MIKROEL®
PRODUCENT URZĄDZEŃ MIKROELEKTRONICZNYCH

MS-986

Technical reference

1. General information

Figure 1: Controller visualization MS-986

1.1. Controller description

MS-986 is a controller dedicated for compressors with a power of up to 500 kW. The controller can work with compressors operating in a star-delta configuration or equipped with an inverter.

Controller features:

- 4.3” touchscreen display
- Built-in web server
- Charts of the most important compressor operation parameters and creating statistics
- Supervision function: network pressure, oil pressure, oil temperature, motor, air, motor power consumption and dew point
- Control of oil heaters, air dryer and condensate drain
- Freely configurable controller input and output
- Automatic operation restart function
- Inverter control using the Modbus RTU protocol (selection of standard Yaskawa, Danfoss and Delta inverter)
- Star-delta or direct start-up (for compressors without inverter)
- Analog inverter control
- Service parameters and user with access control menu
- Service counters and working time counters
- Network operation mode supporting up to 6 compressors
- Remote operation mode (using digital input)
- Operation scheduling with a division into cyclical and one time events, up to 28 events in total
- Software update via USB port

1.2. Input and output list

1. The controller is equipped with 4 RTD inputs to support resistive temperature sensors and has the possibility of independent configuration of each input to a selected sensor (PT100, PT1000, KTY84, PTC). Thanks to the RTD temperature inputs, the controller can control the following parameters:
   - Oil temperature
   - Motor temperature
   - Compressor outlet air temperature
   - Ambient temperature
2. The controller is equipped with 3 analog inputs to support 4-20 mA sensors. The measuring range can be configured from the controller. Supported parameters:
   - Network pressure
   - Oil pressure
   - Dewpoint sensor
   - Oil injector pressure
   - Separator ΔP
3. The controller is equipped with 1 analog input to operate a 5 A standard current transformer. The primary winding current can be freely configured from the controller level.
4. The controller is equipped with 8 digital inputs to support sensors or binary signals with the possibility of configuring the default logic (normally open/normally closed) for each input independently. Supported sensors or signals:
   - Suction sensor
   - Dryer ready
   - Remote start-stop
   - Remote load-unload signal
   - Ready status
   - Emergency stop
   - Power supply asymmetry
   - Phase sequence error signal
   - Overload relay error signal
   - Air filter error signal
   - Oil filter error signal
   - Separator error signal
   - Fan error signal
   - Inverter error signal
5. The controller is equipped with 9 configurable digital (relay) outputs, including:
   - 4 outputs with common potential
   - 4 outputs with independent potential
   - 1 NO/NC output with independent potential

   Functions that can be configured on each of the outputs:
   - Main power supply
   - Star
   - Delta
   - Y valve
   - Condensate drain
   - Inverter start-stop signal
   - Fan
   - Dryer
   - Heater 1
   - Heater 2
   - Warning
   - Error
   - Warning/error status

- Ready
- Running
- Compressing
- Service
- High dew point warning
- Low dew point warning

6. The controller is equipped with 2 USB sockets and 1 Ethernet socket

1.3. Language versions

Controller MS-986 has 4 language versions:

- Polish
- English
- German
- Russian

It is possible to develop other language versions in consultation with the controller manufacturer.

