rexroth

A Bosch Company

Hydraulic Training Schedule

May - December 2025

VENUE	COURSE TITLE		2025
ST NEOTS	BASIC HYDRAULICS	3 days	May 27-29
ST NEOTS	PROPORTIONAL HYDRAULICS*	3 days	May 27-29
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	May 29
WAKEFIELD	BASIC HYDRAULICS	3 days	May 27-29
WAKEFIELD	PROPORTIONAL HYDRAULICS*	3 days	May 27-29
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	May 29
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	May 30
ST NEOTS	BASIC HYDRAULICS	3 days	**June** 3-5
ST NEOTS	PROPORTIONAL HYDRAULICS*	3 days	June 3-5
ST NEOTS	FAULT FINDING* NEW	2 days	June 3-4
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	June 5
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	June 6
CORK	BASIC HYDRAULICS	3 days	June 17-19
ST NEOTS	BASIC HYDRAULICS	3 days	June 24-26
ST NEOTS	PROPORTIONAL HYDRAULICS*	3 days	June 24-26
ST NEOTS	FAULT FINDING* NEW	2 days	June 24-25
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	June 26
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	June 27
WAKEFIELD	**BASIC HYDRAULIC DESIGN* NEW**	3 days	June 24-26
WAKEFIELD	BASIC HYDRAULICS	3 days	June 24-26
WAKEFIELD	PROPORTIONAL HYDRAULICS*	3 days	June 24-26
WAKEFIELD	FAULT FINDING* NEW	2 days	June 24-25
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	June 26
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	June 27
ST NEOTS	BASIC HYDRAULICS	3 days	**July** 8-10
ST NEOTS	PROPORTIONAL HYDRAULICS*	3 days	July 8-10
ST NEOTS	FAULT FINDING* NEW	2 days	July 8-9
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	July 10

ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	July 11
WAKEFIELD	BASIC HYDRAULICS	3 days	July 8-10
WAKEFIELD	PROPORTIONAL HYDRAULICS*	3 days	July 8-10
WAKEFIELD	FAULT FINDING* NEW	2 days	July 8-9
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	July 10
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	July 11
ST NEOTS	BASIC HYDRAULICS	3 days	July 22-24
ST NEOTS	FAULT FINDING* NEW	2 days	July 22-23
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	July 24
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	July 25
WAKEFIELD	BASIC HYDRAULICS	3 days	July 22-24
WAKEFIELD	FAULT FINDING* NEW	2 days	July 22-23
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	July 24
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	July 25
ST NEOTS	BASIC HYDRAULICS	3 days	**August** 5-7
ST NEOTS	PROPORTIONAL HYDRAULICS*	3 days	August 5-7
ST NEOTS	FAULT FINDING* NEW	2 days	August 5-6
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	August 7
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	August 8
WAKEFIELD	BASIC HYDRAULICS	3 days	August 5-7
WAKEFIELD	PROPORTIONAL HYDRAULICS*	3 days	August 5-7
WAKEFIELD	FAULT FINDING* NEW	2 days	August 5-6
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	August 7
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	August 8
ST NEOTS	BASIC HYDRAULICS	3 days	August 19-21
ST NEOTS	FAULT FINDING* NEW	2 days	August 19-20
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	August 21
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	August 22

WAKEFIELD	BASIC HYDRAULICS	3 days	August 19-21
WAKEFIELD	FAULT FINDING* NEW	2 days	August 19-20
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	August 21
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	August 22
ST NEOTS	BASIC HYDRAULICS	3 days	**September** 2-4
ST NEOTS	PROPORTIONAL HYDRAULICS*	3 days	September 2-4
ST NEOTS	FAULT FINDING* NEW	2 days	September 2-3
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	September 4
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	September 5
WAKEFIELD	BASIC HYDRAULICS	3 days	September 2-4
WAKEFIELD	PROPORTIONAL HYDRAULICS*	3 days	September 2-4
WAKEFIELD	FAULT FINDING* NEW	2 days	September 2-3
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	September 4
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	September 5
ST NEOTS	BASIC HYDRAULICS	3 days	September 16-18
ST NEOTS	PROPORTIONAL HYDRAULICS*	3 days	September 16-18
ST NEOTS	FAULT FINDING* NEW	2 days	September 16-17
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	September 18
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	September 19
WAKEFIELD	BASIC HYDRAULICS	3 days	September 16-18
WAKEFIELD	PROPORTIONAL HYDRAULICS*	3 days	September 16-18
WAKEFIELD	FAULT FINDING* NEW	2 days	September 16-17
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	September 18
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	September 19
CORK	BASIC HYDRAULICS	3 days	**October** 21-23
ST NEOTS	BASIC HYDRAULICS	3 days	October 21-23
ST NEOTS	PROPORTIONAL HYDRAULICS*	3 days	October 21-23
ST NEOTS	FAULT FINDING* NEW	2 days	October 21-22

ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	October 23
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	October 24
WAKEFIELD	BASIC HYDRAULICS	3 days	October 21-23
WAKEFIELD	PROPORTIONAL HYDRAULICS*	3 days	October 21-23
WAKEFIELD	FAULT FINDING* NEW	2 days	October 21-22
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	October 23
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	October 24
ST NEOTS	BASIC HYDRAULICS	3 days	**November** 4-6
ST NEOTS	PROPORTIONAL HYDRAULICS*	3 days	November 4-6
ST NEOTS	FAULT FINDING* NEW	2 days	November 4-5
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	November 6
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	November 7
WAKEFIELD	BASIC HYDRAULICS	3 days	November 4-6
WAKEFIELD	PROPORTIONAL HYDRAULICS*	3 days	November 4-6
WAKEFIELD	FAULT FINDING* NEW	2 days	November 4-5
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	November 6
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	November 7
ST NEOTS	BASIC HYDRAULICS	3 days	November 18-20
ST NEOTS	PROPORTIONAL HYDRAULICS*	3 days	November 18-20
ST NEOTS	FAULT FINDING* NEW	2 days	November 18-19
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	November 20
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	November 21
WAKEFIELD	BASIC HYDRAULICS	3 days	November 18-20
WAKEFIELD	PROPORTIONAL HYDRAULICS*	3 days	November 18-20
WAKEFIELD	FAULT FINDING* NEW	2 days	November 18-19
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	November 20
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	November 21
ST NEOTS	BASIC HYDRAULICS	3 days	**December** 2-4

ST NEOTS	PROPORTIONAL HYDRAULICS*	3 days	December 2-4
ST NEOTS	FAULT FINDING* NEW	2 days	December 2-3
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	December 4
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	December 5
WAKEFIELD	BASIC HYDRAULICS	3 days	December 2-4
WAKEFIELD	PROPORTIONAL HYDRAULICS*	3 days	December 2-4
WAKEFIELD	FAULT FINDING* NEW	2 days	December 2-3
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	December 4
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	December 5
ST NEOTS	BASIC HYDRAULICS	3 days	December 16-18
ST NEOTS	PROPORTIONAL HYDRAULICS*	3 days	December16-18
ST NEOTS	FAULT FINDING* NEW	2 days	December 16-17
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	December 18
ST NEOTS	ACCUMULATOR COMPETENCE* NEW	1 day	December 19
WAKEFIELD	BASIC HYDRAULICS	3 days	December 16-18
WAKEFIELD	PROPORTIONAL HYDRAULICS*	3 days	December16-18
WAKEFIELD	FAULT FINDING* NEW	2 days	December 16-17
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	December 18
WAKEFIELD	ACCUMULATOR COMPETENCE* NEW	1 day	December 19

*** Level 2 training course, please refer to entry requirements.**

Booking/Pricing

All bookings subject to receipt of completed booking form (please contact us), and official order number. Quoted price per attendee, per course, excluding VAT.
Course materials and light buffet lunch included.
All visa, travel, hotel and subsistence responsibility of attendee.

Quoted prices refer to standard courses. Bespoke Training packages are also available, delivered at Bosch Rexroth St Neots or Wakefield, or customer site, duration to suit, prices on request. Please contact us for further details.

UK Venues

Bosch Rexroth, St Neots, Cambridgeshire. PE19 2ES
Bosch Rexroth, Normanton, Wakefield. WF6 1GX

Pricing

3-day course	£1130.00
2-day course	£756.00
1-day course	£552.00

Cork

All courses — Price on request

For course bookings, please contact:

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Certified by the British Fluid Power Association

Level 1 Training:

BASIC HYDRAULICS TRAINING COURSE (3 days): Typical Content

1. **Self-Assessment Questionnaire**
   - used to support the introduction to hydraulics and identify levels of previous knowledge and understanding

2. **Introduction to the basic principles of Fluid Power Systems**
   - what is a hydraulic system?
   - important characteristics of hydraulic systems
   - where do we use hydraulics?
   - 7 basic principles that underpin hydraulic systems
   - Pascal's Law, Force Transmission, Pressure Transmission

3. **Introduction to Circuit Symbols (to current ISO standards)**
   - hydraulic symbols, shape and recognition
   - how to read hydraulic circuit diagrams
   - open and closed loop circuits

4. **Pumps**
   - different pump types and basic principal of operation (gear, vane, piston)
   - shaft input power and hydraulic output power
   - suction performance, cavitation, aeration, causes of failure
   - installation and commissioning

