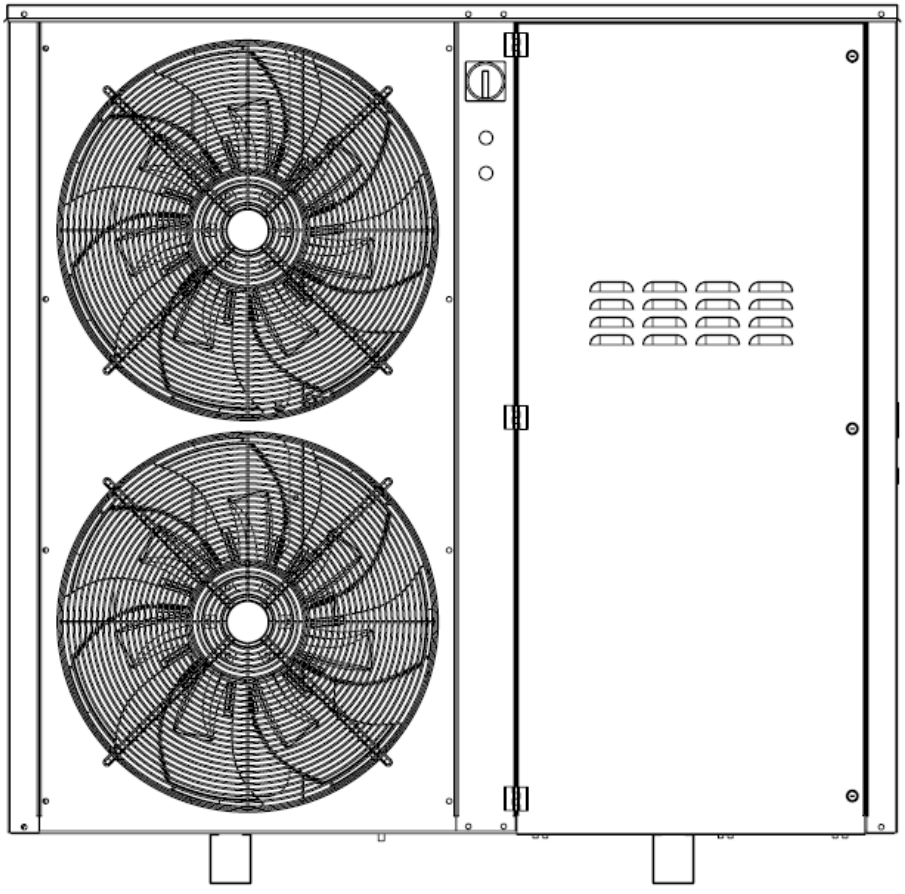
Panasonic®

iCOOL

Outdoor Condensing Units
Unit manual

Model No.

OCU-KSC120M08	OCU-KSC280M08
OCU-KSC150M08	OCU-KSC400M08
OCU-KSC160M08	OCU-KSC420M08
OCU-KSC190M08	OCU-KSC090L08
OCU-KSC240M08	OCU-KSC140L08



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

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1. General Information

- Refrigeration 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 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 unit constitutes only a part of a refrigeration system and must be used only with its other components.
- The evaporator capacity, expansion valve and other components must be selected accordingly to the unit's capacity and the system must be designed to ensure appropriate oil circulation (including its return to the compressor crankcase).
- 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 17.
- Keep this instruction for 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-KSC120M08	OCU-KSC150M08	OCU-KSC160M08	OCU-KSC190M08	OCU-KSC240M08
R448A	✓	✓	✓	✓	✓
R449A	✓	✓	✓	✓	✓
R134a	✓	✓	✓	✓	✓
R513A	✓	✓	✓	✓	✓

Table of permitted refrigerants

	OCU-KSC280M08	OCU-KSC400M08	OCU-KSC420M08	OCU-KSC090L08	OCU-KSC140L08
R448A	✓	✓	✓	✓	✓
R449A	✓	✓	✓	✓	✓
R134a	✓	✓	✓		
R513A	✓	✓	✓		

2. Safety

All work on refrigeration system shall be carried out only by personnel which has been trained and instructed in all work. Personnel which installs, services, maintains, repairs, checks for leaks, 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 us gloves, googles, 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 to cool down.

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

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

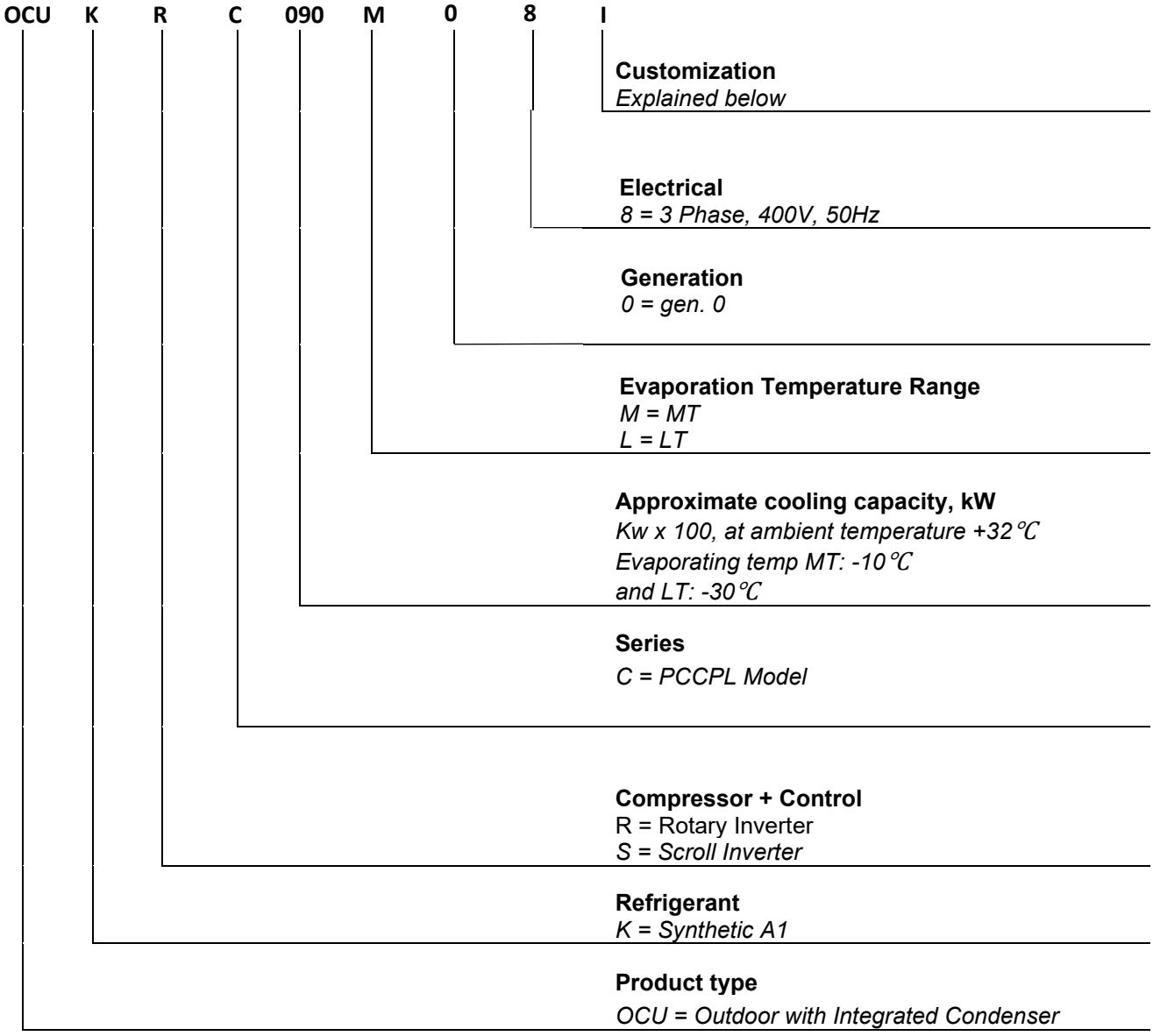
Improper handling can cause electric shock.

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 (N2), 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.

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

3. Type code description



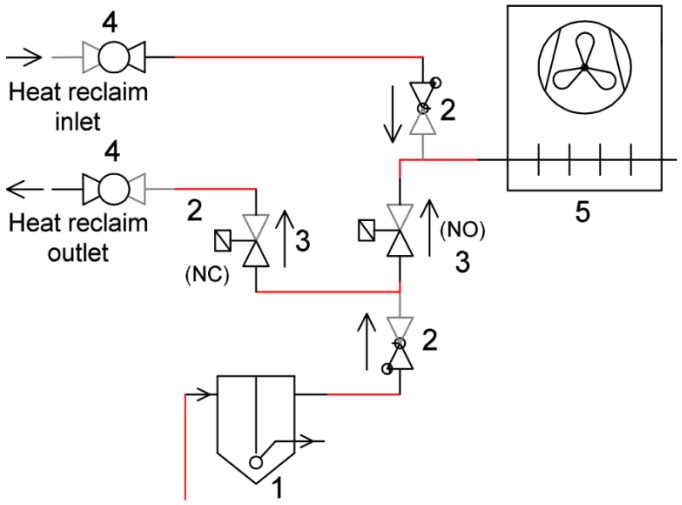
Decoding by example: OCU-KRC100M08-C

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

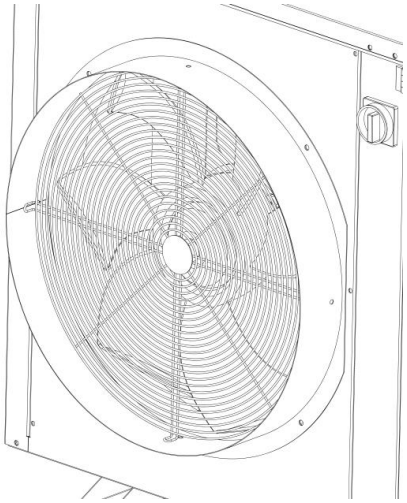
- C – Condenser anticorrosion coating
  Heat exchanger is covered with dedicated protective layer, which effectively protects it from the harmful effects of moisture, salt spray and industrial pollution. This solution significantly extends the life of the condenser and improves the reliability of the 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 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.



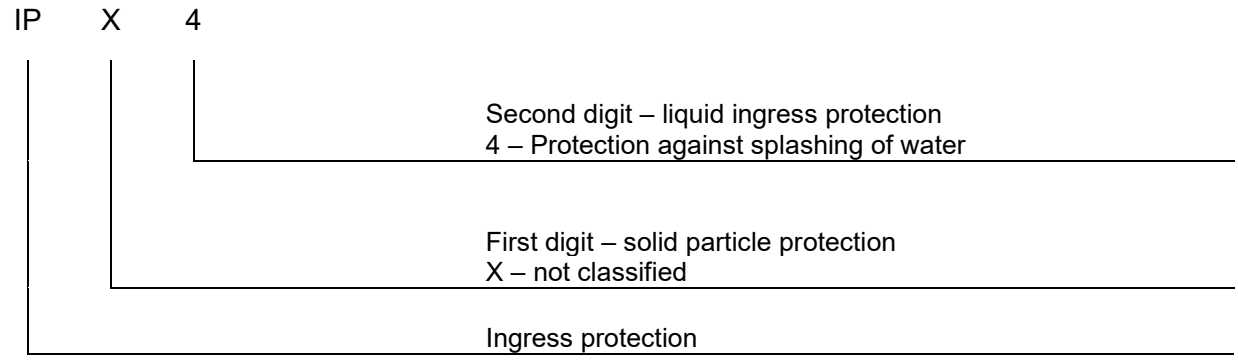
4. Units specification

4.1. Components

- Avic or Panasonic hermetic inverter compressor or tandem of Panasonic compressors (inverter+fixed speed) with crankcase heater
- air-cooled condenser
- EC fans with speed regulator
- 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 with shut-off valve on the outlet
- safety valve
- liquid line: filter drier, sight glass with moisture indicator, shut-off valve
- service valves
- HP/LP pressure switch with auto reset – compressor protection
- LP pressure switch – safety mode of operation (applies to units with two compressors and OCU-KSC150M08),
- inverter – control of compressor's performance,
- soundproof housing

4.2. Unit degree of protection (IP)

Complete unit: IP X4



5. Technical data

Model				OCU-KSC120M08	OCU-KSC150M08	OCU-KSC160M08	OCU-KSC190M08	OCU-KSC240M08
Compressor				**Single compressor**	**Single compressor**	**Tandem compressor**	**Tandem compressor**	**Tandem compressor**
Compatible refrigerants				**R448A, R449A, R134a, R513A**	**R448A, R449A, R134a, R513A**	**R448A, R449A, R134a, R513A**	**R448A, R449A, R134a, R513A**	**R448A, R449A, R134a, R513A**
PED category				**II**	**II**	**II**	**II**	**II**
Application			**MT/LT (kW)**	**MT (12,0)**	**MT (15,0)**	**MT (16,0)**	**MT (19,0)**	**MT (24,0)**
SEPR cooling at ET —10 °C AT 32 °C				**3,48**	**3,87**	**3,61**	**3,39**	**4,31**
SEPR freezing at ET —35 °C AT 32 °C				**—**	**—**	**—**	**—**	**—**
Annual electricity consumption at ET —10 °C AT 32 °C			**kWh/a**	**20 141**	**23 139**	**27 903**	**33 985**	**34 316**
Annual electricity consumption at ET —35 °C AT 32 °C			**kWh/a**	**—**	**—**	**—**	**—**	**—**
Nominal operating current at ET -10 °C MT / -30 °C LT AT 32 °C and 230 - 400 V 50 Hz			A	14,8	15,2	21,3	26,3	25,9
Maximum operating current (in the most loaded phase at 230 - 400 V 50 Hz)			A	20,5	22,6	27,9	32,3	34,8
Maximum power consumption			kW	9,3	10,1	14	17,1	17,4
Dimensions	W x H x D		mm	1 420 x 963 x 439	1 322 x 1 493 x 475	1 521 x 1 493 x 475	1 521 x 1 493 x 475	1 528 x 1 488 x 879
Weight			kg	175	231	283	285	397
Sound level at 10 m			dB(A)	40,0	44,0	44,0	44,0	44,0
Condenser	Fans x diameter		mm	1x710	2x630	2x630	2x630	2x630
	Air flow		m^3/h	6 920	11 150	11 150	11 150	12 600
	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 - 240 / 1 / 50
	Fan power consumption		W	280	2x230	2x230	2x230	2x230
	Nominal fan amperage		A	1,2	2x1	2x1	2x1	2x1
Compressor	Model			C-SBS180H00B	C-SBVN373L0B	C-SBS180H00B/ C-SBN303H8G	C-SBS180H00B/ C-SBN453H8G	C-SBVN373L0B/ C-SBN453H8G
	Volumetric flow		m^3 / h	5,8 - 19,2	9,2 - 24,6	5,8 - 17,4 / 11,6	5,8 - 17,4 / 14,7	7,7 - 24,6 / 14,7
	Rotation range		rps	32 - 100	30 - 80	32 - 90	32 - 90	31 - 80
	Current	Full load amperage	A	15,8	16,9	14,7 / 8,0	15,2 / 11,9	17,2 / 11,9
		Peak current limit / Locked rotor amperage	A	40 / —	46 / —	34 / 48	34 / 66	46 / 66
	Oil type			FV68S (PVE)	FV68S (PVE)	FV68S (PVE)	FV68S (PVE)	FV68S (PVE)
	Crankcase heater power consumption		W	70	90	2x70	2x70	40
Oil charge			dm^3	2,0 + 0,4	2,0 + 0,6	2,0 + 1,7 + 2x0,4	2,0 + 1,7 + 2x0,4	2,0 + 1,7 + 2x0,6
Connections	Suction		Inch	7/8	1 1/8	1 1/8	1 1/8	1 3/8
	Liquid		Inch	1/2	5/8	5/8	5/8	7/8
Liquid receiver			dm^3	10	15	15	15	15
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		mm^2	5x4,0	5x6,0	5x6,0	5x10,0	5x10,0
	Recommended minimum protection			C25	C32	C32	C40	C40
Maximum recommended pipe distance			m	40	50	50	50	70
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	13	13	13	13	13
Maximum quantity of evaporators connected			Qty.	7	7	10	10	10
Evaporation temperature	Min ~ Max		°C	-15 ~ 10	-15 ~ 10	-15 ~ 10	-15 ~ 10	-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.*

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Model				OCU-KSC280M08	OCU-KSC400M08	OCU-KSC420M08	OCU-KSC090L08	OCU-KSC140L08
Compressor				**Tandem compressor**	**Tandem compressor**	**Tandem compressor**	**Single compressor**	**Tandem compressor**
Compatible refrigerants				**R448A, R449A, R134a, R513A**	**R448A, R449A, R134a, R513A**	**R448A, R449A, R134a, R513A**	**R448A, R449A**	**R448A, R449A**
PED category				**II**	**II**	**II**	**II**	**II**
Application			**MT/LT (kW)**	**MT (28,0)**	**MT (40,0)**	**MT (42,0)**	**LT (9,0)**	**LT (14,0)**
SEPR cooling at ET —10 °C AT 32 °C				**4,27**	**3,61**	**3,52**	**—**	**—**
SEPR freezing at ET —35 °C AT 32 °C				**—**	**—**	**—**	**1,65**	**—**
Annual electricity consumption at ET —10 °C AT 32 °C			**kWh/a**	**39 329**	**67 049**	**73 046**	**—**	**—**
Annual electricity consumption at ET —35 °C AT 32 °C			**kWh/a**	**—**	**—**	**—**	**33 998**	**—**
Nominal operating current at ET -10 °C MT / -30 °C LT AT 32 °C and 230 - 400 V 50 Hz			A	30,5	40	43,9	20,7	32,9
Maximum operating current (in the most loaded phase at 230 - 400 V 50 Hz)			A	40,4	53,8	57,3	29,9	43
Maximum power consumption			kW	20,9	28,5	31,4	13,6	21
Dimensions	W x H x D		mm	1 528 x 1 488 x 879	1 670 x 1 695 x 1 090	1 670 x 1 695 x 1 090	1 322 x 1 493 x 475	1 528 x 1 488 x 879
Weight			kg	426	520	520	286	460
Sound level at 10 m			dB(A)	44,0	43,0	43,0	44,0	44,0
Condenser	Fans x diameter		mm	2x630	1x800	1x800	2x630	2x630
	Air flow		m³/h	12 600	21 000	21 000	11 150	12 600
	Fan static pressure		Pa	N/A	160	160	N/A	N/A
	Fan power supply		V / ph / Hz	200 - 277 / 1 / 50	380 - 400 / 3 / 50	380 - 400 / 3 / 50	200 - 277 / 1 / 50	200 - 277 / 1 / 50
	Fan power consumption		W	2x230	1950	1950	2x230	2x230
	Nominal fan amperage		A	2x1	2,8	2,8	2x1	2x1
Compressor	Model			C-SBVN373L0B/ C-SCN603H8T	4CC149NA04/ C-SCN753H8T	4CC149NA04/ C-SCN903H8T	ACC144NA03	ACC144NA03/ C-SCN603L8H
	Volumetric flow		m³ / h	7,7 - 24,6 / 23,6	10,7 - 39,3 / 30,3	10,7 - 39,3 / 36,2	10,0 - 37,6	10 - 37,6 / 23,8
	Rotation range		rps	31 - 80	21 - 75	21 - 75	25 - 72	25 - 72
	Current	Full load amperage	A	18,4 / 16,0	26,0 / 19,4	25,8 / 23,2	22,9	21,6 / 14,8
		Peak current limit / Locked rotor amperage	A	46 / 80	52 / 96	52 / 96	46 / —	46 / 90
	Oil type			FV68S (PVE)	FV68S (PVE)	FV68S (PVE)	FV32S (PVE)	FV32S (PVE)
	Crankcase heater power consumption		W	2x90	2x90	2x90	90	2x90
Oil charge			dm³	2,0 + 2,8 + 2x0,6	2x2,8 + 2,0	2x2,8 + 2,0	2,5 + 0,4	2x2,5 + 2x0,6
Connections	Suction		Inch	1 3/8	1 5/8	1 5/8	1 1/8	1 3/8
	Liquid		Inch	7/8	7/8	7/8	5/8	7/8
Liquid receiver			dm³	15	30	30	15	15
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	5x10,0	5x16,0	5x16,0	5x6,0	5x10,0
	Recommended minimum protection			C50	C63	C63	C32	C50
Maximum recommended pipe distance			m	70	70	70	40	50
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	13	13	13	19	19
Maximum quantity of evaporators connected			Qty.	10	20	20	5	7
Evaporation temperature	Min ~ Max		°C	-15 ~ 10	-15 ~ 10	-15 ~ 10	-35 ~ -10	-35 ~ -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.*

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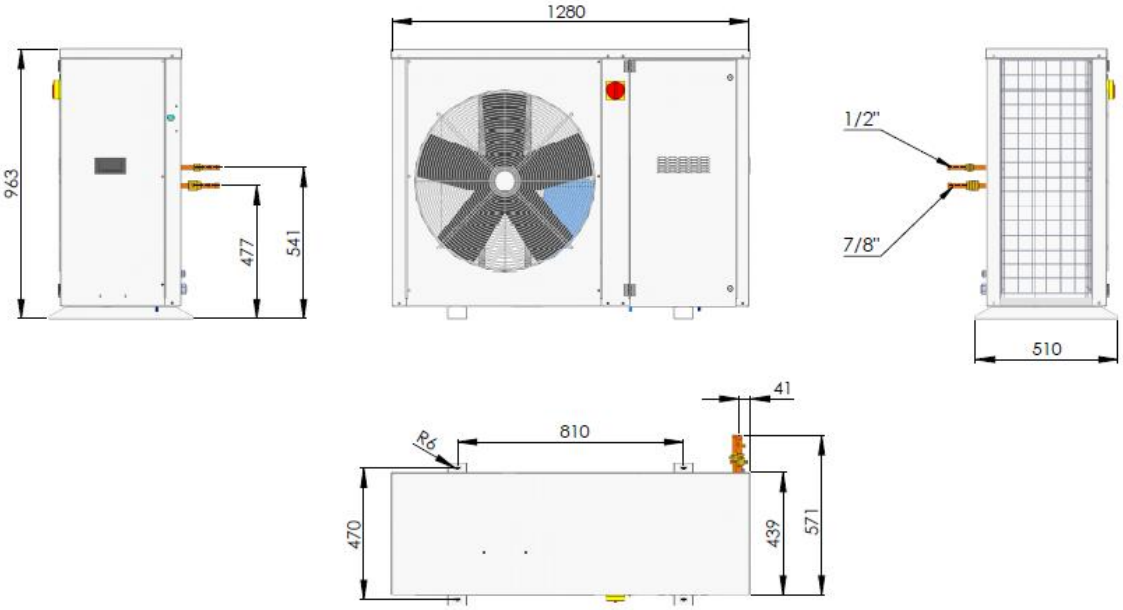
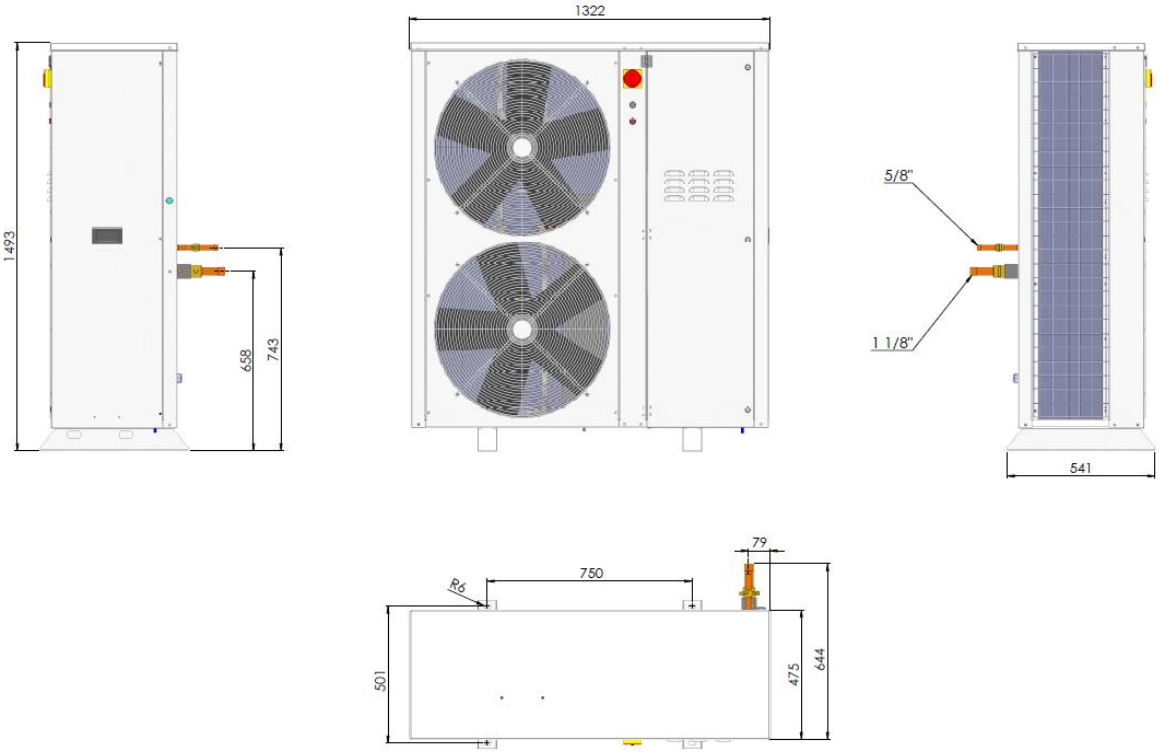
6. Units drawings

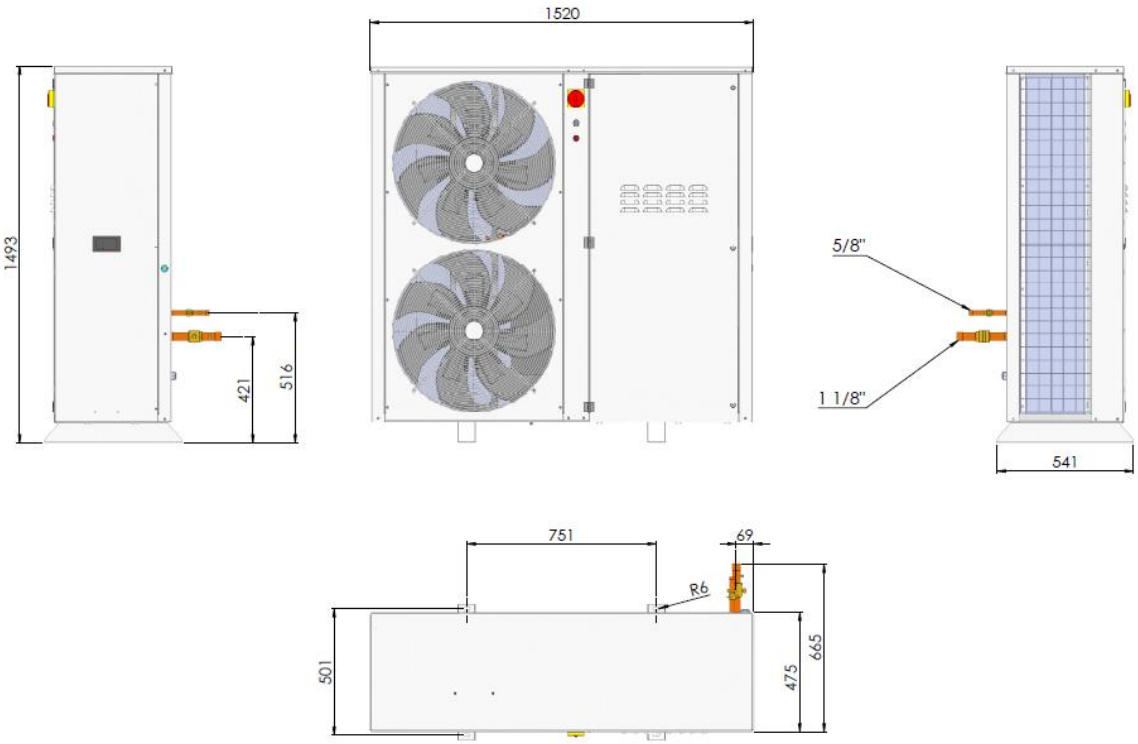
6.1. OCU-KSC120M08



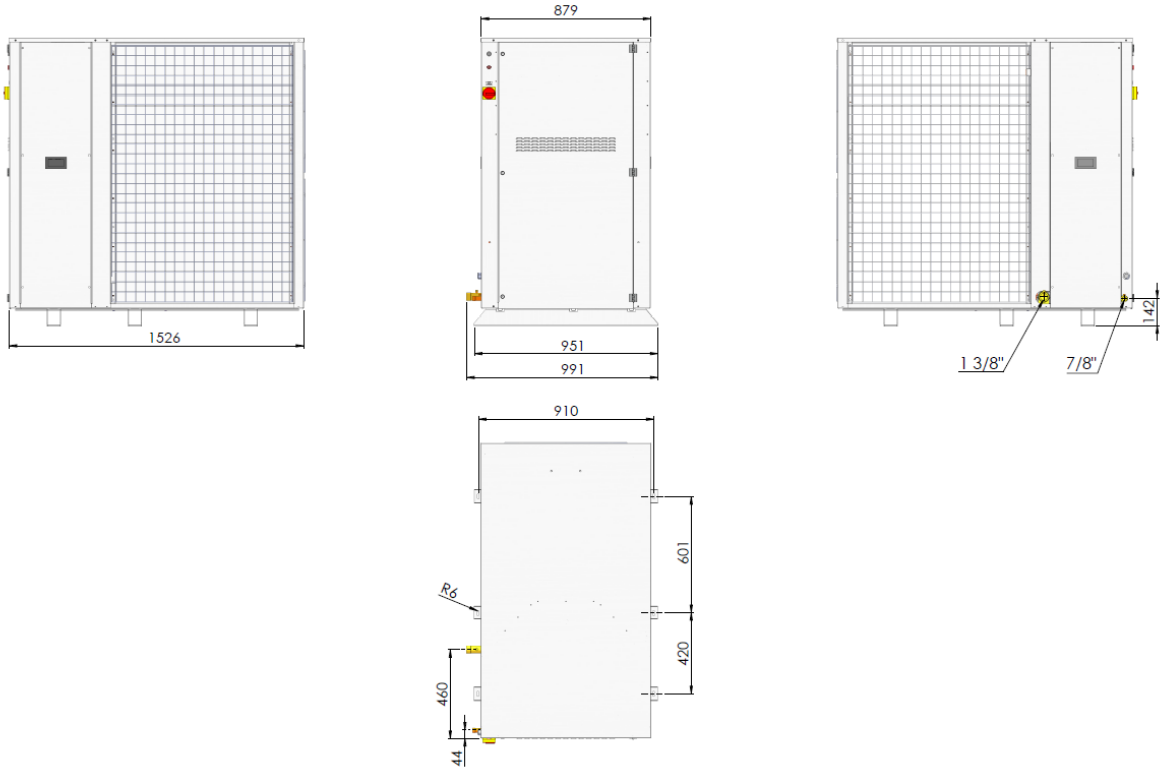
6.2. OCU-KSC090L08 / OCU-KSC150M08



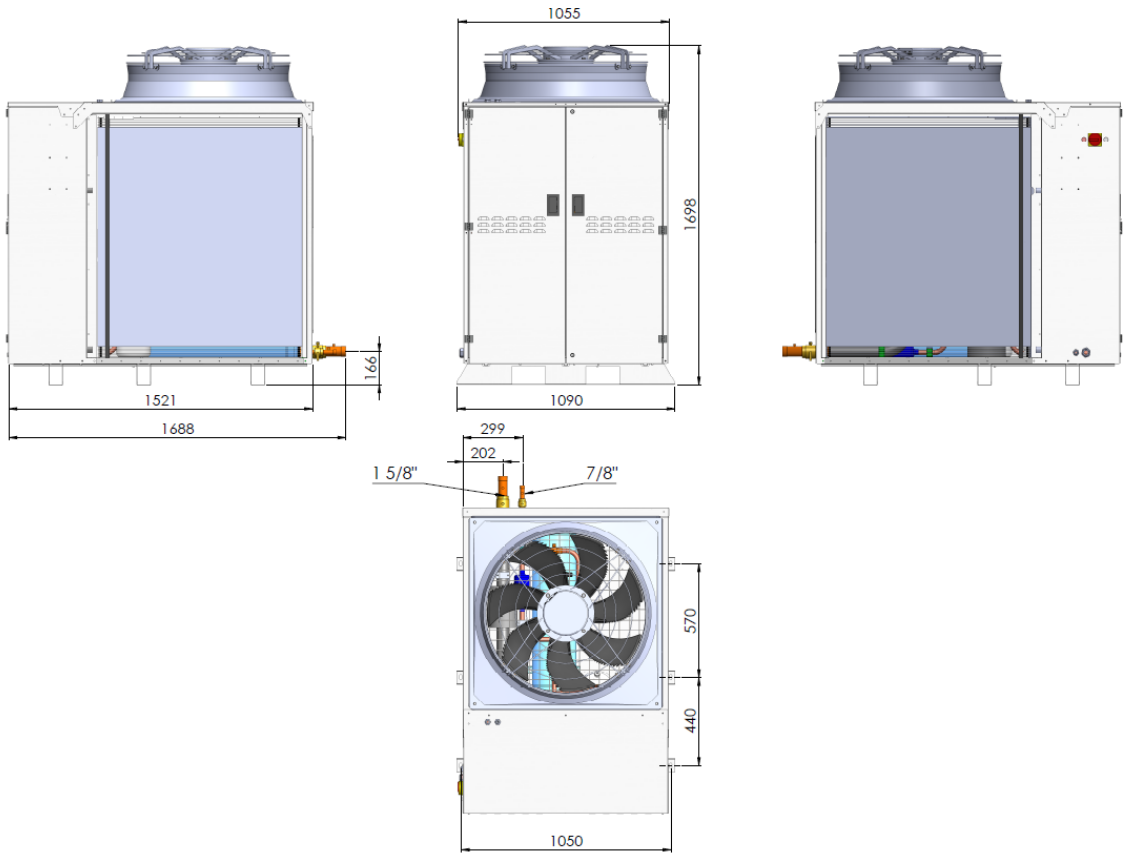
6.3. OCU-KSC160M08 / OCU-KSC190M08



6.4. OCU-KSC140L08 / OCU-KSC240M08 / OCU-KSC280M08

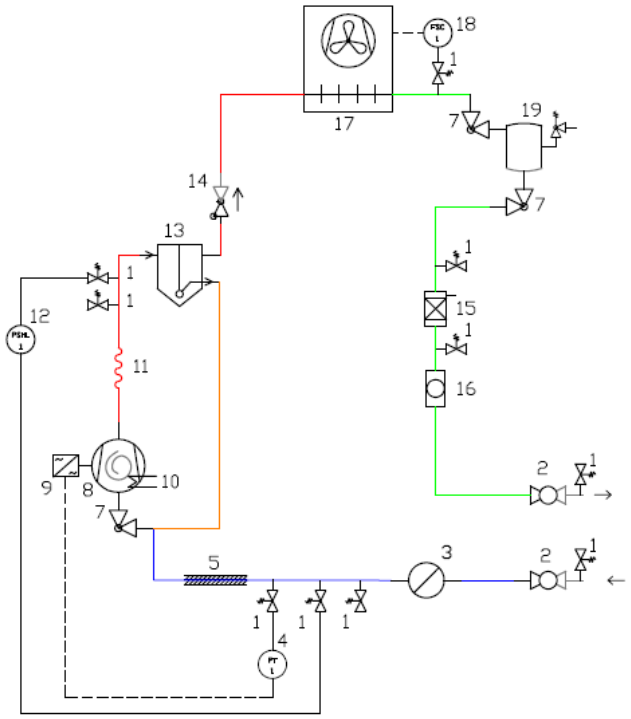


6.5. OCU-KSC400M08 / OCU-KSC420M08



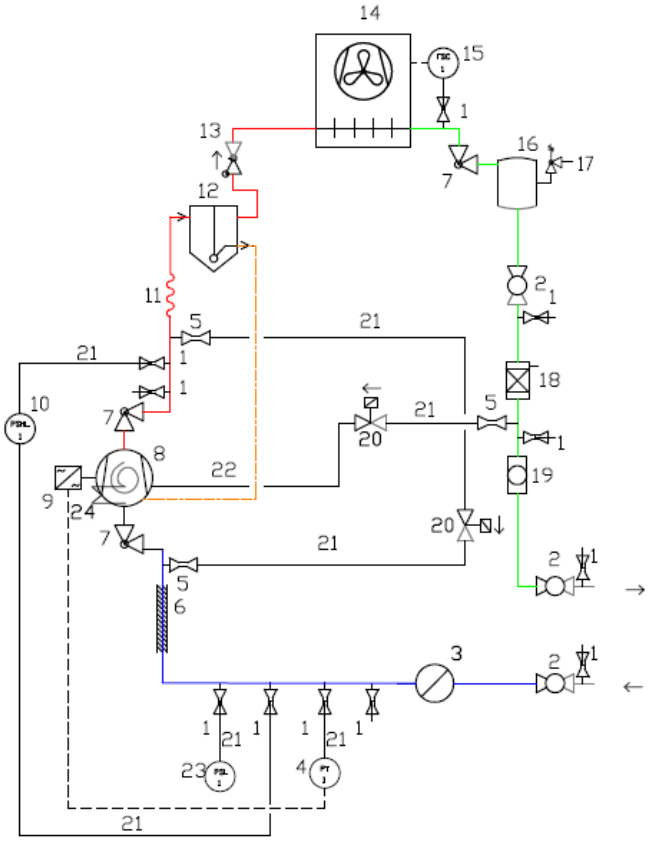
7. Schematic diagrams

7.1. OCU-KRC120M08



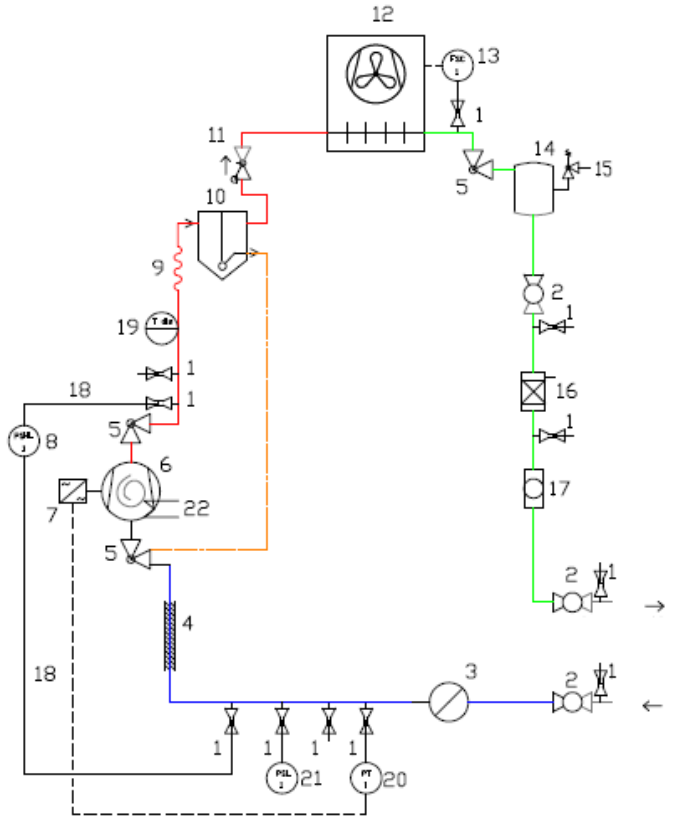
Components	
No.	Name
1	Schrader valve
2	Ball valve
3	Suction separator
4	Suction pressure transmitter
5	Suction insulation
6	Schrader valve body
7	Rotalock valve
8	Compressor
9	Inverter
10	Crankcase heater
11	Vibration absorber
12	Dual pressure switch LP/HP
13	Oil separator
14	Check valve
15	Filter drier
16	Sight glass
17	Condenser with fan
18	Fan speed regulator
19	Liquid receiver
20	Safety valve

