Hydraulic Test Room **HYDRA**

The core branches of production program of ŽĎAS, a.s. include development and manufacture of hydraulic systems. These are represented e.g. with manifolds fitted with hydraulic elements, hydraulic cylinders, valves etc. During manufacture and before equipment assembly, it is always necessary to properly test the hydraulic units at certified test stations. This is the only way to eliminate any manufacturing defects, faults in the product design or incorrect settings of basic parameters. Finally, such a procedure saves time and, primarily, it avoids loss in production plants and in environment. Being aware of this fact, ŽĎAS, a.s. offers a well-equipped hydraulic test room to its partners and customers to push forward the possibilities of testing the hydraulic elements.

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Central hydraulic station – **Charón**

The main function of this equipment is to ensure hydraulic pressure energy as a source of pressure and flow for power supply of the consumers (hydraulic stands) in the hydraulic test-room.

The hydraulic pressure source has the following functions:

- To ensure pressure and flow for the stand SATYR
- To ensure pressure and flow for the stand PROMETEUS
- To ensure pressure and flow for the stand KENTAUR
- To ensure pressure and flow for the pressure chamber HÁDES

Main circuit parameters

Installed motor input	P = 2 x 315 kW
Maximum operating pressure of drive unit No. 1	p_1 = 320 bar
Maximum operating pressure of drive unit No. 2	p_2 = 320 bar
Maximum flow of drive unit No. 1	Q_1 = 2 x 530 (1 060) $dm^3 min^{-1}$
Maximum flow of drive unit No. 2	Q_2 = 2 x 530 (1 060) $dm^3 min^{-1}$

Control-pressure circuit parameters

Installed motor input	P = 45 kW
Maximum operating pressure	p = 320 bar
Maximum flow	Q = 65 $dm^3 min^{-1}$

High-pressure circuit parameters

Installed motor input	P = 7.5 kW
Maximum operating pressure	p = 420 bar
Maximum flow	Q = 6.1 $dm^3 min^{-1}$

General parameters for all the test equipment

Working liquid (mineral oil)	ISO VG46
Required quality of liquid filtration	10 μm
Range of allowed working-liquid temperatures	+20 °C ÷ +60 °C
Range of allowed ambient temperatures	+15 °C ÷ +45 °C
Supply voltage – valves and switches	24 V (DC)
Pressure and position sensor signal	4–20 mA
Cleanness of the working liquid is to be evaluated continually.	

Cooling and filtering circuit parameters

Installed motor input	P = 2 x 18.5 kW
Maximum operating pressure of drive unit No. 1	p_1 = 10 bar
Maximum operating pressure of drive unit No. 2	p_2 = 10 bar
Maximum flow of drive unit No. 1	Q_1 = 600 $dm^3 min^{-1}$
Maximum flow of drive unit No. 2	Q_2 = 600 $dm^3 min^{-1}$
Tank volume	V_N = 12 000 dm^3

Accumulator station parameters

Maximum accumulator volume	V = 500 dm^3
Maximum operating pressure	p = 350 bar
Charge-nitrogen pressure (N_2)	p_0 = 240 bar

Hydraulic stand – **Kentaur**

The Kentaur hydraulic stand is a stationary device designed for testing hydraulic manifolds of smaller sizes (2000 x 300 x 300 mm) including the possibility of control of the load-dependent hydraulic motors. The hydraulic stand is designed to check the test hydraulic manifolds for their properties, functions and characteristics and whether they meet the required criteria imposed on.

Hydraulic stand ensures the following functions:

- Pressurization of the tested manifold with high pressure
- Pressurization of the tested manifold with control pressure
- Pressurization of the tested manifold with working pressure
- Control of the valves on the tested manifold
- Pressure measurement on the tested manifold
- Measurement of the flow of working pressure to the manifold tested
- Control of built-in hydro-motors (hydraulic cylinders, rotating hydraulic motors) by means of the manifold tested

Hydraulic parameters

Maximum operating pressure	p = 320 bar
Maximum control pressure	p_x = 320 bar
Maximum testing pressure	p_3 = 420 bar
Maximum flow	Q_{max} = 300 $dm^3 min^{-1}$

Electrical parameters

Supply voltage – valves, switches and sensors	24 V (DC)
Pressure and flow sensors signal	4–20 mA
Front panel terminal connector voltage	12, 24, 48 VDC; 110, 230 VAC; 98, 205 VDC.

