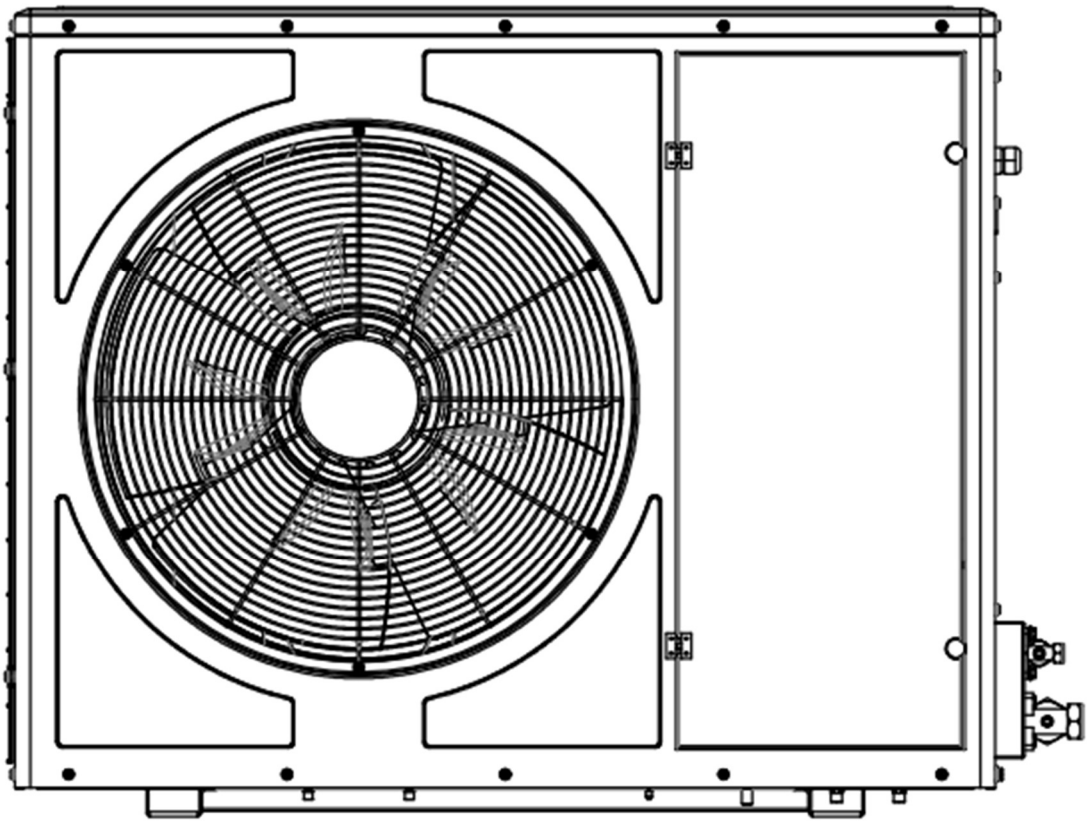
Panasonic®

iCOOL

Condensing units manual

Model No.

OCU-KRE025M05	OCU-KRE045M05	OCU-KRE070M05
OCU-KRE012L05	OCU-KRE022L05	OCU-KRE030L05



Original manual
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1. General Information

- Refrigeration condensing units are designed for automatic operation in refrigerated storage rooms, refrigeration cabinets, liquid coolers, and other equipment the operating parameters of which meet the requirements of the unit's characteristics.
- Condensing units are designed to be used with HFC refrigerants. Refrigerants allowed for specific units are listed in performance tables included in the technical brochure and also in a table at the end of this chapter. Filling or refilling these units with any other refrigerant type can cause damage. The units must not operate in conditions exceeding their working parameters. Doing otherwise can cause damage to the unit and will void the warranty.
- In case of lacking elements, such as safety valves in special versions of units, it may be necessary to equip the installation with them additionally.
- The condensing unit constitutes only a part of a refrigeration system and must be used only with its other components.
- The evaporator capacity, expansion valve, and other components must be selected according to the unit's capacity and the system must be designed to ensure appropriate oil circulation
- Any inconsistencies in delivery must be reported before installing the equipment.
- Before installation and start-up of the unit familiarize yourself with this manual and follow the information provided herein. The manufacturer shall not be responsible for damage or improper operation of the unit resulting from failure to comply with the requirements provided in this manual.
- The general instructions presented below contain certain subjects which must be taken into consideration in order to install units in a correct and safe manner. The guidelines provided are to be used as a checklist: each step must be completed before moving on to the next one. Contact PANASONIC COLD CHAIN POLAND Technical Department to obtain more information.
- Instructions provided in technical and safety standards (for example EN-378, EN 60204, EN 60335), EU directives, national regulations should also be followed.
- During first start of the unit *The Commissioning Report* should be filled. Form can be found in chapter 22.
- Keep this instruction for the whole period of use the condensing unit.

According to F-gas regulations it is necessary to minimalize and work against refrigerant leakage. In case of a leakage it should be fixed without delay.

Table of permitted refrigerants:

	OCU-KRE025M05 OCU-KRE045M05 OCU-KRE070M05	OCU-KRE012L05 OCU-KRE022L05 OCU-KRE030L05
R404A	✓	✓
R448A	✓	✓
R449A	✓	✓
R134a	✓	
R513A	✓	

2. Safety

All work on the refrigeration system shall be carried out only by personnel, which have been trained and instructed in all work. Personnel, who installs, services, , repairs, checks for leaks and decommissions refrigeration systems shall have f-gas certificate for proper category.

A condensing unit is a pressurized system and as such poses the risk of injuries. Protective clothing and googles should be used. Connections must not be opened before lowering the pressure in the system.

While working with refrigerants precautions shall be taken and personal protective equipment, such as gloves and goggles, shall be used.

During operation, surface temperatures exceeding 60°C or below 0°C can be reached, which may cause burns and frostbites. Before working on the unit switch it off and allow it to cool down.

A condensing unit contains rotating parts – fan blades, which can cause injuries, catching and pulling of clothes, etc. Work should be carried out only when the fan power is disconnected

Never use oxygen to carry out pressure tests of the refrigerating or the air conditioning circuit. Oxygen can explode upon contact with oil and cause injuries. When carrying out a pressure test with a pressurized gas such as nitrogen (N_2), make sure to use a regulator to control the pressure.

During installation and decommission precautions shall be taken. Safety and health rules shall be obeyed. Special caution is required during work with electrical and pressurized components.

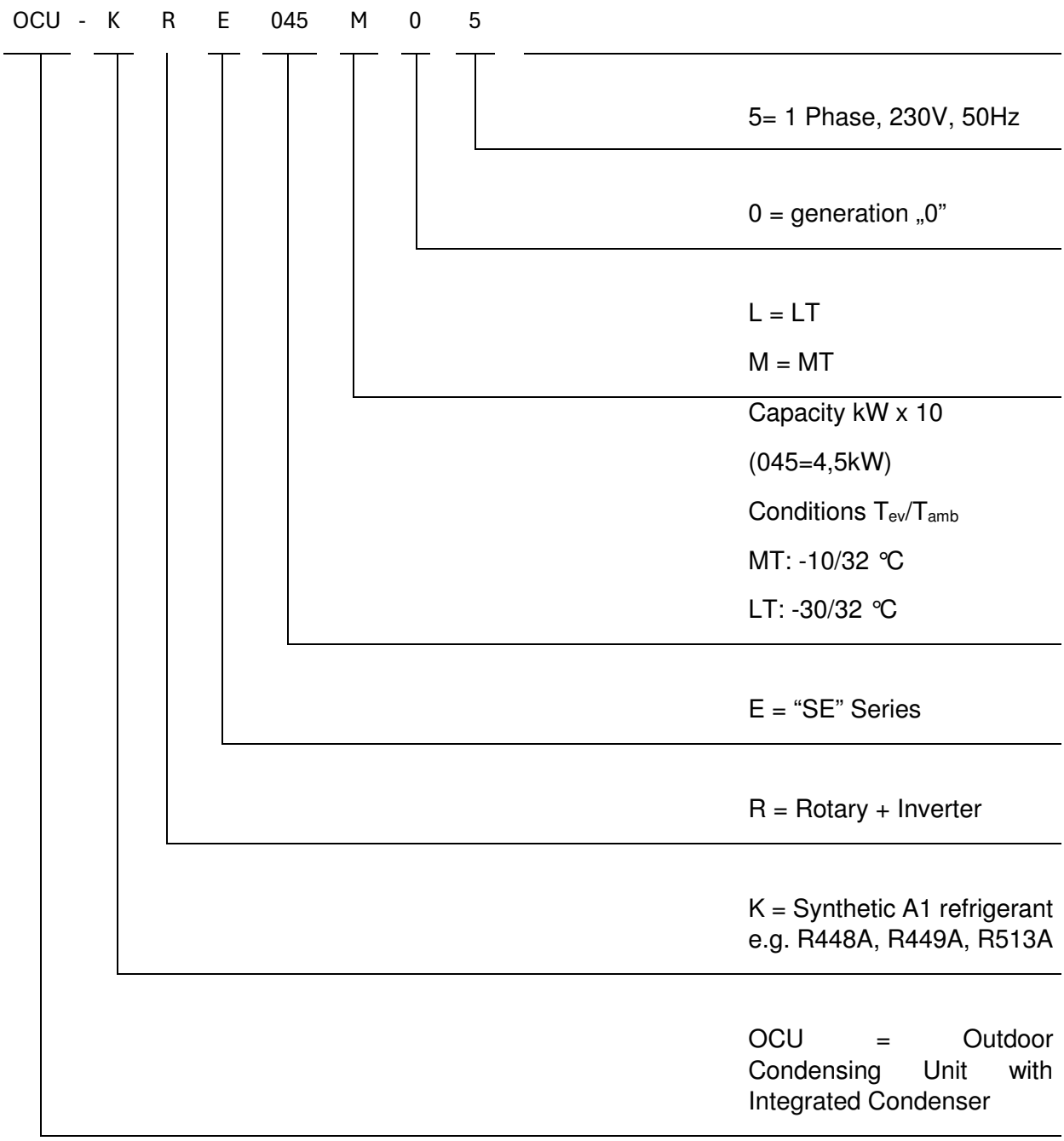
The installation is filled with refrigerant and oil which in specific conditions, for example, while brazing or soldering, can cause fire, explosion or serious injuries and burns.

Instructions provided in technical standard EN-378-3 concerning safety measures, first aid and procedures in case of danger shall be followed.

There is life-threatening voltage inside the device. Any manipulation next to the electric board as well cooling devices may be performed only by qualified and authorized personnel with appropriate professional qualifications and in compliance with the health and safety rules.

Take special care when handling and operating OCU-KRE unit. The device is equipped with several protections that reduce to a minimum the risks that may appear during the working of the device. Incorrect operation, unskilful change of parameters, removing or bypassing safety protections may lead to unforeseen events.

3. Type code description

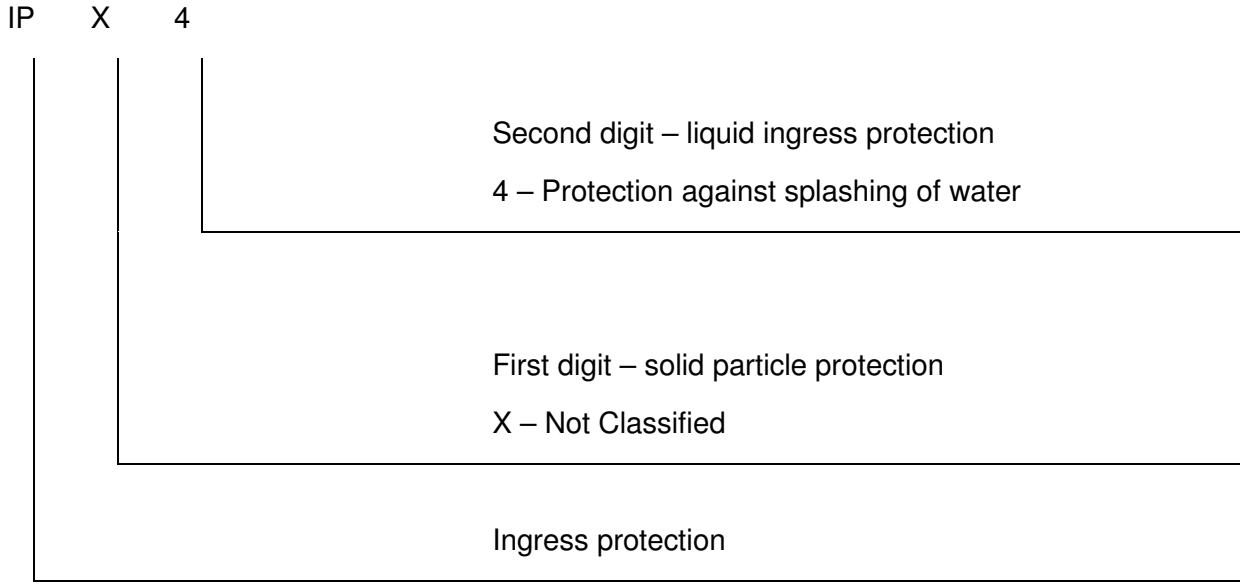


4. Units specification

4.1. Components

- High efficient BLDC rotary compressor (Avic) with crankcase heater
- Air-cooled condenser
- EC fans
- Shut-off valve on suction line
- Insulation on suction pipeline
- Liquid receiver with shut-off valve on the outlet
- Safety valve
- Liquid line: filter drier, sight glass with moisture indicator, shut-off valve
- Service valves
- HP pressure switch with auto reset – compressor protection
- Inverter – control of compressor's performance
- Controller with dedicated software
- Suction and discharge pressure sensor
- Fully equipped electrical board
- Condenser protective grid
- Liquid injection cooling in LT series

4.2. Complete unit: IP44



4.3. Standard operation

Condensing unit is equipped with a programmable logic controller (PLC) Eliwell Free Smart (with PCCPL software), which controls the operation of the unit and allows for more efficient and optimized operation of the cooling system.

The SSPM inverter is responsible for powering the main compressor (inverter - with adjustable capacity), it is fully controlled by the PLC via Modbus RTU communication (RS-485 bus). Compressor speed is determined by the condensing unit suction pressure (-Psuc) and evaporation setpoint (the correct pressure is determined based on the selected refrigerant type and evaporation setpoint in °C).

The speed of the EC fan of the unit is also regulated by the PLC controller with a 0-10V signal (selected models are controlled via the RS-485 bus). The fan speed depends on the measured discharge pressure (-Pdis) and the condensing temperature setpoint (typically around 40 °C), the condensing set point can be lowered at low outdoor temperatures (ECO mode and -Tamb measurement).

Description of standard work:

1) The unit under normal conditions (no alarms, the device is on - the diode ⏻ is constantly on), controls the pressure at the suction (compressor capacity) and the compressor discharge (fan speed).
    a) The correct pressure is determined from the selected refrigerant and the evaporating temperature setting.
2) The cooling start-up is delayed for about 3 minutes after power-up and each time the main compressor is switched off (5 minutes delay between compressor starts is also kept).
3) If the pressure value is about 0.4 bar greater than the set value, the compressor will start after 10 seconds (after compressor rest period).
4) Compressor, after switching on, works at about 50% of its capacity for 60 seconds and then switches to the pressure regulation mode.
5) The unit is switched off in case of:
    a) Persistent pressure is about 0.3 bar lower than the set pressure, and the main compressor operates at minimum speed.
    b) The compressors will stop immediately if the pressure drops below the pumpdown setting

5. Technical data

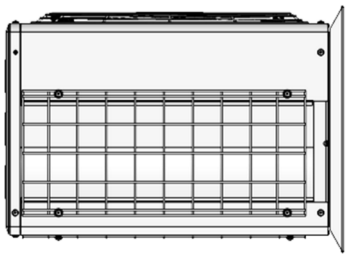
Condensing unit model				OCU-KRE025M05	OCU-KRE045M05	OCU-KRE070M05	OCU-KRE012L05	OCU-KRE022L05	OCU-KRE030L05
Dimensions	Length	A	[mm]	1000	1000	1100	1000	1000	1000
	Height	B	[mm]	605	605	805	605	605	605
	Width	C	[mm]	450	450	450	450	450	450
Gross weight			[kg]	70	70	80	70	70	80
Condenser	Fans x diameter		[mm]	1x450	1x450	1x500	1x450	1x450	1x450
	Airflow		[m^3/h]	3600	3600	5200	3600	3600	3600
	Fan power supply		[V/ph/Hz]	220-240/1/50	220-240/1/50	220-240/1/50	220-240/1/50	220-240/1/50	220-240/1/50
	Fan power consumption		[W]	170	170	230	170	170	170
	Nominal fan amperage		[A]	1,4	1,4	2,1	1,4	1,4	1,4
Compressor	Model			C-6RVN63L0B	C-7RVN113L0B	C-7RVN153L0B	C-6RVN63L0B	C-7RVN113L0B	C-7RVN153L0B
	Volumetric flow		[m^3/h]	0,6-4,1	1,25-7,5	1,7-10,4	0,6-4,1	1,25-7,5	1,7-10,4
	Speed		[RPS]	30-90	30-90	30-90	30-90	30-90	30-90
	Oil type			FV68S	FV68S	FV68S	FV68S	FV68S	FV68S
	Compressor oil fill		[dm^3]	0,6	0,7	0,7	0,6	0,7	0,7
	Crankcase heater power consumption		[W]	35	35	35	35	35	35
Sound level @10 m*			[dBa]	42,5	42,5	42,5	42,5	42,5	42,5
Connections	Suction line		[in]	1/2	5/8	3/4	1/2	5/8	3/4
	Liquid line		[in]	3/8	3/8	3/8	3/8	3/8	3/8
Liquid receiver			[dm^3]	3,9	3,9	5,3	3,9	3,9	3,9
Power supply	Voltage		[V/ph/Hz]	220-240/1/50	220-240/1/50	220-240/1/50	220-240/1/50	220-240/1/50	220-240/1/50
Recommended minimum cable cross-section	[mm^2]			3x2,5	3x2,5	3x2,5	3x2,5	3x2,5	3x2,5
Recommended minimum protection				C16	C20	C20	C16	C20	C20

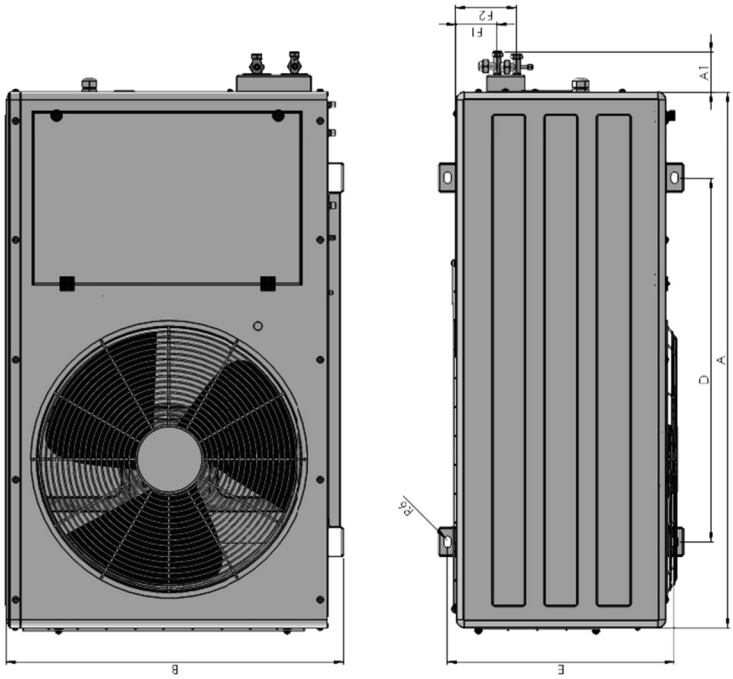
**Sound level is calculated for a condensing unit working with compressor full load and at an ambient temperature 32°C. The sound level may change in a real installation due to surrounding conditions.*

