MOOG

D633 and D634 Series ISO 4401 Size 03 and 05 Installation and Operation Instruction Proportional Control Valves with Integrated Electronics

I. INTRODUCTION

This manual provides instructions and procedures necessary to install, operate and troubleshoot the Moog Inc. Series D633 and D634 Series Proportional control Valves.





2. OPERATION

General

The D633 and D634 Series are Direct Drive Valves (DDV) with electrical closed loop spool position control. The spool drive device is a permanent magnet linear force motor which actively strokes the spool from its spring centered position in both directions. The closed loop spool position electronics and pulse width modulated (PWM) drive electronics are integrated into the valve. This permits control of the valve directly from, for example, a machine control without the use of additional interface electronics.

Direct Drive Valve Operation

An electrical signal corresponding to the desired spool position is applied to the integrated electronics and produces a pulse width modulated (PWM) current in the linear force motor coil. The resulting force causes the spool to move. An oscillator excites the spool position transducer (LVDT), producing an electrical signal proportional to spool position. The demodulated spool position signal is compared with the command signal and the resulting spool position error results in a current to the force motor coil until the spool has moved to its commanded position, and the spool position error is reduced to zero. The resulting spool position is thus proportional to the command signal.

CAUTION

DISASSEMBLY, MAINTENANCE, OR REPAIR OTHER THAN IN ACCORDANCE WITH THE INSTRUCTIONS HEREIN OR OTHER SPECIFIC WRITTEN DIRECTIONS FROM MOOG WILL INVALIDATE MOOG'S OBLIGATIONS UNDER ITS WARRANTY.

ELECTROHYDRAULIC VALVE CUT-AWAY



Figure I Moog Series D633/634

Centering Spring

Technical Data

D634
- 94 ISO 4401 - 05 - 05 - 0 - 94
ort Y ¹) with or without drain port Y ¹)
any, fixed or moveable
30 g, 3 axis
13.89 lb [6.3 kg]
alve see nameplate of the valve
48.87 gpm [185 l/min]
5000 psi [350 bar]
725 psi [50 bar]
5000 psi [350 bar]
directly to tank
+ 60°C] -4° to 140°F [- 20° to + 60°C]
+ 80°C] -4° to 176°F [- 20° to + 80°C]
aulic mineral oil based hydraulic
51524, fluid according to DIN 51524,
n request part 1 to 3, others upon request
45 mm ² /s] 70 to 210 SUS [15 to 45 mm ² /s]
400 mm ² /s] 25 to 1800 SUS [5 to 400 mm ² /s]
inted high pressure filter, mounted
t bypass, in the main flow without bypass,
but with dirt alarm
6 or better ²)
15 / 12 or better ²)
olute) $\beta_{10} \ge 75$ (10 µm absolute)
lute) $\beta_6 \ge 75$ (6 μ m absolute)

²) For long life wear protection of metering lands

3. SAFETY INSTRUCTIONS

Warnings and Symbols

- Refers to special orders and prohibitions to prevent damage a.
- Refers to special orders and prohibitions to prevent injury or b. Kerer 5 ... ANGER extensive damage

Correct Application

- a. The valves series D633 and D634 are proportional valves intended for directional-, velocity-, pressure- and force control in hydraulic control systems.
- The valves are used for flow control in hydraulic systems that operate b. with mineral oil based fluids.
- Using the valves for purposes other than those mentioned above is c. $\frac{1}{2}$ considered contrary to the designated use. The user bears entirely the risk of such misuse.
- Correct application involves observing the operating instruction and also d. complying with the inspection and maintenance directives.

Organizational Measures

We recommend including this operating instruction in the maintenance a. plan of the machine / plant.

b. In addition to the operating instruction, observe also all other generally applicable legal and other mandatory regulations relevant to accident prevention and environmental protection. Instruct the user accordingly.

information etc. see catalogue D633/D634 series.

All safety and danger prevention instructions of the machine or plant c. manufacturer must be followed according to EN 982.

Selection and Qualification of Personnel

- Only well-trained and instructed persons are allowed to work with a. MOOG proportional valves.
- Work with electrohydraulic valves must be carried out only by personnel b. having special knowledge and experience in plants running with electrohydraulic controls.

