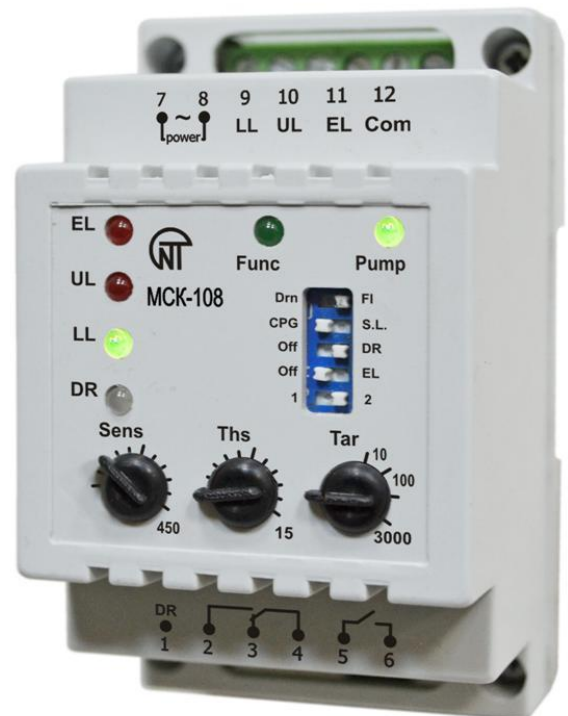


PUMPING PLANT CONTROLLER MCK-108



OPERATING MANUAL CERTIFICATE

Quality control system on the development and production complies with requirements ISO 9001:2015

Dear customer,
Company NOVATEK-ELECTRO LTD. thanks you for purchasing our products.
You will be able to use properly the product after carefully studying the Operating Manual.
Keep the Operating Manual throughout the service life of the product.

ATTENTION! ALL REQUIREMENTS OF THIS OPERATING MANUAL ARE COMPULSORY TO BE MET!



WARNING! – PRODUCT TERMINALS AND INTERNAL COMPONENTS ARE UNDER POTENTIALLY LETHAL VOLTAGE.

TO ENSURE THE PRODUCT SAFE OPERATION IT IS STRICTLY FORBIDDEN THE FOLLOWING:

- TO CARRY OUT MOUNTING WORKS AND MAINTENANCE WITHOUT DISCONNECTING THE PRODUCT FROM THE MAINS;
- TO OPEN AND REPAIR THE PRODUCT INDEPENDENTLY;
- TO OPERATE THE PRODUCT WITH MECHANICAL DAMAGES OF THE CASE.

IT IS NOT ALLOWED WATER PENETRATION ON TERMINALS AND INTERNAL ELEMENTS OF THE PRODUCT.

During operation and maintenance the regulatory document requirements must be met, namely:

- Regulations for Operation of Consumer Electrical Installations;
- Safety Rules for Operation of Consumer Electrical Installations;
- Occupational Safety when in Operation of Electrical Installations;

1 DESCRIPTION AND OPERATION

1.1 APPLICATIONS

The pumping plant controller MCK-108 (hereinafter referred to as either MCK-108 or the device) is designed to create technological processes automation systems, related to control and maintaining of a set level of liquid substances in different kinds of tanks by controlling an electric motor (or electric motors) of one or two pumps.

Maintaining of a set level of liquid substances is performed:

- in case of single-phase motor with capacity of up to 1 kW - by controlling the integrated pump relay;
- in case of three-phase motor or single-phase motor with capacity of over 1 kW - by controlling the magnetic starter coil (contactor).

MCK-108 provides controlling of the electric motor (electric motors) of one or two pumps in an automated mode according to one of the algorithms integrated into the device.

MCK-108 provides working with liquids of various electrical conduction - tap water and polluted water, milk and food products (low-acid, alkaline etc.).

1.2 TERMS AND ABBREVIATIONS

List of Used Abbreviations:

EL – Emergency Level

UL – Upper Level

LL – Lower Level

DR – Dry Run

MS – Magnetic Starter

Conduction-measuring sensor of liquid level is a sensor, the operating principle whereof is based on the increase of electrical conduction between the common and the signal electrodes, if there is liquid between them.

Contact pressure gauge (CPG) measures pressure, produced by liquid. For instance, one can determine the liquid level in the tank by measuring pressure at the bottom of a tank (an outlet pipe).

The pressure gauge used in MCK-108 must correspond to type V (must have two contacts one of which must be a break contact (closed at low pressure); the second contact must be a make one (closing at high pressure); if pressure is between the high and the low levels, both contacts must be broken).

Note - As usual, CPGs with two contacts have universal (transfer) contacts and the necessary type of CPG can be set by the user.

Filling mode - In this mode, MCK-108 controls the pump, filling the outer tank by pumping water from the well.

To prevent failure of the electric motor while draining the well one may use a dry run sensor (conduction-measuring dry run sensor is located in the well). After deactivation of the pump electric motor due to dry run failure, the pump activation delay is provided for the time of filling the well (the delay time is determined by the AR time (automatic reset time) parameter and can be set by the user).

Two pumps may be used in the filling mode. For balancing the tear-and-wear, the user can set the alternate operation of the pumps.

