Panasonic®

iCOOL

Outdoor Condensing Units
Original manual

Model No.

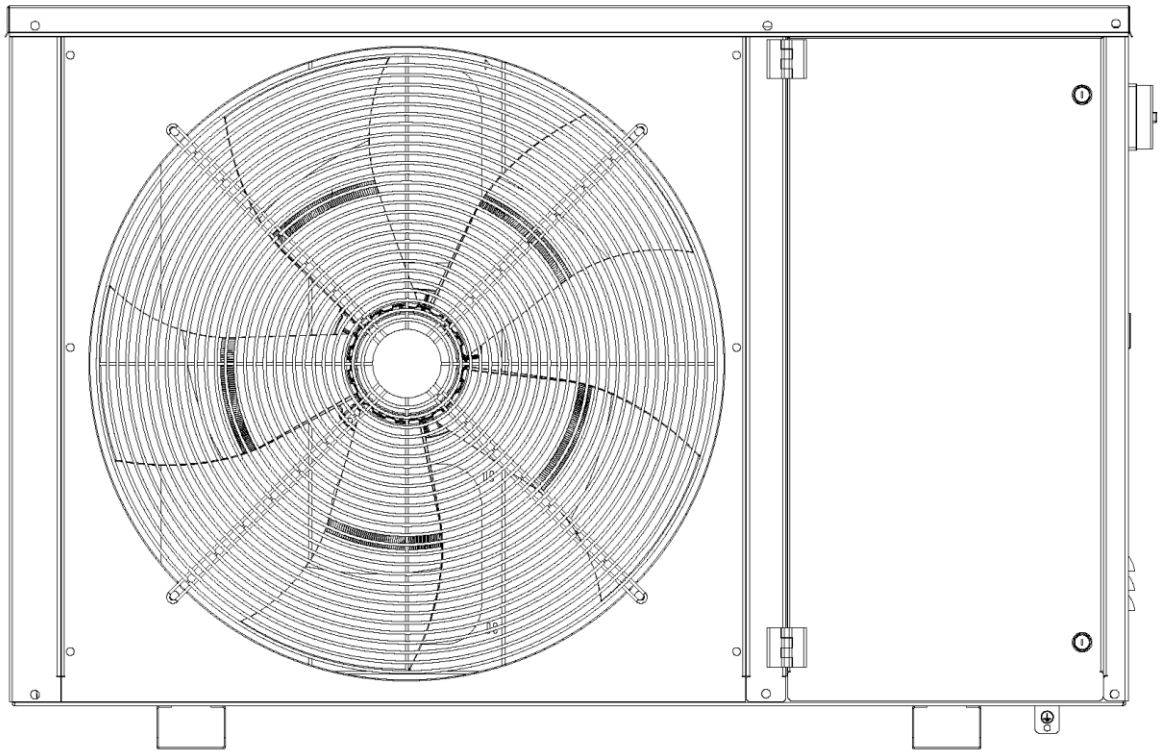
OCU-KRC035L08

OCU-KRC050L08

OCU-KRC045M08

OCU-KRC070M08

OCU-KRC100M08



Original manual OCU-KR R01
04.08 Rev.01-EN

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1. General Information

- Refrigeration OCU (Outdoor 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/HFO refrigerants. Refrigerants allowed for specific units are listed 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.
- Condensing units constitute only a part of the refrigeration system and must be used only with its other components.
- The evaporator, expansion valve and other components must be selected accordingly 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-KRC035L08	OCU-KRC050L08	OCU-KRC045M08	OCU-KRC070M08	OCU-KRC100M08
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

Improper handling can cause electric shocks.

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.

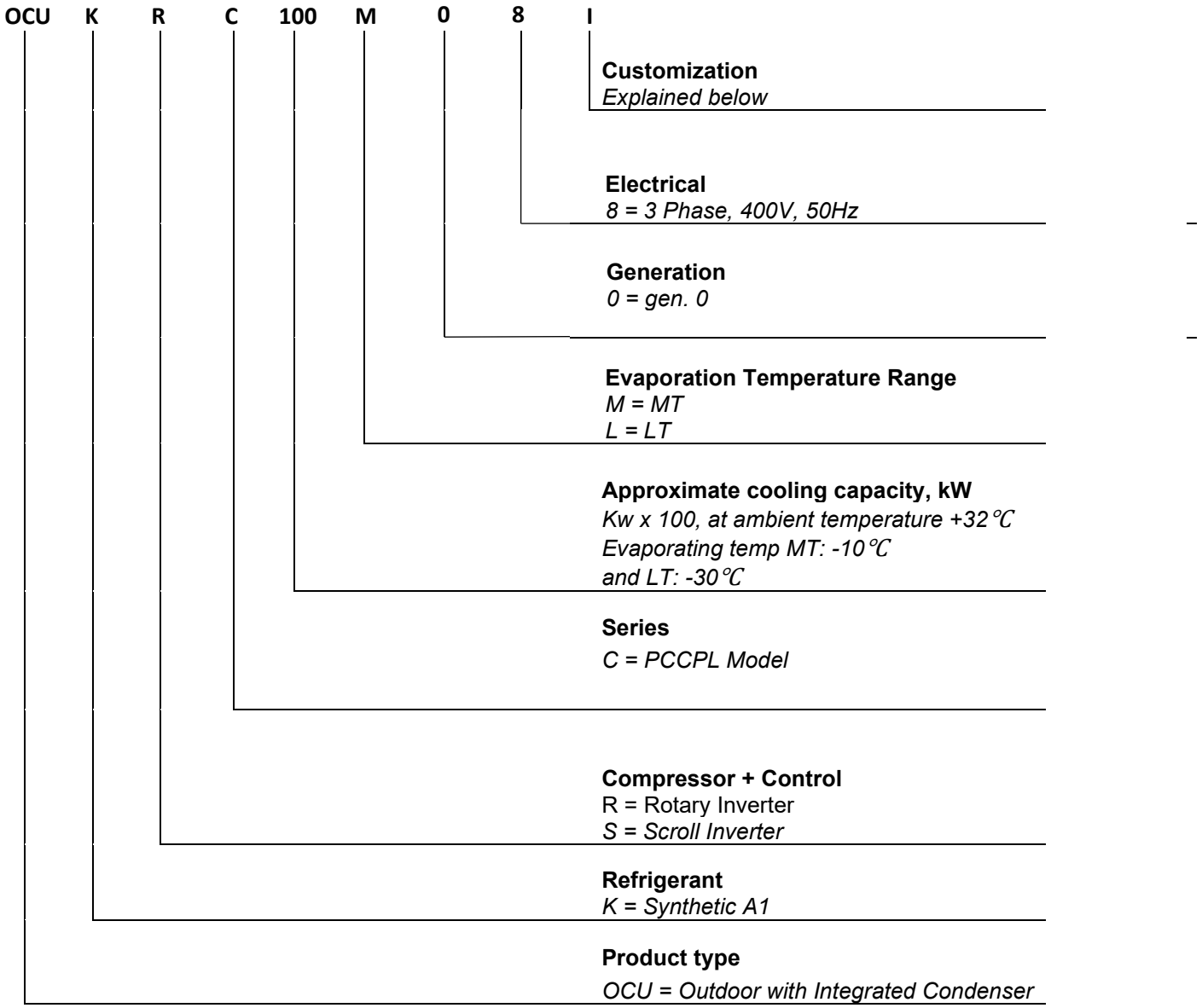
The installation is filled with refrigerant and oil which in specific conditions, for example, brazing or soldering, can cause fire, explosion or serious injuries and burns.

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 (Outdoor Condensing Units). 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



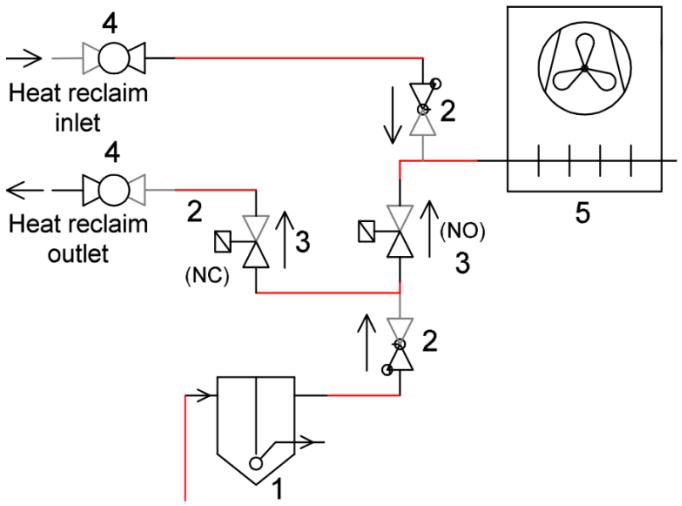
Decoding by example: OCU-KRC100M08-C

Outdoor Condensing Unit on synthetic group A1 refrigerant. Including inverter-controlled rotary compressor. PCCPL series with cooling capacity of 10 kW. Operating on medium evaporation temperature by range with generation named 0. Unit powered by 3 phase, 400V and 50Hz. Unit is equipped with anticorrosion coating on the condenser.

Customization explained

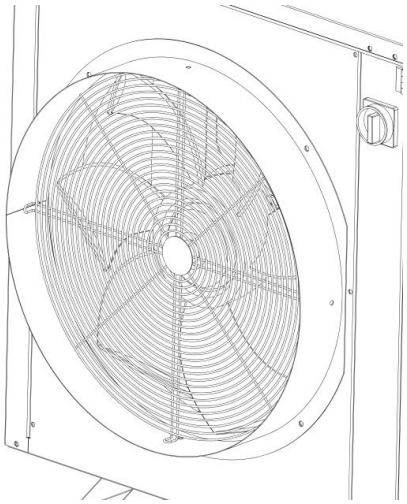
- C – Condenser anticorrosion coating
  Heat exchanger is covered with dedicated protective layer, which effectively protects it from the harmful effects of moisture, salt spray and industrial pollution. This solution significantly extends the life of the condenser and improves the reliability of the unit's operation in aggressive environments. This type of protection is particularly recommended for installations in coastal area, chemical industries and in areas with high air pollution. The coating does not affect the performance of the unit, and reduces risk of leakage.

- D – Superheat recovery
  Additional pipe routing enabling waste heat recovery. By using additional solenoid valves, high-temperature compressed refrigerant can be redirected and used in external heating process enabling significant energy savings. With no demand for heat refrigerant is processed in standard air-cooled condenser.



Components	
No.	Name
1	Oil separator
2	Check valve
3	Solenoid valve
4	Ball valve
5	Condenser with fan

- P – High pressure fan
  OCU is equipped with a 462mm or 640mm duct sleeve and dedicated fan suitable for operation with increased static pressure drop. This makes possible to efficiently exhaust condenser cooling air in ventilation ducts. The solution ensures stable operation of the refrigeration system, dissipation of condensing heat and greater flexibility of the unit's installation place, such as in halls, machine rooms or technical containers.



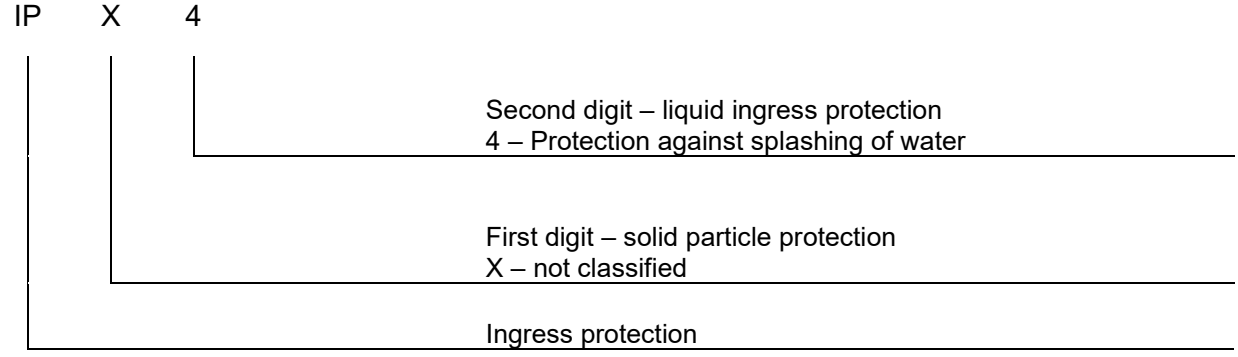
4. Units specification

4.1 Components

- High efficient BLDC rotary compressor (Avic) with crankcase heater
- air-cooled condenser
- EC fans with speed regulation
- suction accumulator on suction line
- shut-off valve on suction line
- insulation on suction pipeline
- oil separator and check valve for each compressor
- liquid receiver
- safety valve
- liquid line: filter drier, sight glass with moisture indicator, shut-off valve
- service valves
- HP Pressure switch with auto reset – compressor protection
- LP Pressure switch with auto reset – compressor protection
- inverter – control of compressor's performance,
- soundproof housing
- controller with dedicated software
- suction and discharge pressure sensor
- fully equipped electrical board
- liquid injection cooling in LT series

4.2 Ingress protection rating IP

Complete unit: IP X4



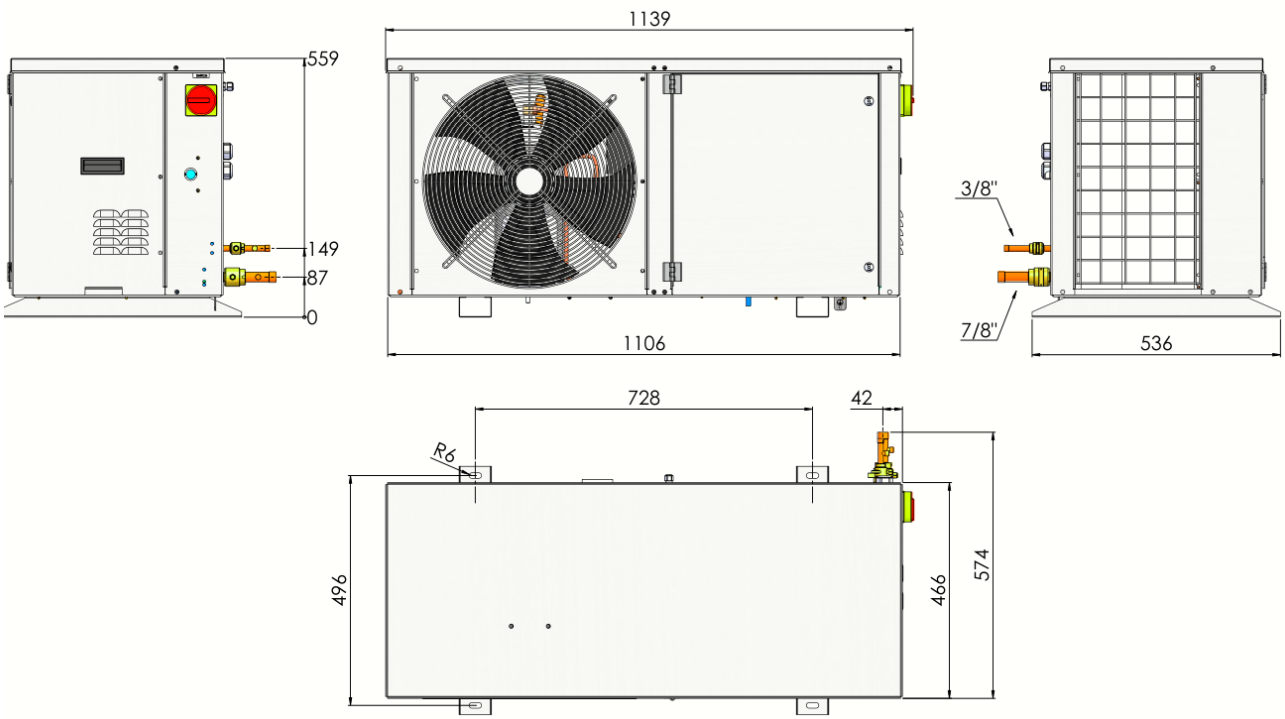
5. Technical data

Model		Unit	OCU-KRC035L08	OCU-KRC050L08	OCU-KRC045M08	OCU-KRC070M08	OCU-KRC100M08
Compressor			Single compressor	Single compressor	Single compressor	Single compressor	Single compressor
Compatible refrigerants			R448A, R449A	R448A, R449A	R448A, R449A, R134a, R513A	R448A, R449A, R134a, R513A	R448A, R449A, R134a, R513A
PED category			I	II	I	II	II
Application		MT or LT	LT	LT	MT	MT	MT
SEPR cooling at ET —10 °C AT 32 °C			—	—	3,28	3,6	4,29
SEPR freezing at ET —35 °C AT 32 °C			1,76	1,83	—	—	—
Annual electricity consumption at ET —10 °C AT 32 °C		kWh/a	—	—	9 070	12 324	13347
Annual electricity consumption at ET —35 °C AT 32 °C		kWh/a	10 630	18 315	—	—	—
Nominal operating current at ET -10 °C MT / -30 °C LT AT 32 °C and 230 - 400 V 50 Hz		A	5,9	10,1	5	6,9	7,2
Maximum operating current (in the most loaded phase at 230 - 400 V 50 Hz)		A	7,9	12,8	7,2	10,1	9,8
Maximum power consumption		kW	4,1	7,2	3,7	5,6	5,4
Dimensions	W x H x D	mm	1 105 x 559 x 466	1 289 x 758 x 439	1 106 x 559 x 461	1 140 x 758 x 439	1 280 x 963 x 439
Weight		kg	96	132	94	110	140
Sound level at 10 m*		dB(A)	39	44	39	40	41
Condenser	Fans x diameter	mm	1x450	1x630	1x450	1x630	1x630
	Air flow	m³/h	3 850	6 150	3 850	6 150	6 150
	Fan static pressure	Pa	N/A	N/A	N/A	N/A	N/A
	Fan power supply	V / ph / Hz	200 - 277 / 1 / 50	200 - 277 / 1 / 50	200 - 277 / 1 / 50	200 - 277 / 1 / 50	200 - 277 / 1 / 50
	Fan power consumption	W	170	220	170	220	220
	Nominal fan amperage	A	1,4	1,2	1,4	1,2	1,2
Compressor	Model		C-7RZ320L4ABL	C-9RZ580L4AAL	C-7RVN113L0A	C-7RZ320L4ABL	C-8RZ420L4AAL
	Volumetric flow	m³ / h	1,7 - 10,4	5,2 - 18,7	1,25 - 7,5	1,7 - 10,4	3,0-13,6
	Rotation range	rps	15 - 90	25 - 90	15 - 90	15 - 90	20-90
	Current – Full load amperage	A	6,4	10	5,8	8,7	8,8
	Current – Peak current limit / Locked rotor amperage	A	19,2 / —	28,4 / —	17,8 / —	19,2 / —	31,9 / -
	Oil type		FV68S (PVE)	FV68S (PVE)	FV68S (PVE)	FV68S (PVE)	FV68S (PVE)
	Crankcase heater power consumption	W	35	35	35	40	35
Oil charge		dm³	0,7 + 0,4	2,1 + 0,4	0,7 + 0,4	0,7 + 0,4	1,35 + 0,4
Connections	Suction	Inch	7/8	7/8	5/8	3/4	7/8
	Liquid	Inch	3/8	3/8	3/8	3/8	1/2
Liquid receiver		dm³	3,9	7,1	3,9	7,1	10
CU power supply	Voltage	V / Hz	3x400 / 50 PE+N (TN-S)	3x400 / 50 PE+N (TN-S)	3x400 / 50 PE+N (TN-S)	3x400 / 50 PE+N (TN-S)	3x400 / 50 PE+N (TN-S)
	Recommended minimum cable cross-section	mm²	5x2,5	5x2,5	5x2,5	5x2,5	5x2,5
	Recommended minimum protection		C16	C20	C16	C16	C20
Maximum recommended pipe distance		m	40	40	40	40	40
Maximum height distance	Evaporator above	m	12	12	12	12	12
	Evaporator below	m	12	12	12	12	12
Which pipes needs to be insulated	Suction / liquid / both		Suction	Suction	Suction	Suction	Suction
Recommended insulation thickness		mm	19	19	13	13	13
Maximum quantity of evaporators connected		Qty.	5	5	5	5	7
Evaporation temperature	Min ~ Max	°C	-35 ~ -15	-35 ~ -15	-15 ~ 5	-15 ~ 5	-15 ~ 10
Ambient temperature	Min ~ Max	°C	-20 ~ 43	-20 ~ 43	-20 ~ 43	-20 ~ 43	-20 ~ 43

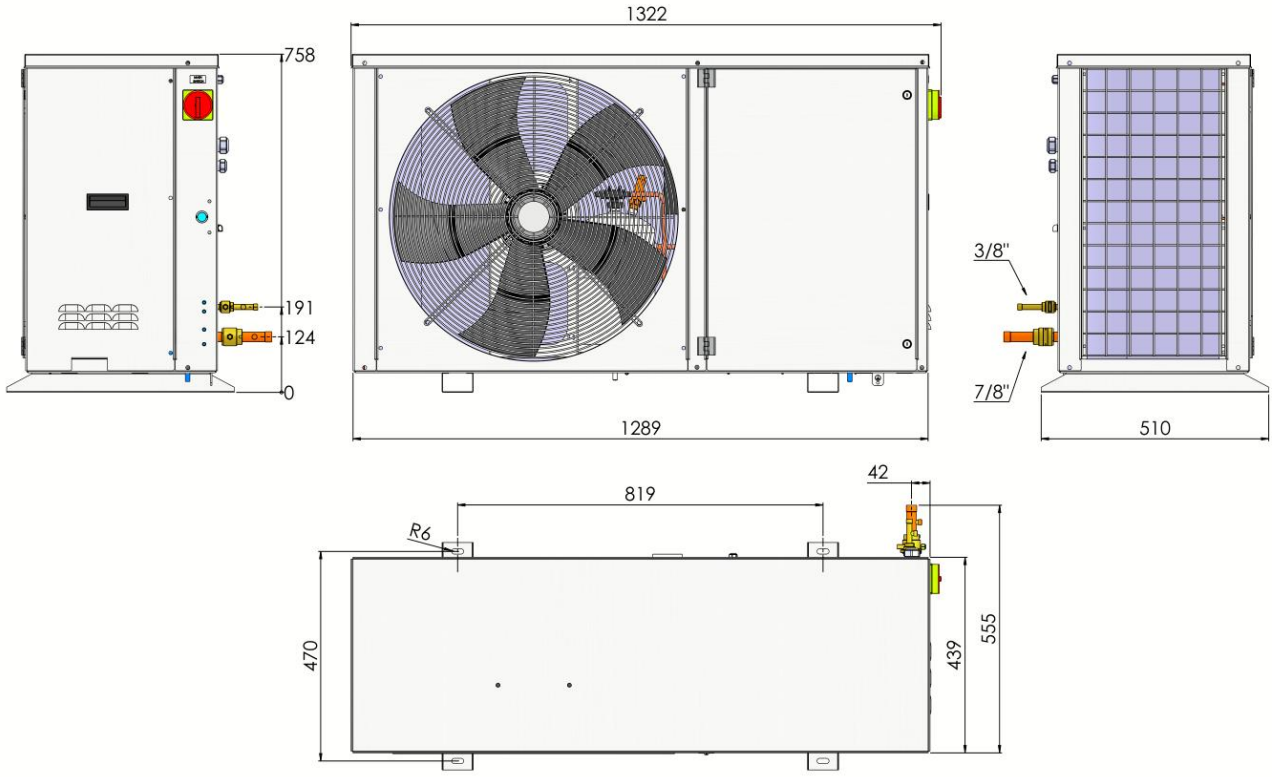
**Sound level is calculated for a condensing unit working with compressor full load and at an ambient temperature 32°C. The sound level may change in a real installation due to surrounding conditions.*

