



## COURSE OVERVIEW ME0294 Commissioning of HVAC System

### Course Title

Commissioning of HVAC System

### Course Date/Venue

Session 1: February 18-22, 2024/The Mouna Meeting Room, The H Dubai Hotel, Sheikh Zayed Rd - Trade Centre, Dubai, UAE

Session 2: March 03-07, 2024/Kizkulesi, Crown Plaza Istanbul Asia Hotels & Convention Center, Istanbul, Turkey



### Course Reference

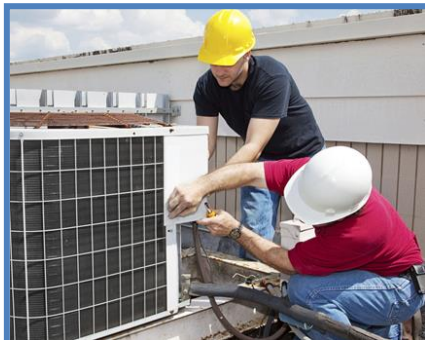
ME0294



### Course Duration/Credits

Five days/3.0 CEUs/30 PDHs

### Course Description



***This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt in the class will be applied using the following practical methods:***

**(1) Industrial Facility Visit:** Course participants will be taken to an industrial facility where they will practice testing, maintenance and troubleshooting. In case that this course is organized inside client premises (In-House), then client shall provide access to its HVAC and refrigeration workshop for practical sessions.

**(2) HVAC Simulator:** Participants will use in the class the state-of-the-art HVAC Simulator to practice some of the skills learnt.

This course is designed to provide participants with a detailed and up-to-date overview of HVAC system commissioning. It covers the basics of HVAC and refrigeration; the HVAC codes and standards for commissioning; the air conditioning, ventilation and refrigeration; the commissioning of HVAC&R systems and refrigeration systems components; the refrigeration circuits components, refrigerant compressors and refrigerant condensers; the performance and efficiency of DX evaporators and flooded evaporators; and the various types of expansion devices comprising of thermal, electronic and capillary tube.



During this highly interactive course, participants will learn the refrigeration circuits performance calculations that include saturation of temperatures, superheat degrees and subcooled degrees; the refrigeration systems refrigerants and P-H charts; the commissioning of chilled water components, air systems components and HVAC systems according to ANSI/ASHRAE 111-2012; the HVAC commissioning for electrical and control circuits; the inspection and maintenance of HVAC in accordance with ANSI/ASHRAE/ACCA 180-2012 standard; and the troubleshooting and analysis of HVAC including the faults, possible causes and actions.

### **Course Objectives**

Upon the successful completion of this course, each participant will be able to: -

- Apply and gain a comprehensive knowledge on HVAC system commissioning
- Discuss the basics of HVAC and refrigeration
- Recognize HVAC&R abbreviations including the HVAC codes and standards for commissioning
- Define air conditioning, ventilation and refrigeration
- Employ commissioning of HVAC&R systems and refrigeration systems components
- Identify refrigeration circuits components including refrigerant compressors and refrigerant condensers
- Determine the performance and efficiency of DX evaporators and flooded evaporators
- Discuss the various types of expansion devices comprising of thermal, electronic and capillary tube
- Carryout refrigeration circuits performance calculations that include saturation of temperatures, superheat degrees and subcooled degrees
- Review refrigeration systems refrigerants and P-H charts covering calculations, performance and measurements
- Employ commissioning of chilled water components, air systems components and HVAC systems according to ANSI/ASHRAE 111-2012 including HVAC commissioning for electrical and control circuits
- Inspect and maintain HVAC in accordance with ANSI/ASHRAE/ACCA 180-2012 standard
- Troubleshoot and analyse HVAC and determine faults, possible causes and actions

### **Exclusive Smart Training Kit - H-STK®**



*Participants of this course will receive the exclusive “Haward Smart Training Kit” (H-STK®). The H-STK® consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*



**Who Should Attend**


This course provides a complete and up-to-date overview of HVAC & refrigeration systems for HVAC, utilities, maintenance, plant, operation and inspection engineers and other technical staff who are involved in the design, installation, maintenance and troubleshooting of such equipment and system. Further, it is suitable for mechanical, design, electrical and consulting engineers.

**Course Certificate(s)**

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

**Certificate Accreditations**


Certificates are accredited by the following international accreditation organizations:-

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The International Accreditors for Continuing Education and Training (IACET - USA)

Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units (CEUs)** in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

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British Accreditation Council (BAC)

Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.



### Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:



**Mr. Mustafa Fadel** is a **Senior HVAC Engineer** with over **20 years** of proven practical experience. His specialization widely covers Heating, Ventilation, Air Conditioning (HVAC) & Refrigeration Systems; Air Cooler Design; Chillers; Mass & Heat Transfer, Electromechanical, Rotating & Static Equipment including Heat Exchangers, Piping & Pipeline, Pressure Vessels, Valves, Tanks Turbines, Compressors, Motors, Pumps, Evaporators, Condensers, Blowers and Fans; Maintenance Planning & Scheduling; Root Cause Failure Analysis; Performance Calculations; Reliability Maintenance and Corrective & Preventive Maintenance. Further, he is well-versed in HSE Management, KPI's, CMMS and AutoCAD as well as in various International Standards such as the ASHRAE, API, ASTM, ASME, AMCA, NFPA and SMACNA. Currently, he is the HVAC&R Specialist in SEGAS LNG Plant.

