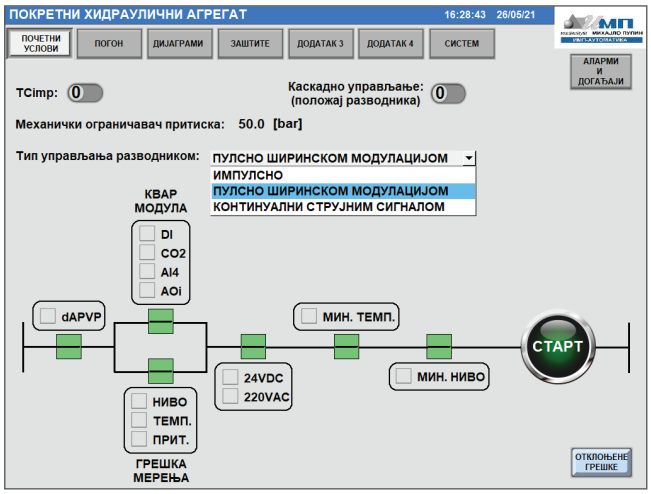
On the cabinet, in addition to the touch screen, for drive control and monitoring, there are 2 sockets for power supply to external consumers with 220 [V] AC and 2 LAN ports for communication with internal electronic components manufactured by the Institute "Mihajlo Pupin".

Picture 4. IMP-PHA - connection to TCimp block

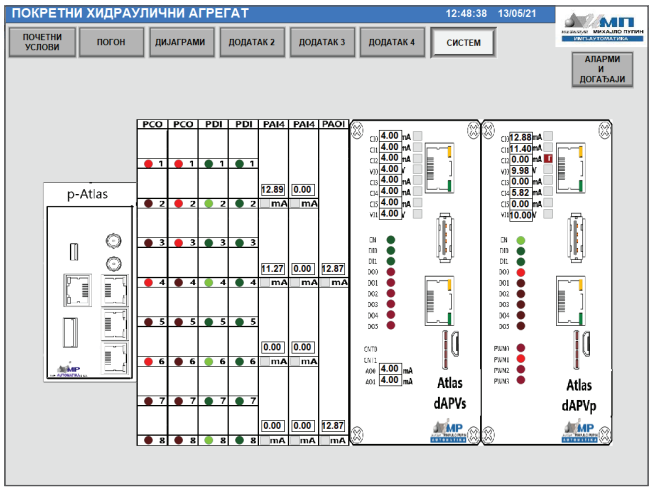


Picture 5. Hydraulic scheme with diagrams

Control and regulation system



Picture 6. Starting IMP-PHA initial conditions



Picture 7. PicoAtlas®-RTL, Atlas dAPV-s, and Atlas dAPV-p

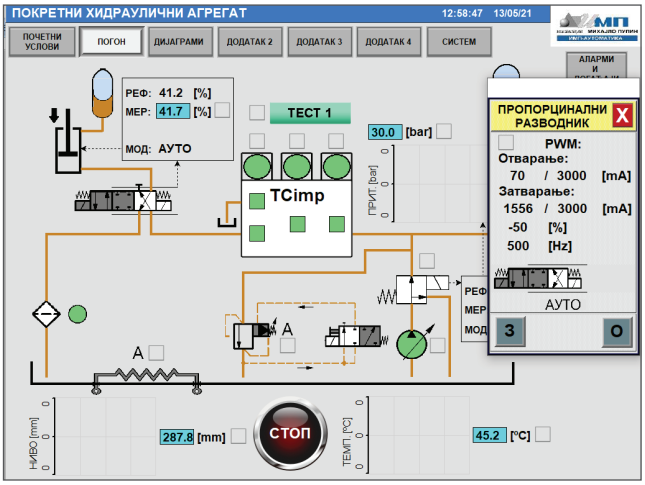
The system is based on picoAtlas®-RTL which consists of:

- CPU module,
- DI - digital input module,
- CO2 - digital output module,
- AI4 - analog input module, and
- AOi - analog output module.

The modules provide the signals:

- 16 digital input signals,
- 8 digital output signals,
- 8 analog input signals 0 ÷ 20 [mA], and
- 2 analog output signals 0 ÷ 20 [mA].

Also, the system includes digital automatic valve positioners Atlas dAPV-p and Atlas dAPV-s, whose main purpose is to control hydraulic servo drives via proportional or pulse distributors. Proportional distributors are controlled by a pulse width modulated signal (PWM outputs to dAPV-p in the frequency range 0 ÷ 1500 [Hz], with a maximum output current of 4 [A]) or a current signal (mA outputs to dAPV-s), while pulse distributors manage digital signals of a certain duration. The cascading management structure that closes the feedback at the position of the pilot valve and the hydraulic servo drive, enables the complex hydraulic systems control that is possible to see in hydro and thermal power plants. With this configuration, it is possible to manage 3 independent hydraulic servo drives at the same time.



Picture 8. Hydraulic scheme active display

In addition, the Atlas dAPV can perform part of the turbine regulator function on hydraulic and steam turbines; enables faster and more precise control of the executive hydraulic system. This device has 2 digital counting inputs with a maximum signal frequency of 10 [kHz], which are used to transmit the turbine speed signal. The Atlas dAPV device maintains (regulates) the oil pressure in the hydraulic system.

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