6. Units drawings

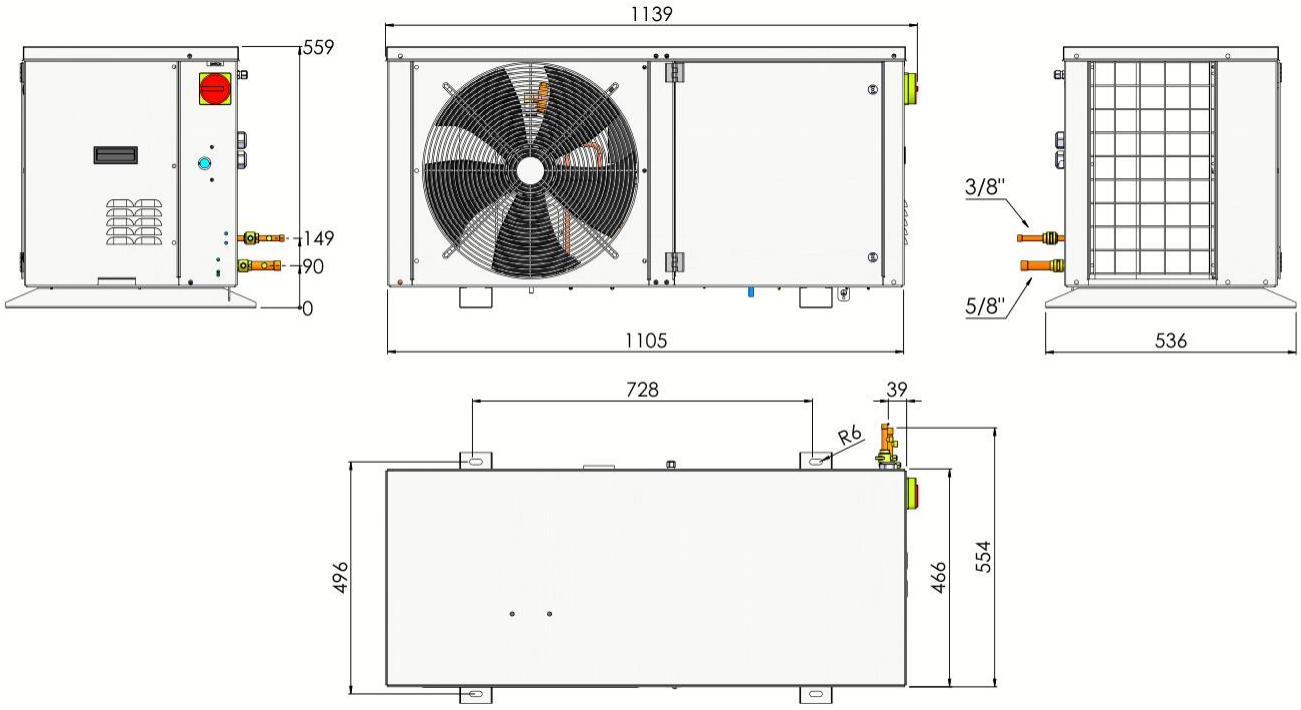
6.1 OCU-KRC035L08



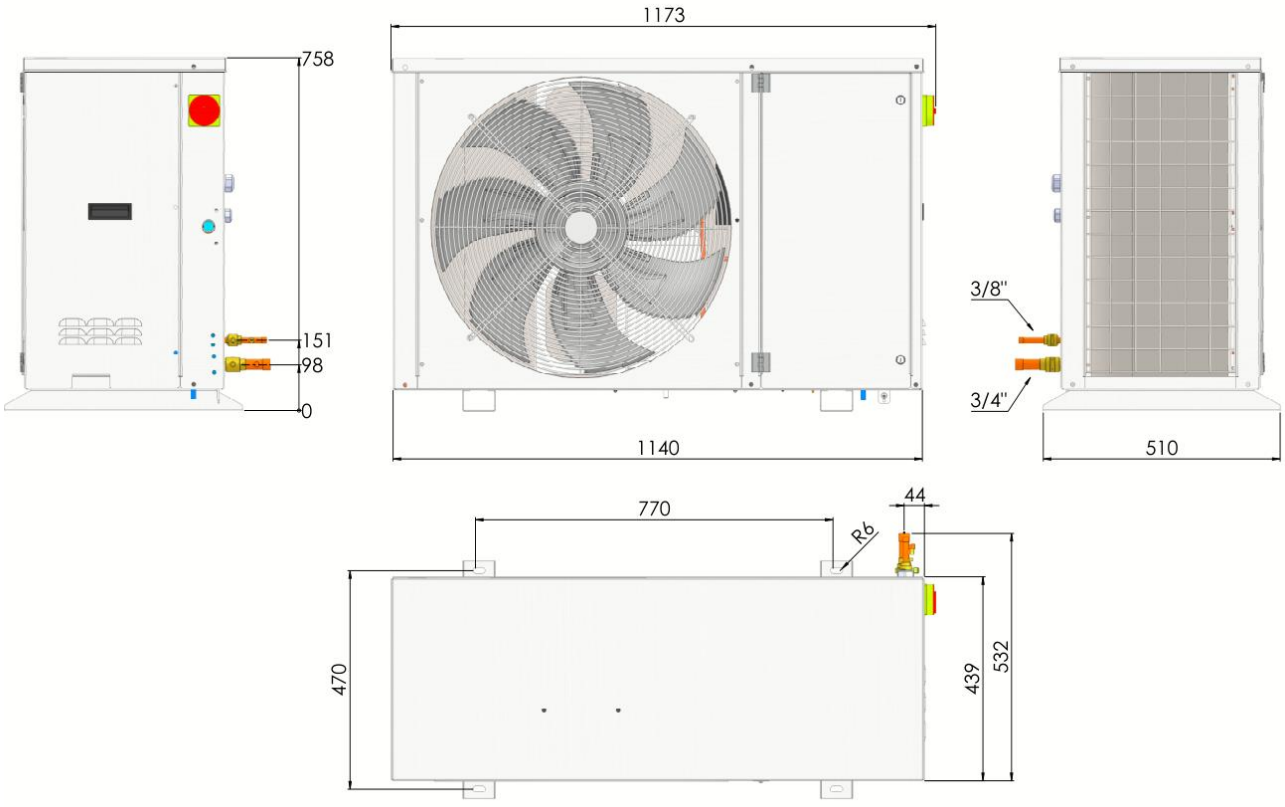
6.2 OCU-KRC050L08



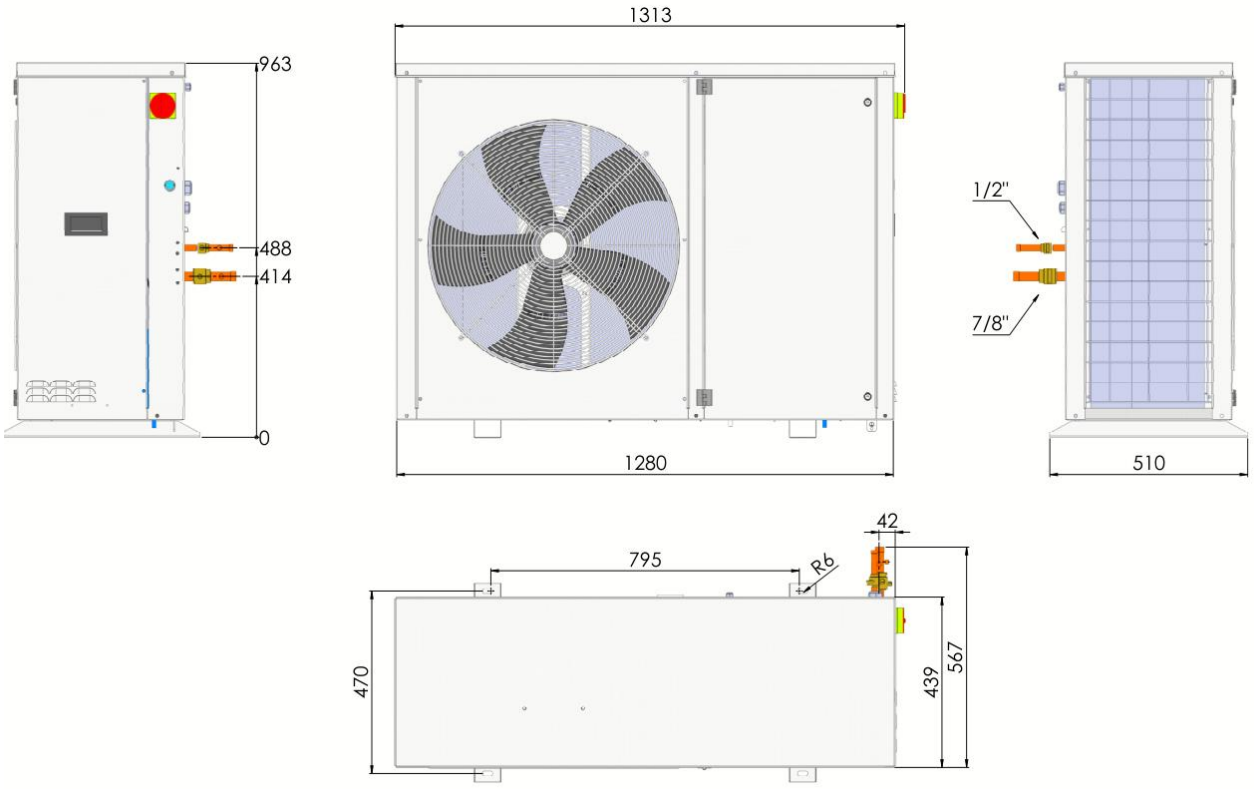
6.3 OCU-KRC045M08



6.4 OCU-KRC070M08

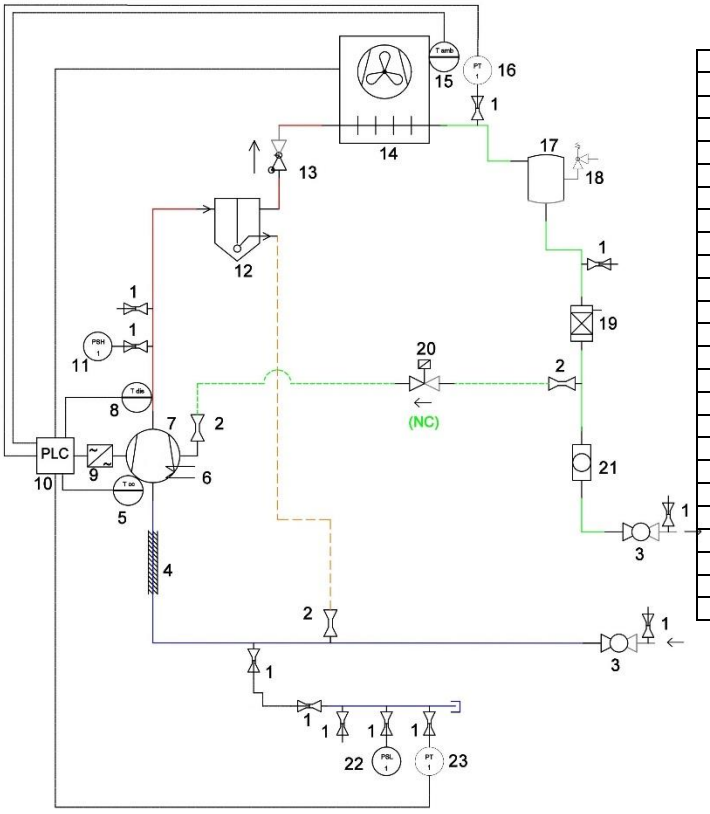


6.5 OCU-KRC100M08



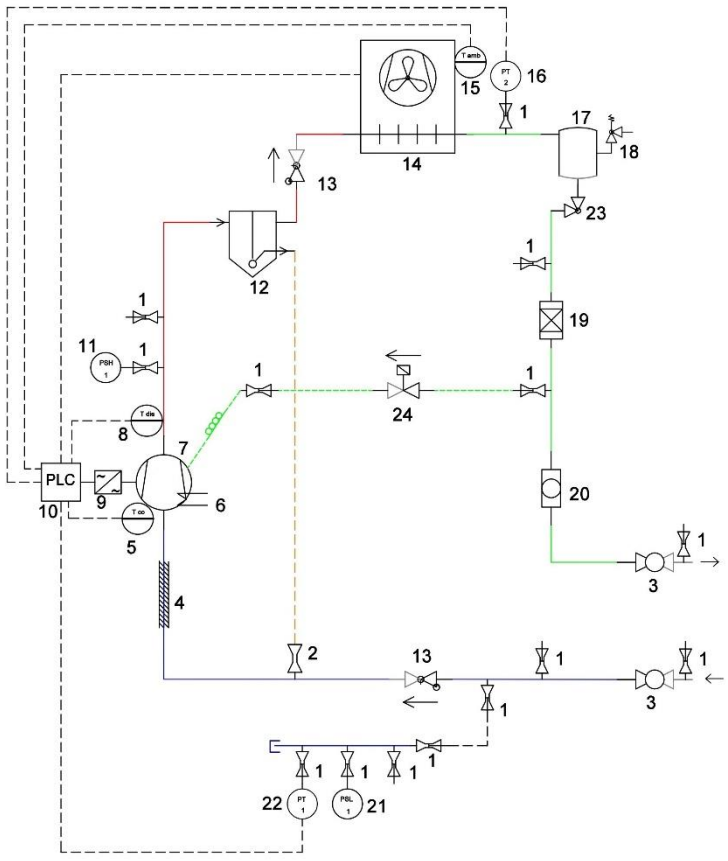
7. Schematic diagrams

7.1 OCU-KRC035L08



Components	
No.	Name
1	Schraeder valve
2	SAE fitting
3	Ball valve
4	Suction line insulation
5	Crankcase temperature sensor
6	Crankcase heater
7	Compressor
8	Discharge temperature sensor
9	Inverter
10	PLC Controller
11	HP Pressure Switch
12	Oil separator
13	Check valve
14	Condenser
15	Ambient temperature sensor
16	High pressure sensor
17	Receiver
18	Safety valve
19	Filter drier
20	NC solenoid valve
21	Sight glass
22	LP pressure switch
23	LP pressure transducer

7.2 OCU-KRC050L08



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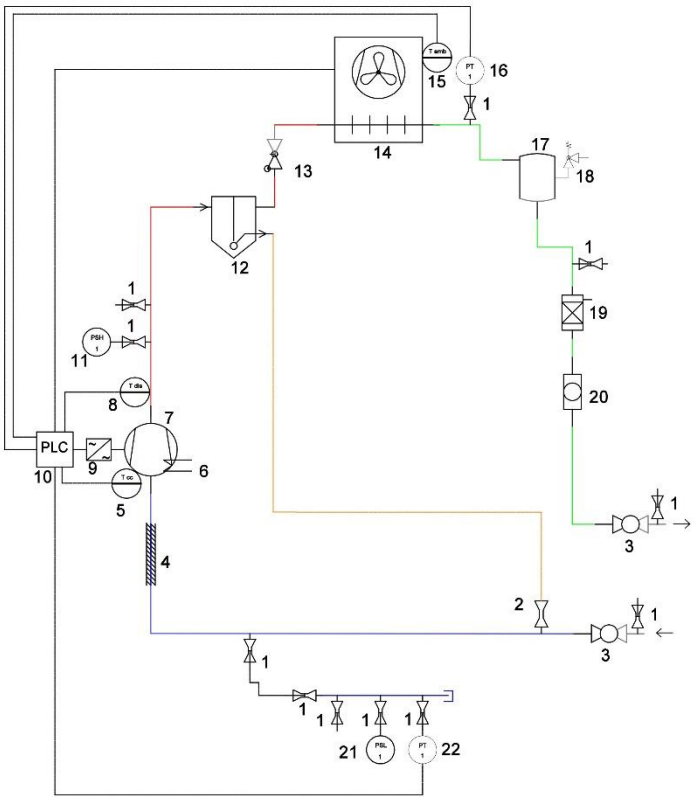
14	Condenser
15	Ambient temperature sensor
16	High pressure sensor
17	Receiver
18	Safety valve
19	Filter drier
20	Sight glass
21	LP pressure switch
22	LP pressure transducer
23	Rotalock valve
24	Solenoid valve

7.3 OCU-KRC045M08



Components	
No.	Name
1	Schraeder valve
2	SAE fitting
3	Ball valve
4	Suction line insulation
5	Crankcase temperature sensor
6	Crankcase heater
7	Compressor
8	Discharge temperature sensor
9	Inverter
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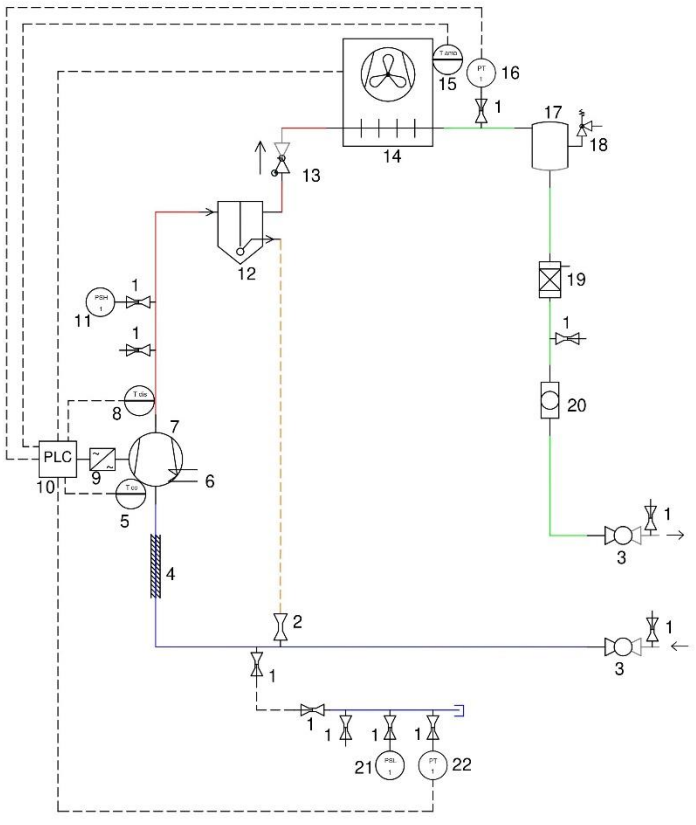
11	HP Pressure Switch
12	Oil separator
13	Check valve
14	Condenser
15	Ambient temperature sensor
16	High pressure sensor
17	Receiver
18	Safety valve
19	Filter drier
20	Sight glass
21	LP pressure switch
22	LP pressure transducer

7.4 OCU-KRC070M08



Components	
No.	Name
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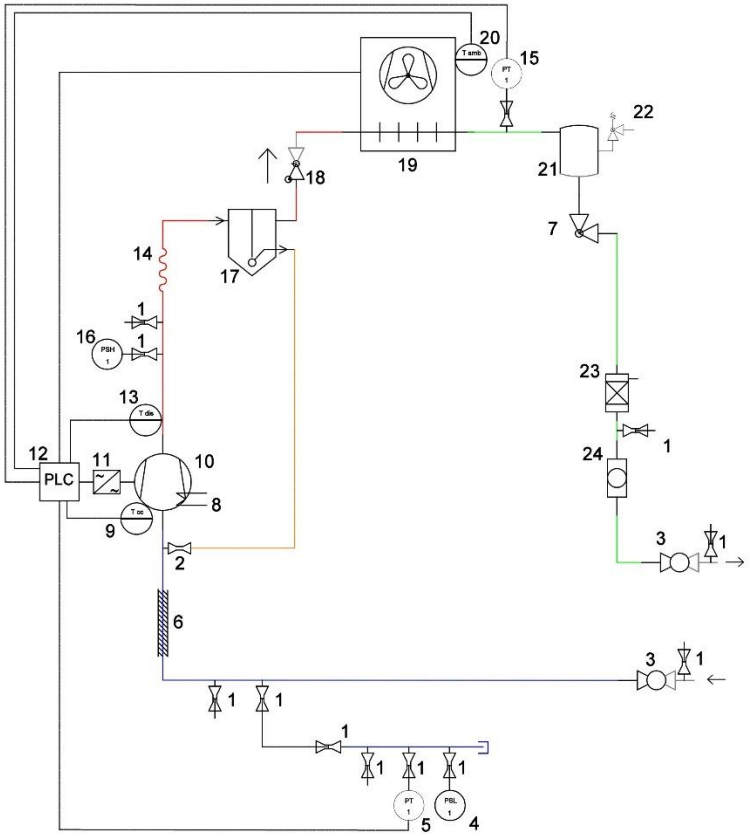
14	Condenser
15	Ambient temperature sensor
16	High pressure sensor
17	Receiver
18	Safety valve
19	Filter drier
20	Sight glass
21	LP pressure switch
22	LP pressure transducer

7.5 OCU-KRC100M08



Components	
No.	Name
1	Schraeder valve
2	SAE fitting
3	Ball valve
4	LP Pressure switch
5	LP pressure transducer
6	Suction line insulation
7	Rotalock valve
8	Crankcase heater
9	Crankcase temperature sensor
10	Compressor
11	Inverter
12	PLC controller
13	Discharge temperature sensor
14	Vibration absorber
15	HP pressure transducer
16	High pressure switch
17	Oil separator
18	Check valve
19	Condenser
20	Ambient temperature sensor
21	Receiver
22	Safety valve
23	Filter drier
24	Sight glass

8. Transportation 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°C and +55°C 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.

9. Verification of the technical condition

Upon receiving the unit check:

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

10. Installation

10.1 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.

10.2 Location and mounting of the unit

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

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.

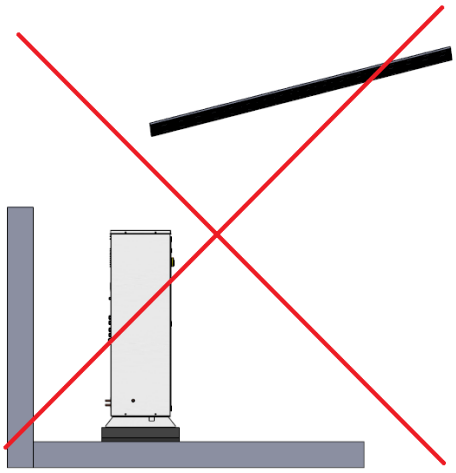
The unit should be placed away from heat sources.

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

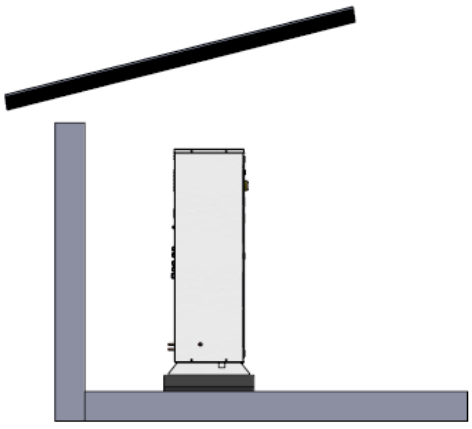
The unit should not be installed in places where the prevailing wind direction is opposite to the outlet air direction. In case of exposure to such wind, it is recommended to use a partition.

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



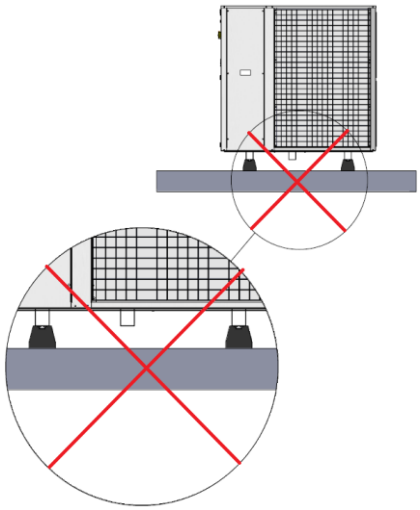
The roof protects the unit against the accumulation of snowdrifts

Unit foundation and support

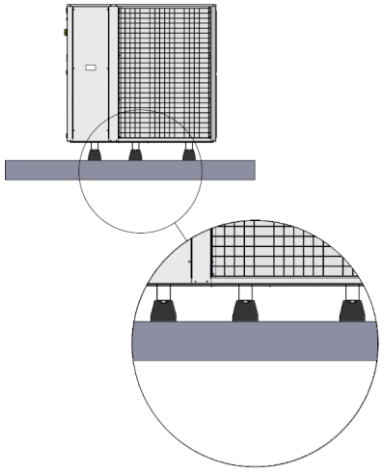
The load-bearing capacity of the ground need to be higher than the condensing unit weight

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.

Supporting the unit on each foot is required, especially if there are three or more feet.

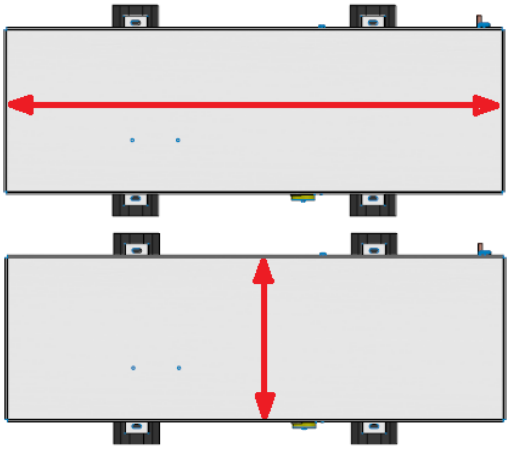


Lack of support for the unit on any foot may result in damage of the unit and loss of refrigerant

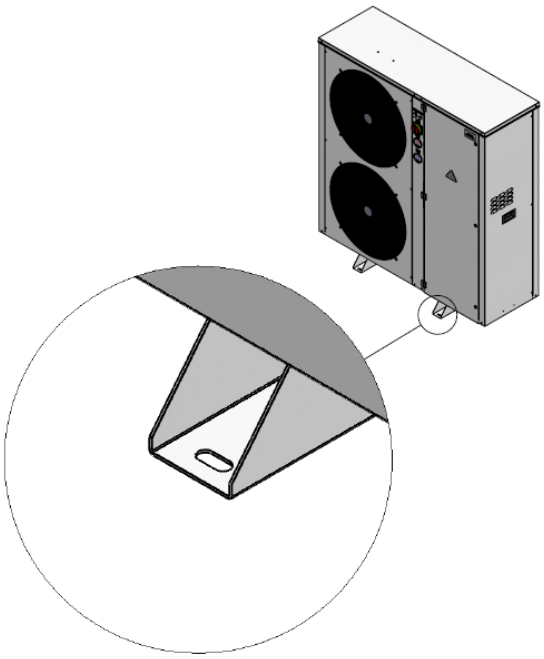


Supporting the unit on each foot provides stability

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



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

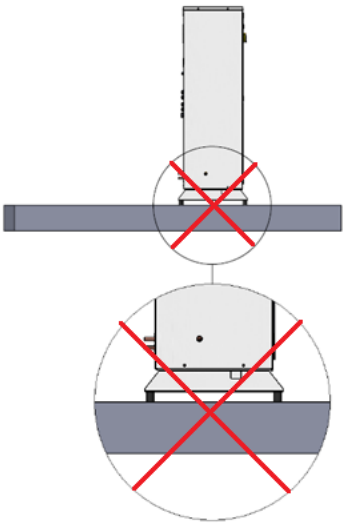


Stiffness of foundation for unit should be verified manually before and after commissioning of the unit.

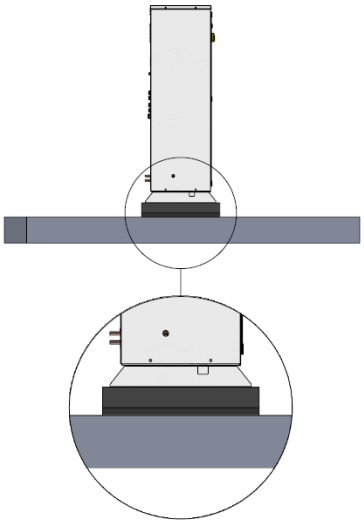
It is required to use vibration isolators with sufficient load-bearing capacity for the weight of the unit.

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

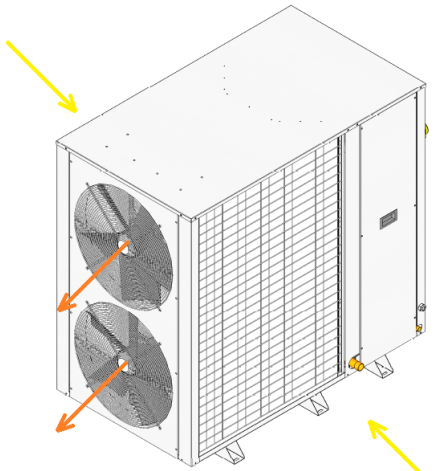


Supporting the unit on full surface of the foot provides stability

Unit position with walls and other units

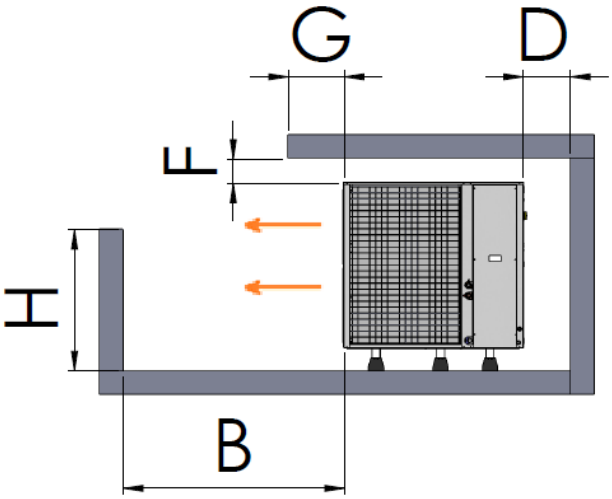
For a correct operation of a unit following requirements regarding distance to the wall need to be fulfilled.

Units with two condensers

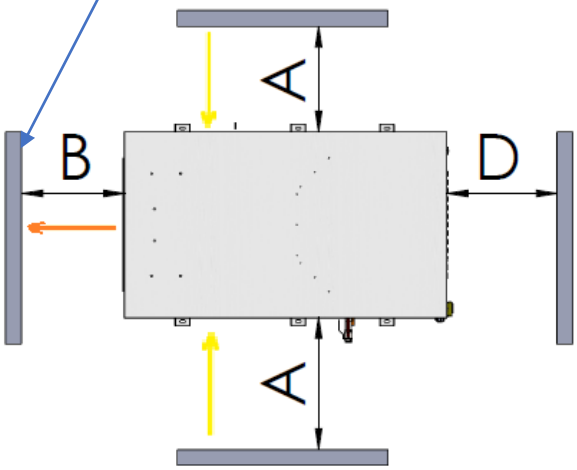


Four-way construction is only allowed if there is a sufficient air low, e.g. additional ventilation or a perforated partition.

From the side

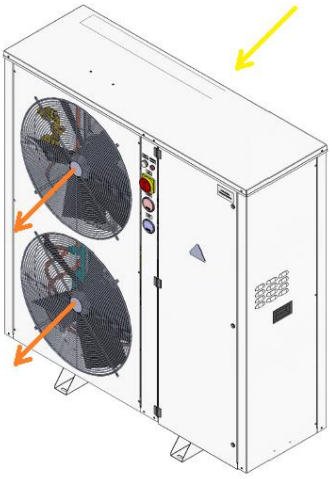


From the top



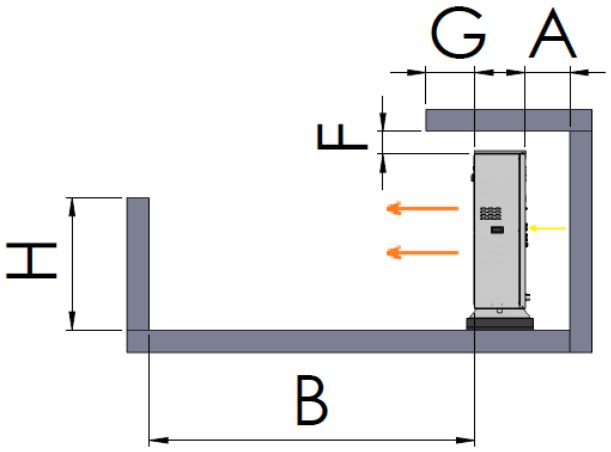
Dimension	Value
A	Min. 400 mm
B	Min. 800 mm, but not less than the height of the unit * For a unit with vertical discharge fan: B = Min. 400 mm
D	Min. 800 mm
F	Min. 400 mm * For a unit with vertical discharge fan: F = Min. 800 mm, but not less than the height of the unit
G	Max. 800 mm
H	Max. 1200 mm
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.	

Units with one condenser

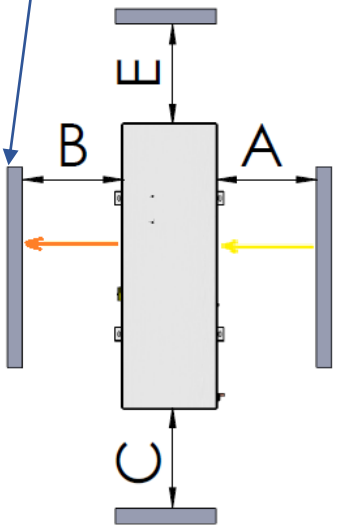


Four-way construction is only allowed if there is a sufficient air flow, e.g. additional ventilation or perforated partition.

