

# QAM 16 EM



## Operating instructions

**MADE IN GERMANY**

0901815 V2

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## 1. Hazards and safety instructions

**Before working with the basic unit QAM 16 EM please make sure you read the following safety rules carefully!**

### Power supply and power cord

The device must be operated only at a power supply with a voltage of 230 V / 50 Hz.



### Connection cable

Place the connection cable always trip proof !  
Replace the power cord only with an original power cord.

### Potential equalization / grounding

Proper grounding and installation of the device must be carried out according to EN 60728-11 / VDE 0855-1 regulations.

Operation without grounding or potential equalization of equipment is not allowed.

### Humidity and placement location

The device must not be exposed to dripping or splashing water. If water condensation occurs, one must wait until the device is completely dry. The device must be installed on a vibration-free location.

### Ambient temperature and heat effect



**The maximum allowable ambient temperature is 45 ° C.**

The ventilation holes of the device must **NOT** be covered under any circumstances. Too much heat or heat accumulation affect the life of the device and can be a source of danger.

To prevent heat buildup and to ensure good ventilation, the device must be mounted horizontally (eg. on a wall). The device must not be mounted above, on top, or near heat sources (e.g radiators, heating plants), where the device is exposed to heat radiation or oil vapors. The installation must be done **only** in rooms that ensure compliance with the permissible ambient temperature range, even under changing climatic conditions.



**If the device exceeds the maximum operating temperature, it automatically switches to a reduced power consumption. The device is out of function during that time.**

**Once the temperature has reached again the allowable range, it automatically switches back on.**

### Warning:

When installed in rooms such as storage or attic one should pay particular attention on compliance with the ambient temperature. Because of the danger of fire due to overheating or lightning strike, it is recommendable to install the device on a noncombustible surface. Combustible surfaces are wood beams or bars, wood boards, plastic materials, etc.

### Conditions to ensure electromagnetic compatibility (EMV ?)

All covers, screws and connectors must be securely mounted and tightened, contact springs must not be bent or oxidized.

## Opening the case

### ATTENTION

Device's case opening and repairs must be performed only by authorized personnel. First to be done is to pull the network plug.

Replacing of fuses must be done only with fuses of same type, value and melting characteristics.



## No maintenance work during storms



### ATTENTION

This module contains ESD components! (ESD = Electrostatic Sensitive Device). An electrostatic discharge is an electrical current pulse, which can flow also through an electrically insulated material, when triggered by large voltage difference.

To ensure the reliability of ESD components, it is necessary to consider their most important handling rules:

Electrostatic sensitive components can be processed only on electrostatic protected area (EPA)!

- Pay attention permanently to potential equalization (equipotential bonding)!
- Use wrist straps, approved footwear for personnel grounding!
- Avoid electrostatically chargeable materials such as normal PE, PVC, polystyrene!
- Avoid electrostatic fields >100 V/cm !
- Use only labeled and defined packing and transportation materials!

**Damage caused by faulty connections and / or improper handling are excluded from any liability.**

## Waste disposal

Electronic equipment is not household waste but should be properly disposed on electrical and electronic equipment waste - in accordance with Directive 2002/96/EC OF THE EUROPEAN PARLIAMENT AND COUNCIL.

Please take this device at the end of its use for proper disposal at the designated public collection points.



**WEEE-Reg.-Nr. DE 51035844**

## 2. General Information

The QAM 16 EM devices are modern, compact transmodulators, which transfer the SAT transponder DVB-S / S 2 (16 x QPSK / 8PSK) into DVB-C (16 x QAM). The simple and quick installation, configuration and programming, enables an unproblematic operation. The QAM 16 devices convert digital SAT signals into QAM signals so that they can be fed into cable networks. It is possible to transfer 16 transponders of different satellites. Thus, a transfer of SD and HD programs over all transponders is possible, regardless whether they are encrypted or unencrypted.

## 3. Description

The QAM 16 converts random DVB-S or DVB-S2 Transponder (QPSK/ 8PSK) in DVB-C channels (QAM). The output frequency range is 112-860 MHz, individually adjustable. This frequency range can be fed into an existing coaxial distribution network. It is not relevant whether it is a network with a star, tree or mixed structure.

Subscribers are able to receive all programs present at the selected transponders with a commercial DVB-C receiver or TV with integrated DVB-C tuner. It is irrelevant whether the individual programs in SDTV or HDTV, will be broadcast as a pay-TV or free to air signals.

Programming is done via a laptop / PC. This is connected via the included USB cable to the USB socket. Programming of QAM 16 via a graphical user interface is easy and quick.

## 4. Scope of delivery

- 1 x QAM 16 EM
- 1 x Power cable
- 1 x USB-cable
- 1 x USB-Stick (Programming software)
- 1 x Operating instructions
- 1 x Installation accessories
- 1 x Drilling template
- 1 x LAN patch cable

## 5. Input circuit

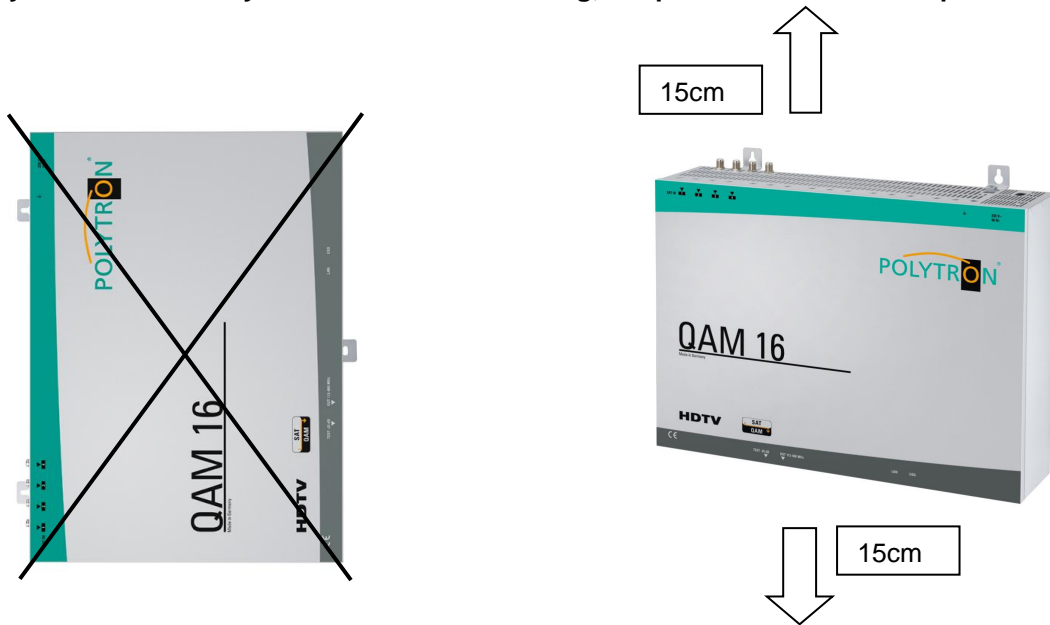
With the 4 in 16 matrix, four SAT-IF freely selectable signals can be switched to the 16 tuners. Here a transponder is selected and converted into a freely selectable output frequency between 112 – 860 MHz.

