

MCK-301-85



CONTROLLER UNIT FOR DEEP FREEZE MIDDLE-AND LOW TEMPERATURE REFRIGERATING MACHINES WITH AUTOMATIC DEFROST

OPERATING MANUAL

Quality control system on the production complies with requirements ISO 9001:2008

Review the Operating manual before using the unit.

Store the unit in the operating environment for 2 hours before switching to the mains.

Do not use abrasives or organic compounds for cleaning (spirit, gasoline, solvents, etc.).



NEVER ATTEMPT TO REMOVE AND REPAIR THE UNIT.

Some of the unit components may be live.

NEVER ATTEMPT TO OPEN AND REPAIR THE PROTECTED EQUIPMENT, IF SWITCHED TO THE UNIT SOCKET.



The electrical contact between the plug and the socket remains even in case of deactivated unit
NEVER ATTEMPT TO OPERATE THE UNIT WITH THE MECHANICAL DAMAGE OF THE HOUSING.



NEVER ATTEMPT TO OPERATE THE UNIT UNDER CONDITIONS OF HIGH HUMIDITY.
Do not let water into the unit.

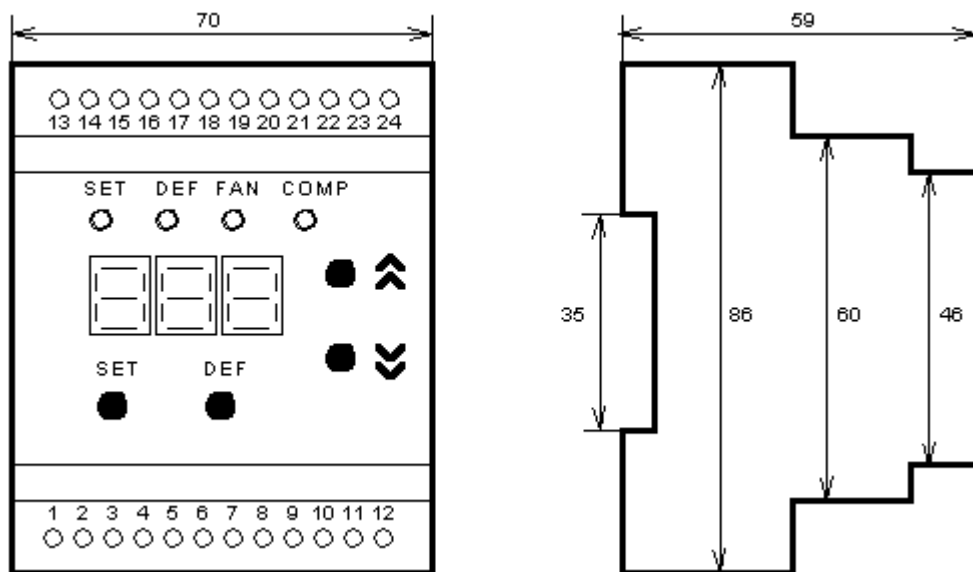
1. APPLICATIONS

The MCK-301-85 is designed to control freezers, refrigerating counters, monoblocs and other refrigerating shop and industrial equipment.

The MCK-301-85 allows to monitor freezer and evaporator temperature and also, depending on a specified mode of operation, to monitor the second evaporator temperature or fan air stream temperature. The device permits to start automatic defrost at temperature difference between refrigerating chamber and fan air stream.

The MCK-301-85 can perform protective compressor cut-out if PTC- or NTC-type temperature sensor of compressor is connected to the MCK-301-85.

The MCK-301-85 provides safety compressor and fan stop under abnormal supply line parameters (the unit performs monitoring of RMS phase voltage and line voltage, phase imbalance, correct phase sequence and power contacts state of external magnetic starter before and after compressor cut-in) and also accomplishes a consequent automatic reset when voltage parameters regenerated after user-ser time delay has expired.



- LED COMP glows when compressor is ON;
- LED FAN glows when fan is ON;
- LED DEF glows when defrost conditions is ON;
- LED SET glows when parameters setting mode is ON.

Figure 1 - MCK-301-85 front panel, controls and dimensions.

Note: Button "▲" - UP in the text, button "▼" - DOWN in the text.

