



NM350

Network Switch

User Manual

Revision 1.4
December 2015



*The product described in this manual is compliant
with all related CE standards.*

Revision Record

Revision No	Brief description of changes	Board index	Revision date
1.0	Initial version	NM350	June 2014
1.1	MTBF value has been revised (subsection 1.1) and adjusted value of warranty period was provided. Adjustment of subsection 1.3 (delivery checklist).	NM350	May 2015
1.2	Second version with a set of mating parts was added: NM350-02 – 2 LAN 1000 Mb/sec, 4 LAN 10/100/1000 Mb/sec with PoE, power supply from 9 V to 36 V, set of connector mating parts. Table 4-4 was added. Figure 2-4 was changed. Adjustment of delivery checklist.	NM350	June 2015
1.3	Change of the number of sets of mating parts of LAN connectors of NM350-02 version.	NM350	November 2015
1.4	Compliance assessment	NM350	December 2015

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Notation Conventions



Warning!

Information marked by this symbol is essential for human and equipment safety.
Read this information attentively, be watchful.



Note

This symbol and title marks important information to be read attentively for your own benefit.

Safety requirements

This product is designed and tested for the purpose of ensuring compliance with the electric safety requirements. Its design guarantees long-term failsafe operation. Life cycle of the device can be sufficiently reduced due to improper handling during unpacking and installation. Therefore, for your own safety and in order to ensure the proper operation of the device, you should observe the below recommendations.

High Voltage Safe Handling Rules



Warning!

All the works that involve this device should be carried out by the appropriately qualified personnel.



Warning, high voltage!

Before installing the board into the system, make sure that the mains supply is switched off.

During installation, repairs and maintenance of the device there is a real danger of exposure to electric shock, therefore you should always disconnect the power supply feeding cable from the socket at the time of works. This also applies to the other power supply feeding cables.

General Board Operation Rules

- To keep the warranty, the product should not be altered or revised in any way. Any alterations or improvements not authorized by Fastwel LLC, except for those specified in this document or obtained from the technical support department of Fastwel LLC as a set of instructions for their implementation, cancel the warranty.
- This device should be installed and connected only to the systems, meeting all the necessary technical and climatic requirements.
- While performing all the required operations for installation and adjustment, please follow the instructions specified only in this document.
- Keep the original package for subsequent storage of the device and transportation in the warranty event. If it is necessary to transport or store the board, please pack it the same way as it was packed upon delivery.
- Exercise special care when unpacking and handling the device. Act in accordance with the instructions given above and in the paragraph 5 Transportation, unpacking and storage.
- Do not leave the board without protective packaging, when it is not operated.

MANUFACTURER'S WARRANTIES

Warranty liabilities

The manufacturer guarantees that device's quality corresponds to the requirements of technical specification TU 465275.001 provided that the Consumer meets operation, storage, transportation and installation conditions and procedures, specified by accompanying documents.

The Manufacturer hereby guarantees that the products supplied thereby are free from defects in workmanship and materials, provided operation and maintenance norms were observed during the currently established warranty period. The Manufacturer's obligation under this warranty is to repair or replace free of charge any defective electronic component being a part of a returned product.

Products that broke down through the Manufacturer's fault during the warranty period will be repaired free of charge. Otherwise the Consumer will be invoiced as per the current labor remuneration rates and expendable materials cost.

Liability limitation right

The Manufacturer shall not be liable for the damage inflicted to the Consumer's property because of the product breakdown in the process of its utilization.

Warranty period

The warranty period for the products made by Fastwel LLC is 24 months since the sale date (unless otherwise provided by the supply contract).

The warranty period for the custom-made products is 36 months from the date the Product was first purchased (unless otherwise provided by the supply contract).

Limitation of warranty obligations

The above warranty obligations shall not be applied:

- To the products (including software), which were repaired or were modified by the employees, that do not represent the manufacturer. Exceptions are the cases where the customer has made repairs or made modifications to the devices in the strict compliance with instructions, preliminary agreed and approved by the manufacturer in writing;
- To the products, broken down due to unacceptable polarity reversal (to the opposite sign) of the power supply, improper operation, transportation, storage, installation, mounting or accident.

Procedure of device returning for repairs

Sequence of activities when returning the products for repairs:

- Apply to Fastwel company or to any of the Fastwel's official representatives for the Product Return Authorization;
- Attach a failure inspection report with a product to be returned in the form, accepted by the Manufacturer, with a description of the failure circumstances and symptoms;
- Carefully package the product in the manufacturer's antistatic bag (carton box), in which the product had been supplied. Failure to package in antistatic material will unilaterally VOID all warranties.
- The customer pays for shipping the product to Fastwel or to an official Fastwel representative or dealer.

1 Introduction

NM350 network switch represents a finished product equipped with six Ethernet channels, designed for the use in data collection and processing systems, operating in harsh environments and based on Gigabit Ethernet interface with a possibility to connect of up to 4 user devices with support of PoE (Power over Ethernet) technology of power supply transfer over Ethernet data transmission lines.

The device is supplied with power via D-Sub front connector using an integrated voltage converter. If there are no connected devices, the board dissipates less than 9 W, which makes it possible not to use additional external cooling.

