RSWM-4X4ER

Extremely Wideband Non-Blocking 4X4 Switching Matrix 20 MHz … 8000 MHz

Features

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

Applications

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

At a Glance

Modern communication standards like digital broadcast, cellular, Wi-Fi, ISM and Bluetooth permanently grow up to higher frequency ranges with larger system bandwidths. Due to the huge amount of radio signals covered in the wide frequency bandwidth, high demands to the linearity of the matrices are required. Additionally, a low noise figure is very important for a high dynamic range.

The RSWM-4X4ER is an innovative and efficient solution for modern radio monitoring and signal routing systems that must cover the frequency range up to more than 8 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-4X4ER 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.
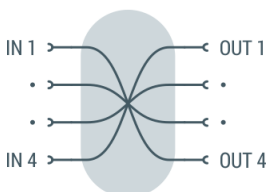
Wear-free Solid State Switches

Inside the RSWM-4X4ER 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-4X4ER 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-4X4ER 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-4X4ER 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.

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}		10	20	MHz	
high frequency	f_{max}	8000	8500		MHz	
gain	S_{21}	0.5	4	7.5	dB	f ≤ 6 GHz
	S_{21}	-1.5	1		dB	f = 8 GHz
input return loss	S_{11}		-15	-9	dB	
output return loss	S_{22}		-13	-10	dB	f ≤ 3 GHz
	S_{22}		-10	-7	dB	f > 3 GHz
1 dB compression	P_{1dB}	+2	+5		dBm	
3rd order intercept	$OIP3^1$	+15	+20		dBm	f ≤ 3 GHz
	$OIP3^1$	+10	+15		dBm	f > 3 GHz
2nd order intercept	$OIP2^2$		+40		dBm	
noise figure	NF		9	11	dB	f < 100 MHz
	NF		8	10	dB	100 MHz ≤ f ≤ 6 GHz
	NF		9	12	dB	f > 6 GHz
channel isolation	S_{21}		-80	-70	dB	f ≤ 3 GHz
	S_{21}		-70	-45	dB	3 GHz < f ≤ 6 GHz
	S_{21}		-60	-45	dB	f > 6 GHz
output isolation	S_{32}		-21	-18	dB	Output 1 to 2 or 3 to 4
	S_{32}		-40		dB	Output 1 or 2 to 3 or 4
input power	P_{IN}		+10		dBm	CW, 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 3
	t_{O_RISE}		1.1		µs	50% trigger → 50% RF rising edge, note 3
switch rise time	t_{RISE}		1		µs	10% → 90% RF
switch fall time	t_{FALL}		2		µs	90% → 10% RF

Note 1: P_{in} = 2 x -10 dBm, specified and tested for Δf = 2 MHz

Note 2: P_{in} = 2 x -10 dBm, Δf = 20 MHz

OIP2 & OIP3 values are the average of the upper and lower intermodulation distortion, in band spurs only

Note 3: capacitive load at 'TRIGGER IO' Port ≤ 100pF, trigger mode "OUT"
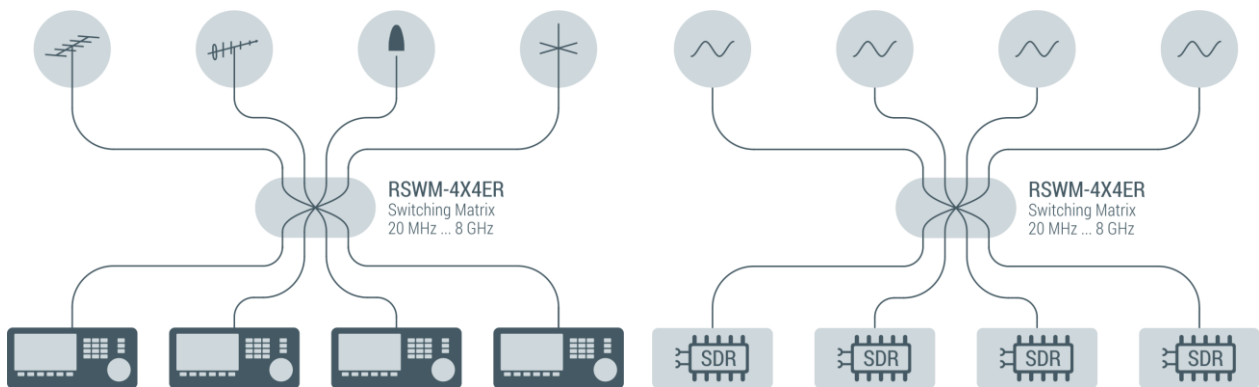
Common Specification