2. TECHNICAL BRIEF

2.1. Analog inputs: there are 3 inputs for NTC/PTC sensors with reinforced electric insulation for temperature monitoring and defrost control;

2.2. A digital input: can be used to connect a door alarm sensor or to control defrost (the decision is made according to «closed/open» state) and as an input for external alarm signal;

2.3. Main outputs:

- two-way break-before make relay output for the compressor control - 8A 250V at $\cos \varphi = 1$;
- a normally open relay output for the evaporator fan control - 8A 250V at $\cos \varphi = 1$;
- a normally open relay output for the electric heater control - 8A 250V at $\cos \varphi = 1$;
- an opto-triac output to start an alarm signalling - 60 mA 50Hz

2.4. Temperature resolution - 0.1 °C;

2.5. Trip threshold accuracy for voltage is no more than 3V;

2.6. Nominal supply voltage: one-phase voltage is 230V/50Hz or three-phase voltage is 400V/50Hz;

2.7. Operating voltage: from 160V to 330V;

2.8. Power consumption is no more than 5W;

2.9. Enclosure: IP40;

2.10. Terminal block enclosure: IP20;

2.11. Operating temperature: from -35 to +55 °C;

- 2.12. Storage temperature: from -45 to +75 °C;
- 2.13. Weight is no more than 0,3kg;
- 2.14. Mounted on the standard 35 mm DIN-rail;
- 2.15. Mounting position is arbitrary;
- 2.16. Operating controls and the dimensions of the device are shown on fig.1.

3. PRE-STARTING PROCEDURE

- 3.1. Connect compressor starter, fan, alarm bell, temperature sensors to the MCK-301-85 according to fig.2.
- 3.2. Plug-in the MCK-301-85.
- 3.3. Power ON and set required operation modes according to the table 2.

Note - All connections must be performed on dead device.

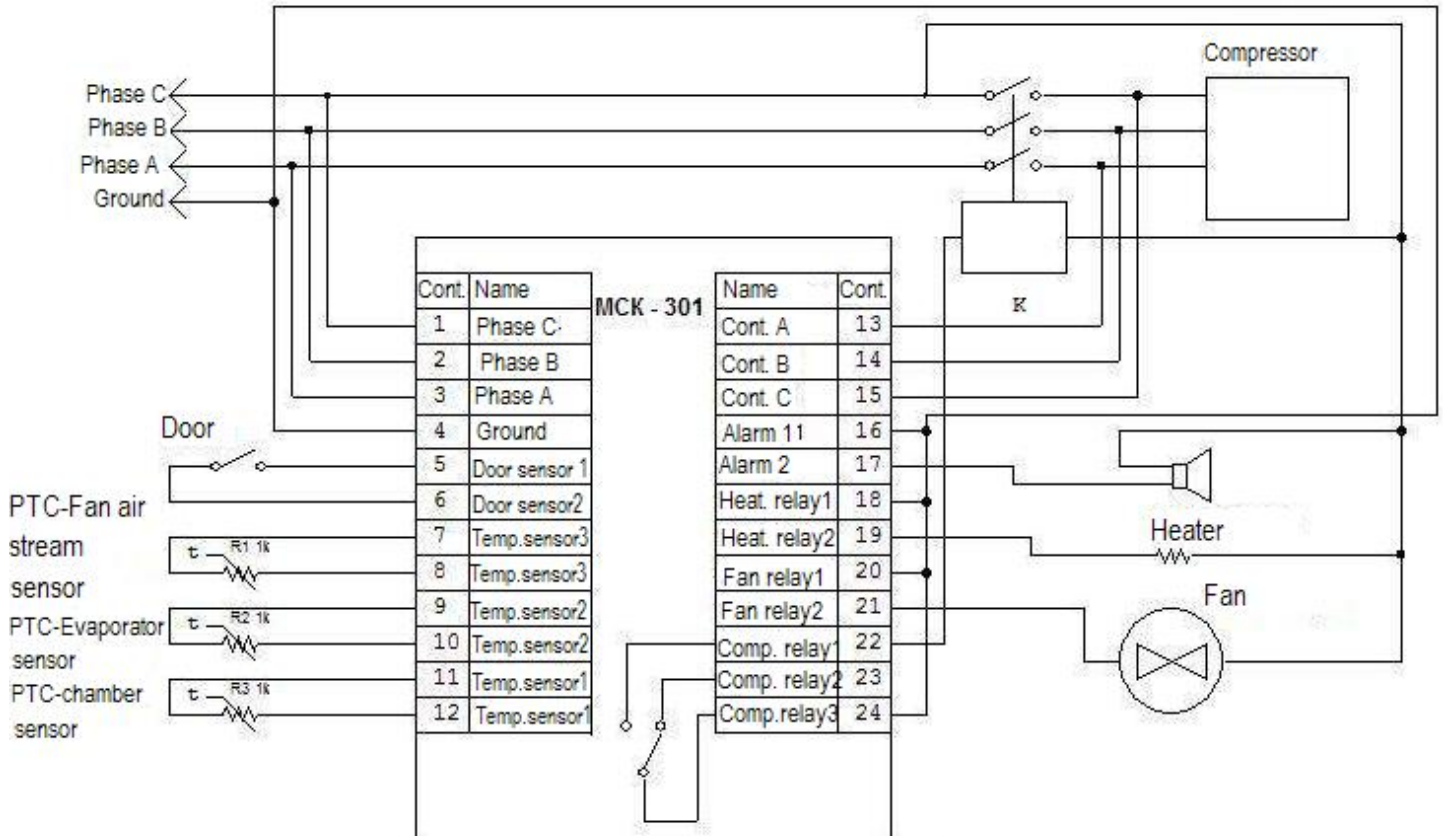


Figure 2 - The MCK-301 connections to the three-phase mains supply

Note - For the MCK-301-85 connection to single-phase mains supply the 1,2,3 terminals must be connected in parallel.