7.2. OCU-KSC090L08



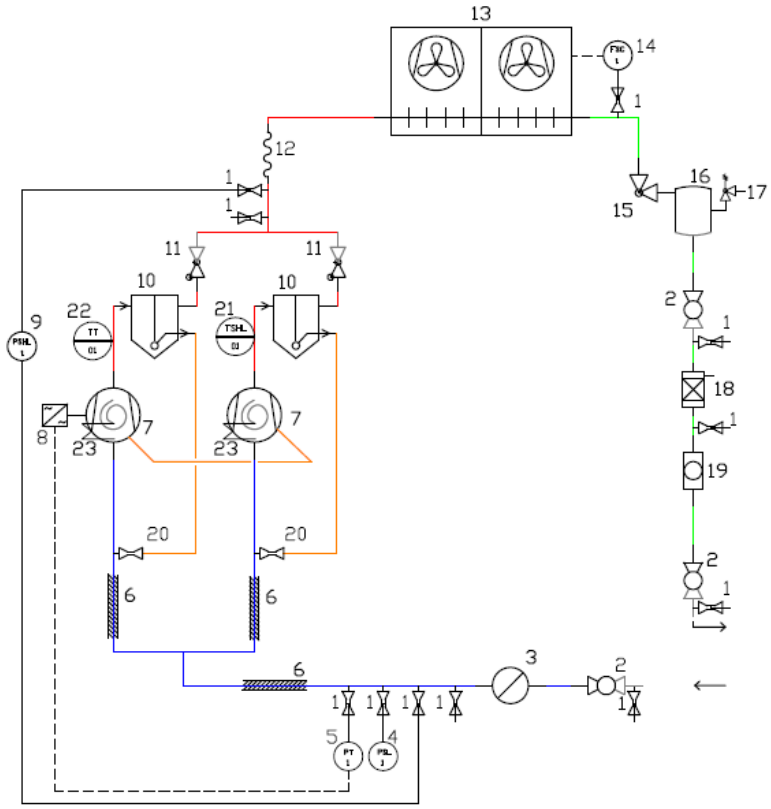
Components	
No.	Name
1	Schrader valve
2	Ball valve
3	Suction separator
4	Suction pressure transmitter
5	SAE fitting
6	Suction insulation
7	Rotalock valve
8	Compressor
9	Inverter
10	Dual pressure switch LP/HP
11	Vibration absorber
12	Oil separator
13	Check valve
14	Condenser with fan
15	Fan speed controller
16	Liquid receiver
17	Safety valve
18	Filter drier
19	Sight glass
20	Solenoid valve NC
21	Pressure conduit
22	Copper capillary tube
23	Pressure switch LP
24	Crankcase heater

7.3. OCU-KSC150M08



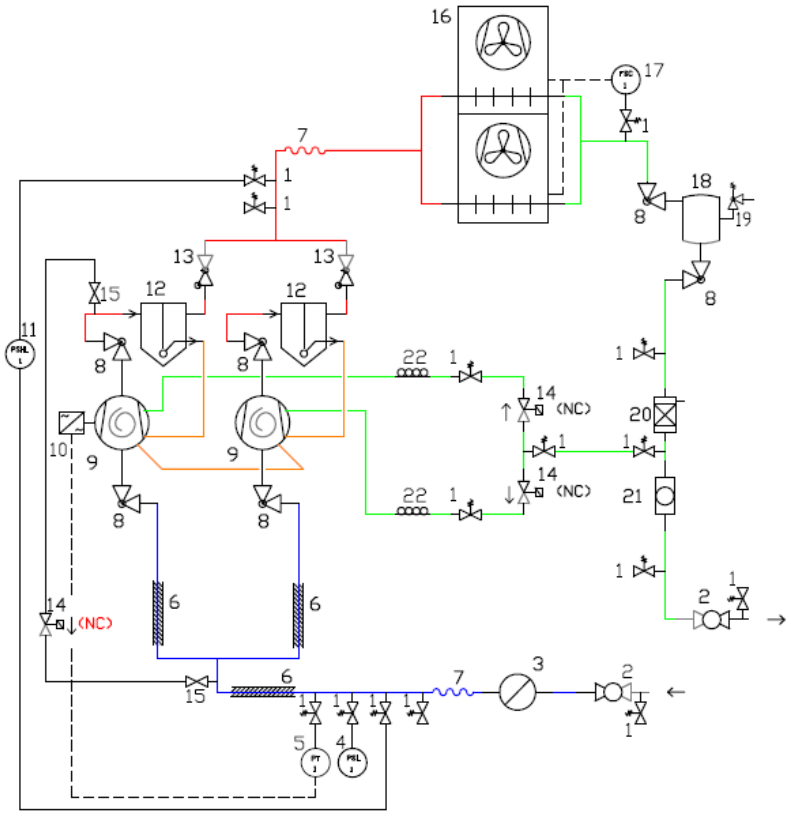
Components	
No.	Name
1	Schrader valve
2	Ball valve
3	Suction separator
4	Suction insulation
5	Rotalock valve
6	Compressor
7	Inverter
8	Dual pressure switch LP/HP
9	Vibration absorber
10	Oil separator
11	Check valve
12	Condenser with fan
13	Fan speed regulator
14	Liquid receiver
15	Safety valve
16	Filter drier
17	Sight glass
18	Pressure conduit
19	Discharge temperature sensor
20	Suction pressure sensor
21	Pressure switch LP
22	Crankcase heater

7.4. OCU-KSC160M08 / OCU-KSC190M08



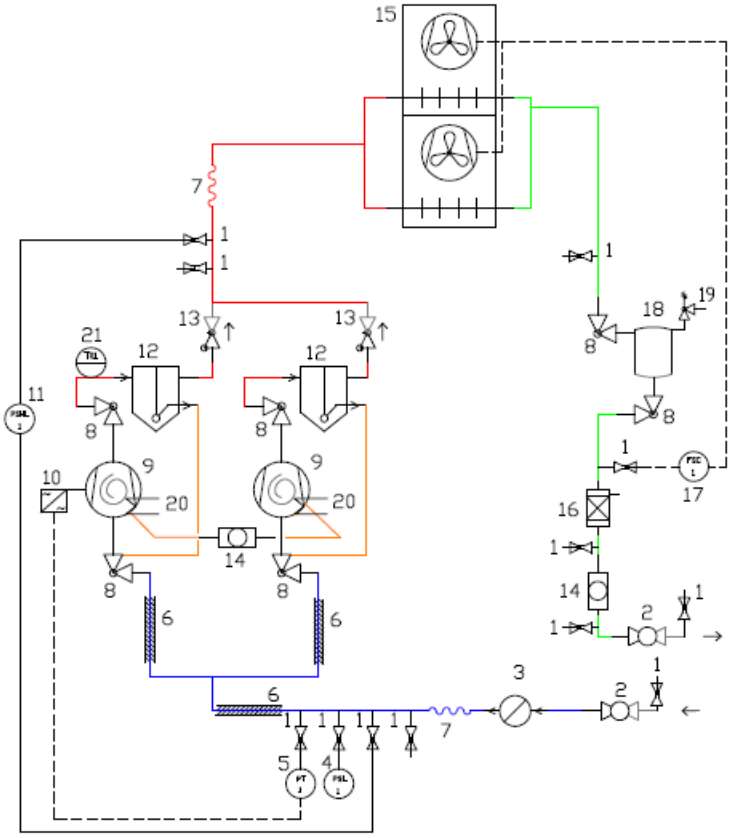
Components	
No.	Name
1	Schrader valve
2	Ball valve
3	Suction separator
4	Pressure switch LP
5	Suction pressure transmitter
6	Suction insulation
7	Compressor
8	Inverter
9	Dual pressure switch LP/HP
10	Oil separator
11	Check valve
12	Vibration absorber
13	Condenser with fan
14	Fan speed controller
15	Rotalock valve
16	Liquid receiver
17	Safety valve
18	Filter drier
19	Sight glass
20	Schrader valve body
21	Thermal switch
22	Temperature sensor
23	Crankcase heater

7.5. OCU-KSC140L08



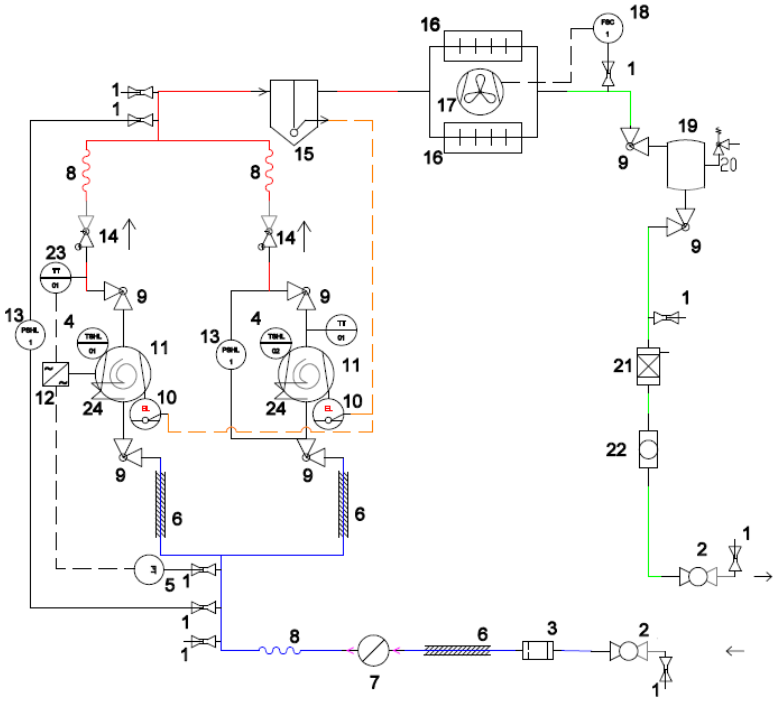
Components	
No.	Name
1	Schrader valve
2	Ball valve
3	Suction separator
4	Pressure switch LP
5	Suction pressure transmitter
6	Suction insulation
7	Vibration absorber
8	Rotalock valve
9	Compressor
10	Inverter
11	Dual pressure switch LP/HP
12	Oil separator
13	Check valve
14	Solenoid valve NC
15	Schrader valve body
16	Condenser with fan
17	Fan speed controller
18	Liquid receiver
19	Safety valve
20	Filter drier
21	Sight glass
22	Copper capillary

7.6. OCU-KSC240M08 / OCU-KSC280M08



Components	
No.	Name
1	Schrader valve
2	Ball valve
3	Suction separator
4	Pressure switch LP
5	Suction pressure transmitter
6	Suction insulation
7	Vibration absorber
8	Rotalock valve
9	Compressor
10	Inverter
11	Dual pressure switch LP/HP
12	Oil separator
13	Check valve
14	Sight glass
15	Condenser with fan
16	Filter drier
17	Fan speed controller
18	Liquid receiver
19	Safety valve
20	Crankcase heater
21	Temperature probe

7.7. OCU-KSC400M08 / OCU-KSC420M08



Components	
No.	Name
1	Schrader valve
2	Ball valve
3	Suction filter
4	Thermal switch
5	Suction pressure transmitter
6	Suction insulation
7	Suction separator
8	Vibration absorber
9	Rotalock valve
10	Oil level regulator
11	Compressor
12	Inverter
13	Dual pressure switch LP/HP
14	Check valve
15	Oil separator
16	Condenser
17	Fan
18	Fan speed controller
19	Liquid receiver
20	Safety valve
21	Filter drier
22	Sight glass
23	Temperature sensor
24	Crankcase heater

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 -35°C and +50°C.

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, carton)

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 the unit into any refrigeration system should be preceded by technical consultation or drawing up a project with 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.

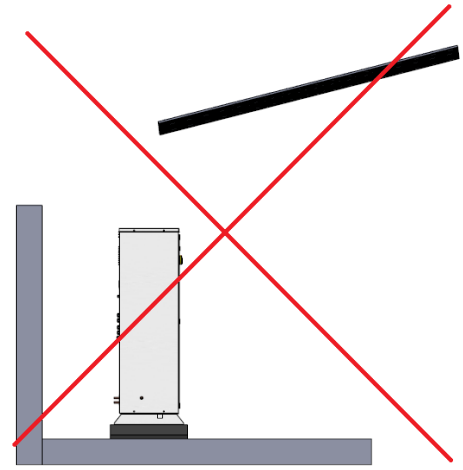
The unit should be placed away from heat sources.

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

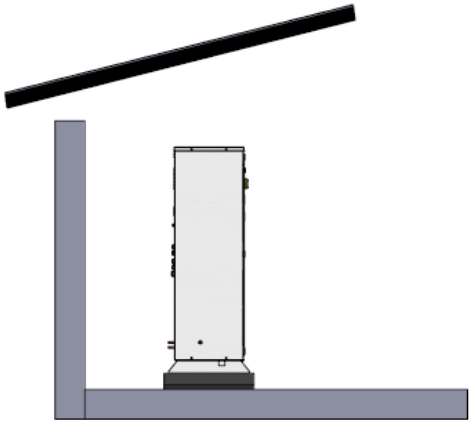
The unit should not be installed in places where the prevailing wind direction is opposite to the outlet air direction. In case of exposure to such wind, it is recommended to use a partition.

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



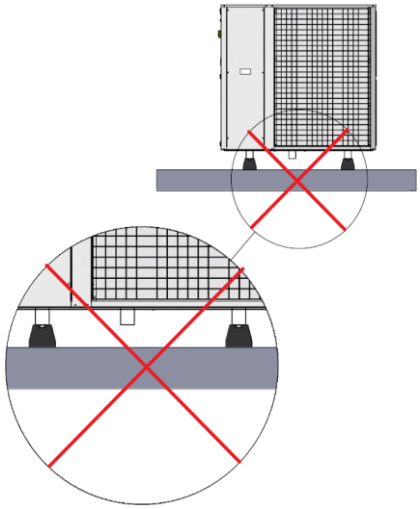
The roof protects the unit against the accumulation of snowdrifts

Unit foundation and support

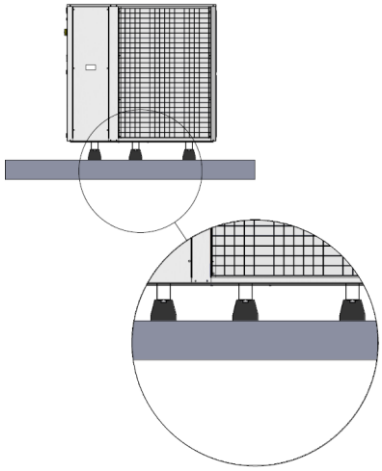
The load-bearing capacity of the ground need to be higher than the condensing unit weight

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.

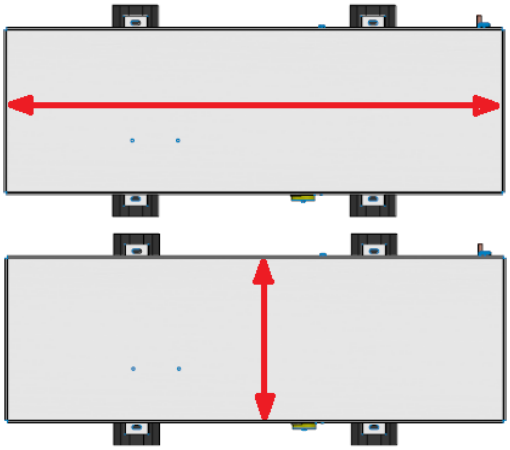


Lack of support for the unit on any foot may result in damage of the unit and loss of refrigerant

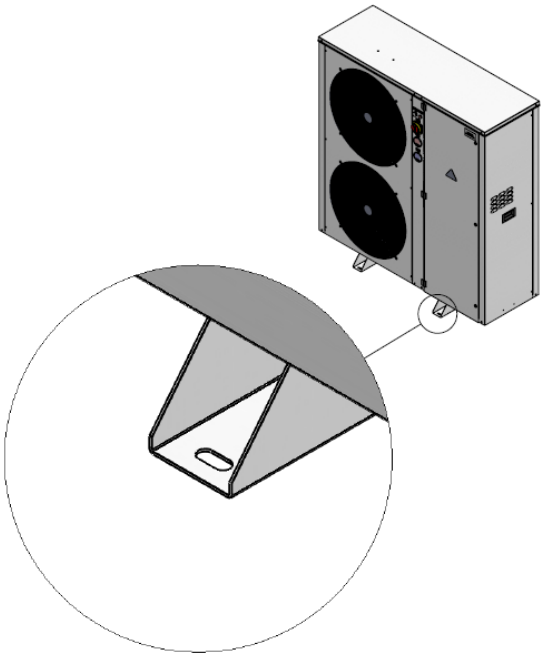


Supporting the unit on each foot provides stability

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



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

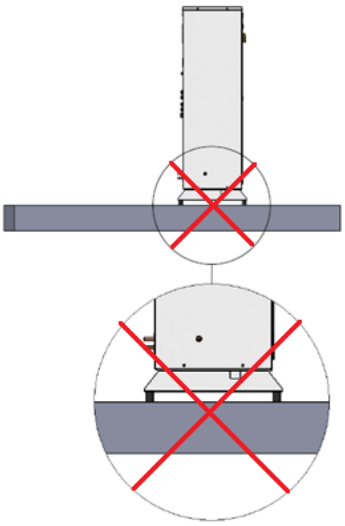


Stiffness of foundation for unit should be verified manually before and after commissioning of the unit.

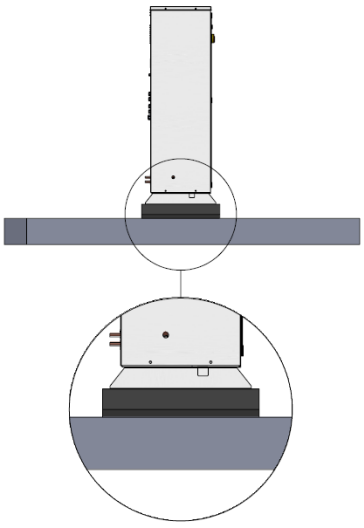
It is required to use vibration isolators with sufficient load-bearing capacity for the weight of the unit.

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

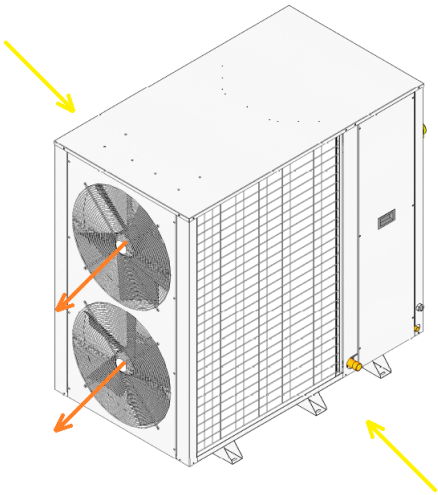


Supporting the unit on full surface of the foot provides stability

Unit position with walls and other units

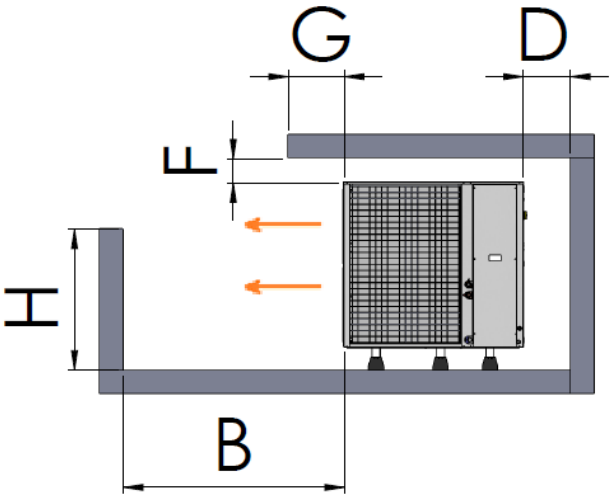
For a correct operation of a unit following requirements regarding distance to the wall need to be fulfilled.

Units with two condensers

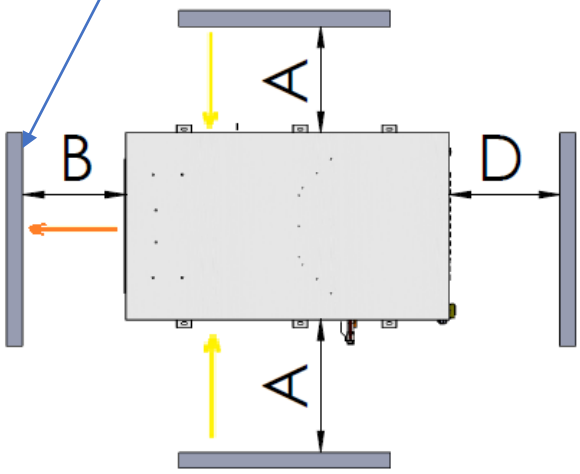


Four-way construction is only allowed if there is a sufficient air low, e.g. additional ventilation or a perforated partition.

From the side

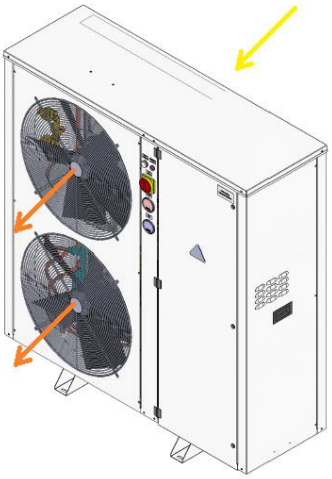


From the top



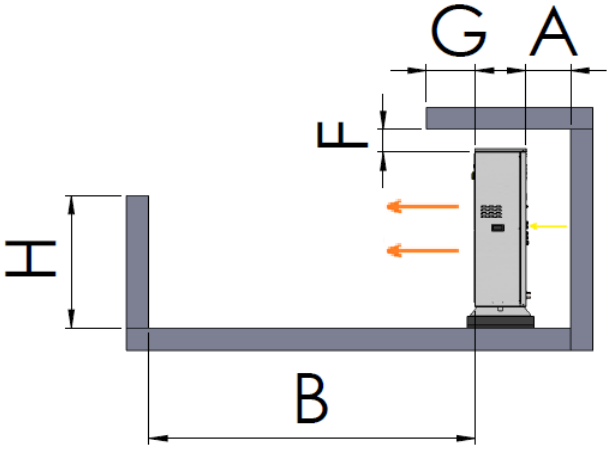
Dimension	Value
A	Min. 400 mm
B	Min. 800 mm, but not less than the height of the unit * For a unit with vertical discharge fan: B = Min. 400 mm
D	Min. 800 mm
F	Min. 400 mm * For a unit with vertical discharge fan: F = Min. 800 mm, but not less than the height of the unit
G	Max. 800 mm
H	Max. 1200 mm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

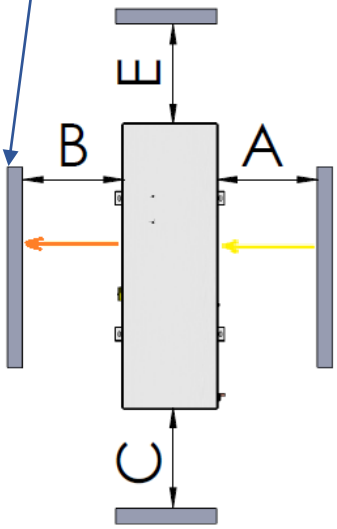


Four-way construction is only allowed if there is a sufficient air flow, e.g. additional ventilation or perforated partition.

From the side

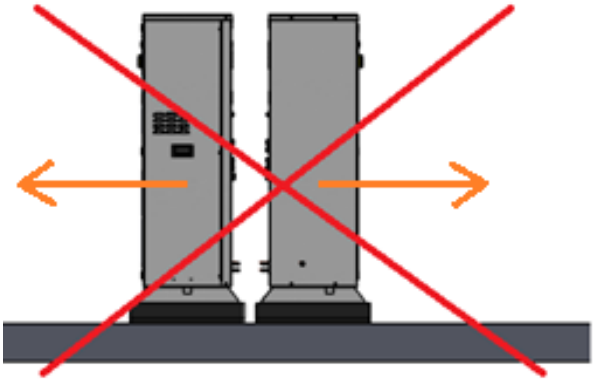


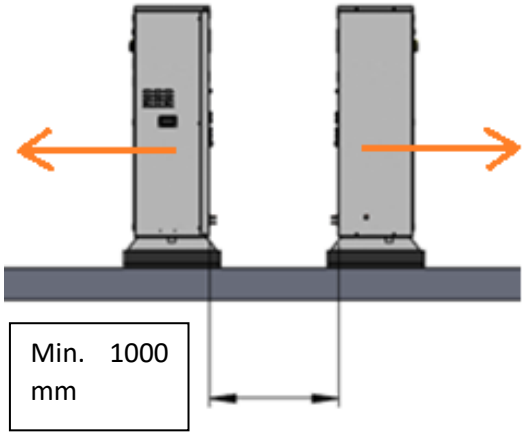
From the top



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.

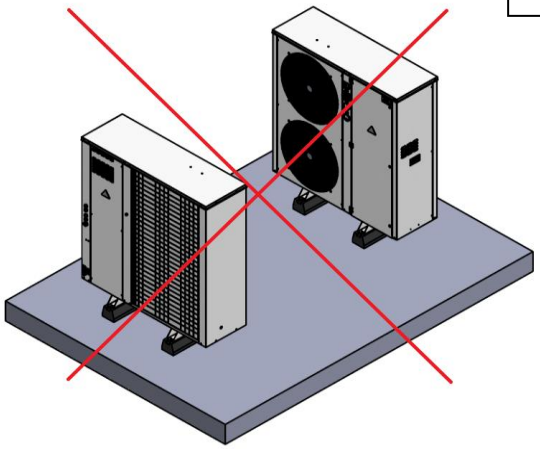


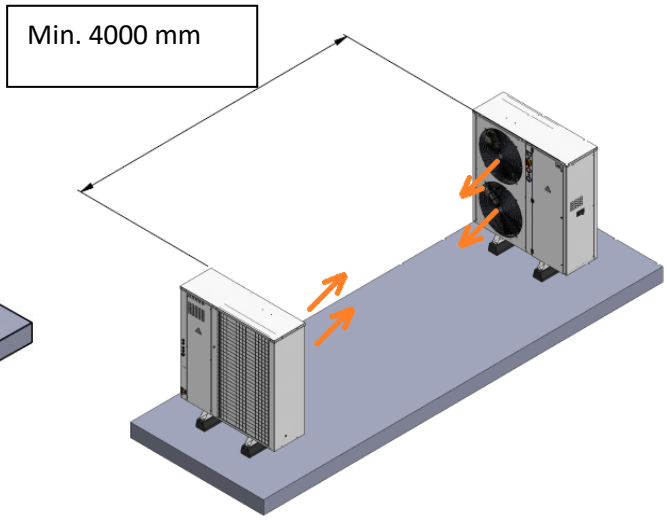


Too short distance between the condensers may result in increase of condensing temperature and shortened lifetime of the unit

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.

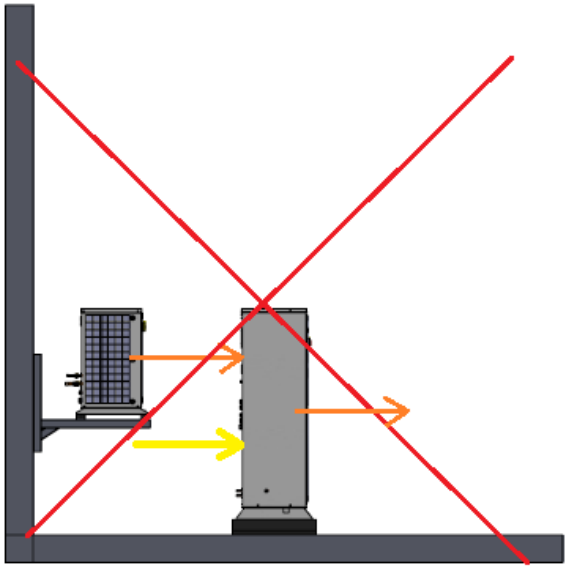




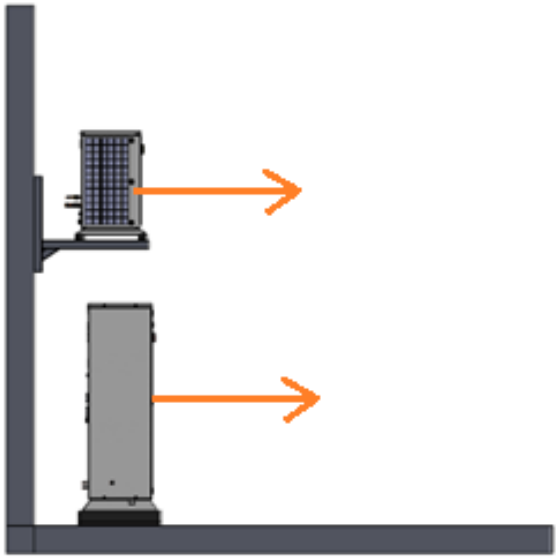
Placing outlet air streams in front of each other may cause improper operation of the unit

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

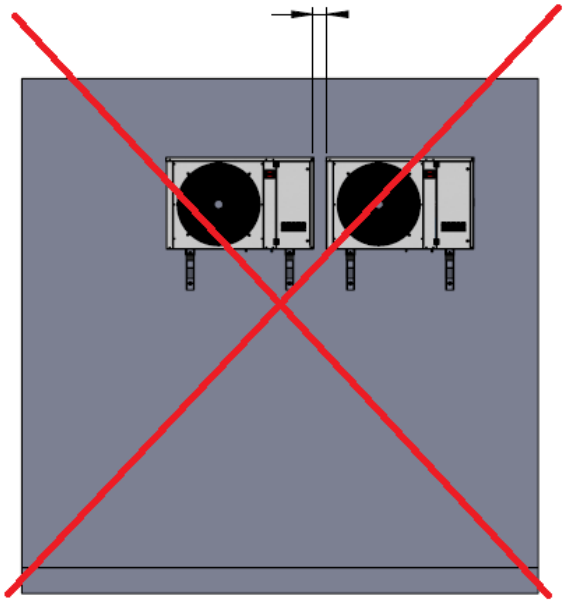


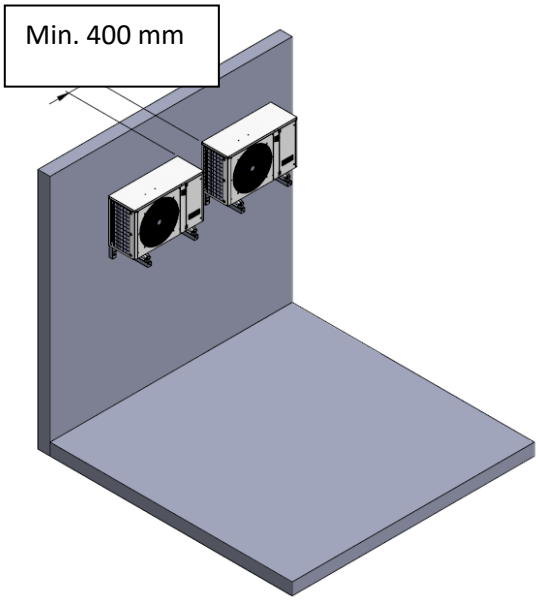
Mixing inlet air stream of unit with outlet air stream of another unit may cause improper operation of units

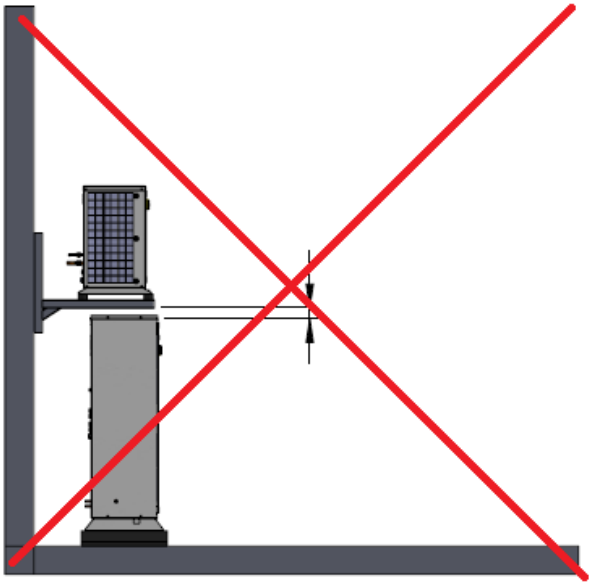


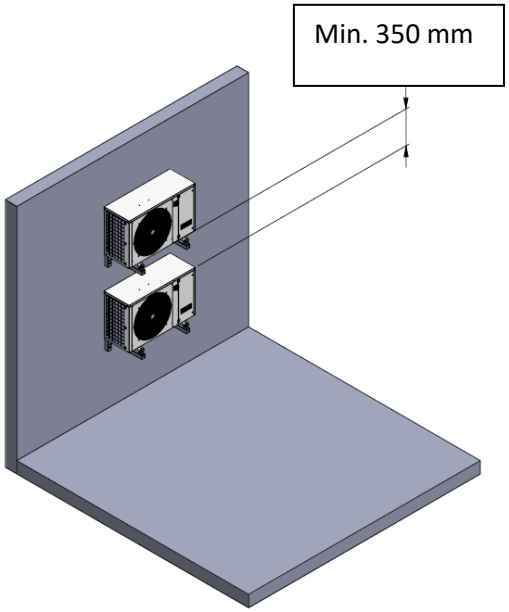
Placing the units with maintained spacing will not cause mixing of inlet and outlet air streams

Provide minimum distances from other units.





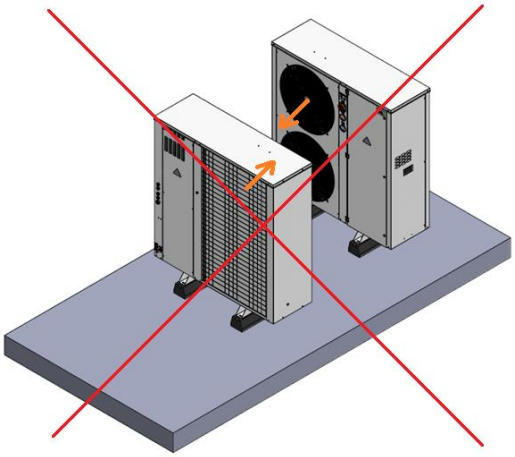




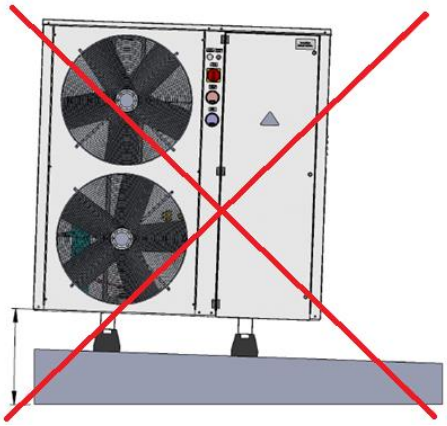
Too short distance between units may cause improper operation of the units and makes service activities harder to perform.

