RSWM-4X4R

Wideband Non-Blocking 4X4 Switching Matrix 100 kHz … 4000 MHz

Features

- high dynamic
- high isolation
- non-reflective
- compact 19”, 1 U design
- two frequency configurations
- graphical user interface

Applications

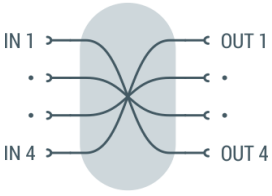
- radio monitoring
- infotainment test
- research & development (R&D)
- test equipment

At a Glance

Modern signal routing systems need an unrestricted access to different signal sources like antennas or signal generators. In receiving systems the large amount different analogue and digital modulated signals like broadcast, cellular, Wi-Fi, ISM and Bluetooth need high linearity for a low distorted transmission. Additionally a low noise figure is very important for a high dynamic range. The RSWM-4X4R is an innovative and efficient solution for modern radio monitoring and signal routing systems that must cover the frequency range to more than 4 GHz. To enable a free access to many signal sources like antennas or signal generators it offers a non-blocking switch system which allows the combination of any input with every output in a flexible and easy way.

Principal Block Diagram

The RSWM-4X4R has 4 equivalent inputs and 4 equivalent outputs interconnected with a non-blocking matrix. Furthermore one input can route to several outputs without any loss of transmission.



Wear-free Solid-State Switches

Inside the RSWM-4X4R modern solid state switching elements are integrated. This ensures a quick response to operating inputs and a huge number of switching cycles with a minimum of maintenance.

High Channel Isolation

To avoid unintended coupling between different types of signals the device offers a high channel isolation. Adjacent radio channels with strong and weak signals have no influence to each other.

Versatile Control

To control and operate with RSWM-4X4R the device is equipped with a local MMI on the front panel as well as LAN and USB interfaces. Suitable to the customer’s application the user is able to manage the system either through the associated and intuitive web-based user interface or with SCPI-based ASCII-commands via its interface ports.

Synchronous Operation

The RSWM-4X4R offers two switching modes:

- Direct switch execution after receiving single commands.
- Common synchronous switching after executed by a SYNC command.

In synchronous mode all upcoming switching operations are done only after receiving a SYNC command.

External Triggering

Like many other products of Becker Nachrichtentechnik GmbH, the RSWM-4X4R offers a TRIGGER IO port. Due to the physical interface the device features a synchronous execution of switching operations in a compound of many matrices, triggered by hardware.

Frequency Configurations

The RSWM-4X4R is available in two frequency configurations optimized for different applications:

- 20 MHz … 4000 MHz for V/UHF applications and
- 100 kHz … 4000 MHz for broadcast applications

To suppress unintended LF and HF signals from e.g. local AM radio stations the 20 MHz … 4000 MHz model is equipped with high pass filters in each input.

The higher bandwidth model 100 kHz … 4000 MHz covers the whole frequency range - including AM - for a full transmission of broadcast signals including GNSS in signal routing applications.

Filters for Short Wave

For operation in short wave applications up to 30 MHz, the variant 100 kHz … 4000 MHz can be equipped with external mounting bandpass filters. These are able to effectively supress out-of-band signals in VHF and UHF range. This avoids unintentional distortions in short-wave frequency range.be easily mounted on the RF input socket of the RSWM-4X4R.

RF Specification

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Impedance	Z_{IN}/Z_{OUT}		50		Ω	
number of inputs	N_{IN}		4			
number of outputs	N_{OUT}		4			
low frequency	f_{MIN}		100	300	kHz	variant without VLF HF suppression
high frequency	f_{MAX}	4000	4500		MHz	
low frequency	f_{MIN}			20	MHz	variant with VLF HF suppression
high frequency	f_{MAX}	4000	4500		MHz	
VLF / HF suppression	S_{21}		-25	-15	dB	@ 5 MHz rel. 100 MHz
gain	S_{21}	-2	2	3	dB	f < 1 GHz
	S_{21}	-2	0	2	dB	f ≥ 1 GHz
input return loss	S_{11}		-13	-8	dB	f ≤ 2 GHz
	S_{11}		-10	-5	dB	f > 2 GHz
output return loss	S_{22}		-17	-12	dB	f ≤ 2 GHz
	S_{22}		-15	-10	dB	f > 2 GHz
1 dB compression	P_{1dB}	+5	+8		dBm	500 kHz ≤ f ≤ 1 GHz
	P_{1dB}	+3	+7		dBm	1 GHz < f ≤ 3 GHz
	P_{1dB}	-2	+3		dBm	f > 3 GHz
reverse isolation	S_{12}		-60	-50	dB	
3rd order intercept	OIP3	+18	+26		dBm	1 MHz ≤ f ≤ 2 GHz, note 1
2nd order intercept	OIP2	+30	+48		dBm	1 MHz ≤ f ≤ 1 GHz, note 1
noise figure	NF		7	10	dB	f ≥ 5 MHz
channel isolation	S_{32}		-80	-45	dB	
output isolation	S_{12}		-35	-30	dB	
RF input power	P_{RF}			+15	dBm	no damage
maximum DC voltage	U_{DC}			20	V	all RF ports
ESD discharge resistor	R_{ESD}		4.7		kΩ	all RF ports
RF connectors	X_{RF}		N female			
processing time	t_{SW}		15		ms	between two switching commands
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