4. THE MCK-301-85 CONTROL LEVELS

4.1. In the initial state the MCK-301 indicator displays an actual temperature of refrigerating chamber. The MCK-301-85 provides three control levels.

4.2. A KEYBOARD LOCKING LEVEL.

Only viewing of the following parameters is available on this level:

- temperature setting, SP;
- first evaporator temperature, tS1;
- second evaporator temperature, tS2 (if parameter o07=1) or fan air stream temperature, tEn (if parameter o07=2);
- MCK-301-85 operation time, tbU;
- compressor operating time, tCO;
- compressor operating time to the MCK-301-85 operation time *relation* for the time set by user, dtt;
- A-phase voltage when U01=0 or AB-line voltage when U01=1, U_1;
- B-phase voltage when U01=0 or BC-line voltage when U01=1, U_2;
- C-phase voltage when U01=0 or CA-line voltage when U01=1, U_3;

To view parameters one needs to press simultaneously the DOWN and the UP buttons,

The parameters scrolling is performed by the DOWN and the UP buttons,

To access a parameter it's necessary to press the SET button.

When the keyboard is locked any button pressing (except simultaneous the UP and the DOWN buttons pressing) makes to appear the LOC label on the indicator. To unlock the keyboard the SET button is pressed. The «SET» LED lights up, and label «0» is blinking on the indicator. By the UP and DOWN buttons user enters a password digit from 1 to 9 and presses the DEF button. If the password is correct, the keyboard is unlocked. If after the keyboard unlocked no button is pressed during 16 sec and the lockage setting is not released by user, the keyboard is relocking.

4.3 USER LEVEL WHEN KEYBOARD IS UNLOCKED

This level allows:

to start defrost or to stop defrost ahead-of-schedule and to go into the thermostat conditions by the DEF button pressing;

to start refrigeration conditions by simultaneous the SET and DOWN buttons pressing;

to change and to view the user level parameters;

to view the adjuster level parameters.

To view and to change the user level parameters one needs to press the SET button, then «SET» LED will glow.

Parameters scrolling is performed by the DOWN and UP buttons, to access a parameter one needs to press the SET button;

Parameter changing is effected by the DOWN and UP buttons;

To set the parameter and go back into the MENU one needs to press the DEF button;

Going back to the menu without parameter setting is effected by the SET button.

If no button is pressed during 15 sec the MCK-301-85 goes into the initial state.

4.4 ADJUSTER LEVEL

To access the adjuster level one needs to press and hold down SET button for 5sec. If the level is protected by a password, the label PAS appears on the indicator. Then press the SET button again. The «SET» LED lights up and the label «000» starts blinking on the indicator. Step-by-step enter three digits (from 1 to 9) of the adjuster password, pressing the DEF button on each digit entry. If the password is incorrect, the PAS label lights on (S is blinking), and the MCK-301-85 goes back to the initial state in 15 sec, otherwise the first parameter of the adjuster menu appears on the indicator;

Parameters scrolling is performed by the DOWN and UP buttons;

To access a parameter one needs to press the SET button;

Parameter changing is effected by the DOWN and UP buttons;

To set a parameter and go back into the menu one needs to press the DEF button;

Going back to the menu without parameter setting is effected by the SET button.

If no button is pressed during 15 sec the MCK-301-85 goes into the initial state;

On the adjuster level the access to any user level parameter can be inhibited or permitted by simultaneous the SET and DOWN buttons pressing. If the access is inhibited a point indication appears on the right digital indicator when one is viewing the parameter value.

4.5 For fast restoration of factory parameters it is necessary to power ON at the device simultaneously pressed buttons SET, DOWN and UP. On the indicator should be light "nAU". To switch off a power. Factory parameters are restored.

5. THE MCK-301-85 MODES OF OPERATION

5.1. THE MCK-301 SUPPORTS THE FOLLOWING MODES OF OPERATION:

thermostat conditions;

refrigeration conditions;

alarm conditions.

The MCK-301-85 in the thermostat conditions maintains preset temperature in the chamber, performs defrost and the condensate drip-off.