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
power supply		90	230	260	V	50 / 60 Hz AC
power consumption			13		W	
power socket	X_{AC}	IEC-60320 C14				country specific mains cable
Remote interfaces						
	LAN	10/100 BaseT		TCP/IP		RJ45
	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-4X4ER		1205.4202.1			

Application Example

The RSWM-4X4ER is suitable for both radio monitoring applications as well as test environments for research and development. Aided by the RSWM-4X4ER 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:

Extremely Wideband Radio Monitoring

Research and development by usage of Software Defined Radios (SDRs)

Screenshot of Graphic User Interface

The GUI allows the definition of application-specific labels to make the selection of inputs more meaningful.
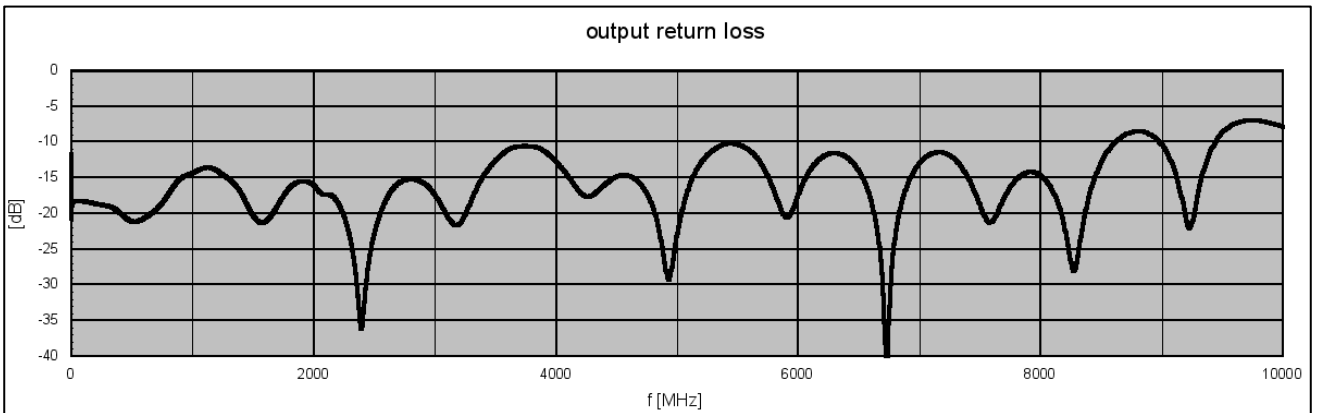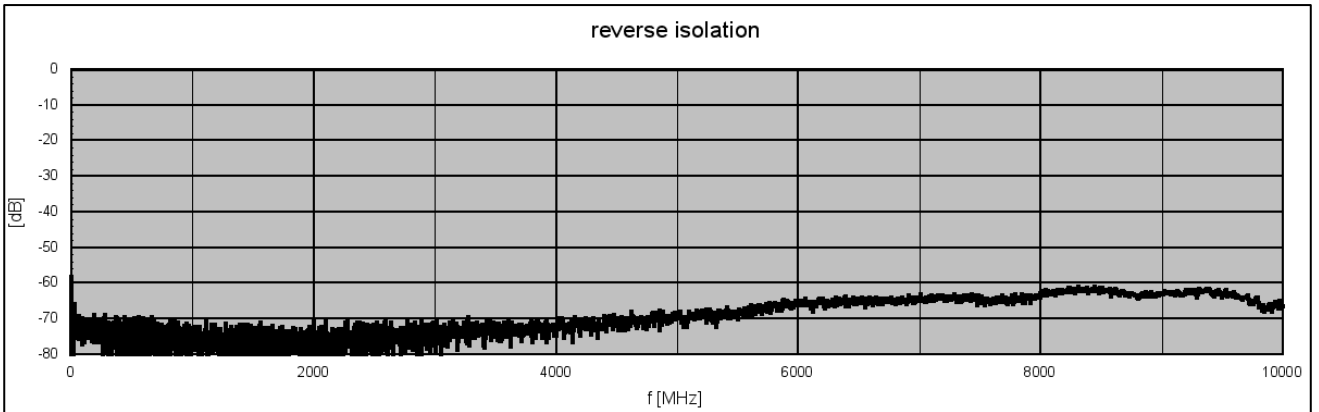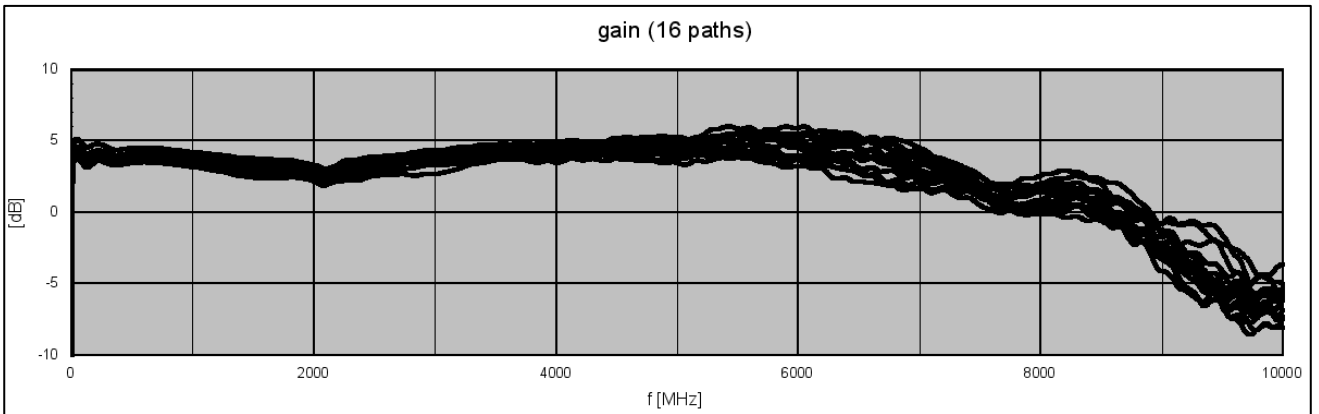
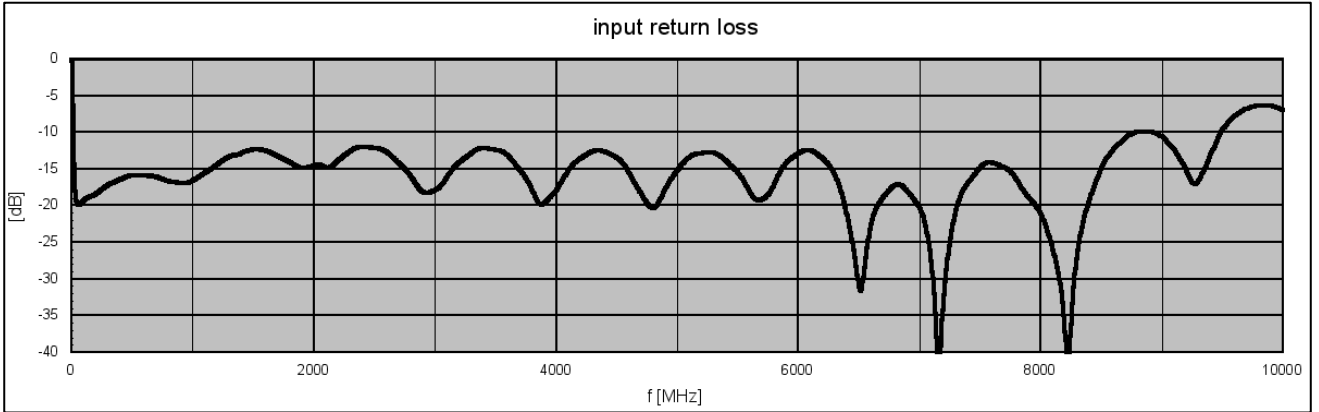| RSWM-4X4ER | ⤬ Switching Matrix | 🔧 Setup ▾ | ⟨⟩ Diagnostic ▾ | ⚙ System ▾ | | ❓ Help ▾ |