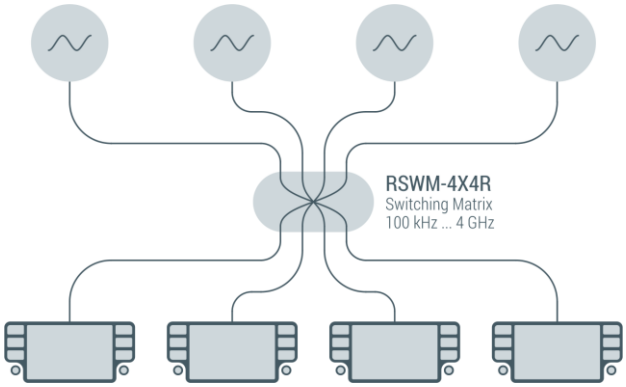
Note 2: capacitive load at 'TRIGGER IO' Port ≤ 100pF, trigger mode "OUT"

Common Specification

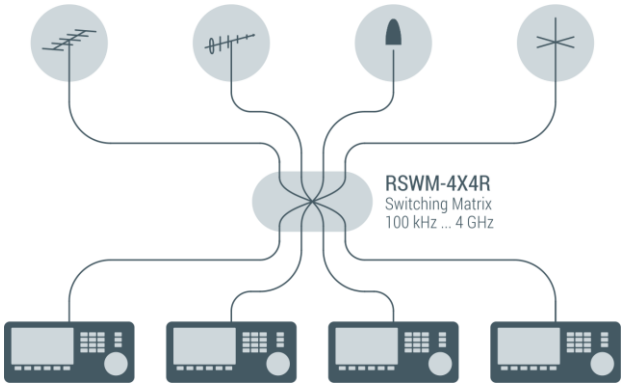
Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
power supply	U_{AC}	90	230	260	V	50 / 60 Hz AC
power consumption	P_{AC}		18		W	
power socket	X_{AC}	IEC-60320 C14				country specific mains cable
remote ports	LAN	10/100 BaseT		TCP/IP		RJ45 on rear side
	USB	2.0 (high speed)				USB type B
Dimensions and weight						
dimensions	W x H x D	approx. 482 x 44 x 265			mm	19” 1 U, without connectors and handles
weight	m		3.4		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), EN55024, 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-4X4R		1205.4102.1			20 MHz…4000 MHz
	RSWM-4X4R		1205.4102.2			100 kHz…4000 MHz

Application Examples

The RSWM-4X4R is suitable for both radio monitoring applications as well as test environments for research and development. Aided by the RSWM-4X4R the customer is able to route input signals to any output of the device. As the illustration shows the input can either be equipped with different signal sources or antennas:



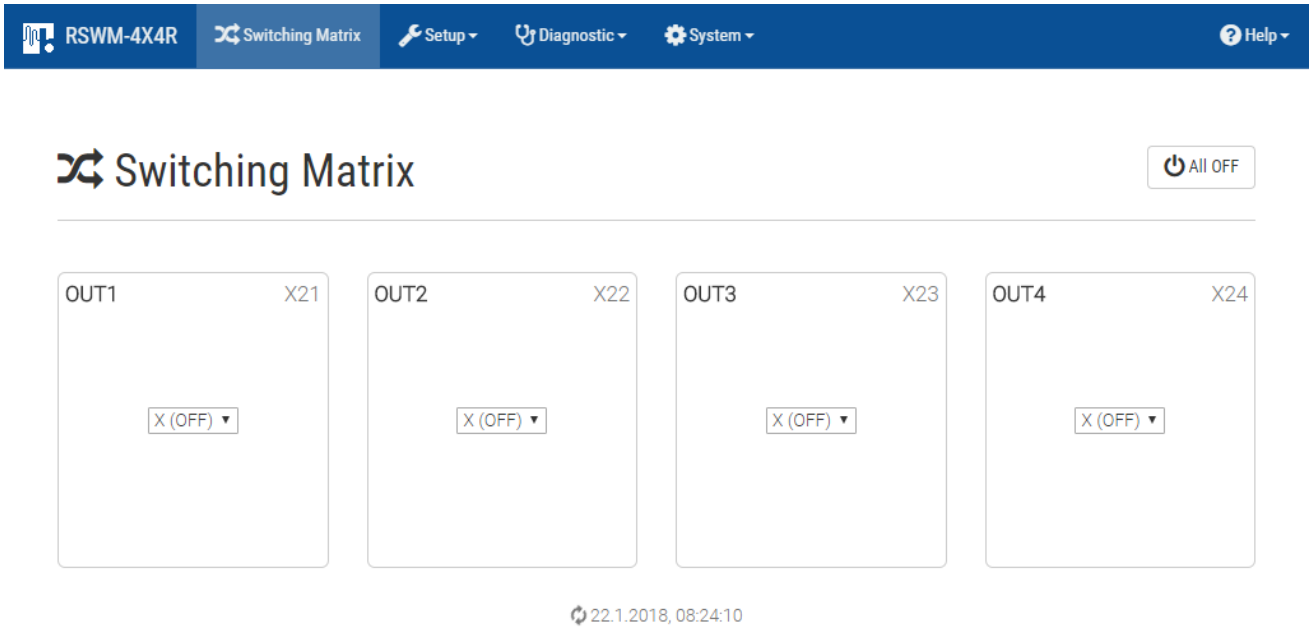
Car Infotainment Test with different GNSS Position Data