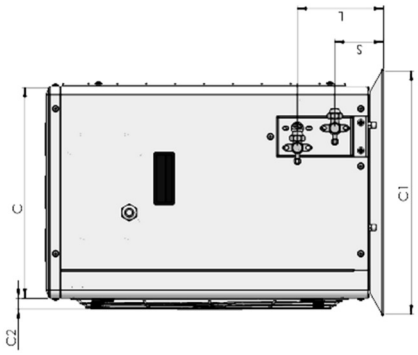
6. Units drawings

6.1. OCU-KRE025M05; OCU-KRE045M05; OCU-KRE012L05; OCU-KRE022L05; OCU-KRE030L05

A	A1	B	C	C1	C2	D	E	F1	F2	S	L
mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
970	72,	610	380	445	20	656	410	75	110	88	156

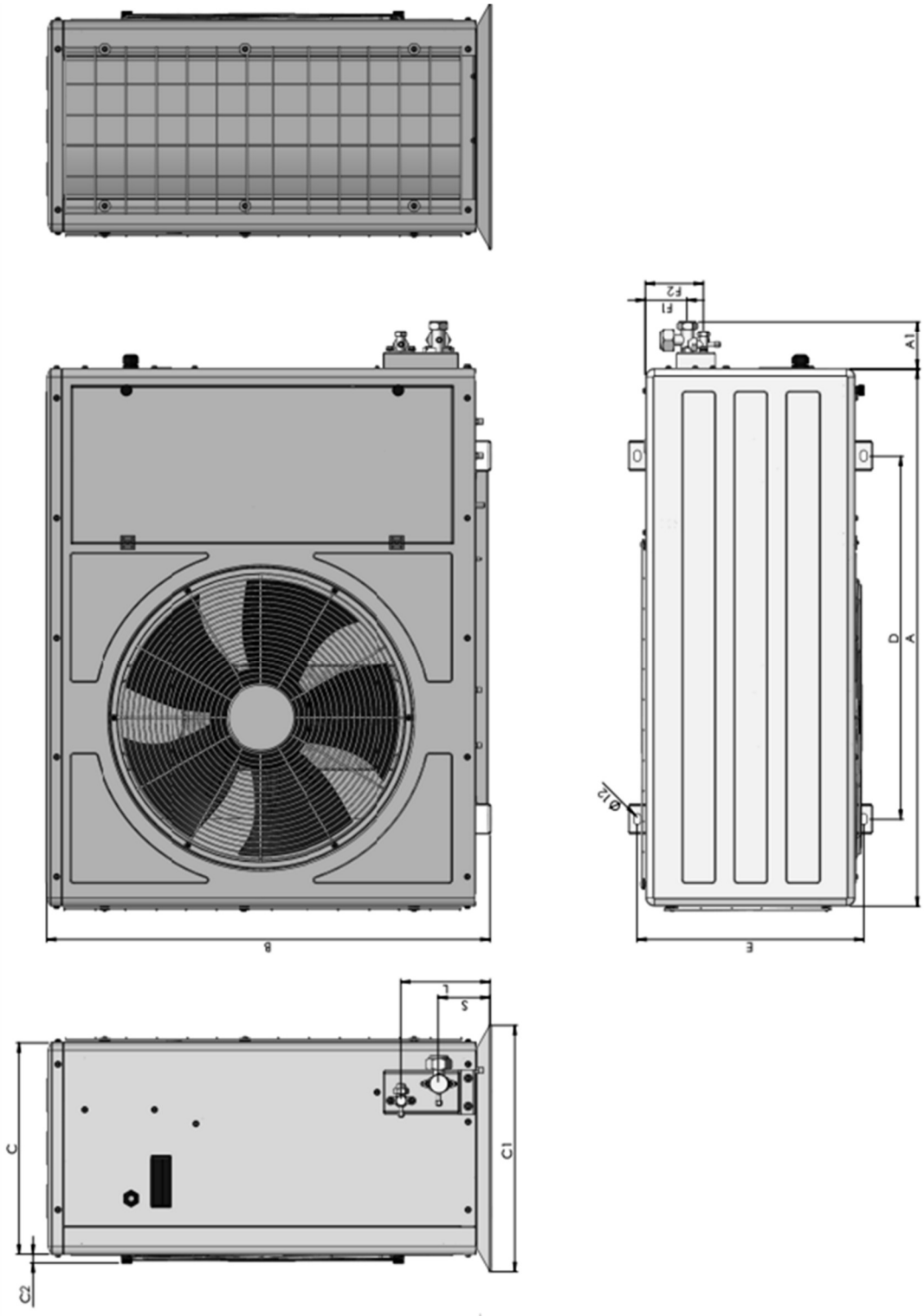






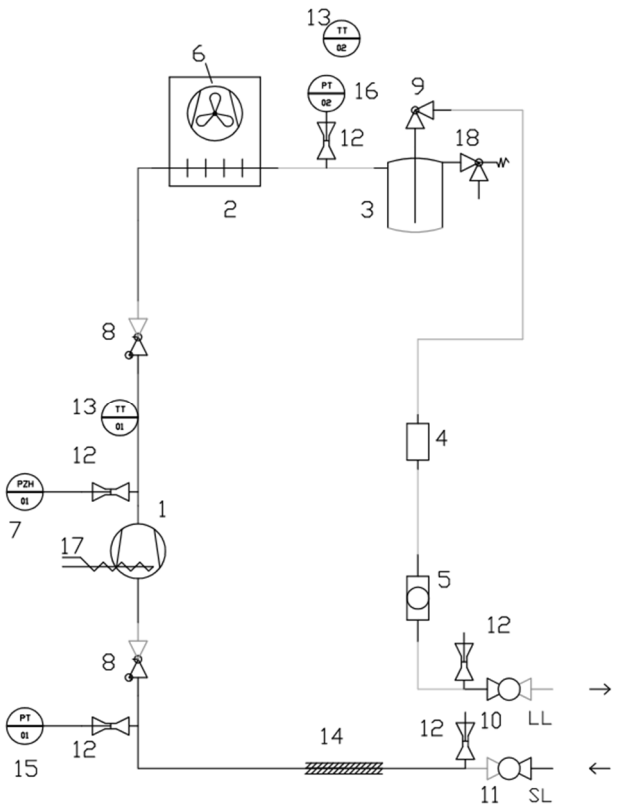
6.2. OCU-KRE070M05

A	A1	B	C	C1	C2	D	E	F1	F2	S	L
975 mm	101 mm	802 mm	385 mm	445 mm	16 mm	656 mm	410 mm	75 mm	105 mm	94 mm	161 mm



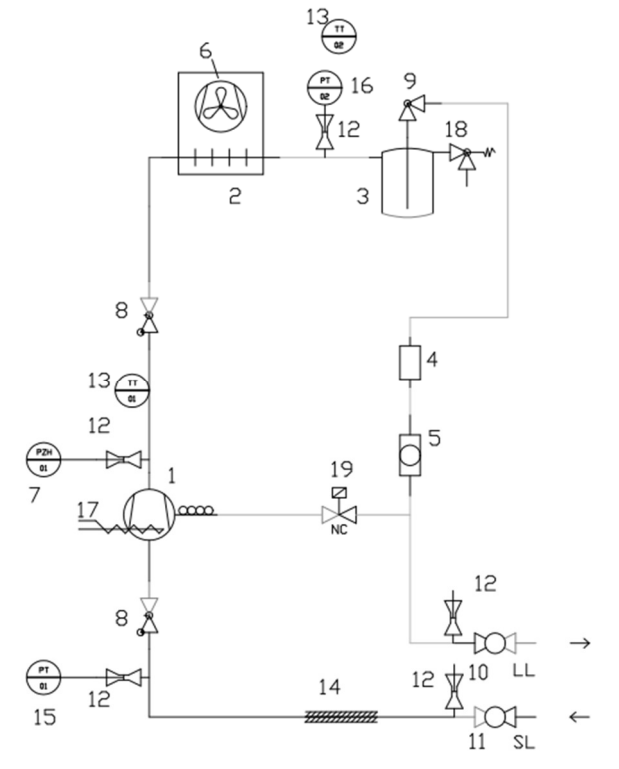
7. Schematic diagrams

*7.1. OCU-KREnnn**M**05 series*



1	Rotary inverter compressor
2	Condenser coil
3	Liquid receiver
4	Filter dryer
5	Sight glass
6	Fan
7	HP pressure switch
8	Check valve
9	Rotalock valve
10	Shut-off valve liquid line
11	Shut-off valve suction line”
12	Service valve
13	Temperature sensor
14	Thermal insulation
15	Pressure transducer LP
16	Pressure transducer HP
17	Crankcase heater
18	Safety valve
LL	Liquid line
SL	Suction line

*7.2. OCU-KREnnn**L**05series*



1	Rotary inverter compressor
2	Condenser coil
3	Liquid receiver
4	Filter dryer
5	Sight glass
6	Fan
7	HP pressure switch
8	Check valve
9	Rotalock valve
10	Shut-off valve liquid line
11	Shut-off valve suction line”
12	Service valve
13	Temperature sensor
14	Thermal insulation
15	Pressure transducer LP
16	Pressure transducer HP
17	Crankcase heater
18	Safety valve
19	Liquid injection solenoid valve
LL	Liquid line
SL	Suction line

8. Condensing unit selection

Selection of an inverter driven condensing unit, which operates with variable load conditions, should be done with consideration of maximum and minimum cooling capacity requirements.

Selection of a condensing unit should be done with tables in the technical brochure or with the local supplier.

8.1. Condensing unit selection – capacity requirements

The cooling capacity of the smallest evaporator, or several evaporators operating simultaneously, (e.g. with one solenoid valve) at operating conditions must be larger than 30% of the nominal (full load) capacity of the condensing unit at that condition.

Condensing unit full load capacity at operating conditions should be equal to maximum (peak) cooling capacity requirement. The simultaneity factor of evaporators operation should be taken into account.

8.2. Condensing unit selection with technical brochure examples

Example 1. In a low temperature system, two evaporators are planned with capacities Q1=800W and Q2=1400W. Both evaporators will be operating at -30°C, using refrigerant R449A and the maximum ambient temperature is 32°C.

The full load capacity of the system will be Q=Q1+Q2= 2200W. A condensing unit that should be good for such conditions would be OCU-KRE022L05, which has a maximum capacity at the operating point equal 2225 W – slightly higher than the total capacity required. 30% of the condensing unit maximum capacity is equal 668 W and is lower than the capacity of the smallest evaporator, so OCU-KRE022L05 meets capacity requirement.

Example 2. In a medium temperature system, four evaporators are planned with capacities Q1=700 W, Q2=700W, Q3=1400W and Q4=1400W. Each evaporator will be operating at -10°C, using refrigerant R449A and the maximum ambient temperature is 38°C.

The full load capacity of the system will be Q=Q1+Q2+Q3+Q4= 4200W. A condensing unit that should be good for such conditions would be OCU-KRE045M05, which has a maximum capacity at the operating point equal 4216 W – slightly higher than the total capacity required. 30% of the condensing unit maximum capacity is equal 1264 W and is higher than the capacity of the smallest evaporators Q1 and Q2. These units should be for example connected together with a common solenoid valve or make pairs Q1+Q3 and Q2+Q4, to have the smallest section of at least 1264 W and then using a model OCU-KRE045M05. If such connecting of evaporators is not applicable, there should be used e.g. 2 pcs of an OCU-KRE025M05.

To take full advantage of smooth regulation and the efficiency of inverter compressors in multi-evaporator systems, the evaporator regulators should be set to maintain the temperature with the lowest possible hysteresis (1-2 ° C). This will ensure a more consistent refrigerant flow and minimize compressor downtime that will occur if most evaporators close at the same time. This recommendation is not valid for 1: 1 (1 condensing unit + 1 evaporator) systems.

9. Transport and storage

Warning: Danger of injury!

Block stacking is not allowed.

During transport and storage, unit should be transported exclusively on a palette.
Lifting by means of sling belts attached to palette is permissible.

Lifting and moving the device should be performed using devices designed for this (forklift, crane, etc.)
Machines used for lifting the unit must meet the requirements of Directive 2006/42/EC, have adequate load capacity and be approved for use.

Never go under a suspended unit.

Unless the unit is transported manually, maintain safe distance from the transported unit of at least 1.5 m.

Tilting the device is not allowed. The unit must stand levelled.

Store the device in shaded area in temperatures between -25℃ and +55℃ with relative humidity 10-90%.

The device with package shall not be subjected to rain, corrosion environment or direct sunlight.

After unpacking, make a judgement whether the unit is undamaged and complete. Noticed discrepancies should be reported to supplier.

During transport and storage, the unit should be protected against humidity and dust (e.g. foil, cardboard)

Use of pipes, condenser collecting pipes or fittings to lift the unit is forbidden.

10. Verification of the technical condition

Upon receiving the unit, check:

- if it was not damaged during transport (every unit is packaged),
- its leak-tightness (each unit is pre-filled with dry nitrogen at the pressure of 3-5 bar)
- its components for damage (pipes, pressure switch etc.),
- if the accessories are according to the order.

11. Installation

11.1. General remarks

Incorporation of the unit into any refrigeration system should be preceded by technical consultation or drawing up a project with a selection of other components of the system (evaporators, automation) and determination of the appropriate location for the unit and pipes.

Unit should be installed by qualified personnel familiar with cooling equipment.

11.2. Location and mounting of the unit

The ambient temperature in which the unit is operated should be within -20℃ to 43℃.

To reduce the risk of exceeding this temperature is recommended to put unit under a canopy or inside a room where free air flow can be ensure.

Unit location selection

Unit location should be selected to limit excessive exposure to sunlight. Unit position on the north or on the east side of the building is recommended.

If it is not possible to mount the unit on the north or east side, it is recommended to install the unit under a canopy.

Installation on large-area roof slopes, in particular those covered with materials that strongly absorb solar radiation (e.g. black felt) is not recommended.

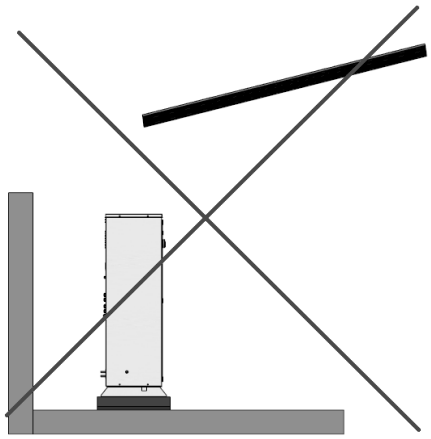
The unit should be placed away from heat sources.

The unit must be installed in places with free air circulation.

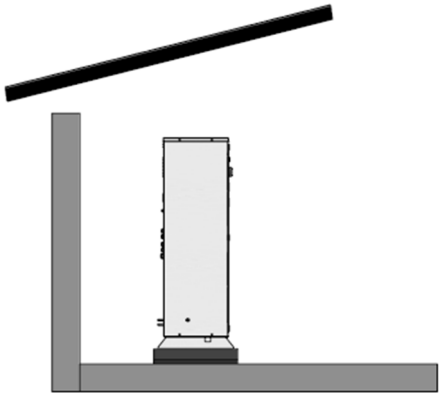
The unit should not be installed in places where the prevailing wind direction is opposite to the outlet air direction. In case of exposure to such wind, it is recommended to use a partition.

Choice of location for unit installation should be done regarding potential nuisance for outsiders

Slope of the roof has to ensure correct operation of the unit, especially during snowfall.



Incorrect placement in relation to the roof may result in the formation of snowdrifts near the unit



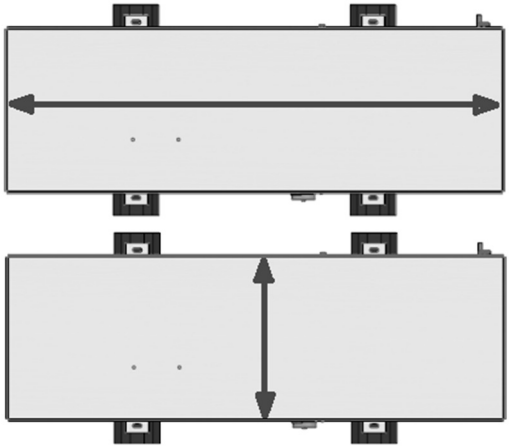
The roof protects the unit against the accumulation of snowdrifts

Unit foundation and support

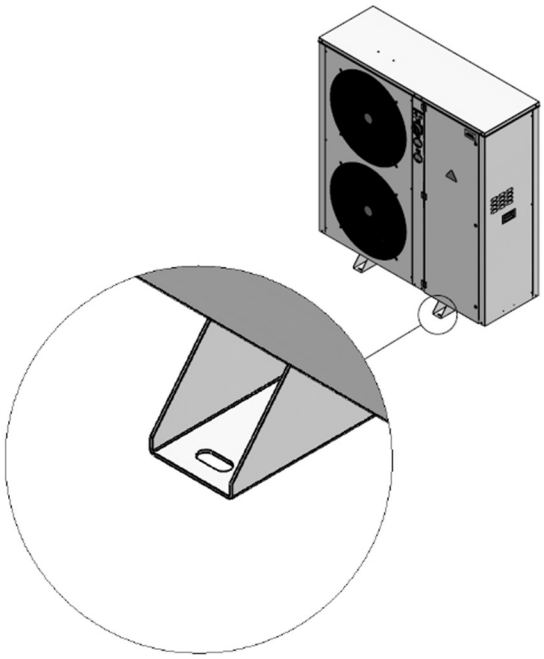
The load-bearing capacity of the ground need to be higher than the condensing unit weight

Strength of bolted or welded steel frames should be supported by calculations. Steel frame must not be deformed after the unit is placed on it.

Maximum allowable tilt in both planes is equal to 10 mm/m.



Fixing the unit using dedicated holes in the feet of the unit.

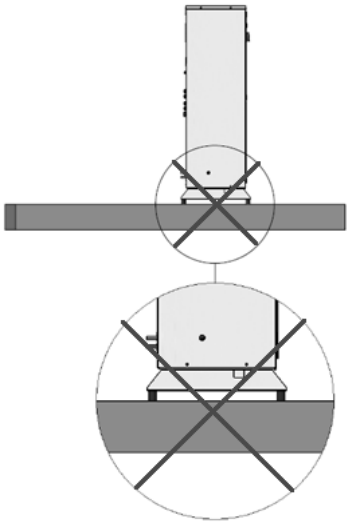


Stiffness of foundation for unit should be verified manually before and after commissioning of the unit.