The MCK-301 in the refrigeration conditions performs refrigeration, defrost delay, defrost.

5.2. THERMOSTAT CONDITIONS

5.2.1 When working in the thermostat conditions the MCK-301-85 holds the user-preset chamber temperature by the compressor and the fan operation control.

5.2.2. Compressor operation

SP (Set Point) and **dif** (differential) and **dif** parameters specify chamber temperature condition. If chamber temperature raised and reached value equal to **SP+dif**, compressor starts and it would stop only when temperature is down again reaching Set Point value.

LSE and **HSE** (a minimum and a maximum Set Point values) limit SP change area for user.

On the chamber sensor fault the compressor control is performed in fault condition (alarm conditions) according to the **Con** and **COF** parameters that specify compressor operation time and compressor stop time. In this case a corresponding **Er2** or **Er3** indication label appears on the indicator.

5.2.3. Fan operation.

Fan control type is selected according to **FCo** parameter:

FCo =0 - fans start and stop together with compressor;

FCo=1-fans operate without interruption.

If a maximum temperature value specified by **FSt** parameter is exceeded the fan is always off.

When working with two evaporators (**o07** = 1) turns off the fan when the temperature on both evaporators will be higher **FSt**.

To reclose the fan in this case it is possible when the temperature of the evaporator is below minus **FSt** **FAd** (when working with two evaporators (**o07** = 1) turns on the fan if the temperature on both evaporators is below minus **FSt** **FAd**

On the evaporator sensor fault MCK-301-85 initiates the label **Er4** or **Er5** appearance on the indicator (as well as the chamber temperature).

5.2.4 Chamber heating mode

Chamber heating mode is designed to maintain the desired temperature in the chamber in such situations when the temperature of surrounding air is lower than the preset temperature inside the chamber. The increase of the temperature in the chamber is provided by turning ON of the electric defrost heaters on the evaporator with simultaneous turn on of the FAN.

MCK-301-85 may switch to the chamber heating mode only in case of electric heater defrost and turned OFF state of the compressor (**tdF**=0).

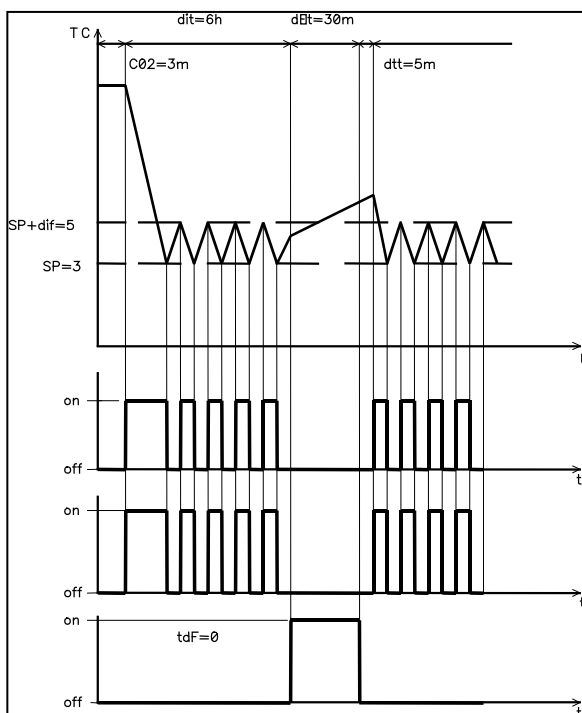
To turn ON the heating of the chamber it's necessary to set the differential value of the heater (**din**) not equal to zero. Then the electric heater will turn ON if the time **tnF** expired from the freeze climbing mode. Or when the time **tnC** expired from the moment of the compressor switched to turned OFF state (to exclude the thermal oscillation processes). And if the temperature in the chamber is lower then **SP-din**. The electric heater will turn OFF when the temperature in the chamber will reach the value of **SP** and when the minimal turn ON time setting for the heater (**tnn**) will expire. If temperature in the chamber will reach the value **SP+diF**, then the heater will turn OFF disregarding the mini-mal turn on time interval (**tnn**).

When MCK-301-85 is working in the chamber heating mode (**din** doesn't equal zero value) – then necessarily turns ON the defrost mode with the DG-frost (the same as with the installed parameters **dCt**=1 and **d13**=0).

When chamber heating mode is activated and when the electric heater is turned ON – on the digital front panel within the 3 seconds interval it's being shown in turns temperature value in the chamber and **HEt** indication.

If the digital sensor is preset as the door-sensor (**o01**=1)and in case of door opening the fan should be switched OFF (**CFo**=1 or **CFo**=3), then on opening the door electric heater and the fan would be switched OFF.

5.2.5 Diagram of the temperature changes in the chamber and time intervals of the output contacts is shown on Figure 3 (drawn in accordance to the default factory settings).