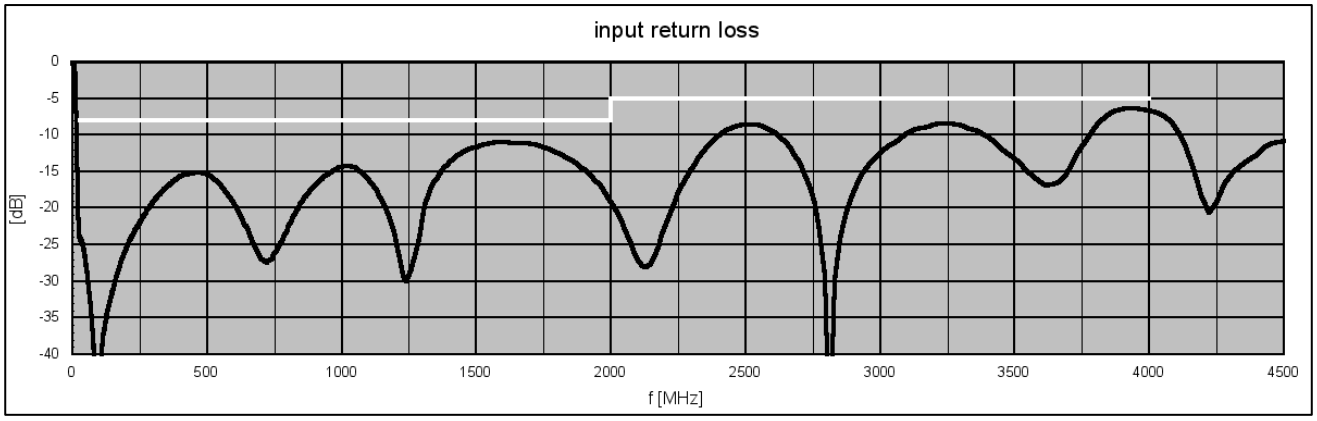
Wideband Radio Monitoring

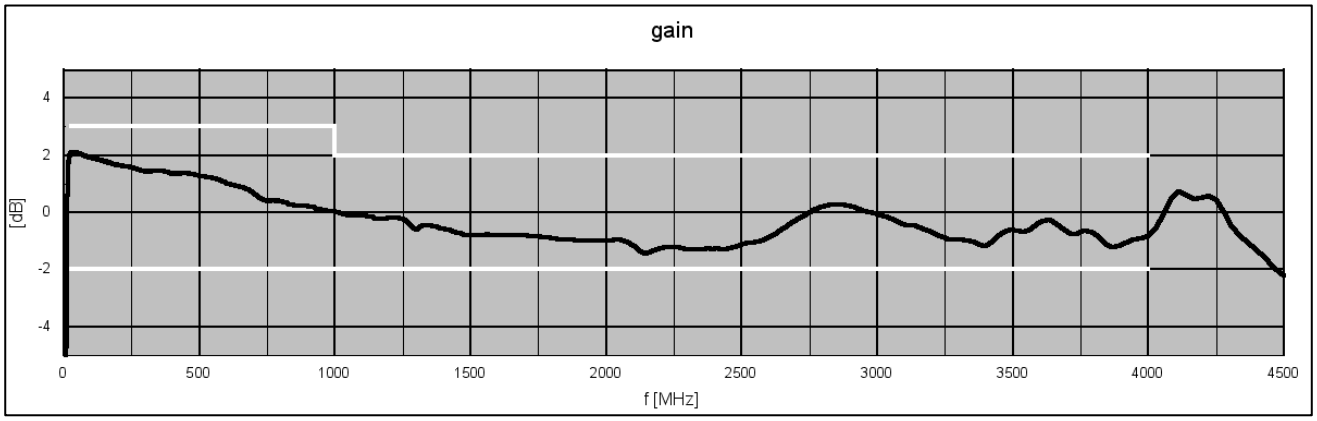
Screenshot of Graphic User Interface

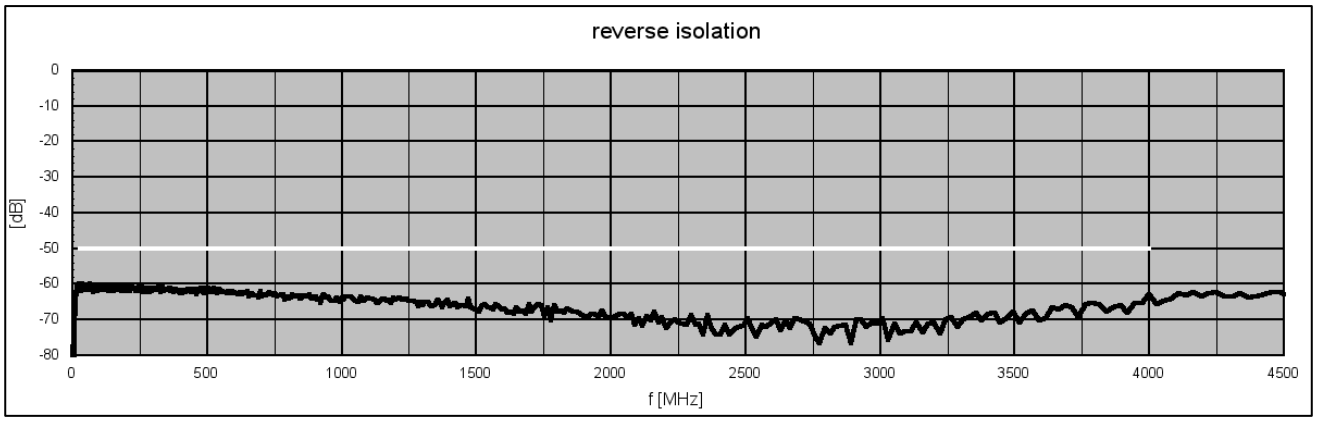