Stability of NM350 network switch operation enables to use it in all industrial applications. Components used as the basis for NM350, are carefully selected following applicability criteria in embedded systems, which makes the module an optimal solution for the systems with a long life cycle.

The User Manual contains directions for a proper and safe installation, powering-on and configuration, connection and interaction of NM350 with external devices.

For proper operation of the module within the specified service life it is required to previously look through the contents of this User Manual.

1.1 Main features of NM350

■ Switch:

- Second level of OSI model;
- 4x 10/100/1000Base-T channels;
- 2x 1000Base-T channels;
- Automatic setting a connection through all the ports (auto-negotiation);
- 1 Mb of the memory dynamic buffer;
- Table for 8 000 MAC addresses with automatic learning and aging;
- Compliance with the 802.3az Energy Efficient Ethernet standard;

■ PoE PSE controller:

- Compliance with the IEEE 802.3af standard;
- Output power to the port: up to 15.4 W;
- Power supply by A method;

■ PoE hardware monitor:

- Outputs in D-Sub connector for the connection of external control and management device over the insulated SMBus;
- Insulation voltage 1500 V;

■ Indication:

- LED for indication of the switch power supply connection;
- LEDs of connection and activity at ports (ACT);
- LEDs of ports connection to Gigabit Ethernet (Gbit);
- LEDs of detection and PoE power supply of the devices over each of the ports.

- **Weight, not more than:**
 - 1.4 kg
- **Dimensions, no more than:**
 - 171 mm × 139 mm x 82 mm.
- **Power supply voltage:**
 - from +9 V to +36 V
- **Maximum power consumption, not including external devices**
 - 9 W.
- **MTBF, not less than:**
 - 170 000 hours
- **PoE control libraries for OS:**
 - Windows XP (Embedded);
 - Linux 2.6;
 - QNX 6.5.

1.2 NM350 ordering information

Notations (ordering information) in Fastwel product catalogs are given in Table 1-1.

Table 1-1: Components of NM350 depending on device version

Name	Conventional	Ordering designation	Note
Network switch NM350	NM350	NM350-01	4 LAN 10/100/1000 Mb/sec with PoE, 2 x LAN 1000 Mb/sec
		NM350-02	4 x LAN 10/100/1000 Mb/sec with PoE, 2 x LAN 1000 Mb/sec, a set of mating parts of connectors

1.3 Delivery checklist of NM350

Delivery checklist of NM350 includes:

1. NM350 device – 1 pcs.;
2. IMES.465921.001 Installation kit (panel fixing) – 1 pcs.;
 - IMES.745532.014 Mounting bracket – 1 pcs.;
 - Screw M4x8 DIN7985 – 4 pcs.;
 - Lock washer M4 DIN25201 – 4 pcs.;
3. IMES.465921.002 Installation kit (DIN-rail mounting) – 1 pcs.;
 - UTA 130 mounting rail adapter p/n 2706412 Phoenix contact – 1 pcs.;
 - Screw M3x8 DIN7985 – 4 pcs.;
 - Lock washer Ø3.2 DIN125 – 4 pcs.;
4. IMES.465921.003 Installation kit – 1 pcs.;
 - Cap p/n 21 01 000 0003 Harting – 6 pcs.;
 - Backshell p/n 09 67 015 0417 Harting – 1 pcs.;

- Screw M4x8 DIN7985 – 1 pcs.;
 - IMES.758441.004 Nut – 1 pcs.;
5. For NM350-02 version, the delivery checklist includes IMES.465921.005 assembly kit:
- 6x kits of mating parts of LAN connectors, which include:
 - M12 connector, p/n 21 03 881 1805 Harting – 1 pcs.;
 - M12 contact, p/n 21 01 100 9014 Harting – 8 pcs.;
 - 1x kit of mating parts of PWR connectors:
 - IP67 D-SUB Backshell, p/n 09 67 015 0538 Harting – 1 pcs.;
 - Cable socket, p/n 09 69 201 7072 Harting – 1 pcs.;
 - Power contacts, p/n 09 69 181 7420 Harting – 2 pcs.;
6. Technical Certificate;
7. Packaging.

Note

As an extra, user can order mating connectors as accessories, if applicable:

LAN - **ASC00066**: Harting p/n: 21 03 881 1805 – 1 pcs.;

Harting p/n: 21 01 100 9014 – 8 pcs.;

PWR - **ASC00066-01**: Harting p/n: 09 67 015 0538 – 1 pcs.;

Harting p/n: 09 69 201 7072 – 1 pcs.;

Harting p/n: 09 69 181 7420 - 2 pcs.

1.4 Packaging information

NM350 is packaged in a box, which has the following overall dimensions: 210 x 160 x 160 mm. Packaged weight of the module is not more than 2 kg.

**Note**

Retain the original antistatic and consumer packages of the module till the end of the guarantee service life period.

1.5 External view and location of components

The below figures will help you identify components, their configuration and functions.

1.5.1 Location of main components and dimensions of NM350

Location of connectors and main components of the device with specification of overall dimensions is given in Fig.