If more than 4 SAT-IF polarizations are needed, it's possible to pull the cable from the matrix and connect the new polarization direct with the tuner.

If some transponder from one polarization needed, then it's possible to build in a splitter in the wholes top of the housing.

## 6. Assembling

The assembly of QAM 16 must be made in a well ventilated area. The ambient temperature must not exceed 45°C. It is necessary to ensure that air can circulate through the ventilation holes. A minimum distance of min. 15 cm must be maintained around the device so that air can circulate freely. For the assembly or for work on the cabling, the power cord should be pulled.



### 6.1 Grounding

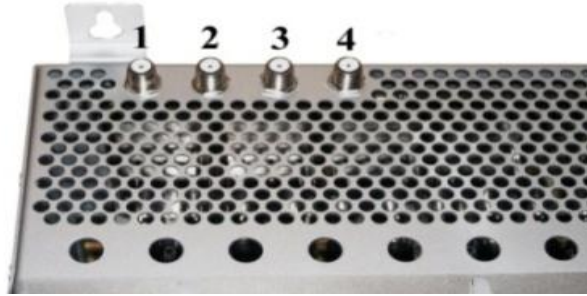
The device must be grounded according to the EN 60728-11.

- Cable insulation of the grounding wire ( 4mm<sup>2</sup>) should be stripped about 15 mm.
- Push the stripped end under the ground screw and tighten the screw.



## 7. Installation

Connect the various levels of the four satellite inputs (SAT 1, SAT 2, SAT 3, SAT 4)



It is possible to connect levels of different LNB's.

The LNB voltage is fixed at the inputs 1 and 4.

The power consumption of the connected LNB's should not exceed 250mA per input.

Please note that a digital-compatible Quattro LNB (e.g. Polytron OSP AP 94) is used.

If the LED of the LNB supply is not lit, the LNB supply is interrupted or disturbed.



### **Please consider!**

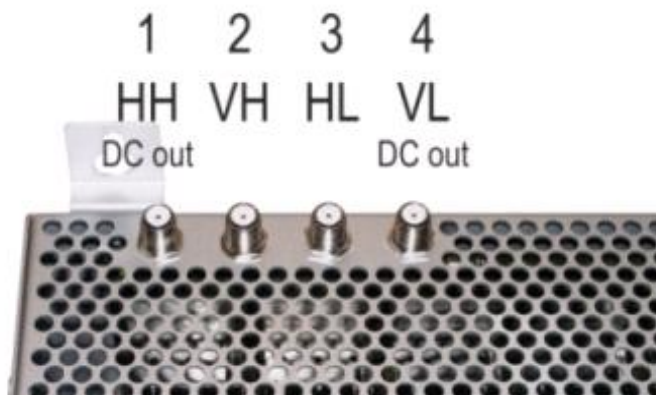
Total allowed power consumption of all connected LNBs cannot amount to more than 500mA.

### 7.1 QAM 16 EM Default setting of the input

The inputs and outputs of the device are programmed from factory with a standard frequency assignment. (see paragraph 13).

To receive the pre-ASTRA transponders, the SAT inputs must be connected as in the picture below.

Preprogrammed assignment



## 7.2 Input level

To ensure a good reception, make sure that the level at the inputs is between **50** and **80 dB $\mu$ V**.



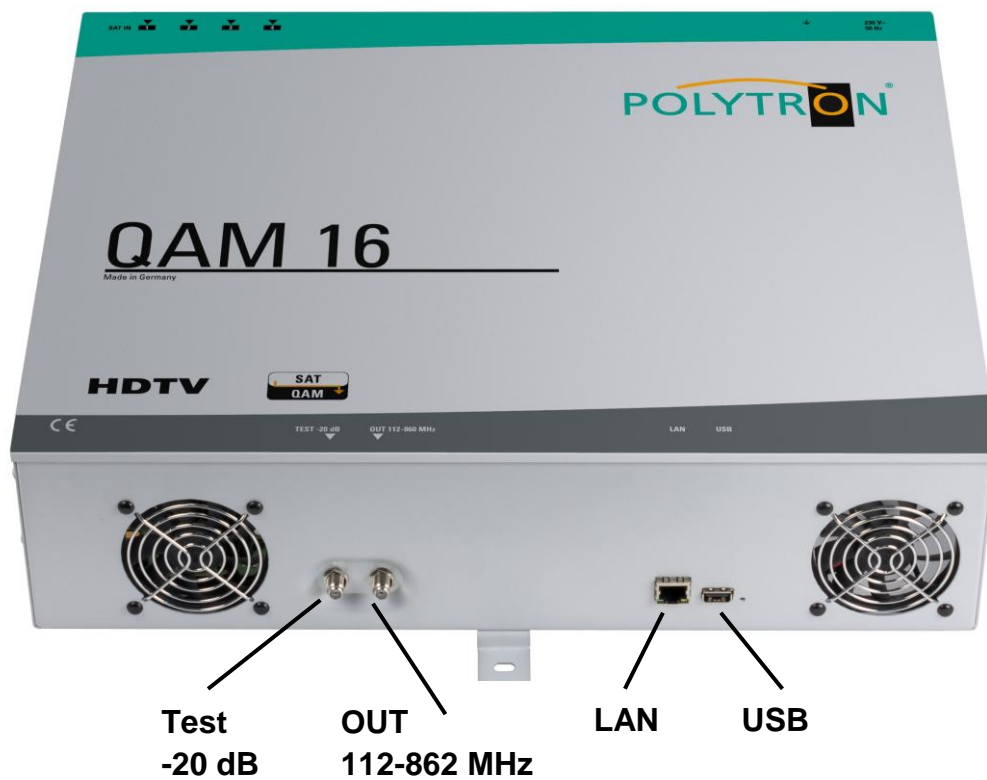
**When receiving digital signals, it is more beneficial to have a lower level rather than a too high level.**

At too high input levels an attenuator should be used.

## 7.3 Output level

The output level is 90 dBmV at delivery. This can be changed by using the programming device (see section 9.2.2).

