

# ETKC Cooling Unit



Contents	Page
Safety Precautions	1
Technical Data	2
Electrical Wiring	3
Installation and Commissioning	4
Operation and Care	5
Handling	5
Maintenance	7
Fault Tracing	8
Refrigeration Flow Chart	9

## Safety Precautions



### IMPORTANT INFORMATION!

- The unit must **NOT** be used in any other way than as a cooling unit!
- Carefully read, study and understand the Operation and Maintenance Instructions before you commission / operate / service / maintain / dismantle the unit.  
Keep these instructions in a safe place for future reference!
- Experts should carry out all service and maintenance! An accredited company with qualified personnel and the necessary protective equipment may only carry out Service/maintenance of the cooling system!
- The unit starts up automatically! Open and lock the main switch of the cooling unit before you begin any work!
- **NEVER** enter the unit to inspect it or carry out work inside it!
- Only original parts may be used as spare parts!

**Non-compliance with any of the rules above could seriously risk the safety of personnel and void the warranty/product liability!**

## Compulsory declaration and recurring inspection

### Compulsory declaration

A declaration of possession of cooling equipment must be submitted to the local inspection authorities, in most cases the Public Health and Environment Authority in your municipality, if the refrigeration equipment in your operations is charged with more than a total of 10 kg refrigerant.

### Recurring inspection

Recurring inspection, i.e. inspection of the refrigerant system to detect possible leakage that must be carried out at least once a year by an accredited inspectorate (normally a refrigeration service company), see "Maintenance".

# ETKC Cooling Unit

## ETKC Data

Size (a)	Capacity Variant (b)	3 x 400 V			3 x 230 V		Approximate Refrigerant charge, kg				Total
		Rated Cooling power (kW)	Rated Input current (A)	Rec. fuse (A)	Rated Input current (A)	Rec. fuse (A)	Circuit 1	Circuit 2	Circuit 3	Circuit 4	
20	2	13	8,2	16	19	25	1	1			2
20	3	18	11,2	16	23	32	1	2			3
30	1	13	8,2	16	19	25	1	2			3
30	2	18	11,2	16	23	32	1	2			3
30	3	26	16,2	20	33	40	2	3			5
35	1	13	8,2	16	19	25	1	2			3
35	2	18	11,2	16	23	32	1	2			3
35	3	26	16,2	20	33	40	2	3			5
40	1	18	11,2	16	50	63	2	3			5
40	2	26	16,2	20	33	40	2	3			5
40	3	43	24,6	35	50	63	3	4			7
50	1	43	26,2	35	83	100	4	5			9
50	2	56	32,9	50	67	80	4	5			9
50	3	68	41,6	50	83	100	5	7			12
65	1	56	32,9	50	67	80	5	6			12
65	2	68	41,6	63	83	100	5	6			12
65	3	91	55,8	63	112	125	5	5	5		16
80	1	92	55,8	63	103	125	7	7	7		21
80	2	138	81,0	100	N.A.	N.A.	7	7	7		21
80	3	183	97,4	125	N.A.	N.A.	9	9	9		27
85	1	92	55,8	63	103	125	7	7	7		21
85	2	138	81,0	100	N.A.	N.A.	7	7	7		21
85	3	183	97,4	125	N.A.	N.A.	7	7	7	7	27

# ETKC Cooling Unit

## Electrical Connections

Check that the main circuit breaker has been opened isolating the power supply to the cooling unit. The electrical connections are made at the main circuit breaker located on the front panel, above the service cover.

**Important!** The direction of rotation of the compressors is determined by the sequence of the phases. The cooling unit must be wired according to the correct phase sequence otherwise an alarm will be initiated.

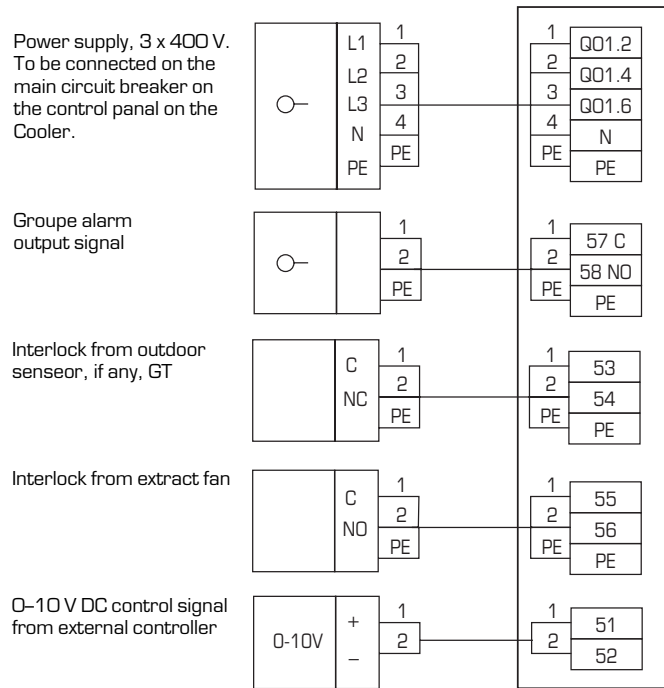
The cooling unit alarm chain circuit can also transmit a group alarm signal to an external monitoring unit. (The ET Air handling unit or other control unit)