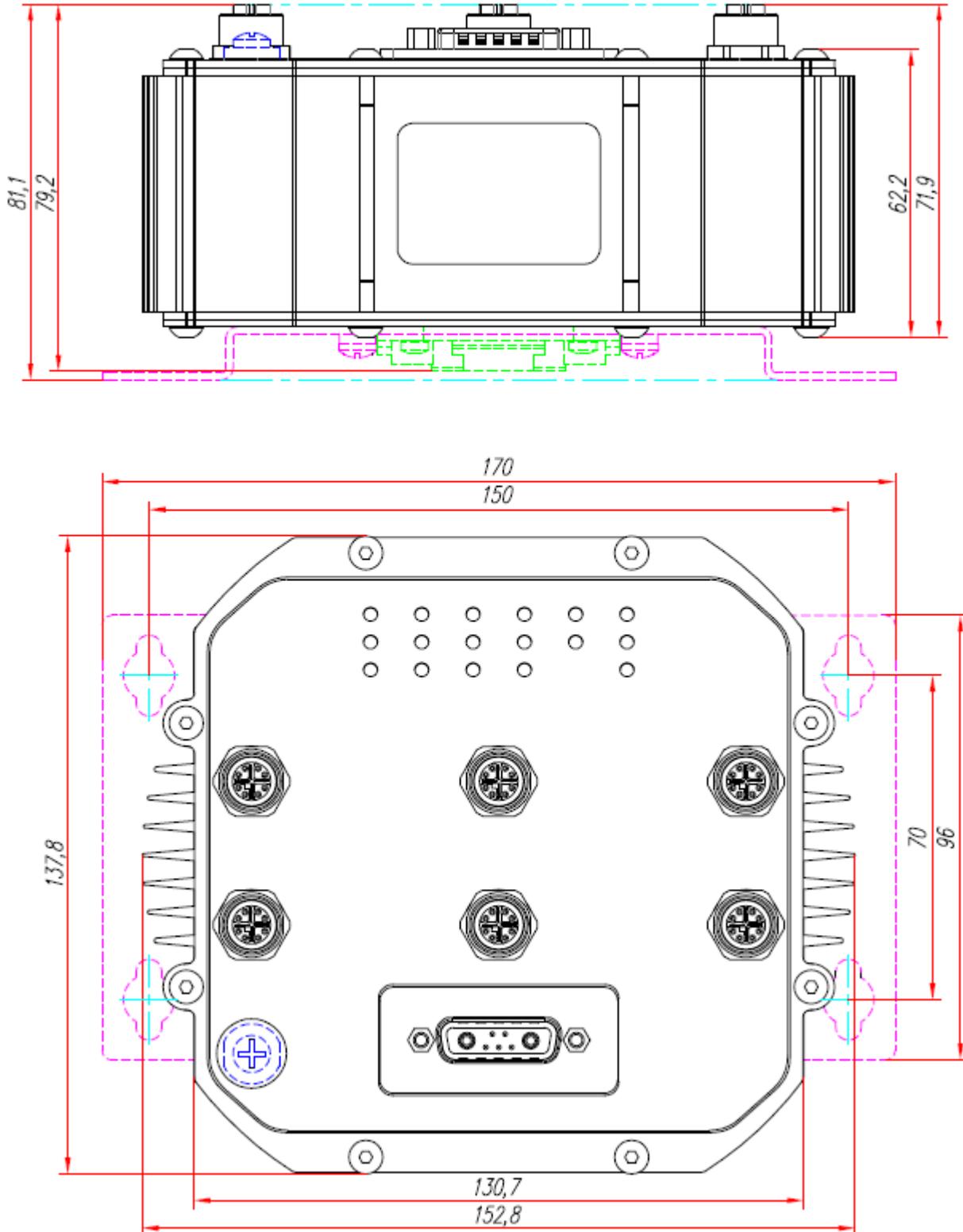


Fig. 1-1: Location of main components and dimensions of NM350

2 Functional description

2.1 Board layout

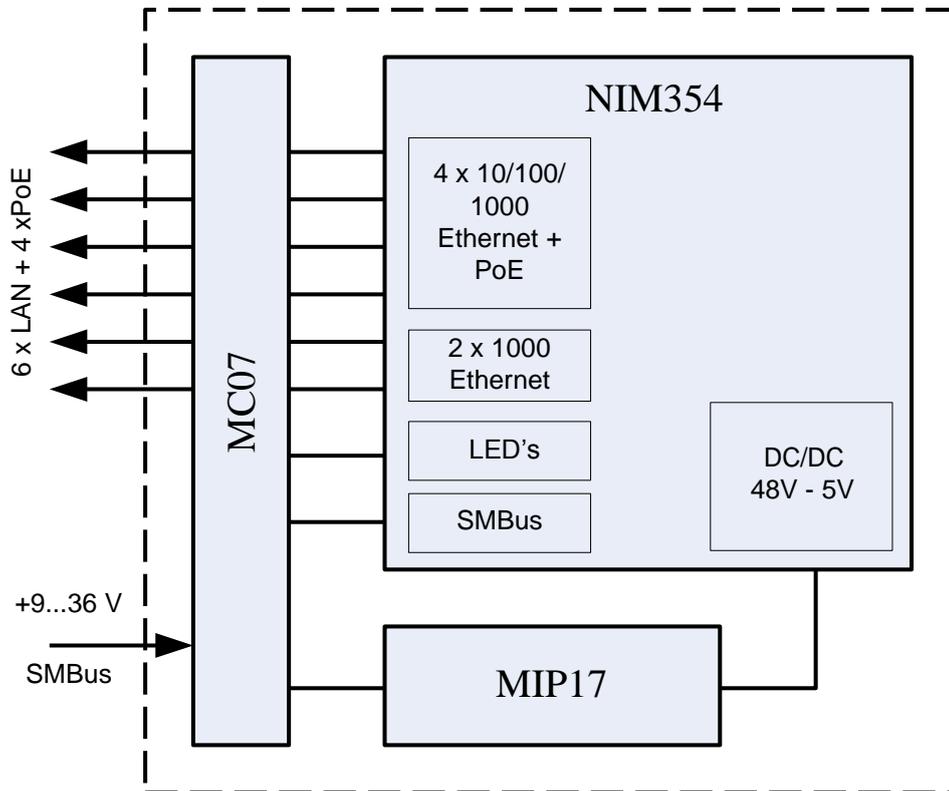


Fig. 2-1: NM350 board layout

NM350 contains the following main functional modules:

- NIM354-03 network module;
- MIP17 power supply source module;
- MC07 switching module.

2.2 Specifics of functional nodes operation

■ NIM354-03

NIM354 network switch module is designed for the use in embedded data collection and processing systems, operating in harsh environments and based on Gigabit Ethernet interface with a possibility of connection up to four devices with PoE (Power over Ethernet) support.

- 4 x LAN 10/100/1000 Mb/sec ports with PoE;
- 2x LAN 1000 Mb/sec ports;
- Power supply range from 36 V to 57 V;

- PoE control bus over SMBus.

■ MIP17

MIP17 power supply source module is designed for the use as part of the devices generating PoE (PSE) power supply.

- Input power supply range from 9 V to 36 V;
- Output voltage 48 V \pm 5 %;
- Maximum output power 75 W.

■ MC07

Module for switching of Ethernet-interfaces of NIM354-03 to external sealed M12 connectors, SMBus interface with high-voltage insulation and input power supply to the connector of D-sub type and output of LED indication.

■ Power supply

- From 9 V up to 36 V from the PWR connector.

2.3 Device interfaces

2.3.1 Gigabit Ethernet interface with PoE

The device has four 10/100/1000 Base-T ports and two 1000 Base-T Ethernet ports routed to the industrial connectors M12 (LAN1...6). Switching of these ports is carried out on the basis of Marvell Ethernet Switch 88E6176 and 2x Marvell PHY 88E1510 switches. Controller's architecture is optimized to achieve high speed switching at minimum power consumption.

For LAN1 - LAN4 ports, the switch ensures automatic determination of transfer rate and switching between data transfer modes 10Base-T, 100Base-TX and 1000Base-T. Auto-negotiation MDI/MDIX is activated in all 6 ports.