The GUI allows the definition of application-specific labels to make the selection of inputs more meaningful.

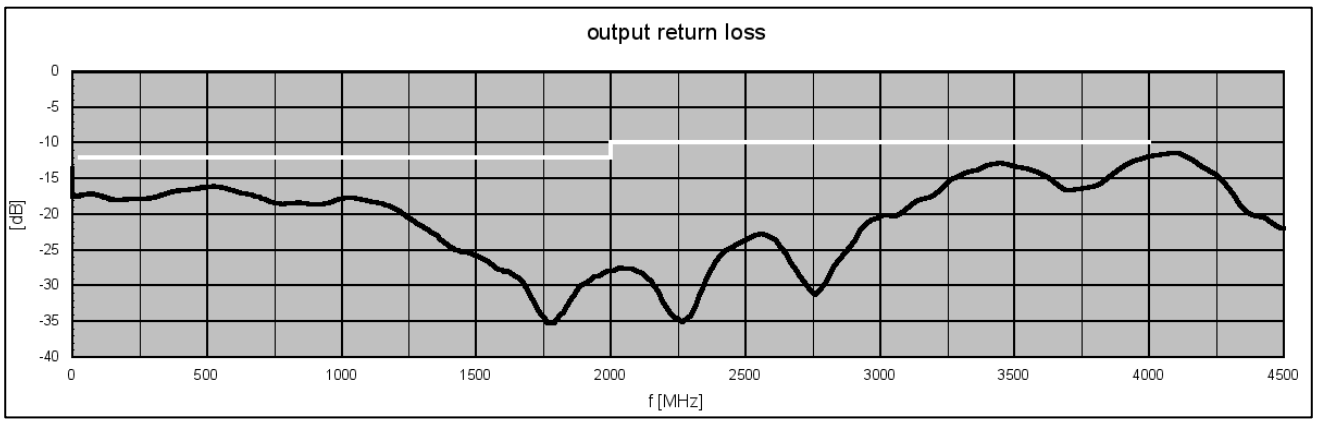


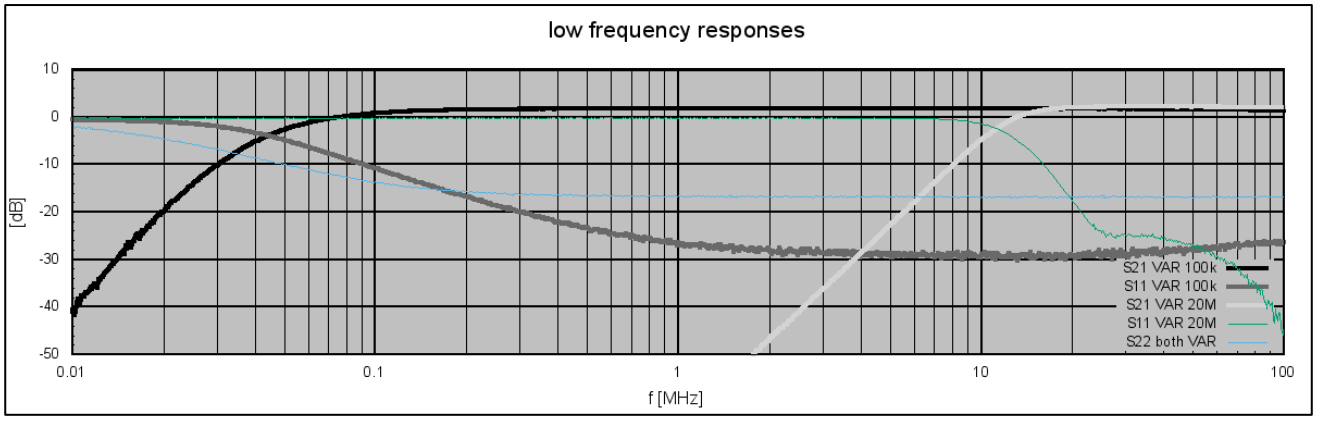
S-Parameters (typical responses)



