

SW 024

24-fold return channel switch
Manual

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Chapter 1 Notes on Safety, Usage, Maintenance and Service

1.1 Safety Instructions

This instrument has been built and tested in accordance with EN 61010-1, protective measures for electronic measuring equipment. The instrument has been supplied ex works in a perfectly safe condition. To maintain this condition and to ensure a safe operation, the user has to observe the instructions and warnings included in this instruction for use.

The instrument corresponds to protection class II (protective insulation).

The instrument corresponds to protection type IP20 according to EN 60529.

The instrument must only be operated with supply voltages between 100-240 V with 50-60 Hz.

Discharges through pin-and-socket connectors may damage the instrument. During handling and operation, the instrument has to be protected against electrostatic discharge.

No external voltages higher than 70 V_{eff} must be applied to the HF input of the measuring receiver, as otherwise the input circuits may be destroyed.

1.2 Instructions for Use

The warranty for a new instrument ends 24 months after leaving the factory.

If the instrument is opened, the warranty claim becomes void!

The technical data given in the specifications apply after a warming-up phase of approx. 10 minutes and **only** if all inputs not used are terminated by 75-Ω terminating resistors and the voltage supply is connected to the instrument and it is switched on!

1.3 Maintenance of the Instrument

The instrument is maintenance-free.

1.4 Cleaning of the Instrument

The casing should be cleaned with a soft, lint-free cloth. Never use solvents such as cellulose thinners, acetone and the like, as otherwise the front panel or the input labeling on the back might be damaged.

1.5 Service

The service address is given on the back cover of this instruction manual.

1.6 Application

The reverse channel switch SW 024 can only be operated together with the AMA 310/UMS. A stand-alone operation or a communication with another head-end, measuring or USB unit is **not** provided.

Chapter 2 Technical Data

FREQUENCY RANGE

$US_{IN,i}$ [$i = 1 \dots 24$]	5 – 67 MHz
US_{OUT}	4.32 – 65.76 MHz
DS_{IN}	45 – 1218 MHz

INTERFACES

24 x US_{IN}	F Socket / 75 Ohm (IEC 60169-24)
1 x DS_{IN}	F Socket / 75 Ohm (IEC 60169-24)
1 x RF_{OUT}	F Socket / 75 Ohm (IEC 60169-24)
1 x USB_{IN}	USB-B Jack; Protocol: KWS proprietary, not USB compliant

UPSTREAM INPUTS

RF Level (nominal)	per Modem- or Signaling Channel	60 – 75 dB μ V
RF Sum Level	per Upstream Input	≤ 90 dB μ V
Transmission Loss	$US_{IN,i} \rightarrow RF_{OUT}$	< 4.5 dB (up to 65 MHz)
Transmission Loss Sum Path	$US_{IN,i} \rightarrow RF_{OUT}$	< 3.8 dB (up to 65 MHz)
Isolation	$US_{IN,i} \rightarrow RF_{OUT}$	> 70 dB (up to 65 MHz)
Isolation	$US_{IN,i} \rightarrow US_{IN,j}$	> 70 dB (up to 65 MHz)
Return Loss	$US_{IN,i}$ active	> 12 dB (up to 65 MHz)
Return Loss	$US_{IN,i}$ active	> 18 dB (up to 65 MHz)
External Voltage		< 70 V $_{eff}$ (DC – 50 Hz)

DOWNSTREAM INPUT

Level (nominal)	per TV channel	$\leq 120 \text{ dB}\mu\text{V}$
Transmission Loss	$\text{DS}_{\text{IN}} \rightarrow \text{RF}_{\text{OUT}}$	$< 1.0 \text{ dB}$ (up to 868 MHz) $< 1.1 \text{ dB}$ (up to 1002 MHz) $< 1.2 \text{ dB}$ (up to 1218 MHz)
Return Loss	DS_{IN} active	$> 12 \text{ dB}$ (up to 868 MHz) $> 12 \text{ dB}$ (up to 1002 MHz) $> 12 \text{ dB}$ (up to 1218 MHz)
Isolation	DS_{IN} inactive \rightarrow RF_{OUT}	$> 75 \text{ dB}$ (up to 204 MHz) $> 60 \text{ dB}$ (up to 868 MHz) $> 56 \text{ dB}$ (up to 1002 MHz) $> 52 \text{ dB}$ (up to 1218 MHz)
RF Sum Power	$\text{US}_{\text{IN},i}$	$< 500 \text{ mW}$
External Voltage		$< 70 \text{ V}_{\text{eff}}$ (DC – 50 Hz)

