Electronic control of hydraulic systems has become commonplace. Understanding proportional electro-hydraulic technology is essential for system designers and service technicians.

This course demonstrates working examples of the interaction between various valves, controllers and amplifier cards through practical exercises.

**Program**

**Day 1**
Welcome, introductions and overview

**Introduction to proportional hydraulics – ST-T09-2**
What is a proportional system? Understanding proportional technology.
What is electro-hydraulic control?
Open loop control and closed loop control

**Introduction to electronics – EL45-T04-0**
What is electrical energy?
Electrical circuits.
Terms and units of measurement.
Using Ohm’s Law.
Measuring electrical energy.

**Solenoid technology – EL45-T05-0**
Coils
Relays
Solenoid construction
Switch solenoids vs. proportional solenoids.

**Proportional valves – CH99-T08-0**
Valve construction
Reading the catalogues.

**Hands-on exercises (Part 1)**
Switches and solenoids

**Hands-on exercises (Part 2)**
Relay circuit
Latching relay circuit
Set up a hydraulic circuit and control it with latching relays.
Timer functions.
Program

Day 2
Overview and revision of day 1.

Proximity switches (Part 3)
Relay circuit

Automation with hard-wired logic (Part 4)
Using electrical wiring to control a hydraulic circuit.
Create a simple PLC ladder program to achieve the same result.

Simple PLC functions using function block language (Part 5)
Industrial logic – EL45-T07-0
Introduction to Programmable Logic Controllers (PLC’s)
Industrial ladder logic
Function block diagrams
Introducing the Siemens LOGO! PLC
LOGO! Basic functions and special functions.

Reciprocating cylinder automation using function block language (Part 6)
Using a PLC to control a hydraulic circuit.

Three cylinder machine cycle using function block language (Part 7)
Change the system outcome by modifying a PLC program to meet a requirement.
Recording of program changes, and completion of service reports.

Day 3
Overview and revision of day 2.
Three cylinder machine cycle (Continued).

Press circuit using function block language (Part 8)
Change the system outcome by modifying a PLC program to meet a requirement.
Troubleshoot a PLC program with multiple faults.

Testing of electronic system components (Part 9)
Troubleshoot sensor faults.

Practical demonstration of setting proportional amplifier card (Part 10)
The basic operation of an electro-hydraulic proportional valve.
• Setting parameters through trim pots.
• The ENABLE command.
• The operation and setting of MIN (Offset).
• The operation and setting of MAX. (Gain).
• The operation and setting of RAMPs.
• Pulse Width Modulation (PWM).
• Low frequency dither through the PWM frequency adjustment.
• High frequency dither though a super-imposed excitation of the PWM signal.

Closed loop pressure control exercise (Part 11)
Install and commission the closed loop pressure control system. This system used to demonstrate the following:
• The basic operation of an electro-hydraulic proportional pressure valve.
• Setting parameters through software.
• The ENABLE command.
• The COMMAND signal through PLC output and manual command.
• The difference in accuracy between open and closed control loops.
• A digital display used in a 4-20mA current loop.

**Day 4**
Overview and revision of day 3.

**Closed loop pressure control exercise (Continued)**
Install and commission the closed loop positional control system. This system used to demonstrate the following:
• The basic operation of an electro-hydraulic proportional directional control valve.
• On-board electronics.
• Closed loop positional control.

Written assessments etc.

**Clothing and equipment**

Pens, paper, tools and training resources are provided.

Clothing should be neat casual, or cotton drill work clothing is fine, but they must be clean.

Dirty work boots are not to be worn, fully covered footwear such as runners are acceptable. Open toed footwear must not be worn.

**Lunches**

Morning tea, lunch and afternoon tea are provided. If you have any special dietary needs, please contact HYDAC beforehand to arrange alternatives.

**Dates and times**

Times: 8:30AM to 5:00PM on the following days in 2017:
• February 28th to March 3rd
• June 27th to 30th
• August 29th to September 1st

**Text book**

We also have a 173 page text book available, entitled “Basics of electronics and measurement technology”, it is a supporting text for this course. It can only be purchased by those who attend this course, or our Understanding Sensors And Measurement Devices course.

Part No: 3802481  
Nett price: $140 plus GST

Price for the course and the text book is $1180 Nett, plus GST.
Course fee

Course fee is AUD $1040 per participant, plus GST. Flights, accommodation and taxi charges are not included in the course fee.

Pre-Requisites

Pre-Requisites for attending the course:
HYDAC Basic Hydraulics 1 course or equivalent.
This course can only be provided for those fluent in English. Participants must be able to read and write, and to follow instructions.

Pre-requisites for the issuance of the TAFE nationally recognised certificate:
It must be established that the following units have been completed before the nationally recognised certificate can be awarded:

For the issuance of MEM18022B Maintain fluid power controls:
MEM18020B Maintain hydraulic system components, and it’s pre-requisites. (See HYDAC Maintain Hydraulics 2).
MEM18021B Maintain Hydraulic Systems

For the issuance of MEM18053B Modify fluid power control systems
The above, and:
MEM12024A Perform computations
MEM12025A Use graphical techniques and perform simple statistical computations
MEM14005A Plan a complete activity
MEM16010A Write reports
MEM18010C Perform equipment condition monitoring and recording
MEM18016B Analyse plant and equipment condition monitoring results
MEM18018C Maintain pneumatic system components
MEM18019B Maintain pneumatic systems
MEM18023B Modify fluid power system operation

It is incumbent on the participant to provide clear evidence that these units or equivalents have been completed. Please bring copies of transcripts of results, or any statements of attainment to the course so that we can make copies to use as evidence on your behalf.

If you do not hold any of the above-mentioned units or certificates, you are still very much encouraged to attend the course, however only a HYDAC training certificate can be issued. i.e. a statement of attendance. This HYDAC certificate will allow you to enrol in further training with us.

Contact

Technical Training Officer

HYDAC

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