RSWM-8X8R

High-Dynamic Non-Blocking 8X8 Switching Matrix 100 kHz … 4000 MHz

Features

- high dynamic
- high isolation
- non-reflective
- compact 19” 1U design
- graphical user interface

Applications

- radio monitoring
- spectrum monitoring
- COMINT / SIGINT

At a Glance

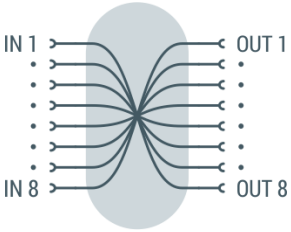
Modern radio monitoring systems need an unrestricted access to many antennas from a variety of receivers. By using the non-blocking architecture of RSWM, specialized and general-purpose receivers can be used alongside each other and chose any of the available antennas without interference between the receivers.

The high linearity and low noise figure of the device ensure the best signal integrity from the antenna to the receiver. Low cross-talk enables the reception of weak signals on one antenna even in the presence of strong signals on a different antenna.

The large bandwidth covers most commercial communication bands, especially those travelling long distances. These include short-wave transmission at one end and private 4G/5G bands at the other end.

Principal Block Diagram

The RSWM-8X8R features eight equivalent inputs and eight equivalent outputs interconnected via a non-blocking matrix. A single input can route to multiple outputs without any loss of signal transmission.



Wear-free Solid-State Switches

The RSWM-8X8R incorporates modern solid-state switching elements, guaranteeing rapid response to operational inputs and an unlimited number of switching cycles with minimal maintenance requirements.

High Channel Isolation

To prevent unintentional signal coupling between different signal types, the device provides high channel isolation. Strong and weak signals in adjacent radio channels do not affect each other.

Versatile Control

The RSWM-8X8R is equipped with multiple control options for user convenience. It features a local MMI on the front panel, as well as LAN and USB interfaces. Depending on the customer's needs, the system can be managed using the intuitive web-based graphical user interface or through SCPI-based ASCII commands via its interface ports.

Synchronous Operation

The RSWM-8X8R offers two switching modes:

- Direct: every switching operation is executed after reception of the command.
- Synchronous: all switching commands are stored until a "SYNC" command executes the switching operation synchronously.

External Triggering

Similar to several other products from Becker Nachrichtentechnik GmbH, the RSWM-8X8R includes a TRIGGER IO port. This physical interface enables the device to execute switching operations synchronously across multiple matrices, triggered by hardware signals.

Optional High Pass Filter

The RSWM can be equipped with an optional high-pass filter designed to attenuate unwanted low-frequency (LF) and high-frequency (HF) signals, such as those from local AM radio stations.

Filters for Short Wave

To enable operation in short-wave applications up to 30 MHz, the variant covering 100 kHz to 4000 MHz can be enhanced with externally mounted bandpass filters. These filters effectively suppress out-of-band signals in the VHF and UHF ranges, preventing unintentional distortions within the short-wave frequency range. They can be easily attached to the RF input socket of the RSWM.

RF Specification

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Impedance	Z_{IN}/Z_{OUT}		50		Ω	
number of inputs	N_{IN}		8			
number of outputs	N_{OUT}		8			
low frequency	f_{MIN}		100	300	kHz	
low frequency	f_{MIN}			20	MHz	variant with VLF HF suppression
high frequency	f_{MAX}	4000	4500		MHz	
VLF / HF suppression	S_{21}		-19	-15	dB	@ 5 MHz rel. 100 MHz variant with VLF HF suppression
gain	S_{21}	-1	2	5	dB	f < 1 GHz
	S_{21}	-3	0	3	dB	f ≥ 1 GHz
input return loss	S_{11}		-15	-10	dB	
output return loss	S_{22}		-15	-10	dB	f ≤ 3 GHz
	S_{22}		-12	-7	dB	f > 3 GHz
1 dB compression	P_{1dB}	+4	+7		dBm	500 kHz ≤ f ≤ 1 GHz
	P_{1dB}	+2	+4		dBm	1 GHz < f ≤ 3 GHz
	P_{1dB}	-6	-1		dBm	f > 3 GHz
reverse isolation	S_{12}		-80		dB	
3rd order intercept	OIP3	+22	+27		dBm	500 kHz ≤ f ≤ 1 GHz
		+12	+17			1 GHz < f ≤ 3 GHz
		-2	+10			f > 3 GHz
noise figure	NF		9	11	dB	f ≥ 5 MHz
channel isolation	S_{32}		-80	-70	dB	f ≤ 3 GHz
output isolation	S_{12}			-30	dB	
RF input power	P_{RF}			+15	dBm	no damage
maximum DC voltage	U_{DC}			15	V	all RF ports
ESD discharge resistor	R_{ESD}		4.7		kΩ	all RF ports
RF connectors	X_{RF}		SMA female			
trigger input	X_{TRIG}		BNC female			internal 1 kΩ pull up, active high
trigger level	u_{TRIG}		TTL (0 / 5 V)			
trigger offset	t_{O_FALL}		6.5		µs	50% trigger → 50% RF falling edge, note 2
	t_{O_RISE}		1.1		µs	50% trigger → 50% RF rising edge, note 2
switch rise time	t_{RISE}		1		µs	10% → 90% RF
switch fall time	t_{FALL}		2		µs	90% → 10% RF