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

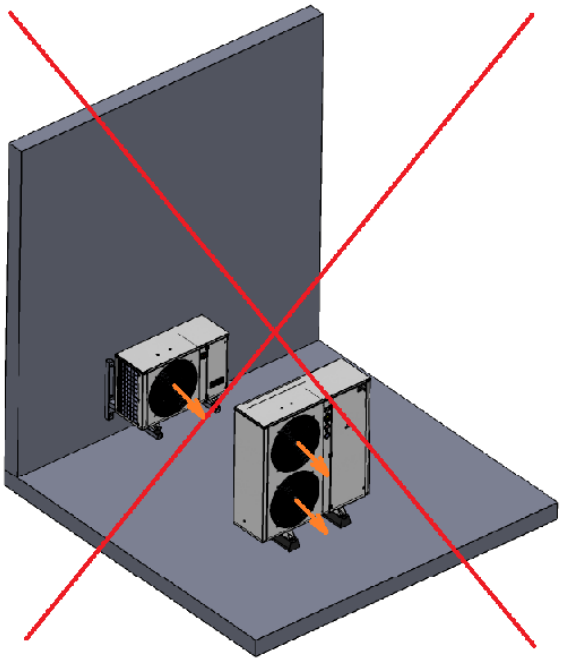
Examples of incorrect placement of the unit:

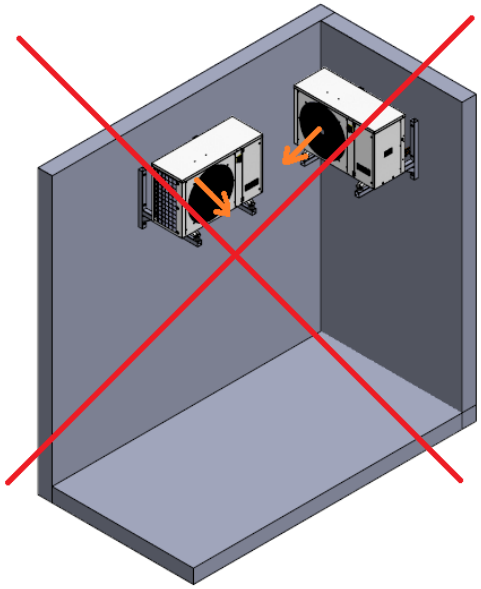


. Placing the units in a way that causes outlet air streams to face each other without maintaining minimum required distance

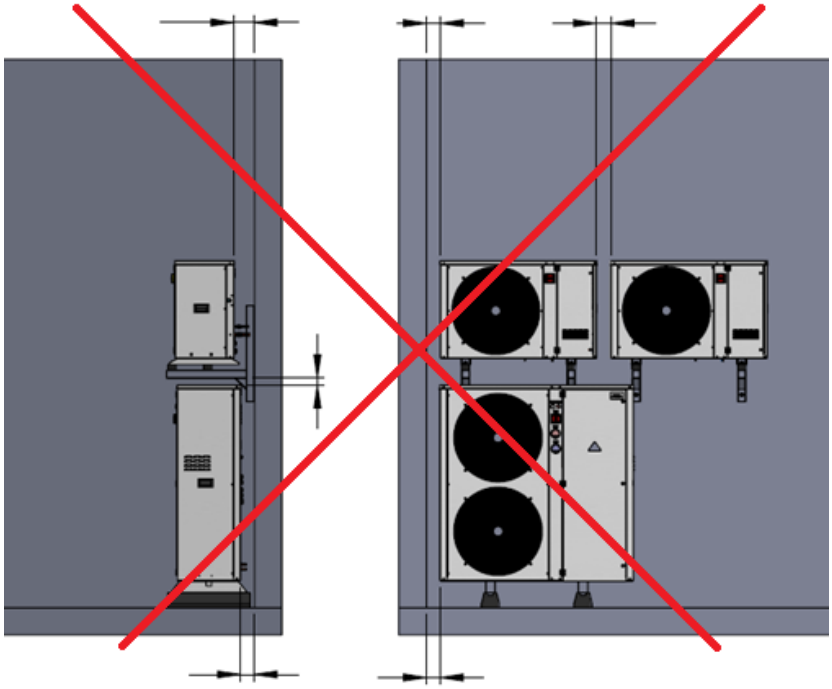


Incorrect leveling of the unit



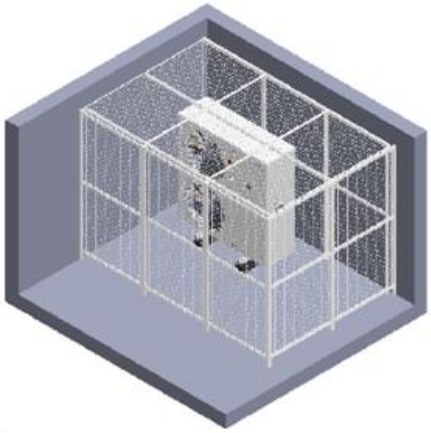


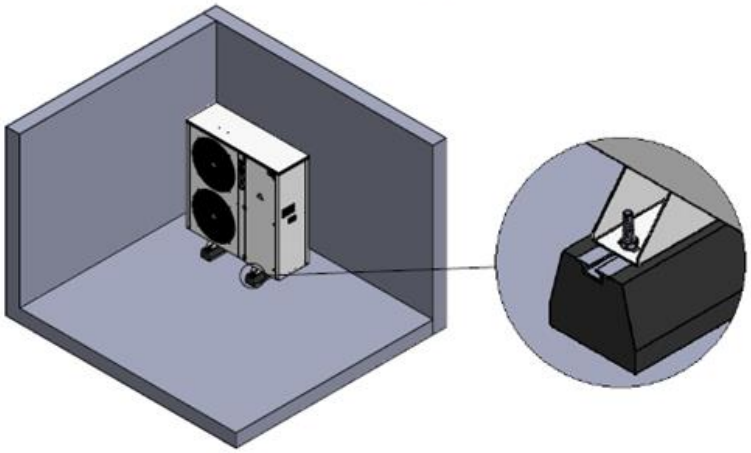
Placing the units in a way that causes one unit to suck outlet air stream from another unit



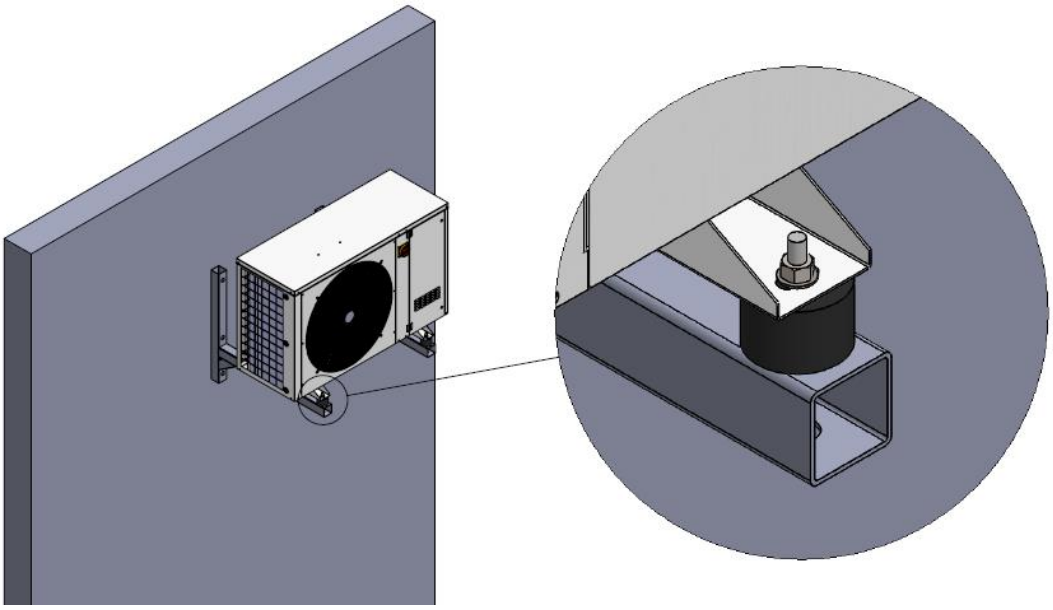
Too short distances from partitions or other units

Examples of correct placement of the unit:

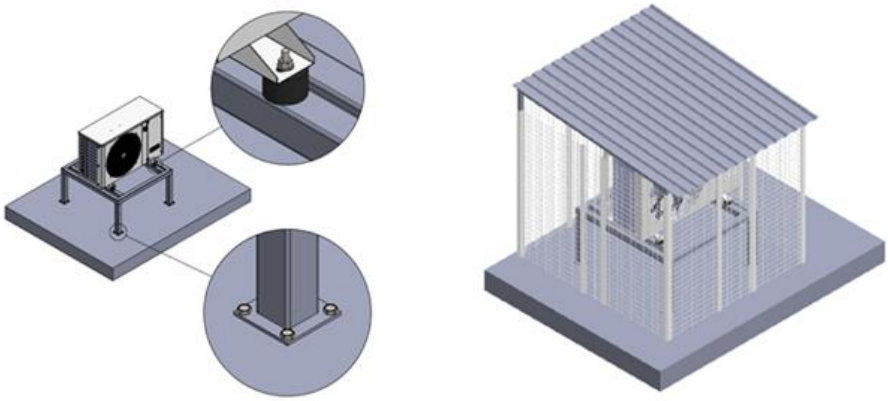




Placement on foundation with use of rubber support feet



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 pressurised nitrogen. To release it, loosen the nuts at valve service connections both at the suction and the discharge side.

In addition the refrigeration system should:
- protect the compressor against ingress of the liquid refrigerant both during operation and shutdown. To do so, route the suction lines in an appropriate way (siphonage), use appropriate automation components, evaporators etc.
- ensure the oil return to the compressor by properly arranging the refrigerant lines (maintain recommended drops, use traps etc.)
- 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.

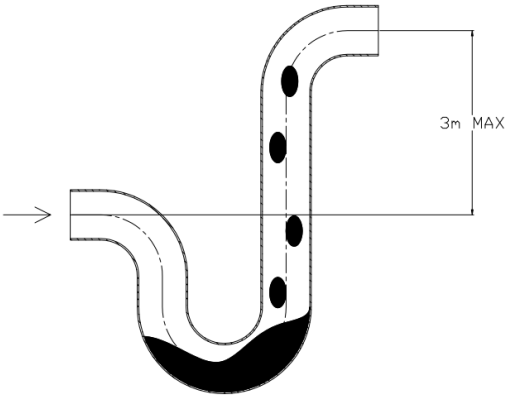
Refrigeration system containing F-gases should be marked accordingly.

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.

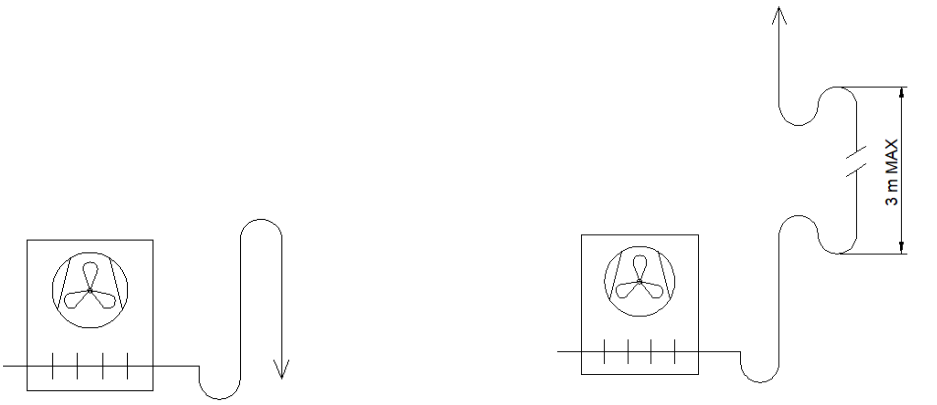
Oil traps

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.

Table 1 Pipeline lenght

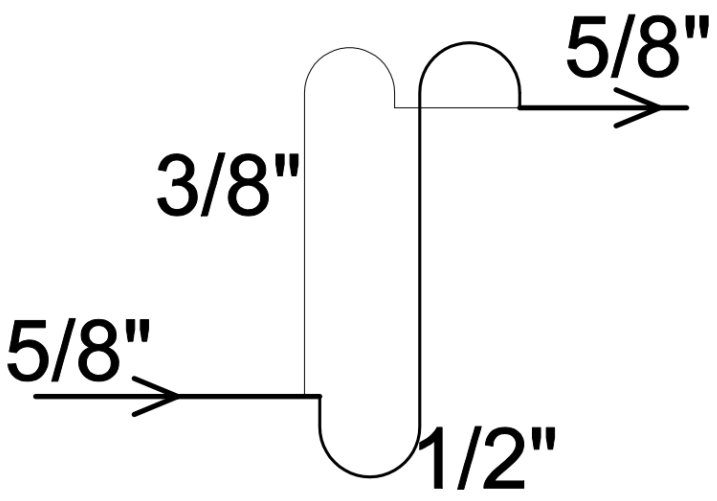
Condensing Unit	Maximum safety length of pipes
OCU-KSC120M08	40m
OCU-KSC090L08 / OCU-KSC150M08 OCU-KSC160M08 / OCU-KSC190M08	50m
OCU-KSC400M08 / OCU-KSC420M08 OCU-KSC140L08 / OCU-KSC240M08 / OCU-KSC280M08	70m

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 rises

To ensure minimal refrigerant velocity in a system with the inverter compressor, suction and discharge 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.

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

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**.

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 10mm2 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).

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)*

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).

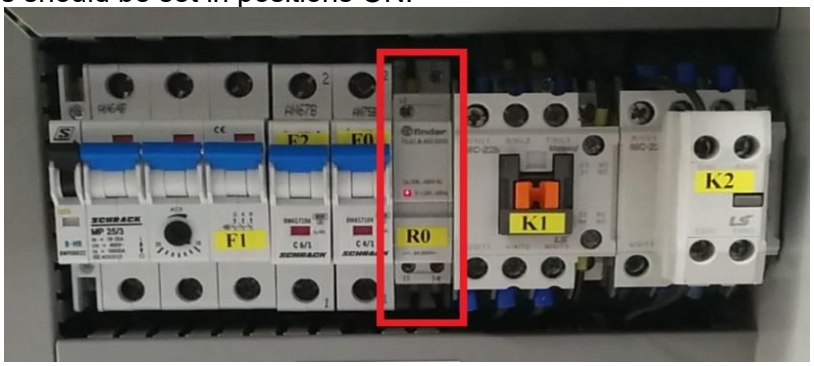
The units are intended for installation in an industrial environment.

When installing the unit in a commercial or residential environment, additional technical measures may be necessary, such as the use of radio frequency interference (RFI) suppression devices or line chokes on the inverter supply, particularly if the power connection impedance is too high. Selection of appropriate solutions should be carried out in consultation with our technical department.

11.6. Control the order of connection of the power supply

Selected units are equipped with a phase presence and rotation control relay (marking -R0). When the power supply is applied, the pilot light on the relay should remain on, otherwise check the voltage present on each phase and the order of phase connection should be checked.

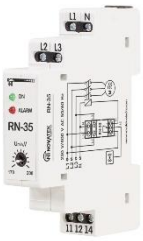
Before start up checking connections in terminal block should be performed. Then whole circuit breakers should be set in positions ON.



Finder F70.61.8.400

The light is flashing: INCORRECT
The light is fixed: CORRECT

Novatek RN-35



The lights are off: NO VOLTAGE OR ASYMMETRY
Red light on: INCORRECT PHASE ORDER
Green light on: CORRECT

11.7. External permission to start

OCU are equipped with an option to connect external start permission of unit, as a potential-free contact (eg. the contact of a standard relay). The connection location of the permit can be identified by the jumper on the electrical panel connectors.

If the above described connection is open the unit will not start!
There is voltage on this terminals if unit is turned on!

12. Starting the unit

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

1) Make sure the S1 switch is in position "0".
2) Set the HP / LP protection switch according to the limits for the refrigerant used (factory settings are for R449A).
3) Set the LP pressure switch for safety mode - the setting should ensure proper installation conditions in the case of operation without smooth regulation (no inverter). *Does not apply to units without safety mode.*
4) Set the fan speed regulator according to the recommended limits for the refrigerant used.
5) Check if all cut-off valves are opened.
6) Turn on the power supply of the unit.
7) Set the operating parameters on the inverter and / or the controller according to the limits for the refrigerant used.
8) Wait until the compressor crankcase is warmed up (point no. 13.3).
9) Turn on start permission signal or install the bridge at the connection point (turn off the power first).
10) Set the S1 switch to operating mode.

Additional information not included in this document is given in Chapter 15

12.1. Unit turn on switch

The units have an on-board switch with the mark -S1 for switching off and on.

Selected models have a 3-position switch with the option of switching the unit in safety mode - the work of the compressor bypassing the inverter.

The unit works only after selecting the operating mode with the -S1 switch.

Use the -S1 switch to select the unit operating mode:

1 - Inverter operation mode (default)
2 - Safety mode - comes in units with two compressors (tandem) and OCU-KSC150M08

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. Use controllers to limit the number of compressor's working cycles.
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:

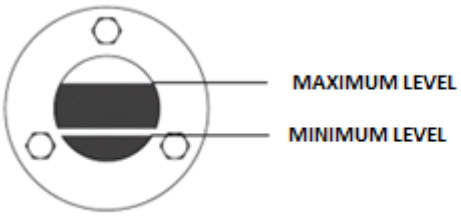
a) The condensing unit should be powered up at least 4 hours before the first startup to heat the crankcase. Check if crankcase heater is powered up.
b) If knocking noise is heard or in case of improper operation, overheating or lack of cooling effect - disconnect the unit from the power supply, locate 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 oil type other than the original one and replenishing the original oil with other oil type can damage the compressor and void the warranty.

Using excessive amount of oil can damage the compressor.

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



Checking the oil level using the sight glass

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 You 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. Adjust pressure switches, 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, adjustment 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. Decomissioning

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

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

In case of changing 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.

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

Oil is pollutive 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

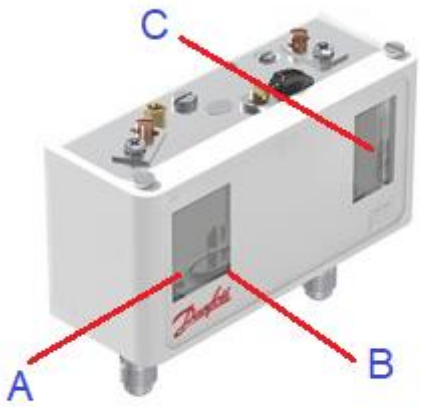
4.	Too much current drawn by the compressor	- Condenser not working properly due to dirt build-up, ambient temperature too high or insufficient air flow (damaged fans) - Phase loss or voltage too low - Evaporator overloaded - Refrigerant selected incorrectly in the unit controller - Lack of oil in compressor
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. Pressure switches settings

HP/LP protection pressure switches



HP/LP protection pressure switch

A – Cut in [bar]

B – Diff [bar]

C – Cut out [bar]

Pressure switch settings for MT units with HP/LP protection pressure switch

MT units				
	R134a	R448A	R449A	R513A
A - LP [bar]	1,4	3,1	3,1	1,5
B - Diff [bar]	0,9	1,5	1,5	0,9
C - HP [bar]	16	26	26	16

Pressure switch settings for LT units with MT/LT protection pressure switch

LT units		
	R448A	R449A
A - LP [bar]	0,7	0,7
B - Diff [bar]	0,7	0,7
C - HP [bar]	26	26

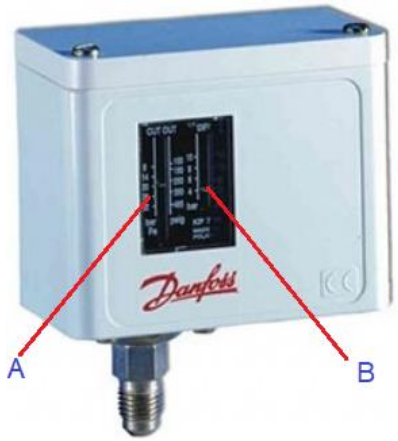
Example for R449A:

- Cut in: 3,1 bar
- Diff: 1,5 bar
- Cut out = Cut in – Diff = 3,1-1,5 = 1,6 bar

LP pressure switch(safety mode)

Only selected versions of outdoor condensing units are equipped with LP pressure switch for safety mode. Settings presented below are minimal values that cannot be exceeded. Settings should be chosen individually for specific case depending on the installation, conditions and modes of operation, etc.

Below recommended settings of LP pressure switch.



LP pressure switchressure switch settings for MT units with LP protection pressure switech (safety mode)

MT *units*				
	R134a	R448A	R449A	R513A
A - LP [bar]	1,4	3,0	3,0	1,7
B - Diff [bar]	0,7	1,0	1,0	0,7

Pressure switch settings for LT units with LP protection pressure switech

LT units		
	R448A	R449A
A - LP [bar]	1,1	1,1
B - Diff [bar]	0,5	0,5

15.2. Fan speed control

The setting of fan speed control for example for R448A/R449A is 17,5 bar (condensing pressure). The setting should be adjusted depending on refrigerant and working conditions of the unit.

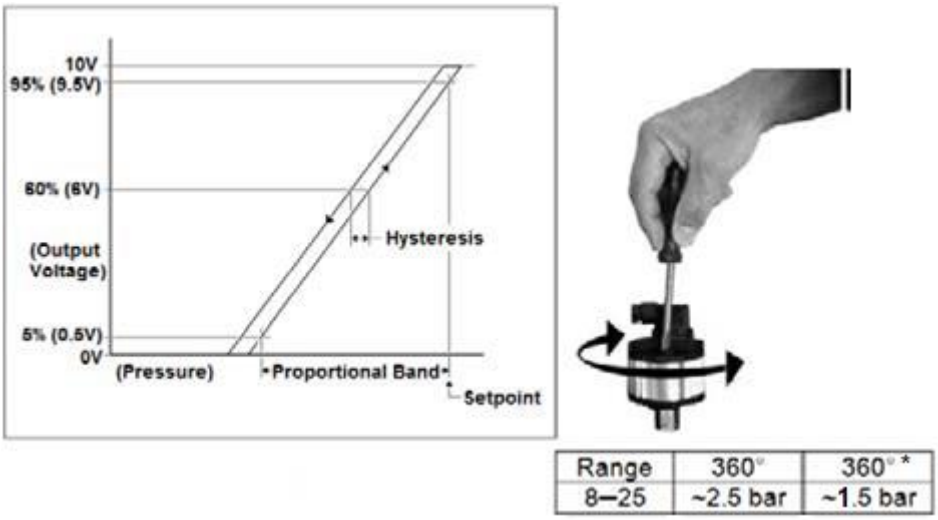
Do not exceed the operating range of the unit and the settings of the HP pressure switch for given refrigerant!

Change the setting to be carried out with the external pressure gauge connected!

Set up to carry out:

- initially with the unit switched off,

- accurately when unit is in operation



Fan speed regulator characteristics (depending on model)*

Fan operating range for MT units

MT units				
	R134a	R448A	R449A	R513A
Maximum speed [bar]	9,0	17,5	17,5	11,0
Fan start [bar]	5 ÷ 5,5	13,5 ÷ 14	13,5 ÷ 14	7 ÷7,5

Fan operating range for LT units

LT units		
	R448A	R449A
Maximum speed [bar]	16,5	16,5
Fan start [bar]	12,5 ÷ 13	12,5 ÷ 13

15.3. Bonfigioli driver parameters

Description of operation

The inverter used in the unit, in addition to the main compressor power supply function, also acts as a controller for the entire unit.

Description of standard operation:

• The unit under normal conditions (proper pressure, READY message on the inverter) starts to control the suction pressure after the start signal is present.

• The unit start is additionally delayed by approximately 5-6 minutes after the power supply on and after each time main compressor has been switched off.

• If the pressure is greater than 0.5 bar from the setpoint, the compressor will start after 10 seconds (after the compressor rest period).

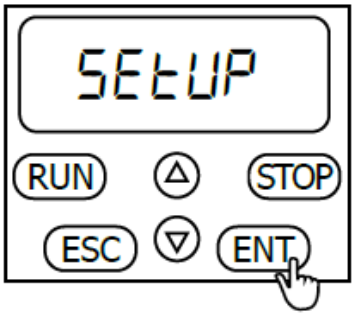
- 2nd compressor (if present) will start also with this condition but after 1st compressor will be at maximum performance.

• The main compressor after switching on switches to 50% of its capacity for 60s and then enters the pressure control mode.

• The switch-off occurs when the pressure is kept 0.3 bar lower than the set pressure despite the main compressor is running at minimum speed.

- 2nd compressor (if present and running) will stop also with this condition but as a first.

Inverter menu



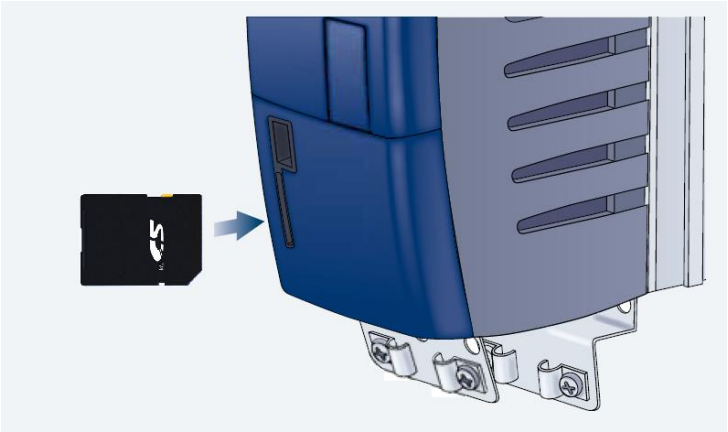
Inverter menu

- The inverter menu is accessed via the arrows keys and ESC and ENT keys.
- Use the ENT key to enter a parameter and / or validate the value, ESC buttons exit the menu or parameter without changing its value.
- Emergency state is confirmed by pressing the STOP button (first go to the top level using the ESC button).
- Accesible menu levels:
    - Actual – current values of inverter operation
    - Para – configuration parameters

- Local – Inverter control with buttons (disabled by default)
- Setup – inverter guided startup menu
- Copy – Support for copying

Selection of refrigerant

- Switch S1 set to OFF position
- Insert the SD card into the inverter



SD card slot in the inverter

- Select COPY from the Inverter menu with the arrows
- Press ENT and select LOAD, press ENT
- Select the appropriate setting number depending on the refrigerant and application, for example:
  - „0612” for OCU-KSC120M08 on refrigerant R449A

Coding of refrigerants

REFRIGERANT	
***Type*:**	***Code*:**
R134a	01xx
R448A	05xx
R449A	06xx
R513A	07xx

Coding of the units

OCU			
***Type*:**	***Code*:**	***Type*:**	***Code*:**
OCU-KSC090L08	xx11	OCU-KSC190M08	xx21
OCU-KSC120M08	xx12	OCU-KSC240M08	xx26
OCU-KSC150M08	xx15	OCU-KSC280M08	xx29
OCU-KSC160M08	xx17	OCU-KSC400M08	xx39
OCU-KSC140L08	xx18	OCU-KSC420M08	xx43

- Press ENT and wait until the process is complete (PROCESS message disappears and the parameter numbers disappear)
- After the process, you can remove the SD card

Suction pressure setting

To set the suction pressure setpoints:

- Use the arrow buttons to select "PARA"
- Select "Std"
- Select the parameter number (P) from the table below
- Set the correct value for the pressure parameter
- Confirm with the ENT key, or cancel with the ESC key.

Suction pressure setpoints for the MT units

***MT units* [bar]**					
[bar]		R134a	R448A	R449A	R513A
P 521	**Suction pressure Setpoint**	**1,4**	**3,0**	**2,95**	**1,7**
	Min÷Max	0,9 ÷ 3,3	2,2 ÷ 6,6	2,2 ÷ 6,6	1,0 ÷ 5,9
P 522	***Force off***	0,70	1,9	1,9	0,93
P 523	***2nd Setpoint***	1,0	2,6	2,6	1,25

Suction pressure setpoints for the LT units

***LT units* [bar]**			
[bar]		R448A	R449A
P 521	**Suction pressure Setpoint**	**1,0**	**1,0**
	Min÷Max	0,5 ÷ 2,6	0,5 ÷ 2,6
P 522	***Force off***	0,3	0,3
P 523	***2nd Setpoint***	1,0	1,0

The force off setting (P522) should be lower by a minimum of 0.5 bar from the suction pressure setting and at the same time it has to be 0.1 bar higher than the LP pressure switch cut out setting (contact opening).

2nd Setpoint (P523) is active only if digital input no. 2 of inverter is energized (IN2D) – check electrical diagram.

Advanced control parameters

Parameters of the pressure regulator

Parameter		**Default**	**MIN**	**MAX**	**Remarks**
P 444	***Gain***	**-14,0**	**-15**	**-0,1**	*Has to be negative!*
P 445	***Integral time*** **[ms]**	**16 000**	**0**	**32 767**	*0 - OFF*
P 446	***Differential time*** **[ms]**	**0**	**0**	**1000**	*0 - OFF*

- P444 ↓ - faster response of the unit to pressure changes
- P444 ↑ - slower reaction of the unit to pressure changes (warning! has to be < 0)
- P445 ↓ - faster response of the unit to a pressure above/below the setpoint.
- P445 ↑ - slower response of the unit to the pressure above/below the setpoint.

NOTE:

If you need to make changes to your settings, it is recommended that you change only one parameter at a time and at intervals of no more than 50% of the current values. It is not advised to use the differential setting (P446) of the regulator.

Oil return forcing signal

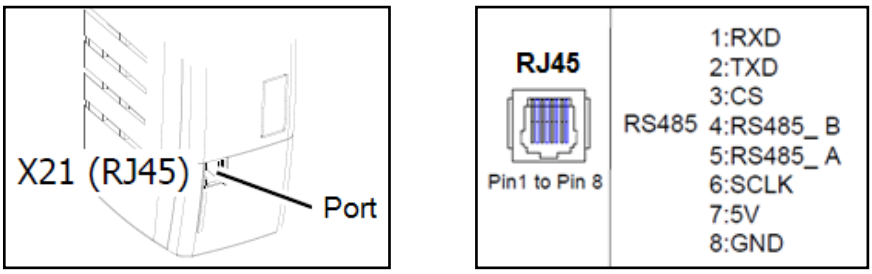
Oil return signal is a digital output on last 2 connectors of terminal “-X” (check electrical diagram).

Functions:

- It is an indication of long low cooling demand and operation of inverter on low frequency and/or without second compressor turned on.
- This signal should be used to stimulate the controllers of evaporators expansion valves to open in order to force the return of the oil to the unit.
- Signal is maintained for the period of 3 minutes in intervals no shorter than 1 hour.
- Simultaneously with this signal unit automatically decrease the suction pressure setpoint in order to ensure that compressor will increase in speed in order to remove the oil deposits in the pipelines

Modbus RTU (RS485) – Connection and parametrization

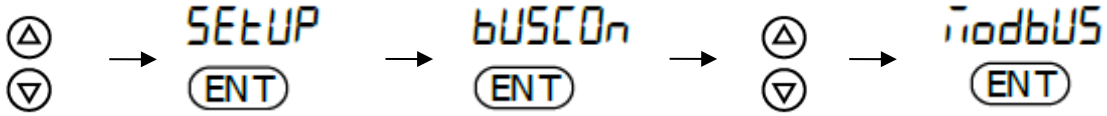
For Modbus communication serves RJ45 (X21) port with RS485 interface, below localization and pinout:



RS485 connection wires in standard RJ45 patch cord:

- white-blue for A (+)
- blue for B (-)

Enter the Modbus parameterization menu:



In order to enable Modbus communication over X21 port, parameter IF SEt (P 395) has to be changed to “1”. Default value “0” is for communication with dedicated for inverter VPlus software.

List of other Modbus communication parameters:

Symbol	Nazwa / *Name*	Zakres / *Range*
nodE id	Adres Modbus / *Modbus Address*	1 – 247
bAUd	Prędkość transmisji / *Baud rate*	1 –2400 Baud; 2 – 4800 Baud; 3 – 9600 Baud; 4 – 19200 Baud; 5 – 57600 Baud; 6 – 115200 Baud; 7 – 230400 Baud
modE	Tryb Modbus / *Modbus Mode*	0 – RTU; 1- ASCII
PAr itY	Parzystość / *Modbus Parity*	0 – EVEN ; 1 – ODD; 2 – NONE *With no parity – 1 extra stop bit is added.*
I F SEt	Interfejs / *InterInterface*	0 – VABus (VPlus) 1 – Modbus 2 – VABus / Modbus for optional comm. module

Working parameters (Actual values)

To navigate to the parameters of the inverter operation, use the arrows to select ACTUAL and press ENT and then the corresponding parameter number.

Below basic set of operating parameters

ACTUAL		
No	**Description**	**Units**
211	*Inverter output current*	A
212	*Inverter output voltage*	V
213	*Inverter output power*	kW
222	*DC-Link Voltage*	V
226	Discharge temp. measurment	°C
229	***Current suction pressure setpoint***	**bar**
230	***Current suction pressure value - measurment***	**bar**
240	*Actual speed*	1/min
241	*Actual frequency*	Hz
244	*Hours of operation*	h
251	*Analog input AI1 value (raw value)*	%
253	*Analog input AI2 value (raw value)*	%
255	*Inverter heat sink temperature*	°C
256	*Inverter electronics temperature*	°C
257	*Analog output AO1 value*	V
259	*Actual error*	-
269	*Actual warning*	-
310	*Last error*	-
311 ÷ 325	*Error list*	-

Messages and alerts

- Resetting the inverter errors with the STOP button
- View of the alarm number using the ENT key

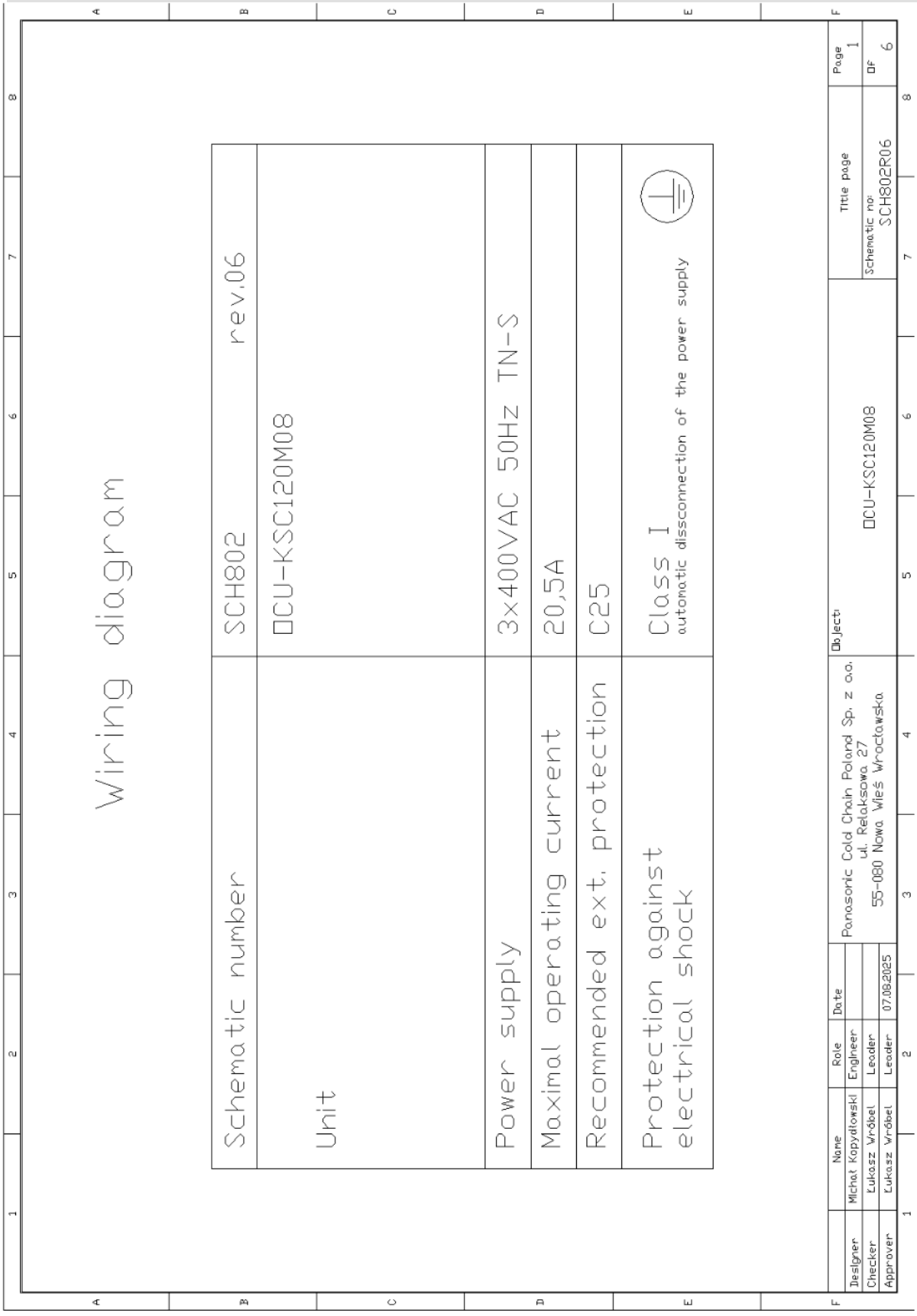
Message		Description	Possible causes
READY		Ready to run	
Error		Fault active	- Check failure list (F)
ALARM		Alarm Active	- Press ENT to check the alarm list (A)
STOP		No permission to run	- Activated HP / LP safety pressure switch - No control voltage on HP / LP pressure switch - No 24VDC control voltage on STOA and STOB inverter terminals
A	100	Inverter power supply alarm	- Inadequate supply voltage or lack of one of the supply phases
A	80	Incorrect behavior of the temperature sensor	- Unconnected or defective temperature sensor
A	080 nFi1	Too low signal from the pressure sensor	- pressure sensor not connected - no voltage supply to the pressure sensor - damaged pressure sensor
A	800	USEr 1 - The compressor Cp1 is not ready for operation	- the supply of crankcase heater of compressor Cp1 is missing - active thermal protection of Cp1 compressor housing
		USEr 2 - The compressor Cp2 is not ready for operation	- the supply of crankcase heater of the compressor Cp2 is missing - No or incorrect supply of Cp2 compressor - wrong phase sequence connection or lack of one of the phases - activation of the HP/LP safety pressure switch
F	102	Inverter overload (60 second current)	- Operation of the compressor outside the envelope (too high condensing pressure) - Too high condensing temperature, too low air flow through the condenser - Pouring the compressor with a liquid refrigerant - Damaged compressor
F	103	Momentary overload of the inverter (60 second current)	
F	200	Too high temperature of inverter heatsink	- Improper ventilation of the inverter chamber - Faulty fan on the unit chassis - Faulty inverter fan - Incorrect location of the unit
F	201	Too low temperature of inverter heatsink	- Faulty fan on the unit chassis - Crankcase heater improper operation - Too short waiting time before powering up the unit after power back up (low heat compressor)
F	300	Too high ambient temperature of the inverter	- Improper ventilation of the inverter chamber - Faulty fan on the unit chassis

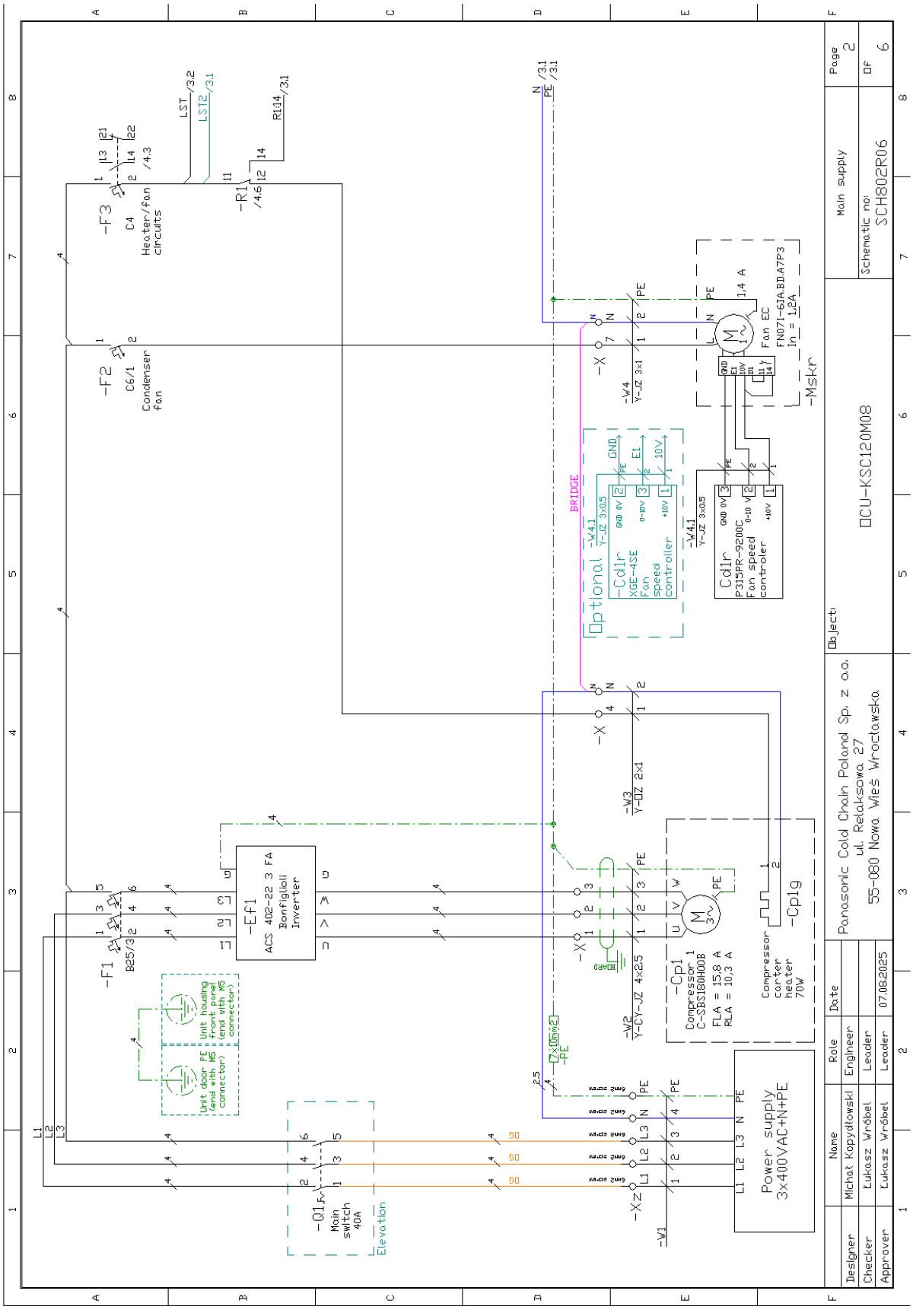
Message		Description	Possible causes
			- Incorrect location of the unit
F	301	Too low ambient temperature of the inverter	- Faulty fan on the unit chassis - Crankcase heater improper operation - Too short waiting time before powering up the unit after power back up (low heat compressor)
F	303	Too high the temperature of the inverter capacitors	- Improper ventilation of the inverter chamber - Faulty fan on the unit chassis - Faulty inverter fan - Incorrect location of the unit
F	400	The temperature at the discharge too high or defective temperature sensor	- Too high temperature compressor discharge by working outside the envelope - Incorrect discharge temperature sensor - defective discharge temperature sensor
F	401	Compressor motor current protection	- Operation of the compressor outside the envelope (too high condensing pressure) - Too high condensing temperature, too low air flow through the condenser - Damaged compressor - Incorrect inverter settings
F	500	Inverter overload	
F	701	Too low power supply voltage	- Incorrect power supply voltage - Lack of one phase power supply - Damaged inverter rectifier bridge
F	1100	Exceeding the maximum frequency / very high frequency spike	- The problem with starting the compressor, check the pressure and shut-off valves - Too high suction / discharge pressure difference - Damaged compressor
F	1205	Incorrect signal on STOA and STOB inverter terminals	- Incorrect wiring at the STOA and STOB inverter inlet terminals - Broken wire - Activation of the safety pressure switch HP / LP\
F	1300	Ground fault	- Short circuit of the inverter output to ground - Moisture inside the chamber - Short circuit inside the compressor
F	1450	No reading from the discharge temperature sensor	- The compressor temperature sensor Cp1 is not connected - Cp1 compressor discharge pipe temperature sensor defective
F	1407	Current on MF1 too high (suction pressure sensor)	- Too high pressure on suction side - Damaged (short circuited) suction pressure sensor