RF OUTPUT

Return Loss		$> 12 \text{ dB}$ ($\text{US}_{\text{IN},i}$ active) $> 12 \text{ dB}$ (DS_{IN} active)
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MIXER

Mixing of the signalization of the field units VAROS 107 in UMS measurement mode

Dual-Conversion Architecture

Input Frequency		5 – 65 MHz
Intermediate Frequency (IF)		433.92 MHz
Target Frequency		4.5 MHz
Mixer Bandwidth	-3 dB	120 kHz

MISCELLANEOUS

User Display	26 x LED red	Power; $\text{US}_{\text{IN},1} - \text{US}_{\text{IN},24}$; DS_{IN}
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POWER SUPPLY	
	Built-in primary Power Supply Unit
Mains Connector	Plug in Accordance with IEC-60320-C8
Mains Voltage	100 – 120 VAC, 200 – 240 VAC, 50 – 60 Hz
Power Consumption	Max. 10 W

ENVIRONMENTAL CONDITIONS	
Operating Temperature	0 °C – +45 °C
Storage Temperature	-10 °C – +55 °C
Humidity	10 % – 90 % (non-condensing)

ELECTROMAGNETIC COMPATIBILITY	per EN 61326-1
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PROTECTION	per EN 61010-1
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DIMENSIONS	approx. W: 440 mm, H: 44.45 mm, D: 275 mm (19" / 1 RU / without clamping angle)
	approx. W: 483 mm, H: 44.45 mm, D: 275 mm (19" / 1 RU / with clamping angle)

WEIGHT	approx. 3.5 kg
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QUANTITY OF DELIVERY	
Included in the delivery	F patch cable (75 Ohm, to connect SW 024 to AMA 310/UMS)
	USB patch cable (USB-B → USB-A, to connect SW 024 to AMA 310/UMS)
	User Manual
	Power Cable
	2 pieces clamping angle for 19" rack mounting
	8 pieces M4 x 8 mm crosshead screws

Chapter 3 Control and Connection Elements, Pin Configurations

3.1 Front Panel

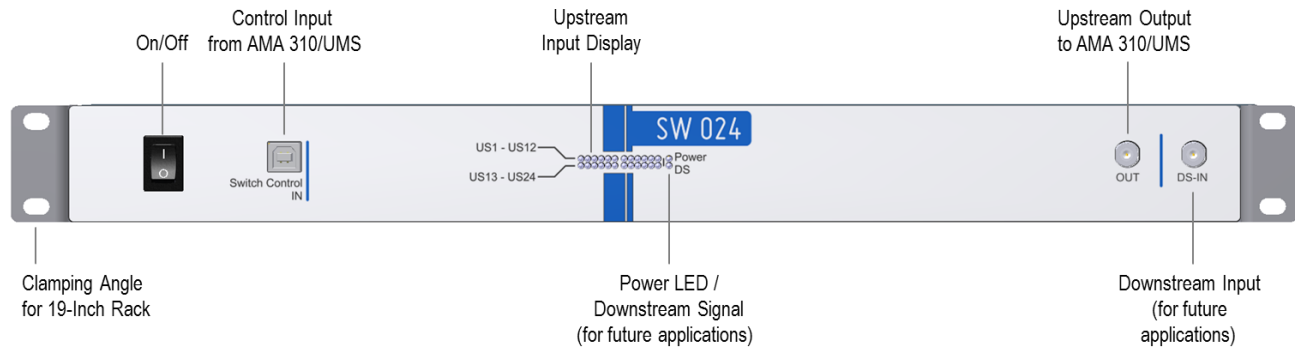


Figure 3-1 Front Panel USB-B-Interface (Control Input from the AMA 310/UMS)

Physically this interface is a USB-B connector.

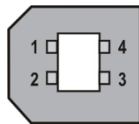


Figure 3-2 USB-B connector

The report used and the assignment of the 4 pins of the interface are KWS proprietary. Therefore, it is not possible to access the instrument by standard USB units (e.g. PC, notebook).

The SW 024 switch is to be connected to the AMA 310/UMS by the USB patch cable included in delivery or by any other USB cable (USB-A on USB-B).