5. **Pressure Control Devices – function, operation and circuit application**
   - pressure relief valves – direct and pilot operated (including unloading)
   - pressure reducing valves
   - sequence valves

6. **Directional Control Valves – function, operation and circuit application**
   - direct operated and pilot operated
   - valve sizes and nominal flow rates
   - poppet valves

7. **Load Holding and Motion Control – function, operation and circuit application**
   - standard check valves
   - pilot operated check valves
   - counter balance valves

8. **Flow Control Valves – function, operation and circuit application**
   - simple throttle valves
   - viscosity compensated valves
   - pressure compensated valves
   - meter in / meter out flow control

9. **Pipes, Hoses and Fittings**
   - compression joints - establishing the perfect connection
   - knowing the parts and application
   - hose construction and selection
   - hose failures and correct installation
   - safety

10. **Motors**
    - different motor types and basic principal of operation (axial piston, radial piston, fixed and variable displacement)
    - shaft speed, displacement, input flow-rate, torque.

11. **Cylinders**
    - different types, basic construction / operation
    - force, effective area, flow rate and velocity
    - intensification
    - regeneration

12. **Accumulators**
    - different types (piston, diaphragm, bladder)
    - Basic principal of operation
    - applications
    - safety and legislation

13. **Hydraulic Oil**
    - important characteristics and different types
    - additives
    - viscosity
    - management control

14. **Contamination Control**
    - origin and nature of contaminants
    - particle sizes and typical component clearances
    - establishing target cleanliness levels
    - monitoring and maintaining cleanliness standards (measurement)
    - sampling methods

15. **Fault Finding**
    - fault diagnosis, start point and procedures to follow
    - health and safety and establishing safe working practices
    - planning and preparation
    - application of 'fault-cause-remedy' techniques

16. **Practical Exercises (in-house training rigs)**
    - performance testing a pump
    - comparing the performance of a simple throttle valve to a pressure compensated flow control valve
    - to observe and understand pressure intensification
    - to prepare a set up procedure for three different pressure control valves with different settings
    - to build and understand a simple accumulator circuit

17. **Hydraulic Safety**
    - general safety, personal hygiene and handling of oils

Level 2 training - please refer to entry requirements.

FAULT FINDING TRAINING COURSE (2 Days): Typical Content

1. **Review of the basic principles of Fluid Power**
   - fundamental principles that underpin hydraulic systems
   - Pascal's Law, transmission of force, power
   - formulae used to calculate flow, pressure, power, torque and force

2. **Maintenance and Fault Finding**
   - maintenance strategies
   - planning and fault finding techniques
   - system monitoring
   - fluid condition
   - tools and measuring equipment
   - use of technical reference information

3. **Circuits and Symbols**
   - review of circuit symbols and circuit diagrams
   - examples of different circuit diagrams
   - circuit errors
   - 'truth tables' / 'solenoid charts'

4. **Accumulators**
   - basic principal of operation
   - back up bottles
   - safety and legislation

5. **Logic Elements**
   - basic function
   - different types (direction and pressure)
   - applications

6. **Proportional Valves**
   - basic function
   - command and feedback signals
   - diagnostic equipment

7. **Faults and Failures**
   - installation problems
   - cavitation and aeration
   - effects of temperature
   - causes of failures

8. **Hydraulic Oil**
   - contamination control
   - condition monitoring
   - sampling methods

9. **Practical Exercises (in-house training rigs)**
   - practical exercises to identify and rectify faults
   - practise fault finding techniques
   - use of measuring equipment

10. **Safety**
    - general safety, personal hygiene and handling of oils
    - risk assessments
    - safe systems of work

Level 2 training - please refer to entry requirements.

ACCUMULATOR COMPETENCE TRAINING COURSE (1 DAY): Typical Content

1. **Introduction - Review of the basic principles of Fluid Power Systems**
   - important characteristics of hydraulic systems
   - basic principles that underpin hydraulic systems
   - the importance of fluid cleanliness
   - Pascal's Law, useful formulas

2. **Introduction to accumulators**
   - history and developments
   - basic operating principles

3. **Gas charged accumulators**
   - gas laws and operating principles
   - nitrogen
   - compressibility
   - gas cylinder - supply options
   - safe working with Nitrogen

4. **Gas charged accumulator types**
   - understanding common terms
   - details of operation of - Diaphragm, Bladder and Piston accumulators
   - back-up gas bottles
   - safety equipment associated with accumulator systems
   - charging kit
   - the gas charging process
   - sources of information

5. **The Pressure System Safety Regulations**
   - the responsibility of users and owners of systems
   - the written scheme of examination
   - drawing up a written scheme of examination

6. **Application examples**
   - various examples

7. **Practical exercises**
   - practical exercises to support the topics
   - practice gas charging
   - build accumulator circuits

Level 2 training - please refer to entry requirements.