Drainage mode is used for pumping liquid out of the well, for instance - in sewerage stations. In the drainage mode, the second pump is activated, if the capacity of one pump is not enough and the liquid level has exceeded the emergency level. If the capacity of both pumps is equal, the user can set the alternate operation of the pumps for balancing the tear-and-wear.

1.3 TECHNICAL CHARACTERISTICS

1.3.1 General Data

General data for MCK-108 are specified in Table 1.1.

Table 1.1 - General Data

Name	Measuring Unit	Value
Purpose of device	-	Control and distribution equipment
Rated operating regime	-	continuous
Protection class	-	IP20
Electric shock protection class	-	II
Climatic version	-	NC3.1
Allowable pollution rating	-	II
Overvoltage category	-	II

Rated insulation overvoltage	V	450
Rated impulse withstand voltage	kV	2.5
Connecting terminals wire section	mm ²	0.5-2
Tightening torque of terminal screws	N*m	0.4

1.3.2 Main Technical Characteristics

The characteristics of the integrated relays output contacts are specified in Table 1.2.

The main technical characteristics of MCK-108 are specified in Table 1.3.

Table 1.2 - The characteristics of the integrated relays output contacts

Operating regime	Max. current at U~250 V, A	Number of trips x1000	Max. switching power, VA	Max. current at U _{post} =30 V, A
cos φ = 0.4	5	50	4000	3
cos φ = 1.0	16	100		

Table 1.3 - The main technical characteristics

Name	Value
Rated supply voltage: single-phase 50 Hz, V	230/240
Voltage, at which operability is maintained: - minimum, V - maximum, V	130 265
Mains frequency, Hz	48-62
Analog Inputs: - input for connecting level sensor (of pressure) - General for level sensors (of pressure)	4 1
Main outputs: - pump relay - make contact for controlling electric motor starter - 16 A 250 V at cos φ=1 - functional relay – transfer contact - 16 A 250 V at cos φ=1	1 1
Controlled environment resistance for conduction-measuring sensor, kiloohm, not more than	450
Power consumption (under pressure), not more than, VA	3.3
Weight, not more than, kg	0.2
Overall dimensions, mm	Figure 1.1
Installation onto standard 35 mm DIN rail	
The device preserves functionality in any position within the space	
Casing material – self-extinguishing plastic	

MCK-108 complies with the requirements of:
IEC 60947-1; IEC 60947-6-2; CISPR 11; IEC 61000-4-2.

There is no amount of harmful substances, exceeding the maximum allowable concentration.

