The KARIN system is the professional headend system in the Hirschmann range of CATV-products and contains all the necessary components from the receiver unit to the antenna socket-outlet. Along with its professional processing units, the KARIN system contains an expandable combining network and an output unit with coaxial and optical outputs. With only perfectly matching components, from the receiver unit to the system output guarantee optimal values at the trunk output even when many channels are being used. For this reason, in addition to the attention paid to the technical data of the individual units, care was taken during development to optimise both the way the components work together and the resulting system data.

Modular construction, the fully automatic reserve system and user-friendly PC monitoring of the headend and its infrastructure are the basis for the KARIN system’s maximum availability. Operating and service costs are kept to a minimum owing to high flexibility and the fact that the system has been optimised for minimum power dissipation.

It is simple to expand the open-ended KARIN system. New developments can be integrated easily, thus eliminating investments later on.

Complete, professional headend system
Compact, modular construction
Open architecture with standard interfaces
Innovative PC monitoring system
Fully-automatic, software controlled reserve system

Complete modular system with standard interfaces
Open-ended system for easy integration of newly developed components
Space saving, compact construction
Maximum availability and minimal operating and service costs
Fully automatic software-controlled reserve system (N+1)
PC monitoring of the headend throughout the whole distribution network
Professional processing units
Expandable combining network
Coaxial and optical outputs up to 862 MHz
Interfaces for additional services and multimedia applications
Tested in accordance with TL 5820-3076 of the Deutsche Bundespost Telekom
ISO 9001 company certification guarantees highest quality.

The KARIN system in the Hirschmann CATV system
Processing units
The KARIN system contains all necessary analogue and digital processing units in high quality design. Signal broadcast both by satellite and terrestrially can be processed. In addition local programmes can be fed in directly.

Combining network
The demands on the combining network increase with the number of channels. Therefore, in addition to high quality individual units, a high performance combining network is the basic requirement necessary for excellent system output values. The KARIN system is designed to combine 144 TV and 48 radio channels and is therefore ideally equipped for the increasing number of programmes on offer.

Output unit
The output unit contains both coaxial and optical outputs. In view of the rising demands on transmission capacity made by the continually increasing number of programmes offered, the output units have a broadband rating of 47 ... 862 MHz. Pilot generators are integrated, as the remote supply for the trunk amplifiers.

Extension devices
A wide range of extension devices ensure that the headend is simple to operate, e.g.:
- components to monitor and control external units
- components for substitute signal distribution
- remote supply for antenna pre-amplifiers, etc.

Reserve unit
In the event of failure, the reserve unit automatically replaces a failed channel within a few seconds, which guarantees a high degree of flexibility.

PC monitoring
The fully integrated PC monitoring system provides an immediate overview of the system at any selected point in the distribution network.

System expansion options
Continual new developments in the multimedia sector ensure that the KARIN system can meet the requirements of the future. Its modular construction, standard interfaces and the processor technology for PC monitoring integrated in every module ensure that new components can be integrated with ease.

Applications
The KARIN system is ideal for high quality CATV networks with a medium to large number of subscribers, whose transmission capacity should not be limited by the headend. In addition, the KARIN system can be used by broadcasting companies for monitoring and supervision equipment.

Technical characteristics
- Guaranteed system parameters from the antenna input to the system output
- 100% suitable for use with adjacent channels even with high channel loading
- High resistance against interference
- High selection
- Level and frequency stability over temperature and aging
- Standard interfaces in RF, IF and baseband
- Frequency locking
- Innovative circuit technology
- Plug-in submodules and subboards
- Space saving compactness through SMD technology

KARIN system
KARIN system analogue and digital processing units
Satellite receiver for DVB
The satellite receiver for DVB (Digital Video Broadcasting) selects a QPSK-modulated carrier from the 1st SAT IF range and converts it to the 2nd SAT IF range.

In the 2nd SAT IF, the bandwidth of the signal is shaped to 27 or 36 MHz and constantly kept at 479.5 MHz by the integrated AFC.

DVB processing
DVB processing takes the MPEG-data from the QPSK-modulated 2nd SAT IF signal, codes it and supplies the QAM modulated IF signals at the output.