A reduced to 20 dBmV output level is applied at the TEST jack.





## 8. General programming

After connecting the power cord, the device runs through an internal routine and all 16 channels are set to the previously stored data.

During this time the status LED next to the USB jack blinks green.

Only after the status LED has turned on continuously on green or orange a connection between the headend and laptop / PC is possible.

**Connect the device only after the Software Installation on the PC.**



### 8.1 Software Installation

Download the software package from the homepage [www.polytron.de](http://www.polytron.de) (satc12\_Vxxx.zip) and unzip it in a desired path (z. B. C:\QAM16).

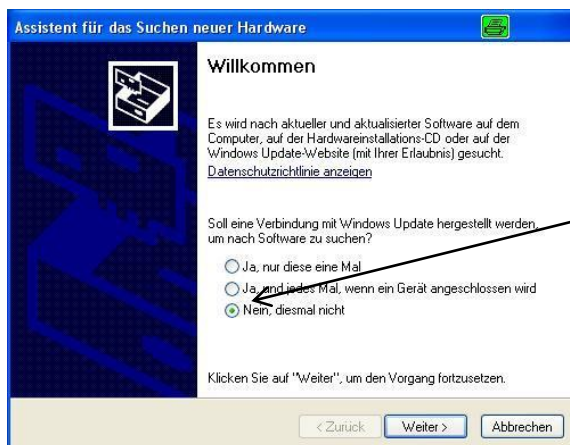
The software can be loaded also from the supplied USB- Stick.

#### 8.1.1 Installation of the driver

Start `Instal_driver.cmd`

**Follow the instructions on the screen.**

For some initial installations the following dialog may appear. That depends on your operating system. Perform the following instructions and make the selections for the selectable fields:



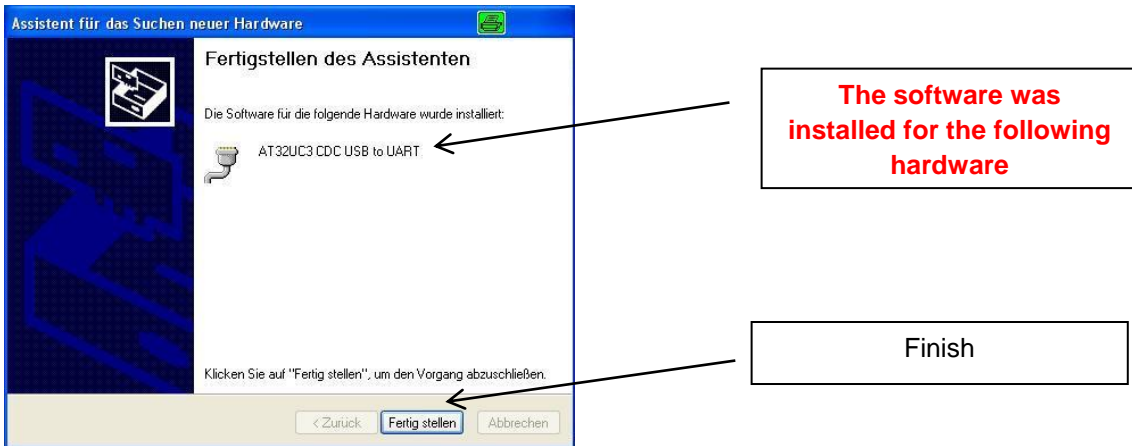
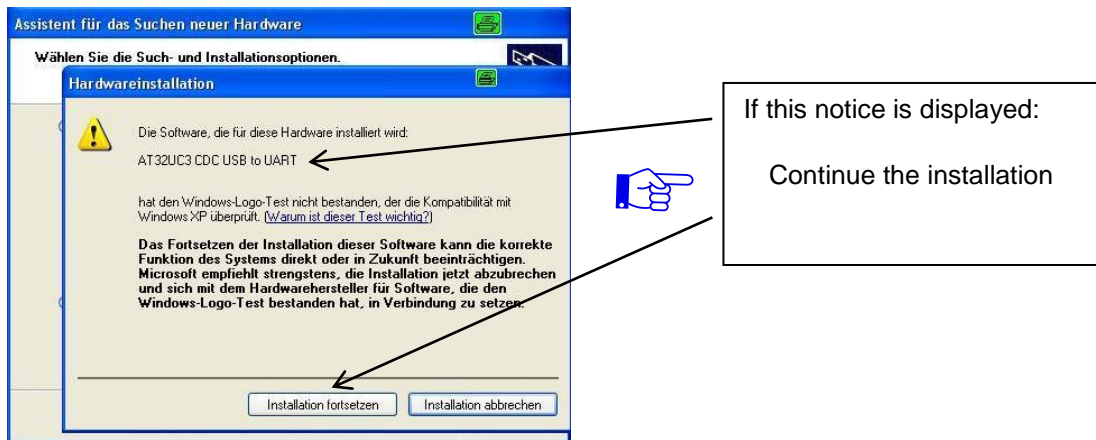
**No, not this time**

Next



**Automatically install software**

Next



The installation of the driver software is now finished.

### 8.1.2 Installation of the programming software

Install the software in the desired folder by launching the program „Setup.exe“.

Follow the instructions on the screen.

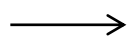
Close the screen at the end of the installation.



After the installation of the programming software on the PC, the QAM device can be connected to the PC using the USB cable.

