



***ValveExpert 8.1.1***



Test Equipment for Servo–  
and Proportional Valves  
ValveExpert 8.1.1

Edition for PHS/MWA Aviation Services

Dr. Mikhail Shashkov

19 January 2019

Review

[shashkov@dietzautomation.com](mailto:shashkov@dietzautomation.com)

# 1 Review of Specifications

Test equipment ValveExpert 8.1.1 is based on a development of an aerospace test stand ValveExpert 8.1 and on the test stand ValveExpert 8.2.5 made for Parker Hannifin Germany. It is an automatic test equipment for checking, maintenance, and adjustment of servo- and proportional valves. The test stand is developed in according to the standards established in SAE ARP 490, ARP 4493, ISO 10770-1 and ISO 10770-2. Below are the main specifications of the stand ValveExpert 8.1.1

## 1.1 Applications

Test stand ValveExpert 8.1.1 is developed for checking, maintenance and adjustment of two, three and four ways servo- and proportional valves.<sup>1</sup> Working pressure of the stand is up to 375bar (5400psi). The maximal test flow is about 80L/min (21Gal/min).

## 1.2 Control signals of the main interface electronics

Main interface electronics of the test stand has got an analogue output to control servo- and proportional valves. It is also equipped with an input channel to read the actual value of the command signal. A servo- or proportional valve under testing can be controlled by voltage or current command signal. The following modes for the control signal are supported:  $\pm 10V$ ,  $\pm 10mA$ ,  $\pm 20mA$ ,  $\pm 50mA$ ,  $\pm 100mA$ , and  $4mA \dots 20mA$ . A short circuit protection limits the current within the the interval  $-25mA \dots + 25mA$  for the range  $\pm 10V$ . The system allows to measure resistance of the load in case of current mode control. Built-in relays can change polarity of control signal and coil configurations: Serial, Parallel, Coil No.1, and Coil No.2.<sup>2</sup>

## 1.3 Enable signal

In order to support servo- or proportional valves with an enable input, the main interface electronics of the test stand has got an analogue output to control the enable signal, and an additional input channel reads the actual values. Range of the enable signal is  $-25V \dots + 25V$ . To protect the output from the short circuit, maximal current of this output is limited by  $-25mA \dots + 25mA$ .

## 1.4 Spool position signals (feedback)

The most of modern servo- or proportional valves with a built in electronics are equipped by spool position transducers. ValveExpert 8.1.1 can check the signal from such a transducer. The standard signal ranges  $\pm 10V$ ,  $\pm 10mA$ ,  $\pm 20mA$ , and  $4 \dots 20mA$  are supported. Spool position transducers can be used for static tests as well as for frequency response and step response analysis.

## 1.5 LVDT/LVT transducers

ValveExpert 8.1.1 is equipped with a programmable LVDT/LVT controller. The most of 3-4-5-6-wire transducers are supported. No additional electronics is required. Amplitude of the

---

<sup>1</sup>We assume that the test stand will not be used for other purposes, like using it as an external hydraulic power unit or similar.

<sup>2</sup>For servovalves with two coils.

excitation signal and working frequency can be specified by the operator.<sup>3</sup> Six different modes can be used to recognize position of the LVDT/LVT transducer.<sup>4</sup> LVDT/LVT transducers can be used for static tests, as well as for frequency response analysis and step response analysis.

## 1.6 Frequency response cylinder (optional)

In case of absence of a spool position transducer or LVDT/LVT transducer, a frequency response cylinder should be used for frequency response analysis. This analysis expressed by amplitude ratio and phase angle which are constructed for harmonic signals from a specific frequency range. The cylinder must be equipped by a position and a velocity transducers with linear voltage outputs. Signals of these transducers should not exceed  $\pm 10V$  range. Optionally, the stand can be equipped by a cylinder ValveExpert FRC 2.2 with effective piston area about  $1850mm^2$  and total stroke about  $30mm (\pm 15mm)$ .

## 1.7 Available electric power supplies

The test stand is equipped with a programmable linear power supply. Voltage and current limit can be specified by the operator.<sup>5</sup> In additional,  $\pm 15V$  can be used for servovalves with build in electronics or other needs.<sup>6</sup>

## 1.8 Hydraulic fluid

The test stand ValveExpert 8.1.1 is designed for aerospace fire-resistant phosphate ester hydraulic fluids with viscosity about  $10cSt$ . We recommend to use *Skydrol*®, *Hyjet*® or similar.<sup>7</sup> The integrated filtration system achieves the cleanliness level 5 of NAS1638 (level 16/14/11 of ISO4406) or better. The capacity of the oil tank is about  $350L$ . The tank must be filled with with  $260L \dots 340L$  hydraulic fluid.

## 1.9 Contamination sensor

ValveExpert 8.1.1 is equipped with a contamination sensor which is used for continuous condition monitoring of the hydraulic fluid. Data about the oil cleanliness can be added to test reports.

## 1.10 Main hydraulic power pack

The test stand does not require an external hydraulic power supply. A modern high efficient and low noise  $47.4kW$  hydraulic power station is built in the stand. Maximal working flow of the power station is about  $80L/min (21Gal/min)$ . Working pressure is up to  $375bar (5400psi)$ . The supply pressure regulator of the hydraulic power pack utilizes a high precision pressure transmitters and FPGA based PID controllers.

---

<sup>3</sup>The frequency range is  $500Hz \dots 10000Hz$ . Amplitude of the excitation signal is up to  $10V$ .

<sup>4</sup>Each mode uses a specific formula to calculate the position.