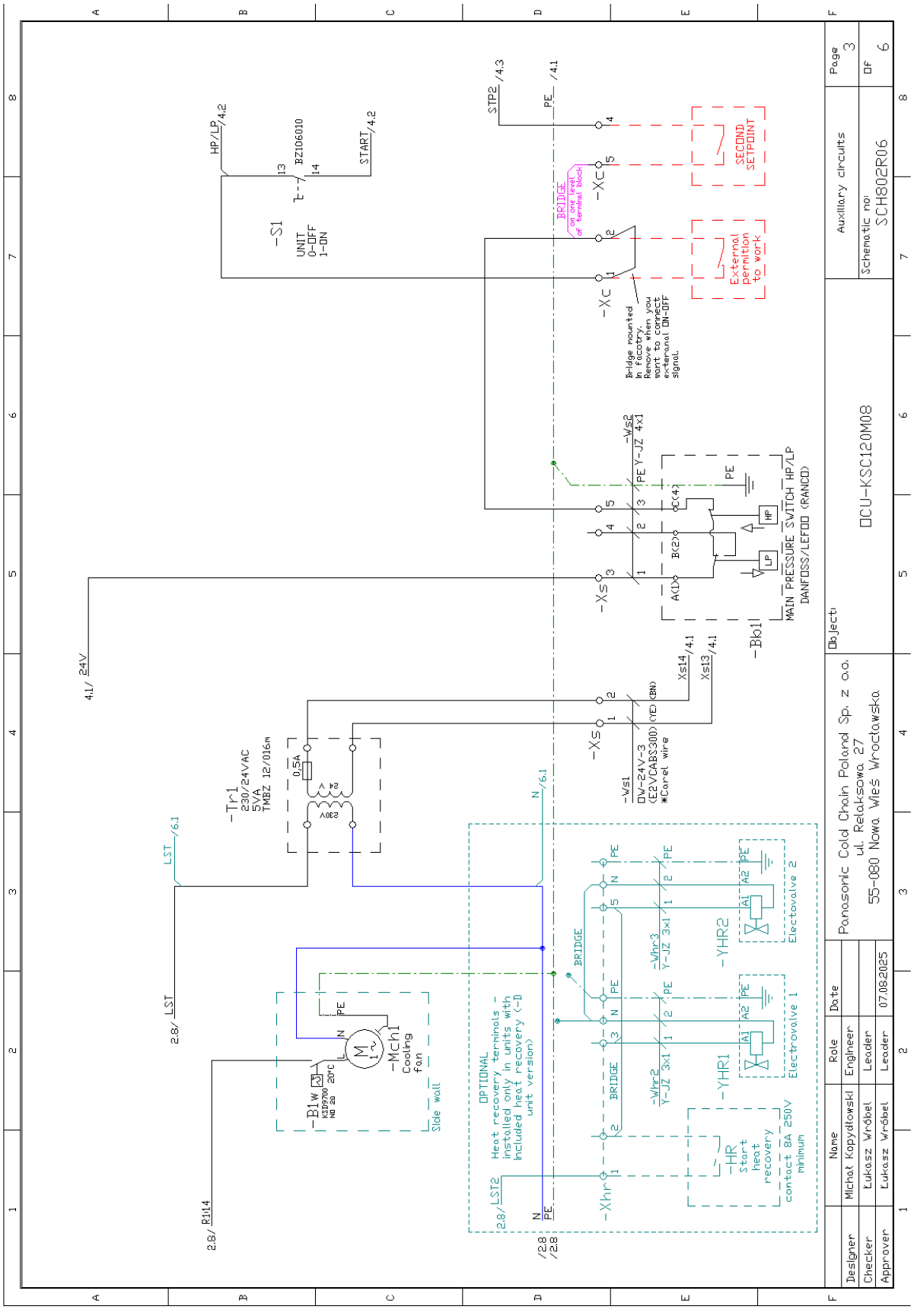
Message		Description	Possible causes
F	3031	Too high suction pressure	- Too much evaporator load - Suction pressure sensor defective
F	3033	No oil in the crankcase (applies to the OCU-KSC120M08)	- The oil level in the compressor's crankcase is too low - Damaged / unpowered oil level sensor
F	3034	Unexpected compressor stop	- Too high discharge pressure - Compressor damaged - Too low voltage supply during compressor operation or lack of 1 phase

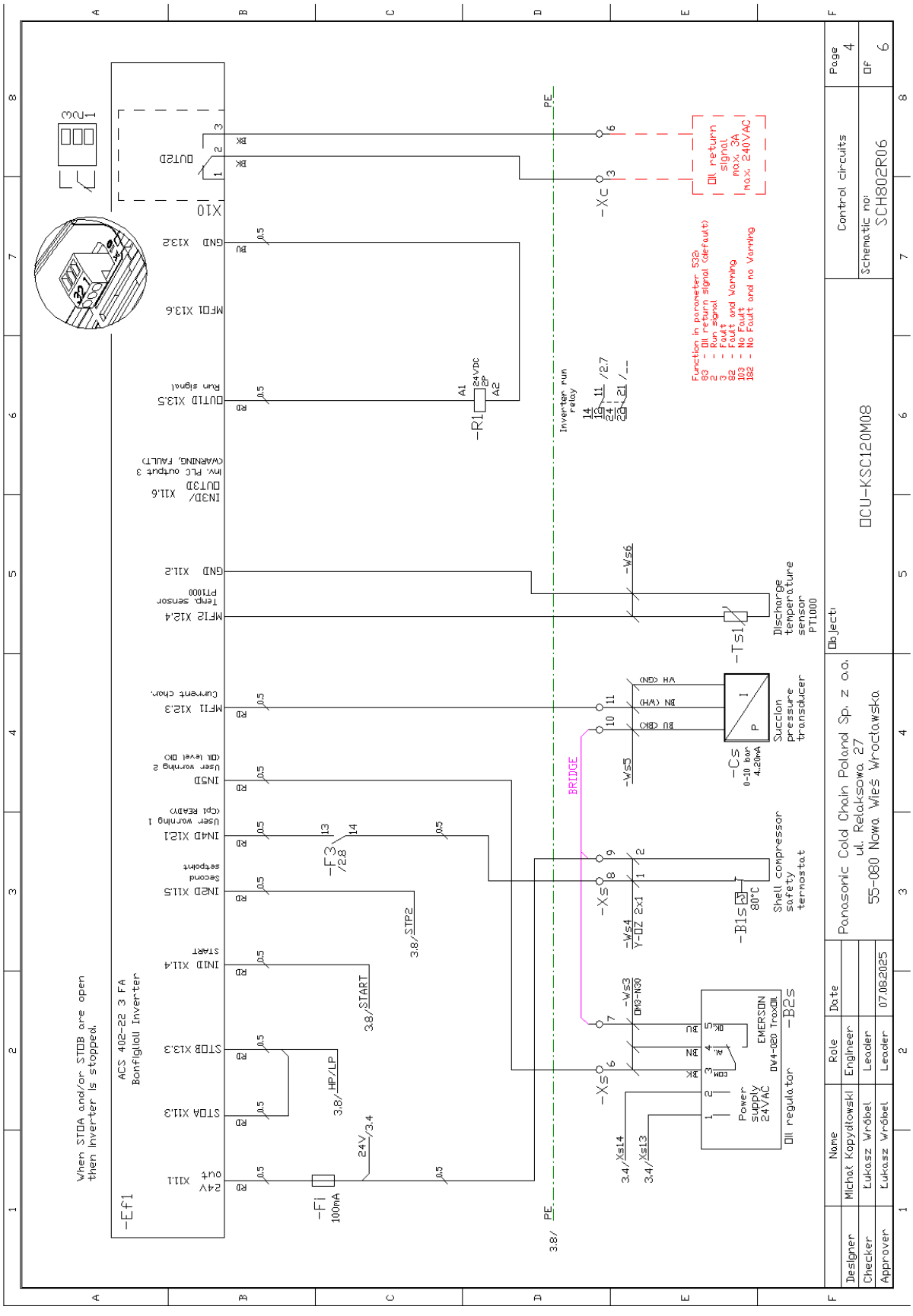
16. Wiring diagrams

16.1. OCU-KSC120M08



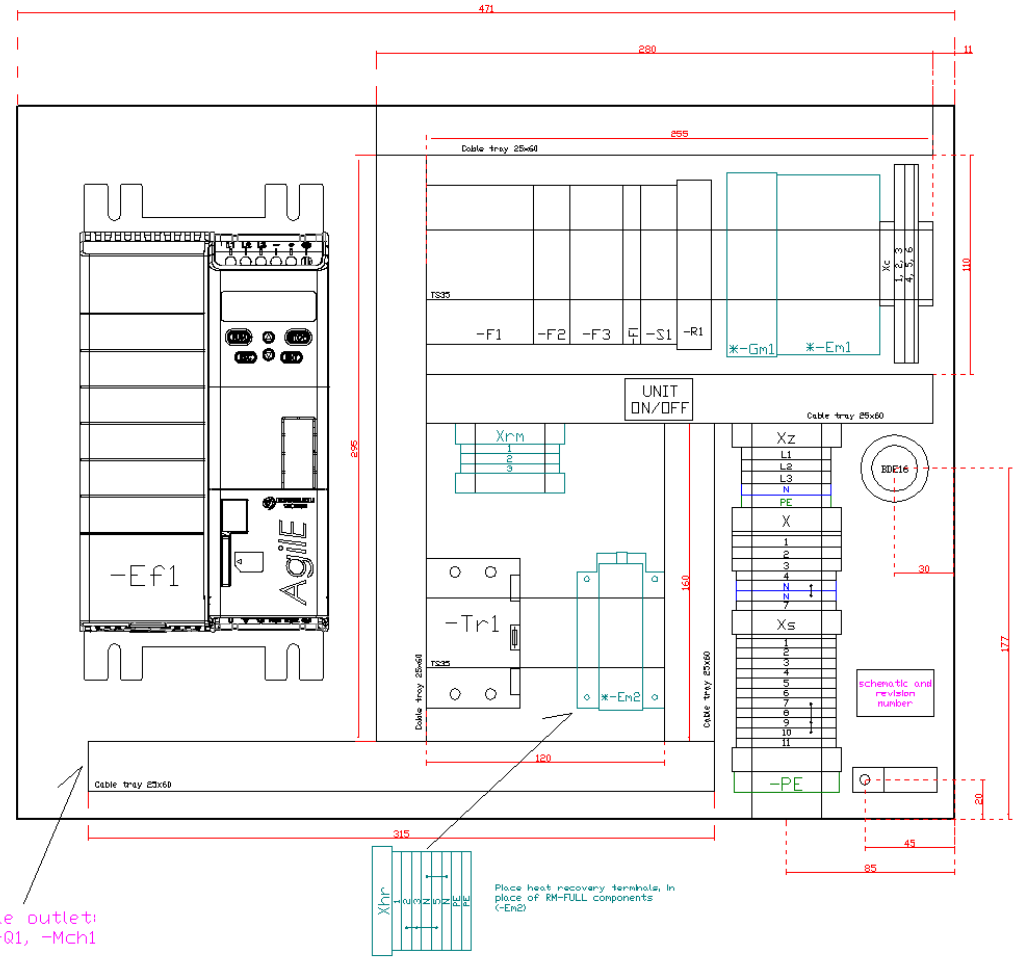

-F3
C4
Heater/fan circuits
-F2
C6/1
Condenser fan
-F1
B25/3
-Ef1
ACS 402-22 3 FA
Bonfiglioli Inverter
-Q1
Main switch 40A
Elevation
-Xz
-W1
Power supply 3x400VAC+N+PE
-W2
Y-CY-JZ 4x2.5
-Cp1
Compressor 1
C-SBS180H00B
FLA = 15,8 A
RLA = 10,3 A
-Cp1g
Compressor carter Heater 70W
-W3
Y-DZ 2x1
-X
-W4
Y-JZ 3x1
-Mskr
Fan EC
FN071-6IA.BD.A7P3
In = 1,2A
1,4 A
-W4.1
Y-JZ 3x0.5
Optional
-Cdlr
XGE-4SE
Fan speed controller
BRIDGE
Cdlr
P315PR-9E00C
Fan speed controler
GND 0V
0-10 V
+10V
Unit housing PE (end with M5 connector)
Unit housing PE (end with M5 connector)
Name
Role
Date
Designer
Michał Kopydłowski
Engineer
Checker
Łukasz Wróbel
Leader
Approver
Łukasz Wróbel
Leader
07.08.2025
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Object:
CU-KSC120M08
Main supply
Schematic no:
SCH802R06
Page
2
OF
6


Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
CU-KSC120M08
Auxiliary circuits
Schematic no: SCH802R06
Page 3
OF 6
Designer Michał Kopydłowski Engineer
Checker Łukasz Wróbel Leader
Approver Łukasz Wróbel Leader 07.08.2025
-S1 UNIT 0-OFF 1-ON
HP/LP /4.2
START /4.2
STP2 /4.3
PE /4.1
BRIDGE on one level of terminal block
-XC
External permition to work
SECOND SETPOINT
Bridge mounted in factory. Remove when you want to connect external ON-OFF signal.
-Vs2 PE Y-JZ 4x1
-Xs
-Bp1 MAIN PRESSURE SWITCH HP/LP DANFOSS/LEFOO (RANCO)
-Vs1 OV-24V-3 (E2VCABS300) *Carel wire
Xs14/4.1
Xs13/4.1
41/ 24V
-Tr1 230/24VAC 5VA TMBZ 12/016m
0,5A
230V
24V
LST /6.1
2.8/ LST
-Mch1 Cooling fan
-B1W KTY9700 Nd 20 20°C
Side wall
OPTIONAL
Heat recovery terminals - installed only in units with included heat recovery (-D unit version)
2.8/LST2
N /6.1
PE
/2.8
/2.8
2.8/ R114
-Xhr
BRIDGE
-Whr2 Y-JZ 3x1
-Whr3 Y-JZ 3x1
-YHR1
-YHR2
-HR Start heat recovery contact 8A 250V minimum
Electrovalve 1
Electrovalve 2


-Ef1
ACS 402-22 3 FA
Bonfiglioli Inverter
When STOA and/or STOB are open
then inverter is stopped.
X10
OUT2D
GND X13.2
MFOI X13.6
OUT1D X13.5
Run signal
IN3D/ X11.6
OUT3D
Inv. PLC output 3
(WARNING, FAULT)
GND X11.2
MFI2 X12.4
Temp. sensor
PT1000
MFI1 X12.3
Current chan.
IN5D
User warning 2
(Oil level DI)
IN4D X12.1
User warning 1
(Cpl READY)
IN2D X11.5
Second
setpoint
IN1D X11.4
START
STOB X13.3
STOA X11.3
24V out X11.1
-Fi
100mA
24V/3.4
3.8/HP/LP
3.8/START
3.8/STP2
-F3
/2.8
13
14
0.5
3.8/
PE
BRIDGE
-Xs
-Ws3
DM3-N00
-Ws4
Y-07 2x1
-Ws5
-Ws6
-B1s
80°C
Shell compressor
safety
termostat
-Cs
0-10 Bar
4..20mA
Suction
pressure
transducer
-Ts1
Discharge
temperature
sensor
PT1000
Power
supply
24V/AC
EMERSON
DW4-020 TraxOil
-B2s
Oil regulator
3.4/Xs14
3.4/Xs13
-Xc
Inverter run
relay
14
18
24
28
11
21
/2.7
/--
A1
24VDC
2P
A2
-R1
Function in parameter S32:
83 - Oil return signal (default)
2 - Run signal
3 - Fault
82 - Fault and Warning
103 - No Fault
182 - No Fault and no Warning
Oil return
signal
max 3A
max 240VAC
OCU-KSC120M08
Object:
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Control circuits
Schematic no:
SCH802R06
Page 4
OF 6
Name
Role
Date
Designer
Michał Kopydłowski
Engineer
Checker
Łukasz Wróbel
Leader
07.08.2025
Approver
Łukasz Wróbel
Leader

Note:
1. Power supply on circuit breaks (-F…) allways on the top.
2. Unmarked wires - cross-section 1mm2.
3. All the wires in the cabinet finished with sleeve ferrule.
4. Wires to the devices not mounted on the panel:
   -Q1: 560mm (out of the cable tray)
   -Mch1: 800mm (PE 900mm) (out of the cable tray)
5. Voltage 24 V - red wire.
6. -Ef1 mounted to the plate by rivet nuts.
7. Number of diagram and it's revision to be labeled on sticker in indicated place.
*. Optional elements.

FRONT



	Name	Role	Date
Designer	Michał Kopydłowski	Engineer	
Checker	Łukasz Wróbel	Leader	
Approver	Łukasz Wróbel	Leader	07.08.2025

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

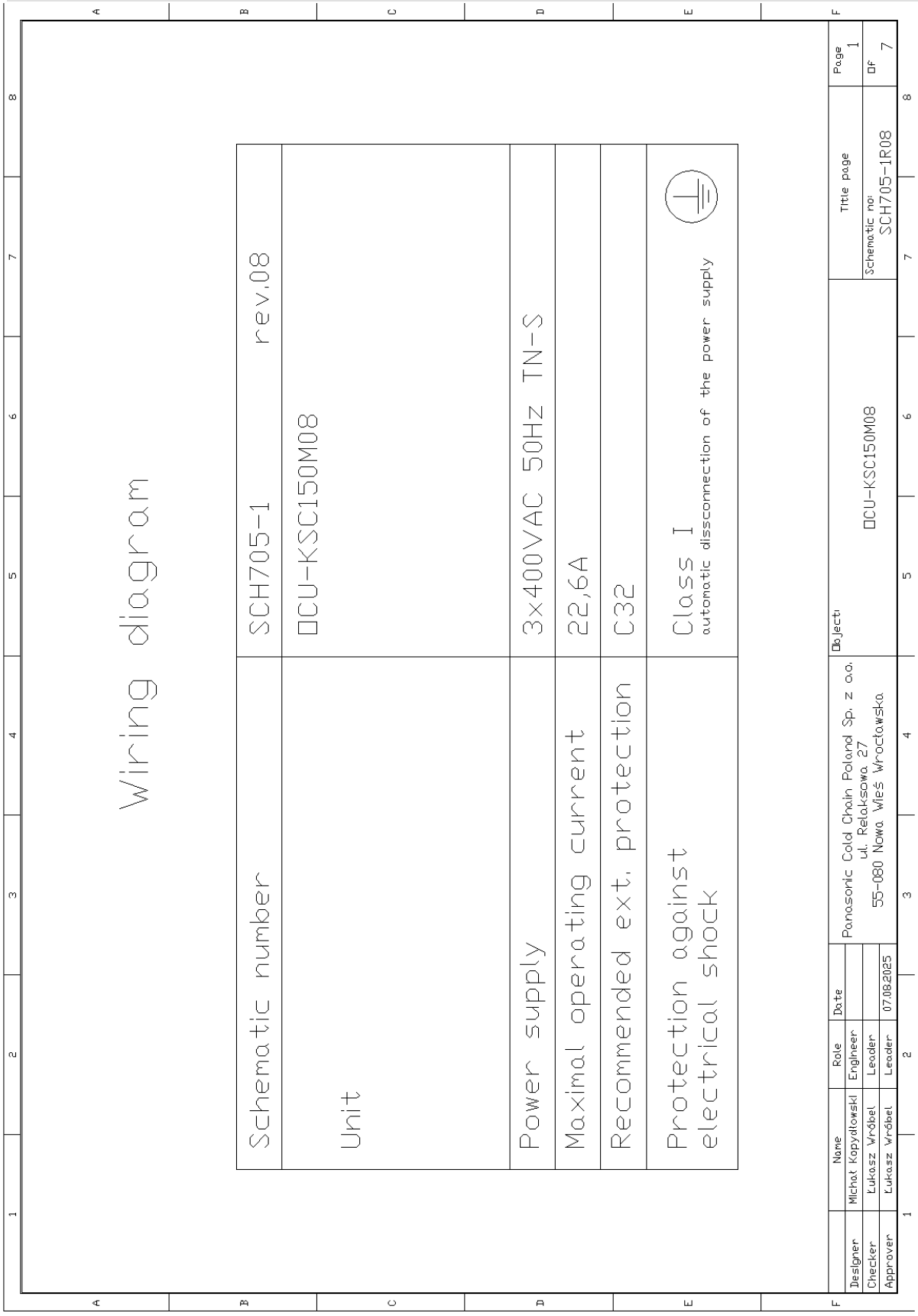
Object:
CU-KSC120M08

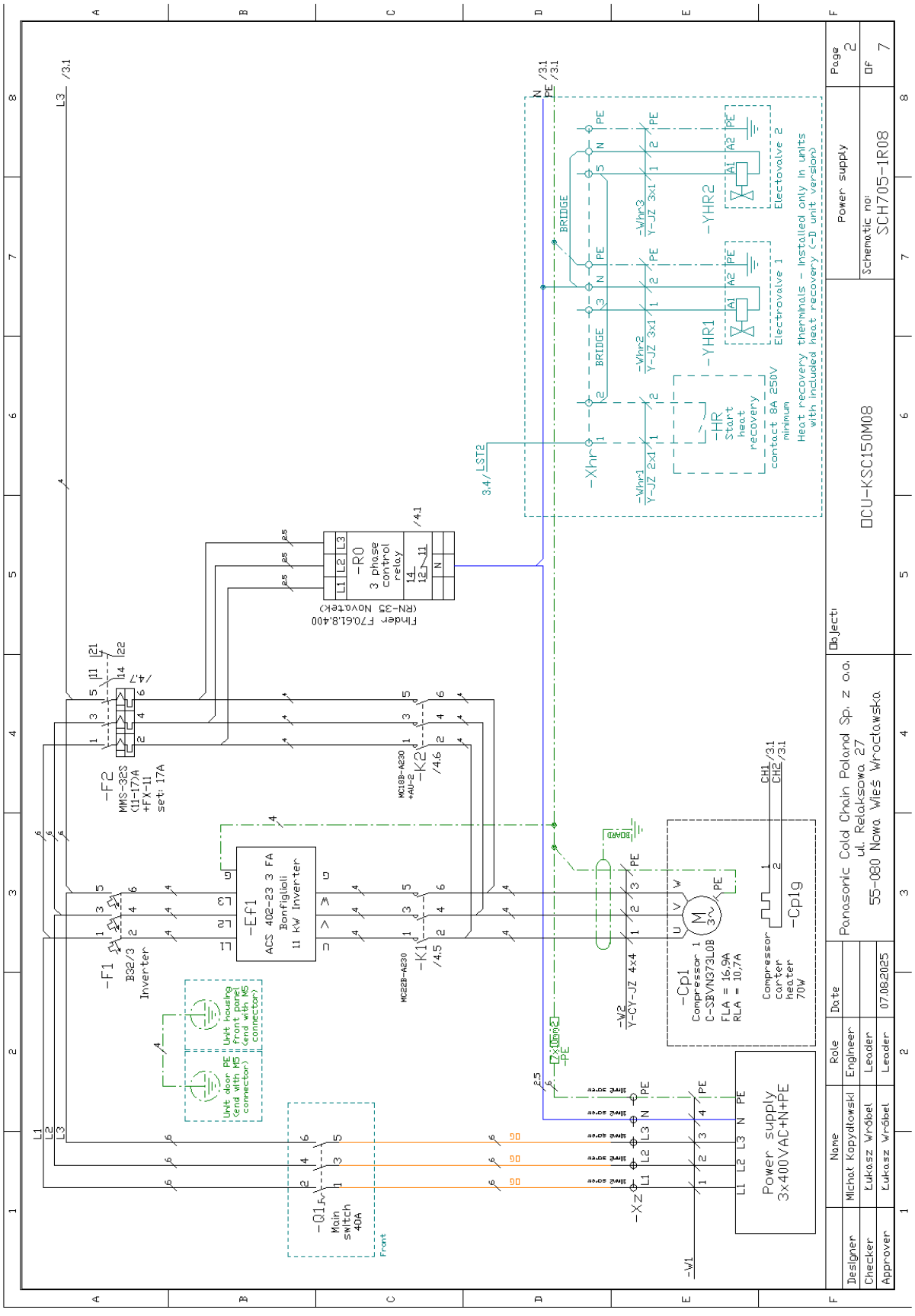
Mounting plate

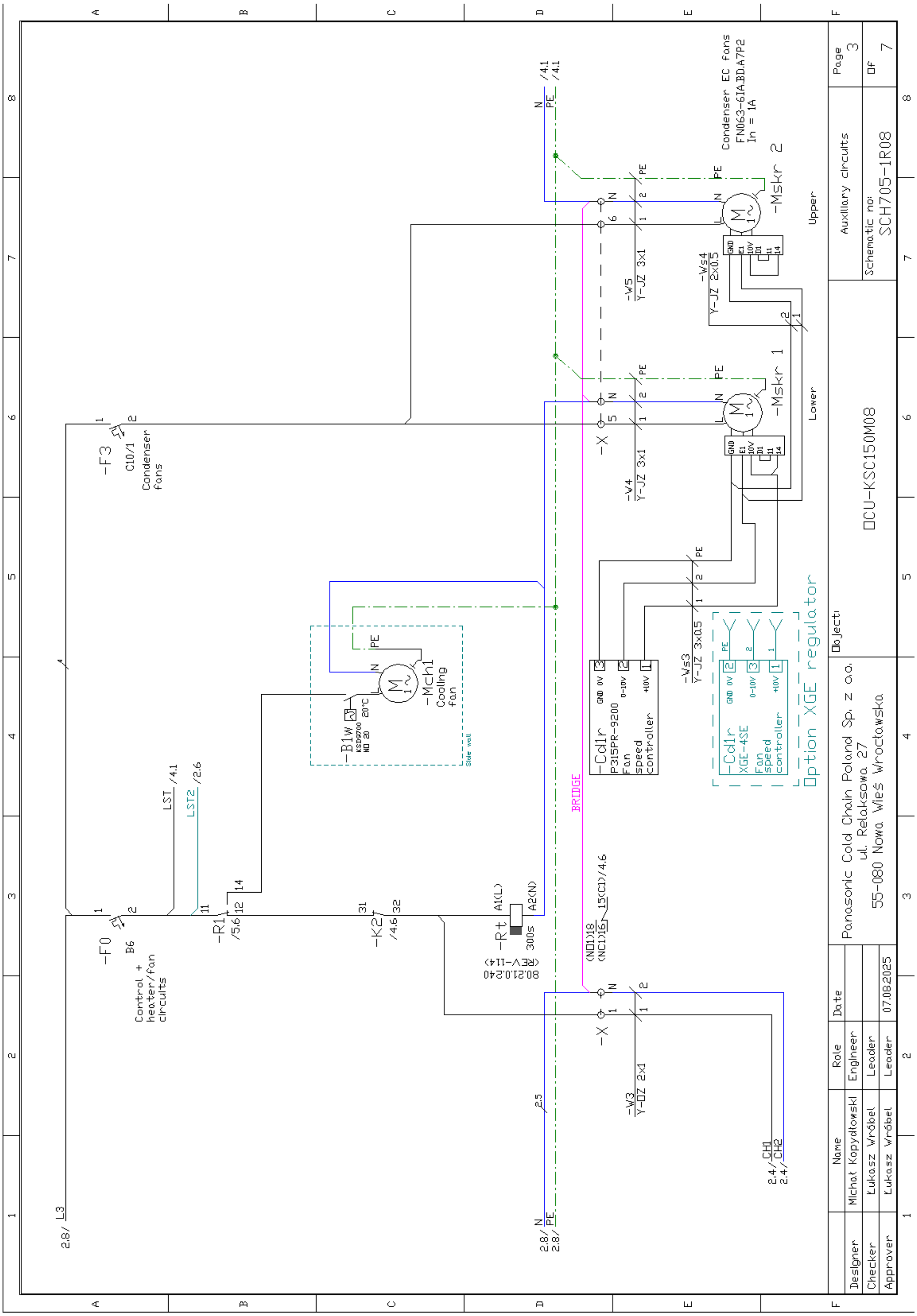
Schematic no:
SCH802R06

Page 5 of 6

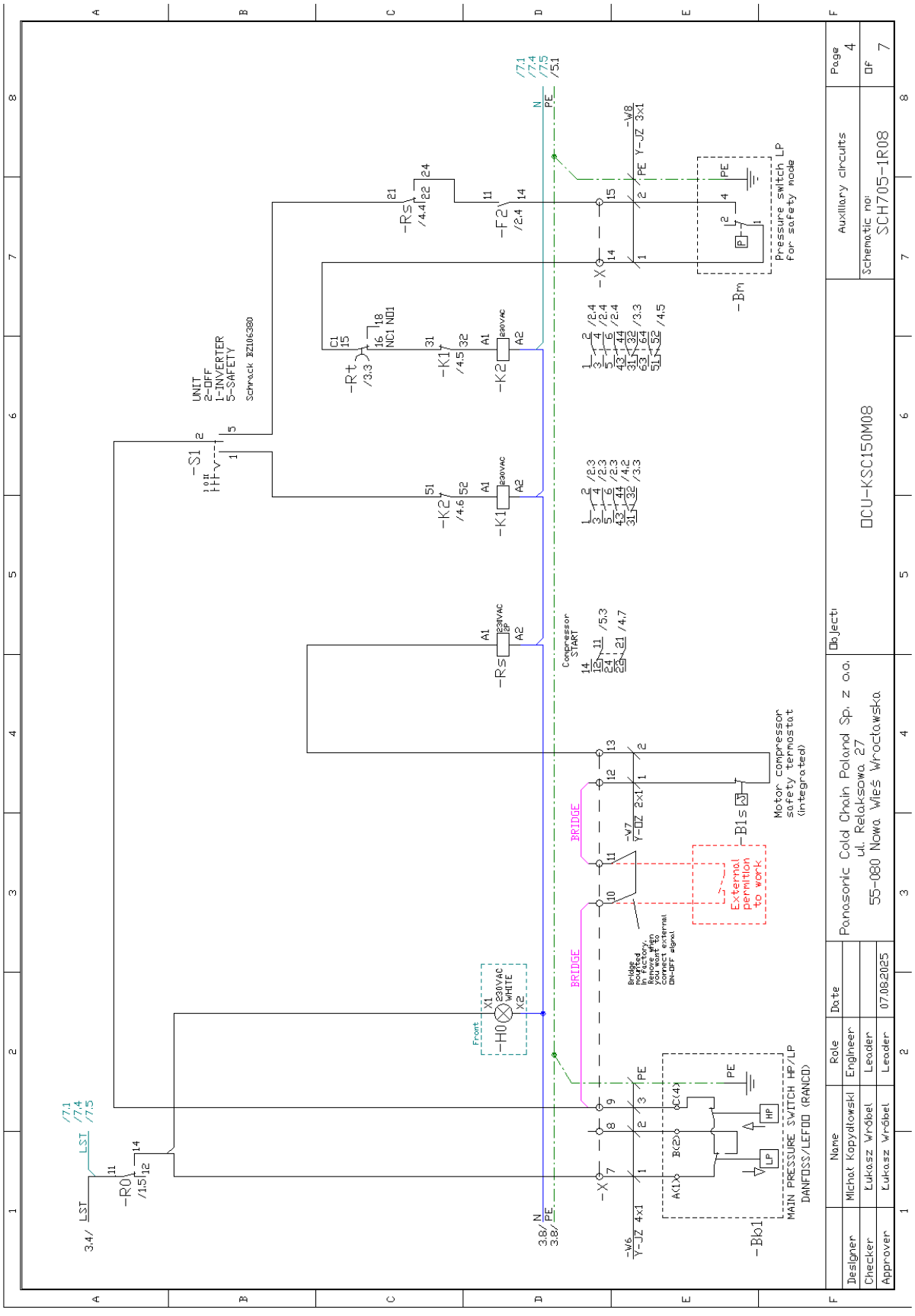
16.2. OCU-KSC150M08

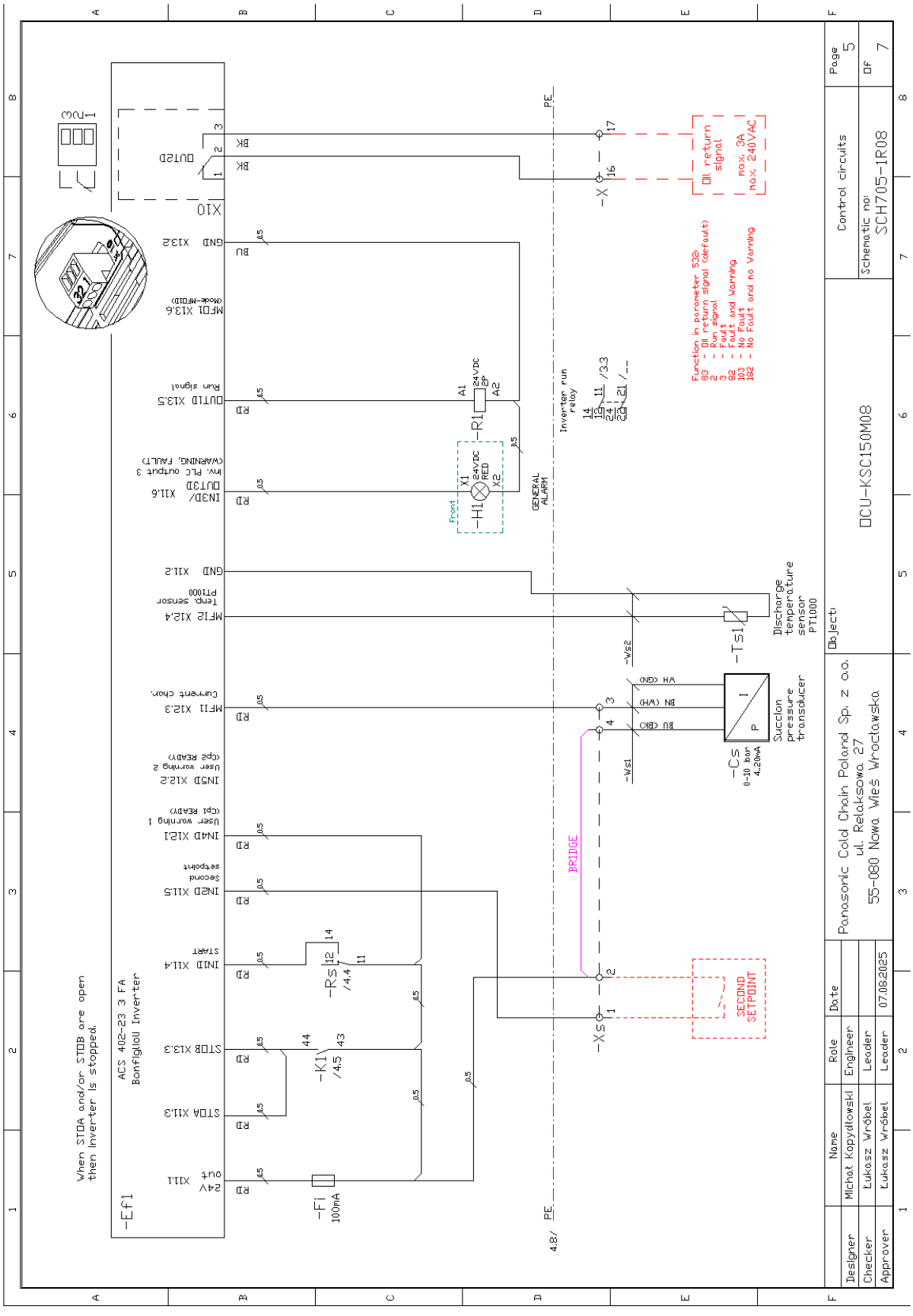



Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Object:
Power supply
Schematic no: SCH705-1R08
Page 2
OF 7
Designer Michał Kopydłowski Engineer
Checker Łukasz Wróbel Leader 07.08.2025
Approver Łukasz Wróbel Leader
Name Role Date
CU-KSC150M08
Power supply 3x400VAC+N+PE
-Q1F Main switch 40A
-F1 B32/3 Inverter
-F2 MMS-32S (11-17)A +FX-11 set: 17A
-Ef1 ACS 402-23 3 FA Bonfiglioli 11 kW Inverter
-K1 MC62B-A230
-K2 MC18B-A230 +AU-2
-R0 3 phase control relay
Finder 70.61.8.400 (RN-33 Novotek)
-Cp1 Compressor 1 C-SBVN373L0B FLA = 16,9A RLA = 10,7A
-Cp1g Compressor carter heater 70W
-W1
-W2 Y-GY-JZ 4x4
-Xz
-Xhr
-Whr1 Y-JZ 2x1
-Whr2 Y-JZ 3x1
-Whr3 Y-JZ 3x1
-HR Start heat recovery
-YHR1
-YHR2
contact 8A 250V minimum
Electrovalve 1
Electrovalve 2
Heat recovery thermhals - installed only in units with included heat recovery (-D unit version)
BRIDGE
Unit door PE (end with M5 connector)
Unit housing (Front panel end with M5 connector)
Front
3.4/LST2
/3.1
/4.1
/4.5
/4.6
/4.7

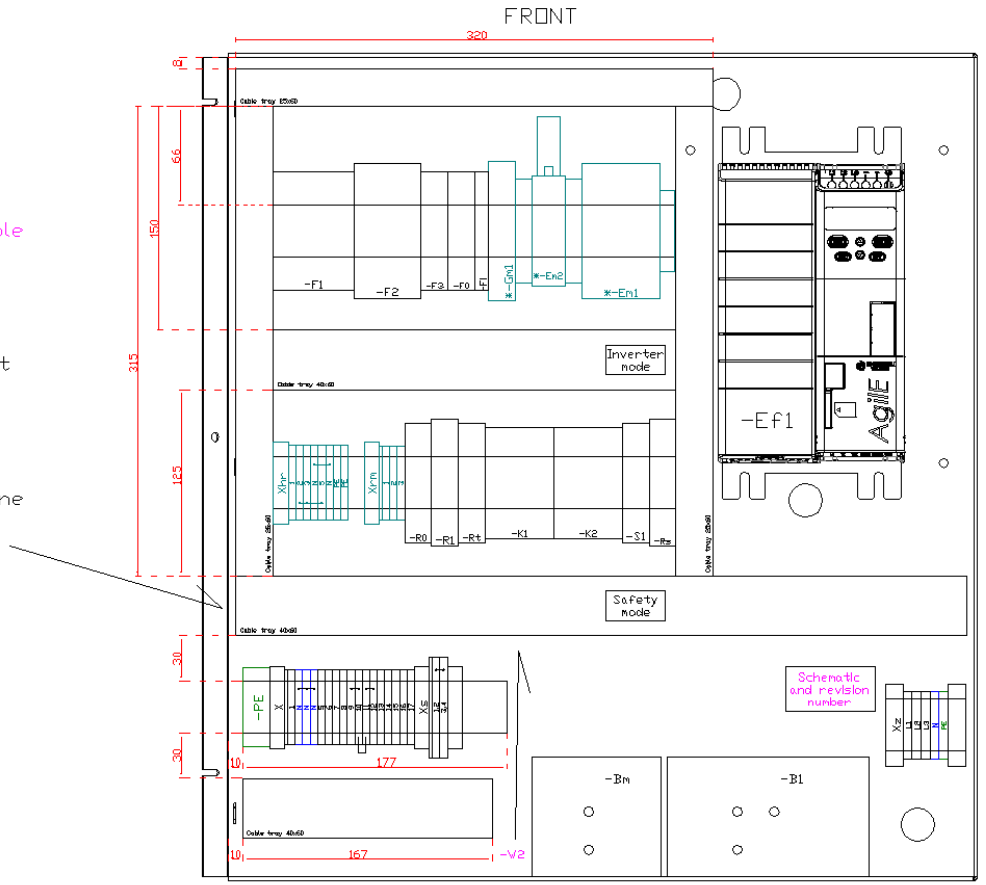


-F0
B6
Control + heater/fan circuits
-F3
C10/1
Condenser fans
-R1
/5.6
-K2
/4.6
-Rt
300s
80.21.0.240
(REV-114)
A1(L)
A2(N)
LST /4.1
LST2 /2.6
BRIDGE
-B1w
KSD9700
NO 20
20°C
-Mch1
Cooling fan
Side wall
-Cd1r
P315PR-9200
Fan speed controller
GND 0V
0-10V
+10V
-Cd1r
XGE-4SE
Fan speed controller
Option XGE regulator
-Ws3
Y-JZ 3x0.5
-W3
Y-OZ 2x1
-W4
Y-JZ 3x1
-W5
Y-JZ 3x1
-Ws4
Y-JZ 2x0.5
-X
-Mskr 1
Lower
-Mskr 2
Upper
Condenser EC fans
FN063-6IA.BD.A7P2
In = 1A
2.8/ L3
2.8/ N
2.8/ PE
N /4.1
PE /4.1
2.4/ CH1
2.4/ CH2
Designer
Checker
Approver
Name
Michał Kopydłowski
Łukasz Wróbel
Łukasz Wróbel
Role
Engineer
Leader
Leader
Date
07.08.2025
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Object:
OCU-KSC150M08
Auxiliary circuits
Schematic no:
SCH705-1R08
Page 3
Of 7


Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Object:
CU-KSC150M08
Auxiliary circuits
Schematic no:
SCH705-1R08
Page 4
OF 7
Designer Michał Kopydłowski Engineer
Checker Łukasz Wróbel Leader
Approver Łukasz Wróbel Leader 07.08.2025
UNIT
2-OFF
1-INVERTER
5-SAFETY
Schrack BZ106380
-S1
-K1
-K2
-Rt
-Rs
-F2
-X
-W8 3x1
-Bm
Pressure switch LP for safety mode
-R0
-H0
230VAC WHITE
-W7 Y-DZ 2x1
-B1s
Motor compressor safety termostat (integrated)
BRIDGE
External permition to work
-W6 Y-JZ 4x1
-Bk1
MAIN PRESSURE SWITCH HP/LP
DANFOSS/LEFOO (RANCO)
HP
LP
Compressor START
LST
N
PE


When STOA and/or STOB are open then inverter is stopped.
ACS 402-23 3 FA
Bonfiglioli Inverter
-Ef1
-Fi
100mA
-K1
-Rs
-R1
-H1
-Cs
-Ts1
-Ws1
-Ws2
-Xs
-X
BRIDGE
SECOND SETPOINT
Inverter run relay
GENERAL ALARM
Discharge temperature sensor PT1000
Suction pressure transducer
Function in parameter 53B
63 - Oil return signal (default)
2 - Run signal
3 - Fault
82 - Fault and Warning
103 - No Fault
182 - No Fault and no Warning
Oil return signal
max. 3A
max. 240VAC
OUT2D
GND X13.2
MFOI X13.6
OUT1D X13.5
IN3D/ OUT3D X11.6
GND X11.2
MFI2 X12.4
MFI1 X12.3
IN5D X12.2
IN4D X12.1
IN2D X11.5
IN1D X11.4
STOB X13.3
STOA X11.3
24V out X11.1
Designer
Checker
Approver
Michał Kopydłowski
Łukasz Wróbel
Łukasz Wróbel
Engineer
Leader
Leader
07.08.2025
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Object:
OCU-KSC150M08
Control circuits
Schematic no:
SCH705-1R08
Page 5
OF 7

Note:
1. Power supply on circuit breaks (-F..) always on the top.
2. Unmarked wires - cross-section 1mm2.
3. All the wires in the cabinet finished with sleeve ferrule.
4. Wires to the devices not mounted on the panel:
   -Q1: - 750 mm (out of the cable tray),
   -Mch1 - 800 mm (PE 900mm) (out of the cable tray),
   -H0 - 650 mm (out of the cable tray),
   -H1 - 600 mm (out of the cable tray).
5. All the wires finished with sleeves ferrule (-Mch1 with connectors)
6. Inverter -Ef1 mounted to the plate by rivet nuts.
7. Connect K1: 2,4,6 and K2: 2,4,6 with wire according to electrical diagram.
8. Number of diagram and it's revision to be labeled on a sticker in indicated place.
9. Feed the shield of the compressor supply line as close as possible to contactor K1.
*. Optional elements.



