Optical transmitters mo418L, mo428L

■ Product description

The optical transmitters mo418L, mo428L are a high performance optical transmitters for forward path transmission of broadcast services. Both types of transmitters permit to use one optical fiber for CATV and SAT IF signal transmission, mo428L transmitter has dual optical output to increase the number of users.

Transmitters are equipped with web server and SNMP agent.

Web server provides remote diagnostics and control of the transmitters via Ethernet type network using a Web browser.

SNMP agent operates together with the transmitters and provides remote diagnostics of the device over SNMP protocol. The transmitters generate all alarms and events as SNMP traps that can be sent to a host manager.

The products are intended for indoor usage only.

■ Safety instructions

The transmitter must be installed in accordance with IEC 60728-11 and national safety standards.

The transmitter is powered from a 12 V power supply unit. This voltage is not dangerous to life.

The power supply unit must have a short circuit protection.

Any repairs must be made by a skilled personnel.

Do not connect the 12 V power supply unit into the mains socket until all cables of transmitter have been correctly connected. The mains socket must be easily accessible.

Do not expose this transmitter to moisture or water splashes.

Avoid placing the transmitter near heat sources, e.g. central heating components or in areas of high humidity.

Keep the transmitter away from naked flames.

If the transmitter has been stored in cold conditions for a long time, bringing it into a warm environment may cause condensation. In such cases let it warm up for at least 2 hours before plugging it into the mains.

To ensure proper ventilation do not block the ventilation openings.

IMPORTANT: Mounting of the transmitter is allowed vertical only and the free flow of air through the unit must be not restricted. If the transmitter is installed in a 19" rack system additional forced air cooling fans may be required (see Table 7 - Operating temperature range). Always leave 10 cm of free space from the top, front and bottom of the unit to allow heat dissipation.

■ Safety of laser product

Optical Transmitter module contains laser diode sources. These devices are rated under IEC60825-1 "Safety of Laser Products", Part 1: Equipment classification and requirements as CLASS 1M laser product.

When operating the equipment note the following:

Most fiber optic laser wavelengths are totally invisible to the eye and will cause permanent eye damage.

Never look into the end of a fiber on a powered device through a magnifying device (microscope, eye loupe, magnifying glass, etc.). Before using such devices always double check that power is disconnected or, if possible, completely disconnect the unit from any power source.

To verify the light output always use an instrument, such as an optical power meter.

Operate only with the proper optical fiber installed in the transmitter optical connector.

Whenever the optical connector is empty the laser transmitter should be turned off.

Before applying power always connect a fiber to the output of the device.

Never leave equipment with radiating bare fibers accessible - always cap the connectors.

■ Cleaning of optical connectors

The fiber ends may be damaged if contaminated connectors are inserted. The warranty does not cover some types of damage, made by the customer. The standard optical connector for optical transmitter is SC/APC.

During the operation each fiber connector may be contaminated by dust or dir. Even tiny particles of dust will affect the transmission quality. Dusty fiber optic connector will contaminate other connected optic parts. If optical reception power and output level of the receiver decrease, active fiber connection should be cleaned and maintained.

Always clean all the fiber optic connectors before setting.

Reel cleaners or prepackaged lint free wipes or swabs with alcohol are the most convenient means of cleaning optical connectors.

Fiber connectors should never be left uncovered.

Do not exceed the minimum bending radius when connecting cable to the system.

■ Structure diagram

■ External view
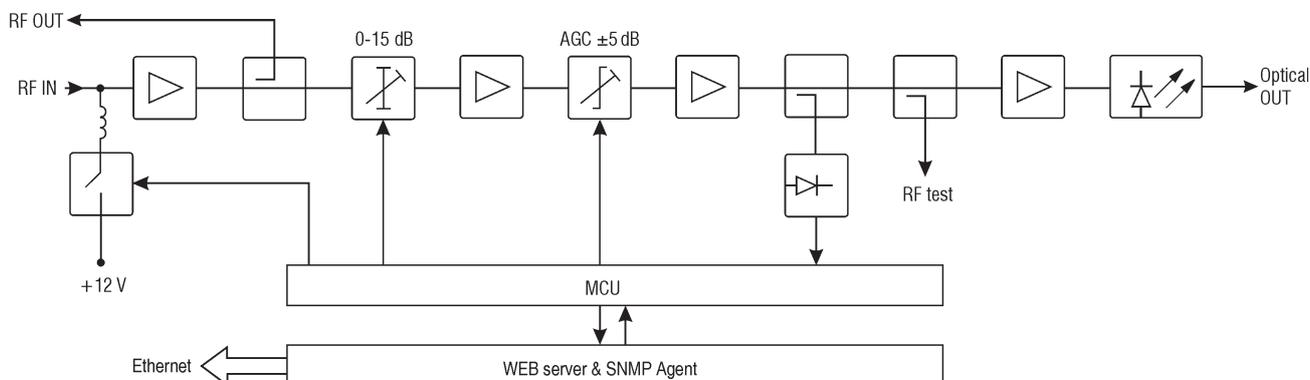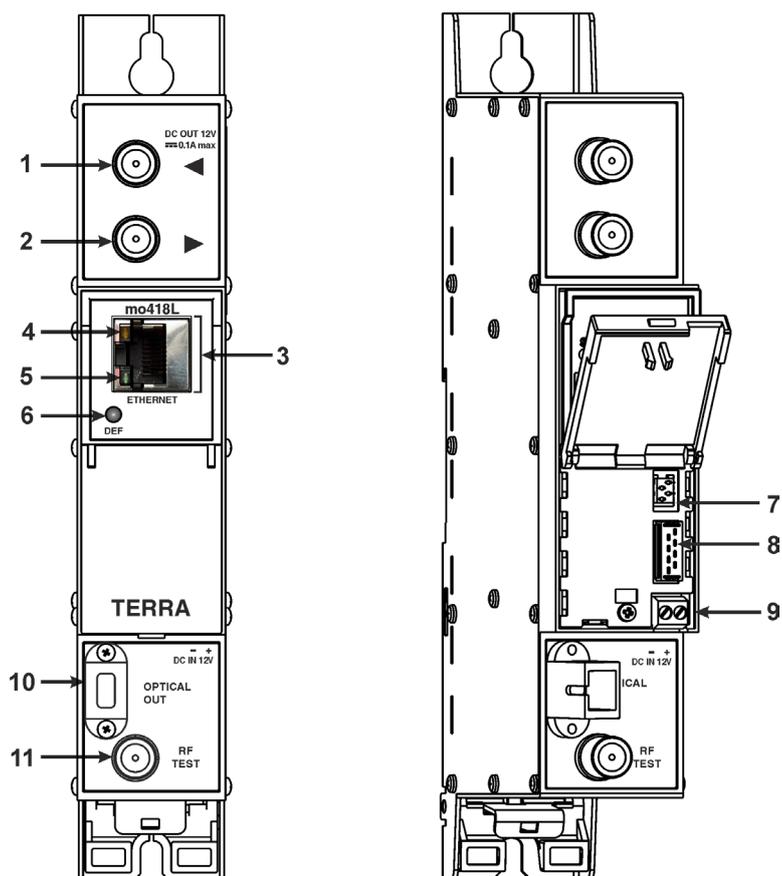
1 - ◄ - RF input, DC output +12 V switchable (F socket)