Note 1: tested at P_{out} 2 x -10dBm; Δf = 2 MHz

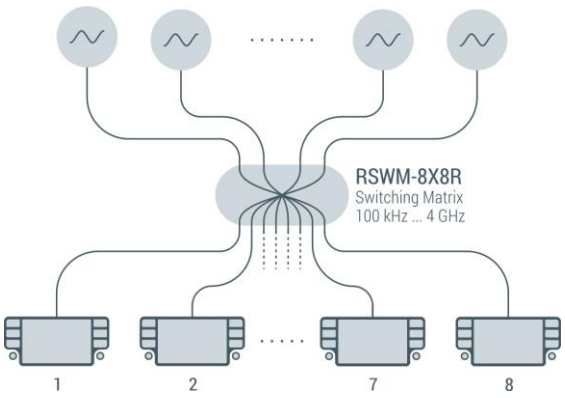
Note 2: capacitive load at 'TRIGGER IO' Port ≤ 100pF, trigger mode "OUT"

Common Specification

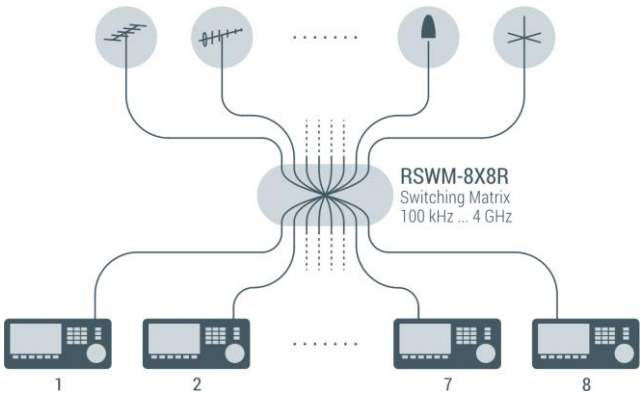
Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
power supply	U_{AC}	90	230	260	V	50 / 60 Hz AC
power consumption	P_{AC}		100		W	
power socket	X_{AC}	IEC-60320 C14				country specific mains cable
remote ports	LAN	10/100 BaseT		TCP/IP		RJ45 on rear side
	USB	2.0 (high speed)				USB type B
Dimensions and weight						
dimensions	W x H x D	approx. 482 x 44 x 455			mm	19” 1U, without connectors and handles
weight	m		5		kg	
Environment conditions						
operating temp. range	T_o	+5		+45	°C	
storage temp. range	T_s	-40		+70	°C	
Product conformity						
Electromagnetic compatibility	EU: in line with EMC directive (2014/30/EC)					applied harmonized standards: EN61326-2-1, (for use in control and laboratory environments), EN55035, EN55032, EN61000-3-2, EN61000-3-3
Electrical safety	EU: in line with low voltage directive (2014/35/EC)					applied harmonized standard: EN 61010-1
Ordering information	RSWM-8X8R		2103.4502.1			
	RSWM-4X4R		2103. 4502.2			variant with VLF HF suppression 20 MHz…4000 MHz

Application Examples

The RSWM-8X8R is versatile, catering to radio monitoring applications and research and development test environments. With the RSWM products, customers can easily route input signals to any device output. As illustrated, the input can be connected to various signal sources or antennas:



