

Refrigeration and Air-conditioning Technology

Climate change, the greenhouse effect and global warming – in the 21st Century there is scarcely any other subject that is more ubiquitous or “hotly” debated. Global environmental accords like the international Kyoto protocol or specifically the European directive on fluorinated gases are devoted to the problems associated with greenhouse relevant agents and the search for solutions on a political level. Refrigeration and air-conditioning applications amplify the effects of global warming.

In the first place they contribute directly and in a big way to the greenhouse effect through the emission of coolants containing fluorine like partially or wholly fluorinated hydrocarbons. One example of how these emissions are caused is because of leaks in refrigeration systems which allow coolants to escape into the atmosphere. Secondly, the operation of refrigeration systems also causes additional, indirect CO₂ emissions due to the not inconsiderable amount of energy required for their operation. This problem is compounded by the fact that demand for refrigeration systems is constantly increasing.

Lucas-Nülle has committed itself to this subject and developed a concept to integrate easily serviceable and effective training systems devoted to this growing sector. Refrigeration and air-conditioning technology is a professional area that builds entirely the latest educational and technical know-how. It is the many years of experience that Lucas-Nülle has accumulated combining theoretical know-how with practical applications which empowers course participants to boost their skills and competence in this area.

Refrigeration workshop



Refrigeration workshop

The refrigeration workshop goes beyond the modular refrigeration training system and allows you to foster the practical skills of your trainees. It covers the topics of refrigeration and of electrical engineering. Participants in the course are guided step by step through refrigeration technology and acquire a high-quality grounding for their work in the future. Installation of coolant piping is only one of the many skills which can be learned with the help of the refrigeration workshop.

Important!

Some of the supplies employed with this equipment set are governed by regulations on hazardous goods and therefore require special handling. We recommend procuring these supplies in the respective country of use to avoid a transport of hazardous goods. The relevant supplies are summarized in the associated section.

RCW2 Design and assembly of advanced refrigeration applications



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Use of this supplementary set requires that basic knowledge has already been learned and the set is conceived for the purpose of special technical training. Additional components allow for more systems to be explored. For instance, multiple refrigeration compartments can be operated in conjunction with a single control system. This allows the individual cold chambers to be operated at differing temperatures depending on the applications for which they are used.

Follow-up projects to supplement the basic set:

- Refrigeration compartment with power regulation by hot-gas by-pass and post-injection
- Air-conditioned space with differing temperatures
- Processing of refrigerant via heat exchangers, liquid/oil traps
- Switching between cooling and heating operation and defrosting by means of four-way valve
- Use of various refrigeration controllers with and without real-time clock

Equipment set comprising the following:

Heat exchanger

SE2675-1K

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Ready-to-use, double-tube heat exchanger designed for project work and equipped with all the necessary connections.

Technical data:

- 1 x WAN heat exchanger
- 1 x Soldered bush, HS 7/8"-16
- 1 x Soldered bush HS 7/16"-6
- 1 x Cap nut, 7/8"
- 1 x Cap nut, 7/16"
- 1 x Sealing cap, DK 7/8"
- 1 x Sealing cap, DK 7/16"
- 1 x Copper pipe, DN 16 mm
- Assembled and soldered



Liquid trap

SE2675-1L

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A liquid trap with a built-in heat exchanger is used when it cannot be ensured that a compressor only sucks in gaseous refrigerant.

Technical data:

- 1 x Liquid trap S-7045HE
- 1 x Soldered bush, HS 7/8"-16
- 1 x Soldered bush, HS 5/8"-10
- 1 x Copper pipe, DN 16 mm
- 1 x Copper pipe, DN 10 mm
- 1 x Sealing cap, DK 7/8"
- 1 x Sealing cap, DK 5/8"
- 1 x Cap nut, 7/8"
- 1 x Cap nut, 5/8"
- 1 x Equipment base, KR 100 12-35
- 1 x Adapter sleeve, M12/M8
- Assembled and soldered



Four-way valve

SE2675-1M

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Four-way valve for installation of systems with hot-gas defrosting.

Technical data:

- 1 x Four-way valve STF-0201G
- 1 x Soldered bush HS 3/4"-12
- 1 x Soldered bush HS 5/8"-10
- 1 x Copper pipe, DN 12 mm
- 1 x Copper pipe, DN 10 mm
- 1 x Cap nut, 5/8"
- 1 x Sealing cap, DK 5/8"
- 1 x Cap nut, 3/4"
- 1 x Sealing cap, 3/4"
- Assembled and soldered



Oil trap

SE2675-1N

1

This component is fitted into a 10-mm hot-gas pipe. For ease of experimentation, a 6-mm window and a 6-mm manual stop-cock are also included. These are fitted into the oil piping by users themselves and assembled the first time they use the equipment.