The front panel is equipped with six Gigabit Ethernet ports, which use this connector type. 4 of them (LAN1, LAN2, LAN3, LAN4) are supplied with the controlled power supply PoE (see subsection 2.3.1.3).

Fig. 2-2: External view of LAN connector



Note

These connectors ensure device tightness only ready-fitted with Harting har-speed M12 mating connectors or special plugs, which are supplied in set with the switch.

2.3.1.1 Purpose of LAN connector contacts

Table 2-1: Purpose of LAN connector contacts

Contact	Data transfer standard						PoE power supply (LAN1 – LAN4)	
	10Base-T		100Base-TX		1000Base-T		Method A	Method B Optional
	I/O	Signal	I/O	Signal	I/O	Signal		
1	O	TX +	O	TX +	I/O	BI_DA+	DC +	–
2	O	TX –	O	TX –	I/O	BI_DA–	DC +	–
3	I	RX +	I	RX +	I/O	BI_DB+	DC –	–
4	I	RX –	I	RX –	I/O	BI_DB-	DC –	–
5	–	–	–	–	I/O	BI_DD+	–	DC +
6	–	–	–	–	I/O	BI_DD-	–	DC +
7	–	–	–	–	I/O	BI_DC-	–	DC –
8	–	–	–	–	I/O	BI_DC+	–	DC –

Connection and operation via each Ethernet port of these connectors are respectively shown through the signals for LEDs at XP5 connector.

Power supply PoE is implemented using the Method A and is described below.

2.3.1.2 LED indication of Ethernet channels state and power supply

Table 2-2: Interpretation of the front panel notations

Name	Port	Purpose
ACT	LAN1 - 6	Connection and activity of Ethernet channel
Gbit	LAN1 - 6	Channel connection in 1000Base-T mode
PoE	LAN1 - 4	Connection and power supply of the external device over
PWR	-	Power supply indicator of the switch

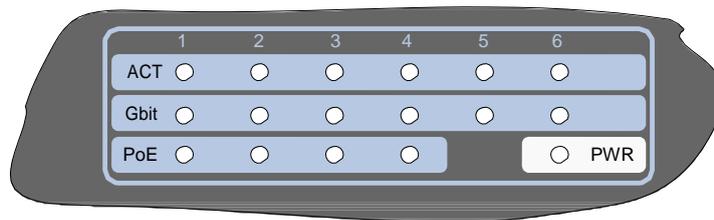


Fig. 2-3: External view of the front panel LEDs

ACT functionality, Link/Activity – LED is on if there is Ethernet connection on the relevant port and flashes, if this port is used for receipt and sending of network packages by the switch. Gbit LED is on when 1000Base-T interface is connected via this port. The relevant port number is signed on the top of its LEDs. PWR LED indicates that the device is switched on.