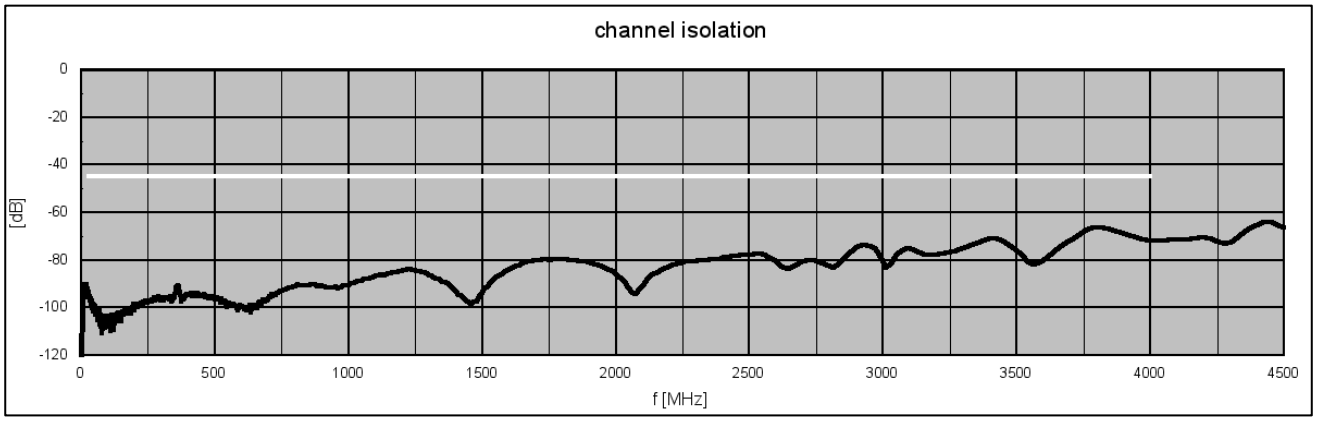


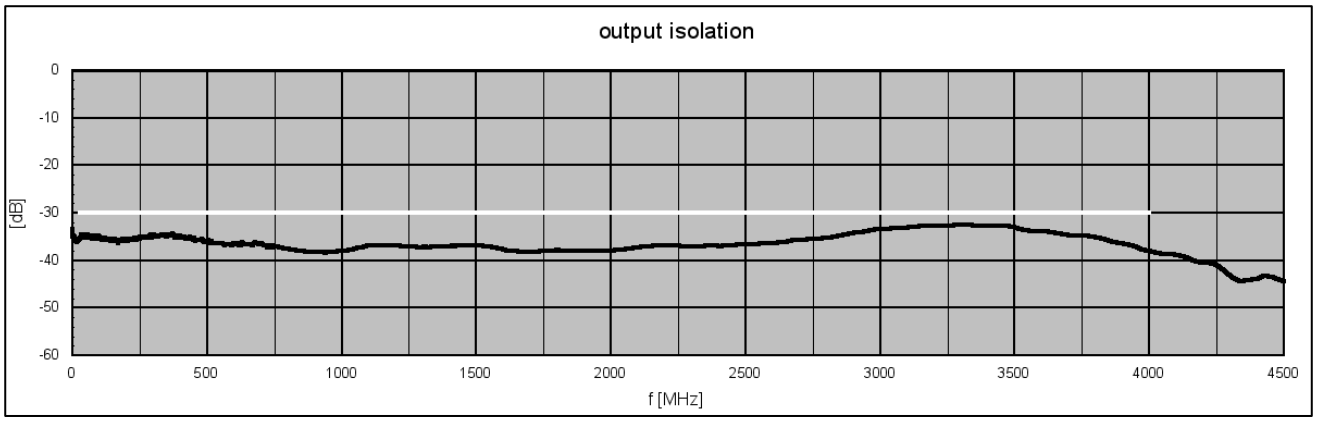