### 8.2 Programming of the device parameters

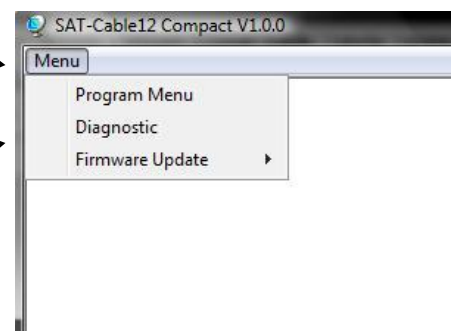
Start the program **SATC12**



Left click on top on **Menu**

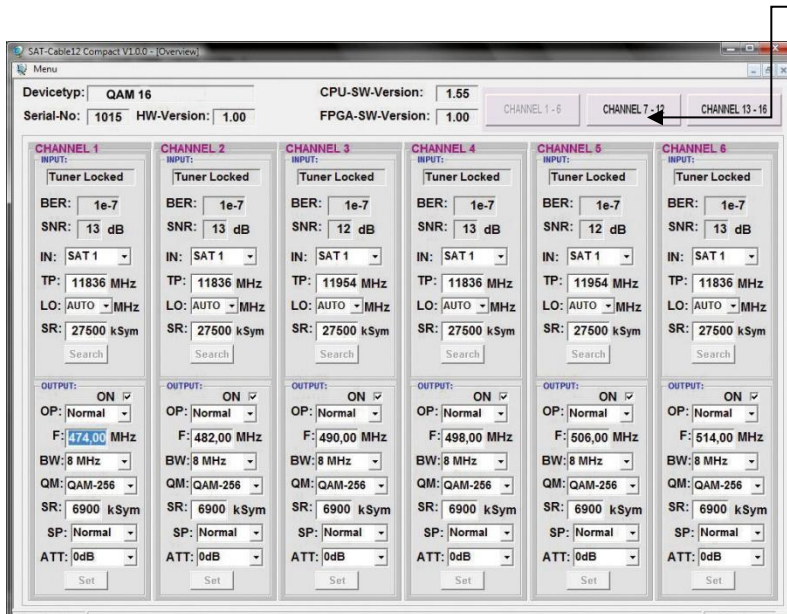
Following menu items are available:

- **Program-Menu**
- **Diagnostic**
- **Firmware-Update**
- **Exit**



In „**Program-Menu**“ all settings of input and output parameters are made. After calling the menu each of the 16 channels are retrieved and the *corresponding parameters settings* are displayed.

For better clarity, the menu is split between three pages 2 times 6 channel and 1 time x 4channel..



At the top part of the menu, the device data is displayed, such as type, serial number, hardware version and software versions for the CPU and FPGA.

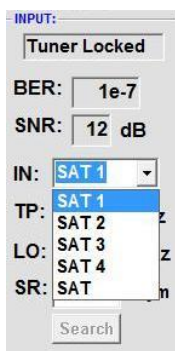
With the menu item „**Settings**“, it is possible to save or load an existing programming.  
See section 9.3



## 8.2.1 Input parameters

**IN** > Selection of the input signal source

### QAM 12 EM



Sat-IF level from **SAT 1**  
to **SAT 4** or the direct  
input at tuner with **SAT**

The desired transponder data shall be entered in the menu fields.

This data can be found on the homepage of the satellite operators e.g. [www.Astra.de](http://www.Astra.de), [www.eutelsat.com](http://www.eutelsat.com), etc.

**TP** > Transponder frequency

Enter transponder frequency

**LO** > LNB Oscillator frequency

**AUTO** is automatically set on the needed frequency. The frequency values **09750**, **10600** or **OTHER** can be also selected.

**SR** > Symbol rate

Enter symbol rate

**Search** > Search

After pressing the button **Search** the data is accepted and the desired transponder set.

If the tuner finds the transponder, **Tuner Locked** is displayed on top.

**Reception conditions**

The quality of the input signal can be evaluated with the bit error rate **BER** and signal to noise ratio **SNR**.

These are dependent on the quality of the reception conditions and the SAT signals.

Recommendation: bit error rate **BER** should be  $\leq 1e-6$

bv

For signal to noise ratio, **SNR** the following displayed guidelines apply.

The corresponding values of the FEC (forward error correction) shall be taken from tables of the satellite operators.

If for example the transponder has an FEC of 5/6, the SNR display should be min. 9 dB.

FEC	good	very good
	good	
1/2	5-7dB	8-11dB
2/3	7-9dB	10-13dB
3/4	8-10dB	11-14dB
5/6	9-11dB	12-15dB
7/8	10-12dB	13-16dB

## 8.2.2 Output parameters

### OP > Operating Mode

Normal > Normal operation

Single > single carrier for level measurement with an analogue antenna measurement instrument

Zero > digital channel with content 0. (constant level without fluctuations)

### F > Output frequency

Frequency freely selectable  
It is recommended to keep the TV-Standard channel spacing. Eingestellt

Frequency of the channel center. (e.g. channel 21, 410-set 474 MHz)

### BW > Band width

Select bandwidth according to output frequency between 7 MHz and 8 MHz

### QM > QAM-Mode

Settings of the possible QAM-Mode (16, 32, 64, 128, 256) are dependent on the data rate of the input transponder. Only the possible QAM- Mode will be displayed.

### SR > Symbol rate

Up to 7.200 kiloSymbole/ sec. It is dependent on the selected QAM-Mode (usual setting in cable networks: 256 QAM / SR 6.900). Only the possible Symbol rates will be accepted.

### SP > Spektrum

**Normal** > Normal operation

**Invers** > signal can be inverted in its spectral range. The inverting is necessary only in exceptional cases.

**On** **OFF** > shutdown output channel

OUTPUT:  
 ON  OFF  
OP: Normal  
F: 474,00 MHz  
BW: 8 MHz  
QM: QAM-256  
SR: 6900 kSym  
SP: Normal  
ATT: 0dB  
Set

If not all 16 output channels are occupied, each channel can be individually turned off with **OFF**.

**ATT** > output level

OUTPUT:  
 ON  OFF  
OP: Normal  
F: 482,00 MHz  
BW: 8 MHz  
QM: QAM-256  
SR: 6900 kSym  
SP: Normal  
ATT: 0dB  
0dB  
-1dB  
-2dB  
-3dB  
-4dB

The output level at the output is 90dB $\mu$ V and for each channel can be attenuated to 12 dB in 1dB steps.

**Set** > accept programming parameters

OUTPUT:  
 ON  OFF  
OP: Normal  
F: 474,00 MHz  
BW: 8 MHz  
QM: QAM-256  
SR: 6900 kSym  
SP: Normal  
ATT: 0dB  
Set

After setting all the parameters press the **Set** button. With this all the settings will be accepted. Repeat steps for other operating channels.



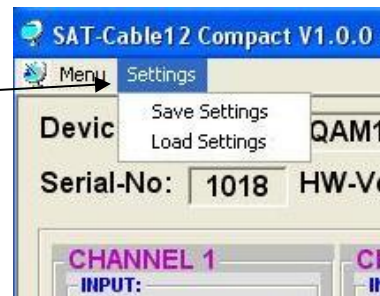
**Note:** The DVB-C / QAM receiver must be programmed according to the set parameters (search).

## 8.3 Storage of the programming

It is possible to save an existing programming on a PC or to download it from a PC. Thus, an archiving of programming configurations can be performed. This simplifies the work with QAM 16.

Open the main program with the menu item

**Settings**



### 8.3.1 Storage of the settings

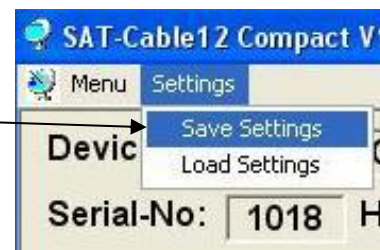
Use the menu item

**Save Settings**

to save the programming on the PC.