- C02** –compressor start delay
- dit** – chamber temperature maintenance
- dEt** – defrost
- dtt** – drip- off
- SP** – setting (temperature set by user)
- diF** – differential

Compressor relay

Fan relay
Fans are **ON** and **OFF** together with the compressor (**FCo**=0)
Heater relay
Defrost by the electric heater (**tdF**=0)

Figure 3

5.3 DEFROST

5.3.1. The MCK-301 allows to specify defrost type, defrost stop type and between-defrost delay count method.

The defrost type can be specified according to **tdF** parameter:

tdF=0 - defrost by electric heater (compressor is off, electric heater is on);

tdF=1 - defrost by hot gas (compressor is on, electric heater is on);

tdF=2 - free defrost (compressor is on, electric heater is off);

Defrost stop type is specified according to **EdF** parameter:

EdF=0 - according to time (dEt parameter specifies defrost duration, min);

EdF=1 - when preset evaporator temperature is reached (dSt parameter specifies defrost stop temperature, ° C);

EdF=2 - according to time and when preset evaporator temperature is reached (defrost stop is specified by **dEt** or **dSt** parameter depending on the parameter value which is reached first).

If the third temperature sensor is used as a second evaporator temperature sensor (o07 = 1), when **EdF = 1** and **EdF = 2** defrost end temperature will occur to achieve both sensors.

When the evaporator temperature sensor failure (or temperature sensors with one of the evaporators o07 = 1) end of the defrost cycle will come in time.

Between-defrost-cycles interval count method is specified by **dCt** parameter:

dCt=0 - according to user-set time (**dit** parameter specifies time interval between two defrost cycles);

dCt=1 - according to compressor operating time (DIGIFROST â method, dit parameter specifies compressor operating hours between two defrost starts);

dCt=2 - compressor stop (defrost starts on every defrost stop).

Defrost start conditions is specified by **d13** parameter:

d13=0 - according to time (**dCt** parameter is used);

d13=1 - defrost start is specified by temperature difference (**d14** parameter, °C) between refrigerating chamber and fan output stream (if the third temperature sensor either is absent/ out of order or used as the second evaporator temperature sensor, the **0 mode** is effected).

Note – When goes into defrost conditions tdF=0 (a method defrost an electroheater - the compressor is switched OFF, the heater is ON) the compressor is disconnected without value of **C01** parameter (minimum ON-time)

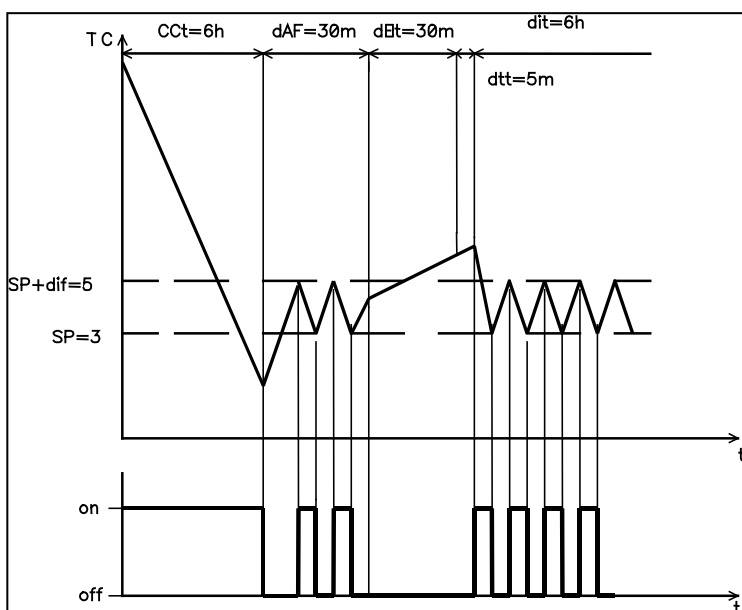
5.3.2. Condensate drip-off.

On defrost stop the MCK-301-85 starts time delay for condensate drip-off (ddt parameter). Besides, it's specified the fan start delay after defrost (**Fdt** parameter, min). The compressor and the electric heater are also off. The label **SLI** appears on the indicator.

5.4. REFRIGERATION CONDITIONS

This mode of operation is designed for a quick refrigeration of the chamber filled with a new (warm) product. The **FrE** label appears on the indicator for the short time.

The MCK-301-85 operation diagram in the refrigeration conditions (for the parameter values preset by producer).



CcT parameter specifies the refrigeration time.
dAF parameter specifies the start-of-defrost delay, i.e. the time before the start of the first defrost after the refrigeration time has expired.

When the refrigeration/ the defrost conditions is over, the MCK-30183 goes into the thermostat conditions automatically.

