

Hydraulics

Subject

Automatic lathe

Title

- To teach the student how to draw the characteristic curve for a pump
- Drawing the hydraulic circuit diagram
- Practical assembly of the circuit
- Determining the various measured values and entering them into the table
- Drawing the characteristic curve for the pump
- Drawing conclusions

Training aim

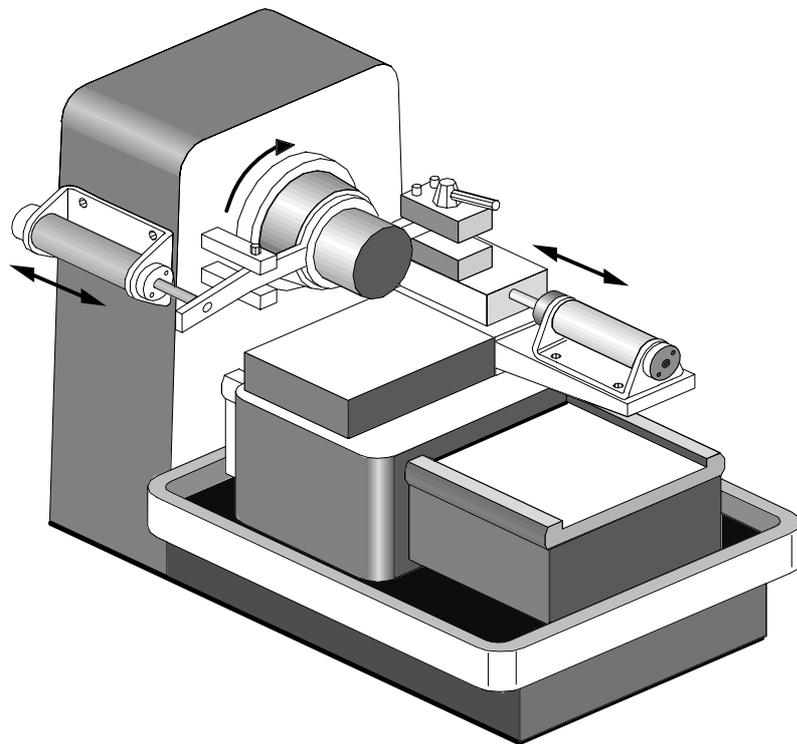
Problem definition

A-4

Exercise 1

Exercise The main spindle on an automatic lathe is driven by a hydraulic motor, while a hydraulic cylinder is used to execute a feed movement of the workpiece slide. It has been established that the specified speed is no longer reached during the processing cycle. The pump characteristic curve is therefore to be evaluated.