Safety Instructions for Specific Operational Phases

- Take the necessary precautions to ensure that the machine / plant is used a. only when in a safe and reliable state.
- Check the machine / plant at least once per working shift for obvious b. damage and defects (i.e. leakage). Report any changes to the responsible group / person immediately. If necessary, stop the machine immediately and secure it.
- In the event of malfunctions, stop the machine / plant immediately and c. secure it. Have any defects rectified immediately.

- d. If the machine / plant is completely shut down for maintenance and repair work at the valve, it must be secured against inadvertent start up by:
 - > Locking the principal control elements and removing the key.
 - > Attaching a warning sign to the main switch.

Safety instructions for the operation of hydraulic plants

- a. Work on electrohydraulic equipment must be carried out only by persons having special knowledge and experience in electrohydraulic controls.
- b. Check all lines, hoses and fittings of the plant regularly for leaks and DINGER obvious damage. Repair damage immediately.
 - Splashed oil may cause injury and fire.
- c. Before removing the valve depressurize all system sections to be Demogram opened, pressure lines and accumulators of the hydraulic system in accordance with the specific instructions for the plant.
- d. When handling oil, grease and other chemical substances, observe safety regulations valid for each product.

4. INSTALLATION

General Information

- Compare model number and valve type with information from the hydraulic schematic or bill of material.
- b. The valve can be mounted in any direction, fixed or moving.
- c. Check mounting surface flatness (0.02 mm for 100 mm) and surface roughness (Ra <1 $\mu m)$
- d. Pay attention to cleanliness of mounting surface and surroundings when installing the valve.
- e. Use lint-free tissue to clean!
- Before installation, remove protection plate from the valve and save it for later use.
- g. Use socket head bolts according to DIN 912 for mounting, strength class 10.9 or 12.9, and cross torque according to table 1 (tolerance ±10%)

Series	Mounting pattern ISO 4401	Bolts to DIN 912-10.9 or DIN 912-12.9	Qty. reqʻd.	Tor [N 10.9	que m] 12.9
D633	03-03-0-94	M5 x 60	4	8.5	10
D634	05-05-0-94	M6 x 60	4	13	15.5

Table I

Pay attention to correct position of ports and location of o-rings during installation.

Electronics Information

- a. Characteristical Data:
 - > Please note information about input signals on the nameplate!

> Supply voltage $U_A = 24$ VDC (22 to 28 VDC). Current consumption $I_{Amax} = 1.2$ A for D633 and 2,2 A for D634.

External fuse per valve D633 1.6 A (slow) D634 2.5 A (slow) b. Input Command Signals:

 \succ Voltage command 0 to \pm 10V

The spool stroke of the valve is proportional to $(U_D - U_E)$. 100 % valve opening P \blacklozenge A and B \blacklozenge T with $(U_D - U_E) = + 10$ V.With single ended signals either pin D or E, depending on the desired flow phasing, is connected to reference voltage level (usually ground \perp).

> Current command 0 to \pm 10 mA

The spool stroke of the valve is proportional to $(I_D - I_E)$. 100 % valve opening P \blacklozenge A and B \blacklozenge T with $(I_D - I_E) = + 10$ mA. Either pin D or E is used according to the desired flow phasing. The unused pin is left open.

Current command 4 to 20 mA

The spool stroke of the valve is proportional to $(I_D - 12 \text{ mA})$. 100 % valve opening P \clubsuit A and B \clubsuit T with $I_D = 20 \text{ mA}$. 100 % valve opening P \clubsuit B and A \clubsuit T with $I_D = 4 \text{ mA}$. Use pin D as signal

input. Pin E is left open.

c. Measuring Output (actual spool position)

> For actual spool position signal I_{p} is available (4 to 20 mA). 100% valve opening P \blacklozenge A and B \blacklozenge T with 20 mA. 100% valve opening P \blacklozenge B and A \blacklozenge T with 4 mA.

> All signal lines (also those of external transducers) should be twisted pair and shielded. Shielding connected radially to \perp (0V), power supply side, and connected to the mating connector housing (EMC).

EMC: Meets the requirements of EN 55011/3.91 class B, EN 50081-1/01.92, and EN 50082-2/03.95, performance criterion A.

Protective grounding lead cross-section AWG 16 [0.75 mm²]

When making electrical connections to the valve (shield, protective grounding) appropriate measures must be taken to ensure that locally different earth potentials do not result in excessive ground currents. See also MOOG Application Note AM 353 E.