A path name and a file name should be entered.

(e.g. object)



### 8.3.2 Load settings

Use the menu item

**Load Settings**

to load an existing programming from

PC to QAM 16.

Select the desired file name from corresponding path

and open it.

The data is automatically loaded.





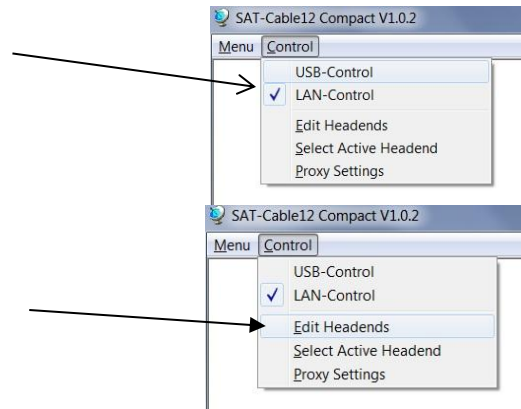


### 8.3.4 Setting up the headends

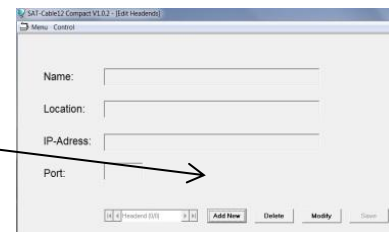
Start the program **SATC12**



- under Control menu activate **LAN-Control**
- select **Edit Headends** for the connection settings of QAM16



- Select **Add New** in the user interface.



- The following menu fields are enabled to enter data:

Enter the name of the equipment (free text)

Name:

Enter the location name (free text)

Location:

Enter the IP address of the controlled headend.

IP-Address:

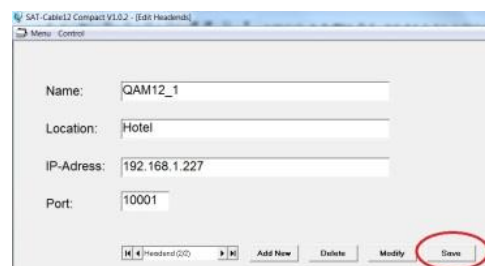
At delivery: 192.168.1.227

Enter the port of the controlled headend.

Port:

At delivery: 10001

Press **Save** button to save the headend data.



Follow the same procedure for creating additional headends.

### 8.3.5 Settings for remote control over Internet

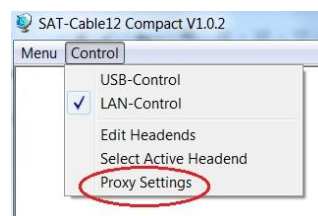
The following settings may vary, depending on the router model. Please follow the instructions in your manual.

#### Walkthrough:

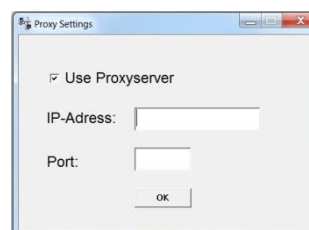
1. Each headend has its own IP address, assigned in an address range (e.g. 192.168.1.XXX). The port can remain the same for all (e.g. 10001).
2. Set the forwarding port on the router. Assign to each headend its external port.
3. If the broadband connection has a static IP, a dynamic DNS must be used.(e.g. www.dyndns.com). This gives your headend an explicit address with which you can always access it (e.g. kopfstelle.dyndns.com).

### 8.3.6 Proxy Settings

If the PC is behind a Proxy server, choose the menu item **Proxy Settings**.

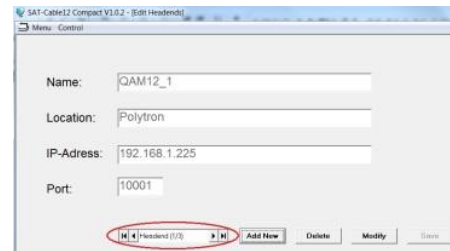


Under „Proxy Settings“ menu enter the address and the port of the Proxy Server.

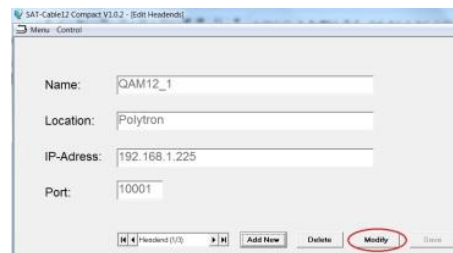


### 8.3.7 Editing the headends settings.

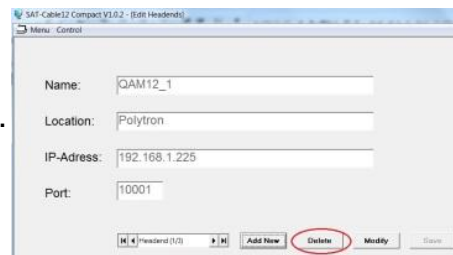
Select headend.



Press **Modify** to change the settings of the selected headend.

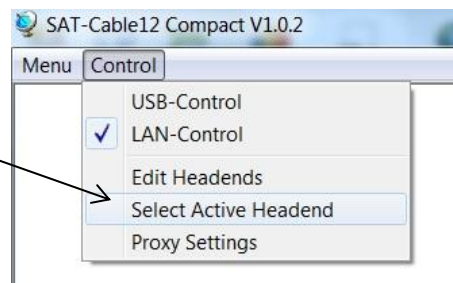


Press **Delete** to delete the selected headend.

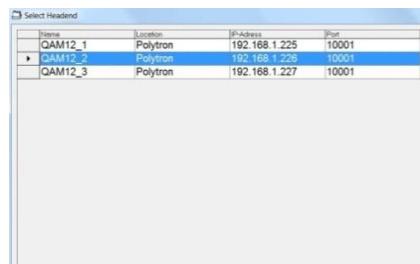


### 8.3.8 Selecting headend for programming.

Select menu item **Select Active Headend**



In the next coming window double click on the desired headend to dial in.



Headend is dialed.

