HM 362
Comparison of pumps

screen mirroring is possible on up to 10 end devices

Description

- **investigation of the operating behaviour of centrifugal, piston and side-channel pumps**
- **all pumps driven separately by three-phase AC motors**
- **plant control via PLC**
- **integrated router for operation and control via an end device and for screen mirroring on up to 10 end devices: PC, tablet, smartphone**

The experiments familiarise students with various pump types, such as centrifugal and positive displacement pumps.

The HM 362 trainer includes two centrifugal pumps, one piston pump as a positive displacement pump and a self-priming side-channel pump. The side-channel pump works primarily as a centrifugal pump and, depending on liquid level, can also act as a positive displacement pump. This means, as a special feature, the side-channel pump also permits gases to be pumped.

The pump being investigated pumps water in a closed circuit. In the process, the performance data of the pump and pressure losses in the pipeline are recorded. The centrifugal pumps can also be operated in parallel or in series configuration. Each pump is driven by a separate three-phase AC motor. The speed of the motors for the centrifugal pumps is variably adjustable by a frequency

converter. All motors are mounted on swivel bearings, so the torque can be measured by way of a force sensor, enabling the mechanical drive power output to be determined.

One free position is likewise equipped with a reversible three-phase AC motor with variable speed. This position can be used for mounting of any pump. Experiments demonstrate the basic operating behaviour of various pump types.

The trainer is operated and controlled by the integrated PLC with touch screen. By means of an integrated router, the trainer can alternatively be operated and controlled via an end device. The user interface can also be displayed on up to 10 end devices (screen mirroring). Via the PLC, the measured values can be stored internally. Access to stored measured values is possible from end devices via WLAN with integrated router/LAN connection to the customer's own network.

Learning objectives/experiments

- investigation and comparison of the operating behaviour of various pump types:
  - ▶ centrifugal pumps
  - ▶ piston pump (positive displacement pump)
  - ▶ side-channel pump
- recording a pump characteristic curve
- recording a system characteristic curve
- determining efficiency
- investigation and comparison of parallel and series configuration of centrifugal pumps
- comparison of pump types

- screen mirroring: mirroring of the user interface on up to 10 end devices
  - ▶ menu navigation independent of the user interface shown on the touch screen
  - ▶ different user levels available on the end device: for observing the experiments or for operation and control

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1 flow control valve (at outlet), 2 connection for additional pump, 3 motor for additional pump, 4 flow rate sensor, 5 piston pump, 6 side-channel pump, 7 centrifugal pump, 8 storage tank
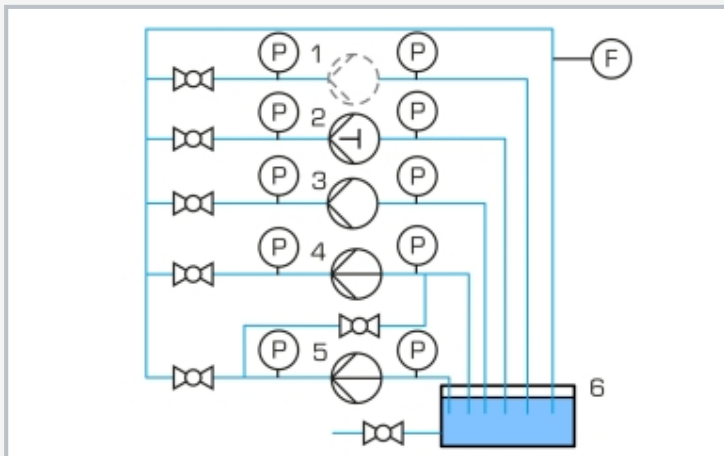
Process schematic of the trainer
1 free place for additional pump (is provided by user), 2 piston pump, 3 side-channel pump, 4+5 centrifugal pump, 6 storage tank; F flow rate, P pressure
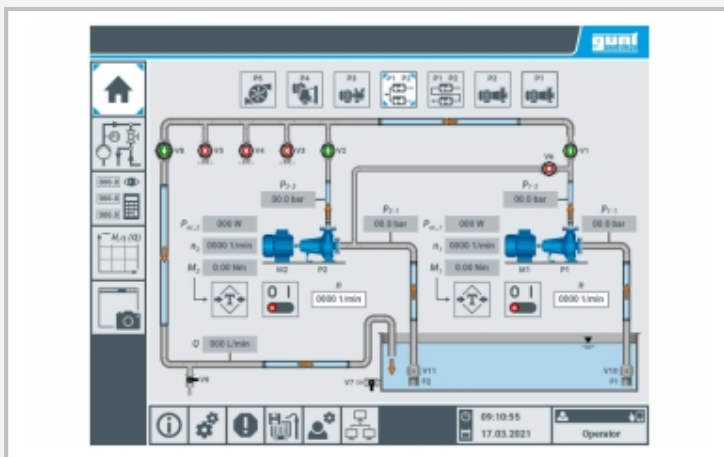
User interface on the touch screen: welcome screen with pumps in parallel configuration

Specification

[1] experiments relating to key issues in pump engineering
[2] comparison of various pump types: centrifugal pump, piston pump, side-channel pump
[3] operation of centrifugal pumps in parallel or series configuration
[4] free position for additional pump
[5] three-phase AC motors for centrifugal pumps and additional motor with variable speed by frequency converter
[6] plant control with PLC, operation via touch screen
[7] integrated router for operation and control via an end device and for screen mirroring: possible to mirror the user interface on up to 10 end devices
[8] data acquisition via PLC on internal USB memory, access to stored measured values via WLAN with integrated router/ LAN connection to customer's own network

Technical data

PLC: Weintek cMT3092X
Centrifugal pump 2x
- max. flow rate: 330L/min
- max. head: 23m
Three-phase AC motor 2x, for centrifugal pump
- power output: 1,5kW
- nominal speed: 2900min^{-1}
Side-channel pump, self-priming, one-stage
- max. flow rate: 83L/min
- max. head: 50m
Three-phase AC motor for side-channel pump
- power output: 1,1kW
- nominal speed: 1500min^{-1}
Piston pump
- max. flow rate: 17L/min
- max. head: 60m
Three-phase AC motor for piston pump
- power output: 0,55kW
- nominal speed: 1400min^{-1}
Three-phase AC motor, additional motor, reversible
- power output: 0,75kW
- nominal speed: 2800min^{-1}

Measuring ranges
- flow rate: 0...700L/min
- pressure (inlet): -1...1,5bar
- pressure (outlet): 0...10bar
- torque: 0...15Nm
- speed: 0...3000min^{-1}
- pump electrical power consumption: 0...3kW

400V, 50Hz, 3 phases; 400V, 60Hz, 3 phases
230V, 60Hz, 3 phases
LxWxH: 2860x1200x1960mm; Weight: approx. 430kg

Scope of delivery

1 trainer
1 set of instructional material