



ARGO-HYTOS Protech

Large Systems for Energy Industry

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(ISO 16016:2002)

We produce fluid power **solutions**

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Customers – Group C1

Custom-designed Hydraulic Power Units for Škoda Power and its Subsuppliers (G-team, Tyco, Emmerson etc.):

- **Distinctiveness:**

- complex supply of hydraulics mostly – hydraulic power unit, servo-actuators, working fluid, pipe-lines, commissioning and training;
- taking into account the equipment sophistication (danger of large damages and financial losses) it is necessary to implement a lot of specific demands – see below;
- connection of electric items to terminal box mostly (especially on hydraulic power units) or by means of connectors Harting (on servo-actuators);
- longer time schedule of particular job orders, similarity of hydraulic systems;
- job orders implemented worldwide in years 2007-2008 – India, Pakistan, Finland, Denmark, Croatia, Germany and Russia, also lubrication and cooling systems in Romania, Chile, Turkey, Latvia.

- **Main strong points - advantages:**

- interesting price level, flexibility and adaptation by meeting the extremely high requirements set by branch and customer contrary to the dominant competitor Rexroth company especially as for turbines with lower output;
- making use of high technical erudition – see description of typical demands;
- effort to constantly improve and modify technical solutions unlike the opposite tendency to supply routinely.

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Definition of the Basic Standards (Requirements) for Hydraulic Systems

- **Hydraulic power unit – most frequent requirements:**
 - stainless steel reservoir with oil sump, enclosure of hydraulic power unit (noise and dirt);
 - redundancy of pressure source, accumulators with pressure fluid reserve for 3-4 cycles of servo-actuators;
 - multiple monitoring of working parameters of fluid (temperature, level, pressure);
 - utilization of synthetic, fire-resistant and biodegradable hydraulic fluid;
 - off-line unit for filling with working fluid, in special cases for fluid regeneration during operation.
- **Servo-actuators – most frequent requirements:**
 - dividing into 2 types of main function – stop valves and control valves actuators;
 - the main demand for stop valve actuators is short closing time – up to 200 ms with controlled reach the end position, safe position ensured by springs, redundancy of safety function, control by seat valves;
 - control pressure for stop valve actuators with the “function 2/3” – disconnection of at least two out of three electromagnets will ensure fast close of steam at the inlet of turbine;
 - servo-valves connected in the way that operational safety is increased;
 - adequate filtration without by-pass;
 - continual position monitoring in multiple (redundant) design.

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- Servo-actuators for control of steam pressure and volume in the inlet of turbine:
 - Rotary double acting servo-actuator without spring – actuator of a common cam shaft, that controls valves of the turbine. The actuator is designed as linear with rotary output (rack-and-pinion);
 - Linear single acting servo-actuator with built-in spring – direct drive of a turbine



without spring – drive of a control valve by



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- Servo-actuators for control of steam pressure and volume in the outlet of turbine:
 - Linear double acting servo-actuator of relieve control valve – direct drive of a relieve valve;
 - Linear double acting servo-actuator of control diaphragm;
 - Rotary servo-actuator of control flap – servo-actuator is designed as linear gearbox



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- Valve blocks of control servo-actuators with high quality items of prestigious companies:
 - continuous control is provided by servo-valves with two solenoids produced by the Rexroth or Moog companies (in case of malfunction of one solenoid full operation is ensured by the second solenoid, only dynamic properties are slightly worse), or proportional valves produced by the Bosch company;
 - quick close of servo-actuator is ensured by poppet and cartridge valves produced by the Rexroth, Sun, Bosch and Hawe companies;
 - adequate cleanness of working fluid is achieved by use of full-flow filters produced by the Argo-Hytos company.
- Sensing of the servo-actuator actual position:
 - the feedback signal (4-20mA) is ensured by a dual position transmitter Balluf or Temposonic, that is installed in a piston rod of servo-actuator.



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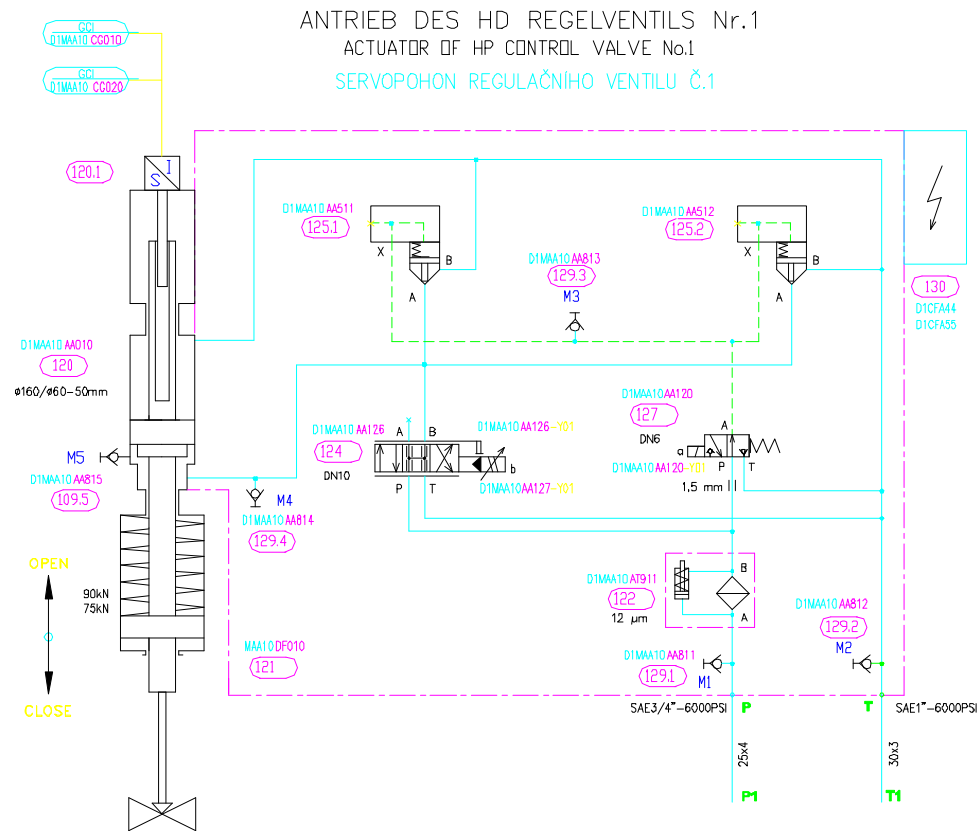
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- Electro-equipment of control servo-actuators according to customers requirements:
 - terminal box;
 - connectors Harting Han;
- Built-in springs of servo-actuators:
 - spiral springs;
 - disc springs