**Program Menü** is automatically opened.

**Programm headend written in the manual of QAM16.**



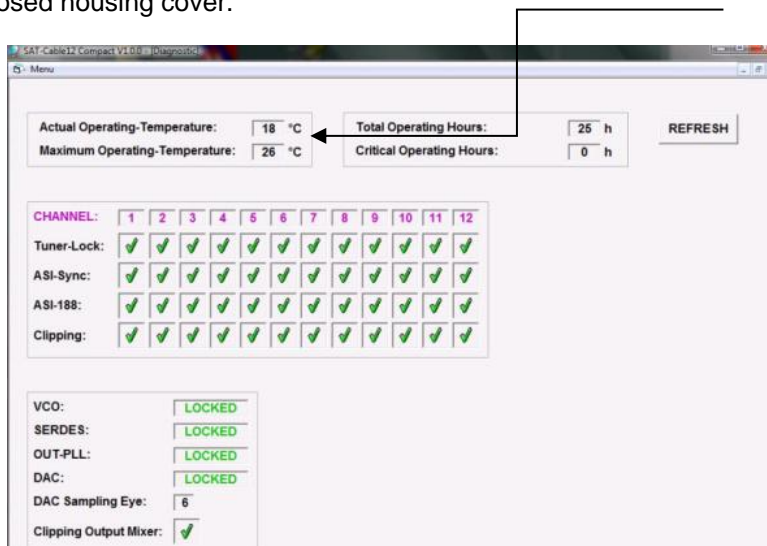
## 8.4 Diagnosis

### Header menu display:

Actual Operating Temperature: approx. actual environment temperature  
 Total Operating Hours: total number of operating hours

Maximum operating Temperature: maximum measured environment temperature  
 Critical Operating Hours: number of operating hours at over 45°C environment temperature

The reported temperatures correspond to the actual value only for professional, vertical installations and a closed housing cover.



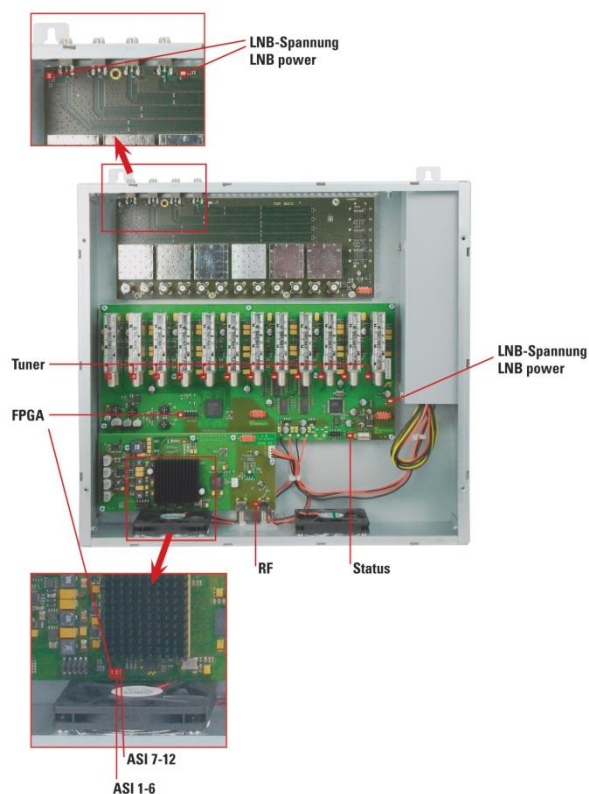
The „Diagnose“ menu is used for service purposes and may be useful for error analysis on the telephone **Hotline +49(0)7081-1702-12.**

With REFRESH you can update the displayed data.

**If one of the fields is displayed in red, an error has occurred.**

## 8.5 LED-Analysis/Interpretation

<b>LNB</b>	green:	12V LNB- voltage
	off:	no LNB- voltage (short circuit?)
<b>Tuner</b>	green continuous:	Tuner logged
	green blinking:	Tuner not logged
<b>FPGA</b>	green:	configured, operational
	off:	error
<b>ASI</b>	green:	interfaces o.k.
	off:	error
<b>RF</b>	green:	output o.k.
	off:	error
<b>Status</b>	green:	all tuners logged, operational
	orange:	different functions in programming



## 8.6 Firmware update

The menu Firmware Update serves to update the firmware of the device. Thus, the basic software of the device is brought up to date.

The programming of the input and output parameters performed in the section 9.2 is not affected.

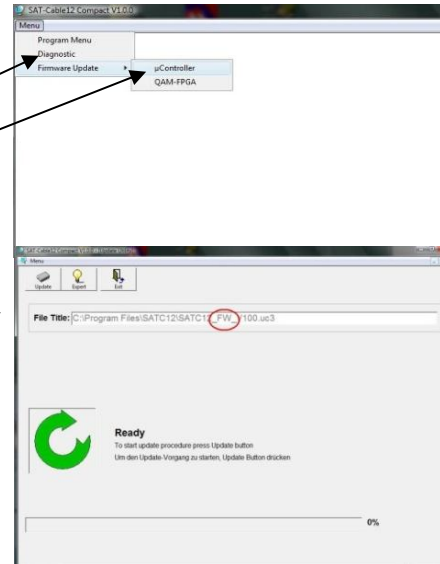
### 8.6.1 CPU ( $\mu$ -Controller)

**Software:** Load the **SATC12\_Vxxx.zip** from Polytron Homepage and open it. (see 9.1)

#### Update over Laptop/PC:

- Select menu item **Firmware Update**
- Select menu item  **$\mu$ Controller**

click **Update** button,  
new CPU software is loaded.



#### Update over USB stick (only for CPU):

Download the file „SATC12\_FW\_xxx.UC3“ from homepage [www.polytron.de](http://www.polytron.de) and copy it on the main directory of the USB stick.

- Disconnect the device from power supply
- Insert the USB stick
- Connect the device to the power supply
- **Status- LED red:** Update in progress
- **DO NOT remove the USB stick**
- **Status- LED green:** Update process is completed
- Remove the USB- Stick



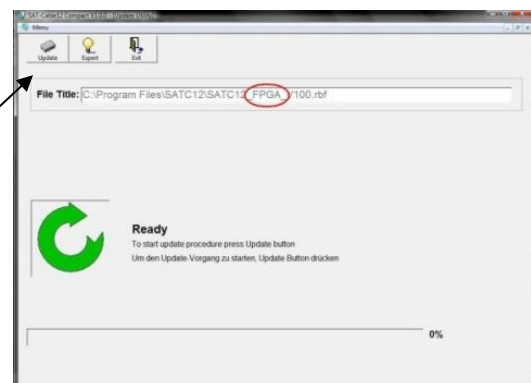
### 8.6.2 FPGA (QAM- Modulator)

**Software:** SATC12\_QAMxxx.RBF

#### Update over Laptop/PC:

- Select menu item **Firmware Update**
- Select menu item **QAM- FPGA**

Click the **Update** button,  
new FPGA software is loaded.