Warning!

For port 5 and 6, Gbit LEDs are on apart from the connection of 1000Base-T, during connection of 100Base-T, but the port itself is operating only in the 1000Base-T mode.

2.3.1.3 PoE power supply

This technology, together with data, enables the switch to transfer power supply to a remote device via 2 Ethernet twisted-pair wires in accordance with the IEEE 802.3af standard, using the method A. This standard allows power supply of devices with the voltage from 44 V to 57 V. The device supplies power to external devices $48V \pm 5\%$.

The IEEE 802.3af standard enables connection of 4 classes of devices, including those with a power up to 15.4 W per channel, therefore a total load to all of the 4x PoE ports can't exceed 62 W. Dependence of the maximum load on ambient temperature conditions is shown in the diagram below.

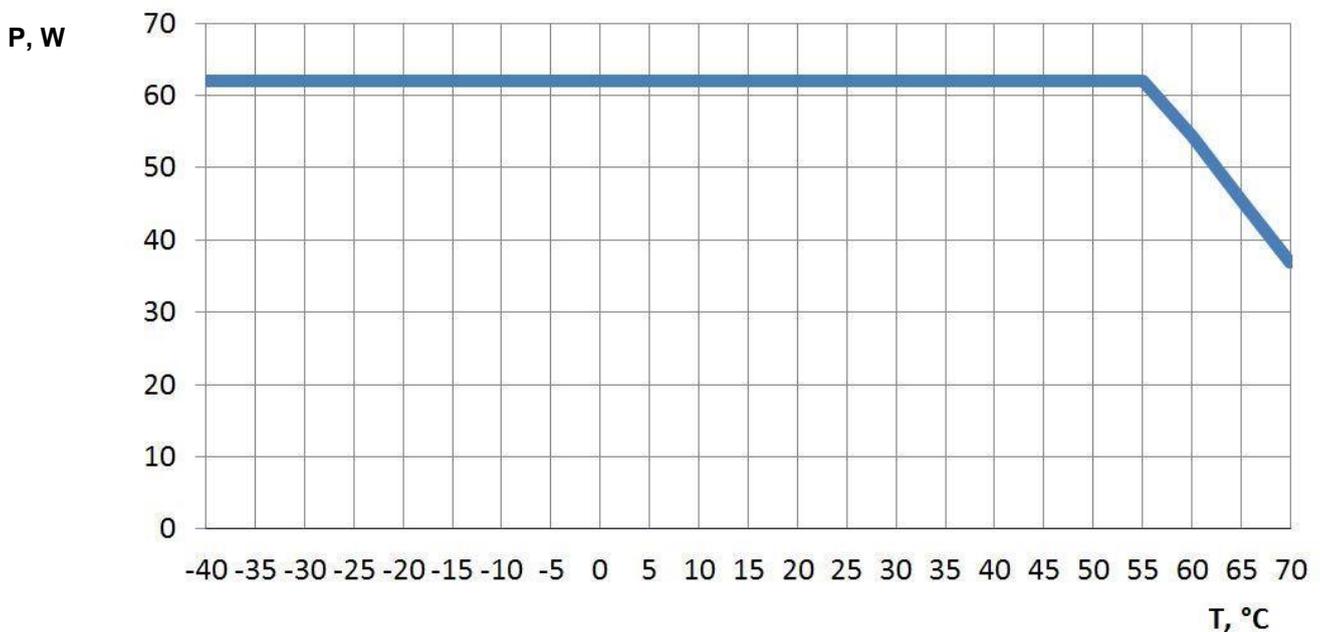


Fig. 2-4: Dependence of the maximum total load to all ports on temperature conditions



Note

When connecting PoE devices with a higher power consumption, special consideration should be given to the dependence of maximum total load on ambient temperature, as well as on the removal of heat from the device.

Operation of PoE microchip of the controller (TPS23841) can be carried out under control of an external device, connected via an insulated I²C bus / SMBus via PWR connector, which contacts purpose is described below.

Table 2-3: Purpose of XP6 connector contacts

Contact number	Signal	Purpose	Input/Output
1	-	-	-
2	-	-	-
3	MDIO	I2C Data	In/Out
4	GND	GND	In
5	MDC	I2C Clock	In
A1	AGND	- U_{in}	In
A2	Vcc	+ U_{in}	In

For various operating systems (OS) drivers and utility programs for operation with TPS23841 over I²C bus / SMBus are supplied with CPC309 CPU Module (can be found on Fastwel FTP).

A. Control in Linux 2.6 OS

Control is carried out via write/read from controller registers (for more detailed information see documentation for TPS23841). PoE.sh script demonstrates operation with device driver.

PoE.sh [port number] [command]

Numbers of the ports: 1, 2, 3, 4 or all in case when a command refers to all the ports.

Commands:

status – displays information on the port's status;
sensors or **sensor** – displays values of sensors in the table;
disable – disables a port;
enable – enables a port;
reset – reset and start of POR cycle of all the ports;
shutdown or **turnoff**, or **poweroff** – disconnects power supply of all the ports;
poweron or **turnon** – turns on the power supply of all the ports;
acoff, **aclow**, **achigh** – control of AC mode.

