



Worksheet SZ1 & Training Record Scissor Lift Sizing and Performance

Equipment Sizing

Email:

Course:

Provider:

Expected Outcomes: (20-30mins)

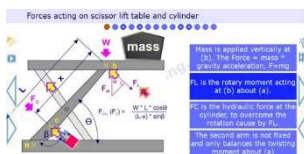
Understand how to perform simple calculations to size hydraulic pumps and actuators.

Appreciate what legal requirements may apply and how design risk analysis procedures are used to identify and reduce risks.

Previous Knowledge Required:

Students should have completed worksheet IH 'Introduction to hydraulics' and FB 'formulas and fundamentals' or have a good working knowledge of hydraulic equipment.

Self-driven micro-learning tutor (SDLT)

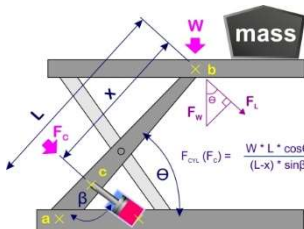


Complete the 'Scissor lift project' SDLT via the website, phone app or CD/download.

On completion, email the results to yourself, or to your course provider. We recommend you also record the time below and note down all observations and exercise findings.

Date, score & time:

Coursework - see also ws_SZ2_calc_scissorlift & ws_SZ3_fmea_scissorlift



Understand how loads and forces are transmitted through the structure:

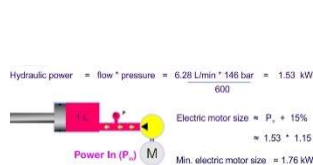
- Calculate the gravitational loads applied to the structure.
- Calculate the moments applied to pivot points.
- Resolve the forces acting on the cylinder.

Appreciate the importance of satisfying national legal requirements and demonstrating that all risks have been identified and minimised:

- Satisfy European LOLER requirements for safe lifting. Or apply legislation applicable to your region.
- Complete FMEA 'ws_SZ3_fmea_scissorlift' to demonstrate a good understanding of the risks to personnel from operating and maintaining lifting equipment.

Failure Mode and Effect Analysis (FMEA) - Scissor lift table example

Ref.	Failure Mode	Failure Effect	Effect of Failure	Cause of Failure	Severity	Occurrence	Detectability	RPN	Actions and Recommendations
1	Supporting structure	Excessive load	Structural failure	Point load or uneven load	4	1	10	40	Reduce maximum load and use safety devices
2	Supporting structure	Excessive load	Structural failure	Point load or uneven load	4	1	10	40	Reduce maximum load and use safety devices
3	Supporting structure	Excessive load	Structural failure	Point load or uneven load	4	1	10	40	Reduce maximum load and use safety devices



Complete a basic cylinder and pump sizing exercise:

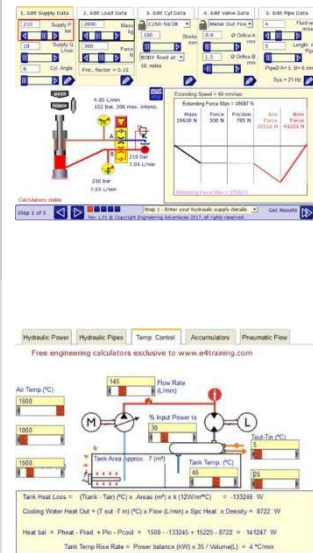
- Print worksheet 'ws_SZ2_calc_scissorlift' and re-work calculations for a different load mass.
- Calculate the cylinder diameter required.
- Calculate the pump flow rate required.
- Calculate the minimum electric motor size required.

Submit calculations

Reproduce and submit the calculations in worksheet ws_SZ_calc_scissorlift using the new lift capacity.



Interactive experiments



Compare your calculated results with the 'valve and cylinder design guide':

- Set the cylinder size and load to your calculated values to check the supply pressure.
- Change the stroke and flow to check the cylinder speed.
- Set the orifice sizes to 6mm if you have no hydraulic speed control.
- Read the design guide instructions if you want to experiment with more complicated hydraulic control systems.
- Discuss and differences or options for providing different designs.

Enter calculated results into the 'hydraulic system design calculator':

- Set the flow rate and pressure to your calculated values and check the hydraulic input power figure.
- Check the electric motor input power at the bottom of the screen.
- Discuss the implications for overheating if the input power remains high for one minute after the cylinder has stopped moving.

App date & duration

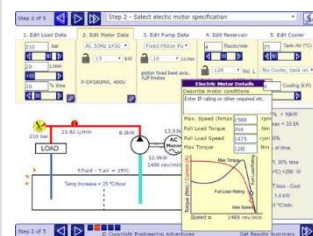
Correct your calculation worksheet before submitting if the values do not coincide. Provided calculation conditions are the same.

Additional video and instructional resources



A full range of lessons covering all aspects of hydraulic system design and maintenance can be found in the course text based explanations and instructional videos.

Further reading and experiments



Experiment with a hydraulic power unit design guide at

www.e4training.com/design_guides/designpu3.php :

- Set the reservoir size based on flow rate.
- Confirm reservoir size provides stable temperature with expected duty cycles.
- Explore and discuss the AC and DC motor performance.

Dates & durations
(Optional):

Qualification requirements:

Students need to complete and return all worksheets and course notes to their registered training provider. Methods of testing and qualification may vary between course providers, however, we recommend that students record as much information about their observations, simulation experiment results, and discussions as possible. To achieve a certificate, students will need to provide written evidence of their findings e.g. when we say observe X, we need to know the results you see and when we say discuss X, we need to know the implications of these findings as well.



In most programs, students can send a record of their actions and results by clicking the email button that will appear in the top menu bar of the app, at mid to end point of the training.