FläktGroup

Ultra-DENCO®

OPERATION MANUAL

Table of Contents

The following pages demonstrate the possible type code and options for an Ultra-DENCO unit.

Please note that the type code is subject to updates and addition due to our continuous improvement process, therefore for the latest options available please contact your local office.

Basic Unit

D	U	C				D	P	L	N			P		
Product	Range	Cooling system	Unit size			Airflow direction	Panel configuration	Heat exchanger	Compressor control	Humidifier	Filter	Fan	Heating	Power supply
D Denco														
U *Ultra*-Denco														
C Chilled water														
	050 Size 050													
	100 Size 100													
	150 Size 150													
	200 Size 200													
		D Downflow - (bottom discharge)												
		P Front full height panel												
		L Large heat exchanger												
		N Not fitted												
			S Steam humidifier standard conductivity											
			L Steam humidifier low conductivity											
			H Steam humidifier high conductivity											
			N Not fitted											
				4 Filter G4										
				7 Filter G7										
					P EC plug fan									
						E Electric heating								
						R Remote signal 0-10V								
						N Not fitted								
							1 3~ 400 V, N, PE, 50 Hz							
							6 3~ 460 V, N, PE, 60 Hz							
							7 3~ 400 V, N, PE, 60 Hz							

Water

D	U	WA						
Product	Range	Key Water	Shut off valve water	Connection type water	Water temperature monitoring	Valve type	Valve actuator	Valve kv

D	Denco
U	*Ultra*-DENCO
WA	Water
S	Shut off valves chilled water
N	Not fitted
G	Flange pipework connections PN06
F	Flange pipework connections PN16
T	Temperature monitoring probes
N	Not fitted
2	2-way water valve
P	2-way water valve, pressure independent
3	3-way water valve with bypass
B	3-way water valve with bypass & regulating valve
N	Not fitted
D	DODC actuator
0	0-10V actuator, drive open, spring return
N	Not fitted
G	kv = 6.3
H	kv = 10
I	kv = 16
J	kv = 25
K	kv = 40
L	kv = 63
M	kv = 100
X	Small
Y	Standard
N	Not fitted

Controls

D	U	CO												N	N				N	
Product	Range	Key Controls	Controls	Interface BMS	Display	Run status	Water detection	Air sensor	Language	Fan speed control indoor	Air volume flow monitoring	Energy monitoring	Pump signal	Ambient temp. control	Main switch	Smoke Detection	Accessories power supply	DENCO-OfficeCool	Uninterrupted power supply	
D	Denco																			
U	*Ultra*-DENCO																			
CO	Controls																			
C	C5-12 controller																			
N	Not fitted																			
L	LonWorks interface																			
B	BACnet MS/TP interface																			
E	BACnet I/P, SNMP, Webpage interface																			
N	Not fitted																			
T	Touch screen display																			
N	Not fitted																			
R	Run status unit																			
N	Not fitted																			
W	Water detection, sensor tape and drain pan sensor																			
1	Water detection, 1 spot sensor and drain pan sensor																			
2	Water detection, 2 spot sensors and drain pan sensor																			
4	Water detection, 4 spot sensors and drain pan sensor																			
6	Water detection, 6 spot sensors and drain pan sensor																			
N	Not fitted																			
1	Return Air T&H sensor																			
2	Remote Return Air T&H sensor																			
7	Return Air T&H + Supply Air Temp sensors																			
8	Return Air T&H + Remote Supply Air T&H sensors																			
9	Return Air T&H + Remote Supply Air Temp sensors																			
A	Remote Return Air T&H + Supply Air Temp sensors																			
B	Remote Return Air T&H + Remote Supply Air T&H sensors																			
N	Not fitted																			
S	Standard languages																			
O	Other language (special)																			
N	Not fitted																			
P	Floor void air pressure control (APS)																			
S	Fan speed control cooling demand																			
N	Not fitted																			
V	Air volume flow monitoring																			
N	Not fitted																			
E	Energy monitoring																			
N	Not fitted																			
N	Not fitted																			
N	Not fitted																			
M	Main switch																			
D	Automatic transfer switch (Dual power supply)																			
S	Smoke detection																			
N	Not fitted																			
P	Condensate pump																			
T	Trend BMS interface																			
1	Condensate pump and Trend BMS interface																			
N	Not fitted																			
N	Not fitted																			
U	Uninterrupted power supply controls																			
N	Not fitted																			

Casing

D	U	CA	B					S			
Product	Range	Key Casing	Connection position	Display position	Unit colour	Filter gauge	Air grille unit top	Panel	Installation wheels/Adjustable Feet	Packaging	Fan Protection
D	Denco										
U	*Ultra*-DENCO										
CA	Casing										
B	Pipework bottom entry										
S	Standard display position										
L	Lower display position										
N	Not fitted										
R	White Laminate, A47SME										
O	Other unit colour (special)										
G	Filter differential pressure gauge										
N	Not fitted										
2	Top air inlet protection grille (Eggcrate)										
P	Prepared for loose air damper										
N	Not fitted										
S	Standard panels										
F	Fan Section Adjustable Feet										
N	Not Fitted										
S	Standard packaging (Domestic)										
E	Wooden crate packaging (Export)										
P	Standard packaging (Domestic) with unit protection sheets										
F	Wooden crate packaging (Export) with unit protection sheets										
C	Container packaging										
S	Standard (4-way airflow grilles)										
T	Standard (4-way airflow grilles) - Front Connections										
U	Standard (4-way airflow grilles) - Side Connections										
W	Wall Configuration (3-way airflow grilles)										
X	Wall Configuration (3-way airflow grilles) - Front Connections										
Y	Wall Configuration (3-way airflow grilles) - Side Connections										

Accessories

D	U	AC		
Product	Range	Key Accessories	Unit size (indoor)	Accessory

D	Denco
U	*Ultra*-DENCO
AC	Accessories
050	Size 050
100	Size 100
150	Size 150
200	Size 200
BAS	Basestand
TIL	Basestand with Raised floor tile supports
PUM	Condensate pump
PUH	Condensate pump with humidifier
DAMT	Shut off damper (Top Mounted)
DAMB	Shut off damper (Bottom Mounted)
TRA	Under unit drip tray
FI4	G4 Spare filter set
FI7	F7 Spare filter set
REMC	Remote monitoring touch screen display (Carel)
TOU	Touch up paint kit
D10	Ceiling connection duct 100 mm
D15	Ceiling connection duct 150 mm
D20	Ceiling connection duct 200 mm
D25	Ceiling connection duct 250 mm
D30	Ceiling connection duct 300 mm
D35	Ceiling connection duct 350 mm
D40	Ceiling connection duct 400 mm
D45	Ceiling connection duct 450 mm
D50	Ceiling connection duct 500 mm
D55	Ceiling connection duct 550 mm
D60	Ceiling connection duct 600 mm
D65	Ceiling connection duct 650 mm
D70	Ceiling connection duct 700 mm
D75	Ceiling connection duct 750 mm
D80	Ceiling connection duct 800 mm
D85	Ceiling connection duct 850 mm
D90	Ceiling connection duct 900 mm
D95	Ceiling connection duct 950 mm
D99	Ceiling connection duct 1000 mm
TRE	Trend BMS interface
FB06	Connection Kit, Flange, Bottom Connection, PN06
FB16	Connection Kit, Flange, Bottom Connection, PN16
FS06	Connection Kit, Flange, Side Connection, PN06
FF06	Connection Kit, Flange, Front Connection, PN06
TS06	Connection Kit, Male Thread, Side Connection, PN06
TF06	Connection Kit, Male Thread, Front Connection, PN06
SS06	Connection Kit, Solder, Side Connection, PN06
SF06	Connection Kit, Solder, Front Connection, PN06
FS16	Connection Kit, Flange, Side Connection, PN16
FF16	Connection Kit, Flange, Front Connection, PN16
TS16	Connection Kit, Male Thread, Side Connection, PN16
TF16	Connection Kit, Male Thread, Front Connection, PN16
SS16	Connection Kit, Solder, Side Connection, PN16
SF16	Connection Kit, Solder, Front Connection, PN16

1 Overview of units and scope of supply

1.1 Introduction

We would like to thank you for purchasing our product.

Ultra-DENCO units are intended and designed for indoor installation for cooling, heating, humidification, dehumidification and filtering of air at atmospheric pressure. The units are designed exclusively as chilled water systems, using chilled water or a glycol mixture. It is prohibited to use our units for any other purposes. The equipment has been designed and manufactured within a Quality Assurance System within a strictly controlled environment to ensure that it reaches you in perfect condition.

For help, assistance, spares or your local office, please visit the following website for contact details in your region:

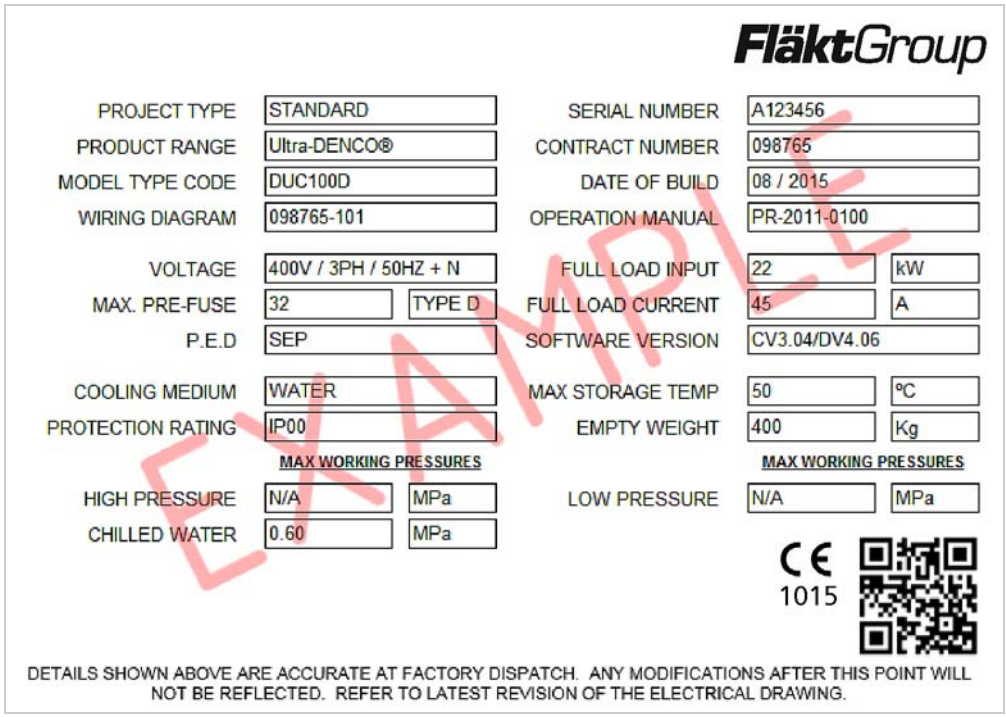
https://www.flaktgroup.com/en/contact-us

1.2 Model number explained

Each product carries an 'Identification Plate' (sometimes referred to as a 'serial plate') inside the equipment. This identification plate carries information that is important and unique to the unit.

Upon receipt of your equipment it is important to check the 'MODEL NUMBER' (a shortened version called 'Model Type Code' is shown on the serial plate) of the equipment, prior to positioning and installation, to ensure it matches your requirements. Any discrepancies should be reported immediately to your representative.

Refer to page 4 for the type code of a particular unit. Below shows an example serial plate for an *Ultra*-DENCO unit.



1.3 Product series overview

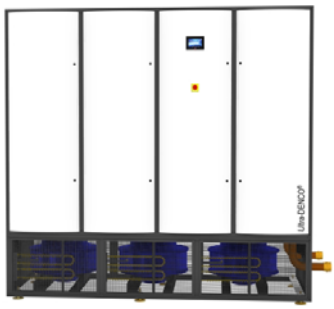


Fig. 1-1: DUC150D

Ultra-DENCO units are only available as chilled water versions.

Common features & options

- 4 standard box sizes (050, 100, 150 and 200)
- Cooling capacities up to 200 kW
- Available only with downflow air path
- Large EC plug fans
- Integrated and/or remote temperature and humidity sensors
- Large surface area for heat exchanger coil
- Full height panel doors
- Fans are mounted below the unit in the raise floor void
- Humidification and heating options available
- Standard control software and hardware
- Building Management System (BMS) interface compatible
- Water based cooling and can operate with glycol
- Can be provided with 3-way or 2-way valves and a variety of actuators

1.4 Scope of supply

A typical order of an *Ultra*-DENCO unit could consist of (but is not limited to):

- **Indoor unit** of *Ultra*-DENCO configuration with associated internal options fitted (for items requiring installation external to the unit, hardware is provided loose within the unit)
- **Unit documentation**
  - A copy of the current operation manual
  - Controls manual
  - Wiring diagram(s)
  - Dimensional drawing
  - Spare part list in the form of a label on the indoor unit
- **Accessories** (optional) Any other accessories that may be required for the indoor unit, for example; base stands, ceiling return sections etc. may be provided in separate packaging

1.5 Accessories and special equipment

Ultra-DENCO units can be designed with a vast number of accessories and features. To determine the scope of accessories fitted to your unit, compare the supplied unit 'Model Number' with the unit model number specified in the typecode.

1.6 Directives and regulations

We certify that products supplied within the range of *Ultra*-DENCO conform to, meet and/or exceed the requirements of the following directives and regulations:

– Directive on Machinery 2006/42/EC
– Low Voltage Directive (LVD) 2014/35/EU
– Electromagnetic Compatibility (EMC) Directive 2014/30/EU

1.7 References within manual

The following references to standards and regulations are made within this manual. These may be updated or revised by their relevant bodies, after publication of this manual or in between revisions. In all instances, review the latest versions for any relevant updates.

EN ISO 3745

2006/42/EC

2014/30/EU

2014/35/EU

2014/68/EU

EN 60204-1 ed.3

2008/98/EC

2012/19/EU

2 Safety and user information

The *Ultra*-DENCO range is designed in accordance with state-of-the-art technological and engineering standards as well as conforming to recognised safety regulations.

It must be used in an appropriate manner for suitable purpose. You must follow the guidelines within this manual and take account of any potential hazards.

Failure to follow the instructions within this manual may result in material damage, incorrect operation or danger to health and safety. This manual attempts to give advice on as many potential risks or hazards as possible, however it is unable to account for all potential situations.

Therefore, all users **must** employ, or be qualified as, a trained professional to assess and minimise any potential hazards, **before** handling the *Ultra*-DENCO unit or accessories.

2.1 Availability of the operation manual

This operation manual contains important information regarding safe and correct operation of the unit.

This manual must always be available at the site where the unit is operating. Every person working on the equipment must read this manual fully before commencing any work. They must observe and understand all relevant information before performing a task.

The operation manual is intended to be used by:

– Fitting and installation companies
– Building service engineers
– Technical personnel
– Electrical and mechanical specialist

2.2 Scope of the operation manual

THIS IS AN ORIGINAL OPERATION MANUAL VERIFIED BY THE MANUFACTURER.

This document has been developed by the manufacturer specifically for the *Ultra*-DENCO range. Information within this manual may be common to other designs or products, but this manual is **exclusive to *Ultra*-DENCO** and is **non-transferable**. The information should not be used as a basis for any other products.

Every effort is made to ensure this manual is fair and accurate, but FläktGroup endeavours to continuously update and improve all of our products. Due to this continuous development, some information contained within this manual may become outdated or no longer relevant. If you are in any doubt regarding any information contained within this document, please contact your local sales or support representative who will be happy to assist you further.

This operation manual covers topics in the following areas:

– Safety and user information
– Technical descriptions
– Shipping and storage
– Installation
– Mechanical and electrical connections
– Commissioning
– Operation
– Servicing and maintenance
– Troubleshooting
– Disassembly

Note!
Refer to the separate manual for controls and controller instructions.

Note!
This manual is valid only for configurations built from our **standard catalogue**. Any units designed or supplied as non-standard (sometimes referred to as '**Engineering Specials**'), may not be covered by previous, existing or future documentation.
Please refer to your sales/support contact for information regarding non-standard designs.

2.3 Document format

Important information for each chapter will be highlighted in the following format:

Note!
Here you will find additional details on using the *Ultra*-DENCO unit.

– This symbol is used to indicate normal lists.
• This symbol indicates instructions to follow.
✓ The result of an action is indicated with this symbol.

2.4 Signs used within this manual

2.4.1 Mandatory signs


General Mandatory Sign


Refer to manual or documentation


Wear ear protection


Wear eye protection


Wear safety footwear


Wear protective gloves


Wear protective clothing


Wear a protective mask


Guards must be used during operation

2.4.2 Prohibition signs


General prohibition sign


No smoking


No open flame, fire, open ignition source

2.4.3 Warning signs


General warning sign


Warning of low temperature


Warning of electricity


Warning of suspended loads


Warning of toxic substances


Warning of hot surfaces


Warning of automatic starting machinery


Warning of sharp elements


Warning of crushing to limbs


Possible damage to machinery


Environmental damage

2.5 Labelling of safety information

The following symbols and notices are provided in appropriate places throughout this document to designate the safety instructions:

2.5.1 DANGER – death/serious irreversible injury

⚠ DANGER

Indicates an extremely hazardous situation which **will result in death or serious irreversible injury**, if the safety instruction is not followed.

Example:

⚠ DANGER

Electrocution through hazardous voltage will lead to death or serious injury!

- Disconnect all electric power and ensure the power cannot be inadvertently energized.
- Verify that all circuits are de-energised, earth, short-circuit and lock off all neighbouring live parts.

2.5.2 WARNING – death/serious injury

⚠ WARNING

Indicates a hazardous situation which **can result in death or serious irreversible injury**, if the safety instruction is not followed.