Technical data:

- 1 x Oil trap OUB 1
- 1 x Connectors, OUB 1, 5/8"
- 1 x Cap nut, 5/8"
- 1 x Sealing cap, DK 5/8"
- 1 x Cap nut, 7/16"
- 1 x Sealing cap, 7/16"
- 1 x Manual stop-cock, HDK 6
- 1 x Inspection window, SGN 6
- Assembled and soldered



LCLE expansion valve

SE2675-1P

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Technical data:

- 1 x Valve top section XB 1019 GL-2B
- 1 x Valve fitting, LCLE1
- 1 x Flange, C 501-5 MM
- 1 x Soldered bush HS 7/16"-6
- 1 x Cap nut, 7/16"
- 1 x Sealing cap, DK 7/16"
- 1 x Soldered bush HS 7/8"-16
- 1 x Cap nut, 7/8"
- 1 x Sealing cap, DK 7/8"
- 1 x Adapter end (reducer), 10a-8
- 1 x Copper pipe, DN 16 mm
- 1 x Screw nozzles, AS 7/8" x 3/4"
- 1 x Copper sealing ring, DR 7/8"
- Assembled and soldered



PWM-type electronic expansion valve EEV PT

SE2675-1Q

1

Electronic expansion valve with sensors for temperature and pressure. Using valves that pulsate heavily on individual systems may lead to damage caused by pulsations in pressure.

Technical data:

- 1 x Cold-chamber regulator EC2-352
- 1 x Expansion valve, EX2-M00
- 1 x Jet nozzles, EX0-00X
- 1 x Jet nozzles, EX0-000
- 1 x Jet nozzles, EX0-001
- 1 x Jet nozzles, EX0-002
- 1 x Screw terminals, K02-000
- 1 x Coil, ASC
- 1 x Air sensor, ECN-S60
- 1 x Pipe sensor, ECN-P60
- 1 x Defrost sensor, ECN-F60
- 1 x Cable, ASC-N60
- 1 x Pressure transmitter, PT4-07M
- 1 x Cable, PT4-M60
- 1 x Danfoss sensor sleeve, 068-1211
- 1 x Cap nut, 3/4"
- 1 x Sealing cap, DK 3/4"
- 1 x Soldered bush HS 3/4"-12
- 1 x Soldered bush HS 7/16"-6
- 1 x Cap nut, 7/16"
- 1 x Sealing cap, DK 7/16"
- Assembled and soldered



PWM-type electronic expansion valve EEV TT

SE2675-1R

1

Electronic expansion valve with sensors for temperature and pressure. Using valves that pulsate heavily on individual systems may lead to damage caused by pulsations in pressure.

Technical data:

- 1 x Cold-chamber regulator, EC2-312
- 1 x Expansion valve, EX2-M00
- 1 x Jet nozzles, EX0-00X
- 1 x Jet nozzles, EX0-000
- 1 x Jet nozzles, EX0-001
- 1 x Jet nozzles, EX0-002
- 1 x Screw terminals, K02-000
- 1 x Coil, ASC
- 1 x Air sensor, ECN-S60
- 1 x Pipe sensor, ECN-P60
- 1 x Defrost sensor, ECN-F60
- 1 x Cable, ASC-N60
- 1 x Danfoss sensor sleeve, 068-1211
- 1 x Cap nut, 3/4"
- 1 x Soldered bush HS 3/4"-12
- 1 x Soldered bush HS 7/16"-6
- 1 x Cap nut, 7/16"
- 1 x Sealing cap, DK 7/16"
- Assembled and soldered
- 1 x Sealing cap, DK 3/4"



Continuously controlled expansion valve, EEVEX4

SE2675-1S

1

Electronic valve controlled by a stepper motor with sensors for temperature and pressure and designed for use as an expansion valve.

Technical data:

- 1 x Cold-chamber regulator, EC3-332
- 1 x Connector terminal set K03-331
- 1 x Display unit, ECD001
- 1 x Connecting lead, ECC-N30
- 1 x Expansion valve, EX4-U31
- 1 x Connecting lead, EX5-L60
- 1 x Pressure transmitter, PT4-07M
- 1 x Cable, PT4-M60
- 1 x Air sensor, ECN-S60
- 1 x Pipe sensor, ECN-P60
- 1 x Defrost sensor, ECN-F60
- 1 x Danfoss sensor sleeve, 068-1211
- 1 x Soldered bush HS 7/8"-16
- 1 x Cap nut, 7/8"
- 1 x Sealing cap, DK 7/8"
- 1 x Copper pipe, DN 16 mm
- Assembled and soldered



Continuous overheating controller

SE2675-1T

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Electronic valve controlled by a stepper motor with sensors for temperature and pressure and designed for use as a heating regulator.