Car Infotainment Test with different GNSS Position Data

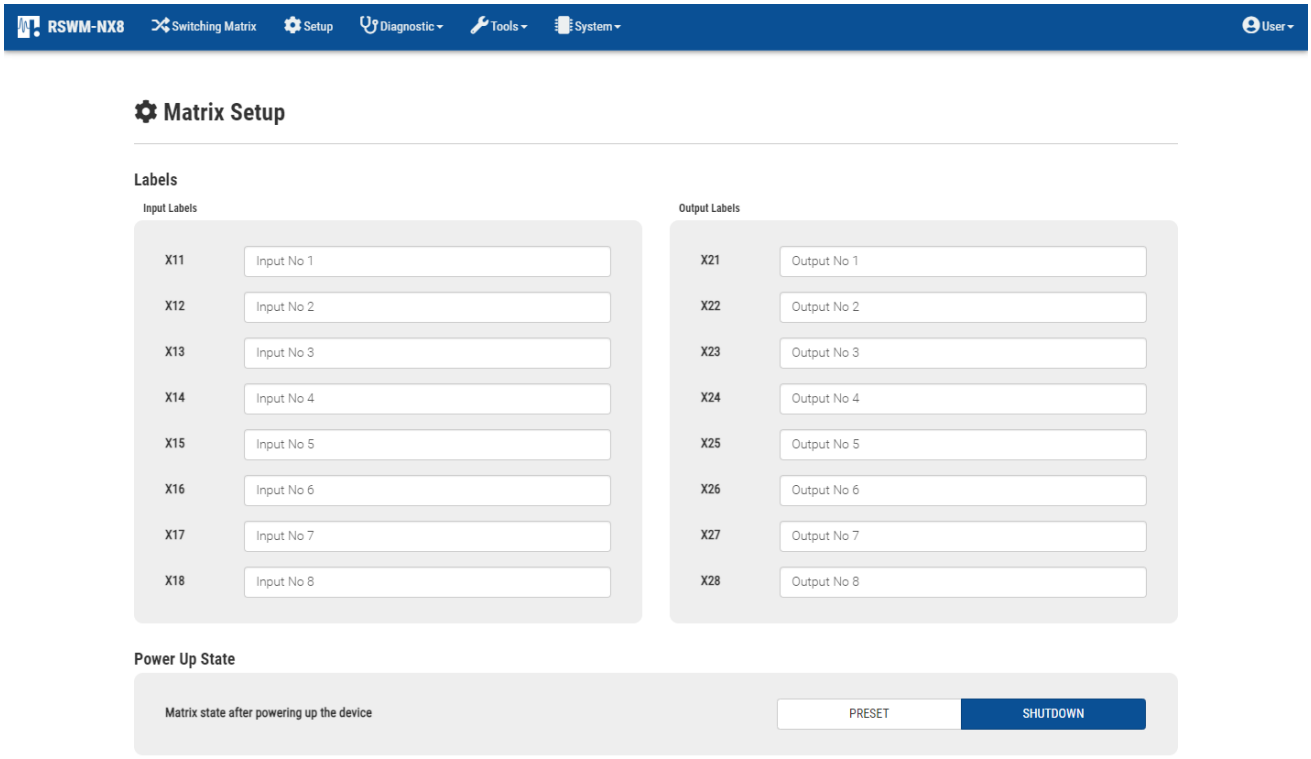


Wideband Radio Monitoring

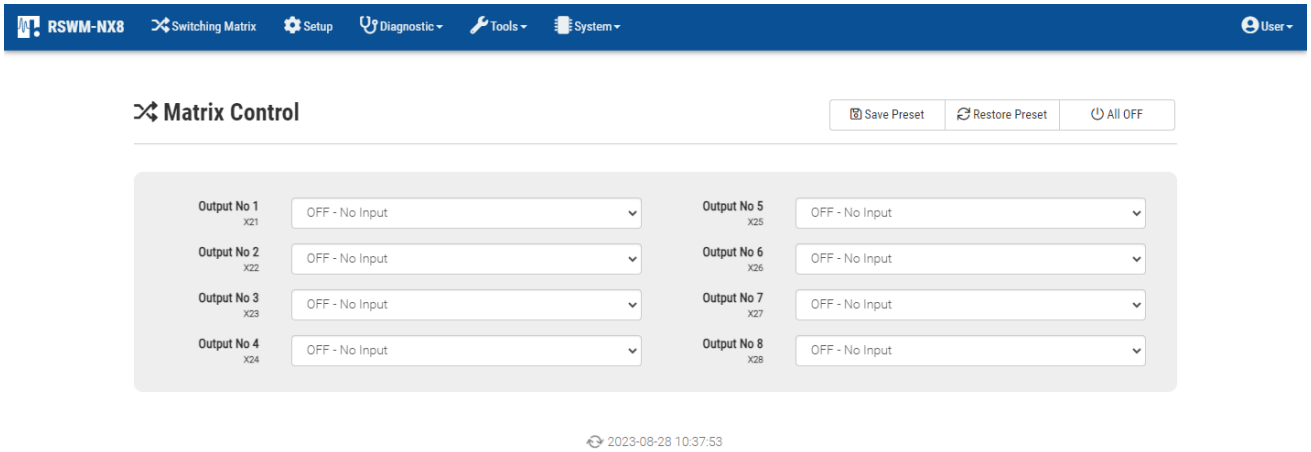
Graphical User Interface

The graphical user interface (GUI) enables users to define custom labels tailored to their specific applications, making input selection more contextually meaningful.