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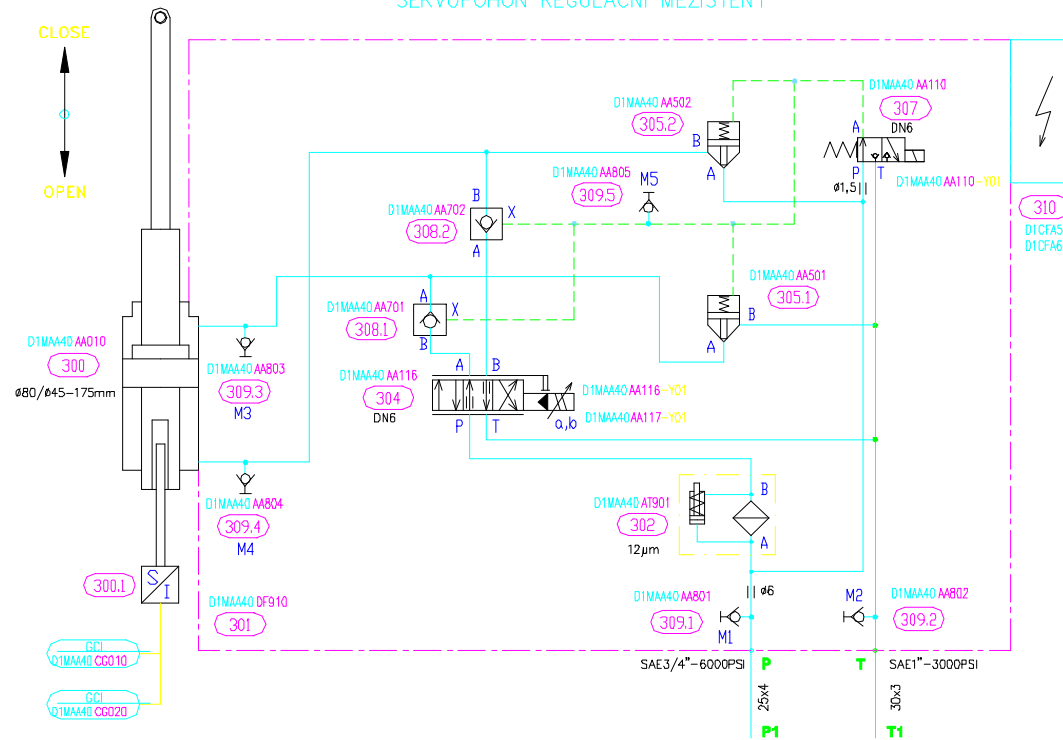
Customers – Group C1 – SERVO-ACTUATORS



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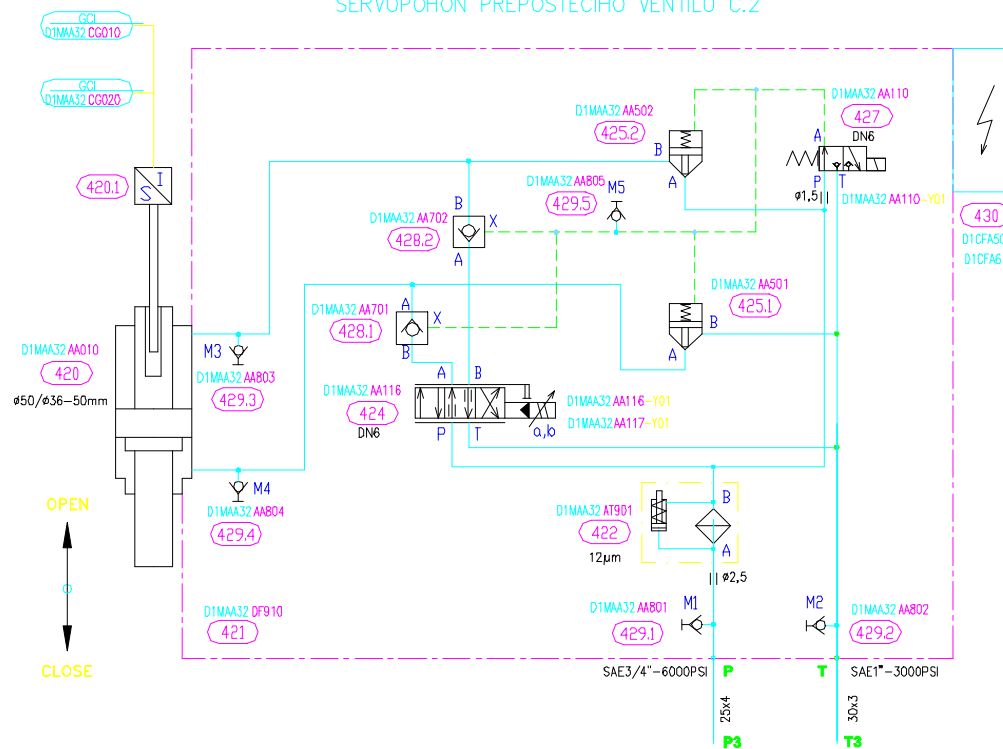
ANTRIEB DER REGELZWISCHENWAND
 ACTUATOR OF CONTROL DIAPHRAGMA
 SERVOPOHON REGULAČNÍ MEZISTĚNY