By demodulating, decoding and error correction, the QPSK demodulator gains the MPEG data stream. The optionally installed MPEG interface forms the interface to the MPEG data stream. MPEG processing units can be connected to this interface (e.g. MPEG-PAL Transcoder). The error protection for the QAM transmission is then added to the MPEG data stream in the channel coder. If the operating signal is incorrect or not present, the PRBS substitute signal generator in the channel coder produces a substitute signal which guarantees that a modulated signal is applied to the output of the following QAM modulator.

The modulation which is selectable between 16, 64 or 256 QAM takes place in the QAM modulator. The QAM modulator automatically switches the modulation off when the spectrum is larger than 7 or 8 MHz owing to excess data rates which could disturb an adjacent channel.

Additional features include the monitoring of the MPEG data stream (data throughput, frame length, sync bytes) and the marking of MPEG frames which cannot be corrected.

DVB processing
- High overload stability even if a high channel loading are used
- Automatic frequency control (AFC)
- Selectable IF-filter bandwidth
- Automatic tuned input bandpass
- PRBS substitute signal generator
- 16, 64 or 256 QAM
- Marks MPEG frames which cannot be corrected
- MPEG interface
- Monitors bit data rate and the structure of MPEG frames
- Automatically switches off modulation if data rate is too high
Satellite processing

The satellite processing for an FM modulated carrier extracts the video and audio signals from the 1st SAT IF signal. In addition, the analogue or digitally-modulated subcarriers are demodulated.

SAT splitter
The active satellite splitter with the integrated LNC supply distributes the 1st SAT IF signal without attenuation to seven outputs.

SAT receiver
The SAT receiver selects an FM modulated carrier from the 1st SAT IF, converts it in the 2nd SAT IF and extracts the baseband signal with a PLL demodulator. The video signal is gained from the baseband signal by filtering, and the audio signal is gained by demodulating the main sound carrier. To gain the subcarriers, the SAT receiver makes the baseband signal available to the subcarrier demodulator and the ADR demodulator.

Subcarrier demodulator
The subcarriers transmitted using the Wegener PANDA I process are gained by the subcarrier demodulator from the baseband signal and then demodulated. Two pairs of subcarriers can be demodulated in the subcarrier demodulator.

ADR demodulator/ADR receiver
Digitally transmitted ADR sound subcarriers (Astra Digital Radio) are processed in the ADR modules. The ADR demodulator gains the audio signals from the QPSK modulated subcarriers in the baseband signal. If only ADR sound subcarriers continue to be used (video signal is not used or transponder is in full use), an ADR receiver is provided, which also contains a satellite receiver.

The ADR demodulator/ADR receiver can process two carriers. To process additional subcarriers the baseband signal is looped through, as a result of which several ADR demodulators can be cascaded.

SAT processing

- Active SAT distribution network with short-circuit proof and interruptable LNC supply
- Selectable 2nd SAT IF bandwidth
- High overload stability even if a high channel loading is used
- PLL demodulation
- PANDA I sound demodulation of two compressed analogue pairs of sound carriers
- ADR receiver/ADR demodulator for decoding 2 ADR subcarriers from the baseband or the 1st SAT IF
- All outputs have automatic muting
PAL modulator
The PAL modulator modulates a video/audio signal and makes a standard IF signal available at the output.

**Video processing**
Automatic control can take place on both the white pulses of the test line and on the synchronous value. The clamping on the rear black porch functions perfectly without impairing burst, even if the SAT programmes have high interference. After modulation, the IF signal is reduced in bandwidth with a professional saw filter guaranteeing perfect adjacent channel operations. In the event of operating signal failure, the modulator switches to the substitute signal. Texts can be inserted into the substitute signal as desired.

**Sound processing**
The transmission mode is normally determined by the data line. It can, however, be determined externally (PC monitoring programme, control cables or switch).

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PAL demodulator
The PAL demodulator extracts the IF signal from the video and audio signal.

**Video processing**
The IF signal is regulated in the IF unit. The video signal can be extracted from highly linear synchronous or quasi-synchronous demodulation.

**Sound processing**
The audio signal can be extracted using either the parallel tone or the intercarrier method. After demodulation the audio signals are dematrixed, fed to a de-emphasis network and floated at the outputs. The mode of transmission is determined by the pilot tone.