2 - ► - RF output (input signal loop-through) (F socket)

3 - **ETHERNET** - LAN port (RJ45 Ethernet 10/100 Base-T)

4 - indicator of LAN activity, yellow LED

5 - indicator of the transmitter activity, green LED

6 - **DEF** - button for default settings

7 - data bus connector

8 - power distribution bus connector

9 - +12 V powering input (screw terminal)

10 - **OPTICAL OUT** - optical output (SC/APC socket)

11 - **RF TEST** - RF test point (F socket)

Figure 1. External view of the transmitter

■ Installation instructions

Read the safety instruction first.
Connect the 75 Ω load to the unused F sockets.
Shielded cable is recommended for Ethernet connection.

■ MOUNTING

The module or mounting bracket must be fixed with steel screws Ø 3.5-4 mm. The screws are not included in a package.
Mounting bracket on DIN rail should be connected to main potential equalization bus.

Mounting on a wall by screws   **Mounting on a bracket (ordering number 01960)**

Perpendicular to the wall   Parallel to the wall
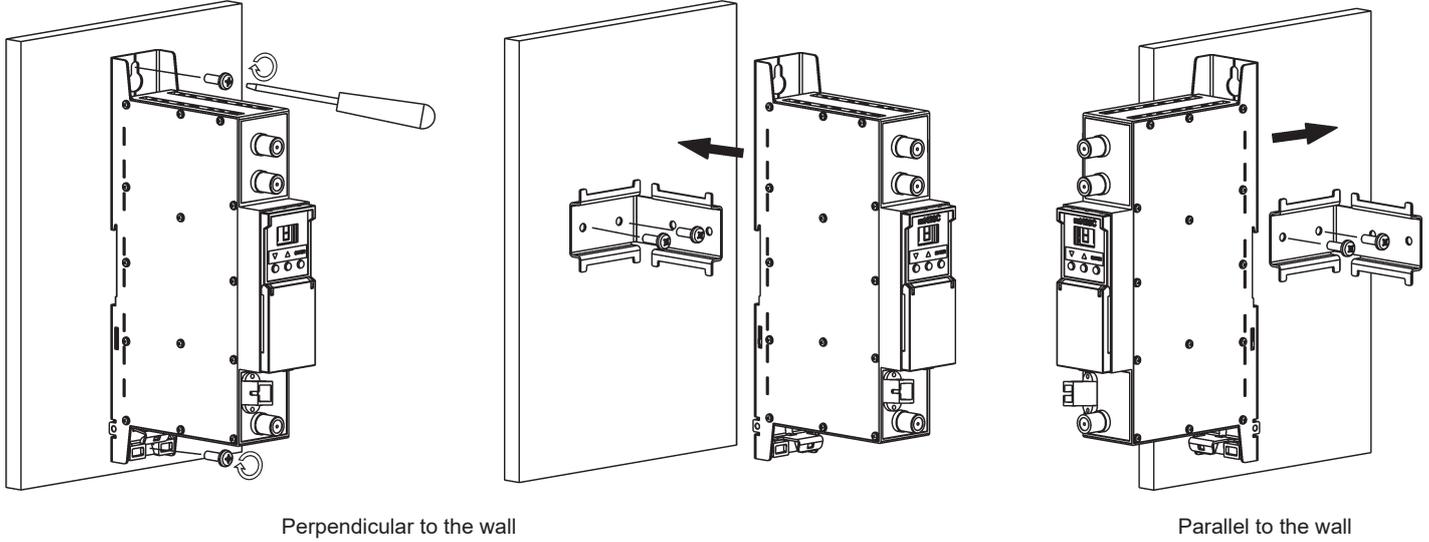
Figure 2. Mounting of the transmitter