Example:

```
# ./PoE.sh 1 status
# ./PoE.sh 2 sensors
# ./PoE.sh all reset
# ./PoE.sh all achigh
```

B. Control in QNX 6.5.

Control is carried out by using the following commands:

Single display of current parameters:

```
# poe-tps23841 -v
```

```
Common=0x00: Ports no fault
```

```
Port #0 status 0x0180: [Fault status is no faults | Class ID is 0 | Discovery status is fail |
WDT is not active | A/D status is not active | Function done is normal | Function
status is searching]
```

Port #0 Discovery Current=0x112: 44.918 [mA]
 Port #0 Voltage=0x00: - [V]
 Port #0 Current=0x00: - [mA]
 Port #1 status 0x0A50: [Fault status is no faults | Class ID is 2 | Discovery status is normal | WDT is not active | A/D status is active (conversion in process) | Function done is complete (self clearing by a new function write) | Function status is power delivery]
 Port #1 Discovery Current=0x505: 210.656 [mA]
 Port #1 Voltage=0x418E: 47.541 [V]
 Port #1 Current=0x865: 59.022 [mA]
 Port #2 status 0x0180: [Fault status is no faults | Class ID is 0 | Discovery status is fail | WDT is not active | A/D status is not active | Function done is normal | Function status is searching]
 Port #2 Discovery Current=0x114: 45.246 [mA]
 Port #2 Voltage=0x00: - [V]
 Port #2 Current=0x00: - [mA]
 Port #3 status 0x0A60: [Fault status is no faults | Class ID is 4 | Discovery status is normal | WDT is not active | A/D status is active (conversion in process) | Function done is complete (self clearing by a new function write) | Function status is power delivery]
 Port #3 Discovery Current=0x445: 179.180 [mA]
 Port #3 Voltage=0x41C2: 47.688 [V]
 Port #3 Current=0x1D9: 12.991 [mA]

Multiple display of parameters with a period of 1 sec.:

poe-tps23841 -v -w

All ports are on:

poe-tps23841 -v -c on

All port turned on

All ports are off:

poe-tps23841 -v -c off

All port turned off

All ports are reset:

poe-tps23841 -v -c reset

All ports reset

Port disable, as an example port#1 is used:

poe-tps23841 -v -p1 -c disable

Port#1 disable

Port enable, as an example port#1 is used:

poe-tps23841 -v -p1 -c enable

Port#1 enable Other

options:

Disable of AC of the port mode, as an example port#1 is used:

poe-tps23841 -v -p1 -c ac_off

Enable of AC HI of the port mode, as an example port#1 is used:

poe-tps23841 -v -p1 -c ac_high

Enable of AC LOW of the port mode, as an example port#1 is used:

poe-tps23841 -v -p1 -c ac_low

C. Control in Windows XP (Embedded).

For this OS, TPS2384monitor.exe utility is supplied.