From the side

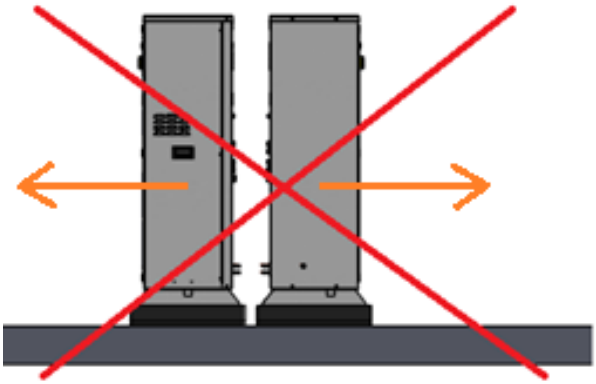


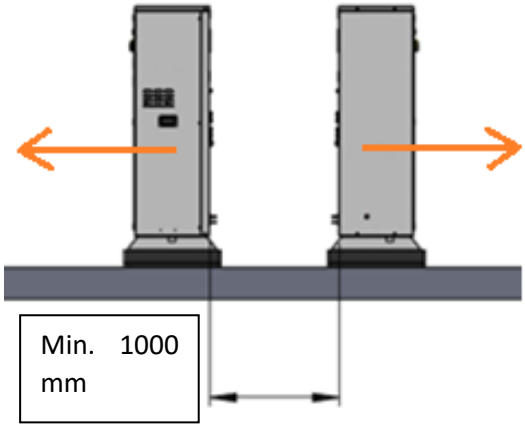
From the top



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.

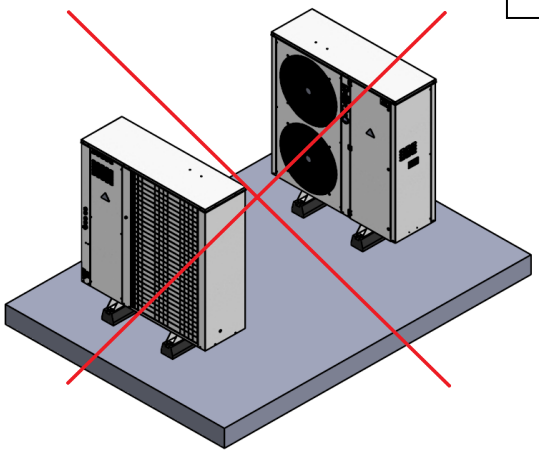


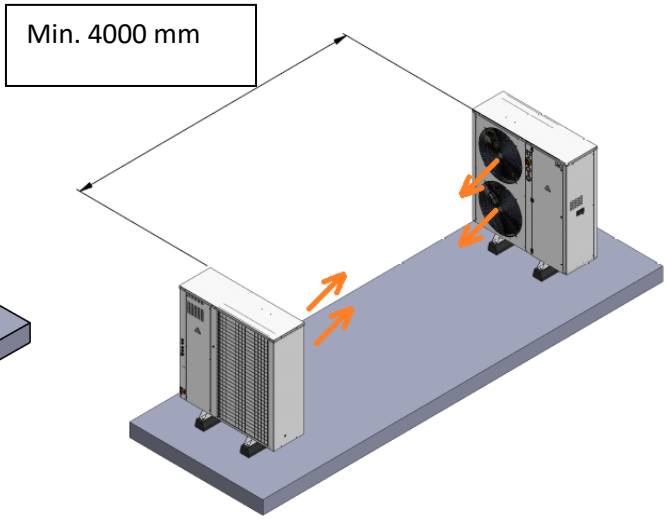


Too short distance between the condensers may result in increase of condensing temperature and shortened lifetime of the unit

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.

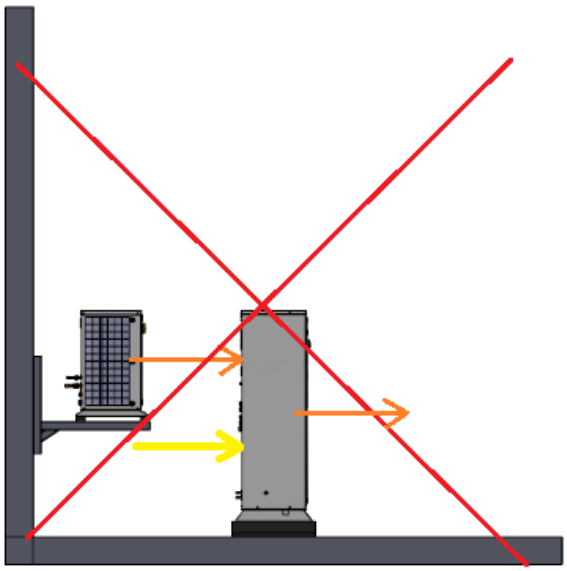




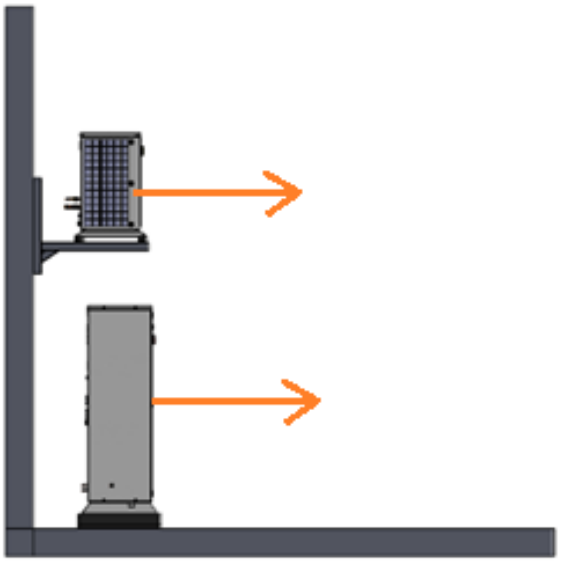
Placing outlet air streams in front of each other may cause improper operation of the unit

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

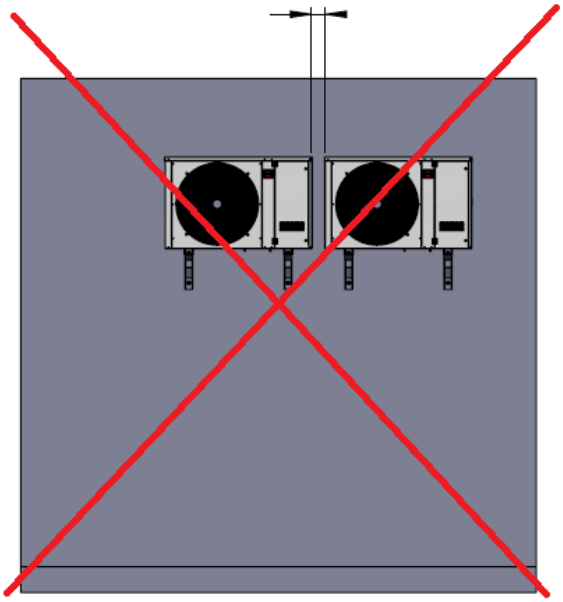


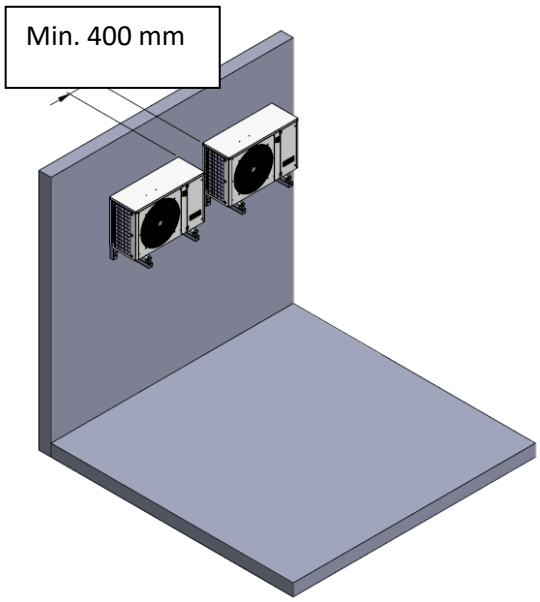
Mixing inlet air stream of unit with outlet air stream of another unit may cause improper operation of units

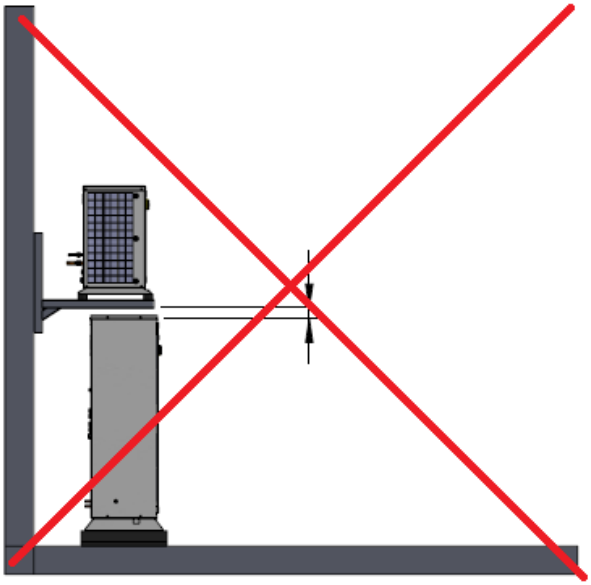


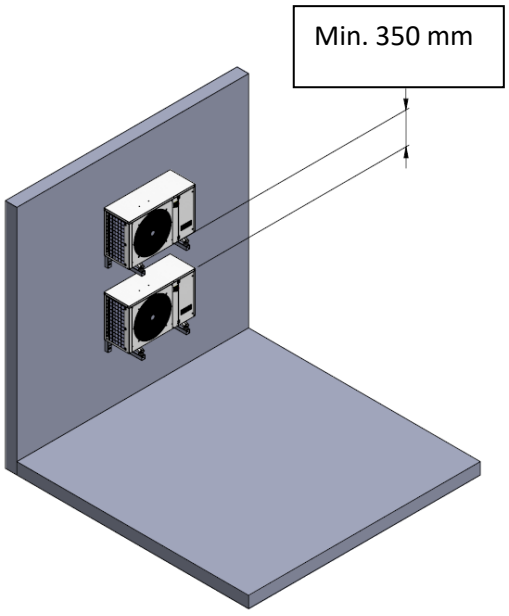
Placing the units with maintained spacing will not cause mixing of inlet and outlet air streams

Provide minimum distances from other units.





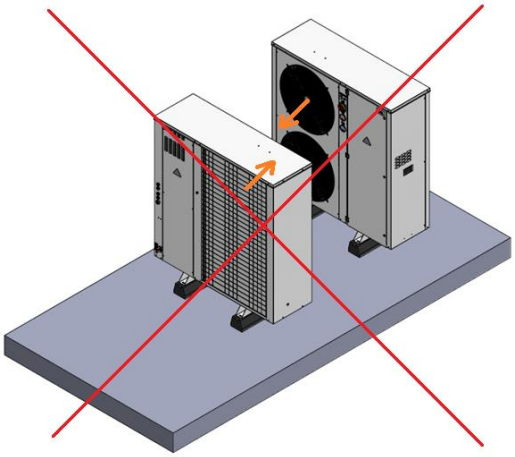




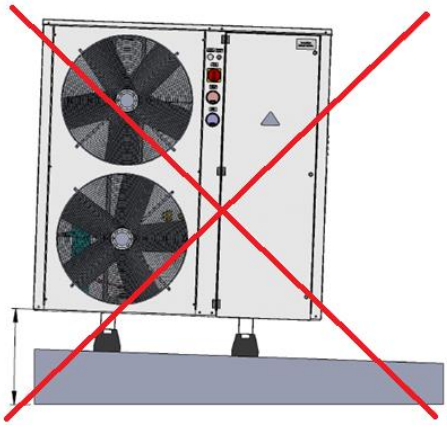
Too short distance between units may cause improper operation of the units and makes service activities harder to perform.

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

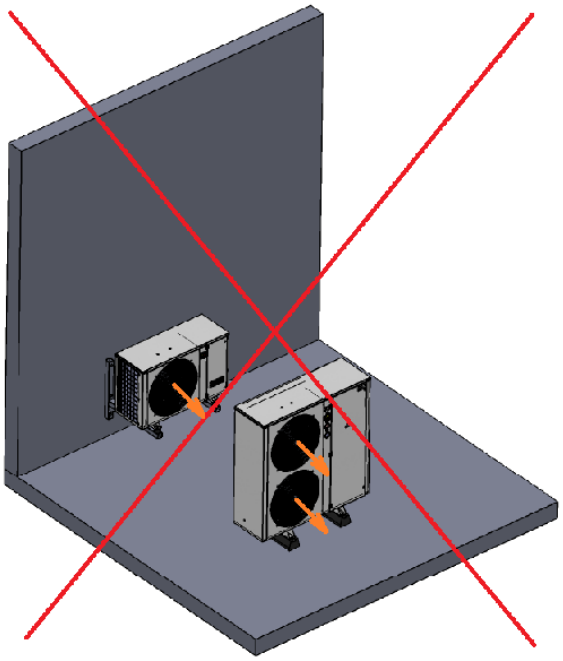
Examples of incorrect placement of the unit:

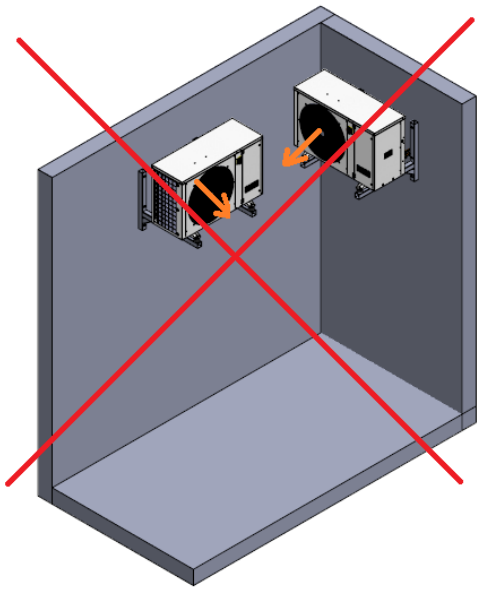


. Placing the units in a way that causes outlet air streams to face each other without maintaining minimum required distance

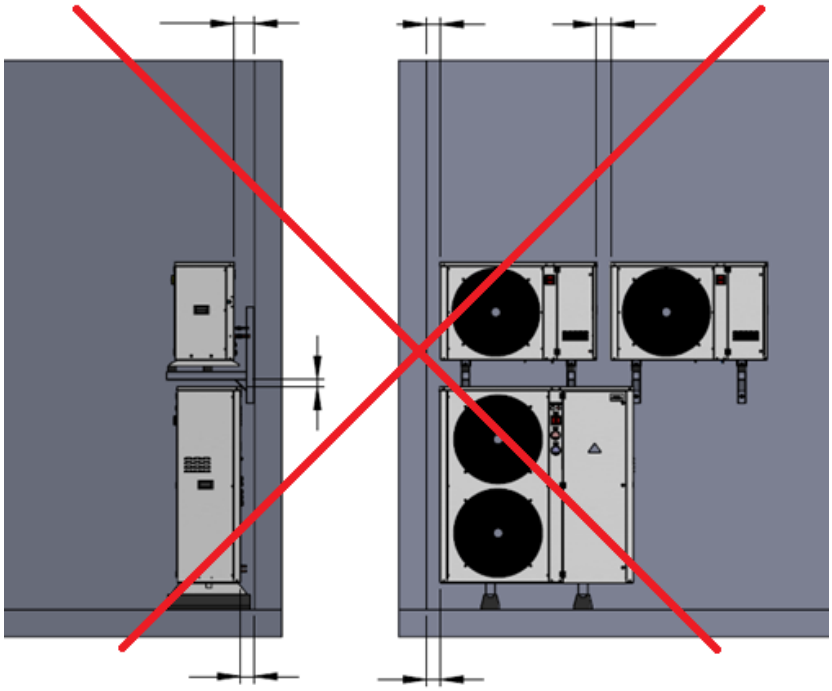


Incorrect leveling of the unit



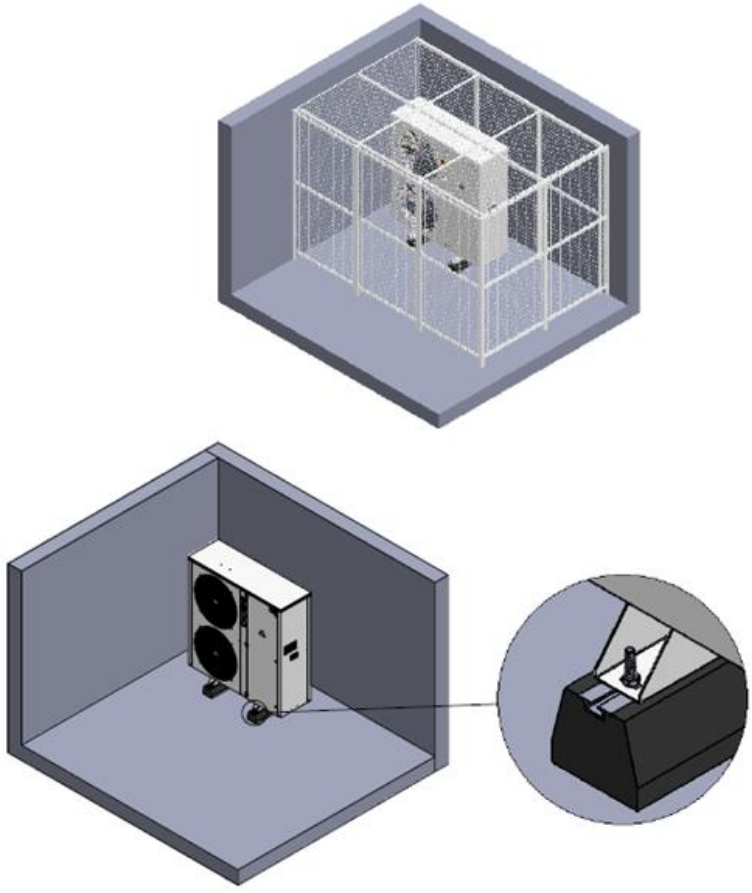


Placing the units in a way that causes one unit to suck outlet air stream from another unit

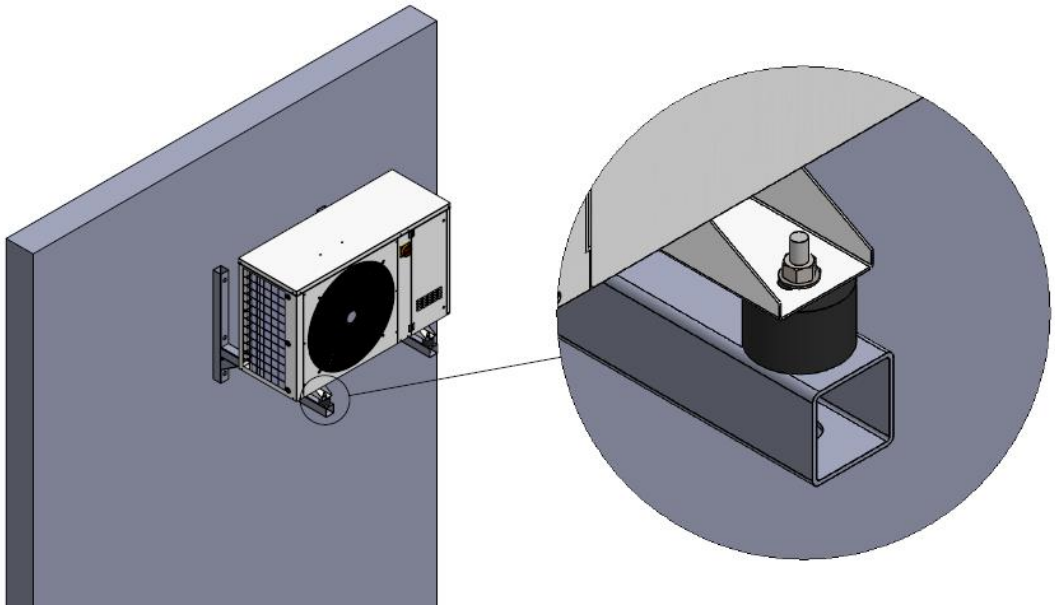


Too short distances from partitions or other units

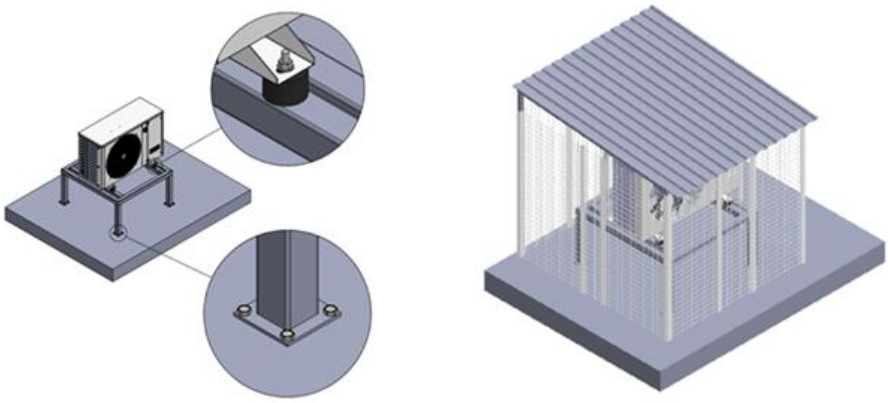
Examples of correct placement of the unit:



Placement on foundation with use of rubber support feet

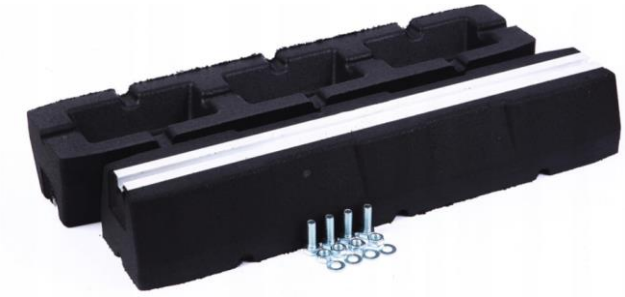


Placement on steel bracket with use of vibration isolators



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.

10.3 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 valve service connections both at the suction and the liquid side.

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 the suction line and in justified cases liquid line

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

- for LP condensing units it is necessary to use expansion valve with MOP function.

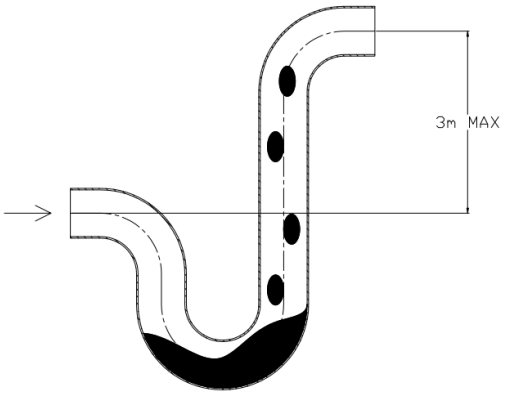
Refrigeration system containing F-gases should be marked accordingly.

Installation evaporation settings notes

To take full advantages 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 unit + 1 evaporator) systems.

Oil traps

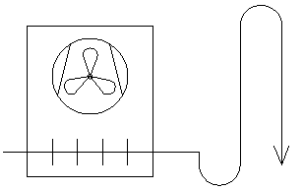
To enable an oil return with a refrigerant on a suction line, P-shaped oil traps should be done, which make oil transport possible. These traps should be made before each vertical suction line section with an upstream flow and at the evaporator outside after the temperature sensor. A single oil trap 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.



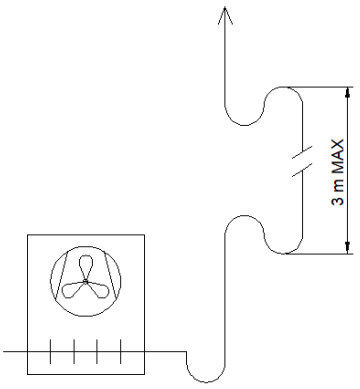
The suction line must be routed appropriately to the relative position of the evaporator and the unit and the height difference between them. This is particularly important to ensure correct oil

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.

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 with used components, to ensure oil return. Use appropriate pipe reduction when necessary.

Pipeline length

Taking into consideration the pressure drop on the pipelines depending on the speed of the medium, the diameter of the pipelines and the medium itself, the maximum safe length of the pipeline between the condensing unit and the evaporator is recommended, as shown in the table below.

Pipeline lenght

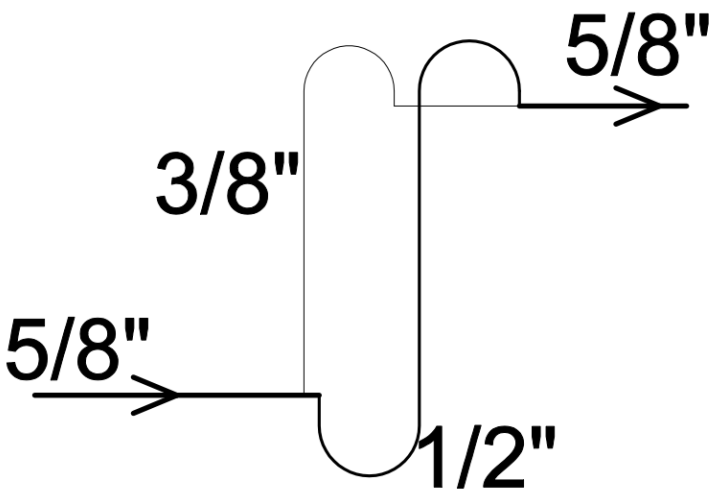
Condensing Unit	Maximum safety length of pipes
OCU-KRC035L08	30m
OCU-KRC050L08	35m
OCU-KRC045M08	30m
OCU-KRC070M08	35m
OCU-KRC100M08	40m

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.

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.

11. Preparation for starting the unit

11.1 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.

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.

11.2 Refrigerant charging

Before charging the refrigerant turn on the crankcase heater.

Zeotropic blends (R449A, R448A) 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.

To avoid overloading the system, which can result in higher energy consumption, the maximum refrigerant charge can be calculated as follows.

$$M_{max} = (V_{rec} + V_{liq}) \cdot 0{,}9$$

Where

$$M_{max} - maximum\ refrigerant\ charge, kg$$

$$V_{rec} - \ receiver\ volume, L$$

$$V_{liq} - internal\ volume\ of\ liquid\ line, L$$

11.3 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.

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

The electrical connection of the unit should be made taking into account the recommendations for the minimum cable cross-sections of the specified unit included in the table in point in chapter **No. 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 15 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).

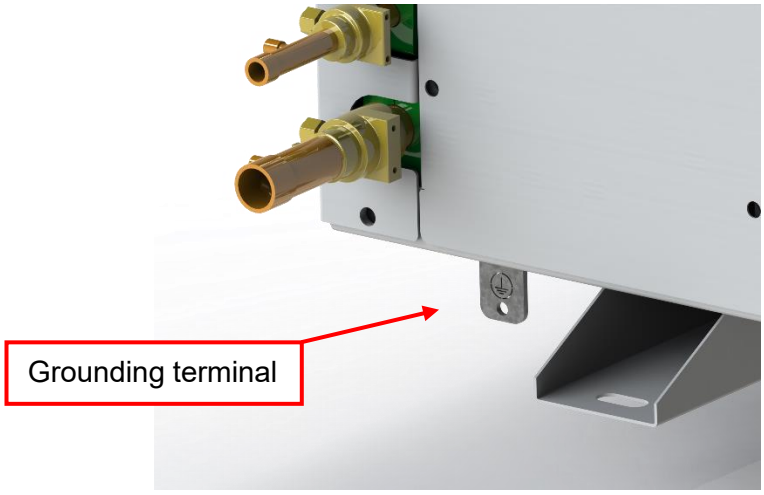
11.4 Unit protection class (electric shock protection)

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

OCU (Outdoor Condensing Units) are fully wired and factory tested.

The user only needs to properly connect the electric power supply.

