ValveExpert VX-MD-008

Magnetizing device for servo valves with torque motors based on AlNiCo magnets

DIETZ automation GmbH

User Guide

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Magnetizing device for servo valves
with torque motors based on AlNiCo magnets

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January 20, 2023, Dr. Mikhail Shashkov
(Date, Name)

Review

The magnetizing device ValveExpert VX-MD-008 is a part of the test system ValveExpert. See the picture on the front page. It consists of a variable transformer and an electromagnetic head. Together with a servovalve test stand ValveExpert series, it allows adjustment of the magnetic field of AlNiCo permanent magnets[1] used in servovalves with mechanical feedback which are similar to Moog 76x series. The variable transformer is used to adjust current through the coil of the electromagnetic head. Figure 1 construction of the electromagnetic head. It consists of an electromagnetic coil, control electronics, a rocker switch and a push button. The rocker switch is used to select between magnetizing "Mag" and demagnetizing "Demag" modes. The push button on the top of the electromagnetic head activates the magnetization procedure. A demo

Figure 1: Head of the magnetizer

video of the magnetization process is available on YouTube: https://youtu.be/2-sZ5sagyUA.

Magnetizing procedure[2]

Demagnetizing

1. Flip the switch "Mag/Demag" to the position "Demag".
2. Turn the knob of the variable transformer to the maximal position.
3. Put the magnetizing head above the first stage of the valve under adjustment.
4. Press the button on the top of the magnetizing head for a short time and at the same time remove the head from the valve. To exclude extra heating of the coil, the duration of this process must be less than a second.

[1] AlNiCo magnets typically consists of 8–12% Al, 15–26% Ni, 5–24% Co, up to 6% Cu, up to 1% Ti.
[2] The magnetizing procedure is shown on Figure 2.

5. Check the flow rate of the servovalve. The flow should not depend on the control signal or this dependence must be very small.

Magnetizing

1. Flip the switch "Mag/Demag" to the position "Mag".

2. Turn the knob of the variable transformer to an *appropriate* position.

3. Put the coil above the first stage of the valve.

4. Press the button on the top of the magnetizing head for a short time. To exclude extra heating of the coil, the duration of this process must be less than a second. Note, in fact, the magnetizing level does not depend on the time and $200ms$ is enough for magnetization.

5. Remove the magnetizing head from the valve and check the flow of the servovalve. Usually it must be nominal flow $\pm 10\%$ at nominal signal.

6. Repeat the steps $1 \ldots 5$ if the value of the flow is not correct.

In order to find the *appropriate* position of the auto-transformer handle, we usually use three test points. It means that we magnetize a servovalve at three different levels. (We use 80, 120 and 150 values of the variable transformer handle). Then we prognosticate the *appropriate* position using the cubic spline interpolation. But, with some experience, the *appropriate* position can be found experimentally without any computer extrapolation. Note that usually you have to demagnetize your valve completely if it is over-magnetized.

Caution

Note, current through the coil of the magnetizer can be up $10A$. It heats the coil very fast, and, therefore, please care that the coil is not too hot ($< 50°C$).