■ Mounting on DIN rail

1. ↑   2. ←
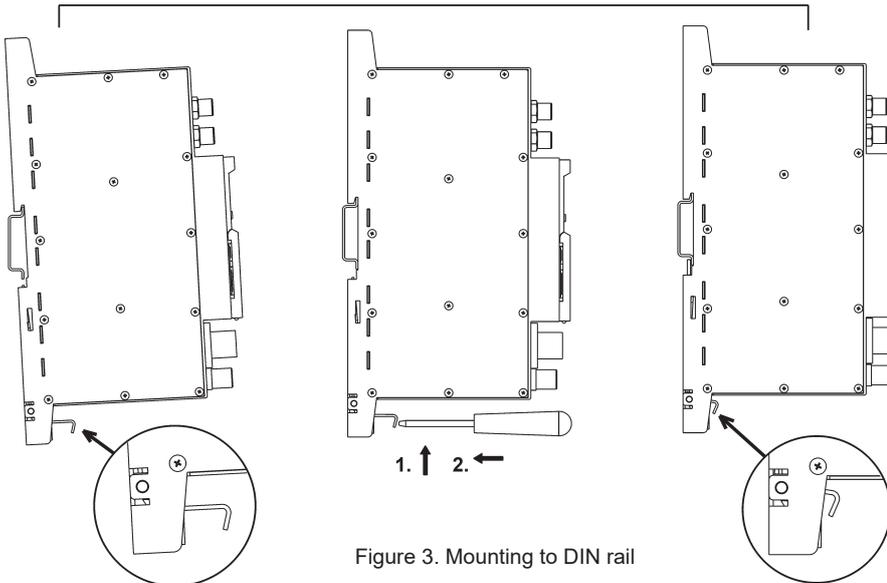
Figure 3. Mounting to DIN rail
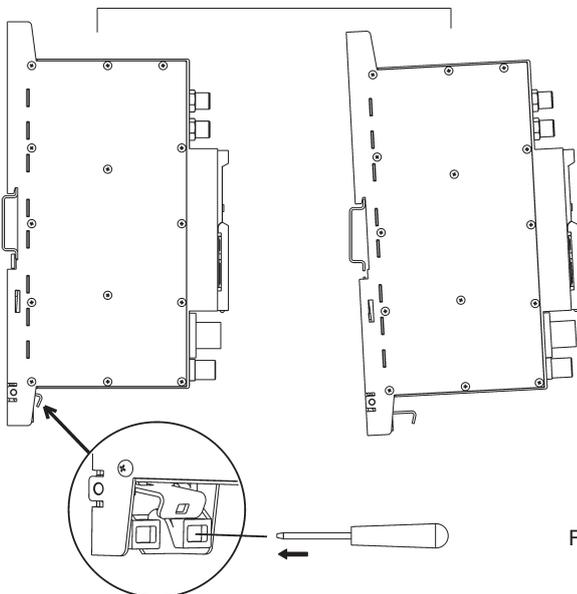
Figure 4. Mounting from DIN rail
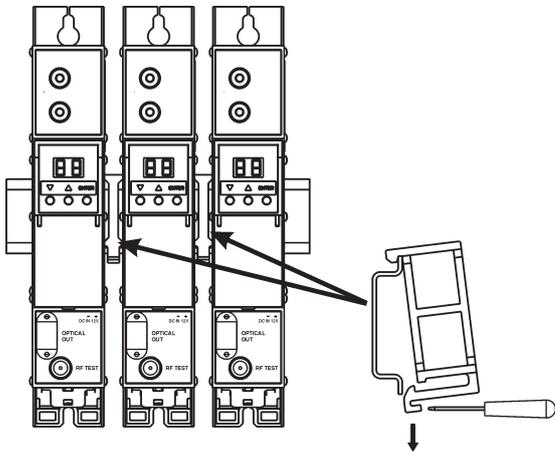
Requirements for power supply unit (PSU)

Recommended power supplies UP410S, UP413.
It is allowed to use an external PSU that meets the next requirements:

• Output voltage	+12 V ± 0.5 V
• Ripple at single and/or double mains frequency	< 10 mV p-p
• Ripple & noise	< 100 mV p-p
• Short circuit protection	
• Double insulated (marked ☐)	
• Meet EN55022 class B conducted emissions requirements, measuring with grounded load	

Figure 5. Mounting or removing to/from DIN rail of plastic spacers (supplied).

■ Connection of cables

UP410S

RF input

quick coaxial bridge
(ordering number 21876)

power distribution bus
(ordering number 21875)

DC input

RF input

UP410S - power supply

75 Ω load
(supplied)
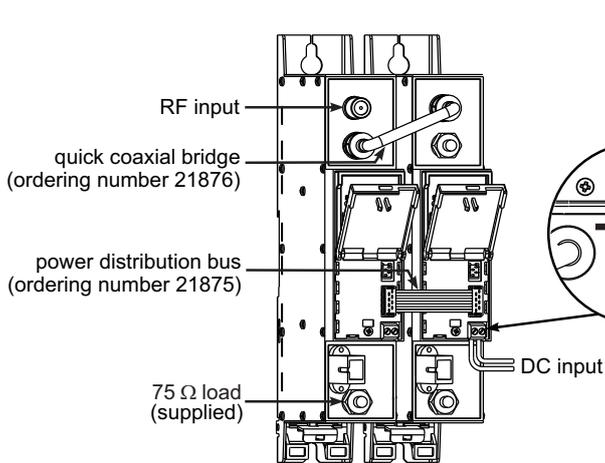
Figure 6 a. Powering of the transmitter
via screw terminal block
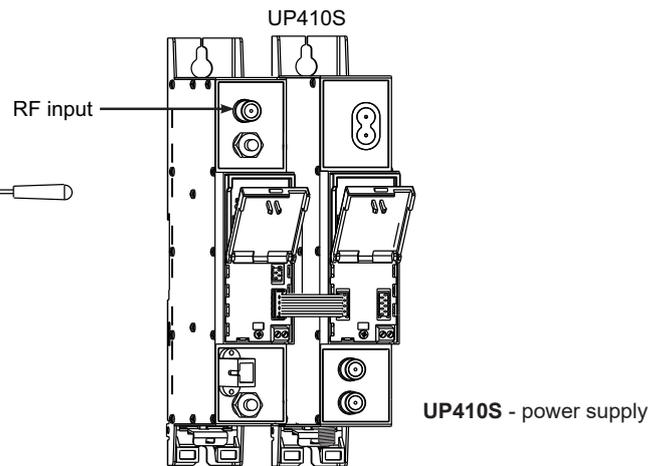
Figure 6 b. Powering of the transmitter
via power distribution bus

OPERATING

■ Operating and adjustment

Optical transmitter with device server provides remote diagnostics and control of the transmitter via Ethernet type network using a conventional WEB browser (e.g., MS Internet Explorer, Google Chrome, Opera, Mozilla FireFox, etc.)

To perform configuration of the transmitter connect it to the network card of the computer (or a network switch) using UTP cable.

If "RF Out" and/or "RF test" connectors is not used, connect the 75 Ω terminator.