IMPORTANT:
Due to the fact that the unit's inverter has a leakage current exceeding 3.5mA, it is necessary to provide (according to IEC 61800-5-1) PE (yellow-green) wire with cross section of minimum 10mm^2 or additional protective connection in the form of a separate PE wire with a cross-section, not smaller than the cross-section of the power supply wires, connected to a separate terminal (or the housing, if such a connection is provided) .



Grounding terminal

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) only a **type B** (delayed) RCD may 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).

11.5 Electromagnetic Compatibility (EMC)

OCU (Outdoor Condensing Units) must be installed by qualified personnel in a manner that ensures compliance with electromagnetic compatibility requirements for the intended operating environment (industrial / commercial / residential).

The units are intended for installation in a commercial environment.

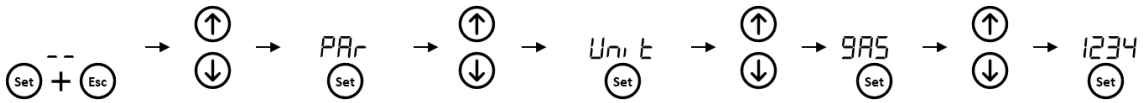
Installation in residential areas or in other locations with stricter EMC requirements may require the use of additional technical measures, such as radio frequency interference (RFI) suppression devices.

For guidance on selecting appropriate solutions, please contact our technical department.

12. Starting the unit

Start the procedure after charging the refrigerant, inspection of: connections, refrigerant charging, leakage, electrical connections and power supply (phase control relay - if present).

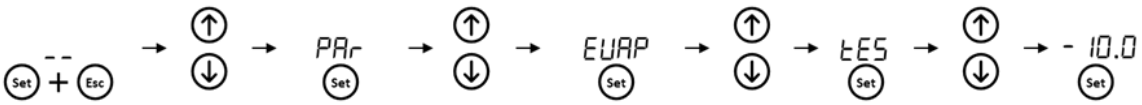
A. Make sure that the unit is **turned off**.
B. Check if all cut-off valves are open.
C. **Turn on** the power supply.
D. Wait for controller start up. Controller is ready for work when FrEE text on display disappears.
E. In case of using a **different** refrigerant than R449A, there is a need to change the mode by setting parameter 9AS according to table below and instruction:



Refrigerants as parameters

Parameter. 9AS	Description
0	404A
1	134A
5	448A
6	449A
7	513A

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



H. Set desired **compressor shut off temperature** (default **-20.0°C**) with parameter tEPd according to the instruction below:

I. **Turn on** the external start permission signal.
J. **Turn on the unit** by pushing and **holding the F1 button** (arrow up) for **3 seconds** (while being out of the menu options).
K. Unit start-up will be confirmed by the appearance of a turn-on symbol on the controllers display:

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

Additional information is included in this document in "Electrical documentation and quick start guide " at the chapter 15.

12.1 Unit start switch

OCU (Outdoor Condensing Units) in standard option do not have physical starting up switch. There is a dedicated controller parameter to start the unit, activated by holding arrow buttons for 3 seconds:

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

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

12.2 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 115ºC

13. Operation and maintenance of the unit

13.1 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.

The maximum allowed number of condenser unit start-ups is 8 per hour and the minimum operating time is 3 minutes. These are limit values and must not be exceeded.

The recommended compressor rest period (time relay) is a minimum of 5 minutes.

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.

13.2 Oil level control

Using another oil type instead of the original one or adding it to the original one can damage the compressor and void the warranty.

Using an excessive amount of oil can damage the compressor.

The minimum and maximum oil levels are reached when the oil amount is 20% lower/higher than the nominal oil level, respectively. In compressors equipped with a sight glass, it corresponds to 1/3 (minimum) and 2/3 (maximum) of the scale. Check the oil quantity and quality regularly regardless of the compressor type.

Control the oil amount in compressors and not equipped with sight glasses by:

- verifying the temperatures of the oil separator and the oil feeding line (lower temperature at the bottom of the oil separator means warm oil is feeding the tube)

- periodically draining the oil and replacing it

13.3 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.

13.4 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 pumped out
8) Condensing unit is ready to plug in power supply and start it

14. Servicing

14.1 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 limits according to the refrigerant compatible with the compressor. Settings of controller must not cause the compressor's operating range to be exceeded. 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 115^0C.
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 pressure gauge readings (suction / liquid).

14.2 Regular inspections of the installation

Once a month User	-Check the cleanliness of the condenser -Check the moisture level in the system (sight glass colour)
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 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.

14.3 Disposal of refrigeration equipment and systems

Electrical and electronic devices, including refrigeration systems, must be disposed of in accordance with Directive 2012/19/EU (WEEE) and national environmental protection regulations.

The device and its packaging must not be discarded with household waste. Packaging should be sorted for recycling, and the device should be delivered to an authorized e-waste collection point or returned to the retailer when purchasing a new device.

The crossed-out wheeled bin symbol indicates that the product is subject to selective waste collection. Proper disposal supports resource recovery and protects human health and the environment.

The device contains refrigerant under high pressure.

Do not dispose of the device with the refrigerant and oil inside, as this may pose a risk of fire or explosion.

Incorrect disposal may result in legal penalties in accordance with applicable legislation.

14.4 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.

14.5 Typical problems

No.	Symptoms	Possible causes
1.	Low pressure switch caused the compressor to switch off	- System is not dry - Liquid filter clogged or sight glass damaged - Liquid or suction pipe buckled - Evaporator insufficient air flow - Expansion or solenoid valve damaged (closed) - Refrigerant charge is too low
2.	High pressure switch caused the compressor to trip	- Presence of air or another gas in the system which does not condense - Condenser not working properly due to dirt build-up, ambient temperature too high or insufficient flow of air (damaged fans) - Evaporator overloaded
3.	Oil pressure switch caused the compressor to trip	- Oil level in the compressor too low - Presence of refrigerant in oil – the crankcase heater may not work properly - Oil supply line damaged – oil filter clogged, oil separator or oil separator valves damaged
4.	Too much current drawn by the compressor	- Condenser not working properly due to dirt build-up, ambient temperature too high or insufficient air flow (damaged fans) - Phase loss or voltage too low - Evaporator overloaded - Refrigerant selected incorrectly in the unit controller - Lack of oil in compressor

5.	High pressure at the suction side, vapour superheat level is normal	- Evaporator overloaded - The compressor does not operate at full capacity - Discharge side valve damaged - Suction valve damaged
6.	High suction pressure, vapour superheat level is low	- Evaporation pressure too high - Refrigerant level too high - Expansion valve damaged – the valve does not close
7.	Low suction pressure, vapour superheat level is high	- Liquid filter clogged or sight glass damaged - Refrigerant level too low - System is not dry - Expansion or solenoid valve damaged (closed)
8.	Low suction pressure, vapour superheat level is normal	- Suction filter clogged - Evaporator load low (clogged coolers)
9.	Condensation pressure too high, refrigerant temperature at the discharge side high	- Condenser not working properly due to dirt build-up - Too high ambient temperature - Insufficient air flow (damaged fans) - Too high suction superheat
10.	Condensation pressure too high, refrigerant temperature at the discharge side low	- Condenser not working properly due to dirt build-up, lack of water flow - Ambient temperature too high - Insufficient air flow (damaged fans) - System overfilled with refrigerant - System is not dry - Evaporator’s thermal load too high
11.	Condensation pressure low, refrigerant temperature at the discharge side is high	- Liquid or suction pipe buckled - Discharge side valve damaged - Expansion valve is not regulated - Suction valve damaged - Suction filter clogged - Solenoid valve damaged - Refrigerant level too low
12.	Condensation pressure low, refrigerant temperature at the discharge side is normal	- The compressor does not operate at full capacity - Evaporator load low – coolers clogged, cooled medium inlet temperature too low
13.	Condensation pressure low, refrigerant temperature at the discharge side is low	- System overfilled with refrigerant - Expansion valve damaged (open)

14.	RLA high	- System overfilled with refrigerant - Presence of air or other improper gas in the system - Condenser not working properly due to dirt build-up, lack of water flow, ambient temperature too high or insufficient air flow (damaged fans)
15.	RLA low	- Filter drier clogged or sight glass damaged - The compressor does not operate at full capacity - Compressor discharge side valve damaged - Compressor suction valve damaged - Expansion or solenoid valve damaged (closed)

15. Electrical documentation and quick start guide

15.1 Description of the unit's operation

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

The 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 unit suction pressure (-Psuc) and evaporation setpoint - midpoint (the correct pressure is determined based on the selected refrigerant type and evaporation setpoint in °C). The second compressor (on tandem units) starts when the suction pressure is above the setpoint despite the inverter compressor running at its highest speed, the second compressor will also run in the case of an inverter failure.

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 (midpoint) setpoint (typically around 40 °C). The condensing setpoint can be lowered at low ambient 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's capacity) and compressor discharge (fan speed).
    a) The correct pressure is determined from the selected medium and the evaporation 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).
    a) Compressor 2 (-Cp2, if present) will also start under this condition, but after the 1st compressor has reached its maximum capacity.
4) Compressor 1 (inverter), 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) 2nd compressor (if present and running) will be stopped first when the above condition is met.

The compressors will stop immediately if the pressure drops below the pumpdown setting.

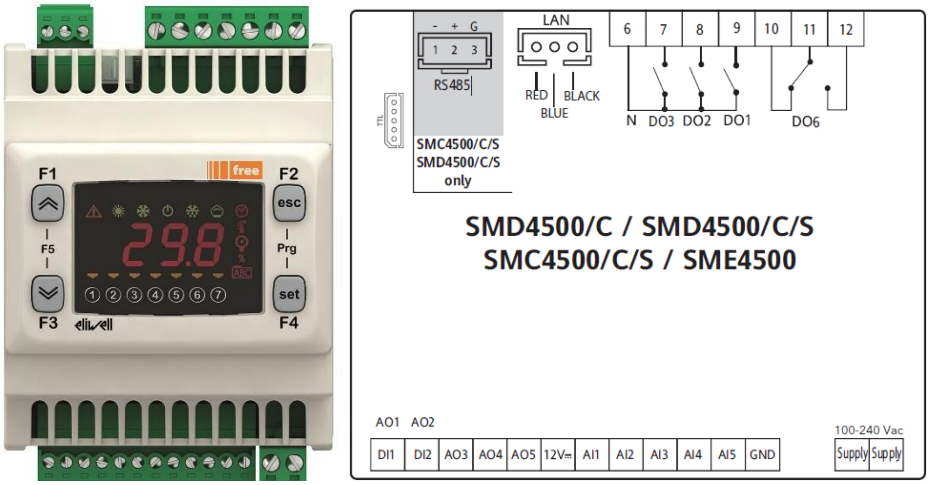
15.2 Safety notes

Take special care when handling and operating OCU. 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, unskillful change of parameters, removing or bypassing safety protections may lead to unforeseen events.

1. **OCU is a device that should not be accessed by unqualified personnel.**
2. **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.**

15.3 Controller – I/O

Below, there is a picture of the controller with the designation of the functions of individual terminals.



15.4 Inverter

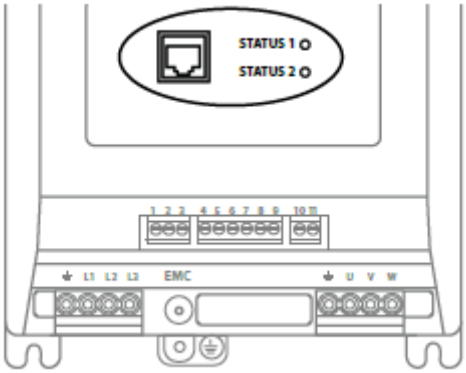
The device is equipped with the inverter. It is used to power the main compressor, performing the function of changing the cooling capacity of the unit.

15.4.1 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. For more information, see section 15.10. Communication.

15.4.2 Description of the inverter LED indicators

The inverter is equipped with two LEDs that indicate the operating status of the device.



Inverter diagnostic LEDs

Description of the inverter LEDs

Inverter status	LED 1 status		LED 2 status
	Green	Red	Yellow
Stop (waiting for start)	Slow flashing	OFF	OFF
STO (active HP/LP pressure switch)	Slow flashing	OFF	Slow flashing alternate
Running	Constant ON	OFF	Slow flashing in case of overload
Compressor carter heater ON	Slow flashing	OFF	ON
Waiting	ON	OFF	Flashing every 3s
Error	OFF	ON	OFF
Internal communication error	OFF	Flashing every 3s	OFF
Optistick transfer succeed	Fast flashing every 2s	OFF	OFF
Optistick transfer failure	OFF	Fast flashing every 2s	OFF
Optistick error - other	OFF	OFF	Fast flashing every 2s
DSP Firmware update	All LED's in order: Green, Yellow, Red, Yellow		
IO Firmware update	All LEDs are dimly lit		

NOTE: After replacing the inverter, it is necessary to set the inverter default values (Menu UNIT - DEFI). For more information, see page 19.

15.5 Unit controller interface

15.5.1 Unit controller buttons

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

Description of the controller buttons

The table below 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 parameter values
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).

15.5.2 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.

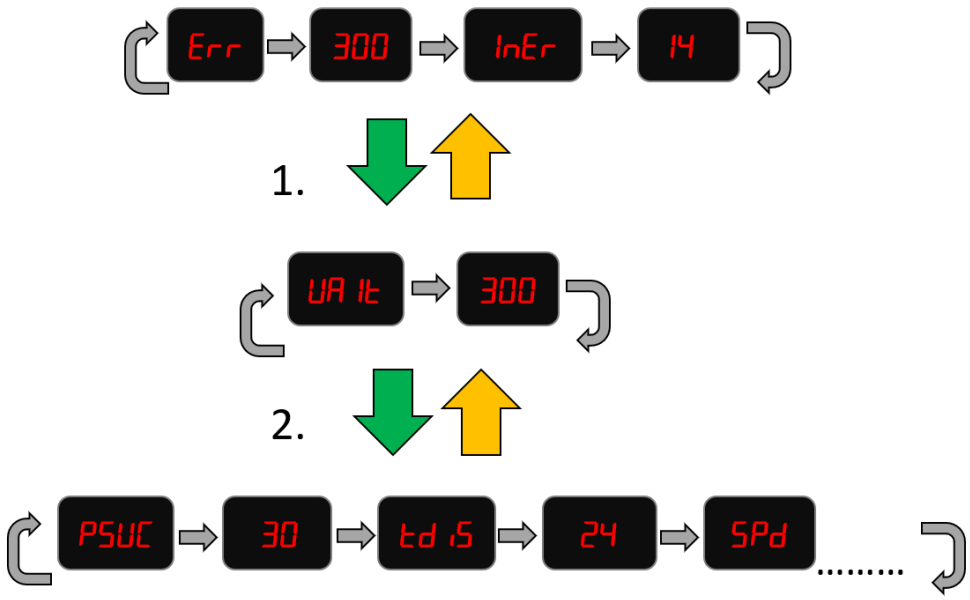
Controller display

Description of the display indications

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)
4.		ECO mode	Not active	Second setpoint active	ECO mode active
5.	1	**Compressor 1** status	OK	**Compressor 1 error (inverter)**	OK, running
6.	2	**Compressor 2** status	OK	**Compressor 2 error**	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 / LP 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!
12.		Timer function	Function OFF	Second setpoint active (DI, timer, ambient temp.)	Second setpoint activated
13.		Compressor 1 carter heater	OFF	ON, despite compressor operation (oil low temp.!)	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

15.5.3 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.



Change of the default view

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.

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],
- Pd i S (pdis): discharge pressure [bar],
- td i 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),
- tLOu (tlow): unit ON, compressor carter temperature low,
- 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 signaled by the ABC symbol on the display. When the symbol is inactive, the default view of the display is displayed.

15.5.4 External work permit

The units are equipped with the option of connecting an external unit operation permit. Most often, the permission is implemented in the form of a potential free contact (e.g. standard relay contacts). The place of connection of the permission can be recognized by the jumper on the electrical board connectors - standard terminals **-Xc: 1-2**.

Lack of permission is manifested by blinking of the diode ⏻.

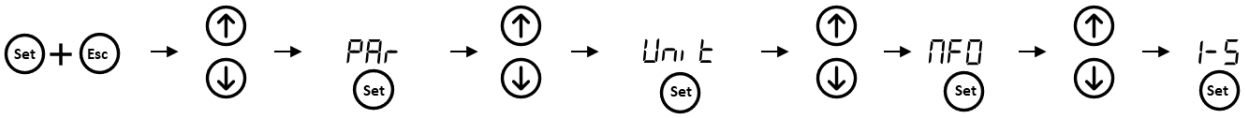
Note: In selected models of units, voltage is present on the above-mentioned terminals! If the connection described above is open, the condensing unit will not start!

15.5.5 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 unit is ready to start the compressor (the compressor will definitely start if the pressure rises). This function was created to protect the 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 „Unit":



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)

15.6 Controller menu

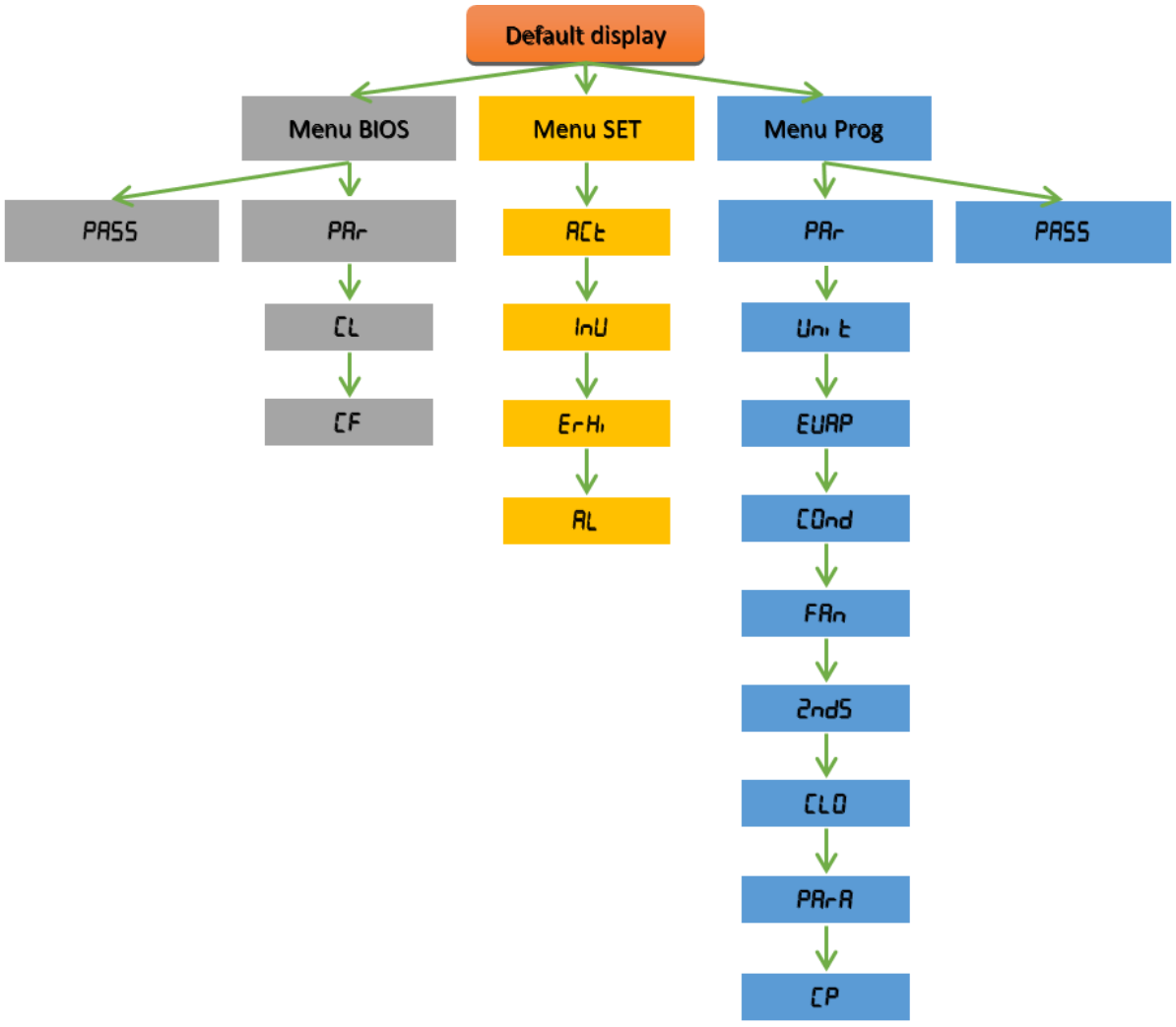
15.6.1 Menu structure

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 menus is signaled by an appropriate symbol on a display (15) described in the table no. 1. 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:



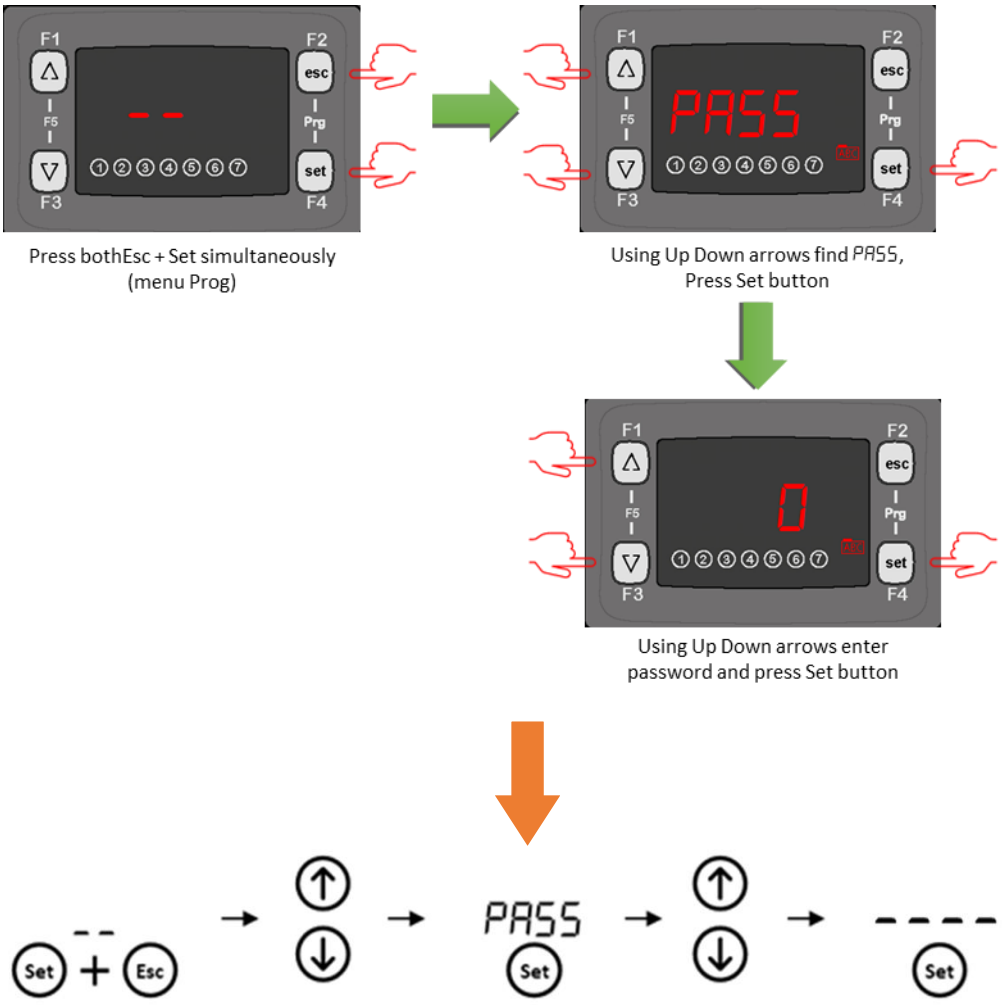
Menu structure

15.6.2 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.



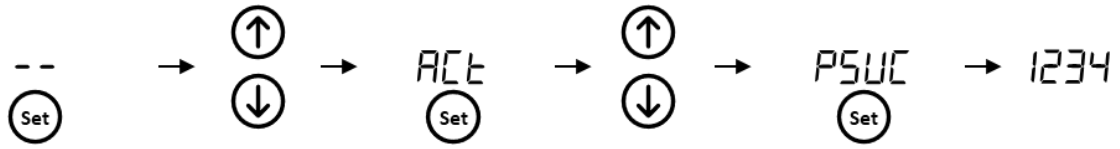
The order of operations in the login process

15.7 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. The menu structure is presented in the figure located in chapter 15.6.1.

15.7.1 Menu ACt (Act) – device operating parameters

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



An example of reading the current parameter from a suctionpressure sensor

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

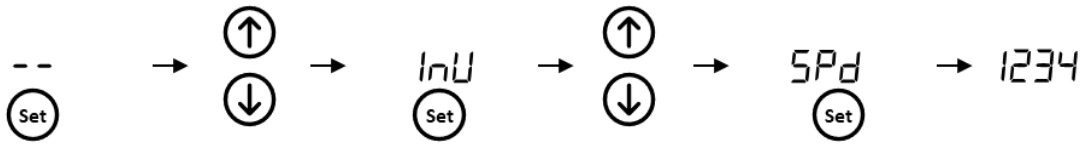
No.	Label	Description	Unit	Scale	Modbus Adr.
1.	PSUC	Current suction pressure	bar	0,01	9113
2.	PSSt	Suction pressure setpoint	bar	0,01	9105
3.	Pd, S	Discharge pressure	bar	0,01	9145
4.	PdSt	Discharge pressure setpoint	bar	0,01	9143
5.	td, S	Discharge temperature	°C	0,1	9166
6.	tAMb	Ambient temperature	°C	0,1	9222
7.	tCC	Compressor carter temperature	°C	0,1	9231
8.	tEUA	Evaporation temperature	°C	0,1	9095
9.	tES	Evaporation temperature setpoint	°C	0,1	9096
10.	tCnd	Current condensing temperature	°C	0,1	9097
11.	tCSt	Condensing temperature setpoint	°C	0,1	9098
12.	PSLL	Lower suction pressure limit (compressor stop)	bar	0,01	9120
13.	CCSH	Compressor superheat (tCC - tEUP)	°C	0,1	9232
14.	CACt	Compressor speed setpoint	%	0,1	9109
15.	FACt	Fan speed	%	0,1	9256

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

15.7.2 Menu InU (Inv) – inverter operating parameters

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



An example of reading the current operating parameters of the inverter

The table below 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.	POUE	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	8996
6.	dC_U	Inverter DC bus voltage	V	1	8985
7.	tdr1	Inverter temperature - power side	°C	0,1	8986
8.	tPCb	Inverter temperature - electronics	°C	0,1	9001
9.	1_St	Inverter status	N/A	N/A	9319
10.	1_Er	Inverter error number	N/A	N/A	9318

15.8 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 located in chapter 15.6.1.

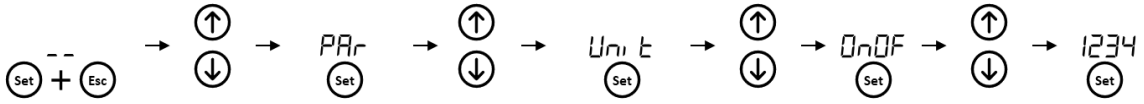
15.8.1 Menu Un1t (Unit) – main settings

Menu Un1t 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 Un1t 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	Always visible	Refrigerant type: 0 - 404A 1 - 134A 4 - 507A 5 - 448A 6 - 449A 7 - 513A	0-7	9058
3.	nF0	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.	nF1	Always visible	Multi-function digital output selection (2nd evaporation setpoint): 1 – Input closed: 2nd setpoint active, 2 – Input opened: 2nd setpoint is inactive.	1-2	16818
5.	dEF1	Level 1	Setting the default values of the inverter operation: (OFF - no changes, ON - forcing default values)	OFF/ON	9065
6.	dEFL	Level 1	Setting the default values of the EEPROM parameters: (OFF - no changes, ON - forcing default values)	OFF/ON	9067
7.	n_S	Level 2	Type of operation of the controller's RS485 port selection (0 – Slave, 1 – Master)	0-1	16533
8.	PuEr	Always visible	PLC software version	1-255	9421
9.	n1 nS	Level 1	Installer password setting (default 11)	1-255	16545
10.	nMAn	Level 2	Setting a manufacturer password	1-255	16546



An example of the OnOF parameter change in the menu Unit

15.8.2 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). Default evaporating temperature setpoint for MT units is -10°C and -27°C for LT.