	Name	Role	Date
Designer	Michał Kopydłowski	Engineer	
Checker	Łukasz Wróbel	Leader	
Approver	Łukasz Wróbel	Leader	07.08.2025

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

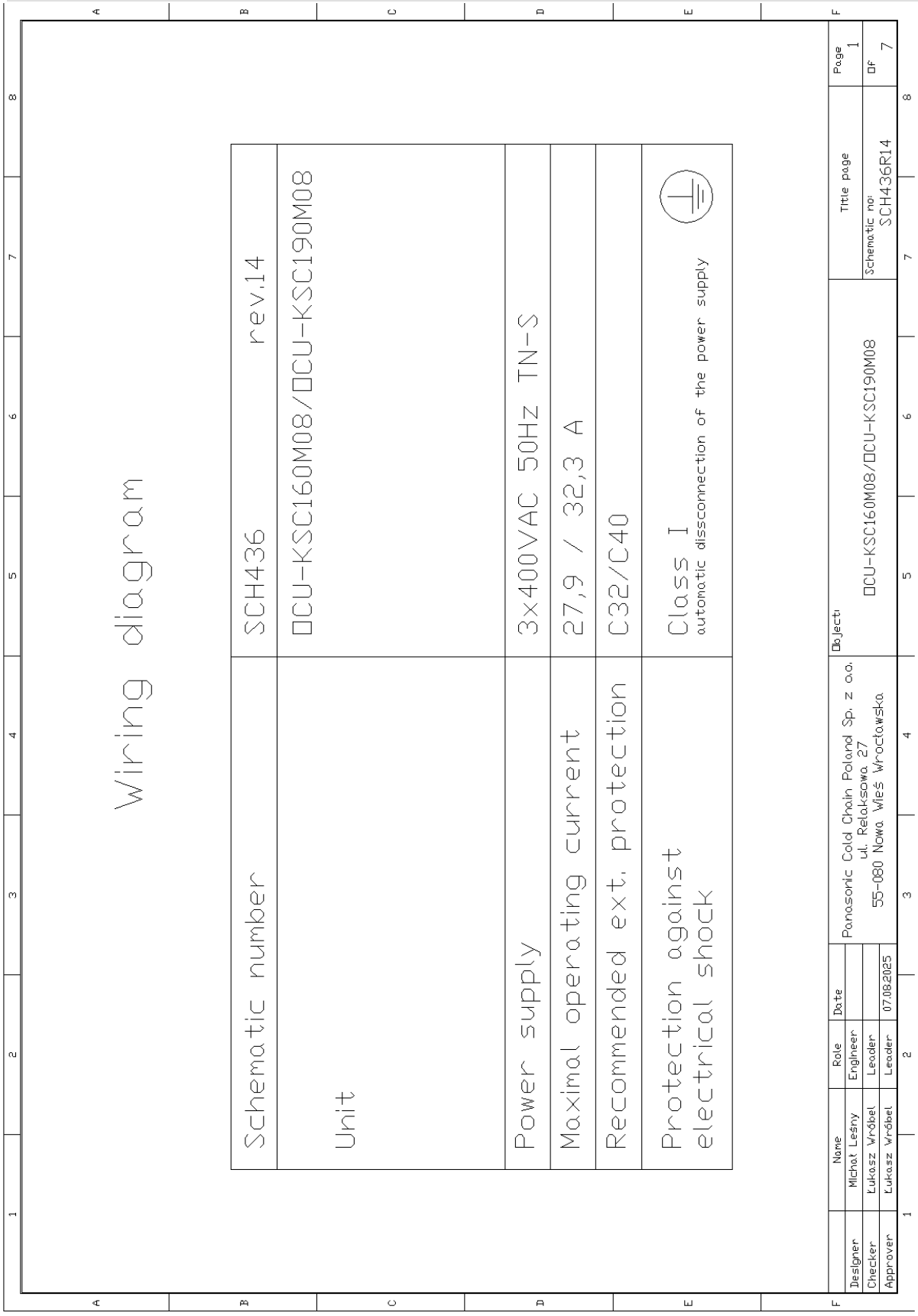
Object:
CU-KSC150M08

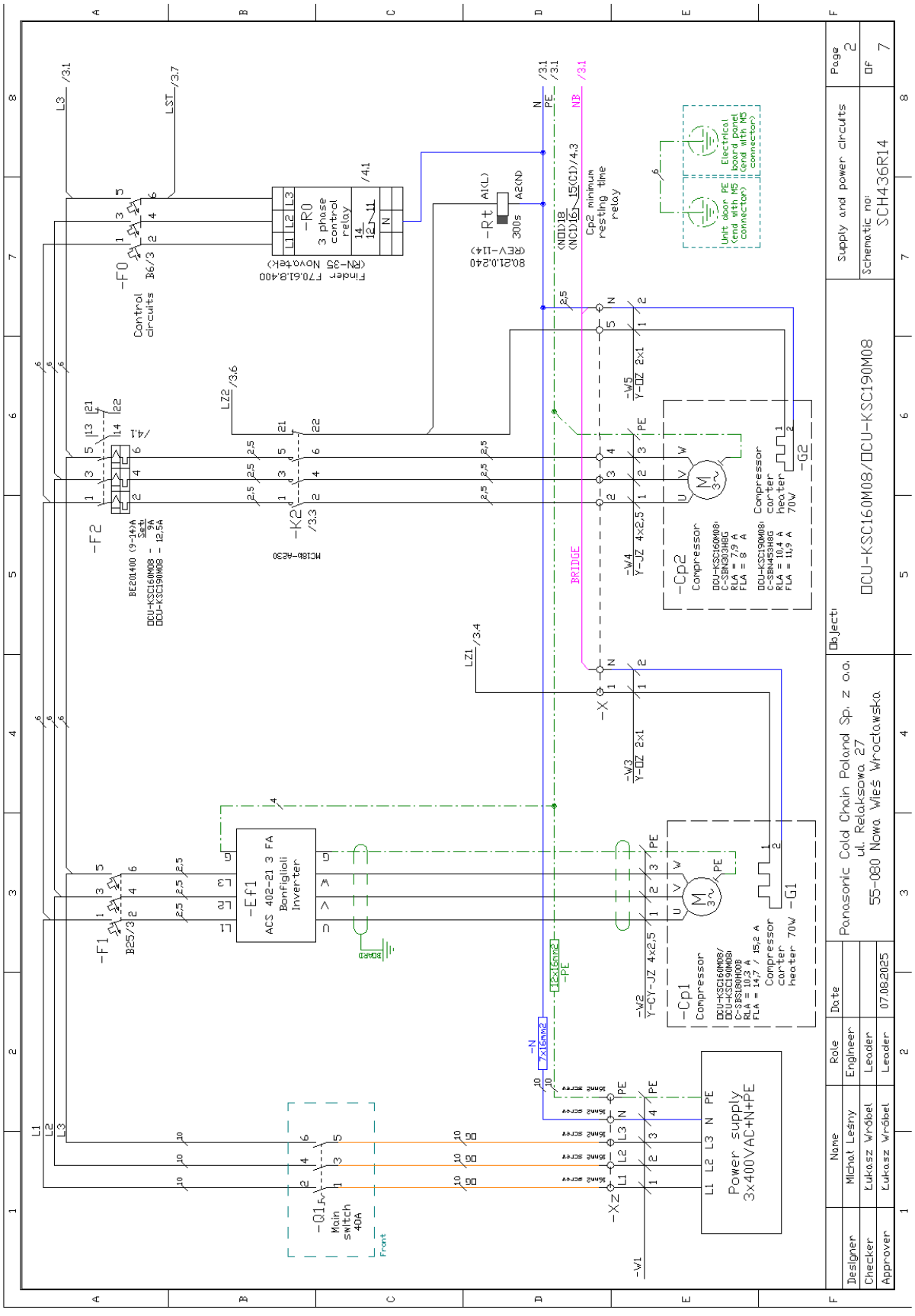
Mounting plate

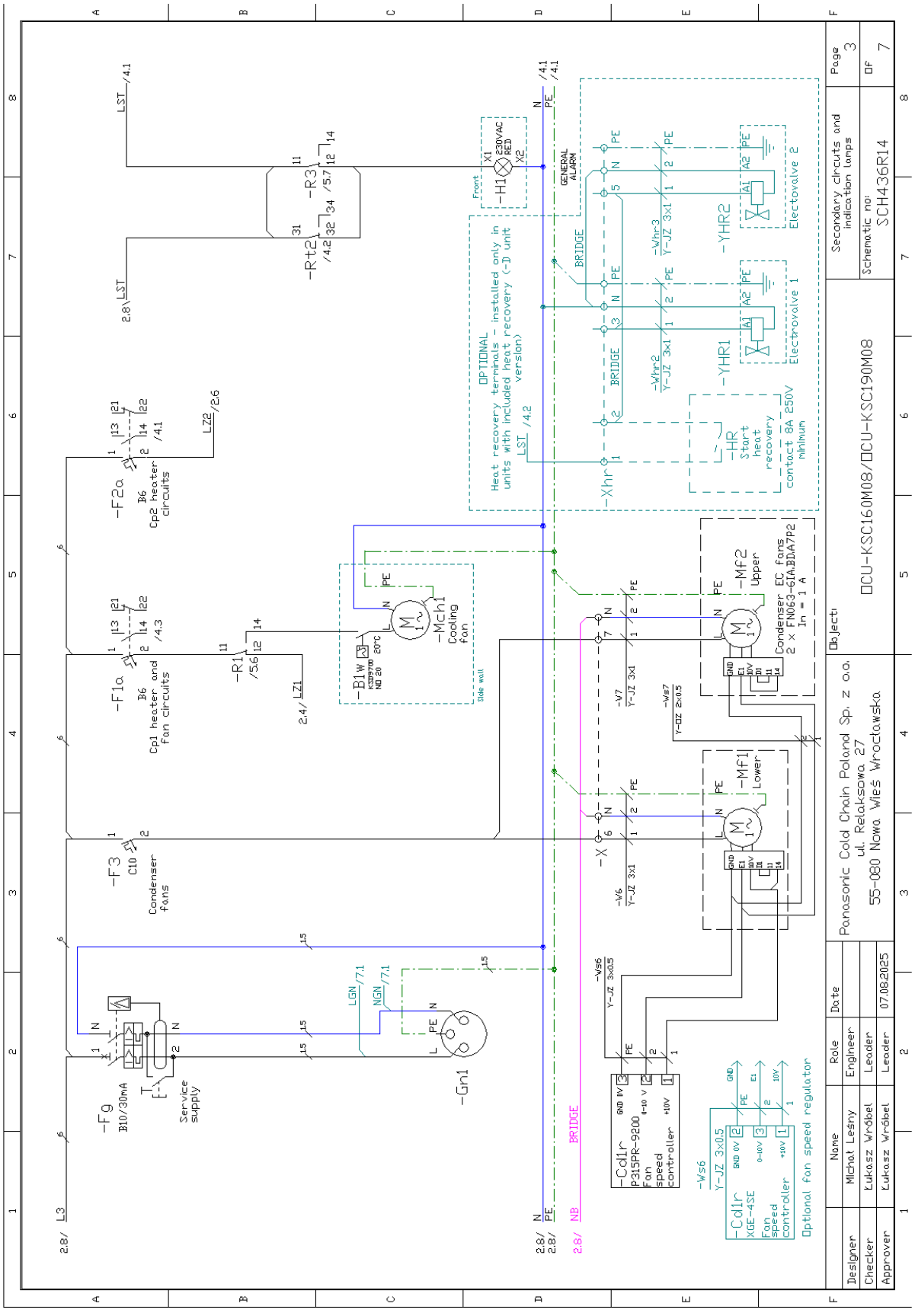
Schematic no:
SCH705-1R08

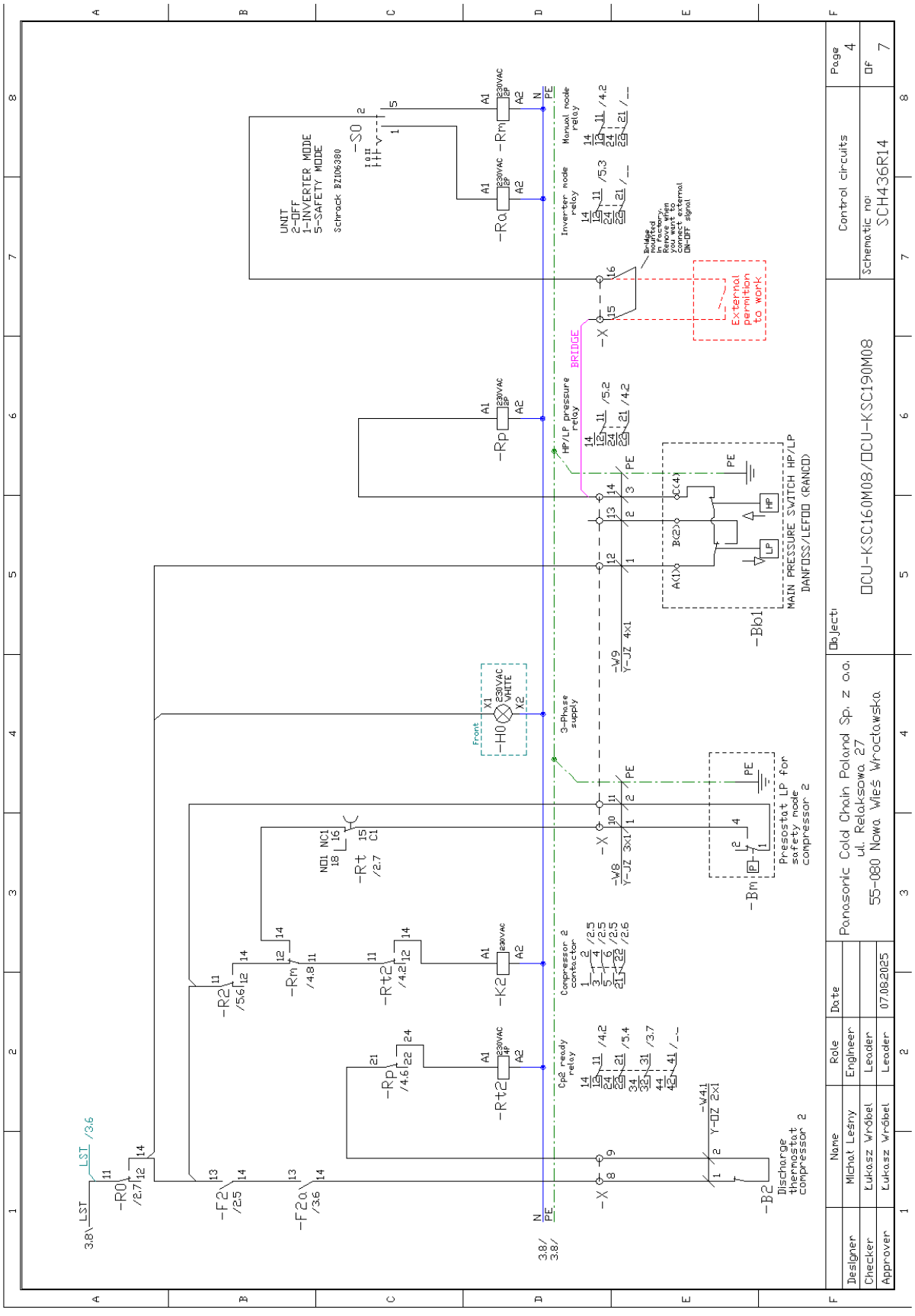
Page 6 of 7

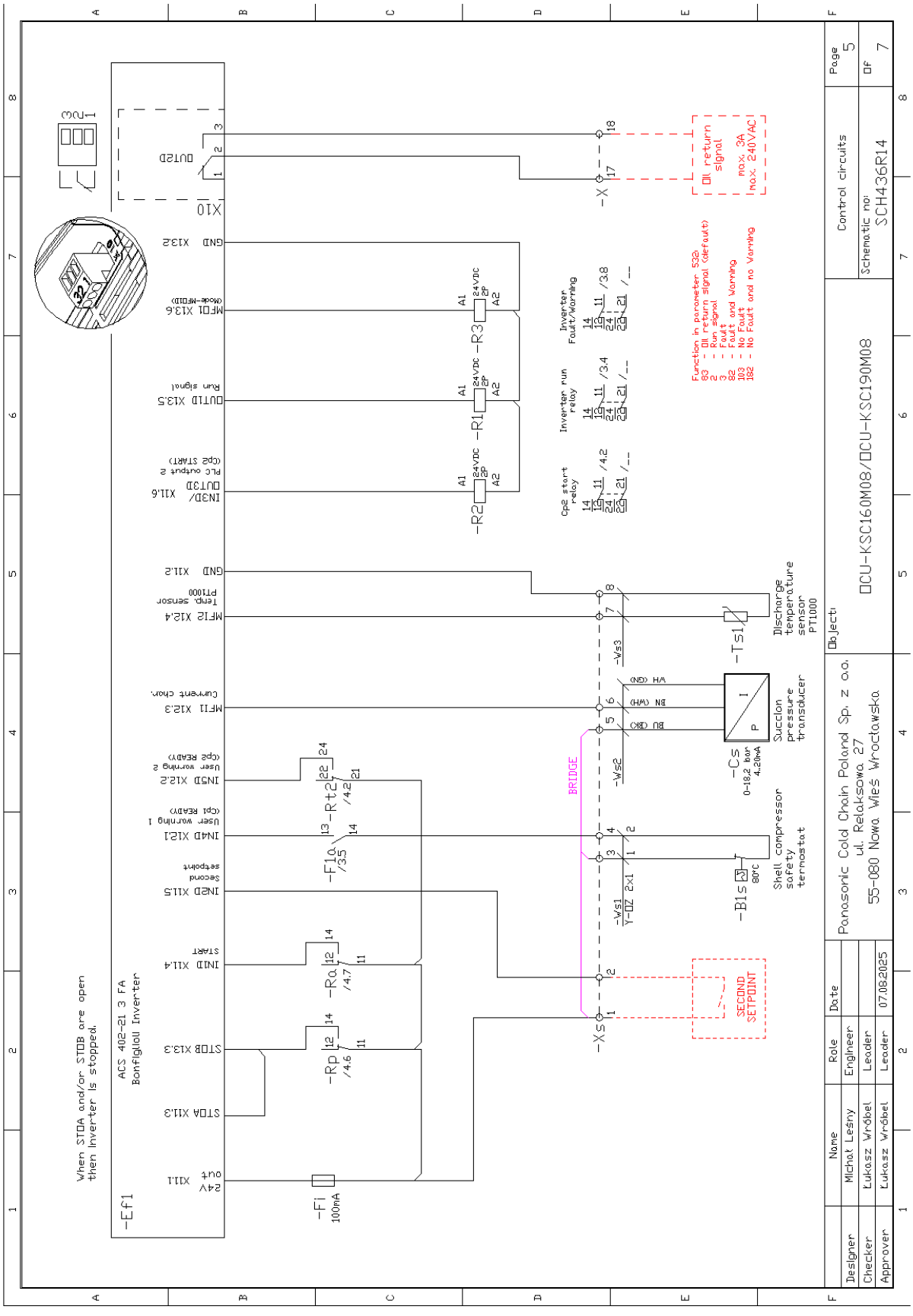
16.3. OCU-KSC160M08/OCU-KSC190M08




Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Object:
DCU-KSC160M08/DCU-KSC190M08
Supply and power circuits
Page 2
Schematic no: SCH436R14
OF 7
Designer Michał Leśny Engineer
Checker Łukasz Wróbel Leader
Approver Łukasz Wróbel Leader 07.08.2025
Name Role Date
Power supply 3x400VAC+N+PE
-F0 Control circuits
-R0 3 phase control relay
-Rt 300s
-K2
-F2
-F1
-Ef1 ACS 402-21 3 FA Bonfiglioli Inverter
-Cp2 Compressor
-Cp1 Compressor
-G2 Compressor carter heater 70W
-G1 Compressor carter heater 70W
-W5 Y-DZ 2x1
-W4 Y-JZ 4x2,5
-W3 Y-DZ 2x1
-W2 Y-GY-JZ 4x2,5
-W1
-X
-Xz
-Q1F Main switch 40A
Front
BRIDGE
-N 2x16mm2
3x16mm2 -PE
Unit door PE (end with M5 connector)
Electrical board panel (end with M5 connector)
Cp2 minimum resting time relay
N.B.


-F9 B10/30mA
Service supply
-F3 C10 4P Condenser fans
-F1a B6 Cp1 heater and fan circuits
-F2a B6 Cp2 heater circuits
-R1 /5.6
-R2 /4.2
-R3 /5.7
-B1 W K339700 ND 20 20°C
-Mch1 Cooling fan
Side wall
-Gn1
-Cd1r P315PR-9200 Fan speed controller
-Cd1r XGE-4SE Fan speed controller
Optional fan speed regulator
-X
-Xhr
-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)
LST /4.2
BRIDGE
GENERAL ALARM
-H1 230VAC RED
-MF1 Lower
-MF2 Upper
Condenser EC fans 2 × FN063-6IA.BD.A7P2 In = 1 A
-V6 Y-JZ 3x1
-V7 Y-JZ 3x1
-Vs6 Y-JZ 3x0.5
-Vs7 Y-OZ 2x0.5
-Vhr2 Y-JZ 3x1
-Vhr3 Y-JZ 3x1
LGN /7.1
NGN /7.1
LST /4.1
LZ2 /2.6
LZ1 /2.4
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Object:
□CU-KSC160M08/□CU-KSC190M08
Secondary circuits and indication lamps
Schematic no: SCH436R14
Page 3
OF 7
Designer Michał Leśny Engineer 07.08.2025
Checker Łukasz Wróbel Leader
Approver Łukasz Wróbel Leader

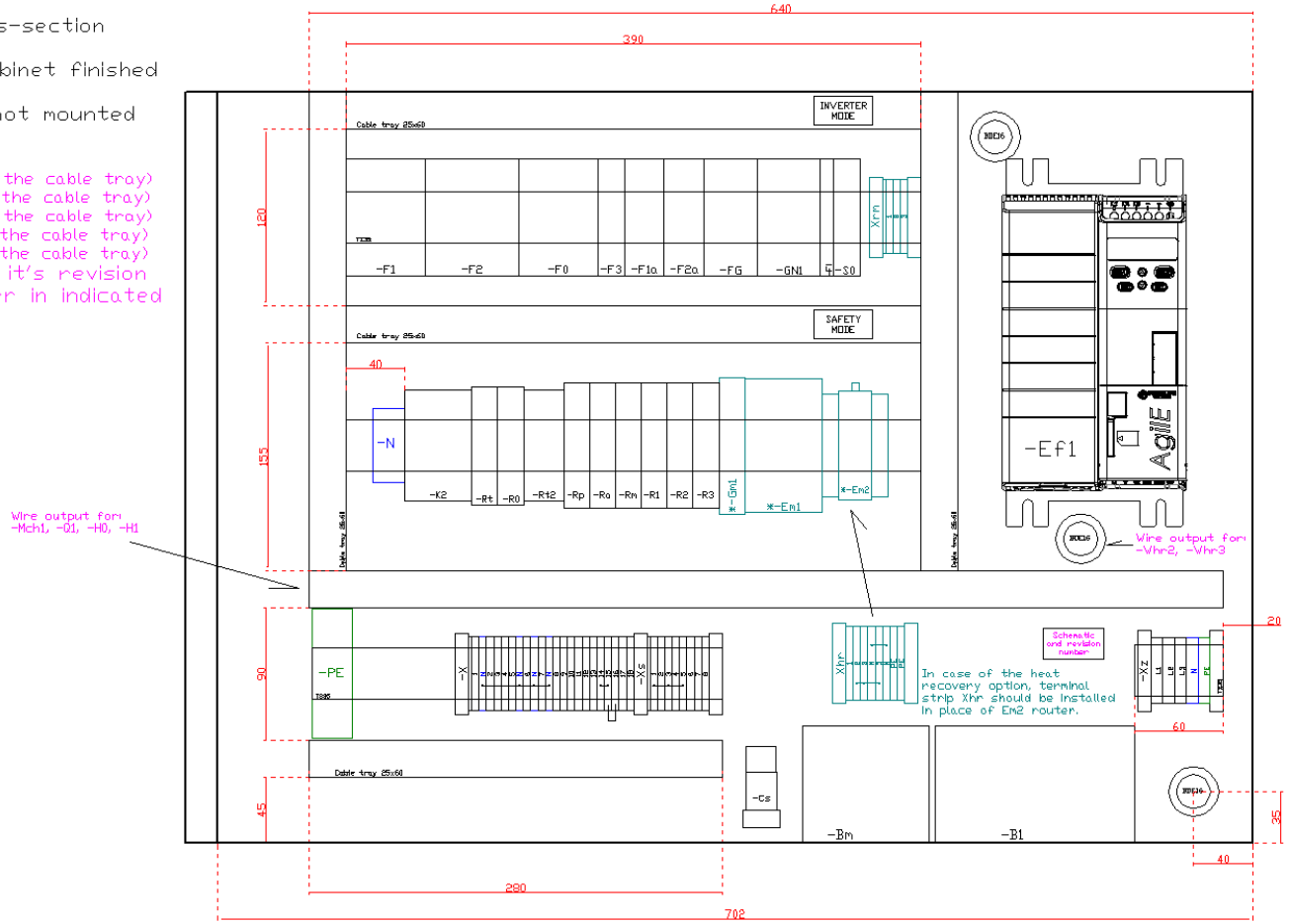

UNIT
2-OFF
1-INVERTER MODE
5-SAFETY MODE
Schrack BZ106380
-S0
-Rm
-Rq
-Rp
-Rt2
-K2
-R2
-F2
-F20
-R0
-H0
-Bl01
-Bm
-B2
-X
-W9
-W8
-W41
-Rt
Inverter mode relay
Manual mode relay
HP/LP pressure relay
Compressor 2 contactor
CpE ready relay
Discharge thermostat compressor 2
Presostat LP for safety mode compressor 2
MAIN PRESSURE SWITCH HP/LP
DANFOSS/LEFOD (RANCO)
Bridge mounted necessary. Remove when inverter is to Connect external ON-OFF signal
External permition to work
BRIDGE
3-Phase supply
Front
LST
N
PE
Designer
Michał Leśny
Engineer
Checker
Łukasz Wróbel
Leader
Approver
Łukasz Wróbel
Leader
07.08.2025
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Object:
OCU-KSC160M08/OCU-KSC190M08
Control circuits
Schematic no:
SCH436R14
Page 4
OF 7


When STOA and/or STOB are open then inverter is stopped.
-Ef1
ACS 402-21 3 FA
Bonfiglioli Inverter
-Fi
100mA
-Rp
-Ro
-Rt2
-F10
-R1
-R2
-R3
-Ws1
-Ws2
-Ws3
-Xs
-X
-Ts1
-Cs
-B1s
BRIDGE
SECOND SETPOINT
Discharge temperature sensor PT1000
Suction pressure transducer
Shell compressor safety termostat
Inverter run relay
Cpe start relay
Inverter Fault/Warning
Function in parameter S3B
63 - DI return signal (default)
2 - Run signal
3 - Fault
82 - Fault and Warning
103 - No Fault
182 - No Fault and no Warning
DI return signal
max. 3A
max. 240VAC
OUT2D
GND X13.2
OUT1D X13.5
IN3D/ OUT3D X11.6
GND X11.2
MFI2 X12.4
MFI1 X12.3
IN2D X12.2
IN1D X12.1
IN2D X11.5
IN1D X11.4
STOB X13.3
STOA X11.3
24V out X11.1
Run signal
PLC output 2 (CPE START)
Temp. sensor PT1000
Current chan.
User warning 2 (CPE READY)
User warning 1 (CPI READY)
Second setpoint
START
Mode-MFDI
Object:
ΠCU-KSC160M08/ΠCU-KSC190M08
Control circuits
Schematic no:
SCH436R14
Page 5
OF 7
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Designer Michał Leśny Engineer
Checker Łukasz Wróbel Leader
Approver Łukasz Wróbel Leader
07.08.2025

Note:
1. Power supply on circuit breaks (-F..) allways on the top.
2. Unmarked wires - cross-section 1mm2.
3. All the wires in the cabinet finished with sleeve ferrule.
4. Wires to the devices not mounted on the panel:

- Q1: (2,4,6) -> 750mm (out of the cable tray)
  (1,3,5) -> 900mm (out of the cable tray)
- H0, H1: -> 700mm (out of the cable tray)
- Mch1: L,N -> 800mm (out of the cable tray)
  PE -> 700mm (out of the cable tray)

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



	Name	Role	Date
Designer	Michał Leśny	Engineer	
Checker	Łukasz Wróbel	Leader	
Approver	Łukasz Wróbel	Leader	07.08.2025