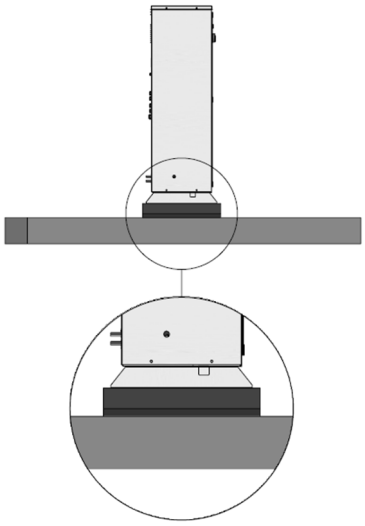
It is required to use vibration isolators with sufficient load-bearing capacity for the weight of the unit.

Support on the full surface of the unit feet is required for units over 200 kg gross weight.

Point support not recommended for units over 150 kg gross weight.



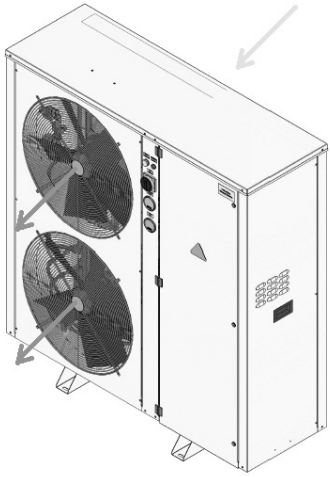
Point support for the foot causes possibility of excessive deflection



Supporting the unit on full surface of the foot provides stability

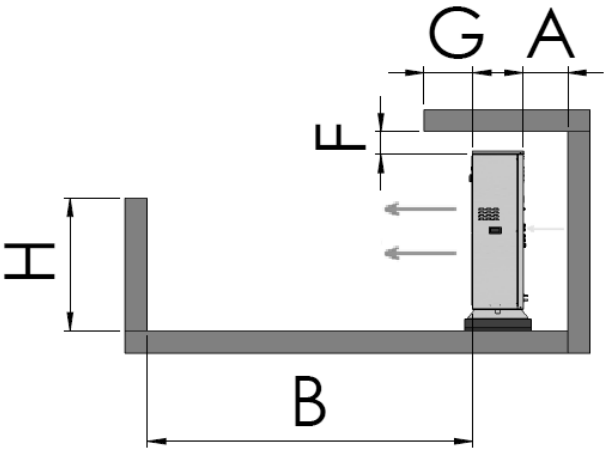
Unit position with walls and other units

For a correct operation of a unit following requirements regarding distance to the wall need to be fulfilled.

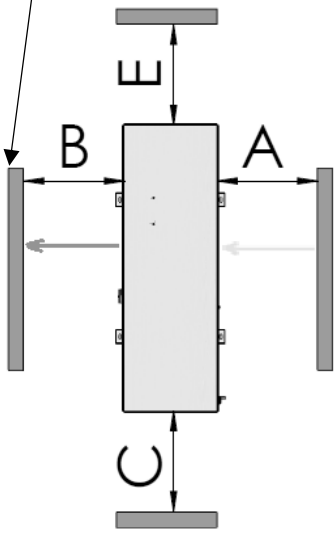


Four-way construction is only allowed if there is a sufficient air flow, e.g. additional ventilation or a perforated partition.

From the side

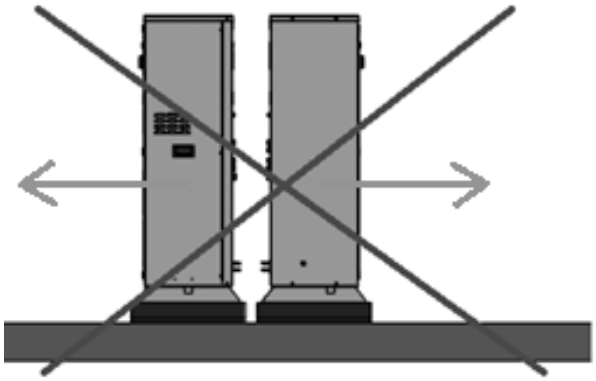


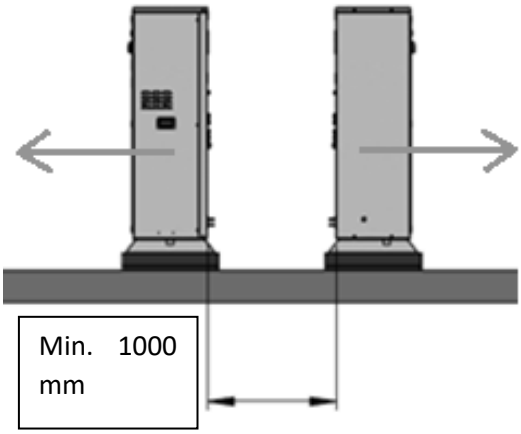
From the top



Dimension	Value
A	Min. 400 mm
B	Min. 800 mm, but not less than the height of the unit * For a unit with vertical discharge fan: B = Min. 400 mm
C	Min. 400 mm
E	Min. 400 mm
F	Min. 400 mm * For a unit with vertical discharge fan: F = Min. 800 mm, but not less than the height of the unit
G	Max. 800 mm
H	Max. 1200 mm
Each time when determining the location of montage, the service space for the unit should be taken into account for the purpose of repair and inspection.	

Provide sufficient distance in case of placing the units with condensers facing each other.

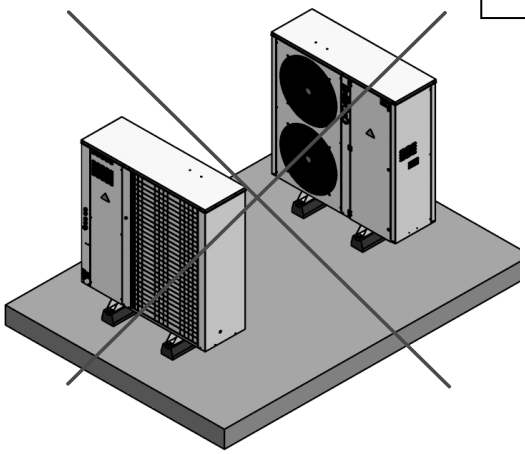


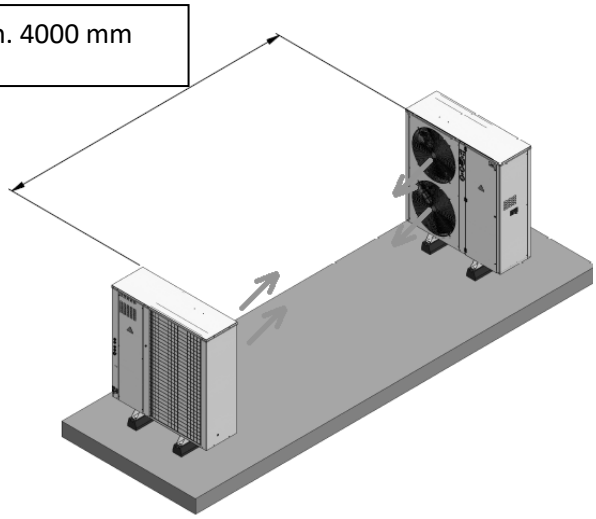


Too short distance between the condensers may result in increase of condensing temperature and shortened lifetime of the unit

Maintaining minimum distance between the condensers does not increase condensing temperature

Provide sufficient distance in case of placing the units with the outlet air streams facing each other.

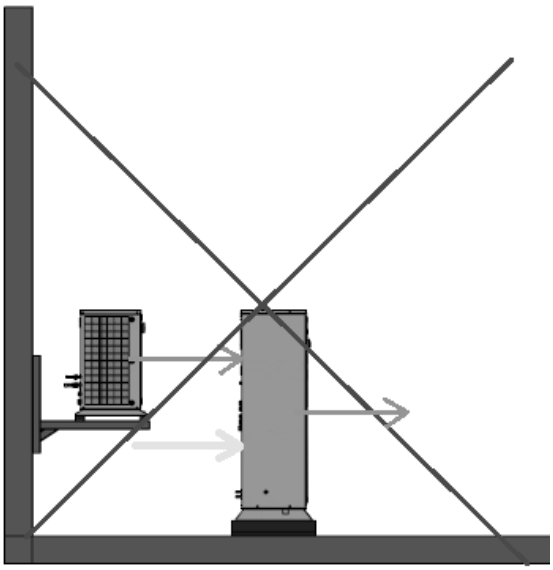




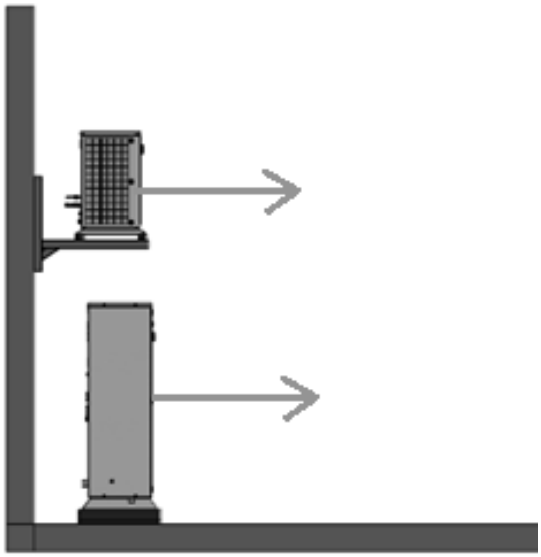
Placing outlet air streams in front of each other may cause improper operation of the unit

Placing the units in front of each other, maintaining the minimum distance, does not cause negative air turbulences

- Separation of inlet and outlet air streams of different units

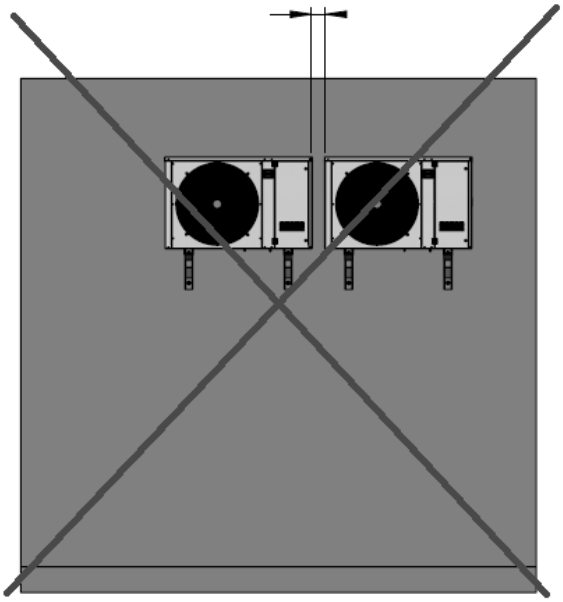


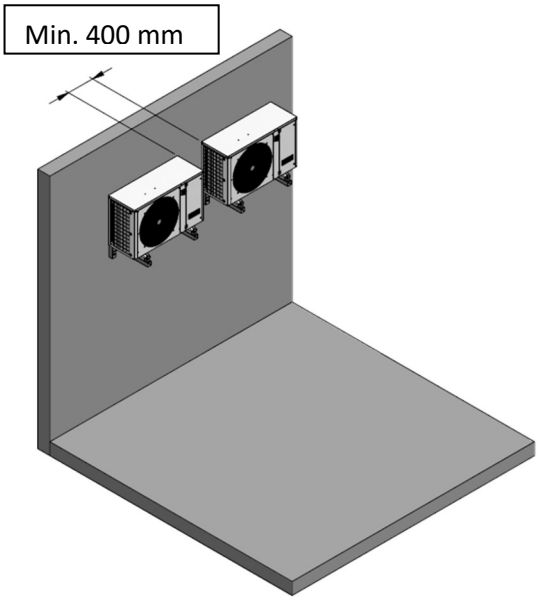
Mixing inlet air stream of unit with outlet air stream of another unit may cause improper operation of units

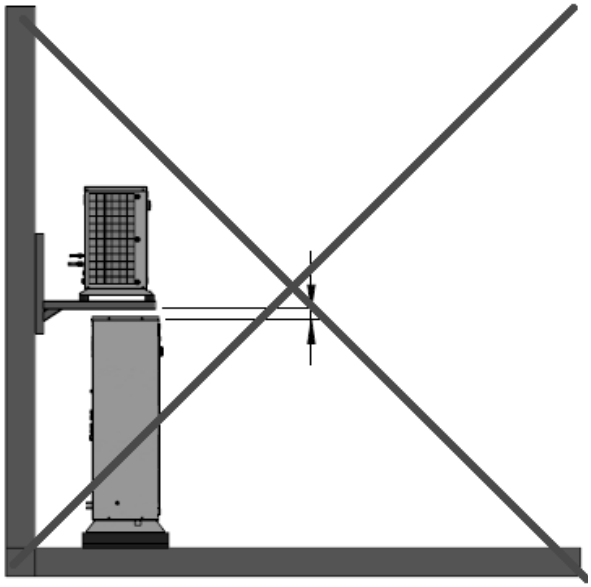


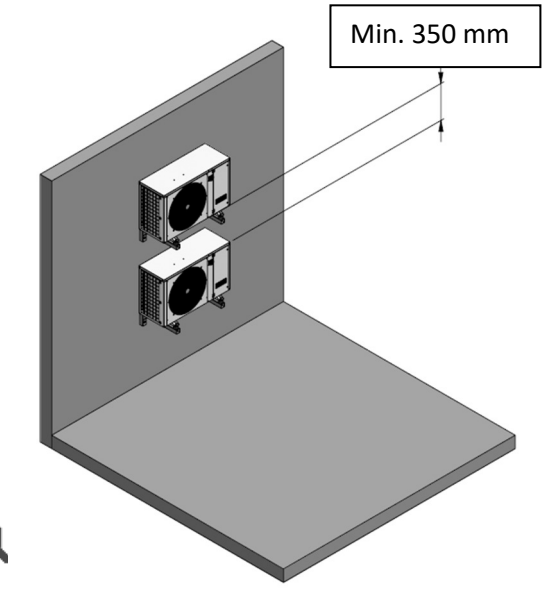
Placing the units with maintained spacing will not cause mixing of inlet and outlet air streams

Provide minimum distances from other units.





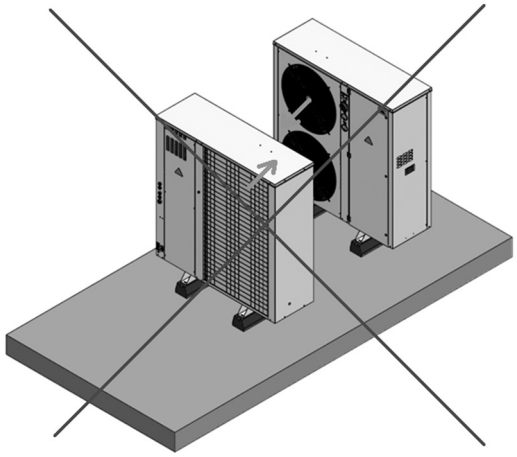




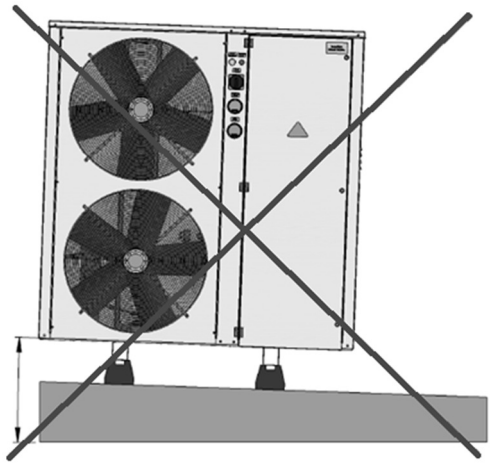
Too short distance between units may cause improper operation of the units and makes service activities harder to perform.

Placing the units maintaining minimum distances does not cause improper operation of the unit and makes service activities easier to perform.

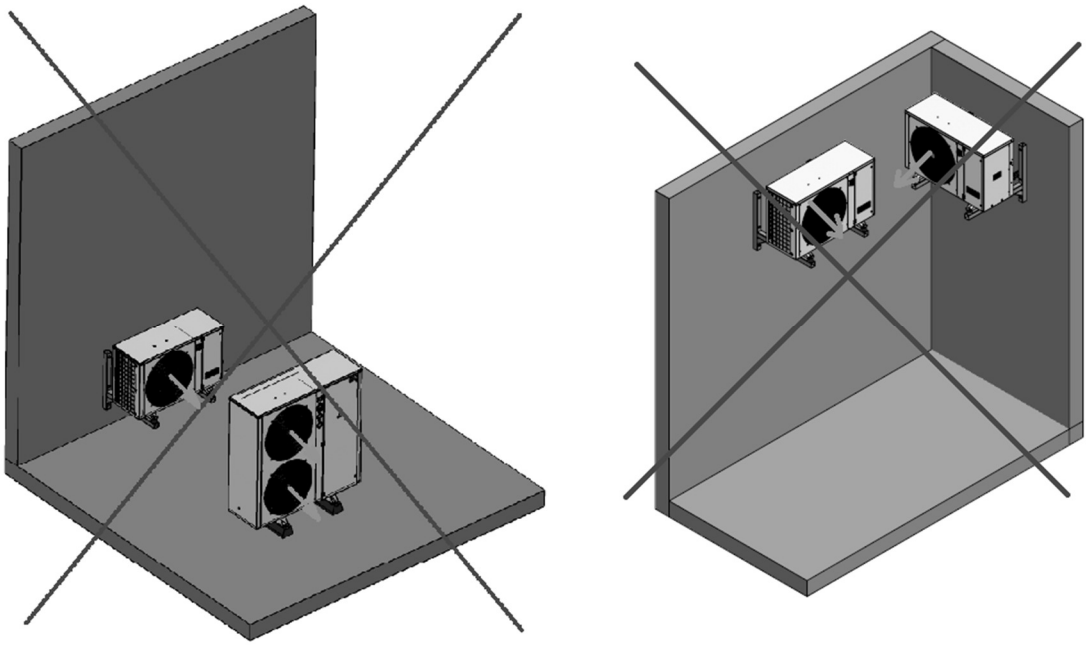
Examples of incorrect placement of the unit:



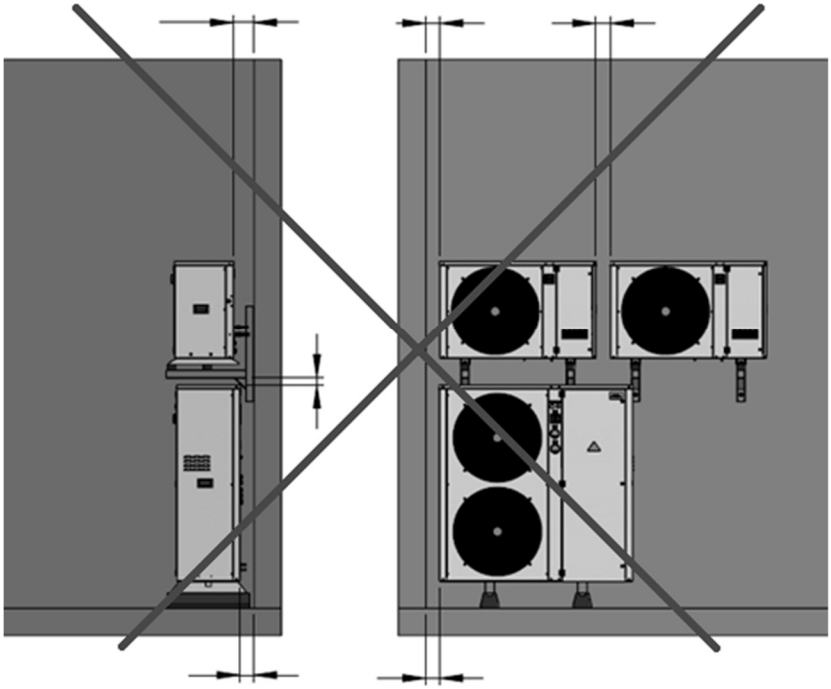
. Placing the units in a way that causes outlet air streams to face each other without maintaining minimum required distance