■ Communicating with the Web browser

For first connection to device server, enter the default IP address value 192.168.1.99 in the address line of WEB browser. When a Web browser connects to the device server, start page as shown below will appear in the Web browser.
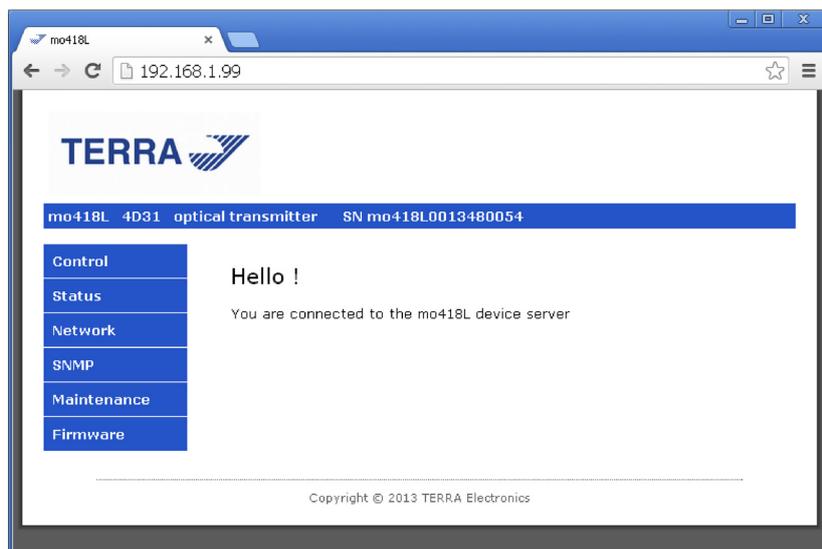
Figure 7. Start screen

Note: The device is protected and unauthorized users can only see the "Status" page.
In order to have full control of the equipment it is necessary to LOGIN to the device server.
When trying to operate the device a page "Authentication required" appears (Figure 8) asking to enter the "User Name" and the "Password".
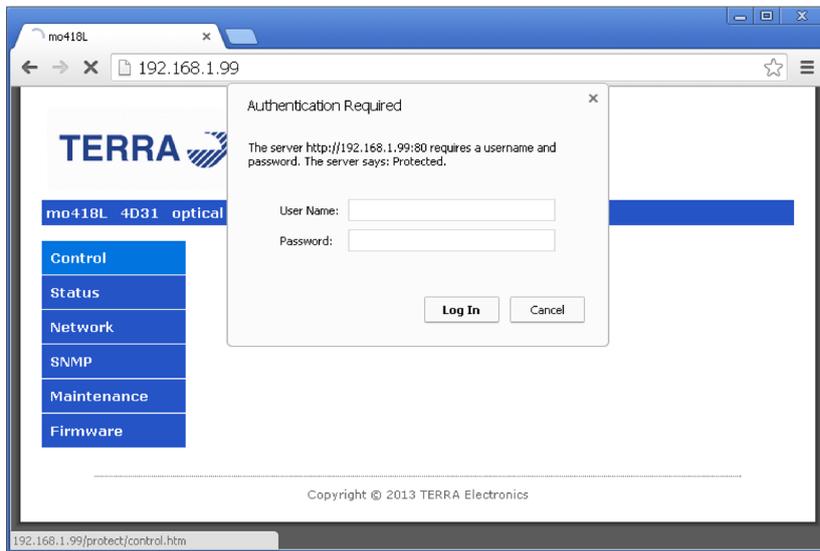
Figure 8. "Authentication required" page

Note: The buttons are shown in different languages depending on the WEB browser and the actual Windows regional setting.

■ Network Configuration

Configuration of network parameters, according to system administrator's requirements, has to be performed before using the transmitter in local network.

The Network configuration menu (Figure 9) allows to modify the IP parameters, user name and password. For security reasons it is highly recommended to change the default login data.

New network parameters will be applied only after rebooting the device server. The device server reboots after clicking "Save Config" button. Rebooting may take time about 1 min.

■ Default network settings

Login settings:
User Name: admin
Password: admin

Network settings:
IP address – 192.168.1.99
Net mask – 255.255.255.0
Gateway – 192.168.1.2

SNMP settings:
Host IP – 192.168.1.1
SNMP read community string = public
SNMP write community string = private
SNMP trap target community string = public
Enable Trap= On

To reset network and login settings of the device server to their default values, press twice the "DEF" button on transmitter front panel (Figure 1, pos.6) as explained:

1) Press the "DEF" button until the transmitter activity LED (Figure 1, pos. 5) lights up in green.
2) Press the "DEF" button a second time. Green LED flashing for a few seconds indicates a successful procedure of rewriting data.

Warning: Changing IP configuration could result in loss of browser connectivity to the current URL. If you change the IP address of the server, you need to change the IP address in your browser before accessing the configuration web page again. IP address of the transmitter should be compatible with the available LAN IP addresses.
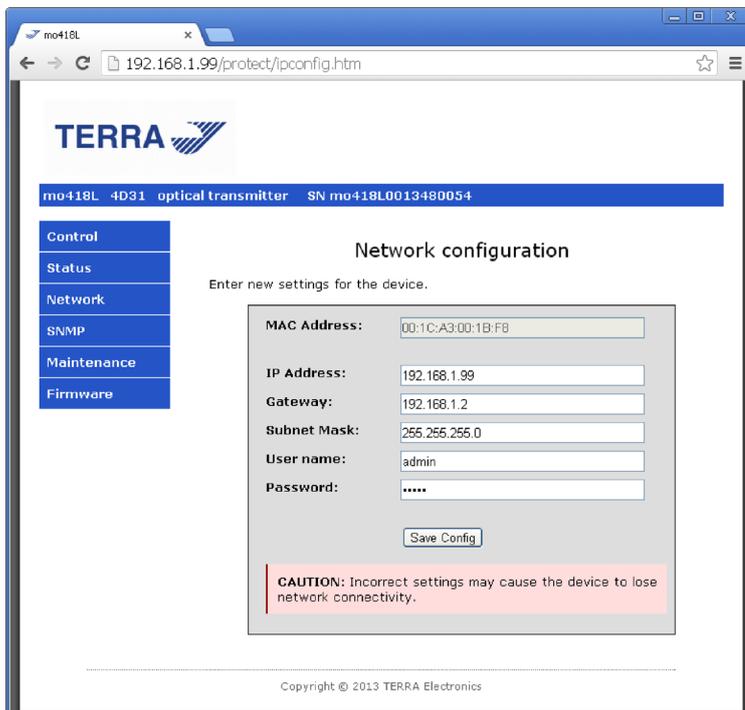
Figure 9. Server Network configuration Menu