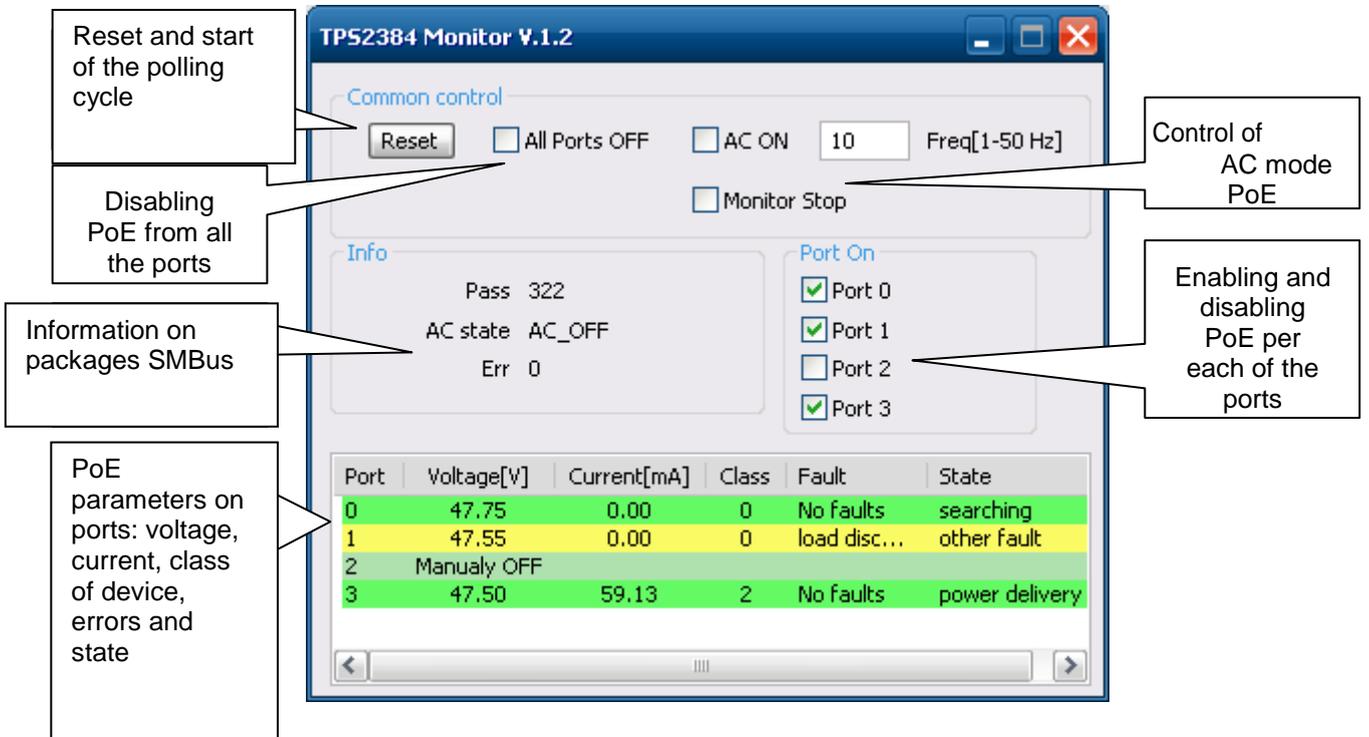


Fig. 2-5: Description of the dialog box of operation with PoE

In order to ensure stable operation of AC mode, it is required to activate "Monitor Stop", which disables monitoring of data on the operation of PoE itself.

3 Installation

3.1 Safety requirements

When handling NM350, strictly follow the below safety requirements. Manufacturer shall not be liable for any damages, arising out as a result of non-observance of such requirements.



Warning!

Turn off the system power supply before installation / removal of the module. Violation of this rule can pose a threat for your health and life, as well as could lead to system or module damages.



Warning!

Tightness of the device (IP65) is guaranteed only when recommended mating parts and plugs are used on unconnected connectors (para. 1.3).

3.2 Installation methods

NM350 allows two mounting types:

- Mounting to panel with the use of the mounting bracket from among the delivery checklist (installation kit IMES.465921.001)
- Mounting to DIN-rail using the kit IMES.465921.002.

NM350 can be mounted on the panel, using a special bracket, included into the kit of mounting parts together with four screws, and supplied with the switch. In the same way, the device is mounted onto DIN-rail, using the IMES.465921.002 kit of mounting parts.

4 Additional information

4.1 Power consumption of NM350

The device uses power supply voltage in the range from +9 V to +36 V from PWR connector.

Consideration should be given to certain requirements, which are essential for ensuring stability and reliability. In Table 4-1 and Table 4-2 contain values of the maximum allowable voltages and currents, which if exceeded, could lead to module damages. Power supply sources, which are to be used with NM350, should be checked in order to meet these requirements.

Table 4-1: Power supply voltage range of NM350

Rate power supply voltage	Maximum allowable value
+24 V	from +9 V to +36 V

Starting consumption current of NM350, no more than 5 A. Operating consumption current does not exceed the values, given in the table below:

Table 4-2: NM350 consumption current

Device type	Consumption current, not including power supply of external circuits, A, no more than	Consumption current, including power supply of external circuits, A, no more than
	+9V	+9V
NM350	1	9

4.2 Compliance with safety requirements

NM350 corresponds to the general safety requirements imposed on IT equipment according to the GOST R IEC 60950-2002.

4.3 Noise resistance of NM350

NM350 corresponds to resistance requirements to IT equipment against electromagnetic interference according to the GOST R 51318.24-99 standard (CISPR 24-97).

NM350 corresponds to the requirements for the level of industrial RF interferences coming from It equipment in accordance with the GOST R 51318.22-99 (CISPR 22-97).

4.4 Operation conditions

The device retains operability under the following climatic and mechanical effects:

Table 4-3: Parameters of climatic and mechanical effects

Type of effect	Parameter name	Parameter value	Document
Temperature change (at relative humidity up to 80 %, without moisture condensation)	Low temperature	- 40°C	GOST 28209-89 (IEC 68-2-14-84)
	High temperature	+ 70°C ¹⁾	
Sinusoidal vibration	Range of frequencies (Hz)	10...500	GOST 28203-89 (IEC 68-2-6-82)
	Acceleration, g	5	
Single shocks	Peak acceleration, g	100	GOST 28213-89 (IEC 68-2-27-87)
Multiple shocks	Peak acceleration, g	50	GOST 28215-89 (IEC 68-2-29-87)
	Number of shocks	1000	

4.5 Malfunctions and troubleshooting methods

Table 4-4: Typical malfunctions and troubleshooting methods

Malfunction	Troubleshooting options
Module failed to start and "PWR" LED is off.	<ol style="list-style-type: none"> 1. Check the power supply cable: polarity and integrity. 2. Check the power supply voltage level.
Connected PoE device failed to start.	<ol style="list-style-type: none"> 1. Make sure that the device is connected to NM350 port that supports PoE power supply: 1 – 4. 2. Check the cable connection accuracy: pin-out and integrity.
No Ethernet connection.	<ol style="list-style-type: none"> 1. Check the cable connection accuracy: pin-out and integrity. 2. Make sure that the port of the device connected to ports 5 or 6 of NM350, operates in the 1000BaseT mode.

In case your problem is not described in this table or the suggested options failed to solve the problem, please contact the device supplier for professional advice.