Incorrect leveling of the unit

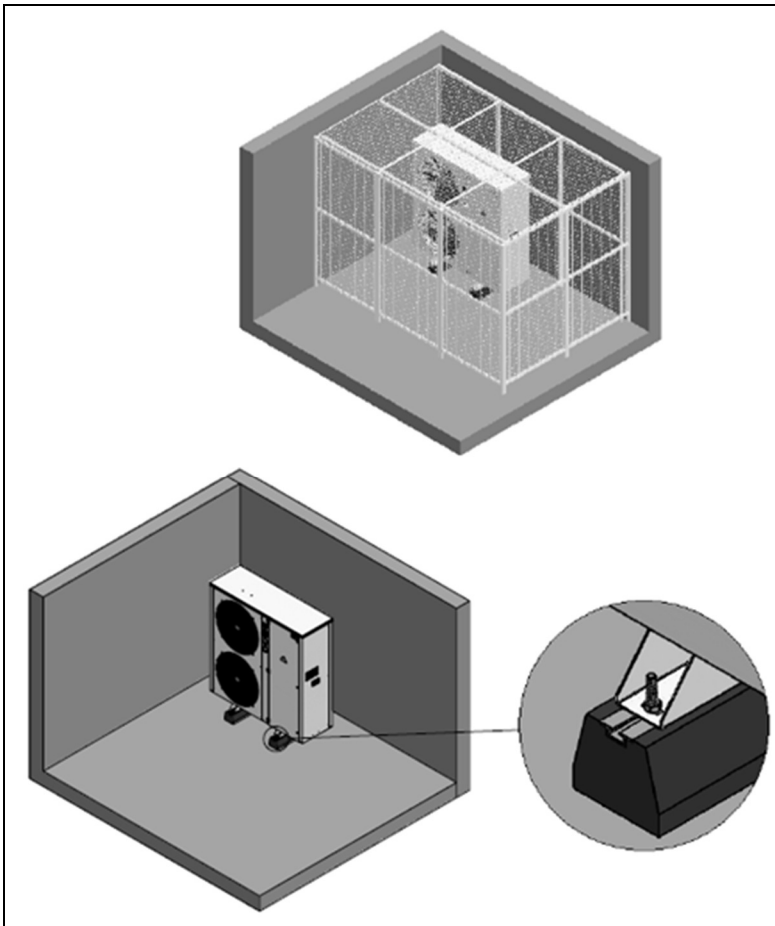


Placing the units in a way that causes one unit to suck outlet air stream from another unit

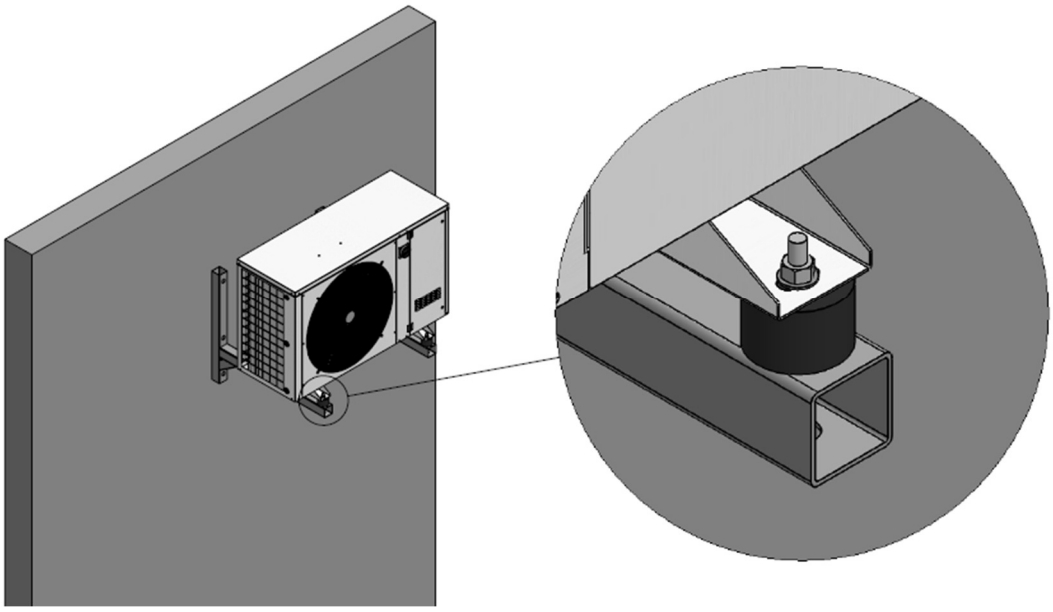


Too short distances from partitions or other units

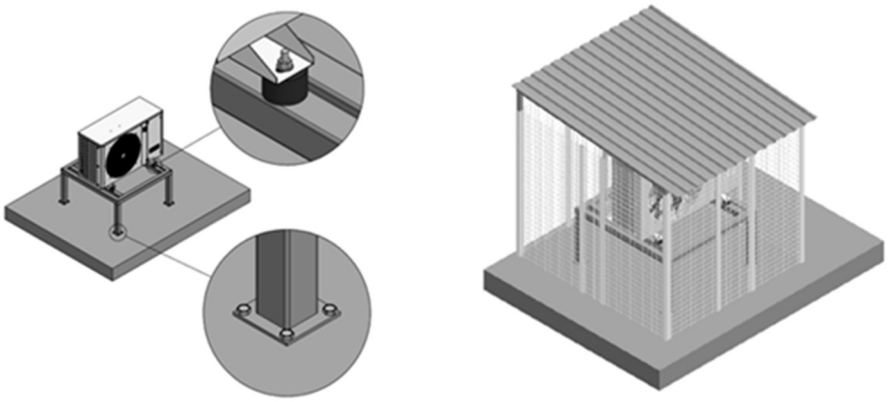
Examples of correct placement of the unit:



Placement on foundation with use of rubber support feet

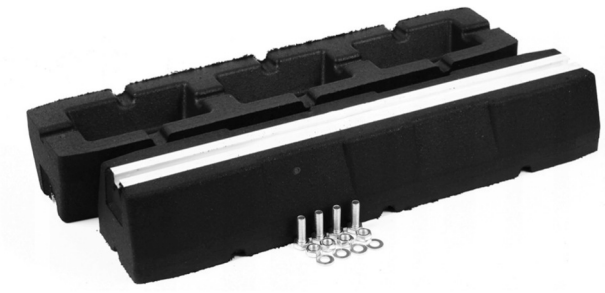


Placement on steel bracket with use of vibration isolators



Placement on a frame made of profiles with use of vibration isolators

Rubber vibration isolators (e.g. Ø60: DVA.1-60-40-M10-28-40) with technical parameters in accordance with the manufacturer's guidelines in terms of weight and size of the unit, providing support across the full width of the unit's foot



Rubber support foot with technical parameters in accordance with manufacturer's guidelines in terms of weight and size of the unit

UNIT MOUNTING SAFETY NOTES	
Install only in well-ventilated places	
	Refrigerant leakage may result in a drop in oxygen concentration that can cause asphyxiation. Flammable refrigerants can explode.
Provide drainage systems where needed	
	Lack of proper water drainage may result in moisture accumulation and wet floor.
Provide a fence around the unit	
	Touching the unit by outsiders may lead to injuries and contusions.
Do not install in places with a possible leakage of flammable substances	
	Flammable substances can be ignited by contact with a spark from the electric part of the unit, resulting in an explosion.
Move the unit in a level position with care	
	Improper handling of the unit may cause it to fall and cause an injury.

11.3. Requirements on the refrigeration system

Condensing units are dried and pre-filled with oil and dry nitrogen gas at the factory. The unit's connections are tight. Pay attention not to introduce dirt and moisture into the system. The refrigeration system must be made of dry and clean components, according to the plan, technical rules and relevant standards and regulations.

The unit is pre-filled with pressurized nitrogen. To release it, loosen the nuts at valves connections both at the suction and the liquid side and open the valves slightly.

In addition the refrigeration system should:

- protect the compressor against ingress of the liquid refrigerant both during operation and shutdown. To do so, appropriately route the suction lines, use appropriate automation components, evaporators etc.

- ensure the oil return to the compressor by properly arranging the refrigerant lines

- provide protection against excess energy losses by insulating both the suction and the liquid refrigerant sides

- all connections must be tight – it is recommended to use soldered connections.

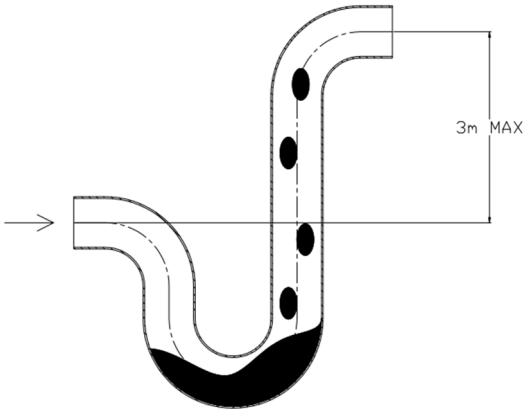
Refrigeration system containing F-gases should be marked accordingly.

Low temperature and freezing installation

In a low temperature system with evaporation temperature below -15℃ only LT series condensing units can be used. LT condensing unit are equipped with a liquid injection solenoid valve, regulated by discharge temperature. Liquid injection is necessary to avoid discharge temperature overheating in a system with high pressure difference between suction and discharge.

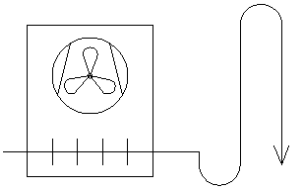
Oil traps

To enable an oil return with a refrigerant on a suction line, P-shaped oil traps should be done, which make oil transport possible. These traps should be made before each vertical suction line section with an upstream flow and at the evaporator outside after the temperature sensor. A single oil trap on the suction pipeline allows oil to flow upwards to the maximum height of three meters. In case of a higher vertical section, there should be additional oil trap made in the middle.

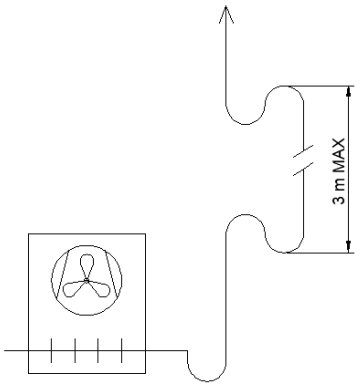


The suction line must be routed appropriately to the relative position of the evaporator and the unit and the height difference between them. This is particularly important to ensure correct oil return from the evaporator, improve refrigerant evaporation, and reduce the risk of flooding the compressor with a liquid refrigerant.

If the evaporator is situated higher than the condensing unit, it is recommended to pump down the refrigerant before stopping the compressor. Suction pipeline should be, at least with U-shaped trap be routed above an evaporator. On vertical section with a flow upstream, oil trap should be made.



Evaporator over condensing unit



Evaporator below condensing unit

Piping diameter requirements

Pipelines diameters should be selected, to ensure a correct refrigerant velocity for a minimum and for a maximum load.

In a suction pipeline, to maintain oil return, the minimum velocity of refrigerant should be 8 m/s in vertical section, and 4 m/s in the horizontal section with 0,5% slope in flow direction. If it is needed use diameter reduction or double riser. In the liquid line section, refrigerant velocity should be lower than 1,5 m/s.

Piping diameters and lining of a suction section should be done to minimize pressure drop at full load operation. Pressure drop should be lower than 3K for a dew point conditions (e.g. for refrigerant R449A it would be about 0,4 bar for MT condition or 0,2bar for LT conditions).

Diameters of condensing unit suction and liquid line connections are optimal diameters of pipes for a typical installation at 30-100% of unit's capacity range in nominal conditions. Each time diameter of a piping should be optimized for the used components, to ensure oil return. Use appropriate pipe reduction when necessary.

Piping length

Due to refrigerant velocity and pressure drop, the recommended maximum absolute length of pipes integrated with the OCU-KRE condensing unit should not exceed 15m for a liquid line and 15m for a suction line. Effective length (straight pipes and equivalent length for connectors and components) should not exceed 20m. It would be an equivalent of e.g. 10 elbows for a 15m installation with 5/8" pipe. Estimated equivalent lengths for different connectors are shown in the table below.

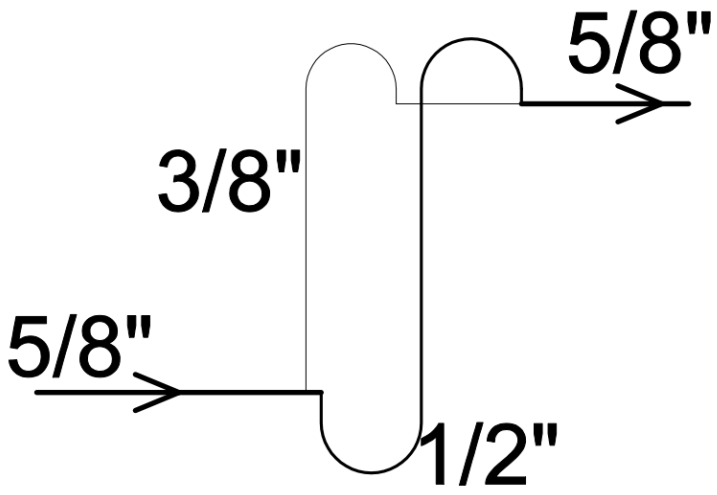
The maximum allowable suction line distance from a condensing unit to the furthest evaporator is 30m (40 m effective length) for MT series and 20m (30 m effective length) for LT series, with careful pipeline selection and design. The maximum height difference between condensing unit and evaporators no larger than 7 m.

	Elbow short 90°	Elbow long 90°	Elbow 45°	U-turn	Tee straight flow	Tee branch flow	Reduce 50%	Reduce 25%
1/4"	0,2	0,2	0,1	0,5	0,2	0,5	0,2	0,2
3/8"	0,3	0,2	0,2	0,7	0,2	0,7	0,3	0,3
1/2"	0,4	0,3	0,2	1	0,3	0,9	0,4	0,4
5/8"	0,5	0,4	0,3	1,2	0,4	1,1	0,5	0,5
3/4"	0,6	0,4	0,3	1,4	0,4	1,3	0,6	0,6
7/8"	0,7	0,5	0,4	1,7	0,5	1,5	0,7	0,7
1 1/8"	0,9	0,6	0,5	2,1	0,6	2	0,9	0,9

Double risers

To ensure minimal refrigerant velocity in a system with the inverter compressor, suction line reduction or double riser should be used, when necessary.

A double riser gives the effect of a downsized riser at minimum load, while providing about the same pressure drop as a full sized line at full load. The smaller riser is sized to insure oil return at the minimum capacity step; the larger riser is sized so that the combined "flow areas" of both of these risers are approximately equal to the main suction or discharge line.



Full load capacity		Minimum capacity			
d_z	area, mm^2	Riser#1		Riser#2	area mm^2 ,
3/8"	44,4 →	8 mm	&	6 mm	40,8
1/2"	89,9 →	3/8"	&	8 mm	72,7
5/8"	151,3 →	1/2"	&	3/8"	134,3
3/4"	228,3 →	5/8"	&	1/2"	241,2
7/8"	321,1 →	3/4"	&	1/2"	318,2
1 1/8"	554,9 →	7/8"	&	3/4"	549,4
1 3/8"	841,4 →	1 1/8"	&	7/8"	876,0
1 5/8"	1187,3 →	1 3/8"	&	7/8"	1162,5

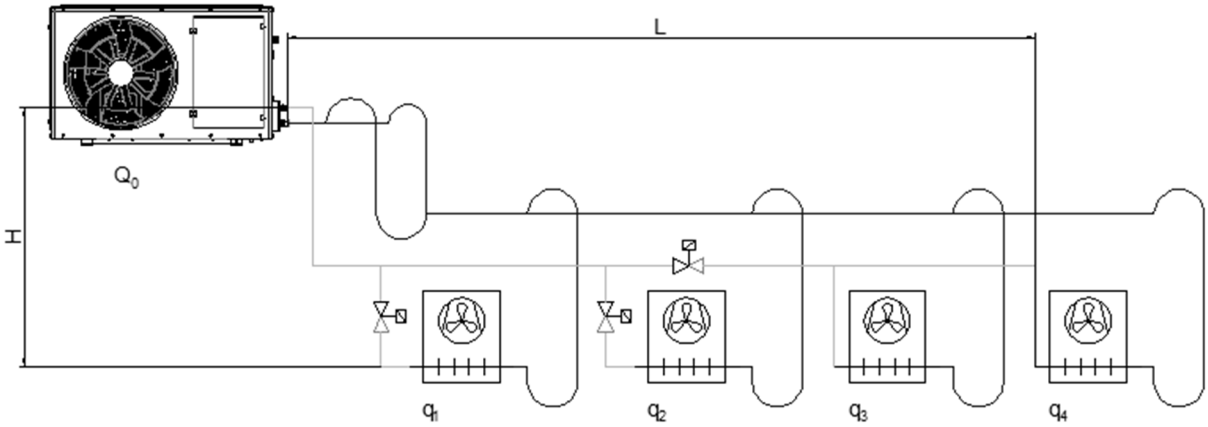
Piping support

Required distances between supports for pipelines depend on pipe size, according to the table below:

Outer pipe diameter (d)	Maximum distance between supports
d ≤ 1/2"	1 meter
1/2" < d ≤ 7/8"	2 meters
7/8" < d ≤ 2 1/8"	3 meters
2 1/8" < d ≤ 2 5/8"	4 meters

- Insulation of suction pipeline with proper pipe covering is required.

The system should be designed to have optimized piping length and diameter. In long piping installation or with too small suction diameter, due to piping resistance, suction pressure read from transducer mounted in condensing unit may have much lower value than the evaporator's pressure read. The largest differences will be observed when unit would be working with a high compressor frequency, which can result in non optimal performance. During the unit's first start-up pressure level must be checked on unit and on evaporator. Adjust condensing unit setpoint if necessary.



H<7 m	H+L<30 m dla MT H+L<20 m dla LT	$q_1 \geq 30\%$ Q_0	$q_2 \geq 30\%$ Q_0	$q_3+q_4 \geq 30\%$ Q_0	$q_1+q_2+q_3+q_4 \approx$ Q_0

12. Preparation for starting the unit

12.1. Leak tightness test and drying

After the installation is complete, carry out a leak test of the system using nitrogen. The tightness of the unit is tested at the factory.

The leak tightness test should be carried out according to EN-378-2.

Pressure of the nitrogen should be increased gradually according to safety rules.

Do not exceed maximal allowable pressure of unit, specified on the units nameplate.

Do not carry out leak tightness tests by introducing chemical agents into the system. Doing so will void the warranty.