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■ SNMP Configuration

A SNMP configuration page is available as shown in the picture below:
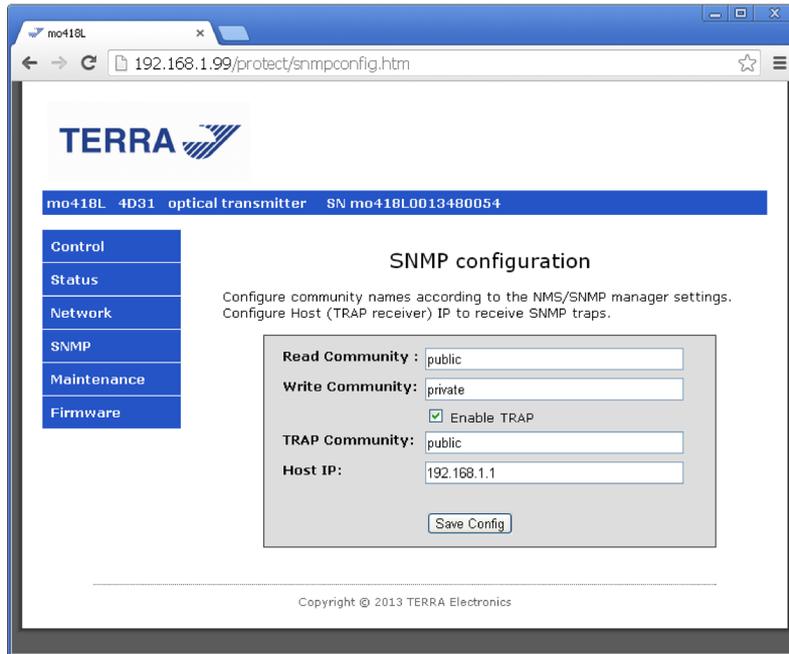
Figure 10. SNMP Configuration Menu

The SNMP configuration menu allows to input the IP address of trap receiver and to change, enable and disable the trap community strings.
Host IP used to set the IP address of the computer with running management system, which receives the SNMP TRAP.
Parameters Read Community, Write Community, Trap Community are used for the SNMP exchange authenticity.
After modifying the values press the button "Save Config" to reboot the server and update the entered parameters.

■ Transmitter control

When the device completes start-up, operation will begin and the Control screen will appear as in Figure 11.
Parameters of the transmitter can be selected by selecting different menu items in the control page.
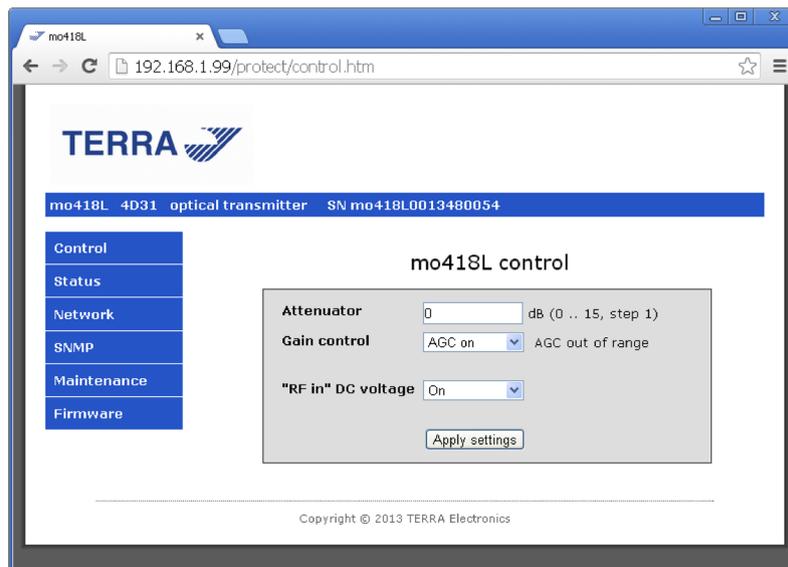
Figure 11. Transmitter control page

• Attenuator parameter enables to decrease or to increase RF attenuator values (0…15 dB, 1 dB step).

Note: *Attenuator* value may be changed step by step using Up/Down buttons at right side of parameter window or entered directly from keyboard. Take in mind that some browsers (e.g. IE) don't support Up/Down control element. In this case the appropriate value should be entered from keyboard.

• Gain control allows to switch "On" or "Off" the AGC of the transmitter. It is used to set automatic RF level control for constant load to the laser. The operating AGC level is set by the user when the button "Apply settings" is pressed. After that, RF level instability is compensated automatically by the internal attenuator. If attenuator can't compensate RF level drift, diagnostic error message "AGC out of range" is displayed.

• "RF in" DC voltage enables to switch DC voltage on RF input socket to OFF (0 V) or ON: (+12 V). This voltage is used for powering external active devices (for example antenna preamplifier) via coaxial cable.
After any control values are changed, press the button "Apply settings".

Note: DC on "RF input" socket (+12 V) can be dangerous for some devices.

To avoid mistakes when installing or operating the transmitter without external preamplifiers, it is recommended to use the DC voltage blocking coupler (VBC). VBC protects test equipment, splitters, couplers, in-line attenuators and other equipment from damage.