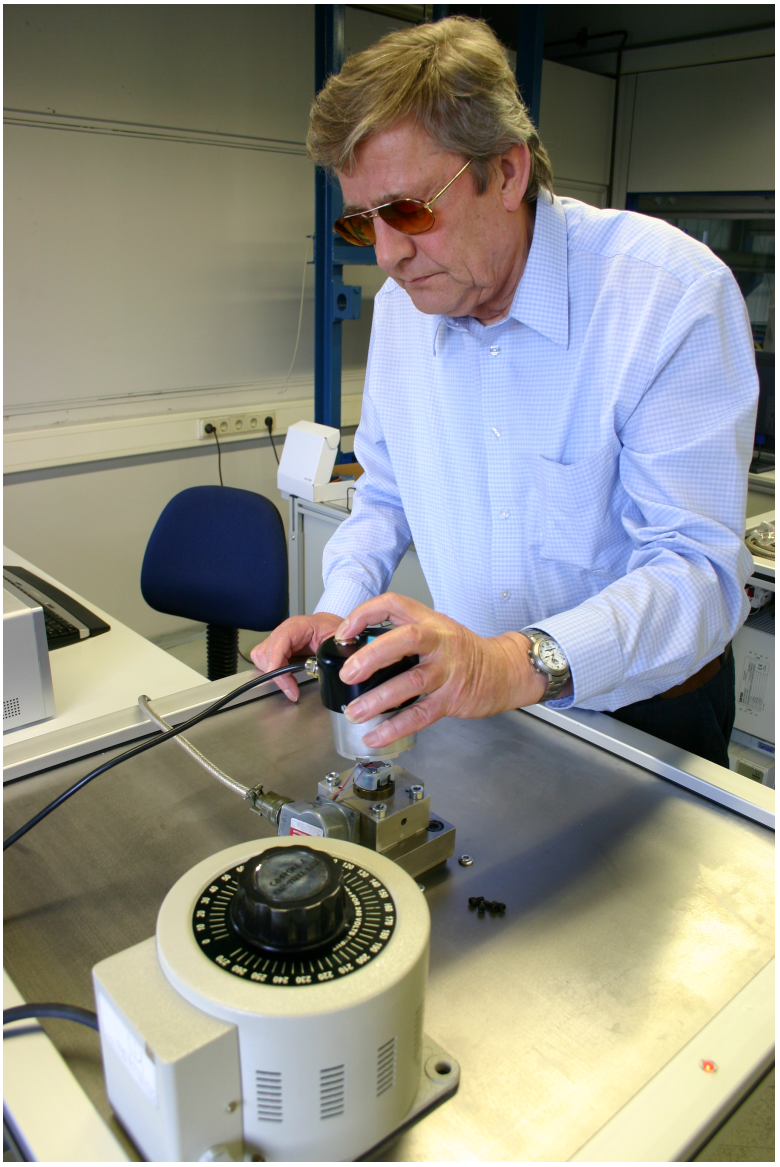

Figure 2: Magnetizing of a Moog servovalve

Test Process

The Figure 3 and Figure 4 show magnetic induction tests of magnetizer series VX-MD-008.[3] Reference settings of the variable auto transformer is $100VAC$.[4] Nominal transformer input voltage is $230VAC$, $50Hz$.[5] Test was done with a hall sensor Honeywell SS495A located in the middle point of the magnetizer bottom plane (see Figure 3 and Figure 4). Label side of the sensor looked inside the magnetic head of the magnetizer. Sensitivity of the sensor is $3.125mV/G$.

[3]Magnetizer with serial No.: VX-MD-25022023.001 was used.
[4]Maximal tested value of the transformer is approximately $330VAC$.
[5]Regular single phase electric power supply in Germany.

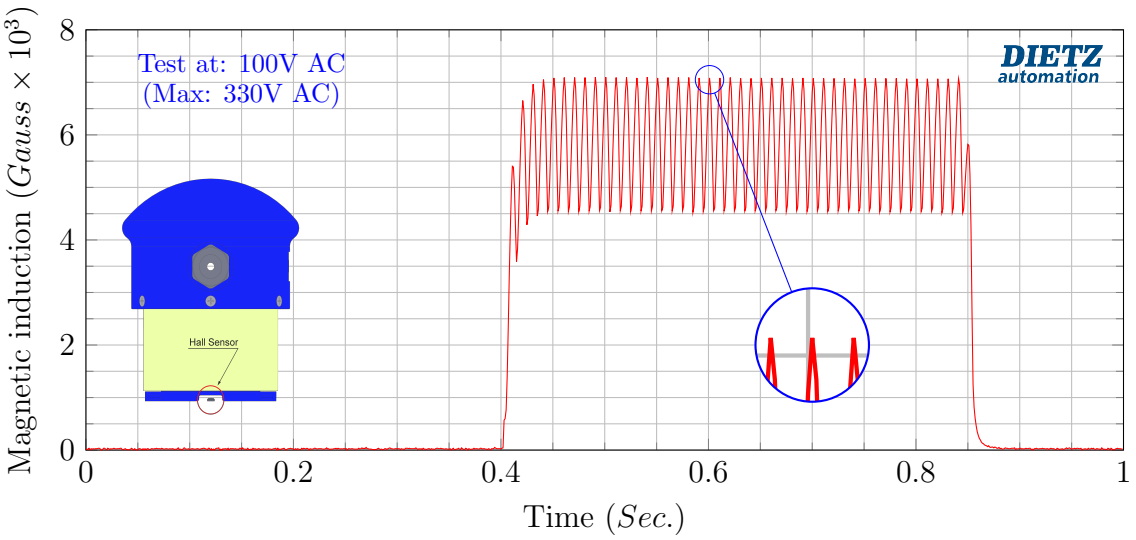

Figure 3: Test results of the magnetizing mode

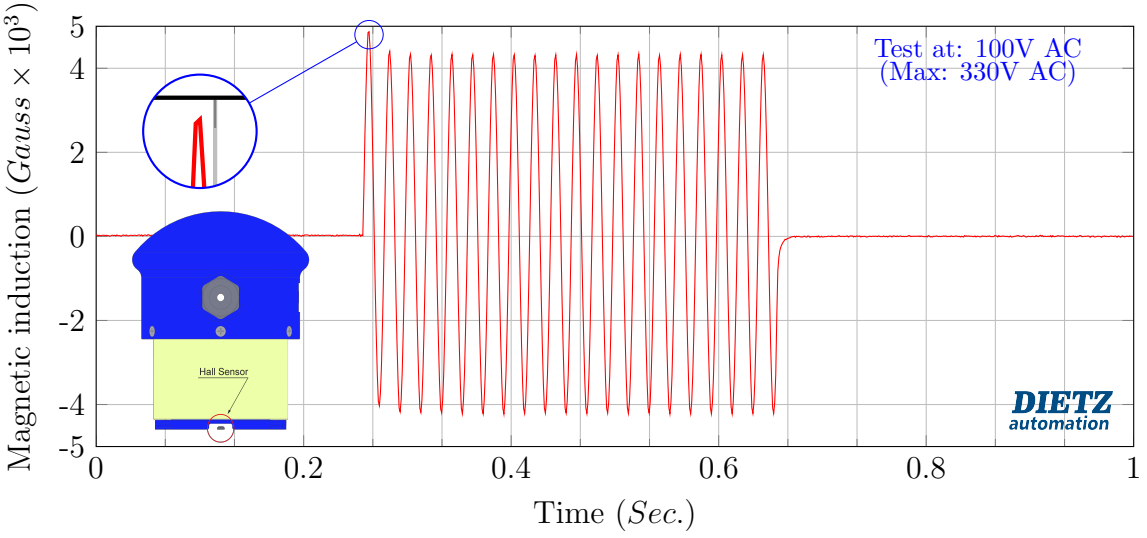

Figure 4: Test results of the demagnetizing mode

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

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

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