To dry the system, generate a vacuum inside and fill the system with nitrogen. Generate vacuum twice: first when the condensing unit's valves are shut and then:

- create a vacuum 1000 microns (1 Tr, 1,3 mbar)

- fill the system with nitrogen to a pressure of at least 10 bar,

- empty the system via service connection on the suction valve,

- generate vacuum when the unit's cut-off valves are opened until the pressure of 1000 microns (1 Tr, 1,3 mbar),

- check the vacuum quality for 3 hours after disconnecting a vacuum pump,

- if the pressure in the system quickly increases, it means there is a leak in the system. The leakage point should be found and repaired, and a vacuum need to be created again.

- if the pressure in the system slowly increases, it means that in the system there may be residual moisture. Filling the system with dry nitrogen and creating vacuum should be repeated.

- if no leak is detected, fill the system with refrigerant.

Do not start the compressor or power the contacts of the electric motor while there is under pressure in the system. It may cause electric arc or irreversible damage to the motor of the compressor.

12.2. Refrigerant charging

Before charging the refrigerant turn on the crankcase heater.

Zeotropic, blends should be charged only in a liquid form.

Liquid refrigerant should be charged into the liquid receiver.

After commissioning it may be necessary to add refrigerant. Adding liquid refrigerant on suction side should be done with special caution, far from condensing unit with throttling a flow.

During first commissioning of an OCU-KRE condensing unit, for each 1 kg of refrigerant above 2,5 kg there should be add 50ml of oil, which is compliant with technical specifications.

12.3. Power connection

The electrical connection should be made by a specialist with the legally required qualifications to connect electrical devices.

The electrical system must meet the requirements of relevant safety regulations and standards.

Suitable means must be provided in the unit power supply installation to enable it's complete disconnection from the power supply on all phases (in the case of units with a single-phase power supply, it must also be possible to completely disconnect the neutral wire). These elements should be placed between the unit and the power source.

The nominal current of the means for disconnecting the power supply from the unit must not be less than the recommended minimum protection for the unit (specified in the table in Chapter 5). The open contacts of such means must provide insulation equivalent to the basic insulation (in accordance with IEC 61058-1) and must ensure complete disconnection under overvoltage category III conditions (minimum 4kV impulse voltage). The means used to disconnect voltage from the unit must be capable of being locked in the disconnected position.

Connect the main power cord to the terminals marked -Xz (L1, L2, L3, N, PE) on the electrical board of the unit.

The -Xz terminals are push-in type. This enables toolless installation of solid core wire or multicore wire ended with a sleeve ferrule. For the installation of multicore wire without a ferrule, a proper tool must be used.

The unit's electrical connection should be made in accordance with the minimum cable cross-section recommendations specified in the table in Chapter 5.

Warning: The use of wires with too small cross-section may result in voltage drops, increased current consumption and incorrect operation of short-circuit and overload protection. This can lead to the destruction of the compressor, condenser fans and health or life threat.

WARNING: The device has capacitors which remain live after disconnecting the power supply (they are slowly discharged). Wait 5 minutes after disconnecting the power supply before carrying out repair or service work!

Before starting the unit for the first time or after a longer standstill, make sure that the power supply wires of the unit are not damaged and that the screw connections of the electrical components have not been loosened! (The loosening of the joints could have been caused by vibration during transport or prolonged work).

12.4. Unit protection class (electric shock protection)

The unit is made in protection **class I**.

Condensing units are fully wired and factory tested.

Residual current circuit breaker (RCD)
If a residual current device (RCD) must be used as an additional protection against electric shock (requirement for the place where the unit is installed). Type B (delayed) of RCD is recommended to be used on the power supply side of the condensing unit.

If a type A residual current device is present in the supply circuit, but is not used to protect the unit, it may be necessary to use an RCD with a higher operating current (100mA or 300mA).

12.5. Electromagnetic Compatibility (EMC)

Condensing units must be installed by trained personnel and in a manner suitable for ensuring the required electromagnetic compatibility for the respective operating environment (industrial/ commercial/residential).

Units are designed for installation in an commercial environment (class C2 according to IEC 61800-3: 2018).

Adapting the unit to residential (C1) environment requires the use of an additional RFI filter, which reduces radio interference (in order to select the solutions, please contact with out technical department).

13. Interface description

13.1. Inverter

The device is equipped with the SSPM inverter. It is used to power the main compressor, performing the function of changing the cooling capacity of the unit.

Communication

The inverter communicates with the Eliwell controller using the Modbus RTU network in the RS485 standard. It is fully managed and controlled by the controller. All parameters of the inverter operations are available from the level of the controller.

Description of the inverter LED indicators

The inverter is equipped with a display from which the current speed of the compressor can be read by default (5400 rpm/60 = 90 rps). Inverter errors are also displayed, as described in table in chapter 18.4: Description of Inverter Error Codes.

13.2. Unit controller interface

Buttons

Built-in buttons of the Eliwell Free Smart controller allow you to navigate through the menu and change parameter values.

The following table provides a detailed description of the controller buttons:

No.	Button	Description
1.	F1 (Up arrow)	Navigate in the menu / Increase the value of a parameter
2.	F2 (Esc)	Exit the menu / Go up in the menu / Cancel the parameter setting
3.	F3 (Down arrow)	Navigate in the menu / Decrease the value of a parameter
4.	F4 (Set)	Enter the “Set” menu from the default view / Enter a submenu / Set the values of parameters
5.	F1 + F3 (F5)	Enter the Bios menu (pressing both buttons at the same time)
6.	F2(Esc) + F4 (Set)	Enter the “Prg” menu from the default view (pressing both buttons at the same time)

Special button functions:

- **Turning on the device:** Press and hold F1 (⏫) button for 3sec in the default view,
- **Turning off the device:** Press and hold F3 (⏬) button for 3sec in the default view,
- **Error reset:** Press the F2 (esc) button in the default view.

Useful functions:

- **Exit to the default view (Menu exit):** Press the F2 (esc) button until " -- " appear on the display,
- **Preview of measurements (enter ACt menu):** Press F4 (set) -> ACt -> F4 (set).

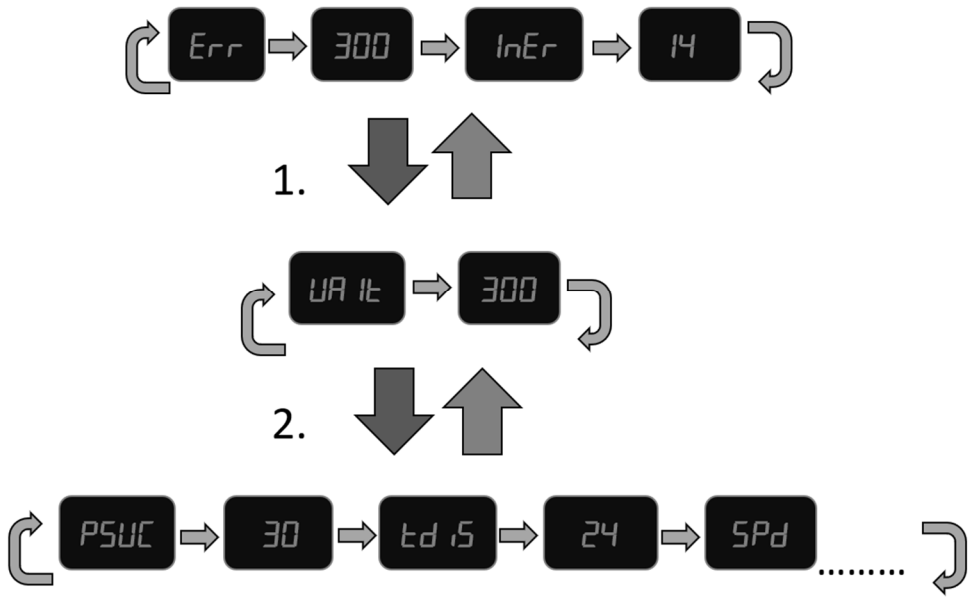
Display

The screen of the Eliwell Free Smart controller is divided into several elements. These are LED symbols and a seven-segment display. They indicate the current operating status of the refrigeration unit by displaying the most important information such as: information from sensors, operating modes as well as failures and errors. They also allow you to change the operating parameters of the device.

No.	Symbol	Description	OFF (○)	Blink (●/○)	ON (●)
1.	⏻	**Permission to start**	OFF	ON, but no ext. perm. to work	ON
2.	⚠	**Error status**	No error / warning	**Warning**	**ERROR**
3.	❄	**Cooling status**	Not active	Compressor waiting for start	Active (compressor running)
		ECO mode	Not active	N/A	ECO mode active
5.	1	**Compressor** status	OK	**Compressor error (inverter)**	OK, running
7.	3	**Fan** status	OFF	N/A	ON
8.	4	Ready to start or working	Not ready	N/A	Ready or running
9.	5	High / low pressure switch (STO)	Pressure switch OK	HP pressure switches circuit open!	N/A
10.	6	Pressure sensors error	Pressure sensors OK	Pressure sensors error!	High discharge / suction pressure!
11.	7	Temperature sensors error	Temperature sensors OK	Temperature sensors error!	Very high discharge temperature!
13.	☀	Compressor carter heater	OFF	N/A	ON
14.	❄	Injection valve	Closed	N/A	Opened
15.	ABC	Menu status	Out of menu, default screen	N/A	Menu active
16.		Gauge pressure	N/A	N/A	Pressure display
17.	%	Percentage value	N/A	N/A	Values display
18.		Temperature °C/K	N/A	N/A	Temperature display
19.	1234	Display	N/A	N/A	Values display

Display – default view

The most important information about the operation of the device is displayed in the default view of the display, depending on the current operating status.



1. When an error occurs, the view changes to display only error information. When an auto reset or manual reset occurs by pressing the F2 (esc) button, the controller returns to displaying the time remaining to start the device.
2. When the external start signal is present and the time to start is 0 seconds, it changes to the main view.

Parameters that appear in the default view:

SPd (spd): compressor speed [RPS],

- PSUC (psuc): suction pressure [bar],
- Pdi S (pdis): discharge pressure [bar],
- tdi S (tdis): discharge temperature [°C],
- OFF (off): unit OFF,
- StOP (stop): unit stopped by pressure switch (HP or LP),
- rUn (run): unit ON / compressor running,
- Stb (stb): unit ON, no cooling required,
- uAi t (wait): unit ON, countdown to start (time remaining to boot will be displayed after uAi t),
- Err (err): unit stopped with error (error number will be displayed after Err),
- InEr (inER): inverter error (code displayed after InEr),
- InAL (inAL): inverter alarm/warning (code displayed after InAL).

In the case of parameters such as: pressure, speed, temperature after displaying the parameter name, the measured value of the given parameter will be displayed.

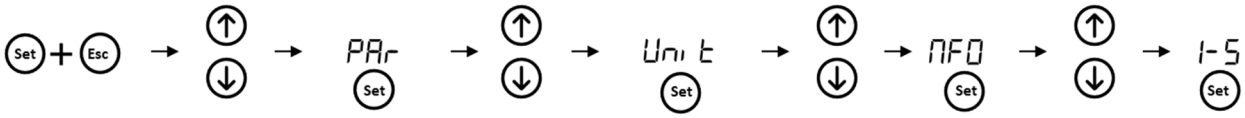
Entering any of the controller menu (exit from the default view) is signalled by the ABC symbol on the display. When this symbol is inactive, the default view is displayed.

Multifunctional digital output

The units are equipped with an optional digital output in the form of a potential-free contact. As a standard, the output is connected to terminals **-Xc: 3-4**.

The default output function is "2: Ready to Run or Running" which means that the compressor is running or the condensing unit is ready to start the compressor (the compressor will definitely start if the pressure rises). This function was created to protect the condensing unit against non-evaporated refrigerant on the suction side of the compressor - this signal is used to allow the expansion valves of the evaporators to open.

Possible output functions set via menu „Prog":



Possible digital output settings:

0.	**OFF**	(output forced to open state)
1.	**ON**	(output forced to closed state)
2.	**Ready to Run or Running**	(closed when the compressor is running, or the unit is ready to start the compressor)
3.	**No Error**	(closed when the unit reports no failures)
4.	**No Warning/Error**	(closed when the unit reports no warnings or failures)
5.	**Cp Running**	(closed when at least one compressor is running)
6.	**Oil Return Active**	(closed when oil return mode has been activated)

14. Starting the unit

14.1. Unit start switch

Condensing units OCU-KRE in standard option do not have physical starting up switch. There is a dedicated controller parameter to start the unit additionally activated by holding arrow buttons for 3 seconds:

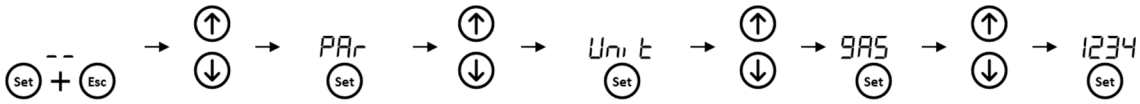
• **Turning on the unit**: Press and hold F1 button (↑) for 3 second outside of menu,

• **Turning off the unit**: Press and hold F3 button (↓) for 3 seconds outside of menu

14.2. Quick start procedure

The procedure should be performed after completing the installation of the device, in particular: verification of the completeness of the installation, charging the refrigerant, electrical connection with verification of the power supply parameters (phase control relay – if present).

A. Make sure that the unit is **turned off**.
B. Check whether all cut-off valves are open.
C. **Turn on** the power supply.
D. Wait for controller start up. Controller is ready for work when FrEE text on display disappears.
E. In case of **different** refrigerant than R449A usage there is a need to change its mode by setting parameter gAS according to table below and instruction:



Parameter. gAS	Description
0	R404A
1	R134A
4	R507A
5	R448A
6	R449A
7	R513A

F. After choosing type of unit the initialization process will start. Controller display will show information LOAd and type of chosen refrigerant. After completing the procedure controller will display the default information (default display).
G. Set desired **evaporation temperature** (default **-10.0°C**) with parameter tES according to instruction below:

H. Set desired **compressor shut off temperature - "pumpdown"** (default **-20.0°C**) with parameter tEPd according to instruction below **(the default values is correct for most applications):**

I. **Turn on** external start permission signal.
J. **Turn on unit** by pushing and **holding F1 button** ( ) for **3 seconds** (while being out of menu options).
K. Confirmation of starting the device will be the appearance of the symbol on the display:

L. **ATTENTION!** When all starting conditions are met the unit will **automatically turn on**.

14.3. Checking the correct operation of the unit

After start-up the unit should operate without generating excessive vibrations, knocks and heat. The evaporators should be covered with frost evenly.

Check the pressure on the test pressure gauges. The difference between the condensing temperature indicated by the pressure gauge and the ambient temperature should be within 0–15 K.

The indicator should indicate a color corresponding to dry refrigerant. The flow should be smooth and non-turbulent. If the flow is turbulent and bubbles are visible, too low amount of refrigerant is used.

The thermostatic valve must be adjusted correctly. Vapor from the evaporator should be superheated by 4–8ºC. The thermostatic valve should be adjusted according to valve instruction manual. Adjust the valve when the refrigeration system is operating.

Gas temperature at the compressor's discharge side must not exceed 110ºC

15. **Controller menu**

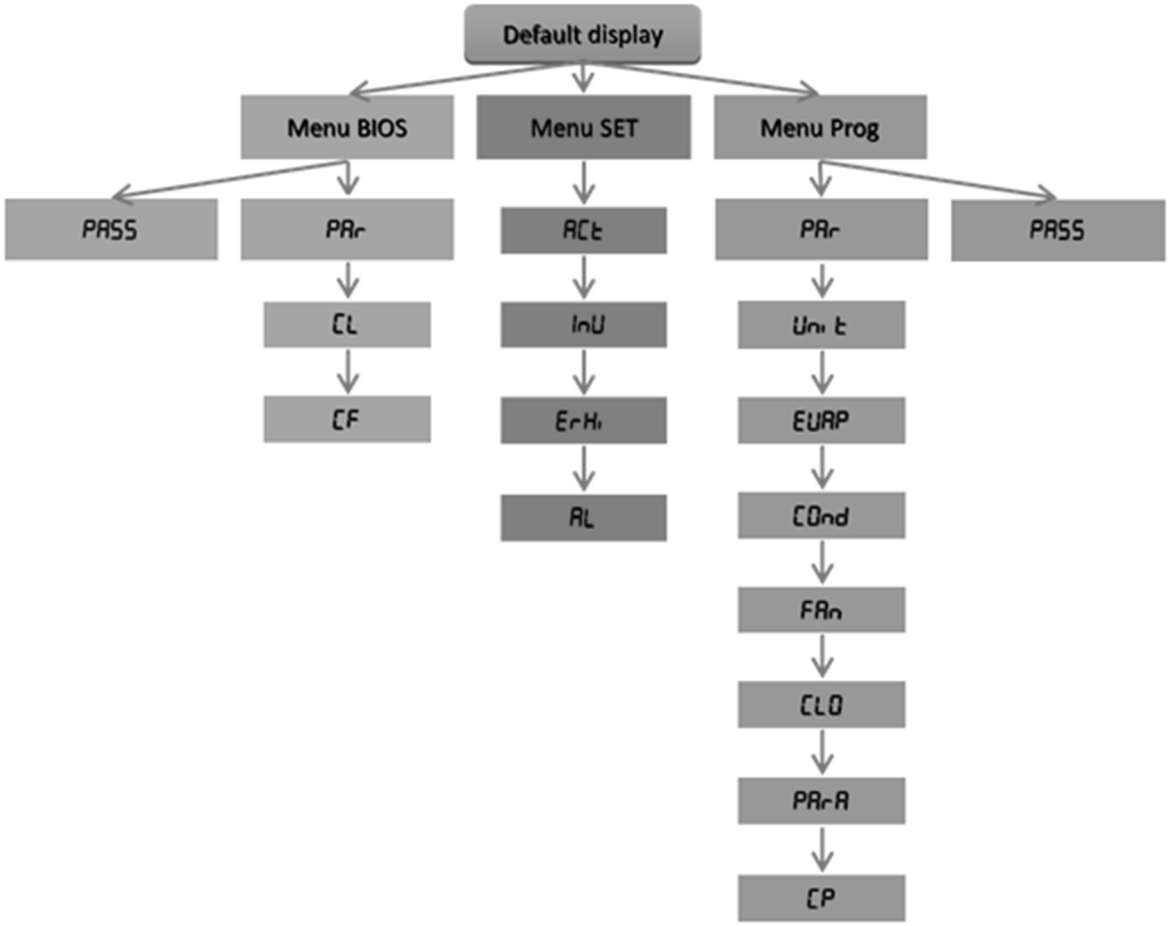
15.1. Menu structure

There are three types of menu in the controller:

- Menu **BIOS** – contains the hardware settings of the controller.
- Menu **Set** – contains the most important information on the operation of the device. This information is always available to the user.
- Menu **Prog** – contains a login window and provides access to advanced settings.

Entering each of the menu is signalled by an appropriate symbol on a display (15). When the symbol is inactive, the **default display** is shown.

The block diagram below shows the menu layout available in the Eliwell Free Smart controller:

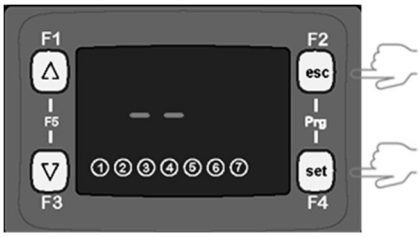


15.2. User login

The parameters in the menu are available from three access levels:

- **Always visible** – parameters are always available, do not require logging in,
- **Level 1** – parameters available after logging in with the installer password (11),
- **Level 2** – parameters available after logging in with the manufacturer's password.