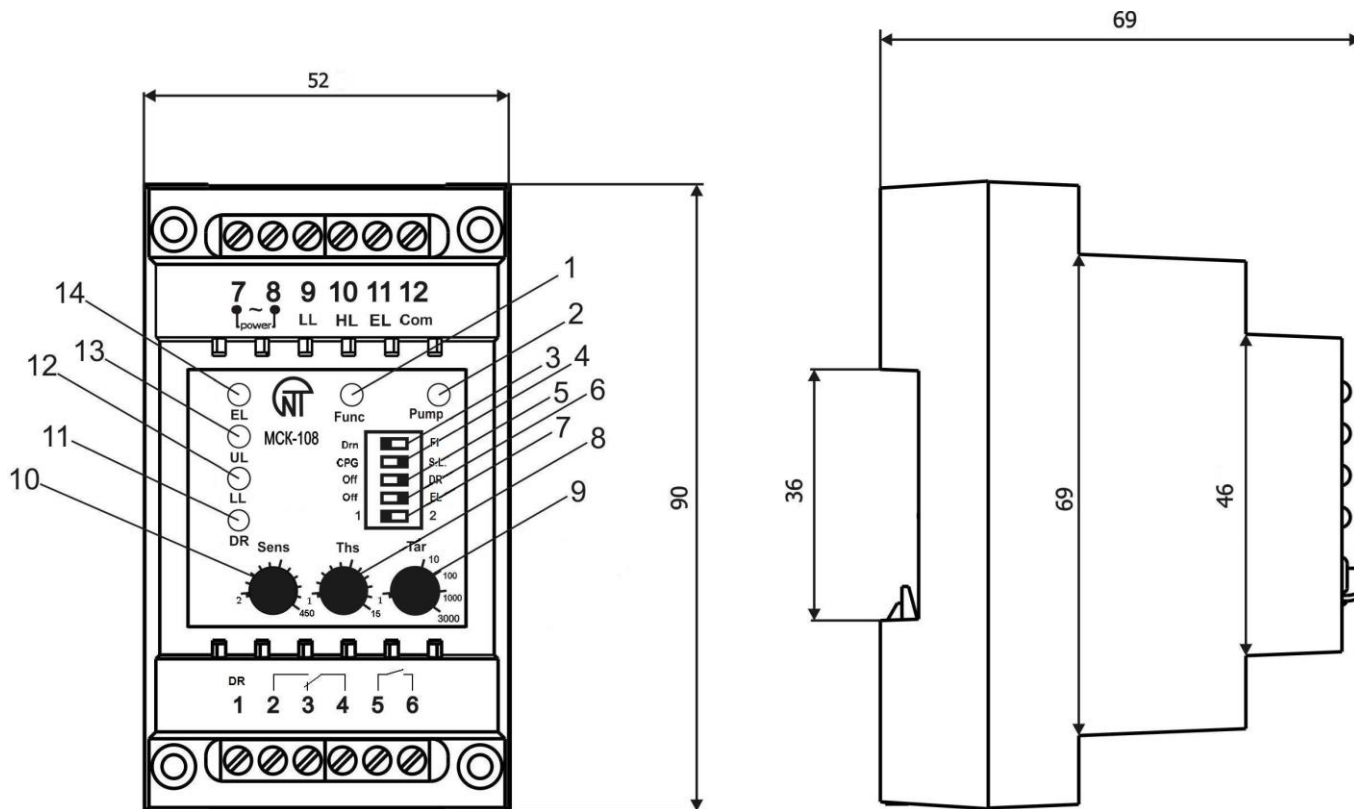
1.3.3 Controls and Overall Dimensions

Controls and overall dimensions of MCK-108 are specified in Figure 1.1.

1.3.4 Designation of contacts

Designation of contacts of MCK-108:

- 1 – sensor "DR" (Dry Run);
- 2 – normally broken contact of the functional relay;
- 3 – normally closed contact of the functional relay;
- 4 – common contact of the functional relay;
- 5 – common contact of the pump relay;
- 6 – normally broken contact of the pump relay;
- 7, 8 – power supply;
- 9 – sensor "LL" (Lower Level);
- 10 – sensor "UL" (Upper Level);
- 11 – sensor "EL" (Emergency Level);
- 12 – common contact for sensors.



- 1 – LED "Func" (Function) glows green if the functional relay contact is closed;
- 2 – LED "Pump" glows green if the pump relay contact is closed;
- 3 – Switch "Dr – Fi" (Drainage – Filling) sets either the drainage or the filling mode;
- 4 – Switch "CPG – S. L." (CPG – Level Sensor) sets either the contact pressure gauge (CPG) or level sensors mode;
- 5 – Switch "DR" (Dry Run) allows operation of the dry run sensor;
- 6 – Switch "EL" (Emergency Level) allows operation of the emergency level sensor;
- 7 – Switch "1 – 2" sets the number of pumps in use;
- 8 - Handle "Ths" adjusts the sensor response delay time (hydraulic shock);
- 9 – Handle "Tar" adjusts the automatic reset (AR) time after failure of "DR" sensor;
- 10 – Handle "Sens" adjusts sensor resistance for various environments;
- 11 – LED "DR" (Dry Run) glows green if the liquid level is higher than the dry run sensor; glows red if the liquid level is lower than the dry run sensor; and blinks green if the liquid level is higher than the dry run sensor, but AR time has not elapsed yet;
- 12 – LED "LL" (Lower Level) glows green the liquid level is higher than the lower level sensor. If the liquid level is lower than the lower level sensor, in the filling mode it glows red, while in the drainage mode it blinks green;
- 13 – LED "UL" (Upper Level) glows red if the liquid level is higher than the upper level sensor;
- 14 – LED "EL" (Emergency Level) glows red if the liquid level is higher than the emergency level sensor.

Figure 1.1 - Controls and overall dimensions of MCK-108

1.4 OPERATIONAL CONDITIONS

- Operating temperature range – from -35 to +55 °C;
- Atmospheric pressure – from 84 to 106,7 kPa;
- Relative humidity 30 ... 80 % (at +25 °C temperature).

ATTENTION! The device is not intended for operation in the following conditions:

- Significant vibration and shocks;
- High humidity;
- Aggressive environment with content in the air of acids, alkalis, etc., as well as severe contaminations (grease, oil, dust, etc.).

2 INTENDED USE

2.1 SAFETY PRECAUTIONS

IT IS PROHIBITED TO PERFORM INSTALLATION WITHOUT DISCONNECTION OF MCK-108 FROM MAINS.

The device is not intended for operation under the impact of vibration or striking.

2.2 PREPARATION FOR USING

2.2.1 Preparation for connection:

- Unpack the product (we recommend to keep the original packing for the entire warranty period of the product operation);
- Check the product for damage after transportation; in case of such damages detection, contact the supplier or manufacturer;
- Carefully study the Operating Manual (**pay special attention to the connection diagram to power the product**);
- If you have any questions regarding the installation of the product, please contact the manufacturer by telephone number indicated at the end of this Operating Manual.

2.2.2 General instructions

If the temperature of the product after transportation or storage differs from the environment temperature at which it is expected to operate, then before connection to electric mains keep the product under the operating conditions within two hours (because the product elements may have moisture condensation).

ATTENTION! RN-111M ARE NOT DESIGNED FOR LOAD COMMUTATION IN CASE OF SHORT CIRCUITS. THEREFORE THEY SHOULD BE PROTECTED BY AUTOMATIC CIRCUIT BREAKERS (FUSES) WITH TRIPPING CURRENT NOT EXCEEDING 15 A.

ATTENTION! ALL CONNECTIONS MUST BE PERFORMED WHEN THE DEVICE IS DE-ENERGIZED.

Error when performing the installation works may damage the product and connected devices.