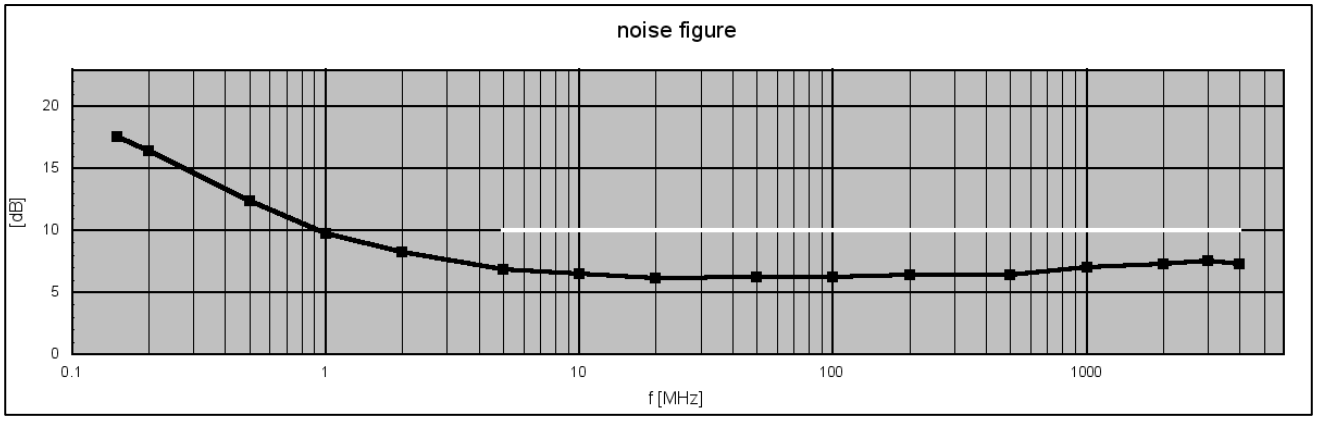


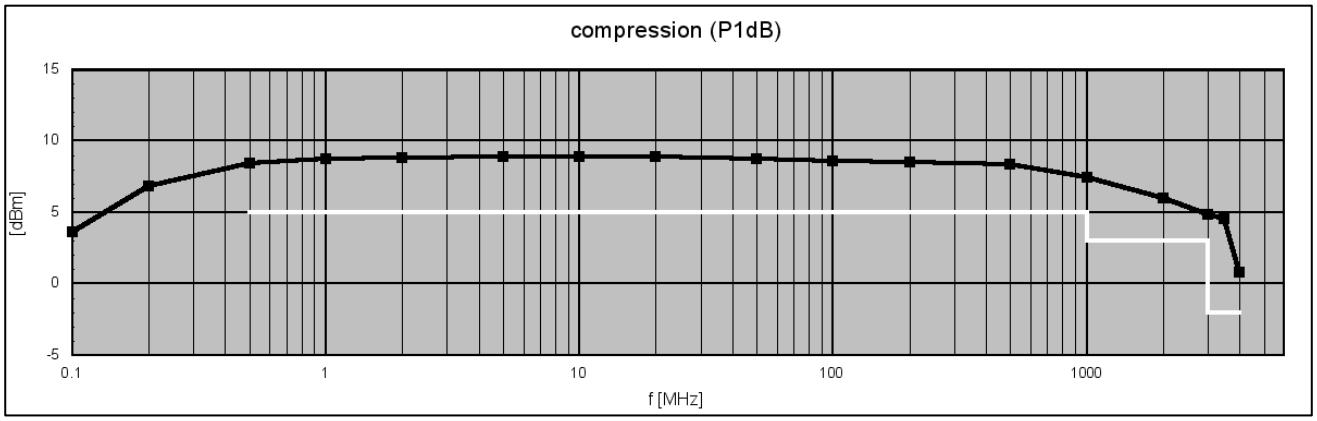
Isolations (typical responses)