This group alarm can be obtained as potential-free contacts at pins 57 and 58 at the terminal board.

To prevent unnecessary stops and alarms from being initiated from the cooling unit, it should be interlocked across extract air fan FF.

Wire the cooling unit according to the wiring diagram below.

## External wiring diagram



# ETKC Cooling Unit

## Installation and Commissioning

### Check List

#### Important!

- Always study safety precautions on page 1 before beginning any work!
- The unit must not be commissioned until the system has been inspected in accordance with the list below!



Check the following *before* initially starting the unit:

- No transport damage, site, (good lighting, level supporting surface, etc.)
- No compressor oil leakage
- Retighten Rotalock connection
- Phase sequence and retighten mains power connections
- Control signal, cooling, from the air handling unit Cooling recovery is not activated
- Crankcase heater is operative
- Condensate drain

*After* commissioning, check the following:

- Outdoor air/supply air temperature
- Condensation/Evaporation temperature
- Hot gas temperature/supercooling/overheating
- Operating currents
- Information presented to personnel

### Connecting the Water-cooled Condenser

If the unit is fitted with a KD-W water cooled condenser (see unit specification), connect tap water at min. 0.5 bar and max. 10 bar pressure. Use an appropriate pipe fitting for connecting the tap water (see connection instructions on the cooling unit). Carefully connect pipe work according to the arrows. Connect the drain water line to an accumulator tank if heat is to be recovered. If the cooling unit has a KD-W water-cooled condenser, the tap water must not be shut off.

**Important!** If the condenser is located outdoors, water mixed with an appropriate amount of anti-freeze must be used.

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### Starting the ETKC Cooling Unit

If commissioning is carried out during the cold season, when the temperature is below +15°C, the compressors must be preheated:

Set the protective motor switch of the compressors in position 0 (Off). Set the main switch in the cooling unit in position 1 (ON) and activate the control fuse. The compressor is now heated up by crankcase heater. If the ambient temperature is below +15°C, wait 4-8 hours until the compressor has become warm, before starting the compressor.

### Presetting the Set Point for Cooling

The control unit in the air handling unit transmits, on a cooling load, a control signal (0-10V) to the cooling unit, which switches in the output stages in proportion to the signal.

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### Checking the Performance

The performance of the cooling unit can be tested by temporarily lowering the set point for cooling, causing the cooling unit to start up.

### Control

For a description of control unit, see page 6.

The control function of the air handling unit should include a min. temperature sensor in the supply air as far away from the unit as possible, and a room or extract air sensor. The cooling unit should be interlocked across the extract air fan (and an outdoor thermostat, if fitted). Due to the location of the condenser coil, so-called cooling energy recovery cannot be used while the cooling unit operates.

### High-pressure Condenser, KD

If the extract air cannot absorb the condenser heat, the KM1 is first switched out ("Capac. Control"). If this is not enough, the high-pressure switch with manual reset will trip, (see page 6).

### Alarm

All alarms are indicated on the display of the control unit (see page 7). Potential-free closure occurs on the group alarm transmission terminal block group, if used.

# ETKC Cooling Unit

## Operation and Care

**Important:** Always study the safety precautions on page 1 before beginning any work!

## Description

The cooling unit is a component of the air-handling unit and is installed as a module in the ET unit. The cooling unit operates independently and has a dedicated electrical equipment panel.

The cooling output is, however, switched in response to signals transmitted from the air-handling unit.

The cooling unit is designed for the cooling of supply air with an entering air temperature within the range +20 - +32°C.

The decrease in temperature can be up to 16°C depending on output variant selected, prevailing air temperatures and the supply air/extract air volume ratio.