2. Description of connectors

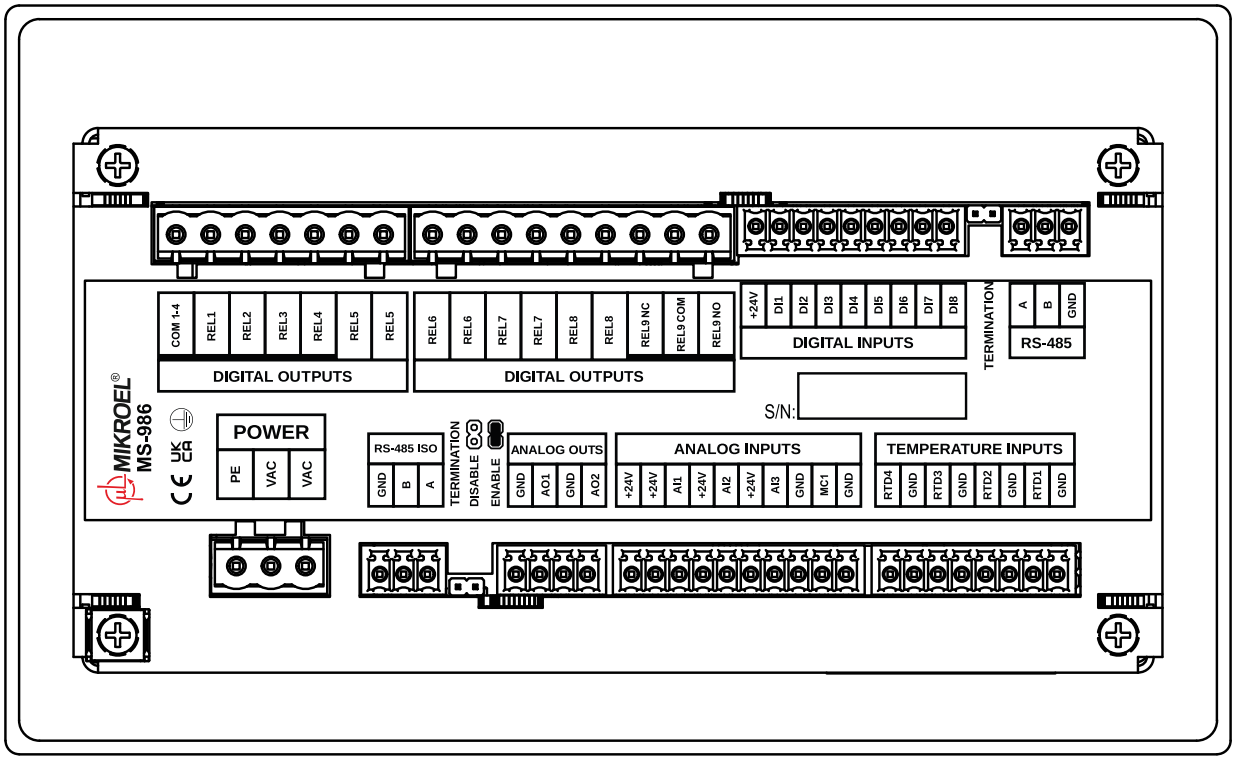

Figure 2: Electrical outlets of the MS-686 controller MS-986 (housing rear wall)

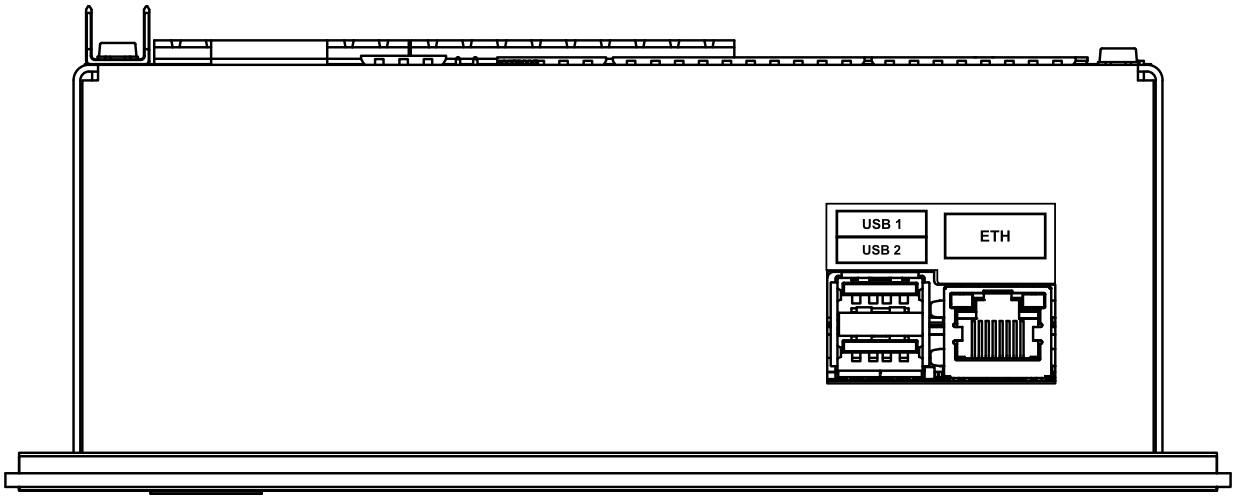

Figure 3: MS-686 controller communication connectors MS-986 (housing side wall)

