

## CONDITIONS AND INSTRUCTIONS FOR VALVES

In general there are different conditions existing under which HYDAC valves could be used in hydraulics.

These conditions are depending on the corresponding valve and described on the depending datasheet in detail.

These conditions are:

1. Pressure
2. Flow rate
3. Type of hydraulic fluid
4. Ambient temperature range
5. Media operating temperature range
6. Viscosity of the fluid
7. Contamination level (filtration) of the operating fluid
8. Nominal current and voltage (proportional and solenoid operated valves)
9. MTTF<sub>d</sub> values

### 1. PRESSURE

Each valve is designed for a certain maximum pressure at which it can be operated without risk to the environment and life. For this value, we assume the warranty, as we have demonstrated in tests. It varies from valve to valve.

### 2. FLOW RATE

Each valve is designed for a certain maximum flow - due to its nominal size. At this flow it is still reasonable to operate the valve. An operation above this value will boost the power dissipation. This value also varies from valve to valve.

### 3. TYPE OF HYDRAULIC FLUID

The type of operating fluid is closely linked to its viscosity. HYDAC can only recommend hydraulic fluids according to DIN 51524 Part 1 and 2. For these fluids the function of the valves is warranted.

### 4. AMBIENT TEMPERATURE RANGE

The ambient temperature has a direct effect on the used materials in the valve, e.g. their mech. strength. Generally, the maximum temperature depends primarily on the sealing materials. HYDAC defines here:

- NBR: from -30°C to +60°C (solenoid valves - 20°C)
- FPM: from -20°C to +80°C (sometimes up to +100°C)

There are also deep temperature valves (TT), where the seals are specially designed for low temperatures.

Other influences of temperature:

- brittle fracture of steel at low temperatures
- relaxation of springs made of spring steel at higher temperatures
- fusing of coils at continuous operation under high current and at high temperatures

### 5. MEDIA OPERATING TEMPERATURE RANGE

Like the ambient temperature the media temp. range has a direct effect on the used materials in the valve, e.g. their mech. strength. Generally, the maximum temperature depends primarily on the sealing materials. HYDAC defines here:

- NBR: from -30°C to +100°C (solenoid valves - 20°C)
- FPM: from -20°C to +120°C (all other influences see point 4)

### 6. VISCOSITY

HYDAC valves may be used generally only in specific viscosity ranges, as in too thin or thick liquids, the assured features can not be fulfilled. These viscosities are also different for the different valves, but in average in the range of 10 mm<sup>2</sup>/s to 420 mm<sup>2</sup>/s.

### 7. CONTAMINATION LEVEL (FILTRATION)

Filtration and the associated particle size of contaminants in the hydraulic oil is the most important point in the operation of a hydraulic system. Exceeding the specified particle size in the filtration classes 21/19/16 to 18/16/13 may cause immediate failure of the parts in the hydraulic system when these particles are accumulated in critical areas.

### 8. NOMINAL TENSION AND VOLTAGE

In solenoid valves coils are used which are designed to operate safely in the voltage range of +/- 15% of nominal voltage at max. 60 ° ambient temperature. The combination of steady surge and very hot temperatures can result in extreme cases to failure of the solenoid. Therefore always a good heat dissipation and voltage level has to be assured.

### 9. MTTF<sub>d</sub> VALUES

We confirm the usage of basically and approved safety principals to ISO 13849-2:2003; charts C.1 and C.2 for the design of our hydraulic valves. (Confirmation in each datasheet of the valve)

The customer is responsible for the implementation and the operation of our valves due to the a.m. standard as well as the adherence of the operation conditions under „Specifications“ of each datasheet.