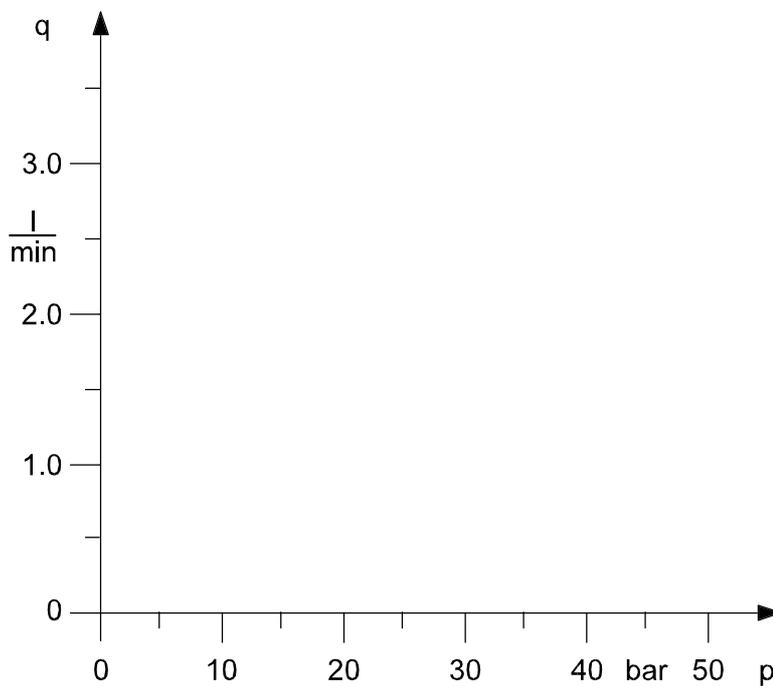
Positional sketch



EXERCISE SHEET

System pressure p	15	20	25	30	35	40	45	50	bar
Flow rate q									l/min

Evaluation

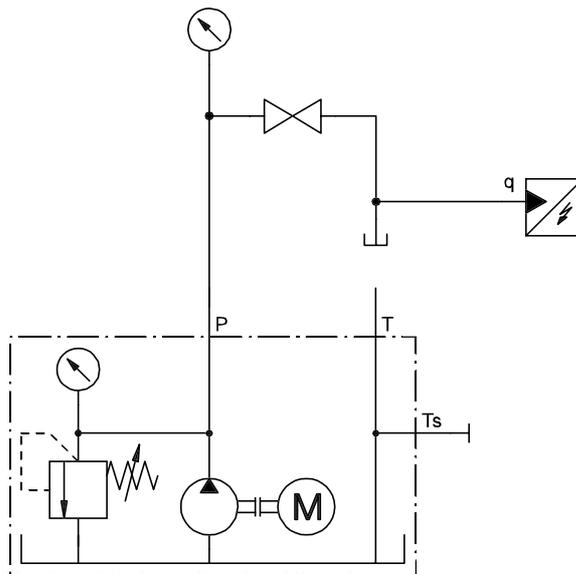


Pump characteristic

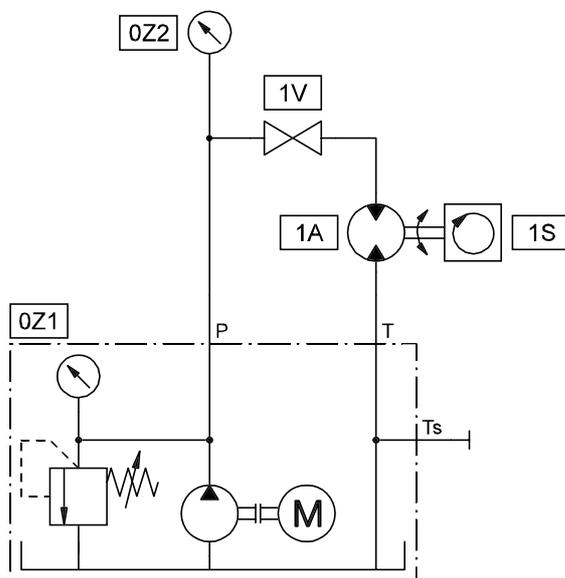
How does the flow rate change as the pressure increases?

Conclusion

Automatic lathe



Circuit diagram, hydraulic



Practical assembly, hydraulic

C-4

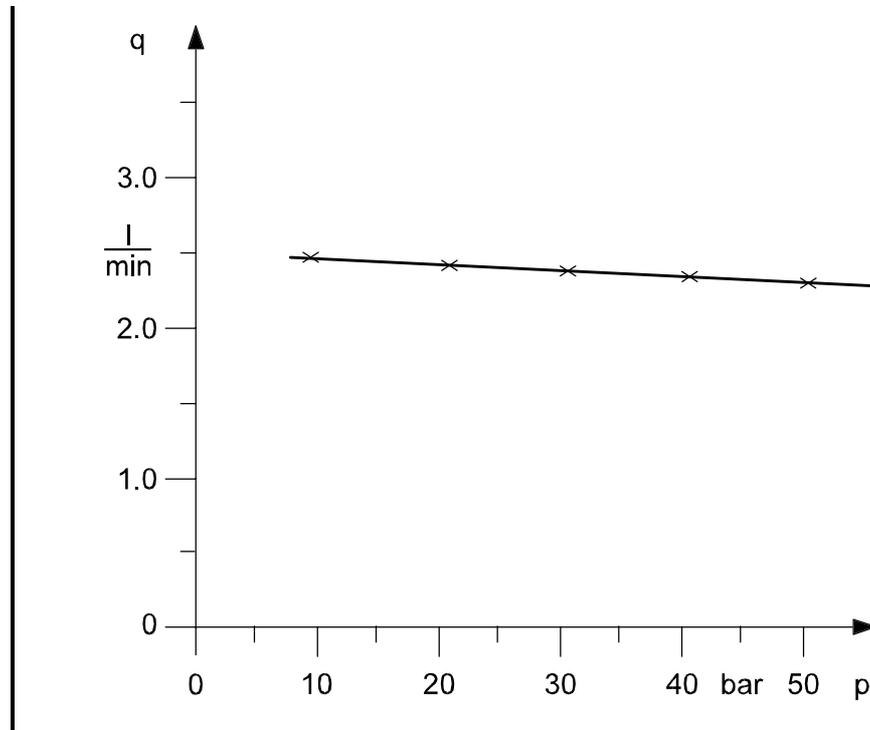
Solution 1

<i>Components list</i>	<i>Item no.</i>	<i>Qty.</i>	<i>Description</i>
	0Z1	1	Hydraulic power pack
	0Z2	1	Pressure gauge
	1V	1	Shut-off valve
	1S	1	Flow sensor
		3	Hose line

Solution description Once the hydraulic circuit has been assembled, valve 1V should be fully opened. Now close this valve slowly to set the first p value as shown on the pressure gauge 0Z2. The maximum attainable pressure is 60 bar, governed by a pressure relief valve built into the pump which is set to this value.

<i>Evaluation</i>	System pressure p	15	20	25	30	35	40	45	50	bar
	Flow rate q	2.33	2.31	2.29	2.28	2.26	2.24	2.22	2.20	l/min

Pump characteristic



As the pressure rises, the pump delivery falls slightly. In theory, the characteristic curve for the pump should be a straight line. The decrease in pump delivery is due to internal leakage losses, which become greater as the pressure increases. The ratio of the measured pump delivery and theoretical pump delivery is the effective volumetric efficiency of the pump.

Conclusions

For technical reasons, the actual value recorded in this exercise is the power consumption of the electric motor or the premature opening of the pressure relief valve. The pump is dimensioned for a maximum pressure of 250 bar (see data sheet). An electric motor with an appropriately high rating would be required to achieve this. This would not, however, be meaningful, since the exercises are carried out with a maximum pressure of 60 bar.