Connector Wiring

Valve Connector Mating Cabinet				
side connector side A 1 1 1 1 1 1 1 1 1 1	Type of signal	Voltage command 0 to ± 10VDC	Current command 0 to ± 10 mA	Current command 4 to 20 mA
	Supply		24 VDC (22 to 28 VDC)	
	Supply		⊥(0∨)	
	not used			
	Input command valve flow	0 to \pm 10 VDC Input resistance 50 k Ω	0 to \pm 10 mA Load resistance 200 Ω	4 to 20 mA Load resistance 200 Ω
	Input inverted command valve flow	0 to \pm 10 VDC Input resistance 50 k Ω	0 to \pm 10 mA Load resistance 200 Ω	not used
	Output actual spool position	Load resi	4 to 20 mA stance 300 to 500 Ω , with respec	tt to⊥(0V)
	Protective ground			

For valve with 6+PE-pole connector according DIN 43563, connector (metal) with leading ground pin $(\frac{1}{2})$.

d. Connector Wiring

See information tag on the valve.

e. Instruction for Crimping

The connectors on the valves D633 and D634 Series are designed for crimp contacts of size 16. Former connectors had solder contacts.
 If you order the connector the necessary socket contacts are enclosed in the delivery bag of the mating connector supplied with the valve.

> Special tools are required for preparing cables and connectors. (See Tools and Equipment, page 6). Pay attention to the wiring instructions, which are to be found in this assembly instruction. The complete instructions can be received from MOOG together with the tools set.

f. Baring Wires

Bare cables professionally to a length of .26 in [6.5 mm]. Don't damage conductor or squeeze insulation.

g. Wiring Contacts

Connect contacts only with prescribed tools (see Tools and Equipment, page 6, and assembly instructions)

- After crimping check whether
- I. Wire can be seen through the inspection hole in the contact
- 2. None of the contacts is bent or damaged
- 3. No strand is outside the

termination hole

 A proper crimp termination with eight crimp indents has been performed.



h. Assembling Contacts

After wiring the contacts, the leads have to be pulled through all accessories used, such as grommet, ferrule, endbell and cable clamp. Make sure that leads are inserted through the appropriate cavity of grommet. In order to ease insertion of leads, the contacts have to be dipped in Isopropyl.

i. Inserting Contacts

 Dip contacts in Isopropyl and insert them with prescribed tool (see Tools and Equipment, page 6, and assembly instructions) through the grommet with constant pressure (into the insulator) until it snaps into its position. Insert contacts according to marking on the insulator.
 Also insert unwired contacts in order to guarantee proper sealing.

Removing contacts

> All accessories are removed in reverse direction as described in chapter.

Remove contacts with prescribed tool according to assembly instructions.

j. Shielding

When fixing a shielding braid to connector with DZ-adaptor

> Loosen lock nut (5). Slide heat shrink component (6) and lock nut (5) over cable (8).

> Push shielding braid (7) onto endbell (3) and over thread (2).

Fix shielding braid (7) into

rounded groove by means of baling wire (4).

 Fold back protruding shielding braid on cone.

The folded back shiel-ding braid

protrudes under the tightened lock nut (5).



Shrink heat shrink component
 (6) until and / lip of heat shrink component

(6) until end / lip of heat shrink component is located in square groove (1).

5. INSTALLATION

This information is valid for new installations to be put into operation as well as for repair cases.

a. Filling the hydraulic system

 \sim New oil is never clean. Therefore the system should generally be filled by using a filling filter. This fine mesh filter should at least comply with the following requirement: $\beta_{10} \ge 75$ (10 µm absolute).

b. Flushing the hydraulic system

Before the hydraulic system is put into operation for the first time (also after modifications) it has to be flushed carefully according to the instructions of the manufacturer of the plant / machine.

> Before flushing, suitable flushing elements should be inserted in the pressure filters instead of the high pressure elements.

 \succ Before flushing the operational temperature of the hydraulic system should be achieved. Observe temperature!

A flushing plate or, if the system allows, a directional valve should be mounted in place of the MOOG porportional valve. The P- and T- connections are flushed through the flushing plate. The user Aand B- connections can also be flushed by the directional valve. Attention, the directional valve can lead to unpermissable movements in the load which may result in damage of the plant / machine. Instructions of the manufacturer have to be strictly observed.