## Operation

An electrical equipment cubicle is located in the service section of the cooling unit contains the following main components:

- Main circuit breaker
- Control fuse
- Protective motor switch
- Control unit with display

## Refrigerant Tank

**Warning!** The refrigerant tank is intended for use only as a "passive" container, i.e. it must **NOT** be connected while the unit is normally operating. (Applicable to a unit with refrigerant tank)

## Description of the Components

### Control unit (RC1)

The control unit is located in the door of the electrical ETKC Cooling Unit equipment cubicle. See description on page 6.

### Control Circuit Fuse

The automatic fuse can be reset by pulling the black handle upward.

**Warning!** The control fuse does **NOT** isolate the power supply to the entire cooling unit! Whenever work is carried out on the cooling unit, the main circuit breaker shall always be open and locked.

### Main Circuit Breaker

The main circuit breaker is used for switching off - switching on the cooling unit.

Whenever work is carried out on the cooling unit, the main circuit breaker shall always be open and locked! Certain terminal blocks can still be energized even though the circuit breaker is switched off, such as the terminals for group alarm output.

# ETKC Cooling Unit

## Functions – General

The output of the compressor is controlled by an external control signal, 0-10V.

The operation of the unit is interlocked across the extract air fan contactor and an outdoor thermostat, if fitted, and across a phase-sequence relay. After the fan is started, the compressors are interlocked for 2 minutes to enable the damper to open, (“Start wait 2 mins.” flashes in the display”). Each compressor has 1 Digital input for resetting alarms and 1 Digital relay output for contactors.

## Delayed Restart

The compressor cannot restart until after a 300/305/310/315 second pause (KM1/KM2/KM3/KM4). During this time “Start wait 2 mins.” is displayed if the need arises for starting the relevant compressor.

## Capacity Control

Compressor 1 has a special high pressure switch for capacity control. If the condensation pressure is high, compressor 1 is switched out and is allowed to restart only after a delay of 300 sec. “Capac.” is shown in the display while Capacity Control is active.

## Compressor Protection

Each compressor is protected by a high pressure switch and a motor protection. A phase-sequence relay protects the compressors against possible wrong phase sequence. Oil heating is switched in whenever the compressors are not in operation.  
**Note! Never alter the stepping sequence.**

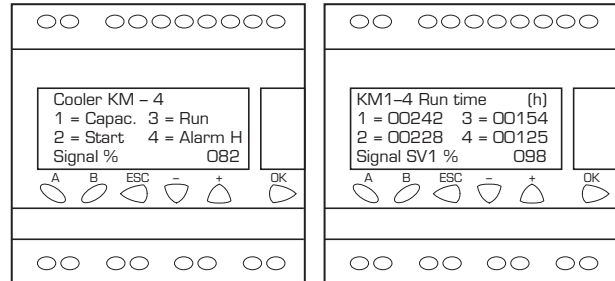
## Switch-in Levels

The different compressor stages are switched in for the following signal levels:

Straight stepping Number of compressors			Binary stepping Number of compressors	
Compressor	3	4	Compressor	2
1	30 %	20 %	1	30%
2	60 %	40 %	1	60 %
3	90 %	60 %	1 + 2	90%
4		80 %		

## Switch-out Levels

With 2 or 3 compressors each stage is switched out at 20% (2.0V) below the stage switch-in level. With 4 compressors they are switched out 10% below.



## Group Alarm

For all alarms, the group alarm energizes the relay for external alarm indication.

### On the display

row 1 shows the type of Cooler  
 Cooler KM11-2 bin. Cooler 1-3 or Cooler 1-4  
 Bin means the stages are switched in binary giving three steps.

### Rows 2 and 3

showing the operational status for compressors 1-4:  
 Start; flashes during delayed start  
 Run; compressor is running  
 Capac. or Capacity control  
 Alarm H or Alarm High Pressure  
 Alarm L or Alarm Low pressure  
 Alarm Q or Alarm Q1 / Term  
 (Q is motor protection and Term is motor thermistor).

### Row 2 can also display

\* 3-Phase alarm \*

### Row 3 can also show

\* Fan stop \*  
 \* Start wait 2 min \*

### Row 4

displays the incoming control signal as 0-100%:  
 Signal % 058

Press button A to see compressor run times.  
 If hot gas bypass is fitted the control signal to the valve is shown on line 4.

## Program

On delivery, the control unit is pre-programmed and ready for duty.  
 The program is locked and can't be altered.

# ETKC Cooling Unit

## Maintenance

**Important:** Always study safety precautions on page 1 before beginning work!

## Inspection/Maintenance

The unit is designed for fully automatic operation, but requires a certain degree of scheduled inspection and maintenance.