Example:

⚠ WARNING

Untested or unused electrical systems pose high risks of faults.
Unsafe operation on these systems can lead to death or serious injury.
Before conducting the below checks:

- Ensure all electrical connections are isolated
- Checking the unit is voltage free
- Switch off all circuit breakers (MCBs)

2.5.3 CAUTION – minor or moderate injury

⚠ CAUTION

Indicates a hazardous situation which **can result in minor or moderate injury**, if the safety instruction is not followed.

Example:

⚠ CAUTION

Injury due to sharp cutting edges!

- While cleaning care should be taken to prevent risk of injury due to thin fins.
- Wear protective gloves

2.5.4 *NOTICE* – Environmental or material damage

NOTICE

Indicates actions that can result in equipment or property-damage only accidents.

Examples:

	NOTICE
	**Environmental Damage!** • Dispose of all components and materials (such as water-glycol mix) depending on material type in an environmentally friendly manner and in accordance with the local codes, practices and environmental regulations.

	NOTICE
	**Damage to the unit!** • Do not mix up cables during connecting. • Use the unit wiring diagram to check electrical cablings.

2.6 Safety-conscious working

The following is general advice. Specific information can be found in relevant chapters in this manual.

2.6.1 At all times

	⚠ WARNING
	Filters (especially used or dirty filters) are easily flammable. – No smoking is allowed in direct proximity of any aspect of the *Ultra*-DENCO system. – No open flames near the system.

You must wear suitable Personal Protective Equipment (PPE) at any point working on an *Ultra*-DENCO unit. As a minimum we recommend to:

- Wear safety footwear
- Wear eye protection
- Wear protective gloves
- Wear protective clothing

If operating for a prolonged period of time, noise reducing ear protection may be required.

- Always conduct your own personal risk assessment to evaluate any further requirements.

2.6.2 During installation & commissioning

At these times there are higher risks involved with the handling and operating around an *Ultra*-DENCO system. Further information is provided in Chapters 4 to 8.

- Always refer to the latest operation manual and technical documents provided with the unit.
- Do not make assumptions based on other products design or documentation.
- If in doubt, contact your local sales office.

- Protect against unauthorised access.
- Do not use or employ un-qualified or inexperienced workers to install, commission or service the *Ultra*-DENCO system.

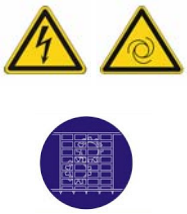
During installation there is a higher chance of leaks of refrigerant or glycols.

Before adding any cooling medium, ensure:

– Any system pipework is thoroughly tested for leaks

– Use non-polluting methods for testing purposes, e.g. Oxygen Free Nitrogen (OFN)

2.6.3 When unit is operational



⚠ WARNING

At any time the unit is operational, rotating machinery and electrically charged components are present. When the unit is not electrically isolated:

- Ensure all guards and doors are closed.
- Only remove guards or open doors:
  - When the unit has been electrically isolated.
  - Sufficient time has been allowed for the rotating fan momentum to cease.
  - Sufficient time has been allowed for inverter circuits to discharge.

Information regarding 'Fan touch protection' can be found in Chapter 5.5.7.

Further relevant information is provided in Chapters 9 to 11.

2.6.4 Systems containing glycol

NOTICE

Properties of different glycols can vary significantly between types and manufacturers

- Always refer to manufacturer's information for usage guidelines
- Always handle and dispose in accordance with local codes, practices and environmental regulations.

General features of glycols:

– Usually mixed with water.

– Can reduce the freezing temperature point of the mixture.

– Reduces cooling capacity when compared to water-only systems.

Further information can be found in Chapter 6 and Chapter 8 of this manual.

2.7 Proper use

The *Ultra*-DENCO series are designed as indoor units and for connection to a heat rejection system. They are designed for cooling, heating, humidification, dehumidification and filtering of air at atmospheric pressure.

Proper use also requires:

– Fulfilling the requirements of any operation manual
– Fulfilling the requirements of any controls manual
– Regular inspection and maintenance

Improper use

Any other use is considered **improper**. The manufacturer/supplier is not liable for damage arising from improper use. The user alone bears any risk or cost that can be attributed to 'improper use'.

It is not allowed to operate units:

– in explosion risk areas
– in areas with strong electromagnetic fields
– in environment with high levels of air contamination
– (unless otherwise stated) in environments with corrosive and/or aggressive air e.g. areas near large volumes of salt water

2.8 Modifications and changes

Any modification or change to *Ultra*-DENCO units, after dispatch, that is not covered by this manual, are subject to approval by FläktGroup. Non-compliance with these requirements could invalidate the CE Conformity or void the warranty.

2.9 Spare parts

Only original spare parts from FläktGroup are allowed. Use of third party spare parts are not allowed and are at the user's own risks. If in any doubt as to the spare part required, please contact your local sales representative who will be able to assist.

2.10 Disposal

All equipment, materials and accessories must be disposed of in a safe and environmentally friendly manner. Always respect and fulfill any legislation that may affect your region.

2.11 Personnel selection and qualification

- Any individual working on the unit must read and understand all of this manual before starting any works.
- Any individual working on this system shall be suitably qualified and licensed.
- All personnel involved with the system must understand and observe any local legislation regarding safe working practice.

2.12 Noise

The sound power level of the unit can rise up to 100 dB(A) according EN ISO 3745 accuracy class 1.

2.13 Environmental considerations

Chilled water as a cooling medium may contain impurities or chemicals (such as glycol) requiring disposal according to local or regional codes, practices and environmental regulations.

FläktGroup recommends that at all stages of our product life cycle (purchase, install, maintenance and disposal) careful consideration is given to ensure minimal environmental impact.

Further information about our policies and values can be found on our website:

www.flaktgroup.com

3 Technical description

3.1 Unit description

Fig. 3-1: Ultra-DENCO Size 150

Ultra-DENCO units are designed for indoor installation (no exposure to outdoor weather) and must be connected to a chilled water network. *Ultra*-DENCO has been specifically design to meet the requirements of high performance data centre cooling.

All *Ultra*-DENCO units recieve warm air from the top of the unit and deliver cold air at the bottom. The airflow can be directed using accessories such as: fan section covers, ceiling return section, base stands and dampers.

Ultra-DENCO units are available in 4 sizes from (WxDxH) 1335x900x1960 mm to 3310x900x1988 mm. On all units, the 550 mm tall fan section is installed in the floor void. This fan section spans the complete width and depth of the unit.
Ultra-DENCO units come with a wide variety of accessories and options allowing each unit can be tailored to your needs.

Once you have received your *Ultra*-DENCO unit, typical onsite tasks include (but are not limited to):

- Installation and positioning of units
- Connection of pipework to a chilled water network
- Connection to a mains condensate drain
- (If fitted) connection of humidifier to mains water supply and drainage
- Connection of electrical power supply
- Connection of communication cabling
- Installation of accessories supplied 'loose' (e.g. water detection tape)
- Commissioning
- Configuration of network settings

3.2 Operating limits

***Ultra*-DENCO**	**Unit**	**C-Version**
Indoor Temperature (Min)	°C	10
Indoor Temperature (Max)	°C	40
Indoor Humidity (Absolute) (Min)	g/kg	2
Indoor Humidity (Absolute) (Max)	g/kg	18
Water Inlet Temperature (Min)	°C	6
Water Inlet Temperature (Max)	°C	36
Water Outlet Temperature (Min)	°C	8
Water Outlet Temperature (Max)	°C	38
Water Flow Rate (Min)	l/s	0.1
Water Flow Rate (Max)	l/s	10
Glycol Concentration (Min)**	%	20
Glycol Concentration (Max)**	%	50
Max. Operating Pressure	MPa	0.6 *

* 0.6 MPa for standard design. 1.0 MPa option available.

** Representative of Propylene only, other glycols may have different concentration limits.

3.3 Operating modes

A basic *Ultra*-DENCO unit is for cooling only. Electric heating or an humidifier can be added for low temperature or humidity control.

Cooling

The main function of a close control unit is to cool the air within a room to a defined set point. This is accomplished by adjusting the water control valve position and the indoor fan speed.

Heating (if fitted)

If the indoor temperatures are too low then the heating function will be activated. When heating is required, the fans may increase their speed. Heating may be available as on/off control, thyristor proportional control or low pressure hot water (LPHW) heating.

Humidification (if fitted)

If the humidity levels are below the set point then the humidifier will be activated to add more moisture to the air. The amount of moisture added to the air can vary proportionally to the demand, with the humidifier able to operate between 25 - 100% of its rated capacity.

Dehumidification (if fitted)

Dehumidification is achieved by increasing the cooling output and reducing the fan speed to produce condensate on the cooling coil. To prevent over-cooling, the air can be re-heated (if options fitted).

Dehumidification mode is only enabled if temperature control is within a suitable range. If the control temperature falls outside of this range, dehumidification is disabled and temperature control take priority.

3.4 Operating strategies

Ultra-DENCO's inbuilt advance software combined with the latest EC variable technology and networking capability, enables the unit to operate with intelligent control strategies to increase performance and maximise energy savings.

Duty/standby

If connected in a network, *Ultra*-DENCO units can be configured with some as active (duty) and others as backup (standby). This is for rooms with N+1, 2N or 2(N+1) requirements, where N represents the number of units required to achieve a design capacity.

If any alarm occurs on a particular unit, the backup (standby) unit(s) can be activated to maintain the room conditions.

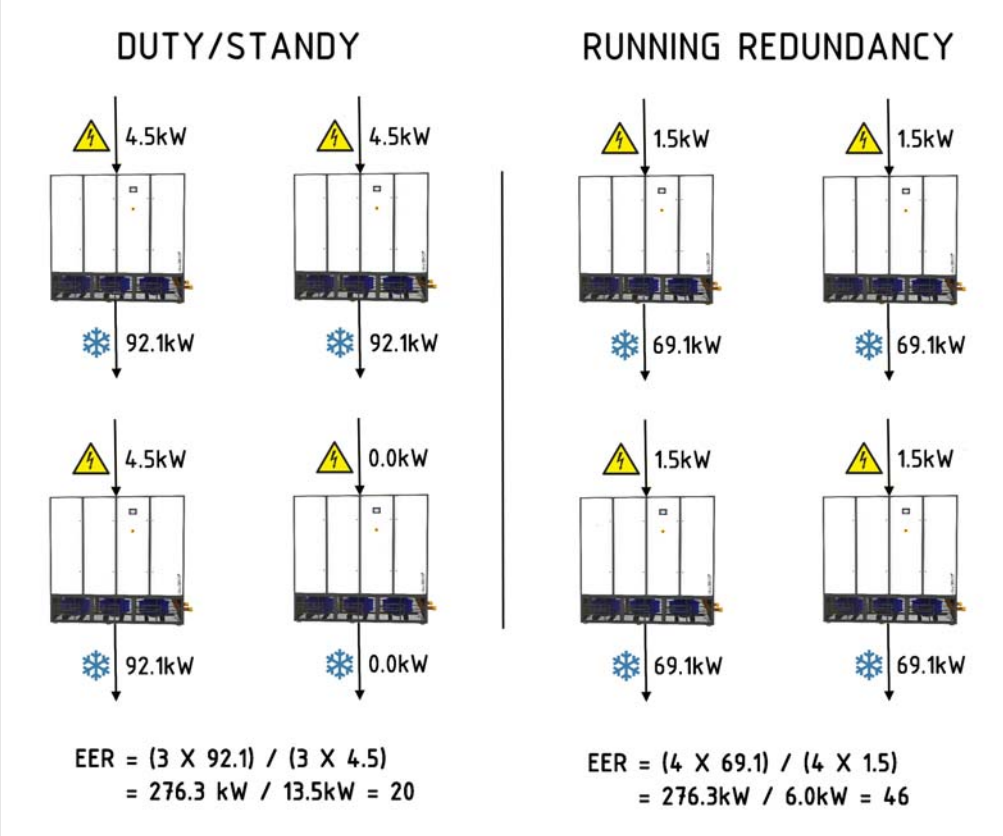
The network of units can be configured so that the unit(s) designated as 'standby' is changed over after a pre-set period to ensure even wear over their lifetimes.

We recommend a duty/standby strategy for rooms where the heat capacity is low compared to the design capacity.

Running redundancy

Running all units in part load conditions (hot standby) can provide significant energy saving compared to duty/standby. Each unit has the ability to increase their cooling output if a fault is developed on one unit, ensuring redundancy is maintained.

The diagram shows an example of the energy savings available:



Sensor averaging

Sensor averaging can be calculated on temperature, humidity or both, when *Ultra*-DENCO units are connected in a network. Each unit sends their sensor readings to every other unit in the network. Each unit then takes all the values and calculates the average.

This gives the advantage of balancing the cooling requirements across all of the units within a room. The software has features to allow for sensor, communication or unit failure, so that the values do no distort the average value and the unit can change back to 'stand-alone' if necessary.

Automatic Pressurisation System (APS)

APS creates a constant pressure in the floor plenum by the *Ultra*-DENCO unit. This can help reduce hot spots and allows for fast reaction to changes in airflow.

This also saves energy as the *Ultra*-DENCO fans only supply the same amount of air to the floor void, as the amount of air being removed by servers.

For datacentres, this feature can be especially efficient when combined with cold-aisle containment.

3.5 Components

1. Casing

The casing design gives the unit a high level of air tightness. The side and rear panels are flat and are flush with the edge of the frame. The front doors are curved and are removable during servicing. All panels are lined with 25mm thick non-eroding, non-combustible insulation and all doors use Southco locks to give a high quality air seal.

The frame is black anodised aluminium and the panels are white PVC coated steel. Other panel colours are available on request.

2. Touch screen display

A 4.3" colour touch screen display is mounted into one of the front doors of the unit (standard configuration). Settings are separated into three levels with passwords for each. The display can switch between several languages, has different screen savers for healthy and alarm status and shows alarms in plain text.

3. Microprocessor control

The microprocessor can control all the functions for cooling, heating, humidifying and dehumidifying. It can monitor all digital and analogue inputs and outputs and can be connected in a network between units. The controller can output to the BMS standard RS485, but other BMS interfaces can be installed into the controller.

As an additional option, the controller can be fitted with an UPS capacitor to enabling the powering of the controls for over 1 minute during a power outage. This feature removes the start-up time of the unit when the power supply is restored.

4. Cooling coil

The cooling coil is inclined within the unit and uses copper tubes and rippled aluminium fins to give high performance. To prevent condensed water entering the supply air, an intermediate drip tray collects water into a larger drip tray, which is mounted to the bottom of the coil.

5. EC fans

All *Ultra*-DENCO units use direct driven, variable speed, high efficiency EC plug fans with 7 backward curved, three dimensional profiled blades as standard. The impeller is optimally balanced according to ISO1940 and fan speed modulates on standard settings.

The fan is made of a composite material and variable speed regulation is performed using a 0-10V controller signal. An EC drive motor with an internal overload protection is integrated in the fan. Fan operation is monitored using a current relay and in the event of a fan failure, all other functions are interlocked, to prevent their operation.

6. Filters

Ultra-DENCO units are provided with G4 class filters as standard, with high efficiency G7 filters or G4 washable filters (Asia Only) available. The filters are positioned directly in front of the coil and are replaceable from the front of the unit. Alternative filters can be supplied upon request.

7. Humidifier

A humidifier can be supplied to control low humidity. The electrode boiler cylinder generates sterile, odourless and mineral deposit free, steam. It has a proportional output with an adaptive drain cycle for increased cylinder life. An inlet hose for the untreated mains cold water supply plus drain connection are provided along with a manual drain down function to empty the cylinder when servicing.

8. Electric heater

Units with electrical heating are equipped with sturdy sheathed elements with stainless steel finning and rated to operate at black heat in order to prevent annealing conditions and sparking. Overheat protection is provided through a thermostat (Klixon).

9. Chilled water valve & actuator

A variety of 3-port and 2-port are available with the *Ultra*-DENCO unit. All valves are fully modulating and are installed within the return water pipework. Actuators are available in 2 versions:

– Drive Open Drive Close (DODC)
– 0-10 V control

These options, combined with the variety of valves, ensure that you have a valve and actuator combination that meets your needs.

10. Pipework connections

Ultra-DENCO units can be provided with several pipework connections to suit your onsite needs. These can be flange, external thread or solder ready connections. The connection point can be made to the front, rear or right hand side of the unit (as you face the unit) and can be provided as PN06 or PN16 rated.

11. Fan grilles

These grilles are fitted to all sides of the fan section to give protection from the rotating fan. Different versions of the grilles can be supplied when pipework connections are required.

Special requirements such as cover strips for floor voids smaller than 550 mm can be made upon request, please contact your local sales office for information.

12. Condensate drain

This is the connection point for the unit's condensate drain. The drain has taken water from condensate tray under the coil and has a U shaped trap to prevent return of air from the drainage system.

13. Electrical connection terminal

Some *Ultra*-DENCO unit may have an electrical box installed in the fan section. This is for joining electrical connections between the components in the fan section (fans, electric heaters, water detection) and the main electrical panel in the coil section.

4 Shipping and storage

4.1 Delivery

On receipt, the equipment should be carefully checked against the dispatch note and examined for completeness and damage.

Note!
Any items missing from the dispatch note or any damage to items must be reported to the transport company or associated insurance company.

- Take photographs of all visible transit damage.

Note!
We recommend keeping the equipment in the original packaging for protection and ease of handling duriing shipping and storage. Remove the original packaging only just before installation.

If the unit is stored for a period of time before installation or commissioning, it must be protected from the elements and build-up of dust and dirt!

4.2 Handling

⚠ DANGER

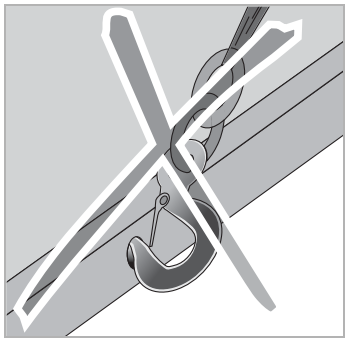
Ultra-DENCO units are heavy and can have a high centre of gravity. Failure to safely secure the equipment may result in death or serious injury.