To ensure the reliability of electrical connections you should use flexible (stranded) wires with insulation for voltage of not less than 450V, the ends of which it is necessary to be striped of insulation for 5±0.5 mm and tightened with bootlaces. Recommended cable cross section for connection is 1 mm², not less. Wires fastening should exclude mechanical damage, twisting and insulation abrasion of wires.

IT IS NOT ALLOWED TO LEAVE EXPOSED PORTIONS OF WIRE PROTRUDING BEYOND THE REMOVABLE TERMINAL BLOCK.

For reliable contact it is necessary to perform tightening of screws of removable terminal block with the force specified in Table 1.1.

To increase the running ability of MCK-108, it is recommended to install protection devices (fuse links or their equivalents) into the following circuits (enumerated in the order of necessity, hyphen is followed by the recommended protection device rating):

- 1) power supply circuits of MCK-108 L, N - 0.5 A;
- 2) relay output contacts (protection device rating is chosen according to the connected circuits, but shall not exceed 15 A).

2.2.3 Connect the level sensors. When using the dry run sensor turn the switch "Off - DR" to "DR" (Dry Run) position. When using the emergency level sensor turn the switch "Off - EL" (Off - Emergency Level) to "EL" position.

2.2.4 When working with one pump, connect the magnetic starter (hereinafter referred to as MS) of the electric motor according to Figure 2.2 and turn the switch "1 – 2" to "1" position. When working with two pumps, connect MS of the electric motor according to Figure 2.6 and turn the switch "1 – 2" to "2" position.

2.2.5 When working in the drainage mode, turn the switch "Drn - FI" (Drainage – Filling) to "Drn" position.

2.2.6 When working in the filling mode with level sensors, turn the switch "CPG – S.L." (CPG – Level Sensor) to "S.L." (Level Sensor) position and turn the switch "Drn - FI" (Drainage – Filling) to "FI" (Filling) position.

2.2.7 Connection of the pressure sensor to MCK-108

To connect the pressure sensor to MCK-108, one must connect the following items by using Figure 1.1 and Figure 2.2:

- contacts "1a" and "1b" on CPG with contact "12" on MCK-108;
- contact "2" on CPG with contact "10" on MCK-108;
- contact "3" on CPG with contact "9" on MCK-108;

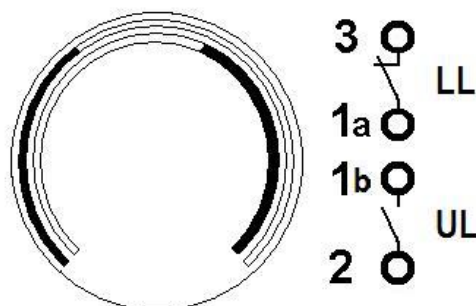


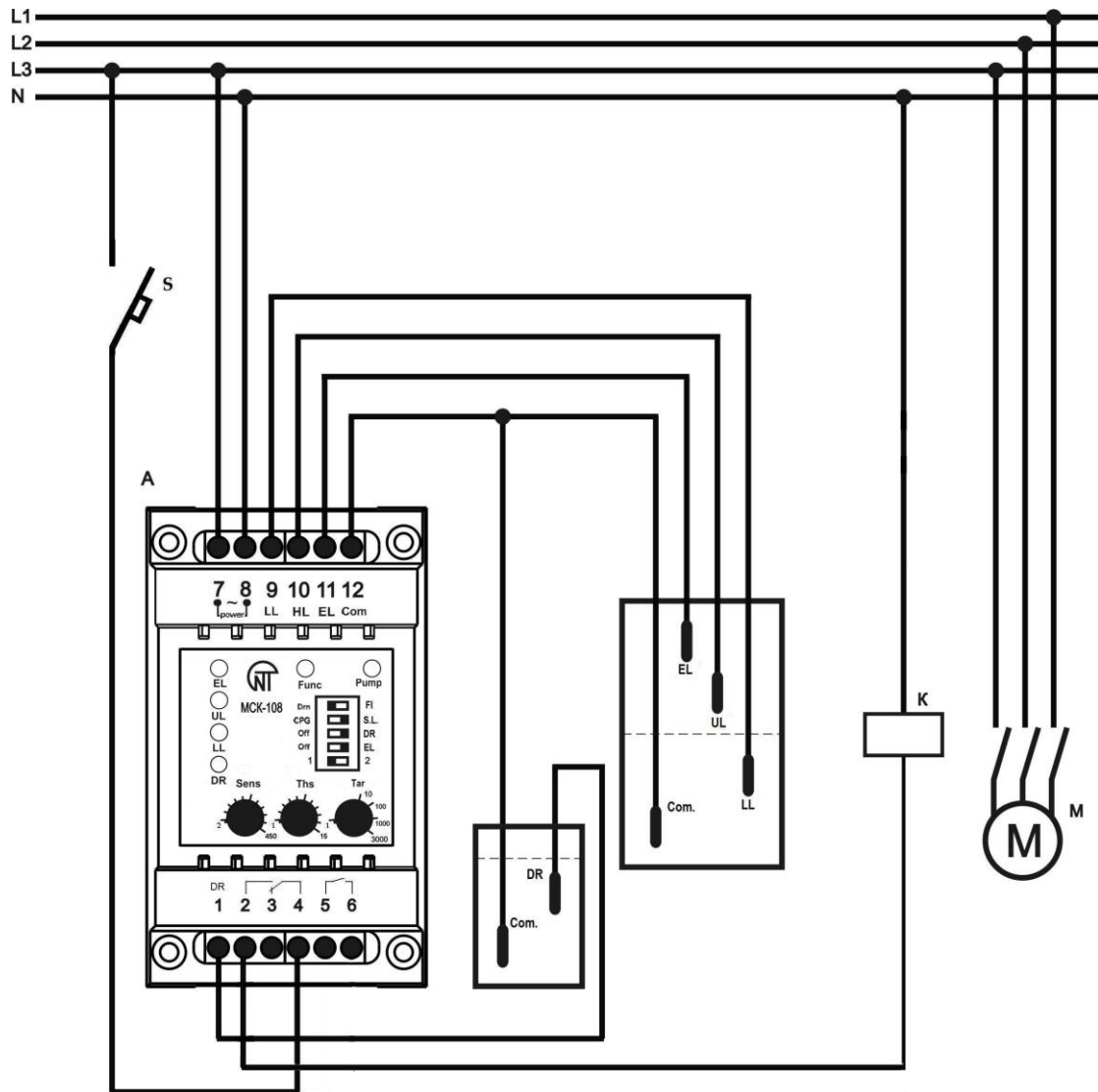
Figure 2.1 – Connection to Pressure Sensor

