engineering **adventures**

Worksheet HA00 & Training Record **Hydraulic Actuator Basics**		**Hydraulic Actuators**
Email:	Course:	Provider:

Learning Objectives/Expected Outcomes: (60-180mins)

1. Appreciate what hydraulic actuators do and where they are used.
2. Understand how hydraulic actuators work.
3. Recognise and be able to interpret their symbols.
4. Appreciate the different types of actuator.
5. Be aware of the different types of load that act on an actuator.

Previous Knowledge Required:

Students should have already completed the HV** 'Hydraulic valves' worksheets and have a good knowledge of what hydraulic components are used for.

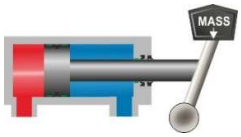
Terminology:

Cylinders, double acting, rod, bore, rotary actuator, motor, LSHT motor, rod seals, piston seals.

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

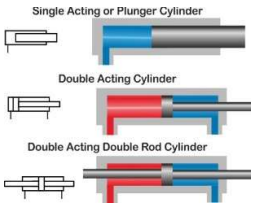


Appreciate 'What Cylinders Do and Where Used' by studying the detailed information and instructional video at www.e4training.com/hyd_actuators/cylinder_basic1.php & 2.php

- Consider why flow and pressure are needed to move the cylinder rod
- List applications where you know cylinders are being used.
- Consider what load forces may be acting on particular cylinders.

Estimated time: 15 minutes, skill level 1-4

Date complete: Complete ☐



Appreciate 'How Hydraulic Cylinders Work' by studying the detailed information and instructional video at:
www.e4training.com/hyd_actuators/cylinder_basic1.php#box2
Use the webpage images to highlight:

- Identify single acting, double acting, and double rod cylinders.
- Compare the line flows on single and double rodded cylinders.
- Appreciate how cushions reduce deceleration loads.

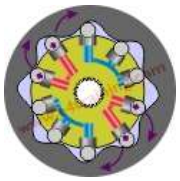
Estimated time: 15 minutes, skill level 1-4

Date complete: Complete ☐

Appreciate 'Different Types of Hydraulic Cylinders' by studying the detailed information at:
www.e4training.com/hyd_actuators/cylinder_basic1.php#box4
Use the webpage images to highlight:

- Identify welded, tie rod, and mill-type cylinder construction.
- Appreciate how cylinder construction changes for different environments, life, or duty.
- Consider where you might have seen telescopic cylinders used.

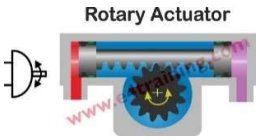
Estimated time: 15 minutes, skill level 1-4
Date complete: Complete ☐



Study the operation, types, and uses of 'Low-Speed High Torque' at
www.e4training.com/hydraulic_pumps/lshtmotors1.php& 2.php

- Appreciate what LSHT motors do and where they are used.
- Understand how LSHT motors work.
- Appreciate the different types of LSHT motor.

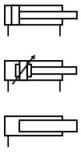
Estimated time: 20 minutes, skill level 1-4
Date complete: Complete ☐



Study the operation, types, and uses of 'Rotary Actuators' at
www.e4training.com/hyd_actuators/rotary_actuator1.php
Use the webpage images to highlight:

- Appreciate what rotary actuators do and where they are used.
- Understand how rotary actuators work.
- Appreciate the different types of rotary actuators.

Estimated time: 20 minutes, skill level 1-4
Date complete: Complete ☐

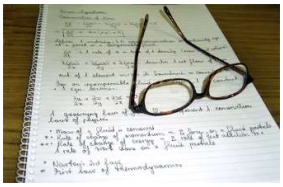


Learn about the different actuator symbols at
www.e4training.com/hyd_princip/symbol_actuate1.php

- What shows that a cylinder has cushions?
- What identifies a single-acting telescopic cylinder?

Estimated time: 10 minutes, skill level 1-4
Date complete: Complete ☐

Practical and coursework assignments

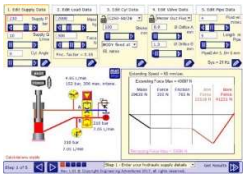


Identify a piece of hydraulic equipment you work with (or consider the scissor lift design example).

- Follow the suggested exercises and observations
  www.e4training.com/hyd_actuators/cylinder_basic3.php

Also consider and review some of the key issues with cylinder life, failure, and maintenance.
Estimated time: 20 minutes, skill level 1-4
Coursework submission: Submit lesson notes ☐

Virtual test rig experiments



Experiment with the cylinder data at
https://www.e4training.com/hyd_actuators/cylinder3.php

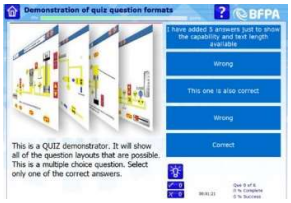
- Familiarise yourself with the concept of load forces and buckling limits. We will explore how to check values in a later exercise.

Estimated time: 15 minutes, skill level 1-4

App date & duration

Complete ☐

Interactive quiz to check and reinforce learning



Complete the 'HA hydraulic actuators' quiz questions at
www.e4training.com/hydraulic_test2.php? Quiz - Hydraulics part 2

Post result when complete.

Estimated time: 10 minutes, skill level 1-4

Quiz name, date, score:

Tick when posted ☐

Key questions / Plenary

Can you predict the number of cycles your design example cylinder will make and if the seals need to be changed after 1 million cycles, when would that be?
Do you know the best way to protect the rod against environmental damage?
Can you explain why cylinder cushions might be required?
Can you describe 3 different motor types and when they might be used?

Record answers:

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: HE00 – Ancillary Equipment.

Or refer to your individual lesson plan or search the worksheet lists at
www.e4training.com/hydraulic_courses/worksheets1.php or courses1.php

Notes