Moreover in accordance with applicable regulations "Recurring inspection" shall be carried out by an accredited refrigeration service company.

### Inspection

(To be carried out by owner/end user once a week).

Check (look/listen) the following:

1. Alarm indications
2. Abnormal noise/vibrations
3. Medium leakage (oil, water)
4. Corrosion, wear
5. Suspension fittings, fasteners
6. Space around the unit, lighting.

### Maintenance

(To be carried out by a refrigeration service company or the like at least once a year).

Check the following:

1. Evaporation/condensation temperature
2. Hot gas temperature
3. Expansion valve (suction gas overheating)
4. Safety equipment (tripping function on pressure switches).
5. Cooling capacity
6. Control equipment (performance control)
7. Electrical equipment (retightening power connections)
8. Cleaning (Coil, drip tray, drain)
9. Air filter.

## Recurring Inspection

A qualified service engineer shall inspect the Cooler annually. The inspection shall be logged.

Check the following in the appropriate components:

1. Pipework
2. Search for possible leakage from the refrigerant system
3. Check for abnormal vibration
4. Corrosion
5. The refrigeration charge
6. Oil leakage
7. Safety equipment
8. Fasteners/seals.

## Scrapping

When scrapping of this type of unit, the refrigerant and compressor oil shall unconditionally be collected in a suitable vessel and transported to an appropriate facility for destruction/recycling.

# ETKC Cooling Unit

## Fault tracing

**Note:** Experts should carry out all service and maintenance! An accredited company with qualified personnel and the necessary protective equipment may only carry out Service/maintenance of the cooling system!

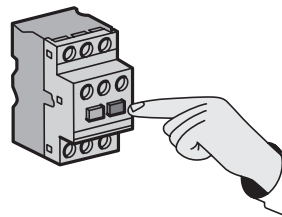
Display text:	Measure
* 3-phase alarm *	Check that power is connected to all phases and that the phase sequence is correct.
* fan Stop *	Start the fans or connect 55-56 on the
* Start wait 2 min *	Wait 2 min so that the dampers open before starting the Cooler
'Alarm H' alt. 'Alarm High pres.'	High-pressure switch has tripped. The reset button is on the pressurestat. Too high load or too little airflow. Check filters and coils.
'Alarm L' alt. 'Alarm low pres.'	Low-pressure switch has tripped. Too low entering air temperature or too little refrigerant.
Alarm Q alt. Alarm Q1 / Term	Motor protection or thermistor has tripped Reset the motor protection relay or alternatively let the compressor cool down. After reset, check that the compressor runs with no abnormal noise.
1= Capac. alt. 1= Capac. Control	The auto-reset high pressure switch has tripped and the compressor is stopped for 5 mins. before restart. High load or low exhaust flow. Check filters and coils.
Signal % <030	Check that the control signal is at least 30% to start the first compressor. To start all compressors the control signal must be at least 90%.
1/2/3/4 = start	Delayed start of compressor for 5 mins. Wait!
1/2/3/4 = run	The compressor should now have started. If not check that there is power to the compressor. If there is power then the compressor is probably damaged.