During his career life, Mr. Fadel has gained his practical and field experience through his various significant positions and dedication as the **Mechanical Head, Project Manager, HVAC Engineer, Mechanical Engineer, HVAC&R Instructor** and **Technical Consultant** for international companies and university like the Foster Wheeler, Technip-Italy, Borner Company, Union FENOSA Gas, Asphalt Bitumen, King Khalid University, Alexandria Petroleum Company, FAWAZ Company, Marium Corporation and many more.

Mr. Fadel has a **Bachelor's** degree in **Power Mechanical Engineering** with **Honours**. He is an active member of the American Society of Heating Refrigerating and Air Conditioning Engineers (ASHRAE) in **USA**. Further, he is a **Certified Instructor/Trainer** and has delivered and participated numerous engineering and inspection projects, training courses and conferences globally.

### Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

- 30% Lectures
- 20% Practical Workshops & Work Presentations
- 30% Hands-on Practical Exercises & Case Studies
- 20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

### Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.



**Course Fee**

Dubai	<b>US\$ 5,500</b> per Delegate + <b>VAT</b> . This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Istanbul	<b>US\$ 6,000</b> per Delegate + <b>VAT</b> . This rate includes Participants Pack (Folder, Manual, Hand-outs, etc.), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

**Course Program**

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

**Day 1**

0730 – 0800	<i>Registration &amp; Coffee</i>
0800 – 0815	<i>Welcome &amp; Introduction</i>
0815 – 0830	<b>PRE-TEST</b>
0830 – 0930	<b>Introduction</b> <i>Introduction to HVAC &amp; Refrigeration Basics • HVAC&amp;R Abbreviations • HVAC Codes &amp; Standards for Commissioning, Adjusting &amp; Balancing</i>
0930 – 0945	<i>Break</i>
0945 – 1100	<b>HVAC&amp;R Definitions</b> <i>Air Conditioning • Ventilation • Refrigeration</i>
1100 – 1215	<b>HVAC&amp;R Systems Commissioning</b> <i>Commissioning (Definition, Systems, Standards, Tools &amp; Log Sheets )</i>
1215 – 1230	<i>Break</i>
1230 – 1420	<b>Commissioning For HVAC &amp; Refrigeration systems Components</b> <i>Refrigeration Circuits Commissioning • Chilled Water Circuits Commissioning • Air Systems Circuits Commissioning • Electrical Circuits Commissioning • Control Circuits Commissioning</i>
1420 – 1430	<b>Recap</b> <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow</i>
1430	<i>Lunch &amp; End of Day One</i>

**Day 2**

0730 – 0930	<b>Refrigeration Circuits Components &amp; Commissioning: Refrigerant Compressors</b> <i>Types of Compressors (Reciprocating, Scroll, Screw &amp; Centrifugal) • Compressor Selection</i>
0930 – 0945	<i>Break</i>
0945 – 1100	<b>Refrigeration Circuits Components &amp; Commissioning: Refrigerant Compressors (cont'd)</b> <i>Commissioning &amp; Performance Test</i>
1100 – 1200	<b>Refrigeration Circuits Components &amp; Commissioning: Refrigerant Condensers</b> <i>Air Cooled Condenser (Selection, Performance, Commissioning Procedures: Log Sheets &amp; Data Record) • Water Cooled Condenser (Selection, Performance, Commissioning Procedures: Log Sheets &amp; Data Record)</i>



1200- 1215	Break
1215 - 1330	<b>Refrigeration Circuits Components &amp; Commissioning: Refrigerant Condensers (cont'd)</b> <i>Comparison Between Air Cooled &amp; Water Cooled (Performance &amp; Efficiency)</i>
1420 - 1430	<b>Recap</b> <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow</i>
1430	Lunch & End of Day Two

**Day 3**

0730 - 0930	<b>Refrigerant Evaporator: Types</b> <i>DX Evaporators • Flooded Evaporators (Performance &amp; Efficiency)</i>
0930 - 0945	Break
0945 - 1145	<b>Expansion Devices: Types</b> <i>Thermal • Electronic • Capillary Tube</i>
1145- 1230	<b>Refrigeration Circuits Performance Calculations</b> <i>Saturation Temps. • Superheat Degrees • Subcooled Degrees</i>
1230 - 1215	Break
1215 - 1420	<b>Refrigeration Systems Refrigerants &amp; P-H Chart</b> <i>Calculations • Performance • Measurements</i>
1420 - 1430	<b>Recap</b> <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow</i>
1430	Lunch & End of Day Three