Table 1: Description of digital outputs (DIGITAL OUTPUTS)

Name	Description
COM 1-4	Common output of relay outputs from 1 to 4
REL1	Configurable relay output 1
REL2	Configurable relay output 2
REL3	Configurable relay output 3
REL4	Configurable relay output 4
REL5	Two outputs of the configurable relay 5
REL6	Two outputs of the configurable relay 6
REL7	Two outputs of the configurable relay 7
REL8	Two outputs of the configurable relay 8
REL9 NC	N/C contact (normally closed) of relay 9
REL9 COM	Configurable relay output 9
REL9 NO	N/O contact (normally open) of relay 9

Table 2: Description of digital inputs (DIGITAL INPUTS)

Name	Description
+24V	Internal reference voltage output
DI1	Configurable digital input 1
DI2	Configurable digital input 2
DI3	Configurable digital input 3
DI4	Configurable digital input 4
DI5	Configurable digital input 5
DI6	Configurable digital input 6
DI7	Configurable digital input 7
DI8	Configurable digital input 8

Table 3: Description of RS-485 connector leads

Name	Description
A	RS-485 interface non-reversing line
B	RS-485 interface reversing line
GND	RS-485 interface ground

Table 4: Description of RS-485 ISO connector leads

Name	Description
GND	Isolated RS-485 interface ground
B	Isolated RS-485 interface reversing line
A	Isolated RS-485 interface non-reversing line

Table 5: Description of power outlets (POWER)

Name	Description
PE	PE Connector
VAC	Controller supply voltage (24 VAC)
VAC	Controller supply voltage (24 VAC)

Table 6: Description of analog outputs (ANALOG OUTPUTS)

Name	Description
GND	Analog output 1 ground
AO1	Analog output 1
GND	Analog output 2 ground
AO2	Analog output 2

Table 7: Description of analog inputs (ANALOG INPUTS)

Name	Description
+24V	24 VDC power output
+24V	Analog input 1 power supply
AI1	Analog input 1
+24V	Analog input 2 power supply
AI2	Analog input 2
+24V	Analog input 3 power supply
AI3	Analog input 3
GND	MC1 analog input ground
MC1	Motor current measurement MC1 analog input
GND	Ground terminal

Table 8: Description of RTD analog inputs (TEMPERATURE INPUTS)

Name	Description
GND	Resistive temperature sensor 1 ground
RTD1	Resistive temperature sensor input 1
GND	Resistive temperature sensor 2 ground
RTD2	Resistive temperature sensor input 2
GND	Resistive temperature sensor 3 ground
RTD3	Resistive temperature sensor input 3
GND	Resistive temperature sensor 4 ground
RTD4	Resistive temperature sensor input 4

Table 9: Description of communication outputs

Name	Description
USB 1	USB port
USB 2	USB port

Table 9: Description of communication outputs

Name	Description
ETH	Ethernet port (RJ45)

The MS-986 controller is equipped with a housing ground terminal, which is located under one of the housing screws.

3. Technical specification

3.1. Electrical parameters

Table 10: List of electrical parameters

Parameter	Value
Supply voltage	24 VAC 50/60 Hz
Power consumption	Up to 10 W
Relays - maximum switching voltage	250 VAC
Maximum load sum of REL1, 2, 3, 4 relay group (resistive)	4 A
Maximum load of each of the REL5, 6, 7, 8 relays (resistive)	3 A
REL9 relay maximum load (resistive)	3 A
Maximum relays load (inductive)	0,5 A
Maximum current in the current loop	28 mA
Maximum power consumption from internal reference voltage	250 mA
Digital inputs - minimum voltage	-0,5 VDC
Digital inputs - maximum voltage	24,7 VDC
Analog inputs - minimum voltage	-0,5 VDC
Analog inputs - maximum voltage	24,7 VDC

3.2. Mechanical parameters

Table 11: Mechanical parameters

Parameter	Value
Housing dimensions	180 x 110 x 74 mm
Weight (without packaging)	951 g
Assembly	Clips