■ Transmitter Status

Status page (Figure 12) shows actual status of the transmitter using error/warning descriptions.
Make sure that the transmitter is not indicating any error or warning.
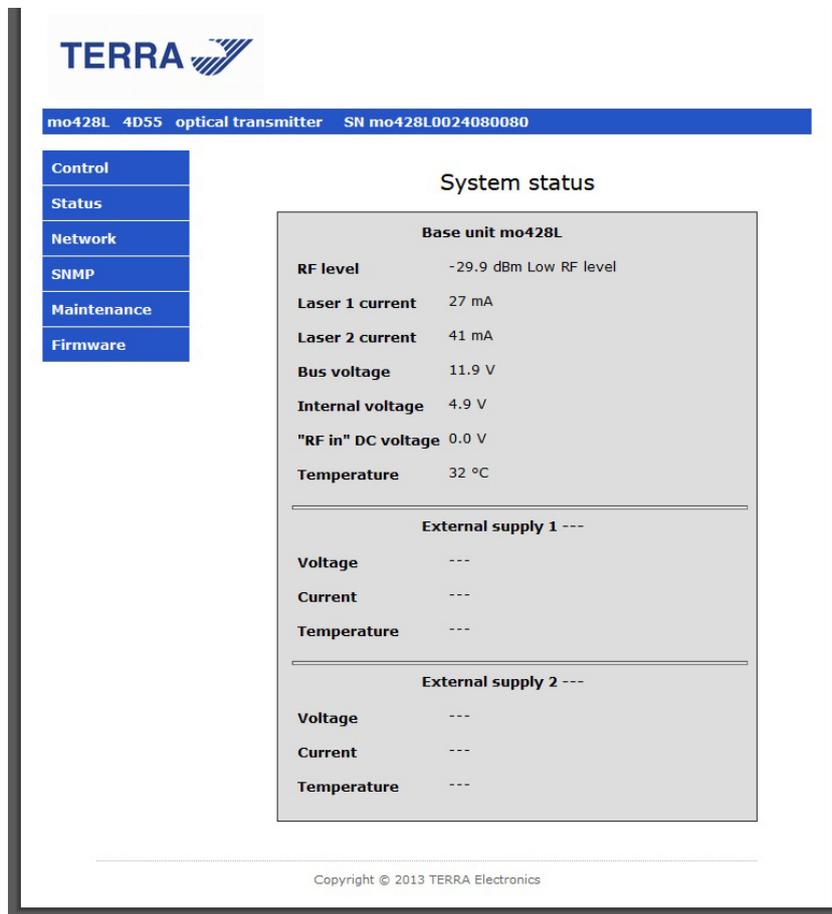
Figure 12. Transmitter status page

• RF Level

The transmitter has a built-in RF power meter, which monitors the total power in the RF test point. This value directly relates to the laser optical modulation index (OMI). It depends on input signals values and number of channels and can be changed by the attenuator.

If RF output power is less than -20 dBm, web server generates error message "Low RF level", if it is more than -5 dBm, then the message" High RF level" is displayed.

Note: measurement of RF output level has not instrument accuracy, it indicates the approximate output level power and output level variation.

• Laser 1 current

Indicates current of Laser 1;

• Laser 2 current (for transmitter mo428L)

Indicates current of Laser 2;

• Bus Voltage

Displays supply voltage of device on power distribution bus or on +12 V powering input (Figure 1, Pos. 9)

• Internal voltage

Indicates voltage of internal 5V supply

• "RF in" DC voltage

Displays the level of output voltage in the RF input socket (Figure 1, Pos. 1)

This voltage is used to power an external amplifier. In case of short circuit, or over current the voltage drops, and error message "Voltage out of range" is displayed in the error message field.

• Temperature

Indicates the internal temperature of the device. If the temperature inside the module achieves the maximum level, the error message "Overheat" is displayed.

■ **Transmitter maintenance**

System maintenance page (Figure 13) allows the restart and/or restore all default settings of device.

All operations will be executed by pressing the "Execute" button.
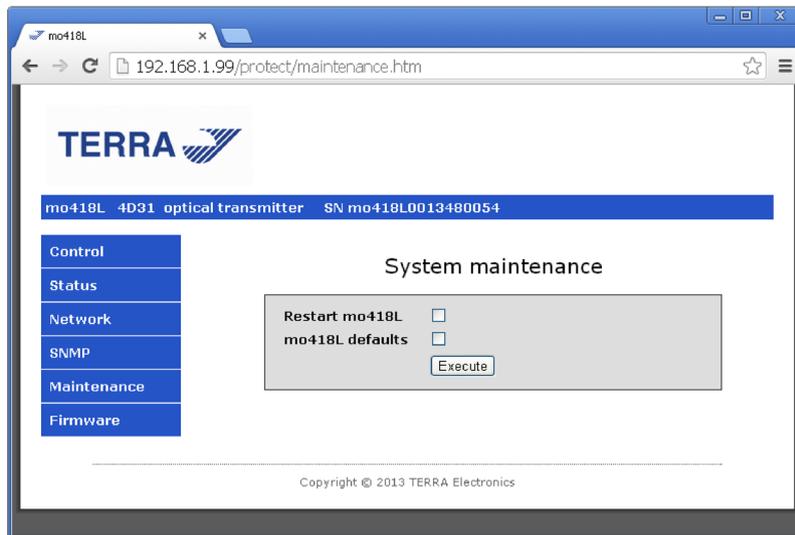
Figure 13. Maintenance page

The transmitter is supplied with the following default settings:

Table 1. Default transmitter settings.

Parameter	Value
Attenuator	0 dB
Gain Control	AGC off
External Output voltage	Off

■ **Firmware upgrade**
It is possible to update the server firmware by uploading it to the optical transmitter using the device server software upload menu as shown below.
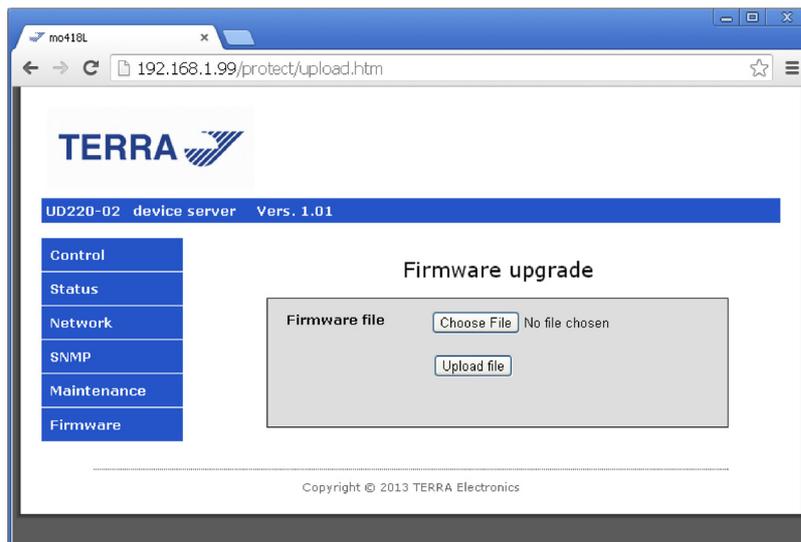
Figure 14. Firmware upgrade of transmitter server

Note: The buttons are shown in different languages, depending on the actual Windows regional setting.
It is recommended to perform software upgrade by connecting the transmitter directly to PC.