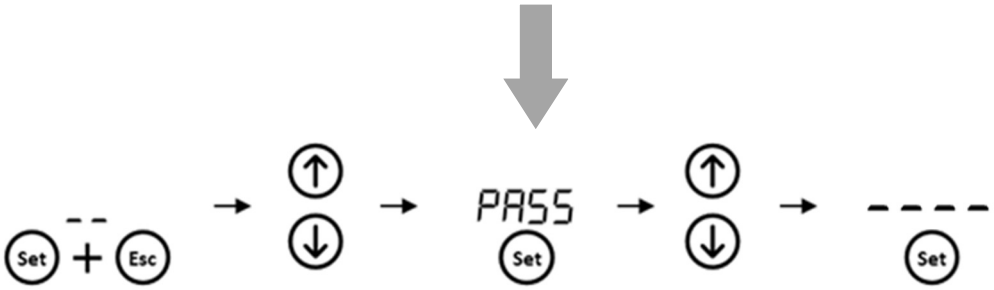
Logging in to the desired level allows you to unlock the visibility of a given parameter in the menu. If the parameter is not visible, the user is not logged in. After a few minutes, the controller will automatically return to the main screen and log the user out.



Press both Esc+Set
simultaneously (menu Prog)

Using Up Down arrows find PASS
Press Set button

Using Up and Down enter password
and press Set button

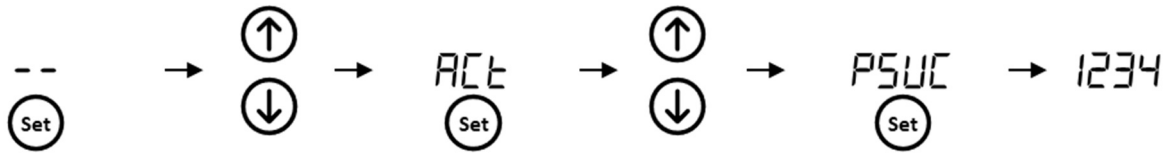


15.3. Current operating parameters

The current operating parameters of the device can be found in the Set menu. They show the current measurement values from sensors and the inverter.

*Menu **ACt** (Act) – device operating parameters*

Menu ACt shows the current measurement values of the sensors and their setpoint values for the device operation.



The following table shows the menu parameters ACt available for reading:

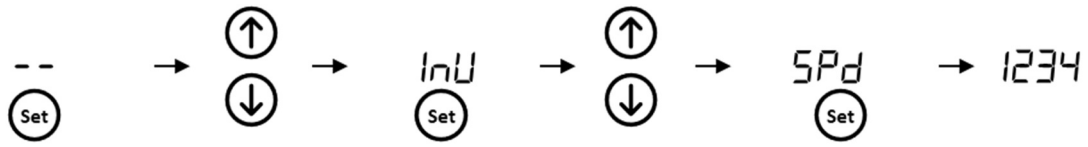
No.	Label	Description	Unit	Scale	Modbus Adr.
1.	PSUC	Current suction pressure	bar	0,01	9113
2.	PSSt	Suction pressure setpoint	bar	0,01	9105
3.	Pdi S	Discharge pressure	bar	0,01	9146
4.	PdSt	Discharge pressure setpoint	bar	0,01	9143
5.	tdi S	Discharge temperature	℃	0,1	9166
6.	tAMb	Ambient temperature	℃	0,1	9222
8.	tEUA	Evaporation temperature	℃	0,1	9095
9.	tES	Evaporation temperature setpoint	℃	0,1	9096
10.	tCnd	Current condensing temperature	℃	0,1	9097
11.	tCSt	Condensing temperature setpoint	℃	0,1	9098
12.	PSLL	Lower suction pressure limit (compressor stop)	bar	0,01	9120
14.	CACt	Compressor speed	%	0,1	9109
15.	FACt	Fan speed	%	0,1	9249

The table below shows list of parameters necessary for controlling the device via RS-485 communication (Modbus RTU).

No.	Description	R/W	Setting range	Modbus Adr.
1.	Unit error active	R	0-1	9025
2.	Unit warning active	R	0-1	9026
3.	Unit warning number (with highest value)	R	0-500	9051
4.	Number of active warnings	R	0-500	9052
5.	Unit error number	R	0-500	9027
6.	Reset unit error	R/W	0-1	9049
7.	Unit ready to start or running	R	0-1	9060

Menu ***InU*** *(Inv) – inverter operating parameters*

The menu InU shows the current values of the inverter operating parameters.



The following table shows the menu InU parameters available for reading:

No.	Label	Description	Unit	Scale	Modbus Adr.
1.	SPd	Current compressor speed	RPS	0,1	9312
2.	CUrr	Current inverter current	A	0,1	8970
3.	POWE	Current inverter power	kW	0,01	8972
4.	UOLt	Current inverter voltage	V	1	9005
5.	rt_H	Total inverter working time – in hours	H	1	9320
6.	rE	Winding resistance	Ω	1	8974
7.	dC_U	Inverter DC bus voltage	V	1	8985
8.	tdr1	Inverter temperature - power side	℃	0,1	8986
9.	tPCb	Inverter temperature – electronics	℃	0,1	9001
10.	1_St	Inverter status	N/A	N/A	9319
11.	1_Er	Inverter error number	N/A	N/A	9318

15.4. Changing the unit operating parameters settings

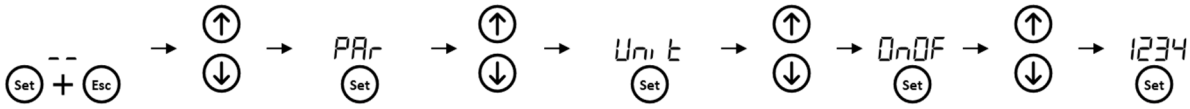
During operation, it may be necessary to change the adjustment parameters of the device. The parameters responsible for this can be found in the Prog menu. The menu structure is presented in the figure (chapter 15.1).

*Menu **Unit** (Unit) – main settings*

Menu Unit contains the main parameters related to the operation of the device. The most important is the parameter OnOF, which decides whether the unit is turned on (change also in the default view through the up-ON, down-OFF arrows held for 3 seconds).

The following table shows the menu Unit parameters:

No.	Label	Access level	Description	Setting range	Modbus Adr.
1.	OnOF	Always visible	Unit operation status (OFF - turned off, ON - turned on)	OFF/ON	16534
2.	gAS	Level 1	Refrigerant type: 0 - 404A 1 - 134A 4 - 507A 5 - 448A 6 - 449A 7 - 513A	0-7	9058
3.	nFO	Always visible	Multi-function digital output function selection: 0 - OFF (output forced to open state) 1 - ON (output forced to closed state) 2 - Ready to Run or Running (closed when the cp is running or ready to start the cp) 3 - No Error (closed when the unit does not report any errors) 4 - No Warning/Error (closed when the unit reports no warnings or errors) 5 - Cp Running (closed when at least one compressor is working) 6 - Oil Return Active (closed when oil return mode was activated)	0-6	16838
4.	dEFL	Level 1	Setting the default values of the EEPROM parameters: (OFF - no changes, ON - forcing default values)	OFF/ON	9067
5.	n_S	Level 2	Type of operation of the controller's RS485 port selection (0 – Slave, 1 – Master)	OFF/ON	16533
6.	PUEr	Always visible	PLC software version	1-255	9421
7.	ins	Level 1	Installer password setting (default 11)	1-255	16545
8.	tYP	Level 2	Type of compressor	1-10	16530

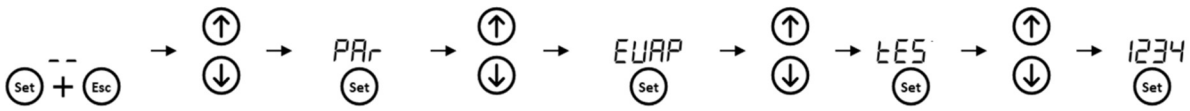


*Menu **EVAP** (Evap) – evaporation settings*

Menu EVAP contains parameters for the evaporation settings. The most important parameter is **tES** - it defines the evaporating temperature (appropriate suction pressure depending on the refrigerant) which is required for the correct operation of the evaporators (the capacity of the compressors will be regulated to keep this pressure at the given level). For a MT condensing units default evaporating temperature setpoint is -10°C and for a LT condensing units is -27°C.

The following table shows the menu EVAP parameters:

No.	Label	Access level	Description	Unit	Scale	Modbus Adr.
1.	tES	Always visible	Evaporation temperature setpoint (for compressors)	°C	0,1	16651
2.	tEPd	Always visible	Evaporation temperature - compressor stop limit	°C	0,1	16659
3.	Sr_P	Always visible	Proportional band (P) of the suction pressure regulator	bar	0,01	16559
4.	Sr_I	Always visible	I factor of the suction pressure regulator (integral time)	s	1	16561
5.	ESt	Level 1	Evaporation temperature maximum limit delay	s	1	16653
6.	tEH3	Level 2	Maximum evaporation temperature	°C	0,1	16655
7.	tEH2	Level 1	Warning evaporation temperature	°C	0,1	16656
8.	FSLt	Level 2	Fast slowdown duration time	s	0,1	16742
9.	FSLU	Level 2	Fast slowdown delay time	s	1	16743
10.	SrSU	Level 1	Acceleration ramp of the suction pressure regulator	%/s	0,1	16556
11.	SrSd	Level 1	Deceleration ramp of the suction pressure regulator	%/s	0,1	16557
12.	SrMA	Level 1	Maximum value of the suction pressure regulator output	%	0,1	16565
13.	Srdb	Level 1	Dead band of the suction pressure regulator	bar	0,01	16558
14.	SUdb	Level 1	Dead band of suction pressure regulation	bar	0,01	16566
15.	EH	Level 1	Temperature difference from setpoint to start Compressor	bar	0,01	16657
16.	tEL	Level 1	Temperature difference from setpoint to stop Compressor	bar	0,01	16658

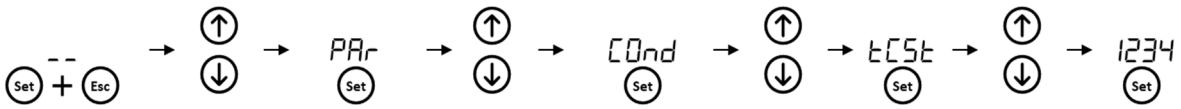


*Menu **COnd** (Cond) – condensing settings*

Menu COnd contains the parameters for the condensing settings. The parameters influence the operation of the fan, the speed, which is regulated based on the discharge pressure (liquid). The most important parameter is tCS - it defines the condensing temperature setpoint (appropriate liquid pressure depending on the refrigerant), at which the fan runs at maximum speed.

The following table shows the COnd menu parameters:

No.	Label	Access level	Description	Unit	Scale	Modbus Adr.
1.	tCS	Always visible	Condensing temperature setpoint	°C	0,1	16668
2.	ECO	Always visible	Floating condensing temperature (ECO mode) – activation (enabled by default)	OFF/ON	N/D	16641
3.	ECOt	Always visible	ECO mode – Minimum condensing temperature setpoint	°C	0,1	16642
4.	ECO1	Always visible	ECO mode - ambient temperature at which the condensing setpoint starts to be reduced	°C	0,1	16643
5.	ECO2	Always visible	ECO mode – ambient temperature where the condensing temperature setpoint is reduced to the value of ECOt	°C	0,1	16644
6.	dr_P	Always visible	Proportional band of the condensing controller	bar	0,1	16597
7.	dr_I	Always visible	Incremental band of the condensing controller	s	1	16598
8.	dStA	Level 1	Differential discharge pressure to start the fan	bar	0,1	16601
9.	dStP	Level 1	Differential discharge pressure to stop the fan	bar	0,1	16602
10.	drdb	Level 1	Dead band of the condensing controller	%	0,1	16596
11.	drSU	Level 1	Acceleration ramp of the condensing controller	%/s	0,1	16599
12.	drSd	Level 1	Deceleration ramp of the condensing controller	%/s	0,1	16600
13.	HHH	Level 2	Critical limit for discharge pressure	bar	0,01	16609
16.	tHHH	Level 2	Discharge temperature - device stopping limit	°C	0,1	16623
17.	toPE	Level 1	Discharge temperature - injection valve closing limit	°C	0,1	16626
18.	tcLo	Level 2	Discharge temperature difference from tope - injection valve opening limit	°C	0,1	16839

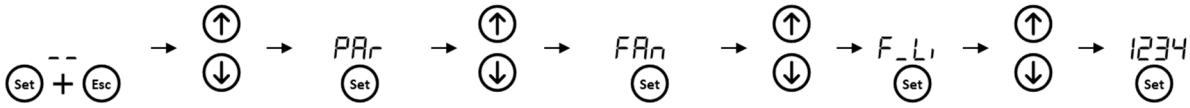


ECO mode – floating condensation setpoint

ECO mode provides a reduction of the condensing temperature setpoint if the ambient temperature is lower. This ensures an increase in the efficiency of the unit, while maintaining the parameters of the average loudness of the unit. It allows the tCS condensing temperature setpoint to be reduced linearly in proportion to the ECOt minimum condensing temperature setpoint when the ambient temperature is below 20°C (start setback) ECO1 to 5°C ECO2 (end setback). The list of parameters is in table above.

Menu **FAn** (Fan) – fan parameter settings Menu FAn contains parameters related to fan settings. The following table shows the menu FAn parameters:

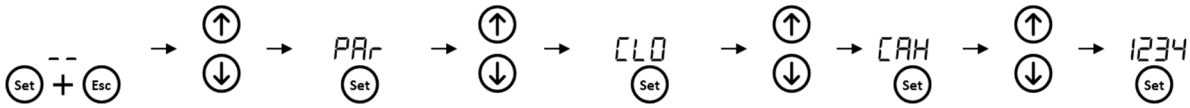
No.	Label	Access level	Description	Unit	Scale	Modbus Adr.
1.	F_MA	Level 1	Maximum fan speed	%	0,1	16719
2.	F_Mi	Level 1	Minimum fan speed	%	0,1	16720
3.	FSnC	Level 1	Manual fan mode - on / off	OFF/ON	N/A	9251
4.	FSON	Level 1	Fan speed in manual mode	%	0,1	9252
5.	rFAn	Level 2	Fan type	0-1	N/A	16532



Menu CLO (Clo) – real time settings (RTC)

Menu CLO contains parameters related to the controller time settings. The following table shows the menu CLO parameters:

No.	Label	Access level	Description	Unit	Scale	Modbus Adr.
1.	CAH	Always visible	Current controller time	h	1	9362
2.	CAM	Always visible	Current controller time	min.	1	9363
3.	CAS	Always visible	Current controller time	s	1	9364
4.	CSH	Always visible	Controller time to update - hours	h	1	9355
5.	CSM	Always visible	Controller time to update - minutes	min.	1	9356
6.	CUPd	Always visible	Update the system time of the controller	OFF/ON	N/A	9350

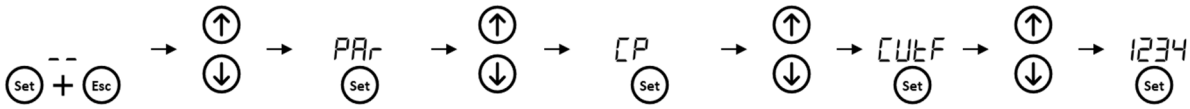


Menu CP (Cp) – compressor settings

Menu CP contains parameters for changing the compressor operating parameter settings.

The following table shows the menu CP parameters:

No.	Label	Access level	Description	Unit	Scale	Modbus Adr.
1.	CUtF	Always visible	Enable the option of skipping the set frequency (enabled by default)	OFF/ON	N/A	16744
2.	FUAL	Always visible	Skip Frequency - Center	RPS	0,1	16745
3.	Fd, F	Always visible	Skip Frequency - Dead Band (+/- Center)	RPS	0,1	16746
4.	tStb	Always visible	Time until the compressor stops once the stop conditions are met	s	1	16731
5.	tbtS	Level 2	Minimum time between compressor starts (between starts time)	s	1	16732
9.	SEL4	Level 2	Analog input type selector of discharge temperature sensor	INT	N/D	16619

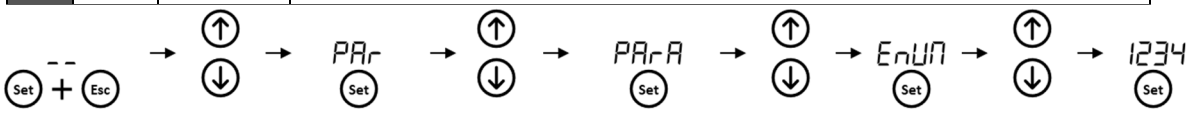


Menu PArA (Para) – access to all parameters (advanced)

Menu PArA contains parameters that allow you to access and change the settings of all controller parameters - **only for the needs of advanced service**.

The following table shows the menu PArA parameters:

No.	Label	Access level	Description
1.	EnUn	Level 1	EEPROM parameter offset selection
2.	EUAL	Level 1	View and change the value of the EEPROM parameter
3.	SnUn	Level 1	Offset selection of the Status parameter
4.	SUAL	Level 1	View and change the value of the Status parameter



Menu bIOS (Bios) – types and scaling setting of analog sensors

In the Eliwell Free Smart controller, it is possible to set the types of sensors connected to it as well as to set the operating ranges - scaling.

- Press the F1 + F3 buttons simultaneously to enter the BIOS menu. FrEE will appear on the screen.
- Then press the F2 + F4 buttons simultaneously to enter the parameter change menu. PAr will appear on the screen.
- Using the arrows, find the PASS parameter and confirm with the Set button.
- Enter the installer password and confirm with the Set button.
- Using the arrows, find the PAr parameter and confirm with the Set button.
- Using the arrows, find the CL parameter group and confirm with the Set button.
- Using the arrows, find the required parameter and confirm with the Set button.
- Change the parameter according to needs and confirm with the Set button.

No.	Label	Setting	Description
1.	CL00	8 = PT1000	AI1: Type of temperature sensor: 2 = NTC / 8 = PT1000
2.	CL01	8 = PT1000	AI2: Type of temperature sensor: 2 = NTC / 8 = PT1000
3.	CL02	3 = 4-20mA	AI3: Type of pressure sensor: 3 = 4-20mA / 4 = 0-10V / 5 = 0-5V / 6 = 0-1V / 7 = 0-20mA
4.	CL03	3 = 4-20mA	AI4: Type of pressure sensor: 3 = 4-20mA / 4 = 0-10V / 5 = 0-5V / 6 = 0-1V / 7 = 0-20mA
5.	CL04	8 = PT1000	AI5: Type of temperature sensor: 2 = NTC / 8 = PT1000
6.	CL 10	1800	High scale range of the AI3 suction pressure sensor (1000 = 10.0 bar)
7.	CL 11	0	Low scale range of the AI3 suction pressure sensor (0 = 0 bar)
8.	CL 12	3000	High scale range of the AI4 discharge pressure sensor (3000 = 30.0 bar)
9.	CL 13	0	Low scale range of the AI4 discharge pressure sensor (0 = 0 bar)

16. Operation and maintenance of the unit

16.1. Requirements concerning operation of the unit

According to F-gas regulations refrigerant systems may be subjected to obligatory tightness tests and keeping records depending on the type of the refrigerant and its charge.