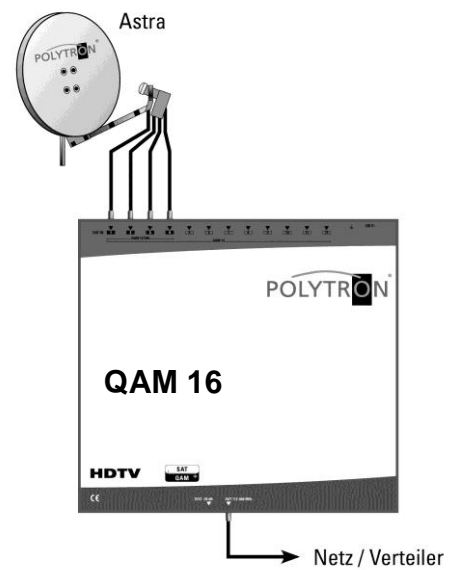
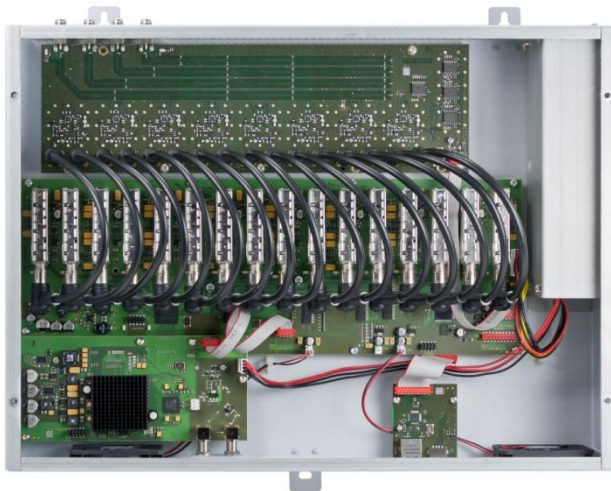


## 9. Application examples

### 9.1 QAM 16 EM

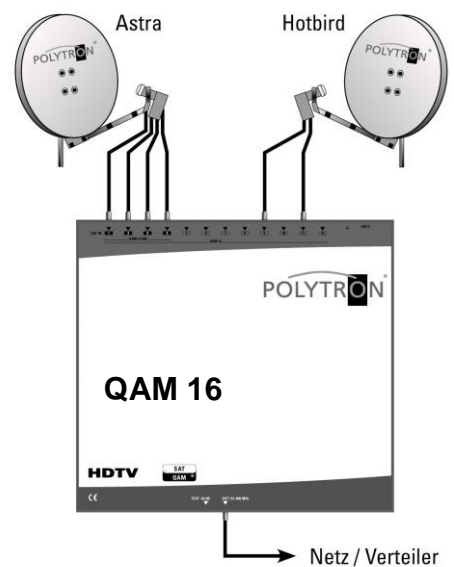
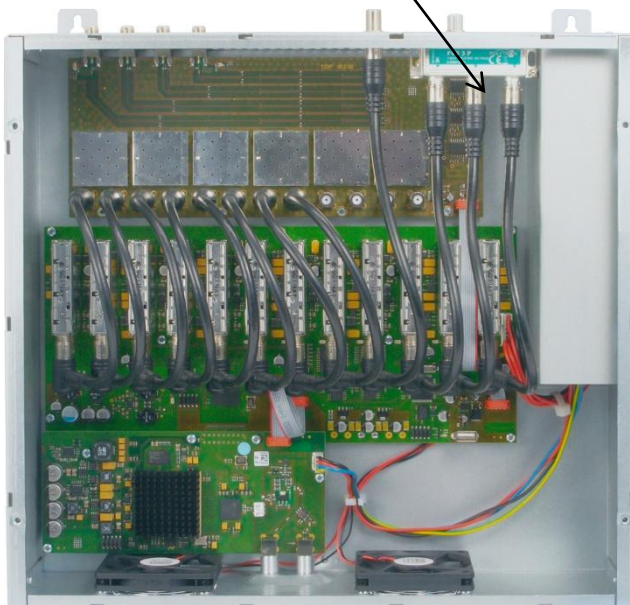
#### Example 1:

All tuner inputs are connected using the satellite input matrix. (Delivery state)

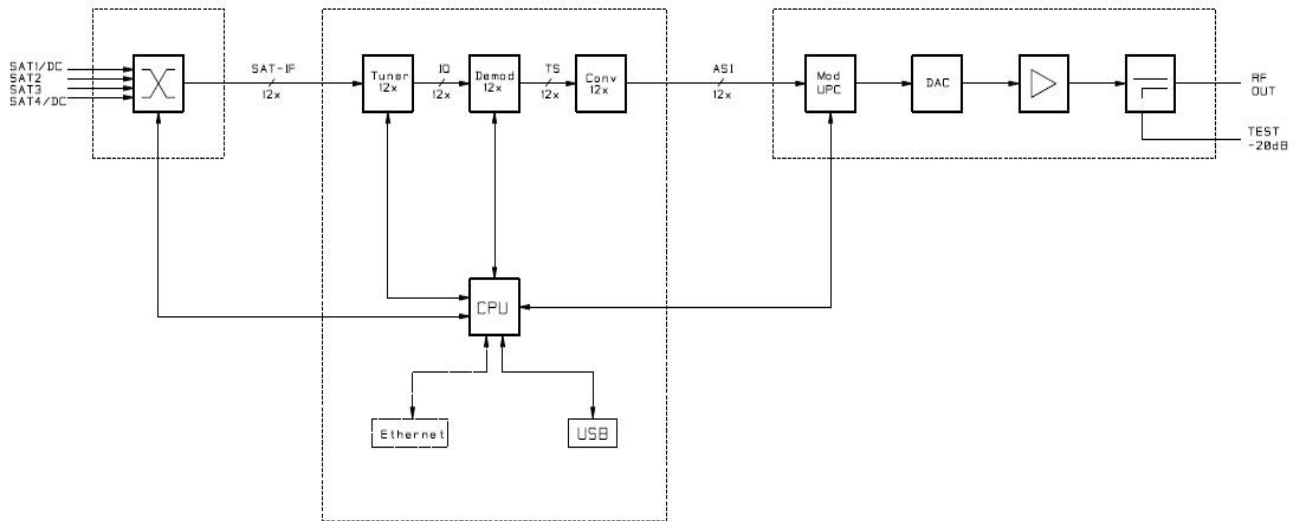


#### Example 2:

Tuner inputs are connected using the satellite input matrix and 2 additional levels of another satellite are connected to a distributor/splitter **FVS 3 P**.