3.2 Rear Panel

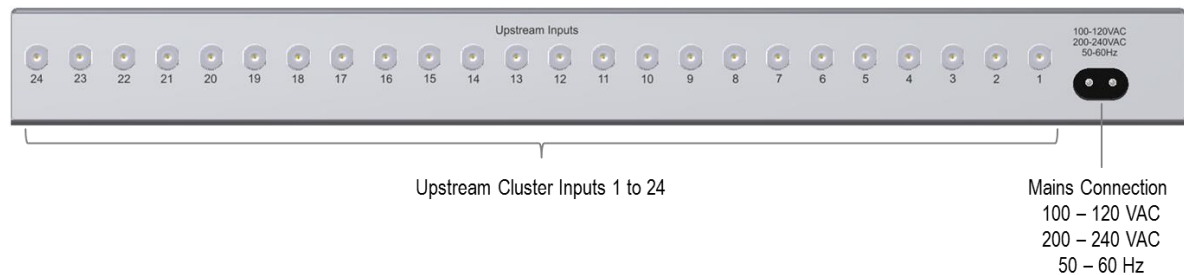


Figure 3-3 Rear Panel

Chapter 4 Initial Operation

4.1 Mains Operation

The mains connection is situated on the back of the instrument. The return path switch is operated by the two-pole mains cable connected to power. The instrument has protection class II (protection insulation).

Caution! During installation (e.g. installing the instrument in a 19" rack) the instrument always has to be disconnected from the supply voltage.

4.2 Assembly of the 19" Installation Angles

In case the switch SW 024 is to be installed in a 19" rack, the angles included in delivery have to be mounted on both sides of the instrument first:

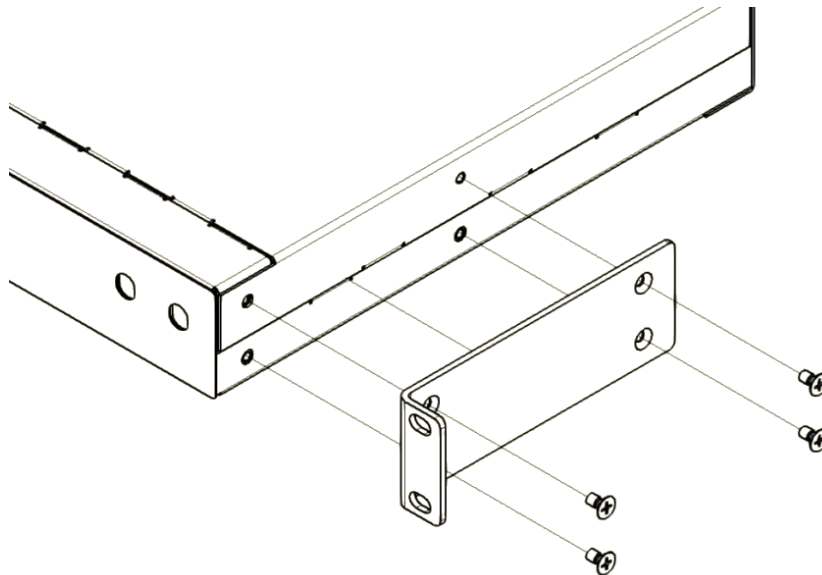


Figure 4-1 Assembly of 19" installation angles

The assembly shall be made by means of the M4 crosshead screws included in the delivery. Each angle has to be fixed on the casing with 4 screws as shown above. The screws have to be tightened firmly.

4.3 Connection to the AMA 310/UMS

The switch SW 024 is to be connected to the AMA 310/UMS via two lines.

The output "Switch Control OUT" of the AMA 310/UMS is to be interconnected with the input "Switch Control IN" of SW 024 by the USB cable supplied. The front output "OUT" of SW 024 is to be connected to the HF input "RF-IN" of the AMA 310/UMS by the F cable bridge supplied.

The length of both cable bridges is designed for the standard arrangement provided, here the SW 024 is placed below the AMA 310/UMS or mounted in the 19" rack. In case another assembly is used, longer cables may be chosen, but make sure that the HF connection is always as short as possible such that the calibration is not falsified.

4.4 Connection of the Upstreams to be Switched

At the rear panel inputs (upstream inputs in **Fehler! Verweisquelle konnte nicht gefunden werden.**) up to 24 upstream signals (e.g. different clusters or different US inputs from CMTS line cards) may be connected.

Make sure that all F-connectors connected will be tightened sufficiently (with a torque wrench where required).