Matrix Setup Interface

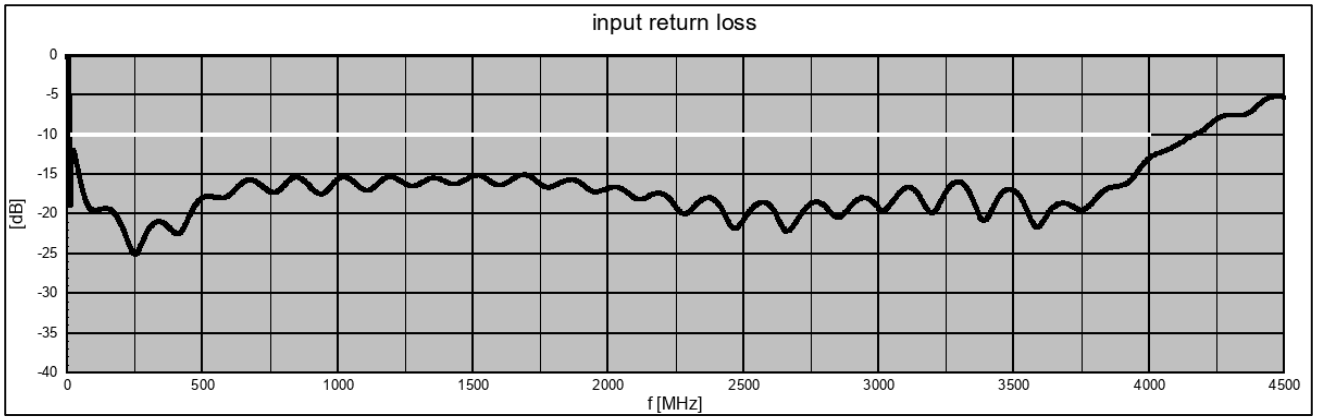


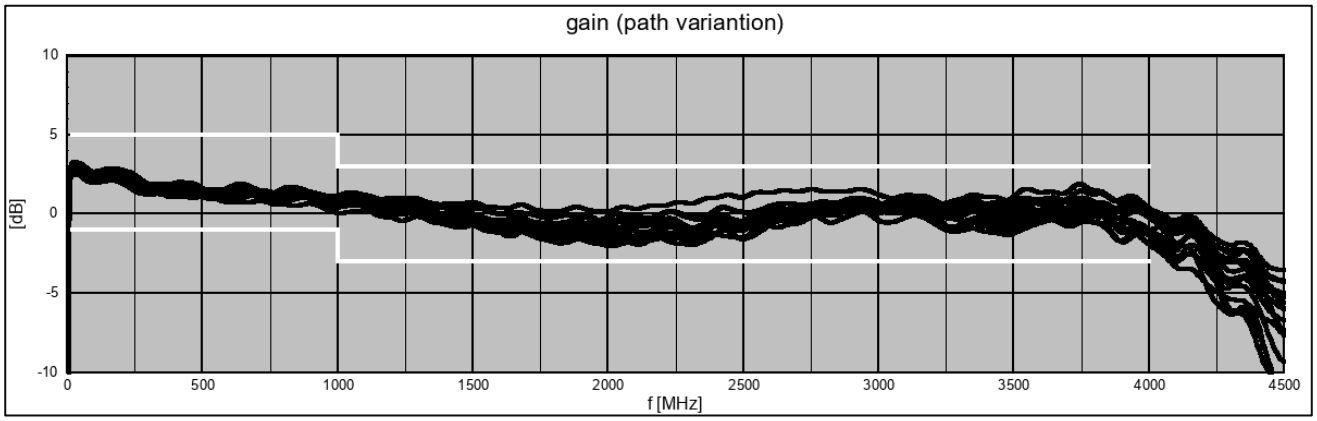
Matrix Control Interface

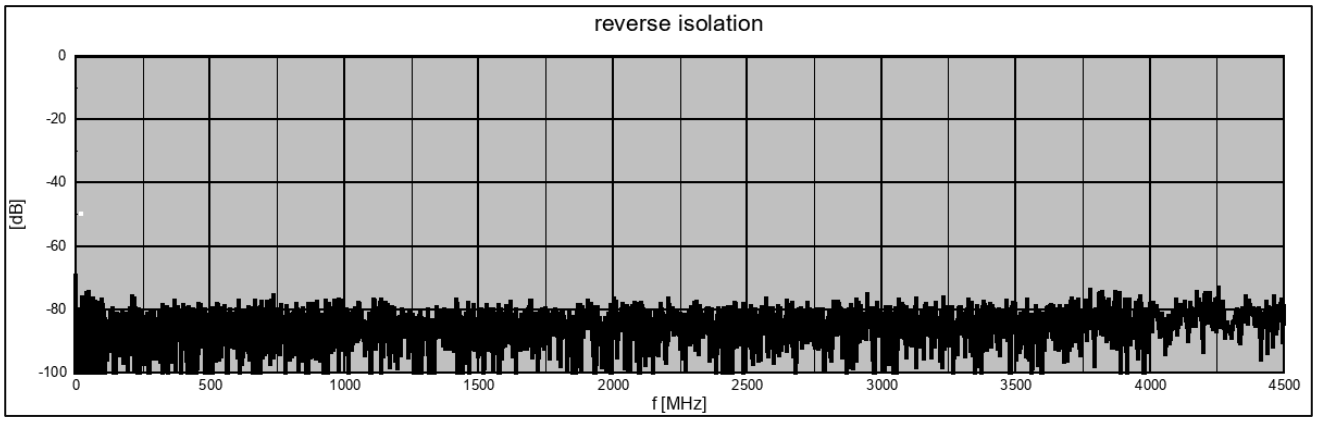


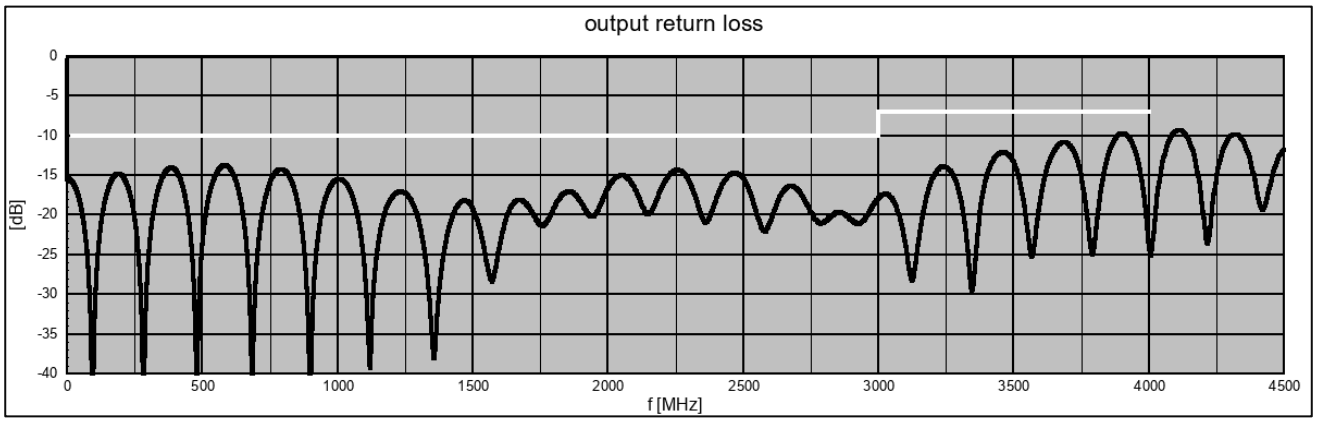