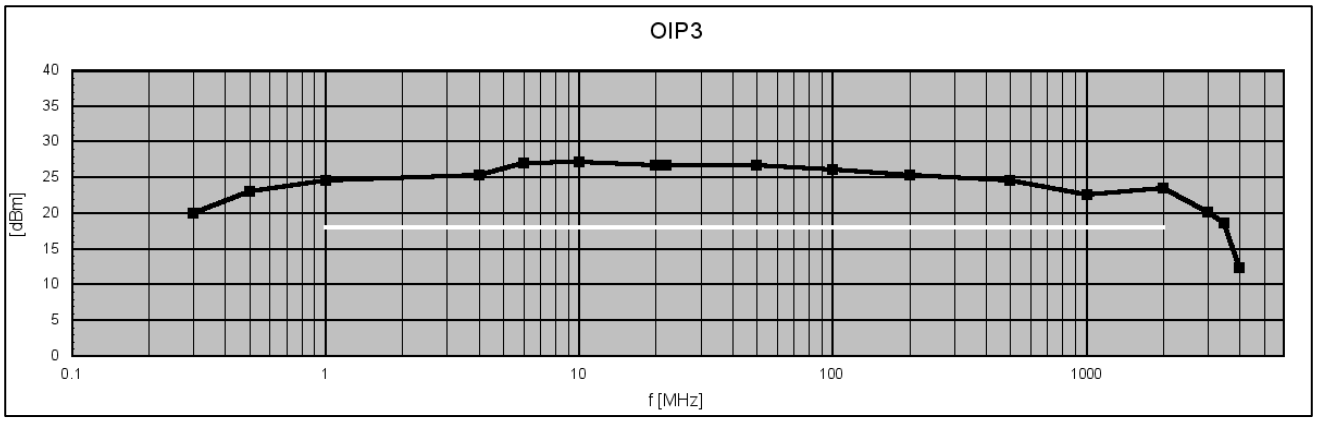


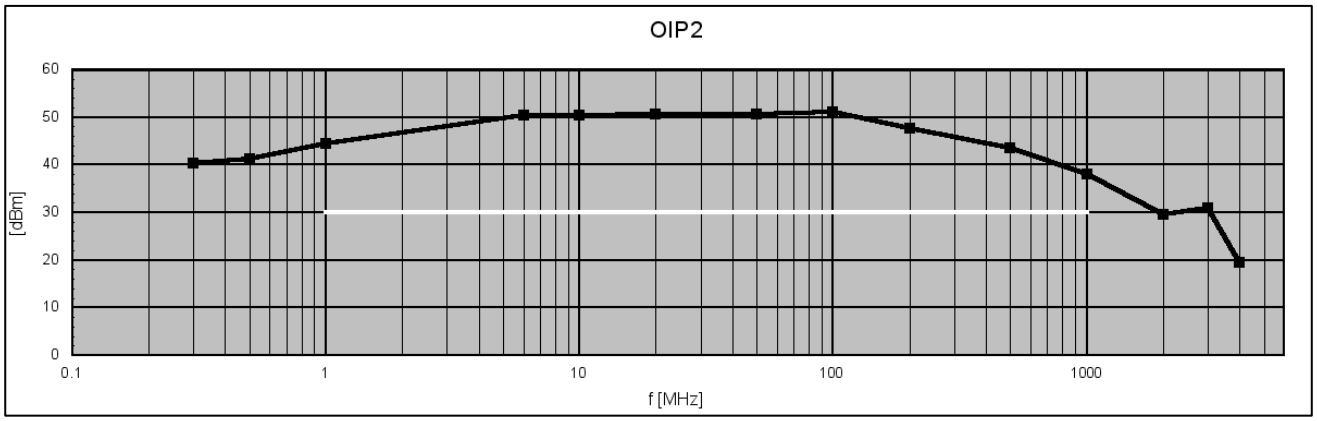
Dynamic Range (typical responses)



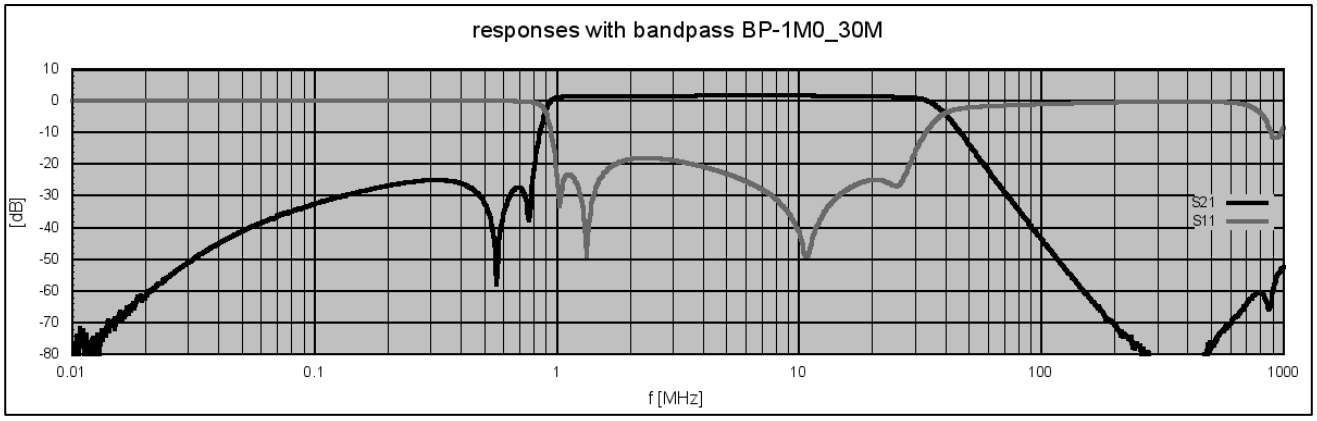


Linearity (typical responses)





S-Parameters with band pass filter for short wave application



Transmission and input return loss with 1 … 30 MHz band pass filter BP-1M0_30M installed in RF input.