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

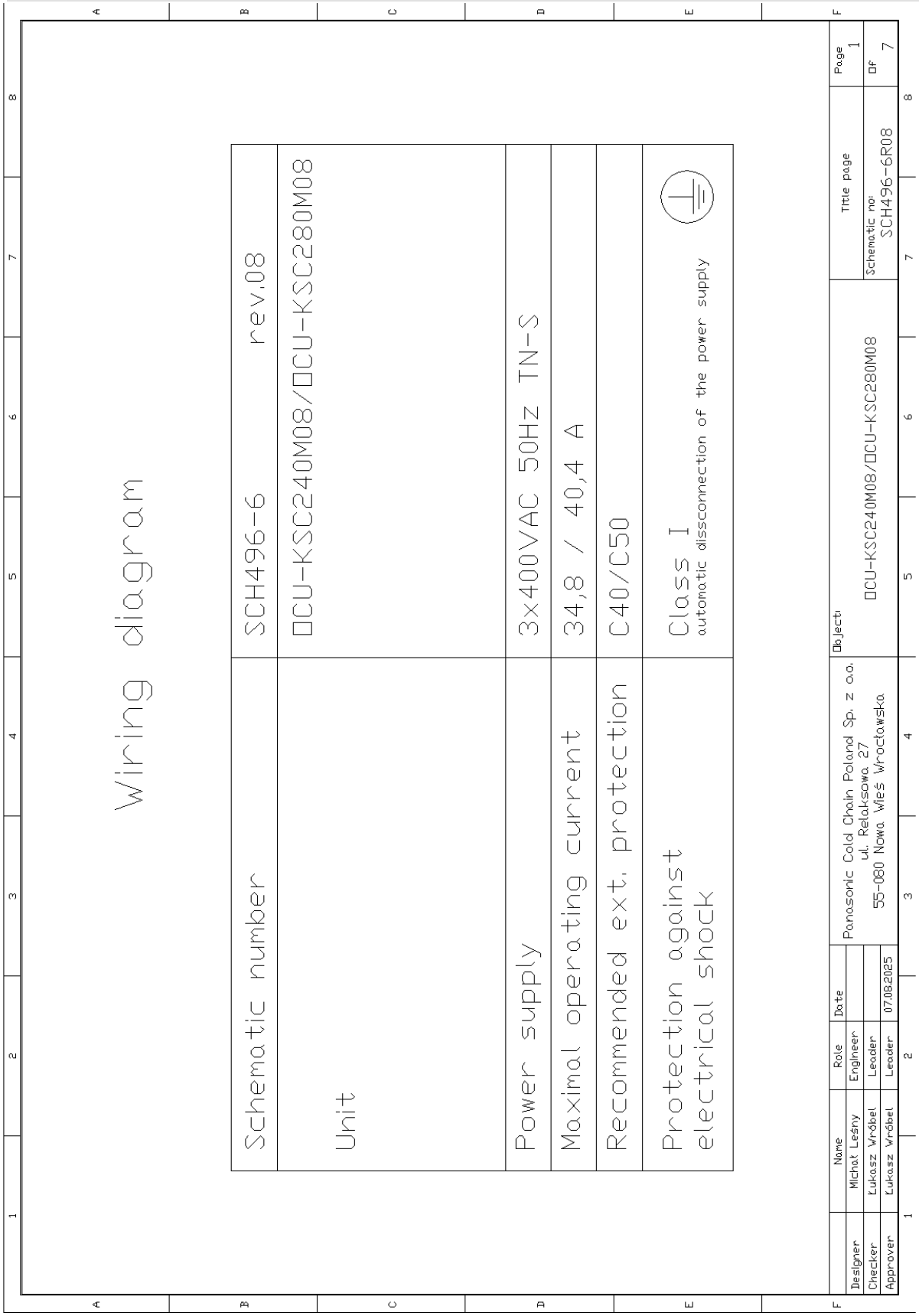
Object:
□CU-KSC160M08/□CU-KSC190M08

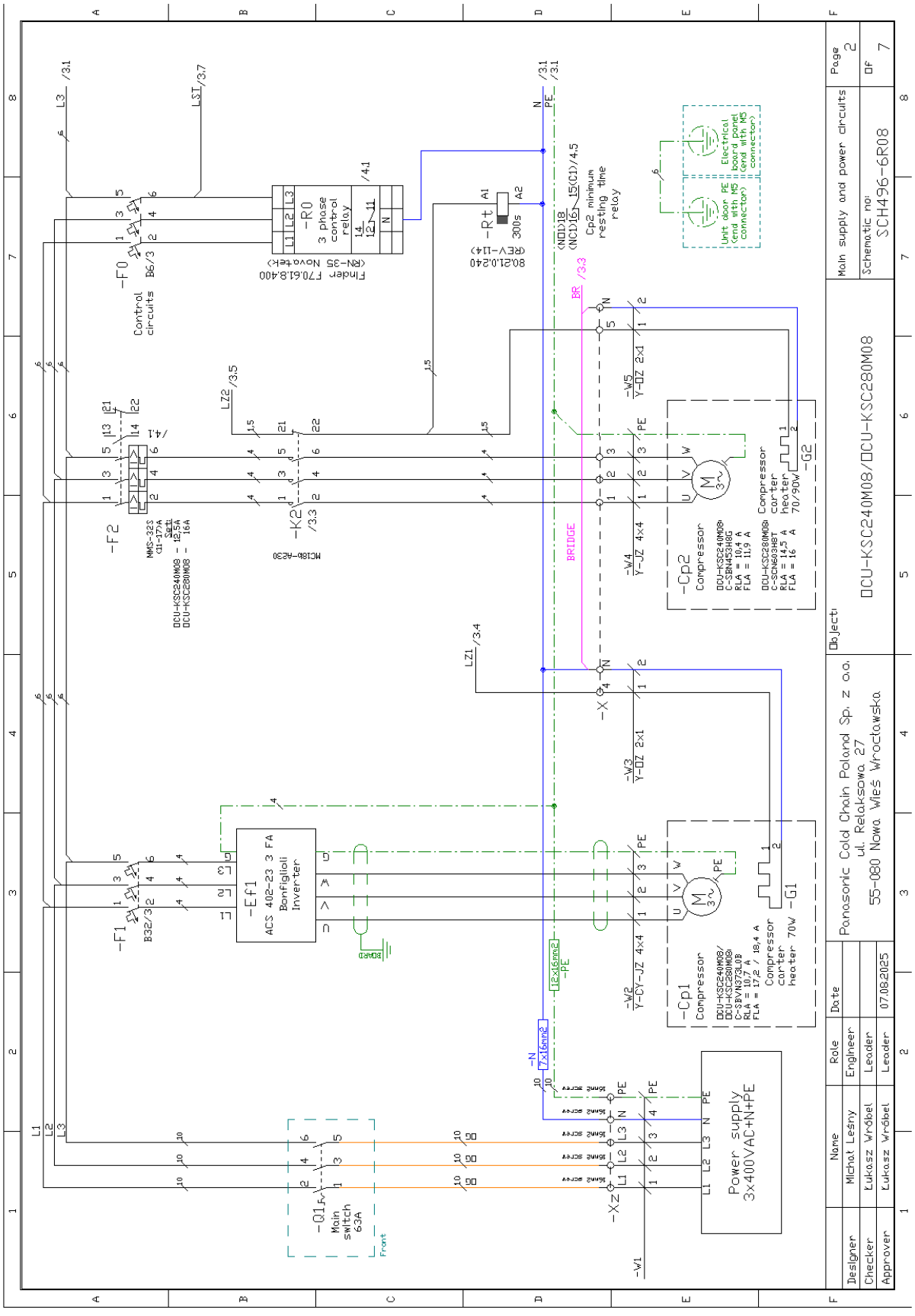
Mounting plate - front

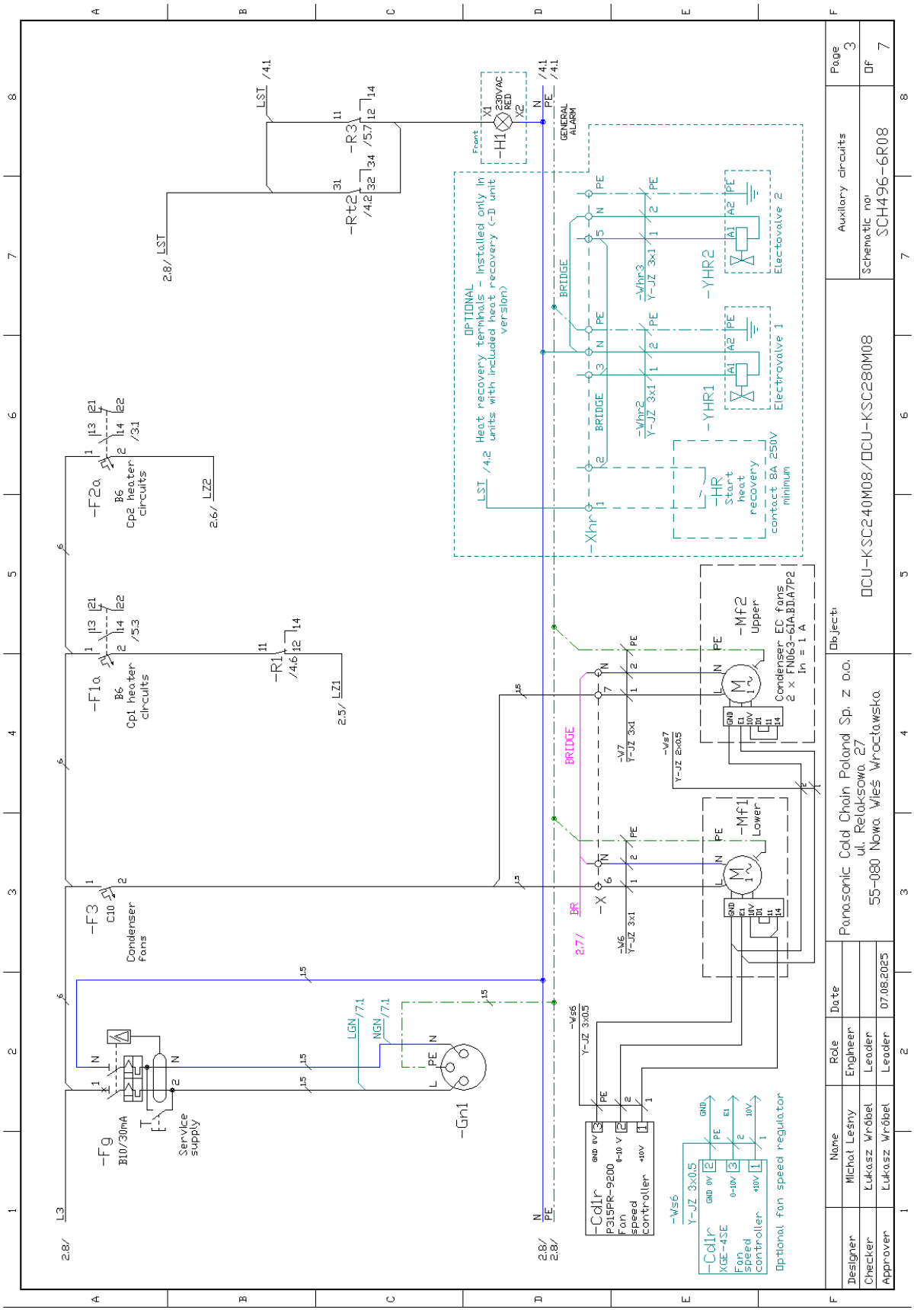
Schematic no:
SCH436R14

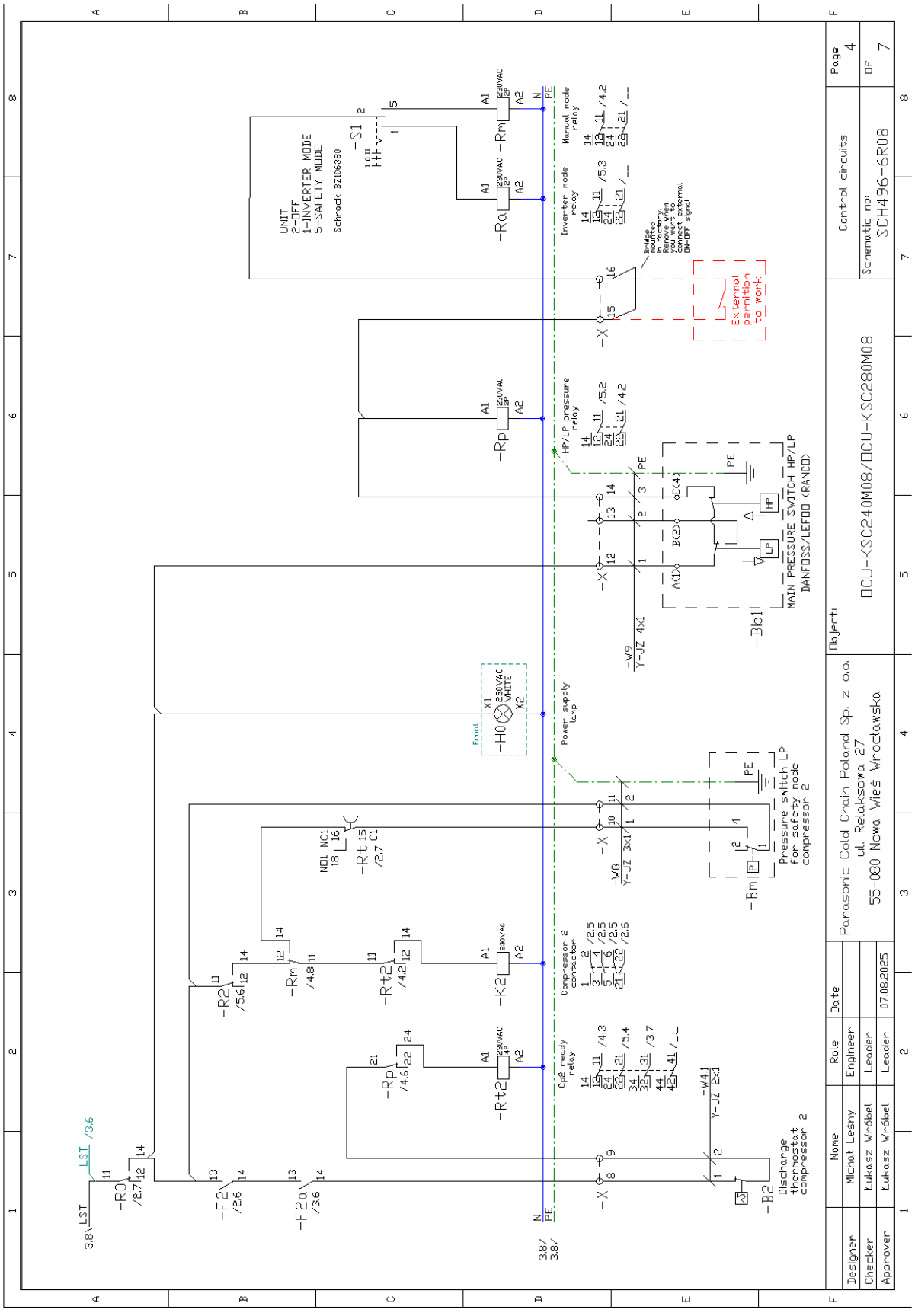
Page 6 of 7

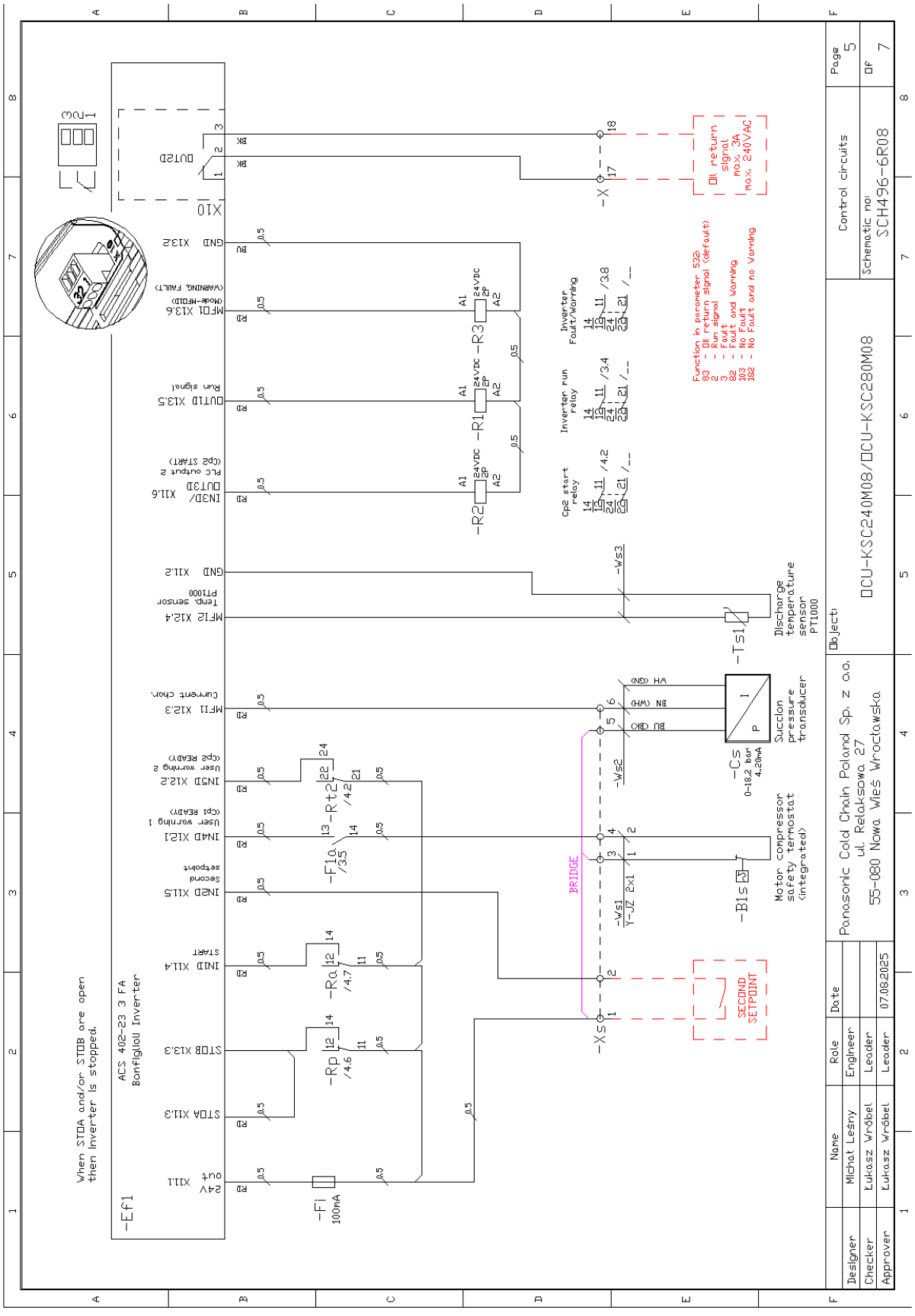
16.4. OCU-KSC240M08/OCU-KSC280M08




Power supply
3x400VAC+N+PE
-Q1
Main switch 63A
-F0
Control circuits
-F1
B32/3
-F2
-K2
-R0
3 phase control relay
-Rt
300s
-EF1
ACS 402-23 3 FA
Banfiglioli
Inverter
-Cp1
Compressor
-Cp2
Compressor
-W1
-W2
-W3
-W4
-W5
-G1
-G2
-X1
-X2
-X4
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Object:
DCU-KSC240M08/DCU-KSC280M08
Main supply and power circuits
Schematic no: SCH496-6R08
Page 2
OF 7
Designer Michał Leśny Engineer
Checker Łukasz Wróbel Leader
Approver Łukasz Wróbel Leader
07.08.2025


DCU-KSC240M08/DCU-KSC280M08
Panasonic Cold Chain Poland Sp. z o.o.
ul. Reaksowa 27
55-080 Nowa Wieś Wrocławska
Auxiliary circuits
Schematic no: SCH496-6R08
Page 3
OF 7
Name
Role
Date
Designer
Michał Leśny
Engineer
Checker
Łukasz Wróbel
Leader
07.08.2025
Approver
Łukasz Wróbel
Leader
-Fg
B10/30mA
Service supply
-F3
C10
Condenser fans
-F1a
B6
Cpl heater circuits
-F2a
B6
Cpl heater circuits
-R1
-R2
-R3
-H1
230VAC RED
GENERAL ALARM
-Gn1
-Cdir
P315PR-9200
Fan speed controller
-Cdir
XGE-4SE
Fan speed controller
Optional fan speed regulator
-Mf1
Lower
-Mf2
Upper
Condenser EC fans
2 x FN063-6IA.BD.A7P2
In = 1 A
-Xhr
-HR
Start heat recovery
contact 8A 250V minimum
-YHR1
Electrovalve 1
-YHR2
Electrovalve 2
-Whr2
-Whr3
Y-JZ 3x1
-W7
-W6
-Ws7
-Ws6
Y-JZ 2x0.5
Y-JZ 3x0.5
OPTIONAL
Heat recovery terminals - installed only in units with included heat recovery (-D unit version)
BRIDGE
BR
LST
LZ1
LZ2
LGN
NGN
L3
N
PE

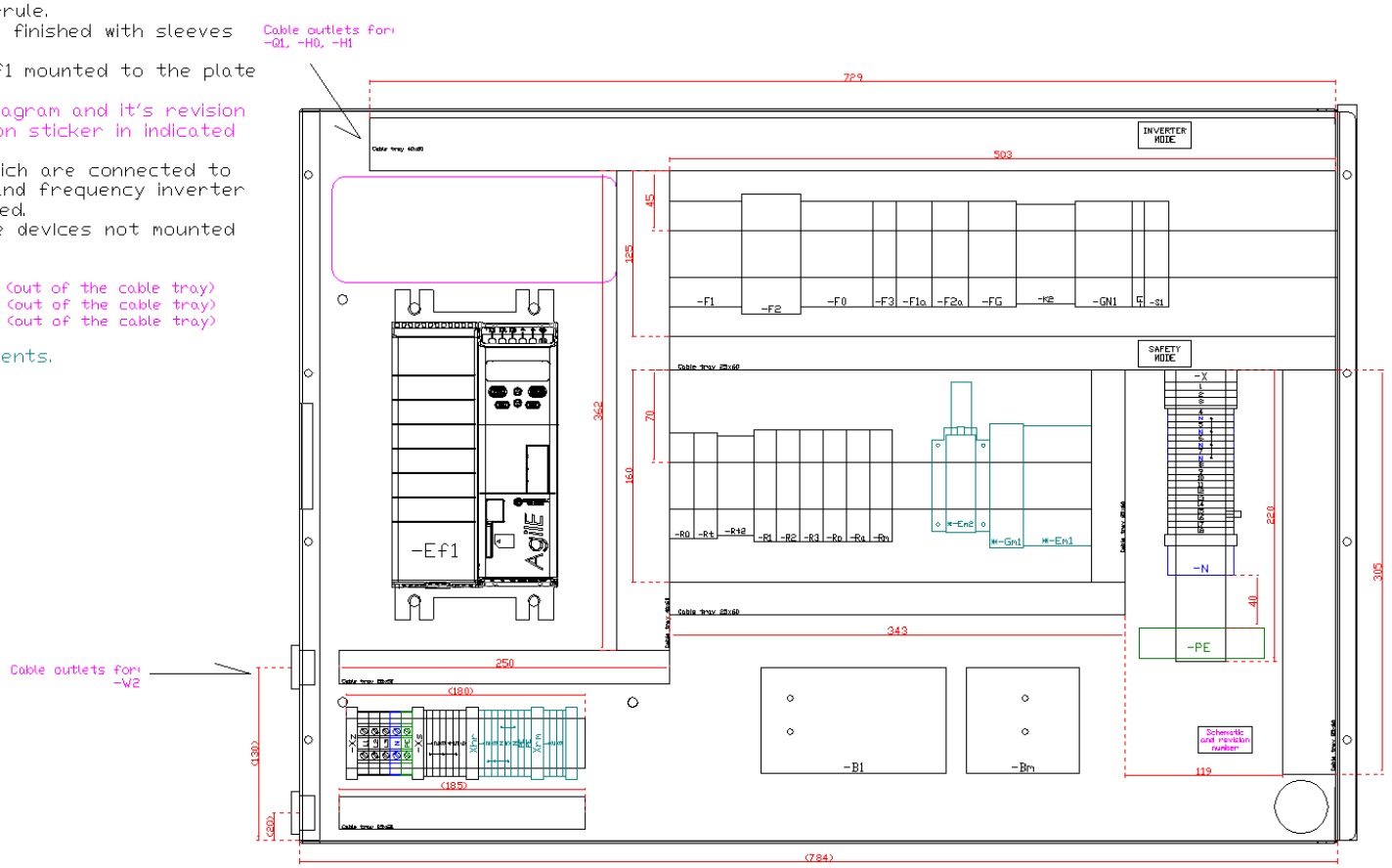

Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
DCU-KSC240M08/DCU-KSC280M08
Control circuits
Schematic no: SCH496-6R08
Page 4
OF 7
Designer Michał Leśny Engineer 07.08.2025
Checker Łukasz Wróbel Leader
Approver Łukasz Wróbel Leader
UNIT
2-OFF
1-INVERTER MODE
5-SAFETY MODE
Schrack BZ106380
-S1
-Rm
-Rq
-Rp
-Rt2
-K2
-R2
-F2
-F20
-R0
-H0
-X
-W9 Y-JZ 4x1
-W8 Y-JZ 3x1
-W41 Y-JZ 2x1
-Bp1
-Bm
-B2
Inverter mode relay
Manual mode relay
HP/LP pressure relay
Compressor 2 contactor
Cpe ready relay
Discharge thermostat compressor 2
Power supply lamp
MAIN PRESSURE SWITCH HP/LP
DANFOSS/LEFOD (RANCO)
Pressure switch LP
For safety mode
compressor 2
External permition to work
Bridge mounted if necessary. Remove when inverter is to Connect external ON-OFF signal
Front
LST /3.6
3.8/
N
PE


When STOA and/or STOB are open then inverter is stopped.
ACS 402-23 3 FA
Bonfiglioli Inverter
-Ef1
-Fi
100mA
-Rp
-Ro
-Rt2
-F10
-R1
-R2
-R3
-Ts1
-Cs
-B1s
-Ws1
-Ws2
-Ws3
-Xs
-X
X10
BRIDGE
SECOND SETPOINT
Discharge temperature sensor PT1000
Suction pressure transducer
Motor compressor safety termostat (integrated)
Inverter run relay
Inverter Fault/Warning
Cpe start relay
Function in parameter S3B:
83 - DU return signal (default)
2 - Run signal
3 - Fault
82 - Fault and Warning
103 - No Fault
182 - No Fault and no Warning
DU return signal max 3A max 240VAC
Designer
Checker
Approver
Michał Leśny
Łukasz Wróbel
Łukasz Wróbel
Engineer
Leader
Leader
07.08.2025
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Object:
DCU-KSC240M08/DCU-KSC280M08
Control circuits
Schematic no:
SCH496-6R08
Page 5
OF 7

Note:
1. Power supply on circuit breaks (-F..) always on the top.
2. Unmarked wires - cross-section 1mm2.
3. All the wires in the cabinet finished with sleeve ferrule.
4. All the wires finished with sleeves ferrule.
5. Inverter -Ef1 mounted to the plate by rivet nuts.
7. Number of diagram and it's revision to be labeled on sticker in indicated place.
8. The wires which are connected to the terminals and frequency inverter should be marked.
9. Wires to the devices not mounted on the panel:

- Q1: -) 630mm (out of the cable tray)
- H0: -) 700mm (out of the cable tray)
- H1: -) 770mm (out of the cable tray)

*. Optional elements.



	Name	Role	Date
Designer	Michał Leśny	Engineer	
Checker	Łukasz Wróbel	Leader	
Approver	Łukasz Wróbel	Leader	07.08.2025

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

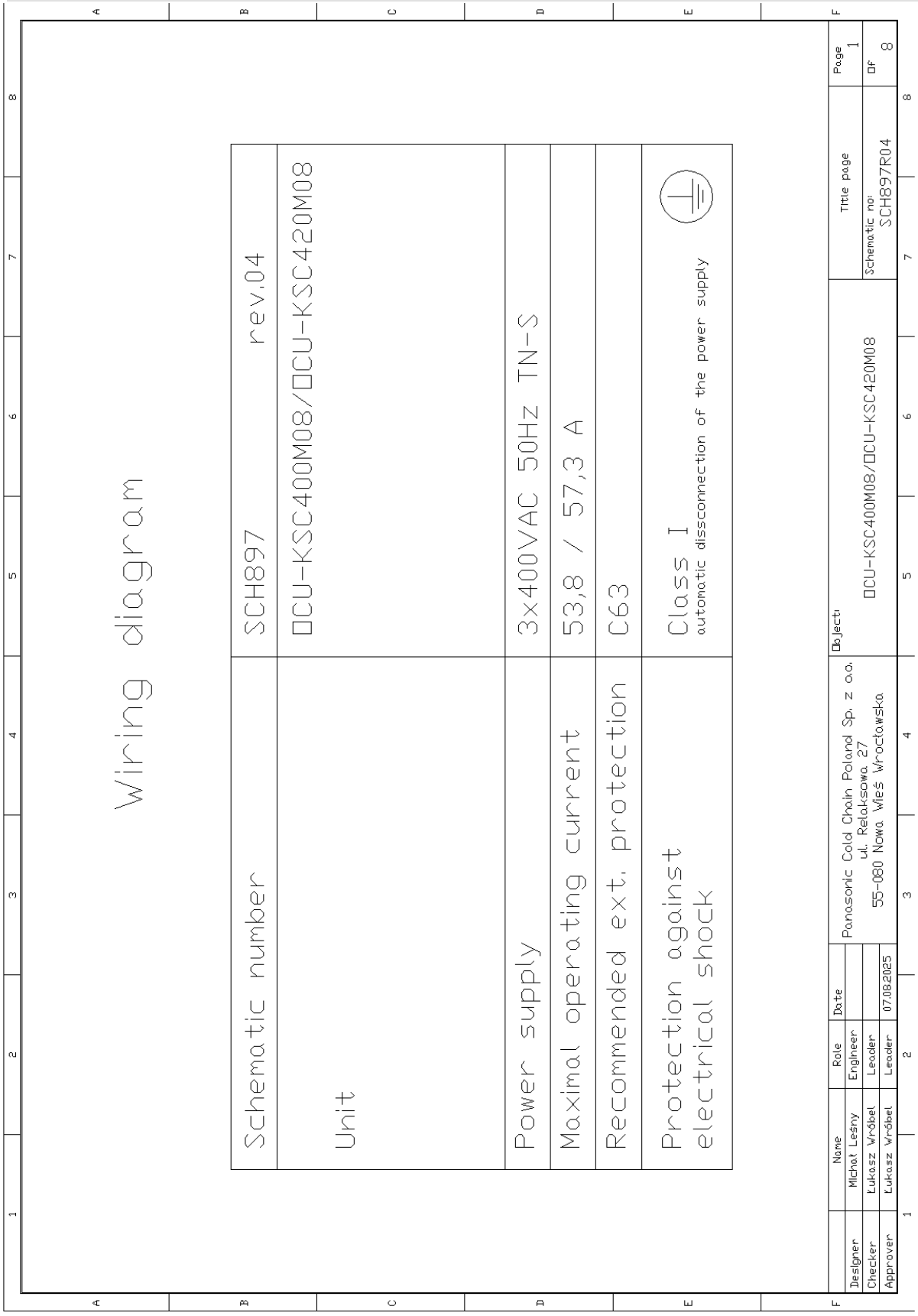
Object:
□CU-KSC240M08/□CU-KSC280M08

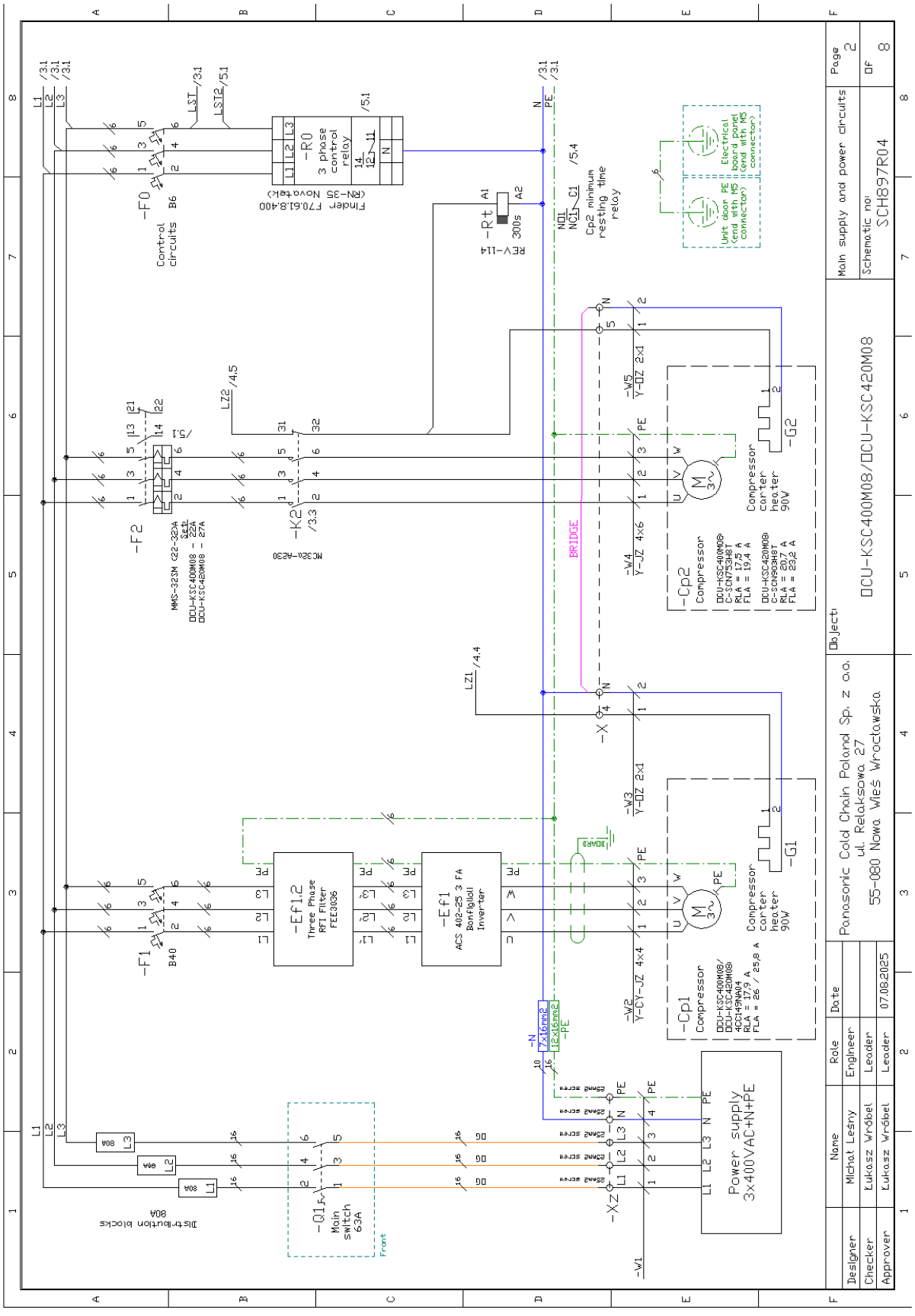
Mounting plate

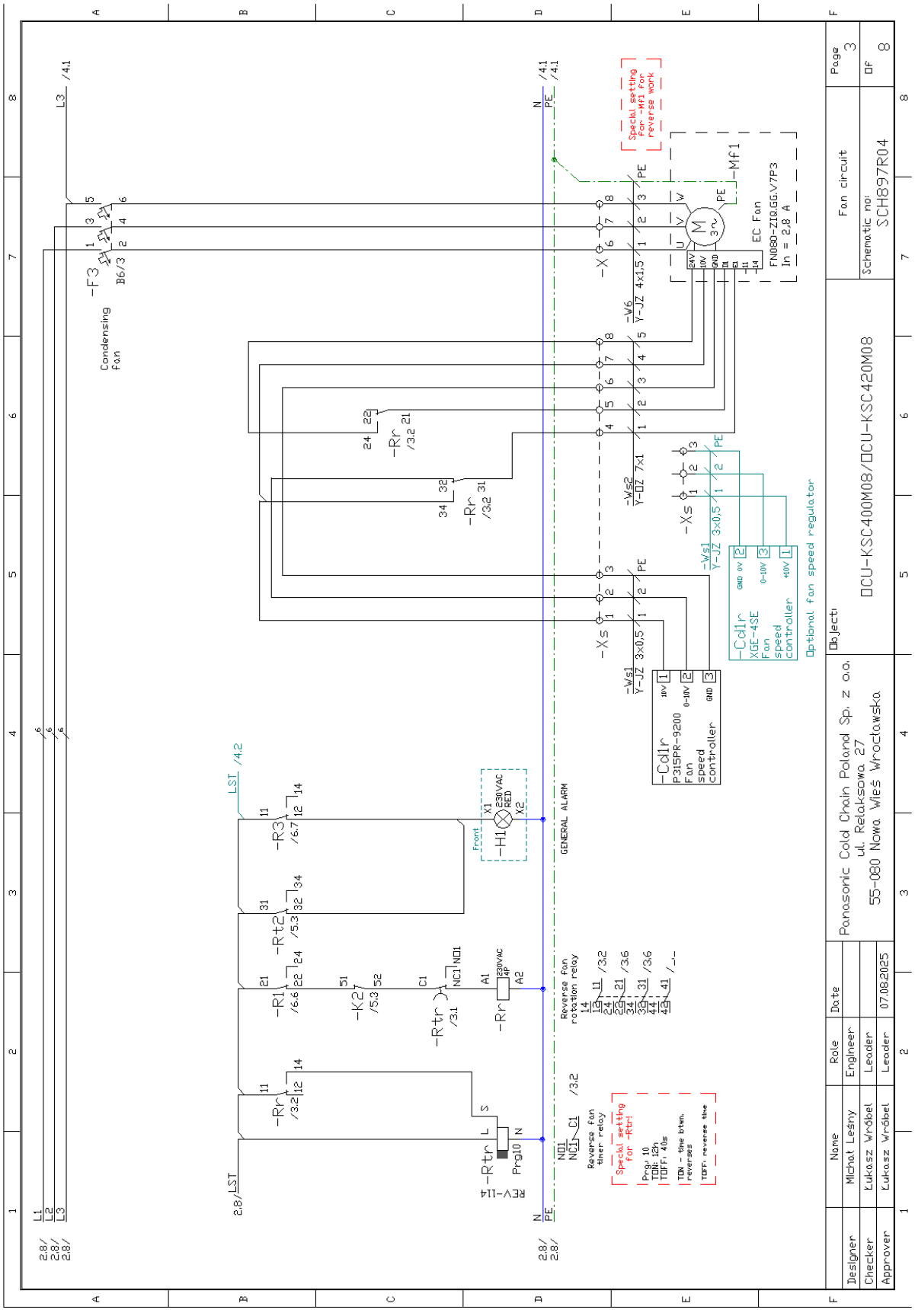
Schematic no:
SCH496-6R08

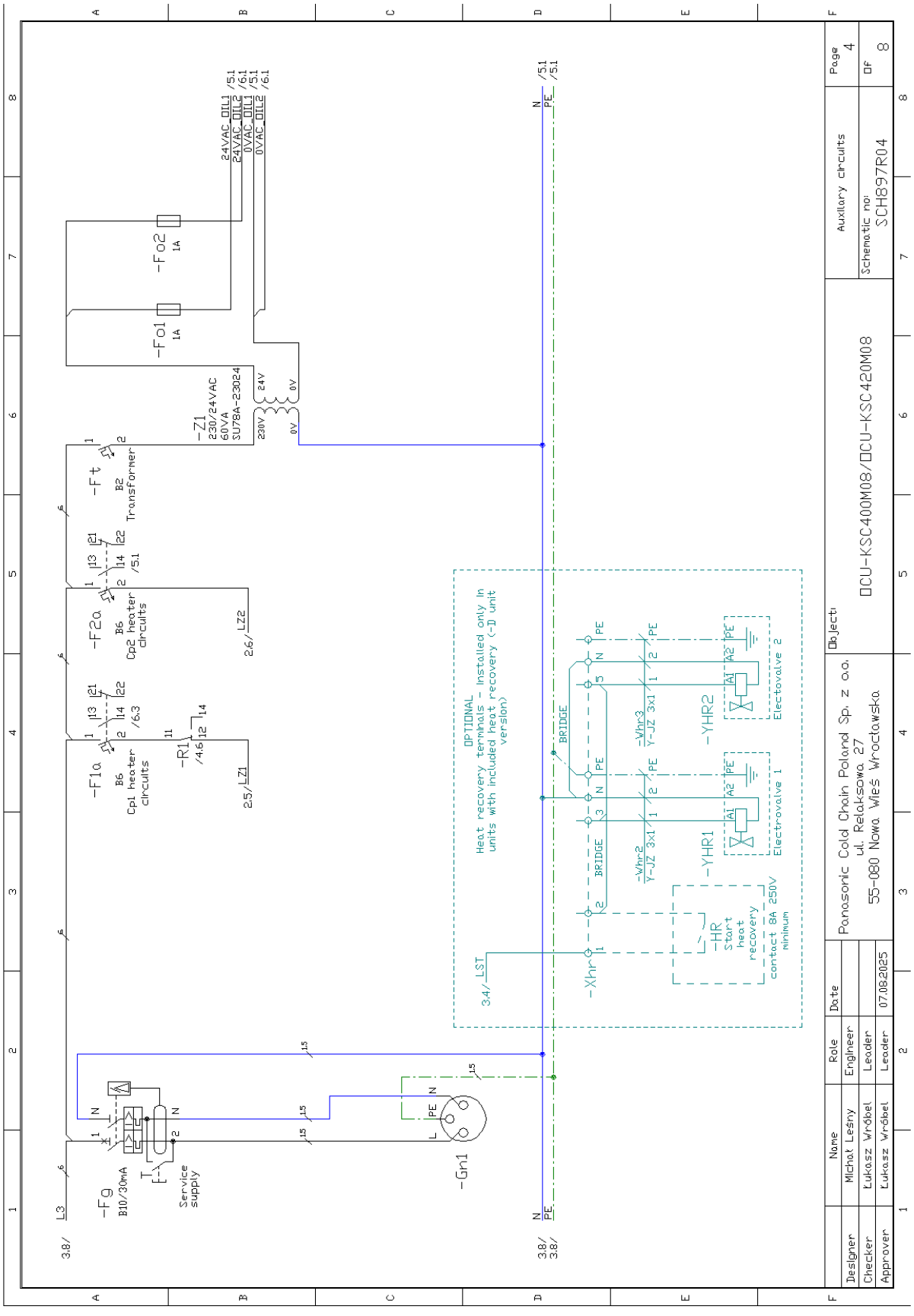
Page 6 of 7

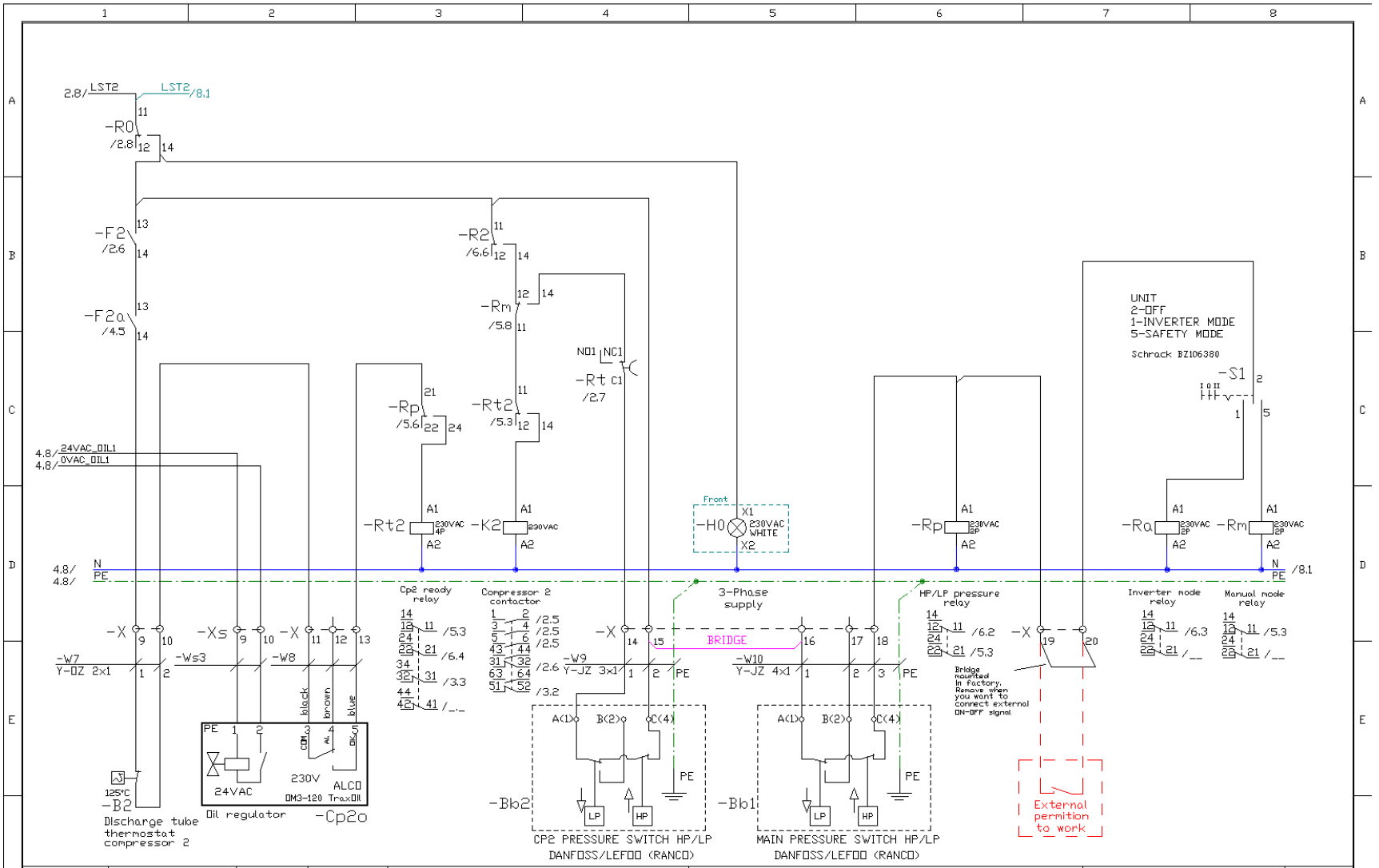
16.5. OCU-KSC400M08/OCU-KSC420M08




DCU-KSC400M08/DCU-KSC420M08
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Main supply and power circuits
Schematic no: SCH897R04
Page 2
OF 8
Designer Michał Leśny Engineer
Checker Łukasz Wróbel Leader 07.08.2025
Approver Łukasz Wróbel Leader
-F0 Control circuits B6
-R0 3 phase control relay
-Rt REV-114 300s
-K2 MC32A-A230
-F2 MMS-32SM C22-32DA DCU-KSC400M08 = 22A DCU-KSC420M08 = 27A
-F1 B40
-Ef1.2 Three Phase RFI Filter FEE3036
-Ef1 ACS 402-25 3 FA Bonfiglioli Inverter
-Q1F Main switch 63A
-X1 Power supply 3x400VAC+N+PE
-X Cp2 minimum resting time relay
-W1 -W2 -W3 -W4 -W5
-Cp1 Compressor DCU-KSC400M08/ DCU-KSC420M08 4CC149NAV4 RLA = 17,9 FLA = 25 / 25,8 A
-Cp2 Compressor DCU-KSC400M08 C-SCN753H8T RLA = 17,5 A FLA = 19,4 A DCU-KSC420M08 C-SCN903H8T RLA = 20,7 A FLA = 23,2 A
-G1 -G2 Compressor carter heater 90W
Unit door PE (end with M5 connector)
Electrical board panel (end with M5 connector)
Distribution blocks 80A
Front
BRIDGE


Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Object:
DCU-KSC400M08/DCU-KSC420M08
Fan circuit
Schematic no:
SCH897R04
Page 3
OF 8
Designer Michał Leśny Engineer
Checker Łukasz Wróbel Leader
Approver Łukasz Wróbel Leader
07.08.2025
Condensing Fan
-F3
-Mf1
EC Fan
FN080-ZIQGG.V7P3
In = 2,8 A
-Cdlr
P315PR-9200
Fan speed controller
-Cdlr
XGE-4SE
Fan speed controller
Optional fan speed regulator
-Rtr
PrgL0
REV-114
-Rr
-R1
-R2
-R3
-K2
-H1
GENERAL ALARM
Reverse fan rotation relay
Reverse fan timer relay
Special setting for -Mf1 for reverse work
Special setting for -Rtr1:
Prg. 10
TON: 12h
TOFF: 40s
TON - time btwn. reversals
TOFF- reverse time


-F9
B10/30mA
Service supply
-Gn1
-F1a
B6
Cp1 heater circuits
-R1
-F2a
B6
Cp2 heater circuits
-Ft
B2
Transformer
-Z1
230/24VAC
60VA
SU78A-23024
-Fo1
1A
-Fo2
1A
24VAC_DIL1 /5.1
24VAC_DIL2 /6.1
0VAC_DIL1 /5.1
0VAC_DIL2 /6.1
OPTIONAL
Heat recovery terminals - installed only in units with included heat recovery (-D unit version)
-Xhr
-Vhr2
Y-JZ 3x1
-Vhr3
Y-JZ 3x1
-YHR1
-YHR2
-HR
Start heat recovery
contact 8A 250V minimum
Electrovalve 1
Electrovalve 2
BRIDGE
3.4/_LST
2.5/_LZ1
2.6/_LZ2
Name
Role
Date
Designer
Michał Leśny
Engineer
Checker
Łukasz Wróbel
Leader
Approver
Łukasz Wróbel
Leader
07.08.2025
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Object:
DCU-KSC400M08/DCU-KSC420M08
Auxiliary circuits
Schematic no:
SCH897R04
Page 4
OF 8



	Name	Role	Date
Designer	Michał Leśny	Engineer	
Checker	Łukasz Wróbel	Leader	
Approver	Łukasz Wróbel	Leader	07.08.2025

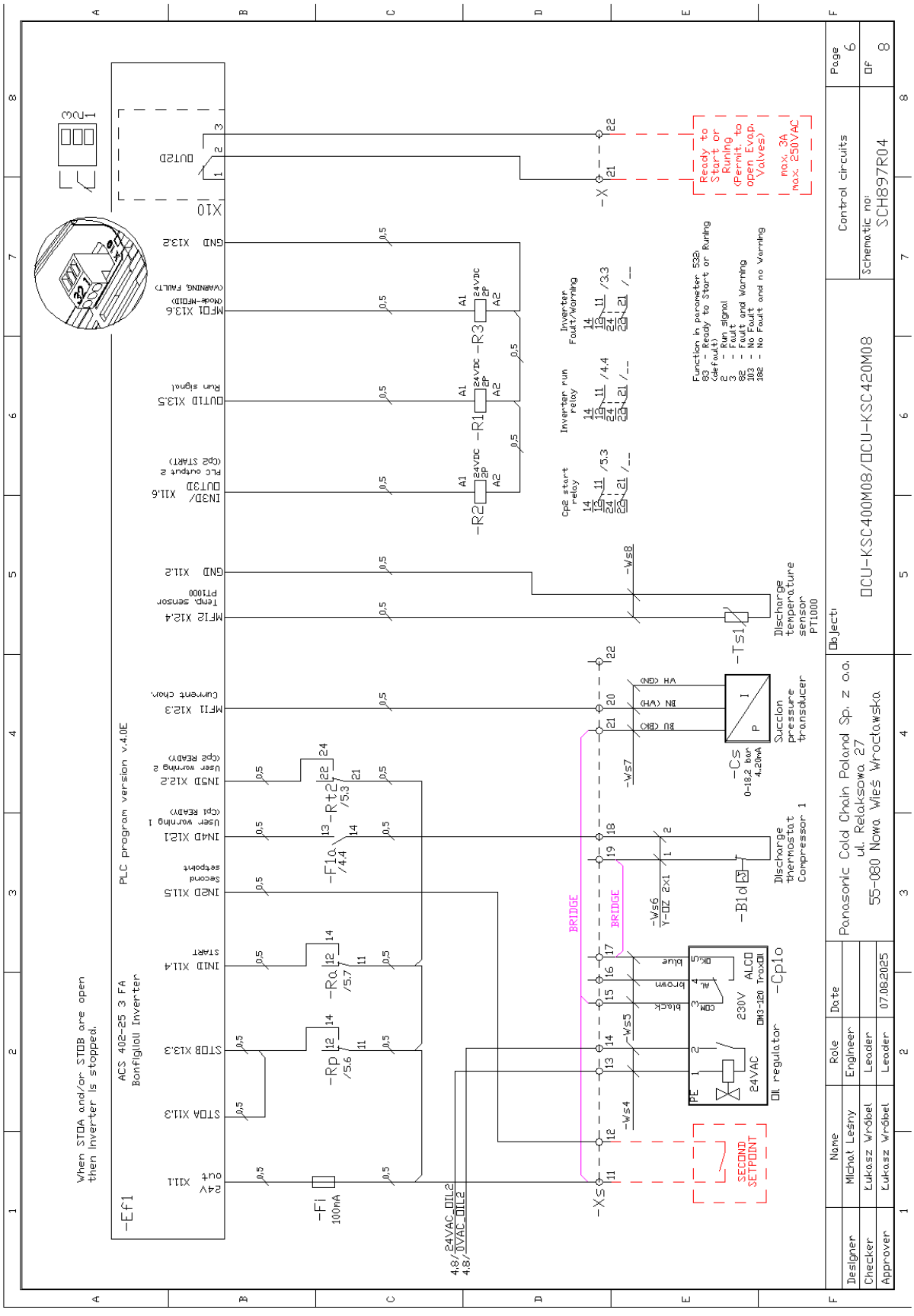
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska

Object:
□CU-KSC400M08/□CU-KSC420M08

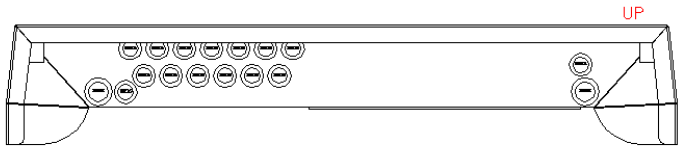
Control circuits

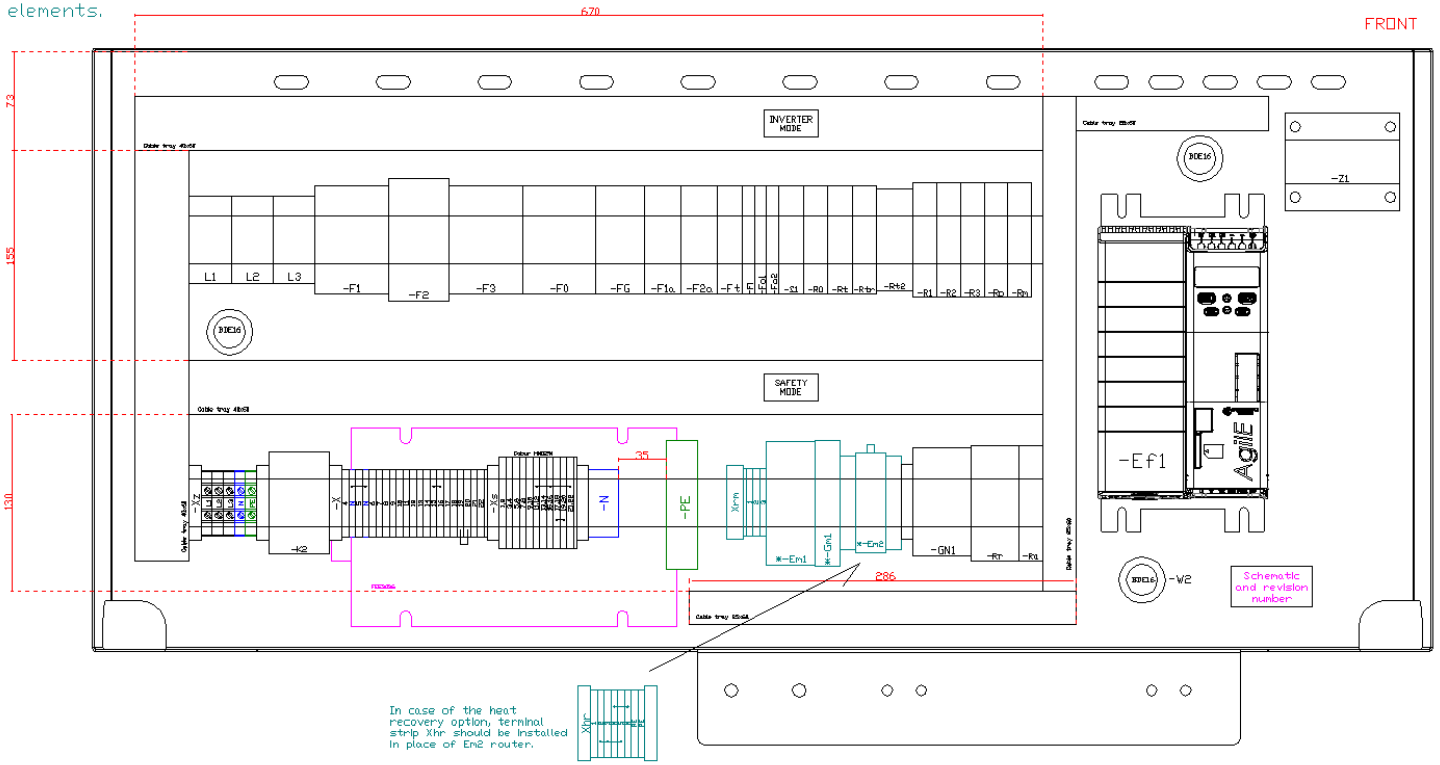
Schematic no:
SCH897R04

Page 5 of 8


-Ef1
ACS 402-25 3 FA
Bonfiglioli Inverter
PLC program version v.40E
When STOA and/or STOB are open
then inverter is stopped.
X10
OUT2D
GND X13.2
MFOI X13.6
OUT1D X13.5
IN3D/ OUT3D X11.6
GND X11.2
MFI2 X12.4
MFI1 X12.3
IN5D X12.2
IN4D X12.1
IN2D X11.5
IN1D X11.4
STOB X13.3
STOA X11.3
24V out X11.1
Temp. sensor Pt1000
Current chan.
User warning 2 (Cpz READY)
User warning 1 (Cp1 READY)
Second setpoint
START
PLC output 2 (Cpz START)
Run signal
(WARNING FAULT)
(Mode-MFOI1D)
-Fi
100mA
4.8/ 24VAC_OIL2
4.8/ 0VAC_OIL2
-Rp /5.6
-Ro /5.7
-Rt2 /5.3
-F10 /4.4
-R1
-R2
-R3
24VDC
Cpz start relay
Inverter run relay
Inverter Fault/Warning
Function in parameter 53a
63 - Ready to Start or Running
0 - Run signal
2 - Fault
62 - Fault and Warning
103 - No Fault and no Warning
182 - No Fault and no Warning
-X
Ready to Start or Running (Permit to open Evap. Valves)
max. 3A max. 250VAC
-Ws8
-Ts1
Discharge temperature sensor PT1000
-Cs
0-18,2 bar 4-20mA
Suction pressure transducer
-Ws7
-Ws6
Y-DZ 2x1
-B10
Discharge thermostat Compressor 1
-Cp1o
Oil regulator
230V ALCD DM3-120 Trox-III
24VAC
PE
COM
black
brown
blue
-Ws5
-Ws4
-Xs
BRIDGE
BRIDGE
SECOND SETPOINT
Object:
DCU-KSC400M08/DCU-KSC420M08
Control circuits
Schematic no:
SCH897R04
Page 6
OF 8
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Designer
Checker
Approver
Name
Michał Leśny
Łukasz Wróbel
Łukasz Wróbel
Role
Engineer
Leader
Leader
Date
07.08.2025

Note:
1. Power supply on circuit breaks (-F..) always on the top.
2. Unmarked wires - cross-section 1mm2.
3. All the wires in the cabinet finished with sleeve ferrule.
4. Inverter -Ef1 mounted to the plate by rivet nuts.
5. Number of diagram and it's revision to be labeled on sticker in indicated place.
*. Optional elements.





	Name	Role	Date
Designer	Michał Leśny	Engineer	
Checker	Łukasz Wróbel	Leader	
Approver	Łukasz Wróbel	Leader	07.08.2025

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

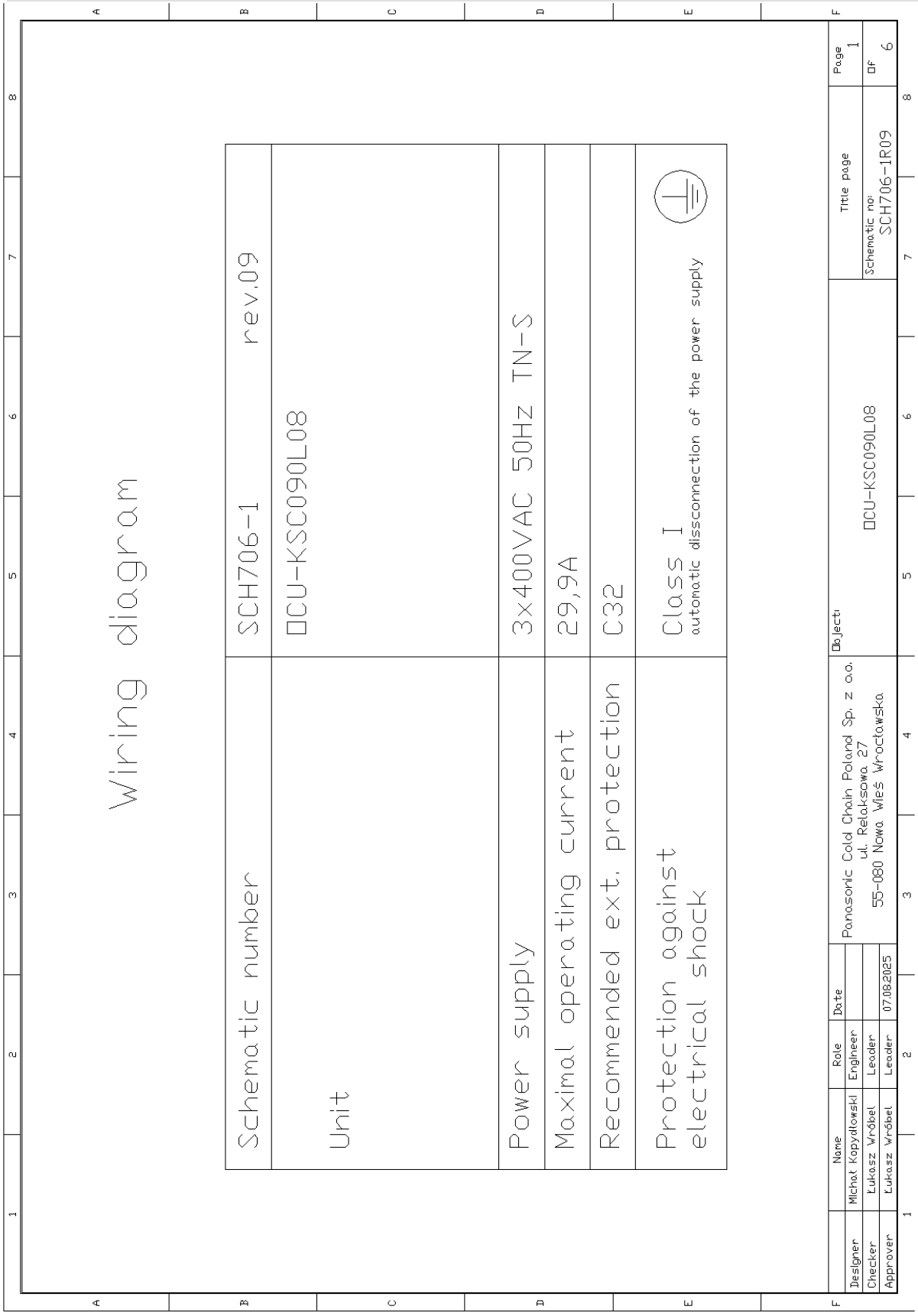
Object:
□CU-KSC400M08/□CU-KSC420M08

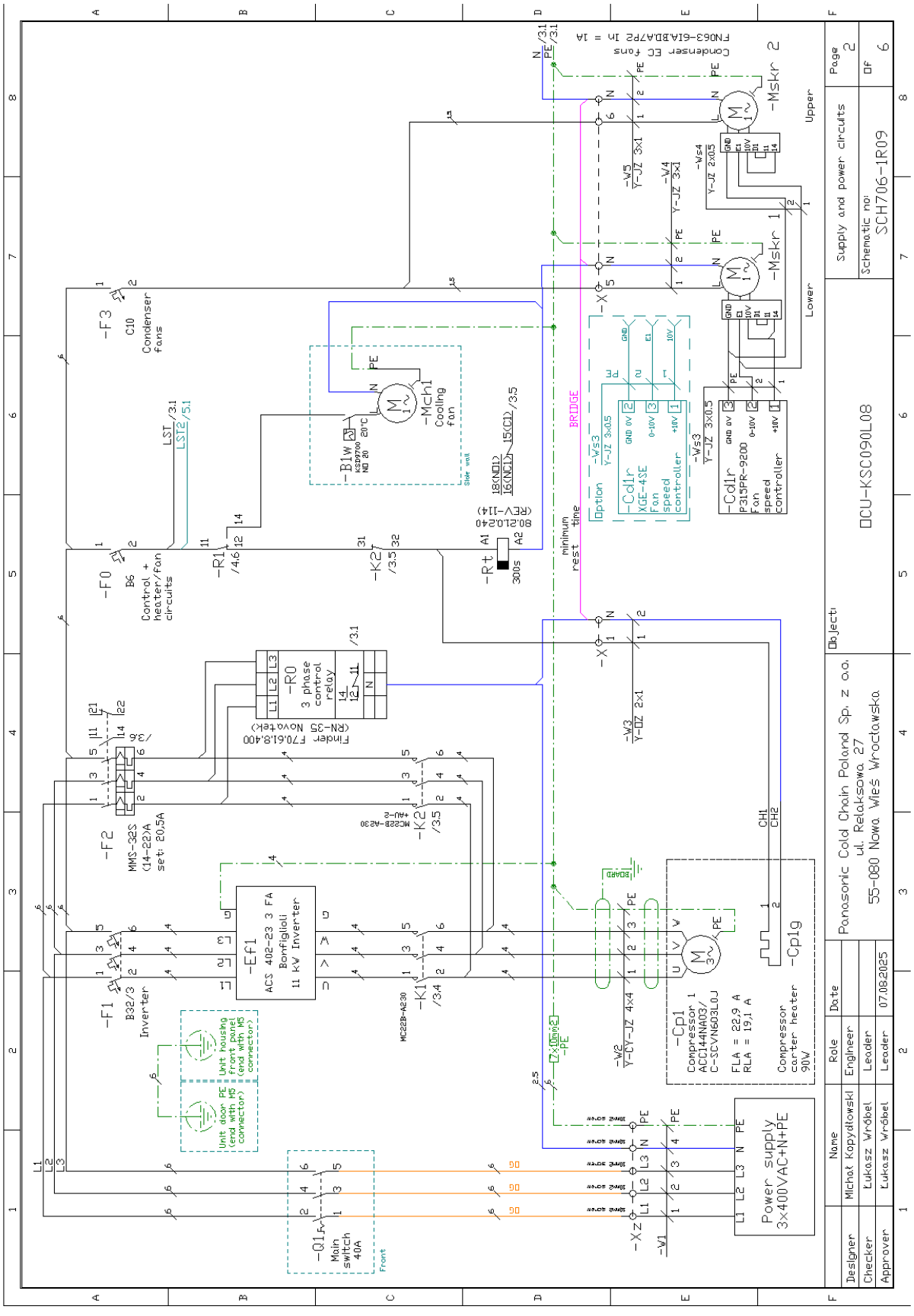
Mounting plate

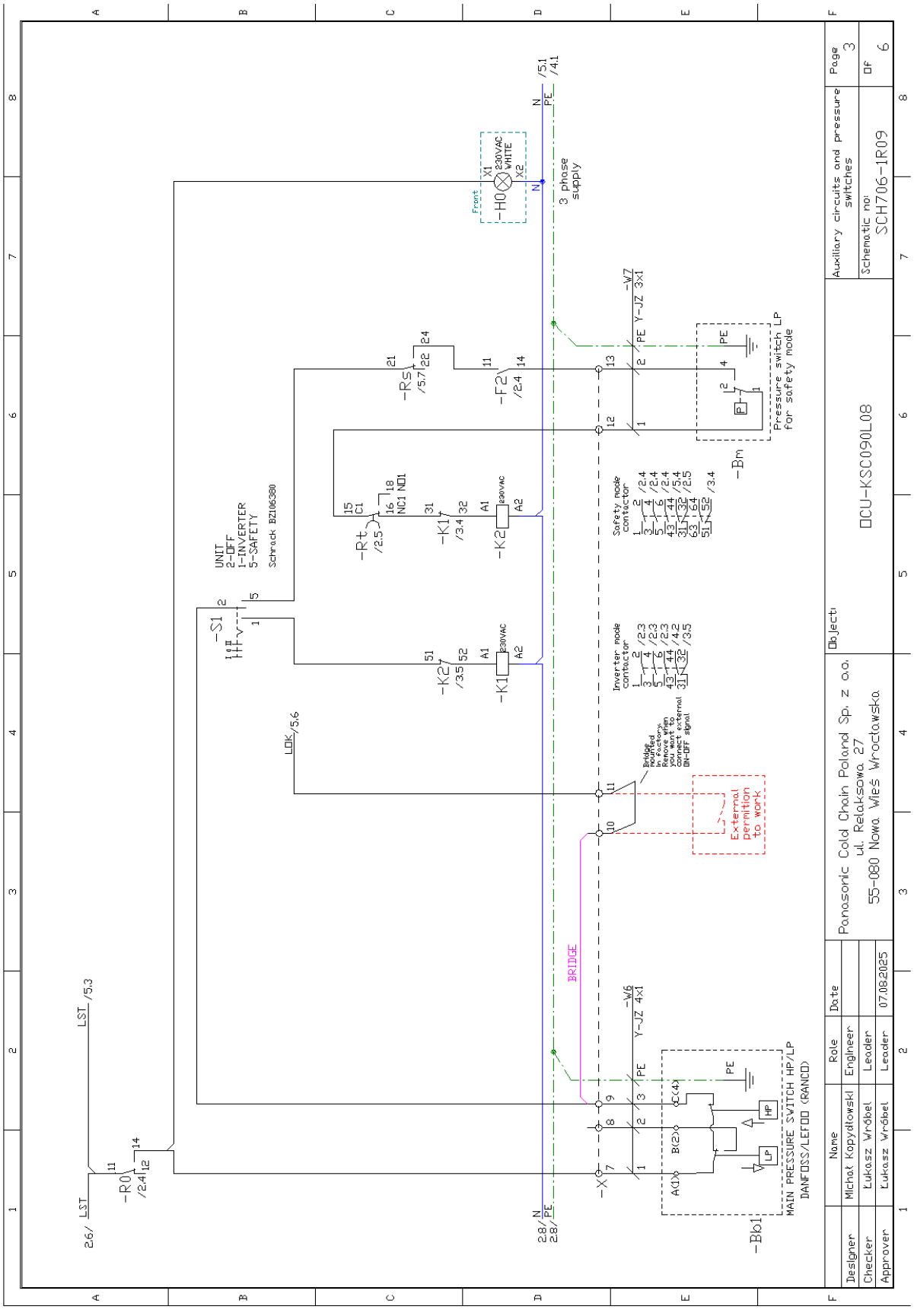
Schematic no:
SCH897R04

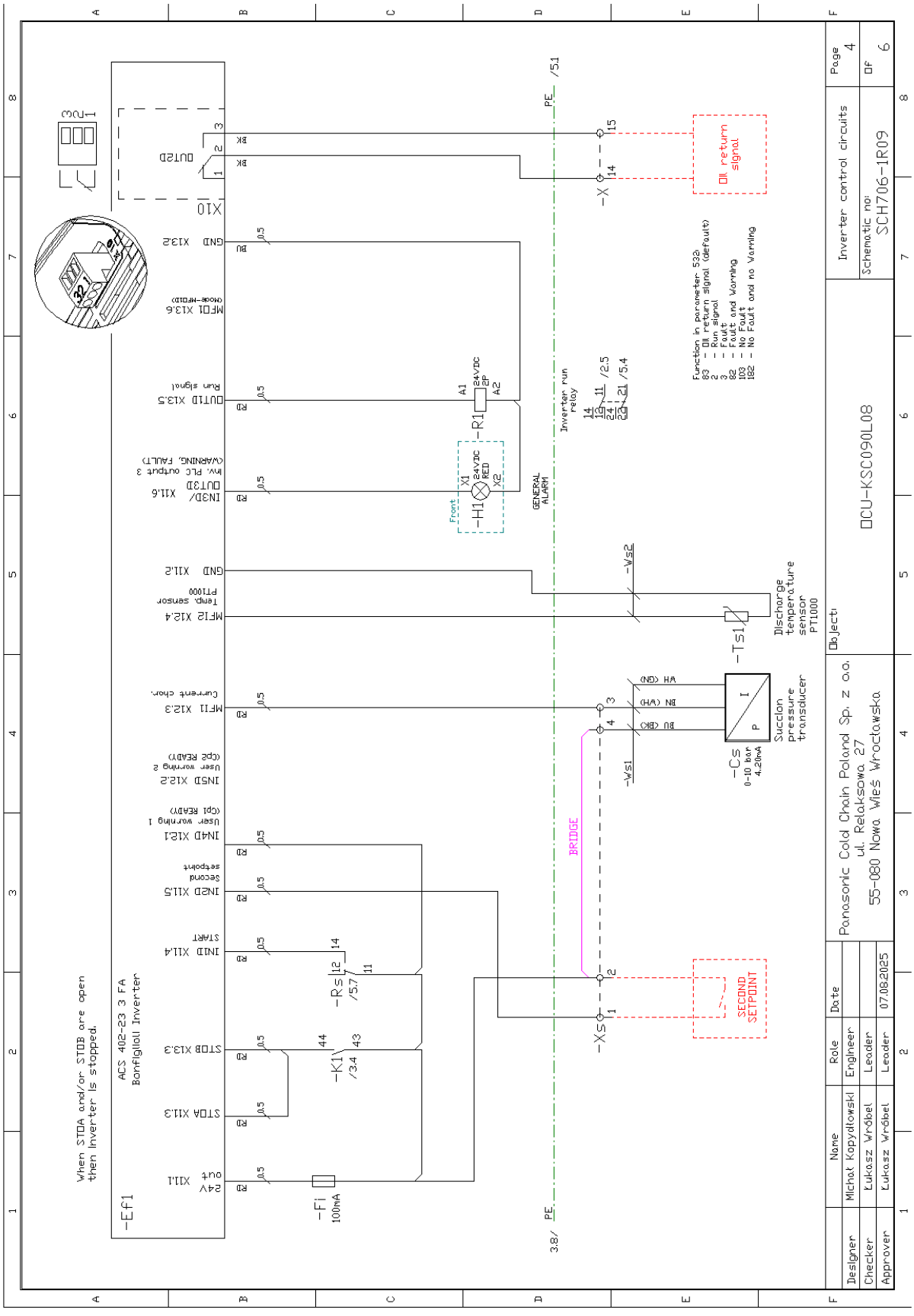
Page 7
OF 8

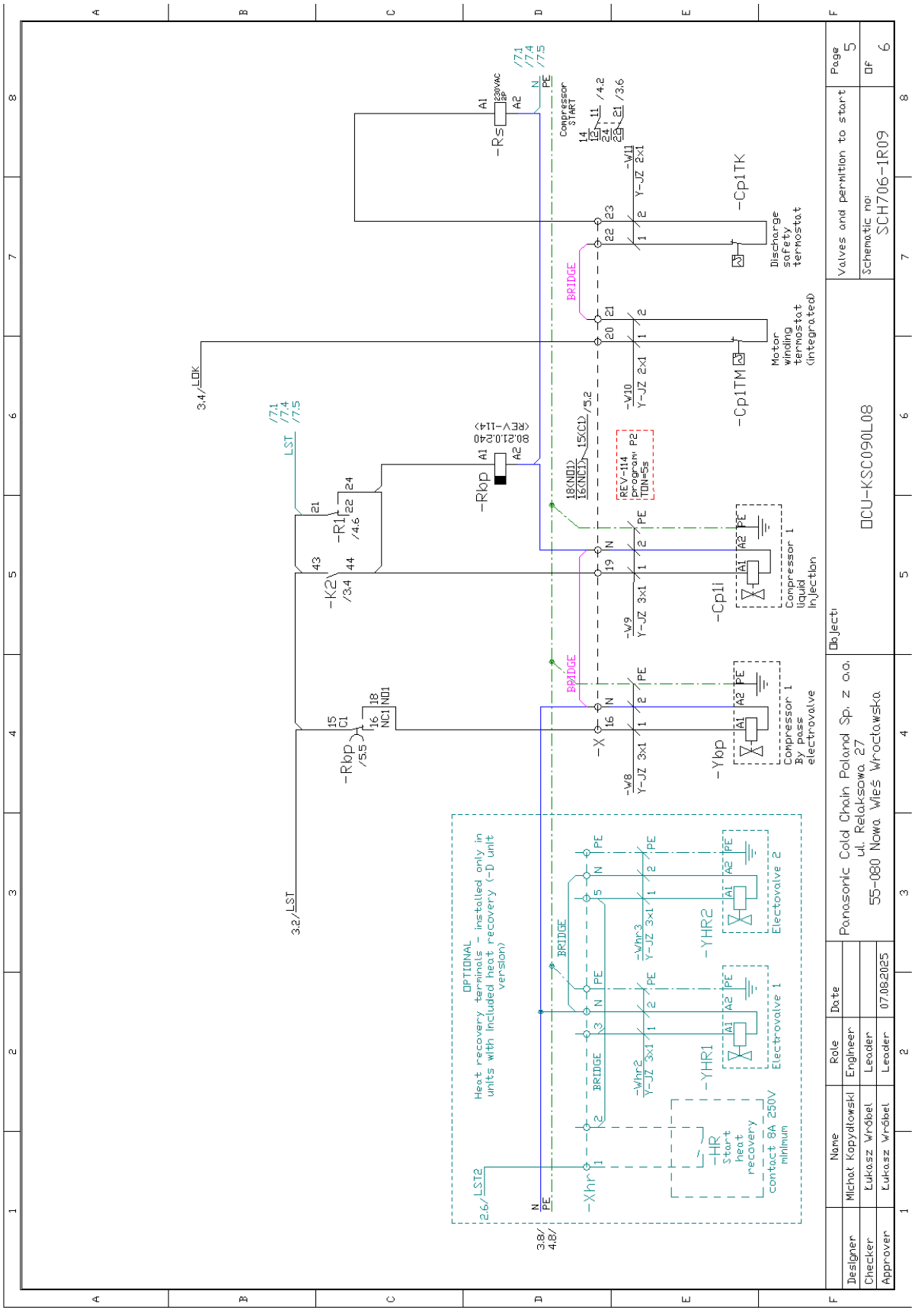
16.6. OCU-KSC090L08



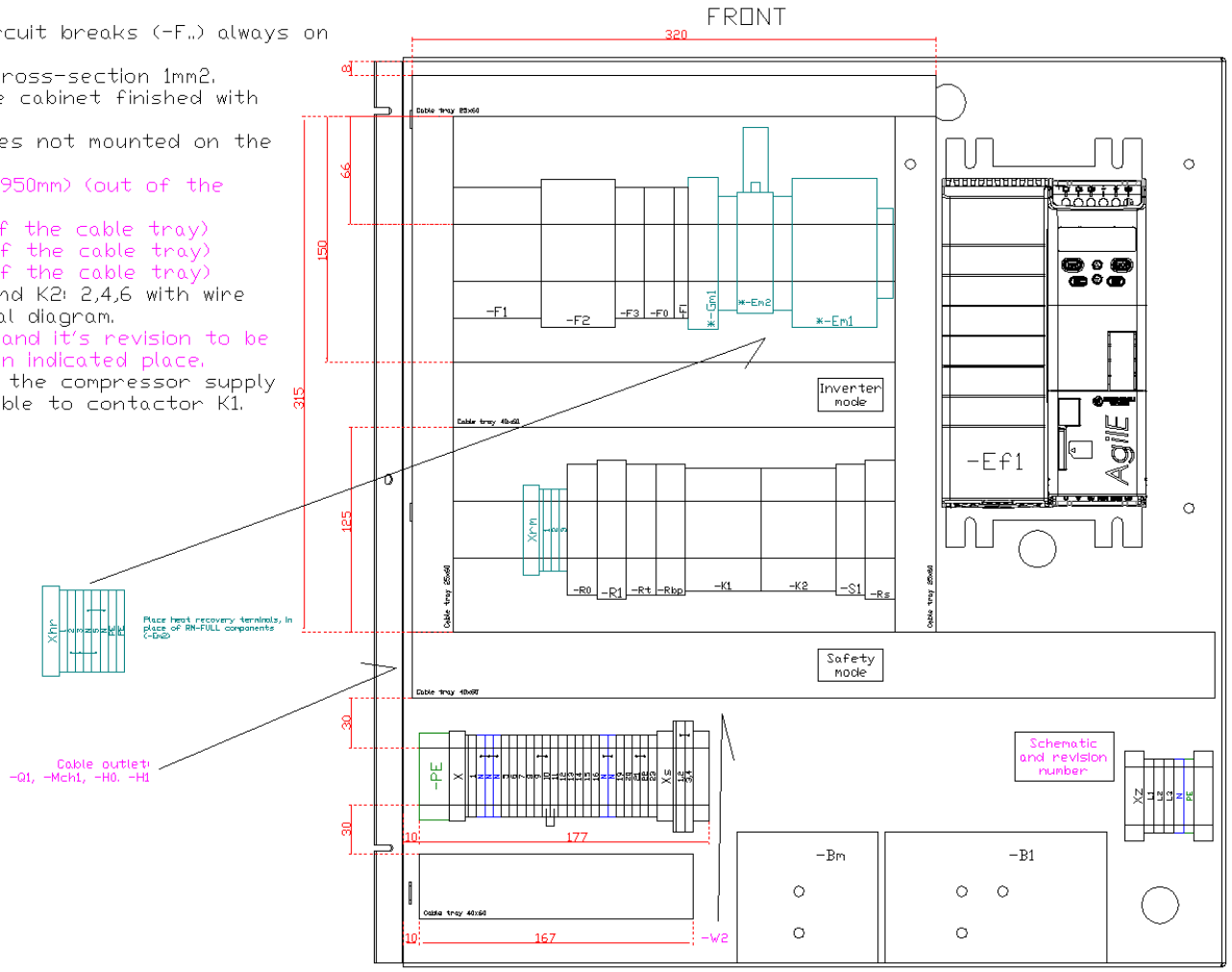

Power supply
3×400VAC+N+PE
-Q1
Main switch 40A
-F1
B32/3
Inverter
-F2
MMS-32S
(14-22)A
set: 20,5A
-F0
B6
Control + heater/fan circuits
-F3
C10
Condenser fans
-EF1
ACS 402-23 3 FA
Bonfiglioli
11 kW Inverter
-K1
-K2
-R0
3 phase control relay
-Rt
300s
-B1W
-MCh1
Cooling fan
-Cp1
Compressor 1
ACC144NA03/
C-SCVN603L0J
FLA = 22,9 A
RLA = 19,1 A
-Cp1g
Compressor carter heater
90W
-Mskr 1
-Mskr 2
Condenser EC fans
FN063-6IA.BD.A7P2 In = 1A
-Cd1r
XGE-4SE
Fan speed controller
-Cd1r
P315PR-9200
Fan speed controller
-X
-W1
-W2
-W3
-W4
-W5
-Ws3
-Ws4
BRIDGE
Option
minimum rest time
Unit door PE (end with M5 connector)
Unit housing Front panel (end with M5 connector)
Front
Upper
Lower
Supply and power circuits
Page 2
Schematic no: SCH706-1R09
OF 6
CU-KSC090L08
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Designer Michał Kopydłowski Engineer
Checker Łukasz Wróbel Leader
Approver Łukasz Wróbel Leader 07.08.2025


Auxiliary circuits and pressure switches
Page 3
Schematic no: SCH706-1R09
OF 6
OCU-KSC090L08
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Name
Role
Date
Designer Michał Kopydłowski Engineer
Checker Łukasz Wróbel Leader 07.08.2025
Approver Łukasz Wróbel Leader
3 phase supply
-H0 230VAC WHITE
-S1 UNIT 2-OFF 1-INVERTER 5-SAFETY Schrack BZ106380
-R0 /2.4
-Rt /2.5
-Rs /5.7
-K1 /3.4
-K2 /3.5
-K1 230VAC
-K2 230VAC
-F2 /2.4
-W7 3x1 PE Y-JZ
-W6 4x1 PE Y-JZ
-Bm Pressure switch LP for safety mode
-Bb1 MAIN PRESSURE SWITCH HP/LP DANFOSS/LEFOO (RANCO)
-X
LDK /5.6
LST /5.3
BRIDGE
External permition to work
Bridge removal necessary. Remove when inverter wants to connect external ON-OFF signal
Inverter mode contactor
Safety mode contactor
N /5.1 PE /4.1
2.8/ N
2.8/ PE
2.6/ LST


-Ef1
ACS 402-23 3 FA
Bonfiglioli Inverter
When STOA and/or STOB are open
then inverter is stopped.
-Fi
100mA
-K1
-Rs
-H1
-R1
-Ts1
-Cs
-Ws1
-Ws2
-X
-XS
BRIDGE
SECOND SETPOINT
DI return signal
Inverter run relay
GENERAL ALARM
Discharge temperature sensor PT1000
Suction pressure transducer
0-10 bar 4-20mA
Function in parameter 538:
68 - DI return signal (default)
2 - Run signal
3 - Fault
82 - Fault and Warning
103 - No Fault
182 - No Fault and no Warning
OUT2D
GND X13.2
OUT1D X13.5
Run signal
IN3D/ X11.6
OUT3D
GND X11.2
MFI2 X12.4
Temp. sensor PT1000
MFI1 X12.3
Current chan.
IN5D X12.2
User warning 2 (CpI READY)
IN4D X12.1
User warning 1 (CpI READY)
IN2D X11.5
Second setpoint
IN1D X11.4
START
STOB X13.3
STOA X11.3
24V out X11.1
PE
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Object:
OCU-KSC090L08
Inverter control circuits
Schematic no: SCH706-1R09
Page 4
OF 6
Designer Michał Kopydłowski Engineer
Checker Łukasz Wróbel Leader
Approver Łukasz Wróbel Leader
07.08.2025


Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Object:
CU-KSC090L08
Valves and permition to start
Schematic no:
SCH706-1R09
Page 5
OF 6
Designer Michał Kopydłowski Engineer
Checker Łukasz Wróbel Leader
Approver Łukasz Wróbel Leader 07.08.2025
Name
Role
Date
OPTIONAL
Heat recovery terminals - installed only in units with included heat recovery (-D unit version)
-Rs
-Rbp
-K2
-R1
-Cp1i
-Cp1TK
-Cp1TM
-Ybp
-X
-Xhr
-HR
-YHR1
-YHR2
-Whr2
-Whr3
-W8
-W9
-W10
-W11
BRIDGE
REV-114 program P2 TON=5s
Compressor START
Discharge safety termostat
Motor winding termostat (integrated)
Compressor 1 Liquid injection
Compressor 1 By pass electrovalve
Electrovolve 1
Electrovolve 2
start heat recovery contact 8A 250V minimum
3.4/LOK
3.2/LST
2.6/LST2
3.8/4.8/

Note:
1. Power supply on circuit breaks (-F..) always on the top.
2. Unmarked wires - cross-section 1mm2.
3. All the wires in the cabinet finished with sleeve ferrule.
4. Wires to the devices not mounted on the panel:
   -Mch1: 850mm (PE 950mm) (out of the cable tray)
   -Q1: 700mm (out of the cable tray)
   -H0: 600mm (out of the cable tray)
   -H1: 550mm (out of the cable tray)
5. Connect K1: 2,4,6 and K2: 2,4,6 with wire according to electrical diagram.
6. Number of diagram and it's revision to be labeled on a sticker in indicated place.
7. Feed the shield of the compressor supply line as close as possible to contactor K1.
*. Optional elements.