S-Parameters

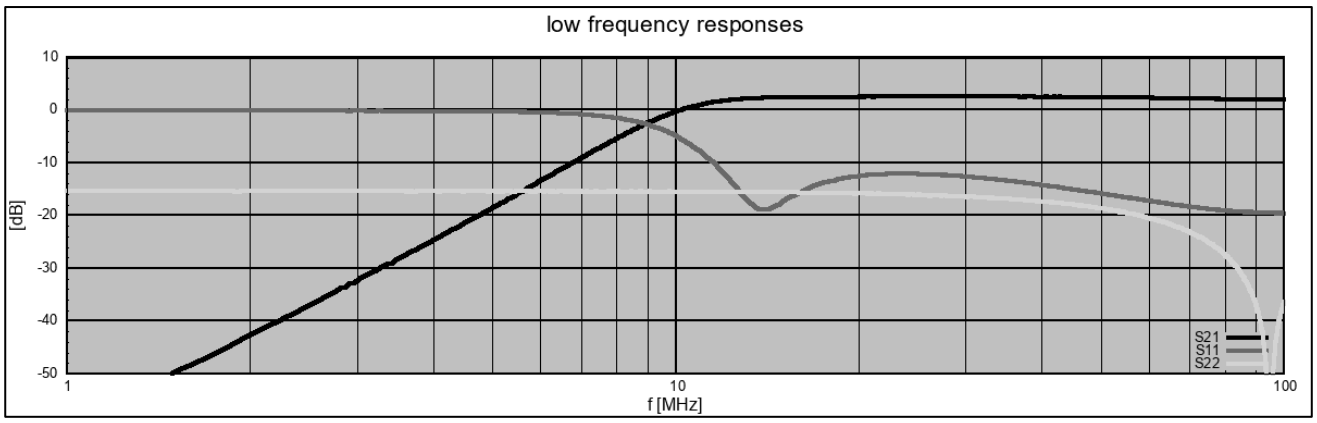
typical responses





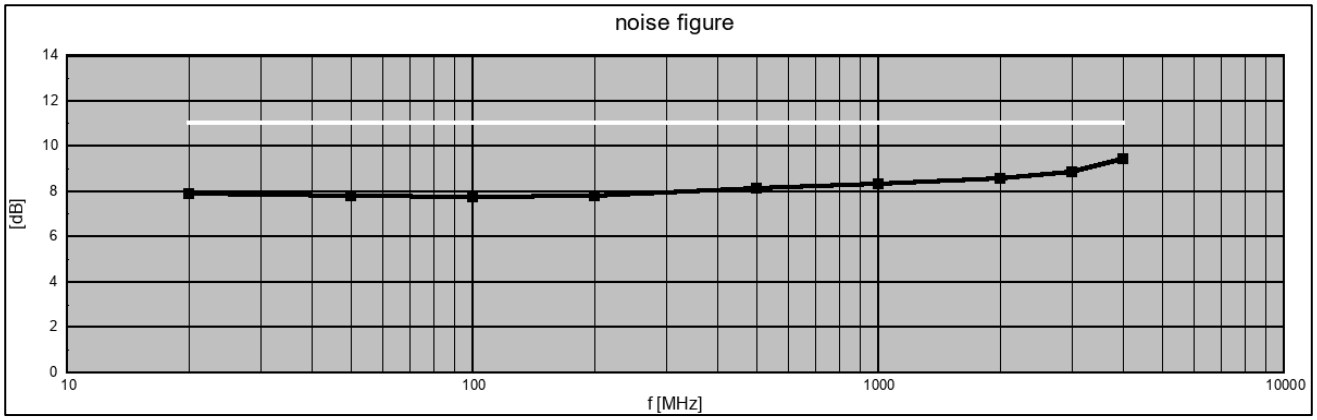


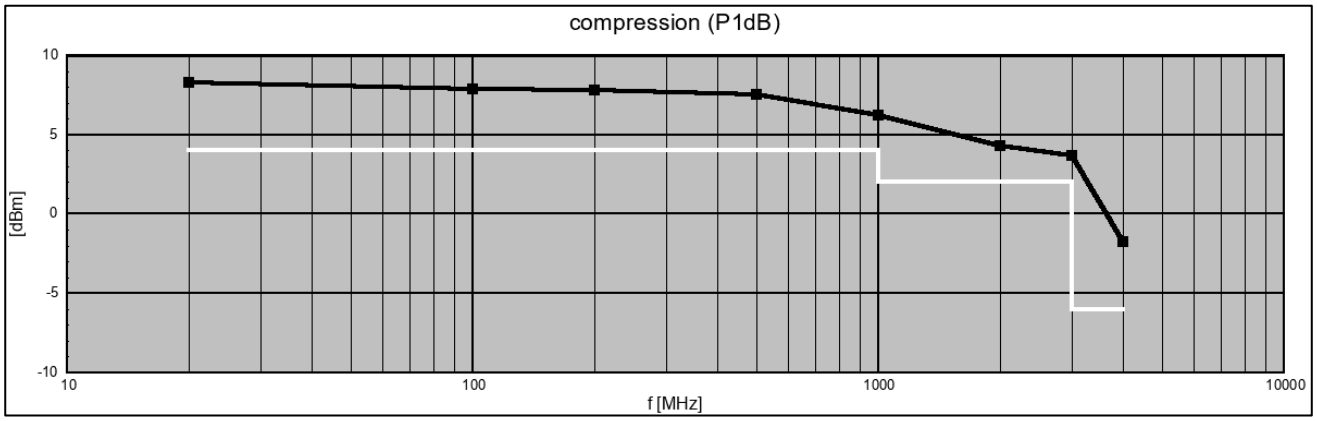


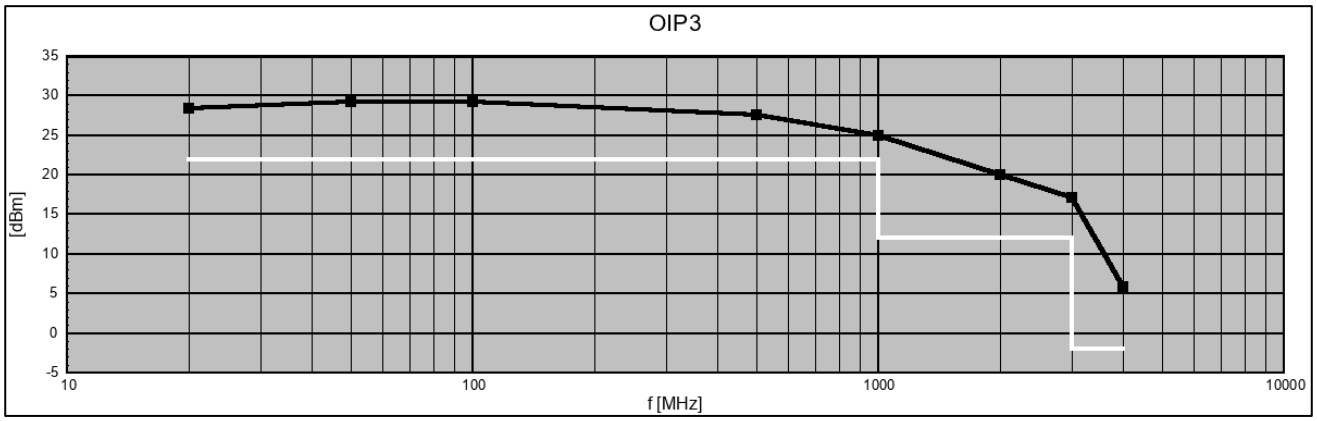

low frequency responses
10
0
-10
-20
-30
-40
-50
[dB]
1
10
100
f [MHz]
S21
S11
S22

Dynamic Range

typical responses







Appearances

Front View

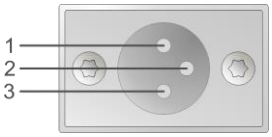
Rear View

Variant with AC-Supply

Variant with DC-Supply

DC Variant Pin Assignment

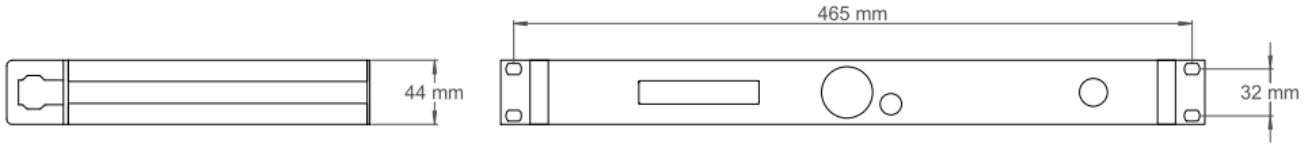
Pin	Assignment
1	DC -
2	not connected
3	DC +(12…27 V), 1 A typ., 4 A max.