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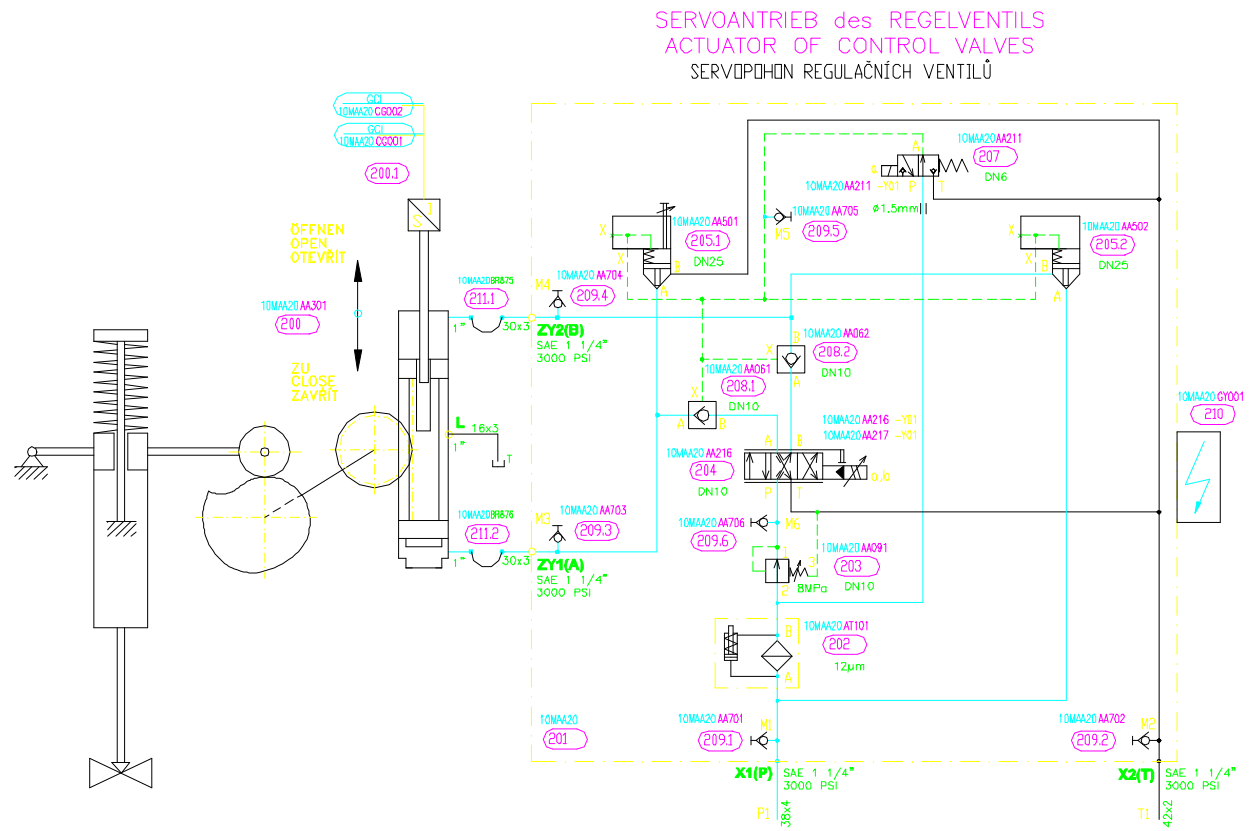
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ANTRIEB DES UMLAUFVENTILS Nr.2
 ACTUATOR OF RELIEF VALVE No.2
 SERVOPOHON PŘEPOŠTĚČIHO VENTILU Č.2