---

- Noise immunity
- Precise white limiter without impairing colour carriers
- Individual text insertion into the substitute signal
- Direct modulation of sound carrier
- Professional SAW filter guarantees perfect operation adjacent channels
- Balanced video and audio inputs
- Determination of mode of sound transmission from the data line.
- Highly linear synchronous or quasi-synchronous demodulation
- Parallel tone or intercarrier demodulation
Down converter

The down converter converts a RF-TV signal in the standard IF from 38.9 MHz. The IF auxiliary signal is fed via the professional SAW filter, perfect operation of adjacent channels is guaranteed even with a lower quality substitute source.

With the IF locking option, the IF is locked to an internal crystal or an external reference. This eliminates variations in the receiving frequency and tolerances of the crystal synthesizer.

The down converter makes its crystal frequency available to the up converter for co-channel conversions.

Up converter

The up converter converts an IF signal in the desired channel and supplies the regulated RF signal to the output.

The option co-channel locking should be fitted for frequency-locked co-channel conversion of a terrestrial TV programme. The reference frequency (REF) is supplied by the down converter. The channel filter at the output suppresses spurious emissions and broadband noise, whereby broadband combining are unlimited. The high quality of signal processing is made possible by parallel tone demodulation. The multi standard detector option also allows standards deviating from the CCIR B/G to be transmitted correctly.

---

## Down converter

- Completely adjacent channel qualified
- Large dynamic range ideal for difficult reception conditions
- IF locking possible
- Substitute signal processing with SAW filter
- Adjustable input level threshold

## Up converter

- Suppression of spurious emissions and broadband noise, whereby broadband combining are unlimited.
- High quality processing for perfect demodulation using the parallel tone method
**FM converter**

In the FM converter the desired carrier is selected using tracking input filters, which guarantees problem-free use of the FM converter even under difficult reception conditions. Then the MPX signal extracted by a conversion to IF and demodulation. In MPX state, higher frequency parts are suppressed using plug-in filters, leading to significantly improved interference signal suppression and selection. Following this step, the MPX signal directly modulates the desired FM carrier. If the input level is too low, the output is disconnected, which prevents noise in the receivers.

**FM modulator**

In the FM modulator, an audio signal directly modulates the desired carrier in the 87.5 ... 108 MHz range. The input unit of the FM modulator consists of the switchable input impedance, the large input level range and the interruptable pre-emphasis. The integrated, bridgeable coder allows the processing of mono, stereo or MPX signals. After matrixing, the MPX signal directly modulates the FM carrier.

Additional information (ARI, RDS, ...) can be added to the MPX signal at the ADD-IN port. The FM modulator provides a 19 kHz pilot tone for synchronisation with the appropriate coder.

**FM demodulator**

The FM demodulator converts a FM signal into IF, demodulates it and delivers the MPX signal at the output. IF level selection is carried out independently of the type of carrier. 150 kHz coil filters for stereo and an additional ceramic filter for mono transmissions guarantee optimal bandwidth limitation. Plug-in low-pass filters allow additional suppression of unwanted frequencies.
Combining network

**General**
A modular, expandable combining network is used to feed the processed TV and audio channels into the distribution network. This combining network has up to 144 TV inputs and 48 audio inputs, and consists of active and passive components. The combination of active and passive components allows a lower output level at the individual processing units and thus less loss in the system than with purely passive interconnection. Optimum system safety is ensured by parallel switching of hybrid amplifiers in the active multi channel amplifiers.

**TV combining**
The components of the combining for TV are designed for 47 ... 862 MHz. Up to 6 TV programmes are combined with the broadband, passive RF combiner located in the up converter main frame. For transmission of more than 24 TV programmes, up to 6 RF combiners are connected together with a combiner amplifier. Four combiner amplifiers can be connected together with the passive output combiner. Passive interconnection of the most important TV programmes is possible by directing the output of the RF combiner directly into the output combiner.

**Audio combining**
Up to 12 audio channels can be combined via the passive sound combiner. Up to four such sound combiners can be switched together with the four-way sound combiner. The sound combiners are located in the FM main frame.