⤬ Switching Matrix

⏻ All OFF

OUT1	X21
X (OFF) ▾	

OUT2	X22
X (OFF) ▾	

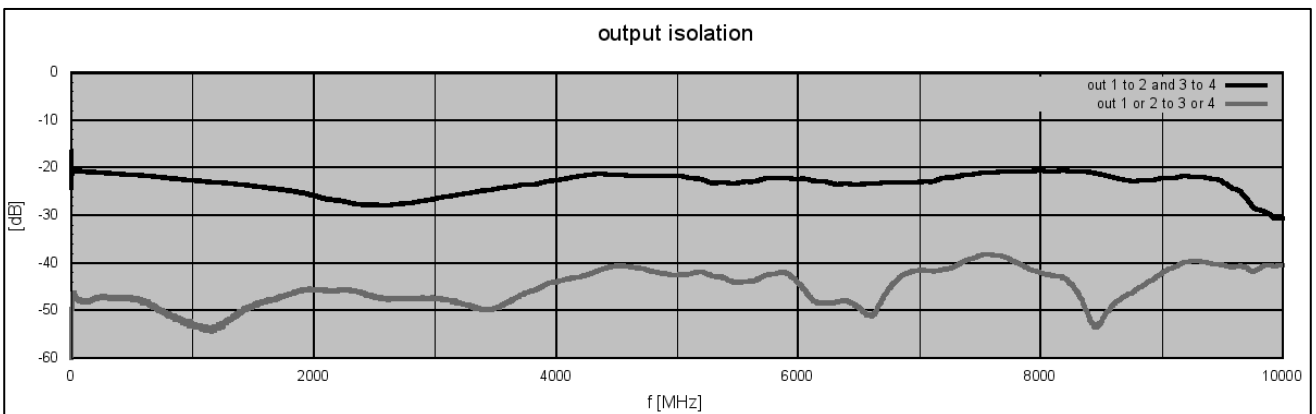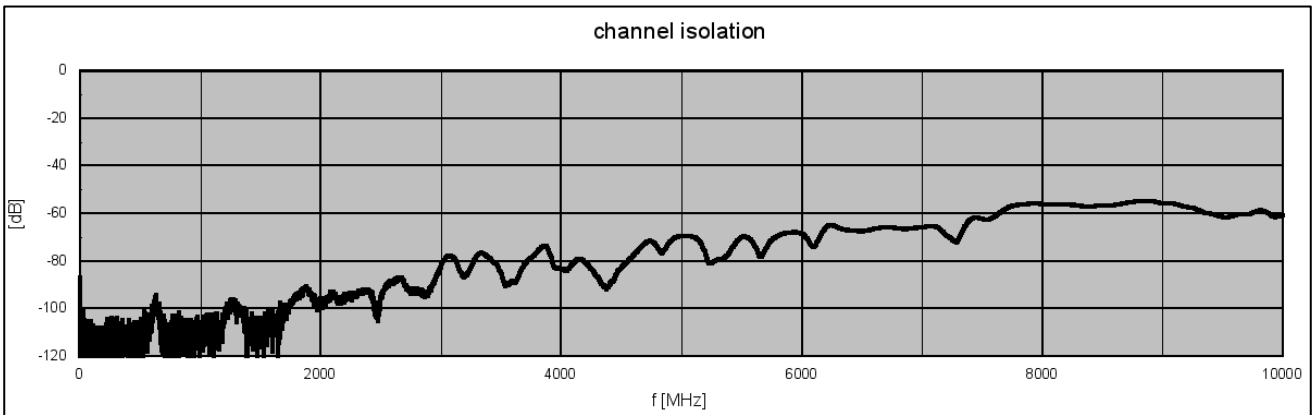| OUT3	X23
X (OFF) ▾	