Mechanical parameters

Mass of horizontal weight	200 kg
Mass of vertical weight	290 kg
Mass of pendulum weight	160 kg
Test space dimensions (d x h x w)	696 x 1 342 x 2 536 mm

Hydraulic stand – **Satyr**

The Satyr hydraulic stand is a stationary device designed for the pressure and functional testing of standard and proportional hydraulic elements.

The hydraulic stand is designed for:

- Testing the hydraulic elements with installation dimensions per ISO 4401/DIN 24340 FORM A for inside diameters DN6 – DN32
- Testing the hydraulic elements with installation dimensions per ISO 6264/DIN 24340 FORM D for inside diameters DN10 – DN32
- Testing the hydraulic elements with installation dimensions per ISO 6264/DIN 24340 FORM E for inside diameters DN10 – DN32
- Testing the hydraulic elements with installation dimensions per ISO 6263/DIN 24340 FORM G for inside diameters DN6 – DN16
- Testing the hydraulic elements with installation dimensions per ISO 7368/DIN 24342 for inside diameters DN16 – DN40

Hydraulic parameters	
Max. operating pressure for functional tests	p_1 = 320 bar
Max. operating pressure for pressure tests	p_2 = 420 bar
Maximum flow for functional tests	Q_1 = 1 000 $dm^3 min^{-1}$
Maximum flow for pressure tests	Q_2 = 6 $dm^3 min^{-1}$

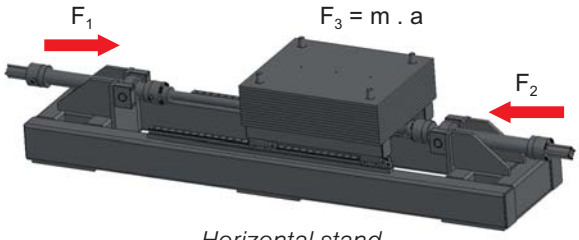
Electrical parameters	
Supply voltage – valves, switches and sensors	24 V (DC)
Pressure and flow sensors signal	4–20 mA
Front panel terminal connector voltage	12, 24, 48 VDC; 110, 230 VAC; 98, 205 VDC.

Development stand – **Prometeus**

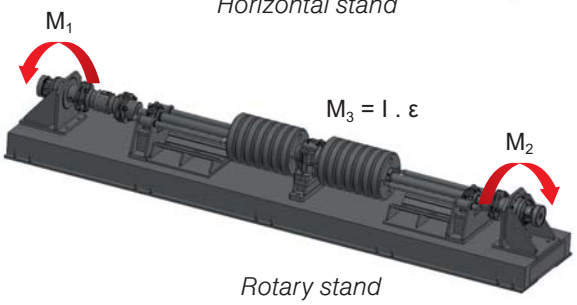
Main demand placed on this stand is a possibility to take research measurements of hydraulic drives with tangible load and accurately and quickly log the data from the hydraulic circuit. Matlab computer program and dSPACE hardware module for circuit control and data logging serve for this purpose. The development stand is a system of control stand and three drives – horizontal stand, vertical stand and rotary stand. The vertical stand also performs the function quick forging simulation. Individual stands are shown in the following pictures:

Hydraulic stand performs the following functions:

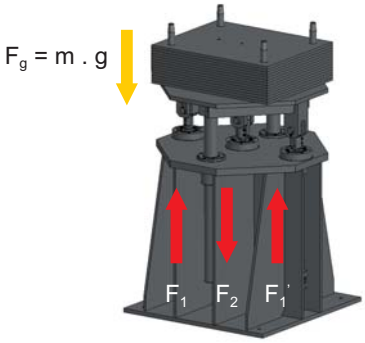
- Manual control of individual stand movement (reaching the end position),
- stand movement in closed loop with reduced parameters,
- loading the drives with directional proportional valve,
- loading the drives with safety valve (static load),
- drive torque regulation,
- sequence of quick forging of the vertical stand,
- control of movements and data logging by means of dSPACE system and Matlab program.