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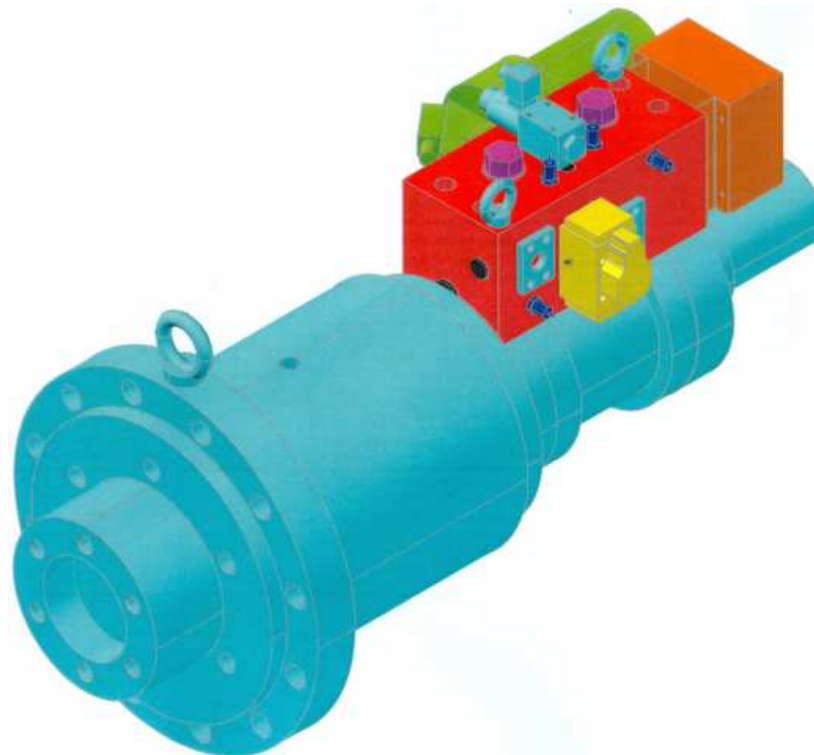
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Model of linear single acting control servo-actuator with built-in spring:



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Model of linear double acting servo-actuator of control diaphragm:



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- Stop valve servo-actuators for emergency close of steam inlet of a turbine:
 - two positions single acting servo-actuator of stop valve (position open/close);
 - orientation of closing (opening) according to customers requirements;
 - closing of servo-actuator is secured by the force of built-in spring;
 - closing time of a stop valve is 200 ms;
 - the run down to an end position is cushioned and adjustable;
 - both positions of the servo-actuator are checked by non-contact proximity switches.
- Stop flap servo-actuators
- By-passes for steam and water:
 - control by-passes;
 - two positions by-passes;
 - flaps.



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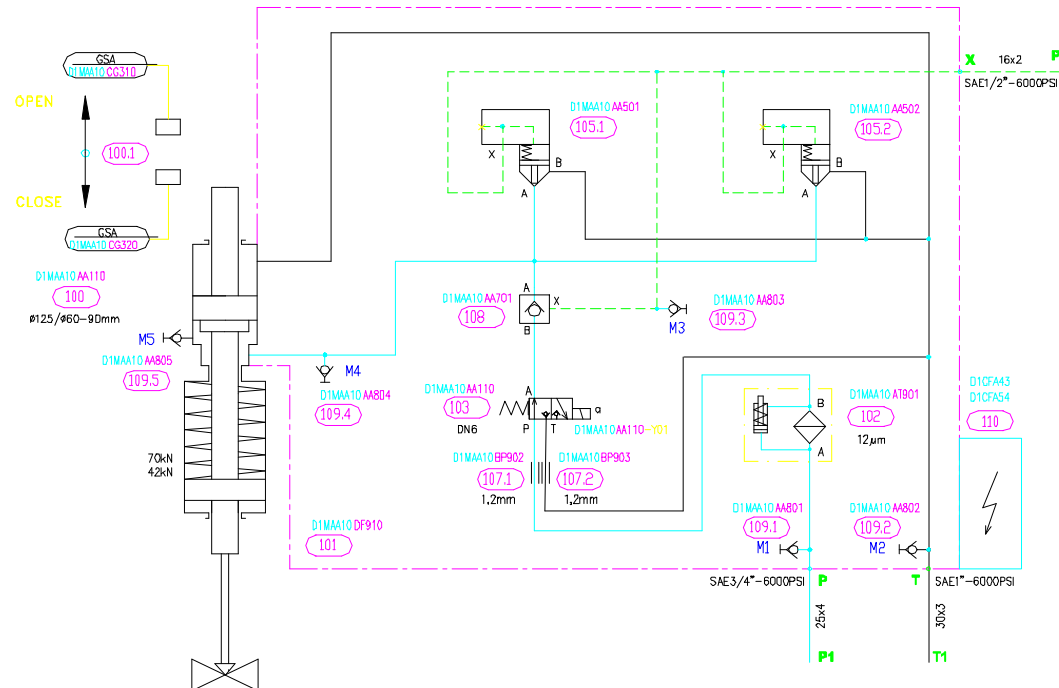
- Valve blocks of stop valve servo-actuators are equipped with high quality items of prestigious companies:
 - quick close of servo-actuator is ensured by poppet and cartridge valves produced by the Rexroth, Sun, Bosch and Hawe companies;
 - adequate cleanness of working fluid is achieved by use of full-flow filters produced by the Argo-Hytos company.
- Limit switches:
 - positions of the servo-actuator are checked by non-contact proximity switches produced by the Siemens (Bero) or Turck companies.
- Electro-equipment of stop servo-actuators according to customers requirements:
 - terminal box;
 - connectors Harting Han.
- Built-in springs of servo-actuators:
 - spiral springs;
 - disc springs.