2.2.8 When working in the filling mode with the level sensor, turn the switch "CPG – S.L." (CPG – Level Sensor) to "CPG" position and turn the switch "Drn - Fi" (Drainage – Filling) to "Fi" position.

2.2.9 By using the handle "Ths", adjust the necessary response delay time, which shall exclude false level sensor tripping due to a possible hydraulic shock.

2.2.10 Turn the handle "Sens" to the position, corresponding to the measured liquid resistance.

2.2.11 By using the handle "Tar", adjust the necessary AR time, after deactivation of the pump motor due to a dry run failure. Setting the AR time depends on either the time of filling the well or the liquid flow from the tank.



A – controller of MCK-108
 K – contactor starter
 M – electric motor of the pump
 EL – emergency level sensor
 UL – upper level sensor

LL – lower level sensor
 DR – dry run sensor
 Com. – common electrode
 S – automatic protector

Figure 2.2 - Connection Diagram for MCK-108

2.3 INTENDED USE

2.3.1 MCK-108 operation in the automated mode with one pump

2.3.1.1 Operation modes of MCK-108 with one pump

When operating with one pump, MCK-108 uses the functional relay for alarm activation. The alarm is activated (contacts "2 – 4" are closed and contacts "3 – 4" are broken) in the following cases:

- liquid level is higher than EL;
- liquid level is lower than DR;
- failure of UL, LL or EL sensors.

MCK-108 provides operation in the following automated modes:

- filling with pressure sensors (Figure 2.3);
- filling with level sensors (Figure 2.4);
- drainage with level sensors (Figure 2.5).