## 10. Technical data



- **Electrical specifications**

- Power supply 230 VAC,
- Mains frequency 50/60 Hz
- Power consumption < 78W incl. 500mA LNB

- **Mechanical specifications**

- Temperature range 0°C...+45°C
- Storage temperature -25°C...+75°
- Relative humidity 95% (not condensing)
- Dimensions (W x H x D) 360 x 125 x 380mm
- weight 7,1Kg (QAM 12 EM)

- **Input**

- connector F- jack
- Frequency range 950 - 2150 MHz
- Tuning steps 1 MHz steps
- AFC- range +/- 5 MHz (depending on baud rate)
- AGC- adjustment range 50- 80 dB $\mu$ V
- LNB- voltage 12V / max. 2 x 250mA
- Impedance 75 $\Omega$

- **DVB-S2 Demodulator**

- Symbol rate QPSK 1 – 45 MS/ s  
8PSK 1 – 37 MS/ s
- Code rate DVB- S 1/2, 2/3, 3/4, 5/6, 7/8  
DVB-S2 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
- Roll off 0.35, 0.25, 0.20

### QAM- Modulator

- QAM- Modulation DVB-C (Standard)
- QAM- constellation 16; 32; 64; 128; 256
- Fault protection/ FEC Reed Solomon (204, 188)
- Symbol rate 1,0 – 7,2 MS/s
- Bandwidth 7 / 8 MHz (abhängig von der Symbolrate) /  $\alpha = 0,15$
- Data rate max. 53 Mbit/s
- Spectrum Normal / Invers
- Test signals
  - QAM- Test signal (Zero- content) digital
  - Analog (Single- carrier) analog

### • HF- output

- connector F- jack
- Impedance 75 $\Omega$
- Output frequency range 114 - 858 MHz
- Tuning steps 250 kHz
- Channel allocation suitable for adjacent channels
- Output level 90 dB $\mu$ V
- Level attenuation (per channel) 0 - 12 dB

### • Signal quality

- MER > 40 dB
- Spurious > 50 dB

### • Test output

- connector F- jack
- attenuation 20dB (+/- 2dB)



## 11. New functionality „Password“:

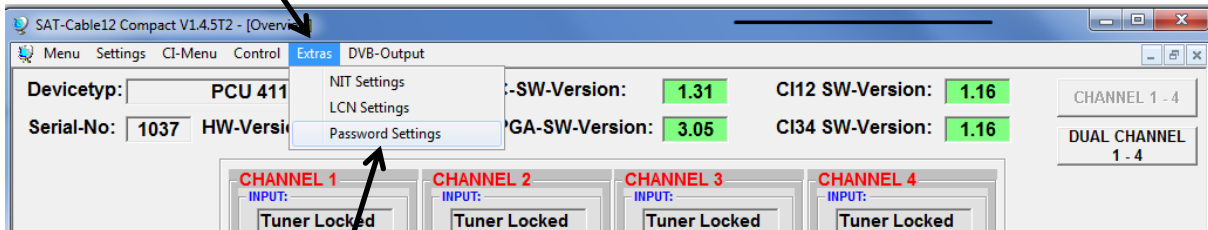
➔ Protection against unauthorized access to the Program-Menu.

The password function isn't activated in the factory settings and can be switched on from µC-SW-Version 1.31 on, like described as follows:

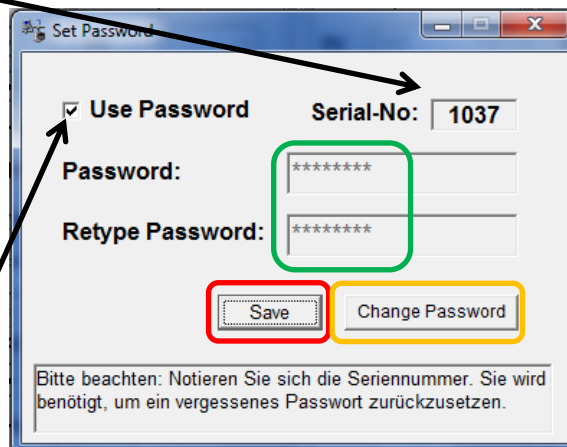
- Start program [SATC12] ➔



- Klick on **Extras** in the upper row.



- Klick on **Password Settings**. It appears following pop-up window, please urgently note the serial-number, because this will be needed to reset the password, if required.



- Place a tick in the check-box to select **Use Password**.
- Enter the password (min.6 / max.10 digits) in the input field **Password** (consisting of letters, numbers or special characters in random sequence) and retype the password in the input field **Retype Password**.
- By clicking on **Change Password** a new password can be created.

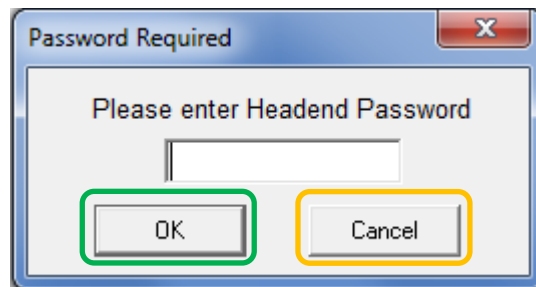


Klick on **Save** to store the password-settings.



- Exit the program [SATC12] or go on with the settings, if necessary.

After next time starting the program [SATC12] please enter the password in the input field and then click on **OK** to confirm the password or click on **Cancel** to correct the password, if required.



➔ Please note: **In this pop-up window is no change of the password possible.**

Should the password get lost or has fallen into oblivion we willingly help you relating to the generally password-reset. For this purpose we urgently need the serial-number of the device, as already mentioned on page 1. The serial-number you can also find on the label which is affixed on the outer side of the housing.

The generally password-reset can only be applied by POLYTRON, for this procedure you will get a new password to reactivate the access to the device again.

By removing the tick in the check-box **Use Password** you can certainly also deactivate the password function, but you will need the password to log on before.



## 12. Default setting

Please see supplemental sheet

### **13. Service call QAM 16**

The main features of the Polytron QAM headends are easy handling and high quality. In case of a problem, it can be solved quick and uncomplicated by phone usually. Our experts know your products very well and will give you helpful information and support.

Take our service and call us from Monday to Friday between 8:00 and 16:30 o'clock.

Technical Hotline: +49 7081-1702-12

Outside office hours you can reach a technician via mobile on:

+49 151-16508206

In case of a technical defect, please return the unit with error description to our hands.

**Polytron-Vertrieb GmbH**

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75313 Bad Wildbad

Zentrale/Bestellannahme

H.Q. Order department + 49 (0) 70 81/1702 - 0

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