PROPORTIONAL HYDRAULICS TRAINING COURSE (3 Day)
TYPICAL CONTENT

A copy of the Bosch Rexroth Vol 2 Training Manual, R900018626, Proportional and Servo Valve Technology, is included as part of the course material.

1. Proportional Hydraulics – An Introduction
- overview of 'on-off' control and its limitations
- introduction to a 'proportional' alternative

2. How Proportional Valves control flow
- the proportional DCV spool
- spool characteristics (flow rate, symmetry and notch shape)
- symbol recognition

3. Proportional DCV's
- direct operated and pilot operated DCV's
- feedback and non-feedback valves
- describing valve performance in graphical form

4. Other Proportional Valves and Servo Valves
- proportional relief valves and proportional reducing valves
- proportional flow control valves
- pump and motor displacement controls
- overview of high response proportional and servo valves

5. Control Systems, Input and Output Signals
- construction and characteristics of a proportional solenoid
- role of the amplifier (deadband compensation, ramp and dither)
- input signals and gain control
- valve spool feedback transducers and 'internal closed loop' control
- PID control
- overview of pulse width modulation
- valves with integral amplifiers

6. Proportional Valves used in real circuits
- oil cleanliness requirements
- using pressure compensators
- solenoid air bleeds
- effect of proportional valves on load control valves

7. Practical Work
- proportional and bang-bang solenoid characteristics
- force control, stroke control and hysteresis
- proportionality/ramps with DCV and motor circuit
- proportional relief valve performance
- deadband compensation and gain control
- cylinder velocity profile control with 4/3 proportional DCV

*Level 2 training - please refer to entry requirements.

BASIC HYDRAULIC DESIGN TRAINING COURSE (3 Day)
TYPICAL CONTENT

1. Determining the Load
- size, volume, density, and mass
- calculating force and acceleration
- effects of gravity
- effects of static and sliding friction
- calculating torque
- calculating rotational speed

2. Sizing the Actuator
- cylinder sizing
- rod buckling load calculation
- motor sizing
- use of step-up and step-down gearboxes

3. Planning and Duty Cycle
- flow-time graphical representation
- pressure-time graphical representation

4. Control Valve Selection
- directional valve selection from graphical characteristic curves
- open-centre and closed centre 'mobile' multi-function valves
- PO Check valve pilot pressure calculation
- counterbalance and overcentre valve selection and pilot pressure calculation
- logic valve sizing (including area ratios) and pilot pressure calculations

5. Sizing the Power-Pack (Pump, Prime Mover and Reservoir)
- pump sizing and selection
- prime mover selection (electric motors & diesel engines)
- reservoir sizing
- reservoir layout and internal construction

6. Throttling
- orifice calculation
- calculating intensification for meter-out throttling applications
- proportional/mobile valve spool selection from graphical performance curves

7. Heating and Cooling
- Fluid selection (choosing viscosity grade for ambient temperature)
- Cooling calculations (including ambient radiation from reservoirs)
- Heating calculations

8. Sizing Pipework and Hoses
- Calculating pipe & hose internal diameter
- Calculating change of pressure drop due to changes in flowrate

9. Turbulent Flow Flushing

- calculating turbulent flowrate for flushing

10. Tips and Tricks to Improve Machine Performance

- accumulator sizing calculations
- use of 2-stage relief valve for unloading and multiple pressure selection
- use of externally piloted 'unloader' valve for Hi-Lo pump systems and accumulator charging applications
- calculating cylinder regenerative ('regen') extension flow/speed

11. Filter Placement

- use of BFPA 'P5' process to determine filter placement

12. Case Study

- attendees will carry out a case study to design a typical hydraulic system incorporating the above topics

Level 2 Training

- Fault Finding
- Accumulator Competence
- Proportional Hydraulics
- Basic Hydraulic Design

Entry Requirements

Completion of the Basic Hydraulics course is strongly recommended prior to attending a Level 2 course. Alternatively, attendees must have sound knowledge/experience of:

→ the basic principles that underpin all hydraulic systems (relationship between, pressure, flow, force, torque, speed, power);
→ reading and interpreting circuit diagrams using current symbols;
→ the function and operation of relief, sequence and pressure reducing valves;
→ the principle of pressure compensation relating to flow control; operation of spool valves; gear, vane and piston pumps;
→ characteristics of oils and contamination control;
→ accumulators and their use, safety and legislation.

A Bosch Company

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