Compressor relay

5.5. FIRST START FEATURES

User is free to pre-specify a performance type the unit will follow when power is ON:

The performance type can be selected as:

- an operation in the thermostat conditions immediately after power is ON (dPO =0) during the time set by C02 parameter (this mode of operation starts with 30 sec delay after **StA** indication appears);
- first defrost after 30sec delay from the unit start-up moment has expired (dPO=1).

6. FAULT STATES CONTROL SYSTEM

In the thermostat conditions the unit performs the chamber temperature monitoring and detects when the temperature is outside the preset range (**LAL** and **HAL** parameters). This kind of monitoring is not performed in the refrigeration conditions and defrost conditions.

According to the preset additional temperature sensors (**d10**, **o07**) connection parameters the unit performs sensors short-circuit & disconnection monitoring.

If an open door state time exceeds user-preset time **AO7** parameter the situation considered to be a fault state.

To block premature trippings for temperature fault the **tAO**, **PAO** and **dAo** parameters are used.

The MCK-301-85 performs power supply voltage parameters monitoring in all modes of operation and when the power supply parameters deviate from the set range, the MCK-301-85 stops the compressor, the fan, the electric heater and cuts-in the alarm signal. On return to normal operating conditions for power supply parameters the MCK-301-85 resets back to the conditions where voltage fault occurred after **U05** reset delay has expired, if only user-set power voltage regeneration time doesn't exceed **Utt** parameter. If yes, the MCK-301 begins to perform the program executing from the start-up. The MCK-301-85 will start the program from the start, and when from the power supply until the time of the accident voltage will be less than 200 seconds.

When **U08=1** the MCK-301-85 performs a voltage monitoring at the compressor starter output terminals and stops the compressor, the fan, the electric heater and triggers the alarm signal if the starter contacts stick. To recover from this fault and from the fault induced by incorrect phase sequence one needs to restart the MCK-301-85.

When **U08=2** the MCK-301-85 performs a voltage monitoring at the compressor starter output terminals and if all the starter contacts open simultaneously it doesn't considered to be a fault but when only one or two contacts remain open it's considered to be the fault.

When **o07=3** or **o07=4** (the third temperature sensor is used as the compressor temperature sensor) MCK-301-85 determines the compressor temperature sensor resistance and if the resistance is above (below) the resistance set by **rd3** parameter, it stops the compressor. The compressor will reset when the time delay specified in **td3** parameter has expired.

When **o01=3** or **o01=4** it's considered by the MCK-301-85 to be an external fault: the controller cuts out the compressor and the fan immediately and the "Aci" code appears on the indicator. After the external alarm signal has disappeared the controller will continue the normal operation.

All fault state codes are displayed on the digital indicator according to the Table 1.

Table 1 - Fault codes

Fault signals on the indicator		Alarm signals on the indicator	
Fault in controller	Er1	High temperature	A ⁼⁼
Disconnected refrigerating chamber sensor	Er2	Low temperature	A ₌₌
Short-circuited refrigerating chamber sensor	Er3	Open door	Ado
Disconnected (evaporator) defrost sensor	Er4	Compressor temperature is exceeded	Ac ⁼
Short-circuited (evaporator) defrost sensor	Er5	Digital indicator fault	Aci
		Minimum voltage	U ₌₌
Disconnected the third temperature sensor	Er6	Maximum voltage	U ⁼⁼
Short-circuited the third temperature sensor	Er7	Phase imbalance	U _{PP}
		Voltage failure at starter terminals	U _{UL}
		Incorrect phase sequence	U _{1'1}
		Phase failure	U _o

Notes:

1. In the standard conditions ("rrS=0") the alarm relay energizes when any alarm signal appears on the indicator.
2. When "rrS"=1 the alarm relay will be energized as long as there is no fault for voltage.