Technical data:

- 1 x Heating regulator, EC3-X32
- 1 x Connector terminal set, K03-33
- 1 x Display unit, ECD002
- 1 x Connecting lead, ECC-N30
- 1 x Expansion valve, EX4-U31
- 1 x Connecting lead, EX5-L60
- 1 x Pressure transmitter, PT4-07M
- 1 x Cable, PT4-M60
- 1 x Pipe sensor, ECN-P60
- 1 x Danfoss sensor sleeve, 068-1211
- 1 x Soldered bush HS 7/8"-15
- 1 x Cap nut, 7/8"
- 1 x Sealing cap, DK 7/8"
- 1 x Copper piped 16 mm
- Assembled and soldered



Continuous pressure regulator with EX4 valve

SE2675-1U

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This valve can be used as a hot-gas by-pass or evaporation regulator. When used as an evaporation regulator, a return valve with a static opening pressure difference of 1.4 bars is also needed.

Technical data:

- 1 x Carel pressure regulator, FCM0002000
- 1 x Pressure transmitter, PT4-07M
- 1 x Pressure transmitter, PT4-30M
- 1 x Cable, PT4-M60
- 1 x Stepper motor driver, Alco EXD-U00
- 1 x Connector terminal set, K09-U00
- 1 x Connecting lead, EX5-L60
- 1 x Expansion valve, EX4-U31
- 1 x Soldered bush HS 7/8"-15
- 1 x Cap nut, 7/8"
- 1 x Sealing cap, DK 7/8"
- 1 x Copper pipe, 16 mm
- Assembled and soldered



Continuous pressure regulator with EX6 valve

SE2675-1V

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This valve can be used as an evaporator pressure regulator or suction pressure regulator.

Technical data:

- 1 x Carel pressure regulator, FCM0002000
- 1 x Pressure transmitter, PT4-07M
- 1 x Cable, PT4-M60
- 1 x Stepper motor driver, Alco EXD-U00
- 1 x Connector terminal set, K09-U00
- 1 x Connecting lead, EX5-L60
- 1 x Expansion valve, EX6-U31
- 1 x Soldered bush HS 7/8"- 15
- 1 x Cap nut, 7/8"
- 1 x Sealing cap, DK 7/8"
- 1 x Adapter end (reducer), 28a-18
- Assembled and soldered



DIXELL cold room regulator

SE2675-1W

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Technical data:

- Dimensions: Front 78x37 mm, depth 60 mm
- Assembly: Equipment for assembly on board with an opening of 71x29 mm.
- Supply voltage: 24V
- Power consumption: 3 VAmax.
- Display: numbers, red LEDs, height 14.2 mm.
- Analog inputs: up to 4x PTC sensors or 2x NTC sensors
- Digital input: floating
- Relay output for compressor: 8(3) A250 Vac
- Relay output for defrosting: 8(3) A250 Vac
- Relay output for fan: 5(2) A250 Vac
- Relay output for auxiliary relay: (8(3) A250 Vac
- Ambient temperature for operation: 0..60°C
- Measuring ranges: PTC -50....150°C; NTC -40....110°C
- Resolution: 0.1 K or 1 K or 1°F (configurable)
- Precision at 25°C: ±0.1°C, ±1 digit
- Built into switch cabinet



Universal cold room regulator with real-time clock

SE2675-1X

1

Technical data:

- Refrigeration and heating regulator
- Selectable inputs, NTC10K or PTC
- Energy-saving function usable for saving energy or for additional set-point
- Defrosting in regular cycles or in real time, remote start
- Direct compressor control using 16(5)-A high-power relay
- Optimum evaporator fan regulation
- Absolute or relative temperature alarms and door alarm
- Temperature/pressure monitoring and notifications for evaporator servicing
- Light and stand-by control (on/off)
- Rapid programming via programming keys
- Connection to LAE monitoring systems
- Regulation range: -50.....120°C
- Resolution: 0.1 / 1°; °C / °F
- Precision: NTC10K <±0.3°C (-40.....70°C)
PTC1000 <±0.5°C (-50.....120°C)
- Operating voltage: 115/230V~ ±10% 50/60HZ 3W
- Dimensions: 71x29 mm



Media:

Interactive Lab Assistant: Montage und Inbetriebnahme erweiterter Kälteprozesse

SO2801-1Y

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Montage und Inbetriebnahme erweiterter Kälteprozesse

Der ILA-Kurs zur Montage und Inbetriebnahme erweiterter Kälteprozesse gibt dem Schüler Arbeitsaufträge zur Bearbeitung in der Kältewerkstatt. Wie in der Realität erhält der Schüler Fließbilder und Schaltpläne die ihm helfen die komplexeren Arbeitsaufträge zu bearbeiten.