¹⁾ NM350 module at the ambient temperature of +70°C allows connection of PoE devices with a total power of no more than 30 W. Maximum permissible total power to all the ports under various temperature operating conditions can be obtained from the diagram (see Fig. 2-4: Dependence of the maximum total load to all ports on the ambient temperature conditions)

5 Transportation, unpacking and storage

5.1 Transportation

The module should be transported in a separate packaging box (transport packaging) of the manufacturing facility, which consists of an individual antistatic bag and a cardboard box, in the closed transport (automobile, railway, air transportation in heated and pressurized compartments) in storage conditions 5 defined in the GOST standard 15150-69 (IEC 721-2-1 standard) or in storage conditions 3 during sea transportation.

The packaged modules should be transported in accordance with the shipping rules, operating with this particular type of transport.

During handling and transportation operations, the packaged modules should not undergo sharp pounding, falls, shocks and exposure to atmospheric precipitation. The packaged modules should be stored in a carrier vehicle in such a manner which will prevent their moving.

5.2 Unpacking

Prior to unpacking, before transportation at subzero temperature of ambient air the modules should be kept within 6 hours under storage conditions 1 defined in the GOST standard 15150-69 (IEC 721-2-1 standard).

It is prohibited to place the packaged module close to the heat source, prior to unpacking.

While unpacking, it is required to comply with all safety precautions, which ensure its safety, as well as marketable condition of consumer packaging of the manufacturing company.

At the time of unpacking it is required to check the module that it has no external mechanical damages after transportation.

5.3 Storage

Module storage conditions for group 1 are defined in the GOST standard 15150-69 (IEC 721-2-1 standard).

ANNEX B

DISCLAIMER

This Disclaimer contains special operating conditions of Fastwel in the following areas: intellectual property, warranty policy, conditions of the order and delivery.

1 INTELLECTUAL PROPERTY

1.1 If any infraction, interference, improper use, illegitimate exploitation and/or violation of the industrial and/or intellectual property rights of any third party and/or property, exploitation during the use of Fastwel Embedded Module will take place – Fastwel does not guarantee to replace the materials, computer programs, procedures or equipment affected by the complaint and under no circumstances doesn't bear responsibility in any form for possible refusal in case of such a replacement.

1.2 Use of the Fastwel products as well as the objects of intellectual property containing in them, in the ways and for the purposes, not provided by the present user manual and datasheet isn't allowed without preliminary written approval of Fastwel.

1.3 Fastwel is not responsible for possible incidents and losses, related to the operation of end devices, in which the original Fastwel equipment is used.

2 WARRANTY POLICY

2.1 When the detected flaws in an element can be corrected without decreasing the foreseen technical features and functionality for it, User may demand Fastwel the urgent correction of the failures in additionally agreed period and an increasing of the period of the guarantee of the element equal as the time elapsed from the formal request to repair the failures, until the receipt of the repaired element. All costs associated to the correction of failures, included those of assembly, dismantle, transport, tests, etc, if they exist, shall be prosecuted according the Warranty Policy of Fastwel.

3 ORDER AND DELIVERY CONDITIONS

3.1 The general rule is that all Fastwel equipment prices are determined with due consideration of delivery under the EXW terms and conditions (Incoterms 2010). Delivery of the products under other terms and conditions should be preliminary agreed and stated in writing between the parties.

3.2 Unless otherwise expressly agreed with Fastwel, all the deliveries of Fastwel equipment will be carried out only after the official purchase order is obtained and provided that the ordered products have been prepaid in full. Other terms and conditions of cooperation should be made in writing.

3.3 Any delivery of Fastwel electronics is submitted with the right package in accordance with the current rules and standards in the Member States of the European Economic Area. The purchaser independently bears all risks regarding the compliance of package and marking of Fastwel products with legislation requirements being in effect at the place of purchased products destination (in the buyer's country). The specified condition excludes unequivocally any liability of Fastwel for possible non-compliance of package and marking of products with the requirements of legislation of the country of products destination.

3.4 In general, all components of the supply are properly protected with respect to freight, in order to avoid any damage to the supply, third parties, environmental damages or unrelated goods, as consequence of wrong packaging.

3.5 Each package unit is labeled on the exterior area with the indications of product's Part Number and Serial Number.

3.6 The support documents for the order should be made either in English or in Russian unless otherwise agreed between parties in writing.

3.7 Fastwel does not pay penalties and does not cover costs associated with delay in the delivery of the products caused by actions of the third parties, force-majeure etc. - Fastwel doesn't bear any responsibility for non-execution or inadequate execution of the obligations in a case when it is caused by actions of the third parties (for example producers or suppliers of accessories), force majeure etc.

3.8 Fastwel declares that independently and at any time without damage, it has an exclusive right to define and change functionality architecture, bill of materials of its products without any preliminary coordination and approvals of the third parties.

4 OTHER CONDITIONS

4.1 Fastwel has the obligation to respect the current Russian legislation (including, but not limited to environmental, labor, social laws) in each moment and to apply it to its embedded electronics considering all and each execution phase, that is to say, from the design until the commissioning and subsequent maintenance. In this regard Fastwel is not liable to the user or other persons in connection with possible changes of the company's rules (including, but not limited to warranty, ordering policy) caused by changes of the Russian legislation.

4.2 Unless otherwise expressly agreed in writing, Fastwel provides no training for assembly\installation\adjustment\operation of its equipment.