7. PROGRAMMABLE AND USED PARAMETERS are given in table 2.

Table 2 Refrigerator control unit modes of operation

Settings and read-off parameters	Parameter codes	Minimum values	Maximum values	Factory setting	Operation
Temperature control Temperature SP, °C	SP	-44	49	3	Setting (refrigeration chamber temperature value set by user)
Thermostat					In thermostat mode compressor starts if temperature reaches SP plus differential, and stops if temperature reaches SP
Differential, °C	diF	1	20	2	Difference between the set temperature and the compressor start temperature
Upper temperature bound, °C	HSE	LSE	50	50	Adjuster level The limitation means that temperature which is higher than HSE can not be set by user
Lower temperature bound, °C	LSE	-45	HSE	-45	Adjuster level The limitation means that temperature which is lower than LSE can not be set by user
Chamber temperature sensor calibration, °C	CA1	-9,9	+9,9	0	CA1 scale shift from chamber temperature read by sensor
Evaporator temperature sensor calibration, °C	CA2	-9,9	+9,9	0	CA2 scale shift from evaporator temperature read by sensor
Fan air stream temperature sensor calibration, °C	CA3	-9,9	+9,9	0	CA3 scale shift from fan air stream temperature read by sensor (the second evaporator)
Temperature scale	C_F	0	1	0	0 - Celsius degrees 1 - Fahrenheit degrees (Fahrenheit temperature scale is not used in this version)
Alarm signalling					
Temperature alarm delay, min	tAO	0	90	30	
Temperature alarm delay after power is ON	PAO	0	48 hours	2 hours	
Temperature alarm delay after defrost and refrigeration mode, hours	dAo	0	10	1	
Door alarm trip delay	A07	0	90 min	30 min	
Fault temperature setting mode 0 - absolute temperature value 1 - temperature value relative to the setting	Att	0	1	1	Interpretation HAL and LAL values Alarm starts: a) in "0" mode - when set HAL and LAL values are reached b) in "1" mode - when upper temperature is SP+ diF+HAL - when lower temperature is SP-LAL
Positive temperature deviation	HAL Att=0 Att=1	LAL+1 1	50 50	5	
Negative temperature deviation	LAL Att=0 Att=1	-45 1	HAL-1	5	
Compressor					
Minimum ON-time, min	c01	1	15	5	Compressor protection against frequent cut-ins
Minimum OFF-time	c02	1 min	15 min	5 min	
Compressor ON-time at refrigerating chamber sensor failure	COon	5 min	120 min	20 min	Controller will use this value throughout the first three days and nights, then it will calculate the value by itself

Settings and read-off parameters	Parameter codes	Minimum values	Maximum values	Factory setting	Operation
Compressor OFF-time at refrigerating chamber sensor failure	COF	5 min	120 min	30 min	Controller will use this value during the first three days and nights, then it will calculate the value by itself
Compressor and fan status at open door	CFo	0	3	0	0 - normal mode of operation 1 - compressor is ON, fan is OFF 2 - compressor is OFF, fan is ON 3 - compressor is OFF, fan is OFF
Compressor protection at thermal sensor failure	cPP	0	2	2	0- Compressor is constantly OFF 1- Compressor is constantly ON 2- COn and COF parameters are used
Compressor ON-time in refrigeration mode	CCt	1 h	24 h	6 h	
Defrost					
Defrost method	tdF	0	2	0	0 - compressor is OFF, electric heater is ON 1 - hot steam defrost - compressor is ON, electric heater is ON 2 - compressor is ON, electric heater is OFF
Defrost stop temperature, °C	dSt	0	25	6	Temperature is measured on the evaporator
Interval between defrost starts, hours	dit	1	48	6	
First defrost start delay after the refrigeration mode has been completed, min	dAF	0	60	0	
Fan start delay after defrost, min	Fdt	0	20	1	
Between-defrost- starts interval counting method	DCt	0	2	1	Between-defrosts counting method 1 - DIGIFROST method. Defrost start time (dit) is specified by the compressor total ON-time 0 - real time - defrost starts frequency is specified by real time elapsed; the interval between defrosts is always alike 2 - compressor stop; defrost starts with every compressor stop
Maximum defrost duration, min	dEt	0	180	30	
Condensate drip-off time, min	ddt	0	90	3	
Fan cut-in during defrost	dFd	0	1	0	0 - OFF 1 - ON
Defrost sensor	d10	0	1	1	0 - no 1 - yes
Indicator readings during defrost	ddL	0	3	0	0- real temperature 1- defrost start temperature 2- Setting value (SP) 3- Label dEF
Defrost after start-up	dPO	0	1	0	0 - no 1 - yes
Defrost start mode	d13	0	1	0	0 - according to time 1 - according to temperature difference between refrigerating chamber temperature and fan output stream temperature. If the third temperature sensor is absent or used as the second evaporator temperature sensor the "0" mode is performed