<sup>5</sup>Voltage range is:  $0 \dots + 32V$ . Current range is  $0 \dots + 3A$ . See Rigol DP832 specifications for details.

<sup>6</sup>Maximal current for  $\pm 15V$  power supply is  $2A$ .

<sup>7</sup>See standards established in SAE AS1241D.

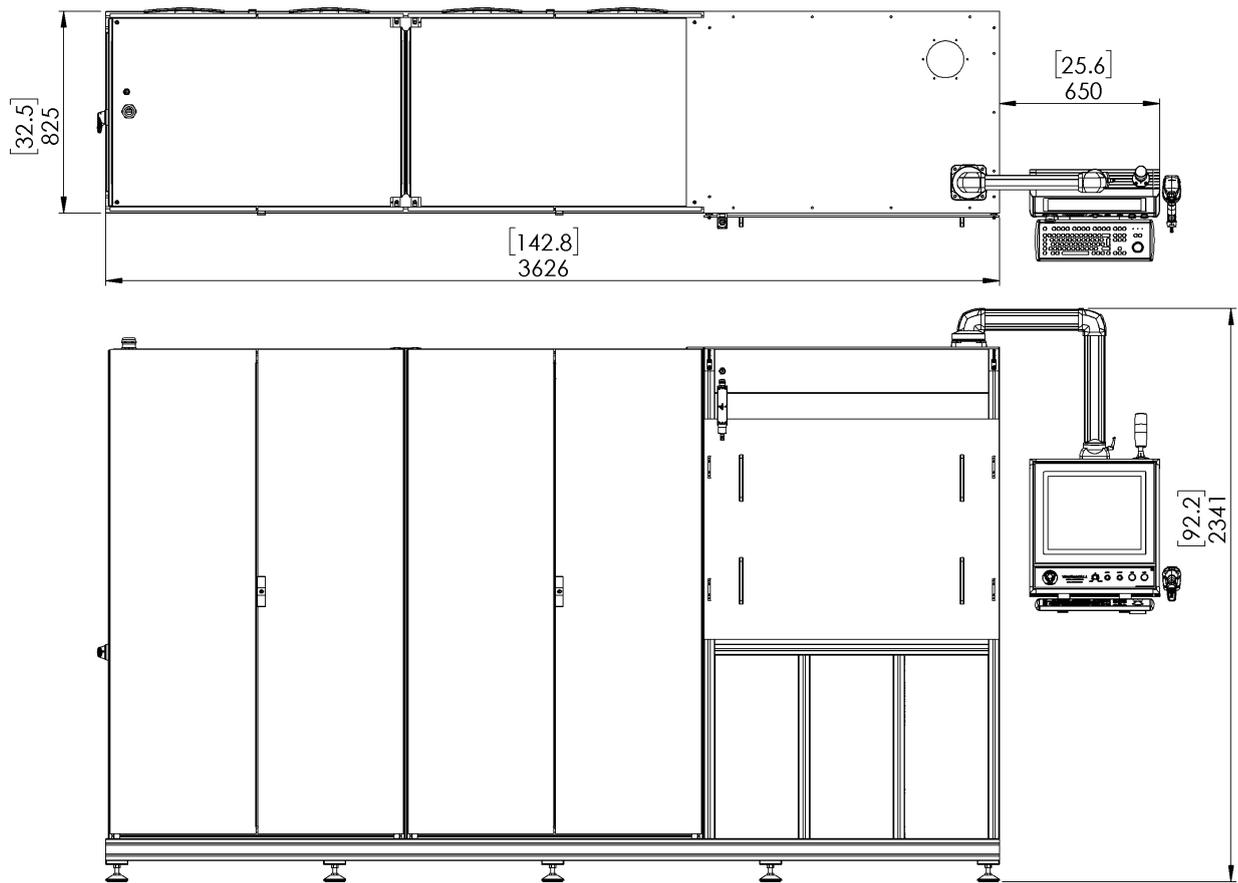


Figure 1: Dimensions of the test stand ValveExpert 8.1.1.

### 1.11 Pressure control of the return and control lines

In addition to the supply pressure regulation, the test equipment allows to control pressure in return and control output ports. The required values can be specified by the operator. Maximal pressure is set to 350bar (5050psi).

### 1.12 Electric power requirements

Hydraulic power pack of ValveExpert 8.1.1 requires a 3-phase 4-wire grounded electric power: 340VAC...528VAC, 45Hz...65Hz, 120A. Low power electronics of the test stand requires single-phase electric power: 120VAC...240VAC, 45Hz...65Hz, 16A.

### 1.13 Water cooling

Water connection for cooling system is required for oil temperature regulation. Note, the temperature control system allows to stabilize the oil temperature in a specified range with tolerance  $\pm 2^{\circ}\text{C}$ .

### 1.14 Dimensions and weight

Dimensions of the test stand ValveExpert 8.1.1 are shown on Figure 1.<sup>8</sup> Weight of the stand is

<sup>8</sup>Detailed drawings of the test stand are supplied in additional.

about 2300kg. Approximate dimensions of a wood box for transport are: 3910mm × 1280mm × 2550mm (*Length × Width × Height*). Tara weight is about 370kg. Customs tariff number: HTS 9031.20.0000 Test Bench.

DIETZ automation GmbH  
Auf Maien 17  
66538 Neunkirchen  
Germany  
office: +49 6821 8691762  
cell: +49 1522 8712097  
shashkov@dietzautomation.com  
www.dietzautomation.com

USt. ID Nr.: 219 401 070  
Geschäftsführer: Dr. Mikhail Shashkov  
Handelsregister: AG Saarbrücken HRB 12729