**Output combiner**
The passive output combiner allows the interconnection of the TV and FM programmes, as well as pilot tones and the data for PC monitoring. The output combiner has two equal output ports.

- Broadband from 47 ... 862 MHz
- Inputs for 144 TV and 48 audio channels
- Modular construction allows for step-by-step expansion
- The use of active and passive combiners guarantees optimum system configuration with regard to S/N and intermodulation
- Parallel connected hybrid amplifiers in the combiner amplifier for high levels and operational reliability
**Output amplifier**
The output amplifier with its hybrids connected in double amplifies the RF signal for feeding into the coaxial network.
In addition, the data for monitoring the headend of a PC connected to the CATV distribution network is fed out from the reverse channel.
For remote supply of trunk amplifiers, a power inserter is integrated into the output amplifier.

**Pilot generator**
The pilot tones for controlling the trunk amplifiers are generated by pilot generators.

**Remote supply**
The remote supply generates the remote supply voltage, which is fed into the coaxial cable via an inserter in the output amplifier.

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**Distribution network for KARIN-OVL**
For feeding optical feeder links, up to 2 x 96 optical transmitters can be fed with the distribution network.
The distribution network consists of active and passive components. It guarantees optimal system configuration with regard to noise and intermodulation.

The system description for KARIN-OVL contains further information on the optical connection network.

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- System output with pilot generator and remote supply
- Output with either 606 or 862 MHz
- Output amplifier with integrated reverse channel and power inserter
- Selection of up to 2 x 96 optical transmitters
- Combined active / passive distribution network guarantees low loss
Local transmitter locking
The constantly growing of programmes offered is leading to more and more dense use of the channels in the CATV network. For this reason, the use of channels susceptible to interference has become necessary. Local transmitters broadcast in the CATV network and interfere with programs being broadcasted on the same frequency. This leads to interference, which is seen as lines crossing the screen. With local transmitter locking, the visibility of this interference is greatly reduced. With local transmitter locking, the vision carrier of the channel at risk is locked to the carrier frequency of the local transmitter.

Frequency locking system
The increasing number of programmes and the resulting use of adjacent channels have pushed many CATV networks to their limits. The intermodulation caused by multi-channel use makes totally problem-free operation impossible. A frequency locking system solves this problem and offers substantially improved picture quality in the entire distribution network.

While local transmitter locking only locks one channel, frequency locking system locks all channels to a single reference frequency.

The advantages resulting from frequency locking all carriers have been exploited in terrestrial networks for some time now (normal frequency locking).

The KARIN system allows these frequency locked system advantages to be used in CATV networks as well. Such system reduces the visibility level of interference caused by intermodulation by up to 15 dB.

The advantages of the frequency locking system can only really be fully utilised when all useful carriers are locked to the reference frequency. The pilot tones in the KARIN system can also be locked to the reference frequency. In order to prevent interference in the TV programmes due to frequency-modulated FM carriers, the FM carriers are set at least 7 dB lower at the system output.

The reference frequency for frequency locking system can be derived from both an absolutely precise transmitter and a frequency standard.

Advantages of the frequency locking system
- Denser use of channels with the same network structure
- Higher system level, hence more system reserve
- Substantially improved picture quality in the entire distribution network
Satellite reception
If the standard operating signal fails, the video processor (in PAL modulator) automatically switches over to the substitute signal input, where the signal from the 2nd receiver is.

2 up converters or 2 FM converters
If a programme is being fed in from two different sources, one substitute switch per 2 up converters or 2 FM converters can be implemented.

If the operating unit detects a loss of operating signal, the substitute unit automatically switches to its substitute output (only for substitute connection with 2 up converters).
There is also a fully automatic reserve system (N+1) available for the KARIN system, in addition to the usual substitute connections. This means that the effort required for servicing can be reduced significantly because the reserve system automatically replaces a failed channel in a matter of seconds, using a reserve unit.

The reserve system automatically initialise the reserve unit with the parameters of the operating unit so that it is not necessary to enter large numbers of parameters manually.

**Method of function**

The reserve system consists of a reserve unit control module and the reserve units.