- See the unit's serial plate or documents for weight information.
- Always use proper and suitable lifting equipment for each movement.
- When lifting secure the unit against tilting.
- Never stand beneath suspended loads.

As a minimum for handling and shipping, we recommend wearing:

– Safety footwear
– Protective gloves

- Conduct your own risk assessment to evaluate the need for any additional PPE.



When handling an *Ultra*-DENCO unit:

- Only use the designated lifting points.
- Never attach lifting hooks or similar gear directly to the unit construction.
- Use proper and appropriate lifting gear.
- When handling and shipping, do not tilt the unit by more than 15°.
- When lifting a unit with slings, leave the bottom packing pallet in place, then position spreader bars at the top.

- Before lifting or shipping the unit, make sure that all mountings are fixed and secured.
- Only use lifting gear with sufficient load carrying capacity.
- Never use damaged lifting equipment.
- Ropes/chains shall not be knotted or be exposed to sharp edges.
- Only use ropes/chains of the same length.
- Move the unit carefully without fast irregular movements.
- Always set the unit down gently, without a large impact.
- Take steps to avoid twisting the unit frame during positioning.
- If necessary, use a specialist company to transport and position the unit.

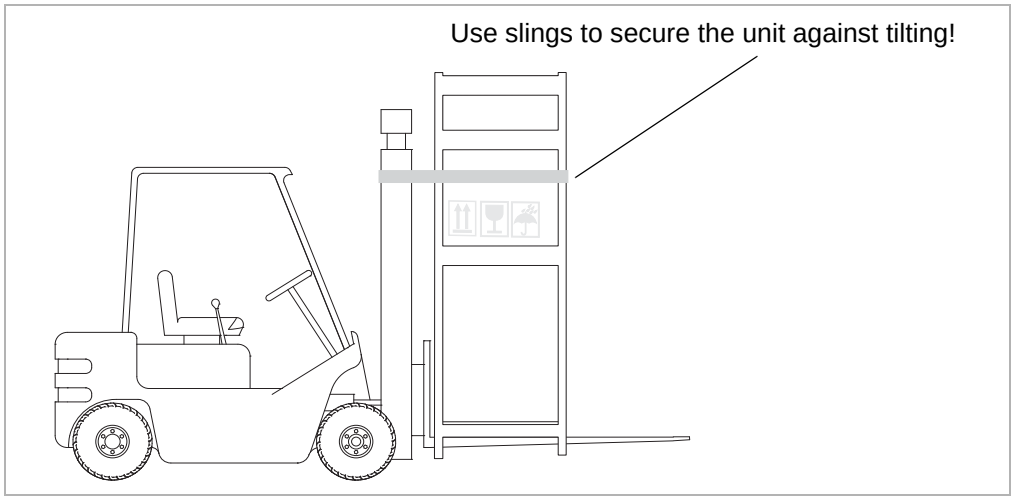


Fig. 4-1: Handling of unit in export packing and wooden crate

Note!
The only valid dimensional drawing is enclosed with the unit documentation.

Unit placement is covered by Chapter 5.3.

4.3 Storage

Storage conditions for uninstalled units

Air temperature: -20 °C to +50 °C

Air humidity: up to 90 % (relative humidity with no condensation)

During storage, the unit and packaging must be in a protected environment and not exposed to the outdoor environment.

5 Installation

Note for unit assembly and installation!
Only suitably qualified personnel may carry out placement, assembly and installation. They must comply with any applicable health and safety legislation and safe working practices.

Moving the unit after installation!
Every time the unit is moved or relocated it must be re-commissioned.

As a minimum for handling and positioning, we recommend wearing:
– Safety footwear
– Protective gloves
• Conduct your own risk assessment to evaluate the need for any additional PPE.

5.1 Requirements and considerations

Refer to the unit's dimensional drawing for weights and dimensions.

5.1.1 General requirements

NOTICE

Dusty environments can damage electronic printed circuit boards.
• Ensure the *Ultra*-DENCO unit is protected from dust during installation
• Clean the unit before first use

Humidity sensors can be damaged by aggressive vapours (e.g. chlorine or acetone)
• Ensure possible vapours are removed from the local environment before installation
• Ensure the room has a good 'air tightness' to prevent any entry of vapours.

– Ensure that the floor is level and that it can support the weight of the equipment.
– The unit should be set in an upright position - level in both directions. Failure to perform levelling correctly may cause operational problems, particularly drainage. Misalignment of panels will indicate that the unit is not level.
– The unit should be installed so that it is only accessible to trained and authorised personnel.
– Sufficient clearance in front of the unit must be provided for maintenance and service.

5.1.2 Noise consideration at installation site

It is important to consider noise requirements before installation.

When planning or installing units, consider:

– the acoustic properties of the room - soft furnishings, curtains and carpets tend to reduce sound reflections. Bare walls and vertical surfaces increase sound reflections resulting in higher noise levels.
– Equipment placed alongside a solid wall can transmit noise through and along the wall into adjacent areas.
– Floors with high deflections (e.g. wooden floors) can amplify noise produced by the unit.

The following suggestions may help minimise noise issues, depending on site conditions:

– Ensure that any vertical panels directly in front of the unit are acoustically insulated.
– Where units are situated in equipment rooms/cupboards, acoustic treatment of the walls and ceiling reduces room noise levels.
– Acoustic pads may be placed behind equipment to reduce wall transmissions.
– Panels and cables in the air flow can cause vibrations and produce noise. Rigidly support these components to a solid structure.
– Positioning close control air handling units on building columns or supporting elements of the building to try to minimise noise transmission on the building. Steel floor framing for unit equipment may be used for this purpose.
– Acoustic rubber pads for vibration insulation may be used beneath the equipment.
– Abrupt bends in pipework should be avoided by fitting long turn elbows or forming long radius bends.
– Where pipes pass through walls or partitions, an oversize sleeve to be packed with suitable insulation material is recommended.
– Insulate and rigidly support interconnecting pipework to the building structure.

5.2 Clearances and access

5.2.1 Clearance

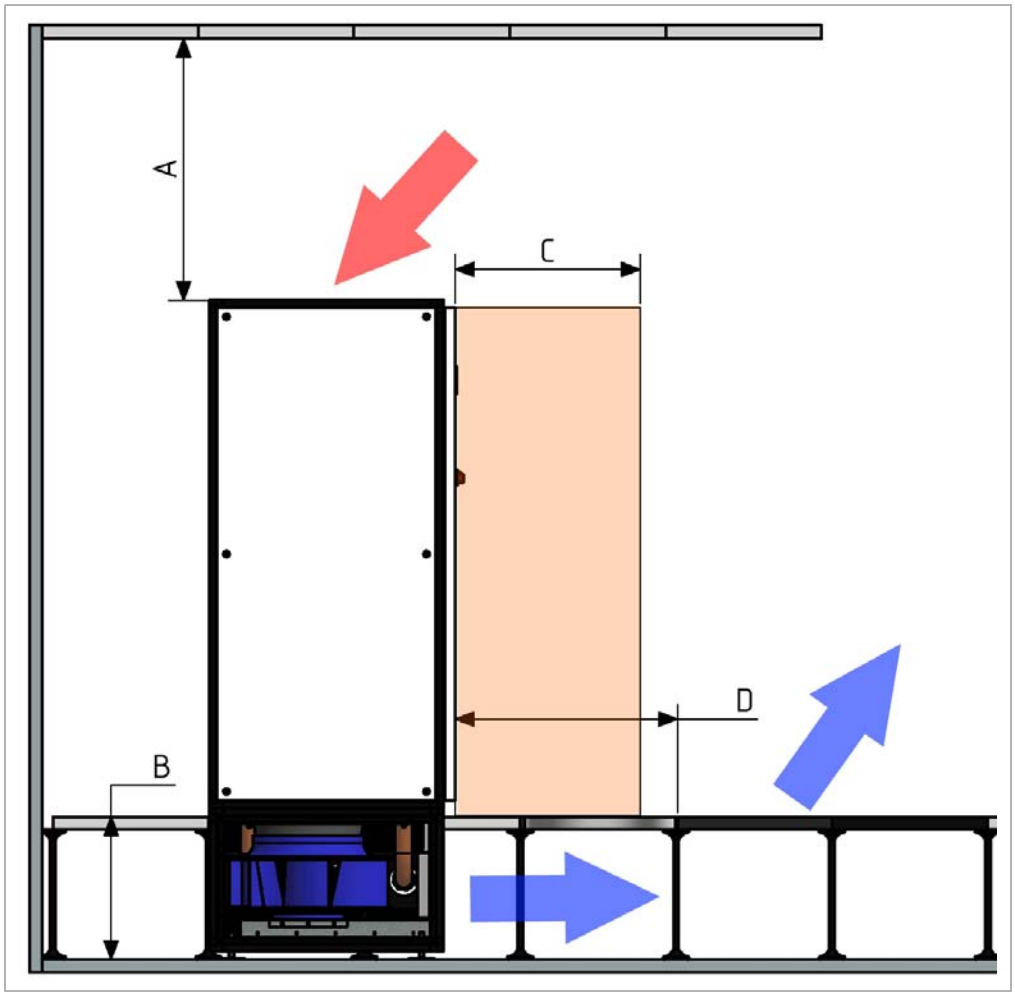


Fig. 5-1

Size	Unit Width mm	Nominal Airflow m^3/s	Clearance above unit (A) mm	Floor Void (B) mm	Service Access (C) mm	Distance to first tile (D) mm
050	1335	2.80	500	550	900	2000
100	1995	5.70	600	550	900	2000
150	2650	8.50	650	550	900	2000
200	3310	11.36	700	550	900	2000

Tab. 5-1

Columns A and D are **recommended minimum values** to ensure satisfactory operation by your *Ultra*-DENCO unit.

Column B is the minimum value for standard configuration for the fan section. Special design fan sections are available with floor voids less than 550 mm.

Column C is the **mandatory minimum values** to ensure service access for your *Ultra*-DENCO unit.

Note!
Column C is **ONLY** the minimum service requirements and does not reflect any health and safety regulations or requirements affecting your installation.

No clearance is required on the rear-side of the unit.

5.2.2 Access

Ultra-DENCO has been designed with service access exclusively through the front doors of the unit (the curved doors). Access to the right hand side panel (as you face the unit) can increase the speed of service, but is not mandatory. If any pipework connection kits are used then consider future servicing requirements.

Ultra-DENCO units are compact and efficient design, therefore the larger the clearance all around the unit, the easier service and repair work can be conducted.

5.2.3 Removing panels

⚠ CAUTION

Doors and panels can weigh up to 11kg and easily tip and fall.

- Ensure panels are held in place when fixings are being removed.
- Ensure doors are properly attended when being removed.
- Use access platforms for units that are installed above floor height.

- To open up the front panels, use the special key (supplied with the unit) to release the 1/4 turn compression locks.
- Before removing a door with a display remove the cable to the C5-12 controller.
- Release the upper hinge retainer and remove panel.
- To reinstall the doors, first lift the panel and clip into the bottom retainer. Release the top retainer, shift the panel upwards to the unit and clip into the top retainer.
- The rear and side panels can be removed by unscrewing six screws (per panel).

5.2.4 Ductwork

On units where ductwork is to be fitted, ductwork connections must be completed before any pipework and electrical connections are made.

Note!
Care must be taken when fixing ductwork to the unit that all panels and metal plates can be removed and are not impeded by rivets, 'tec-screws' and other fixings!

5.3 Unit placement

Generally, it is easier to install the base stand and fan section before the raised floor is completed. The heat exchanger section can then be positioned after the floor has been installed. Reuse transport packing to provide protection whilst positioning.

⚠ DANGER

Ultra-DENCO units are heavy and can have a high centre of gravity. Failure to safely secure the equipment may result in death or serious injury.

- Never stand beneath suspended loads.

⚠ CAUTION

Ultra-DENCO units are heavy and can have a high centre of gravity. The unit, or parts of the unit can, tip and fall. Failure to safely install the equipment may result in death or serious injury.

- Secure the unit against tipping before removing the unit from the pallet.
- Do not lean against or lean objects against the unit.
- Do not expose any part of your body, limbs or hands to the space between the unit and any substructures (see Chapter 5.4) or between the unit and the ground.

NOTICE

During installation and placement, weight loads may be increased or concentrated. Failure to account for this can cause damage to the floor or the unit.

- Ensure the floor can withstand the weight and forces of the unit, lifting equipment and operators.
- For installation on a raised floor, ensure flooring can support increased point loads.

Fig. 5-2: Heavy-duty jack

Recommendation!
We recommend using **two heavy-duty jacks**. Always refer to the manufacturer's instructions when operating the heavy-duty jacks. For further advice, consult your local sales office.

5.3.1 Location

Note!
The options listed below are standard configurations available and account for most common install requirements. Bespoke designs (such as designs for floor voids smaller than 550 mm) can be made on special requests. Please contact your local sales contact to discuss your option available.

⚠ WARNING

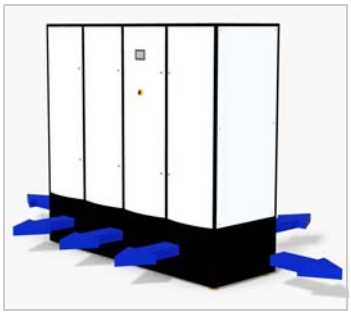
Ultra-DENCO uses fans which are regulated independently by the main control board. Failure to install suitable fan touch protection can result in serious injury.

- The **INSTALLER** must ensure any *Ultra*-DENCO unit meets local, regional or national safety requirements and installation standards.

Where you locate your *Ultra*-DENCO unit is affected by your selection of grille design. **ANY** installation must provide sufficient protection from the rotating fans.
Please review details on this protection in section 5.5.7 Fan touch protection.

Note!
Floor void not shown in images below.

Standard protection grille (4-way airflow)



In this configuration, a grille is fitted to every side of the fan section to provide protection. The air discharge will be in all directions around the unit. If required, options are available for front and side pipework connection kits.

Fig. 5-3

Wall configuration (3-way airflow)

For this option, grilles are placed on the front and sides, but no protection is provided to the rear of the fan section. For this installation, the *Ultra*-DENCO units **MUST** be installed with a wall behind the unit. The wall **MUST** cover the full width of the *Ultra*-DENCO unit and **MUST BE AT LEAST** as tall as the floor void.

When positioning the unit, the gap/clearance between the wall and the frame of the fan section must be as small as possible and no more than 12 mm.

Fig. 5-4

Installation with a base stand

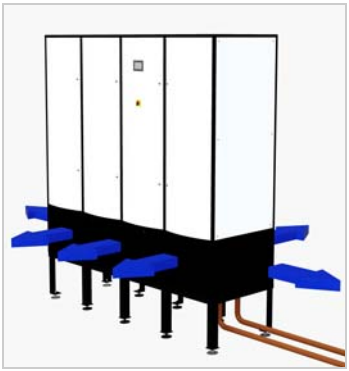


Fig. 5-5

Both options above can be installed on a base stand, where floor voids are greater than 550 mm. Any base stand should be dimensioned so that the top of the fan section is level with the top of the floor level, to ensure that the *Ultra*-DENCO doors can open without obstruction.

If the unit is to be installed in a location where individuals have easy access to the floor void, the further protection on the underside of the fan section may also be required. For more details please see section 5.5.7 Fan touch protection.

Other room features

When locating an *Ultra*-DENCO unit, other considerations include:

– An external grille or damper installed in the floor void must have at least 100 mm separation from the fan section on all/any sides.
– Consider pipework requirements and site connections (more information in Chapter 6).
– Any bespoke design must consider that sufficient 'free-area' is made available for the discharge of the fans to ensure that the airflow velocity is not too high (ideally less than 5 m/s).
– It is better to align the *Ultra*-DENCO unit with an edge of a floor tile to ensure good air tightness between the room and the floor void. The better the air tightness, the better the *Ultra*-DENCO unit will perform.

5.3.2 Placement

Note!
We strongly recommend using a specialist company to offload and position all *Ultra*-DENCO equipment.
If the unit is to be placed next to a wall or other solid surfaces, remember to remove any protective wrapping prior to positioning as it may not be possible to remove this protection once the unit has been set in its final location.

When positioning:

- Take care to prevent damage from lifting gear
- Always secure against tipping
- Lift from the base of the unit **ONLY**
- Perform levelling of the fan section **BEFORE** placement of the heat exchanger section

Note!
For size 200 *Ultra*-DENCO units, additional lifting supports are installed at the bottom of the unit.

Placement without a raised floor

The **fan section** can be placed on a lift truck or a two-to-six wheeled platform and manoeuvred to its installation site.

The **heat exchanger section** must be mounted on top of the fan section, therefore it is recommended that either fork lift truck(s) are used or you wait for the installation of the raised floor to allow the section to be lowered on top of the fan section.

Placement with a raised floor

Use appropriate lifting gear (for example; slings) to lower the **fan section** into the floor void. Position the **heat exchanger section** similar to the previous method.

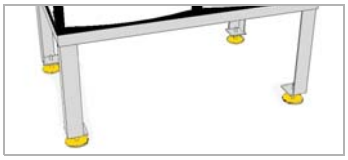
5.3.3 Connecting the heat exchanger and fan section

Fig. 5-6

- Ensure an adequate gasket or seal is fitted between the fan and heat exchanger sections. No gasket may result in increased noise and vibration along with possibly damage to the unit.
- Connect two enclosed bolts diagonally in the corners of the fan section.
- Align the heat exchanger section over the fan section and lower it onto the vertical bolts. Once aligned and at rest (by gravity) ensure the sections are bolted together.

5.4 Additional substructures

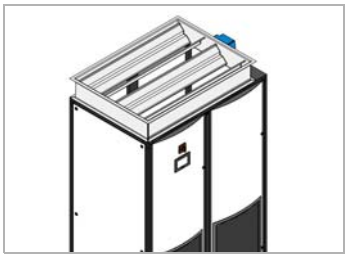
5.4.1 Base stand



The fan section is design to be mounted in the floor void. If the floor void is larger than the fan section (550 mm) then it may be necessary to install a base stand below.