Resetting the pressure



The pressurestat is mounted on the compressor

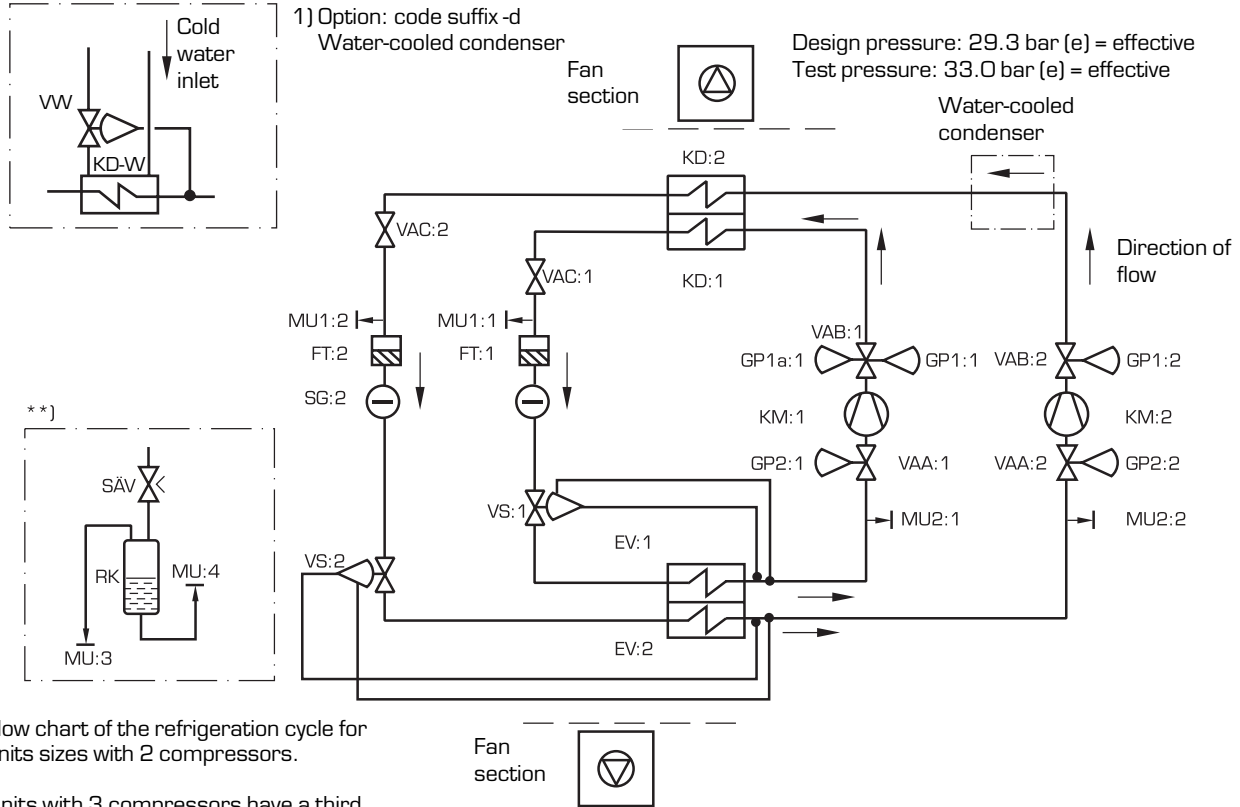
Resetting the motor protection circuit breaker



The motor PCB is fitted in the electrical panel.

# ETKC Cooling Unit

## Description of functions, for unit with two compressors



Units with 3 compressors have a third circuit that is similar to Circuit No. 2

## Description of functions

- Symbols used:**
- EV: 1, EV: 2, EV: 3 = Evaporator
  - FT: 1, FT: 2, FT: 3 = Filter-dryer
  - GP1: 1, GP1: 2, GP1: 3 = Protective pressure switch – high pressure
  - GP1 a: 1 = In-service pressure switch – high pressure
  - GP2: 1, GP2: 2, GP2: 3 = In-service pressure switch – low pressure
  - KD: 1, KD: 2, KD: 3 = Condenser
  - KD-W = Water-cooled condenser (option)
  - KK: 1, KK: 2, KK: 3 = Compressor
  - MU1: 1, MU1: 2, MU1: 3 = Measurement tapping – high pressure
  - MU2: 1, MU2: 2, MU2: 3 = Measurement tapping – low pressure
  - RK = Refrigerant receiver
  - SG: 1, SG: 2, SG: 3 = Sight glass
  - SV = Safety valve
  - VAA: 1, VAA: 2, VAA: 3 = Shut-off valve – low pressure
  - VAB: 1, VAB: 2, VAB: 3 = Shut-off valve – high pressure
  - VAC: 1, VAC: 2, VAC: 3 = Shut-off valve
  - VAD: 1, VAD: 2 = Shut-off valve
  - VAE: 1, VAE: 2 = Shut-off valve
  - VS: 1, VS: 2, VS: 3 = Expansion valve
  - VW = Pressure-controlled, water-saving valve (option)

## Operation

The cooling unit is started and stopped by an external 0–10 V control signal.

The compressors are switched in 3 cooling stages. If the cooling unit has 2 compressors, they are of different sizes, and the smaller of them (KK:1) is will be started first on a control signal of approx. 3 V. The larger compressor (KK:2) will start on a signal of approx. 7 V and the smaller compressor will then be stopped. When the signal is approx. 10 V, KK:2 is in operation and KK:1 will start, i.e. maximum cooling output will be obtained. If the cooling unit has 3 compressors, they are started in sequence at the following control signal levels: KK:1 at 3.5 V, KK:2 at 7 V, KK:3 at 10 V.

When the cooling output is to be reduced, the compressors will be switched out in the reverse order, and at 0 V all compressors are switched out.

**Note:** the water cooled condenser is fitted in circuit 3 or 4 on those sizes with 3 or 4 compressors.