■ **SNMP and the Management Information Base**
A Simple Network Management Protocol (SNMP) Management Information Base (MIB) is a hierarchically organized collection of information. MIB's consists of managed objects that are identified by object identifiers (OIDs). Some attributes in the MIB are fixed while others are dynamic values calculated by the agent software running on the device.

Ethernet SNMP agent operates together with optical transmitter and provides remote diagnostics and control of the transmitter via Ethernet type network using SNMP protocol.

The agent of transmitter can receive SNMP requests from a number of SNMP managers and can send traps to dedicated trap receiver.

The SNMP agent generates all alarms and events as SNMP traps (notifications) if parameters of the transmitter exceed limits and/or abnormal situations occur. These traps will be sent to trap manager, identified by host IP address. The SNMP agent generates traps containing an object ID (OID) that uniquely identifies the alarm. The traps also contain a date/time stamp that shows the date and time of the alarm.

The a network management system (NMS) can be implemented to enable a more sophisticated alarm management with alarm filtering, alarm acknowledgement and automatic messaging through Emails or SMS etc.

The table 2 shows the notification type and the MIB object for each event notification.

Table 2. Notification type and the MIB object

OID	Alarm	Description
30631.1.2.2.1	alarmInternalVoltage	Internal 5V source voltage out of range
30631.1.2.2.2	alarmBusVoltage	Supply bus voltage out of range
30631.1.2.2.3	alarmAgcRange	AGC out of range
30631.1.2.2.4	alarmLowRf	Input RF level low
30631.1.2.2.5	alarmHighRf	Input RF level high (Overdrive)
30631.1.2.2.6	alarmOutVoltageRange	External devices powering voltage out of range
30631.1.2.2.7	alarmOverTemperature	Device overheated
30631.1.2.2.8	alarmLaser1Ageing	Laser diode 1 ageing
30631.1.2.2.9	alarmLaser2Ageing	Laser diode 2 ageing. Applicable only for mo428L type
30631.1.2.2.10	alarmExtSupply1	External supply 1 - attention required. The variable value bits represent the cause of alarm, as described below: bit 0 - Low output voltage bit 1 – High output voltage bit 2 - Current overload bit 3 - High temperature
30631.1.2.2.11	alarmExtSupply2	External supply 2 - attention required. The variable value bits represent the cause of alarm, as described below: bit 0 - Low output voltage; bit 1 - High output voltage; bit 2 - Current overload; bit 3 - High temperature

It is possible to get transmitter diagnostic data and indications of parameters exceeding operating limits – alarms (Table 3).

Table 3. Alarm OID's

OID	Alarm	Description
30631.1.2.2.1	alarmInternalVoltage	Internal 5V source voltage out of range
30631.1.2.2.2	alarmBusVoltage	Supply bus voltage out of range
30631.1.2.2.3	alarmAgcRange	AGC out of range
30631.1.2.2.4	alarmLowRf	Input RF level low
30631.1.2.2.5	alarmHighRf	Input RF level high (Overdrive)
30631.1.2.2.6	alarmOutVoltageRange	External devices powering voltage out of range
30631.1.2.2.7	alarmOverTemperature	Device overheated
30631.1.2.2.8	alarmLaser1Ageing	Laser diode 1 ageing
30631.1.2.2.9	alarmLaser2Ageing	Laser diode 2 ageing. Applicable only for mo428L type
30631.1.2.2.10	alarmExtSupply1	External supply 1 - attention required. The variable value bits represent the cause of alarm, as described below: bit 0 - Low output voltage bit 1 – High output voltage bit 2 - Current overload bit 3 - High temperature
30631.1.2.2.11	alarmExtSupply2	External supply 2 - attention required. The variable value bits represent the cause of alarm, as described below: bit 0 - Low output voltage; bit 1 - High output voltage; bit 2 - Current overload; bit 3 - High temperature

By means of SNMP protocol it is possible to get status parameters values of the transmitter (RF level, laser current, supply voltages, temperature inside module) and parameters of the external power suppliers (Table 4).

Table 4. Status parameters

OID	Status	Description
30631.1.2.1.1	measRfLevel	RF level. Represented in tenth of dB. as example, a value of -299 represents level of -29.9 dBm
30631.1.2.1.2	measLaser1Current	"Laser 1 current, represented in mA.
30631.1.2.1.3	measLaser2Current	Laser 2 current, represented in mA. Applicable only for mo428L type
30631.1.2.1.4	measSupplyVoltage	"Power bus voltage in tenth of Volt. As example, a value of 121 represents voltage of 12.1 V.
30631.1.2.1.5	measIntVoltage	Internal 5V source voltage in tenth of Volt. As example, a value of 51 represents voltage of 5.1 V
30631.1.2.1.6	measOutVoltage	Output voltage for external devices powering in tenth of Volt. As example, a value of 121 represents voltage of 12.1 V.
30631.1.2.1.7	measTempr	Device temperature, represented in deg C.
30631.1.2.1.8	measExtVoltage1	1st External supply voltage in tenth of Volt. As example, a value of 121 represents voltage of 12.1 V.
30631.1.2.1.9	measExtCurrent1	1st External supply current in tenth of Ampere. As example, a value of 4 represents current of 0.4 A.
30631.1.2.1.10	measExtTempr1	1st External supply temperature, represented in deg C.
30631.1.2.1.11	measExtVoltage2	2nd External supply voltage in tenth of Volt. As example, a value of 121 represents voltage of 12.1 V.
30631.1.2.1.12	measExtCurrent2	2nd External supply current in tenth of Ampere. As example, a value of 4 represents current of 0.4 A.
30631.1.2.1.13	measExtTempr2	2nd External supply temperature, represented in deg C.

User can sent SNMP request and get information of serial number and software version of transmitter (Table 5).