Horizontal stand



Rotary stand



Vertical stand with function of quick forging simulation

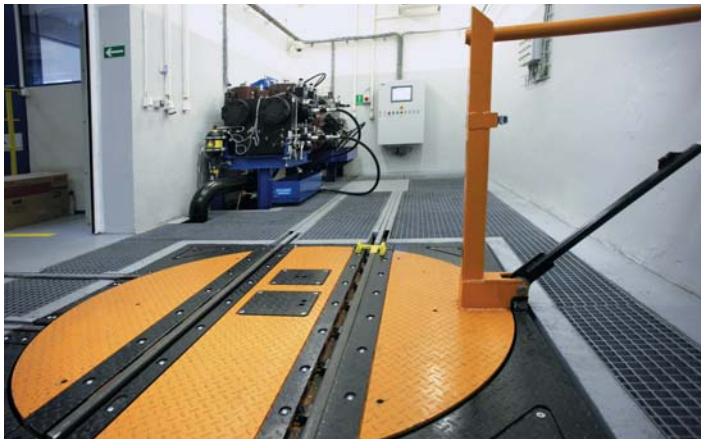
Hydraulic parameters	
Maximum working pressure	p = 320 bar
Maximum control pressure	p_x = 320 bar
Maximum flow	Q_{max} = 300 $dm^3 min^{-1}$

Electrical parameters	
Supply voltage – valves, switches, sensors, system	24 V (DC)
Signal from pressure and flow sensors	4–20 mA, 0–10 VDC

Mechanical parameters	
Horizontal weight	1 722 kg
Vertical weight	1 722 kg
Rotary weight	1 710 kg
Horizontal and vertical stand run-out	700 mm
Rotary stand speed, max.	180 min^{-1}

Pressurizing Chamber – **Hádes**

Main demand placed on this device is to test bulky hydraulic components, hydraulic units, valves and other hydraulic equipment. This chamber meets high safety requirements.



The pressurizing chamber performs the following functions:

- hydraulic cylinder and manifold testing
- built-in valve testing per ISO 7368/DIN 24342 for inside diameters DN50 – DN125 (DN 160)

Working parameters	
Max. working pressure (for main circuit)	p_1 = 320 bar
Max. working pressure (for control pressure)	p = 320 bar
Max. working pressure (for high pressure)	p_2 = 420 bar
Maximum rate of flow (for functional tests)	Q_1 = 6 000 $dm^3\,min^{-1}$
Maximum rate of flow (for pressure tests)	Q_2 = 6 $dm^3\,min^{-1}$

Mobile Test Unit – **Ikaros**

Main demand placed on this stand is a possibility to transport it (mobility) to other workstations by means of crane and/or rail transport, if it is to be moved between adjacent buildings within ŽĎAS, a. s. premises.

The mobile test unit performs the following functions:

- source of hydraulic pressure energy for selected application mode (e. g. hydraulic station, hydraulic cylinder cycling or pressurizing)
- source of high-pressure hydraulic energy
- source of control hydraulic pressure energy
- independent source for hydraulic liquid temperature and purity stability

General parameters for test stand IKAROS	
Installed input of main electric motor	P = 110 kW
Maximum pressure of pump	p_{HG} = 350 bar
Maximum rate of flow of pump	Q_{HG} = 200 $dm^3\,min^{-1}$
Working liquid (mineral oil)	ISO VG46
Required liquid filtration value	10 μm

Range of working liquid temperatures permitted	+20 °C ÷ +60 °C
Range of ambient temperatures permitted	+15 °C ÷ +45 °C
Supply voltage – electric motors	400 V AC; 50 Hz
Supply voltage – heating bodies (heaters)	400 V AC; 50 Hz
Supply voltage – valves and sensors	24 V (DC)
Signal from pressure sensor	4–20 mA

Parameters of control pressure unit	
Installed input of main electric motor	P = 30 kW
Maximum pressure of pump	p_{HG} = 160 bar
Maximum rate of flow of pump	Q_{HG} = 117 $dm^3\,min^{-1}$

Parameters of high-pressure drive unit	
Installed input of main electric motor	P = 7.5 kW
Maximum pressure of pump	p_{HG} = 630 bar
Maximum rate of flow of pump	Q_{HG} = 6,2 $dm^3\,min^{-1}$

Parameters of cooling and filtering unit	
Installed input of main electric motor	P = 4 kW
Maximum pressure of pump	p_{HG} = 10 bar
Maximum rate of flow of pump	Q_{HG} = 150 $dm^3\,min^{-1}$

Specified working environment	
Relative air humidity	max. 80 %
Ambient temperature – IKAROS	min. +5 °C max. +45 °C
Ambient temperature – HYDRA	min. +5 °C max. +40 °C
Elevation above sea-level	max. 1 000 m
Max. temperature variation	10 °C/hod
Type of environment	nonaggressive, slight dust nuisance
Outside influences	AB5, AC1, AD1, AE4, AF1, BA4