The base stand comes complete with adjustable feet (+/- 25 mm available). The surface between the base stand and the unit is lined with a 3 mm semi-hard gasket.

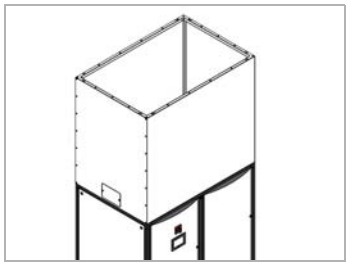
5.4.2 Air damper



Dampers can be provided loose for installation on-site. The control of the damper is linked to the unit's controller and can be made to open/close depending on the unit starting/stopping. The damper can close if a critical alarm is generated or can be linked to a fire alarm to shutdown and protect your units.

Damper failure is monitored and can generate an airflow alarm.

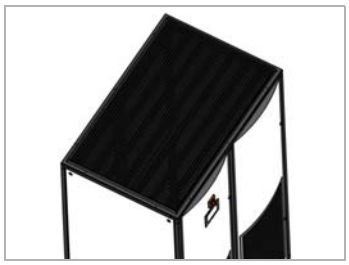
5.4.3 Ceiling connection duct



For units that wish to connect with a suspended ceiling, a matching ceiling connection duct can be supplied.

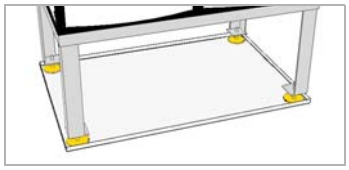
The ceiling connection duct is made of the same material as the unit's panels. Height of ceiling connection ducts are made to specification and they can bolt onto the top of the unit through a service panel on either side.

5.4.4 Protection grille



This is the grille that is placed directly on top of the unit to protect individuals from access into the unit.

5.4.5 Under unit drip tray



To protect the floor underneath a unit from any condensation, a drip tray can be mounted underneath either a base stand or directly underneath the fan section.

The drip tray can be used in a raised floor (underneath a base frame). It is design to only hold a small volume of water and should be used along with water detection to generate an alarm with any significant build-up of water.

5.5 Installing enclosed accessories

Below is a list of items or options that could be supplied with your *Ultra*-DENCO unit. The accessories could be inside of the unit on delivery or as a separate package. The below items will need further installation once the unit is in place.

5.5.1 Interface cards

There are several versions of the interface cards available, these all install directly into the controller within the unit.

- Installation and configuration of these cards must only be performed by a suitably qualified person.

5.5.2 Air sensor

If a temperature and humidity sensor is supplied as an enclosed accessory item, it must be positioned in the reference air flow and must not be subjected to direct sunlight.

The sensor cable is already connected to the unit and can be extended to a maximum of 30 m by using a cable of the same specification.

Note!

- Take care when positioning the remote air sensor as the unit will attempt to control the conditions of the room based on the sensor's location.
- Do not place the sensor in areas of draft or anywhere near a heat source that could provide a 'false reading' and unsatisfactory room conditions.

5.5.3 Floor void air pressure control (APS)

Fig. 5-7

- The air differential pressure sensor is mounted within the unit, but the two hoses must be connected to the sensor at install to enable the sensor to read the air pressures.
- Two hose ports are available: '+' (high pressure), which needs the hose to be positioned within the floor void. The other hose, '-' (low pressure) which needs to be installed within the room space.

Recommended:

- Air hose opening in the raised floor must be positioned at the right angle to air flow, in order to prevent measurement of dynamic pressure. This can also be achieved if the hoses are enclosed in perforated boxes.
- The pressure test point(s) must be placed at least 2 m away from the unit.
- It is recommended to run multiple pressure test points in one closed circular line, shown in this figure Fig. 5-8.
- APS can also be used to monitor pressure difference between a hot and cold aisle.
- If multiple units used within a room, a BMS system must be used to calculate an average value and then use the BMS to adjust the fan speed.

Fig. 5-8

5.5.4 Water detection

Note!
The water detection sensor(s) should be installed prior to commissioning and the end user should be made aware that, upon contact with water, an alarm is generated by the controller as an indication of the presence of water. The alarm does not protect the unit from water build up, it only highlights the issue. At every occurrence of the alarm, the cause should be investigated and rectified.
If an under-unit drip tray is supplied, it is ideal to mount the sensors here.

The sensors:

- Must be connected directly to the unit's controller during installation (these sensors may be provided loose inside the unit).
- Must be positioned where they are most likely to sense any water created. Consider if the floor is un-even and position the sensors towards the bottom of the slope.
- Must be fitted to the floor in such a way that it maintains contact with the surface at all times, but does not contact any vibrating parts that could damage the sensor. A quick curing, non-conductive epoxy resin or silicon sealant is an effective way to secure the sensor.
- If multiple sensors used, distribute evenly, to help ensure all areas can detect water build up.

5.5.5 Condensate pump

⚠ CAUTION

When a humidifier is fitted, condensate collected in drip trays and condensate pumps can be at near boiling temperatures. This condensate, or surfaces that it has been in contact with, can cause scalding or burns.

- The installer must install condensate tubing suitable for these temperatures.
- The installer must ensure individuals cannot come in contact with this fluid, tubing or affected regions.

Fig. 5-9

When installing a condensate pump:

- Never run power supply cables for the condensate pump together with control cabling
- Position the condensate pump carefully and secure it against slipping
- Consider future servicing needs where this pump will be removed and cleaned as part of a maintenance program

- Fitting the condensate pump outside of the unit casing offers the best access
- Care must be taken that condensate inlet and outlet are not placed beneath the fan
- Ensure that no power or water hoses can contact the fan, if necessary, suitable condensate hose bracketing should be installed

For **cold water** condensate pumps (units without a humidifier):

Max. Flow Rate: 780 litres per hour at 1 m discharge height
300 litres per hour at 5 m discharge height

For **hot water** condensate pumps (units with a humidifier):

Max. Flow Rate: 480 litres per hour for 1 m discharge height
120 litres per hour for 6 m discharge height

5.5.6 Remote monitoring touch screen display

Fig. 5-10

- The display can be mounted up to 50 m away from the C5-12 controller in the *Ultra*-DENCO unit.
- A 24 VAC supply is required, to power the display, together with a two core screened data cable that networks the display to the pLAN connection on the C5-12 controller. For further details refer to the wiring diagram.

5.5.7 Fan touch protection

It is extremely important that no one can come into contact with the fans within the *Ultra*-DENCO unit. All units are designed as downflow air configuration, therefore the fans will always be positioned in the floor void.

It is recommended that at any installation, the floor tiles installed cannot be removed without the use of tools. This then allows for standard designs to provide sufficient fan touch protection.

The installer must also consider any gaps created by the routing of the chilled water pipework connections through the fan section and ensure that any clearance is smaller than the requirements.

If the unit is installed in a room where floor tiles are removable without tools, then the installer must install an additional fan protection (suggestions below) to prevent access to the fans.

Units mounted on base stands: If the unit is mounted on an additional base stand (floor void is greater than 550 mm), and the floor tiles can be removed without the use of tools, it is necessary to fit fan protection on the underside of the fan section also.

Standard grille (4-way Airflow): When the fan section has a grille on every side of the fan section, the installer needs only to ensure that any gaps created by the adjustable feet do not create a large gap below the unit.

Wall configuration (3-way airflow): As described earlier in the chapter, the installer must ensure that the gap between the rear side of the unit and wall is less than 12 mm and the structure is fixed in place so it cannot move.

The wall must be within the floor void and be at least as high as the floor void. Individuals must not be able to access the fan section, through the wall, without the use of tools.

Other designs (bespoke): If special designs for fan sections have been made for your project, you must review the design and assess the steps required for the safe installation. Your local sales representative may be able to give advice on your requirements.

⚠ WARNING

The fan section can be supplied with different types of protection grilles.

- Any grilles removed MUST be re-fitted **BEFORE** the unit is started.

The grilles are designed for safety and can only be removed when all the following criteria is met:

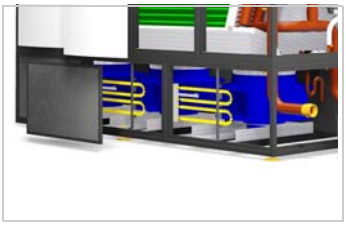
– During servicing
– When the unit is electrical isolated
– The fans are not operating

5.5.8 Heat touch protection (electric heating)

⚠ WARNING

Electric heating elements are mounted at the front of the fan section. Some heat will be transferred into the metallic grille and frame members. Over prolonged periods, this can reach temperatures that could cause scalding and burning.

- Ensure, once installed, no one can come into contact with the grilles and surrounding frame members.
- **ALL** installations with electric heating **MUST** be installed in a room where the floor tiles are not removable without the use of tools.



Note!
Specific or bespoke design may not be possible with electric heating (e.g. fan cover strip for floor voids less than 550 mm). This is due to the danger of heat transfer that could take place.

Fig. 5-11

5.6 EC declaration of conformity

For any installation of *Ultra*-DENCO equipment that requires interconnecting pipework, it is the responsibility of the installer to produce an EC Declaration of Conformity, if installed within the European Economic Area (EEA). Outside of the EEA there may be similar, separate requirements by different nations.

To assist with these requirements, we have prepared a short guide. This guide is NOT exhaustive and care should be taken by the installer that the EC Declaration of Conformity that is produced, conforms to the necessary requirements.

Guidelines on producing a declaration of conformity

Since the installation is the concept/design of the installer, the EC Declaration of Conformity of the whole system needs to be prepared and completed by the installer. This will require the creation of a technical file along with suitable documentation of safety and design to meet the legal requirements.

It is the responsibility of the installer to carry out the assessment and to prepare the EC Declaration of Conformity. For the installation of the interconnecting pipework and electrical cabling, the declaration must then be signed by your legally responsible representative (which may be the Managing Director of the Company).

The installer will need to consider some or all of the following:

1. Machinery Directive 2006/42/EC
2. Electromagnetic Compatibility (EMC) Directive 2014/30/EU
3. Low Voltage Directive (LVD) 2014/35/EU
4. Pressure Equipment Directive (PED) 2014/68/EU
5. EC type examination certificate
6. Applied Harmonised Standards
7. Safety of machinery: Electrical equipment
8. Safety of machinery: Basic design, concept and technical principle
9. EMC emissions for residential, commercial and light industrial environments
10. EMC immunity for industrial environments

11. Refrigerating Systems
12. Pressure equipment for refrigerating systems and heat pumps (General piping)
13. Applied National Standards/Technical Specifications

This assessment will need to include creating a technical file including:

1. Description of the equipment, accompanied by a block diagram
2. Wiring, circuit diagrams, and cable sizing information
3. Pipework layout drawing
4. List of standards applied (see above)
5. Records of risk assessments and assessments to standards
6. Description of control philosophy/logic (Controls Manual)
7. Materials list including source traceability on pressure related components e.g. pipework, fittings, and brazing materials etc.
8. Copies of any markings and labels
9. Copy of this manual
10. Test reports e.g. pressure test certificates, wiring test certificates
11. Commissioning records
12. Declaration of Conformity

6 Cooling medium connections

Note!
When routing pipework, take due care that the air flow is not obstructed, as this may reduce the efficiency of the system.

6.1 Connecting water pipework

When connecting:

– The entire chilled water circuit must be designed and installed to national and local standards and regulations.
– Piping and pump(s) must be properly sized to meet the design volume flow. Non-compliance can cause operational malfunctions.
– All chilled water and dry-cooler water pipework must be vapour sealed and insulated to avoid condensation and capacity losses. The exterior surface of steel piping must be protected against corrosion using protective paint.
– Hydraulic devices such as solenoid valves, modulating valves or hand shut off valves may cause hydraulic hammer. This condition should be avoided.
– Beware of any residual glycol solution that may be left in the hydraulic circuit following testing. Residual glycol solution must be disposed of in an environmentally-friendly manner.
– Whenever possible it is recommended that "reverse return" piping be used for multiple installations to ensure an evenly balanced system.
– Regulating valves (preferably with pressure test points for measurement of volume flow) should be installed before each unit to enable balancing of water flow rates.

NOTICE

The chilled water circuit must be protected from fouling, freezing or solid materials. Failure to do so may result in poor performance or system failure.

- Install at least 1 water strainer per hydraulic circuit
- Provide frost protection through glycol or trace heating on external pipework
- Chemically treat condenser water served by an open evaporative cooling tower
- Ensure filtration of solid materials within the circuit

We recommend using a plate heat exchanger for system separation

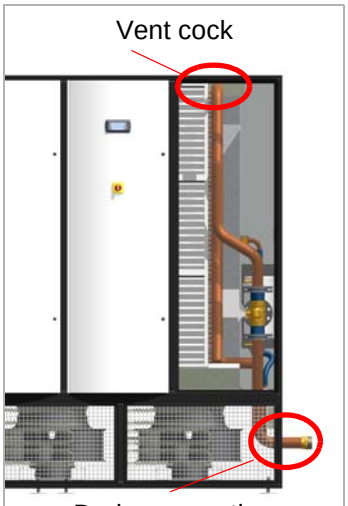


Fig. 6-1: Air venting and draining

– Separate isolating valves should be installed to enable servicing to be carried out without draining the water circuit system.
– Thermometers and pressure gauge test points should be located in supply and return pipe work of air handling units, heat rejection unit or chillers for commissioning and maintenance.
– All high points and coils of the water circuit must be provided with vent cocks to enable system venting. Your *Ultra*-DENCO unit is already provided with a vent at the top of the coil.
– All coils and low points of the water circuit must be provided with drain cocks.
– Pipe expansion and contraction should be accounted for during installation.
– A closed type expansion tank must be provided for the hydraulic system.
– Pipework must be properly cleaned and flushed.
– Pressurisation may be required to ensure a static head pressure is always available to protect the circulation pump from cavitation.

6.1.1 Water quality

Recommendation on water quality for chilled, warm and condensing water circuits/heat exchanger:

Parameter		Unit	Value
pH-value (at 20 °C)			7.5 - 9
Conductivity (at 20 °C)		µS/cm	< 700
Oxygen content	O_2	mg/l	< 0.1
Total hardness		°dH	1 - 15
Dissolved sulphur	S		not detectable
Sodium	Na^+	mg/l	< 100
Iron	Fe^{2+}, Fe^{3+}	mg/l	< 0.1
Manganese	Mn^{2+}	mg/l	< 0.05
Ammonium content	NH_4^+	mg/l	< 0.1
Chloride	Cl^-	mg/l	< 100
Sulphate	SO_4^{2-}	mg/l	< 50
Nitrite	NO_2^-	mg/l	< 50
Nitrate	NO_3^-	mg/l	< 50

Tab. 6-1

NOTICE

A good water quality – e.g. salt and lime free drinking water – considerably increases the service life and efficiency of the unit and the connected secondary system.

- Check the system values once a year to avoid damage to the hydraulic components.

6.1.2 Glycols

⚠ CAUTION

Glycols and other anti-freeze materials can be harmful for humans and animals.

- Prior to use, refer to the supplier's Material Safety Data Sheet (MSDS).
- If ingested, seek urgent medical help.

NOTE!

The following recommendations are based on using the brands Antifrogen® N for ethylene glycol and Antifrogen® L for propylene glycol. Other suppliers and variety may have different properties or hazard warnings.

- Always refer to the supplier's information and the MSDS.

Water-glycol mixtures have different thermodynamic and physical properties to water-only chilled water systems. If glycol is mixed with a medium, when compared with water only, the resultant mixture has:

– Lower specific heat capacity
– Higher viscosity
– Increase flow rate
– Increased pressure drops
– Increased power and current consumption of a pump
– Lower cooling capacity
– Larger thermal expansion

When using glycol:

- Use only one type of glycol, do not mix different types.
- Only charge the system with a prepared water-glycol mixture.
- Do not use Teflon seals if using water-glycol mixtures.
- Add glycol concentration to match the ambient temperatures to ensure energy consumption of the pump is not excessively increased.
- Once a system is filled, always double check the water-glycol concentrations.
- Water-glycol mixture forms a slush-ice when the mixture is cooled below the freezing point.

Minimum concentrations to prevent corrosion:

– Ethylene glycol = 20% by volume
– Propylene glycol = 25% by volume.

	NOTICE
	Excessive volumes of glycol within a chilled water system can result in poor heat transfer, increased viscosity and possible damage to pumps and valves. • Glycol content must be less than 50% of total system content.

6.2 Connecting chilled water pipework

	NOTICE
	Incorrect fitting of water inlet and outlet connections can result in leaks and a reduction in cooling capacity. • Counter hold connection fittings to prevent damage. – We recommend using a pipe wrench.

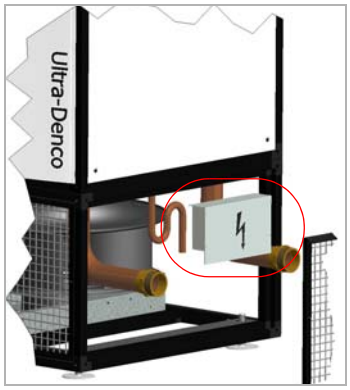


Fig. 6-2

- If necessary (and fitted) remove the electrical connection box in the fan section to help the installation.
- Connect the piping system to the chilled water inlet and outlet in accordance with best practice and adhering to local and national regulations.

6.2.1 Pipe connection options

Note!
When routing pipework, ensure the air path is not obstructed!

Note!
There are three different customer connections available when using the connections kits.

– BSP Male pipework connections
– Flange pipework connections
– Solder connections

If no connection kit is used, a flange connection must be made to the bottom of the coil section/top of the fan section. Matching flanges can be supplied with the unit as an optional extra. Ensure the correct PN rated fittings are installed.