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.	ESt1	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.	Srdb	Level 1	Dead band of the suction pressure regulator	bar	0,01	16558
13.	SrMA	Level 1	Maximum value of the suction pressure regulator output	%	0,1	16565
14.	SUdb	Level 1	Dead band of low limit of suction pressure regulation	bar	0,01	16566
15.	EH	Level 1	Temperature difference from setpoint to start Compressor	K	0,1	16657
16.	tEL	Level 1	Temperature difference from setpoint to stop Compressor	K	0,1	16658
17.	PSbO	Level 1	Permission to work with a defective pressure suction sensor	OFF/ON	N/A	16572

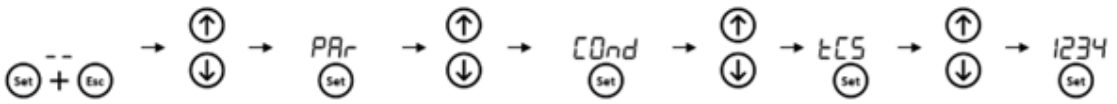
An example of the changing the tES parameter in menu Evap

15.8.3 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/A	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	°C	0,1	16644
6.	*ECO3*	Always visible	Ambient temp below which ECO is forced to OFF	°C	0,1	16645
7.	*dr_P*	Always visible	Proportional band of the condensing controller	bar	0,1	16597
8.	*dr_I*	Level 1	Incremental band of the condensing controller	s	1	16598
9.	*dStA*	Level 1	Differential discharge pressure to start the fan	bar	0,1	16601
10.	*dStP*	Level 1	Differential discharge pressure to stop the fan	bar	0,1	16602
11.	*drFF*	Level 1	Ratio of the fan speed to the compressor speed.	%	1	16605
12.	*drdb*	Level 1	Dead band of the condensing controller	%	0,1	16596
13.	*drSU*	Level 1	Acceleration ramp of the condensing controller	%/s	0,1	16599
14.	*drSd*	Level 1	Deceleration ramp of the condensing controller	%/s	0,1	16600
15.	*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
19.	*PdbO*	Always visible	Permission to work with a broken discharge pressure sensor	OFF/ON	N/D	16606



An example of the changing the tCS parameter in the menu Cond

15.8.4 *ECO* (ECO) mode – floating condensation setpoint

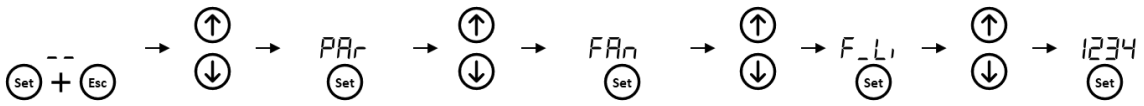
ECO mode provides a reduction of the condensing temperature setpoint if the ambient temperature is lower. This ensures an increase in the efficiency of the unit, while maintaining the parameters of the average loudness of the unit. It allows the *tCS* condensing temperature setpoint to be reduced linearly 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 9 above.

15.8.5 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_L1	Always visible	Fan Silent Mode – activation (enabled by default)	OFF/ON	N/A	16721
2.	F_LS	Always visible	Fan speed in Silent mode	%	0,1	16722
3.	F_SS	Always visible	Fan speed in safe mode (operation without discharge pressure sensor)	%	0,1	16725
4.	F_MA	Level 1	Maximum fan speed	%	0,1	16719
5.	F_Mi	Level 1	Minimum fan speed	%	0,1	16720
6.	FSnC	Level 1	Manual fan mode - on / off	OFF/ON	N/A	9251
7.	FSOn	Level 1	Fan speed in manual mode	%	0,1	9252
8.	1FAn	Level 2	Fan type	0-1	N/A	16532



An example of changing the F_L1 in the menu Fan

15.8.6 Menu 2ndS (2ndS) – evaporating temperature 2 (suction pressure 2 – 2nd setpoint)

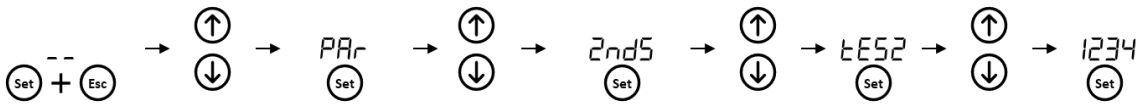
The unit has the function of a second evaporating temperature setpoint (suction pressure). It is possible to activate the setting with:

- Time of day - Timer (change at a specified time to a given time), RTC setting in section 9.6.,
- Ambient temperature (change when the temperature drops below a certain value),
- Digital inputs DI2 (single compressor units only).

Menu 2ndS contains the parameters for setting the second suction pressure threshold.

The following table shows the 2ndS menu parameters:

No.	Label	Access level	Description	Unit	Scale	Modbus Adr.
1.	tES2	Always visible	Evaporation temperature setpoint 2	°C	0,1	16652
2.	2SAC	Always visible	Activate evaporation temperature mode 2: 0 - Disabled 1 - Time of day (Timer) 2 - Ambient temperature 3 - Digital input (DI2)	N/A	0-3	16799
3.	tASL	Level 1	Activation ambient temperature (activation below this setting)	°C	0,1	16689
4.	2SOH	Always visible	Time of day of activation - hour	h	1	16848
5.	2SOM	Always visible	Time of day of activation - minute	min.	1	16849
6.	2SdH	Always visible	Duration - hours	h	1	16845
7.	2SdM	Always visible	Duration - minutes	min.	1	16846



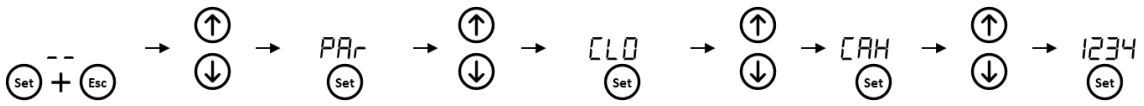
An example of changing the tES2 parameter in the menu 2ndS

15.8.7 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	Actual controller time - hours	h	1	9362
2.	CAM	Always visible	Actual controller time - minutes	min.	1	9363
3.	CAS	Always visible	Actual controller time - seconds	sec.	1	9364
4.	CSH	Always visible	Set time - hours	h	1	9355
5.	CSM	Always visible	Set time - minutes	min.	1	9356
6.	CUPd	Always visible	Update time	OFF/ON	N/A	9350



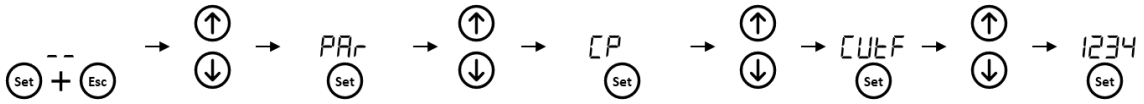
An example of accesing the CAH parameter in the CLO menu

15.8.8 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.	C2t 1	Level 1	Time to turn on the second compressor (-Cp2) after meeting start conditions	s	1	16750
6.	tbtS	Level 2	Minimum time between compressor starts (between starts time)	s	1	16732
7.	tCCd	Level 1	Evaporation and compressor temperature difference	K	0,1	16706
8.	tCCC	Level 1	Carter heater temperature correction	K	0,1	16707
9.	CCMA	Level 1	Compressor's highest temperature limit	°C	0,1	16709
10.	CCHH	Level 1	Compressor temperature limit high	°C	0,1	16710
11.	tCCb	Level 2	Compressor dead band	°C	0,1	16712



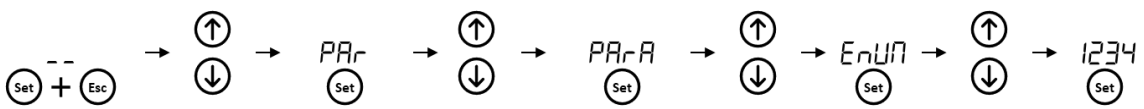
Access to the parameters CP

15.8.9 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.	EnUM	Level 1	EEPROM parameter offset selection
2.	EVAL	Level 1	View and change the value of the EEPROM parameter
3.	SnUM	Level 1	Offset selection of the Status parameter
4.	SVAL	Level 1	View and change the value of the Status parameter

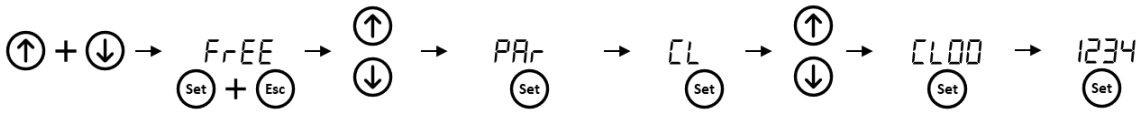


List of changing the EnUn parameter in the manu Para

15.8.10 Menu b, 05 (Bios) – types and scaling settings 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.



An example of changing the CL00 parameter in the menu Bios

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	1820	High scale range of the AI3 suction pressure sensor (1820 = 18.2 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)

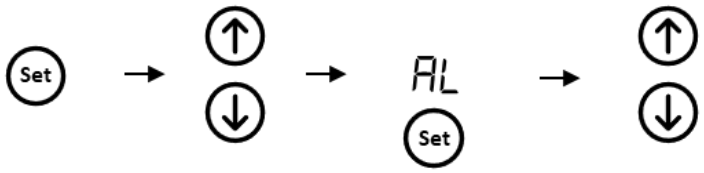
NOTE: You must power cycle the device (controller) after any BIOS parameter modifications.

15.9 Alarms, troubleshooting

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).

15.9.1 List of active warnings and errors - 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.



Alarm access in the menu AL

No.	Label	Description	Num.
1.	Err	Active error (unit stop)	n/a
2.	WArn	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.	tc H	High condensing temperature limit reached	1204
12.	tc L	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.	tc5b	Compressor carter temperature sensor error (-Tcc)	1501
19.	tccH	High limit of the carter temperature reached	1502
20.	tccL	Low limit of the carter temperature reached	1503
21.	inHL	Inverter limit high	1601
22.	inLL	Inverter limit low	1602
23.	intH	Inverter temperature limit high	1603
24.	intL	Inverter temperature limit low	1604
25.	inSP	Inverter didn't reach min. speed	n/a
26.	iErr	Active error - inverter	1605
27.	iWAr	Active warning - inverter	1606
28.	cP2E	Compressor 2 error	n/a
29.	UL_P	Unit stopped by too frequent STO error	n/a
30.	ULPd	Unit stopped by too many the highest limits reached	n/a
31.	ULPS	Unit locked by inverter	n/a
32.	UcP2	Unit blocked due to too many compressor 2 errors	n/a
33.	ULPd	Unit stopped due to too frequent high discharge temperature	n/a
34.	MbrE	Modbus reading error	n/a
35.	MbWE	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 – limit reached),
- 10 – 99 : level 2 (warning),
- 100 – 254 : level 3 (error - unit stopped).

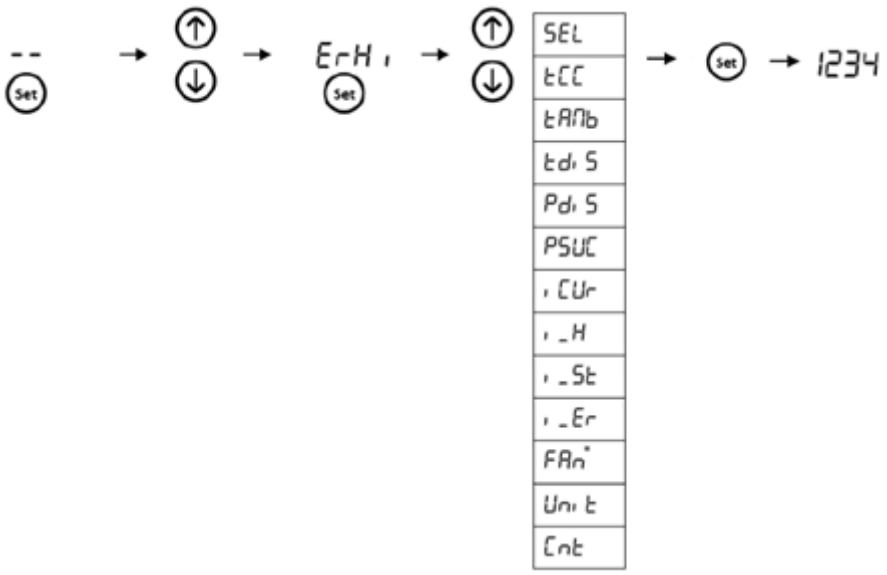
In case of a sensor error, the value of the parameter in the table above indicates the status of the chiller relative to the status of the sensor:

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

15.9.2 Error history – ErH1

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 unit at the time of its occurrence.

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



Error history menu access ErH

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.	Un1 t	Always visible	Device error (Err - table no. 18)	9033
4.	FAn	Always visible	Fan speed during error*	9034
5.	1 _Er	Always visible	Inverter error (InEr - table no. 19)	9035
6.	1 _St	Always visible	Inverter status when the error occurred	9036
7.	1 _H	Always visible	Inverter working time when the error occurred	9037
8.	1 CUr	Always visible	Inverter current when the error occurred	9038
9.	PSUC	Always visible	Suction pressure value when the error occurred	9039
10.	Pd1 S	Always visible	Discharge pressure value when the error occurred	9040
11.	td1 S	Always visible	Discharge temperature value when the error occurred	9041
12.	tAMb	Always visible	Ambient temperature value when the error occurred	9042
13.	tCC	Always visible	Compressor carter temperature value while the error occurred	9043

15.9.3 Unit errors – 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	Error 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 chiller 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	Evaporation 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 chiller after reaching lower temperatures. Overheat control at the outlet of the evaporators.
4.	105	Evaporation 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 input temperature sensor (Tdis)		Check the correct connection of the sensor. Replace the sensor.
11.	113	Input 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.	203	Damaged compressor base temperature sensor(Tcc)		Check the condition of the temperature sensor and its location

No.	Error number	Error name	Possible reason	Solution
16.	204	Compressor base temperature too high (Tcc / Csh)		Stop the chiller. Check the cause of compressor overheating.
17.	205	Compressor base temperature too low (-Tcc/ Csh)	Compressor watering. Incorrect location of the compressor base sensor.	Wait for the compressor to warm up. Check the operation of the crankcase heater.
18.	300	Main inverter error - **Check the error number in InEr section 15.9.4.**		
19.	301	STO (HP/LP pressure switch open during operation)		Increase / decrease pressure in the refrigeration system. Cool down the compressor, see point 4 and 8 of the table. Check the electrical connection of the pressure switches. Check the fuse.
20.	302	PTC (compressor housing temperature thermostat open)		Stop the unit. Cool down the compressor. Check the filling level of the system. Check the evaporator overheating settings. Check the oil level.
21.	303	Inverter overload		Pump down the refrigerant from the system on the suction side of the compressor. Try to restart with refrigerant on the suction side.
22.	304	Communication error		Check the communication cable.
23.	305	The mains voltage fluctuates too much or one phase of the inverter is missing	Incorrect mains voltage	Check the quality of the mains voltage.
24.	307	Unspecified inverter error (not ready or communication lost)	Cord damage. Loose plug.	Check the connections to the inverter.
25.	309	Compressor didn't reach minimum speed	Inverter overload or wrong inverter parameters	Check connections with the inverter, compressor Download parameters to the inverter
26.	315	STO (HP/LP pressure switch open during standby)	Activation of the low/high pressure switch while compressor was on standby.	Check the correct operation of the fan. Check the electrical pressure switches.
27.	400	Device blocked by too frequent inverter errors		Check the cause of the error and follow the instructions above.
28.	401	Device blocked by frequent high sensor limits		Check the cause of the error and follow the instructions above.
29.	402	Device blocked by too frequent STO errors		Check the cause of the error and follow the instructions above.
30.	403	Device blocked by too frequent high discharge temperature		Check the cause of the error and follow the instructions above.
31.	404	Unit blocked by second compressor errors		Check the cause of the error and follow the instructions above. Check the condition of the oil, the setting of the motor switch and the resistance of the motor windings.

15.9.4 Inverter errors – InEr

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

No.	Error number	Error name	Possible reason	Solution
1.	3	Inverter current overload	Compressor blocked	Pumpdown refrigerant from the system on the suction side of the compressor. Attempt to restart with low amount of refrigerant on the suction side.
2.	4	Engine overheating	Work above the maximum current for a long time	Check the refrigeration system.
3.	5	Inverter power unit error	Inverter failure	Diagnosis / replacement of the inverter.
4.	6	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.
5.	7	Inverter DC bus voltage too low	Incorrect mains voltage	Check the quality of the mains voltage.
6.	13	DC bus ripple too high - phase-to-phase power instability	Phase-to-phase power instability	Check the quality of the mains voltage.
7.	14	One of the supply phases is missing	Damage to the condensing unit power circuit	Check the quality of the mains voltage. Check the condensing unit power connection. Check the protection and power cables of the inverter.
8.	15	Instantaneous over current on drive output	Hardware overcurrent on drive output	Check the protection and power cables of the inverter.
9.	21	Inverter PTC error (compressor thermostat)	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.
10.	22	Inverter cooling fan error	Fan failure	Diagnosis / replacement of the inverter.
11.	29	STO (HP/LP pressure switch open during operation)	Activation of the low/high pressure switch or compressor housing thermostat	Increase / decrease the pressure in the refrigeration system. Check the correct operation of the fan. Check the electrical pressure switches.
12.	49	Phase loss at inverter output	Damage to the compressor or the compressor supply cable	Check the compressor connection. Wind resistance measurement.
13.	50	Modbus communication error	Communication error / inverter error - incorrect inverter settings	Verification of the correctness of the inverter and controller wiring. Checking the connection of the inverter plugs. Verifying communication settings.
14.	60	STO (HP/LP pressure switch open during standby)	Activation of the low/high pressure switch while compressor was on standby.	Check the correct operation of the fan. Check the electrical pressure switches.
15.	90	Other inverter communication error	Communication error / inverter error - incorrect inverter settings	Verification of the correctness of the inverter and controller wiring. Checking the connection of the inverter plugs. Verifying communication settings.

15.9.5 Inverter Alarms - InAL

Warning and alarms are shown on main screen after ! nAL are related to Inverter.

Lp.	Alarm number	Alarm name	Possible reason	Solution
1.	2	Current limit active	Work over current limit	Pumpdown refrigerant from the system on the suction side of the compressor. Attempt to restart with low amount of refrigerant on the suction side.
2.	4	Power limit active	Work over power limit	Pumpdown refrigerant from the system on the suction side of the compressor. Attempt to restart with low amount of refrigerant on the suction side.
3.	8	Motor thermal managment active (Ixt)	Work over motor temperature limit	Pumpdown refrigerant from the system on the suction side of the compressor. Attempt to restart with low amount of refrigerant on the suction side.
4.	16	Drive thermal managment active (Heatsink temperature)	Work over inwerter temperature limit	Check ambient inverter fan and ambient temperature.

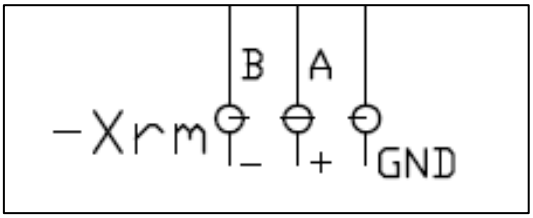
15.10 Communication

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 kit versions).

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

15.10.1 RS485 interface parameters

To enable communication with the controller, the device should be connected in accordance with the electrical schematic provided with the device (terminals -Xrm), following the standards of RS485 serial communication.

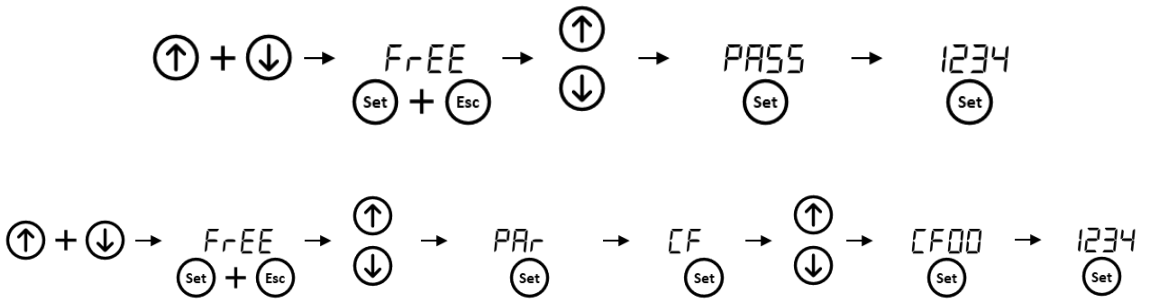


Default settings of RS485 (Modbus RTU) communication parameters:

- 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 procedure for changing the menu BIOS parameters

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)

15.10.2 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 Single— 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.

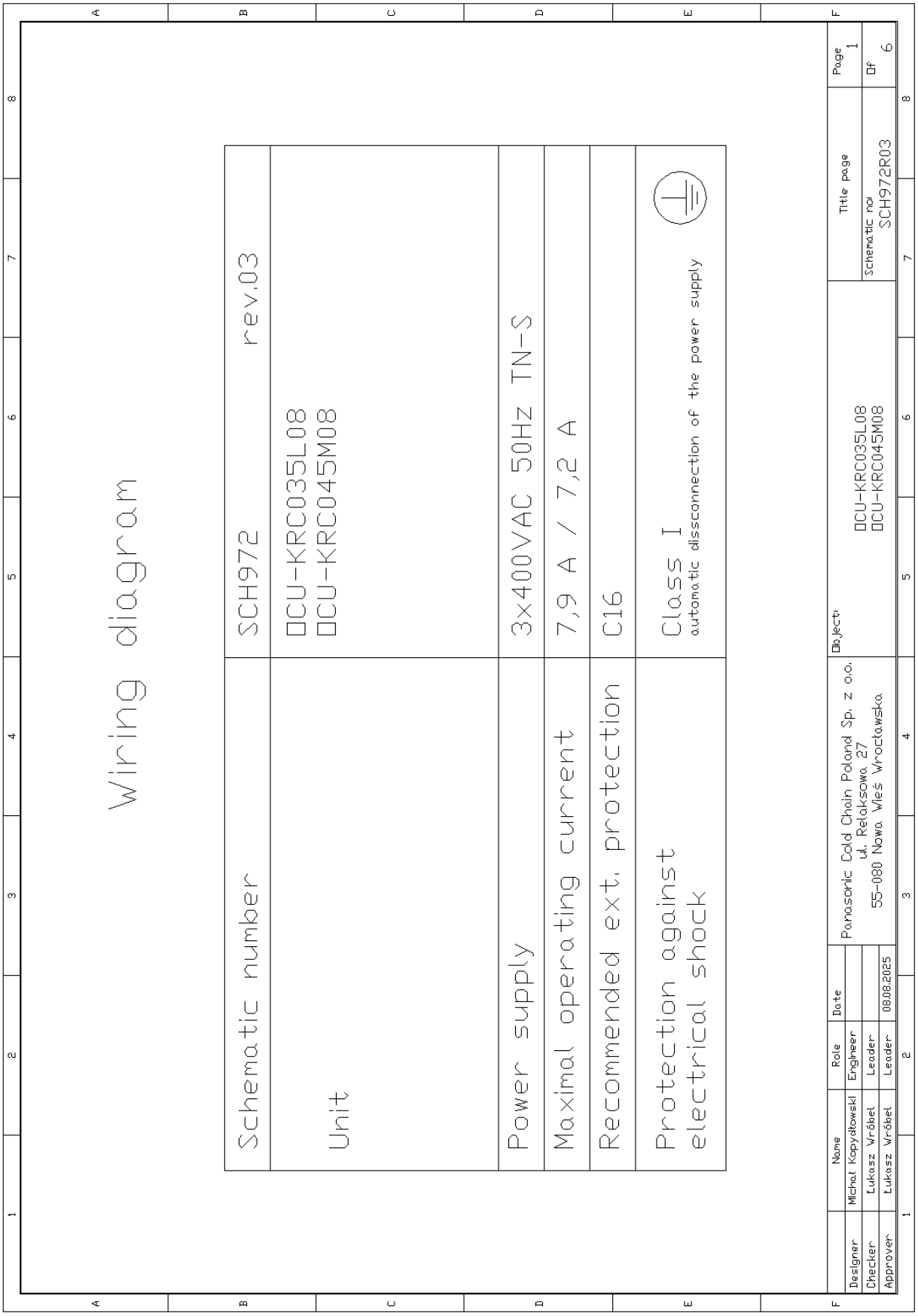
15.11 Additional functions of F1 button

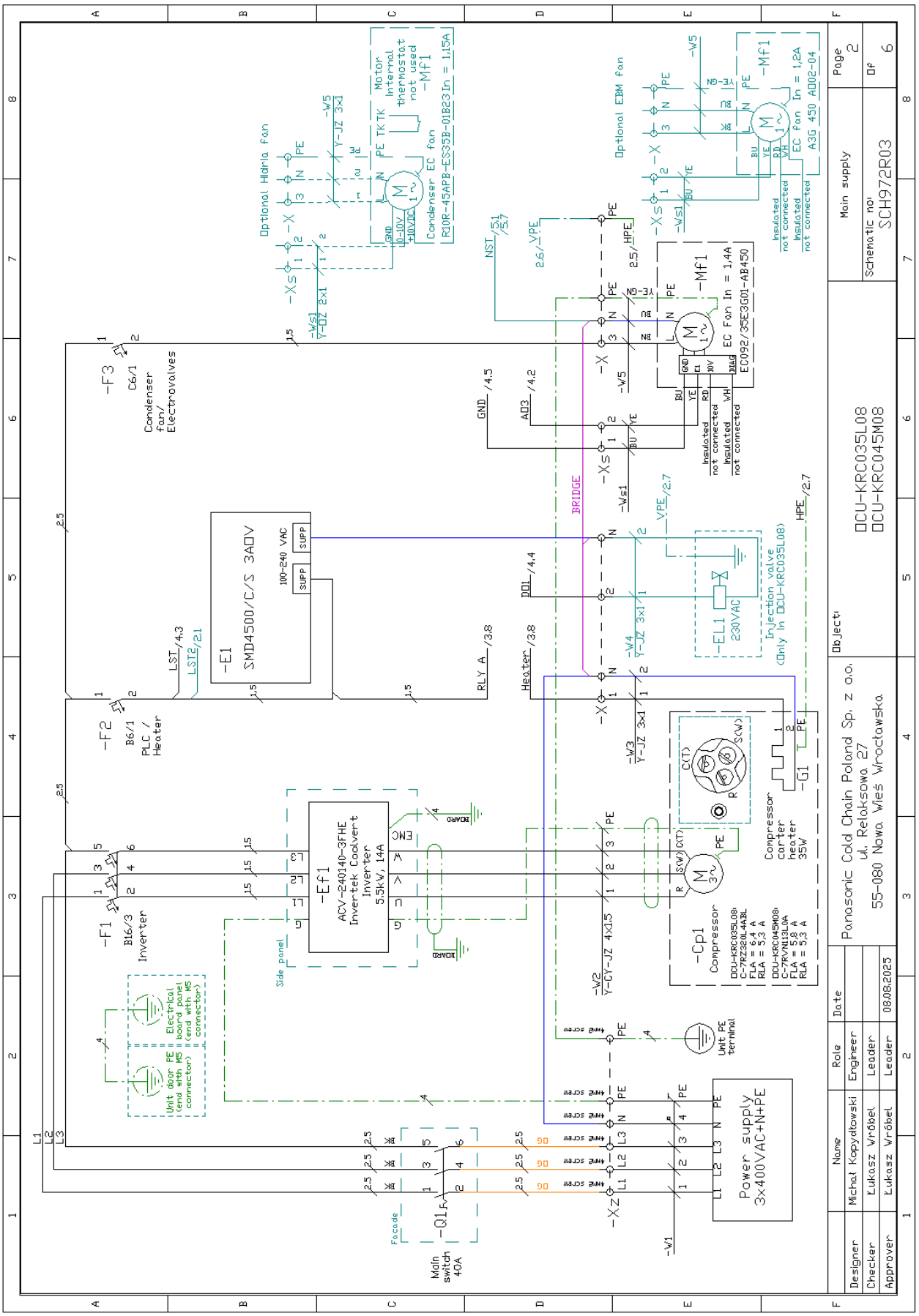
Special F1 button functions:

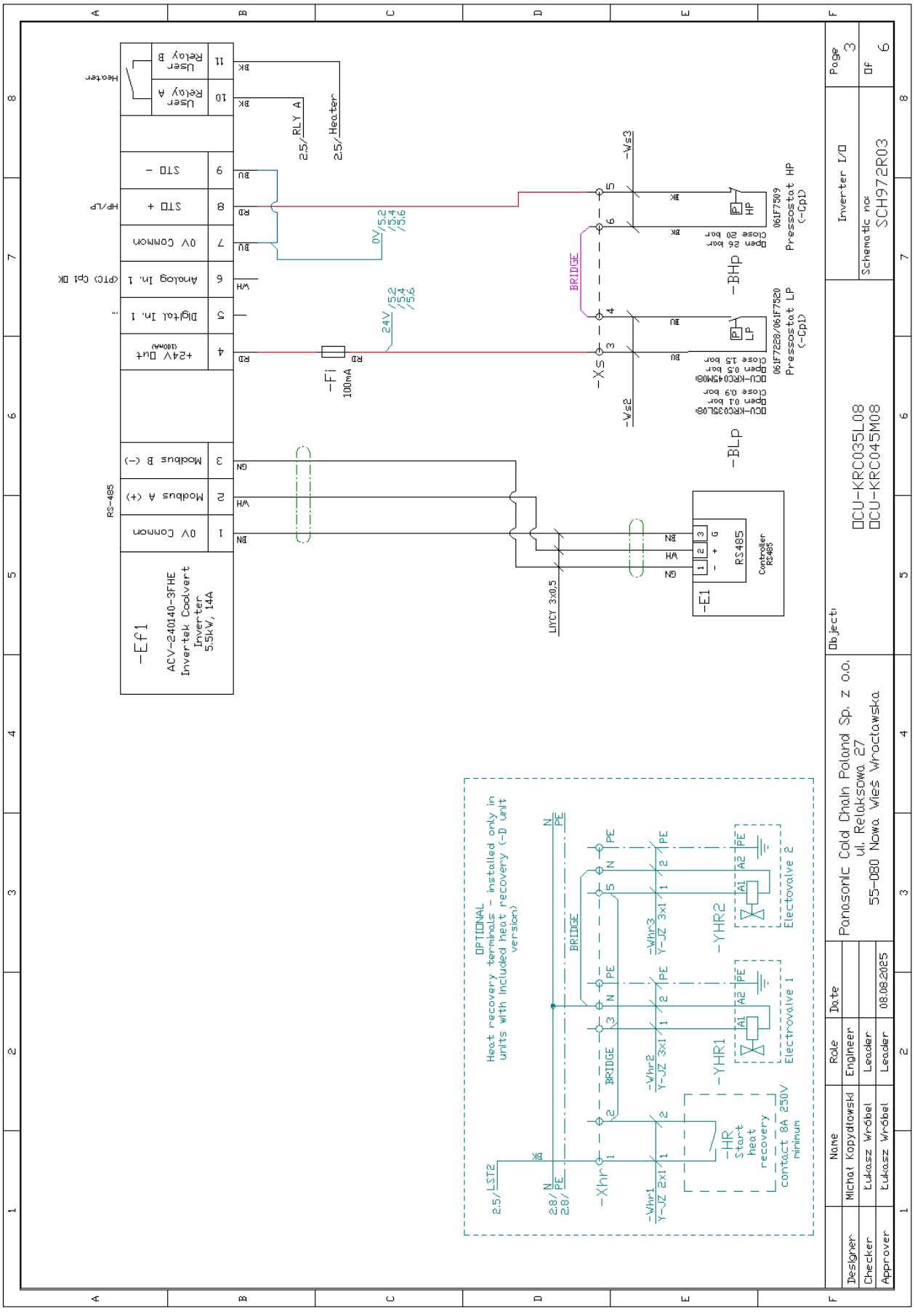
- **Force device start (skip idle time)**: Press and hold the F1 (⏫) button for 10 seconds in the main view,
- **Force fan operations:** Press and hold the F1 (⏫) button for at least 10 seconds in the main view. The fan will operate at 100% speed as long as the button is pressed. After releasing the 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.