Caution! All upstream inputs used have to be terminated with 75- Ω terminating resistors. The technical data stated only apply if all upstream inputs are connected to a 75 Ω network (e.g. HFC net) or terminated.

4.5 Downstream Input

For regular operation, the DS input also has to be terminated. See chapter 5.4 Downstream Measurement for further information.

4.6 Switch-On

When the instrument is connected to the mains power supply and switched on by an ON/OFF switch, the red power LED on the front panel lights up. In the basic condition also the Downstream LED (DS-LED) is on. This operating mode has been provided for future applications and in combination with the current version of the AMA 310/UMS they are not applicable.

Caution! In combination with the AMA 310/UMS the HF Switch SW 024 has to be switched on BEFORE the AMA 310/UMS!

Depending on the operating mode (see Chapter 5) provided by AMA 310/UMS in regular operation, no further LEDs are on in addition to the Power LED, the DS-LED or one of the US LEDs.

Caution! The specifications listed in Chapter 2 Technical Data only apply if the instrument is connected to the mains and switched on.

Without a mains power supply the decoupling of the individual upstream inputs among each other deteriorates significantly!

Chapter 5 Operation and Operating Modes

After successful installation and during the ongoing return path monitoring operation no control of the SW 024 by the operator is required. All adjustments regarding the instrument will be made by the operator at the AMA 310/UMS (see relevant operating instructions). During operation the SW 024 will be controlled by AMA 310/UMS via the control interface (USB, proprietary).

Below you will find a short description of the major operating modes. For detailed information we refer to the manual of AMA 310/UMS as well as the Application Note AN006 "Upstream-Monitoring-System UMS" (www.kws-electronic.de → "SUPPORT" → "Application Notes").

5.1 Operating Mode Selective Measuring

In this mode an upstream input channel is connected through from the AMA 310/UMS to the output. Apart from the power LED the LED of the relevant input channel is on. Extensive communication and remote control of the measuring system can only be done by field instruments in the cluster connected through. The possibility of basic communication with the measuring system also for field instruments from other clusters than the cluster connected through is possible at any time via the mixing path (see chapter 5.3 Mixing Path).

5.2 Operating Mode Summation Measurement

In this mode a signal consisting of the sum of all 24 inputs is led to the output of SW 024. Only the power LED is on. In the summation mode the basic noise measured at the AMA 310/UMS is higher than in the selective measuring mode. The summation mode is always activated by the UMS measuring system on the SW 024 if currently no field instrument requests a cluster-selective measurement. AMA 310/UMS receives all signaling information from all field instruments without any limitation.

5.3 Mixing Path

In order to enable field instruments to transmit signaling information to the headend unit AMA 310/UMS even if the field instrument is located in another cluster (and/or connected to another input) than the one which is currently set for an exclusive measurement, a mixer in the SW 024 transforms a certain signaling frequency of all inputs to a frequency (4.5 MHz) below the return path range. This frequency may be configured in the headend unit AMA 310/UMS and will always be received and utilized by it. The activation of the mixing path is also done automatically and requires no adjustment at the SW 024 by the operator.

5.4 Downstream Measurement

The DS measuring mode has been provided for future applications and currently it is not yet supported by the overall system. The DS measuring mode is the basic state of SW 024, the power LED and the DS LED are on. The SW 024 is in this mode if no AMA 310/UMS is connected to the SW 024 or if the measuring instrument is switched off or if it is in another mode than active UMS measurement.

Chapter 6 Instrument Management

The instrument management of the SW 024 runs exclusively via the AMA 310/UMS.

6.1 FPGA Version Readout

To read out the FPGA version of the SW 024, the switch has to be connected to the AMA 310/UMS by the USB patch cable and both units have to be switched on. The AMA 310/UMS has to be in the basic state (see operating instructions of AMA 310/UMS).

By the key combination **MODE** → **SERVICE** → **HARDWARE** the version numbers of all configurable boards in the instrument will be read. By the soft key **>>>** (i.e. by the **F4 key**) the last menu page may be chosen. Here the FPGA version of the SW 024 may now be read behind the item "SWITCH-MATRIX 261L48".

HARDWARE				
WREG-DECODER	258L28:	FPGA V01.00	DSP V01.01	
DSP-MODUL	251L47:	FPGA V01.01	ARM V02.02	
SWITCH-MATRIX	261L48:	FPGA V01.00		
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Figure 6-1 Retrieval of the FPGA Version of the SW 024

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