3.3. Operating conditions

Table 12: Permissible operating conditions

Parameter	Value
Operating temperature	-15 ÷ 50°C
Storage temperature	-20 ÷ 70°C
Relative humidity	10 ÷ 90%, no condensation

4. Controller dimensions

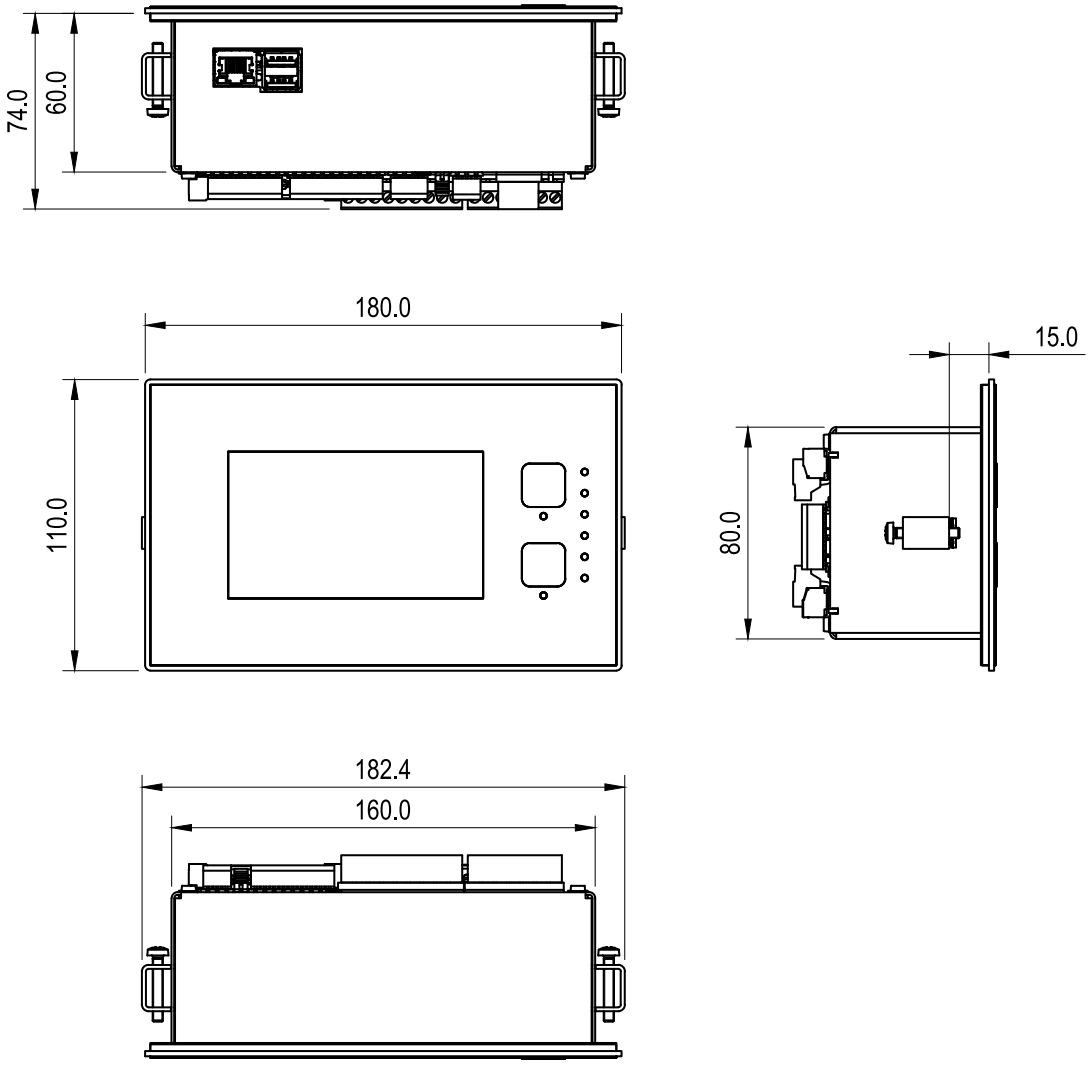

Figure 4: Controller case drawing MS-986