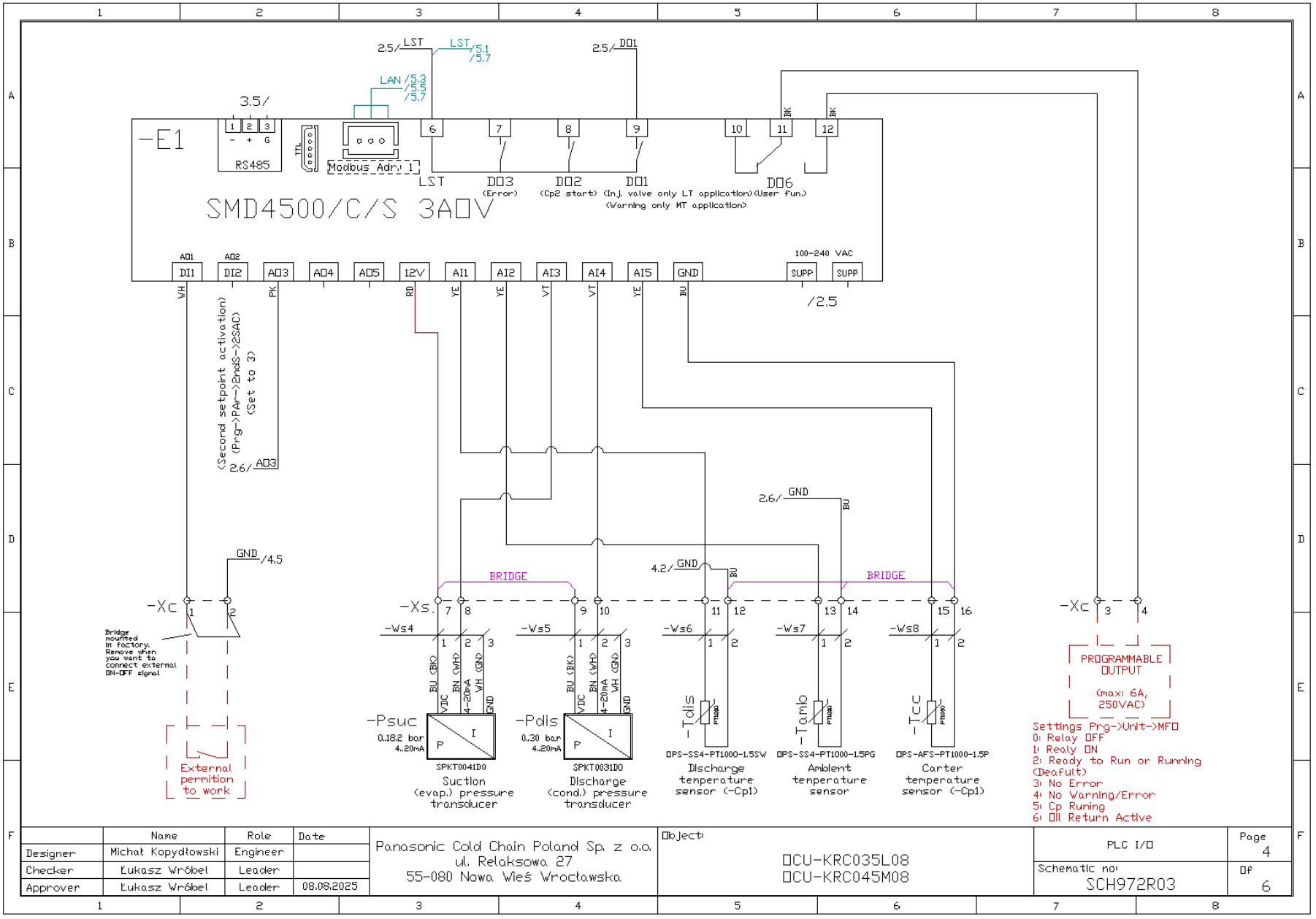
16. Wiring diagrams

16.1 OCU-KRC035L08 / OCU-KRC045M08




Power supply
3x400VAC+N+PE
-Q1F
Main switch 40A
-Cp1
Compressor
-Ef1
ACV-240140-3FHE
Inverter
-E1
SMD4500/C/S 3AOV
-EL1
230VAC
Injection valve
(Only in OCU-KRC035L08)
-Mf1
EC Fan In = 1,44A
-F1
-F2
-F3
-G1
Compressor carter heater 35W
Optional Hidria fan
Optional EBM fan
Condenser EC fan
Motor internal thermostat not used
EC fan In = 1,2A
Unit PE terminal
Side panel
Facade
BRIDGE
OCU-KRC035L08
OCU-KRC045M08
Panasonic Cold Chain Poland Sp. z o.o.
ul. Reaksowa 27
55-080 Nowa Wieś Wrocławska
Main supply
Schematic no:
SCH972R03
Page 2
Of 6
Designer Michał Kopydłowski Engineer
Checker Łukasz Wróbel Leader
Approver Łukasz Wróbel Leader
08.08.2025


-Ef1
ACV-240140-3FHE
Inverter Coolvert
5.5kW, 14A
RS-485
1 0V Common
2 Modbus A (+)
3 Modbus B (-)
4 +24V Out (100mA)
5 Digital In. 1
6 Analog In. 1 (PTC) Cpl DK
7 0V Common
8 STB +
9 STB -
HP/LP
10 User Relay A
11 User Relay B
Heater
2.5/ RLY A
2.5/ Heater
-Fl
100mA
24V /5.2 /5.4 /5.6
0V /5.2 /5.4 /5.6
-Ws3
-Ws2
-Xs
BRIDGE
-BHp
-BLp
HP
LP
Open 26 bar
Close 20 bar
Open 0.1 bar
Close 0.9 bar
Open 0.5 bar
Close 1.5 bar
061F7509
Pressostat HP
(-Cp1)
061F7228/061F7520
Pressostat LP
(-Cp1)
DCU-KRC035L08
DCU-KRC045M08
LiYCY 3x0.5
-E1
RS485
Controller RS485
OPTIONAL
Heat recovery terminals - installed only in units with included heat recovery (-D unit version)
2.5/LST2
2.8/ N
2.8/ PE
-Xhr
-Whr1 Y-JZ 2x1
-Whr2 Y-JZ 3x1
-Whr3 Y-JZ 3x1
-HR Start heat recovery contact 8A 250V minimum
-YHR1
-YHR2
Electrovalve 1
Electrovalve 2
Designer Michał Kopydłowski Engineer
Checker Łukasz Wróbel Leader
Approver Łukasz Wróbel Leader 08.08.2025
Name Role Date
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Object:
DCU-KRC035L08
DCU-KRC045M08
Inverter I/O
Schematic no: SCH972R03
Page 3
OF 6



	Name	Role	Date
Designer	Michał Kapydłowski	Engineer	
Checker	Łukasz Wróbel	Leader	
Approver	Łukasz Wróbel	Leader	08.08.2025

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Object:
□CU-KRC035L08
□CU-KRC045M08

PLC I/□

Page 4 of 6

Schematic no: SCH972R03

Note:
1. Power supply on circuit breaks (-F..) always on the top.

2. Unmarked wires - cross-section 1mm2. Wire colors names according to IEC 60757

3. All the wires in the cabinet finished with sleeve.

4. Wires to the devices not mounted on the panel:

- Q1: 1,3,5 -> 350mm (out of the outlet)
- Q1: 2,4,6 -> 350mm (out of the outlet)
- Power wires to -Ef1: L1,L2,L3,G -> 750mm (to back of the plate and out of the outlet)
- Control wires to -Ef1 -> 200mm (out of the cable tray)
- Unit PE -> 550mm (out of the outlet)

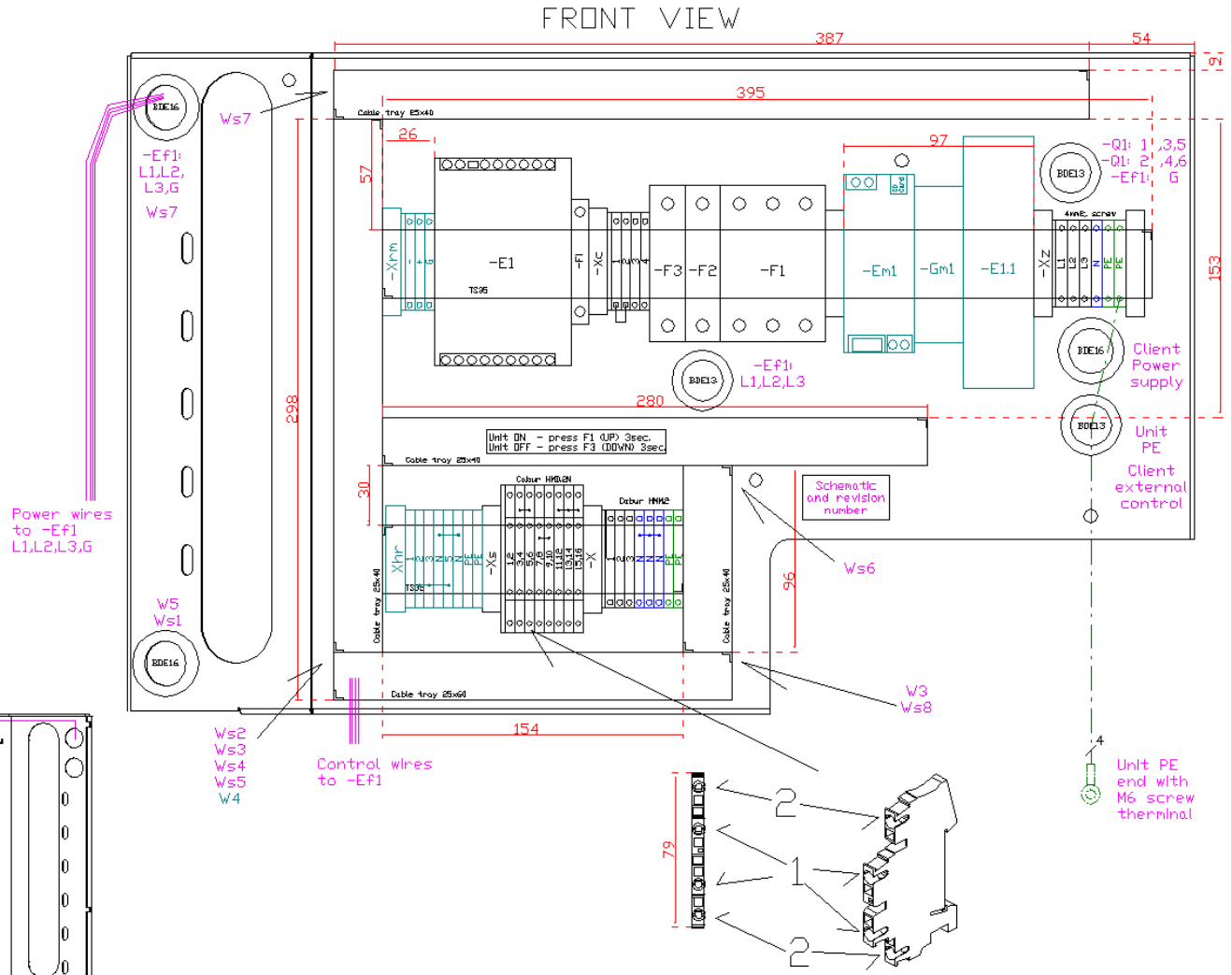
5. Number of diagram and it's revision to be labeled on a sticker in indicated place.

6. All the wires to external components marked with pin numbers according to electric diagram and finished with sleeve.

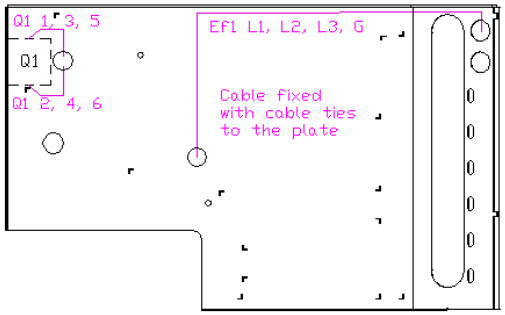
7. Wires at the back of the plate wrapped with spiral wrap

*. Optional elements.

FRONT VIEW



BACK VIEW



	Name	Role	Date
Designer	Michał Kopydłowski	Engineer	
Checker	Łukasz Wróbel	Leader	
Approver	Łukasz Wróbel	Leader	08.08.2025

Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska

Object:
CU-KRC035L08
CU-KRC045M08

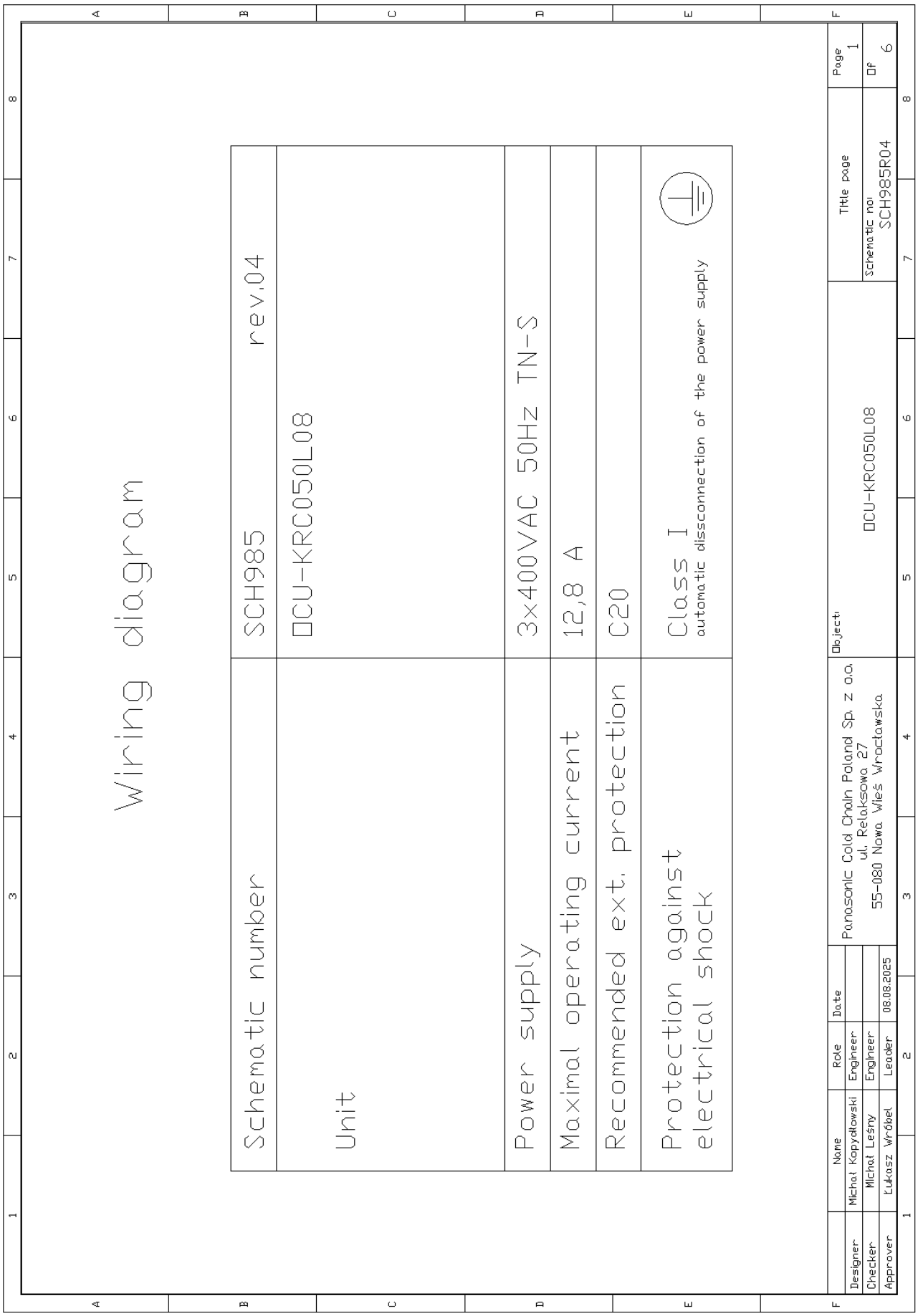
Mounting plate

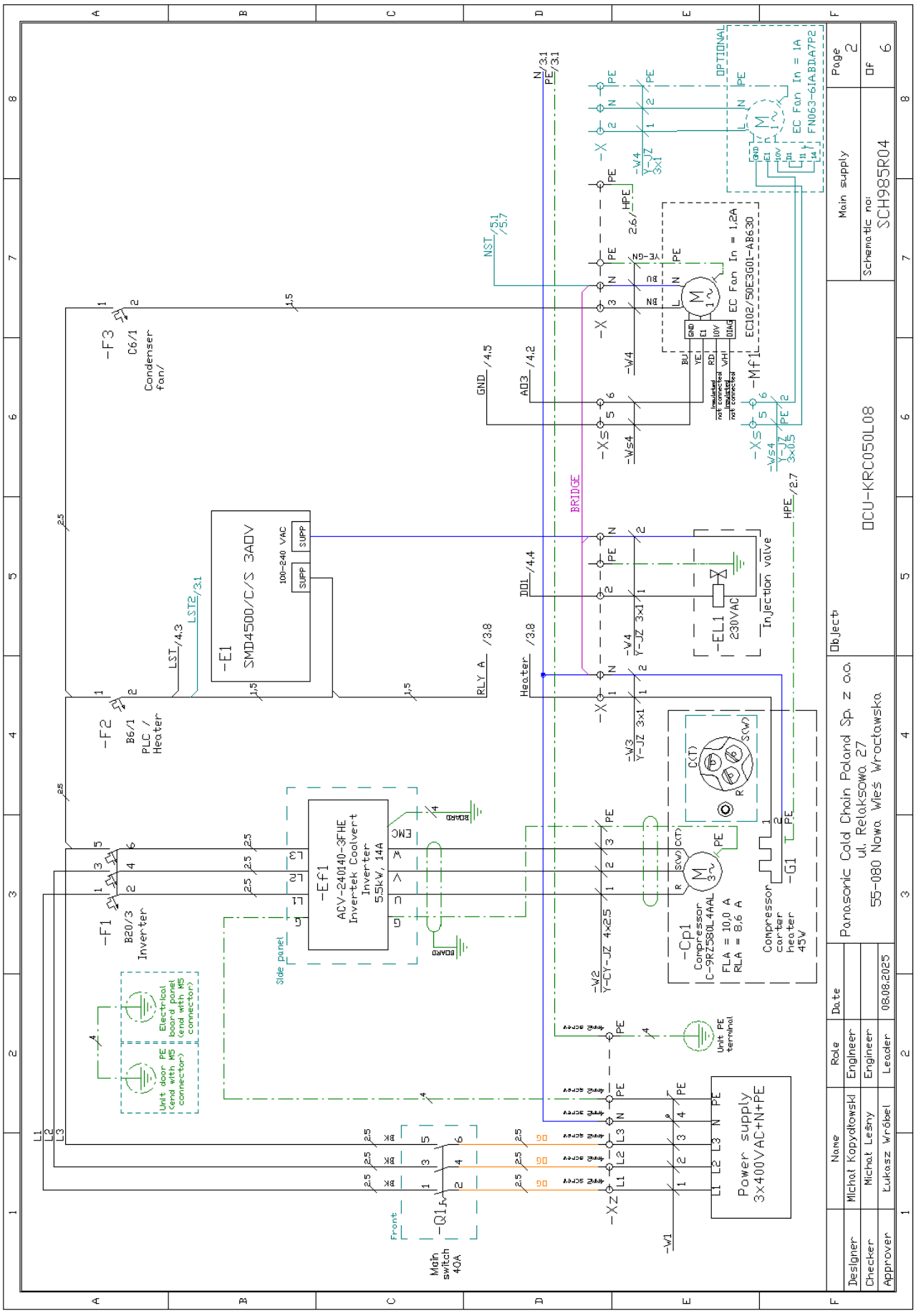
Page 6

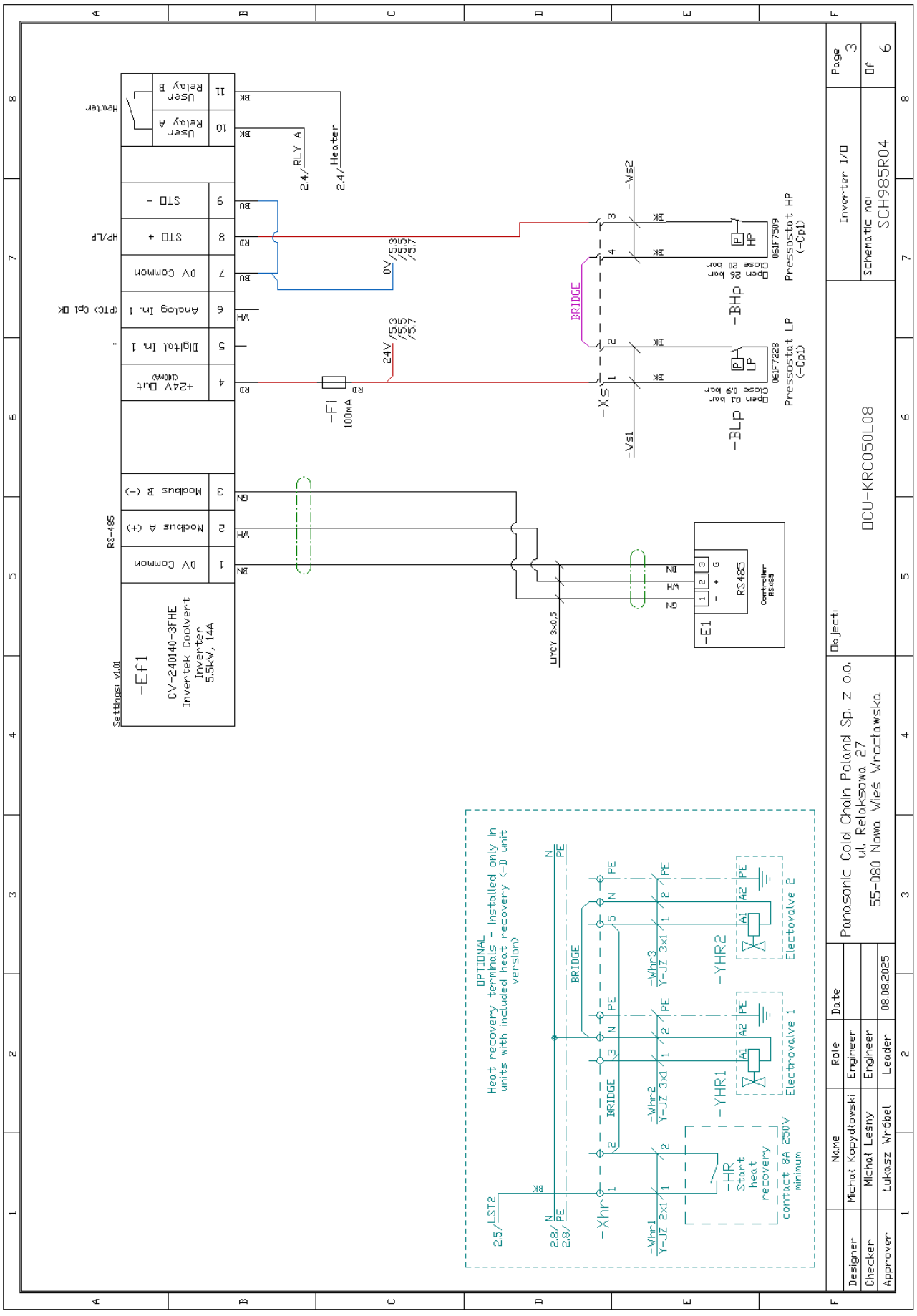
Schematic no:
SCH972R03

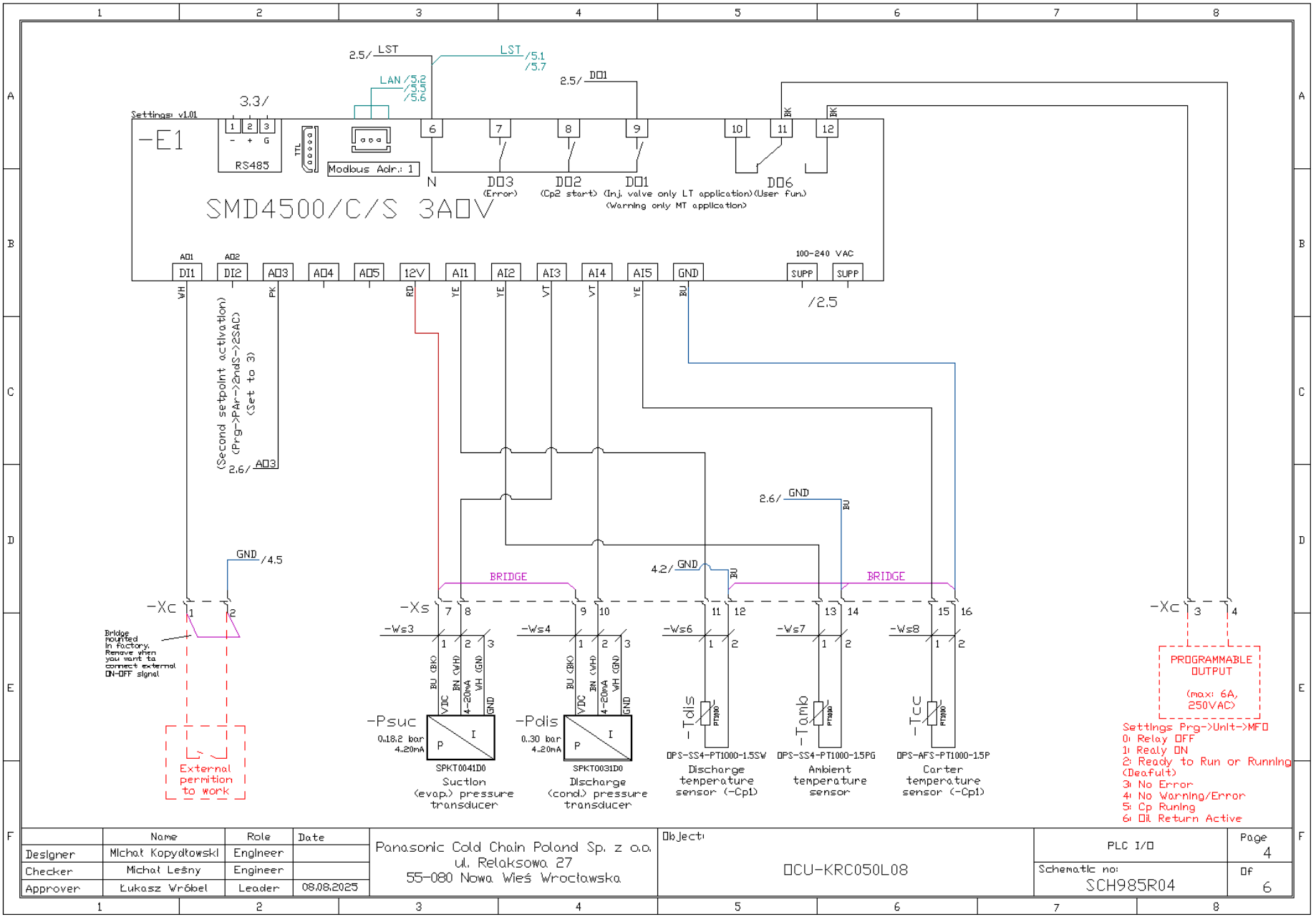
Of 6

16.2 OCU-KRC050L08




Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Object
DCU-KRC050L08
Main supply
Schematic no:
SCH985R04
Page 2
of 6
Designer Michał Kopyciowski Engineer
Checker Michał Leśny Engineer
Approver Łukasz Wróbel Leader
08.08.2025
Power supply 3x400VAC+N+PE
-Q1 Main switch 40A
-F1 B20/3 Inverter
-F2 B6/1 PLC / Heater
-F3 C6/1 Condenser fan
-Ef1 ACV-240140-3FHE Inver-tek Coolvert Inverter 5.5kW, 14A
-E1 SMD4500/C/S 3AOV
-Cp1 Compressor C-9RZ58GL4AAL FLA = 10,0 A RLA = 8,6 A
-G1 Compressor carter heater 45W
-EL1 230VAC Injection valve
-Mf1 EC102/50E3G01-AB630 EC Fan In = 1,2A
EC Fan In = 1A FN063-6IA.BD.A7P2
OPTIONAL
BRIDGE
Side panel
Front
Unit door PE (end with M5 connector)
Electrical board panel (end with M5 connector)
Unit PE terminal


-Ef1
CV-240140-3FHE
Inverter Coolvert
5.5kW, 14A
Settings: v1.01
RS-485
0V Common
Modbus A (+)
Modbus B (-)
+24V Out (100mA)
Digital In. 1
Analog In. 1 (PTC) Opt DK
0V Common
STO +
STO -
HP/LP
User Relay A
User Relay B
Heater
-Fi
100mA
-BLp
-BHp
-Xs1
-Xs2
-Ws1
-Ws2
BRIDGE
Pressostat LP (-Cp1)
Pressostat HP (-Cp1)
-E1
RS485
Controller RS485
LiYCY 3x0.5
RLY A
Heater
0V
24V
-Xhr
-Whr1
-Whr2
-Whr3
-HR
Start heat recovery
contact 8A 250V minimum
-YHR1
-YHR2
Electrovalve 1
Electrovalve 2
OPTIONAL
Heat recovery terminals - installed only in units with included heat recovery (-D unit version)
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Objecti
DCU-KRC050L08
Inverter I/O
Schematic no
SCH985R04
Page 3
Of 6
Name
Role
Date
Designer
Michał Kopydłowski
Engineer
Checker
Michał Leśny
Engineer
Approver
Łukasz Wróbel
Leader
08.08.2025



	Name	Role	Date
Designer	Michał Kopydłowski	Engineer	
Checker	Michał Leśny	Engineer	
Approver	Łukasz Wróbel	Leader	08.08.2025

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55-080 Nowa Wieś Wrocławska

Object:
□CU-KRC050L08

PLC I/□

Page 4

Schematic no: SCH985R04

Of 6

Note:
1. Power supply on circuit breaks (-F..) always on the top.

2. Unmarked wires - cross-section 1mm2. Wire colors names according to IEC 60757

3. All the wires in the cabinet finished with sleeve.

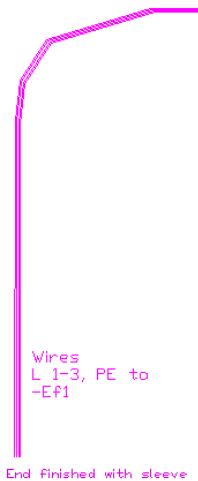
4. Wires to the devices not mounted on the panel:
- Q1: 1,3,5 -> 160mm (out of the outlet)
- Q1: 2,4,6 -> 200mm (out of the outlet)
- E1:L1-3 + PE -> 880mm (out of the outlet)
- -E1 <> -Ef1 -> 200mm (out of the outlet)

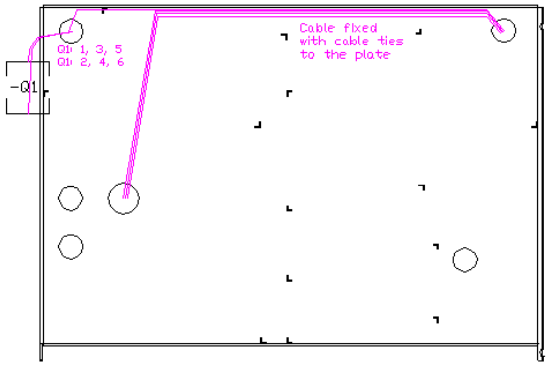
5. Cables to inverter marked with pin numbers 4-11 of the inverter.

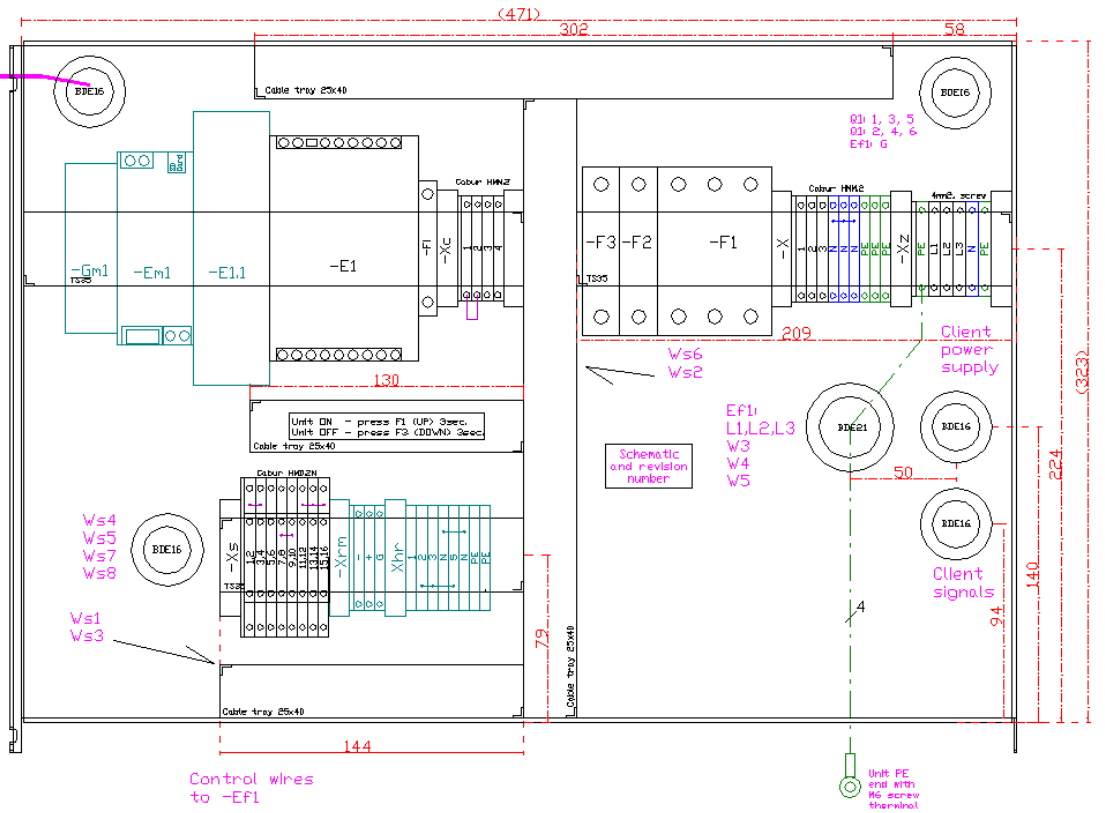
6. M5 rivet nuts must be mounted in hexagonal holes in the electrical plate.

7. Number of diagram and it's revision to be labeled on a sticker in indicated place.

*. Optional elements.







	Name	Role	Date
Designer	Michał Kopydłowski	Engineer	
Checker	Michał Leśny	Engineer	
Approver	Łukasz Wróbel	Leader	08.08.2025

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ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska

Object:
DCU-KRC050L08

Mounting plate

Schematic no:
SCH985R04

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Wiring diagram

Schematic number	SCH952 rev.05
Unit	OCU-KRC070M08
Power supply	3x400VAC 50Hz TN-S
Maximal operating current	10,1 A
Recommended ext. protection	C16
Protection against electrical shock	Class I automatic dissconnection of the power supply

	Name	Role	Date
Designer	Michał Kopydłowski	Engineer	
Checker	Michał Leśny	Engineer	
Approver	Łukasz Wróbel	Leader	08.08.2025

Panasonic Cold Chain Poland Sp. z o.o.
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55-080 Nowa Wieś Wrocławska

Object:
OCU-KRC070M08

Title page

Schematic no:
SCH952R05

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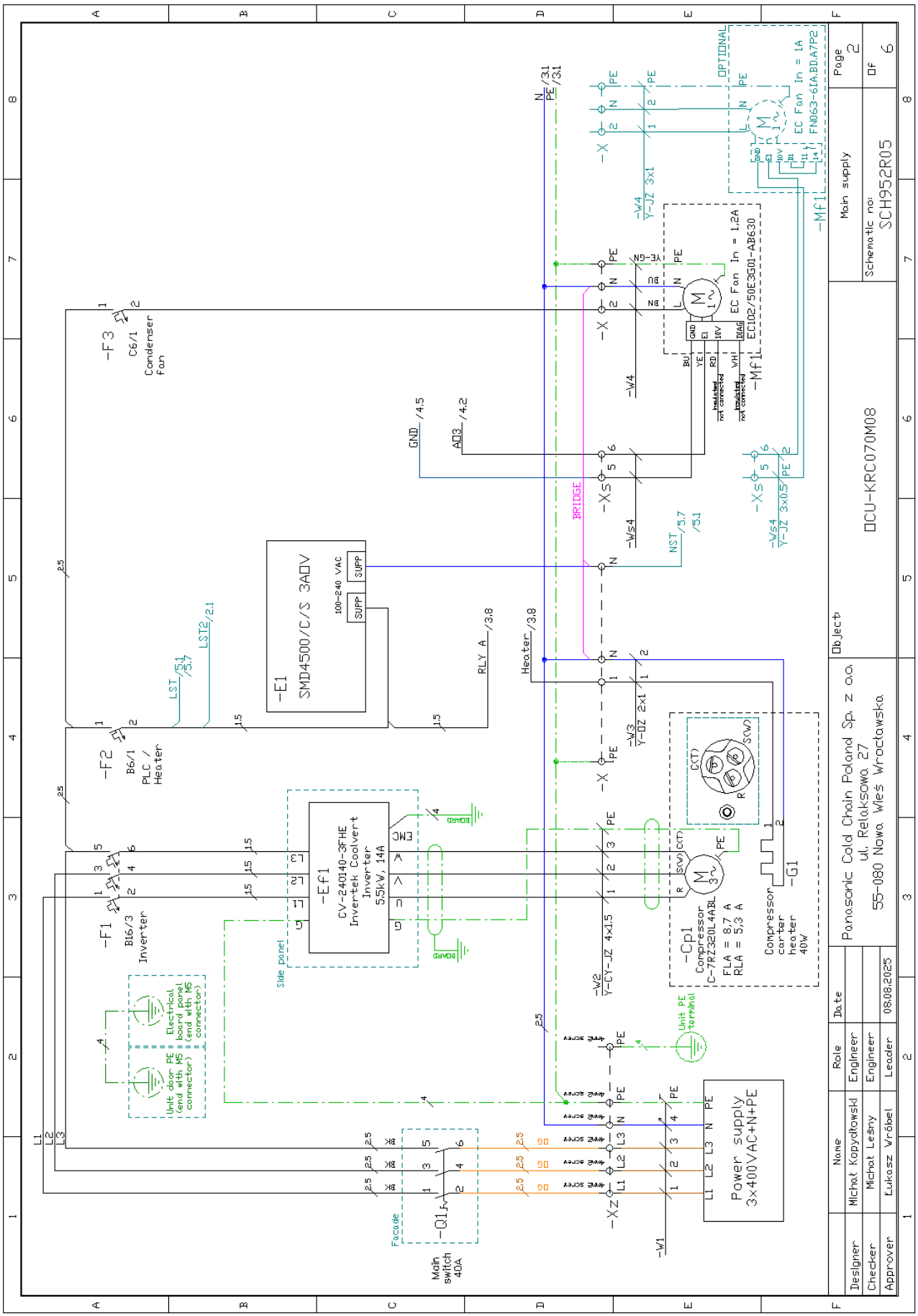
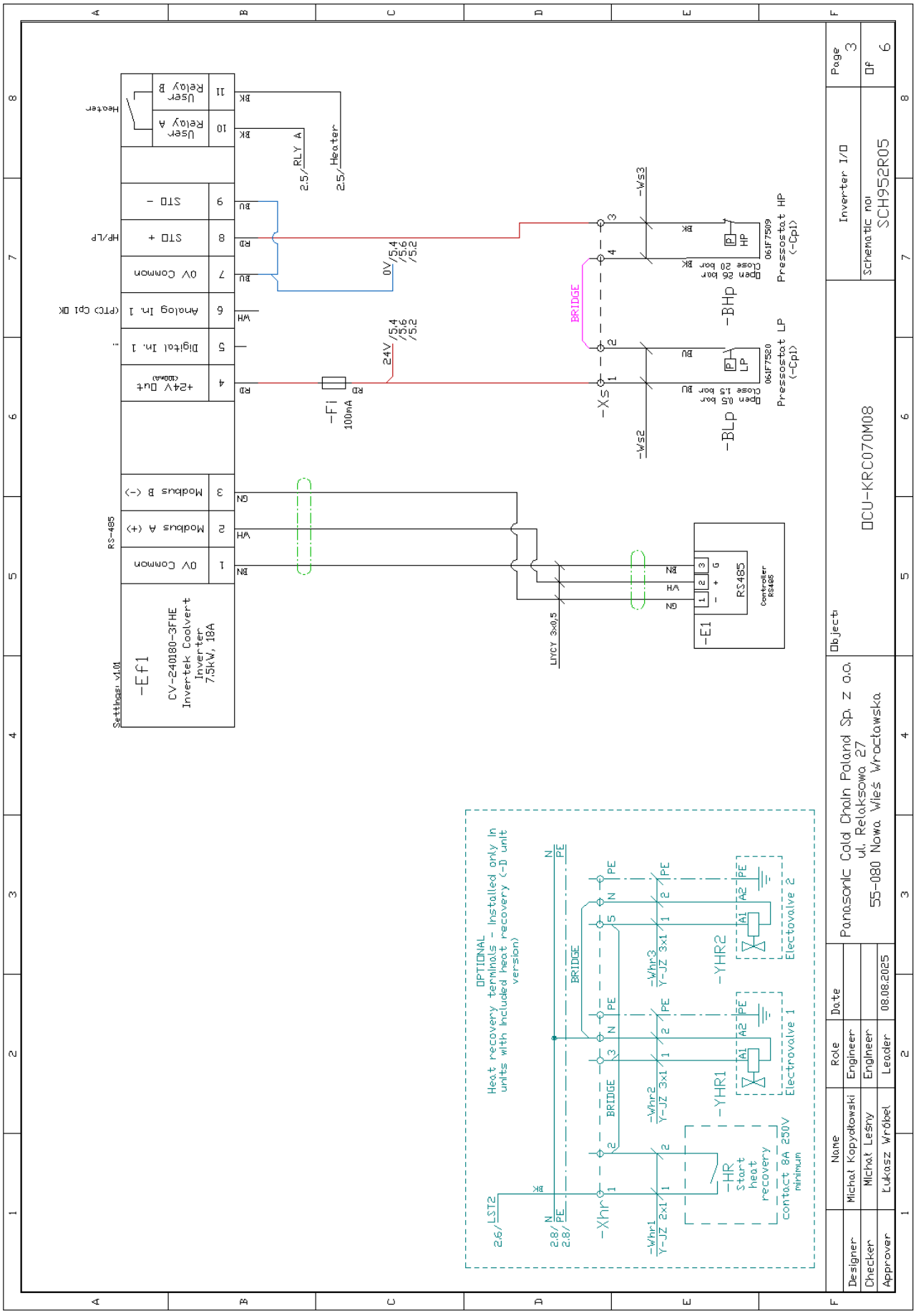
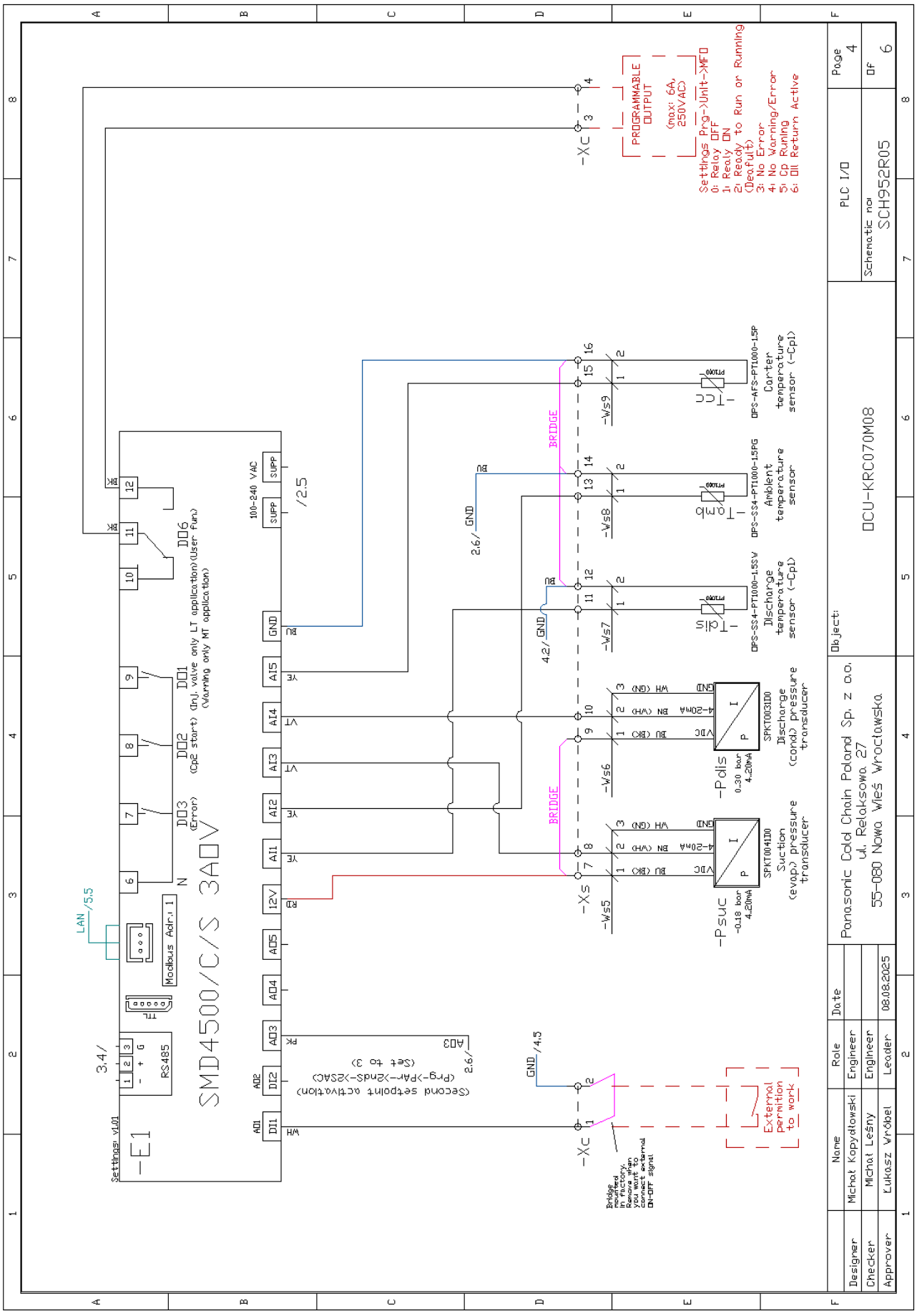

Object
OCU-KRC070M08
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Main supply
Schematic no:
SCH952R05
Page 2
Of 6
Designer Michał Kopydłowski Engineer
Checker Michał Leśny Engineer
Approver Łukasz Wróbel Leader 08.08.2025
-F3 C6/1 Condenser fan
-F2 B6/1 PLC / Heater
-F1 B16/3 Inverter
-E1 SMD4500/C/S 3ADV
100-240 VAC
-Ef1 CV-240140-3FHE Inver-tek Coolvert Inverter 5,5kW, 14A
-Cp1 Compressor C-7RZ320L4ABL FLA = 8,7 A RLA = 5,3 A
Compressor carter heater 40W -G1
-Q1 Main switch 40A
Power supply 3x400VAC+N+PE
Unit door PE (end with M5 connector)
Electrical board panel (end with M5 connector)
Unit PE terminal
Side panel
Façade
-W1
-W2 Y-CY-JZ 4x1,5
-W3 Y-DZ 2x1
-W4 Y-JZ 3x1
-Ws4 Y-JZ 3x0,5
-Mf1 EC102/50E3G01-AB630 EC Fan In = 1,2A
-Mf1 FN063-6IA.BD.A7P2 EC Fan In = 1A
OPTIONAL
BRIDGE
Heater /3.8
RLY A /3.8
LST /5.1 /5.7
LST2 /2.1
NST /5.7 /5.1
GND /4.5
AD3 /4.2
N /31
PE /31


-EF1
CV-240180-3FHE
Inverter-tek Coolvert
Inverter
7,5kW, 18A
Settings: v1.01
RS-485
1 0V Common
2 Modbus A (+)
3 Modbus B (-)
4 +24V Out (100mA)
5 Digital In. 1
6 Analog In. 1 (PTC Opt OK
7 0V Common
8 STO +
9 STO -
10 User Relay A
11 User Relay B
Heater
-Fi
100mA
24V /5.4 /5.6 /5.2
0V /5.4 /5.6 /5.2
-Xs
-Ws2
-Ws3
-BLp
-BHp
BRIDGE
Open 1.5 bar Close 1.0 bar
Open 28 bar Close 20 bar
Pressostat LP (-Cp1)
Pressostat HP (-Cp1)
LUYCY 3x0,5
-E1
RS485
Controller RS485
2.5/ RLY A
2.5/ Heater
OPTIONAL
Heat recovery terminals - installed only in units with included heat recovery (-D unit version)
2.6/ LST2
2.8/ N
2.8/ PE
-Xhr
-Whr1 Y-JZ 2x1
-Whr2 Y-JZ 3x1
-Whr3 Y-JZ 3x1
-YHR1
-YHR2
-HR Start heat recovery contact 8A 250V minimum
Electrovalve 1
Electrovalve 2
Designer Michał Kapyałkowski Engineer
Checker Michał Leśny Engineer
Approver Łukasz Wróbel Leader 08.08.2025
Panasonic Cold Chain Poland Sp. z o.o.
ul. Reaksowa 27
55-080 Nowa Wieś Wrocławska
Object:
OCU-KRC070M08
Inverter I/O
Schematic no: SCH952R05
Page 3
Of 6


SMD4500/C/S 3A0V
-E1
Settings v1.01
RS485
Modbus Adr.: 1
LAN /5.5
3.4/
DO1 (Inj. valve only LT application)(User fun)
(Warning only MT application)
DO2 (Cp2 start)
DO3 (Error)
DO6
N
100-240 VAC
/2.5
(Second setpoint activation)
(Prg->Par->2nds->2SAC)
(Set to 3)
2.6/
GND /4.5
Bridge mounted in factory. Remove when you want to connect external On-off signal
External permition to work
-XC
-XS
-Ws5
-Ws6
-Ws7
-Ws8
-Ws9
-Psuc
-Pdis
SPKT0041D0
Suction (evap) pressure transducer
SPKT0031D0
Discharge (cond) pressure transducer
DPS-SS4-PT1000-15SW
Discharge temperature sensor (-Cp1)
DPS-SS4-PT1000-15PG
Ambient temperature sensor
DPS-AFS-PT1000-15P
Carter temperature sensor (-Cp1)
PROGRAMMABLE OUTPUT
(max: 6A, 250VAC)
Settings Prg->Unit->MF0
0: Relay OFF
1: Ready ON
2: Ready to Run or Running (Default)
3: No Error
4: No Warning/Error
5: Cp Running
6: Oil Return Active
BRIDGE
4.2/ GND
2.6/ GND
Designer
Checker
Approver
Michał Kopydłowski
Michał Leśny
Łukasz Wróbel
Engineer
Engineer
Leader
08.08.2025
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Object:
DCU-KRC070M08
PLC I/O
Schematic no
SCH952R05
Page 4
of 6

Note:
1. Power supply on circuit breaks (-F..) always on the top.