The reserve unit control module which is located in the headend, monitors all modules in the headend via the KARIN-bus. In the event of failure it co-ordinates automatic programme take-over by the reserve unit. To do this it first switches off the output of the operating unit to prevent interference to other channels and also to occupy this channel with the reserve unit. The reserve unit is then automatically initialised.

If the reserve unit can transmit the programme correctly, it is switched on by the reserve unit control. Otherwise (e.g. if the source is interrupted) the reserve unit remains free.

**Cables**

The reserve modules can be used from any position. This guarantees simple cabling.

**Priorities**

By assigning priorities, more important programmes can be dealt with preferentially.

- Fully automatic software-controlled reserve system (N+1)
- Automatic parameter initialising means that parameters do not have to be entered manually
- Simple cabling
- Programme priorities can be selected
Along with the usual monitoring and signalling facilities such as
- LEDs
- monitoring outputs
- alarm and control lines
all active modules can be monitored with the PC software.

User-friendly PC monitoring reduces the amount of time and equipment needed for controlling the function of the headend and servicing and maintaining them. In addition, most adjustments can be carried out via the PC monitoring software. Simple control functions (e.g. adjustment of an up converter) can be carried out from the PC. This means that it is extremely easy to locate faults caused by a single processing unit.

A PC with a monitoring software is all that is needed for monitoring. The hardware and software required to record measured values is integrated in the modules as a standard feature. A data processor in every main frame and a data modem per headend is necessary for data evaluation.

Communication between the headend and the PC can take place as follows:
- Directly via the RS 232 interface (PC at the headend)
- Via the optical or coaxial distribution network
- Via the telephone network

If there is a two-way connection from the PC to the headend (expanded reverse channel, telephone network) control functions can also be carried out at the headend.

If the data exchange takes place over the telephone network any number of headends can be monitored at a central location.

- PC control and monitoring of the KARIN system
- No measuring instruments necessary for function control
- Nearly all adjustments can be carried out with the PC monitoring software
- Hardware and software for PC monitoring integrated in the modules
- Monitoring of several headbands at a central service station
PC monitoring software

General
The user-friendly PC monitoring software provides a rapid survey of the system thanks to its graphic user interface. The menu-managed Windows software is used with the mouse and only requires minimal computer skills.

Clear overview together with the easy-to-use menu management make it possible to call up data extremely fast. The wide-ranging display of system data on the PC reduces the need for measuring instruments for both function controls and maintenance.

Integrated password-demand guarantees optimal security. The system can only be set up and configured after the password has been entered.

The monitoring software provides three display modes "headend", "modules" and "programmes".

The module menu is accessed via the various display levels of the individual modes (see fig. below).

Module menu
The module menu includes the current front panel signalling and the block diagram of the selected module. It allows you to follow the module processes via computer.

Front panel signalling corresponds to the module front panel in the KARIN system.

The module functions are shown on the block diagram in a simplified form, whereby attention was paid first and foremost to a practical layout of the functional blocks.

The most important measured values and status settings and frequency details are shown clearly in the module menu. This means that all relevant headend data are available at any position in the distribution network.

- Easy to operate
- Graphic user interface
- No measuring instruments necessary for monitoring or function control
- Analogue and numerical display of measured values with details of permissible ranges
- Display of operating conditions and additional information (channel, frequency)
- Representation of module function in simple block diagram form
- Measured value print out
- Rapid error diagnosis
- Fault protocol
- Password protection

Module menu display
1) Numerical display of the most important measured values
2) Rack, main frame and module address describe the exact position in the system; TV channel / programme number
3) Function strip
4) Additional information (frequency, channel)
5) Switch for control operations
6) Analogue display of selected measured values with details of the tolerance range
7) Front panel with signalling
**Headend**
The whole headend is clearly shown according to its mechanical design.

By making the appropriate selections in the rack, main frame and module display levels, access is gained to the simplified block diagrams of the desired module (Module menu).

**Modules**
The module types present in the system are indicated.

By selecting in the "module" and "measured values" lists you gain access to the "measured values displayed". The selected measured value of all modules of the same type are displayed. The module menu forms the lowest level.

**Programmes**
This mode shows the modules allocated to a programme (e.g. PRO 7).

After the desired programme has been selected, the appropriate processing unit is shown in the form of the module front panels. The module menu also forms the lowest level here.