Minimum flushing time t can be calculated as follows:

 $t = \frac{V}{O} \bullet 5 \text{ [min]} \quad \stackrel{V = \text{ content of reservoir, gallon [liter]}}{Q = \text{ flow rate of the pump, g/min [l/min]}}$

> The flushing process can be considered completed when a system cleanliness of ISO 4406 15/12 or better is achieved. A long life of the metering lands of the proportional valve can be expected for this cleanliness class.

► Replace flushing elements in the pressure filters with suitable high pressure elements after flushing. Install MOOG proportional valve instead of flushing plate or directional valve.

c. Setting up

> Set up plant / machine according to the operation instructions of the manufacturer after the valves have been installed. Vent hydraulic system!

 \succ The safety instructions of the machine / plant manufacturer must be observed. Especially the safety requirements for machines like injection moulding machines (EN 201), blow moulding machines (EN 422) and die casting machines (EN 869), to name a few, are important.

> Observe oil temperature.

> Check hydraulic system for external leakage!

6. ELECTRICAL NULL ADJUSTMENT

It may be desirable to adjust the proportional valve for flow null independent of other system parameters. The electrical null adjustment permits convenient control set-ups. The electrical null adjust is a 4-turn potentiometer located behind the pan head screw in the electronics housing. When turned, it provides control of the spool position to obtain the desired flow null. (see figure 1)

7. TOOLS AND EQUIPMENT

- a. 4mm Allen wrench
- b. 5mm Allen wrench
- c. Wide blade screwdriver
- d. Small screwdriver
- e. Tweezers

The D633 and D634 Series valves do not require maintenance. Tools are only required for installation and set up.

- \succ Installation of the valve
- Mounting of the D633 Series requires 4mm Allen wrench
- ightarrow Mounting of the D634 Series requires 5mm Allen wrench
- ightarrow Null adjust of the valve at set up. Both types require the same tool
- Wide blade screwdriver to remove the cover screw (see cut-away diagram on page 1)
- \succ Small screwdriver for zero setting on internal potentiometer

Replacement Parts

Part Description	D633 D634	Qty.	Part Number
O-Ring, ports P, T, A, B	x	4	42082-013
O-Ring, port Y	x	T	42082-012
O-Ring, ports P, T, A, B	x	5	42082-004
O-Ring, port X, Y	x	2	42082-011

Accessories (not included in the valve delivery)

Part Description	D633	D634	Qty.	Part Number	•
Mating Connector, 6+PE pole, protection IP65	x	x		B97007-061	
Mounting Bolts M5x60 DIN 912-10.9 or 12.9	x		4	A03665-050	-060
Mounting Bolts M6x60 DIN 912-10.9 or 12.9		x	4	A03665-060-	060
Flushing Plate	x			B46634-002	
Flushing Plate		x		B67728-001	
Flushing Plate		x		B67728-002	
Flushing Plate		x		B67728-003	

8. TROUBLESHOOTING CHART

The following troubleshooting chart lists potential troubles encountered, probable causes and remedies.

Potential Trouble	Probable Cause	Remedy
Leakage at the mounting surface of the valve.	I. Required torque is incorrect. 2. Seals missing or damaged.	 Make sure all seals are installed at ports A, B, P and T are ok. Check to see seal at port Y is ok. Tighten mounting bolts.
Leakage at the screw plug of the linear force motor.	I. Ports not connected properly. 2. Pressure in ports T or Y excessively high.	I. Check ports P and T for connection. 2. Check pressure in ports T and Y. 3. Do not exceed return pressure in port T over 50 bar.
No hydraulic response of the valve.	 Loss of hydraulic pressure. Loss of supply voltage. 	 Check all signals from Pin A to Pin F. Check the mating connector for corrosion. Check hydraulic supply.
Instability of the system, plant oscillates.	I. Unstable external loop. 2. Valve electronics defective.	I. Check whether output signal at Pin F (6) is following exactly the command signal at Pin D. 2. Factory repair.
Loss of command signal, supply voltage or broken cable.	1. Spool does not respond.	I. Check for broken cable. Check all signals.

9. AUTHORIZED REPAIR FACILITIES

If servovalve continues to malfunction after all recommended corrective action procedures are performed, defective valve should be returned to Moog for repair. Moog does not authorize any facilities other than Moog or Moog subsidiaries to repair its servovalves. It is recommended you contact Moog at (716)655-3000 to locate your closest Moog repair facility. Repair by an independent (unauthorized) repair house will result in voiding the Moog warranty and could lead to performance degradation or safety problems.

D633 AND D634 INSTALLATION AND OPERATION INSTRUCTION











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