	Name	Role	Date
Designer	Michał Kopydłowski	Engineer	
Checker	Łukasz Wróbel	Leader	
Approver	Łukasz Wróbel	Leader	07.08.2025

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

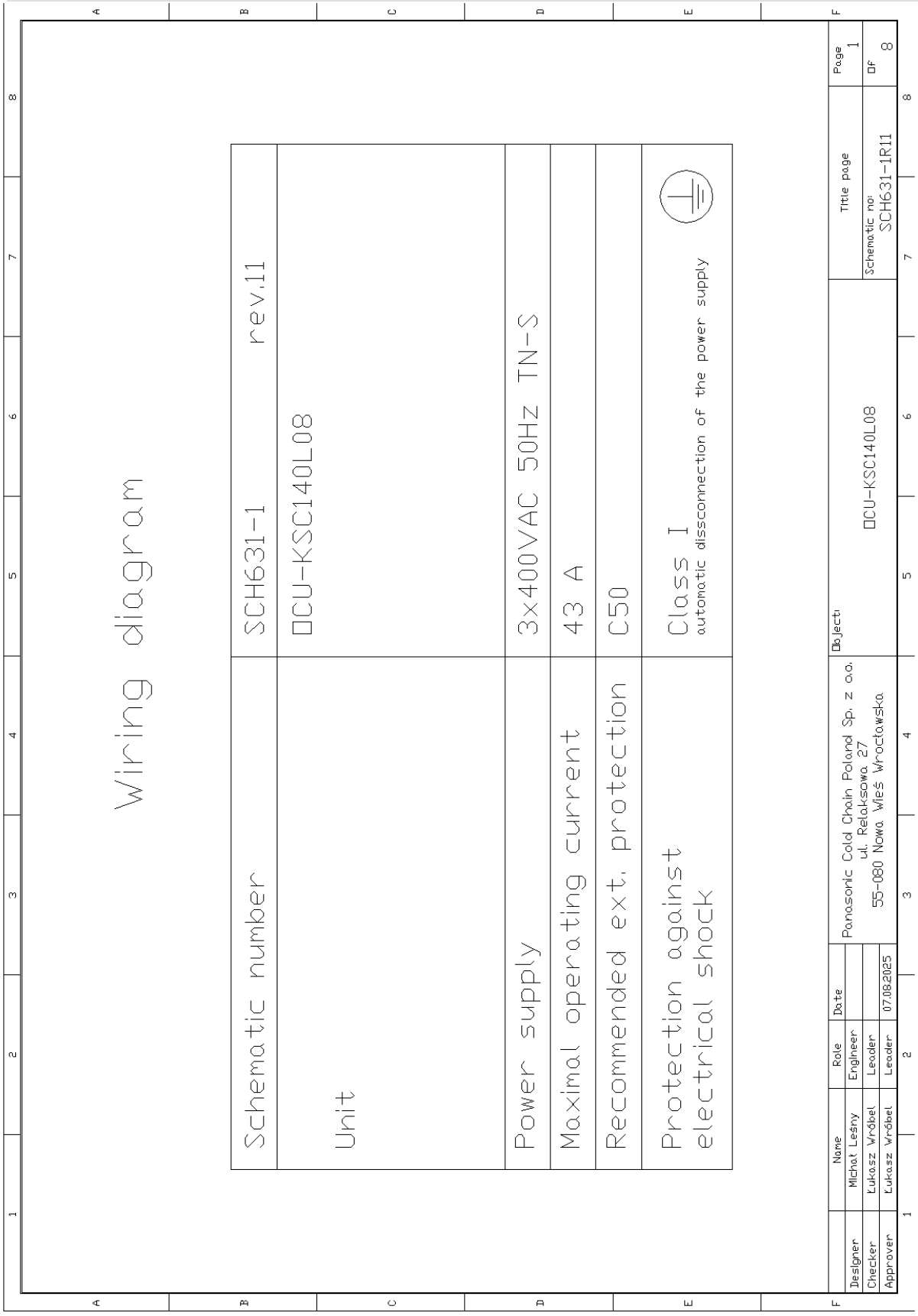
Object:
CU-KSC090L08

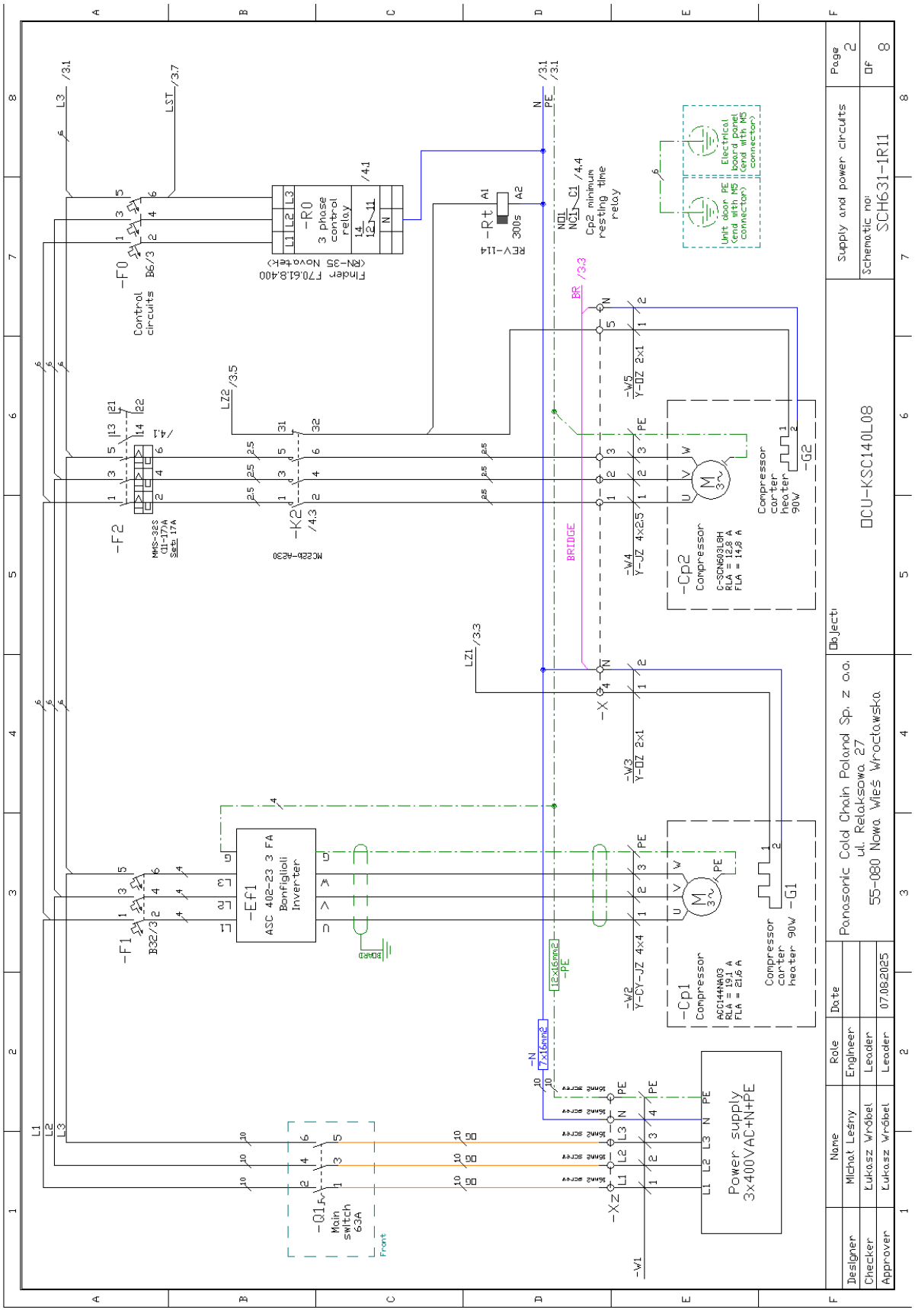
Mounting plate

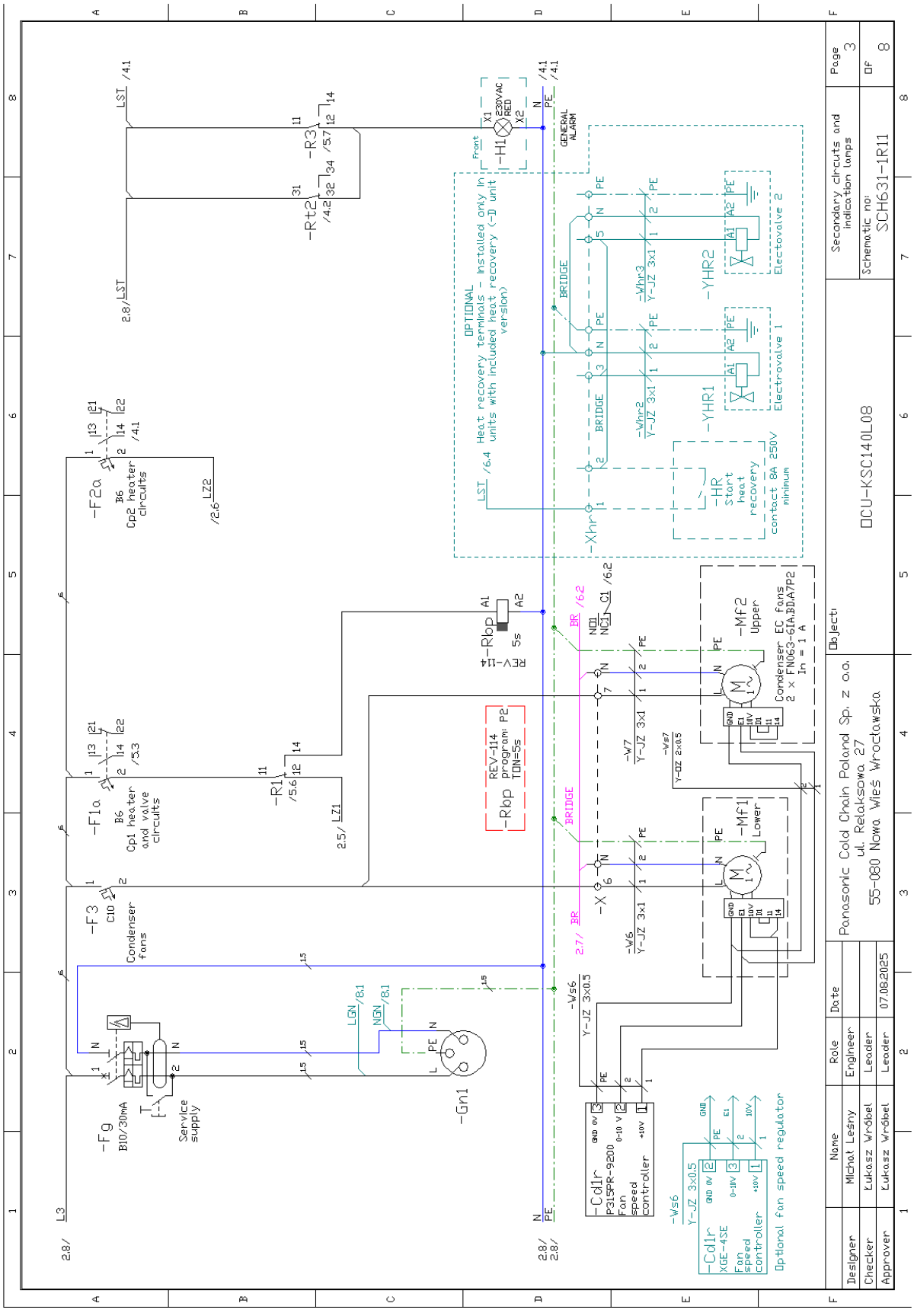
Schematic no:
SCH706-1R09

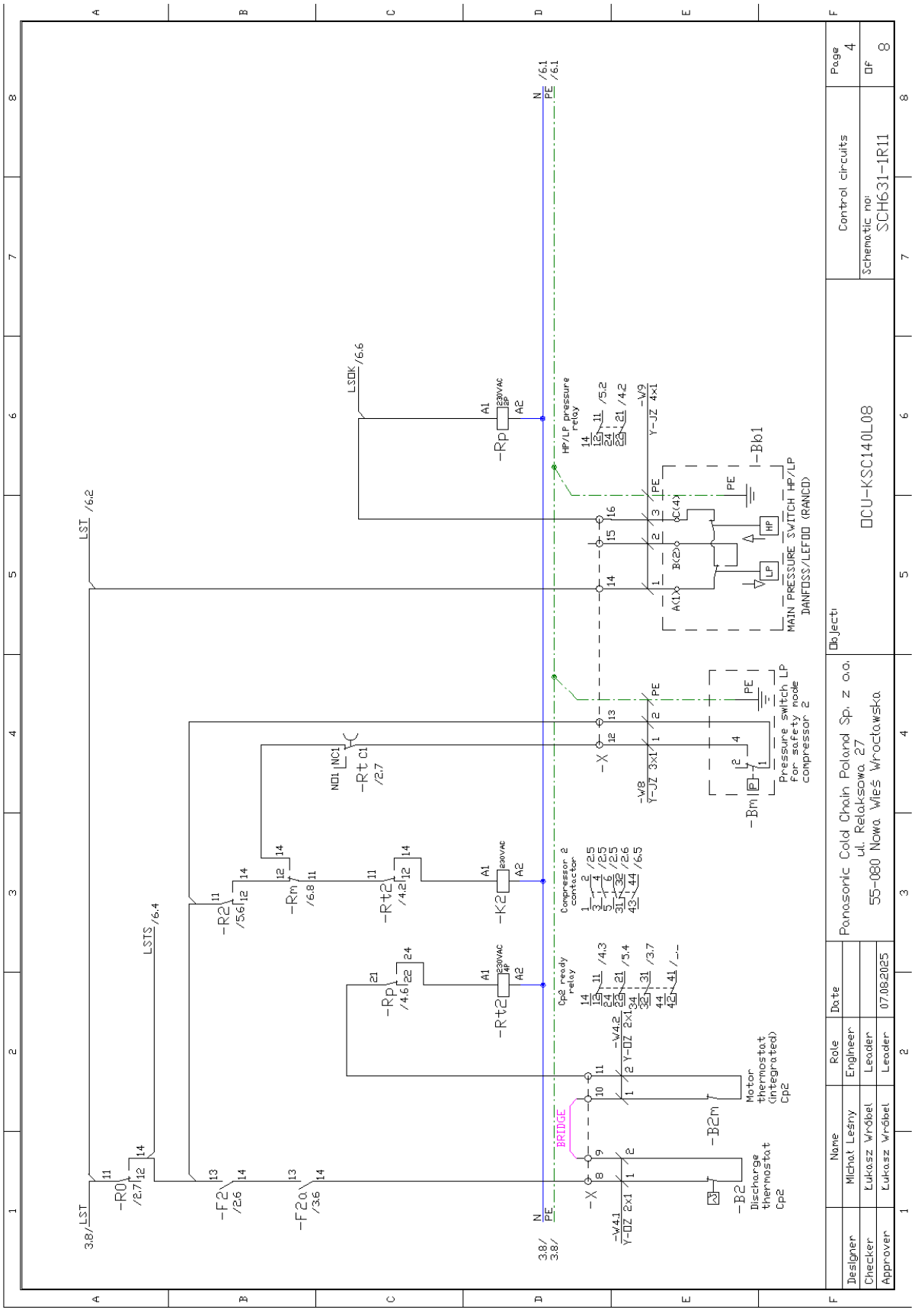
Page 6 of 6

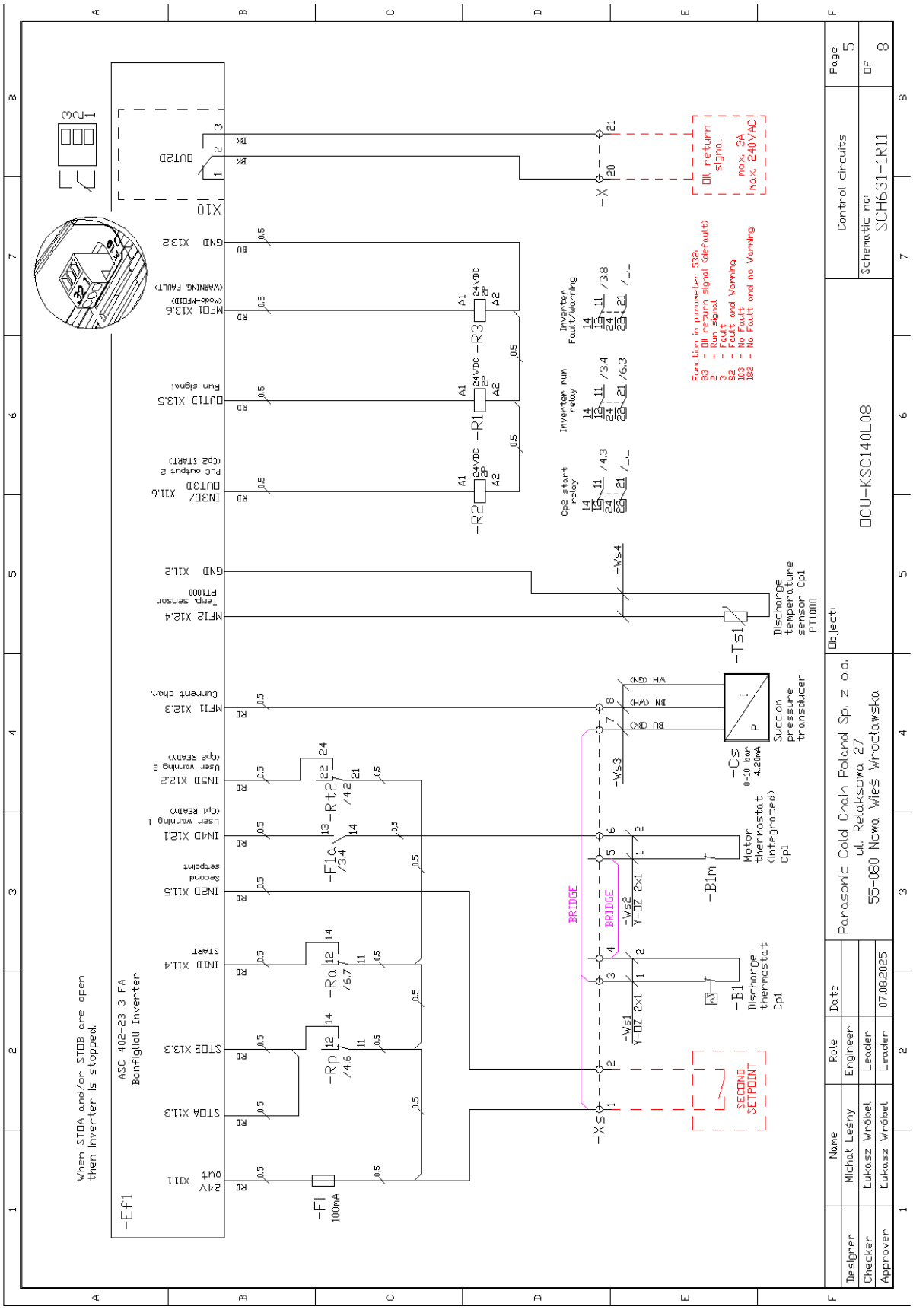
16.7. OCU-KSC140L08

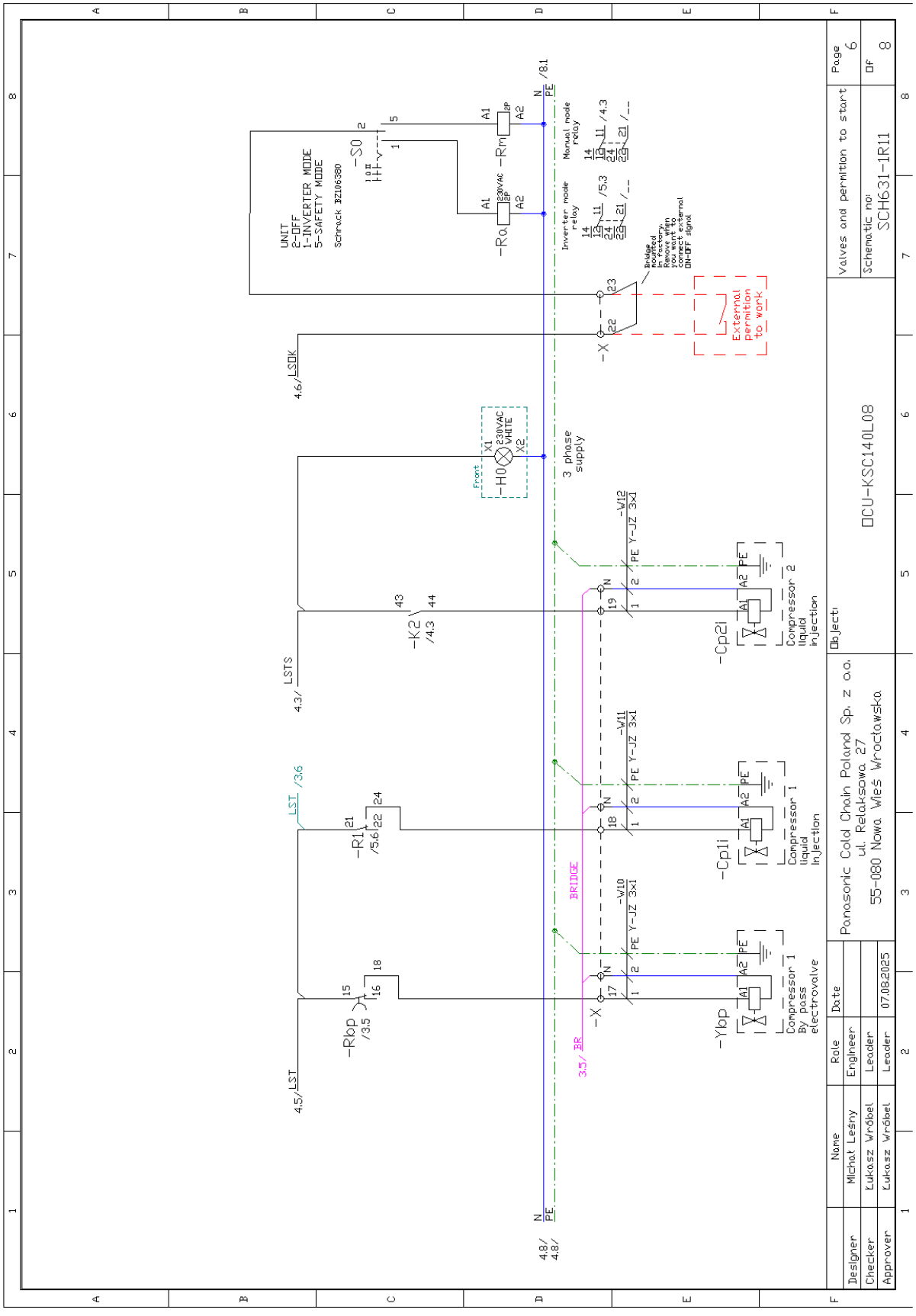



Supply and power circuits
Page 2
Schematic no: SCH631-1R11
OF 8
CU-KSC140L08
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Object:
Name
Role
Date
Designer
Michał Leśny
Engineer
Checker
Łukasz Wróbel
Leader
07.08.2025
Approver
Łukasz Wróbel
Leader
Power supply
3x400VAC+N+PE
-Q1F
Main switch 63A
-F0
Control circuits
B6/3
-F1
B32/3
-F2
MMS-32S
-K2
-R0
3 phase control relay
Finder 70.61.8.400
-Rt
REV-LL4
300s
-Ef1
ASC 402-23 3 FA
Banfigioli
Inverter
-Cp1
Compressor
-Cp2
Compressor
C-SCN603L8H
RLA = 12.8 A
FLA = 14.8 A
-G1
Compressor carter heater 90W
-G2
Compressor carter heater 90W
-W1
-W2
Y-CY-JZ 4x4
-W3
Y-OZ 2x1
-W4
Y-JZ 4x2.5
-W5
Y-OZ 2x1
-X1
-X2
-X4
BRIDGE
Unit door PE (end with M5 connector)
Electrical board panel (end with M5 connector)
Front


Secondary circuits and indication lamps
Schematic no: SCH631-1R11
Page 3
OF 8
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Object:
CU-KSC140L08
Designer Michał Leśny Engineer 07.08.2025
Checker Łukasz Wróbel Leader
Approver Łukasz Wróbel Leader
-Fg B10/30mA
Service supply
-F3 C10 Condenser fans
-F1a B6 Cpl heater and valve circuits
-F2a B6 Cp2 heater circuits
-R1
-Rop REV-114 program: PE TON=5s
-R3
-Rt2
-H1 230VAC RED GENERAL ALARM
-Gn1
-Cdlr P315PR-9200 Fan speed controller
-Cdlr XGE-4SE Fan speed controller
Optional fan speed regulator
-X
-Xhr
-HR Start heat recovery contact 8A 250V minimum
-YHR1 Electrovalve 1
-YHR2 Electrovalve 2
-Whr2 Y-JZ 3x1
-Whr3 Y-JZ 3x1
-Mf1 Lower
-Mf2 Upper
Condenser EC fans 2 × FN063-6IA.BIA7P2 In = 1 A
-W7 Y-JZ 3x1
-Ws7 Y-OZ 2x0.5
-W6 Y-JZ 3x1
-Ws6 Y-JZ 3x0.5
BRIDGE
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
Object:
CU-KSC140L08
Control circuits
Schematic no:
SCH631-1R11
Page 4
OF 8
Name
Role
Date
Designer
Michał Leśny
Engineer
Checker
Łukasz Wróbel
Leader
07.08.2025
Approver
Łukasz Wróbel
Leader
LST
LSTS
LSOK
N
PE
BRIDGE
-R0
-F2
-F2a
-R2
-Rm
-Rt2
-K2
-Rp
-Rt1
-X
-W4.1
-W4.2
-W8
-W9
-B2
-B2m
-Bm
-Bb1
Discharge thermostat Cp2
Motor thermostat (integrated) Cp2
Compressor 2 contactor
Cp2 ready relay
HP/LP pressure relay
MAIN PRESSURE SWITCH HP/LP
DANFOSS/LEFOO (RANCO)
Pressure switch LP for safety mode compressor 2

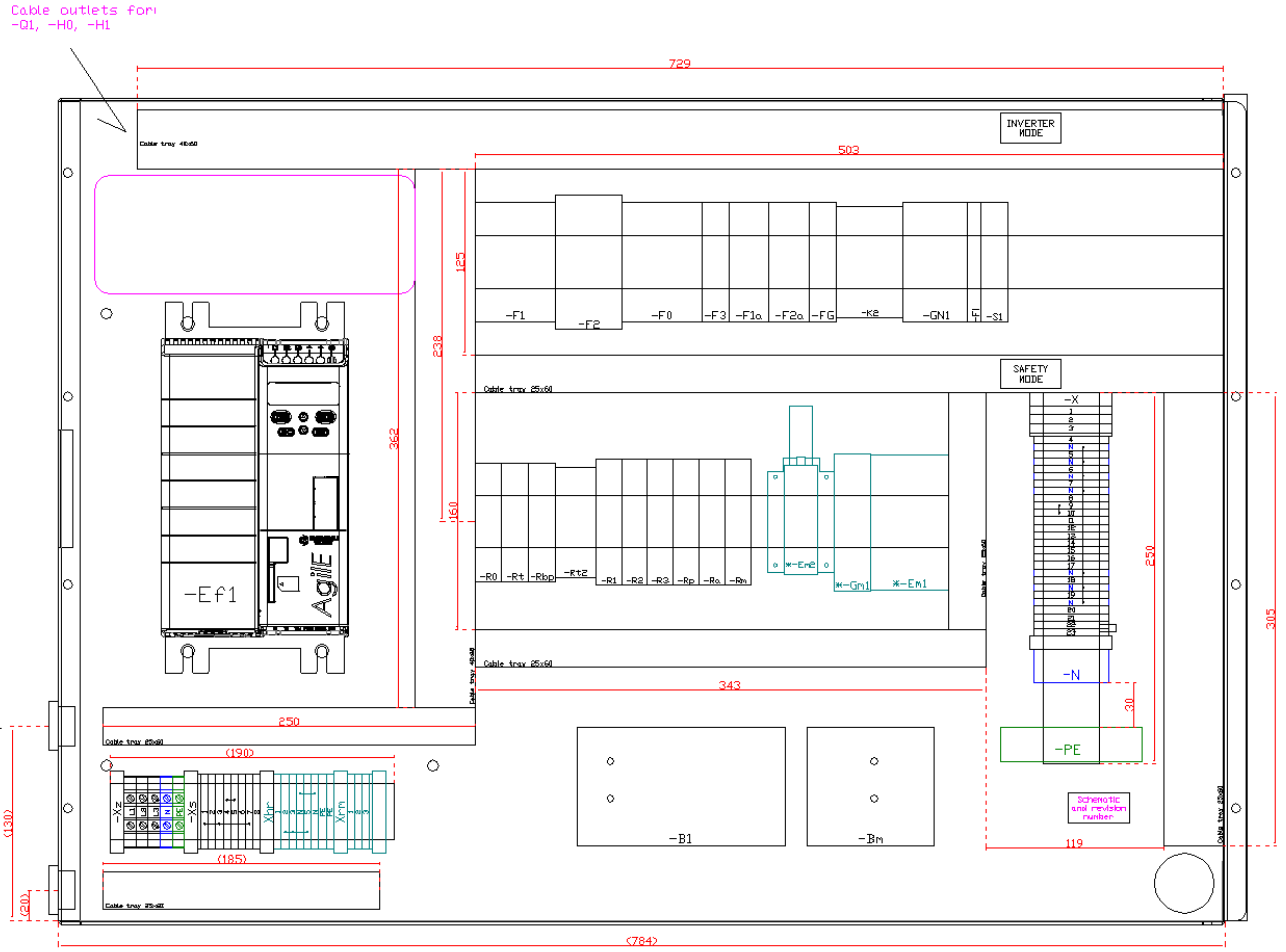

-Ef1
ASC 402-23 3 FA
Bonfiglioli Inverter
When STOA and/or STOB are open
then inverter is stopped.
X10
OUT2D
-X
Function in parameter S3B
63 - DI return signal (default)
2 - Run signal
3 - Fault
82 - Fault and Warning
103 - No Fault
182 - No Fault and no Warning
DI return signal
max. 3A
max. 240VAC
GND X13.2
MFO1 X13.6
(Mode-MFO1D)
(WARNING FAULT)
OUT1D X13.5
Run signal
IN3D/ X11.6
OUT3D
PLC output n
(Cp2 START)
GND X11.2
MFI2 X12.4
Temp. sensor
Pt1000
MFI1 X12.3
Current chan.
IN2D X12.2
User warning n
(Cp2 READY)
IN1D X12.1
User warning 1
(Cp1 READY)
IN2D X11.5
Second
setpoint
IN1D X11.4
START
STOB X13.3
STOA X11.3
24V out X11.1
-Fi
100mA
-Rp
-Ro
-Rt2
-F1o
-R1
-R2
-R3
24VDC
2P
A1
A2
Cp2 start relay
Inverter run relay
Inverter Fault/Warning
-Ws4
-Ts1
Discharge temperature sensor Cp1
PT1000
-Cs
0-10 Bar
4-20mA
Suction pressure transducer
-Ws3
-Ws2
Y-DZ 2x1
-B1m
Motor thermostat (Integrated) Cp1
BRIDGE
-Ws1
-B1
Discharge thermostat Cp1
-Xs
SECOND SETPOINT
Object:
CU-KSC140L08
Control circuits
Schematic no:
SCH631-1R11
Page 5
OF 8
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Designer
Checker
Approver
Name
Michał Leśny
Łukasz Wróbel
Łukasz Wróbel
Role
Engineer
Leader
Leader
Date
07.08.2025


UNIT
2-OFF
1-INVERTER MODE
5-SAFETY MODE
Schrack BZ106380
-S0
-Rm
-Ra
Manual mode relay
Inverter mode relay
Bridge mounted in factory. Remove when connecting to connect external ON-OFF signal
External permition to work
-X
-H0
230VAC WHITE
Front
3 phase supply
-K2
-R1
-Rbp
-Cp2i
-Cp1i
-Ybp
-W12 3x1 Y-JZ
-W11 3x1 Y-JZ
-W10 3x1 Y-JZ
Compressor 2 liquid injection
Compressor 1 liquid injection
Compressor 1 By pass electrovalve
BRIDGE
LST
LSTS
LSDK
N
PE
Valves and permition to start
Schematic no: SCH631-1R11
Page 6
OF 8
CU-KSC140L08
Panasonic Cold Chain Poland Sp. z o.o.
ul. Relaksowa 27
55-080 Nowa Wieś Wrocławska
Name
Role
Date
Designer
Michał Leśny
Engineer
Checker
Łukasz Wróbel
Leader
Approver
Łukasz Wróbel
Leader
07.08.2025

Note:
1. Power supply on circuit breaks (-F..) allways on the top.
2. Unmarked wires - cross-section 1mm2.
3. All the wires in the cabinet finished with sleeve ferrule.
4. Number of diagram and it's revision to be labeled on sticker in indicated place.
5. The wires which are connected to the terminals and frequency inverter should be marked.
6. Wires to the devices not mounted on the panel:

- Q1: -> 630mm (out of the cable tray)
- H0: -> 700mm (out of the cable tray)
- H1: -> 770mm (out of the cable tray)

*. Optional elements.



	Name	Role	Date
Designer	Michał Leśny	Engineer	
Checker	Łukasz Wróbel	Leader	
Approver	Łukasz Wróbel	Leader	07.08.2025

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Object:
CU-KSC140L08

Mounting plate

Schematic no:
SCH631-1R11

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17. The commissioning report

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

Parameter	Unit of measurement	Value
Pressure switch LP setting	bar	
Pressure switch HP setting	bar	
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(PAR.211)in stable working conditions	A	
Reading of fan amperage	A	
Reading of output voltage from inverter (PAR.212)	V	
Evaporation pressure in stable working conditions(steady load)/quantity of working units	bar	
Superheating on evaporator	◦C	
Quantity of registered(weighed) refrigerant	kg	
Quantity of Cooling units/ evaporators	pcs	
Maximal Cooling load	kW	
Minimal Cooling load	kW	
Pressure of condensing measured with manometers	bar	
Suction temperature measured	◦C	
F-Gas certification	NUMBER	

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

THIS COMMISSIONING PROTOCOL SHOULD BE DELIVERED TO THE MANUFACTURER WITHIN 5 WORKING DAYS.

Panasonic®

Address

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Poland

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