---

Display modes

Rack

Main frame

Module

Module list

Measured values list

Measured values display

Processing unit

Module menu
External measurement monitoring
Integrated PC monitoring together with the "external measurement monitoring" also make it possible to monitor non-KARIN components. Thus, in addition to the headends it is also possible to monitor the infrastructure of such components by PC.

Twelve configurable measuring inputs and three floating control outputs form the interfaces to the external units.

This makes it possible to monitor the parameters of a headend infrastructure, for example:
- Indoor temperature
- Outdoor temperature
- Mains voltage
- Air conditioning
- Antenna mast lighting
- Access security

Of course the PC monitoring software can also be used to control external systems such as:
- Air conditioning
- Carrying out trial runs with the emergency generator
- Switching on reflector heating

The "external measurement monitoring" module can, for example, reduce power consumption for reflector heating to a minimum. This is achieved by means of a decrease in the input level which is transmitted to the service centre by the SAT receiver using the monitoring software.

- Monitoring and control of external units
- Several "external measurement monitors" can be integrated into the system
- 12 configurable measurement inputs
- 3 floating control outputs
Rack systems

Rack
The processing and supply units are located in 40 or 44 HU racks for 19" main frames.

Main frames
A main frame usually contains only functional groups of the same kind, e.g. 6 up converters or 3 PAL modulators. The processing units are housed in plug-in units located in the main frames. The rear panel of the main frame forms the connecting unit between the modules in the main frame and the rack cabling. The plug-in connection connects the module with the rear panel.

Cables
The power supply as well as the KARIN bus required for PC monitoring is precabled in each rack. This means that if additional main frames or modules are fitted only signal cabling needs to be carried out. As the appropriate combiners are located on the main frames there is only one cable leading away from the main frame which means that cabling is even simpler.

Power supply
In each main frame there is a central power supply unit consisting of two parallel power packs. During normal operations these operate with half the rated current. If one power supply should fail, the intact power supply supplies the whole main frame thus providing more operational reliability.

Compact Units
The compact unit which can also be connected to a computer is to allow additional fittings to be made to existing non-KARIN systems. A compact unit contains all that is necessary to process one or several channel chains. The compact unit for DVB processing consists, for example of:
- Satellite distribution network
- Satellite receiver for DVB
- QPSK demodulator
- MPEG interface
- Channel coder
- QAM modulator
- Up converter
- Power supply

Additional compact units
- Satellite processing with a PAL modulator, up converter, subcarrier demodulator / ADR demodulator and 2 FM modulators.
- 2 down and up converters
- 2 PAL modulators with up converters
- 2 SAT distribution networks and 3 SAT receivers with 3 subcarrier demodulators / ADR demodulators
- Down converter with PAL demodulator

As the compact units are also located in 19" main frames they can be fitted to the KARIN rack at any time.

Modules
The active module components are designed as broadband units. The passive components are for specific bands and can easily be replaced as they are plug-in sub-modules. This active / passive separation means that service work is very easy in the event of channel changes, storage and repairs.

Setting elements
The most important operating elements are located on the practically designed front panel of the module and are thus easily accessible. Setting elements which must be activated when adjusting a module (e.g. when changing a channel) are located on its board. With a functionally designed adapter module they are also easily accessible even if the module is in use.

Inputs and outputs
In principle all module inputs and outputs are located on the module rear plug-in connections. The cable between the individual main frames is located on the rack rear which means that it is not necessary to loosen connections on the front panel when replacing a module. Only the monitoring outputs are located on the front panels.

Necessary space
Thanks to the use of the latest technology (highly integrated components, SMD technology, digital processing) it was possible to achieve a high degree of efficiency and capacity in a very small unit.
## General data

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rack dimensions (HxWxD)</td>
<td>1960 x 550 x 595 mm (40 HU)</td>
</tr>
<tr>
<td>Paint</td>
<td>RAL 7032</td>
</tr>
<tr>
<td>Cooling system</td>
<td>Convection (no climatising necessary)</td>
</tr>
<tr>
<td>Temperature range to maintain</td>
<td>+5°C...+40°C (air conditioning model R14 of the Deutsche Bundespost Telekom)</td>
</tr>
<tr>
<td>Technical specifications</td>
<td></td>
</tr>
<tr>
<td>- Functionality</td>
<td>-10°C...+45°C</td>
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</tbody>
</table>