Table 5. Info parameters

OID	Info	Description
30631.1.2.5.1	infBaseSerNum	Represents Base device Serial Number
30631.1.2.5.2	infBaseVersion	Represents Base device firmware version number

MIB files, which ensure binding of controlled parameters of the transmitter to the NMS, can be downloaded from www.terraelectronics.com.

■ Installation example

There is a recommended installation example when it is necessary to ensure a high reliability of optical system. For this purpose a power supply UP413 is recommended, as it is designed for operation in parallel connection to ensure the back-up function.
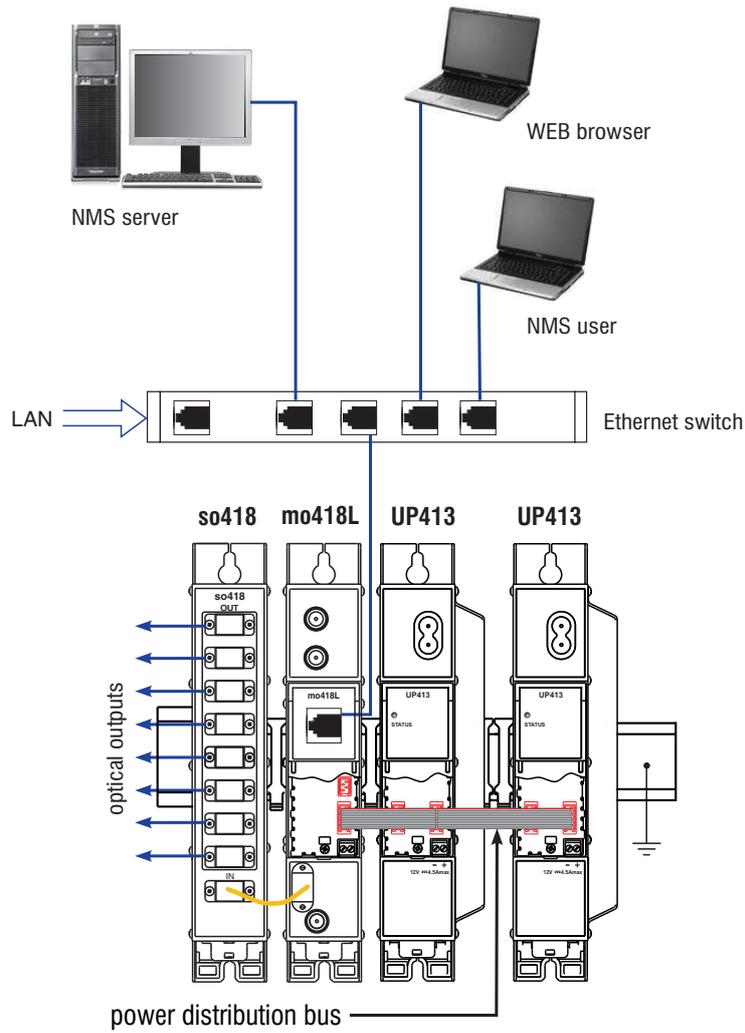

Figure 15. Application diagram of mo418L installation with redundant power supply and WEB/SNMP control possibility.

Table 7. Technical characteristics

Type		mo418L*	mo428L*
Number of optical outputs		1	2
Optical power		1x6 dBm	2x6 dBm
RF frequency range		47-2400 MHz	
RF input level		70-85 dBµV	
RF input impedance		75 Ω	
Gain adjustment		0...-15 dB by 1 dB step	
AGC range		± 5 dB	
RF input loop through	frequency range	47-2400 MHz	
	loss	< 1 dB	
	flatness	± 1.0 dB	
Return loss		≥ 18 dB at 40 MHz -1.5 dB/oct (47-950 MHz); ≥ 10 dB up to 1750 MHz; ≥ 7 dB up to 2400 MHz	
Terr.TV	intermodulation distortion CSO**	> 55 dB	
	intermodulation distortion CTB**	> 60 dB	
	carrier/noise ratio C/N**	> 50 dB	
SAT IF intermodulation distortions IMD3***		> 35 dB	
Test point****		8.0 ± 1.0 dB (47-1750 MHz); 6.5 ± 1.5 dB (1750-2400 MHz)	
Optical connector		SC/APC	
Network server parameters	Ethernet standard	10/100 Base-T	
	connector	RJ-45	
	supported protocols	ARP, Ipv4, HTTP, Ping, SNMPv2c	
Supply voltage		12 V ± 1 V⎓	
DC feeding for external		12 V 0.4 A	
Current consumption without external load		0.35 A max.	0.4 A max.
Current consumption with external load		0.75 A max.	0.8 A max.
Operating temperature range		0° ÷ + 50° C	
Dimensions/Weight (packed)		198x107.5x36 mm/ 0.9 kg	

* Type	Laser
mo418L 4D31	6 dBm DFB 1310 nm
mo418L 4D55	6 dBm DFB 1550 nm
mo418L 4D56	6 dBm DFB 1555 nm
mo418L 4F31	6 dBm FP 1310 nm
mo428L 4D31	2x6 dBm DFB 1310 nm
mo428L 4D55	2x6 dBm DFB 1550 nm
mo428L 4D56	2x6 dBm DFB 1555 nm
mo428L 4F31	2x6 dBm FP 1310 nm

** measurement conditions according EN 60728-3, 42 CENELEC:
optical modulation index (OMI) 4.0%;
the sticker "RF test level" with the exact RF level dBµV/chan for OMI=4.0% is placed on the side of the cover

*** two tone test metod according EN 60728-3 OMI 20 %

**** relative to RF IN port with 0 dB attenuator and off AGC

INVISIBLE LASER RADIATION DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS.
Wave length 1270-1610 nm, IEC60825-1.

This product complies with the relevant clauses of the European Directive 2002/96/EC. The unit must be recycled or discarded according to applicable local and national regulations.

Equipment intended for indoor usage only.

This product is in accordance to following norms of EU: EMC norm EN50083-2, safety norm EN IEC62368-1, RoHS norm EN50581.

This product is in accordance with Custom Union Technical Regulations: "Electromagnetic compatibility of technical equipment" CU TR 020/2011, "On safety of low-voltage equipment" CU TR 004/2011.

This product is in accordance with safety standard AS/NZS 60065 and EMC standards of Australia.