To ensure appropriate compressor working conditions, its number of start/stop cycles must be limited. For this reason the unit's capacity should be selected accordingly to the capacity requirements. Use controllers to limit the number of compressor's working cycles.

To ensure the correct work of the unit during operation:

a) The condensing unit should be powered up at least 4 hours before the first startup to heat the crankcase. Check if crankcase heater is powered up
b) If knocking noise is heard or in case of improper operation, overheating or lack of cooling effect - disconnect the unit from the power supply, locate the faults and address them,
c) When there is a risk of ice formation on the evaporators, effective defrosting must be ensured.
d) In the case of planned stoppages longer than 3 days, there should be made a pomp-down procedure and the unit must be turned off on the controller. For stops longer than 1 week, it is recommended to disconnect the power supply.
e) If a compressor have a sight-glass, after the first 40 hours of operation check the oil quantity and refill it if necessary,
f) Check if the refrigerant is dry; if necessary replace the filter drier.

16.2. Oil level control

Any change in a factory oil quantity should noted in the start-up protocol and service protocols of the condensing unit.

The minimum and maximum oil levels are reached when the oil amount is 20% less/more than the nominal oil level respectively.

Using excessive amount of oil can damage the compressor.

Using oil type other than the original one and replenishing the original oil with other oil type can damage the compressor and void the warranty.

16.3. Crankcase heater

The heater can reach the temperature of 80^{0}C. Touching the heater can cause burns. The oil temperature should be maintained at approximately +10 to 15^{0}C above ambient temperature.

Lack of heater or its damage must be immediately reported to the supplier.

Failure to connect the electric heater to the power supply can damage the compressor. This will void the warranty.

Oil crankcase heater must be connected to the power supply at least 4 hours before starting the compressor after longer period of non-operation, as well as during normal operation of the system, even if the compressor does not operate.

16.4. Safety valve service

Safety valve service on the purpose of legalization (which should be done according to law regulations which are mandatory in the country of installation) or replacement has to be done according to the procedure below :

1) Disconnect condensing unit power supply
2) Cut-off section(close the valves) where safety valve is mounted
3) Refrigerant in the section where the safety valve is mounted should be pumped out and its mass should be measured. Make sure there is not refrigerant in this section.
4) Change the safety valve
5) Create a vacuum 1000 microns (1 Tr, 1,3 mbar) in the serviced section
6) Open valves on the serviced section
7) Refill the systems with the same amount of refrigerant as You pumped out
8) Condensing unit is ready to plug in power supply and start it

17. Servicing

17.1. Servicing actions

The condensing unit must be regularly checked by authorized and qualified personnel.

Any modifications of the system introduced by third parties are the sole responsibility of the user and will void the warranty.

1) Before attempting to carry out maintenance work, make sure that the equipment is not operating and is disconnected from the power supply. Exercise caution when carrying out maintenance of electrical connections.
2) Visually check if there is no visible damage which would render the system non-operational.
3) If the system was dried or is filled with nitrogen, dry and fill the system. Carry out these operations according to the general rules.
4) Check if the pipes and connections are not broken and if there are no visible cracks and other signs of mechanical damage. Make sure that transport or long period of non-operation did not cause components to move in relation to each other which could damage them.
5) Switch on the heaters 4 hours before the start-up. This is required before the first start-up and after each prolonged period of non-operation if the voltage was disconnected from the terminals. Failure to do so may cause oil to foam and lead to compressor damage.
6) Before the start-up, particularly after installation or maintenance, make sure the compressor cut-off valves at the suction and discharge sides are opened. Close the valves only when necessary.
7) When emptying the system and compressors follow the general rules.
8) Do not leave air in the compressor before filling it with refrigerant. Dry the compressor thoroughly.
9) The oil level in the compressor and the oil separator circuit must be correct. If significant oil loss is noticed, replenish the oil by using the same oil type which was used originally or its alternative.
10) Set the pressure switches and pressure limits according to the refrigerant compatible with the compressor. Settings of controller and pressure switches must not cause the compressor's operating range to be exceeded.

    In case of OCU-KRE units pressure switches are not adjustable, but during commissioning correct refrigerant has to be selected in the unit controller!

11) Before starting the entire system check if the compressors are connected correctly. To do so, measure the current drawn by the compressor during start-up. Measure the current when the suction and discharge side valves are opened. The current at the start-up should quickly increase to the maximum value and drop after reaching it. If this does not happen, check for the cause of this problem and address it.
12) The refrigerant temperature at the discharge side should not exceed 110^0C.
13) The vapor at the suction side should be superheated by 10–20 K. If these values are exceeded, adjust the expansion valves or controllers.
14) Check the pressure readings in the controller are consistent with the manometer readings (suction / liquid). The fan speed should be adjusted on the regulator (if the regulator is present)

17.2. Regular inspections of the installation

Once a month User	-Check the cleanliness of the condenser -Check the moisture level in the system (sight glass color)
Once in 6 months User	-Checking the condition of evaporators' drip trays -Checking the condition of pipelines of a condensate
Once in 12 months Service	-Clean the condenser -Check the operation of check and solenoid valves -Checking tightening of threaded electrical connections -Check the condition of flexible couplings -Check if there are any refrigerant and oil leaks -Check alarm history -Check the pressure at the discharge side -Check the pressure at the suction side -Check the temperature of the suction vapor -Check the temperature of vapor at the discharge side -Check the crankcase temperature -Check the vapor superheating

In case any irregularities are noticed, take appropriate steps to address them. It is recommended to prepare a form to be filled in during the periodic inspections, repairs, adjustments and maintenance.

18. Typical problems, alarms and troubleshooting

Condensing units OCU-KRE are equipped with a controller which displays the current error.

In case of an error, this situation will be appropriately signaled with an error code that will appear on the display in the default view. The error number is also saved in the error history (last 4 occurrences).

18.1. List of active warnings and errors – AL (Al)

When an alarm (warning) or error occurs, it is possible to check the list of current errors and alarms in the **Set** menu under AL position. The alarm list (AL) appears dynamically when any alarm occurs, while inside only the active alarm or error is visible.

No.	Label	Description	Num.
1.	Err	Active error (unit stop)	n/a
2.	UArn	Active warning	n/a
3.	PS_b	Suction pressure sensor error (-Psuc)	1101
4.	PS H	High limit of the suction pressure reached	1102
5.	PS L	Low limit of the suction pressure reached	1103
6.	tE H	High limit of the evaporation temperature reached	1104
7.	tE L	Low limit of the evaporation temperature reached	1105
8.	Pd_b	Discharge pressure sensor error (-Pdis)	1201
9.	Pd H	High limit of discharge pressure reached	1202
10.	Pd L	Low limit of discharge pressure reached	1203
11.	tcoH	High condensing temperature limit reached	1204
12.	tcoL	Low condensing temperature limit reached	1205
13.	td_b	Discharge temperature sensor error (-Tdis)	1301
14.	td H	High limit of the discharge temperature reached	1302
15.	tA_b	Ambient temperature sensor error (-Tamb)	1401
16.	tA H	High limit of the ambient temperature reached	1402
17.	tA L	Low limit of the ambient temperature reached	1403
18.	InEr	Active error - inverter	1601
19.	InAL	Active warning - inverter	1602
20.	inSP	Inverter didn't reach min. speed	n/a
21.	UL_P	Unit stopped by too frequent STO error	n/a
22.	ULPd	Unit stopped by too many the highest limits reached	n/a
23.	ULPS	Unit locked by inverter	n/a
24.	ULtd	Unit stopped due to too frequent high discharge temperature	n/a
25.	MbrE	Modbus reading error	n/a
26.	Mb E	Modbus sending error	n/a

In case of reaching high and low limits, the error number (to view the value, enter the given warning with the Set button) means the level of the limit reached:

- 3 – 9 : level 1 (information),
- 10-99 : level 2 (warning),

- 100 – 254 : level 3 (error - unit stopped).

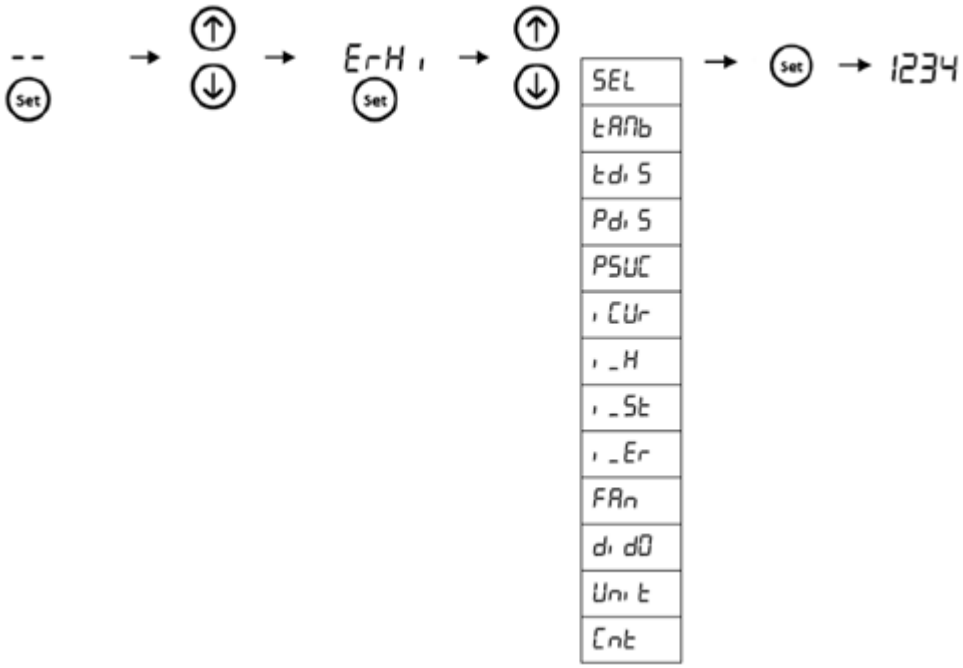
In case of a sensor error, the value of the parameter in the table above indicates the status of the condensing unit relative to the status of the sensor:

- 10 – off,
- 99 – damaged but does not lock the operation of the unit,
- 254 – damaged (unit stopped).

18.2. Error history – ErH1 (ErHi)

If it is necessary to check the history of errors or temporary error or power failure - it is possible to read the last error value that was saved in the controller memory. The controller remembers the last four errors as well as the operating parameters of the condensing unit at the time of its occurrence.

The history can be found in the menu **ErH1.**



To check the historical values, first select index from 1 to 4 – parameter SEL.

No.	Label	Access level	Description	Modbus Adr
1.	SEL	Always visible	Fault index to be displayed 1-4 (4 = oldest fault)	9031
2.	Cnt	Always visible	Number of the last alarm (counted from the unit leaving production)	9032
3.	Unit	Always visible	Device error **Err**	9033
4.	FAn	Always visible	Fan speed during error*	9034
5.	1_Er	Always visible	Inverter error **InEr**	9035
6.	1_St	Always visible	Inverter status	9036
7.	1_H	Always visible	Inverter working time	9037
8.	1CUr	Always visible	Inverter current	9038
9.	PSUC	Always visible	Suction pressure value when the error occurred	9039
10.	Pdi5	Always visible	Discharge pressure value when the error occurred	9040
11.	tdi5	Always visible	Discharge temperature value when the error occurred	9041
12.	tAMb	Always visible	Ambient temperature value when the error occurred	9042

* displayed parameters may differ depending on the software version.

18.3. Unit errors – Err (Err)

Errors preceded by the information Err on the display concern the operation of the device (the error number is also saved in the error history).

No.	Error number	Alarm name	Possible reason	Solution
1.	100	Suction pressure sensor error (Psuc)	Pressure transducer disconnected	Check the sensor cable plug. Check the correct connection of the sensor.
			Defective pressure transducer	Replace of the suction pressure sensor.
2.	102	Suction pressure too low (Psuc)	No refrigerant in the system	Check the amount of refrigerant in the system. Verify if the condensing unit shutoff valves are open.
			Incorrect system settings (pumpdown too deep with low system volume)	Increase the pumpdown setpoint (tepd) to 2 °C higher and test the system again.
3.	104	Evaporating temperature too high (Tevap)	Too much refrigerant in the system	Check the amount of refrigerant in the system. Check the settings (evaporation setting tes).
			Too much cold reception	Oversized evaporator (too many evaporators). Reduce cold pick-up. The cold room is just being cooled down. Clear the error and verify the operation of the condensing after reaching lower temperatures. Overheat control at the outlet of the evaporators.
4.	105	Evaporating temperature too low (Tevap)	Incorrect system settings (pumpdown too deep with low system volume)	Increase the pumpdown setting (tepd) to 2 °C higher and test the system again.
5.	106	Defective discharge pressure sensor (Pdis)	Pressure transducer disconnected	Check the sensor cable plug. Check the correct connection of the sensor.
			Defective discharge pressure transducer	Replace the discharge sensor.
6.	107	Discharge pressure too high (Pdis)		Check the amount of refrigerant in the system. Check the settings.
7.	108	Discharge pressure too low (Pdis)		Check the amount of refrigerant in the system. Check the settings.
8.	109	Condensing temperature too high (Tcond)		Check the amount of refrigerant in the system. Check the settings. Check the operation of the fan. Check the patency and cleanliness of the condenser.
9.	110	Condensing temperature too low (Tcond)		Check the amount of refrigerant in the system. Check the settings.
10.	112	Defective discharge temperature sensor (Tdis)		Check the correct connection of the sensor. Replace the sensor.
11.	113	Discharge temperature too high (Tdis)		Check the amount of refrigerant in the system. Check the settings.
12.	200	Defective ambient temperature sensor (Tamb)		Check the correct connection of the sensor. Replace the sensor.
13.	201	Ambient temperature too high (Tamb)		Check the condition of the temperature sensor and its location.
14.	202	Ambient temperature too low (Tamb)		Check the condition of the temperature sensor and its location
15.	300	Main inverter error - **Check the error number in table 18 (section 10.4.)**		

No.	Error number	Alarm name	Possible reason	Solution
16.	301	STO (HP pressure switch open during operation)		Increase pressure in the refrigeration system. Cool down the compressor, see point 4 and 8 of the table. Check the electrical connection of the pressure switch. Check the fuse.
17.	302	Phase current disturbances	Phase-to-phase power instability	Check the quality of the mains voltage.
18.	303	Inverter current limit reached		Pumpdown the refrigerant from the system on the suction side of the compressor. Try to restart with refrigerant on the suction side.
19.	304	Communication error		Check the communication cable.
20.	305	Inverter DC bus voltage too low	Incorrect mains voltage or inverter damage	Check the quality of the mains voltage.
21.	306	Phase current too high	Cord damage Loose plug	Check the connections to the inverter.
22.	307	Compressor phase synchronization lost	Incorrect mains voltage or inverter damage	Check the quality of the mains voltage.
23.	308	Inverter output phase loss (Speed too high)	Damage to the compressor or the compressor supply cable	Check compressor connection. Wind resistance measurement.
24.	309	Inverter output phase loss (Phase current too high)	Incorrect mains voltage or inverter damage	Check the quality of the mains voltage.
25.	310	Too much inverter power	Incorrect inverter parameter settings for the given compressor	Check the correct wiring of the inverter and the compressor. Check the connection of the inverter plugs. Change the type of refrigerant to any other than required. Return to the required one (point E of the quick start guide).
26.	311	Compressor temperature sensor error	Compressor overheat	Stop the unit. Cool down the compressor. Check the filling level of the system. Check the evaporator overheating settings. Check the oil level.
27.	312	Inverter supply current too high	Compressor blocked	Pumpdown the refrigerant from the system on the suction side of the compressor. Try to restart with refrigerant on the suction side.
28.	313	Inverter temperature too high	Inverter overheating	Stop the unit. Cool down the compressor. Check the filling level of the system. Check the evaporator overheating settings. Check the oil level.
29.	314	Inverter EEPROM error		Pumpdown the refrigerant from the system on the suction side of the compressor. Try to restart with refrigerant on the suction side.
30.	315	Inverter AD error		Unknown inverter error
31.	400	Device blocked by too frequent inverter errors		Check the cause of the error and follow the instructions above.
32.	401	Device blocked by frequent high sensor limits		Check the cause of the error and follow the instructions above
33.	402	Device blocked by too frequent STO errors		Check the cause of the error and follow the instructions above.
34.	403	Device blocked by too frequent high discharge temperature		Check the cause of the error and follow the instructions above.
35.	404	Compressor didn't reach minimum speed	Inverter overload or wrong inverter parameters	Check connections with the inverter, compressor Download parameters to the inverter
36.	408	Inverter dataset mismatch	Incompatibility of inverter parameters with the selected unit type	Change different unit type and change again to proper one.

18.4. Inverter errors – inEr (inEr)

Errors preceded on the display (default view) by the information inU and are related to the operation of the inverter:

No.	Error number	Alarm name	Possible reason	Solution
1.	1	Inverter DC bus voltage too high	Incorrect inverter parameter settings for the given compressor	Check the correct wiring of the inverter and the compressor. Check the connection of the inverter plugs. Change the type of refrigerant to any other than required and return to the required one (point E of the quick start guide).
2.	2	Inverter DC bus voltage too low	Incorrect mains voltage	Check the quality of the mains voltage
3.	3	Phase current too high	Cord damage Loose plug	Check the connections to the inverter.
4.	4	Compressor phase synchronization lost	Incorrect mains voltage	Check the quality of the mains voltage.
5.	5	Inverter output phase loss (Speed too high)	Damage to the compressor or the compressor supply cable	Check the compressor connection. Wind resistance measurement.
6.	6	Inverter output phase loss (Phase current too high)		
7.	7	IPM_FO failing edge		Unknown inverter error
8.	8	IPM_FO level		Unknown inverter error
9.	12	PFC Current too high	Incorrect inverter parameter settings for the compressor	Check the correct wiring of the inverter and the compressor. Check the connection of the inverter plugs. Change the type of refrigerant to any other than required and return to the required one (point E of the quick start guide).
10.	13	Too much inverter power	Incorrect inverter parameter settings for the compressor	Check the correct wiring of the inverter and the compressor. Check the connection of the inverter plugs. Change the type of refrigerant to any other than required and return to the required one (point E of the quick start guide).
11.	14	AC voltage out of range	Incorrect inverter parameter settings for the compressor	Check the correct wiring of the inverter and the compressor. Check the connection of the inverter plugs. Change the type of refrigerant to any other than required and return to the required one (point E of the quick start guide).
12.	15	Inverter AD error		Unknown inverter error.
13.	18	Compressor temperature sensor error	Compressor overheating	Stop the unit. Cool down the compressor. Check the filling level of the system. Check the evaporator overheating settings. Check the oil level.