Connections kits allow for easy on-site connections. Please note that different pipework routing can affect the grilles fitted to the fan section, therefore the connection position should be reviewed before the unit is manufactured. In the examples below, all are shown with the flange pipework connections.

No connection kit

Fig. 6-3

If no connection kit is used then a connection must be made directly to the coil section of the unit. It is recommended that the unit is mounted on a base stand to allow for pipe routing underneath the unit as the fan section will have grilles on all 4 sides.

This connection must be made with a flange connection. Check PN rating before installation.

Side connection kit

Fig. 6-4

For installations where the floor void height may be low and pipework cannot be routed underneath the fan section: a connection kit can be fitted to allow for site connections to be made to the right hand side of the unit - outside of the fan section (as you face the unit's display).

Note!
When using this connection kit, ensure access to the pipework is maintained, after the installation, with a removable floor tile directly above the pipe connections.

Front connection kit

Fig. 6-5

When the floor void height is low and there is no access to the right hand side of the unit (as you face the display) a front connection kit can be fitted. During this installation it may be necessary to remove the right-most fan to make the pipework connections.

6.3 Humidifier water connections (optional)

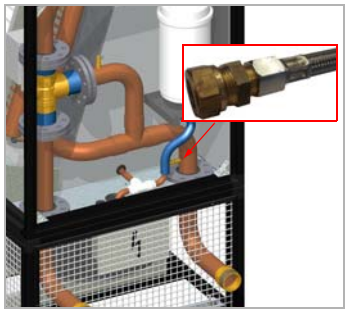


Fig. 6-6: Humidifier connection

The humidifier unit must be connected to a standard cold water supply. All mains water pipework to humidifiers must be installed to national and local standards, in particular, local water authorities' regulations and requirements.

- Connect the humidifier using a fitted flexible hose and a compression fitting.
- The water supply should have a stop cock adjacent to the unit.
- The earth bonding (supplied) must be connected to the incoming water supply and also to the drain line (if electrically conducting tubing is used).

Supply water quality

In general the water supply feed to the humidifier must be normal drinking water, but must also comply with the following parameters:

– Water feed pressure between 0.1 and 0.8 MPa (1 and 8 bar)
– Temperature between 1 and 40 °C
– Hardness not exceeding 400 ppm equalling CaCO3 (40 °fH)
– Conductivity 125 to 1250 µS/cm (microSiemens/cm) (depending on bottle used)
– No organic substances

⚠ CAUTION

In operation, the humidifier can produce hot water vapour. The vapour, tubing that it is directed through and areas that it has been in contact with can be hot and will cause scalding or burns.

- Always allow time for the humidifier and affected regions to cool sufficiently before starting any work.
- Do not touch affected regions with unprotected skin.

Notice on water use!

- Under no circumstances should the water supply be fed from a water softening system.
- Do not add disinfectants or anti-corrosive substances (irritants).
- It is not recommended to use industrial water or chemically and bacteriologically polluted water for cooling circuits.
- Do not use demineralised water (e.g. osmosis/purified water)
- Where a salt exchange plant is in use at a site, the feed water to the unit should by-pass this.

Water feed quality	Unit	Normal tap water		Water with low salt content	
		Min.	***Max.***	***Min.***	***Max.***
Activity of hydrogen ions (pH)	–	7	8,5	7	8,5
Specific conductivity 20 °C (σR,20 °C)	µS/cm	350	1250	75	350
Dissolved solid materials (cR)	mg/l	(1)	(1)	(1)	(1)
Solid residue at 180 °C (R180)	mg/l	(1)	(1)	(1)	(1)
Total hardness (TH)	mg/l $CaCO_3$	100 (2)	400	50 (2)	160
Temporary hardness	mg/l $CaCO_3$	60 (3)	300	30 (3)	100
Iron + manganese	mg/l Fe+Mn	=	0,2	=	0,2
Chlorides	mg/l Cl-	=	30	=	20
Silica	mg/l SiO_2	=	20	=	20
Residual chlorine	mg/l Cl_2	=	0,2	=	0,2
Calcium sulphate	mg/l $CaSO_4$	=	100	=	60
Metal contamination	mg/l	0	0	0	0
Dissolvents, thinners, detergents, lubricants	mg/l	0	0	0	0

(1) = General values, depending on specific conductivity: $C_R \cong 0{,}65 \times \sigma R{,}20\ °C$; $R_{180} \cong \sigma R{,}20\ °C$
(2) = Not below 200 % of chloride content in mg/l Cl
(3) = Not below 300 % of chloride content in mg/l Cl

Tab. 6-2

6.4 Connecting condensate drain

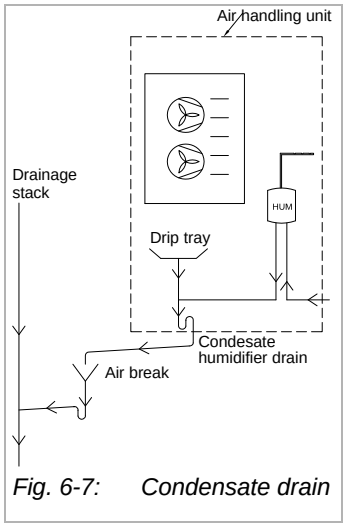


Fig. 6-7: Condensate drain

The following should be considered for drain pipework during installation:

– Must be 22 mm OD or larger.
– Must be of water carrying quality and made of either copper or high temperature rigid plastic.
– Must be adequately supported at regular intervals.
– Must have a slope of at least 2 % or higher to ensure drainage.
– Suitable cleaning (rodding) eyes should be installed at bends.

– If the unit has a humidifier fitted, drain pipework must be designed as temperature proof to withstand up to 100 °C.
– Upon installation, drain pipework must be tested for leaks.
– Condensate traps must be filled with water prior to commissioning and after long inactive periods.
– Electrically conductive drain pipework should be earthed at a point adjacent to the unit.
– A loose copper condensate trap is provided with the unit. This must be fitted as per Fig. 6-8 & Fig. 6-9.

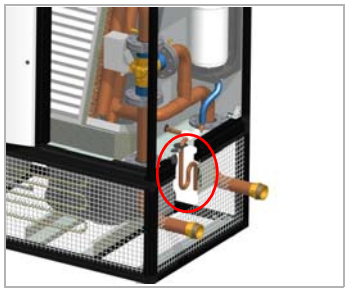


Fig. 6-8: Condensate drain

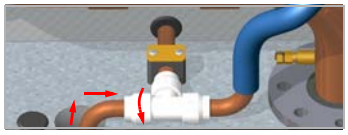


Fig. 6-9: Connecting condensate trap

NOTICE

Local and regional legislation will require a minimum quality standard for drainage.

- Ensure the drainage system is reviewed during installation and assessed for possible issues, such as, blockage, overflow, contamination and Legionella.

Note!
Direct connection to a waste network is not allowed. Ensure drain has an air break fitted as shown in Fig. 6-7.

7 Electrical connections

When making an electrical installation, the installer must:

- Be qualified and licensed according to local and regional regulation
- Observe regulation relating to electrical power supply for the region
- Observe the Low Voltage Directive (LVD) 2014/35/EU
- Provide potential equalisation
- Must wire an earth connection to any equipped or connected components

⚠ DANGER

Unmade or partly made electrical connections have a high hazard of creating an electrical potential on other materials. This can lead to death or serious injury.
When installing electrical connections:

- Ensure all power supplies are disconnected including existing connections and power to new connections to be made
- Ensure any power supply cannot be inadvertently energised by 'locking' the power supply.

NOTICE

The electrical wiring must be installed fully and correctly.
Failure to do so may result in damage to components and failure to operate.

- Always refer to the 'unit-specific' wiring diagram.
- Never connect multiple units to the same mains power supply.

Failure to follow these instructions can invalidate warranty.

7.1 Requirements

Before making electrical connections, check the following:

– The mains power supply properties comply with EN 60204-1 ed.3 and the power requirements of the unit.
– Mains power supply voltage tolerance should not exceed ± 10% of its design rating with a maximum phase difference of 3%.

Note!
We recommend installing power surge protection devices in areas of poor quality electrical supply.

7.2 Electrical connections between fan and coil section

⚠ WARNING

Incomplete electrical cables are hazardous:

- Do **NOT** connect the mains power supply before completing the instructions in Chapter 7.2

The *Ultra*-DENCO unit is delivered in 2 parts, therefore interconnecting electrical wiring must be completed on site:

– Locate the incomplete wiring from the fans and electric heating (if fitted) within the fan section
– Route the cables through the appropriate grommet (right hand side of the unit, between chilled water pipework)
– Route the cables to the control panel using the trunking provided
– Connect the wires to the associated connection points in the control panel as per the contract wiring diagram

7.3 Connecting mains power supply

7.3.1 Cable requirements

A suitable 3-phase mains supply (with earth and neutral) shall be available to connect the unit (voltage and frequency must be according to the unit identification plate). The mains power supply must be equipped with necessary protection devices; we recommend fuses should be of type D or equivalent.

7.3.2 Electrical protection requirements

The pre-fuse size should be determined on the basis of the wiring diagram or unit identification plate and must not exceed the size specified in the documents. For further information contact your local sales office.

7.3.3 Cable connection

Connect the main power supply cable to the isolator provided within the unit. **ALWAYS** refer to electric wiring diagram supplied with the unit.

Note!
When connecting the supply voltage, make sure to ensure correct phase rotation! If the rotation direction is incorrect, an adjustment shall be performed by changing the phases using the main connection of the unit. Change the phase sequence of the power supply lines using a suitably qualified personnel.
Never change the wiring in the unit control cabinet.

Note!
If **NO** door interlocked isolator is fitted to the unit, a multi-core cable must be used for unit power (to avoid cable breaks by the hinged cabinets) and a means of isolation must be provided to meet country specific regulations. Always refer to local and country specific electrical regulations when installing power supplies. A maximum distance of 1m from the unit is recommended.

If the unit is supplied with an "*Automatic Transfer Switch (Dual Power Supply)*", this will be in a different location to the isolator.

7.3.4 Cable routing inside unit

- *Ultra*-DENCO units are designed for cable entry from the **BOTTOM** of the unit.
- Secure any interconnecting cables within the unit and ensure that the cables cannot make contact with the fan or any hot components.
- Do NOT remove any unused rubber glands or blanking plugs.
- Do NOT drill any holes in the top panels of ANY electrical cabinets.
- Cable routing must consider that some electrical panels can pivot on hinges.

7.3.5 Automatic Transfer Switch (ATS)

This device allows for two power supplies to be connected to a single unit. If there is a mains power failure on the primary supply, after a short delay (MFT), the unit will automatically switch to the secondary power supply. When the primary supply is re-instated and following the defined delay (MRT), the device will switch back to the primary supply automatically.

To define the primary power supply, set the device position to either I or II. The ATS will always return to this power supply, when both power supplies are healthy.

To override the ATS to isolate both power supplies, set the device to position 0.

The DIP switches must be set to:

– A: 3-phase power supply
– F: 2 second delay in OFF position during change-over
– H: Transformer/Transformer type of supply

Depending on power supply, configure this DIP switch:

– C: 50 Hz
– D: 60 Hz

Note!
The clear plastic cover must be fully closed to activate the automatic change-over function.

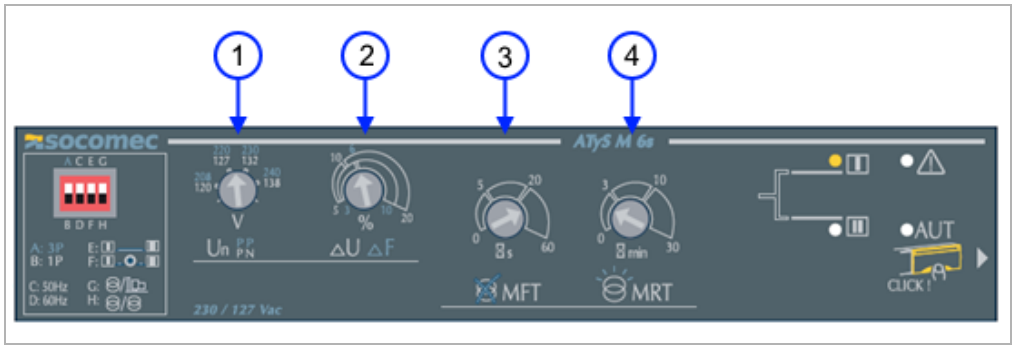


Fig. 7-1

1: Nominal Voltage
2: Voltage range (recommended 5 %)
3: Mains Failure Timer (recommended 2 seconds)
4: Mains Return Timer (recommended 10 minutes)

7.4 Connecting signal cabling

Note!
This chapter is for C5-12 controls only.

Note!
For all electric connections ensure that control and safety signals (24 V AC) are run in a separate cable to the mains power cable (e.g. 400 V AC / 230 V AC). Where power and signal/control cables have to run together, then a minimum gap of 30 mm between each category is to be maintained. Ideally, power and signal/control cables should never cross, but if unavoidable, ensure that they cross at 90°.

7.4.1 Signal cable installation

Maximum cable length: **100 m**

Minimum Cable Cross-Section: **1.5 mm^2**

- *Ultra*-DENCO units are designed for cable entry from the **BOTTOM** of the unit.
- Secure any interconnecting cables within the unit and ensure that the cables cannot make contact with the fan or any hot components.
- Do NOT remove ANY unused rubber glands or blanking plugs.
- Do NOT drill any holes in the top panels of ANY electrical cabinets.
- Cable routing must consider that some electrical panels can rotate on hinges.
- Signal cables must enter the controls cabinet at the side of the cabinet, through the rubber grommets provided

7.4.2 Remote display

For a remote/dual display, provided with an *Ultra*-DENCO unit, the electrical requirements are:

– 2 core screen cable for data signal to the unit controller
– A 24 V AC power source (can be from the *Ultra*-DENCO unit)

The remote display can be installed up to 50 m away from the *Ultra*-DENCO unit. In all installations, consider the effect of signal attenuation and voltage drop.

7.4.3 Unit networking

When multiple *Ultra*-DENCO are located within the same cold space, it is best practice to set them up in a network. Creating a network has the advantages of being able to perform sensor averaging or rotating standby units.

Details of how to network your units are available in the electrical drawing provided with the unit and also within the Controls Manual.

NOTE!
If networking multiple *Ultra*-DENCO units together it is strongly recommended that this is carried out by an experienced FläktGroup engineer due to its complex nature. Your local office can help arrange this.

7.4.4 Network wiring

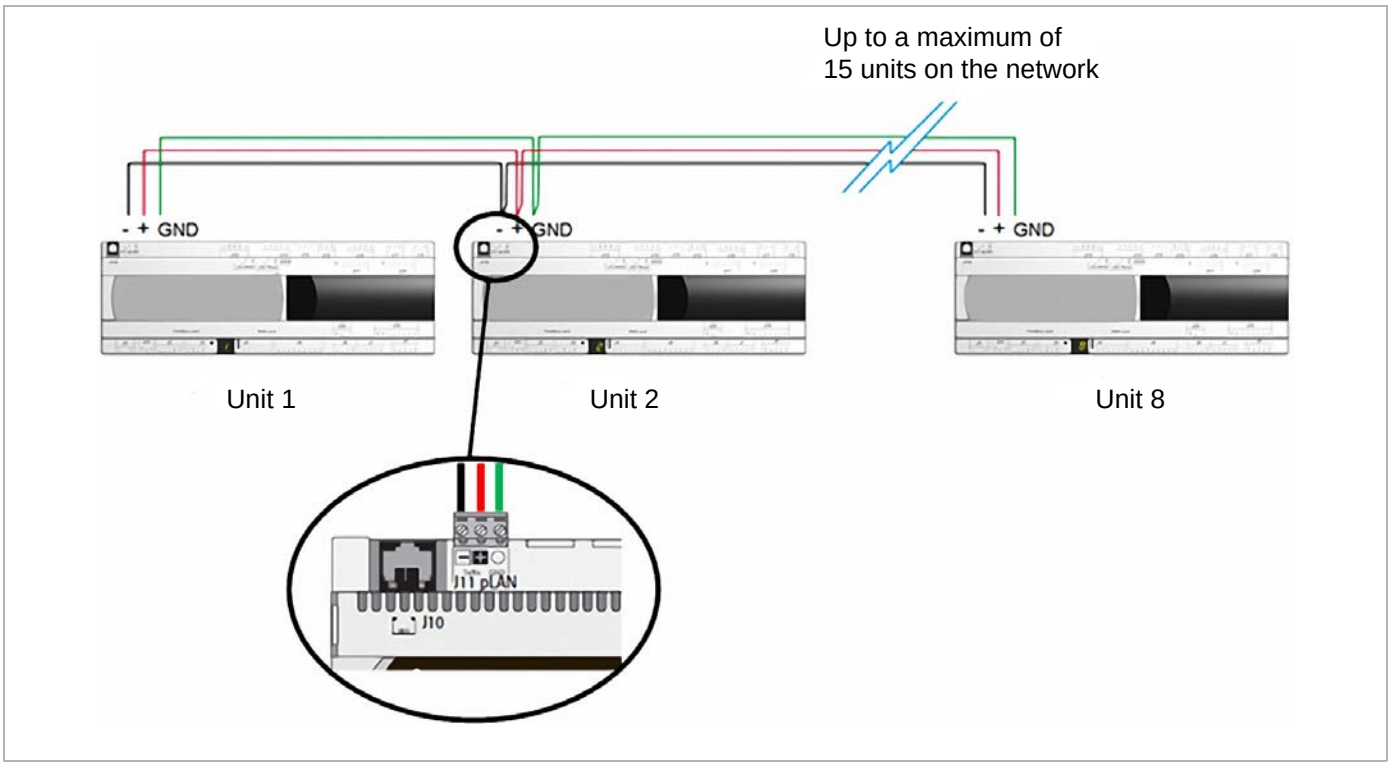


Fig. 7-2

A recommended cable specification to use for the network wiring is 22 AWG (0.326 mm²) stranded conductors, polyethylene insulation, twisted pair with 22 AWG (0.326 mm²) drain wire and aluminium foil outer shield, covered in a PVC jacket.