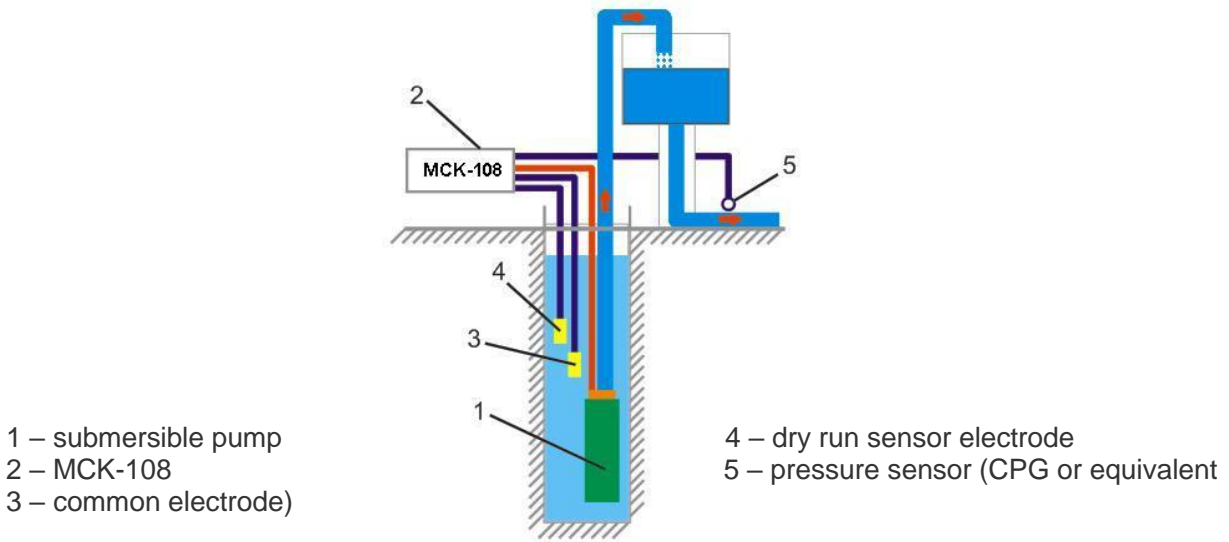


Figure 2.3 – Application of MCK-108 in the filling mode with pressure sensor

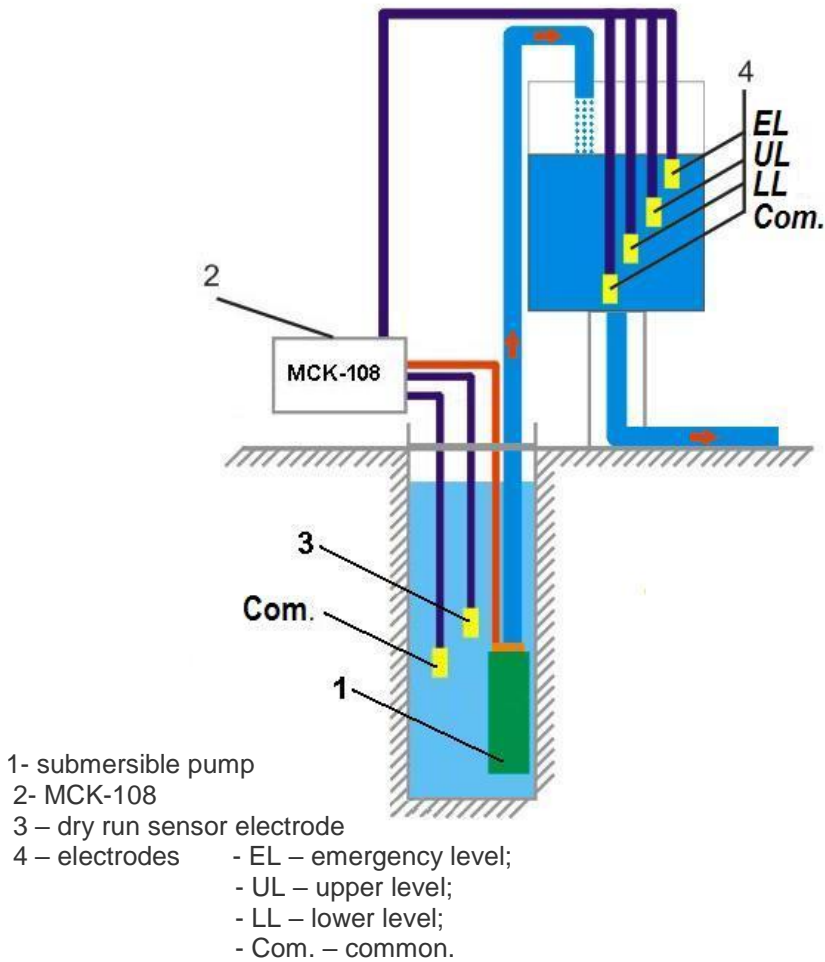


Figure 2.4 – Application of MCK-108 in the filling mode with conduction-measuring sensors (level sensors)

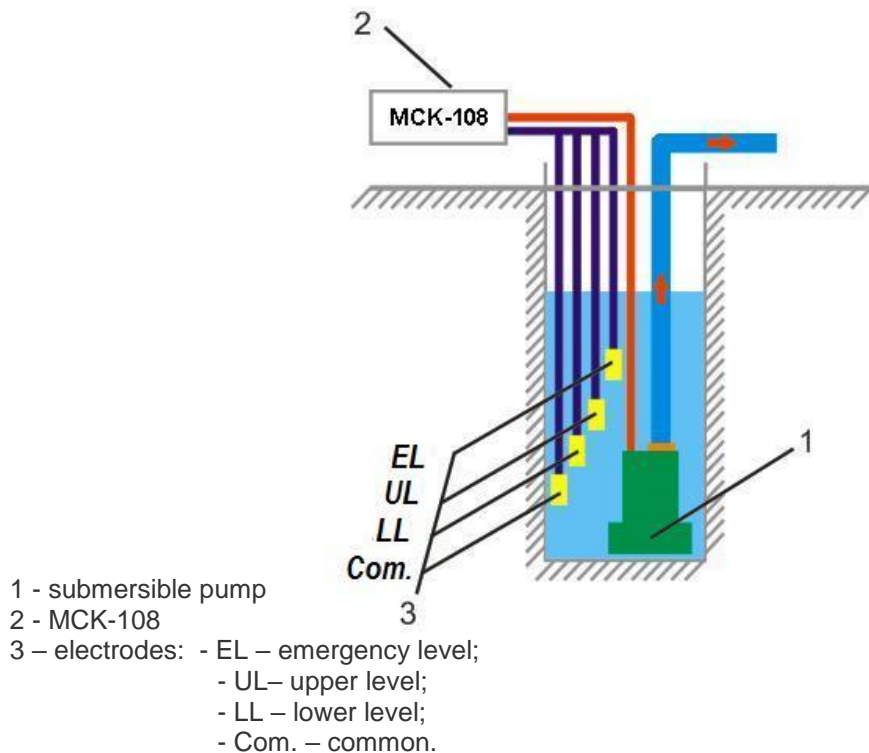


Figure 2.5 – Application of MCK-108 in the drainage mode with conduction-measuring sensors (level sensors)

2.3.1.2 Operation in the automated filling mode with the pressure sensor

If the movable contact in the initial state is located between the UL and LL contacts, when starting the power supply, the electric motor will not be activated.