No.	Error number	Alarm name	Possible reason	Solution
14.	19	Engine overheating	Working above the maximum current for a long time	Check the refrigeration system.
15.	20	Other inverter error	Communication error / inverter error - incorrect inverter settings	Check the correct wiring of the inverter and the compressor. Check the connection of the inverter plugs.
16.	21	Phase current disturbances	Phase-to-phase power instability	Check the quality of the mains voltage.
17.	22	Modbus communication error	Communication error / inverter error - incorrect inverter settings	Check the correct wiring of the inverter and the compressor. Check the connection of the inverter plugs. Change the type of refrigerant to any other than required and return to the required one (point E of the quick start guide).
18.	23	Inverter EEPROM error		Pumpdown refrigerant from the system on the suction side of the compressor. Attempt to restart with refrigerant on the suction side.
19.	26	Inverter temperature too high	Inverter overheating	Stop the unit. Cool down the compressor. Check the filling level of the system. Check the evaporator overheating settings. Check the oil level.
20.	27	Inverter current overload	Compressor blocked	Pumpdown refrigerant from the system on the suction side of the compressor. Attempt to restart with refrigerant on the suction side.
21.	29	STO (HP pressure switch open during operation)		Increase pressure in the refrigeration system. Cool down the compressor, see point 4 and 8 of the table. Check the electrical connection of the pressure switch. Check the fuse.
22.	50	Modbus communication error	Communication error / inverter error - incorrect inverter settings	Check the correct wiring of the inverter and the compressor. Check the connection of the inverter plugs. Change the type of refrigerant to any other than required and return to the required one (point E of the quick start guide).

Communication

The device can be equipped with a Modbus RTU communication module (RS485 electrical standard). Communication with the Eliwell Free Smart controller is managed by the Eliwell SMALAN4850400 module (installed in RMS unit versions).

Additionally, condensing unit feature options for remote monitoring of the unit, as well as other devices within the refrigeration system. Remote monitoring options (CRM) provide access to the cloud.

18.5. Modbus communication parameters

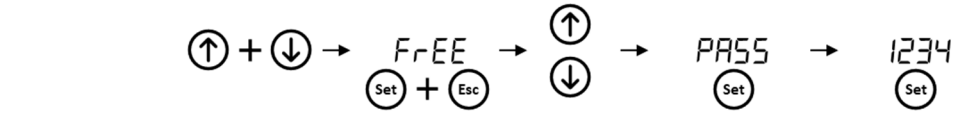
To enable communication with the controller, the device must be connected to the MODBUS network in accordance with the attached wiring diagram, keeping the principles of the RS485 serial communication standard.

Default settings of MODBUS communication parameters:

- Address: 1,
- Communication speed: 19200, Number of bits: 8, No parity bit, Number of stop bits: 1 (**19.2bps 8N1**)

Communication parameters can be changed to adapt the device to the existing network. To do this, change the parameters in the menu BIOS:

- Press the F1 + F3 buttons simultaneously to enter the menu BIOS. FrEE will appear on the screen.
- Then press the F2 + F4 buttons simultaneously to enter the parameter change menu. PAr will appear on the screen.
- Using the arrows, find the PASS parameter and confirm with the Set button.
- Enter the installer password and confirm with the Set button.
- Using the arrows, find the PAr parameter and confirm with the Set button.
- Using the arrows, find the CF parameter group and confirm with the Set button.
- Using the arrows, find the required parameter and confirm with the Set button.
- Change the parameter as needed and confirm with the Set button.
- Reset the controller using man switch by disconnecting and reconnecting the power supply.



The list of parameters is shown in the table below:

No.	Label	Description	Default
1.	CF00	Communication method : 2 = Modbus, 3 = LAN (DISPLAY)	2 (Modbus)
2.	CF35	Modbus address of the controller: 1 - 127	1
3.	CF36	Communication speed: 3 = 9600 / 4 = 19200 [bps]	4 (19200)
4.	CF37	Parity bit: 1 = Even, 2 = None, 3 = Odd	2 (None)

18.6. Modbus RTU communication parameters

The controller supports Modbus RTU communication and operates as a SLAVE (Server) device in the network. All controller variables are 16-bit (single Modbus register), and the supported commands are:

- **03** - Read Multiple Holding Registers – for reading one or multiple registers at once
- **06** - Write Single Holding Register – for writing a single register

The controller memory is divided into two areas:

- Volatile Status **Memory (Addresses 8960 – 9471)** – containing statuses and current operating parameters of the device,
- Non-volatile **EEPROM Memory (Addresses 16384 – 16895)** – containing settings that retain their values in case of power loss.

The addresses of individual variables are listed in the parameter lists in the previous sections of this manual. An expanded list is also available for BMS systems.

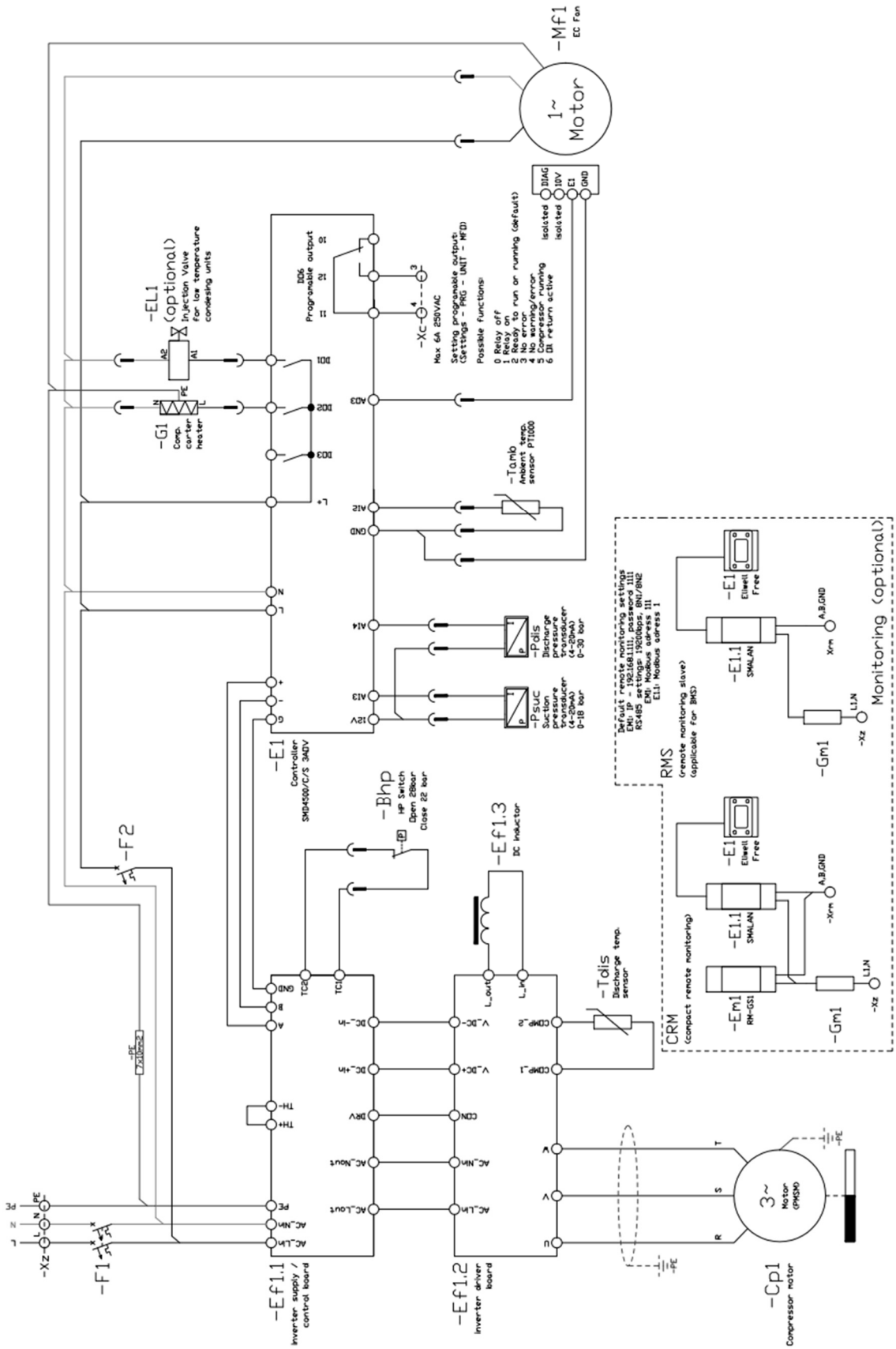
NOTE: Many Modbus RTU MASTER (Client) devices treat the first register address as 0, so it may be necessary to subtract 1 from register numbers to obtain the correct register number.

18.7. Additional functions of F1 button

Special F1 button functions:

- **Force device start (skip idle time)**: Press and hold the F1 (⏫) button for 10 seconds in the main view,
- **Force fan operations:** Press and hold the F1 (⏫) button for at least 10 seconds in the main view. The fan will operate at 100% speed as long as the button is pressed. After releasing the F1 button, it will return to its normal operation (regulated based on the discharge pressure),
- **Force opening of evaporators:** Press and hold the F1 (⏫) button for at least 15 seconds in the main view.

19. General electrical diagram



Presented electrical diagram is a simplified general schematic for an each unit. Specific schematic can be download from a Panasonic website. Electrical schematic number can be find on a sticker placed in electrical board.

SCHnnn-n – Schematic number
REV.nn or **Rnn** – revision number.

Symbol	Component		OCU-KRE025M05	OCU-KRE045M05	OCU-KRE070M05	OCU-KRE012L05	OCU-KRE022L05	OCU-KRE030L05
Bhp	HP pressure switch		Cut in 22bar Cut out 28bar					
Cp1	BLDC Compressor	Model	C-6RVN63L0B	C-7RVN113L0B	C-7RVN153L0B	C-6RVN63L0B	C-7RVN113L0B	C-7RVN153L0B
		RLA	3,4 A	7 A	9 A	3,4 A	7 A	9 A
		FLA	4 A	7,6 A	9,4 A	3,6 A	7,1 A	9,6 A
		Peak limit current	15 A	25 A	25 A	15 A	25 A	25 A
E1	Controller		SMD4500/C/S 3AOV					
Ef1.1	Inverter supply / control board		SSPM20A-220A	SPM30A-220B	SPM30A-220B	SSPM20A-220A	SPM30A-220B	SPM30A-220B
Ef1.2	Inverter driver board		SPM20A-Drv	SPM30A-Drv	SPM30A-Drv	SPM20A-Drv	SPM30A-Drv	SPM30A-Drv
Ef1.3	DC inductor		16A, 5mH	20A, 5mH	20A, 5mH	16A, 5mH	20A, 5mH	20A, 5mH
EL1	Liquid injection solenoid valve (LT only)		N/A			230V AC		
F1	Circuit breaker		B16/2	B20/2	B20/2	B16/2	B20/2	B20/2
F2	Circuit breaker		B6/1					
G1	Crankcase heater		35W					
Mf1	EC fan		EC092/35E3G01-AB450; 1,4A	EC092/35E3G01-AB450; 1,4A	EC102/50E3G01-AB500; 2,1A	EC092/35E3G01-AB450; 1,4A	EC092/35E3G01-AB450; 1,4A	EC092/35E3G01-AB450; 1,4A
Pdis	Discharger pressure transducer		4-20 mA 0-30 bar					
Psuc	Suction pressure transducer		4-20 mA 0-18 bar					
Tamb	Ambient temperature sensor		PT1000					
Tdis	Discharge temperature sensor		R0=187.25kΩ; B0/100=3979K					

20. Decommissioning

In case of decommissioning the unit or its components exercise caution with electrical and pressurized components

Before decommissioning disconnect the supply voltage and extract the refrigerant according to rules concerning handling refrigerants.

In case of changing a single element close shut-off valves before and after it and extract the refrigerant from that section.

Refrigerant recovered from the installation should be recycled, reclaimed, or utilized.

The temperature of the oil extracted from the compressor and oil separator can be above 60ºC. Exercise caution.

Oil is polluting waste and should be utilized.

21. DoC example

Panasonic

Panasonic Cold Chain Poland sp. z o.o.
ul. Relaksowa 27, 55-080 Nowa Wieś Wrocławska, Poland
NIP: 8971013179; Tel: +48 71 354 56 24

DEKLARACJA ZGODNOŚCI UE

Niniejszym deklarujemy, że niżej wymienione urządzenia

OCU-KRE025M05 OCU-KRE045M05 OCU-KRE070M05

OCU-KRE012L05 OCU-KRE022L05 OCU-KRE030L05

o numerach seryjnych zawierających się w przedziale:

	Numer / Number	Dzień / Day	Miesiąc / Month	Rok / Year
Od / From	S0001	01	01	YYYY
Do / To	S6500	31	12	YYYY

spełniają wymagania następujących dyrektyw:

- **Dyrektywa ciśnieniowa 2014/68/UE (PED)**

Zastosowano procedurę oceny zgodności wyrobu z Dyrektywą 2014/68/UE Załącznik III, pkt. 11 (moduł H), co zostało potwierdzone w certyfikacie zgodności UE nr: 01 2627 PL/H-200002.03 wydanym przez:

TÜV Rheinland Polska Sp. z o.o.,
Jednostka Notyfikowana nr 2627,
ul. Wolności 347,
41-800 Zabrze.

Wykaz zastosowanych norm zharmonizowanych:

PN-EN 378-2:2017-03
PN-EN 14276-1:2020-07
PN-EN 14276-2:2020-07

- **Dyrektywa maszynowa 2006/42/WE (załącznik II, 1.A.) (MD)**

Deklaracja ta odnosi się wyłącznie do maszyny w stanie, w jakim została wprowadzona do obrotu i nie obejmuje części składowych dodanych przez użytkownika końcowego lub przeprowadzonych przez niego późniejszych działań.

Wykaz zastosowanych norm zharmonizowanych:

PN-EN 60335-1:2012
PN-EN 60335-1:2012/AC:2014
PN-EN 60335-1:2012/A11:2014
PN-EN 60335-1:2012/A13:2017
PN-EN 60335-1:2012/A1:2019
PN-EN 60335-1:2012/A14:2020
PN-EN 60335-1:2012/A2:2019

PCCPL.DZ.iC.YY.nn

EU DECLARATION OF CONFORMITY

We hereby declare that the following units

OCU-KRE025M05 OCU-KRE045M05 OCU-KRE070M05

OCU-KRE012L05 OCU-KRE022L05 OCU-KRE030L05

whose serial number is contained in range:

	Numer / Number	Dzień / Day	Miesiąc / Month	Rok / Year
Od / From	S0001	01	01	YYYY
Do / To	S6500	31	12	YYYY

meet the requirements of the following directives:

- **The Pressure Equipment Directive 2014/68/EU (PED)**

The product conformity assessment procedure was applied with Directive 2014/68/EU Annex III, point 11 (module H), which was confirmed in the EU certificate of conformity no .: 01 2627 PL/H-200002.03 issued by:

TÜV Rheinland Polska Sp. z o.o.,
Notified Body No. 2627,
ul. Wolności 347,
41-800 Zabrze.

List of harmonized standards used:

PN-EN 378-2:2017-03
PN-EN 14276-1:2020-07
PN-EN 14276-2:2020-07

- **Machinery Directive 2006/42/EU (Annex II, 1.A.) (MD)**

This declaration relates only to the machine in the state in which it was placed on the market and does not cover it components added by the end user or activities carried out by the end user.

List of harmonized standards used:

PN-EN 60335-1:2012
PN-EN 60335-1:2012/AC:2014
PN-EN 60335-1:2012/A11:2014
PN-EN 60335-1:2012/A13:2017
PN-EN 60335-1:2012/A1:2019
PN-EN 60335-1:2012/A14:2020
PN-EN 60335-1:2012/A2:2019

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NIP: 8971013179; Tel: +48 71 354 56 24

- **Dyrektywa kompatybilności elektromagnetycznej 2014/30/UE (EMC)**

Wykaz zastosowanych norm zharmonizowanych:

PN-EN 61800-3:2019-02

- **Dyrektywa RoHS 2011/65/UE**

Opisany powyżej przedmiot deklaracji jest zgodny z dyrektywą Parlamentu Europejskiego i Rady 2011/65/UE z dnia 8 czerwca 2011 r. w sprawie ograniczenia stosowania niektórych niebezpiecznych substancji w sprzęcie elektrycznym i elektronicznym oraz załącznikiem II zgodnie z Dyrektywą 2015/863 z dnia 31 marca 2015 r.

Wymieniony powyżej przedmiot niniejszej deklaracji jest zgodny z odnośnymi wymaganiami unijnego prawodawstwa harmonizacyjnego.

Niniejsza deklaracja wydana zostaje na wyłączną odpowiedzialność producenta

- **Dyrektywa Ecodesign 2009/125/WE**

Zgodność z powyższą dyrektywą dotyczy jedynie agregatów skraplających.
Deklarujemy iż wyżej wymienione urządzenia spełniają parametry zgodnie z załącznikiem V, pkt. 1 b) rozporządzenia komisji (UE) 2015/1095 z dnia 5 maj 2015r.

Wymieniony powyżej przedmiot niniejszej deklaracji jest zgodny z odnośnymi wymaganiami unijnego prawodawstwa harmonizacyjnego.
Niniejsza deklaracja wydana zostaje na wyłączną odpowiedzialność producenta

Osoba upoważniona do przygotowania dokumentacji technicznej oraz jej przechowywania:
Name & Surname, Kierownik Działu Konstrukcji. Ul. Relaksowa 27, 55-080 Nowa Wieś Wrocławska

- **Electromagnetic Compatibility Directive 2014/30/EU (EMC)**

List of harmonized standards used:

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- **2011/65/EU RoHS Directive**

The subject of the declaration described above complies with Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment and with Annex II in accordance with Directive 2015/863 of 31 March 2015 r.

The object of this declaration mentioned above is in conformity with the relevant requirements of the Union harmonization legislation.

This declaration is issued under the sole responsibility of the manufacturer

- **Ecodesign Directive 2009/125/WE**

Compliance with the above directive applies only to condensing units.
We declare that the above-mentioned devices meet the parameters in accordance with Annex V, point 1 b) Commission Regulation (EU) 2015/1095 of May 5, 2015.

The object of this declaration mentioned above is in conformity with the relevant requirements of the Union harmonization legislation.
This declaration is issued under the sole responsibility of the manufacturer.

The person who has created and hold the technical dossier:
Name & Surname, R&D Manager. Ul. Relaksowa 27, 55-080 Nowa Wieś Wrocławska

Name & surname
R&D Manager

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22. The commissioning report

PROTOCOL OF UNIT START UP				
SERIAL NUMBER	**UNIT TYPE**	**DATE OF START UP**	**REFRIGERANT**	**QUANTITY [KG]**

Parameter	Unit of measurement	Value
Voltage reading of phase L1- L2 of unit power supply	V	
Voltage reading of phase L2- L3 of unit power supply	V	
Voltage reading of phase L3- L1 of unit power supply	V	
Voltage reading of phase L1- N of unit power supply	V	
Voltage reading of phase L2- N of unit power supply	V	
Voltage reading of phase L3- N of unit power supply	V	
Reading of compressor amperage from inverter (InU / CUrr)in stable working conditions	A	
Reading of fan amperage	A	
Reading of output voltage from inverter (InU / UOLt)	V	
Evaporation pressure in stable working conditions(steady load)/quantity of working units	bar	
Superheating on evaporator	°C	
Quantity of registered(weighed) refrigerant	kg	
Quantity of Cooling units/ evaporators	Pcs.	
Maximal Cooling load	kW	
Minimal Cooling load	kW	
Pressure of condensing measured with manometers	bar	
Suction temperature -measured	°C	
F-Gas certification	NUMBER	

Name of person performing start up	Date	Signature
Name of company installing the units		
Facility address		

COPY OF THIS START-UP PROTOCOL SHOULD BE DELIVERED TO THE MANUFACTURER WITHIN 5 WORKING DAYS

Panasonic®

Address

Panasonic Cold Chain Poland sp z o.o

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55-080 Nowa Wieś Wrocławska

Poland

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