Examples of this style of cable are:

– Beldon 8761
– Alpha 2401C
– BICC H8082

7.5 Customer terminals on C5-12 unit controller

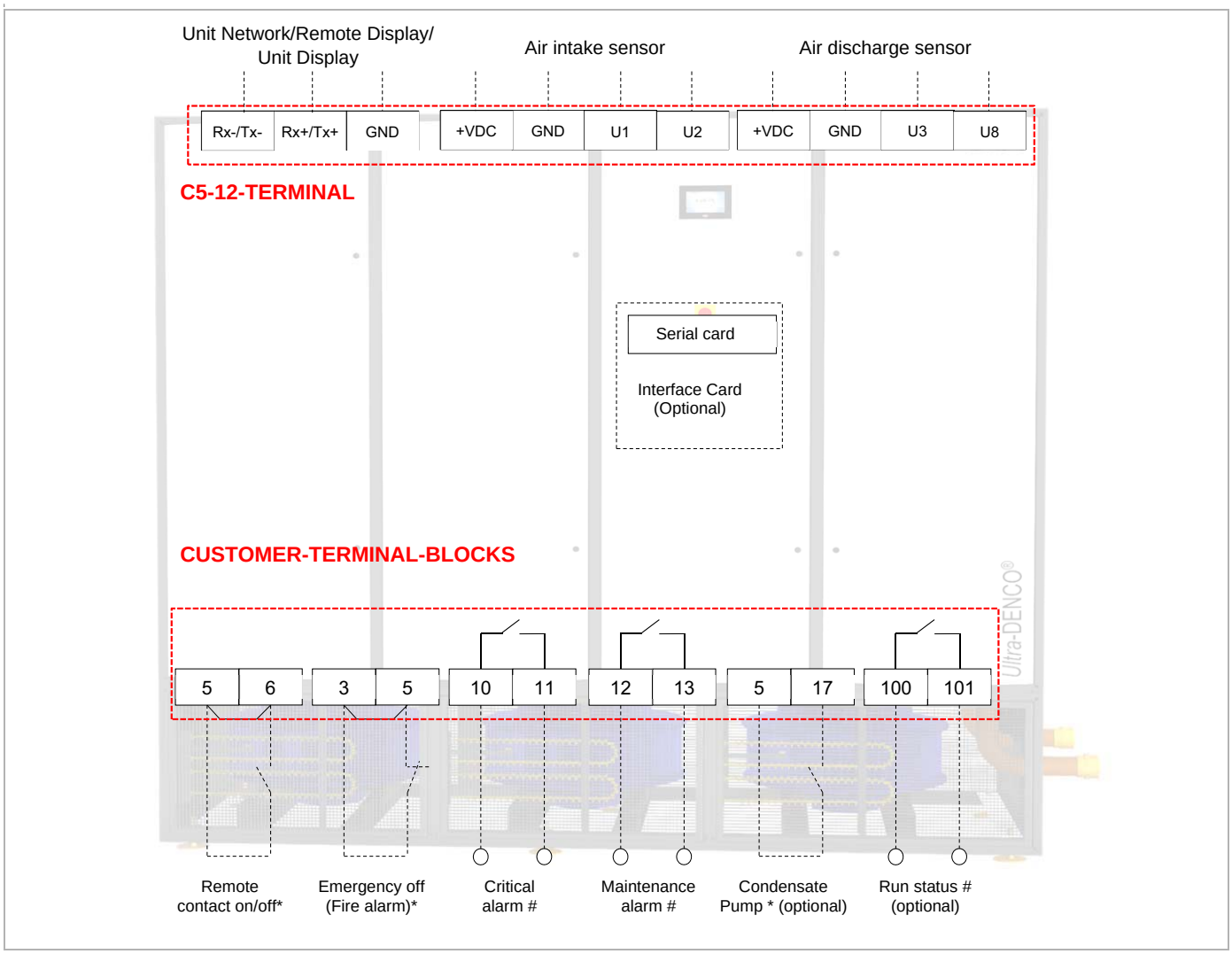


Fig. 7-3: Electrical integration C5-12 controls

Terminals	Notes
5 – 6	Remote On/Off for activating and deactivating the unit via a normally open volt free contact by others
3 – 5	Emergency Off, a volt free contact (supplied by others) opening, deactivates the unit (e.g. used in a fire alarm system)
10 – 11	The unit's critical alarm indication e.g. HP/LP, Airflow, High Temperature
12 – 13	The unit's maintenance alarm indication e.g. Dirty Filter, humidifier
5 – 17	Alarm contact of condensate pump (optional accessory)
100 – 101	Indication of unit's operation (i.e. fans enabled)
+VDC – GND – U1 – U2	Air intake sensor
+VDC – GND – U3 – U8	Air discharge sensor (optional, only if the item is fitted)
Serial Card	Interface cards for building management (optional)
Rx-/Tx- - Rx+/Tx+ - GND	Unit's network terminals for connecting multiple units. Displays already connected to these terminals
--------	Cabling provided by others
#	Volt free contacts (voltage or signal to be provided by others)
*	On-site volt free contacts must be provided (if function is required remove jumper)

NOTICE

Wiring that is not isolated from active (live) components of non-SELV or non-PELV circuits may induce power than can cause damage to control boards. This may cause poor operation or system failure.

- Use double or reinforce insulation on electrical wiring external to the unit.

8 Commissioning

	NOTICE
	READ ALL OF THIS CHAPTER BEFORE STARTING ANY WORK. – Different options can require different commissioning procedures. – This chapter applies to initial commissioning as well as re-commissioning due to extended shut down periods or relocation.

	⚠ WARNING
	During commissioning: • Ensure a full risk assessment has been conducted. • Ensure only qualified individuals conduct work on the system. • Establish an exclusion zone from the system for non-essential individuals. • Ensure that the room is well ventilated.

8.1 Requirements

8.1.1 Commissioning report

– A copy of the Commissioning Report is available in Chapter 13.3
– An electronic version can be provided upon request
– The report must be completed, during commissioning, by a Service representative or an appointed contractor
– Once completed, the report **MUST** be sent to your sales/service representative
– Failure to send the completed report may invalidate warranty

8.1.2 Suggested equipment

It is important that all equipment is safe to use, is calibrated and is portable appliance tested (PAT) where appropriate. Below is a list of recommended equipment to be able to fully commission a unit:

– Electrical test meter
– Phase rotation meter
– Current measuring device
– Airflow measuring device
– Digital thermometer
– (If humidifier is fitted) water conductivity meter
– Hydronic manometer
– (if using glycol) refractometer

8.2 Pre-commissioning procedure

Ensure all protective clothing and equipment is worn. In particular:

– Suitable eye protection
– Suitable hand/finger protection
– Protective cloths for entire body including safety footwear

8.2.1 Assembly statement

The installation company must follow to the requirements listed in Chapter 5 "Installation" and Chapter 7 "Electrical connections". Once complete they **MUST** complete the **Assembly Statement**.

The signature of this statement validates the CE label and the Declaration of Conformity, for the unit of the "Heat Exchanger" section being connected with the "Fan Section".

A copy of the statement can be found in Chapter 13.1. It is important that the end user maintains a copy of this document for their records.

8.2.2 Pre-commissioning checklist

We recommend that the "**Pre-Commissioning Checklist**" is completed, by the installer/contractor, prior to the commissioning engineer attending site. A copy of this checklist can be found in Chapter 13.2. Please present this complete checklist to the engineer upon their arrival.

If the site does not meet the requirements or information required in the checklist, the engineer may be unable to conduct the commissioning and may abort the commissioning.

8.2.3 General checks

AFTER all installation work has been completed and the pre-commissioning checklist has been completed, the following checks should be completed **BEFORE** mains electrical supply power is applied to the unit:

Documentation

- Check that the unit configuration (listed on the serial plate) matches what has been ordered
- Check the "**Pre-Commissioning Checklist**" has been completed and has been filed appropriately
- Check that a copy of this manual is available
- Check a copy of the electrical drawings/wiring drawings are available

Ultra-DENCO unit

- Check the unit internally and externally for any damage
- Photograph and record any damage (including shipping damage) and inform the end user
- Check the unit has the minimum clearances available (Chapter 5.2.1)
- Check that the fans inside the unit can rotate freely
- Check the unit is mounted suitably within the room (e.g. if on a base frame)
- Check that the entire heat exchanger is protected by the air filter(s)
- (If fitted) check the humidifier is supplied with water and that the earth bonding device is secured to the incoming pipework
- Check that the condensate drain is connected correctly and water can drain freely

Room

- Check interconnecting services, Mechanical and Electrical, have been installed as per requirements in Chapter 6 & Chapter 7 respectively
- Check the dimensions of raised floor is sufficient and that the heat exchanger section of the *Ultra*-DENCO unit is level with the floor
- Ensure any items in the floor void near the fan section are suitably secured, due to high airflow velocities
- Check no floor tiles can prevent the opening of panels and doors
- (If electrical heaters are fitted) in the raised floor, ensure that any items or articles have a sufficient separation from the fan section due to high surface temperatures produced by the electric heating
- (If used) check all dampers (including fire protection) are fully open
- (For humidity control) check the control space/installation room is vapour sealed and fresh air is not supplied excessively

8.2.4 Checking water circuits

- Check the hydraulic connections have been made correctly
- Check the hydraulic circuit is fitted with a water filter and is not contaminated
- Check the water pipework is clean and has been flushed
- Check all shut off valves within the unit are open
- Check all filling valves and vent cocks are closed
- Check any water circuit safety devices for proper function
- Check that suitable cooling medium is present within the water circuits

8.2.5 Checking electrical connections

⚠ WARNING

Untested or unused electrical systems pose high risks of faults.
Unsafe operation on these systems can lead to death or serious injury.
Before conducting the below checks:

- Ensure all electrical connections are isolated
- Checking the unit is voltage free
- Switch off all circuit breakers (MCBs)

Note!
When commissioning a unit with the optional "Automatic Transfer Switch (Dual Power Supply)" it is important to check the electrical supply of **BOTH** the incoming supplies. Both electrical supplies must match the requirements of the unit name-plate. Also the phase rotation of both incoming supplies must be checked. Select a primary supply using the supplied key and test that the dual power supply changes over when the primary supply is lost. Then select the other supply to be the primary power supply and carry out the test again.

- Check any electrical installation has been conducted as per the unit specific contract electrical drawing
- Check all electrical connections are tight
- Check earth conductors are connected correctly and the earth terminals are secured tightly
- Check any signal and mains power cables are segregated
- Check inside of the control cabinet and the connection box in the fan section (if fitted) for loose connections or damaged components
- Tighten all supply terminals in the motor terminal clamps
- Check that MCBs are appropriately rated for the design and requirements of the *Ultra*-DENCO unit
- Ensure temperature and humidity sensors are adequately protected by their enclosures

ONLY when all the above checks been completed can the unit's circuit breakers (MCBs) can be set to the ON position.

8.3 Commissioning procedure

Note!
Due to the complex nature of the *Ultra*-DENCO product, we strongly recommend that a FläktGroup commissioning engineer is employed to carry out the commissioning procedure. Contact your local representative for further information.

8.3.1 Room considerations

During commissioning, for *Ultra*-DENCO units, it is important to understand the heat load and the water inlet temperature in relation to:

– Initial design conditions
– Current conditions (during commissioning)
– (Possible) future conditions

Wherever possible, attempt to recreate the required conditions needed by the end user, so that the unit is configured for the appropriate operating range.

8.3.2 Enabling the unit

⚠ WARNING

Danger of electrical current!
Once the electric supply is energised to the unit, beware of electric shock during checking and commissioning the unit. Exercise due caution and attention when carrying out this work.

- Enable any isolator or circuit breakers in the main power distribution board (both boards for units with dual power supplies)
- Enable any 'in-line' isolation for the *Ultra*-DENCO unit
- Set the door interlock isolator (if fitted) to the 'ON' position
- Wait 1 - 2 minutes for the unit to start up
- When display is active, press the 'Enable' button in the bottom left corner of the display

✓ The unit will now being to operate and control to the default settings in the controller.

8.3.3 Calibration of control sensors

Recommendation!
If suitable cooling demand can be provided to the unit during commissioning, at this point in the procedure change the set-point and other variables to the requirements of the end-user. Details of how to change values in the controller are available in the *Ultra*-DENCO controls manual.

Once the unit is enabled and operating, calibration of control sensors is vital to ensuring an accurate and efficient operation of your *Ultra*-DENCO unit. These sensors include (but are not limited to):

– Control temperature and humidity sensors - both fitted within the unit and/or remote
– Pipework temperature sensors
– Floor void air pressure control (APS) sensors

These sensors must be calibrated accurately to allow for a successful commissioning. Failure to calibrate these sensors may lead to inefficient operation or possibly alarms and non-operation of the unit.

8.3.4 Commissioning chilled water circuits

Procedure

- Check for an established water flow (more details below)
- Check that any temperature sensors are securely fastened to the correct pipework
- Take readings of water temperature sensors and compare these values with the values displayed on the controller: all probes and sensors **MUST** be calibrated
- Check for correct rotation in the water pump and any air within the water system is being removed by the pump
- (If applicable) add, as required, pressure to any expansion vessels
- (If applicable) sample and check Glycol concentration (more details below)
- Within the controller either use 'Hand Override' mode or lower the set point temperature to check valve operation (restore values once test complete)
- Record all details to the commissioning report

Measuring water volume flow

a

b

c

Fig. 8-1: Valves

- Use the manual function of the actuator to open the valve completely, refer to Fig. 8-1 a.
- Balance the chilled water pipework to achieve the design flow rate.
- The best method of measuring water flow is by incorporating an external double regulating valve with pressure tapings at each unit (Fig. 8-1 b) and measuring via differential pressure meter.
- As an alternative method, a separate regulating valve and a flow measuring element (Fig. 8-1 c) can be used.
  - If these valves have not been installed, pressure drop readings should be taken using the chilled water control valve.
  - Pressure measurement connectors are already fitted on the unit. In this case volume flow is calculated on the basis of k_{VS} value and read using a valve pressure drop diagram.
- Enter the water volume flow and differential pressure in the commissioning report.

Glycol and corrosion inhibitors

Recommendation!
We recommend using a hand held refractometer (for example Kittiwake, RHA-21ATC) for measuring glycol concentrations. It is able to give accurate readings from a very small sample of fluid and covers both Ethylene Glycol and Propylene Glycol.

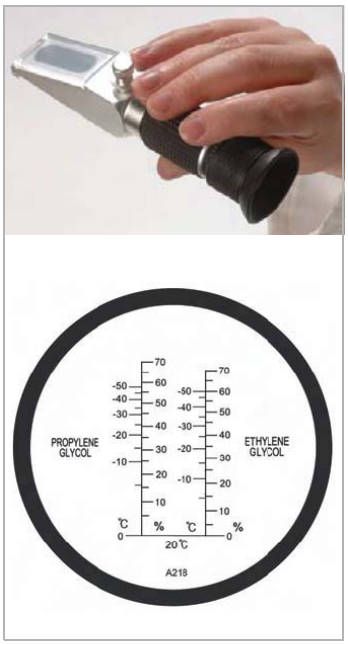


Fig. 8-2: Kittiwake hand held refractometer

It is important to ascertain the quality and quantity of any glycol and corrosion inhibitors (see Chapter 6.1.2). Automotive inhibitors and anti-freeze **MUST NOT BE USED** as nearly all automotive anti-freeze contains silicate-based inhibitors, which gel and foul, coating heat exchanger surfaces and reducing energy efficiency. These silicates have also been shown to significantly reduce the lifespan of pump seals.

Note!
The minimum concentration need for the corrosion inhibitor element to provide the required level of protection is normally 20 %. Below this level there is a risk of corrosion of steel or iron components in the pipework and units

Coolant concentration is determined by first deciding what freeze and/or burst protection is appropriate for the application, based on operating temperatures or ambient temperatures.

Freeze protection

This is imperative when a system requires pumping. It is achieved when glycol concentrations in a system are sufficient to prevent ice crystals from forming when the fluid experiences the lowest temperature for its application.

Burst protection

This is achieved when the concentration of glycol in a system is high enough to prevent the fluid from freezing solid. The glycol concentration will be lower than that of a 'Freeze Protected' system, therefore it can form ice crystals at low temperatures (being a semi-fluid state) and will no longer be pump-able. When ice crystals begin to form the solution will expand.

The table refers to general percentage concentration of Ethylene Glycol. Always contact the manufacturer for up specific values for their variant of Glycol:

Temperature	Percentage concentration needed for (%):	
°C	Freeze Protection	Burst Protection
-7	16	11
-12	25	16
-18	32	21
-23	39	26
-28	44	31
-34	48	36
-40	52	37
-46	55	38

Tab. 8-1

Ethylene glycol gives added protection against system damage from bursting:

– On freezing water expands about 9 %
– This volume change may rupture piping and cause catastrophic system failure
– The addition of ethylene glycol significantly reduces the expansion the solution undergoes on freezing, thus reducing the likelihood of system pipes bursting
– The higher the ethylene glycol concentration, the less the expansion
– Pure ethylene glycol does not expand at all upon freezing

Refer to Tab. 8-1 for freeze and burst protection. In a system not operational in winter, it may be sufficient to choose a lower fluid concentration, one that merely protects against bursting, since some crystal formation in the fluid will not be harmful.

Water balancing

3 & 2-port Drive Open Drive Close Valves (DODC)

- Ensure the valve is '100 % open' during water balancing; failure to follow this may result limited capacity of the unit.
- To force the valve to be 100 % open, use the controls to modify the set-point temperature (supply or return) so that it is below the water temperatures within the chilled water circuit

2-port Pressure Independent Control Valves (PICV)

Note!
The following instructions are for 2-port PICV valves used with C5-12 controllers in *Ultra*-DENCO units. For all other configurations or equipment please see separate manuals or contact your local office.