When closing the movable contact with the contact of the UL upper setting, the automatic deactivation of the electric motor takes place.

When closing the movable contact with the contact of the LL lower setting, the automatic activation of the electric motor takes place and the cycle is repeated.

2.3.1.3 Operation in the automated filling mode with the level sensors

In the initial state (in case there is no liquid in the tank), when starting the power supply, the pump electric motor will be activated automatically.

When the liquid level reaches the UL sensor, the automatic deactivation of the electric motor takes place.

When the liquid level in the tank is lower than the LL sensor, the automatic activation of the pump electric motor takes place to feed the liquid into the tank and the cycle is repeated.

2.3.1.4 Operation in the automated drainage mode with the level sensors

In the initial state (in case the liquid level in the tank is lower than the UL sensor), when starting the power supply, the pump electric motor will not be activated.

When the liquid level reaches the UL sensor, the automatic activation of the pump electric motor takes place.

When the liquid level in the tank is lower than the LL sensor, the automatic deactivation of the pump electric motor takes place and the cycle is repeated.

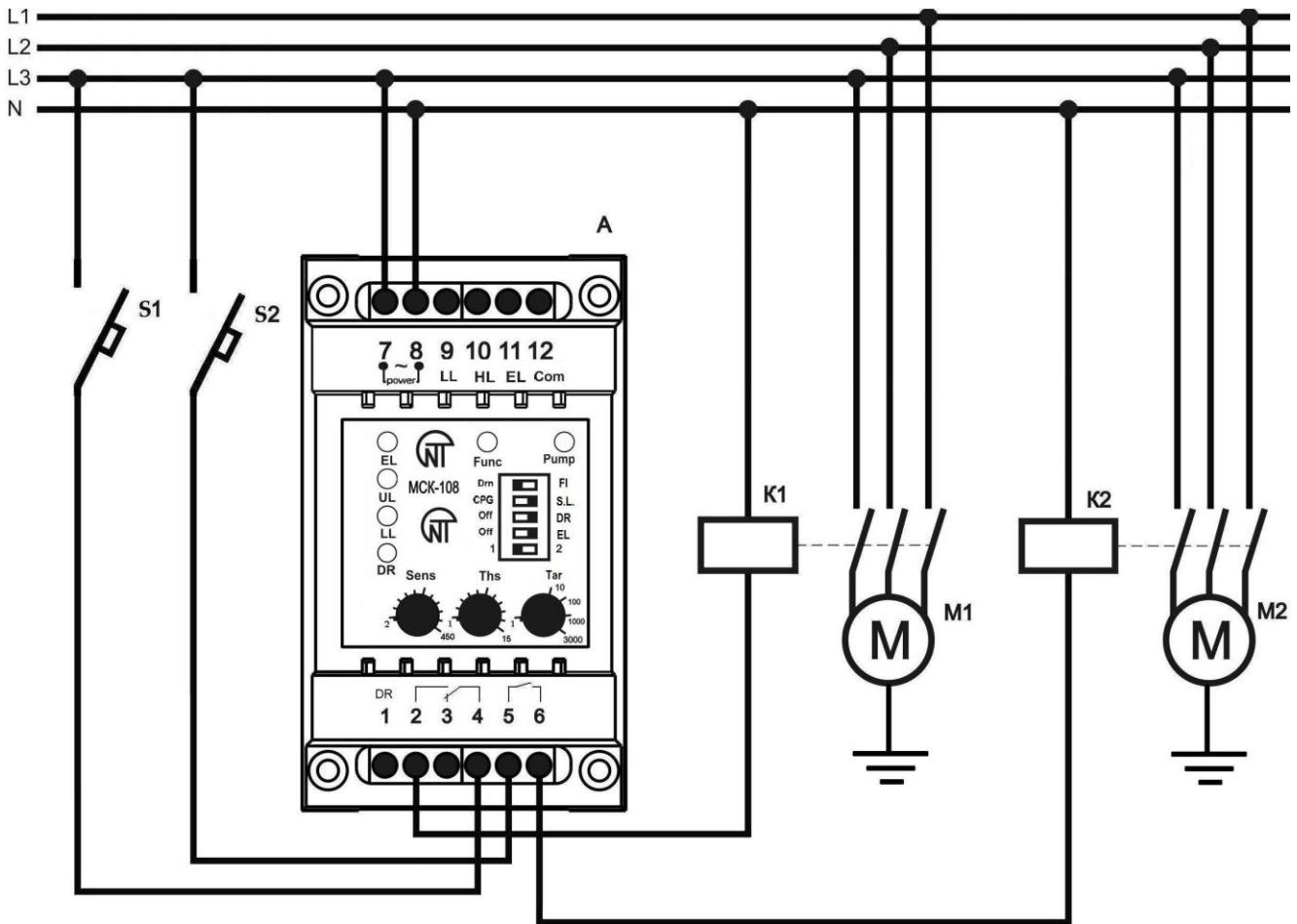
2.3.2 MCK-108 operation in the automated modes with two pumps

For operating MCK-108 with two pumps, one must connect the contactor starter of the second pump according to Figure 2.6.

