



Worksheet HE00 & Training Record Hydraulic Ancillary Equipment

Hydraulic Ancillaries

Email:

Course:

Provider:

Learning Objectives/Expected Outcomes: (100-160mins)

1. Appreciate what hydraulic filters and accumulators do and where they are used.
2. Understand how hydraulic filters and accumulators work.
3. Recognise and be able to interpret their symbols
4. Appreciate the different types of hydraulic filter and accumulator.
5. Be aware of how important filters are for system reliability.
6. Be aware of the potential dangers from accumulators.

Previous Knowledge Required:

Students should have already completed the HP04 'Fluid contamination control' worksheets and have a good knowledge of what hydraulic components are used for.

Terminology:

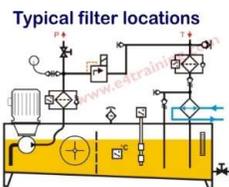
Filter, air breather, filter element, clogging indicator, accumulator, bladder, safety block.

Record of Achievement:



Click the mail icon to post your results to any free or standard LRS/LMS systems. See www.e4training.com/xapi/ for more details. Complete and keep this training record sheet along with any additional written work or sample calculations.

Coursework investigations



Appreciate 'What Hydraulic Filters Do and Where Used' by studying the detailed information and instructional video at 'at www.e4training.com/hyd_ancillary/filters1.php & filters2.php

- Consider why filters significantly reduce equipment failures.
- Consider how many different filters a power unit might have.

Estimated time: 10 minutes, skill level 1-4

Date complete:

Complete

Beta Ratio = Efficiency

$$\beta_x = 10 = 90.0\%$$

$$\beta_x = 20 = 95.0\%$$

$$\beta_x = 75 = 98.7\%$$

$$\beta_x = 200 = 99.5\%$$

Appreciate 'How Hydraulic Filters Work' by studying the detailed information and instructional video at:

www.e4training.com/hyd_ancillary/filters1.php#box2

- Are there standard tests for rating filter performance.
- How would you make sure you purchase a suitable replacement element.

Estimated time: 10 minutes, skill level 1-4

Date complete:

Complete



Typical filter designs



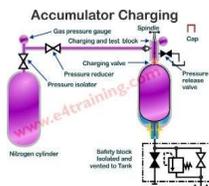
Appreciate 'Different Types of Hydraulic Filter' by studying the detailed information at: www.e4training.com/hyd_ancillary/filters1.php#box3

- Could you use a pressure and return line filter in the same position in the circuit.
- What might happen without a bypass check valve fitted?
- What might happen with a bypass check valve fitted?

Estimated time: 10 minutes, skill level 1-4

Date complete:

Complete



Appreciate 'What Accumulators Do and Where Used' by studying the detailed information and instructional video at

www.e4training.com/hyd_ancillary/accumulators1.php & 2.php

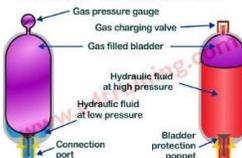
- Draw a flow demand and supply graph to explain how accumulators will compensate for short periods of high flow demand.
- Consider where the different accumulator functions might be used.

Estimated time: 10 minutes, skill level 1-4

Date complete:

Complete

Bladder Accumulator



Appreciate 'How Accumulators Work' by studying the detailed information and instructional video at:

www.e4training.com/hyd_ancillary/accumulators1.php#box2

- Compare the compressibility values for Oil and Nitrogen.
- Consider the risks of having energy stored in a system that is turned off.
- What restricts the maximum flow an accumulator can produce.

Estimated time: 10 minutes, skill level 1-4

Date complete:

Complete

Piston Accumulator



Appreciate 'Different Types of Accumulator' by studying the detailed information at:

www.e4training.com/hyd_ancillary/accumulators1.php#box3

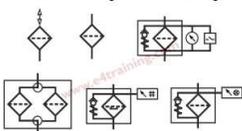
- Identify welded, tie rod, and mill-type cylinder construction.
- When might you require a safety block to be fitted and why?
- Consider where you might have seen telescopic cylinders used.

Estimated time: 10 minutes, skill level 1-4

Date complete:

Complete

Air breather and hydraulic filter symbols



Learn about the different ancillary equipment symbols at

www.e4training.com/hyd_princip/symbol_ancillary1.php

- How can you tell a filter's micron rating?
- Consider the different types of clogging indicator.
- How do you identify the different types of accumulator?

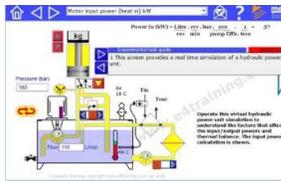
Estimated time: 10 minutes, skill level 1-4

Date complete:

Complete



Virtual test rig experiments



Experiment with the cylinder data at

www.e4training.com/hyd_ancillarys/filters3.php

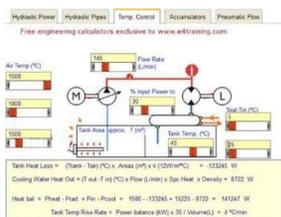
- Follow the suggested exercises and observations list below the simulation.
- Run the experiments, answer the questions, and click the buttons to see the answers.

Observe how contamination comes from the pump, cylinder, and air breather.

Estimated time: 20 minutes, skill level 1-4

Date, score:

Complete



Experiment with an accumulator sizing calculator at

https://www.e4training.com/hyd_ancillarys/accumulators3.php

- Follow the suggested exercises and observations list below the simulation.
- Run the experiments, answer the questions, and click the buttons to see the answers.

Explore the relationship between accumulator size, pressure, usable volume, and pre-charge.

Estimated time: 20 minutes, skill level 1-4

Date complete:

Complete

Practical and coursework assignments



Identify a piece of hydraulic equipment you work with (or consider the scissor lift project example).

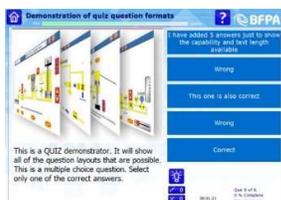
- Practice selecting the appropriate filter and breathers www.e4training.com/hyd_ancillary/filterpro3.php
- Accumulator charging exercise see www.e4training.com/hyd_ancillary/accumulator_pro3.php

Estimated time: 30 minutes, skill level 2-4

Date complete:

Submit lesson notes

Interactive quiz to check and reinforce learning



Complete the 'HE Ancillary equipment' quiz questions at

[www.e4training.com/hydraulic_test2.php?Quiz - Hydraulics part 2](http://www.e4training.com/hydraulic_test2.php?Quiz-Hydraulics%20part%202)

Post result when complete.

Estimated time: 20 minutes, skill level 1-4

Quiz name, date, score:

Tick when posted



Key questions / Plenary

Can you describe the five locations you can find fluid and air filters?
Do you know how to check/assess the correct filter rating for your operating and environmental conditions?
Can you explain three factors that affect the usable volume of an accumulator?
Will a new accumulator be charged to zero, low pressure, or pre-charge pressure when it's delivered?

Record answers:

Repeat course if you answer no or tick when complete

And Finally:

Complete this worksheet and keep for your certification records. Submit any written coursework etc. to your training course provider.

Follow-on Course Worksheets:

Potential follow-on worksheets include: HE05 – Hydraulic pipework and fittings.

Or refer to your individual lesson plan or search the worksheet lists at www.e4training.com/hydraulic_courses/worksheets1.php or [courses1.php](http://www.e4training.com/courses1.php)

Notes