To set up the maximum design chilled water flow rate, on site:

- The unit must be powered on, pre-commissioned and running under automatic control
- The chilled water pump must be operating to provide pressure differential across the unit of 100 kPa (minimum 50 kPa, maximum 350 kPa)
- Force the chilled water valve to 100 % open by reducing the set-point temperature (supply or return) to below the water temperatures within the chilled water circuit
- Measure the chilled water flow rate using a hydronic manometer with the hoses connected to the local orifice plate in the external chilled water pipework supplying the unit (supplied/fitted by others)
- To adjust the maximum chilled water flow rate to design conditions, adjust the setting PIC Valve Max Value % to achieve the design maximum flow rate (see the C5-12 controller manual for instructions on how to do this)
- Record the *maximum flow rate and PIC Valve Max Value %*

8.4 Post-commissioning procedure

8.4.1 Saving controller settings

After commissioning, we recommend that your commissioning engineer saves the unit configurations to the controller. This can allow for the system settings to be restored, back to commissioning settings, if subsequent settings are changed. More details of this feature are available in the controller manual.

8.4.2 Commissioning report

As mentioned previously, it is very important that you submit a copy of the commissioning report to your local sales/service representative, so that this can be retained against the project. Failure to do so may invalidate warranty.

8.4.3 Configuration of accessories

Depending upon the design options that have been selected, you may be required to continue with configuration of specific accessories (for example, humidifier or condensate pump).

Refer to initial design selection or the serial plate within the unit to establish if all necessary parts have been commissioned and configured.

NOTE!

For filter switches, we recommend the following settings:

– G4 = 0.7mbar (70 Pa)
– G7 = 1.2 mbar (120 Pa)

These values are based on standard pressure drops when fans operating at max velocity. Different values may be required if fans are operating at lower speeds (as alarm may not occur until fan increases speed to compensate for dirty filters).

9 Operation

More comprehensive details on the control and regulation of the *Ultra*-DENCO units are available in Controller Manual.

This manual does not cover control of units that have been provided "without controls".

9.1 Requirements

Prior to using an *Ultra*-DENCO unit, a full and safe installation and commission must have been completed and the information recorded. The commissioning report (Chapter 13.3) must be sent to your local sales office to validate warranty.

Before use, all operators **MUST** be familiar with the following:

- The contents of this manual
- Safety assessment of the *Ultra*-DENCO and its surroundings
- Location of the associated outdoor unit (if applicable)
- Location of power distribution board isolator
- Location of the mains isolator
  - Either fitted within the door of the *Ultra*-DENCO unit or within 1m of the unit
- Location of circuit breakers (MCBs) inside the *Ultra*-DENCO unit
- Shut off (isolation) valves for the *Ultra*-DENCO unit including (if applicable):
  - Chilled Water Circuit
  - Humidifier Circuit

9.2 General operation

Close control units, like *Ultra*-DENCO, are designed for continuous operation to cover the 8760 hours in a year, allowing constant indoor temperatures to be maintained.

9.2.1 Enabling the unit

To enable the unit to operate, you must:

- Switch the isolator to the 'ON' position at the mains distribution board
- Switch the isolator to the 'ON' position on isolator fitted to the unit (or within 1 m)
- Wait for the unit to begin its start-up procedure (approximately 45 seconds)
- Enable the unit by keyboard (see the next chapter for details)

9.2.2 The home screen (C5-12)

1: Unit ON/OFF (by keyboard)
2: Unit Status
3: Alarms Page
4: Unit Graphs
5: Login
6: Status Information
7: Current Temperature (depending on control sensor)
8: Current Humidity (depending on control sensor)
9: Unit Number (for networking)
10: Model Reference
11: Icon if any alarms are active
12: Date
13: Unit function Icons
14: Network Status
15: Time
16: Help/additional information

9.2.3 Screen saver

If you do not use the touch screen for 15 minutes, a screen saver is displayed. To turn off the screen saver simply touch the display. The screen will show a bright red alarm symbol, if the unit has an active alarm during screen saver mode.

9.2.4 Physical operation and access

NOTICE

During operation:

- Do not open any doors.
- Do not remove any panels from an operating unit.
- Do not remove any floor tiles near to the unit.
- Do not conduct any work above or below the unit.
- Do not insert any tools through any of the grilles of the unit.

9.2.5 Stopping the unit

⚠ WARNING

Ultra-DENCO units use fans which are regulated independently by the main control board. Removing guards whilst unit is operational risks death or serious injury.

- To stop the *Ultra*-DENCO unit, simply press the ON/OFF button on the home screen.
- ✓ The screen will display 'UNIT OFF BY KEYBOARD' if successful.
- Disable the unit.
- Electrically isolate the unit by switching the isolator to the 'OFF' position on the isolator fitted to the unit (or within 1 m).
- Wait **AT LEAST 5 minutes**.
- ✓ Once fan momentum has ceased, you can open the doors and conduct work.

9.2.6 Disconnecting from power supply

Having deactivated the unit (Chapter 9.2.5) and waiting **AT LEAST 5 MINUTES**, you can disconnect the unit by:

- Ensure the isolator to the 'OFF' position on the isolator fitted to the unit (or within 1 m)
- Switch the isolator to the 'OFF' position at the mains distribution board

⚠ DANGER

When the isolator fitted to the unit (or within 1 m) is in the OFF position, the first half of the isolator could still be live (with electrical power).

- To ensure safe operations, ensure that the circuit has been isolated in the OFF position at the mains distribution board and suitably locked to prevent inadvertent re-connection of electrical power.

9.3 Alarms and error messages

Details and explanation of the alarms by *Ultra*-DENCO units are available in controller manual.

Chapter 11 'Fault finding and troubleshooting' has details of typical issues than can be encountered.

NOTICE

Resetting of alarms without rectifying the cause can lead to extended unit damage, which may result in the voiding of the warranty.

10 Servicing and maintenance

Regular preventative maintenance of your equipment is strongly recommended to ensure that it is kept in excellent operating condition.

Along with equipment recommended in Chapter 2, we recommend that a protective mask is worn during service and maintenance.

- Review your cleaning equipment's guidelines for the required properties of your protective mask.
- Ensure your working area is well ventilated.
- Conduct your own personal risk assessment to evaluate any further requirements.

Note!
We recommend a maintenance contract with FläktGroup or an approved service company.

⚠ WARNING

- Ensure all incoming electrical connections are isolated and cannot be inadvertently energised.
- Rotating fans required at least 5 minutes from electrically isolating the unit before any doors or panels can be removed.

– Units fitted with an humidifier may have hot water condensate and hot pipework/metal work.

⚠ CAUTION

Whilst cleaning, thin fins present a risk of cutting. Panels and doors can be heavy and present a crushing risk when being removed.

- Do not touch the coil with unprotected skin.
- Ensure doors are properly attended when being removed.
- Use access platforms for units that are installed above floor height.

NOTICE

Damaging fins or louvres during the cleaning process will reduce the unit's cooling capacity.

10.1 Planned maintenance

Routine, planned maintenance visits will be required throughout the year to maintain efficiency and may also be a legal requirement depending on country specific legislation.

The intervals of service will depend entirely on the operating conditions of your room. This can be as often as once per month for critical, production essential equipment. Your FläktGroup representative will be able to assist you with arranging a maintenance contract that will suit your needs.

10.2 Example maintenance schedule

Below show an example maintenance schedule for an *Ultra*-DENCO unit. We advised the below is the minimum requirements for maintenance of the unit. Most situations will require further actions and a shorter time interval to ensure optimum operations.

After every inspection, any relevant information must be recorded into the unit's log-book. Certain countries have specific legislation regarding record keeping. Please refer to Chapter 10.5 for more details.

Interval	Action
Daily	1: Check for any outstanding alarms. 2: Check display for satisfactory operation. 3: Visual inspection of exterior condition of the unit.
Weekly	1: Visual inspection gaskets, leaks, insulation, fan bearings and water drain of *Ultra*-DENCO unit, pay attention for any unusual noises. 2: Visual inspection in and around the *Ultra*-DENCO unit.
Monthly	1: Check cleanliness of filters – inspect for break up and suitable sealing. Replace if necessary. 2: Check cleanliness of grilles. 3: Check cleanliness of unit inside and outside.
Every Three Months	1: Check safety cut-outs (including on/off switches) and temperature alarms operate correctly. 2: Check capacity control for correct operation and configuration. 3: Check electrical connections for tightness. Repair or replace all damaged terminals. 4: Check all component electrical currents are within acceptable limits. 5: Check condensate drain for free flow and drainage. 6: Check all accessible pipework fixings for tightness and security. 7: Inspect fan touch protection devices for compliance and functionality. 8: Check operation of on-board electrode steam boiler humidifier (if fitted): Checking drain down and fill function, disposal pumps, and bottle current. Replace any expired bottles. 9: Take readings of the chilled water supply and return temperatures and compare with design requirements.
Every Six Months	1: Check contactors for wear and pitting. 2: Check that the overload functions are set correctly. 3: Check any crankcase heaters (if fitted) for correct operation. 4: Check the evaporator fans are unimpeded for rotation. 5: Checks conditions of heat exchanger coil and clean as required. Heat exchangers will be inspected for free airflow, cleaned and combed out where necessary. 6: If not conducted within the last 6 months; change air filters. 7: Check pipework and insulation for damage (including site pipework). 8: The glycol content should be checked (if applicable) then adjusted and recorded as necessary. 9: Check the condition of the water pipework, water volume flow, valve operation, and the cleanliness of all the strainers. 10: Check the calibration and functionality of the unit controller. 11: Check casing and connected ducting for any air leakage – repair where required. 12: Check room conditions required and adjust unit settings as necessary. 13: Clean unit inside and out with vacuum cleaner and wipe down with damp cloth.

Associated equipment should also be service in accordance with manufactures specifications.

10.3 Humidifier maintenance (if fitted)

Cylinder life will be dependent on the quality of the water and the length of time the cylinder will be active. Each cylinder is equipped with an integrated filter in the drain pipe. With every cylinder replacement this filter must be changed also.

10.4 Closing down procedure

It is essential for starting, closing down, emergency operation and fault finding to know the location of the following components:

– Location of isolator for power distribution to the unit
– Main isolator (integral to unit or local position)
– ON/OFF icon on the display of the unit
– All valves likely to affect water supply to humidifier (when fitted)

Note!
The units are design for continuous operation and it is recommended that the system is kept running overnight and at weekends to maintain stable room conditions.

Short Periods Should you require the equipment to be closed down for the weekend or Bank Holiday, no special precautions are required. Each unit may simply be turned off by pressing the ON/OFF icon. Alternatively, the "ON/OFF Times" can be configured in the controller software.

Long Periods If the plant is to be shut down for longer periods (up to a month) this can be done by switching off at the ON/OFF icon, then setting the mains isolator to the 'OFF' position and closing the local mains water supply to the humidifier (if fitted).

Indefinitely When the equipment is to be taken out of service for an indefinite period we recommend employing a qualified air conditioning engineer. An engineer will also be required to restart the equipment.

The mains power should remain "ON" for at least the stroke time of the valve actuator to ensure that the valve closes fully.

10.4.1 Freeze prevention of water pipework

If water piping is installed where the temperature may drop below freezing, it must be completely drained. Water coils are difficult to drain therefore it is advisable to remove any remaining water by using compressed air.

If systems are to remain out of operation for long periods, this can result in corrosion of the inner surfaces of the piping and coils. Therefore we recommend that the hydraulic system be refilled with an anti-freeze solution. The anti-freeze solution should contain inhibitors. Refer to Chapter 6.1.2 and ask your anti-freeze supplier for advice.

On re-commissioning the equipment, the anti-freeze solution must be drained and properly recycled.

10.5 Logbook

FläktGroup recommends a logbook should be available throughout the working life of the equipment.

The logbook should include (but is not limited to) the following information:

– Details of any maintenance or repair work
– Changes and replacements of any components
– Results of all periodic routine tests
– The periods of any significant non-use

It is also recommended that the initial design conditions and any subsequent changes are documented and kept with the logbook to enable an easy understanding of the history of the unit.

11 Fault finding and troubleshooting

The *Ultra*-DENCO product range is designed to perform its primary function: cooling of the controlled space, for as long as possible. As long as a consistent and suitable power supply is given to the unit, only 'Critical' alarms will stop the unit performing its primary function. Other alarms or faults may deactivate additional features of the unit (e.g. turn off the humidifier etc).

Fault finding shall only be carried out by qualified licensed individuals with professional training and experience in the relevant accident prevention regulations, as well as other generally recognized safety and occupational health codes.

Provided that a high quality, thorough and planned maintenance program is maintained, an *Ultra*-DENCO unit should provide years of problem-free operation.

Note!
A quality, routine, planned maintenance program should be implemented from commissioning. Failure to have a maintenance program in place during the warranty period may invalidate the warranty.

If you find that your room conditions are outside of design specifications, there are some simple areas that you can check to gather valuable information:

– Have conditions within the room changed?
– Has the equipment been recently repositioned?
– Is the airtightness of the room compromised (e.g. door/window open)?
– Is there new equipment with higher/lower heat load?
– Is the air path temporarily blocked?
– Has additional cooling equipment been added to the room?
– Have the grille tiles been repositioned

Observing the unit status:

– Has the unit got power from the main distribution board?
– Is the unit isolator in the ON position?
– Is the unit display working?
– What does the unit status description say?
– Is the unit controlled via BMS? What are the current commands?
– Is the unit a part of a network with other *Ultra*-DENCO units? Is it currently in duty or standby mode?
– Can you hear the fans operating?
– Observe what previous alarms have been made (and dismissed)
– Have the unit set-points been modified?
– When was the unit's last service?

These simple questions and observations give invaluable information to an engineer to be able to appreciate a situation before attending site. The more information you can provide, the more likely the issue will be solved in a concise and timely manner.

11.1 Common issues

Note!
The advice in the following section is with the assumption that the unit has been operating consistently for a substantial amount of time with appropriate design conditions, application and all necessary resources are supplied to the unit (electrical, power, water, free airflow etc.).

⚠ WARNING

Ultra-DENCO units use fans which are regulated independently by the main control board. Removing guards whilst unit is operational risks death or serious injury. Inverters also store energy for a period of time after isolation.

- Disable the unit.
- Electrically isolate the unit.
- Wait **AT LEAST** 5 minutes

✓ Once fan momentum has ceased, you can open the doors and conduct work.

Below is a list of conventional alarms or issues that, if initially installed and commissioned properly, have a small chance of occurring for the *Ultra*-DENCO unit. Before addressing the fault and possible remedy, please observe the following:

– Always refer to the correct electrical wiring diagram
– For water based circuits; plant hydraulics settings should not be altered as this may affect the balance of the complete system. Rebalancing of a system can be a costly operation, therefore any adjustments must be conducted by qualified individuals with full knowledge of the system design and requirements.
– Regular maintenance is the most effective measure to preventing any issue.
– If troubleshooting requires adjustments to the controller's setting, please refer to the separate controller manual before proceeding.
– All person(s) must know the safety location of the unit (e.g. isolation points) before conducting any work

Note!
Due to the relationship between temperature and humidity, high temperature and low humidity or alternatively low temperature and high humidity can occur at the same time. To resolve such situations, always address the temperature first, before taking measures to resolve humidity.

Fault	Possible Reason	Possible Remedy
Indoor fan(s) not operating	Blocked filter alarm	Check the coil filters for cleanliness, clean or replace as appropriate
	Fan motor failure	The fan and the motor are a dynamic pair, therefore the fan assembly must be replaced
	Fan relay not activating	Check the fan relays (1 relay per fan)
	Unit off by…	Check the controller display to see if the unit has been disabled by; BMS, Time or Keyboard. If the unit is also part of a network, it could be on a 'Stand-by' status.
No image on the display	No power to the unit	Check the power supply at the mains power distribution board and at the local isolator.
	Display unit cable disconnected	Deactivate the unit and open the door with the display. Inspect the connection and cable at the display and the controller.

Fault	Possible Reason	Possible Remedy
Unit not Cooling/Heating/ Humidifying/Dehumidifying	Airflow Failure Alarm	Check fan operation and suitable clearances in and around the fan. Check output of the controller to the fan and each fan relay is energised.
	Heater Over-temperature Alarm (Heating Only)	Check the heater klixon for functionality, replace if necessary and check function of heaters.
	Water Detection Alarm	Standard configuration disables the humidifier only. Settings in the controller allow for whole unit operation to be stopped. Inspect underneath the unit for presence of water and check coil condensate tray.
	Sensor Failure	Certain temperature and pressure sensors, upon failure, will disable functions of the unit. Refer to the controls manual to see what function is affected by each sensor.
High Water Temperature	Chiller thermostat set too high or chiller malfunction	Check chiller control system
	Mixing valve malfunction	Try to recalibrate the valve, if unsuccessful, repair or replace.
Low Water Temperature	Chiller thermostat set too low	Check chiller control system
	Air in the hydraulic system	Vent the system at all ‘high’ points of the circuit
	Mixing valve malfunction	Try to recalibrate the valve, if unsuccessful, repair or replace.
Circulation too high	Hydraulic system out of balance	Check system balancing valves against commissioning details. Perform re-balancing if required.
Circulation too low	System out of balance or valves closed/partially closed	Check system balancing valves against commissioning details. Perform re-balancing if required.
		Ensure all Shut off valves are fully open
	Air in hydraulic system	Vent the system at all ‘high’ points of the circuit
	Pipework blockage	Investigate pipework in question by taking spot temperatures and/or pressure readings. Clean or replace pipework
High Airflow	Filters not installed or damaged	Replace filters
	Fan speed too high	Check settings on the controller and reduce maximum fan speed – check against commissioning values
Low Airflow	Filters blocked	Replace filters and check operation of filter differential pressure switch (if fitted)
Unusual fan noise or vibration	Loosing brackets or bolts	Inspect bolts, replace if damaged and re-tighten
	Fan motor out of balance	Have fan professionally rebalanced or replace fan

Fault	Possible Reason	Possible Remedy
Incorrect temperature or humidity shown on display	Sensor calibration incorrect	Use independent tool to check value required and adjust calibration in the controller
	Loose cable connection or faulty connection	Inspect wiring integrity and repair/replace as necessary
	Earth screen on sensor cable ineffective	The sensor wiring must be screened and fully segregated from wiring carrying mains potential. The screen should be terminated to earth at one end only.