**Day 4**

0730 - 0930	<b>Chilled Water Components &amp; Commissioning</b> <i>Installation Guides • Pumps Performance • Pipelines • Pressure Gages Readings (Inspection, Pre Commissioning, Log Sheet &amp; Data Records)</i>
0930 - 0945	Break
0945 - 1100	<b>Air Systems Components &amp; Commissioning</b> <i>Air Ducts • Air Dampers • Air Filters • Air Outlets (Air Quality, Air Velocities, Air Flow, Noisy Levels ) • Measurements Tools</i>
1100 - 1200	<b>HVAC Systems Commissioning Standard</b> <i>Commissioning Standards ANSI/ ASHRAE 111-2012 • Recommendations Guide Lines</i>
1200 - 1215	Break
1215 - 1420	<b>Commissioning</b> <i>Case Studies (Faults, Symptoms &amp; Action)</i>
1420 - 1430	<b>Recap</b> <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow</i>
1430	Lunch & End of Day Four



**Day 5**

0730 – 0930	<b>HVAC Commissioning for Electrical &amp; Control Circuits</b> Power Circuits (Volt, Amps, Power Consumption) • Protection Elements (Setting Limits, Data Log) • Control Circuits ( AC/DC Volts Measurements, Timers Operation, Signals Timing & Faults Signals Analysis )
0930 – 0945	Break
0945 – 1100	<b>HVAC Inspection &amp; Performance Calculations</b> HVAC&R Equipment
1100 – 1200	<b>HVAC Inspection &amp; Maintenance Standards</b> ANSI/ASHRAE/ACCA 180-2012 Standard
1200 – 1215	Break
1215 – 1345	<b>Some HVAC Troubleshooting Analysis</b> Faults • Possible Causes • Actions
1345 – 1400	<b>Course Conclusion</b> Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course
1400 – 1415	<b>POST-TEST</b>
1415 – 1430	Presentation of Course Certificates
1430	Lunch & End of Course



**Practical Sessions/Site Visit**

Site visit will be organized during the course for delegates to practice the theory learnt:-

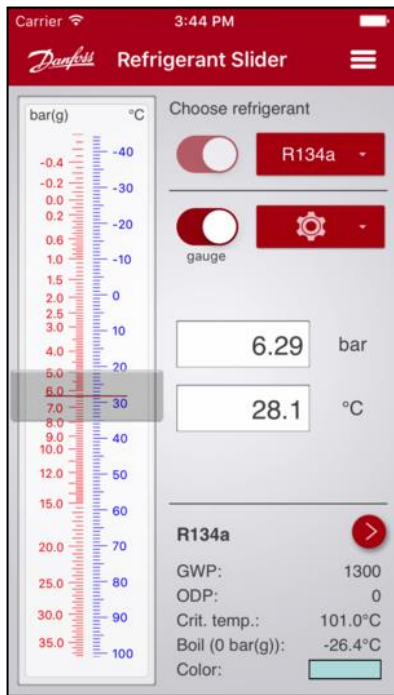




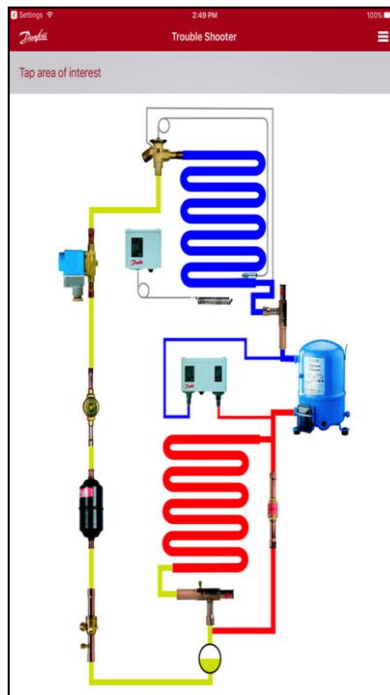


**Simulator (Hands-on Practical Sessions)**

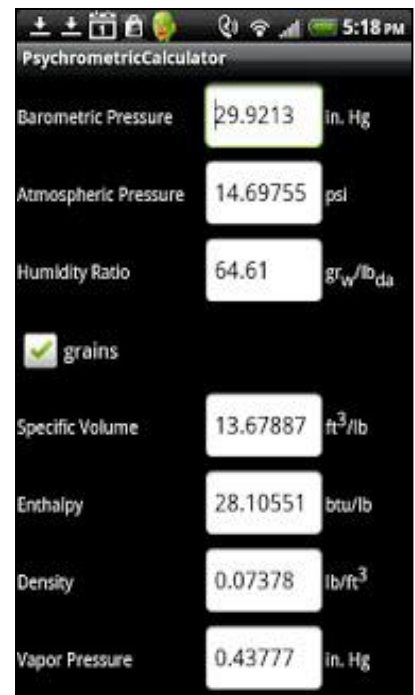
Practical session will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using the simulator “Danfoss Refrigerant Slider App”, “Danfoss Trouble Shooter App” and “Air Lite Psychrometric Calcs”.



**Danfoss Refrigerant Slider App**



**Danfoss Trouble Shooter App**



**Air Lite Psychrometric Calcs**

**Course Coordinator**

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