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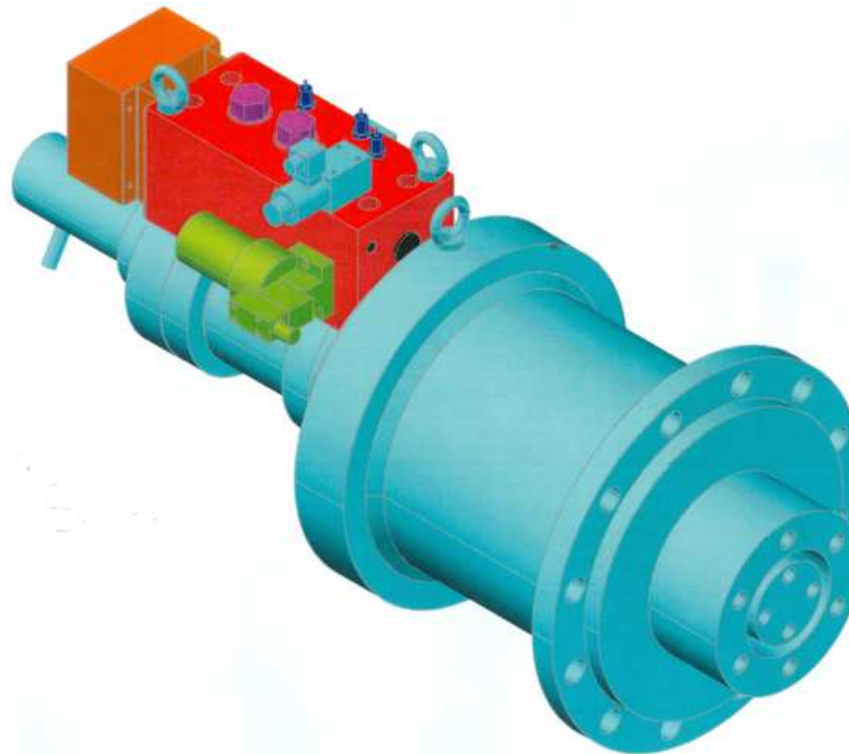
ANTRIEB DES HD SCHNELLSCHLUSSVENTILS – LINKS
 ACTUATOR OF HP STOP VALVE - LEFT
 SERVOPOHON RYCHLOZÁVĚRNÉHO VENTILU – LEVÝ



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Model of linear single acting stop valve servo-actuator with built-in spring:



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- Hydraulic power units have a closed steel frame with doors (according to customer requirements);
- Drip tray is designed for interception of the working liquid during its changing, equipment revisions etc.;
- Stainless steel reservoir with volume from 160 to 630 liters with accessories according to customer requirements:
 - float level switch in stainless steel design produced by the Kübler company;
 - temperature sensor produced by the Rosemount, Siemens, ABB, JSP and Endress-Hauser companies;
 - immersion heaters fitted in tubes in order to ensure their replacement during operation;
 - air-breather filter with silica gel to separate air humidity.



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- Duplex source of working pressure liquid (100% standby) in a vertical arrangement, working pressure 16 MPa:
 - motor-pump units with a control pump – output from 7.5 to 18.5 kW:
 - > axial piston pump with a remote pressure control;
 - > pumps produced by the Rexroth, Parker and Sauer-Danfoss companies (double pump – axial piston + gear pump).
 - motor-pump units with a gear pump – output up to 7.5 kW:
 - > gear pump with pressure unload - hydraulic or electric;
 - > pressure unload valves produced by the Rexroth and Bosch companies.