Appearance of external mountable filter

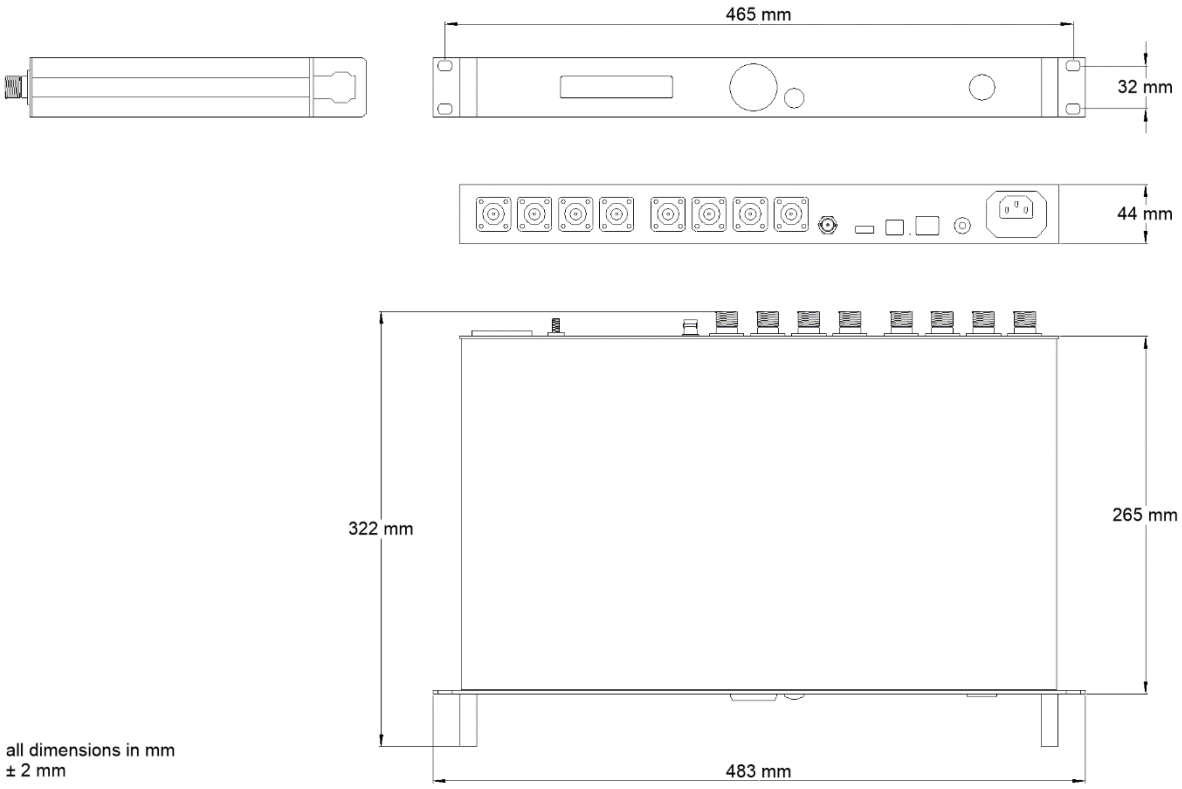
Filters for short wave with different bandwidths are available. See table related products.

Appearances

Front View

Rear View

Dimensions



all dimensions in mm
± 2 mm

Related Products

Product	P/N	Description
RSWM-4X4R	1205.4102.x	Wideband Non-Blocking 4X4 Switching Matrix 2 variants: 100 kHz … 4000 MHz and 20 MHz … 4000 MHz, LAN remote interface with SNMPv2 trap function.
RSWM-4X8R	2005.4302.1	Wideband Non-Blocking 4X8 Switching Matrix 20 MHz … 4000 MHz, LAN remote interface with SNMPv2 trap function.
RSWM-8X8R	2005.4402.1	Wideband Non-Blocking 8X8 Switching Matrix 20 MHz … 4000 MHz, LAN remote interface with SNMPv2 trap function.
RSWM-4X4ER	1205.4202.1	Extremely Wideband Non-Blocking 4X4 Switching Matrix 20 … 8000 MHz, LAN remote interface with SNMPv2 trap function.
RSWM-4X8ER	2005.4502.1	Extremely Wideband Non-Blocking 4X8 Switching Matrix 20 … 8000 MHz, LAN remote interface with SNMPv2 trap function.
RSWM-8X8ER	2005.4602.1	Extremely Wideband Non-Blocking 8X8 Switching Matrix 20 … 8000 MHz, LAN remote interface with SNMPv2 trap function.
BSWM-4X4ER	1205.4502.1	4X4 Bidirectional Blocking Wideband Switching Matrix 100 kHz … 8000 MHz, LAN remote interface with SNMPv2 trap function.
BSWM-4X8ER	2005.4702.1	4X8 Bidirectional Blocking Wideband Switching Matrix 100 kHz … 8000 MHz, LAN remote interface with SNMPv2 trap function.
BSWM-8X8ER	2005.4802.1	8X8 Bidirectional Blocking Wideband Switching Matrix 100 kHz … 8000 MHz, LAN remote interface with SNMPv2 trap function.

Related Accessories (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)
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)