OUT4	X24
X (OFF) ▾	

↻ 10.2.2020, 11:08:51

S-Parameters (typical responses)

input return loss

gain (16 paths)

reverse isolation

output return loss

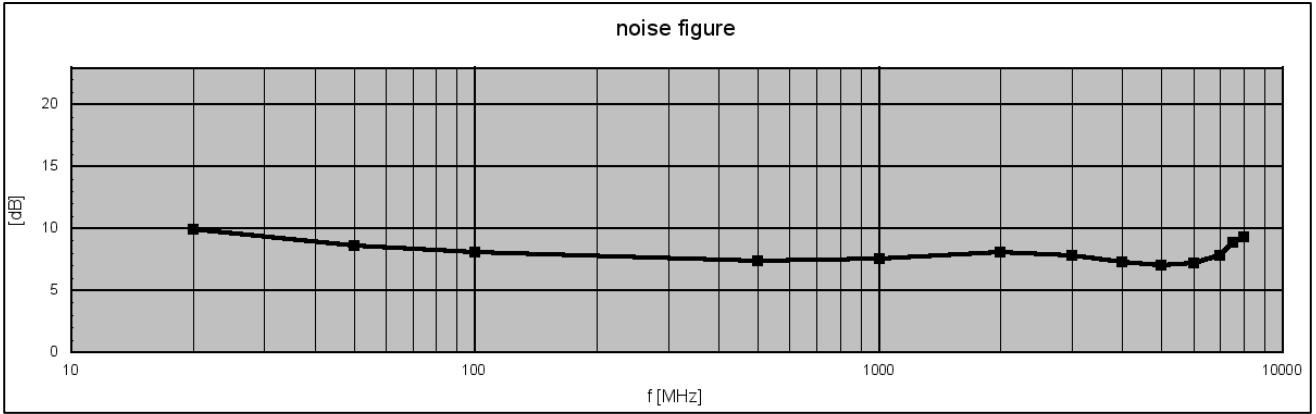## low frequency responses
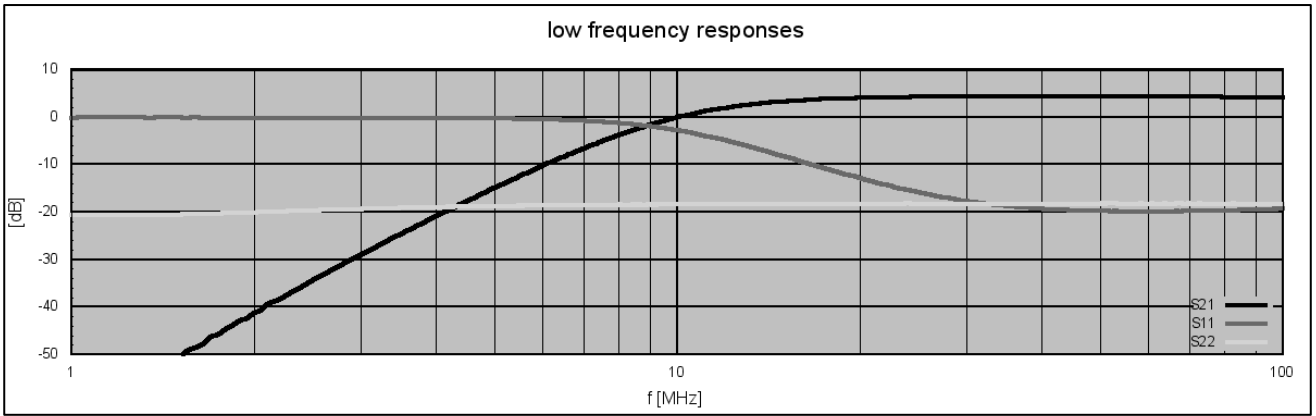
Isolations (typical responses)

channel isolation

output isolation

Dynamic Range (typical responses)

noise figure

compression (P1dB)
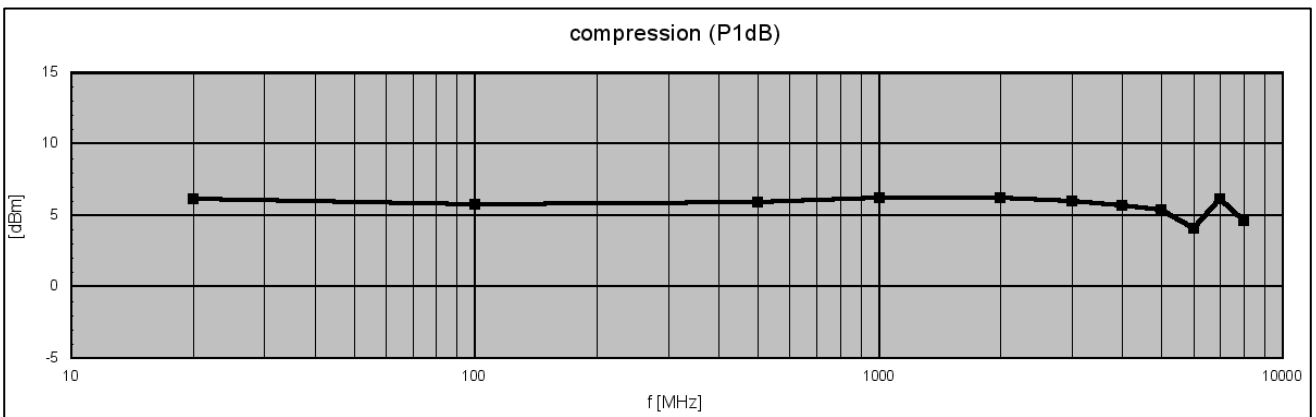
Linearity (typical responses)