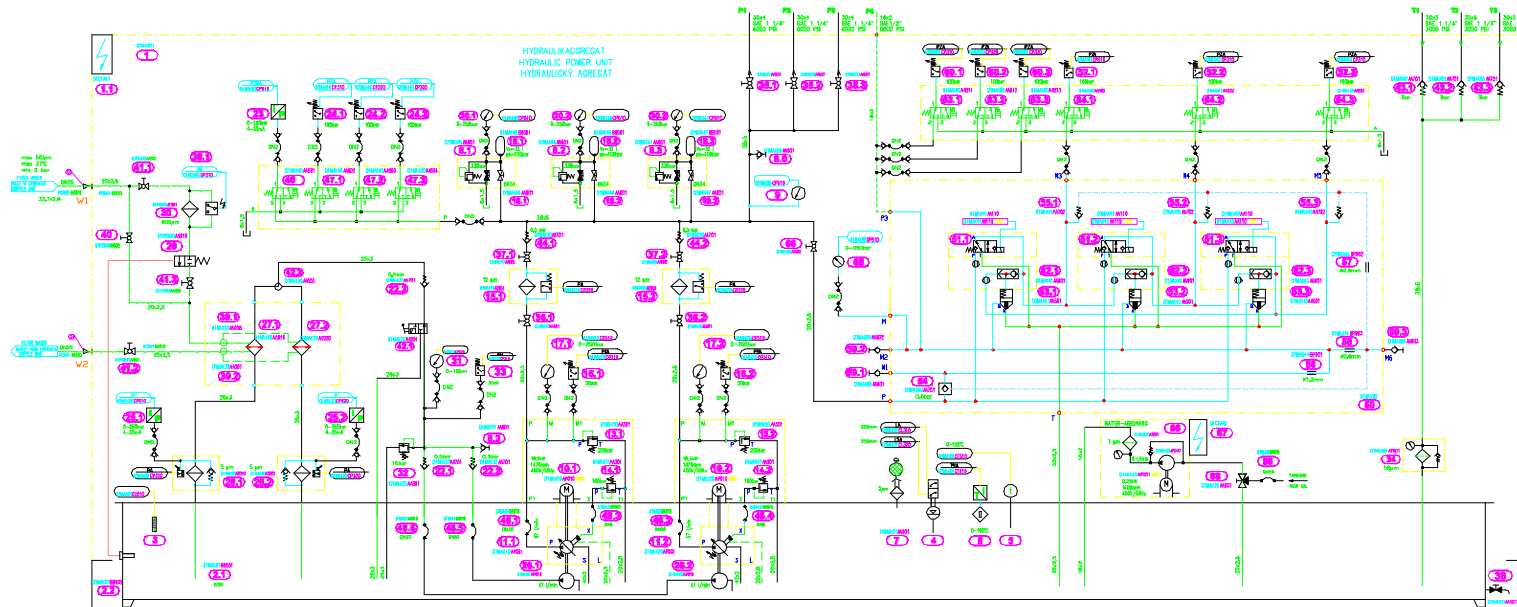


- Accumulators connected to pressure outlet of hydraulic power unit:
 - designed with reserve of working pressure fluid for 3 up to 4 control cycles (0 – 100%) of all servo-actuators in case of failure;
 - stabilize pressure of working fluid during startup of standby motor-pump unit;
 - ensure immediate supply of working fluid in case of sudden rise of its consumption.

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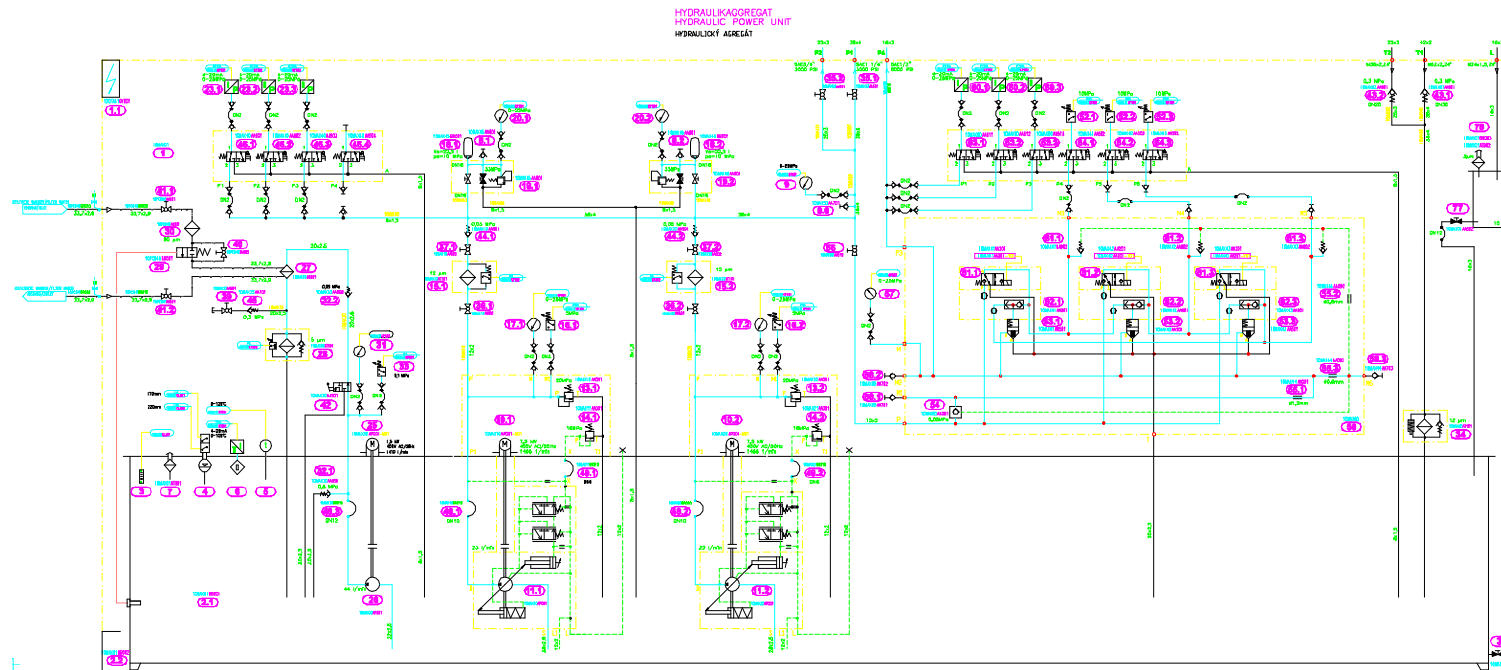
Circuit diagram of hydraulic power unit with double pumps (axial piston + gear):