In the automated operation modes of MCK-108 with two pumps, the operation logic of the device is preserved, but the functional relay is used to control the electric motor of the second pump and, subsequently, does not respond to emergency conditions.

Activation of the electric motors of the pumps (activation of the functional relay and the pump relay) takes place in turn.

In the automated drainage mode, if the emergency level has been reached, the electric motors of the pumps are activated simultaneously.



A – MCK-108 controller
 K1,K2 – contactor starter
 M1 – electric motor of the first pump

M2 – electric motor of the second pump
 S1, S2 – automatic protectors

Figure 2.6 – Connection of two pumps to MCK-108

2.3.3 Emergency conditions

2.3.3.1 Protection of the pump electric motor from the inadmissibly low liquid level in the well
 Protection works if the DR sensor is activated.

If the liquid level in the well falls lower than the DR sensor:

- the pump electric motor is deactivated;
- the LED DR starts to glow red;
- the functional relay activates the alarm (at operation with one electric motor).

If the liquid level reaches the DR sensor and the AR time elapses, the pump electric motor will be activated:

If the DR sensor is off, the LED DR goes out.

2.3.3.2 Emergency shutdown of the pump electric motor on tripping of the EL emergency level sensor.

If the EL sensor is activated, on the liquid level reaching the EL sensor:

- the pump electric motor is deactivated (except for the drainage mode);
- the LED EL starts to glow red;
- when working with one pump electric motor, the functional relay activates the alarm.

If the liquid level falls lower than the EL sensor:

- the pump electric motor is activated;
 - the LED EL goes out;
 - the functional relay deactivates the alarm.
- If the EL sensor is off, the LED EL goes out.

2.3.4 Sensor Failures

Failures of the (pressure) level sensors are specified in Table 2.1

Table 2.1

Name of Failure	Cause	Indication
Failure of the lower level sensor (LL)	If the UL or EL sensor has tripped (except for the operation mode with the pressure sensor), the LL sensor shall indicate the absence of liquid. Or if the UL or EL sensor has tripped (in the operation mode with the pressure sensor), the LL sensor shall indicate a closed condition.	The LED "LL" blinks red
Failure of the upper level sensor (UL)	If the EL sensor has tripped, the UL sensor shall indicate the absence of liquid.	The LED "UL" blinks red

Note – At failure of the UL sensor, MCK-108 will continue operating, using the emergency level sensor as an UL sensor.

2.3.5 EEPROM Failure

When EEPROM failure, calibration of resistance of liquid off and MCK-108 is locked, giving the following error message – in turn and with 1 Hz frequency **EL, UL, LL, DR** LEDs starts to glow.

ATTENTION! In case of EEPROM failure the MCK-108 needs to be laid off and sent for repair.

3 MAINTENANCE

3.1 SAFETY PRECAUTIONS



THE TERMINALS AND THE PRODUCT INTERNAL ELEMENTS CONTAINS POTENTIALLY LETHAL VOLTAGE.

DURING MAINTENANCE IT IS NECESSARY TO DISABLE THE PRODUCT AND CONNECTED DEVICES FROM THE MAINS.

3.2 Maintenance of the product must be performed by qualified service personnel.

3.3. Recommended frequency of maintenance is **every six months**.

3.4. MAINTENANCE PROCEDURE:

- 1) Check the connection reliability of the wires, if necessary, clamp with the force specified in Table 1.1;
- 2) Visually check the integrity of the housing, in case of detection of cracks and damages to remove the product from service and send for repair;
- 3) If necessary, wipe with cloth the front panel and the product housing.

Do not use abrasives and solvents for cleaning.

4 TRANSPORTATION AND STORAGE

MCK-108 in the manufacturer's package must be stored in an indoor area at the temperature from minus 45 to +60 °C and relative humidity not exceeding 80 %, provided there are no vapours, causing any damaging impact on the package and the materials of the device.

5 OPERATION LIFE AND MANUFACTURER'S WARRANTY

5.1. The lifetime of the product is 10 years. Upon expiration of the service life, contact the manufacturer.

5.2. Shelf life is 3 years.

5.3. Warranty period of the product operation is 5 years from the date of sale.

During the warranty period of operation (in the case of failure of the product) the manufacturer is responsible for free repair of the product.

ATTENTION! IF THE PRODUCT HAS BEEN OPERATED IN VIOLATION OF THE REQUIREMENTS OF THIS MANUAL, THE MANUFACTURER HAS THE RIGHT TO REFUSE IN WARRANTY SERVICE.

5.4. Warranty service is performed at the place of purchase or by the manufacturer of the product.

5.5. Post-warranty service of the product is performed by the manufacturer at current rates.

5.6. Before sending for repair, the product should be packed in the original or other packing excluding mechanical damage.

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.

6 ACCEPTANCE CERTIFICATE

The pumping plant controller MCK-108 No._____ is produced and accepted according to the requirements of the effective technical documentation and is acknowledged to be suitable for operation.