OIP3

OIP2

Subject to change in specification and design without notice.
released version 1.02 – august 2021
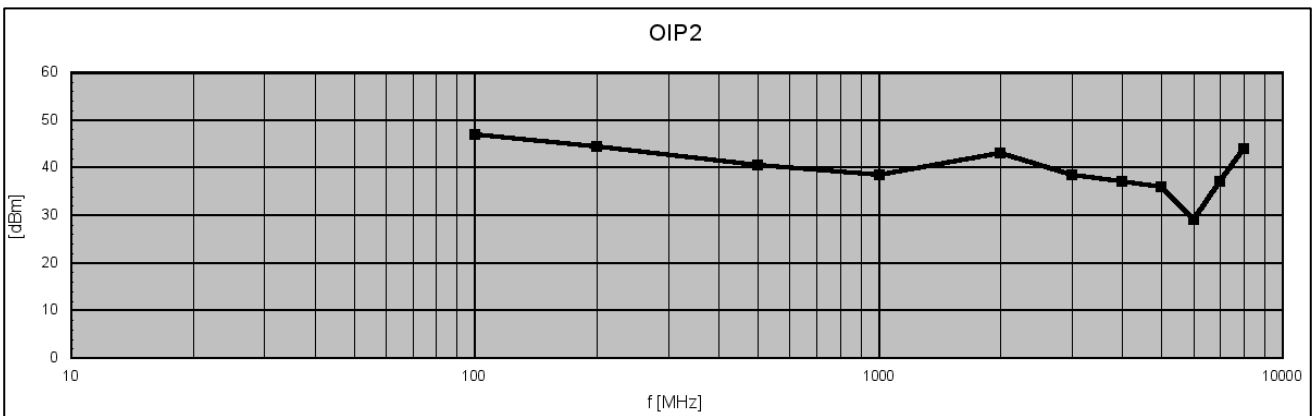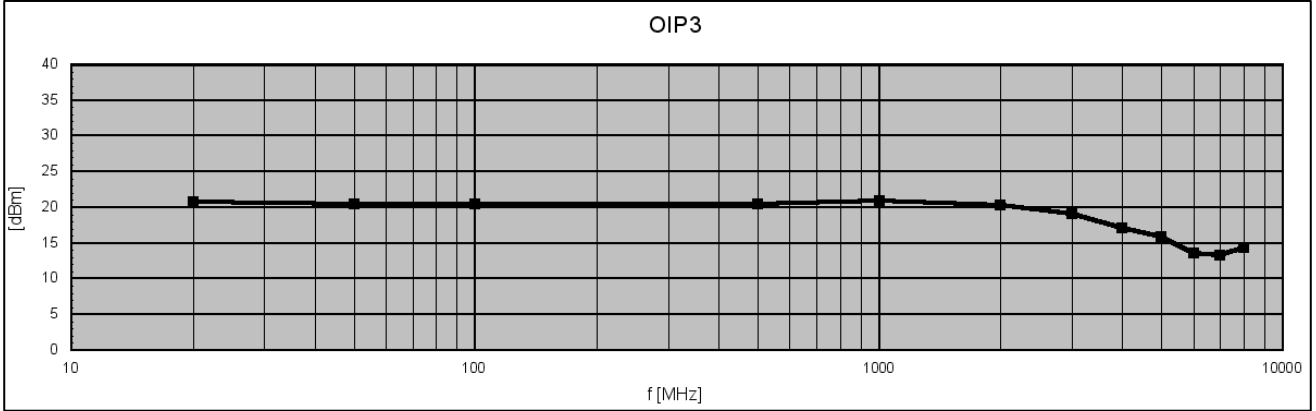
Appearances