## Paint

- RAL 7032

## Cooling system

- Convection (no climatising necessary)

## Technical data

### Mains connection

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mains voltage</td>
<td>230 V -15% ... +10%</td>
</tr>
<tr>
<td>Mains frequency</td>
<td>50 Hz</td>
</tr>
</tbody>
</table>

### TV

- **RF input:**
  - Frequency: 47 ... 862 MHz
  - Level: -67 ... -27 dBm (0.1 ... 10 mV)
  - Impedance: 50 ohm
  - Return loss: ≥ 18 dB (typ. ≥ 23 dB)
- **Remote supply for antenna preamplifier:** switchable between +12 V and +24 V

### SAT input:

- **Frequency:** 950 ... 2050 MHz (2150 MHz)
- **Level:** -55 ... -25 dBm
- **Impedance:** 50 ohm
- **Return loss:** ≥ 14 dB (typ. ≥ 18 dB)
- **LNC supply:** +15 or +18 V

### Baseband output:

- **Frequency:** 0 ... 12 MHz
- **Level:** 1 Vpp
- **Impedance:** 75 ohm
- **Return loss:**
  - up to 5 MHz: ≥ 34 dB
  - up to 12 MHz: ≥ 26 dB

### Video-/Audio input:

- **Video:**
  - Frequency: 25 Hz ... 5 MHz
  - Level: 0.5 ... 2 Vpp
  - Impedance: 75 ohm
  - Return loss: ≥ 30 dB (typ. ≥ 34 dB)
- **Audio:**
  - Frequency: 40 Hz ... 15 kHz
  - Level: 0/+6 dBm related to 600 ohm
  - Impedance: 600 ohms / >12 kohm

### Video-/Audio output:

- **Video:**
  - Frequency: 25 Hz ... 5 MHz
  - Level: 1 Vpp
  - Impedance: 75 ohm
  - Return loss: ≥ 25 dB
- **Audio:**
  - Frequency: 40 Hz ... 15 kHz
  - Level: 0/+6 dBm related to 600 ohm
  - Impedance: 600 ohms / >12 kohm

### MPEG interface:

- **Format:** MPEG transport stream
- **Max. data rate:** 56 Mbits/s
- **Level:** TTL

## Radio

- **RF input:**
  - Frequency: 87.5 ... 108 MHz
  - Level for mono: -89 ... -9 dBm
  - Level for stereo: -69 ... -9 dBm
  - Impedance: 50 ohm
  - Return loss: ≥ 18 dB (typ. ≥ 23 dB)

### Audio input:

- **Frequency:** 40 Hz ... 15 kHz
- **Level:** 0 dBm / +6 dBm (600 ohm)
- **Impedance:** 600 ohm / >12 kohm

### MPX output:

- **Frequency:** 40 Hz ... 100 kHz
- **Level:** +6 dBm (600 ohm)
- **Impedance:** < 30 ohm

### System output coaxial

- **Frequency:** 47 ... 862 MHz
- **Level TV with 606 MHz output unit:** 95 dBuV/ 75 ohm
- **Level TV with 862 MHz output unit:** 93 dBuV/ 75 ohm
- **Impedance:** 75 ohm
- **Return loss at 47 MHz:** ≥ 18 dB / -1 dB/octave
- **Remote supply:** 50 V / 6 A
- **Reverse channel:**
  - **Frequency:** 5 ... 28.75 / 5 ... 60 MHz
  - **Impedance:** 50 ohm
  - **Return loss:** ≥ 25 dB

### System output for the optical transmitter

- **Level:** -32 dBm
- **Impedance:** 50 ohms
- **Return loss at 47 MHz:** ≥ 18 dB / -1 dB/octave

### Signalling and monitoring

- **Function monitoring:** LED’s, PC monitoring, Monitoring outputs, Alarm and control lines

### PC monitoring

- **Minimum configuration of the PC:** DOS 5.0, Windows 3.1
- **Communication:** Serial interface COM1/COM2
- **Data rate:** 19200 baud

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