Settings and read-off parameters	Parameter codes	Minimum values	Maximum values	Factory setting	Operation
Temperature difference in the 1 defrost start mode of operation (d13=1), °C	d14	1	30	3	
Time of the compressor continuous operation before the moment of defrost checking based on temperature difference, min	d15	1	30	5	Used when parameter d13=1
Defrost stop type	EdF	0	2	0	EdF=0 - according to time (parameter dEt) EdF=1 - when preset evaporator temperature is reached (parameter dSt) EdF=2 - according to time and temperature (depending on which of the parameter value is reached first).
FAN					
Fan cut-out at compressor stop	Fco	0	1	1	0 - yes 1 - no
Fans cut-out temperature, °C	FSt	-20	30	2	When this temperature is exceeded, the fan always stop- measured on the evaporator
Differential of the fan start	FAd	1	20	2	
VARIA					
Alarm relay mode of operation	rrS	0	1	0	0 – standard mode of operation 1—alarm relay is used as voltage relay output. If voltage is normal optorelay is energized
Digital input signals	o01	0	4	1	0 - not used 1 - door alarm 2 – defrost 3 – fault at closed digital contact 4 – fault at open digital contact <i>Door alarm:</i> if single-pole N.C. contact is broken down, door alarm starts <i>Defrost:</i> if single-pole contact is broken down, defrost starts <i>Fault</i> – compressor relay, fan relay and heater relay are de-energized at once
MCK-301-85 ON time	tbU	0 u.	999 u.	0 u.	(1 unit == twenty four hours)
Compressor ON time	tCO	0 u.	999 u.	0 u.	(1 unit == twenty four hours)
Time	ttt	1 u.	15 u.	1 u.	The time for calculation of the dtt relation (1 unit == twenty four hours)
User access code	LOC	0	9	0	0 - keyboard is unlocked 1-9 - user password
Adjuster access code	PAS	000	999	123	000 - access to the adjuster level is permitted 000-999 - adjuster password
Temperature sensors type	tPd	0	1	1	0 - NTC, 1 - PTC
Third temperature sensor	o07	0	4	0	0 - OFF 1 - used as the second evaporator temperature sensor 2 - used as output air stream fan temperature sensor 3 - used as compressor temperature PTC-sensor

Settings and read-off parameters	Parameter codes	Minimum values	Maximum values	Factory setting	Operation
					4 - used as compressor temperature NTC-sensor
Reset delay	td3	10 min	300 min	30 min	Compressor reset delay after temperature fault
Third temperature sensor critical resistance, kOhm	rd3	0.3	8	1.00	When the third temperature sensor resistance is exceeded (o07=3), compressor stops. If o07=4, compressor stops when the resistance is lower than the specified one
VOLTAGES					
Measured voltage	U01	0	1	0	0 - phase voltage 1 - line voltage 2 - voltage monitoring is cut-out
Minimum voltage, V	U02	160-277	240-415	185-320	U01=0 U01=1
Maximum voltage, V	U03	165-329	280-475	245-415	U01=0 U01=1
Phase imbalance, V	U04	5 5	70 121	20 35	U01=0 U01=1
Reset delay, s	U05	5	300	10	
Cut-out delay for minimum voltage, s	U06	5	30	10	
All fault types delay, s	U07	0	30	1	
Starter terminals voltage monitoring	U08	0	2	0	0 - cut-out 1 - cut-in 2 - cut-in, when there is no voltage on all phases or the starter starts it's not considered to be a fault
Program start-up delay after voltage fault, min	Utt	0 min	180 min	10	
PARAMETERS OF CHAMBER HEATING					
Differential value for the Turn ON temperature for the heater, °C	din	0	20	0	
Turn ON time delay for the chamber heating mode after the performance of the desired freeze climbing, min	tnF	10	180	60	
Time interval between ON and OFF states of compressor heater or between compressor OFF state and heater turning ON , min	tnc	1	60	5	Time interval is necessary to avoid the thermal oscillation process
Minimal time for the heater operation, min	tnn	1	30	1	To eliminate frequent heater turn ON
Device version	rEL			85	

8. STORAGE AND SHIPPING CONDITIONS

The unit in manufacturer package should be stored in enclosed rooms at -45 to +70 °C and exposed to no more than 80% of relative humidity when there are no fumes in the air that exert a deleterious effect on package and the unit material. The Buyer must provide the protection of the unit against mechanical damages in transit.

9. WARRANTY AND CLAIMS CONDITIONS

Warranty period is 36 month upon the day of sale.

The manufacturer shall repair the unit, in the compliance with the operating manual by the user, within the warranty period.

MCK-301-85 is not subject to the warranty service in the following cases:

- expiry of the warranty period;
- availability of mechanical damages;
- attempts to open and repair ;
- traces of moisture attack or in the presence of foreign items inside the unit;
- damage caused by an electric current or voltage values which exceed the nameplate, improper or careless handling of the product is not subject to the instructions for installation and use;
- damage is caused by electric current or voltage in excess to the permissible values as indicated in the Operating manual.

Warranty service is provided in the place of purchase.

Post-warranty service shall be provided by the manufacturer.

The manufacturer's warranty does not cover compensation for direct or indirect losses associated with the unit transportation to the place of purchase or manufacturer's plant.

Earnest request: indicate the reason for return in the notice of faults field at the return of the device or in case of submitting for warranty service or post-warranty service.

10. ACCEPTANCE CERTIFICATE

MCK-301-85 was produced and accepted in accordance with the requirements of effective technical documentation and was recognized as suitable for operation.