2. Unmarked wires - cross-section 1mm2. Wire colors names according to IEC 60757

3. All the wires in the cabinet finished with sleeve.

4. Wires to the devices not mounted on the panel:

- Q1: 1,3,5 -> 140mm
  (out of the outlet)
- Q1: 2,4,6 -> 140mm
  (out of the outlet)
- Power wires to -Ef1:
  L1,L2,L3,G -> 810mm
  (to back of the plate
  and out of the outlet)
- Control wires to -Ef1 -> 300mm
  (out of the outlet)
- Unit PE -> 550mm
  (out of the outlet)

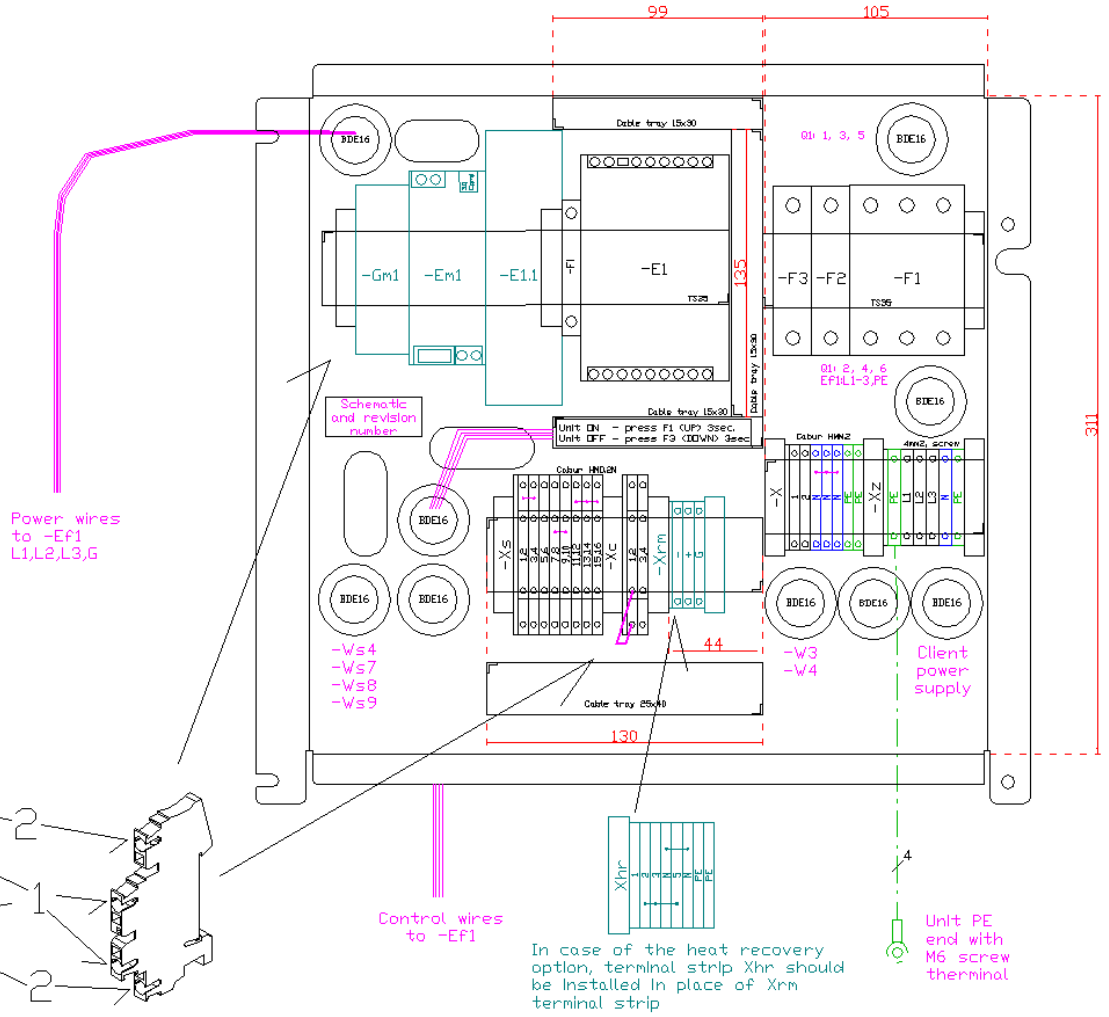
5. Number of diagram and it's revision to be labeled on plate in indicated place.

6. All the wires to external components marked with pin numbers according to electric diagram and finished with sleeve.

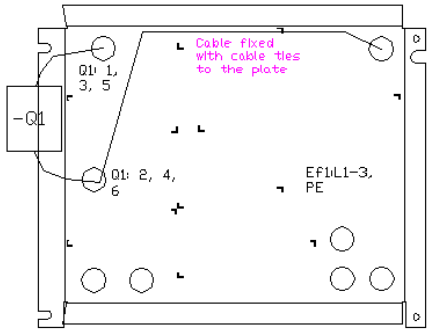
7. Wires at the back of the plate wrapped with spiral wrap

*. Optional elements.

FRONT VIEW



BACK VIEW



	Name	Role	Date
Designer	Michał Kopydłowski	Engineer	
Checker	Michał Leśny	Engineer	
Approver	Łukasz Wróbel	Leader	08.08.2025

Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska

Object:
DCU-KRC070M08

Mounting plate

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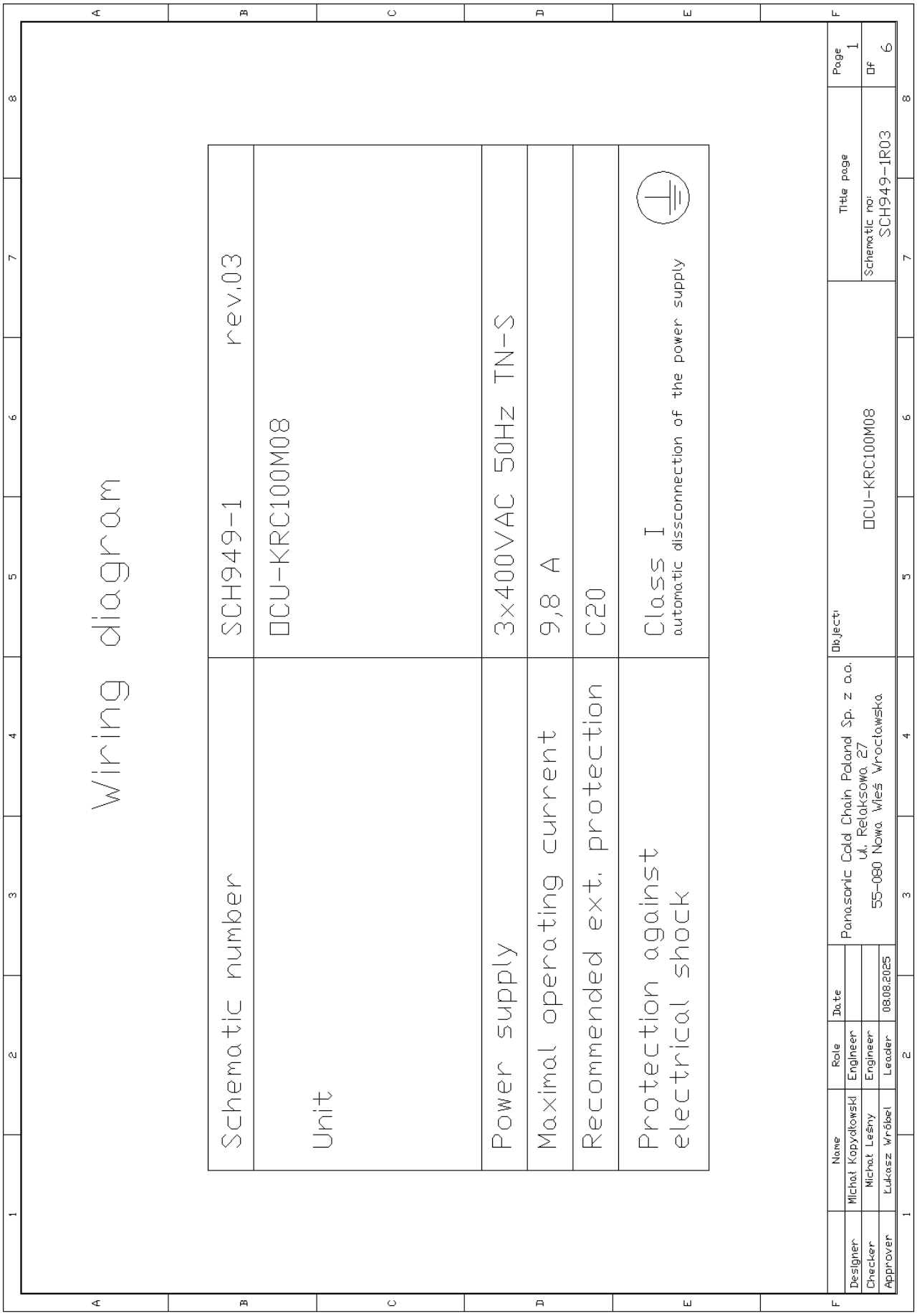
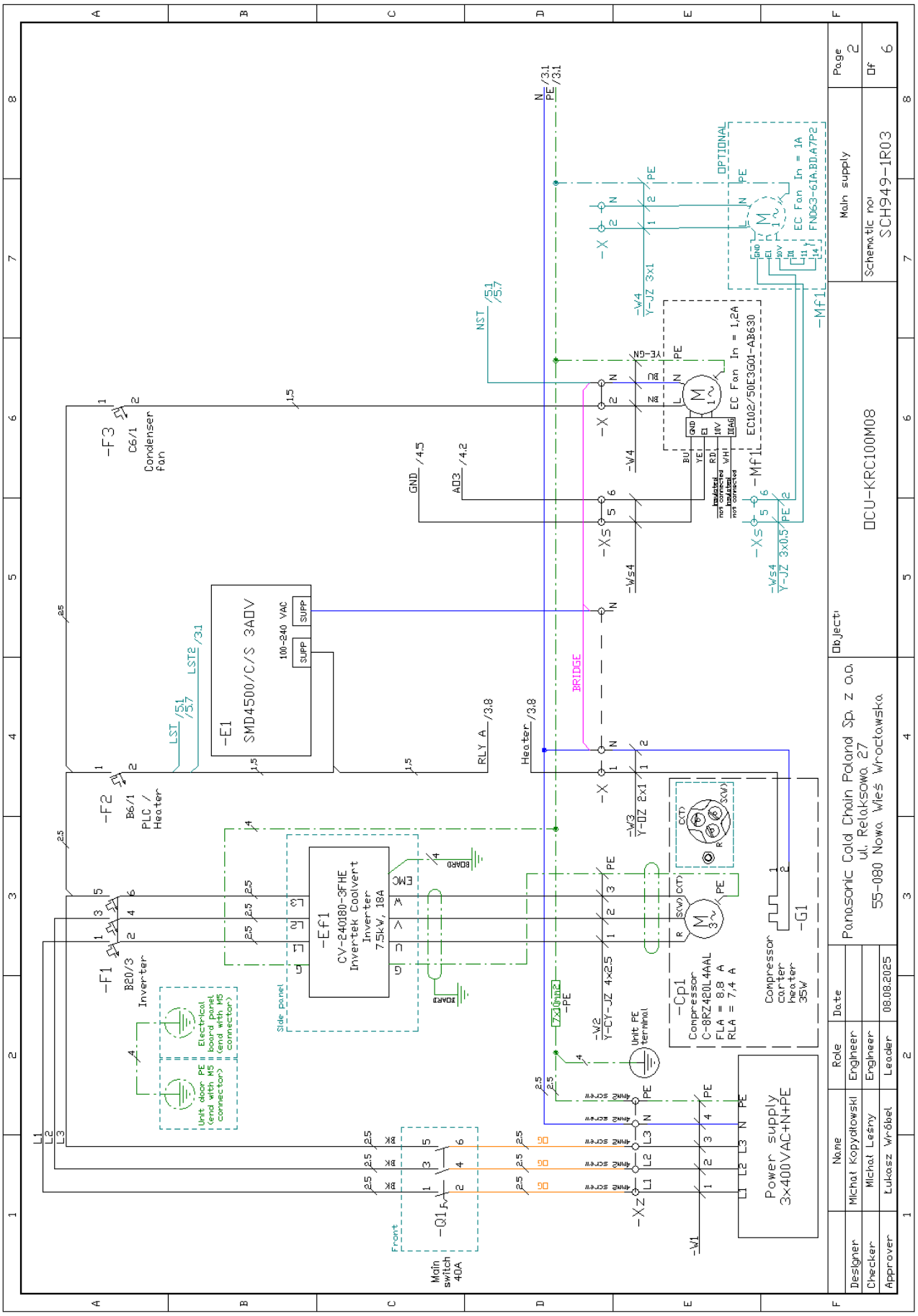
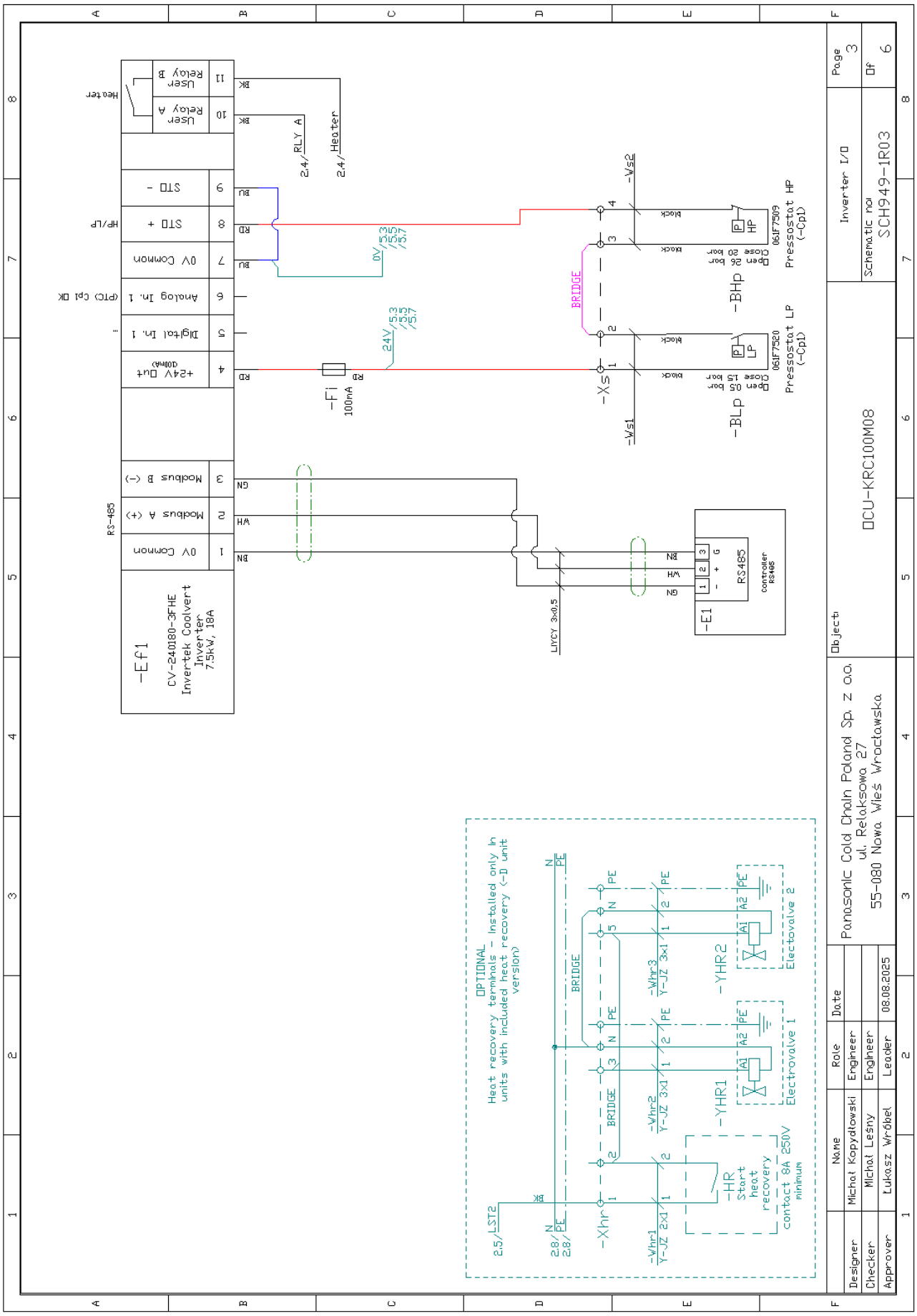
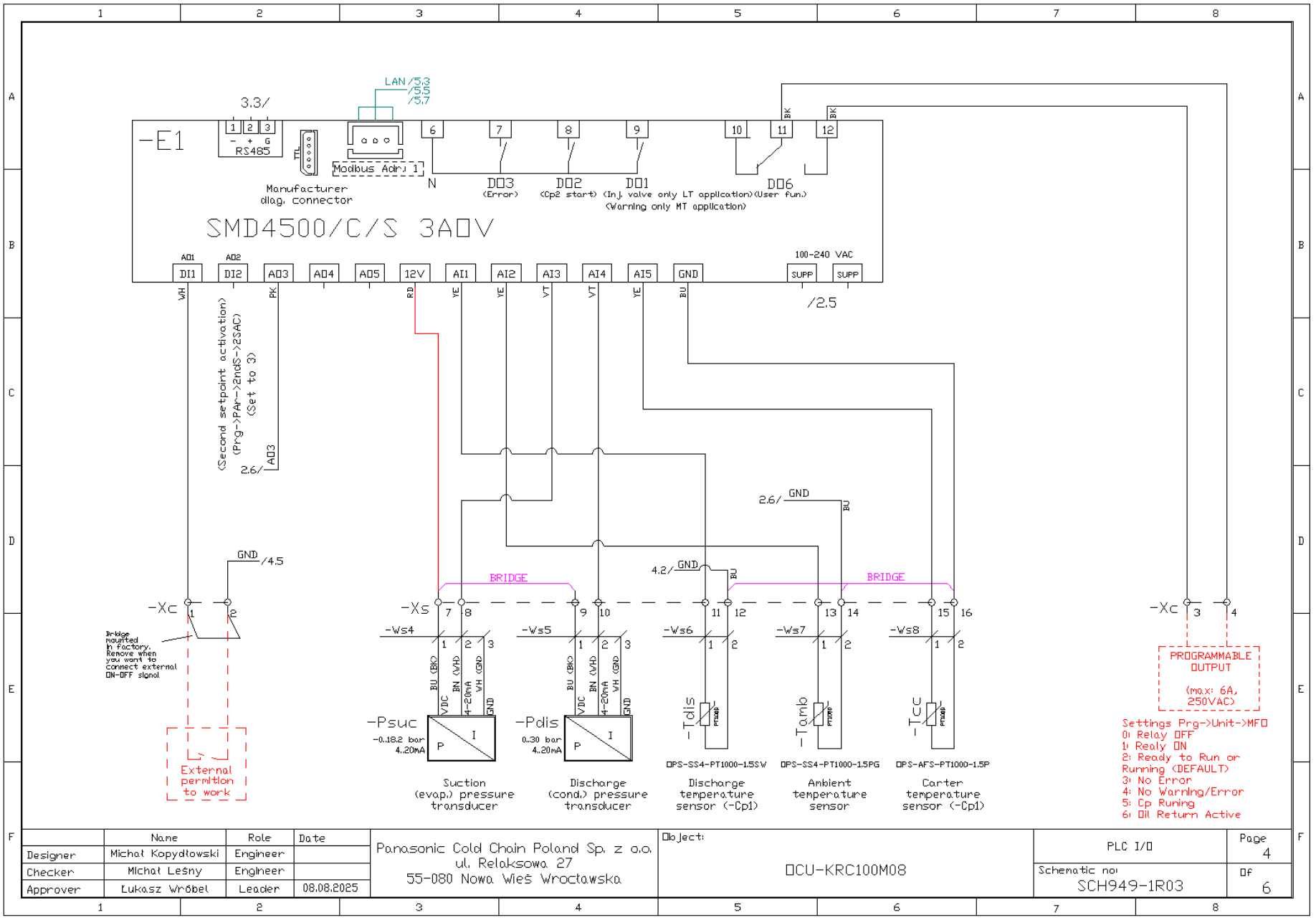
Schematic no:
SCH952R05

16.4 OCU-KRC100M08




Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
OCU-KRC100M08
Main supply
Schematic no: SCH949-1R03
Page 2
Of 6
Designer Michał Kopydłowski Engineer
Checker Michał Leśny Engineer
Approver Łukasz Wróbel Leader 08.08.2025
-E1 SMD4500/C/S 3A0V
-Ef1 CV-240180-3FHE Inverter-tek Coolvert Inverter 7.5kW, 18A
-F1 B20/3 Inverter
-F2 B6/1 PLC / Heater
-F3 C6/1 Condenser Fan
-Mf1 EC102/50E3G01-AB630 EC Fan In = 1,2A
-Mf1 FN063-61A.BD.A7P2 EC Fan In = 1A
-Cp1 Compressor C-8RZ420L4AAL FLA = 8,8 A RLA = 7,4 A
-G1 Compressor carter heater 35W
-Q1 Main switch 40A
-Xz Power supply 3x400VAC+N+PE
-W1 -W2 -W3 -W4 -Ws4
-X -Xs
OPTIONAL
BRIDGE
Heater /3.8
RLY A /3.8
LST /5.1 /5.7
LST2 /3.1
NST /5.1 /5.7
GND /4.5
AO3 /4.2
N /3.1
PE /3.1
100-240 VAC
Unit door PE (end with M5 connector)
Electrical board panel (end with M5 connector)
Side panel
Unit PE terminal
Front


-Ef1
CV-240180-3FHE
Inverter-tek Coolvert
Inverter
7.5kW, 18A
0V Common
Modbus A (+)
Modbus B (-)
+24V Out
Digital In. 1
Analog In. 1 (PTC) Cpl OK
0V Common
STO +
STO -
User Relay A
User Relay B
HP/LP
Heater
RS-485
-Fl
100mA
24V /53 /57
0V /53 /57
2.4/ RLY A
2.4/ Heater
-Xs
-Ws1
-Ws2
-BLp
-BHp
BRIDGE
Open 0.5 bar
Close 1.5 bar
Open 2.6 bar
Close 2.0 bar
Pressostat LP (-Cp1)
Pressostat HP (-Cp1)
LIYCY 3x0.5
-E1
RS485
controller RS485
OPTIONAL
Heat recovery terminals - installed only in units with included heat recovery (-D unit version)
2.5/ LST2
2.8/ N
2.8/ PE
-Xhr
-Whr1 Y-JZ 2x1
-Whr2 Y-JZ 3x1
-Whr3 Y-JZ 3x1
-HR Start heat recovery contact 8A 250V minimum
-YHR1 Electrovalve 1
-YHR2 Electrovalve 2
OCU-KRC100M08
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Inverter I/O
Schematic no SCH949-1R03
Page 3
Of 6
Designer Michał Kopydłowski Engineer
Checker Michał Leśny Engineer
Approver Łukasz Wróbel Leader
08.08.2025



	Name	Role	Date
Designer	Michał Kopydłowski	Engineer	
Checker	Michał Leśny	Engineer	
Approver	Łukasz Wróbel	Leader	08.08.2025

Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska

Object:
□CU-KRC100M08

PLC I/□

Page 4

Schematic no:
SCH949-1R03

Of 6

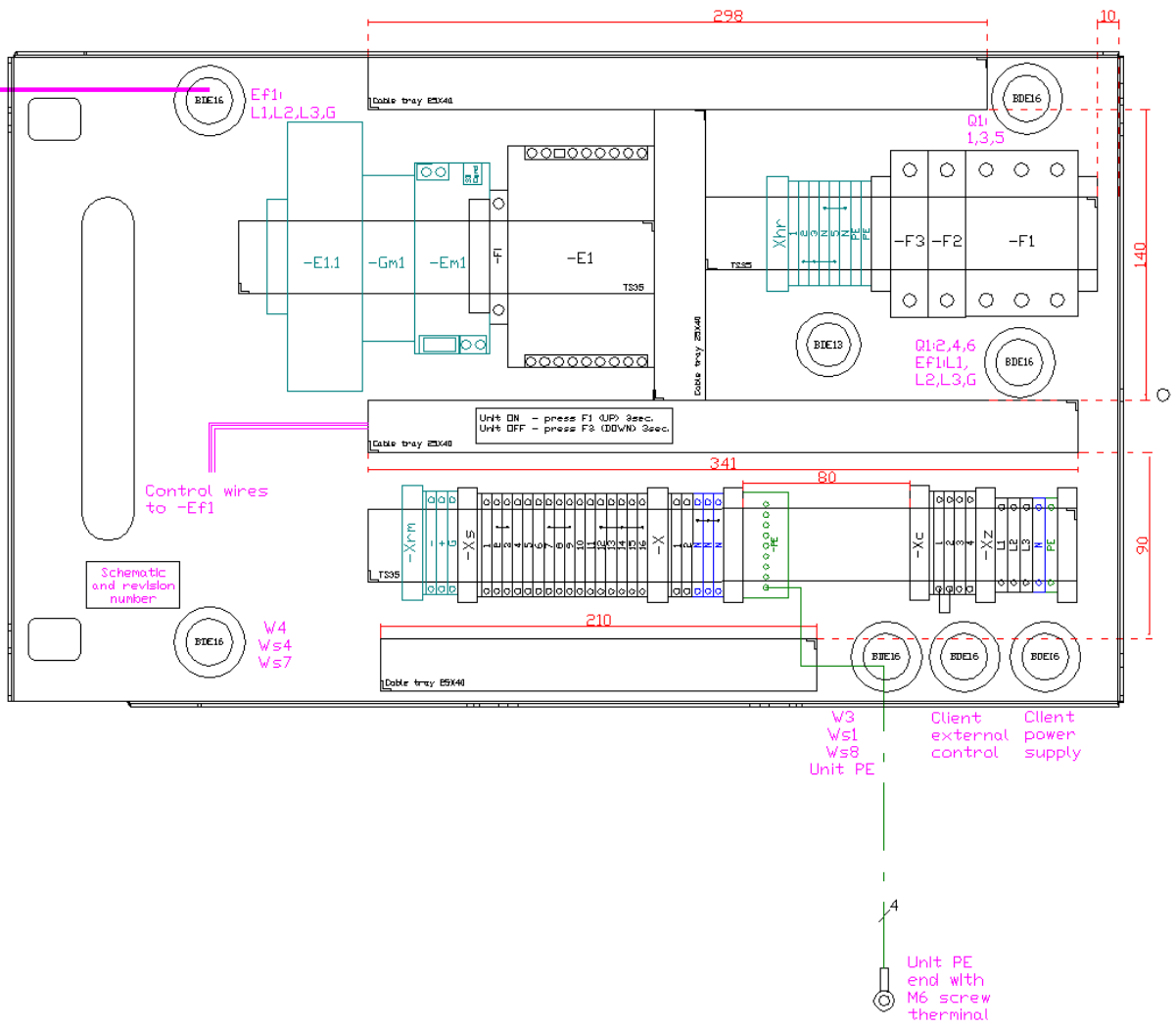
Note:
1. Power supply on circuit breaks (-F..) always on the top.
2. Unmarked wires - cross-section 1mm2. Wire colors names according to IEC 60757
3. All the wires in the cabinet finished with sleeve.
4. Wires to the devices not mounted on the panel:

- Q1: 1,3,5 -> 140mm (out of the outlet)
- Q1: 2,4,6 -> 140mm (out of the outlet)
- Power wires to -Ef1: L1,L2,L3,G -> 750mm (to back of the plate and out of the outlet)
- Control wires to -Ef1 -> 320mm (out of the cable tray)
- Unit PE -> 750mm (out of the outlet)

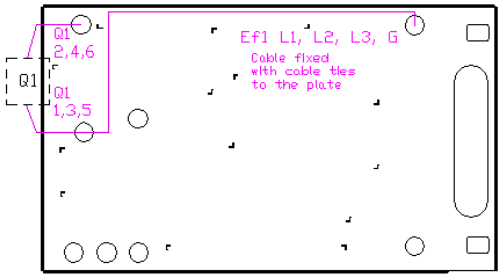
5. Cables to inverter marked with pin numbers of inverter.
6. All the wires to external components marked with pin numbers according to electric diagram and finished with sleeve.
7. Wires at the back of the plate wrapped with spiral wrap

*. Optional elements.

FRONT VIEW



BACK VIEW



	Name	Role	Date
Designer	Michał Kopydłowski	Engineer	
Checker	Michał Leśny	Engineer	
Approver	Łukasz Wróbel	Leader	08.08.2025

Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska

Object: CU-KRC100M08

Mounting plate

Schematic no: SCH949-1R03

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17. The commissioning report

PROTOCOL OF UNIT START UP			
SERIAL NUMBER	**UNIT TYPE**	**DATE OF START UP**	**REFRIGERANT**

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	bar	
Unit suction pipe 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

ul. Relaksowa 27

55-080 Nowa Wieś Wrocławska

Poland

Tel: +48 71 354 56 24

www.refrigeration.panasonic.eu | www.panasonicproclub.com