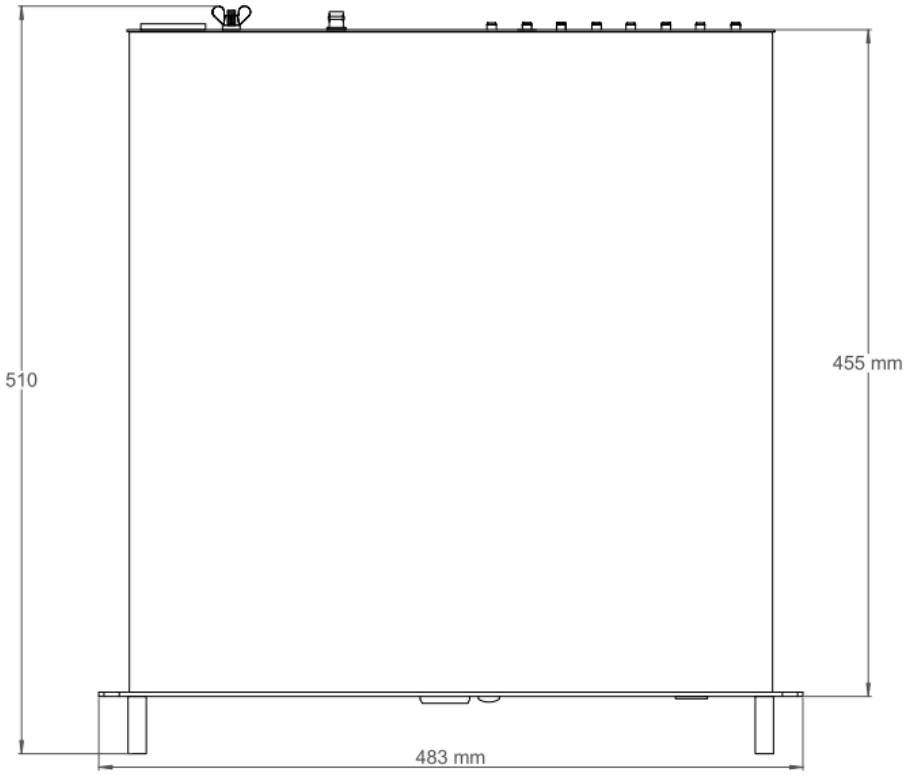
Appearance of external mountable filter

Filters for short wave with different bandwidths are available. See table related products.

Dimensions



all dimensions in mm
± 2 mm



Related Products

External filters for short wave applications

Product	P/N	Description
BP-0M5_30M	1502.6301.1	Band Pass Filter Module 0.5 … 30 MHz 90 V surge arrestor and 100 kΩ ESD resistor to GND at input, level limiter, stop band rejections: 30 dB typ. f < 400 kHz, 45 dB typ. 80 MHz ≤ f ≤ 200 MHz, N RF connectors (male / female)
BP-1M0_30M	1502.6311.1	Band Pass Filter Module 1.0 … 30 MHz 90 V surge arrestor and 100 kΩ ESD resistor to GND at input, level limiter, stop band rejections: 30 dB typ. f < 800 kHz, 45 dB typ. 80 MHz ≤ f ≤ 200 MHz, N RF connectors (male / female) R&S P/N: 3663.7171.02
BP-1M7_30M	1502.6321.1	Band Pass Filter Module 1.7 … 30 MHz 90 V surge arrestor and 100 kΩ ESD resistor to GND at input, level limiter, stop band rejections: 30 dB typ. f < 1.3 MHz, 45 dB typ. 80 MHz ≤ f ≤ 200 MHz, N RF connectors (male / female)
LP-30M	1107.6301.1	30 MHz Low Pass Filter Module Passband DC…30 MHz 90 V surge arrestor and 100 kΩ ESD resistor to GND at input, level limiter, stop band rejection: 45 dB typ. @ 80 MHz ≤ f ≤ 200 MHz, N RF connectors (male / female)

Related Products

Further switching matrices

Product	P/N	Description
RSWM-4X4LR	1205.4402.X	Wideband Non-Blocking 4X4 Switching Matrix 100 kHz … 4000 MHz LAN remote interface with SNMPv2 trap function
RSWM-4X8LR	2103.4452.X	Wideband Non-Blocking 4X8 Switching Matrix 100 kHz … 4000 MHz LAN remote interface with SNMPv2 trap function
RSWM-8X8LR	2103.4552.X	Wideband Non-Blocking 8X8 Switching Matrix 100 kHz … 4000 MHz LAN remote interface with SNMPv2 trap function
RSWM-4X4R	1205.4102.X	High-Dynamic Non-Blocking 4X4 Switching Matrix 100 kHz … 4000 MHz LAN remote interface with SNMPv2 trap function
RSWM-4X8R	2103.4302.X	High-Dynamic Non-Blocking 4X8 Switching Matrix 100 kHz … 4000 MHz LAN remote interface with SNMPv2 trap function
RSWM-8X8R	2103.4502.X	High-Dynamic Non-Blocking 8X8 Switching Matrix 100 kHz … 4000 MHz LAN remote interface with SNMPv2 trap function
RSWM-4X4ER	1205.4202.X	Extremely Wideband Non-Blocking 4X4 Switching Matrix 20 … 8000 MHz LAN remote interface with SNMPv2 trap function
RSWM-4X8ER	2103.4402.X	Extremely Wideband Non-Blocking 4X8 Switching Matrix 20 … 8000 MHz LAN remote interface with SNMPv2 trap function
RSWM-8X8ER	2103.4602.X	Extremely Wideband Non-Blocking 8X8 Switching Matrix 20 … 8000 MHz LAN remote interface with SNMPv2 trap function
BSWM-4X4ER	1205.4502.X	4X4 Bidirectional Blocking Wideband Switching Matrix 100 kHz … 8000 MHz LAN remote interface with SNMPv2 trap function
BSWM-4X8ER	2103.4702.X	4X8 Bidirectional Blocking Wideband Switching Matrix 100 kHz … 8000 MHz LAN remote interface with SNMPv2 trap function
BSWM-8X8ER	2103.4802.X	8X8 Bidirectional Blocking Wideband Switching Matrix 100 kHz … 8000 MHz LAN remote interface with SNMPv2 trap function