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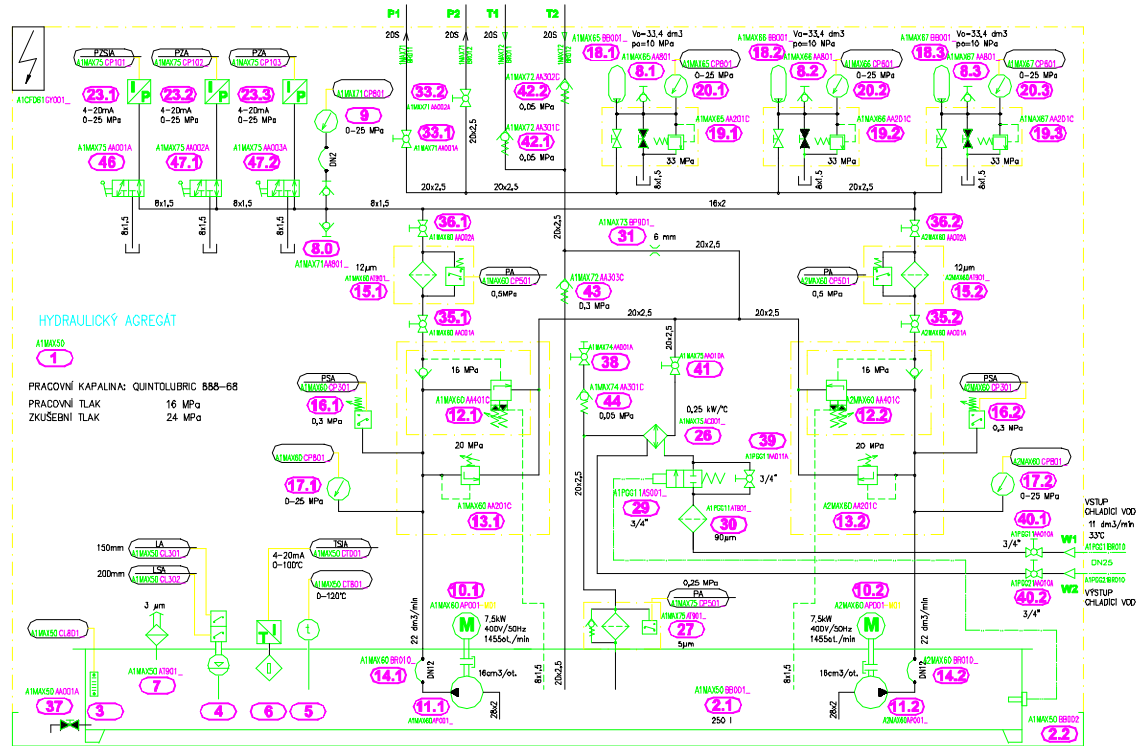
Circuit diagram of hydraulic power unit with axial piston pumps:



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Circuit diagram of hydraulic power unit with gear pumps and pre



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Customers – Group C1 – POWER UNITS

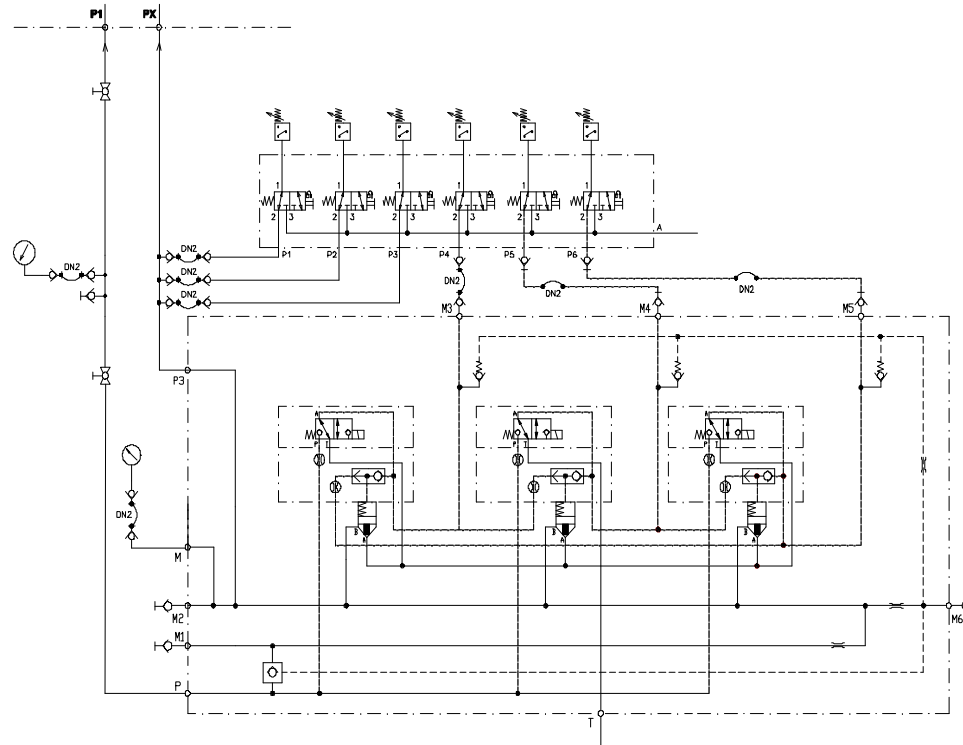


- Hydraulic block 2 out of 3 selection ensures control fluid for a tripping circuit of stop valve servo-actuator:
 - small compact part with minimal possibility of leakage;
 - in case of disconnection of power supply to at least two out of three solenoids of poppet valves (or a failure of two out of three cartridge valves or poppet valves), their ports will be connected, a hydraulic driven check valve will be closed, control fluid in the tripping circuit will loose pressure and the stop valve servo-actuator will be closed and ensures quick close of steam in the inlet of turbine;
 - a failure of one poppet valve or disconnection of power supply to one solenoid has no influence on pressure of control fluid in the tripping circuit;
 - pressure monitoring of the hydraulic block 2 out of 3 selection:
 - > pressure switches Argo-Hytos;
 - > pressure transducers Rosemount, Siemens, ABB, Endress-Hauser, Philips;
 - > pressure switches and transducers are mounted on compact manifolds with cut-off poppet valves.

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Circuit diagram of hydraulic block 2 out of 3 selection:



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- Monitoring of working pressure in outlet line of hydraulic power unit is ensured by several pressure transducers and switches:
 - pressure switches Argo-Hytos;
 - pressure transducers Siemens, Rosemount, ABB, Endress-Houser, Yokogawa, Philips;
 - pressure switches and transducers are mounted on compact manifolds with cut-off poppet valves.