Front   **View**

Rear   **View**

Dimensions

465 mm

32 mm

44 mm

322 mm

265 mm

483 mm
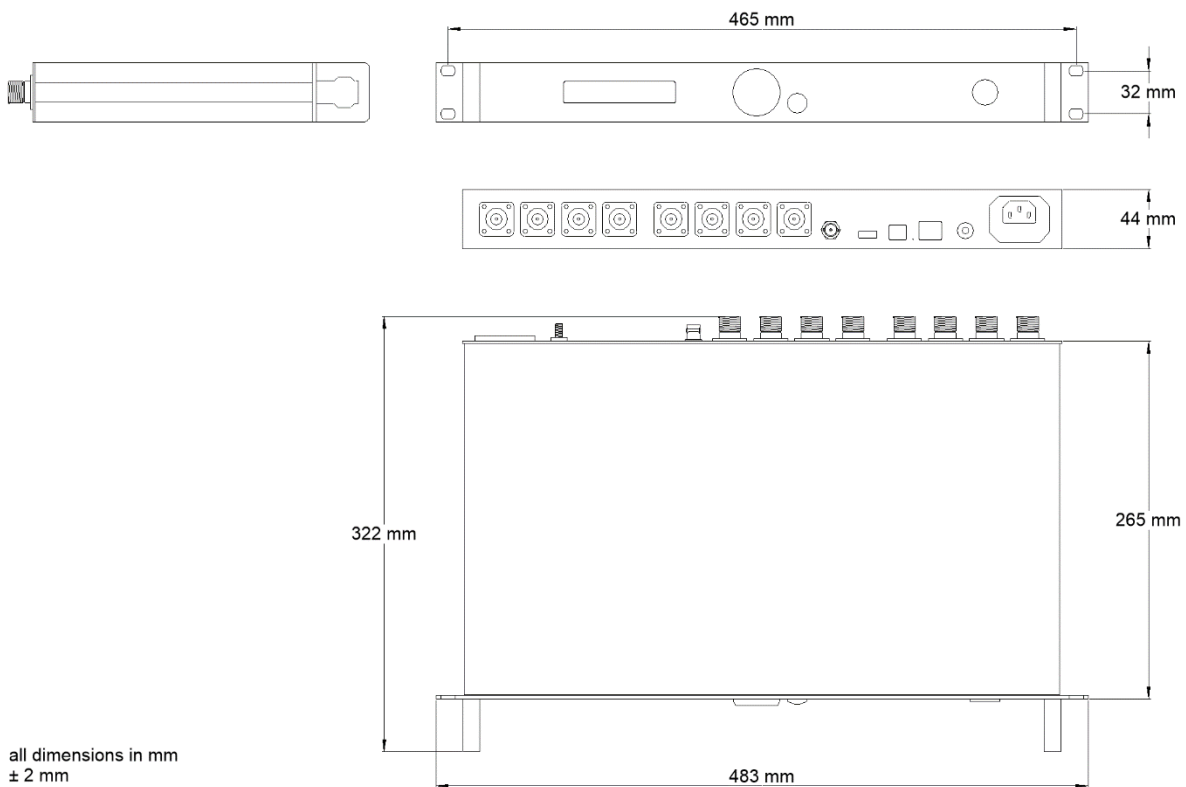
all dimensions in mm
± 2 mm

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	2103.4302.1	Wideband Non-Blocking 4X8 Switching Matrix 20 MHz … 4000 MHz, LAN remote interface with SNMPv2 trap function.
RSWM-8X8R	2103.4502.1	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	2103.4402.1	Extremely Wideband Non-Blocking 4X8 Switching Matrix 20 … 8000 MHz, LAN remote interface with SNMPv2 trap function.
RSWM-8X8ER	2103.4602.1	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	2103.4702.1	4X8 Bidirectional Blocking Wideband Switching Matrix 100 kHz … 8000 MHz, LAN remote interface with SNMPv2 trap function.
BSWM-8X8ER	2103.4802.1	8X8 Bidirectional Blocking Wideband Switching Matrix 100 kHz … 8000 MHz, LAN remote interface with SNMPv2 trap function.