12 Dismantling and disposal

12.1 Dismantling

To dismantle an *Ultra*-DENCO unit, proceed as follows:

⚠ WARNING

- Ensure all incoming electrical connections are isolated and cannot be inadvertently energised.
- Rotating fans required at least 5 minutes from electrically isolating the unit before any doors or panels can be removed.
- Use earth and short-circuit and cover or isolate any neighbouring live parts.
- Recover all cooling medium.

- Stop the unit as per Chapter 9.2.5 "Stopping the unit"
- Disable electrical power to the unit as per Chapter 9.2.6 "Disconnecting from power supply"
- Ensure that the power supply cannot be 're-activated' by interlocking the supply/ supplies at the main power board and removing any fuses
- Humidifier
  - Turn off the water feed to the humidifier (if fitted)
  - Remove the humidifier connection to the condensate drain
  - Ensure the humidifier bottle is suitably sealed or appropriately drained
- Water Circuits
  - Close off/shut the valve on any water circuits
  - Drain the water mixture from the circuit
  - Disconnect the water connections and ensure no further fluid is leaking
- **A qualified electrical contractor** should be employed to remove/recover the main(s) and any interconnecting cabling
- Once mechanically and electrically separated from the building systems
  - Disconnect any electrical cables between the fan section and the heat exchanger section
  - Attend to releasing the *Ultra*-DENCO unit from any fixings to the floor or other sub-structures
- Prepare the unit for handling and transportation as per instructions in Chapter 4 "Shipping and storage", ensuring the fan and heat exchanger sections are moved separately

12.2 Disposal

NOTICE

Environmental Damage!

- Dispose of all components and materials (such as water-glycol mix) depending on material type in an environmentally friendly manner and in accordance with the local codes, practices and environmental regulations.

An **authorized appointed contractor** specializing in waste processing shall dispose of the unit or its individual components. This appointed contractor shall ensure that:

– the components are separated according to material types
– the used operating materials are sorted and separated according to their respective properties.
– They observe all local, national and international legislation and regulation regarding the disposal of materials. For example, within Europe, they may refer to (amongst others):
  – Waste Electrical & Electronic Equipment (WEEE) 2012/19/EU
  – Waste Framework Directive 2008/98/EC

13 Appendix

Note!
Please note that these documents are samples from the time of publishing and may not be the latest revision. For copies of the latest versions, please contact your local sales office who will be able to provide them in either electronic or printed form.

13.1 Assembly Statement (DQA 656)

It is mandatory for the installation company to complete and sign the Assembly Statement once the fan and coil sections have been securely and safety connected. Only when this statement is signed and recorded can the CE label and Declaration of Conformity become valid.

13.2 Pre-Commissioning Checklist (DQA 880)

This document is to be completed before the commissioning engineer arrives to ensure all requirements have been completed and checked. The commissioning engineer will ask you to present this document before they can proceed.

13.3 Commissioning Report (DQA 890)

This is the template for the commissioning report of *Ultra*-DENCO units

13.1 Assembly statement (DQA 656)

ULTRA-DENCO®
ASSEMBLY STATEMENT

FläktGroup

Installation Company Details

NAME	
OFFICE / REGION	
ADDRESS	
CONTACT NAME	
CONTACT NUMBER	
CONTACT EMAIL	

Equipment Location

ROOM NAME/NO.	
SITE ADDRESS	

Product

MODEL CODE	
PROJECT NUMBER	
SERIAL NUMBER	

An *Ultra*-DENCO® unit requires the two sections (fan section and coil section) to be successfully installed and joined as per the requirements of the latest version of the Operation Manual (PR-2011-0100), in particular:

- Chapter 5: Installation
- Chapter 6: Medium Connections
- Chapter 7: Electrical Connections

These requirements establish a complete and safe system. Installation must also be completed following requirements of the Machinery Directive 2006/42/EC and observing any local or regional legislation.

Failure to meet the above requirements may affect or invalidate CE certification, Declaration of Conformity or Incorporation and the supplier's warranty.

- Your signature of this document validates the CE label, fitted to the unit serial plate, and the Declaration of Conformity.

SIGNATURE	
NAME	
JOB TITLE	
DATE	

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13.2 Pre-commissioning checklist (DQA 880)

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Pre – Commissioning Checklist

As a pre-requisite to accepting a firm booking for commissioning we need clarification that all aspects of the installation are ready for us to proceed without delay when we arrive on site. Will you please therefore complete all relevant sections of this form and e-mail back to your designated FläktGroup contact.

End Users – Site Name:	
Installers Name:	
Full Site Address:	
Site Post Code:	
DencoHappel Contract	
DencoHappel Contracts Engineer.	
DencoHappel Contracts Engineers E-Mail Address.	

Checklist Item	Tick Boxes			Comments
	Yes	No	N/A	
Is equipment in correct positions, mounted on floor stands (if required) and levelled up.				
Is work area clean, tidy, safe, and accessible? If area has raised floor is it complete and free from hazards.				
Are all grilles and ductwork complete and ready for use?				
Has refrigeration pipework been pressure tested and test certificates available for our inspection and retention?				
Is all refrigeration pipework installed, connected, evacuated, and left with a holding charge of refrigerant.				
Is mains cold water supply pipework connected and pressure available (equipment with humidifiers only)				
Is chilled water or condenser water pipework installed, fitted with auto air vents, strainers, and dosing pots, tested and systems filled and vented?				

Failure to complete this form or failure to have all required items ready for commissioning may result in an abortive visit by our commissioning engineer, Your signature on page 2 authorises the acceptance of any abortive costs accordingly

Page **1** of **3** **DQA880 – Rev FG2**

Checklist Item	Tick Boxes			Comments
	Yes	No	N/A	
If chilled water or condenser water system is to be filled with a glycol mix has this been done and accurate concentration readings available for our retention.				
Is drainage pipework connected and tested.				
Are condensate pumps fitted and tested with electrical supply and pipework and has internal packing been removed.				
Has mains power supply been installed, connected, phase rotation checked, and power available at isolators.				
Has interconnecting electrical wiring been installed and connected as per wiring diagrams.				
Have fire shutdown connections been installed and verified as operating correctly.				
Have external stop – start connections (if required) been installed and tested.				
Have interconnection cables (Denconet) been installed utilising correct Belden type cable and left for our connection.				
Do mains power supplies – cables have source isolation that complies with the current electrical regulations.				
Is secure on-site parking available for our commissioning engineer's vehicle?				
Is an H & S induction required before our commissioning engineer can commence work?				
Spare				
Spare				
Spare				
Spare				

Notes:

1. To comply with F-Gas regulations where the system has refrigerant charge (supply & commission projects) clients must have their own engineer on site for the duration of the works to add refrigerant to systems and create the relevant statutory records.

2. On chilled water or condenser cooling water systems (e.g. Ambicool) clients must have their own engineer on site for the duration of the works to measure and set up the flow rates.

3. If the equipment is to be connected to a BMS system then clients must have their own BMS engineer on site.

Failure to complete this form or failure to have all required items ready for commissioning may result in an abortive visit by our commissioning engineer, Your signature on page 2 authorises the acceptance of any abortive costs accordingly

Comments:	
Completed By:	
Signature:	
On Behalf Of:	
Date:	

Failure to complete this form or failure to have all required items ready for commissioning may result in an abortive visit by our commissioning engineer, Your signature on page 2 authorises the acceptance of any abortive costs accordingly

13.3 *Ultra*-DENCO Commissioning report (DQA 890)

Commissioning Record Book

FläktGroup

Before working on this equipment, ensure that all incoming electrical connections are isolated and checked as voltage free by a competent person.
FAILURE TO DO SO MAY RESULT IN SERIOUS INJURY OR DEATH
Refer to appropriate electrical wiring schematic for all external wiring

Section A: 1 copy for completion by contracts engineer in respect of each model or variant on site.					
All boxes in section A to be completed before handing - sending to commissioning engineer.					
Contract's Engs Name			**Date Required & Agreed**		
End User's Name					
Induction Required			**If Yes State Time Of Start**		
Client's Name					
Installer's Name					
Site Address					
Site Contact's name			**Contract Number**		
Site Contact's Tel No			**Quantity of this model**		
Air Balance	**Yes / No**		**Supply Only**	**Yes / No**	
Water Balance	**Yes / No**		**Supply & Install**	**Yes / No**	
Design RA Condition	**Temperature c**		**Design RA Condition**	**Humidity % RH**	
Design Total Cooling	**Kilowatts**		**Design Sensible Cooling**	**Kilowatts**	
AHU Model No			**Heat Rejection Model No**		
PPE Requirements					
Parking on Site			**Do Site Specific RAM's apply**		
Special Instructions					

Section B: For completion by commissioning engineer for each unit on site before starting commissioning. MANDATORY			
AHU Serial No.		Heat Rejection Serial Nos	
AHU Location		AHU Site Reference No.	
Heat Load Available During Commissioning Process			
Check piping installation complies with O&M manual & Approved Code of Practice-DX Installations		Initial Box =	
Check & confirm interconnecting wiring and unit mains power supply matches contract wiring diagram		Initial Box =	
Work may not proceed until the above checks have been completed and the initial box filled in and the contract technical data has been added. All instrumentation must be covered by a current calibration certificate including pressure gauges, vacuum gauges, thermometers, airflow meters, ammeter, multimeter, etc.			

Electrical Power Supply						
					Units	
L1 Mains Supply Voltage	V			L3 Mains Supply Voltage	V	
L2 Mains Supply Voltage	V			Control Circuit Voltage	V	
Fan Motor Currents						
	Amps	Phase 1	Phase 2	Phase 3		
Fan Motor 1 Current Min	A					
Fan Motor 1 Current Max	A					
Fan Motor 2 Current Min	A					
Fan Motor 2 Current Max	A					
Fan Motor 3 Current Min	A					
Fan Motor 3 Current Max	A					

Measurement of air volumes and the amperages of all fans in both minimum speed and maximum speed is mandatory - no exceptions are permitted.

SUPERSEDES ALL PREVIOUS VERSIONS WITHOUT EXCEPTION
NO MODIFICATIONS TO FORMAT ALLOWED

Commissioning Record Book

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Air Volume Checks					
Measured Air Volume	m^3/s		Air On Temperature	°C	
Max Fan Speed Setting	% or V		Air Off Temperature	°C	
Min Fan Speed Setting	% or V		Air Flow Fail Setting Check	Yes/No	
Dehum Fan Speed	% or V				
Room Distribution Checked	Yes/No		Filter Change	Mbar/Pa	
Glycol Circuit (if option fitted)			Option Fitted to Machine	Yes/No	
Pump Make			Pump Model		
Pump Suction Pressure	Bar		Pump Delivery Pressure	Bar	
Design Flowrate	Lps		Actual Flowrate	Lps	
Design Exp Vessel Pressure	Bar		Actual Exp Vessel Pressure	Bar	
Drycooler Target Setting	°C		Local Isolators Fitted	Yes / No	
Fluid Inlet Temperature	°C		Fluid Outlet Temperature	°C	
Auto Air Vents Fitted	Yes / No		Air Vents Checked	Yes / No	
Glycol Concentration	%		Double Reg Valve Setting	No / kpa	
Glycol Type			Volume Glycol Added	Litres	
Dry Cooler Motor Amps	A		State average amps across all phases & motors if even		
Glycol Pump Amps	A		State average amps across all phases & pumps if even		
Controls					
Temperature Set Point	°C		Humidity Set Point	%RH	
Dead Zone T	°C		Dead Zone RH	%RH	
Proportional Band T	°C		Proportional Band RH	%RH	
Oil Recovery Time (SIAM only)	Seconds		Controller Software Vers	Number	
Sensor Calibration T	°C		Sensor Calibration RH	%RH	
Strategy Selected	P or PI		Type of control selected	T or TH	
Software Settings Entered	Yes / No		Network Number of Unit	Number	
Network Connected	Yes / No		Type of Comm's Card		
Comms Card Fitted	Yes / No		Hum and RH Control Enabled	Yes / No	
Discharge Transducer Reading	Bar		Discharge Transducer Calibration	Bar	
Suction Transducer Reading	Bar		Suction Transducer Calibratio	Bar	
Suction Sensor Reading	°C		Suction Sensor Calibration	°C	
Refrigeration Circuit (if option fitted)			Option Fitted to Machine	Yes/No	
Pressure Test Level	Bar		Vacuum Achieved	Torr	
Circuit Pipe Length	M		Total Pipework Rise	M	
Compressor Model 1			Oil Added To Circuit	Ltrs	
Compressor Model 2			Weight of Refrigerant R401A	Kg	
Full Load Suction Pressure	Bar		Full Load Superheat Temp	°K	
Liquid Line Temperature	°C		Part Load Superheat Temp	°K	
Stable Discharge Pressure	Bar		Sub Cooling Temperature	°K	
Full Load Discharge Temp	°C		Full Load Discharge S / heat	°K	
Part Load Discharge Temp	°C		Part Load Discharge S / heat	°K	
Compressor 1 Current	A		Design Compressor 1 Current	A	
Compressor 2 Current	A		Design Compressor 2 Current	A	
Condenser Motor Current	A		Software H.P Switch Setting	Bar	
L.P. Envelope Threshold	Bar		Mech H.P Switch Setting	Bar	
L.P. Alarm Threshold	Bar		EEV Sight Glass Condition		

Commissioning Record Book

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Chilled Water (if option fitted)			Option Fitted to Machine	Yes/No	
CW Flowrate	Lps		Double Reg Valve Setting	No / kpa	
CW Water Inlet Temp.	°C		CW Water Outlet Temp	°C	
Electric Heating (if option fitted)			Option Fitted to Machine	Yes/No	
Thyristor Control Fitted	Yes/No		Heater 2 Current	A	
Heater 1 Current	A		Heater 3 Current	A	
Humidifier (if option fitted)			Option Fitted to Machine	Yes/No	
L1 Humidifier Current	A		Water Supply Conductivity	Ms	
L2 Humidifier Current	A		Bottle Type	kg	
L3 Humidifier Current	A		% Output Set	%	
Bottle Conductivity Range	Ms		Bottle Part Number	Number	
Condensate Pump Drain (if option fitted)					
Gravity or Pumped	**N/A**		Pump Model		
System Lift			Function Test Pass / Fail		

Please initial box below to certify and confirm that the listed functional tests have been carried out on the equipment

Low pressure transducer set correctly & function		Head pressure control function & setting correct	
High pressure transducer set correctly & functior		High temperature alarm set and function operating	
High pressure switch set correctly & functions		Low temperature alarm set and function operating	
Airflow failure transducer set correctly & function		Filter blocked transducer set correctly & functions	
Water detection operates (if fitted & laid out)		Alarm output relays set up and operating correctly	
Layout of the suction lines has been checked		Superheat stable and correctly set as TI & OEM	
Discharge line temperature sensor fixing checke		System correctly evacuated before charging	
Discharge line traps fitted if required		Any additional oil added taken from new can	
Requirement for crankcase heating checked		System fully leak tested after commissioning	
Fans free from vibration at all speeds		Condensers correctly installed	
Discharge pressure is at least 1.8 times suction pressure		Pressure transducer readings checked	
DQA892 Multi Denco Charging procedure followed		Spare	

You are verifying that key issues - functions have been checked and conform to the requirements- settings in the O & M manual

Please Detail Any Checks - Measurements Not Completed And Reasons Why
Please detail all site related issues (not equipment) found during commissioning that might affect performance and reliability
Please detail any issues or site related problems (not equipment) with air distribution in the conditioned space

Additionally Complete And Sign Page 4 for DX Units Charged In The Field

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Commissioning Record Book

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F-Gas regulation No 842/2006 Record Log Sheet Information For Owners Use - Answer All Questions					
Plant Name			Reference Number		
Location of Plant			Serial Number		
Plant Operator			Plant Operator		
Operator Contact					
Cooling Loads Served					
Refrigerant Type			Quantity Installed		
Plant Manufacturer			Year of Installation		
Refrigerant Additions (If none state none)					
Date	Engineer	Amount Added in KG	Reason for Addition		
Refrigerant Removals (If none state none)					
Date	Engineer	Amount Removed in KG	Reason For Removal & What Was Done With Recovered Refrigerant		
Leak Tests (State Method Used - Mandatory)					
Date	Engineer	Test Result	Follow Up Actions Required		
Leak Detector Details		Model Number		Serial Number	
Follow Up Action (If none state none)					
Date	Engineer	Related To Test On	Actions Taken		
Testing Of Automatic Leak Detector (State none if not fitted)					
Date	Engineer	Test Result	Comments		
Notes:					
Notes:					
Engineers Full Name			Date		
Engineers Signature					

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EXCELLENCE IN SOLUTIONS

FläktGroup is the European market leader for smart and energy efficient Indoor Air and Critical Air solutions to support every application area. We offer our customers innovative technologies, high quality and outstanding performance supported by more than a century of accumulated industry experience. The widest product range in the market, and strong market presence in 65 countries worldwide, guarantee that we are always by your side, ready to deliver Excellence in Solutions.

PRODUCT FUNCTIONS BY FLÄKTGROUP

Air Treatment | Air Movement | Air Diffusion | Air Distribution | Air Filtration
Air Management | Air Conditioning & Heating | Controls | Service

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