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- Filtration of working liquid ensure filters produced by the Argo-Hytos company:
 - pressure full-flow filters (without by-pass), filter fineness 10 μm ;
 - return line filters, filter fineness 3 μm ;
 - circulation filters, filter fineness 10 μm .
- Separate filtration and cooling circuit:
 - working liquid flows to this circuit from a reservoir via a gear pump driven by an electromotor;
 - pressure monitoring is ensured by pressure gauge and pressure switch produced by the Suco company;
 - filtration by circulation filter with filter fineness 10 μm ;
 - water cooler in plate or pipe design for various cooling fluids:
 - > industrial water;
 - > sea water;
 - > demi water;
 - > water-glycol.
- Terminal box is a part of each hydraulic power unit and all electrical items except electromotors and immersion heaters are connected into it.
- There is used synthetic, fire-resistant, biodegradable hydraulic fluid HFD-U Quintolubric 888-68 in hydraulic systems.



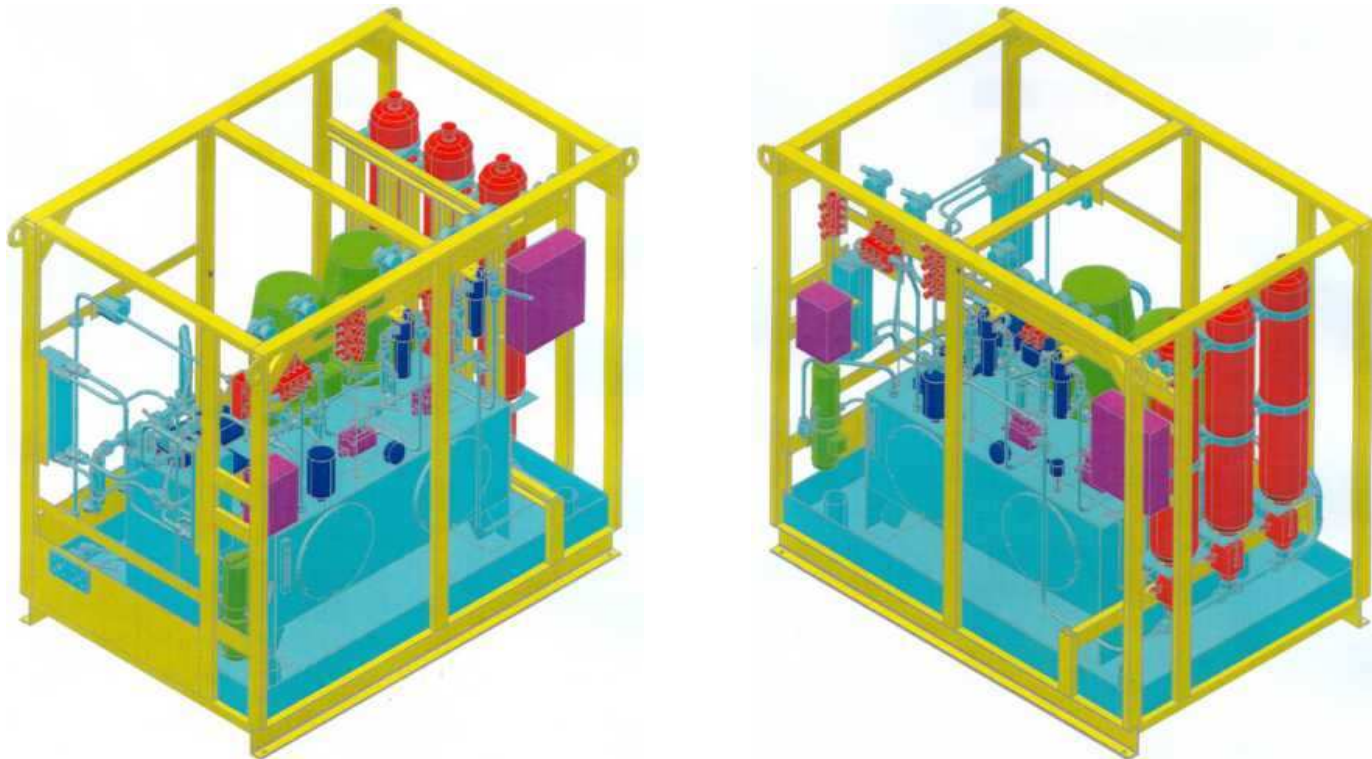
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- Off-line units of hydraulic power units:
 - dewatering filter unit controlled by the Siemens LOGO! system is used to dewater working fluid and for filling (emptying) of reservoir;
 - filtration units with filter fineness $1\mu\text{m}$ to achieve the maximal cleanness of working fluid;
 - filling and emptying unit.



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Model of hydraulic power unit:



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Customers – Group C1 – POWER UNITS 2008



Custom-designed HPU - Fynsvaerket 38 MW

- Serial No.: 08017
- Customer: ŠKODA POWER a.s.
- Order No.: 8021/08
- Circuit diagram: 1-H-41 575
- Implementation date: June 2008
- Main parameters:
 - reservoir volume 300 dm³, stainless steel
 - pump control pump + gear pump
 - Electromotor 2x 7.5 kW, 400/690 V, 1500 rpm
 - working pressure 16 MPa
 - working flow 22+35 dm³.min⁻¹
 - scope of delivery hydraulic system

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